CML Microcircuits

COMMUNICATION SEMICONDUCTORS

3rd September 2012

(CMX7011 – Demonstrator 3)

External routing of vocoder voice data using one PE0101-7011 evaluation kit

Introduction

This document is intended to assist with the evaluation and demonstration of the CMX7011 Digital Voice Processor and the real-time digital voice encryption Function Image™ 7011FI-1.2.x. It describes the use of the PE0002 Interface Card for easy connection to a computer via a USB cable and a single PE0101-7011 (CMX7011 evaluation kit) connected to the PE0002 C-BUS1 port.

General description

This script demonstrates the use of a single vocoder voice frame being routing to and from an external host, via C-BUS input/output buffers. Using a digital audio editing software such as Audacity®, allows the transmit signal to be saved and then played back to the device, to recover the analogue voice.

In reality up to four vocoder voice frames can be buffered and then routed to and from the host. In addition, a 'PTT Delay' can also be included to eliminate PPT voice clipping in a real application.

Transmit – Analogue voice applied to the mic input is vocoded, each voice frame is then passed to the C-BUS output buffer for transfer to a external host. A voice frame received in the C-BUS input buffer from the external host, is then passed to the audio-band modem where it is fed into an over-air protocol and the resulting signal presented at speaker output. This transmit signal would then, in a radio application, be inserted into the radio's audio Tx path.

Receive – The receive signal (encrypted modem data), in a radio application from the radio's audio Rx path, is applied to the mic input where each voice frame is passed to the C-BUS output buffer, for transfer to the external host. A voice frame received in the C-BUS input buffer from the external host is de-vocoded, converting it back to analogue voice and presented to the speaker output.

Note : The script uses a simple byte reversal technique in the external host function for demonstration purposes only.

© 2012 CML Microcircuits

Key Items Required

- 1 off PE0002 Interface card
- 1 off PE0101-7011
- USB audio card with mic/line and speaker connections
- 5V power supply
- Digital audio editor software such as Audacity® (http://audacity.sourceforge.net)
- PE0002 GUI Software - ES000243.exe
- Tx script - externalroutetx.pes
- Rx script - externalrouterx.pes
- Function Image 7011FI-1.2.x – (fi7011_1020.ped or later)
- Voice sound file example

Connection Diagram

Demonstration Procedure

1. Make connections as shown in the diagram
2. Turn on power supply
3. Setup signal levels
    a. Play audio level from USB sound card, should be ~ 2Vp-p
    b. Record level on the USB sound card should be set to prevent clipping
4. Run Audacity
    a. Setup to allow simultaneous play and record on the USB sound card
    b. Load in an appropriate sound file and set the project rate to say 44100Hz
    c. Use the time shift tool to delay the playback by approx. 5 seconds
    d. Run PE0002 GUI program (ES000243.exe)
5. Transmit operation
    a. Select 'Script handler' tab (PE0002 GUI program)
    b. Find folder where script files are located (> button)
    c. Click 'Select Script' button
    d. Select externalroutetx.pes and 'Open'
    e. Select 'Run' in the ES000243.exe window and follow on-screen instructions
        i. **Connect SPKR jack to line/mic input on computer** (should already be done)
        ii. **Invert byte order via external routing** – select yes
        iii. **Start Record** – select record in Audacity
        iv. Before the 5 second time-shifted sound file starts playing - press 'OK'
        v. **Stop generating FFSK** – press 'OK' after a short while to end transmission
        vi. Press Stop in Audacity - The transmit signal (modem data signal) is recorded and can be seen in the Audacity® window
6. Receive operation
    a. Click 'Select Script' button (PE0002 GUI program)
    b. Select externalrouterx.pes and 'Open'
    c. **Invert byte order via external routing** – select yes
    d. Press 'Run' button
    e. In Audacity®
        i. Mute original sound file
        ii. Select record – to simultaneously play the Tx modem signal and record the recovered analogue voice
    f. When 'End of Transmission' received press Stop in Audacity
    g. The original and recovered analogue voice signal can be played using the mute and play facilities within Audacity®.

Example Audacity Screen Shot

Original analogue voice

Tx signal (audio modem signal)

Recovered analogue voice in Rx

Recovered analogue signal with Tx and Rx script 'Invert byte' operations set differently