

RETRO

Studio

The RCA Studio II, an obscure Seventies console long glossed over in the annals of video game history, gets an exclusive origin story by Retro Gamer's Marty Goldberg that you certainly will not want to miss



II

The RCA Studio II has to be one of the more unique and interesting consoles for us to write about. Not just because it was only on the US market for about a year, sandwiched in between the Fairchild Channel F

and Atari Video Computer System, but because of the new found respect for this console that tracking down its origin history provided us, a history that has never been presented before, until now.

The origins of the Studio II present themselves in a time in history when there was a movement in the electronics industry towards pursuing the next big thing in computer technology. We're talking about the idea of shrinking the CPU of large mainframe and minicomputers down to a small IC chip called a microprocessor. It was being done out of the desire to pursue the next generation of computer driven devices for the consumer market, which included the march towards microcomputers. While it sounds like common sense, the notion of being able to shrink computers down to a size for the classroom, or even for the home, was revolutionary at the time.

Electronic component companies like Intel and Fairchild Semiconductor had started research in the late Sixties and were soon joined by the large consumer electronics companies that had research divisions such as RCA. RCA itself had been releasing mainframe computers since entering the field under the direction of RCA general manager, David Sarnoff, in the late Fifties. Becoming one of the 'big eight' manufacturers of computers during the Sixties, it was only natural that it joined in the electronics arms race for the miniaturization of the computer. RCA's high tech charge into the field was lead by Joseph Weisbecker.

Joseph Weisbecker had obtained his Bachelor Of Science in Electrical Engineering from Drexel University in 1956. Joseph was interested in computer technology for educational use from the beginning, designing things such as a *Tic-Tac-Toe* computer out of relays and several grade school educational aids using lights and switches. In 1956 he found himself in an internship with RCA installing its first commercial computer, the RCA BIZMAC (a large \$4 million computer composed of 25,000 vacuum tubes). Upon graduation he joined RCA and became a member ▶





INTERVIEW WITH *Forrest* *MacGregor*

We take a closer look at the creation of the RCA Studio II

How did you get involved at RCA?

In 1976, I graduated from Appalachian State University in Boone, NC with a degree in Industrial Arts and Computer Science. I had made a special study of microcontrollers, which were just emerging. As luck would have it, I applied at RCA Distributor and Special Products Division in Swannanoa, NC, and they were excited to find someone with formal training in micros. First job out of college for me, they promised that they would employ me in a videogame project, but it wasn't quite ready to start so for several months.

How was production done at RCA, considering it was the first videogame system it had created?

It was made on a human intensive assembly line of 125 or so mostly women. Chips were hand inserted, as were discrete components. Everything was wave soldered except a few wires. Board cleaning was in an ultrasonic degreaser using Freon TF. (I have a good memory.) Production rates were 1000 units a day on a single shift. Three or four adjustment/troubleshoot stations were in the line for rough testing of the RF components. We had a small cartridge with a test program for the console that put different patterns on the screen, tested the keys, beeper, expansion slot.

Considering its brief production, what were some of the signs on your side that the Studio II wasn't doing well and how did production wind down?

Units piled up in the warehouse and never did sell briskly. Competitive product from Fairchild and Atari were color, high resolution, sound-via-TV stuff with joysticks, so the monochrome block displays and keypad-only UI were outclassed from day 1. After 6-8 months, units were made available to employees at a discount. Eventually, RCA saw the writing on the wall, abandoned software development and the Studio 3, and shut it down. Inventory was sold to Radio Shack for 10 cents on the dollar.



» RCA Studio II team from left to right: Walt Stobbe, Dave Callaghan and Bill Stonaker.

► of the small team that developed RCA's first transistorised computer, the RCA 501, which he also coded a series of test and measurement programs for. Between the 501 and being co-architect of RCA's 601 system, Joseph had been gaining the foundation and experience he would put into good use for the design of his microprocessor years later. In fact, he was becoming a person who was able to predict coming trends, such as the time when he saw the move to mini-computers in the Sixties and proposed that RCA start planning its own, spec'ing out a system incorporating a low cost dot matrix serial printer, ROM subroutine storage, and combination projector-CRT display. RCA ignored his idea, and would continue to churn out large mainframe computers for the rest of the Sixties before exiting the market in 1971.

One area of Joseph's research RCA didn't ignore, though, was his research into the future applications of Large Scale Integration (the process of fitting thousands of transistors on a single chip) during the early Sixties, which was a time when the idea of integrated circuits was still very new, and the industry was still struggling to fit hundred of transistors on a single chip. It lead to him being a consultant on future products for RCA for much of the rest of the Sixties, besides designing unique I/O and storage systems for RCA's mainframe computers.

FRED (Flexible Recreational And Educational Device) is really what became the genesis of the RCA Studio II. Conceived in 1970 as a full microcomputer system based around a custom of the to be created microprocessor, encompassing all of Joseph's advanced LSI research, its first incarnation was the System 00 built in 1971. FRED/System 00 called for the FRED microprocessor, (8-bit single chip) along with 64K of RAM (DMA access), a cassette tape based storage system, a gravity card reader, small keyboard for input, and a standard TV set as a display for the output. As Joseph wrote in a 1972 memo, "FRED is an exciting new consumer product possibility. For the first time, a full power electronic

computer could be available at the price of a Hi-Fi system or color TV. Every home and classroom is a potential customer."

Joseph had a TTL (transistor-transistor logic, the same technology early video arcade games were based off of) based prototype of the microprocessor completed in 1971. Formally designated the COSMAC microprocessor in 1972, the full FRED prototype was completed that year, and its unique reduced instruction set architecture is considered the grandfather of today's RISC based microprocessors. Small changes include FRED's keyboard being realised as small 16-position keyboard, and a low-resolution black and white dot matrix TV display system that was chosen for both flexibility and low cost.

Work on software began that very year, too. Joseph's own vision for the software was for a complete computer suite including "a collection of programs that will demonstrate the power of [its] hardware in entertainment, education, and utility applications. Games, stimulants of artistic flair, simple drill-type learning programs, and calculator functions are included."

As 1973 rolled around, the tech world around Joseph seemed to be changing, and he seemed to find himself in direct odds with it at times. Joseph's vision was to make computer power available for the masses by making it affordable. It was a vision not unlike the one Jack Tramiel would summarize over a decade later as, "computers for the masses not the classes." The problem was, the microprocessor 'arms race' had now begun and everyone was chasing more and more powerful chips against making microprocessors for a lower cost.

As Jack summarized in a later internal article at RCA, "There is no shortage of ideas for using computers, but there are no computers with a mass-market price tag. For widespread home and school use, the price of a free-standing, self-contained computer system should be well under \$500. This is the price level for colour TVs, quality audio systems, home-study courses, air hockey games, pool tables, one-week vacations, cheap electronic organs, and encyclopedias." He further illustrated, "Unfortunately, old habits are hard to break and we can also expect to see increased emphasis on [microprocessor] performance instead of cost."

The first fabrications of the low cost COSMAC had been completed towards the end of 1972 in a





» We quite like the design of the RCA Studio II, even if it does look like some hi-tech telephone.

2-chip format that Joseph spent 1973 integrating into FRED as FRED2. Joseph and RCA set up a field test program with Random House, the New York based children's publisher and RCA subsidiary who at that time were the gold standard in elementary schools. Random House helped define the creation of programs for reading and mathematics, and the entire process lead to the creation of the RCA Microtutor (a stripped down version of the \$300 COSMAC based tutorial computer for learning the principles of microprocessors) the following year. In fact, most

IT'S NEW!! FROM RCA

INTRODUCING THE ADD-ON CARTRIDGE VIDEOGAME THAT KEEPS THE FUN COMING.

STUDIO II FROM RCA

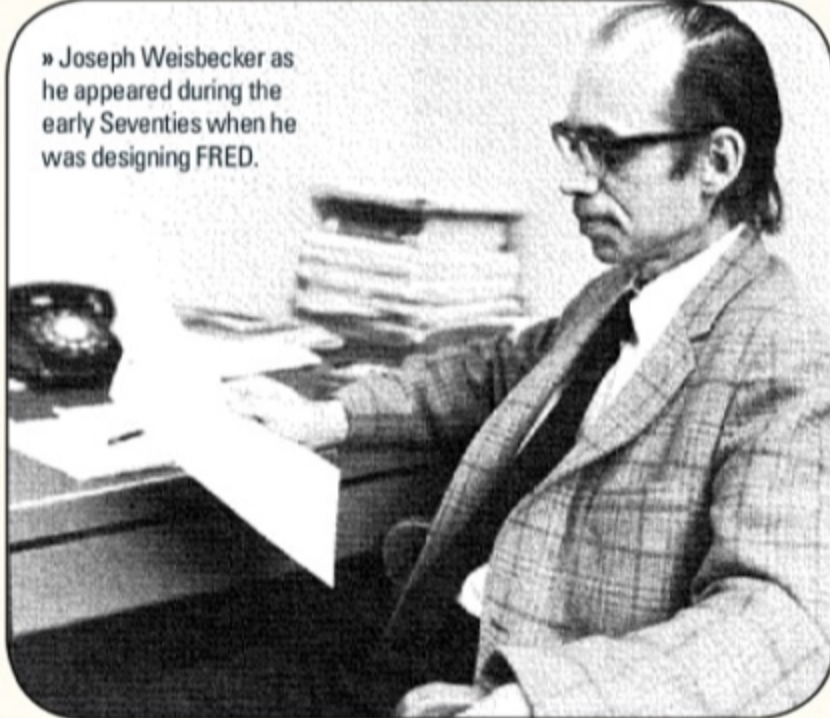
Only at these RCA dealers:

- Derby Electric
- Darraf's TV
- WATSON
- WATSON Radio & TV
- TAUSICK-KAUFFMAN
- MULTI-MEDIA
- Western Auto
- WALSH
- Makin TV
- WATSON
- Ferguson-Gagnon

RCA STUDIO II

GAMES, GAMES, GAMES

- TV GREETING CARD
- ELECTRONIC 'ETCH A SKETCH'
- AUDIO-VISUAL DEMONSTRATOR
- TV ARITHMETIC DRILL
- WORD SPELLING DRILL
- WORD RECOGNITION TEST
- NUMBER BASE CONVERSION DRILL
- LOGICAL DEDUCTION TEST (21 QUESTIONS)
- NUMBER BASE CONVERSION DRILL
- TIC TAC TOE
- HEXAPAWN
- SLIDING BLOCK PUZZLES
- STATE CHANGE GAMES/ PUZZLES
- BOWLING
- MINIKRIEG
- TARGET SHOOT (OPTIONAL GUN)
- RACING
- ONE-ARMED BANDIT
- NETWORK GAMES
- TWENTY-ONE
- CELL MATCHING GAMES
- MAZE TRACING (INVISIBLE CHANGING)
- RACE GAMES (AGAINST TIME)
- SPACE WAR
- NIM GAMES
- LIFE



» Joseph Weisbecker as he appeared during the early Seventies when he was designing FRED.

With the increased popularity of arcade videogames, RCA wanted to consider entering into this market too. RCA had been flirting with the medium ever since it been approached in 1969 by Sanders Associates and Ralph Baer in order to license the technology around Baer's Brown Box prototype to create a videogame console. Contracts were drafted and upon their completion in March 1970, Sanders decided to walk away from the deal, with Ralph later saying that the deal had been too onerous. One of the RCA team members left to become VP of Marketing for Magnavox, scoring the console for Magnavox and its historical 1972 release.

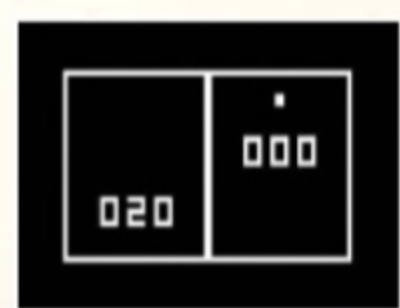
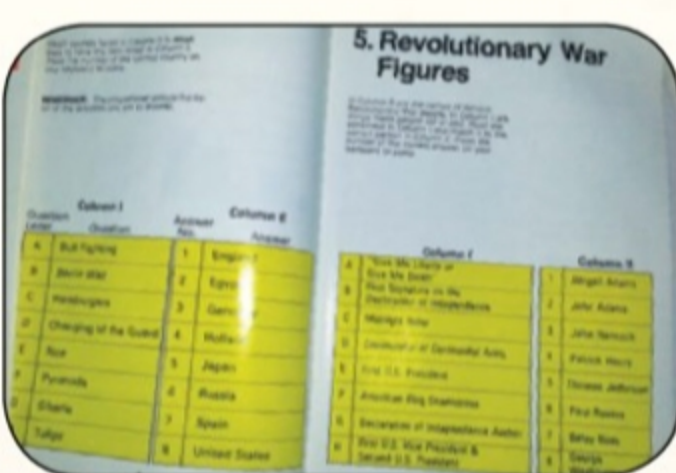
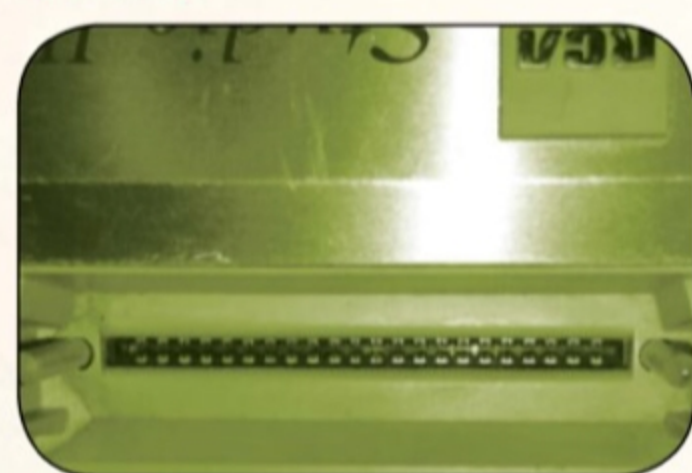
Towards the end of 1974, RCA now wanted to see about leveraging FRED for coin hardware. There was one minor change, however, the games would be in removable ROM packs. The prototype would be completed in 1975 and moved to testing at several malls in the New Jersey area. Ultimately RCA decided not to get into the coin-op business or license it, but had it been released it would have provided switchable games almost a full six years before the Japanese DECO cassette based system was unveiled. The one positive thing to come out of those tests,

“Towards the end of 1974, RCA now wanted to see about leveraging FRED for coin hardware”

RCA becomes aware of the lucrative coin-op market

of the games and 'edutainment' software later available to the RCA Studio II were actually written during the 1973-1974 period. As Joseph noted at the time, "there has been no problem in motivating people to write game programs." At a time when home games consisted of basic Pong style play that needed two players, the games being designed for FRED2 such as Tic-Tac-Toe, Hexapawn, Twenty-one, and Space War were able to use the computer as the opponent with a rudimentary, yet adaptable AI. "The computer learns to play perfectly only after a number of games have been played," stated Joseph in 1974. The entire offerings of games, had they been released as a commercial product at that time or the following year, would have placed a home entertainment product on the market that was miles above the Magnavox Odyssey and the forthcoming onslaught of Pong derivative consoles. Joseph and P.K. Baltzer coded most of these titles, and even Joseph's daughter, Joyce, joined in to help with her father's work.

» Like many early systems, the RCA Studio II used cartridges for playing its games library.





» Joyce Weisbecker and her sister operating the FRED2 computer. Joyce would also develop some of the early games.

▶ however, was that it became obvious that the FRED technology combined with the new removable ROM technology could be scaled for a programmable home game console. During the second half of 1975, several prototype FRED-based consoles were built into attaché cases for demonstration and field testing. It did well enough that a console project is formally proposed to RCA's Engineering/Distributor and Special Products Division (D&SPD) to create a console with a planned targeted release in 1976.

The Studio II officially started development in January 1976, with the mandate of taking the modified FRED design and creating an actual product out of it. The vision for the console still aligned with Joseph's

original goals by bringing a programmable computer into the people's homes for a low cost. The team consisted of a talented and dedicated set of RCA engineers including Dave Callaghan, manager of engineering and responsible for all product development at D&SPD, including the Studio II, Bill Stonaker, who was responsible for the Studio II's digital circuit design, and Walt Stobbe, who was responsible for the Studio II's unique RF/power box.

The Studio II's design was timed just right to take advantage of the newly released single chip version of the COSMAC, the 1802, further lowering the cost

of the console. Ultimately, RCA divided its product into three areas needed for any console of the time: the main unit, the switch box and the power supply. A problem with most of the *Pong* consoles at the time was that the controls were directly on the console or in the vicinity of it. This meant either sitting up close to the television or leave a trail of chords (for power and RF) from behind the system to wherever the players were sitting.

The team came up with a unique method for cutting down on cables by having a single power/RF cable go from the console to the switchbox connected behind the TV. The power supply is in turn plugged into the this RF switch box, and the entire system is turned on by sliding the TV output selector on the switchbox. The unique setup would also be leveraged about five years later for Atari's 5200 system which also didn't find success.

The Studio II was designed with keypads for input, which were in turn developed specifically by RCA's Deptford mechanical engineering group and purposely arranged in a touch tone telephone format for familiarity. Why keypads? In keeping with the unique keyboard input of the FRED, and already created program base, the team needed to support both gameplay and numerical/character input. That planned usage is also why the Studio II was billed as the Home TV Programmer on its release. Rather than create a multitude of controls, RCA felt the built-in keypads would provide a quick plug and play setup, low cost, and stand up to the pressures of the high excitement gameplay situations we have come to experience.

The FREDs display circuitry and DMA memory circuitry were productized as the RCA CDP-1861 video display generator, a custom IC that provides the Studio II with a black and white 32 x 64 dot display matrix. And while the FRED used audio tape in its cassette player for sounds, the Studio II uses a 555 timer-oscillator circuit for generating its 'beep' sounds (which can also be shut off on the unit). Finally, five built in games were added: *Addition*, *Bowling*, *Doodle*, *Freeway*, and *Patterns*.

Completed by Fall 1976, the console went into manufacturing for a January 1977 limited release which was followed by a larger national release. With a list cost of \$149.95 and cartridges at \$14.95 each, it truly represented an affordable way for the consumer to enter into programmable consoles.



» An impressive closeup of the COSMAC Microtutor main unit. The main processing parts are on removable cards that dock in the empty slots shown.



» The COSMAC Microtutor kit, the first FRED-based product to reach the general public. Tested in schools by Random House, a 100 total were eventually produced.



FROM THE ASHES

The technology behind the cancelled full-color RCA Studio III was licensed by RCA to several manufacturers around the globe who built their own version of the console much like 3DO would be marketed from its beginnings almost two decades later. Released in 1978 -1979, these versions include:

TOSHIBA VISICOM COM-100

■ Released in Japan, the Visicom includes a more computer like look and detachable joysticks. It also uses a different cartridge format than the other clones around at the time, and as such, it has its own series of games.



MUSTANG 9016 TELESPIEL COMPUTER

■ Released in Germany, this clone more directly resembles the Studio II in terms of visuals.

HANIMEX MPT-02 JEU TV

■ The French version of the console. The keypads are actually removable in this version of the system to allow easy holding in the hands. Hanimex also released several other programmable consoles in the MPT series.





“After a disappointing Christmas, RCA announced in the spring of 1978 it was cancelling the Studio II”

RCA's dream was sadly short-lived

use in Europe, Australia and Japan. Joseph's dream of low cost, affordable computing still lived on in the 1976 released COSMAC ELF, and 1977 released COSMAC VIP, and his work on FRED and its other variants would win several awards including the David Sarnoff Outstanding Achievement Award. Unfortunately, the RCA Studio II would sadly reach no such heights. The unfortunate console drifted off into relative obscurity it became an interesting footnote in video game history. The RCA Studio II was the only console of the period to start its life as a personal computer and then be scaled down to a console against the promise of upgrading to a full computer that the other late Seventies manufacturers were chasing at that point in time. *

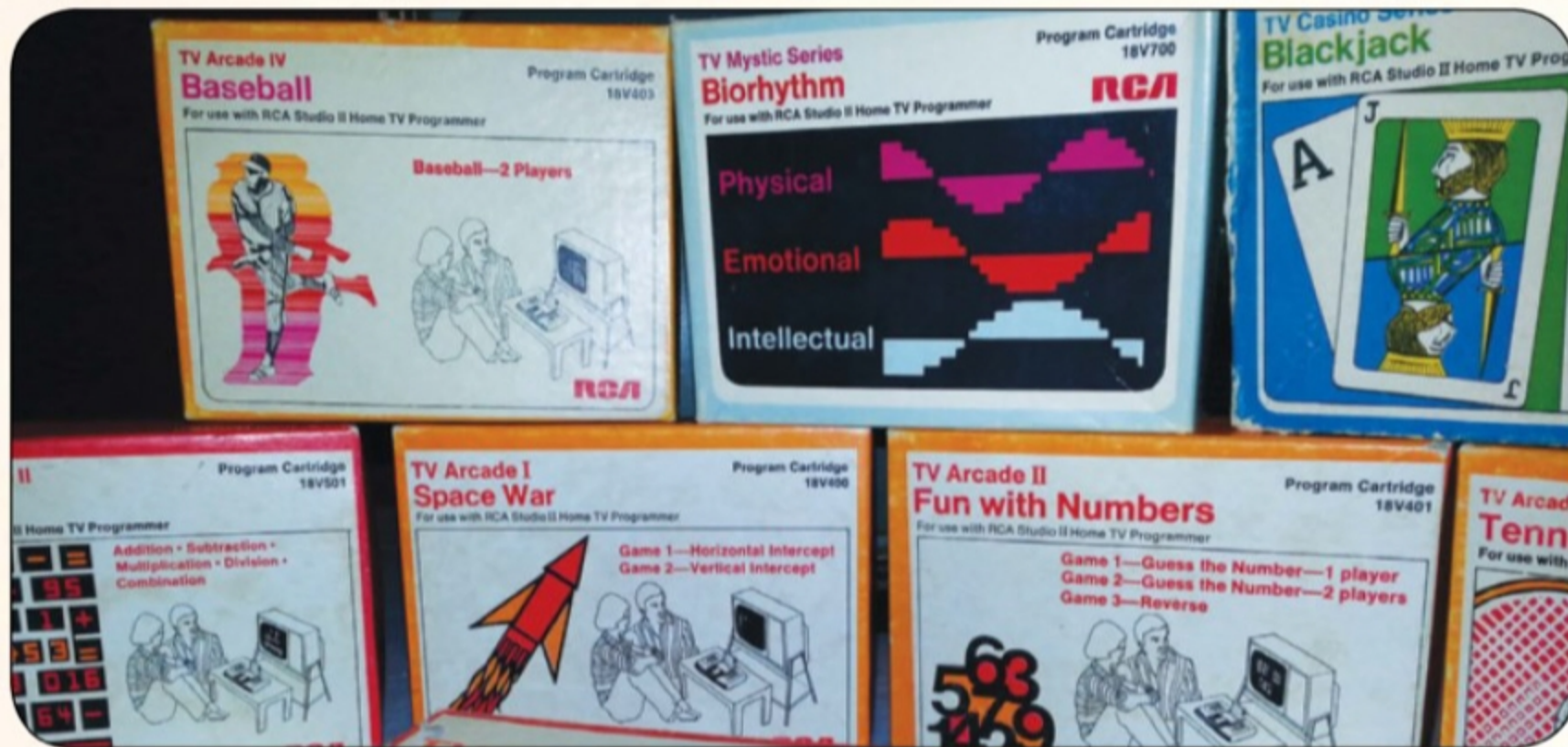
* There are a number of multiplayer games available, but the playing area can make things feel crowded.

RCA was proud of its new console, trumpeting in late 1976 that the RCA Studio II “should offer the consumer a clear advantage over the subtle variations on the ‘ball going back and forth’ type of game that has been

available for the past year or so.” That wasn’t exactly the case. You see, the problem was that it took so long for Joseph’s technology to get to market that the console became sandwiched between the release of the two consoles that had essentially leapfrogged it in terms of technology: the Fairchild Channel F and the Atari Video Computer System.

After a disappointing Christmas, RCA announced in the spring of 1978 that it was cancelling the RCA Studio II. Work had immediately started on a full color version called the RCA Studio III which also included Joseph’s new Chip 8 programming language, but the RCA Studio II’s cancellation also put an end to this. However, the technology was licensed for

» The RCA Studio II catered for two sides of the market, offering fun games and educational ones.



SHEEN 1200 MICROPROCESSOR PROGRAMMABLE TV GAME

■ Also for the Australian market, this clone is basically the same as the Mustang.

SOUNDIC MPT-02 VICTORY

■ Similar to the Hanimex model, the main difference is that it can use detachable joysticks similar to the type built into the Visicom.



CONIC M-1200 COLOUR

■ Produced for the European market by Conic, who released a series of pong consoles during the late 1970s. It again is derivative of the Mustang and Sheen versions.