COYNE ASSOCIATES LIMITED
SYSTEMS CONSULTANTS
38 MAGIL ROAD
DOLLARD DES ORMEAUX, P.Q.
CANADA H9G 1W4
TEL (514) 620-0909

PRELIMINARY REPORT
ON A
DATABASE
ON
CATV HARDWARE MANUFACTURERS

FOR THE

RESEARCH BRANCH
OF THE
DEPARTMENT OF COMMUNICATIONS
OF THE
GOVERNMENT OF CANADA

CONTRACT NO. OST5-0090

JULY, 1976

PRELIMINARY REPORT
ON A
DATABASE
ON
CATV HARDWARE MANUFACTURERS

FOR THE

RESEARCH BRANCH
OF THE
DEPARTMENT OF COMMUNICATIONS
OF THE
GOVERNMENT OF CANADA

CONTRACT NO. OST5-0090

JULY, 1976

TABLE OF CONTENTS

SECTION

1. INTRODUCTION
    - 1.1 General
    - 1.2 Study Methodology

2. SURVEY AND INFORMATION DATABASE
    - 2.1 General
    - 2.2 Financial Information Summary
    - 2.3 Technical Information Summary

3. TECHNICAL CONSIDERATIONS - RURAL CATV DISTRIBUTION
    - 3.1 General
    - 3.2 Design Objectives for Rural CATV Distribution
    - 3.3 Development of Design Equations
    - 3.4 Cascadability Analysis of a 35 Channel Rural CATV System Based on the Magnavox MX-404 Amplifier
    - 3.5 Cascadability Analysis of a 12 Channel Rural CATV System
    - 3.6 Cascadability Analysis of a 5 Channel Rural CATV System
    - 3.7 Subscriber Drop Design Considerations

4. COST ANALYSIS - RURAL CATV DISTRIBUTION

5. SUMMARY AND CONCLUSIONS

TABLE OF CONTENTS

APPENDIX

I FORM LETTER USED IN MAIL SURVEY

II SUMMARY OF INFORMATION OBTAINED IN THE SURVEY

III SUMMARY OF CATV TRUNK AMPLIFIER PERFORMANCE SPECIFICATIONS

IV SUMMARY OF LINE EXTENDER PERFORMANCE SPECIFICATIONS

V SUMMARY OF PERFORMANCE SPECIFICATIONS OF COAXIAL CABLES FOR TRUNK AND DISTRIBUTION

VI SUMMARY OF PERFORMANCE SPECIFICATIONS FOR CATV DROP CABLES

I INTRODUCTION

1.1 GENERAL

There is still a major segment of the population of Canada that does not have access to good quality telecommunication services at reasonable cost and on demand. This group of subscribers lives exclusively in the rural areas of our country, remote from large urban centers. Although most of these subscribers have access to some communication service, it is usually only in the form of multi-party telephone service, where between 4 and 18 subscribers may share a single telephone line. Single party service is often not available -- and if it were -- the rate charged would be unsupportable by the average subscriber. Also, the problem is even greater in some regions, where a large portion of the existing switching and distribution must be rebuilt. Finally, despite the lack of educational, cultural, and entertainment facilities that already exists in rural areas, even Community Antenna Television (CATV) is not available, despite its general availability at low cost to urban dwellers.

The major reason for this gap in service between the rural and urban subscriber is probably related to the much higher cost of providing telecommunication services in low density population areas, using traditional technology.

In response to these inequities, the Department of Communications has begun a long term study program that has as its objective: "the identification of ways in which the range, quality, and sophistication of telecommunication services in rural areas may be improved". This preliminary database on CATV hardware suppliers serves as a starting point for work, to be carried out during the course of the Rural Communication Study, that will examine the economic feasability of providing CATV and telephony in rural areas

by integrating the distribution of CATV and telephony. It will also provide a basis for evaluating whether presently available CATV hardware can be used satisfactorily, with or without adaptation, in the Canadian rural environment.

1.2 STUDY METHODOLOGY

The preliminary database was developed by first preparing, in consultation with CRC, a form letter with an outline of information required attached. This letter was then sent out to more than 50 companies across Canada and the U.S., that are involved in CATV hardware manufacturing.

Unfortunately, many companies were very slow or incomplete in their responses. By attending the American National Cable Television Association (NCTA), and the Canadian Cable Television Association (CCTA) conferences, it was possible to fill in most of the gaps in technical and price information. More complete data of a fiscal nature was obtained by making use of the financial database of SVP Canada. All of the information obtained was compiled and summarized in tabular form.

A preliminary design objective for Rural CATV was outlined and design equations developed. These design equations make it possible to select a coaxial cable having the maximum allowable loss (and therefore lowest cost), while still meeting the design objectives.

The technical and cost data was then used to examine simple system models for Rural CATV, as a function of subscriber density. Systems having capacities of 35 channels, 12 channels, and 5 channels, were all examined for the cases of high, medium, and low density rural distribution.

For each of these situations, technical feasability was shown (in general terms) and broadguage installed capital costs were determined, using typical installation costs. The results

obtained are of a preliminary nature only. Considerably more technical and economic analysis is required to determine the true cost of implementing rural CATV distribution on a widespread basis in Canada.

II SURVEY AND INFORMATION DATABASE

2.1 GENERAL

The major tool used to obtain information for the preliminary database was the mail survey. In addition, due to the difficulty of getting some of the information, this was supplemented by visits to the American NCTA Convention in Dallas during April, as well as the CCTA Convention in Toronto during June. Fiscal information was obtained largely with the assistance of SVP Canada.

A copy of the form letter used in the survey, is shown in Appendix I. The attachment outlines, in detail, what information was requested from the manufacturers.

In general, most companies responded by sending off-the-shelf technical datasheets, pricelists, and technical papers and manuals. If these were not complete, no attempt was made to supplement them. Nonetheless, most of the important technical and pricing information was obtained. Appendix II provides a tabulated summary of all the companies contacted, addresses, telephone numbers, contact personnel, and the names of their Canadian sales representatives.

For each company, the products manufactured are listed by general classification, and a complete listing of information obtained and included in the Preliminary Database, is given. In other words, Appendix II also represents a table of contents for the actual database of CATV hardware suppliers.

2.2 FINANCIAL INFORMATION SUMMARY

With the assistance of the SVP Canada financial information service, it was possible to assemble a brief financial profile on the 20 most significant manufacturers of CATV hardware. The information that was obtained is summarized in Table 2.1. The information obtained is still somewhat incomplete but is nonetheless informative. Our goal is to fill in the remaining important information gaps during the course of the follow-up work to this contract.

From this information it can be seen that Jerrold Electronics (owned by General Instruments) occupies a clear leadership position in terms of overall sales volume, with American sales of $60M to $70M, on a total U.S. CATV market of about $127M, during 1975. The remainder of the market is split into more or less equal portions by Anaconda CATV Ltd. and Thetacom, followed closely by Magnavox, RCA/CATV Systems, and Coral. We have been unable to date to get a breakout on Canadian CATV hardware sales. But it is believed that in the order of 20% to 40% of the listed American sales may in fact have been directed to Canadian CATV systems, via manufacturers representatives.

Another observation that one can make is that CATV hardware manufacturers have put in a rather poor financial performance during 1974 and 1975. Thetacom (with a loss of $1.5M on less than $12M sales), and Delta-Benco-Cascade (with losses of $0.7M on $4.2M sales) are two companies that we have data on. In fact, only two weeks ago, news was released indicating that Thetacom is dropping their CATV distribution product line to concentrate on their very successful multi-channel CARS Band AML Microwave system.

TABLE 2.1

FINANCIAL INFORMATION SUMMARY
CATV HARDWARE MANUFACTURERS

COMPANY	HOLDING COMPANY	PRODUCTS	NO. OF EMPLOYEES (C/HC)	SALES 1975 (C/HC)	PROFIT 1975 (C/HC)	MARKET SHARE
AEL Communications Corporation	American Electronics Lab, Inc.	A,P		-/$33.9M*	-/1.24M*	
Ameco Inc.		A,P	117	$2.24M	($0.53M)	
Anaconda CATV Ltd.		A,P	110	$14M		
C-Cor Electronics		A,P	100	$2M-$3M	$0.03M	5%
Catel	United Scientific Corp.	S	40			
Cerro		C	150	$10M		
Comm/Scope	Superior Continental	C	125			35%
Coral, Inc.		A,P	300	$6M		
Delta Benco Cascade	Rediffusion Corp.	A,P	305	$4.2M*	($0.7M)	
General Cable Corp.		C	6,700	$518M*	$27M	
Intech		S	30	$.5M-$1M		
Jerrold Electronics	General Instruments	A,P,S		$60M-$70M		
Jerrold Electronics (Canada)	General Instruments of Canada	A,P,S	150/100	- /$32M*	-/$2.3M	
Keeble Selectra		M	20			
Lindsay Specialty Products		A,P	654	$3M		
Magnavox Co. (CATV Division)	Magnavox	A,P	300/19500	$9M/$685M	0/$14M	
Phasecom Corp.		S	20	$.5M-$1M		
RCA/CATV Systems (EIE)		A,P,S	120	$8M		15%
Scientific-Atlanta		A,P,S	1200	$35.7M*	$1.2M*	
Theta-Com Electron.	Hughes Aircraft	A,P	240	$10M-$12M	($1.5M)	25%
Times Wire & Cable	Insilco	C		$283M*		
Triple Crown Elec.		A	20			2%

Notes:
*1. A large portion of these sales are contributed by other than the CATV market.
2. Product codes are:
A - Active components, i.e. Amplifiers, Line Extenders, etc.
P - Passive Components, i.e. Direct Couplers and Taps
C - Coaxial Cable
S - Signal Processing Equipment, i.e. Hetrodyne Converters, Modulators and Demodulators
M - Miscellaneous, i.e. Topset Converters, etc.

It is expected that there will be some increase in sales during 1976, (i.e. about 12%) with the bulk of the growth occuring in Pay T.V. hardware (which is expected to grow from $12.5M sales during 1975 to $33M in 1976). If this strong Pay T.V. growth does occur, Delta-Benco-Cascade will stand to benefit greatly with its newly developed IT-4 addressable tap system for Pay T.V., and may be able to improve its financial position.

However, despite the difficulties of the recent past, the CATV hardware business is improving in general. It is believed that the marketplace became saturated two years ago, in part because the futuristic "wired city" vision of CATV was oversold, and then suffered even further when the recent economic recession occurred. There is every indication that most of the manufacturers with successful product lines will be in a reasonably profitable position again by the end of 1976.

2.3 TECHNICAL INFORMATION SUMMARY

To assist in comparing the technical and cost performance and trade-offs between different CATV trunk amplifiers and line extenders , as well as trunk cables and drop cables, several summaries of performance specifications are provided as appendices. These are:

Appendix III	- CATV Trunk Amplifier Performance Specifications
Appendix IV	- Line Extender Performance Specifications
Appendix V	- Performance Specifications of Coaxial Cables for Trunk and Distribution
Appendix VI	- Performance Specifications for CATV Drop Cables

These summaries cover most hardware varieties that are of current interest. Information is provided on all major technical parameters, operating features, as well as sample list prices (Canadian or American) where the information is available. Any more detailed information must be obtained by consulting the manufacturers brochures or by contacting them directly.

The actual prices for hardware and cable will range from 10% to 20% below the list prices given, depending on the supplier. For purposes of our analysis we have assumed that actual selling prices will be 15% below list price. In addition, if only the American price is available, the Canadian price is taken as being 37% above the American price. This allows for Duty, Federal Sales Tax, Currency exchange rates, and distributer profit. In practise, the actual conversion factor may be somewhat more or less.

Finally, it must be kept in mind that actual equipment performance may be somewhat different than what is claimed in manufacturer specifications - particularly when all environmental factors are considered. Nonetheless they do give a reasonable indication of equipment performance capabilities.

III - TECHNICAL CONSIDERATIONS
RURAL CATV DISTRIBUTION

3.1 GENERAL

In this preliminary examination of the technical feasability of rural CATV distribution, two major topological alternatives are examined.

In the classical parallel trunk and feeder, the Bridger amplifier provides very high signal level to each subscriber via the feeder cable. This is particularly suited to an urban environment, since it isolates the large number of subscribers from the Trunk line. This makes it possible to minimize service degradations due to interference and/or equipment failure, and yet, the signal is distributed in the most effective manner.

However, in a rural area, with low subscriber density, the parallel trunk and feeder approach becomes relatively expensive and the technical advantages are reduced. In fact, for subscriber densities of approximately 1 subscriber/Kft or less, a direct tapping approach can provide significant cost savings without serious performance penalties occuring. Figures 3.1 and 3.2 illustrate the two approaches.

With the foregoing thoughts in mind, the simple CATV system models are analyzed for technical feasability, in this chapter, for capacities of 35 channels, 12 channels, and 5 channels, as a function of subscriber density. In addition, by inspection it is obvious that the lowest possible frequency plan should be used so as to minimize cable and electronics costs. Thus for 5 channel systems the frequency band of 5-50 Mhz is favored. For a 12 channel system the frequency band of 5-108 Mhz is favored. For the 35 channel system the standard frequency band of 50-300 Mhz is used.

Of course when the non-standard frequency bands are used, a top-set converter is required as an interface between the distribution system and the TV receiver.

The design parameters for each level of subscriber density are summarized in Table 3.1. The installed capital costs for each case are determined in the next chapter.

This chapter outlines a preliminary design objective for rural CATV distribution. Then, using technical data from typical amplifiers (or slight variations of them) and typical coaxial cables, system designs are carried out for each channel capacity and each subscriber density. This is accomplished with the aid of design equations that are determined in section 3.3. Design information for rural subscriber drops is also provided in section 3.7.

SIMPLE SYSTEM MODELS
RURAL CATV DISTRIBUTION

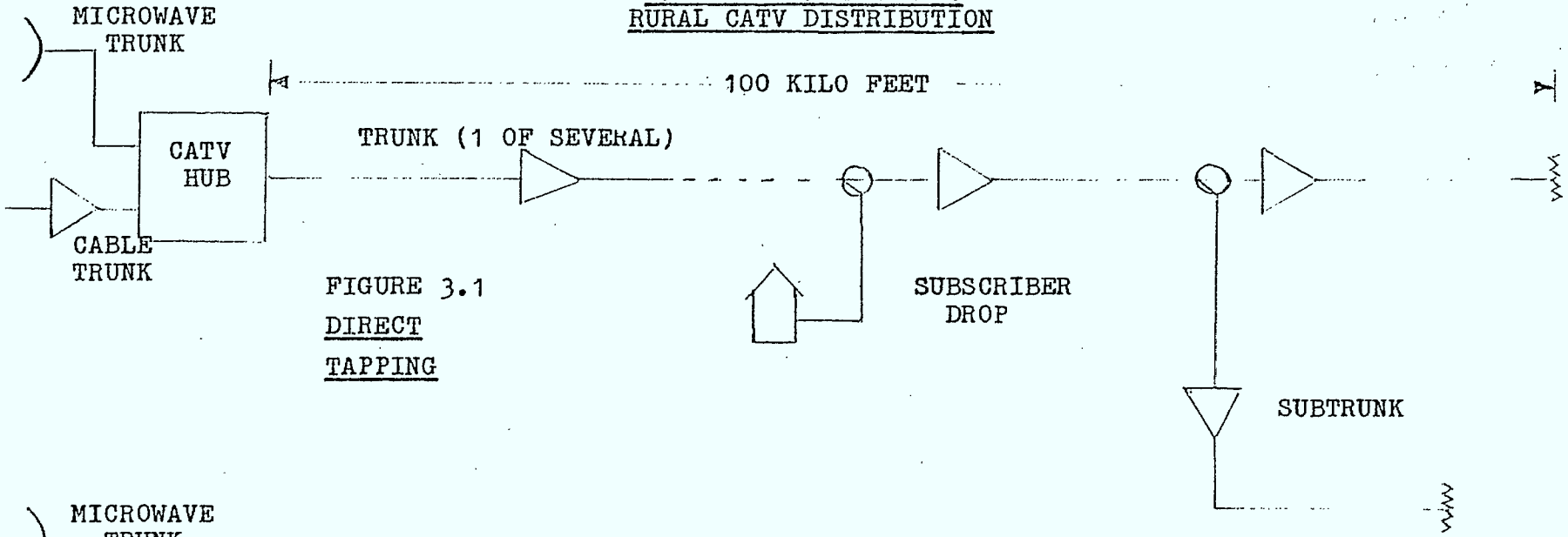

FIGURE 3.1
DIRECT
TAPPING

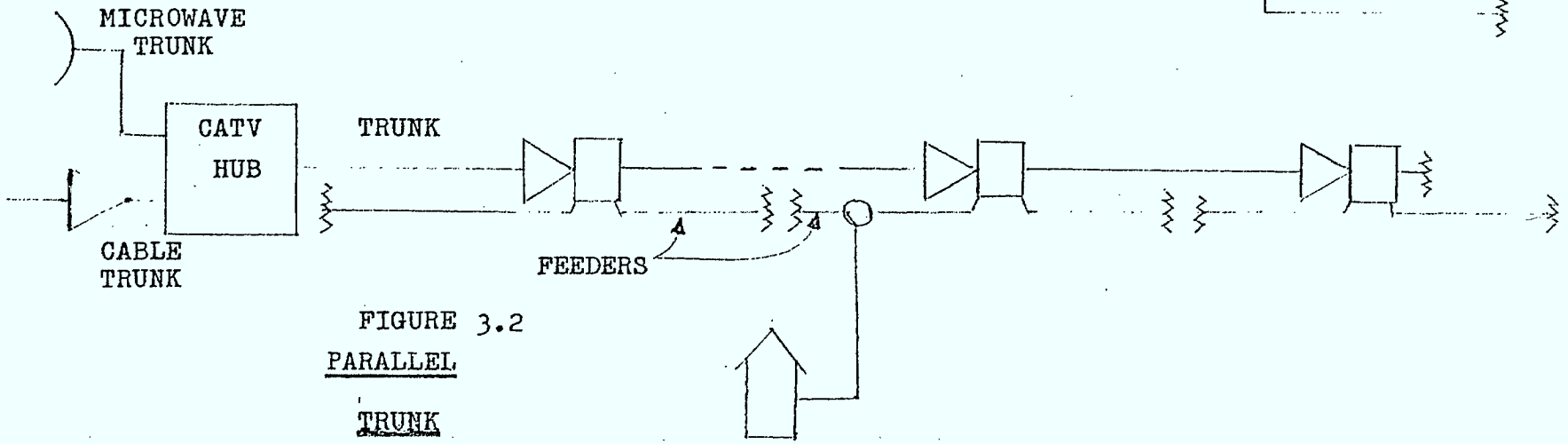

FIGURE 3.2
PARALLEL
TRUNK
AND
FEEDER

TABLE 3.1

DESIGN PARAMETERS
AS A FUNCTION OF
SUBSCRIBER DENSITY
FOR TYPICAL RURAL AREAS

DESCRIPTION	SUBSCRIBER DENSITY	TYPICAL DROP LENGTH	TOPOLOGY
HIGH DENSITY RURAL	5 Subs/Kft	250 ft	Parallel Feeder
MEDIUM DENSITY RURAL	1 Sub/Kft	400 ft	Direct Tapped
LOW DENSITY RURAL	1 Sub/5Kft	1,000 ft	Direct Tapped
URBAN (for comparison)	10-50 Subs/Kft	125 ft	Parallel Feeder

NOTE: For purposes of this study, the feeder length is assumed to be 100 Kft.

3.2 DESIGN OBJECTIVES FOR RURAL CATV DISTRIBUTION

Our Design objective is based on providing the rural subscriber with a CATV signal that meets the D.O.C. requirements as set out in Broadcast Procedure #23. Furthermore, in this preliminary study, it is assumed that signal degradations are divided equally between the Rural Distribution System and the Long Haul Trunk system that brings distant signals to the Rural Distribution Hub.

Thus, for the Rural Distribution System (which is the only concern here) our Preliminary Design Objective can be summarized as:

1. Signal-to-Noise Ratio: 43dB
2. Cross-Modulation Ratio: 54dB
3. Intermodulation Ratios: 60dB
   - -Second Order: 63dB
   - -Third Order: 66dB
4. Subscriber Signal Level: 0dBmV-10dBmV

3.3 DEVELOPMENT OF DESIGN EQUATIONS

The fundamental design equations for constant channel load are as follows:

$$SNR_T = S_o - G - (-59 + F) - 10 \log n - P \quad (1)$$

$$XM_T = XM_R + 2(S_o - S_R) + 20 \log n + 2P \quad (2)$$

$$CM3_T = CM3_R + 2(S_o - S_R) + 20 \log n + 2P \quad (3)$$

$$CM2_T = CM2_R + (S_o - S_R) + 10 \log n + P \quad (4)$$

where the symbols have the following definitions:

SNR_T - Overall Signal to Noise Objective
XM_T - Overall Crossmodulation Ratio Objective
$CM3_T$ - Overall Composite Triple Beat Objective
$CM2_T$ - Overall Second Order Distortion Objective
S_o - Amplifier Output Level
G - Amplifier Gain
F - Amplifier Noise Figure
n - Number of Amplifiers
S_R - Reference Output Level
XM_R - Single Amplifier Cross-Mod Performance (@ S_R)
$CM3_R$ - Single Amplifier Composite Triple Beat Performance (@ S_R)
$CM2_R$ - Single Amplifier Second Order Performance (@ S_R)
P - Margin for Thermal effects, Misalignment, Aging, etc.

By substituting equation (1) into (2), (3), and (4), we determine system cascadability limits due to cross-modulation, triple beat, and second order distortion respectively.

From (1) $S_o = SNR_T + G - 59 + F + 10 \log n + P \quad (5)$

$$2S_o = 2SNR_T + 2G - 118 + 2F + 20 \log n + 2P \quad (6)$$

Therefore (2) becomes:

$$XM_T = XM_R + 2SNR_T + 2G - 118 + 2F + 20 \log n - 2S_R + 20 \log n + 2P + 2P$$

$$20 \log n = 1/2 (XM_T - XM_R) - (SNR_T + G + F - 59 - S_R) - 2P \quad (7)$$

And (3) becomes:

$$CM3_T = CM3_R + 2SNR_T + 2G - 118 + 2F + 20 \log n - 2S_R + 20\log n + 2P + 2P$$

$$20 \log n = 1/2\ (CM3_T - CM3_R) - (SNR_T + G + F - 59 - S_R) - 2P \quad (8)$$

And (4) becomes:

$$CM2_T = CM2_R + SNR_T + G - 59 + F + 10 \log n - S_R + 10 \log n + 2P$$

$$20 \log n = (CM2_T - CM2_R) - (SNR_T + G + F - 59 - S_R) - 2P \quad (9)$$

3.4 CASCADABILITY ANALYSIS OF A 35 CHANNEL RURAL CATV SYSTEM BASED ON THE MAGNAVOX MX-404 AMPLIFIER

The Magnavox MX-404 amplifier series has been selected for use in the preliminary cost analysis of a 35 Channel Rural CATV System, because it is typical of CATV amplifiers on the market. It is one among several amplifiers which could be used.

From the table of CATV Trunk Amplifier Performance Specifications, the 30 channel Output Capability of the MX-404 is 48dBmV for a single amplifier with cross-modulation of -57dB, Second Order Distortion of -66dB and Composite Triple Beat of -74dB. The 35 channel Output capability is approximately 1dB lower at the same distortion levels.

Thus, for this amplifier, we have:

G = 20dB (Allowing a 2dB loss for Trunk Bridger and Equalizer)

F = 9dB

S_R = 47dBmV

XM_R = -57dB

$CM3_R$ = -74dB

$CM2_R$ = -66dB

Assume that we have a buried cable system requiring ALC every third amplifier and take P = 1.5dB.

Our design objectives are:

SNR_T = 43dB

XM_T = -54dB

$CM3_T$ = -66dB

$CM2_T$ = -63dB

Substituting into equation (7), we obtain the cascadability limit due to cross-modulation.

$$20 \log n = 1/2(-54-(-57)) - (43 + 20 + 9 - 59 - 47 + 2(1.5))$$

$$= 1.5 - (-31) = 32.5$$

$$n = \text{alog} \frac{(32.5)}{20} = 10^{1.625}$$

$$\ln n = 1.625 \ln 10$$

$$\therefore n = \text{aln}(1.625 \ln 10) = \text{aln}(3.7416) = 42.16$$

Thus the cascadability limit due to cross-modulation is 42 amplifiers.

For Triple Beat the Cascadability limit is:

$$20 \log n = 1/2\ (-66-(-74)) + 31 = 35$$

$$n = \text{alog}\ \frac{(35)}{20} = 10^{1.75} = 56 > 42$$

For Second Order distortion, the cascadability limit is:

$$20 \log n = (-63 - (-66)) + 31 = 34$$

$$n = \text{alog}\ \frac{(34)}{20} = 10^{1.7} = 50 > 42$$

From the above, we see that our analysis indicates that cross-modulation limits cascadability to about 42 amplifiers or 840dB of system loss.

However, this is based on cross-modulation being generated by 35 synchronous channels. In fact, no more than 10 to 15 channels are likely to be synchronized - particularly if care is taken. Thus, the effective value of XM_R will be at least -61dB (rather than -57dB). This improves the XMod cascadability limit to

$$20 \log n = 1/2(-54 - (-61)) - (-31) = 34.5$$

or $$n = \text{alog}\ \frac{34.5}{20} = 10^{1.725} = 56 > 50$$

So Second Order distortion is limiting at a cascadability of 50 amplifiers and 1,000dB.

For a system length of 100 Kft, using parallel trunk and feeder construction, if we allow 30dB for miscellaneous losses (e.g. sub-feeder tap-offs, etc.), then we require a cable having a loss of less than 970/1000 = 0.97dB/100 ft. One cable (of several good candidates) that meets this requirement is Cerrofoam 3/4 inch coaxial cable with Polystyrene dielectric (2750S-CC), which has a loss of 0.89dB/100 ft.

For a system length of 100Kft and direct tapped construction, (no parallel trunk) with a subscriber density of 1 subscriber per Kft, there is an additional loss of about 1dB/Kft if 12dB directional couplers are used to connect each subscriber tap. Thus the allowable system cable loss is reduced to 870dB. This means that a cable having a loss of less than 0.87dB/100 ft. is required in this case. General Cable Fused Disc 3/4 in. coaxial cable is one such cable, and it has a loss of 0.84dB/100ft.

In a direct tapped system with a subscriber density of only 1 subscriber/5Kft, the allowable system cable loss can be up to 950dB. In this case the Cerrofoam 3/4 inch coaxial cable becomes feasable again.

The foregoing preliminary analysis provides the information required to determine the cost of rural distribution of 35 channels for the low, medium, and high density rural models.

It neglects to include the additional signal degradations that will result when subscribers have drops that require extra gain, because they are too long or are located at a low level point on the trunk cable.

3.5 CASCADABILITY ANALYSIS OF A 12 CHANNEL RURAL CATV SYSTEM

The Jerrold Starline SLA-610 amplifier was designed for use as a low capacity long distance point-to-point CATV trunk system. However, it is adaptable for use as a low channel capacity rural CATV distribution system.

From the table of Transportation Amplifier Performance Specifications, for 5 channel operation, at 36dBmV, cross-modulation is -89dB, and second order distortion is -78dB. For 12 channel operation, cross-modulation becomes -81dB and second order distortion is -74dB at 36dBmV.

Thus for 12 channel operation we have:

G = 30dB P = 1.5

F = 8dB

S_R = 36dBmV

XM_R = -81dB

$CM2_R$ = -74dB

SNR_T = 43dB

XM_T = -54dB

$CM2_T$ = -63dB

For systems of 12 channels, Composite Triple Beat has no significant effect.

The cascadability limit due to cross-modulation is given by:

$$20 \log n = 1/2(-54 - (-81)) - (43 + 30 + 8 - 59 - 36 + 3)$$

$$= 1/2(27) - (-11) = 13.5 + 11 = 24.5$$

$$n = \text{alog} \frac{(24.5)}{20} = \text{alog } 1.225 = 16$$

The cascadability limit due to second order distortion is:

$$20 \log n = (-63 - (-74)) - (-11) = 22$$

$$n = \text{alog} \frac{(22)}{20} = \text{alog } 1.10 = 12 < 16$$

Thus, second Order distortion is the most critical factor, and limits system length to 12 amplifiers or 360dB.
The optimum output level is:

$S_o = 43 + 30 - 59 + 8 + 10 \log 12 + 1.5$

$= 93.5 - 59 = 34.5\text{dBmV}$

For a system length of 100Kft, using parallel trunk and feeder construction, if we allow 30dB for miscellaneous losses, then we require a cable having a loss of 330/1.000 = 0.33dB/100 ft. at 108Mhz. This loss requirement is lower than what can be obtained with even 1" diameter coaxial cable. Thus this high gain approach is infeasable. Let us assume that a low gain (20dB) version of the SLA-610, meeting the same distortion specifications, can be made available at the same cost as the existing high gain version. In this case the cascadability limit due to cross-modulation is given by:

$20 \log n = 1/2(-54 - (-81)) - (43 + 20 + 8 - 59 - 36 + 3)$

$= 1/2(27) - (-21) = 13.5 + 21 = 34.5$

$n = \text{alog } \frac{34.5}{20} = \text{alog } 1.725 = 52$

The cascadability limit due to second order distortion is still the limiting factor and limits the system length to 39 amplifiers or 780dB.
The optimum output level is:

$S_o = 43 + 20 - 59 + 8 + 10 \log 39 + 1.5$

$= 88.5 - 59 = 29.5\text{dBmV}$

For a system length of 100Kft., using parallel trunk and feeder construction, with 30dB for miscellaneous losses, we require a cable with a loss of less than 750/1000 = 0.75dB/Kft @ 108Mhz. One cable that meets this requirement is Cerrofoam //2 in. coaxial cable with Polystyrene dielectric (2500S-CC).

For a system length of 100Kft and direct tapped construction and a subscriber density of 1 sub/Kft, there is an additional loss of about 1dB/Kft. Thus, in this case, the allowable system cable loss is reduced to 650dB. This means a cable having a loss of less than 0.65dB/100 ft @ 108 Mhz is required. One such cable is CCS Hatfield 3/4 in. Polyethylene cable (74203) which has a loss of 0.57dB/100 ft.

For a system length of 100Kft and directly tapped subscribers at a density of 1 subscriber/5Kft, the allowable system loss is 730dB. The maximum allowable trunk cable loss is 730/1000 = 0.73dB/100 ft. @ 108Mhz. This requirement can be met to all intents and purposes with the Cerrofoam Polystyrene 1/2 in. coaxial cable (2500S-CC).

3.6 CASCADABILITY ANALYSIS OF A 5 CHANNEL RURAL CATV SYSTEM

Again, we will make use of the modified lower gain (20dB) Jerrold Starline SLA - 610 amplifier. In this case the repeatered line will be equalized for 50Mhz operation to provide a 5 channel capacity, but longer repeater spacings.

Thus for a 5 Channel operation we have:

$G = 20dB$

$F = 8dB$

$S_R = 36dBmV$

$XM_R = -89dB$

$CM2_R = -78dB$

$SNR_T = 43dB$

$XM_T = -54dB$

$CM2_T = -63dB$

$P = 1.5dB$

The triple beat has no significant effect. The cascadability limit due to cross-modulation is given by:

$$20 \log n = 1/2(-54 - (-89)) - (43 + 20 + 8 - 59 - 36 + 3)$$

$$= 1/2(34) - (-21) = 17 + 21 = 38$$

$$n = \text{alog} \frac{(38)}{20} = \text{alog } 1.9 = 79$$

The cascadability limit due to second order distortion is given by:

$$20 \log n = (-63 - (-78)) - (-21) = 15 + 21 = 36$$

$$n = \text{alog} \frac{(36)}{20} = \text{alog } 1.8 = 63 < 79$$

Thus, second order distortion is still the limiting factor and limits the system length to 63 amplifiers or 1260dB @ 50Mhz. The optimum output level is:

$$S_o = 43 + 20 - 59 + 8 + 10 \log 63 + 1.5 = 90.5 - 54 = 31dBmV$$

For a 100Kft system length, with parallel trunk and feeder construction, we require a cable having a loss of less than 1230/1000 = 1.23dB/100 ft. @ 50 Mhz. One cable that easily meets this requirement is CCS Hatfield 0.412 inch Polyethylene coax with a loss of 0.69dB/100ft @ 50Mhz.

In fact, it is easily seen that this cable can also be used for the direct tapped systems with subscriber densities as high as 1 subscriber/Kft.

3.7 SUBSCRIBER DROP DESIGN CONSIDERATIONS

The other problem area with rural CATV distribution concerns the requirement for long drops(i.e. 250 ft to 1 Kft versus 125 ft for the urban environment). The most effective solution involves the use of lower loss drop cable, with the addition of a low cost fixed gain module where required. This gain module could currently be implemented using a line extender such as the Triple Crown DL352, at a list price of $208 per unit. Ultimately, if a module were designed for just this purpose, its cost could probably be reduced to about $100 per unit.

For purposes of this preliminary study, we will assume that all subscribers on the direct tapped systems will have a line extender of the DL352 type (with an effective gain of 22dB), purchased in quantity at $177/unit. In addition, a sufficiently low loss co-axial cable will be used to ensure a signal of 0dBmV-10dBmV is received on the subscriber premises.

A guide for subscriber drop configurations for rural CATV Distribution is given in Table 3.2.

TABLE 3.2

SUBSCRIBER DROP CONFIGURATION GUIDE
RURAL CATV DISTRIBUTION

SUBSCRIBER DENSITY	DROP LENGTH	50 MHZ		108 MHZ		300 MHZ	
		CABLE	AMPLIFIER* REQUIREMENT	CABLE	AMPLIFIER* REQUIREMENT	CABLE	AMPLIFIER* REQUIREMENT
HIGH	250 FT	Cerro 6FT4DP	3.5dBmV	Cerro 6FT4DP	5.5dBmV	Cerro 6FT4DP	8.9dBmV
MEDIUM	400 FT	Cerro 6FT4DP	5.6dBmV	Cerro 6FT4DP	8.8dBmV	Times .412" DYNAFOAM	6.5dBmV
LOW	1000 FT	Times .412" DYNAFOAM	6.2dBmV	.412" DYNAFOAM	9.5dBmV	.500" DYNAFOAM	13.2dBmV

NOTE:

*If the signal level at the subscriber tap output drops below this level, then a line extender (e.g. DL352) must be inserted in the subscriber drop.

IV COST ANALYSIS
RURAL CATV DISTRIBUTION

This cost analysis is based on the simple rural CATV distribution models described in Figures 3.1, 3.2, and Table 3.1, and is configured in accordance with the design information determined in Sections 3.4 to 3.7.

The cost analysis for the 35 channel, 12 channel, and 5 channel system capacities are shown in Tables 4.1, 4.2, and 4.3 respectively, for three typical subscriber densities and a system length of 100 Kft. In addition, the installed capital costs per subscriber are further summarized in Table 5.1.

From the analysis, it can be seen that for high density rural distribution (5 subscribers per Kft.) the capital cost ranges from $491 to $562 per subscriber for 5 channel and 35 channel system capacities respectively. For medium density distribution (1 subscriber per Kft) the cost ranges from $1,144 to $1,548 per subscriber. For the case of low density distribution (1 subscriber per 5 Kft) the cost ranges from $4,709 to $6,348 per subscriber.

It should be noted that these cost levels are attained with existing technology or slight variations thereof. If only CATV service is to be implemented on a rural broadband distribution system, it is expected that system reliability will be satisfactory - even though the cost of providing service may be high.

However, if telephony is going to be integrated with CATV on the same broadband media, provision will have to be made to allow telephony signals to by-pass the CATV repeaters by using the lowest part of the frequency spectrum and amplifying telephony signals separately. This can probably be done satisfactorily on a redesigned system. Further study of these problem areas is obviously required.

TABLE 4.1

PRELIMINARY SYSTEM COST ESTIMATES

35 CHANNEL RURAL CATV DISTRIBUTION

SUBSCRIBER DENSITY	DISTRIBUTION CABLE			SUBSCRIBER DROP		TRUNK AMPS		INSTALLED COST PER POTENTIAL SUB
	TYPE	LOSS	COST/SUB	CABLE	AMP	QTY	COST/SUB	
HIGH 5 Subs/Kft	Cerrofoam 0.750"	.89	$188	$48	$227	46	$99	$562
MEDIUM 1 Sub/Kft	Fused Disc .750"	.84	$758	$190	$227	49	$373	$1548
LOW 1 Sub/5Kft	Cerrofoam 0.750"	.89	$3790	$543	$227	47	$1788	$6348

1. $300/Kft has been added to the material cost of distribution cable for installation (buried or aerial placement) charges.
2. $150/Kft has been added to the material cost of drop cable for installation charges.
3. $50 has been added to the cost of each amplifier for installation charges.

TABLE 4.2

PRELIMINARY SYSTEM COST ESTIMATES

12 CHANNEL RURAL CATV DISTRIBUTION

SUBSCRIBER DENSITY	DISTRIBUTION CABLE			SUBSCRIBER DROP		TRUNK AMPS		INSTALLED COST PER POTENTIAL SUB
	TYPE	LOSS	COST/SUB	CABLE	AMP	QTY	COST PER SUB	
HIGH 5 Subs/Kft	Cerrofoam 0.500"	0.74 DB/ 100'	$145	$48	$227	39	$106	$526
MEDIUM 1 Sub/Kft	CCS Hatfield 0.750"	0.57	$678	$77	$227	35	$338	$1320
LOW 1 Sub/5Kft	Cerrofoam 0.500"	0.74	$2565	$474	$227	40	$1928	$5194

1. $300/Kft has been added to the material cost of distribution cable for installation (burial or aerial placement) charges.
2. $150/Kft has been added to the material cost of drop cable for installation charges.
3. $50 has been added to the cost os each amplifier for installation charges.

TABLE 4.3

PRELIMINARY SYSTEM COST ESTIMATES

5 CHANNEL RURAL CATV DISTRIBUTION

SUBSCRIBER DENSITY	DISTRIBUTION CABLE			SUBSCRIBER DROP		TRUNK AMPS		INSTALLED COST PER POTENTIAL SUB
	TYPE	LOSS	COST/SUB	CABLE	AMP	QTY	COST PER SUB	
HIGH 5 Subs/Kft	CCS Hatfield 0.412" Polyeth.	0.69 DB/ 100'	$118	$48	$227	36	$98	$491
MEDIUM 1 Sub/Kft	"	"	$445	$77	$227	41	$395	$1144
LOW 1 Sub/5Kft	"	"	$2225	$474	$227	37	$1783	$4709

1. $300/Kft has been added to the material cost of distribution cable for installation (burial or aerial placement) charges.
2. $150/Kft has been added to the material cost of drop cable for installation charges.
3. $50 has been added to the cost of each amplifier for installation charges.

V SUMMARY AND CONCLUSIONS

During the course of the work carried out in this contract, it has become clear that visits should be made to the following companies:

- Jerrold Electronics
- Thetacom
- Delta-Benco-Cascade
- Anaconda
- Magnavox
- Triple Crown
- Lindsay Specialty Products
- RCA/CATV Systems
- Coral
- Scientific Atlanta

It had originally been our intention to also visit Northern Telecom (Cable Division) and Canada Wire and Cable. Unfortunately, both of these companies are no longer in the business of manufacturing coaxial cables for the CATV industry.

The major conclusions of this preliminary study are as follows:

1. Rural CATV distribution is technically feasable with current technology, although some variations on design approach are desirable to lower costs.
2. Implementing a direct tapped distribution system is one design variation that appears feasable for low and medium density rural CATV distribution.
3. Furthermore, for 12 and 5 channel capacity rural CATV distribution the use of the lowest possible frequency plan is recommended. For the 5 channel capacity system, the upper frequency is 50 Mhz. For the 12 channel system, the upper frequency of operation can be held to 108 Mhz.
4. The relatively long rural subscriber drops require the use of larger diameter coaxial cable than is typical in urban CATV systems and may also require a line extender to maintain desirable signal levels.

5. The cost of implementing rural CATV distribution can range from $491 per subscriber (high density and 5 video channels) to $6,348 per subscriber (low density and 35 video channels). See Table 5.1 for a more complete summary.

6. Much further analysis is required to determine the overall cost of implementing rural CATV distribution on a widespread basis.

TABLE 5.1

PRELIMINARY COST ESTIMATES
RURAL CATV DISTRIBUTION
AS A FUNCTION OF SUBSCRIBER DENSITY

SUBSCRIBER DENSITY	INSTALLED CAPITAL COSTS PER SUBSCRIBER		
	35 CHANNELS	12 CHANNELS	5 CHANNELS
HIGH (5 Subs/Kft)	$560	$530	$490
MEDIUM (1 Sub/Kft)	$1,550	$1,320	$1,140
LOW (1 Sub/5Kft)	$6,350	$5,190	$4,710

NOTES:
The above preliminary cost estimates are based on a simple system model with typical installation costs, and so are of a budgetary nature only. Further analysis is required to determine the true cost of implementing Rural CATV Distribution on a large scale basis, under all types of demographic conditions.

APPENDIX I

FORM LETTER USED

IN MAIL SURVEY

COYNE ASSOCIATES LIMITED
SYSTEMS CONSULTANTS
39 MAGIL ROAD
DOLLARD DES ORMEAUX, P.Q.
CANADA H9G 1N4
TEL. (514) 620-0909

Dear Sir,

Coyne Associates Systems Consultants Ltd. is developing a database on CATV hardware on behalf of the Research Branch of the Department of Communications of the Government of Canada. This effort is being conducted as part of the Rural Communications Research Program, which has as its objective: "the identification of ways and means in which the range, quality, and sophistication of communication services in rural areas may be improved".

This database will serve as a starting point for work to be carried out later, that will examine the economic feasibility of providing CATV service to the rural areas of Canada. It will also provide a basis for evaluating whether presently available CATV hardware can be used satisfactorily, with or without adaptation, in the Canadian rural environment. Work is already underway on a similiar activity with respect to telephone service improvement.

As a first step, we are requesting that you provide us with two complete sets of technical and pricing information on your complete CATV and related hardware product lines, including any other miscellaneous information that you believe may be of use to us.

A detailed list of the desired documentation and technical data is given in the two attachments. After we review the information that you send us, it is our intention to follow up by telephone and/or visits to your business establishments, as it seems appropriate.

If rural CATV proves to be economically and socially acceptable, it could have a significant impact on Canadian rural life. In addition, the market for CATV electronics and cable could be increased by in the order of several hundred million dollars (over the length of the implementation program). Keeping this in mind, we believe our survey warrants your careful attention, and as complete a response as possible.

It is our hope that you will respond within two or three weeks, and suggest that you use First Class Air Mail, in doing so. If there are any questions please contact us at (514) - 620 - 0909.

Yours truly,

John J. Coyne

John J. Coyne, P.Eng.
President

January 22, 1976.

ATTACHMENT I

DOCUMENTATION TO BE REQUESTED FROM SUPPLIERS

Each manufacturer is requested to provide two copies of each relevant item as indicated in the following sections.

1. Equipment Catalog

This should include any or all of the following items:

1.1 Amplifiers
- Trunk
- Trunk-Bridgers
- Line Extenders

1.2 Head - end Equipment
- Modulators, Demodulators, Converters
- Antennas
- Combiners, Filters, etc.

1.3 Coaxial Cable
1.4 Coaxial Cable Connectors
1.5 Subscriber Hardware
- Subscriber Taps
- Top-set Converters
- Miscellaneous items

1.6 Special Purpose Equipment
- IF Switchers
- Time-Message-Weather Display System
- Directional Couplers, Attenuators, etc.

1.7 Test Equipment
1.8 Outside Plant Hardware

2. Specification Sheets

Specifications on all the items of CATV hardware should be provided based on standard NCTA and/or D.O.C. BP #24 (Canadian) tests, wherever possible. If another test method has been used please indicate the nature of it in as much detail as possible. Indicate temperature range of operation within specification. Actual test results as a function of temperature for specific hardware items, or for a complete system (including cable trunk amplifiers and line extenders) would be much appreciated.

Information on hardware or system Mean - Time - Between - Failure (MTBF), and overall system maintainability should be provided - based on theoretical and/or actual field results.

See the detailed break-down of technical performance information required in the second attachment.

3. Price Lists

Both Canadian and American price lists should be provided covering all hardware items where possible. Information on quantity discount schedule should also be provided.

4. Annual Reports

5. Technical Papers recently published by company personnel.

6. General Comments and/or Suggestions

Suggestions as to how your CATV hardware might be used in the most economical fashion for CATV in the Canadian rural environment. (Subscriber densities from 10/mile to 1/mile, and temperatures down to -40°C (-40°F)).

ATTACHMENT II

PERFORMANCE SPECIFICATION DETAILS

1. Amplifier Performance Specifications

This information is required for all lines of trunk amplifiers, bridger amplifiers, line extenders. State specifications on amplifier modules separately e.g. trunk, bridger, return amplifiers, and together, i.e. trunk-bridger.

1.1 Pass - band
1.2 Frequency Response Flatness (within above frequency band)
1.3 Minimum Full Gain
1.4 Recommended Operating Gain
1.5 Rated Output (12 and 35 channels)
- Cross-Modulation
- 2nd Order Beat
- 2nd Harmonic (as function of frequency)
- Triple Beat
- 3rd Harmonic (as function of frequency)

1.6 Typical Operating Levels
- Input
- Output

1.7 Distortion Characteristics (worst case or as function of frequency - state measurement frequencies)
- Cross-Mod
- 2nd Order Beat
- 3rd Order Beat

1.8 Max Noise Figure (as function of frequency)
1.9 Manual Gain Control Range
1.10 Manual Slope Control Range (what carriers are used)
1.11 Automatic Slope and Gain Control Range
1.12 Thermal Compensation
- Cable Span
- Temperature Range
- Accuracy

1.13 Hum Modulator
1.14 Terminal Match
1.15 Power requirements
- Voltage (overall)
- Current
- Wattage
- Module Operating Voltage

1.16 Powering Bypass Capability
1.17 MTBF (Theoretical, Actual)
1.18 Dimensions
1.19 Operating Temperature Range

1.20 Special Operating Features
- Modularity
- Test Points
- Fault Location System
- Surge Protection
- Automatic Stand-by Power

1.21 Band-split Filters for Two-way Operation
- Pass-bands
- Insertion Loss
- Stopband Attenuation
- Terminal Match (Low band/High band)
- Chroma Delay (Low band/High band)

2. Signal Processor Performance Specifications

This information is required for all lines of head-end signal processor hardware.

2.1 Operating Channels
- Input
- Output

2.2 Recommended Input Level

2.3 Input Level Range

2.4 Recommended Output Level

2.5 Output Level Range

2.6 RF Terminal Match
- Input
- Output

2.7 Noise Figure (at Full Gain)

2.8 Carrier - to - Noise Ratio (at Recommended Input Level)

2.9 Spurious Output (at Recommended Output Level)

2.10 Adjacent Channel Rejection
- without additional band-pass filters
- with additional band-pass filters, as part of total head-end system

2.11 Intermodulation

2.12 Cross-modulation (at recommended input level)

2.13 Image Rejection

2.14 Amplitude Response
- From -0.75 to +4.18 Mhz
- From 0 to+3.58 Mhz

2.15 Group Delay Variation
- From -0.75 to +4.18 Mhz
- From 0 to +3.58 Mhz

2.16 Frequency Conversion Accuracy

2.17 Phase Locking
- Capture Range (Khz)
- Reference Signal Level Range

2.18 AGC Accuracy

2.19 AGC Response Speed to a 6 dB Input Change

2.20 Operating Temperature Range

2.21 Power Requirements

2.22 Dimensions

2.23 Special Features

3. Modulator Performance Specifications

3.1 RF Operating Channel Capability
3.2 RF Output Terminal Match
3.3 Recommended RF Operating Level
3.4 RF Output Level Range
3.5 Spurious Output (Modulator Only)
3.6 Output Frequency Accuracy (Modulator Only)
3.7 Amplitude Response
3.8 Group Delay Variation
3.9 Recommended Video Input Level
3.10 Video Input Terminal Match
3.11 Differential Gain
3.12 Differential Phase
3.13 Synch Compression
3.14 Tilt/Sag of 60 Hz Square Wave
3.15 AM Hum and Noise
3.16 Recommended Audio Input Level and Adjustment Range
3.17 Audio Frequency Response
3.18 Harmonic Distortion
3.19 FM Hum and Noise
3.20 Phase Locking
- Capture Range
- Operating Reference Signal Range
3.21 Temperature Range
3.22 Dimensions
3.23 Power Requirements
3.24 Special Features

4. Demodulator Performance Specifications

This information is required for all lines of demodulator equipment.

4.1 Operating Channels
- Input
- Output

4.2 Recommended Input Level
4.3 Input Level Range
4.4 RF Input Terminal Match
4.5 Noise Figure
4.6 Adjacent Channel Rejection
- without additional band-pass filters
- with additional band-pass filters

4.7 Image Rejection
4.8 Intermodulation
4.9 Cross-modulation
4.10 Amplitude Response
4.11 Group Delay Variation
4.12 Phase Locking
- Capture Range
- Reference Signal Level Range

4.13 AGC Accuracy
4.14 AGC Response Speed to a 6dB Input Change
4.15 Differential Gain
4.16 Differential Phase
4.17 Synch Compression
4.18 Tilt/Sag
4.19 Audio Frequency Response
4.20 Audio Frequency Distortion
4.21 Recommended Audio Output Level and Range
4.22 Operating Temperature Range
4.23 Power Requirements
4.24 Dimensions
4.25 Special Features

5. Topset Channel Converter Performance Specifications

5.1 Input Channel Operating Capabilities
5.2 Output Channel Capabilities
5.3 Output ChannelAmplitude Response
5.4 Output Channel Delay Distortion
5.5 Noise Figure
5.6 Gain
5.7 Recommended Input Level and Range
5.8 Cross-modulation (at recommended input level and full channel load)
5.9 Second Order Distortion
5.10 Frequency Accuracy
5.11 AFC Capability
5.12 Fine Tuning Range
5.13 VSWR
- Input
- Output
5.14 Operating Temperature Range
5.15 Power Requirements
5.16 Dimensions
5.17 Special Features

6. Subscriber Taps - Performance Specifications

6.1 Operating Frequency Range
6.2 Tap Values Available
6.3 For each of the tap values available provide:
- Tap Loss from Input to Tap Output
- Maximum Insertion Loss
- Isolation Between Output and Tap
- Isolation Between Taps
- Directivity
- Amplitude Response Over Operating Frequency Range

6.4 Operating Temperature Range
6.5 Other Features

APPENDIX II

SUMMARY OF INFORMATION OBTAINED IN THE SURVEY

SURVEY RESPONSE

COMPANY	CANADIAN REPRESENTATIVE	PRODUCTS	LITERATURE OBTAINED
A. Deskin Sales Corp. 290 Benjamin-Hudon Montreal, P.Q. H4N 1J4 (514)-331-2860		1. Blonder-Tongue - Headend Equipment 2. Cerro Communications - Coax Cable 3. Gilbert Engineering - Connectors 4. Theta-Com - Distribution Amplifiers 5. Utility Tools 6. Repco - Closures 7. RMS - Passives	To be found under respective companies
AEL Communications Corporation P.O. Box 507 Lansdale PA U.S.A. 19446 (215)-822-2929 Irving A. Faye Vice President		1. Amplifier Trunk and Line Extenders 2. Tunerless Block Converters	1. Catalog 2. Equipment Specifications 3. Price List (American) 4. Instruction and Maintenance Manuals - Mark IV Series Trunk Amplifiers - Colorvue Series Amplifiers - M-5E Line Extender Amplifiers
Ameco Inc. P.O. Box 13741 Phoenix AZ U.S.A. 85002 (602)-252-5716 R.W. Behringer President		1. Amplifier Trunk and Line Extenders 2. Signal Processors 3. Passives 4. Power Supply 5. Test Instrument	1. Equipment Description and Specification Sheets 2. Price List (American) 3. Installation and Maintenance Manuals - Channeleer Mark II Signal Processor - Nova 300 Line Extender

COMPANY	CANADIAN REPRESENTATIVE	PRODUCTS	LITERATURE OBTAINED
Ameco Inc. (continued)			- Metrocom Sub-Nova Amplifier - Nova 300 Trunk Amplifier - DC Type Directional Couplers 4. Technical Papers - Design Criteria for Addressable Taps - Cable in the Valley
Amplifier Design and Service, Inc.* 223 Crescent St. Waltham, Mass. U.S.A. 02154 (617)-899-7910		Distribution Amplifiers for CATV (including a Feedforward unit)	Equipment Specification and Price List
Anaconda CATV Ltd. 1580 Rand Ave. Vancouver B.C. V6P 3T9 Gary Brothers		1. Amplifiers Trunk and Line Extenders 2. Signal Processors 3. Passives 4. Connectors and Tools 5. Test Equipment 6. Coax Cable (Systems Wire & Cable, Inc.)	1. Equipment Description and Specification Sheets 2. Price List (Canadian) 3. Technical Papers - Test Data for 16 Amplifier Cascade - Introduction to System 21 and 22 Cable incorporating GAS Injected Polyethelyne - Reliability Data on Century Amplifier - Design Considerations for Two-way Systems - Destructive Corrosion in CATV Distribution Equipment - TV Communications Reprint - Contribution Sources of Envelope Delay in Cable Transmission Components

COMPANY	CANADIAN REPRESENTATIVE	PRODUCTS	LITERATURE OBTAINED
Anaconda CATV (continued)			- Level Control Concepts for Multi-channel and Two-way Control Systems - Several small application notes
Andrew Antenna Co. 606 Beech St. Whitby, Ont Robert W. Clements Sales Engineer		1. Antennas 2. Waveguide	1. Catalog 2. Equipment Specifications 3. Price List 4. Application Note: - Microwave Antenna Systems Planning
Anixter-Pruzan 1963 First Ave. S. Seatle WA U.S.A. 98134 (206)-624-6505	Turmac Electronics	1. Outside Plant Hardware 2. Connectors 3. Tools	1. Catalog 2. Equipment Specifications 3. Price List
Ava Electronics Corp.* 242 Pembroke Ave. Lansdowne PA U.S.A. 19050 (215)-284-2500		1. CATV Indoor Amplifiers 2. Passives 3. Connectors	1. Catalog 2. Equipment Specifications
Belden Corporation* Richmond, Indiana U.S.A. 47374	White Radio Ltd. Suite 245 3300 Cavendish Blvd. Montreal, P.Q. (514)-481-0158	1. Drop Cables	1. Catalog 2. Equipment Specifications 3. Two Application Notes
Blonder-Tongue Laboratories Inc. One Jake Brown Rd. Old Bridge NJ U.S.A. 08857	Telequipment Box 3411 London, Ont. (416)-439-8871 H.M. Carioni, P.Eng.	1. Antennas 2. CATV Distribution Amplifiers 3. Signal Processors 4. Passives	1. Catalog 2. Equipment Specifications 3. Canadian Price List 4. Technical Paper - "A Hard Look At Headend Processing"

COMPANY	CANADIAN REPRESENTATIVE	PRODUCTS	LITERATURE OBTAINED
Blonder-Tongue (continued)		5. Outside Plant Hardware 6. Test Equipment	
Cannon Electric (ITT)* 666 E. Dyer Road Santa Ana CA U.S.A. 92702 (714)-557-4700	ITT Cannon Electric Canada Four Cannon Court Whitby, Ontario	1. Coaxial Cable connectors	1. Catalog 2. Equipment Specifications
C-Cor Electronics 60 Decibel Rd. State College PA U.S.A. 16801 (814)-238-2461	Turmac Electronics	1. CATV Distribution Amplifiers 2. Passives	1. Catalog 2. Equipment Specifications 3. American Price List
Catel Div. United Scientific Corp. 1400-D Stierlin Rd. Mountain View CA U.S.A. 94043 Frank Genochio President	Welsh Communications 43 Railside Rd. Don Mills, Ont. M3A 3L9 Gilles Vrignaud Engineering Manager	1. FM Modems for Video, Data, and Telephony on CATV Systems	1. Specifications Sheets 2. Several Article Reprints 3. Technical Paper - FM Coaxial Cable Transmission System
Cerro CATV Div. Cerro Corp. Halls Mill Rd. Freehold NJ U.S.A. 07728	Turmac Electronics A. Deskin Sales Corp.	1. Full range of CATV Coaxial Cables	1. Specifications Sheets 2. Canadian Price List
Comm-Plex Electronics 5215 rue de la Savanne Montreal, P.Q. H4P 1V4 Dave A. Shefler General Manager (514)-341-7440		1. Coral CATV Distribution Amplifiers 2. Triple Crown CATV amplifiers and passives	1. Catalog 2. Equipment Specifications 3. Canadian Price List

COMPANY	CANADIAN REPRESENTATIVE	PRODUCTS	LITERATURE OBTAINED
Comm-Plex (continued)		3. Phasecom CATV Signal Processors 4. CSS Hatfield Communication products coaxial cables 5. Gamco Connectors 6. Vitek Passives 7. Kay Elemetrics Test Equipment 8. Miscellaneous items	
Comm/Scope Co. Box 2406 Hickory NC U.S.A. 28601	RF Communications Box 180 Brossard, P.Q. Paul Caron Director of Sales (514)-866-8324	1. Full range of CATV coaxial cables	1. Specification Sheets 2. Canadian and American Price Lists 3. Technical Papers - Transmission Data for System Design - Performance Testing for CATV Coax
Coral Inc. 7700 Marine Plaza River Road North Bergen NJ U.S.A. 07047	Comm-Plex Electronics	1. CATV Distribution Amplifiers 2. Passives 3. Miscellaneous Products	1. Catalog 2. Equipment Specifications 3. Canadian Price List
Davis Mfg. Div. of J.I. Case Box 1801 Wichita KN U.S.A. 67213 (800)-835-3016		1. Underground Construction Equipment	

COMPANY	CANADIAN REPRESENTATIVE	PRODUCTS	LITERATURE OBTAINED
Dynair Electronics 6360 Federal Blvd. San Diego CA U.S.A. 92114 Robert A. Jacobs Sales Manager		1. Baseband Video Distribution Equipment and Systems 2. CATV Signal Processors	1. Catalog 2. Technical Specifications 3. American Price Data
Dynascan Corp. B & K Division 1801 W. Belle Plaine Ave. Chicago IL U.S.A. 60613	Atlas Electronics 50 Wingold Street Toronto, Ontario	1. CATV Test Equipment	1. Catalog 2. Technical Specifications 3. Instruction Manuals - Sweep/Marker Generator - Television Analyst
Farinon Electric 1691 Bayport Ave. San Carlos CA U.S.A. 94070	Farinon Electric of Canada, Ltd. 657 Orly Ave. Dorval, P.Q. H9P 1G1 (514)-636-0974	1. Microwave Systems for CATV; Baseband Video, Data and Telephony	1. Technical Specifications 2. Annual Report
General Cable Corp. 500 W. Putnam Ave. Greenwich CT U.S.A. 06830 (203)-661-0100 W.S. Crawford Director, Export Sales		1. Coax Cable for CATV Trunk Lines	1. Equipment Specifications 2. American Price List 3. Two Technical Papers - Fused Disc Coaxial Cable for Broadband Transmission - Analysis of Structural Return Loss in CATV Coaxial Cables
Globe Battery 5757 N. Green Bay Ave. Milwaukee, WI U.S.A. 53201 J. Christofferson Sales Manager (414)-228-2581		1. Storage Cells for remote power point back-up	1. Technical Description 2. Annual Report

COMPANY	CANADIAN REPRESENTATIVE	PRODUCTS	LITERATURE OBTAINED
Gilbert Engineering 3700 N. 36th Ave. Phoenix, Arizona U.S.A. 85019 (602)-272-6871	A. Deskin Sales Corp.	1. Coaxial Cable Connectors for CATV	1. Listing of CATV connectors 2. Installation Instructions
Industrial Wire & Cable Co. P.O. Box 130 Station U Toronto 18, Ont. (416)-622-3800 L. Hanesiak		1. CATV Drop Cables	1. Technical Specifications
Intech Laboratories 4175 Veterens Hwy. Ronkonkoma, NY U.S.A. 11779 (516)-585-6574		1. Modems for Wide-band Data on CATV Systems 2. Security Control and Monitoring Hardware for CATV Systems	1. Product Bulletins 2. Technical Papers - Reprint from Communication News - System Description of Intech Data Modems
ITT Space Communications, Inc. 69 Spring St. Ramsey, NJ U.S.A. 07446 (201)-825-1600		1. Receive only Satellite Earth Station for CATV	1. News Release 2. System Outline
Jerrold Electronics 60 Winfield Ave. Toronto, Ont. M6B 1P5 John Barnes		1. Complete Line of CATV Systems Hardware	1. Catalog 2. Technical specifications 3. Canadian Price List
Kay Elemetrics Corp. 12 Maple Ave. Pine Brook NJ U.S.A. 07058		1. Test Instruments for CATV	1. Technical Specifications 2. Price List 3. CATV Performance and Maintenance Test Manual

COMPANY	CANADIAN REPRESENTATIVE	PRODUCTS	LITERATURE OBTAINED
Keeble Selectra Corp. 1216 Lawrence Ave. W. Toronto, Ont. M6A 1E3 (416)-789-9131		1. Remote Control Topset Converter	1. Technical Specification Sheet
Lindsay Specialty Products 50 Mary St. W. Lindsay, Ont. K9V 4S7 (705)-324-2196 John Thomas		1. CATV Distribution Amplifiers 2. Passives 3. Connectors 4. Antennas	1. Catalog 2. Technical Specifications 3. Price List
Magnavox Co. CATV Division 100 Fairgrounds Dr. Manlius NY U.S.A. 13104	RF Communications	1. CATV Distribution Amplifiers 2. Passives 3. Addressable Taps for Pay TV	1. Technical Description and Operation Manual 2. Canadian Price List
Microwave Assoc. Northwest Ind. Park Burlington MA U.S.A. 01803	Microwave Assoc. International, Inc. Box 22 Waterloo, Ont. (519)-884-1620 G. James Wilson	1. Microwave Systems for CATV and Video Applications	1. Catalog 2. Technical Specifications
Oak Communications Oak Industries Inc. Crystal Lake IL U.S.A. 60014		1. Topset Converters for CATV 2. Addressable Tap for Pay TV	1. Equipment Specifications
Phasecom Corp. 13130 S. Yukon Ave. Hawthorne CA U.S.A. 90250 (213)-973-4191	Comm-Plex	1. Coherent Signal Processing Systems for CATV Headends 2. Information Display Systems for CATV	1. Technical Specifications 2. Application Note "The Coherent Headend Primer"

COMPANY	CANADIAN REPRESENTATIVE	PRODUCTS	LITERATURE OBTAINED
QE Manufacturing Co. Box 227 New Berlin, Penn. U.S.A. 17855	Comm-Plex	1. Outside Plant Tools and Equipment for CATV	1. Catalog 2. Canadian Price List
RCA/CATV Systems (EIE) 7355 Fulton Ave. North Hollywood CA U.S.A. 91605	RCA/Service Division 375 Decarie Blvd. Montreal, P.Q. H4L 3K7 (514)-336-2222 Normand Kearney	1. CATV Distribution Amplifiers 2. Signal Processors	1. Catalog 2. Equipment Specifications 3. Canadian Price List 4. Technical Papers - Design Aspects of Bidirectional Cable Systems - Required System Triple Beat Performance - Design Considerations for CATV System Construction - A Computer Controlled Bidirectional Communication System
RF Communications 1441 Dolomite Dr. Downsview, Ont. M3J 2N1		1. Magnavox CATV Distribution Amplifiers and Passives 2. Comm/Scope Coaxial Cable 3. Utility Products Buried Cable Closures 4. SLATER CATV Outside Plant Hardware 5. Murray-Jensen Fasteners 6. Cablematic Tools	1. Catalog 2. Equipment Specifications 3. Canadian Price List 4. Magnavox Series 4-2 Trunk Amplifier Installation Manual

COMPANY	CANADIAN REPRESENTATIVE	PRODUCTS	LITERATURE OBTAINED
Repco Products 7400 Stste Rd. Philadelphia PA U.S.A. 19136 (215)-338-1110	A. Deskin Sales Corp.	1. CATV Cable closures	1. Catalog
Rhode & Schwarz 8000 Munchen 80 Muhldorf Str 15	RUSINT Electronics and Sales Canada Ltd. 28A Northside Rd. Ottawa, Ont. K2H 5Z3 (613)-829-3944 Marvin Crouch	1. Signal Processors for Video and CATV 2. Test Equipment for Video Broadcasting and CATV	1. Catalog 2. Technical Specifications 3. Technical Papers - TV Translator Specifications - TV Transmitter/Transposer Test System - RF Video Testing Techniques
Scientific-Atlanta, Inc. 3845 Pleasantdale Rd. Atlanta, Georgia U.S.A. 30340 (404)-449-2000 Harry L. Blanks Sales Representative	Scientific-Atlanta Olympia Square, Suite 701 797 Don Mills, Ont. (416)-429-4953	1. CATV Distribution Amplifiers 2. Signal Processors for CATV Headends 3. Antennas 4. Satellite Earth Station for CATV	1. Catalogs 2. Technical Specifications
Systems Wire and Cable, Inc. 3500 S. 30th St. Phoenix AZ U.S.A. 85040	Anaconda CATV Ltd. Unit 13, 5200 Dixie Rd. Mississauga, Ontario L4W 1E4 (416)-625-6263 Gary Brothers	1. Coax Cable for CATV Systems	1. Catalog 2. Technical Specifications 3. Canadian Price List
Tektronix Inc. Box 500 Beaverton OR U.S.A. 97007	Tektronix Canada Ltd. 900 Selkirk St. Pointe Claire, P.Q. H9R 3S3 (514)-697-5340	1. Test Equipment for Video and CATV	1. Catalog 2. Technical Specifications 3. Application Notes - Proof of performance for CATV

COMPANY	CANADIAN REPRESENTATIVE	PRODUCTS	LITERATURE OBTAINED
Tektronix, Inc. (continued)			- Simultaneous Sweep Testing - Several on Baseband Video Test Proceedures
Theta-Com Box 9728 Phoenix, AZ U.S.A. 85068	Welsh Communications for AML Microwave A. Deskin Sales Corp. for CATV Distribution Amplifiers	1. CATV Distribution Amplifiers 2. Passives 3. AML Microwave for CATV	1. Catalog 2. Technical Specifications 3. American Price List 4. Technical Papers - Transient Considerations for CATV Systems - Correlation of Triple Beat Measurement Methods to Visual Threshold for System Design - Potential Benefits of Precise Frequency Control of Television Transmission - Second Order Beats on CATV Systems - A New Approach to Evaluating CATV System Triple Beat Performance - Applications of Optical Fibre to CATV Systems - Design Considerations for a large two-way System
Times Wire & Cable 358 Hall Ave. Wallingford CT U.S.A. 06492	Jerrold Electronics 60 Winfield Ave. Toronto, Ont. M6B 1P5	1. Full Line of Coaxial Cables for CATV	1. Catalog 2. Technical Specifications 3. Annual Report for Insilco Corp.

COMPANY	CANADIAN REPRESENTATIVE	PRODUCTS	LITERATURE OBTAINED
Times Wire & Cable (continued)			4. Technical Papers - Dynafoam Coax Comes of Age for CATV - Moving Ahead in CATV Cable Development - Proceedures for Handling Aluminum Sheathed Coaxial Cable - Drop Cable Tips
TOCOM Box 47066 Dallas, Texas U.S.A. 75247 (214)-259-7691		1. CATV Distribution Amplifiers 2. Signal Processors 3. Hardware for Two-Way Interactive CATV Systems	1. Technical Specifications and Product Description 2. Technical Paper - Two-Way is Alive and Well
TOMCO Communications, Inc. 1132 Independence Ave Mountain View CA U.S.A. 94043 (415)-969-3042 V. R. Borelli		1. Signal Processors for CATV Headends 2. MATV Amplifiers	1. Catalog 2. Technical Specifications 3. American Price List
Triple Crown Electronics Inc. 42 Racine Rd. Rexdale Ont. M9W 2Z3 (416)-743-1481	Comm-Plex	1. CATV Distribution Amplifiers (including a Feed-forward unit) 2. Miscellaneous Items	1. Equipment Description and Specification Sheet 2. Price List

COMPANY	CANADIAN REPRESENTATIVE	PRODUCTS	LITERATURE OBTAINED
Turmac Electronics 2975 Victoria St. Lachine, P.Q. (514)-637-3511 René Lavoie		1. Anixter-Pruzan CATV Tools and Outside Plant Hardware 2. Cerro Coaxial Cable 3. Raychem Heat Shrinkable Tubing 4. Gilbert Connectors 5. Anixter-Pruzan CATV Passives 6. Anixter-Pruzan CATV Test Equipment 7. Blonder-Tongue CATV Headend Equipment	1. Catalog 2. Technical Specifications 3. Price List (Canadian)
Utility Products 3111 W. Mill Rd. Milwaukee WI U.S.A. 53209 (414)-352-8500			1. Catalog 2. Price List 3. Technical Paper - Sophisticated technology extending the life of the humble Pedestal
Varian Assoc. Electron Device Grp. 611 Hansen Way Palo Alto CA U.S.A. 94303	Comm-Plex	1. FM Microwave TV Receiver for low cost Satellite Earth Stations	1. Product Description and Technical Specifications 2. General Brochure
Vitek Electronics 200 Wood Ave. Middlesex NJ U.S.A. 08846 (201)-469-9400		1. Pay TV Cable Trap Filters	1. Technical Specifications

COMPANY	CANADIAN REPRESENTATIVE	PRODUCTS	LITERATURE OBTAINED
Wavetek Indiana Inc. 66 N. First Ave. Beech Grove IN U.S.A. 46107		1. CATV and Video Test Instruments	1. Catalog 2. Technical Specifications

LIST OF MISCELLANEOUS INFORMATION

1. Broadcast Equipment Today - Jan/Feb 1976
2. Broadcast Equipment Today - March/April 1976
3. Broadcast Equipment Today - May/June 1976
4. Broadcaster - April 1976
5. Broadcasting - April 1976
6. Cable Communications - March 1976
   (Annual Directory and Buyers Guide)
7. Cable Communications - May 1976
8. Cable News - April 1976
9. Cable Tech - March/April 1976
10. CableVision - March 1976
11. CATJ - April 1976
12. CATV - April 1976
13. Communications Business - May/June 1976
14. Communications/Engineering Digest - April 1976
15. Television Digest - April 1976
16. The Communicator - April 1976
17. TV Communications - April 1976
18. Videography - April 1976
19. Video Systems - March/April 1976

APPENDIX III

SUMMARY OF

CATV TRUNK AMPLIFIER

PERFORMANCE SPECIFICATIONS

CATV TRUNK AMPLIFIER PERFORMANCE SPECIFICATIONS

MANUFACTURER	AEL	AEL
CODE	MARK IV SERIES M-4	MARK V SERIES CVT-5T
1.1 Pass-band	50 - 300 Mhz	50 - 300 Mhz
1.2 Freq response flatness	0.5 dB	+/- 0.25 dB
1.3 Min. full gain	26 dB	26 dB
1.4 Rec. Operating Gain	22 dB	19 1/4 dB
1.5 Rated output		
For Cross Mod		
For 2nd Order		
For Triple Beat		
1.6 Typ. Operating Levels		
Input	8.5 dbmV	11 dbmV
Output	30.5 dbmV	30.25 dbmV
1.7 Distortion	30 channels	30 channels
Cross-mod	-94 dB (typical)	-90 dB
2nd Order Beat	-88 dB (typical)	-85 dB
3rd Order Beat	-108 dB (typical)	-104 dB
1.8 Max Noise Figure	9.5 dB (Chan. 13)	9 dB (Chan. 13)
1.9 Man Gain Control	6 dB	4 dB
1.10Man Slope Control	+/- 4 dB	5 dB
1.11ASA and AGC Range	+/- 4 dB	+/- 5 dB
Output Stability	+/- 0.3 dB	+/- 0.3 dB
1.12Thermal Compensation		
Cable span	22 dB	
Temp. Range	+/- 50°F	
Accuracy	+/- 0.7 dB	
1.13 Hum Mod	75 dB	
1.14 Terminal Match	16 dB	13 - 16 dB
1.15 Power requirements		
Voltage	60 - 40 Volts	60 - 40 Volts
Current		
Wattage		
Mod. Op. Voltage		
1.16 Powering Bypass Cap.	12 amps	12 amps
1.17 MTBF		
1.18 Dimensions	19.5x10.3x7.3 in.	21x13.5x7.5 in.
1.19 Op. Temp. Range	-40 F to +140 F	-40 F to +140 F
1.20 Special Operating Features	Fully Modular Single Cable System Bidirectional Surge Protection Plug-in Baseplate	Fully Modular 2 Cable System Bidirectional Surge Protection Plug-in Baseplate
1.21 Band-Split Filters		
Pass-bands	5-32 Mhz/50-300 Mhz	5-32.5Mhz/50-300Mhz
Insertion Loss		
Stopband Attenuation		
Terminal Match	18 dB	16 dB
Chroma Delay	11 n sec.	7 n sec.
1.22 Manual Trunk	$545 (American)	$695 (American)
1.23 AGC Trunk/Bridger	$918 (American)	$1,060 (American)

AMECO NOVA 300-2/W TM	AMECO NOVA P-II M	ANACONDA CENTURY II 2201B-300/30M
50 - 300 Mhz	50 - 270 Mhz	50 - 300 Mhz
+/-0.25 dB	+/-0.25 dB	+/-0.25 dB
25 dB	26 dB	23 dB
22 dB		21 dB
		35 channels
		48 dBmV (-57dB)
		48 dBmV (-76dB)
		48 dBmV (-70dB)
10 dBmV		10 dBmV
32 dBmV	32 dBmV	31 dBmV (5dB B.T.)
35 chan-7dB Tilt	30 chan-7dB Tilt	
-94 dB	-91 dB	-91 dB
-84 dB	-84 dB	-110 dB
-91 dB	-91 dB	-88 dB
8 dB	9 dB (w/o Eqlzr)	9 dB
8 dB	6 dB	8 dB
6 dB (of cable)	+/-3 dB	8 dB
+/-3 dB	+/-3 dB	+3/-5 dB
+/-0.5 dB	+/-0.5 dB	+/-0.5 dB
		20 dB
-40 F-+140 F	-20 F-+120 F	-40 F-+140 F
		+/-0.5 dB
-60 dB	-60 dB	-66 dB
18 dB	18 dB	16 dB
60V/30V	60V/35V	60V
0.37A/0.74A	.33A/.48A	.400 Amps
22 Watts	20 Watts	24 Watts
		10A
		$4x10^6$ Hrs (Hybrid Pair)
		$-40^{\circ}F$ to $+140^{\circ}F$
	Separate Housing for Return Capability	Single/Dual Cable Bidirectional
Full Modularity		Fully Modular
Built-in Filters	Built-in Filters	Gas Tube Protectors
Single Cable Bidirectional	Single Cable Bidirectional	Two carrier AGC/ASC
		Sub and Mid-Split
5-30Mhz/50-300Mhz	5-32Mhz/50-270Mhz	5-30Mhz/50-300Mhz
		18 dB
15 nsec.	15 nsec.	16 nsec.
$794(American)	$365 (American)	$1,004 (Canadian)
$1,018 (American)	$599 (American)	$1,481 (Canadian)

CATV TRUNK AMPLIFIER PERFORMANCE SPECIFICATIONS

MANUFACTURER CODE		CORAL 1-300	CORAL 2-300
1.1	Pass-band	50-300 Mhz	
1.2	Freq Response Flatness	+/-0.25 dB	
1.3	Min. Full Gain	27dB (32dB,23dB opt.)	
1.4	Rec. Operating Gain	22dB	
1.5	Rated Output	(30 channels)	
	For Cross Mod	49.5 dBmV (-57dB)	
	For 2nd Order		SAME PERFORMANCE
	For Triple Beat		
1.6	Typ. Operating Levels		AS CORAL 1-300
	Input	11 dBmV	
	Output	33 dBmV (6dB B.T.)	
1.7	Distortion		
	Cross-Mod		
	2nd Order Beat	-70dB (@50dBmV)	
	3rd Order Beat	-78dB (@50dBmV)	
1.8	Max. Noise Figure	9.7dB	
1.9	Man. Gain Control	10dB	
1.10	Man. Slope Control	9dB	
1.11	ASA and AGC Range	+/-4.5 dB	
	Output Stability	+/-0.5 dB	
1.12	Thermal Compensation		
	Cable Span		
	Temperature Range	-40°F to +140°F	
	Accuracy		
1.13	Hum Mod	-60dB	
1.14	Terminal Match	16dB	
1.15	Power Requirements		
	Voltage	60V/20V	
	Current	0.6/1.8 Amps	
	Wattage	36 Watts	
	Mod. Operating Voltage		
1.16	Powering Bypass Cap.	12 Amps	
1.17	MTBF		
1.18	Dimensions		
1.19	Operating Temp. Range	-40°F to +140°F	
1.20	Special Operating Features	Single Cable Bidirectional Gas Tube Protectors Two carrier AGC/ASC Sub split only Discrete Electronics	Single Cable Bidirectional With Redundancy Quick Release Housing Built-in Return Filters
1.21	Band-Split Filters		
	Pass-Bands	5-30Mhz/50-300Mhz	
	Insertion Loss		
	Stopband Attenuation		
	Terminal Match	16 dB	
	Chroma Delay		
1.22	Manual Trunk	$720(Canadian)	$940 (Canadian)
1.23	AGC Trunk/Bridger	$990 (Canadian)	$1,260 (Canadian) Redundant Modules Extra

C-COR T-427	C-COR T-446	C-COR T-432/433
50-300Mhz	50-300Mhz	50-245Mhz
+/-0.2dB	+/-0.25dB	+/-0.2dB
26dB	32dB	37dB
22dB	29dB	34dB
(35 channels)	(30 channels)	(12 channels)
48.5dBmV (-57dB)	52dBmV (-57dB)	58dBmV (-57dB)
10dBmV (+6dB Tilt)	8dBmV (+8dB Tilt)	9dBmV (+6dB Tilt)
32dBmV (-7dB Tilt)	37dBmV (-10dB Tilt)	43dBmV (-9dB Tilt)
-90dB	-89dB (30 channels)	-87dB (12 channels)
-86dB	-87dB	-81dB
-108dB	-98dB	-84dB
9dB	9dB	9dB
8dB	8dB	8dB
8dB	12dB	8dB
+/-3dB	+/-3dB	+/-3dB
+/-.5dB	+/-.5dB	+/-.5dB
16dB	16dB	16dB
25 Watts	30 Watts	25 Watts
24 Volts	24 Volts	24 Volts
$2x10^5$Hrs (Total Station)	$2x10^5$Hrs (Total Sta)	$2x10^5$Hrs (Total Sta)
18.6x9.5x5.75 in.	18.6x9.5x5.75 in.	18.6x9.5x5.75 in.
-20 F to +130 F	-20 F to+130 F	-20 F to +130 F
Modular Single Cable Bidirectional Bridger can be in separate Housing Gas Tube Surge Protection Direct Power Feed	SAME AS C-COR T-427	Single Cable One-Way System Bridger can be in Separate Housing Gas Tube Surge Protection
5-30Mhz/50-300Mhz		
1dB/Filter Pair		
25 dB	SAME AS	N/A
20 dB	C-COR T-427	
12 nsec./5 nsec.		
$715 (American)	$780 (American)	$650 (American)
$1,140 (American)	$1,205 (American	$1,075 (American)

CATV TRUNK AMPLIFIER PERFORMANCE SPECIFICATIONS

MANUFACTURER CODE		DELTA-BENCO-CASCADE 701-008-01	DELTA-BENCO-CASCADE 701-001-01
1.1	Pass-Band	50-310Mhz	50-252Mhz
1.2	Freq Response Flatness	+/-0.25dB	
1.3	Min. Full Gain	22.5dB	
1.4	Rec. Operating Gain	22dB	
1.5	Rated Output	(35 channels)	
	For Cross Mod		
	For 2nd Order		
	For Triple Beat		
1.6	Typ. Operating Levels		
	Input	11dBmV	
	Output	33dBmV	
1.7	Distortion		
	Cross-Mod	-90dB	
	2nd Order Beat	-84dB	
	3rd Order Beat	-90dB	
1.8	Max. Noise Figure	11.5dB	
1.9	Man. Gain Control	8dB	DATA NOT AVAILABLE
1.10	Man. Slope Control	12dB	
1.11	ASA and AGC Range	+/-3.5dB	
	Output Stability		
1.12	Thermal Compensation		
	Cable Span	22dB	
	Temperature Range	-40 C to +60 C	
	Accuracy	+/-0.5dB	
1.13	Hum Mod	-60dB	
1.14	Terminal Match	16dB	
1.15	Power Requirements		
	Voltage	25V/60V	
	Current		
	Wattage	9.6 Watts	
	Mod. Operating Voltage	24 Volts	
1.16	Powering Bypass Cap.	10A	
1.17	MTBF	$2x10^5$Hrs(Theoretical)	
1.18	Dimensions	16.8x9.8x4.8 in.	
1.19	Operating Temp. Range	-40 C to +60 C	
1.20	Special Operating Features	Single Cable Bidirectional Fully Modular Surge Protection Fault Location can be Provided on Special Order	
1.21	Band-Split Filters		
	Pass-Bands	50-30Mhz/50-310Mhz	
	Insertion Loss		
	Stopband Attenuation	30dB	
	Terminal Match	26dB	
	Chroma Delay	6 nsec.	
1.22	Manual Trunk	$745 (Canadian)	$575 (CAnadian)
1.23	AGC Trunk/Bridger	$1,226 (Canadian)	$827 (Canadian)

JERROLD STARLINE 20/300 SJ-4/E	JERROLD STARLINE 300 J-4/E	JERROLD STARLINE 20 SP-4-2W
40-300Mhz	40-300Mhz	40-260Mhz
+/-0.15dB	+/-0.15dB	+/-0.25dB
25dB	23dB	24dB
22dB	21dB	22dB
(35 channels)	(35 channels)	(30 channels)
46dBmV(-57dB)	49dBmV(-57dB)	48dBmV(-57dB)
47dBmV(-70dB)	50dBmV(-70dB)	
49dBmV(-70dB)	50dBmV(-70dB)	47dBmV(-74dB)
10dBmV	10dBmV	9dBmV
32dBmV	31dBmV	31dBmV
-87dB	-93dB	-91dB
-86dB	-89dB	-85dB
-104 to 110dB	-108 to -112dB	-106dB
7dB-9dB	8dB-8dB(W.E.)	9dB-10dB(W.E.)
6dB	6dB	6dB
6-7dB*		6-8dB
+3/-4dB	+3/-4dB	-3/+5dB
+/-0.5dB	+/-0.5dB	+/-0.5dB
18dB	18dB	18dB
-40/+140°F	-40/+140°F	-40/+140°F
+/-0.75dB	+/-0.75dB	
-70dB	-70dB	-60dB
16dB	16dB	16dB
60/30 Volts	60/30 Volts	60/30 Volts
0.225/0.45 Amps	.23/.46 Amps	.40/.75 Amps
13.5 Watts	14 Watts	24 Watts
-27 Volts	-22 Volts	
8 Amps	10 Amps	8 Amps
18.75x5.25x8.8 in.		18.3x5.25x8.8 in.
-40 F to +140 F	-40°F-+140°F	-40 F - +140 F
Fully Modular	Fully Modular	Single Cable
Single Cable	Two Cable	Bidirectional
Bidirectional	Redundant and/or	Single Carrier AGC
Two Carrier	Bidirectional	System
AGC/ASC	Two Carrier	Separate ASC Station
	AGC/ASC	
$1,013 (Canadian)	$1,288 (Canadian)	$900 (Canadian)
$1,653 (Canadian)	$2,021 (Canadian)	$1,525 (Canadian)

CATV TRUNK AMPLIFIER PERFORMANCE SPECIFICATIONS

MANUFACTURER		LINDSAY	MAGNAVOX
CODE		931	MX-404 SERIES
1.1	Pass-Band	50-303Mhz	50-300Mhz
1.2	Freq Response Flatness	+/-0.25dB	+/-0.2dB
1.3	Min. Full Gain	28dB	24.5dB
1.4	Rec. Operating Gain	26dB	
1.5	Rated Output		30 Channels
	For Cross Mod		48dBmV(-57dB)
	For 2nd Order		48dBmV(-66dB)
	For Triple Beat		48dBmV(-74dB)
1.6	Typ. Operating Levels		
	Input	34dBmV	
	Output	8dBmV	
1.7	Distortion		
	Cross-Mod	-93dB(24 chan)	
	2nd Order Beat	-84dB	
	3rd Order Beat		
1.8	Max. Noise Figure	8dB	9dB
1.9	Man. Gain Control	6dB	10dB
1.10	Man. Slope Control	7dB	7dB
1.11	ASA and AGC Range		+/-4dB
	Output Stability	+/-0.5dB	+/-0.5dB
1.12	Thermal Compensation		
	Cable Span	NO THERMAL	
	Temperature Range	COMPENSATION	
	Accuracy		
1.13	Hum Mod	-65dB	-60dB
1.14	Terminal Match	16dB	16dB
1.15	Power Requirements		
	Voltage	20Vto60V	30V-60V
	Current		1.18A-0.59A
	Wattage	12 Watts	36 Watts
	Mod. Operating Voltage	20 Volts	
1.16	Powering Bypass Cap.		10 Amps
1.17	MTBF		
1.18	Dimensions		
1.19	Operating Temp. Range	-40°F-+120°F	-40°F-+120°F
1.20	Special Operating Features	Single Cable Bidirectional Separate Housing for Bridger Efficient Switching Mode Power Supply Dual Pilot ALC	Single Cable Bidirectional Status Monitoring Dual Pilot ALC Surge Protection
1.21	Band-Split Filters		
	Pass-Bands		
	Insertion Loss		
	Stopband Attenuation		
	Terminal Match		
	Chroma Delay		
1.22	Manual Trunk	$485 C	$711 C
1.23	AGC Trunk Bridger	$1,070 C	$1.030 C

MAGNAVOX MICROLINE 4-M	RCA (EIE) MODEL 151	SCIENTIFIC-ATLANTA 6500 SERIES
40-300Mhz	50-300Mhz	54-300Mhz
+/-0.25dB	+/-0.2dB	+/-0.25dB
23dB	24dB	25.5dB
20dB	22dB	22dB
30dBmV	10dBmV	10dBmV
10dBmV	32dBmV	32dBmV
20 channels	(35 channels)	(35 channels)
-90dB	-90dB(6dB Tilt)	-86dB
-81dB	-88dB	-85dB
-100dB	-87dB	-102dB
10dB	8dB	9.5dB
10dB	3.5dB	8dB
6dB	3dB	
-2.5/+5.5dB	6-8dB	
+/-0.5dB	+/-0.5dB	
	19dB	
-70dB	-70dB	
20dB	16dB	16dB
30V-60V	30V-60V	35V-60V
0.62A@30V	0.8A/0.45A	
18Watts	24/27 Watts	20 Watts
		24 V.
	10 Amps	8 Amps
8.5x5x7.5 in.	9x9.9x4.4 in.	
	-40 F to +140 F	
Single Cable One Way	Fully Modular	Modular
Single Pilot ALC	Single/Dual Cable	Single/Dual Cable
	Bidirectional	Bidirectional
	Surge Protection	
		5-30Mhz/54-300Mhz
N/A		40dB
		20dB
		8 nsec.
$436 C		
$646 C		

CATV TRUNK AMPLIFIER PERFORMANCE SPECIFICATIONS

	MANUFACTURER	TELENG	THETACOM
	CODE	AQ8501/07	XR-2 PLUS TF-M
1.1	Pass-Band	50-300Mhz	50-300Mhz
1.2	Freq Response Flatness	+/-0.25dB	+/-0.25dB
1.3	Min. Full Gain	26dB	26dB
1.4	Rec. Operating Gain	21dB	22dB
1.5	Rated Output		
	For Cross Mod		
	For 2nd Order		
	For Triple Beat		
1.6	Typ. Operating Levels		
	Input	10dBmV	32dBmV(4dB B.T.)
	Output	31dBmV	10dBmV
1.7	Distortion	35 Channels	30 Channels
	Cross-Mod	-87dB	-95dB
	2nd Order Beat	-85dB	-83dB
	3rd Order Beat	-106dB	-99dB
1.8	Max. Noise Figure	9.5dB	9.5dB
1.9	Man. Gain Control	10dB	
1.10	Man. Slope Control	8dB	
1.11	ASA and AGC Range	+/-4dB	+/-4dB
	Output Stability	+/-0.25dB	+/-0.5dB
1.12	Thermal Compensation		
	Cable Span	24dB	
	Temperature Range		
	Accuracy		
1.13	Hum Mod	60dB	
1.14	Terminal Match	16dB	18dB
1.15	Power Requirements		
	Voltage	60V	60V/30V
	Current	0.75A	
	Wattage		
	Mod. Operating Voltage		
1.16	Powering Bypass Cap.		
1.17	MTBF		
1.18	Dimensions	17.5x10.75x6.75 in.	
1.19	Operating Temp. Range	-40 C to +60 C	
1.20	Special Operating Features	Modular Single Cable Bidirectional	Single/Dual Cable Bidirectional Systems Modular Dual Carrier ALC
1.21	Band-Split Filters		
	Pass-Bands	5-30Mhz/54-300Mhz	
	Insertion Loss		
	Stopband Attenuation		
	Terminal Match	18dB	
	Chroma Delay	12 nsec.	
1.22	Manual Trunk	$447 C	$665 A
1.23	AGC Trunk Bridger	$730 C	$1,086 A

THETACOM
PHOENICIAN II KG-M

54-225Mhz
+/-0.25dB
25dB
22dB

32dBmV (4dB B.T.)
10dBmV
20 Channels
-93dB
-81dB
-93dB
8.5dB

+/-3dB
+/-0.5dB

18dB

Single Cable
Bidirectional
Modular
Single Carrier ALC

$366 A
$790 A

CATV TRANSPORTATION AMPLIFIER PERFORMANCE SPECIFICATIONS

MANUFACTURER		STARLINE	AMECO
CODE		LOW-SUB SLA-610	SUBNOVA
1.1	Pass-Band	5-95Mhz	6-48Mhz
1.2	Freq Response Flatness	+/-0.25dB	+/-0.15dB
1.3	Min. Full Gain	35 dB	29dB
1.4	Rec. Operating Gain	30dB	25dB
1.5	Rated Output	(12 channels)	(7 channels)
	For Cross Mod	52dBmV(-57dB)	
	For 2nd Order		
	For Triple Beat		
1.6	Typ. Operating Levels		
	Input	4dBmV	10dBmV
	Output	34dBmV	35dBmV
1.7	Distortion	(5 chan @ 36dBmV)	(7 chan @35dBmV)
	Cross-Mod	-89dB	-85dB
	2nd Order Beat	-78dB	-77dB
	3rd Order Beat		
1.8	Max. Noise Figure	8dB	7.5dB
1.9	Man. Gain Control	10dB	9dB
1.10	Man. Slope Control	+/-4dB	0 to -3dB
1.11	ASA and AGC Range	+/-4dB	+/-3dB
	Output Stability	+/-1dB	+/-.25dB
1.12	Thermal Compensation		
	Cable Span	29dB	25dB
	Temperature Range	-40 F to +120°F	-40 F to +140°F
	Accuracy		
1.13	Hum Mod		-65dB
1.14	Terminal Match	16dB	20dB
1.15	Power Requirements		
	Voltage	30 Volts	22 Volts
	Current	1 Amp	.45 Amps
	Wattage	30 Watts	9.9 Watts
	Mod. Operating Voltage	22 Volts	
1.16	Powering Bypass Cap.		
1.17	MTBF		
1.18	Dimensions	16x8x4 in.	7.5x14.5x17" (4 repeaters
1.19	Operating Temp. Range	-40 F to +120°F	-40 F to +140 F
1.20	Special Operating Features	Fully Modular Single Cable One Way Two carrier AGC/ASC Separate ASC Station	Fully Modular Multicable Operation (4 to 8 cables) One Way or Bidirectional Operation
1.21	Band-Split Filters		
	Pass-Bands		
	Insertion Loss		
	Stopband Attenuation		
	Terminal Match		
	Chroma Delay		
1.22	Manual Trunk	$1,075 C	$1.048 A
1.23	AGC Trunk/Bridger	BRIDGER NOT AVAILABLE	BRIDGER NOT AVAILABLE

C-COR T-056	RCA (EIE) 175 TRANSPORTATION
5-108 Mhz	5-110Mhz
+/-0.25dB	+/-0.25Mhz
37dB	18dB
34dB	13dB
(8 channels)	
58dBmV	
13dBmV(+10dB Tilt)	20dBmV
43dBmV(-11dB Tilt)	33dBmV
8 channels	3 channels
-87dB	-100dB
-80dB	-77dB
-87dB	-100dB
8dB	12dB
8dB	3.5dB
8dB	3dB
+/-3dB	7dB
+/-.5dB	+/-0.5dB
	17dB
	-14°F to +140°F
20dB	16dB
	25V/60V
	0.9A/0.25A
20 Watts	22/15 Watts
24 Volts	
18.6x9.5x5.75 in.	9x9.9x6.4 in.
-20 F to +130 F	-40°F to +140°F
Modular	Fully Modular
One Way Single Cable	Single or Dual Cable
Gas Tube Protection	Gas Tube Protection
Single Carrier ALC	

$675 A

APPENDIX IV

SUMMARY OF

LINE EXTENDER

PERFORMANCE SPECIFICATIONS

LINE EXTENDER PERFORMANCE SPECIFICATIONS

COMPANY	MODEL	(1) X-MOD OUTPUT CAP. (dBmV)	(6) 2ND ORDER (dB)	(4) 3 CH. TRIPLE BEAT (dB)	(5) COMP. TRIPLE BEAT (dB)	(2) GAIN (dB)	(3) NOISE FIG. (dB)	FREQ. RANGE MHZ	RETURN LOSS (dB) IN/OUT	POWER CONSUM. (WATTS)	LIST PRICE
AEL	CVT-4E-S1	+47.5*				27	8.5	50-270	16/16	16	$160.00A
AMECO	NOVA LE	+46	-68	-75	-53	25	12	50-300	18/18	28	$125.00A
AMECO	SUPER NOVA	+51.5	-74	-93	-71	28	12	50-300	18/18	30	$139.00A
ANACONDA	2109-B	+51.0	-71			27	12	50-300	16/16	14	
C-COR	D-416	+48.5	-73	-84	-59	27	10	50-300	16/16	20	
DBC	CELE 300	+51	-73		-70	25		50-310	16/16	7	$268.00C
EIE	SERIES 100 -150 TYPE	+50	-72	-88		25	12	50-300	16/16	26	
JERROLD	SLE-300 2W	+46	-70	-76		25	16	54-300	16	21	
	SLR-300	+49	-78	-80		28	11	40-300	16	21	
LINDSAY	933S	+50				28	9	50-300	16/16	19	$255.00C
MAGNAVOX	MX-404 4-LER	+51.5	-74	-86		28	10	50-300	16/16	31	
SYLVANIA	LE-2	+50	-71	-82		30	10	50-300	14/14	29	$135.00A
THETA-COM	TFLE	+49	-69		-58	25	10	50-300	18/16		$168.00A
TRIPLE-CROWN	DL352	+48	-73		-66	26		50-300	16/16	15	$208.00C

*20 CHANNELS

NOTES:
(1) 35 Channels, 7dB TILT -57dB Cross-Mod
(2) Without Equalizer
(3) Max Gain - W/O Equalizer
(4) +44 dBmV - CW Carriers
(5) +44 dBmV, 35 CH., 7dB Tilt
(6) +44 dBmV

APPENDIX V

SUMMARY OF PERFORMANCE SPECIFICATIONS OF COAXIAL CABLES FOR TRUNK AND DISTRIBUTION

PERFORMANCE SPECIFICATIONS
TRUNK AND DISTRIBUTION CABLES

COMPANY TYPE	CODE	SHIELD TYPE	SHIELD DIAM	DIELECTRIC	CENTER CONDUCTOR	MAX ATTENUATION dB/100' @ 68°F 50Mhz	108Mhz	300Mhz	LIST PRICE PER KFT
SYSTEMS WIRE & CABLE (ANACONDA)									
COMPATH-1	1-412-JF	Seamless	.412"	Solid	Solid	0.75	1.15	1.95	$175 C
	1-500-JF	Aluminum	.500"	Polyethylene	Copper	0.64	0.95	1.61	$236 C
	1-750-JF	Sheath	.750"	"	"	0.47	0.68	1.12	$467 C
COMPATH-2	2-412-JF	"	.412"	"	Copper Clad	0.75	1.15	1.95	$169 C
	2-500-JF	"	.500"	"	Aluminum	0.64	0.95	1.61	$227 C
	2-750-JF	"	.750"	"	"	0.47	0.68	1.12	$444 C
COMPATH-21	21-412-JF	"	.412"	Gas Injected	Solid	0.70	1.03	1.81	$183 C
	21-500-JF	"	.500"	Polyethylene	Copper	0.57	0.84	1.49	$250 C
	21-750-JF	"	.750"	"	"	0.39	0.58	1.05	$486 C
COMPATH-22	22-412-JF	"	.412"	"	Copper Clad	0.70	1.03	1.81	$174 C
	22-500-JF	"	.500"	"	Aluminum	0.57	0.84	1.49	$237 C
	22-750-JF	"	.750"	"	"	0.39	0.58	1.05	$454 C
	22-875-JF	"	.875"	"	"	0.34	0.51	0.90	$667 C
TIMES WIRE & CABLE									
DYNAFOAM	JT2412JB	Aluminum	.412"	Extruded	Copper Clad	0.62	0.95	1.63	$205 C
	JT2500JB	Seamless	.500"	Foam	Aluminum	0.50	0.78	1.32	$286 C
	JT2750JB	Tubing	.750"	Polystyrene	"	0.34	0.53	0.895	$548 C
	JT21000JB	"	1.000"	"	"	0.26	0.42	0.72	$938 C
ALUMIFOAM	JT3412JB	"	.412"	Extruded	"	0.71	1.07	1.81	$192 C
II	JT3500JB	"	.500"	Foam	"	0.56	0.88	1.49	$259 C
	JT3750JB	"	.750"	Polyethylene	"	0.39	0.62	1.05	$508 C
LUMIFOAM	JT4412JB	"	.412"	"	"	0.62	1.17	1.63	
III	JT4500JB	"	.500"	"	"	0.50	0.95	1.32	
	JT4750JB	"	.750"	"	"	0.34	0.68	0.895	

MISCELLANEOUS PARAMETERS
TRUNK AND DISTRIBUTION CABLES

TYPE	COMPANY CODE	OUTER DIAMETER	WT PER KFT (LBS)	BENDING RADIUS (INS)	MAX PULLING FORCE (LBS)	SRL dB	D.C. LOOP RESISTANCE OHMS/KFT
SYSTEMS WIRE & CABLE (ANACONDA)							
COMPATH-1	1-412-JF	.475	95	4.5	150	26	2.22
	1-500-JF	.580	135	5.0	185	26	1.45
	1-750-JF	.830	284	7.5	420	26	0.66
COMPATH-2	2-412-JF	.475	84	4.5	150	26	3.08
	2-500-JF	.580	118	5.0	185	26	1.99
	2-750-JF	.830	246	7.5	420	26	0.89
COMPATH-21	21-412-JF	.475	95	4.5	150	26	2.22
	21-500-JF	.580	135	5.0	185	26	1.45
	21-750-JF	.830	204	7.5	420	26	0.66
COMPATH-22	22-412-JF	.475	84	4.5	150	26	3.08
	22-500-JF	.580	118	5.0	185	26	1.99
	22-750-JF	.830	246	7.5	420	26	0.89
	22-875-JF					26	
TIMES WIRE & CABLE							
DYNAFOAM	JT2412JB	.500	82	5.0	150		2.40
	JT2500JB	.600	108	6.0	200		1.63
	JT2750JB	.870	223	8.7	425		0.70
	JT21000JB	1.130	434	11.3	575		0.40
ALUMIFOAM II	JT3412JB	.500	95	5.0	150		3.20
	JT3500JB	.600	129	6.0	200		1.98
	JT3750JB	.870	267	8.7	425		0.70
LUMIFOAM III	JT4412JB	.500	82	5.0	150		2.40
	JT4500JB	.600	108	6.0	200		1.63
	JT4750JB	.870	223	8.7	425		0.70

PERFORMANCE SPECIFICATIONS
TRUNK AND DISTRIBUTION CABLES

COMPANY TYPE	CODE	SHIELD TYPE	SHIELD DIAM	DIELECTRIC	CENTER CONDUCTOR	MAX ATTENUATION dB/100' @ 68°F 50Mhz	108Mhz	300Mhz	LIST PRICE PER KFT
CCS	44203	Seamless	.412"	Gas Injected	Copper Clad	0.69	1.03	1.81	$171 C
HATFIELD	54203	Aluminum	.500"	Cellular	Aluminum	0.56	0.84	1.49	$231 C
	74203	Tube	.750"	Polyethylene		0.39	0.57	1.05	$445 C
CERRO	1412S-SC	Seamless	.412"	Cellular	Solid	0.75	1.13	2.00	$175 C
CATV	1500S-SC	Drawn	.500"	Polyethylene	Copper	0.63	0.95	1.60	$236 C
	1750S-SC	Aluminum	.750"	"	"	0.47	0.68	1.12	$536 C
	1412S-CC	"	.412"	"	Copper Clad	0.75	1.13	2.00	$169 C
	1500S-CC	"	.500"	"	Aluminum	0.63	0.95	1.60	$218 C
	1750S-CC	"	.750"	"	"	0.47	0.68	1.12	$429 C
CERROFOAM	2412S-CC	"	.412"	Polystyrene	"	0.61	0.92	1.61	$184 C
	2500S-CC	"	.500"	"	"	0.50	0.74	1.32	$250 C
	2750S-CC	"	.750"	"	"	0.33	0.50	0.89	$500 C
	21000S-CC	"	1.000"	"	"	0.26	0.39	0.70	$972 C
COMM/SCOPE									
PARAMETER I									
	75-412JFSS	Solid	.412"	Expanded	Solid	0.74	1.08	1.81	$132 A
	75-500JFSS	Aluminum	.500"	Polyethylene	Copper	0.56	0.85	1.49	$174 A
	75-750JFSS	"	.750"	"	"	0.39	0.59	1.05	$350 A
	75-412JFCASS	"	.412"	"	Copper Clad	0.74	1.08	1.81	$122 A
	75-500JFCASS	"	.500"	"	Aluminum	0.56	0.85	1.49	$160 A
	75-750JFCASS	"	.750"	"	"	0.39	0.59	1.05	$324 A
	75-1000JFCASS	"	1.000"	"	"	0.31	0.47	0.90	$651 A
PARAMETER II									
	75-412JFCASS	"	.412"	"	"	0.64	0.96	1.62	$132 A
	75-500JFCASS	"	.500"	"	"	0.51	0.75	1.31	$180 A
	75-750JFCASS	"	.750"	"	"	0.35	0.52	0.91	$355 A
GENERAL CABLE									
FUSED DISC	6948251	Aluminum	.412"	Dry Gas and	Copper Clad	0.60	0.88	1.53	$141 A
II	6948319	Tubing	.500"	Thermoplastic	Aluminum	0.50	0.76	1.27	$187 A
	6948376	"	.750	Discs	Solid Copper	0.32	0.49	0.84	$393 A
3800/3400	SERIES	"	1.000"	"	Optional	0.25	0.37	0.65	$659 A

MISCELLANEOUS PARAMETERS
TRUNK AND DISTRIBUTION CABLES

TYPE	COMPANY CODE	OUTER DIAMETER (INS)	WT PER KFT (LBS)	BENDING RADIUS (INS)	MAX PULLING FORCE (LBS)	SRL dB	D.C. LOOP RESISTANCE OHMS/KFT
CCS HATFIELD							
	44203	.492	106	4.5	150	28	3.24
	54203	.580	140	5.0	185	28	2.02
	74203	.830	272	7.5	420	28	0.92
CERRO CATV							
	1412S-SC	.520	123	4	140	30	2.30
	1500S-SC	.620	176	5	190	on	1.44
	1750S-SC	.890	390	8	420	req.	0.66
	1412S-CC	.520	113	4	140	"	3.25
	1500S-CC	.620	159	5	190	"	2.00
	1750S-CC	.890	351	8	420	"	0.95
CERROFOAM	2412S-CC	.522	101	5	165	"	2.35
	2500S-CC	.620	147	6	200	"	1.54
	2750S-CC	.890	325	9	415	"	0.68
	21000S-CC	1.160	493	12	725	"	0.39
COMM/SCOPE							
PARAMETER							
I	75-412JFSS	.512	128	4	150		2.16
	75-500JFSS	.600	168	4.5	190		1.46
	75-750JFSS	.850	361	7	420		0.68
	75-412JFCASS	.512	116	4	150		3.06
	75-500JFCASS	.600	144	4.5	190		2.03
	75-750JFCASS	.850	311	7	420		0.94
	75-1000JFCASS	1.10	646	8.5	490		0.52
PARAMETER							
II	75-412JFCASS	.512	116	7	150		2.54
	75-500JFCASS	.600	135	8	200		1.64
	75-750JFCASS	.850	308	10	420		0.72
GENERAL CABLE							
FUSED DISC	6948251	.670	70	5		30	2.15
II	6948319	.770	105	5		30	1.45
	6948376	1.05	230	7.5		30	0.61
3800/3400 SERIES		1.12	375	10		30	0.35

APPENDIX VI

SUMMARY OF

PERFORMANCE SPECIFICATIONS

FOR CATV DROP CABLES

PERFORMANCE SPECIFICATIONS FOR DROP CABLES

COMPANY TYPE	CODE	SHIELD TYPE	SHIELD DIAM	DIELECTRIC	OUTER DIAM	SHIELD EFF	WT PER KFT	MAX ATTENUATION dB/100' @ 68°F 50Mhz	108Mhz	300Mhz	PRICE PER KFT
SYSTEMS WIRE & CABLE (ANACONDA)											
COMPATH-5	5-1002FPE	Aluminum Tape	.146"	Cellular	.238"		24	1.83*	2.74*	4.60*	
	5-1003FPE	+40% Braid	.146"	Solid	.238"		26	2.32*	3.45*	5.80*	$48 C
COMPATH-6	6-1002FPE	"	.185"	Cellular	.285"		34	1.55*	2.30*	3.90*	
	6-1003FPE	"	.185"	Solid	.285"		36	1.97*	2.92*	5.00*	$62 C
COMPATH-7	7-1002FPE	"	.285"	Cellular	.407"		65	0.98*	1.47*	2.52*	
	7-1003FPE	"	.285"	Solid	.407"		71	1.33*	1.97*	3.40*	$125 C
COMM/SCOPE											
59 SERIES	ADS59PEF	Aluminum Tape +60% Braid	.176"	Solid Polyethylene	.242"	80	22	2.40	3.42	5.85	$34 A
68 SERIES	ADS68PE	Aluminum Tape	.210"	"	.265"	80	29	1.81	2.71	4.59	$35 A
	ADS 11	"		"	.405"	80		1.52	2.40	4.00	
	ADF 11	"		Expanded Polyethylene	.405"	80		1.24	1.56	2.80	
COPPERDROP	DP4000	Copper Braid Only	.146"	Solid Polyethylene	.242"		36	2.40	3.64	6.30	$46 A
CERRO CATV											
	59FT95SP	Aluminum Tape +95% Braid	.146"	Foam Polyethylene	.240"			1.70	2.50	4.25	
	M59FT50SP	Aluminum Tape +50% Braid	.146"	"	.240"			1.70	2.50	4.25	
	M59ST50SP	"	.146"	Solid Polyethylene	.240"			2.25	3.36	5.60	$46 C
	11FD95P	Double Braid 95%+90%	.285"	Foam Polyethylene	.405"			0.95	1.42	2.40	$196 C
	6FT4DP	Aluminum Tape +4 Drain Wires	.185"	"	.275"			1.40	2.20	3.55	$47 C

NOTES:

1.* These are nominal attenuation values rather than maximun.

2. Many other variations on the above typical cable types are available from most large manufacturers.

PERFORMANCE SPECIFICATIONS FOR DROP CABLES

COMPANY TYPE	CODE	SHIELD TYPE	SHIELD DIAM	DIELECTRIC	OUTER DIAM	SHIELD EFF	WT PER KFT	MAX ATTENUATION dB/100' @ 68°F 50Mhz	108Mhz	300Mhz	PRICE PER KFT
TIMES WIRE & CABLE											
ALUMIFOIL	2074	Aluminum Polypropelene	.147"	Foam Polyethylene	.237"	81	23	1.68	2.54	4.27	
	2060	Aluminum	.186"	"	.262"	81	28	1.35	2.05	3.46	
	2079	Tape	.147"	Solid	.237	81	24.5	2.22	3.34	5.62	
	2078	"	.186"	Polyethylene	.262"	81	29.5	1.77	2.69	4.52	
INDUSTRIAL WIRE & CABLE											
RG 59 TYPE IWT3159 DROP CABLE (Several Variations)		Aluminum Tape and Braiding	.173"	Solid Polyethylene	.235"			2.99	3.80	6.34	
CCS HATFIELD											
320 SERIES	11600	100% Aluminum Tape and 50%		Solid Polyethylene	.242"			2.48	3.76	6.70	$45 C
	22600	Aluminum		Foam	.242"			1.81	2.73	4.70	$48 C
	23600	Braid		Polyethylene	.285"			1.43	2.17	3.80	
BELDEN											
DUOBOND	9280	Bonded Alum.		Cellular	.242"	86		1.90*	2.80*	4.80*	$38 A
	9284	+61% Aluminum Braid		Polyethylene	.275"	86		1.50*	2.10*	3.55*	$56 A
DUOFOIL	9275	+40% Braid		"		79		1.90*	2.80*	4.80*	$32 A
	9301	+53% Braid		"		82		1.90*	2.80*	4.80*	$33 A

NOTES:

1.* These are nominal attenuation values rather than maximum.

2. Many other variations on the above typical cable types are available from most large manufacturers.