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Paul Evenson

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Calculation of Multiple Regression with Three Independent Variables Using a Programmable Pocket Calculator

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Agricultural Experiment Station
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Brookings, South Dakota

Calculation of Multiple Regression with Three Independent Variables Using a Programable Pocket Calculator

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Multiple regression is used to develop equations that describe relationships among several variables.

This paper describes a multiple regression program for an equation with one dependent and three independent variables, which was written for a Hewlett-Packard 97 programable "pocket" calculator.

Once each variable is entered, the program calculates sums, sums of squares, sums of cross-products and means of all variables, as well as the number of entries. It also computes the deter-

minant of the matrix, elements of the inverted matrix, and regression coefficients. The intercept is calculated after means of all variables are re-entered, and a predicted value for the dependent variable can be determined for any set of independent variables.

The multiple regression equation with three independent variables has the form $\hat{Y} = a + b_1X_1 + b_2X_2 + b_3X_3$ where a is the intercept; b_1 , b_2 , and b_3 are regression coefficients; Y is the dependent variable; and X_1 , X_2 , and X_3 are independent variables.

Calculation of Regression Coefficients

The normal equations for this multiple regression are:

$$x_1 : \Sigma x_1^2 b_1 + \Sigma x_1 x_2 b_2 + \Sigma x_1 x_3 b_3 = \Sigma x_1 y$$

$$x_2 : \Sigma x_1 x_2 b_1 + \Sigma x_2^2 b_2 + \Sigma x_2 x_3 b_3 = \Sigma x_2 y$$

$$x_3 : \Sigma x_1 x_3 b_1 + \Sigma x_2 x_3 b_2 + \Sigma x_3^2 b_3 = \Sigma x_3 y$$

where

$$\Sigma x_i^2 = \Sigma X_i^2 - \frac{(\Sigma X_i)^2}{n}$$

$$\Sigma x_i y = \Sigma X_i Y - \frac{(\Sigma X_i)(\Sigma Y)}{n}$$

$$\Sigma x_i x_j = \Sigma X_i X_j - \frac{(\Sigma X_i)(\Sigma X_j)}{n}$$

n = number of entries

The following matrices are used to solve this set of equations.

$$A = \begin{bmatrix} \Sigma x_1^2 & \Sigma x_1 x_2 & \Sigma x_1 x_3 \\ \Sigma x_1 x_2 & \Sigma x_2^2 & \Sigma x_2 x_3 \\ \Sigma x_1 x_3 & \Sigma x_2 x_3 & \Sigma x_3^2 \end{bmatrix}, B = \begin{bmatrix} b_1 \\ b_2 \\ b_3 \end{bmatrix}, \text{ and } C = \begin{bmatrix} \Sigma x_1 y \\ \Sigma x_2 y \\ \Sigma x_3 y \end{bmatrix}$$

where

$$A \cdot B = C$$

To solve for B, multiply both sides of the equation by the inverse of A, A^{-1} .

$$A^{-1} \cdot A \cdot B = C \cdot A^{-1}$$

Since $A^{-1} \cdot A = I$, the identity matrix, then

$$I \cdot B = C \cdot A^{-1} \text{ or } B = C \cdot A^{-1}$$

$$A^{-1} \cdot C = \begin{bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{bmatrix} \begin{bmatrix} \Sigma x_1 y \\ \Sigma x_2 y \\ \Sigma x_3 y \end{bmatrix} = B = \begin{bmatrix} b_1 \\ b_2 \\ b_3 \end{bmatrix}$$

where a_{ij} 's are elements of A^{-1} .

$|A|$ is the determinant of A and is used in calculating A^{-1} .

Calculation of the Intercept

$$\text{The intercept } a = \bar{y} - b_1 \bar{x}_1 - b_2 \bar{x}_2 - b_3 \bar{x}_3$$

where

$$\bar{y} = \frac{\Sigma Y}{n} \text{ and } \bar{x}_i = \frac{\Sigma X_i}{n}$$

User Instructions

1

Multiple Regression (Card 1)

A & C

X_1, X_2, X_3, Y Matrices |A|

2

STEP	INSTRUCTIONS	INPUT DATA/UNITS	KEYS	OUTPUT DATA/UNITS
1.	Enter card 1		<input type="text"/> <input type="text"/>	
2.	Do 3 - 6 for each entry		<input type="text"/> <input type="text"/>	
3.	Enter X_1	X_1	<input type="text"/> ↑ <input type="text"/>	X_1
4.	Enter X_2	X_2	<input type="text"/> ↑ <input type="text"/>	X_2
5.	Enter X_3	X_3	<input type="text"/> ↑ <input type="text"/>	X_3
6.	Enter Y and compute sums, sum of squares, and sum of cross-products	Y	<input type="text"/> A <input type="text"/>	Y
7.	Calculate statistics for A & C matrices		<input type="text"/> B <input type="text"/>	ΣX_1 0
			<input type="text"/> <input type="text"/>	ΣX_2 1
			<input type="text"/> <input type="text"/>	ΣX_3 2
			<input type="text"/> <input type="text"/>	ΣY 3
			<input type="text"/> <input type="text"/>	ΣX_1^2 4
			<input type="text"/> <input type="text"/>	ΣX_2^2 5
			<input type="text"/> <input type="text"/>	ΣX_3^2 6
			<input type="text"/> <input type="text"/>	ΣY^2 7
			<input type="text"/> <input type="text"/>	-- 8
			<input type="text"/> <input type="text"/>	n 9
			<input type="text"/> <input type="text"/>	-- A
			<input type="text"/> <input type="text"/>	X_1 B
			<input type="text"/> <input type="text"/>	X_2 C
			<input type="text"/> <input type="text"/>	X_3 D
			<input type="text"/> <input type="text"/>	Y E
			<input type="text"/> <input type="text"/>	-- I
			<input type="text"/> <input type="text"/>	
			<input type="text"/> <input type="text"/>	$\Sigma X_1 X_2$ 0
			<input type="text"/> <input type="text"/>	$\Sigma X_1 X_3$ 1
			<input type="text"/> <input type="text"/>	$\Sigma X_1 Y$ 2
			<input type="text"/> <input type="text"/>	$\Sigma X_2 X_3$ 3
			<input type="text"/> <input type="text"/>	$\Sigma X_2 Y$ 4
			<input type="text"/> <input type="text"/>	$\Sigma X_3 Y$ 5
			<input type="text"/> <input type="text"/>	-- 6
			<input type="text"/> <input type="text"/>	-- 7
			<input type="text"/> <input type="text"/>	-- 8
			<input type="text"/> <input type="text"/>	-- 9
			<input type="text"/> <input type="text"/>	-- A
			<input type="text"/> <input type="text"/>	X_1 B
			<input type="text"/> <input type="text"/>	X_2 C
			<input type="text"/> <input type="text"/>	X_3 D
			<input type="text"/> <input type="text"/>	Y E
			<input type="text"/> <input type="text"/>	-- I

(continued)

continued

STEP	INSTRUCTIONS	INPUT DATA/UNITS	KEYS		OUTPUT DATA/UNITS
			<input type="text"/>	<input type="text"/>	$\Sigma x_1 x_2$ 0
			<input type="text"/>	<input type="text"/>	$\Sigma x_1 x_3$ 1
			<input type="text"/>	<input type="text"/>	$\Sigma x_1 y$ 2
			<input type="text"/>	<input type="text"/>	$\Sigma x_2 x_3$ 3
			<input type="text"/>	<input type="text"/>	$\Sigma x_2 y$ 4
			<input type="text"/>	<input type="text"/>	$\Sigma x_3 y$ 5
			<input type="text"/>	<input type="text"/>	Σx_1^2 6
			<input type="text"/>	<input type="text"/>	Σx_2^2 7
			<input type="text"/>	<input type="text"/>	Σx_3^2 8
			<input type="text"/>	<input type="text"/>	Σy^2 9
			<input type="text"/>	<input type="text"/>	-- A
			<input type="text"/>	<input type="text"/>	X_1 B
			<input type="text"/>	<input type="text"/>	X_2 C
			<input type="text"/>	<input type="text"/>	X_3 D
			<input type="text"/>	<input type="text"/>	Y E
			<input type="text"/>	<input type="text"/>	-- I
			<input type="text"/>	<input type="text"/>	
			<input type="text"/>	<input type="text"/>	ΣX_1 0
			<input type="text"/>	<input type="text"/>	ΣX_2 1
			<input type="text"/>	<input type="text"/>	ΣX_3 2
			<input type="text"/>	<input type="text"/>	ΣY 3
			<input type="text"/>	<input type="text"/>	\bar{x}_1 4
			<input type="text"/>	<input type="text"/>	\bar{x}_2 5
			<input type="text"/>	<input type="text"/>	\bar{x}_3 6
			<input type="text"/>	<input type="text"/>	y 7
			<input type="text"/>	<input type="text"/>	-- 8
			<input type="text"/>	<input type="text"/>	n 9
			<input type="text"/>	<input type="text"/>	-- A
			<input type="text"/>	<input type="text"/>	X_1 B
			<input type="text"/>	<input type="text"/>	X_2 C
			<input type="text"/>	<input type="text"/>	X_3 D
			<input type="text"/>	<input type="text"/>	Y E
			<input type="text"/>	<input type="text"/>	-- I
8.	Calculate determinant $ A $		C	<input type="text"/>	$ A $
			<input type="text"/>	<input type="text"/>	
			<input type="text"/>	<input type="text"/>	
			<input type="text"/>	<input type="text"/>	
			<input type="text"/>	<input type="text"/>	
			<input type="text"/>	<input type="text"/>	

User Instructions



STEP	INSTRUCTIONS	INPUT DATA/UNITS	KEYS	OUTPUT DATA/UNITS
9.	Enter Card 2		<input type="text"/> <input type="text"/>	
10.	Calculate elements of A^{-1}		A <input type="text"/>	a_{11} 0
			<input type="text"/> <input type="text"/>	a_{12} 1
			<input type="text"/> <input type="text"/>	a_{13} 2
			<input type="text"/> <input type="text"/>	a_{21} 3
			<input type="text"/> <input type="text"/>	a_{22} 4
			<input type="text"/> <input type="text"/>	a_{23} 5
			<input type="text"/> <input type="text"/>	a_{31} 6
			<input type="text"/> <input type="text"/>	a_{32} 7
			<input type="text"/> <input type="text"/>	a_{33} 8
			<input type="text"/> <input type="text"/>	n 9
			<input type="text"/> <input type="text"/>	-- A
			<input type="text"/> <input type="text"/>	X_1 B
			<input type="text"/> <input type="text"/>	X_2 C
			<input type="text"/> <input type="text"/>	X_3 D
			<input type="text"/> <input type="text"/>	Y E
			<input type="text"/> <input type="text"/>	A I
11.	Calculate regression coefficients and store in R_0' , R_1' , and R_2' , respectively.		B <input type="text"/>	-- T
			<input type="text"/> <input type="text"/>	b_3 Z
			<input type="text"/> <input type="text"/>	b_2 Y
			<input type="text"/> <input type="text"/>	b_1 X
12.	Re-enter \bar{x}_1	\bar{x}_1	f a <input type="text"/>	\bar{x}_1
13.	Re-enter \bar{x}_2	\bar{x}_2	R/S <input type="text"/>	\bar{x}_2
14.	Re-enter \bar{x}_3	\bar{x}_3	R/S <input type="text"/>	\bar{x}_3
15.	Re-enter \bar{y}	\bar{y}	R/S <input type="text"/>	\bar{y}
16.	Calculate intercept		f b <input type="text"/>	a
17.	Calculate \hat{Y}		<input type="text"/> <input type="text"/>	
	Enter X_1	X_1	<input type="text"/> <input type="text"/>	
	Enter X_2	X_2	<input type="text"/> <input type="text"/>	
	Enter X_3	X_3	f c <input type="text"/>	\hat{Y}

Example

Entry #	X_1	X_2	X_3	Y
1	0.94	4.22	1.58	8.23
2	1.13	3.48	1.28	8.26
3	0.61	2.20	0.64	9.33
4	1.17	2.20	0.08	8.92
5	0.93	2.25	0.38	8.89
6	1.94	2.45	1.45	8.34
7	2.12	2.62	2.31	8.51
8	1.03	2.97	3.60	9.15
9	0.67	2.90	2.59	9.40
10	0.78	2.64	1.62	9.01
11	1.10	2.64	3.16	8.77
12	1.78	2.39	0.23	8.11
13	1.54	2.76	0.76	8.00
14	1.77	2.23	1.42	8.68
15	2.22	3.35	1.86	8.11

<u>Operation</u>	<u>Output</u>
1. Enter Card I _____	0.00 ***
2. .94 (↑) _____	0.94 Ent ↑
3. 4.22 (↑) _____	4.22 Ent ↑
4. 1.58 (↑) _____	1.58 Ent ↑
5. 8.23 (A) _____	8.23 GSBA
6. 1.13 (↑) _____	1.13 Ent ↑
7. 3.48 (↑) _____	3.48 Ent ↑
8. 1.28 (↑) _____	1.28 Ent ↑
9. 8.26 (A) _____	8.26 GSBA
:	:
:	:
:	:

57.	2.22	↑	2.22	Ent	↑
58.	3.35	↑	3.35	Ent	↑
59.	1.86	↑	1.86	Ent	↑
60.	8.11	A	8.11	GSBA	
61.		B		GSBB	

ΣX_1	19.73	0
ΣX_2	41.30	1
ΣX_3	22.96	2
ΣY	129.71	3
ΣX_1^2	29.95	4
ΣX_2^2	118.22	5
ΣX_3^2	50.52	6
ΣY^2	1124.65	7
	0.00	8
n	15.00	9
	0.00	A
used	2.22	B
used	3.35	C
used	1.86	D
used	8.11	E
	0.00	I
$\Sigma X_1 X_2$	54.07	0
$\Sigma X_1 X_3$	29.88	1
$\Sigma X_1 Y$	168.21	2
$\Sigma X_2 X_3$	66.03	3
$\Sigma X_2 Y$	355.72	4
$\Sigma X_3 Y$	200.34	5
	0.00	6
	0.00	7
	0.00	8
	0.00	9
	0.00	A
used	2.22	B
used	3.35	C
used	1.86	D
used	8.11	E
	0.00	I

$\Sigma x_1 x_2$	-0.25	0
$\Sigma x_1 x_3$	-0.32	1
$\Sigma x_1 y$	-2.40	2
$\Sigma x_2 x_3$	2.82	3
$\Sigma x_2 y$	-1.42	4
$\Sigma x_3 y$	1.80	5
Σx_1^2	4.00	6
Σx_2^2	4.51	7
Σx_3^2	15.37	8
Σy^2	3.00	9
	0.00	A
used	2.22	B
used	3.35	C
used	1.86	D
used	8.11	E
	0.00	I
ΣX_1	19.73	0
ΣX_2	41.30	1
ΣX_3	22.96	2
ΣY	129.71	3
\bar{x}_1	1.32	4
\bar{x}_2	2.75	5
\bar{x}_3	1.53	6
\bar{y}	8.65	7
	0.00	8
n	15.00	9
	0.00	A
used	2.22	B
used	3.35	C
used	1.86	D
used	8.11	E
	0.00	I

62.

C

GSBC

|A|

244.83 ***

63. Enter Card 2

64.	A			GSBA
		a_{11} of A^{-1}	0.25	0
		a_{12} of A^{-1}	0.01	1
		a_{13} of A^{-1}	2.890104573-03	2
		a_{21} of A^{-1}	0.01	3
		a_{22} of A^{-1}	0.25	4
		a_{23} of A^{-1}	-0.05	5
		a_{31} of A^{-1}	2.890104573-03	6
		a_{32} of A^{-1}	-0.05	7
		a_{33} of A^{-1}	0.07	8
		n	15.00	9
			0.00	A
		used	2.22	B
		used	3.35	C
		used	1.86	D
		used	8.11	E
		A	244.83	I

65.	B			GSBB
			used	-0.01 T
			b_3	0.19 Z
			b_2	-0.47 Y
			b_1	-0.62 X
66.	1.32	f a	\bar{x}_1	1.32 GSBA
67.	2.75	R/S	\bar{x}_2	2.75 R/S
68.	1.53	R/S	\bar{x}_3	1.53 R/S
69.	8.65	R/S	\bar{y}	8.65 R/S
70.	f b			GSBb
			a	10.46 ***
71.	1.00	↑	X_1	1.00 Ent ↑
72.	3.00	↑	X_2	3.00 Ent ↑
73.	1.50	f c	X_3	1.50 GSBe
			\hat{Y}	8.72 ***

Therefore, $\hat{Y} = 10.46 - 0.62 X_1 - 0.47 X_2 + 0.19 X_3$
 When $X_1 = 1.00$, $X_2 = 3.00$, and $X_3 = 1.50$; $\hat{Y} = 8.72$

Program - Card 1

001	*LBLA	21 11	061	RCL4	36 04	121	RCL2	36 02	181	RCL1	36 01
002	STOE	35 15	062	RCL0	36 00	122	RCL9	36 09	182	x	-35
003	R↓	-31	063	RCL9	36 09	123	÷	-24	183	x	-35
004	STOD	35 14	064	÷	-24	124	x	-35	184	2	02
005	R↓	-31	065	STO4	35 04	125	-	-45	185	x	-35
006	STOC	35 13	066	X ²	53	126	P ² S	16-51	186	+	-55
007	R↓	-31	067	RCL9	36 09	127	STO1	35 01	187	RCL1	36 01
008	STOB	35 12	068	x	-35	128	RCL2	36 02	188	X ²	53
009	ST+0	35-55 00	069	-	-45	129	P ² S	16-51	189	RCL7	36 07
010	X ²	53	070	P ² S	16-51	130	RCL0	36 00	190	x	-35
011	ST+4	35-55 04	071	STO6	35 06	131	RCL3	36 03	191	-	-45
012	R↑	16-31	072	P ² S	16-51	132	RCL9	36 09	192	RCL0	36 00
013	ST+1	35-55 01	073	RCL5	36 05	133	÷	-24	193	X ²	53
014	X ²	53	074	RCL1	36 01	134	x	-35	194	RCL8	36 08
015	ST+5	35-55 05	075	RCL9	36 09	135	-	-45	195	x	-35
016	R↑	16-31	076	÷	-24	136	P ² S	16-51	196	-	-45
017	ST+2	35-55 02	077	STO5	35 05	137	STO2	35 02	197	RCL3	36 03
018	X ²	53	078	X ²	53	138	RCL3	36 03	198	X ²	53
019	ST+6	35-55 06	079	RCL9	36 09	139	P ² S	16-51	199	RCL6	36 06
020	R↑	16-31	080	x	-35	140	RCL1	36 01	200	x	-35
021	ST+3	35-55 03	081	-	-45	141	RCL2	36 02	201	-	-45
022	X ²	53	082	P ² S	16-51	142	RCL9	36 09	202	STO1	35 46
023	ST+7	35-55 07	083	STO7	35 07	143	÷	-24	203	PRTX	-14
024	RCL9	36 09	084	P ² S	16-51	144	x	-35	204	RTN	24
025	1	01	085	RCL6	36 06	145	-	-45	205	R/S	51
026	+	-55	086	RCL2	36 02	146	P ² S	16-51			
027	STO9	35 09	087	RCL9	36 09	147	STO3	35 03			
028	P ² S	16-51	088	÷	-24	148	RCL4	36 04			
029	RCLB	36 12	089	STO6	35 06	149	P ² S	16-51			
030	RCLC	36 13	090	X ²	53	150	RCL1	36 01			
031	x	-35	091	RCL9	36 09	151	RCL3	36 03			
032	ST+0	35-55 00	092	x	-35	152	RCL9	36 09			
033	RCLB	36 12	093	-	-45	153	÷	-24			
034	RCLD	36 14	094	P ² S	16-51	154	x	-35			
035	x	-35	095	STO8	35 08	155	-	-45			
036	ST+1	35-55 01	096	P ² S	16-51	156	P ² S	16-51			
037	RCLB	36 12	097	RCL7	36 07	157	STO4	35 04			
038	RCLC	36 15	098	RCL3	36 03	158	RCL5	36 05			
039	x	-35	099	RCL9	36 09	159	P ² S	16-51			
040	ST+2	35-55 02	100	÷	-24	160	RCL2	36 02			
041	RCLC	36 13	101	STO7	35 07	161	RCL3	36 03			
042	RCLD	36 14	102	X ²	53	162	RCL9	36 09			
043	x	-35	103	RCL9	36 09	163	÷	-24			
044	ST+3	35-55 03	104	x	-35	164	x	-35			
045	RCLC	36 13	105	-	-45	165	-	-45			
046	RCLC	36 13	106	P ² S	16-51	166	P ² S	16-51			
047	x	-35	107	STO9	35 09	167	STO5	35 05			
048	ST+4	35-55 04	108	RCL0	36 00	168	PREG	16-13			
049	RCLD	36 14	109	P ² S	16-51	169	P ² S	16-51			
050	RCLC	36 15	110	RCL0	36 00	170	PREG	16-13			
051	x	-35	111	RCL1	36 01	171	RTN	24			
052	ST+5	35-55 05	112	RCL9	36 09	172	*LBLC	21 13			
053	P ² S	16-51	113	÷	-24	173	P ² S	16-51			
054	RCL9	36 09	114	x	-35	174	RCL6	36 06			
055	RTN	24	115	-	-45	175	RCL7	36 07			
056	*LBLB	21 12	116	P ² S	16-51	176	RCL8	36 08			
057	PREG	16-13	117	STO0	35 00	177	x	-35			
058	P ² S	16-51	118	RCL1	36 01	178	x	-35			
059	PREG	16-13	119	P ² S	16-51	179	RCL0	36 00			
060	P ² S	16-51	120	RCL0	36 00	180	RCL3	36 03			

Program - Card 2

001	*L2LA	21 11	061	P2S	16-51	121	RCL0	36 00	181	RCL4	36 04
002	RCL7	36 07	062	RCL6	36 06	122	RCLC	36 13	182	x	-35
003	RCL8	36 08	063	RCL3	36 03	123	x	-35	183	-	-45
004	x	-35	064	x	-35	124	RCL1	36 01	184	RCL2	36 02
005	RCL3	36 03	065	RCL1	36 01	125	RCLD	36 14	185	RCL5	36 05
006	X2	53	066	RCL0	36 00	126	x	-35	186	x	-35
007	-	-45	067	x	-35	127	RCL2	36 02	187	-	-45
008	RCLI	36 46	068	-	-45	128	RCLE	36 15	188	ST07	35 07
009	÷	-24	069	RCLI	36 46	129	x	-35	189	PRTX	-14
010	P2S	16-51	070	÷	-24	130	+	-55	190	RTN	24
011	ST00	35 00	071	P2S	16-51	131	+	-55	191	*LBLc	21 16 13
012	P2S	16-51	072	CHS	-22	132	P2S	16-51	192	RCL2	36 02
013	RCL0	36 00	073	ST05	35 05	133	ST00	35 00	193	x	-35
014	RCL8	36 08	074	P2S	16-51	134	P2S	16-51	194	ST08	35 08
015	x	-35	075	RCL0	36 00	135	RCL3	36 03	195	R4	-31
016	RCL1	36 01	076	RCL3	36 03	136	RCLC	36 13	196	RCL1	36 01
017	RCL3	36 03	077	x	-35	137	x	-35	197	x	-35
018	x	-35	078	RCL7	36 07	138	RCL4	36 04	198	ST+8	35-55 00
019	-	-45	079	RCL1	36 01	139	RCLD	36 14	199	R4	-31
020	RCLI	36 46	080	x	-35	140	x	-35	200	RCL0	36 00
021	÷	-24	081	-	-45	141	RCL5	36 05	201	x	-35
022	P2S	16-51	082	RCLI	36 46	142	RCLE	36 15	202	ST+8	35-55 00
023	CHS	-22	083	÷	-24	143	x	-35	203	RCL7	36 07
024	ST01	35 01	084	P2S	16-51	144	+	-55	204	RCL8	36 08
025	P2S	16-51	085	ST06	35 06	145	+	-55	205	+	-55
026	RCL0	36 00	086	P2S	16-51	146	P2S	16-51	206	PRTX	-14
027	RCL3	36 03	087	RCL6	36 06	147	ST01	35 01	207	RTN	24
028	x	-35	088	RCL3	36 03	148	P2S	16-51	208	R/S	51
029	RCL1	36 01	089	x	-35	149	RCL6	36 06			
030	RCL7	36 07	090	RCL0	36 00	150	RCLC	36 13			
031	x	-35	091	RCL1	36 01	151	x	-35			
032	-	-45	092	x	-35	152	RCL7	36 07			
033	RCLI	36 46	093	-	-45	153	RCLD	36 14			
034	÷	-24	094	RCLI	36 46	154	x	-35			
035	P2S	16-51	095	÷	-24	155	RCL8	36 08			
036	ST02	35 02	096	P2S	16-51	156	RCLE	36 15			
037	P2S	16-51	097	CHS	-22	157	x	-35			
038	RCL0	36 00	098	ST07	35 07	158	+	-55			
039	RCL8	36 08	099	P2S	16-51	159	+	-55			
040	x	-35	100	RCL6	36 06	160	P2S	16-51			
041	RCL3	36 03	101	RCL7	36 07	161	ST02	35 02			
042	RCL1	36 01	102	x	-35	162	RCL1	36 01			
043	x	-35	103	RCL0	36 00	163	RCL0	36 00			
044	-	-45	104	X2	53	164	PRST	16-14			
045	RCLI	36 46	105	-	-45	165	RTN	24			
046	÷	-24	106	RCLI	36 46	166	*LBLa	21 16 11			
047	P2S	16-51	107	÷	-24	167	ST03	35 03			
048	CHS	-22	108	P2S	16-51	168	R/S	51			
049	ST03	35 03	109	ST08	35 08	169	ST04	35 04			
050	P2S	16-51	110	PREG	16-13	170	R/S	51			
051	RCL6	36 06	111	RTN	24	171	ST05	35 05			
052	RCL8	36 08	112	*LBLB	21 12	172	R/S	51			
053	x	-35	113	P2S	16-51	173	ST06	35 06			
054	RCL1	36 01	114	RCL2	36 02	174	RTN	24			
055	X2	53	115	ST0C	35 13	175	*LBLb	21 16 12			
056	-	-45	116	RCL4	36 04	176	RCL0	36 00			
057	RCLI	36 46	117	ST0D	35 14	177	RCL3	36 03			
058	÷	-24	118	RCL5	36 05	178	x	-35			
059	P2S	16-51	119	ST0E	35 15	179	-	-45			
060	ST04	35 04	120	P2S	16-51	180	RCL1	36 01			

