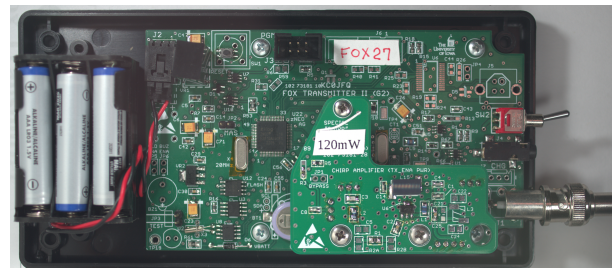


The ICARC FOX Transmitter System



The ICARC FOX Transmitter System
Transmitter Audio Clips

KC0JFQ: William Robison
<http://n952.ooguy.com/HamRDF/index.html>
http://icarc.org/icarc_foxhunt.htm
 File: fox`present`11.tex May 5, 2025



The ICARC FOX Transmitter System Transmitter Audio Clips

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File: fox`present`11.tex

May 5, 2025

└ Outline

Outline

Audio Waveform Data
FOX Binary Loader
Base Clips
Audio Group: Chirping
Audio Group: Field Day
Audio Group: Sing Sing
Audio Group: 2001: A Space Odyssey
Audio Group: Star Trek
Audio Group: More of The 3 Stooges
Audio Group: Operators Choice
Code Generation



Outline



Audio Waveform Data

FOX Binary Loader

Base Clips

Audio Group: Chirping

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Audio Group: Star Trek

Audio Group: More of The 3 Stooges

Audio Group: Operators Choice

Code Generation

The ICARC FOX Transmitter System

└ Audio Waveform Data

└ Audio Waveform Data

1. Notes for page **frame:Audio Waveform Data**.
2. Toolchain to get from 40KHz 16 bit stereo to 4KHz 8 bit mono.
3. Audio is stored external to the SOC (system on chip). We can use any audio source that can be converted to the needed sample width and data rate.
4. Bandwidth is low as that is all that is necessary for audio within the bandwidth limits of our VHF handheld radio.
5. Other than the clips mentioned on the following pages, you are free to choose your own names assuming they don't overflow the directory records in which they are stored. That is 32 bytes for TALK=, the filename, and the starting point in the FLASH.

Audio Waveform Data

Size limit imposed by FLASH device and FRAM device
 8Mb or larger FLASH; 256Kb or larger FRAM
 FRAM needs 32 bytes per directory entry
 FLASH needs 4,000 or 5,000 bytes per second of audio

AUDACITY audio editor; extract utterances

SOX audio format conversion; down sample to 4000 rate

audio_util convert from .wav to InTel HEX

fox_binary fast loader; InTel HEX to target

Audio Source your choice
 Target audio file must be:
 RIFF/WAVE need the .WAV header
 mono single DAC in Tx
 8-bit DAC width in Tx
 Sample rate 4KHz or 5KHz

Audio Waveform Data



Size limit imposed by FLASH device and FRAM device

8Mb or larger FLASH, 256Kb or larger FRAM

FRAM needs 32 bytes per directory entry

FLASH needs 4,000 or 5,000 bytes per second of audio.

AUDACITY audio editor; extract utterances

SOX audio format conversion; down sample to 4KHz rate

audio_util convert from .wav to InTel HEX

fox_binary fast loader; InTel HEX to target

Audio Source your choice

Target audio file must be:

RIFF/WAVE	<i>need the .WAV header</i>
mono	<i>single DAC in Tx</i>
8-bit	<i>DAC width in Tx</i>
Sample rate	<i>4KHz or 5KHz</i>

1. Notes for page **frame:FOX Binary Loader**.
2. Other than the clips mentioned on the following pages, you are free to choose your own names assuming they don't overflow the directory records in which they are stored. That is 32 bytes for **TALK=**, the filename, and the starting point in the FLASH.
3. Toolchain to get from 40KHz 16 bit stereo to 4KHz 8 bit mono.

**High Speed FRAM/FLASH loader utility.**

This utility implements a binary load protocol to speed up loading of the FLASH memory.

Works equally well loading FRAM.

Load speed improvement here too!

Loads command sequence files (plain text)

Loads audio clips (InTeL HEX files)

FOX Binary Loader

**High Speed FRAM/FLASH loader utility.**

This utility implements a binary load protocol to speed up loading of the FLASH memory.

Works equally well loading FRAM.

Load speed improvement here too!

Loads command sequence files (plain text)

Loads audio clips (InTeL HEX files)

1. Notes for page **frame:Base Clips**.
2. Numbers, units, and the like.
3. Namespace defined in zNEO program, have to use it the way the program flash defines it or you don't get a vocalization
4. small subset of commands can use the audio clips. TALK and BATTERY condition come to mind.

Fixed namespace of audio utterances**Vocalize system status** (battery, etc.)

Numbers 0 through 9
Channel name, volts, milliamps, point
Small subset to announce operating frequency

Example use **BATV V 7.2**

Vocalize station identity

Callsign
Nickname
May want to load all nicknames everywhere!
Example use **TALK <CALL>** and **TALK <NAME>**

Base Clips

**Fixed namespace of audio utterances****Vocalize system status** (battery, etc.)

Numbers 0 through 9

Channel name, volts, milliamps, point

Small subset to announce operating frequency

Example use **BATV V 7.2**

Vocalize station identity

Callsign

Nickname

May want to load all nicknames everywhere!

Example use **TALK <CALL>** and **TALK <NAME>**

1. Notes for page **frame:Fixed Namespace**
2. Top half of the slide are the names that **must** appear exactly as shown. The filenames are fixed in the zNEO firmware.
3. The bottom half of the slide are the nicknames and callsigns. Callsign must match exactly for vocalization and station identification to work correctly. There is string substitution happening to allow the callsign to be assigned in **one command** in the **INI=** file.
4. The nicknames must match those defined in the **INI=** file. In this example I simply called the FOX1, FOX2, etc. Just running up the number line. Most of the FOX1 through FOX19 units exist but are no longer used.
5. For convenience (the audio filesystem is shared between all units) all nicknames are loaded.
6. The RIFF/WAVE header has all the information about the audio we need to process it.

Fixed Namespace



BATTI "Battery Current"
BATTV "Battery Voltage"
REG5 "Regulated 5V"

POINT "Point"
V_MAMP "Milliamps"
V_VOLTS "Volts"

V_HZ "Hertz"
V_KHZ "Kilohertz"
V_MHZ "Megahertz"

V_N0 "Zero"
V_N1 "One"
V_N2 "Two"

V_N3 "Three"
V_N4 "Four"
V_N5 "Five"

V_N6 "Six"
V_N7 "Seven"
V_N8 "Eight"

V_N9 "Nine"

V_F144 "One forty four point"
V_F145 "One forty five point"
V_F200 "Two Hundred"
V_F225 "Two Hundred twenty five"
V_F250 "Two Hundred fifty"
V_F275 "Two Hundred seventy five"
V_F300 "Three Hundred"
V_F325 "Three Hundred twenty five"
V_F350 "Three Hundred fifty"
V_F375 "Three Hundred seventy five"

FOX20 "Fox twenty"
FOX21 "Fox twenty one"
FOX22 "Fox twenty two"
FOX23 "Fox twenty three"
FOX24 "Fox twenty four"
FOX25 "Fox twenty five"
FOX26 "Fox twenty six"
FOX27 "Fox twenty seven"
FOX28 "Fox twenty eight"
FOX29 "Fox twenty nine"

FOX30 "Fox thirty"
FOX31 "Fox thirty one"
FOX32 "Fox thirty two"
FOX33 "Fox thirty three"
FOX34 "Fox thirty four"
FOX35 "Fox thirty five"
FOX36 "Fox thirty six"
FOX37 "Fox thirty seven"
FOX38 "Fox thirty eight"
FOX39 "Fox thirty nine"

W0JV "Whiskey Zero Juliet Victor"

KC0JFQ

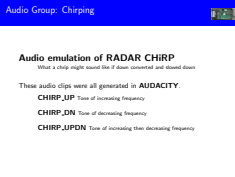
"Kilo Charlie Zero Juliet Foxtrot Quebec"

The ICARC FOX Transmitter System

└ Audio Group: Chirping

└ Audio Group: Chirping

1. Continuation for page **frame:Fixed Namespace**
2. Sample rates of 4K, 5K, 8K, and 16K can be processed. Only 4K and 5K make sense for use in the Fox Transmitter.
3. The other rates are there to support some other projects that make use of the 102-73181-10 circuit board.
4. Some of the larger FLASH devices take forever to erase. They'll erase correctly, but you can't access them during the erase cycle. They will look like they died. Just give 'em time.
5. The FRAM doesn't need to be erased (it is a RAM, after all). Just send an updated image using the *fox.binary* loader and you're set. This assumes you keep everything well managed on the host system.
6. Notes for page **frame:Audio Group: Chirping**
7. This set of clips is used to implement a mode where carrier is suppressed between the "chirps". This is a chicken-shit simulation of real RADAR chirping.



Audio Group: Chirping



Audio emulation of RADAR CHiRP

What a chirp might sound like if down converted and slowed down

These audio clips were all generated in **AUDACITY**.

CHIRP_UP Tone of increasing frequency

CHIRP_DN Tone of decreasing frequency

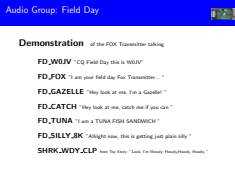
CHIRP_UPDN Tone of increasing then decreasing frequency

The ICARC FOX Transmitter System

└ Audio Group: Field Day

└ Audio Group: Field Day

1. Notes for page **frame:Audio Group: Field Day**
2. Although we are, for the most part, talking about the voice capability of the Fox Transmitter, keep in mind that we can freely intermix code (**CODE text to send**) and voice (**TALK file to send**)
3. We are also free to switch between FM (**CONF FM**) and CW (**CONF CW**) mode of operation.
4. The **CONF FM** command tells the handlers to keep the carrier on throughout the message (i.e. between **BEGN** and **DONE** commands).
5. The **CONF CW** command tells the handlers to interrupt the carrier when not actively sending voice waveform or dit/dah (kinda like full break-in) codewords.
6. Notes for page **frame:Audio Group: Sing Sing**
7. This is an old 3-Stooges comedy sketch. If you remember Dr. Max, you'll remember this sketch.



Audio Group: Field Day



Demonstration of the FOX Transmitter talking

FD_W0JV "CQ Field Day this is W0JV"

FD_F0X "I am your field day Fox Transmitter... "

FD_GAZELLE "Hey look at me, I'm a Gazelle! "

FD_CATCH "Hey look at me, catch me if you can "

FD_TUNA "I am a TUNA FISH SANDWICH "

FD_SILLY_8K "Alright now, this is getting just plain silly "

SHRK_WDY_CLP from Toy Story: "Look, I'm Woody; Howdy,Howdy, Howdy, "

The ICARC FOX Transmitter System

└ Audio Group: Sing Sing

└ Audio Group: Sing Sing

1. Continuation for page **frame:Audio Group: Sing Sing**
2. Shemp finds a playbill for *Svengali* the hypnotist and tells Moe, he can perform a hypnosis just as well.
3. Away we go. Shemp hypnotises Moe, having him believe he is in Los Angeles.
4. Moe, plays along and admits to being in Los Angeles.
5. Shemp takes a step to the left and tells Moe: "You are now in New York".
6. Moe follows to the left and replies" "I am now in New York".
7. Well, Shemp take Moe upsate to Sing Sing, where New Yous correctional facility is located: "You are now in Sing Sing".
8. Moe picks up a straight back chair, holds it in front of his face (jail bars) and makes the move to Sing Sing.
9. Shemp now moves to Boston: "You are now in Boston".



Audio Group: Sing Sing



The 3 Stooges The SING SING sketch

TS_1 Shemp: "You are now in Los Angeles "

TS_1R Moe: "I am now in Los Angeles "

TS_2 Shemp: "You are now in New York "

TS_2R Moe: "I am now in New York "

TS_3 Shemp: "You are now in Sing Sing "

TS_3R Moe: "I am now in Sing Sing "

TS_4 Shemp: "You are now in Boston "

The ICARC FOX Transmitter System

└ Audio Group: 2001: A Space Odyssey

└ Audio Group: 2001: A Space Odyssey

1. Continuation for page **frame:Audio Group: Sing Sing**
2. Moe with the chair still in place and replies "I am now in Sing Sing". to Sing Sing.
3. Shemp, rather flustered by this point has the chair mercilessly smashed over his head and they carry on with the episode...
4. This sketch is implemented on two Fix Transmitters. One voices the Shemp part, and the other voices the Moe part.
5. The clocks need to have been set the night before for this to work correctly.
6. Notes for page **frame:Audio Group: 2001: A Space Odyssey**
7. For HAL9000 fans...

Audio Group: 2001: A Space Odyssey



HAL 9000

2K1_H_9000 "I am a HAL9000 computer "
 2K1_FOOLPROOF "We are all, by any practical definition of the word foolproof... "
 2K1_HUMAN_ERR "This ... has cropped up before,... always due to human error "
 2K1_GD_EVE "Good Evening Dave, everything is running smoothly "
 2K1_CHESS2 "Would you like to play a game of chess "
 2K1_ENJOYA "Thank you for a very enjoyable game "
 2K1_JUST_MOM "I know it's a bit silly, just a moment... "
 2K1_MSG_4_U "There is a message for you "
 2K1_MSG_REP "Do you want me to repeat the message "
 2K1_DANGER "Do you think there is danger here "
 2K1_IGNIT "Ignition, full thrust "

Audio Group: 2001: A Space Odyssey



HAL 9000

2K1_H_9000 "I am a HAL9000 computer "

2K1_FOOLPROOF "We are all, by any practical definition of the word foolproof... "

2K1_HUMAN_ERR "This ... has cropped up before,... always due to human error "

2K1_GD_EVE "Good Evening Dave, everything is running smoothly "

2K1_CHESS2 "Would you like to play a game of chess "

2K1_ENJOYA "Thank you for a very enjoyable game "

2K1_JUST_MOM "I know it's a bit silly, just a moment... "

2K1_MSG_4_U "There is a message for you "

2K1_MSG_REP "Do you want me to repeat the message "

2K1_DANGER "Do you think there is danger here "

2K1_IGNIT "Ignition, full thrust "

The ICARC FOX Transmitter System

└ Audio Group: Star Trek

└ Audio Group: Star Trek

1. Notes for page **frame:Audio Group: Star Trek**
2. For Star Trek fans...

Audio Group: Star Trek

Kirk and Spock

TREK_ABSORPT "You are ordered to accompany us to the absorption chambers "

TREK_AYE_SIR "Mister Scott, ready the transporter "

TREK_ENERGY "Pure energy, pure thought, totally incorporeal... "

TREK_GREETIN "Greetings and Felicitations "

TREK_HAILING "Hailing frequencies are open "

TREK_MCCOY_ "What am I? A doctor or a moon shuttle conductor "

TREK_QUESTION "Since before your sun burned host in space... "

TREK_SQRE_NOST "I fail to understand your romantic nostalgia for such a place "

TREK_SQRE_UNUS "Unusual captain, I'm now getting... "

TREK_YELLOW "This is the captain, condition Yellow Alert "

Audio Group: Star Trek



Kirk and Spock

TREK_ABSORPT "You are ordered to accompany us to the absorption chambers "

TREK_AYE_SIR "Mister Scott, ready the transporter "

TREK_ENERGY "Pure energy, pure thought, totally incorporeal... "

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TREK_SQRE_UNUS "Unusual captain, I'm now getting... "

TREK_YELLOW "This is the captain, condition Yellow Alert "

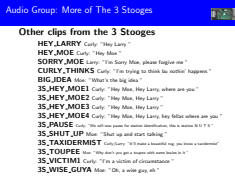


The ICARC FOX Transmitter System

└ Audio Group: More of The 3 Stooges

└ Audio Group: More of The 3 Stooges

1. Notes for page **frame:Audio Group: More of The 3 Stooges**
2. And a few more 3 stooges clips...



Audio Group: More of The 3 Stooges



Other clips from the 3 Stooges

HEY_LARRY Curly: "Hey Larry"

HEY_MOE Curly: "Hey Moe"

SORRY_MOE Larry: "I'm Sorry Moe, please forgive me"

CURLY_THINKS Curly: "I'm trying to think bu nothin' happens"

BIG_IDEA Moe: "What's the big idea"

3S_HEY_MOE1 Curly: "Hey Moe, Hey Larry, where are you"

3S_HEY_MOE2 Curly: "Hey Moe, Hey Larry"

3S_HEY_MOE3 Curly: "Hey Moe, Hey Larry"

3S_HEY_MOE4 Curly: "Hey Moe, Hey Larry, hey fellas where are you"

3S_PAUSE Curly: "We will now pause for station identification, this is station N U T S"

3S_SHUT_UP Moe: "Shut up and start talking"

3S_TAXIDERMIST Curly/Larry: "It'll make a beautiful rug, you know a taxidermist"

3S_TOUPEE Moe: "Why don't you get a toupee with some brains in it"

3S_VICTIM1 Curly: "I'm a victim of circumstance"

3S_WISE_GUYA Moe: "Oh, a wise guy, eh"





Fill in the blanks

Make your own vocalizations to meet your needs.

Name " "

Name " "

Name " "

Name " "

Name " "

Name " "

Audio Group: Operators Choice



Fill in the blanks

Make your own vocalizations to meet your needs.

Name " "

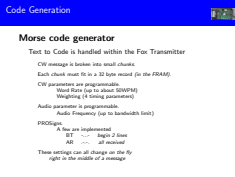
Name " "

Name " "

Name " "

Name " "

Name " "



1. Continuation for page **frame:Code Generation**
2. All other timing specifications are in terms of **dits**.
3. Typical command is **CWPM 35,1,3,7,14**.
4. CWPM is the command to set code parameters.
5. 35 is the word rate we send at (*sets the interrupt rate*).
6. 1 is quiet spacing between individual dit/dah.
7. 3 is quiet spacing between letters.
8. 7 is spacing between words.
9. 14 is spacing after sentence (i.e. after period).
10. ISR runs at rate determined by the **WPM** selection.
11. All other timings are a result of counting interrupts.

Code Generation



Morse code generator

Text to Code is handled within the Fox Transmitter

CW message is broken into small *chunks*.

Each *chunk* must fit in a 32 byte record (*in the FRAM*).

CW parameters are programmable.

Word Rate (up to about 50WPM)

Weighting (4 timing parameters)

Audio parameter is programmable.

Audio Frequency (up to bandwidth limit)

PROSigns.

A few are implemented

BT -...- *begin 2 lines*

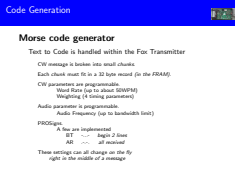
AR .-.-. *all received*

These settings can all change *on the fly*
right in the middle of a message

The ICARC FOX Transmitter System

└ Code Generation

└ Code Generation



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11. All other timings are a result of counting interrupts.

Scary Notes for the Presenter

PAY NO ATTENTION TO THE MAN BEHIND THE CURTAIN!

Notes for the terminally forgetful

Here we go again!

-Dolly Parton

Reformat the PDF, expanding it to about 80% of the page:

```
gs -sDEVICE=pdfwrite \
    -dDEVICEWIDTHPOINTS=499 \
    -dDEVICEHEIGHTPOINTS=634 \
    -dCompatibilityLevel=1.4 \
    -dNOPAUSE \
    -dBATCH \
    -dPDFFitPage \
    -sOutputFile=fox_Print_11.pdf \
    fox_present_11.pdf
```

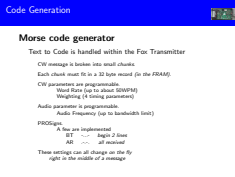
Reformat PDF file to PS file for printing

```
pdftops -paper letter \
    fox_Print_11.pdf \
    fox_Print_11.ps
```

The ICARC FOX Transmitter System

└ Code Generation

└ Code Generation



1. Continuation for page **frame:Code Generation**
2. All other timing specifications are in terms of **dits**.
3. Typical command is **CWPM 35,1,3,7,14**.
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5. 35 is the word rate we send at (*sets the interrupt rate*).
6. 1 is quiet spacing between individual dit/dah.
7. 3 is quiet spacing between letters.
8. 7 is spacing between words.
9. 14 is spacing after sentence (i.e. after period).
10. ISR runs at rate determined by the **WPM** selection.
11. All other timings are a result of counting interrupts.

Test Print

Verify Margins (for 3-hole punch)

Verify orientation (running from 3-ring binder???)

```
lp -d HP_LaserJet_M209 \
    -o portrait \
    -o media=letter \
    -o sides=two-sided-long-edge \
    -P 1,2 \
    fox_Print_11.ps
```

Print it with the presenter notes (at the end)

```
lp -d HP_LaserJet_M209 \
    -o portrait \
    -o media=letter \
    -o sides=two-sided-long-edge \
    fox_Print_11.ps
```

Before we begin

Please feel free to ask questions.

I'll try to give an overview of the audio clips I have rate-shifted and loaded into FLASH memory.

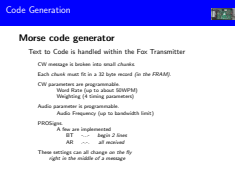
Minimum FLASH for what I have here is 8mB.

Most of the boards have a 64mB FLASH device that will hold a bit over 30 minutes of audio at a 4KHz rate.

The ICARC FOX Transmitter System

└ Code Generation

└ Code Generation



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10. ISR runs at rate determined by the **WPM** selection.
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Notes for page 5 FOX Binary Loader.

Life began using an InTeL HEX file to load the FLASH memory (command decode recognizes HEX record as special case). Gawd this is sloooooooooow.

Implement a simple protocol to send binary data over the coimunications channel with handshake to program the FLASH. Uses same *guts* for FRAM and FLAH so we get really fast FRAM loads for free :-)