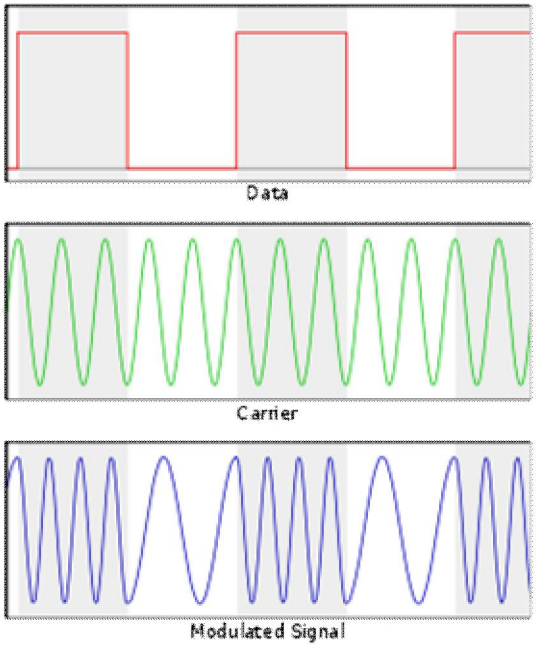
SIMPLE OSD AUDIO MODEM PROTOCOL DATASHEET

Audio FSK



Audio frequency-shift keying (AFSK) is a modulation technique by which digital data is represented by changes in the frequency (pitch) of an audio tone, yielding an encoded signal suitable for transmission via radio or telephone. Normally, the transmitted audio alternates between two tones: one, the "mark", represents a binary one; the other, the "space", represents a binary zero.

AFSK differs from regular frequency-shift keying in performing the modulation at baseband frequencies. In radio applications, the AFSK-modulated signal normally is being used to modulate an RF carrier (using a conventional technique, such as AM or FM) for transmission.

AFSK is not always used for high-speed data communications, since it is far less efficient in both power and bandwidth than most other modulation modes. In addition to its simplicity, however, AFSK has the advantage that encoded signals will pass through AC-coupled links, including most equipment originally designed to carry music or speech.

Applications

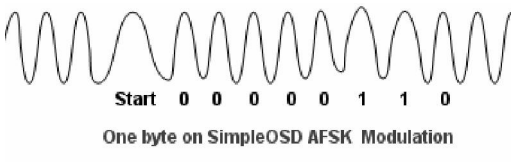
Most early telephone-line modems used audio frequency-shift keying to send and receive data, up to rates of about 300 bits per second. The common Bell 103 modem used this technique, for example. Even today, North American caller ID uses 1200 baud AFSK in the form of the Bell 202 standard. Some early microcomputers used a specific form of AFSK modulation, the Kansas City standard, to store data on audio cassettes. AFSK is still widely used in amateur radio, as it allows data transmission through unmodified voiceband equipment. Radio control gear uses FSK, but calls it FM and PPM instead.

AFSK is also used in the United States' Emergency Alert System to transmit warning information. It is used at higher bitrates for Weathercopy used on Weatheradio by NOAA in the U.S., and more extensively by Environment Canada.

SimpleOSD AFSK Stream

SimpleOSD uses AFSK method for send telemetry data to the ground over VideoTX's audio channel.

Typically one bytes looks like this(rigth) on SimpleOSD AFSK Stream. Carrier is 2100Hz and Byte starts with one 1300hz wave, SimpleOSD send data bits after the start bit. and it send minimum 10 carier wave(zero) before a new start bit.



One byte on SimpleOSD AFSK Modulation

SimpleOSD Telemetry Data Stream

SimpeOSD send 20 byte telemetry data for telemetry.

[0-3] Latitude (4 byte = 32 bit long integer of coordinates)
[4-7] Longitude (4 byte = 32 bit long integer of coordinates)
[8-9] Altitude (2 byte = 16 bit long integer of altitude)
[10] Heading Angle (multiply it with 1.4 for finding angle value)
[11] Battery 1 voltage (divide 10 for value, 111 mean 11.1Volt)
[12] Battery 1 voltage (divide 10 for value, 74 mean 7.4Volt)
[13] Current Sensor 1 (multiply with 0.4 for value, 101 mean 40.4Ah
[14] Current Sensor 2 (multiply with 0.4 for value, 101 mean 40.4Ah
[15] RSSI (It is percentage of maximum value, 35 mean %35)
[16] Speed (km/h)
[17] Line End 1 (value 10)
[18] Line End 2 (value 13)
[19] CRC (8 bit totals of first 19 btye)

Delphi Sample of CRC calculation

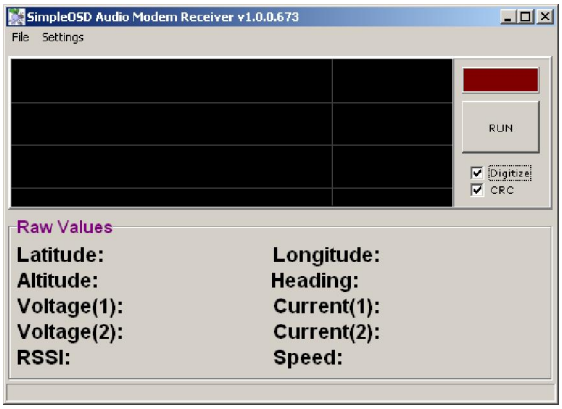
```
function crc_calculator(values: string) : integer;
var
i : integer;
crc : byte;
begin
crc :=0 ;

for i:=1 to length(values)-1 do
  begin
  crc := crc + ord(satir[i]);
  end;

crc_ calculator := crc;

end;
```

SimpleOSD Audio Modem Receiver



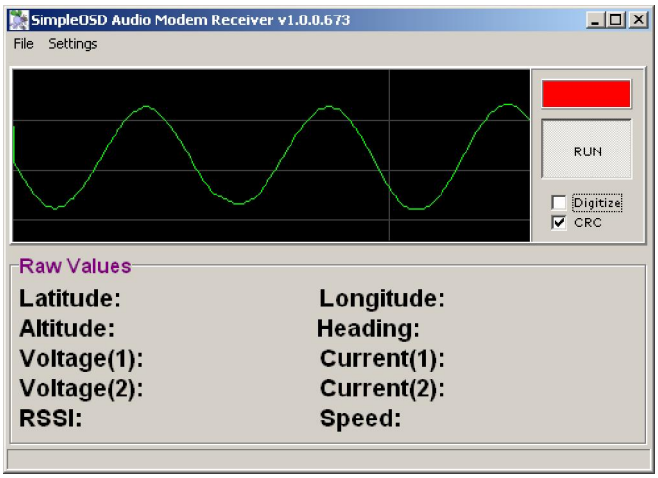
It is first audio modem receiver software over soundcard, this mean you dont need any external device or part for reading telemetry data on the ground station. It reducing cost of your FPV set and increasing the flexibility.

Tool reading AFSK waves from your microphone (or line-in) input and analysing it for byes and giving out from TCP 1976 port for external plugin softwares like google earth interfaces, data rcordars or flight gauges.

Follow this 3 easy steps for reading telemetry datas:

1. Power on SimpleOSD XL (ofcourse connect it's audio pin on your video TX's audio input.)
2. Connect your video receivers audio output on you computer's line-in or microhone input. You will hear the AFSK signals from your speaker. (if not, check your sound card's recorder input options)
3. Run the SimpleOSD Audio Modem Receiver software and press the RUN button.

Fine Tune:



- Every video receiver's have different output levels for audio signals and you must finetune it from your computer.
- Uncheck the Digitize check box. It will show audible signals on the screen.
- You should see full waves on the screen, if waves too small or overloaded it is affect your data quality.
- Open your sond card's "Recording Control" menu and change the Gain value for optimising the AFSK waves on acceptible wave size.Waves mus be smaller then oscilloscope screen height and higher than half of screen. %80 is best size for waves.
- Check Digitize check box after fine tuning.

Developing a Plugin for Audio Modem Receiver

Modem tool including very easy plugin system for all programming languages.
It opens Port 1976 on your computer like an TCP server application and sends 2 different streams for all client softwares/plugins.

$TELE,lat,lon,alti,heading,voltag1,voltage2,curren t1,current2,rssi, speed, #13 #10

$RAWS,byte0,byte1,byte2,byte3,byte4.....,byte16, #13 #10