

User's Manual

DSP Series LCD Customer Display



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LCD Customer Display

Model DSP Series

1. Information

A. Standard Package:

- | | |
|------------------|------|
| 1. Display Unit | 1 PC |
| 2. User's Manual | 1 PC |
| 3. CD Disc | 1 PC |
| 4. Power Kit | 1 PC |

to retrieve power 12V DC from switching power supply inside computer

B. Optional Accessories:

1. Switch-Mode Power Supply:

Input: 100V AC~240V AC, 50Hz~60Hz

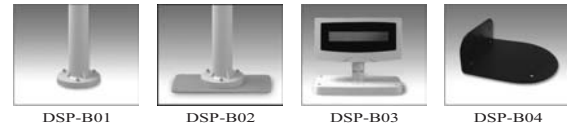
Output: DC 9V, 1.33A

2. Y-connection cable:

for printer pass-through connection

3. Optional Pole/Base:

- DSP-B01: Long pole with small round base
- DSP-B02: Metal base (used with DSP-B01)
- DSP-B03: Short pole with square base
- DSP-B04: Side wall mounting bracket (used with DSP-B01)



4. Optional LCD Display:

- Model DSP-420: Normal size font display
- Model DSP-430: Super large font display

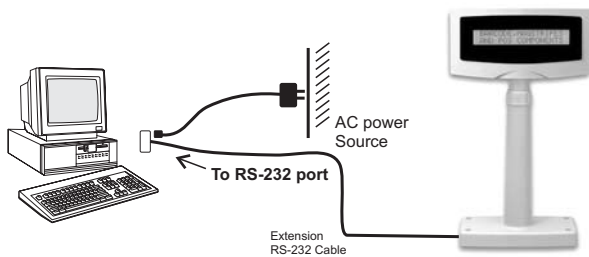
5. Optional Double Side Display:

- Model DSP-422: DSP-420 with small back display

Note: Version for using 5V DC power is upon customer's request.

2. Installation (RS-232 Interface)

- Step 1: Turn the computer system power off.
- Step 2: Connect the Display Cable to the RS-232 Port of the computer.
- Step 3: Connect the DC power source by the appropriate DC power adapter.
- Step 4: Turn on the computer and the power supply unit, the display will be on and ready for receiving data.

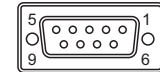


3. Interfaces

A. Cable-end DSUB


DSUB-9F Connector

- 2 — TXD
- 3 — RXD
- 5 — GND
- 7 Short connection
- 8 Short connection
- 9 — N.C.
- 1 Short Connection
- 4 Short Connection
- 6 Short Connection



B. DC Power Jack



GND —  — +750~1000mA 9~12VDC

Note : To use 5 V DC power source should modify the PCB circuit in factory.

4. Character Fonts Table

A. Character Font Table (1)

JS version for English and Japanese

C. Interface of Display Panel Side

- Specifications

Data transmission method : Asynchronous Serial.
 Default protocol : 9600 bps, non-parity,
 8 data bits, 1 stop bit.

- Interface connector (display panel side)

7 pin Male-Header

Pin assignments:



Upper 4 bit Lower 4 bit	LLLL	LLLH	LLHL	LLHH	LHLH	LHLH	LHHL	LHHH	HLLL	HLLH	HHLH	HHLH	HHLH	HHLH	HHLH	HHLH	HHLH	HHLH	HHLH
CG RAM (1)																			
LLLH (2)																			
LLHL (3)																			
LLHH (4)																			
LHLH (5)																			
LHLH (6)																			
LHHL (7)																			
LHHH (8)																			
HLLL (1)																			
HLLH (2)																			
HHLH (3)																			
HHLH (4)																			
HHLH (5)																			
HHLH (6)																			
HHLH (7)																			
HHLH (8)																			

Note 1: CG ROM is character generator ROM, contains character pattern.
 Note 2: Optional 3 versions to support various languages.

B. Character Font Table (2)

EE version for English and European

Upper 4 bit Lower 4 bit	LLLL	LLLH	LLHL	LLHH	LHLL	LHLH	LHHL	LHHH	HLLL	HLLH	HLHL	HLHH	HLLL	HLLH	HHLH	HHHL	HHHH
LLLL	CG RAM (1)	±	0	0	E	P	'	P	G	E	á	'	r	M	p	t	
LLLH	CG RAM (2)	≡	!	1	A	Q	a	a	9	0	a	i	'	J	t	y	o
LLHL	CG RAM (3)	7	"	2	E	R	b	r	e	é	E	ó	'	ø	ë	ÿ	
LLHH	CG RAM (4)	Δ	#	3	C	S	c	s	á	ó	'	P	T	e	q		
LHLL	CG RAM (5)	Γ	\$	4	D	T	d	t	á	ó	'	e	Γ	z	o		
LHLH	CG RAM (6)	√	%	5	E	U	e	u	á	ó	'	e	Γ	z	o		
LHHL	CG RAM (7)	γ	&	6	F	U	f	u	á	ó	'	e	Γ	z	o		
LHHH	CG RAM (8)	γ	'	7	E	U	e	u	á	ó	'	e	Γ	z	o		
HLLL	CG RAM (1)	Γ	(	B	H	K	h	x	é	ó	'	e	Γ	z	o		
HLLH	CG RAM (2)	Γ	)	9	I	Y	i	y	é	ó	'	e	Γ	z	o		
HLHL	CG RAM (3)	∗	*	#	J	Z	j	z	é	ó	'	e	Γ	z	o		
HLHH	CG RAM (4)	Γ	+	;	K	L	k	l	é	ó	'	e	Γ	z	o		
HHLH	CG RAM (5)	≡	,	<	L	\	l	l	é	ó	'	e	Γ	z	o		
HHLH	CG RAM (6)	∞	~	=	M	J	m	j	é	ó	'	e	Γ	z	o		
HHHL	CG RAM (7)	#	.	>	N	^	n	^	é	ó	'	e	Γ	z	o		
HHHH	CG RAM (8)	#	/	?	O	_	o	_	é	ó	'	e	Γ	z	o		

C. Character Font Table (3)

CP version for English and Russian

Upper 4 bit Lower 4 bit	LLLL	LLLH	LLHL	LLHH	LHLL	LHLH	LHHL	LHHH	HLLL	HLLH	HLHL	HLHH	HLLL	HLLH	HHLH	HHHL	HHHH
LLLL	CG RAM (1)			0	a	p	'	p					B	W	4	.	2
LLLH	CG RAM (2)		!	1	A	Q	a	a					Г	9	w	.	U
LLHL	CG RAM (3)		"	2	E	R	b	r					Е	6	ь	.	U
LLHH	CG RAM (4)		#	3	C	S	c	s					Н	б	у	.	U
LHLL	CG RAM (5)		\$	4	D	T	d	t					З	р	ь	.	U
LHLH	CG RAM (6)		%	5	E	U	e	u					Н	е	а	.	U
LHHL	CG RAM (7)		&	6	F	U	f	u					Р	а	к	.	U
LHHH	CG RAM (8)		'	7	E	U	e	u					Г	3	a	.	U
HLLL	CG RAM (1)		(	B	H	K	h	x					П	е	.	.	U
HLLH	CG RAM (2)		)	9	I	Y	i	y					У	о	.	.	U
HLHL	CG RAM (3)		*	#	J	Z	j	z					Ф	к	.	.	U
HLHH	CG RAM (4)		+	;	K	L	k	l					Ч	а	.	.	U
HHLH	CG RAM (5)		,	<	L	\	l	l					Ш	Н	.	.	U
HHLH	CG RAM (6)		~	=	M	J	m	j					б	н	.	.	U
HHHL	CG RAM (7)		>	N	^	n	^						б	н	.	.	U
HHHH	CG RAM (8)		/	?	O	_	o	_					3	т	.	.	U

5. Specifications:

A. Front Main Display

- Liquid Crystal Display (LCD)
- Number of Characters: 40 (20 columns x 2 lines)
- Character size: H 9.8 x W 6.0mm, or H 13.95 x W 6.0mm
- Character font: 5 x 7 dot matrix
- Character type: 192 Character
- A variety of display control functions
- LED or CCFL backlight type

B. Dimension

- Display unit: 110mmH x 220mmL x 45mmD
- Support pole: 270mm~440mm
- Base: 12mm Height with 80mm OD (Round Base)
- Tilt angle: 45 degree
- Horizontal angle: 360 degree
- Weight: Apprpx. 800 grams

C. Interface

- RS-232C Interface

D. Operating Environment

- Temperature: 5 to 45 degree C
- Humidity: 10 to 90% relative

E. Storage Environment

- Temperature: -10 to 50 degree C
- Humidity: 10 to 90% relative

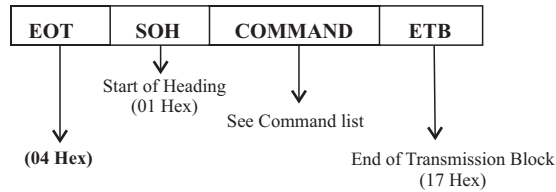
F. Optional Back LCD Display

- Display: Liquid Crystal Display
- LCD Mode: STN Negative, Blue
- Display pattern: 5x7 dot + Cursor
- Number of characters: 20 characters x 2 lines
- Character Size: 3.2mm(W)x 5.5mm(H)
- Back light Type: LED, Amber
- Viewing Area: 85.0mm x 18.6mm

6. Application Notes

(1) Software Control

A. Command format



B. Commands list

1. Set Baud Rate

COMMAND: B

COMPUTER: EOT SOH 'B' 'BAUD RATE' 'N' ETB

ASCII (04H)(01H)(42H) (31H~36H)(4EH)(17H)

Byte 1 1 1 1 1 1 1

DISPLAY: ACK (or NACK if failed)

ASCII (06H) (15H)

Byte 1 1

Note: Baud rates

- 31H : 9600
- 32H : 4800
- 33H : 2400
- 34H : 1200
- 35H : 600
- 36H : 300

2. Save the current view message

(Save Demo view data)

COMMAND: S

COMPUTER: EOT SOH 'S' 'Layer' ETB

ASCII (04H)(01H)(53H)(31H~36H)(17H)

Byte 1 1 1 1 1

DISPLAY: ACK (or NACK if failed)

ASCII (06H) (15H)

Byte 1 1

3. Set cursor position

COMMAND: P

COMPUTER: EOT SOH 'P' 'Position' ETB

ASCII (04H)(01H)(50H)(31H~58H)(17H)

Byte 1 1 1 1 1

DISPLAY: ACK (or NACK if failed)

ASCII (06H) (15H)

Byte 1 1

Note: The cursor can be set to the position from 1 to 40
 Position 1 means the upper left corner position.
 Position 20 means the upper right corner position.
 Position 21 means the lower left corner position.
 Position 40 means the lower right corner position.

4. Clear display range

COMMAND: C

COMPUTER: EOT SOH 'C' 'START' 'END' ETB

ASCII (04H)(01H)(43H)(31H~58H)(31H~58H)(17H)

Byte 1 1 1 1 1 1

DISPLAY: ACK (or NACK if failed)

ASCII (06H) (15H)

Byte 1 1

Note: Some part of the current view messages can be cleared by this COMMAND. It can start clearing between position 1 and position 40.

5. Display the saved DEMO message (DEMO on set)

COMMAND: D

COMPUTER: EOT SOH 'D' 'Layer' 'Mode' ETB

ASCII (04H)(01H)(44H)(31H~37H)(31H~33H)(17H)

Byte 1 1 1 1 1 1

DISPLAY: ACK (or NACK if failed)

ASCII (06H) (15H)

Byte 1 1

Note:

- 1) There are three layers of saved view messages as described on COMMAND "S"
- 2) There are two modes of display:
 - Mode 1 is running the saved messages from right to left, which is a horizontal scroll mode.
 - Mode 2 is running the saved messages from the lower line to the upper line, which is a vertical scroll mode.
- 3) For display layers:
 - select 31H means display the message saved on layer 1.
 - select 32H means display the message saved on layer 2.
 - select 33H means display the message saved on layer 1+ layer 2.
 - select 34H means display the message saved on layer 3.
 - select 35H means display the two messages saved on layer 1 + layer 3.
 - select 36H means display the two messages saved on layer 2 + layer 3.
 - select 37H means display all the messages saved on layer 1 + layer 2 + layer 3.
- 4) For display modes,
 - select 31H means display the message with Mode 1.
 - select 32H means display the message with Mode 2.
 - select 33H means display the message with Mode 1+Mode 2.For this Demo display function, you must have saved the message by COMMAND "S" previously, For example, select 37H for displaying layers and select 33H for displaying modes, DSP would display all the three messages saved on layer 1+ layer 2 + layer 3 with both Mode 1 + Mode 2 displaying modes.
- 5) Any new message from the computer would stop this Demo display function and DSP would display that new message from the computer.

6. Transmit the current view message to computer

COMMAND: T

COMPUTER:	EOT	SOH	'T'	ETB
	ASCII (04H)	(01H)	(54H)	(17H)
	Byte	1	1	1
DISPLAY:	SOH	'DATA'		ETB
	ASCII (01H)			(17H)
	Byte	1	40	1

C. Transmission method

Each ASCII character is transmitted with

1 start bit
8 data bits
1 stop bit
No parity

Note: You may generate your own application software to run the display according to the standard RS-232C communication protocols and the SOFTWARE CONTROL information listed on this chapter.

(2) Instructions of Configuration Utilities

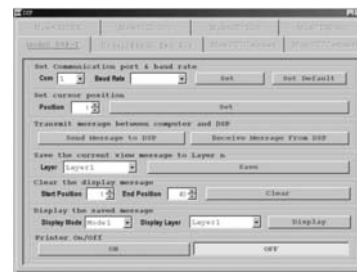
Note: For the first installation, you had better connect the Display with the COM1 port of the computer due to the initial value COM1 for Display

The Default value of Display communication parameters are:

COM port : COM1
Baud rate = 9600
Parity = None

A. Install the DSP-400 Windows version configuration software:

1. Insert the bundled CD disc into the CD-ROM drive
2. Run "your CD-ROM\Configuration_Utilities\DSP-400\DSP-WIN\setup.exe."
3. Follow the installation hints until the installation process is fully completed
4. Go "Start Menu" > "Programs" > "DSP" , Click: "DSP" to begin the customer display configuration.



B. DSP-400 DOS version configuration software:

1. Run "Your_CD-ROM: \ Configuration_Utilities \ DSP-400 \ DSP-DOS \ DSP-400.exe" to setup the customer display's RS-232 communication under DOS mode



```
F1. PC RS232 Communication set: COM1 9600 N 8 1
F2. RS232 Communication set : 9600 N 8 1
F3. DSP International character set: 0
F4. DSP Save demo view data
-----
F5. DSP Cursor position set(1-40)
F6. DSP Clear display range
F7. DSP DEMO on set
F9. DSP TX view date to PC ( S0H 'T' ETB )
-----
ESC  QUIT
```

2. Then, follow this menu to run the utility.
 - Press F1 to set RS-232 communication of the computer, select COM port. Baud rate must be set as the same as the baud rate shown on the lower line of the display, such as "9600 N 8 1" means baud rate 9600, No Parity, 8 data bits, and 1 stop bit.
 - Press F2 to set RS-232 communication of Display, select Baud rate and Parity must be No Parity. Also the selections at F1 and F2 must be the same, otherwise Display can not communicate with the computer.
 - F3 to select International Character Code Set. (Not support in LCD display, only available in VFD display.)

- Press F4 to save the current view message into the memory of Display
- Press F5 to move the cursor position.
- Press F6 to clear some or all the current view message.
- Press F7 to display the previously saved message.
- Press F8 to transmit the current view message to the computer.

- C. After the handshaking between Display and the computer is completed, this means the operations F1 and F2 have successfully been done, the Display would display any message character from the computer. Any new message from the computer would cover the old message on the display. You may enter any message to display.

Appendix: SELECT COMMAND MODES

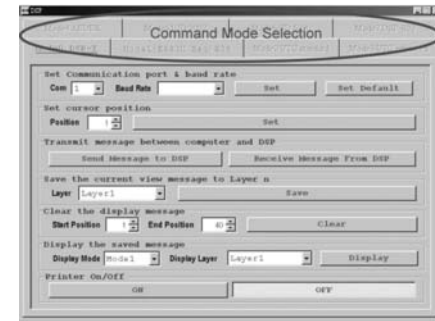
DSP provides various command modes which are compatible to most popular displays, then the user can easily replace the used display and no need to modify the application software.

- Mode 0 : DSP-T (Default setting)
- Mode 1 : EPSON Esc/POS
- Mode 2 : UTC Standard
- Mode 3 : UTC Enhanced
- Mode 4 : AEDEX
- Mode 5 : ICD 2002
- Mode 6 : CD 5220
- Mode 7 : DSP-800

To select the display command mode, you need to make sure the RS-232 communication protocol of PC and display should be set at 9600 (Baud Rate), 8 (Data bits), N (No parity), 1 (Stop bit).

A. Select Command Mode by configuration utility (Windows version)

1. Make sure the customer display is powered up and connected properly to your PC/Terminal's COM port.
2. Run "Start Menu" > "Programs" > "DSP" > "DSP":
3. The configuration utility will auto detect the customer display connection to COM port.
4. Choose preferred software command mode by click on the index tab of the DSP-400 configuration software utility.



5. You may test the software commands such as Cursor Position, Screen Display, and Display Mode under each Command Mode index.
6. Close the DSP-400 Configuration Utility to complete the setup process.

B. Select Command Mode by configuration utility (DOS version)

1. Make sure the customer display is powered up and connected properly to your PC/Terminal's COM port.
2. Make sure the COM port communication setting is correct. Execute the DSP-400.exe in "CD-ROM: \ Configuration_Uilities \ DSP-400 \ DSP-DOS \\" to setup the communication if necessary.
3. Run Your_CD-ROM:\Configuration_Uilities \ DSP-400 \ DSP-DOS \ DSPMODE.exe



4. Select the corresponding COM port where your customer display is attached by press \uparrow \downarrow keys on your keyboard.
5. Select the preferred Command Mode by moving keyboard \uparrow \downarrow keys or press hot keys "0" to "8"
6. Press ESC. To exit the program.

Mode 0: DSP-T mode commands list Refer to page 12

Command	Hexadecimal Codes	Function
B	42H	Set baud rate and parity
I	49H	Select international character set
S	53H	Save the current view message
P	50H	Set cursor position
C	43H	Clear display message
D	44H	Display the saved DEMO message
T	54H	Transmit the current view message to computer

Mode 1: EPSON Esc/POS mode commands list

Command	Code description (hex)	Function description
HT	09	move cursor right
BS	08	move cursor left
US LF	1F 0A	move cursor up
LF	0A	move cursor down
US CR	1F 0D	move cursor to right-most position
CR	0D	move cursor to left-most position
HOM	0B	move cursor to home position
US B	1F 42	move cursor to bottom position
US \$ x y	1F 24 x y X=1-20 y=01,02	move cursor to specified position
CLR	0C	clear display screen
CAN	18	clear cursor line
US E n	1F 45 n n=00-ff	blink display screen
ESC @	1B 40	initialize display
US MD1	1F 01	specify overwrite mode
US MD2	1F 02	specify vertical scroll mode
US MD3	1F 03	specify horizontal scroll mode
ESC W n s x1 y1 x2 y2	1B 57 n s x1 y1 x2 y2 n=1,2,3,4 s=0, 1	specify/cancel the window range 1<=x1<=x2<=20 1<=y1<=y2<=2
US:	1F 3A	set starting/ending position of macro definition
US ^ n m	1F 5E n m 00<=(n,m)<=ff	execute and quit macro
US @	1F 40	execute self-test
US T h m	1F 54 h m 0<=h<=17, 0<=m<=3b	display time
US U	1F 55	display time continuously

Mode 2: UTC standard mode commands list

Command	Code description (hex)	Function description
BS	08	back space
HT	09	horizontal tab
LF	0A	line feed
CR	0D	carriage return
DLE	0F	display position
DC1	11	over write display mode
DC2	12	vertical scroll mode
DC3	13	cursor on
DC4	14	cursor off
ESC d	1B 64	change to UTC enhanced mode
US	1F	clear display

Mode 3: UTC enhanced mode commands list

Command	Code description (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 20]0D	upper line message scroll continuously
ESC u E CR	1B 75 45 hh ':' mm 0D h,m='0'-'9'	display time
ESC u F CR	1B 75 46 [data x 20]0D	upper line message scroll once pass
ESC u H CR	1B 75 48 n m 0D 20h<=n,m	change attention code
ESC u I CR	1B 75 49 [data x 40]0D	two line display
ESC RS CR	1B 0F 0D	change to UTC standard mode

Mode 4: AEDEX mode commands list

Command	Code description (hex)	Function description
! # 1CR	21 23 31 [data x 20] 0D	upper line display
! # 2CR	21 23 32 [data x 20] 0D	bottom line display
! # 4CR	21 23 34 [data x 20] 0D	upper line message scroll continuously
! # 5CR	21 23 35 hh ':' mm 0D h,m='0'-'9'	display time
! # 6CR	21 23 36 [data x 20] 0D	upper line message scroll once pass
! # 8CR	21 23 38 n m 0D 20h<=n,m	change attention code
! # 9CR	21 23 39 [data x 40] 0D	two line display
! # ACR	21 23 41 [data x 20] 0D	upper line scroll message
! # BCR	21 23 42 [data x 20] 0D	bottom line display message

Mode 5: ICD 2002 mode commands list

Command	Code description (hex)	Function description
HT	09	move cursor right (only valid in overwrite mode)
BS	08	move cursor left (only valid in overwrite mode)
CR	0D	move cursor to left-most position (only valid in overwrite mode)
ESC @	1B 40	initialize customer display to initial state, clears display buffer, set display mode to shift and sets current display row to upper row
ESC U	1B 55	select upper row as current row (initial default)
ESC D	1B 44	select lower row as current row
ESC A $r \phi$	1B 41 $r \phi$	sets customer display disable or enable $r \phi$ 'D'=disable, 'E'=enable
ESC C $r c$	1B 43 $r c$	move cursor to specified position (only valid in overwrite mode) -r Row ('U'=upper,'D'=lower) -c Column number (range from 1~20)
ESC E $r \phi$	1B 45 $r \phi$	set special effect or display mode of specified row

REMARK)* Using command "ESC E r ϕ ", the value of parameter:

- r 58= all rows
- 55= upper row
- 44= lower row
- r ϕ special function, the value is one of
 - 30= shift mode(default display mode)
 - 31= rotation mode
 - 32= blink mode
 - 33= clear this row and switch to shift mode
 - 34= overwrite mode
 - 35= vertical mode

Mode 6: CD 5220 standard mode commands list

Command	Code description (hex)	Function description
ESC DC1	1B 11	overwrite mode
ESC DC2	1B 12	vertical scroll mode
ESC DC3	1B 13	horizontal scroll mode
ESC Q A.....CR	1B 51 41 [n]x20 0D	set the string display mode, write string to upper line
ESC Q B.....CR	1B 51 42 [n]x20 0D	set the string display mode, write string to lower line
ESC Q D.....CR	1B 51 44 [n]x20 0D	upper line message scroll continuously
ESC [D	1B 5B 44	move cursor left
BS	08	move cursor left
ESC [C	1B 5B 43	move cursor right
HT	09	move cursor right
ESC [A	1B 5B 41	move cursor up
ESC [B	1B 5B 42	move cursor down
LF	0A	move cursor down
ESD [H	1B 5B 48	move cursor to home position
HOM	0B	move cursor to home position
ESC [L	1B 5B 4C	move cursor to left-most position
CR	0D	move cursor to left-most position
ESC [R	1B 5B 52	move cursor to right-most position
ESC [K	1B 5B 4B	move cursor to bottom position
ESC 1 x y	1B 6C x y 1<=x<=20, y=1,2	move cursor to specified position

Command	Code description (hex)	Function description
ESC @	1B 40	initialize display
ESC W s x1 x2 y	1B 57 1 x1 x2 y 1<=x1<=x2<=20 y=1,2	set or cancel the window range at horizontal scroll mode
CLR	0C	clear display screen, and clear string mode
CAN	18	clear cursor line, and clear string mode
ESC _ n	1B 5F n n=0,1	set cursor ON/OFF

Mode 7: DSP-800 mode commands list

Command	Code description (hex)	Function description
EOT SOH P n ETB	04 01 50 n 17 n=31H-58H	move cursor to specified position
EOT SOH C n m ETB	04 01 43 n m 17 31H<=n<=m<=58H	clear display range from <u>n</u> position to <u>m</u> position and move cursor to <u>n</u> position.
EOT SOH S n ETB	04 01 53 n 17 n=31H-35H	save the current displaying data to n layer for demo display
EOT SOH D n m ETB	04 01 44 n m 17 n=31H-4FH m=31H-33H	display the saved data
EOT SOH T ETB	04 01 54 17	transmit the current view message to computer
EOT SOH B n N ETB	04 01 42 n 4E 17 n=31H: 9600 n=32H: 4800 n=33H: 2400 n=34H: 1200 n=35H: 600 n=36H: 300	set baud rate