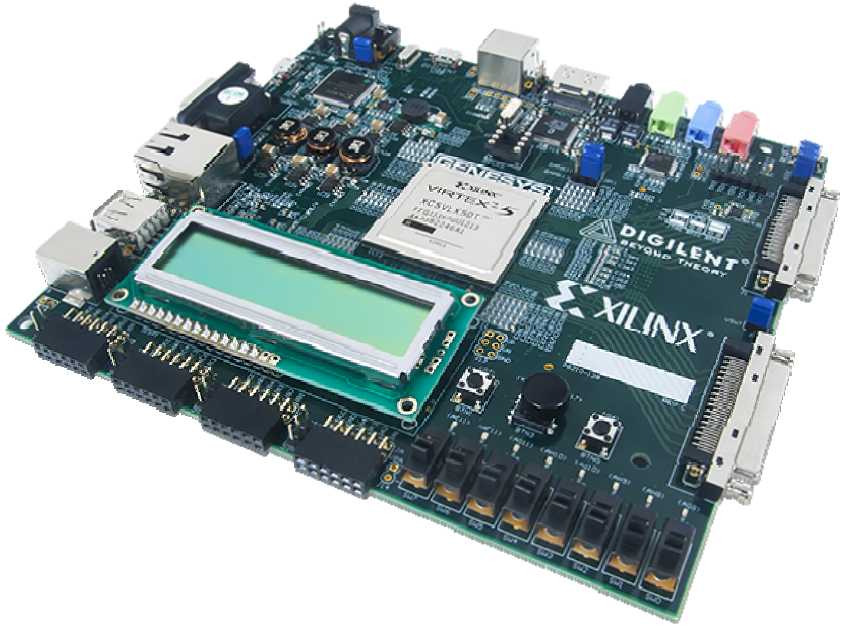
# Реализация терминала на основе PS/2 клавиатуры и VGA/HDMI




Работу выполнил студент 2 курса Ким Андрей


ASUS
acer
PREDATOR
DIGILENT
XILINX

- Xilinx Virtex-5 LX50T FPGA in a 1136-pin BGA package
- 256Mbyte DDR2 SODIMM with 64-bit wide data
- 32Mbyte Numonyx™ StrataFlash™ for configuration and user-data storage
- 100 MHz fixed oscillator and (up to) 400 MHz programmable clock generator
- Real time power monitors on all power rails
- Ships with a 20W power supply, USB cable, and protective plexiglass covers
- 10/100/1000 Ethernet PHY and RS-232 serial port
- Multiple USB2 ports for programming, data transfer, and hosting applications
- HDMI video with resolution up to 1600x1200 & 24-bit color
- AC-97 Codec with 48 KHz sampling and line-in, line-out, microphone and headphone ports
- GPIO includes 8 LEDs, 2 buttons, two-axis navigation switch, 8 slide switches, and a 16x2 character LCD
- 112 FPGA I/Os routed to expansion connectors (two high-speed parallel VHDC connectors and four 8-pin headers)
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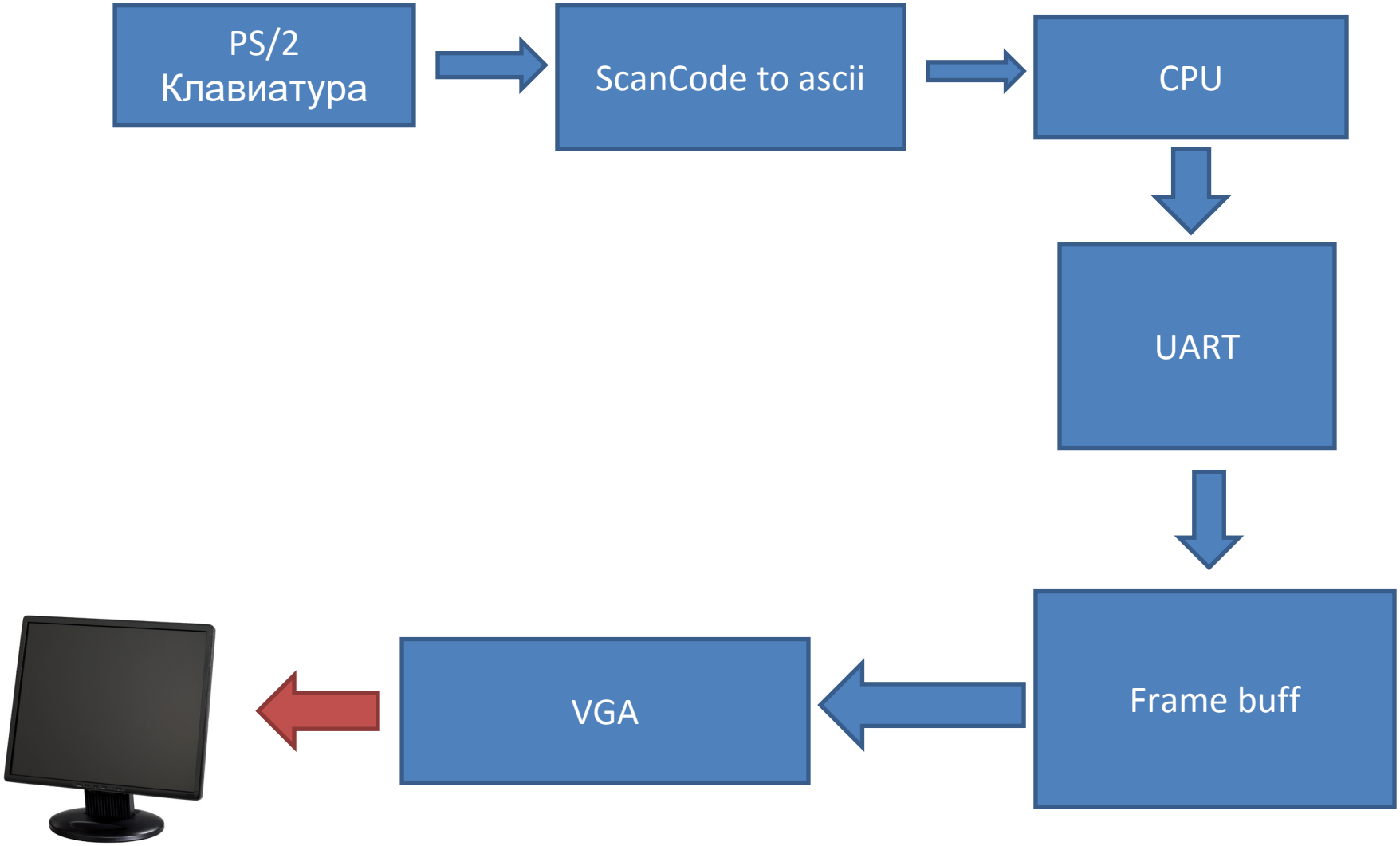
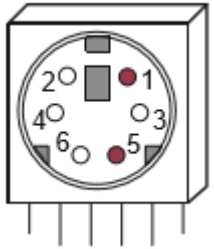
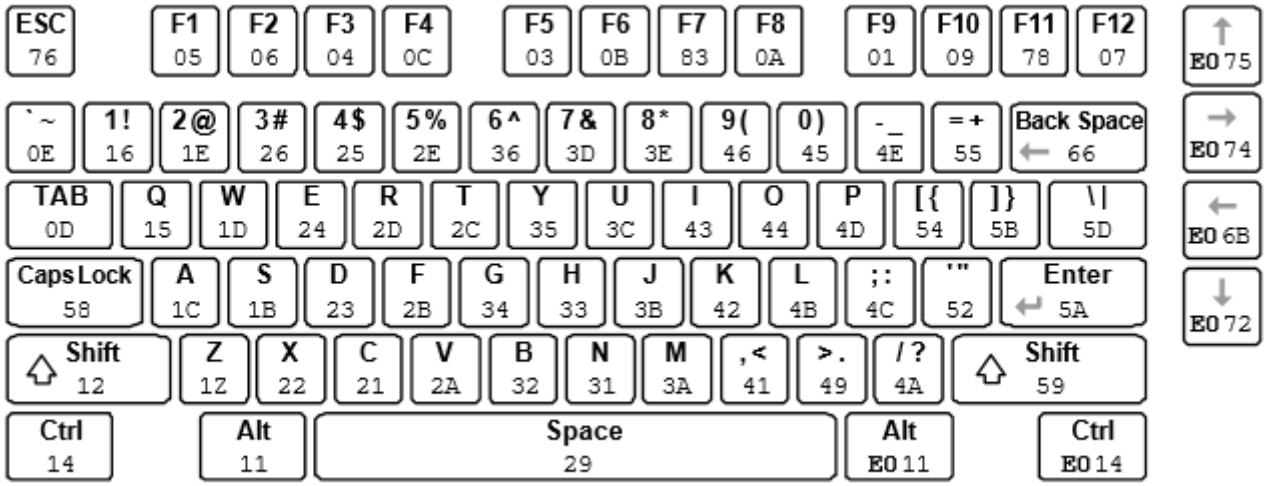

PS/2
Клавиатура
ScanCode to ascii
CPU
UART
Frame buff
VGA

# PS/2

| PS/2 DIN Pin | Signal | FPGA Pin |
|---|---|---|
| 1 | DATA (PS2D) | M15 |
| 2 | Reserved | — |
| 3 | GND | GND |
| 4 | Voltage Supply | — |
| 5 | CLK (PS2C) | M16 |
| 6 | Reserved | — |



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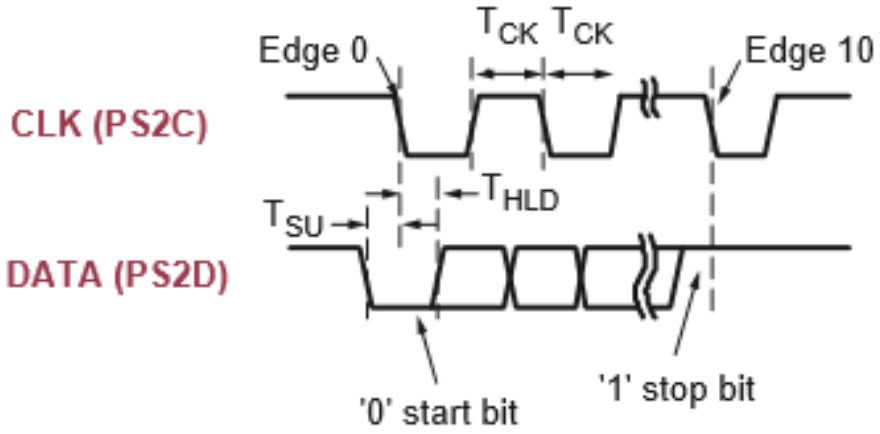
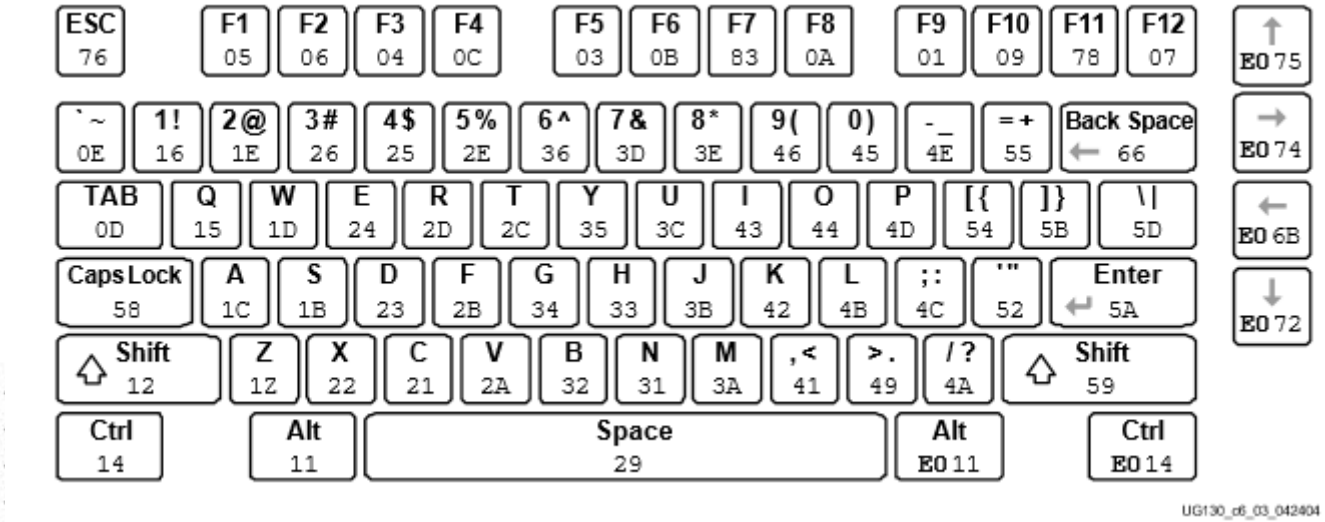
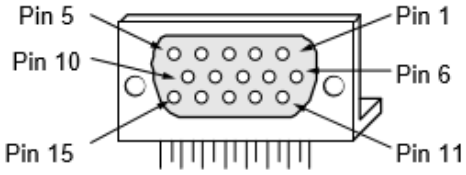


| Dec | Hx | Oct | Char | Dec | Hx | Oct | Html | Chr | Dec | Hx | Oct | Html | Chr | Dec | Hx | Oct | Html | Chr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 000 | NUL (null) | 32 | 20 | 040 |   | Space | 64 | 40 | 100 | @ | @ | 96 | 60 | 140 | ` | ` |
| 1 | 1 | 001 | SOH (start of heading) | 33 | 21 | 041 | ! | ! | 65 | 41 | 101 | A | A | 97 | 61 | 141 | a | a |
| 2 | 2 | 002 | STX (start of text) | 34 | 22 | 042 | " | " | 66 | 42 | 102 | B | B | 98 | 62 | 142 | b | b |
| 3 | 3 | 003 | ETX (end of text) | 35 | 23 | 043 | # | # | 67 | 43 | 103 | C | C | 99 | 63 | 143 | c | c |
| 4 | 4 | 004 | EOT (end of transmission) | 36 | 24 | 044 | $ | $ | 68 | 44 | 104 | D | D | 100 | 64 | 144 | d | d |
| 5 | | | | | | | | | | | | | E | 101 | 65 | 145 | e | e |
| 6 | | | | | | | | | | | | | F | 102 | 66 | 146 | f | f |
| 7 | | | | | | | | | | | | | G | 103 | 67 | 147 | g | g |
| 8 | | | | | | | | | | | | | H | 104 | 68 | 150 | h | h |
| 9 | | | | | | | | | | | | | I | 105 | 69 | 151 | i | i |
| 10 | | | | | | | | | | | | | J | 106 | 6A | 152 | j | j |
| 11 | | | | | | | | | | | | | K | 107 | 6B | 153 | k | k |
| 12 | | | | | | | | | | | | | L | 108 | 6C | 154 | l | l |
| 13 | | | | | | | | | | | | | M | 109 | 6D | 155 | m | m |
| 14 | | | | | | | | | | | | | N | 110 | 6E | 156 | n | n |
| 15 | | | | | | | | | | | | | O | 111 | 6F | 157 | o | o |
| 16 | | | | | | | | | | | | | P | 112 | 70 | 160 | p | p |
| 17 | | | | | | | | | | | | | Q | 113 | 71 | 161 | q | q |
| 18 | | | | | | | | | | | | | R | 114 | 72 | 162 | r | r |
| 19 | | | | | | | | | | | | | S | 115 | 73 | 163 | s | s |
| 20 | | | | | | | | | | | | | T | 116 | 74 | 164 | t | t |
| 21 | 15 | 025 | NAK (negative acknowledge) | 53 | 35 | 065 | 5 | 5 | 85 | 55 | 125 | U | U | 117 | 75 | 165 | u | u |
| 22 | 16 | 026 | SYN (synchronous idle) | 54 | 36 | 066 | 6 | 6 | 86 | 56 | 126 | V | V | 118 | 76 | 166 | v | v |
| 23 | 17 | 027 | ETB (end of trans. block) | 55 | 37 | 067 | 7 | 7 | 87 | 57 | 127 | W | W | 119 | 77 | 167 | w | w |
| 24 | 18 | 030 | CAN (cancel) | 56 | 38 | 070 | 8 | 8 | 88 | 58 | 130 | X | X | 120 | 78 | 170 | x | x |
| 25 | 19 | 031 | EM (end of medium) | 57 | 39 | 071 | 9 | 9 | 89 | 59 | 131 | Y | Y | 121 | 79 | 171 | y | y |
| 26 | 1A | 032 | SUB (substitute) | 58 | 3A | 072 | : | : | 90 | 5A | 132 | Z | Z | 122 | 7A | 172 | z | z |
| 27 | 1B | 033 | ESC (escape) | 59 | 3B | 073 | ; | ; | 91 | 5B | 133 | [ | [ | 123 | 7B | 173 | { | { |
| 28 | 1C | 034 | FS (file separator) | 60 | 3C | 074 | < | < | 92 | 5C | 134 | \ | \ | 124 | 7C | 174 | | | \| |
| 29 | 1D | 035 | GS (group separator) | 61 | 3D | 075 | = | = | 93 | 5D | 135 | ] | ] | 125 | 7D | 175 | } | } |
| 30 | 1E | 036 | RS (record separator) | 62 | 3E | 076 | > | > | 94 | 5E | 136 | ^ | ^ | 126 | 7E | 176 | ~ | ~ |
| 31 | 1F | 037 | US (unit separator) | 63 | 3F | 077 | ? | ? | 95 | 5F | 137 | _ | _ | 127 | 7F | 177 | &#127; | DEL |



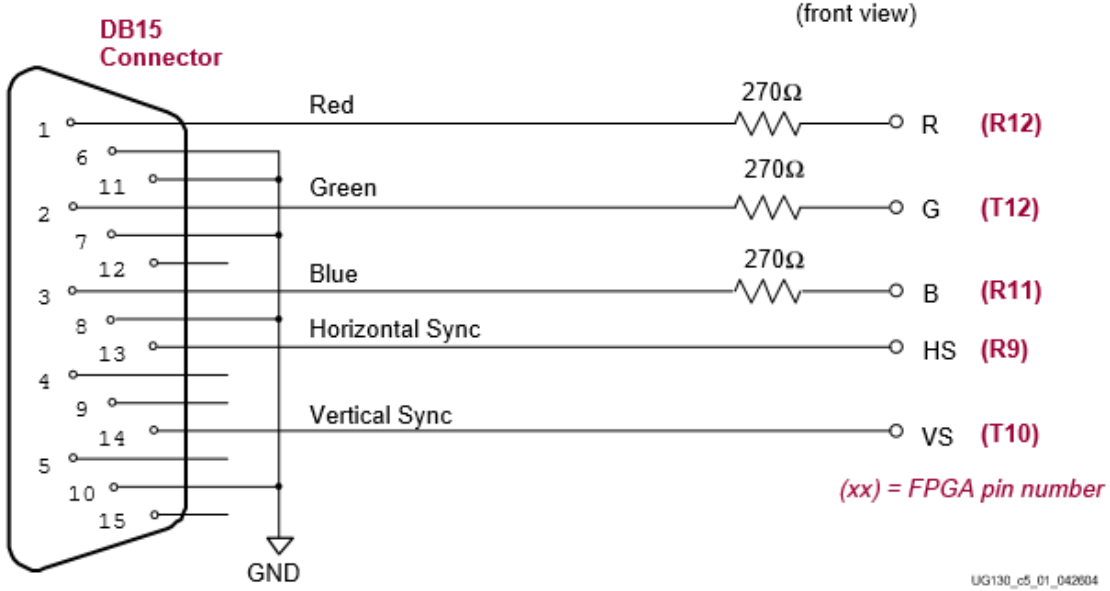
# VGA

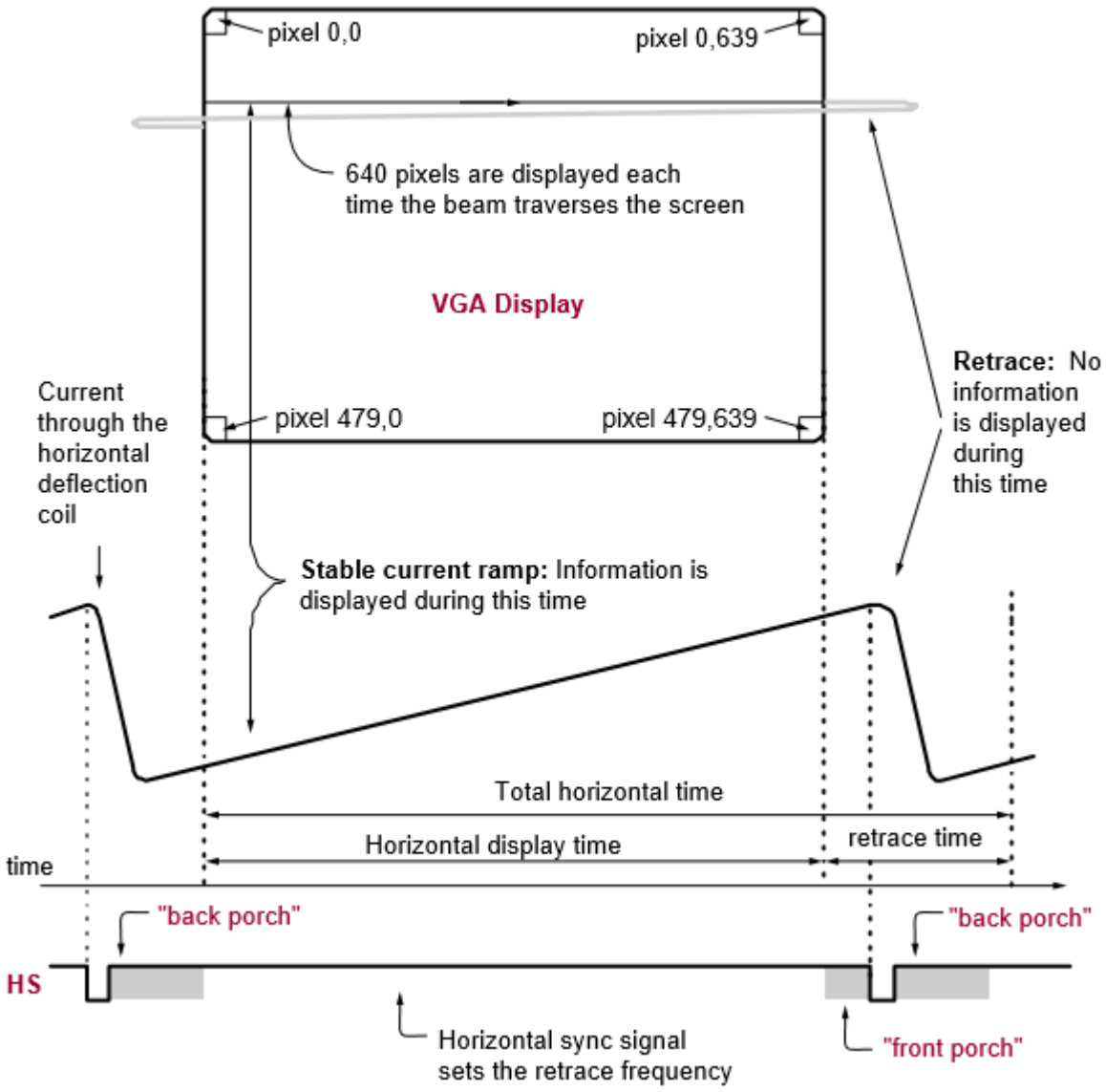
| Signal | FPGA Pin |
|---|---|
| Red (R) | R12 |
| Green (G) | T12 |
| Blue (B) | R11 |
| Horizontal Sync (HS) | R9 |
| Vertical Sync (VS) | T10 |

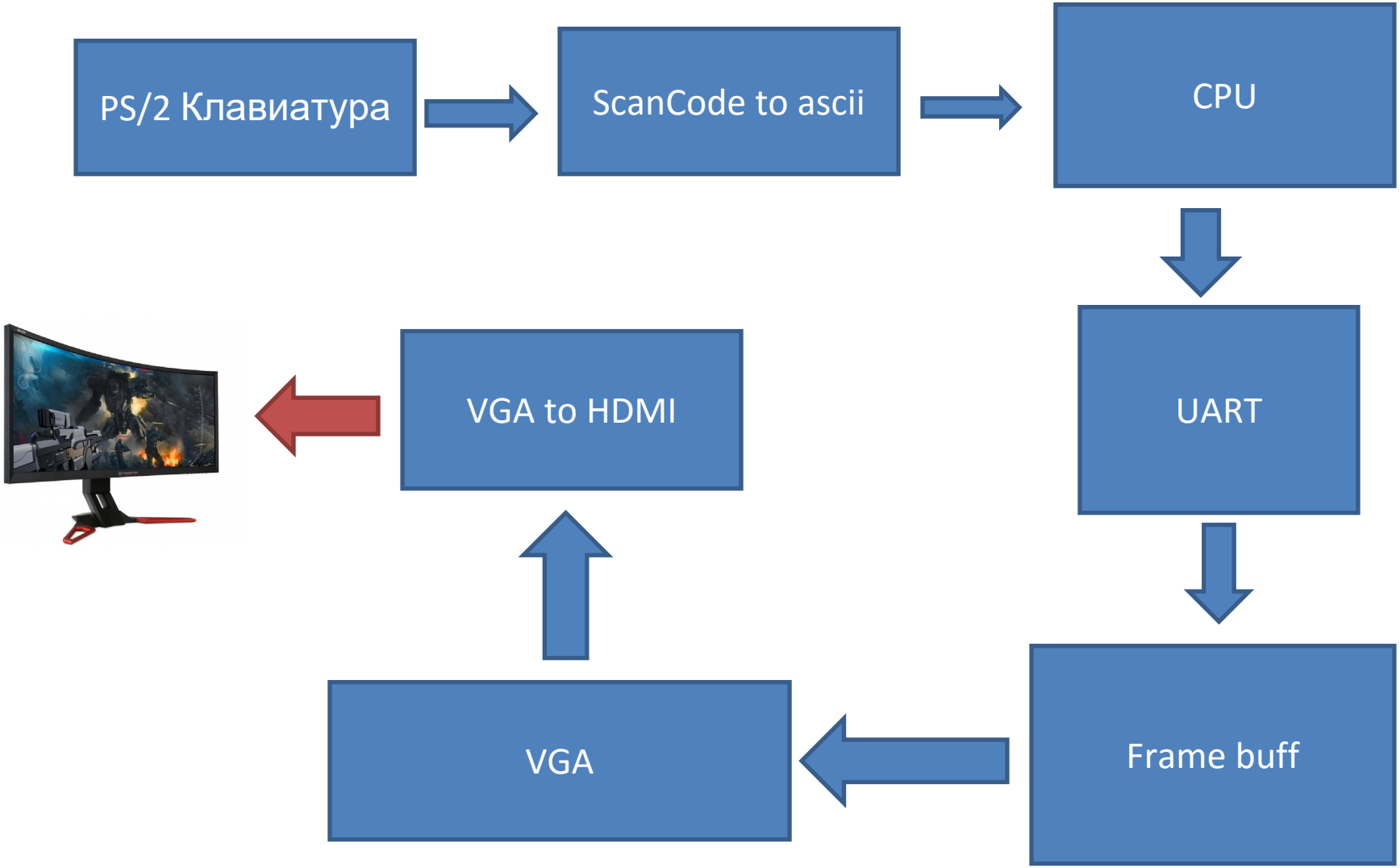



**DB15 VGA Connector**
(front view)

| Red (R) | Green (G) | Blue (B) | Resulting Color |
|---|---|---|---|
| 0 | 0 | 0 | **Black** |
| 0 | 0 | 1 | **Blue** |
| 0 | 1 | 0 | **Green** |
| 0 | 1 | 1 | **Cyan** |
| 1 | 0 | 0 | **Red** |
| 1 | 0 | 1 | **Magenta** |
| 1 | 1 | 0 | **Yellow** |
| 1 | 1 | 1 | **White** |




pixel 0,0
pixel 0,639
640 pixels are displayed each time the beam traverses the screen
VGA Display
pixel 479,0
pixel 479,639
Retrace: No information is displayed during this time
Current through the horizontal deflection coil
Stable current ramp: Information is displayed during this time
Total horizontal time
Horizontal display time
retrace time
time
"back porch"
"back porch"
HS
Horizontal sync signal sets the retrace frequency
"front porch"


PS/2 Клавиатура
ScanCode to ascii
CPU
UART
Frame buff
VGA
VGA to HDMI

Спасибо за внимание!!!