COMMUNICATIONS
FORUM

"Digital Television in the Home and Workplace"

March 12, 1992

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

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Seminar Notes

Mr. Edward Horowitz, Senior Vice President, Viacom International

Mr. Robert Hubbard, Vice President, Hubbard Broadcasting, Inc.

Dr. Keith Pennington, IBM Thomas J. Watson Research Center

Prof. Andrew Lippman, Associate Director, Media Lab, MIT

Elizabeth H. Prodromou, MIT, Rapporteur

Lippman observed that people tend to think of t.v. as a low-tech industry and of computers as a high-tech industry. But Blockbuster is a fourth mechanism for using computers to get their entertainment programming into people's homes. This new technology should force people to augment their view of what happens when a computer gets into your t.v. and of what happens when visual imagery gets into your work station.

Pennington stated that we are witnessing a revolution in technologies and, as with most revolutions, people are relatively unaware of the fact that they are part of such a dramatic change. But the outcome of this technological revolution will be almost unavoidable. The revolution is that of getting visual imagery onto computers and into communications networks. Why is it a revolution? If you look at how this new technology operates, its revolutionary quality becomes clear. The visual system is the fastest, most efficient way of operating - it is a multi-dimensional power input detector and processor. Also, 50% of the brain is taken up in processing the information received from the visual channel; so, what we have is the most efficient channel backed by the most powerful processor hitherto available.

In terms of the visual channel, Pennington explained that the main message is that we see applications in virtually every area of human activity (e.g. the home, the office, manufacturing, etc.). Also, there are so many applications in all of these different areas that, even if only a few of them are ultimately implemented, we will be stretching our abilities to see them. What we need is an efficient way to see the imagery - we see this same issue as relevant if we look at earlier models.

It took a long time to start on the applications side of this sort of technology, because the initial costs were excessive. As we have proceeded with the ability to compress with time, many of these applications have become real world. While you add value in the system, you also worthwhile management of the system. We are also moving into the area of where many other applications are now becoming cost effective.

These image-based technologies will revolutionize many of the ways we do business and live our lives. Multimedia will release another new wave of creativity in the populus. There are many experts out there with hobbies, but the are not readily able to develop a program to sell to the public - the development of these low ends of applications will change the public's everyday life. Image-based applications and networks will change business opportunities now and in the future. We see that the technology is now available for U.S. corporations to start deploying and meeting many applications needs.

According to Pennington, one of the problems, however, is that in the U.S. there is more emphasis placed on the multimedia-based applications in a manner that is not consistent with a good evolutionary approach to digital images in the workplace and in the home, either for now or for the future. Pennington's maintained that, if you look at the present image situation (operational imagery), there are sizeable applications already in certain areas (e.g. binary-binary, etc.). There are enormous image applications just for storing images and databases - consider, for example, the Library of Congress databases, or those of the Smithsonian. These databases constitute enormous repositories of heavy amounts of the intellectual, cultural, and artistic capabilities of society.

In Pennington's view, the above are the applications media that we will require in order to make multimedia practical. At the moment, however, the deployment of resources in the U.S. is not efficient in terms of infrastructure. The large image interface is a critical part of this infrastructure.

At the moment, without some of the other technologies, we have the technology available to address large image data bases of still video in libraries, news gatherers, advertising agencies, and art galleries. They have enormous libraries not readily accessible, and the digital revolution will increase our ability to have access to these time sensitive materials.

Pennington explained that he avoids the use of the term "image archives" because it connotes for people the idea of information that is not easily used. Instead, he maintained, these images are of immediate use to their customers and for their businesses. We will increase the ability to develop derivative products for existing databases, by using the same information to create other products in this multimedia revolution.

One of the most important tools for multimedia people will be very rapid access to large databases for a variety of applications. Also, the infrastructure will allow a further rapid increase in

the ability to obtain and to support derivative products and networks. It will offer opportunities to the digitial network services providers. Many companies could have an image video system just for their own service - various departments linked on a fiber backbone communication line. Also, this sort of communication line will allow interaction with various vendors, and will allow many ways of configuring the systems necessary to support particular applications objectives.

Pennington remarked that he can see a scenario developing where many of the various industries for our own needs could develop derivative products that can then ultimately have access to the network and allow others to have access to the network data base for a fee. It is important for us to start getting the evolutionary strategy correct. In Pennington's view, one of the biggest obstacles will be the fact that, in the past, U.S. industry has tended not to take evolutionary strategies but, instead, has gone for the silver bullet at the expense of long-term development.

Pennington stated that his company has a vision for multimedia and that what is need is an intelligent evolutionary strategy along a continuum that allows for the construction of adequate management procedures and for the capture of those databases that will make for major business opportunities.

Question and Answer

The first questioner asked for comments on competition in the high power DBS market. He observed that DBS began as competition to cable, and asked the speakers how they envision people migrating from cable to DBS and how people will be able to afford the $700 per home price of the technology.

Hubbard explained that C-band had started out rurally, duet to its antenna size, but that C-band is no longer a rural business. Notwithstanding certain zoning limitations, C-band is now scattered throughout the country. His company's research shows that people will be willing and able to spend betwee $700 to $800 for the technology.

The next question asked what the channel line-up will be for Hubbard's 60-channel service and what the programming package will be like.

Hubbard responded that, of the 60-plus channels that will be available, his company will control approximately 25. The remainder will be controlled by Hughes. Hubbard is competing on the program side; for its 25 channels, Hubbard will offer a mix of traditional cable-type products, as well as new products.

The final question concerned pricing plans for the Hubbard programming.

Hubbard noted that the pricing would be on a subscription (as opposed to a metered) basis, and would be on-demand service. There will always be one channel which is offered for free - this will be a general entertainment or super-station type channel.

Digital: The Tide Of Change

)ver the Years, Cable Has Built a Vast Communications Infrastructure

n Large Part, the Information has Traditionally Consisted of Analog T(
iignals.

?ecently, the Cable Infrastructure has been Upgraded to Handle a Lar(
:apacity of Information.

Today, the World is Converting to Digital

)igital Telecommunications Equipment and Standards are In-Place fo
)eployment Today.

:ompeting Information Providers do not Presently Have Sufficiently /
Plant and Equipment to Provide All of the Customer's Needs.

Therefore, Through its Evolutionary Upgrade Process, the Cable Indu
Positioned to Serve the Larger Information Market.

Digital: The Tide Of Change

Summary

- Cable's Capacity is Increasing as Part of Its Natural Evolutionary Upgrade Program.

- Cable Has a Vast Network In-Place and Operating.

- Simultaneously, There are a Growing Number of Potential Non-Video and Data Services Customers.

- The Telcos, and Other Potential Competitive Service Providers, are Not Positioned to Adequately Serve ALL these Customer's Needs in the Near Term.

- Simultaneously, the Telcos are Attempting to Migrate Toward Video Services to the Home.

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Digital: The Tide Of Change
Summary (cont.)

- The Telcos' Exisiting Networks Have Serious Limitations for Delivery of Video.

- Options to Conform The Network to Video Services are Expensive and Time Consuming.

- Cable is Well Positioned to Exploit the Growing Marketplace for Non-Traditional and Non-Video Services.

- Cable Will Continue to Remain Strong in Their Traditional Area of Entertainment Services by Providing Further Service Upgrades and Improvements.

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Digital Services

Entertainment
- Basic Cable
- Premium Services
- Multiplex Channels
- Pay Per View
- HDTV
- Near Video On Demand
- Digital Audio Services
- Niche Services / Customized Programming

Interactive / Games
- Play Along Games
- Video Games
- Role Playing Games
- Virtual Reality

Digital Services

Information Services
- Electronic Yellow Pages
- Financial Data
- Sports Scores
- Airline Scheduling & Sales
- Shopping Services
- Ticket Services
- Encyclopedia / Information
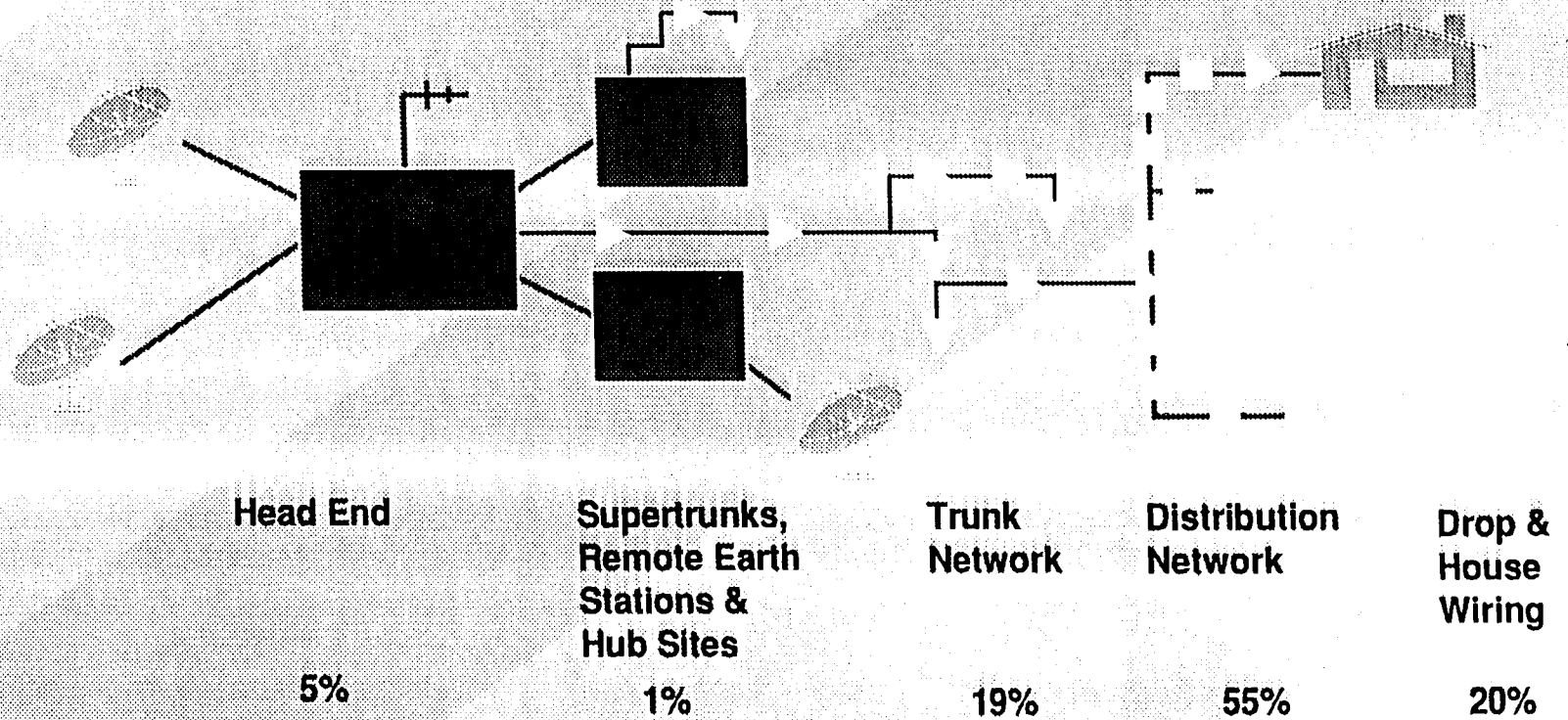- Bulletin Boards
- Personalized News

Personal Communications Networks
- Local / Long Distance Services
- Picture Phone
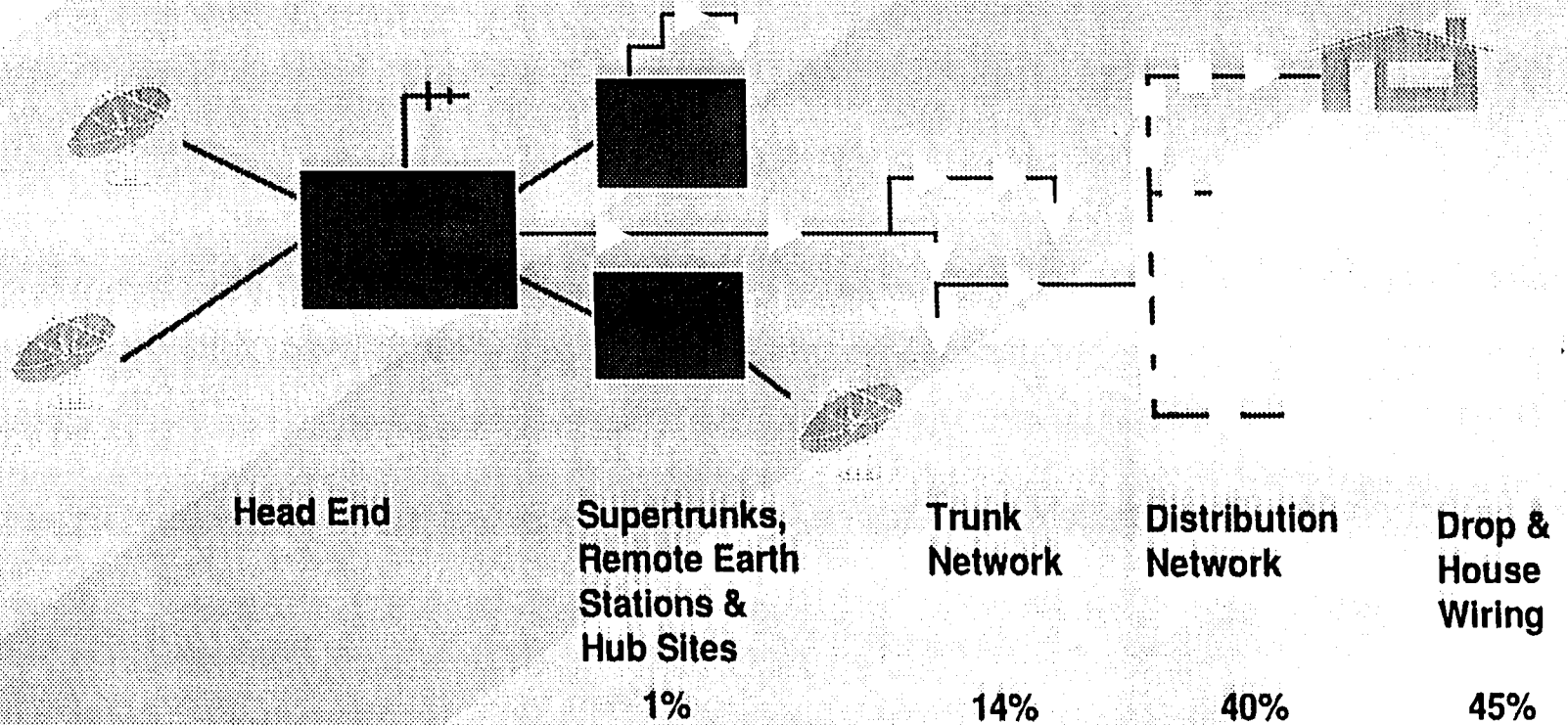- E-Mail

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Elements of Cable Television Plant

Plant Investment Percentages

Head End	Supertrunks, Remote Earth Stations & Hub Sites	Trunk Network	Distribution Network	Drop & House Wiring
5%	1%	19%	55%	20%

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Elements of Cable Television Plant

Plant Mileage Percentages

Head End	Supertrunks, Remote Earth Stations & Hub Sites	Trunk Network	Distribution Network	Drop & House Wiring
	1%	14%	40%	45%

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The Television Community Is Moving Toward Digital Standards

Digital Production / Origination

Video Tape
Audio Tape
Cameras
Computer Generated Video
Routing and Switching
HDTV Recording
Digital Effects
Picture Creation
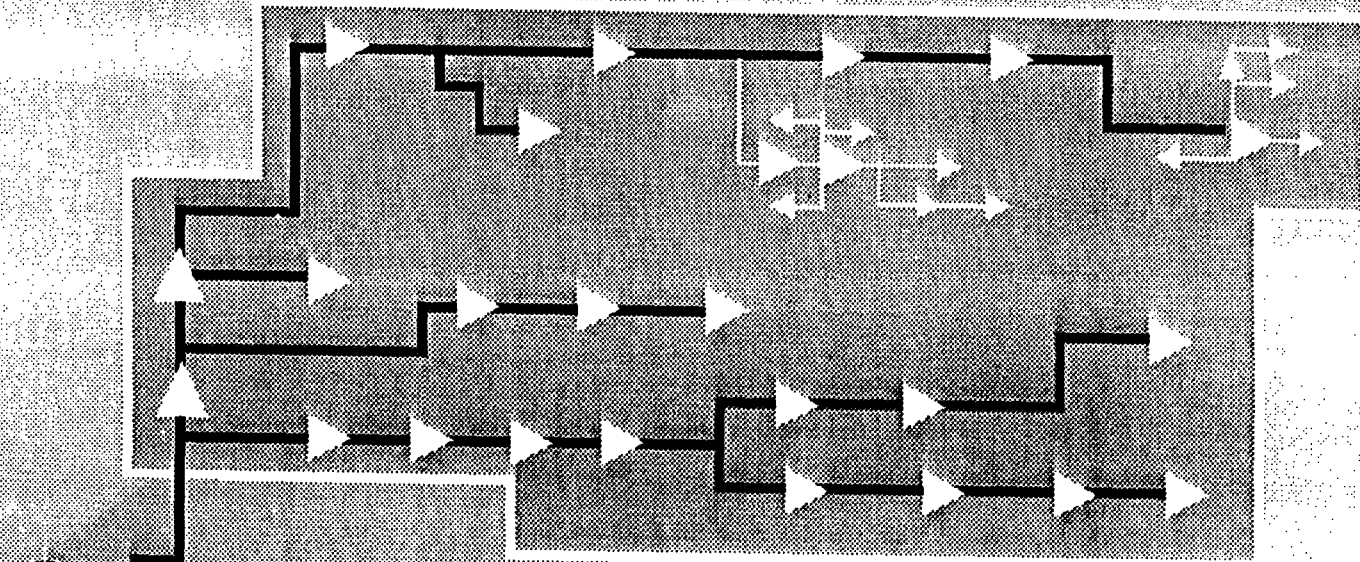Animation
Film / Telecine

Displays

Computer Based TV's and VCR's
Computer Workstations
Video Games
Interactive Services
Teletext: Stock Quotes
                    Sports Scores

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Current Network
Conventional Coaxial Plant

▷ Trunk / Bridge Amplifier   ——— Trunk Cable

▷ Line Extenders   ·········· Distribution Cable

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Phase - I
Fiber Trunk Upgrades
Network Configuratiuon

● Fiber Receive Nodes ········· Fiber Cable

▷ Trunk / Bridge Amplifier ——— Trunk Cable

▷ Line Extenders   Distribution Cable
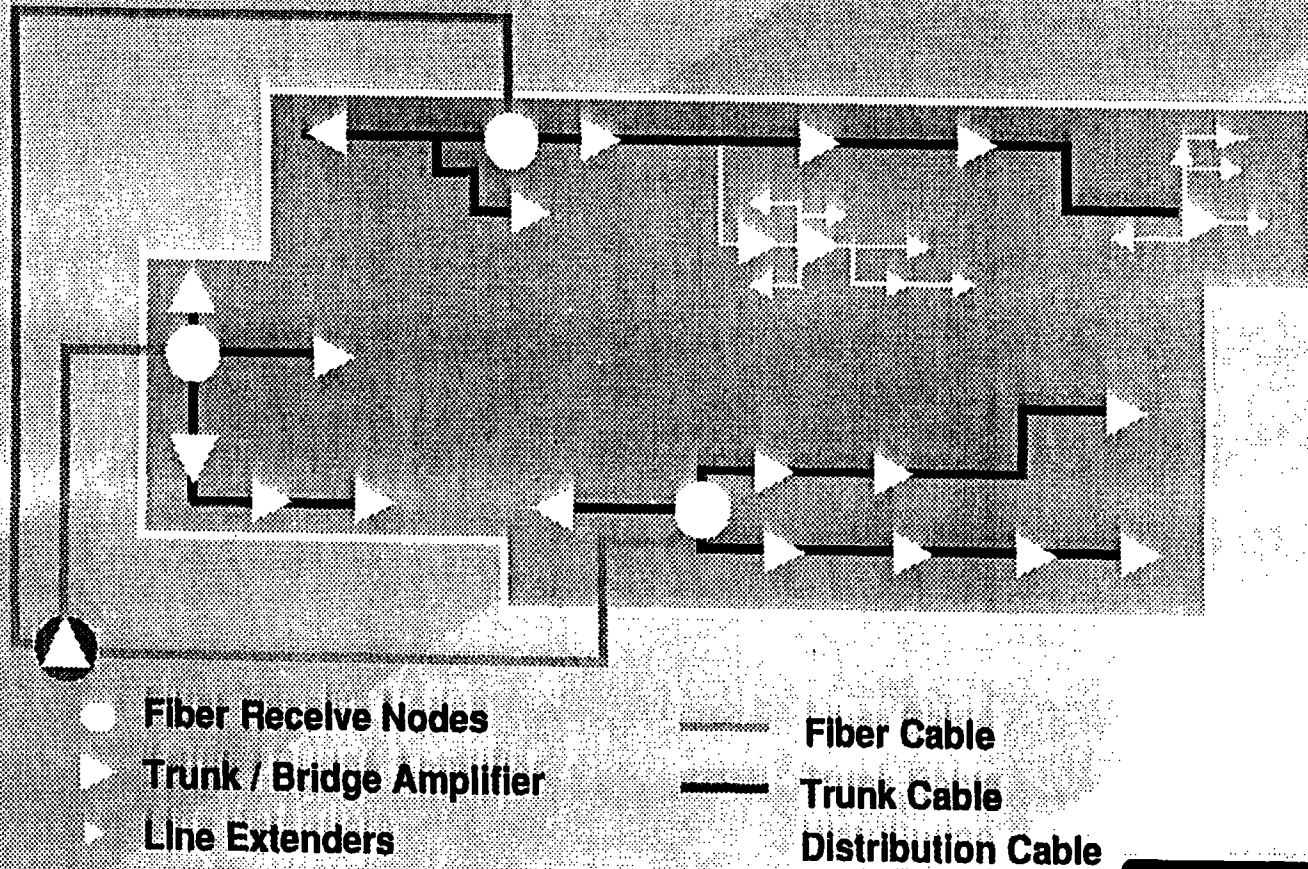
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Phase III
Fiber Trunk, Extended Bandwidth Systems
Network Configuration

PCN Cells

● Optical Receiver   —————— Fiber

▷ Distribution Amplifier   —————— Coaxial Feeder
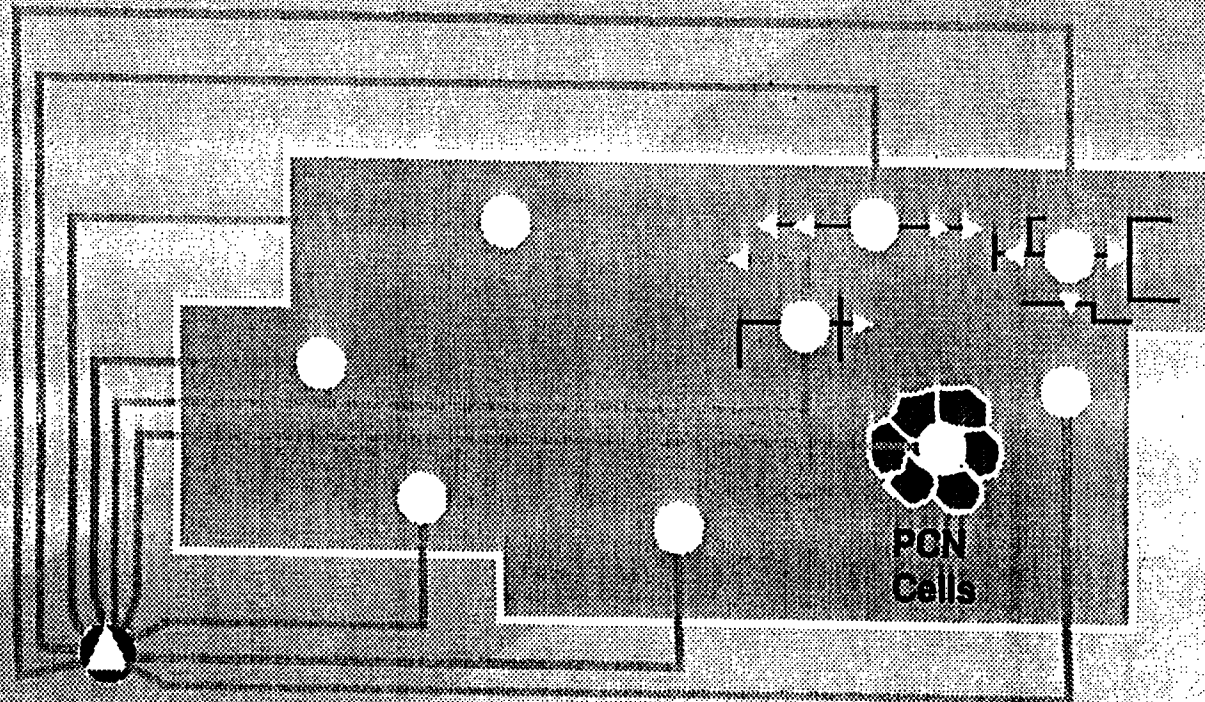
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Phase II
Fiber Trunk 2-Way System
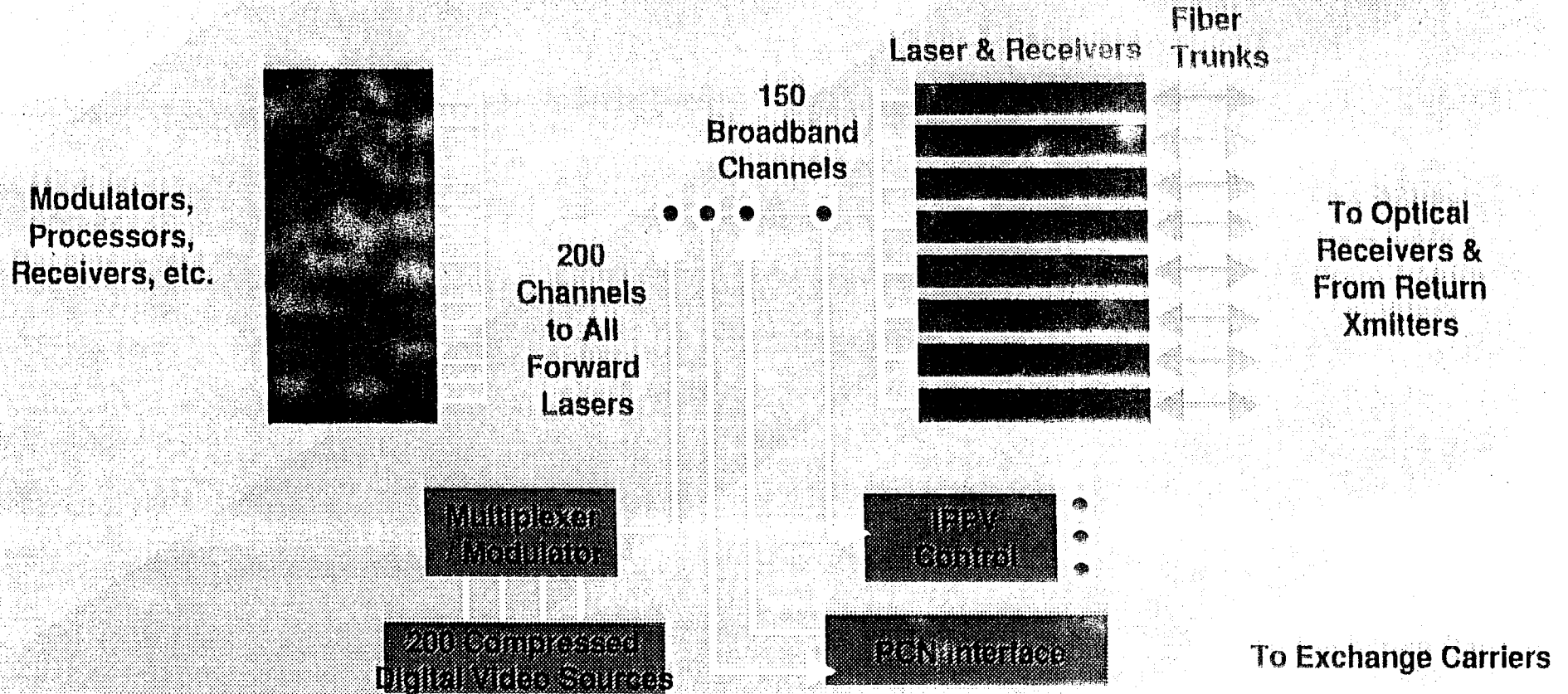## Network Configuration

PCN
Cells
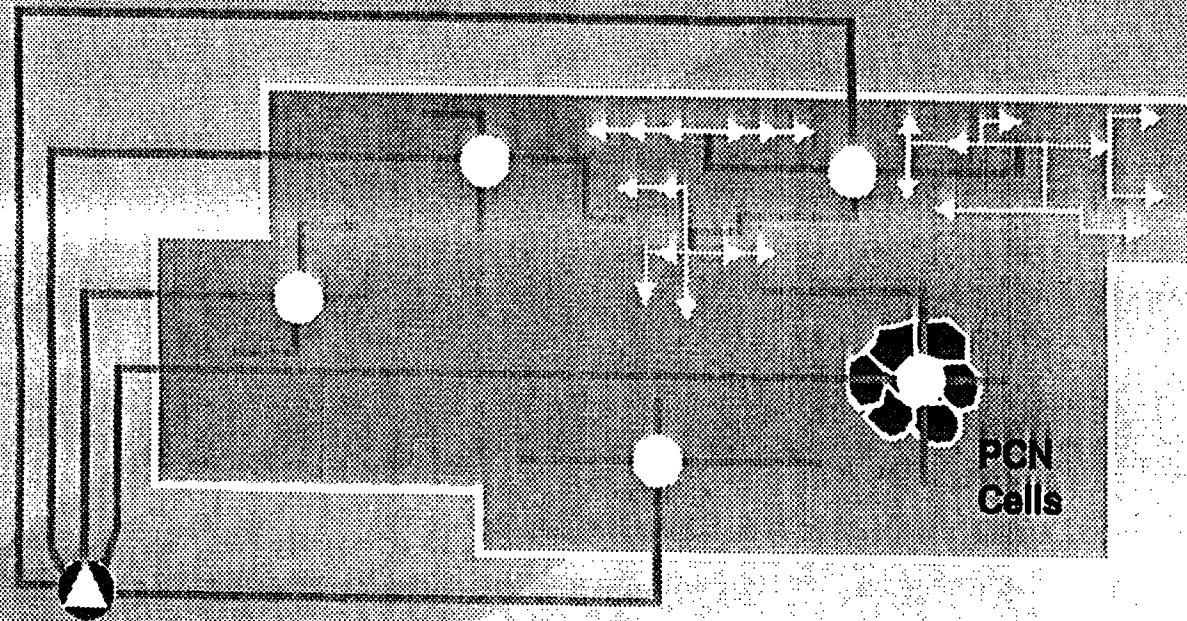
Optical Receiver
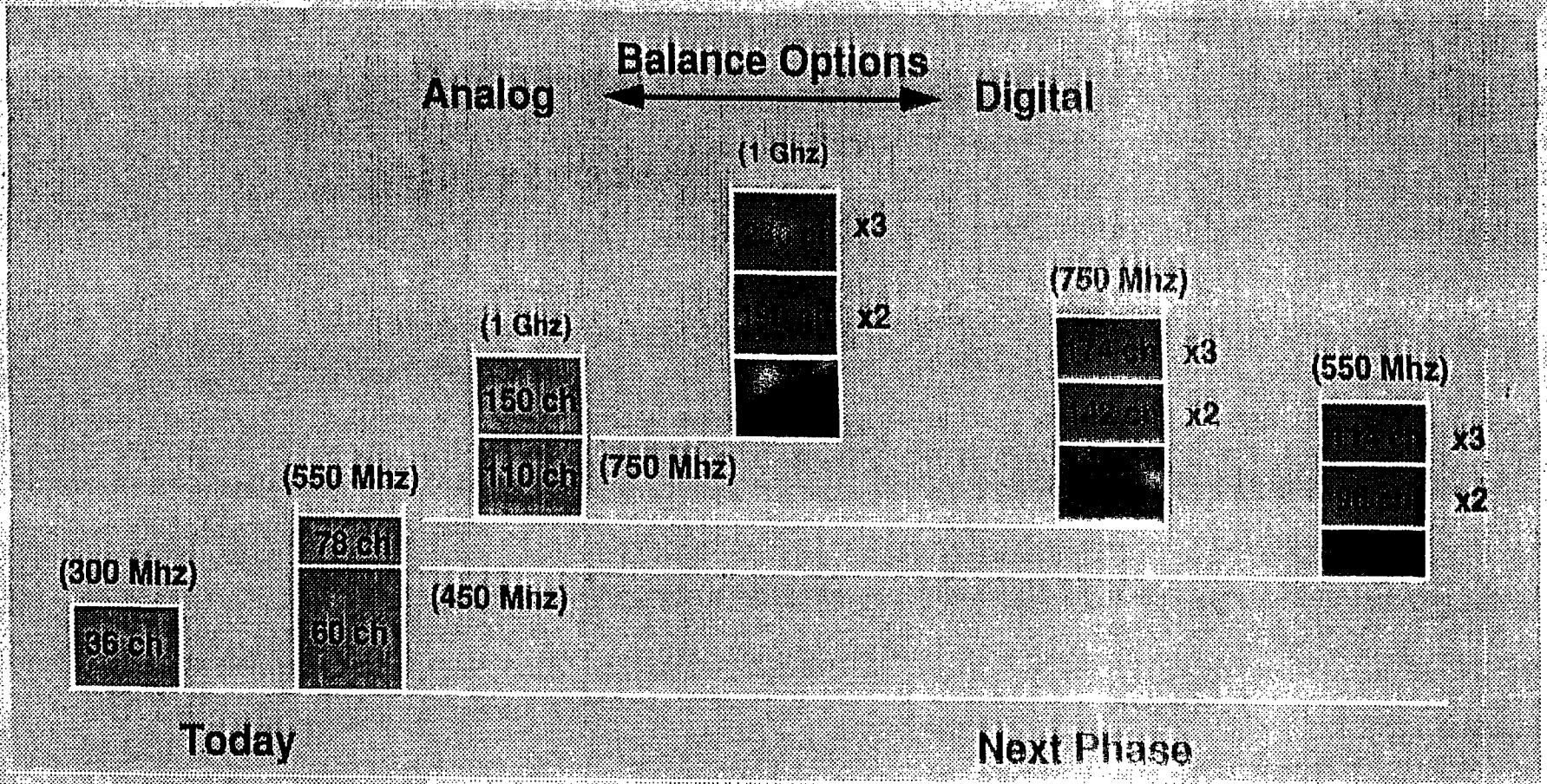
Distribution Amplifier

Express Feeder

Coaxial Feeder

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Phase IV
1 Ghz Head End With 75 Broadband
& 200 Compressed Digital Channels

Fiber
Laser & Receivers Trunks

150
Broadband
Channels

Modulators,
Processors,
Receivers, etc.

• • • •

200
Channels
to All
Forward
Lasers

To Optical
Receivers &
From Return
Xmitters

Multiplexer
/Modulator

IPPV
Control

• • •

200 Compressed
Digital Video Sources

PCN Interface

To Exchange Carriers

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Cable System
Conversion / Migration Strategy

Balance Options

Analog ◄──────────► Digital

(1 Ghz)
x3
x2

(750 Mhz)
x3
x2

(1 Ghz)
150 ch
110 ch
(750 Mhz)

(550 Mhz)
x3
x2

(550 Mhz)
78 ch
(450 Mhz)

(300 Mhz)
36 ch
60 ch

Today

Next Phase

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Digital to Headend
Mixed Analog and Digital on Cable

Digital
Transmission

Combiner/
Conditional
Access

Interdiction
Subscriber
Unit

Satellite
Receiver/
Demodulator(s)

Headend

Analog &
Digital

Digital
Cable-Ready
TV

Digital
Decompressor(s)

Channel AM
Modulator(s)

Analog

Cable-Ready
TV

Digital
Processor/Mod

Other AM Channels

Analog

Analog

Basic SST
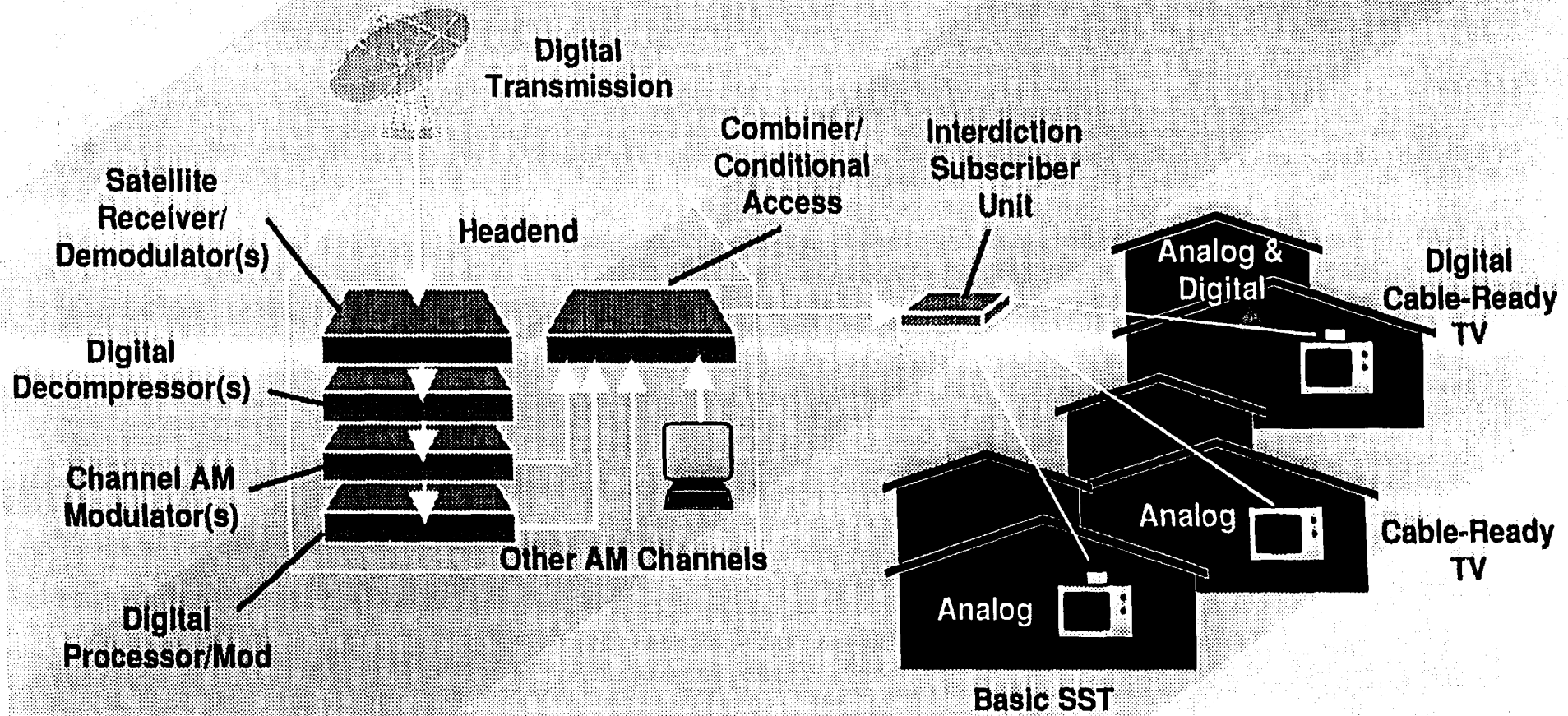
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Phase I
Spectrum
550 Mhz VSB-AM Plant

Sub-Low Return

75 Basic, Premium and Pay per View Channels

5 Mhz   50 Mhz   300 Mhz   550 Mhz
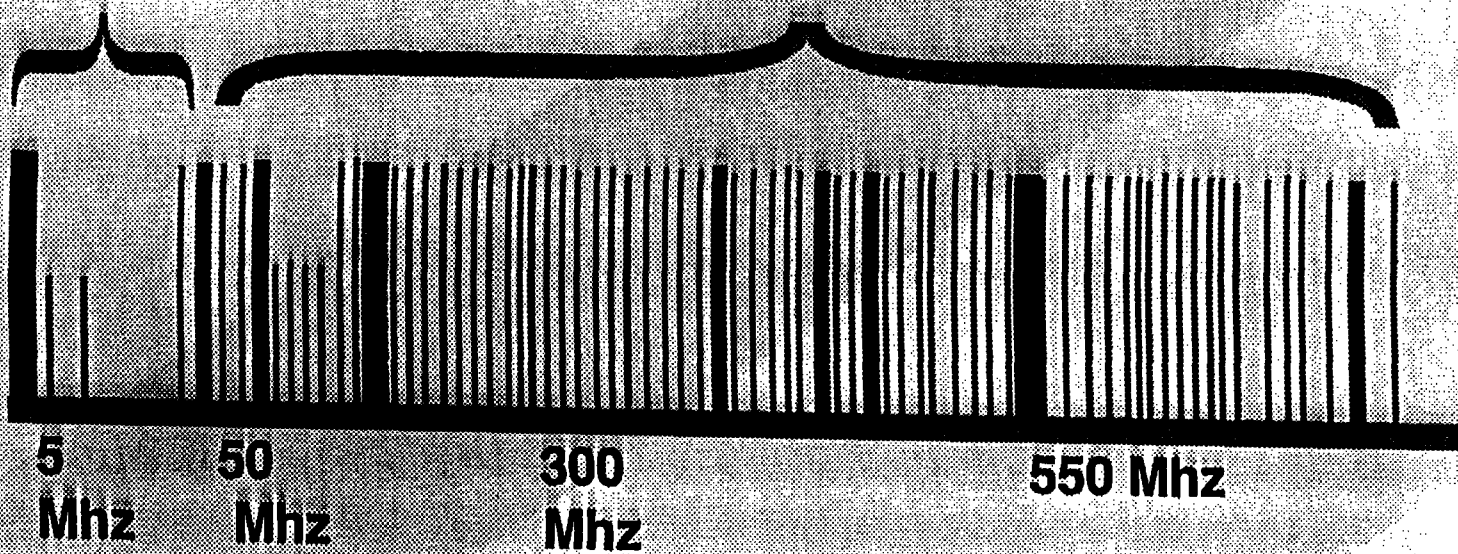
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Phase III
Spectrum
1 Ghz VSB-AM Plant

**Sub-Low
Return**

**150 Broadband Channels
Basic, Premium, PPV Channels**

**PCN
Carriers**

5
Mhz

50
Mhz

300
Mhz

550
Mhz

1 Ghz

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Phase IV
Spectrum
1 Ghz VSB-AM / Digital Plant
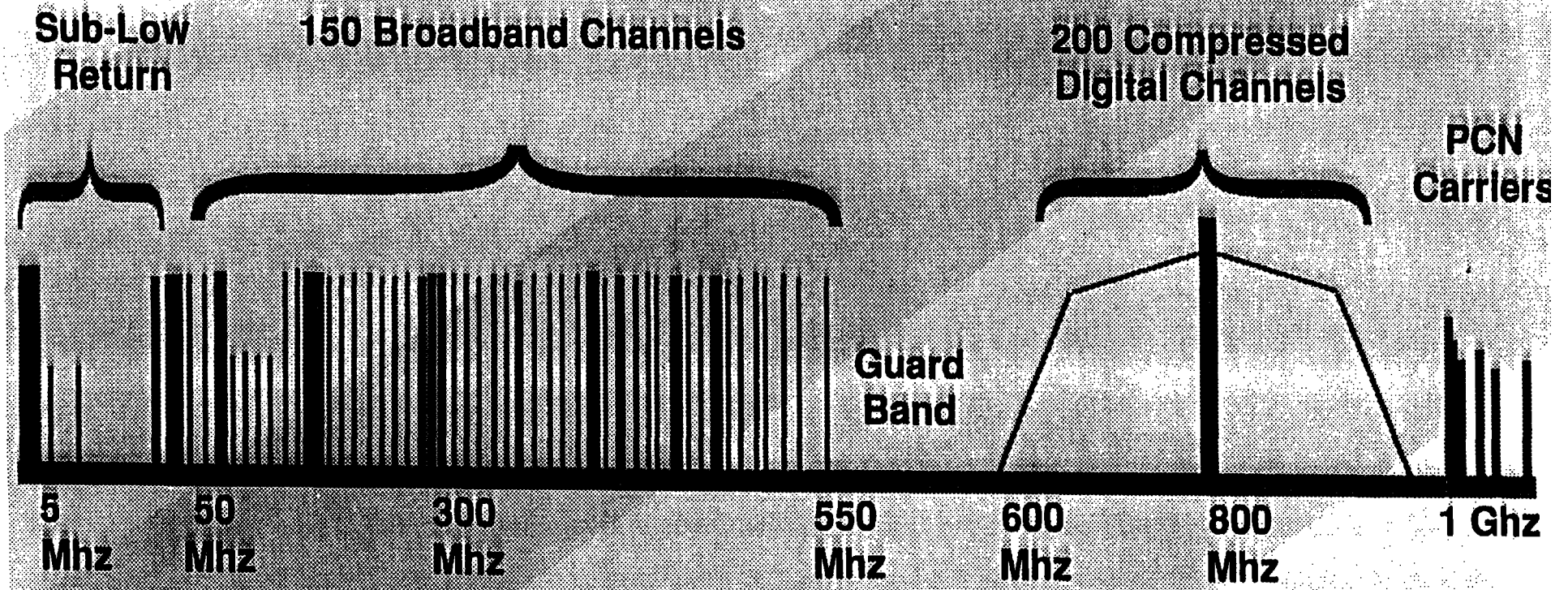
Typical Cable Infrastructure
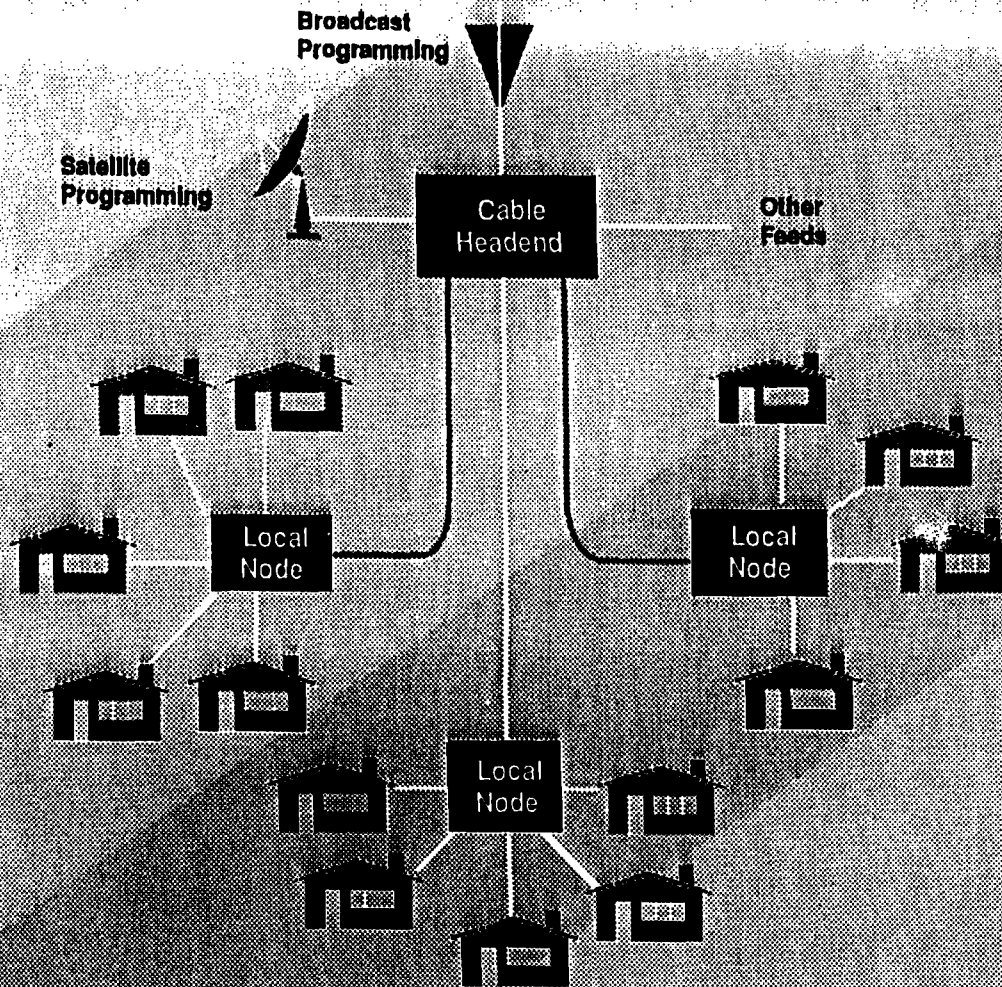
Integrated Cable Home

Value Added Applications

Basic Cable
Premium Cable
Pay Per View
Video On Demand
Play Along Games
Merchandise
Ordering
Data Dump
Video Dump
Video Games
Computer
Applications
On Screen Program
Guide
Remote Control of
Timed VCR Recordings
Other Interactive
Applications

Broadcast

Cable Value
Added Interface

Cable

IR

VCR

IR

Computer

IR Remote

Telephone

TV Receiver

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