2. AVC-Lan - how it work ?

2.1 Transmission layer

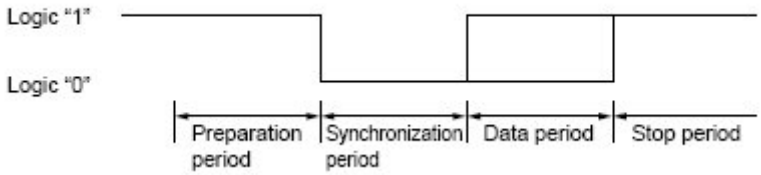
AVCLan is based on **IE-Bus (Electrical Interface Bus)** defined by NEC. **IEbus Description**
Devices made by NEC are very difficult (or just impossible) to purchase, so we need build own receiver for talking to AVC network. The NEC public datasheet for uProcessor and receiver where are informations how to IE-Bus work.
datasheet 1 **datasheet 2**
WIKI infopage
Most important informations:

IEBus Transmission Signal Format

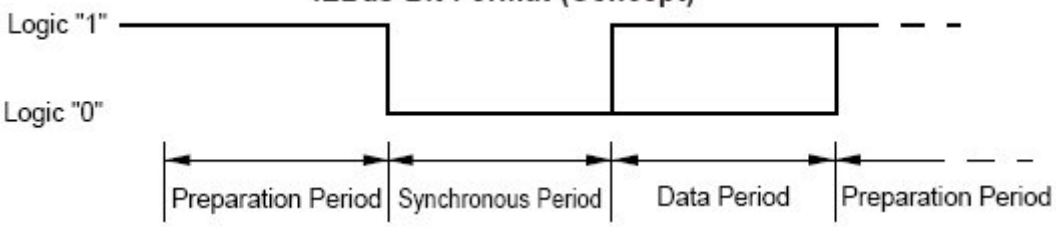
Header		Master address field		Slave address field			Control field			Telegraph length field			Data field					
Start bit	Broad-casting bit	Master address bit	P	Slave address bit	P	A	Control bit	P	A	Tele-graph length bit	P	A	Data bit	P	A	Data bit	P	A

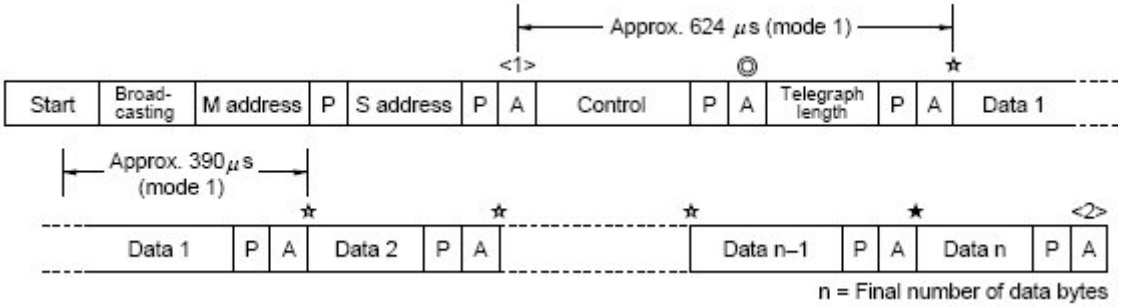
1. P: Parity bit, A: $\overline{\text{ACK}}$/NACK bit
2. The master station ignores the acknowledge bit during broadcasting communication.

Bit Format of IEBus



IEBus Bit Format (Concept)

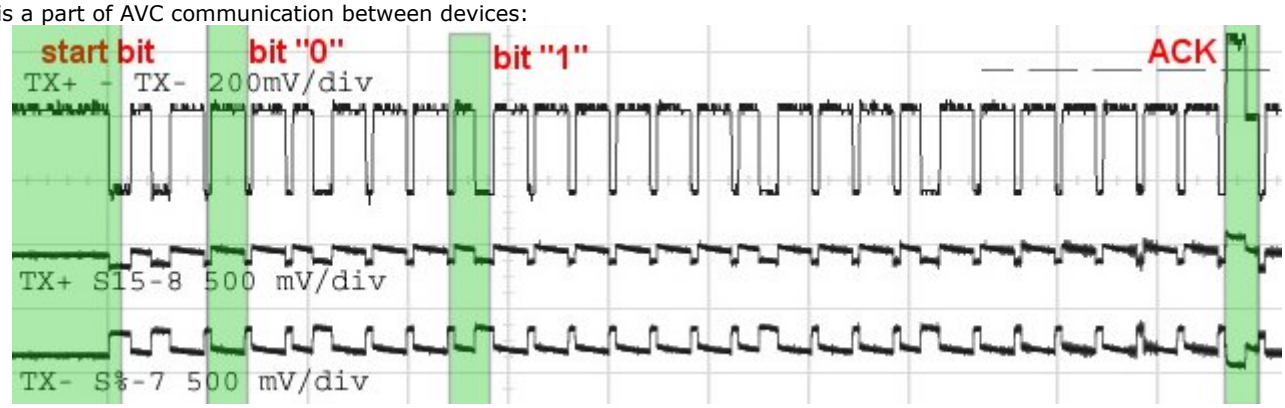




n = Final number of data bytes

After this, we know, that one single bit duration is about 39 uS.
(390us for 8 bit of data, 1 parity bit and 1 ACK bit : 390/10 = 39)

This is a part of AVC communication between devices:



Now, we can identity logic "0" and logic "1" by count time of duration high state of the transmission line.
Let single bit duration on the bus is 40 uS. Logic "0" is 33uS high and 7uS low, logic "1" is 20uS high and 20uS low.
I discover that on transmission layer AVC-Lan is the same as Pioneer (blue) IP-Bus.
(More information about other **CD Changer Protocols**)

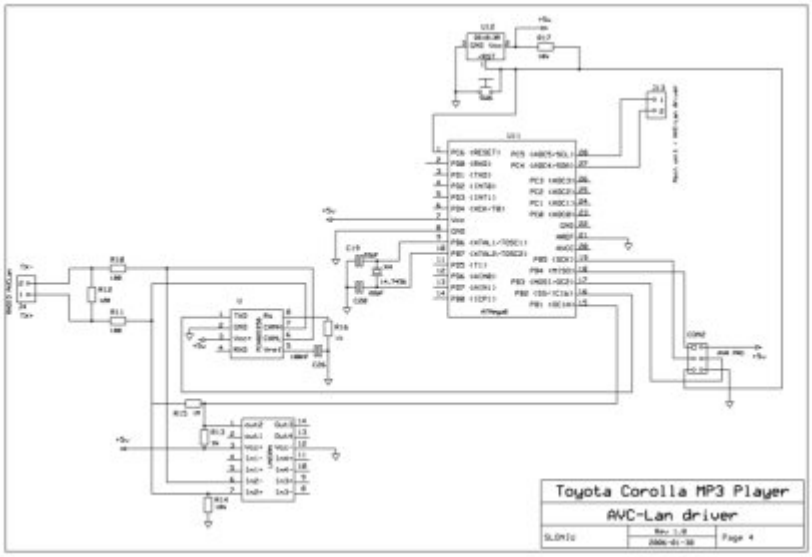
2.2 Hardware layer

Focus that minimal 'low' state is 2 uS ($\frac{2}{1\,000\,000}$ sec)! Is it short time? Yes, it is, but not in digital transmission world - read something about CAN network.

Relationship between IEBus Signals and Logical Statuses

Logical Status	IEBus Signals
0	(BUS+) – (BUS–) ≥ 120mV
1	(BUS+) – (BUS–) ≤ 20mV

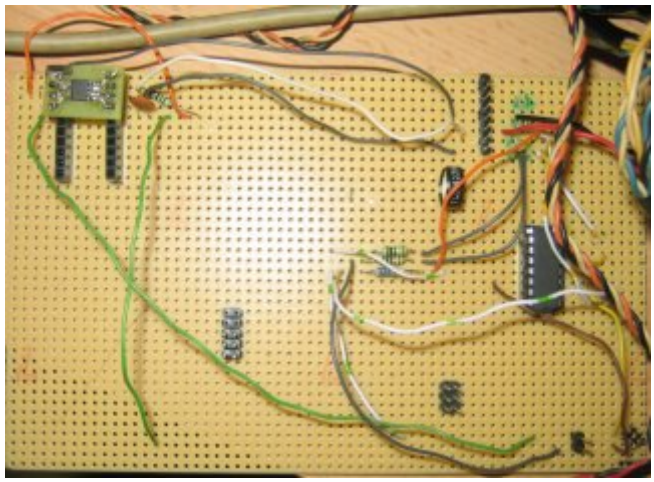
circuit



components

U - Atmega8
U - LN239N
U - PCA82C250
U - DS1813R (optional)
R - 2 x 180, 120, 1M, 3k, 2 x 10k
C - 2 x 22pF, 100nF
X - 14,7456 MHz

My experimental device and transmission part:



2.3 Protocol layer

Every device in network have unique address.
When single device have more functions, then additional 'logic id' exists.

table : **hardware address and device names**

110	EMV	120	AVX	128	1DIN TV
140	AVN	144	G-BOOK	160	AUDIO H/U
178	NAVI	17C	MONET	190	AUDIO H/U
1AC	CAMERA-C	180	Rr-TV	1C0	Rr-CONT
1C2	TV-TUNER2	1C4	PANEL	1C6	G/W
1C8	FM-M-LCD	1D8	G/W for Trip	1EC	Body
1F0	RADIO TUNER	1F1	XM	1F2	SIRIUS
230	TV-TUNER	240	CD-CH2	250	DVD-CH
280	CAMERA	360	CD-CH1	3A0	MD-CH
17D	TEL	440	DSP-AMP	530	ETC
5C8	MAYDAY	1A0	DVD-P	1D6	CLOCK
1F4	RSA	1F6	RSE	480	AMP
1CC	ST.WHEEL CTRL				

table : **logic device ID**

01	communication ctrl	58	navigation ECU	80	GPS receiver
21	SW	23	SW with name	25	command SW
12	communication	60	tuner	74	Audio amplifier
61	tape deck	62	CD	63	CD changer
34	front passenger monitor	24	SW converting	85	voice control
E5	Trip info	55	Bluetooth tel	56	information drawing
5D	Climate ctrl drawing	5E	Audio drawing	5F	trip info drawing
28	beep dev in HU	29	beep via speakers	E0	climate ctrl dev
5C	camera				

Example of command transmission (this it BEEP request , sent by EMV to DSP-AMP):

1	2	3	4	5	6	7	8	9	A	B
0x1	0x1	0x110	0x440	0xF	0x5	0x0	0x5E	0x29	0x60	0x1

1	start bit
2	regular command (not a broadcast)
3	master device address : EMV
4	slave device address: DSP-AMP
5	control field - WRITE data
6	length of data: 5 bytes
7	0x0 when device-to-device communication; nothing when broadcast
8	from logic device id
9	to logic device id
A	command
B-..	command parameters

logged command map *(all values in HEX format)*:

broadcast (C) going to LAN check mode

0 160 FFF F 3 0 1 C

broadcast (C) back from LAN check mode
0 160 FFF F 3 12 1 0

broadcast (C) LAN restart
0 160 FFF F 3 12 1 1

broadcast (C) any device is use
0 160 FFF F 3 12 1 46

broadcast (C) xx=60,61,62,63... logic device ID in use
0 160 FFF F 4 12 1 45 xx

broadcast (C) xx=frequency, yy=0 - radio is oFF, yy=1 - radio is ON
0 160 1FF F D 60 31 F1 yy yy 81 xx xx xx 81 0 80 0

broadcast (C) AF+REG enable
0 160 1FF F D 60 31 F1 1 1 81 0 1 1 81 10 80 0

broadcast (C) VOLUME vv=0-FF
0 160 1FF F F 74 31 F1 90 vv 10 10 10 10 10 0 0 0 3 0

broadcast (C) BASS bb=0B-15 : 0B=-5, 10=0, 15=+5
0 160 1FF F F 74 31 F1 90 vv 10 10 bb 10 10 0 0 0 3 0

broadcast (C) TREB tt=0B-15 : 0B=-5, 10=0, 15=+5
0 160 1FF F F 74 31 F1 90 vv 10 10 10 10 tt 0 0 0 3 0

broadcast (C) FADE ff=0B-15 : 0B=F5, 10=0, 15=R5
0 160 1FF F F 74 31 F1 90 vv 10 ff 10 10 10 0 0 0 3 0

broadcast (C) BALANCE bb=09-17 : 09=Left7, 10=0, 17=Right7
0 160 1FF F F 74 31 F1 90 vv bb 10 10 10 10 0 0 0 3 0

broadcast (C) TAPE IN
0 160 1FF F 7 61 31 F1 1 4 0 0

broadcast (C) TAPE PLAY
0 160 1FF F 7 61 31 F1 1 84 0 0

broadcast (C) DOLBY ON
0 160 1FF F 7 61 31 F1 1 84 0 2

broadcast (C) SKIP
0 160 1FF F 7 61 31 F1 1 84 40 0

broadcast (C) REVERSE
0 160 1FF F 7 61 31 F1 1 89 0 0

broadcast (C) FAST FORWARD
0 160 1FF F 7 61 31 F1 1 88 0 0

broadcast (C) REPEAT
0 160 1FF F 7 61 31 F1 1 84 10 0

broadcast (C) RANDOM
0 160 1FF F 7 61 31 F1 1 4 10 0

broadcast (C) TAPE EJECT
0 160 1FF F 7 61 31 F1 0 3 0 0

broadcast (C) NO TAPE

```
0   160   1FF   F   7   61   31   F1   0   0   0   0

        broadcast (C)                                   TAPE DECK not ready (??)
0   160   1FF   F   4   61   31   9F   0

        broadcast (C)                                   internal CD Player not ready (??)
0   160   1FF   F   B   62   31   F1   0   0   0   0   0   0   0   0

      device-to-device (P)                              request to play Beep tt=1-?? duration
1   110   440   F   5   0   5E   29   60   dd

      device-to-device (P)                              press on screen xx,yy - position xx=0-FF, yy=0-FF
1   110   178   F   8   0   21   24   78   xx   yy   xx   yy

      device-to-device (P)                      BALANCE slide d-direction d=9C up, d=9D down, r=1-4 relative pos.
1   190   440   F   5   0   25   74   d   r

      device-to-device (P)                              BALANCE bb=9-17
1   190   440   F   5   0   25   74   91   bb

      device-to-device (P)                              FADE ff=9-17
1   190   440   F   5   0   25   74   92   ff

      device-to-device (P)                              BASS bb=B-15
1   190   440   F   5   0   25   74   93   bb

      device-to-device (P)                              MID mm=B-15
1   190   440   F   5   0   25   74   94   mm

        broadcast (C)                   CD status: ss=10-play, ss=80-load, ss=01-open, ss=02=err1, ss=03-wait
                                        dd-disc no, tt-track no, mm-play time min., ee-play time sec
                                        pp=0-normal, pp=2-disc rand, pp=4-rand,pp=8-disc rep.,pp=10-rep.,pp=20-disc scan,
                                        pp=40-scan
1   360   1FF   F   B   63   31   F1   01   ss   dd   tt   mm   ee   pp   80
```

(C)-logged in Corolla, (P)-logged in Prius

Do you know more?

To be continued....

<< PREV.PAGE **NEXT PAGE >>**

HOME |**AVCLan** |**MP3** |**AUX input** |**lan sniffer** |**Users FORUM** | **OBD-II project** | **OBD-II v3 VIDEO Project** | **(new) FPGA VIDEO Project**

Where above informations are hidden.

AVC-Lan
- **Prius forum** | **Lexus forum** | **Sienna forum**

IE-Bus
- **NEC**

some CD changer bus
- **Mictronics** | **Vitat**

MP3 player
- **Yampp project**

If you have more information about AVCLan - MAIL: **SLONIU**