

IV.

FreeBSD

:

-
- PPP PPPoE
-
-
-

가

FreeBSD

20

20.1

10

FreeBSD

가

:

- FreeBSD 가
- - 가
- 가 가
- 가

:

- (9).
- (3).
- FreeBSD () 가

20.2

20.2.1

bps

DTE

DCE

RS-232

EIA

" (baud)"

"bps(")

)"가

20.2.2

FreeBSD

가

20.2.2.1

(" ") RS-232

[]

1.

" (Signal Ground)"

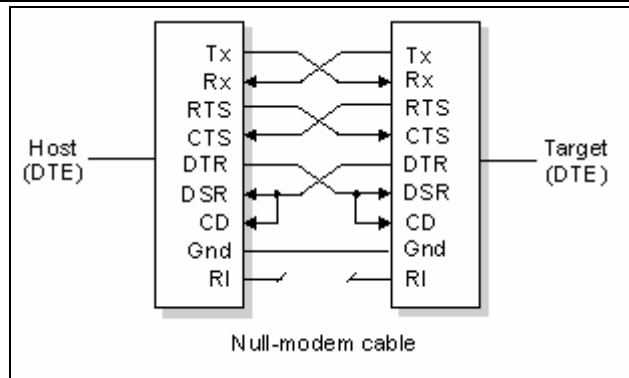
"가

RS-232C

DB-25

SG; (Signal Ground)	7	7	SG
TxD; DTE (Transmitted Data)	2	3	RxD
RxD; DCE (Received Data)	3	2	TxD
RTS; DTE 가 (Request to Send)	4	5	CTS
CTS; DCE 가 가(Clear to Send)	5	4	RTS
DTR; DTE 가 (Data Terminal Ready)	20	6	DSR
DCD; (Data Carrier Detect)	8	6	DSR
DSR; DCE 가 (Data Set Ready)	6	20	DTR

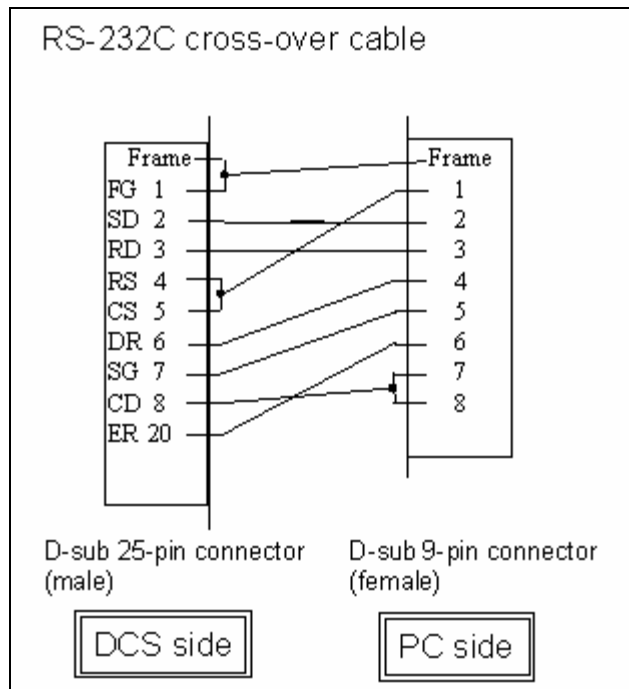
Note: "Data Set Ready(DSR)" "Data Carrier Detect(DCD)"
"Data Terminal Ready(DTR)"



2. RS-232C

RS-232C "가 FreeBSD"

RS-232C



20.2.2.2

FreeBSD

가

가 FreeBSD

[]

1.

가 가 FreeBSD

DB25 가 FreeBSD PC

DB25 DB9 가 PC

가 RJ-12 RJ-45 가

2.

FreeBSD /dev 가

가 :

- (Call-in) /dev/ttydN, N 0 가
- (DCD) 가 on
- (Call-out) /dev/cuaaN

(MS-DOS COM1) /dev/ttyd0

(MS-DOS COM2)

/dev/ttyd1

20.2.3

FreeBSD 4 . MS-DOS COM1,
COM2, COM3 COM4 . FreeBSD Digiboard Stallion
Technologies BocaBoard 1008 2016
"dumb" . COM

/sbin/dmesg . sio

Tip: sio 가 :

/sbin/dmesg | grep 'sio'

4 가
:

```
sio0 at 0x3f8-0x3ff irq 4 on isa
sio0: type 16550A
sio1 at 0x2f8-0x2ff irq 3 on isa
sio1: type 16550A
sio2 at 0x3e8-0x3ef irq 5 on isa
sio2: type 16550A
sio3 at 0x2e8-0x2ef irq 9 on isa
sio3: type 16550A
```

FreeBSD

8 .

FreeBSD 4.X :

```
device sio0 at isa? port IO_COM1 irq 4
device sio1 at isa? port IO_COM2 irq 3
device sio2 at isa? port IO_COM3 irq 5
device sio3 at isa? port IO_COM4 irq 9
```

FreeBSD 5.X :

device	sio
--------	-----

FreeBSD 4.X 가 ;
FreeBSD 5.X /boot/device.hints .

sio(4)

FreeBSD

Note:

port 0x3f8 , *IO_COM2 0x2f8*, *IO_COM3 0x38* *IO_COM4 0x2e8*
; 4, 3, 5 9 COM1 COM4
IRQ . ISA PC IRQ
(IRQ 16550A).

20.2.4

/dev " " . sio
/dev/ttydM(dial-in) /dev/cuaaM(call-out) . FreeBSD
(/dev/ttyidN /dev/cuaiaM) (/dev/ttyldN /dev/cual0N) .
RTS/CTS crtscts(
) 가 ;
, , termios(4), sio(4)
stty(1) .

20.2.4.1

/dev MAKEDEV . MAKEDEV
COM1(0) - (dial-up) /dev
MAKEDEV ttyd0 . 가 COM2(1)

MAKEDEV ttyd1

Note: FreeBSD 5.0

devfs(5)

가 . devfs가

FreeBSD

```
MAKEDEV /dev/ttydN /dev/cuaaN, /dev/cuaiaN, /dev/cualaN,
/dev/ttyldN /dev/ttyidN
```

가

(/dev/cua*) --

가 - . /dev/cua*

:

crw-rw----	1 uucp	dialer	28, 129	Feb 15 14:38	/dev/cuaa1
crw-rw----	1 uucp	dialer	28, 161	Feb 15 14:38	/dev/cuaia1
crw-rw----	1 uucp	dialer	28, 193	Feb 15 14:38	/dev/cuala1

uucp dialer call-out()

20.2.5

ttydN(cuaaN) 가

I/O 가 .

:

```
# stty -a -f /dev/ttyd1
```

가 . 가

" (initial state)"

ttyd5 CLOCAL , 8bit XON/XOFF

:

```
# stty -f /dev/ttyid5 cllocal cs8 ixon ixoff
```

/etc/rc.serial

" (lock state)"

ttyd5 57600 bps

stty -f /dev/ttyd5 57600

ttyd5 57600 bps

root (write)

20.3

FreeBSD

FreeBSD

20.3.1

가

PC

가

가

X

xterm

FreeBSD

가

IBM PC

FreeBSD 가

FreeBSD 3 :

- Dumb
- PC
- X

20.3.1.1 Dumb

Dumb

“dumb”

. dumb

, , e ,

Digital Equipment Corporations VT-100 Wyse WY-75
dumb

FreeBSD

Dumb X

20.3.1.2 PC

dumb

dumb

가 가

가 FreeBSD

FreeBSD

20.3.2.1 /etc/ttys 가

```

/etc/ttys          FreeBSD          가          .
          가          ttyv0          가          .
          .          .          가          ,          pseudo-
ttys          가          .          /dev          (          /dev/ttyv0
ttyv0          )          /dev          .

FreeBSD          ttyd0          ttyd3          4
          /etc/ttys          가          .
          가          .
  
```

20-1. /etc/ttys 가

```

          가          : Wyse-50          286 IBM PC
VT-100          Procomm          . Wyse
          286          (          )
/etc/ttys          :
  
```

```

ttyd1 ❶ "/usr/libexec/getty std.38400" ❷ wy50 ❸ on ❹ insecure ❺
ttyd5  "/usr/libexec/getty std.19200" vt100 on insecure
  
```

```

❶          /dev          .
❷          (          getty(8))          . getty
          ,          login(1)
          .
getty          (          )          getty
getty          bps          . getty
          /etc/gettytab          .
          /etc/gettytab          가
          .          std
          .          . 110          115200          bps
std          가          .          가          . gettytab(5)
  
```

```

/etc/ttys      getty
               Wyse-50          38400 bps      . 286
PC            19200 bps

```

```

③            tty                - (dial-up)
              가                -
              unknown          dialup
                                termcap(5)

```

```

               Wyse-50          Procomm          286
PC  VT-100

```

```

④            . on              init
              getty            off          getty 가

```

```

⑤            가                secure
              root ( ID 가 0 )
              root              . Insecure

```

```
su(1)
```

```

"insecure"
su

```

20.3.2.2 /etc/ttys init 가

```

/etc/ttys      init 가          SIGHUP
:
# kill -HUP 1

```

Note: init PID 1 가 .
getty .

20.3.3

가 .
가 .

20.3.3.1

가 .

가 .

FreeBSD 가

FreeBSD bps .
가 가 .
가 .

getty 가 . getty
ps :

ps -axww|grep getty

ttyd1

getty 가 /etc/gettytab std.38400 :

22189 d1 ls+ 0:00.03 /usr/libexec/getty std.38400 tttyd1
--

getty 가 /etc/ttys .
ttys kill -HUP 1 .


```
가 . 16550 16
. 16
16550A-
가 16550A-
```

20.4.3

```
init - (dial-in) getty
/dev/ttyd0 ps ax
:
```

4850 ?? 0:00.09 /usr/libexec/getty V19200 ttyd0

```
가 CD( )
가 gettys 가 . getty
login: 가
getty
```

```
가 getty
/usr/bin/login
```

20.4.4

```
/etc FreeBSD -
3 . /etc/gettytab /usr/libexec/getty
가 /etc/ttys tty getty
/sbin/init 가 /etc/rc.serial
가
RS-232
```



```
#
# Fast dialup terminals, 2400/1200/300 rotary (can start either way)
#
D2400|d2400|Fast - Dial - 2400:
:nx=D1200:tc=2400 - baud:
3|D1200|Fast - Dial - 1200:
:nx=D300:tc=1200 - baud:
5|D300|Fast - Dial - 300:
:nx=D2400:tc=300 - baud:
```

```
가 /etc/gettytab 가 ;
14.4kbps 19.2kbps :
```

```
#
# Additions for a V.32bis Modem
#
um|V300|High Speed Modem at 300,8-bit:
:nx=V19200:tc=std.300:
un|V1200|High Speed Modem at 1200,8-bit:
:nx=V300:tc=std.1200:
uo|V2400|High Speed Modem at 2400,8-bit:
:nx=V1200:tc=std.2400:
up|V9600|High Speed Modem at 9600,8-bit:
:nx=V2400:tc=std.9600:
uq|V19200|High Speed Modem at 19200,8-bit:
:nx=V9600:tc=std.19200:
```

```
8-bit
19.2 kbps(V.32bis) 9600 bps,
2400 bps, 1200 bps, 300 bps 19.2 kbps
nx=("next table") " "
tc=("table Continuation")
28.8 kbps 가 14.4 kbps 19.2
kbps 57.6 kbps gettytab
```

가 :

```
#
# Additions for a V.32bis or V.34 Modem
# Starting at 57.6 Kbps
#
vm|VH300|Very High Speed Modem at 300,8-bit:
:nx=VH57600:tc=std.300:
vn|VH1200|Very High Speed Modem at 1200,8-bit:
:nx=VH300:tc=std.1200:
vo|VH2400|Very High Speed Modem at 2400,8-bit:
:nx=VH1200:tc=std.2400:
vp|VH9600|Very High Speed Modem at 9600,8-bit:
:nx=VH2400:tc=std.9600:
vq|VH57600|Very High Speed Modem at 57600,8-bit:
:nx=VH9600:tc=std.57600:
```

```
CPU 가          가          16550A          가
57.6kbps      sio "silo"          .
```

20.4.4.2 /etc/ttys

```
/etc/ttys          20-1          .
getty          .
:
```

```
ttyd0  "/usr/libexec/getty xxx"  dialup on
```

```
          . ttyd0          getty 가
          /dev/ttyd0          .          "/usr/libexec/getty xxx" (xxx
gettytab          )  init 가          .          dialup
          .          on  init          .
          secure 가          (          )
```

```
( dialup) (preference)
dialup -
dialup
가 VT102
vt102
/etc/ttys HUP init
# kill -HUP 1
```

```
init
```

```
[ ]
1.
getty 가 ttys
가 19.2 kbps ttys :
ttyd0 "/usr/libexec/getty std.19200" dialup on
std.19200 std.speed
/etc/gettytab
2.
ttys /etc/gettytab "auto-baud"(sic)
19.2Kbps(gettytab
V19200 )
가 ttys :
ttyd0 "/usr/libexec/getty V19200" dialup on
```


USRobotics Sportster 14,400

ATZ

AT&C1&D2&H1&I0&R2&W

V.42bis MNP5

USR Sportster 14,400

DIP 가 ;

- Switch 1: UP -- DTR.
- Switch 2: N/A (/).
- Switch 3: UP --
- Switch 4: DOWN -- off
- Switch 5: UP --
- Switch 6: UP -- CD.
- Switch 7: UP --
- Switch 8: N/A (Smart Mode/Dumb Mode)

getty 가

login:

getty

20.4.5.1

. USR Sporster 14,400

ATZ

AT&B1&W

20.4.5.2

. USR Sportster 14,400
error - corrected
non - error - corrected .

ATZ

AT&B2&W

20.4.5.3

. USR Sportster 14,400 AT15
ATZ AT14
가

20.4.6

가 가 .

20.4.6.1 FreeBSD

FreeBSD 가
, login: 가 DTR 가
— FreeBSD getty
가 가 .
DTR 가 FreeBSD FreeBSD 가
getty ps ax 가
:

```
114 ?? | 0:00.10 /usr/libexec/getty V19200 ttyd0
115 ?? | 0:00.10 /usr/libexec/getty V19200 ttyd1
```

```
114 d0 | 0:00.10 /usr/libexec/getty V19200 ttyd0
```

```

getty 가 . getty CD( ) 가
on
.
ttydN getty 가 /etc/ttys
. init getty 가
/var/log/messages . 가
/etc/ttys /etc/gettytab
/dev/ttydN .

```

20.4.6.2 -

```

- (dial-in) 8 bits, 1 stop bit
. 가 가 Enter
. login: BREAK .
(dialing) (
USR Sportster AT&B1 )
login: /etc/gettytab
.

```

- /etc/ttys /etc/gettytab .
- nx= 가 gettytab .
- tc= 가 gettytab .

- FreeBSD DTR on

DTR *on*

FreeBSD

20.5 - (Dial - out)

BBS

FTP 가 PPP 가 FTP Z
FTP 가 PPP

20.5.1 Stock Hayes

가?

tip(tip full - duplex)
Hayes (dialer) /etc/remote
at=hayes

Hayes (BUSY, NO DIALTONE CONNECT 115200

tip(ATX0&W)

tip 60
tip . ATS7=45&W

Note: tip Hayes
/usr/src/usr.bin/tip/tip tipconf.h

가 .

```
#define HAYES 0 #define HAYES 1 . make make
install . . .
```

20.5.2 AT 가?

```
/etc/remote "direct" .
/dev/cuaa0 :
```

cuaa0:dv=/dev/cuaa0:br#19200:pa=none

```
br bps . tip cuaa0
```

```
/dev/cuaa0 가 :
```

```
# cd /dev
# sh MAKEDEV cuaa0
```

```
root cu :
```

```
# cu -lline -sspeed
```

```
line ( : /dev/cuaa0) speed ( : 57600). AT
가 ~. .
```

20.5.3 pn @ 가 !

```
@ tip /etc/phones .
```

```
@ /etc/remote
:
```

```
pn= @
```

20.5.4

가?

"generic" /etc/remote . 가 :

```
tip115200|Dial any phone number at 115200 bps:
:dv=/dev/cuaa0:br#115200:at=hayes:pa=none:du:
tip57600|Dial any phone number at 57600 bps:
:dv=/dev/cuaa0:br#57600:at=hayes:pa=none:du:
```

:

tip -115200 5551234

tip cu tip cu :

```
cu115200|Use cu to dial any number at 115200bps:
:dv=/dev/cuaa1:br#57600:at=hayes:pa=none:du:
```

:

cu 5551234 -s 115200

20.5.5

bps

가?

```
tip1200 cu1200 br . tip
가 1200bps tip1200 .
1200 bps .
```

20.5.6

```
CONNECT <host> tip cm
/etc/remote :
```

```
pain|pain.deep13.com|Forrester's machine:
:cm=CONNECT pain n:tc=deep13:
muffin|muffin.deep13.com|Frank's machine:
:cm=CONNECT muffin n:tc=deep13:
deep13:Gizmonics Institute terminal server:
:dv=/dev/cuaa2:br#38400:at=hayes:du:pa=none:pn=5551234:
```

```
tip pain tip mffin pain muffin
tip deep13 .
```

20.5.7

tip

가?

가 .

```
/etc/remote pn @ :
```

```
big - university:
:pn= @:tc=dialout
dialout:
:dv=/dev/cuaa3:br#9600:at=courier:du:pa=none:
```

```
/etc/phones :
```

```
big - university 5551111
big - university 5551112
big - university 5551113
big - university 5551114
```

tip .

tip while .

20.5.8 Ctrl+P

Ctrl+P

가?

Ctrl+P tip 가 "force" .
 " " 가 ~s force .
 ~sforce=*single-char* . *single-char*
 1 . *single-char* force Ctrl+2 Ctrl+Space
 (nul) .
single-char Shift+Ctrl+6 .
 \$HOME/.tiprc force :

```
force=<single-char>
```

20.5.9

가 ?

Caps-Lock 가 tip "raise character" Ctrl+A
 . ~s raisechar .
 force .
 Ctrl+2 Ctrl+A Emacs .tiprc :

```
force=^^
raisechar=^^
```

^^ Shift+Ctrl+6 .

20.5.10 tip

가?

~p(put) ~t(take) .

cat echo . :

~p []

~t []

가 z .

20.5.11 tip z

가?

~C rz

~C sz

20.6

20.6.1

FreeBSD dumb 가 FreeBSD

12 FreeBSD 3

FreeBSD

(/boot/loader)

20.6.2

```
가 . 가
.
COM1
echo -h > /boot.config

/etc/ttys   ttyd0   off  on

shutdown -r now
```

20.6.3

```
가
.
PC
가
가
가
(Phoenix BIOS 가 "keyboard failed"
).
Tip: BIOS "Not installed"
가 BIOS
"Not installed" 가
```


0x40

(0x10)

(http://www.freebsd.org/doc/en_US.ISO8859-1/books/developers-handbook/index.html)

Note: FreeBSD 4.0 0x40 가

:

device sio0 at isa? port IO_COM1 flags 0x10 irq 4

sio(4)

가 UserConfig()

a root boot.config

-h

() -h

-h

-D

()

-h

-h 가 가

-P 가 *-h* 가

-D *-h*

Note: *-P* 가 101 (F11 F12) 가) *-P*

-P *-h*

가 boot(8)

-P (/boot/loader)

-h /boot.config *-h* *-D*

;

FreeBSD /boot.config

/boot.config: *-P*
Keyboard: no

-P /boot.config 가
(presence)/ (absence) /boot.config

	가
none	
-h	
-D	
-Dh	
-P, keyboard present	
-P, keyboard absent	

가

Enter

```
>> FreeBSD/i386 BOOT
Default: 0:wd(0,a)/boot/loader
boot:
```

/boot.config

가

가

Enter

가

-h

Enter/Return(가)

()

가

가

20.6.4

20.6.4.1 1: sio0 0x10 .

device sio0 at isa? port IO_COM1 flags 0x10 irq 4

/boot.config			
-h			
-D			
-Dh			
-P, keyboard present			
-P, keyboard absent			

20.6.4.2 2: sio0 0x30 .

device sio0 at isa? port IO_COM1 flags 0x30 irq 4

/boot.config			
-h			
-D			
-Dh			
-P, keyboard present			
-P, keyboard absent			

20.6.5

20.6.5.1

: 9600 , 8bits, 1 stop bit .
/etc/make.conf
가 :

```
BOOT_COMCONSOLE_SPEED=19200
```

-h

가

:

```
options CONSPEED=19200
```

20.6.5.2 sio0 가

sio 가 가 .
(19)
/etc/make.conf (0x3F8, 0x2F8, 0x3E8 or 0x2E8)
BOOT_COMCONSOLE_PORT . sio0 sio3(COM1
COM4)
가
가 . sio1(COM2) :

```
device sio1 at isa? port IO_COM2 flags 0x10 irq 3
```

```
device sio1 at isa? port IO_COM2 flags 0x30 irq 3
```

```
# cd /sys/boot  
# make clean  
# make  
# make install
```

```
disklabel(8)
```

20.6.5.3

DDB

가

```
( BREAK  
 ) 가 :
```

```
options BREAK_TO_DEBUGGER  
options DDB
```

20.6.5.4

```
login
```


가 :

```
set console=vidconsole
```

console

-h

3.2 /boot/loader.rc /boot/loader.conf.local /boot/loader.conf
/boot/loader.rc :

```
include /boot/loader.4th  
start
```

/boot/loader.conf.local

가 .

```
console=comconsole
```

```
console=vidconsole
```

loader.conf(5) .

Note:

-P

가

20.6.6.2

sio0 가

sio0 가

“sio0 가

”

20.6.7

가

. AMI BIOS 가 "graphics adapter"
CMOS "Not installed"

가

) . AMI BIOS