

# KD Rev 2.1

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## Introduction

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The KD Rev 2.1 is a generic 5x7 character matrix with 2 lines and 20 characters per line display, software command compatible with:

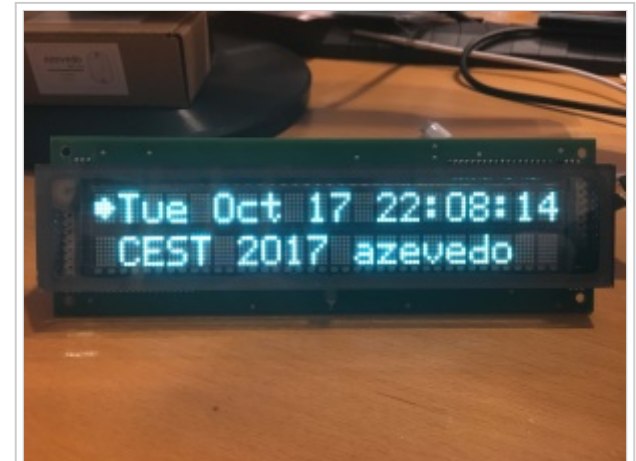
<b>Noritake</b>	CU20026SCP-B-T30A	<a href="#">Datasheet</a>	<a href="#">Manual</a>
<b>NEC</b>	FC20X2JA-AB	<a href="#">Datasheet</a>	

The most obvious differences are the lack of parallel bus, no speed selection, no various charsets and a different PCB size.

The KD Rev 2.1 is controlled by a generic ATmega AT90S8515 - and the ISCP header is clearly available.

On the software side, the display is command compatible with the Noritake displays. However, the built in character set is completely different. The odd character set and the generic ATmega, hints that this display could be programmed on demand with different character sets for different applications.

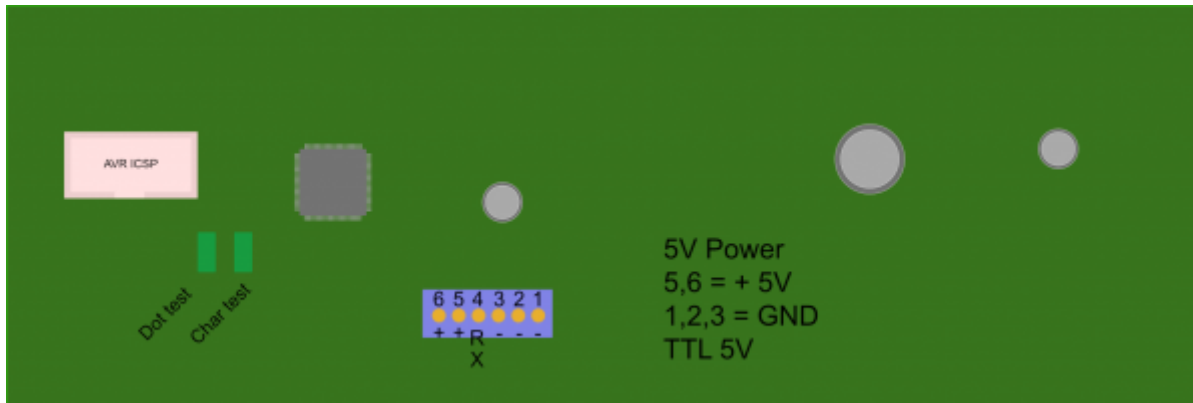
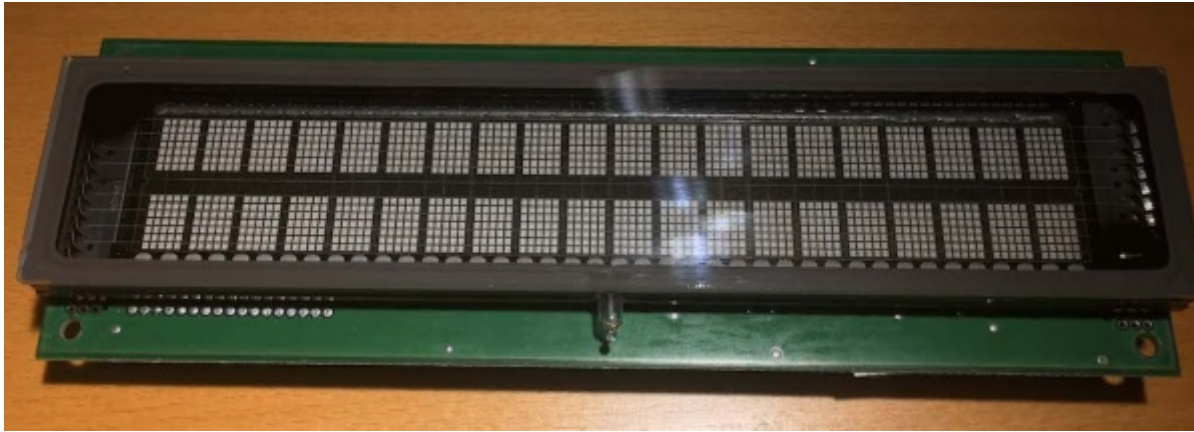
Nowadays the references for the original manufacturer of this particular model are quite rare.



KD Rev 2.1

## Display hardware

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The display runs on 5V DC, it accepts a 5V TTL input at 9600 bps for serial data display. It might be 3.3V tolerant as the ATmega seems to be, but this was not tested.

It has two jumpers for testing the display. The leftmost jumper, when closed, shows all pixels on, being useful to check if any is not working. The rightmost jumper, when closed, shows a sample character test.

For normal operation, both jumpers need to be open.







The back connector has 6 pins, with the leftmost pin being number 6:

Pin	Function
1,2,3	GND
4	TTL RX
5,6	+5V

## Character set

	00	10	20	30	40	50	60	70	80	90	A0	B0	C0	D0	E0	F0
0				0	@	P	i	p	€		Ä	Ó	ä	ó	⓪	
1	DIM1	DC1	!	1	A	Q	a	q		ß	Å	Ò	å	ò	①	
2	DIM2	DC2	"	2	B	R	b	r			Ä	À	á	à	②	
3	DIM3	DC3	#	3	C	S	c	s			Ö	ß	ç	ç	③	
4	DIM4	DC4	\$	4	D	T	d	t			Ü	Ë	â	ë	④	
5		DC5	%	5	E	U	e	u			ä	Ü	æ	ü	⑤	
6		CM1	&	6	F	V	f	v			ö	Ú	é	ú	⑥	
7		CM2	'	7	G	W	g	w			ü	Ù	è	ù	⑦	
8	BS	CM3	(	8	H	X	h	x			Ê	Û	ê	û	⑧	
9	HT		)	9	I	Y	i	y			Ï	°	ï	ï	⑨	§
A	LF	SB	*	:	J	Z	j	z			Í	±	í	⊙	SP	
B		ESC	+	;	K	[	k	{			Ì	÷	ì	●	SP	
C	CLR		,	<	L	\	l				Î	→	î	□	SP	
D	CR		-	=	M	]	m	}			Ö	⇨	ö	■	SP	
E			.	>	N	^	n	~			Ñ	◆	ñ	◇	SP	



	Working command
	Non working command (display does not have cursor support)
	Matches NEC standard ASCII table
	Specific char/position for KD Rev 2.1
	Non command/empty char
	Character seems corrupt

The display has a very peculiar character set, with large parts that are empty and character 0xE3 is corrupt:



Fortunately the display allows for custom character creation, so it's easy to change any character from `0x20` to `0xFF`.

## Commands

The KD Rev 2.1 is compatible with Nortitake commands, with the exception of cursor related commands. The display does not react to any cursor display commands:

Command	HEX	Name	Status	Description	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
BS	<code>0x08</code>	Backspace	OK	Cursor moves one char left								
HT	<code>0x09</code>	Horizontal tab	OK	Cursor moves one char right								
LF	<code>0x0A</code>	Line Feed	OK	All chars are cleared, but cursor remains in same position								
CLR	<code>0x0C</code>	Clear	OK	Clears display and memory. Cursor goes to pos 1								
CR	<code>0x0D</code>	Carriage Return	OK	Cursor moves to pos 1								
DC1	<code>0x11</code>	Normal	OK	Cursor moves to next char to the right. At								

	write		the end, returns to top	
DC2	0x12	Scroll write	OK	Cursor moves to next char. At then end, pushes text to the left
DC3	0x13	Cursor ON	N/A	Cursor turns ON
DC4	0x14	Cursor OFF	N/A	Cursor turns OFF
DC5	0x15	Cursor BLINK	N/A	Cursor turns ON and BLINKS
CM1	0x16	Underline Cursor	N/A	Underline cursor
CM2	0x17	Block Cursor	N/A	All segments at cursor turn on
CM3	0x18	Reverse Cursor	N/A	Character at cursor is reversed
SB	0x1A	Sub Sequence	OK	<p>Create custom character. Define character to change at byte 1</p> <p>Byte 2 is the first line of the 5x7 matrix of the char and so on</p> <p>Position cursor on pos defined by byte 1</p>
ESC	0x1B	ESC	OK	<p>Position ( 0x00 = 1,1; 0x13 = 1,20; 0x14 = 2,1; 0x27 = 2,20)</p>

0x20 - 0x00 - 0x00 - 0x00 - 0x00 - 0x00 - 0x00 - 0x00 -  
 0xFF - 0x1F - 0x1F - 0x1F - 0x1F - 0x1F - 0x1F - 0x1F -

0x00 -  
 0x27 -

## Custom characters

The display allows the creation of custom characters. The format is quite simple.

As an example, to correct the broken square 3 at position 0xE3, we just need to send to the display the initial SB 0x1A command, followed by 0xE3 and the lines that form the character, one byte per line. The entire command to send is:

0x1A 0xE3 0x1F 0x19 0x17 0x0F 0x1D 0x19 0x1F

When displaying the character at position 0xE3, it now shows correctly:



To build the scanlines, the 1st byte is the 1st line from the top of the character. Each column value, from left to right is: 1, 2, 4, 8, 16, with 0x00 full off and 0x1F fully lit.

The Excel file at the bottom of this page contains two macros to create a C style char array and to display said char array back:

	A	B	C	D	E	F	G	H	I	J	K
1	<b>Builder</b>										
2		<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>		<b>DEC</b>	<b>HEX</b>		<b>C Byte Array</b>
3	<b>1</b>							0	0x00		{0x00,0x0A,0x1F,0x1F,0x1F,0x0E,0x04}
4	<b>2</b>							10	0x0A		
5	<b>3</b>							31	0x1F		Build your character on the matrix. An empty cell means OFF, anything else means ON.
6	<b>4</b>							31	0x1F		You can then copy the above C style byte array to your program
7	<b>5</b>							31	0x1F		
8	<b>6</b>							14	0x0E		
9	<b>7</b>							4	0x04		
10											
11											
12											
13	<b>Display</b>										
14		<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>		<b>DEC</b>	<b>HEX</b>		<b>C Byte Array</b>
15	<b>1</b>							31	0x1F		{0x1F,0x19,0x17,0x1B,0x17,0x19,0x1F}
16	<b>2</b>							25	0x19		
17	<b>3</b>							23	0x17		Copy the array to the above field. It needs to have no spaces and all 0x values need to be 2 digits (0x00 instead of 0x0)
18	<b>4</b>							27	0x1B		It will then be shown on the blue matrix
19	<b>5</b>							23	0x17		
20	<b>6</b>							25	0x19		
21	<b>7</b>							31	0x1F		
22											

Several characters can be changed. Custom characters are not saved - restarting the display will clear these custom characters from memory.



## Downloads

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Reference Excel document with tables, macros and command references

- [KD Rev 2.1-Commands-v1.xlsx](#)

## References

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- [http://www.noritake-itron.com/specs/cu-t/cu20026scpb-t30a\\_e00-a2.pdf](http://www.noritake-itron.com/specs/cu-t/cu20026scpb-t30a_e00-a2.pdf)
- <http://www.noritake-itron.com/specs/cu-t/cu20026scpb-t30a-01.pdf>
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