CML Microcircuits
COMMUNICATION SEMICONDUCTORS

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(CMX7011 – Demonstrator 1)
Digital voice scrambler for analogue radio using the PE0101-7010

Introduction

This document is intended to assist with the evaluation and demonstration of the CMX7011 Digital Voice Processor and the Digital Voice Scrambler Function Image™ 7011FI-1.0.0.0. It describes the use of the PE0002 Interface Card for easy connection to a computer via a USB cable and a single PE0101-7010 (CMX7011 demonstrator board) connected to the PE0002 C-BUS1 port.

General description

Scripts are provided to demonstrate digital voice scrambling functionality with the device. Using 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.

Transmit – Analogue voice applied to the mic input is digitised, scrambled and passed to the audio-band modem where it is fed into an over-air protocol and presented at the speaker output. This transmit signal would, in a radio application, then be inserted into the radio's audio Tx path.

Receive – The receive signal (scrambled modem data), in a radio application from the radio's audio Rx path, is applied to the mic input where it is descrambled, converted back to analogue voice and presented to the speaker output.

Key Items Required

- 1 off PE0002 Interface card
- 1 off PE0101-7010 (CMX7011 demonstrator board)
- 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 - Compstoretx.pes
- Rx script - Compstorerx.pes
- Function Image 7011FI-1.x – (fi7011_1000.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 compstoretx.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. **Start Record** – select record in Audacity
        iii. Before the 5 second time-shifted sound file starts playing - press 'OK'
        iv. **Stop generating FFSK** – press 'OK' after a short while to end transmission
        v. 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 compstorerx.pes and 'Open'
    c. Press 'Run' button
    d. In Audacity®
        i. Mute original sound file
        ii. Select record – to simultaneously play the Tx modem signal and record the recovered analogue voice
    e. Click 'Abort' when complete
    f. 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