

FLUORESCENT INDICATOR MODULE FC20X1SA-AA/AB

NEC Dot Matrix Type Fluorescent Indicator Modules, Model FC20X1SA-AA/AB, provide 20 characters capacity (1 line x 20 characters) of alphanumeric and any kind of foreign characters with associated electronics, having repertoire of up to 224 characters defined by 8-bit codes.

The characters are displayed on NEC FLUORESCENT INDICATOR PANEL (FIP), model CF20X1SA in a 5 x 7 dot matrix.

These FIP modules are of CIG (Chip In Glass) type and are equipped with:

- An eight-bit one-chip CMOS microcomputer
- Latch and driver chips
- Character generator
- DC/DC, AC converter

These modules are readily interfaced to a host system since they can be directly connected to the Data Bus and other control signals, making them particularly suitable for OEM's sophisticated applications such as man-machine interface.

The modules are useful for applications such as:

- Word-processing equipment
- Typewriters
- Photocopiers
- Medical / Chemical analytical instruments
- Automated teller terminals
- N/C machine tools
- Test instrumentation
- Data terminals.

The followings are some of the many features of these modules:

- It can be driven by 5V power source.
- It can be directly connected to a Data Bus of a host system because it is equipped with a microcomputer chip.
- Data input is achieved through an 8-Bit Parallel or Serial Data Bus.
- It has a wide operational temperature range (-20 to +70°C).
- It has a long life and high reliability.
- It is light in weight and very compact.

GENERAL SPECIFICATION

No. of Characters:	20 (20 characters, 1 line)
Character Format:	5 x 7 dot matrix
Character Height:	9.0 mm
Character Width:	6.3 mm
Dot Pitch:	1.35 mm
Dot Size:	0.9 mm \varnothing
Color:	Green (without filter)
Luminance:	1000 cd/m ² (291fL) TYP.
.....	500 cd/m ² (145fL) MIN.
Character Pitch:	8.3 mm
Weight:	100 g. approx.

MODULE CONSTRUCTION

Outline Drawing: Fig. 1
 Block Diagram: Fig. 2

ABSOLUTE MAXIMUM RATINGS

ITEM	SYMBOL	VALUE	UNIT
Display Supply Voltage	V_{cc}	+7	V
High Level Input Voltage	V_{IH}	+7	V
Low Level Input Voltage	V_{IL}	-0.5	V
Operating Temperature Range	T_{op}	-20° to +70°	C
Storage Temperature Range	T_{stg}	-40° to +85°	C
Relative Humidity (Operation)	H_{op}	0 to 85	%
Relative Humidity (Storage)	H_{stg}	0 to 95	%
Vibration	-	Displacement: 0.5 mm (10 to 55Hz)	X,Y,Z axis
Shock	-	40(10ms)	G

ELECTRICAL CHARACTERISTICS

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT
Display Supply Voltage	V_{cc}	4.75	5.0	5.25	V
Display Supply Current*	$I_{cc}(V_{cc}=5V)$	-	0.5	0.7	A
High Level Input Voltage	V_{IH}	2.2	-	5.25	V
Low Level Input Voltage	V_{IL}	-0.3	-	0.8	V
High Level Output Voltage ($I_{OH} = -50\mu A$)	V_{OH}	4.45	-	-	V
Low Level Output Voltage ($I_{OL} = 1.6mA$)	V_{OL}	-	-	0.45	V

* The value is defined with all lit "B" characters.

** All signals are CMOS level.

FUNCTIONS

These modules are provided with five general functions as follows:

- (1) Data write
- (2) Command write
- (3) Test mode
- (4) Blanking
- (5) Serial data input

\overline{CS}	\overline{WR}	A_0	\overline{BL}	T_0	FUNCTION	DATA BUS HOLD	
						HOST SYSTEM	MODULE
0	0→1	0	-	-	DATA WRITE	→	→
0	0→1	1	-	-	COMMAND WRITE	→	→
-	-	-	0	-	BLANKING	-	-
-	-	-	-	0	TEST MODE	-	-

Once data write and command write are done, busy signal, which indicates data disposition performance, is output.
 (During data disposition performance: busy signal = logic "1")

(1) DATA WRITE

When \overline{WR} changes from "0" to "1" at the setting of $\overline{CS} = A_0 = "0"$, Data Write becomes possible.

All data and character codes are shown in Table 2 and 3.

(apply correspondingly to JIS C-6220)

Each control data performs the following control:

BS: BACK SPACE

DC1 mode: The cursor position shifts one character to the left. If it is at the left end, it cannot shift anymore.

DC2 mode: The same as above.

HT: HORIZONTAL TAB

DC1 mode: The cursor position shifts one character to the right. If it is at the right end, it cannot shift anymore.

DC2 mode: The same as above.

LF: LINE FEED

DC1 mode: All characters are cleared, while the cursor position remains at the same position.

DC2 mode: The same as above.

CLR: CLEAR

DC1 mode: The data clears display and memory. The cursor position shifts to the left end.

DC2 mode: The same as above.

CR: CARRIAGE RETURN

DC1 mode: The cursor position shifts to the left end.

DC2 mode: The same as above.

ESC: ESCAPE

The cursor position may be defined by 1byte data after the ESC data.

0000 0000 (1st column)

0001 0011 (20th column)

Display Modes

The modules have two selectable display modes, DC1 and DC2. The display mode is kept until another mode is selected.

DC1 mode: ORDINARY MODE

The cursor position shifts one character to the right automatically, when a character data is written. If it is at the right end, it shifts to the left end

DC2 mode: HORIZONTAL SCROLL MODE

All characters are shifted by one character to the left and the newly written character is displayed at the right end, when the cursor position reaches to the right end.

Cursor Modes

The modules have three selectable cursor modes (DC3, DC4, DC5). A cursor mode is kept till another mode is selected.

DC3 mode: The cursor turns ON.

DC4 mode: The cursor turns OFF.

DC5 mode: The cursor turns on and blinks.

These modules have also three other cursors functions:

CM1: No action.

CM2: All segments located at the cursor position are lit.

CM3: The characters located at the cursor position are lit in reverse.

Luminance Levels

The modules have four selectable luminance levels (DIM1, DIM2, DIM3 and DIM4).

data	relative luminance (%)
DIM1 (Hex01)	100
DIM2 (Hex02)	75
DIM3 (Hex03)	50
DIM4 (Hex04)	25

SB: SUB SEQUENCE

One user character can be registered by 8 bytes after the SB data as follows:

- 1st byte: Enter the character code (Hex20 to FF), where it can be registered.
- 2nd byte: Enter the data (active high) as shown below.
- At this time, D5 to D7 are invalid.
- 8th byte

	D0	D1	D2	D3	D4	example of "S"
2nd byte	0	1	1	1	1	Hex1E
3rd byte	1	0	0	0	0	Hex01
4th byte	1	0	0	0	0	Hex01
5th byte	0	1	1	1	0	Hex0E
6th byte	0	0	0	0	1	Hex10
7th byte	0	0	0	0	1	Hex10
8th byte	1	1	1	1	0	Hex0F

D7	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
D6	0	0	0	0	1	1	1	1	0	0	0	0	1	1	1	1
D5	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1
D4	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1

D3	D2	D1	D0	C R	example of "S"															
					0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	0	0	0	0			SP	#	@	P	,	p	↑	α	SP	-	ク	ミ	-	≤
0	0	0	1	1	DIM1	DC1	!	1	A	Q	a	q	↓	β	.	ア	チ	△	■	≥
0	0	1	0	2	DIM2	DC2	"	2	B	R	b	r	←	γ	「	イ	ツ	ノ	■	±
0	0	1	1	3	DIM3	DC3	#	3	C	S	c	s	→	δ	」	ウ	テ	モ	■	≠
0	1	0	0	4	DIM4	DC4	\$	4	D	T	d	t	↔	ε	,	エ	ト	ヤ	■	∟
0	1	0	1	5		DC5	%	5	E	U	e	u	*	ζ	.	オ	ナ	ユ	■	∞
0	1	1	0	6		CM1	&	6	F	V	f	v	▲	θ	ヲ	カ	ニ	ヨ	■	?
0	1	1	1	7		CM2	∗	7	G	W	g	w	▲	λ	ア	キ	ヌ	ラ	■	C
1	0	0	0	8	BS	CM3	(	8	H	X	h	x	-1	μ	イ	ク	ネ	リ	■	£
1	0	0	1	9	HT		)	9	I	Y	i	y	2	π	ウ	ケ	ノ	ル	〒	\$
1	0	1	0	A	LF	SB	*	:	J	Z	j	z	3	ρ	エ	コ	ハ	レ	∴	©
1	0	1	1	B		ESC	+	:	K	[	k	:	0	σ	オ	サ	ヒ	ロ	▶	∟
1	1	0	0	C	CLR		.	<	L	¥	l	:	1/2	φ	ヤ	シ	フ	ワ	◀	∟
1	1	0	1	D	CR		-	=	M	)	m	:	X	ω	ユ	ス	ヘ	ン	▼	∟
1	1	1	0	E			.	>	N	^	n	~	÷	△	ヨ	セ	ホ	.	▲	∟
1	1	1	1	F			/	?	O	_	o	∟	Ω	Σ	ツ	ソ	マ	.	◆	キ

Table 2. DATA TABLE FOR FC20X1SA-AA

(4) **BLANKING**

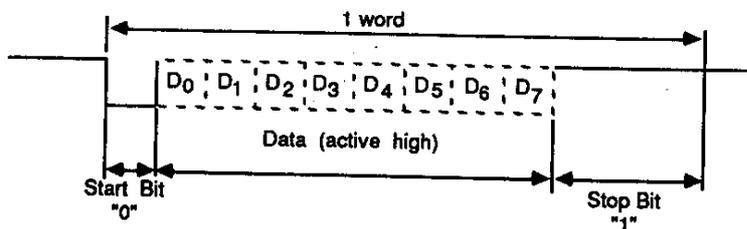
The displays are blanked by turning \overline{BL} ="0".

Quick blanking response is possible due to direct ON, OFF operation of the driver. Since the content of memory is not affected, restoring of \overline{BL} ="1" displays the previous characters. Use of this line facilitates blinking of the displays.

(5) **SERIAL DATA INPUT**

Serial Data Input is asynchronously transmitted, through terminal "R_{XD}", at CMOS signal level. Baud rate is selectable using jumpers J1 to J3, and the various baud rate selectable combinations are shown in the table below.

One word consists of 8-bit data with one start bit and two stop bits as shown below.



J3	J2	J1	BAUD RATE (baud)
L	L	L	9600
L	L	H	4800
L	H	L	2400
L	H	H	1200
H	L	L	600
H	L	H	300
H	H	L	150
H	H	H	75

FUNCTION OF JUMPER LEAD

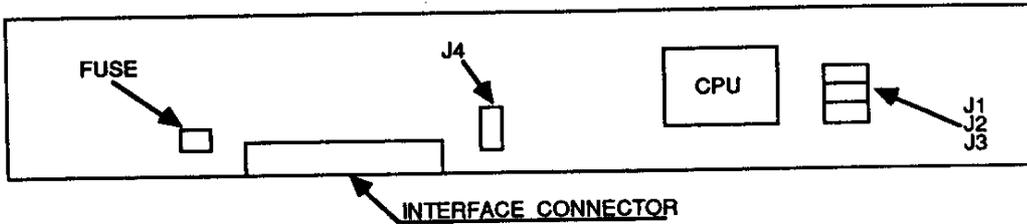
J1 to J3 Selection of Baud Rate.
9600 baud is set when shipping.

J4 Selection of Serial Input Level.
This is valid when μ PD4711G is mounted.

- 1 TTL
- 2 RS-232C

LOCATION OF JUMPER LEAD

FC20X1SA-AA/AB



MODULE INITIALIZATION (INITIAL STATE)

The following occurs automatically during power-up of the module:

- (1) All character data becomes „SPACE“.
- (2) Cursor position is set to the left end (CM1).
- (3) The luminance level is set to DIM1.
- (4) Display mode is set to DC1.

PIN CONNECTION

- (1) Interface Pin Connection

Module side

Connector: HIF3FC-34PA-2.54DS
or equivalent

System side

HIF3BA-34D-2.54R
or equivalent

<u>Pin No.</u>	<u>Signal</u>	<u>Pin No.</u>	<u>Signal</u>
1	D ₇	2	GND
3	D ₆	4	GND
5	D ₅	6	GND
7	D ₄	8	GND
9	D ₃	10	GND
11	D ₂	12	GND
13	D ₁	14	GND
15	D ₀	16	GND
17	\overline{WR}	18	GND
19	A ₀	20	GND
21	N.C.	22	GND
23	\overline{CS}	24	GND
25	T ₀	26	GND
27	BUSY	28	GND
29	\overline{BL}	30	GND
31	N.C.	32	GND
33	R _{XD}	34	GND

(2) Power supply Pin Connection

Module side
Connector: 171826-2(AMP)

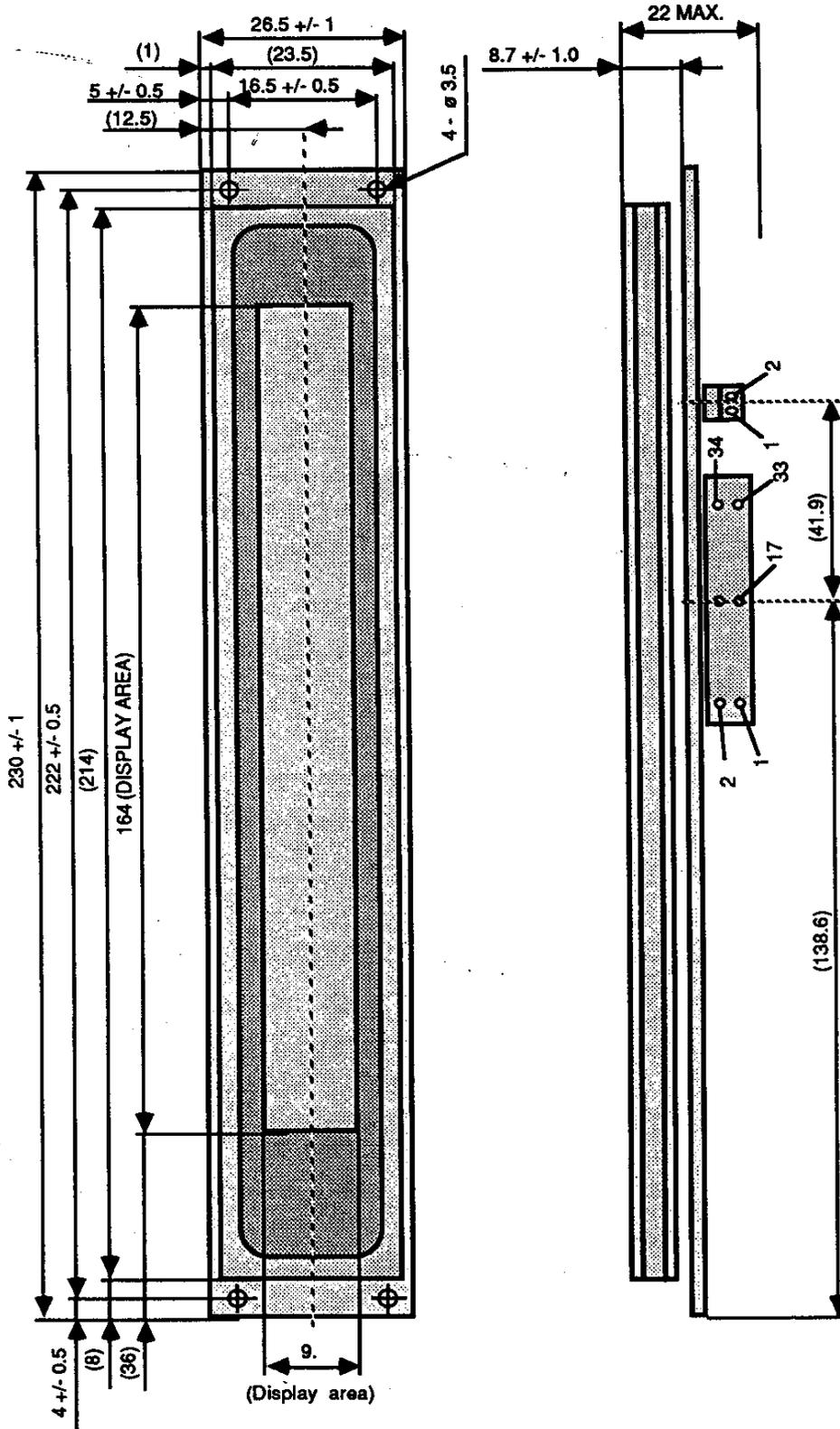
Pin No.
1
2

System side
Housing 171822-2 (AMP)
Pin 170204-1 (AMP)
or 170204-2 (AMP)
Connection
Vcc (+5V)
GND

GENERAL CAUTIONS

- (1) The module may be damaged if the interface connector is plugged in or out without switching off the external power supply or interface signals.
- (2) The external power supply must reach the specified supply voltage within 100ms after switch-on.
- (3) When power supply is switched on, it has to allow surge current (about 1.5 times the specified value) as it enables to start the oscillation of DC/DC,AC converter in the module.
- (4) When input voltage from the power supply is lower than the specified value, defects may happen by abnormal operation of DC/DC,AC converter and it may cause burn-out of fuse resistor or damage of the parts. Higher input voltage than the specified value may cause incorrect operation as well. Specified typical supply voltage to the module is preferable .
- (5) When handling and operating this module, special care must be taken in order to avoid any damage. The module should be kept away from places where vibrations and shocks exceeding those specified in this proposal are present.
- (6) The display panel installed in the module is mainly composed of glass. Therefore, it should be handled very carefully.
- (7) Do not use the module under too strong EMI. It might cause the module to malfunction. It is recommended to use the module with interface cable of less than 50cm length in order to keep correct signal transfer.

NEC cannot assume any responsibility for any circuit shown or represent, that they are free from patent infringement. Also, the subject can be changed without any notice.



() dimension: only for reference
unit: mm

Fig. 1 OUTLINE DRAWING

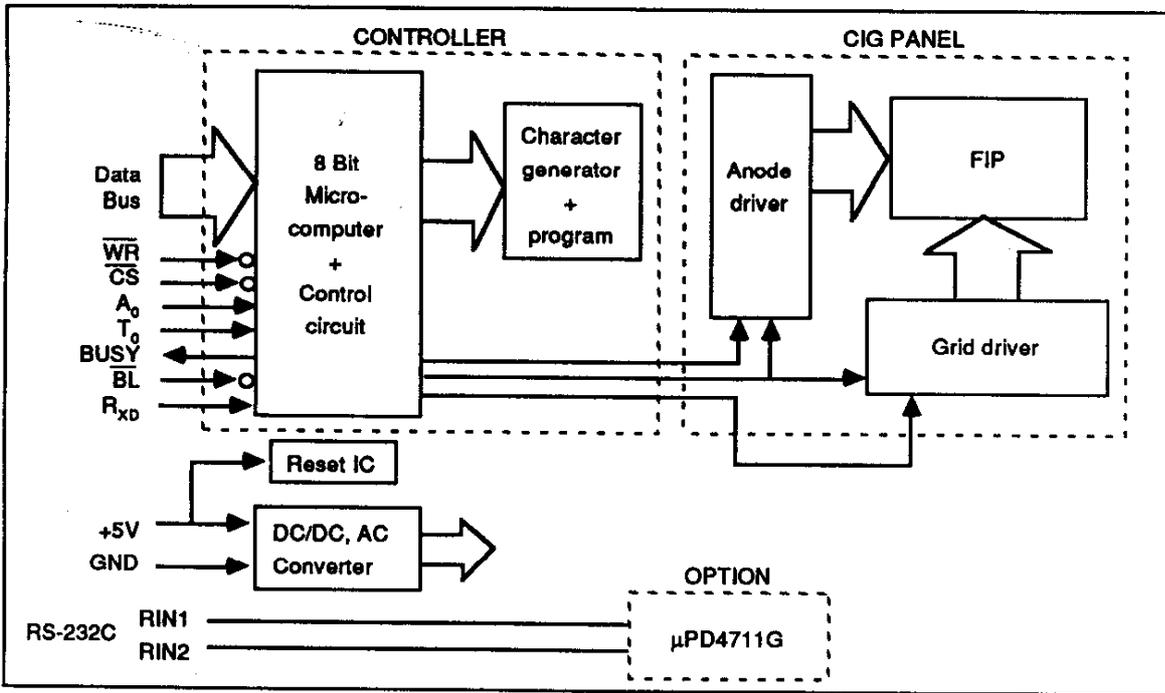


Fig. 2 BLOCK DIAGRAM

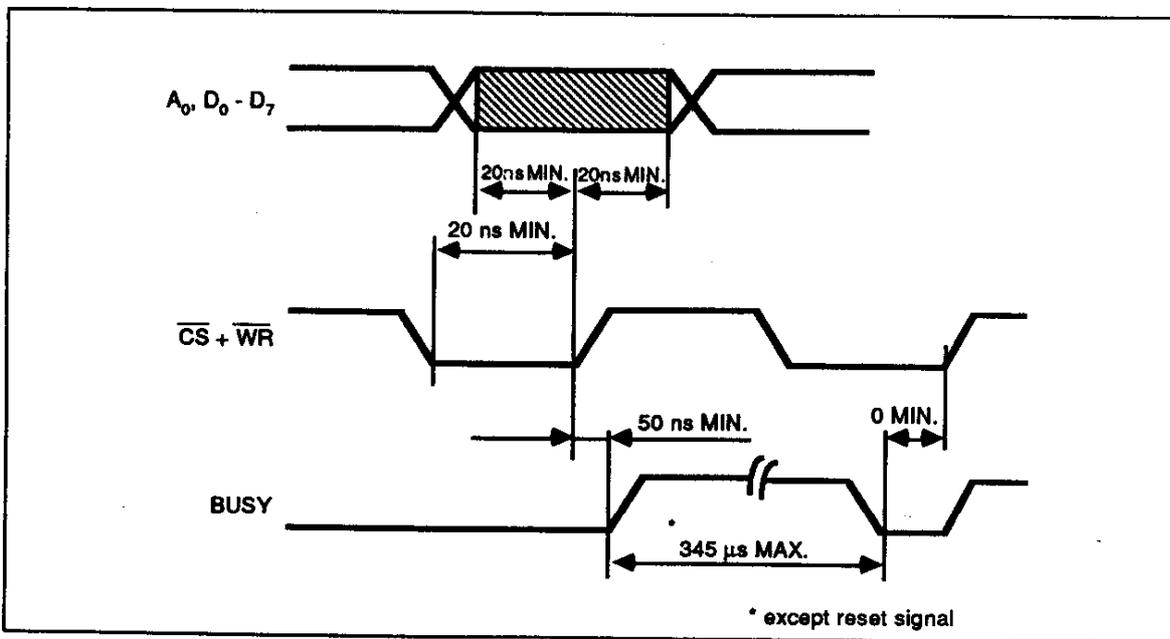


Fig. 3 TIMING CHART

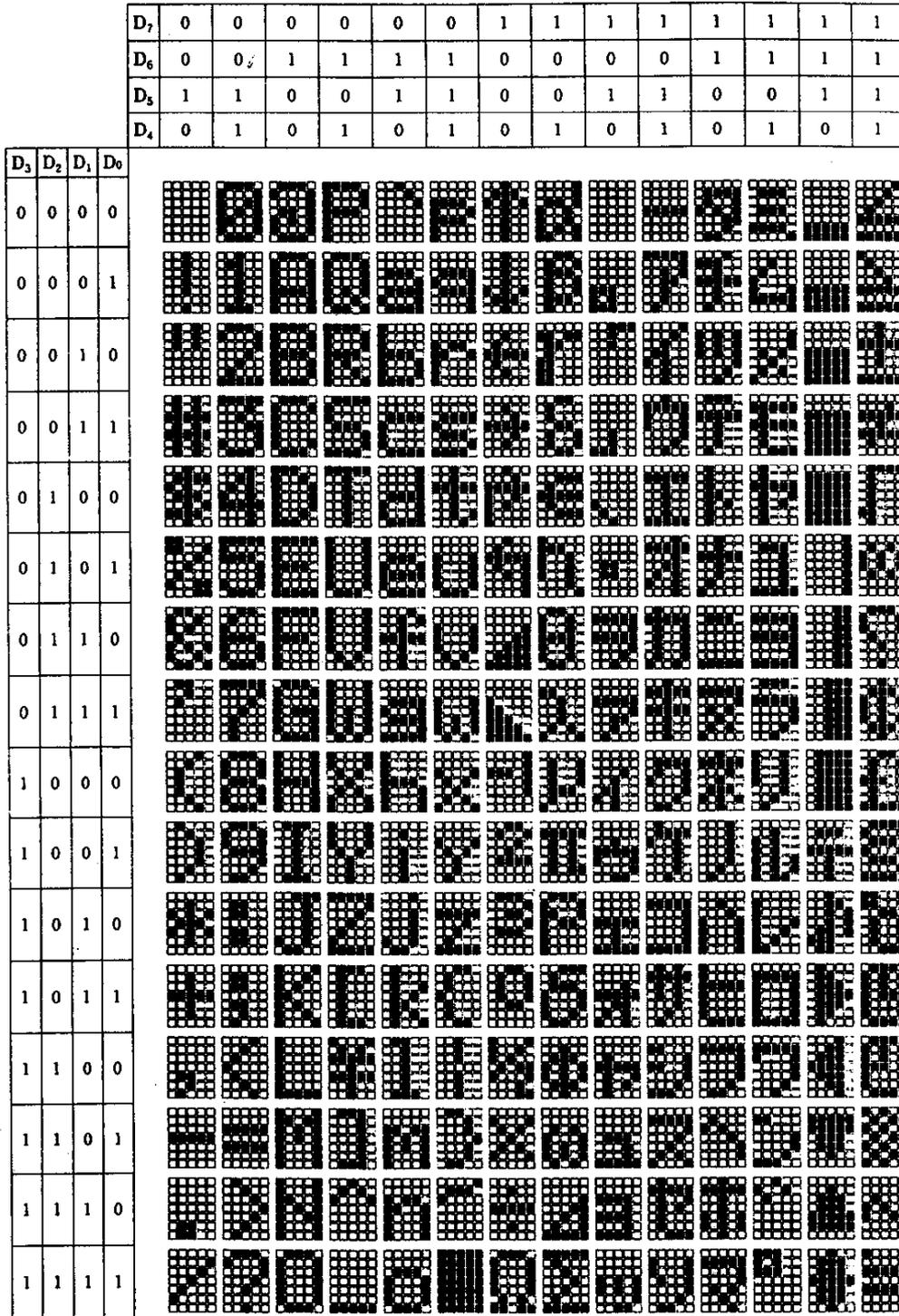


Fig. 4 FC20X1SA-AA CHARACTER FORMAT



Fig. 5 FC20X1SA-AB CHARACTER FORMAT

FC8(4)-0292E(2)
Febr. 14, 1991