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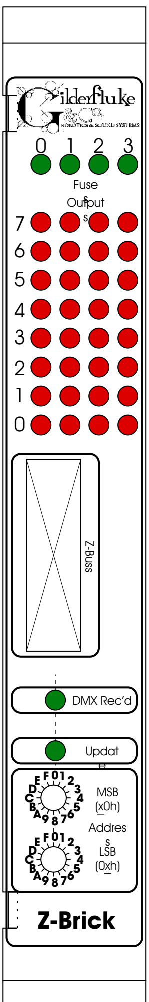
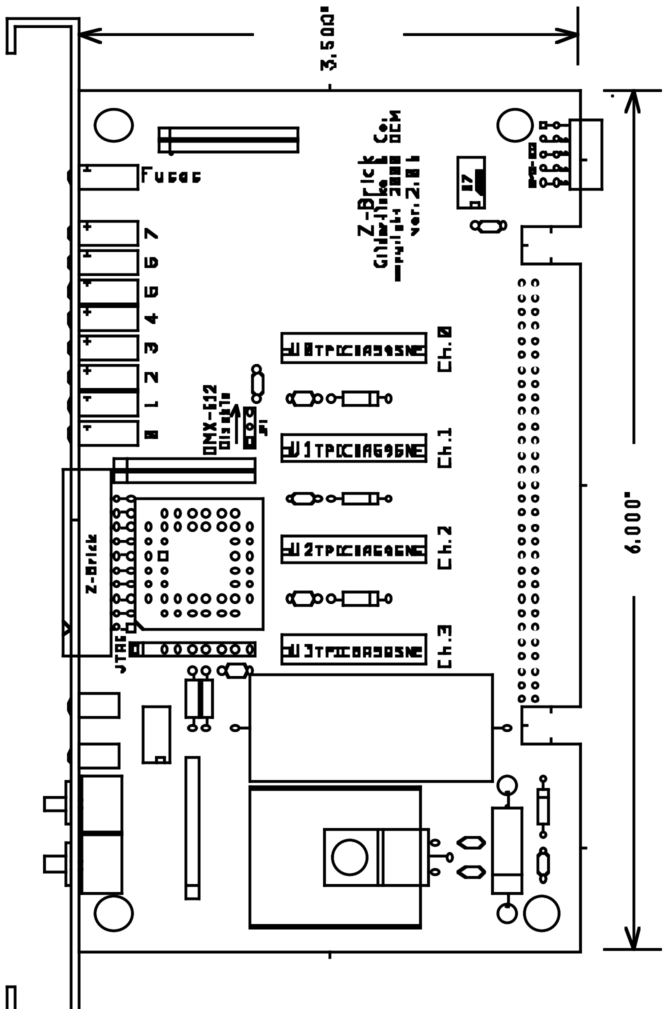
Z-Brick

Printed April 25, 2002





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A note about this manual:

This manual covers the specifics of the Z-Brick. To program the Z-Brick you will need to also need the PC•MACs manual sections that cover the PC•MACs software.

Gilderfluke Show Control Equipment is sometimes programmed in '**Software-only**' or '**Hardwareless Realtime**' mode. Refer to the 'Quick Start' sections of the PC·MACs manual if you are unfamiliar with their use. If you are using the PC•MACs MACs-SMP or MACs-USB for programming your Z-Brick through the DMX-512 input, please refer to the PC•MACs '**Unlimited**' mode.

The full PC•MACs manual can be downloaded from our web site at:

http:/ /www.gilderfluke.com

Overview:

The Z-Brick is an output card which has thirty-two digital outputs. It is designed to be used as an output card for use in a PC·MACs system, or as a digital output expansion card for BR-ANAs, BR-EFBs, BR-SmartMedia, or any other Gilderfluke & Company card which provides a Z-Buss or DMX-512 output. Each Z-Brick adds another thirty-two digital outputs. Up to sixty-four Z-Bricks can be used for a total of 2048 digital outputs.

The Z-Brick can be used in two different ways:

1) **Z-Brick with DMX-512 input:** In this mode the Z-Brick receives up to 256 channels of DMX-512 data transmitted by a PC•MACs Animation Control System, or any other source of DMX-512 data, and uses four channels of this data to update its outputs. The Z-Brick can be addressed to use any DMX-512 address from 0 to 255. The DMX-512 input allows the Z-Brick to be used as a permanent output device for a PC•MACs or other Animation or Lighting Control System. DMX-512 reception can be disabled by moving the 'DMX-512 Disable' jumper to the 'disabled' position.

2) **Z-Brick as a Digital Output Expander:** BR-ANAs, BR-EFBs, BR-SmartMedia, and some other Gilderfluke & Company cards don't themselves have digital outputs. One or more Z-Bricks can be attached to these cards via the twenty position IDS 'Z-Buss' connection on their front panels.

In either of the modes, the Z-Brick's thirty-two outputs are addressed as four consecutive eight bit channels. This means that each Z-Brick needs four eight bit channels worth of data. The two HEXadecimal switches on the front of the Z-Brick are used to set the address. The address is set using HEXadecimal numbers (a chart which shows both numbering systems is at the rear of this and all Gilderfluke manuals). The upper switch is used to set the upper hex nibble's address. The lower switch is used to set the lower hex nibble's address.

As an example, a typical address for a Z-Brick is right after the sixteen eight bit resolution analog outputs on a BR-ANA. If the BR-ANA outputs are addressed at address 0, then the last analog channel is in address 15. This translates to 0Fh, so the first address which is available to the Z-Brick is 16 (decimal), or 10h. To set this address on a Z-Brick, the upper address switch would be set to '1', and the lower switch set to '0'.

Another common address is right after sixteen analog outputs of a BR-ANA which are set to twelve bits of resolution. These sixteen twelve bit resolution outputs occupy twenty-four channels worth of data. If they are addressed at address 0, then the last analog channel is in address 23. This translates to 17h, so the first address which is available to the Z-Brick is 24 (decimal), or 18h. The upper address switch needs to be set to '1', and the lower switch set to '8'.

The Z-Brick can be mounted in one 1" wide slot in any of our Brick Card cages. The Z-Brick can be used in conjunction with any selection of Smart Bricks, Smart Brick Brains, Electronic FeedBack (EFB) Smart Bricks and Z-Bricks in the same card cage. Card cages with one, two or sixteen slots are available. The card cages provide all of the connections for power supply, control signals and outputs that any Brick card will need. Several different styles of output connectors are available on the one and two slot card cages. The sixteen slot card cage mounts in seven inches (4U) of standard 19" rack space (4-1/2" of space behind the panel). In some applications you may need to mount a single Smart Brick. This can be done by mounting the Brick on standoffs, and connecting to the card's edge connector with a mating connector. We usually recommend a sixty position insulation displacement connector for this type of installation.

Power requirements for each Z-Brick are 9 to 24 VDC. The actual current requirements are determined by the loads attached to the unit. The Z-Brick itself draws about 200 ma. of current.

On the Front of the Z-Brick:

A) Output LEDs: These thirty-two LEDs show the current status of the thirty-two digital outputs. If a LED is lit, then that output is 'ON'. Because the outputs of a Z-Brick are 'Open Collector, Switch To Ground', you can ground out any output pin, and the appropriate LED will light. This can be useful when diagnosing output wiring problems. If you are commanding 'on' an output and you don't see a LED, then the output is probably drawing too much current and the output is 'self protecting'. Disconnect the load and see if the LED now lights. If it does, then it definitely is an overload problem. If it does not, then try turning 'on' some of the other outputs. if they light OK, then the output driver might be damaged. If they do not, then verify your addressing and retest.

B) Fuse LEDs: The thirty-two outputs of the Z-Brick are divided into four, eight bit 'channels'. Each of these channels is fused for approximately one Amp of continuous current. These four LEDs light to show if the four fuses are OK. If any are out, then a short circuit (or too heavy of a load) is dragging the outputs down and causing the fuse to open. The fuses are actually 'PTC fuses', which act more like circuit breakers. Once the overload is removed, they reset.

C) Update LED: This LED will flash on each update from DMX-512 or the Z-Buss. It shows you the the Z-Brick is receiving data OK.

D) DMX-512 LED: This LED will be lit when the Z-Brick is receiving DMX-512 data. DMX-512 reception can be disabled by moving the 'DMX-512 Disable' jumper to the 'disabled' position.

E) Address Switches: The address for the Z-Brick is set using Hexadecimal numbers. The first digit of the Hexadecimal address is set on the upper of the two switches. The second digit of the hexadecimal address is set on the lower of the two switches. If you are not sure how these translate from decimal numbers, a chart at the end of every Gilderfluke & Company manual will show you the equivalent numbers..

F) Z-Buss: This twenty pin IDS connector is used to connect one or more Z-Bricks to the ONE card that is sourcing data. This 'sourcing' card can be a BR-ANA, BR-EFB, BR-SmartMedia, or any other Gilderfluke & Co. card with an appropriate Z-Buss output. The BR-ANA, BR-EFB, or BR-SmartMedia outputs data from the DMX-512 or serial input or onboard Flash Memory to this connector. The pinouts of this connector is as follows:

IDS pin #	SIGNAL
1	Data bit 0
2	Data bit 1
3	Data bit 2
4	Data bit 3
5	Data bit 4
6	Data bit 5
7	Data bit 6
8	Data bit 7
9	Address bit 0
10	Address bit 1
11	Address bit 2
12	Address bit 3
13	Address bit 4
14	Address bit 5
15	Address bit 6
16	Address bit 7
17	ground
18	ground
19	Strobe/
20	Reset/

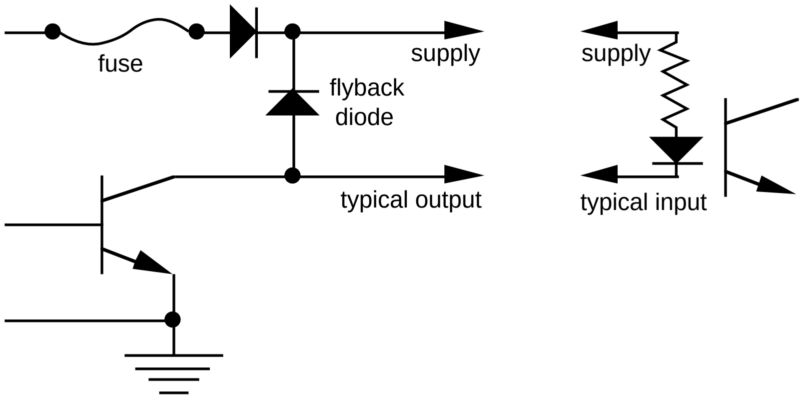
When the address and data lines are valid, the rising edge of the Strobe line will latch the data into the addressed outputs.

If the Z-Buss input is not going to be used, you should insert a two position jumper between pins #17 and #19. This will tie down any spurious outputs that might otherwise happen if the DMX-512 data is not present. The Z-Bricks ship from Gilderfluke & Co. with a jumper in just this position.

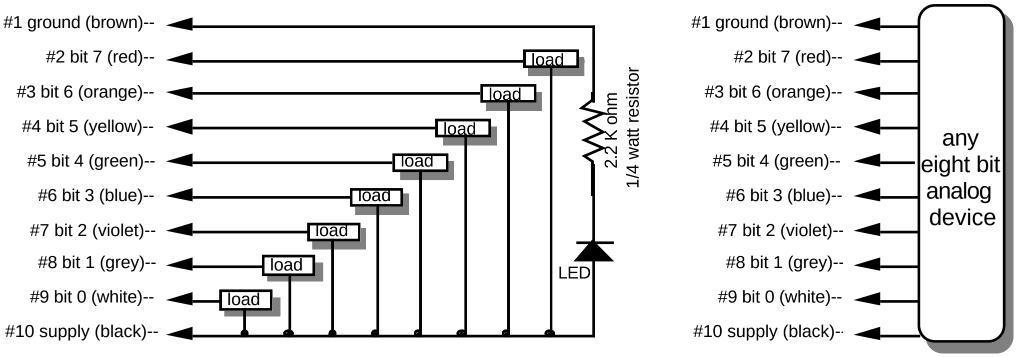
On the Back of the Z-Brick:

In all animation systems made by Gilderfluke & Company all digital output cabling is through what we call 'J-6' standard output cables. These are forty wire cables which are made up of four identical eight bit wide 'channels'. A J-6 cable is often split up into four individual channels. As each channel also includes a common power supply and ground wire, each '1/4 J-6' cable is made up of ten wires, and can be used to control eight individual 'digital' (off/on) devices, or one eight bit wide 'analog' device.

All Gilderfluke & Co. digital outputs are open collector switches to ground, and all inputs are opto isolated. Flyback diodes are included in the outputs for driving inductive loads:



To simplify wiring to any MACs animation system, the connectors used on the J-6 cables are what are called 'insulation displacement connectors'. These simply snap on to an entire cable, automatically 'displacing' the wire insulation and making contact with the wires within. This means that an entire 40 wire cable can be terminated in seconds. All connectors are polarized, to keep them from being plugged in backwards. Although there are tools made specifically for installing these connectors, the tool we find works best is a small bench vise.



The supply line for each 1/4 J-6 is PTC fused for 1 amp. You should treat each 1/4 J-6 as an individual, and not cross the outputs or supply lines from one channel to the lines from any other channel. Doing this won't cause any damage, but can reduce the protection for the outputs that the fuses normally provide.

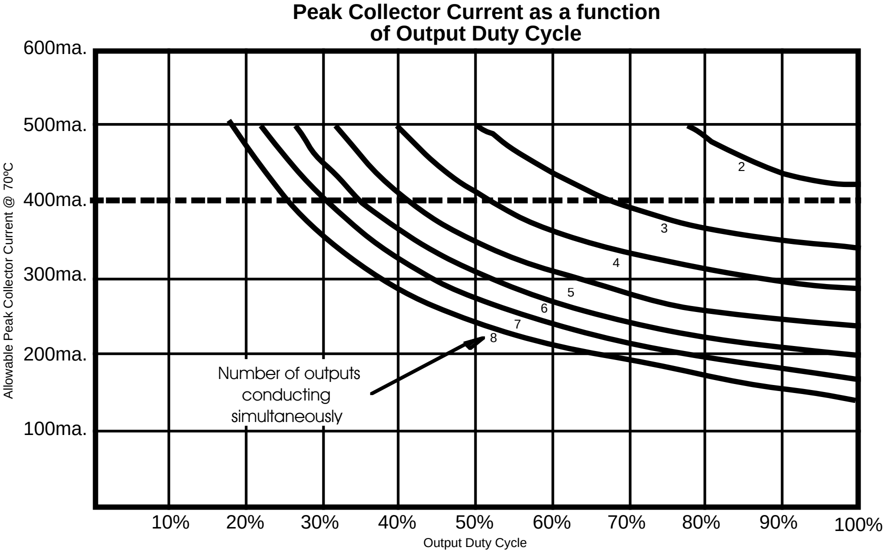
Each J-6 cable is arranged in the following order:

wire number	**color**	**wire function**
1	brown	circuit ground
2	red	channel 0 data bit 7
3	orange	channel 0 data bit 6
4	yellow	channel 0 data bit 5
5	green	channel 0 data bit 4
6	blue	channel 0 data bit 3
7	violet	channel 0 data bit 2
8	gray	channel 0 data bit 1
9	white	channel 0 data bit 0
10	black	unregulated power supply (PTC fused for 1 amp)
11	brown	circuit ground
12	red	channel 1 data bit 7
13	orange	channel 1 data bit 6
14	yellow	channel 1 data bit 5
15	green	channel 1 data bit 4
16	blue	channel 1 data bit 3
17	violet	channel 1 data bit 2
18	gray	channel 1 data bit 1
19	white	channel 1 data bit 0
20	black	unregulated power supply (PTC fused for 1 amp)
21	brown	circuit ground
22	red	channel 2 data bit 7
23	orange	channel 2 data bit 6

24	yellow	channel 2 data bit 5
25	green	channel 2 data bit 4
26	blue	channel 2 data bit 3
27	violet	channel 2 data bit 2
28	gray	channel 2 data bit 1
29	white	channel 2 data bit 0
30	black	unregulated power supply (PTC fused for 1 amp)
31	brown	circuit ground
32	red	channel 3 data bit 7
33	orange	channel 3 data bit 6
34	yellow	channel 3 data bit 5
35	green	channel 3 data bit 4
36	blue	channel 3 data bit 3
37	violet	channel 3 data bit 2
38	gray	channel 3 data bit 1
39	white	channel 3 data bit 0
40	black	unregulated power supply (PTC fused for 1 amp)

Any eight digital devices or one eight bit analog device can be connected to any 1/4 J-6 cable as shown. The LED between the ground (pin #1 brown) wire and supply (pin #10 black) wire acts as an indicator which is lit if the fuse for that channel is OK:

The current Output Capacity of a each output is as shown in the following chart:



Since it is unusual to have more than 50% of the outputs on at any one time, you can usually assume the system has a 250 ma output current capacity. If you are going to be turning on lots of heavy loads at the same time, you should derate this to 150 ma.. This is sufficient to drive the majority of loads which will be directly connected to the outputs of the animation system. If additional current capacity is needed, or if you need to drive higher voltage loads, you can connect relays as needed to the outputs of the animation system. Coincidentally, boards for doing this are available from Gilderfluke & Company. These include:

DPDT relay board: A set of eight electromechanical relays with double pole/double throw contacts rated at 5 amps each.

Reed relay board: A set of eight small electromechanical relays with normally open contacts rated at 150 ma each.

I/O module: A set of eight small solid state relays with normally open contacts rated at 3.5 amps each (AC and DC relays available).

Solid State Relay Fanning Strip: For connecting up to eight popular 'hockey puck' style relays to a 1/4 J-6 output cable. These are available with capacities of up to 75 amps each.

DMX-512 Data In/Out: Ten pin Male header connector. The Z-Brick will stop listening to the Z-Buss whenever there is a DMX-512 signal present on this input. DMX-512 reception can be disabled by moving the 'DMX-512 Disable' jumper to the 'disabled' position. You will want to disable the DMX-512 reception if your installation will normally feed the Z-Bricks from the Z-Buss, and is only temporarily using DMX-512 during programming.

The DMX-512 standard was developed by the United States Institute for Theatrical Technology (USITT) for a high speed (250 KBaud) asynchronous serial data link. Although it was originally designed for controlling light dimmers, it is now supported by hundreds of suppliers throughout the world for controlling all kinds of theatrical equipment.

Even though the DMX-512 standard calls for 512 channels of data, the DMX transmission from PC•MACs is limited to 256 eight bit wide channels. You can address your DMX-512 compatible output devices to respond to any address between 00 and 255. Addresses above the 256th are used in PC•MACs for transmitting a checksum. The BR-ANA can use this to verify that the data received from PC•MACs has no transmission errors in it. If you address a light dimmer or other DMX-512 device to addresses 256 or 257, you will see this verification data displayed as a flickering pattern. Note that at frame rates higher than sixty FPS, not all 256 channels can be transmitted through the DMX-512 output.

The DMX-512 standard calls out a 5 pin XLR connector or screw terminals for all connections. All card cages will provide either screw terminals or other appropriate connection for attaching the DMX-512 input and output.

Edge Connector: All of the connections to and from Z-Brick Cards are available on the 60 position edge connector. You can use an Insulation Displacement Edge (IDE) connector if you aren't going to be using one of our card cages:

output wire #	Edge pin #	color	wire function
n/a	1	brown	not used
n/a	2	red	not used
n/a	3	orange	not used
n/a	4	yellow	not used
n/a	5	green	not used
n/a	6	blue	not used
n/a	7	violet	not used
n/a	8	gray	not used
n/a	9	white	not used
n/a	10	black	not used
#1	11	brown	J6 out channel 0 Ground
#2	12	red	J6 out channel 0 bit 7
#3	13	orange	J6 out channel 0 bit 6
#4	14	yellow	J6 out channel 0 bit 5
#5	15	green	J6 out channel 0 bit 4
#6	16	blue	J6 out channel 0 bit 3
#7	17	violet	J6 out channel 0 bit 2
#8	18	gray	J6 out channel 0 bit 1
#9	19	white	J6 out channel 0 bit 0
#10	20	black	J6 out channel 0 + Supply
#11	21	brown	J6 out channel 1 Ground
#12	22	red	J6 out channel 1 bit 7
#13	23	orange	J6 out channel 1 bit 6
#14	24	yellow	J6 out channel 1 bit 5
#15	25	green	J6 out channel 1 bit 4
#16	26	blue	J6 out channel 1 bit 3
#17	27	violet	J6 out channel 1 bit 2
#18	28	gray	J6 out channel 1 bit 1
#19	29	white	J6 out channel 1 bit 0
#20	30	black	J6 out channel 1 + Supply
#21	31	brown	J6 out channel 2 Ground
#22	32	red	J6 out channel 2 bit 7
#23	33	orange	J6 out channel 2 bit 6
#24	34	yellow	J6 out channel 2 bit 5
#25	35	green	J6 out channel 2 bit 4
#26	36	blue	J6 out channel 2 bit 3

#27	37	violet	J6 out channel 2 bit 2
#28	38	gray	J6 out channel 2 bit 1
#29	39	white	J6 out channel 2 bit 0
#30	40	black	J6 out channel 2 + Supply
#31	41	brown	J6 out channel 3 Ground
#32	42	red	J6 out channel 3 bit 7
#33	43	orange	J6 out channel 3 bit 6
#34	44	yellow	J6 out channel 3 bit 5
#35	45	green	J6 out channel 3 bit 4
#36	46	blue	J6 out channel 3 bit 3
#37	47	violet	J6 out channel 3 bit 2
#38	48	gray	J6 out channel 3 bit 1
#39	49	white	J6 out channel 3 bit 0
#40	50	black	J6 out channel 3 + Supply
black	51	brown	power supply ground
black	52	red	power supply ground
black	53	orange	power supply ground
black	54	yellow	power supply ground
black	55	green	power supply ground
red	56	blue	+ power supply input
red	57	violet	+ power supply input
red	58	gray	+ power supply input
red	59	white	+ power supply input
red	60	black	+ power supply input

- HEXadecimal to Decimal to Percentage -

This chart shows decimal, HEXadecimal, and a few percentage equivalents to aid you when you need to convert between numbering bases:

decimal	HEX	ASCII	%	decimal	HEX	ASCII	%	decimal	HEX	ASCII	%	decimal	HEX	ASCII	%
00	00h	null	0%	64	40h	@	25%	128	80h	(null)	50%	192	C0h	(@)	75%
1	01h	soh/^A		65	41h	A		129	81h	(soh)		193	C1h	(A)	
2	02h	stx/^B		66	42h	B		130	82h	(stx)		194	C2h	(B)	
3	03h	etx/^C		67	43h	C		131	83h	(etx/)		195	C3h	(C)	
4	04h	eot/^D		68	44h	D		132	84h	(eot)		196	C4h	(D)	
5	05h	eng/^E		69	45h	E		133	85h	(eng)		197	C5h	(E)	
6	06h	ack/^F		70	46h	F		134	86h	(ack)		198	C6h	(F)	
7	07h	bell/^G		71	47h	G		135	87h	(bell)		199	C7h	(G)	
8	08h	bs/^H		72	48h	H		136	88h	(bs)		200	C8h	(H)	
9	09h	ht/^I		73	49h	I		137	89h	(ht)		201	C9h	(I)	
10	0Ah	lf/^J		74	4Ah	J		138	8Ah	(lf)		202	CAh	(J)	
11	0Bh	vt/^K		75	4Bh	K		139	8Bh	(vt)		203	CBh	(K)	
12	0Ch	ff/^L		76	4Ch	L		140	8Ch	(ff)		204	CCh	(L)	
13	0Dh	cr/^M		77	4Dh	M		141	8Dh	(cr)		205	CDh	(M)	
14	0Eh	so/^N		78	4Eh	N		142	8Eh	(so)		206	CEh	(N)	
15	0Fh	si/^O		79	4Fh	O		143	8Fh	(si)		207	CFh	(O)	
16	10h	dle/^P		80	50h	P		144	90h	(dls)		208	D0h	(P)	
17	11h	dc1/^Q		81	51h	Q		145	91h	(dc1)		209	D1h	(Q)	
18	12h	dc2/^R		82	52h	R		146	92h	(dc2)		210	D2h	(R)	
19	13h	dc3/^S		83	53h	S		147	93h	(dc3)		211	D3h	(S)	
20	14h	dc4/^T		84	54h	T		148	94h	(dc4)		212	D4h	(T)	
21	15h	nak/^U		85	55h	U		149	95h	(nak)		213	D5h	(U)	
22	16h	syn/^V		86	56h	V		150	96h	(syn)		214	D6h	(V)	
23	17h	etb/^W		87	57h	W		151	97h	(etb)		215	D7h	(W)	
24	18h	can/^X		88	58h	X		152	98h	(can)		216	D8h	(X)	
25	19h	em/^Y		89	59h	Y		153	99h	(em)		217	D9h	(Y)	
26	1Ah	sub/^Z		90	5Ah	Z		154	9Ah	(sub)		218	DAh	(Z)	
27	1Bh	ESC		91	5Bh	[		155	9Bh	(ESC)		219	DBh	([)	
28	1Ch	FS		92	5Ch	\		156	9Ch	(FS)		220	DCh	(\)	
29	1Dh	GS		93	5Dh	]		157	9Dh	(GS)		221	DDh	(])	
30	1Eh	RS		94	5Eh	^		158	9Eh	(RS)		222	DEh	(^)	
31	1Fh	VS		95	5Fh			159	9Fh	(VS)		223	DFh	( )	
32	20h	SP	12.5%	96	60h	`	37.5%	160	A0h	(SP)	62.5%	224	E0h	(`)	87.5%
33	21h	!		97	61h	a		161	A1h	(!)		225	E1h	(a)	
34	22h	“		98	62h	b		162	A2h	(“)		226	E2h	(b)	
35	23h	#		99	63h	c		163	A3h	(#)		227	E3h	(c)	
36	24h	$		100	64h	d		164	A4h	($)		228	E4h	(d)	
37	25h	%		101	65h	e		165	A5h	(%)		229	E5h	(e)	
38	26h	&		102	66h	f		166	A6h	(&)		230	E6h	(f)	
39	27h	‘		103	67h	g		167	A7h	(‘)		231	E7h	(g)	
40	28h	(		104	68h	h		168	A8h	(()		232	E8h	(h)	
41	29h	)		105	69h	i		169	A9h	())		233	E9h	(i)	
42	2Ah	*		106	6Ah	j		170	AAh	(*)		234	EAh	(j)	
43	2Bh	+		107	6Bh	k		171	ABh	(+)		235	EBh	(k)	
44	2Ch	‘		108	6Ch	l		172	ACh	(‘)		236	ECh	(l)	
45	2Dh	-		109	6Dh	m		173	ADh	(-)		237	EDh	(m)	
46	2Eh	•		110	6Eh	n		174	AEh	(•)		238	EEh	(n)	
47	2Fh	/		111	6Fh	o		175	AFh	(/)		239	EFh	(o)	
48	30h	0		112	70h	p		176	B0h	(0)		240	F0h	(p)	
49	31h	1		113	71h	q		177	B1h	(1)		241	F1h	(q)	
50	32h	2		114	72h	r		178	B2h	(2)		242	F2h	(r)	
51	33h	3		115	73h	s		179	B3h	(3)		243	F3h	(s)	
52	34h	4		116	74h	t		180	B4h	(4)		244	F4h	(t)	
53	35h	5		117	75h	u		181	B5h	(5)		245	F5h	(u)	
54	36h	6		118	76h	v		182	B6h	(6)		246	F6h	(v)	
55	37h	7		119	77h	w		183	B7h	(7)		247	F7h	(w)	
56	38h	8		120	78h	x		184	B8h	(8)		248	F8h	(x)	
57	39h	9		121	79h	y		185	B9h	(9)		249	F9h	(y)	
58	3Ah	:		122	7Ah	z		186	BAh	(:)		250	FAh	(z)	
59	3Bh	;		123	7Bh			187	BBh	(;)		251	FBh	( )	
60	3Ch	<		124	7Ch			188	BCh	(<)		252	FCh	( )	
61	3Dh	=		125	7Dh	|		189	BDh	(=)		253	FDh	(|)	
62	3Eh	>		126	7Eh	~		190	BEh	(>)		254	FEh	(~)	
63	3Fh	?		127	7Fh	del		191	BFh	(/)		255	FFh	(del)	100%