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TV VIDEO GAMES FOR CHRISTMAS

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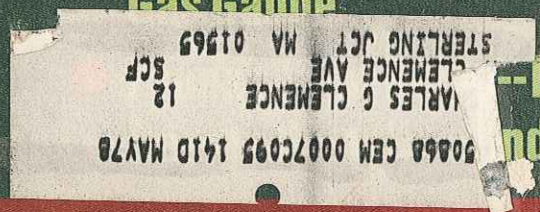
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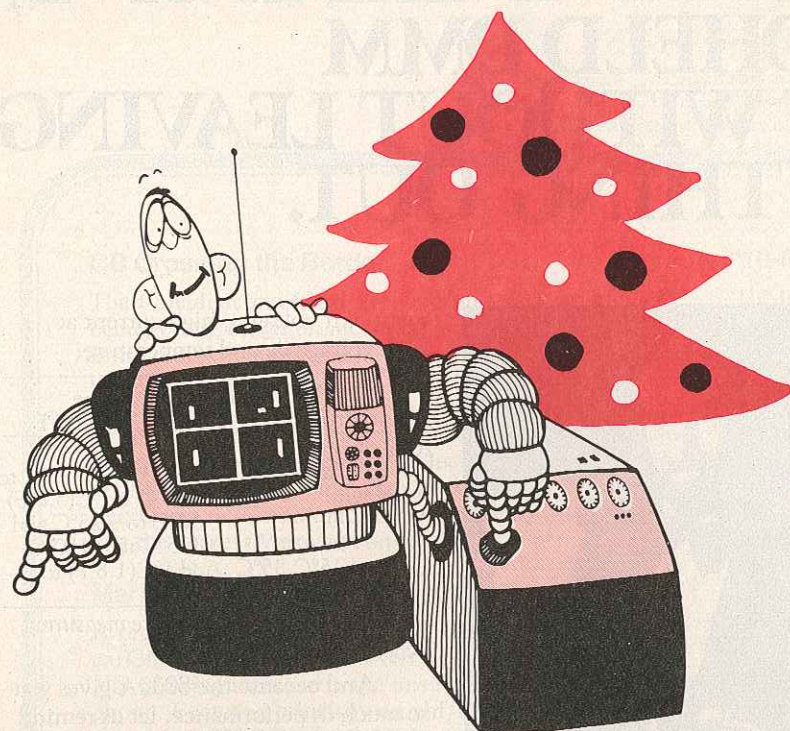
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Roundup of TV Electronic Games

National Semiconductor's Adversary

Video games are becoming almost as popular as pocket calculators, digital watches, and CB transceivers on the consumer electronics scene. In fact, suppliers don't believe they can produce enough TV games to keep retailers' shelves filled during this Christmas season of 1976.

Connected to the antenna terminals of any TV receiver, these new electronic marvels pit one player against another or against the machine in a variety of games ranging from tennis to tic-tac-toe. Some of the new video games illustrate the on-screen graphics in color.

Magnavox got the video game market rolling about four years ago with the introduction of its Odyssey® game. The original game was basically paddles and a white square that moved about on an empty TV screen. The playing field, a plastic laminate that physically attached to the face of the picture tube, gave the game boundaries, markers, and areas from which to maneuver your "man" on the screen.

It was not until fairly recently that video games began to catch on as improved versions were introduced to the market. Atari, makers of Pong®, is one company that deserves a lot of credit for popularizing the video game. Pong, a game of table tennis, added some significant improvements: electronically generated on-screen colored courts; sound effects for every hit, miss, and ricochet of the ball; and automatic on-screen digital scoring. Add to this the selling expertise of Sears, and you have a notable contender for the projected $750-million market by 1980.

There are currently some 35 companies making video games. At this writing, however, only 20 or so have had their games type approved by the FCC and are marketing games.

Tennis Anyone? Tennis (actually, table tennis) is available in all video games in one form or another. The first game of Odyssey gave player control over the ball in both horizontal and vertical positions. Pong® and the newer games give player control in only the vertical position. Competition between the new game makers has not grown out of what moves a player can make but on the games in which he can participate. The new games still include tennis, but now hockey and handball are typically available at the flip of a switch.

The new Odyssey 400 now allows you to play handball and hockey as well as tennis and includes on-screen digital scoring and sound effects. Atari's new Super Pong gives you a choice of the original Pong tennis game, two-man team tennis called Super Pong, Catch, and Solitaire. Catch is unique in that it allows you to control the position of a "hole" in the boundary on your side of the court. Solitaire is similar to a one-man handball game, but the height of the backboard wall is adjustable to make the game easy or difficult. When you play Solitaire, if you get the ball over the wall, you make a point; miss on a return bounce, however, and the machine scores.

Games designed to pit your skill against the machine are made by companies other than Atari and Magnavox. In addition to tennis and hockey, First Dimension has a clever Robot game

Magnavox's Odyssey

that has you trying to score by getting the ball into a goal that is usually blocked by a mechanized moving paddle. Coleco's handball game has provisions for only one player to bounce the ball off a wall at the far side of the screen; you can miss, losing a point, but the wall remains stationary, always returning the serve.

Unisonic gives you a choice of six games, two of which are Skeet and Targets. A white block, your target, randomly crosses the screen. You shoot at this target with an electronic gun supplied with the game. Your score of hits is automatically displayed on the TV screen after 15 rounds. Skeet and Targets are slightly different in concept than other games that merely use the TV screen as a graphic display; in these two games, the screen is an active part of the circuitry. A photocell inside the gun senses the presence (or absence if you miss) of light from the screen each time you pull the trigger and updates the score accordingly.

The Unisonic machine's sound effects are different, too. Rather than having the sound come from a speaker built into the game itself, the audio is modulated with the video and sent to the TV receiver. The sound is then reproduced by the TV receiver's speaker.

Universal Research has added a button to give hockey a realistic twist. Ordinarily, the puck can only be deflected by players on the screen as with most

other games. A special "Puck Control" switch on the Universal Research game allows each player to catch and hold the puck, passing off only when desired. This is just one of the many switches now appearing on the more complex games.

In addition to the usual player position controls, many manufacturers are incorporating other controls to add to the skill level requirements of their games. Paddle size, speed, and ball angle can all be changed, either individually or collectively, depending on the switching arrangement provided in a particular video game. Odyssey 300, for example, has one switch with Amateur, Average, and Professional skill positions. In the Amateur position, the paddle is large and the

speed and angle of the ball are mild. In Average, the paddles become smaller and the angle of deflection is increased, but the speed remains the same. In Professional, the paddles again become large, but only to keep up with the large deflection angles (40° versus 20°) and high speed (0.65 versus 1.3 seconds across the screen) of the ball while it is in play.

APF uses three separate switches to allow the player to tailor the game to the way he wishes it to be played. First Dimension allows just the speed of the ball to be changed, but each player is provided with a separate speed control, which is a bit more practical because each player can be separately handicapped. Other switches on some games permit
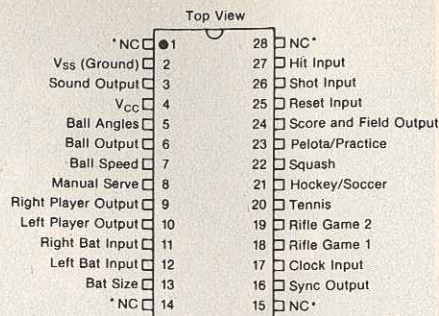

Atari's Super Pong

two or four players to participate in the game and provide automatic and manual serve selection.

The game selector switch sets up the playing field for the particular game you wish to play. While the graphics are generally set up in the same manner by each manufacturer, there are differences here, too. National Semiconductor's Adversary game, for example, allows you to play tennis on a green court, hockey on blue "ice," and handball on a brown "clay" court when used with a color TV receiver.

IC Technology Base. What has been primarily responsible for bringing video games down to practical size and price is the LSI integrated circuit technology support the industry has received. For many game manufacturers, the General Instruments dedicated n-channel MOS chip is used. (There are separate chips available for U.S. and European TV standards.) The 28-pin IC contains all the logic required for tennis, hockey, handball, and practice. With slightly more outboard logic, this chip also provides target and skeet game modes that are played with a remote electronic gun. Score update and display for all games are also on-chip generated for these IC's.

Input programming pins on the General Instruments chip permit direct non-buffered switch connections for game selection, ball speed, paddle size, and four different ball-return angles. Other inputs provide for automatic and manual ball serving after each point is scored and separate resetting.

Separate video outputs from the GI chip allow combining for a monochrome or use with a color generator for a color picture display. An audio output pin on the IC can be used to deliver a signal that can be modulated with the video signal or buffered through a one-transistor circuit to drive a loudspeaker.

The flexibility of the GI chip makes it quite attractive to video games manufacturers. Game complexity, which determines the manufacturing cost, is basically a matter of whether or not a given pin on the IC is used. All that must be added to the primary circuit are a 2-MHz clock generator, r-f modulator for TV Channel 3 or Channel 4, paddle control potentiometers, loudspeaker, and power supply. The power supply is usually a set of six C cells, which may or may not be supplied with the game.

The game Adversary is quite naturally designed around National Semiconductor's MM57100 video game and LM1889 video modulator chips. In addition to providing three selectable skill levels, Adversary allows an opponent to play against another opponent, against himself, or against the machine. A special "time-out" feature stops the play instantly, with no effect on the game. (The usual reset function returns all scores to 0 and initiates a new game.)

Texas Instruments has also gotten into the video-games market, but not with a finished product that bears its name. TI is offering six separate chips that can be combined in different arrays to create a range of video games from simple to complex. The TI chips currently being offered include: game logic with automatic random English, horizontal and vertical sync generator, game logic

Pin configuration of General Instrument's AY-3-8500 game chip.

Pin		Pin	
*NC	1	28	NC*
Vss (Ground)	2	27	Hit Input
Sound Output	3	26	Shot Input
Vcc	4	25	Reset Input
Ball Angles	5	24	Score and Field Output
Ball Output	6	23	Pelota/Practice
Ball Speed	7	22	Squash
Manual Serve	8	21	Hockey/Soccer
Right Player Output	9	20	Tennis
Left Player Output	10	19	Rifle Game 2
Right Bat Input	11	18	Rifle Game 1
Left Bat Input	12	17	Clock Input
Bat Size	13	16	Sync Output
*NC	14	15	NC*

HOME VIDEO GAMES

Brand	Model	Price	Games*	Players	Color	Remarks
APF	401	80	1,2,3,4	2,1	no	
Atari	Pong	80	1	2	yes	
	Super Pong	90	1,7,8	2,1	yes	4th game, Super Pong, is ten. dbls. (4 players)
Coleco	Telstar	60	1,2,4	2,1	no	
	Telstar Classic	70	1,2,4	2,1	no	same as above except cabinet and ac operation
Dyn	Paddle Four	70	1,2,3,4	2,1	no	
	Ralley Four	80	1,2,3,4	2,1	no	same as above except cabinet different
Enterprex	Apollo	80	1,2,3,4	2,1	no	
Entex	Tele Pong	60	1,3,4	2,1	no	H-V control on tennis. 4th game, table tennis has V-control only
Executive Games	TV	70	1,2	2	no	manual scoring
	Tennis Hockey/ Soccer	90	2	2	no	360° player movement, puck control
First Dimension	76	70	1,2,3,4	2,1	no	
	76C	80	1,2,3,4	2,1	yes	same as 76, with color
	3000 W	100	1,2,9	4,2,1	no	on-screen moving bar for score
Heath	GD-1380	50	1,2,3,4	2,1	no	Video output. Can be used only with Heath kit TV receivers
Kings Point	TG-600	60	1,2,3,4	2,1	no	
Lloyds	Lloyds	100	1–6	2,1	no	
	Monte Verde	100	1–6	2,1	no	same as above except cabinet different
Magnavox	200	70	1,2,3	2,1	no	H-V player movement. On-screen moving bar score
	300	70	1,2,3	2	no	
	400	100	1,2,3	2	yes	H-V player movement. English control.
Micro-electronics	Ricco-chet	120	1,2,3,4	2,1	yes	var. color, English
National Semiconductor	Adver-sary	100	1,2,3	2,1	yes	time-out button
Phoenix	Video Sports	80	1,2,3,4	2,1	no	
Quadtronics	Q-376	70	1,2,3,4	2,1	yes	second model, $80, same but with remote controls
Radio Shack	60-3050	70	1,2,3,4	2,1	no	
Tele-Match	4400	70	1,2,3,4	2,1	no	
	7700	90	1,2,3,4	2,1	no	same as above except cabinet
Unisonic	2000	120	1–6	2,1	no	
Universal Research	Video Action III	120	1,2,9	2,1	yes	

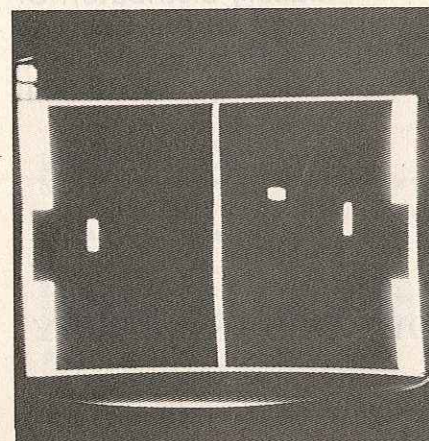*1–tennis, 2–hockey, 3–handball, 4–practice, 5–targets, 6–skeet, 7–solitaire, 8–catch, 9–robot.

with manual English, wall and ball generator, character generator, and digital scorekeeping IC's. TI plans to supplement this lineup with other chips in the near future.

In spite of the wide acceptance of dedicated video-game IC's, Fairchild's new game (not available at this time) may set the trend for all video games for the future. Built around the F8 microprocessor and four random-access memory (RAM) chips, the Fairchild game is unique because it can be externally programmed with a special "Videocart" and a keyboard on the player console. Similar to a cassette tape, the Videocart reprograms the system for a new selection of games other than the system's resident tennis and hockey games. You simply consult the jacket of the Videocart for the particular game you would like to play and use the keyboard to punch in the game number. Skill levels and even time limits can be added at the console.

Fairchild intends to market the Videocarts for about $20 each. The first cartridge contains programming for a tic-tac-toe game, shooting gallery, and a doodle game that allows you to draw in color on your TV receiver's screen. Fairchild expects a total of 17 games to be available by Christmas.

As a point of interest, the use of a computer-based video-game system, which is the idea behind the Fairchild game, opens possibilities for using your TV receiver as a serious tool for learning and storing information. One Videocart might contain a question-and-answer quiz for students, while another might be programmed with a host of cooking recipes. The possibilities of such a system are limited only by the imagination of the user. Greg Reyes, Vice President and General Manager of Fairchild's Consumer Group, sees it as "opening up a flexible capability for future TV-based applications."
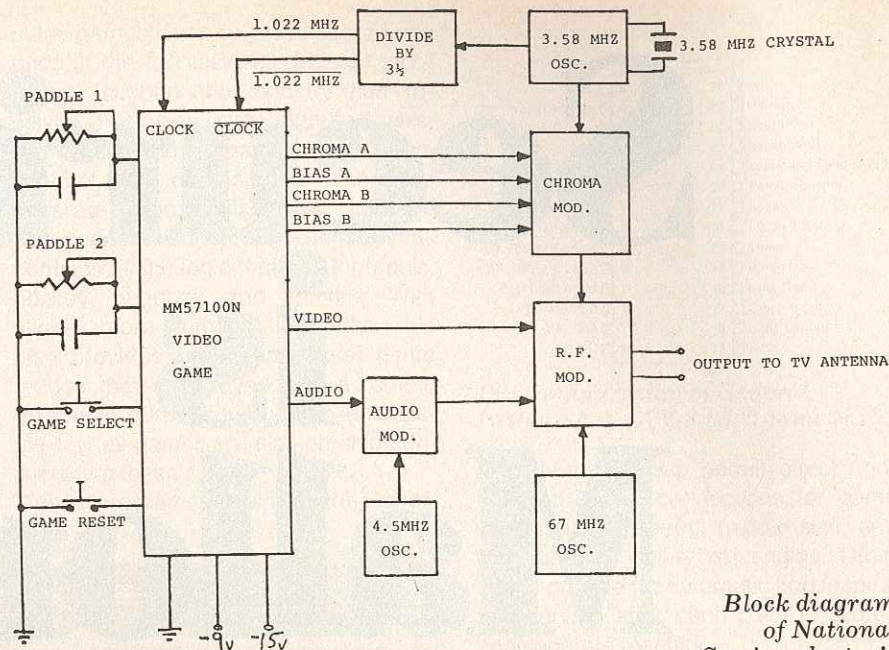
Block diagram of National Semiconductor's Adversary game.

Hooking It Up. Since all video games contain their own modulator for the video (and sometimes the audio) signal, they simply connect to your TV receiver via its vhf antenna input terminals. Each game manufacturer supplies a small r-f switching box that accepts an input from the game console and another from an external standard TV antenna. Once the system is hooked up, you can select either the TV or the GAME position of the switch as desired. A second switch, which is usually buried inside the game console, allows selection of the modulator frequency for either Channel 3 or Channel 4.

Ironically, the simplest section of the video game's circuitry has been the cause of a great deal of trouble for the game manufacturers. Since video games are r-f generating devices, they must meet the requirements of Part 15 of the FCC's Rules and Regulations. There must be a minimum of 60 dB of isolation between the video game and TV antenna to keep the game signal from exceeding the 15-µV/m limit of radiation from the antenna set by the FCC. Unless the TV/GAME selector switch can provide the necessary 60-dB minimum isolation, the game will not receive FCC type acceptance.

There is an alternative to the r-f problem that eliminates the need for a modulator—direct video access to the TV receiver with which the game is to be used. Unfortunately, there are not many TV receivers around that provide this access. Magnavox, however, plans to offer a 1977 TV receiver with a built-in video game. The game will feed directly into the video amplifier section of the receiver, bypassing the r-f and i-f sections of the receiver. Once the trend gets started, TV receivers of the future are likely to have video input jacks as standard equipment. Such jacks will not only accommodate video games, but they will also accommodate video tape recorders and video discs. ◇

Hockey game on a TV screen. Courtesy First Dimension.

Fairchild's new game (not available at time of writing) is built around the F8 MPU and four RAM's.

BY ROBERT COLMAN
AND TOSHIAKI OKAWA

Decodes SQ and QS or provides surround sound or concert hall enhancement to stereo.

BUILD A

Universal 4-Channel Matrix Decoder

FOUR-CHANNEL sound can produce a new, welcome audio dimension, approaching a live performance ambience. Although it has not yet captured the consumer's fancy in the manner that stereo did (for reasons such as higher cost, multiple quadraphonic systems, and poor separation with earlier systems), it is slowly but surely moving into the marketplace.

With more and more matrix 4-channel FM broadcasts available around the country and lots of matrix-type records that use standard stereo cartridges, quadraphonic sound promises to grow in importance over the years.

The universal decoder presented here features the advanced QS vario-matrix approach used by Sansui, and will operate with SQ (producing the equivalent of "half logic" SQ) and other matrix-encoded media. Additionally it can synthesize four channels from existing two-channel sources, yielding a choice of simulated quadraphonic sound or "Surround Sound," each with 20-dB separation. A complete kit is available for $75 plus $12 for an attractive case. As illustrated in Fig. 1, the circuit employs only four unique IC's and a handful of transistors.

Circuit Operation. Essentially, the QS vario-matrix analyzes where the reproduced sources are coming from, and adjusts the matrix parameters to cancel out the inter-channel leakages that are normally present in simple matrix decoding. This approach is in contrast with the gain-riding logic that attempts to alter the gain of the four channels to reduce the undesired inter-channel crosstalk.

As shown in Fig. 1, the two-channel audio enters the system via the LT (left) and RT (right) input jacks. After a stage of gain (Q01-Q02), the signal splits into two paths.

One pair of signals (marked A and B in Fig. 1) is used to drive the two phase discriminator IC's (HA 1327) that use the phase and level signals between the L_{total} and R_{total} encoded signals to detect the location of the predominant signal. The outputs of these two IC's then become four control signals—right, left,