OSI Challenger Audio Cassette Interface

The Challenger audio cassette interface is located on an OSI 430 board. The interface should not be connected until the user has inter- faced a keyboard and display and has become familiar with the operation of OSI 65V monitor.

The audio cassette interface uses the popular "Kansas City Standard" 300 baud two tone system. The interface is the speed dependent type, that is, it is somewhat sensitive to tape recorder speed. For this reason, it should be used with medium or high quality audio tape recorders. The Panasonic Model RQ-309 recorder works well with this interface and usually retails for $39.95.

The connections to audio cassette are via the 12 pin Molex connector along the edge of the board. Pin 1 of this connector is the pin closest to the right angle mounting bracket. Audio cables should be soldered directly to the male connector supplied with the board.

The tape recorder's 8 ohm speaker output or auxilary output signal should be connected to pin 6 and that cable's shield or ground should be connected to pin 2. The recorder's microphone input can be connected to pin 8 or its auxilary input can be connected to pin 7 (NOT BOTH!!). The shield or ground of this cable should be connected to pin 11.

Operating Tips:

1. The cassette recorder should be operating from 110 VAC not batteries.

2. The playback volume on small portable recorders should be mid-range.

3. Use only short length high-quality cassettes. Memorex MRX$_2$ C-30s are recommended.

<u>Use with OSI Auto-Load Tapes:</u>

OSI 65V's load command transfers control from the keyboard to audio cassette. This allows the tape to build a complete operating system without operator intervention. The typical format for auto-load tapes is the CRT simulator routine, checksum loader, and then the program of interest (such as BASIC).

<u>To use Auto-Load tapes, simply do the following:</u>

1. Turn the computer and tape recorder on.

2. Reset the computer.

3. Rewind the tape and start playing it.

4. As soon as the white leader on the tape is passed by the tape head, press the "L" key on the keyboard.

5. The rest is automatic!

After typing an "L", nothing will happen for five to ten seconds. Then, you will see a program being loaded in 65V format starting at OEXX typically. After a few more seconds, this program will auto-execute and you will see a checksum format load taking place via the CRT routine.

This load may take several minutes depending on the length of the program. The program may auto-execute or return to the monitor if operator intervention is required. If a loading error occurs during the checksum load operation, "ERR" will be typed out and the load will stop. The re-entry point will be set up automatically. If you notice the error within a few seconds of its occurance, simply stop the recorder, rewind the recorder for a few seconds (depending on how far past the error you have gone), start playing the tape, and type a "G". If you are unsure about this process, simply start the load over again from system reset.

OSI 6502 Life

Purpose:

     To play Horton Conway's game of life as described in the
"Mathematical Games" department of Scientific American
(during the winter of 1970-1971). The program requires
4K of memory at OXXX and a 440 Video Board at DXXX with a keyboard
set up for the 65V monitor or a teletype set up for the 65A.
     Two programs are provided. With one version, all the user
program I/O is done on a teletype with the pattern of the Life
game appearing on the screen via the video board. The second
version uses a dialog between the user's keyboard and the
screen display. Documentation is in two parts. Please read
both because similarities are not repeated in the teletype
version documentation.

Starting Address:
     Ø2ØØ for both versions

OSI Life 440 Keyboard Version

Memory Allocation:
     Program uses Ø2ØØ to Ø5C8 and ØA2Ø to ØA72 for executable statements.
Locations ØØ to 14 on page zero are also used. The matrix is
stored in locations Ø6ØØ to Ø9FF. The program loads zeros in
memory locations between Ø5DØ to Ø9FF. (The program listing shows
ØØs between ØAØØ and ØA1F-- the user must place these here).

External Subroutine Calls
     The program assumes that at location 1E43 there is a
keyboard input routine for the 440 board and an output routine at
1EE6. These I / O routines are present in the OSI Extended
Video Monitor and must be present. The subroutines are available
separately.

INCH Calls	OUTCH Calls
ØA61	ØA52
Ø2ØC	Ø224
Ø23D	Ø2A8
Ø2C3	Ø423
	Ø428
	Ø42D
	Ø4F1

Use
     Start the program at Ø2ØØ. It will ask for a timing constant
(a number from 1-99) For a 1us cycle time machine, 1 means
that there will be a 1/100 second delay between generations
while 99 means a 99/100 second delay.
     Next, the points for the initial pattern are requested. They
are represented as coordinate pairs (eg. 01,02 or 1F,1D) where
the first number represents X(horizontal) and the second number
represents Y (vertical). The origin is at the lower left hand
corner of the screen.   As soon as the program has the coordinate,
it plots the point and erases the numbers the user typed as
coordinates. The user can continue to enter

points in this manner* When the user decides to exit this input
mode, a "$" is typed. (note: coordinates are in hex)
    This places the user in command mode. Any key may be
depressed during or before each generation. Non-command keys
are ignored.

Commands

    C - Causes the generation cycle to start or continue
    E - Causes the program to exit, i.e., to jump to Monitor
         (Vector is at Ø25Ø. It currently jumps to 1A7A, the
         extended Video Monitor Starting address. The user may
         wish to modify this).
    R - Jump to the beginning of this program and start over.
    P - Freezes pattern so you may view it for extended
        time period.

    During the input mode, the user can type a"(", after which, the
program accepts a four digit absolute hexadecimal address where it
will start to take ASCII codes right out of memory instead of from
the keyboard until it finds an ASCII 21 (an !). It then returns
to normal keyboard control. This permits the user to store
patterns in memory.
    These patterns may be stored by starting Life at ØA5Ø. It
will type a"(" and will accept a four digit absolute hexadecimal
address where it will start to store the ASCII codes which follow.
The user then types in coordinates in exactly the same manner as
he would during normal input mode. The only difference is that
these will be stored in memory. When "!" is typed, the program
returns to the monitor (vector at ØA7Ø is 1A7A also). To use this
pattern, simply type "(nnnn" to the input mode and it will accept
those input characters instead and will return to the input mode
when finished (nnnn is the location of the pattern in memory where
each n represents one hexadecimal digit, which together, form an
absolute memory address).

Life Teletype Version

Memory Allocation

    The program uses Ø2ØØ to Ø5AØ for executable statements. It
also uses ØØ to 14 on page zero. The matrix is stored in Ø6ØØ to
Ø9FF. The program clears memory between Ø5DØ and ØAFF when initialized.

External Sbroutine calls

    The program assumes that an OSI 65A is present at FEØØ and
that a teletype is available, that is, that INCH and OUTCH
are used.

INCH Call Locations	OUTCH Call Locations
Ø2ØC	Ø224
Ø23D	Ø2A8
Ø2C3	

* All non-hexadecimal characters are ignored.

The program can be modified to use different INCH/OUTCH subroutines. However, the program requires an ACIA at FC∅∅ despite the changes in these I/O calls. Otherwise, there is no way to stop the generation cycle (aging cycle).

Use

Use of this version is the same as for the Video Keyboard Version. However, the memory storage of patterns option is not available since tape storage is available here. Otherwise, entering of patterns is the same as with the keyboard version. (See sample output)

LIFE SAMPLE OUTPUT

```
   -LIFE-
ENTER TIMING CONSTANT (1 TO 99): 1
INPUT POINTS AS
X1,Y1 X2,Y2                             R-Pentomino
X3,Y3...$
10,10 10,0F 0F,0F 10,0E 11,10$
AVAILABLE COMMANDS:
C - CONTINUE
E - EXIT
P - PAUSE
R - RESTART

TYPE ANY DURING AGING
LIFE>C
LIFE>R
   -LIFE-
ENTER TIMING CONSTANT (1 TO 99): 99       Pulsar  CP 48-56-72
INPUT POINTS AS
X1,Y1 X2,Y2
X3,Y3...$
0E,10 0F,10 0C,10 0D,10 10,,10 10,11 0C,11
$
AVAILABLE COMMANDS:
C - CONTINUE
E - EXIT
P - PAUSE
R - RESTART

TYPE ANY DURING AGING
LIFE>C
LIFE>P
LIFE>C
LIFE>T?
LIFE>C
LIFE>E
```

"Life" Video Version

```
P0200
20 28 04 49 30 20 EF 02
A9 00 85 04 20 43 1E C9
0D F0 0F 1E 2A 2A 2A 2A
A0 04 24 26 0A 88 D0 FA
F0 EA A9 0A 20 E6 1E 4C
00 03 A9 5E EA EA EA 4C
38 02 AD 01 DF EA 30 23
A9 5E 20 EF 02 20 43 1E
C9 52 F0 3C C9 43 F0 13
C9 50 F0 EC C9 45 D0 03
4C 7A 1A A9 3F EA EA EA
4C 38 02 20 0A 04 20 00
05 20 EB 03 4C 32 02 A9
06 85 05 85 07 A9 1F 85
06 A9 20 85 04 A9 00 48
AA 91 00 91 02 81 04 81
06 18 A5 04 69 20 85 04
90 03 E6 05 18 A5 06 69
20 85 06 90 02 E6 07 C8
8A C0 1F D0 DC 60 20 1D
04 EA B1 98 C9 5F F0 08
20 E6 1E E6 08 4C A2 02
60 20 C3 02 0A 0A 0A 0A
85 13 20 C3 02 29 0F 18
65 13 60 20 43 1E 4C 20
0A 00 C9 30 30 F5 C9 47
10 F1 C9 40 30 03 18 69
09 60 BA E8 E8 9A 4C 2A
02 18 69 30 0D 0D C8 60
91 0D 0D E6 0D 4C 9E 48
20 D0 03 6F 4C 9E 02 00
00 00 00 00 00 00 00 00
R
```

```
P0300
20 3C 03 20 4B 03 A9 C4
20 EF 02 20 B1 02 85 11
20 31 02 85 12 49 06 85
0E A9 00 85 0D A5 11 20
EE 04 A9 1F 38 E5 12 A8
F0 08 A9 20 20 00 04 88
D0 F8 A9 80 91 0D 20 54
03 4C 06 03 A9 05 85 0E
A9 DD 20 F1 03 98 91 0D
A9 01 20 00 04 A5 0E C9
0A D0 F2 60 10 A9 06 85
84 0D 42 20 20 8A 03 8A
91 0F B1 0D 10 04 49 2A
91 0F E6 0E 02 E6 10
E6 0D D0 EA 0E A9 EA D4
C5 10 D0 E3 20 8B 03 EA
EA EA 60 40 00 20 B4 03
EA A9 D0 85 0E A2 01 B5
0B 48 44 44 44 20 20 E1
02 68 29 0F 20 E1 02 CA
10 ED 69 A9 00 85 03 85
0C 4C 54 03 A9 D0 85 0E
A9 84 85 0D A9 4C 20 E8
02 A9 49 20 E8 02 A9 46
20 E8 02 A9 45 4C F6 03
A9 04 85 09 60 00 00 A5
0A A2 08 A9 FF 88 D0 FD
CA D0 F8 E9 20 54 03 D7
D0 EF 60 A0 00 60 20 E8
03 85 0D A0 00 85 0D 00
02 A9 98 85 0D 60 00 00
R
```

```
P0400
18 65 0D 85 0D 90 02 E6
0E 60 A9 00 85 00 49 06
85 01 A9 E1 85 02 A9 09
85 03 4C 67 02 A0 00 85
08 A9 80 20 E6 1E A9 0A
4C E6 1E A9 81 4C E6 1E
0D 0A 20 20 2D 4C 49 46
45 2D 0D 0A 45 4D 49 45
52 20 4F 4E 49 4D 54 20
20 43 4F 4C 4C 41 31 20
54 28 29 3A 29 20 5F 0A
39 39 3A 20 41 4C 41 42
41 56 20 4C 4C 4D 41 4C
45 20 4F 4D 4D 54 41 4E
44 53 0A 54 54 20 20 53
20 20 0A 45 54 45 20 45
45 0A 55 54 55 20 20 45
5A 49 54 55 0A 50 20 20
20 50 41 53 20 20 45 20
52 52 20 53 52 45 53 0A
41 52 52 20 45 53 53 54
00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00
46 45 3E 5F 49 4E 50 49
54 20 5F 4F 49 4E 54 55
20 41 53 0A 4E 4E 2C 53
20 2E 2E 5A 33 2C 59 59
0D 0A 5A 24 24 0D 0A 5F
2E 2E 20 20 5F 4C 32 49
0D 20 20 E6 1E 68 4C 3E
F3 4F E1 AB 23 18 00 54
R
```

P0500
```
A9 06 85 0E A9 00 85 0D
38 A5 0D E9 21 85 0F A5
0E E9 00 85 10 A0 00 A2
00 B1 0F 10 01 E8 C8 B1
0F 10 01 E8 C8 B1 0F 10
01 E8 A0 20 B1 0F 10 01
E8 C8 C8 B1 0F 10 01 E8
A0 40 B1 0F 10 01 E8 C8
B1 0F 10 01 E8 C8 B1 0F
10 01 E8 A0 21 8A 18 71
0F 91 0F E6 0D D0 B1 E6
0E A5 0E C9 0A D0 A9 A9
06 85 0E A9 00 85 0D A8
B1 0D 10 0F 29 0F C9 04
10 04 C9 02 10 0B 98 91
0D F0 0A 29 0F C9 03 D0
F5 A9 80 91 0D E6 0D D0
DF E6 0E A5 0E C9 0A D0
D7 F8 18 A5 0B 69 01 85
0B A5 0C 69 00 85 0C D8
60 84 17 A0 00 B1 15 E6
15 D0 02 E6 16 C9 21 D0
15 A9 43 8D C4 02 A9 1E
8D C5 02 A9 06 8D 3A 03
BA E8 E8 4C 48 0A A4 17
60 00 00 00 00 00 00 20
R
```

P0A00
```
00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00
C9 24 D0 03 4C DA 02 C9
28 F0 03 4C CA 02 20 B1
02 85 16 20 B1 02 85 15
A9 A1 8D C4 02 A9 05 8D
C5 02 A9 08 8D 3A 03 BA
E8 E8 E8 E8 9A 4C 39 03
A9 28 20 E6 1E 20 B1 02
85 16 20 B1 02 85 15 A0
00 20 43 1E 91 15 E6 15
D0 02 E6 16 C9 21 D0 F1
4C 7A 1A 00 00 00 00 00
R
```

LIFE PATTERNS:

```
C0B00   -   PULSAR CP 48-56-72
C0B1D   -   R-PENTOMINO
C0B32   -   BARBER POLE
C0B73   -   FIGURE 8
C0B8C   -   PI
C0BD9   -   GLIDER
```

P0B00
```
30 45 31 30 30 46 31 30
30 43 31 30 30 44 31 30
31 30 31 30 31 30 31 31
30 43 31 31 21 31 30 31
30 31 30 30 46 30 46 30
46 31 30 30 45 31 31 31
30 21 31 30 31 30 31 30
31 32 30 45 31 32 30 45
31 34 30 43 31 34 30 43
31 36 30 42 31 37 30 41
31 37 30 41 31 36 31 32
31 30 31 32 30 45 31 34
30 45 31 34 30 43 31 35
30 42 31 36 30 42 31 36
30 43 21 30 46 31 30 30
45 31 30 30 44 31 30 30
44 31 31 30 45 31 31 30
46 31 31 30 46 31 32 30
45 31 32 30 44 31 32 31
30 30 46 31 31 30 46 31
32 30 46 31 32 30 45 31
31 30 45 31 30 30 45 31
30 30 44 31 31 30 44 31
32 30 44 21 31 30 31 30
31 31 31 30 30 46 31 30
30 46 30 46 30 46 30 45
31 31 30 46 31 31 30 45
21 30 35 31 38 30 34 31
38 30 33 31 38 30 35 31
39 30 34 31 41 21 00 00
00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00
R
```

OSI 11679 HAYDEN STREET HIRAM, OHIO 44234

"Life" TTY Version

```
P0200
42 28 9A A9 30 20 EF 02
A9 00 85 0A 20 00 FE C9
0D F0 0F 18 2A 2A 2A 2A
A0 04 2A 26 0A 88 D0 FA
F0 EA A9 0A 20 0B FE 20
90 03 A9 5E 20 EF 02 4C
38 02 AD 00 FC 4A 90 23
A9 BC 20 EF 02 20 00 FE
C9 52 F0 BF C9 43 F0 13
C9 50 F0 EC C9 45 D0 03
4C 40 FE A9 3F 20 0B FE
4C 38 02 20 0A 04 20 00
05 20 E3 03 4C 32 02 A9
06 85 05 85 07 A9 1F 85
06 A9 20 85 04 A9 00 A8
AA 91 00 91 02 81 04 81
06 18 A5 04 69 20 85 04
90 03 E6 05 18 A5 06 69
20 85 06 90 02 E6 07 C8
8A C0 1F D0 DC 60 A0 00
85 08 B1 08 C9 5F F0 08
20 0B FE E6 08 4C A2 02
60 20 C3 02 0A 0A 0A 0A
85 13 20 00 FE C9 24 0A
65 13 60 20 00 FE C9 47
F0 10 C9 30 30 F5 C9 69
10 F1 C9 40 30 03 18 69
09 60 8A E8 E8 E8 E8 9A
60 18 69 30 91 0D C8 60
91 0D E6 0D 68 4C 9E 02
20 D0 03 68 4C 9E 02 00
00 00 00 00 00 00 00 00
R
```

```
P0300
20 3C 03 20 AB 03 49 C4
20 EF 02 20 B1 02 85 11
20 B1 02 85 12 A9 06 85
0E A9 00 85 0D 45 11 20
00 04 A9 1F 38 E5 12 48
F0 04 A9 20 20 00 04 88
D0 F8 A9 80 91 0D 20 54
03 4C 0B 03 A9 05 85 0E
A9 0D 20 F1 03 98 91 0D
A9 01 20 00 04 45 0E C9
0B D0 F2 60 A9 06 85 0E
A9 00 85 10 A0 00 84 0F
84 0D A2 20 20 BA 03 3A
91 0F B1 0D 10 04 A9 2A
91 0F E6 0F D0 02 E6 10
E6 0D D0 EB E6 0E A9 D4
C5 10 D0 E3 20 RB 03 EA
EA EA 60 A0 00 20 34 03
EA A9 D0 85 0E A2 01 85
0B 48 4A 4A 44 20 20 E1
02 68 29 0F 20 E1 02 CA
10 ED 60 A9 00 85 0B 85
0C 4C 54 03 A9 D0 85 0E
A9 84 85 0D A9 4C 20 E8
49 4E 45 20 E8 02 A9 46
02 A9 49 20 E8 02 4C F6 03
20 E8 02 85 09 60 00 45
A9 04 85 0A A0 FF 38 E9 FD
0A A2 08 A0 FF 88 D0 FD
CA D0 F8 60 20 54 03 D7
D0 EF 60 0D A0 00 60 E8
03 85 0D A0 00 60 0D 00
02 49 98 85 0D 69 00 00
R
```

```
P0400
18 65 0D 85 0D 90 02 E6
0E 69 A9 00 85 00 49 06
85 01 A9 E1 85 02 A9 09
85 03 4C 67 02 00 00 00
00 00 00 00 00 00 00 00
00 00 00 00 28 02 00 00
0D 0A 20 20 2D 4C 49 46
45 20 0D 0A 45 4E 54 45
52 20 54 49 4D 45 20 47
20 43 4F 4C 20 4E 4F 2D
39 39 3A 20 4C 4D 4E 55
41 56 20 49 4F 4D 41 45
45 20 43 3A 4F 45 20 2D
44 53 0D 0A 4E 54 49 20
20 43 4F 4C 20 4E 4F 2D
50 45 52 20 41 4E 20 44
55 52 4E 5F 47 20 41 49
49 4E 45 3E 5F 0A 4C 55
46 45 45 20 49 4E 53 53
54 20 50 4F 49 4E 58 31 2C
20 41 53 20 58 32 2C 59
59 31 20 58 33 2C 59 32 2E
0D 0A 58 32 2C 59 5F 00
2E 2E 0D 0A 24 0D 00 00
00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00
R
```

"Life" TTY Version

```
P0500 A9 06 85 0E A9 00 85 0D
      38 A5 0D E9 21 85 0F A5
      0E E9 00 85 10 A0 00 A2
      00 B1 0F 10 01 E8 C8 B1
      0F 10 01 E8 C8 B1 0F 10
      01 E8 A0 20 B1 0F 10 01
      E8 C8 C8 B1 0F 10 01 E8
      A0 40 B1 0F 10 01 E8 C8
      B1 0F 10 01 E8 A0 21 8A
      10 01 E8 A0 18 71 0F E6
      0F 91 0F E6 C9 0A D0 91
      0E A5 0E C9 02 10 0B 98
      06 85 0E A9 00 85 0D D0
      B1 0D 10 0F 29 0F C9 03
      10 04 C9 02 10 0A 29 D0
      0D F0 0A 29 0F C9 04 D0
      DF E6 0E A5 0E C9 0A D0
      D7 F8 18 A5 0B 69 01 85
      0B A5 0C 69 00 85 0C D8
      60 20 20 20 20 20 20 20
      R
```

BARBER POLE:
10,10 10,12 0E,12 0E,14 0C,14 0C,16 0B,17 0A,17 0A,16 12,10 12,0E
14,0E 14,0C 15,0B 16,0B 16,0C

FIGURE 8:
0F,10 0E,10 0D,10 0D,11 0E,11 0F,11 0F,12 0E,12 0D,12
10,0F 11,0F 12,0F 12,0E 11,0E 10,0E 10,0D 11,0D 12,0D

PI: 380
10,10 11,10 0F,10 0F,0F 0F,0E 11,0F 11,0E

R-PENTOMINO:
10,10 10,0F 0F,0F 10,0E 11,10

GLIDER:
05,18 04,18 03,18 05,19 04,1A

PULSAR CP 48-56-72
0E,10 0F,10 0C,10 0D,10 10,10 10,11 0C,11

X:
00,00 01,01 02,02 03,03 04,04 05,05 06,06 07,07 08,08 09,09 0A,0A
0B,0B 0C,0C 0D,0D 0E,0E 0F,0F 10,10 11,11 12,12 13,13 14,14 15,15
16,16 17,17 18,18 19,19 1A,1A 1B,1B 1C,1C 1D,1D 1E,1E 1F,1F
00,1F 01,1E 02,1D 03,1C 04,1B 05,1A 06,19 07,18 08,17 09 16 0A,15
0B 14 0C,13 0D,12 0E,11 0F,10 10,0F 11,0E 12,0D 13,0C 14,0B 15,0A
16,09 17,08 18,07 19,06 1A,05 1B,04 1C,03 1D,02 1E,01 1F,00