CONSUMER SOFTWARE SERVICES VIA CABLE TELEVISION SYSTEMS

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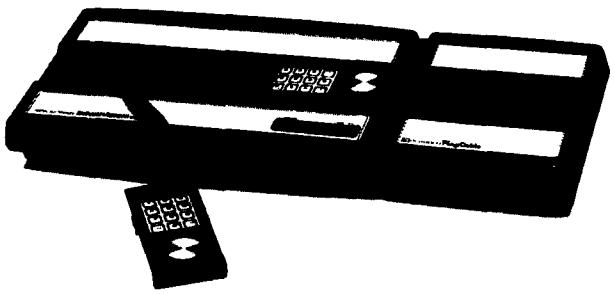
Application of digital integrated circuit technology to consumer products is increasing at an explosive rate. The wide selection and phenomenal demand for electronically based entertainment devices indicates the beginning of the long awaited "Home Computer Revolution" is at hand. The General Instrument, Jerrold Division's PlayCable™ system addresses this new market segment with a unique offering of advanced home video services with capabilities eclipsing the European Teletext/ Antiope services. Specifically, the PlayCable subscriber video terminal system will be demonstrated to efficiently provide a large variety of entertainment, education and information services, and will provide the subscriber with a useful software service. Technical details of the PlayCable CATV data transmission system are presented, highlighted by a headend computer system which will be the basis for a host of future CATV data services. The unique time/frequency division multiplexing scheme employed to transmit the service will be shown to be spectrally efficient and frequency agile.

INTRODUCTION

Microprocessor and digital electronic circuitry emerged as a revolutionary force in the consumer products industry in the 1970's. From calculators to watches, digital circuitry replaced traditional techniques for accomplishing mechanical or analog functions with increased reliability and lower costs. Additionally, digital techniques are proven to provide features undreamed of at little or no extra cost in the product. Today as we enter the 1980's, this same technology is poised to address the telecommunications and CATV industry in the entertainment field. Complimenting the explosive growth in premium pay programming which resulted from the launching of SATCOM I, such services as Teletext, ViewData, and PlayCable are emerging as potential service offerings for the CATV industry.

In the early 1970's a new form of video entertainment was developed...the TV video game. Primitive by today's standards, these devices permitted the consumer to interact with the display on his TV set. Dedicated to one or two display formats for interaction, the consumer quickly tired of the capabilities of these machines and put them aside. To answer the deficiencies of the dedicated video games, programmable home computer systems were introduced in the mid-1970's. Based on microcomputers, these systems provided consumers with the flexibility of changing format, game rules, colors, etc. This was accomplished by simply inserting a new program cartridge into the game system; video resolution and sound effects were increased to give added appeal.



Intellivision PlayCable Adapter

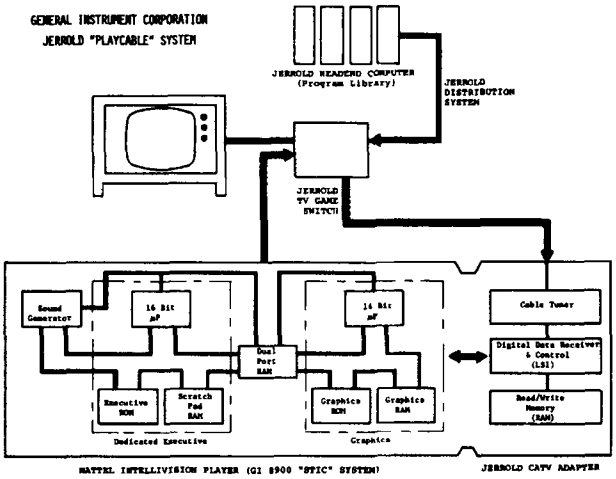
Today, a new generation of digitally based home video system is being introduced through PlayCable. PlayCable is the trademark for a computer in the home service. Utilizing any one or two-way CATV system, digital software is transmitted to a sophisticated home video terminal. A CATV subscriber has access to a wide variety of digital software programs. Such offerings as NFL Football, Major League Baseball, and even Speed Reading or Income Tax Calculations may be processed. The subscriber never again needs to purchase cartridges or tapes containing the software programming to operate his Intellivision Master Component. In addition to games and educational program offerings, PlayCable can provide information services that would be provided by Teletext systems.

THE PLAYCABLE SYSTEM

The system consists of three major building blocks:

1. Headend computer - data modulator
2. Jerrold Adapter
3. Mattel Intellivision Master Component

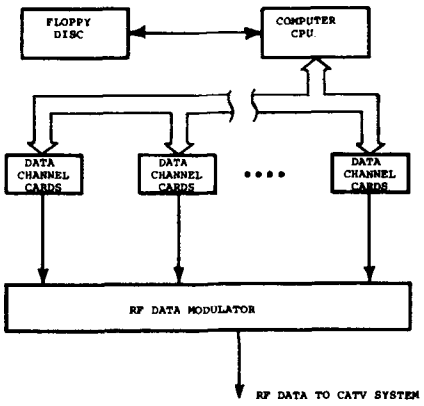
The heart of PlayCable is the headend computer. Based on the Digital Equipment Corporation - PDP11/03 computer - the architecture of this system utilizes the advanced concept of distributed processing for high reliability. The computer reformats the data for compatible transmission over the CATV system in a vacant portion of the spectrum. The Adapter receives the RF data, processes it, and stores it in the random access memory. Once the entire program is processed, the Mattel Intellivision Player interprets this software program and generates the appropriate video sound information for display on the subscriber's TV set.



HEADEND COMPUTER SYSTEM

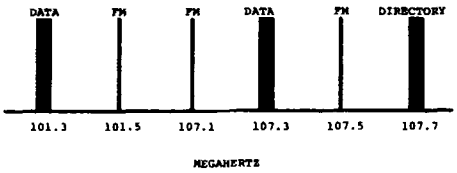
The headend computer consists of a PDP11/03 computer, floppy disc storage drive, data channel cards, and an RF data modulator. The program software offerings are received on a periodic basis in the form of a floppy disc. The floppy disc is inserted into the drive mechanism and read by the PDP11/03 CPU. The information contained on the floppy disc is interpreted and placed into a predesignated data channel card. These data channel cards contain memory for program storage and a microprocessor which formats the data in serial data streams. Each channel card is capable of providing two serial data streams to the RF data modulator.

The headend data modulator is an FSK signal generator which converts the serial data streams into a form for suitable transmission in an unused portion of the CATV spectrum. The output from the data modulator is then combined with other signals from the cable system.



Jerrold PlayCable Headend

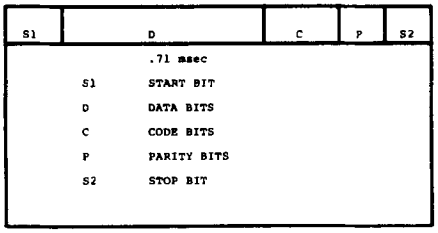
The computer is designed to be completely self operating. During instances of power outages or the introduction of new program material, the computer automatically "boot straps" itself into operation.



Frequency Division Multiplex

RF DATA STREAM

In the PlayCable system, both frequency division multiplex (FDM) and time division multiplex (TDM) data transmission techniques are used for maximum flexibility and minimum access time. Within one spectrum assigned to PlayCable, a specific frequency is dedicated as the "directory channel". The directory provides all the necessary information for the PlayCable Adapter and Intellivision Master Component to select and receive a software offering from the cable library. The data containing software program offerings may be spaced either in a continuous portion of a dedicated spectrum at 200 KHz spaces, or may be interspersed among other services such as FM channels or data channels providing services such as addressability,



Data Transmission Word Format

security, etc. Additionally, within each data channel a time division multiplex scheme is used for packing various programs. On any one data channel, multiple program offerings may be recycled on a continuous basis. Use of both FDM and TDM data transmission techniques provides an average access time from program selection to the time it is displayed on the screen, of ten seconds.

MASTER COMPONENT AND ADAPTER

The Adapter is designed to be an integral part of the Mattel Intellivision Master Component system. The unique architecture of the Intellivision system incorporates two microprocessors. One 16-bit microprocessor performs the executive supervisory system control of the Intellivision system. The second microprocessor is dedicated to interpretation of program instructions for graphics and sound display. This dual system concept provides unexcelled computational, graphics and sound capabilities.

Operation of the system is as follows:

1. Upon starting up the PlayCable terminal, the 16-bit microprocessor polls the system and interprets which peripherals are connected to the system. When the adapter is present, the 16-bit microprocessor instructs it to load the directory channel into random access memory.

2. The information contained in this memory is then interpreted by the 16-bit microprocessor and transferred to a second 14-bit microprocessor which is responsible for the generation of the visual graphics on the TV set. The system remains in a stable condition until the consumer has selected the appropriate programs from the menu.

3. The 16-bit microprocessor instructs the adapter to tune to the proper frequency associated with a particular program. Additionally, it continues to interpret incoming data until the proper program on that data channel is received.

4. The program information is loaded into the random access memory and monitored for errors. Once the entire program has been loaded into the adapter, the executive microprocessor then initiates the start of the particular program. This instructs the graphic microprocessor to display the information appropriate for that program.

The adapter is capable storing up to 80,000 bits of program information for interpretation of program control. However, the capability exists for software offerings which require more than 80,000 bits of storage. The system is capable of automatically retrieving additional information from the cable system as the need arises.

TABLE 1

DATA TRANSMISSION SPECIFICATIONS:

• Transmission Method	FDM/TDM FSK Carriers
• Maximum Data Rate	13.982 KHz
• Maximum Channel Capacity	30 channels @ 200 KHz spacing
• FSK Deviation	±75 KHz
• Signal Level	-24 dBmV (typ)
• Effective Data Rate (Alpha/numeric)	34.95 lines/sec

TABLE 2

PLAYCABLE RECEIVER/INTELLIVISION SPECIFICATIONS:

• Display Resolution:	
Alpa Numeric	20 x 12
Graphic (Pixels)	160 x 96
Colors	8 x 16
• Maximum Frequency Display	2 MHz
• Sound Capability	Digital Analog

TABLE 3

HEADEND SPECIFICATIONS:

• Minicomputer Based	PDP 11/03
• Storage Media	1 Megabyte floppy disc
• Automatic error sensing and program loading	
• Capacity	21 games plus catalog
• Access time	10 seconds average

SUMMARY

In the coming years, the digital software services to the consumer will increase in importance. The PlayCable system currently being tested in four trial systems in the United States is just a beginning. Capable of providing Teletext type service, educational offerings, games, and self-improvement courses, the PlayCable hardware offerings will expand in the coming year to a full computer in the home system. The technology and the marketing knowledge necessary for the CATV industry to pioneer these services to the consumer is being tested today on PlayCable.