

Atari 2600

Knox Game Design

August 2026

Overview

- Processor
 - 6507 – derivative of 6502 processor
- Assembler
 - DASM by Matt Dillon 1988
- Emulators
 - Stella
 - Z26
 - expects game files on be on same drive as home directory OR specify game file on command line
 - can install with RetroArch

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OpCodes

- These will look familiar to NES 6502 OpCodes
 - LDX
 - INX
 - STX
 - LDY
 - INY
 - STY
 - LDA
 - STA
- These will look familiar to NES registers
 - X, Y, A

Differences from NES 6502

- Not all 6502 assemblers are the same
- Headers
 - macro.h
 - vcs.h
- Symbols
 - StartOfFrame
 - VBLANK
 - COLUBK
 - WSYNC
- Keywords
 - REPEAT, REPEND
- TIA (Television Interface Adaptor) registers
- NTSC resolution: 160x192 Atari, 256x240 NES
- Graphics: TIA Atari, PPU NES

Assemble

- dasm is the assembler executable
- -I path to header files
- -o output file
 - Recommend using *a26* extension, otherwise some emulators won't recognize it

```
START OF PASS: 1
back to: src\atari00\test.asm
back to: src\atari00\test.asm

-----
SEGMENT NAME          INIT PC  INIT RPC  FINAL PC  FINAL RPC
-----
RIOT                   [u] 0280             0280
TIA_REGISTERS_READ     [u] 0000             0000
TIA_REGISTERS_WRITE    [u] 0000             0000
INITIAL CODE SEGMENT   0000 ????             0000 ????
-----

3 references to unknown symbols.
0 events requiring another assembler pass.

--- Symbol List (sorted by symbol)
0.FREE_BYTES           0000
AUDC0                   0015
AUDC1                   0016
AUDF0                   0017
AUDF1                   0018
AUDV0                   0019
AUDV1                   001a
COLUBK                  0009          ( R )
COLUP0                  0006
COLUP1                  0007
COLUPF                  0008
CTRLPF                  000a
CXBLPF                  0006
CXCLR                   002c
CXMF0B                  0004
CXMF0P                  0000
CXMF1B                  0005
CXMF1P                  0001
CXP0FB                  0002
CXP1FB                  0003
CXPPMM                  0007
ENABL                   001f
ENAM0                   001d
ENAM1                   001e
GRP0                    001b
GRP1                    001c
HMBL                    0024
HMCLR                   002b
HMM0                    0022
HMM1                    0023
HMOVE                   002a
HMP0                    0020
HMP1                    0021
```

```
INPT0                   0008
INPT1                   0009
INPT2                   000a
INPT3                   000b
INPT4                   000c
INPT5                   000d
INTIM                   0284
NUSIZ0                  0004
NUSIZ1                  0005
PF0                     000d
PF1                     000e
PF2                     000f
REFP0                   000b
REFP1                   000c
RESBL                   0014
Reset                   f000          ( R )
RESM0                   0012
RESM1                   0013
RESMP0                  0028
RESMP1                  0029
RESP0                   0010
RESP1                   0011
RSYNC                   0003
StartOfFrame            f000          ( R )
SWACNT                  0281
SWBCNT                  0283
SWCHA                   0280
SWCHB                   0282
T1024T                  0297
TIA_BASE_ADDRESS        0000          ( R )
TIA_BASE_READ_ADDRESS   0000          ( R )
TIA_BASE_WRITE_ADDRESS  0000          ( R )
TIM1T                   0294
TIM64T                  0296
TIM8T                   0295
TIMINT                  0285
VBLANK                  0001          ( R )
VDELBL                  0027
VDELP0                  0025
VDELP1                  0026
VERSION_MACRO            006d
VERSION_VCS             006a
VSYNC                   0000          ( R )
WSYNC                   0002          ( R )
--- End of Symbol List.

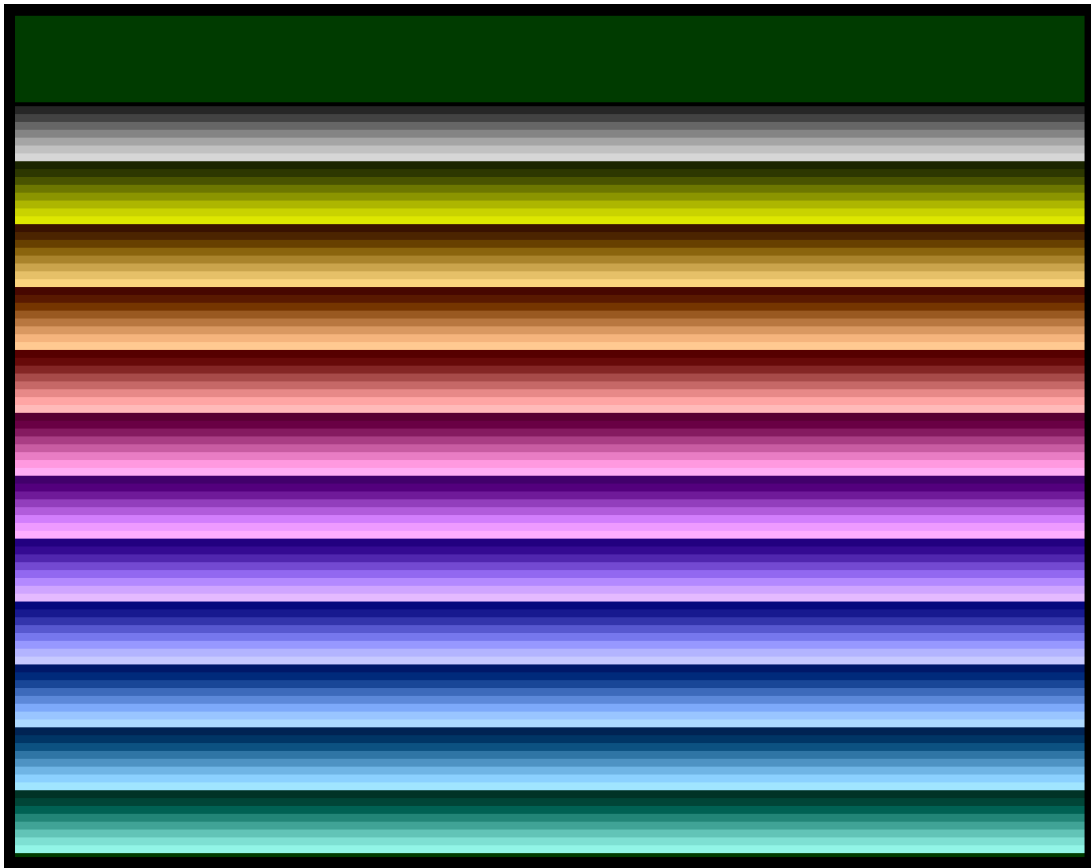
Complete. (0)
```

```
>.\dasm-2.20.14.1-win-x64\dasm src\atari00\test.asm -I.\dasm-2.20.14.1-win-x64\machines\atari2600 -ltest.txt -f3 -v5 -oatari00.a26
```

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Run test game file in emulator

```
>.\z26_407_win10\z26 atari00.a26
```



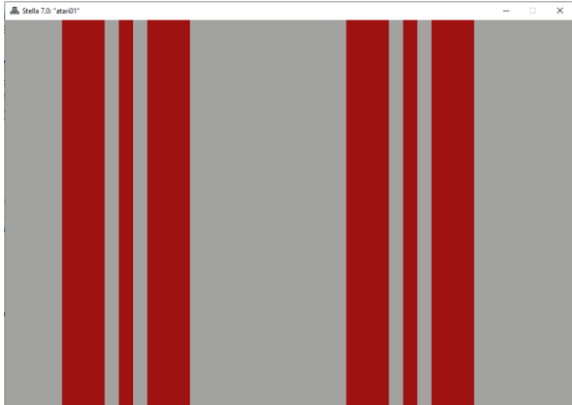
- First step is to verify that you can create an Atari 2600 ROM file from 6502 assembly code
- Start with assembly from *Session 8: Our First Kernel*
- Verify that it runs in an emulator

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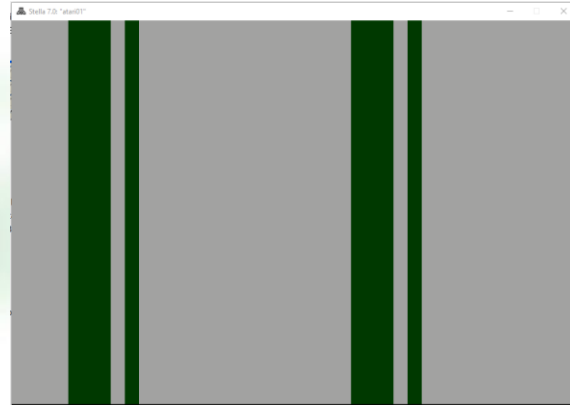
KNOX in Morse Code

- Using *Symmetric Playfield* drawing method
- Left playfield side is copied (or mirrored) to right side
- Three playfield data registers: PF0, PF1, PF2
- Playfield color is set in COLUPF

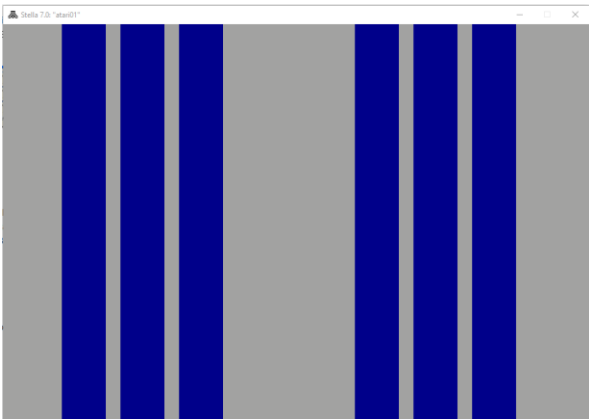
K



N



O



X



NTSC palette [\[edit \]](#)

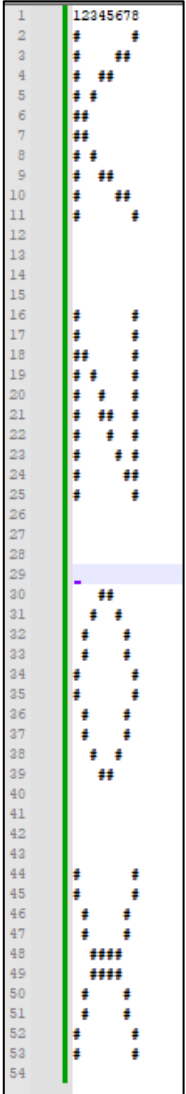
luminance hue	0	2	4	6	8	10	12	14
0								
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								

Atari Color code table

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Displaying KNOX

- Using *Asymmetric Playfield* drawing method
- Helper script pf_gen.py to generate playfield data based on text file
- 192 total horizontal lines
- only displaying on strip 1



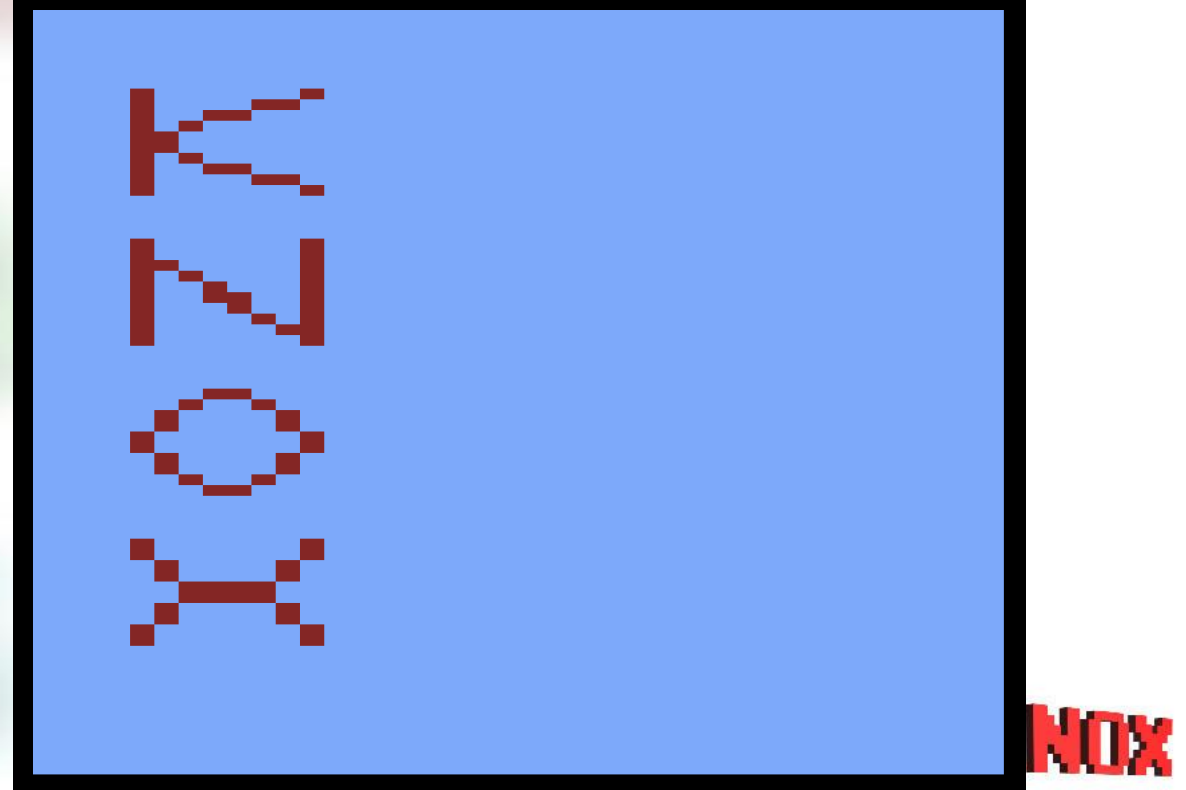
```
#2026 Levi D. Smith for Knox Game Design - August 2026
f = open("knox.txt")

data = f.readlines()
int_data = []

for i in range(len(data)):
    if i == 0:
        continue
    val = data[i].rstrip()
    val = val.replace('#', '1')
    val = val.replace(' ', '0')
    val = val.ljust(8, '0')
    val = int(val, 2)
    int_data.append(val)

while(len(int_data) < 192):
    int_data.append(0)

for i in range(6):
    print(f"knox_STRIP_{i}")
    for j in range(192):
        if i == 1:
            print(f".byte {int_data[j]}")
            print(f".byte {int_data[j // 3]}")
        else:
            print(" .byte 0")
    ~
```

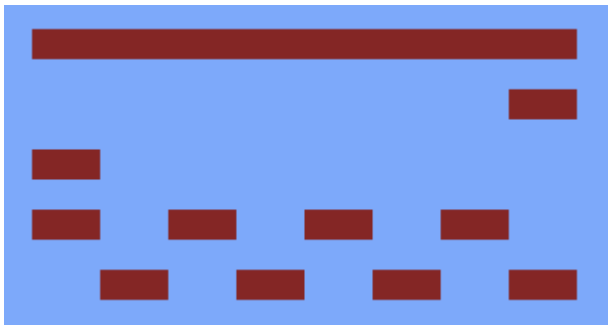


Note – in the example, we are repeating each line 3 times with // 3

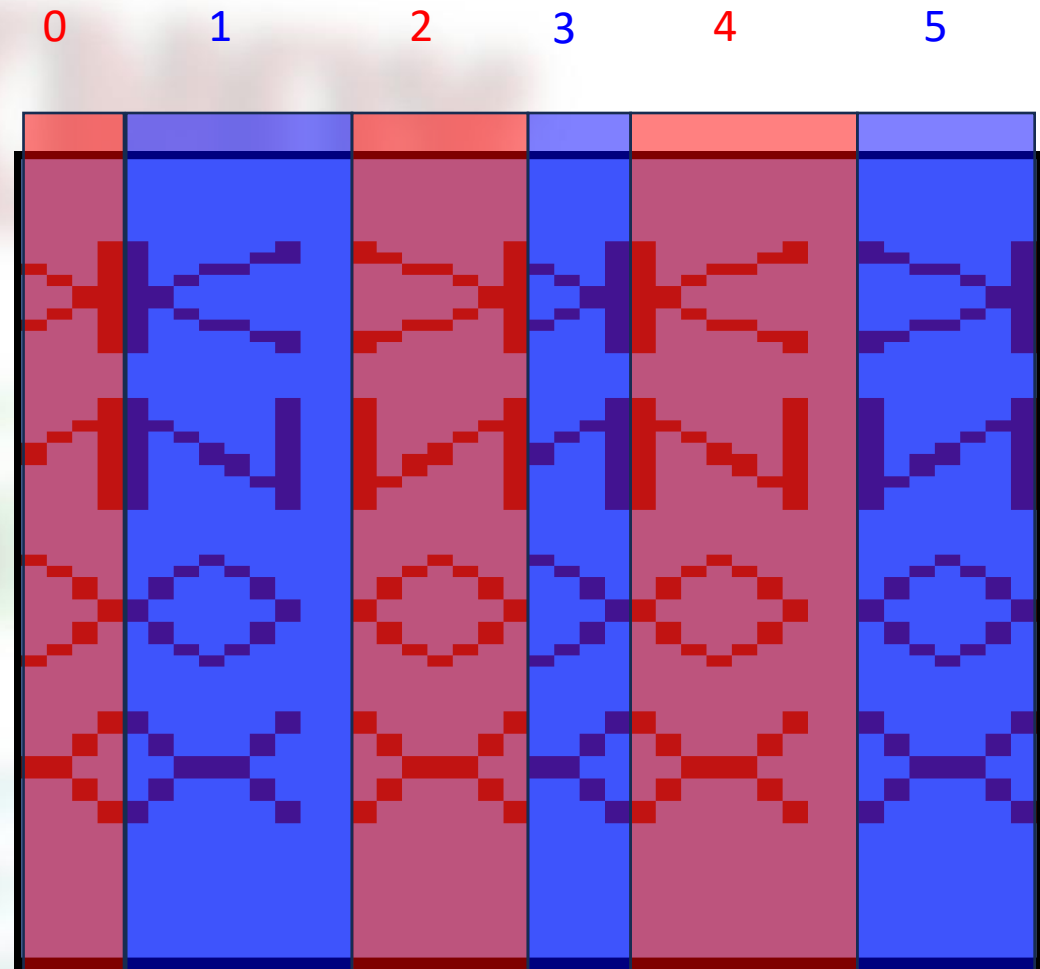
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Playfield strips

- 6 playfield strips
- Each strip is 1 byte (8 bits)
 - 0 – first 4 bits (reverse bit order)
 - 1 – all 8 bits (in bit order)
 - 2 – all 8 bits (reverse bit order)
 - 3 – first 4 bits (reverse bit order)
 - 4 – all 8 bits (in bit order)
 - 5 – all 8 bits (reverse bit order)



11111111 = 255
00000001 = 1
10000000 = 128
10101010 = 170
01010101 = 85



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