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1 Introduction

1.1 Features

- The customer display is liquid-crystal display which has only 1 kind of display pattern, 20 columns and 2 lines, each columns is 16x16 dots.
- Blue-white color is clear and easy-to-read.
- The display panel is movable so that it can be adjusted for the best viewing angle.
- The customer display could have different height of dimension by adjusting the poles.
- The interface of customer display is USB with virtual RS-232 port, with baud rate selected from 9600 or 19200 bps, which is set 9600 bps as default.
- The user defined and international character sets are the standard of the customer display.
- The customer display supports 11 command modes, with Ultimate command mode set as default.
- The customer display supports power from 5V to 12V(RS232 only), it prevents any mindless use of improper power input to cause malfunction.
- Easy configure & various settings through its multi-functional set-up Utility. For example, user can set up Welcome Message and plenty of code pages setting by their selves, and also including others advanced setting.
- Control boards design in top panel to prevent water or wet counter surface may damage from the bottom.
- Panel is structured to easy-detachable and available for wall mounting install and OEM.

Attention

1. This specification shall apply only to the product(s) coming along with this manual inside.
 2. This manual may not apply to the previous or later product(s).
 3. This specification may be modified without any notice. If it is necessary for "customers" to have a latest manual about specification, please inquire your suppliers.
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2 General Specification

2.1 LCM Panel

Display Mode	320x32 Dots matrix
Character font	16x16 Dots Matrix
Brightness	270 cd/m ²
Character Size	7.12(H) x 9.9(V) mm
Dot Size (X * Y)	0.426(H) x 0.6(V) mm
Character Number	40 (20 columns x 2 lines)
Active area	142.7mm(H) x 19.82mm(V)
Viewing Angle	$\theta_T \phi=90^\circ$ (12 o'clock) $\theta_B \phi=270^\circ$ (6 o'clock) $\theta_L \phi=180^\circ$ (9 o'clock) $\theta_R \phi=0^\circ$ (3 o'clock)
Module dimension	163mm x 34.9mm x 2.8mm

2.2 Electricity

Interface	RS232	USB
Connector	D-Sub9	USB Type-A
Power Source	DC +5V/+12V	DC +5V
Power Consumption	5V 350 mA/ 12V 120 mA	350mA

2.3 Environment

Operating Temperature	+10°C to +50°C
Storage Temperature	-10°C to +60°C
Relative Humidity	0% to 90% RH

2.4 User Setting

The default protocol of virtual RS232 port is 9600 bps, non-parity, 8 data bits, 1 stop bit and with DTR/DSR control.

2.5 Function Setting

No switch, all user setting is set up by Application Program (AP).

2.6 Baud Rate Select for RS232 interface

Baud Rate (bps)
9600
19200

(USB interface is the traditional USB transfer rate)

2.7 FIRMWARE : 1.02.20

2.8 OPOS : 1.1.4

2.9 Command Type Select

Command Type	Hex Code
Ultimate	00
UTC Standard	01
UTC Enhance	02
AEDEX	03
ADM788	04
DSP800	05
PTC(CD5220)	06
EMAX	07
LOGIC CONTROL	08

2.10 International Character Set

Country	Hex code
U.S.A.	0
France	1
Germany	2
U.K.	3
Denmark I	4
Sweden	5
Italy	6
Spain I	7
Japan	8
Norway	9
Denmark II	10
Spain II	11
Latin America	12
Korea	13
Slovenia/Croatia	14
China	15
Vietnam	16
Arabia	17
Russia	18

3 Command Description

3.1 LM900 Command Set

3.1.1 Ultimate(default)

Command	Hex	Function Description
BS	08	Move cursor left
ESC [D	1B 5B 44	
HT	09	Move cursor right
ESC [C	1B 5B 43	
LF	0A	Move cursor down
ESC [B	1B 5B 42	
US LF	1F 0A	Move cursor up
ESC [A	1B 5B 41	
CR	0D	Move cursor to left-most position
ESC [L	1B 5B 4C	
US CR	1F 0D	Move cursor to right-most position
ESC [R	1B 5B 52	
HOM	0B	Move cursor to home position
ESD [H	1B 5B 48	
US B	1F 42	Move cursor to bottom position
ESC [K	1B 5B 4B	
US \$ x y	1F 24 x y	Move cursor to specified position $0x01 \leq x(\text{column}) \leq 0x14$; $0x01 \leq y(\text{row}) \leq 0x02$
ESC l x y	1B 6C x y	
EOT SOH P n ETB	04 01 50 n 17	Move cursor to specified position $0x31 \leq n \leq 0x58$
ESC C r c	1B 43 r c	Move cursor to specified position (Only valid in overwrite mode) $r = U(0x55)$, upper row ; $r = D(0x44)$, lower row $0x01 \leq c \leq 0x14$ (column number)
^P n	10 n	Digital select, $n = 0x00 \sim 0x27$
US C n	1F 43 n	Select/cancel cursor display $n=0$:canceled ; $n=1$:selected
ESC _ n	1B 5F n	Set cursor ON/OFF $n=0$:Off ; $1:On$
^S	13	Cursor on
^T	14	Cursor off
CLR	0C	Clear display screen
CAN	18	Clear cursor line
ESC @	1B 40	Initialize display
EOT SOH % ETB	04 01 25 17	
US E n	1F 45 n	Blink display screen $0x0 \leq n \leq 0xFF$ ($n*50\text{ms}$) ON / ($n*50\text{ms}$) OFF
ESC t n	1B 74 n	Select character code table[<i>Table 1</i>]

ESC R n	1B 52 n	Select international character set[Table 2]
US r n	1F 72 n	Select/cancel reverse character n=0: canceled ; n=1: selected
US MD1	1F 01	Specify overwrite mode
ESC DC1	1B 11	
^Q	11	
US MD 2	1F 02	Specify vertical scroll mode
ESC DC2	1B 12	
^R	12	
US MD 3	1F 03	Specify horizontal scroll mode
ESC DC3	1B 13	
ESC & s n m [a(p1..p32)] (m-n+1)	1B 26 s n m [a(p1..p32)] (m- n+1)	Define download characters s=1 ; 32 ≤ n ≤ m ≤ 126 ; a=32 (p1..p32 = pattern1..pattern32)
ESC % n	1B 25 n	Select / cancel download character set. n=0(canceled) ; n=1(selected)
ESC ? n	1B 3F n	Delete download characters 32 ≤ n ≤ 126 (n=character code)
US @	1F 40	Execute self-test
US T h m	1F 54 h m	Display time : 0x00 ≤ h ≤ 0x17 ; 0x00 ≤ m ≤ 0x3B
US U	1F 55	Display of time counter
ESC u E CR	1B 75 45 hh 3A mm 0D	Set and display 24 hour time 0 ≤ h , m ≤ 9
ESC Q A CR	1B 51 41 [data x 20] 0D	Set string display mode, write string to upper line
ESC Q B CR	1B 51 42 [data x 20] 0D	Set string display mode, write string to lower line
ESC Q D CR	1B 51 44 [data x m] 0D	Upper line message scroll continuously m < 40
EOT SOH I n ETB	04 01 49 n 17	Select international character set[Table 4]
EOT SOH C n m ETB	04 01 43 n m 17	Clear display range from n position to m position and move cursor to n position 0x31 ≤ n ≤ m ≤ 0x58
ESC f n	1B 66 n	Select international character set[Table 3]
ESC u A CR	1B 75 41 [data x 20] 0D	Upper line display
ESC u B CR	1B 75 42 [data x 20] 0D	Bottom line display
ESC u D CR	1B 75 44 [data x 45] 0D	Marquee on line 1.
ESC u J CR	1B 75 4A [data x 45] 0D	Marquee on line 2.
ESC u 1 CR	1B 75 49 [data x 40] 0D	Two line display
ESC U	1B 55	Select upper row as current row
ESC D	1B 44	Select lower row as current row

3.2 UTC Standard

Command	Hex	Function Description
BS	08	Back spacing
HT	09	Move cursor right
LF	0A	Move cursor down
CR	0D	Move cursor to left-most position
^Q	11	Specify overwrite mode
^R	12	Specify vertical scroll mode
^S	13	Cursor on
^T	14	Cursor off
ESC u A CR	1B 75 41 [data x 20] 0D	Upper line display
ESC u B CR	1B 75 42 [data x 20] 0D	Bottom line display
ESC u D CR	1B 75 44 [data x 45] 0D	Upper line message scroll continuously
ESC u F CR	1B 75 46 [data x 45] 0D	Upper line message scroll once pass
ESC u E CR	1B 75 45 <i>hh</i> 3A <i>mm</i> 0D	Set and display 24 hour time $0x00 \leq h, m \leq 0x09$
ESC u 1 CR	1B 75 49 [data x 40] 0D	Two line display
DC0 p	10 p	Move cursor to specified position, $0 \leq p \leq 39$ (Please refer Row Character Position Chart)
ESC d	1B 64	Change to UTC enhanced mode
US	1F	Reset display

3.3 UTC Enhance

Command	Hex	Function Description
ESC u A CR	1B 75 41 [data x 20] 0D	Upper line display
ESC u B CR	1B 75 42 [data x 20] 0D	Bottom line display
ESC u D CR	1B 75 44 [data x 45] 0D	Upper line message scroll continuously
ESC u F CR	1B 75 46 [data x 45] 0D	Upper line message scroll once pass
ESC u E CR	1B 75 45 <i>hh</i> 3A <i>mm</i> 0D	Set and display 24 hour time $0x00 \leq h, m \leq 0x09$
ESC u 1 CR	1B 75 49 [data x 40] 0D	Two line display

ESC RS CR	1B 0F 0D	Change to UTC standard mode
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3.4 AEDEX Command Mode

Command	Hex	Function Description
! # 1..CR	21 23 31 [data x 20] 0D	Upper line display
! # 2..CR	21 23 32 [data x 20] 0D	Bottom line display
! # 4..CR ! # 4..CR	21 23 34 [data x 45] 0D	Upper line message scroll continuously
! # 5..CR	21 23 35 hh 3A mm 0D	Set and display 24 hours time $0 \leq h, m \leq 9$
! # 5 CR	21 23 35 0D	Display 24 hour time
! # 6..CR	21 23 36 [data x 45] 0D	Upper line message scroll once pass
! # 9..CR	21 23 39 [data x 40] 0D	Two line display

3.5 ADM788 Command Mode

Command	Hex	Function Description
CR	0D	Move cursor to left-most position
CLR	0C	Clear display screen
SLE1	0E	Clear up line and move cursor to upper line left most end
SLE2	0F	Clear low line and move cursor to lower line left most end
DC1	11 n	Set line blinking n=1, upper line n=2, lower line
DC2	12 n	Clear line blinking n=1, upper line n=2, lower line

3.6 DSP800 Command Mode

Command	Hex	Function Description
EOT SOH I n ETB	04 01 49 n 17	Select international character set[Table 4]
EOT SOH P n ETB	04 01 50 n 17	Move cursor to specified position $49(0x31) \leq n \leq$ $88(0x58)$
EOT SOH C n m ETB	04 01 43 n m 17	Clear display range from n position to m position and move cursor to n position $49(0x31) \leq$ $n \leq m \leq 88(0x58)$
EOT SOH % ETB	04 01 25 17	Initialize display

3.7 CD5220 Command Mode

Command	Hex	Function Description
BS	08	Move cursor left
ESC [D	1B 5B 44	Move cursor left
HT	09	Move cursor right
ESC [C	1B 5B 43	Move cursor right
LF	0A	Move cursor down
ESC [B	1B 5B 42	Move cursor down
ESC [A	1B 5B 41	Move cursor up
CR	0D	Move cursor to left-most position
ESC [L	1B 5B 4C	Move cursor to left-most position
ESC [R	1B 5B 52	Move cursor to right-most position
HOM	0B	Move cursor to home position
ESD [H	1B 5B 48	Move cursor to home position
ESC [K	1B 5B 4B	Move cursor to bottom position
ESC l x y	1B 6C x y	Move cursor to specified position $1 \leq x(\text{column}) \leq 20$; $1 \leq y(\text{row}) \leq 2$
ESC _ n	1B 5F n	Set cursor ON/OFF $n=0,1$ (Off,On)
CLR	0C	Clear display screen
CAN	18	Clear cursor line
ESC @	1B 40	Initialize display
ESC DC1	1B 11	Specify overwrite mode
ESC DC2	1B 12	Specify vertical scroll mode
ESC DC3	1B 13	Specify horizontal scroll mode
ESC % n	1B 25 n	Select / cancel download character set. $n=0$, canceled ; $n=1$, selected
ESC & s n m [a(p1..p5)] (m-n+1)	1B 26 s n m [a(p1..p5)] (m-n+1)	Define download characters $s=1$; $32 \leq n \leq m \leq 126$; $a=5$ (p1..p5 = pattern1..pattern5)
ESC ? n	1B 3F n	Delete download characters $32 \leq n \leq 126$ (n=character code)
ESC Q A CR	1B 51 41 [data x 20] 0D	Set string display mode, write string to upper line
ESC Q B CR	1B 51 42 [data x 20] 0D	Set string display mode, write string to lower line
ESC Q D CR	1B 51 44 [data x m] 0D	Upper line message scroll continuously $m < 40$
ESC f n	1B 66 n	Select international fonts set[Table 3]
ESC f n	1B 63 n	Select fonts, ASCII code or JIS code[Table 5]

3.8 EMAX Command Mode

Command	Hex	Function Description
ESC [D	1B 5B 44	Move cursor left
ESC [C	1B 5B 43	Move cursor right
ESC [B	1B 5B 42	Move cursor down
ESC [A	1B 5B 41	Move cursor up
ESC [L	1B 5B 4C	Move cursor to left-most position
ESC [R	1B 5B 52	Move cursor to right-most position
ESD [H	1B 5B 48	Move cursor to home position
ESC [K	1B 5B 4B	Move cursor to bottom position
ESC l x y	1B 6C x y	Move cursor to specified position $1 \leq x(\text{column}) \leq 20$; $1 \leq y(\text{row}) \leq 2$
ESC _ n	1B 5F n	Set cursor ON/OFF $n=0,1$ (Off,On)
CLR	0C	Clear display screen
CAN	18	Clear cursor line
ESC @	1B 40	Initialize display
ESC DC1	1B 11	Specify overwrite mode
ESC DC2	1B 12	Specify vertical scroll mode
ESC DC3	1B 13	Specify horizontal scroll mode
ESC f n	1B 66 n	Select international fonts set[<i>Table 3</i> International Character Set - CD5220 / EMAX command mode]
ESC f n	1B 63 n	Select fonts, ASCII code or JIS code[<i>Table 5</i>]

3.9 LOGIC Command Mode

Command	Hex	Function Description
BS	08	Move cursor left
HT	09	Move cursor right
LF	0A	Move cursor down
CR	0D	Move cursor to left-most position
^Q	11	Specify overwrite mode
^R	12	Specify vertical scroll mode
^S	13	Cursor on
^T	14	Cursor off
^P	10 n	Digital select, $n= 0\sim 40$
US	1F	Reset

4 Appendix

4.1 Code page list

Table 1

Codepage List - Ultimate command mode

<i>n</i> (Dec)	<i>n</i> (Hex)	Codepage
0	0x00	CP-437
1	0x01	Katakana
2	0x02	CP-850
3	0x03	CP-860
4	0x04	CP-863
5	0x05	CP-865
11	0x0B	CP-851
12	0x0C	CP-853
13	0x0D	CP-857
14	0x0E	CP-737
16	0x10	CP-1252
17	0x11	CP-866
18	0x12	CP-852
19	0x13	CP-858
20	0x14	CP-874
32	0x20	CP-720
33	0x21	CP-775
34	0x22	CP-855
35	0x23	CP-861
36	0x24	CP-862
37	0x25	CP-864
38	0x26	CP-869
45	0x2D	CP-1250
46	0x2E	CP-1251
47	0x2F	CP-1253
48	0x30	CP-1254
49	0x31	CP-1255
50	0x32	CP-1256
51	0x33	CP-1257
52	0x34	CP-1258
241	0xF1	CP-950
242	0xF2	CP-936
243	0xF3	CP-949
244	0xF4	CP-932

4.2 International Character Set

Table 2

International character set - Ultimate command mode

n	Country	23	24	25	2A	40	5B	5C	5D	5E	60	7B	7C	7D	7E
0	U.S.A.	#	\$	%	*	@	[\]	^	`	{		}	~
1	France	#	\$	%	*	à	°	ç	§	^	`	é	ù	è	¨
2	Germany	#	\$	%	*	§	Ä	Ö	Ü	^	`	ä	ö	ü	ß
3	U.K.	£	\$	%	*	@	[\]	^	`	{		}	~
4	Denmark I	#	\$	%	*	@	Æ	Ø	Å	^	`	æ	ø	å	~
5	Sweden	#	¤	%	*	É	Ä	Ö	Å	Ü	é	ä	ö	å	ü
6	Italy	#	\$	%	*	@	°	\	é	^	ù	à	ò	è	ì
7	Spain I	Pts	\$	%	*	@	i	Ñ	¿	^	`	¨	ñ	}	~
8	Japan	#	\$	%	*	@	[¥]	^	`	{		}	~
9	Norway	#	¤	%	*	É	Æ	Ø	Å	Ü	é	æ	ø	å	ü
10	Denmark II	#	\$	%	*	É	Æ	Ø	Å	Ü	é	æ	ø	å	ü
11	Spain II	#	\$	%	*	á	i	Ñ	¿	é	`	í	ñ	ó	ú
12	Latin America	#	\$	%	*	á	i	Ñ	¿	é	ü	í	ñ	ó	ú
13	Korea	#	\$	%	*	@	[₩]	^	`	{		}	~
14	Slovenia/Croatia	#	\$	%	*	Ž	Š	Đ	Ć	Č	ž	š	đ	ć	č
15	China	#	¥	%	*	@	[\]	^	`	{		}	~
16	Vietnam	đ	\$	%	*	@	[\]	^	`	{		}	~
17	Arabia	#	\$	%	*	@	[\]	^	`	{		}	~
18	Russia	#	\$	%	*	@	[\]	^	`	{		}	~

Table 3

International Character Set - CD5220 / EMAX command mode

n (Hex)	International Character Set
A(0x41)	USA
F(0x46)	FRANCE
G(0x47)	GERMANY
U(0x55)	U.K.
D(0x44)	DENMARK I
W(0x57)	SWEDEN
I(0x49)	ITALY
S(0x53)	SPAIN
J(0x4A)	JAPAN
N(0x4E)	NORWAY
E(0x45)	DENMARK II
L(0x4C)	SLAVONIC
R(0x52)	RUSSIA

*Table 4
International Character Set - DSP800F command mode*

<i>n</i> (Hex)	International Character Set
30h	U.S.A.
31h	FRANCE
32h	GERMANY
33h	U.K.
34h	DENMARK I
35h	SWEDEN
36h	ITALY
37h	SPAIN
38h	JAPAN
39h	NORWAY
3Ah	DENMARK II

4.3 CD5220 command table

*Table 5
Select Code Table - CD5220 command mode*

<i>n</i> (Hex)	Code
A(0x41)	compliance with ASCII code
J(0x4A)	compliance with JIS code
R(0x52)	compliance with RUSSIA code
L(0x4C)	compliance with SLAVONIC code