

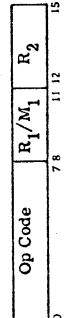
OPERATION CODES FOR:

RR FORMAT INSTRUCTIONS

Deci- mal	Hexa- deci- mal	Mnemonic	Graphic & Control Symbols	7-Track Tape BCDIC	Punched Card Code	System/360 8-bit Code
0	00				12-0-8-1	00000000
1	01				12-0-9-1	00000001
2	02				12-0-0-2	00000010
3	03				12-0-0-3	00000011
4	04	SPM	PF		12-0-0-4	00000010
5	05	BAUR	HT		12-0-5-5	00000101
6	06	BCTR	LC		12-0-6-6	00000110
7	07	ACR	DEL		12-0-7-7	00000111
8	08	TSK			12-0-8-8	00001000
9	09	SVC			12-0-8-2	00001010
10	0A				12-0-8-5	00001011
11	0B	(EBCDIC +)			12-9-8-4	00001100
12	0C	(EBCDIC -)			12-9-8-5	00001101
13	0D				12-9-8-6	00001110
14	0E				12-9-8-7	00001111
15	0F				12-11-9-8-1	00010000
16	10	LPR			11-9-1	00010001
17	11	LNR			11-9-2	00010010
18	12	LTR			11-9-3	00010011
19	13	LCR			11-9-4	00010010
20	14	NR	RES		11-9-5	00010001
21	15	CLR	NL		11-9-6	00010010
22	16	OR	BS		11-9-7	00010011
23	17	XR	IL		11-9-8	00011000
24	18	LR			11-9-8-1	00011001
25	19	CR			11-9-8-2	00011010
26	1A	AR			11-9-8-3	00011011
27	1B	SR			11-9-8-4	00011100
28	1C	MR			11-9-8-5	00011101
29	1D	DR			11-9-8-6	00011110
30	1E	ALR			11-9-8-7	00011111
31	1F	SLR			11-0-9-8-1	00100000
32	20	LPDR			0-9-1	00100001
33	21	LNDR			0-9-2	00100010
34	22	LTRD			0-9-3	00100011
35	23	LCDR			0-9-4	00100100
36	24	HDR			0-9-5	00100101
37	25				0-9-6	00100110
38	26				0-9-7	00100111
39	27	LDR			0-9-8	00101000
40	28	CDR			0-9-8-1	00101001
41	29	NDR			0-9-8-2	00101010
42	2A	NADR			0-9-8-3	00101011
43	2B	NDR			0-9-8-4	00101100
44	2C	NDR			0-9-8-5	00101101
45	2D	NDR			0-9-8-6	00101110
46	2E	NDR			0-9-8-7	00101111
47	2F	SWR			12-11-0-9-8-1	00110000
48	30	LEBR			9-1	00110001
49	31	LEBR			9-2	00110010
50	32	LEBR			9-3	00110011
51	33	LEBR			9-4	00110100
52	34	LEBR			9-5	00110101
53	35	LEBR			9-6	00110110
54	36	LEBR			9-7	00110111
55	37	LEBR			9-8	00111000
56	38	LEBR			9-8-1	00111001
57	39	LEBR			9-8-2	00111010
58	3A	LEBR			9-8-3	00111011
59	3B	LEBR			9-8-4	00111100
60	3C	LEBR			9-8-5	00111101
61	3D	LEBR			9-8-6	00111110
62	3E	LEBR			9-8-7	00111111
63	3F	LEBR			9-8-8	00111111

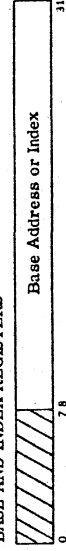
(2) Note that check bit (C) is not shown; add C bit for odd oct from parity as needed except
 (3) CCW flag bit assignments
 (4) Decimal feature instructions
 (5) System/360 assembler programs require these codes

RR Format



R1, R2 - Meaningful for all RR instructions except SPM and SVC

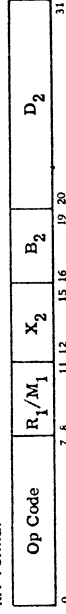
BASE AND INDEX REGISTERS



RX FORMAT INSTRUCTIONS

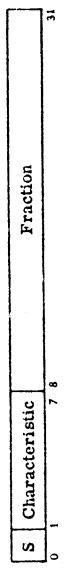
Deci- mal	Hexa- deci- mal	Mnemonic	Graphic & Control Symbols	7-Track Tape BCDIC	Punched Card Code	System/360 8-bit Code
64	40	STH			no punches	01000000
65	41	LA			12-0-9-2	01000001
66	42	STC			12-0-9-3	01000010
67	43	VC			12-0-9-4	01000011
68	44	EXL			12-0-9-5	01000100
69	45	BAL			12-0-9-6	01000101
70	46	BC			12-0-9-7	01000110
71	47	BC			12-0-9-8	01000111
72	48	CH			12-8-1	01001000
73	49	CH			12-8-2	01001010
74	4A	SH			12-8-3	01001011
75	4B	SH			12-8-4	01001100
76	4C	MH			12-8-5	01001101
77	4D	CH			12-8-6	01001110
78	4E	CVD			12-8-7	01001111
79	4F	CVB			12-8-8	01001111
80	50	ST			12-11-9-1	01010000
81	51	ST			12-11-9-2	01010001
82	52	ST			12-11-9-3	01010010
83	53	ST			12-11-9-4	01010011
84	54	N			12-11-9-5	01010100
85	55	CL			12-11-9-6	01010101
86	56	0			12-11-9-7	01010110
87	57	X			12-11-9-8	01010111
88	58	L			12-11-9-8	01011000
89	59	C			11-8-1	01011001
90	5A	A			11-8-2	01011010
91	5B	A			11-8-3	01011011
92	5C	M			11-8-4	01011100
93	5D	D			11-8-5	01011101
94	5E	AL			11-8-6	01011110
95	5F	SL			11-8-7	01011111
96	60	STD			11	01100000
97	61	A			0-1	01100001
98	62				11-0-9-2	01100010
99	63				11-0-9-3	01100011
100	64				11-0-9-4	01100100
101	65				11-0-9-5	01100101
102	66				11-0-9-6	01100110
103	67				11-0-9-7	01100111
104	68	LD			11-0-9-8	01101000
105	69	LD			0-8-1	01101001
106	6A	LD			12-11	01101010
107	6B	LD			0-8-4	01101011
108	6C	NAD			0-8-4	01101100
109	6D	NAD			0-8-5	01101101
110	6E	AW			0-8-6	01101110
111	6F	SW			0-8-6	01101111
112	70	STE			12-11-0	01101111
113	71				12-11-0-9-1	01110000
114	72				12-11-0-9-2	01110001
115	73				12-11-0-9-3	01110010
116	74				12-11-0-9-4	01110011
117	75				12-11-0-9-5	01110100
118	76				12-11-0-9-6	01110101
119	77	LE			12-11-0-9-7	01110110
120	78	LE			12-11-0-9-8	01110111
121	79	CE			8-1	01111000
122	7A	NAE			8-1	01111001
123	7B	NSE			8-2	01111010
124	7C	NSE			8-2	01111011
125	7D	NDE			8-4	01111100
126	7E	AU			8-4	01111101
127	7F	SU			8-4	01111110
128	80				8-4	01111111

RX Format

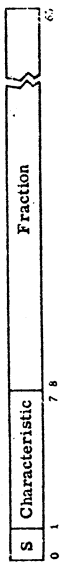


R1, D2(X2, B2)
 R1, S(X2)

SHORT FLOATING-POINT NUMBER



LONG FLOATING-POINT NUMBER



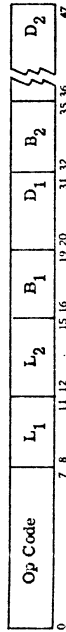
RS, SI FORMAT INSTRUCTIONS

Deci- mal	Hexa- deci- mal	Mnemonic	Graphic & Control Symbols	7-Track Tape BCDIC	Punched Card Code	System/360 8-bit Code
128	80	SSM			12-0-8-1	10000000
129	81	LPSW	a		12-0-8-1	10000001
130	82	LPSW	b		12-0-8-2	10000010
131	83	LPSW	c		12-0-8-3	10000011
132	84	WPD	d		12-0-4	10000100
133	85	R00	e		12-0-5	10000101
134	86	BXH	f		12-0-6	10000110
135	87	BXLE	g		12-0-7	10000111
136	88	SRL	h		12-0-8	10001000
137	89	SLL	i		12-0-9	10001001
138	8A	SRA			12-0-8-2	10001010
139	8B	SRA			12-0-8-3	10001011
140	8C	SRL			12-0-8-4	10001100
141	8D	SRL			12-0-8-5	10001101
142	8E	SRL			12-0-8-6	10001110
143	8F	SRL			12-0-8-7	10001111
144	90	SRA			12-11-8-1	10010000
145	91	SRA			12-11-8-2	10010001
146	92	SRA			12-11-8-3	10010010
147	93	SRA			12-11-8-4	10010011
148	94	SRA			12-11-8-5	10010100
149	95	SRA			12-11-8-6	10010101
150	96	SRA			12-11-8-7	10010110
151	97	SRA			12-11-8-8	10010111
152	98	SRA			12-11-8	10011000
153	99	SRA			12-11-9	10011001
154	9A	SRA			12-11-8-2	10011010
155	9B	SRA			12-11-8-3	10011011
156	9C	SRA			12-11-8-4	10011100
157	9D	SRA			12-11-8-5	10011101
158	9E	SRA			12-11-8-6	10011110
159	9F	SRA			12-11-8-7	10011111
160	AD	TCH			11-0-8-1	10100000
161	AE	TCH			11-0-8-2	10100001
162	AF	TCH			11-0-8-3	10100010
163	A0	TCH			11-0-8-4	10100011
164	A1	TCH			11-0-8-5	10100100
165	A2	TCH			11-0-8-6	10100101
166	A3	TCH			11-0-8-7	10100110
167	A4	TCH			11-0-8-8	10100111
168	A5	TCH			11-0-8	10101000
169	A6	TCH			11-0-9	10101001
170	AA	TCH			11-0-9-1	10101010
171	AB	TCH			11-0-9-2	10101011
172	AC	TCH			11-0-9-3	10101100
173	AD	TCH			11-0-9-4	10101101
174	AE	TCH			11-0-9-5	10101110
175	AF	TCH			11-0-9-6	10101111
176	80	TCH			12-11-0-9-1	10110000
177	81	TCH			12-11-0-9-2	10110001
178	82	TCH			12-11-0-9-3	10110010
179	83	TCH			12-11-0-9-4	10110011
180	84	TCH			12-11-0-9-5	10110100
181	85	TCH			12-11-0-9-6	10110101
182	86	TCH			12-11-0-9-7	10110110
183	87	TCH			12-11-0-9-8	10110111
184	88	TCH			12-11-0-9-8	10111000
185	89	TCH			12-11-0-9-9	10111001
186	8A	TCH			12-11-0-9-10	10111010
187	8B	TCH				

55 FORMAT INSTRUCTIONS

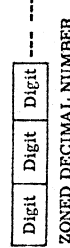
Deci- mal	Hexa- mal	Mnemonic	Graphic & Control Symbols	7-Track Type	Punched Card Code	System/360 8-bit Code	(1)
192	C0		A	B A 8 2	12-0	1100 0000	CCW
193	C1		A	B A 2	12-1	1100 0001	
194	C2		B	B A 2	12-2	1100 0010	
195	C3		C	B A 2	12-3	1100 0011	
196	C4		D	B A 2	12-4	1100 0100	
197	C5		E	B A 4	12-5	1100 0101	
198	C6		F	B A 4	12-6	1100 0110	
199	C7		G	B A 4 2 1	12-7	1100 0111	CCW
200	C8		H	B A 8	12-8	1100 1000	
201	C9		I	B A 8	12-9	1100 1001	
202	CA		J	B 8 2	12-0-9-8-2	1100 1010	
203	CB		K	B 8 2	12-0-9-8-3	1100 1011	
204	CC		L	B 8 2	12-0-9-8-4	1100 1100	
205	CD		M	B 8 2	12-0-9-8-5	1100 1101	
206	CE		N	B 8 2	12-0-9-8-6	1100 1110	
207	CF		O	B 8 2	12-0-9-8-7	1100 1111	
208	00		P	B 8 2	11-0	1100 0000	CCW
209	01	MVN	Q	B 8 2	11-1	1100 0001	
210	02	MVC	R	B 2	11-2	1100 0010	
211	03	MVZ	S	B 2 1	11-3	1100 0011	
212	04	NC	T	B 4	11-4	1100 0100	
213	05	CLC	U	B 4 1	11-5	1100 0101	
214	06	OC	V	B 4 2	11-6	1100 0110	
215	07	XC	W	B 4 2 1	11-7	1100 0111	
216	08		X	B 8	11-8	1100 1000	CCW
217	09		Y	B 8 1	11-9	1100 1001	
218	0A		Z	B 8 1	11-0-8-2	1100 1010	
219	0B			B 8 1	11-0-8-3	1100 1011	
220	0C	TR		B 8 1	11-0-8-4	1100 1100	
221	0D			B 8 1	11-0-8-5	1100 1101	
222	0E	ED (4)		B 8 2	12-11-9-8-6	1100 1110	
223	0F	EDMK (4)		A 8 2	12-11-9-8-7	1100 0000	CCW
224	10		S	A 2	11-0-9-1	1100 0001	
225	11		T	A 2	11-0-9-2	1100 0010	
226	12		U	A 2 1	11-0-9-3	1100 0011	
227	13		V	A 4	11-0-9-4	1100 0100	
228	14		W	A 4 1	11-0-9-5	1100 0101	
229	15		X	A 4 1	11-0-9-6	1100 0110	
230	16		Y	A 4 2	11-0-9-7	1100 0111	
231	17		Z	A 8	11-0-9-8	1100 1000	CCW
232	18			A 8 1	11-0-9-9	1100 1001	
233	19			A 8 1	11-0-9-8-2	1100 1010	
234	1A			A 8 1	11-0-9-8-3	1100 1011	
235	1B			A 8 1	11-0-9-8-4	1100 1100	
236	1C			A 8 1	11-0-9-8-5	1100 1101	
237	1D			A 8 1	11-0-9-8-6	1100 1110	
238	1E			A 8 1	11-0-9-8-7	1100 1111	CCW
239	1F			8 2	11-0	1110 0000	
240	20	MVO		8 2	11-1	1110 0001	
241	21			8 2	11-2	1110 0010	
242	22	PACK		2 2	11-3	1110 0011	
243	23	UNPK		3 3	11-4	1110 0100	
244	24			4 4	11-5	1110 0101	
245	25			5 5	11-6	1110 0110	
246	26			6 6	11-7	1110 0111	
247	27			7 7	11-8	1110 1000	CCW
248	28	ZAP (4)		8 8	11-9	1110 1001	
249	29	CP (4)		8 8	12-11-0-9-8-2	1110 1010	
250	2A	AP (4)		8 8	12-11-0-9-8-3	1110 1011	
251	2B	SP (4)		8 8	12-11-0-9-8-4	1110 1100	
252	2C	MP (4)		8 8	12-11-0-9-8-5	1110 1101	
253	2D	DP (4)		8 8	12-11-0-9-8-6	1110 1110	
254	2E			8 8	12-11-0-9-8-7	1110 1111	

55 Format

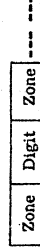


D(L1,B1), D2(L2,B2) { PACK, UNPK, MVO, AP, SI(L1), S2(L2) }
 D(L,B1), D2(B2) { NC, OC, XC, CLC, MVC, MVN, MVZ, TR, TRT, ED, EDMK }

PACKED DECIMAL NUMBER



ZONED DECIMAL NUMBER



INPUT/OUTPUT

CHANNEL ADDRESS WORD

Key	0 0 0 0	Command Address	15 16	23 24	31
CHANNEL COMMAND WORD					
Command Code	7 16	Data Address	15 16	23 24	31
Flags	0 0 0	Byte Count	47 48	55 56	63

Refer to OPERATION CODE tables for flag bit (Bits 32-36) assignments.
 Bit 32 causes the address portion of the next CCW to be used.
 Bit 33 causes the command code and data address in the next CCW to be used.
 Bit 34 causes a possible incorrect length indication to be suppressed.
 Bit 35 suppresses the transfer of information to main storage.
 Bit 36 causes an interruption as Program Control Interrupt.

CHANNEL STATUS WORD

Key	0 0 0 0	Command Address	15 16	23 24	31
Status	39 40	Byte Count	47 48	55 56	63

- 32 Attention
- 33 Status modifier
- 34 Control unit end
- 35 Busy
- 36 Channel end
- 37 Device end
- 38 Unit check
- 39 Unit exception
- 40 Program-controlled interruption
- 41 Incorrect length
- 42 Program check
- 43 Protection check
- 44 Channel data check
- 45 Channel control check
- 46 Interface control check
- 47 Chaining check

Count: Bits 48-63 form the residual count for the last CCW used.

DASD CHANNEL COMMAND CODES (See A26-5988)

Command for CCW	Control	Count	Multiple Track		M-T On
			8-Bit Code (M-T) Off	Hex Dec	
No Op	X	0000 0011	03	03	
Release*	X	0001 0111	17	23	
Seek	X	0000 0011	13	19	
Seek Cylinder	6	0000 0111	07	07	
Seek Head	6	0001 1011	13	27	
Sense I/O	4	0000 0100	04	04	
Set File Mask	1	0001 1111	1F	31	
Space Record	X	0000 1111	0F	15	
Transfer in Channel	X	XXXX 1000	X0		
Home Address EQ	4 (usually)	0011 1001	39	57	B9
Identifier EQ	5 (usually)	0011 0001	31	49	B1
Identifier HI	5 (usually)	0101 0001	51	81	D1
Identifier EQ or HI	5 (usually)	0111 0001	71	113	F1
Key EQ	1 to 255	0100 1001	29	41	A9
Key HI	1 to 255	0100 1001	49	73	C9
Key EQ or HI	1 to 255	0110 1001	69	105	E9
Key & Data EQ*	Note 1	0010 1101	4D	45	AD
Key & Data HI*	Note 1	0100 1101	4D	77	CD
Key & Data EQ or HI*	Note 1	0110 1101	6D	109	ED
Home Address	5	0001 1010	1A	26	9A
Record R0	8	0001 0010	12	18	92
Data	Number of bytes trans-ferred	0000 0110	06	06	86
Key & Data	5 (usually)	0000 1110	0E	14	8E
Home Address	8+KL+DL of R0	0001 1110	1E	30	9E
Record R0	8+KL+DL of R0	0001 0101	15	21	
Count, Key & Data	8+KL+DL	0001 1101	1D	29	
Special Count, Key & Data	DL	0000 0011	05	05	
Key & Data	KL & DL	0000 1101	0D	13	

* Special Feature Note 1: Includes mask bytes in search argument.
 † M-T On = M-T Off except, during Search and Read (0 = 1 in M-T On, X = not significant, M-T Key, length, DL, Data Length, SP, Suppl, HI = High)

CHANNEL COMMAND CODES

Device	Command for CCW	8-bit Code	Hex	Dec
1052	Read Inquiry BCD	0 0 0 0 1 0 1 0	7	0A
	Read Reader 2 BCD	0 0 0 0 1 0 1 0	0	02
	Write BCD, Auto Carriage Return	0 0 0 0 1 0 0 1	1	09
	No Op	0 0 0 0 0 0 1 1	01	01
	Sense	0 0 0 0 0 1 0 1	03	04
	Alarm	0 0 0 0 1 0 1 1	0B	11
	Read, Feed, Select Stacker SS	S S D D 0 0 1 0		
	Read, Feed (1400 compatibility mode only)	S S D D 0 0 1 0		
	Feed, Select Stacker SS	S S 1 0 0 0 1 1		
	PF Punch, Feed, Select Stacker SS	S S 1 0 0 0 1 1		
Punch, Feed, Select Stacker SS	S S D D 0 0 0 1			
2540	Read	S S D D 0 0 1 0		
	Write	S S D D 0 0 1 1		
	Control	S S 1 0 0 0 1 1		
	Sense	S S D D 0 0 1 1		
	Read	S S D D 0 0 1 0		
	Write	S S D D 0 0 1 1		
	Control	S S 1 0 0 0 1 1		
	Sense	S S D D 0 0 1 1		
	Read	S S D D 0 0 1 0		
	Write	S S D D 0 0 1 1		
1442 NI	Read	M M M M 0 0 1 0		
	Write	M M M M 0 0 1 1		
	Control	M M 1 0 0 0 1 1		
	Sense	M M D D 0 0 1 1		
	Read	M M M M 0 0 1 0		
	Write	M M M M 0 0 1 1		
	Control	M M 1 0 0 0 1 1		
	Sense	M M D D 0 0 1 1		
	Read	M M M M 0 0 1 0		
	Write	M M M M 0 0 1 1		
1403 or 1443	Write, No Space	0 0 0 0 0 0 1 1	01	01
	Write, Space 1 After Print	0 0 0 0 1 0 0 1	09	09
	Write, Space 2 After Print	0 0 0 0 1 0 0 1	11	17
	Write, Space 3 After Print	0 0 0 0 1 0 0 1	19	25
	Write, Skip To Channel N After Print	1 C H A N 0 0 1 1		
	Diagnostic Read	0 0 0 0 0 0 1 0	02	02
	Test I/O	0 0 0 0 0 0 1 0	00	00
	Sense	0 0 0 0 0 0 1 0	04	04
	Space 1 Line Immediately	0 0 0 0 1 0 1 1	0B	11
	Space 2 Line Immediately	0 0 0 1 0 1 1 1	13	19
Space 3 Line Immediately	0 0 0 1 0 1 1 1	1D	27	
Skip To Channel N Immediately	1 C H A N 0 1 1 1			
No Op	0 0 0 0 0 0 1 1	03	03	
2400 Tape*	Transfer in Channel	C H A I N Channel		
	Sense	0 1 1 1 0 6		
	Read Backward**	0 1 1 1 0 7		
	Write	0 1 1 1 0 8		
	Control	0 1 1 0 1 9		
	Mode Set	0 1 1 0 1 10		
	Control	0 1 1 1 0 11		
	Transfer in Channel	1 1 1 0 1 12		
	Sense	0 0 0 0 1 0 0 1	08	08
	Read Backward**	0 0 0 0 1 0 0 1	04	04
Write	0 0 0 0 1 0 0 1	0C	12	
Control	0 0 0 0 0 0 1 0	01	01	
Mode Set	0 0 0 0 0 0 1 1	02	02	
Control	D D D M M M 0 1 1			

* 9 track op. forces R00 R01 and odd parity; also, it overrides 7 track but does not reset 7 track. Load/Sys. Rest forces 7 track to R00 R01, odd parity, data converter on, translator off.

Control	CIC	Codes	Hex	Dec
0	0	0	7	15
1	0	1	0F	15
2	0	1	1	31
3	0	1	1F	31
4	0	1	0B	27
5	0	1	0B	27
6	1	1	0F	31
7	1	1	0F	31
8	1	1	0F	31
9	1	1	0F	31
10	1	1	0F	31
11	1	1	0F	31
12	1	1	0F	31

**Override Data Converter On

Control	D	D	7 Track Density
0	0	0	200
1	0	1	350
2	0	1	800
3	1	1	1
4	1	1	1
5	1	1	1
6	1	1	1
7	1	1	1
8	1	1	1
9	1	1	1
10	1	1	1
11	1	1	1
12	1	1	1

M M M (Mode Modifiers)
 0 = 0, No Op.
 1 = 1, Rev. Cond.
 2 = 2, Rev. Cond.
 3 = 3, Rev. Cond.
 4 = 4, Rev. Cond.
 5 = 5, Rev. Cond.
 6 = 6, Rev. Cond.
 7 = 7, Rev. Cond.
 8 = 8, Rev. Cond.
 9 = 9, Rev. Cond.
 10 = 10, Rev. Cond.
 11 = 11, Rev. Cond.
 12 = 12, Rev. Cond.