TABLE I
CALCULATION SUMMARY

QUANTITY TO BE CALCULATED	GIVEN	EQUATION NUMBER	SR-56 CALCULATOR PROGRAM
Filter capacitor values	Line-to-line, line-to-ground capacitance	1,2	—
Common mode insertion loss	Filter element values, source capacitance	3	A
Floating generator, differential mode insertion loss	Filter element values, source resistance	4 + Equation 5 (Ref. correction)	B* + Equation 5 (Ref. correction)
Pseudo-differential (grounded generator) mode insertion loss	Filter element values, source resistance	6	Computer circuit analysis program only
Pseudo-differential mode insertion loss - approximate solution	Filter element values source resistance	7 + Equation 5 (Ref. correction)	B** + Equation 5
MIL-STD-220 insertion loss with unused terminals grounded	Filter element values	8	B***
MIL-STD-220 insertion loss with unused terminals open (exact solution)	Filter element values	9	C,D,E,F In succession
MIL-STD-220 insertion loss with unused terminals open (approximate solution)	Filter element values	10	B****

Use following substitutions in programs *	**	***	****
$\frac{C_1}{2}$ for C_1			$\frac{C_1}{2}$ for C_1
ℓ for L	ℓ for L	ℓ for L	1 pF for C_2
300 for R_L	300 for R_L	50 for R_L	50 for R_L
R_R for R_S	R_R for R_S	50 for R_S	50 for R_S

VI. INSERTION-LOSS EQUATIONS

Tables I and II summarize the applicable equations which were derived from the equivalent-circuit schematic diagrams. The equations are written in a form considered most adaptable to solution by programmable hand calculators such as the Hewlett-Packard HP65 and the Texas Instruments SR56. SR56 program listings are referenced in Table I and included in the appendix. One exception is (6) for pseudo-differential-mode insertion loss, which is seen to be too complex for a hand calculator. Figure 8 shows the loop-current equations and the derivation of the coefficient of coupling from the measured elements L and l. In this case, only, a computer-circuit analysis program was used to establish the relationship between the pseudo-differential-mode insertion loss, which could be measured, and the desired, but unmeasurable, true-differential-mode insertion loss. The computer output also revealed that the absolute value of loop current $i3$ is always equal to, or greater than, the absolute value of $(i3-i4)$, as expected.

TABLE II
EQUATION SUMMARY

1.

$$C_1 = \frac{C_G C_L}{2C_L - \frac{C_G}{2}}$$

C_G = Line – To – Ground Capacitance

C_L = Line – To – Line Capacitance

2.

$$C_2 = \frac{C_L(2C_L - C_G)}{2C_L - \frac{C_G}{2}} = C_L - \frac{C_1}{2}$$

3.

$$\text{C.M.I.L.} = 20\,\text{Log}_{10}\left[\frac{2C_E}{C_c}\left|\frac{75 + j(X_L - X_{cE})}{150 - jX_{c_c}}\right|\right] \text{ Decibels}$$

$$C_E = C_c + 2C_1$$

4.

$$\text{D.M.I.L.} = 20\,\text{Log}_{10}\left|\frac{V_R}{V}\right| \text{ Decibels}$$

$$\left|\frac{V_R}{V}\right| = \frac{\left[\left\{\left(300 + R_R\right) - \frac{300X_\ell}{Xc_2} - \frac{X_\ell R_R}{2Xc_1}\right\}^2 + \left\{X_\ell + 300R_R\left[-\frac{X_\ell}{2Xc_1Xc_2} + \frac{1}{Xc_2} + \frac{1}{2Xc_1}\right]\right\}^2\right]^{1/2}}{(300 + R_R)}$$

See 9 for ℓ Definition

5.

$$\left\{\begin{matrix}\text{Reference}\\ \text{Correction}\end{matrix}\right\} = 6 + 20\,\text{Log}_{10}\left[\frac{2(R_R + 150)}{R_R + 300}\right] \text{ Decibels}$$

6. Determinate Form

$$i_3 = \frac{\begin{vmatrix} R_R - jXc_1 & +jXc_1 & e & 0 \\ +jXc_1 & j(X_\ell - Xc_2 - Xc_1) & 0 & +j\frac{\ell}{2L}X_L \\ 0 & jXc_2 & 0 & -150 \\ 0 & -j\frac{\ell}{2L}X_L & 0 & 150 + jX_L \end{vmatrix}}{\begin{vmatrix} R_R - jXc_1 & +jXc_1 & 0 & 0 \\ +jXc_1 & j(X_\ell - Xc_2 - Xc_1) & +jXc_2 & j\frac{\ell}{2L}X_L \\ 0 & jXc_2 & 300 - jXc_2 & -150 \\ 0 & -j\frac{\ell}{2L}X_L & -150 & 150 + jX_L \end{vmatrix}}$$

$$\text{P.D.I.L.} = 20\,\text{Log}_{10}\left|\frac{e}{100 i_3}\right|$$

See 9 for ℓ Definition

7.

$$\left|\frac{V_R}{V}\right| \cong \frac{\left[\left\{\left(300 + R_R\right) - \frac{300X_\ell}{Xc_2} - \frac{X_\ell R_R}{Xc_1}\right\}^2 + \left\{X_\ell + 300R_R\left[\frac{X_\ell}{Xc_1Xc_2} + \frac{1}{Xc_2} + \frac{1}{Xc_1}\right]\right\}^2\right]^{1/2}}{300 + R_R}$$

$$\text{P.D.I.L.} = 20\,\text{Log}_{10}\left|\frac{V_R}{V}\right| \text{ Decibels}$$

See 9 for ℓ Definition

8.

$$\text{I.L.} = 20\,\text{Log}_{10}\left|\frac{V_R}{V}\right| \text{ Decibels}$$

$$\left|\frac{V_R}{V}\right| = \frac{\left[\left\{100 - \frac{50X_\ell}{Xc_2} - \frac{50X_\ell}{Xc_1}\right\}^2 + \left\{X_\ell + 2500\left[-\frac{X_\ell}{Xc_1Xc_2} + \frac{1}{Xc_2} + \frac{1}{Xc_1}\right]\right\}^2\right]^{1/2}}{100}$$

9.

$$\text{I.L.} = 20\,\text{Log}_{10}\left|\frac{i_0}{i_3}\right| \text{ Decibels}$$

$$\frac{i_0}{i_3} = \frac{50\left[Xc_1(T + Xc_1) - TU + S^2\right] + j\left[(50)^2T + Xc_1(TU - S^2 + Xc_1U)\right]}{-100\,Xc_1S}$$

$S = Xc_X - \frac{\ell}{2L}X_L$

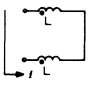
$T = X_\ell - Xc_X - Xc_1$

$U = X_L - Xc_X$

$C_X = \frac{C_1C_2}{C_1 + C_2}$

i_0 = Load current without Filter

i_3 = Load current with Filter



10.

$$\text{I.L.} = 20\,\text{Log}_{10}\left\{\frac{\left[\left(100 - \frac{50X_L}{Xc_1}\right)^2 + \left(X_L + \frac{(50)^2}{Xc_2}\right)^2\right]^{1/2}}{100}\right\} \text{ Decibels}$$

Program A

Common Mode Insertion Loss ;

TITLE Common Core Filter (C Source) PAGE 1 OF 2

PROGRAMMER Hornsby DATE 15 Aug 1977

SR-56 Coding Form

TEXAS INSTRUMENTS INCORPORATED

LOC	CODE	KEY	COMMENTS	LOC	CODE	KEY	COMMENTS	LOC	CODE	KEY	COMMENTS	LOC	CODE	KEY	COMMENTS
00	44	EE		25	02	2		50	20	* 1/x		75	49	* Fix	
01	06	6		26	64	×		51	26	* f(n)		76	42	RST	
02	64	×		27	02	2		52	03	R→P		77			
03	02	2		28	53	)		53	32	X⇄t		78			
04	64	×		29	33	STO		54	53	)		79			
05	69	* π		30	04	4		55	64	×		80			
06	94	=		31	53	)		56	02	2		81			
07	33	STO		32	20	* 1/x		57	64	×		82			
08	00	0		33	94	=		58	34	RCL		83			
09	64	×		34	26	* f(n)		59	04	4		84			
10	34	RCL		35	03	R→P		60	54	÷		85			
11	01	1		36	32	X⇄t		61	34	RCL		86			
12	74	−		37	54	÷		62	03	3		87			
13	52	(		38	52	(		63	94	=		88			
14	07	7		39	01	1		64	18	* Log		89			
15	05	5		40	05	5		65	64	×		90			
16	32	X⇄t		41	00	0		66	02	2		91			
17	34	RCL		42	32	X⇄t		67	00	0		92			
18	00	0		43	52	(		68	94	=		93			
19	64	×		44	34	RCL		69	12	INV		94			
20	52	(		45	03	3		70	44	EE		95			
21	34	RCL		46	64	×		71	49	* Fix		96			
22	03	3		47	34	RCL		72	02	2		97			
23	84	+		48	00	0		73	41	R/S		98			
24	34	RCL		49	53	)		74	12	INV		99			

REGISTERS	
0	ω
1	L (H)
2	C_1 (F)
3	C_C (F)
4	C_E (F)
5	
6	
7	
8	Used For R→P
9	

NOTES
C's Must Not
Be Zero Or
Overflow
Will Result ;
Use 1 pF
Instead

Program A

Common Mode Insertion Loss ,

TITLE Common Core Filter (C Source) PAGE 2 OF 2

PROGRAMMER Hornsby DATE 15 Aug 1977

SR-56 User Instructions

STEP	PROCEDURE	ENTER	PRESS				DISPLAY
1	Clear Calculator		CLR				0
2	Reset Program Counter		RST				0
3	Enter Learn Mode		LRN				00 00
4	Enter Program						
5	Return To Calculate Mode		LRN				0
6	Reset Program		RST				0
7	Enter L , Henries	L (H)	STO	1			L (H)
8	Enter C_1 , Farads	C_1 (F)	STO	2			C_1 (F)
9	Enter C_C , Farads	C_C (F)	STO	3			C_C (F)
10	Enter Frequency , Megahertz	f (MHz)					f (MHz)
11	Compute Common Mode I.L. (Decibels)		R/S				C.M.I.L. (dB)
12	Return To Step 10 For New Freq.						
	Sample Problem :						
	L = 442 Microhenries						
	C_1 = 0.005 35 Microfarads						
	C_C = 220 Picofarads						
	f = 0.9 Megahertz						
	C.M.I.L. = 49.59 Decibels						

Program B

SR-56 Coding Form

TEXAS INSTRUMENTS

TITLE: π Filter Insertion Loss For $R_{Load} \neq R_{source}$ PAGE 1 OF 2

PROGRAMMER: Hornsby DATE: 10 Feb 1977

LOC	CODE	KEY	COMMENTS	LOC	CODE	KEY	COMMENTS	LOC	CODE	KEY	COMMENTS	LOC	CODE	KEY	COMMENTS
00	33	STO		25	07	7		50	84	+		75	84	+	
01	00	0		26	84	+		51	34	RCL		76	53	(	
02	41	R/s		27	53	(		52	08	8		77	34	RCL	
03	64	X		28	34	RCL		53	93	+/−		78	04	4	
04	02	2		29	05	5		54	94	=		79	84	+	
05	64	X		30	64	X		55	43	x^2		80	34	RCL	
06	69	* π		31	34	RCL		56	84	+		81	00	0	
07	94	=		32	03	3		57	53	(		82	53	)	
08	33	STO		33	53	)		58	34	RCL		83	33	STO	
09	05	5		34	93	+/−		59	00	0		84	09	9	
10	64	X		35	33	STO		60	64	X		85	53	)	
11	34	RCL		36	08	8		61	34	RCL		86	43	x^2	
12	01	1		37	64	X		62	08	8		87	94	=	
13	94	=		38	34	RCL		63	64	X		88	48	* $\sqrt{x}$	
14	33	STO		39	06	6		64	34	RCL		89	54	÷	
15	06	6		40	64	X		65	06	6		90	34	RCL	
16	84	+		41	34	RCL		66	84	+		91	09	9	
17	52	(		42	07	7		67	34	RCL		92	94	=	
18	34	RCL		43	94	=		68	04	4		93	18	* Log	
19	05	5		44	64	X		69	64	X		94	64	X	
20	64	X		45	34	RCL		70	34	RCL		95	02	2	
21	34	RCL		46	04	4		71	08	8		96	00	0	
22	02	2		47	64	X		72	64	X		97	94	=	
23	53	)		48	34	RCL		73	34	RCL		98	41	R/s	
24	33	STO		49	00	0		74	07	7		99	42	RST	

REGISTERS	
0	R_S
1	C_1
2	C_2
3	L
4	R_L
5	ω
6	$1/X_{C_1}$
7	$1/X_{C_2}$
8	$-X_L$
9	$R_L + R_S$

NOTES
When C=0;
Overflow −
Use C=1 pF
Program set
Up For
Using R_S
Which Varies
With
Frequency

Program B

SR-56 User Instructions

TITLE: π Filter Insertion Loss For $R_{Load} \neq R_{source}$ PAGE 2 OF 2

PROGRAMMER: Hornsby DATE: 10 Feb 1977

STEP	PROCEDURE	ENTER	PRESS				DISPLAY
1	Clear Calculator		CLR				0
2	Reset Program Counter		RST				0
3	Enter Learn Mode		LRN				00 00
4	Enter Program						
5	Return To Calculate Mode		LRN				0
6	Reset Program Counter		RST				0
7	Enter Value of C_1 - Farads	C_1 (F)	STO	1			C_1 (F)
8	Enter Value of C_2 - Farads	C_2 (F)	STO	2			C_2 (F)
9	Enter Value of L - Henries	L (H)	STO	3			L (H)
10	Enter Value of Load Resistance - Ohms	R_L (Ω)	STO	4			R_L (Ω)
11	Enter Value of Source Resistance - Ohms	R_S (Ω)	R/s				R_S (Ω)
12	Enter Frequency - Hertz	f (Hz)					f (Hz)
13	Compute Insertion Loss - Decibels		R/s				I.L. (dB)
14	For New Freq., Go To Step 11						

Sample Problem :

$C_1 = 0.016\ \mu F$

$C_2 = 0.008\ \mu F$

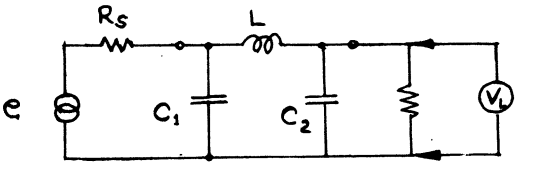
$L = 83.1\ \mu H$

$R_L = 16.7$ ohms

$R_S = 1.3$ ohms

$f = 1.42$ MHz

I.L. = 36.183 58 dB



$[X_{C_1}(T+X_{C_1})-TU+S^2]$

Part of Eqn. For MIL-STD-220A I.L.

TITLE With Unused Terminals Open PAGE 1 OF 2

PROGRAMMER Hornsby DATE 19 Aug 1977

Program C

SR-56 Coding Form

TEXAS INSTRUMENTS

LOC	CODE	KEY	COMMENTS	LOC	CODE	KEY	COMMENTS	LOC	CODE	KEY	COMMENTS	LOC	CODE	KEY	COMMENTS
00	64	X		25	52	(		50	06	6		75	74	−	
01	02	2		26	52	(		51	34	RCL		76	34	RCL	
02	64	X		27	34	RCL		52	00	0		77	05	5	
03	69	* π		28	01	1		53	64	X		78	94	=	
04	94	=		29	64	X		54	34	RCL		79	64	X	
05	33	STO		30	34	RCL		55	04	4		80	34	RCL	
06	00	0		31	02	2		56	74	−		81	09	9	
07	64	X		32	54	÷		57	34	RCL		82	84	+	
08	34	RCL		33	52	(		58	08	8		83	34	RCL	
09	03	3		34	34	RCL		59	74	−		84	06	6	
10	94	=		35	01	1		60	52	(		85	43	X^2	
11	33	STO		36	84	+		61	34	RCL		86	84	+	
12	05	5		37	34	RCL		62	00	0		87	52	(	
13	64	X		38	02	2		63	64	X		88	34	RCL	
14	34	RCL		39	53	)		64	34	RCL		89	09	9	
15	04	4		40	53	)		65	01	1		90	84	+	
16	54	÷		41	64	X		66	53	)		91	34	RCL	
17	52	(		42	34	RCL		67	20	* 1/x		92	07	7	
18	02	2		43	00	0		68	33	STO		93	53	)	
19	64	X		44	53	)		69	07	7		94	64	X	
20	34	RCL		45	20	* 1/x		70	94	=		95	34	RCL	
21	03	3		46	33	STO		71	33	STO		96	07	7	
22	94	=		47	08	8		72	09	9		97	94	=	
23	93	+/−		48	94	=		73	34	RCL		98	41	R/S	
24	84	+		49	33	STO		74	08	8		99	42	RST	

REGISTERS	
0	ω
1	C_1 (F)
2	C_2 (F)
3	L (H)
4	ℓ (H)
5	X_L
6	S
7	X_{C_1}
8	X_{C_x}
9	T

NOTES
C's Must
Not Be Zero;
Overflow -
Use 1 pF
Instead.

Part of Eqn For MIL-STD-220A I. L.

TITLE With Unused Terminals Open PAGE 2 OF 2

PROGRAMMER Hornsby DATE 19 Aug 1977

Program C

SR-56 User Instructions

STEP	PROCEDURE	ENTER	PRESS				DISPLAY
1	Clear Calculator		CLR				0
2	Reset Program Counter		RST				0
3	Enter Learn Mode		LRN				00 00
4	Enter Program						
5	Return To Calculate Mode		LRN				0
6	Reset Program Counter		RST				0
7	Enter C_1 - Farads	C_1 (F)	STO	1			C_1 (F)
8	Enter C_2 - Farads	C_2 (F)	STO	2			C_2 (F)
9	Enter L - Henries	L (H)	STO	3			L (H)
10	Enter ℓ - Henries	ℓ (H)	STO	4			ℓ (H)
11	Enter Frequency - Hertz	f (H_z)					f (H_z)
12	Compute $[X_{C_1}(T+X_{C_1})-TU+S^2]$		R/S				Ans.
	Where						
	$S = X_{C_x} - \frac{\ell}{2L} X_L$						
	$C_x = \frac{C_1 C_2}{C_1 + C_2}$						
	$T = X_\ell - X_{C_x} - X_{C_1}$						
	$U = X_L - X_{C_x}$						
	Sample Problem :						
	$C_1 = 0.005\,35\ \mu F$						
	$C_2 = 0.008\,92\ \mu F$						
	$L = 442\ \mu H$						
	$\ell = 2.1\ \mu H$						
	$f = 0.9\ MH_z$						
	Ans. $= 1.8204 \times 10^5$						
	Return To Step 11 For New Freq.						

$[TU - S^2 + X_{C_1} U]$

Part of Eqn. For MIL-STD-220A I.L.

Program D

TITLE With Unused Terminals Open PAGE 1 OF 2

PROGRAMMER Hornsby DATE 19 Aug 1977

SR-56 Coding Form

TEXAS INSTRUMENTS

LOC	CODE	KEY	COMMENTS
00	64	×	See Notes
01	02	2	
02	64	×	
03	69	* π	
04	94	=	
05	33	STO	
06	00	0	
07	64	×	
08	34	RCL	
09	03	3	
10	94	=	
11	33	STO	
12	05	5	
13	64	×	
14	34	RCL	
15	04	4	
16	54	÷	
17	52	(	
18	02	2	
19	64	×	
20	34	RCL	
21	03	3	
22	94	=	
23	93	+/-	
24	84	+	
25	52	(	
26	52	(	
27	34	RCL	
28	01	1	
29	64	×	
30	34	RCL	
31	02	2	
32	54	÷	
33	52	(	
34	34	RCL	
35	01	1	
36	84	+	
37	34	RCL	
38	02	2	
39	53	)	
40	53	)	
41	64	×	
42	34	RCL	
43	00	0	
44	53	)	
45	20	* 1/x	
46	33	STO	
47	08	8	
48	94	=	
49	33	STO	
50	06	6	
51	34	RCL	1
52	00	0	1
53	64	×	1
54	34	RCL	
55	04	4	
56	74	−	
57	34	RCL	
58	08	8	
59	74	−	
60	52	(	
61	34	RCL	
62	00	0	
63	64	×	
64	34	RCL	
65	01	1	
66	53	)	
67	20	* 1/x	
68	33	STO	
69	07	7	
70	94	=	
71	33	STO	
72	09	9	
73	64	×	
74	52	(	
75	34	RCL	
76	05	5	
77	74	−	
78	34	RCL	
79	08	8	
80	53	)	
81	33	STO	
82	05	5	
83	74	−	
84	34	RCL	
85	06	6	
86	43	X^2	
87	84	+	
88	34	RCL	
89	07	7	
90	64	×	
91	34	RCL	
92	05	5	
93	94	=	
94	41	R/S	
95	42	RST	
96			
97			
98			
99			

Same As Program C

REGISTERS	
0	ω
1	C_1 (F)
2	C_2 (F)
3	L (H)
4	ℓ (H)
5	Used
6	S
7	X_{C_1}
8	X_{C_X}
9	T

NOTES
First 73 Program Steps Same As Program C
C's Must Not Be Zero; Overflow - Use 1 pF Instead

Part of Eqn. For MIL-STD-220A I.L.

Program D

TITLE With Unused Terminals Open PAGE 2 OF 2

PROGRAMMER Hornsby DATE 19 Aug 1977

SR-56 User Instructions

STEP	PROCEDURE	ENTER	PRESS				DISPLAY
1	Clear Calculator		CLR				0
2	Reset Program Counter		RST				0
3	Enter Learn Mode		LRN				00 00
4	Enter Program						
5	Return To Calculate Mode		LRN				0
6	Reset Program Counter		RST				0
7	Enter C_1 - Farads (only If Not Previously Loaded)	C_1 (F)	STO	1			C_1 (F)
8	Enter C_2 - Farads	C_2 (F)	STO	2			C_2 (F)
9	Enter L - Henries	L (H)	STO	3			L (H)
10	Enter ℓ - Henries	ℓ (H)	STO	4			ℓ (H)
11	Enter Frequency - Hertz	f (Hz)					f (Hz)
12	Compute $[TU - S^2 + X_{C_1} U]$		R/S				Ans.
	Where $S = X_{C_X} - \frac{\ell}{2L} X_L$						
	$C_X = \frac{C_1 C_2}{C_1 + C_2}$						
	$T = X_L - X_{C_X} - X_{C_1}$						
	$U = X_L - X_{C_X}$						
	Sample Problem:						
	$C_1 = 0.005\ 35\ \mu F$						
	$C_2 = 0.008\ 92\ \mu F$						
	$L = 442\ \mu H$						
	$\ell = 2.1\ \mu H$						
	$f = 0.9\ MHz$						
	Ans. $= -1.0252 \times 10^5$						
	Return To Step 11 For New Freq.						

Part of Eqn. For MIL-STD-220A I.L.

Program E

TITLE With Unused Terminals Open PAGE 1 OF 2

PROGRAMMER Hornsby DATE 19 Aug 1977

SR-56 Coding Form

TEXAS INSTRUMENTS INCORPORATED

LOC	CODE	KEY	COMMENTS	LOC	CODE	KEY	COMMENTS	LOC	CODE	KEY	COMMENTS	LOC	CODE	KEY	COMMENTS
00	64	X	See Notes	25	52	(		50	06	6		75	05	5	
01	02	2		26	52	(		51	34	RCL		76	00	0	
02	64	X		27	34	RCL		52	00	0		77	94	=	
03	69	*π		28	01	1		53	64	X		78	32	X⇄t	
04	94	=		29	64	X		54	34	RCL		79	41	R/S	
05	33	STO		30	34	RCL		55	04	4		80	64	X	
06	00	0		31	02	2		56	74	−		81	34	RCL	
07	64	X		32	54	÷		57	34	RCL		82	07	7	
08	34	RCL		33	52	(		58	08	8		83	84	+	
09	03	3		34	34	RCL		59	74	−		84	34	RCL	
10	94	=		35	01	1		60	52	(		85	09	9	
11	33	STO		36	84	+		61	34	RCL		86	64	X	
12	05	5		37	34	RCL		62	00	0		87	05	5	
13	64	X		38	02	2		63	64	X		88	00	0	
14	34	RCL		39	53	)		64	34	RCL		89	43	X^2	
15	04	4		40	53	)		65	01	1		90	94	=	
16	54	÷		41	64	X		66	53	)		91	26	*f(n)	
17	52	(		42	34	RCL		67	20	* 1/X		92	03	R→P	
18	02	2		43	00	0		68	33	STO		93	32	X⇄t	
19	64	X		44	53	)		69	07	7		94	41	R/S	
20	34	RCL		45	20	* 1/X		70	94	=		95	42	RST	
21	03	3		46	33	STO		71	33	STO		96			
22	94	=		47	08	8		72	09	9		97			
23	93	+/−		48	94	=		73	41	R/S		98			
24	84	+		49	33	STO		74	64	X		99			

Part of Eqn. For MIL-STD-220A I.L. Program D

REGISTERS	
0	ω
1	C_1 (F)
2	C_2 (F)
3	L (H)
4	ℓ (H)
5	X_L
6	S
7	X_{C_1}
8	X_{C_X}
9	T

NOTES
First 73 Program Steps Same As Program D
C's Must Not Be Zero; Overflow − Use 1 pF Instead

Part of Eqn. For MIL-STD-220A I.L.

Program E

TITLE With Unused Terminals Open PAGE 2 OF 2

PROGRAMMER Hornsby DATE 19 Aug 1977

SR-56 User Instructions

STEP	PROCEDURE	ENTER	PRESS				DISPLAY
1	Clear Calculator		CLR				0
2	Reset Program Counter		RST				0
3	Enter Learn Mode		LRN				00 00
4	Enter Program						
5	Return To Calculate Mode		LRN				0
6	Reset Program Counter		RST				0
7	Enter C_1 - Farads } only If	C_1 (F)	STO	1			C_1 (F)
8	Enter C_2 - Farads } Not Previously	C_2 (F)	STO	2			C_2 (F)
9	Enter L - Henries } Loaded	L (H)	STO	3			L (H)
10	Enter ℓ - Henries }	ℓ (H)	STO	4			ℓ (H)
11	Enter Frequency - H_z	f (H_z)	R/S				
12	Enter Ans. From Program C	Prog. C Ans.					
	$[X_{C_1}(T + X_{C_1}) - TU + S^2]$						
13	Enter Ans. From Program D	Prog. D Ans.					
	$[TU - S^2 + X_{C_1}U]$						
14	Compute Absolute Value of Numerator of L_0/L_3		R/S				Ans.
	Sample Problem: $C_1 = 0.00535\ \mu F$						
	$C_2 = 0.00892\ \mu F$						
	$L = 442\ \mu H$						
	$\ell = 2.1\ \mu H$						
	$f = 0.9\ MH_z$						
	Ans. From Prog. C = 1.8204×10^5						
	Ans From Prog. D = -1.0252×10^5						
	Ans. = 9.7785×10^6						
	Return To Step 11 For New Freq.						

Insertion Loss Per MIL-STD-220A
TITLE With Unused Terminals Open PAGE 1 OF 2
PROGRAMMER Hornsby DATE 19 Aug 1977

Program F
SR-56 Coding Form
TEXAS INSTRUMENTS

LOC	CODE	KEY	COMMENTS	LOC	CODE	KEY	COMMENTS	LOC	CODE	KEY	COMMENTS	LOC	CODE	KEY	COMMENTS
00	64	×	See Notes	25	52	(		50	06	6		75	94	=	
01	02	2		26	52	(		51	34	RCL		76	20	* 1/x	
02	64	×		27	34	RCL		52	00	0		77	64	×	
03	69	* π		28	01	1		53	64	×		78	41	R/S	
04	94	=		29	64	×		54	34	RCL	Same As Program E	79	94	=	
05	33	STO		30	34	RCL		55	04	4		80	28	* |x|	
06	00	0		31	02	2		56	74	−		81	18	* Log	
07	64	×		32	54	÷		57	34	RCL		82	64	×	
08	34	RCL		33	52	(		58	08	8		83	02	2	
09	03	3		34	34	RCL		59	74	−		84	00	0	
10	94	=		35	01	1		60	52	(		85	94	=	
11	33	STO		36	84	+		61	34	RCL		86	49	* Fix	
12	05	5		37	34	RCL		62	00	0		87	02	2	
13	64	×		38	02	2		63	64	×		88	12	INV	
14	34	RCL		39	53	)		64	34	RCL		89	44	EE	
15	04	4		40	53	)		65	01	1		90	41	R/S	
16	54	÷		41	64	×		66	53	)		91	12	INV	
17	52	(		42	34	RCL		67	20	* 1/x		92	49	* Fix	
18	02	2		43	00	0		68	64	×		93	42	RST	
19	64	×		44	53	)		69	34	RCL		94			
20	34	RCL		45	20	* 1/x		70	06	6		95			
21	03	3		46	33	STO		71	64	×		96			
22	94	=		47	08	8		72	01	1		97			
23	93	+/−		48	94	=		73	00	0		98			
24	84	+		49	33	STO		74	00	0		99			

REGISTERS	
0	ω
1	C_1 (F)
2	C_2 (F)
3	L (H)
4	ℓ (H)
5	X_L
6	S
7	X_{C_1}
8	Used
9	Used

NOTES
First 68
Program
Steps Same
As Prog. E
C's Must Not
Be Zero ;
Overflow -
Use 1 pF
Instead

Insertion Loss Per MIL-STD-220A
TITLE With Unused Terminals Open PAGE 2 OF 2
PROGRAMMER Hornsby DATE 19 Aug 1977

Program F
SR-56 User Instructions

STEP	PROCEDURE	ENTER	PRESS				DISPLAY
1	Clear Calculator		CLR				0
2	Reset Program Counter		RST				0
3	Enter Learn Mode		LRN				00 00
4	Enter Program						
5	Return To Calculate Mode		LRN				0
6	Reset Program Counter		RST				0
7	Enter C_1 - Farads } Only If	C_1 (F)	STO	1			C_1 (F)
8	Enter C_2 - Farads } Not Previously	C_2 (F)	STO	2			C_2 (F)
9	Enter L - Henries } Loaded	L (H)	STO	3			L (H)
10	Enter ℓ - Henries }	ℓ (H)	STO	4			ℓ (H)
11	Enter Frequency - Hertz	f (H_z)	R/S				
12	Enter Ans. From Program E	Prog. E Ans.					Prog. E Ans.
	[Absolute Value of Numerator of C_0/C_3]						
13	Compute Insertion Loss - Decibels		R/S				I.L. (dB)
	Sample Problem :						
	C_1 = 0.005 35 μF						
	C_2 = 0.008 92 μF						
	L = 442 μH						
	ℓ = 2.1 μH						
	f = 0.9 MHz						
	Ans. From Prog. E = 9.7785×10^6						
	Insertion Loss = 35.99 Decibels						
	Return To Step 11 For New Freq.						