May 18, 1978

TO: YALE HARRISON
    GLEN HIGHTOWER

FROM: DAVE CHANDLER

SUBJECT: INTERMISSION CODE

A good solution to the Intermission Code for the Video Games is the use of keys 1 and 9 or 3 and 7 simultaneously. These are the diagonals of the 9-key portion of the key pad, so they should be easy to remember. Either diagonal pair will give the same code, so either pair can be used by the operator.

The result of depressing the two keys of one of these pairs will be to have the system go immediately into the Intermission mode. In this mode, the T.V. screen goes to a solid color (whatever the background color was for the game being played) and the game action is suspended at that point. After a short interval to allow clearing of the keyboard, the game can be reactivated by pushing any key or control on either controller. Game play then continues where it was interrupted by use of the Intermission code. (The system will automatically enter this same mode after 5 minutes of no activity from either controller).

The octal code generated by the controller when 1 and 9 or 3 and 7 are depressed is 132. This is a unique 8-bit code which is not likely to occur in any of the normal uses of the controller.

DPC:1b

cc: Denis Bosley
    Richard Chang
    Dick Haffey
    Ed Krakauer
    Mal Kuhn
    Bob Lovejoy
    Jeff Rochlis
    Rick Timmins
    Kent Wall
<table>
<thead>
<tr>
<th>SIGNAL</th>
<th>ORIGIN</th>
<th>NO. OF LEADS</th>
<th>INPUT/OUTPUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>DBO-DB 15</td>
<td>CP1610</td>
<td>16</td>
<td>I/O</td>
</tr>
<tr>
<td>BUS CNTRL. OUT</td>
<td>CP1610</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>BUS CNTRL. IN</td>
<td>CART.</td>
<td>3</td>
<td>I</td>
</tr>
<tr>
<td>SR1</td>
<td>8900</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>INTR. M.</td>
<td>CART.</td>
<td>1</td>
<td>I</td>
</tr>
<tr>
<td>SR2</td>
<td>8900</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>BUSRQ</td>
<td>CART.</td>
<td>1</td>
<td>I</td>
</tr>
<tr>
<td>BUSAK</td>
<td>CP1600</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>SST</td>
<td>CART.</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>MSYNC</td>
<td>8900</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>MCLK</td>
<td>8915</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>CBLNK</td>
<td>8900</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>INTR</td>
<td>CART.</td>
<td>1</td>
<td>I</td>
</tr>
<tr>
<td>RESET</td>
<td>CART.</td>
<td>1</td>
<td>I</td>
</tr>
<tr>
<td>+5</td>
<td>P.S.</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>GND</td>
<td>P.S.</td>
<td>6</td>
<td>0</td>
</tr>
</tbody>
</table>

* These signal pairs are looped through the ROM cartridge.

¹ This signal is grounded by the cartridge.
Executive Interface to User Programs

Programs executing under the Executive must have sufficient program resident in the absolute 8K of address space following the fixed cartridge start address. In particular, there is a universal data block located in the first 40 decies of the cartridge address space.

On Startup:

1.) If home computer ROM exists, call (JSR R5,) to the first address of that ROM.

On Return:

2.) If cable T.V. ROM exists, call to the first address of that ROM.

On Interrupt:

1.) Push PSW and registers.

2.) Jump to the address specified by the first 2 bytes in the 8-bit RAM.

If the home computer/cable T.V. doesn't want control at interrupt level, it should leave these bytes unchanged.

If the home computer/cable T.V. assume control at interrupt level but want normal Exec functions carried on, the program may call the Exec routine EINTSER to perform these functions.
## BASIC SLIDE SWITCHES

<table>
<thead>
<tr>
<th>TYPE NUMBER AND CONTACT RATING</th>
<th>DESCRIPTION</th>
<th>SCHEMATIC</th>
<th>RATINGS* ALL U.L. LISTED</th>
<th>HOUSING DIMENSIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>SINGLE POLE – C.S.A. APPROVED AC AMPS @ 125 V.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>FIG. NO.</td>
<td>WIDTH DIM.</td>
</tr>
<tr>
<td>SW-311-M</td>
<td>SP – ST</td>
<td></td>
<td>3.0 not CSA Listed</td>
<td>17</td>
</tr>
<tr>
<td>SW-411</td>
<td>SP – ST</td>
<td></td>
<td>4.0</td>
<td>6.0</td>
</tr>
<tr>
<td>SW-411-L</td>
<td>Spring Ret, Norm Open</td>
<td></td>
<td>4.0</td>
<td>6.0</td>
</tr>
<tr>
<td>SW-412</td>
<td>Spring Ret, Norm Open</td>
<td></td>
<td>4.0</td>
<td>6.0</td>
</tr>
<tr>
<td>SW-412-L</td>
<td>Spring Ret, Norm Open</td>
<td></td>
<td>4.0</td>
<td>10.1</td>
</tr>
<tr>
<td>SW-511*</td>
<td>Side operated</td>
<td></td>
<td>4.0</td>
<td>5.0</td>
</tr>
<tr>
<td>SW-511-L*</td>
<td>Plug in mounting</td>
<td></td>
<td>4.0</td>
<td>5.0</td>
</tr>
<tr>
<td>SW-422</td>
<td>DP – DT</td>
<td></td>
<td>4.0</td>
<td>6.0</td>
</tr>
<tr>
<td>SW-422-L*</td>
<td>DP – DT</td>
<td></td>
<td>4.0</td>
<td>6.0</td>
</tr>
<tr>
<td>SW-422-L*</td>
<td>Spring Return</td>
<td></td>
<td>4.0</td>
<td>6.0</td>
</tr>
<tr>
<td>SW-422-PP*</td>
<td>DP – DT</td>
<td></td>
<td>4.0</td>
<td>6.0</td>
</tr>
<tr>
<td>SW-422-PP*</td>
<td>Push-Pull</td>
<td></td>
<td>4.0</td>
<td>6.0</td>
</tr>
<tr>
<td>SW-422-PP*</td>
<td>DP – DT</td>
<td></td>
<td>4.0</td>
<td>6.0</td>
</tr>
<tr>
<td>SW-422-PP*</td>
<td>Push-Pull</td>
<td></td>
<td>4.0</td>
<td>6.0</td>
</tr>
<tr>
<td>SW-433-PP*</td>
<td>DP – TT</td>
<td></td>
<td>4.0</td>
<td>6.0</td>
</tr>
<tr>
<td>SW-433-PP*</td>
<td>Push-Pull</td>
<td></td>
<td>4.0</td>
<td>6.0</td>
</tr>
<tr>
<td>SW-433-PP*</td>
<td>DP – TT</td>
<td></td>
<td>4.0</td>
<td>6.0</td>
</tr>
<tr>
<td>SW-433-PP*</td>
<td>Push-Pull</td>
<td></td>
<td>4.0</td>
<td>6.0</td>
</tr>
<tr>
<td>SW-442</td>
<td>TP – TT</td>
<td></td>
<td>4.0</td>
<td>6.0</td>
</tr>
<tr>
<td>SW-442-L</td>
<td>TP – TT</td>
<td></td>
<td>4.0</td>
<td>6.0</td>
</tr>
<tr>
<td>SW-443</td>
<td>TP – TT</td>
<td></td>
<td>4.0</td>
<td>6.0</td>
</tr>
<tr>
<td>SW-443-L</td>
<td>TP – TT</td>
<td></td>
<td>4.0</td>
<td>6.0</td>
</tr>
</tbody>
</table>

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*All 4 AMP switches are U.L. listed at 125 VAC, 1.5 AMP at 250 VAC and 0.5 AMPs at 125 VDC. All 6 AMP switches are U.L. listed at 125 VAC and 0.5 AMPs at 125 VDC. Standard DP switches with solder guard are CSA listed. For specific ratings, please contact factory. **19/32"" nylon handle only.

---

*3/16"" Terminal Screws...*** .940"" Over Taps on Terminal Board.
SOFTWARE

1. Roughly equivalent Mattel game play will require 1 1/2 to 2 48K Groms per game.

2. After initial learning period, will require reconceptualization and 100% reprogramming effort.

HARDWARE

3. Lack of mag tape would result in only 10% to 20% of planned Mattel Personal Computer programs (as opposed to game programs) are feasible on H.E.C.

4. Reduced control quality from keyboards and controllers.
ALTERNATES TO CONSIDER

1. Possible but not very attractive:

   Scale down Mattel games to fit into 1 GROM for present H.E.C.

   Will loose much of the impact of the games.

   Will still require 100% reprogramming.

2. Not likely:

   Squeeze enough executive and GPL into 4K x 8 resident ROM to permit effective single GROM games.
November 20, 1978

TO: Ed Krakauer
FROM: Howard L. Cohen
SUBJ: Video Console / Cartridge Status

I. Cost Analysis

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contract price</td>
<td>$70.00</td>
</tr>
<tr>
<td>G.I. Chip Set price</td>
<td>30.39</td>
</tr>
<tr>
<td>Cartridge price</td>
<td>5.00</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>105.39</strong></td>
</tr>
</tbody>
</table>

II. Anticipated Changes

<table>
<thead>
<tr>
<th>Change Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Addition of Revision C parts &amp; labor</td>
<td>1.80</td>
</tr>
<tr>
<td>Addition of RF Shields</td>
<td>2.00</td>
</tr>
<tr>
<td>Addition of Fan</td>
<td>1.00</td>
</tr>
<tr>
<td>Addition of incoming chip inspection</td>
<td>2.00</td>
</tr>
<tr>
<td>Addition of outgoing burn-in</td>
<td>1.00</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>7.80</strong></td>
</tr>
</tbody>
</table>

III. Anticipated Cost Reductions

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Removal of Sockets</td>
<td>1.00</td>
</tr>
<tr>
<td>Elimination of cartridge airfreight</td>
<td>0.20</td>
</tr>
<tr>
<td>Chip set attrition reduction</td>
<td>0.20</td>
</tr>
<tr>
<td>Volume discount (after 200M)</td>
<td>5.25</td>
</tr>
<tr>
<td>Re-engineering (Per Chandler)</td>
<td>2.00</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>8.65</strong></td>
</tr>
</tbody>
</table>

IV. Contract Status, Sylvania

Four final copies given to Josh Denham on 11/17/78 for signature. All copies to be sent to Sylvania on or about 11/20/78, signed, and two returned.

V. Contract Status, General Instrument

G.I. to submit suggested contract by 11/27/78 for Mattel review, per meeting of 10/24/78.
VI. Cartridge Orders and Status

Purchasing to request Letters of Credit for Radofin and Wong (both HK) for initial six cartridges (three each) by 12/4/78. PABS to supply packaging.

Purchasing to issue Purchase Releases to G.I. for ROM's to support cartridge production by 12/4/78. Parts to be supplied via Kaohsiung.

ROM testing method remains undefined.

cc: Fred Held
    Paul Ashcraft
    Jeff Rochlis
    Josh Denham
    Frank Murnane
    Gary Leonard
December 13, 1978

MEMORANDUM

To: Dave Chandler
    Howard Cohen
    Jim Kingsbury
    Frank Murnane
    Jeff Rochlis

cc: Richard Chang
    Denis Bogart

Subject: RADOFIN

Regarding Radofin's involvement in the development of the PAL video system in Europe and the master components, the following agreements were reached:

Responsibility

1. The cost of $97 F.O.B. factory which provides duty of 10% was provided.
   Howard Cohen

2. Prices for the European market, i.e., the U.K., Germany, and the remainder of Western Europe where Radofin will act as a distributor will be developed.
   Ed Krakauer
   Frank Murnane

3. A schedule for development of the needed chips, i.e. PAL, and the colour chip will be obtained from G.I.
   Ed Krakauer
   (Tentatively, it is planned to proceed with a PAL version of the STIK chip, and to utilise external colour circuitry which Radofin will provide. At a later date it is intended to have G.I. modify the colour chip for European use, as a cost saving reduction).
December 13, 1978

RADOFIN

4. The tape drive and keyboard components are limiting items in developing the housing tool. The target date of December 20 has been set for the selection of both components. At that time alternative solutions for each component along with the advantages and disadvantages of each and the associated costs will be presented, and decisions made.

   Responsibility

   Dave Chandler

5. A working bread board to permit programming of the software is required by March 1. Plans are to develop the bread board internally.

   Dave Chandler

6. A meeting will be scheduled with Josh Denham and Frank Sesto to determine if tooling can be accepted.

   Ed Krakauer

Ed Krakauer
December 11, 1978

TO: HOWARD COHEN
FROM: DAVE P. CHANDLER
SUBJECT: REVISIONS TO PLAN FOR FABRICATION OF FIRST 50 INTELLIVISION MASTER COMPONENTS

Because of the time pressure in preparation for CES, GI plans to build 5 systems to satisfy FCC requirements and then build 10 more systems for CES. This is a change from the 10 total that GI was going to build. In addition, we plan to have Sylvania assemble logic boards and power supply boards for 10 systems as quickly as possible and ship them to us for checkout and assembly into 10 more systems for CES. We will also want parts for 2 more systems from Sylvania for use by APH in building the first system using a RAM - emulator board. Sylvania would then build the remaining 23 systems with help from GI on checkout of the boards and systems.

This has been discussed with Sylvania. They are preparing to send 5 more sets of parts to GI. They will also give us a schedule for fabrication of the 10 sets of boards for us. If we proceed on this plan, which I am assuming we will, Sylvania will want documentation from you to this effect. The net cost result should be downward as far as Sylvania is concerned because they will build fewer systems. There may be some added expense associated with rushing the 10 sets of boards through. GI probably will invoice us for the additional cost of building more systems.

GI will use the 10 CES systems they build for preparing the first back-up approach, namely fully working chip systems with PROMS for Executive and Game Programs. We (with APH) will use the 10 systems we check-out and assemble in preparing the intermediate backup approach using an emulation board for the System RAM. If either of these approaches is used at CES, all 20 systems will be available. This will provide 10 spares of the basic systems.

cc: Denny Bogart
    Jeff Rochlis
    Ed Krakauer
    Clif Perry
    Chi Wang
    Frank Murname

DPC:mu
DATE: DECEMBER 15, 1978

TO: DAVE COHEN

FROM: DAVE CHANDLER

SUBJECT: UPDATE OF DECEMBER 11, 1978, MEMO ON FABRICATION OF FIRST 50 SYSTEMS.

Sylvania plans to send us the 2 sets of PC boards and parts Monday, December 18, 1978. They also plan to send us 10 assembled sets of boards and miscellaneous parts December 22, 1978.

In addition (a new requirement), Sylvania will send 17 sets (15 plus spares) of PC boards to C.I. December 18, 1978. At the same time, they will send parts for the additional 5 systems plus the conversion parts for the first 10 systems.

Would you please send the necessary authorization to John Robertson to cover the changes outlined here and in the referenced document.

DC:mu

cc: Denny Bogart
    Jeff Rochlis
    Ed Krakauer
    Clif Perry
    Chi Wang
    Frank Murname
SEQUENCE OF EVENTS IN PREPARATION FOR CES

SOFTWARE FOR EMULATOR SYSTEMS
(SCHEDULE ASSUMES USE OF PAPER TAPE AND A SUCCESSFUL TRANSFER PROCESS)

* Dec 18: EXEC, BASEBALL, LAS VEGAS I
* Dec 19: BASKETBALL, BACKGAMMON
* Dec 20: ELECTRIC CO MATH, TANK
* Dec 22: FOOTBALL, GALACTICA, CHECKERS

EMULATOR SYSTEMS

* Dec 20: WE SEND 4 HOUSINGS
* Dec 22: WE DECIDE WHETHER TO SEND 4TH EMULATOR
* ONE EMULATOR NEEDED IN LAS VEGAS JAM ALONG WITH PROM BOARDS OF ALL PROGRAMS FOR TRAINING

MASTER COMPONENT FABRICATION COVERED IN MEMOS TO COHEN DATED 12-11-78 AND 12-15-78.

RAM EMULATOR BOARDS

* BEING BUILT BY APH
* Dec 23: FIRST SYSTEM EXPECTED IF CHIPS AVAIL.
  FROM GI BY 12-20-78.
* TEN RAM EMULATORS PLUS SPARES BY CES.

PROM BOARDS FOR MASTER COMPONENT

* PC BOARDS BEING BUILT AND ASSEMBLED BY MARTEK.
  1 BD BY 12-27-78
  10 BDS BY 12-29-78
  14 BDS BY 1-2-79
* PROMS DUE FROM SCHWEBER 12-20-78
* PROMS TO BE PROGRAMMED BY APH AFTER PROGRAMS CHECKED OUT ON RAM EMULATOR SYSTEM.
ASSESSMENT – WITH NO CHANGE TO H.E.C.

SOFTWARE

1. Roughly equivalent Mattel game play will require 1 1/2 to 2 48K Groms per game.

2. After initial learning period, will require reconceptualization and 100% reprogramming effort.

HARDWARE

3. Lack of mag tape would result in only 10% to 20% of planned Mattel Personal Computer programs (as opposed to game programs) are feasible on H.E.C.

4. Reduced control quality from keyboards and controllers.

MATTEL CONFIDENTIAL
10-12-78
MATTEL SYSTEM ARCHITECTURE

Mattel system contains:

2K x 8 Graphics ROM
4K x 10 Executive ROM

Necessary RAM and additional circuitry to function as a TV game, including hardware mechanization of such things as:

(a) Hit detect
(b) Scrolling of background fields
(c) Sound generator envelop control

Game cartridges contain 4K x 10 ROM

Full audio/digital tape under computer control

Different keyboard and controller configuration

MATTEL CONFIDENTIAL
10/12/78
MINIMUM RECOMMENDED SOLUTION

Add 4K x8 Executive ROM to H.E.C. (change GPL ROM to 8K x 8).

THEN:

1. Roughly equivalent Mattel game play can be programmed into 1 GROM - probably with added frills.

2. Reprogramming effort will be reduced by 30% to 50%.

Still does not solve problem for Personal Computer programs or controller restrictions.
ALTERTNATES TO CONSIDER

1. Possible but not very attractive:
   Scale down Mattel games to fit into 1 GROM for present H.E.C.
   Will lose much of the impact of the games.
   Will still require 100% reprogramming.

2. Not likely:
   Squeeze enough executive and GPL into 4K x 8 resident ROM to permit effective
   single GROM games.