

OPEN POS

S/W REFERENCE MANUAL

Product Name : LIUST-5X Display Module

Model Name : Display

Solution by TEC

NOT APPROVED FOR COPY	CONFIDENTIAL
--------------------------	--------------

No.

Copyright(c)1998

TOSHIBA TEC Corporation

All Rights Reserved



Information in this document is subject to change without notice.
No part of this document may be reproduced or transmitted in any form or by any means, electronic or mechanical, for any purpose, without the express written permission of TOSHIBA TEC Corporation.

Technical data contained herein are proprietary information of TEC Corporation which shall be treated confidentially, and shall not be furnished to third parties or made public without prior written permission by TEC Corporation.

These technical data are subject to export control law of Japan / COCOM regulations, and diversion contrary thereto is prohibited.

TOSHIBA TEC CORPORATION

OPEN POS

S/W REFERENCE MANUAL

LIUST-5X Display Module

Display

1998,2 2nd Edition

Copyright(c) 1998

TOSHIBA TEC Corporation

All Rights Reserved

Specification No. : EYA-03969

Product Name : LIUST-5X Display Module

Model Name : Display

Specifications : LIUST-5X Display Module Controller Reference Manual

Specifications

2nd Edition : Feb. 03, 1998

Confirmation	[Eng.]	(Eng. Group)		
	App.by	App.by	Ckd.by	Drf.by
	<i>Matsui</i>	<i>Yamamoto</i>	<i>Uematsu</i>	Matsui
	3.3.'98	3.2.'98	3.2.'98	Feb.03,'98

TEC Corporation

Copyright (C)1997-98
TEC Corporation
All Rights Reserved

CONTENTS

1.Introduction-----	1.1
2.Specification -----	2.1
2.1.Function-----	2.1
2.1.1.Display mode and fonts-----	2.1
2.1.2.Country code-----	2.2
2.1.3.Cursor (Valid only for ANK display mode)-----	2.2
2.1.4.Brightness-----	2.2
2.1.5.Character attributes (Valid only for LIUST-52/53)-----	2.3
2.1.6.External character setting (Valid only for LIUST-52/53)-----	2.3
2.1.7.Graphic display (Valid only for LIUST-52/53)-----	2.3
2.1.8.One line horizontal scroll (Valid only for LIUST-52/53)-----	2.4
2.1.9.Multi-line horizontal scroll (Valid only for LIUST-52/53)-----	2.4
2.2.Host interface-----	2.5
2.2.1.Interface-----	2.5
2.2.2.Connector wiring-----	2.5
2.2.3.Dip switch-----	2.6
2.2.4.Transmission sequence-----	2.7
2.2.5.Transmission abnormal processing-----	2.7
3.Command-----	3.1
3.1.Command list-----	3.1
3.2.Command detail-----	3.3
1)Back Space without deleting -----	3.3
2)Line feed -----	3.3
3)Carriage return -----	3.4
4)Clear display -----	3.4
5)Set virtual cursor -----	3.5
6>Delete to end of line -----	3.5
7)Set country code -----	3.6
8)Dimming -----	3.7
9)Cursor Mode -----	3.7
10)Triangle Mark (Only for LIUST-51)-----	3.8
11)Identification Code -----	3.8

12)Screen Mode -----	3.9
13)One line horizontal scroll (Valid only for LIUST-52/53)-----	3.12
14)Dispaly attribte Blink/Reverse/Reset/Double width (Only for LIUST-52/53)---	3.14
15)External character setting (Only for LIUST-52/53)-----	3.15
16)Graphic display (Only for LIUST-52/53)-----	3.17
17)Character Font Data ANK -----	3.18
18)Character Font Data Japan Shift-JIS (Only for LIUST-52/53)-----	3.18
19)Multi-line horizontal scroll (Mode dedicated to horozontal scroll) (Only for LIUST-52/53) -----	3.19
4.Diagnostics -----	4.1
4.1.Self diagnostics-----	4.1
4.2.Display test-----	4.1

----- APPENDIX -----

A1.FONT 5x7 ANK -----	A1.1
A2.FONT Japan ANK,Shift-JIS1,2 -----	A2.1
A3.Example Program Module -----	A3.1
A4.Attentions on WindowsNT -----	A4.1

1. Introduction

This document describes the overview, the function, the interface and so on of LIU controller for POS and is the specification of the display module used to directly control the display module for POS.

Note: LIU--DOT fluorescent display device

2. Specification

2.1. Function

Controls the dot display by commands and data received through serial interface from the host.

2.1.1. Display mode and fonts

Displays characters.

Also displays to the descriptor (only LIUST-51).

Display Mode	LIUST -50	LIUST -51	LIUST -52	LIUST -53
ANK 5x7 Font 20 digits 2 columns	*	-	-	-
ANK 5x7 Font 20 digits 2 columns With triangle mark	-	*	-	-
ANK 5x7 Font 20 digits 4 columns	-	-	*	-
ANK 5x7 Font 20 digits 5 columns	-	-	*	-
JIS 1·2 16x16(8x16)Font 10(20) digits 2 columns	-	-	*	-
ANK 5x7 Font 42 digits 8 columns	-	-	-	*
JIS 1·2 16x16(8x16)Font 16(32) digits 3 columns	-	-	-	*
JIS 1·2 24x24(12x24)Font 10(20) digits 2 columns	-	-	-	*
JIS 1·2 24x24(12x24)Font 10(20) digits 1 columns	-	-	-	*
JIS 1·2 16x16(8x16)Font 16(32) digits 2 columns	-	-	-	*
JIS 1·2 16x16(8x16)Font 16(32) digits 4 columns	-	-	-	*

*Valid / -Invalid

- See Appendix-A1 and Appendix-A2 for fonts.

2.1.2. Country code

17 kinds of country codes are provided. Codes can be switched by commands.

Contry CODE	L I U S T 5 0	L I U S T 5 1	L8 I5 U0 SE Ta 5s 1t	L8 I5 U2 S T 5 1	L I U S T 5 2	L I U S T 5 3
00 USA						
01 France						
02 Germany						
03 UK						
04 Denmark 1						
05 Sweden	*	*	*	*	*	*
06 Italy						
07 Spain 1						
08 Japan						
09 Norway						
0A Denmark 2						
0B Spain 2						
0C Latin America						
0D 850(East Europe)	-	-	*	-	*	*
0E 852(Ice Land+Greek)	-	-	-	*	*	*
63 Japan2	*	*	-	-	*	*
64 Japan Shift JIS	-	-	-	-	*	*

Note: Default value is Germany when the power in on.

*Valid/ -Invalid

2.1.3. Cursor (Valid only for ANK display mode)

Selectable from light-up, flashing and light-off.

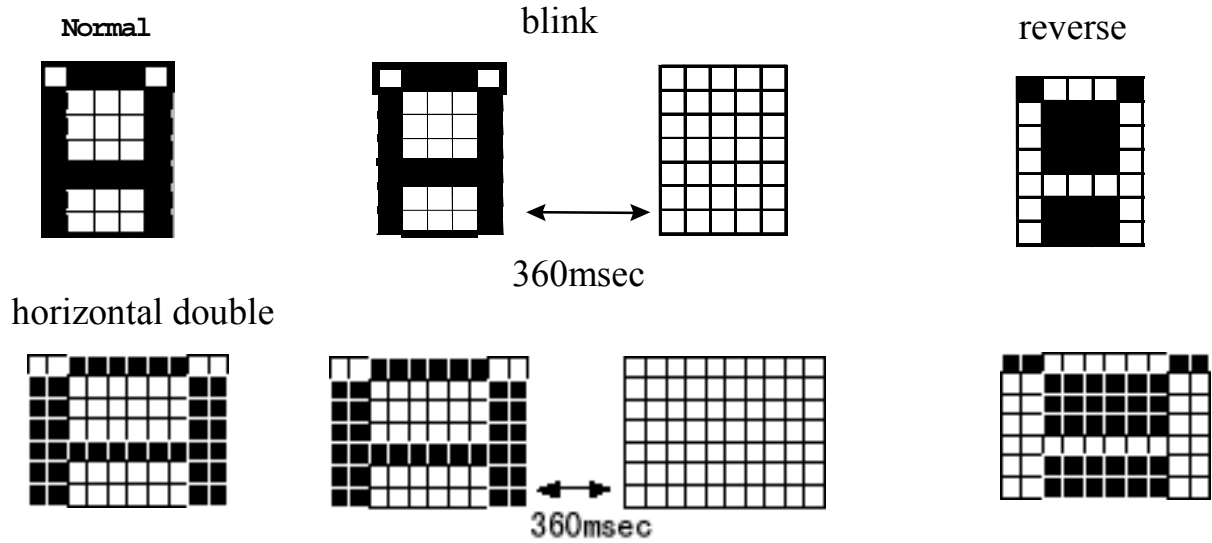
Note: Default value is light-off when the power in on.

2.1.4. Brightness

Display device	Selectable brightness(%)					
LIUST-50	Brightness setting is not allowed.					
LIUST-51	0	20	40	60	80	100
LIUST-52	0	35.7	42.9	57.1	78.6	100
LIUST-53	0	31.6	45.0	58.8	79.4	100

Note: The default value is 100% when the power is on.

2.1.5. Character attributes (Valid only for LIUST-52/LIUST-53)



2.1.6. External character setting (Valid only for LIUST-52/LIUST-53)

Specify the following external character setting and setting codes

(ANK character/20H-FFH for half-size character).

Priority is given to external setting when displayed.

Full size(16x16) 16

Half size(8x16) 32

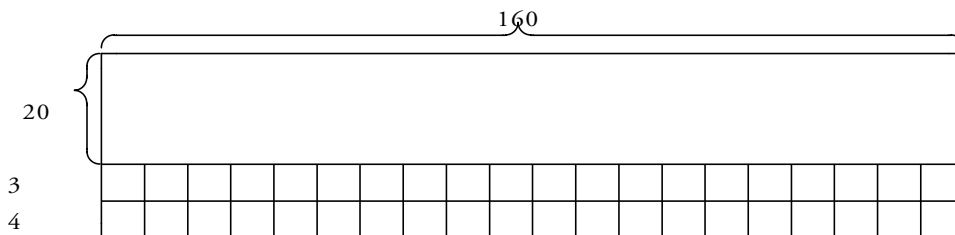
ANK character(5x7) 32

Full size(24x24) 16 (Valid only for LIUST-53)

Half size(12x24) 32 (Valid only for LIUST-53)

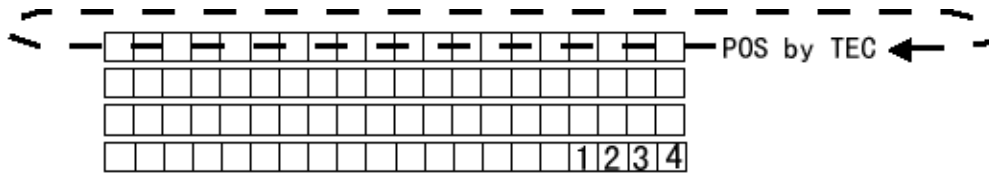
2.1.7. Graphic display (Valid only for LIUST-52/LIUST-53)

Can be displayed with text (maximum 40x160 LIUST-52). (No overlapping is allowed.)



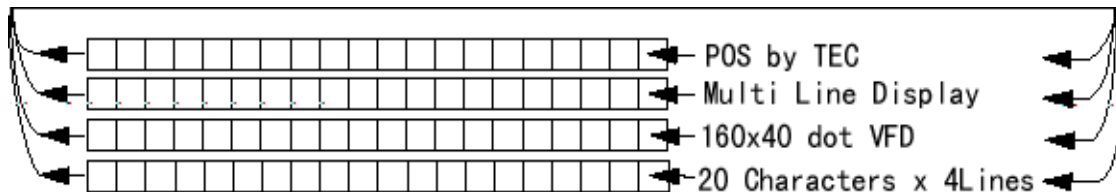
2.1.8. One line horizontal scroll (Valid only for LIUST-52/LIUST-53)

(Specified maximum characters are 128 (64 for full size characters)
 Smooth scroll by dots. Specifying multiple lines is not allowed.
 Row specification is allowed.
 The speed of scrolling can be specified. (10ms/dot 20ms/dot)
 Other commands can be executed at the same time. (Smooth scrolling is available.)



2.1.9. All lines horizontal scroll (Valid only for LIUST-52/LIUST-53)

(Specified maximum characters are 128 (64 for full size characters)
 Smooth scroll by dots. Specifying multiple lines is allowed.
 The speed of scrolling can be specified. (10ms/dot 20ms/dot)
 Other commands can not be executed at the same time. (Smooth scrolling is available.)



2.2. Host interface

2.2.1. Interface

Communication method : RS232C compliant
 Mode : asynchronous Full duplex
 Start bit : 1bit
 Data length : 8bit
 Stop bit : 1bit
 Baud rate : 1200 /2400 /4800 /9600 (/19200 only for LIUST-52/LIUST-53) bit/s
 Default value is 9600bps. (Selectable by dip switch)
 Parity : EVEN /ODD /NONE Default value is odd. (Selectable by dip switch)
 Signal : TXD,RXD,CTS,RTS
 Flow control : Hand-shake method by CTS/RTS signal.

2.2.2. Connector wiring

PIN No.	Signal name	in/out
1	RTS: Request To Send Used by the controller as the status to inform the host whether data receiving is enabled or disabled. Mark: Receiving disabled/Space:receiving enabled	out
2	CTS: Clear To Send Used by the host as the status to inform the controller whether data receiving is enabled or disabled. Mark: Receiving disabled/Space: receiving enabled	in
3	GND	-
4	RXD: Receive Data Data input line from the host to the controller. Equilibrium is "Mark".	in
5	TXD: Transmit Data Data output line from the controller to the host. Equilibrium is "Mark".	out
6	12V	-

2.2.3. Dip switch

• LIUST-50/LIUST-51

SW No.	Function							
1	ON	1200	OFF	2400	ON	4800	OFF	9600
2	ON	BPS	ON	BPS	OFF	BPS	OFF	BPS
3	Parity ON:ENABLE OFF:DISABLE							
4	Select ON:ODD OFF:EVEN							
5	Self test ON:TEST OFF:NORMAL							
6	Reserved OFF							

• LIUST-52

SW No.	Function									
1	ON	1200	OFF	2400	ON	4800	OFF	9600	OFF	19200
2	ON	BPS	ON	BPS	OFF	BPS	OFF	BPS	OFF	BPS
3	OFF		OFF		OFF		OFF		ON	
4	Parity ON:ENABLE OFF:DISABLE									
5	Select ON:ODD OFF:EVEN									
6	Self test ON:TEST OFF:NORMAL									

• LIUST-53

SW No.	Function									
1	ON	1200	OFF	2400	ON	4800	OFF	9600	OFF	19200
2	ON	BPS	ON	BPS	OFF	BPS	OFF	BPS	OFF	BPS
3	OFF		OFF		OFF		OFF		ON	
4	Parity ON:ENABLE OFF:DISABLE									
5	Select ON:ODD OFF:EVEN									
6	Self test ON:TEST OFF:NORMAL									
7	Module Select ON:Secondary OFF:NORMAL(Primary)									
8	Display Mode ON: ANK 5x7 Font OFF: JIS 1·2 16x16(8x16)Font 42 Colum 8 Line 16(32) Colum 3 Line									

2.2.4. Transmission sequence

- RTS/CTS Hand-shake method

- 1) Receiving by RTS signal (Host -> controller)

The controller sets RTS signal to Space when receiving from the host is enabled and sets the signal to Mark when the receiving is disabled.

Therefore, the host checks RTS signal before sending a character and sends one character after verifying that the status is Space.

- 2) Sending by CTS signal (Controller -> host)

The controller sends data to the host after verifying that CTS signal is Space.

Therefore, the host controls receiving from the controller by setting CTS signal to Space when receiving is enabled and by setting the signal to Mark when receiving is disabled.

2.2.5. Transmission abnormal processing

- 1) Even if the data sent from the controller is not received by the host due to transmission trouble, the controller regards the data as transmitted.
- 2) When the command is received from the host and overrun and framing error occurred, the command is ignored.
- 3) When the data is received from the host and overrun and framing error occurred, the data is ignored.
- 4) When the command is received from the host and parity error occurred, the command is ignored.
- 5) When the data is received from the host and parity error occurred, the data is ignored.
- 6) An illegal command received from the host is ignored.

3. Command

3.1. Command list

N O.	Command	Code	Code(Hex)	LIUST-xx			
				5 0	5 1	5 2	5 3
1	Back space without Deleting	BS	08	*	*	*	*
2	Line feed	LF	0A	*	*	*	*
3	Carriage return	CR	0D	*	*	*	*
4	Clear display	ESC[2J	1B 5B 32 4A	*	*	*	*
5	Set virtual cursor	ESC[Py;PxH	1B 5B Py 3B Px 48	*	*	*	*
6	Delete to end of line	ESC[0K	1B 5B 30 4B	*	*	*	*
7	Set country code	ESCRn	1B 52 n	*	*	*	*
8	Dimming	ESC[?LDPs	1B 5C 3F 4C 44 Ps	-	*	*	*
9	Cursor Mode	ESC[?LCPs	1B 5C 3F 4C 43 Ps	*	*	*	*
10	Triangle Mark	ESC[?LTP4P3P2P1 P0	1B 5C 3F 4C 54 P4 P3 P2 P1 P0	-	*	-	-
11	Identification code	ESC[c or ESC[0c	1B 5B 63 or 1B 5B 30 63	*	*	*	*
12	Screen Mode	ESC[?LSPs	1B 5C 3F 4C 53 Ps	-	-	*	*
13	One line horizontal scroll	ESC[?LH Pm;Pl;Pt;Pn;Pd...Pd	1B 5C 3F 4C 48 Pm 3B Pl 3B Pt 3B Pn 3B Pd...Pd	-	-	*	*
14	Display attribute Blink Reverse Reset Double width display Set Reset	ESC[5m ESC[7m ESC[0m ESC#6 ESC#5	1B 5B 35 6D 1B 5B 37 6D 1B 5B 30 6D 1B 23 36 1B 23 35	-	-	*	*
15	External character setting ANK (5x7) Half size(8x16) Full size(16x16) Half size(12x24) Full size(24x24)	ESC[?LW1 ;Pn;Pc;Pd...Pd ESC[?LW2 ;Pn;Pc;Pd...Pd ESC[?LW3 ;Pn;Pc;Pd...Pd ESC[?LW4 ;Pn;Pc;Pd...Pd ESC[?LW5 ;Pn;Pc;Pd...Pd	1B 5C 3F 4C 57 31 3B Pn 3B Pc 3B Pd...Pd 1B 5C 3F 4C 57 32 3B Pn 3B Pc 3B Pd...Pd 1B 5C 3F 4C 57 33 3B Pn 3B Pc 3B Pd...Pd 1B 5C 3F 4C 57 34 3B Pn 3B Pc 3B Pd...Pd 1B 5C 3F 4C 57 35 3B Pn 3B Pc 3B Pd...Pd	-	-	*	*
16	Graphic display	ESC[?LG Px;Py;Ph;Pw;Pd...	1B 5C 3F 4C 47 Px 3B Py 3B Ph 3B Pw 3B Pd...	-	-	*	*
17	Character Font Data ANK	xx	20-FF	*	*	*	*
18	Character Font Data Shift-JIS	xx yy	1st byte(81-9F, E0-EF) 2nd byte(40-7E, 80-FC)	-	-	*	*

*Valid / -Invalid

TEC Corporation EYA03969

N O.	Command	Code	Code(Hex)	LIUST-xx			
				5 0	5 1	5 2	5 3
19	Full screen Start Horizontal scroll End Go Set Line String	ESC\?LMS ESC\?LME ESC\?LMG ESC\?LM Pm;Pl;Pt;Pn;Pd...Pd	1B 5C 3F 4C 4D 53 1B 5C 3F 4C 4D 45 1B 5C 3F 4C 4D 47 1B 5C 3F 4C 4D Pm 3B Pl 3B Pt 3B Pn 3B Pd...Pd	-	-	*	*

*Valid / -Invalid

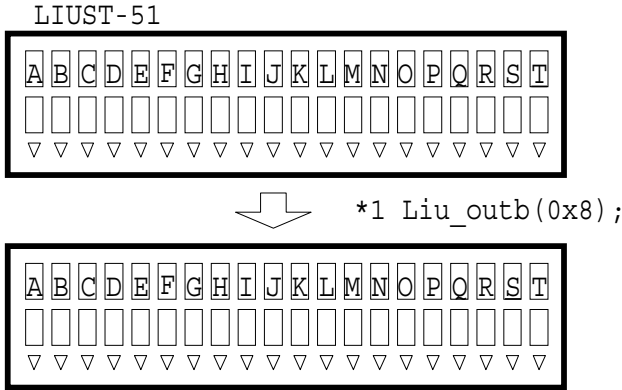
3.2. Command detail

1) Back Space without deleting

Format: BS (08)

Function: Writing position shifts left by one digit. Fonts displayed stay displayed at the time. If writing position is at the leftmost position, nothing happens.

Example)

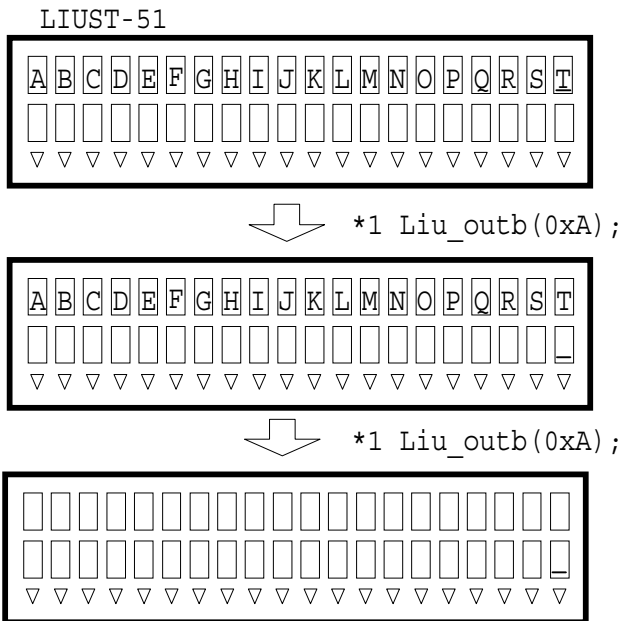


2) Line feed

Format: LF (0Ah)

Function: Writing position shifts left by one digit. Fonts displayed stay displayed at the time. If writing position is at the leftmost position, nothing happens.

Example)



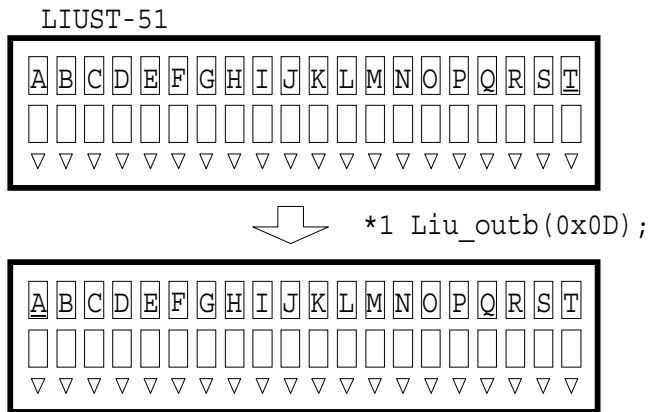
*1 See Appendix-A3.

3) Carriage return

Format: CR (0D)

Function: Writing position shifts to the leftmost position on the same line.
 If writing position is at the leftmost position, nothing happens.

Example)

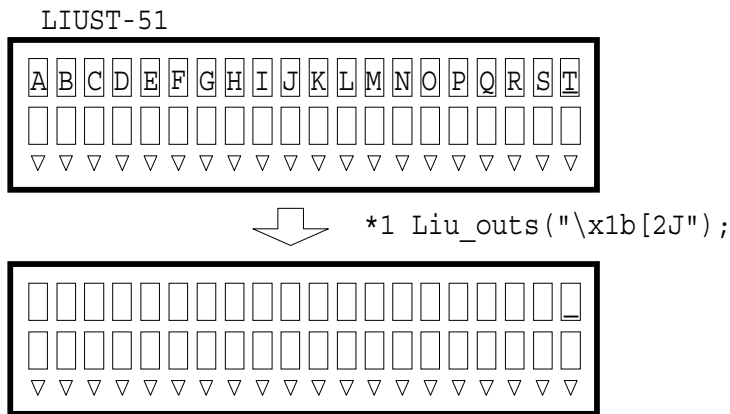


4) Clear display

Format: ESC[2J (1B 5B 32 4A)

Function: All the display Erases on the screen will be erased. Writing position will not move.

Example)



*1 See Appendix-A3.

5) Set virtual cursor

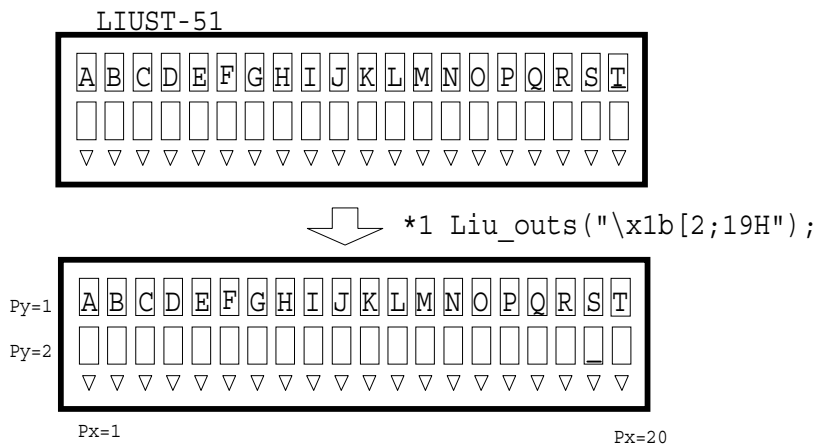
Format: ESC[Py;PxH (1B 5B Py 3B Px 4B)

Function: Moves to the writing position of Py(Row) and Px(Column).

Py: If it is 0, 1 is assumed. If it is greater than the maximum line, it is assumed to be the maximum.

Px: If it is 0, 1 is assumed. If it is greater than the maximum column, it is assumed to be the maximum.

Example)



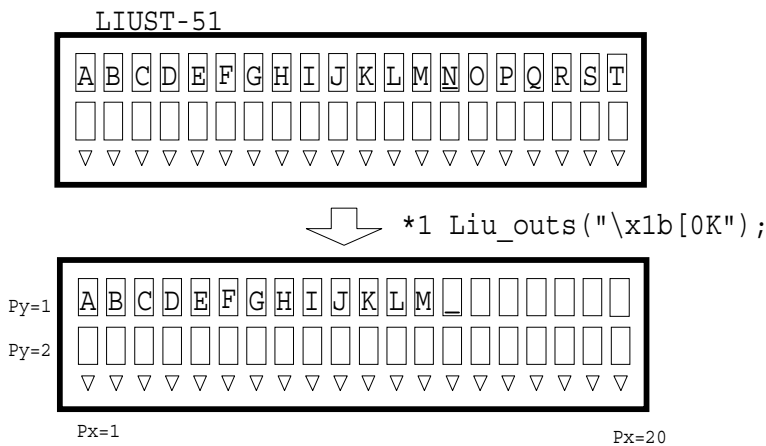
6) Delete to end of line

Format: ESC[0K (1B 5B 30 4B)

Function: Data displayed after the writing position on the same line will be erased.

Writing position will not move.

Example)



*1 See Appendix-A3.

7) Set country code

Format: ESCRn (1B 52 n) Only valid for 5x7 font use.

Function: 'n' is one byte parameter signifying country code to switch fonts.

The initial value after power on shall be 02h(Germany).

Parameter: n country code

Contry CODE	L I U S T 5 0	L I U S T 5 1	L8 I5 U0 SE Ta 5s 1t	L8 I5 U2 S T 5 1	L I U S T 5 2	L I U S T 5 3			
00 USA									
01 France									
02 Germany									
03 UK									
04 Denmark 1									
05 Sweden	*	*	*	*	*	*			
06 Italy									
07 Spain 1									
08 Japan									
09 Norway									
0A Denmark 2									
0B Spain 2									
0C Latin America									
0D 850(East Europe)	-	-	*	-	*	*			
0E 852(Ice Land+Greek)	-	-	-	*	*	*			
63 Japan2	*	*	-	-	*	*			
64 Japan Shift JIS	-	-	-	-	*	*			

Note: The default value after power on is Germany.

*Valid / -Invalid

Example)

Set country code USA

*1 Liu_outs("\x1bR"); Liu_outb(0);

*1 See Appendix-A3.

8) Dimming

Format: ESC\?LDPs (1B 5C 3F 4C 44 Ps)

Function: Changes the brightness of the display device.

The default value after power on will be '5'(100%).

Parameter: Ps Dimming

Display device Ps	0 (30h)	1 (31h)	2 (32h)	3 (33h)	4 (34h)	5 (35h)
	Available brightness (%)					
LIUST-50	Brightness setting is not available.					
LIUST-51	0	20	40	60	80	100
LIUST-52	0	35.7	42.9	57.1	78.6	100
LIUST-53	0	31.6	45.0	58.8	79.4	100

Example)

Set Dimming 100%

```
*1 Liu_outs("\x1b\?LD5");
```

9) Cursor Mode

Format: ESC\?LCPs (1B 5C 3F 4C 43 Ps) Only valid for 5x7 font use.

Function: Changes Cursor Mode.

Parameter: Ps='0' Cursor light off (Default after power on)

'1' Cursor blink

'2' Crsor light up

Example)

To set the cursor to blink

```
*1 Liu_outs("\x1b\?LC1");
```

*1 See Appendix-A3.

10) Triangle Mark (Only for LIUST-51)

Format: ESC\?LTP4P3P2P1P0 (1B 5C 3F 4C 54 P4 P3 P2 P1 P0)

Function: To light up or light off Triangle mark.

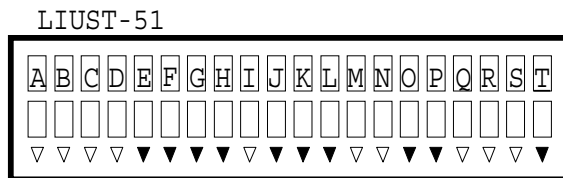
Parameter: P4P3P2P1P0 Data obtained by displaying triangle mark light-up/light-off data in 20-bit mask pattern and converting it to 5 digit hexadecimal ASCII.

Example)

The following is the example to light up the triangle mark as shown below (P4P3P2P1P0).

```
P4 P3 P2 P1 P0
0000 1111 0111 0011 0001 b
0 F 7 3 1 h
```

*1 Liu_outs("\x1b\?LT0F731");



*1 See Appendix-A3.

11) Identification Code

Format: ESC[c or ESC[0c (1B 5B 63 or 1B 5B 30 63)

Function: Reads the characteristics of the display device.

Result: ESC[?R1;R2;R3;R4;R5c (1B 5B 3F R1 32 R2 32 R3 32 R4 32 R5 63)

Parameter: R1='2' (Display Type =VFD)

R2='xx' (ROM Version =xx)

R3='2' (Character Set=IBM)

R4='l' (Line =l)

R5='cc' (Colum =cc)

	Line=l (Hex)	Colum=cc (Hex)
LIUST-50/LIUST-51	'2' (32)	'20' (32 30)
LIUST-52	'4' (34)	'20' (32 30)
LIUST-53	'3' (33)	'16' (31 36)

Example)

LIUST-51 (Module Version 00)

unsigned char id[16];

```
*1 liu_idrd(id, 0); // send "\x1b[c" Get Response id[16]
id 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15(00)
```

Response: ESC[?2;00;2;2;20c (1B 5B 3F 32 3B 30 30 3B 32 3B 32 3B 32 30 63)

*1 See Appendix-A3.

12) Screen Mode

Format: ESC\?LSPs (1B 5C 3F 4C 53 Ps)

Function: Sets screen mode.

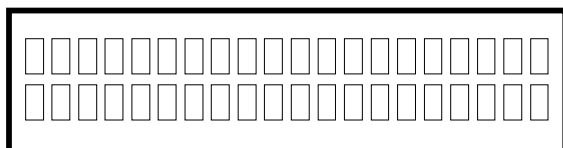
Only sets screen mode and does not erase the screen.

Parameter: Ps Screen Mode

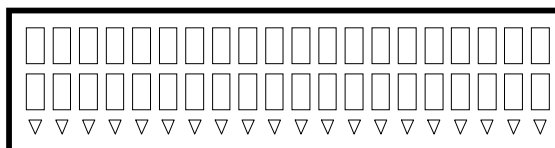
Ps(Hex)	Line x Colum	Font	LL	L	L
			U	I	I
			U	U	U
			SS	S	S
			TT	T	T
			55	5	5
			01	2	3
-	2 Line x 20 Colum	ANK 5x7	*	-	-
1 (31)	8 Line x 42 Colum	ANK 5x7	-	-	*
2 (32)	3 Line x 16(32) Colum	Shift-JIS KANJI 16x16 (ANK 8x16)	-	-	*
3 (33)	2 Line x 10(20) Colum	Shift-JIS KANJI 24x24 (ANK 12x24)	-	-	*
4 (34)	1 Line x 10(20) Colum +2 Line x 16(32) Colum	Shift-JIS KANJI 24x24 (ANK 12x24) Shift-JIS KANJI 16x16 (ANK 8x16)	-	-	*
5 (35)	4 Line x 16(32) Colum	Shift-JIS KANJI 16x16 (ANK 8x16)	-	-	*
6 (36)	4 Line x 20 Colum	ANK 5x7	-	*	-
7 (37)	5 Line x 20 Colum	ANK 5x7	-	*	-
8 (38)	2 Line x 10(20) Colum	Shift-JIS KANJI 16x16 (ANK 8x16)	-	*	-

*Valid / -Invalid

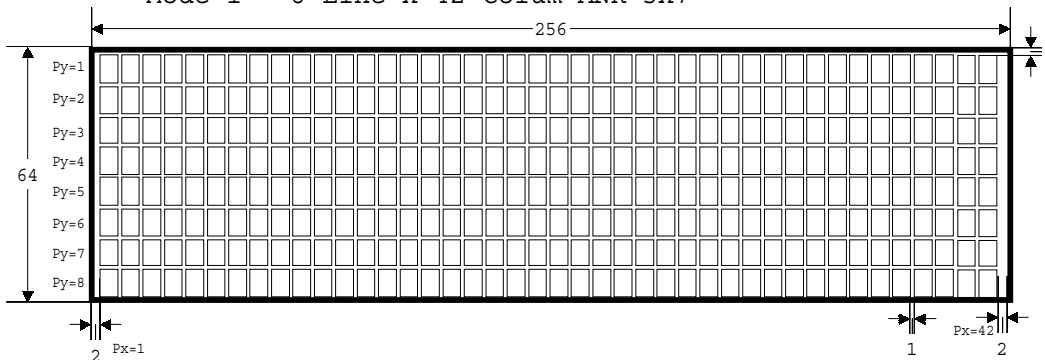
LIUST-50 2Line x 20Colum ANK 5x7



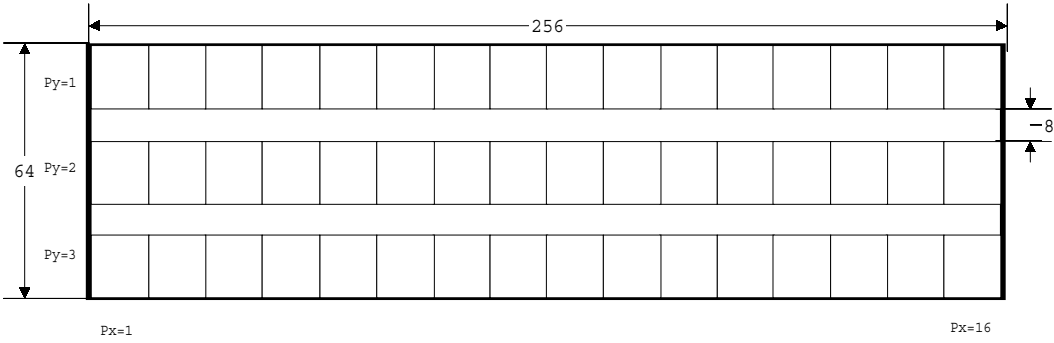
LIUST-51 2Line x 20Colum ANK 5x7



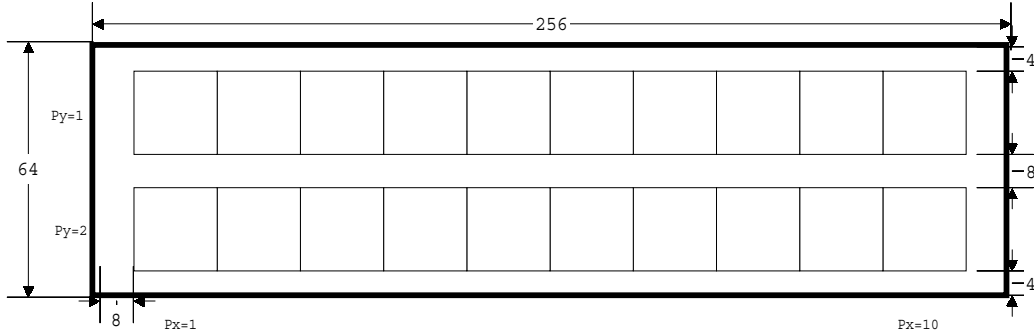
Mode=1 8 Line x 42 Colum ANK 5x7



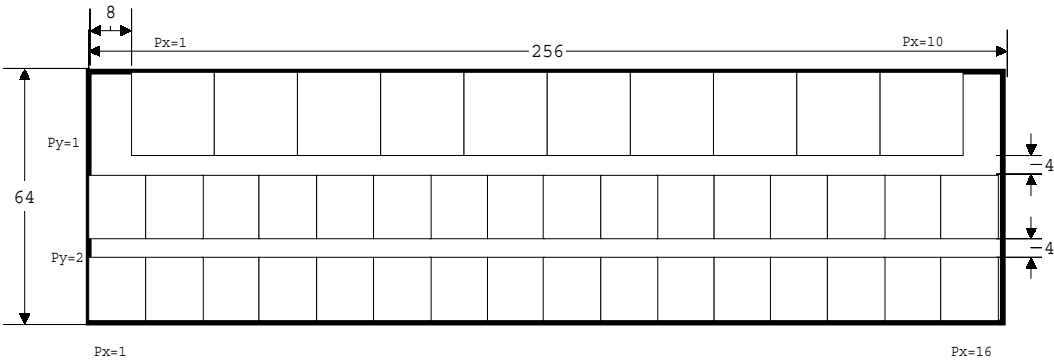
Mode=2 3 Line x 16(32) Colum Shift-JIS KANJI 16x16 (ANK 8x16)



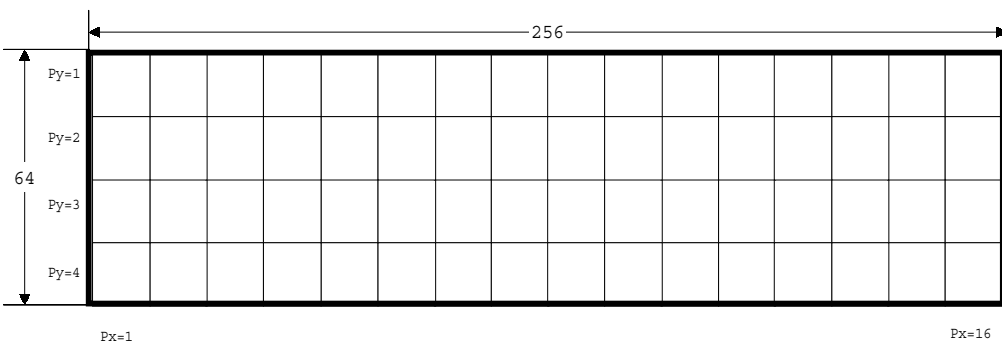
Mode=3 2 Line x 10(20) Colum Shift-JIS KANJI 24x24 (ANK 12x24)

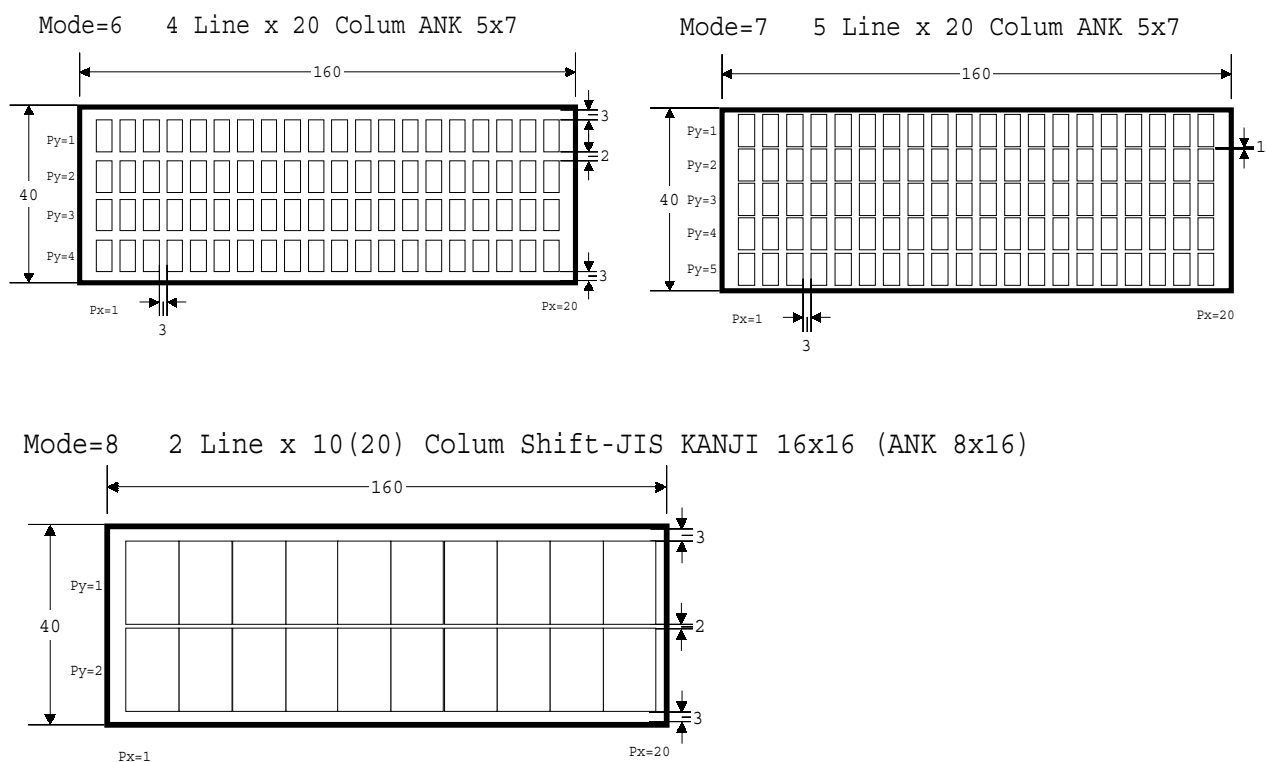


Mode=4 1 Line x 10(20) Colum Shift-JIS KANJI 24x24 (ANK 12x24)
2 Line x 16(32) Colum Shift-JIS KANJI 16x16 (ANK 8x16)



Mode=5 4 Line x 16(32) Colum Shift-JIS KANJI 16x16 (ANK 8x16)



**Example)**

LIUST-52 Set Screen Mode 4 Line x 20 Colum ANK 5x7

```
*1 Liu_outs("\x1b\\?LS6");
```

*1 See Appendix-A3.

13) One line horizontal scroll (Valid only for LIUST-52/LIUST-53)

Format: ESC\?LHPm;PI;Pt;Pn;Pd...Pd

(1B 5C 3F 4C 48 Pm 3B PI 3B Pt 3B Pn 3B Pd...Pd)

Function: Performs one line horizontal scroll setting.

Parameter: Pm PI Pt Pn Pd...Pd

Pm Screen Mode	1 (31): 8 Line x 42 Colum ANK 5x7 2 (32): 3 Line x 16(32) Colum Shift-JIS KANJI 16x16 (ANK 8x16) 3 (33): 2 Line x 10(20) Colum Shift-JIS KANJI 24x24 (ANK 12x24) 4 (34): 1 Line x 10(20) Colum Shift-JIS KANJI 24x24 (ANK 12x24) +2 Line x 16(32) Colum Shift-JIS KANJI 16x16 (ANK 8x16) 5 (35): 4 Line x 16(32) Colum Shift-JIS KANJI 16x16 (ANK 8x16)	L 15 U3 S T
	6 (36): 4 Line x 20 Colum ANK 5x7 7 (37): 5 Line x 20 Colum ANK 5x7 8 (38): 2 Line x 10(20) Colum Shift-JIS KANJI 16x16 (ANK 8x16)		L 15 U2 S T
PI Scroll Line	1-MAX Line No.	
Pt Scroll Speed	1 (31H): 1 dot/10ms 2 (32H): 1 dot/20ms	
Pn Number of Character	ANK/Shift-JIS ANK 1 Shift-JIS KANJI 2 MAX 128 (80)Bytes	
Pd...Pd Character Code	Character Code The following display attributes are available. 1)Blink 2)Inverse 3)Horizontal Double	

Basic operations:

- (1) If the specified line has some characters when horizontal scroll starts, those characters in the line will be cleared.
- (2) Horizontal scroll will scrolls characters in an eternal loop unless reset.
Characters are horizontally scrolled so that the beginning and the ending meet.
- (3) Scrolling will not start unless the same Pm Screen Mode as the current display screen is specified.
- (4) Screen is scrolled from the right to the left in dots.
- (5) The range of scroll display depends on the screen mode.
- (6) Horizontal scrolling is released by the number of characters Pn=00.
- (7) Scrollinf is applicable to one line.
- (8) To display the scrolling line by adding display attribute command, enter scroll display data with the display attribute command(Reverse¥Blink¥Horizontal Double).
Duplicate specification of the display attributes is not allowed.
- (9) To replace characters in a scrolling line, specify the scroll command again on the same line. To specify the command again on the different line, release the specification and perform setting.
- (10)Graphic command sent during scrolling will not be executed.

Note: Displaying could be interrupted by sending the long command such as external character registration.

Example)

LIUST-52

```

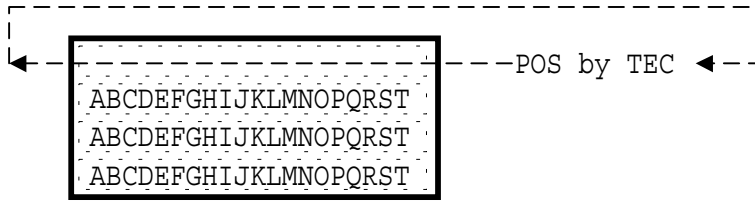
. ABCDEFGHIJKLMNOPQRST .
. ABCDEFGHIJKLMNOPQRST .
. ABCDEFGHIJKLMNOPQRST .
. ABCDEFGHIJKLMNOPQRST .

```

```

*1 Liu_outs("\x1b\\LH6;1;1;");
  Liu_outb(30);
  Liu_outs("                                POS by TEC");

```



```

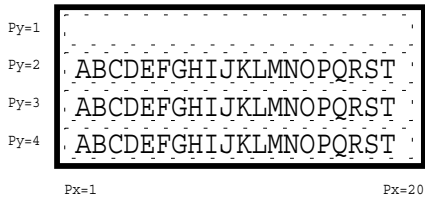
. ABCDEFGHIJKLMNOPQRST .
. ABCDEFGHIJKLMNOPQRST .
. ABCDEFGHIJKLMNOPQRST .

```

```

*1 Liu_outs("\x1b\\LH6;1;1;"); // Stop Scroll
  Liu_outb(0);
  Liu_outs(";");

```



*1 See Appendix-A3.

14) Display attribute Blink/Reverse/Reset/Double width (Valid only for LIUST-52/LIUST-53)

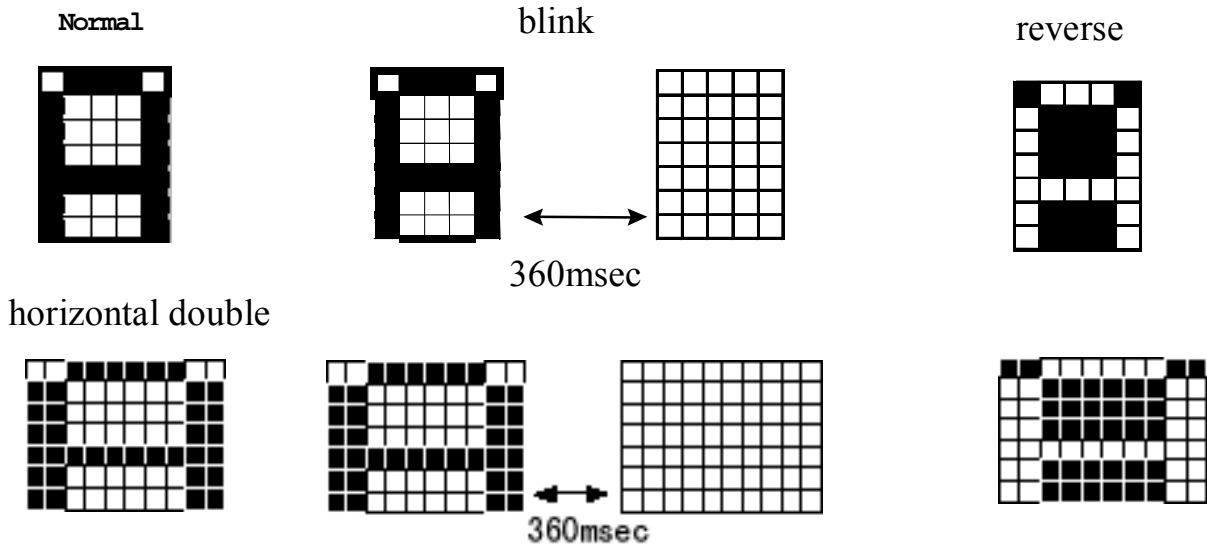
Format: Blink: ESC[5m (1B 5B 35 6D)
 Reverse: ESC[7m (1B 5B 37 6D)
 Blink/Reverse Reset: ESC[0m (1B 5B 30 6D)
 Horizontal Double Set: ESC#6 (1B 23 36)
 Horizontal Double Reset: ESC#5 (1B 23 35)

Function: characters following the definition described above will be displayed with attributes as specified.

Example)

LIUST-52 Set Screen Mode 4 Line x 20 Column ANK 5x7

```
*1 Liu_outs("\x1b#5\x1b[0mA");           // Normal 'A'
Liu_outs("\x1b#5\x1b[5mA\x1b[0m");      // Blink 'A'
Liu_outs("\x1b#5\x1b[7mA\x1b[0m");      // Reverse 'A'
Liu_outs("\x1b[0m\x1b#6A\x1b#5");       // horizontal double 'A'
Liu_outs("\x1b[5m\x1b#6A\x1b#5\x1b[0m"); // horizontal double + Blink 'A'
Liu_outs("\x1b[7m\x1b#6A\x1b#5\x1b[0m"); // horizontal double + Reverse 'A'
```



*1 See Appendix-A3.

15) External character setting (Only for LIUST-52/LIUST-53)

Format: ESC\?LWPF;Pn;Pc;Pd...Pd (1B 5C 3F 4C 57 Pf 3B Pn 3B Pc 3B Pd...Pd)

Function: Sets character fonts.

Controls by Pn FONT number. Pc signifies Character Code.

When Pc=0 is specified, font will be deleted.

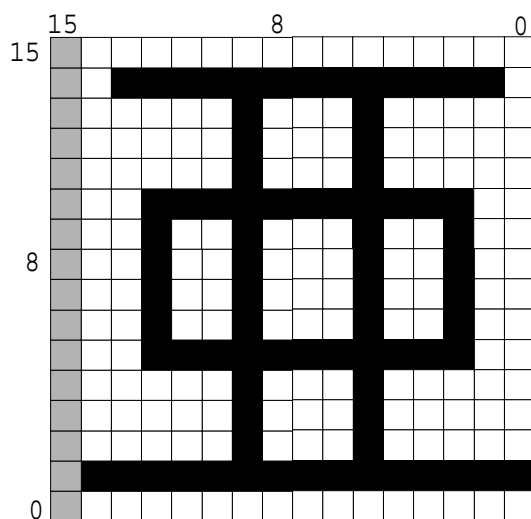
(In this case, Pd...Pd is not allowed.)

Parameter: Pf Pn Pc Pd...Pd

Parameter		LIUST -52	LIUST -53
Pf Character Font	1 (31): ANK 5x 7 Font	*	*
	2 (32): ANK 8x16 Font	*	*
	3 (33): Shift-JIS KANJI 16x16 Font	*	*
	4 (34): ANK 12x24 Font	-	*
	5 (35): Shift-JIS KANJI 24x24 Font	-	*
Pn Font NO.	1-32 (01-20) (Pf=1,2,4) 1-16 (01-10) (Pf=3,5)		
Pc Character Code	xx (20-FF) (Pf=1,2,4) xx yy(Shift-JIS KANJI CODE) (Pf=3,5)		
Pd...Pd Font Data	xx (00-FF)		

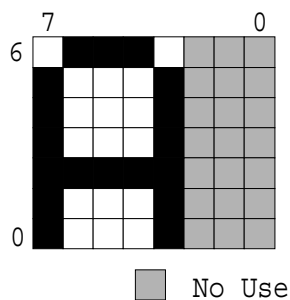
*Valid / -Invalid

16x16 Font


 Space

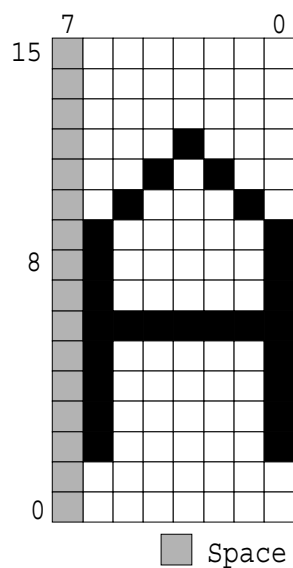
0 Byte (00)	1 Byte (00)
2 Byte (3F)	3 Byte (FE)
4 Byte (02)	5 Byte (20)
6 Byte (02)	7 Byte (20)
8 Byte (02)	9 Byte (20)
10 Byte (1F)	11 Byte (FC)
12 Byte (12)	13 Byte (24)
14 Byte (12)	15 Byte (24)
16 Byte (12)	17 Byte (24)
18 Byte (12)	19 Byte (24)
20 Byte (1F)	21 Byte (FC)
22 Byte (02)	23 Byte (20)
24 Byte (02)	25 Byte (20)
26 Byte (02)	27 Byte (20)
28 Byte (7F)	29 Byte (FF)
30 Byte (00)	31 Byte (00)

5x7 Font



0 Byte (70)
 1 Byte (88)
 2 Byte (88)
 3 Byte (88)
 4 Byte (F8)
 5 Byte (88)
 6 Byte (88)

8x16 Font



0 Byte (00)
 1 Byte (00)
 2 Byte (00)
 3 Byte (08)
 4 Byte (14)
 5 Byte (22)
 6 Byte (41)
 7 Byte (41)
 8 Byte (41)
 9 Byte (7F)
 10 Byte (41)
 11 Byte (41)
 12 Byte (41)
 13 Byte (41)
 14 Byte (00)
 15 Byte (00)

Example)

LIUST-52 Set ANK 5x7 Font, 'A', ANK Code= 41H, Font No= 16

```
*1 Liu_outs("\x1b\\?LW1;");
  Liu_outb(16);           // Font No= 16
  Liu_outs(";"); Liu_outb(0x41); // ANK Code= 41H 'A'
  Liu_outs(";");
  Liu_outb(0x70);         // 0 Byte Font ANK 5x7 Font Pd...Pd
  Liu_outb(0x88);         // 1 Byte
  Liu_outb(0x88);         // 2 Byte
  Liu_outb(0x88);         // 3 Byte
  Liu_outb(0xF8);         // 4 Byte
  Liu_outb(0x88);         // 5 Byte
  Liu_outb(0x88);         // 6 Byte
```

Clear ANK 5x7 Font,Font No=16

```
*1 Liu_outs("\x1b\\?LW1;");
  Liu_outb(16);           // Font No= 16
  Liu_outs(";"); Liu_outb(0); // ANK Code= 00H Font Clear
  Liu_outs(";");
```

*1 See Appendix-A3.

16) Graphic display (Only for LIUST-52/LIUST-53)

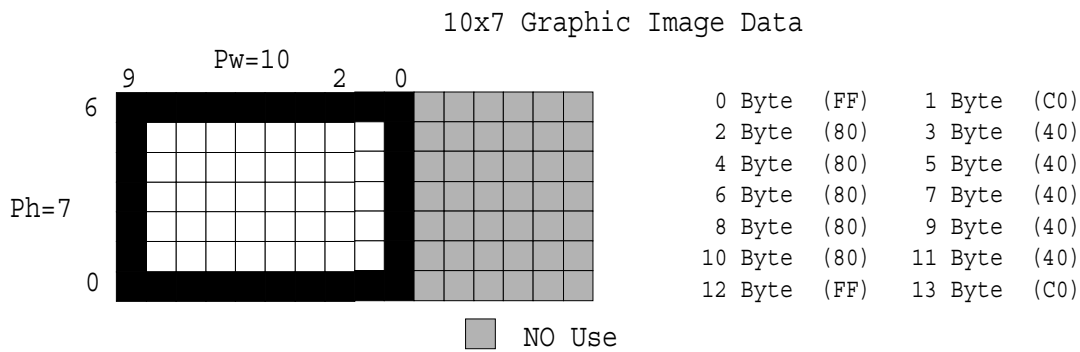
Format: ESC\?LGPx;Py;Ph;Pw;Pd...Pd
 (1B 5C 3F 4C 47 Px 3B Py 3B Ph 3B Pw 3B Pd...Pd)

Function: Displays graphic image.

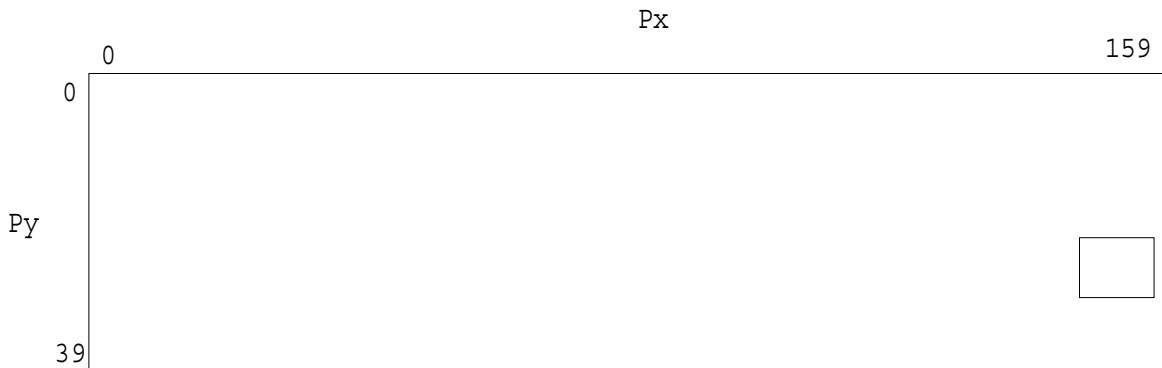
Parameter: Px Py Ph Pw Pd...Pd

Display Position	LIUST-52	LIUST-53
Px (ASCII 1-3 Byte)	0-159 (30-31 35 39)	0-255 (30-32 35 35)
Py (ASCII 1-2 Byte)	0-39 (30-33 39)	0-63 (30-36 33)
Height		
Ph (ASCII 1-2 Byte)	1-40 (31-34 30)	1-64 (31-36 34)
Wide		
Pw (ASCII 1-3 Byte)	1-160 (31-31 36 30)	1-256 (31-32 35 36)
Graphic Image Pd...Pd	xx (00-FF)	

Example)



```
*1 liu_outs("\x1b\?\?LG150;24;7;10;");
    liu_outs("\xFF\xC0\x80\x40\x80\x40\x80\x40\x80\x40\x80\x40\x80\x40\x80\x40\xFF\xC0");
```



*1 See Appendix-A3.

17) Character Font Data ANK

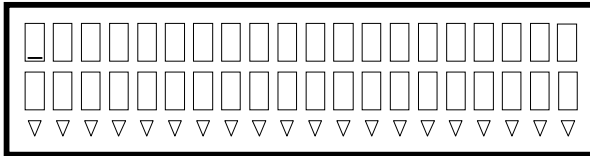
Format: xx (20-FF)

Function: Displays ANK characters.

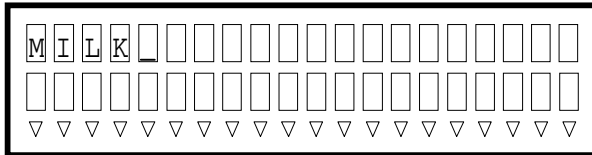
Font to be used is decided by Screen Mode and Country Code.(See Appendix-A1.)

Example)

LIUST-51



↓ *1 Liu_outs("MILK");



18) Character Font Data Japan Shift-JIS (Only for LIUST-52/LIUST-53)

Format: xx 1st byte(81-9F, E0-EF)

yy 2nd byte(40-7E, 80-FC)

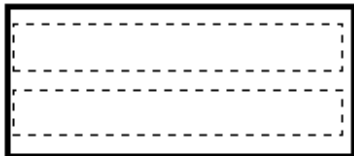
Function: Displays Japan Shift-JIS characters.

See Appendix-A2 for fonts to be used.

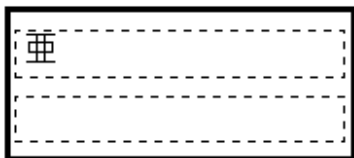
Can be displayed only when Screen Mode=8 and Country Code=63.

Example)

LIUST-52



↓ *1 Liu_outb(0x88); Liu_outb(0x9F);



*1 See Appendix-A3.

19) Multi-line horizontal scroll (Mode dedicated to horizontal scroll)

(Only for LIUST-52/LIUST-53)

Format: **Start**: ESC\?LMS (1B 5C 3F 4C 4D 53)**End**: ESC\?LME (1B 5C 3F 4C 4D 45)**Go**: ESC\?LMG (1B 5C 3F 4C 4D 47)**Set Line String**: ESC\?LMPm;PI;Pt;Pn;Pd...Pd
(1B 5C 3F 4C 4D Pm 3B PI 3B Pt 3B Pn 3B Pd...Pd)

Function: Sets multi-line horizontal scroll.

Mode is dedicated to horizontal scroll and no other commands are not executable.

Parameter: Pm PI Pt Pn Pd...Pd

Pm Screen Mode	1 (31): 8 Line x 42 Colum ANK 5x7 2 (32): 3 Line x 16(32) Colum Shift-JIS KANJI 16x16 (ANK 8x16) 3 (33): 2 Line x 10(20) Colum Shift-JIS KANJI 24x24 (ANK 12x24) 5 (35): 4 Line x 16(32) Colum Shift-JIS KANJI 16x16 (ANK 8x16)	L I 5 U 3 S T
	6 (36): 4 Line x 20 Colum ANK 5x7 7 (37): 5 Line x 20 Colum ANK 5x7 8 (38): 2 Line x 10(20) Colum Shift-JIS KANJI 16x16 (ANK 8x16)		L I 5 U 2 S T
PI Scroll Line	1-MAX Line No.	
Pt Scroll Speed	1 (31H): 1 dot/10ms 2 (32H): 1 dot/20ms	
Pn Number of Character	ANK/Shift-JIS ANK 1 Shift-JIS KANJI 2 MAX 128 (80)Bytes	
Pd...Pd Character Code	Character Code The following display attributes are available. 1)Blink 2)Inverse 3)Horizontal Double	

Basic operation (Specify instructions as shown below.)

(1) **Start**

Multi-line Scroll Mode starts by this instruction. Cursor position, screen mode and screen status before executing this instruction will be kept. However, normal instructions will not be accepted after accepting this instruction.

(2) **Set Line String**

This instruction can be specified for multiple lines. However, this instruction operates under the following conditions depending on parameters.

- If Pm(Screen Mode) specification is different, the last screen mode is effective and the previous specification is invalid.
- If the same PI(Scroll Line) is specified, the last one is valid.
- If Pt(Scroll Speed) specification is different, the last one is valid.

(3) **GO**

Multi-line Scroll starts by this instruction. Other commands than End command will not be executed after this command is started. Therefore, display characters cannot be changed during execution.

(4) **End**

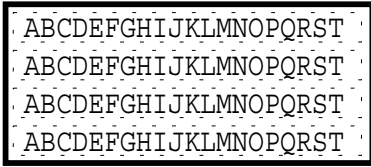
Multi-line scroll is stopped by this command and the cursor position, screen mode and screen status before executing this instruction will be resumed.

Example)

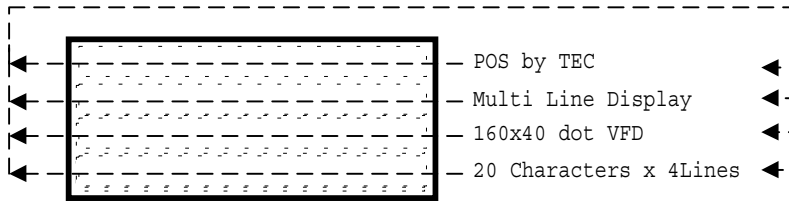
TEC Corporation

EYA03969

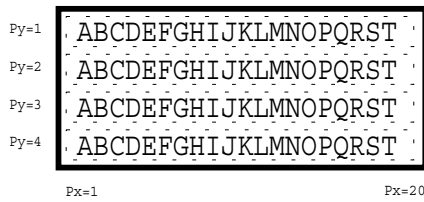
LIUST-52



```
*1 Liu_outs("\x1b\?\LMS"); // Start Scroll Mode
Liu_outs("\x1b\?\LM6;1;1"); Liu_outb(10); liu_outs("POS by TEC");
Liu_outs("\x1b\?\LM6;2;1;"); Liu_outb(18); liu_outs("Multi Line Display");
Liu_outs("\x1b\?\LM6;3;1;"); Liu_outb(14); liu_outs("160x40 dot VFD");
Liu_outs("\x1b\?\LM6;4;1;"); Liu_outb(22); liu_outs("20 Characters x 4Lines");
Liu_outs("\x1b\?\LMG"); // Start Scroll
```



```
*1 Liu_outs("\x1b\?\LME"); // Stop Scroll
```



*1 See Appendix-A3.

4. Diagnostics

4.1. Self diagnostics

After power on, the display module performs ROM test and RAM test TEST and in the case of error, it disables RTS to show receive not ready.

After power on, all lights are lit for about 500ms.

4.2. Display test

After power on, display test is done under the following conditions.

1)When DipSW's Self Test Mode=Test.

2)When DipSW's Self Test Mode=Normal and the display module's RTS and CTS/RXD and TXD are connected.

• LIUST-51

- 1) All lights lighting display (2S)
- 2) All dots light up every other column (2S)
- 3) Two vertical lines light up (2S)
- 4) Three horizontal lines light up (2S)
- 5) All lights light off (2S)
- 6) Displays country codes from 20H to FFH one at a time on the entire screen.(2S)
Triangle marks are lit up and off by one character.
- 7) After displaying the country code USA, other country codes with the different font will be displayed on the entire screen in the following order. France, Germany, Great Britain, Denmark 1,Sweden...
- 8) After displaying all country codes, returns to 1).

• LIUST-52/LIUST-53

- 1) All lights lighting display
- 2) All dots light up every other line
- 3) Four vertical lines light up (2S)
- 4) All lights light off (2S)
- 5) All lights light up again and stop.

A1. FONT 5x7 ANK

Default Mode (Germany Mode:02h)

			20	30	40	50	60	70	80	90	A0	B0	C0	D0	E0	F0
0			O	S	P	`	P	9	E	á	☐			α	≡	
1		!	1	A	Q	a	q	ü	æ	ç	☒			β	±	
2		"	2	B	R	b	r	é	Æ	ó	☒			Γ	≡	
3		#	3	C	S	c	s	â	ô	û				π	≡	
4		\$	4	D	T	d	t	ä	ö	ÿ			ψ	Σ	↑	
5		%	5	E	U	e	u	à	ò	ÿ				δ	↓	
6		&	6	F	V	f	v	ä	ü	ö	☐			μ	÷	
7		'	7	G	W	g	w	ç	û	ö				τ	⊗	
8		(	8	H	X	h	x	è	ÿ	ç				ϕ	□	
9		)	9	I	Y	i	y	ë	ö	Γ				θ	■	
A		*	:	J	Z	j	z	è	ü	Γ				Ω	·	
B		+	;	K	A	k	ä	ü	ç	½			■	δ	√	
C		,	<	L	O	l	ö	ü	Æ	¼			■	ø	³	
D		-	=	M	U	m	ü	ç	ï				■	φ	²	
E		.	>	N	^	n	ß	Ä	Æ	¼			■	ε	■	
F		/	?	O	_	o	ä	ç	¼				■	∏		

International character set

No	Country/Char	23	24	40	5B	5C	5D	5E	60	7B	7C	7D	7E
00h	USA	#	\$	@	[	\	\]	^	`	(	|	)	~
01h	France	#	\$	ä	•	ç	ç	^	`	é	ù	è	•
02h	Germany	#	\$	š	Ä	Ö	Ü	^	`	ä	ö	ü	ß
03h	UK	£	\$	@	[	\	\]	^	`	(	|	)	~
04h	Denmark 1	#	\$	@	Æ	Ø	Å	^	`	æ	ø	å	~
05h	Sweden	#	Å	É	Ä	Ö	Å	Ü	é	ä	ö	å	Ü
06h	Italy	#	\$	@	•	\	é	^	ù	à	ò	è	ç
07h	Spain	₧	\$	@	í	ñ	ç	^	`	•	ñ)	~
08h	Japan	#	\$	@	[	¥	]	^	`	(	|	)	~
09h	Norway	#	Å	É	Æ	Ø	Å	Ü	é	æ	ø	å	Ü
0Ah	Denmark 2	#	\$	É	Æ	Ø	Å	Ü	é	æ	ø	å	Ü
0Bh	Spain 2	#	\$	á	í	ñ	ç	é	`	ç	ñ	ó	ú
0Ch	Latin America	#	\$	á	í	ñ	ç	é	ü	ç	ñ	ó	ú

TEC Corporation EYA03969

Japan Mode(Japan 2 Mode:63h)

			20	30	40	50	60	70	80	90	A0	B0	C0	D0	E0	F0
0			0	a	P	`	p				※	ー	夕	ミ	ㄨ	→
1			!	1	A	Q	a	q			。	ア	チ	△	β	←
2			"	2	B	R	b	r			「	イ	ツ	×	Γ	↓
3			#	3	C	S	c	s			」	ウ	テ	モ	π	↑
4			\$	4	D	T	d	t			,	エ	ト	ホ	Σ	↗
5			%	5	E	U	e	u			+	オ	ナ	1	δ	↘
6			&	6	F	V	f	v			ヲ	カ	ニ	ヨ	μ	★
7			'	7	G	W	g	w			フ	キ	ヌ	ラ	τ	◇
8			<	8	H	X	h	x			ィ	ク	ネ	リ	臺	⊗
9			>	9	I	Y	i	y			ウ	ケ	ル	ル	⊖	↳
A			*	:	J	Z	j	z			エ	コ	ハ	レ	Ω	⊛
B			+	;	K	[	k	(			オ	サ	ヒ	ロ	δ	×
C			,	<	L	羊	l	l			カ	シ	フ	ワ	⊙	⚡
D			-	=	M	]m	)				ユ	ス	ハ	ン	Φ	▲
E			.	>	N	^n	~				ヨ	セ	ホ	°	∑	⊖
F			/	?	O	_o	△				ツ	ソ	マ	°	∩	

Code Page 852 East Europe (East Europe Mode:0Dh)

			20	30	40	50	60	70	80	90	A0	B0	C0	D0	E0	F0
0				0	Q	P	`	P	Q	E	Š	Š		đ	ó	■
1			!	1	A	Q	a	q	ü	ł	ł	Š		Đ	ß	ˆ
2			"	2	B	R	b	r	é	ł	ó	Š		Ǫ	ó	ł
3			#	3	C	S	c	s	á	ó	ł			Ě	Ź	ˆ
4			\$	4	D	T	d	t	ä	ö	Ń			Ǻ	Ń	ˆ
5			%	5	E	U	e	u	č	ł	á	Ń		Ź	Ń	Š
6			&	6	F	V	f	v	ć	ł	Ń	Ń	Ń	f	Ń	ł
7			'	7	G	W	g	w	ę	Ń	Ń	Ń	Ń	ę	Ń	ł
8			(	8	H	X	h	x	ł	Ń	Ń	Ń		Ń	Ń	ł
9			)	9	I	Y	i	y	ë	ö	Ń			ł	ł	ł
A			*	:	J	Z	j	z	ø	ü					ł	ł
B			+	;	K	[	k	(	ø	ř	Ń			■	ó	ł
C			,	<	L	\	l	|	č	ř	Ń			■	Ź	Ń
D			-	=	M	]m	)	Ń	Ń	Ź	Ń			Ź	Ź	Ń
E			.	>	N	^	n	ˆ	Ń	Ź	Ź			ó	t	■
F			/	?	O	_	o	ó	č	ř	Ź		Ź	■	,	

Code Page 850 IceLand (IceLand Mode:0Eh)

			20	30	40	50	60	70	80	90	A0	B0	C0	D0	E0	F0
0				0	@	P	`	p	Ɔ	É	á	⌘		ð	ó	3
1			!	1	A	Q	a	q	ü	*	ç	⌘		Ð	Þ	±
2			"	2	B	R	b	r	é	Æ	ó	⌘		É	Ö	
3			#	3	C	S	c	s	â	ö	ú			Ë	Ö	
4			\$	4	D	T	d	t	ä	ö	ÿ			Ë	Ö	
5			%	5	E	U	e	u	å	ö	z	Å		ı	ö	Ş
6			&	6	F	V	f	v	ä	ö	z	Å	Å	ı	ı	ı
7			'	7	G	W	g	w	ç	ü	ı	Å	Å	ı	ı	ı
8			(	8	H	X	h	x	æ	ÿ	ç			İ	ı	ı
9			)	9	I	Y	i	y	ö	ü				Ü	ı	ı
A			*	:	J	Z	j	z	ö	ü				Ö	ı	ı
B			+	;	K	[	k	[	ü	ö	z			■	Ü	ı
C			,	<	L	\	l	\	ü	ö	z			■	Ü	ı
D			-	=	M	]m	)	ı	ı	ı	ı				ı	ı
E			.	>	N	^	n	~	ı	*	*	ı		ı		■
F			/	?	O	_	o	ˆ	ı	*			ı	■		

A2. FONT ANK5x7,Japan Shift-JIS ANK8x16,12x24 (Shift-JIS Mode:64H)

ANK Char	ANK Char	ANK Char	ANK Char	ANK Char
20H SP	40H @	60H `		C0H タ
21H !	41H A	61H a	A1H 。	C1H チ
22H ”	42H B	62H b	A2H 「	C2H ツ
23H #	43H C	63H c	A3H 」	C3H テ
24H \$	44H D	64H d	A4H 、	C4H ト
25H %	45H E	65H e	A5H ・	C5H ナ
26H &	46H F	66H f	A6H フ	C6H ニ
27H ’	47H G	67H g	A7H ヲ	C7H ヌ
28H (	48H H	68H h	A8H イ	C8H ネ
29H)	49H I	69H i	A9H ウ	C9H ノ
2AH *	4AH J	6AH j	AAH エ	CAH ハ
2BH +	4BH K	6BH k	ABH オ	CBH ヒ
2CH ,	4CH L	6CH l	ACH ヤ	CCH フ
2DH -	4DH M	6DH m	ADH ュ	CDH ヘ
2EH .	4EH N	6EH n	AEH ヨ	CEH ホ
2FH /	4FH O	6FH o	AFH ッ	CFH マ
30H 0	50H P	70H p	B0H ー	D0H ミ
31H 1	51H Q	71H q	B1H ア	D1H ム
32H 2	52H R	72H r	B2H イ	D2H メ
33H 3	53H S	73H s	B3H ウ	D3H モ
34H 4	54H T	74H t	B4H エ	D4H ヤ
35H 5	55H U	75H u	B5H オ	D5H ュ
36H 6	56H V	76H v	B6H カ	D6H ヨ
37H 7	57H W	77H w	B7H キ	D7H ラ
38H 8	58H X	78H x	B8H ク	D8H リ
39H 9	59H Y	79H y	B9H ケ	D9H ル
3AH :	5AH Z	7AH z	BAH コ	DAH レ
3BH ;	5BH [	7BH {	BBH サ	DBH ロ
3CH <	5CH ¥	7CH |	BCH シ	DCH ワ
3DH =	5DH]	7DH }	BDH ス	DDH ン
3EH >	5EH ^	7EH ~	BEH セ	DEH ”
3FH ?	5FH _	7FH SP	BFH ソ	DFH °

A2. FONT Japan Shift-JIS Kanji16x16,24x24 (1/6) (Shift-JIS Mode:64H)

Shift-JIS	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	Shift-JIS	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F		
8140	SP、。	。	。	。	。	。	。	。	。	。	。	。	。	。	。	。	839F	Α	Β	Γ	Δ	Ε	Ζ	Η	Θ	Ι	Κ	Λ	Μ	Ν	Ξ	Ο	Π		
8150	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	83AF	Ρ	Σ	Τ	Υ	Φ	Χ	Ψ	Ω										
8160	~	||	|	…	…	’	“	”	(	)	[	]	{				83BF	α	β	γ	δ	ε	ξ	η	θ	ι	κ	λ	μ	ν	ξ	ο	π	
8170	}	<	>	《	》	「	」	『	』	【	】	+	-	±	×		83CF	ρ	σ	τ	υ	φ	χ	ψ	ω										
8180	÷	=	≠	<	>	≤	≥	∞	∴	♂	♀	°	′	″	℃	¥	83DF																		
8190	\$	¢	£	%	#	&	*	@	§	☆	★	○	●	◎	◇		83EF																		
819F	◆	□	■	△	▲	▽	▼	*	〒	→	←	↑	↓	=		8440	Α	Β	Γ	Δ	Ε	Ζ	Η	Θ	Ι	Κ	Λ	Μ	Ν	Ο					
81AF												Ε	Θ	Σ	Ζ	Ο	U	8450	Π	Ρ	Σ	Τ	Υ	Φ	Χ	Ψ	Ω	Ъ	Ы	Ь	Э	Ю			
81BF	∩											Λ	∇	→	⇒	∨	∃	8460	Я																
81CF																		8470	а	б	в	г	д	е	ё	ж	з	и	й	к	л	м	н		
81DF	≡	≋	≪	≫	∫	∞	∞	∴	∫	∫								8480	о	п	р	с	т	у	ф	х	ц	ч	ш	щ	ъ	ы	ь	э	
81EF	Å	%	#	♪	†	‡	¶											8490	ю	я															
8240																		849F	—	|	┌	┐	└	┘	├	┤	┼	┴	┬	┴	┬	┴			
8250	1	2	3	4	5	6	7	8	9									84AF	└	┐	├	┤	┼	┴	┬	┴	┬	┴	┬	┴	┬	┴			
8260	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P		84BF																	
8270	Q	R	S	T	U	V	W	X	Y	Z								84CF																	
8280	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o		84DF																		
8290	p	q	r	s	t	u	v	w	x	y	z							84EF																	
829F	あ	い	う	え	お	か	が	き	ぐ									889F	亜	唾	娃	阿	哀	愛	挨	始	逢	葵	茜	穉	惠	握	渥	旭	
82AF	け	げ	こ	ご	さ	ざ	し	じ	ず	ぜ	そ	ぞ	た	だ				88AF	葦	芦	鱒	梓	压	斡	扱	宛	姐	虻	鉛	絢	綾	鮎	或	粟	
82BF	ち	ち	っ	つ	づ	て	で	と	ど	な	に	ぬ	ね	の	は	ば		88BF	裕	安	庵	按	暗	案	闇	鞍	鞍	杏	以	伊	位	依	偉	固	夷
82CF	ば	ひ	び	び	ぶ	ぶ	へ	べ	べ	ほ	ぼ	ぼ	ま	み	む			88CF	委	威	尉	惟	意	慰	易	綺	為	畏	異	移	維	緯	胃	姜	
82DF	め	も	や	や	ゆ	ゆ	よ	ら	り	る	れ	る	わ	わ	め			88DF	衣	謂	違	追	医	井	亥	域	育	郁	磯	一	壹	溢	逸	稻	
82EF	ゑ	を	ん															88EF	茨	芋	罽	允	印	咽	員	因	姻	引	飲	淫	胤	蔭			
8340	マ	ア	イ	ウ	エ	オ	カ	ガ	キ	グ								8940	院	陰	颯	韻	吋	右	宇	鳥	羽	迂	雨	卯	鵝	窺	丑	確	
8350	ケ	ゲ	コ	ゴ	サ	ザ	シ	ジ	ス	ズ	セ	ゼ	ソ	ゾ	タ	ダ			8950	白	渦	噓	唄	擗	蔚	綈	媵	厥	浦	瓜	閨	啤	云	運	雲
8360	チ	ヂ	ツ	ヅ	テ	デ	ト	ド	ナ	ニ	ノ	ハ	バ					8960	荏	餌	餽	宮	嬰	影	映	曳	榮	永	泳	洩	瑛	盈	穎	穎	
8370	パ	ピ	ピ	プ	ブ	ヘ	ベ	ベ	ホ	ボ	ポ	マ	ミ					8970	英	衛	詠	銳	液	疫	益	馱	悦	謁	越	閱	楨	厭	円		
8380	ム	メ	モ	ヤ	ユ	ユ	ヨ	ラ	リ	ル	レ	ロ	ワ					8980	園	堰	奄	宴	延	怨	掩	援	沿	炎	焰	煙	燕	猿	綠		
8390	キ	ユ	マン	ヴ	カ	ケ												8990	艷	苑	茵	遠	鉛	鴛	塩	於	汚	甥	凹	央	輿	往	庇		
																		899F	押	旺	橫	歐	毆	王	翁	襖	鴟	黃	岡	沖	荻	億	屋		
																		89AF	憶	臆	補	壯	乙	俺	卸	恩	溫	穩	音	下	化	假	何	伽	
																		89BF	価	佳	加	可	嘉	夏	嫁	家	寡	科	暇	果	架	歌	河	火	
																		89CF	珂	禍	禾	稼	箇	花	苛	茄	荷	華	葉	蝦	課	嘩	貨	迦	
																		89DF	過	霞	蚊	俄	峨	我	牙	画	臥	芽	蛾	賀	雅	餓	鴛	介	
																		89EF	舍	解	回	塊	壞	迴	快	怪	悔	恢	懷	戒	拐	改			
																		8A40	魁	晦	械	海	灰	界	皆	絵	芥	蟹	開	階	貝	凱	効	外	
																		8A50	咳	害	崖	慨	概	涯	碍	蓋	街	該	鎧	骸	湮	馨	蛙	垣	
																		8A60	柿	蛭	鈎	劇	嘯	各	廓	披	攬	格	核	穀	獲	確	穫	寬	
																		8A70	角	赫	較	郭	閣	隔	革	学	岳	樂	額	額	掛	笠	徑		
																		8A80	櫃	梘	齏	瀉	割	喝	恰	括	活	渴	滑	葛	褐	轄	且	經	
																		8A90	叶	梳	權	靴	株	兜	窰	蒲	釜	鎌	嘴	鴨	栢	茅	萱		
																		8A9F	粥	刈	苜	瓦	乾	侃	冠	寒	刊	勘	勸	卷	喚	堪	姦	完	
																		8AAF	官	寬	干	幹	患	感	慣	憾	換	敢	柑	桓	棺	款	飲	汗	
																		8ABF	澳	濶	漚	環	甘	監	看	竿	管	筒	緩	缶	翰	肝	隘	莞	
																		8ACF	觀	諫	貫	還	鑑	間	閑	閑	隔	韓	館	館	丸	含	岸	巖	

A2. FONT Japan Shift-JIS Kanji16x16,24x24 (2/6) (Shift-JIS Mode:64H)

Shift-JIS	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
8ADF	玩	癌	眼	岩	斲	質	雁	頑	顏	願	企	伎	危	喜	器	基
8AEF	奇	嬉	寄	岐	希	幾	忌	揮	机	旗	既	期	棋	棄		
8B40	機	婦	教	氣	汽	畿	祈	季	稀	紀	徽	規	記	負	起	軌
8B50	輝	飢	騎	鬼	龜	偽	儀	妓	宜	戲	技	擬	欺	嫌	疑	祗
8B60	義	蟻	誼	謙	鞠	菊	鞠	吉	吃	喫	桔	橘	詰	砧	杵	黍
8B70	却	客	脚	倉	逆	丘	久	仇	休	及	吸	宮	弓	急	救	
8B80	朽	求	汲	泣	泣	球	突	窮	笈	級	糾	給	旧	牛	去	居
8B90	巨	拒	迦	拳	渠	虛	許	距	鋸	漁	樂	魚	亨	亨	京	
8B9F	供	俠	僂	兇	競	共	凶	協	匡	卿	叫	喬	境	峡	強	疆
8BAF	怯	恐	恭	扶	教	橋	況	狂	狹	矯	胸	脅	興	薈	鄉	鏡
8BBF	響	鸞	驚	仰	凝	堯	曉	業	局	曲	極	玉	桐	籽	僅	勤
8BCF	均	巾	錦	斤	欣	欽	琴	禁	禽	筋	繫	芹	茵	衿	襟	謹
8BDF	近	金	吟	銀	九	俱	句	区	狗	玫	矩	苦	軀	驅	駟	駒
8BEF	具	愚	虞	喰	喰	偶	寓	遇	隅	串	櫛	訓	屑	屈		
8C40	掘	窟	沓	靴	靴	窪	熊	隈	桑	栗	縑	桑	鋤	勳	君	薰
8C50	訓	群	軍	郡	卦	袞	袞	係	傾	刑	兄	啓	圭	珪	璽	契
8C60	形	徑	惠	慶	慧	憩	揭	携	敬	景	桂	溪	畦	稽	系	經
8C70	繼	繫	莖	荊	荳	計	詣	警	輕	頸	鷄	芸	迎	鯨		
8C80	劇	戲	鞞	激	險	衍	傑	欠	決	潔	穴	結	血	訣	月	件
8C90	儉	倦	健	兼	券	劍	喧	圈	堅	嫌	建	憲	懸	拳	捲	
8C9F	檢	權	牽	犬	猷	研	硯	絹	具	肩	見	謙	賢	軒	遺	鍵
8CAF	陝	頭	驗	醜	元	嚴	幻	弦	減	源	玄	現	絃	絃	言	
8CBF	諺	限	乎	個	古	呼	固	姑	孤	己	庫	弧	戶	故	枯	湖
8CCF	狐	糊	袴	股	胡	菰	虎	誇	跨	鈞	雇	顧	鼓	互	互	伍
8CDF	午	吳	吾	娛	後	御	悟	梧	檣	瑚	暮	語	誤	謨	匄	乞
8CEF	鯉	交	佼	侯	倖	光	公	功	効	勾	厚	口	向			
8D40	后	喉	坑	垢	好	孔	孝	宏	工	巧	巷	幸	庠	康	康	弘
8D50	恒	慌	抗	控	控	攻	昂	晃	更	杭	校	梗	構	江	洪	浩
8D60	港	溝	甲	皇	硬	藕	糠	紅	絨	絳	綱	耕	考	肯	脰	腔
8D70	脊	航	荒	行	衡	講	貢	購	郊	醇	鉞	鉞	綱	閣	降	
8D80	項	香	高	鴻	剛	劊	号	合	壕	拷	濠	豪	轟	趨	克	刻
8D90	告	国	穀	酷	鵠	黑	獄	濼	腰	飯	忽	惚	骨	迫	込	
8D9F	此	頃	今	困	坤	壘	婚	恨	戀	昏	昆	根	梱	混	痕	紺
8DAF	良	魂	些	佐	叉	咳	嗑	左	差	查	沙	磋	砂	詐	鎖	梁
8DBF	坐	座	挫	債	催	再	最	哉	塞	妻	宰	彩	才	採	栽	歲
8DCF	濟	災	采	犀	碎	碧	祭	齋	細	菜	裁	載	際	劑	在	材
8DDF	罪	財	沔	坂	阪	堺	神	着	咲	崎	埼	崎	鷺	作	削	咋
8DEF	擇	昨	朔	柵	窄	策	索	錯	櫻	鮭	筴	匙	冊	刷		
8E40	察	撈	搗	擦	札	殺	薩	雜	阜	鯖	捌	鑄	鮫	皿	晒	三
8E50	傘	參	山	慘	撒	散	棧	燦	珊	產	算	纂	蠶	譚	贊	酸
8E60	餐	斬	暫	残	什	仔	伺	使	刺	司	史	嗣	四	士	始	姉
8E70	姿	子	屍	市	師	志	思	指	支	孜	斯	施	旨	枝	止	
8E80	死	氏	獅	社	私	糸	紙	紫	肢	脂	至	視	詞	詩	試	誌
8E90	諮	資	賜	雌	飼	齒	事	似	侍	見	字	寺	慈	持	時	
8E9F	次	滋	治	爾	靈	壽	磁	示	而	耳	自	時	辭	沙	鹿	式
8EAF	識	鳴	竺	軸	穴	零	七	叱	執	失	嫉	室	悉	濕	漆	疾

Shift-JIS	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
8EBF	質	實	蔀	篠	偲	柴	芝	屨	蕊	縞	舍	写	射	捨	赦	斜
8ECF	煮	社	紗	者	謝	車	遮	蛇	邪	借	勺	尺	杓	灼	爵	酌
8EDF	糝	錫	若	寂	弱	惹	主	取	守	手	朱	殊	狩	珠	種	腫
8EEF	趣	酒	首	儒	受	呪	寿	授	樹	綬	霈	囚	取	周		
8F40	宗	就	州	修	愁	拾	洲	秀	秋	終	繡	習	臭	舟	菟	衆
8F50	襲	讐	蹶	輯	迴	首	酬	集	醜	什	住	充	十	從	戎	柔
8F60	汗	洪	獸	縱	重	銃	叔	夙	宿	淑	祝	縮	肅	塾	熟	出
8F70	術	述	俊	峻	春	瞬	竣	舜	駿	准	循	旬	楯	殉	淳	
8F80	準	潤	盾	純	巡	遵	醇	順	處	初	所	暑	曙	渚	庶	緒
8F90	署	書	著	諸	諸	助	叙	女	序	徐	恕	鋤	除	傷	償	
8F9F	勝	匠	升	召	哨	商	唱	管	獎	妾	娼	宵	將	小	少	尚
8FAF	庄	床	廠	彰	承	抄	招	掌	捷	昇	昌	昭	晶	松	梢	樟
8FBF	樵	沼	消	涉	湘	燒	焦	照	症	省	硝	確	祥	称	章	筴
8FCF	粧	紹	肖	苜	苜	蕉	衡	裳	訟	証	詔	詳	象	賞	醬	鉦
8FDF	鍾	鐘	障	鞘	上	丈	丞	乘	兪	剩	城	場	壤	孃	常	情
8FEF	擾	桑	杖	淨	狀	疊	穰	蒸	讓	讓	錠	噀	埴	飾		
9040	拭	植	殖	燭	織	職	色	蝕	食	蝕	辱	尻	伸	信	侵	唇
9050	娠	寢	審	心	慎	振	新	晉	森	榛	浸	深	申	疹	真	神
9060	秦	紳	臣	芯	薪	親	診	身	辛	進	針	震	人	仁	刃	塵
9070	壬	尋	甚	尽	腎	訊	迅	鞭	鞞	筍	誦	須	醉	囚	厨	
9080	逗	吹	垂	帥	推	水	炊	睡	粹	粹	衰	遂	醉	錘	錘	隨
9090	瑞	髓	崇	嵩	敷	樞	趨	雖	掘	杉	榻	菅	頗	雀	裾	
909F	澄	摺	寸	世	瀨	敵	是	淒	制	勢	姓	征	性	成	政	整
90AF	星	晴	棲	栖	正	清	牲	生	盛	精	聖	声	製	西	誠	誓
90BF	請	逝	醒	青	靜	齊	稅	脆	隻	席	惜	戚	斥	昔	析	石
90CF	積	籍	績	脊	責	赤	跡	蹟	碩	切	拙	接	攝	折	設	窃
90DF	節	說	雪	絕	舌	彈	仙	先	千	占	宣	專	尖	川	戰	扇
90EF	撰	栓	梅	泉	淺	洗	染	潛	煎	煽	旋	穿	箭	線		
9140	織	羨	腺	舛	船	薦	詮	賤	踐	選	選	錢	銑	閃	鮮	前
9150	善	漸	然	全	禪	繕	膳	糧	糧	望	唄	措	曾	曾	楚	狙
9160	疏	疎	礎	祖	粗	素	組	蘇	訴	阻	邈	鼠	僧	創	双	
9170	叢	倉	喪	壯	奏	爽	宋	層	匣	惣	惣	惣	惣	掃	掃	搔
9180	揀	早	曹	巢	槽	槽	漕	燥	燥	度	相	窓	糟	綜	綜	聰
9190	草	莊	葬	蒼	藻	裝	走	送	遭	鎗	霜	騷	像	增	憎	
919F	臟	藏	贈	造	促	側	則	即	息	捉	束	測	足	速	俗	屬
91AF	賊	族	統	卒	袖	其	揃	存	孫	尊	損	村	邈	他	多	太
91BF	汰	訖	唾	墮	妥	情	打	花	舵	舵	駝	駝	駝	駝	駝	駝
91CF	耐	岱	帶	待	怠	態	戴	替	秦	滯	胎	腿	苔	袋	貸	退
91DF	逮	隊	黛	調	代	台	大	第	醒	題	鷹	淹	瀧	卓	啄	宅
91EF	托	扱	拓	汰	濯	琢	託	澤	諾	茸	夙	蝟	只			
9240	叩	但	達	辰	奪	脫	異	堅	迥	棚	谷	狸	體	樽	誰	丹
9250	單	嘆	坦	担	探	且	軟	淡	炭	炭	短	端	單	綻	耽	胆
9260	蛋	誕	鍛	團	壇	彈	斷	暖	禮	段	男	談	值	知	地	弛
9270	恥	智	池	痴	稚	置	致	御	遲	馳	築	畜	竹	筑	蓄	
9280	逐	秩	窒	茶	嫡	著	中	仲	宙	忠	抽	屋	柱	注	虫	衷
9290	註	耐	鑄	駐	朽	瀟	猪	芋	著	貯	丁	兆	凋	喋	寵	

A3. Example Program Module

```

/* *****
   RIU Test
   ***** */
#include <conio.h>

#define DEBUG 1 // 1:DEBUG else:NO DEBUG
/* *****
   VL16C452 port definition
   ***** */
#define COM1 0x03f8 // VL16C452(#1) port address
#define COM2 0x02f8 // VL16C452(#2) port address
#define COM3 0x03e8 // VL16C452(#3) port address
#define COM4 0x0270 // VL16C452(#4) port address
#define COM5 0x02e8 // SIO port address
static const unsigned com_port[5]={COM1,COM2,COM3,COM4,COM5};
static unsigned COM; // COM Port Base Address
unsigned char str[64];

#define IER 1 // int. enable reg.
#define IIR 2 // int. identify reg.
#define LCR 3 // line control reg.
#define MCR 4 // modem control reg.
#define LSR 5 // line status reg.
#define MSR 6 // modem status reg.

#define IER_RX 0x01 //00000001b // RxRDY intr. enable
#define IER_TX 0x02 //00000010b // TxRDY intr. enable
#define IER_ERR 0x04 //00000100b // receive error intr. enable
#define IER_MDM 0x08 //00001000b // MODEM transition intr. enable

#define MCR_DTR 0x01 //00000001b // DTR ON
#define MCR_RTS 0x02 //00000010b // RTS ON
#define MCR_MIE 0x08 //00001000b // MIE enable

#define LSR_RXR 0x01 //00000001b // Rx ready
#define LSR_OE 0x02 //00000010b // overrun error
#define LSR_PE 0x04 //00000100b // parity error
#define LSR_FE 0x08 //00001000b // framing error
#define LSR_TXR 0x20 //00100000b // Tx ready
#define LSR_TXE 0x40 //01000000b // Tx empty

#define MSR_CTS 0x10 //00010000b // CTS ON
#define MSR_DSR 0x20 //00100000b // DSR ON
#define MSR_CI 0x40 //01000000b // RI ON

/* *****
   PC standard port definition
   ***** */
#define PICMC 0x20 // PIC(master) control reg.
#define PICMM 0x21 // PIC(master) mask reg.
#define PICSC 0x0A0 // PIC(slave) control reg.
#define PICSM 0x0A1 // PIC(slave) mask reg.

```



```

/* #####
   liu_outs: LIU Output String Module
           rc = liu_outs(unsigned char *dat)

   Input:   unsigned char *dat : RIU Output Data

   Output:  rc = Return Code 0:Normal -1:Error
##### */
liu_outs(unsigned char *dat)
{
    int i,j;
    unsigned d;

    for(i=0; dat[i]!='\0'; i++)
        if(liu_outb(dat[i])!=0){
            if(DEBUG==1) printf("\n##### liu_outs timeout");
            gets(str);
            return(-1);
        }
    return(0);           // normal
}/*liu_outs*/

/* #####
   liu_idrd: LIU id read Module
           rc = liu_idrd(unsigned char *id, unsigned sw)

   Input:   none :

   Output:  unsigned char *id : id data
##### */
/* =====
   liu_idrd: LIU id read Module
           rc = liu_idrd(unsigned char *id, unsigned sw)

   Input:   none :

   Output:  unsigned char *id : id data
===== */
/* -----
   Dummy_rd: Dummy read Module
           void Dummy_rd()

   Input:   none :
   Output:  none :
----- */
void Dummy_rd()
{
    int i,d,j;
    unsigned char s,flg;

    for(i=0; i<15; i++)
        for(j=(20000/30); j>0; j--){           // 2000*20/1336 -> 30ms/30 1ms
            _outp(0x0ed,0);                     // Delay
            for(flg=(_inp(0x61))&0x10; flg==(_inp(0x61))&0x10); //Delay 20/1336 msec
            if(((s=_inp(COM+LSR))&LSR_RXR)!=0){ // read LSR
                // test Rx ready
                if((s&(LSR_OE+LSR_PE+LSR_FE))!=0){
                    if(DEBUG==1) printf("\n##### get_data parity error"); // parity error
                }else{
                    /*Dummy Read*/
                    d= _inp(COM);
                    if((i>=14)&&(d=='c')) break;
                }
            }
        }
}/*Dummy_rd*/

get_data(unsigned char *id,unsigned sw)
{

```

```

int i,s;
long j,k;
unsigned char flg,tflg;

Dummy_rd();
liu_outs("\x1b[0c"); // LIUST-5X Read ID Command
for(i=tflg=0; (tflg==0)&&(i<17); i++){
  for(j=(20000*1l); j>0l; j--){ // 2000*20/1336 -> 30ms*1 30ms
    _outp(0x0ed,0); // Delay
    for(flg=(_inp(0x61))&0x10; flg==( _inp(0x61)&0x10);) //Delay 20/1336 msec
      if(((s=_inp(COM+LSR))&LSR_RXR)!=0){ // read LSR
        // test Rx ready
        if((s&(LSR_OE+LSR_PE+LSR_FE))!=0){
          if(DEBUG==1) printf("\n##### get_data parity error");
          gets(str);
          id[i]='\0';
          return(-1); // parity error
        }else{
          id[i]= _inp(COM);
          if((i>=14)&&(id[i]=='c')) tflg=1;
          if(sw==1) printf("\ni:%2u(%02x)",i,id[i]);
          break;
        }
      }
    }
  }
  if(sw!=0) if(j<=0l){
    if(DEBUG==1) printf("\n##### get_data timeout");
    gets(str);
    id[i]='\0';
    return(-1); // TimeOut error
  }
  id[i]='\0';
  return(0);
}/*get_data*/

liu_idrd(unsigned char *id,unsigned sw)
{
  int r,retry;

  if(sw==1) retry=1; else retry= 3;
  id[0]='\0';
  _outp(COM+MCR, MCR_RTS); // RTS,DTR ON
  do{
    r= get_data(id,sw); // GET LIU Data
  }while((--retry>0)&&(strlen(id)!=15));
  _outp(COM+MCR, 0); // RTS,DTR OFF
  if(DEBUG==1)if((sw==0)&&(retry==0)){
    printf("\n##### liu_idrd retry over");
    gets(str);
  }
  return(r);
}/*liu_idrd*/

```

```

/* #####
   liu_init: LIU Module Initialize
           rc = liu_init(int COM_NO)

   Input:   COM_NO: 1-5 COM1-COM5

   Output:  rc = Return Code 0:Normal -1:Error
##### */
liu_init(int com_no,int b)
{
    if((com_no<0)||5<com_no){
        if(DEBUG==1) printf("\n##### liu_init illigal COMx: No");
        gets(str);
        return(-1);
    }
    COM= com_port[com_no];
    if(b==1) b= 6; /*19200bps*/ else b=12; /*9600bps*/
    //printf("COM:%x com_no:%u\n",COM, com_no);
    //gets(com_no);
    _outp(COM+LCR,0x8b);      //10001011b      // select Baud Rate reg.
    _outp(COM+IER,0);        // all intr. disable
    _outp(COM,b);            //0:9600bps 1:19200bps
    _outp(COM+1,0);          // set Baud Rate
    _outp(COM+LCR,0x0b);     //00001011b      // odd parity
    // _outp(COM+LCR,0x13);   //00010011b      // EVEN NO parity

    liu_outs("\x1b[2J");     // 'ESC[2J' Clear display
    liu_outs("\x1b[1;1H");   // 'ESC[1;1H'   Set Home Pozition
    return(0);
}/*liu_init*/

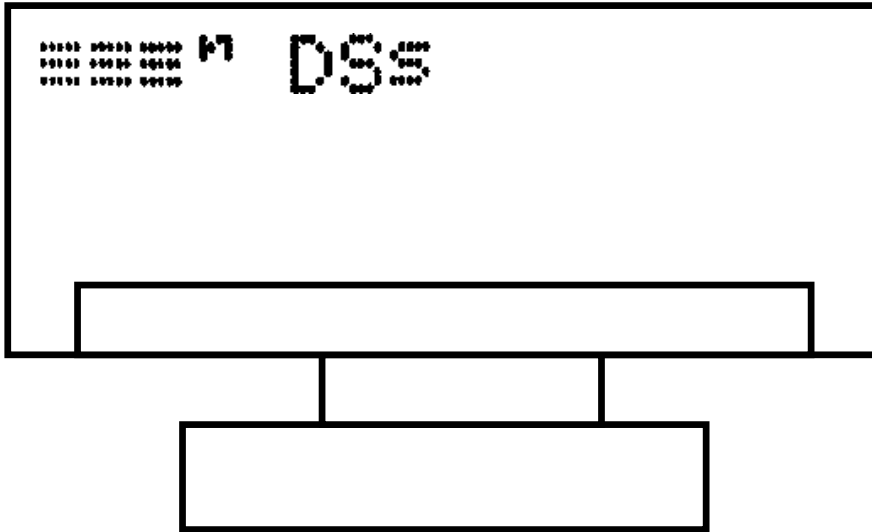
```

A4. Attentions on WindowsNT

Problems on LIUST – 5X NT

Example LIUST – 53

NT displays Garbage when it is set up if it is connecting with COM1 - COM 4
(See the reference below)



It is possible to prevent displaying the garbage of LIU by changing the boot options on NT.

How to prevent:

The garbage should not be displayed by changing BOOT.INI files as follows.

If the serial mouse is not used:

```
[boot loader]
timeout=30
default=multi(0)disk(0)rdisk(0)partition(1)\WINNT
[operating systems]
multi(0)disk(0)rdisk(0)partition(1)\WINNT="Windows NT Workstation Version 4.00" /NOSERIALMICE /NOSERIAL
multi(0)disk(0)rdisk(0)partition(1)\WINNT="Windows NT Workstation Version 4.00 [VGA mode]"/basevideo /sos
C:\ = "MS-DOS"
```

If the serial mouse is used for COM1:

```
[boot loader]
timeout=30
default=multi(0)disk(0)rdisk(0)partition(1)\WINNT
[operating systems]
multi(0)disk(0)rdisk(0)partition(1)\WINNT="Windows NT Workstation Version 4.00" /NOSERIALMICE=COM2,3,4
multi(0)disk(0)rdisk(0)partition(1)\WINNT="Windows NT Workstation Version 4.00 [VGA mode]"/basevideo /sos
C:\ = "MS-DOS"
```