Videogames: In The Beginning



by Ralph H. Baer

The Inventor of Home Videogames

Videogames: In The Beginning

"Ralph Baer's story — and the ubiquitous catalogue of games, toys and other projects which he pioneered — are captured here with youthful enthusiasm and without the personal agendas all too common in the autobiographies of great men; Ralph's phlegmatic tone keeps even the most potentially vitriolic issues in perspective. Videogames: In the Beginning should be a tentpole in the library of any student of electronic games."
Bill Kunkel – Videogame Journalist

"This work could be the definitive history of the engineering of the videogame. But more than that, it offers a glimpse into the challenges faced by the earliest innovators."
David Crane - co-founder Activision and creator of *Pitfall!* one of the most successful videogames of all time.

"It's great that there's finally a book that reveals why we game developers (from all over the world) owe our careers to Ralph Baer. I feel very fortunate that our industry is not too old to give us a chance to learn about his experiences first hand, and also it gives us a chance to appreciate his first steps, that have now generated billions of hours of fun entertainment for people."
David Perry - President - Shiny Entertainment, Inc.

"Videogame pioneer and Odyssey inventor Ralph Baer tells all in amazing detail, staking his claim as the inventor of consumer videogames. A fascinating read for the extreme videophile."
Eugene Jarvis -Videogame Designer: *Defender*, *Cruisin USA*

"Ralph Baer has done an amazing job of explaining both the bolts and particularly the nuts of the origins of videogames. He blows away the popular myths and finally exposes the truth of where it really came from. No one has cut a wider swath through videogame history. "
Howard Scott Warshaw - Creator of *Yar's Revenge* and *E.T* for the Atari 2600

"I can never thank Ralph enough for what he gave to me and everyone else."
Steve Wozniak – co-founder Apple Computers

"Videogames: In the Beginning, like everything else from the engineer/inventor who wrote it, is tight, intelligent, and meticulously documented. Baer is brilliant, knowledgeable, and, perhaps, a little angry. Can you blame him?"
Steven L. Kent – author: *The Ultimate History of Video Games*

Videogames: In The Beginning

Ralph H. Baer

ROLENTA PRESS
PO BOX 1365
SPRINGFIELD, NJ 07081-5365

VIDEOGAMES: IN THE BEGINNING
Copyright © 2005 by Ralph H. Baer

All rights reserved. No part of this book may be reproduced in any form, except for the inclusion of brief quotations in a review, without permission in writing from the author or publisher.

All names mentioned or images displayed are trademarks or registered trademarks of their respective owners.

This book has not been approved, authorized, or endorsed by any of the manufacturing companies that are mentioned within.

Published by Rolenta Press
PO Box 1365
Springfield, NJ 07081-5365
www.rolentapress.com

First Edition
First Printing • 3000 • April 2005
Library of Congress Control Number: 2004115956
ISBN 0-9643848-1-7

To Dena...
who has patiently held house and home together
while I spent all hours of the day and night working in the lab.

Contents

Foreword xiii

Acknowledgements xiv

Cast of Characters xvi

Introduction 1

In The Beginning 3

- Who Really Invented Videogames? 5
- A Matter Of Opinion....And A Little Malice, Maybe? 5
- *Pong's* Genesis 5
- Priorities 9
- ...And Then There's Russell 15
- Higginbotham's Claim To Fame 16
- End Note 17

Life at Sanders 18

- September 6th, 1966 - Genesis! 19
- Getting Started 27
- 1967 - Early TV Game Development 30
- Improving TVG Unit # 2 - The "Pump" Chassis 39
- August 1967 - TVG Unit # 3, Our First "Product" Is Ready! 44
- November 1967: Ping-Pong Games Are Here! 45
- Cable Games 48
- Video Quiz Games 49
- Back on Track - Building TV Game Unit # 6 And The Brown Box 52
- The Brown Box Makes It's Debut 54
- Calling All TV Set Manufacturers! 56
- 1971 - Keeping The Licensing Ball Rolling 58
- Making A Maximum Effort In Ft.Wayne 59
- Will The Consumer Like Skill-O-Vision? 62

Odyssey Rolls Off The Production Line 73

- Flashback: Hard Times In The Defense Electronics Business 74
- Odyssey Makes Its Entrance! 75
- The Birth Of *Pong* 76
- Winter Of 1972-73 - Upgrading Odyssey 85
- 1973 - Rethinking My Act 88
- 1974 - Tracking Magnavox 90

I Become A Freelancer 93
Tracking Videogame Activity In The Field - And How Sanders Almost Got Into The Arcade Videogame Manufacturing Business 94
1974: Cable Games Redux 107
Trying To Get Magnavox Into The Arcade Videogame Business And Super Odyssey 110
Interactive Video Systems: Working With WPI And ILG 112
The Ay-3-8500 Chip Saga 115
The Centronics Game Interlude...Beware The Mafia! 121
Monday Nite Football 122
1976 - History Redux 124
1976 - The Lawsuits Start 126
Back To The Magnavox Saga Ca. 1975 133
Salvaging Odyssey^2 134
The *Telesketch* Story 135
Telesketch Finds A Home At Magnavox 136
A Short Postscript To The Magnavox Support Story - Interactive Video 137
The Coleco Story 138
Coleco's Telstar Is Born - But There Is A Problem 139
We Help Design Coleco's Next-Gen Line 141
Learning To Live With Eric Bromley 142
Leading Coleco Into Interactive Video Territory 143
Coping With Tricky Legal Relationships 143
Dual Image 145
Using Audio Tape Players In Videogames To Get Superior Sound 145
Kid-Vid 146
Pushing New Technology 149
The TV Alarm Clock... And Other Interactive Video Gadgetry 149
Promoting Advanced Interactive Video Systems At Coleco 150
Getting Videodisc-Assisted Colecovision Under Way 151
End Game At Hartford 152
Atari And Me 153
Smile, You're On Camera! 155
An Encounter With The Nintendo NES 157
The Nintendo Lawsuit Interlude 159
Interactive Video technology At Sanders - The IVTS Pinball Videogame 161
Another Aside: The Precision Rifle Story 163
1988 - Leaving Sanders... But Not The Videogame And Interactive Video Scene 168

Closing Thoughts About Videogames 169

Appendix One: From *Touch-Me* to *Simon* 171
Appendix Two: TV Game Chronology 174
Appendix Three: A Chronological Summary of My Involvement with Magnavox (1975-1979) 180
Appendix Four: From Our Loose Notes and Note Books - 1966 to 1972 187
Appendix Five: Videogame and Interactive Patents 197
Appendix Six: Schematics and Experiments 221
Appendix Seven: R.H. Baer Firsts in Chronological Order 235
Appendix Eight: My Designs 251
Bibliography 253
Contributor's Bios 255
Index 256

Figures

Figure 1 - Computer Space 6
Figure 2 - Magnovox Odyssey 6
Figure 3-4 - Paper design using CMOS Integrated Circuit 7-8
Figure 5-8 - Arcade Games Sales & Summary Spreadsheet 10-13
Figure 9 - Spacewar 16
Figure 10 - Tennis for Two 17
Figure 11 - Sanders Associates Canal Street Building in Nashua, NH. 18
Figure 12 - Bob Solomon 19
Figure 13 - Ralph H. Baer 19
Figure 14-18 - Disclosure Document 20-24
Figure 19 - The Heathkit IG-62 Generator 27
Figure 20 - Original Schematic, TV Game 6/9/66 28
Figure 21 - Vacuum Tube 29
Figure 22 - Bottom view of TVG#1 29
Figure 23 - List of Games 31
Figure 24 - 2/27/67 - Our first Quiz Light Pen 32
Figure 25-30 - Original Memo 33-38
Figure 31 - TVG Unit # 2 - the "Pump" chassis 40
Figure 32 - John Mason's Original Idea 40
Figure 33 - Our first and second (and improved) target shooting "guns" 41
Figure 34 - Pumping Game Overlay 44
Figure 35 - Bill Harrison & Bill Rusch 45
Figure 36 - RHB withTVG#3 during 1992 deposition 45
Figure 37 - An excerpt from Rusch's Notebook showing the concept of Ping -Pong (9/10/67) . .46
Figure 38 - Holding the controls of TV Game 48
Figure 39 - The first de/dt chassis, TV Game Unit # 5 50
Figure 40 - Video Quiz Game "pistol" 50
Figure 41 - Schematic of ODD/EVEN Light Gun 51
Figure 42 - From a 1968 interactive videotape:A quiz with six encoded right/wrong "spots." . . .52
Figure 43 - TV Game Unit # 6 53
Figure 44 - The Brown Box, our TV Game Unit #7 with its hand controls and gun (1/69) 55
Figure 45 - Brown Box 55
Figure 46 - Golf putting joystick 55
Figure 47 - Some of the graphically challenged overlays which we used with TV Game unit #6 & #7 56
Figure 48 - Engineer David Bateman and my tech George Mitchell playing Ping-Pong on the Brown Box 56
Figure 49 - Bottom View of the second "de/dt" (velocity responsive) ballgame chassis, our TVG # 8 (12/68) 56

Figure 50-51 - Contact Report 60-61
Figure 52-54 Screen Overlays 63
Figure 57-58 - Effort-To-Date Memo 64-65
Figure 59-61 - Skill-O-Vision Questionnaire 66-68
Figure 62-63 - Questionnaire Follow-Up 69-70
Figure 64-65 - Questionnaire Results 71-72
Figure 66 - The motherboard and baby boards of the Odyssey 1TL-200 73
Figure 67 - Magnavox Odyssey 1TL-200 TV Game, Controls and Box 75
Figure 68 - Odyssey with most of its goodies - overlays, playing cards, dice, plug-in carts, manual 76
Figure 69-70 - Odyssey (Model 1TL-200) glossy catalog advertising flier 77-78
Figure 71 - Discounted Odyssey Flyer 79
Figure 72 - Magnavox Profit Caravan 1972 80
Figure 73-75 - Visitor's Log 81
Figure 76-78 - Bob Fritsche Memo 83-85
Figure 79 - Jim, me and Larry... studying the Instructions 86
Figure 80 - Attaching the Roulette overlay 86
Figure 81 - Playing The Game 86
Figure 82 - Lil Bryan and Dena watch "enthusiastically" 86
Figure 83 - Early Odyssey Review 87
Figure 84 - "Active" Handball Card 88
Figure 85 - French advertising flyer for Odyssey 89
Figure 86-89 - Arcade Report 95-98
Figure 90 - HIT-N-RUN and SKATE-N-SCORE Operation and Service Manuals 99
Figure 91 - Hockey Player Shape Layout for ROM 99
Figure 92 - SKATE-N-SCORE Screen Shot 99
Figure 93 - Sanders HIT-N-RUN Arcade Games 100
Figure 94-96 - MOA Report 102-104
Figure 97-105 - MOA Notes 104-106
Figure 106-108 - Letter to Bob Fritsche 108-110
Figure 109 - Annotation System Sketch 113
Figure 110 - Video Buddy - Digital Video Modem (Optical) Data Extraction System (1999) . . .115
Figure 111 - The General Instruments AY-3-8500 videogame chip and some of the screen images it produced 116
Figure 112-114 - Trip Report 118-120
Figure 115 - Odyssey 100 120
Figure 116 - Ad for the German Version of the Odyssey 200 120
Figure 117 - Gamex "21" Video Casino Game 121
Figure 118 - A MNFB Hand Controller 122
Figure 119 - MNFB - A Screen Display and 7 Story Boards of Game Strategy and Play 123
Figure 120 - The MNFB Development Unit and "Production" Model 124

Figure 121 - A Screen Shot Of The Game 124
Figure 122 - Sanders PR Binders 125
Figure 123 - Cover Page Of The '480 Patent 127
Figure 124 - Page 7 Of The '285 Baer, Harrison, Rusch Patent Showing The Basic Elements Of Machine And Manually Controlled Screen Symbols In A Ping-Pong Game. . . .128
Figure 125-126 - Judge Grady's Ruling 128-129
Figure 127 - Odyssey^2 In Its Box 134
Figure 128 - Odyssey^2 134
Figure 129 - Telesketch Control Unit 136
Figure 130 - "Writing/Erasing" with Telesketch 136
Figure 131 - Pinball Game With Player-Programmable Bumper Positions 137
Figure 132 - The Coleco Telstar Videogame 140
Figure 133 - Arnold Greenberg Demonstrating Telstar 140
Figure 134 - Coleco Telstar Arcade 142
Figure 135 - Coleco Telstar Alpha 142
Figure 136 - Exterior and Inside View of the Interface Unit Built For Coleco By Circuits & Systems ('84) 144
Figure 137 - "Dr. Seuss, One-Fish-Two-Fish" Demo Unit 146
Figure 138 - Coleco's Kid-Vid Version 147
Figure 139 - Berenstain Bears Program Cassette For Kid-Vid (1983) 148
Figure 140 - Lenny Cope With Weather Station 150
Figure 141 - TV Alarm Clock 150
Figure 142 - RCA SelectaVision Videodisc Player 152
Figure 143 - "FACE" Digitizing Logic Board 156
Figure 144 - 47a. Patent Drawing Of The Arcade Game With Camera 156
Figure 145-146 - Nintendo Note 158-159
Figure 147 - Nintendo Design 160
Figure 148 - NES Code 160
Figure 149- Our TV Pinball Game 162
Figure 150 - Sketch of the Videotape Programmer & Game System 162
Figure 151 - The Precision Rifle Along With The Small IR Data Receiver That Plugged Into The Apple IIie Computer 163
Figure 152 - The M72A2 Light Antitank Weapon (LAW) Modified For Emulation Training . .166
Figure 153 - Top and Bottom of the C&S Built 167
Figure 154- IVTS Conversion Unit used with an Apple IIe 167
Figure 155 - STINGER Version of our LAW Interactive Video Training System 167
Figure 156 - The CEV Interactive Video Trainer 168
Figure 157 - Bob Pelovitz (2001) 168
Figure 158 - Touch-Me 171
Figure 159 - Simon 172

Foreword

As a videogame historian, it is my job to get the facts straight, with little room for my own personal opinions. Unfortunately, when the topic of who invented the videogames comes up, you may get four different responses, depending upon whom you talk to. It's unfortunate that the rightful inventor doesn't always get recognized for his work but obviously, it's not the first time in history that this has happened. Everyone knows that Thomas Edison invented the electric light bulb. But if you go to Edison's laboratory in West Orange, NJ, they'll tell you something else. Joseph Swan of England actually invented the first practical incandescent light bulb a full ten months before Edison. However Edison brought his to market first and he established a name for himself.

This almost happened to the inventor of videogames as well. Despite what some people might say, Ralph Baer did invent videogames. The first videogame patents are under his name. Now, while it is undoubtedly true that if Ralph Baer had not invented videogames, someone else would have come along and got the job done. But it was Ralph who did it first.

While Ralph Baer was working on how to get affordable and enjoyable games to play on home TV sets, Nolan Bushnell was working on how to get games into arcades. But Ralph did it first and Nolan Bushnell got all of the credit.

In 1982, Videogames magazine published an interview between Ralph Baer and its editor Steve Bloom in which Bloom referred to Baer as the 'Godfather of Videogames'. Although it was an honorable title Baer made it clear in the interview that he would rather be known as the 'Father of Videogames'. In the time since that article was written little has changed to get Ralph Baer's name into the public consciousness. The current edition of the New York Public Library Desk Reference states that Nolan Bushnell invented videogames. Most other resources agree. Nevertheless, it is wrong.

In 1997 I sent Ralph a copy of my book, Phoenix: The Fall & Rise of Videogames. He responded by inviting me up to his home. When my editor at Electronic Gaming Monthly magazine learned of my trip, he asked me to write an article about it. That article was printed in the January 2000 edition of EGM and to date it remains one of the most popular articles in the history of the magazine. For the first time, a new generation of gamers learned Ralph Baer's name and his importance in the history of videogames.

In 1999 Ralph and his wife Dena, attended the very first Classic Gaming Expo, an annual show that celebrates classic videogames and the people behind them. Ralph was the hit of the show! At his keynote speech the crowd was in awe as he set up his famous Brown Box and we watched as the ball traveled across the screen only to be stopped by a paddle and forced to go in the opposite direction.

And although we were in an age where the graphics of videogames rivaled motion pictures, we all sat dumbfounded as if we were witnessing a videogame for the very first time.

Of course, there are still detractors who claim Ralph wasn't first. When questioned about them Ralph will just sigh and say that there will always be people who will believe what they want to believe and nothing will ever change their mind. But naturally, Ralph would like to try. And this book is one way for him to get his word out.

Here is the story of videogames, from Ralph Baer, the father of videogames. I hope you'll enjoy it!

Leonard Herman
Springfield, NJ
June 9, 2004

Acknowledgements

This book cites a large quantity of historical data and displays many documents, schematics, sketches, photos of hardware, screen shots and the like. Most of that material came from files which I took with me when I left Sanders Associates in 1988. A great deal more was physically and laboriously extracted by David Winter and myself from the hundreds of boxes stored by the law firms that had carried on the long string of patent infringement suits of the 1970's and 1980's. Without David's help, we would never have rescued the original 4-page Disclosure Document from oblivion, nor would such illuminating documents as the Magnavox' Guest Book have survived, or their Skill-O-Vision consumer acceptance data. Certainly, the Odyssey production and marketing data that speak so emphatically to the commercial success of the first home video game would never have been seen again. So I thank David for his outstanding support with the collection and the interpretation of data, as well as his much appreciated help in checking the manuscript for factual errors.

Secondly, there is Leonard Herman, my friend, editor and publisher. Lenny must get special mention here because of the prodigious amount of work he put into this volume. Getting this book through final edit and into print has been almost entirely Lenny's work. I could not have done it without him.

I must also make special mention of my son-in-law Ador Yano. Ador, a talented graphic designer, agreed early on to do all of the internal design work on the book. Unfortunately Ador had to bow out at the eleventh hour due to unforeseen personal responsibilities. At the last moment Rusel DeMaria jumped in to provide the creative layout that was needed. Anyone who is familiar with Rusel's book *High Score: The Illustrated History of Electronic Games* will understand how truly grateful and honored I am to have him volunteer his services.

The first part of a book that anyone sees is the cover. I am thankful to have had Michael Thomasson, also a gifted graphic designer, create that important piece.

Along the way I have had help and encouragement from a few of the original actors in the drama of conceiving and commercializing the first home video games. These include ex-Sanders co-workers Louis Etlinger, our senior patent counsel and Bill Harrison, who built every one of the early developmental TV game units. Precious few of the Magnavox engineers, programmers and management people that play so prominent a role in my story have been available for comment or criticism, George Kent, Ed Averett and Bob Harris being the sole exception.

Cheering me on have been many new friends I made via the web and during interviews by newspaper, magazine and video production people involved in, or reporting on, the video game business. On top of that list are those authors who have preceded me with their own works dealing with this industry; that list includes my friend Van Burnham, Steven Kent, J.F. William, Mark Wolf, Sellam Ismail, all of whom I "met" during their own struggle to get a book out. They all knew that I was cranking away at this story and encouraged me to push on and get it done.

Writing for magazines of various descriptions, Crispin Boyer, Lauren Gonzalez, Christian Wirsig and Konrad Lischka (the latter two in Germany) have also been rooting for me; so have some of the folks from the Smithsonian who came to my house to gather up some of my ancient goodies for permanent display at the Smithsonian, among them David Allison who plans to build a videogame display there; and Joyce Bedi and especially Arthur Mollela at the museum's Lemelson Center who have been particularly kind and supportive. Another friend on the museum front who has been very supportive is Andreas Lange of the Computerspiel Museum in Berlin.

Behind the scenes I had several people obtaining permissions for me to use the many memos that have been included. Phillip Riggins and Ed Goodman of Magnavox, Marianne Murphy and Joan Ferguson of BAE Systems, and Mark David of Penton Media all went out of their way to obtain the required permissions.

Last but not least, there is my better half, Dena, who has gracefully put up with the fact that I spent more time at the computer than with her.

My thanks go out to all of you.

Ralph H. Baer

Acknowledgments Continued

The photo in Figure 11 is reproduced with the permission of Sanders Associates, Inc.

Figures 14-18, 20, 23, 25-30, 32, 50-51, 86-89, 94-108, 112-114, 145-146, are reproduced with the permission of BAE Systems.

Figures 57-65, 69-78, 85 are reproduced with the permission of Koninklijke Philips Electronics N.V. All rights reserved.

Figure 83 is reprinted with permission from Electronic Design, 08 17, 1972. Copyright 1972, Penton Media Inc.

Cast of Characters

- **Nat Adamson** - A senior manager at Magnavox, Fort Wayne whom I needed to sprinkle holy water on some of my attempts to support the Magnavox videogame license.
- **Al Alcorn** - Designed Pong for Atari in 1972 and did a great job. He was instrumental in helping to launch the arcade videogame industry.
- **Ted Andrson, Esq.** - The lead lawyer from Neuman, Williams, Anderson and Olson on all of our videogame litigation, which lasted well over a decade and made a lot of money for Magnavox and Sanders....and for Neuman, Williams, Anderson and Olson.
- **Henry Argento** - A member of Sanders' Board of Directors and an early videogame supporter.
- Ed and Linda Averett - Magnavox's outside programmer(s) with exclusive rights to come up with new game carts for Odyssey^2. As far as I know, Ed got financially comfortable creating the Odyssey^2 game carts. He now lives happily ever after in Seattle.
- **Geoffrey Breslow** - MGA's managing partner after the shooting death of Anson Isaacson; Geoffrey came to New Hampshire to look me over and the result was a ten-year association with Marvin Glass & Associates in Chicago.
- **Tom Briody** - Corporate Director of Patents at Magnavox. Tom brought in the law firm of Neuman-Williams and went tenaciously after videogame patent infringers. He made a lot of money for Magnavox and Sanders - another good guy with whom I enjoyed working.
- **Eric Bromley** - My main contact at Coleco during the several years when I licensed Kid-Vid and other goodies to them.
- **Nolan Bushnell** - Came up with the idea of making video arcade games in the late 1960s; eventually started Atari, whose first great success was the *Pong* game, a knock-off of Odyssey's Ping-Pong game. *Pong* put him on the map - he was the president of Atari - a videogame icon in the 1970's.
- **Herbert Campman** - Sanders Associates' corporate director of R&D. Herb was a true friend and supporter of my early videogame development work...a guy with vision.
- **Marshall Caras** - Coleco's former Director, Advanced Research and Development. I never had much contact with him.
- **Dan Chisholm** - A Sanders VP assigned top tracking our videogame project for management.
- **Jon Clemens** - I met Jon through David Allen. Jon was a VP and ran the SelectaVision videodisc program at RCA in the 1980s. He is president of a West Coast electronics company now.
- **Leonard Cope** - Became my young sidekick (joined at the hip) at Sanders in the mid-1970s. He was a Maine boy, a University of Maine and Yale graduate...basically a mathematician. Lenny was an excellent programmer-he worked on videogames and other interactive video inventions of mine inside Sanders and on handheld games (with Marvin Glass & Associates) such as *Simon* outside our regular Sanders jobs.
- **Frank Cot -** Another one in the endless series of Magnavox managers who did not do me much good.
- **John D'Aiuto** - Was another engineering manager at Fort Wayne involved in videogames.
- **John DeScipio** - Magnavox's president in 1977. The buck stopped at his office when videogame business decisions had to be made.
- **Bob Despathy** - My manager of the Radio Frequency Interference Lab at Sanders.

- **Chuck Dolk** - A VP at Magnavox whose major contribution to videogames-and my relationship with Magnavox-was obstructionism.
- **Bill Enders** - A marketer at RCA when he first visited Sanders for videogame demos; then he became a VP for Magnavox and was instrumental in having us invited to Fort Wayne to demo our Brown Box. The result: Home videogames were launched commercially.
- **Louis Etlinger** - Sanders' director of patents. He reported directly to the president of the company. Lou was my co-conspirator (along with Herb Campman) in getting the videogame industry started and in making a lot of money for (Magnavox) and Sanders Associates. And ah, yes...the lawyers.
- **John Fauth** - A Senior VP at Magnavox and the President of Magnavox's Tennessee TV set manufacturing plant. He decided to turn the (cancelled) Odyssey^2 program back on after I made a presentation to him.
- **Bob Fritsche** - Assigned to the job of product manager for videogames at Magnavox in 1971. I worked with Bob on many decisions regarding the first Odyssey product and for years thereafter.
- **Judge John Grady** - He was the judge in the Federal District Court in Chicago where we won our first patent litigation, hands down. Judge Grady called my '480 patent "the pioneer patent of the (videogame) industry."
- **Arnold Greenberg** - Was the president of Coleco. I met Arnold at Marvin Glass & Associates and got Coleco into the videogame business through him. I have had continuing dealings with Arnold over the years.
- **Leonard Greenberg** - Was the CEO of major toy and game manufacturer Coleco. I helped Coleco get into videogames early on.
- **Bob Harris** - Worked in Sam Overton's group at Magnavox/Philips on Odyssey^2 cart programming and also had a job at Milton Bradley working on videogames...on money the company made from *Simon*, he says.
- **Bill Harrison** - A technician, later an engineering associate in the Electronic Design Department. at Sanders Associates. Bill designed much of the circuitry and built the demo models of all of our original TV Games (now called videogames). We were a twosome for years, designing and building interactive video systems that resulted in many issued patents. He lives in near Orlando, Florida, where he spends his time trying to refurbish a nice older sailboat-among other things.
- **Chuck Heffron** - Became one of Magnavox's long series of videogame engineering group managers.
- **John Helms** - The videogame engineering group manager for Magnavox, Fort Wayne in 1975.
- **Bob Howard** - Was the president of Centronics and their subsidiary, Gamex in 1975. Lenny Cope and I designed a "21" video gambling machine for him for use in Las Vegas. The Mafia nixed that project.
- **Lars Jensen** - An independent consulting engineer, like me, who also got taken by doing work for the Tramiels modus-operandi at Atari.
- **Al Kahn** - A senior type at Coleco; he was the manager of my Kid-Vid product and is the guy who saved the company by bringing in Cabbage Patch Kids, the ugliest dolls in the world.
- **Irving Kahn** - Also came up to Sanders from New York for a cable game demo. He was the president of TelePrompter.
- **Gene Kale** - Became the "Intel" videogame (the Odyssey^2) group leader at Magnavox in 1977.
- **Michael Katz** - Variously president or VP of assorted videogame companies. When I last contacted him he was one of the Tramiel family's minions after they bought Atari.
- **George Kent** - A senior engineer in TV development at Magnavox who got assigned to head the

group that took our Brown Box into production; it became the Magnavox Odyssey game of 1972.

- **John Kinney** - Was at North American Philips Labs, Briar Cliff Manor, New York. He was responsible for special applications of Videodisc (VLP System). I suggested that he join Bob Fritsche and John Slusarski for videodisc-TVG demo...he never did show up.
- **Sam Lackoff** - A radio engineer like me, and chief engineer at Loral, where I first met him when I worked there in 1950. He started Transitron in 1953 and I became his chief engineer. Eventually he moved the company to New Hampshire and took along a dozen senior company people, including myself.
- **Leydic, Voit** - The successor law firm to Neuman, Williams, Anderson and Olson after the latter firm disbanded. Ted Anderson moved over to Leydic, Voit where Wes Mueller eventually took over from him in videogame matters.
- **Jim Maben** - A talented r.f. design engineer in Equipment Design; he fixed some of the radio frequency circuitry problems in Coleco's videogames.
- **Gerry Martin** - Marketing manager for TV receivers at Magnavox, Fort Wayne. He singlehandedly decided to go after videogames when we demonstrated the Brown Box to him and others at Magnavox.
- **Stan Maser** - A senior engineering manager at Intel who was involved in Intel's first foray into videogame chip sets for Magnavox's Odyssey^2.
- **John Mason** - Another Sanders electrical engineer with whom I occasionally consulted on early videogame technology problems and concepts.
- **Steve Mayer** - One of several at Grass Valley who designed the Atari VCS videogame system.
- **Sandy McGarvey** - A legal- and contracts beagle at Coleco who gave Lou Etlinger a case of indigestion.
- **Don McGuiness** - An engineer who worked at Sanders and was tagged to program a game cart for Odyssey^2.
- **Joe Milner** - One of several at Grass Valley who designed the Atari VCS videogame system.
- **George Mitchell** - Took over as a technician where Bill Harrison left off. We worked together for many years on interactive video projects, cable and arcade games...a great tech and a good guy.
- **Howard Morrison** - My contact point man at Marvin Glass & Associates, frequent co-inventor and later, great family friend along with his wife, Pauline, who brought up two sets of kids successfully.
- **Richard Murray** - The examiner at the U.S. Patent Office who handled the earliest of our videogame patent applications.
- **Neuman, Williams, Anderson and Olson** - A Chicago Intellectual Properties law firm that became Magnavox's outside lawyers for videogame litigation in 1975. I spent endless hours with them in preparation for depositions and court appearances.
- **Sam Overton** - Software manager for the Odyssey^2 games. He was our contact during the development of the pinball cartridge for Odyssey^2 at Sanders.
- **John Pacocha** - An outside patent lawyer who handled some of Marvin Glass' patent applications in the 1980s...including my "Face" digitizing invention.
- **Bob Pelovitz** - Picked up where Lenny Cope left off and became my close associate at Sanders and in after-hour work...just like Lenny. He now runs Micro-Pros as an independent consultant (like me). We still work together whenever there is an opportunity. " Talkin' Tools for Hasbro was our latest (2001-2003) product.

- **John Peserb** - The chief engineer at Bally-Midway in charge of arcade videogame design in 1985; he took charge of engineering my "Face" digitizing scheme into a Midway videogame.
- **Harold Pope** - Sanders Executive VP and my boss for many years. Harold was the former chief engineer at Lockheed in California, a great guy and a supportive boss. After Royden Sanders left the company, Harold became its next president.
- **Bob Price** - Another technician at Sanders who worked on various projects for me. Later on he built many an electronic game prototype for me-a nice guy, with a nice family.
- **Frank Quota** - Chuck Heffron's boss in 1972.
- **Bert Reiner** - Was Coleco's chief engineer who was in deep doo-doo because their Telstar videogame console flunked r.f.i. tests at the Federal Communications Commission (FCC).
- **Dr. Eugene Rubin** - Gene to me. He was a division manager at Sanders at the same time as I ran the Equipment Design Division. We shared many special assignments together-such as being Associate Directors for a while. Gene often supported me in many ways. A guy with vision and a real friend.
- **Bill Rusch** - A creative engineer, ex-MIT; he worked with Bill Harrison and me on our earliest ball and paddle videogames. He came up with the idea of a machine-controlled ball that would interact with player-controlled "paddles".
- **Ed Sacks** - The general manger of General Instruments' Hicksville, Long Island plant. A sharp, classy and aggressive Ph.D., he brought the AY-3-8500 chip over from Scotland to the U.S. It was used in millions of videogames. Ed later ran General Instruments' semiconductor plant in Phoenix.
- **Royden Sanders** - Started Sanders Associates, Inc. in Waltham, Massachusetts with a group of engineers from Raytheon who became the "Associates." Sandy moved the operation into a large plant in Nashua, New Hampshire (at Canal Street) and was the president of the company for many years.
- **Rob Schenck** - A competent engineering supervisor at Coleco during the ColecoVision and Adam days.
- **Hubert Schlafly** - A VP at TelePrompter in New York and one of that company's founders. He came to visit us in Nashua to see a cable TV game demonstration in January of 1968.
- **Dick Seligman** - Worked for Lou Etlinger as his chief patent attorney. Dick and I worked together on all of my videogame related patents. Dick wrote the final patent applications for all of my inventions at Sanders and he did a great job because everyone of them got allowed.
- **Shiraz Shivji** - Atari's director of engineering during the Tramiel family reign.
- **Bob Solomon** - Came to Sanders from Control Data in Minneapolis and was an engineer in my division. In September of 1966 he signed the four-page disclosure document that laid out the concept of videogames.
- **John Slusarski** - An engineering manager at Magnavox who was involved with various videodisc and videogame responsibilities.
- **Mike Staup** - Became Magnavox's new Odyssey product manager in late 1977. He was their former VCR manager.
- **Drew Sunstein** - An old engineering acquaintance from early Sanders days who left the company and started Circuits & Systems, an electronic design and development operation that is still successful in Londonderry, New Hampshire.
- **Bob Tremblay** - A tech in the electronic design department whom I commandeered to do some elementary work on moving "spots" around a TV screen in 1966.
- **Jim Williams** - The next senior lawyer working with Ted Anderson on our lawsuits. He was technically savvy and we spent a lot of time together going over technical data submitted by the opposition, etc.

- **Duncan Withun** - I hired Dunc from GE Syracuse to run the Electronic Design Department early on. When I left the Equipment Design Division behind to run the Flexprint Division, I made Dunc my successor. He remained the division manager for years after.

Introduction

This is the story of the early history of videogames of which I was a part. It is also an account of other interactive video activities that were intimately related to my work on videogames.

First off, a little perspective: You don't have to be a card-carrying videogame addict to know that there is a huge industry out there selling all manner of videogame hardware, software, publications, keepsakes and whatnot. Walk into any store that sells magazines and count the number of glossy, and mostly thick, magazines that cover various aspects of the videogame industry. A look at any of them confirms that videogames are a big deal: The annual sales of game consoles, carts, game-discs, hand controllers and other accessories are beginning to pass the movie industry's total sales figures.

Then there is the whole world of arcade videogames. Finally, large-scale, web-based, multiparty gaming on the Internet is there, too.

Videogames have become so much part of our culture that they appear to have been a part of the landscape forever.

Well, forever is a long time. I can vouch for the fact that there was no such thing as a videogame a scant thirty-eight years ago. I know that because I officially came up with the concept of playing games on a home TV set in 1966. That was the industry's genesis. Little could I have known at the time that what I had started would become so pervasive in a few decades. There was no way to foresee that. What started as an idea to build a "box" that could make novel use of any garden-variety TV set became an industry...and a whole new way of playing games that radically changed how large subsets of this planet's population spend their free time.

What follows is my account of how that apparently minor innovation became an industry. Like a genie, once out of the bottle, there was no stopping it. As these pages will also inform you, I was not alone in the quest to make things appear on a CRT screen that wasn't being delivered by the networks.

It comes down to this: When technology is ready for something novel, when the components needed to build something new become affordable, it is going to get done by someone-and more than likely, by several people. So it was with the telephone, the steamboat, the electric light and on and on. None of these started in a vacuum. A lot of legwork on the part of a host of inventors, mechanics, engineers and scientists paved the way. History has also shown us that the best man or the best idea didn't necessarily win.

The modern form of digital computer came along in the 1950s. Now what would you expect a group of college students at MIT with access to a PDP-1 to do but come up with ways to play games on it. So they wrote some code and *Spacewar* was born. What else was that refrigerator-sized computer good for, anyway? Run boring math problems? Shucks... that's no fun!

Nolan Bushnell, later president of Atari, the 1970s most successful videogame company,

played those computer games at the University of Utah; he came up with a novel idea in the late 1960s: Make *Spacewar*-like games for the bars and arcades of this world...that should be a lot more fun than playing pinball. And so *that* happened. Integrated Circuit (I.C.) technology was ready; microprocessors were becoming more than just a gleam in an engineer's eye and they were getting cheaper by the month. Atari took advantage of that.

Several years *before* that happened, I came along and took a mental inventory of all those hundreds of millions of TV sets across the globe that did nothing but play whatever one-way fare the local stations delivered. I had an inspiration - a Eureka! - and Home TV Games were born...a bit early, technically, because low-cost microprocessors weren't available yet and digital I.C.s were still too expensive, so the games had to be relatively primitive. But our 1968 *Brown Box*, the last of a series of home videogame machines we built at Sanders Associates between 1966 and 1968, still works today and the Ping-Pong game we occasionally play on it is still fun! So is its handball game and games that require players to shoot at targets, moving or otherwise.

We live in a world that seems bound and determined to track Intel's Gordon Moore Law, which says: Everything doubles every eighteen months in electronics...circuit speeds, memory capacity, disc drive capacity. Videogames have been following that trend; if anything, they are moving still faster technologically. Being able to buy, for a few hundred dollars, an interactive, complex graphics machine like Nintendo's, Sony's or Microsoft's videogame consoles boggles the mind. That we plug in carts or CDs with megabytes of memory when only yesterday we were happy to have 64K or 128K in our Apple II and PC workhorses...that's nothing short of phenomenal.

I'm pretty sure that a case could be made for this proposition: If it hadn't been for videogame enthusiasts and the absolute commercial need to keep them happy with ever-better graphics requiring ever-higher processor speeds, complex computer graphics would still be found only in the high-priced domains of the business and science world. Anybody who denies that computers invaded the majority of homes via the videogame console must have recently arrived from another planet.

The story of videogames reflects the momentous shift to a progressively more technological society, a trend that started more than a half century ago. An entire generation of talented people, engineers, artists, scriptwriters, musicians, programmers, have been busy creating a whole new art form for us. The name of this new game is interactivity.

Here is an account of my part, and that of my immediate associates, in this revolution based on our notes, records, and much other material in the public domain.

-Ralph Baer

In the Beginning...

By way of introducing myself for the purposes of this story, let me tell you that I am a television engineer by degree. After WWII, having served stateside and overseas in the U.S. Army during the war for three years, I finally got to go to college, courtesy of the G.I. Bill of Rights. In 1948, at the age of twenty-six, I graduated with a B.S. in Television Engineering, the first one given in the U.S.

Along the way, I gained practical experience in designing and building television equipment. During my college days, I had a part-time job working on television studio equipment. While employed as an engineer at Loral, I designed a commercial TV set; therefore, I am intimately familiar with television technology. Ironically, I then spent the next sixteen years engineering or managing engineers in every area of electronics except television. Instead, I designed, built, and put into production, transmitters, receivers, test equipment, radar systems and a variety of other things...but no television receivers. So it goes.

Ever since the year of 1950-1951 during which I was building that high-class projection TV set at Loral Electronics Corp in the Bronx, the TV-engineer lurking "unused" inside of me pondered about ways of using a TV set for something other than watching standard broadcasts. I suggested to Sam Lackoff, then the Chief Engineer at Loral, that we build some form of game into our TV set to differentiate it from the competition. Some of the test equipment I used during this development job allowed me to create lines and checkerboard patterns on the screen. I thought that it wouldn't take much to make similar circuitry into a game. Sam's answer was predictable.

"Forget it. Just build the damn TV set; you're behind schedule as it is." Once that TV set design job was finished, I slid seamlessly into defense electronics because that was what was going on at Loral. I wanted to keep my job there, so that's what I had to do. Virtually overnight, I changed careers and wound up working in defense electronics development for the next forty years, starting at Loral, then at Transitron, and later at Sanders Associates until it became a Lockheed company. It was demanding work. During those years I moved up through the ranks of engineering and became a chief engineer, later a VP for Engineering at Transitron, still later a division manager at Sanders and eventually, an Engineering Fellow at Sanders/Lockheed.

Along the way I wandered off the straight and narrow into interactive video areas that initially had nothing at all to do with the normal work going on in my division at Sanders. The invention of videogames in 1966, the concept of using TV sets for something other than watching network fare, came first; building the early feasibility models came next. The activity started out as a skunk-works operation, but it didn't stay that way for long. On another tack, I showed early on how to convert passive videotape presentations into interactive ones for training and education. Not far behind that was a long term effort to build interactive video systems that would be of interest to our military customers, especially for use in weapons simulation and training. Shooting at targets in an arcade game is not too different technically from shooting at targets in a weapons training exercise. That became a new business area for Sanders.

Quite often, novel videogame ideas and some new technology required to make them work came first. After that was done, we thought about how to use our new insights for military purposes.

Then there was the videogame track that was eventually to change my life:

September 1, 1966 marks the beginning of that saga. Working our way through a succession of ever better game system for the next three years, we finally found a licensee for our home videogames. That was Magnavox, and that got the industry going, starting with the introduction of their Odyssey game system. For the next ten years, the license agreement between Sanders Associates and Magnavox became a major source of income to Sanders. As additional sub licensees signed up, we helped some of them build novel videogame systems; meanwhile, Sanders' cash register kept ringing. Finally, we beat all the hold-

outs among the manufacturers of videogames whom we were forced to sue in Federal and Appeals Courts all over the country and they had to pay up. The result was that about a hundred million dollars changed hands.

There is a reason why these apparently dissimilar applications share much of the same technology: Say, for example, you are designing circuitry or writing code to determine the location of the bumpers on a video-taped pinball field, which you will use as the dynamic, colorful background for a videogame - a scheme we pursued intensively in the late 1970s and early 1980s because good looking, computer-generated backgrounds didn't exist, computer power and memory being too expensive then. In this scenario, you would need to solve the problem of how to get your machine-generated ball symbol or image to bounce correctly off these video taped bumpers. Once you have accomplished that, you have also solved such problems as how to locate the position of a Russian tank moving through the woods during a videotape playback. Now you can fire an electro-optic version of a shoulder-launched "missile" at the tank and have it "explode" at the aim point. Bang!

The same interactive video technology works well in both scenarios. I loved that stuff...and moving back and forth between the commercial and the military world was no problem at Sanders because the license income from videogames gave me a nearly free hand to determine what I wanted to work on. Money talks! Going back to the technical track of my life, note that I have been designing electronic products, both of the consumer and defense electronics variety, since Pluto was a pup. Many of these products broke new ground...creativity at work! I have no idea whose ancestral genes have blessed me with the gift of imagination or my technical bent. Whoever it was...I thank you! Coming up with novel ideas and converting them into "real" products has always been as natural as breathing for me.

I recently read an absolutely amazing book entitled *Time, Love, Memory* by Jonathan Weiner (Alfred A. Knopf). It is the story of a great biogeneticist, Seymour Benzer, and the quest for the origins of behavior. It traces the stories of this particular scientist and his many associates (and adversaries) through fifty years of study on genes and how they encode knowledge and behavior, feelings, even love and hate. When you finish reading his book you will have an increased appreciation of the various ancestors "living" inside of you, perpetuating their particular talents and insights and knowledge through you. A story from Weiner's book illustrates that feeling best:

"An instinct, like a gene, is a kind of memory, a gift of time. The gift confers enormous advantages on all those that possess it. We are born knowing a thousand things we could not reinvent in a lifetime if we had to start from scratch. At Caltech, Delbrück (one of Benzer's mentors and associates) used to play chess with the mathematician Solomon Golomb. Delbrück spent sixty minutes to Golomb's one minute and still couldn't win. Delbrück's friends asked him why he kept losing when he gave so much thought to each move. Delbrück said, "I think, he knows."

That says it all...well, not quite all. We also know that genes are switched on and off by environmental factors. Violinist Maori concertized at age five - I'll bet she was handed a violin and not a mandolin at an early age; nevertheless, she "knows."

To lend some tangible credence to my assertion that "inventing" comes naturally to me, one might note that I currently hold about fifty U.S. patents and another one hundred patents elsewhere in the world. Most of these have resulted in useful products or became parts of real life systems. But they represent a mere fraction of the ideas that I have come up with over the years that went on to success, never mind all of those that went nowhere, or disappeared inside some classified piece of military equipment. Clearly, there is a lot of stuff I "know" - and polished up by study and self-application. Fortunately, some of the more important ones of that collection of ideas made it all the way to success in the marketplace (and to the bank) or else I probably wouldn't be sitting here writing this stuff. Videogames are in that category.

Now, this book is meant to be a first hand story of videogame history...or at least that part of the history that intimately involved me. I am writing my recollections of what went on during the sixties and seventies from the vantage point of a guy who was there and helped make it happen and backed up by tons of doc-

umentation and a long legal history.

You would think, therefore, that when I represent myself as the man who really invented videogames that this statement would go uncontested.

It ain't necessarily so.

Now on to the real story!

Who Really Invented Videogames ?

It's a sign of the times that the number of websites devoted to a topic may safely be taken as a measure of its popularity. By that standard, videogames are definitely "in". Furthermore, there are a lot of individuals out there who are genuinely interested in playing retro games that they fondly remember from their long-lost youth; maybe it's *Pac-Man* that beckons or perhaps *Space Invaders* conjures up happy moments of a player's past. More than a few amongst these players are also interested in the story of how those ancient videogames came into being.

There are numerous websites devoted to that subject. Unfortunately, the accuracy of the "facts" about early videogames chronicled on some of these websites often leave much to be desired. It's probably no great shock to learn that many of the chroniclers clearly have no compunction about editorializing things when they can't be bothered to research the subject...that being too much like work! Then again, webmasters having once brought their preconceived notions to the task then go on blithely ignoring suggestions to remedy errors when they are called to their attention. Obviously, they want nobody to screw around with ***their*** religiously held beliefs of what happened back in the primordial ooze.

So...not only is there a lot of unadulterated editorial garbage masquerading as facts on videogame websites but some of the commentary associated with certain websites is downright libelous.

It's only natural that the fulminations of know-nothing Luddites tick off those of us in the field whose hard work, knowledge and experience have truly contributed to the success of videogames. We have a right to get angry when some ignoramus who never lifted a finger to contribute to the field makes statements that denigrate those who did.

Whatever you do, don't ask one of these guys: "Who really invented videogames?" Like everything else in real life, there is no simple answer to this question. So let's roll back the clock, check in on some reality and see where that leads us.

A Matter Of Opinion.... And A Little Malice, Maybe?

The scene is Federal Judge Charles E. Legge's courtroom in San Francisco. The date is June 13, 1982. Mr. Nolan Bushnell, founder and past president of Atari is on the stand as a witness for "the Defendants: Activision, a Corporation." At issue is whether some of Activision's cartridges for the Atari VCS game console infringe certain claims of videogame patents held by Baer, Rusch and Harrison of Sanders Associates, Inc. in Nashua, New Hampshire and licensed to Magnavox.

On the plaintiff's side there is Ted Anderson, a partner in Magnavox's outside law firm in Chicago. He is carrying the ball for Magnavox along with Jim Williams because under the license agreement between Sanders Associates and Magnavox, the latter company is responsible for pursuing infringement of the patents.

Mr. Bushnell has been called to the stand to testify on behalf of the defendant, Activision. Marty Glick, Esq., Activision's outside lawyer is doing most of the talking.

Pong's Genesis

It's almost exactly ten years since Nolan Bushnell attended a demonstration of Magnavox's first home videogame, the Odyssey. To be exact, it was May 24th, 1972 when he went to the Airport Marina in Burlingame to check out the Odyssey system. He signed the guest book along with two other men from Nutting Associates, the firm which employed Mr. Bushnell back then and was currently producing his *Computer Space* arcade videogame.

Mr. Bushnell did indeed play the Magnavox Odyssey's Ping-Pong game hands-on. He clearly needed no instructions on how to play that game. On the other hand, his much more elaborate *Computer*

Space game was failing in the market place because it was too complicated to play. A light bulb may have gone on in Mr. Bushnell's head the moment he played ping-pong on the Odyssey: "Keep it simple." Complicated games may work for nerds but not for ordinary people. At least then...at the beginning.

But that is not what Mr. Bushnell said when interrogated by Mr. Glick, who asked him, "how did whatever it was you observed or thought you observed about the Odyssey game compare to what you understood you were doing?"

To which Mr. Bushnell responded: "...Well, I felt it was created by analog circuits. It had no scoring. I don't think it had any sound effects. That it relied on overlays which, you know, anticipated certain sizes of screens....That the motion was in fact erratic and difficult to control. I felt that it was not a satisfactory game playing device".

It's amazing what ten years can do to one's memory, isn't it? Particularly, if you have an axe to grind and when you are in Court and on the "stand" in support of a party line.

Some of Mr. Bushnell's negative comments regarding Odyssey's design were factually warranted. The technology in that game was identical to that which Rusch, Harrison and I had pioneered in the lab at Sanders between 1966 and 1968. It was even then getting a little long in the tooth and I knew it. I had Bill Harrison spend a few hours on October 10th, 1967 looking into a design using Series 7400 TTL integrated circuits as sync and spot generators. I had another fellow engineer go through a paper design using CMOS Integrated Circuits (Figs 1 & 2) as early as 1969. We have documents that show all this. Harrison and I concluded at the time that these IC's were attractive but still too expensive for use in a consumer product. Also, they were power hogs and for that reason alone couldn't be used in a battery operated consumer product. Instead, we stuck with discrete components such as transistors, resistors, capacitors and the like; the same kinds of parts then found in TV sets. By the time we concluded a license agreement with Magnavox we were well into 1971, an eternity in terms of progress of electronic developments nowadays, and quite a long stretch of time even back in the 1960's. After all, IC's had been around since the early sixties.

Nevertheless, the Odyssey Ping-Pong or tennis game played like a champ. The motion of the spots depicting the "rackets" or "paddles" was easily and reliably controlled with vertical and horizontal control knobs. An additional "English" knob added challenge to the game by allowing the player to adjust the flight path of the ball



Figure 1 - Computer Space

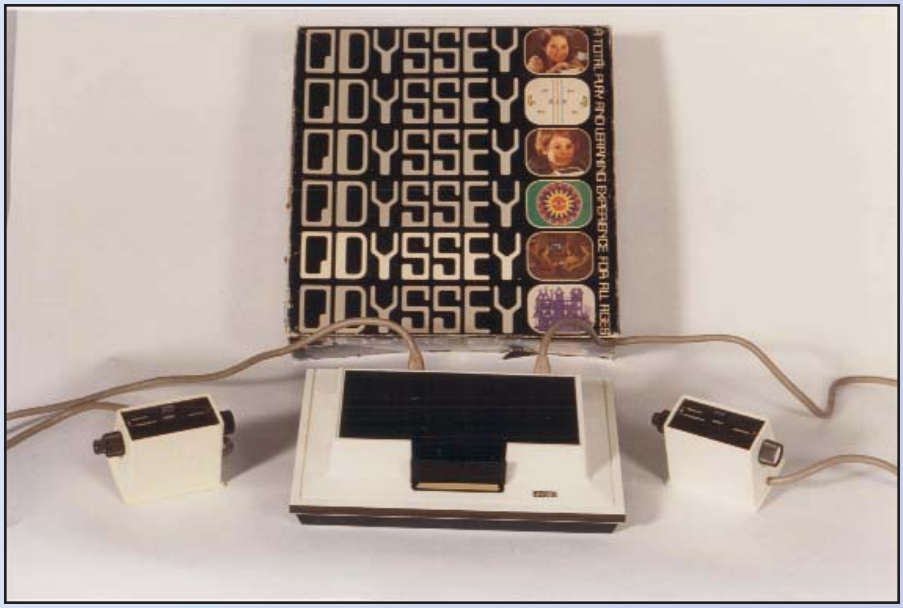


Figure 2 - Magnovox Odyssey

after it left the paddle. Slight differences of ball speeds depending on the direction of the ball were present. They were the by-products of the nonlinear analog circuitry used in the Odyssey system and its prototype, the "Brown Box"; they actually contributed to the game play, allowing more advanced players to take advantage of their existence. A ball speed adjusting knob allowed play at different skill labels.

So what was the validity behind this reference to "uncontrollability" and to the characterization of the Odyssey game as being an "unsatisfactory" game playing device?

The short answer: It was bunk! The fact is that customers found Odyssey game play so intriguing that they bought close to one hundred thousand systems that Fall and Winter season (1972). Both the press and the public reaction to the game were very positive, despite some marketing gaffes made by Magnavox. Meanwhile Nutting Associates was struggling to sell off about a thousand *Computer Space* arcade games that the public had rejected as basically unplayable.

Further to the subject of Odyssey's commercial success: Between 1972 and 1973, 165,000 Odyssey's were produced and sold. Pushed by aggressive advertising, the still one-and-only home TV game sold another two hundred thousand units in 1974 and 1975, its last year in production, for a total of 350,000 units. Not too shabby. So much for all that talk about how "uninteresting and uncontrollable" Odyssey's game system was and what a "commercial failure" it had been. A look at the spreadsheet (Figs 3 - 6) showing the detailed data of Magnavox videogame sales will put the nonsense about *Pong* having started the industry to rest. Another spread sheet below also

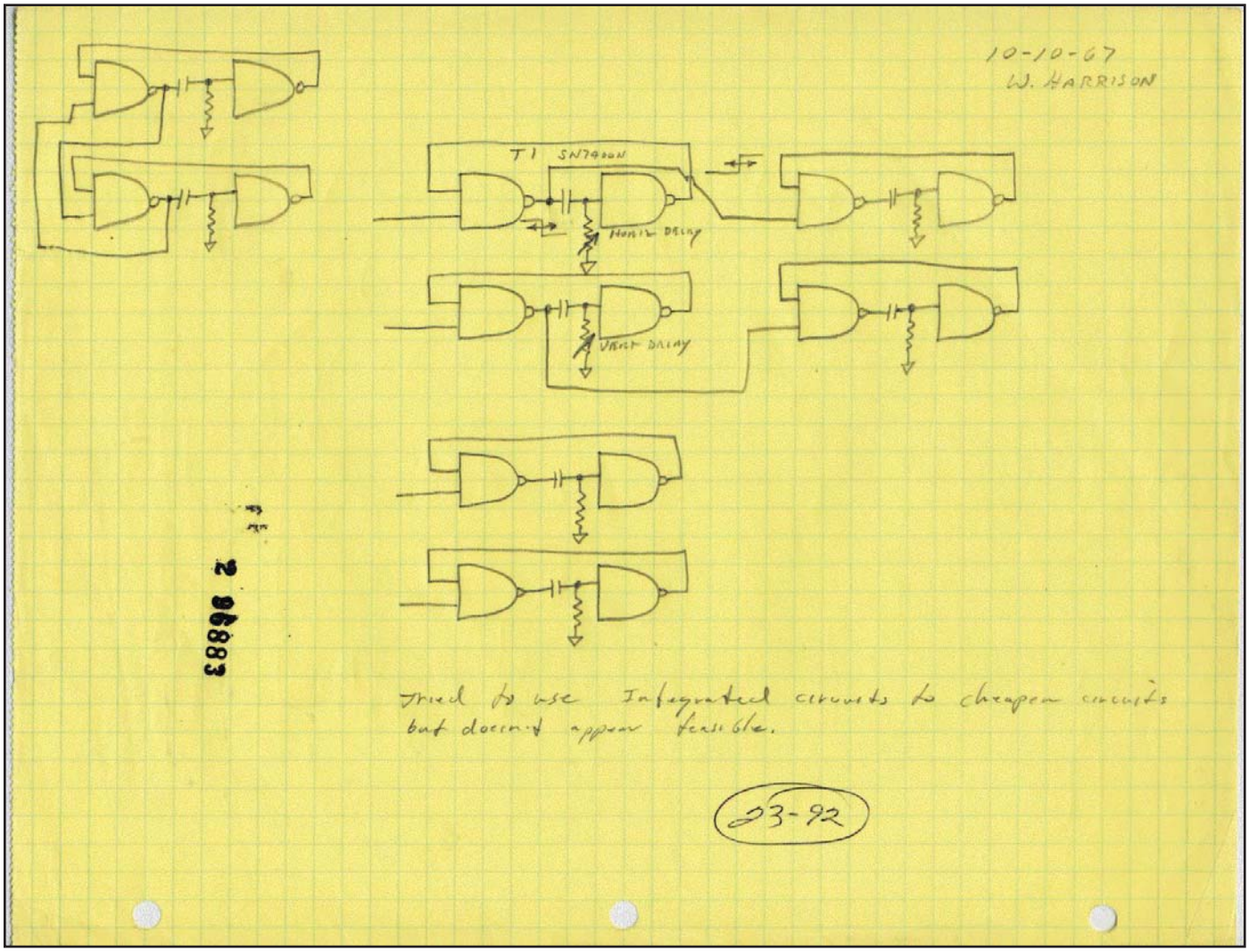
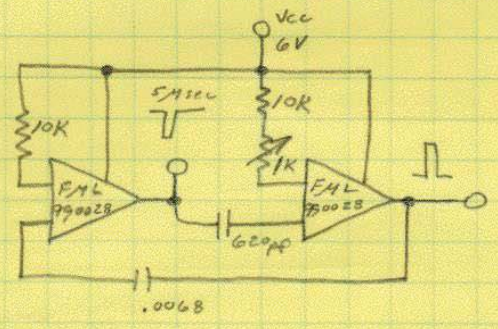


Figure 3 - Paper design using CMOS Integrated Circuits 1/2

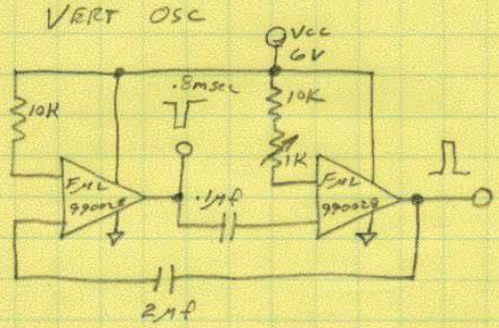
10-11-67
W. HARRISON

UTILIZING INTEGRATED CKTS

HORIZ OSC



VERT OSC



23-95

The IC's work but no cheaper & consume more power.

2 96886

Figure 4 - Paper design using CMOS Integrated Circuits 2/2

shows that Atari did not dominate the arcade business after the first six months of 1973. As the charts show, a large number of small and big firms first copied the *Pong* game and then went on to innovate different arcade video games in the period from 1973 through 1976.

The arcade game marketing data which I used to construct that spreadsheet in 1976 came mostly from *Playmeter*, the industry's premiere magazine at the time.

Mr. Bushnell left Nutting Associates in a tiff during May of 1972 and started Atari together with partner Ted Dabney. One of the first things he did was to hire Al Alcorn, a young engineer whom he had met at Ampex, where Mr. Bushnell had been employed as an engineer prior to joining Nutting Associates.

Mr. Bushnell charged Al Alcorn with designing and building a simple Ping-Pong game. Would that decision have been made had Mr. Bushnell not attended the Magnavox show where he played the Odyssey hands-on? How likely is that? As it happened, Al Alcorn did a superb job. The first developmental *Pong* did extremely well on location at Al Capp's bar in August of 1972. The cash box overflowed - so the story goes - after the first day on location and Bushnell knew that his arcade Ping- Pong game would be a winner.

Al Alcorn also built a portable version of *Pong* and Nolan Bushnell went off to Chicago to try and sell Bally on building the game. After failing to interest them, Mr. Bushnell did a gutsy, entrepreneurial thing: He decided to produce *Pong* at Atari. In November he moved the company, such as it was then, to Winchester Boulevard in Santa Clara where he had rented space at the Martin Avenue roller skating rink. Soon *Pong* was in production. Next year, *Pong* arcade game sales reached 2000 units at Atari alone, launching the arcade videogame era and causing ever increasing numbers of imitators to manufacture similar games starting in the summer of 1973. There is probably something to the assertion that *Pong* helped to sell Odyssey home TV consoles. After all, if you had been hanging around the arcades and became a *Pong* player, there was just one way to have that experience at home: go out and buy a Magnavox Odyssey. As the other chart shows, about 350,000 people eventually did just that.

Priorities

Now step back once more and think of how Mr. Bushnell might have felt when he first heard about the Odyssey. In 1970, while he was still working at Ampex during the day, he had slaved away nights in his daughter's bedroom to work on what was clearly an invention: an arcade-compatible version of the *Spacewar* game that he had played on a PDP-1 in college, along with other science and engineering students of that period. He soon abandoned the impractical idea of building the game around a minicomputer and decided to develop it using TTL Integrated Circuits with which he had become familiar at Ampex. I don't know this for a fact, but working at Ampex where the modern videotape recorder was born, Bushnell must have been surrounded by raster scan video technology being built into one product or another. So it would be natural for him to apply this experience to the design of an arcade game. He understood that he could convert an ordinary TV set into a monitor by bypassing the front end of the receiver. And he knew that the design of the circuitry had to start out with the generation of reasonably accurate horizontal on vertical synchronization signals. In turn, these could come from a timing chain that could also be used for player and ball-spot generation and their movement further down into the design. Although there is no record of any kind that tells us just when he first put his arcade and his TV experience together in his head, as far as he was concerned, he was the original inventor of raster scan based videogames.

Close...but not close enough. Working at Sanders Associates in 1966, I had independently come up with the idea of playing games on a standard home TV set. I had never heard of, never mind played, *Spacewar* games anywhere. As a TV engineer by degree, inventing something that attached to a TV set and shared many circuit and component similarities with TV sets of that era - that was a natural for me.

Being a careful and well-organized guy, I meticulously documented everything I did, starting with a 4-page paper I wrote on September 1, 1966 in which I laid out the whole idea of playing games on a TV set and defined many specific game categories. The object of the exercise was to come up with a device that would attach to an ordinary TV set and play inter-

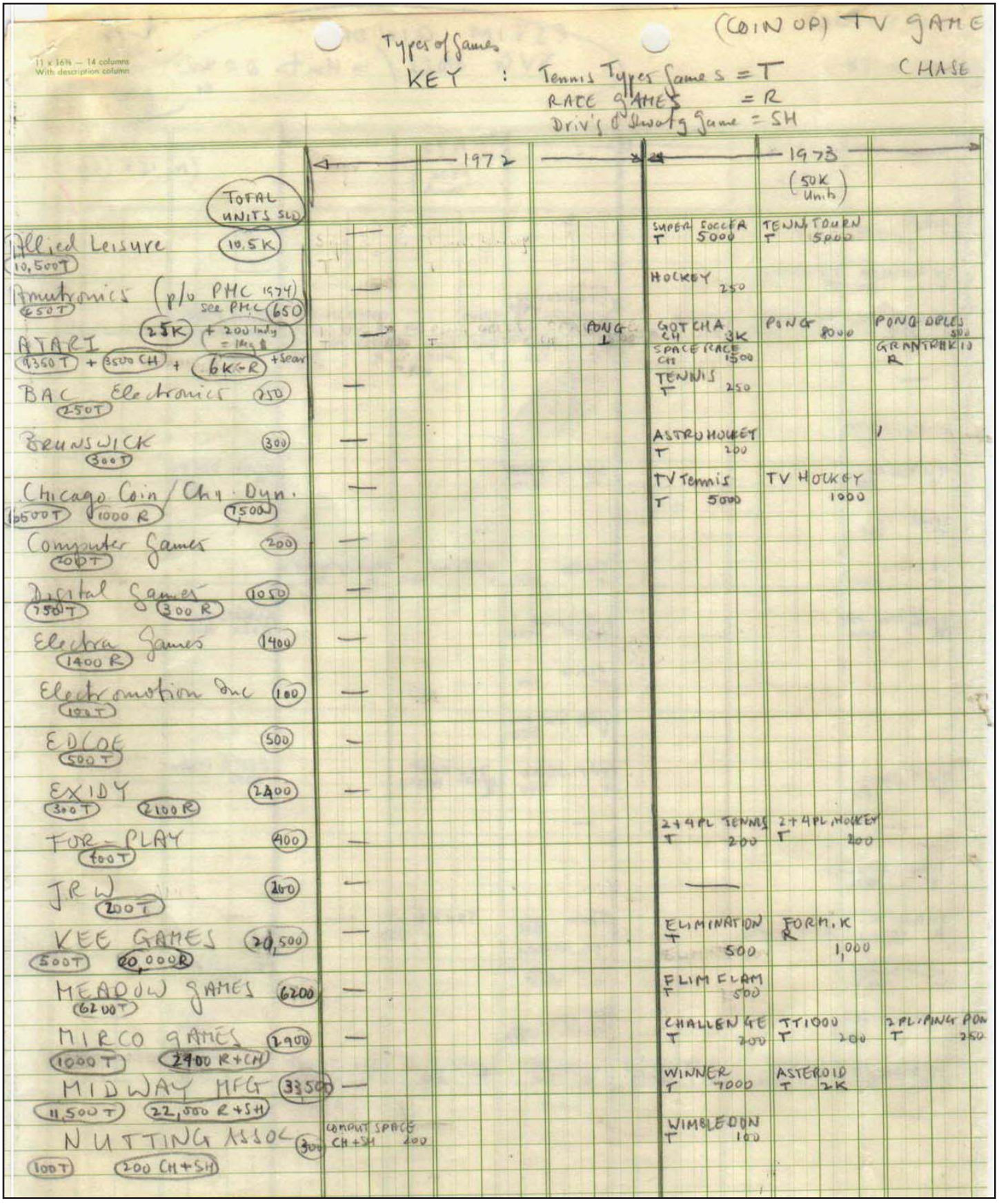


Figure 5 - Arcade Games Sales & Summary Spreadsheet 1/4

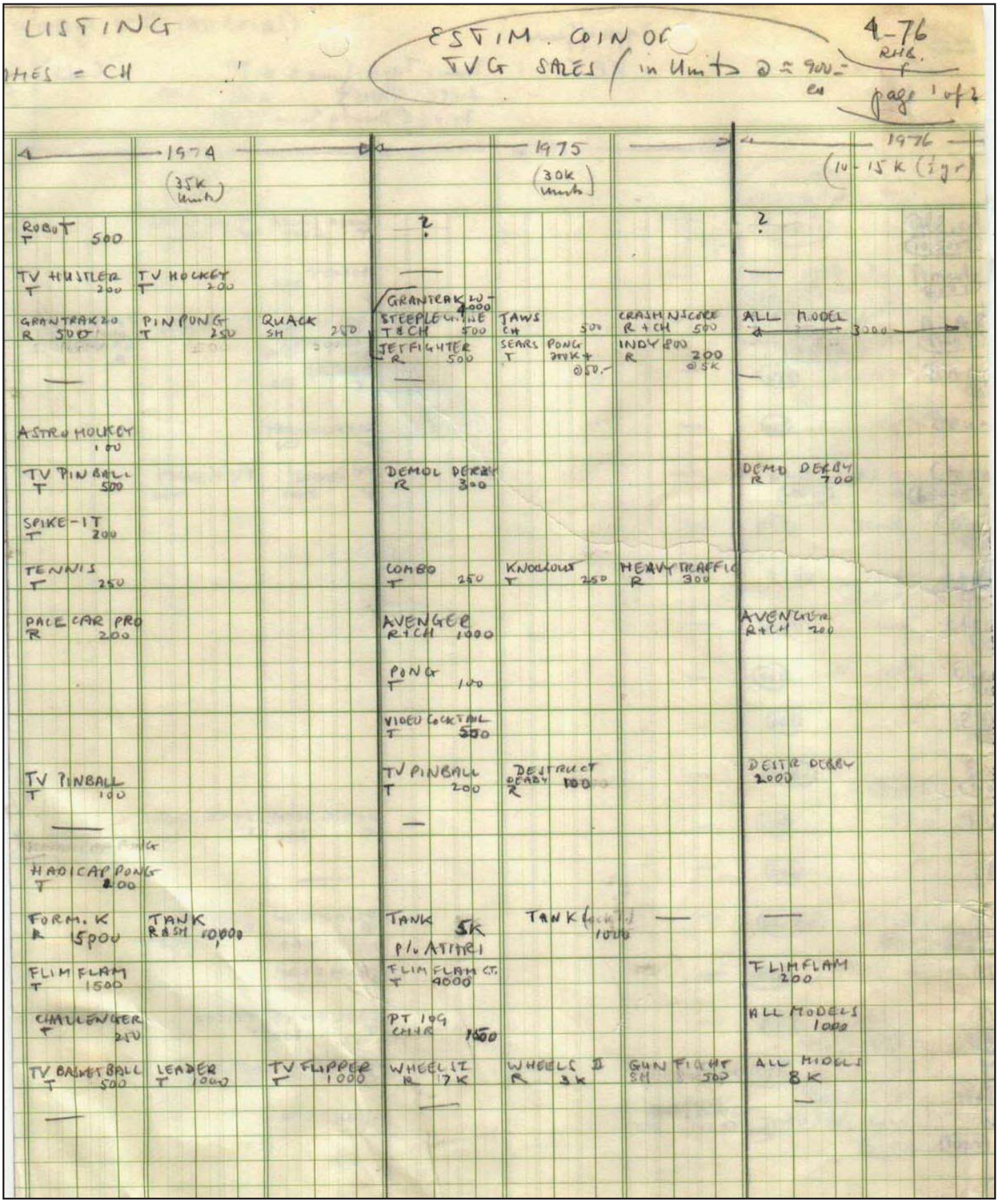


Figure 6 - Arcade Games Sales & Summary Spreadsheet 2/4

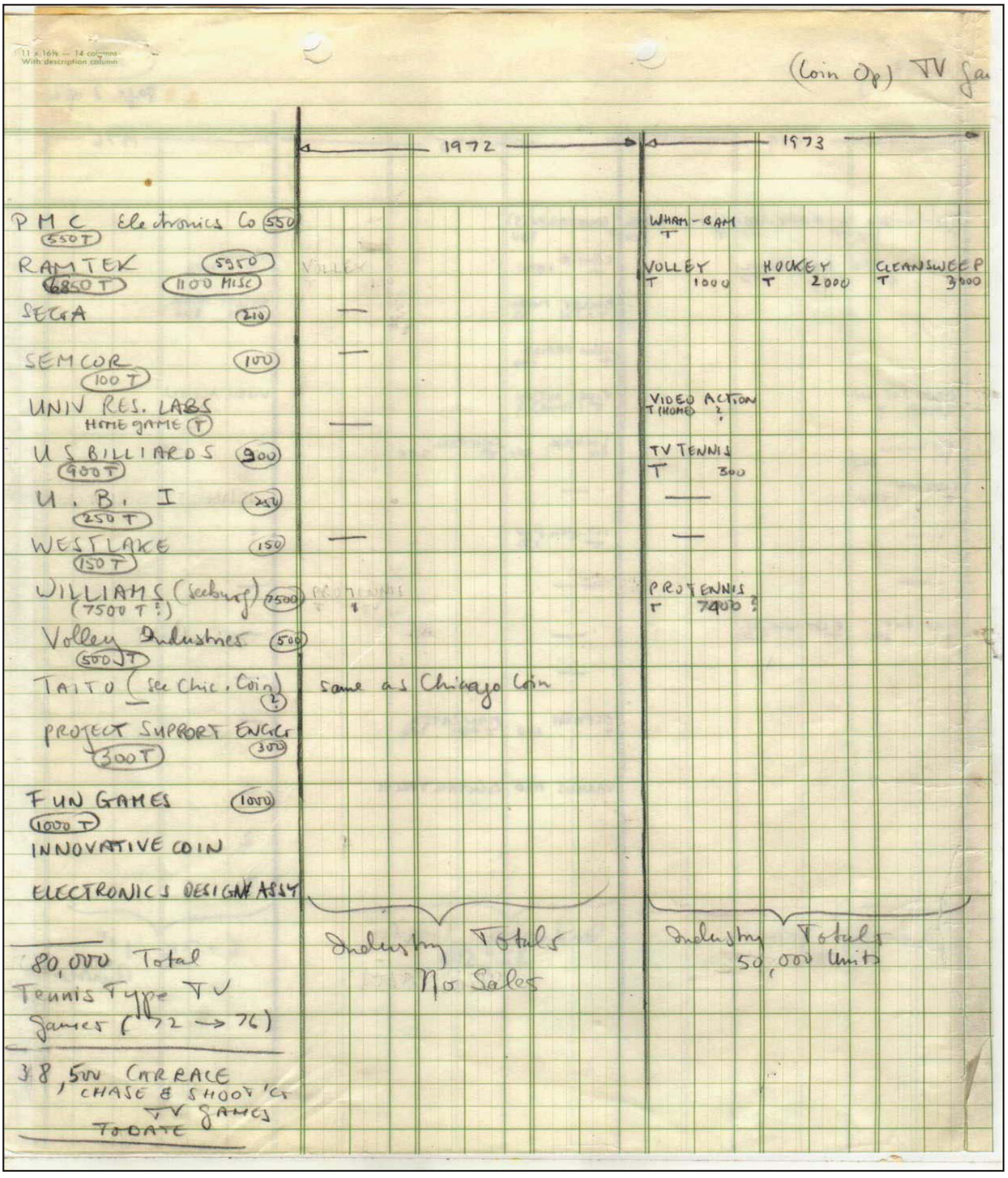


Figure 7 - Arcade Games Sales & Summary Spreadsheet 3/4

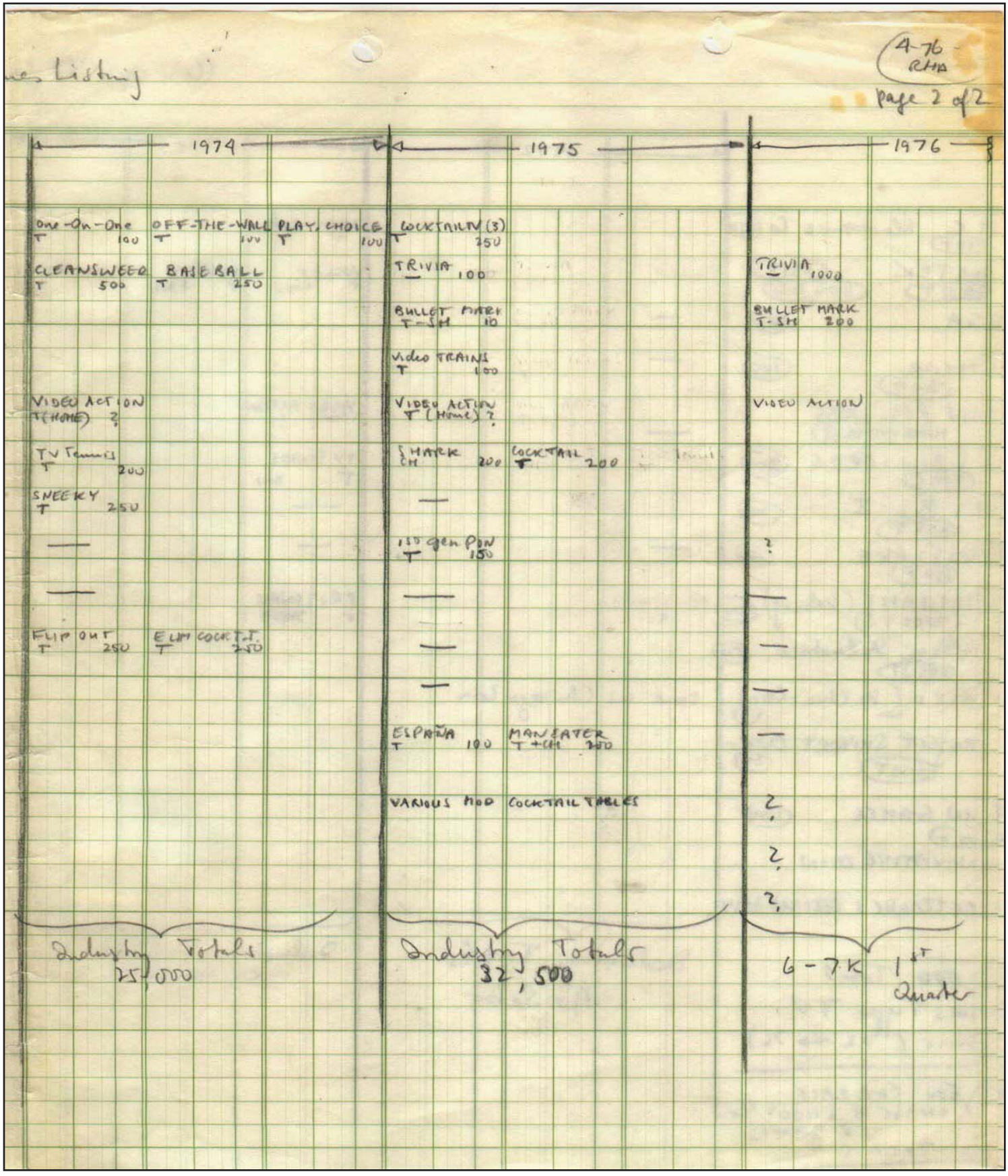


Figure 8 - Arcade Games Sales & Summary Spreadsheet 4/4

esting games. Since there were over 40 million sets in the US alone at the time, this looked like a business opportunity.

At the time I was a division manager and the Chief Engineer for Equipment Design at Sanders Associates, a large New Hampshire defense electronics company. The work on videogames started as a Skunk Works project and soon produced useful looking results. By late 1967 we were playing ping-pong games and we knew we were on to something. By this time, the project had gone "public" inside Sanders Associates and we started cranking away at patent disclosures close upon the heels of making the hardware work. As a result, when Sanders first applied for patents on my invention in mid-1967, we established once and for all who it was who came up first with the concept of playing games on the screen of an ordinary TV set: me.

That makes me the Father of Videogames by definition, both in this country where the "first to invent" is the controlling factor of who gets credited with priority of an invention through an issued patent; and overseas where mostly the "first to file" determines who gets the nod as the original inventor.

Snide comments made by certain people on various cable shows would have everyone believe that "Baer somehow got a patent on moving a spot around the screen and went off and sued everybody to make a lot of money". The facts are slightly different: First of all, there was nothing trivial about inventing a way for ordinary people to interact with their TV sets, no matter how primitive the game was. But that is not what the first of the issued patents claims. That patent not only goes to the basics of the human interaction with a home TV set but describes novel games such a screen symbols chasing each other over the screen and wiping out on contact; gun games using photoelectric techniques for taking a bead on a target spot on that same home TV set and shooting it "off"; other game schemes for playing multiple choice quizzes; and more. But what these "experts" on the subject don't bother to look into is the fact that when we finally went to court it was to pursue infringers of something far more sophisticated. That was the concept and the implementation of videogames in which player-controlled screen symbols interact with machine-controlled symbols, such as the paddles and the ball in a ping-pong game. Judges in the Federal District Courts (and there were many trials in Chicago, New York, San Francisco and elsewhere) and again in the Court of Appeals totally agreed with our position and tens of millions of dollars passed hands. So much for the simple-minded thing that the US Patent Office allowed this guy Baer whereupon he sued the world. Of course, I didn't sue anybody. It was Magnavox who went after infringers on behalf of themselves and Sanders Associates, to whom my patents and those of Bill Rusch and Bill Harrison had been assigned.

Mine and Bushnell's inventions were driven by profoundly different perspectives and completely different objectives. Ever since he worked arcade crowds during summer college vacations and had played *Spacewar*, Nolan Bushnell had the vision to introduce videogames into the arcade environment where pinball machines and billiard tables were the order of the day. My vision was to do something novel and enjoyable with some of the forty million TV sets in the US and millions more elsewhere. We clearly had different visions. Finally, as far as the priority of coming up with the concept of playing videogames is concerned, I did the work years before Nolan Bushnell, as did my two associates. As a result, we received many basic patents early on. One of these was the pioneer patent of the industry; others were patents listing Baer, Harrison and Rusch as joint inventors and then there was a patent that Rusch alone held which was also always in contention during the lawsuits.

By 1971 Magnavox and Sanders had finally completed the wrangling about the details of a license agreement between the two firms. Magnavox now started to work on a production design. Since their management had dragged out the negotiations with Sanders for such a long time, their engineers had lost a year of lead time and they simply copied most of our "Brown Box" design. It worked reliably, so why start from scratch? That decision meant that the Odyssey would be built with "old" technology.

Once both the Odyssey and Atari's *Pong* were out in the public eye, Atari (and Mr. Bushnell in particular) turned out to be much more adept at publicity than Magnavox. In terms of what the public saw, my reputation as the original inventor of videogames was a no-

show. On the one hand, there was my natural reluctance as an engineer to make a big deal of what I had started. This was aided and abetted by the fact that for its first two years, Magnavox's Odyssey did well enough for a brand new concept, but videogames certainly showed no sign yet of becoming the hugely successful product category that they would become in a few years. Furthermore, I had many other inventions to my credit by then and I wasn't going around crowing about any of those from the rooftops, either. The fact that our lawyers told me to "cool it" after Atari became a licensee in May of 1976 also did nothing to put my name in front of the public. In retrospect, it was pretty dumb of me to accept that dictum.

Nolan Bushnell, on the other hand, had started a company and had different objectives and motives. He might have been initially committed to arcade videogames but once he saw and played the Odyssey he was quick to recognize that a potential base of millions of customers in their homes was a hell of a lot more interesting than a few thousand arcades. While that business was taking off on the strength of *Pong*, the stepson of Odyssey, he acted promptly to get into the home game business although some historians claim that it was one of his techies, Harold Lee, who kept pushing the need for a home game and eventually designed one in cooperation with Al Alcorn and Robert Brown. It became Atari's smash hit when Sears bought a 150,000 units of the game for the Christmas 1975 season. Meanwhile throughout the early seventies Nolan Bushnell wasn't shy about sticking his head in front of the cameras to promote his products, his company and himself. He was just doing his job as an entrepreneur and the head of a growing company - and a hell of a good job he did, too. Let me spell it out once more: Atari's *Pong* is a derivative of the Odyssey 1TL200. Atari's entrance into the home videogame business was also spawned by the appearance of the Odyssey. To dispute this is to stand the facts on their head.

So much for the relationship between Baer's and Bushnell's inventions. Now we come to other situations which are often used to denigrate my work as being less than original - with far fewer complaints of similar nature addressed to Mr. Bushnell who had become a folk hero and something of an untouchable as far as his reputation as an inventor was concerned.

Fortunately for my legacy, places such as the American History Museum of the Smithsonian in Washington, the Japanese National Science Museum in Tokyo (their "Smithsonian"), the Heinz Nixdorf Museum in Germany and other venues are all have original or Baer-built replica 1968 *Brown Boxes*, light guns and even earlier developmental hardware These museums have placed those items in permanent displays accompanied by historically accurate posters. The Smithsonian is also the repositiory of many linear feet of data generated by me, Harrison and Rusch during the years of 1966 through 1972. It is the existence of that data which made it possible to write the detailed account of what we did in the sixties and spell it all out in this book.

...And Then There's Russell

To confuse issue of who invented videogames even more, MIT student Steve Russell's *Spacewar* is often trotted out as having been the first videogame. Well, it definitely was a creative, novel computer game and it ***was*** played on the screen of a cathode ray tube, albeit one using a vector drawing scheme unlike the method used by ordinary TV sets to "paint" symbols or pictures on the screen. Secondly, it needed a sixty-thousand dollar computer to make things work. Thoughts of converting this monster into a product for use by the general public were not even a glimmer in Steve Russell's eye or anybody else's.

Had Russell been able to read the tea leaves more accurately he might have realized the potential of what he was doing. Also, had he been introduced to the concept of patenting ideas at that stage of his development, he might have been able to get some claims allowed by the US Patent Office. For all we know, he might have been able to persuade the examiner to grant him fundamental claims on playing games on the screen of a CRT, never mind that his computer games seemed to have no practical, commercial future...then! But that is all hindsight.

What distinguishes Bushnell's work and mine from that early activity is that we both had practical ideas - Eurekas in fact - that could be implemented in the real world and would result in the design and production of viable products. That's a lot different from what

Russell did and requires insights and experiences which were not commonly found in the halls of academe where Russell and associates played midnight games of *Spacewar*. More importantly from a legal point of view, Baer and associates did their homework, which Russell did not do.

The Court recognized all of that and repeatedly rejected arguments based on the so-called precedence of *Spacewar*. It was Judge John F. Grady in 1975 during our first patent infringement law suit against Bally, Atari and others, who called my '480 patent the pioneer patent of the industry. That determination remained firm throughout subsequent trials in various Federal District Courts and in the Court of Appeals. We won every one of those contests. The settlements with Atari (who opted out of that first trial and settled out of court), Bally-Midway, Mattel, Activision and others, along with income from dozens of videogame licensees would eventually make close to a hundred million dollars for Magnavox, Sanders and, last but not least, the lawyers.

While we're on the subject of "playing games on the screen of a CRT", I appreciate that fans of technology in Britain have not seen fit to join the fray of one-upmanship. In 1949 the so-called EDSAC computer used three special CRTs, one of which displayed the '1s' and 'Os' held in memory. That display had a 35 x 16 matrix of phosphor dots. It could show the contents of one of the thirty-two memory "tanks" (or sections), which stored sixteen words of thirty-five bits. Back in 1952, a student called A.S. Douglas came up with the idea of playing Tic-Tac-Toe using the EDSAC's display. Now that certainly was a game but again, it wasn't a videogame.

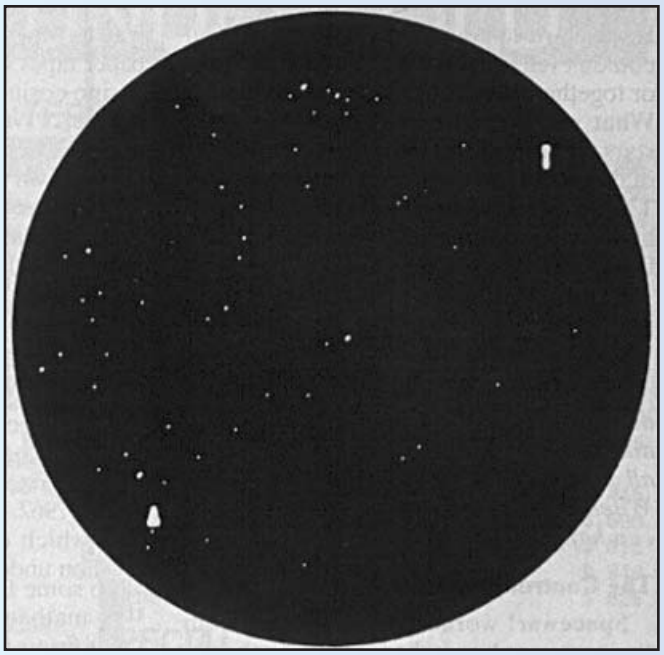


Figure 9 - Spacewar

Fortunately for videogame history, it hasn't been paraded around to justify still another group's unshakeable belief in who invented videogames.

To put a finer point on it, both "what-ifs" and even real inventions are a dime a dozen and not worth more unless they lead to practical results in the real world and stand up in court, if it comes to that. The concept of playing games on a raster scan monitor or on the screen of a standard home TV set was undoubtedly of a pioneering nature and repeatedly passed all the legal smell tests thrown in its way, unlike Steve Russell's *Spacewar*.

The same thing applies to that other much ballyhooed "game" system developed by Willy Higginbotham.

Higginbotham's Claim To Fame

There isn't an engineer born into this world who hasn't fiddled with his oscilloscope and some function generators such a pulse or sine wave test sets and produced neat motions of spots and lines on the screen of his beloved oscilloscope. As a matter of fact, my erstwhile brother-in-law, Walter Sabel swore on a stack of bibles that he saw me fiddle with my first DuMont 'scope in my New York home lab back in 1946 and make a spot go back and forth on its five-inch, round screen...just like a tennis game, he said. Heck, I don't remember doing that but it doesn't matter one way or the other.

Nintendo brought Willy Higginbotham's existence to the attention of the world by having him testify on their behalf during a lawsuit they laid on our lawyers and me in an effort to void our patents and avoid having to pay up. If they hadn't trotted Mr. Higginbotham before Judge Sands in Federal District Court in New York in 1982, the myths of Higginbotham's game having been the "first videogame" would never have gotten a start. A whole lot of negative nabobs would not now be bleating about Willy Higginbotham having "invented" videogames. As it happened, he did nothing

of the kind.

Judge Sands was a tough activist kind of judge and still Nintendo's lawyers (who hailed from the highest priced law firm in New York) lost their lawsuit and had to pay up. Nevertheless the Higginbotham myth was launched. Like a genie once out of the bottle, it is still circulating to this day.

What really happened is simple. In 1958, Long Island's Brookhaven National Labs, where Dr. Higginbotham worked on atomic energy projects, held an "open-house" for family and friends. Willy Higginbotham decided to put on a neat demo of what he called a "tennis game", something interesting for the visitors to play with. He had a variety of Donner analog computers at his disposal so he designed some circuitry and he set a tech to work. The end result was a lash-up of relays interconnected through the plug-board to one of the company's analog computer; this ingenious lash-up would trace a horizontal base line on his display: a DuMont Model 804 oscilloscope - a later version of the test instrument I had on my lab bench in 1946. That line was supposed to depict the base of a tennis court. A short central, vertical line served as the side view of the "net". Pushing a button on a small hand control box launched the ball from left to right. A knob controlled its trajectory. Pushing the button again whenever the ball spot would reach the end of the court would reverse its direction. Failing to time this button push at the appropriate instant would move the ball out of play. There were no paddle symbols.

The game delighted the visitors. After the "open house" was over, all of the circuitry was dismantled and the parts put back in the storeroom. Those analog computers of the 40's and '50's weren't cheap and couldn't be tied up with stuff that had nothing to do with the serious business taking place at Brookhaven. And there the whole affair would have been left to rest in peace if it hadn't been for Nintendo stirring up the self-elected "experts" about who invented what, many years later, when videogames had become a household word.

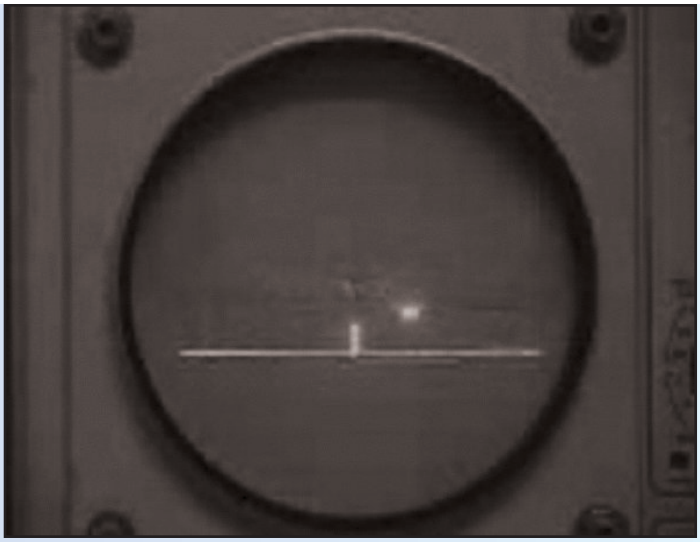


Figure 10 - Tennis for Two

Again: Higginbotham had invented a game. No question about that. But it wasn't a videogame and it had nothing to do with playing games on the screen of a raster scan device such as a home TV set or monitor. Like Russell's *Spacewar*, it was a fun demonstration of how computers can handle and display ballistic motions and the Courts saw it that way. A copy of what Higginbotham built back then was produced more recently by former associates of his at Brookhaven and is reportedly still fun to play.

End Note

I think I'll leave it right there. Lucky for me and my legacy, Magnavox spent the money to pursue infringers of the patents which they, Magnavox, had licensed from Sanders. If they hadn't, the revisionists would undoubtedly have prevailed and my contributions to the videogame business would have wound up on the ash heap of History.

Convincing the Luddites that I am really the Father of Videogames is another matter. Might as well tilt with windmills.

Life at Sanders

In the late 1950s, I quit my job as a VP for engineering at Transitron, Inc, a Manchester, New Hampshire electronics design, development and manufacturing operation. With almost 20 years of electronics engineering experience under my belt at that time, I joined Sanders Associates Inc., in Nashua, New Hampshire. There I soon became the manager of the Equipment Design Division. Sanders was then a large R&D and production company. We worked almost exclusively on advanced defense-electronics programs such as airborne radar countermeasure and antisubmarine warfare electronics. For many years, Sanders was the largest employer in the State of New Hampshire. The corporation became a Lockheed company in the mid-1980s and later, it would be a Lockheed-Martin company. In 2001, Sanders Associates was absorbed by BAE as a subsidiary.

During the 1960s and 1970s I was officially the company's Chief Engineer for Equipment Design. There were as many as 500 engineers, technicians, and support personnel in my division at one time or another. I was a busy guy. We were involved in many CRT display programs that delivered what then passed for high resolution graphics. None of the work in my division, or in the rest of the company for that matter, involved development of broadcast television technology or other forms of raster-scan displays. The display systems we had bought or built were of the stroke-writing, also called vector, types. More on that later.

At the time there were roughly forty million TV sets in U.S. homes alone, to say nothing of many additional millions of TV sets in the rest of the world. They were literally begging to be used for something other than watching commercial television broadcasts!

Thoughts about playing games using an ordinary TV set began to percolate in my mind again, shades of my earlier desire to include some form of game into the TV set I designed at Loral in 1951. That idea had been nixed by my boss at the time, Sam Lackoff, Loral's chief engineer.

During a business trip for Sanders to New York City in 1966 I found myself waiting for another Sanders engineer at a bus terminal; he was going to join me for a meeting with a client. I took advantage of my free time and jotted down some notes on the subject of using ordinary home TV sets for the purpose of playing games. I have a distinct image in my mind of sitting on a cement step outside the bus terminal, enjoying a nice warm, sunny summer day, occasionally looking out at the passing traffic, waiting for my associate to show up and scribbling notes on a small pad. It was "Eureka" time...but of course I didn't know that then. The concept of playing games on an ordinary TV set had bubbled up once again from my subconscious and I got that exciting feeling of "being on to something," a feeling that is so familiar to me.



Figure 11 - Sanders Associates Canal Street Building in Nashua, NH.

September 6, 1966 - Genesis!

When I got back to my office in New Hampshire on September 1, 1966, I transcribed those notes into a four-page disclosure document and tossed the New York notes into the wastebasket. In those four new pages I outlined the idea of playing interactive television games on a home TV set. That was the genesis of the industry.

The disclosure document lists various types of games that I thought to be feasible using an ordinary, unmodified TV set as a display. Described are Action Games, Board Games, Sports Games, Chase Games, and others, all in some detail. What I had in mind at the time was to develop a small "game box" that would do neat things and cost, perhaps, twenty-five dollars at retail. The games would appear on a TV set tuned to Channel 3 or 4. In the Disclosure, I called them Channel LP for "Let's Play!"

That same morning I called Bob Solomon into my office. He was an engineer in my division. I had recently hired him in from Control Data in Minneapolis. "Read, date and initial this document, Bob," I said. It's the standard operating procedure to establish a legal record. Bob's signature is in the upper left corner of each of the four pages. Those four, handwritten pages, complete with torn edges and stickers left over from the legal wars in the seventies and eighties, are reproduced on the following pages, followed by a transliteration, which will be easier to read, beginning on page 25.



Figure 12 - Bob Solomon



Figure 13 - Ralph H. Baer

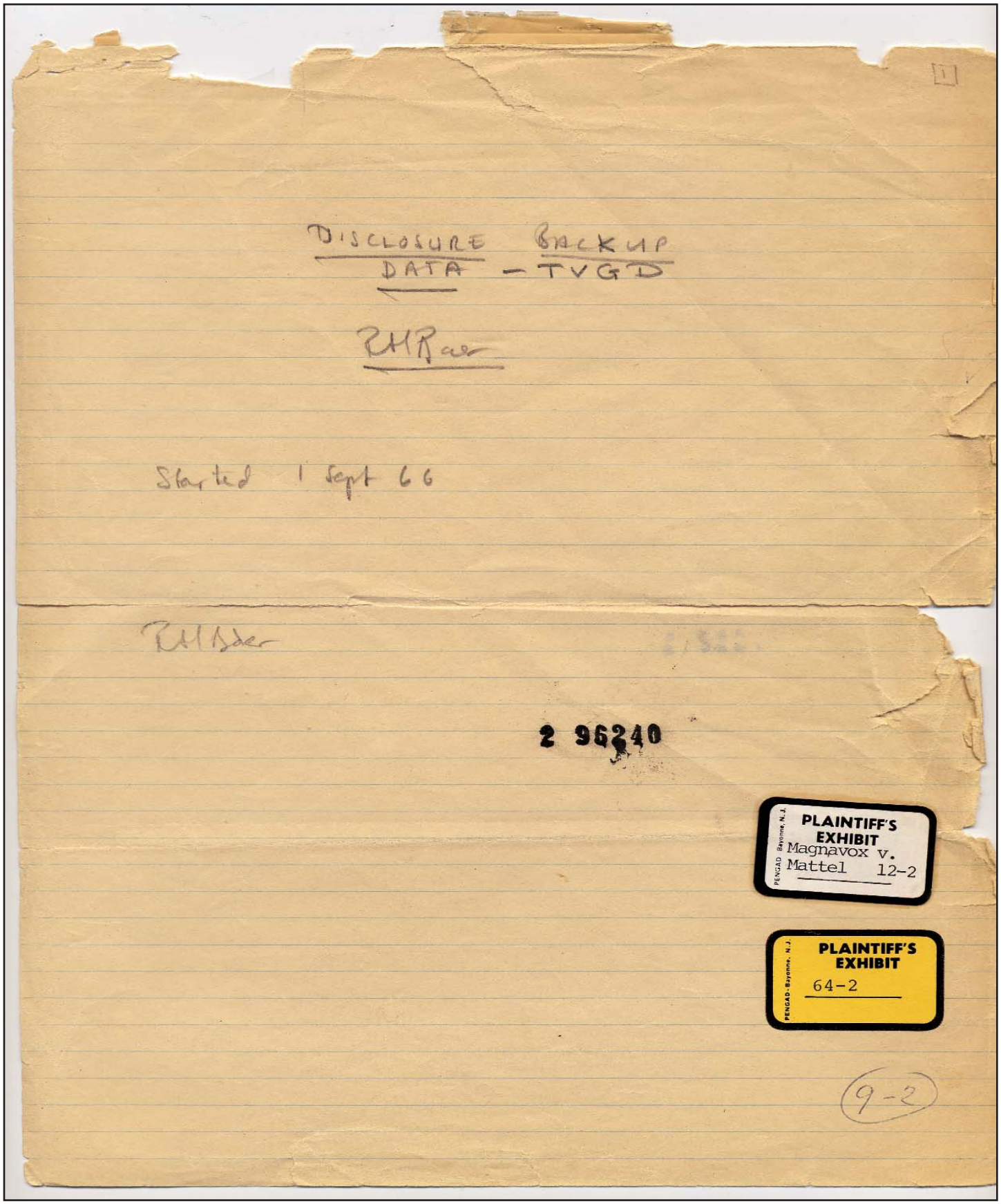


Figure 14 - Disclosure Document 1/5

Witnessed & understood R.M. Solomon 2 Sept 66

page 1 of 4 RH Baer 1 Sept 66

Background Material - Conceptual, TV Gaming Display

PLAINTIFF'S EXHIBIT 64-3

1 Intent

The purpose of the invention is to provide a large variety of low-cost data entry devices which can be used by an operator to communicate with a monochrome or color TV set of standard, commercial unmodified type. Entry into the TV set is to be gained either through direct connection to the video system (at 2nd detector) or by connection to the antenna terminals thus substituting the entry device (hereinafter called "Generator") for the broadcast TV signal, by modulating an RF oscillator operating on one of several standard TV channel frequencies, and tuning the TV set to that channel (Channel 4 for Let's Play).

2 96241

2. Some Classes of Games Considered

The following general classes of games are presently visualized

(A) Action games in which skill of operator (observation, manual-dexterity) play a part. Example: "Steering" a wheel to control random drift of color (hue) over the CRT face - timer determines which participant (hereinafter called player) can maintain a particular hue longest etc.

(B) Board Skill games - i.e. classes of games imitative of checkers, Chess, Pominoes,

(C) Artistic games in which the player manipulates controls to produce artistic designs, working against time (integral timer)

9-3

(D) Instructional games designed to teach basics of geometry, basic arithmetic (ex. adding blocks)

(E) Board Chance games - i.e. classes of games imitative

Figure 15 - Disclosure Document 2/5

Witnessed & understood: R. H. Solomon 2 Sept 66

page 2 of 4 RHBaer 1 Sept 66

of board games usually employing dice, roulette wheels etc to determine character of next move.

(F) Card Games - games imitative of card games requiring intellectual "skill" or dexterity; such games might be played with coded cards which player inserts into generator

(G) Game Monitoring - players communicate with TV set while playing standard games (cards, skill etc) for the purpose of entering score into generator & displaying it on TV set. generator may have provisions to provide simple arithmetic operations (such as adding a player scored points).

(H) Sports Games - such as Auto Racing, using screen as road way or obstacle course; or Target Shooting, using screen as target

2 96242

9-4

PLAINTIFF'S EXHIBIT 64-4

Figure 16 - Disclosure Document 3/5

witnessed & Understood R. H. Solomon 2 Sept 64

page 4 of 4 pages
RH Baer
1 Sept 66

3. Prior to the practical implementation of the above mentioned approaches to TV gaming the following conceptual ideas have been formulated and are here recorded to show the extent of the possible combinations & permutations which are presently apparent; and to form a basis for possible patent (protective) action. It is planned to follow this conceptual deposition by corporately-financed experimental work in the immediate future. Such work will be carried on in the company's facility at Nashua NH and will be properly guarded against inadvertent disclosure by confining it to a minimum number of personel & by conducting the work in a guarded & otherwise inaccessible room.

The following is a list of conceptual ideas and techniques which have occured to the writer. It is intended to supplement this list with new material as it is formulated by adding new depositions (sheets) appropriately dated to this present material. No special order will be followed. However, each conceptual scheme will be coded as to gaming category by appending to it a letter corresponding to "Class" letter of section 2, pages 1 and 2 above.

2 96243

3.1 An oscillator centered at 3.579545 MC or approx 3.58 MC is provided with a phase shift control in its output which is capable of producing a signal displaced from the basic 3.58 MC output (pulse) over a range of 0° up to 360°. Purpose: to develop single-color flat field on TV screen. Applications—
(a) Connect shaft of phase shift control to flywheel—player spins flywheel. Player's score if flywheel comes to rest in player-preselected color on CRT screen. [E, H (manual skill required to position phase shift control so as to produce desired color)] (9-5)

3.2 Two players operate a "Pump" — one pumps "up", one down; ~~pump control~~ 3.58 MC pulses plus phase shifted chroma pulses are generated; pump controls level of

PLAINTIFF'S EXHIBIT 64-5

Figure 17 - Disclosure Document 4/5

WITNESSED & UNDERSTOOD R. H. Solomon 2 Sept 66

page 4 of 4
1 Sept 66
RHBaer

chroma signal. One player pumps for black, other pumps for saturated color, alternate (for monochrome) players pump for black or white screen. [A, H] Use CRT overlay showing section of vessel being filled

3.3 Bar, Line or Dot Generation – player control selective Blanking, Blinking, color coding of lines, Bars, Dots, fields via generator [B, C, D, E]

3.4 Noise injection – in combination with color, geometric patterns such as lines, bars, dots etc to form characteristic displays of color distribution, brightness distribution. Variations may be result of selective blanking etc as in 3.2 above or by controlling spectral content, distribution, bandwidth of noise. Noise may be modulated into 3.58 mc carrier, used as substitute for chroma signal etc. [A, E, H]

3.4. Scan Conversion Techniques. –
Using a mechanically vibrating or rotating devices, such as spinning Nipkov disk, in the generator, the player can enter data (color, brightness, dots, squares, circles, other geometric figures) by placing sensor (photocell, capacitive pickoff, magnetic pickoff, electric contact etc) over spining Nipkov disk or similar device, multiple pickoffs for several players may be used.

2 96244

3.5 Free-Running Raster Techniques –
generation of displays by providing only Horiz, only Vertical, Both or neither synchronization pulses to the TV set from the generator, entering TV set only with either horiz sync or vertical sync correlated signals or noise or totally uncorrelated noise, using level, blink-rate etc as characteristic (identifying) display.

9-6

PLAINTIFF'S EXHIBIT 64-6

Figure 18 - Disclosure Document 5/5

Background Material - Conceptual, TV Gaming Display

1. Intent

The purpose of the invention is to provide a large variety of low-cost data entry devices which can be used by an operator to communicate with a monochrome or color TV set of standard, commercial unmodified type. Entry into the TV set is to be gained either through direct connection to the video system (at 2nd detector) or by connection to the antenna terminals, thus substituting the entry device (hereinafter called "generator") for the broadcast TV signal, by modulating an RF oscillator operating on one of the several standard TV channel frequencies, and tuning the TV set to that channel (channel LP for Let's Play).

2. Some Classes of Games Considered

The following general classes of games are presently visualized:

(A) Action games in which skill of operator <observation, manual dexterity) play a part. Example: "Steering" a wheel to control random drift of color (hue) over the CRT face - timer determines which participant (hereinafter called player) can maintain the particular hue longest, etc.

(B) Board Skill Games - i.e., classes of games imitative of checkers, chess, domino,

(C) Artistic Games in which the player manipulates controls to produce artistic designs, working against time (integral timer)

(D) Instructional Games designed to teach basics of geometry, basic arithmetic (ex. adding blocks).

(E) Board Chance Games - i.e., classes of games imitative of board games usually employing dice, roulette wheels, etc. to determine character of next move.

(F) Card Games - Games imitative of card games requiring intellectual "skill" or dexterity; such games might be played with coded cards which player inserts into generator.

(G) Game Monitoring - Players communicate with TV set while playing standard games (cards, skill, etc.) for the purpose of entering score into generator and displaying it on TV set. Generator may have provisions to provide simple arithmetic operations (such as adding a player's score points).

(H) Sports Games - such as Auto Racing, using screen as roadway or obstacle course; or target shooting, using screen as target.

3. Prior to the practical implementation of the above mentioned approaches to TV gaming the following conceptual ideas have been formulated and are here recorded to show the extent of the possible combinations and permutations which are presently apparent; and to form a basis for possible patent (protective) action It is planned to follow this conceptual deposition by corporately- financed experimental work in the immediate future. Such work will be carried on in the company's facility and Nashua, N.H. and will be properly guarded against inadvertent disclosure by confining it to a

minimum number of personnel and by conducting the work in a guarded and otherwise inaccessible room.

The following is a list of conceptual ideas and techniques which have occurred to the writer. It is intended to supplement this list with a new material as it is formulated by adding new depositions (sheets) appropriately dated to this present material. No special order will be followed. However, each conceptual scheme will be coded as to gaming category by appending to it a letter corresponding to "Class" letter of Section 2, pages 1 and 2 above.

3.1 An oscillator centered at 3.759545 MC or approx. 3.58 MC is provided with a phase shift control in its output which is capable of producing a signal displaced from the basic 3.58 MC output (pulse) over a range of 0° up to 360°. Purpose: to develop single color flat field on TV screen.

Applications -

(a) Connect shift of phase shift control to flywheel - player spins flywheel. P1ayers score if flywheel comes to rest in player - preselected color on CRT screen [E, H (manual skill required to position phase shift control so as to produce desired color)]

3.2 Two players operate a "pump" - one pumps "up", and down; 3.38 MC pulses plus phase shifted chroma pulse are generated; pump controls level of chroma signal. One player pumps for black, the other pumps for saturated color; alternate (for monochrome) players pump for black or white screen. [A, H] Use CRT overlay showing section of vessel being filled.

3.3 Bar, line or dot generation - players control selective blanking, blinking, color coding of lines, bars, dots, fields via generator [B, C, D, E]

3.4 Noise injection - in combination with color, geometric patterns such as lines, bars, dots, etc. to form characteristic displays of color distribution, brightness distribution. Variations may be result of selective blanking etc. as in 3.2 above or by controlling spectral content, distribution, bandwidth of noise. Noise may be modulated onto 3.58 MC carrier used as substitute for chroma signal, etc. [A,E,H]

3.5 Scan conversion techniques - Using mechanically vibrating of rotating devices, such as spinning Nipkow disk, in the generator, the player can enter data (color, brightness, dots, squares, circles, other geometric figures) by placing sensor (photocell, capacitive pick off, magnetic pickoff, electric contact, etc.) over spinning Nipkow disk or similar device. Multiple pickoffs for several players may be used.

3.6 Free-running raster techniques - Generation of displays by providing only horizontal, only vertical, both or neither synchronization pulses to the TV set from the generator, entering TV set only with either horizontal sync or vertical sync

correlated signals or noise or totally uncorrelated noise, using level, blink rate, etc. as characteristic (identifying) display.

Getting Started

The first paragraph on page 18 shows how conflicted I was at the moment I wrote this disclosure document. What was all that verbiage about "low cost data entry devices which can be used by an operator to communicate with a monochrome or color TV set." Well, here I was in a defense electronics company disclosing concepts about playing games on a TV set. So the initial impulse was to clothe it all in military jargon. That lasted about two more lines and then I clearly said to myself, "the hell with it! Let's call it what it really is: TV Games."

Little did I know that this disclosure document had started a ball rolling which would eventually turn into today's huge home videogame industry! Nor could I have anticipated that these four pages would surface again after 1976 in Federal District Courts in Chicago, San Francisco, New York, Ottawa, and many other places, in pursuit of patent infringers, and that a lot of money would change hands as a result of the process begun by that document.

Five days later, on September 6, 1966, I put my somewhat dormant television receiver and transmitter design knowledge to work and drew up an elementary schematic (Figure 2). It showed the circuit building blocks required to place two spots on a TV screen and manipulate the spots so they can be moved anywhere on the screen and allowed two players to "chase" each other's white "spots" around the screen; the most basic of game actions! My schematic showed the use of two sets of vertical and horizontal control knobs for use by the players; and it indicated exactly how these "spot generators" would modulate a transmitter tuned to Channel 3 or 4 so that the game signals could enter any TV set by way of its antenna terminals. Finally, I also showed in that schematic how color could be added to the playing field.

A few days later, I called one of my department managers and asked to borrow a technician. He



Figure 19 - The Heathkit IG-62 Generator

assigned Bob Tremblay to me. I immediately put Bob to work on building up a vacuum-tube circuit to prove that we knew how to move spots or lines around a TV screen. To save time, I bought a Heathkit IG-62 TV alignment generator, a piece of test equipment intended for adjusting TV sets. It provided us with instant access to some critical circuits that I needed to place an image on a TV screen. That saved us time that would otherwise have been spent on building this circuitry from scratch.

I showed Tremblay how to bring out wires from the horizontal and vertical sync signals inside the IG-62 and how to get back into the Channel 3 or 4 r.f. modulator with our "player" screen symbol, a simple vertical line of adjustable height and variable horizontal position.

"Don't spend more than a couple of weeks on this," I said, "I just want to get a feel for what it takes circuitwise to move a spot around the screen." Trembley picked up a sheet of aluminum about 4x6 inches and hogged out holes for four tube sockets. Bread boarding circuitry using vacuum tubes was a royal pain and took time. I sketched a schematic for Tremblay's use that showed him how to wire up two Delay Multi Vibrators (DMV). Wiring these to the IG-62 was supposed to get us to our objectives: displaying and moving a vertical line on the TV screen. A learning exercise.

Tremblay was repeatedly pulled off my project to solve some problems on the job from which I had commandeered him, He finished my assignment in early December. The two-tube unit was ready for testing and we could indeed put up a line and move it across

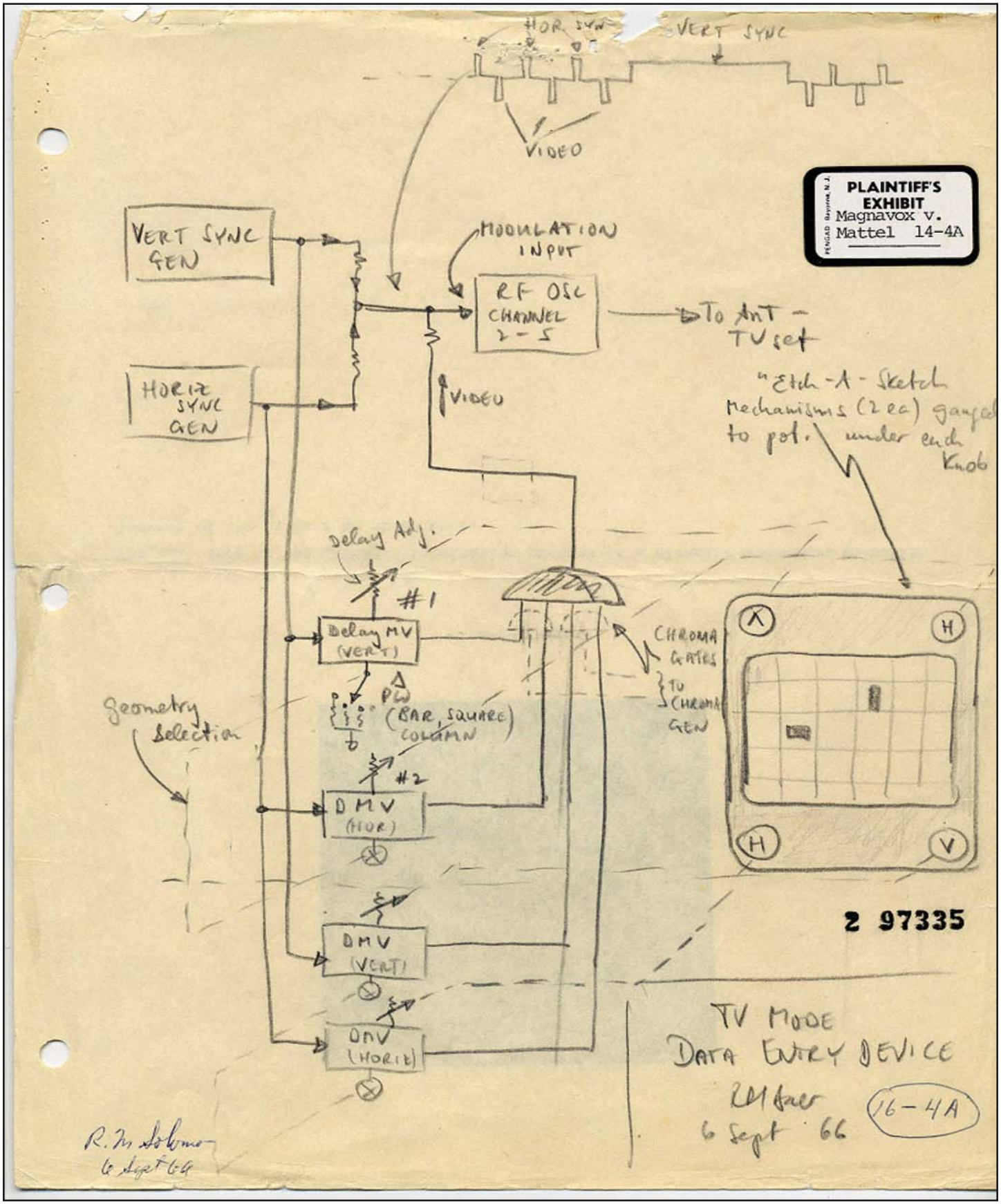


Figure 20 - Original Schematic, TV Game 6/9/66

the screen. So far, so good. I drew up a schematic that shows how the two DMVs operated and how they were hooked up to the IG- 62. (See Experiment 1 - Page 221).

Next I worked on coloring the line. When I was finished I handed a schematic to Tremblay and had him wire up two additional vacuum tubes to handle that job (See Experiment 2 - Page 222).

By December 10 that was all done. Tremblay drew a final schematic of the color circuitry and returned to his regular job.

The venerable piece of hardware that Bob Tremblay built still exists. Its current home is in the Smithsonian Institute's National Museum of American History, along with other early videogame units we built at Sanders. The experimental unit basically amounts to no more than two tubes comprising two "one-shot" timing circuits that could put a vertical line on the screen, change its height and move it left and right on the screen. Two additional tubes proved that we knew how to create various hues and could use them to "color" our line or the background. That was it! We labeled it TV Game (TVG) Unit #1. It was crude, but the experiment served the purpose. It confirmed what I thought we needed circuit-wise to build a simple game unit.

"Why vacuum tubes?" you might ask.

We used vacuum tubes for this first feasibility test for a couple of reasons: Transistors had not been around very long and I was not yet comfortable with designing them into television circuitry. We couldn't use more complex integrated circuit "chips" which we were beginning to design into military hardware because they were much too expensive for use in a consumer product at the time. Mainly, however, it was my lack of comfort with transistor circuit design that mandated the tube choice. That would soon change.

Obviously, this unofficial activity had absolutely nothing to do with the normal business of developing military electronics in my division. At the time, the direct labor cost for my organization was somewhere near ten million dollars a year. Since I was running such a large operation, I could afford to experiment with a few things without even rippling the division's substantial overhead. So I just did it!

Needless to say, things could not remain that way indefinitely. Either I had something that was worth pursuing that the company ought to support officially, or I didn't. It was time to go "public." By December of 1966 I decided that the best course of action was to demonstrate the concept of Home TV Games to Herbert Campman, the company's Corporate Director of Research and Development. His operation was the most likely source of funding.

"Herb, I would like you to look at a demo of something new," I said.

He came up to the small room I had commandeered for the game development work and looked at our crude demonstration of making one spot move around the screen or stretch into a line of varying length. It wasn't much but Herb understood where it was heading.

"This looks like it has potential," he said, "but it better do more interesting things than this."

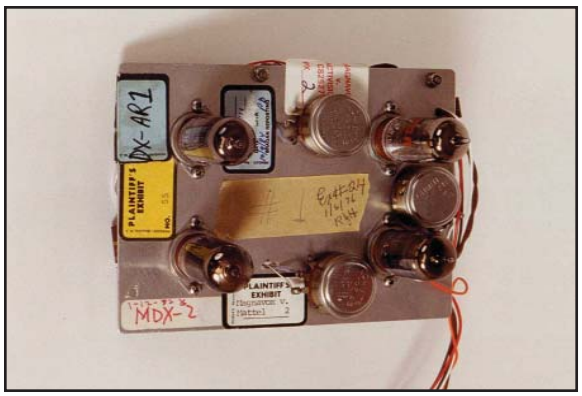


Figure 21 - Vacuum Tube Feasibility Unit #1- adorned with stickers from various lawsuits

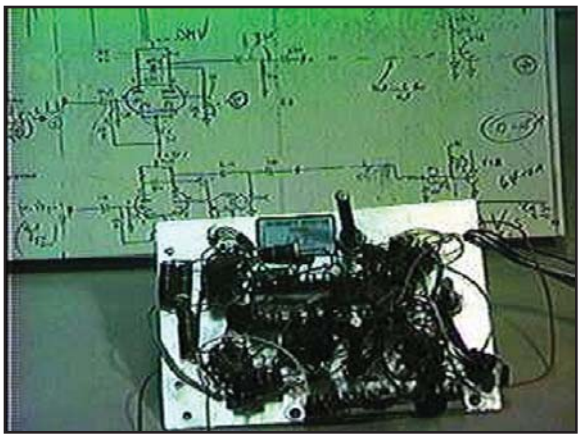


Figure 22 - Bottom view of TVG#1

Herb said that he liked the concept of Home TV Games. He expressed confidence that we could build on this simple beginning. I was hoping that he would ask me to write a request for funding of further TV Game development work, and he did just that. I didn't have to prompt him. Herb had vision.

On December 22, 1966, I sent Herb a memo outlining what we planned to do with his money. As a result, we got our first official R&D funding: a grand total of $2,000 for direct labor and $500 for direct materials. It wasn't exactly a princely sum but it was enough to make us honest and keep the project going.

Not much happened over the Christmas and New Year's holiday period. Sanders was as deserted as usual at that time of year and those of us who were still on the premises didn't feel much like working. It was a good time to catch up on filing and other paperwork, but not much else. January also went by without further work being done on the TV game project.

Early in the new year I sketched a couple pages on "some proposed BASIC CIRCUITS" including ways to display a cross whose crossover point could be varied and used with checkerboard overlays to play board games. Also on the list was another sketch that showed how to twirl a disk and make it generate a spectrum of colors to be guessed at.

I also wrote a tutorial on the U.S. color TV system which I thought would help the next tech to come aboard the game project. As far as I knew none of our techs had any knowledge of TV circuits. Bob Solomon and I got together off and on throughout January and early February and came up with ideas for simple games that would be realizable with next-to-no-circuitry. All along we kept in mind the ultimate objective: to design and build an inexpensive but interesting interactive accessory for a TV set. We talked about how to play Chase Games, Bucket-Filling Games, Skill Games, an ever-lengthening list of games that looked technically feasible and were, hopefully, fun to play. We also bought an RCA 19-inch color TV set for future experimental work. On February 11 I drew up a list of games (Figure 9) which proposed to use a line traversing the screen horizontally that would divide the screen into two halves, an upper and a lower one. The screen below the line would have one color; above the line the would be another color. Game play would consist of causing the dividing line to rise or fall in response to player actions. Proposed were the use of this scheme for scoring, "bucket filling", game timing and "skill games".

1967 - Early TV Game Development -

Quiz Games

In early February of 1967, I sketched some preliminary designs for a transistorized version of a basic TV game unit. On the twelfth, I brought Bill Harrison on board the TV game project. Bill was another electronic technician in my division who later became an Engineering Associate. Several years earlier we had briefly worked together on a Quick-Reaction-Program called BRANDY. That involved the design, fabrication and assembly of some specialized radio signal detection circuitry. Together with commercial radio receivers and electronics hardware designed on the spot, BRANDY was going to monitor Russian radio transmissions in occupied Berlin. Bill Harrison left that project after two weeks and I finished it working 'round the clock with the help of another tech. We spent seven days a week, eighteen hours a day on this project and finished it in less than four weeks. It established my reputation at Sanders as a guy who could get things done. I got to like Bill and to respect his abilities during the short time he was with me on that crash-and-burn project. He was an excellent technician, good at transistorized circuit design, good with his hands, and ultra-reliable. My kind of guy! He also had some television circuitry experience, having built a Heathkit TV set and serviced TV sets in his spare time. So I exercised my prerogatives as the division manager and commandeered him from his regular work.

For a little perspective on the state of electronics technology, consider that a Time-of-Day clock we designed for BRANDY (that did nothing but display local time in digital format) took an entire 18 inch wide rack panel assembly about 9 inches high with some 10-15 printed circuit cards to do that job. Each of these cards contained no more than a couple of transistorized Flip-Flop circuits, or a few AND or OR Gates. That whole rack did less - far less - than the simplest LCD watch we wear on our wrists today.

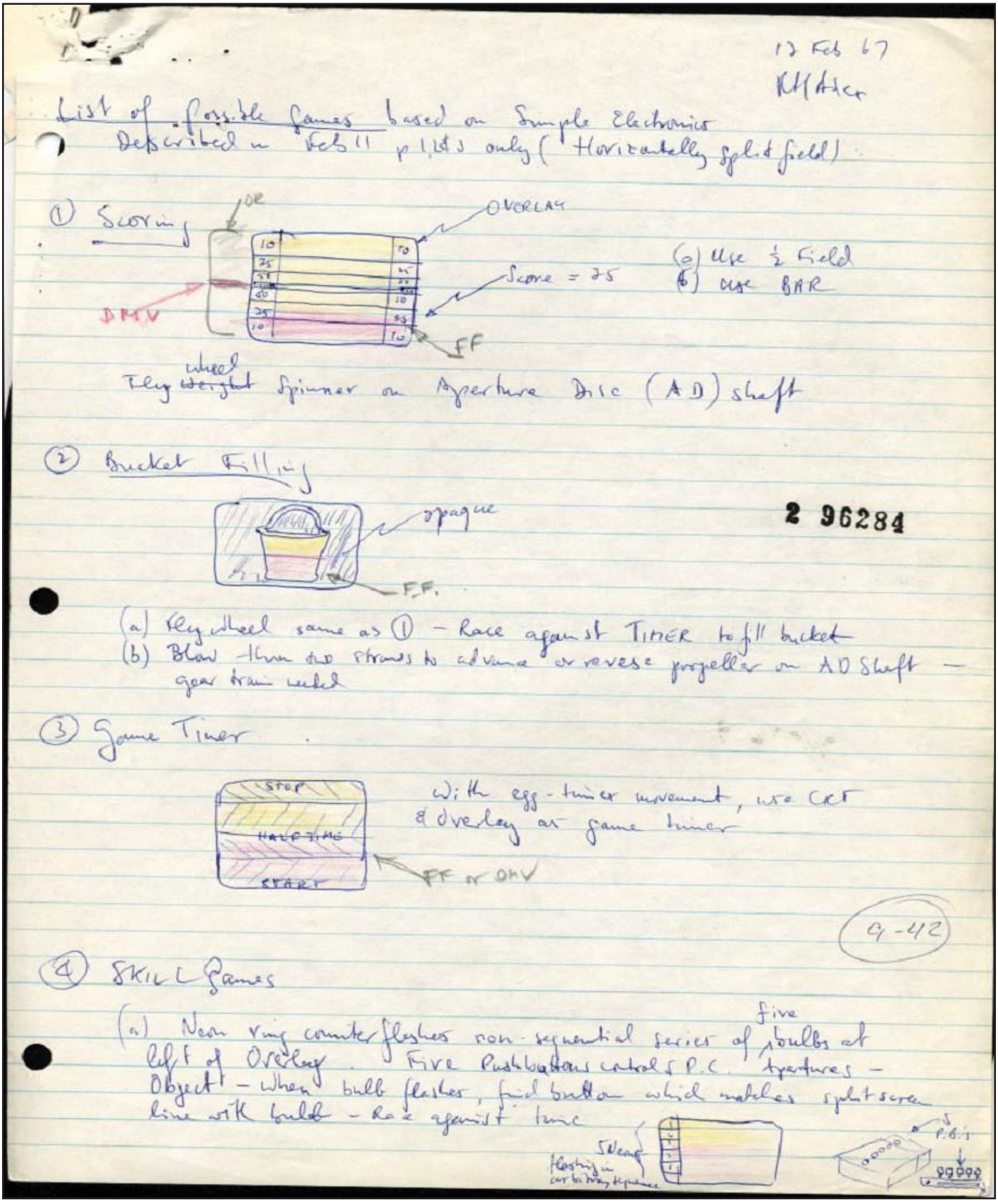


Figure 23 - List of Games

On February 12th, 1967, Bill moved into our 10 foot by 20 foot lab, the same place where Tremblay had worked on the vacuum tube hardware. It was located on the fifth floor immediately opposite the elevator of Sanders' huge Canal Street building in Nashua. That little room had once been the company's library during the early days of Sanders. The few books that had been in there were mostly donated by members of the engineering staff. Talk about small beginnings.

"Here's the key to the door, Bill," I said. "I don't want anyone to know what's going on in here, for now. Treat it like a classified project. Keep good notes in a standard Sanders-issue brown notebook".

I had the only other key to the lab. The facilities guys had placed a workbench along one wall for us and wired it up, so that we could plug in test equipment, power supplies, and our 19-inch color TV set. We had a desk, a couple of metal file cabinets, and two chairs. That pretty much filled up the rest of floor space. It was a tight fit.

Bill started out by reviewing what Tremblay and I had done so far. He copied the notes I had made a week earlier into his own Notebook. Before he could get started on game design, however, I had a new idea. I told Bill to drop what he was doing.

"I want you to build a photo pen and put this circuit into a small box," I told him and handed him a schematic I had drawn. Its purpose was to play quiz games by pointing the light pen at one of several white spots on the TV screen. Each of those spots corresponded to a different answer to a quiz question. If the light pen pointed at the correct answer, a green light would immediately turn on. Wrong answers produced a red light indication.

For some time I had been thinking of adding such a quiz scheme to existing tutorial video tapes to make them "interactive". Not that I used that term, it probably hadn't even been coined at the time. Generating "coded" spots had come out of a conversation with fellow engineer Bill Rusch. It was a simple scheme. An even number of white spots displayed on the screen at the normal TV rate of 60 a second would be a "CORRECT" spot. An odd number of spot appearances represented a "WRONG" spot, simple as that. We called it the ODD/EVEN scheme. Bill Harrison found a



Figure 24 - 2/27/67 - Our first Quiz Light Pen

small transistor "pocket" radio in a black case somewhere, ripped out the circuitry, and built into it the simple flip-flop circuitry that Rusch and I had come up with. Red and green miniature pilot lights served as RIGHT/WRONG indicators. This scheme became the subject of our first interactive video patent, USP No.3,599,221 (page 213).

Bill had also begun to look into the design of a quiz code encoder and started to get acquainted with color TV circuitry when all work had to stop. He was recalled to finish some urgent work on a major military electronics program that he had been working on before he joined me on the game project. Priorities being what they were at Sanders, I had no choice but to let him go. I did not get him back on the job until early May. All activity in our "game room" came to an abrupt halt.

For the next three months, until Bill Harrison finished his high-priority program and returned, the only game activity consisted of an occasional meeting between myself and Bill Rusch, an engineer who was assigned to Herb Campman at the time. We kicked around various game concepts and made appropriate notes. After a couple of weeks, I insisted that Bill Rusch put it all down in a memo and that I would do the required illustrations. Bill handed me a draft on May 10 which I cleaned up, drew the six sketches it needed, and added some new stuff. My secretary typed up what turned into a six-page memo (Figures 11-16). I told her to stamp it ***Company Private*** and limit the distribution to Bill Rusch, Bob Solomon and John Mason, one of my engineers with whom we had

COMPANY PRIVATE

To: R. Baer

From: W. Rusch

File Reference: RB/dc/1-2300/67/92

Subject: Misc. Ideas for T.V.G.

Date: May 10, 1967

1. Picture Drawing

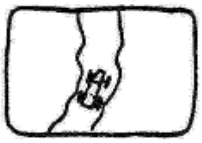
(a) Have horizontal and vertical line drawing controls. (Or, one "joystick" controlling Hand V.)

(b) Push-buttons for desired color.

Need memory scheme, of course.

2. Car Steering

Have steering wheel ... put car on screen ... movable road ... player tries to keep car on road



or, show view thru "car windshield"



3. Same as 2, but skiing.

4. Chase Game

Use ships, dots or probably best two old "dog fighting" type WWI planes ... or, up-to-date, plane and missle ... or ship and torpedo.

One operator moves "target", other pursues ... when "hit" by contact with pursuer target vanishes.

5. Maze Game

Put maze on screen. Player moves dot (or white rat) thru maze using h + v control (or, joystick better) ... if hits line of maze, "rat" disappears and reappears back at starting point.

COMPANY PRIVATE

Figure 25 - Original Memo - 1/6

6. Rotating Spiral

(a) Spiral "track" rotates.

(b) Operator tries to keep car, boat, dot, etc., from touching lines.

(c) Could do with only one axis (H or V) control of operators dot.

(d) Maybe have 2nd player control instantaneous rotation speed for competitive aspect.

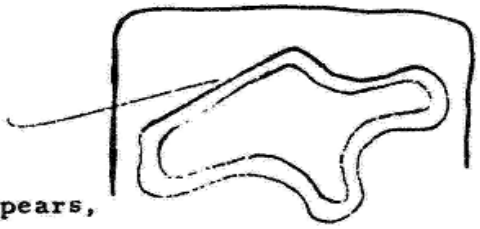


7. Racing Game

Layout "track" on screen....

Put two different color cars on it . . .

Two players - if car hits track boundaries, it disappears, if car in rear runs into car in front, rear offending car disappears and other one wins.



8. "Roulette"

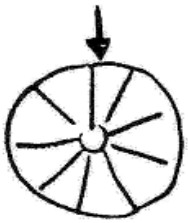
Have wheel

(a) Either just black + red, or

(b) Various colors

(c) Numbered.

Players pick # (or color) . . . wheel spins . . . and then comes to rest - like "Vegas wheels."



2 96287

9. "Baseball" Guessing Game

Divide Screen into 3 to 5 horizontal sections (strips).



Pitcher (using push-buttons) selects strip in which ball will appear). Batter selects strip in which bat will appear. Pitcher pushes "pitch" button, bell rings and ball appears on screen sometime (second or two) after bell rings . . then, second or two, later bat appears. If both in same strip, "HIT" Sign flashes and ball disappears, otherwise, "strike" lights up.

10. Baseball "Skill Game" #1

As above, except "ball" stays on for brief period only.

Batter has some time (but very brief, requiring excellent reflexes) after pitch appears to try to get bat in same strip as ball (by push buttons)

COMPANY PRIVATE

Figure 26 - Original Memo - 2/6

11. "Map" Game - 1 or 2 Players

Outline Map of U.S. (for example) shown on screen. "Teacher" (Player #1 or the "machine") pushes button which lights up one state and starts timer displayed on screen.

"Student" names state, at same time pushing button which stops timer and displays correct name of state* (on state or - easier - at a fixed place on screen).

Allow certain maximum time for "student player" to answer - maybe 10 seconds - check experimentally. If he hasn't answered by then, chalk up a "wrong".

For scoring, consider accuracy and speed of course. Thus, could have three columns displayed. Number Right, Number Wrong, and total time (sume of time in seconds taken for each state "try"). Total time would be done automatically.

"Teacher" or student himself could push "Right or Wrong" button after each try.

*If two players, perhaps better if "teacher" pushes time stop button after student answers.

12. "Tracer Bullet Shooting Game"

One player positions target plane (or bird, etc.) with a joystick. At start, screen is blank (blue for sky?). "Target operator" pushes start button, at which time plane appears, "bullets" appear, and displayed "timer" starts "ticking away" seconds.

"Bullets" appear as flashed dots .. being lit only for brief time.. and not reappearing for some time interval (determine experimentally) later.

Shooter positions "bullets" with joystick.

If a bullet "flash" coincides with plane's position, plane disappears (or, neat if could have it turn into orange red flame and sink out of sight off screen) .. and "timer" stops. Displayed seconds indicate how long it took shooter to hit

COMPANY PRIVAT

Figure 27 - Original Memo - 3/6

target.

Could also make into single player game by having planes' movements controlled automatically and semi-randomly (i.e., "smooth" turns, continuous flight path but random flight path).

13. "Baseball Skill Game" #2

(a) Batter controls circled "hitting area" of displayed bat with joystick.

(b) Bat appears for certain brief time after batter pushes a "swing" button (with hand not controlling positioning joystick).

(c) Pitcher will have variety of controls so he can preselect:

SLOW MEDIUM FAST*

*Straight Ball (Divide displayed "strike zone" into maybe at least nine (9) squares to cover shoulders, belt, knees ... and inside, center or outside ... a straight ball just lights up one square).

Curve (ball moves from left to right at constant height).

Hook (ball moves from upper left to lower right).

Drop (ball moves from top to bottom in straight line).

Inshoot (opposite direction of curve).

*Maybe allow option of putting a "hop" on a FAST-STRAIGHT ball by letting it hop up one square (note that squares are not to be displayed) just before disappearing, etc.

When pitcher pushes "pitch" button, bell rings or light flashes. If he's preselected fast, ball appears immediately after pitch signal . . . if MEDIUM or SLOW, ball's appearance will be delayed.

Note also that length of time ball "stays on" might be governed slightly (may not need this feature however) by type of pitch, i.e., a fast ball arrives sooner after leaving pitcher's hand and crosses plate more quickly than a slow ball.

Thus, fun comes in, in both position and time. Not only must batter position bat "circle" (Holy Baseballs, Batman!) skillfully - when circle covers ball a "HIT" signal is displayed - - but he must have "timing" right. Thus, if he anticipates a fast ball and presses SWING button right after PITCH SIGNAL is given, he "uses up" some of his time (during which bat is displayed) before a slow pitch appears,

COMPANY PRIVATE

Figure 28 - Original Memo - 4/6

and has less time for positioning. If he waits, a fast ball may be almost "gone" by the time he has decided to SWING and then he has less time for positioning the circle.

4. Skeet Shooting #1

"Gun" is displayed at bottom of screen. Gun stock is fixed at bottom center of screen. Gun pivots about this point so that gun barrel can point in various directions. Gun's angle is determined by position of a player's joystick.
Target shoots out from either side of screen at various speeds and angles - (check to see whether in real skeet shooter knows beforehand from which side target will appear - simulate the real thing).
Shooter "leads target" by pivoting gun with joystick. To fire, he pushes button or, better - pulls trigger built into joystick.
If " hit" occurs, have target disappear.

5. ESP Game

"Sender" and "Receiver" each have push buttons to select one of 10 numbers (or one of different colors, etc.). Sender selects one number (color) which is NOT displayed. When "Receiver" is ready to guess the number (color) he pushes his button whereupon both players' numbers (colors) are displayed.
A manually operated but displayed "score" column can keep record of "hits and misses."

6. "Hare and Hounds" Game

Give one player a dot (the hare) which can be moved quickly by joystick.
Give other player several (4 to 10) dots of a different color (the hounds) . . to give "hare" a chance, make movement of "hound dots" sluggish in response to their joysticks.
Game ends (SIGNAL FLASHES) or "hare" disappears when hound and hare positions coincide. Probably make "hound dots" larger than "hare" dot.

7. "Bullfight"

Similar to above - big bull "charges" and turns sluggishly in response to joystick.
"Matador" is round circle (like looking down on bull fight from above) with extremely colored cape. Matador's position can be changed quickly and he can pivot (by turning joystick).

COMPANY PRIVATE

Figure 29 - Original Memo - 5/6

18 "Soccer, Hockey, Polo, etc."

Each player has X (how many in soccer?) "men" each positioned by a joystick. Also, allow less men .... if only 2 play, let each use 2 men, controlling a joy stick with each hand.

If more players, each can control one or two men.

When displayed ball (puck, etc.) is touched by a man it moves in direction man was going - maybe modify so "ball" moves away from man like a kicked ball or passed puck and/or allow man to nudge ball along (like hockey player moving puck with him).

19 Skeet (Airplane) Shooting #2

Targets move across screen (one at a time or possibly several at once) at random times, and at random heights, speeds and angles.

"Gunner" has a circle or cross hair which he must position over target. As one is hit, it disappears and displayed score counter adds one.

Probably best to have "stored" random target program so each player gets same choice of targets for score comparison.

However, could have unstored target program and two guns, for two players. Thus, both could go after same targets - whoever hits it first gets it.

20 Golf Putting

Display hole (be able to put it in different positions on screen).

Display ball and rectangular "putter". Player positions putter (with one joystick) and aligns it for proper direction with another, rectangular shaped, control. With this second control he can move putter back and then "tap ball".... ball moves in direction and distance determined by this control.

21 "Horse Racing"

Have several vertical columns on screen - each with a different colored "horse" displayed in it.

Give each player push buttons to select colors. Somewhere on screen have a "color move indicator" which will change colors randomly.

Have a bell ring (or light indicator). Each player "guesses" which color will appear on the "color move indicator" - and pushes the color button of his choice.

When all guesses are in, "color move indicator" displays its (random) color.

The horses of all players who guessed right will move up one notch.

COMPANY PRIVATE

Figure 30 - Original Memo - 6/6

consulted on some technical problems. The memo described twenty-one different games, including chase, maze, target shooting, and golf putting games. We implemented most of them shortly thereafter. That memo is interesting mainly because it clearly shows our mindset at the time.

Bill Harrison returned to the fold on May 2. Over the next five or six days he started the design of transistorized oscillator circuits needed to supply vertical and horizontal synchronization (sync) signals. He also built a vertical scoring bar circuit and a chroma circuit for adding color. These circuits were built up on a number of individual copper-clad p.c. board pieces, soldering the components to insulated standoffs which were in turn soldered to the copper-clad p.c. board sheet. He tied all of these boards together to the Channel 3/4 r.f. oscillator/modulator in the IG- 62. Now we could split the screen horizontally and display a blue background below the junction. That was exactly what we needed for a "pumping" game where one participant tried to raise the bottom, blue portion of the screen and the other player attempted to "pump" the line down. We used an opaque overlay with a cutout of a large bucket at the center of the screen. Now, if the "blue player" didn't pump fast enough to raise the level of the blue "water" in the bucket, then the bucket would turn red when the game's timer ran out. Pumping was done with one push-button for each participant. There was some heavy breathing going on while we whacked away at those dumb buttons. It was primitive, but it was a beginning, and it was fun, at least for a short time. Bill made the following entry into his notebook on the May 15, 1967:

"Circuits and control on previous page assembled and via a paper overlay on TV screen. the first contest was played between R.H. Baer and W. Harrison. *Winner's name will be withheld*."

The underlining is Harrison's. We played our first competitive game and, of course, he won. What do you expect? He had been working on this stuff for two weeks while I was off doing my regular job. At least he was discreet about it. And, yes, Virginia, we had color right from the start.

That Pumping Game was one of five different game ideas I had asked Bill to pursue. They were:

1. The Pumping Game
2. The Firefighters (pumping) game
3. Color Catching (Guessing) Contest
4. Roulette
5. Car Ride (Race) Game

Within a few days Bill has actually implemented most of these games, primitive though they were. All of these games required only a single "spot" generator circuit. Stretched out, the "spot" could cover half the screen for the pumping games. Stretched vertically and made narrow, it could become a vertical thermometer- like scoring bar. All of this circuitry was recorded on a schematic Bill drew on May 15 (See Experiment 3 - Page 223).

It was obvious what we had to do next: Get rid of the rest of the umbilical connection to the IG-62 and design our own modulator/r.f. oscillator circuit to produce a Channel 3 or 4 carrier signal. Being an old hand at radio-frequency (r.f.) design. I showed Bill how to do this. Piece of cake.

On May 22 I asked Bill to add a second spot generator so that we could move two spots on screen in horizontal and vertical (H&V) directions with independent controls for each player. Interactive, two-player chase games were born!

When all those circuits were working well, Bill mounted them, along with some others, in an aluminum chassis the size of a kitchen sink which he had picked it up in the electronic supply store. That unit would see many additions over the next month or so. It was a work in progress: our TV Game Unit #2.

Improving TVG Unit # 2 - The "Pump" Chassis

In order for our chase games to have a measure of realism, the "spot" being chased by the other spot had to be "blown away", or disappear, whenever the two touched. This called for a coincidence detector circuit. Technically, that could be as simple as a couple of diodes or a transistor AND-circuit. I sketched that out for Bill. He built it and made it all work on May 25 so we then had a "wipeout" capability: Very neat! Every day we added to our stable of capabilities. Minor though they were, we were rapidly getting to the point where we could make this simple circuitry do a fair number of different things: Move spots; change their



Figure 31 - TVG Unit # 2 – the "Pump" chassis

shapes for use as lines or columns, the latter to be used for scoring or as walls; wipe out spots upon coincidence; change colors; we now had a self-contained unit sans IG-62. It was June of 1967.

The best game our new unit allowed us to play so far was clearly the chase game, where one player "chased" the other player's spot with his, until he caught up with it and wiped the opponent's spot off the face of the TV screen.

To improve the game, we decided to use a random-noise generator circuit designed by John Mason, another engineer in my division.

Figure 5 (below) shows how John described his original idea:

What survived of the ideas in this note was the "random number generation" idea which we used in our "Fox and Hounds" game. We never got around to making John's "cards".

Technically, John's CLUDGE consisted of two sets of free running oscillators using small NE-2 neon bulbs as the active elements. Bill built the circuitry up on a separate 2x6 inch board. With that circuitry we could change both the horizontal and vertical position of one of our "spots" very rapidly. The result was that we could simultaneously display two, three or even half a dozen spots on our TV screen. They would pop up randomly all over the screen. We could alter their number and apparent duration on-screen simply by controlling the

CLUDGE

This Cludge will contain a bunch of random numbers formed by depressing a push button which actuates a neon bulb ring counter. This action simulates throwing dice. To start the Cludge, a digitally coded card is inserted in the gismatchy. A small number of cards is provided with the thing. An assortment of other cards are available separately.

The cards may be read out on photo sensitive transistors.

The combination of random numbers, the coded cards, and other directions presented to the beast will direct the advancement and the next step. One could play Monopoly this way.

Figure 32 - John Mason's Original Idea





Figure 33 - Our first and second (and improved) target shooting "guns"

clock rate of Mason's neon oscillator circuit. Bingo! We had a "Fox and Hounds game". We colored one hand-controlled spot red and called it the fox. A bunch of white "hounds" would chase that poor fox all over the screen, while the player using the H&V controls of the "fox" would frantically try to keep from getting wiped out. It turned out to be an interesting two-player game with a lot of activity on the screen and it looked like winner to us.

The schematic for the CLUDGE circuitry is shown with Experiment 4 on page 224.

We had also come up with the idea of using a vertical column whose height would indicate the score. Technically that column was simply one of our "spots" stretched to form a vertical bar. We used this adjustable-height vertical bar as a scoring means in one of our games by having the column rise in a cutout of an appropriately graduated overlay, much like a fever thermometer. Now we had a primitive form of on-screen scoring.

By early June Bill had also built two new light guns that worked well in conjunction with new target generating circuitry in the "Pump" chassis. Using their long barrel again as our "optics" we positioned the photo sensor near the breech. That sensor was still a photo resistor. Now we could stand back five or six feet from the TV set and "shoot down" target spots that the other player moved manually, or that were moved helter-skelter by Mason's random-noise generator circuit (running at very low speeds). Alternatively we could just shoot at a stationary target or have the target spot appear randomly behind windows of an overlay.

Again, we asked Herb Campman to come up to our small room on the fifth floor so we could demonstrate to him how far we had progressed. Herb first "fired" our target gun from the shoulder, aiming at a spot on the TV set, some six feet distant. When he got good at that he fired the gun from the hip. He got pretty good at that too and he was hooked. We all thought we were well on our way towards a commercial product.

By the middle of June we had cleaned up Unit #2 to a point that we thought was adequate for a show-and-tell to management. We asked Herb Campman to come up to our small lab again for a preliminary demonstration. We wanted to be sure that he would be satisfied with our demo before we went on to get management involved. Herb brought along Louis Etlinger, our Corporate Patent Counsel. That visit was on June 14, 1967.

Herb played all of the games. Herb and even Lou must have been impressed, because they gave us new R&D money so that we could continue the project. We began to talk about the need for getting some of this novel stuff down on paper in preparation for several patent applications. I also made Herb and Lou sign a statement to the effect that they had played these games that day, building a legal track record. They agreed that we had enough variety to venture a major demonstration to Sanders senior management

By this time, that big chassis had filled up with one small circuit board after another. Bill worked on an improved color circuit and installed that. The last component that we added was a 4.5 MHz FM oscillator/modulator circuit that we used for voice announcement from an audio tape player, as we'll see further on. No longer missing from the game unit was the r.f. oscillator/modulator circuit that generated a Channel 3 or 4 signal capable of entering the TV set via its antenna terminals. We had finally cut the umbilical cord to the IG-62 generator and built our own "modulator and transmitter" circuit.

The schematic shown with Experiment #5 on page 225 shows all the circuitry contained in TV Game Unit #2 with the exception of Mason's random spot positioning neon-oscillator circuitry, the "CLUDGE".

As one might expect, word had gotten around in the upper echelons of the company that Baer was "screwing around" with some TV gadgetry. It was put-up or shut-up time! We had to demonstrate what we were doing to the boss.

We planned to show our prospective visitors seven games: Chess, steeplechase, fox and hounds, target shooting, color wheel, bucket filling, and a pumping game.

"We can't afford to blow this one, Bill," I said. "Let's make absolutely sure that we will not screw up this demo."

Herb Campman told us to expect Royden Sanders, the company's president, and Harold Pope, the executive VP of the company to whom I reported at the time in my capacity of division manager. We also heard that another VP, Dan Chisholm, might be there, as well as Henry Argento and several other members of the Board of Directors who happened to be in town for a board meeting during the week the demo was scheduled to take place. This was not the time and place to blow our demo.

To make sure all of the game demos would flow smoothly, I recorded verbal comments on a standard audio tape recorder, using my voice to introduce each game before we actually played it. We designed and built a 4.5 MHz FM modulator/oscillator circuit for adding the sound signals from that tape recorder to the video signal of our game box. That ensured that my prerecorded voice-announcements (describing each of the games) would come from the speaker of our RCA color TV set. We thought that was a neat touch: Videogames with voice-over game instructions!

All of our hardware was contained in the large aluminum chassis, our TV Game Unit #2. It worked like a charm during the demo. We impressed everyone present to one degree or another. I made the first of a few faithful converts there who would stick by me when others in management began to question "what the hell we thought we were doing, anyway." We had demonstrated playing games on a standard home TV set with canned voice announcements introducing each game in detail! We had interactive games, gun games, chase games...all in living color. Not too shabby for a start, we thought.

The audio cassette we used for the voice-over instructions turned up in a search of old files: Here is a copy of the transcript I used for those taped voice announcements:



1. Chess

"Please, may I have your attention, please! The first game we will play is our Chess game. Please fasten the Chess Board overlay and get further instructions from me. Shut me off, please." After an overlay has been mounted on the TV screen and the tape player turned on again: "This game is played by two players using joysticks. Starting positions are indicated by the two dots on the overlay. It is the object of this game to reach the opponents dot position. Orthogonal moves on clear squares only are allowed. That means, straight up and down, or sideways, one square at a time. Never move into a position adjacent to your opponent's. If you do, he'll wipe you out on the next move. You can back track if you like, just don't move diagonally, if you please. Now let's go...and shut me off, please."

2. Steeple Chase

"Now for a little more action in the second game: Let's have a steeplechase. One will be the Hunter, one will be the Fox (or the Chased Player), one will be the score keeper. The Chaser is white, the Fox is red and the rules are as follows:

The Hunter says: "Ready, Set, Go!" 1..2..3 and he starts chasing the Fox after saying "Go!" All action ceases if a hit is made, turning the screen red; or if no hit is made after saying the word "Three." This procedure is repeated five times. The scorekeeper records the hits; for example, he records "1 out 5," or "2 out

of 5," or whatever the case may be. After five turns the Hunter becomes the Fox, the Scorer becomes the Chaser and the Hare or Fox becomes the Scorer (Confused? I am!) Thank you!"

3. Fox and Hounds Game

"For our third game, we will have a Fox and Hounds chase. This game will require two players. The object is to have the red Fox run away from the white hounds, which are playing about the screen, which as you'll see, will be spread out 6 to 8 inches over the field.

The object is to have the red Fox pass diagonally from the upper right to the lower left corner five times consecutively without, of course, being caught by one of the Hounds. If the Fox is caught by one of the Hounds, it will be indicated by having the Fox turn white. After trying for five times, the Scorer will score "1 out of 1," "1 out of 2," etc. whatever the case may be; each time a hit is made, the button will be pushed to restore the screen to a normal condition, and after five consecutive tries, the players will change positions; one will take the position of the Fox, the other swill take the position of the three white hounds. Have fun! Shut me off, please!"

4. Target Shooting

"Our fourth game will be a target shooting game. Here we're going to test your accuracy as a marksman with our Type M1M2M3M4Mark2-1967 Rifle. We guarantee, if you can shoot straight with this rifle, you can shoot straight with anything. Anyway, if you can't hit that great big bull's eye we're going to show you on the screen, we don't believe you could hit the broadside of a barn. To begin with, we'll give you some time to practice and we'll give you a stationary white square in the middle of the screen to shoot at. Happy Hunting! Now, we'll make life a little more interesting and the game a little more challenging for you. We're going to connect things up in such a way so one of the players can move the bull's eye across the screen at will by using a joystick. Now let's see how good you are at shooting...

...To continue our target shooting practice, and just in case you thought that shooting at moving targets was too easy, we've got a little surprise planned for you! In our game box we have a white-noise generator, which has the nasty characteristic of moving the target on the screen at random. There is no way of predicting just where that target is going to be! Now let's see if you can hit it!"

5. Color Wheel Game

"Our fifth and next game, which we are going to play, is the color guessing game. As you will see, this game has been designed for the younger set. It can be played by two, four, or any even number of participants. The object is to "call a color" and then spin for it. Scoring is done in accordance with the instructions on the overlay. The joystick is used to keep score. The first one to reach 75 wins the game. Shut me off, please!"

6. Bucket Filling Game

"The next and sixth game is the Bucket Filling Game. Please, attach the Bucket- Filling overlay and start at the halfway mark. The object is to push the switch against an opponent and against a built-in timer. It will be player A's job to attempt to fill the bucket in the time allowed by the timer, and of course, it will be player B's job to attempt to either keep the level even, or to empty the bucket in the allotted time. Let's see who wins."

7. Pumping Game

"Are you an ambulance or a fire truck chaser? Well, whether you are or not, the seventh game and last game is a Firefighters game. Using the overlay, it will be your job to pump against (time) as determined by the timer-and we want you to proceed as follows: First push the left button to lower the red level. Just as soon as it disappears out of sight push the timer button and start pumping the wooden "pump" handle for all you are worth. If the blue "water" reaches the window level before the house bursts into flame, you win. If you're too slow...that's tough...the house will go up in flames. Let me repeat: First push the red button to lower the red level. Just as the level disappears, push the timer button which will make the color blue and start pumping that blue water up the hose! And if that water doesn't reach the window level before the timer goes off, the house burns up and there is nothing you can do about it. It looks easy, but it isn't. Happy pumping! Please, shut me off." .....End of the Transcript

I had asked one of our Sanders' draftsmen, Stew

Gregory, who was also a good cartoonist, to make up some professional looking transparencies for me so we wouldn't have to present the ratty-looking stuff which I had drawn. Stew obliged and here is what the Firefighters' overlay looked like:

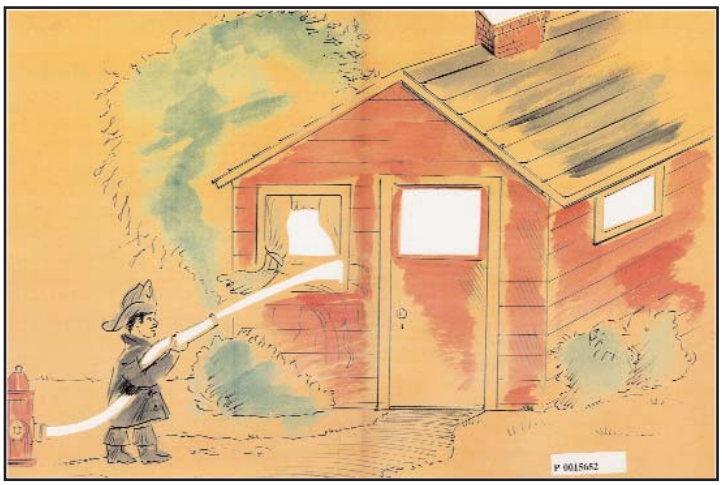


Figure 34 - Pumping Game Overlay

Note that the hose sections and windows are transparent. A rising - or dropping - level of blue would show through those openings and the entire screen would turn red and backlight the windows if we didn't beat the timer.

Royden Sanders, Harold Pope, and the entire Board of Directors showed up on June 15th, 1967 for our demonstration. We had moved our dog-and-pony show to a conference room. There was no way we could have squeezed that large a group into our small game lab. - The demonstration was well received, although there was more than one expression of doubt that we could make this into a business. Henry Argento was probably the most enthusiastic of the board members there. He really liked what he saw and remained a faithful booster for years afterwards. Sandy and Harold Pope conferred briefly and decided to let us continue with additional game development despite currently unanswered questions about where the work might lead commercially. Management's edict now became: "Build something we can sell or license."

August 1967 - TVG Unit # 3, Our First "Product" Is Ready!

Bill Harrison continued to work away at new improved circuit designs. In July we were essentially finished. We had a 5x5x6 inch stand-alone game box that played several simple chase games, board games using overlays and light gun games. We had thrown out anything that wasn't absolutely necessary to play chase and gun games. That included color, timers, and some of the other do-dads like the random number generator and the "pumping" circuitry.

We decided to reduce cost by "modularizing" the construction, using plug-in printed circuit cards for the various sub circuits such as the player spots, H&V sync circuits, and so on. The general idea was to simplify test and assembly in production. This became TVG Unit #3 (Figure 36). I told Bill to keep working on improvements to the circuitry and the light gun. That did not take him long. By mid-September he was finished and made up a list of materials for TVG Unit #3. Then he "priced" it based on the cost of typical U.S.-made components. We decided on a probable production run of ten thousand units and came up with a direct-material cost of fifteen dollars and seventy-five cents. Bill had designed the unit using three small, modular circuit boards. To keep down the cost of connecting these board to the "motherboard", I searched for and found some rudimentary edge board connectors available for just pennies. The modularization did reduce anticipated assembly and test time but there still was not enough perceived play value to justify the projected cost. That meant that my initial idea of a U.S. manufactured, twenty-five-dollar game at retail was probably a pipe dream. It was clear that we needed to do something different, something more exciting that would warrant a probable $50.00 retail price for a TV game. So it was back to the bench to cook up new and better games!

A historical note: This scheme of modularizing the circuitry was revived in Magnavox's Odyssey game system where it ran up the cost of the hardware needlessly. Anyway, mere incremental cost reductions were not getting us anywhere...we absolutely needed better games. No amount of gimmickry was going to fix our cost problem.

Talking about the cost problem: Later that year, in mid-October I told Bill Harrison to take a crack at pricing a design based of the use of 7400 series TTL Integrated

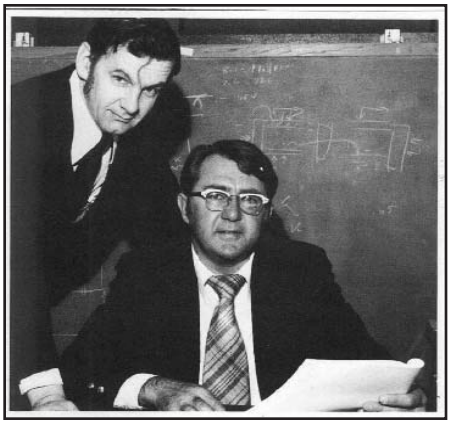


Fig 35 - Bill Harrison & Bill Rusch

Circuits. Using the 7400 One-Shots and various AND gates it was easy to see how we could duplicate the functions of our two spot generators and that of the H & V oscillators using TTL IC's. But bringing the cost down with these devices was not in the cards. They were much too expensive at the time. Bill Harrison gave up on them with a note dated October 10 that essentially said: "tried to use 7400 TTL but it is too expensive". It's not like we were unaware of better technical ways to implement our games, but that avenue just wasn't practical at the time.

What we really needed to do now was to come up with fresh ideas for better games - and fast! Herb Campman came to the rescue: "I can make Bill Rusch available for a few weeks, if you want him," he said. "You know how creative he is. I don't have anything for him to do just now." For free, take!

That's how Bill Rusch joined the project on August 18, 1967. He was an experienced engineer, an MIT-graduate normally assigned to Herb Campman's small Corporate R&D group. Herb knew we were in trouble and hoped that Rusch could help us out.

The end of summer was catching up with us; we were well into September 1967. Bill Harrison had spent the better part of July, August and early September on improving our third TV Game unit by adding a color circuit in an attempt to give the "product" more perceived play value. Bill had also improved the Channel 4 modulator/r.f. oscillator circuits which had been giving us some trouble. We definitely had a reliable design.

The final schematic of TV Game #3 reflects all of the changes and additions we had made to insure functionality and reliability (See Experiment #7 - Page 227).

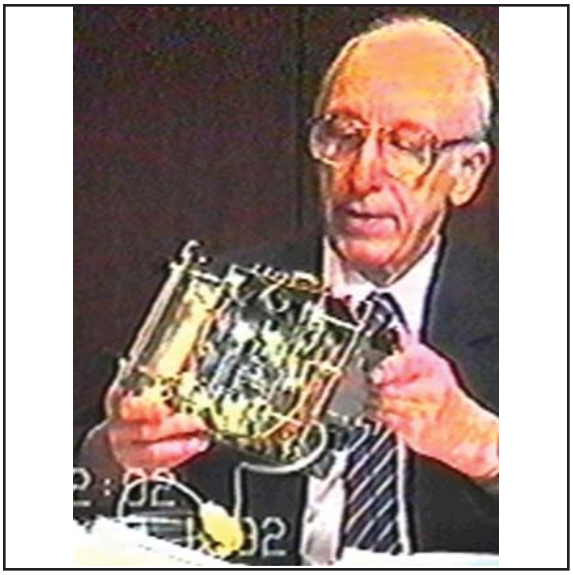


Figure 36 - RHB withTVG#3 during 1992 deposition

Except for the hiatus from February through early May of the year after Bill had come aboard, we had been working on those first-generation games off and on for a nearly a year. We were beginning to put a small dent into Herb Campman's discretionary R&D budget. Truthfully, we were also getting quite concerned about the limited scope of the Chase and Gun games in TV game unit #3. They were already beginning to get "old". But now, with Rusch on-board for a couple of months, the concept of a third spot, touched on in the May Memo, was born. Ping-Pong, tennis, hockey, soccer, and handball games were conceived in rapid succession, at least on paper. This was a different ball game altogether, to coin a phrase! Unlike the two manually controlled spots we had been using, the third spot's movement was to be machine-controlled. Bill Rusch came up with the idea of using that spot as a "ball" so that we could play some sort of ball game with it. We batted around ideas of how we could implement games such as Ping-Pong and other sports games. (Figure 37).

November 1967: Ping-Pong Games Are Here!

During October 1967 Bill Rusch designed some novel spot generator circuitry on paper. The idea was that round spots or rings would look neater than the square

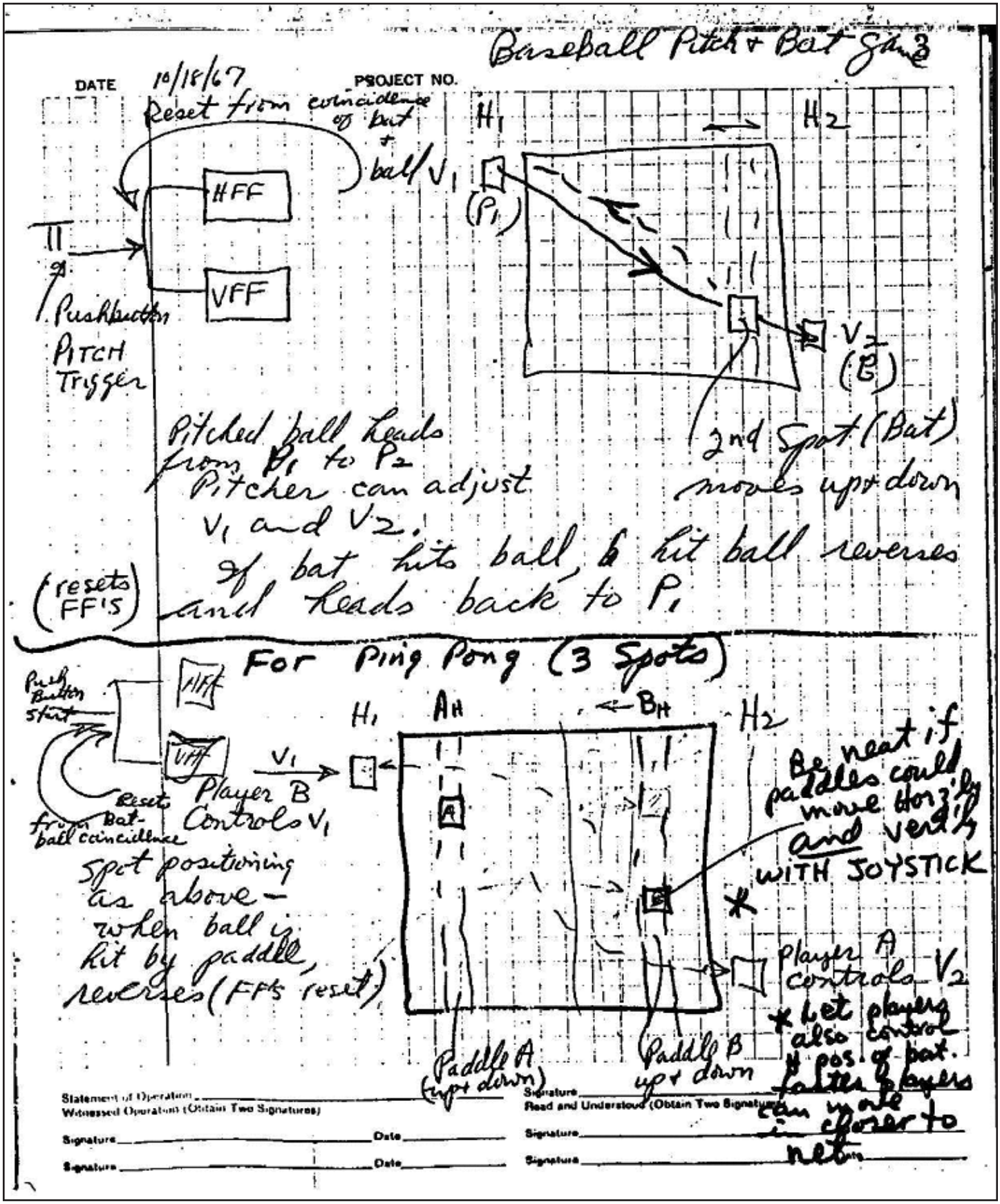


Figure 37 - An excerpt from Rusch's Notebook showing the concept of Ping -Pong (9/10/67)

variety we had been using so far. Bill Harrison worked on them briefly and got the circuits to work, more or less. Rusch called them" slicer circuits" because of the manner in which they sliced a segment out of a waveform. That done, Bill Harrison built up a complete version of Rusch's paper design which became TV Game #4. It had the ability to deliver both Ping-Pong and chase games, using Rusch's slicer spot generators for the ball and paddle "spots". It had two joysticks, recovered from TV Game unit #2, which were used for the chase games and two hand controllers with H & V and English knobs for the Ball & Paddle games. A switch changed the circuitry from Ball & Paddle to chase games.

By early November we had a functional Ping-Pong game going. In our records, the chassis that housed this circuitry became TVG #4. Its ball game action was far more interesting than any of the old chase games. Herb Campman came up to the lab again to play the new Ping-Pong game. Together with target shooting, chase and checker games, we now had a nice collection of valid games. "Seems to me, we're finally getting there!" Herb observed when he played our new demo system. "This looks like it's for real." We all felt that we were finally on the right track. Even the increased Bill of Materials did not spook us any more. We were on the move!

The project had earlier received another infusion of money from Herb's R&D budget in October, about eight grand, and more came later. This allowed us to spend several months into 1968 perfecting circuitry for a multi-game unit that could play Ping-Pong, hockey (which was Ping-Pong without the central "net" line), gun games and chase games. All of these had color content. The backgrounds changed with the game played: Blue for hockey, green for Ping-Pong and later, volley and handball; black for target shooting and various chase games. Paddles, player spots and targets remained white.

Rusch's spot generating "slicer" circuits were unique. His paddle and ball spot generator circuits used the nonlinear characteristic of 1N270 germanium diodes to produce spots on the TV screen that could be nearly round, or star shaped. The non-linear resistance vs. current curve of the diodes made these shapes possible when operating in the right current range. It was all very attractive, except that the design was prone to drift, meaning that the spots randomly drifted around over time and also slowly changed their shape. There was little hope of fixing that problem any time soon.

Just about that time the need for a game demonstration to TelePrompter came upon us with a vengeance. After the demonstration was over, I decided to use our earlier spot generator circuits, and add d.c. control to the circuits. These very desirable features were borrowed from Rusch's design and put an end to our "drift" problems. This also made Rusch an unhappy camper and he let me know in no uncertain terms. One just doesn't screw around with a masterpiece without incurring the wrath of the great artist. Ping-Pong, tennis, handball, and soccer games were soon working and putting a big smile on our faces...at least, Bill Harrison's and mine.

Not so for Bill Rusch. He was beginning to come in later every morning and often spent hours on the phone with his broker, or who knows whom. Bill was going to show me that he didn't take kindly to being "directed."

Meanwhile, he had begun to work on advanced paper concepts for games that would let us move a ball spot in a natural fashion. To me, that looked like the right way to move forward technically so I put up with his eccentricities. The object of this advanced circuitry was to make the ball bounce off a player's spot (say, a "hockey stick") in the direction towards which it was propelled by the stick and with a speed corresponding to the velocity of the impact. Talk about realism! We were light years ahead of ourselves.

Since the analog circuitry required to accomplish such tricks required signals that are the differential of another signal (the velocity of the puck being the differential of the stick's speed with respect to time, etc.), we dubbed these circuit "de/dt" (the differential of a voltage e with respect to time t, from basic calculus). It was all Rusch at his best.

Harrison did not have time to build any physical de/dt circuitry then because I decided to move the basic game design toward a conclusion. De/dt action could wait. I decided that Harrison should get back to designing and building a de/dt chassis some time later. Rusch grumbled some more and wrote unkind

things about me into his notebook. His displeasure was nothing compared to the pressure I felt to make the game project pay off.

Cable Games

In mid-1967 the concern that was uppermost in my mind was how the company was going to get a return on their investment. We had already spent a fair amount of time, energy and money on this totally novel thing called Home TV Games with no practical business plan in sight. Since Sanders Associates was principally a high-tech, defense-electronics firm, it did not appear likely that we would ever be able to manufacture such a product, nor did we have any experience in the distribution and marketing of consumer products. We clearly needed a licensee.

The question of how to bring our concepts to market remained unresolved for several months. Meanwhile, management was beginning to ask us where we thought we were heading. Sometimes these questions took the form of: "Are you still fooling around with that stuff?" An answer had to be found and I had to come up with it.

My first approach was that playing games at home on a TV set might be of interest to the nascent cable-television industry. The idea behind this thought went something like this: Cable TV was in trouble. It was growing entirely too slowly in major U.S. cities like New York, Chicago and Los Angeles and it needed a shot in the arm. I thought that perhaps playing games with the aid of the cable might be just what was needed to inject some life into the business.

Technically speaking, the concept was quite simple. We would create the action and the cable company would provide colorful backgrounds for our games. The state of the art in the 1960s simply did not allow us to generate good background graphics within a low-cost game box. The best we would do on later TV game units was to draw a line down the middle (tennis net); a line at the left side (wall for a handball game); or a central half-height vertical line (side view of a volley ball game net). Nothing like that existed in Chassis #4, our current unit.

On the other hand, any cable station could easily transmit the bird's-eye view of a tennis court complete with spectator stands, all in living color; all they needed to do was point a color camera at a poster that displayed the desired graphics. Our white player-spots and our ball-spot could then be superimposed electronically on this colorful, complex background and the result would be a rich-looking screen presentation. Towards the end of 1967 we had acted on this concept by adding new circuitry to Chassis #4, our Ping-Pong and gun-games demonstration unit. These modifications allowed the game unit's spot-generating hardware to work synchronously with a cable signal. To emulate a cable signal, we pointed a small video camera at a set of flipcharts sitting on an easel.

I decided to write a letter to Irving Kahn, Mr. Cable to the industry at the time and president of TelePrompter Corporation in New York. They were the largest cable company in the U.S. at the time, with some 60,000 households wired up. Eventually, I received a call from Hubert Schlafly, a senior VP at TelePrompter. He was interested enough in the possibilities of cable games to set a date for a visit to New Hampshire on January18, 1968. Actually, Schlafly was involved in trying to use cable as a home security provider and thought that Sanders might be able to help him with the required technology.

Hub Schlafly came up on a gray and snowy day - a typical wintry day in New England. I appreciated his willingness to brave the weather on the long drive from New York. We immediately brought him up to our lab and gave him a good demo of what cable



Figure 38 - Holding the controls of TV Game

games might be like. Flip-charts provided the backgrounds for our sports games which included our "leader" Ping-Pong game. We also played hockey and soccer with him and demonstrated chase games and checker-like games as well as target-shooting, all played against suitable faux-cable backgrounds provided by our camera, emulating the potential TelePrompter camera signals coming down the cable. Mr. Schlafly seemed to enjoy the demonstration, which went off flawlessly. Bill Rusch came up and participated by showing off his complicated maze games ad nauseum.

Hub Schlafly was sufficiently impressed to persuade Irving Kahn, TelePrompter's President to visit Nashua for a similar demonstration in early February. He drove up in his big, black, chauffeured Cadillac limo on the 13th and also liked what he saw. The scene appeared to be set to move into cable games in cooperation with the largest cable outfit anywhere. Progress on the business front!

Thereafter, I made several trips to New York City to the TelePrompter headquarters with Bill Harrison to participate in developing a plan of action for our two companies. Lou Etlinger, our Corporate Director of Patents, and Irving Kahn began to negotiate an agreement based on a detailed, multi-page presentation of who would do what. I had worked it up with Lou as a venture analysis. It was dated March 5, 1968. Finally, it began to look like we had found a solution to our marketing problem. Dr. Eugene Rubin, another one of Sanders division managers who had taken an early interest in my television game activity, came along on one of these trips to help with the negotiations.

On the occasion of our first visit to New York, Irving Kahn took Lou Etlinger, Gene Rubin, Bill Harrison and me to a lab across the street at the American Cable Company, an outfit somehow associated with TelePrompter. There we saw the first alphanumeric raster-scan character generator for cable television. It was housed in a five-foot high, 19-inch wide rack panel enclosure, a digital television signal generating breakthrough, built by RCA in their Princeton labs. Nowadays, all of that large machine's capability would occupy merely a very small part of a current- generation integrated circuit chip, say, a small slice of silicon about 2 square millimeters in size, about ten thousandths of an inch thick. What a difference a quarter of a century makes!

In mid-April I returned to New York for another session with Hub Schlafly and others to work on the agreement. This time I took our demo hardware along and gave a demo to various TelePrompter and Manhattan Cable personnel. Everyone seemed impressed. We had hoped that my cable game concepts would "spark" renewed interest in cable TV. At the time all of the U.S. cable TV companies, including TelePrompter, were in the midst of cash-flow problems. Their difficulties paralleled those of the general business conditions of the late 1960s and early 1970s. Recession had hit Sanders also. We went from some 11,000 employees down to barely 4,000 during that period. Morale was at an all-time low. Unfortunately, the cable business also got worse and worse, along with everything else. What was to have been a concerted, cooperative effort between Sanders and TelePrompter fizzled for lack of funding on their part, thus aborting the first attempt in the history of civilization to play interactive games over the cable. We were back to square one. We needed to find a marketing solution for our TV game project. All that remained of our attempts to bring interactive games to the cable business was a forty-page report resting in peace in our TelePrompter file.

That ended our attempt to launch videogames via cable. We took another run at getting videogames into the cable environment in 1974. That time we would be working with Magnavox and Warner Cable but, again, nothing came of it. Nearly three decades would pass before playing games over cable , i.e. the web, would become a reality.

Video Quiz Games

During December 1967 and January 1968, Bill Harrison continued to spend time on improving our games and added two new sports games: handball and volleyball. These were variations of the Ping-Pong theme which required modifications of the net used in Ping-Pong. Bill did all of the bench work while Rusch kept cranking on long lists of new game ideas in his notebook.

Harrison also built some of the first de/dt circuitry and put it into a large chassis that we designated TV



Figure 39 - The first de/dt chassis, TV Game Unit # 5

Game Unit #5. At the end of December work stopped on the de/dt chassis because we got sidetracked by the need to make our ball-and- paddle games work in a cable environment. That was done in a matter of a few days and in good time for the TelePrompter demos.

During December I also had Bill Harrison build me an improved version of the Quiz light pen he had built back in May with the TelePrompter demos in mind. The first Quiz pen had a short barrel, which required us to touch its muzzle to the CRT screen while responding to the quiz, much like early computer light pens. In the new version Bill lengthened the barrel (our beam narrowing "optics") so that we could "shoot" at the quiz spots from some distance...more fun, we thought.

To create an encoded tape needed for a Quiz demo, we started out with a video tape that covered a series of discrete instructional units of a training course. We then interrupted the flow of the instructor's presentation at the end of each instructional unit. There we added new video footage showing multiple choice answers to training-related questions that had been covered in the segment and which we displayed on-screen. Each one of the multiple "answers" had a white spot located next to it. Three out of four of these "answer" spots represented the "wrong" answers; they would rapidly blink an even number of times during the time allotted for answering the question. The fourth spot (representing the correct answer) would blink an odd number of times, our ODD/EVEN code scheme. I had kicked the problem of how to decode such a string of "white flashes" around with Bill Rusch earlier and we had come up with a simple circuit that allowed our light gun to recognize the difference between those odd and even counts...a crude digital code.

As a marketing idea, the concept was simple: A cable-delivered program would display multiple answers to quiz questions based on prior video action material shown on screen; each of the four answers on screen would be associated with one of four flickering white "spots" adjacent to an answer on the screen. Viewers of this quiz program could then play multiple-choice games by deciding which of the four answers was the correct one, pointing the pistol at the associated spot on the screen, and pulling the trigger. This would result in instant feedback: A small red or green light bulb on the pistol informed the user. Playing interactive games or quizzes with our coded spots would be the first of my TV game-related patents to issue. It became USP No. 3,599,221, which we filed in March of 1968. A novel form of interactive video was born right then and there in our lab. What was so neat about this scheme was that this sort of game could be played in cooperation with a cable station or even over a network broadcast channel, providing fun and games or educational quizzes. Furthermore, it didn't take a big investment on the

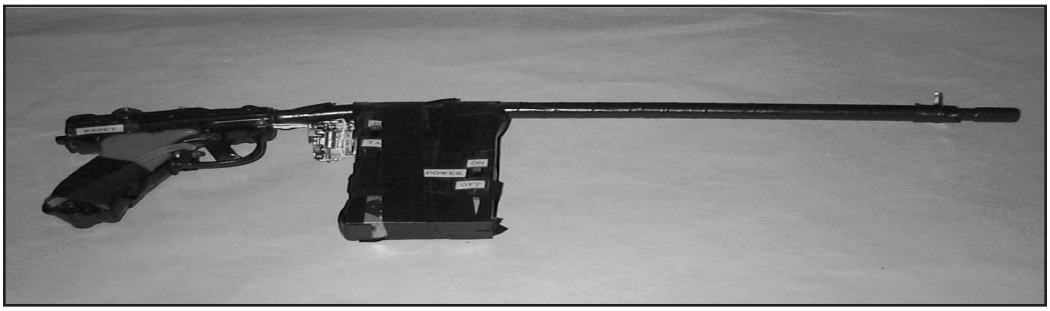


Figure 40 - Video Quiz Game "pistol"

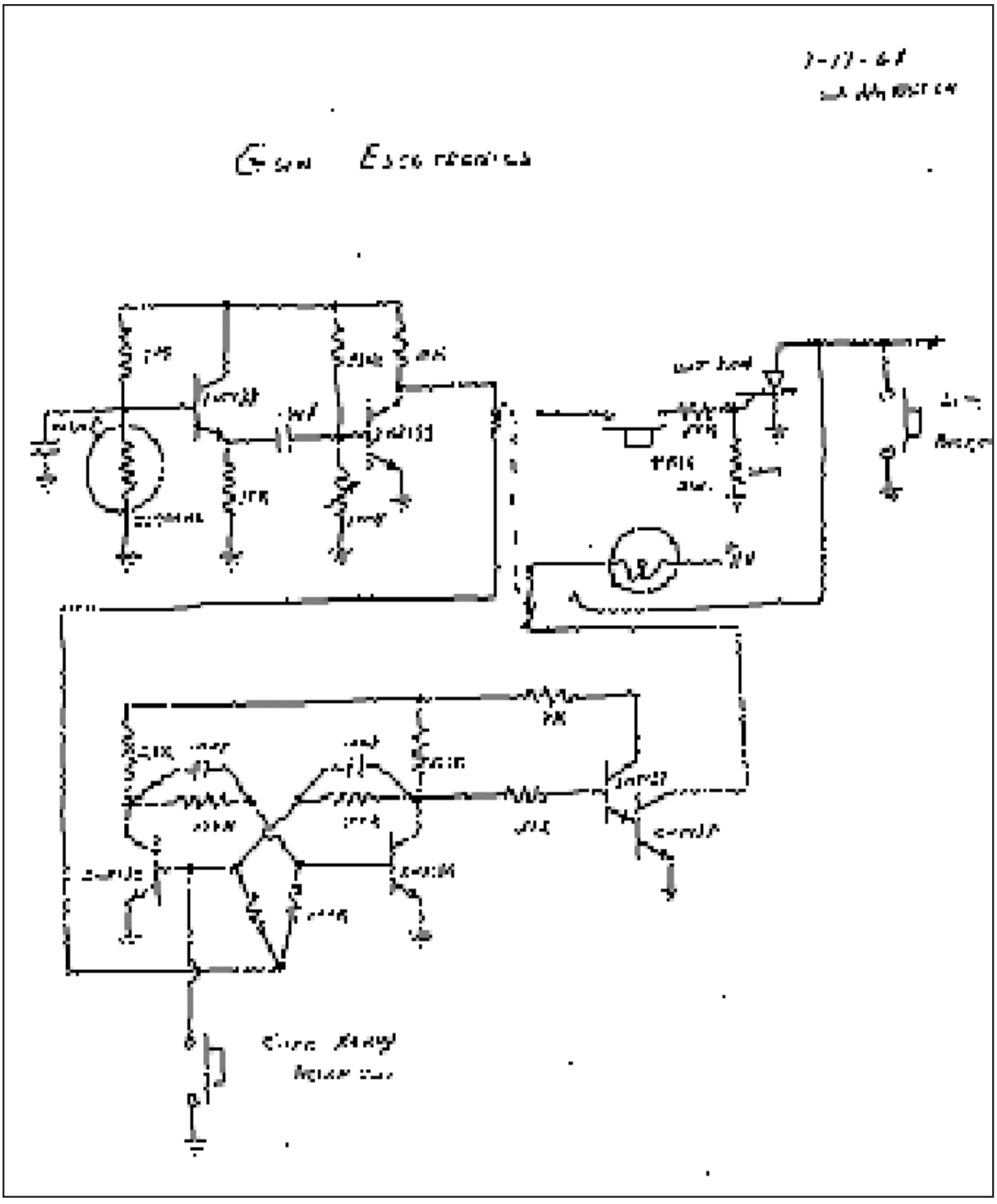


Figure 41 - Schematic of ODD/EVEN Light Gun

part of the producing source. It certainly would not be difficult to take existing, tired old video program segments and bring them back to life in the form of a quiz spots...more fun, we thought. The TV show *Jeopardy* still does it to this day. We hoped that we could get TelePrompter to take an interest in this scheme. Perhaps later we might get TV broadcasters to use their extensive film libraries for our Video Quiz techniques.

While all of this was going on, I was busy managing the Equipment Design Division with its several hundred engineering and support personnel. I took the time to stop by our small TV Game lab once or twice a day for a few minutes to confer with Bill and keep the

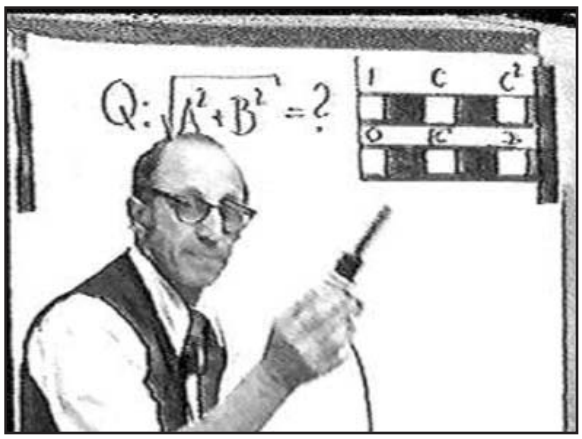


Fig 42 - From a 1968 interactive videotape: A quiz with six encoded right/wrong "spots."

effort on track. He did the work and he did it well. At the same time, Rusch was at his desk, working on a voluminous disclosure document describing his de/dt circuitry which would later issue in a separate patent.

At the end of January 1968, on the heels of the TelePrompter demos, Herb Campman issued a Stop Order, shutting off all of our money. All lab activity on games ceased for several months. Bill Harrison went to work somewhere else in the Equipment Design division; Bill Rusch returned to Campman's R&D domain, although we frequently touched base. For the next several months I was kept busy working with Lou Etlinger on the TelePrompter project until that dried up too, as described. Thinking hard about where to head TV home games next was still uppermost in my mind.

Back on Track - Building TV Game Unit # 6 And The Brown Box

In September of 1968, after an eight-month hiatus, Herb got me some new money and I was able to get Bill Harrison back on board. At first Bill worked some more on "cleaning up" various subcircuits, such as our coincidence detector and some de/dt circuitry. Then he began to concentrate on building still another "production" unit. This time we chose to use a rotary switch to select the various games built into the unit. These were Ping-Pong, handball, chase games and gun games. That unit became # 6 in our series of TV Game Units. The only photo of TV Game Unit #6 that has turned up is a video frame showing me holding unit up for inspection during that deposition in 1992.

Not shown in these photos is the new "gun" that Bill had built and which plugged into TV Game #6 via a connector on the front panel. Bill had picked up the plastic rifle at a Sears store on Main Street in downtown Nashua, about a mile from our Canal Street lab. He said he walked both ways and carried the "gun" carefully covered by a paper bag. His new design used a transistor amplifier and a small light bulb to bias the photo resistor optically into a more sensitive region. This increased the sensitivity of the "gun" and it worked like a charm even at considerable distances from the TV screen. The same "rifle" was used again with what became TV Game #7, our Brown Box. Our assorted kids, the boys of course, really like shooting at the screen. They also figured out quickly that they could cheat by pointing the gun at some nearby fluorescent lamp and get a "hit".

In November, Bill worked briefly on a paper design of a version of TV game unit #6 that could be built into a TV set. There it could clearly share many components because we could reach into the horizontal and vertical sweep circuitry of the TV set to obtain H & V signals that we would otherwise have to generate ourselves. Therefore, neither H&V generators, modulator, or r.f. oscillator circuits were needed, reducing the Bill of Materials quite a bit.

Harrison got the stand-alone version of TV Game unit #6 working by the end of 1968. As the photo





Figure 43 - TV Game Unit # 6 – The rotary game-select switch is at the lower left. Note the hand-controllers in the right-hand picture

(Figure 43) and the schematic (Page 233) show (if you know where to look), it was equipped with a 3-position rotary switch which allowed the player to select either Ping-Pong with a central net line, or a Chase game or a "Target shooting" game and finally a hand-ball game. The connector at the bottom right hand corner of the schematic indicates the connections to the end of the gun's cable.

All spot generators were d.c. controlled - no more drift. What a relief!

Here is what Bill Harrison told me as he reminisced recently about the design of those spot generators:

> *"I do indeed remember very clearly what happened and why and how I came up with the two-transistor design instead of using standard four transistor delay circuits for those spot generation circuits!*
>
> *"Someone, specifically the boss on the job (you), said to me that we have got to reduce the parts count to get the cost down and I understood that. We had just demonstrated the big aluminum box to Mr. Sanders and others. That was the "pump" unit, TVG#2. It worked well but it had altogether too many parts in it. That circuitry was much too expensive. So I studied the circuits as they were at the time and it suddenly occurred to me that the horizontal and vertical sync generator output transistors could recharge the delay time capacitors which got rid of a transistor in each of the two (H & V) delay circuits. That being so it also became obvious that the H and V delay circuits transistors could generate the spots' H and V, width and height respectively, with only the addition of a capacitor and resistor to determine the "on-time" of the horizontal line segments. Finally, two more transistors with their collectors tied (i.e. logically OR'ed) together and we would have a spot generator that required only four transistors.*
>
> *"I recall how pleased you were with me and me with myself."*

It was Bill Harrison's creative use of his knowledge of electronic circuits that allowed him to come up with a design using half the number of parts that a standard solution demanded. Bill applied that same ingenuity towards much of the rest of the early TV game circuitry. That made the whole thing practical.

Three cheers for the artistry of the lone designer doing his thing!

Let me add, parenthetically, that one of the great

pleasures of my life as a practicing engineer was to do exactly that: come up with creative solutions to circuit design problems using a minimum number of parts in clever ways. It's an art form, mixed with a little science, and it's as satisfying to accomplish as finishing a great picture with the fewest brush strokes must be to a painter.

Bill Harrison then spent several days coming up with a new Bill of Materials. A quick off-the-top-of-the-head estimate for the cost of materials and labor still came in above fifteen dollars, not counting the gun. That added another five dollars to our manufactured" cost.

This time around I was not dismayed by these figures because we were all of the opinion that the Ping-Pong game alone was worth the fifty dollar retail price that the unit was likely to command.

The Brown Box Makes It's Debut

Our TV Game unit #6 was an unqualified accomplishment. Just the same, we asked ourselves how we could make it still more attractive without adding any substantial cost. A quick study of the schematic showed that we could make some minor switch and diode logic changes and bingo! we had a volleyball game. It displayed the side view of a half-screen-height net at the center; the players were supposed to get the ball over that "net" without touching it. (That turned out to take a lot of practice.) By adding another panel connector we could easily make a golf putting game in which an actual golf ball mounted at the end of a joystick was used. When gently nudged with a putter, the on-screen spot representing the ball would drift over towards the other spot, the "hole". Now we had two accessories: the gun and the golf game unit.

We determined that we could add these additional games merely by replacing the rotary switch with slide switches to select games and get more play-value in exchange for a very small number of additional parts. That decided, TV Game Unit #6 quickly became history and Bill Harrison started on a new design. It used slide switches to select the specific circuit interconnections needed for a particular game. Together with several new overlays, that method allowed us to come up with a total of at least seven legitimate games.

The new unit became TV Game Unit #7. We duplicated the hand controllers used with Unit #6 and used the gun we had built for that unit. We dubbed it the ***Brown Box*** because Bill had covered the aluminum chassis containing the game circuitry (and the cardboard lid) with brown, self-adhesive, wood-grain vinyl to make it look a little more attractive. He had previously used the same material on the hand controllers connected to Unit #6. Our good-looking, target-shooting gun didn't need any more work. Building the simple golf joystick was just a matter of linking two potentiometers with a few sheet metal brackets. We mounted a "real" golf ball at the end of the control shaft and presto! we had ourselves a low-cost golf ball accessory for that "putting" game. The Brown Box was "programmed" by inserting cards between its two rows of switches. Dots on the cards indicated which switch to move for a given game.

The hand-controllers are identical to those used with TV Game Unit #6. As the photo (Figure 44) shows, the "Vertical" paddle is the knob at the right side of the controller. The "Horizontal" paddle position control is located on top at the left; and ball "English" is controlled with knob on top at the right. A pushbutton switch, located at the lower top right of the hand controls is used to launch the ball that is out of play; or to restore a target or chase spot that has been "hit" and that has disappeared from the screen. We could set up the switches on our Brown Box to deliver the following games:

- Ping-Pong - which had two player spots, a ball spot plus a vertical (net) line in the center of the screen.
- Handball - which was like Ping-Pong except that the net moved all the way to the left of the screen and became the handball court's wall.
- Hockey, Soccer or Football - which were the tennis game minus the net but with an appropriate overlay.
- Volleyball - which had the same three spots but a central, half-height vertical line, representing the side view of the net.
- Target Shooting - with the rifle's cable plugged



Figure 44 - The Brown Box, our TV Game Unit #7 with its hand controls and gun (1/69)

into a connector at the rear of the Brown Box, we could shoot at stationary or moving target spots.

- Golf Putting - a golf ball mounted on the end of a joystick which, when placed on the floor, was tapped with a putter to make the "ball" spot fly into the "hole" spot and disappear.
- Checker Games - with and without obstacles - that were played with transparent overlays.

Bill Harrison kept working on circuit improvements of the Brown Box over the next half year, although it was in good, demonstrable shape by the middle of January of 1968, The Brown Box was clearly a "real" game machine. Furthermore, it was engineered so that it could be reproduced without a problem...there were no hokey or unstable circuits that couldn't be reliably duplicated; it was a good pre-production design. That would become important later.

Some of the games required overlays to depict features of the playing field such as goals in soccer and hockey. The same applied to the many board games, most of them Bill Rusch's brain children, and target shooting seemed more interesting when the gun's aim was a poor Tweety Bird. Technically, Ping-Pong, hockey and soccer games were the same except that the latter two games were played without the central net line and our (arbitrary) game rules were different.

Herb Campman came up to the lab again to play the new game unit. Our overlays were a little on the primitive side but we now clearly had a nice collection of valid games. "Seems to me, we're finally getting there!" Herb observed when he played games with our

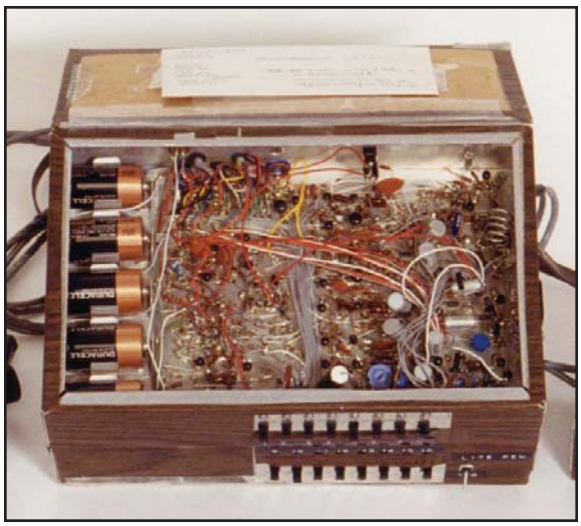


Figure 45 - Brown Box interior

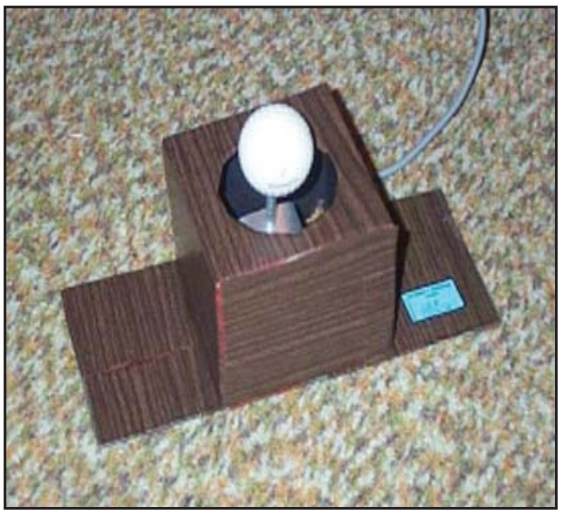


Figure 46 - Golf putting joystick

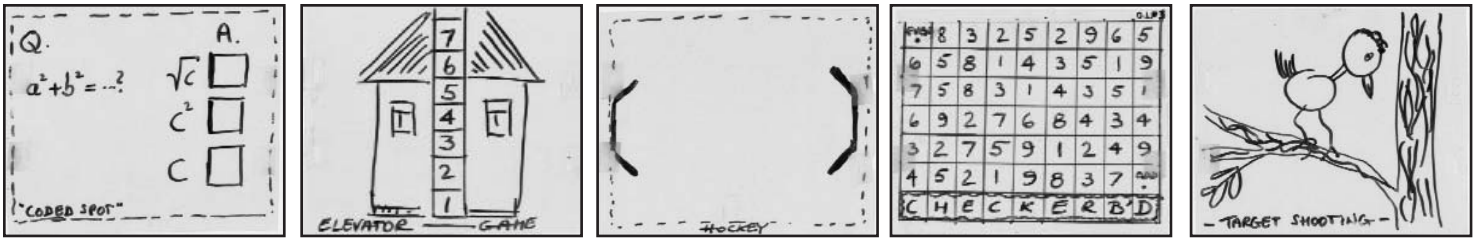


Figure 47 - Some of the graphically challenged overlays which we used with TV Game unit #6 & #7

Brown Box. "This looks like it's for real." We felt that we were on the right track.

Bill Harrison also built up a second chassis meant to demonstrate the power of the velocity sensitive ball circuitry, Rusch's so-called de/dt scheme. That chassis became TVG Unit # 8; it interfaced to our Brown Box via a large connector on the side of the Brown Box. It did a fair job of demonstrating the method of manipulating a "ball" with a paddle in a realistic way.

However, just one look at the Bill of Materials for this added feature convinced us to hide it under a bushel barrel for now. Its ball-and-paddle-dynamics concepts would come in very handy when we turned our attention to designing and building arcade games a few years later.

Our TV Game project had earlier received another infusion of money from Herb Campman's R&D budget in October, about eight grand, and more came later. This allowed us to spend the first two weeks of 1968 adding the handball and volleyball features with money to spare.

Calling All TV Set Manufacturers!

I don't remember if it was me who woke up to the fact that a Home TV Game product might be the natural province of television set manufacturers. After all, the circuitry, the components and assembly techniques required for a Home TV Game were certainly close to those used in a TV receiver. They used the same resistors, capacitors, transistors and so on and TV manufacturers already had the advantage of scale. Lou Etlinger told me that things didn't happen quite that way. He claims that I came to his office one day and he said to me, "now that you have fooled around long enough, I'll show you how to sell this thing."

To pursue this idea I met repeatedly with Lou who started the ball rolling by calling and inviting representatives of various U.S. television set manufacturers to come to Nashua for demonstrations.

Yes, Virginia, there were U.S. TV set manufacturers then. Well over a hundred in fact. It may seem hard to believe now but their brands dominated the



Figure 48 - Engineer David Bateman and my tech George Mitchell playing Ping-Pong on the Brown Box

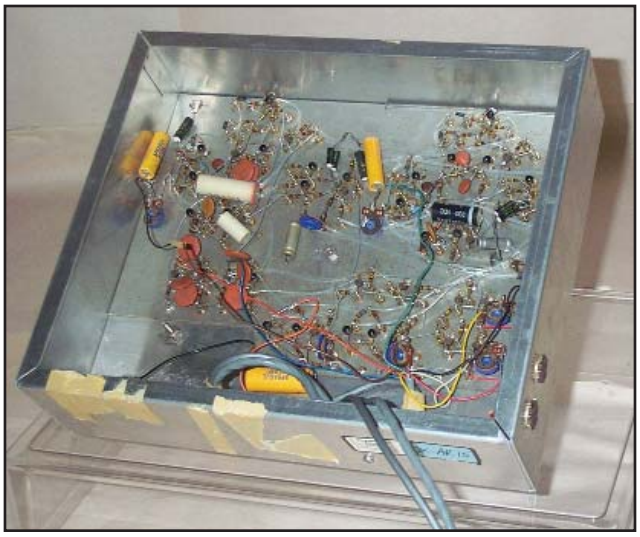


Figure 49 - Bottom View of the second "de/dt" (velocity responsive) ballgame chassis, our TVG # 8 (12/68)

U.S. TV set market. It wasn't until the 1970s that the second-generation managers, the new financial wizards with their MBAs, who were now running our consumer electronics companies decided to put their corporations' money into car rentals and similar businesses, effectively handing the U.S. consumer electronics industry to the Japanese.

RCA engineers and marketing people were the first to visit Sanders. They came in the middle of January 1969 and were followed over the next few months by Zenith, Sylvania, GE, Motorola, and Magnavox, all of them substantial U.S. TV set manufacturers at that time.

Warwick, Sears Roebuck's TV set suppliers, expressed interest but told us to contact a particular individual at Sears. Lou Etlinger, Bill Harrison and I flew to Chicago and visited that Sears buyer right after the first RCA group left. He watched us demonstrate the Brown Box and allowed as how he would never put one of these "things" in his stores: "All the mothers will drop off their kids on Saturday morning and have us baby-sit them all day", he said and proceeded to spend an hour telling us of his exploits in the ham radio business. It turned out to be a wasted trip to Chicago.

GE suggested that we visit their small-color-set assembly operation in Virginia and demonstrate the Brown Box there. Lou, Bill Harrison and I did just that in May. We got a nice tour of their large and very modern TV set assembly line. It was an interesting trip but again, nothing else came of it.

The reaction to our various demos of the Brown Box and its accessories was uniformly positive:

Bill Harrison recalls that when the RCA visitors first saw that ball bouncing back and forth, there were a lot of smiles and head nodding and he felt instantly encouraged that we were on the road to success. Everyone in the delegations that came to Nashua for TV game demos agreed that playing games on a home TV set was an interesting concept that had "legs." But only RCA proceeded to negotiate a licensing agreement with Lou Etlinger. That began in the spring of 1969. After months of working on the details of the agreement these negotiations fell apart. Big RCA's legal beagles figured they could snooker us. They didn't reckon on Lou Etlinger, an ex-New Yorker. When operating from his base in New Hampshire he liked to act the local hayseed lawyer but it was usually Lou who did the snookering! Nevertheless, without an RCA agreement we were back to where we started and had essentially lost nearly another year.

Fortunately for us Bill Enders, a member of the RCA team, had left that company and moved on to become a marketing VP at Magnavox in their New York sales offices. He had been thoroughly impressed with the January demonstration of our Brown Box. During the month of July, Enders came up to Nashua to get another personal look at our game devices. He got even more enthusiastic and urged Magnavox management, headquartered in Fort Wayne, Indiana, to take a second look at our game concepts. Here was another guy with vision.

A few days later, we received an official invitation from Fort Wayne, asking us to bring in our road show. Lou Etlinger and I got on an airplane on the 17th of July and flew to Indiana for that all-important demonstration. When we arrived in Fort Wayne, half the countryside was flooded.

That was nothing new...happens every other year, we were told. Fortunately, the road to Magnavox was not affected. We thought the weather was a bad omen.

They gave us the use of their boardroom and brought in one of their 19-inch TV sets; I set up the TV, along with our Brown Box, the light gun, and our golf putting device. One by one, a large number of people filed into the room. Gerry Martin, the VP and General Manager for Console Products who had set up the meeting, arrived last and we started our demonstration. My recollection is that of a room full of guys sitting around a long, dark conference table, looking generally glum and non-committal.

Clearly, the reception we were getting was not exactly overwhelmingly enthusiastic. During and at the conclusion of what I thought was a really good demonstration, no one showed any visible degree of enthusiasm except for one man in the room: Gerry Martin. He immediately saw the prospect of a novel product category for Magnavox in our game concepts...and he was the boss! He made a decision right then and there to try and push ahead with a Magnavox Home TV Game product. A man after our own hearts!

It was remarkable how the atmosphere in the room changed after Gerry Martin announced, "We're

going with this!"

Unfortunately, Lou and I couldn't celebrate victory just yet. Gerry Martin still had to convince Magnavox corporate management to support his decision to spend about a million dollars on tooling, engineering, consumer acceptance testing, and marketing so that he could confidently build games in their Morrison, Tennessee TV set manufacturing plant. It took until March of 1970, nine months later, for that to happen.

Then license negotiations began in earnest between Lou Etlinger, Gerry Martin and others at Magnavox. These dragged on for the better part of another year. I was not particularly involved in this eternal wrangling and just as well. At the time, business in general and Sanders in particular were hitting rock bottom. Just about everybody was depressed if not one of the walking dead. I was not in great shape myself. I was happy to leave the details to Lou and was none too sanguine about how it all would work out and whether our relationship with Magnavox would ever produce a reasonable return on Sanders investment.

1971 - Keeping The Licensing Ball Rolling

A preliminary agreement was finally signed between the two companies, Sanders Associates and Magnavox, in January of 1971. A lot of back-and-forth haggling began and when that settled out we turned our Brown Box and all our design data over to Magnavox engineers in Fort Wayne. They got started on a prototype for what was to become the first Odyssey TV Game (their Model 1TL-200) in 1972. Note that the term "videogame" had not been coined yet!

Bill Harrison and I made trips to Fort Wayne in March and again in June 1971 to help with technical and marketing decisions, respectively. We had prepared a substantial package of data for the engineers who had been assigned to the TV Game project. Bill spent much of his time going over the details with the group's leader, George Kent, and with other engineers working for George. Our data package consisted of an overall schematic diagram of the Brown Box, various block diagrams, and individual schematic diagrams of each of the sub-circuits. These included the H & V Synch Signal generators, the Spot (Player, Ball and wall/net) Generator circuit, the Primary and Secondary Flip-Flop circuits (used to reverse ball motion); the gate matrix (used to determine coincidence between ball and paddle in Ping-Pong and between the handball wall and the ball); the Rifle electronics and the Golf Putting electronics. Though planned as add-on games for the Mod.1TL200, the latter didn't make it into the final Odyssey game components list. Neither did the pumping-game switch circuitry and the Chroma Generator circuit, all of which fell by the wayside, ostensibly for cost reasons. Other changes were also made to save a few dollars. For example, the original double-sided circuit board was replaced by a single-sided to save another $1.60. Another component was removed to save $1.25 and so on. Interestingly, a study was made to see whether it was possible to allow 4-player games but this never made it through the product definition process. A 4-player Odyssey had also been planned and designed on paper in 1973 or 1974, but was rejected.

In any event, every game element we ever worked on at Sanders had been documented in detail, complete with a component parts list. It was Magnavox's ballgame now. They had to decide which of the goodies they wanted to put into their new product. I worked mostly with Bob Fritsche who had become Magnavox's Odyssey product manager. His primary concern was to define all the games that the machine should play so the engineers could help in evaluating tradeoffs between performance features and cost and help him settle on a final design. Next came such things as the choice of colored overlays since the decision had been made to leave out our color circuitry in order to "save some money".

Throughout this process I felt like the outsider that I was. My problem was that I had no veto power, only friendly persuasion. Some poor choices were made and there wasn't much I could do about it. We debated which games were to be included with the basic Odyssey product, and which were to be set aside for aftermarket sale and so on. The bottom line was that a lot of good stuff was left for "next time"...and we all know about "next time". Some new games were added, mostly by way of overlays. While I had my trepidations, I did like Bob Fritsche right from the start and

generally trusted his judgment. We worked together as well as could be expected that spring and would have a cooperative relationship for several years thereafter. Well, sort of.

On March 3, 1971, Bill Harrison and I had a face-to-face meeting with the Magnavox personnel in their headquarters building in Ft. Wayne. We split up into two groups after some initial demonstrations were completed. Some sense of what went on during these two meetings is reflected in a Memo (Figure 50) I wrote when I got back to Nashua. Note my negative assessment regarding a 1972 to-market date in paragraph 5 on page 2 of the Memo. I definitely underestimated the alacrity with which those guys could move once they were pointed in the right direction. It's too bad that several audio tapes made at those meetings didn't survive.

On the contractual side, negotiating a final agreement between Sanders Associates and Magnavox was another matter. For Magnavox, there was Gerald G. Martin. As the V.P. for Console Products Planning, it was he who had taken the lead to bring TV games into his product line. The exposure he faced to fund development of a production design and to commit the company to expensive, new tooling had been considerable. Gerry's reputation and future were on the line and he let us know that in no uncertain terms.

On the Sanders Associates' side, Louis Etlinger, our Corporate Patent Counsel, stayed in charge of the negotiations. There was a constant exchange of offers and counter offers between Magnavox, mostly via Gerry Martin, and Lou that had begun with the proposed license agreement written by Lou in October 1970. That was followed by months of haggling about various aspects of the agreement, in particular on the specifics of the amounts of various fees such as the option payments and the royalties.

A check for $5,000 came in the mail during March to cover Magnavox's option on what they had now started calling their Skill-O-Vision game product. That name stuck until early 1972 after which the game took on the Odyssey name. The name of the person who coined the new moniker is lost to the fogs of time.

Making A Maximum Effort In Ft.Wayne

During the spring and summer of 1971, management, engineering, marketing, and sales at Magnavox went into high gear. The first order of business was to define and develop an engineering model. The engineers working under George Kent at Fort Wayne dug into the job of designing their version of a game unit. Starting with the circuitry we had designed into the Brown Box at Sanders, George's group basically copied all our sub-circuitry except for the electronic color background components. The golf putting game capability and our ODD/EVEN Quiz and pump games also got the axe in the course of events, as will be seen further along. Bill and I were not happy to see those features gutted. On the other hand, we thought that Magnavox engineering's change from the sixteen game-selection switches on our Brown Box to plug-in programming cards was a stroke of genius! Anybody who argues nowadays that plug-in videogame programmability didn't start with those programming cards must have just come in from outer space. The idea lives and flourishes to this day.

Recently discovered copies of interoffice memos circulating at Magnavox during this development period shed new light on how the various feature-versus cost trade-offs were internally decided upon. These give us an interesting view of what was actually built into early Skill-O-Vision units.

One of the things that these memos reflect is that the engineers really wanted the chroma circuitry to be put into the game console so that the console would produce colored backgrounds, as did our Brown Box. There's a memo from a G. E. Hauke dated Sept 24, 1971 which says "Chroma circuit must be incorporated in the initial production." It didn't happen.

Most interesting is a letter dated 11/18/71 from Bob Fritsche, always trying to get the engineers to shave a nickel of cost here and there:

A. Delete chroma (cost reduction: $1.64)

B. Replace double-sided PCB with single-sided with 100 jumpers (cost reduction: $1.60)

C. Redesign the p.c. motherboard so that the Game (programming) Card inserts in the middle

CONTACT REPORT

Visit to:
MAGNAVOX, Fort Wayne, Indiana (H.Q. Bldg.) 3/30/71 Subject: TVG

Contacts: See below

1. Ran through a typical TVG demonstration using a tube-type 19" TV set. Good sync & color performance - none of the difficulties experienced with another model (both at the motel & at our previous demonstration). Only difficulty was some annoying warping of top 20% of screen.

2. In attendance were the following:

Gerry Martin.....VP, Console Product Dev't
Bob Sanders.....VP, Director of Engrg.
Bob Wiles.....Color TV Product Mgr.
Bob Grant.....Mgr. of TV Engrg.
Paul Knauer,.....Chief Color TV Engr.
George Kent.....Section Chief, Color TV Engrg.
Clarence Greaf.....Color Engr.
Gene Kile.....Mgr. of Design
Clyde (Wiley) Welbaum,Director of Design

3. After the demonstration, we broke up into two groups:

(a) R. H. Baer with Wiles, Kile & Welbaum
(b) W. Harrison with Knauer, Kent, Greaf (& later, Grant)

Martin & Sanders left after the demonstration.

Group 3(a) spent some 4 hours exploring program schedule milestones, marketing strategy, review of demo games and speculation on other games not presently implemented - this session was taped as was group 3(b)'s discussion. The latter was an initial introduction of the technical personnel assigned to TVG to the data package (block diagram, schematics, P/L's, etc.) This session will be continued 3/31 by the same group in a relatively secure area (into which lab equipment was moved 3/30 to take some initial waveforms from the demonstration equipment).

4. There was a positive attitude displayed by all attendees to the demo and at subsequent sessions with the exception of Bob Sanders who refused to enter into the spirit of the TVG, as he did on our prior visit - cannot "read" his real position as yet.

People to be reckoned with are Wiles & Knauer - Wiles has limited ability to demand services from engineering or marketing (see Org. Chart). Must "sell" his programs through the functional daisy chain. Knauer appears to be a very knowledgeable and strong engineering manager - his present approach to the job is to turn out carbon copies of our demo equipment.

Figure 50 - Contact Report 1/2

- 2 -

4. (cont.) I attempted to lay the groundwork for a more broad-gage approach - At a minimum, I suggested including added function switches to expand the TVG repertoire in accordance with suggestions and ideas generated in today's discussions, as well as future inputs of their own (which are bound to develop as they become more familiar with the equipment through hands-on use).

5. In the group 3(a) session, it was pointed out that Product introduction in the TV business occurs in April & May. Therefore, barely a year remains for evaluation and product engineering, manufacturing, etc. if TVG were to be introduced in '72 (Unlikely).

6. All parties recognize the need for an engineering team supported by at least one non-engineering, creative, imaginative software man - to generate saleable games, all necessary software (overlays, instruction booklets, etc.).

7. Some initial design decisions were made:

   (a) Electronics box and two (2) control boxes separated by ribbon cable (4-6 feet each side)

   (b) Electronics box to accommodate a 6 x 9" P.C. card and 1½" height.

   (c) Possible exterior appearance of electronics box to be similar to portable cassette recorder with pushbutton or inclined panel.

8. W. Harrison will return 3/31 (evening) - additional visits to be made a/r.

Attachment - Partial Organization Chart, Magnavox Consumer Products Division.

R. H. Baer

cc: L. Etlinger
W. Harrison

Figure 51 - Contact Report 2/2

which will delete half the (wire) jumpers, (cost reduction: $0.50)

D. Remove Crystal for FCC requirement (cost reduction: $1.50)

E. Use copper clad program card (cost reduction: $0.70)

F. Remove eight square inches from the double-sided board for 2-player function with chroma (cost reduction: $0.40)

Most of these action items were incorporated into the final design, for better or for worse. Much later that year, on December 27, 1971, after Odyssey's final specs had long since been set in concrete, Fritsche wrote a 5-pager about his concepts for the follow-up models of Skill-O-Vision, soon to be called Odyssey. These game systems were to be "deluxe units" available in two versions: 1TL203 and 1TL204. They would operate on Channel 3 and 4 respectively. They would come with 5 games and 10 overlays (as opposed to 6 games actually supplied with Odyssey 1TL-200). 10 extra games were planned for August 1972. My golf putting device was also planned as to be made available as their Model 1TL951. The gun had been put into production and was actually released as their Model 1TL950.

Fritsche's letter also specifies that his projected next-generation units would feature color (chroma) control. It also mentioned some "product areas that remain to be resolved". These included the "Method of returning the English Control to mechanical center after use". It was a smart idea that should have been pursued but wasn't. Anyone who has ever played an Odyssey Ping-Pong game knows that leaving the manual, third-knob English control in some position far from its central one, usually caused confusion with the ball going way off-screen where it stayed until someone figured out that the English control needed to be adjusted.

Work on Skill-O-Vision product definition progressed rapidly during the summer of 1971. Most of the features that were decided on during this phase made it all the way to the Odyssey product definition. There were many differences initially. Overlays were monochrome (Figures 52-56) and plug-in cart connections differed from those eventually used. The development crew designed various fixtures to make their job easier, such as special test carts with switches that used three multi-pole push button switches: one for ball motion (slow/fast), one to switch between 2 games and another for normal/difficult game play. I have 2 or 3 different versions of the early test documents. As far as I know, three versions exist:

- American Odyssey (Model 1TL200)
- German version (Model YE7100)
- Singapore version (Model YE7101)

The record of those product definition days also shows some sort of proposed user manual in photocopy style for Skill-O-Vision units. An interesting item shown in the manual is the Ping-Pong overlay, which shows a HORIZONTAL net line. This game was meant to be played vertically, as opposed to sideways play action we had done so far. As a matter of fact, this mode of play would have required very few circuit changes since one could easily play it this way using the English control.

Will The Consumer Like Skill-O-Vision?

In July, Bob Wiles, Magnavox's Color TV Product manager, wrote a memo that summarized the "effort to date (on the Skill-O-Vision project) and the planned dates for market tests covering the new product, Skill-O-Vision." The memo went on to define a New Product Market Survey whose principal objective was to determine if the product had large scale consumer appeal. The memo had an attachment consisting of three pages. These were headed "SKILL-O-VISION QUESTIONNAIRE" and were to be handed out to attendees at the projected market survey demos. The questionnaire focused not only on the general likes and dislikes of the product by "customer" but probed the customer's preferences for such alternative features as plug-in program cards versus switches.

Surveys of customer acceptance for Skill-O-Vision prototypes were conducted during July and October 1971 at Magnavox Home Entertainment Centers in San Diego and Grand Rapids respectively. They were divided into three demo sessions, one per day, each at a different location.

Bob Wiles was in charge of these tests which were

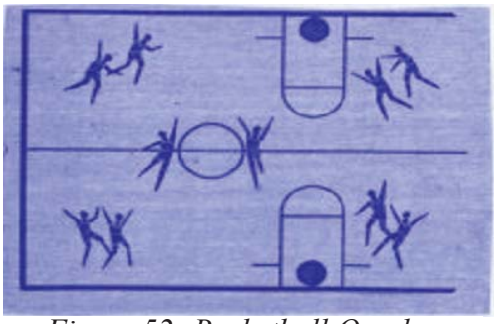


Figure 52- Basketball Overlay

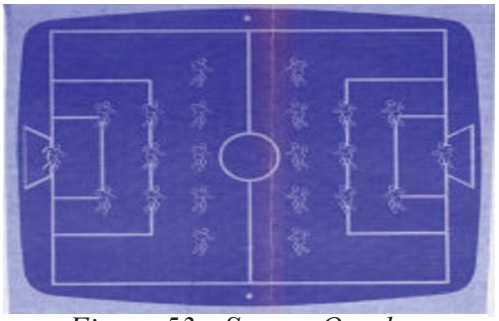


Figure 53 - Soccer Overlay

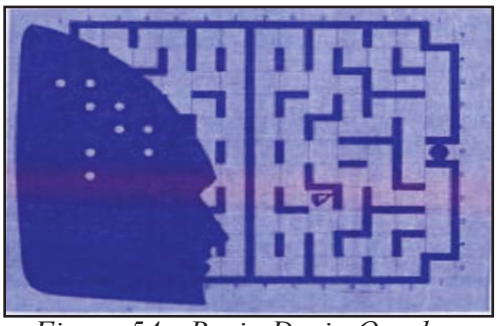


Figure 54 - Brain Drain Overlay

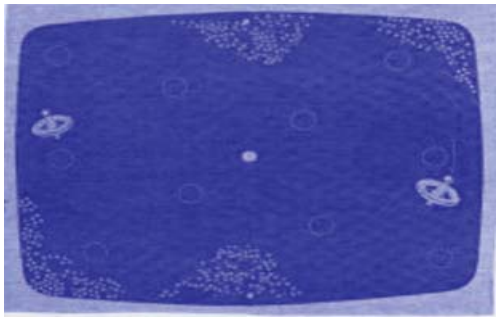


Figure 55 - Interplanetary Overlay

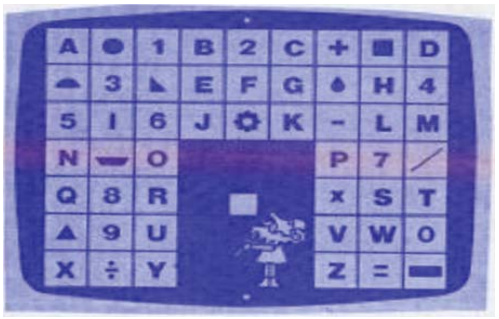


Figure 56 - W.I.N. Overlay

held in a quiet room of a Magnavox Home Entertainment Center. Clarence Greaf, one of George Kent's engineers, went along to handle the technical end of the demos. Also present was Vern Parnell, a local Magnavox sales trainer.

After the completion of the tests, Bob Wiles sent a memo to all parties at Ft. Wayne who were involved in the product launch. He attached a tabulation of the customer's responses that were recorded during the two days of tests in San Diego. Encouraged by the generally favorable customer reactions, Bob Wiles called for a meeting to determine actions and schedules necessary to introduce the Skill- O-Vision product by May of 1972.

Gerry Martin, Bob Sanders, John Silvey, George Kent, Clarence Greaf and others attended that meeting which officially committed the Magnavox Company to proceed with the product design and manufacturing program of what became the Model 1TL-200. A new industry, the home videogame industry, was finally launched.

(INTEROFFICE COMMUNICATION)

C. CREAF

Magnavox

TO: T. Garvin DATE: July 20, 1971 FROM: R. E. Wiles

COPIES TO: M. Turner
G. Martin

SUBJECT: Skill-O-Vision

This letter will summarize the effort to date and the planned dates of the market test covering the new product, Skill-O-Vision. I've been working with Monte regarding the test but briefly you'll recall I discussed the project first with you and Monte during the San Diego Zone Show and then with Ken Crane.

At the outset and as a matter of record, the project is confidential as we as a company stand to gain substantially if we are the first on the market with the product.

In outline form, the following is the suggested program:

New Product Market Survey

I. Objective

To market survey the product to determine if the product concept has large scale consumer appeal.

II. Product

The product, Skill-O-Vision, enables you to play electronic games utilizing a Black and White or Color television receiver.

The product consists of a "Master Control" box approximately one foot square, and two "player" controls approximately six inches long and three inches wide. The controls are interconnected with flexible cords.

III. Method

The survey will be conducted using the attached questionnaire. As we must have a representative sample to guide us, a store location with maximum traffic potential should be selected.

IV. Location of Survey

Referring to our San Diego discussion, Ken Crane has consented to let us use one of his locations. We selected a HEC for the initial test for confidential reasons as opposed to a Mall, as an example.

(INTEROFFICE COMMUNICATION) M 794-1

Figure 57 - Effort-To-Date Memo - 1/2

Skill-O-Vision -2- July 20, 1971

V. Space and Equipment Required

We will require the following space and equipment:

A. Space - approximately 10 feet by 10 feet that could offer some privacy and a location that would not disrupt the normal store activities. A vinyette would be ideal. We would contact the customers after they have finished their shopping in the store.

B. Equipment -
1. A 25" Color TV set
2. Four chairs - two comfortable ones
3. A bench or low coffee table
4. An easel, if available

VI. Timing

A. Arrival - Monday, July 26, 1971

B. Set-up - Monday afternoon and evening. Explain and demonstrate unit to Magnavox and HEC personnel.

C. Survey - Monday thru Thursday (evenings if the store is open)

D. Departure - Friday, July 30, 1971.

VII. Personnel

R. E. Wiles, Color TV Product Manager
Clarence Greaf, Project Engineer
Vern Parnell, Sales Trainer

VIII. Reservations

Would you please make room reservations at a motel appropriate to the store location for the above personnel, Monday thru Thursday evening.

I will call you or Monte Thursday, July 22.

R. E. Wiles

jh

Figure 58 - Effort-To-Date Memo - 2/2

RESPONDENT NUMBER _____

SKILL-O-VISION QUESTIONNAIRE

HELLO! I'M _____

WE ARE CONDUCTING A MARKET RESEARCH SURVEY FOR A TV MANUFACTURER TO DETERMINE THE SALES POTENTIAL OF A NEW PRODUCT.

THIS NEW PRODUCT WILL ENABLE YOU TO PLAY ELECTRONIC GAMES USING YOUR BLACK AND WHITE OR COLOR TELEVISION SET.

WOULD YOU LIKE TO PARTICIPATE IN OUR MARKET SURVEY?

1. YES _____ (PROCEED WITH INTERVIEW) NO _____ (TERMINATE INTERVIEW)

. . . . . .

PLEASE SIT DOWN AND LET ME EXPLAIN THE CONCEPT OF THE NEW PRODUCT USING THIS ARTIST'S DRAWING OF A FAMILY ROOM SETTING.

SHOWN HERE IS THE "MASTER CONTROL" BOX INCLUDING THE ELECTRONIC "GAME CARDS". ALSO SHOWN IN EACH OF THE BOY'S HANDS ARE THE "PLAYER" CONTROLS. THESE CONTROLS ARE CONNECTED TO THE "MASTER CONTROL" BOX BY FLEXIBLE CORDS.

THE "MASTER CONTROL" BOX IS BATTERY OPERATED AND IS CONNECTED TO THE COLOR TELEVISION SET BY A FLEXIBLE CORD. THE CORD IS SIMPLY CONNECTED TO THE TV ANTENNA TERMINALS AT THE BACK OF THE TV SET.

UNDER NO CIRCUMSTANCES WILL THE ELECTRONIC GAMES IMPAIR YOUR TELEVISION RECEPTION.

WITH THE "MASTER CONTROL" BOX CONNECTED TO THE TV THE TELEVISION SET IS THEN TURNED ON AND TUNED TO CHANNEL 2.

YOU ARE NOW READY TO PLAY "SKILL-O-VISION"!

. . . . . .

THE ELECTRONIC GAMES FALL INTO THREE CATEGORIES:

1. COMPETITIVE GAMES SUCH AS PING PONG, BASEBALL, HOCKEY, GOLF, RIFLE RANGE, AND RACE TRACK.

2. CHECKERBOARD GAMES USING NUMBER OR LETTERS.

3. TEACHING SKILL GAMES SUCH AS CHILDREN'S MATH FLASH CARDS, VOCABULARY CARDS, ETC.

WHILE ALL THESE GAMES ARE AVAILABLE, BECAUSE OF THE LIMITATIONS OF TIME, WE WILL ONLY DEMONSTRATE A FEW.

. . . . . .

TO PLAY THE GAMES:

FIRST WE SELECT A "GAME" CARD AND INSERT IT IN THE "MASTER CONTROL" BOX.

THEN, REVIEW THE "PLAYER" CONTROLS:

HORIZONTAL CONTROL - FOR MOVING THE "PLAYER" HORIZONTALLY LEFT AND RIGHT ON THE SCREEN.

Figure 59 - Skill-O-Vision Questionnaire - 1/3

-2-

COMBINATION VERTICAL
AND ENGLISH CONTROL - FOR MOVING THE "PLAYER" VERTICALLY UP AND DOWN ON THE SCREEN AND IMPARTING "ENGLISH" TO THE BALL IN A VERTICAL PLANE.

RESET CONTROL - RESETS THE BALL AFTER A SCORE HAS BEEN MADE.

WE'RE NOW READY TO PLAY, AND TO SHOW YOU THE VARIETY OF GAMES AVAILABLE WITH THE NEW PRODUCT, WE'LL PLAY SOME OF THE MORE TYPICAL GAMES.

1.	PING PONG	OVERLAY NOT REQUIRED
2.	CHECKERBOARD I	OVERLAY REQUIRED
3.	STATES AND CAPITALS	OVERLAY REQUIRED
4.	BASEBALL	OVERLAY REQUIRED
5.	RIFLE RANGE	OVERLAY REQUIRED

IN MOST GAMES, AN OVERLAY IS REQUIRED WHICH IS VERY SIMPLY ATTACHED TO THE PICTURE TUBE.

. . . . . .

AFTER DEMONSTRATING SEVERAL OF THE GAMES, ASK THE RESPONDENT TO PARTICIPATE.

FOLLOWING THE GAME DEMONSTRATIONS, ASK IF THERE ARE ANY QUESTIONS!

. . . . . .

NOW THAT YOU HAVE HAD AN OPPORTUNITY TO PLAY SOME OF OUR ELECTRONIC GAMES, MAY WE ASK YOUR OPINION OF THE NEW PRODUCT.

2. HOW WOULD YOU DESCRIBE YOUR INTEREST LEVEL?

A. LIKE IT VERY MUCH _____
B. LIKE IT SOMEWHAT _____
C. DISLIKE IT SOMEWHAT _____
D. DISLIKE IT VERY MUCH _____

3. WHAT DO YOU PARTICULARLY LIKE OR DISLIKE ABOUT THE NEW PRODUCT? (WRITE DOWN COMMENTS)

4. REGARDING THE "MASTER CONTROL" BOX, DO YOU PREFER THE CONCEPT OF "GAME CARDS" OR WOULD YOU PREFER A "MASTER CONTROL" BOX SIMILAR TO THIS ARTIST"S DRAWING WHERE A DIAL SELECTOR IS USED?

A. I PREFER "GAME CARDS" _____ B. I PREFER A DIAL SELECTOR _____

WHY? (WRITE DOWN COMMENTS)

5. WHO WOULD BE THE PRIMARY USER OF THE GAMES IN YOUR FAMILY?

A. ADULTS _____
B. TEENS _____
C. PRETEENS _____
D. GRADE SCHOOLERS _____
E. PRESCHOOLERS _____

Figure 60 - Skill-O-Vision Questionnaire - 2/3

-3-

6. WHICH OF THE FOLLOWING TOYS DO YOU PRESENTLY HAVE IN YOUR HOUSEHOLD?

A. ELECTRIC TRAINS _____
B. ROAD RACING KITS _____
C. CHESS OR CHECKERS _____
D. SCRABBLE _____
E. TARGET RIFLES (BB'S, 22 CALIBER, ETC.) _____

7. DO YOU PRESENTLY OWN A COLOR TV SET?

YES _____ NO _____

8. DO YOU FEEL THE NAME "SKILL-O-VISION" APTLY DESCRIBES THE NEW PRODUCT?

YES _____ NO _____

9. WOULD YOU BUY THIS NEW PRODUCT IF IT WERE OFFERED FOR SALE AT $75?

A. YES _____ B. NO _____
C. IF NO, WHAT PRICE DO YOU THINK THE PRODUCT SHOULD SELL FOR? _____

. . . . . .

TO HELP US DETERMINE THE ULTIMATE POTENTIAL OF THE PRODUCT, WOULD YOU PLEASE ANSWER THESE QUESTIONS.

11. ARE YOU MARRIED OR SINGLE? _____ MARRIED _____ SINGLE

IF MARRIED, DO YOU HAVE ANY CHILDREN? WHAT ARE THEIR AGES?

A. GIRLS _____ AGES _____
B. BOYS _____ AGES _____

12. WOULD YOU TELL ME THE AGE BRACKET OF THE HEAD OF YOUR HOUSEHOLD.

A. UNDER 20 _____
B. 20 - 24 _____
C. 25 - 34 _____
D. 35 - 44 _____
E. 45 - 54 _____
F. 55 OR OVER _____

13. WOULD YOU ALSO TELL ME THE HIGHEST EDUCATIONAL LEVEL OF THE HEAD OF YOUR HOUSEHOLD.

A. ELEMENTARY _____
B. SOME HIGH SCHOOL _____
C. HIGH SCHOOL GRADUATE _____
D. SOME COLLEGE _____
E. COLLEGE GRADUATE _____

14. INTO WHICH OF THE FOLLOWING GROUPS DOES YOUR FAMILY INCOME FALL?

A. UNDER $3,000 _____
B. $3,000 TO $7,500 _____
C. $7,500 TO $10,000 _____
D. $12,000 TO $15,000 _____
E. OVER $15,000

THANK YOU AGAIN FOR YOUR INTEREST AND TIME.

Figure 61 - Skill-O-Vision Questionnaire - 3/3

Magnavox

TO: C. Cochran
R. Grant
COPIES TO: C. Creaf ✓
D. Hall
G. Hauke
G. Kent
G. Kile
G. McMahon
E. Rossig
R. Sanders
J. Silvey
B. Van Dyke

DATE: October 15, 1971 FROM: R. E. Fritsche

SUBJECT: Skill-O-Vision

During July and October, Market Surveys of Skill-O-Vision were performed in Magnavox Home Entertainment Centers located in Los Angeles and Grand Rapids respectively. The Los Angeles survey was conducted at three different free standing stores, whereas in Grand Rapids, one store in a Mall location was used.

The surveys were basically conducted in the same manner to provide continuity in compiling overall results. In each location, a demonstration room was made available along with a 25" color set. Two to four participants at a time were invited into the "demo room" to view a complete demonstration of the product including an opportunity to operate the controls. Following the demonstration, we asked a series of questions designed to determine their acceptance of the product, interest level, likes/dislikes, primary users, willingness to buy, etc. Attached is a copy of the survey results for your review.

Some general observations we have made as a result of the surveys are as follows:

1. The product concept has very <u>high consumer acceptance</u> (89% like it very much).

2. <u>Broad Consumer Appeal.</u> The Michigan survey didn't have the "whole family" mentioned nearly as often as California (Michigan 31% vs California 65%); however, a wide range of age groups were identified. The broad consumer appeal was based upon the variety of games presented which fall into general categories of (1) competitive sports, (2) adult games, (3) educational reinforcement thru game format.

3. Although 65% of the people said the name Skill-O-Vision adequately described the product, they qualified their yes answer by saying they thought we could find a better name.

Figure 62 - Questionnaire Follow-Up 1/2

Skill-O-Vision -2- October 15, 1971

4. The price of $75.00 presents no barrier inasmuch as 77% of the Michigan respondents and 84% of the California respondents indicated they would buy the product. Michigan's acceptance of price is lower than California's; however, their 3 to 1 acceptance is significant in that Grand Rapids is more conservative, and traditionally known as a hard to sell market.

Robert E Fritsche

Robert E. Fritsche

Encl.

jh

Figure 63 - Questionnaire Follow-Up 2/2

COMBINED SURVEY QUESTIONS SUMMARY

(California & Michigan)

2. Interest Level

	California	Michigan	Total
A. Liked it Very Much	38 of 43 or 88%	35 of 39 or 90%	73 of 82 or 89%
B. Liked it Somewhat	5 of 43 or 12%	4 of 39 or 10%	9 of 82 or 11%
C. Dislike it Somewhat	None	None	None
D. Dislike it Very Much	None	None	None

3. Likes/Dislikes (Most Frequently Stated Comments)

	California	Michigan	Total
A. Appeals to all ages - anyone can play	4	-	4
B. Competitive - Group Games - Participation	7	12	19
C. Develop skill - Dexterity	5	2	7
D. Different - Unique - It's fun	11	8	19
E. Variety of games - All Sports	2	6	8
F. Adult Games	5	2	7
G. Replace TV Reruns	4	2	6
H. Educational	4	12	16

5. Users (More than one answer)

	California	Michigan	Total
A. Adults	12 of 43 or 28%	25 of 39 or 64%	37 of 82 or 45%
B. Teens	8 of 43 or 19%	11 of 39 or 28%	19 of 82 or 23%
C. Pre-Teens	8 of 43 or 19%	4 of 39 or 10%	12 of 82 or 15%
D. Grade School	3 of 43 or 7%	14 of 39 or 36%	17 of 82 or 21%
E. Pre-School	4 of 43 or 9%	2 of 39 or 5%	6 of 82 or 7%
F. Whole Family	28 of 43 or 65%	12 of 39 or 31%	40 of 82 or 49%

6. Toys Owned (More than one answer)

	California	Michigan	Total
A. Trains	15 of 43 or 35%	8 of 39 or 21%	23 of 82 or 28%
B. Racing Car Kits	18 of 43 or 42%	19 of 39 or 49%	37 of 82 or 45%
C. Chess/Checkers	1 of 43 or 3%	27 of 39 or 69%	28 of 82 or 34%
D. Scrabble	2 of 43 or 5%	23 of 39 or 59%	25 of 82 or 30%
E. Target Shoots	4 of 43 or 9%	6 of 39 or 15%	10 of 82 or 12%

7. Color TV Owners (without wives)

	California	Michigan	Total
Yes	25 of 32 or 78%	24 of 31 or 77%	49 of 63 or 78%
No	7 of 32 or 22%	7 of 31 or 23%	14 of 63 or 22%

Color TV Owners (with wives)

	California	Michigan	Total
Yes	36 of 43 or 84%	31 of 39 or 79%	67 of 82 or 82%
No	7 of 43 or 16%	8 of 39 or 21%	15 of 82 or 18%

Figure 64 - Questionnaire Results - 1/2

8. Name of Product (Skill-O-Vision)

	California	Michigan	Total
Like	20 of 43 or 70%	23 of 38 or 61%	53 of 81 or 65%
Dislike	13 of 43 or 30%	15 of 38 or 39%	28 of 81 or 35%

Note: One participant from Michigan survey - no opinion.

9. Pricing (@ $75.00)

	California	Michigan	Total
Yes	36 of 43 or 84%	30 of 39 or 77%	66 of 82 or 80%
No	7 of 43 or 16%	9 of 39 or 23%	16 of 82 or 20%

Note: 50 or 88% of those that own color Tv said they would buy at $75.00.

11. Sex of Respondents

	California	Michigan	Total
Male	24 of 44 or 55%	30 of 39 or 77%	54 of 83 or 65%
Female	21 of 44 or 45%	9 of 39 or 23%	30 of 83 or 35%

12. Ages of Respondent

	California	Michigan	Total
Under 20	1 of 44 or 1%	6 of 39 or 15%	7 of 83 or 8%
20 - 24	14 of 44 or 32%	14 of 39 or 36%	28 of 83 or 34%
25 - 34	4 of 44 or 9%	12 of 39 or 31%	16 of 83 or 19%
35 - 44	13 of 44 or 30%	5 of 39 or 13%	18 of 83 or 22%
45 - 54	6 of 44 or 14%	2 of 39 or 5%	8 of 83 or 10%
55 - Over	6 of 44 or 14%	0 of 39 or 0%	6 of 83 or 7%

13. Education Level of Respondents

	California	Michigan	Total
Elementary School	1 of 42 or 4%	0 of 37 or 0%	1 of 79 or 2%
Some High School	0 of 42 or 0%	0 of 37 or 0%	0 of 79 or 0%
High School Graduate	22 of 42 or 52%	15 of 37 or 41%	37 of 79 or 47%
Some College	10 of 42 or 23%	13 of 37 or 35%	23 of 79 or 29%
College Graduate	9 of 42 or 21%	9 of 37 or 24%	18 of 79 or 22%

Note: Two Respondents did not answer in each Survey.

14. Total Family Income

	California	Michigan	Total
Under $3,000	0 of 34 or 0%	3 of 32 or 10%	3 of 66 or 5%
$3,000 - $7,500	3 of 34 or 9%	3 of 32 or 10%	6 of 66 or 9%
$7,500 - $10,000	15 of 34 or 44%	9 of 32 or 28%	24 of 66 or 36%
$10,000 - $15,000	5 of 34 or 15%	9 of 32 or 28%	14 of 66 or 21%
$15,000 & Over	11 of 34 or 32%	8 of 32 or 24%	19 of 66 or 29%

Note: (1) Couples counted as one in both Surveys.
(2) All 3 from Michigan Survey with Income of under $3,000 are students.

Figure 65 - Questionnaire Results - 2/2

Odyssey Rolls Off the Production Line

Unlike the design of the Brown Box, the Odyssey unit ended up having one large p.c. board. A series a small "baby" boards were plugged into the "mother board". These small, modular boards contained the various sub-circuits, such as the ball spot and player spot generators, the H&V sync signal generators, and so forth. All of these were identical to the sub-circuits we had documented. Alongside the motherboard was the battery box that contained six "C" cells which provided 9 volts for operating the game circuitry.

Schematically (page 234) the final Odyssey design was not much different from what we had drawn up for the Brown Box. Both were quite formidable.

Among the problems that George Kent's engineers encountered during the redesign from our Brown Box to the Odyssey was the need to meet new FCC specifications that limited the amount of r.f. signals that were unintentionally delivered to the TV by the game unit. George and his crew solved the problem by designing a switch that allowed the user to choose between "Game" and "TV" positions. Millions of similar switch boxes were copied during the 1970s by manufacturers of videogames all across the globe.

Once George had taken the final design of the game unit and antenna switch to the FCC labs in Washington and passed their tests, Odyssey production at Magnavox's Tennessee plant went into high gear. Everyone involved in the effort to get production started in time to meet the projected May 1972 deadline did a great job.

By June 1971, six Odyssey pre-production models and a couple of light guns were available so that Gerry

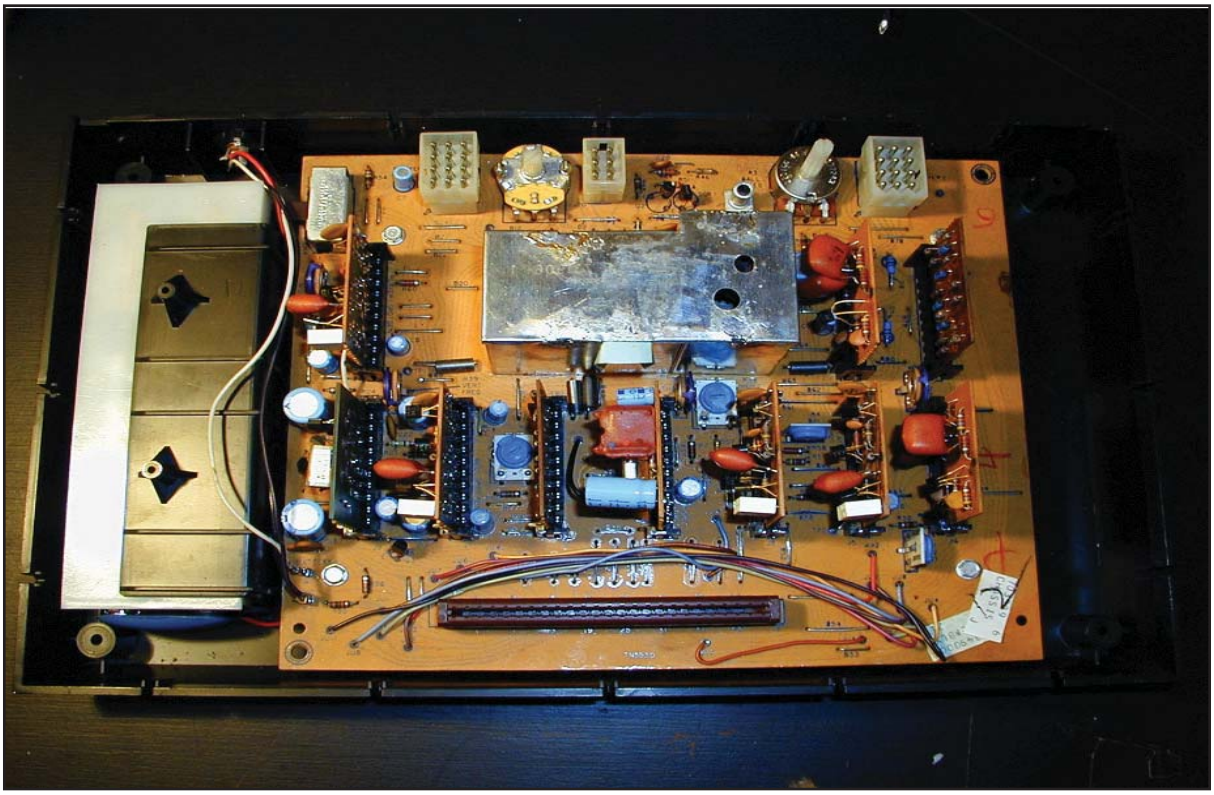


Figure 66 - The motherboard and baby boards of the Odyssey 1TL-200

Martin could launch product acceptance tests. The first of these took place in California, followed by similar tests in Grand Rapids, Michigan which was considered a more conservative setting. The results were overwhelmingly enthusiastic and most encouraging.

In October 1971, Gerry Martin sent Magnavox's 5-truck "Profit Caravan" containing samples of his entire 1972 product line to some 22 states around the United States. All of the dealers who were exposed to the Odyssey game had extremely positive reactions. In fact, the response was phenomenal. "The best thing to come down the pike in years!" was the general consensus. *TV Digest* and the consumer-electronics press carried articles about an upcoming "mystery product" from Magnavox. There was much speculation in the trade press just what that "mystery product" might be. The trade, the press and the public would have to wait until May of 1972 to get an official introduction to Odyssey and to play it hands-on at Magnavox dealerships.

Flashback: Hard Times In The Defense Electronics Business

In the late 1960s and early 1970s, the defense electronics industry began to contract drastically as Congress progressively reduced spending on military electronic systems. At the nadir of that decline in business, Sanders Associates went from close to 11,000 employees to barely more than 4,000. It was a traumatic time for everyone involved in defense electronics. Needless to say there were a lot of depressed and demoralized characters at Sanders during those years slinking around the halls and waiting for the axe to fall. The walking wounded. I was one of them.

I quit my Equipment Design Division job and turned it over to Dunc Withun, one of my department managers. Corporate management had persuaded me to run the company's Flexprint plant for a year. That operation produced sophisticated flexible and hard multi-layer printed circuit boards. Flexprint had been on its last legs for some time. Its prior managers had left to start an independent p.c. company in nearby Massachusetts and took all of the best designers and production people with them. They left behind a disaster. The production equipment was antiquated and there was a lack of competent personnel. The place that I inherited was demoralized and it did nothing to improve my depression. I stuck it out for about one year.

Afterwards I switched positions within the company again. Gene Rubin was kind enough to make me the Chief Engineer of his Electro-Optics Division. He knew that I was not in the best of spirits but he did it anyway. A friend in need. With all of these changes my mood didn't improve substantially. I'm afraid my wife Dena and our three kids got the worst of it. I was not a happy camper and they were at the receiving end of my frustration. While I was in this blue funk, I decided to have a long-delayed, minor operation done: My main objective was simply to get away from the stressful daily grind for a while. It was a hard way to do that!

The operation was routine. The recovery was slow, painful, and uneventful. While I was still in the hospital I had a visit from several Sanders co-workers, including Lou Etlinger who was still our Corporate Director of Patents, and Herb Campman, still our Corporate Director of R&D. I was pleased to see them and even happier when I discovered what they had brought with them.

They presented me with a three-foot-long photocopy of a $100,000 check from Magnavox, our first TV Game license income! This was welcome and tangible evidence of a success to which all three of us had contributed. Our long struggle to get the TV game business to show some return on investment was starting to pay off. The check was dated 2/8/72.

Miraculously, my depression evaporated instantly as if someone had flipped a switch. It never bothered me again. It also confirmed what I had come to recognize, but never voiced, that the root cause of my long-lasting depression was all about the loss of self-confidence and abject refusal to believe in my own worth and capabilities...for no valid reason!

That oversized facsimile of a check sure lifted my mood in a hurry. Added to that was the fact that April of 1972 was around the corner and we knew that Magnavox was about to go public with Odyssey.

Odyssey Makes Its Entrance!

On May 3rd, Magnavox's "Profit Caravan" traveling road show began a series of presentations touting Magnavox's 1972 product line for dealers and the press. The Caravan's first stop was Phoenix. I was pleased to be invited to the product line introduction on May 22 at the Bowling Greene Restaurant in the middle of New York's Central Park.

The Magnavox line that spring season included several new TV sets, a new color camera for personal use, and their Odyssey TV Game System: Model 1TL-200. As I sat in the audience among dealers and reporters, I watched their reactions. It was obvious to me that the Odyssey was the undisputed hit of the show! Naturally I got pretty excited and was hard-pressed to keep my mouth shut and restrain myself from jumping up on the stage and yelling, "that's my baby!"

Over the following months Magnavox began supplying the dealers with production units. They also started shipping a very nice-looking, pump-action plastic "rifle," for which they provided a separate, large, in-store easel display. Magnavox also shipped six additional game packs, each containing an overlay, instructions and other goodies for after-market sales. Some of these had new "cards" and others used existing cards that had come with the original Odyssey game system.

A handsome flier was widely distributed. It introduced the idea of Home TV Game playing. It showed the basic and optional Odyssey games and the shooting gallery games.

The Home TV Game industry had launched for real!

Unexpected problems soon began to haunt the program. First, Magnavox featured the Odyssey in their fall TV advertising in such a way that everyone got the impression that the game would only work with Magnavox TV sets. Next they set the price at a steep $100 for the game unit plus six program cards that could play twelve different games using overlays. Finally, they decided to charge another whopping $25 for the rifle. This made it all a hard sell. On top of that, sales were mainly limited to Magnavox's franchised dealer stores. In the 1960s and 1970s, Magnavox did not yet sell most of their products through independent stores or mass merchandisers such as Sears or Montgomery-Ward. That naturally narrowed the potential sales base considerably.

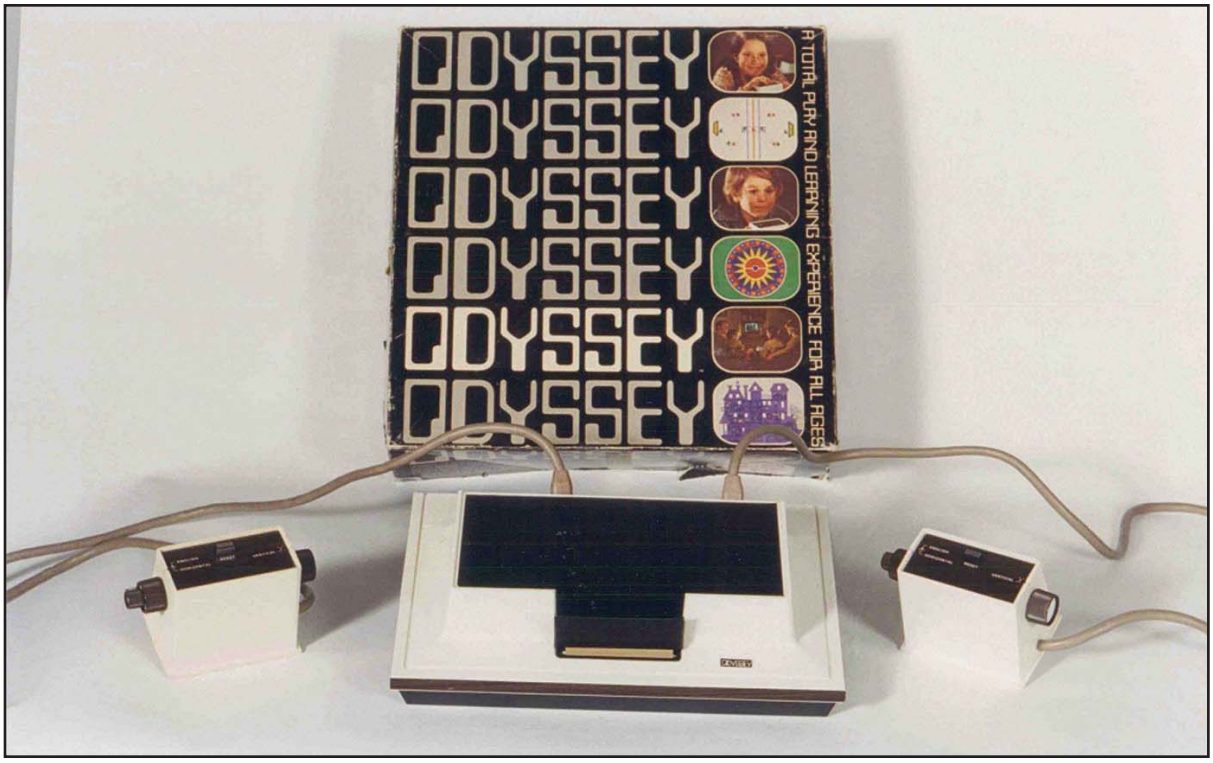


Figure 67 - Magnavox Odyssey 1TL-200 TV Game, Controls and Box

On the positive side, a television commercial featuring old "Blue Eyes," Frank Sinatra, helped spark up sales in the fall. Close to one hundred thousand Odysseys were sold that season.

However by early 1973, Odyssey consoles were already being discounted to $79. In 1973 foreign sales took up some of the slack (Figure 76).

Magnavox also fumbled the sale of the ten additional plug-in carts that had been offered in two different game packs. These featured some of the best games such as Handball, Baseball, Wipe-Out, Invasion, and Fun Zoo in one pack; and WIN, Brain Wave, Interplanetary Voyage, Basketball, Wipeout and Volleyball in the other. All of those packs wound up under the store counters for after-market sale but since Magnavox neglected to train sales personnel to "push" the packs, very few of them were sold.

In spite of all of these unfortunate marketing and sales gaffes, and with help from their TV ad campaign, Magnavox had really done a very respectable job introducing the public to this new concept of Television Games by the time Christmas rolled around. Who knows how many more would have moved off the shelves that holiday season, or the next, if Magnavox had enjoyed broader distribution. Restricting Odyssey sales mainly to "authorized" Magnavox dealerships was a huge handicap. Magnavox would be forced to eliminate this marketing and sales scheme a couple of years later when they were sued by the Government for restraint of trade.

Nevertheless, the Odyssey had staying power and production of the 1TL-200 model continued through 1975. Some 350,000 units were produced during this period. The biggest spurt in sales and production was in 1974 when heavy promotions moved 150,000 units across the counters.

By any measure the Magnavox Odyssey 1TL200 was also a commercial success and introduced the public to playing games on their home TVs.

The Birth Of Pong

After the New York product line presentation, the Caravan moved on to the Airport Marina in Burlingame, California, near San Francisco. The 1972 Magnavox line was displayed there on May 24 and 25.

On May 24, Nolan Bushnell, at the time employed by Nutting Associates and later President of Atari, signed the visitors' log (Figure 75) and attended the product line demonstration. There he played an Odyssey unit which of

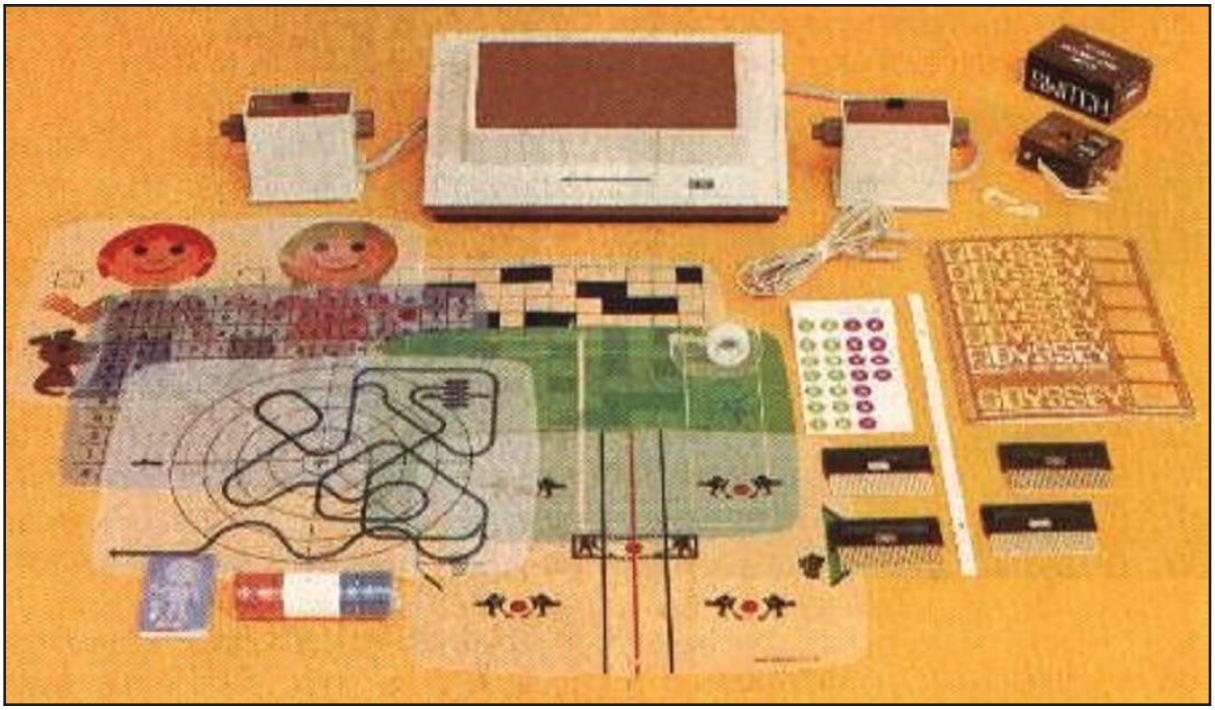


Fig. 68 - Odyssey with most of its goodies – overlays, playing cards, dice, plug-in carts, manual

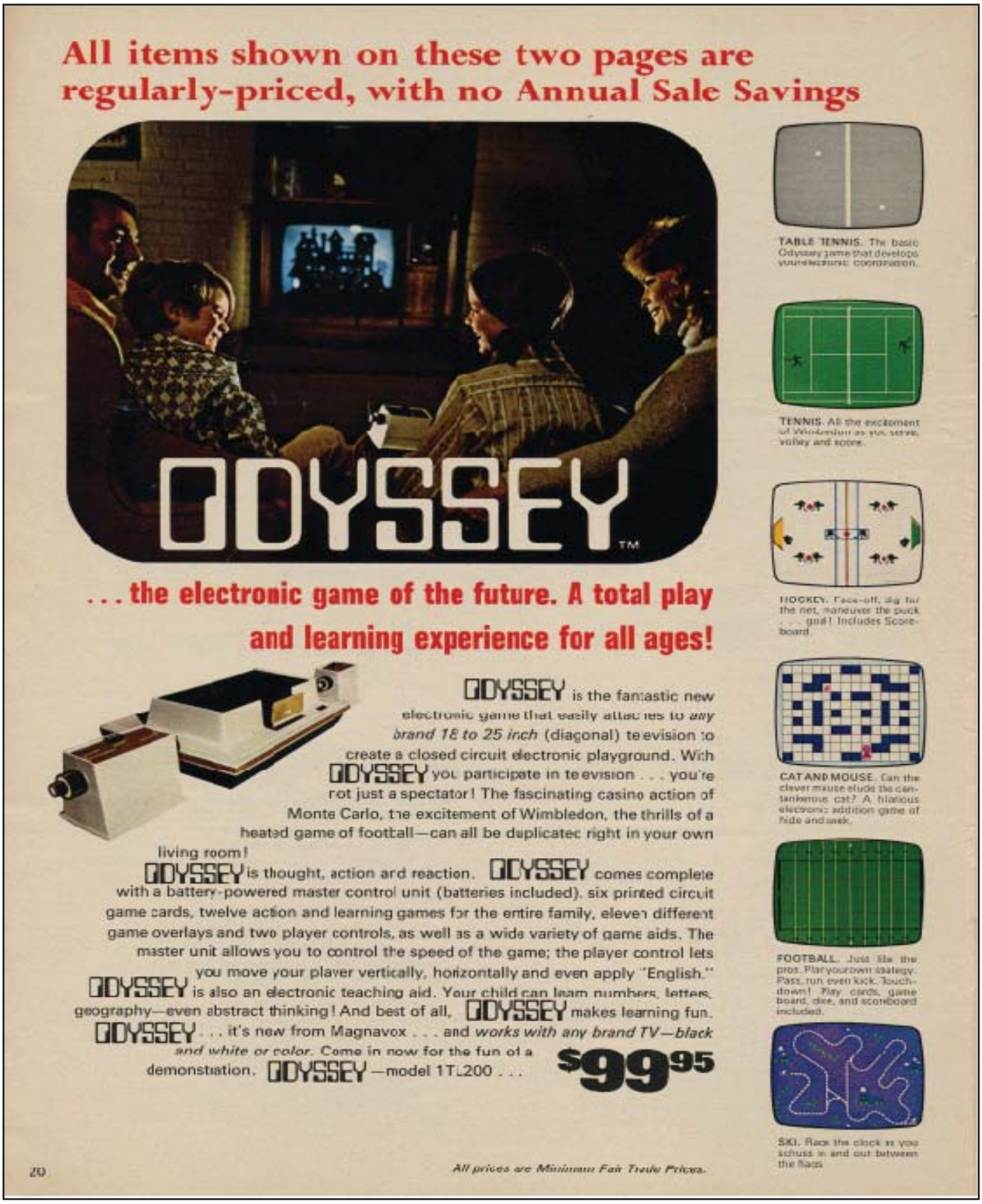


Figure 69 - Odyssey (Model 1TL-200) glossy catalog advertising flier - 1/2



STATES. A fun maze of riddles and rhymes that helps you learn the states and their capitals. States cards, study map and answer folder included.

ROULETTE. Fascinating casino action. Put your chips down on your lucky number and try to break the bank. Includes chips, play money, layout board.

HAUNTED HOUSE. Grope in the dark as cats, bats, skeletons and a scary ghost guide you to the secret treasure. Includes clue and secret message cards.

ANALOGIC. A space race through the numeric maze of a computer charted galaxie. A fascinating electronic addition game for all ages.

SIMON SAYS. A learning game created to help preschoolers associate parts of the body with the printed word. Includes Simon Says Cards.

SUBMARINE. Navigate your convoy into harbor as you pass through dangerous submarine infested waters.

Optional ODYSSEY Shooting Gallery

. . . offers you an exciting new dimension in the enjoyment of your ODYSSEY The SHOOTING GALLERY, model 1TL950, includes an ELECTRONIC RIFLE, two Printed Circuit Game Cards and 4 different Target Overlays in two sizes. The total unit offers 6 variations for creating your own home shooting gallery. $24.95

SHOOTOUT | SHOOTING GALLERY | PREHISTORIC SAFARI | DOGFIGHT

Other Optional ODYSSEY Games...

are available, too . . . and at a very modest price—only $5.95 each! Once you've tried ODYSSEY, you'll want to have *every exciting* game offered. Here are additional games that will bring you and your family great fun and hours of entertainment. Complete instructions, as well as game aids are included with each.

VOLLEYBALL (1TL702). A demanding game of your electronic coordination as you try to smash the ball over the net and out of your opponent's reach.

INVASION (1TL801). Try to capture all opposing enemy castles. You launch your assault by land or sea, but must strategically protect your castles during the battle. Includes Treasure Loot cards, game board, army tokens and dice.

FUN ZOO (1TL900). Youngsters will have fun at the Zoo as they read the game cards and follow the paths to the correct animal's cage, or stop at the snack shop. 28 Fun Zoo cards are also included.

BASEBALL (1TL700). Select your team and plan your batting line-up. You are the manager, so lead your team and plan the game strategy. Includes play cards, scoreboard, runner tokens, and dice.

HANDBALL (1TL701). The electronic version of handball that challenges your responses and reactions in a fast-moving game.

WIPEOUT (1TL800). Advance your car along the game board as you complete your laps. You must be fast, but also accurate, as you are timed and penalized by the timer light. Includes game board, car tokens and pit stop cards also.

21

Figure 70 - Odyssey (Model 1TL-200) glossy catalog advertising flier - 2/2



Figure 71 - Discounted Odyssey Flyer

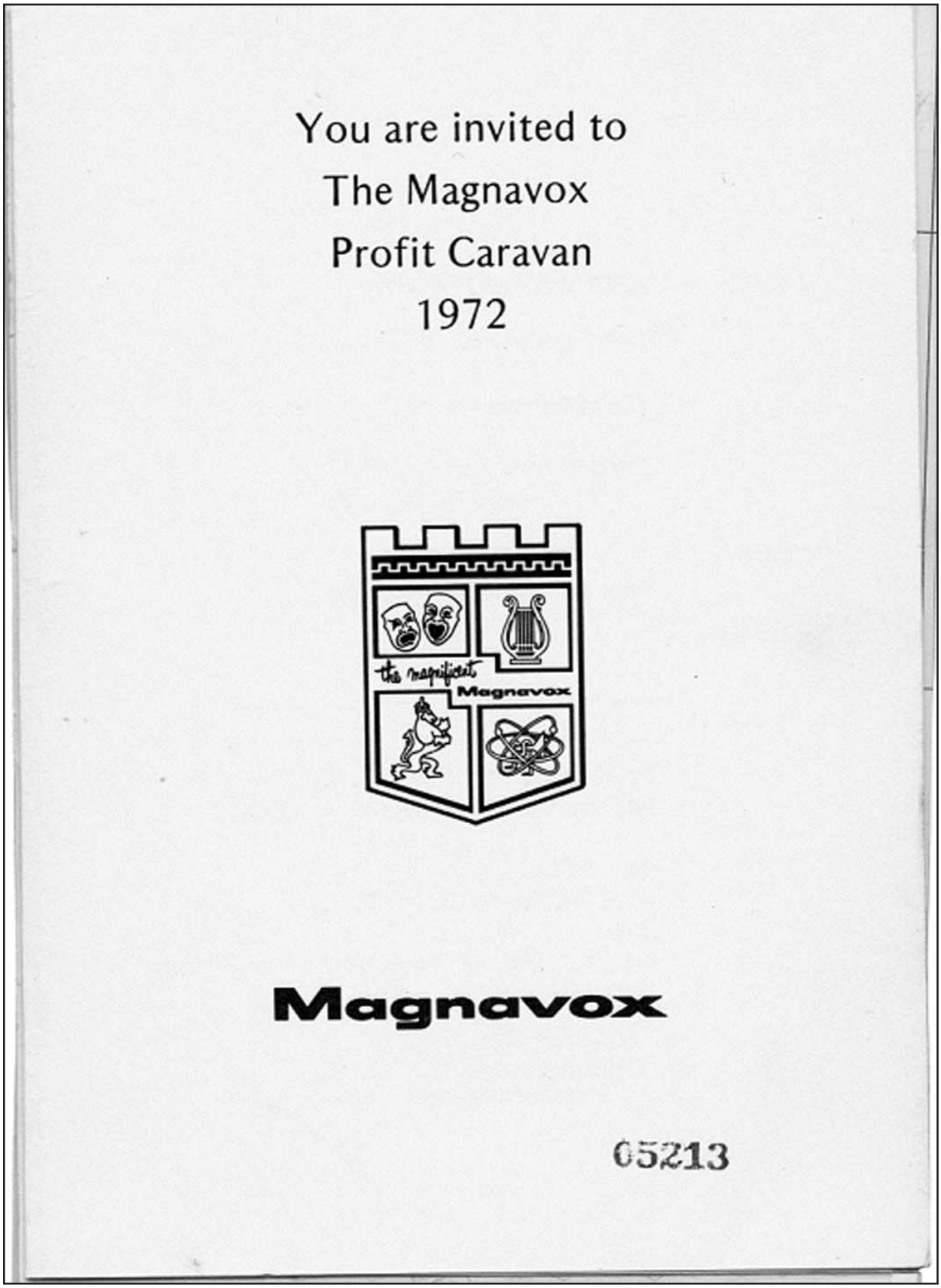


Figure 72 - Magnavox Profit Caravan 1972

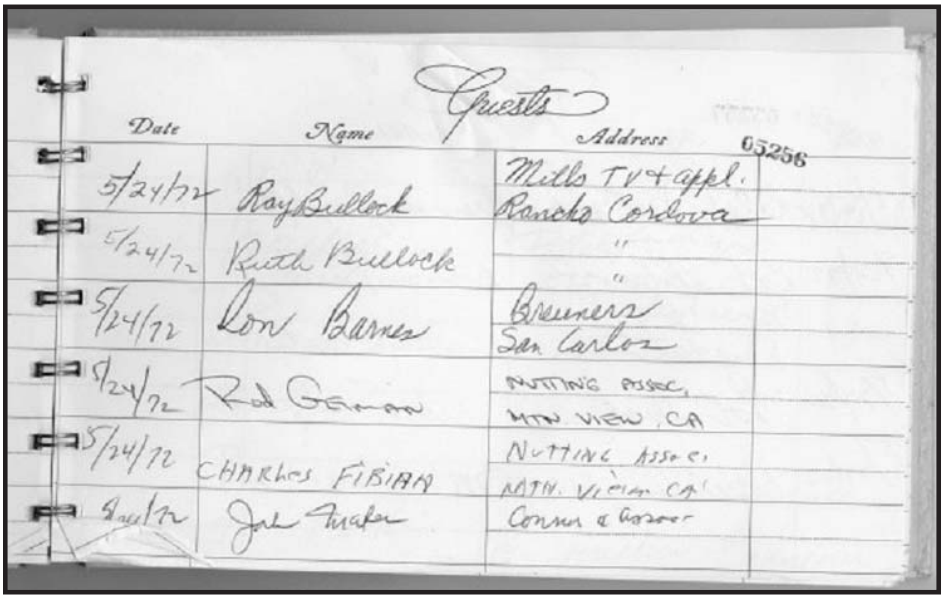


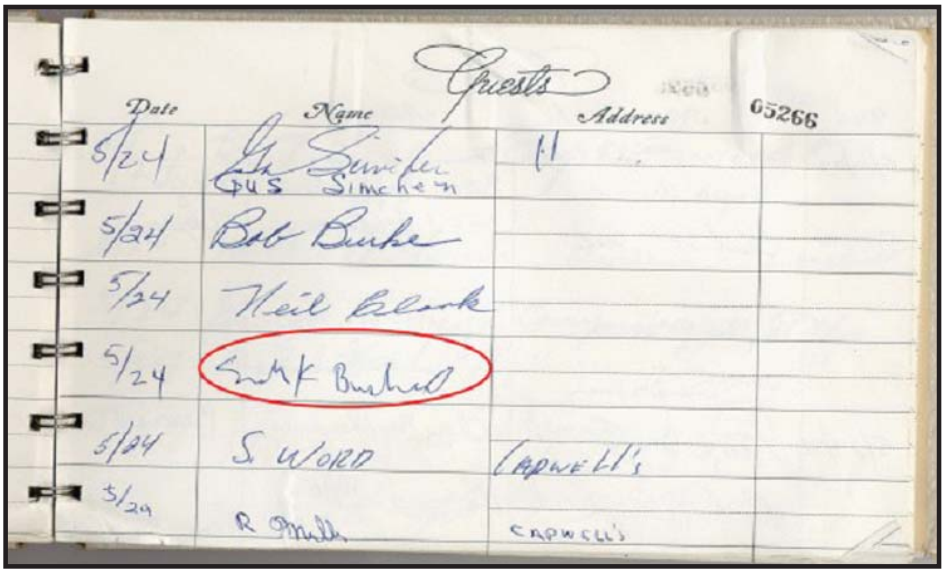
Images on this page...

Top: *Figure 73 - Visitor's Log Cover*

Middle: *Figure 74 - Visitor's Log With Representatives From Nutting Associates*

Bottom: *Figure 75 - Visitor's Log With Nolan Bushnell's Signature*





course included its Ping-Pong game.

Shortly after that demo Bushnell hired 23 year-old engineer Al Alcorn from Ampex, where Bushnell had worked from 1968 to 1970. There, Al had learned all about synthesizing video and had worked on a TV (NTSC) sync generator. Bushnell described the Ping-Pong game he wanted, gave Al the schematic of his *Computer Space* game (which Alcorn said he couldn't decipher) and came up with a perfectly fine circuit design of his own for an arcade game which they named *Pong*. Years later, during depositions for a suit in Federal Court, Bushnell told the court how the Odyssey Ping-Pong game he had played in Burlingame "wasn't very interesting". However, the fact that he had actually played the Odyssey Ping- Pong game that May rendered his "recollections" more than a little unconvincing to the court and to Federal District Judge John F. Grady in particular.

More on this story later on.

In his design of an arcade game, Alcorn had the freedom to use about 100 integrated logic circuits, so-called '7400 series TTL IC's. That was a perfectly sensible way to go with a design for a coin-op machine that cost many hundreds of dollars and sold for somewhere near a thousand dollars, but it was a totally inaccessible route at the time for a Home TV Game designer.

Alcorn did a great job and improved on the basic Ping-Pong features of the Odyssey by providing a segmented paddle for vertical ball control in place of Odyssey's "English" control. He also added a wall bounce and scoring, and most effectively, he came up with that *Pong* sound which gave the game an unmistakable character. Production of *Pong* units did not start until November when Atari moved into their Santa Clara facilities and started a run of 2,500 units. As just about everybody knows *Pong* became a great hit in the bars and arcades of America. *Pong* can clearly be credited with having starting the coin-operated arcade videogame industry with a bang! Videogames, both the Home and Coin-Op varieties, were launched.

Much has been made of the proposition that *Pong* helped Odyssey sales in 1972, after all, an Odyssey game system was the only way you could have some of the *Pong* experience at home. However, there were probably 80,000 Odysseys in stores and customers' homes by the time the first production *Pong* machine started moving out of the Atari plant. So much for that myth. In fact, Magnavox's Odyssey was very well received by most of its purchasers. A November 1972 Memo (Figure 76) from Bob Fritsche to Gerry Martin and Bob Wiles lists a number of unsolicited comments by new owners of Odyssey systems. That puts to bed the negative spin on the Odyssey's acceptance by the public that revisionists have been trying to pander in their version of videogame history.

Let me hasten to add that Sanders Associates' and my personal involvement with videogames, and interactive video systems in general, didn't stop there. In fact, it was just the beginning. Some time after the initial May introduction of the Odyssey game, Magnavox management saw fit to send both Lou Etlinger and me one standard production unit. Thank you very much! How generous can you get? However, that was my first opportunity to see what Bob Fritsche and his great engineers in Fort Wayne had finally wrought. I remember opening the package containing the game in its box, accompanied by all those playing cards, overlays, chips and other goodies, while my friend Joe Bryan and his family were up from New York visiting with us for a few days.

My son Jim, then seventeen years old, and Larry Bryan, Joe's son and my godson, joined Joe and me in unpacking things. We briefly read the instruction manual and hooked the game unit up to a 19-inch TV set.

Here are some of the pictures that record that momentous occasion.

The more we played the Odyssey, the more I thought that all that ancillary material such as the chips and the playing cards were likely to be ignored by the new television game players in favor of the sports games. Ping-Pong, Tennis (which was basically Ping-Pong using a colorful overlay for the playing field), Handball, and all of the Target Shooting games that used the Light Gun accessory seemed to me likely to be played almost to the exclusion of everything else. As it turned out, quite a few "real" game players actually *liked* the quasi board-games and the small fry evidently had fun just moving a spot around the screen.

The press was also universally impressed with the

(INTEROFFICE COMMUNICATION)

Magnavox

TO: G. G. Martin DATE: November 28, 1972 FROM: R. E. Fritsche

COPIES TO: R. E. Wiles SUBJECT: ODYSSEY

As I mentioned to you last week, I have received a considerable number of very favorable unsolicited consumer comments about Odyssey. Below, I have selected a variety of the comments reflecting the extremely high consumer satisfaction with the product and in some cases, unique uses and adaptations being employed.

The comments have been received on the "Consumer Registration and Product Information Card", which has relatively little space for comments, also on the follow up "Consumer Questionnaire" which was mailed November 14. In addition to the information sheets we have initiated, many consumers have written or telephoned us.

Comments received on the Consumer Information Cards and Consumer Questionnaire are as follows.

"It's Magnavox products that I like. ODYSSEY is the best product on the market" J. Vankats, Ontario CR #21

"Fantastic Game Idea" S. Palaman, New Jersey CR #117

"The most unique product I've seen" D. Cole, Georgia CR #420

"The Odyssey is an extremely enjoyable and different concept in game playing" E. Mandel, Florida CR #464

"This game has got to be the greatest thing Magnavox has developed recently for family entertainment. We love it!!! Even my 4 year old child enjoys it as much as we do." N. Algor, Florida CR #497

"You've got a great thing!!! We also purchased 5 additional games." M. Markowitz CR #111 and 1188

"Fantastic! By far the game of the century" D. Berman CR #1308

"We like and think this game is the most fun and interesting thing we have owned. Thank you very much." G. Golemgeske CR #738

"Since we purchased Odyssey, six of our friends have purchased sets from playing with ours." A. Elser, California CQ #1316

"Used Odyssey in my class for Mentally Retarded Teenagers. It has proven popular and my results even amaze me. With small adaptations it could serve the entire educational field" F. Scott, Kentucky CQ #535

"Very satisfied with my Odyssey. Thank you" R. Batten, Michigan CQ #670

Figure 76 - Bob Fritsche Memo - 1/3

Unsolicited letters written by consumers are summarized as follows:

"Many thanks to Magnavox for Odyssey an outstanding contribution to family home entertainment." E. Brown, Illinois

"Just have to tell you what a fun thing you have in Odyssey. It is fantastic . . . we have had hours of fun with it. R. Larkins, Ohio

"Let me congratulate you on your inventiveness, courage and skill in coming up with Odyssey" Sludikoff, Lippman Associates, California

" . . . The concept, operation, ease of installation, design, graphics . . . the whole thing is put together with a sophistication of thought that is very unusual in this age of cold technology and rushing products to market. It's nice to know that there are still engineers around with this degree of imagination and companies that will follow a new idea through." B. Monement, Michigan

"As a form of family recreation and as an aid to training young people in rifle marksmanship, I think it is great.

I congratulate your Company on two counts. First for making this fascinating electronic game available and for your objective thinking in selling any recreational device including a gun. Odyssey is a fine educational as well as recreational device." Merrill Wright 2nd Vice President, National Rifle Association.

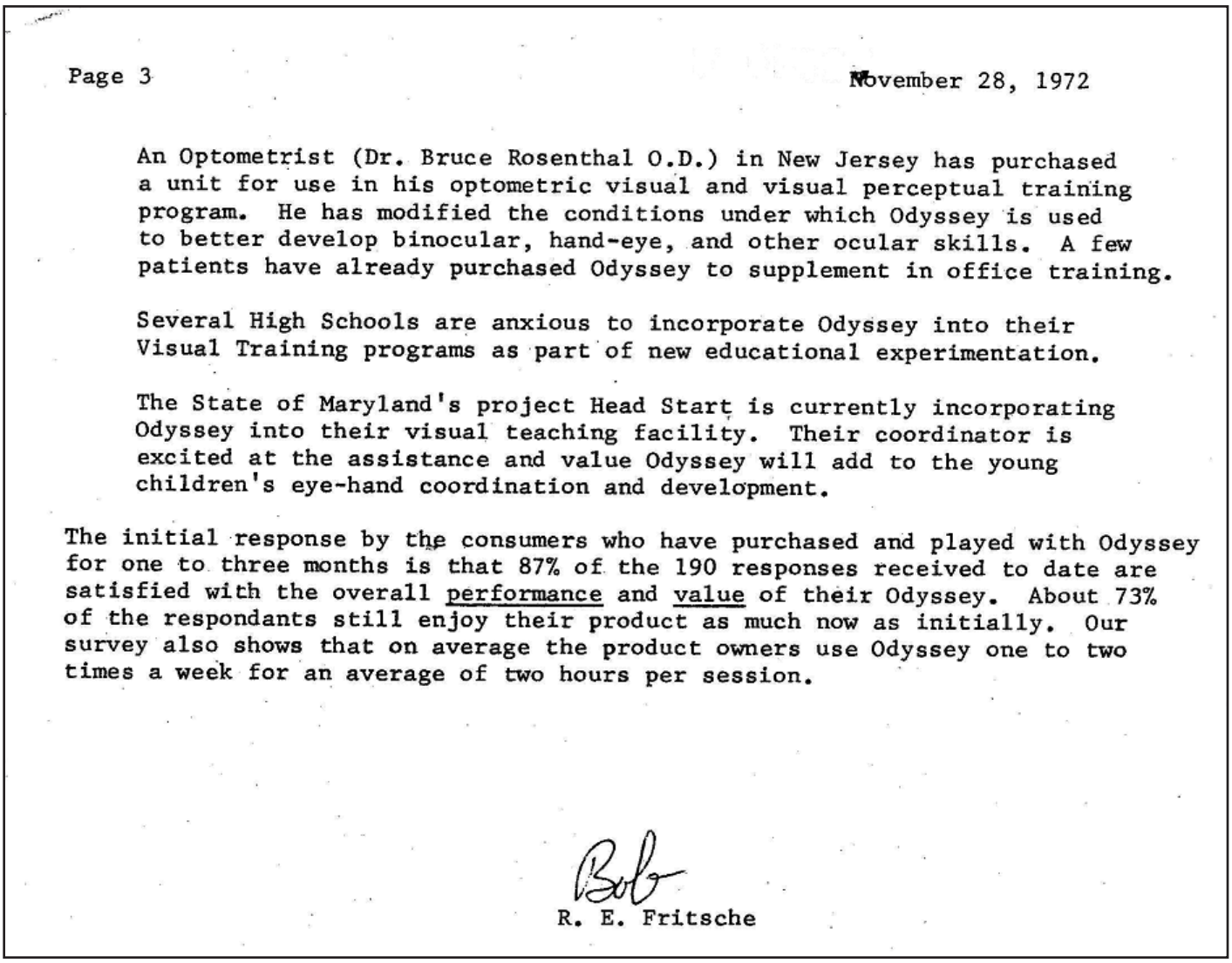
Following are summaries of unique and secondary uses for Odyssey which some consumers and institutions have employed.

Los Angeles Air Traffic Controller Training Center who trains new Air Traffic Controllers has purchased two units for use in their training program. They reduced the size of the player light and interfaced it with a multi light TV screen to simulate air traffic.

Veterans Administration in New York (Bio Engineering Research Service) has adapted current Odyssey units for Quadraplegic patients use. The patients are immobile from the neck down and have specially adapted chin and neck braces that are used to control or manipulate artificial limbs. The VA group has adapted our player controls to the patients chin and neck braces to allow the patient to control the Odyssey player light. A micro switch is affixed behind the head to activate the reset button.

The University of Kentucky has purchased two units for use in an experimental program involving motor responses as it relates to visual perception. They are measuring monkeys brain waves as the subjects maneuver the Odyssey lights on the screen

Figure 77 - Bob Fritsche Memo - 2/3



Page 3 November 28, 1972

An Optometrist (Dr. Bruce Rosenthal O.D.) in New Jersey has purchased a unit for use in his optometric visual and visual perceptual training program. He has modified the conditions under which Odyssey is used to better develop binocular, hand-eye, and other ocular skills. A few patients have already purchased Odyssey to supplement in office training.

Several High Schools are anxious to incorporate Odyssey into their Visual Training programs as part of new educational experimentation.

The State of Maryland's project Head Start is currently incorporating Odyssey into their visual teaching facility. Their coordinator is excited at the assistance and value Odyssey will add to the young children's eye-hand coordination and development.

The initial response by the consumers who have purchased and played with Odyssey for one to three months is that 87% of the 190 responses received to date are satisfied with the overall performance and value of their Odyssey. About 73% of the respondants still enjoy their product as much now as initially. Our survey also shows that on average the product owners use Odyssey one to two times a week for an average of two hours per session.

Bob

R. E. Fritsche

Figure 78 - Bob Fritsche Memo - 3/3

whole idea of playing games on a TV set and with the Odyssey in particular. A lot of complimentary articles appeared in newspapers, magazines, and the trade press after the initial demonstrations of the game in the Magnavox Profit Caravan. The positive articles made me feel good and pleased my management at Sanders Associates who could finally see a return on their investment taking shape. Business is business.

Winter Of 1972-73 - Upgrading Odyssey

After I suffered through the strengths and weaknesses of the Odyssey rollout and agonized over the trade-offs between cost and the machine's performance, there was one thing that was high on my priority list: doing my utmost to help Magnavox add improvements to the product that would increase its appeal. My ultimate objective was, of course, to increase potential license income to Sanders from Magnavox to keep my management happy.

During the ensuing winter months I spent after-hours in my home-lab working on improving the Odyssey. Taking a leaf from what I had heard about *Pong*, it was obvious that future Odyssey models would need sound and scoring. The latter seemed out of reach price-wise, but sound was entirely feasible. I got busy and designed a small box that plugged into the Odyssey base unit, detected coincidence signals between the "ball" and "paddle" symbols, and produced a *Pong*-like sound via a small, built-in speaker.

When I completed the sound-unit, I showed it to



Figure 79 - Jim, me and Larry... studying the Instructions



Figure 80 - Attaching the Roulette overlay



Figure 81 - Playing The Game



Fig. 82 - Lil Bryan and Dena watch "enthusiastically"

Magnavox. The response was my first encounter with what was to become Magnavox's recurrent bouts of doubt about their future in the videogame business. To my chagrin and total annoyance, nobody paid serious attention to my sound accessory. In fact, Magnavox was considering selling off Odyssey 1TL-200 inventory. Senior management was not certain whether there would ever be another run of that product or for that matter, whether there was a future for a TV game product line at Magnavox. Fortunately, the supporters of the new product prevailed. Another 27,000 1TL- 200's had to be produced in 1973 for a total of about 160,000 units so that they could fill orders for another 83,000 needed by the time Christmas 1973 rolled around.

Rejecting my sound accessory did not make me a happy camper. This would be only the first of a long string of disappointments with our early Magnavox association. The next one came when I showed them several novel games I had developed. These games were made possible by adding "active components," such as transistors and diodes, to the Odyssey's "passive" plug-in programming cards. Those active components opened up game possibilities that the basic game circuitry and "old" card design could not handle. Again, my efforts were received without any visible signs of enthusiasm at Fort Wayne. So much for trying to support our licensee!

In retrospect, the concept of plugging in a cartridge or card carrying active components to "program" a

Anyone for armchair tennis? Try it soon on your TV screen

When television programs get boring, viewers will be able to generate their own excitement, starting this fall, by converting the TV screen into an electronic game board. They'll be able to play simulated tennis, roulette, and 10 other games.

A game simulator that connects to the vhf antenna terminals of the TV set is being placed on the market by the Magnavox Co., Fort Wayne, Ind. Called Odyssey, it is comprised of three basic units: a master control, which contains most of the electronics, and two player control boxes, with which the contestants move lighted squares or other symbols around on the TV screen.

Odyssey will come with a set of 12 printed-circuit game program cards. To play a game, the contestants insert the appropriate game card into a slot in the master control unit. They then choose a corresponding transparent overlay that is taped to the TV screen. Suitable for screens 18 inches and larger, the overlay turns the screen into a game board or playing field, depending on which particular game is chosen.



An electronic game simulator that connects to the TV set antenna, by the Magnavox Co., permits TV viewers to play a dozen games of skill or chance. Figures on the screen are manipulated by the contestants.

For example, when the "tennis" card is inserted, a fixed vertical bar, or "net," appears on the screen, dividing it into two equal parts, as shown in the photo. At the same time, two squares of light appear, one on each side of the net. These represent the "players."

The players can be moved up, down, or sideways by rotating a large knob on the side of the operator's unit.

The "ball"—a third, smaller square of light—appears from a player's square when a button on top of the control boxes is pushed.

The ball is bounced back and forth between two players as the contestants manipulate their control boxes. When a player intercepts the ball, it is returned automatically to the other side of the net. If the player fails to intercept the ball, it continues on off the screen, and must be served again.

To provide a curved trajectory, or "english," on the ball, a second, smaller knob is included on the side of the control box.

The speed with which the ball bounces back and forth is controlled by a knob on the master control unit.

According to John Silvey, director of consumer product engineering at Magnavox, the master control unit electronics produces the TV rf carrier for either channel 3 or 4, to which the set must be tuned. In addition, horizontal and vertical sync signals are generated in this same unit.

From these sync signals, video pulses are produced that can be advanced or restarted, with respect to the raster sweep, by the controls on the operator's unit. This has the effect of moving the images around on the screen. ■■

Figure 83 - Early Odyssey Review

videogame was absolutely novel. Had I then been as aware of the need for patenting concepts as I became in subsequent years, Sanders would have been able to obtain a patent that might have covered all ROM-cartridges when they appeared a few years later. A technical and legal case could certainly be made that ROM-based plug-in carts for "programming" videogames achieve their objectives, presenting game graphics and controlling game flow, by using "active components," namely their ROMs. When you get right down to it, a ROM is basically an integrated form of a diode and transistor matrix. That's what I had added to those plug-in carts.

License income from this invention might have dwarfed what we eventually realized from our basic game licenses and from successfully litigating patent infringement lawsuits. These started in 1975 and continued off and on for the better part of twenty years. They ended up collecting close to a hundred million dollars for Magnavox and Sanders...and the lawyers, of course. As for my "active component" plug-in cart idea...well, it died of neglect.

In 2003, having sent off the Brown Box and several other early game units to the Smithsonian Institute, I started the process of building functional replicas. While I was at it, I decided to rebuild two of the "active" cards I had designed that winter.

Clearly, the first order of business was to create an "active" card for Odyssey that would also make *Pong* sounds "missing" in the Odyssey game. I designed and built some circuitry that did just that. Since the output of the digital flip-flop in the Odyssey that moves the ball-spot back and forth is available on one of the pins of the Ping-Pong p.c. card (Card No.1) I could apply its positive and negative transitions to some timing and sound generating circuits that would produce a nice pong sound through a small loudspeaker. That done, I added two small potiomemeters and some trivial circuitry that allowed each player to adjust his or her ball speed individually. The whole process of designing and building this novel "active" plug-in card was a matter of a few days' effort. It was really neat to be able to play Ping-Pong with that "missing" sound in action. So far, so good!

I then went to work on an additional "active card" idea. This one was to modify the handball card so that it too would have sound and something new, a moving-wall feature. The new card also has a loudspeaker and the circuitry required to make a slapping sound whenever the ball rebounded from the wall or the players' "hands". A slide switch on the left front of the card introduces another new game function: In the DOWN position, the wall (which was normally stationary at the left side of the screen) starts to "move in" towards the players and the game gets faster and faster. Pressing either one of the RESET buttons on the Odyssey hand controllers moves the wall back to its left starting position instantly. This game mode puts extra pressure on the players. Technically it also introduced a fourth, machine-controlled interactive symbol on the screen.

History redux... although, not quite. Some of the components I used weren't available back in 1972-73 but I won't tell anybody if you won't.

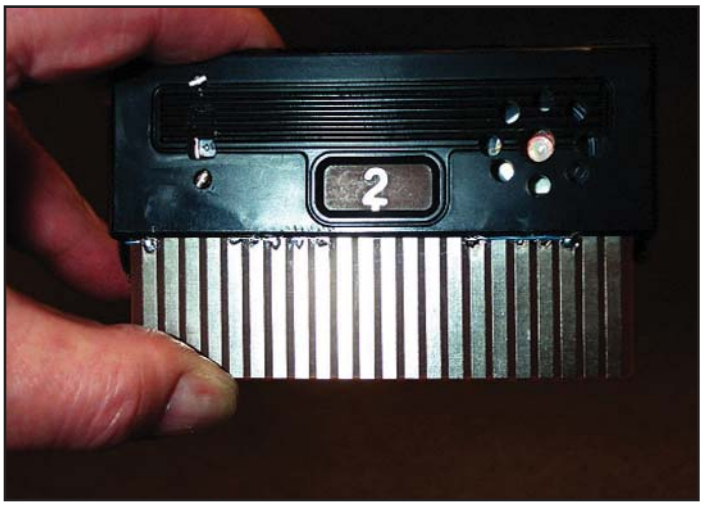


Figure 84 - "Active" Handball Card

1973 - Rethinking My Act

After my abortive attempts to peddle my sound unit and the "active" plug-in carts, I was reduced to calling Bob Fritsche frequently so I could keep track of what was happening in the videogame group in Fort Wayne. What I heard from him were mostly sorry tales about his managements' marginal interest in the TV game business he was trying to build, and not much about work going on to come up with next-generation designs. He was fighting for a new product line but he wasn't getting any support for it from management.

That year I came to the conclusion that the 1960's discrete component design of the first Odyssey sys-



Figure 85 - French advertising flyer for Odyssey

tem had to make room for 1970's integrated circuitry. I began tracking several semiconductor houses, such as Texas Instruments, MOSTechnology, General Instrument and others to determine the feasibility of using integrated circuit technology cost-effectively for Home TV Games. To fan the flames at Magnavox, I used Bob Fritsche as my go-between to pass on all my information to Magnavox management and engineering. In particular, the emergence of the PMOS method for IC fabrication looked like the way to go for a system based on a few chips, or perhaps even a single chip. That was clearly the wave of the future and I wanted Magnavox to get with it. Atari engineers were thinking along the same line. Their single-chip *Pong* home game, which they eventually sold to Sears in 1975, would put them on the map to stay!

During the balance of 1973, I did not see much hope for Magnavox's success in the videogame business. While I wasn't privy to all that was going on inside that company, I sure didn't get the feeling that Bob Fritsche, who was still struggling to make something of his product area, was getting the support he needed from his management who were mostly interested in selling off residual inventory. Magnavox produced another 27,000 units in 1973, all of which were sold that year together with residual inventory of the 1972 run of 140,100 units. They also shipped a small number of games modified for use in France. Meanwhile, small operators in Europe were already ripping off the Odyssey design. An example is the Overkal from Spain. Released in 1973, it is believed to be the earliest known non-U.S. videogame system. Externally, it didn't look anything like the Odyssey. It didn't include the plug for the electronic rifle and instead of using cartridges, it had five push-buttons for five games. However, circuit-wise, it was a virtual Odyssey knockoff.

Then there was Sweden's Kanal 34 which was a larger rectangular unit that bore little resemblance to the Odyssey on the outside, but on the inside it used the same electronic circuits. The first original videogame system following the Odyssey was Britain's Videomaster Home T.V. Game which was released in early 1974. Clearly, the Europeans knew a good thing when they saw it.

Throughout most of 1973 I was mainly occupied with helping Dr. Gene Rubin improve the technical capabilities of Sanders' Electro-Optics Division that he ran. Much of my attention was focused on getting us into the crystal-growing business so we could produce materials needed for military arc-light-pumped lasers. That effort, at least, was successful. Within a year, we were growing usable quantities of Yttrium-Lithium-Fluoride (YLF) crystals, building laser cavities to house them and getting them to oscillate, i.e. to emit a sharply-focused laser beam. Suddenly we were successfully launched into the military laser business! I wish I could then have been more certain about the future of the video game business.

1974 - Tracking Magnavox

In 1974 Magnavox finally make a truly visible effort to retain their leadership in the home video game market. They ran a lot of promotions and the orders rolled in. A production run was launched that topped 170,000 1TL-200 Odysseys which would add up a total run of about 350,000 systems by 1975. Even with the demand for the basic Odyssey units holding up, much of it overseas, management neither moved ahead vigorously on new product design nor were they inclined to go looking for licensees.

I was not kept well informed on European sales. It turned out that the Odyssey Model 1TL200 had been exported to twelve foreign countries: Australia, Belgium, England, France, Germany, Greece, Israel, Italy, Spain, Switzerland, USSR, and Venezuela.

The *Cat & Mouse*, *Football*, *Haunted House*, *Roulette*, and *States* games were removed from the export models, leaving seven of the original games. To these Magnavox added three games that had originally been available as plug-in card add-ons: *Soccer*, *Volleyball* and *Wipe Out*. *Soccer* was simply a re-release of *Football* with the game rules changed to suit. The *Simon Says* and *Wipe Out* paper cards were re-printed with English, German, Spanish and Italian text.

This special export version of the Odyssey had a mercifully briefer 24 page user manual. The console listed an additional patent on its rear as well as the patents from the twelve countries to which it was exported. The German Odyssey contained two totally

new manuals that were written in German and included very detailed information. One manual was for the system itself and the other was for the game rules. Who knows why? Whatever sells!

If you have a burning desire to inspect these manuals, go and look them up on David Winter's website at http://www.pong-story.com/o1german.htm. David informs me that the Magnavox and ITT manuals were the same except that ITT added a blue logo to the cover, bottom right. So there...!

In retrospect, returning to the Magnavox scene, it is hard to know whether Magnavox management could have done a better job with the Odyssey 1TL-200 product in 1973. They moved a lot of Odysseys that year and next despite the fact that they were selling a game that had been engineered with mid-1960's technology. In retrospect it's hard to be believe.

Was the Odyssey a success on Magnavox's bottom line? That's difficult to determine but the best answer has to be: "Not particularly". Their average production cost was about $40 to $50 between 1972 and 1975. That means that the 350,000 or so units made had to cost the company about 15 million dollars. Startup cost including initial tooling and market testing must have added up to something like $750,000 to a million dollars or maybe even more. Then there were the 1972 and 1974 TV promotions including the "Blue-Eyes" commercial that probably accounted for another million dollars - not all of it for Odyssey, of course. So their basic cost for the total production and sales program had to be in the seventeen million dollar range, give or take a million or so. They took a hit from substantial returns of the product over the four year period amounting to about forty-thousand units about whose disposition I have no idea. At an estimated factory sales prices of anywhere from sixty to sixty-five dollars, their total receipts were in the neighborhood of twenty million dollars. The difference of three or four million dollars was probably eaten up in part by the returns. Knowing how big companies work, there is uncertainty as to just what the actual overhead rates were for the TV game product versus those with which the product actually got charged. Be that as it may, the return on investment was a small number at a firm that made hundreds of millions of dollars in their radio receiver, phonograph and TV set business.

Certain management people at Magnavox kept rubbing in this disparity between the size of their TV game business versus that of their standard product line...all this by way of explaining their diffidence when it came to supporting Magnavox's TV game products. I had a hard time keeping my mouth shut and refraining from asking questions like, "Isn't the whole idea of putting substantial effort into new game development to make the TV game product line a much larger proportion of your total business?" Not that I wasn't tempted. Clearly, I could have been more aggressive and gotten major management people at Sanders to help push from the top down at Magnavox. But that's all hindsight.

With Magnavox's future efforts a big question mark from where I sat with my limited access to information, I kept cogitating about ways to improve our chances for continued and substantial license income from Home TV Games. A memo I wrote to Dan Chisholm, Lou Etlinger and Herb Campman on March 18th sums up what I was thinking. I described Magnavox's then still complete lack of effort in the sublicensing arena and recounted my frustration with their foot dragging in accepting my technical support. I specifically wrote about my effort to get Magnavox to work with me on a single-chip PMOS design that was by now more than feasible.

Atari certainly lost no time in bringing a single chip product to market, through Sears to boot, and that almost by accident. Such a design would have given Magnavox an attractive package to present to future sub-licensees, especially overseas. At least that was my opinion. But Magnavox was playing it "safe" and that was a recipe for failure. They were having Texas Instruments convert the baby boards in the Odyssey into single chip devices. By the time they connected to these so-called integrated circuits all of the necessary external resistors and capacitors, they had hardly touched the parts count. I couldn't believe it when I first heard about this approach. How to cast history in stone, make that silicon, while the world of technology is passing you by.

Magnavox resisted the thought of sub-licensing. They insisted that they did not want to generate competition for themselves. It had long been obvious to me

that both Atari and others were going to develop the home video game business whether Magnavox liked it or not, now that we had shown the world that there was such a thing and it was clear that people would actually fork over good money to buy games in large quantities. I was getting more frustrated by the minute.

As it turned out, I had been correct. Although momentum carried over into the next year and another 80,000 1TL 200's were produced and sold the appearance of General Instrument's AY-3-8500 game chip in March of 1975 changed everything - forever. Suddenly anybody would soon be able to produce a high quality *Pong*-like video game for home use. With this new situation, the pressure to get a sub-licensing program organized at Magnavox went up dramatically and still they resisted to go that route!

In my memo, I further reported on Magnavox's dealings with Texas Instruments on the development of that integrated circuit chip-set that would basically imitate our Brown Box's, and Odyssey's, discrete component designs. The chipset eventually included the sync circuits, the ball-and-paddle spot-generators, as well as our so-called summer circuit, our flip-flop circuits and assorted diode matrices, exactly like the baby-boards of Magnavox's Odyssey 1TL-200. It really was a dumb idea!

In May of 1974, Texas Instrument and Magnavox had signed an agreement to have Texas Instrument proceed, with Magnavox's help, on the design and fabrication of these devices, copying our circuitry practically component for component. Under a contract negotiated that month, Texas Instrument was to supply multiple chip sets to Magnavox within eight months. They were to be used to produce the Odyssey 100 and 200 models by Magnavox in 1975, a development spurred on by the inside knowledge of an impending Atari home videogame system.

Texas Instruments promised to deliver that chip set in January 1975. Magnavox, finally getting up some steam, wanted a fall-back position and went ahead with a discrete-component design in case Texas Instruments failed to deliver their subcircuit chips. At a time when others where pushing integrated circuit chip technology, both of these approaches were strictly from hunger and I expressed my unhappiness to that effect in talks with Bob Fritsche.

In August, Magnavox received a proposal from National Semiconductor for a single-chip, PMOS design for delivery in January or February 1975. There was a $30K to $40K design cost associated with this chip set and devices were estimated to cost $7 to $8 per chip. This chip became the MM-57100N, also known as MM- 57105 in Europe. Unlike General Instrument's AY-3-8500, it generated color video signal and played three games.

I no sooner got this piece of encouraging intelligence when Bob Fritsche told me that National Semiconductor was out, at least for the time being. Management had balked at the up-front cost for these chips. It's hard to believe this in retrospect. They had decided to go with the design calling for the five Texas Instruments chips "aping" our discrete component design, a ten-year-old technology camouflaged in chip form. A single-chip design was to follow later. Talk about getting behind the curve.

I knew I couldn't hang around waiting for Magnavox to get off the dime if we were to get a meaningful stream of license income at Sanders. I had begun to spend less and less time on my primary job as chief engineer in the Electro-Optics division even though Gene Rubin, the division's manager, was still covering my paycheck. My main focus now had to be directed at squeezing as much mileage out of our Magnavox licensing deal as possible. That wasn't going to happen anytime soon if I focused solely on Magnavox.

I Become a Freelancer

As I got more involved in pushing our licensing business with Magnavox, my level of participation in the Electro-Optics Division necessarily took a hit. Gene Rubin had been very supportive of what I was doing, as was Herb Campman. Eventually we came to the conclusion that I should move into a staff position and pursue licensing and new TV Game product development full-time. Both Harold Pope, our executive VP, and Royden Sanders, our president, agreed that this seemed to make sense.

On paper I was now assigned Herb Campman's Corporate R&D office. In actual fact, it was a pro-forma arrangement. I had to belong somewhere organizationally so that was as good a place as any. I had worked, and would continue to work, closely with Herb, on whom I depended for funding. Lou Etlinger and Dick Seligman, one of Lou's two patent lawyers, were additional, close associates in my new venture.

Dick wrote all of the many patents that we applied for over the next ten or fifteen years and we had a very high success rate. Most of them were eventually issued. Dick and I frequently traveled to the U.S. Patent and Trademark Offices at Crystal City in Washington, D.C. to argue our case in person after we received the customary first Office Action denying just about all our claims, as is typical.

On one notable occasion, Dick, Lou, and I went to see Richard Murray, the Primary Examiner of several of my early videogame patent applications. The subject was an office action regarding the initial application of what would become the '480 patent. I had brought along a 12-inch GE black-and-white TV set and one of our early Ping-Pong game units. While Dick and Lou argued with the examiner over details of the claims, I blithely set up the TV set and the game on a couple of chairs and started the Ping-Pong game.

When we first arrived at his office, the examiner had rejected the idea of a demo out of hand. It just wasn't done! But once the old Ping-Pong ball was bouncing back and forth between two paddles, there was no way he could keep himself from peeking at it. Half an hour later, Murray and half a dozen examiners who had come in from their offices up and down the hallways, were squeezed into Murray's small room watching Dick and me play Ping-Pong.

The '480 patent, the pioneer patent of the videogame industry, issued on April 17, 1973. At least that's what Federal District Judge John Grady declared it to be from the bench and would subsequently document in his decision on the Magnavox vs. Bally et al suit. We had first filed an application that led to this patent on April 1, 1968. '480 would have issued in 1971 had we not decided to correct deficiencies in the application which made the patent stronger and which the examiner at the U.S. Patent and Trademark Office found acceptable. This is often done when you recognize deficiencies in your application after a filing has been made and after much Patent Office action has already taken place. So we abandoned the original application and re-filed on March 22, 1971.

To keep game hardware and eventually software development moving forward as we saw the need for it at Sanders, I had to acquire at least one technician and one engineer to start off. I was lucky to get Bill Harrison back on board and interviewed a few young engineers from within the company. I settled on Leonard Cope, a University of Maine and Yale graduate. Lenny wasn't particularly happy with his work in the Program Group to which he had been assigned and his program manager wasn't happy with him. Lenny was a maverick and what he needed was motivation. We developed a great working relationship. He turned out to be exactly what I needed. Lenny had the detailed gital circuit design experience that I lacked and he was a good programmer. That would come in handy as we pursued dozens of videogame and interactive video concepts over the following half a decade.

Lenny also became my right-hand man in my professional non-Sanders life with Marvin Glass & Associates, the Chicago toy and game inventors where I became the outside electronic developer in 1977. Just for starters, Lenny did the software for *Simon*, the most successful handheld, single chip-

microprocessor game of the 1980s. Lenny was good: *Simon* is still in the stores in 2004. See page 171 for the complete *Simon* story!

Tracking Videogame Activity In The Field - And How Sanders Almost Got Into The Arcade Videogame Manufacturing Business

In November 1973 I attended a Music Operators of America (MOA) trade show of coin-op games in Chicago. It featured arcade videogames and was the first of many MOA shows that I went to over the years. The object was to collect information on infringing games and that is exactly what I did.

At the convention in the old Parker House Hotel I "walked the floor" and studied or played whatever games were accessible. Then I stepped aside and made detailed notes from memory, generally ducking inconspicuously behind a column, facing away from the display area. I felt like a gumshoe but it was efficient and I got the information we were looking for! Back at the home front I would type up a proper report on what I had seen and my data was then passed along to Magnavox by Lou Etlinger. This activity became one important part of my continuing attempts to get Magnavox management off dead center and motivate them to start pursuing infringers in a serious way.

A couple of months after I returned from the November 1973 MOA show, Royden Sanders, our president, asked for a briefing. I sent him a copy of a Memo (Figure 86) that I had circulated to all involved, reporting on what I had seen at the show. I ran through some of the current arcade videogame business numbers for Sandy. That prompted him to ask me, "Why aren't we in that business if it's so lucrative?"

Since pursuing that line meant getting into the commercial-product manufacturing business, of which Sanders collectively knew zip, I ducked and I weaved but to no avail. I had to come up with a response to Sandy's question.

This memo represents a good overview of the arcade videogame business of 1973, just one year after Atari Pong opened up this segment of the videogame market; and further served as a roadmap to what this business might look like in 1974.

The memo also covered some impressions on Magnavox's attitude towards licensing at the time. They were thinking of palming off the licensing business to Seeburg. This was something we were strenuously opposed to at Sanders because it was not what our Agreement contemplated and what we at Sanders were counting on to give us a substantial return on our investment.

With more than a little trepidation, I sat down and generated a preliminary paper-design of a coin-op machine which used Rusch's "de/dt" velocity-sensitive circuit functions. As I mentioned earlier, it featured methods for controlling the motion of the ball in a hockey game so the puck would have realistic velocity and directional characteristics, making the puck move in the direction in which it was "hit," and causing it to slow down naturally. Its speed across the "ice" would also correspond to how hard it had been struck. Our TV Game Units #5 and #8 had shown the promise of this scheme of things, although we did not fully debug their de/dt circuitry at the time. The more I thought about how neat it would be do actually build a "real" de/dt game, the better the idea of getting Sanders into the arcade game manufacturing business began to look. The idea kept growing on me and the engineer in me was busy suppressing the muted voices of reason that said: "Sanders has no business getting into arcade videogame manufacturing." Half of me was still hoping that my proposals, and the attendant financial exposure for Sanders, would put an end to this trail. The other half of me was already gung-ho to get this new venture underway, so I got with it. Once I had sketched out that preliminary "de/dt" design, I used it to generate a cost estimate of parts and assembly labor. That done, I came up with a business plan to produce what we would later call our Skate-N-Score and Hit-N-Run arcade game machines. Sandy and Harold Pope examined the data that I presented to them and told me to go ahead and design and build something. The ball was in my court for better or for worse.

Herb Campman's R&D office contributed initial funding for this project and an additional $50K was kicked in by Dr. Rubin out of some discretionary kitty

SA

MEMORANDUM

TO: R. C. Sanders

FROM: R. H. Baer

SUBJECT: Video Arcade Games

FILE REFERENCE: RHB/jh/1-1400-74-011

DATE: 24 January 1974

You asked me to summarize where we are going with Video Games; the basic questions you raised when we first talked about the subject, were roughly:

(1) Should we get into the business of building machines of our own design?

(2) Can we provide an industry service capability?

(3) What else can we do?

Background Review:

The industry grew up from ground zero in '72; 1st machines appeared in Fall of '72. 1973 was banner year; over 50,000 units manufactured and sold - four major manufacturers:

(1) Allied Leisure, about 5-10K units

(2) Williams Electronics, Div. Seeburg, 10K

(3) Midway Div. Bally (biggest mechanical game machine mfr in US) about 10K

(4) ATARI, about 10K units.

Ten additional smaller manufacturers dividing balance of 10-20K units among them.

All units basically a copy, variation of ATARI PONG (2 or 4 player tennis, hockey , , . all the same). ATARI about to have patent (on digital techniques) issued- basis for our/Magnavox negotiations - ATARI patents + S/A patents should = collect back-royalties for 50K units already out there.

Where does that situation stand? Magnavox thought they could get Seeburg to take exclusive sublicense, let Seeburg collect from everybody - easy way out - told 'em it's a pipe dream - Seeburg "studied" it to death for 5 weeks - now want only nonexclusive - Ellinger, Chisholm "pushing" Magnavox to press ATARI agreemen

SA-00 470 (9-68)

Figure 86 - Arcade Report - 1/4

TO: R. C. Sanders -2- RHB/jh/1-1400-74-011
FR: R. H. Baer 24 January 1974

More History:

Machines are sold by manufacturer for $800 to $1200 each, to distributors. Distributors mark them up 1/3 (say 900 to 1200), sell to operator, who (a) places them on location,, (b) services them and (c) splits coin-take 50-50 with location owner. Operators "struggling" in past with pinball (relay) machines - Took a year or more to pay off machines from cash box receipts - just about time machines begin to crap out - need much maintenance. When income falls off in a location, operator moves machines on to "second best" location, then "third", etc. - Cycle from spigot to drain considered about 4-5 years. Cash flow so poor that Mafia not interested - definitely! After 4-5 years, major distributors pick-up machines for next-to-nothing - refurbish en-masse and ship off to Upper Ubangi or Lower Slabovia, South America, Africa, etc. Well established routine, been going on for decades.

Enter Video Games! At $50. - to $250. - cash box take per week and a 50-50 split, machines are paid for after 3-4 months; with good q. c./quality by mfr, in latter half of '73 and quick repair/warranty replacement service by board mfrs (not machine mfrs), operators have little repair trouble, are raking it in. Heart of machine is P. C. Board (like one I showed you a photo of), with about 80 T^2L I. C. 's (worth $40. -) and about $30. - worth of discretes, "Boards" go for $170 to 190. - are about 18 x 8". - Operators, mfrs, everybody's happy - I see smiling faces at Chicago M. O. A. (Music Operators of America) trade show, where 1973-74 line is on exhibit (14 mfrs, 2 to 3 models each) - Right about time of show, business takes nose dive - Why? - General panic in industry - little guys starving - Midway Mfg only making about 50 units/week - ATARI "struggling", I'm told - possible effect on Seeburg's licensing decision - Best guess as to cause: Everybody copies each others game - basically ATARI's design - creative engineering practically non-existent - public suddenly fed-up with 28 x same damn thing! Moral: Nobody knows for sure;but best guess is GAMES WILL SELL BIG, IF they're different, challenging - must provide "hand-to-hand combat" between players, lots of action, noise, not readily "learnable" games.

Think I learned a lot about what's needed - talked to a lot of trade people, last 4-5 weeks. Not too certain that mfrs (even big guys, Midway, ATARI, Williams, Allied Leisure) are now scrambling to put good stuff out there, regain momentum - might be trapped by own rut - The message: If we can make a "good" machine, there are dozens of large distributors who'll buy. I'm certain of it.

Question: Can we build-to-price - say $800. -/machine?

Machines consist of following:

(1) P. C. Board - with all game circuits

Figure 87 - Arcade Report - 2/4

TO: R. C. Sanders -3- RHB/jh/1-1400-74-011
FR: R. H. Baer 24 January 1974

(2) Power Supply

(3) TV monitor/set

(4) Coin box and mechanism

(5) Cabinet with player controls

Item (1) is 90 + % of the machine - technically. The rest is dog work - have good access to information on where to get coin boxes, game counters, monitors, etc. used by the industry now.

Pricing exercise (1 week) going on now in SDS to cost typical board, all components, automatic parts insertion, flow soldering, automated testing; tooling for board fab, testing, etc. - Dick Phillips, Walt Schwaiger, SDS Mfg, pushing. You said it's an unnecessary exercise - probably right, hope so. But I want to go to Allied, Midway, etc., who vend most of their board work out and try to second-source boards - and Harold will throw me out of his office if I come in there with proposals for boards without a clean back-up package. Am under no illusion of walking off with a big board order tomorrow, in light of the present video game business situation - but we'll never get anywhere if we sit back and wait for turn-around - want to be ready when it comes.

Here's my plan (such as it is):

(1) Price boards.

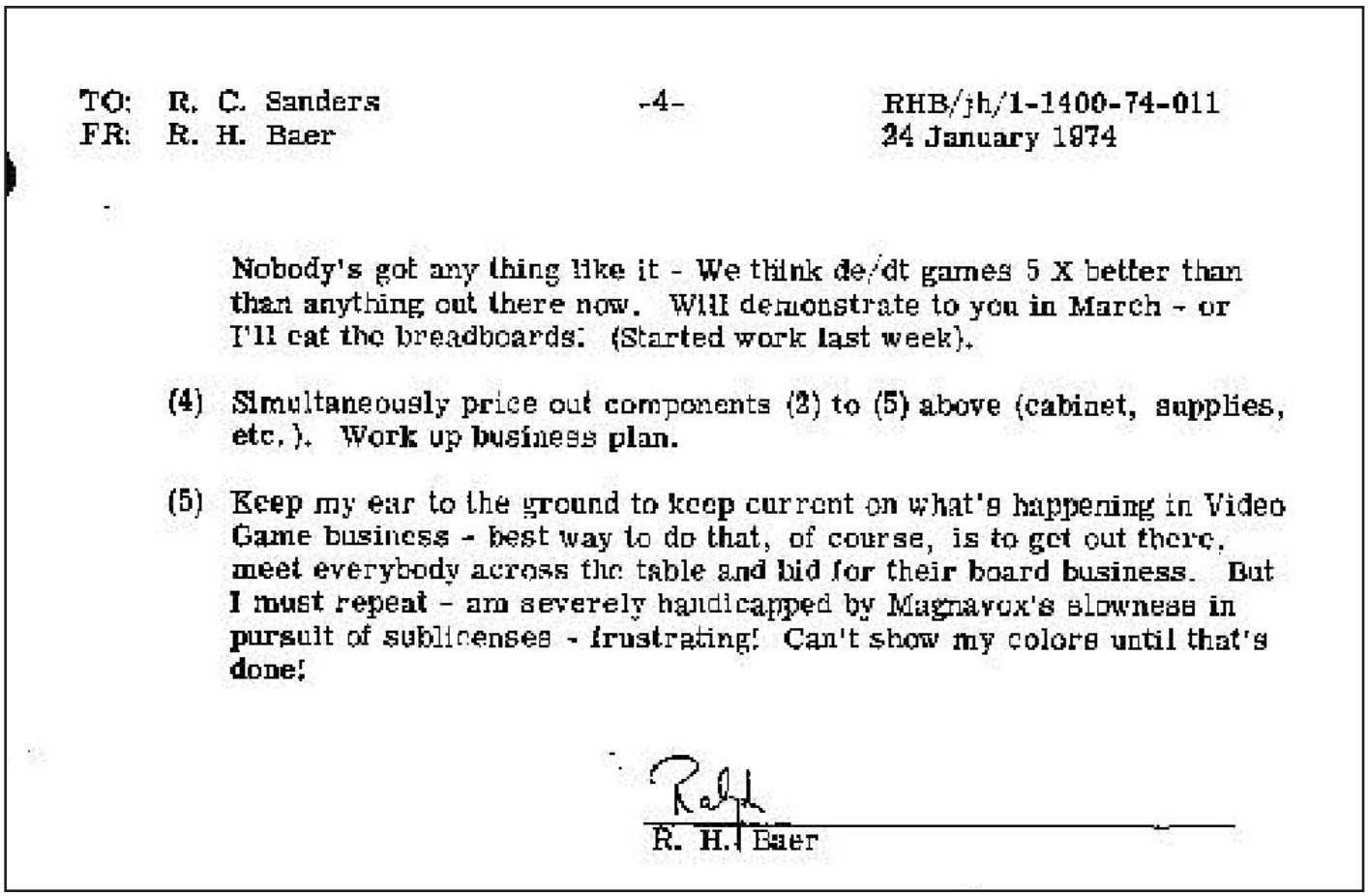
(2) Try to sell board capability -

MUST WAIT TILL Magnavox/ATARI, etc. negotiations nailed down - MY BIGGEST HANG-UP!

Will do it cautiously through second party anyway - can't sit around and wait for g. d. lawyers.

(3) Unpack 7 year-old Baer and Rusch patent disclosures (issued patents 1-3 years old) and build a "great" machine based on de/dt circuits - ball games in which ball moves as function of how hard it is hit by player, and in the direction in which it was hit, i.e., ball motion is f (de/dt) of the voltages (horizontal and vertical) generated by a player joystick at moment of ball + player intercept. Add 4-wall bounce - like hockey, etc.

Figure 88 - Arcade Report - 3/4



TO: R. C. Sanders -4- RHB/jh/1-1400-74-011
FR: R. H. Baer 24 January 1974

Nobody's got any thing like it - We think de/dt games 5 X better than than anything out there now. Will demonstrate to you in March - or I'll eat the breadboards! (Started work last week).

(4) Simultaneously price out components (2) to (5) above (cabinet, supplies, etc.). Work up business plan.

(5) Keep my ear to the ground to keep current on what's happening in Video Game business - best way to do that, of course, is to get out there, meet everybody across the table and bid for their board business. But I must repeat - am severely handicapped by Magnavox's slowness in pursuit of sublicenses - frustrating! Can't show my colors until that's done!

R. H. Baer

Figure 89 - Arcade Report - 4/4

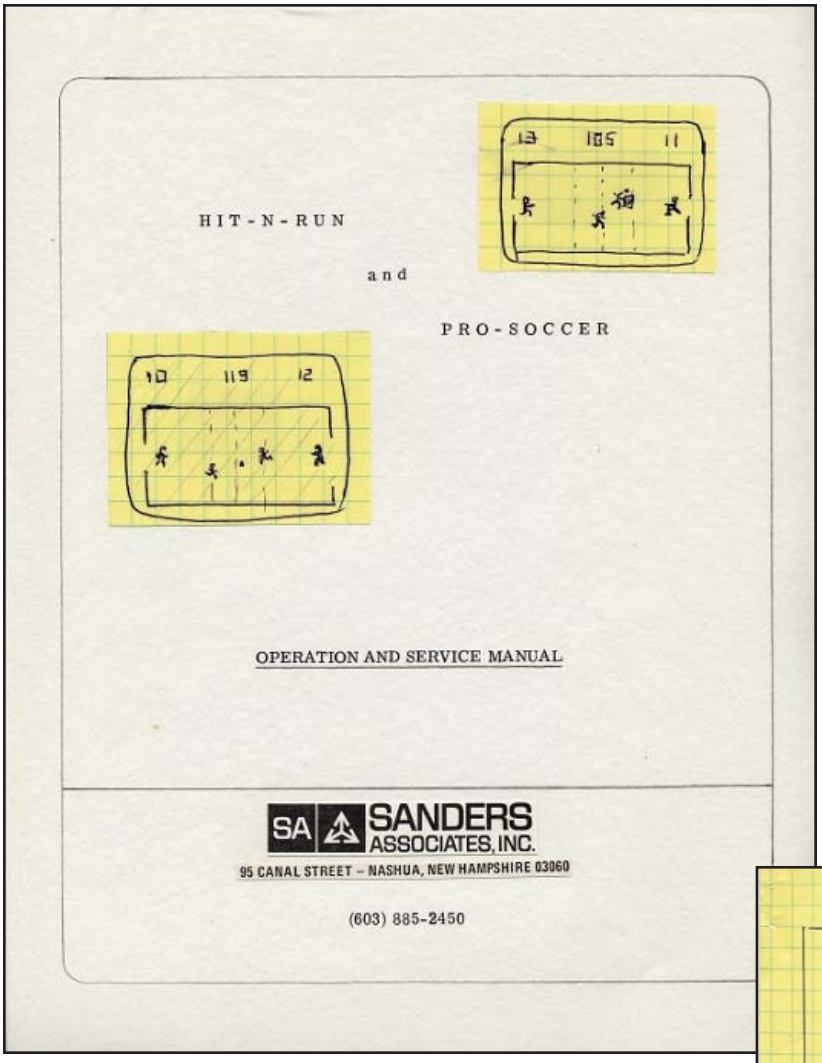
he had for his divisional electro-optics R&D. He liked the idea of Sanders doing something out-of-the-box that had a fair chance of success. Gene was a gutsy guy. A lot of us thought that he should have become president of Sanders in the 1980s, but he never got that chance.

I gathered a small group of engineers and technicians and we acquired a fair-sized lab located in the Rear-Mill building behind Sanders' main Canal Street plant. The Rear-Mill dates back to Lincoln's time, Lord knows how much money had been spent on refurbishing it over the years. There we designed three versions of a basic sports game: a hockey game called *Skate-N-Score*, *Hit-N-Run*, and *Pro-Soccer*. All three had that realistic, ballistic ball motion inspired by Rusch's "de/dt" concepts. The circuitry consisted of about 105 TTL integrated circuits, five ROM chips and about a dozen discrete transistors, all on one large p.c. board. We finished building a prototype in less than nine weeks. The games played like gangbusters.

I had defined the screen figures as seen in Figure 91. All three games were essentially the same game except for the ROM-stored figure shapes, and small differences like the addition of a faceoff spot in the center of the screen for hockey.

Three months later we had assembled ten complete prototype arcade games. Being an "old" radio-serviceman, I insisted on making the unit easily serviceable. Nobody was going to bust their chops repairing "my" machines. As a result, the final design ended up with all of the electronics located on a single, one-foot square p.c. board. This was attached to the inside of the hinged door at the front of the five foot high cabinet. When you opened up that door, there was the whole electronic works in front of you, readily accessible for servicing, along with the coin mechanism-box. It was a good design all-around, and the units proved to be very reliable.

We placed several of these machines on test at Electro Games, an arcade location in nearby Salem that was owned by Russ Gosselin, an earlier acquaintance of mine. He instantly liked the games and so did



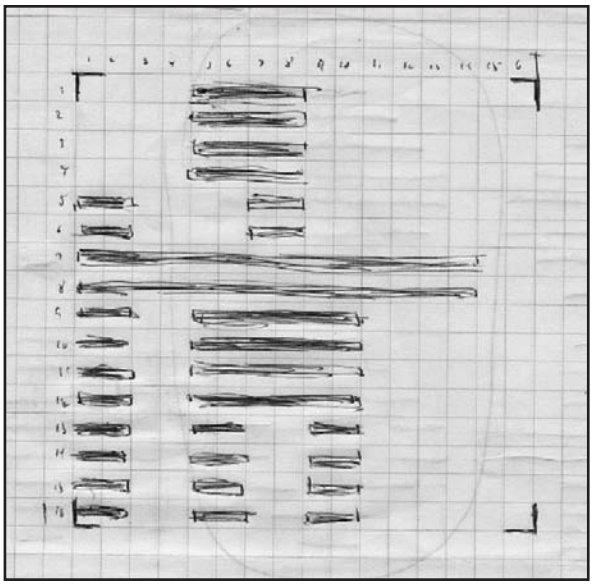


Figure 91 - Hockey Player Shape Layout for ROM

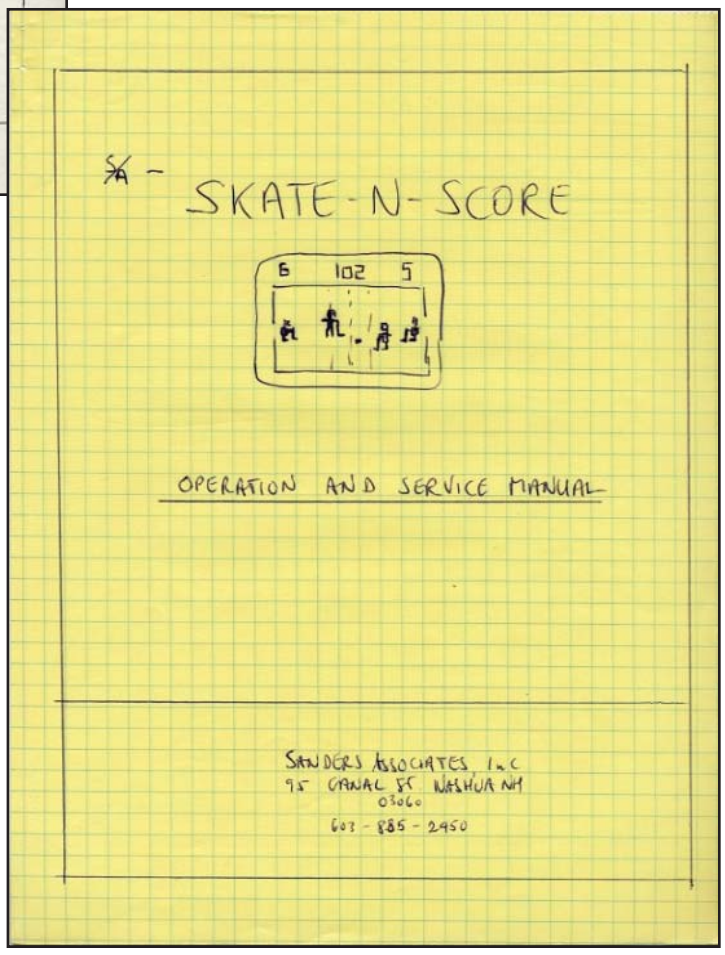


Figure 90 - HIT-N-RUN and SKATE-N-SCORE Operation and Service Manuals

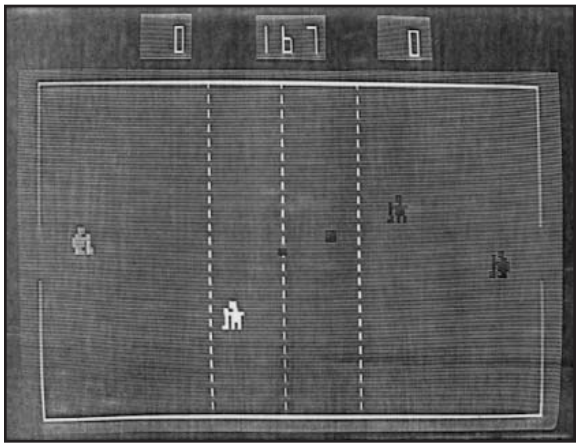


Figure 92 - SKATE-N-SCORE Screen Shot

his customers; *Hit-N-Run* and *Skate-N-Score* easily beat the Atari and Midway coin-op games at that location by a factor of two to one.

This looked very promising. Everybody involved in the project was happy with those machines. Unfortunately it wasn't long before some nattering nay sayers at Sanders began to ruminate openly about whether we really belonged in this business. We made several demos of our arcade games for Sandy and others in the company. Next I presented my latest, detailed business plan which described precisely how we would get started and develop a going concern. One component of my presentation was the request to set up shop in a small and nearly empty building that we owned about a mile from our Canal Street facility, right off the intersection between the Everitt Turnpike and Route 101 in Nashua. A second component was my stipulation that nobody from Sanders military operation should be transferred or have anything to do with this proposed commercial products operation. Having lived on both sides of the fence, in consumer product manufacturing and defense electronics, I knew only too well how incompatible these two activities were. I wanted to hire a new crew from scratch.



Figure 93 - Sanders HIT-N-RUN Arcade Games

That proposal seemed to cast a pall over the whole project, but I was insistent. We couldn't afford to have Sanders' gold-plated military-electronics production methods and personnel associated with this venture. This was a different animal.

A typical big company scenario evolved. Instead of making a decision, management gave me some unasked-for, high-powered accounting help to produce several additional versions of increasingly fancy business plans. The end result was predictable and the whole thing just went away quietly. I'll never know if it was for better or for worse.

After all that effort I had been psyched to see the venture through the whole way. In the process, I had pushed all second thoughts into the background about how that activity might affect my career. As it all began to evaporate, week by week, I found myself unnerved for a while but had little trouble putting the episode behind me emotionally. Who knew...? Maybe I had once again been saved by the bell?

I asked myself how I was going to salvage something from the effort. If our game system was so great, then why didn't I go to Midway, Atari or Seeburg and offer them a license that might just jumpstart their moribund arcade game businesses? The answer to this question was all tangled up in the unresolved details of our licensing agreement with Magnavox. I referred to that problem several times in the Memo to Royden Sanders (Figure 86). Every time I wanted to move out to show our colors, I was flagged down by Lou Etlinger because of the strict way in which he interpreted what he had negotiated with Magnavox: They had the last word on what we at Sanders could or could not do with our videogame technology. They had rights of first refusal and they asserted it every inch of the way. It was frustrating, to

say the least.

A couple of years later I had George Mitchell, my longtime tech and sidekick at Sanders, build one of our *Skate-N-Score* circuit boards into a large wooden box equipped with four joysticks, spaced well-apart for a four-player game: Two goalies and two opposing players. When he was done, we hooked the game up to our Kloss front-projection TV set with its freestanding, monstrous six foot diameter "movie" screen. There was our hockey rink with its blue ice and white goals and borders spread out over that huge screen; two players manned the goalies; two additional players "ran" the animated hockey players who were holding hockey sticks and whacking away at the puck in the most realistic manner. Player symbols flipped to face into whatever direction they were moving. What a great game that was!

We took this game unit to my home one day and set it up in the large room next to my lab, along with the Kloss projection TV. It stayed there for a few months. My kids, their friends and I played that hockey game by the hour. For its time it was the most advanced multi-player sports game anywhere. Two years passed and the industry never produced anything like it.

In November 1974 I went to Chicago again to attend the second MOA show featuring arcade videogames. By that time the business was already getting very competitive and sales were flattening out, mostly because everybody was still making nothing but variations of *Pong*. People were getting tired of it. I was secretly glad to have escaped that scenario myself and wrote a three-page memo to Royden Sanders (Figures 19a through 19c) and others at Sanders to show what the current situation was. I attached nine pages of notes that I had made on the floor of the MOA show (Figure 20).

With all of this substantial arcade videogame business out there in the market place, I did a slow boil about Magnavox's lack of attention to licensing. However I was too far out of the financial loop to be able to do much more about it than to remonstrate with Lou Etlinger that Magnavox (or he, for that matter) didn't seem to want to make any "real" money from videogames. I was more than a little frustrated.

The problem at Magnavox was the usual one. The bean counters ran numbers for management that were designed to discourage spending money on potential litigation. Rather than make a decision that might work out badly, everybody sat on their hands. The fact that there were numerous management changes at Magnavox at the time didn't help either.

It wasn't until late in 1975 that this situation was finally resolved. During a meeting at Magnavox in Fort Wayne where I joined Nat Adamson, Tom Briody and Bob Fritsche we eventually got around to the subject of Magnavox's attitude towards licensing. It turned out that they were finally serious about licensing coin-op and home videogame manufacturers or pursuing infringers in court if they refused to take a license and pay up. I reported this news in a memo to Campman and Etlinger.

I also informed them that Magnavox would miss big shipments of their models 100 and 200 because of Texas Instruments' chip-set problems. It wasn't long before the deposition-taking started; the usual preliminaries before going to court. But I'm jumping ahead!

SA

MEMORANDUM

J. Williams/R. anderson

TO: Distribution

FROM: R. H. Baer

FILE REFERENCE: RHB/jh/1-1400-74-112

SUBJECT: Coin Operated TV Games - Visit to M. O. A.

DATE: 5 November 1974

1. The M. O. A. (Music Operators of America) Trade Show was attended NOV. 1 and 2. The following data summarizes information gathered there.

2. Eighteen (18) companies showed Video Games:

1.	Allied Leisure Hialea, Fla.	2 new games	(ROBOT, Expt'l)
2.	ATARI Los Gatos, Cal.	3 new games	(GRANTRAK 20, Ping Pong, QWAK)
3.	Brunswick, Stokie, Ill.	2 old games	(ASTRO HOCKEY, 2 types)
4.	Computer Games Hingham, Mass.	1 old game	(SPIKE-IT)
5.	Digital Games Corina, Cal.	4 new games	(2 upright, 2 cocktail type Pongs)
6.	Electra Games Elk Grove Village, Ill	1 new game	(PACE CAR PRO)
7.	EXIDY Palo Alto, Cal.	1 new game	(TV PINBALL)
8.	JRW Sunnyvale, Cal.	2 "new" games	(reworked PONGS as Clean Sweeps)
9.	Kee Games Santa Clara, Cal.	2 new games	(FORMULA K Racer, TANK)
10.	Meadow Games Sunnyvale, Cal.	2 "new" games	(Flim Flam II and Cocktail Flim-Flam)
11.	MicroGames Phoenix, Ariz.	3 new games	(Challenge TV Tennis 2 player PING PONG)

SA-00-478 (9-68)

Figure 94 - MOA Report - 1/3

TO: Distribution
FR: R. H. Baer

RHB/jh/1-1400-74-112
5 November 1974

12. Midway Div. Bally Schiller Park, Ill.	3 new games	(TV Flipper, Leader, Basketball)
13. PMC Electronics Co. Southampton, Pa.	2 new games	(Players Choice, ONE on ONE, OFF THE WALL)
14. Amutronics (p/o PMC) (bought out by PMC)	2 new games	(TV Hustler, TV Hockey)
15. RAMTEK Sunnyvale, Cal.	1 new game 1 old	(BASEBALL, CLEAN SWEEP)
16. URL/Control Sales Elk Grove Village, Ill.	1 old game	(Video Action Home Game)
17. U. B. I. Union, N. J.	1 new game	(SNEEKY)
18. Volley Electronics Montreal, Canda	2 new games	(Flipout, Low Boy Pong types)

Games underlined above are distinctly new designs, all others are variations of standard Pong TV Games.

3. The following 1972-73 TV Game Mfrs were not showing any TV Games, or were not present at the M. O. A. Show:

1. Williams Electronics Div. Seeburg, Chicago	NO TV Game shown
2. Chicago Dynamics Div. Chicago Coin Co.	NO TV Game shown
3. Arizona Automation Phoenix, Ariz.	Not there
4. BAC Cherry Hill, N. J.	Not there
5. Nutting Assoc. Mountain View, Cal.	Not there
6. U. S. Billiards Amityville, N. Y.	NO TV Game shown

Figure 95 - MOA Report - 2/3

TO: Distribution
FR: R. H. Baer

RHB/jh/1-1400-74-112
5 November 1974

4. Major Chicago area distributors of TV Games:

o EMPIRE DISTRIBUTING, INC. (showed no TV Games)
Chicago, Ill.

o WORLD WIDE DISTRIBUTORS
See attached ad from CASH BOX Magazine

5. General Impressions

Unexpectly large number of new TV Games, and generally positive attitude by all vs. new, good TV Games.

6. Sales and Technical Data

The attached notes on each of the machines identified in 2. above describe each of these machines. Copies of sales material is attached wherever available at the show.

R. H. Baer

R. H. Baer

Figure 96 - MOA Report - 3/3

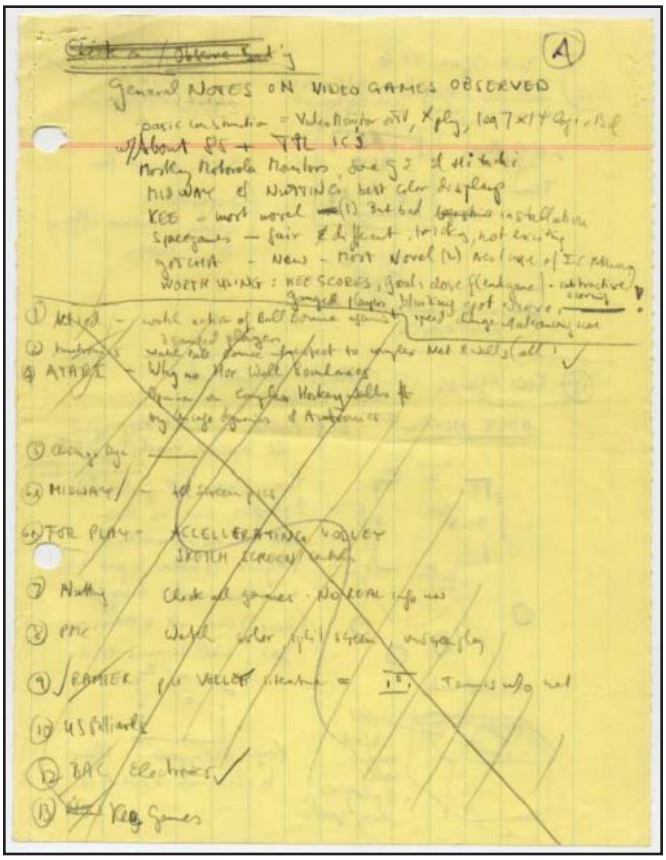


Figure 97 - MOA Notes - 1/9

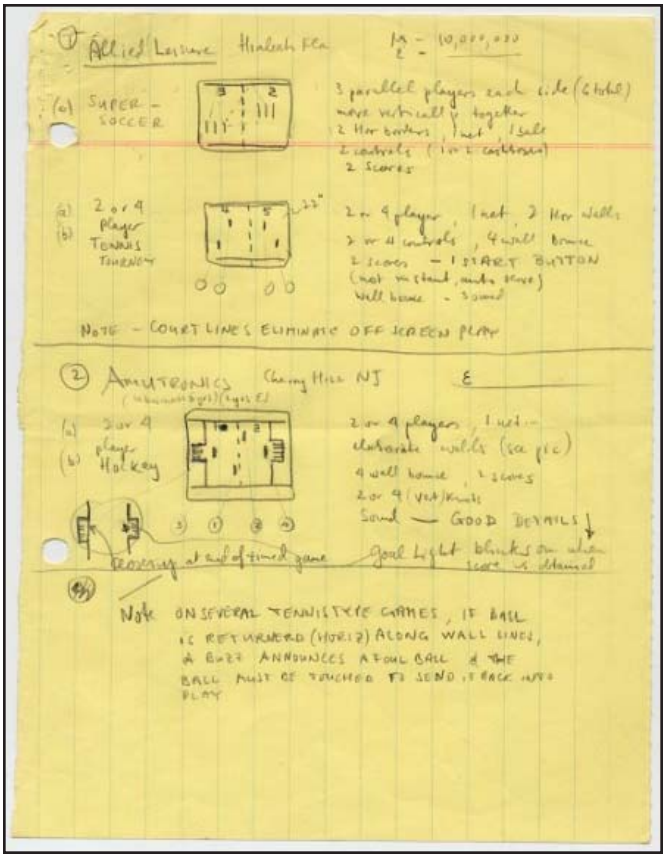


Figure 98 - MOA Notes - 2/9

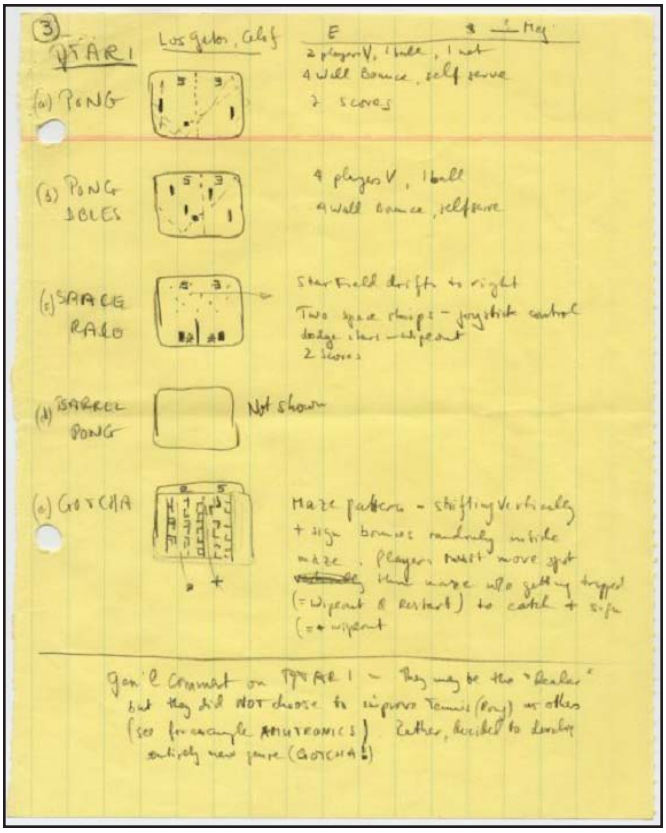


Figure 99 - MOA Notes -3/9

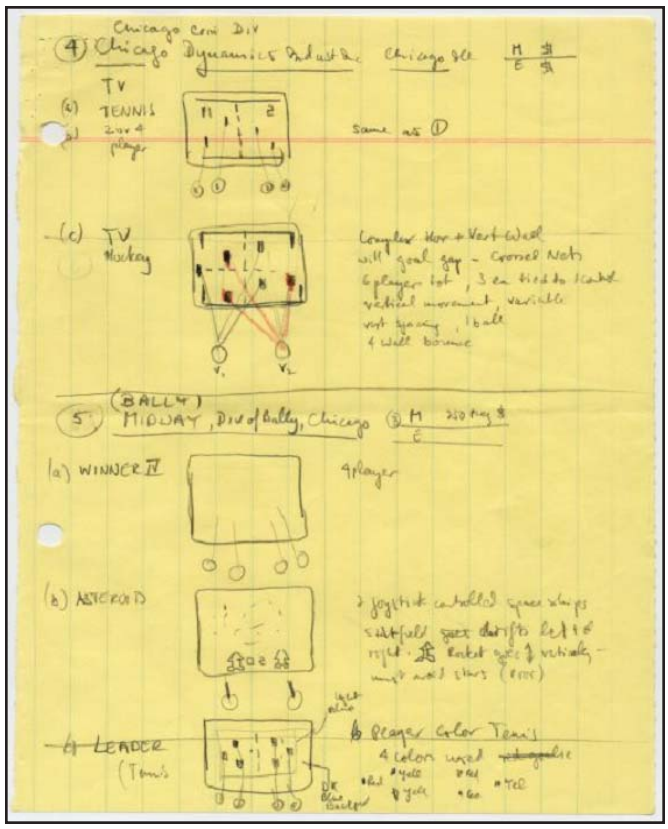


Figure 100 - MOA Notes - 4/9

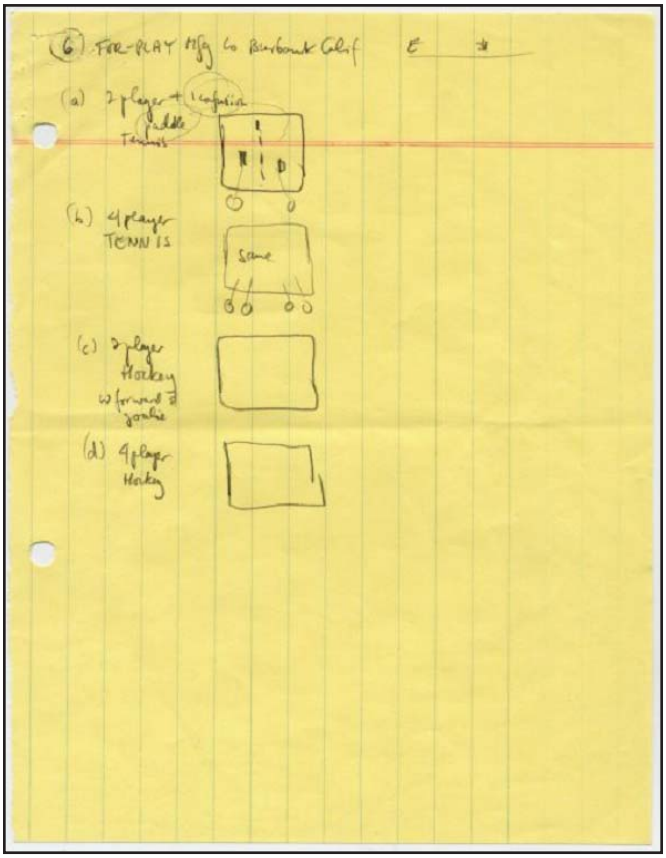


Figure 101 - MOA Notes - 5/9

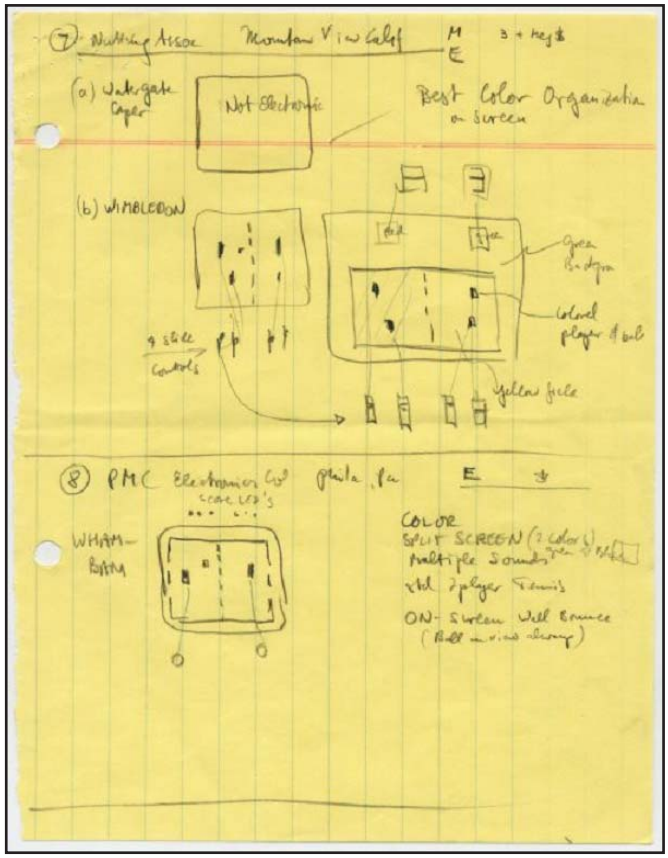


Figure 102- MOA Notes - 6/9

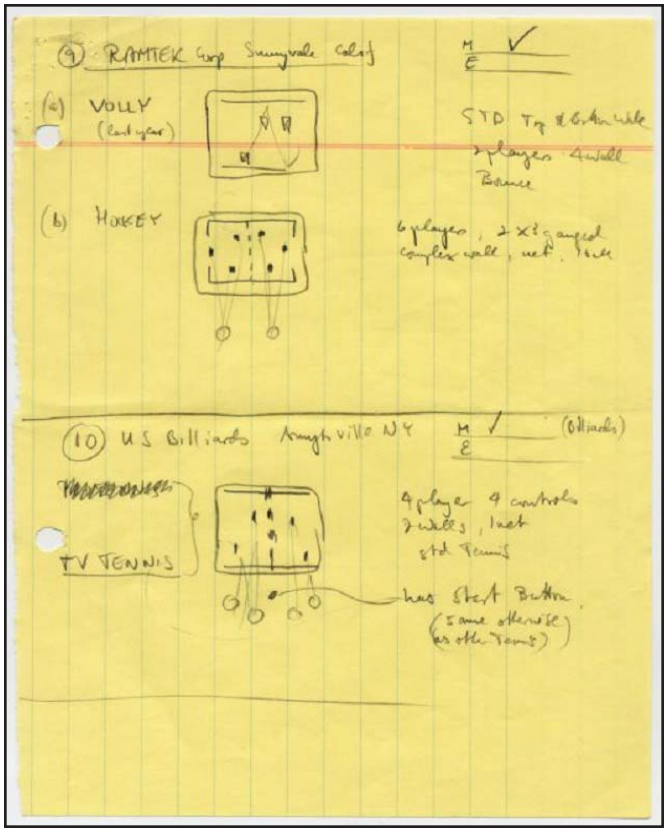


Figure 103- MOA Notes -7/9

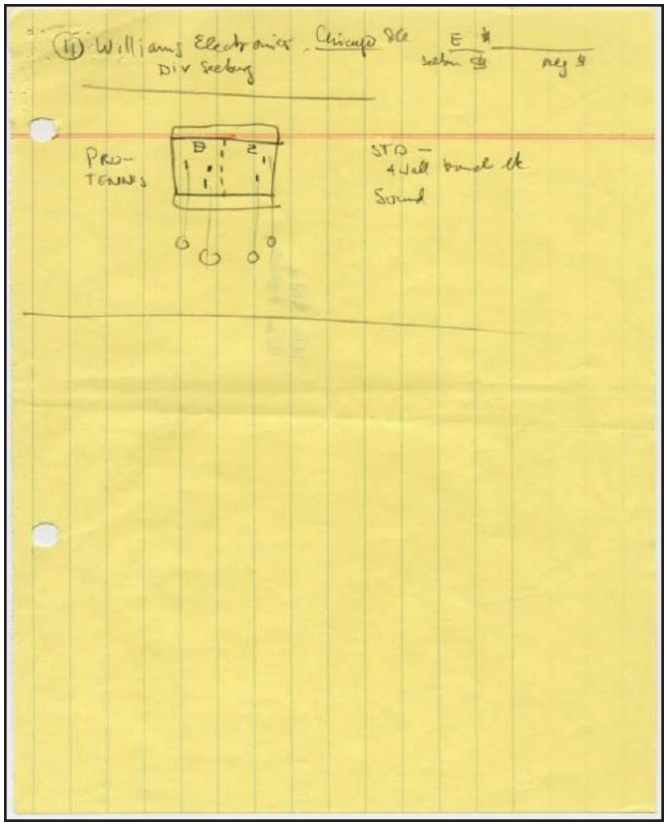


Figure 104 - MOA Notes - 8/9

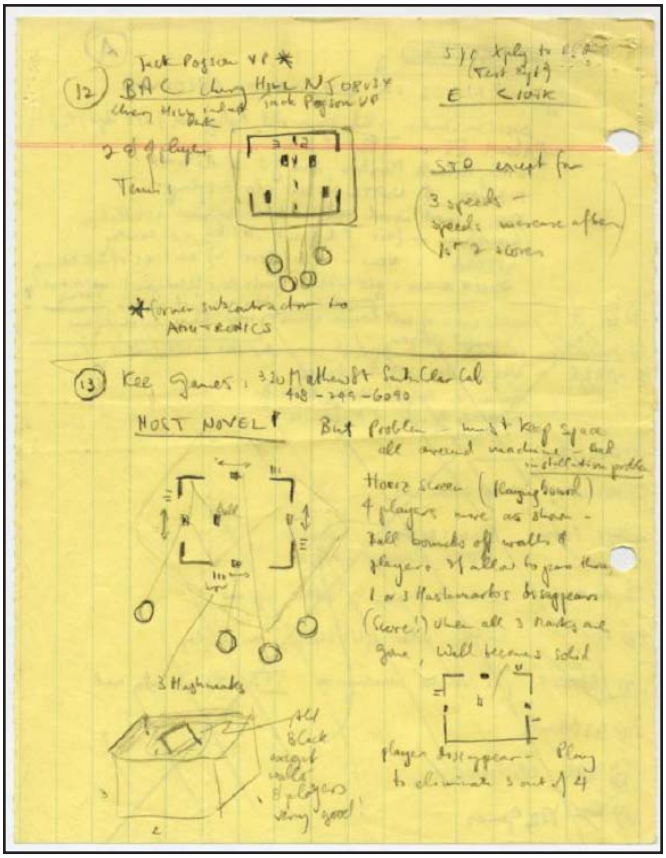


Figure 105- MOA Notes - 9/9

1974: Cable Games Redux

While our first attempt to introduce videogames via the cable failed with the aborted TelePrompter effort back in 1969, playing games and running quiz shows over the cable continued to look attractive to me. Now that videogames were a reality, it seemed to me that using a version of the Odyssey game to play games over the cable might be just the ticket. At the time several companies were trying to get into interactive television one way or another. Warner Cable, for one, spent tons of money on testing various forms of interactive programming. I wanted in on those tests and started working on connections that would get me there. My contact became Dr. Robert Sorensen, brother of JFK's advisor, Theodore C. Sorenson.

It seemed to me that Magnavox ought to have been very interested in broadening their sales base for Odyssey via cable and I kept pushing that idea in Ft. Wayne and via Bill Enders in New York. A letter that I sent to Bob Fritsche (Figures 108-110) in January 1974 summed up what I was trying to do.

Try as I might, I couldn't get Magnavox to show any interest in our interactive cable videogames or our quiz game and video teaching systems so I went on to try and peddle them elsewhere. This time around I concentrated on the Warner Cable Company and General Instrument's Jerrold division which made most of the set top tuners of the day. I made a number of presentations of what we now called our video annotation and video quiz systems and pushed playing videogames over the cable, shades of our 1967 attempt to get TelePrompter to do exactly that.

Eventually our efforts seemed to hit pay dirt. I was able to access an Everitt, Massachusetts Warner Cable system to put interactive videogames on their cable on a technical trial basis. The manager, Alan Roades, made the station available.

For these tests, Bill Harrison and I modified an ordinary Odyssey 1TL-200 videogame console for use at the viewing end of the cable in the game player's home. We also built a spot-generator unit for Warner that allowed them to overlay Odd/Even quiz spots, as well as randomly-moving "player-spots", on top of a camera-generated, color video graphics background. What we built was a modified and updated version of our 1967 demo to TelePrompter.

At the receiving end in the home, a TV set connected to our modified Odyssey game unit showed the Odyssey's normal pair of "soccer" or "hockey" player spots and the ball. They appeared over the cable delivered color picture of a playing field. In addition, there were also all those cable-transmitted player spots on the playing field. That gave us an attractive view of the playing field with four or six player spots, two or three on each of the teams.

It was the neatest thing to watch these remotely-generated, randomly-moving "player" spots that were sent to us over the cable. They seemed to be just as capable of intercepting and reversing or forwarding the ball as the manually controlled "soccer player" spots coming from our Odyssey game unit. Some of those spots always appeared to be in exactly the right place at the right time.

We now had a much more natural, busier and richer-looking game than anything else available. Bill Harrison and I put that test on the cable late one evening and it worked like a charm. We were more than pleased with the way it functioned and we left for home very late that night. On the way we stopped off at a diner on Route 1 for some fast food and ruminated on our work and life in general. We talked about how we were practically free agents working out of a big company who were assured a paycheck every month while we did our own thing with virtually total freedom from the usual nonsense attendant to a normal job. We knew how unusual this arrangement was and we felt very fortunate. We also knew that we had to produce results to keep this desirable situation going.

Again we had a technical success, but even after a year of trying to get Warner to put some serious money behind this approach, we were still treading water. I attended many meetings dedicated to this subject with both managerial and technical people at Warner and some of their associated companies. Interactive TV was a hot topic in the 1970s and a good deal of money was then wasted on various start-up efforts. I received quite a bit of cooperation and encouragement, but in the end the idea proved to be twenty-five years too soon.

Coming up with interesting systems concepts and developing the technical approaches to demonstrate

SANDERS ASSOCIATES, INC.
CREATING NEW DIRECTIONS IN ELECTRONICS
95 CANAL ST., NASHUA, NEW HAMPSHIRE 03060 • PHONE: (603) 885-2450

Mailed
11 January 1974
RHB

Mr. Robert E. Fritsche
Magnavox
Ft. Wayne, Indiana 46804

Dear Bob:

As you know, we had a visit here at our Nashua facility back in late October, by Dr. Robert Sorensen of Warner Communications. This visit had been arranged by Bill Enders ostensibly because he was then trying to explore Warner's interest in Odyssey. He asked for a demonstration and for some discussion of Odyssey in a CATV environment - and, naturally, we complied.

Early during the visit it became clear that Warner's interest in Odyssey was essentially zero unless we could show them how to use Odyssey effectively in CATV. At this point Enders seemed to lose interest rapidly and it is only in retrospect that I can account for his strange behavior. As it turned out, Sorensen and I developed a good rapport as soon as it became clear what he was really after and the visit concluded on a positive note.

Sorensen suggested that "we" participate in 2-way Cable Test on one of their systems early in '74 to develop some first-hand viewer/participants' experience with CATV Gaming - Warner is spending a very substantial amount of money to conduct meaningful 2-way CATV tests using a "live" audience of about 20 Akron, Ohio homes for a start. Although the size of this "sampling" is not great, Warner seems to be going about these tests in an organized and effective manner. This creates a working environment into which gaming tests could be integrated in an effective manner. If this can be done, it should provide a very useful and important window on how to broaden Odyssey's base into CATV.

Subsequent to the Warner visit, I did some thinking about the best, and hopefully lowest cost, way to get into such a test situation and make a good showing for CATV games, since these experiments will undoubtedly get quite a bit of publicity and will be watched closely by the whole CATV community. Consequently I roughed out the following suggestions:

Figure 106 - Letter to Bob Fritsche 1/3

Mr. Robert E. Fritsche
Page 2

(1) Produce a Color Video tape (cassette) for use in CATV Games, for hands-off presentations, i.e., automatic (canned) program presentation.

(2) Instrument two types of games:

(a) Sports

Hockey, Basketball, Tennis

(b) Board Games

Analogic, W.I.N.

In order to demonstrate the value of CATV Gaming it is necessary to do more then to simply provide "overlay-like" backgrounds and accompanying music - at least in the sports games;- games must be introduced "on stage", rules explained, "sample" games played. Finally and most importantly, CATV gaming should provide additional capability to the viewer/player, such as additional players on-screen with whom he can interact as if they were generated in his Odyssey box. Therefore, the Hockey Game should have, at a minimum, two goaly "spots" moving randomly in front of their goals and capable of intercepting the ball and returning it into play. Basketball can be enhanced by an "active" basket-spot which indicates a score by returning the ball automatically; and Tennis could have a dashed-line net capable of intercepting the ball.

I subsequently had some lab work done to confirm the feasibility of these approaches. Warner then suggested that we create a gaming tape using one of their local (Mass.) cable color-studios, and offered both the manpower and equipment to write script and tape all the necessary sequences - needless to say, this involves a considerable effort.

If we are to go forward and take advantage of this opportunity, the following things must happen rather quickly:

(1) A prototype CATV version of Odyssey must be built

(2) Video tape games - generating equipment must be built

(3) A video tape must be produced

(4) A quantity of 20 CATV-Odyssey's must be built

(5) The Warner Cable tests in Akron, Ohio must be supported during checkout phase for the game activities and as required thereafter.

Figure 107 - Letter to Bob Fritsche 2/3

Mr. Robert E. Fritsche
Page 3

I have had Items (1) and (2) underway for several weeks, as you know. - Item (3) is on the agenda for this month (Jan '74) - However, Item (4) depends on the availability of 20 Odyssey sets from you. It would also be useful to get 20 TV Video IF modules, since we need some Channel 2 gain (about 60 db), and a Video IF strip can be retuned to work up there (on Ch. 2) without a great deal of effort.

At this point I would like to invite discussions on the if, how and when of proceeding with this effort, and in particular, on the details of Items (4) and (5) above. I would also like you to determine the extent of active participation and support we can expect from you for the whole program, and specifically, but not limited to, the Akron field tests and the expense involved in Items (2), (4) and (5) above.

Cordially,

Ralph.

Ralph H. Baer

Figure 108 - Letter to Bob Fritsche 3/3

those concepts, no matter how good and valid, was a lot easier than turning them into a business. I tell everyone who wants to listen that inventing something is easy; designing hardware and software to make it work is also relatively easy, if you know how; but selling or licensing the darned stuff...that's the hard part. No wonder the marketers of this world drive Cadillacs and the engineers come to work in their Chevies and Fords.

Trying To Get Magnavox Into The Arcade Videogame Business And Super Odyssey

While Bill Harrison and I were pushing into cable games in 1974, I made frequent contact with Bob Fritsche. So far Magnavox was still "it" as far as getting returns from licensing activities was concerned. What they were planning to do would have a direct impact on Sanders' bottom line and hence, on my credibility within the company.

Bob Fritsche was my point man at Magnavox. Only through him could I exercise some influence over Magnavox's future videogame product programs. He was the only one I could influence to keep the license-income stream flowing. If Magnavox brought out new games and they sold through, we would collect. If they didn't, there wouldn't be any money changing hands. We badly needed Magnavox to sign up potential licensees and pursue current infringers of our patents, but on that score they were still sitting on their hands. Developing and controlling sublicenses was Magnavox's job under our agreement. All I could contribute to getting that process moving was to feed them the market intelligence I picked up for them at the MOA shows and elsewhere. The rest was in their hands and they weren't moving off the dime.

At the working level, Bob Fritsche was committed to making videogames into a going concern at Magnavox. He had been really motivated from the start and remained enthusiastic despite management's lukewarm support. Having to contend with their opposition to sublicensing was very frustrating for him, too. He deserved help.

Fritsche called me on October 1, 1974 to arrange for a visit to Sanders. Having failed to sell my own management into setting up a separate arcade game operation, my fall-back plan was to then try and get

Magnavox into the arcade videogame business. Everything seemed to be in place for that move. We had two completely engineered games, our *Skate-N-Score* and *Hit-N-Run* designs, and all the documentation needed to put them into production was completed. In short, all the hard work of developing and prototyping of a good arcade game series was behind us and ready for someone else to run with production. Magnavox's Tennessee TV set manufacturing operation would have had no problem moving our designs through their existing production lines provided Magnavox's management had made the decision to pursue this business.

So I was hopeful that Bob Fritsche would agree and carry this ball for me in his company. He seemed to like the idea a lot. It made sense to him, too.

In addition to arcade games, we also planned to talk about something that Bob had been noodling around in his head. He called it *Super Odyssey*, a high-end home console that would be able to play the *Skate-N-Score* and *Hit-N-Run* games. He called me repeatedly to discuss this pet-project of his. I was happy to oblige although I had grave doubts whether he could sell this high-priced product concept to Magnavox management.

Early in November 1974, Fritsche and I went over the details of what it would take to lower the cost of his Super Odyssey game concept. He was hot-to-trot and came to Nashua on the 12th of the month to discuss technical details. With him were Bob Price and John Slusarski, both from Magnavox's videogame engineering group.

Bill Harrison and I were still occupying a nice spacious lab in the Rear Mill where we had developed the two arcade games. We took our Fort Wayne visitors there and demonstrated both units to them. Housed in their wooden arcade cabinets, they looked very attractive. They also worked so well and were obviously so completely production-engineered that everybody got very excited about moving forward with dispatch. From where we sat, having Magnavox take over the production and distribution of our *Skate-N-Score* and *Hit-N-Run* arcade games was a slam-dunk. It was, of course, the best chance to recoup the money we had spent at Sanders on developing these games.

But Bob had a bug in his head that day. While he liked the arcade game transfer idea a lot, it was his Super Odyssey concept that clearly preoccupied him. As he visualized it, the product would be a game with a built-in, 17-inch color TV set that would be housed either in an armoire-type cabinet or one of the low floor consoles of their deluxe TV set line. No competitor of Magnavox's had anything like that in their TV product lines.

After seeing our sports-action games and playing them for the nth time that afternoon, Bob Fritsche sat down and did a preliminary paper-and-pencil estimate of what Magnavox's cost would likely be for his high-end, Super Odyssey/TV combo product. He projected an initial sales base of 3,500 to 4,000 units and planned on working through Magnavox's exclusive distribution chain to sell the item. He came up with a price of $424 at retail and admitted as how that was kind of steep. Naturally he asked me to look into ways to reduce the cost. It was the last thing I wanted to do. I knew then this track wasn't going to go far. Another blind alley!

Our three visitors left for Fort Wayne the next day, all fired-up with the Super Odyssey concept. The arcade business seemed to have suddenly moved into the background. I was disappointed about the direction into which our discussions had turned. My main objective had been to get Magnavox into the arcade game manufacturing business. That no longer seemed to be on top of their priority list.

I could see why things had turned out the way they did. The people at Magnavox were from the world of home TV receivers; the arcade business was not familiar territory. That naturally biased their judgment. What I should have done was to get on an airplane to Tennessee and talk to management there but that seemed like an end run around friends and so I didn't do it.

Getting the price down for Fritsche's Super Odyssey wasn't really in the cards. I was intimately familiar with the design details of our arcade game boards and there was no way to wring much water from their bill of materials. Those big p.c. boards with 100+ I.C.s simply weren't designed to go into a consumer product.

Instead of wasting time trying to do the undoable and to salvage something for us, I started to push

Fritsche gently to think about a different version of Super Odyssey, which would be based on an updated Odyssey home game unit. Building one of those games into a TV set was a practical idea.

I needn't have bothered. Fritsche called me on November 21 and reported to me that the decision about whether to go ahead with either effort, the arcade games or Super Odyssey, was mired in internal management politics. I got the feeling that I better not hold my breath in anticipation of great decisions from Magnavox. It was not a novel sensation.

To try and get something going after all, Bob Fritsche arranged for a meeting in Fort Wayne after Thanksgiving, November 26 and 27. He wanted me to meet with Nat Adamson, the General Manager, to "sort things out." I agreed and made a plane reservation to go to Fort Wayne the night before the meeting. That same day, I wound up having a somewhat heated argument on the phone with Tom Briody, Magnavox's Chief Patent Counsel in Fort Wayne. He had heard about my Nashua meeting with Fritsche and called into question the legality of the arcade game venture, at least under the present Sanders-Magnavox license agreement. I told Tom that we had nothing but Magnavox's best interest at heart and to leave Bob Fritsche and me alone, at least until something concrete was decided by operational management at their end. We could certainly take care of the contractual niceties later when there really was something to talk about. At that time it was all smoke and mirrors.

Later that day I attempted to reach Nat Adamson to try to end-run any obstructionism from Magnavox's patent department (Tom Briody). As it turned out, there was no need for a confrontation. Once we got over standing on ceremony and discussed the objectives of our proposed cooperative effort, Tom became a supporter. He and I eventually became good friends.

He later turned out to be the driving force behind Magnavox's successful videogame patent licensing program.

That same month, Philips announced, from its Dutch headquarters, the arrival of its 12-inch laser videodisc players. I had my eye on one of those for a while because, in my mind, their random branching capabilities made them the natural successors to videotape players for interactive video training, education, and game systems. As soon as I saw that announcement, I started bugging Magnavox for a sample unit and began involving Bob Fritsche in discussions on how to tie videogames and discs together to create a new product line for Magnavox and Philips.

Interactive Video Systems: Working With WPI And ILG

In September 1974 I had written a Memo to Dan Chisholm, who had recently become a Sanders VP. He was now the corporate management representative charged with keeping track of what was going on in our various videogame activities. My report to Dan covered details of Magnavox's current sales, as best I knew them; I also projected license income from Magnavox's single-chip game system, which had finally been scheduled to ship in 1975. That same memo covered a report on the success of our *Skate-N-Score* machines during market testing in the Salem, New Hampshire arcade. The memo obviously pre-dated the protracted abortion of my arcade game venture.

I also used that memo to bring Dan up to speed on my recent demonstrations of interactive video systems based on the use of videotape combined with computer generated graphics. We were all set to introduce the military to novel weapons simulation systems which was an excellent application of our videogame technology and of major interest to our military customers.

Successive generations of such systems would validate my "credibility card" at Sanders for years.

Years earlier, Bill Harrison and I had developed ways of interacting with videotaped presentations or over-the-air and cable programs. These schemes were variations of our 1967 and 1968 multiple-choice quiz games that made use of a light gun and allowed viewers to take part in quiz shows and get immediate feedback after choosing one of several answers displayed on the screen. A sketch of this "annotation" system taken from Harrison's notes can be seen in Figure 111. I had shown Magnavox several ver-

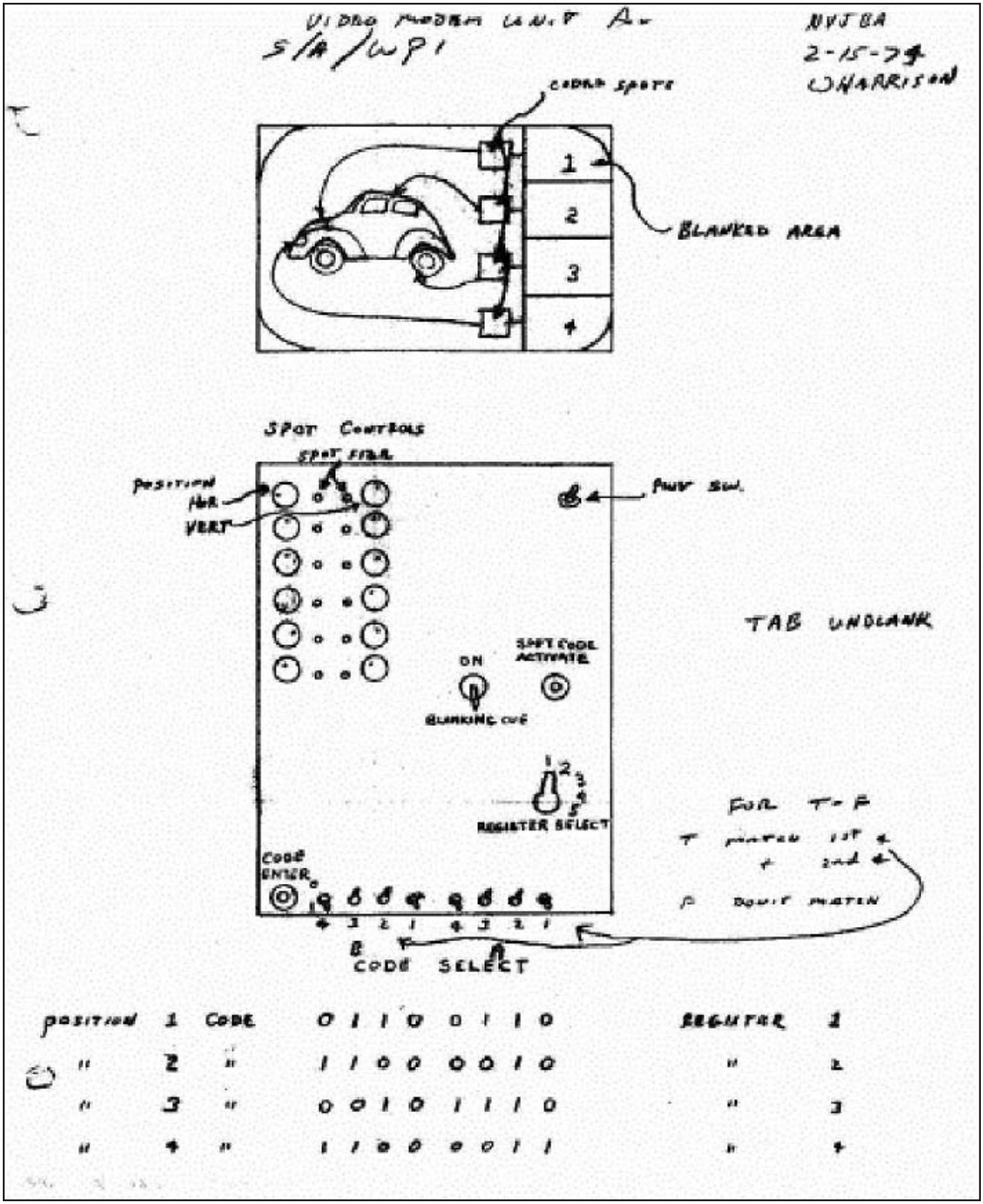


Figure 109 - Annotation System Sketch

sions of this optical data extraction scheme for use in quizzes as early as 1973. Bill Harrison and I had been busy off and on throughout 1973 and 1974 further developing this interactive technology. I still saw it as a cost-effective way to convert existing military and commercial training videos into interactive ones that would provide far more efficient training than straight linear video training tapes ever could. Somehow I could never get Magnavox or anyone else to express any real interest in this technique for creating multiple-choice games on the cheap, although they liked what they saw when we demonstrated them on several occasions.

In order to make a good representative "encoded" videotape demonstration, we had gone to Worcester Polytechnic Institute. There we got together with two graduate students whom we persuaded to make this interactive video technique demo into the centerpiece of their final dissertation. I am not sure whether we actually coined the term "interactive video" ourselves then but that's what we were pioneering. We loaned them the hardware that Bill and I had built to "annotate" and "encode" existing videotape footage with complex coded spots. Our equipment allowed them to add interactive quiz segments to existing tutorial videotapes and change these tapes from passive viewing to user-interaction.

The WPI students decided to do their own videotape production. I still have a copy of it. It's in a half-inch, open-reel format, a common format before 3/4" Umatic, 1/2" Betamax, and VHS formats came into existence.

Annotating existing video footage to make it interactive occupied my interest and energy off and on for the next twenty-five years. For a while I really thought that the world would beat a path to my door. Here was a low-cost way to convert tutorial material from droning on and on by making it interactive. Educationally and technically, it made all the sense in the world. But we were lacking adequate marketing support. There was none to be had at Sanders. I didn't push hard enough to get some professional help from within the company, so I tried to do it all myself. Never let an engineer try to sell his stuff. It rarely works unless you are Akio Morita.

During the mid 1970s, we vastly improved the data rate of our quiz systems that nested digital data in video. We did it with our novel "Digital Video Modem" method that we built into a variety of demonstration units.

Our Digital Video Modem operated by showing a rectangular spot of white data, usually at the lower right corner of a TV screen. Each of the white line segments in that otherwise black rectangle represented a digital "bit", a '1'. An unilluminated (black) line segment was a '0'. In some applications we made the rectangles eight lines high, which allowed us to transmit an 8-bit (one byte) chunk of data every picture field. Since there are sixty of these per second in U.S. TV sets, we could download 480 bits or 60 bytes of data per second. Not too shabby a data rate for many applications. One of these was a couponing system we designed, built and licensed to CBS. With it, we struck some modest pay dirt for all our efforts.

Good ideas (like those behind our Digital Video Modem technique) never die: In the late 1990s my optical data-extraction method was resurrected by the Interactive Learning Group (ILG) in Minneapolis; they had developed it for an interactive preschooler videotape-based system called *Video Buddy*.

ILG had reinvented my old Digital Video Modem method only they couldn't get it to work reliably. Clark Johnson, a physics-type consultant and an old friend of mine in Minneapolis became aware of their problems and told them to come and see me for technical help. They met with me and Bob Pelovitz in my Manchester lab and we became ILG's technical consultants. Bob was my former sidekick at Sanders during the 1980s. He is now an independent engineering consultant like me.

We fixed ILG's technical problems over the next six months. We also took a piece of the action as a partial payment for our services, and got deeply involved in this modern revival of an old technique of mine. *Video Buddy* first began to fill the shelves of video rental stores in Minnesota early in 2000. Sales started off well. The old suction cup with the photo sensor, taking data off a "spot" in the lower right corner of the screen, finally became a real product. It only took thirty years to get there.



Figure 110 - Video Buddy - Digital Video Modem (Optical) Data Extraction System (1999)

The AY-3-8500 Chip Saga

Despite all the friendly camaraderie between Bob Fritsche and myself, it was still like pulling teeth to stay abreast of what he was doing to get Magnavox into the next generation of videogames. It is always hard to work at a level of trust with someone when his company's modus operandi is one of playing their cards close to the vest. That was certainly true of Magnavox and I was altogether too familiar with that mind-set at Sanders.

Fortunately, Magnavox management was not completely asleep at the wheel. Bob Fritsche finally prevailed and early in 1975 Magnavox started producing two new Odyssey units, their Models 100 and 200. They used those T.I. chip sets imitative of the Odyssey printed circuit modules, not great, but better than nothing. The Odyssey 100 used four Texas Instruments chips while the Model 200 used six chips. The additional chips allowed it to play "Smash." The 100 also had mechanical sliders that could be moved up and down in slots on the top of their cases as a scoring means. The Model 200 displayed two line segments at the bottom of the screen to indicate the game's score. Magnavox called the scoring scheme "Follow Me". Here was the first indication that Magnavox used some imagination that might cause our cash register to ring once again.

Several semiconductor outfits finally moved into the design and production of integrated videogame chips. In the main, it was the success of Atari's home version of *Pong* for Sears that woke up the sleeping giants. In February, National Semiconductor entered the U.K. market with a three-game I.C. design that retailed at about the equivalent of $85 (U.S.) I couldn't see how anybody could build a salable game around that cost, but at least it showed that the semiconductor manufacturers were waking up to the promise of videogames. General Instrument also had something new to offer.

Early in March, I drove down to G.I.'s Hicksville, Long Island plant, at Ed Sacks' invitation. Dr. Sacks was the general manager there. As soon as I arrived, Ed led me into a lab and gave me a preview of G.I.'s AY-3-8500 multi-game single chip videogame. We didn't know it then but that device and its successors would dominate home videogame designs for the next several years all across the globe.

The AY-3-8500 chip had been designed by Gilbert Duncan Harrower, an engineer at General Instruments' Glen Rothes' operation in Scotland. Ed Sacks got wind of what was going on there and had two Scottish engineers associated with the project sent to Hicksville to demonstrate their device and redesign it for US NTSC standards. They never went home again. One of them, Ed Maine, stayed on at General Instrument in Long Island for several years and our paths crossed a number of times after that initial meeting.

I first got a demo of this great new AY-3-8500 videogame chip at General Instrument with the two Scotsmen handling the controls. Then they let me play its games hands-on. They also showed me the schematic of the circuitry required to support that chip and there wasn't much to it. What a boon to humanity, I thought. I got pretty excited about the possibilities. The performance of that chip was truly impressive and cost projections were very attractive.

It looked like a winner.

When the demo was over, Ed Sacks told me that he was anxious to test the waters for interest in the AY-3-8500 chip by U.S. toy and game manufacturers: Would I help?

As soon as I got back to the office I called Arnold Greenberg, the President of Coleco. He had expressed a desire to get into the videogame business sometime earlier, probably during a meeting with me at Marvin Glass & Associates in Chicago. I told Arnold to get himself or someone else down to General Instrument to check out the AY-3-8500 A.S.A.P. He did. I was there again during that visit. Coleco became the first company to place a major order for General Instrument's new videogame chips. They would eventually wind up in Coleco's first, and wildly successful, *Telstar* product. That timely move put Coleco right at the top of the priority list for chip deliveries from General Instrument at a time when they were still having problems producing the device in large quantities. It consequently put Coleco in a position to beat their competition to the market place.

That single move assured Sanders of a new licensee, even if Arnold did not see it that way at the time. He made no move to get under the Magnavox license, even though I broached the subject with him repeatedly. He would soon have to change his mind.

Back on the Magnavox front, I sent Bob Fritsche a letter on the 19th of March. In it I proposed that we work together on videogames by making use of Magnavox's videodisc player. I suggested that he come back to Nashua and view demonstrations in which we had emulated a videodisc player by using videotape source material. In that demo we showed a soccer game with background and goalies provided by the videotape - similar to our Warner Cable demo; several additional players were generated by the game unit and interacted normally with those coming from the surrogate disc source. The result was a complex, colorful playing field with lots of action.

This scheme may sound like the hard way to get videogames to a new level, but remember, there were no alternatives to creating games with rich graphics until we got into the era of low-cost microprocessors. Even then game graphics remained pretty crude for another ten years. That was mainly because big ROMs and substantial computer power were still expensive. Fritsche and I discussed a possible 1977-1978 time frame for a product realistically based on the idea of combining a videogame with a videodisc player. We should be so lucky!

Referring back to the chip set made by Texas Instruments for Magnavox, I sent a Memo to Dan Chisholm and Lou Etlinger on March 21 that said, in effect, "watch out for Texas Instruments to offer for sale their (crummy) TV game chip set to all comers...it will happen." (And it did!)

Texas Instruments published data sheets for all five of the I.C.s that comprised their videogame chip line. I also warned Sanders' management that National Semiconductor was going to go it alone with their chip and develop a game machine of

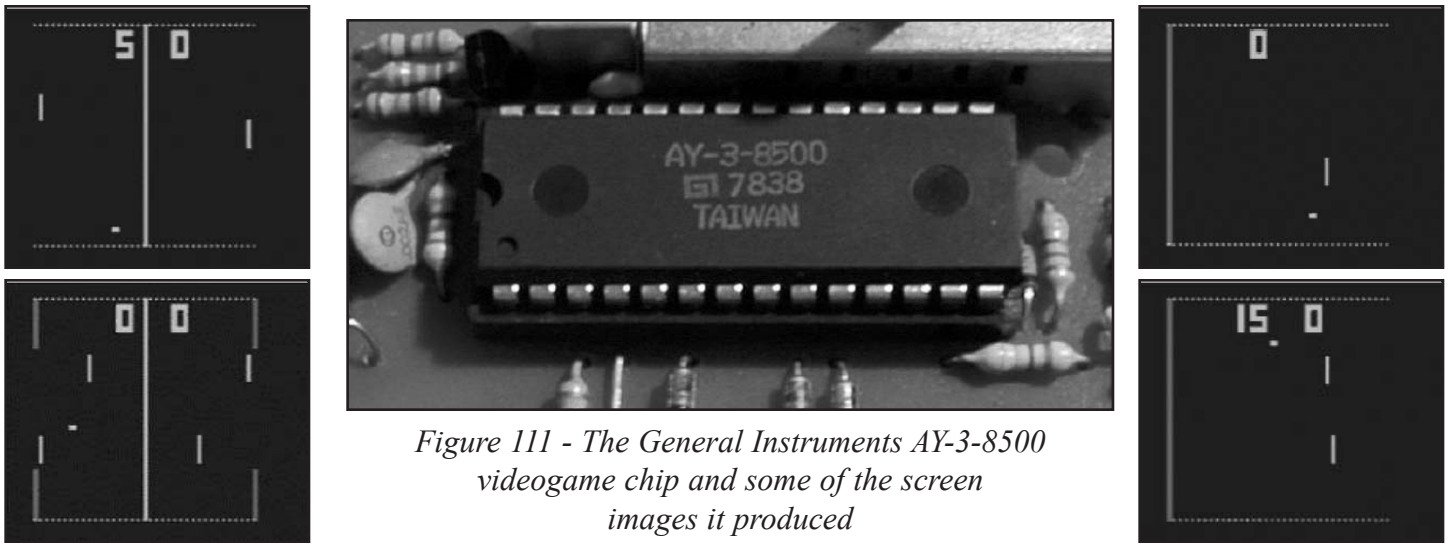


Figure 111 - The General Instruments AY-3-8500 videogame chip and some of the screen images it produced

their own...all cause for laying legal notices on both of them to take a license or cease and desist. Once again, I urged Lou Etlinger and Dan Chisholm to put pressure on Magnavox, preferably above the Tom Briody level, to get serious about pursuing licensees and infringers alike.

RCA was also moving into the arena with their COSMAC CDP-1802 microprocessor- based *Studio II* game system. Lou Etlinger now had the problem of trying to get Magnavox to move forward and attempt to get RCA under license. That also applied to Fairchild's *Channel F*, the first microprocessor game to appear on the market that was programmable by changing plug-in cartridges containing ROM with game-specific code.

In April I learned that General Instrument was visiting Magnavox in Fort Wayne to demo their AY-3-8500 chip. I had judiciously refrained from mentioning that device and my involvement with Coleco, so I said little. I also heard that a color Odyssey unit, the Model 300 was in the works for 1976.

Things were finally looking up on the Magnavox game development and manufacturing front and with it our potential for direct license income at Sanders. We were still dead in the water on the sub-licensing front, except for Coleco - I knew they would have to take a license, no matter how much Arnold Greenberg ducked and weaved and no matter how much Magnavox would duck and weave before recognizing the inevitable.

Fritsche and associates never did show up in Nashua for the videodisc-based game demo. Later in May we tried to get John Slusarski to come and discuss Magnavox's interest in our video quiz and audio tape player-controlled videogame concepts and demo systems, again to no avail. I would have better luck palming off the tape player scheme on Coleco a few years later when it became their *Kid-Vid* videogame accessory.

Fritsche went off to Philips' headquarters at Eindhoven, Holland, in June for a second meeting regarding videodisc players. He again brought up the relationship between videogames and videodiscs, a subject that I had been harping on at length. Apparently, it did not make a great impression on the Dutchmen.

When Bob came back from Holland, we set up a meeting for July 7. John Kinney, an engineer at Philips in Bryar Cliff Manor, New York, was supposed to join Bob on that trip. John was responsible for special applications of the Philips videodisc system. That visit also never happened.

Their excuse was that Magnavox/Philips could not "chase all the options that were out there."

This was the type of thinking that eventually scuttled videodisc as a mass market product. They had no imagination! I decided to give it one more try, so on August 13 I flew out to Fort Wayne for another meeting with Magnavox. This time it was John D'Aiuto, John Slusarski, and Bob Price who met me and professed continued interest in Sanders' support. I wanted to discuss these topics:

- A videodisc/videogame program
- A videogame built into a TV set-top unit with remote control, such as those made by Jerrold, popular at the time
- A cocktail table for coin-op use
- A home use cocktail table game

We wound up talking mostly about the need for one-on-one games rather than the two-player games that were so predominant. The bottom line was that they wanted us, Sanders, to help the Fort Wayne videogame crew come up with better one-on-one games. Talk about changing the subject! While I was in Fort Wayne, I saw their Model 100, their two-game leader model for 1975 and a prototype of the Model 200, a three-game unit which had the Smash game and scoring.

The products looked very good. The promises of future license income for Sanders and a reprieve for me were all very encouraging. A memo written on August 13, 1975 summarized all of this (Figure 24).

SA *

MEMORANDUM

TO: H. Campman/L. Etlinger FILE REFERENCE:

FROM: R. H. Baer

SUBJECT: Trip Report - Visit to Magnavox, Ft. Wayne DATE: 13 August 1975

1. Meeting with Odyssey Eng'g Group - John Slusarki, John D'Aiotu, and Bob Price.

Subjects:

(a) Status of '75 product
(b) '76 Product planning
(c) Discussion on future product
(d) Video disc/TV game approaches
(e) Foreign products

Summary:

(a) Saw Leader (Model #100) (2 games) and Standard (Model #200)(3 games) Product looks very good; Model #200 has sound and scoring.

Big push to get TI over production humps of 5 IC chips (total B/M for 5 chips < $6.00). Production must start 25 AUG - now scheduled for only 500 units/day; - marketing trying to get management decision to get up to 2000/day right away. Big Problem - Management decided NOT to double-tool - this means that only 150 to 180K units can be produced and pumped into the distribution pipeline in time for Xmas.

Therefore, Magnavox will AGAIN not meet the minimum shipping requirements of our license agreement and we will collect $100K in minimum fees for U.S. sales. THEY KNOW NOW THAT THEY COULD EASILY SELL 250K Units this winter - it's a g.d. shame!

(b) '76 product is well along; it features color and animated players, sound and scoring. Program somewhat behind schedule because everybody is flat out with TI for '75 product.

(c) Future Product Plans -

(1) J. Slusarski to make investigation of COSMAC processor chip next year as a learning tool towards design of special microprocessor chip for advanced Odyssey.
(2) J. Slusarski and R. Fritsche separately briefed by RHBaer on coin-op TVG business, in roads made by one-on-one (one

SA-00-478 (9-68)

*T.M. Sanders Associates, Inc.

Figure 112 - Trip Report - 1/3

H. Campman/L. Etlinger
Page 2

player vs machine) game; and the clear need to bring out a future one-on-one Odyssey unit (such as a combination of Tanks by KEE and Wheels by Williams).

(d) Video Disc/TV Game - Magnavox eng'g and I have long seen eye-to-eye on this requirement - had discussion on how to get some management interest within Magnavox/Phillips - see discussion with Fritsche.

(e) Foreign Products - Saw Senussi TV game, ditto Blue Newt and two other English games - Senussi's unit is well-tooled, impressive - but unfortunately does not perform too well (ball gets trapped off screen). English units physically crude; good electrically.

2. Meeting with R. Fritsche (Marketing/Product Management)

Subjects:
(a) Video disc - how to proceed
(b) Magnavox management position relative to U. S. home product license
(c) Cocktail table TV games

Summary:
(a) Video Disc - R. Fritsche shares my sense of urgency regarding TV game/disc product for '77, '78, etc., particularly in view of the fact that the Phillips disc system has digital track selection and stop action capability built right in (essential to TV game and educational applications like our Video Quizz techniques, etc.)

Result of discussion: R. Fritsche will discuss the subject with Nat Adamson (Marketing VP) (Fritsche's boss) - Adamson is very involved in directly supervising the disc engineering activity at Magnavox/Ft. Wayne and therefore is very much interested in disc applications. We attempted to go in to see Adamson, but he was out with visitors. We agreed to have RHBaer call Adamson, Friday, 8/15 to get a discourse started. Also Adamson travels frequently into NYC and could readily come up to SAN for a demo of our VTR/TV games. I will try to get him to do that and have Fritsche attend the same meeting.

(b) I raised the question of Magnavox' position on selling a license to a manufacturer and/or distributor for a home TV game. I have been approached by a number of people who are in a position to arrange for a meeting between senior people from a very large (non-TV mfg) company and Magnavox to discuss this subject very seriously. Furthermore, Magnavox engineering, at least in part at my pushing, has already built a very low-cost, single game well-performing unit made from existing tooling - which might be ideal for such an arrangement, since Magnavox is not inclined to push it. Fritsche told me that this unit could be sold (if made by Magnavox and sold by Magnavox) for $29.95.

Figure113 - Trip Report - 2/3

H. Campman/L. Etlinger
Page 3

Therefore, it could be "list priced" at $49.95 and sold at anywhere from about $35.00 on up. This places it right into an area of interest for my contacts. Again Fritsche's advice was to discuss this subject with Nat Adamson.

(c) Cocktail Tables - I finally got Fritsche's admission that ponderous Magnavox will NEVER move their corporate tail in time to decide in favor of getting into the cocktail table TV game market (which they gave lip service to, previously). Therefore, Fritsche guaranteed me delivery of several hundred (or up to 1K) Model #200 units before Xmas (much more than needed!) which we could use for a cocktail table, either at RDM Assoc. or with the Irving Kaye Co. with whom I will be discussing this subject next week. If Kaye is interested, RDM Asso. would do their PC board work (providing we get together with RDM).

Action Item Summary:

(1) Call Nat Adamson regarding Video Disc/TV Games and U.S. home TV game license

(2) Follow-up I. Kaye's requirements.

R. H. Baer

R. H. Baer

cc: D. Chisholm

Figure 114 - Trip Report - 3/3

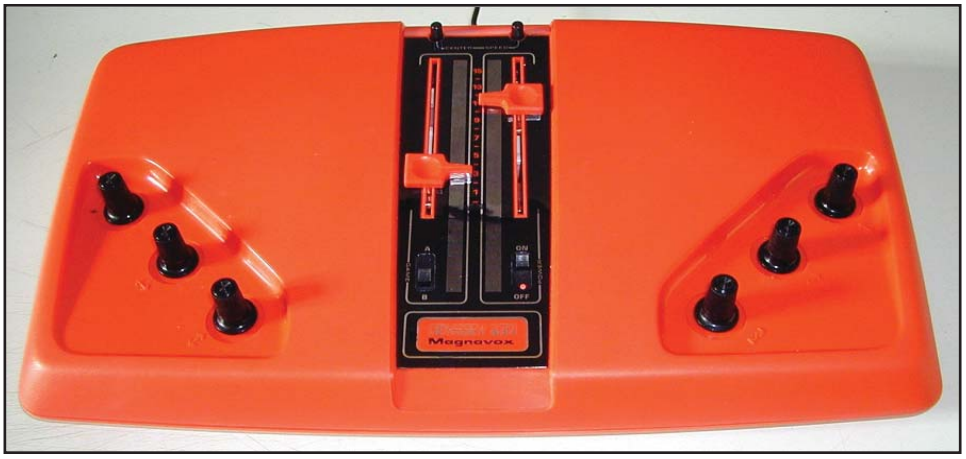


Figure 115 - Odyssey 100



Figure 116 - Ad for the German Version of the Odyssey 200

The Centronics Game Interlude...Beware The Mafia!

Late in January 1975, I sat at my desk in our videogame development lab at Sanders, having recently returned from an MOA arcade game show in Chicago. The phone rang in the late afternoon. At the other end was the president of Centronics, Bob Howard.

At the time, and for many years afterwards, Centronics was a household word in the nascent personal computer printer business. Centronics had a substantial, modern plant in Hudson, New Hampshire, where they assembled large quantities of printers. Their basic engines, the printer mechanisms, were imported from Japan, but Centronics developed and fabricated all of the electronics needed to interface printers and computers efficiently. They also wrote all of the necessary software drivers. Their engineers created the Centronics interface hardware, connector and software standards that are in use to this day. Centronics was a very successful operation. Conveniently for me, their plant was no more than about five miles from my Canal Street office in Nashua.

Bob Howard told me that he had recently returned from England where he had attended an arcade videogame show. When he got back he had his lawyers look into who owned patents in that business, because he had a specific interest in the subject. His lawyers told him to call down the street, because a quick search of the patent files brought up multiple patents by Sanders and Baer.

Bob invited me to his office the following morning. When I arrived at the handsome Centronics plant the next day I learned that his company had a small subsidiary named Gamex. It's objective was to introduce electronics, specifically computer-controlled games and accounting practices, into Las Vegas. Howard said that he wanted to build an all-electronic "21" machine for a start.

He asked me if Sanders would be interested in extending the necessary licenses and could we help design this machine? Naturally the answer was yes!

The next day, my sidekick, Lenny Cope, and I went back to their plant and met with several of their engineers. We discussed the details of the machine they were looking for. Back at our lab, we wrote a proposal, submitted it, and in short order, got a contract for the job of designing the display portion of Gamex's "21" game. Bingo! We were in the videogame consulting-engineering business.

To keep the cost down, we designed the game around a 12-inch black-and white monitor and used a transparent vinyl color overlay to create the illusion of a full-color presentation. That worked out very well. Several engineers at Centronics wrote the software that responded to the player's button presses and interfaced with our display hardware. The result was a slick video "21" machine that played flawlessly and had the required adjustability of the odds for use by the casino operators. It was potentially cheaper and far more reliable than its mechanical counterpart.

Later in 1975, Bob Howard extended our contract to cover the design of a horse racing game. Lenny Cope and I again designed the graphic display portion



Figure 117 - Gamex "21" Video Casino Game

of the game. What the player saw was a perspective view of the racetrack, taken from an effective "camera" angle above and alongside the straightaway. Animated horses ran from left to right, with a picket fence zipping by behind them. There was a tote board that showed the horses' numbers, the odds, the bets, and the winner. It all looked very realistic and might have become an exciting game except for a minor glitch. Early in 1976, about the time we had finished the first pass of the graphic display hardware for *Photo Finish*, we got the word from Centronics to stop all work! Certain "elements" in the gambling business let it be known that Gamex was to "get the hell out of this business!" The next thing we knew, the lead engineer at Centronics who worked on the Gamex project left the company and started working for Bally in Chicago. A set of drawings, schematics, the hardware, and all the code that had been written for the two games presumably went with him. That appeared to be the end of our foray into the world of gambling machines. Here we were pioneering the introduction of videogame machines into Las Vegas and we had to beat a hasty retreat.

Monday Nite Football

Curiously enough, our 1976 *Monday Nite Football* (*MNFB*) game ended in a very similar fiasco. *MNFB* was unusual in concept. It was a two-player, head-to-head sports game. Before the action started on the football field, gamers would decide on the paths to be taken by their quarterbacks, receivers and other onscreen "team members". The players used handheld controllers that sported joysticks and eight directional arrows; they used these to enter their movement choices prior to pushing the "hike" button. The screen presented an overhead view of the field.

In terms of game action, the two opposing players first acted in the capacity of their team's coach, mentally drawing the next scrimmage's moves on a whiteboard, but actually putting these moves into the computer through their functional hand controllers. It was a unique concept that, as it turned out, played like a charm. Lenny Cope and my technician, George Mitchell (who did most of the hardware construction work) wound up spending hours playing the game until we had to literally "pull 'em off".



Figure 118 - A MNFB Hand Controller

When the *hike* button was pushed, the action began as pre-planned. The on-screen football players started to move in accordance with their pre-programmed instructions. After that start, each player had the option of overriding his pre-programmed team members to correct for new situations resulting from the real-time interaction of the two teams. For example, a player could move his "receiver" to increase the chance of completing a successful pass. Similarly, the opponent could influence the possibility of an intercept by overriding one of his on-screen player symbols.

MNFB represented a sizable effort on the part of Sanders. My side-kick Lenny Cope did most of the system design and code generation, aided by Tom Mortimer and Ollie Holt, two experienced Sanders microprocessor system designers.

While the concept was born sometime in early 1976, actual work began in June and a finished system was functional late in 1976. It consisted of several wire wrapped cards and took up quite a bit of space as can be seen in Figure 120. The two hand controllers could be detached from the position on the front panel and held by the two opposing players.

In April 1976 I got Marvin Glass and Sanders together in a contractual, mutually supportive relationship for the purpose of exploring novel videogame technology and marketing it. Various people at Marvin

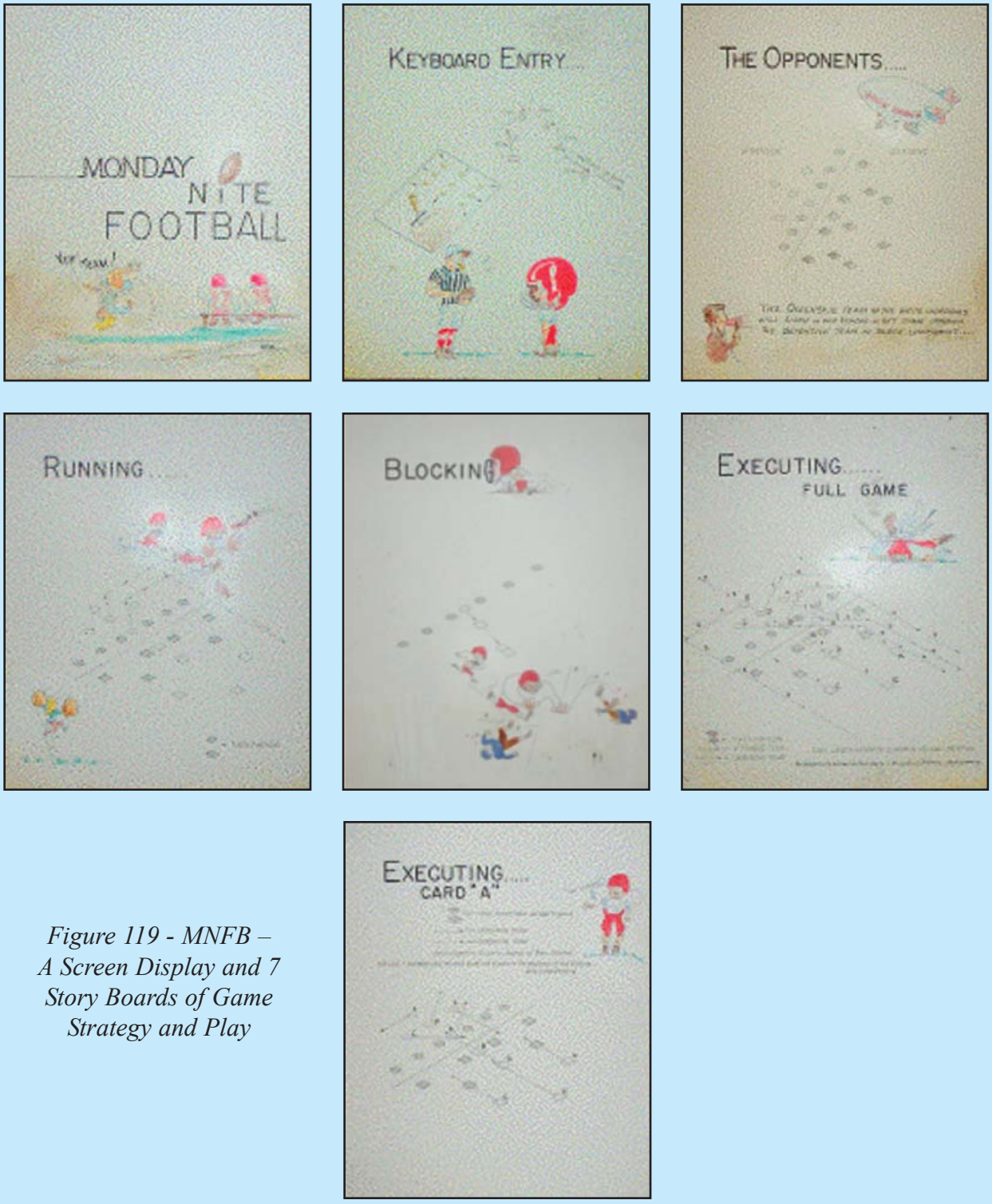


Figure 119 - MNFB – A Screen Display and 7 Story Boards of Game Strategy and Play



Figure 120 - The MNFB Development Unit Is The Large Unit- MGA's "Production" Model Is On Top



Figure 121 A Screen Shot Of The Game

Glass, especially Howard Morrison, participated in the early definition of the play action of our first cooperative game, *MNFB*. He visited us regularly in Nashua during that year and also had the Glass model shop make up a "looks-like" model. It is the white unit sitting on top of our *MNFB* development system shown in Figure 122.

The Marvin Glass partners decided to offer *MNFB* to Kenner, Coleco and Mattel. Ross Sheer, Mattel's president, signed a confidential agreement in February 1977. Weeks went by and eventually that prospect dried up. For the Kenner demonstration, my technician George Mitchell and I stuffed ourselves and all of our demo equipment into a small four-seater, two-engine airplane that took off from our Sanders hangar in Manchester and landed us in Cincinnati. Having just been operated on and still fairly sore in certain places, this was no joy ride for me. In the end Kenner did not go for the concept either.

Howard then decided that Bally might be a candidate for taking an arcade game license and indeed they expressed considerable interest. So George Mitchell and I packed our demo system once more into its sturdy, foam cushioned American Tourister suitcase and took it with us to Chicago. We accompanied Howard Morrison to Bally's offices.

Howard and George ran the demo, having decided that I was a lousy football game player. We set the *MNFB* demo unit and a Bally monitor up in a poorly lit conference room at the end of a long, central table. Soon we found ourselves surrounded by a half-dozen glum-looking Bally managers. Howard and George played their usual fast, intelligent game. But try as we might, we could not get any reaction out of the poker faces of those Bally people. The game worked exactly as advertised. They just watched, mumbled, nodded and shook their heads and eventually left the room and caucused somewhere else. When they returned to the conference room, their verdict was "Thumbs down!"

We were all disappointed, but frankly, I was glad to get the hell out of there! They sure were a spooky bunch. Some weeks later we demonstrated *MNFB* to Coleco and Ideal, two of Marvin Glass' major clients. Unfortunately, even the Glass partners could not convince anybody to run with it! Attempts to get Magnavox interested via demos and presentations also did not result in signing up a licensee.

A lot of work and money went down the drain with *MNFB*. There would never again be a football game quite like it.

1976 - History Redux

I have to reiterate that the 1972 Odyssey 1TL-200 game unit was just a production version of our Brown Box, the switch-programmable videogame system that we had built at Sanders between 1967 and 1968. Atari's *Pong*, on the other hand, was a knock-off of the Odyssey's Ping-Pong game. As previously noted, Nolan Bushnell had played that game hands-on at the Burlingame, California Magnavox "Caravan" during their open house in May of 1972. His engineer, Al Alcorn, did a great job designing *Pong* with its 100 or so TTL integrated circuits located on a one-foot square printed circuit board. It was okay for a coin-op

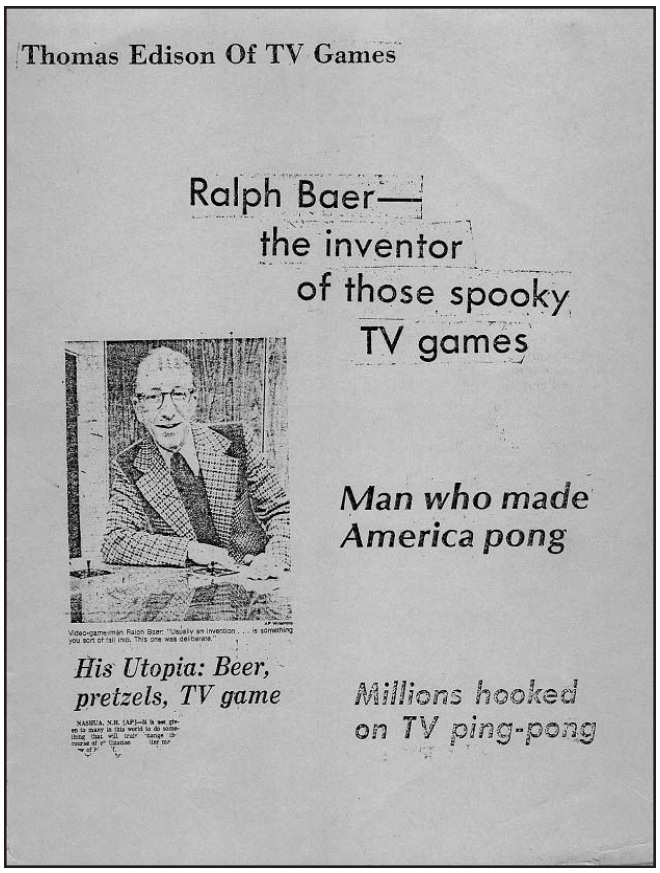
machine but out of the question price-wise for a home game. In subsequent years, I became increasingly bothered to hear Nolan Bushnell referred to as the "father" of videogames. He certainly deserves to be recognized for having started the arcade videogame industry, but was he the "father" of (all) videogames?

The Father of Videogames was and is yours truly. Not that it proves anything but I did get some credit in 1975 for having been there first. Both the UPI and API ran an article about me and that ping-ponged all through the nation's newspapers. The P.R. guys at Sanders put two volumes of these articles together and bound them into two spiral binders (Figure 122). Most of them headlined stories about the "**Thomas Edison Of T.V. Games**" or "**Ralph Baer, the Inventor of those spooky TV games**" and showed my mug and a TV screen displaying those three magic blips and the line down the middle...Ping-Pong.

Until I came along and disclosed the concept in 1966, nobody had pursued the idea of using home TV sets to play games...certainly not Nolan Bushnell. It took until 1970 to get Magnavox seriously interested in taking a license. By 1976 Magnavox finally decided that it was in their interest to go after infringers of Sanders' videogame patents.

Among the defendants in the first lawsuit was Atari, Nolan Bushnell's company. I met Nolan Bushnell briefly at the start of the trial on the stone steps of the Federal Court Building. He was in the company of his San Francisco lawyer, Tom Herbert. I was with Ted Anderson and Jim Williams, the outside counsels for Magnavox from the Chicago law firm of Neuman, Williams, Anderson, and Olson, and Tom Briody, Magnavox's Director of Patents. Lawyers as far as the eye could see, except for Nolan and me.

Nolan and I shook hands. There was a brief exchange of pleasantries and that was that. Several days after this encounter, Bushnell decided to opt out of the suit and to take a license forthwith. Years later, on the stand in court and during various depositions, Nolan admitted to the fact that his *Pong* was inspired by playing Magnavox's Odyssey. Unfortunately he never said that in public and that continued to tick me off. Nolan had built a successful company and there was enough glory in that to go around without telling stories. But the lawyers kept telling me to cool it, especially



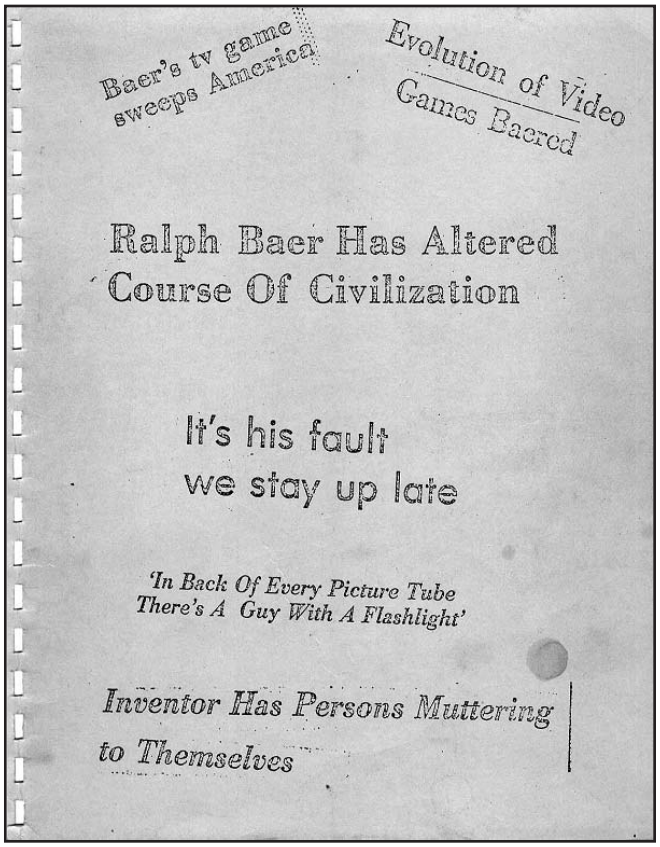


Figure 122 - Sanders PR Binders

after Bushnell became our first licensee.

And so, like a good boy, I did just that.

At a keynote speech at the Classic Gaming Expo in 2003, Nolan mentioned in passing that he had indeed seen the Odyssey before he came up with the idea for *Pong*. However he added that the Odyssey was already a failure when he saw it. It puzzles me how a product could be a failure before it was even released! And if selling 350,000 pieces of a totally novel item in a couple of years is a not evidence commercial success, then I don't know what is.

1976 - The Lawsuits Start

Atari was joined in a suit with Chicago Dynamics and Seeburg, which Magnavox laid on them. Tom Briody had emphatically got his act together. He had engaged the Chicago law firm Neuman, Williams, Anderson and Olson to handle all videogame related litigation. Once the "clock was running", Ted Anderson and Jim Williams, both very senior intellectual property lawyers, began to exercise various Sanders and Magnavox people, including me, in preparation for appearances in Federal Court in pursuit of our first lawsuits. We spent many days and late evenings at the firm's offices on Washington Street. Traveling to their multi-story offices would become a frequent exercise over the next ten years. I would fly into O'Hare and take the train into town. Since it stopped at Washington Street, I just had to walk a couple of blocks to get to their building.

Proceedings began in June 1976 at Federal District Court in downtown Chicago with Judge John Grady presiding. I had the dubious pleasure of being on the witness stand as a fact witness, day after day from June 2 through June 10. Spread out before me were TV Game Units #1 through #8, all of the game hardware units we had built at Sanders between 1966 and 1969, as well as a 5-foot high stack of documents. They were mostly Harrison's, Rusch's and my daily logs and assorted technical loose notes. Off to one side at the front of the courtroom, the Brown Box was hooked up to a small, color TV set, ready for action. Judge Grady was very interested in the subject. He was a tall, relatively young, athletic-looking person who had recently left private law practice. We soon discovered that he was very sharp and would amaze all of us with the amount of technical detail he absorbed and digested during the trial. He was also very friendly and approachable. He often turned to me from the bench while I was on the witness stand and asked for explanations of some technical detail that had escaped him. He was a "regular" guy and that eased the tension.

One day the opposition brought an arcade *Pong*-type game into the courtroom. When Judge Grady asked that the back be removed so that he could see what was inside, we found a modified Admiral TV set with its r.f. front-end bypassed to make it effectively into a TV monitor, all of which I had described in my '480 patent. Judge Grady took one look at that set-up, smiled and drew the proper conclusions: This was exactly the same arrangement of components our patents had disclosed years earlier. Everything described in '480 was there: TV set with front end disabled to make it into a "monitor"; game electronics; and hand controllers.

After weeks of intensive proceedings in that Chicago courtroom, the judge acknowledged the validity of the important Claims in our '480 and '285 patents and Rusch's '507 patent, which covered the basic interaction between machine controlled and manually-controlled player symbols. The '507 Claims became the main determining factors of whether a game infringed, or didn't. We were able to assert those Claims later in the Mattel and Activision cases to cover cartridges that contained those same symbol interactions. With that determination, license income from videogames soon began to spurt. The trial ended with Judge Grady's decision in favor of Magnavox on all counts. In a rare move, he read his decision from the bench on January 10, 1977. It could not have been more favorable if we had written it ourselves. We had won in a big way. Naturally, I was pleased to hear him state unequivocally that my '480 patent was the "pioneer patent" of the nascent videogame industry. The official record of the decision (Figure 126) also makes the same statement: U.S. Patent 3,728,480 entitled "Television Gaming and Training Apparatus" is the pioneering patent of the videogame art.

Judge Grady debunked any notion or assertion by

United States Patent [19]

Baer

[11] **3,728,480**

[45] **Apr. 17, 1973**

[54] **TELEVISION GAMING AND TRAINING APPARATUS**

[75] Inventor: **Ralph H. Baer**, Manchester, N.H.

[73] Assignee: **Sanders Associates, Inc.**, Nashua, N.H.

[22] Filed: **Mar. 22, 1971**

[21] Appl. No.: **126,966**

Related U.S. Application Data

[63] Continuation of Ser. No. 697,798, Jan. 15, 1968, abandoned.

[52] U.S. Cl. 178/6.8, 178/6, 178/DIG. 1

[51] Int. Cl. H04n 7/18

[58] Field of Search ..... 273/101.1, 101.2; 315/22, 26, 30, 10, 18; 178/DIG. 4, 7.83, DIG. 6

[56] **References Cited**

UNITED STATES PATENTS

2,489,883	11/1949	Hecht	250/217 CR
2,552,022	5/1951	Watson et al.	315/26
2,595,646	6/1952	Doba, Jr. et al.	328/187
2,648,724	8/1953	Enslein	178/6 TT
2,956,116	10/1960	Singleman	178/6 TT
3,014,724	12/1961	Cryder et al.	178/7.83
3,046,676	6/1962	Hermann et al.	35/25
3,151,248	9/1964	Glaser et al.	273/101.1
3,401,331	9/1968	Mussulman	178/6 TT
2,621,246	12/1952	Clayden et al.	178/DIG. 6
1,180,470	6/1959	France	

FOREIGN PATENTS OR APPLICATIONS

OTHER PUBLICATIONS

Radio and Television News; August 1956, pp. 63.
Radio Electronics, May 1956, pp. 38.

Primary Examiner—Richard Murray
Attorney—Louis Etlinger

[57] **ABSTRACT**

The present invention pertains to an apparatus and method, in conjunction with standard monochrome and color television receivers, for the generation, display, manipulation, and use of symbols or geometric figures upon the screen of the television receivers for the purpose of training simulation, for playing games, and for engaging in other activities by one or more participants. The invention comprises in one embodiment a control unit, connecting means and in some applications a television screen overlay mask utilized in conjunction with a standard television receiver. The control unit includes the control means, switches and electronic circuitry for the generation, manipulation and control of video signals which are to be displayed on the television screen. The connecting means couples the video signals to the receiver antenna terminals thereby using existing electronic circuits within the receiver to process and display the signals. An overlay mask which may be removably attached to the television screen may determine the nature of the game to be played or the training simulated. Control units are provided for each of the participants. Alternatively, games, training simulations and other activities may be carried out in conjunction with background and other pictorial information originated in the television receiver by commercial TV, closed-circuit TV or a CATV station.

46 Claims, 26 Drawing Figures

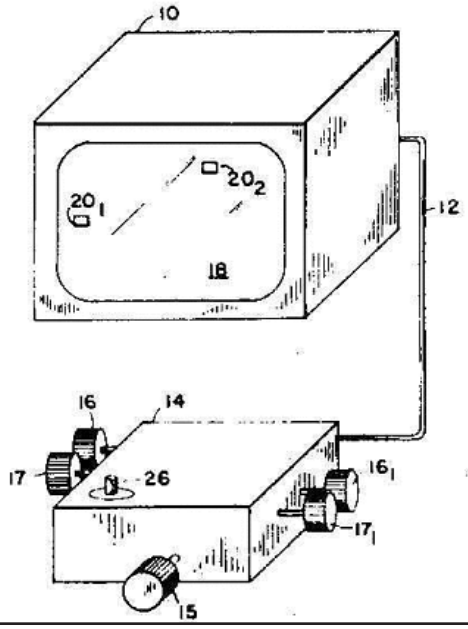


Figure 123 - Cover Page Of The '480 Patent

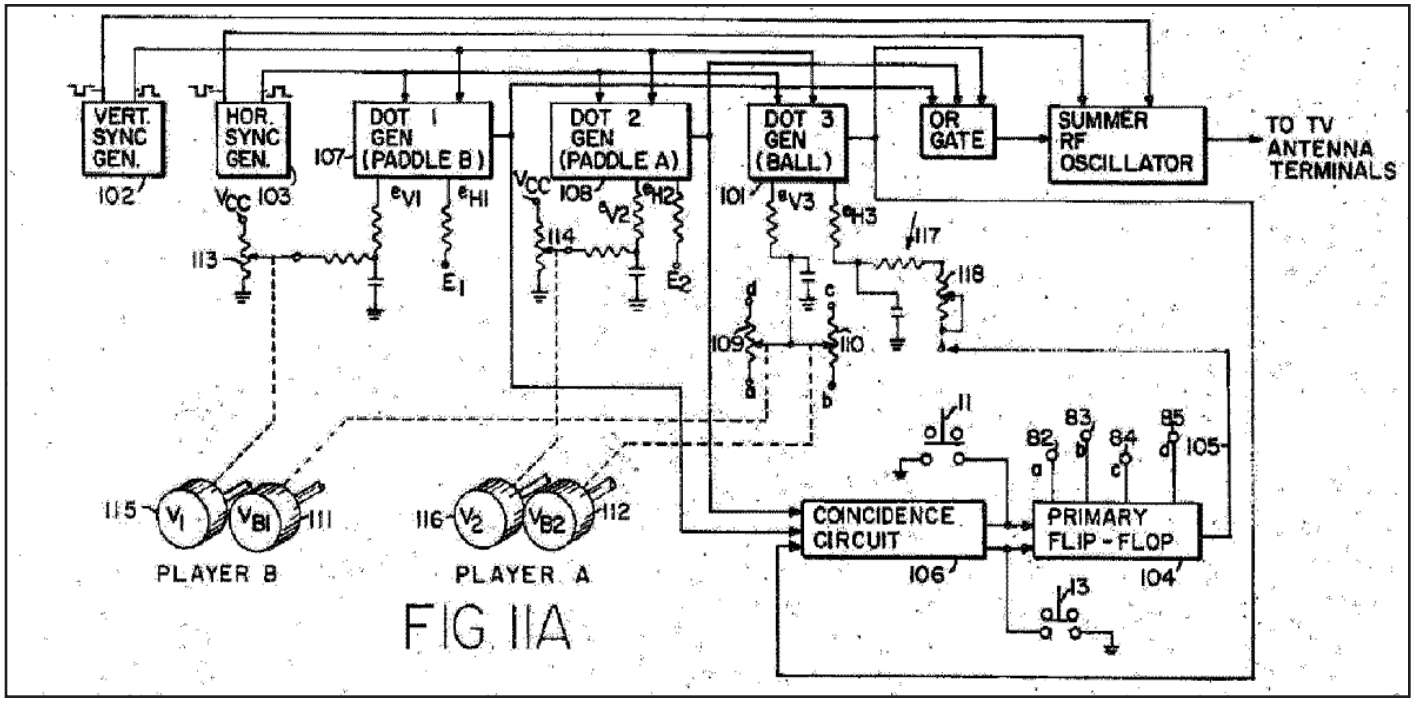


Figure 124 - Page 7 Of The '285 Baer, Harrison, Rusch Patent Showing The Basic Elements Of Machine And Manually Controlled Screen Symbols In A Ping-Pong Game. In This Block Diagram, The Coincidence Circuit Determines The Interaction Of The Paddles (A) And (B) And The Ball (101). The Flip-Flop Circuit (104) Then Effects The Ball 'S Reversal Upon Coincidence

[3] Another factor that I took into consideration on the question of the obviousness of the '507 invention is the fact that it was imitated by others, and that is quite clear from the evidence in the case of the Pong game. Here again Mr. Bushnell and his associates were highly sophisticated people in the electronic field, and they even had a little bit of experience in a sub-art, games and machines of that kind. Yet there is no real evidence which I find persuasive that Mr. Bushnell had conceived of anything like the Pong game prior to the time that he saw the Odyssey game. When he did see the Odyssey game, what he did basically was to copy it.

Figure 125 - Judge Grady's Ruling 1/2

9. Infringement — Substitution of equivalents — In general (§39.751)

Analog and digital circuitry are two means, which are largely interchangeable, which are equivalent, and which are, therefore, essentially same means for achieving substantially same results in substantially same way; every electronic invention would be fair game for anyone who simply used reverse method of circuitry to achieve same result, if mere change from analog to digital circuitry were sufficient change to deprive analog patent of protection; however, they are substantially same thing and simply are different choices open to designer of particular device, and that choice is dictated by such things as economy and items of that kind.

10. Construction of specification and claims — Combination claims (§22.35)

Infringement — Combinations — Omission of element (§39.257)

Patents on television game and receiver of television signals in connection with that game should not be read in such way as necessarily to include as indispensable part of patent those features of television set that have nothing whatever to do with generation of TV game on receiver.

Particular patents — Television Gaming

Re. 28,598, Baer, Rusch, and Harrison, Television Gaming Apparatus and Method, invalid.

Action by The Magnavox Co., and Sanders Associates, Inc., against Chicago Dynamic Industries, Seeburg Industries, Inc., The Seeburg Corporation of Delaware, Williams Electronics, Inc. and World Wide Distributors, Inc. for patent infringement. Judgment for plaintiff.

Theodore W. Anderson, and Neuman, Williams, Anderson & Olson, both of Chicago, Ill., for plaintiff.

Melvin M. Goldenberg, and McDougall, Hersh & Scott, both of Chicago, Ill., for Seeburg Industries, Inc., The Seeburg Corporation of Delaware, Williams Electronics, Inc., and World Wide Distributors, Inc.

Grady, District Judge (orally).

The Court is prepared to state its findings of fact and conclusions of law. Before doing that, I would like to compliment counsel on both sides for what I regard as an exceptionally good presentation. The evidence was well marshalled and presented, I think, in about as clear a fashion as it could have been, considering the extreme complexity of the technological aspects of the case.

I am grateful to competent counsel on both sides who did an extraordinarily good job. I believe, I also think that the witnesses who testified in the case were competent, and their testimony is of considerable assistance to me.

My own view as to what art is involved here is that we are dealing with the art of playing games on cathode ray tubes by means of electronic circuitry. The state of that art immediately prior to the '480 invention, I think, was rather primitive. Despite the very impressive accomplishments of the computer games, they were, nonetheless, unsuited for the type of small scale game playing that is involved in the patents in suit and, indeed, is involved in all the accused games as well.

While I am aware of the great advances that were made in computer technology between 1954 and, say, 1968, it is nonetheless significant that those advances did not find their way into the computer game that was demonstrated in 1967. We were still dealing with a very large computer, and this was virtually on the eve of the '480 and the '507 invention.

The '480 patent, I think, is the pioneer patent in this art, and I refer to the art of playing games on a small scale, with the players participating in the game in an environment such as a home or someplace where a large computer would clearly not be available.

The '507 patent is, I believe, distinguishable from the prior art in one principal respect, and it is the respect which the plaintiff has urged in this case. This invention discloses a movable hitting spot which is controlled by the player and which, by striking a hit spot, can change the direction of that hit spot. Now, that is something new, I believe, something that is not shown in the prior art; nor do I find anything in the prior art which is even strongly suggestive of the development of such a thing.

The term "distinct motion" as used in the patent I think does not mean what some of the witnesses have indicated; namely, a predictable motion. Perhaps it could have that meaning, but it seems to me that the plain meaning of it is that the motion is different from the motion that characterized the hit spot immediately prior to coincidence with the hitting spot, such as a

Figure 126 - Judge Grady's Ruling 2/2

the opposition that playing the Odyssey Ping-Pong game had no influence "whatsoever" on Nolan Bushnell's decision to build *Pong* and restated his positon that *Pong* was a knock-off of the Ping-Pong game in Magnavox's Odyssey game system.

Nolan Bushnell already had second thoughts before the trial began. On June 1, 1976, he had a meeting with Tom Briody, Magnavox's Chief Patent Counsel. Tom had come in from Fort Wayne to attend the Chicago Dynamics trial in which Atari also joined. Tom was in the company of Ted Anderson. Ted would become the lead attorney in all videogame litigation over the next decade and more.

As told to me by Tom Briody a few days later:

- NB/Atari is "anxious" for settlement
- NB now feels that Magnavox's (licensing) umbrella could help keep out pirates
- NB is worried about standard *Pong* business being killed by too many competitive entries
- NB feels Coleco is in market this year only *(Coleco's Telstar game was "hot" that year-and they stayed in the videogame business for several more successful years. NB got that wrong!)* Italics are mine.
- NB drew an extensive marketing picture for Tom Briody and Ted Anderson. There will be: Software and hardware-programmable TV/Videogames; Games that are add-ons (p.c. cards, etc. with chips) to calculators, maybe other devices. NB sees all games becoming microprocessor controlled (he was right!). Atari was already working on what would eventually become their extremely successful VCS computer controlled, programmable videogame.

The bottom line was that Nolan Bushnell/Atari settled with Magnavox while the lawsuit against Chicago Dynamics, Seeburg and others went on. Atari received a low-cost, paid-up license, which also covered past infringement for products sold in the U.S., but no foreign rights. Those were negotiated five years later. That initial agreement was dated June 6, 1976. A second agreement, signed in 1981, was unusual because it called for the exchange of technical data between Magnavox and Atari. Atari actually did turn over some of the technical details on some of their games to Magnavox. They carefully neglected to include information on the VCS.

"It was kind of a head fake", said Mr. Bushnell while being interrogated on the stand during the Magnavox vs. Activision case. Atari also paid royalties on coin-op games and cartridges that were found to infringe our patents. By 1980, these royalties had exceeded three million dollars.

Taking that initial license in 1976 instantly made Nolan Bushnell into a licensee, a client of sorts. One doesn't go around knocking clients so for years I kept my mouth shut while Nolan frequently got his photogenic face in front of the cameras and repeated his claim to the press, convinced that he ought to be treated as the original "inventor" of videogames. Maybe he was just doing his job, but naturally it kept bugging me, especially since at the time I had a couple of dozen patents compared to Nolan's sole patent.

Nolan Bushnell got the glory, but I got something like the last laugh. For that story, check out "From *Touch-Me* to *Simon*" in the Appendix.

The Chicago Dynamics et al lawsuit was just the first in a long string of legal actions against infringers of our patents. Mattel was the defendant in the next major patent suit. The venue was again in Chicago. We won that one handily; the lawsuit went on to the Court of Appeals where we also won. About sixteen million dollars eventually changed hands.

Then it was Activision's turn in the barrel. That trial took place in San Francisco and we were luxuriously ensconced at the Hyatt Regency Hotel, located in the Embarcadero section of the business district. Our work base was in the offices of a law firm diagonally across the street from the hotel. The best part of that week in San Francisco, aside from winning the lawsuit, was the early morning breakfast that I shared with Ted Anderson and his associate Jim Williams. Warm, fresh, sourdough rolls served up in a bakery right across the street from the hotel. Mmmmm!

Further legal battles were fought in Ottawa and New York where Nintendo tried to lay an "inequitable conduct" charge on us. They lost and eventually more money changed hands. That series of lawsuits ran longer than any Broadway play ever did. It wasn't until

1998, long after all of the patents had expired, that Magnavox settled the last of the lawsuits for past infringement. The final action was directed against two arcade game manufacturers, Data East and Taito; I was deposed once again in August 1997, with Ted Anderson again present, representing my side of the deposition.

More money changed hands and went into the coffers of Sanders/Lockheed and Magnavox. Not mine, unfortunately. For me, that deposition felt like déjà vu. Same questions, same hardware in evidence, same documents I had dealt with a decade earlier. It was a piece of cake! This time 'round I collected a fee for my services from Neuman-Williams, since I was an independent consultant by then.

Talk about how reliable solid-state electronics really are: Even after all those years, all I had to do during that deposition was to flip on the power switch and my good old Brown Box worked like a champ. It does need an occasional new set of "C" batteries, but that's all. The gun worked too but it was rarely part of the lawsuits.

More about the reliable Brown Box and the gun: In 1999 and again in 2000 I was invited to be a keynote speaker at Classic Gaming Expo in Las Vegas. I demonstrated the Brown Box there and it worked as advertised to the delight of the attendees. Members of the CGExpo1999 audience played Ping-Pong, handball, and volleyball with me and fired the "gun" at the target spot. It was one of the highlights of the show. At CGE2K the following year, my grandchildren, Jon and Danielle, were in the audience along with their parents, my son, Jim, and his wife, Andrea. They had come in from Boulder, Colorado to see Grandpa hold forth and, incidentally, ride the spectacular Vegas roller coasters endlessly - the kids, not me! Jon and I played several games using the Brown Box and demonstrated the gun to the delight of his old Opa (that's me) and the assembled audience.

The Brown Box worked like a charm once again.

Over a period of ten years beginning with the Chicago Dynamics lawsuit in 1976-1977, I was frequently called on to support the lawyers in that succession of lawsuits laid on companies such as Mattel and Activision, and later, Nintendo and Sega. The end of this trail was the suit in 1997, which Magnavox had laid on Data East and Taito.

Throughout that decade and a half of litigation, the lawyers frequently commandeered me on short notice to come to Chicago for a week or more of preparatory work. There I burnt a lot of late-night oil with Ted Anderson at the extensive law offices of Neuman-Williams, Anderson, and Olson. Jim Williams assisted Ted until the early 1980s, when Jim left Neuman-Williams to join a big New York law firm.

On the opposing side was a succession of sharp lawyers, who tried give me and other friendly witnesses a hard time. As a fact witness, I spent as much as a week at a stretch on the stand, day after day, going through those voluminous Sanders' documents over and over again; or answering detailed questions about the various pieces of our 1966-1969 game hardware that we trucked with us all over the country. They were usually spread out on tables in front of the judge's bench in an impressive pile.

The Brown Box made all of these court appearances. Occasionally, some wire or component fell off during all this moving around and I'd spend the next lunch break rushing off to Radio Shack to buy soldering equipment and tools. Back in the courtroom, I would troubleshoot and fix my game unit, often just in time to beat the judge's re-appearance after the break. That scenario was repeated a number of times in Chicago, Ottawa, New York, and San Francisco.

We won every one of those lawsuits. They all went to appeal, and we won again in the Court of Appeals. The better part of a hundred million dollars changed hands over the years. That money, minus legal expenses, was split 50/50 between Magnavox (later Philips) and Sanders (later Sanders/Lockheed).

Once we won that first lawsuit in 1976 in which Nolan Bushnell decided to leave in favor of an agreement, we had a formula that no adversary seemed to be able to break. If a game had "Hit" and "Hitting" symbols, it infringed. That meant that any game, or cartridge, infringed if it had a machine-controlled screen-symbol that would change its direction or was otherwise affected by an intercept with a manually controlled symbol. If these conditions existed, it infringed! Period! We never lost a suit based on these elements for the better part of twenty years.

Predictably, even in the early years before my

involvement in the lingering lawsuits was waning, nobody bothered to notify me or let me know in some manner that we "won another one." In later years, when I was no longer directly involved in the process, information on moneys collected from legal action were again rarely communicated to me. Naturally, I was interested in the outcomes of lawsuits for which I had been subpoenaed or dragged through a lengthy deposition. I typically had to ferret those details out the hard way. Management knew, of course, that I was interested in the resolution of the lawsuits. My guess is that both Sanders and Magnavox figured that keeping me uninformed would make it less likely that I might hold my hand out and make monetary demands on them.

I considered doing exactly that at various times if for no other reason then that I did not appreciate being treated so diffidently. However, I desisted for several reasons. In the first place, I had been compensated in the 1970s with Sanders stock options, which were more or less in proportion to the amount of license revenue that flowed into Sanders' coffers. Secondly, I found it hard to put a value on the substantial freedom of action I had at Sanders in the 1970s and 1980s...I still feel that it was worth far more than money.

Bill Rusch obviously didn't feel that way. In the early 1980s he hired a lawyer and extracted some money from Sanders/Lockheed. Rumors had it that he collected around fifty thousand dollars, a small enough sum considering his contributions to TV Game development and their importance to the success of the lawsuits. After Rusch received that settlement, the legal beagles got even more wary of the possibility that Baer might take a leaf from Rusch's notebook and hold out his hand, too.

Interestingly enough, when Lockheed bought Sanders Associates in 1985, new rules regarding the compensation of employees went into effect. Under the new regime, inventions that brought in outside license income entitled the inventor to a substantial portion of the moneys collected. A little too late to do me any good.

Back to the Magnavox Saga c. 1975

Once the Odyssey was in production, I was definitely never again quite in the loop with videogame activities at Magnavox. Neither Bob Fritsche nor his successors saw fit to tell me what went on in their Odyssey business unless I dug out that information during a conversation related to other subjects. For that reason I did not know much about the details of foreign sales of the Odyssey 1TL-200.

Of course, all of these foreign sales added to the bottom line at Sanders under our licensing agreement with Magnavox. In that fashion they effectively wound up on the plus side of my "company credit card," even though I didn't know it at the time.

Over the next few years, actually all the way from 1972 through 1977, I kept trying to stay in the loop with Magnavox in Fort Wayne and Tennessee in order to somehow influence activities there to Sanders' advantage. By and large, that effort bore little fruit with one major exception. When the system that became Magnavox's Odyssey^2 was nearly fully developed, Magnavox management decided to stop the project and get out of the videogame business altogether. I can probably take credit for turning that decision around so that Odyssey^2 rose from the ashes like the proverbial Phoenix. More on that below.

My relationship with Magnavox's videogame programs continued for several years. I have listed some of the details in the Appendix for the sake of completeness. Classic game enthusiasts may find some gems of interest in this long list of things.

Basically, I was pretty much decoupled from the day-to-day activities and videogame product decisions made at Magnavox for the next three years. It was Coleco, not Magnavox, that I helped get into business with the General Instrument AY-3-8500 type videogame systems. While that worked out well in the end from a bottom line point of view at Sanders, it wasn't a deliberate plan. I can't take credit for that. It just more or less happened because Magnavox wouldn't let me get close to their product planning.

Not that they were exactly helpless. The Fort Wayne group designed and brought out eight different models of videogames between mid 1975 and late 1977. George Kent's engineers were certainly not asleep at the wheel. They hopped on the General Instrument AY-3-8500 chip bandwagon like everybody else. In 1975 they produced and sold about 100,000 of their Model 100 games and about 200,000 Model 200's. In 1976 and 1977 their Models 300 and 400 ran at about half a million units and 150 thousand each respectively, not too shabby. The final series of non-microprocessor games, their Models 2000, 3000 and 4000 were produced and sold in 1977 and added up to about another 400,000 videogame systems to the total. Something like 1.7 million videogames had been produced and sold by Magnavox by this time.

Still, Magnavox was ambivalent about competing with the Atari VCS and Mattel Intellivision systems.

My relationship with Magnavox during the years from 1973 through 1977 were concerned mostly with trying to get them motivated to work with me on one or another videogame related product concept. First there was the arcade business, with our *Skate-N-Score* units that would have been an ideal fit for their Tennessee plant. Next there was a long series of attempts to link the videodisc to videogames. That idea was born of the fact that great looking, colorful graphics for such things as realistic background scenery in 2-D games just wasn't in the cards with existing semi-conductor technology of that day. Here again, with their parent company, Philips, in the forefront of video disc player development and production, I thought I had an opportunity to shape the future direction of videogames and Interactive Video in particular by getting Magnavox to work with me. Perhaps we could change the way the world plays games at home once more.

Many other inventors and promoters were thinking along the same lines during this period. A lot of money was spent. Some systems made it all the way to the market place, with Don Bluth's *Dragon's Lair* interactive videodisc-based games being a perfect example in the arcade game area.

All the workers in Interactive Video were struggling to solve the same problem. Semiconductor memory and micro-processor speeds and prices limited what could be done in consumer products. Using videotape and later videodisc, as a source of rich static and moving pictures, all in great color and terrific detail, was a logical way to go...or so it seemed.

In retrospect, disc-based videogames and other interactive video scenarios, such as training and educational applications, did not come into their own until the price of digital components, both Integrated Circuits and digital data delivery machinery such as CD's and DVD's, became commodity items with unbelievably low cost structures.

Salvaging Odyssey²

On August 2, 1977 I had a telephone conversation with John Helms. He said that he "sold" the concept of Sanders (meaning mine) participation to Magnavox program planning, but he reported big potential trouble at their Tennessee TV set and Videogame manufacturing plant. There was talk about canceling the Odyssey² program altogether, that very day!

Helms suggested that I get myself down to the Tennessee plant on August 10, bright and early in the morning to attend a planned meeting. The subject was going to be "Discontinuance of Odyssey² development by Magnavox management". He said he would meet me there. I told him that I'd be there, no fail!

I flew into the Tri-City, Tennessee airport via Piedmont Airlines. The meeting began promptly at ten in the morning. About a dozen people sat around a long conference table in an otherwise barren, unadorned conference room. The contrast between this place and the carpeted offices up in Fort Wayne was stark. So was the mood.

John was there, as promised. He had made the necessary introductions. I led off by presenting my involvement with the support of Coleco's videogame business at Sanders and Coleco's outstanding success in that business. Using the details of this account to establish my credentials, I argued that Odyssey² had a good shot at becoming a successful product and urged John Fauth, a Senior VP at Magnavox, to turn the Odyssey² development program back on immediately. I was asked to leave the room after I finished my presentation. In a management meeting right afterwards, John Fauth decided to go forward with the program. All he needed to make it official was approval from John DeScipio, Magnavox's president in Fort Wayne. After lunch I flew up to Fort Wayne in Magnavox's corporate airplane along with Fauth and John Helms.

It was a short hop by air from Tennessee to Indiana and we arrived in Fort Wayne early that afternoon.



Figure 127 - Odyssey2 In Its Box



Figure 128 - Odyssey²

When we got to the videogame group's quarters, there was black paper crepe draped around the doorways! Most of the Odyssey^2 project engineers were on the phone trying to find themselves new jobs.

Helms expressed "cautious optimism" to the troops about the possible reversal of management's decision but the atmosphere was decidedly glum. Nevertheless they were glad to show me a fully functional Odyssey^2 developmental unit. That was the first time I had seen the game hardware and was pleased to see how well it worked and how different it was compared to anything else out there. I especially liked the keyboard, which was deliberately made to give Odyssey^2 the look of a personal computer.

I spent August 11 at Fort Wayne with the engineers. Among other things, I was given specs for Odyssey^2's Intel microprocessor and display processor chips, as well as copies of the code that had already been generated. John Helms suggested that we study the material at Sanders and comment on it. He wanted moral support for their Intel chip-set decision. I also got copies of all the available schematics for Odyssey^2. By then the official word had come down that the Odyssey^2 program was "on" again! Chuck Heffron became the Videogame Chief Engineer and Gene Kale was assigned to the "Intel Game" (Odyssey^2) as their group leader. Things were looking up again!

After I came back to Nashua, I wrote a Memo to Distribution headed: "Trip Report, Magnavox Visit 8/10 and 11: Turn-around at Magnavox re. Odyssey^2. Almost certain I salvaged the program!"

By September 28 I was sure! Word came down from Magnavox management sprinkling holy water on the Odyssey^2 project and everyone heaved a sigh of relief.

Although Odyssey^2 did not turn out to be a great competitor for the popular Atari VCS in North America, it did very well in Europe and Australia. Roughly one million units were sold worldwide. Not too shabby but a far cry from the number of Atari VCS that made it all the way into people's homes.

Then again, the number of Odyssey^2 game systems that reached the public might have been a big fat zero if I hadn't stuck my finger in the dyke in 1977. And for all those Odyssey^2 enthusiasts worldwide, life would never have been the same.

The Telesketch Story

Designing videogame hardware in 1976 was a far cry technically from where we started in 1966. Integrated circuits were ubiquitous and low-priced to boot and semi-conductor memory was affordable.

One day in 1976 I said to Lenny Cope, "Let's see what it takes to draw on the screen of a TV set." We sat down and drew up some elementary schematics.

"This doesn't look too tough," I said. "Now, what can we do with it?"

Obviously, we could draw letters, numbers, crude, cartoonish characters, anything at all that would fit into the low horizontal and vertical resolution that we could afford without pricing ourselves out of something reasonable.

"How about this, Lenny," I said. "Can we draw symbols that can interact with others...like drawing a wall from which a ball symbol would "know" to bounce off?"

"Sure," said Lenny. "That sounds like a good idea."

We decided to build a demo that allowed us to draw on the screen, using a couple of control knobs. Our unit could also do a ball-and-paddle game, but with the added feature of being able to quickly "draw" something during the game, such as a *Breakout* wall, that would immediately become an active part of the ball game.

We called the project *Telesketch*. The name obviously applied to the unit's ability to allow "sketching" on the screen. But it didn't even hint at the more important capability of drawing "active" symbology for use during a videogame.

That part was indeed novel and when we applied for a patent in September 1977, it didn't take too long before the examiner saw that we had come up with another "First." Drawing on a screen was old art, at least at the television production end. But drawing interactive figures while playing a game was definitely new.

U.S. Patent 4,355,408 was issued on October 26, 1977. We started to hawk this new game capability to anybody who would listen, such as Magnavox and

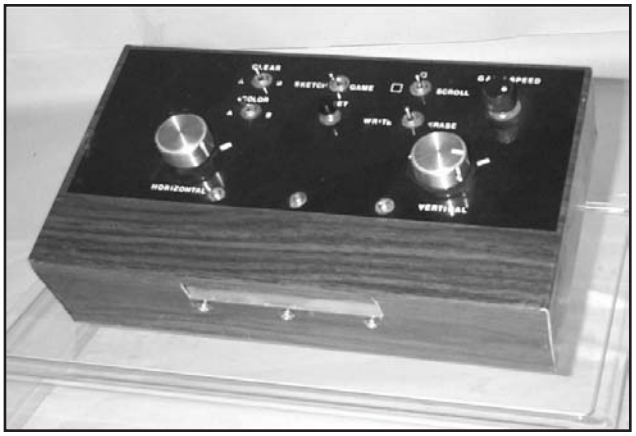


Figure 129 - Telesketch Control Unit



Figure 130 - "Writing/Erasing" with Telesketch

Coleco, but we couldn't find any takers for the longest time. The first promising opportunity to license the concept arose in 1976.

On one of my early trips to Marvin Glass & Associates in Chicago I took our Telesketch demo unit along and showed it to several of the partners. They were impressed. Julie Cooper, one of the big wheels at Ideal Toy Company, visited that day to look at our "product." Here was a perfect opportunity to get Ideal into the videogame business with something nobody else had. Julie played with the demo for a while and was excited about it. "Let's do something," he said. "Call me at the office next week."

When I got back to New Hampshire, I called Julie to establish his real level of interest. "Well," he said, "Telesketch is great stuff, but we would feel safer if it had a few regular ball and paddle games. Can that be done?"

"Sure, Julie. It's more work, but we'll do it." I said. That was a mistake. Never offer to spend your time and money on something simply because someone else asks for it without a quid pro quo... such as a firm commitment in the form of a signed agreement, or at least a willingness to share in the cost of the requested modification. Business is business and doing something for nothing gets you exactly that more often than not. I wish I would take my own advice.

Anyway, we took out our game circuitry and built a General Instrument AY- 3-8500 chip game into the Telesketch demo unit. A couple of months later I met Julie again at Glass' studios. The unit worked really well. It did a fine job of demonstrating how a player could volley a square, ball like symbol (a "bomb") at someone's character on-screen in an attempt to wipe him off the map, and how the defending player could quickly "build" a squiggly wall with his joystick that would bounce the ball right back to where it came from. At the same time, the "hit" piece of the wall disappeared as in "breakout" games.

In addition, players could draw on the screen: We drew things like a smiley face with a message below it: "Go for it, Julie!"

Julie and everybody else who saw this new demo of our modified Telesketch unit, were very impressed once more. However, as the weeks went by it became obvious that Ideal wasn't going to commit to a license agreement and that trail got cold.

Telesketch Finds A Home At Magnavox

Somewhere along the line I also got a chance to demo Telesketch to Magnavox. Again everybody thought the idea of drawing "active" symbols on a screen during a game was neat, but nobody stepped up to the plate to take a shot at including the scheme into our existing license agreements. They would change their minds a few years later. Meanwhile Telesketch just sat there. Another novel technical game feature with no takers.

It wasn't until early 1978, when we were deep into negotiations with Magnavox to establish a support activity for Odyssey^2 game programming at Sanders, that the Telesketch capability of drawing or moving active symbology on screen finally found a home. Among the games we proposed coding for Magnavox was a pinball game that would feature "Telesketch" capabilities.

After much wrangling and delay, Magnavox finally sent us an Intel-built emulator for Odyssey^2 game pro-

gramming. I managed to snag Don McGuiness, an engineer in my old Equipment Design Division for the job of coding this pinball game. Don went to work and programmed a cartridge, working part-time for three or four months. The cart turned out be bug-free and was moderately fun to play, if not exactly earthshaking. Before starting the actual game, players would move the bumpers around on the background to wherever they liked them, "drop them off" in those positions and then the game would begin, with the ball bouncing off realistically from the custom-placed bumpers as well as off the flippers.

Unfortunately, the pinball cart never made it into Odyssey^2 production. One reason might have been that Magnavox had some sort of contractual conflict. As far as I know, Ed Averett, (and his wife Linda) were their only "outside" programmers for Odyssey^2 games. They reputedly had an agreement stipulating that Magnavox

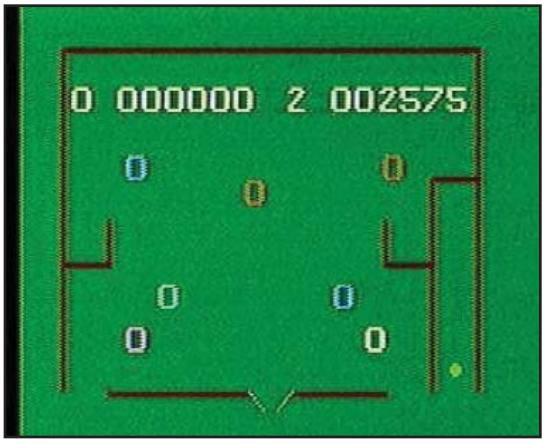


Figure 131 - Pinball Game With Player-Programmable Bumper Positions

would not use any other outside game designer for Odyssey^2. Or maybe it was just that the pinball game was still an unfinished work-in-progress and that nobody thought enough of it to finish it.

Now, here was a game in which you could draw characters on the screen that then become part of the action. While it wasn't a polished game yet, it played well. Seems a shame it never made it through the internal tangle at Magnavox.

In early 2000, I asked my friend, videogame historian Leonard Herman, to look into ways that I could make copies of the pinball game myself. Lenny suggested producing a limited number of cartridges and selling them at Classic Gaming Expo 2000, which I was attending that August. Lenny contacted Sean Kelly, one of the organizers of the event, and Sean made approximately two-dozen copies of the pinball game using a PROM version that I had in my collection. The duplicate cartridges used genuine Odyssey^2 shells and sported a label that looked just like one from a 1978 Odyssey^2 game cart. The organizers asked me to autograph these carts and they sold at cost like hotcakes to attendees at the show.

A Short Postscript To The Magnavox Support Story - Interactive Video

By the late 1970s it had become obvious that Magnavox was not willing to spend the money and go head-to-head against the Atari VCS juggernaut that dominated the videogame business. That was one of many reasons I stopped worrying about Magnavox. I had what I thought were more promising fish to fry by then. I shifted gears and returned to my earlier ideas about the connection between videotape and games, as well as the use of the VCR for interactive education and training.. Over the next ten years I concentrated on developing systems that married the videotape player, later the videodisc, and finally the CD player, to the computer for interactive games, training, and educational purposes.

After all these years of trying to interest Magnavox in our interactive video technology without visible results, I gave up on Magnavox and turned my attention elsewhere.

The Coleco Story

We need to step back to 1973.

Back then I had written a letter to Marvin Glass & Associates (MGA) in Chicago. I had inquired whether they were interested in help with the design of hand-held electronic games, which were then in their infancy. Mattel had started the business with a small, hand-held football game. The Glass partners promptly sent Geoffrey Breslow, one of their Associates, to New Hampshire. He spent half a day in my lab giving me the once-over and went home.

I promptly received an invitation to visit MGA in Chicago. A week later I presented myself to the rest of the associates. Anson Isaacson was the senior partner at the time. Marvin Glass himself had died a year or two earlier. Two hours into the interview with Anson Isaacson, Howard Morrison, Burt Meyer, Geoffrey Breslow and the rest of the partners, I had a handshake agreement. I became their "outside electronics capability."

That association lasted for the better part of a decade. It resulted in such well-known products as Milton Bradley's *Simon*, Ideal's *Maniac*, Lakeside's *Computer Perfection*, Coleco's *Amazatron*, and several other single-chip microprocessor-based hand-held games. For me, it opened up the doors to senior management at all of the major toy companies. During my frequent visits to MGA, I often shared lunch in their executive dining room with some of the partners and the president or VP of this or that toy company. That is how and where I first met Arnold Greenberg, Coleco's president.

Sanders tolerated my arrangement with Marvin Glass because I managed to carry it on in a non-interfering manner, meaning I did the work for MGA mostly at night and during weekends. Furthermore, there was a certain synergism between my work on interactive video-based systems at Sanders and several of the projects in which I was involved at MGA. Most importantly, licensing income to Sanders via Magnavox was beginning to make substantial contributions to Sanders bottom line. Nobody at Sanders wanted to disturb that process and I was a key to it. As money arrived at Sanders in ever larger amounts, I virtually needed no other mantle of legitimacy.

For all practical purposes I held down two jobs and received two paychecks every month. Herb Campman, our Director of R&D at Sanders, was kind enough to protect my derrière legally by signing off on an official Sanders document that sprinkled holy water over the new arrangement. Every quarter, Lou Etlinger, our Director of Patents, and I sat through financial and program status reports projected on the big screen in the auditorium at Sanders' HQ in South Nashua. Our videogame license income frequently beat that of the Electronic Countermeasure Division, the biggest division in the company. My name was all but up on the headquarters tower in neon lights.

The defense electronics business was still coming out of a deep recession. Sanders quarterly statements would have looked a lot less cheerful if it had not been for the substantial contributions our videogame licensing and litigating activities added to the bottom line. I've often been asked how Sanders expressed their appreciation of my part in this happy state of affairs.

In the first place, I began to have total freedom of action starting in the mid 1970s, while I was still working within a big company with all of its resources. How do you put a price on that? Secondly, bonuses came along with most of the major influxes of cash from licensing. Thirdly, starting in 1976 and ending in 1985, Sanders awarded me a string of stock options that added up to better than a quarter of a million dollars. Since most of that money wound up being invested and has at least doubled over the intervening years, you might say that my direct return on videogame activities was a half million dollars.

The value of those options was enhanced quite a bit by what happened in 1986. Loral, my old alma mater, made an unfriendly takeover attempt on Sanders Associates. Our stock was trading in the mid-thirty dollar range at the time. Loral's offer pushed the price up

above forty-seven dollars. Then Lockheed came along as a white knight and bought the company. That pushed our stock price up still further, well beyond sixty dollars. As a result, all of us who were sitting on a collection of options were forced to tender them at that price, and we cried all the way to the bank.

Sanders changed my title to Engineering Fellow, a newly created job description for old-timers who didn't want to run operational groups anymore but were too valuable to the company to lose. In fact, I was the first Engineering Fellow at Sanders.

At the same time, in my after-hours life, I joined the ranks of independent toy and game designers in the U.S., a relatively small group. Most of us in that community either know of each other or have actually met at one time or another, either at the annual Toy Fair in New York or at some client's facility, or a hotel room, where we were "showing product." My specialty was and still is, of course, electronic toys and games. I called myself *R. H. Baer Consultants* and joined that community of small business operators tendering a Schedule C to the IRS every year.

Twenty-odd years later, Uncle Sam is still my silent partner. Sanders allowed me the freedom to collect two paychecks, sometimes three (when I took on Hallmark Cards), each and every month. Who could ask for more?

Coleco's Telstar Is Born - But There Is A Problem

As I mentioned earlier in this narrative, I received word in March 1975 about the development of a single-chip videogame integrated circuit device. I heard that it was being developed by two engineers at General Instrument's labs in Scotland and that it had been an "unofficial" skunk works project there. The guys at General Instrument on Long Island jumped on the bandwagon and saw to it that the two engineers working on the project were transferred over here. As I've also mentioned earlier, I had previously met Arnold Greenberg, Coleco's president, at the Marvin Glass studios. At my urging, Arnold met me at General Instrument's Hicksville, Long Island plant where we saw prototypes of the AY-3- 8500 single-chip, a multi-game MOS device. The two Scottish engineers who had brought this device with them from Glen Rothes demonstrated the Ping-Pong game that the chip generated flawlessly.

We then moved on to a meeting with Dr. Ed Sacks, who ran the Hicksville plant. (In later years, Ed moved General Instrument's I.C. manufacturing to Phoenix, Arizona-it's now Micro Circuits). That day Coleco became General Instrument's first and preferred customer for the AY-3-8500, a chip around which millions of offshore videogames were later built in Hong Kong, Taiwan, Europe and South America.

Sanders and Magnavox collected royalties on all of these home videogames, thank you! They also had the desired effect of punching new holes into my credibility card!

Arnold Greenberg was impressed by what he saw at General Instrument's and thus was born *Telstar*, Coleco's wildly successful first videogame. Being first on General Instrument's waiting list for AY-3-8500 chip delivery gave Coleco a jump-start over everybody else. That was more or less the beginning of my involvement with Coleco. There was to be much more.

On a late Tuesday afternoon in 1976, I received a phone call in my lab at Sanders from Arnold Greenberg. At the same time, his brother, Coleco CEO Leonard Greenberg, was on another line from Hartford, Connecticut with Dan Chisholm, Sanders' VP who was nominally in charge of videogame licensing relations. He had worked closely with Lou Etlinger and me for some time.

Why were there two simultaneous phone calls from Coleco? There was a major emergency in Hartford! They were looking to Sanders to help pull a rabbit out of a hat, but fast!

On the prior Monday Coleco personnel had been at the Federal Communications Commission's (FCC) Radio Frequency Interference (RFI) labs in Maryland for compliance testing of their *Telstar* product. They had flunked the RFI tests because there was too much radiation at harmonics (multiples) of the Channel 3 or 4 signals. These are the two frequency bands used by videogames to get entry into a TV set via its antenna terminals.



Figure 132 - The Coleco Telstar Videogame

Specifically, Coleco's *Telstar* units failed to qualify under Rules 15 of the FCC. The guys from Hartford were told to come back to Maryland for retesting on Friday of that week. They were also informed that if they could not get their problem fixed by then, they would have to "get to the back of the line" while the FCC tested other companies' products that had been scheduled for the following two weeks! Since Coleco had some thirty million dollar's worth of *Telstar* inventory sitting in the warehouse ready for distribution, there was panic in Connecticut!

Luckily for Coleco, Arnold Greenberg remembered Sanders and specifically, his previous encounters with me at Marvin Glass and General Instrument. He hoped that we could help them ASAP. Even more fortunate for Coleco, there was an RFI test lab at Sanders Associates that I had set up years before in my Equipment Design Division. Our military contracts required us to do a lot of RFI testing at Sanders. Despite that obvious need there was no such capability at Sanders before I came along. I saw an opportunity to provide good in-house RFI service and hired two RFI engineers away from Sylvania's plant on Route 128. Then I lobbied management for the funds needed to buy a screen room and associated RFI test equipment. I got what I needed. Starting about 1968 we were in a position to offer RFI service to our in-house engineering groups at Canal Street.

As I expected, the demand for RFI work within the company grew rapidly. The RFI lab expanded into an extremely well-equipped test center over the years. The RFI Department's personnel roster increased in numbers right along with it. Bob Despathy, one of the two Sylvania engineers whom I had hired, became the RFI operation's general manager, reporting to me. He



Figure 133 - Arnold Greenberg Demonstrating Telstar

built up a competent crew over several years.

The in-house workload kept growing. In addition to that, Despathy hung out a shingle for outside RFI work and soon ran the largest RFI test lab in the Northeast. Taking in outside washing defied Sanders' defense-business-oriented bookkeepers. Somehow, Despathy outfoxed them. The bureaucracy kept trying to throw rocks in the works but he prevailed. Soon, the group was booking a million dollars of RFI business a year. That was the easy part. The hard part remained end-running the accountants year after year and somehow keeping two sets of books...one of Bob Despathy's lasting achievements!

When the phone calls came in from Coleco asking for RFI help, they were informed that we would be glad to help them if they signed Magnavox's Videogame Technology Licensing Agreement (which they hadn't done at that point in time). A Coleco engineer and tech showed up on Wednesday morning with an executed copy of the agreement. Our RFI lab crew went to work on a *Telstar* console to bring its spurious radiation within FCC spec limits.

Tests took place on the partial fourth floor roof of Sanders' Canal Street building. That day, we used various conventional methods to suppress the undesirable radiation by trying bypass capacitors here or there, changing "grounds", the kinds of things engineers routinely do to improve the operation of high-frequency circuitry. Although the crew worked the problem all day, they didn't do too well. By quitting time, no solution was in sight. I brooded about what to do all evening and half the night.

Early Thursday morning I was in the lab on the fifth floor adjacent to the exposed fourth floor roof test area. As yet, no one else had showed up to resume the RFI reduction job. As I wandered through the large lab, I saw two pieces of electronic equipment sitting on a test bench. They were connected together with some common coaxial cable. What attracted my attention was the presence of a couple of small ferrite toroids. These are powdered iron rings that have certain electro-magnetic characteristics when used at high frequencies. The cable had been looped through these toroids, taking two or three tight turns.

On a hunch, I asked the few engineers present at that early hour just what were those rings for. Lo and behold somebody actually knew the answer. It turned out that during operation of the two electronic boxes, the coax cable had picked up stray signals from some nearby radio transmitter and this had screwed up the performance of the boxes. One of the engineers had the bright idea of suppressing the interfering surface wave created by that incident radiation with some inductive "chokes"...and that's what those ferrite rings were!

At that moment, a light bulb went on in my head: I ran around the lab opening storage cabinet doors and desk drawers, generally poking around until I found some ferrite toroids. When the RFI crew arrived on the roof for further *Telstar* tests, I slipped one of these toroids over the shielded coax cable of the *Telstar* unit being tested. I looped the cable twice through the ring, two turns, at the point where the coax just "left" the plastic case, in the manner of a strain relief. Then the crew resumed testing.

BINGO! The unit passed the spurious radiation tests. The toroid satisfactorily suppressed the undesired harmonics and we were in like Flynn with an easy, low-cost fix. We sent the Coleco folks back to Maryland. *Telstar* passed the FCC tests and everybody breathed a sigh of relief. Coleco's *Telstar* became the most popular videogame of the season and contributed mightily to the Connecticut company's bottom line that year. Even Atari had to start taking Coleco seriously from that point on.

We Help Design Coleco's Next-Gen Line

As a result of this episode, Coleco further relied on Sanders to help them with the development of their next generation of videogames. In the following year, Arnold Greenberg asked me whether we, Sanders, could provide some technical development support to their in-house design group. Naturally, that was music to my ears. Here we had a chance at Sanders to make sure that Coleco would put more license-income-producing hardware on the market and we would get paid for doing it!

There was a minor problem though. We had to figure out how to handle such a support job within Sanders, a large military defense electronics company whose overhead rates were closely monitored and regulated by the Department of Defense. Sanders' overhead rates were negotiated with the Government since virtually all the work there was done under contract to the Military. Taking on commercial consulting work was highly irregular. Nobody seemed to be able to tell us what overhead rates we should use so that we could calculate what we would bill Coleco. We got hold of some creative accounting types and figured out a formula.

In order to accommodate Coleco, I asked Dunc Withun (my former Electronic Design Department manger and now manager of the Equipment Design Division I once ran) to assemble a small group of engineers and technicians and head it up himself. We created a separate little profit-center on paper for the purpose. While that was an actuarial stretch at a "military" company like Sanders, it made good business sense. As I said, we were supporting a licensee, guaranteeing license income for Sanders, and we were getting paid for doing it. Nothing wrong with that formula!

Under this contract, initiated in March 1976, we first helped to improve the frequency-stability of the Channel 3/4 r.f. oscillator in their *Telstar* line. This radio-frequency oscillator acts like a TV transmitter in a videogame. Jim Maben, a first-class R.F. engineer in my old group did the actual work of getting *Telstar's* R.F. oscillator to behave itself under all temperature and battery levels. That led to a number of trips with Jim down to Hartford, a drive of



Figure 134 - Coleco Telstar Arcade

about 135 miles door-to-door from my house in Manchester, New Hampshire. Once the R.F. oscillator problem was solved, we soon became involved in the detail design of their next generation games.

The first of these new videogames was the triangular *Telstar Arcade* game. It was different all right. One side had the standard Ping-Pong paddle control knobs. A second side held a tethered "pistol" for shooting games. The third side had a small steering wheel for driving games.

Next we worked on Coleco's *Combat* game, which was based on General Instrument's *Tank* game embedded in an AY-3-8700 chip. Finally, we helped them with the design of their *Telstar Alpha* game unit.

We did the work. Coleco paid their bills and sold a lot of good, new games. Our license income got a boost, and so did my standing at Sanders. I always did want to get into the videogame business. There was no way Sanders would enter it officially so we did it circuitously by taking on Coleco's development work at Sanders and collected two ways in the process.

Learning To Live With Eric Bromley

All this activity had me frequently traveling down to Hartford. During one of these visits to Coleco in 1975, I was sitting in their board room waiting for Arnold Greenberg and some other individuals to show up, when a second fellow was admitted to the room. He turned out to be Eric



Bromley, a new hire at Coleco who was soon to become their senior product manager for videogames. We introduced ourselves and waited for the Coleco people to come and pick us up.

When Arnold Greenberg finally came in, I found myself in the somewhat hilarious position of having to introduce him to someone he had just recently hired but had never met before. It turned out that Eric Bromley had some arcade videogame experience but knew precious little about TV technology. I soon found myself tutoring Eric in the fundamentals of television signals and, in particular, in the vagaries and details of the U.S. method for color signal processing. In subsequent group meetings at Coleco I sat there while Eric held forth on the chalkboard explaining to one and all how color TV worked. Good old Eric! He was a quick study.

In April 1976, after a brief visit to General Instrument in Hicksville, I took a cab to LaGuardia and a helicopter hop from there to Newark airport, where I planned to catch an airplane. During that brief flight I came up with a low-cost solution for adding color to Coleco's AY-3-8500 game systems. I had a hard time drawing schematics while the helicopter rattled and shook, but I got the fundamentals down before we landed in New Jersey.

Technically, the idea was simple enough: Since the difference between various colors in a U.S. television signal is the phase, the relative timing, of a 3.58 MHz carrier signal, I proposed using an inexpensive integrated circuit device to provide the required time (and hence phase) delays. A common CMOS hex-inverter integrated circuit chip driven by a 3.58 MHz crystal oscillator was the basis of the design. The six individual inverter sections of this I.C. would be hooked up serially - in cascade. Each junction between a pair of inverters would then output a 3.58 MHz signal

delayed a few hundred nanoseconds over the prior stage, exactly what was needed to get four or five different color carrier signals: red, blue, green, yellow and brown among them. And all that for less than a dollar, the 3.58 MHz crystal being the most expensive part of the whole deal.

Later that month, I took that design idea to Hartford and laid it out in detail for Eric. It wasn't long before I was listening again to Eric holding forth to a group of people on how he was going to get color into Telstar. And he did.

Leading Coleco Into Interactive Video Territory

At about that time, my small group at Sanders and I had finished a number of interactive video concept demonstration systems involving the use of videotape playback in conjunction with videogames. We also had completed the design of several video-based stand-alone products, such as our TV Alarm Clock, and other goodies. Having made some demos of these novel items at Coleco, I began to push Lou Etlinger to initiate high-level meetings in anticipation of going to contract.

At Lou's invitation, Arnold Greenberg and Bert Reiner, his chief engineer, came up to Nashua on July 2, 1976 to negotiate an area of agreement defining the scope and the specifics of my inventions and of the applicable patents. They met with Lou and Dan Chisholm upstairs in the HQ tower in Lou's fancy office. Lou's sidekick and able patent lawyer, Dick Seligman, also got involved with these negotiations. They did not go well that day and, in fact, would drag on for a year or so.

In May 1977 licensing agreements with Coleco were still in a state of flux. By that time, my group at Sanders, and Howard Morrison of Marvin Glass, had cooperated on our *Monday Nite Football* game. That became another subject for negotiations with Coleco; a lot of correspondence between Lou Etlinger and Arnold Greenberg took place trying to come to some agreement.

The basic problem was Coleco's (i.e. Greenberg's) visceral disdain of paying anybody for any intellectual property if they could get away with it.

Meanwhile I went merrily ahead inventing stuff and demonstrating it to Coleco's videogame engineering staff under protective non-disclosure agreements. Since Magnavox had not shown any sustained interest in what I was doing no matter how many times I tried to get them involved, I now concentrated on Coleco. I figured I would let the lawyers come up with the answer to who's on first and who's on second, contractually. I didn't feel like waiting for them to cross their t's and dot their i's. I figured that a few *fait-accomplis* might actually give the contractual negotiations a shot in the arm. Like most technology, my interactive concepts were time-sensitive. I knew that speed was of the essence and that advances in digital technology would soon pass us by and make all this good stuff moot if we didn't hustle.

As far as our *MNFB* videogame was concerned, it never did get enough of Coleco's attention to turn that great game into one of their products. That was too bad. Coleco was just the company that could have made a successful product out of it. But some of my interactive video systems technology did catch on at Coleco in time to develop some potentially great products!

Coping With Tricky Legal Relationships

The relationship between Sanders and Coleco was complicated by the terms of Sanders' exclusive licensing agreement with Magnavox for videogame technology. Among many issues was the question of what rights Magnavox had to the additional videogame-related inventions I kept coming up with during the late 1970s and early to mid-1980s, and what rights they had to the patents that issued for this work. One of my biggest problems was to persuade Lou Etlinger to make liberal interpretations of our Sanders/Magnavox license agreements that would allow me to support Coleco (and any other licensee) without having to worry about Magnavox raising a stink.

In the beginning, Lou seemed to take the position that I couldn't do this support work for one of Magnavox's competitors. The guys in Fort Wayne were doing their own AY-3-8500 game designs during this period. Lou did not want to consider licensing

new technology-concepts of mine, such as the one that later made Coleco's 1983 *Kid-Vid* product possible. My response to that chicken heartedness was to plow ahead with Coleco and present Lou with fait-accomplis.

The idea was to get him to figure out how to finesse Magnavox rights to all of my new stuff. Unfortunately, two years went by. We were into 1980 and still agreements on interactive video systems technology with Coleco had not moved off a dime. I continued showing them new videogame and interactive video technology anyway for the better part of 1980 through 1982.

All this time, Lou worried about product liability issues as well as the Magnavox problem, but I just plowed ahead. On the record, I sent him a number of memos that presented my view of the legal situation. I pointed out in a memo dated September 1, 1982 that Magnavox had been kept informed of our novel techniques, issued patents, and so forth on a number of occasions during 1980 and 1981 and that they had expressed no interest whatsoever in any of my stuff. I told him that in view of this situation, "I believed that we had discharged our obligations to North American Philips/Magnavox with respect to their rights of first refusal to new disclosures, etc."

Off the record, I told Etlinger: "Go and tuck it to them, Lou!" Magnavox was just playing a spoiler's game.

Lou finally settled with Magnavox by giving them some non-exclusive rights. They were almost meaningless because of Magnavox's evident lack of interest to proceed with any of them. They were fig leaves but they finally got Magnavox out of my hair.

Just the same, it had taken until January 13, 1983 before Lou Etlinger and Coleco's lawyer Sandy McGarvey signed off a negotiated agreement that covered all the interactive video systems bases. That finally allowed me to send off a letter to Eric Bromley, at his request, offering Sanders' engineering services in support of a subcontract from Coleco to Circuits & Systems in Hollis, New Hampshire that I had quietly promoted. My friend, Drew Sunstein, and his engineers at C&S had previously built an Apple II-based interactive video weapons training system for us at Sanders under another subcontract: the *Light Antitank Weapon* (LAW) missile launcher (See page xx).

They had done a great job and were, therefore, the logical source for engineering support to Coleco on an almost identical interactive videotape or videodisc-based system concept that I had been promoting at Coleco. The systems we had designed at Sanders involved the use of a videodisc player to provide game backgrounds as well as scene-related graphics-all nested as data on a videodisc. It was the sort of thing that takes place routinely nowadays on computer and videogames using a CD-ROM.

Drew Sunstein was an old friend from earlier Sanders days when he worked there. I was comfortable knowing that Drew would protect Sanders interests by doing an outstanding job for Coleco. Nothing like keeping the work in the family! Drew sent a proposal for this development work to Marshall Caras, then Coleco's Director, Advanced Research and Development, initially quoting



Figure 136 - Exterior and Inside View of the Interface Unit Built For Coleco By Circuits & Systems ('84)

$55,000 for the job. Marshall got out a signed contract after much typical Coleco haggling. Several months later, C&S delivered functional hardware to Coleco that allowed their new ColecoVision game units to be interfaced (i.e.: gen-locked) with external video sources such as a videodisc player. No one had done that with a videogame system, ever.

The major engineering challenge of this job was to make the ColecoVision circuitry run in an interlaced scan mode, the format that television signals are normally delivered by TV stations and by videotape or videodisc. No videogame had been run in an interlaced mode before. It involved solving all manner of tricky problems, particularly a whole serious of nasty crawling interference patterns. C&S managed to banish these pesky devils and the system looked very promising. More of this on page 153.

Dual Image

While Drew's crew was working on the interactive video tape/disc game technology project, I was in constant correspondence with Eric Bromley about another one of my patents. I figured that my '266 patent which concerned a scheme that I called "Dual Image" would supplement the interactive video license that we were negotiating. This new patent was a way of placing one image on the even scan lines of a TV display and another one on the odd lines. The object was to allow rapid branching from one screen image to another or from an entirely different image when a videotape player was used.

I had cooked up an imaginary scenario entitled *The Great Train Robbery* to illustrate how a Dual Image scheme would function. The action had a train robber enter a baggage car and get into a fight with the character guarding the gold. It required rapid scene changes (i.e.: different views of the baggage car) that could not ordinarily be done with a linear videotape system. Dual Image techniques could do that job, although they required non-interlaced television displays.

While normal television programs use interlace (alternate odd and even lines appearing on the TV screen), videogames had been non-interlaced since day one.

To give Eric an idea of what a non-interlaced picture looked like (as compared to an interlaced one) on a real-time basis, I built a TV sync generator in my lab that produced both interlaced and non-interlaced synchronization signals. I took it to Hartford, along with a video camera. An A/B switch changed a scene viewed by the camera from interlaced to non-interlaced. Eric instantly decided that he didn't like non-interlaced pictures. In view of the fact that I had really put myself out to make this demo possible, I was more than a little ticked off by his stubbornness and offhanded decision-making. I had put in a lot of time and effort into designing and building the demo and he dismissed it with a wave of his hand. Worse, by brushing that solution off so abruptly he put the kibosh to the use of Dual Image technology, at least at Coleco where it could have been used to program some great games. My mood wasn't improved that day by the fact that Eric had kept me cooling my heels outside of his office while he spent a half-hour on the phone yakking with his broker. The partition to the anteroom in which I was sitting was thin enough so that I couldn't help overhearing the whole conversation. That had already set the tone of the meeting before I even entered his office.

Eric and I had a tenuous relationship with each other from the start. Nevertheless, I must give him credit because he sat through many meetings on the subject of videotape/videodisc-based interactive game technology and paid close attention. Once Eric caught on to the possibilities of the technology, he became a strong advocate. He eventually convinced Arnold Greenberg and Bert Reiner, the Chief Engineer at the time, that interactive videotape or disc-based systems were the wave of the future. We won't dwell on the fact that things didn't quite turn out that way.

Using Audio Tape Players In Videogames To Get Superior Sound

Back in 1977, I had worked on the idea of using ordinary audio tape players in conjunction with videogames, not a particularly high-tech idea, but a timely one. The basic thought was that the videogames of that era had no decent sound capabilities. They beeped and pinged and ponged, played some monotonal music, and made some explosive noises, but not much else. I proposed using pre-

recorded audio, played back under control of the videogame console, to bring some real music, action sounds and speech into the games.

At the time we were intensively working at Sanders on videogame and interactive video projects, some of which were directed towards weapons simulation and training. Shooting at Russian tanks on a big TV projection screen with a LAW on our shoulder was one of the more outstanding examples of our applied interactive video technology. Much of that early work was done using Apple IIe computers. They were perfect for the job because they had been designed by Steve Jobs and Steve Wozniak to be an engineer's machine. It was easy to interface external hardware to those old Apples and it still is.

I put that Apple IIe experience to good use on the game front. Soon we had interesting emulations of videogames running on our monitor in which the progress of the game was controlled by data on one track of our audio tape player while another track delivered impressive sounds, all under control of the Apple IIe. That work resulted in a patent application that we submitted in July 1978. It issued as the '198 patent on March 18, 1982.

As usual, inventing and building demo hardware was the easy part. In April 1980 I described the use of audio tape control described by the '198 patent to Magnavox. I couldn't get a rise out of them. Par for the course.

Another two years passed before I finally came up with the idea for a really attractive videogame demonstration system that used an audio tape player. It had occurred to me that nobody had done a videogame suitable for three-to-five-year olds, preschoolers. Also, there were millions of Atari Video Computer Systems (VCS) in people's homes, with many of them already stowed away in assorted closets. Maybe they could be revived for use by toddlers and early-schoolers?

As a practical matter, any preschooler gadget had be to be designed to work with those ubiquitous Atari game consoles if it was to have a chance at commercial success. What if we could interest and license Coleco to produce and ship a game attachment that would potentially plug into even as few as five percent of those Atari VCS machines out there in people's homes? What a business that would be!

Kid-Vid

By 1982 the videogame business was beginning to head towards temporary oblivion from which Nintendo rescued it a few years later. There were too many carts out there with virtually identical games. People got fed up with playing the same games over and over again. So how about trying to revive some VCS business by going after the preschoolers? Virgin territory.

I thought a while about how I might demonstrate that concept in a convincing manner. Then I went to Toys R Us and bought a cute little white kiddy tape player made by Tiger. Working in my own lab at home, I rebuilt its innards and interfaced the tape player with an Apple IIe computer. The idea was to have the Apple emulate an Atari VCS with the tape player plugged into one of the hand controller connectors. The computer's job was to turn the tape player's motor on and off under program-control. The VCS' microprocessor would do the same thing in a production version, taking its instructions from one of the stereo tracks of the audio tape player.

I also created some simple low-resolution Apple IIe graphics that showed a fish swimming around on a blue background. This could be manipulated by an Atari joystick in a simple way compatible with the limited abilities of a three-year- old. Then I wrote a voice-over script that was basically a parody of a Dr. Seuss scenario. It started with these rhymes: "*One fish, two fish, red fish, blue fish - swimming 'round this great big lake. Don't they get tired, for goodness sake...*"

I narrated that script onto the second track of the audiotape, using my best grandfatherly voice. The first

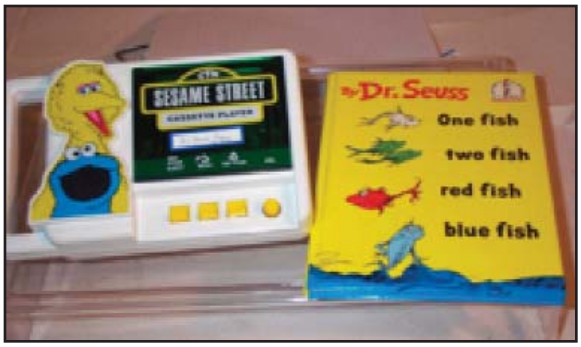


Figure 137 - "Dr. Seuss, One-Fish-Two-Fish" Demo Unit

track, which contained data signals used to keep the screen action synchronized with the voice-over audio presentation, accurately turned the tape player on and off at the right time. It all worked like a charm, was really cute, and looked like it might become a fun product for the preschool set.

As soon as I had this demo working flawlessly, I packed up my Apple, its monitor and floppy disk drive, and the modified Tiger tape player and took it all to Coleco on August 12, 1982. Eric Bromley, Arnold and Leonard Greenberg, and several other people came into the room where I had set up my demo. I emphasized that the major object of the exercise was to tap into the Atari VCS market. As the game began, with me acting as a preschooler handling the Atari joystick, and with "Dr. Seuss" rhymes issuing forth from the tape player's speaker, I could see Arnold and several others exchange nods and eye contacts. I knew right then that I had rung some bell. There must have been something similar to my demo going on at Coleco, which allowed them to understand my system without the need for a sales pitch. I instantly had a handshake agreement Coleco took a license to an ancient '161 audio control patent of mine that had issued back in 1975 and also to my novel methods of controlling an audio tape player by a microprocessor videogame, specifically an Atari VCS. In fact, they were soon shooting for product release in time for next year's July 1983 Consumer Electronics Show (CES).

What I didn't know at the time was that Coleco was also working on Gemini, a knock-off of the Atari VCS of their own design, also slated for CES introduction. They saw my *Dr. Seuss* demo system, which would later become known as Kid-Vid, as a natural complement to their Gemini machine. It was something that Atari could not offer. Bingo!

Al Kahn was assigned as the product manager for both Kid-Vid and Gemini at Coleco. We got along just fine. When things were going well prior to Coleco's Adam computer problems, which started in the fall of 1983, I could always reach Al and find out where things stood. Sad to say, after Adam hit the fan, I couldn't locate him no-how!

It was reported that Coleco spent a million dollars to acquire licenses for the *Berenstain Bears*, the Smurfs, as well as some of Dr. Seuss' characters for use with Kid-Vid, a lot more money than we at Sanders ever received from the Kid-Vid license by a long shot. Coleco's in-house programmers did a fine job of coming up with suitable graphics, preschooler-friendly game play and great voice-over and music. Unlike the usual crummy sounds issuing from videogames of the day, Kid-Vid was a neat little machine playing real voice and instrumental ensembles, singing and speaking in sync with the screen presentations and generally making videogames attractive for the preschooler set. Kid-Vid was definitely a good product.

Kid-Vid made its first public appearance during February 1983 at the annual International Toy Fair in New York. It received some good notices in the trade press during the first two or three days of Toy Fair.

Unfortunately, instead of a cute little kiddy tape player like the white Tiger machine that I had modified for my Dr. Seuss demo, Coleco, in its corporate wisdom chose to use a standard black "shoe box" tape recorder for Kid-Vid. That did nothing for its appearance. Equally unfortunate for Kid-Vid was its introduction at the same CES show as Adam, Coleco's abortive venture into the home computer business. Adam's technical problems were to become legion. It was introduced too soon - before it was properly debugged - and it almost killed the company.

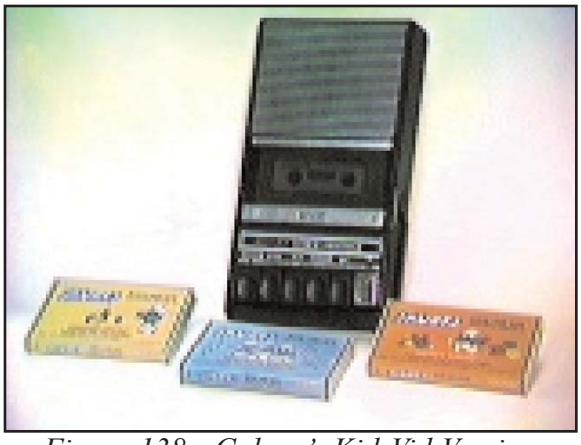


Figure 138 - Coleco's Kid-Vid Version

Because of Adam there was precious little promotion money available to push Kid-Vid sales. Coleco had huge cash-flow problems.

Adam stirred up so much excitement at the Chicago CES show in the summer of 1983 that I

spent a half-hour on the phone from the Convention floor, talking to my broker at Merrill-Lynch in New York. Coleco's stock had been doing extremely well in anticipation of Adam and I was well ahead of the game on paper. Naturally, I bought some more Coleco. Big mistake!

When I looked for the display that showed off "my" Kid-Vids at CES, I was disappointed to find them hooked up exclusively to Coleco's Gemini console, their knock-off of the VCS. There was nary a sign anywhere that even mentioned the fact that Kid-Vid could plug into any one of the millions of Atari VCS units out there, which was the whole idea to begin with. It was the story of Magnavox Odyssey playing only on Magnavox TV sets all over again! There was no spotlight on them. Half a dozen Kid-Vid units rested forlornly on a dark display table, black on black. They just sat there, poorly lit, misleading signs and all. I got a real bad feeling right then and there that something was clearly wrong. After spending all that money on getting a whole Kid-Vid product line ready for the show, securing all those expensive licenses for their software...where was the pizzazz?

The cause of this lack of attention to Kid-Vid and everything else in the Coleco line, of course, turned out to be Adam's serious problems. Everything else was small potatoes at Coleco and took a back seat. Another example of how good ideas die and a lot of money goes down the drain. Even so, several tens of thousand of Coleco's Kid-Vids were produced and sold through at retail that year. But that was the end of this product of my imagination.

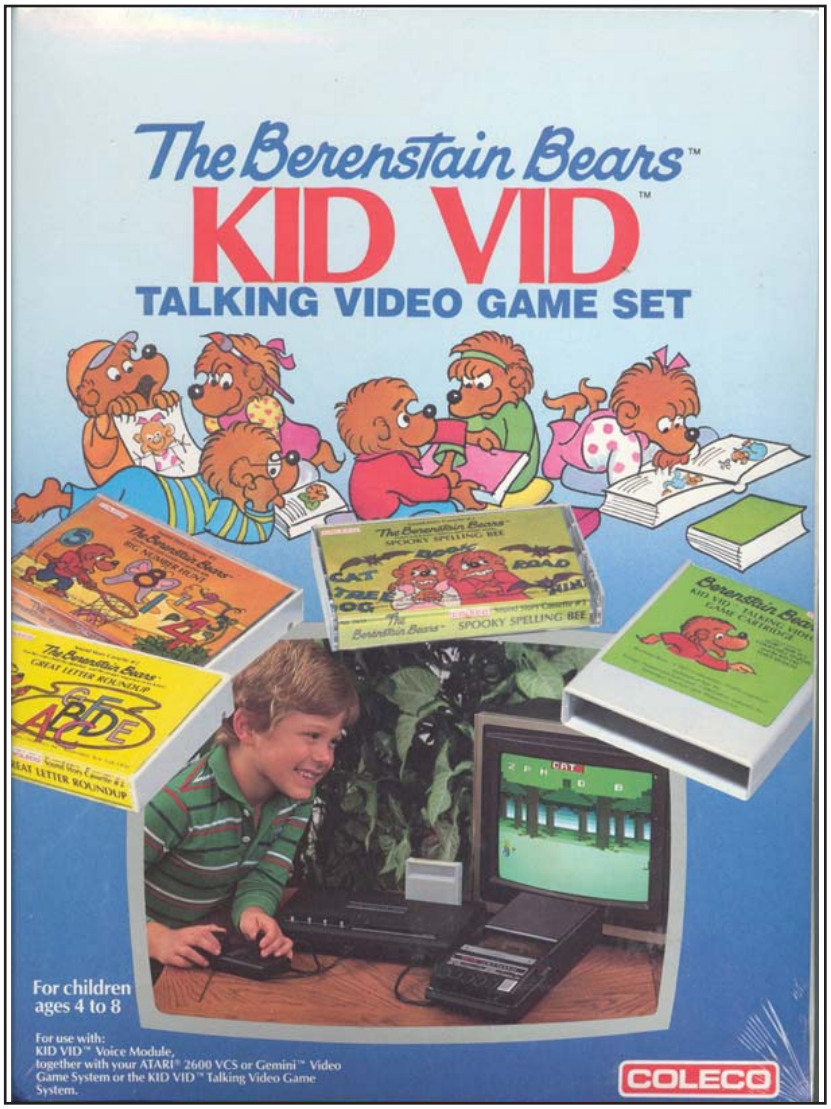


Figure 139 - Berenstain Bears Program Cassette For Kid-Vid (1983)

Neither Kid-Vid nor Adam were actually introduced to the public until that summer 1983 CES in Chicago. Months earlier, unaware of the impending disaster, I tried to get Coleco interested in some additional technology that we had developed at Sanders. I invited myself down to Hartford on March 1 and demonstrated my goodies to Eric Bromley, Rob Schenck, his lead engineer on ColecoVision and Adam, and to several others.

I had four sets of goodies to show off:

1) *Telesketch*: the method of drawing on the screen during a videogame to create interactive symbols;

2) a novel software scheme for allowing players to get an "instant replay" during a sports game;

3) a low-cost method using colored filters for use with light guns for shooting and recognizing targets on the screen. A hand-held "Laser Starfighter" was my demo "gun" for this scheme during that trip; and

4) my method to combine videogames with laserdisc players.

These demonstrations set another train of negotiations in motion that eventually led nowhere.

Years later I would see instant replay and functions similar to *Telesketch* in many home and arcade games but sales of products infringing my patents for these features were never big enough to warrant "going after" the infringers. Infringement involving product having sold less than a hundred million worth at retail can't be practically pursued because the cost of litigation is too high.

The TV Alarm Clock... And Other Interactive Video Gadgetry

When I brought the *Kid-Vid* down to Hartford in 1982 I had taken three other video items along that I thought I might be able to license to Coleco. Following the *Dr. Seuss* demo, I went on to the next product concept, my "TV Alarm Clock" system. This was a small unit that could be placed atop a TV set. There it would show the time of day in large, alpha-numerics on the TV screen. It could also be used as an alarm clock. You could set a wake-up time on the screen and the device would turn on the TV set at the allotted hour. This was another product ten years ahead of its time, which often appeared to be one of my specialties! I had come up with this concept (and others like it) in the early 1980s. The heart of the system was a novel technique for superimposing alpha-numerics onto an on-going TV broadcast picture. The method I used involved placing small box between the antenna or cable and the TV set and "crow-barring," i.e.: reducing to zero, the level of the incoming signal whenever a pixel of a digit or letter needed to show up on the screen. That worked because U.S. TV signals produce white video at low, incoming, transmitted r.f. carrier levels.

The need for synchronization between my display circuitry and the TV program made the project difficult. I made it work by extracting horizontal synchronization signals with a small wire antenna that picked up the radiation of horizontal sweep signals from the TV's deflection coils which sit on the neck of every picture tube. The scheme allowed me to regenerate the horizontal sync signals I needed to synchronize my alpha-numerics with the TV program.

Vertical sync was recovered by "looking" at the raster of lines on the TV screen with a photo sensor placed in the lower right corner of the TV screen. This process required quite a bit of signal massaging but it worked remarkably well when we finally got it all together at Sanders.

I thought that we had come up with a practical, licensable, electronic consumer TV product. I introduced the TV Alarm Clock concept at an IEEE conference on Electronic Consumer Products, where I gave a talk and demonstrated the device. The concept was well received. Patent applications were also on their way by that time. GT&E wanted to do an offshore cost

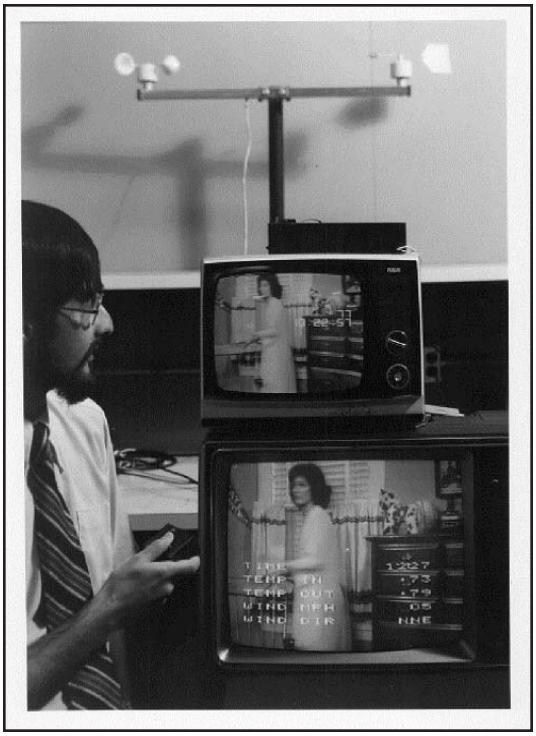


Figure 140 - Lenny Cope With Weather Station

estimate, based on an LSI device that Ed Sacks (General Instrument - Hicksville) was supposed to quote but he'd never gotten around to it.

Another product that I demonstrated to Coleco was a video weather station. The hardware was made from a kit supplied by Radio Shack. It displayed on the screen using the same technology that made the TV Alarm Clock work. Temperature, wind speed, wind direction, and barometric pressure were all displayed on the TV screen. And with any luck you could beat the local weatherman at predicting the weather more or less accurately.

Eric Bromley really liked the TV Alarm Clock. He came up and visited me at Sanders on August 12. Unfortunately, like so many other things I tried to work on with Eric, the TV Alarm Clock went into semi-limbo. In a telephone conversation with him five days later, he had already cooled to the idea. He did confirm during that phone call that both the Kid-Vid and my interactive video patent licenses were "something we could definitely get together on." That meant that Coleco intended to sign license agreements if the prices were right.



Figure 141 - TV Alarm Clock

Promoting Advanced Interactive Video Systems At Coleco

The fourth invention of mine that I had demonstrated to Coleco at that same meeting was far more complex than the other three. For some time I had been experimenting with the concept of interfacing videogame consoles such as the Atari VCS with videodisc players. The object was to get much more detailed graphics onto the screen than those possible with current game graphics display technologies. I thought that Coleco's superior ColecoVision system was a perfect platform to use these novel, interactive videodisc systems concepts. Incredibly, Coleco was interested in my demonstration of a colorful pinball game based on this technology.

Promoting the use of a videodisc player in conjunction with, and under control of, a ColecoVision game (and possibly an Adam computer later on) for interactive games had evolved from earlier activities at Sanders. These initially involved the use of videotape players and, later, videodisc players together with videogame systems. One of the earliest of these systems, which we had built at Sanders, demonstrated the method of the madness via a pinball game. A videotape player provided the very rich graphics of the typical arcade pinball machine's playing surface; the computer-generated and computer-controlled "ball" would bounce off all the bumpers in the required manner since their shapes and screen locations were stored in RAM (Random Access Memory), using data downloaded from the videotape. The flippers were also computer-generated graphics.

Over time, having been impressed by my initial demo of the pinball "machine," Coleco, Arnold Greenberg and Eric Bromley in particular, became believers in interactive video technology, although their support didn't speed up the contract negotiations: It took until January 13, 1983 for Lou Etlinger and Coleco's lawyer, Sandy McGarvey, to sign off on a negotiated agreement that finally covered all the bases.

That done, I sent Eric a letter on January 23 at his request, offering Sanders engineering services in support of a subcontract from Coleco to Circuits & Systems in Hollis, New Hampshire to build the demo system, all of which I have mentioned on page 147.

By June 16, C&S was able to show a working demonstration of a ColecoVision unit synchronized by a videodisc player working in an interlaced mode. That was quite a feat. Others had tried running videogames in interlaced mode like regular TV broadcasts only to run into all sorts of visual distortions. The worst of these was a "zipper" effect. C&S had overcome all of these problems.

Their demo was well received by Coleco who authorized C&S to go ahead with further contract work. That revolved mainly around nesting data on the videodisc in accordance with another one of my patents, also licensed to Coleco. This data was sent to the game's microprocessor on a running basis to synchronize disc-supplied graphics with those overlaid by the game system.

Getting Videodisc-Assisted Colecovision Under Way

Making an interactive game system, which would use a ColecoVision console in conjunction with a random-accessible videodisc player was no easy task. To make this scenario economically feasible and wind up with a reasonably priced consumer product, we absolutely needed a low-cost videodisc player. Think of a modern CD or DVD player and you'll get the picture.

Getting Philips in Holland, or Pioneer in Japan to modify and cost-reduce their unpopular and expensive 12-inch laserdisc players was not in the cards. On the other hand, converting one of RCA's SelectaVision, capacitive-stylus sensor (CED) videodisc players seemed eminently feasible to me based on a study of their standard, 12-inch product. SelectaVision was a fine disc player, and was superior to the optical, analog laserdisc formats. In fact, the RCA system had twice the laser system's picture signal carrying capacity and was much less costly to produce. For high-volume distribution, RCA videodiscs were inexpensively produced from masters by pressing them, just like phonograph records.

The advantage of the CED over the laserdisc systems of the 1980's was its bandwidth. For the same signal-to-noise ratio, you could get nearly twice the playing time out of the CED vs. laserdiscs. RCA never pushed their system to its limits. Had CED prevailed, it could have also delivered twice the data rate in digital applications. As it turned out, optical laserdiscs prevailed and were refined with each passing year until they evolved via audio CD's into data delivery CD ROMs, etc. It's interesting to speculate on how far CED might have progressed if the same amount of time and money had been spent on it instead of optical discs. But now, especially with the development of blue semiconductor laser sources and eventually ultraviolet sources, bandwidth per unit area keeps going up and up and prices down and down. The same, of course, holds true for magnetic recording. It was supposed to have reached the limits of resolution years ago but continued developments keep pushing them out.

If this raises a question in your mind regarding why the SelectaVision system did not "make it" in the U.S. consumer market, you're on the right track. The trouble was elementary.

SelectaVision arrived a year or two too soon. Nobody wanted a video player that couldn't record and it was not obvious in 1983 that only two years later people would go out and rent prerecorded video movies by the millions in video rental stores. RCA missed that window of opportunity by a hair, which is how it goes in the real world. Timing is everything!

Between 1982 and 1983 I had a number of discussions with Jon Clemens, the general manager of the SelectaVision videodisc program at the RCA Labs in Princeton, New Jersey. Jon and I had previously met a number of times at various technical conferences and had exchanged ideas about using videodisc

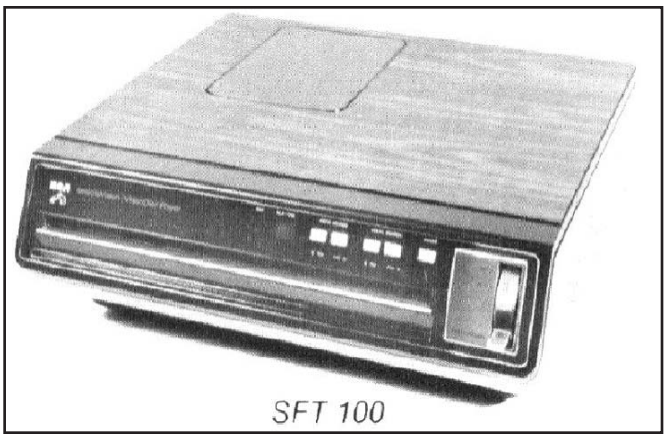


Figure 142 - RCA SelectaVision Videodisc Player

players in conjunction with microprocessor-controlled videogames. Here was our chance to finally make it happen!

Jon concurred with my estimate that it was entirely feasible to scale down his large player mechanism for this application. In fact, Jon's group in Princeton was already working on a radically cost-reduced version of their CED player for a CES '84 introduction. I put him in touch with Eric Bromley immediately. They began to negotiate a development program for a 5-inch version of RCA's SelectaVision machine that would suitably interface with ColecoVision. That arrangement was a real coup.

Looking at this activity from today's perspective, we were some fifteen years ahead of the curve. Shades of modern PCs and videogame systems using shiny 5-inch CD-ROM disks for interactive games!

Negotiations between Coleco and RCA went well. Some measure of my confidence in what was happening was reflected in a Memo I wrote on June 16, 1983. That same memo also reported on Kid-Vid's appearance at CES, referring to it as the Gemini Voice Unit. There was a technical meeting at RCA's Indian Road, Indianapolis facility that several Coleco and Sanders people attended, including me. Topics for discussion included product size, data nesting and extracting and disc branching requirements, schedule, cost projections, and so forth. I thought we were well on the way to revolutionizing the videogame industry.

No such luck! In the fall of 1984 Coleco began getting into hot water trying to cope with Adam's problems. Their computers were being returned faster than they could ship new ones. The writing was on the wall. By the time Winter CES in January 1984 rolled around, Coleco's booth was already virtually deserted. Adam had done a job on the company's reputation.

I met Arnold Greenberg on the floor of that show. He was clearly not in great spirits. In fact, he was so distracted that he asked me "why I had been a stranger at Coleco." Considering that I was in touch with Hartford practically every day, it seemed like a strange question. When I got back to New Hampshire I sat down and wrote a long letter to Arnold. He never responded to it. I'll admit he had bigger problems than keeping me happy. I mention it merely because that letter summed up everything we were trying to accomplish to make Coleco into a videogame market leader again. But the tides were against us.

By 1985 the Adam fiasco put a halt to our cooperative work in interactive video with Coleco just as it terminated all further development efforts by the company on ColecoVision and Adam.

Losing that chance to interface games with 5-inch shiny discs containing data and graphics was a blow and nearly fifteen years would pass until fully-digital versions of that system reappeared in the videogame world in Sony's PlayStation and various Nintendo and Sega game systems. By that time my mixed-digital-and analog- systems concepts were essentially obsolete and displaced by the all-digital technology of the 1990s. My interactive video patents were also history by then.

Historians may find fault with the fact that I don't mention that NEC delivered the first system that used CD-ROMS for the game data. The use of a CD in place of a plug-in with ROM is NOT what I am talking about here. It is the use of a CD both as a source of game and graphic data as well as a source of data that can be accessed during the game to do many things: Change the environment (scene), bring up new characters, etc. That's what characterizes true interactive video; not just delivering code off a CD instead of a ROM cart at the beginning of a game.

End Game At Hartford

The major reason why the interactive video project came to a screeching halt can be laid directly at

Adam's feet. But there were other factors that got in the way of successful product development. There were two warring factions in Coleco's engineering group. Eric Bromley led one of these, and Rob Schenck led the other. Rob nominally reported to Eric, but they constantly battled over every technical decision along the way. Rob was a savvy engineer, while Eric was the consummate mover and shaker with more marketing foresight than technical insight. It made working with Coleco progressively more difficult for me, especially when Rob insisted on baring his soul to me during CES '84. He took me aside and bent my ear for the better part of two hours.

Responding to Rob's requests for my opinions on his position in the scheme of things would have put me between a rock and a hard place. I acted my best laconic type, nodded agreement here and there, but committed to nothing. The situation left me with the distinct feeling that things were falling apart in Coleco's engineering group, which they were!

As a company, Coleco recovered from the Adam debacle courtesy of the ugliest dolls in the world, the Cabbage Patch Kids. Al Kahn claimed to be the guy who discovered that product. I was in Coleco's Hartford offices on business when Al came in with the first few of those dolls. Everybody there, including me, looked with disbelief at those ugly little critters. Who could have predicted that they would end up saving Coleco from an untimely demise?

Although I tried a few more times, I would never again place an electronic product concept, toy or game, with Coleco. Electronics became a dirty word there. The company finally went out of business altogether in 1989, mainly I think, because the Greenbergs got older and grew tired of the rat race. With it went a lot of my pioneering interactive videogame work.

ColecoVision games continue to have a loyal following in the Classic Games community. I'm still waiting to see one of the current crop of retro-game designers interface a ColecoVision console to a CD-ROM or DVD player to extend the game machine's capabilities. That would close the circle for me.

Atari And Me

Over the years, while I was still at Sanders, I had occasional contact with current and former Atari folks in one place or another. Under that category, I include guys from Grass Valley and other outfits that were organizationally independent but worked almost exclusively for Atari.

This brief account of my trials and tribulations with Atari covers a period from 1978 through 1989. Just for perspective, by 1978 the Atari VCS, designed by Steve Mayer, Joe Milner, and others at Grass Valley, was already going strong. As I've done so often with other people's hardware, I tried to come up with novel accessory ideas for the VCS. It was a natural thing for me to want to do. There were so many VCS's out there. Plugging something new and useful into them seemed to me to make good business sense.

One of my successful attempts to ride on the Atari VCS bandwagon was my Kid-Vid. During the design of that unit, I needed no direct contact with anyone at Atari. In the first place, I emulated the VCS with an Apple IIe computer during my initial demos to Coleco of my *Dr. Seuss*, One-Fish-Two-Fish sample program. In the second place, there were several engineers at Coleco who were thoroughly familiar with the VCS because they had just finished "knocking it off," developing their Atari VCS clone, the Gemini.

In 1982 I decided to put another emphatic push behind my idea of building accessories for the VCS. I experimented with light pens and created a series of quiz games that seemed different and interesting. In the process, I discovered that one way to make a light pen selective to what it would "see" on a TV screen, and what it would ignore, was to use color. Much to my surprise, it turned out that ordinary phototransistors developed the largest signal output when "looking" at blue colors on the TV screen. That wasn't what theory predicted, since silicon photo transistors are much more sensitive to red light than to blue. The reason for this reversal was the high luminous efficiency of the blue phosphors on the picture tubes. They put out far more light than the red ones.

Once I discovered this phenomenon, I used it to build light guns that would detect targets simply because they were blue and ignored everything else

on the screen. A piece of blue acrylic film in front of my photo transistor was all I needed to get this result. I wrote a disclosure and had Dick Seligman, Sanders' patent attorney, apply for a patent. It actually issued a couple of years later. It's too bad that this simple scheme for making light guns work was never licensed to anybody. Shooting at the screen couldn't get simpler and cheaper.

I also used this scheme in a small plastic box camera that produced a signal when it was pointed at a blue object on the screen. This simple scheme could be used to play detective games, where "photographing an object" would allow you to accumulate clues.

For the next two years, Bob Pelovitz and I designed and built a variety of similar accessories in the lab at Sanders and, often, downstairs in my own lab at home. The most important concept to come out of all this work was the idea of involving the videogame player physically, i.e. require him (or her) to move about the room in response to the game's story line action.

We also built an *Atari Download* prototype which has survived to this day in a cigar box. If I remember correctly, this project was meant to demonstrate how easy it was to download games to the Atari VCS. We imagined a distant games (software) server to which one could connect in order to download games using a modem. The prototype used an Apple IIe computer, acting as the remote source of game data. The Apple IIe was connected to a special cartridge plugged into the VCS to which the computer sent the game software. The cartridge contained nothing but a simple RAM chip into which the program was copied. Once that was done, the game could immediately be run on the VCS. Others were on the same track, promising to deliver VCS-compatible games over the telephone line but each of these ventures foundered in short order.

My work with accessories for the Atari VCS game system fizzled for lack of interest by prospective licensees. The entire videogame business tanked during the early 1980s until Nintendo came along and revived the industry. Several years later I had an "accessory" idea that was so compelling, I just had to pick up where I left off in 1982. The new concept was basically a novel way to do shooting games. Taking a leaf from the ever-popular laser tag games (where two players chase each other with IR "guns' and try to "hit" the other fellow's chest unit), I came up with the idea of Laser Tag Video.

This was to be a videogame where the player could shoot at bad guys on the screen but could also be "hit" by those same screen characters. The on-screen opponents also had the uncanny ability to locate exactly where the player was physically located in the room with respect to the TV set - a feature I dubbed "spatial recognition." As in a laser tag game, the player would wear a chest-mounted IR receiver.

With this system, players could hide behind furniture, exposing their positions just long enough to get a shot off at the opponent on screen, making for a physical game that would probably play well in a home videogame, but also had all the earmarks for success in an arcade environment. In fact, a very similar system appeared in 2001 from Konami. It was called *Police 911* and used a floor mat to determine the spatial position of the player. While that worked fairly well as long as the player stayed within the small confines of the mat, my wireless spatial schemes were much more capable.

What's more, I had a specific candidate system and company in mind for this videogame concept: Atari.

Over the years, I had followed the exploits of Michael Katz as he moved from Coleco to Epyx, where he was the company's president, and on to Atari, which was then run by the Tramiel family. Michael joined them in 1985 as their VP for new product development.

I called up Michael and invited him to come and visit me at Sanders. He showed up on December 3, along with Shiraz Shivji, Atari's Director of Engineering. We went over a disclosure document that I had written in November, which laid out various technical options to achieve the desired game action. I had already built a feasibility breadboard that demonstrated exactly how I would divide up the room in front of the TV set into five zones and showed that I could follow the player's movements through these zones.

Michael and Shiraz expressed considerable interest in getting together to develop "spatial recognition" game hardware and software for the Atari VCS. So far, so good.

Right after the New Year holidays were over, I sent a letter to Michael proposing that we enter into a contract for a demo system that would work in conjunction with an Apple IIe computer. In anticipation of getting a go-ahead, I spent the next two weeks building hardware and had Bob Pelovitz do the programming required to interface my hardware to an Apple IIe computer. We used a picture of *Sesame Street's* Ernie character on the monitor screen for this demo. Ernie's eyes moved from side to side, tracking us as we moved in front of the TV set. "Spatial recognition" worked! It was quite uncanny to have Ernie track us with his eyeballs. It made the character come alive in an almost eerie way. We were definitely on to something.

I finally reached Michael Katz by phone in early February and got a verbal go-ahead to do the things we had actually already done, with a payment of $5,000 being due upon delivery of the demo system, as requested in my letter.

A month went by. Bob and I kept making improvements to our system but the check wasn't in the mail. It finally arrived in the middle of April. It had been made out in March for the amount of $2,500 - half of what Michael had agreed to verbally.

He had a new stipulation which was to get some Atari people started on a demo on an Atari 800 computer. This was supposed to be a second phase activity scheduled to start after delivery of my Apple IIe demo. Since Michael chose not to come and look at that demo, I felt entitled to collect the balance of $2,500, which, in any event, was chicken feed compared to the amount of time and energy Bob and I had put into this project so far.

With some trepidation of where all of this was heading, I spent another two months, off and on, working with Lars Jensen, another outside developer who worked for Atari, reengineering my spatial recognition hardware so it would interface with an Atari 800. Lars was supposedly under contract to write the required software.

That effort ground to a halt because Atari, i.e. the Tramiel crowd, wasn't paying Lars either. The bottom line was that I never saw the other half of my $5,000 charge to Atari and Michael Katz wouldn't answer his phone. I postponed writing him a letter until December in which I expressed my unhappiness with Atari (and everyone connected with that firm) and asked him never to darken my door again (at least as long as he was connected with you-know-who). He didn't. Maybe he was just embarrassed.

So much for Atari under the Tramiels. The things they reputed to have pulled were to become legend; my experience with them was relatively trivial.

Smile, You're On Camera!

In 1985 I had occasion to work with Chicago-based Bally-Midway once again. By this time they were clearly a very professionally run arcade videogame company and this time we had better luck licensing them under patents for a game system that I had invented. It made use of a video camera that was built into an arcade game to take a picture of the player's face. After digitizing and storing the face, the image would be used in the game as the head of one of the on-screen characters; and it could also be used to display the players' faces alongside their scoring credits.

I had come up with that original idea and built a simple demo back in Manchester. It proved that I could inexpensively digitize a face and play it back at will. When I had that working reliably, I took it to Chicago where Howard Morrison and Geoffrey Breslow helped me set up my demo. We experimented with room brightness and external lighting to illuminate faces until we got good-looking, digitized pictures onto the TV screen. Howard invited John Peserb, a one-time major league baseball player and Chief Engineer at Bally-Midway, to come and look at our demo at Marvin Glass' impressive studios on North LaSalle Street. The demo went off fine. John liked the concept and immediately began to negotiate for a license with the Glass partners.

After I returned home to New Hampshire, I designed and built another more complex board that did a far better job reproducing faces. It took a circuit board full of TTL Integrated Circuit logic devices and a small amount of digital memory to come up with that capability. What I got for all that effort was much higher resolution and better gray-scale, which reproduced faces very recognizably. When I had it working well, I

shipped the new board to John Peserb. Bally's own engineers took it from there and designed similar circuitry into a new arcade game whose design they shared with Marvin Glass. A year later, when Bally did not need it anymore, I got that board back. I converted it to a scanner for passport-size photos. Never waste a nice piece of electronics!

Once programmers at Marvin Glass and Bally had produced a game using the camera concept, the machine went to a Chicago arcade where it worked well and attracted players. Within a day, however, some idiot got up on a chair, dropped his pants, and mooned the camera...and that was the end of the concept of using a TV camera in a coin-op game. It takes all kinds to make a world.

The project was salvaged by digitizing the faces of a rock group and placing their images on top of screen characters in a game called *Journey*. It was the first game to make use of digitized human faces or bodies. Eventually, a patent issued that covers the generic art of digitizing faces and using them in games. Another Baer First! Unfortunately, my name was inadvertently and mysteriously left off the patent through a major screw-up. I did not discover this state of affairs until years later. It took three years to get the U.S. Patent Office to add me to the list of inventors.

In the late 1990s, Nintendo's Gameboy sported a video camera accessory that did exactly what I had come up with twenty years earlier. It used a small plug-in module with a low-cost, low-resolution camera that took pictures of the player's face and allowed that digitized image to be placed on the body of a screen character.

I urged John Pacocha, a patent lawyer handling patents in the Marvin Glass estate trust, to lay a preliminary letter on Nintendo in 2001 suggesting that they take a license to the patent. Even if he had, knowing Nintendo, I wouldn't hold my breath waiting for money to pass hands. As it turned out, no letter was ever sent out at the time.

The concept of digitizing the facial features of famous people would eventually be regularly incorporated into most modern sports and many other games. In fact, games without images of currently "hot" performers are now just plain inconceivable. Times change. Technology changes. What was too expensive to do yesterday is like falling off a log today.

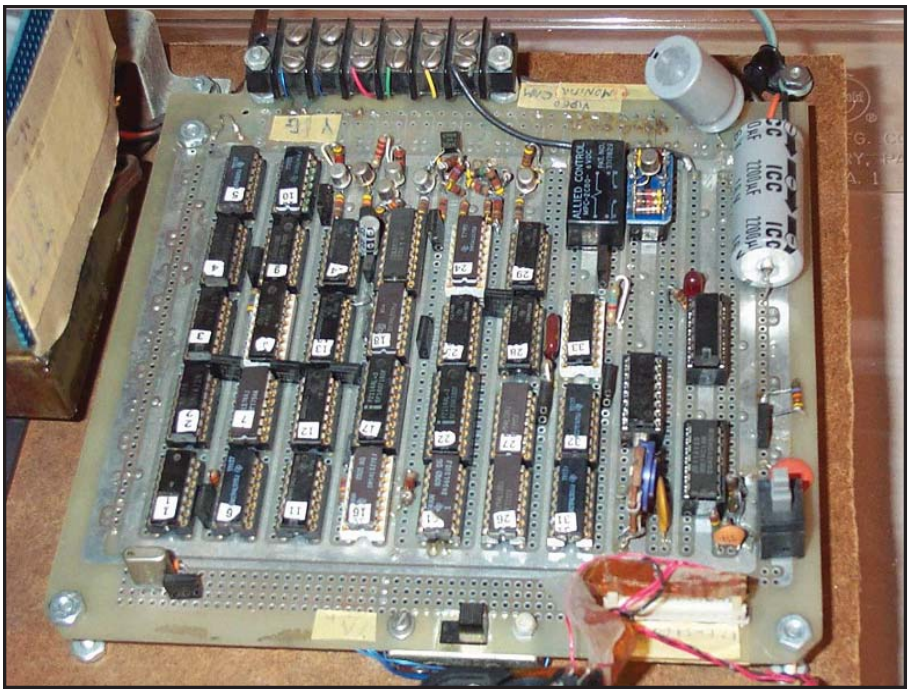


Figure 143 - "FACE" Digitizing Logic Board

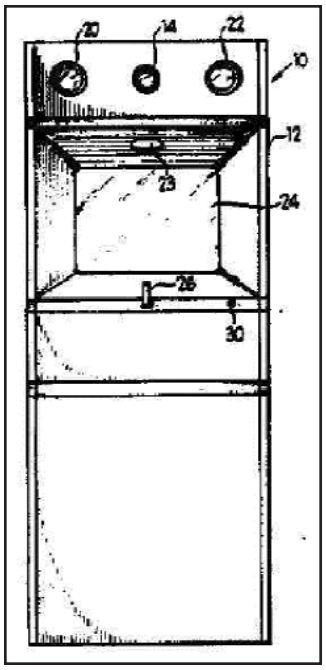


Figure 144 - 47a. Patent Drawing Of The Arcade Game With Camera

An Encounter With The Nintendo NES

The Gameboy Camera wouldn't be the first Nintendo product that I suspected infringed on my patents. In the mid-eighties, the home videogame industry tanked, absolutely and totally. There wasn't a dealer in the U.S. who would consider taking on a new line of videogames. The market had been saturated by shoddy look-alike games. Atari cartridges were being dumped in land-fills. It was that bad.

Nintendo of Japan had developed a new game system which they called the Famicom. It did well in Japan but the idea of introducing it into the U.S. did not look like a winner. Nintendo's game system made its first appearance at the Las Vegas CES in January 1986. In *The Ultimate History of Videogames* by Steve Kent (Prima, 2000), Howard Lincoln, the chairman of Nintendo of America is quoted as saying: "*We didn't even know if we really wanted to get into the home videogame business in the United States. We got a mixed reception at the show. The reaction, as I recall, was that anybody who would get into the videogame business was nuts. They liked the hardware, though, and the games*."

As Steve Kent described it, once Howard Lincoln and Minoru Arikawa, president of Nintendo of America, returned to their Seattle office after the show, the decision was made to sell their system as something other than a videogame. Kent told it this way: The solution came in the form of a light pistol and a little robot; a little robot that got its instructions via visible code flashes on the screen of the TV set. Sound familiar?

I encountered my first Nintendo Entertainment System (NES) sometime in late 1985. Lou Etlinger had sent me two NES units which he had received from Magnavox (by this time a brand name of North American Philips), with the usual request: "Could you please look this stuff over and see what makes it tick". English translation: "What parts of this system appear to infringe our patents...and thank you for your free advice".

I remember unpacking the components and setting them up in my lab at Sanders like it was yesterday. Playing the *Duck Hunt* gun game was an absolute blast in my humble opinion. Then there was that robot, ROB. It worked perfectly, even if it was a little incongruous. My first reaction was: "Why did they bother with this thing...it's cute but it's just a gimmick". My second reaction was a little different: "Hey, the gun game infringes several of my earliest patents; and sending digital code to the robot via flashes on the screen steps squarely on the toes of more of my patents."

After this epiphany I went to work and traced the p.c. wiring of the mother board in sufficient detail to get a good idea of what made the NES tick. I drew a rough sketch identifying the components on the board (Figure 148). Using a storage oscilloscope, I recorded the digital flash sequences that told ROB to raise or lower his arm, turn left or right, open or close hands. I drew a matrix of that code and added it along with the layout sketch to a memo (Figure 150) which I addressed to Lou Etlinger.

P.S. Historical non-sequitur: This memo was typed by me on a Coleco Adam.

I followed up the memo with a visit to Lou in his office. Basically, my question was: "What are you going to do about this?" Lou said that he would first ask Dick Seligman, his assistant (and the man who wrote all of our early videogame patents), to go over the details and make an assessment of the situation. Dick did just that in his usual, thorough way after I had given him a demo. Some of the scribbled comments in the memo's margin reflected my thoughts after getting feedback from him. In particular, he didn't think that my '805 Digital Video Modem patent would apply because there was only one digital light flash on the screen per bit during the transmission of the ROB code. My Digital Video Modem technique covered transmitting a whole byte (8 bits) per screen. However, other digitally coded data transmission via flashes from the TV screen were covered by some of my patents.

At that point the ball was in Lou Etlinger and Tom Briody's court. Did they want to lay this on Nintendo, given the fact that there were currently licensing negotiations going on between NAP and Nintendo? Potentially, there was also an "inequitable conduct" lawsuit waiting in the wings that could be scheduled by the Court at any time. As far as I know, the subject of

RHB copy
11/30/85

Memo

To L.Etlinger
From R.H. Baer
Subject: NINTENDO NES (Home Video Game)

I studied the NINTENDO NES game unit; pistol attachment and robot accessory supplied to us by NAP. The results of this investigation are summarized below:

1.Game Unit. The game unit of the NES consists of a single p.c. board comprising a ROM-cartridge -programmable microprocessor controlled video game with roughly the same capabilities, resolution etc as the Z-80-based Colecovision game. The attached sketch of the p.c. board shows the CPU, the PPU (picture processing unit), the V(ideo) RAM, the W(orking) RAM associated with the CPU, a custom (NINTENDO,U 10) IC which I assume to be the sound-generating IC, some glue-logic including joystick-ports interface logic (DA 1 thru 4); also present is a central edge-connector which is accessible through the bottom of the unit via a break-away plastic cover. This is apparently meant to allow additional RAM or ROM via a small permanently installed plug-in unit in the well on the bottom of the case.I make this assumption because the p.c. board traces show that this connector shares many of the ROM lines.
2.Robot Unit. The robot is a free-standing, battery-operated unit which gets its commands (to raise its arms, close its hands etc.) by "looking" at the screen and picking up digital codes optically in the maner of our (S/A)digital video Modem. The actual code used is shown in the attached sketch. It cosists of flashing the entire screen with near-white(greenish) color for max.light output. As can be seen from the sketch, 10 consecutive field are used to convey a digital command, i.e. 10 bits are transmitted to the photosensor in the robots head, for each function (e.g. raise arms, etc.). Note that there are only 4 significant data bits (ONES); the first ONE being a clock/start bit and all other odd column ONES being fixed.

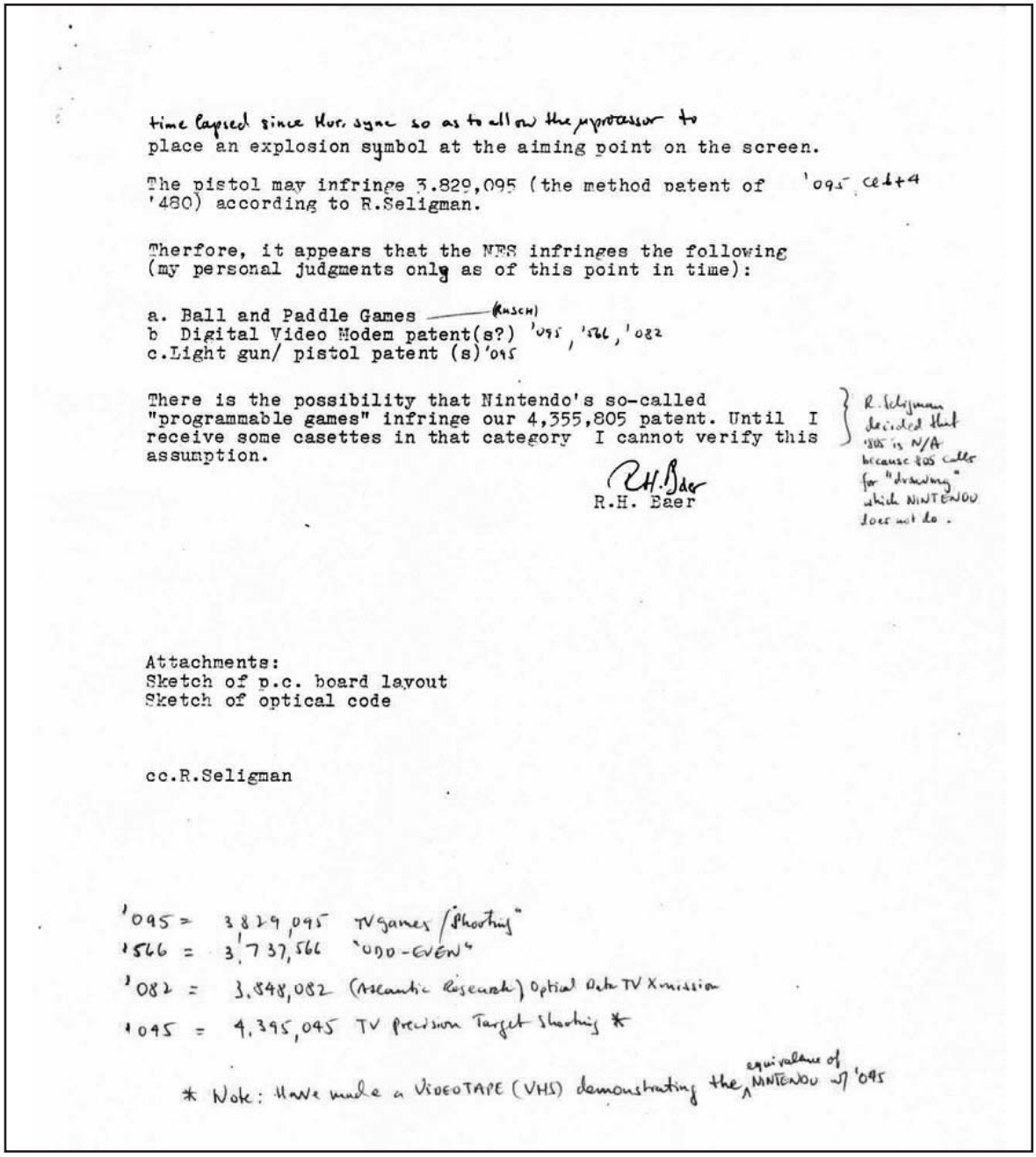
This method of optically transmitting data from the screen of a TV set to a device is close to our digital video modem patents, in particular the Atlantic Research patent which we acquired last year.

'095, cl 1+4
'566 = prior art, Robot only 4 bits over odd — won
'082 if VIDEO/AUX signal is substituted for camera.
'095, cl 1+4
'045, cl 1, 2, 3, 9, Fig 13

3. The Pistol Unit. This pistol contains a photo sensor and some (amplification, etc) active circuitry and plugs into one of the paddle-ports. It uses no lenses and relies on "barrel optics" for focusing. Nevertheless it appears to function like a photopen in that it recognizes the area of the screen at which the pistol is pointed by apparently counting hor. lines from vertival interval and horizontal

SA-00-1768 (6-81)

Figure 145 - Nintendo Note (1/2)



time lapsed since Hor. sync so as to allow the processor to
place an explosion symbol at the aiming point on the screen.

The pistol may infringe 3.829,095 (the method patent of '095 cited '480) according to R.Seligman.

Therfore, it appears that the NES infringes the following (my personal judgments only as of this point in time):

a. Ball and Paddle Games (Rusch)
b Digital Video Modem patent(s?) '095, '566, '082
c.Light gun/ pistol patent (s) '095

There is the possibility that Nintendo's so-called "programmable games" infringe our 4,355,805 patent. Until I receive some casettes in that category I cannot verify this assumption.

R.H. Baer

R. Seligman decided that '805 is N/A because 805 calls for "drawing" which NINTENDO does not do.

Attachments:
Sketch of p.c. board layout
Sketch of optical code

cc.R.Seligman

'095 = 3829,095 TV games / Shooting"
'566 = 3,737,566 "ODD-EVEN"
'082 = 3,848,082 (Ascantic Research) Optical Data TV Xmission
'045 = 4,395,045 TV Precision Target Shooting *

* Note: Have made a VIDEOTAPE (VHS) demonstrating the equivalence of NINTENDO w/ '095

Figure 146 - Nintendo Note (2/2)

going after Nintendo for infringing the gun and optical data transmission patents was never raised. Battling Nintendo in New York Federal Court came soon enough.

The Nintendo Lawsuit Interlude

The '045 Precision Rifle patent came back to haunt me in 1986. Nintendo, trying to get out from under a patent infringement lawsuit Magnavox/NAP had finally laid on them, turned around and sued Magnavox's outside lawyers and me for what they claimed was fraud on the Patent Office. In their declaratory judgment action Nintendo claimed that we had misled the USPTO in various ways. They tried to make a big deal of the fact that Jim Williams had seen a version of *Spacewar* decades ago. In my case they attempted to cast aspersions on my veracity by claiming that the '045 patent was fraudulently obtained. The basis for their assertion was a report I made on an Atari *Qwak!* arcade game at the 1974 MOA show in Chicago. Nintendo claimed that I had merely reinvented what

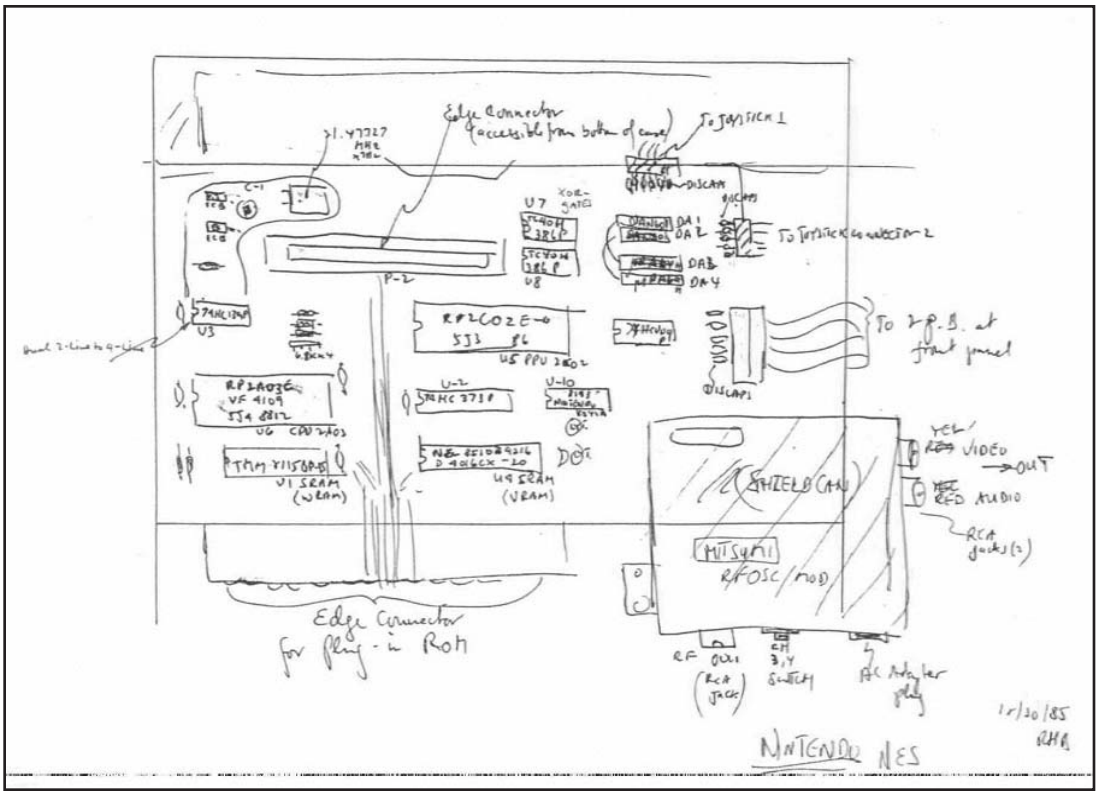


Figure 147 - Nintendo Design

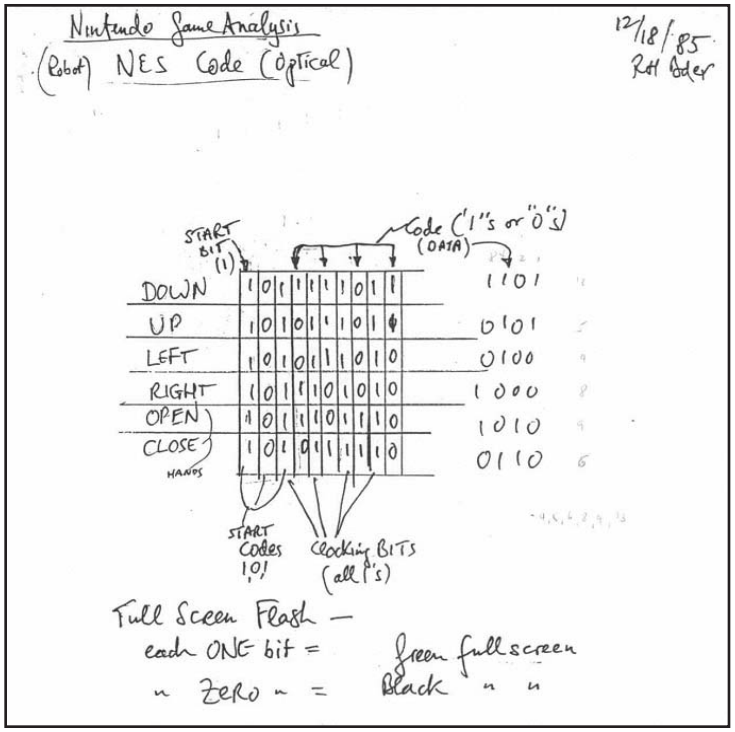


Figure 148 - NES Code

that game did. They also cited a string of other so-called problems in our contacts with the USPTO. It was all so much hot air being pandered by Rose Mudge, then about the most expensive New York law firm headed by John Kirby, who took pains to give me a hard time.

The trial took place early in 1986 at New York Federal District Court in front of Judge Leonard B. Sands. He was a tough activist type who had just gained notoriety by laying a fine of $100,000 a day on the city of Yonkers for failing to make adequate low-cost housing available for low income renters. It took three days of nasty confrontations in court during which the judge listened to all of the Nintendo lawyer's verbal garbage, growled a lot at all the lawyers, and eventually threw the Nintendo suit out on its ear.

Throughout that session I was bugged because I hadn't been able to figure out just how that old Atari *Qwak!* game functioned. It was quite immaterial as far as the suit was concerned, but as an engineer, it bothered me until I finally puzzled it out. I suspected that the game was simply one of the then already well-known types where a single white spot is put up on the screen at the target's location and where that spot lasts for just one video field. So why didn't I see the darn spot? The answer came to me in the middle of the trial. The *Qwak!* game was in black and white. At the bottom of the picture tube, a graphic of a bunch of reeds sticking up into the air at the edge of the duck pond, was silk screened onto the CRT. There had to be some backlighting to make those reeds visible as silhouettes. That meant that the screen would normally have to be at some moderate brightness level. Bingo! With the screen normally quite light, it was that much harder to visually observe the sixtieth-of-a-second, single-field white target flash whose brightness did not exceed that of the normal screen by much. So that's why I couldn't see that damn spot.

During a recess in court I tried to convey this sudden insight to our lawyers but they thought it was irrelevant to our defense. They were right on that point but to me, it was like finally getting rid of an itch that I hadn't been able to scratch for the longest time.

That inequitable-conduct episode certainly wasn't the end of Nintendo's attempt to outflank our demands that they get under a Magnavox license. Having been foiled in their attempt to get our patents invalidated, a new trial was eventually scheduled. This time it was to be a jury trial, again in front of intimidating Judge Sands. In August 1990 (yep, the wheels of justice turn slowly, to put it kindly) I was once again put on notice to get prepared for another appearance before the bear. At that time, the dates for discovery to close, for the final pretrial order and for the commencement of the trial were set for September to November. Again I spent a week in Chicago, surrounded by mountains of documents and all of my old game hardware, going over my forthcoming testimony. Then the word came from Magnavox: "Hold off, we're negotiating with Nintendo." In late February 1991 the word was circulated that Nintendo and Magnavox had "resolved their differences". They advised Judge Sands' clerk that the trial be removed from his calendar. I got the usual letter of thanks from Ted Anderson for my "valuable assistance" but, of course, nobody would divulge what the settlement actually consisted of. It wasn't until many years later that I saw a document that shows what happened: Nintendo paid NAP an even ten million dollars to settle all differences and to cover past infringement. They got away cheap.

So much for Nintendo and the problems with my precision target shooting patent.

Interactive Video technology At Sanders - The IVTS Pinball Videogame

I had been noodling the idea of using a VCR to provide colorful backgrounds for video games around in my head since the sixties. After all, our work on Cable Games with TelePrompter and with Warner Cable had the same objective, namely, to spruce up the display, do away with overlays, and make the screen come to life!

Sometime in 1975 I came up with the idea of using a VTR to provide those dynamic backgrounds. By chance I came across a page in *Playmeter* magazine that showed a colorful full-page picture of a new pinball machine's playing field. I took one look at that illustration and said: "That's what we want to see on our TV screen when we play a pinball video game".

Betamax and VHS tape recorders were just beginning to appear and were becoming affordable. So the idea of using your home Video Tape Recorder (VTR, it changed into VCR for Video Cassette Recorder a few years later) made economical sense.

Technically, it was a challenge to combine a VTR playing back a pinball field with flashing lights and gyrating bumpers and overlay computer graphics on that field. Everything had to be designed and built from scratch.

Lenny Cope and Tom Mortimer did an initial paper design based on an Intel chip set using an 8085 CPU, two 8355 ROMs, an 8155 Scratch Pad RAM, an 8102 Character RAM and a 2108 CRT RAM. Tom also designed the Video Tape Programmer whose function was to generate a tape that not only contained the visual playing field, but had somehow nested in it all the data needed to define just where the various bumpers, walls, chutes etc. were located at any one moment, in real time, as the expression goes.

The better part of six months went into hardware design and assembly of the Pinball Game unit itself, with Lenny and my technician, George Mitchell, doing the work. The system was based on Lenny's earlier paper designs of what we had termed a Home Entertainment Center (HEC). It was our concept of a versatile videogame system that could double as a PC by means of what we called "Personality" plug in units. We had previously tried to get Texas Instruments to adopt this game system. In fact, discussions between TI and Sanders got up to the senior management level, with Harold Pope, our Exec VP, and the President of Texas Instruments getting into the act. In the end, Texas Instruments went their own way. Lenny designed a Personality Plug-In specifically for the TV Pinball game and George built all of the hardware into a wooden box.

At the same time Tom Mortimer designed and George assembled the Video Tape Programmer and worked on it until it performed to spec. Its function was to annotate the videogame tape during the horizontal retrace interval (a bare five microseconds during which the picture tube's beam sweeps left from the end of one horizontal line to the beginning of the next line. As the sketch of the Video Tape Programmer shows, we pointed a color camera at a large colorful poster of the pinball playing field. Fixed and moving bumpers were back lighted via windows



Figure 149- Our TV Pinball Game - Note The Flipper Button (Right) And Ball Launch Plunger (Front)

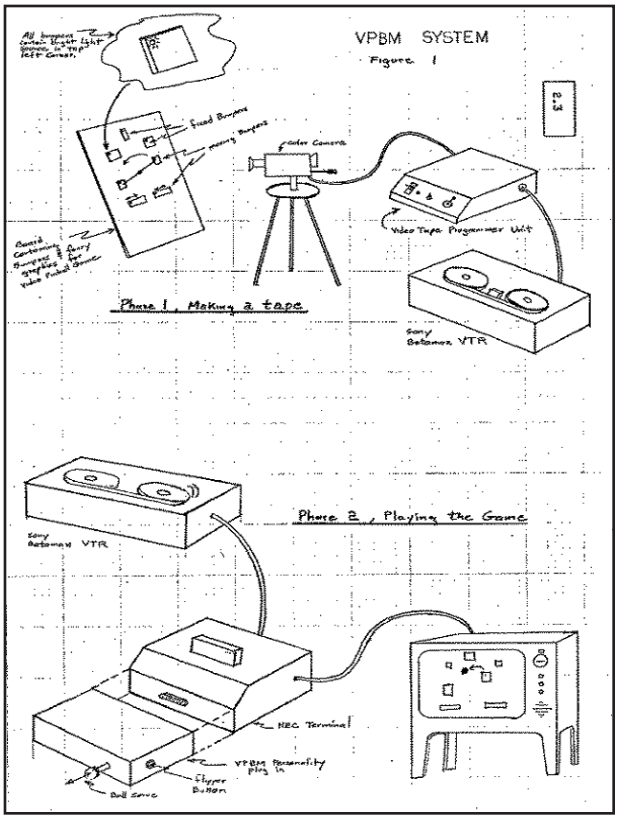


Figure 150 - Sketch of the Videotape Programmer & Game System

behind each item that the pinball might encounter. The instantaneous locations of these lights were extracted from the video signal and used to generate x-y location data which were stored on the video tape during the vertical interval (the time the CRT beam takes to go from the bottom of the screen to the top, once every 60th of a second).

The TV Pinball system was working by the summer of 1978. It worked extremely well and clearly demonstrated the feasibility of combining videogame technology with video tape players. We showed it repeatedly to prospective licensees, starting with Magnavox and Coleco. While everybody was impressed with the way it all worked, no agreement was reached. That wouldn't happen until another four years passed by, an eternity as measured by digital technology's time table, when the VTR was replaced by the videodisc player.

Another Aside: The Precision Rifle Story

Now, I wasn't in the Army and I didn't get a Marksman's medal for nothing. Using Interactive Video for precision marksmanship practice by soldiers and for training police officers in "Shoot or Not to Shoot" decision-making were obvious things to pursue. They were certainly practical applications of our newly developed ability of displaying computer generated symbology on top of realistic scenery that was delivered by videotape and projected onto a big screen. What's more, they might interest in-house military marketers and motivate them to get Sanders involved in the weapons training and simulation business.

The simple, actually crude, methods for shooting at TV screens that we had used in our original light guns for our early videogames wouldn't do for precision targeting. These older schemes generally depended on either a large, visible white dot target or one that came up briefly after a trigger pull and was basically invisible to the human eye. What we needed now was a way to tell us which scan line and exactly where along that line we were sighting our weapon. Since there are roughly 250 horizontal scan lines in each field, we looked to develop the capability of recognizing each one of these lines. That called for a precision of better than half a percent.

Good optical design handled that requirement. Resolving the horizontal position required high electronic speed. We settled for a response time from the photo sensor and its amplifier of a couple of microseconds, or about three to four percent accuracy since a horizontal TV line is about 60 microseconds long. That took some doing and kept me busy in the lab experimenting with various sensors and circuit designs.

The gun worked in conjunction with an Apple IIe computer that one of my engineers at Sanders spent several months modifying. He got the computer to run "interlaced" and to be responsive to digital data that was nested on the video tape to whose signal the Apple IIe was "gen-locked" or synchronized. Nested data generally consisted of such things as the coordinates of a target, or the type of target used during a precision rifle training exercise.

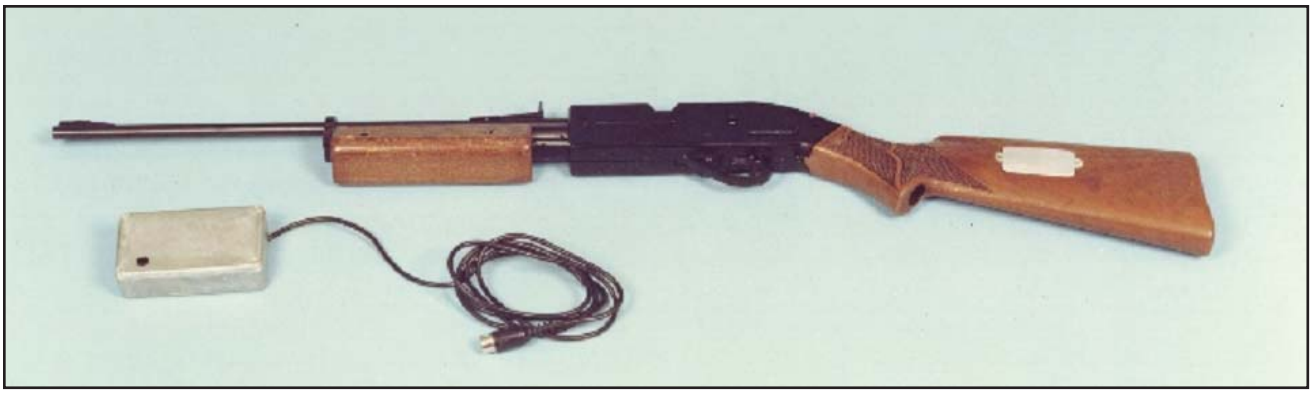


Figure 151 - The Precision Rifle Along With The Small IR Data Receiver That Plugged Into The Apple IIie Computer

When we got that all working in September 1979, we built the optics and electronics into the pump action BB gun. Using our big Kloss six-foot diameter projection screen system, we had a very respectable weapons training demonstration that we showed off to various interested people at Sanders. In August 1980 we also demonstrated it to the Nashua police chief who was planning to train his officers with a program developed by Motorola to improve police officers' decision making in tough situations. That program consisted of a videotape presentation containing about a dozen two-minute scenarios depicting policemen in various tight spots.

A typical scenario was that of a police officer climbing up a staircase. The officer in training acted as the back-up for the officer who was climbing. The trainee's job was to provide cover for the on-screen officer and to be prepared to shoot if a door suddenly opened and an armed person threatened them. In the Motorola program, another officer watched the trainee's performance and graded his performance and compared his reactions to those deemed appropriate by the Motorola textbook.

We went out and bought an optical adapter for a 0.45 caliber Colt police revolver and modified it with electronics and optics similar to those in our precision rifle. Now we could overlay graphic "hits" on the ongoing video presentation; by using a second tape recorder, we could tape the performance of the trainee officer so that it could be played back repeatedly for scoring and discussion. Unfortunately, the Nashua chief couldn't find the money to go forward with the project although he thought it was very worthwhile. I gave the Colt to our security people for safekeeping. I hoped that we would find another client for that scheme but of course it never happened.

The system of precision targeting a video presentation had a number of novel features; the most notable being the business of nesting data on the videotape that was related to certain target spots in the scenery. The nesting and extraction of this real-time data from the videotape and its subsequent use by the system's computer for such things as locating the graphic "hit" spot explosion symbol were definitely new. Patent '045 was eventually issued for this system (page 219).

Our demonstrations of Interactive Video Tape technology were noticed by various people in Sanders' Defensive System's division. In particular, Al Nunes, a former U.S. Army field engineer, recognized the obvious. Our technology was the cat's meow for military training simulations.

One day Al showed up in our lab with a Light Antitank Weapon (LAW) and asked the crucial question:

"Can you make a video tape that has some Russian tanks moving around the countryside and can you play it through your IVTS so that I can "shoot" a LAW at the tanks and tell where the round landed and whether I got a hit?" Of course we could.

Tom Mortimer and Lenny Cope sat down with me and did a detailed estimate of what it might cost to do that job. We came up with a program schedule calling for about $50K and six months.

Herb Campman, our Corporate Director of R&D, went along with these projections and we got funded. Of course we didn't know it then, but this activity started us on a multi-year trek of developing military Interactive Video Training Systems that eventually resulted in quite a number of contracts for Sanders Associates. It was the Precision Rifle demo that started it all.

Welcome to Interactive Videogames in the Army!

The basic idea for the LAW system was the same as that underlying the Pinball game and the Precision Rifle system. It used motion video in combination with computer-generated graphics at a point in time when complex graphics could not yet be economically generated by small computers, never mind microprocessors. In the Pinball game, the VCR delivered the colorful background graphics. In the LAW training simulation system, the VCR delivered the military scenario with Russian tanks rolling by in the countryside.

The LAW program was a major challenge because it was basically a high- precision video target shooting system, as were all of our later weapons simulation systems. The object was to be able to point a modified LAW at a TV projection screen that showed such things as enemy tanks on the move. Either existing video footage, or new scenarios generated by running realistic scale models over outdoor terrain and videotaping them, could be used. Upon accurately aiming

and "firing" the LAW, we then had the job of displaying the computer generated graphic of an "explosion" on screen at the exact aim spot chosen by the "gunner". This required us to build optics and fast photo sensor circuitry that could pinpoint the aim point down to one particular television scan line (out of some 250 per field) and also determine its position along that scan line. The low-cost and rinky-dink videogame gun game technology that we had pioneered in 1966 and 1967 for our early videogames was obviously nowhere near capable of delivering the precision we needed for realistic weapons training simulations. Once we had videotaped a "battle scenario", it had to be sent through a system that allowed us to encode the horizontal and vertical coordinates of all critical aim points, such as a particular tank's turret, all in real time. When we "fired" the LAW at that turret as the tank went rumbling by on-screen, the system's computer had to extract that positioning data off the videotape, again in real time. If the gunner's aim was correct, the system would inform him of a "HIT," The (graphics) explosion on screen would be exactly where the gunner had aimed the LAW.

Since our LAW emulator was a shoulder-launched, freestanding device, we had to send the aim point coordinates it developed to a remote receiver, using some wireless method. A close look at the front of the LAW shows an IR diode just below the large lens. The "HIT" signal was sent via this IR transmitting device to a remote IR receiver. We discarded the designs used with the Pinball game demo system and used an Apple IIe computer to do all of the controlling and computational tasks. That computer was modified to produce interlaced video similar to video delivered by normal television programs and, of course, our videotape player. It took the better part of six months to get all that to work. The first time around, engineers in my old division, working with Lenny Cope, cobbled all of this hardware and software together. For later programs, such as the support-program with Coleco to interface their ColecoVision console to a videodisc player, we went "outside" and had Circuits & Systems do the work.

We demonstrated the working LAW system extensively inside Sanders to give it exposure to various program groups and motivate them to pursue the use of our IVTS technology. Al Nunes was in the forefront of making this happen and it took several years.

At one point, George Mitchell and I took our LAW demonstration to Washington and exhibited it at one of the annual U.S. Army weapons shows. We had a large projection screen set up, on which we showed our videotaped presentation of Russian tanks moving through snowy, wooded terrain. Positioning the 4-foot long LAW "stove-pipe" on a shoulder, we "fired missiles" at these tanks, with "hits" resulting in explosions on-screen, and "whooshing" sounds coming out of the rear of the LAW. During the afternoon, a couple of guys from the Russian embassy came over to our display area and asked us if they could "fire" the LAW.

"Sure thing," we said, "we never miss."

"That's not nice," one of the Embassy types said; but they went ahead and fired the LAW anyway. Of course, they got good "hits" also. They thanked us and left without further comment.

In September 1979, Al Nunes, George Mitchell, and I took our LAW demo system to the Pentagon. We spent the day rolling a large cart loaded with our equipment all over the infinitely long hallways of that monstrous collection of concentric-ring buildings, on our way to set up demonstrations for various personnel. The gear worked flawlessly.

Some general staff officers were so impressed with the way it worked that we were moved up the line until we wound up the day by demonstrating to the Honorable William Perry, the Under Secretary of Defense for Research & Engineering; and, finally, to Dr. Walter LaBerge who was then the Under Secretary of the Army. A two-star general actually demonstrated "firing' the LAW for the benefit of the Secretary. How's that for high-powered help? Word spread around and that came in handy when we bid on the LAW and STINGER training systems emulator a year later. Having the LAW system work and feel like a big, neat videogame didn't hurt either.

All this activity was finally crowned with a contract for a number of LAW IVTS units for the U.S. Army. We subcontracted the work to Circuits & Systems. They redesigned our hardware and software and built the hardware into a base that was positioned under an Apple IIe and painted to match the Apple IIe's case colors. All the required electronics were in that base unit except for one card which plugged into one of the connectors on the Apple IIe's motherboard. Very neat and



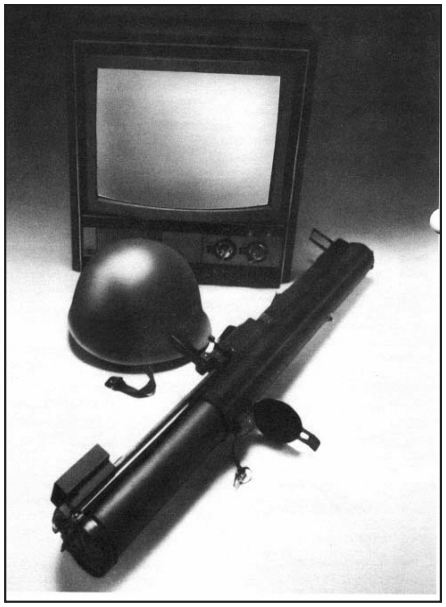


Figure 152 - The M72A2 Light Antitank Weapon (LAW) Modified For Emulation Training

very functional! Similar hardware was later built for other IVTS programs at Sanders such as the STINGER Trainer.

Early in 1980, Lenny Cope left Sanders and went to work for Mitre as a mathematician, which is what he had wanted to do all along. Bob Pelovitz took his place as my assistant. Together, working with Al Nunes and a few other innovative- minded marketers in the company, we managed to get Sanders into a number of weapons-simulation and weapons-training programs. That might never have happened if it hadn't been for our prior pioneering interactive videogame work.

One of these programs was a Combat Engineers Trainer that provided gunnery- mission training for the Combat Engineer Vehicle (CEV). Combat Engineers, using a special gun installed in an M-1 tank, used the CEV to shoot large satchel charges at embankments and fortifications. We emulated the gunner's position in the tank, using motion video to simulate the outside world as viewed through a monocular telescope controlled by a hand wheel. The gunner would steer his cross hairs onto the video "target," press a button, and launch the "charge." Then he observed the impact of the charge at the exact point that he had aimed at.

Another coup for interactive video training and simulation technology occurred at Sanders in 1986, after a prolonged effort on the part of a small band of dis-establishment characters that included Bob Pelovitz and Dan Florio, a savvy marketeer and former Navy pilot, and me. Basically, we were instrumental in salvaging a thirty million dollar contract from falling into the hands of the competition. The object of our attention was the upcoming contest for an aircraft carrier based Electronic-Counter-Measure (ECM) Maintenance System. Our aim was to use our interactive video technology, honed on LAW, STINGER, and the CEV, to help the typical, young electronic maintenance Navy tech charged with servicing complex ECM radar equipment on board a carrier.

The in-house group responsible for bidding on a new version of the Test Bench was more inclined to offer the customer an updated version of what they had provided the Navy in the past, rather than listen to us mavericks who were preaching a new interactive video based gospel. It was clear to us that if Sanders didn't offer the Navy something that would truly help the service technician, we would lose the job. We knew we could give their technicians meaningful help using motion video presentations and interactive "expert" software to support them every step of the way during troubleshooting of defective ECM equipment. We felt that we were on the right track but we had to convince the Navy that our videodisc-based technology would really do the job even under the most intense combat situations. In the real world, there's hell to pay when the Admiral is blowing his stack because his airplanes aren't leaving the carrier deck!



Figure 153 - Top and Bottom of the C&S Built

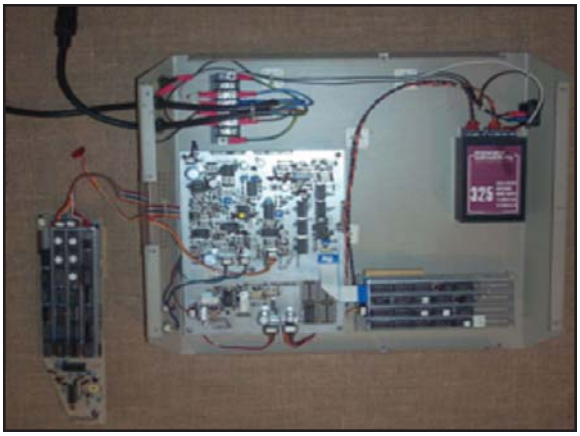


Figure 154- IVTS Conversion Unit used with an Apple IIe

No aircraft leaves the ship without completely functional ECM equipment...or it may never come back. Pity the poor tech who is at the tail end of the pecking order and has to make it all work. We built a demo laserdisc-based maintenance support system that showed how we could guide the tech efficiently through all the steps required to "fix" defective ECM suites.

Our system was to be the nearest thing to an interactive video movie. It would feature a motion video presentation by a senior Navy tech on-screen. He would walk the maintenance tech through servicing steps, one at a time, working with inputs from the tech based on measurements he was instructed to make. An "expert" software program on the videodisc fed that data to the system's computer. Its job was to answer the tech's question: "What do I do next?" The software's guidance would take him to the appropriate step. At a minimum, the system kept the tech from things like inadvertently and irreparably screwing up delicate microwave components of the ECM equipment during troubleshooting.

To bring interactive video-assisted maintenance training to their programs, we actually had to end-run the in-house program group responsible for Navy ECM Maintenance Systems. Our marketer, Dan Florio, and his associates, worked with the Navy customer at Point Megu over a period of a couple of years, while R&D funding gave Bob and me a chance to demonstrate the concepts via a detailed emulation. When the Navy finally saw the light, they mandated the use of interactive video for the program. It was: "Bid it this way or lose the program!" Since our concepts were clearly way ahead of the competition, the Sanders in-house program group finally got the message and brought in that thirty million dollar program.

It goes without saying that end-running existing organizational structures within the company did not



Figure 155 - STINGER Version of our LAW Interactive Video Training System



Figure 156 - The CEV Interactive Video Trainer



Figure 157 - Bob Pelovitz (2001)

endear us to the powers that be. However, Bob and I came out of this effort feeling that we had earned our keep. Interactive video-based training systems, IVTS, were here to stay. We were gratified to see that we had once again made all our R&D funding pay off.

1988 - Leaving Sanders... But Not The Videogame And Interactive Video Scene

With my ever-growing involvement in my own electronic toy and game invention and development business, and with the apparent end of videogame litigation, my interest in staying at Sanders began to wane rapidly. The feeling was evidently mutual because I got relegated to increasingly poorer office space during my last two years there.

My last office, actually a cubicle barely big enough to house my desk and some file cabinets, was located in the old Canal Street building where my career with Sanders had taken off some 25 years earlier. The view from my office window was that of a 10-foot wide alley between sections of the building. My office was also distinguished by its prime location right next to the shipping department at the far eastern end of the building. At least I didn't have to go very far when the time came to pack up my stuff. Plenty of old cartons in the shipping department. Bunch of nice, helpful guys in there too. They made it easy for me to take my records with me. Without them this book would have been mercifully shorter but much less informative on those early days of videogame and interactive video history.

I occupied that office while I was still employed by Sanders and during the year afterwards when I came in daily as a consultant. I had "quit" on a Friday afternoon, turned in my badge, and returned to that same place on Monday wearing a consultant's badge. During that year I pursued mostly those videogame or interactive video technology subjects that were of interest to me; I steadfastly resisted Sanders' attempts to drag me back into one divisional proposal effort or another. Finally, I decided that I had enough of commuting and resolved to devote myself 100% to R. H. Baer Consultants. I left Sanders in 1988 when I was 66 years old.

While I occupied that office, a four-player *Skate-N-Score* unit with the picture tube facing up (which we had put into a horizontal cabinet years earlier) sat

unwanted in the hallway right outside my door. I didn't feel like cluttering up my lab or my demo area at home so I left it there. The same fate befell the four-player *Skate-N-Score* game in the wooden box, which hung around a shelf in a storage area in South Nashua for years. Too bad. All of these were unique examples of the progression in technology during the first decade of videogame history-and I neglected to take charge of them.

It's like they say in Pennsylvania: "We get too late schmart."

Meanwhile, Bob Pelovitz had joined a program group at Sanders and clawed his way back up into the system. His absence from "legitimate" work at Sanders while working with me hadn't helped his position within the company. Despite this handicap he moved up the line for a couple of years by dint of sheer effort and superior brains. About that time I also introduced him to various law firms who were looking to me for support in videogame-related lawsuits. I was not tempted to engage in them anymore and happily handed them off to Bob. That activity proved to be his meat. Eventually, he too quit Sanders and started Micro- Pros, his own consulting firm.

Bob and I continued to work together since leaving Sanders. We have worked on a number of toy and game inventions and took on several engineering jobs. Among these was Video Buddy, a preschooler, interactive videotape based educational product which used optical data-extraction technology that I had invented in the 1960s. In 2000, we licensed Hasbro/Tonka to produce a series of *Talkin' Tools* that I had come up with and which Bob had programmed for me. My connection with videogames continues but it has become quite tenuous. Except for my exposure to the limelight at the Classic Gaming Expo in Las Vegas, along with the Brown Box, and the possible further pursuit of "spatial recognition" games, working on videogames is soon going to be history for me. But not quite yet.

Keeping the details of the early days of videogame history alive is a job that still needs attention. This book is just one attempt to fill in many of the details.

I am also taking care to see to it that the Brown Box and other early game units and associated data will be properly preserved and exhibited in suitable venues. The Brown Box and some of the earlier TV game units are already at the Smithsonian Institute's National Museum of American History and will become part of a permanent exhibit there. Data that David Winter and I recently unearthed in a Chicago warehouse, together with Bill Harrison's notes (of which I had copies), have made it possible to replicate virtually any of the game systems that had been built between 1966 and 1969. I have already built replicas of the Brown Box' predecessor, our TV Game #6, as well as replicas of TV Games #2 and #3, and the Brown Box.

Perhaps sometime soon kids will be playing Ping-Pong or Handball on the Brown Box, or a faux replica of it in one museum or another somewhere on the globe. As for me and my involvement with videogames and the rest of the interactive video systems scene, everything has to end sometime.

I've had a great run. No complaints!

Closing Thoughts About Videogames

I would be amiss if I didn't pontificate about where all of this is heading. Looking back over the period during which the history of modern videogames took place - some 40 years now - and trying to get a feeling for the change in technology in today's videogames, is quite stretch. It's like trying to understand the progress made in transportation starting with a Model T and ending with the Mars Rover. There is just no way to put your arms around that revolution and fathom it unless you have lived it.

As a technologist, I have been a part of this phenomenal, revolutionary change, but it still boggles my mind to think that only yesterday I was happy to program an Apple II with 48K of memory and now I think nothing of casually buying a memory backup device with 48 gigabytes - just a cool million times more powerful - and probably for less then a couple of hundred dollars.

What we can all understand is that this technical progress locomotive is churning along at a geometric pace. It's like compound interest: it starts up slowly at first, then speeds up until changes start happening at

blinding speeds. What will the future bring?

Every year, the future is already there.

While I am currently busy in my home lab reproducing 1960's type video game hardware for historical purposes (such as museum displays) which involves working on electronic circuitry technically chronologically equal to a Model A (not T, now that's progress, isn't it?), there are large development groups out there spending literally billions to get to the next level of play...whatever that might be: true 3D presentations, ever more complex handheld games in cell phones, web games, whatever.

The scale of the activity and the money involved are all orders of magnitude above those that were typical of videogame development activities taking place only a few years ago. With all that money, brains and energy being thrown at the problem of coming up with ever better resolution and novel game concepts, who knows what will be the next major step ...the world of technology is on steroids! We don't even recognize revolutionary developments any more when we see them, that's how blasé we have become when in comes to assessing our electronic gadgetry. Stick a video camera into a PDA or into a cell phone, so what's the big deal? Play games with some guy half way around the world...what took 'em so long to get that going?

Things are happening too fast out there to keep track of all that is going on. Pressing the REWIND button on my crystal ball, it flashes up images of the past that take up 95 percent of its surface...the voice-switched intercom I designed in the forties that used twelve vacuum tube all of which could live on a small corner of a modern silicon chip; the handle with the power supply and the transmitter for the TV camera that went to the moon that I built in the sixties; the laptop I am typing this on...that totally incredible piece of hardware.

There is no stopping this express train. Videogame displays of the future will be infinitely more realistic than they are today. Whether they will be more fun to play than crude little old Pac-Man games is another story.

I'll let you be the judge.

Ralph H. Baer
2004

Appendix One
From *Touch-Me* to *Simon*

In November 1976 I was in Chicago attending an MOA (Music Operators of America) show of coin-op arcade devices. I went to these shows routinely on Sanders' and Magnavox' behalf to check on the presence of games that might be infringing our patents, for which Magnavox was our primary licensee.

Atari had several coin-op units at the show. One of these was *Touch-Me*.

Touch-Me was a in a waist-high cabinet with four large, dark "buttons" facing the player on its top, nearly horizontal surface; during the game, the buttons lit up in random sequences and the machine issued truly awful, raucous accompanying sounds. It was the player's job to follow the light sequence by pressing the appropriate buttons.

Howard Morrison also saw *Touch-Me* and played it. Howard was one of the partners at Marvin Glass & Associates, then the U.S.' premier independent toy & game design group whose outside electronics "capability" I had become the year before, requiring me to spend a lot of time at their Chicago design offices and working with them on new products when I wasn't cranking out designs back home in my New Hampshire lab.

Some time later, Howard and I discussed that Atari game, *Touch-Me*. We both came to the same conclusion: nice game-play, terrible execution, visually boring, and miserable, rasping sounds!

It was not until late in '76 or early in '77 that we got around to thinking about doing a hand-held game using *Touch-Me*'s basic, generic game play of "Simon Says". Howard thought it was worth a shot. We outlined a brief spec for what we called our "Follow-Me" game. He presented the concept to Geoffrey Breslow, Marvin Glass' managing partner. Howard simply drew a square with four colored touch areas, one at each corner. He tapped these "buttons" with his finger tips, hummed tones and emulated the game play that was basically a memory test which required associating sequential sounds and colors. Geoffrey liked it. And yes, the earliest versions of the game were square; the round shape came later.

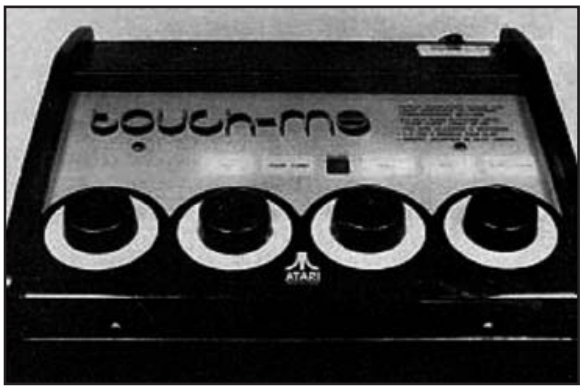


Figure 158 - Touch-Me

Back home in New Hampshire I corralled Lenny Cope, my young software guru and associate at Sanders. After hours and weekends, he and I took a first look at the hardware and software requirements for "Follow-Me". We decided to build the game around the Texas Instruments TMS-1000 microprocessor chip, having had experience with the TMS-1000 on a programmable record changer for which Lenny had written the code in 1976.

It was not until very early in 1977 that we intensively got into the job of writing code for the new game. In March of that year I had to have a back operation. I remember distinctly sitting in my dining room a couple of weeks later, still

in my bathrobe and feeling less than great, surrounded by the local Texas Instruments rep, two Texas Instruments tech reps from the regional office and Lenny, hacking away at the technical spec for the game.

Writing programs for the TMS-1000 in those days was a real chore. We had a Teletype terminal, which Lenny used to communicate with a computer somewhere in Pennsylvania on which Texas Instruments' program for the device was resident. The monthly telephone bills that ensued looked like the National Debt. And, of course, communicating at a couple of hundred baud (bits) per second took forever. Nevertheless, Lenny 'coped' with the situation and made gradual progress encoding the ever-growing list of changes Howard Morrison and I laid on him as we got into the rhythm of the game play.

I designed and built a physical unit containing a version of the TMS-1000 using external Read-Only-Memory (ROM), a socket for the ROM, the four light bulbs and the loudspeaker and their transistor "drivers", the four push-button switches and several game-selector switches. Also, I took on the job of selecting the four tones, which was a non-trivial matter because it is those tones that actually define much of *Simon*'s character. Looking through my kid's *Compton Encyclopedia* for an instrument that can play a variety of tunes using only four notes, I found what I was looking for: The bugle! Henceforth, our game was programmed to beep G, C, E and G...the bugle sounds that can be played in any sequence and still sound pleasant!

Pretty soon we were ready for a demo to potential clients: Milton Bradley were the first to see the current incarnation of "Follow Me" at the Marvin Glass studio in Chicago. As usual, it was Mel Taft who came from Milton Bradley's Massachusetts' head-shed to view new product. What he saw at the time was a square unit, about 8x8 inches, which played like gangbusters. The illustration in the *Simon* patent still shows that configuration. The cover page of that patent is shown nearby. At the time, the game had acquired a new name: "Feedback".

Milton Bradley decided to "go" with the game shortly after that demo; they renamed the game *Simon*, which made perfect sense.

I'll spare you a description of the assorted trials and tribulations we went through while finishing the development of *Simon* to Milton Bradley's satisfaction. In those days, Jim Shea, Milton Bradley's president, accompanied by Dorothy Wooster, his game-play psychology guru and sidekick, were the sole arbiters of what flew and what didn't at Milton Bradley. If they liked a game, it was a GO...if not, the game was dead! Good old Dorothy Wooster, PhD, kept upping the ante...wanting more and more game features in *Simon*. So... Lenny kept repacking the suitcase (so to speak) to squeeze additional code into the very limited memory of the TMS-1000.



Figure 159 - Simon

That he did a good job is testified to by the subsequent sales of many millions of *Simon* games...sales that are still going strong 20+ years after *Simon*'s first introduction in 1979.

Publicity for *Simon* started with a midnight showing to the press at Studio 54 in New York, temporarily interrupting the din of the DJ's dance music and halting the movement of the mostly

zonked-out patrons on the floor, while a 4-foot diameter *Simon* floated through the air above. George Dittomassi, then a Milton Bradley VP and later its president, was in charge of *Simon*'s introduction to an unsuspecting world; he held forth briefly on the game's virtues. I don't know who listened to him because it was about three o'clock in the morning by that time and those of us who weren't dancing (or whatever you call that stuff they were doing on the floor) were trying hard to stay awake up in the balcony where it was pitch-dark but where the sound was a few dozen decibels lower. I was up there with several of the Marvin Glass partners, having been ferried to Studio 54 with them by stretch-limo from the Waldorf Astoria hotel, courtesy of Milton Bradley. I got a kick out of watching the crowds on the sidewalk part like the Red Sea did for Moses when we got out of that limo and entered the Club. Maybe we looked like a bunch of Mafiosi to them.

One of the things that serendipitously helped Simon sales during its first year was the appearance of the popular movie *Close Encounters of the Third Kind*. In that movie, a spaceship lands at a U.S. military installation. The spaceship (a round saucer) looked for all the world like a big *Simon*, or vice versa; and it communicated with the earthlings by emitting sounds, a sequence of tones that also resembled *Simon's*...talk about serendipity!

We filed for a patent on *Simon* in July 1977. It issued as U.S. patent No. 4,207,087 in June 1980. Cited under "Other Publications" in the references on the cover page is " *Touch-Me* - Operating and Maintenance Manual pp.-8".

And so, quite unintentionally, I managed to upstage Nolan Bushnell just that once.

Appendix Two
TV Game Chronology

The following Listing is a chronology of TV (Video) Game activities at Sanders Associates, Inc. during the period of September of 1966 through July of 1972.

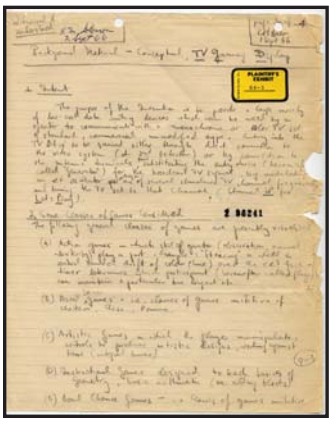
This data was extracted from Bill Harrison's and Bill Rusch's daily log books as well as from loose notes made by myself during the course of the development of the various models of TV Games.

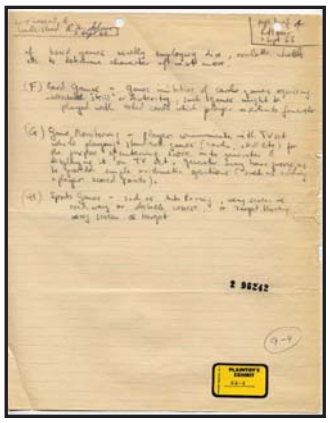
The chronology starts with the 4-page paper I wrote on September 1, 1966, outlining my novel concepts for playing games on an ordinary TV set. These four pages are shown below. They laid out the vision of Videogames (first called TV Games).

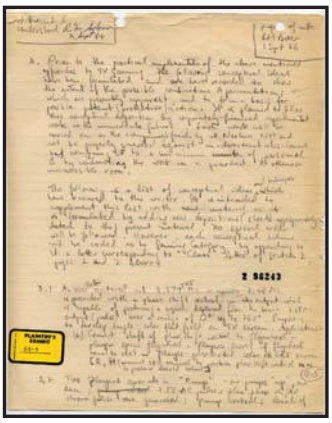
It proceeds chronologically through the development of the seven different game units we developed, starting with a vacuum tube feasibility unit through the "Brown Box".

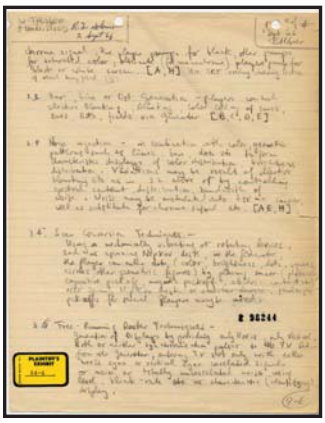
I have reproduced this listing here to provide a detailed chronological reference to all of the TV Game development activity at Sanders. Following the 4-page document is a brief listing of he various TV Game (TVG) models we built and photos showing what they looked like.

Here is the 4-page "Eureka" document:





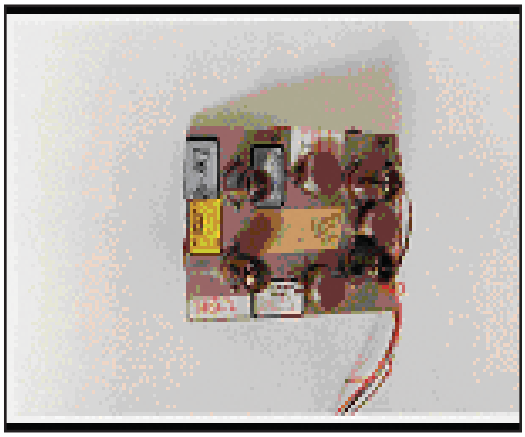




See pages 16-19 for larger versions of these images

TV Game Units built at Sanders between 9/66 and 1969

TVG#1 - The vacuum tube chassis used in conjunction with a Heathkit IG-62 TV Alignment Generator to produce lines and squares movable across the screen. Used in 1966 to prove the concept of using low-cost circuitry for playing games ion a home TV set.



TVG#1 - vacuum tube spot generator



The Heathkit IG-62 Generator

TVG#2: (The "Pump Unit"). TVG#2 has individual circuits for the timing, the spot generation, the color generation used for chase and gun games. TVG#2 games include a color disc spinning game, a "pumping" and "fireman's game. Some of these make use of a built-in the random number generator board which also provides multiple spots groups ("hounds") in a Fox Hunting game. Chase type games were played using two joysticks.



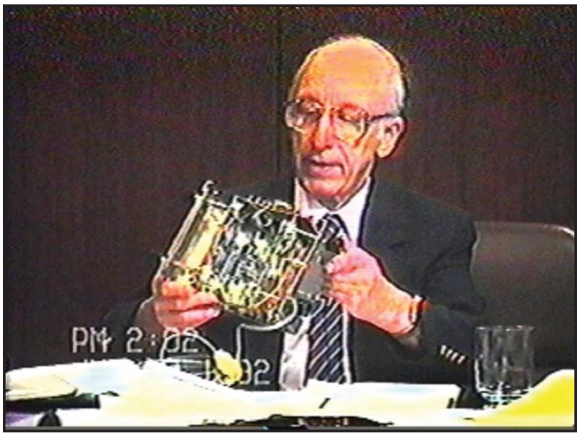
TVG#1 - vacuum tube spot generator



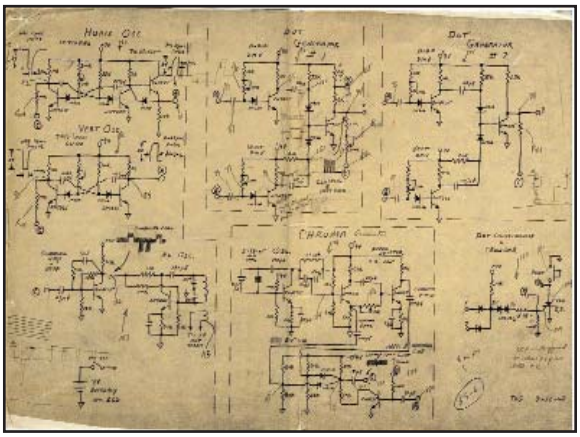
Chase game screen

TVG#3: This is a small, modular unit with each of the two player symbol spot generators located on one of two plug-in boards. The schematic information shows that it has two player spots, provides wipe-out in Chase Games and accommodates a light gun for Target Shooting Games.

The following five photos show me holding various TV Game system components during a video-taped deposition session in 1996. These pictures of TV Games #3, 4, 5 and 6 are the only ones that have been found.



Holding TVG #3 - Note Plug-In Cards

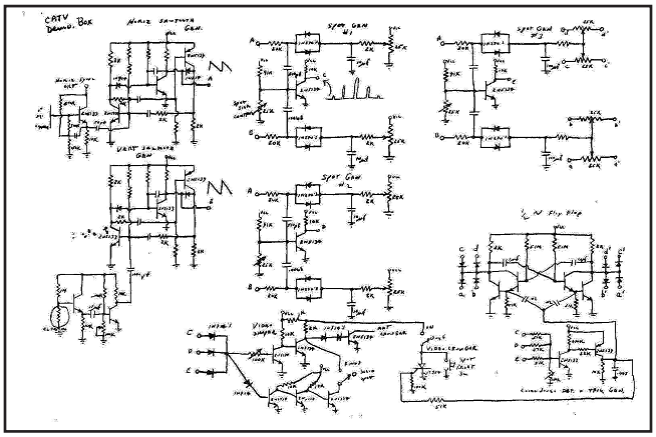


TVG #3 schematic

TVG#4: (Slicer circuit ping-pong unit). The schematic of the slicer circuit type of ping-pong game shown here is modified for cable use. This circuitry was used to play the first ever ping-pong/tennis games.



Handling TVG #4

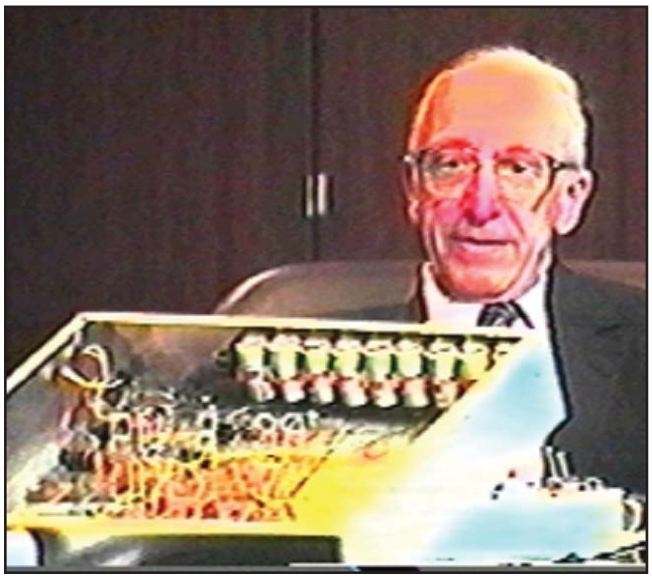


Schematic for TVG #4



Reproduction of TV Game #4 along with the "rifle" that was later used with the Brown Box

TVG#5: (1st st "de/dt" unit unit). This unit was our first attempt to design and build functional ball and paddle circuitry that caused the ball to rebound with a velocity and in a direction determined by the speed of closure between ball and paddle and by the angle of intercept, hence the term de/dt.



Bottom view of TVG #5

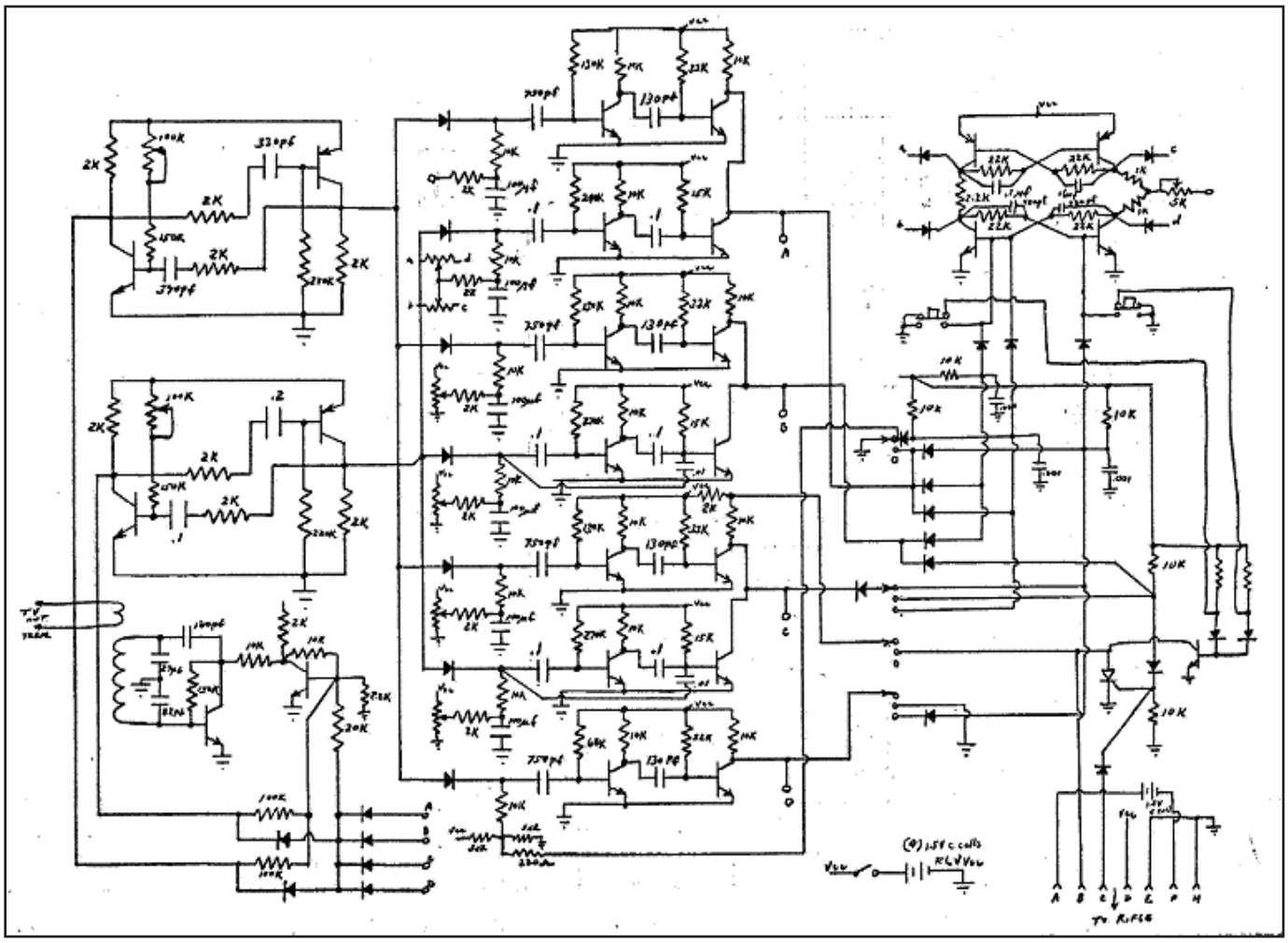
TVG#6: 3-Game Rotary switch game selection unit: TVG#6 plays Ping-Pong, Chase games, Handball and Target Shooting games. This unit used the hand controllers later used in the Brown Box.



Handling controls above chassis of TVG #6



Bottom view if TVG #6

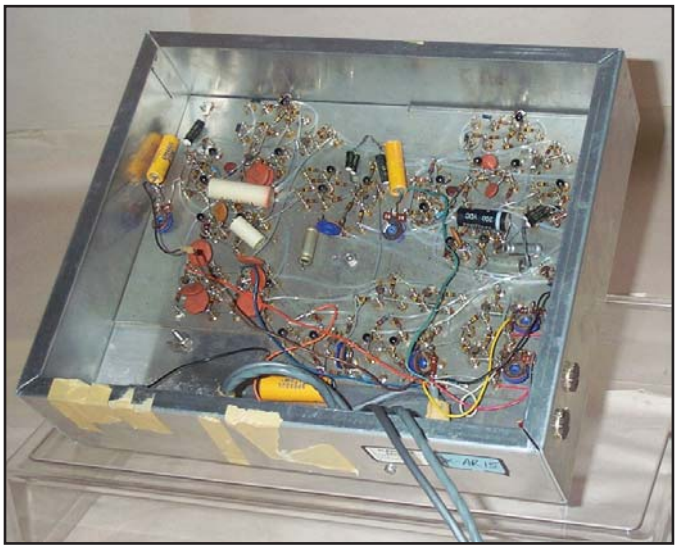


The schematic for TVG #6. The unit played ping-pong, handball, chase and gun games.

TVG#7 - The Brown Box - Our final, switch-programmable, multi-game system. A production version of the Brown Box became the Magnavox Odyssey 1TL200 (1972) home TV Game that started the videogame industry.



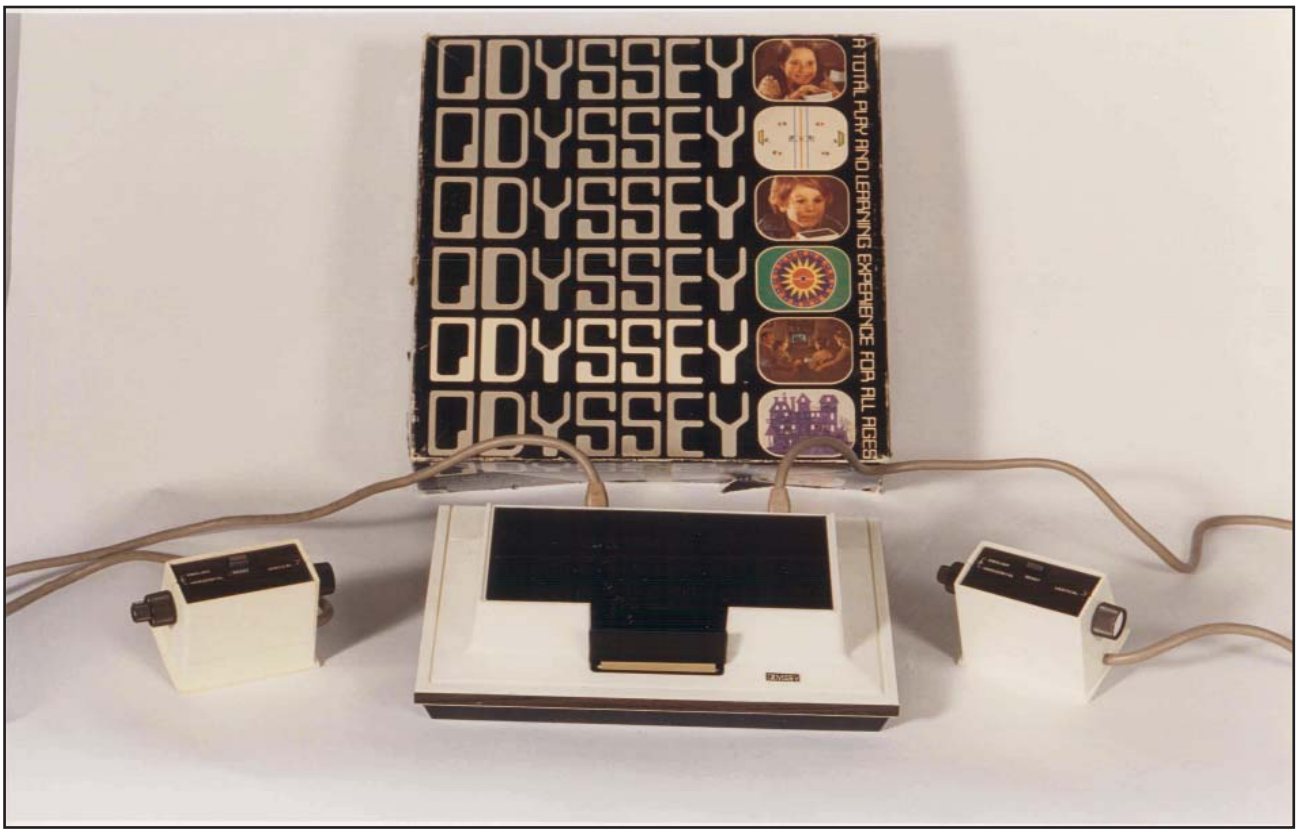
The Brown Box



The Heathkit IG-62 Generator

TVG#8 The final "de/dt" unit which has true dynamic ball motion. It plugs into connector at the side of the Brown Box).

The Magnavox 1TL200 Odyssey Television Game System (1972)



Appendix Three

A Chronological Summary of my Involvement with Magnavox (1975-1979)

The electronic circuit design of this system by Magnavox engineers was virtually identical with the Brown Box (TVG #7). Games offered with the base unit were selected by Magnavox after yearlong field tests during which the unit was known as Skill-O-Vision.

The following summary reports are taken from entries files which cover my activities on behalf of Magnavox's videogame business. Some of this material has already been covered in the book. I repeat it here for the sake of continuity.

In addition to videogame activities here are a lot of references to Interactive Video projects that kept me hopping during this period.

1975 - From my records:

- 3/75 - Magnavox produces Model 200 - it's the same as Model 100 but with two additional Texas Instruments chips to play Smash.
- 2/75-3/75 - National Semiconductor enters U.K. market with a three-game I.C. design at about the equivalent of $85 U.S.
- 3/75 - RHB (Ralph Baer) visits General Instrument at Hicksville, Long Island, New York. Gets preview of AY-3-8500 single-chip game (designed at General Instrument's Glen Rothes' plant in Scotland). RHB asks Arnold Greenberg, president of Coleco, to meet him at Hicksville for a demo of this TV game chip. Coleco gets on top of list for the AY-3-8500 chip delivery.
- 3/19/75 - Letter from RHB to R. Fritsche: Discussion and proposal to work with Magnavox on Videodisc-based TV Games - RHB describes demo we produced using a VCR as surrogate videodisc player of a soccer game with background and goalies on tape, other players in game unit, interacting normally. Looking ahead to 1977-1978 time frame for "real" product.
- 3/21/75 - Memo to D. Chisholm/L. Etlinger: Watch out for Texas Instruments to sell TV Game chip sets designed for Magnavox - it will happen: Texas Instruments makes up data sheets and offers to one and all. Also RHB warns that National Semiconductor will go it alone...must pursue legally. RHB suggests to apply pressure above Tom Briody (Director of Patents) level at Magnavox to get licensing moving. RCA also in videogame business now with RCA Studio II, same licensing problem!
- 4/75 - General Instrument delegation visits Magnavox, Fort Wayne and demo's AY-3-8500 chip.
- 4/18/75 - RHB Memo to E.S. Rubin (Mgr. of Electro-Optics Division at Sanders Associates). Rubin expressed an interest in supporting me (also kicked in some R&D dollars) for *Sight-N-Sound* (later called

Skate-N-Score) arcade game machine development!

- 5/1/75 - Heard that Odyssey Model 100 is in the works for 1976.
- 5/75/75 - Prepare demo to Magnavox representatives (J. Slusarski) re: Videodisc games and video quiz; discuss add-on's: Rifle, audio control (audio tape player-controlled games per RHB patents) of TV Games.
- 6/3/75 - Telecon with R. Fritsche-he just returned from Philips at Eindhoven, Holland; discussed videodisc games, some interest. Expects to visit Sanders Associates with John Slusarski re. Eindhoven visit. Discussed need for legal action vs. National Semiconductor. I asked for a 13-inch black-and-white chassis for use with Centronics/Gamex "21" game design we had under contract at Sanders Associates.
- 6/25/75 - Telecon with George Kinney, North American Philips Labs, Briar Cliff Manor, NY, responsible for special applications of Videodisc (VLP System) - suggested that he join Fritsche and Slusarski for videodisc/TV Game demo.
- 6/27/75 - Memo to Herb Campman: Request for funds to pursue videodisc/TV Games, so that we can demo Digital Video Modem and other capabilities to Magnavox and Philips.
- 6/30/75 - John Kinney calls, begs off...too many applications on hand already! Sounds like we'll get nowhere with him! End of the videodisc trail for now.
- 8/5/75 - Memo to Herb Campman asking for funding to improve videodisc/TV Game demo capability to increase interest by Magnavox.
- 8/13/75 - RHB visit to Magnavox Fort Wayne, meetings with Byron Garoufalis who works for VP of Engineering, John Sylva. Discussed one-on-one games (single player games), add-on accessories like rifle, lightpen; racing games including *TANK* and *WHEELS* game. Get John Slusarski and Bob Price to attend next MOA show to inform themselves and resolve question whether Magnavox belongs in coin-op video, cocktail table game business via licensing Sanders Associates *Hit-N-Run* or *Skate-N-Score* arcade (de/dt) design.

  Also met with Nat Adamson, Tom Briody, Bob Fritsche re. Magnavox attitude towards licensing. They are finally serious about licensing of coin-op manufacturers. Reported in Memo to Campman and Etlinger: Magnavox missing big shipments of Models 100 and 200 because of Texas Instruments' chip-set problems; detailed discussion on licensing.
- 8/14/75 - Memo to Herb Campman: Summarized video disc/ TV Game "sales" effort - need for "paid" help to RHB. Also: Another Memo to Etlinger on the Magnavox/Philips videodisc/ TV Game subject followed by this note: "I have since talked to Briody and Fritsche who state that Magnavox will NOT license any "competitor" unless they are so big that they would "go ahead" anyway with or without license, i.e.: they'll license only defensively! But they would take "guaranteed" orders for large volumes of TV Games! Unacceptable attitude!
- 8/28/75 - Memo to Lou Etlinger from RHB re. Magnavox license negotiations: What we offer in videodisc-related technology, advanced game support etc.; why Magnavox should be interested.
- 8/75 - Neuman, Williams, Anderson & Olson engaged by Tom Briody, Magnavox to pursue infringers. FINALLY some legal action sanctioned by Management - a sea change at Magnavox.
- 9/12/75 - Steven Forte, General Instrument Scotland visits Magnavox re. AY-3-8500 single-chip

videogame device; mentions possibility of going head-to-head with Atari design, changes in chip design from 12 to 9 volts. No deliverable chips exist as yet, he reports.

- 10/1/75 - Telecons with John Slusarski and Bob Fritsche re. Magnavox reorganization. Closing NY HQ. R. Fritsche leaving to become marketing manager at Beatrice Products. John Helms takes his place. Slusarski says that Atari had a half million unit order with General Instrument for AY-3-8500, sight-unseen, if they could deliver before 9/1/75. AY-3-8500 devices to sell for $5.- General Instrument bitter about loss of business to two competitors: SYNERTEC, National Semiconductor spin-off (made Atari's game chip) and Electronic Arrays, Mountain View, CA. Suspect Hughes did layout and Atari went to SYNERTEC and Electronic Arrays for production.
- 10/1/75 - Telecon with Tom Briody: Negotiating license with Executive Games...to meet on 10/11. Attitude at Magnavox re. licensing has CHANGED: Rozell (Magnavox Pres.) is for it, Kenny Ingram "maybe," Tom Briody is pushing for it!
- 10/7/75 - Meeting with Lou Etlinger on the subject of what (of the many improvements, new concepts, patent applications by RHB) Magnavox is entitled to under their current license. Lou begins to negotiate this subject with Magnavox. Basic idea: Give 'em nothing they're not entitled to!
- 11/18-27/75 - Multiple telecons with John Helms and Slusarski re. Chip data and visit to Sanders Associates. General Instrument AY-3-8500 chip models finally under way for 1976 delivery.
- 12/9/75 - Letter to John Helms outlining Cocktail Table program, videodisc related activities, future product planning for Magnavox by Sanders Associates.
- 12/75/75 - Sears sells Atari *Pong* game with SYNERTEC chip...big order, big success. Atari/Nolan Bushnell in the big-time now...they deserve their success - got off their duff and pursued a single-chip design while Magnavox sat on their hands.
- 12/4/75 - Memo from RHB to Lou Etlinger. Summary: How to get max. return from Magnavox license, Magnavox still not motivated to pursue infringers energetically. Do something!

1976 - From my records:

- 1/12/76 - Proposal by RHB to Magnavox to combine TV game with popular set-top Jerrold Remote Control Tuner.
- 3/9/76 - Agenda for Fort Wayne visit: Intend to discuss add-on features - rifle, light pen, cassette player for audio control of TV game, user-programmable obstacles, my Telesketch invention, R/C controls; videodisc TV Games; Proposed Consulting and Product Design by Sanders Associates.
- 3/12/76 - Trip report on visit to M, Fort Wayne
- 3/9 - No decisions by Magnavox to-date. Saw Model 300 prototype - designed to compete with Coleco's Telstar...same AY-3-8500 "guts."

  Also saw Model 400 and 500 prototypes, last models to be shipped with Texas Instruments chip set in them...real dinosaurs already.

The Lawsuits begin:

- 6/2-6/10/1976 - RHB in court: On witness stand (as a fact witness) for six days in Magnavox vs. Chicago Dynamics & Atari patent infringement lawsuit in Federal Court in Chicago, Judge John Grady presiding. Slow, page-by-page wading through about three linear feet of technical documents by RHB, W. L. Harrison and Bill Rusch, plus detailed examinations of all of the developmental hardware built between 1966 and 1969, including the Brown Box, day after day.
- 6/10/76 - Nolan Bushnell has a meeting with Tom Briody and Ted Anderson, Esq., representing Magnavox; Bushnell has change of mind, enters into a paid-up agreement with Magnavox, Atari leaves lawsuit - our first licensee.

1977 - From my records:

- 1/10/77 - Judge Grady reads decision from the bench; calls RHB's '480 patent the "pioneer" patent of the videogame industry; holds for Magnavox Sanders Associates on all counts. We win big-time!
- 7/13/77 - Visit to Sanders Associates by John Helms. Subjects covered: Sanders Associates support to Magnavox on low-end product design and help with Intel microprocessor (Odyssey^2) TV game; Cable games; Videodisc games; TV add-on products (RHB inventions TV Alarm Clock, TV Weather Station, etc.)
- 7/15/77 - Memo on meeting. Detailed listing of subjects covered.
- 7/26/77 - Letter to John Helms following up on visit. Four-page proposal for various cooperative efforts including cost estimates.

Salvaging Odyssey^2

- 8/2/77 - I have a telephone conversation with John Helms. He says that he "sold" the concept of Sanders Associates participation to Magnavox program planning, but he reported big potential trouble at their Tennessee TV set and Videogame manufacturing plant. There is talk about canceling the Odyssey^2 program altogether - today!

The rest of that story appears in the book.

- o 8/12/77 - RHB Memo to Distribution: Trip Report, Magnavox Visit 8/10 and 11: Turn-around at Magnavox re. Odyssey^2. Almost certain I salvaged the program! -(By 9/28 I would be sure!)

Trying to help support Odyssey^2

- 8/22/77 - Told Lenny Cope to contact Stan Maser at Intel to discuss technical detail of Odyssey^2 chip-set for our information. Proposed to Magnavox to have us flow-chart and write code for our *Monday Nite Football* game (developed in cooperation with Marvin Glass & Associates), also for *Run-Silent, Run-Deep*, *Off-to-the-Races*, *Battlefield*, all novel games sketched out in detail by my side-kick, Lenny Cope. I proposed to let Stan Maser at Intel build a second Odyssey^2 breadboard system for us (Sanders Associates), which Stan said would take two weeks. Suggested additional socket for 8355 ROM and 8155 RAM in

original µP TV Game design to accommodate *Monday Nite Football*. Agreed with John Helms on how to proceed.

- 8/24/77 - Telecon with Frank Quota, Magnavox Fort Wayne, Chuck Heffron's boss: Apology for once again excluding us from participation. Citing excuses...still wants support to Magnavox videogame management from us. Wants us to work on their business plan with them.
- 9/3+ - I decided to stay cooperative for the moment.
- 9/5/77 - Press Report: Videogame operation shaken up by Magnavox. Helms out, Fauth now Sr. VP of products and marketing reporting to Magnavox President, Alfred DiScipio. Chuck Dolk is VP of product management. "All engineers working on videogame development let go by company"...wrong, fortunately! Aborted by RHB's visit to TN. But John Helms is out. Need to sell our coop effort all over again!
- 9/8-9/9/77 - Trip to Fort Wayne. Meeting with Frank Quota and Chuck Heffron. Subject 1978 program. Discussed two low-end designs with General Instrument AY-3-8600 series chips and with Signetics two-game (color) chipset; possible plug-in programmable unit with General Instrument dedicated plug-in chip system with one proprietary chip; possible µP + ROM (2-chip) game - 48 weeks.
- 9/15/77 - Letter to John Fauth: (1) Discuss the proposed product line; Opinion: OK; (2) Suggest strong management action to beef up component cost control, target pricing, lack of strong product manager. (Some nerve!). Expressed hope that Magnavox can pull team together to make promising product line happen in 1978. Offered to help!
- 9/13/77 - Trip Report: Trip made at request of Frank Quota, mgr. Video products to put together a videogame product line. Detailed description of game products planned for year 1978. They plan to have three models ready: Models 2000 and 3000 are AY-3-8500 chip designs; Model 4000 is AY 3-8600 (ten games) design and has and AY-3-8615 for color encoding. My assessment of their probable success: Program optimistic, but deserves our support because it will result in good line with substantial sales and consequent royalties to Sanders Associates. Need to work through John Fauth.
- 9/19/77 - John Fauth called, expressed regrets about not having gotten back to me sooner. Confirmed Magnavox management decision to proceed with Intel design (Odyssey^2) and General Instrument 8600-series low-cost products. Wanted software/game generation support from Sanders Associates. Told me to "wait" for Chuck Dolk's contact.
- 9/28/77 - Memo re. Magnavox Support Program: Report telephone conversation with Frank Quota who says: Fauth, Dolk, DiScipio met, approved immediate go-ahead with Intel µP game for USA (Odyssey^2) and for Europe (PAL/Philips version); also approved a must-have low cost µP game; backup General Instrument AY-3-8600 series. Dedicated chip game system. Expressed everyone's belief at Magnavox that they need us (Sanders Associates) for game generation, critique, to get ahead of Atari. Want meeting at Fort Wayne 10/6. Results of meeting to be presented to DiScipio. Magnavox TV game group "counting on us to keep all Magnavox management people in positive mood re. videogames." I asked Howard Morrison of Marvin Glass to come along on 10/6 to present *Monday Nite Football*, other possible Marvin Glass Associates input.
- 9/29/77 - Wrote out Sanders Associates - Marvin Glass Associates and Magnavox Ground Rules to be proposed to Magnavox: No exclusives, Game generation to be paid for by Magnavox; Standard Sanders Associates - Magnavox Agreement applies; right to sell game developed for Magnavox elsewhere if Magnavox does not proceed.
- 9/29/77 - Discussion with Lou Etlinger on exact nature of technical support to Magnavox, in prepara-

tion for 10/8 meeting.

- 10/77 - Detailed MAGNAVOX 1978 TV GAMES PROGRAM: Ground rules for Sanders Associates and Marvin Glass Associates effort on Magnavox behalf.
- 10/8/77 - Visit with Chuck Dolk at Fort Wayne, accompanied by Howard Morrison of Marvin Glass Associates. Meeting with Dolk a big flop: He takes less than five minutes to undermine all of my missionary work at Marvin Glass & Associates by telling us that he isn't interested, doesn't understand videogames, doesn't want to learn; games represent 10% of Magnavox gross, therefore we'll get 10% type attention! Howard is disgusted...will take *Monday Nite Football* to Milton Bradley and to Bally.
- 10/10/77 - Memo/Trip Report: Describes RHB extensive briefing at Marvin Glass Associates in Chicago 8/5.
- 10/11/77 - Howard Morrison sends letter to Chuck Dolk telling him that since Magnavox wants exclusive rights, license income would be too low; therefore, Marvin Glass Associates is declining an association with Magnavox. Translation: Go jump in the lake, Dolk!
- 10/12/77 - Memo from D. Chisholm to H. W. Pope (exec VP, Sanders Associates) and J. L. Bowers (Pres, Sanders Associates), outlining receipts from licensing; details on current litigation; our Fort Wayne problems with Dolk, etc.
- 10/13/77 - Telecon with Frank Cot: Follow-up on meetings with Dolk, Fauth, etc. after our visit: New proposal to work together in spite of Dolk.
- 10/18/77 - Telecon with Frank Cot: Progress report on Intel chip machine, price renegotiation, etc., desire to work together.
- 11/29/77 - Telecon with Frank Quota: Mike Staup is new product manager for Odyssey; inside man, ex VCR manager. France impounded 40,000 Coleco units, passed new radio frequency interference (RFI) law Coleco didn't meet. Told me to expect a call from Chuck Dolk! Also: Magnavox OEM'ing videogame for Mattel with General Instrument microprocessor; going to be produced by Magnavox TN, software by Mattel.
- 12/7/77 - Telecon with Chuck Dolk: Moving ahead on own way; might want to sit down and discuss how we can help them with software generation. Mike, Frank responsible but out until next week. Invited me to come to Fort Wayne on 12/20.
- 12/20/77 - Visit to Magnavox in Fort Wayne.
- 12/22/77 - Memo/Trip Report: Met with Dolk, Quota, Staup re Sanders Associates support to TV game program. Want one or two games from us that make good use of Odyssey^2 Game unit's capabilities (especially the alpha-numerics game using the keyboard). Magnavox wants input on "good" games...concepts, preliminary flowcharting only, support of Magnavox programmers (Ed Averett is their outside subcontractor, Sam Overton and Bob Harris are Magnavox in-house programmers); games to be available 2/1/78!!!; possibly exercise games on simulator at Sanders Associates. Summary: Minimal Sanders Associates participation...we must decide: What's in it for us...need meeting to set ground rules.
- 12/21/77 - *Wall Street Journal* article: NV Philips unit files two suits charging patent infringement (Bally-Midway, Sears/Montgomery-Ward). Magnavox has forty licensees now. License income is beginning to be substantial for both Magnavox and Sanders Associates.

1978 - From my records:

- 1/23/78 - Telecon with Frank Cot, Magnavox Fort Wayne: Re. TV Game support program; Told Frank that Chuck Dolk approved in principle; requested all available info on Odyssey^2 hardware, study it, visit Magnavox with draft of proposals. Frank Cot assigns Sam Overton (software designer) to coordinate with us. Sam called: Sending more data; I told Sam we'll go as far as flowcharting. Sam says he's lone programmer at Magnavox. His problem: Who'll do additional coding? Sam says: six carts are finished, needs ten by Christmas. My position: One outstanding game is better than ten so-so's. We offer to do programming.
- 1/27/78 - Memo to Distribution: "Magnavox 1980/81 TV Game Plan." Magnavox wants two-three games from us; Magnavox is getting ready to analyze 1980+ product needs. We propose Lenny Cope's Home Entertainment Center design. Will submit to Magnavox under Nondisclosure Agreement.
- 2/13/78 - Memo to Distribution: "Magnavox Game Generation Program, Guidelines." Extensive proposal for four THEME areas: TV Arcade Fun, TV Casino Royal, TV Board Master Games, Body-and-Soul TV Magic...possibly preschooler games. Detailed description of all games is given.
- 2/28/78 - Memo to Sanders Associates "Magnavox TV Game Team" re. Detroit Fever and Telesketch. Telesketch technology (related U.S. patent No. 4,194,198 issued to Sanders Associates - RHB).
- 2/13/78 - Memo: Use of player-positioned bumpers suggested. Covered by '198 patent covering our Telesketch techniques. Narrative and pictorials attached.
- 10/78 - Delivered the Programmable Pinball cart ($50K job). Standing by to revise as requested by Magnavox.
- 12/25/78 - Electronic News article: Magnavox sues four firms over microprocessor - controlled videogames: Fairchild, Bally, Sears, Montgomery-Ward. RCA was threatened too, but dropped out of the (Studio II) videogame business...this article covers importance of license income from videogames, progress in licensing, etc.

1979 - From my records:

- 1/79 - Odyssey^2 is introduced, well-received at Consumer Electronics Show (CES) in January. Our pinball cartridge is not among available games. Note: Ed Averett had a lock on "outside" generation of games, as reported above in the Telesketch story.

Appendix Four
From Our Loose Notes and Note Books - 1966 to 1972

The following pages are a chronological record of the events as recorded by Baer, Rusch and Harrison during the period of 1966 through 1972

DATE	TVG ACTIVITIES - CHRONOLOGY	Document or Hardware	Notebook page-line
TV GAME (TVG) CONCEPT STAGE/ TVG #1			
9/1/66	R.H. Baer's original disclosure document written disclosing concept and details of playing variety of games on home TV set.	4 page doc 9/1/66	WLH#4958 H p.1-4
9/6/66	RHB documents first design concept of 2-player TV Game with two movable spots, color	schematic attached to p.4 of orig doc (looks like Etch-a-Sketch)	H p.4
10/20/66	R. Tremblay starts on 4-tube techniques demo, TVG#1 attaches to Heathkit IG-62 and allows lines and spots to be displayed and moved manually (1st spot generator).	WLH notebook and loose notes	H p.5-9
12/6/66	Analysis of IG-62; design of V line generator.	Mod.IG62 block diagram, schematics	H p.5-9
12/10/66	Purchase RCA Color TV for development work		
12/10/66	Bob Tremblay interfaces Chassis#1 with Heath IG-62 TV Alignment unit to experiment with manual movement of spots & lines on TV	DMV schematic 12/10/66 of 4-tube breadboard built by Bob Tremblay	H p.5-8
12/20/66	1st official Sanders funding of TVG project (NDB)	Memo RHB to H.W. Campman 12/20/66	
1/2/67	RHB designs circuits for coloring H & V movable lines; designs , color spinner	RHB Notes "TVTY-NDB" p.1-4	
1/4/67	Color TV tutorial by RHB for technicians 2 colors, play back on RCA TV set.	RHB Document "Operation of Color TV..."	
2/6/67	Finish tests of hardware; manually movable vert split screen, bottom half blue, top red.	Schematics by RHB and R. Trombley of work in progress (IG62 interfacing)	

	Proved our knowledge of TVG fundamentals		

TVG#2 -Techniques development using IG-62

2/11/67	Future Planning, Discussion by RHB w/R. Solomon Describe game concepts: Scoring, Bucket Filling, Game Timing, Skill Games, etc.	5 p. doc "Discussion w/R. Solomon..." Decision to build transistorized unit connected to IG-62	
2/12/67	Propose transistorized demo of unit with H&V generator, movable H horizon, color changes	WLH copies of RHB notes	
2/12/67	Bill Harrison (WLH) works on light gun(in radio case), color, , spot generator circuits for R. Baer and Bob Solomon. Device is a code detector.	see 2/67 description Became USP 3,599,221	
2/13-5/1	Bill Harrison off TVG job; only occasional TVG discussions between R. Baer and Bill Rusch	No relevant WLH notebook entries	H p.9-20
5/2-5/12	WLH starts on TVG project (Task NFGAA) Design H & V sync circuits; studies color methods. Interface cts. w/IG-62 rf oscillator-modulator. WLH works on light gun.	WLH notebook and loose docs.	H. p.21-29
5/10/67	Misc. Ideas for TV Games discussed by RHB and Bill Rusch: Pic dwg, car steering, Chase games etc.	Memo from WR to RHB; illustrated by RHB. Typed by RHB's secretary.	
5/15/67	RHB tutorial notes to WLH re. chroma, bar graphs	RHB loose notes, 3 pages.	
5/15/67	WLH finishes first TV Game demo unit, TVG#2 which still uses IG-62 video-amp and CH.3 r.f. oscillator/modulator. Plays split-screen, two-color "Bucket-Filling Pumping Game".		H p.30,31
5/16/67	RHB writes 7 p. notes: TV Game ideas (Pumping Game, Firefighting Game, Color Catching Game	RHB Notes 5/16/67 "TVG"	
5/17/18 1967	1st "Pumping" Games built & played with components for (future) Model#2 but still tied to IG-62.	Loose WLH notes & WLH notebook Played by RHB and WLH	H p.32-35

TVG#2 - Build self-contained game unit

5/23/67	RHB initiates design of hardware for two players (spots), movable in H&V w/ independent controls Circuit design H&V spots, sync cts, color background	WLH notebook	H p.42 H p.43-44
5/24/67	1st coincidence detector circuit designed & built for spot coincidence detect. & "wipeout" games	WLH notebook dto.	H p.45-46
5/25-6/1	Circuit work(WLH): RF oscillator,4.5MHz Audio, etc. WLH mounts breadboards into a chassis (5/29)		H p.46-50
6/1/67	1st Checker Board Game played w/2 player spots	WLH notebook	H p.51
6/5/67	Target shooting game design ideas started, cts built	dto.	H p.53

6/6/67	Power supply design work	dto.	H p.54
6/6/67	RHB Notes (2 pages) "Summary of Major Games" describes:(1)Chess Game;(2)Fox Hunt;(3)Fox & Hounds Chase;(4)Target Shooting;(5)Color Guessing ; (6)Bucket Filling;(7)Firefighters (forTVG#2)	RHB loose notes	
6/7/67	Test of circuits vs. various TV sets at WLH home	dto.	H p.55-57
6/8/67	Ct. design, neon random pulse generator, integrator w/smooth, random (target)spot motion	dto.	H p.58-62
6/14/67	Completed design of demonstrable TVG#2	WLH Block diagrams and schematics	
6/14/67	Demo TVG#2 to L. Etlinger, H.W. Campman Voice-over description of games tape player via 4.5MHz FM oscillator in large Chassis/TVG.#2	HWC and LE sign p.63 of WLH Notebook attesting to having seen demo Transcript (RHB handwriting) of audiotape	H.p.63
6/15/67	RHB 6 pages of Notes-New games suggested: Analgesic, Child &Adult Psych Games, Warship vs. Torpedo Game, Target Shooting w/ sound, drawing games, split screen games etc.	Handwritten Notes 6/15/67	Att'd to p.53
6/15/67	1st design of TVG built into TV (used as "monitor") Chase games, color changing games, target shooting	WLH notebook Also WLH loose notes on built-in target	H p.64&65
6/16/67	Demo of TVG#2 to R.C. Sanders (Pres) & H.W. Pope Exec VP, also Hy Argento, other S/A Board members	same demo as 6/14 w/tape prompting	H p.66
6/17/67	RHB doc Attachment #2 TV Gaming Status Report (1) Re.2 Basic Implementations (2) Suggested action per discussion w/ RCS, HWP (3) Applications proposed (Games types)	RHB paper discusses Standalone vs Integral (Built-in TV) Game; Modular Plug-in circuit board design	
6/15/67	Stand-alone Target Game design concept	WLH notebook	H p.67

TVG#3- Modular Product Design

6/16/67	WLH starts on new H&V sync circuits, new dot generator circuits., new "gun" for modular TVG#3 Objective: A reproducible TVG production design.	Loose WLH papers and notebook pages	H.p.68-72
6/17/67	RHB writes 3 p. Note (Attachment #2) describing next steps toward 3 products: 1.Stand-alone; 2.In-TV-set & 3.Target shooting only	RRHB 3 p. notes ("Attachment #2)	
7/11/67	Complete schematic of 2-player TV Game w/gun w/coincidence (wipeout) action; Box/Mod.#3	WLH loose notes, Schematic & Parts Lists Prelim. price lists	

7/7-14	Additional ct. design: Photopen, AND-gates, coincidence circuits, power supply circuits.	WLH notebook plus loose notes	H p.73-76
7/13/67	New schematic w/simpler cts over p.71.(TVG#2)	Became US Patent 3,728,480	
7/17-7/21	Work on measurements for photo pen and light gun	WLH notebook plus loose notes	H. p.77-80
1/18/67	Rusch joins RHB and WLH unofficially part-time	RHB("Reconstruction of'67 Activities").	
7/28/67	WLH Summary of Construction of Engineering. model using modular construction. Two player spots on separate plugin boards	dto.	H p.81
8/2/67	Complete schematic of TVG#3 as built: 2-player games w/wipeout, target shooting, board games using overlays	attached to WLH p.82	H p.82
8/3/67	More Target Game circuit work by WLH	WLH notebook	H p.83-85
8/14/67	Chroma circuit design work by WLH	dto.	H p.86
9/6-9/7	Summer circuit and chroma design work by WLH	dto. plus loose notes	H p.87-89
9/12/67	"Rifle"/ light gun design by WLH	dto.	H p.90
9/12/67	TVG#3 unit completed by WLH includes improved gun design WLH "prices" components etc. at $15.76	"Digital Spot Generator" TV Game schematic and block diagram by WLH Also Parts List	
9/27/67	Bill Rusch (WTR) officially assigned to TVG project.	WTR moves up to 5th floor TV Gameroom	H p.95-97

TVG#4 Rusch Ball & Paddle Design

9/29/67	Rusch designs 1st "slicer" type spot-generator ct. Objective: Create 2or4 "spots" of diff. shapes	Rusch notebook	R p.96,97
10/4/67	Received additional funding ($8,110.-) for circuit simplification, new applications concepts, etc.	Special Sales Order NKM	
10/5/67	Work on Cable Games techniques: Antenna crowbar H&V sync pick-up to lock to cable transmission	WLH notebook	H p.91
10/12/67	WLH experiments w/gun: Shoot at spot and move it!.	WLH loose note Labeled "Photo Cell"	
10/12/67	Rusch designs slicer circuit. using operational amplifiers	Rusch notebook	R p.98-99
10/12/18	WLH tries misc. versions of slicers, chroma circuits tc.	WLH loose notes	
10/18/67	Rusch shows how to move a spot under machine control for moving target in gun-ping-pong.	Rusch notebook	R.p.100,1,2

10/18/67	Rusch describes Basketball and Ping-pong game, suggests moving paddles in H & V with joystick Also suggest "Soccer" using "slave spots"	Rusch notebook	R p.3-5
10/19/67	WLH works on dot "disappearance (coincidence) circuits, also "2-spot baseball" concept	WLH lose note, 3 pages.	
10/20/23	Rusch works on "Maze" game concepts	Rusch notebook	R p.7-17
10/23/31	WR & WLH work on improved slicer & saw tooth Sync Generator circuits. (the latter drive slicers)	WR notebook and WLH loose notes	R. p.18-42
11/1/67	WLH reviews "square " spots, gun circuits at RHB request	WLH loose notes (2 pages)	
1/1-11/3	WR & WLH work on "English Flip-Flops" for machine-controlled reversal of motion.	WR notebook and WLH loose notes	R p.43-53
11/7/67	New R&D $ requested to pursue Ball & Paddle (B&P) games	IR&D Monthly Status Report	
11/9/13	WLH works on "ping-Pong" circuits; TVG#4 assembly completed and functional. Uses rotary switch for game selection.	WLH loose notes, 4 pages	
11/11/12	RHB & WHLH adapt TVG#4 to CABLE demo use Add H&V sync pick-off circuits, crowbar modulator Add H&V sync pick-off circuits, crowbar modulator Play Ping-pong, Chase, Checker & Gun games	WLH schematic "CATV Demo Box" NOTE: Demos to Teleprompter in NH lab NOTE: Demos to Teleprompter in NH lab H. Schlaftly on1/18&I.Kahn 2/13/68 Demo @ TP in NYC 4/19/68	
11/13/15	WLH documents TVG#4 w/ B&P games using using slicer circuits., draws o.a. schematic & L/M	WLH loose notes (7 pages)	
11/15/17 to 11/27	Rusch defines, WLH works on circuits. to use audio as motion control. Car & Horse Race methods (circ. & oval tracks);side view (badminton) game More checker board games, golf concept	Rusch notebook & WLH loose page11/17 Also: L/M by WLH 11/27/67	R p.54-75
11/20/67	RHB and WLH design voltage-controlled player spot (H & V positioning) circuits. WLH concept: 4.5 MHZ oscillator FM'ed by diaphragm for voice modulation.	WLH loose notes (4 pages)	
11/20/67	RHB and WLH design voltage-controlled spot generators	WLH loose notes (4 pages)	

END OF "TVG DEVELOPMENT DOCUMENTATION", VOL.

TVG#4 modified for CABLE & TVG#5 (Rusch de/dt cts)
Built 10/68 through 12/68

11/20/21 1967	Rusch describes variety of game concepts: Improved ping-pong ball-reversal circuits; ditto for soccer, hockey, pool, bowling, etc.	Rusch notebook	R p.76-89
11/21/67	Rusch defines "kicking, striking action required to cause ball to move with velocity= f(de/dt) of paddle, and movement in direction of paddle intercepted ("BREAKTHROUGH!")	Rusch notebook	R p.90
11/22/67	More game concepts based on de/dt action	Rusch notebook	R p.91-96
11/22/67	Refinement of page 90 (de/dt) circuits	Rusch notebook	R p.97
11/21/22	WHLH experiments w/ integrator and differentiator circuits	WLH schematic, loose note 11/21-22	
11/27/67	Rusch: Pool ball bounce action concepts	Rusch notebook	R. p.98-100
11/28/29	WLH designs for de/dt circuits, golf putting	WLH loose notes, 3 pages	
11/29/67	Rusch describes "Steeple Chase" game	WR notebook	R. p.101
11/29/67	Rusch describes "Obstacle for Race Game"	WR New Notebook	R. p.1
11/30/67	Rusch describes "Angled Bounces" for Billiards, etc	WR notebook	R p.2-6
11/30-12/1/67	Rush and WLH work on gated differentiators WLH builds gated differentiator circuit	Rusch notebook WLH loose notes, 3 pages	R p.10,11
12/4/67	Rusch describes various games: Plane vs. ship bombing, Race, Pinball, Boxing	Rusch - 4 fold-out sheets	
12/5/67	More de/dt, gated diff. circuit details by Rusch	WR notebook	R p.7,12,13
12/8/67	Rusch describes wall bounce details	WR notbook	p.8,9,14,15
12/6/10	WLH experiments w/ de/dt circuits.	WLH loose notes/schematics (8 pages)	
12/11/67	Rusch defines Wall- and Wall+Paddle-Bounce	WR notebook	R p.17-23
12/13/18	Rusch does novel "Category" Search Ouija Board, Puppet Show, Fish Indicator, "Slave Spots", team sports methods	Rusch notebook	R p 24-31
12/15/20	WLH works on de/dt circuits. (Integrators, gated integrators and differentiators	WLH loose notes (6 pages)	
12/20/67	Rusch: More "Categories": R/C games, etc. Use of motors to drive variables	Rusch notebook	R p.32-34

12/22/67	WLH designs de/dt circuits to be combined with Box#4 circuits for B&P, checker & gun games. de/dt circuits are functional.	WLH loose notes (12 pages)	
12/26/67	WLH starts to work on techniques required for Cable (CATV) games in anticipation of TelePrompter demos.	WLH loose note	
12/27/28	WLH works on de/dt circuits etc. WLH starts TVG#5 chassis to house circuit boards designed by 12/22	WLH loose notes, schematics, 3 pages	
12/29/67	WLH works on light measurements for gun	WLH notebook + 7/12 schematic	H p.4
1/8/68	Letter from RHB to I. Kahn extending invitation	TelePrompter File	
1/2/68	Rusch starts Coded Spot investigation including use of antenna-crowbar'ed displays	Rusch notebook	R p.35-42
1/2/68	IR&D Monthly Report (NKM) by Rusch	IR&D form, 1 page	
1/3/68	WLH works on OD/EVEN decoder demo	WLH notebook, 4 pages	H p.p.5-8
1/4-5/68	Rusch works on additional coded spot ideas	Rusch notebook	R p.44-46
1/8/68	WLH works on sync extraction for CATV demo	WLH notebook	H p.9-10
1/11/12	RHB &WLH notes on CTAV-TVG demo work	Loose notes, 4 pages	
1/12/68	Rusch defines hollow-ring "spots"	Rusch notebook	R p.47
1/15/68	Rusch works on Even/Odd maze games	Rusch notebook	R p.48
1/16/68	WLH designs improved crow-bar driver	WLH notebook	H p.11
1/16/68	Rusch proposes various Checker Games	Rusch notebook	R p.49-58
1/17/68	WLH documents CATV-TVG#4 schematics, LM	WLH loose notes, 17 pages	
1/18/68	Demo @ S/A to Hub Schlafly, VP TelePrompter of TVG#4 adapted for CATV, also "ODD/EVEN Quiz gun" and miscellaneous maze games demonstrated	TelePrompter File - both W. Shreiber & H. Schlafly sign "AGREEMENT" (1 p.)	
1/19/23	WLH touches up design details for TVG#4	WLH notebook	H p.12-17
1/26/68	WLH documents additional changes to game, gun	WLH loose notes,4(incl.Box#4Schematic)	
1/24/68	Demo @ S/A to H. Solomon, Merrimac Cable of TVG#4 adapted for CATV	In TelePrompter File (for convenience) Solomon signs "AGREEMENT" (1 p.)	
1/?/68	RHB paper "Possible approaches to TVG" Initial concept of coop Cable-TVG effort w/TP	RHB handwritten notes, 2 pages	
1/31/68	H. Campman issues Stop Order for NKM	Official S/A SSO, 1 page	

1/68 & 2/2/68	Rusch writes detailed Disclosure Document on TV Gaming Device, New System", describes Slicer & de/dt circuits. for realistic sports games	Handwritten version 1/68 by Rusch Offic. S/A Pat. Discl. Form typed on 2/2/68 is official document
2/6/68	H.W. Campman (IR&D) Stop Order NKM	Active Lab work stops until July (Rusch) and August '68 (WLH)
2/6/68	RHB Telecon with H. Schlafly confirming visit 2/13 by I. Kahn & Walter Schreiber, TP	RHB Note (1 p.)
2/13/68	Demo @ S/A to I. Kahn, Pres. TP, NYC of TVG #4 adapted for CATV	TelePrompter File I. Kahn signs "AGREEMENT" (1 p.)
2/19/68	RHB, L. Etlinger (S/A Pat. Counsel), E. Rubin, (S/A VP), visit TP & Manhattan Cable in NYC Meeting with Schlafly, Roger Wilson, Chief. Engineer TP	RHB Notes, 4 pages describes
4/19/68	Demo of TVG#4(CATV) to TP & Manhattan Cable in NYC	Teleprompter File
3/5/68	RHB generates Analysis of CATV/ TVG business, outlines coop. plan for S/A & TP	RHB paper, 3 p. in TP File
3/5/12	L. Etlinger/I. Kahn telecons, letter to TP With copy of RHB 3/5 Joint Venture analysis	L. Etlinger correspondence in TP File
3/15/68	L. Etlinger presents Joint Venture to I. Kahn	Letter from Etlinger to Kahn in TP File
4/12/68	RHB & L. Etlinger write detailed analysis of proposed joint venture for S/A use	Document, approx. 40 pages in TelePrompter File
8/5/68	RHB and Rusch write Final Report for NKM	Offici'l S/A IR&D Status Report,9 pages
8/11/68	WLH works on stable Vertical sync oscillator	WLH loose notes, 1 page

TVG#6 RHB/WLH redesigned B&P game

9/6/68	WLH works on gun circuits using photo transistors	WLH loose note, 1page
9/6-10/7	RHB summary: "Important Circuit work done" WLH schematic on summers, coincidence detectors, gated differentiators, Wall Bounce and change design to voltage control (exit slicers !) Voltage controlled square spots now used.	RHB & WLH loose notes, 16 pages
10/24/68	WLH complete schematic of TVG w/ voltage-controlled square spots and new net/wall line (RHB/WLH design)= TVG#6	WLH schematics showing ping-pong w/central net, gun ct.
10/26/68	RHB List of Games playable with various Configurations"- describes Handball, Ping-Pong, Hockey, Golf Putting, Chase & Gun Games	RHB loose notes, 6 pages

11/4/68	WLH works on TVG integral to color TV set	WLH notebook and loose notes,11 pages	H p.18,19
11/1-11/5	WLH works on improving gun response	WLH notebook and 2 loose pages	H p.21
11/7-11/8	WLH solves problems of unstable ball Flip Flop	WLH loose notes, 3 pages	
11/11/68	WLH makes TV set measurements re. integral TVG		H p.23-25
11/17-12/9/68	WLH finishes design of TVG#6. Uses small chassis, rotary switch (3 pos) for game selection. Has external Hand Controls with H,V & English knobs	WLH loose notes (schematics, sketches)	
11/13-11/15	WLH documents TVG#6 w/ B&P games using TVG#7 -The Brown Box	WLH loose notes (7 pages)	
12/10/68	WLH reworks rifle electronics-adds light bulb as optical bias source for photocell. Builds Joystick Assembly for Golf game	WLH notebook	H p.26-27
12/18/68	WLH troubleshooting Ball Flip-Flop mistriggering	WLH notebook	H p.28
1/2/69	WLH adds 2nd Flip-Flop for RHB Handball game Builds Pumping Game circuits. RHB lists 10 games to be played.	WLH 3 loose pages RHB 2 loose pages	
1/3/68	RHB - new List "Game Sequence" listing 11 games to be playable w/Brown Box including color of background and overlay	RHB loose note, 1 page	
1/14/69	RCA 1st visit to S/A- Brown Box demo Negotiations begin - last 1 year	RCA File	
1/20/69	WLH draws schematics, L/M for Brown Box as of that date. RHB summarizes cost (1 p.)	WLH fold-out schematic of Brown Box and of accessories; L/M=9 pages	
3/10/69	Zenith visit to S/A for Brow n Box demo	Zenith File	
3/19/69	Sylvania visit to S/A for Brown Box demo	Sylvania File	
5/7/69	GE visit to S/A for Brown Box demo	GE File	
5/26/69	Rusch generates new L/M and prices it	Rusch loose notes, 7 pages	
5/26/69	RHB draws block diagram of additional capabilities for Brown Box per RHB 3/1/69 Game List	RHB loose note, 1 page	
5/28/69	RHB, WLH & L. Etlinger demo Brown Box at GE in VA	GE File	
5/29/69	WLH investigates round spot generation	WLH loose note, 1 page	
5/29/69	Motorola visit to S/A, Brown Box demo	Motorola File	
8/21/69	WLH generates Brown Box L/M's, schematics by module; plus complete schematics (2) List of Games, accessories (including Code Gen)	WLH loose notes,approx.26 pages, plus 2 fold-out schematics	

Aug/Sept '69 WLH builds second de/dt chassis, TVG#8

Sep-69	Rusch leaves TVG activity for Mort Goulder' s operation	
1/15/70	RHB, WLH, L. Etlinger demo Brown Box @Sears in Chic.	Sears File
Mar-70	Harrison leaves TVG, works on power supplies and on cardioscope	RHB notes ("Who was where when?")
7/17/70	Bill Enders (ex RCA) now Magnavox, NY, visits S/A for discussions, demo in Nashua, NH	Magnavox File
7/?/70	RHB & L. Etlinger demo Brown Box, Golf, Gun to Magnavox, Fort Wayne, IN - Gerry Martin, VP Marketing, others	
3/3/71	Magnavox/Sanders preliminary Agreement signed	
3/24/25	Package of engineering drawings, block diagrams schematics, L/M's of Brown Box etc. ready for Magnavox	
3/30/71	Bill Harrison back on board. RHB & WLH visit Magnavox .Fort Wayne. RHB works with R. Frische on game selection WLH works with George Kent, start M. engineering of TVG	RHB loose note "Ref #6
6/16/17 1971	2nd trip to Fort Wayne by WLH to solve technical problems	RHB loose note Ref #6
8/12/16 1971	WLH phone support of Magnavox engineering FCC approval cycle starts - George Kent in charge	RHB loose note Ref #6
Fall'71	Magnavox shows "Mystery Product" to dealers	
1/27/72	Magnavox signs exclusive license with rights and duties to sublicense everyone	RHB loose note Ref #6
Mar-72	S/A receives 1st $100,000 royalty check from Magnavox	dto.
4/22/72	Magnavox shows Odyssey ITL100 to trade RHB attends showing at Tavern-in-the-Green, NYC	dto.
7/26/72	RHB & L. Etlinger trip to Fort Wayne Discuss product plans and legal details	dto.

Appendix Five Videogame and Interactive Patents

The following pages cover some of the original videogame inventions as well as later, interactive video systems and methods patents.

This series of Patents starts with the **'480 patent, the Pioneer Patent of the Videogame Industry.**

Patent # 3,728,480	Television Gaming And Training Apparatus
Patent # 3,829,095	Method Employing A Television Receiver For Active Participation
Patent # 3,659,285	Televsion Gaming Apparatus And Method
Patent # 4,117,511	Universal Television Interface And Sync Generator Therepor
Patent # 4,567,532	Selectable View Video Record/Playback System
Patent # 3,737,566	Television Coder And Decoder
Patent # 4,571,640	Video Disc Program Branching System
Patent # 4,654,700	Optical Decoder
Patent # 4,355,805	Manually Programmable Video Gaming System
Patent # 4,310,854	Television Captioning System
Patent # 3,993,861	Digital Video Modulation And Demodulation System
Patent # 4,034,990	Interactive Television Gaming System
Patent # 4,496,158	Electro-Optical Sensor For Color Television Games And Training Systems
Patent # 3,921,161	Preprogrammed Television Gaming System
Patent # 4,194,198	Digital Preprogrammed Television Game System
Patent # 3,599,221	Recording CRT Light Gun And Method
Patent # 4,359,223	Interactive Video Playback System
Patent # 3,991,266	Dual Image Television
Patent # 4,346,407	Apparatus For Synchronization Of A Source Of Computer Controlled Video To Another Video Source
Patent # 4,342,454	Method And Apparatus For Instant Replay And Other Capabilities For Microprocessor-Controlled Videogames
Patent # 4,357,014	Interactive Game And Control Therefor
Patent # 4,395,045	Television Precision Target Shooting Apparatus And Method
Patent # 4,077,049	Universal Television Interface

United States Patent [19]

Baer

[11] **3,728,480**

[45] **Apr. 17, 1973**

[54] TELEVISION GAMING AND TRAINING APPARATUS

[75] Inventor: **Ralph H. Baer, Manchester, N.H.**

[73] Assignee: **Sanders Associates, Inc., Nashua, N.H.**

[22] Filed: **Mar. 22, 1971**

[21] Appl. No.: **126,966**

Related U.S. Application Data

[63] Continuation of Ser. No. 697,798, Jan. 15, 1968, abandoned.

[52] U.S. Cl. 178/6.8, 178/6, 178/DIG. 1

[51] Int. Cl. H04n 7/18

[58] Field of Search ..... 273/101.1, 101.2; 315/22, 26, 30, 10, 18; 178/DIG. 4, 7.83, DIG. 6

[56] **References Cited**

UNITED STATES PATENTS

2,489,883	11/1949	Hecht	250/217 CR
2,552,022	5/1951	Watson et al.	315/26
2,595,646	6/1952	Doba, Jr. et al.	328/187
2,648,724	8/1953	Enslein	178/6 TT
2,956,116	10/1960	Singleman	178/6 TT
3,014,724	12/1961	Cryder et al.	178/7.83
3,046,676	6/1962	Hermann et al.	35/25
3,151,248	9/1964	Glaser et al.	273/101.1
3,401,331	9/1968	Musselman	178/6 TT
2,621,246	12/1952	Clayden et al.	178/DIG. 6
1,180,470	6/1959	France	

FOREIGN PATENTS OR APPLICATIONS

OTHER PUBLICATIONS

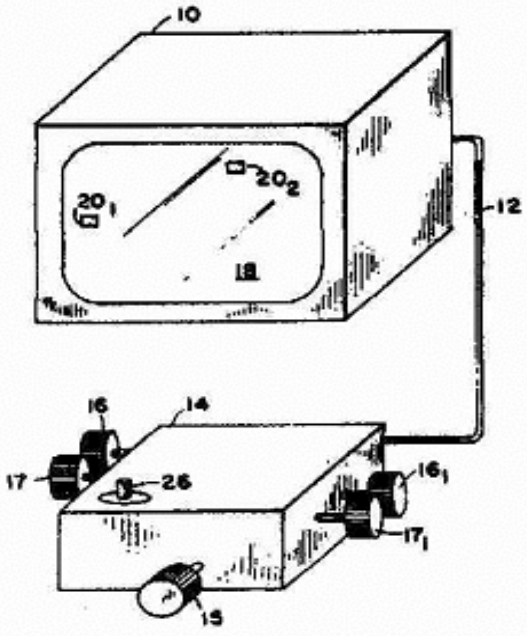
Radio and Television News; August 1956, pp. 63.
Radio Electronics, May 1956, pp. 38.

Primary Examiner—Richard Murray
Attorney—Louis Etlinger

[57] **ABSTRACT**

The present invention pertains to an apparatus and method, in conjunction with standard monochrome and color television receivers, for the generation, display, manipulation, and use of symbols or geometric figures upon the screen of the television receivers for the purpose of training simulation, for playing games, and for engaging in other activities by one or more participants. The invention comprises in one embodiment a control unit, connecting means and in some applications a television screen overlay mask utilized in conjunction with a standard television receiver. The control unit includes the control means, switches and electronic circuitry for the generation, manipulation and control of video signals which are to be displayed on the television screen. The connecting means couples the video signals to the receiver antenna terminals thereby using existing electronic circuits within the receiver to process and display the signals. An overlay mask which may be removably attached to the television screen may determine the nature of the game to be played or the training simulated. Control units are provided for each of the participants. Alternatively, games, training simulations and other activities may be carried out in conjunction with background and other pictorial information originated in the television receiver by commercial TV, closed-circuit TV or a CATV station.

46 Claims, 26 Drawing Figures



United States Patent [19]

Baer

[11] **3,829,095**

[45] **Aug. 13, 1974**

[54] **METHOD OF EMPLOYING A TELEVISION RECEIVER FOR ACTIVE PARTICIPATION**

[75] Inventor: **Ralph H. Baer**, Manchester, N.H.

[73] Assignee: **Sanders Associates, Inc.**, Nashua, N.H.

[22] Filed: **Aug. 10, 1970**

[21] Appl. No.: **62,691**

Related U.S. Application Data

[62] Division of Ser. No. 697,798, Jan. 15, 1968, abandoned.

[52] **U.S. Cl.**.... **273/101.1**, 340/324 AD, 178/7.5 D, 273/DIG. 28

[51] **Int. Cl.**..... **F41j 16/08**

[58] **Field of Search**..... 273/1 E, 101.1, 101.2, 273/85; 178/6.8, 7.5 D; 315/30; 340/324 AD

[56] **References Cited**

UNITED STATES PATENTS

2,042,174	5/1936	Foisy	273/101.1
2,569,594	10/1951	Aagesen	273/101.1
3,046,676	7/1962	Hermann	273/1 E
3,211,456	10/1965	Glass	273/101.2

FOREIGN PATENTS OR APPLICATIONS

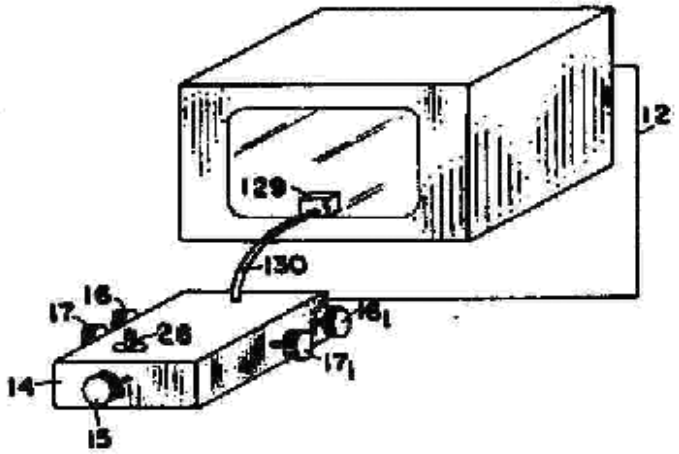
1,180,470	6/1959	France

Primary Examiner—Richard C. Pinkham
Assistant Examiner—Marvin Siskind
Attorney, Agent, or Firm—Louis Etlinger

[57] **ABSTRACT**

The present invention pertains to an apparatus and method, in conjunction with standard monochrome and color television receivers, for the generation, display, manipulation, and use of symbols or geometric figures upon the screen of the television receivers for the purpose of training simulation, for playing games, and for engaging in other activities by one or more participants. The invention comprises in one embodiment a control unit, connecting elements and in some applications a television screen overlay mask utilized in conjunction with a standard television receiver. The control 10 unit includes the control, switches and electronic circuitry for the generation, manipulation and control of video signals which are to be displayed on the television screen. The connecting elements couple the video signals to the receiver antenna terminals thereby using existing electronic circuits within the receiver to process and display the signals. An overlay mask which may be removably attached to the television screen may determine the nature of the game to be played or the training simulated. Control units are provided for each of the participants. In the present invention dots are generated on a television screen and controls are provided to cause one dot to overlap the other. Alternatively, a photoelectric element senses light emitted by a displayed dot and denotes that the light has been sensed.

6 Claims, 26 Drawing Figures



United States Patent

Baer et al.

[15] 3,659,285
[45] Apr. 25, 1972

[54] TELEVISION GAMING APPARATUS AND METHOD

[72] Inventors: Ralph H. Baer, Manchester; William T. Rusch, Hollis; William L. Harrison, Nashua, all of N.H.

[73] Assignee: Sanders Associates, Inc., Nashua, N.H.

[22] Filed: Aug. 21, 1969

[21] Appl. No.: 851,865

[52] U.S. Cl. ..... 340/324 A, 178/6.8, 250/217 CR, 273/85, 315/22, 315/30

[51] Int. Cl. G08b 5/22

[58] Field of Search ..... 340/324 A; 315/18, 22, 30; 328/110, 187, 189, 227, 228, 229, 231; 178/6.8; 250/217 CR

[56] References Cited

UNITED STATES PATENTS

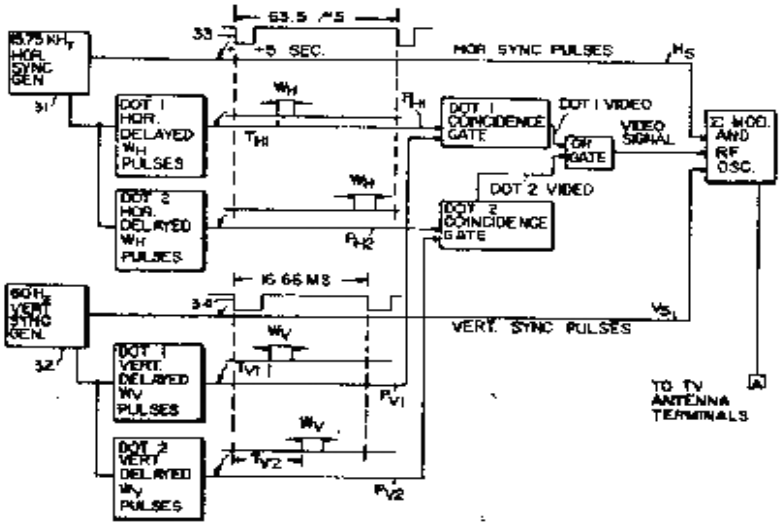
2,847,661	8/1958	Althouse	315/22 X
3,158,858	11/1964	Ragen et al.	340/324 A X
2,595,646	5/1952	Doba et al.	340/324 A X
3,189,889	6/1965	Bridgett	340/324 A
3,017,625	1/1962	Evans et al.	340/324 A
2,455,992	12/1948	Goldsmith et al.	315/22
3,249,796	5/1966	Moffitt	315/22
3,497,760	2/1970	Kiesling	178/6.8 X
3,334,236	8/1967	Bacon	250/217 CR

Primary Examiner—David L. Trafton
Attorney—Louis Ethinger

[57] ABSTRACT

Apparatus and methods are herein disclosed for use in conjunction with standard monochrome and color television receivers, for the generation, display and manipulation of symbols upon the screen of the television receivers for the purpose of playing games, training simulation and for engaging in other activities by one or more participants. The invention comprises in one embodiment a control unit, connecting means and in some applications a television screen overlay mask utilized in conjunction with a standard television receiver. The control unit includes the control means, switches and electronic circuitry for the generation, manipulation and control of video signals representing symbols which are to be displayed on the television screen. The symbols are generated by voltage controlled delay of pulses and coincidence gating. The connecting means couples the video signals to the receiver antenna terminals thereby using existing electronic circuits within the receiver to process and display the signals. An overlay mask which may be removably attached to the television screen may determine the nature of the game to be played. Control units may be provided for each of the participants. Alternatively, games may be carried out in conjunction with background and other pictorial information originated in the television receiver by commercial TV, closed-circuit TV or a CATV station.

12 Claims, 37 Drawing Figures



OPTICAL SCAN EXAMINATION
(Graphics overlay)

United States Patent [19]

Baer et al.

[11] **4,117,511**

[45] **Sep. 26, 1978**

[54] **UNIVERSAL TELEVISION INTERFACE AND SYNC GENERATOR THEREFOR**

[75] Inventors: **Ralph H. Baer**, Manchester; **Leonard D. Cope**, Merrimack, both of N.H.

[73] Assignee: **Sanders Associates, Inc.**, Nashua, N.H.

[21] Appl. No.: **817,642**

[22] Filed: **Jul. 21, 1977**

[51] Int. Cl.² H04N 5/06; H04N 5/50

[52] U.S. Cl. 358/83; 358/93; 358/142; 358/148; 358/150; 358/192

[58] Field of Search 358/142, 146, 148, 149, 358/150, 93, 83, 192

[56] **References Cited**

U.S. PATENT DOCUMENTS

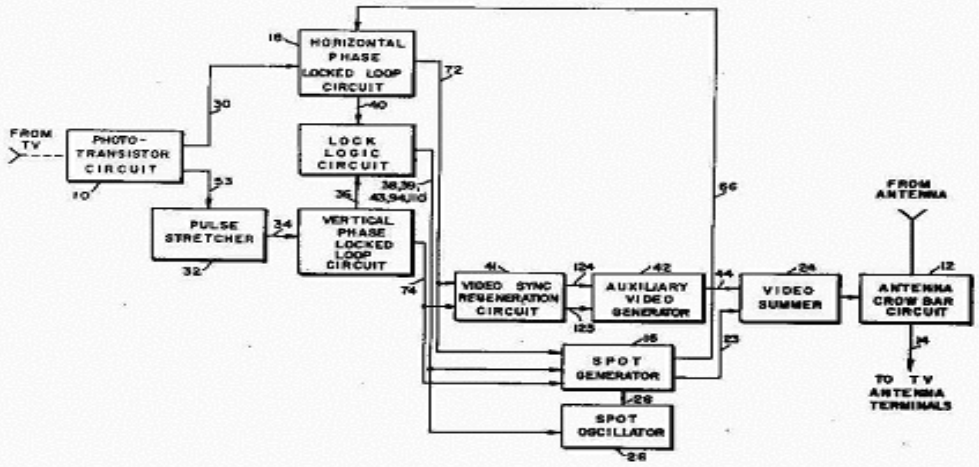
3,728,480 4/1973 Baer 358/93

Primary Examiner—Robert L. Richardson
Attorney, Agent, or Firm—Louis Etlinger; Richard I. Seligman

[57] **ABSTRACT**

Apparatus for generating horizontal and vertical synchronization signals in synchronism with synchronization signals generated by an ongoing television program received by a user without internal connections to the user's television receiver, is provided by optically extracting pulses from a displayed raster of the ongoing television program and generating therefrom the synchronization signals in synchronization with the ongoing program.

13 Claims, 11 Drawing Figures



United States Patent [19]

Baer et al.

[11] **Patent Number: 4,567,532**

[45] **Date of Patent: Jan. 28, 1986**

[54] **SELECTABLE VIEW VIDEO RECORD/PLAYBACK SYSTEM**

[75] Inventors: **Ralph H. Baer**, Manchester, N.H.; **David Allen**, Scituate, Mass.

[73] Assignee: **Sanders Associates, Inc.**, Nashua, N.H.

[21] Appl. No.: **532,874**

[22] Filed: **Sep. 16, 1983**

[51] **Int. Cl.**[4] **H04N 5/76**

[52] **U.S. Cl.** **358/342**; 358/907

[58] **Field of Search** 360/33.1, 10.1, 10.2, 360/10.3, 11.1, 35.1; 358/108, 181, 335, 342, 907; 369/32; 434/323, 43; 273/DIG. 28; 364/521, 410

[56] **References Cited**

U.S. PATENT DOCUMENTS

3,829,610	8/1974	Meeussen et al.	358/342
3,911,484	10/1975	Mutou et al.	360/35.1
4,094,013	6/1978	Hill et al.	369/32
4,198,656	4/1980	Mathisen	358/108
4,305,131	12/1981	Best	364/521
4,360,876	11/1982	Girsult et al.	364/521
4,463,389	7/1984	Golding	358/342
4,475,132	10/1984	Rodesch	358/342

OTHER PUBLICATIONS

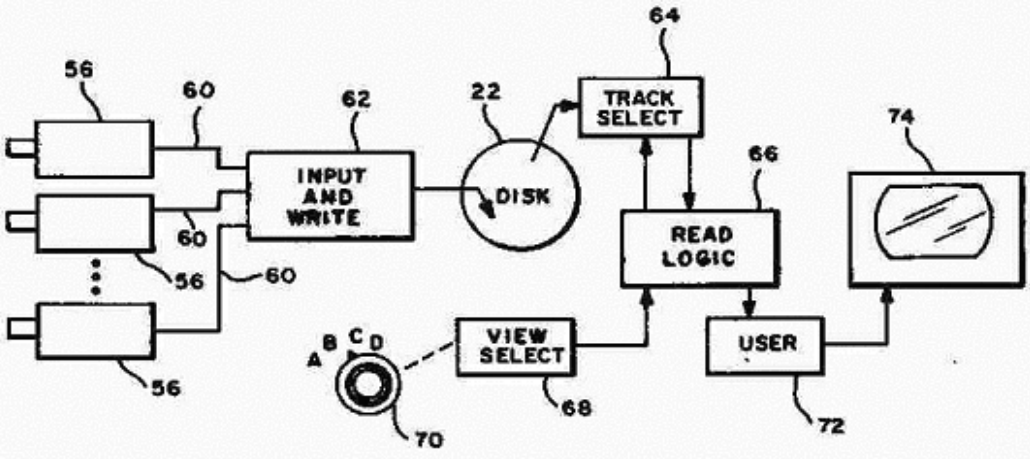
John Free, "Through the Electronic Looking Glass into Living Pictures", *Popular Science*, Aug. 1981, pp. 68–70.

Primary Examiner—Donald McElheny, Jr.
Attorney, Agent, or Firm—Louis Etlinger; R. I. Seligman

[57] **ABSTRACT**

A video recorder and playback system adapted to provide the viewer with selectable views of the action in progress. During recording, a plurality of cameras simultaneously record the action in progress on addressable subtracks of a multi-track loop recording medium such as a laser disk or magnetic surfaced disk. At playback time, the playback and display portion of the system is adapted to read from the same subtract on sequential tracks beginning at a selected starting point. Means are provided for the viewer to change on demand the one of the subtracks being read whereby the view can be instantaneously changed by selecting the one of the subtracks containing the desired view.

3 Claims, 10 Drawing Figures



United States Patent [19]

Baer et al.

[11] 3,737,566
[45] June 5, 1973

[54] TELEVISION CODER AND DECODER

[75] Inventors: Ralph H. Baer, Manchester; William T. Rusch, Hollis, both of N.H.

[73] Assignee: Sanders Associates, Inc., Nashua, N.H.

[22] Filed: Dec. 8, 1970

[21] Appl. No.: 96,033

Related U.S. Application Data

[60] Continuation-in-part of Ser. No. 852,349, Aug. 22, 1969, abandoned, which is a division of Ser. No. 697,798, Jan. 15, 1968, abandoned.

[52] U.S. Cl. ..... 178/5.8 R, 178/DIG. 35
[51] Int. Cl. H04n 5/44
[58] Field of Search ..... 35/9 B, 9 C, 9 G, 35/9 H; 178/5.6; 340/324 A, 190; 250/217 CR

[56] References Cited

UNITED STATES PATENTS

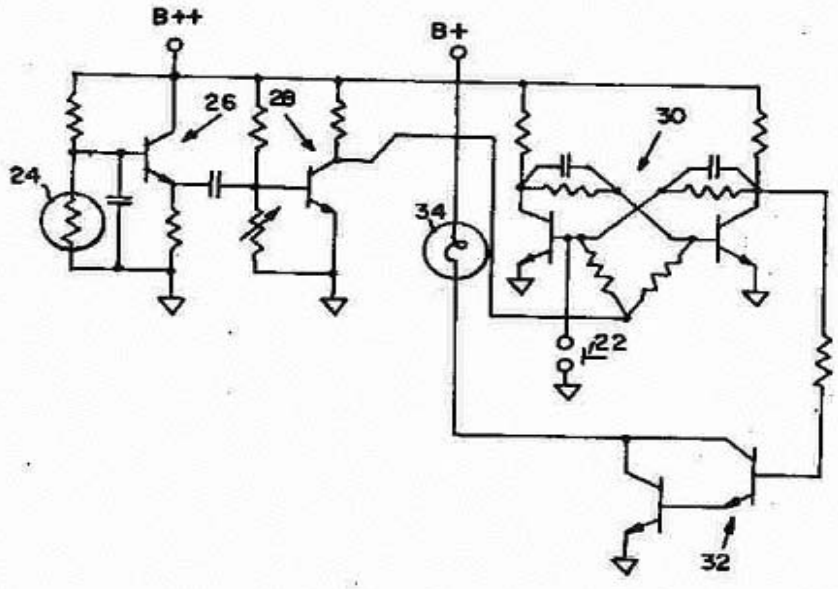
2,540,144	2/1951	Stern	250/217 CR
2,994,077	7/1961	Terhune	250/217 CR
3,095,653	7/1963	Corrigan	35/9 B

Primary Examiner—Richard Murray
Attorney—Louis Etlinger

[57] ABSTRACT

Apparatus is herein disclosed for use in conjunction with television receivers for presenting coded messages displayed on a television screen and for decoding same by the selection of a particular displayed coded symbol. The coder comprises means for flashing symbols on the television screen an odd or even number of times. The decoder comprises a multivibrator responsive to said coded symbol.

8 Claims, 4 Drawing Figures



United States Patent [19]

Baer

[11] **Patent Number: 4,571,640**

[45] **Date of Patent: Feb. 18, 1986**

[54] **VIDEO DISC PROGRAM BRANCHING SYSTEM**

[75] Inventor: **Ralph H. Baer**, Manchester, N.H.

[73] Assignee: **Sanders Associates, Inc.**, Nashua, N.H.

[21] Appl. No.: **438,139**

[22] Filed: **Nov. 1, 1982**

[51] **Int. Cl.**[4] **H04N 5/781**

[52] **U.S. Cl.** **358/342**; 369/32; 369/33; 369/41; 358/142; 434/323; 434/336

[58] **Field of Search** 358/342, 343, 142; 369/32, 33, 41, 126, 109, 111; 434/323, 335, 336, 309

[56] **References Cited**

U.S. PATENT DOCUMENTS

2,009,438	7/1935	Dudley	358/142 X
3,164,685	1/1965	Banning, Jr. et al.	369/7
4,052,798	10/1977	Tomita et al.	434/336 X

OTHER PUBLICATIONS

Bogels, System Coding Parameter, IEEE Transactions on Consumer Electronics, 11/76, pp. 309–317.

Bennion et al., Interactive Videodisc Systems for Education, Journal of the SMPTE, vol. 84, No. 12, 12/75, pp. 949–953.

Inoue et al., The VHD Video Disk System, SMPTE Journal, 11/82, pp. 1071–1076.

Clemens, RCA Review, vol. 39, 3/78, pp. 33–59.

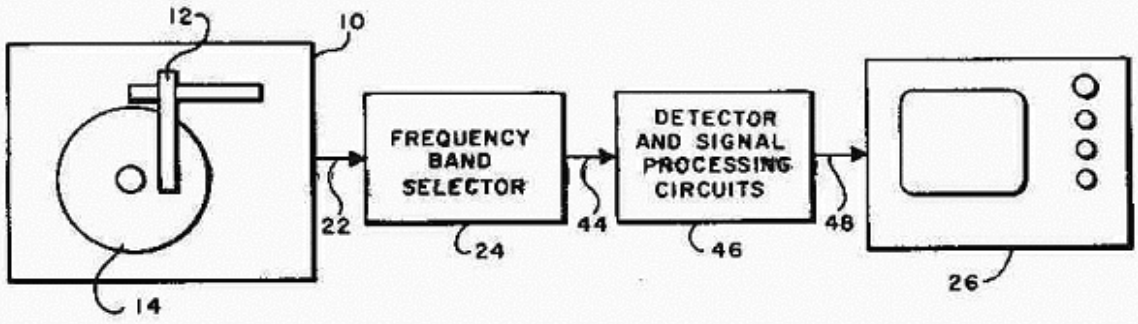
Primary Examiner—Robert L. Richardson

Attorney, Agent, or Firm—Louis Etlinger; Richard I. Seligman

[57] **ABSTRACT**

A video disc program branching system comprising multiple programs frequency multiplexed on a video disc and co-located substantially in the same portion of the disc wherein branching is achieved by designating specific ones of said multiple programs through frequency band selection.

9 Claims, 4 Drawing Figures



United States Patent [19]

Baer

[11] **Patent Number: 4,654,700**

[45] **Date of Patent: Mar. 31, 1987**

[54] OPTICAL DECODER

[75] Inventor: **Ralph H. Baer**, Manchester, N.H.

[73] Assignee: **Sanders Associates, Inc.**, Nashua, N.H.

[21] Appl. No.: 718,679

[22] Filed: Apr. 1, 1985

[51] Int. Cl.⁴ H04N 7/00

[52] U.S. Cl. 358/93; 340/707; 434/323; 273/DIG. 28

[58] Field of Search 358/93; 340/707, 708, 340/712; 434/362, 323, 327, 350; 273/DIG. 28

[56] References Cited

U.S. PATENT DOCUMENTS

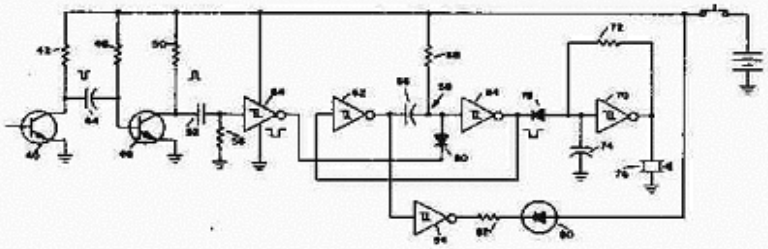
3,737,566	6/1973	Baer et al.	358/93
3,993,861	11/1976	Baer	358/142
4,329,684	5/1982	Monteath et al.	340/707

Primary Examiner—James J. Groody
Assistant Examiner—John K. Peng
Attorney, Agent, or Firm—Louis Etlinger; Richard I. Seligman

[57] ABSTRACT

An optical decoder to permit differentiating between at least two flashing spots displayed on a cathode ray tube screen is provided by a photosensor and an electrical circuit which is responsive to the absence of flashes during a flashing sequence which is different for the two spots and not distinguishable by the naked eye.

19 Claims, 8 Drawing Figures



United States Patent [19]

Baer et al.

[11] 4,355,805

[45] Oct. 26, 1982

[54] MANUALLY PROGRAMMABLE VIDEO GAMING SYSTEM

[75] Inventors: Ralph H. Baer, Manchester; Leonard D. Cope, Merrimack, both of N.H.

[73] Assignee: Sanders Associates, Inc., Nashua, N.H.

[21] Appl. No.: 838,419

[22] Filed: Sep. 30, 1977

[51] Int. Cl.³ A63F 9/22

[52] U.S. Cl. ..... 273/85 G; 273/313; 273/DIG. 28; 340/709; 340/723

[58] Field of Search ..... 273/1 G, 85 G, 101.2, 273/DIG. 28, 237, 313, 35/9 C; 340/324 A, 324 AD, 709, 710, 723–725; 364/200 MS File, 900 MS File, 410

[56] References Cited

U.S. PATENT DOCUMENTS

3,399,401	8/1968	Ellis et al.	364/200
3,659,284	4/1972	Rusch	340/324 AD
3,659,285	4/1972	Baer et al.	340/324 AD
3,728,480	4/1973	Baer	273/DIG. 28
3,731,299	5/1973	Bouchard et al.	340/324 A
3,742,289	6/1973	Koeijmans	315/18
3,761,877	9/1973	Fernald	35/9 C X
3,778,058	12/1973	Rausch	273/85 G
3,809,395	5/1974	Allison et al.	273/DIG. 28
3,846,826	11/1974	Mueller	340/710
3,891,792	6/1975	Kimura	340/726
3,921,161	11/1975	Baer	273/85 G
3,980,994	9/1976	Ying et al.	364/200
4,026,555	5/1977	Kirschner et al.	273/85 G
4,034,950	7/1977	Baer	273/85 G
4,053,740	10/1977	Rosenthal	273/DIG. 28
4,126,851	11/1978	Okor	273/DIG. 28
4,127,849	11/1978	Okor	358/182
4,156,928	5/1979	Inose	273/237

OTHER PUBLICATIONS

Popular Electronics, "Build the Pixie Graphic Display", Jul., 1977, pp. 41–46

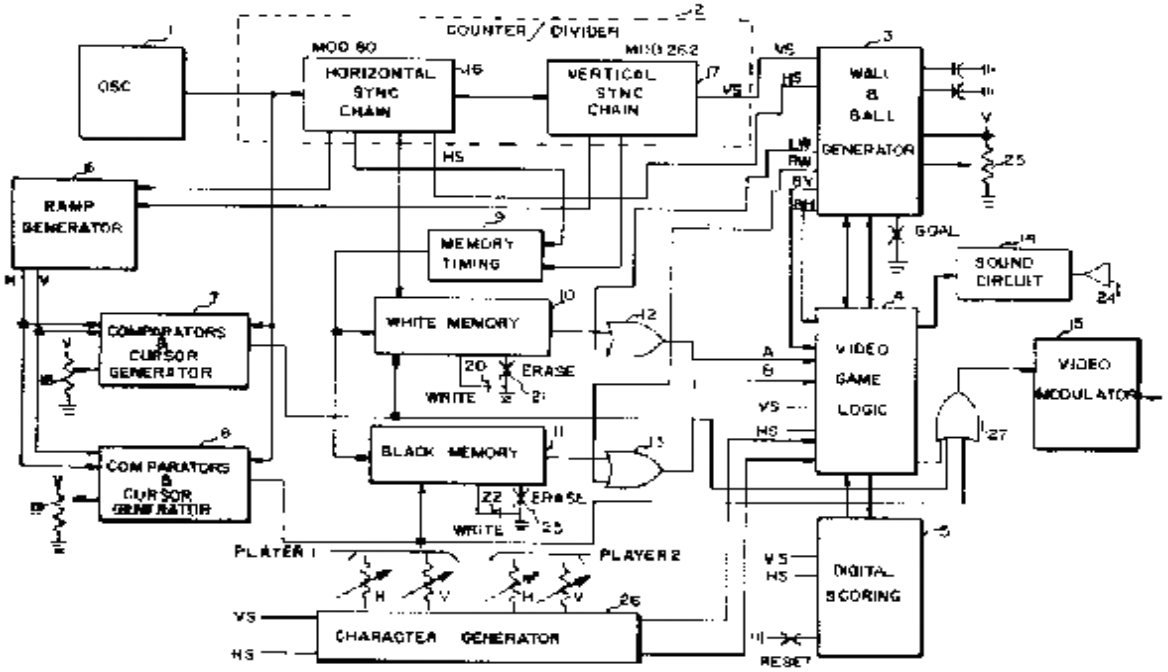
Primary Examiner—Vance Y. Hum

Attorney, Agent, or Firm—Louis Bilinger; Richard I. Seligman

[57] ABSTRACT

Apparatus and methods are disclosed herein for use in conjunction with raster scan video displays, including standard monochrome and color television receivers, for the generation, display and manipulation of images upon the screen of a display for the purpose of playing games or for the purpose of drawing pictures. In addition to the generation of signals which, when supplied to the video display, cause the display of moveable and immoveable game playing indicia such as walls, players, and balls to play a variety of typical games such as tennis, handball, billiards, and the like, in a manner well known in the art, other indicia are displayed on the display screen in response to commands from the game operator which are defined by the operator as to shape, location, color and other attributes and are, furthermore, endorsed with interactive characteristics.

14 Claims, 3 Drawing Figures



United States Patent [19]

Baer

[11] **4,310,854**

[45] **Jan. 12, 1982**

[54] TELEVISION CAPTIONING SYSTEM

[75] Inventor: **Ralph H. Baer, Manchester, N.H.**

[73] Assignee: **Sanders Associates, Inc., Nashua, N.H.**

[21] Appl. No.: **69,483**

[22] Filed: **Aug. 24, 1979**

[51] **Int. Cl.**³ **H04N 7/04**

[52] **U.S. Cl.** **358/143**

[58] **Field of Search** 358/142, 143, 144, 145, 358/183, 198, 186, 149, 150, 154, 210, 281, 256, 257, 263, 280; 328/187

[56] **References Cited**

U.S. PATENT DOCUMENTS

3,046,329	7/1962	Reesor	358/198
3,221,098	11/1965	Feldman et al.	358/143
3,412,205	11/1968	Saeger	375/42
3,581,011	5/1971	Ward et al.	358/150
3,632,863	1/1972	Hirashima	358/142
3,816,658	6/1974	Vidovic	358/149

OTHER PUBLICATIONS

Radio Shack *Dictionary of Electronics*, 1974–1975 edition pp. 575 and 630.

Mohanty, "Simultaneous Transmission of Two Languages on Television", J. Instn. Telecom. Engrs. vol. 18, No. 7, 1972, pp. 313–319.

Heathkit Color TV Model GR-581, *Photofact*, vol. 138, Set 1373, Howard W. Sams & Co, 1975.

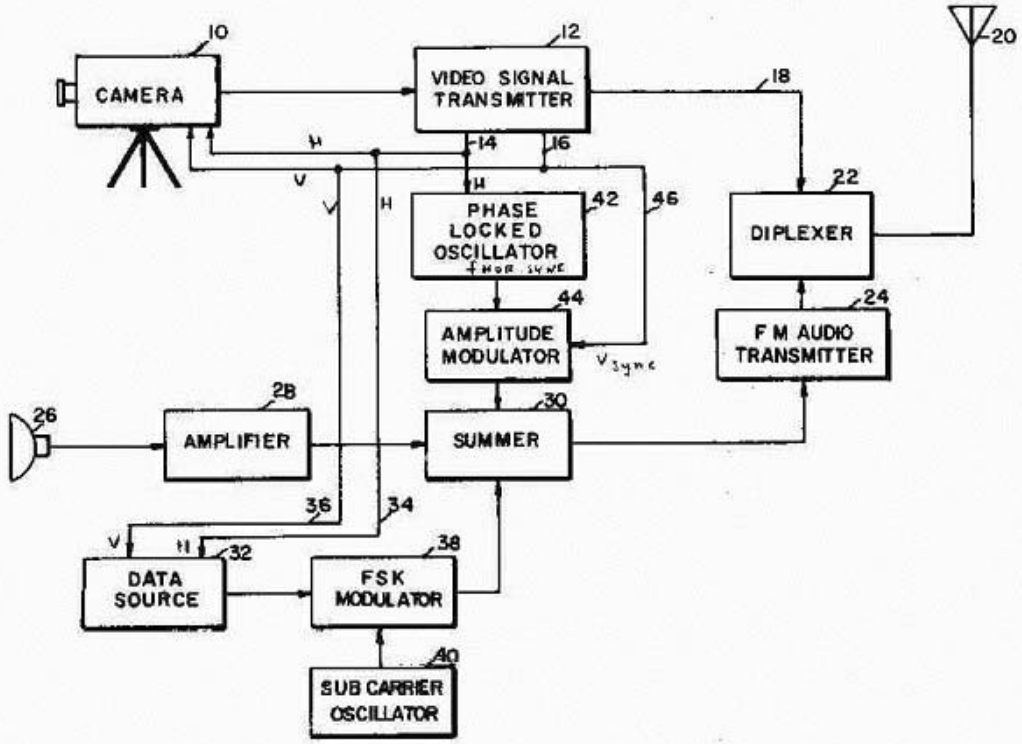
Primary Examiner—John C. Martin

Attorney, Agent, or Firm—Louis Etlinger; Richard I. Seligman

[57] **ABSTRACT**

Captioning of television presentations is achieved by transmitting digital data superimposed on the normal FM sound signal by modulation of an ultrasonic subcarrier and receiving the digital data at a viewer's television receiver by picking up the ultrasonic signal from the television receiver's loudspeaker; the received digital data being demodulated and applied to the television receiver as readable alphanumeric captions.

16 Claims, 5 Drawing Figures



United States Patent [19]

Baer

[11] **3,993,861**

[45] **Nov. 23, 1976**

[54] **DIGITAL VIDEO MODULATION AND DEMODULATION SYSTEM**

[75] Inventor: **Ralph H. Baer**, Manchester, N.H.

[73] Assignee: **Sanders Associates, Inc.**, South Nashua, N.H.

[22] Filed: **Mar. 24, 1975**

[21] Appl. No.: **561,131**

[52] U.S. Cl. **178/5.6**; 178/DIG. 1

[51] Int. Cl.[2] **H04N 7/00**

[58] Field of Search ..... 178/5.6, DIG. 1, DIG. 23, 178/DIG. 35, DIG. 38

[56] **References Cited**

UNITED STATES PATENTS

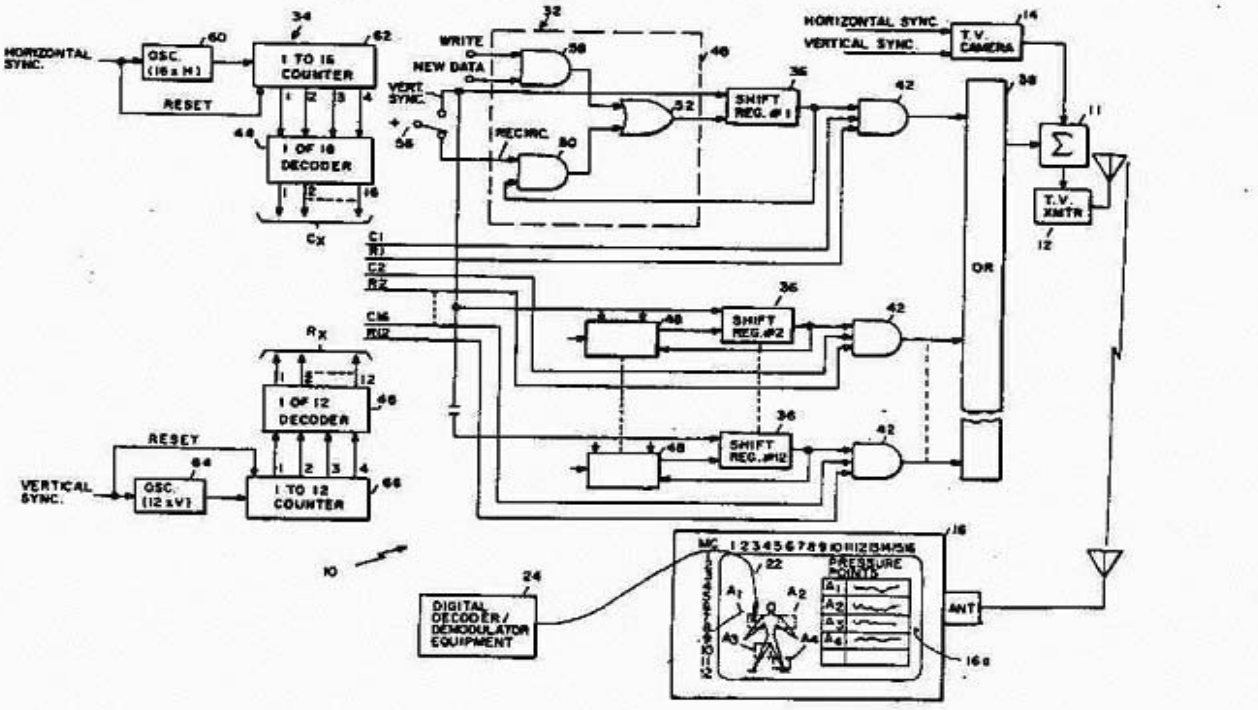
3,369,073	2/1968	Scholz	178/5.6
3,493,674	2/1970	Houghton	178/5.6
3,663,937	5/1972	Bolner	178/DIG. 1
3,728,480	4/1973	Baer	178/DIG. 1
3,737,566	6/1973	Baer et al.	178/5.8 R
3,743,767	7/1973	Bitzer et al.	178/DIG. 23
3,891,792	6/1975	Kimura	178/5.6 X
3,900,887	8/1975	Soga et al.	178/DIG. 23

Primary Examiner—Richard Murray
Assistant Examiner—Aristotelis M. Psitos
Attorney, Agent, or Firm—Louis Etlinger; Richard I. Seligman

[57] **ABSTRACT**

In a television system, a digital video system permits the transmission of data along with the usual television picture. The television picture field includes one or more selectively addressable areas and the data is imprissed on these areas as digital, binary-coded brightness modulations at rates greater than the vertical field rate. At the receiving end of the system, the viewer positions one or more light sensors opposite these screen areas. The light sensors respond to the binary-coded brightness modulations by developing corresponding binary-coded digital electrical signals. The data stream from a light sensor can then be decoded by a demodulator/decoder operated by the viewer.

18 Claims, 6 Drawing Figures



United States Patent [19]

Baer

[11] **4,034,990**

[45] **July 12, 1977**

[54] **INTERACTIVE TELEVISION GAMING SYSTEM**

[75] Inventor: **Ralph H. Baer**, Manchester, N.H.

[73] Assignee: **Sanders Associates, Inc.**, Nashua, N.H.

[21] Appl. No.: **574,113**

[22] Filed: **May 2, 1975**

[51] **Int. Cl.**[3] **A63F 7/06; G08B 5/22; H04N 7/18**

[52] **U.S. Cl.** ..... **273/85 R; 273/DIG. 28; 340/324 AD**

[58] **Field of Search** ..... 35/9 R, 9 A, 9 C, 9 B, 35/12 N, 11 A, 25; 273/1 E, 85 R, 101.1, 136 A, DIG. 28; 178/6.8, DIG. 35; 235/92 GA; 340/324 AD, 323 R

[56] **References Cited**

U.S. PATENT DOCUMENTS

3,002,801	10/1961	Bomzer et al.	360/79
3,486,242	12/1969	Aronson	35/11 A
3,560,644	2/1971	Petrocelli et al.	35/25
3,562,415	2/1971	Michels et al.	178/6.8 X
3,728,480	4/1973	Baer	178/6.8
3,778,058	12/1973	Rausch	273/1 E
3,808,705	5/1974	Schmoyer	35/9 A
3,874,669	4/1975	Ariano et al.	273/DIG. 28
3,921,161	11/1975	Baer	273/85 R X
Re. 28,598	10/1975	Baer et al.	273/85 R

OTHER PUBLICATIONS

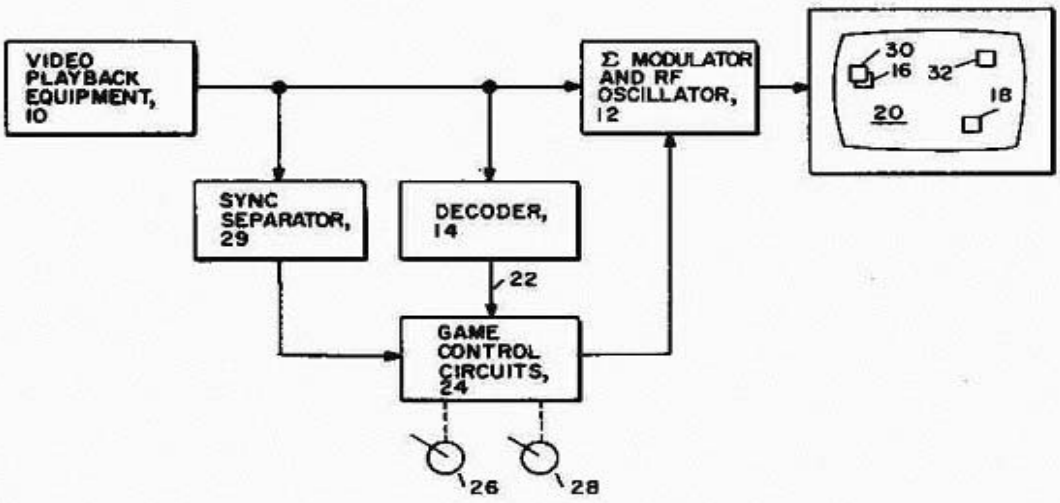
Popular Electronics; "Video Cartridges, Cassettes and Compatibility; Dec. 1972, p. 6.

Primary Examiner—Richard C. Pinkham
Assistant Examiner—Vance Y. Hum
Attorney, Agent, or Firm—Louis Etlinger; Richard Seligman

[57] **ABSTRACT**

Apparatus for playing games on the cathode ray tube screen of a television receiver or monitor is disclosed comprising a viewer/participant game control box of conventional design and having components for providing location controllable symbols on the screen and a prerecorded source providing additional symbols on the screen. The output from the prerecorded source is decoded and applied to the game control box such that the game control box can operate on the symbols generated by the prerecorded source in a manner which it normally performs on internally generated symbols whereby the internally generated symbols and the prerecorded symbols interact to provide a game playing capability.

17 Claims, 9 Drawing Figures



United States Patent [19]

Baer

[11] **Patent Number: 4,496,158**

[45] **Date of Patent: Jan. 29, 1985**

[54] **ELECTRO-OPTICAL SENSOR FOR COLOR TELEVISION GAMES AND TRAINING SYSTEMS**

[75] Inventor: **Ralph H. Baer**, Manchester, N.H.

[73] Assignee: **Sanders Associates, Inc.**, Nashua, N.H.

[21] Appl. No.: **449,069**

[22] Filed: **Dec. 13, 1982**

[51] **Int. Cl.**³ **A63F 9/22**

[52] **U.S. Cl.** ..... **273/312**; 273/314; 273/DIG. 28; 273/1 E; 340/702; 340/707; 434/22

[58] **Field of Search** ..... 273/312-316, 273/1 E, DIG. 28, 310; 358/60; 340/701-704, 707; 434/20-22; 235/465, 469

[56] **References Cited**

U.S. PATENT DOCUMENTS

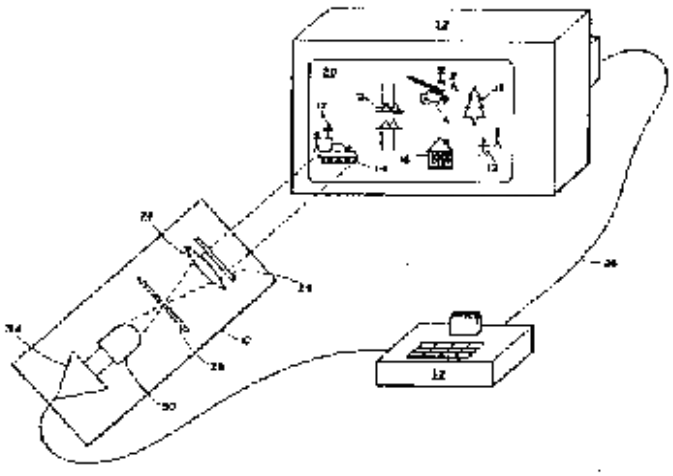
3,376,465	4/1968	Corpew	340/701
3,443,072	5/1969	Mori	235/465
3,775,005	11/1973	Szabo	340/707
3,798,363	3/1974	Melchior	340/707
4,223,454	9/1980	Mobon et al.	434/22
4,243,972	1/1981	Toussaint	340/707
4,328,493	5/1982	Shanks et al.	340/703
4,349,337	9/1982	Pardes	273/310

Primary Examiner—Richard C. Pinkham
Assistant Examiner—MaryAnn Lastova
Attorney, Agent, or Firm—Louis Etlinger; Richard I. Seligman

[57] **ABSTRACT**

Apparatus for discriminating at a distance between one or more colored symbols displayed on the screen of a television receiver from a plurality of other symbols of different colors includes a colored filter which corresponds to the color of the symbol which is to be discriminated.

6 Claims, 1 Drawing Figure



United States Patent [19]

Baer

[11] **3,921,161**

[45] **Nov. 18, 1975**

[54] **PREPROGRAMMED TELEVISION GAMING SYSTEM**

[75] Inventor: **Ralph H. Baer**, Manchester, N.H.

[73] Assignee: **Sanders Associates, Inc.**, Nashua, N.H.

[22] Filed: **Feb. 22, 1974**

[21] Appl. No.: **445,022**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 365,000, May 29, 1973, abandoned.

[52] **U.S. Cl.** ..... **340/324 AD**; 178/6.8; 273/85 R; 273/DIG. 28; 340/147 P; 360/29; 360/79

[51] **Int. Cl.²** **G06F 3/14**

[58] **Field of Search** ..... 340/324 AD, 147 P; 178/6.6 A, 6.8; 360/29, 79; 273/DIG. 28, 85 R

[56] **References Cited**

UNITED STATES PATENTS

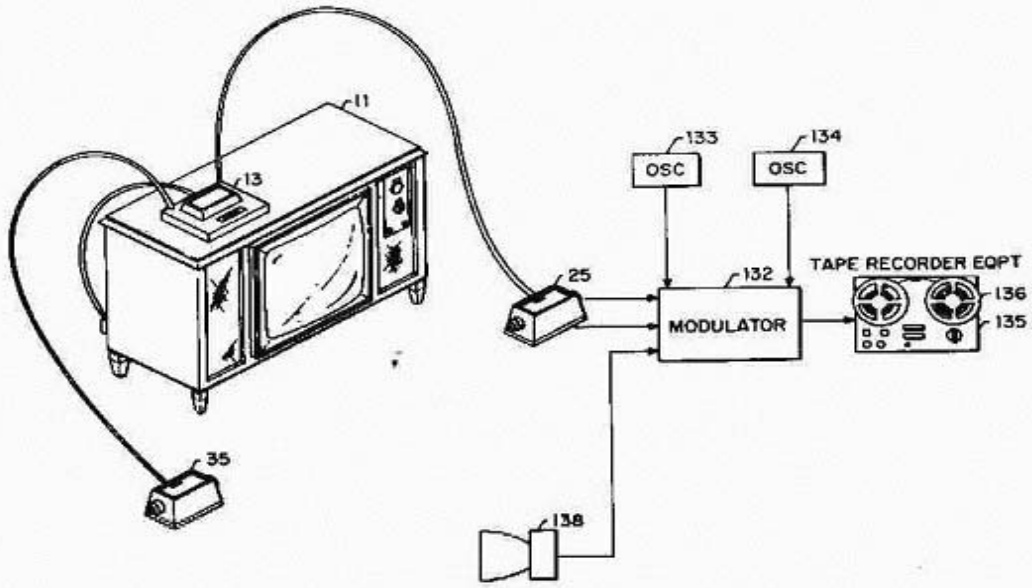
2,847,661	8/1958	Althouse	340/212
3,002,801	10/1961	Bomzer et al.	360/79
3,009,025	11/1961	Takayanagi et al.	360/29
3,017,625	1/1962	Evans et al.	340/324 AD
3,051,777	8/1962	Lemelson	178/6.6 A
3,317,783	5/1967	Neumeister	340/324 A
3,562,415	2/1971	Michels et al.	178/6.8

Primary Examiner—David L. Trafton
Attorney, Agent, or Firm—Louis Etlinger; Richard I. Seligman

[57] **ABSTRACT**

Apparatus for playing games on the cathode ray tube screen of a television receiver is disclosed comprising a gaming device having components for providing location controllable spots on the screen, a source of prerecorded modulated audio frequency control signals, and means for demodulating those control signals and for supplying them to selected gaming device components to thereby provide gaming capabilities where the progress of a game is in part controlled by the recorded signals and in part controlled by the actions of a player. The signal source may be a magnetic tape or record/disc player and a selected prerecorded game tape or disc with control signals recorded thereon as a plurality of modulated audio frequency signals to thereby allow signal separation based on frequency and waveform control techniques and subsequent demodulation of each so separated carrier to provide a plurality of control signals.

25 Claims, 10 Drawing Figures



United States Patent [19]

Baer et al.

[11] **4,194,198**

[45] **Mar. 18, 1980**

[54] **DIGITAL PREPROGRAMMED TELEVISION GAME SYSTEM**

[75] Inventors: **Ralph H. Baer**, Manchester; **Leonard D. Cope**, Nashua, both of N.H.

[73] Assignee: **Sanders Associates, Inc.**, Nashua, N.H.

[21] Appl. No.: **922,451**

[22] Filed: **Jul. 3, 1978**

Related U.S. Application Data

[63] Continuation of Ser. No. 679,301, Apr. 22, 1976, abandoned.

[51] **Int. Cl.**[2] **G06K 15/20**

[52] **U.S. Cl.** ..... **340/724**; 273/85 G; 340/798; 358/127; 360/27; 360/79

[58] **Field of Search** ..... 340/724, 725, 798, 799; 358/127; 360/27, 32, 79; 273/85 G, DIG. 28

[56] **References Cited**

U.S. PATENT DOCUMENTS

3,668,648	6/1972	Yoshikawa	360/79 X
3,740,491	6/1973	Cook et al.	360/27
3,921,161	11/1975	Baer	340/724 X
4,016,361	4/1977	Pandey	358/127 X
4,040,088	8/1977	Hannan	358/127

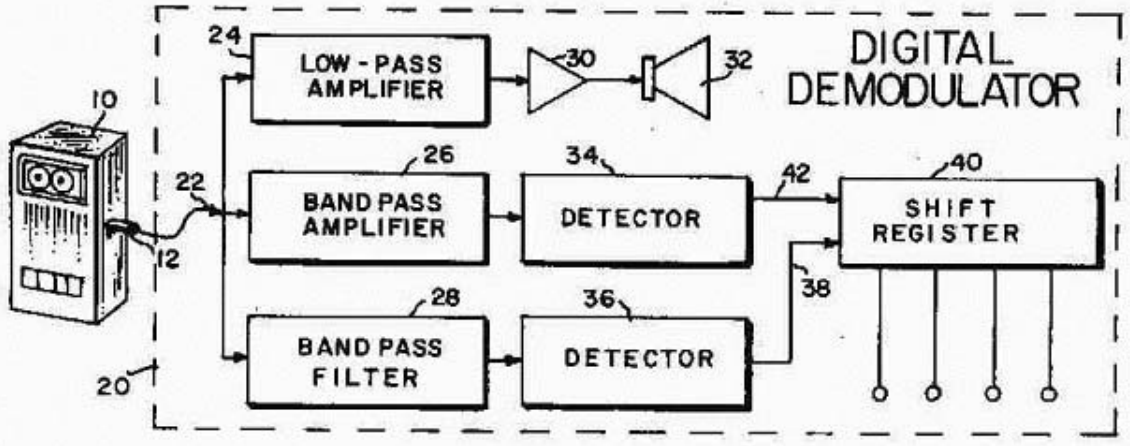
Primary Examiner—David L. Trafton

Attorney, Agent, or Firm—Louis Etlinger; Richard I. Seligman

[57] **ABSTRACT**

Apparatus is provided to permit the control of circuitry within a video game generator including an audio playback device employing an audio tape or phonograph disc having recorded thereon digital data which is decoded and interfaced with the video game generator.

25 Claims, 7 Drawing Figures



United States Patent

[11] 3,599,221

[72] Inventor: Ralph H. Baer, Manchester, N.H.

[21] Appl. No. 713,954
[22] Filed Mar. 18, 1968
[45] Patented Aug. 10, 1971
[73] Assignee Sanders Associates, Inc. Nashua, N.H.

[54] **RECORDING CRT LIGHT GUN AND METHOD**
16 Claims, 10 Drawing Figs.

[52] U.S. Cl. ..... 346/1, 346/74 CR, 250/217 CR, 35/9 R, 346/37
[51] Int. Cl. G01d 5/26, H04n 5/76
[50] Field of Search ..... 346/37, 33, 110, 74 CR, 1, 340/173, 324.1; 178/6.6 A; 250/217 CR; 35/9.48; 346/1

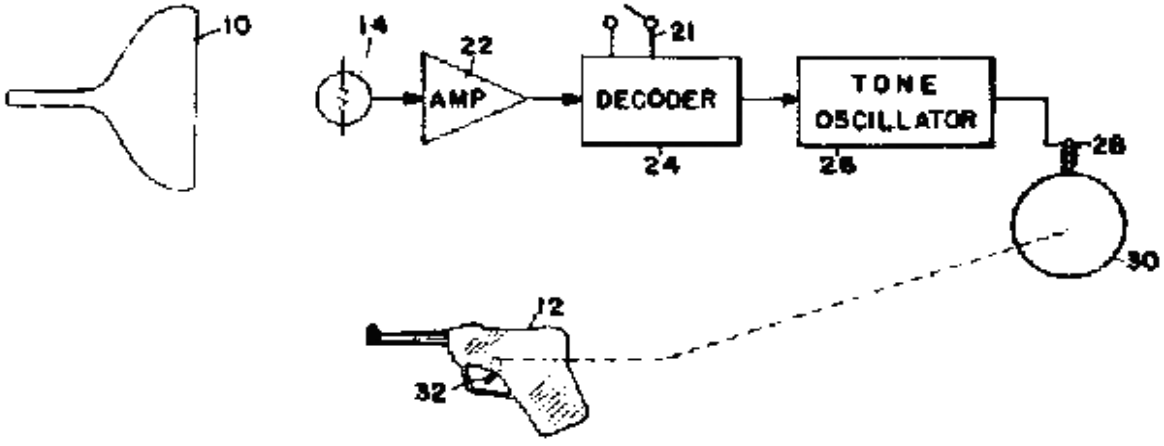
[56] References Cited

UNITED STATES PATENTS

2,454,651	11/1948	Hornrighous	178/69.5
2,540,144	2/1951	Stern	250/217 X
2,595,701	5/1952	Potter	179/100.3
3,136,839	6/1964	Safir	250/217 X
3,233,244	2/1966	Winterhalter	346/74 X
2,994,863	8/1961	Trapnell	346/33 X
3,031,250	4/1962	Laeufer et al.	346/76
3,095,653	7/1963	Corrigan	35/9
3,181,154	4/1965	Henne	250/217 X
3,189,889	6/1965	Bridgett	340/324
3,292,489	12/1966	Johnson et al.	353/25

Primary Examiner—Joseph W. Hartary
Attorneys—Louis Etlinger and Richard I. Seligman

ABSTRACT: Apparatus and method for recording a coded pattern on a CRT display comprises a detector for detecting the coded pattern, a decoder for recognizing the coded pattern, apparatus for generating a signal in response to a decode, and apparatus for recording the generated signal in a nondeceptive manner by recording the decode immediately subsequent the occurrence thereof. Alternatively, a signal is generated in response to a detected signal and recorded directly without decoding.



United States Patent [19]

Baer et al.

[11] **4,359,223**

[45] **Nov. 16, 1982**

[54] INTERACTIVE VIDEO PLAYBACK SYSTEM

[75] Inventors: **Ralph H. Baer**, Manchester; **Leonard D. Cope**, Merrimack, both of N.H.

[73] Assignee: **Sanders Associates, Inc.**, Nashua, N.H.

[21] Appl. No.: **90,830**

[22] Filed: **Nov. 1, 1979**

[51] **Int. Cl.**³ **A63F 9/22**

[52] **U.S. Cl.** ..... **273/85 G**; 273/312; 273/313; 273/DIG. 28; 434/22

[58] **Field of Search** 273/DIG. 28; 434/307, 434/323, 21–22; 340/723–726; 360/33, 35, 37, 10

[56] **References Cited**

U.S. PATENT DOCUMENTS

3,697,678	10/1972	Belleson	360/33
3,742,289	6/1973	Koeijmans	364/900
3,760,375	9/1973	Irwin	364/200
3,778,058	12/1973	Rausch	273/85 G
3,874,669	4/1975	Ariano et al.	273/85 G
3,900,887	8/1975	Soga et al.	360/18
3,921,161	11/1975	Baer	273/85 G X
3,973,244	8/1976	Lovercheck et al.	364/200
3,987,484	10/1976	Bosche et al.	434/307
4,026,555	5/1977	Kirschner et al.	273/85 G
4,032,897	6/1977	Pooley	364/900
4,045,789	8/1977	Bristow	273/DIG. 28
4,094,079	6/1978	Dorsett	434/307
4,126,851	11/1978	Okor	273/237 X
4,156,928	5/1979	Inose et al.	273/85 G
4,177,462	12/1979	Chung	273/85 G

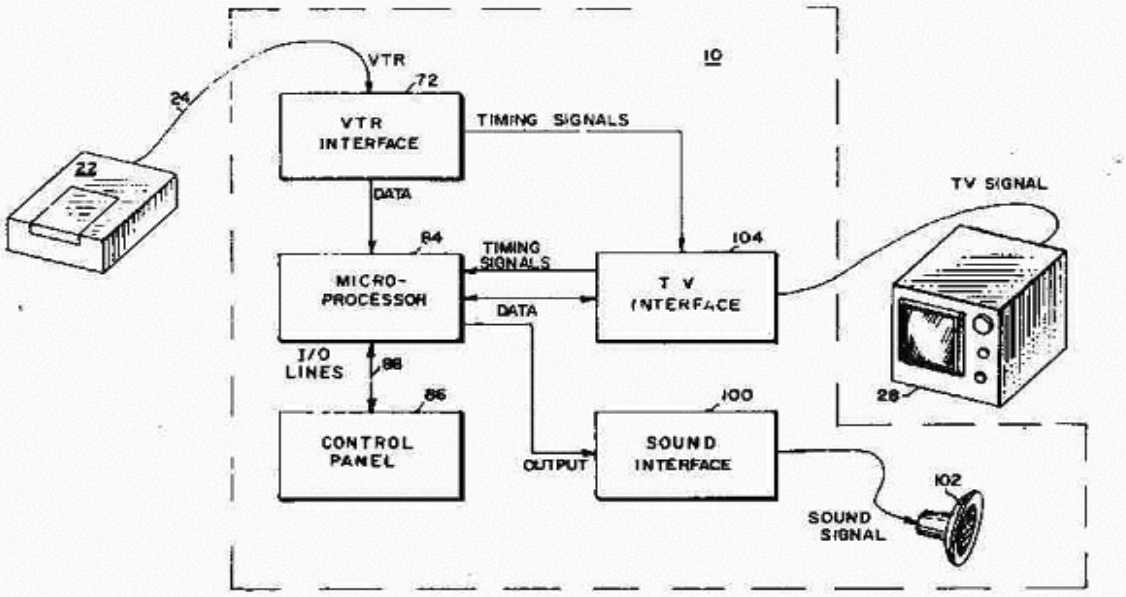
Primary Examiner—Vance Y. Hum

Attorney, Agent, or Firm—Louis Etlinger; Richard I. Seligman

[57] **ABSTRACT**

Video images derived from a video recording medium (such as a video disc or tape) using a video playback unit are displayed on the screen of a cathode ray tube display simultaneously with video images generated from a microprocessor-controlled video game. The video game permits a user to manually control the position of some of the generated video images displayed. Signals in the horizontal interval portion of each field from the video playback unit are related to the video images in the pictorial portion of each such field and identify certain characteristics of the video images such as the location of the video images. This information is used in such a manner that the video images from the video playback unit can interact with the video images from the video game.

20 Claims, 12 Drawing Figures



United States Patent [19]

Baer

[11] **3,991,266**

[45] **Nov. 9, 1976**

[54] **DUAL IMAGE TELEVISION**

[75] Inventor: **Ralph H. Baer**, Manchester, N.H.

[73] Assignee: **Sanders Associates, Inc.**, Nashua, N.H.

[22] Filed: **Sept. 3, 1974**

[21] Appl. No.: **503,007**

[52] **U.S. Cl.** ..... **178/5.8 R; 178/DIG. 23**

[51] **Int. Cl.²** **H04N 7/04**

[58] **Field of Search** ..... 178/6.5, 5.6, 5.8 R, 178/7.1, 7.2, DIG. 23; 315/3

[56] **References Cited**

UNITED STATES PATENTS

2,301,254	11/1942	Carnahan	178/6.5
2,769,025	10/1956	Hoffmann et al.	178/5.1
3,165,578	1/1965	Lauricella	178/6.5 X
3,294,898	12/1966	Gold	178/6.5 UX
3,358,079	12/1967	Banning	178/6.5
3,626,404	12/1971	Ophir et al.	178/6.5 X
3,725,571	4/1973	Justice	178/DIG. 23
3,743,767	7/1973	Bitzer et al.	178/5.6
3,745,241	7/1973	Hirashima	178/DIG. 23
3,745,242	7/1973	Justice	178/DIG. 23
3,783,184	1/1974	Ernstoff et al.	17/5.4 BD
3,821,466	6/1974	Roese	178/6.5
3,837,003	9/1974	Justice	178/DIG. 23
3,858,001	12/1974	Bonne	178/6.5
3,903,358	9/1975	Roese	178/6.5

OTHER PUBLICATIONS

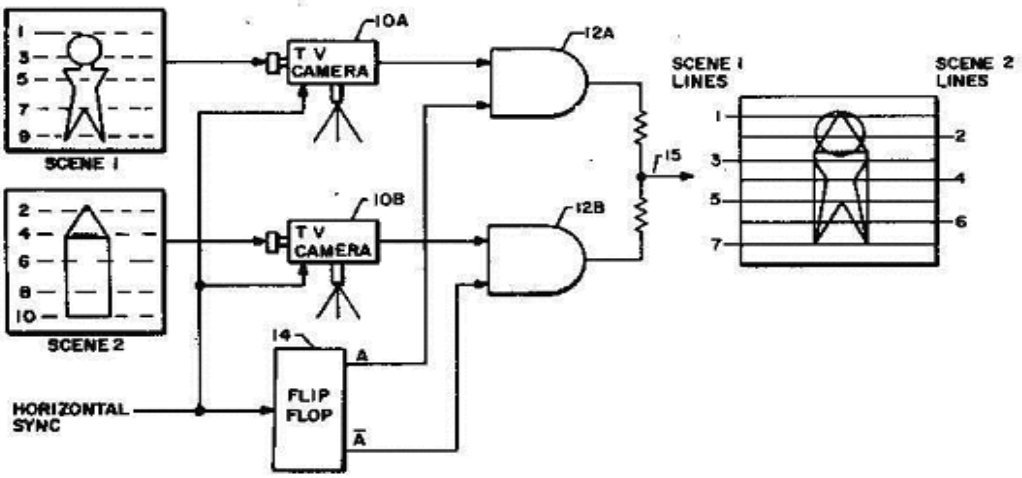
Altman, "The New Concept for Memory and Imaging: Charge Coupling," *Electronics*, June 21, 1971, pp. 50–59.

Primary Examiner—Robert L. Richardson
Attorney, Agent, or Firm—Louis Etlinger; Richard I. Seligman

[57] **ABSTRACT**

In a television system, a multiplexing system permits the simultaneous transmission of two or more images with apparent full resolution, but without a corresponding increase in required transmission bandwidth. The television transmission uses the method of interleaving successive scan lines from different picture sources, such as two TV cameras, these sources being synchronized by common horizontal and vertical synchronization signals.

1 Claim, 9 Drawing Figures



United States Patent [19]

Baer et al.

[11] 4,346,407

[45] Aug. 24, 1982

[54] **APPARATUS FOR SYNCHRONIZATION OF A SOURCE OF COMPUTER CONTROLLED VIDEO TO ANOTHER VIDEO SOURCE**

[75] Inventors: Ralph H. Baer, Manchester; Leonard D. Cope, Merrimack, both of N.H.

[73] Assignee: Sanders Associates, Inc., Nashua, N.H.

[21] Appl. No.: 159,548

[22] Filed: Jun. 16, 1980

[51] Int. Cl.³ H04N 5/04

[52] U.S. Cl. 358/149; 358/148; 340/814

[58] Field of Search 358/149, 148, 17, 150, 358/151, 153, 22, 183; 360/14; 340/721, 725, 734, 814

[56] **References Cited**

U.S. PATENT DOCUMENTS

4,011,401	3/1977	Presti	358/183
4,018,990	4/1977	Long	358/149
4,092,672	5/1978	Aschwanden	358/149
4,157,572	6/1979	Kennedy	358/183
4,203,135	5/1980	Sasaki	358/149
4,222,074	9/1980	Breithaupt	358/149
4,270,125	5/1981	Weisbecker	340/814

OTHER PUBLICATIONS

"The Tifax XMII Teletext Decoder", Norris & Garrard Texas Instrument.

"Video Effects Generator", Television, Apr. 1978, Parr, pp. 294–297.

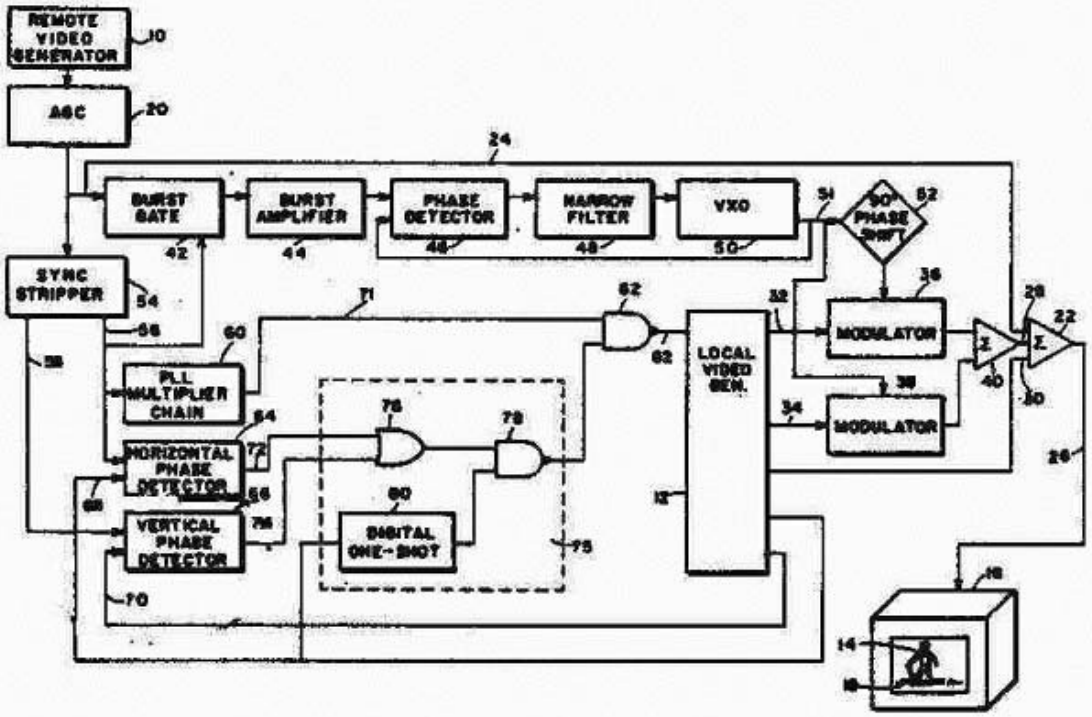
Primary Examiner—Michael A. Masinick

Attorney, Agent, or Firm—Louis Etlinger; Richard I. Seligman

[57] **ABSTRACT**

Synchronization of a source of computer controlled video to another video source is achieved by providing clock pulses for the source of computer controlled video at some multiple of the horizontal synchronization frequency of the other video source to obtain frequency coherence and by detecting phase incoherence between the signals from the two sources and in response thereto causing the clock pulses to cease for a predetermined period to allow the source of computer controlled video to "slip" sync to obtain phase coherence.

23 Claims, 2 Drawing Figures



United States Patent [19]

Baer et al.

[11] **4,342,454**

[45] **Aug. 3, 1982**

[54] **METHOD AND APPARATUS FOR INSTANT REPLAY AND OTHER CAPABILITIES FOR MICROPROCESSOR-CONTROLLED VIDEO GAMES**

[75] Inventors: **Ralph H. Baer, Manchester; Leonard D. Cope, Merrimack; Thomas J. Mortimer, Amherst, all of N.H.**

[73] Assignee: **Sanders Associates, Inc., Nashua, N.H.**

[21] Appl. No.: **1,806**

[22] Filed: **Jan. 8, 1979**

[51] **Int. Cl.**[3] **A63F 9/22**

[52] **U.S. Cl.** ..... **273/85 G; 273/94; 273/DIG. 28; 340/726**

[58] **Field of Search** ..... 273/1 E, 85 G, 86 R, 273/86 B, 313, 237, DIG. 28; 358/93; 340/323 R, 723–725, 726; 360/10

[56] **References Cited**

U.S. PATENT DOCUMENTS

3,614,766	10/1971	Kievit	340/726
3,653,027	3/1972	Scheer	340/726
4,017,072	4/1977	Kurtz	273/DIG. 28
4,019,745	4/1977	Mustelier	273/237
4,026,555	5/1977	Kirschner	273/85 G
4,082,285	4/1978	Bathurst	273/237
4,126,851	11/1978	Okor	273/237
4,148,014	4/1979	Burson	340/724 X
4,156,928	5/1979	Inoue et al.	273/237
4,163,993	8/1979	Ravizza	360/10
4,165,521	8/1979	Watanabe	340/726
4,181,308	1/1980	Fox et al.	273/138 A X
4,197,590	4/1980	Sukonick et al.	340/726
4,200,869	4/1980	Murayama et al.	340/726

FOREIGN PATENT DOCUMENTS

1437795	6/1976	United Kingdom	358/93

OTHER PUBLICATIONS

Popular Electronics, "Build the Pixie Graphic Display", Jul. 1977, pp. 41–46.

Scientific American, Sep. 1977, pp. 16–17.

Gametronics Proceedings, "The Trazor TM–A New Input Device", Jan. 1977, pp. 115–120.

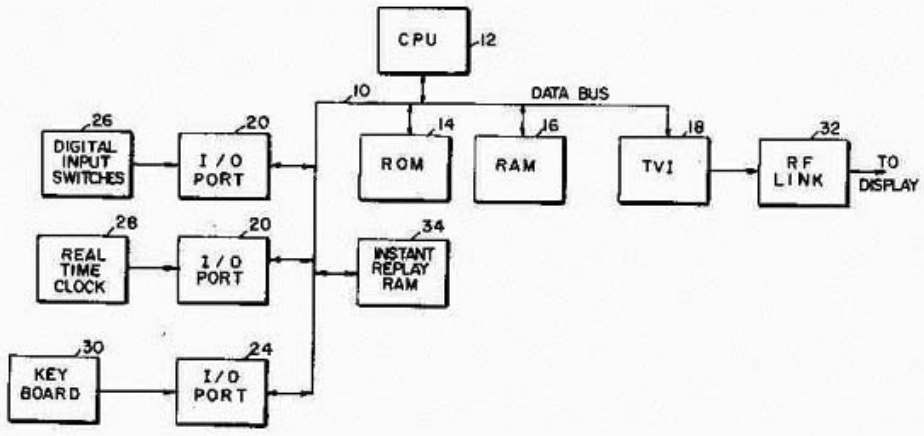
Primary Examiner—Vance Y. Hum

Attorney, Agent, or Firm—Louis Etlinger; Richard I. Seligman

[57] **ABSTRACT**

Instant replay for microprocessor-controlled video games is provided by storing and retaining for a period of time in a random access memory the results of microprocessor polling of each of the player command entry devices. In a memory conserving embodiment only newly entered player commands and the times when such commands are entered need be stored and retained.

13 Claims, 7 Drawing Figures



United States Patent [19]

Baer et al.

[11] **4,357,014**

[45] **Nov. 2, 1982**

[54] **INTERACTIVE GAME AND CONTROL THEREFOR**

[75] Inventors: **Ralph H. Baer**, Manchester; **Leonard D. Cope**, Merrimack; **Oliver D. Holt**, Amherst, all of N.H.; **Howard J. Morrison**, Deerfield, Ill.

[73] Assignees: **Sanders Associates, Inc.**, Nashua, N.H.; **Marvin Glass & Associates**, Chicago, Ill.

[21] Appl. No.: **146,832**

[22] Filed: **May 5, 1980**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 770,735, Feb. 22, 1977, abandoned.

[51] **Int. Cl.**³ **A63F 9/22**

[52] **U.S. Cl.** ..... **273/85 G**; 273/94; 273/DIG. 28

[58] **Field of Search** ..... 273/DIG. 28, 85 G, 88, 273/94, 313–315; 340/723–726; 358/98, 104, 183

[56] **References Cited**

U.S. PATENT DOCUMENTS

3,659,285	4/1972	Baer et al.	273/85 G
3,777,410	12/1973	Robinson	273/DIG. 28
3,821,468	6/1974	Busch	358/183
3,868,112	2/1975	Avera	273/94
3,874,669	4/1975	Ariano et al.	273/85 G
3,879,722	4/1975	Knowlton	340/365 R
3,895,798	7/1975	Collins	273/94
4,026,555	5/1977	Kirschner et al.	273/85 G
4,045,789	8/1977	Bristow	273/DIG. 28
4,093,223	6/1978	Wilke	273/94 R
4,104,625	8/1978	Bristow et al.	273/DIG. 28
4,126,851	11/1978	Okor	273/237
4,156,928	5/1979	Inose et al.	273/237 X
4,249,735	2/1981	Bromley	273/85 G

Primary Examiner—Vance Y. Hum

Attorney, Agent, or Firm—Louis Etlinger; Richard I. Seligman

[57] **ABSTRACT**

An interactive game of a strategy nature employing a digital processor includes a keyboard to preselect the successive directional movements of one or more of the simulated player symbols prior to the start of the game and/or supplement this preprogrammed game action with real-time control over further game action during the playing of the game.

9 Claims, 9 Drawing Figures

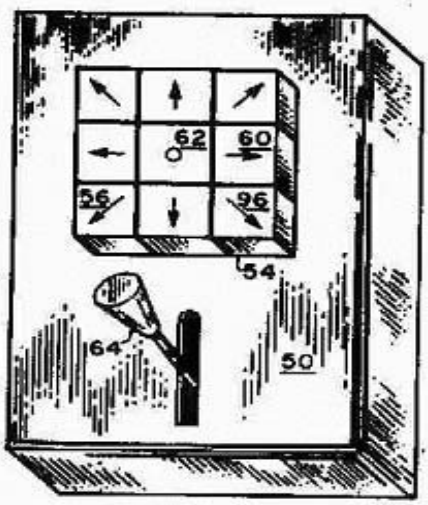


FIG. 2.

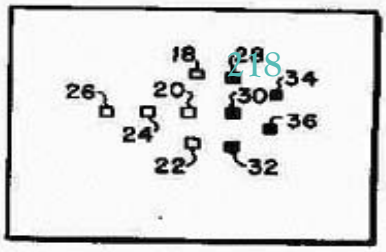


FIG. 3.

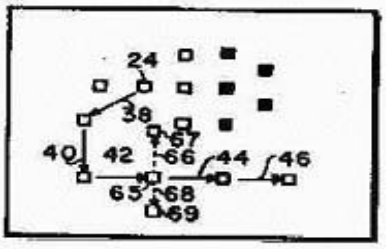


FIG. 4.

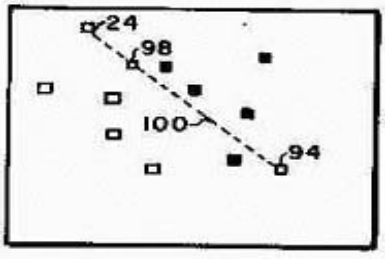


FIG. 5.

United States Patent [19]

Baer

[11] **4,395,045**

[45] **Jul. 26, 1983**

[54] **TELEVISION PRECISION TARGET SHOOTING APPARATUS AND METHOD**

[75] Inventor: **Ralph H. Baer, Manchester, N.H.**

[73] Assignee: **Sanders Associates, Inc., Nashua, N.H.**

[21] Appl. No.: **159,530**

[22] Filed: **Jun. 16, 1980**

[51] **Int. Cl.**[3] **A63F 9/22**

[52] **U.S. Cl.** **273/312**; 273/313; 273/DIG. 28; 434/20; 434/22

[58] **Field of Search** ..... 273/85 G, 310–316, 273/DIG. 28; 358/93; 364/410; 340/323–325; 434/20, 22, 21

[56] **References Cited**

U.S. PATENT DOCUMENTS

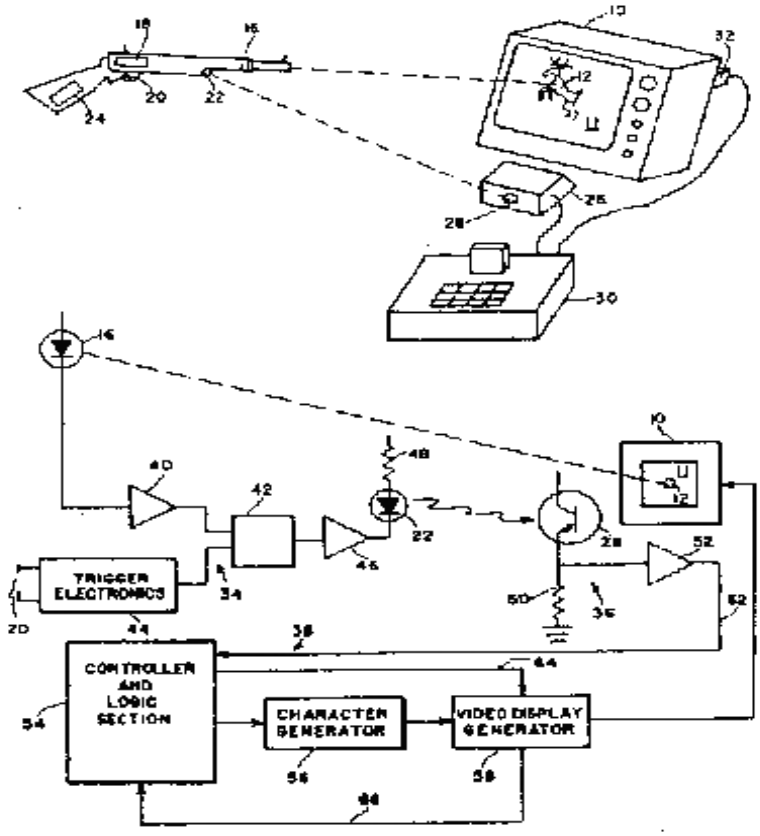
Re. 28,507	10/1975	Rausch	273/DIG. 28
Re. 28,598	10/1975	Baer et al.	273/DIG. 28
2,502,834	4/1950	Dreyer	273/316
3,599,221	8/1971	Baer	273/DIG. 28
3,728,480	6/1973	Baer	273/DIG. 28
3,829,093	8/1974	Baer	273/DIG. 28
3,964,178	6/1976	Marshall et al.	434/22
4,053,740	10/1977	Rosenthal	273/85 G
4,068,847	1/1978	Lukkarila et al.	273/85 G
4,086,711	5/1978	Gammarano et al.	434/22
4,111,421	9/1978	Mierzwinski	273/85 G
4,126,851	11/1978	Okor	273/DIG. 28
4,177,462	12/1979	Chung	273/DIG. 28
4,210,329	7/1980	Steiger et al.	273/313

Primary Examiner—Vance Y. Hum
Attorney, Agent, or Firm—Louis Etlinger; Richard I. Seligman

[57] **ABSTRACT**

Simulated shooting at displayed images on the screen of a television receiver using an untethered, simulated gun provides indication on the screen of where the gun was pointed at the time of trigger pull. This is achieved by flashing the screen white subsequent a trigger pull in order that a photosensor within the gun will be responsive to short segments of horizontal raster lines such that by counting vertical lines and time intervals with respect to vertical and horizontal synchronization pulses, respectively, identification of where on the screen the gun was pointing is achieved, permitting a symbol to be displayed upon the screen at that location.

13 Claims, 9 Drawing Figures



United States Patent [19]

Baer

[11] **4,077,049**

[45] **Feb. 28, 1978**

[54] **UNIVERSAL TELEVISION INTERFACE**

[75] Inventor: **Ralph H. Baer, Manchester, N.H.**

[73] Assignee: **Sanders Associates, Inc., Nashua, N.H.**

[21] Appl. No.: **762,539**

[22] Filed: **Jan. 26, 1977**

[51] **Int. Cl.²** **H04N 7/18**

[52] **U.S. Cl.** **358/93**

[58] **Field of Search** ..... 358/93, 139; 340/324 AD

[56] **References Cited**

U.S. PATENT DOCUMENTS

2,956,116	10/1960	Singelman	358/139
3,027,420	3/1962	Schaffer et al.	358/139
3,728,480	4/1973	Baer	358/93

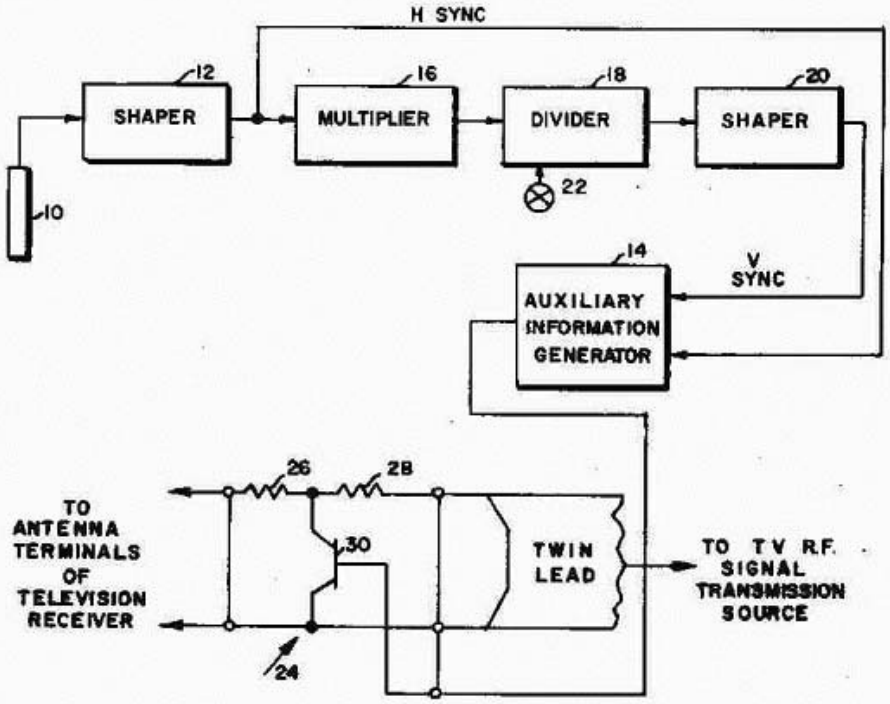
Primary Examiner—Richard Murray

Attorney, Agent, or Firm—Louis Etlinger; Richard I. Seligman

[57] **ABSTRACT**

Apparatus for generating horizontal and vertical synchronization signals in synchronism with synchronization signals generated from an on-going television program received by a user is provided by employing a capacitive or inductive coupling to extract the electric or magnetic field surrounding the horizontal output transformer and deflection yoke of a television receiver and shaping the output of the coupler to provide pulses at the horizontal synchronization rate of the received program. These pulses are further multiplied, divided and shaped to provide vertical synchronization pulses. The dividing circuits include means for temporarily changing the divisor to accomplish proper framing. Auxiliary presentations can be displayed in conjunction with programs normally received by synchronizing the auxiliary presentations with the received programs by employing the generated synchronization signals.

16 Claims, 4 Drawing Figures

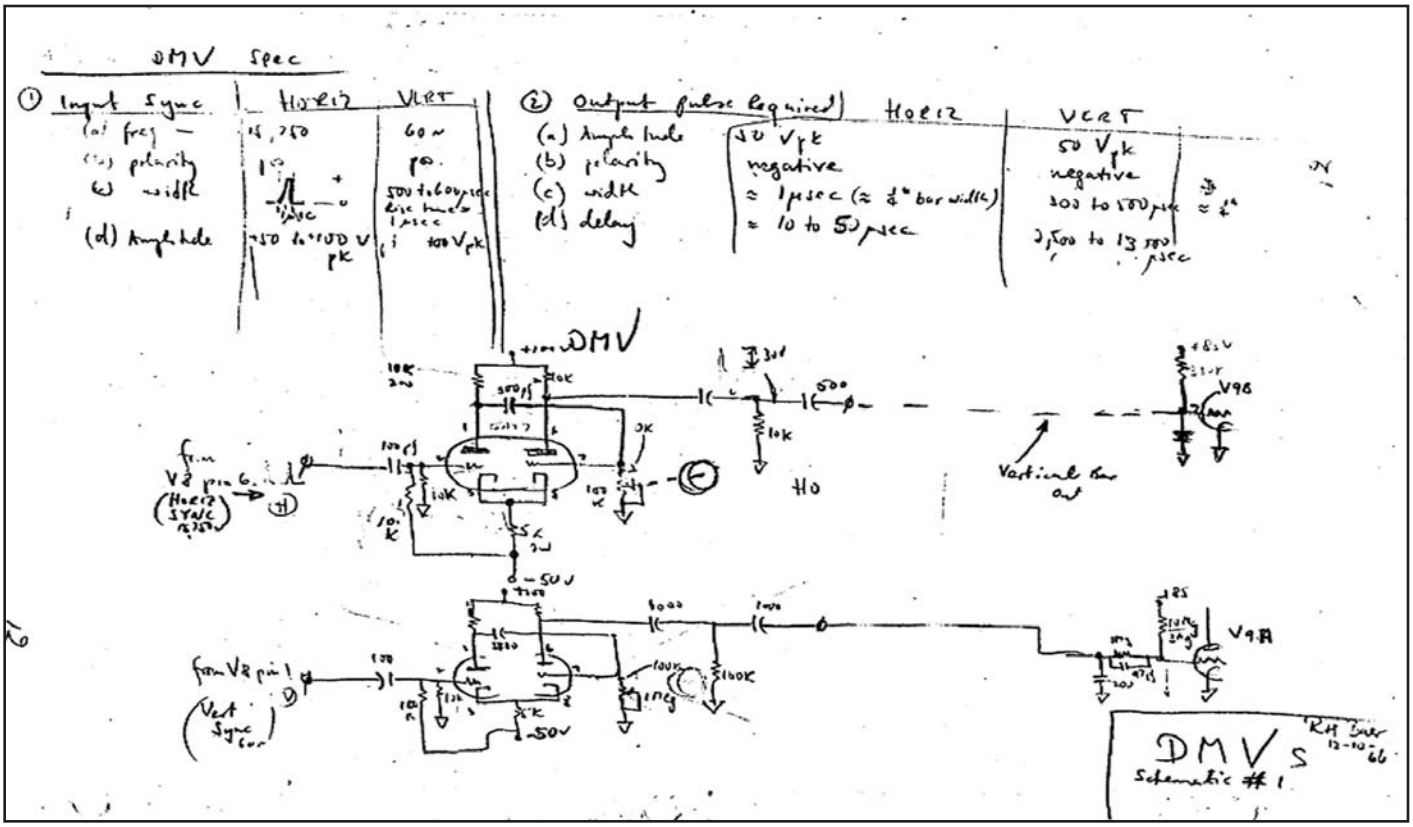


Appendix Six Schematics and Experiments

FIRST EXPERIMENT

Objective: An experiment to display a vertical line of fixed width, manually move it horizontally and change its height from the bottom of the screen.

Operation: Two dual-triode One-Shot Multi vibrators (OS MV) are used as Delay MV's (DMV's). The upper O.S. is triggered by a positive horizontal sync pulse to pin 2, the grid of the first 12AT7. The delay of the output of the second 12AT7 is determined by the RC values connected to its grid. Varying the 100k spot from grid to ground varies the horizontal location (along a scan line) of the output pulse. This pulse is generated by the coupling capacitor and the 10K resistor to ground that feed the grid of V6 in the CG-62. The lower 12AT7 O.S. works in the same way except that it is driven by vertical sync pulses. Its output is delayed by manually adjusting the 1 Meg. Potentiometer. The length of the delayed output pulse is also determined by the RC values coupling the pulse to pin 2 of V6. V6 is internal to the CG-62; it combines the horizontal and vertical pulses, AND's them and produces the desired vertical line whose height and horizontal position are manually adjustable.

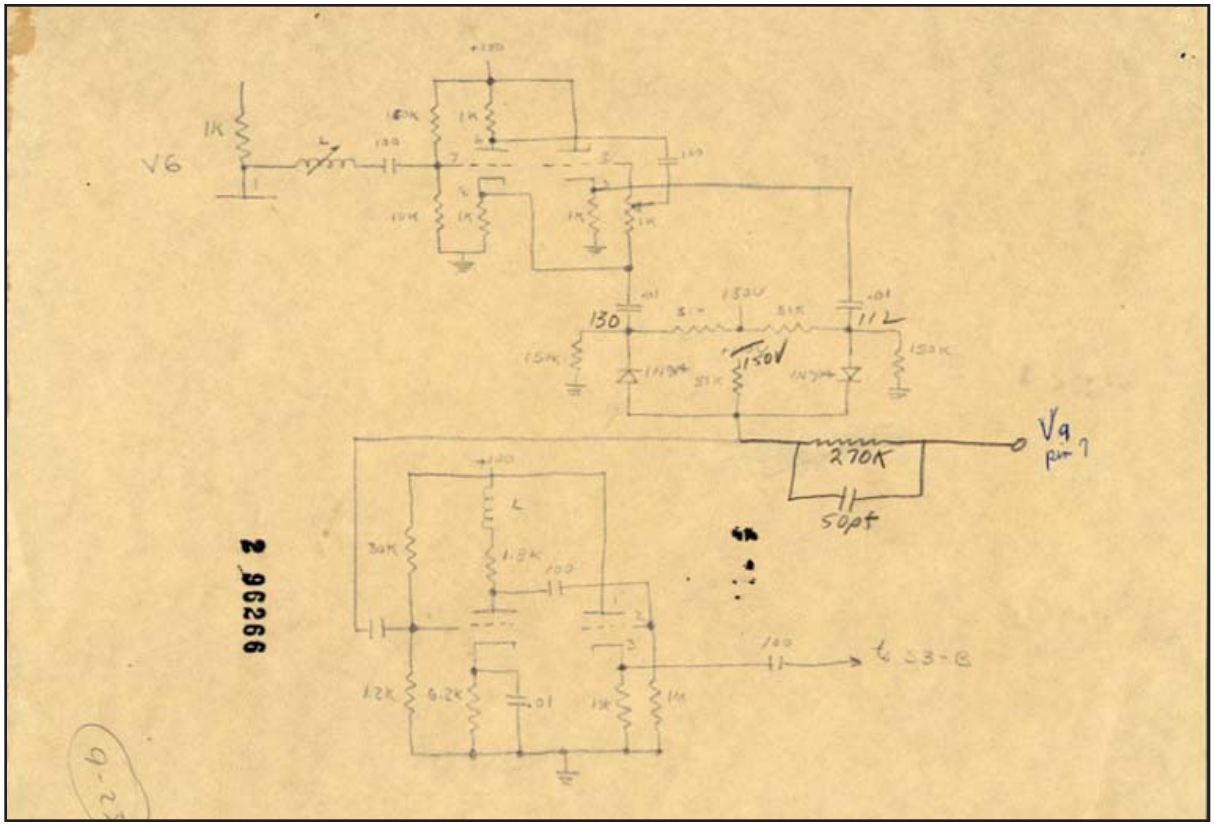


First Experiment: Moving symbols on a TV screen

SECOND EXPERIMENT

Objective: To take a 3.579545 (3.58 nom.) MHz signal from the CG-62 and provide circuitry that allows: (a) developing a quasi color burst signal and (b) phase-shifting the 3.58 MHz signal during horizontal sweep periods so as the deliver a chroma signal of a specific hue, the color being determined by the amount of phase shift.

Operation: A 3.58 MHz signal is delivered by pin 1, the plate of V6 in the CG-62 through a series signal to pin 1, the grid of the upper 12AT7. This tube, acting as a cathode follower, supplies a signal from its cathode that is phase with the CG-62 input signal. An equally large signal appears 180 degrees out of phase at the plate of the first 12AT7.This signal is applied through a capacitor to the grid, pin 7, of the 12AT7. A variable resistor (pot) from this grid goes to the first cathode. When the resistance of the spot is high(1 K) then the phase of the 3.58 signal at the junction of the spot and the cap is nearly 180 degrees different from the input signal. When the spot is at zero resistance, then that junction is close to the input signal's phase. Hence varying the spot delivers a signal to the grid that covers a gamut of colors. The second 1/2 12AT7 is another cathode follower. The ref. phase signal and the variable-phase signal are either passed or blocked by two diodes. V9b pin 7 from the CG-62 supplies pos. H sync signals to the diodes through a 270 K resistor. During H sync, the right-hand diode is turned off and vice versa. Therefore, the left diode passes a ref. phase signal through a 100k resistor to the lower 12AT7 amp during and just past the hor. sync period. This acts as a color burst signal that is compatible with older TV sets; and the right diode passes a variable phase signal to the same amplifier during hor. sweep periods. These signals are amplified by a stage of gain (in the lower 12AT7) and delivered via a cathode follower to the video amp of the CG-62, thus coloring symbols or background, depending on their level and on how the chroma signal is combined with the video (spot and line) signals.



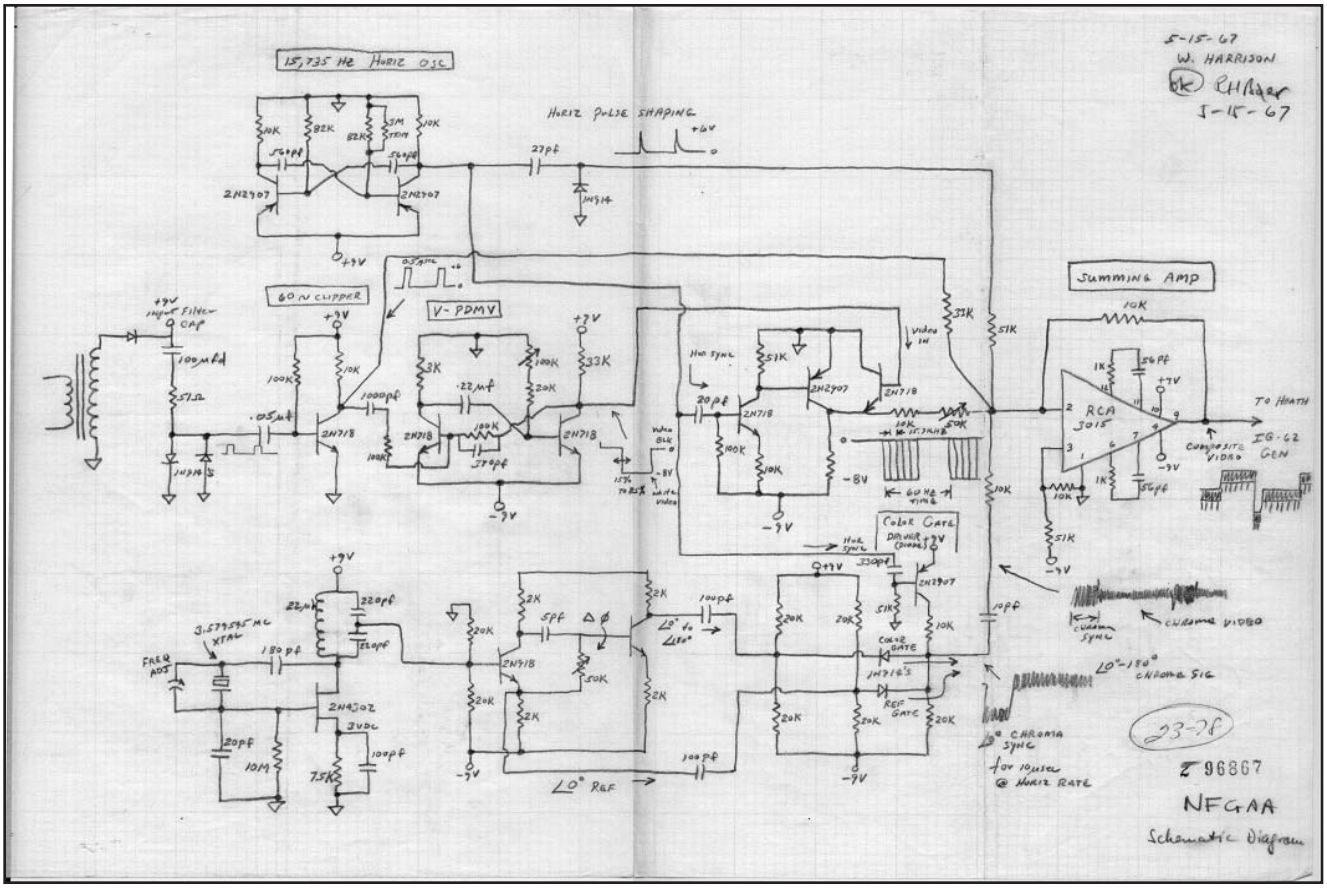
Second Experiment: Creating various hues from background and screen symbols

THIRD EXPERIMENT

Objective: To move to transistor circuitry and independence from CG-62 except for r.f. oscillator/modulator).

Operation: Hor. sync is generated by a MV, upper left, that feeds pos. sync signals to video op amp (RCA 3015) input (a sum point) via a cap and clamping diode. It also delivers negative horizontal sync pulses to the NPN/PNP amplifier/clipper input via a 25 pf cap. This cap together with the 100K resistor to ground delays the NPN stage output pulse by about 20+ µsecs, or half a line width to locate the generated line segment near the center of the screen. This "video" signal is suppressed during vertical sync by the NPN transistor in parallel with the PNP. The NPN is driven by Vertical sync generator V-DDVM, which in turn is synchronized with the 60 Hz power line signal via the power transformer and back-to-back diode clippers, followed by an amplifier. The latter supplies a positive-going vertical sync signal to the op amp's sum junction.

At the lower half of the schematic is the transistor circuit version of color generation Experiment #2. A 3.58 MHz oscillator feeds a split-load stage that supplies signals 180 degrees apart. The reference and the phase shifted signals are applied to diode gates as in Expt.#2. The diodes are again alternately turned on/off by hor. sync via transistor COLOR GATE. The output chroma signal is applied to the summing input of the RCA op amp.



Schematic for early May start of TV Game #2

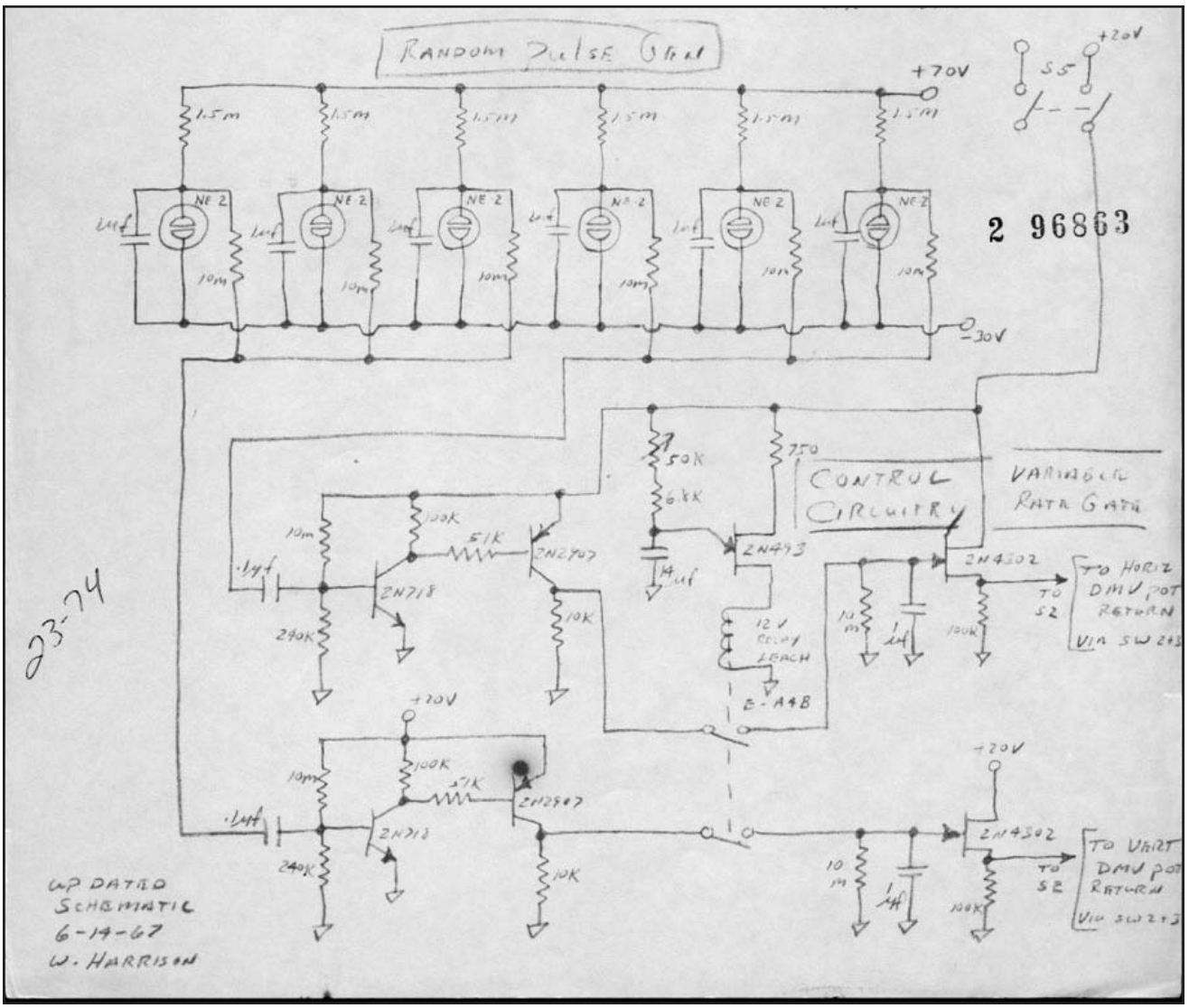
FOURTH EXPERIMENT

Objective: To generate two signals that can randomly vary the position of a line or spot on the screen in H and V; an analog "random number generator.

Operation: Two sets of free running neon-relaxation-oscillators are shown at the top of the schematic. The left hand triplet sums their sawtooth outputs into the lower two-stage amplifier. The frequencies of these three sawtooth shaped signals are all different and are somewhat slower or faster than the field rate (60 Hz). The right hand set works at slightly higher or lower rates than horizontal line rate (15,734 Hz).

When these signals are applied to the H and V DMVs of the game circuitry, they cause both H & V position of the displayed symbol (say a "spot") to vary, i.e. to randomly move about the screen By experimentally adjusting the frequencies of the neon oscillators, theses random movements can be made slow or fast. Higher oscillator frequencies cause multiple spots to be displayed at different locations of the screen.

The two amplifier outputs are delivered to field-effect transistor emitter followers to the V and H inputs of a spot generator. The unijunction-driven relay at the center of the schematic is a timer circuit which was used in various games played " against time".



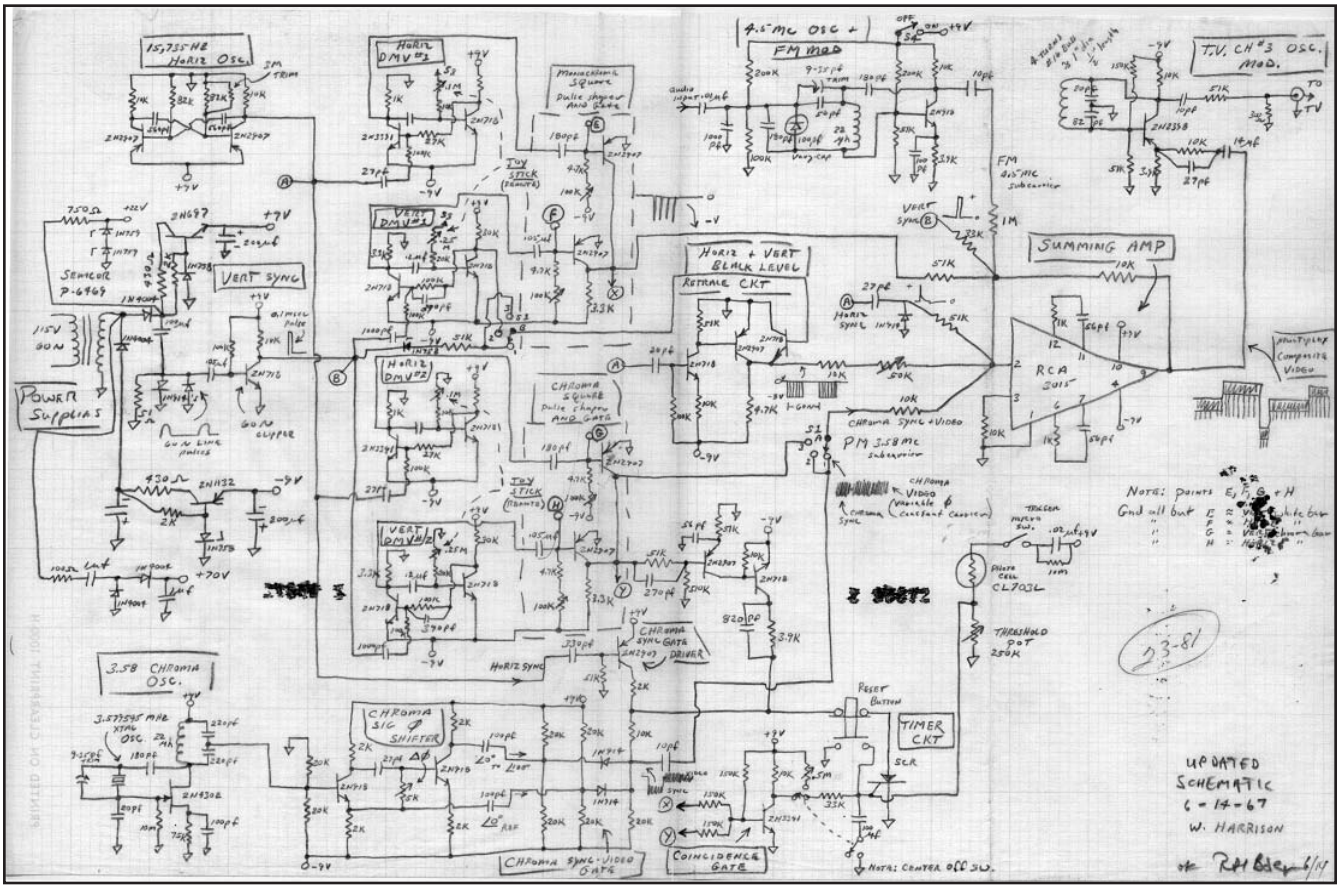
The Cludge Circuit

FIFTH EXPERIMENT

Objective: Two generate two player spots for use in chase and gun games.

Operation: This circuit is almost identical to the " Early May" TVG#2 circuit with the following additions: The power transformer is again used to supply V sync but also supplies +9V and -9V via emitter follower with Zener diodes for voltage regulation on their bases. There are two spot generators, each of which has a separate H and V DMV. These are collector AND'ed to produce spots at (X) and (Y). The spot generators consist of a pulse delay stage adjustable with the hand control spot followed by a fixed pulse-width generating stage. At the upper right of the schematic is the FM oscillator that allows audio/voice signals to be modulated on a 4.5 MHZ carrier, which is then added to the op amp and causes sound signals to be delivered to the TV set. Next to this circuit is the Channel 3 or 4 r.f. oscillator which is amplitude modulated by the output of the op amp with sync, video (spot) and chroma signals. The photocell shown along with a trigger switch are part of a photo responsive "gun". The parallel RC circuit to which the trigger switch is connected to +Vcc limits the viewing time of the photo cell to a fraction of a second. The color circuitry at he bottom is identical to that in the early May circuit.

This schematic does not reflect all of the games that eventually occupied the cavernous TVG#2 chassis. Not shown are the Cludge and the Pumping circuitry, the Timer, and the Color Wheel circuits.



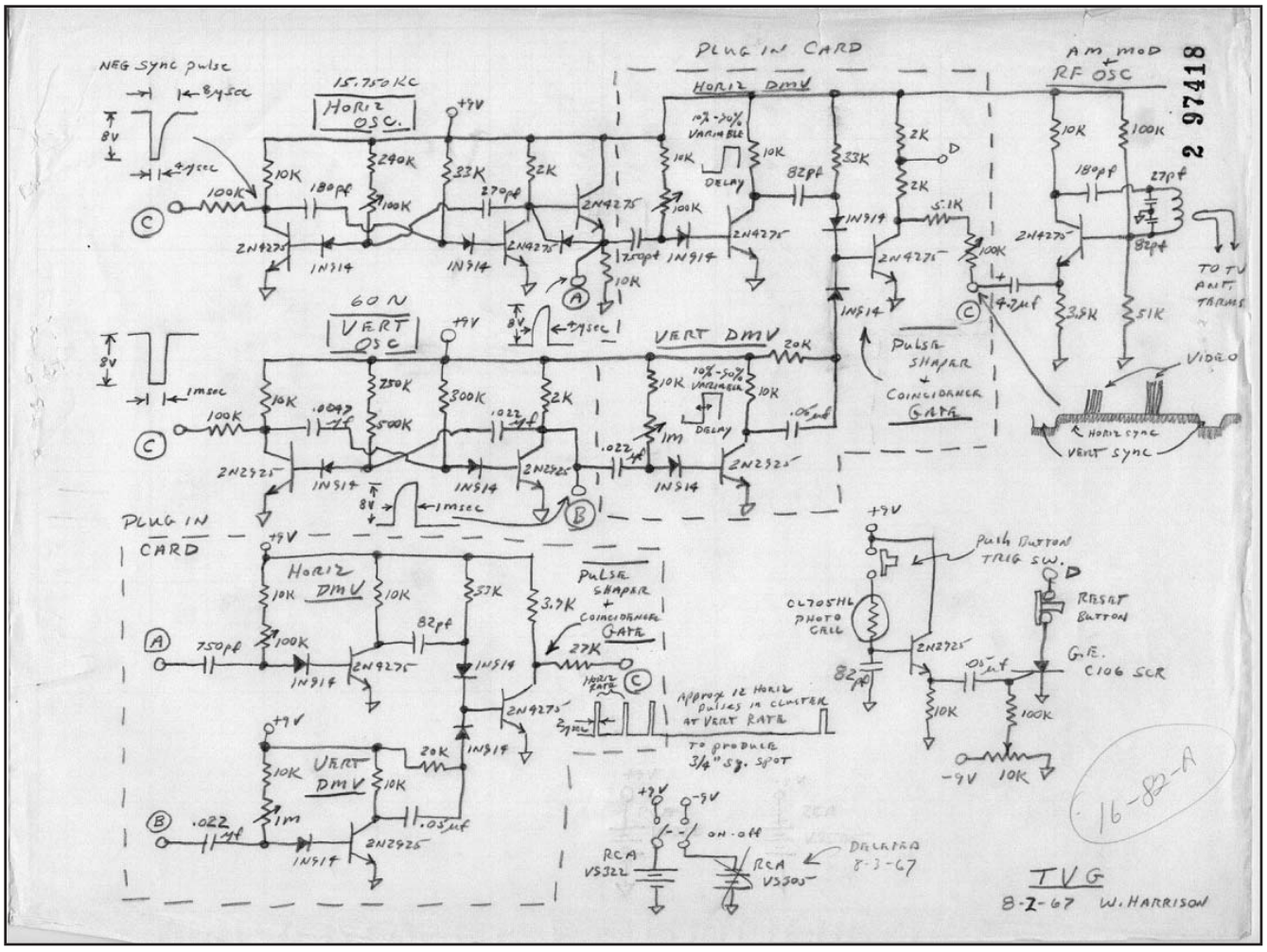
TV Game #2 - 6/14/67 schematic

SIXTH EXPERIMENT

Objective: A low-cost circuit designed to play Chase and Gun games in a self-contained, battery operated unit.

Operation: A horizontal MV (HORIZ OSC) and a Vertical MV (VERT OSC) develop H & V sync signals. Positive-going outputs (A) and (B) drive H and V Schematic of TVG Game Unit #3, completed 8/2/67 DMV's on plug-in Cards 1 and 2. Spots from base to +Vcc at the inputs of all four DMV's control delay, hence H and V "spot" positioning in conjunction with the base input capacitors. The width of the pulse from the first transistors in the DMV's is determined by the values of their output R-C networks (82 pf and 33K for horizontal width and 0.05 μFD and 20K for vertical height of the spot). The positive going H and V output pulses are AND'ed by two diodes which drive a transistor with output (C).

Both player spot outputs are applied via a scaling resistor to the emitter of the Channel 3 or 4 r.f. oscillator/transmitter. Negative-going H and V sync pulses (top and center left) are also applied to the r.f. oscillator via 100K resistors. A gun circuit with a (resistive) light sensor (lower right) delivers a positive pulse upon trigger pull if simultaneously imaging a " spot". This is passed on via an emitter follower to an SCR. A "hit" (i.e. receiving a spot's light by the photo resistor) triggers the SCR which grounds point D of spot #1 generator and causes the target spot to disappear. Opening and closing the P.B. switch in the SCR output resets the SCR.



Schematic of TVG Game Unit #3, completed 8/2/67

SEVENTH EXPERIMENT

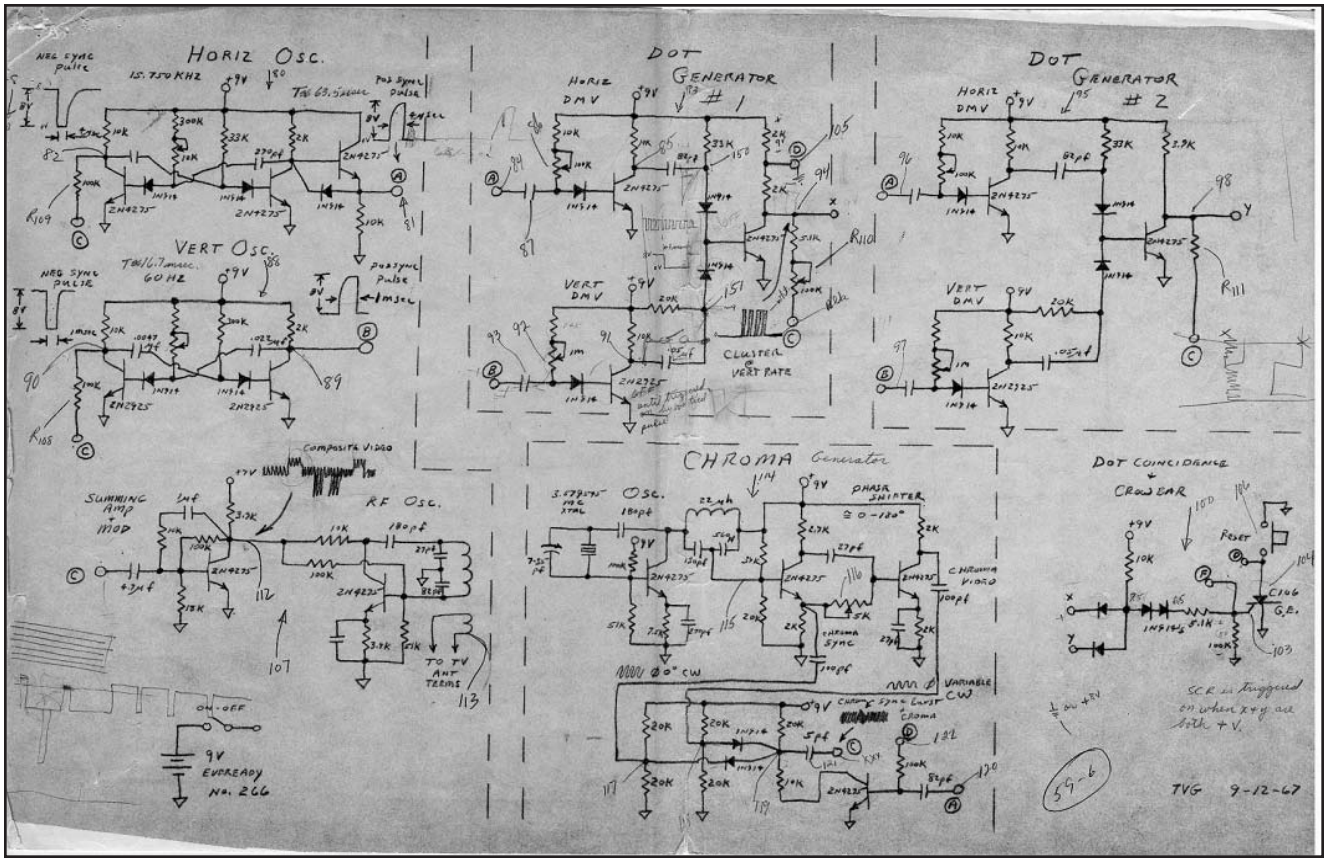
Objective: To add color to TV Game #3 of 8/2/67

Operation: This circuit is identical to that of the 8/2/67 unit except for the following:

(1) Addition of color circuitry - shown at the bottom of the schematic and

(2) elimination of the " gun" circuitry. The Vertical and Horizontal sync generator oscillators as well as the two spot generators are identical to the earlier TVG#3 unit. However, spot coincidence is detected by a two-diode AND gate (lower right). When signals from both spots overlap, the junction of the 10K pull-up resistor of the AND gate goes HIGH and triggers the SCR. The latter pulls down the resistor junction at (D), causing spot #2 to disappear. Another change is the use of a modulator stage that sums sync and video signals and drives the high side of the r.f. oscillator (collector modulation).

The color circuitry is essentially the same as that used in TV Game #2.

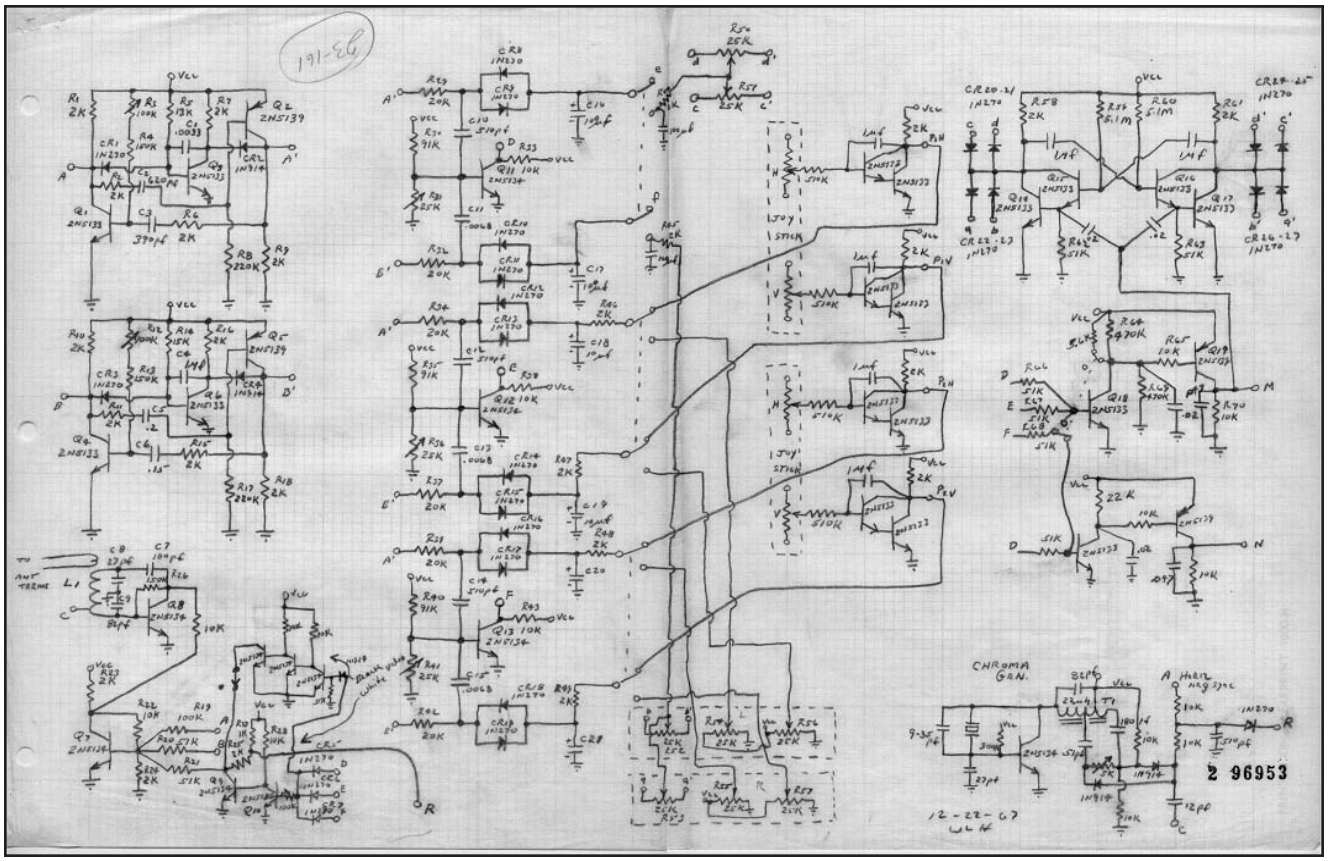


Schematic for early May start of TV Game #2

EIGHTH EXPERIMENT

Objective: A design that plays Ball & Paddle games and displays the Player (Paddle) and Ball as round spots or rings, all in battery-operated self-contained unit.

Operation: The two circuits at the left are the Hor. (upper) sync generator and the V sync generators. These produce sawtooth outputs at A' and B' which drive the " slicer" spot generator circuits. Sync signals are taken from A and B and applied to the modulator (lower left corner). There are three slicer circuits; each uses a single transistor driven by a signal resulting from the drop across two back-to-back diodes. By adjusting the bias at the base of this transistor, its output wave shape can be varied. The outputs at the collectors of the three transistor and are summed via three diodes into the modulator circuit at D, E and F. Player spots (paddles) are moved on-screen in H and V (a) with joysticks followed by single transistor integrators (for motion delay and smoothing); or (b) hand controllers with H&V spots (bottom center). The ball is moved from side-to-side by a Flip Flop (FF, upper right hand) which is triggered by ball+paddle coincidence at D, E and F. The FF drives 4 spots: 2 each for "English" (vertical) control of ball in flight; and 2 each for control of horizontal path length (a feature not used on any subsequent game). A chroma generator using a 3.58 MHz Xtal oscillator and the phase shifting and color gate keying scheme of TVG#3 is at lower right. Chroma signal (C) from this circuit is applied to the base of the r.f. oscillator transistor for background color. Switch S1 as shown disconnects the ball generator for Chase Games. Coincidence of spots D, E & F is applied to the crowbar circuit above the modulator. During E&F coincidence this crowbar "kills" the video signal in chase games when the switch connecting the open collector of the crowbar circuit is closed.

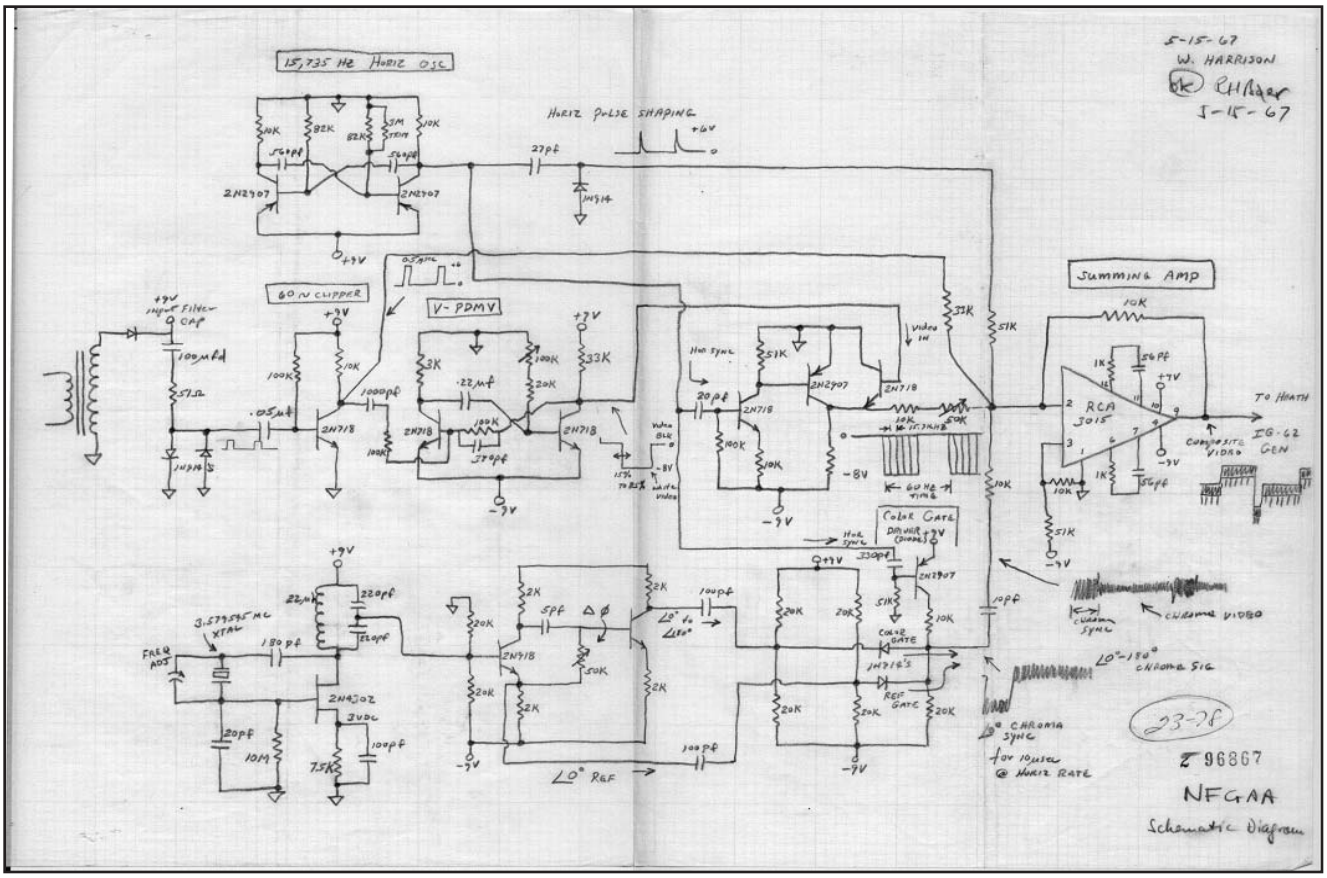


Game Unit #4 with Rusch's Slicer Circuits as ball and paddle generators (11/67)

NINTH EXPERIMENT

Objective: A version of TVG#4 that plays B&P games and display the Player(Paddle) and Ball symbols as round spots or rings, allowing these symbols to be superimposed on video being received from the Cable.

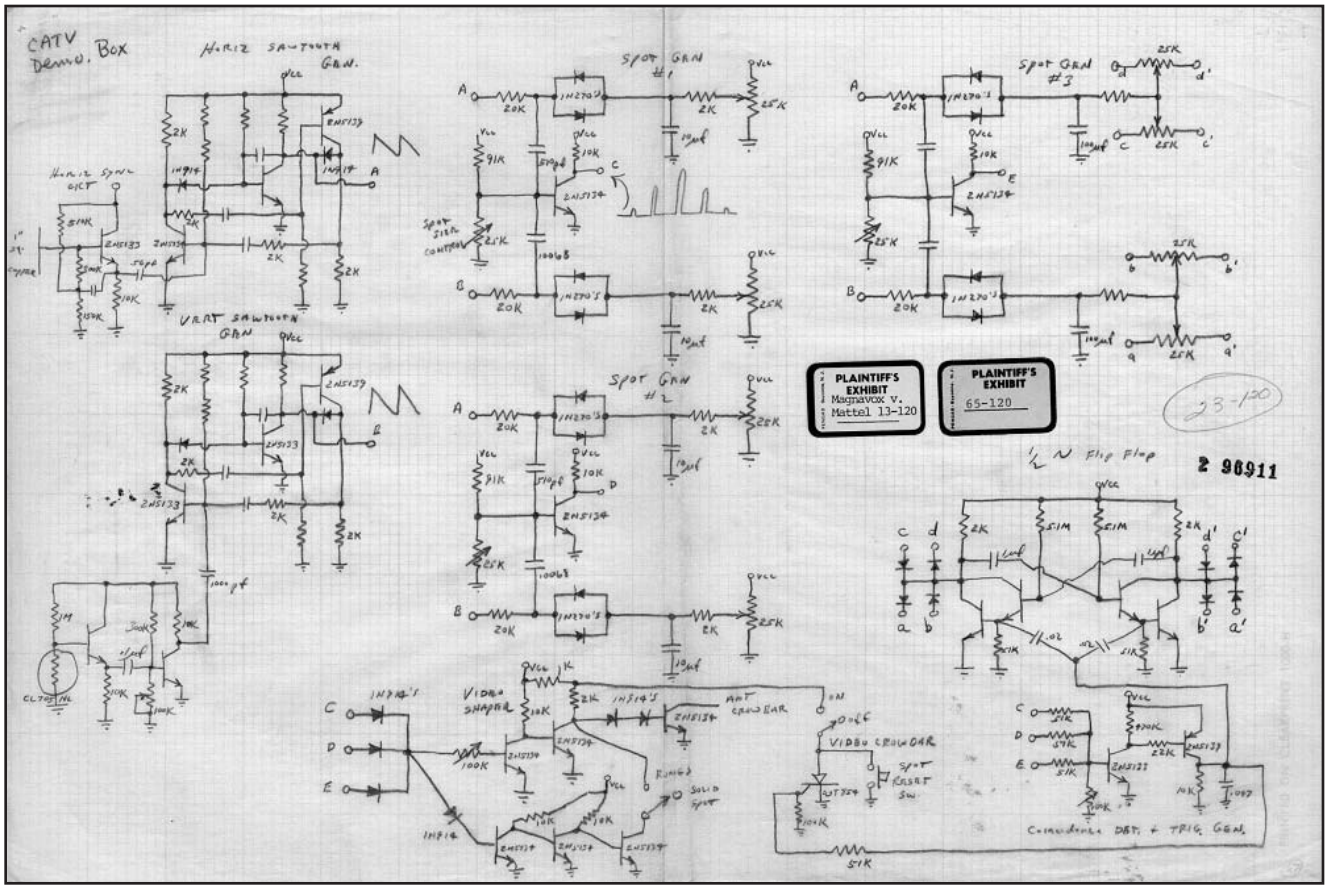
Operation: The two circuits at the left are the H (upper) sync generator and the V sync generator. These produce sawtooth outputs needed to drive the" slicer" spot generator circuits. There are three slicer circuits which use a single transistor driven by the signal developed by the sawtooth wave form feeding two back-to-back diodes. By adjusting the bias at the base of the transistor, its output wave shape can be varied. Cable operation requires that the game video signals be superimposed onto incoming cable r.f. signals. This is accomplished by antenna crowbaring (shorting the antenna terminals). Synchronization is achieved by capacitive pickup of stray hor. signals (upper left) and optical pickup of V sync from the bright background at the bottom of the TV screen. 2-transistor amplifier shaper circuits produce rail-to-rail H & V sync pulses. The three (paddle and ball) video signals are applied through three diodes to drive a 2N2330 transistor which "shorts" the incoming r.f. cable signal. This produces white symbols displayed on top of cable-delivered video graphics or live action pictures. Closing the switch at the collector of the bottom string of three transistors changes the wave shape of the spots, allowing rings or discs to be displayed. The Flip-Flop at the lower right drives both H & V "English" spots (shown at upper right hand corner) in the same manner as the 12/22/68 version of the slicer circuit. The FF is toggled by ball and paddle coincidence developed by the NPN-PNP circuit (below the FF), which is driven by the three video signals via resistors. An SCR driven by spot coincidence is used for chase games when switch SW1 is closed. Coincidence between chasing and chased spot results in triggering the SCR and disabling the antenna crowbar, wiping out both spots.



Schematic for early May start of TV Game #2

Objective: Point gun at spot displayed on TV set and develop logic-level output if trigger is pulled at the same moment.

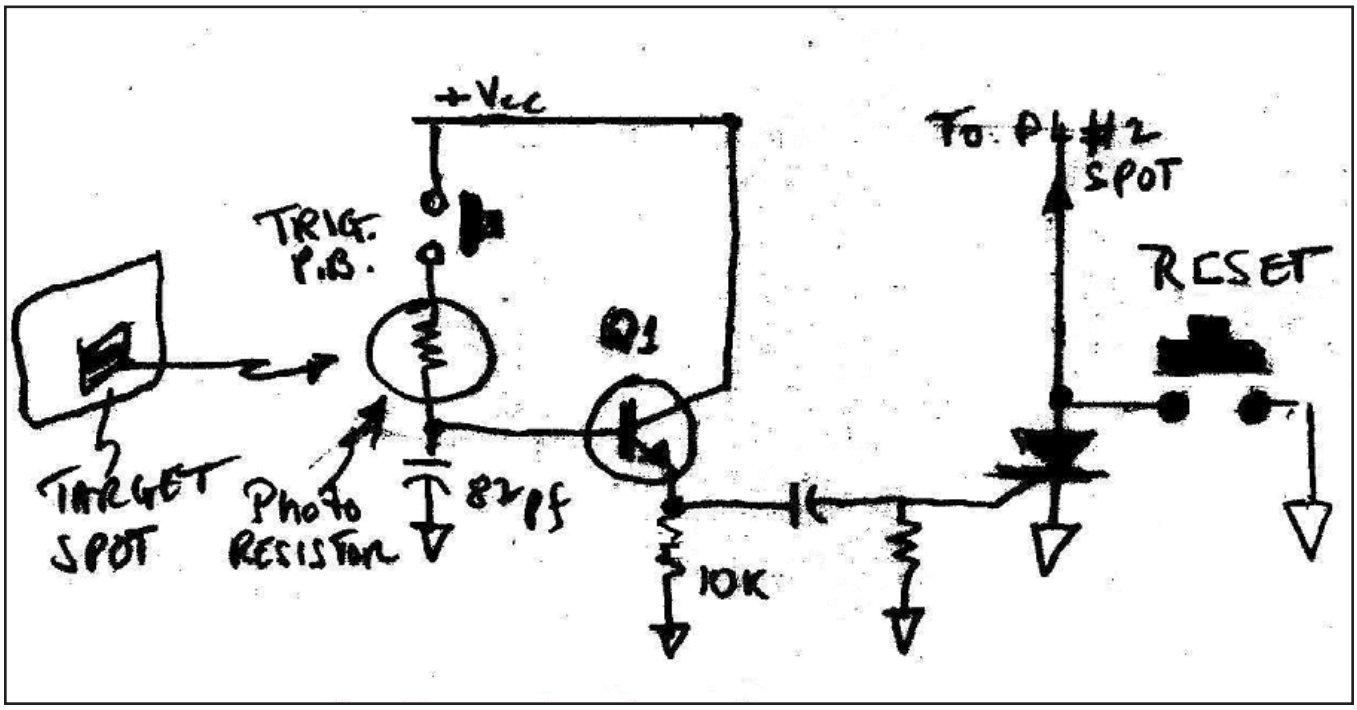
Operation: Light from a bright "target" spot on the TV set illuminates the photo resistor and sharply lowers its resistive value if the gun is properly aligned. If the trigger P.B. switch is simultaneously closed, applying +Vcc to the photo resistor, then emitter follower Q1 is turned ON and a positive pulse is applied to the trigger input of the SCR via a capacitor. This shorts the SCR anode to ground, thereby disabling the target spot. Pressing the RESET push-button switch disables the SCR and restores the displayed target spot.



TV Game Unit #4 - Ball & Paddle Slicer Circuits adapted for Cable

Objective: Point gun at spot displayed on TV set and develop logic-level output if trigger is pulled at the same moment.

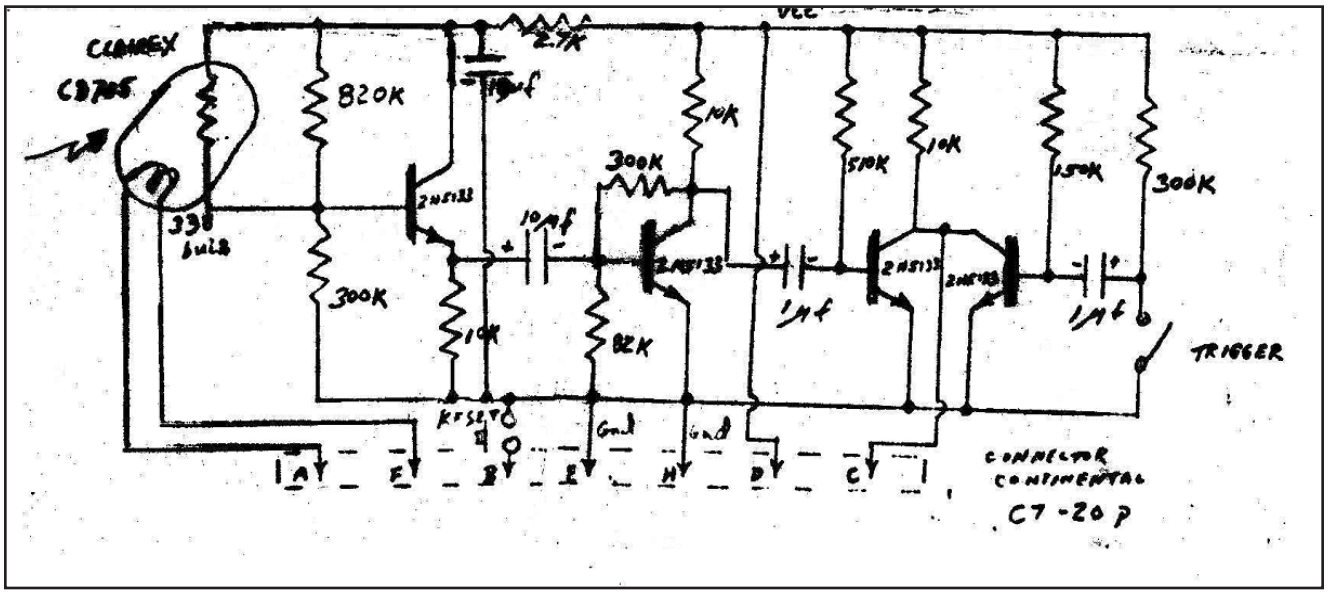
Operation: A cad-sulphide photo sensor is illuminated by a small incandescent bulb to increase its sensitivity. This bulb is connected to a 1.4 V cell. When imaging a target spot, the photo cell's resistance drops and the output from the emitter follower goes positive. This pulse is coupled through a 10 µf capacitor to a stage of gain. Its negative output pulse turns off the third transistor. If the Trigger switch is closed at the same moment, then the fourth transistor will also be momentarily turned off. Since two transistors are collector AND'ed, their 10K collector resistor pulls contact "C" HIGH which triggers the SCR crowbar circuit in the game's circuit.



Old Photo sensitive "Gun" schematic

Objective: To design a self-contained game with minimum parts that plays Tennis, Handball, Chase and Gun Games.

Operation: At the left edge, there are the Hor. and Vert. Sync generators (with trim spots for frequency adjustments) and below them the modulator/r.f. oscillator The 4-diode input of the modulator is fed by Paddle, Player 1&2, Net (or Wall in Handball) video signals. These are all rail-to-rail signals. All spot generators are of the voltage-controlled Harrison design. Circuit functions are essentially identical to TV Game Unit #4 except for the use of a diode matrix to control F.F. triggering. Offside balls are brought back into play by pushing one of the RESET button that trigger the FF. - The 3-position switch is shown in the upper, Ping-Pong position. The center position is for Chase and gun games; and the lowest position is for Handball. The lowest (4th) spot generator provides the Net or Wall video. In switch position 1 this generator delivers a centrally located line (the Net). In the 3rd (Handball) switch position, this spot generator delivers a vertical line at the left of the screen. Position change is accomplished with input voltage control resistors. In Ping-Pong, ANDing/coincidence between A and B causes the FF to move the ball from L to R; Coincidence between A and C triggers the FF to move the "ball" toward the left. In Handball, ANDing the player and wall video causes the ball to move to the left (towards the Wall). ANDing the Wall and Ball causes the latter to move towards the right (towards the players). In the central (Chase, Gun) switch position, the ball is disabled and coincidence between players wipes out PL#2 by triggering an SCR which pulls down a resistor junction in the output of PL#2. The connector in the lower right hand corner leads to a gun which also triggers the SCR when both light (received from the target spot) and the momentary trigger pull signal are coincident. Either one of the two P.B.'s can reset the SCR and restore PL#1 video.



Final "Gun" circuitry used with TV Game #6 and the "Brown Box"

Objective: A "spot" generator circuit that has minimum parts count, has voltage controllable "spot" positioning and rail-to-rail pulse (line segment) output.

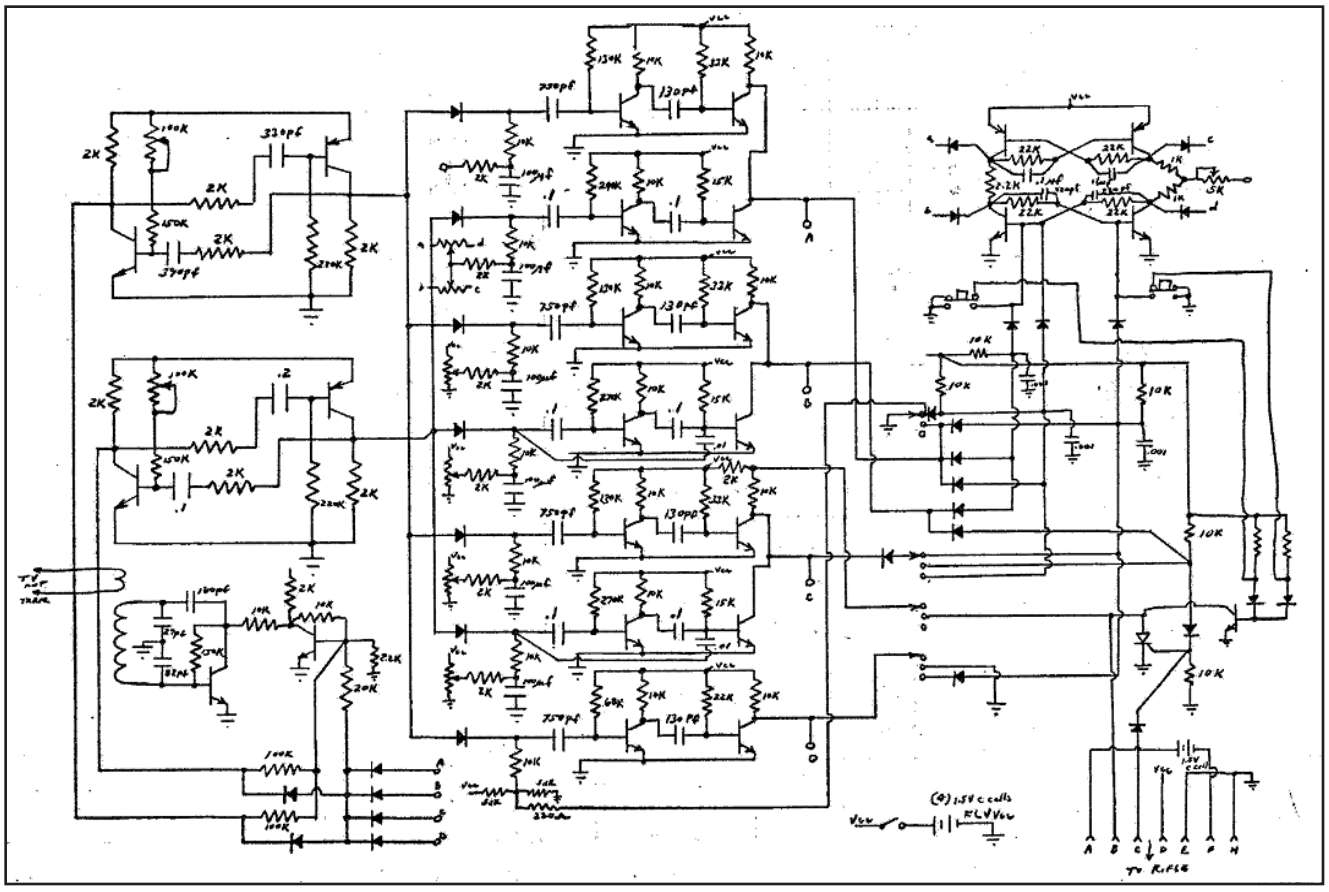
Operation: Positive-going H sync pulses are applied to C2 via CR1 and through the saturated base-emitter junction of Q1. The collector of Q1 is at Vcesat (near 0 volts). Cap C2 charges until it reaches a voltage roughly equal to that applied by the (player-controlled) positioning voltage at R1. If that voltage is LOW, then C2 charges to a level approximating +Vcc. After Hsync ceases, C2 discharges through R3 and Q1 stays saturated for about. 50 µsecs. This causes the " spot" segments to be displayed near the right side of the screen. If the hor. positioning voltage delivered by the player-controlled spot to R1 is HIGH, then C2 charges to a fraction of Vcc and discharges in a few µsecs through R3, placing the spot's line segments near the left side of the screen. The width of the displayed spot is determined by C5 and R6. - The same action in the lower circuit develops vertical delay and length control functions. Note that the H and V output transistor collectors are tied (AND'ed) together. This causes the horizontal line segments making up the "spot" to be displayed only during the period determined by the player's vertical positioning control and for a duration (height) determined by C6 and R10 respectively. Horizontal line segments thus generated are rail-to-rail in amplitude. Cables to the hand controllers carry only d.c. - no high speed signals - and hence are not critical as to length and wire-to-wire capacity.

Objective: To design and build a prototype for a commercial, switch-programmable unit with all of the games of TV Game #6 plus Volleyball, ODD/EVEN Quiz & Board Games.

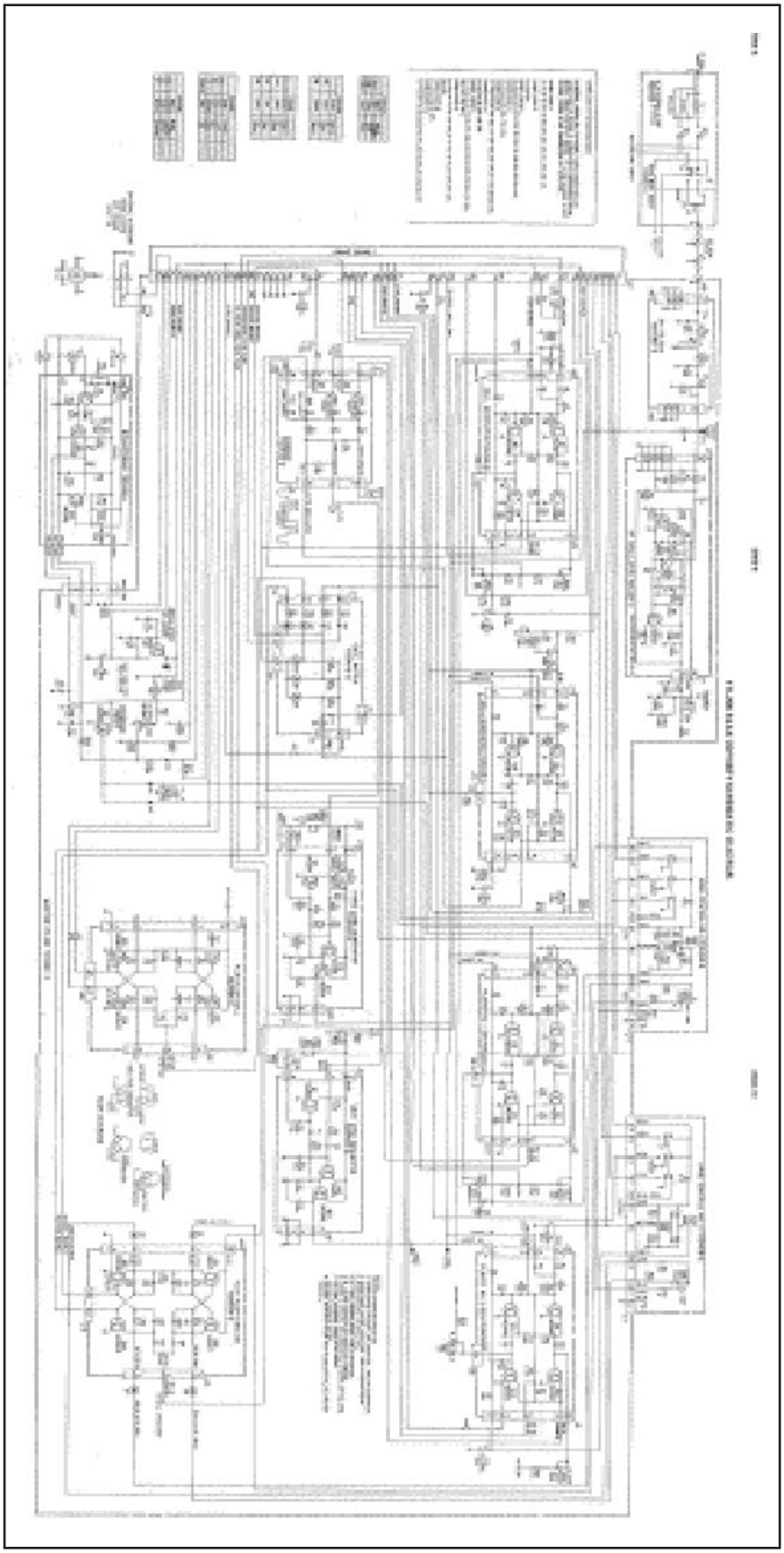
Operation: The following circuits are identical to TVG#6:

H&V Sync generators, Ball=Spot Gen #4; Player Spot Gens#1&2; Wall and Net (Spot Gen #3) symbols (with the provision for a central half-height net for Volleyball); Pl#2 spot wipeout by Pl#1 coincidence; gun games; Flip-Flop for horizontal ball reversal which is triggered by similar diode matrices. RESET P.B. Switches and associated transistor and SCR (crowbar) circuits; English controls for adjusting vertical ball flight path only (not horizontal as in slicer unit TVG#4).

Differences: A secondary F.F. used for Handball; Joystick amps for use in Golf game; Chroma circuit using a center-tapped secondary on a tuned transformer to provide two 3.58 MHz signals 180 degrees apart and using just two diodes (driven by negative-going Hsync. output) to switch From the reference phase during (and trailing) horizontal sync (delivering a quasi color burst) and during H sweep period (delivering desired hue); 12 Slide switches for game selection. Also different was the inclusion of a transistor circuit version of the ("CLUDGE") neon oscillator circuitry to provide the Brown Box with multiple player spot capability. That circuit is located in the lower left corner of the schematic.



Schematic for TV Game Unit #6



Odyssey Schematic

Appendix Seven
R.H. Baer Firsts
in Chronological Order

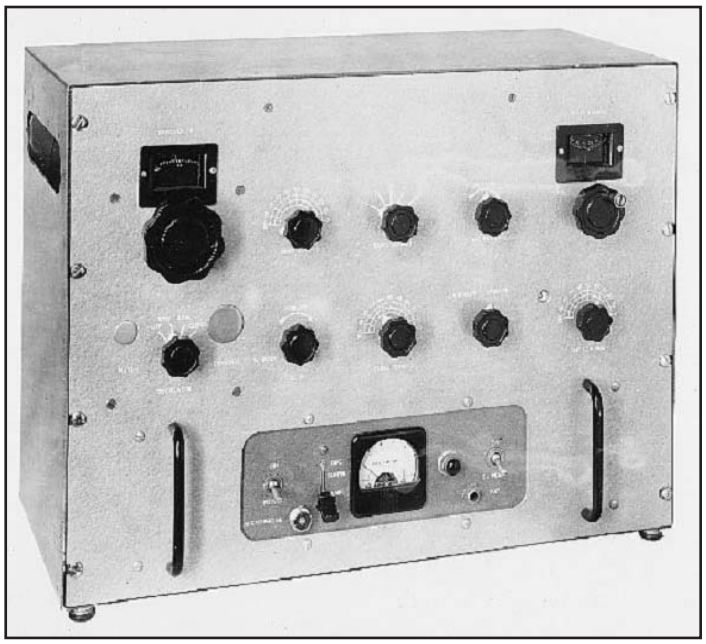
A List of some of the more significant "Firsts"

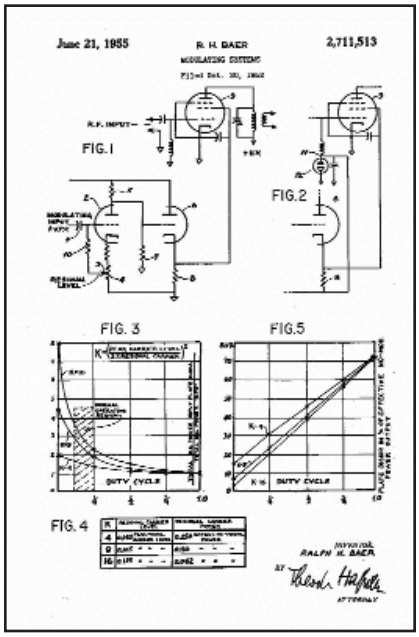


1. First to demonstrate a **hands-off, voice-switched switched Intercom (1949)** for home use.

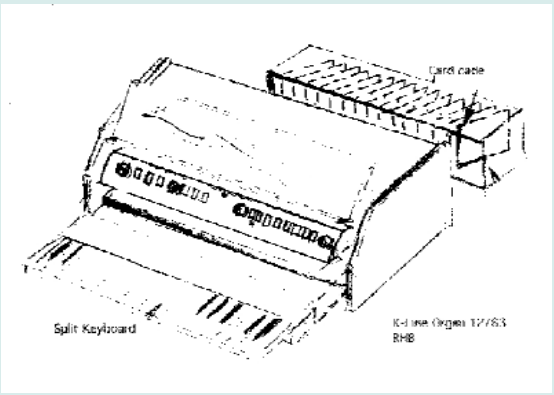
2. First to suggest incorporating a game into a TV set which I designed and built while at Loral (1951) - Management refused to go along with this groundbreaking idea. **It took another fifteen years for the idea to resurface.**

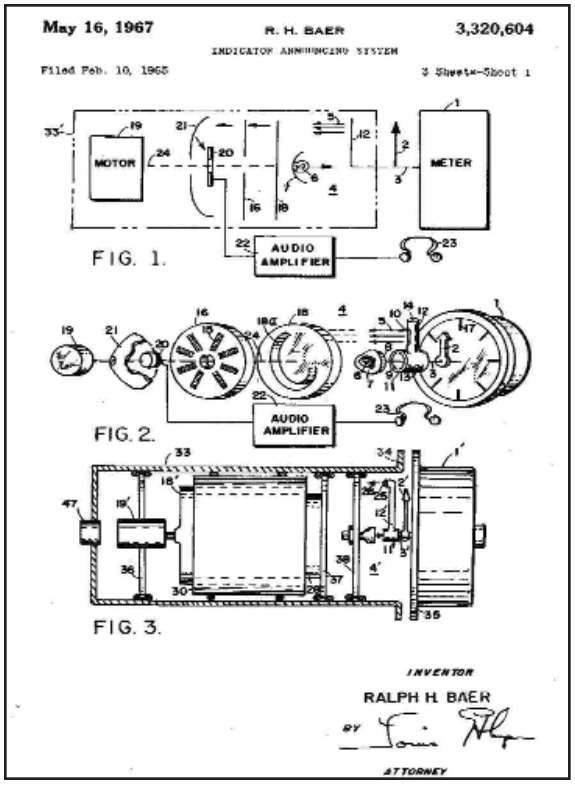
3. **First to develop a practical low-level AM Modulation System** for amateur radio and commercial radio transmissions (1954) which halved the size of a typical power supply typically required for **normal A< (plate Modulation Systems.**



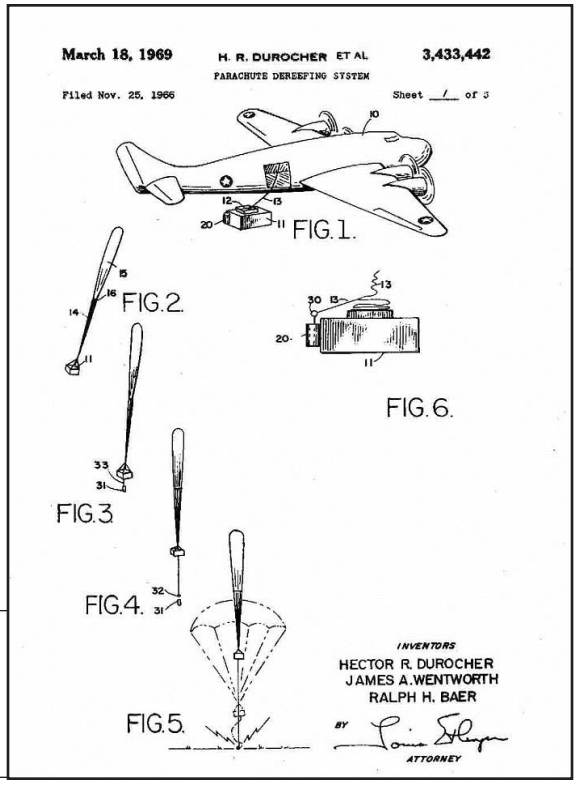


4. First to develop an ELECTRONIC ORGAN with a **splittable keyboard. Lowest 12 keys** were switchable to become either a chord section or the **normal low end of the keyboard (1965).**





5. First to develop a Talking Altimeter (1965)

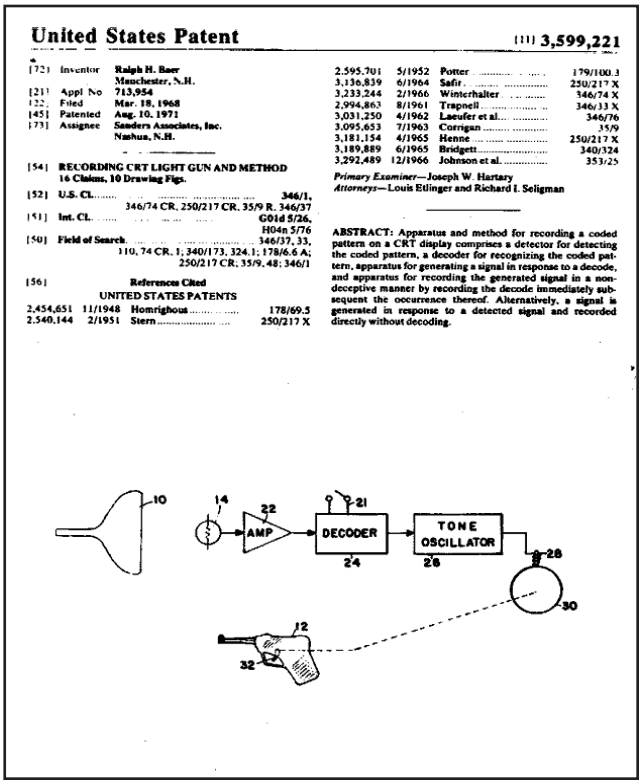


6. Parachute Dereefing system (1969)

7. First to demonstrate an Interac- Interactive Video Quiz Game (1967):

Coded "spots" on-screen contain RIGHT/WRONG data which provides vides immediate feedback to student/viewer.

A novel way to make linear video tape presentations into interactive videotraining, education or game tapes.



United States Patent (11) 3,599,221

[72] Inventor: Ralph H. Baer, Manchester, N.H.
[21] Appl No 713,954
[22] Filed Mar. 18, 1968
[45] Patented Aug. 10, 1971
[73] Assignee Sanders Associates, Inc., Nashua, N.H.

[54] RECORDING CRT LIGHT GUN AND METHOD
16 Claims, 10 Drawing Figs.

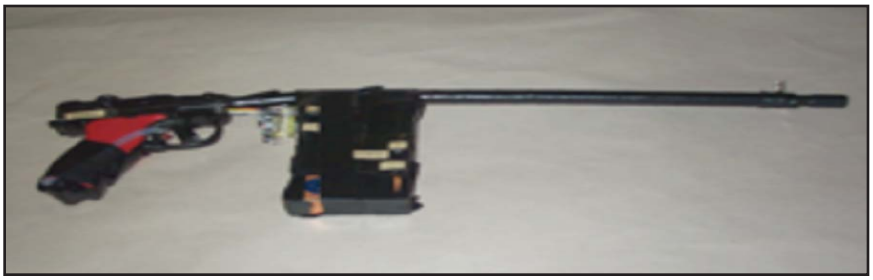
[52] U.S. Cl. ..... 346/1, 346/74 CR, 250/217 CR, 35/9 R, 346/37
[51] Int. Cl. G01d 5/26, H04n 5/76
[50] Field of Search ..... 346/37, 33, 110, 74 CR, 1; 340/173, 324.1; 178/6.6 A; 250/217 CR; 35/9, 48; 346/1

[56] References Cited
UNITED STATES PATENTS

2,454,651	11/1948	Homrighous	178/69.5
2,540,144	2/1951	Stern	250/217 X
2,595,701	5/1952	Potter	179/100.3
3,136,839	6/1964	Safir	250/217 X
3,233,244	2/1966	Winterhalter	346/74 X
2,994,863	8/1961	Trapnell	346/33 X
3,031,250	4/1962	Laeufer et al.	346/76
3,095,653	7/1963	Corrigan	35/9
3,181,154	4/1965	Henne	250/217 X
3,189,889	6/1965	Bridgett	340/324
3,292,489	12/1966	Johnson et al.	353/25

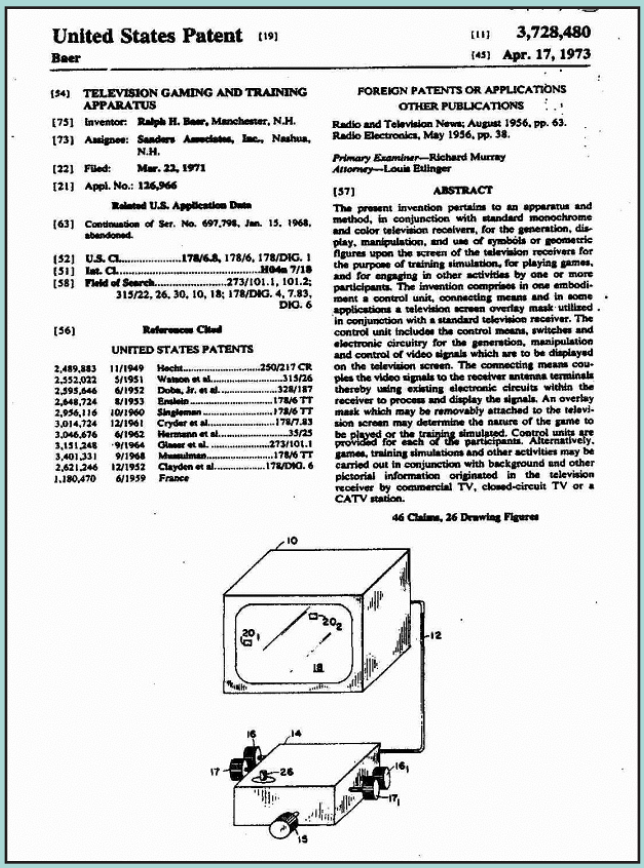
Primary Examiner—Joseph W. Hartary
Attorneys—Louis Etlinger and Richard I. Seligman

ABSTRACT: Apparatus and method for recording a coded pattern on a CRT display comprises a detector for detecting the coded pattern, a decoder for recognizing the coded pattern, apparatus for generating a signal in response to a decode, and apparatus for recording the generated signal in a non-deceptive manner by recording the decode immediately subsequent the occurrence thereof. Alternatively, a signal is generated in response to a detected signal and recorded directly without decoding.



8. First to invent and design a TV Target Shooting Game using a Light Gun. (1967)





United States Patent [19]
Baer

[11] 3,728,480
[45] Apr. 17, 1973

[54] TELEVISION GAMING AND TRAINING APPARATUS

[75] Inventor: Ralph H. Baer, Manchester, N.H.
[73] Assignee: Sanders Associates, Inc., Nashua, N.H.
[22] Filed: Mar. 22, 1971
[21] Appl. No.: 126,966

Related U.S. Application Data

[63] Continuation of Ser. No. 697,798, Jan. 15, 1968, abandoned.

[52] U.S. Cl. 178/6.8, 178/6, 178/DIG. 1
[51] Int. Cl. H04n 7/18
[58] Field of Search ..... 273/101.1, 101.2; 315/22, 26, 30, 10, 18; 178/DIG. 4, 7.83, DIG. 6

[56] References Cited

UNITED STATES PATENTS

2,489,883	11/1949	Hecht	250/217 CR
2,552,022	5/1951	Watson et al.	315/26
2,595,646	6/1952	Doba, Jr. et al.	328/187
2,648,724	8/1953	Enslein	178/6 TT
2,956,116	10/1960	Singleman	178/6 TT
3,014,724	12/1961	Cryder et al.	178/7.83
3,046,676	6/1962	Hermann et al.	35/25
3,151,248	9/1964	Glaser et al.	273/101.1
3,401,331	9/1968	Musselman	178/6 TT
2,621,246	12/1952	Clayden et al.	178/DIG. 6
1,180,470	6/1959	France	

FOREIGN PATENTS OR APPLICATIONS
OTHER PUBLICATIONS

Radio and Television News; August 1956, pp. 63.
Radio Electronics, May 1956, pp. 38.

Primary Examiner—Richard Murray
Attorney—Louis Etlinger

[57] ABSTRACT

The present invention pertains to an apparatus and method, in conjunction with standard monochrome and color television receivers, for the generation, display, manipulation, and use of symbols or geometric figures upon the screen of the television receivers for the purpose of training simulation, for playing games, and for engaging in other activities by one or more participants. The invention comprises in one embodiment a control unit, connecting means and in some applications a television screen overlay mask utilized in conjunction with a standard television receiver. The control unit includes the control means, switches and electronic circuitry for the generation, manipulation and control of video signals which are to be displayed on the television screen. The connecting means couples the video signals to the receiver antenas terminals thereby using existing electronic circuits within the receiver to process and display the signals. An overlay mask which may be removably attached to the television screen may determine the nature of the game to be played or the training simulated. Control units are provided for each of the participants. Alternatively, games, training simulations and other activities may be carried out in conjunction with background and other pictorial information originated in the television receiver by commercial TV, closed-circuit TV or a CATV station.

46 Claims, 26 Drawing Figures



9. First to build a two-player Video action Game (chase and gun game) (1967). This '480 patent is the Pioneer Patent of the Videogame Industry. 1st Filing:1/15/68.



10. First to demonstrate Ping-Pong and other Sports Videogames (1967).

11. First to demonstrate Video Sports Games with ballistic ball and "paddle" actions (1968).

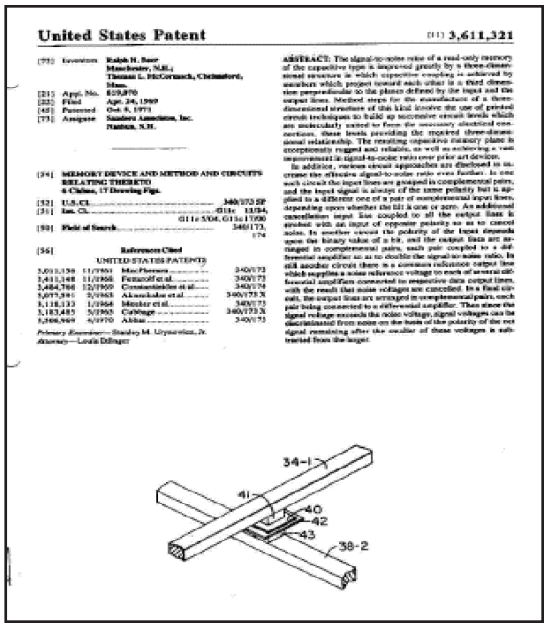
12. First to demonstrate Videogame playing over the Cable (1969).

13. First to design and build a programmable, multiplayer game, The "BROWN BOX" (1969)





14. First to demonstrate a Golf Videogame using actual golf ball (mounted on a joystick) and a putter (1969)



United States Patent [11] 3,611,321

[72] Inventors: Ralph H. Baer, Manchester, N.H.; Thomas L. McCormack, Chelmsford, Mass.

[21] Appl. No. 859,970
[22] Filed Sept. 24, 1969
[45] Patented Oct. 5, 1971
[73] Assignee Sanders Associates, Inc. Nashua, N.H.

[54] MEMORY DEVICE AND METHOD AND CIRCUITS RELATING THERETO
4 Claims, 17 Drawing Figs.

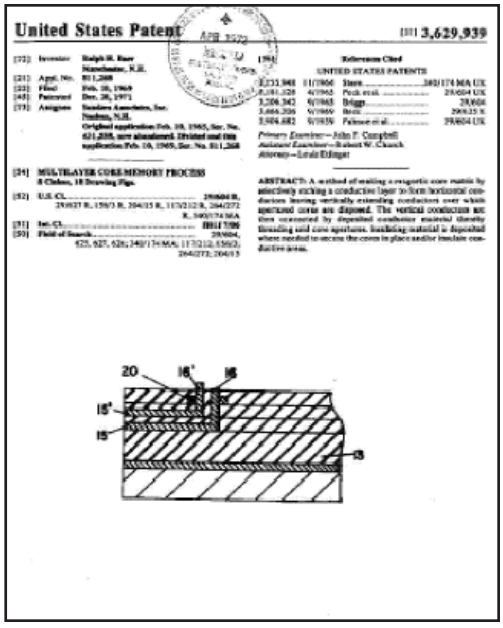
[52] U.S. Cl. 340/173 SP
[51] Int. Cl. G11c 13/04, G11c 11/00
[50] Field of Search 340/173, 174

[56] References Cited
UNITED STATES PATENTS

ABSTRACT: The signal-to-noise ratio of a read-only memory of the capacitive type is improved greatly by a three-dimensional structure in which capacitive coupling is achieved by conductors which project toward each other in a third dimension perpendicular to the planes defined by the input and the output lines. Method steps for the manufacture of a three-dimensional structure of this kind involve the use of printed circuit techniques to build up successive circuit levels which are understandably suited to form the necessary electrical connections, these levels providing the required three-dimensional relationship. The resulting capacitive memory plane is exceptionally rugged and reliable, as well as exhibiting a vast improvement in signal-to-noise ratio over prior art devices.

In addition, various circuit approaches are disclosed to increase the effective signal-to-noise ratio even further. In one such circuit the input lines are grouped in complemental pairs, and the input signal is always of the same polarity but is applied to a different one of a pair of complemental input lines, depending upon whether the bit is one or zero. An additional cancellation input line coupled to all the output lines is provided with an input of opposite polarity so as to cancel noise. In another circuit the polarity of the input depends upon the binary value of a bit, and the output lines are arranged in complemental pairs, each pair coupled to a differential amplifier so as to double the signal-to-noise ratio. In still another circuit there is a common reference output line which supplies a noise reference voltage to each of several differential amplifiers connected to respective data output lines, with the result that noise voltages are cancelled. In a final circuit, the output lines are arranged in complemental pairs, each pair being connected to a differential amplifier. Then since the signal voltage exceeds the noise voltage, signal voltages can be discriminated from noise on the basis of the polarity of the net signal remaining after the smaller of these voltages is subtracted from the larger.

15. First to use multi-layer printed circuit techniques to mass produce Capacitive Dynamic and Magnetic core Memory boards using multi-layer p.c. techniques (1970)



United States Patent [11] 3,629,939

[72] Inventor: Ralph H. Baer, Manchester, N.H.

[21] Appl. No. 811,268
[22] Filed Feb. 10, 1969
[45] Patented Dec. 28, 1971
[73] Assignee Sanders Associates, Inc. Nashua, N.H.

Original application Feb. 10, 1965, Ser. No. 431,208, now abandoned. Divided and this application Feb. 10, 1969, Ser. No. 811,268

[54] MULTILAYER CORE MEMORY PROCESS
6 Claims, 10 Drawing Figs.

[52] U.S. Cl. 29/604, 29/625, 340/174 MA, 174 TF, 174 TW
[51] Int. Cl. H01f 7/06
[50] Field of Search 29/604, 625, 627, 628; 340/174 MA, 174 TF, 174 TW; 264/272; 264/61

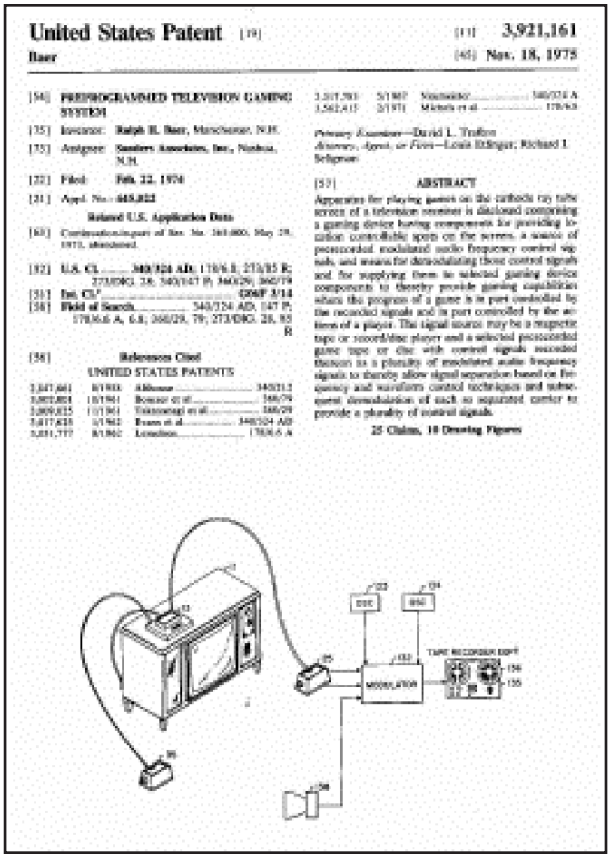
UNITED STATES PATENTS

Primary Examiner—John F. Campbell
Assistant Examiner—Robert W. Church
Attorney—Louis Etlinger

ABSTRACT: A method of making a magnetic core matrix by selectively etching a conductive layer to form horizontal conductors leaving vertically extending conductors over which apertured cores are disposed. The vertical conductors are then connected by deposited conductive material thereby threading said core apertures. Insulating material is deposited where needed to secure the cores in place and/or insulate conductive areas.

16. First to couple video game to audio tape player for natural sounds under game control (1973)





United States Patent [19]
Baer
[11] 3,921,161
[45] Nov. 18, 1975

[54] PREPROGRAMMED TELEVISION GAMING SYSTEM

[75] Inventor: Ralph H. Baer, Manchester, N.H.

[73] Assignee: Sanders Associates, Inc., Nashua, N.H.

[22] Filed: Feb. 22, 1974

[21] Appl. No.: 445,022

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 361,600, May 18, 1973, abandoned.

[52] U.S. Cl. ..... 340/324 AD; 178/6.8; 273/85 R; 273/DIG. 28; 340/347 P; 340/29; 360/74

[51] Int. Cl.² G09F 3/14

[58] Field of Search ..... 340/324 AD, 347 P, 178/6.8 A, 6.8; 360/29, 79; 273/DIG. 28, 85 R

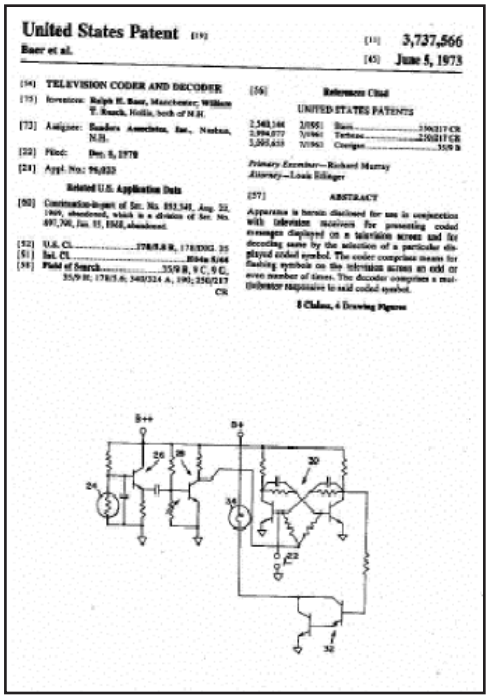
[56] References Cited
UNITED STATES PATENTS

[57] ABSTRACT

Apparatus for playing games on the cathode ray tube screen of a television receiver is disclosed comprising a gaming device having components for providing location controllable spots on the screen, a source of prerecorded modulated audio frequency control signals, and means for demodulating these control signals and for supplying them to selected gaming device components to thereby provide gaming capabilities where the program of a game is in part controlled by the recorded signals and in part controlled by the actions of a player. The signal source may be a magnetic tape or record/disc player and a selected prerecorded game tape or disc with control signals recorded thereon as a plurality of modulated audio frequency signals to thereby allow signal separation based on frequency and narrowband control techniques and subsequent demodulation of each so separated carrier to provide a plurality of control signals.

25 Claims, 10 Drawing Figures

17. First to show Video Branching in real time on a linear medium (e.g. on video tape) (1973).



United States Patent [19]
Baer et al.
[11] 3,737,566
[45] June 5, 1973

[54] TELEVISION CODER AND DECODER

[75] Inventors: Ralph H. Baer, Manchester; William T. Rusch, Hollis, both of N.H.

[73] Assignee: Sanders Associates, Inc., Nashua, N.H.

[22] Filed: Dec. 8, 1970

[21] Appl. No.: 96,022

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 851,541, Aug. 22, 1969, abandoned, which is a division of Ser. No. 697,708, Jan. 15, 1968, abandoned.

[52] U.S. Cl. ..... 178/5.8 R, 178/DIG. 35

[51] Int. Cl. H04n 5/44

[58] Field of Search ..... 359/8 R, 9 C, 9 E, 359/10; 178/5.6; 340/324 A, 190; 250/217 CR

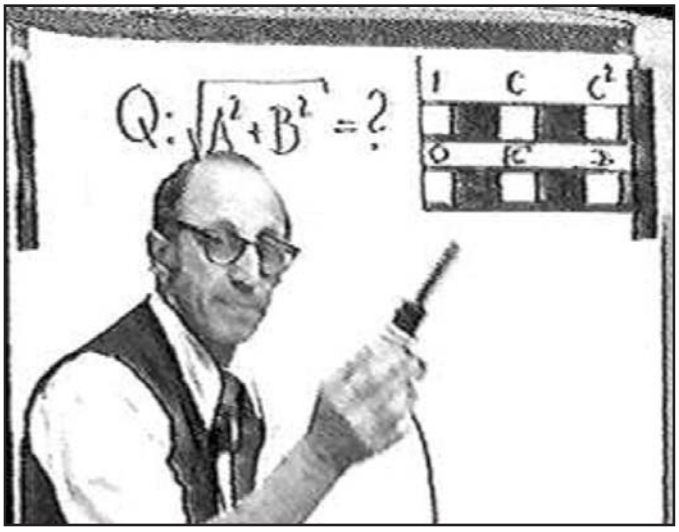
[56] References Cited
UNITED STATES PATENTS

Primary Examiner—Richard Murray
Attorney—Louis Etlinger

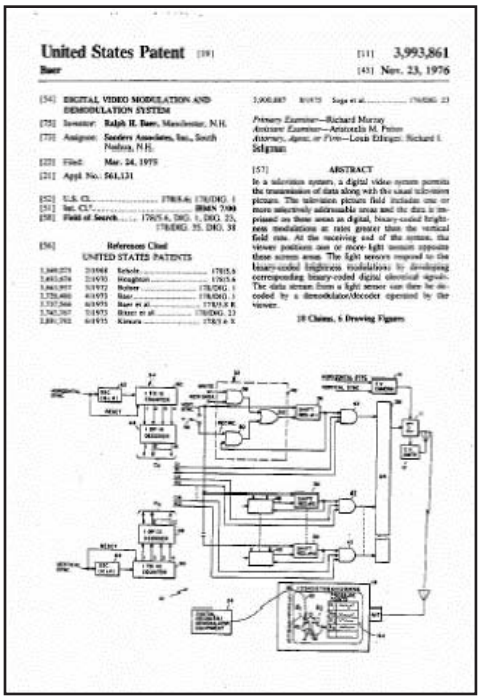
[57] ABSTRACT

Apparatus is herein disclosed for use in conjunction with television receivers for presenting coded messages displayed on a television screen and for decoding same by the selection of a particular displayed coded symbol. The coder comprises means for flashing symbols on the television screen an odd or even number of times. The decoder comprises a multivibrator responsive to said coded symbol.

8 Claims, 4 Drawing Figures



* First to demonstrate how to convert entertainment & educational tional video. tapes into Interactive Video programs (1974)



United States Patent [19]
Baer
[11] 3,993,861
[45] Nov. 23, 1976

[54] DIGITAL VIDEO MODULATION AND DEMODULATION SYSTEM

[75] Inventor: Ralph H. Baer, Manchester, N.H.

[73] Assignee: Sanders Associates, Inc., South Nashua, N.H.

[22] Filed: Mar. 24, 1975

[21] Appl. No.: 561,131

[52] U.S. Cl. 178/5.6; 178/DIG. 1
[51] Int. Cl.² H04N 7/00
[58] Field of Search ..... 178/5.6, DIG. 1, DIG. 23, 178/DIG. 25, DIG. 38

[56] References Cited
UNITED STATES PATENTS

Primary Examiner—Richard Murray
Assistant Examiner—Aristotelis M. Psitos
Attorney, Agent, or Firm—Louis Etlinger; Richard I. Seligman

[57] ABSTRACT

In a television system, a digital video system permits the transmission of data along with the usual television picture. The television picture field includes one or more selectively addressable areas and the data is imprinted on these areas as digital, binary-coded brightness modulations at rates greater than the vertical field rate. At the receiving end of the system, the viewer positions one or more light sensors opposite these screen areas. The light sensors respond to the binary-coded brightness modulations by developing corresponding binary-coded digital electrical signals. The data stream from a light sensor can then be decoded by a demodulation/decoder operated by the viewer.

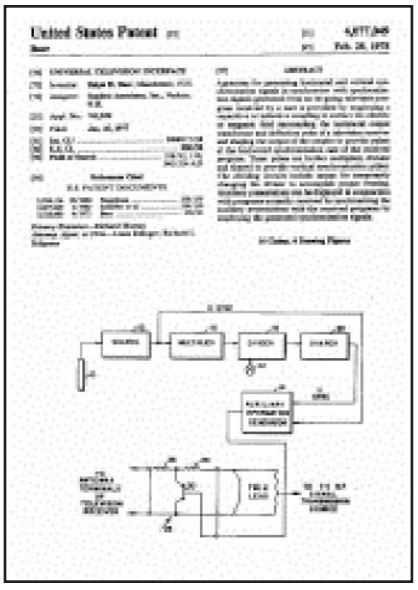
10 Claims, 6 Drawing Figures



18. First to nest & extract data optically from video presentation in real time (1974)



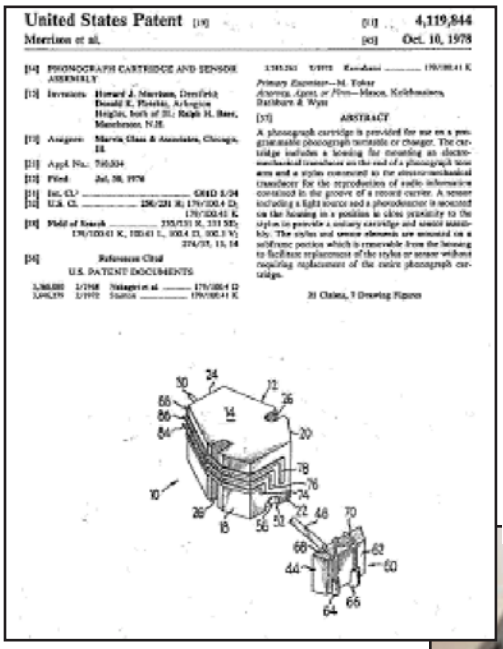
19. First to allow captions and other A/N data or graphics to be introduced into a TV set via its antenna terminals (provides captions in ordinary TV set (1975)



United States Patent [19]
Baer
[11] 4,077,006
[45] Feb. 28, 1978

[54] UNIVERSAL TELEVISION INTERFACE

[57] ABSTRACT



United States Patent [19]
Morrison et al.
[11] 4,119,844
[45] Oct. 10, 1978

[54] PHONOGRAPH CARTRIDGE AND SENSOR ASSEMBLY

[75] Inventors: Howard J. Morrison, Deerfield; Donald E. Plotnik, Arlington Heights, both of Ill.; Ralph H. Baer, Manchester, N.H.

[73] Assignee: Marvin Glass & Associates, Chicago, Ill.

[21] Appl. No.: 760,934

[22] Filed: Jan. 38, 1978

[51] Int. Cl.[2] G11B 3/04
[52] U.S. Cl. ..... 250/231 R; 179/100.4 D; 179/100.41 K
[58] Field of Search ..... 250/231 R, 231 SE; 179/100.41 K, 100.41 L, 100.4 D, 100.3 V; 274/37, 13, 14

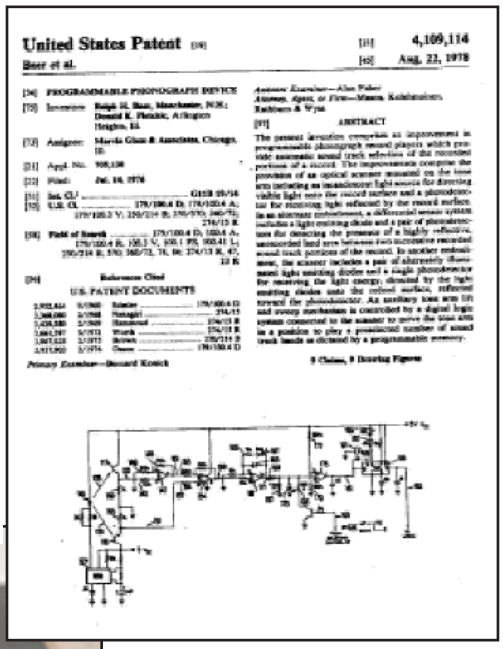
[56] References Cited
U.S. PATENT DOCUMENTS

ABSTRACT

A phonograph cartridge is provided for use on a programmable phonograph turntable or changer. The cartridge includes a housing for mounting an electromechanical transducer on the end of a phonograph tone arm and a stylus connected to the electromechanical transducer for the reproduction of audio information contained in the groove of a record carrier. A sensor including a light source and a photodetector is mounted on the housing in a position to allow proximity to the stylus to provide a unitary cartridge and sensor assembly. The stylus and sensor elements are mounted on a self-frame portion which is removable from the housing to facilitate replacement of the stylus or sensor without requiring replacement of the entire phonograph cartridge.

31 Claims, 7 Drawing Figures

20. First to develop a programmable & remotely controllable record changer (1977). Its objective was to make remote control and automatic band changes possible for ordinary record changers to make "space age" products out of them. All of this did not become a standard feature of consumer audio products until the advent of CD audio players.



United States Patent [19]
Baer et al.
[11] 4,109,114
[45] Aug. 22, 1978

[54] PROGRAMMABLE PHONOGRAPH DEVICE

[75] Inventors: Ralph H. Baer, Manchester, N.H.; Donald E. Plotnik, Arlington Heights, Ill.

[73] Assignee: Marvin Glass & Associates, Chicago, Ill.

[21] Appl. No.: 905,130

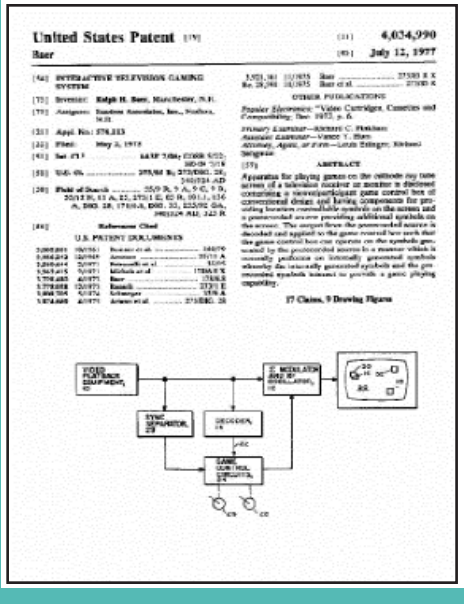
[22] Filed: Jul. 14, 1978

[51] Int. Cl.[2] G11B 19/14
[52] U.S. Cl. ..... 179/100.4 D; 179/100.4 A; 179/100.3 V; 250/214 B; 250/555; 340/711; 274/13 R
[58] Field of Search ..... 179/100.4 D, 100.4 A, 179/100.4 R, 100.1 PE, 100.41 L; 250/214 B, 555; 340/711, 71, 56; 274/13 R, 47, 10 R

[56] References Cited
U.S. PATENT DOCUMENTS

Primary Examiner—Bernard Konick





United States Patent [19]
Baer
[11] 4,034,990
[45] July 12, 1977

[54] INTERACTIVE TELEVISION GAMING SYSTEM

[75] Inventor: Ralph H. Baer, Manchester, N.H.

[73] Assignee: Sanders Associates, Inc., Nashua, N.H.

[21] Appl. No.: 574,113

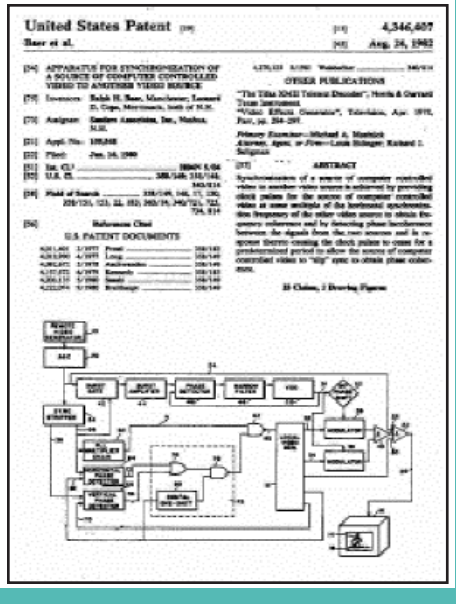
[22] Filed: May 5, 1975

[51] Int. Cl.[2] A63F 9/00; G09G 1/02; H04N 7/18
[52] U.S. Cl. ..... 273/85 G; 273/DIG. 28; 340/324 AD
[58] Field of Search ..... 273/85 G, 1 A, 1 E, 1 R, 1 J, 1 K, 1 L, 1 M, 1 N, 1 P, 1 S, 1 T, 1 U, 1 V, 1 W, 1 X, 1 Y, 1 Z, DIG. 28, 85 R, 85 A, 85 B, 85 C, 85 D, 85 E, 85 F, 85 G, 85 H, 85 J, 85 K, 85 L, 85 M, 85 N, 85 P, 85 Q, 85 R, 85 S, 85 T, 85 U, 85 V, 85 W, 85 X, 85 Y, 85 Z, 1 R, 1 A, 22, 273/1 E, 02 R, 101.1, 156 A, 1003, 18, 17101-3, 1001, 22, 1225/02 Ga, 340/324 AD, 347 R

[56] References Cited
U.S. PATENT DOCUMENTS



21. First to nest data on videotape/disc where that data is related in real time to locations and characteristics of on-screen pictorial information (1978)



United States Patent [19]
Baer et al.
[11] 4,346,407
[45] Aug. 24, 1982

[54] APPARATUS FOR SYNCHRONIZATION OF A SOURCE OF COMPUTER CONTROLLED VIDEO TO ANOTHER VIDEO SOURCE

[75] Inventors: Ralph H. Baer, Manchester; Leonard D. Cope, Merrimack, both of N.H.

[73] Assignee: Sanders Associates, Inc., Nashua, N.H.

[21] Appl. No.: 105,048

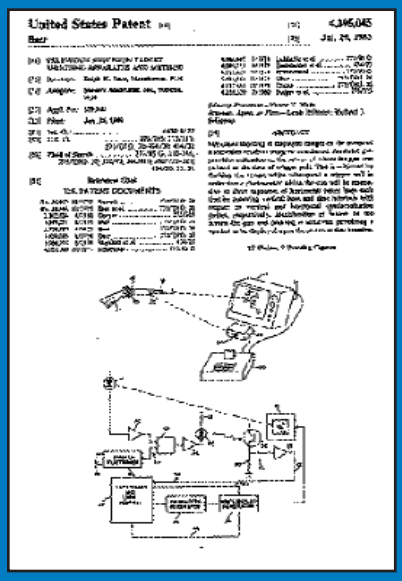
[22] Filed: Dec. 19, 1979

[51] Int. Cl.[3] H04N 5/04
[52] U.S. Cl. 358/149; 340/723
[58] Field of Search 358/149, 146, 171, 136; 340/723, 724, 814

[56] References Cited
U.S. PATENT DOCUMENTS

OTHER PUBLICATIONS

ABSTRACT


United States Patent [19]

4,395,045

Baer

[11]

[45] Jul. 26, 1983

[54] VIDEO GAME APPARATUS AND METHOD

[75] Inventor: Ralph H. Baer, Manchester, N.H.

[73] Assignee: Sanders Associates, Inc., Nashua, N.H.

[21] Appl. No.: 159,941

[22] Filed: Jun. 16, 1980

[51] Int. Cl.³ A63F 9/22

[52] U.S. Cl. ..... 273/85 G; 273/DIG. 28; 340/709; 358/93

[58] Field of Search ..... 273/85 G, DIG. 28; 340/709; 358/93

[56] References Cited

U.S. PATENT DOCUMENTS

[57] ABSTRACT

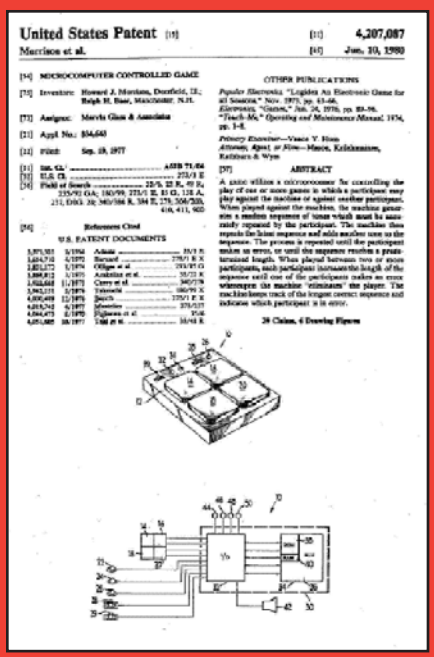

22. First Precision Rifle Shooting Video Training System for use with large screen (projected) imagery. Resolution high enough to resolve single scan line and five microsecond image width.



23. First to develop a truly successful microprocessor controlled handheld sequence game, Milton Bradley's "Simon" (1979)




United States Patent [19]

4,207,087

Merrison et al.

[11]

[45] Jun. 10, 1980

[54] MICROCOMPUTER CONTROLLED GAME

[75] Inventors: Howard J. Morrison, Deerfield, IL; Ralph H. Baer, Manchester, N.H.

[73] Assignee: Marvin Glass & Associates

[21] Appl. No.: 934,640

[22] Filed: Sep. 19, 1977

[51] Int. Cl.² A63B 71/04

[52] U.S. Cl. ..... 273/1 E

[58] Field of Search ..... 273/1 E, 85 G, 95 R, 95 B, 95 M, 235/92 GA, 180/98, 273/1 R, 1 E, 121 A, 121 DIG. 28, 340/166 R, 324 R, 278, 304/310, 410, 411, 903

[56] References Cited

U.S. PATENT DOCUMENTS

OTHER PUBLICATIONS

Popular Electronics "Logidyn An Electronic Game for all Seasons," Nov. 1975, pp. 43-46.

Electronics, "Games," Jan. 24, 1976, pp. 89-96.

"Teach-Me," *Operating and Maintenance Manual*, 1976, pp. 1-8.

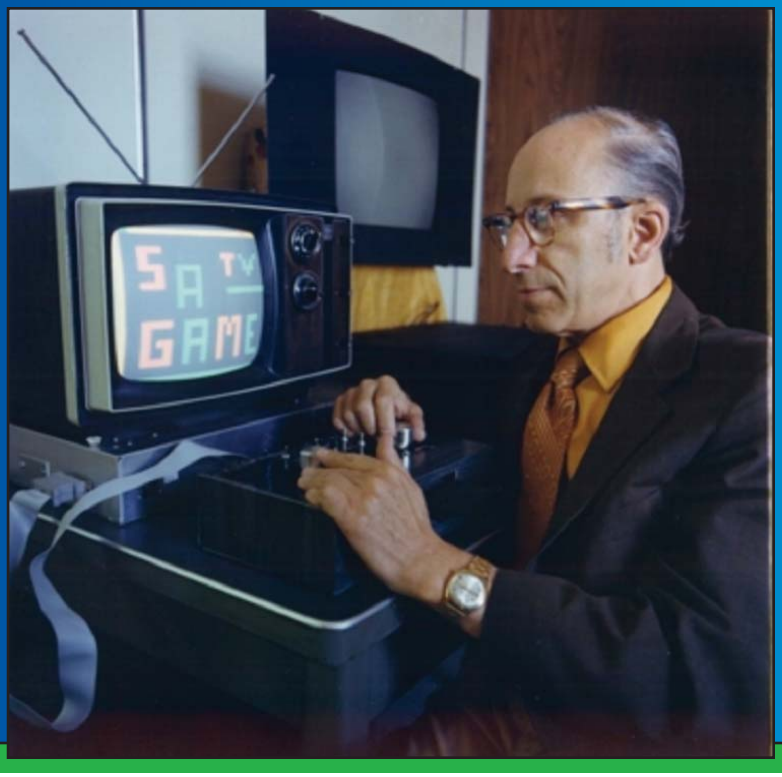
Primary Examiner—Vance Y. Hum

Attorney, Agent, or Firm—Morse, Kelmmaann, Kalmbaru & Wyss

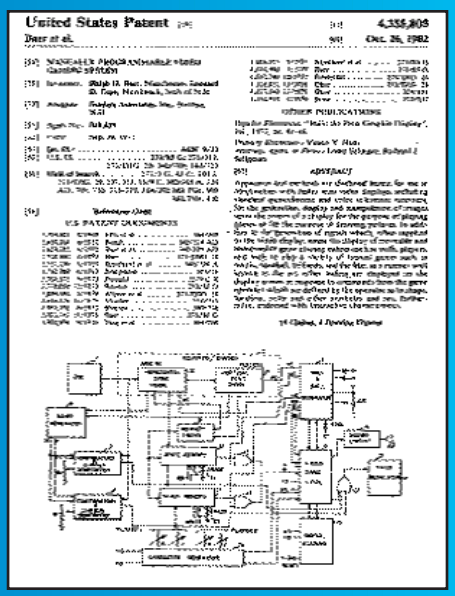
[57] ABSTRACT

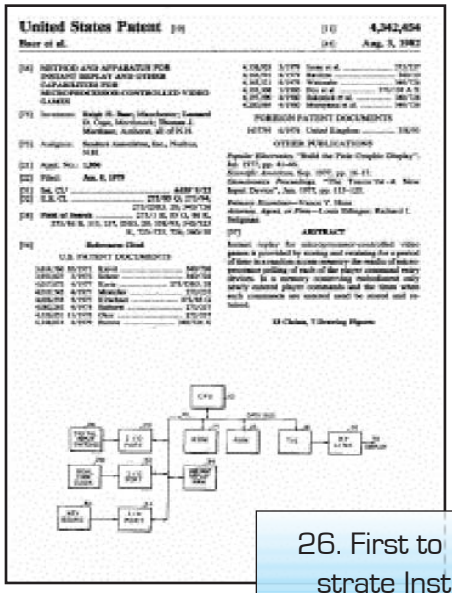
24. First to design a Video 21 Gaming Machine (1980) Used a B&W monitor and colored Acrylic overlays to cut cost. Started at Gamex and completed at Bally-Midway





25. First to draw interactive symbols on a TV screen during videogame play (1980)




United States Patent [19]
Baer et al.
[11] 4,342,454
[45] Aug. 3, 1982

[54] METHOD AND APPARATUS FOR INSTANT REPLAY AND OTHER CAPABILITIES FOR MICROPROCESSOR-CONTROLLED VIDEO GAMES

[75] Inventors: Ralph H. Baer, Manchester; Thomas J. Matthias, Amherst, all of N.H.

[73] Assignee: Sanders Associates, Inc., Nashua, N.H.

[21] Appl. No.: 1,396

[22] Filed: Jan. 8, 1979

[51] Int. Cl.³ A63F 9/22
[52] U.S. Cl. ..... 273/85 G; 273/DIG. 28; 340/728
[58] Field of Search ..... 273/1 E, 85 G, 86 B, 273/DIG. 28, 101, 102, 121, 123, 124, 125, 126, 127 R, 128 R, 129 R, 130 R, 131 R, 132 R, 133 R, 134 R, 135 R, 136, 137 R, 138 R, 139 R, 140 R, 141 R, 142 R, 143 R, 144 R, 145 R, 146 R, 147 R, 148 R, 149 R, 150 R, 151 R, 152 R, 153 R, 154 R, 155 R, 156 R, 157 R, 158 R, 159 R, 160 R, 161 R, 162 R, 163 R, 164 R, 165 R, 166 R, 167 R, 168 R, 169 R, 170 R, 171 R, 172 R, 173 R, 174 R, 175 R, 176 R, 177 R, 178 R, 179 R, 180 R, 181 R, 182 R, 183 R, 184 R, 185 R, 186 R, 187 R, 188 R, 189 R, 190 R, 191 R, 192 R, 193 R, 194 R, 195 R, 196 R, 197 R, 198 R, 199 R, 200 R, 201 R, 202 R, 203 R, 204 R, 205 R, 206 R, 207 R, 208 R, 209 R, 210 R, 211 R, 212 R, 213 R, 214 R, 215 R, 216 R, 217 R, 218 R, 219 R, 220 R, 221 R, 222 R, 223 R, 224 R, 225 R, 226 R, 227 R, 228 R, 229 R, 230 R, 231 R, 232 R, 233 R, 234 R, 235 R, 236 R, 237 R, 238 R, 239 R, 240 R, 241 R, 242 R, 243 R, 244 R, 245 R, 246 R, 247 R, 248 R, 249 R, 250 R, 251 R, 252 R, 253 R, 254 R, 255 R, 256 R, 257 R, 258 R, 259 R, 260 R, 261 R, 262 R, 263 R, 264 R, 265 R, 266 R, 267 R, 268 R, 269 R, 270 R, 271 R, 272 R, 273 R, 274 R, 275 R, 276 R, 277 R, 278 R, 279 R, 280 R, 281 R, 282 R, 283 R, 284 R, 285 R, 286 R, 287 R, 288 R, 289 R, 290 R, 291 R, 292 R, 293 R, 294 R, 295 R, 296 R, 297 R, 298 R, 299 R, 300 R, 301 R, 302 R, 303 R, 304 R, 305 R, 306 R, 307 R, 308 R, 309 R, 310 R, 311 R, 312 R, 313 R, 314 R, 315 R, 316 R, 317 R, 318 R, 319 R, 320 R, 321 R, 322 R, 323 R, 324 R, 325 R, 326 R, 327 R, 328 R, 329 R, 330 R, 331 R, 332 R, 333 R, 334 R, 335 R, 336 R, 337 R, 338 R, 339 R, 340 R, 341 R, 342 R, 343 R, 344 R, 345 R, 346 R, 347 R, 348 R, 349 R, 350 R, 351 R, 352 R, 353 R, 354 R, 355 R, 356 R, 357 R, 358 R, 359 R, 360 R, 361 R, 362 R, 363 R, 364 R, 365 R, 366 R, 367 R, 368 R, 369 R, 370 R, 371 R, 372 R, 373 R, 374 R, 375 R, 376 R, 377 R, 378 R, 379 R, 380 R, 381 R, 382 R, 383 R, 384 R, 385 R, 386 R, 387 R, 388 R, 389 R, 390 R, 391 R, 392 R, 393 R, 394 R, 395 R, 396 R, 397 R, 398 R, 399 R, 400 R, 401 R, 402 R, 403 R, 404 R, 405 R, 406 R, 407 R, 408 R, 409 R, 410 R, 411 R, 412 R, 413 R, 414 R, 415 R, 416 R, 417 R, 418 R, 419 R, 420 R, 421 R, 422 R, 423 R, 424 R, 425 R, 426 R, 427 R, 428 R, 429 R, 430 R, 431 R, 432 R, 433 R, 434 R, 435 R, 436 R, 437 R, 438 R, 439 R, 440 R, 441 R, 442 R, 443 R, 444 R, 445 R, 446 R, 447 R, 448 R, 449 R, 450 R, 451 R, 452 R, 453 R, 454 R, 455 R, 456 R, 457 R, 458 R, 459 R, 460 R, 461 R, 462 R, 463 R, 464 R, 465 R, 466 R, 467 R, 468 R, 469 R, 470 R, 471 R, 472 R, 473 R, 474 R, 475 R, 476 R, 477 R, 478 R, 479 R, 480 R, 481 R, 482 R, 483 R, 484 R, 485 R, 486 R, 487 R, 488 R, 489 R, 490 R, 491 R, 492 R, 493 R, 494 R, 495 R, 496 R, 497 R, 498 R, 499 R, 500 R, 501 R, 502 R, 503 R, 504 R, 505 R, 506 R, 507 R, 508 R, 509 R, 510 R, 511 R, 512 R, 513 R, 514 R, 515 R, 516 R, 517 R, 518 R, 519 R, 520 R, 521 R, 522 R, 523 R, 524 R, 525 R, 526 R, 527 R, 528 R, 529 R, 530 R, 531 R, 532 R, 533 R, 534 R, 535 R, 536 R, 537 R, 538 R, 539 R, 540 R, 541 R, 542 R, 543 R, 544 R, 545 R, 546 R, 547 R, 548 R, 549 R, 550 R, 551 R, 552 R, 553 R, 554 R, 555 R, 556 R, 557 R, 558 R, 559 R, 560 R, 561 R, 562 R, 563 R, 564 R, 565 R, 566 R, 567 R, 568 R, 569 R, 570 R, 571 R, 572 R, 573 R, 574 R, 575 R, 576 R, 577 R, 578 R, 579 R, 580 R, 581 R, 582 R, 583 R, 584 R, 585 R, 586 R, 587 R, 588 R, 589 R, 590 R, 591 R, 592 R, 593 R, 594 R, 595 R, 596 R, 597 R, 598 R, 599 R, 600 R, 601 R, 602 R, 603 R, 604 R, 605 R, 606 R, 607 R, 608 R, 609 R, 610 R, 611 R, 612 R, 613 R, 614 R, 615 R, 616 R, 617 R, 618 R, 619 R, 620 R, 621 R, 622 R, 623 R, 624 R, 625 R, 626 R, 627 R, 628 R, 629 R, 630 R, 631 R, 632 R, 633 R, 634 R, 635 R, 636 R, 637 R, 638 R, 639 R, 640 R, 641 R, 642 R, 643 R, 644 R, 645 R, 646 R, 647 R, 648 R, 649 R, 650 R, 651 R, 652 R, 653 R, 654 R, 655 R, 656 R, 657 R, 658 R, 659 R, 660 R, 661 R, 662 R, 663 R, 664 R, 665 R, 666 R, 667 R, 668 R, 669 R, 670 R, 671 R, 672 R, 673 R, 674 R, 675 R, 676 R, 677 R, 678 R, 679 R, 680 R, 681 R, 682 R, 683 R, 684 R, 685 R, 686 R, 687 R, 688 R, 689 R, 690 R, 691 R, 692 R, 693 R, 694 R, 695 R, 696 R, 697 R, 698 R, 699 R, 700 R, 701 R, 702 R, 703 R, 704 R, 705 R, 706 R, 707 R, 708 R, 709 R, 710 R, 711 R, 712 R, 713 R, 714 R, 715 R, 716 R, 717 R, 718 R, 719 R, 720 R, 721 R, 722 R, 723 R, 724 R, 725 R, 726 R, 727 R, 728 R, 729 R, 730 R, 731 R, 732 R, 733 R, 734 R, 735 R, 736 R, 737 R, 738 R, 739 R, 740 R, 741 R, 742 R, 743 R, 744 R, 745 R, 746 R, 747 R, 748 R, 749 R, 750 R, 751 R, 752 R, 753 R, 754 R, 755 R, 756 R, 757 R, 758 R, 759 R, 760 R, 761 R, 762 R, 763 R, 764 R, 765 R, 766 R, 767 R, 768 R, 769 R, 770 R, 771 R, 772 R, 773 R, 774 R, 775 R, 776 R, 777 R, 778 R, 779 R, 780 R, 781 R, 782 R, 783 R, 784 R, 785 R, 786 R, 787 R, 788 R, 789 R, 790 R, 791 R, 792 R, 793 R, 794 R, 795 R, 796 R, 797 R, 798 R, 799 R, 800 R, 801 R, 802 R, 803 R, 804 R, 805 R, 806 R, 807 R, 808 R, 809 R, 810 R, 811 R, 812 R, 813 R, 814 R, 815 R, 816 R, 817 R, 818 R, 819 R, 820 R, 821 R, 822 R, 823 R, 824 R, 825 R, 826 R, 827 R, 828 R, 829 R, 830 R, 831 R, 832 R, 833 R, 834 R, 835 R, 836 R, 837 R, 838 R, 839 R, 840 R, 841 R, 842 R, 843 R, 844 R, 845 R, 846 R, 847 R, 848 R, 849 R, 850 R, 851 R, 852 R, 853 R, 854 R, 855 R, 856 R, 857 R, 858 R, 859 R, 860 R, 861 R, 862 R, 863 R, 864 R, 865 R, 866 R, 867 R, 868 R, 869 R, 870 R, 871 R, 872 R, 873 R, 874 R, 875 R, 876 R, 877 R, 878 R, 879 R, 880 R, 881 R, 882 R, 883 R, 884 R, 885 R, 886 R, 887 R, 888 R, 889 R, 890 R, 891 R, 892 R, 893 R, 894 R, 895 R, 896 R, 897 R, 898 R, 899 R, 900 R, 901 R, 902 R, 903 R, 904 R, 905 R, 906 R, 907 R, 908 R, 909 R, 910 R, 911 R, 912 R, 913 R, 914 R, 915 R, 916 R, 917 R, 918 R, 919 R, 920 R, 921 R, 922 R, 923 R, 924 R, 925 R, 926 R, 927 R, 928 R, 929 R, 930 R, 931 R, 932 R, 933 R, 934 R, 935 R, 936 R, 937 R, 938 R, 939 R, 940 R, 941 R, 942 R, 943 R, 944 R, 945 R, 946 R, 947 R, 948 R, 949 R, 950 R, 951 R, 952 R, 953 R, 954 R, 955 R, 956 R, 957 R, 958 R, 959 R, 960 R, 961 R, 962 R, 963 R, 964 R, 965 R, 966 R, 967 R, 968 R, 969 R, 970 R, 971 R, 972 R, 973 R, 974 R, 975 R, 976 R, 977 R, 978 R, 979 R, 980 R, 981 R, 982 R, 983 R, 984 R, 985 R, 986 R, 987 R, 988 R, 989 R, 990 R, 991 R, 992 R, 993 R, 994 R, 995 R, 996 R, 997 R, 998 R, 999 R, 1000 R

[56] References Cited
U.S. PATENT DOCUMENTS

FOREIGN PATENT DOCUMENTS

OTHER PUBLICATIONS

[57] ABSTRACT

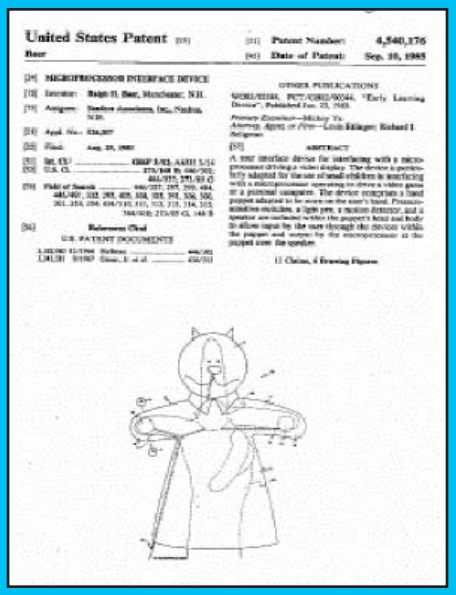
11 Claims, 7 Drawing Figures

26. First to patent and demonstrate Instant Replay for videogames (1981)

27. First to develop a Talking Greeting Card for Hallmark (1982) based on the availability of a low cost speech chip developed by General Instruments that year.

28. First to propose glove like devices (e.g. hand puppet) as videogame or interactive VCR game controller (1983)




United States Patent [19]
Baer
[11] Patent Number: 4,540,176
[45] Date of Patent: Sep. 10, 1985

[54] MICROPROCESSOR INTERFACE DEVICE

[75] Inventor: Ralph H. Baer, Manchester, N.H.

[73] Assignee: Sanders Associates, Inc., Nashua, N.H.

[21] Appl. No.: 634,207

[22] Filed: Aug. 23, 1984

[51] Int. Cl.⁴ G06F 3/02; A63H 11/14
[52] U.S. Cl. ..... 273/148 B; 434/307; 446/175; 273/85 G
[58] Field of Search ..... 434/307, 317, 319, 434; 446/297, 332, 353, 408, 330, 331, 353, 356, 358, 361, 374, 376, 434; 273/85 G, 148 B; 364/410; 273/85 G, 148 B

[56] References Cited
U.S. PATENT DOCUMENTS

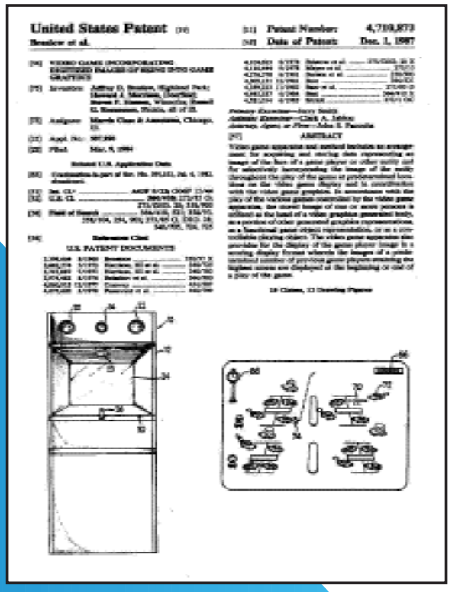
OTHER PUBLICATIONS

[57] ABSTRACT

11 Claims, 4 Drawing Figures



Digital circuitry built for first videogame using Digitized faces of "famous" persons

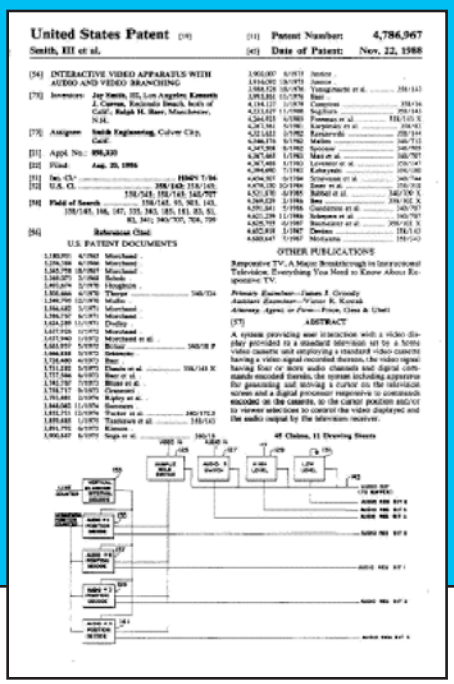


United States Patent [19]

Video Camera to place gamer's face on the screen of a videogame.

30. First to develop an interactive VCR game with real time branching to 2-4 screens and 2-4 audio tracks nested in video signal (1984)





United States Patent [19]

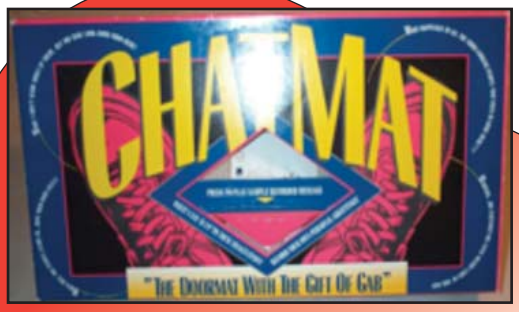
Smith, III et al.

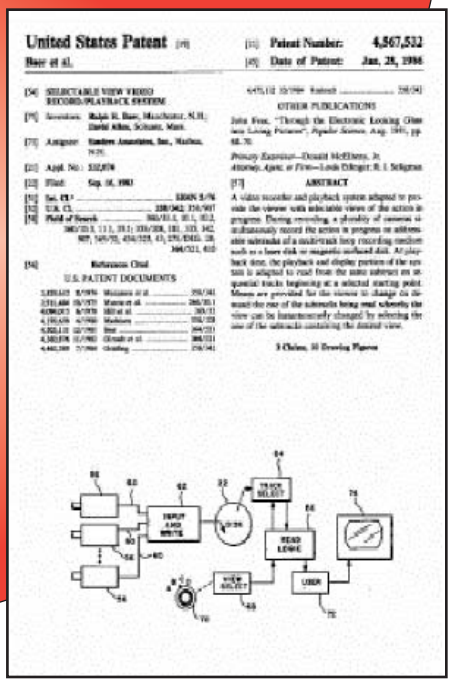
Patent Number: 4,786,967

Date of Patent: Nov. 22, 1988

INTERACTIVE VIDEO APPARATUS WITH AUDIO AND VIDEO BRANCHING

31. First Recordable, Talking Doormat (1992)




United States Patent [19]
Baer et al.
[11] Patent Number: 4,567,532
[45] Date of Patent: Jan. 28, 1986
[54] SELECTABLE VIEW VIDEO RECORD/PLAYBACK SYSTEM
OTHER PUBLICATIONS
ABSTRACT
U.S. PATENT DOCUMENTS

32. First to develop MultiView real time instant branching to different venues of the same action e.g.football game) (1985)

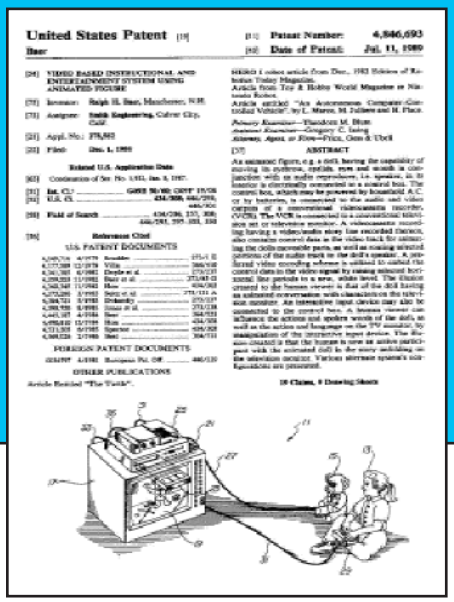


33. First to develop a doll that could hold a book or look at a flashcard and read the text of the page out loud (1987)

Doll swivels head from side to side While reading remote bar code nested Illustrations and made of IR absorptive Ink. IR beam focused into vertical line segment scans the code, reflects code to IR receiver and µprocessor/ Voice synthesizer 34. First to develop a plush bear capable of interacting with characters on screen during VCR presentation while under control of data nested in video signal (1987)

34. First to develop a plush bear capable of interacting with characters on screen during VCR presentation while under control of data nested in video signal (1987)




United States Patent [19]

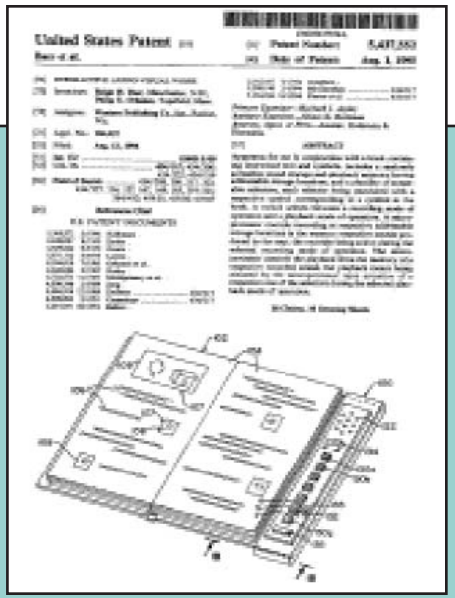
Baer

[11] Patent Number: 4,846,693

[45] Date of Patent: Jul. 11, 1989

VIDEO BASED INSTRUCTIONAL AND ENTERTAINMENT SYSTEM USING ANIMATED FIGURE

ABSTRACT


United States Patent [19]



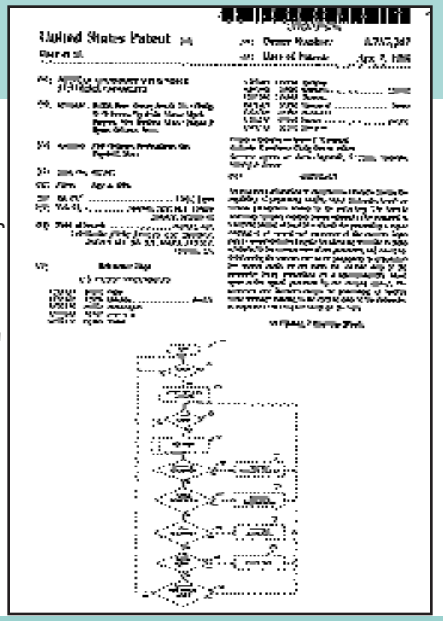
35. First to develop interactive, RECORDABLE talking books for Golden Books (1993)



36. First to develop & license a line of electronics for GI Joe to Milton-Bradley (1995)



37. First to develop a Talking Speedometer and Odometer for bicycles (Milton-Bradley's) "BikeMax" (1997)





38. First to design recordable Talking Picture Frame for 1-4 photos & voice messages Talking Compass (1996)





39. First to develop a Talking Tape Measure and other Talkin'Tools licensed to Hasbro/ Tonka (2000-2003)



Appendix Eight
My Designs

What follows is a list of electronic products which I designed and/or put into production, or which went into production via licenses -

Note: Items that actually made it into substantial production and distribution bution are marked with a "P" within the date brackets. Some of these were included in the "Firsts" above:

A. Videogames, Electronic Toys & Games, Video Arcade Games

- Magnavox Odyssey ITL200 videogame (P-1972)
- Coleco's Amazatron (P-1978)
- Coleco's Kid-Vid videogame accessory (P-1982)
- Gamex Video "21" Machine for Las Vegas (1975)
- Sanders Associates "Hit-N-Run" Arcade Videogames (P-1974)
- Milton-Bradley's Simon (P-1979)
- Ideal's Maniac (P-1980)
- Lakeside's Computer Perfection (P-1980)
- Milton-Bradley's Super Simon (P-1983)
- Kenner's Laser Command (P-1985)
- Galoob's Smarty-Bear Video (P-1986)
- Yes!Entertainment's TV Teddy (P-1992)
- ICP's Motion Pad (P-1995)
- ICP's DigiPad 20 and DigiPad 75 (P-1995)
- ICP's TimePad (P-1996)
- ICP's Time Frame (P-1996)
- ICP's Auto Voice (P-1996)
- Golden Books (Western Publishing) Recordable Talking Books (P-1998)
- ILG's Video Buddy Interactive VCR based game (P-1999)
- Bell Sports' Bike Blaster (P-1999)
- Tonka's Talkin' Tools (P-2000)

...and about 100 more electronic toys & games some of which did and didn't make it into production

B. Amateur (Ham) Radio and other Radio Products

- WWV Time Code Receiver (1953)
- 15 Watt MobileTransmitter for Indian Govt. (P-1954)
- Series Gate all-band 2-32 MHz. Radio Amateur Transmitter (1954)
- Vantron Base & Mobile 2-way radio sets (P-1955)
- TR100 T/R Switch for Ham Radio use (P-1955)
- Transitron 500 Linear Amplifier, 3-32 MHz (P-1956)
- Q-Probe transmitter tester (P-1956)
- Vantron 300 100-Watt Linear Amplifier for Hams (P-1956)

C. Consumer Electronics and Industrial Products

- 300 Watt Time-Clock synchronizing-tones amplifier for IBM (P-1950)
- TV (on screen) Alarm Clock (1982)
- Voice-actuated Intercom (1950)
- K-Line Electronic Organ (1963)
- Bacova's Recordable Talking Doormat (P-1996)
- Digital Video Modem Coupon printer (1982)
- Hallmark Talking Greeting Card (P-1984)
- Over-the-phone recorded Voice-Message Unit for 800-Flowers (1982)

D. Military and Commercial Test Equipment

- High-Voltage Insulation Tester for Navy Aircraft (P-1952)
- SG159/TMS-1000 400-1000MHz Radar test set (P-1953)

- SG-161/ TMS-1600 0.9-2.1 GHz Radar test set (P-1954)
- SG-153/ TMS-4000 1.8-4.0 GHz Radar test set (P-1954)
- SG-32 /TRM-3, 15-400 MHz Sweep Generator (P-1955)
- Radar Spectrum Analyzer - 10 GHz (P-1955)
- Electronic Counter / Eput meter ,0- 1 MHz max (P-1955)
- FS-195 0.1,1.0.10 MHz Frequency Standard (1958)
- Oscilloscope Voltage Calibrator (1951)
- Audio Oscillator (like original H-P AF Oscillator) (1947)
- Vacuum Tube Voltmeter / Grid Dipper (1947)

E. Electro-Medical Equipment

- RS 490 Surgytherm Surgical cutting unit (P-1949)
- Dehydra Depilation unit (P-1949)
- CG-30 Muscle Toning Waveform Generator (P-1949)

F. Defense Electronics Systems Components

- "Brandy" - Russian radio transmission monitoring system (P-1958)
- Combat Engineer Vehicle (CEV) Trainer (P-1984)
- Acoustic-Artillery - Ranging Display Map Table (P-1962)
- Interactive Video Training System (IVTS) Rifle Training System (P-1983)
- Light Antitank Weapon (LAW) Simulator (P-1985)
- LCD Panel for Navy aircraft (P-1965)
- LCD Panel for Boeing Helicopter (P.1965)
- Multilayer Printed Circuit Boards (P-1966)

G. Space Electronics:

- Handle with power supply and r.f. transmitter for First B&W (GE) hand-held moon landing camera (P-1962)
- High-speed deflection yokes for NASA vector display CRT's (P-1961)

Bibliography

A. Published Articles and Papers delivered

1977 - “Television Games: Their past, Present and Future, Gametronics Proceedings” 1/77 p 7-30 *IEEE Transactions on Consumer Electronics,* 11/77 p.496

1979 - “Innovative Add-On TV Products” , *IEEE Transactions on Consumer Electronics* 11/79 p.765

1979 - “Telebriefs - A Novel User-Selectable Real-Time News Headline Service for Cable-TV”; paper delivered at CES Chicago 7/79

1981 - “Personal Electronics - The Home Terminal” - Sanders Internal Publication 8/81

1982 - “Synchronization of Computer-Controlled Video Sources to Videodisc or Tape in Consumer Products”, Int'l Conference on Consumer Electronics, Digest of Technical papers 6/82 p.158

1983 - “Ruminations On Why We Need Interactive Videodisc-Player-assisted Home Computer Terminals”, Sanders Intern. Pub 10/83

1984 - “Come to Your Senses”, *Digital Deli*, Workman Pubs. NYC 11/84 p.227

B. Articles, Awards and Books on RHB and Videogames - (a sampling)

1977 - "Getting into Games", *Personal Computing* 11/7 p.85

1979 - "Game Inventor Just Wanted To Keep TVs Busy", *Harris County Journal*, Ogden UT

1980 - “Baer is Selected Inventor of the Year”, *Nashua Telegraph* 5/5/80

1979 - “Baer, Rusch Recipients of Distinguished Quarterly Technical Achievement Award”, *Sanders News* 11/79

1982 - "Profiling New Hampshire Business", *NH Profiles* Winter 1982, p.24

1983 - “Videogames Interview: Ralph Baer”, *Videogames* 2/83 p.32

1983 - "The Honest to Goodness History of Videogames", *Video Review* 6/83 p.40

1983 - “Videogame Mastermind Turns Sights On Education”, *Boston Globe* 8/28/83

1983 - "Hands On...Meet Ralph Baer", *Videography* Mag. 12/83

1983 - *Screen Play: The Story of Videogames* by George Sullivan

1984 - Computer Time Line , *Digital Deli*, Workman Pubs. NYC 11/84 p.27

1985 - "New England's Gift to America", *YANKEE Magazine* 9/85 p.5

1986 - "A Videogame's Odyssey", *Electronic Business* 3/15/86 p.50

1989 - "Inventors Anonymous", *USAir Magazine* 12/89 p.36

1992 - "An Idea, Vision and Hard Work Led to TV Games' Development", *Lockheed Today*, 7/92 p.1

1982 - *Video Invaders* by Steve Bloom

1984 - *ZAP: The Rise and Fall of ATARI* by Scott Cohen

1999 - "The Electronic Gamemaker", *Games Magazine*, May 1999

2000 - "The Baer Essentials", *Electronic Gaming Monthly* #126, 1/2000

2000 - "Witness to Big Bang of Videogames", *Manchester Union Leader* 8/19/2000

2001 - "Game Boy", *Sunday Nashua Telegraph* 11/11/01

2001 - *The Medium of the Videogame* by Mark Wolf with foreword by R.H. Baer

2001 - Videogame History covered by TV segments WMUR, NH, History Channel,

2001 - *Phoenix: The Fall & Rise of Videogames,* 3rd edition by Leonard Herman with a Foreword by R.H. Baer

2001 - "Ralph 'Odyssey' Baer", *Electronic Gaming Monthly* #149 12/01

2001 - *Supercade* by Van Burnham with a Foreword by R.H. Baer

2002 - *The Ultimate History of Video Games* by Stephen Kent

2002 - *High Score: The Illustrated History of Electronic Games* by Rusel DeMaria & Johnny Wilson

Contributor's Bios

Ralph H. Baer - Author

Mr. Ralph H. Baer is an electronic engineer and engineering consultant with nearly 60 years of hands-on engineering management and product licensing experience. Mr. Baer has over 150 US and foreign patents. He is probably best known as the "Father of Videogames" and holds the pioneer patent covering video games. His work in the sixties resulted in the Magnavox Odyssey game system which was the first commercial home videogame. His early videogame hardware already resides in such places as the Smithsonian and the Japanese National Science Museum.

For over fifty years Mr. Baer has been active in both the commercial and defense electronics development and production business; and in electronic toy and game invention, design and licensing. Many well-known handheld electronic toys such as Milton-Bradley's *Simon* came from his lab. He and his wife Dena have lived in Manchester, New Hampshire for the past 48 years. They move around a lot. His website is www.ralphbaer.com

Leonard Herman - Editor

Leonard Herman, the Game Scholar, fell in love with videogames the first time he played *Pong* at a local bowling alley in 1972. He began collecting videogames in 1979 after he purchased his first Atari VCS and then began writing his first book on videogames: *ABC To The VCS*, which wouldn't be published until 1996. A programmer and technical writer by trade, Mr. Herman founded Rolenta Press in 1994 to publish his book, *Phoenix: The Fall & Rise of Videogames*, the first serious book on videogame history. Three editions have been published between 1994 and 2001 and a fourth edition is planned for late 2005. Mr. Herman has written videogame articles for *Electronic Gaming Monthly*, *Videogaming Illustrated*, *Official US Playstation*, *Games*, *Pocket Games*, *Classic Gamer Magazine*, *Manci Games*, *Video Game Collector*, and *Gamespot*. Mr. Herman resides in New Jersey with his wife Tamar and their children Ronnie and Gregory. His website is www.rolentapress.com.

Rusel DeMaria - Layout

Rusel DeMaria was just waiting for videogames to appear in his life, which they did in the late Sixties when he accidentally stumbled upon *Spacewar*. It was love - and awe - at first sight. It was science fiction come true. "Where can I get more of that?" he asked.

However, not being nearly as clever or forward thinking as people like Ralph Baer, he never even thought about creating videogames himself (not until many years later, anyway); instead he became a musician and played every game he could get his hands on through the 1970s, only for fun. What a concept! Then, starting in the early 1980s, he discovered that he could get games for free if he would review them for magazines, and that started several decades of writing about games and software, including more than 60 books, some magazine editing, a few columns and some game design work. In researching his book with Johnny Wilson, *High Score: The Illustrated History of Electronic Games,* Rusel discovered the story of Ralph Baer and had the privilege of speaking with Ralph on several occasions. Rusel lives with his wife, Viola, in Oregon. His website is sadly neglected and out of date.

Michael Thomasson - Cover

Michael Thomasson is one of the most widely respected videogame historians in the videogame field today. He currently teaches college level videogame history, design, and graphics courses and is the founder and president of the highly respected Good Deal Games videogame database. Michael has written business plans for several videogame vendors and managed almost a dozen game-related retail stores spanning two decades. His historical columns have been distributed worldwide in newspapers and magazines. He has also contributed towards or published dozens of games for several consoles, such as the Sega CD, Colecovision, CD-i and Vectrex. Michael's classic gaming business also sponsors retro-gaming tradeshows and expos across the United States and Canada. Mr. Thomasson and his wife JoAnn reside in New York. His website is www.gooddealgames.com.

Index

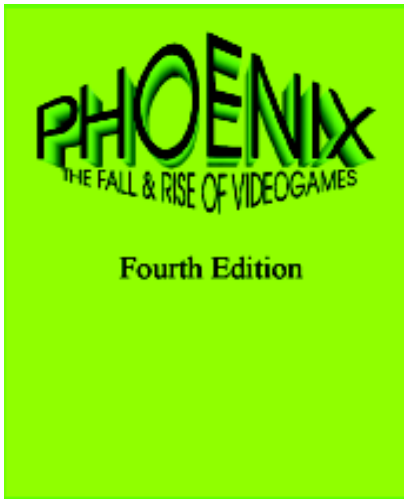
800: See Atari
Activision: 5, 16, 126, 130-131
Adam: xix, 147- 150, 152-153, 157
Adamson, Nat: xvi, 101, 112, 181
Admiral: 126
Airport Marina: 76
Al Capp's: 9
Alcorn, Al: xvi, 9, 15, 82, 124
Allen, David: xvi
Amazatron: 138
American Cable Company: 49
American Press Institute (API): 125
American Tourister: 124
Ampex: 9, 82
Anderson, Ted: xvi, xviii-xix, 5, 125-126, 130-131, 161, 183
Apple: 147
  Apple II: 2, 144, 169
  Apple IIe: 146, 153-155, 163, 165, 167
Argento, Henry: xvi, 42-44
Arikawa, Minoru: 157
Atari: viii, xvi- xix, 1-2, 5, 9, 14-16, 76, 82, 90-92, 100, 115, 124-126, 130, 133, 135, 137, 141, 146-148, 150, 153-155, 157, 159, 161, 171, 182-184, 254
  800: 155
  Breakout: 135, 138
  Pong: xvi, 5, 7, 9, 14-15, 76, 82, 85, 88, 90, 92, 101, 115, 124-126, 130, 182
  Qwak!: 159, 161
  Touch-Me: 130, 171, 173
  Video Computer System (*VCS*): xviii, 5, 130, 133, 135, 137, 146-148, 150, 153-154
Averett, Ed: xvi, 137, 185-186
Averett, Linda: xvi, 137
BAE: *See Sanders Associates*
Baer, Andrea: 131
Baer, Danielle: 131
Baer, Dena: 74
Baer, Jim: 82, 131
Baer, Jon: 131
Baer, Ralph: 5, 14-16, 39, 42, 121, 125, 132, 156, 180-186
Bally: 9, 16, 93, 122, 124, 156, 185-186
  Bally-Midway: 16, 155, 185
  Midway: xix, 100
Beatrice Products: 182
Benzer, Seymour: 4
Berenstain Bears: 147
Bluth, Don: 134
Bowers, J.L.: 185
Bowling Greene Restaurant: 75
Breakout: See Atari
Breslow, Geoffrey: xvi, 138, 155, 171
Briody, Tom: xvi, 101, 112, 117, 125-126, 130, 180-183
Bromley, Eric: xvi, 142-145, 147, 149-153
Brookhaven National Labs: 17
Brown, Robert: 15
Bryan, Joe: 82
Bryan, Larry: 82
Bushnell, Nolan: xvi, 1, 5, 6, 9, 14-15, 76, 82, 124-126, 130-131, 173, 182-183
Cabbage Patch Kids: xvii, 153
Caltech: 4
Campman, Herbert: xvi-xvii, 29-30, 32, 41-42, 45, 47, 52, 55-56, 74, 91, 93-94, 101, 138, 164, 181
Caras, Marshall: xvi, 144-145
CBS: 114
Centronics: xvii, 121-122, 181
Channel F: 117
Chicago Dynamics: 126, 130-131, 183
Chisholm, Dan: xvi, 42, 91, 112, 116-117, 139, 143, 180, 185
Circuits & Systems (C&S): xix, 144-145, 151, 165
Classic Gaming Expo: 126, 131, 137, 169
Clemens, Jon: xvi, 151-152
Close Encounters of the Third Kind: 173
Coleco: xvi-xix, 116-117, 124, 130, 133-134, 136, 138-154, 157, 163, 165, 180, 182, 185
  ColecoVision: xix, 145, 149-153, 165
  Combat: 142
  Kid-Vid: xvi-xvii, 144, 146-150, 152-153
  Telstar: xix, 116, 130, 139-141, 143, 182
  Telstar Alpha: 142
  Telstar Arcade: 142
Colt: 164
Combat: See Coleco
Combat Engineer Vehicle (CEV): 166
Compton Encyclopedia: 172
Computer Perfection: 138
Computer Space: 5, 7, 82
Consumer Electronics Show (CES): 147-149, 152-153, 157, 186
Control Data: xix, 19
Cooper, Julie: 136
Cope, Leonard: xvi-xviii, 93, 121-122, 135, 150, 162, 164-166, 171-172, 183, 186
Cot, Frank: xvi, 185-186
Dabney, Ted: 9
D'Aiuto, John: xvi, 117
Data East: 131
Delbrück: 4
DeScipio, John: xvi, 134
Despathy, Bob: xvi, 140
DiScipio, Alfred: 184
Dittomassi, George: 173
Dolk, Chuck: xvii, 184-186
Donner: 17
Douglas, A.S.: 16
Dr. Seuss: 146-147, 149, 153
Dragon's Lair: 134
Duck Hunt: See Nintendo
DuMont: 16-17
Edison, Thomas: 125
EDSAC: 16
Electro Games: 98
Electronic Arrays: 182
Enders, Bill: xvii, 57, 107
Epyx: 154
Etlinger, Louis: xvii-xix, 41, 49, 52, 56-59, 74, 82, 91, 93, 100-101, 116-117, 138-139, 143-144, 151, 157, 180-182, 184
Executive Games: 182
Fairchild: 117, 186
Famicom: See Nintendo
Fauth, John: xvii, 134, 184-185
Federal Communications Commission (FCC): xix, 73, 139-141
Florio, Dan: 166-167
Forte, Steven: 181
Fritsche, Bob: xvii-xviii, 58-59, 62, 82, 88, 90, 92, 101, 107, 110-112, 115-117, 133, 180-182
Gameboy: See Nintendo
Gameboy Camera: See Nintendo
Gamex: xvii, 121-122, 181
Garoufalis, Byron: 181
GE: xx, 57, 93
Gemini: 147-148, 152-153
General Instrument (G.I.): xix, 90, 92, 107, 115-117, 133, 136, 139-140, 142, 150,

180-182, 184-185
Glass, Marvin: 138
Glick,Marty: 5-6
Golomb, Solomon: 4
Gosselin, Russ: 98
Grady, Judge John: xvii, 16, 82, 93, 126, 183
Greaf, Clarence: 63
Great Train Robbery, The: 145
Greenberg: xvii, 153
Greenberg, Arnold: xvii, 116-117, 138-143, 145, 147, 151-152, 180
Greenberg, Leonard: xvii, 139, 147
Gregory, Stew: 44
GT&E: 149
Hallmark Cards: 139
Harris, Bob: xvii, 185
Harrison, Bill: xvii-xix, 5-6, 14-15, 30, 32, 39-42, 44-45, 47, 49-50, 52-59, 93, 107, 110-112, 114, 126, 169, 174, 183
Harrower, Gilbert Duncan: 115
Hasbro: xviii, 169
Hauke, G.E.: 59
Heathkit: 27, 30, 175, 179
Heffron, Chuck: xvii, xix, 135, 184
Heinz Nixdorf Museum: 15
Helms, John: xvii, 134-135, 182-184
Herbert, Tom: 125
Herman, Leonard: 137
Higginbotham, Willy: 16-17
Hit-N-Run: 98, 100, 111, 181
Holt, Ollie: 122
Howard, Bob: xvii, 121
Hyatt Regency Hotel: 130
Ideal Toy Company: 136, 138
IEEE: 149
Ingram, Kenny: 182
Intel: xvii, xviii, 135-136, 183-185
Intellivision: *See Mattel*
Interactive Learning Group (ILG): 112, 114
Interactive Video Training System (IVTS): 161, 164-168
Isaacson, Anson: xvi, 138
Japanese National Science Museum: 15
Jensen, Lars: xvii, 155
Jeopardy: 52
Jerrold: 107, 117, 182
Jobs, Steve: 146
Johnson, Clark: 114
Journey: 156
Kahn, Al: xvii, 147, 153
Kahn, Irving: xvii, 48-49
Kale, Gene: xvii, 135
Kanal 34: 90
Katz, Michael: xvii, 154-155
Kelly, Sean: 137
Kenner: 124
Kent, George: xvii, 58-59, 63, 73, 133
Kent, Steve: 157
Kid-Vid: See Coleco
Kinney, John: xviii, 117, 181
Kirby, John: 161
Kloss: 101, 164
Konami: 154
LaBerge, Dr. Walter: 165
Lackoff, Sam: xviii, 3, 18
Lakeside: 138
Lee, Harold: 15
Legge, Judge Charles E.: 5
Leydic, Voit: xviii
Light Antitank Weapon (LAW): 144, 146, 164-167
Lincoln, Howard: 157
Lockheed: *See Sanders Associates*
Lockheed-Martin: *See Sanders Associates*
Loral: xviii, 3, 18, 138, 235
Maben, Jim: xviii, 141
Magnavox: xvi-xix, 3, 5-7, 9, 14-17, 44, 49, 57-59, 62-63, 73-76, 82, 85-86, 88, 90-93, 100-101, 107, 110-112, 114-117, 124-126, 130-140, 143-144, 146, 148, 157, 159, 161, 163, 171, 178-186
North American Philips (NAP): xviii, 144, 157, 159, 161, 181
NV Philips: 185
Odyssey: xvi-xix, 3, 5-7, 9, 14-15, 44, 58-59, 62, 73-76, 82, 85-86, 88, 90-92, 107, 112, 115, 117, 124-126, 130, 133, 148, 178-179, 181, 185
Odyssey 100: 101, 115, 117, 133, 180-181
Odyssey 200: 101, 115, 117, 133, 180-181
Odyssey 2000: 133, 184
Odyssey 300: 117, 133, 182
Odyssey 3000: 133, 184
Odyssey 400: 133, 182
Odyssey 4000: 133, 184
Odyssey 500: 182
Odyssey²: xvi-xviii, 133-137, 183-186
Philips: xvii, 112, 117, 131, 133, 151, 181, 184
Super Odyssey: 110-112
Maine, Ed: 115
Manhattan Cable: 49
Maniac: 138
Maori: 4
Martin, Gerry: xviii, 57-59, 63, 74, 82
Marvin Glass & Associates (MGA): xvi, xviii, 116, 122, 124, 136, 138-140, 143, 155-156, 171-173, 183-185
Maser, Stan: xviii, 183
Mason, John: xviii, 32, 40-42
Mattel: 16, 124, 126, 130-131, 133, 138, 185
Intellivision: 133
Mayer, Steve: xviii, 153
McGarvey, Sandy: xviii, 144, 151
McGuiness, Don: xviii, 137
Merrill-Lynch: 148
Meyer, Burt: 138
Micro Circuits: 139
Micro-Pros: xviii, 169
Microsoft: 2
Midway: *See Bally*
Milner, Joe: xviii, 153
Milton Bradley: xvii, 138, 172-173, 185
MIT: xix, 15, 45
Mitchell, George: xviii, 101, 122, 124, 162, 165
Mitre: 166
Monday Nite Football (MNFB): 122, 124, 143, 183-185
Montgomery-Ward: 75, 185-186
Moore, Gordon: 2
Morita, Akio: 114
Morrison, Howard: xviii, 124, 138, 143, 155, 171-172, 184-185
Morrison, Pauline: xviii
Mortimer, Tom: 122, 162, 164
MOS: 139
MOSTechnology: 90
Motorola: 57, 164
Mueller, Wes: xviii
Murray, Richard: 93
Music Operators of America (MOA): 101, 110, 121, 159, 171, 181
National Museum of American History,: 29
National Semiconductor: 92, 115-116, 180-182
NEC: 152
NES (Nintendo Entertainment System): See Nintendo
Neuman, Williams, Anderson and Olson: xvi, xviii, 125-126, 131, 181
Nintendo: 2, 17, 131, 152, 154, 156-157, 159-161
Duck Hunt: 157
Famicom: 157
Gameboy: 156
Gameboy Camera: 157
NES (Nintendo Entertainment System): 157, 160
Nintendo of America: 157
Nintendo of Japan: 157
ROB: 157

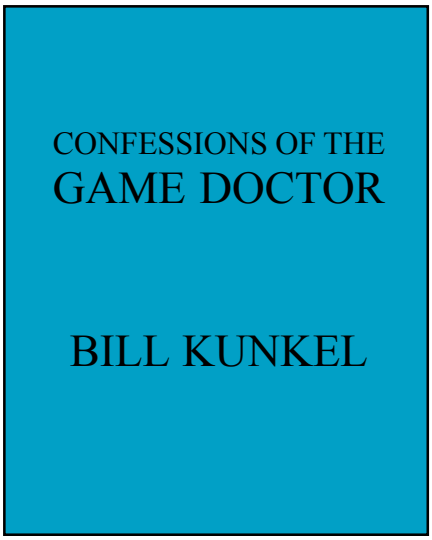
North American Philips (NAP): *See Magnavox*
Nunes, Al: 164-166
Nutting Associates: 5, 7, 9, 76
NV Philips: *See Magnavox*
Odyssey: See Magnavox
Odyssey 100: See Magnavox
Odyssey 200: See Magnavox
Odyssey 2000: See Magnavox
Odyssey 300: See Magnavox
Odyssey 3000: See Magnavox
Odyssey 400: See Magnavox
Odyssey 4000: See Magnavox
Odyssey 500: See Magnavox
Odyssey²: See Magnavox
Overkal: 90
Overton, Sam: xvii, xviii, 185-186
Pac-Man: 5
Pacocha, John: xviii, 156
Parnell, Vern: 63
PC: 2, 152, 162
PDP-1: 9
Pelovitz, Bob: xviii, 114, 154-155, 166-169
Perry, William: 165
Peserb, John: xix, 155-156
Philips: *See Magnavox*
Photo Finish: 122
Pioneer: 151
Playmeter: 9, 161
PlayStation: *See Sony*
Police 911: 154
Pong: See Atari
Pope, Harold: xix, 42, 44, 93, 162, 185
Price, Bob: xix, 111, 117, 181
Pro-Soccer: 98
Quota, Frank: xix, 184-186
Qwak!: See Atari
R. H. Baer Consultants: 139, 168
Radio Shack: 131, 150
Raytheon: xix
RCA: xvi-xvii, 30, 42, 49, 57, 117, 151-152, 180, 186
SelectaVision: xvi, 151-152
Studio II: 117, 180, 186
Reiner, Bert: xix, 143, 145
ROB: See Nintendo
Rose Mudge: 161
Rubin, Eugene: xix, 49, 74, 90, 92-94, 98, 180
Rusch, Bill: xix, 5-6, 14-15, 32, 45, 47, 49-50, 52, 55, 98, 126, 132, 174, 183
Russell, Steve: 15-17
Sabel, Walter: 16
Sacks, Ed: xix, 115-116, 139, 150
Sanders Associates: xvi-xix, 2-6, 9, 14, 16-18, 29-30, 32, 41, 43, 48-49, 57-59, 74, 82, 85, 88, 90-91, 93, 98, 100-101, 110-112, 114-117, 121-122, 124-126, 131-136, 138-144, 146, 149-154, 157, 161-169, 171, 174-175, 180-186
BAE: 18
Lockheed: 18, 132, 139
Lockheed-Martin: 18
Sanders/Lockheed: 3, 131-132
Sanders, Bob: 63
Sanders, Royden: xix, 42, 44, 53, 93, 100-101
Sanders/Lockheed: *See Sanders Associates*
Sands, Judge Leonard: 16-17, 161
Schenck, Rob: xix, 149, 153
Schlafly, Hubert: xix, 48-49
Sears: 15, 52, 57, 75, 90-91, 115, 182, 185-186
Seeburg: 100, 126, 130
Sega: 131, 152
SelectaVision: See RCA
Seligman, Dick: xix, 93, 143, 154, 157
Sesame Street: 155
Shea, Jim: 172
Sheer, Ross: 124
Shivji, Shiraz: xix, 154
Sight-N-Sound: 180
Signetics: 184
Silvey, John: 63
Simon: xvi, xvii, 130, 138, 171-173
Sinatra, Frank: 76
Skate-N-Score: 98, 100-101, 111-112, 133, 168-169, 181
Slusarski, John: xviii-xix, 111, 117, 181-182
Smithsonian Institute: 15, 29, 88, 169
Solomon, Bob: xix, 19, 30, 32
Sony: 2, 152
PlayStation: 152
Sorensen, Dr. Robert: 107
Sorenson, Theodore C.: 107
Space Invaders: 5
Spacewar: 2, 9, 14-17, 159
Staup, Mike: xix, 185
STINGER: 165-167
Studio 54: 172-173
Studio II: See RCA
Sunstein, Drew: xix, 144-145
Super Odyssey: See Magnavox
Sylva, John: 181
Sylvania: 57, 140
SYNERTEC: 182
Taft, Mel: 172
Taito: 131
Talkin' Tools: xviii, 169
Tank: 142
TelePrompter: xvii, xix, 47-50, 52, 107, 161
Telesketch: 135-136, 149, 182, 186
Telstar: See Coleco
Telstar Alpha: See Coleco
Telstar Arcade: See Coleco
Texas Instruments: 90-92, 101, 115-116, 162, 171-172, 180-182
Tiger: 146-147
Time, Love, Memory: 4
Tonka: 169
Touch-Me: See Atari
Toy Fair: 139, 147
Toys R Us: 146
Tramiel: xvii, xix, 154-155
Transitron: xviii, 3, 18
Tremblay, Bob: xix, 27, 29, 32
TV Digest: 74
Ultimate History of Videogames, The: 157
United Press International (UPI): 125
University of Maine: xvi, 93
Video Buddy: 114-115, 169
Video Computer System (VCS): See Atari
Videomaster: 90
Waldorf Astoria: 173
Wall Street Journal: 185
Warner Cable: 49, 107, 116, 161
Warwick: 57
Weiner, Jonathan: 4
Wiles, Bob: 62-63, 82
Williams, Jim: xix, 5, 125-126, 130-131, 159
Winter, David: 91, 169
Withun, Duncan: xx, 74, 141
Wooster, Dorothy: 172
Worcester Polytechnic Institute (WPI): 112, 114
Wozniak, Steve: 146
Yale: xvi, 93
Zenith: 57

Other books from

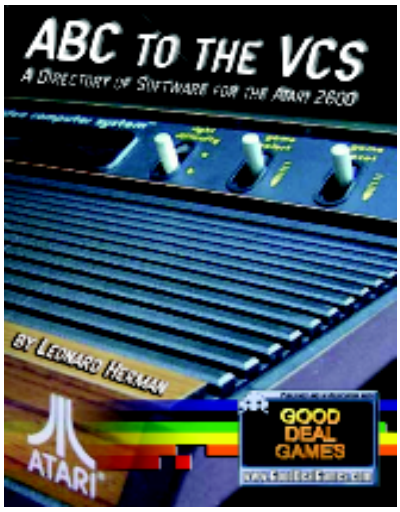
ROLENTA PRESS



The original videogame history book returns in an all-new edition. Acclaimed as the *definitive* book on videogame history, this edition includes new chapters covering 2001 through 2004.



Bill Kunkel, co-founder of Electronic Games, the pioneering videogaming magazine of the early '80s, opens his vault of information and reveals everything you always wanted to know about the golden age of videogames from an insider's perspective.



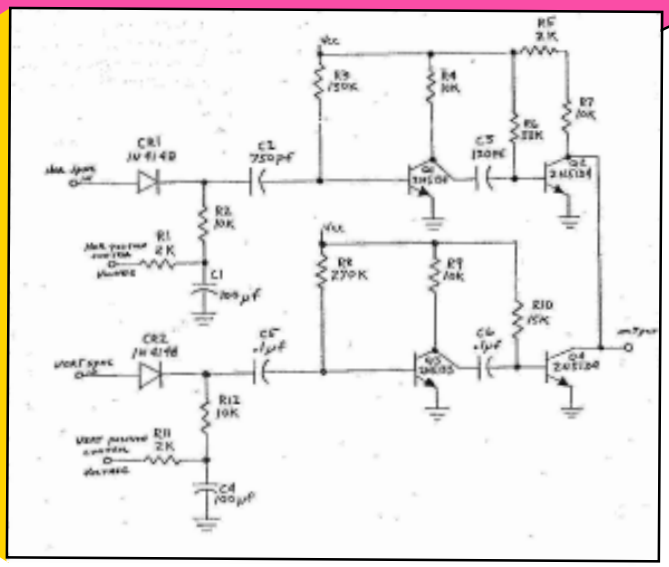
The book that would not die! Originally written in 1983 and released by popular demand in 1996, this second editon includes summaries of new games for the Atari 2600 that have been released since publication of the first edition. Also included are screen shots from nearly every game.

Look for these, and other fine books coming soon from

ROLENTA PRESS
PO BOX 1365
SPRINGFIELD, NJ 07082-5365
www.rolentapress.com

BUILD YOUR OWN BROWN BOX!!





All of the schematics that appear in this book are also available on a companion CD as high-resolution JPEGS that can be resized and printed. The CD contains never-before-seen Quicktime videos of Ralph H. Baer demonstrating how to play the Odyssey. These videos are playable on both PCs and Macs.



The cost of this CD is only $10.00 + $1.00 for postage (U.S. only. Please write to info@rolentapress.com for postage outside the United States.

To order by credit card or Paypal, please go to www.rolentapress.com

To order by check or money order, mail coupon (or copy) to:
Rolenta Press
PO Box 1365
Springfield, NJ 07081-5365

Please send a copy of Ralph Baer's Schematic CD. I have enclosed $10 + postage for each CD.

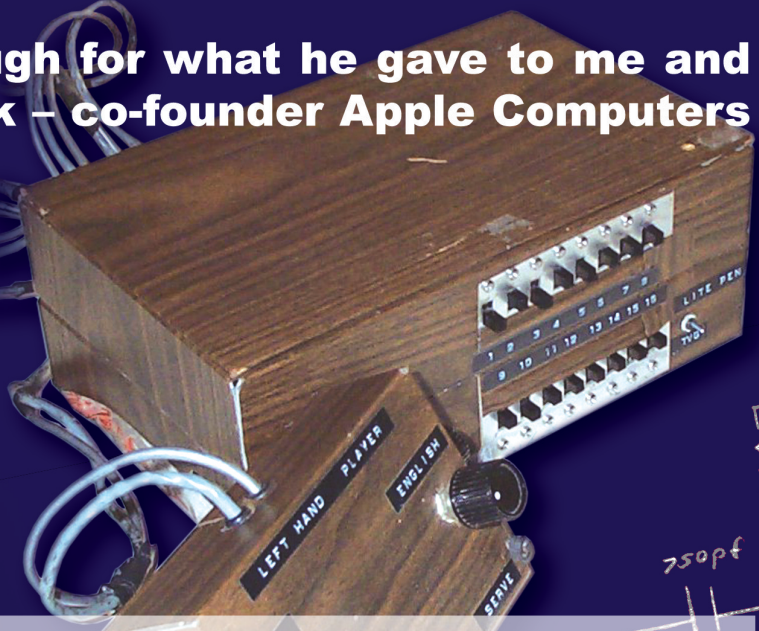
Name_____

Address_____

City _____ State _____ Zip _____

"I can never thank Ralph enough for what he gave to me and everyone else." Steve Wozniak – co-founder Apple Computers





THE REAL STORY BEHIND VIDEOGAMES

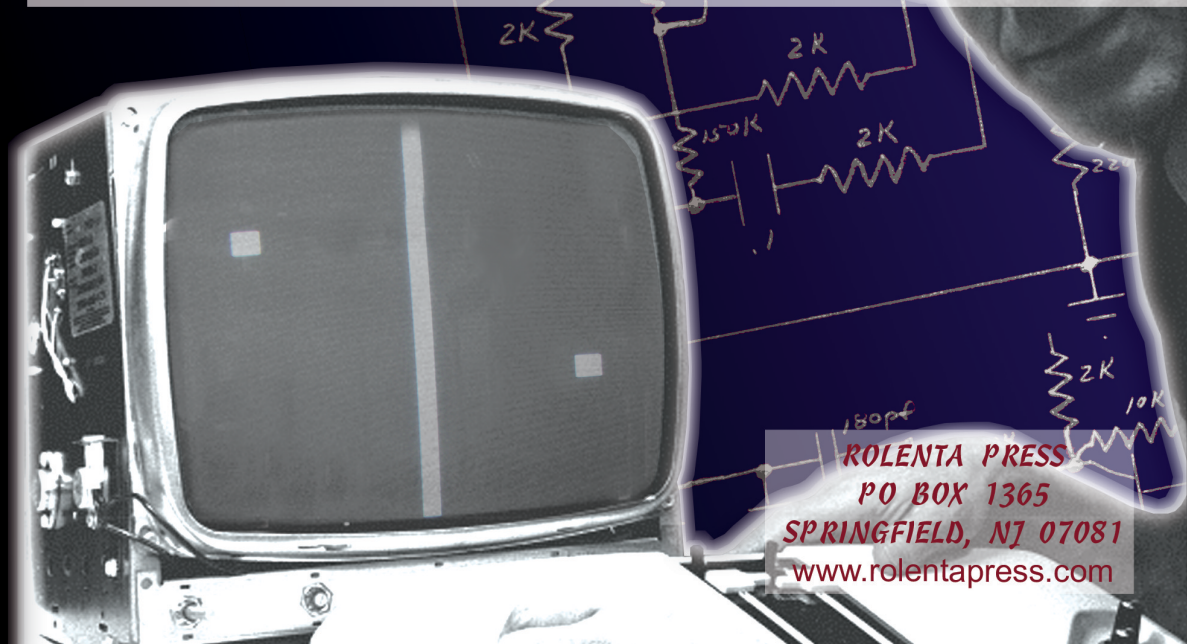
Long before there was a Sony Playstation, Microsoft Xbox or Nintendo Gamecube, there was the Magnavox Odyssey, the world's first home videogame console. But the story of videogames predates the Odyssey by six years. It begins in 1966 when a television engineer named Ralph H. Baer sat down at a New York bus station and entered history.

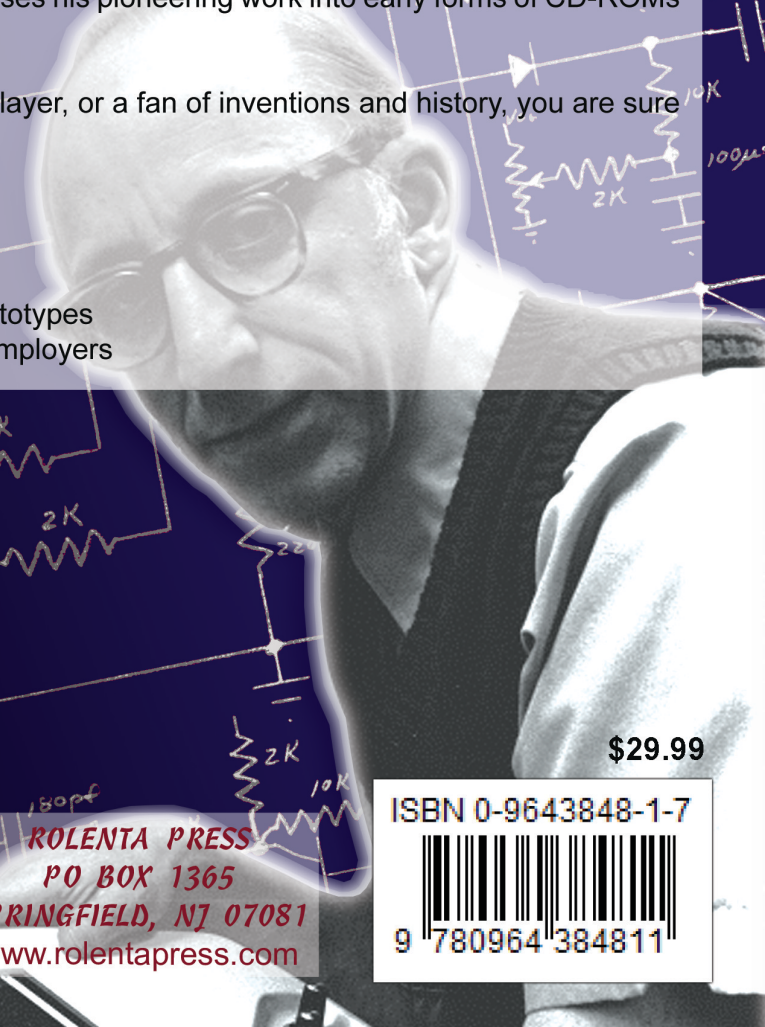
Videogames: In The Beginning is Ralph H. Baer's account of how today's $11-billion per year videogame industry began. A meticulous note keeper, Baer presents in his own words the real story of what led to the Odyssey… and beyond.

But he doesn't end there. In this book Baer also examines other products that he has worked on such as Simon, the most popular electronic toy ever created. He also discusses his pioneering work into early forms of CD-ROMs and digital imagery.

Whether you are a student of videogame design, a game player, or a fan of inventions and history, you are sure to find Baer's history fascinating and informative.

Included in this book are:
· Original United States patents
· Original top secret internal notes and memos
· Original schematics and photos of the first videogame prototypes
· The actual four-page treatise that Baer presented to his employers





ROLENTA PRESS
PO BOX 1365
SPRINGFIELD, NJ 07081
www.rolentapress.com

$29.99

ISBN 0-9643848-1-7
9 780964 384811