FreeBSD

Korea FreeBSD Users Group – http://www.kr.FreeBSD.org/

Chapter 20 :

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: 2004   8   7

: 2005   3   8

: 1.0

FreeBSD Documentation Project   FreeBSD Handbook   2004   8

7   . FreeBSD Handbook   ,

, CVS Repository

.

,   .

.   KFUG(Korea FreeBSD Users Group)

,   KFUG

.

"FreeBSD Handbook"   "FreeBSD Documentation Project"   ,   "   FreeBSD

"   "   (Young-oak Lee)"   .

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KFUG   ,   .
.

IV.

FreeBSD   .

                                                                                          :

-
- PPP   PPPoE
-
-
-

                                                                                    .

                        FreeBSD

            .

20

20.1

                                        .
                              .   10
                                            .   FreeBSD
                                              .

                                                                  :

- FreeBSD
-
-
-

                                                                            :

KFUG

-          (9).
-          (3).
- FreeBSD   (   )
       .

20.2

20.2.1

bps
     –   .

DTE
       – –   .

DCE
       ––   .

RS-232
         EIA   .

         " (baud)"   .
         "bps(
)"   .

20.2.2

FreeBSD
        .
        .

<rick@rickinc.com>

20.2.2.1

.

("   ") RS-232   .

.

[   ]

1.

"   (Signal Ground)"

.   "   "   "

"

.

RS-232C   DB-25   .

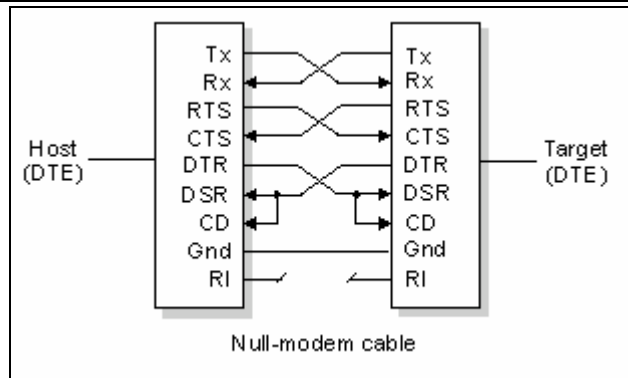|			
SG; (Signal Ground)	7	7	SG
TxD; DTE (Transmitted Data)	2	3	RxD
RxD; DCE (Received Data)	3	2	TxD
RTS; DTE (Request to Send)	4	5	CTS
CTS; DCE (Clear to Send)	5	4	RTS
DTR; DTE (Data Terminal Ready)	20	6	DSR
DCD; (Data Carrier Detect)	8	6	DSR
DSR; DCE (Data Set Ready)	6	20	DTR

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

"Data Terminal Ready(DTR)″   .

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KFUG   ,   .

.

Null-modem cable

[20-1.bmp]

2.   RS-232C

RS-232C   "   "

"   "   .   FreeBSD

                    .

RS-232C

RS-232C cross-over cable

D-sub 25-pin connector (male) — DCS side
D-sub 9-pin connector (female) — PC side
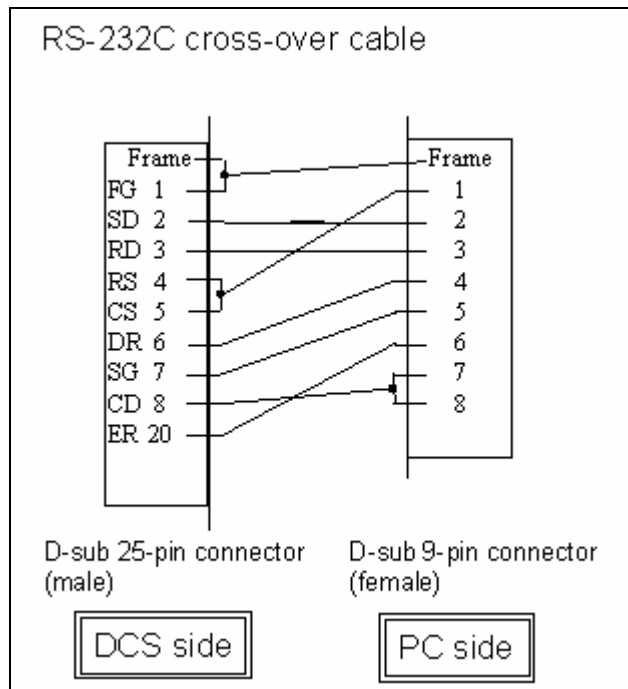
[20-2.bmp]

[   ]

20.2.2.2

FreeBSD   .

FreeBSD   .

[   ]]

1.

.   FreeBSD

DB25   . FreeBSD   PC

DB25   DB9   . PC

RJ-12   RJ-45   .

.

.

2.

FreeBSD   /dev   .

:

- (Call-in)   /dev/ttyd$N$, N 0   .

.

(DCD)   *on*   .

- (Call-out)   /dev/cuaa$N$.

.

.

(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   :
       # **/sbin/dmesg | grep 'sio'**

            4
     :

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   ;
FreeBSD 5.X   /boot/device.hints   .
                                                          sio(4)
         .   FreeBSD
                                    .

   Note: *port IO_COM1*
   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/ttyd*N*(dial-in)   /dev/cuaa*N*(call-out)   . FreeBSD
     (/dev/ttyid*N*   /dev/cuaia*N*)   (/dev/ttyldN   /dev/cualON)   .
                              RTS/CTS   crtscts(
)   .
                                                                                       ;
              ,   ,   termios(4), sio(4)
stty(1)   .

20.2.4.1

/dev   MAKEDEV   . MAKEDEV
COM1(0)   -   (dial-up)   /dev
MAKEDEV ttyd0   .   COM2(1)
        MAKEDEV ttyd1   .

> **Note**: FreeBSD 5.0   devfs(5)
>   . *devfs*   FreeBSD
>   .

MAKEDEV   /dev/ttyd*N*   /dev/cuaa*N*, /dev/cuaia*N*, /dev/cuala*N*,
/dev/ttyld*N*   /dev/ttyid*N*   .

                                 (/dev/cua*   )   - -
                  -                                  . /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

ttyd*N*(cuaa*N*)   .
                  I/O   .
          :

stty -a -f /dev/ttyd1

" (initial state)"

ttyd5 *CLOCAL* , 8bit *XON/XOFF*

:

stty -f /dev/ttyid5 clocal cs8 ixon ixoff

/etc/rc.serial .

" (lock state)"

. ttyd5 57600 bps :

stty -f /dev/ttyld5 57600

ttyd5 57600 bps .

root (write) .

17.3

FreeBSD . FreeBSD

20.3.1

-

PC

X

xterm   .

FreeBSD
.   IBM PC   FreeBSD
.

.

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

KFUG   ,   .
.

dumb   .

                                                                .   FreeBSD

        FreeBSD   .

20.3.1.3 X

X   .
                                                    .   X
                        .

                        X   X   ,
                        .

20.3.2

                                                FreeBSD
        .
                                    .

12   init
                        . Init   /etc/ttys
                getty   . getty
        login   .

        root   FreeBSD   :

                        /dev   /etc/ttys   .
        /usr/libexec/getty   /etc/gettytab
        getty   .
                                        .
                "on"   .

"secure"   .

/etc/ttys   init   .

/etc/gettytab   getty
.   ;   gettytab(5)   getty(8)
.

20.3.2.1 /etc/ttys

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

FreeBSD   ttyd0   ttyd3   4
/etc/ttys   .
.

20-1. /etc/ttys

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

```
ttyd1❶    "/usr/libexec/getty std.38400"❷    wy50❸    on❹    insecure❺
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

                .   *std*
                .   . 110   115200   bps
std   .   . gettytab(5)
                                                            .

/etc/ttys   *getty*   .

                Wyse- 50   38400 bps   . 286
PC   19200 bps   .

❸   tty   .   -   (dial- up)
                                                                                            -
                unknown   *dialup*   .
                                                termcap(5)
                        .

                Wyse- 50   **Procomm**   286
PC   VT- 100   .

❹   . *on*   init
                                getty   .   *off*   getty
                                        .

❺   .   secure
                        root   (ID   0   )
                .   root   . Insecure

su(1)   .

                                "insecure"   .
                                su   .

20.3.2.2 /etc/ttys   init

/etc/ttys   init   SIGHUP
            :

    # kill - HUP 1

    Note: init   PID 1   .

                                                                    getty
                                                                      .

20.3.3

                                                                    .
                            .

20.3.3.1   .

                            .
                                                                        .

                            FreeBSD
        .

        FreeBSD   bps   .
                                                        .
                            .

getty   .   getty
            ps   :

ps - axww| grep getty

ttyd1

getty   /etc/gettytab   *std.38400*   :

```
22189  d1  Is+     0:00.03 /usr/libexec/getty std.38400 ttyd1
```

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

getty

                                                            (handshaking)
                          . /etc/ttys   *std.38400*   *3wire.38400*
kill - HUP 1   . *3wire*   *std*   .
3wire   (baud rate)
                      .

20.3.3.2   .

          FreeBSD   bps   .   getty
                getty   .   /etc/ttys   kill -
HUP 1   .

20.3.3.3   ;

                .

              "half duplex"   "local echo"   "full duplex"   (
)   .

20.4   - (Dial- in)

              -                  FreeBSD

KFUG   ,   .
                                          .

FreeBSD
<rick@rickinc.com>

.

20.4.1 VS

RS-232 .

- .

.

DIP

.

.

20.4.1.1

. RS-232C

:

- Transmitted Data (SD)
- Received Data (RD)
- Request to Send (RTS)
- Clear to Send (CTS)
- Data Set Ready (DSR)
- Data Terminal Ready (DTR)
- Carrier Detect (CD)
- Signal Ground (SG)

FreeBSD 2400bps   RTS   CTS   . CD

DTR

( )   .

.

FreeBSD

Korea FreeBSD Users Group   - 17 -   http://www.kr.FreeBSD.org/
KFUG   ,   .
.

. FreeBSD

20.4.2

FreeBSD   NS8250- , NS16450- , NS16550-   NS16550A-   EIA RS-
232C(CCITT V.24)   . 8250   16450

                     . 16550   16

            .   16

          16550A -   .

                                                          16550A -

                          .

20.4.3

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

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

                                       CD(   )

       .   gettys   . getty

          login: .

                              getty

       .

                          getty
                    /usr/bin/login   .

20.4.4

     /etc   FreeBSD   -

                  KFUG

3   /etc/gettytab   /usr/libexec/getty

.   /etc/ttys   tty   getty

/sbin/init   .   /etc/rc.serial

.

-   .

RS-232   .

.

Emacs   (Full)

.

RS-232   .

V.32bis(14.4 kbps)   RS-232   19.2 kbps

2400 bps   RS-232   2400 bps   .

getty   getty

login: .

Enter   .

getty   login:

.

.   "   "

.

.

20.4.4.1 /etc/gettytab

/etc/gettytab   getty(8)   termcap(5)   .

gettytab(5)   .

[   ]

1.

/etc/gettytab

2.

getty   /etc/gettytab

. 2400bps   *2400D*   .

```
#
# 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:
```

/etc/gettytab   ;

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:
```

KFUG   ,   .

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   14.4 kbps   19.2
kbps   .   57.6 kbps   gettytab
              :

```
#
# 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   16550A
57.6kbps   sio "silo"   .

20.4.4.2 /etc/ttys

/etc/ttys   20-1   .
getty   .
                              :

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

. ttyd0   getty

/dev/ttyd0   .   *"/usr/libexec/getty xxx"* (xxx

gettytab   )   init   .   *dialup*

.   *on*   init   .

secure   (   )

.

(*dialup*)   (preference)   .

dialup   -

dialup

.   VT102

vt102   .

/etc/ttys   HUP   init

.

kill - HUP 1

init

.

[   ]

1.

getty   ttys

.   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   )

ttys   :

```
ttyd0    "/usr/libexec/getty V19200"      dialup on
```

20.4.4.3 /etc/rc.serial

V.32, V.32bis   V.34   (RTS/CTS)

. FreeBSD   stty

/etc/rc.serial   .

termios   *crtscts*   #1(COM2)   -   (dial-in)

-      (dial-out)   /etc/rc.serial   :

```
# Serial port initial configuration
stty -f /dev/ttyid1 crtscts
stty -f /dev/cuaia1 crtscts
```

20.4.5

(MS-DOS   Telix   FreeBSD   tip   )

. getty

:

- CD   *on*.
- DTR *on*,   DTR   *off*   .
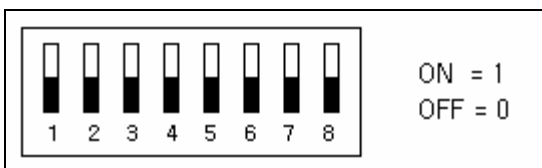- CTS   .
- XON/XOFF(   )   .
- RTS   .

- Quite mode(   ).
-

DIP   .

DIP

[20-3.bmp]

USRobotics Sportster 14,400

:

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

V.42bis   MNP5

.

USR Sportster 14,400   DIP   ;
:

- 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   login:

KFUG   ,
.

. 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

.

20.4.6

.

20.4.6.1 FreeBSD

FreeBSD

,   login: DTR
—   FreeBSD   getty
.

DTR   FreeBSD   FreeBSD
getty   ps ax   .
:

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

. :

114 d0 I   0:00.10 /usr/libexec/getty V19200 ttyd0

getty   . getty   CD(   )
on
.

ttyd*N*   getty   /etc/ttys
.   init   getty
/var/log/messages   .
/etc/ttys   /etc/gettytab
/dev/ttyd*N*   .

20.4.6.2   -

- (dial-in)   8 bits,   1 stop bit

.   Enter
.   login: BREAK   .
(dialing)   (
USR Sportster   AT&B1   )   .

login: /etc/gettytab
.

- ● /etc/ttys   /etc/gettytab   .
- ● *nx*=   gettytab   .
- ● *tc*=   gettytab   .

- FreeBSD   DTR *on*
.   DTR *on*
.

.

FreeBSD

.

20.5   - (Dial-out)

.

BBS   .

PPP   .
FTP   PPP   FTP   .   Z
.

20.5.1 Stock Hayes   .

?

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
                                        .

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

20.5.2   AT   ?

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

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

br   bps   .   tip cuaa0
              .

            /dev/cuaa0   :

cd /dev
sh MAKEDEV cuaa0

root   cu   :

cu -l_line_ **-s**_speed_

line   (: /dev/cuaa0)   _speed_   (: 57600). AT
                                        ~ .   .

20.5.3 pn   @   !

                        @   tip   /etc/phones   .
@   /etc/remote   .
                    :

pn=   @

20.5.4   ?

"generic"   /etc/remote   .   :

```
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   _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   ?

tip1200   *cu1200*   br   . tip
                        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

                        ?

                                .

                                /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

?

Ctrl+P   tip   "force"   .
"   "   ~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   ?

Caps-Lock   tip   "raise character"   **Ctrl+A**
.   ~s   *raisechar*   .
             force   .

      Ctrl+2   **Ctrl+A**   **Emacs**   .tiprc   :

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

^^   **Shift+Ctrl+6**   .

20.5.10 tip   ?
            ~p(put)   ~t(take)   .
                        cat   echo   .   :

~p   [   ]
~t   [   ]

                        z   .

20.5.11 tip   z   ?
                                            .   ~C rz
             .

                                                    .   ~C sz
                        .

20.6

20.6.1

FreeBSD   dumb   .
                                                                      : FreeBSD
                                                                          .

12   FreeBSD   3   .
         FreeBSD   .
                      (/boot/loader)   .

                                              '
    .

20.6.2

                                              .
                                           .

                               .   COM1   .
                                        echo –h > /boot.config

         .

    /etc/ttys   ttyd0   off   on   .
                                                              .

    shutdown –r now   .

20.6.3

                                                                  .

                                       .

         .

PC

(Phoenix BIOS   "keyboard failed"
).

Tip: BIOS   "Not installed"
.   BIOS

.   "Not installed"
.

BIOS   .
.
.

Note: PS/2
.   PS/2
.

AMI Bios   Gateway 2000   90Mhz
.
.

dumb   COM1 (sio0)   .
dumb   PC/XT
. COM1 (sio0)   .
COM1
.   COM1
FreeBSD
(COM1   /   /   ;
COM1   (COM1
COM2   (sio1)   )   ).

COM1 (sio0)   .

KFUG   ,   .
.

:

0x10

.

.   ;

(   )   .

.   *-h*

.

0x20

–h   (

)   .   FreeBSD   2.*X*   *COMCONSOLE*

.   *0x20*   *0x10*   .

0x40

(0x10   )   .

.   .

(http://www.freebsd.org/doc/en_US.ISO8859-1/books/developers-

handbook/index.html)   .

Note: FreeBSD 4.0   *0x40*

.

:

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

sio(4)   .

UserConfig(   )

.

a   root   boot.config   .

KFUG   ,   .

.

FreeBSD

FreeBSD

<rick@rickinc.com>

:

- h

( )   *–h*

- h

- D

( )

–h

–h

- h

- P

- D   *–h*

Note: *- P*

. 101   (F11   F12

)   .

- P

–P   *- h*

boot(8)

- P   (/boot/loader)   .

Korea FreeBSD Users Group   -   36   -   http://www.kr.FreeBSD.org/

KFUG

–h

.   /boot.config   –h   –D

;   .

FreeBSD   /boot.config   .

:

/boot.config: - P
Keyboard: no

-P   /boot.config

(presence)/   (absence)   .   /boot.config

.

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

.

.

Enter

.   .

:

KFUG   ,   .
.

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

/boot.config

Enter

- *h*

Enter/Return( ) ( )

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
:

BOOT_COMCONSOLE_SPEED=19200

.

- h

:

options CONSPEED=19200

20.6.5.2 sio0

sio   .

                                                    '

          .

                              (19   )

          /etc/make.conf   (0x3F8, 0x2F8, 0x3E8 or 0x2E8)
          BOOT_COMCONSOLE_PORT   . sio0   sio3(COM1
          COM4   )   .

                              .

                    .   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

(BREAK
)   :

```
options BREAK_TO_DEBUGGER
options DDB
```

20.6.5.4

                     login   .

/etc/ttys   :

```
ttyd0 "/usr/libexec/getty std.9600" unknown off secure
ttyd1 "/usr/libexec/getty std.9600" unknown off secure
ttyd2 "/usr/libexec/getty std.9600" unknown off secure
ttyd3 "/usr/libexec/getty std.9600" unknown off secure
```

ttyd0   *ttyd3*   COM1   COM4   .   *off*   *on*   .
                                 std.9600   *std.19200*

    .

                 unknown   .

                           kill -HUP 1   .

20.6.6

.

20.6.6.1

/boot/loader.rc

:

set console=comconsole

.

/boot/loader.rc .

.

:

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 .

```
console=comconsole



console=vidconsole
```

---

loader.conf(5)   .

Note: −P   .

.

20.6.6.2   sio0

sio0
.   " sio0   "   .

20.6.7

.

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

.   (
)   . AMI BIOS   .