

BABCOCK & WILCOX COMPANY  
 Research Center  
 Alliance, Ohio

AUTOMATIC TRACING ROUTINE FOR ELECTRODATA COMPUTER

Coded by: Gene Boyle

September 1955

Subroutine: Tracing

Operation:

This tracing routine will start at any desired memory location containing a command and do the following operations:

1. Print out the cell number, contents of A register, contents of R register, contents of B register, mnemonic command and the operand if one exists.
2. Perform the command specified.
3. Go to the next address of the program and again print out, etc.

Notes:

1. Negative commands will be printed out with a star in the sign position and have the "B" register added to them.
2. If a command causing overflow in the program being traced was not followed by a conditional transfer of control command of any type, the tracing routine will print out "no cc" and stop.
3. The following is a list of the mnemonic command symbols printed by this routine for the cases where the symbols are not exactly the same as used in the ElectroData command list:

Tracing Routine

EDC Command List

b;a  
 cur  
 bl 4 }  
 bl 4 ←  
 ccr  
 cubr  
 ccbR

B→A  
 cu R  
 bl(4) → etc.  
 bl(4) ← etc.  
 cc R  
 cub R  
 ccb R

4. If the program being traced has a "9" in the breakpoint position and the skip switch is on, the tracing routine will skip this command and stop (as would the program itself).

5. If it is desired to load the tracing routine starting at any position other than 0000, the "B" register must be used for the address modification.

Subroutine Entry and Exit:

1. The address of the first command to be traced must be placed in the spares positions in the "0000" location of tracing routine.
2. Normally there is zero in the floating address equivalent to (0721). This causes the print out of the R & B registers. To omit this print out, place a "1" in this location. If it is later desired to print these registers without reloading this routine, restore the zero in this location.
3. To enter the tracing routine use an unconditional transfer of control to address 0002 of the tracing routine.
4. To stop tracing press the stop button and use an unconditional transfer of control to the desired address within program being traced.

Storage:

This routine uses 725 storage locations. It does not use any of the quick access loops for its own computations.

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DATE September 1955

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PAGE No. 1

INSTRUCTION LIST

S	NUMERICAL CODE			CC/CS RETURNS	CALL NUMBER	INSTRUCTION			IMMEDIATE EFFECT	CONTINUITY
	SPACE	ORDER	ADDRESS			S	ORDER	ADDRESS		
0	XXXX	00	0000		0000					Enter address of their first command
0	0000	00	0000		0001					
2	0000	64	0106		0002					
0	0000	03	0402		0003			lower case		
0	0000	07	0500		0004			carriage return		cu back to here from each sub routine
2	0000	20	0698		0005					
0	0000	03	0304		0006			cell no.		
2	0000	64	0052		0007			(A)a = 34 34 34 0000		
0	0000	03	0406		0008			3 spaces		
2	0000	64	0049		0009			A		
0	0000	03	0010		0010			(A)		
2	0000	64	0052		0011			(A)a = 3434340000		
0	0000	03	0406		0012			3 spaces		
2	0000	20	0722		0013					
0	0000	03	0310		0014			(R)		
2	0000	64	0052		0015			(A)a = 3434340000		
0	0000	03	0404		0016			3 spaces (2 here)		
0	0000	11	0000		0017			(A)a = 0000 00 BBBB		
0	0000	64	0006		0018			(A)a = BBBB 00 0000		
0	0000	03	0304		0019			space (B)		
2	0000	64	0052		0020			(A)a = 34 34 34 00 00		
0	0000	03	0406		0021			3 spaces		
2	0000	64	0000		0022			(A)a = XXXX		
0	0000	13	0006		0023			(A)a = 0000 00 XXXX		
2	0000	74	0053		0024			(A)a = 0000 64 XXXX		
2	0000	12	0026		0025					
0	0000	00	0000		0026			000064 XXXX ; (A)a = their command		
2	0000	12	0051		0027					
2	0000	73	0052		0028			compare with positive no.		
2	0000	28	0037		0029					
2	0000	63	0054		0030			(A)a = 0000 YY XXXX (R)a = 0	spares become "0"	
0	0000	13	0004		0031			(A)a = 0000 YX XXXX		
2	0000	74	0055		0032			(A)a = 0000 20 00 <sup>YY</sup> / <sub>60</sub> (R)a = XXXX		
2	0000	02	0036		0033					
2	0000	64	0051		0034			(A)a = their command (R)a = XXXX		
0	0000	03	0004		0035			spares		

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PAGE No. 2

INSTRUCTION LIST

S	NUMERICAL CODE			CC/CS RETURNS	CALL NUMBER	INSTRUCTION		IMMEDIATE EFFECT	CONTINUITY
	SPACE	ORDER	ADDRESS			S	ORDER		
0	0000	00	0000		0036			0000 20 00 <del>YY</del> 60	this will cu to dictionary
0	0000	11	0000		0037		(A)a = 0000 00 BBBB		
2	0000	76	0051		0038		(A)a = 0000 YY <del>XXXX</del> BBBB; their command + "B" Reg		
2	0000	12	0051		0039		store this as a plus command with "B" already added		
2	0000	63	0054		0040		(A)a = 0000 YY <del>XXXX</del> BBBB spares become "0"		
0	0000	13	0004		0041		(A)a = 0000 00 00YY (R)a = <del>XXXX</del> BBBB		
2	0000	74	0055		0042		(A)a = 0000 20 00 <del>XY</del> 60+(R)a = <del>XXXX</del> BBBB		
2	0000	02	0048		0043				
2	0000	64	0317		0044		(A)a = 3050012700		
0	0000	03	0408		0045		- ; back space		
2	0000	64	0051		0046		(A)a = their command		
0	0000	03	0304		0047		spares		
0	0000	00	0000		0048		0000 20 00 <del>XY</del> 60	will cu to dictionary	
0	0000	00	0000		0049		store A		
0	0000	00	0000		0050		store R		
0	0000	00	0000		0051		store command		
0	34 34	34	0000		0052				
0	0000	64	0000		0053				
0	0000	11	1111		0054				
2	0000	20	0060		0055				
0	3470	74	3400		0056				
0	0000	00	0000		0057		dumping space		
0	0001	00	0000		0058				
0	3436	62	3600		0059				
2	0000	20	0138		0060		00 in X		
2	0000	20	0150		0061		01 lcl n		
2	0000	20	0195		0062		02 tmc x		
2	0000	20	0207		0063		03 po n		
2	0000	20	0209		0064		04 Z y		
0	3423	73	6200		0065				
2	0000	20	0222		0066		06 ua		
2	0000	20	0233		0067		07 po f		
2	0000	20	0235		0068		08 stop		
0	3476	75	3400		0069				
2	0000	20	0238		0070		10 d A		
2	0000	20	0280		0071		1 B → A		

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**INSTRUCTION LIST**

PAGE No. 3

S	NUMERICAL CODE			CC/CO RETURNS	CALL NUMBER	INSTRUCTION			IMMEDIATE EFFECT	CONTINUITY
	SPARE	ORDER	ADDRESS			S	ORDER	ADDRESS		
2	0000	20	0282		0072				12 tmh X	
2	0000	20	0284		0073				13 sr n	
2	0000	20	0299		0074				14 sl n	
2	0000	20	0301		0075				15 spl y	
2	0000	20	0318		0076				16 spc +	
2	0000	20	0321		0077				17 spc -	
0	0000	00	1111		0078					
0	0000	01	0000		0079					
2	0000	20	0324		0080				20 cu y	
2	0000	20	0331		0081				21 cu Ry	
2	0000	20	0341		0082				22 B- y	
2	0000	20	0350		0083				23 ro	
2	0000	20	0368		0084				24 bl 4 → x	
2	0000	20	0380		0085				25 bl 5 → x	
2	0000	20	0383		0086				26 bl 6 → x	
2	0000	20	0386		0087				27 bl 7 → x	
2	0000	20	0389		0088				28 cc y	
2	0000	20	0401		0089				29 cc Ry	
2	0000	20	0411		0090				30 cub y	
2	0000	20	0415		0091				31 cub Ry	
2	0000	20	0439		0092				32 B+	
2	0000	20	0445		0093				33 cl R	
2	0000	20	0451		0094				34 bl 4 ← x	
2	0000	20	0455		0095				35 bl 5 ← x	
2	0000	20	0457		0096				36 bl 6 ← x	
2	0000	20	0459		0097				37 bl 7 ← x	
2	0000	20	0462		0098				38 cc b y	
2	0000	20	0471		0099				39 ccb Ry	
2	0000	20	0488		0100				40 tr x	
0	3434	57	3400		0101					
2	0000	20	0491		0102				42 ts	
0	3452	20	3400		0103					
2	0000	20	0529		0104				44 cl x	
0	3476	75	6500		0105					
0	2722	23	7576		0106					
0	3463	30	2027		0107					

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**INSTRUCTION LIST**

PAGE No. 4

S	NUMERICAL CODE			CC/CR RETURNS	CALL NUMBER	INSTRUCTION			IMMEDIATE EFFECT	CONTINUITY
	SPARE	ORDER	ADDRESS			S	ORDER	ADDRESS		
0	2734	61	2620		0108					
0	3423	73	6700		0109					
2	0000	20	0532		0110				50 tw x	
0	3422	21	3400		0111					
2	0000	20	0535		0112				52 rw	
0	3422	36	3400		0113					
2	0000	20	0538		0114				54 co x	
0	3422	76	3600		0115					
0	2276	62	2400		0116					
0	0000	00	0000		0117					
0	0000	00	0001		0118					
0	0000	11	0000		0119					
2	0000	20	0541		0120				60 mh x	
2	0000	20	0564		0121				61 div x	
0	0000	28	0000		0122					
2	0000	20	0598		0123				63 ex x	
2	0000	20	0629		0124				64 ca x	
2	0000	20	0648		0125				65 cs x	
2	0000	20	0651		0126				66 caa x	
2	0000	20	0654		0127				67 csa x	
0	0000	29	0000		0128					
0	0000	38	0000		0129					
2	0000	20	0657		0130				70 mr x	
0	0000	39	0000		0131					
2	0000	20	0660		0132				72 B x	
2	0000	20	0677		0133				73 sgc x	
2	0000	20	0680		0134				74 ad x	
2	0000	20	0683		0135				75 su x	
2	0000	20	0686		0136				76 ada x	
2	0000	20	0689		0137				77 sua x	
2	0000	64	0056		0138				(R)a = XXXX	
0	0000	03	0408		0139				in	00 in X
2	0000	02	0057		0140					
0	0000	14	0010		0141					
0	0000	73	0304		0142				X X	

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INSTRUCTION LIST

PAGE No. 5

S	NUMERICAL CODE			CC/CU RETURNS	CALL NUMBER	INSTRUCTION			IMMEDIATE EFFECT	CONTINUITY
	SPARE	ORDER	ADDRESS			S	ORDER	ADDRESS		
2	0000	64	0000		0143				cell no.	
2	0000	74	0058		0144				+ 1	
2	0000	02	0000		0145					
2	0000	20	0004		0146					
0	0000	00	0011		0147					
0	0000	00	0000		0148				store "sg" digit; if 0 or 1 store 0; otherwise	
1	1111	11	1111		0149				actual value after po or lcl	
2	0000	64	0059		0150					
0	0000	03	0408		0151				lcl	01 lcl
2	0000	02	0057		0152					
0	0000	14	0010		0153					
0	0000	03	0304		0154				XXXX	
0	0000	07	0500		0155				carriage return	
2	0000	64	0000		0156				cell no.	
2	0000	74	0058		0157					
2	0000	12	0000		0158					
0	0000	03	0304		0159					
2	0000	64	0052		0160					01 lcl continued
0	0000	03	0406		0161					
2	0000	64	0051		0162					
2	0000	63	0147		0163				} this routine can now be used for "po" commands, also	
2	0000	74	0079		0164					
2	0000	12	0170		0165					
2	0000	02	0193		0166					
2	0000	64	0148		0167					
2	0000	04	0188		0168					
2	0000	64	0049		0169					
0	0000	00	0000		0170					
2	0000	12	0049		0171					
0	0000	01	0000		0172					
2	0000	63	0118		0173					
2	0000	12	0148		0174					
2	0000	75	0118		0175					
2	0000	73	0149		0176					
2	0000	28	0182		0177					
2	0000	02	0057		0178					
2	0000	02	0148		0179					

[0000 01 n]

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INSTRUCTION LIST

PAGE No. 6

S	NUMERICAL CODE			CC/CU RETURNS	CALL NUMBER	INSTRUCTION			IMMEDIATE EFFECT	CONTINUITY
	SPARE	ORDER	ADDRESS			S	ORDER	ADDRESS		
2	0000	64	0049		0180					
2	0000	20	0010		0181					
2	0000	64	0049		0182					
0	0000	13	0010		0183					
2	0000	64	0148		0184					
0	0000	01	0009		0185					
0	0000	14	0010		0186					
2	0000	20	0010		0187					01 lcl n continued
2	0000	64	0049		0188					
0	0000	13	0010		0189					
2	0000	64	0148		0190					
0	0000	01	0009		0191					
0	0000	14	0010		0192					
0	0000	00	0000		0193				[0000 01 n]	
2	0000	20	0171		0194					
2	0000	64	0065		0195					
0	0000	03	0410		0196			tmc		02 tmc x
2	0000	02	0057		0197					
0	0000	14	0010		0198					
0	0000	03	0304		0199			XXXX		
2	0000	64	0051		0200			their command		
2	0000	02	0203		0201					
2	0000	64	0049		0202			add A		
0	0000	00	0000		0203			[their command]		
2	0000	02	0049		0204			store A		
2	0000	02	0148		0205			to destroy any no. other than "0" or "1" stored		
2	0000	20	0143		0206			from sign column due to "po" or "lcl"		
2	0000	64	0069		0207					
2	0000	20	0151		0208					03 po n
2	0000	64	0101		0209					
0	0000	03	0408		0210					04 Z y
2	0000	02	0057		0211					
0	0000	14	0010		0212					
0	0000	03	0304		0213					
2	0000	64	0049		0214					



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PAGE No. 7

INSTRUCTION LIST

S	NUMERICAL CODE			CC/CU RETURNS	CALL NUMBER	INSTRUCTION			IMMEDIATE EFFECT	CONTINUITY
	SPARE	ORDER	ADDRESS			S	ORDER	ADDRESS		
2	0000	04	0217		0215					
2	0000	20	0205		0216					
2	0000	64	0051		0217					
2	0000	63	0078		0218					
0	0000	14	0006		0219					04 Zy continued
2	0000	02	0000		0220					
2	0000	20	0625		0221					
2	0000	64	0103		0222					
0	0000	03	0408		0223			ua		
2	0000	02	0057		0224					
0	0000	14	0010		0225					06 ua
0	0000	03	0304		0226					
2	0000	64	0051		0227					
2	0000	02	0230		0228					
2	0000	64	0049		0229					
0	0000	00	0000		0230			[their command]		
2	0000	02	0049		0231					
2	0000	20	0143		0232					
2	0000	64	0105		0233					07 po f
2	0000	20	0139		0234					
2	0000	64	0106		0235					
0	0000	03	0410		0236			STOP		08 stop
2	0000	20	0224		0237					
2	0000	64	0107		0238					
0	0000	03	0410		0239			d A		10 d A
2	0000	02	0057		0240					
0	0000	14	0010		0241					
0	0000	03	0304		0242					
2	0000	64	0051		0243					
2	0000	02	0246		0244					
2	0000	64	0049		0245					
0	0000	00	0000		0246			[their command]		
2	0000	28	0250		0247					
2	0000	02	0049		0248					
2	000	20	0205		0249					

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DATE September 1955

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INSTRUCTION LIST

PAGE No. 8

S	NUMERICAL CODE			CC/CU RETURNS	CALL NUMBER	INSTRUCTION			IMMEDIATE EFFECT	CONTINUITY
	SPARE	ORDER	ADDRESS			S	ORDER	ADDRESS		
2	0000	02	0049		0250					
2	0000	64	0118		0251					
2	0000	02	0117		0252			store "1" here if OFI set		
2	0000	64	0026		0253			(A)a = 0000 64 XXXX "XXXX" = address of this		
2	0000	74	0118		0254					command
2	0000	02	0256		0255					
0	0000	00	0000		0256			[0000 64 XXXX]		
2	0000	63	0119		0257			(A)a = 0000 IYY 0000		10 d A
2	0000	12	0057		0258					continued
2	0000	75	0122		0259			su 28		
2	0000	04	0262		0260					
2	0000	20	0205		0261					
2	0000	64	0057		0262					
2	0000	75	0128		0263			su 29		
2	0000	04	0266		0264					
2	0000	20	0205		0265					
2	0000	64	0057		0266					
2	0000	75	0129		0267			su 38		
2	0000	04	0270		0268					
2	0000	20	0205		0269					
2	0000	64	0057		0270					
2	0000	75	0131		0271			su 39		
2	0000	04	0274		0272					
2	0000	20	0205		0273					
2	0000	64	0279		0274					
0	0000	03	0410		0275			no cc		
2	0000	20	0057		0276					
2	0000	20	0148		0277					
0	0000	08	0000		0278					
0	7475	34	6262		0279					
2	0000	64	0108		0280					
2	0000	20	0196		0281					11 B → A ba
2	0000	64	0109		0282					
2	0000	20	0223		0283					12 tmh x
2	0000	64	0111		0284					

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DATE September 1955

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PAGE No. 9

INSTRUCTION LIST

S	NUMERICAL CODE			CC/CU RETURNS	CALL NUMBER	INSTRUCTION			IMMEDIATE EFFECT	CONTINUITY
	SPARE	ORDER	ADDRESS			S	ORDER	ADDRESS		
0	0000	03	0408		0285					
2	0000	02	0057		0286			sr		13 sr n
2	0000	14	0010		0287					
0	0000	03	0304		0288			XXXX		
2	0000	64	0051		0289					
2	0000	02	0294		0290					
2	0000	64	0050		0291					
0	0000	13	0010		0292					
2	0000	64	0049		0293					
0	0000	00	0000		0294			[their (sr, etc.) command]		
2	0000	02	0049		0295					
0	0000	14	0010		0296					
2	0000	02	0050		0297					
2	0000	20	0143		0298					
2	0000	64	0113		0299					
2	0000	20	0285		0300					14 sl n
2	0000	64	0115		0301					
0	0000	03	0408		0302			spl		15 spl y
2	0000	02	0057		0303					
0	0000	14	0010		0304					no transfer
0	0000	03	0304		0305			XXXX		
2	0000	64	0050		0306					
0	0000	13	0010		0307					
2	0000	64	0049		0308					
2	0000	15	0314		0309					
2	0000	02	0049		0310					
0	0000	14	0010		0311					15 spl y
2	0000	02	0050		0312					
2	0000	20	0143		0313					continued
2	0000	02	0049		0314					
2	0000	02	0050		0315			store "0" in R		
2	0000	20	0691		0316					
0	3050	01	2700		2317					
2	0000	64	0116		0318					
2	0000	20	0239		0319					16 spc+

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DATE September 1955

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PAGE No. 10

INSTRUCTION LIST

S	NUMERICAL CODE			CC/CU RETURNS	CALL NUMBER	INSTRUCTION			IMMEDIATE EFFECT	CONTINUITY
	SPARE	ORDER	ADDRESS			S	ORDER	ADDRESS		
0	2276	62	2500		0320					
2	0000	64	0320		0321					
2	0000	20	0239		0322					17 spc -
0	3462	52	3400		0323					
2	0000	64	0323		0324					20 cu y
0	0000	03	0410		0325				cu	
2	0000	02	0057		0326					
0	0000	14	0010		0327					
0	0000	03	0304		0328					
2	0000	20	0691		0329					
0	3462	52	2721		0330					
2	0000	64	0330		0331					21 cu R y
0	0000	03	0410		0332				cu R	
2	0000	02	0057		0333					
0	0000	14	0010		0334					
0	0000	03	0304		0335					
2	0000	64	0000		0336				cell no.	
2	0000	74	0058		0337					
2	0000	02	0050		0338				(R) stored = R <sub>1</sub> R <sub>2</sub> R <sub>3</sub> R <sub>4</sub> = next cell no.	
2	0000	20	0691		0339					
0	3430	61	2725		0340					22 B <sup>-</sup> y
2	0000	64	0340		0341					
0	0000	03	0410		0342				B-	
2	0000	64	0052		0343					B <sup>-</sup> y continued
0	0000	03	0402		0344				space	
0	0000	14	0010		0345					
0	0000	03	0304		0346				XXXX	
2	0000	22	0217		0347					
2	0000	20	0560		0348					
0	3421	75	3400		0349					
2	0000	64	0349		0350					
0	0000	03	0408		0351					23 ro
2	0000	02	0057		0352					
0	0000	14	0010		0353					
0	0000	03	0304		0354					

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PAGE NO. 11

INSTRUCTION LIST

S	NUMERICAL CODE			CC/CU RETURNS	CALL NUMBER	INSTRUCTION			IMMEDIATE EFFECT	CONTINUITY
	SPARE	ORDER	ADDRESS			S	ORDER	ADDRESS		
2	0000	64	0050		0355				(R)	
0	0000	14	0010		0356					
2	0000	64	0049		0357					
0	0000	23	0000		0358					
2	0000	28	0363		0359					
2	0000	02	0049		0360					
2	0000	02	0050		0361				store "0" in R	
2	0000	20	0205		0362					
2	0000	02	0049		0363					
2	0000	02	0050		0364					
2	0000	20	0251		0365					
0	6136	44	0000		0366					
0	3040	01	2725		0367					24 bl 4 → x
2	0000	64	0366		0368					
0	0000	03	0406		0369				bl 4	
2	0000	64	0367		0370					
0	0000	03	0410		0371				→	
2	0000	02	0057		0372					
0	0000	14	0010		0373					24
0	0000	03	0304		0374				XXXX	bl 4 → x
2	0000	64	0051		0375					continued
2	0000	02	0377		0376					
0	0000	00	0000		0377				[bl etc → x]	
2	0000	20	0143		0378					
0	6136	45	0000		0379					25
2	0000	64	0379		0380					bl 5 → x
2	0000	20	0369		0381					
0	6136	46	0000		0382					26
2	0000	64	0382		0383					bl 6 → x
2	0000	20	0369		0384					
0	6136	47	0000		0385					27
2	0000	64	0385		0386					bl 7 → x
2	0000	20	0369		0387					
0	3462	62	3400		0388					
2	0000	64	0388		0389					28 ccy

BABCOCK & WILCOX COMPANY

RESEARCH CENTER  
ALLIANCE, OHIO

CODED BY Cora Gene Boyle

DATE September 1955

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INSTRUCTION LIST

PAGE No. 12

S	NUMERICAL CODE			CC/CB RETURNS	CALL NUMBER	INSTRUCTION			IMMEDIATE EFFECT	CONTINUITY
	SPARE	ORDER	ADDRESS			S	ORDER	ADDRESS		
0	0000	03	0408		0390					
2	0000	02	0057		0391					not zero
0	0000	14	0010		0392					
0	0000	03	0304		0393					
2	0000	64	0117		0394			"0" stored here if previous step		had no overflow
2	0000	04	0397		0395					
2	0000	20	0143		0396					
2	0000	02	0057		0397					
2	0000	02	0117		0398			Restore "0" in checking position		
2	0000	20	0691		0399					
0	3462	62	2721		0400					
2	0000	64	0117		0401					29 cc R y
2	0000	04	0406		0402					
2	0000	64	0400		0403					
0	0000	03	0410		0404			cc R		
2	0000	20	0140		0405					29 cc R y
2	0000	02	0057		0406					
2	0000	02	0117		0407					continued
2	0000	64	0400		0408					
2	0000	20	0332		0409					
0	3462	52	6100		0410					
2	0000	64	0410		0411			cub		30 cub y
0	0000	03	0408		0412					
2	0000	20	0420		0413					
0	6252	61	2721		0414					
2	0000	64	0000		0415					31 cub R y
2	0000	74	0058		0416					
2	0000	02	0050		0417			storing R <sub>1</sub> R <sub>2</sub> R <sub>3</sub> R <sub>4</sub> - next cell address		
2	0000	64	0414		0418					
0	0000	03	0410		0419			cub R		
2	0000	02	0057		0420					
0	0000	14	0010		0421					
0	0000	03	0304		0422					
2	0000	64	0051		0423					
2	0000	63	0078		0424					

BABCOCK & WILCOX COMPANY  
 RESEARCH CENTER  
 ALLIANCE, OHIO

CODED BY Cora Gene Boyle

DATE September 1955

CHECKED BY \_\_\_\_\_

PAGE No. 13

INSTRUCTION LIST

S	NUMERICAL CODE			CC/CS RETURNS	CALL NUMBER	INSTRUCTION			IMMEDIATE EFFECT	CONTINUITY
	SPACE	INDEX	ADDRESS			S	ORDER	ADDRESS		
2	0000	12	0057		0425					
2	0000	74	0435		0426					
2	0000	02	0428		0427					
0	0000	00	0000		0428				[0000 37 XXXX] = b1 7 ← x	
2	0000	64	0057		0429					
2	0000	63	0436		0430					
2	0000	74	0437		0431					
0	0000	14	0006		0432					
2	0000	02	0000		0433					
2	0000	20	0004		0434					
0	0000	37	0000		0435					constants for
0	0000	00	0011		0436					31 cub R y
0	0000	00	7000		0437					
0	3034	61	2724		0438					
2	0000	64	0438		0439					32 B+
0	0000	03	0410		0440				B+	
2	0000	64	0052		0441				space	
0	0000	03	0402		0442					
2	0000	20	0197		0443					
0	6236	30	2127		0444					
2	0000	64	0444		0445					33 C1 R
0	0000	03	0410		0446					
2	0000	02	0057		0447					
2	0000	02	0050		0448				store "0" in R	
2	0000	20	0141		0449					
0	3051	01	2725		0450					
2	0000	64	0366		0451					34 b1 4 ← x
0	0000	03	0406		0452					
2	0000	64	0450		0453					
2	0000	20	0371		0454					
2	0000	64	0379		0455					
2	0000	20	0452		0456					35 b1 5 ← x
2	0000	64	0382		0457					
2	0000	20	0452		0458					36 b1 6 ← x
2	0000	64	0385		0459					
2	0000	20	0452		0460					37 b1 7 ←

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RESEARCH CENTER  
ALLIANCE, OHIO

DATE September 1955

CHECKED BY \_\_\_\_\_

INSTRUCTION LIST

PAGE No. 14

S	NUMERICAL CODE			CC/CB RETURNS	CALL NUMBER	INSTRUCTION			IMMEDIATE EFFECT	CONTINUITY
	SPARE	ORDER	ADDRESS			S	ORDER	ADDRESS		
0	3462	62	6100		0461					
2	0000	64	0117		0462					38 ccb y
2	0000	04	0466		0463					
2	0000	64	0461		0464					
2	0000	20	0139		0465					
2	0000	02	0057		0466					
2	0000	02	0117		0467					38 ccb y
2	0000	64	0461		0468					continued
2	0000	20	0419		0469					
0	6262	61	2721		0470					
2	0000	64	0117		0471					39 ccb R y
2	0000	04	0476		0472					
2	0000	64	0470		0473					
0	0000	03	0410		0474			ccb R		
2	0000	20	0140		0475					
2	0000	02	0057		0476					
2	0000	02	0117		0477					
2	0000	64	0470		0478					
0	0000	03	0410		0479					
2	0000	02	0057		0480					
0	0000	14	0010		0481					
0	0000	03	0304		0482					
2	0000	64	0000		0483					
2	0000	74	0058		0484					
2	0000	02	0050		0485					
2	0000	20	0423		0486					
0	3423	21	3400		0487					
2	0000	64	0487		0488					40 tr x
2	0000	20	0239		0489					
0	3423	22	3400		0490					
2	0000	64	0490		0491					42 ts
0	0000	03	0408		0492					
2	0000	02	0057		0493					
0	0000	14	0010		0494					
0	0000	03	0304		0495					
2	0000	64	0051		0496					



BABCOCK & WILCOX COMPANY

RESEARCH CENTER  
ALLIANCE, OHIO

CODED BY Cora Gene Boyle

DATE September 1955

CHECKED BY \_\_\_\_\_

PAGE No. 15

INSTRUCTION LIST

S	NUMERICAL CODE			CC/CU RETURNS	CALL NUMBER	INSTRUCTION			IMMEDIATE EFFECT	CONTINUITY
	SPARE	ORDER	ADDRESS			S	ORDER	ADDRESS		
2	0000	02	0499		0497				This will allow me to use this routine for sgc [their command] 42 ts continued	
2	0000	64	0049		0498					
0	0000	00	0000		0499					
2	0000	28	0502		0500					
2	0000	20	0143		0501					
2	0000	64	0118		0502					
2	0000	02	0117		0503					
2	0000	64	0026		0504			(A)a = 0000 64 XXXX		
2	0000	74	0118		0505					
2	0000	02	0507		0506					
0	0000	00	0000		0507			[0000 64 XXX <sup>X</sup> <sub>f</sub> ]		
2	0000	63	0119		0508			(A)a = 0000 YY <sup>1</sup> 0000		
2	0000	12	0057		0509					
2	0000	75	0122		0510					
2	0000	04	0513		0511					
2	0000	20	0143		0512					
2	0000	64	0057		0513					
2	0000	75	0128		0514					
2	0000	04	0517		0515					
2	0000	20	0143		0516					
2	0000	64	0057		0517					
2	0000	75	0129		0518					
2	0000	04	0521		0519					
2	0000	20	0143		0520					
2	0000	64	0057		0521					
2	0000	75	0131		0522					
2	0000	04	0525		0523					
2	0000	20	0143		0524					
2	0000	64	0279		0525					
0	0000	03	0410		0526					
0	0000	08	0000		0527					
0	3462	70	3400		0528					
2	0000	64	0528		0529					
2	0000	64	0196		0530					
0	3427	54	3400		0531					

44 ci x

BABCOCK & WILCOX COMPANY

RESEARCH CENTER  
ALLIANCE, OHIO

CODED BY Cora Gene Boyle

DATE September 1955

CHECKED BY \_\_\_\_\_

PAGE No. 16

INSTRUCTION LIST

S	NUMERICAL CODE			CC/CH RETURNS	CALL NUMBER	INSTRUCTION			IMMEDIATE EFFECT	CONTINUITY
	SPARE	ORDER	ADDRESS			S	ORDER	ADDRESS		
2	0000	64	0531		0532					50 tw x
2	0000	20	0239		0533					
0	3421	54	3400		0534					52 rw
2	0000	64	0534		0535					
2	0000	20	0492		0536					
0	3462	75	3400		0537					54 co x
2	0000	64	0537		0538					
2	0000	20	0196		0539					
0	3473	67	3400		0540					60 mh x
2	0000	64	0540		0541					
0	0000	03	0408		0542				mh	
2	0000	02	0057		0543					
0	0000	14	0010		0544					
0	0000	03	0304		0545				XXXX	
2	0000	64	0051		0546					
2	0000	12	0552		0547					
2	0000	63	0078		0548					
2	0000	74	0053		0549					
2	0000	02	0558		0550					
2	0000	64	0049		0551					
0	0000	00	0000		0552				[their command]	
2	0000	02	0049		0553					
0	0000	14	0010		0554					
2	0000	02	0050		0555					
2	0000	64	0052		0556					
0	0000	03	0406		0557				3 spaces	
0	0000	00	0000		0558				[0000 64 XXXX]←data address	continued
0	0000	03	0010		0559					60 mh
2	0000	02	0057		0560					continued
2	0000	02	0148		0561					
2	0000	20	0143		0562					
0	3463	70	5300		0563					
2	0000	64	0563		0564					61 div x
0	0000	03	0408		0565					no OFT
2	0000	02	0057		0566					

BABCOCK & WILCOX COMPANY

RESEARCH CENTER  
ALLIANCE, OHIO

INSTRUCTION LIST

CODED BY Cora Gene Boyle

DATE September 1955

CHECKED BY \_\_\_\_\_

PAGE No. 17

S	NUMERICAL CODE			CC/CU RETURNS	CALL NUMBER	INSTRUCTION			IMMEDIATE EFFECT	CONTINUITY
	SPARE	ORDER	ADDRESS			S	ORDER	ADDRESS		
0	0000	14	0010		0567					
0	0000	03	0304		0568					
2	0000	64	0051		0569					
2	0000	12	0578		0570					
2	0000	63	0078		0571					
2	0000	74	0053		0572					
2	0000	12	0585		0573					
2	0000	02	0594		0574					
2	0000	64	0050		0575					
0	0000	13	0010		0576					
2	0000	64	0049		0577					
0	0000	00	0000		0578				[their command]	
2	0000	28	0590		0579					
2	0000	02	0049		0580					
0	0000	14	0010		0581					
2	0000	02	0050		0582					
2	0000	64	0052		0583					
0	0000	03	0406		0584					
0	0000	00	0000		0585				[0000 64 XXXX]	
0	0000	03	0010		0586					
2	0000	02	0057		0587					
2	0000	02	0148		0588					
2	0000	20	0143		0589					
2	0000	02	0049		0590					
2	0000	02	0050		0591					
2	0000	64	0052		0592					61 div x continued
0	0000	03	0406		0593					
0	0000	00	0000		0594				[0000 64 XXXX]	
0	0000	03	0010		0595					
2	0000	20	0251		0596					
0	3464	55	3400		0597					
2	0000	64	0597		0598					63 ex x
0	0000	03	0408		0599					
2	0000	02	0057		0600					
0	0000	14	0010		0601					
0	0000	03	0304		0602					

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**RESEARCH CENTER**  
**ALLIANCE, OHIO**

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DATE September 1955

CHECKED BY \_\_\_\_\_

**INSTRUCTION LIST**

PAGE No. 18

S	NUMERICAL CODE			CC/CS RETURNS	CALL NUMBER	INSTRUCTION			IMMEDIATE EFFECT	CONTINUITY
	SPARE	ORDER	ADDRESS			S	ORDER	ADDRESS		
2	0000	64	0051		0603					
2	0000	12	0610		0604					
2	0000	63	0078		0605					
2	0000	74	0053		0606					
2	0000	12	0615		0607					
2	0000	02	0622		0608					
2	0000	64	0049		0609					
0	0000	00	0000		0610				[their ex command]	
2	0000	28	0619		0611				(if no.'s other than "0's" and	"1" are used -
2	0000	02	0049		0612				overflow can be	caused
2	0000	64	0052		0613					
0	0000	03	0406		0614					
0	0000	00	0000		0615				[0000 64 XXXX]- data address	
0	0000	03	0010		0616					
2	0000	02	0057		0617					
2	0000	20	0205		0618					
2	0000	02	0049		0619					
2	0000	64	0052		0620					
0	0000	03	0406		0621					63 ex x
0	0000	00	0000		0622				[0000 64 XXXX]	continued
0	0000	03	0010		0623					
2	0000	20	0251		0624					
2	0000	02	0148		0625					
2	0000	20	0004		0626					
0	0000	00	0000		0627				not used	
0	3462	20	3400		0628					
2	0000	64	0628		0629					64 ca x
0	0000	03	0408		0630					
2	0000	02	0057		0631					
0	0000	14	0010		0632					
0	0000	03	0304		0633					
2	0000	64	0051		0634					
2	0000	12	0639		0635					
2	0000	63	0078		0636					
2	0000	74	0053		0637					
2	0000	02	0644		0638					

BABCOCK & WILCOX COMPANY

RESEARCH CENTER  
ALLIANCE, OHIO

CODED BY Cora Gene Boyle

DATE September 1955

CHECKED BY \_\_\_\_\_

INSTRUCTION LIST

PAGE No. 19

S	NUMERICAL CODE			CC/CU RETURNS	CALL NUMBER	INSTRUCTION			IMMEDIATE EFFECT	CONTINUITY
	SPARE	ORDER	ADDRESS			S	ORDER	ADDRESS		
0	0000	00	0000		0639				[their command]	
2	0000	02	0049		0640					
2	0000	02	0148		0641					
2	0000	64	0052		0642					
0	0000	03	0406		0643					
0	0000	00	0000		0644				[0000 64 XXXX] = data address	
0	0000	03	0010		0645					
2	0000	20	0143		0646					
0	3462	22	3400		0647					
2	0000	64	0647		0648					65 cs x
2	0000	20	0630		0649					
0	3462	20	2000		0650					66 caa x
2	0000	64	0650		0651					
2	0000	20	0630		0652					66 caa x continued
0	3462	22	2000		0653					67 csa x
2	0000	64	0653		0654					
2	0000	20	0630		0655					
0	3473	21	3400		0656					70 mr x
2	0000	64	0656		0657					
2	0000	20	0542		0658					
0	3434	30	6127		0659					72 B x
2	0000	64	0659		0660					
0	0000	03	0410		0661					
2	0000	02	0057		0662					
0	0000	14	0010		0663					
0	0000	03	0304		0664					
2	0000	64	0051		0665					
2	0000	12	0670		0666					
2	0000	63	0078		0667					
2	0000	74	0053		0668					
2	0000	02	0673		0669					
0	0000	00	0000		0670				[their command]	
2	0000	64	0052		0671					
0	0000	03	0406		0672					
0	0000	00	0000		0673				[0000 64 XXXX]	

BABCOCK & WILCOX COMPANY

RESEARCH CENTER  
ALLIANCE, OHIO

CODED BY Cora Gene Boyle

DATE September 1955

CHECKED BY \_\_\_\_\_

INSTRUCTION LIST

PAGE No. 20

S	NUMERICAL CODE			CC/CU RETURNS	CALL NUMBER	INSTRUCTION			IMMEDIATE EFFECT	CONTINUITY
	SPARE	ORDER	ADDRESS			S	ORDER	ADDRESS		
0	0000	03	0010		0674					
2	0000	20	0560		0675					
0	3422	66	6200		0676					
2	0000	64	0676		0677					73 sgc x with OFT
2	0000	20	0599		0678					
0	3420	63	3400		0679					OFT NO.
2	0000	64	0679		0680					74 ad x
2	0000	20	0599		0681					
0	3422	52	3400		0682					
2	0000	64	0682		0683					75 su x
2	0000	20	0599		0684					75 su x continued
0	3420	63	2000		0685					76 ada x
2	0000	64	0685		0686					no OFT yet
2	0000	20	0599		0687					
0	3422	52	2000		0688					
2	0000	64	0688		0689					77 sua x
2	0000	20	0599		0690					
2	0000	64	0051		0691					
2	0000	63	0078		0692					
0	0000	14	0006		0693					
2	0000	02	0000		0694					
2	0000	20	0004		0695					
2	0000	02	0148		0696					
2	0000	20	0004		0697					
2	0000	64	0000		0698				address	
0	0000	13	0006		0699					
2	0000	74	0053		0700				0000 64 XXXX	
2	0000	02	0702		0701					
0	0000	00	0000		0702				[clear & add this command]	
2	0000	12	0051		0703					
2	0000	63	0058		0704				save 4th digit - sign will become + if not	
2	0000	12	0057		0705					
2	0000	75	0719		0706				su 7	
2	0000	73	0052		0707				with + no.	
2	0000	28	0717		0708					

BABCOCK & WILCOX COMPANY

RESEARCH CENTER  
ALLIANCE, OHIO

CODED BY Cora Gene Boyle

DATE September 1955

CHECKED BY \_\_\_\_\_

INSTRUCTION LIST

PAGE No. 21

S	NUMERICAL CODE			CC/CU RETURNS	CALL NUMBER	INSTRUCTION			IMMEDIATE EFFECT	CONTINUITY
	SPARE	ORDER	ADDRESS			S	ORDER	ADDRESS		
2	0000	64	0057		0709					
2	0000	74	0720		0710					
2	0000	02	0712		0711					
0	0000	00	0000		0712					
2	0000	64	0000		0713					
2	0000	74	0058		0714					
2	0000	12	0000		0715					
2	0000	20	0699		0716					
2	0000	64	0000		0717					
2	0000	20	0006		0718					
0	0007	00	0000		0719					
2	0000	20	0717		0720					
0	0000	00	0000		0721					
2	0000	64	0721		0722					
2	0000	04	0022		0723					
2	0000	64	0050		0724					
2	0000	20	0014		0725					
6	0000	08	0000							

[0009 20 0717]

this will be "1" if no. R & B otherwise 0