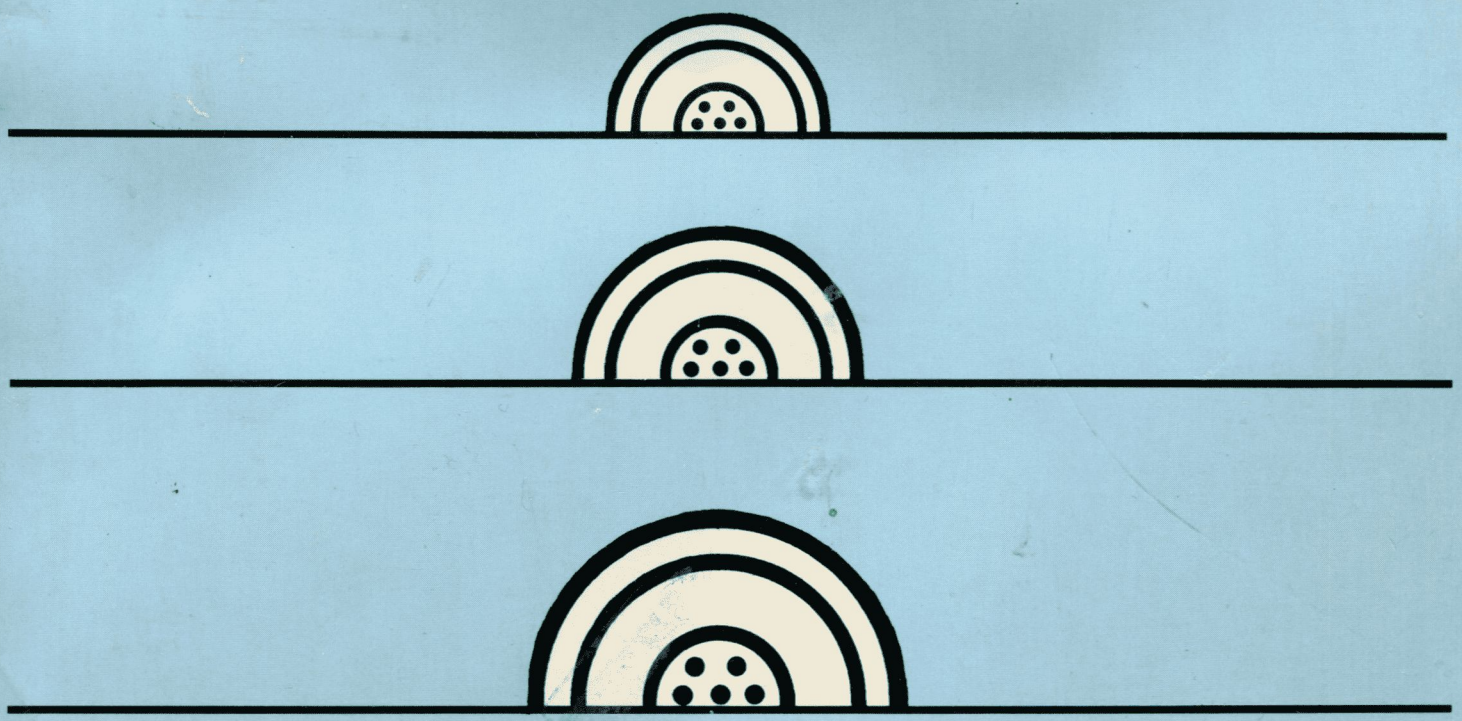
HOW TO BUY A TELEPHONE SYSTEM

A STEP BY STEP APPROACH



Richard A. Kuehn

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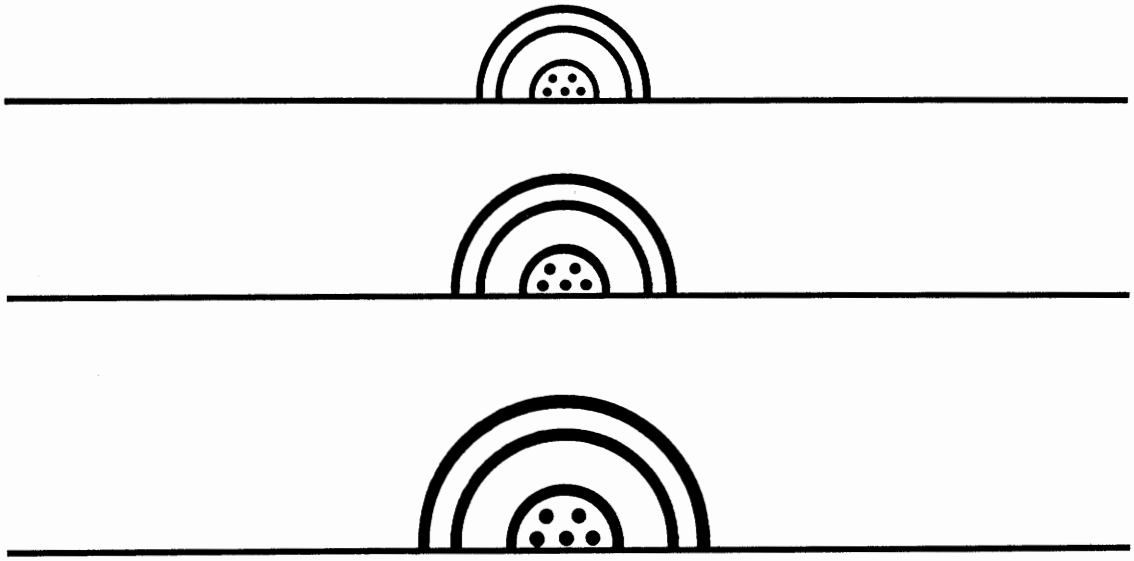

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Author's Foreword

This manual provides a solid introduction to the selection and purchase of a telephone system, useful for any business or a governmental agency. With the Divestiture of the Bell Operating Telephone Companies from ATT, it is virtually mandatory that a telephone system be purchased. Whether that purchase takes place from what has been viewed as a "interconnect company;" from the deregulated equipment marketing arm of ATT:IS (ATT:Information Systems); from the unregulated marketing arm of the RBOC (Regional Bell Operating Companies); or, the purchase of the existing utility leased system (known as "Embedded Base Equipment") from ATT. Purchase is unavoidable. Expenditures of hundreds, thousands and even millions of dollars can be at stake. The successful operation of the organization is at risk. Yet, in general, United States industry is ill prepared to take on this responsibility. It is the intention of this book to provide a foundation on which the individual responsible for this selection process may build a base leading to successful system acquisition and implementation.

The interconnect industry is slightly under sixteen years old. In those sixteen years the fledgling industry has sold and installed telephone equipment valued at over $10 billion. There is hardly a Fortune 500 company that hasn't "gone interconnect" with at least one telephone system. Several Fortune 500 companies are aggressively swapping out most of their telephone company provided systems, or installing private systems in brand-new space. These Fortune 500 companies are often finding their investments in telephone systems are among the best they can make in today's era of telecommunication uncertainty. Increasingly new vendors are entering the market with advanced products designed to integrate the entire Office Automation function. The selection ranging from simple voice switching systems to fully integrated voice/data systems will have a profound effect on office automation for years to come.

The communication industry, as we define it in this manual, produces, distributes, sells and installs three types of telecommunications equipment or systems. These three types are:

1. Voice telephone systems - key systems, PABXs (Private Automatic Branch Exchanges) and "hybrid" (combination key/PABX telephone systems.)
2. Data transmission equipment.
3. Telephone usage control devices.

This manual will focus on the selection and purchase of voice telephone systems. This consists of all telephone instruments and telephone switching equipment installed to serve a business or a government agency

and used primarily for voice transmission and switching. However, one cannot avoid examination of the potential integration of the telephone system into a single system carrying voice, data, and even pictorial, or video information. Truly, the possibility of a single system fully serving all the information transfer requirements of the organization must be viewed as a possibility.

This book will begin with the history of this still new industry and then move through the design, specification preparation, selection process and finish with the negotiation of the acquisition and maintenance contract. Many of the recommended points are the result of the author's experience with thousands of systems. It is hoped that this experience will help the novice and experienced buyer alike in reaching that goal of successful system selection.

Chapter One

The Carterfone Case

The story begins in the mid-1960s when Tom Carter, President of Carter Electronics of Dallas, Texas, began marketing a product known as the Carterfone. The Carterfone allowed users of privately owned mobile radios to be accoustically coupled to the telephone network. In that way a vehicle, remote from a land line telephone location, had access to the world. The original Carterfone was sold primarily to oil exploration and drilling companies to permit field engineers using mobile radios to communicate directly with corporate offices in distant cities. Bell did not offer a comparable device.

This is how the system worked: the oil engineer used the mobile radio unit to contact the local base station. The base station, by using the Carterfone device, placed the phone in a cradle device the exact opposite of a telephone. This "acoustically" connected the base station to the telephone line. In that way, the radio transmission was coupled to the land line and a conversation could take place over the total link.

At that time, typical telephone company Tariffs (a Tariff is the written rules and regulations under which a utility, in this case a telephone company, must provide all service. These Tariffs are generally written by the utility. However, they are subject to the approval of the appropriate regulatory body in each jurisdiction. These are known as the Public Utility Commission, Public Service Commission, etc. This regulation pertained to all intra-state offerings. Regulation of inter-state services was under the control of the Federal Communications Commission.) prohibited attaching to telephone company property any item not supplied by the telephone company itself. During that era, the author remembers prohibitions against such things as telephone directory covers and shoulder rests. In the early 1960's some major battles were fought over these items. Using this Tariff provision, the telephone companies threatened to disconnect the service of any customer using the Carterfone unit.

Carter Electronics responded to this challenge by taking the case to the Federal District Court in Texas. After lengthy hearings and appeals through the U.S. Supreme Court, the case was finally sent to the Federal Communications Commission in Washington, D. C. The Supreme Court had decided that the FCC had "prior jurisdiction."

In late 1968, after hearing extensive testimony by telephone utilities and others (by that time many other communications equipment manufacturers and industry organizations had intervened in the case), the FCC decided that while customer owned and maintained equipment could inject hazardous signals or voltages into the national telephone network, it directed American Telephone and Telegraph to file appropriate tariffs allowing customer owned and maintained equipment that was "privately beneficial and but not publicly detrimental" to be interconnected to the telephone

network. This "interconnection" was to be accomplished through a voice connecting arrangement or "interconnect device."

These tariffs, made as revisions to FCC Tariffs, became effective on January 1, 1969. The FCC decision, known as the "Carterfone Decision," and the new Tariffs filed by AT&T to comply gave rise to a multi-billion dollar industry that now enjoys annual sales of over $100 million a year. Until 1979, connection of privately-owned equipment to the telephone company network was achieved through a VCA (Voice Connecting Arrangement) leased to the user by the telephone company. This device was alleged to provide necessary protection to the nationwide network from customer-induced, harmful signals. But in 1979 the FCC created a series of standards for connecting phone equipment directly to the nationwide network without using VCAs. This is known as Rule 68. It provides for direct connection to the network using certified installation and manufacturing processes.

Today, protection to the telephone network can be provided in two ways. The first: those systems installed prior to the FCC 1979 certification ruling, require either the installation of certified Voice Connecting Arrangements purchasd outright from an outside supplier or the modification of the existing PABX or key telephone system. This modification normally involves the installation of new trunk units. Either of these items carry some cost from the vendor. However, in either instance it's preferable (financially) to continuing to rent Voice Connecting Arrangements from the telephone company. Today, telephone systems are manufactured and installed in accordance with FCC Rule 68. They are directly connected eliminating the VCA problem and cost.

Because these VCA units carried a relatively (i.e., $6.00 to $7.00 per month per outside business line) cost, their removal made the small system replacement market (those systems under 20 telephones) viable. While systems supplied and installed today are usually type approved, it is necessary when connecting any equipment to telephone company circuits to provide the operating telephone company with the FCC Certification number and the Ringer Equivalency number. In a typical single line telephone instrument, directly connected to telephone company lines, this is normally found on the bottom of the instrument. In the case of telephone system this is normally supplied by the vendor.

During this same time frame, two other events started in 1975 and 1974, respectively, were slowly grinding their way toward the creation of the telecommunication industry as it exists today. These were the Federal Communication Commission Computer Inquiry II and the anti-trust case: U.S. Department of Justice vs. ATT.

The first of these, CI II, was originally initiated by the FCC in an attempt to distinguish the difference between "communications" and "data processing." As a result of a previous anti-trust case, ending with a Consent Decree in 1956, ATT was prohibited from engaging in any business which was not "common carrier communications." Yet, it was realized that

the data processing industry and telecommunications were rapidly moving together on a collision course. Therefore, it was felt necessary to attempt to define these two areas. In April of 1980, the FCC issued their surprising order in conjunction with Computer Inquiry II. The major thrust of that Order was to allow ATT to engage in any business other than common carrier communications through a Fully Separate Subsidiary. This quickly became known in the industry as an FSS. At the same time, effective January 1, 1983, the Operating Telephone Companies were prohibited from providing new telephone systems and equipment, or expanding existing systems unless the provided components were available from existing inventory. To fill this marketing void, the ATT sales entity known as Information Systems (originally known as American Bell Incorporated) was created. Under the terms of the FCC order, the Operating Telephone Companies would become the provider of dial tone, or Central Office connections. They quickly became known as WACCOs (Wire And Cable Companies). Thus, with the provision of all new telephone systems in a purchased environment "interconnect" was dead and the telecommunication manager faced a new era.

Simultaneously, the anti-trust case was slowly working its way through the judicial system. In January of 1982, in a second surprise move, ATT and the U. S. Department of Justice agreed to settle this case with a Consent Decree. This ultimately became known as the MFJ (Modified Final Judgement) as this was done through a modification of the previously mentioned 1956 Consent Decree. While Computer Inquiry II became known as "Deregulation" this MFJ became known as "Divestiture." This is because under the terms of the settlement, ATT was required to "divest" themselves of their existing 22 Operating Telephone Companies.

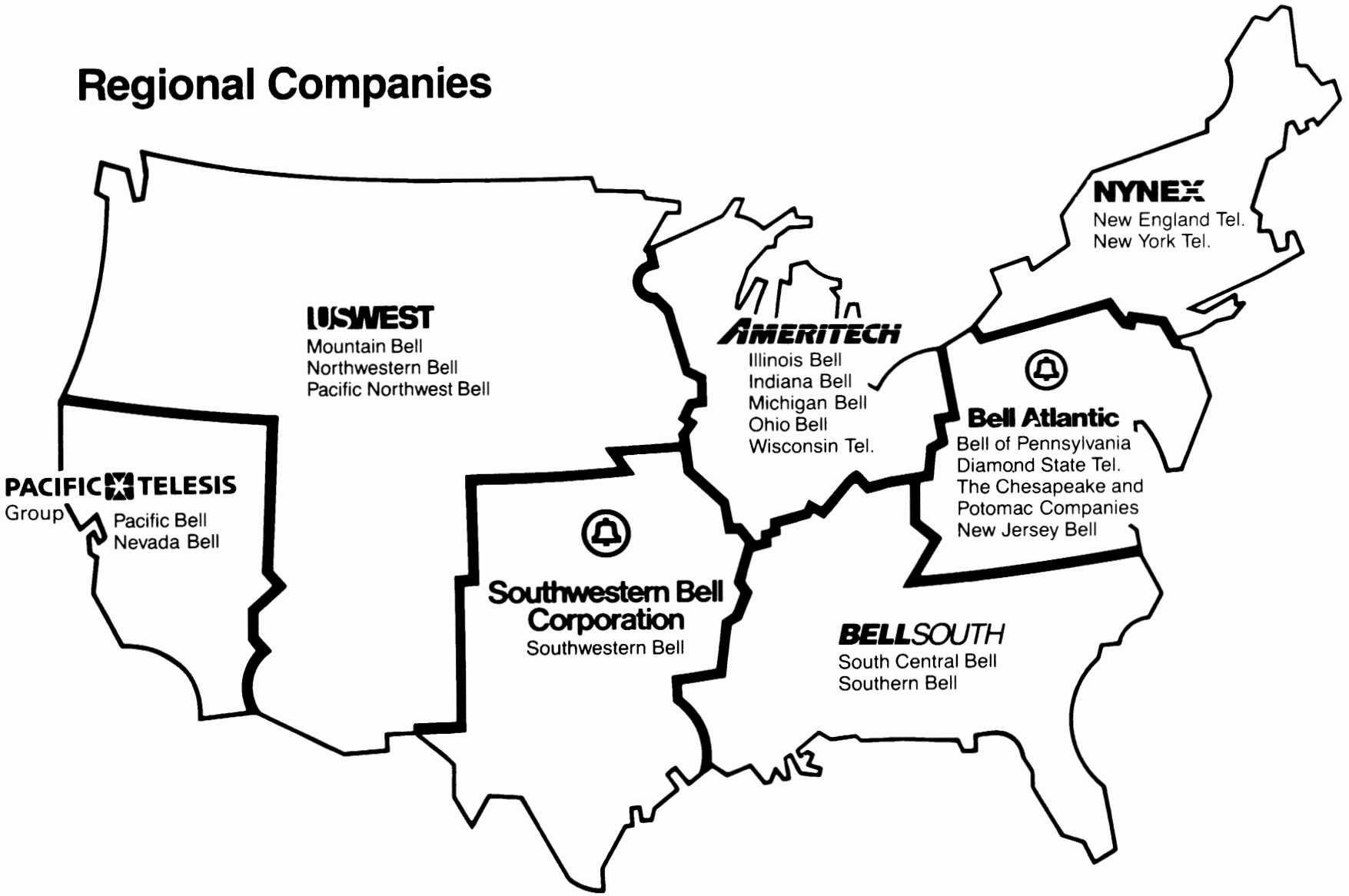
While this Divestiture could have been termed a "surprise" the major surprise was the fact that the final terms of the MFJ allowed the Regional Bell Operating Companies to again offer customer premise telephone equipment. Its only proviso being that the RBOC was restricted from owning a manufacturing entity and must provide this equipment through a separate and unregulated entity. Thus, a third major player is introduced to the telecommunication manager. The only restriction, placed upon that player, was that they could not enter the market until January 1, 1984. This did leave a one year void. And, with the transfer of the Embedded Base to ATT, these new competitors were entering from "ground zero." This placed the telecommunication manager in the position of having three possible providers of telephone systems:

1. The interconnect company.
2. ATT:Information Systems.
3. The local Operating Telephone Company from a separate, deregulated subsidiary.

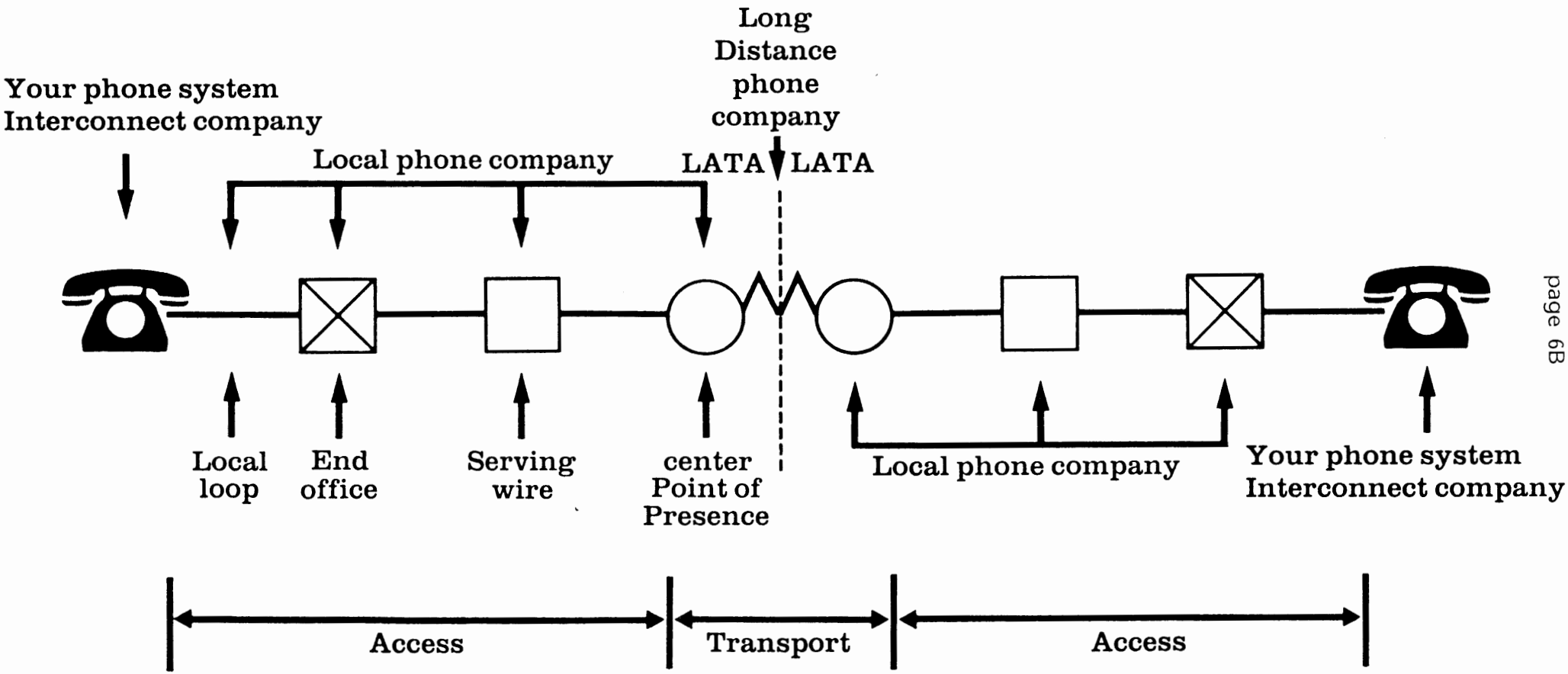
Therefore, "interconnect" was dead and all system procurement was placed in a deregulated (i.e., not subject to regulatory body scrutiny as to service offerings, performance, customer support or prices) environment. Granted, systems are still available on a lease/purchase or operating lease environment. However, both of these differ from the traditional telephone company lease in that financing is provided by a third party. In the former case, ownership of the system is secured at the conclusion of the lease/purchase payments and in the latter case, a "fair market value" buy-out clause exists in the operating lease environment. Neither of these ownership options were available from the traditional telephone company offerings.

Most recently a number of large real estate developers have re-entered the communication system leasing business. In conjunction with their rental properties they are endeavoring to offer leased telecommunication service to their tenants. The overall concept of this shared or "tenant service" is to provide a combination of lower cost and more sophisticated services than could be afforded by the individual tenant. This promises to be an area which will increasingly be offered to the telecommunication manager and, therefore, must be evaluated. Because of the lack of Regulatory Body protection in these offerings the evaluation process of both system manufacture, features and vendor stability/support must be conducted. In addition, contracts protecting the end user must be negotiated. Perhaps, the most ironic part of this concept is the fact that the so called "outside vendor" is proposing on-going equipment leasing while the operating telephone company is now in the position of proposing in equipment sale. Thus in just 13 short years one portion of the industry has done a complete 180 degree change.

Regional Companies



Who's Responsible For What



Chapter Two

Network Connection

While telephone systems can be secured from the previously mentioned sources, in a deregulated environment, the Operating Telephone Companies are still responsible for providing connections to the world, or "dial tone." This connection to a PABX is done through a "trunk" (trunks convert switching systems to switching systems) and directly to a telephone instrument by a "business line." One conversation is possible per trunk or business line. While these are the ultimate connection of any telephone system, ranging from the single line resident telephone to the largest telephone system, this Operating Telephone Company will only be responsible for carrying calls on an intra-LATA (Local Access Transport Area) basis.

A LATA is a predefined geographic area (in many cases, several are found within a single state). In addition, the Operating Telephone Company will be responsible for carrying calls to the inter-LATA (whether for inter- or intra-state carriage) "Point of Presence" of the inter-LATA, or interexchange, carrier. Illustration two depicts these relationships. The major point of that illustration is to indicate the relationship of the three potential suppliers. The RBOC (Regional Bell Operating Company) is providing local service and "dialtone." They are also providing connection to both ATT:Communications and the Specialized or Resale Carriers serving the market (equal access must be provided by mid-1985). The equipment vendor is providing the key telephone system, single line instrument, PABX or resident's instrument. In the case of Centrex, while the instruments are provided by the deregulated vendor, the actual dialtone and switching capability is a tariffed item of the Operating Telephone Company. A further important point of recognition is that from a "purist" point of view, trunks connect switching systems to switching systems while "lines" connect telephone instruments to switching systems.

While this dual responsibility exists a single invoice is still received from the Regional Bell Operating Company. This is divided into the following general components:

1. Local Access and other basic regulated services (i.e. Touchtone, intra-LATA leased channels, etc.);
2. Intra-LATA calling (local message units and/or toll);
3. Equipment rental (if secured under the transfer of equipment arrangement to ATT);
4. Long distance or inter-LATA service.

With this fundamental understanding of the relationship between vendors, it is now possible to turn to the equipment itself.

TYPES OF CPE SYSTEMS AND SUPPLIERS

When you buy your own phone system it's typically referred to as "Customer Premise Equipment" -- thus CPE.

The industry produces, sells, and services two principal types of voice equipment. The first of these, is the "key telephone system". (KTS). While it can be placed behind large PABX systems, in this context, it is normally found in small offices. A key telephone system can range from as small as two Central Office lines and several telephones to as large as several dozen outside lines and eighty telephones. The new larger key systems can serve over 100 telephones. These systems ae typically called "Hybrid", because they are a cross between key systems and private automatic branch exchanges (PABXs).

Again the "purist" definition between a "hybrid key telephone system" and a "PABX" (Private Automatic Branch Exchange) is the method of accessing outgoing Business or Trunk lines. Access by depressing a button on the telephone, or simply lifting the handset on a single line telephone, providing direct connection would make the system a "key" telephone system and the access channel a line. Access by dialing a code would make it a PABX. Unfortunately, this distinction is rapidly disappearing as key telephone systems become larger and intrude on the PABX market. Increasingly on these key systems, access to outgoing facilities is secured by dialing an access code. This is possible because of the FCC Certification program. In that instance, it is possible for the manufacturer to specify the type of Certification requested. Once certified, irrespective of the method of access, the system is known as a "key" or "PABX" system. This does have a major affect on customer operating cost as in most jurisdictions. The monthly rental cost of the Central Office Access is lower for Business Lines used to connect key systems to the Central Office than for Trunks used with a PABX.

Before the need for the Voice Connecting Arrangements was eliminated it was virtually impossible to cost justify buying very small systems. This was because the high cost of the necessary telephone-company supplied VCAs deeply eroded much of the savings on the equipment purchase.

This is no longer true. Now, the greatest inhibiting factor to cost justification in a replacement key system installation rests in the cost of labor as a percent of the overall system price. Irrespective, acquisitions of small-sized systems, particularly for a new installation (as against a replacement installation), can be equally as cost-effective as larger PABX installations. The methods of investigation and vendor selection are identical to those for larger PABXs.

Key telephone systems can be provided in two types. The traditional type as has been provided for any number of years is the 1A2 type of equipment. This utilizes a Key Service Unit located adjacent to the instruments it

serves. Housed within that unit are Line Cards to provide the line features (i.e., hold, illumination, lamp flashing) for each line. These cards are provided on a one-per-line basis. Typical wiring between the Central Office or the PABX and the Key Service Unit is one pair of wires per discrete number. Typical wiring between the Key Service Unit and the telephone instrument is 25 pair of wires per six-buttons used on the instrument.

In the electronic or hybrid system wiring between the key controller (a replacement for the key service unit) and the Central Office or PABX is the same pair per number. The instrument typically requires two to four pairs of wires irrespective of the instrument size from controller to set. In some PABX systems, the electronic key telephone instruments are driven from the main switching system. In these cases, the controller is not required and the two to four pair requirement exists from instrument to switching system. If all telephone outlets are wired to accommodate this type of connection (a 2500 type instrument only requires a single pair) for a particular vendor's electronic key set at every telephone outlet, it is known as "uniform wiring."

Recently, so called "smart sets" have been appearing on the market. These are instruments designed to be used with older, electro-mechanical equipment or as direct connections to Central Office Business Lines. Using VLSI technology many of the features (i.e. hold, re-dial last number dialed, built in calculators, etc.) that are normally associated with the computer driven electronic key telephone or PABX system can be secured by the single line user. These also hold the promise of providing some enhancement of the features available to the Centrex user.

Larger than the key system is the PABX (private automatic branch exchange). In contrast to the key system, this system can consist of any number of telephone stations, central office or trunk lines, a dial intercommunication system and a wide array of features. PABX systems also involve the use of operator consoles to route all incoming calls to various telephone stations and may or may not include the Centrex-type features, such as Direct Inward Dialing. Do not become confused with the large quantity of various initials presented by various telephone system manufacturers. With the creation of this whole competitive industry, every manufacturer found it necessary to create "buzzword" initials to identify their product. Such terms as EPABX (Electronic Private Automatic Branch Exchange); CBX (Computer Branch Exchange); IBX (Information Business Exchange); ISX (Information Switching Exchange); etc. all ultimately evolve to one thing: will the system provide "dialtone" for the provision of telephone service.

The major distinction in the PABX market rests in the provision of Direct Inward Dialing service. With DID it is possible for an outside caller knowing the "NNX" (Central Office Number) and the discrete, 4-digit station number of the desired party to reach that individual by dialing the seven-digit number. This differs from the conventional PABX in that all

incoming calls are routed through the telephone operator.

In the DID environment, calls can reach the station user through two types of systems. The first of these is Centrex service which is still offered by the Regional Bell Operating Company. In that instance, the Centrex line, or "dial tone," is a tariffed offering and the switching equipment is actually located in the telephone company Central Office. (Centrex is an acronym for Central Exchange.) It is also possible to secure a PABX switching system, located on the Customer Premise which will provide the same Direct In Dial service. In order to secure this service, it is necessary that the Telephone Company be able to answer "yes" to the following questions:

1. Is the serving Central Office equipped with Direct In Dial service?
2. Are Direct In Dial trunks available? And in what quantity?
3. Are Direct In Dial numbers available? And in what quantity?

An affirmative answer to each of these questions together with sufficient quantities of trunks and numbers would indicate that Direct Inward Dialing could be provided if its provision is economically feasible. If the decision is made that such installation is economically feasible, it would be prudent to order the necessary facilities and numbers for installation at the time a system change is expected. This will insure that those facilities will not be lost to the requirements of some other customer.

Of the three potential sources of equipment supply, those could be further subdivided. One logical subdivision would be direct manufacturer represented sales offices versus a distributor network. Increasingly, this is being divided into a large and small system category. Major system suppliers, generally defined as those providing telephone systems over 200 stations, are increasingly moving toward direct distribution outlets. In this case, manufacturer owned sales outlets provide the marketing and service support for the system. A number of secondary suppliers, generally measured by market penetration, utilize local distributors. However, in this larger system market segment it could logically be expected over the "near term" that the major vendors will continue to secure control over their sales/service effort through acquisition of distributors or creation of factory offices.

In the smaller market (i.e., below 200 stations) distributors can remain reasonably active. This is because in the majority of cases, the potential of sophisticated integration of voice/data on a single system would not logically be expected during the anticipated seven year system life. In the market below 50 to 100 stations, one could logically expect this will evolve to a "telephone store" with installation and service arranged from a third party. Granted, there will continue to remain in the marketplace a certain quantity of "mom and pop" small system interconnect companies.

However, the cost of this small system sale will become increasingly burdensome on the marketing effort and, therefore, the cheaper telephone store method of distribution should become commonplace.

Finally, as the perception of the telephone system serving as a "interconnection node" for all information transfer throughout the organization's environment becomes more widespread, numerous new organizations will enter the telecommunication arena. Many of these are offering the so called "integrated office." The telecommunication manager must decide whether the incremental costs and risk of new market entrant, for this future potential capability, is worth the expenditure on a "if come" basis over the projected life of the telephone system. (Telephone system life is projected presently to be seven years. This is based on the fact that the Federal Communications Commission has allowed Operating Telephone Companies to depreciate customer premise telephone equipment on a 6.6 year schedule. Also to secure the full 10% Investment Tax Credit a 5-year system life must be used.)

As an alternative, at what would be a considerably lower cost, a simple voice system could be secured. Finally, with many of these new vendors it will be necessary to determine their ability to remain viable in the marketplace. In that sense, one must always remember that it is service and support, not technology, that ultimately brings "dialtone."

In all cases, before buying a telephone system you should thoroughly investigate the supplier's business (financial) stability and reputation for performance. This is a local situation. Because a vendor is responsive in City A will not guarantee the same level of service in City B. This requires telephone interviews and visits to customers of each potential vendor. This long term operating requirement cannot be overemphasized as the system must be kept working long after any perceived saving is forgotten.

In its early days, the interconnect industry was fraught with instability. Many companies came and went. With the advent of more manufacture controlled offices, some of this instability has disappeared. However, in the smaller system range, and as relates to distributors of any system, caution should still be exercised relative to the stability of both the local vendor and the manufacturer. In many cases this small system size, because of ease of entry, is more difficult to work in than are large systems.

There is no single criterion that can be applied universally in determining which system to purchase and from whom. The customer has a choice today he did not have a few short years ago. This choice can mean savings, for considerable economies can be realized over the long term. The purchase of any communication system, from any vendor, involves a series of "risks and rewards." "Risks" are both "you bet your job" and the ability for the organization to function. "Rewards" are the potential lower cost of service and improved functionality. Each case is separate and unique.

Some telephone systems will result in huge savings; others not so large. And some may make no sense at all. The purpose of this book is to help you find those savings -- if they exist.

Chapter Three

System Feasibility & Equipment Features

Before making a sizable investment in your own telephone system, you should carefully examine:

1. Projected telephone system growth
2. System economics - "Contestable" revenues
3. System traffic
4. Desired telephone system features

Let's take a detailed look at each of these basics.

PROJECTED TELEPHONE-SYSTEM GROWTH

The projected growth of the system involves two considerations:

(1) anticipating the number of telephone stations and trunk lines that will be required to adequately serve the organization's needs during the system's expected life (this involves both actual count and accommodation of calling traffic); and,

(2) establishing some certainty that the business will be using the equipment at the same location for a reasonable period of time. Normally it is necessary to project a purchased system to an operating and location life of a minimum of seven years.

It is possible to assure continued ability to accommodate future requirements through a system which will, as installed, meet the long-term forecasted growth needs, or through a "modular" system with growth capabilities at a guaranteed cost. The system size is usually established using the quantity of station lines as a basis. This is termed the "equipped" size. It is determined either through a count of existing lines, a review of new construction plans or a similar actual count.

Two other sizes must be established. The next of these is called "wired" size. This is the line size of the system several years hence. It is arrived at by using the established, or projected, annual growth compounded. The implication of the term "wired" is that it is only necessary to plug line or trunk cards into existing carriers, or shelves, to be equipped to the projected wired size.

The third, or final size is the "maximum" size. This is determined by using the previously established projected growth rate to compound a line size in year seven or ten (the expected system life). It is expected that it will be necessary to add shelves and equipment cabinets to reach this

size.

When dealing with the location life, it is generally not wise to project a life longer than the term of any present property or office space lease. Exceptions to this rule should be made only if the system "move cost" is anticipated in a long-range cash flow projection or lease renewals are considered certain. If the system is owned, the move of any system will usually have to be carried out over a "long weekend" if normal operations are to be maintained. If the system is large, a weekend move may be difficult, if not impossible. This is known as an "out of service move." It is fraught with danger as it is impossible to test the system at its new location prior to the move. The alternative to moving equipment is trading in existing equipment and simultaneous purchase of a new system. Since about 25 to 40 percent of the purchase price of a telephone system is installation cost, a sizable portion of the investment on the original system may have to be written off.

SYSTEM ECONOMICS

The purchase of a telephone system will involve a significant capital expenditure. For estimating or "ball park," purposes, the cost of an installed key telephone system wll be $600 to $850 per instrument depending upon the sophistication of the system (1A2 vs hybrid/electronic). The purchase of a Stored Program Control (i.e. modern) PABX system will be $900 to $1,100 per line range dependent upon sophistication, installation location and software flexibility. The newer "voice/data" offerings can cost as much as $1,600 per line when fully equipped. These prices include the complete installation of the system, from instrument through cable to switching system. If just a switching system is purchased, as in the case of replacement with continued use of existing instruments, the cost per line will be in the $500 to $600 per line, or number range.

The first step is to establish the approximate system line size at installation. This should closely approximate the present number of station instruments presently in use. The reader should note that this is the number of "instruments" rather than the number of "lines" or station numbers. In many systems, either due to lack of features or the desire to concentrate highly expensive Centrex lines, the number of instruments will greatly exceed that of working station numbers. In today's stored program control systems, it is much more common to find the quantity of working lines, or discrete telephone numbers, equaling the number of instruments installed. Multiplying this times the suggested "ball park" figures should result in a reasonably accurate (plus or minus 10%) estimated cost. This cost can then be compared to the "contestable revenue" involved in the system.

The contestable revenue is reached by securing from the local phone company a "Service and Equipment Record" (also called an SN-981, an AER, PCAP, Equipment Billing Record, the "green sheet" and other equally illogical names) from the local telephone company. This itemization lists all

equipment being billed by the telephone company. The installation of a system will not cause all this cost to disappear. You will still have to pay for directory listings, trunk lines connecting the system to the telephone company central office, leased channels to off-premise locations, direct in dial numbers, etc. The cost of all those items remaining after system replacement should be subtracted from the present monthly equipment cost to yield the "net contestable revenue" amount.

Under the new separated billing resulting from Divestiture, the billed equipment cost will be the "contestible revenue" and the Operating Telephone Company billed cost will be the "non-contestible revenue." However, presuming the continued availability of the equipment itemization, the pre-separation of these two numbers should not eliminate the requirement for reviewing the Equipment Itemization. Any telephone system contains a number of minor miscellaneous items. Such things as speakerphones, loud bells, headsets, automatic dialers, and similar devices will all carry an incremental cost in the purchase of any new telephone system. It will be necessary to itemize these in the system specification. To not do so will result in major system cost overruns. Therefore, it is mandatory, during a system specification process to include all of these minor, though expensive, items. If they are not included, a definite risk of underbudgeting exists. This is because if these items are not included in the specifications they will still be necessary to complete the installation succesfully. These will represent added cost to the contract when billed as extras. Extras raise contract prices.

It is then necessary to determine the estimated acquisition cost. The established, equipped line quantity multiplied by the previously mentioned figures will yield a reasonably accurate estimated cost. If specialized items such as self-processing station message detail recording systems, automatic call distribution, etc. are included in the specification, their cost should be added to this calculated estimate. If the estimated purchase price divided by the "contestable revenue" equals a simple 48 month or less simple "breakeven," it is worth pursuing the acquisition of the new telephone system.

Increasingly, with the possibility of the purchase of telephone systems now being 16 years old, existing systems are being replaced. Obviously, it is easy to replace those systems that have been outgrown for one reason or another or for which service, or parts availability, is becoming an increasing problem. However, as time passes, it will also become increasingly difficult to justify the change or acquisition of a new telephone system based upon the displacement of "contestible revenue." After the first system purchase, "contestible revenue" no longer exists. Again, systems can be easily replaced because of growth or service problems. However, as these systems potentially become the hub of an integrated office information system, these justifications must also be done on a totally, or in part, productivity improvement basis.

At this time, the entire telecommunication management industry is beginning

to "feel its way" in this type of justification. However, one thing can be assured: the previously mentioned 48-month breakeven point justified against "hard dollars" will be materially reduced as "soft dollar" savings are projected. Management has been historically skeptical of portrayed soft dollar saving in the acquisition of any capital expenditure. Thus, it would be expected that as the increased use of these soft dollars is portrayed for system acquisition, the portrayed breakeven point will be reduced. It would not be surprising to see this reduced to as low as something under 24 months.

SYSTEM TRAFFIC

One of the more difficult aspects of system design and selection involves the traffic, or call-handling, capability of the system. (It is not the intent of this book to be an in depth review of traffic engineering. For further depth see the bibliography of Recommended Readings at the back of this book.) In brief, management must establish the adequacy of existing trunk or business lines to handle the probable simultaneous volume of incoming and outgoing calls. This involves establishing the ratio of trunk lines to telephone stations. The present quantities can be determined from the previously mentioned Equipment Record. These should then be projected against planned or probable increases in the number of stations as a measure of the long-range ability of the system to accommodate the trunk lines to and from the outside world. This long range system growth is normally projected in three size ranges:

1. Equipped: is the quantity of stations and trunks expected to be working at the time of system installation.

2. Wired: is the quantity of stations and trunks expected at some future date. This is normally projected to be two years after installation. The implication of the term "wired" is that all cabinetry, carriers and other common equipment will be provided at the time of installation. Therefore, to reach the "wired" size, it will only be necessary to plug-in station line and trunk cards.

3. Maximum: is the quantity of stations and trunks expected at the systems maximum size. Present systems are generally viewed, because of FCC depreciation direction as having a seven-year life. Therefore, this would be the maximum quantity of stations and trunks expected during the seven-year life of the system.

Economies of scale are achieved as the rotary, or hunting, size of the trunk group increases. Proportionate increases of trunks to stations should not be expected.

It is possible to project the quantity of trunk lines required for an expanded system or the previously mentioned wired and maximum sizes using ratios determined from typical telephone traffic engineering tables. For example, assume that a review of the Equipment Record indicates that the present telephone system contains 200 working station lines and 15 incoming trunk lines. It is expected that the size of the system will grow to 400 stations. This 400 could be either the equipped size of an expanded system to be installed, or the projected wired or maximum sizes. Logic would say that a doubling of station line would require a doubling of the incoming trunk line quantity. However, using the previously mentioned table to establish a ratio, it is possible to illustrate the economies of scale found in larger trunk groups and also to project the quantity of trunk

lines necessary at the 400 stations.

For this purpose, it is important to emphasize that the trunk design in this manner is not designing a specific level of service. Rather, this exercise is designed to duplicate the existing level of service, irrespective of how good or how bad it is. The first step the designer must take is to select a specific traffic table. Any table may be selected. However, once selected that table cannot be changed for the calculation projection. Turning to the enclosed table, Table 10 will be selected. This would indicate that if the system was providing a P01 level of service (1% busy signal rate in Busy Hour or 10/1000) on 15 trunks, a total of 269 CCS could be expected. Dividing that number by the known 200 stations, a CCS per line load of 1.35 CCS per line on incoming trunks could be expected. Projecting this to 400 stations, a CCS load of 540 CCSs or 26 trunks (rounding is up) could be required. That is:

	Present 200	Projected 400
CCS @ P01 (Table 10) 15 Trunks	269	
No. of Stations	200	
CCS per line	1.35	1.35
No. of Stations		× 400
Projected CCS		540
Trunks from Table 10		26

Thus, while the quantity of stations lines have increased 100%, the quantity of trunks has only increased 73%, yet the same service level has been maintained. This also illustrates the previously mentioned economies of scale found in larger trunk groups.

Each separate traffic carrying group of the system must be traffic engineered. These individual items are defined as those things having a commonality. For example, the incoming trunk group must be engineered separately from the outgoing trunk group. If the system is equipped with Direct Inward Dialing, it must be determined whether the operator's console will be reached through the direct in-dial trunks or on a separate trunk group. The simplist design is to have the Listed Directory Number (LDN) be reached through the DID trunk group. This eliminates the engineering problems and system rearrangements necessary as the direct to in-dial ratio increases and maximizes the trunk economy of scale.

This combination of the LDN into the DID trunk group does have the advantage of reducing trunk costs. At the same time it does create a certain degree of vulnerability. During a system failure, it would be impossible to reach the organization on any of the Direct In Dial trunks. Therefore, to provide some security, the LDN could be installed utilizing the quantity of Central Office trunks required to handle calls arriving at the organization through the switchboard. In that instance, those trunks could be equipped with power failure transfer relays. Those relays would

Appendix A. Poisson Distribution Tables, 1–100 Lines to P10

Hundred Call Seconds and Percent Use at Various Service Levels for Group Sizes of 1 to 50

The table number indicates the number of calls per 1000 encountering all equipment in the group busy

Trunks	Table 1		Table 5		Table 10		Table 20		Table 30		Table 40		Table 50		Table 60		Table 70		Table 80		Table 90		Table 100		Trunks
	CCS	% Usage	CCS	% Usage	CCS	% Usage	CCS	% Usage	CCS	% Usage	CCS	% Usage	CCS	% Usage	CCS	% Usage	CCS	% Usage	CCS	% Usage	CCS	% Usage	CCS	% Usage	
1	.1	.1	.2	.5	.4	1.0	.7	2.0	1.1	3.1	1.5	4.2	1.9	5.1	2.2	6.2	2.6	7.3	3.0	8.3	3.4	9.4	3.8	10.5	1
2	1.6	2.3	3.7	4.8	5.4	7.5	7.9	10.9	9.7	13.5	11.3	15.7	12.9	17.9	14.2	19.7	15.5	21.7	16.8	23.3	18.0	25.0	19.1	26.7	2
3	6.9	6.4	12.2	11.3	15.7	14.5	20.4	18.9	24.0	22.2	26.9	24.9	29.4	27.2	31.7	29.4	33.9	31.4	35.9	53.3	37.8	35.0	39.6	36.7	3
4	15.4	10.7	24.2	16.8	29.6	20.6	36.7	25.5	41.6	28.9	45.7	31.8	49.1	34.1	52	36.1	55	38.3	58	40.3	60	41.7	63	43.9	4
5	26.6	14.8	38.9	21.6	46.1	25.6	55.8	31.0	61.6	34.2	66.6	37.0	70.9	39.5	75	41.7	78	43.3	81	45.0	85	47.2	88	48.9	5
6	40.0	18.5	55.4	53.7	64.4	29.8	76.0	35.2	82.8	38.3	89.3	41.3	94.1	43.5	99	45.8	103	47.8	107	49.4	110	50.8	113	52.2	6
7	54.7	21.7	73.4	29.1	83.9	33.3	96.8	38.4	105	41.7	112	44.4	118	46.8	123	48.9	128	50.8	132	52.5	136	53.9	140	55.6	7
8	70.9	24.6	92.5	32.1	105	36.5	119	41.3	129	44.8	137	47.6	143	49.7	149	51.7	154	53.6	159	55.2	163	56.7	168	58.3	8
9	88.2	27.2	113	34.9	126	38.9	142	43.8	153	47.2	162	50.0	169	52.2	175	53.9	181	56.8	186	57.5	191	58.9	195	60.3	9
10	107	29.7	134	37.2	149	41.4	166	46.1	178	49.4	188	52.2	195	54.2	202	56.1	208	57.6	214	59.4	219	60.8	224	62.2	10
11	126	31.8	156	39.4	172	43.4	191	48.2	204	51.5	214	54.0	222	56.1	230	58.1	236	59.7	242	61.1	248	62.5	253	63.9	11
12	145	33.6	178	41.2	195	45.1	216	50.0	230	53.3	240	55.6	249	56.9	258	59.7	264	61.1	270	62.5	277	64.2	282	65.3	12
13	166	35.5	201	42.9	220	47.0	241	51.5	256	54.7	267	57.1	277	59.2	286	61.1	292	62.5	299	63.9	306	65.3	311	66.4	13
14	187	37.1	224	44.4	244	48.4	267	53.0	283	56.1	295	58.5	305	60.5	314	62.2	321	63.6	328	65.0	335	66.4	341	67.8	14
15	208	38.5	248	45.9	269	49.8	293	54.3	310	57.4	322	89.6	333	61.7	342	63.3	350	64.7	357	66.1	364	67.6	370	68.6	15
16	231	40.0	273	47.4	294	51.1	320	55.6	337	58.5	350	60.8	362	62.9	371	64.4	379	65.8	387	67.2	394	68.3	401	69.7	16
17	253	41.3	297	48.5	320	52.3	347	56.7	365	59.6	378	61.8	390	63.7	400	65.3	409	66.9	416	68.1	424	69.2	431	70.6	17
18	276	42.6	322	49.7	346	53.4	374	57.7	392	60.5	407	62.8	419	64.7	429	66.1	438	67.6	446	68.9	455	70.3	462	71.4	18
19	299	43.7	347	50.7	373	54.5	401	58.6	420	61.4	436	63.8	448	65.5	458	66.9	468	68.3	476	69.7	485	70.8	492	71.9	19
20	323	44.9	373	51.8	399	55.4	429	59.6	449	62.4	465	64.6	477	66.3	488	67.8	498	69.2	506	70.3	516	71.7	523	72.8	20
21	346	45.8	399	52.8	426	56.4	458	60.6	478	63.2	494	65.3	507	67.1	517	68.3	528	69.7	537	71.1	546	72.2	554	73.3	21
22	370	46.7	424	53.5	453	57.2	486	61.4	507	64.0	523	66.0	536	67.7	547	69.2	558	70.6	567	71.7	577	72.8	585	73.9	22
23	395	47.7	451	54.5	480	58.0	514	62.3	536	64.7	552	66.7	566	68.4	577	69.7	589	71.1	598	72.2	607	73.3	616	74.4	23
24	419	48.5	477	55.2	507	58.7	542	62.8	564	65.3	582	67.4	596	69.0	608	70.3	619	71.7	629	72.8	638	73.9	647	75.0	24
25	444	49.3	504	56.0	535	59.4	571	63.4	593	65.9	611	67.9	626	69.6	638	70.8	650	72.2	660	73.3	669	74.4	678	75.3	25
26	469	50.1	531	56.7	562	60.1	599	64.0	623	66.6	641	68.5	656	70.1	669	71.4	680	72.8	691	73.9	700	74.7	710	75.8	26
27	495	50.9	558	57.4	590	60.7	627	64.5	652	67.1	671	68.9	686	70.6	699	71.9	711	73.1	722	74.2	731	75.3	741	76.1	27
28	520	51.6	585	58.0	618	61.3	656	65.1	682	67.7	701	69.6	717	71.1	730	72.5	742	73.6	753	74.7	763	75.6	773	76.7	28
29	545	52.2	612	58.6	647	62.0	685	65.6	711	68.1	731	70.0	747	71.6	761	72.8	773	74.2	784	75.0	794	76.1	805	77.2	29
30	571	52.9	640	59.3	675	62.5	715	66.2	741	68.6	762	70.6	778	72.0	792	73.3	804	74.4	815	75.6	826	76.4	836	77.5	30
31	597	53.5	667	59.8	703	63.0	744	66.7	771	69.1	792	71.0	809	72.5	823	73.6	835	74.7	846	75.8	858	76.9	868	77.8	31
32	624	54.2	695	60.3	732	63.6	773	67.1	801	69.5	822	71.4	840	72.9	854	74.2	867	75.3	878	76.1	890	77.2	900	78.1	32
33	650	54.7	723	60.8	760	64.0	803	67.6	831	69.9	852	71.7	871	73.3	885	74.4	898	75.6	909	76.4	922	77.5	932	78.3	33
34	676	55.2	751	61.4	789	64.5	872	68.0	861	70.3	883	72.1	902	73.7	917	75.0	930	76.1	941	76.9	954	78.1	964	78.9	34
35	703	55.8	779	61.8	818	64.9	862	68.4	891	70.7	913	72.5	933	74.1	948	75.3	961	76.4	973	77.2	986	78.3	996	79.2	35
36	729	56.3	807	62.3	847	65.4	892	68.8	922	71.1	944	72.8	964	74.4	979	75.6	993	76.7	1005	77.5	1018	78.6	1028	79.3	36
37	756	56.8	836	62.8	878	65.8	922	69.2	952	71.5	975	73.2	995	74.7	1011	75.8	1024	76.9	1037	77.8	1050	78.9	1060	79.6	37
38	783	57.3	864	63.2	905	66.2	952	69.6	982	71.8	1006	73.5	1026	75.0	1042	76.1	1056	77.2	1069	78.1	1082	79.2	1092	79.7	38
39	810	57.7	892	63.5	935	66.6	982	69.9	1013	72.1	1037	73.9	1057	75.3	1074	76.5	1087	77.5	1101	78.4	1114	79.4	1125	80.1	39
40	837	58.1	921	64.0	964	66.9	1012	70.3	1043	72.4	1069	74.2	1088	75.6	1105	76.8	1119	77.8	1133	78.7	1146	79.6	1157	80.4	40
41	865	58.6	950	64.4	993	67.3	1042	70.6	1074	72.8	1099	74.4	1120	75.9	1137	76.9	1151	78.1	1165	78.9	1178	79.8	1190	80.6	41
42	892	59.0	979	64.7	1023	67.7	1072	70.9	1104	73.0	1130	74.7	1151	76.1	1168	77.2	1183	78.3	1197	79.2	1210	80.0	1222	80.8	42
43	919	59.4	1008	65.1	1052	68.0	1103	71.3	1135	73.3	1161	75.0	1183	76.4	1200	77.5	1215	78.5	1229	79.4	1243	80.3	1255	81.1	43
44	947	59.8	1036	65.4	1082	68.3	1133	71.5	1166	73.6	1192	75.3	1214	76.6	1232	77.8	1247	78.7	1262	79.7	1275	80.6	1287	81.3	44
45	975	60.2	1066	65.8	1112	68.6	1164	71.8	1197	73.9	1223	75.5	1246	76.9	1263	78.1	1279	78.9	1294	79.9	1308	80.8	1320	81.4	45
46	1003	60.6	1095	66.1	1142	69.0	1194	72.1	1228	74.2	1255	75.8	1277	77.1	1295	78.2	1311	79.2	1326	80.0	1340	80.9	1352	81.7	46
47	1030	60.9	1124	66.4	1171	69.2	1225	72.4	1259	74.4	1286	76.0	1309	77.4	1327	78.4	1343	79.4	1358	80.3	1373	81.1	1385	81.9	47
48	1058	61.2	1153	66.7	1201	69.5	1255	72.6	1291	74.7	1317	76.2	1340	77.6	1359	78.6	1375	79.6	1391	80.5	1405	81.3	1417	82.0	48
49	1086	61.6	1183	67.1	1231	69.8	1286	72.9	1322	74.9	1349	76.5	1372	77.8	1390	78.8	1407	79.7	1423	80.7	1438	81.5	1450	82.2	49
50	1115	61.9	1212	67.3	1261	70.1	1317	73.2	1353	75.2	1381	76.7	1403	77.9	1422	79.0	1439	80.0	1455	80.8	1470	81.7	1482	82.3	50

Appendix A. (Continued)

Hundred Call Seconds and Percent Use at Various Service Levels for Group Sizes of 51 to 100

The table number indicates the number of calls per 1000 encountering all equipment in the group busy

Trunks	Table 1		Table 5		Table 10		Table 20		Table 30		Table 40		Table 50		Table 60		Table 70		Table 80		Table 90		Table 100		Trunks
	CCS	% Usage	CCS	% Usage	CCS	% Usage	CCS	% Usage	CCS	% Usage	CCS	% Usage	CCS	% Usage	CCS	% Usage	CCS	% Usage	CCS	% Usage	CCS	% Usage	CCS	% Usage	
51	1143	62.3	1241	67.6	1291	70.3	1348	73.4	1384	75.4	1412	76.9	1435	78.2	1454	79.2	1471	80.0	1488	81.1	1503	81.9	1515	82.5	51
52	1171	62.6	1271	67.9	1322	70.6	1374	73.6	1416	75.6	1444	77.1	1467	78.4	1486	79.4	1503	80.3	1520	81.2	1535	82.0	1548	82.7	52
53	1200	62.9	1301	68.2	1352	70.9	1410	73.9	1447	75.8	1475	77.3	1499	78.6	1518	79.6	1536	80.5	1553	81.4	1568	82.2	1581	82.9	53
54	1228	63.2	1330	68.4	1382	71.1	1441	74.1	1478	76.0	1507	77.5	1531	78.8	1551	79.8	1568	80.7	1585	81.5	1600	82.3	1614	83.0	54
55	1256	63.4	1360	68.7	1412	71.3	1472	74.3	1509	76.2	1539	77.7	1563	78.9	1583	79.9	1601	80.9	1618	81.7	1633	82.5	1646	83.1	55
56	1285	63.8	1390	68.9	1443	71.6	1503	74.6	1541	76.4	1571	77.9	1595	79.1	1615	80.1	1633	81.1	1650	81.8	1666	82.6	1679	83.3	56
57	1313	64.0	1419	69.2	1473	71.8	1534	74.8	1572	76.6	1602	78.1	1627	79.3	1647	80.3	1666	81.2	1683	82.0	1698	82.8	1712	83.4	57
58	1342	64.3	1449	69.4	1504	72.0	1565	74.9	1604	76.8	1634	78.3	1659	79.4	1680	80.5	1698	81.4	1715	82.1	1731	82.9	1745	83.6	58
59	1371	64.6	1479	69.6	1534	72.2	1596	75.1	1635	77.0	1666	78.4	1691	79.6	1712	80.6	1731	81.5	1748	82.3	1764	83.1	1778	83.7	59
60	1400	64.8	1509	69.9	1565	72.4	1627	75.3	1667	77.2	1698	78.6	1723	79.8	1744	80.8	1763	81.7	1780	82.4	1797	83.2	1811	83.8	60
61	1428	65.0	1538	70.1	1595	72.6	1659	75.5	1698	77.3	1730	78.8	1755	79.9	1777	80.9	1796	81.8	1813	82.6	1830	83.3	1844	84.0	61
62	1457	65.3	1570	70.3	1626	72.9	1690	75.7	1730	77.5	1762	78.9	1787	80.1	1809	81.1	1828	81.9	1845	82.7	1863	83.5	1877	84.1	62
63	1486	65.5	1599	70.5	1657	73.1	1722	75.9	1762	77.7	1794	79.1	1819	80.2	1842	81.2	1861	82.1	1878	82.8	1896	83.6	1910	84.2	63
64	1516	65.8	1630	70.7	1687	73.2	1752	76.1	1794	77.9	1826	79.3	1851	80.3	1874	81.3	1894	82.2	1911	82.9	1929	83.7	1943	84.3	64
65	1544	66.0	1660	70.9	1718	73.4	1784	76.3	1825	78.0	1858	79.4	1834	80.5	1907	81.5	1926	82.3	1944	83.1	1962	83.9	1976	84.4	65
66	1574	66.2	1690	71.1	1749	73.6	1816	76.4	1857	78.2	1890	79.6	1916	80.6	1939	81.6	1959	82.5	1977	83.2	1995	84.0	2009	84.6	66
67	1603	66.4	1721	71.3	1780	73.8	1847	76.6	1889	78.3	1922	79.7	1948	80.8	1972	81.8	1992	82.6	2010	83.3	2028	84.1	2042	84.7	67
68	1632	66.7	1751	71.5	1811	74.0	1878	76.7	1921	78.5	1955	79.9	1981	80.9	2004	81.9	2024	82.8	2043	83.4	2061	84.2	2076	84.8	68
69	1661	66.9	1781	71.7	1842	74.2	1910	76.9	1953	78.6	1987	80.0	2013	81.0	2037	82.0	2057	82.9	2076	83.6	2094	84.3	2109	84.9	69
70	1691	67.1	1812	71.9	1873	74.3	1941	77.0	1985	78.8	2019	80.1	2046	81.2	2069	82.1	2090	83.0	2109	83.7	2127	84.4	2142	85.0	70
71	1720	67.3	1842	72.1	1904	74.5	1973	77.2	2017	78.9	2051	80.3	2078	81.3	2102	82.2	2123	83.1	2142	83.8	2160	84.5	2175	85.1	71
72	1750	67.5	1873	72.3	1935	74.7	2004	77.3	2048	79.0	2084	80.4	2111	81.4	2134	82.3	2156	83.2	2175	83.9	2193	84.6	2209	85.2	72
73	1779	67.7	1903	72.4	1966	74.8	2036	77.5	2080	79.1	2116	80.5	2143	81.6	2167	82.4	2189	83.3	2208	84.0	2227	84.7	2242	85.3	73
74	1809	67.9	1934	72.6	1997	75.0	2067	77.6	2112	79.3	2148	80.6	2176	81.7	2200	82.6	2222	83.4	2241	84.1	2360	84.8	2276	85.4	74
75	1838	68.1	1965	72.8	2028	75.1	2099	77.8	2145	79.4	2181	80.8	2208	81.8	2233	82.7	2255	83.5	2275	84.2	2293	84.9	2309	85.5	75
76	1868	68.3	1995	72.9	2059	75.3	2130	77.9	2176	79.5	2213	80.9	2242	81.9	2265	82.8	2288	83.6	2308	84.3	2327	85.0	2342	85.6	76
77	1898	68.5	2026	73.1	2091	75.4	2162	78.0	2209	79.7	2245	81.0	2274	82.0	2298	82.9	2321	83.7	2341	84.4	2360	85.1	2376	85.7	77
78	1927	68.6	2057	73.3	2122	75.6	2194	78.1	2241	79.8	2278	81.1	2306	82.1	2331	83.0	2354	83.8	2374	84.5	2393	85.2	2410	85.8	78
79	1957	68.8	2088	73.4	2153	75.7	2226	78.3	2273	79.9	2310	81.2	2339	82.3	2364	83.1	2387	83.9	2408	84.6	2427	85.3	2443	85.9	79
80	1986	69.0	2118	73.5	2184	75.8	2258	78.4	2305	80.0	2343	81.3	2372	82.4	2397	83.2	2420	84.0	2441	84.7	2460	85.4	2477	86.0	80
81	2016	69.1	2149	73.7	2215	76.6	2290	78.5	2337	80.1	2375	81.4	2405	82.5	2430	83.3	2453	81.1	2474	84.8	2493	85.5	2510	86.1	81
82	2046	69.3	2180	73.9	2247	76.1	2322	78.7	2370	80.3	2408	81.6	2437	82.6	2463	83.4	2486	84.2	1507	84.9	2527	85.6	2543	86.2	82
83	2076	69.5	2211	74.0	2278	76.3	2354	78.8	2402	80.4	2440	81.7	2470	82.7	2496	83.5	2519	84.3	2541	85.0	2560	85.7	2577	86.3	83
84	2106	69.6	2242	74.1	2310	76.4	2386	78.9	2435	80.5	2473	81.8	2503	82.8	2529	83.6	2552	84.4	2574	85.1	2593	85.7	2610	86.3	84
85	2136	69.8	2273	74.3	2341	76.5	2418	79.0	2467	80.6	2506	81.9	2536	82.9	2562	83.7	2585	84.5	2607	85.2	2627	85.8	2644	86.4	85
86	2166	70.0	2304	74.4	2373	76.6	2450	79.1	2499	80.7	2538	82.0	2569	83.0	2595	83.8	2618	84.6	2640	85.3	2660	85.9	2678	86.5	86
87	2196	70.1	2335	74.6	2404	76.8	2482	79.3	2532	80.8	2571	82.1	2601	83.1	2628	83.9	2652	84.7	2674	85.4	2694	86.0	2711	86.6	87
88	2226	70.3	2366	74.7	2436	76.9	2514	79.4	2564	80.9	2604	82.2	2634	83.2	2661	84.0	2685	84.8	2707	85.5	2727	86.0	2745	86.6	88
89	2256	70.4	2397	74.8	2467	77.0	2546	79.5	2596	81.0	2636	82.3	2667	83.3	2694	84.1	2718	84.8	2740	85.5	2761	86.1	2778	86.7	89
90	2286	70.6	2428	74.9	2499	77.1	2578	79.6	2629	81.1	2669	82.4	2700	83.3	2727	84.2	2751	84.9	2773	85.6	2794	86.2	2812	86.8	90
91	2317	70.7	2459	75.1	2530	77.2	2611	79.7	2661	81.2	2702	82.5	2733	83.4	2760	84.3	2734	85.0	2807	85.7	2828	86.3	2846	86.9	91
92	2346	70.8	2490	75.2	2562	77.4	2643	79.8	2694	81.3	2735	82.6	2766	83.5	2793	84.3	2817	85.1	2840	85.8	2861	86.3	2880	86.9	92
93	2377	71.0	2521	75.3	2594	77.5	2674	79.9	2726	81.4	2767	82.6	2798	83.6	2826	84.4	2851	85.2	2873	85.8	2895	86.4	2913	87.0	93
94	2407	71.1	2553	75.4	2625	77.6	2706	80.0	2759	81.5	2800	82.7	2831	83.7	2859	84.5	2884	85.2	2907	85.9	2928	86.5	2947	87.1	94
95	2437	71.3	2584	75.6	2657	77.7	2739	80.1	2791	81.6	2833	82.8	2864	83.8	2892	84.6	2917	85.3	2940	86.0	2962	86.6	2981	87.2	95
96	2468	71.4	2615	75.7	2689	77.8	2771	80.2	2824	81.7	2865	82.9	2897	83.8	2925	84.6	2950	85.4	2973	86.0	2995	86.6	3014	87.2	96
97	2498	71.5	2646	75.8	2721	77.9	2803	80.3	2857	81.8	2898	83.0	2930	83.9	2958	84.7	2984	85.4	3007	86.1	3029	86.7	3048	87.3	97
98	2528	71.7	2678	75.9	2752	78.0	2836	80.4	2889	81.9	2931	83.1	2963	84.0	2991	84.8	3017	85.5	3040	86.2	3062	86.8	3082	87.4	98
99	2559	71.8	2709	76.0	2784	78.1	2868	80.5	2921	82.0	2964	83.2	2996	84.1	3024	84.9	3050	85.6	3073	86.2	3096	86.9	3116	87.5	99
100	2589	71.9	2740	76.1	2816	78.2	2900	80.6	2954	82.1	2996	83.2	3029	84.1	3057	84.9	3083	85.7	3107	86.3	3129	86.9	3149	87.5	100

directly connect the dialed Central Office trunks used for LDN service to specific telephone instruments in the event of a system failure. It should be noted that any power failure transfer relays associated with the telephone system should be equipped with manual override capability. There are cases where the system will fail while not activating the power failure relays.

While the above calculation dealt specifically with the incoming trunk group, each specific trunk group (i.e., incoming Central Office, Direct Inward Dial, each outgoing WATS Service Group, individual tie line groups, etc., etc.) must be engineered separately for their Busy Hour traffic loads. After each trunk group is designed all of the calls must pass through the common switching arrangement, the PABX. Thus, it is necessary to determine if the PABX will be able to carry the total traffic generated. This is the sum total of all the busy hour projected trunk traffic plus internal system calling.

The normal measurement used for indicating switching system traffic loads is in CCS (Centum, or 100, Call Seconds) per line at a given grade of service. For example, a switching system quoted as capable of handling 6.5 CCS per line at a P.01 grade of service indicates that each telephone instrument can be off-hook connected, in the Busy Hour, for a maximum of 650 seconds without exceeding a 1% busy signal rate. (650 seconds is 10.8 minutes.) In order to achieve this total number, it is necessary to add the total Busy Hour CCS load determined for each of the individual trunk groups plus busy hour internal traffic and divide that by the number of anticipated station lines. This will yield the CCS load per line. With this load per line, it is necessary to state the desired service level or busy signal rate. Generally, this is a P01 Grade of Service.

Historically, each system has been equipped with some predetermined number of traffic or conversation paths. To maintain a desired service level, the total anticipated CCS load cannot exceed the projected system traffic volume in CCSs. For example, if a 1% busy signal rate was desired on a system providing 64 simultaneous conversations, the sum total of Busy Hour traffic on all trunks and calls internal to the system could not exceed 1,687 CCS. See Table 10 on the Traffic Table.

Increasingly, systems are being advertised as "virtually;" "essentially;" or, "totally" non-blocking. This means that a conversation path is available for every potential port pair (station to station or station to/from trunk) pair. It would be extremely easy to simply specify a "non-blocking system." However, this abdication of traffic design carries with it, in many systems, a cost. For example, one manufacture°s system offered as "non-blocking" is capable of accommodating 50% more stations if conventional traffic levels in the 8 CCS load per line is used. In this case, to not review this possibility would result in the necessity of installing a larger processor at an increased cost of approximately $140,000. Therefore, traffic engineering cannot be abdicated to the "non-blocking eliminates the traffic engineering effort" syndrome.

Even when dealing in the "non-blocking" environment, traffic does become an issue. That issue simply transfers to the question of "Processor Occupancy" or "Real Time." Today's telephone systems are driven by computers. A computer is capable of processing a finite number of transactions or calls during any given Busy Hour. In addition to the processing of these calls, a certain portion of processor occupancy is taken up with the simple overhead of administering the telephone system. This area of Procssor Occupancy is by far the most complex of system evaluations as each discrete event, answering a call, transferring a call, speed calling, etc. requires a given number of processor milliseconds to be accomplished. Therefore, in order to actually determine processor occupancy, it is necessary to find the number of each discrete event taking place in the system in the Busy Hour. As a simpler method of evaluation, the manufacturer's "Auto Quote" normally states the anticipated Processor Occupancy. In most instances, a simple request for that information in the Request For Proposal should be sufficient for evaluation. However, it is expected in the future this will become more complex and something that the typical system evaluation will have to incorporate in greater detail.

Since this is not intended to be a treatise on traffic engineering, we strongly suggest that in larger systems, or those having highly complex traffic routing patterns, further research be done in books devoted to traffic engineering problems (see bibliography).

DESIRED SYSTEM FEATURES

Once these studies have been completed and present and future needs established, organizations considering the purchase of their own telephone equipment will want to consider what features are necessary to meet their particular requirements. Investigation of features usually begins with the PABX salesperson promoting the particular features of the system they represent. System features vary with the offerings of different manufacturers. In fact, the same feature with the same name can mean different things on different systems. The labels manufacturers attach to similar features also vary, a situation that confuses the prospective customer. This places the burden on the purchaser to understand exactly how each vendor's feature is defined and operates. In the specification process, the use of functional, rather than vendor specific, specifications allows the system designer to prepare a Request For Proposal that will permit the maximum number of vendors to respond. This functional specification and maximum number of responses is the opposite of the sales person's desire to be a sole source.

During the past several years, vendors have increasingly utilized proprietary telephone instruments as replacements for conventional, generic 1A2 multi-line or key telephone equipment. This does create some problem in the specification stage as it is virtually impossible to specify electronic key telephone equipment or its method of operation without creating a sole source specification. Therefore, in the instrument area,

conventional 1A2 key telephone equipment is specified and suggestions of vendor provided alternates for electronic equipment are made.

This is typical of the care which must be taken in preparing the specification. During the entire system selection process it is necessary to maintain the highest possible level of impartiality. First, rarely are the system requirements such that only a single vendor is capable of meeting them. Therefore, the ability to choose between a number of competing, viable local suppliers can only be a benefit to the telephone communication manager. Second, the sales person's method of compensation must be kept in mind. Simply, that is, to one degree or another, a commission incentive. Thus, any vendor that feels they are being unfairly treated may well "go over the telecommunication managers head" in a search for a friendly ear. In that environment they have absolutely nothing to lose and potentially a great deal to gain, called "commission." Should an "end run" of this type meet a receptive listener it is necessary that the communication manager be able to justify each point in the specification as either a mandatory requirement of the organization or as a requirement capable of being met by most suppliers. This is not to say that in those instances where real, logical reasons can be portrayed for requesting a specific, proprietary item that they should be eliminated from the specification. Rather, if such items are specified a requirement to defend that section of the specification should be anticipated.

Many features interact one with another. For example, call forwarding and call pick-up are cancelled when call queueing is activated. Thus, in this instance, call coverage becomes difficult in the absence of multi-line sets. However, at the same time the multi-line instrument will create some confusion when answering a call-back queued call. While it is adequate, and even time saving, to utilize the functional specifications, it is necessary that the final selection process incorporate an intimate understanding of the operation and interaction of all features on the telephone system. Features that are difficult to understand or operate are one of the surest ways to create user dissatisfaction with the new telephone system.

Several dictionaries or glossaries of system feature definitions are mentioned in the bibliography and are available from a number of sources. Therefore, it is not within the province of this manual to provide a dictionary. Rather, the next few pages will discuss the systems available and those features that are either unique to a particular system, present some particular design problem or are productivity improving. Later in the manual, a total functional specification will provide explanations of many of the standard features.

Today two types of key or multi-line systems can be found (this excludes those proprietary key telephone instruments provided as part of or driven by the PABX). The first of these is the historically available, generic 1A2 electro-mechanical key, or multi-line telephone equipment that has been available for years. This could either be used as backup equipment, for

line concentration, behind a traditional PABX or as stand-alone equipment in a typical small branch office. The heart of the system was a Key Service Unit. Typically, these were provided in 13-line frames. These frames were used to provide common power and support to "400" type cards. One of these cards was required to provide the features (i.e., lamping, hold, etc.) for each line served by the key telephone system. A typical six-button, or key instrument, was then connected to the key service unit by a 25-pair cable. A typical stand-alone system of that type will cost in the $550 to $650 per instrument range. That price is totally installed including cable.

While the acquisition cost is relatively low, the long term system operating cost can be viewed as relatively high. A system subject to consistent moves, changes and rearrangements (referred to in the industry as "churn") finds that the high labor intensitivity of the equipment is expensive to support. This is simply because every change or modification to a telephone instrument requires the onsite presence of an installation technician. This is in addition to the expense of the 25 pair, multi-conductor cable, its installation and the labor consumed in physically connecting that cable. Nevertheless, in those applications requiring few sets (generally less than 19) and not subject to the typical move and change "churn" the 1A2 equipment can provide a cost effective alternative.

Increasingly, electronic key telephone systems or "hybrid" systems have been replacing this electro-mechanical equipment. The hybrid system utilizes "uniform wiring." This can range from two to four-pair of wire connecting all stations on the system to the central controller. In this instance, the central controller is normally operated by a micro-processor. Typcally, both business lines and features are directly terminated on buttons located on the telephone instruments. Access to those Business Lines or WATS, etc. not terminated on the instrument is provided by a dial access code. These systems are increasingly reaching the proportions of a small PABX with systems in the 100 to 125 line capacity not uncommon.

This does present certain problems to the system designer. Typically, the advantage found in the key or multi-line system was the appearance of all incoming lines on every telephone instrument. While an attendant console could be provided with such features as a Busy Lamp Field and Direct Station Select Panel, it was still possible for all stations to answer incoming calls. This provided a flexibility of call coverage not found in the larger systems. Typically on those systems all lines do not appear on the attendant console. Therefore, it is necessary in those cases where the attendant is absent from the position to provide coverage. This was not true when all lines appeared on all instruments. At that point it was sufficient to say, "Would you please cover for me while I am gone." and that coverage could be provided from any desk in the organization. Without the appearance of all lines on the secondary instrument, it is necessary to move the relief to the attendant console. This would disrupt the work flow of the office. Therefore, key telephone systems, whether

electro-mechanical or electronic are typically installed to serve the below maximum 50 line instrument size with PABX systems installed to serve beyond that size. Those PABX systems do require an attendant console.

While a great number of station features are provided on these systems, those which should receive special attention from the designer are:

MULTI-LINE, OR KEY TELEPHONE FEATURES

Internal Channels: This is some quantity of internal or intercom paths. These paths can be all accessed from a single "intercom" button or on a "path per button" arrangement. It would be preferable to do this from a single button as it does eliminate one user step of selecting an available channel.
Dedicated Link for Attendant. Larger systems use an attendant console for answering incoming calls. In such systems a Dedicated Link makes certain an intercom path is always available for use in announcing incoming calls to the called parties.

Direct Station Selection: A phone user may dial someone else in the same office by simply pushing down one button on his phone. The one button corresponds to the intercom number of the person being called. This is usually associated with the Handsfree Answerback feature on the telephone instrument.

Handsfree Answerback: This is the most sophisticated form of intercom. The calling party, perhaps the receptionist, dials someone and says "Joe Smith is calling. Will you speak with him?" The called person hears the receptionists's words coming from his phone and he can talk without touching his telephone. His phone has a microphone and speaker built into it. In this case, several methods of protecting the station user from inadvertent eavesdropping should be provided. Normally, these are a speaker/microphone cutoff button and a tone to indicate when the microphone has been activated.

System Power Failure Ringing: In a normal key system, the power to separate the system is provided by the electric utility through a transformer in the key service or control unit. In the case of a power outage, or a blown fuse or tripped circuit breaker in the office, there would be no way to receive or place outside calls. To avoid this, a bell or several bells can be wired to ring directly from the telephone company power (usually no more than four bells per line). At additional cost, an emergency system can be installed with a relay that connects some instruments directly to the telephone company business lines when the system fails.

PABX FEATURES

The features found on the PABX (Private Branch Exchange) system are more abundant, often more glamorous, and occasionally more useful. To the

degree that we, as users, have accepted the proliferation of system features, we have become our own worst enemy relative to cost control. For example, the early days of "interconnect" a typical PABX cost $800 per line fully installed.

With the introduction of the computer for system control, both price and features offered have increased. So has system cost. Those systems typically cost in the $1,000 per line range. This cost can increase to $1,400 to $1,600 per line for "Office of the Future" systems providing fully integrated voice and data capability. In many cases, many users have purchased these added features blindly as "valuable". Many of the features such as Station Message Detail Recording (SMDR), Least Cost Routing and simultaneous voice/data transmission found in today's systems are viewed as ends in themselves. This could not be further from the truth. They are only tools allowing more effective management and operation of a limited communications systems. They are one part of a two part ingredient.

In telephone system management, the most important ingredient is not features, but rather top management's willingness to support the feature's use. It does little good to purchase a stored program control telephone system, with exotic features which reduce the quantity of key telephones, if key phones will be installed anyway. It's of no use to be able to identify apparently abusive or unnecessary long distance calling if management is unwilling to question and enforce calling standards. Least Cost Routing is of little value if toll, or long distance cost is negligible. Perhaps the greatest danger rests in the potential "voice/data" integration. This presupposes either a present requirement or one that will exist during the expected life of the telephone system. To spend the potentially large incremental add-on cost for this capability on the "if come" basis could be an imprudent expenditure of communication budget.

In fact, this rush to voice/data intergation could be one of the present major system selection errors. The statement that "our system can integrate voice and data" is too simplistic. In any system of size, a review of data communication applications will generally find four distinct types of users:

1. High Capacity/Wide Band: These are generally typified by processors or computers of one kind or another talking to other processors at speeds above 56,000 bits per second. In most cases, these processors occupy a fixed location (i.e., very rarely would equipment of this type be portable) and, therefore, could adequately be served by a hard-wire connection of some kind.

2. On-Line/Real Time: are typified by those terminals accessing a single database for the duration of the operating day. This direct connection is provided either because of the volume of input information or in order to

achieve a minimal response time to that information which is input. In either case, it would again seem more intelligent to serve these terminals using a hardwire connection and eliminate the necessity of providing switching capacity for this equipment.

3. The Terminal Farmer: This is an an individual having a requirement to access many different databases throughout the organization. Generally, the quantity of these is directly proportionate to the organization's involvement in distributed data processing. Nevertheless, that individual can be found with a number of terminals, each directly hardwired to an individual database, on the desk. Clearly, providing dial-up data services to each of the respective, distributed databases would result in a reduction in terminal cost and, therefore, be cost effective. This is the first individual that would find some advantage in that voice/data integration.

4. "The Great Unwashed User": This is the user that could turn up at any time with an acoustically coupled, slow-speed terminal or personal computer that would be connected to the telephone instrument. In that instance, the coupling device normally incorporates a modem (used to convert the business machine digital signals to analog signals for network transmission). Therefore, there is little reason to attempt to digitize this information at the handset. Thus, to attempt to provide voice/data capability at every instrument location can result in an expensive overkill.

Two further problems can be found with this simplistic voice/data integration. In many cases, a telephone instrument does not presently cohabit a data transmission location. For example, in a typical word processing environment, a number of input devices reach a central processing unit. However, there is not a telephone instrument associated with each input device. Rather, a telephone instrument is provided, if at all, for the word processing room. Secondly, with the cost of conventional modems, or data sets dropping, the incremental cost of providing a data set at those locations requiring transmission, rather than throughout the system, is equal to or less than the incremental cost of installing the alternate voice/data capability. Conversely, this integration does offer the advantage of eliminating the cost of installation of co-axial cable or separate wiring for data terminals. In that instance the integration would have an operating cost reduction effect. Therefore, extreme caution should be exercised before blindly assuming a requirement for this voice/data integration. To assume that could have the effect of materially increasing acquisition cost while reducing the possible vendor choices and, therefore, the competition.

Turning to those other features which provide the greatest potential problems in specification preparation, the system designer will have to consider:

Least Cost Routing: This is perhaps the most difficult to define and digest. This carries more potential different definitions than anyother vendor offered feature. In general, it will be specifically necessary for the designer to attempt to define the total quantity of routes necessary in the system. These routes must be specified on a six-digit basis. In other words, both the area code and exchanges for each route must be defined in order to determine the total quantity of routes required. This could require a detailed analysis of long distance service requirements prior to system specification.

In mid-1985 with the introduction of "equal access" to all of the Specialized and Resale Carriers, it will also be necessary for the system to be capable of inserting a four-digit preference route for every outgoing long distance call. This will have the effect of greatly increasing the quantity of memory required on any telephone system. One could simply specify a single "carrier of preference" for all calls. This would eliminate the least cost routing requirement. However, it is doubtful that any carrier will be the lowest cost to all destinations or that the level of service will be identical. Therefore, the ability to route any long distance call over a single trunk group with the four-digit routing code indicating the "carrier of preference" for that call will reduce the quantity of trunk lines required. This will not only decrease the monthly operating cost by the reduced quantity of trunk lines and their respective access charges, but it will also reduce the cost of switching system acquisition as fewer trunks must be terminated. Therefore, while no vendor can presently provide that feature it is still advisable to insert that in the specification and determine the potential vendor's response to that request and its applicable value to system operation.

It is expected that a future offering of the RBOC will be least cost routing based in the Central Office. Therefore, one could forgo least cost routing in the PABX. That will ultimately be an economic decision. However, with the introduction of virtual private lines (a tie line or Foreign Exchange line with wired connection to the Point of Presence and a usage sensitive charge on the inter-city portion of the call) and timed multi-message unit local calling, the least cost routing will take on new applications. These will probably be required in the PABX since they will be user specific.

Attendant Busy Lamp Field: When the attendant console is equipped with the attendant direct station selection, lamps are provided behind each station pushbutton. They indicate if the station is available or busy. Depressing the appropriate station button will then effect the call transfer. When the operator doesn't have direct station selection, the attendant busy lamp field is simply a special display providing illuminated station numbers for those stations that are busy. As such, it may or may

not be an integral part of the attendant console.

When the attendant busy lamp field if identified as either standard or optional, the busy verification-of-stations feature is identified in like manner. The term "gated" refers to larger systems which use only 100 lamps on the display panel. In that case there is a special key to "draw-up" the display for "200-299", "300-399" series of numbers etc. There is some question as to the value of Direct Station Select beyond 200 stations. In that case, it is first necessary for the attendant to make a separate operational step to "key up" the appropriate display. This could simply be more work in light of the fact that the attendant must still transfer that call.

Attendant Loops: In most systems, incoming calls to the Listed Directory Number are routed through the PABX to the attendant console. These can terminate on the console in two ways. The first of these is a switch loop trunk. A call routed through a switch loop attendant trunk occupies the attendant loop until the call is answered by the terminating station. In high trafficked systems, this can present a major problem. For example, every system has a limited number of attendant loops. In a high volume situation, using a typical system with six attendant switch loops, if the attendant has six calls in a camped-on, held, or being processed condition of any kind, it is impossible for a seventh call to reach the attendant console. This seventh call will simply ring-back to the called party. In many busy systems, this is the source of ring-no-answer complaints.

The alternative to this is to use Release Loop Trunks. Here, the loop is released, or freed, once the attendant transfers the call to a station. This is true even if the station has not answered. If the call is not answered in a pre-determined amount of time, it returns, or is recalled, to the console. Hopefully, this return indicates to the attendant the reason for the return and the station to which the connection was being attempted.

Call Forwarding-Busy Line: When the called station is busy, this feature automatically reroutes a call to a busy station to an alternate answer point.

Call Forwarding-Don't Answer: This is similar in function to the busy line version just described. Automatic rerouting to another answer point occurs when a given station does not answer within a prescribed time interval. The interval depends on the type of switching system, but it is generally around 18 seconds (3 rings). In some systems the time interval can be altered to suit individual needs. This is set on a system basis.

With some of these Call Forwarding features comes the capability to significantly reduce the quantity of key telephone equipment. It is possible to "cover" any line without installing that line on an instrument. A call reaching a busy line or unanswered station simply forwards to a designated station. While this can reduce the quantity of key telephone equipment, it also precludes the ability of screening or answering a call

by the individual's name.

The reduction is somewhat proportionate to the number of steps in the forwarding sequence. Two step forwarding, allowing a call to step from a primary line to secretary to message desk seems most satisfactory. In those cases where two or more step call forwarding is not provided, it is normally found that a larger quantity of multi-line telephones at an increased cost are required. Without the two-step capability, it is necessary to place a multi-line instrument at the secretary location for coverage and to forward from there to message desk.

Experience has indicated the elimination of the desire for screening will materially reduce the cost of multi-button or key telephone instruments. (In those cases where call screening is still desired, it can be achieved by publishing the principal's directory number for the secretary. Then calls answered by the secretary can be station transferred to the principal. In that way the screening process is still achieved utilizing single line telephones.)

Many proprietary electronic instruments are providing an instrument display. That instrument display will indicate the number of the station line being forwarded, and in some cases the name, to the answer position. This assists in the provision of individualized call coverage. This is because the answering point can then respond with the line users name rather than some type of generic answer.

Classes of Service: This refers to the capability of assigning to each station a variety of allowable or denied types of calls, on both an incoming and an outgoing basis by trunk or feature group. Each PABX system has a predetermined number of such classes available for assignment to any station. The concept is to give everyone "What they need" in the way of telephone service, not total, unfettered access to the outside world.

A typical problem found with class of service assignments in a multi-location organization is a requirement of the station users to contact the organization's locations throughout the United States. Typical toll denial on a telephone system is by virtue of denial of access to a specific NPA (Area Code). However, when one exchange in the Area Code must be accessed, all are available to the station user. A simple method around this problem is to provide a System Speed Call List. In that case, the organization's locations can be incorporated into the list. Providing a class of service allowing access to the Speed Call list while denying access to long distance will enable those telephones denied toll to access the organization's locations throughout the country. It should also be noted that this does have the counterproductive feature of negating the value of Direct Inward Dialing at those outlying locations.

In the case of voice/data integration it is possible to utilize the Class of Service capability to provide some level of security to dial accessed computer ports. By accessing these ports over trunk lines it is possible

to provide some level of security over utilization of the class of service to restrict access to these computer ports. Further, in those systems providing queuing, and in some cases associating priorities with the queue, it is possible to integrate this feature into the access. This would have the effect of providing superior service levels to certain desired parties. Finally, utilizing the trunk side connection allows the utilization of the Station Message Detail Recording system to determine the station number of any instrument accessing the computer system, thereby providing a further level of security and a method of charge back for computer access time.

Conversion of Station DTMF to Rotary Dial Outpulsing: DTMF means pushbutton dialing. With this feature, outgoing central office calls can be made with a standard pushbutton telephone; conversion to rotary dial outpulsing is accomplished by the PABX. The facility thus permits a system to be fully tone dialing internally while not paying (extra) for the DTMF dialing feature on trunks or to secure DTMF dialing in a central office where it is not available. While this does have the advantage of reducing the incremental cost added to Trunk or Business Lines for this service there will be a perceptible pause inserted into the call processing chain. That could be objectionable to the user.

Music on Hold: The general perception of this feature is negative. That is, "If they are providing me music, they are expecting to hold me for a long time." However, to the telecommunication manager, this feature can provide a training and operational advantage.

Consistently in training programs, users are instructed that when transferring a call they should remain on the line until the party to whom the call is transferred is reached. In spite of that instruction, users will continue to perform "blind transfers." These are the instances where a transferred party is left in silence awaiting the party to whom the call is transferred to answer. In many cases, that answer and the corresponding "hello" takes place prior to the switching system completing the actual transfer. In those cases, silence is then heard by both parties. This results in the called party hanging up and the calling party being disconnected. This results in a later complaint as to the quality of telephone service.

The interjection of music on hold provides noise, instead of silence, to the transferred party. When the transfer is complete, the music is disconnected. At that point, the transferred party has a chance to say something prior to the called party disconnecting. The use of music on hold has proved to reduce materially, the quantity of caller complaints due to disconnects.

Feature Access Instrument: Historically, station features have been accessed from a single line telephone instrument through the "flash" of the switchhook. This has consistently created user problems because of the natural inhibition in using the same device for feature activation or call disconnect. To depress the switchhook for too short a period results in

the feature not being accessed; too long a time results in a disconnect. This user fear results in resistance to feature use and ultimately dissatisfaction with the system. On multi-line key telephone instruments with automatic resetable line buttons or electronic key telephone instruments the problem was solved through the installation of a small "recall" button which was used to simulate the switchhook flash.

This same flash simulation button has recently found its way to most standard 2500 type instruments. Consideration should be given to utilizing that instrument, equipped with a "feature activation button". This has the advantage of eliminating the users requirement to manipulate the switchhook for feature activation and results in a greater acceptance of the system features and easier station user training.

Traffic Measurement & Capture: The Stored Program Control systems of today provide an entire array of computer captured data necessary for system administration. These can be manually retrieved on demand or programmed for actual CCS and overflow traffic on each and every individual trunk group within a system. The data is then used for traffic engineering to assure that effective grades of service are being provided and that special alternate toll facilities such as WATS, FX, Specialized Carriers, etc. are being used to their maximum cost effectiveness. In preparing specifications, it is necessary for the designer to specify the number of individual trunk or facility groups that must be separately monitored.

Customer System Administration: This allows the communications manager access to the computer control program to perform station feature changes, changes in hunting sequences and classes of service, etc. where uniform wiring is used it is even possible to remotely move two stations. For example, if two individuals are "swapping" desks, you can change the telephone numbers on those two instruments from the customer administrative terminal. However, remember that like instruments (i.e., 2500 for 2500, or electronic key for electronic key) must be interchanged if no work is to be performed on the switching system. The use of electronic telephones on the PABX also provides the capability for the system administrator to change features or call pickups on individual instruments. This is not possible on the 1A2 key telephone equipment. The difference in administrating either system can be as much as 50% of the "churn" cost of the telephone system. Remember, if a new outlet is required, no terminal is capable of installing that cable.

Uniform Wiring: Every vendor specifies that they plan to provide uniform wiring. Uniform wiring is the use of standard quantities of cable pairs (ranging from two to four) between the central switching system and the telephone instrument location. These multi-pairs are generally required for electronic key telephone equipment. From a telephone system acquisition perspective, it is advantageous to the designer to specify a given quantity of cable to every outlet.

In a typical telephone system, the cost of cable and installation comprises

some 15% to 25% of the overall system cost. At the same time, while the telephone system is expected to have the recommended FCC seven-year life, there is no reason that this same life should apply to the inside cable plant. Therefore, the specification of adequate cable plant can result in the ability to reuse that cable with a replacement system. This will result in a material reduction in long term system operating cost to the owner. At this point, the maximum quantity of pairs required to individual telephone station is four. Therefore, it could be advantageous to specify that quantity. This would allow the reuse of existing cable, forgoing the new cost of cable acquisition in the future, at the time of system replacement.

Electronic Key Telephone Instruments: The great quantity of features found on telephones used with the PABX has become increasingly complex to the station user. For example, it is not uncommon to have a station instruction manual of some 14 pages indicating some 22 different codes to be used with 12 or more tones, beeps and ringing signals indicating what the system is doing.

This presents an initial and ongoing training problem. Thus, manufacturers are increasingly introducing electronic key telephone instruments. These phones provide access to system features through the touch of a button rather than through dial access using various difficult codes. In using these instruments, it is well to remember that these instruments are proprietary. They can only be used on the system manufactured by that one vendor and they do increase, in some cases materially, the cost of the telephone system. At the same time, they do provide the capability of concentrating station lines and may, therefore, reduce the cost of the telephone system.

MAINTENANCE OF COST CONTROL

It is obvious many of the features just described go considerably past the concept of POTS (Plain Old Telephone Service), and therefore they increase the system cost. This additional cost must be offset in some manner.

Reducing the number of key telephone sets is claimed to off-set additional costs. However, while initial reductions in costs do take place, unless the system is carefully controlled, the key sets will reappear in short order. This takes place for several reasons.

First, with the increased sophistication of station features (historically controlled by manipulation of the switchhook), intensive, ongoing user training is necessary. This training usually does not take place, and it therefore becomes necessary to replace removed key sets. Also, the status value of key telephone equipment cannot be minimized.

The ability to automatically route long distance calls over the lowest cost long distance circuit and to capture detail on every call made -- where it went, who made it, how much it cost, etc.-- can be meaningful and can

result in significant cost reductions. This will become increasingly important as the Divestiture environment forces the Regional Bell Operating Companies into usage sensitive local calling. At that point, it is expected that timed, multi-message unit calling will be instituted throughout the country. When that happens, the potential of utilizing this least cost routing and call accountability to reduce the cost of local calling will be as significant as it is today in larger systems with quantities of toll, or long distance calling. In many cases, the potential saving through long distance Foreign Exchange or tie lines using end hop-off will be eliminated with the anticipated major increased cost of those dedicated facilities. However, this same capability will then prove valuable on a local level to those callers with large volumes of traffic. These long distance circuits may be replaced with "virtual" circuits. If that does take place, even more sophisticated least cost routing will be required.

However, this increased responsibility for facility selection and system sophistication will require daily follow-up on the part of the communications manager both from a training and management policy point of view. Training is needed because of the complexity found in present systems. Enforcement of management policy is necessary to secure the desired cost reductions either in equipment or use. It goes without saying that this effort must have the unqualified support of the corporation's top management. Without this support, any program planning to save money through the use of system features, route optimization and call detail recording may not succeed. In making the system selection, and before making the expenditure, it is imperative that an accurate reading be taken of management's willingness to provide this support.

When considering system acquisition, it is necessary to be sure that the proper type of instrument is selected. When the instrument is purchased, the die is cast. To change becomes expensive in terms of both the additional investment and the placing in stock of the eliminated station.

In addition, when selecting equipment it is best to incorporate only those features which are necessary for use in that system. Only those operating characteristics necessary to meet your particular communications needs are important. Those systems that do not meet your needs should be eliminated. Those that exceed your needs should not, in most cases, be given added credit for the additional features. The important point to remember is that the features incorporated must either recover their incremental cost through demonstrable savings or bear no increased cost.

For example, a system being investigated provides Least Cost Routing. However, long distance expenditure at the organization is less than $1,000 per month. Therefore, this feature would have little value and would not justify paying an incremental cost to secure it. Unfortunately, most systems come in packages with software providing predetermined features --- whether they are needed or not. The same analogy could be drawn with the call detail recording. For example, during the initial investigation and

preliminary feasibility study (i.e. when the contestable revenue was being reviewed), a cursory examination of the telephone bill, or bills, would indicate the toll and message unit cost for the organization. It is a fairly safe assumption that with strict management and accountability a minimum of ten to fifteen percent of this usage cost can be saved through these features. However, this potential saving must be then compared against the incremental cost of providing the features on the system. This value analysis is even more critical when deciding to acquire those additional features which carry relatively high incremental additional costs. This is typical of such things as Centralized Attendant Service, Automatic Call Distribution capability or the previously discussed voice/data integration.

DIRECT IN DIAL AND LARGE SYSTEMS

Until a few short years ago, Direct Inward Dialing to instruments on the telephone system was the exclusive province of Centrex. Centrex, an acronym for CENTRal EXchange, placed the switching equipment on the telephone company's premises at the Central Office. This system was found to be primarily cost-effective because the direct in-dialing resulted in fewer operators and placing the switching equipment on telephone company premises resulted in reduced space requirements. Hopefully, these two reductions more than offset the increased cost of Centrex.

This is no longer true. Today, on-premise customer switching vehicles can be provided in both a PABX mode (all incoming calls routed through the operator), a direct in-dial mode, or a combination of both, both using an on-site switching system. Obviously, the major advantage of Direct Inward Dialing still rests in fewer operators. However, with the introduction of DID PABXs, the justification for this service is much easier. For example, if cost justification was to be achieved through the elimination of a switchboard operator, it was necessary for the telephone system to have a minimum of two operators.

Today, most systems with growing operator traffic requiring the possible addition of a second operator, as well as those already in a multi-operator environment, can easily justify the installation of a DID PABX. The primary reason for this is the relatively low additional cost for the DID feature. While the PABX must be equipped for Direct Inward Dialing, it is also necessary to secure seven-digit DID numbers from the telephone company. (CAUTION: Before embarking on a selection of a DID system, establish the availability of such service from the Central Office which services your location.)

The approximate cost of Direct Inward Dialing from the telephone company is $450 per month for 100 numbers plus $45 per month per 100 additional numbers. When this cost is combined with the cost of business trunks also necessary in this type of system, the total cost will usually be lower than a similar size Centrex installation. For example, one recent study comparing the two systems, both secured from the telephone company, found a

1,200 phone system costing approximately $50,000 per year less with DID PABX than Centrex.

At the time of this writing, the Regional Bell Operating Companies have apparently embarked on a totally different method of DID pricing. Where previously the DID Trunk bore no incremental increased cost and the initial 100 station lines were relatively expensive, this relationship appears to be changing. Several Tariffs have recently been filed placing a surcharge on each Direct-In-Dial trunk. That charge is in the $30 to $50 per month range. Then Direct-In-Dial numbers are secured in 20 number increments at the relatively low cost of approximately $3.50 per 20 numbers. However, under this environment the quantity of Direct-In-Dial trunks will be a direct result of those stations being Direct Inward Dialed during the Busy Hour. Thus, it would appear that it will be increasingly necessary to weight the economics of increased In-Dial service, perhaps to the whole organization, with that of the attendant or operator cost and the lower cost trunk lines used to reach the Listed Directory Number.

Perhaps, of greater concern at the time of this writing, is the application of Central Office Access charges imposed by the FCC as a result of Divestiture. These charges promise to place an incremental charge on every Central Office access line (one is required for every discrete Centrex telephone number). This is presently scheduled to be a charge of $2 per Centrex line per month growing ultimately to $8 per line per month by 1988. If this comes to pass, it could signal the death knell of the Centrex service. This is because in the case of the DID PABX it is only necessary to pay access charges (at this point $6 per trunk per month rising to $8 per trunk per month) for the Central Office Trunk access lines. Therefore, the access charge is considerably lower with the DID type PABX than it is with Centrex.

As if these potential savings were not enough, the present rate structure being introduced by Bell telephone companies for Centrex, originally called ESSX-1 service and receiving many names such as Centrex, Centron, etc., is forcing the cost of Interstate Central Office DID systems to a level which will ultimately force more users to on-premise customer switching systems. The ESSX service, or pricing, was designed to ultimately replace present Centrex rates. This has the effect of raising the cost of Centrex service, beyond normal Centrex rate increases by approximately 16%. At the time of this writing it is an active tariff in approximately 20 jurisdictions.

With the first writing of this manual, in 1974, very few large interconnect systems had been implemented. However, with the passage of time and with telephone company price increases, many large systems are now successfully operating. It goes without saying that as the system size increases, the potential number of available vendors decreases. Also, as the system increases in size, it becomes increasingly economical and therefore possible for the purchaser to train and afford an in-house service and maintenance staff.

Present maintenance contract charges on telephone systems range from $3.00 to $4.00 per month. This would indicate a system size approximately 3,000 lines or better (costing $9,000 to $12,000 per month for a maintenance contract) to justify the cost of one's own in-place service department. With that magnitude of maintenance cost, it is possible to justify a staff of several individuals, including the cost of keeping on hand necessary parts, equipment inventories and test equipment. A staff of several is necessary if the buyer is to avoid the vulnerability which is inherent in the one-man department. There is an inherent danger in the decision to utilize an in-house maintenance staff. While this can be justified against a maintenance contract cost, it is generally difficult to utilize that same staff for typical adds, moves and changes. This is because those tend to arrive in "random bunches" with relatively short lead times. In those cases where in-house staffs are used, it is generally found that much of this cable installation labor must still be subcontracted to some outside vendor.

TYPES OF SWITCHING EQUIPMENT

Any discussion of system feasibility calls for a brief comment on the types of switching equipment in use or being offered by interconnect vendors. The original step-by-step equipment rapidly disappeared with the introduction of competition because of the difficulty in providing station features, the need for large equipment rooms, and high maintenance costs. Next, common-control crossbar and electronic also disappeared as offerings. Their equipment life as customer offerings was short.

These three types of switching equipment use a process known as space switching, in which a processed call occupies a given wire path, or "space," through the switching equipment. Today, most manufacturers have introduced some type of Time Division Multiplex (TDM) switching. In this case the analog, or voice, speech pattern is sampled. Some form of coded signal is transmitted. This is transmitted over a time slot, or time slots, between the input and output of the switching system on a common data bus.

The introduction of TDM switching brought a whole new controversy to telecommunications system selection. This is the result of the various types of coding schemes used to transmit the voice sample in the TDM time slot. By far, the most common of these must be the PAM (Pulse Amplitude Modulation) used in Western Electric's Dimension PABX series. This signal is created by sampling the voice wave form and transmitting a signal in the appropriate time slot that indicates the amplitude, or volume level of the speech. This signal can then be used to regenerate the speech pattern for the called party. This process takes place within the switching equipment. Because these samples transmit a signal indicating the amplitude they can be viewed, from a purist perspective, as an analog type transmission. Therefore many took the view that this was not a "pure digital signal."

The second most common method of transmitting this signal over the common

bus is to use a PCM (Pulse Code Modulated) signal. In this case, the analog to digital converter, in the telephone switching system, creates a definite data bit pattern indicating the amplitude of the sample. This is then reconverted to analog at the switching output. With the introduction of the System 85 in January of 1983, the "digital world" using PCM transmission seems to have won the battle of transmission methods.

A third method is known as Delta Modulation. In this scheme, a bit pattern is created indicating the difference in amplitude (higher or lower) that this sample is from the previous sample. Finally, there is PWM (Pulse Width Modulation), which is similar to PAM. In this, the width rather than the amplitude of each signal is varied to indicate the level of the signal. (As the electronic engineer will realize, this description was certainly not intended to be definitive nor detailed.)

Each manufacturer will claim specific advantages for their specific architecture and method of switching. Most of these rest in statements such as: "Digital transmission is better for switching data"; "Digital transmission has fewer errors"; "Digital transmission is the wave of the future". Further confusion is added to the entire program through the introduction of the voice/data integrated system. In many of these systems, the digital to analog conversion is performed in the telephone instrument. Moving the Codec (a contraction of Coder/Decoder. This is the device which creates the "digitized" signal.) to the instrument, instead of the switching system, simplifies the integration of voice and data into a digital stream. However, again the designer is faced with the decision between these potentially more expensive integrated systems being offered as "fourth generation" equipment and the lower acquisition cost of the more conventional equipment. In addition, a further problem exists in that the long-term viability of these new system vendors must be assessed. Ultimately, service and support, not technology will assure the viability of this system over the projected operating life.

Certainly, none of the vendors' sales statements can be denied. However, in weighing their value, one must remember that the telephone industry has been constructed in an analog, not digital world. Historical regulation has mandated an extremely long equipment service and life. The transition from analog to digital public networks will be slow. The initial digital switching actually provides limited, but potentially valuable, applications in today's environment. Many of the valuable applications have to do with networking within the organization. Until the local network provides universally available digital channels little external value will be gained. However, there is little question that all things being equal:

1. System expansion
2. Necessary system features
3. Manufacturer reputation and stability
4. Local distributor capability and service
5. Price....

Then digital PCM format would be the choice. Unfortunately, those items are never equal.

Chapter Four

The Requests for Proposal

The thrust of this discussion would seem that the customer's interest in system change was initiated by the vendor. This is not always the case. For many reasons, the purchaser or user may initiate the analysis. Typical of these are expansion requirements beyond the capability of the present system, inability to secure timely service because of obsolescence or the demise of the vendor, "migrations" forced by rising cost and relocation which would necessitate an undesirable out-of-service move.

No matter who makes the first move, it is obviously desirable to secure more than one vendor quotation. To talk with all potential suppliers is a waste of time and would probably only serve to confuse the buyer. This is not to say that the preparation of a Request For Proposal can be done in a vacuum and vendors should never be talked to. Obviously, conversations with vendors provide a valuable source of information to the telecommunication manager.

However, the manager should be in control of these meetings. To do so, a minimum of two meetings with any potential vendor would be minimally necessary. Those vendors with whom meetings should be held are the organizations considered most viable in the provision of a system to meet the manager's needs. In many cases the specific vendors can be identified through previous sales contacts or through conversations with the manager's peers in the general serving area. These two sources of vendors will begin to provide the communication manager with a basis to proceed. In the initial meeting a general outline of the proposed project indicating both size and scope should be made. At that time a request for detailed, technical product literature should be made. This literature is normally identified by the manufacturer as a "General Description Manual." Any vendor should be willing to provide that manual for their product. Upon receipt of that information the telecommunication manager should become thoroughly familiar with the documentation in order to ask specific, probing questions during the second meeting.

During the course of these conversations it is necessary to separate the so called "wheat from the chaff." The manager must be aware of the difference between features necessary for the organization's operation and those being "sold" by the manufacturers sales representative to create an aura of exclusivity for the offered product.

To avoid such problems it is most convenient to use a Request for Proposal (RFP) which can be sent simultaneously to all potential vendors. To minimize confusion this should be limited to no more than four or five vendors.

The RFP should contain an itemization of equipment and an enumeration of the features desired for the specific system under study. For years, with the telephone company as the only vendor, it was more or less necessary for

the operation of an organization to conform to equipment capabilities offered by the telephone company. Today, with the alternate supplier option, it is possible to select the equipment that best meets the organization's operating needs. This is probably the greatest and, in the long run, the only advantage to competition. The RFP should ask many questions regarding availability of service and parts. While these are questions which would normally have been asked of individual supplier representatives during the interview process, it is also wise to get these answers in writing in the Proposal.

The vendor responses will allow the evaluation of each system while minimizing lost time interviewing individual suppliers. It cannot be accented too strongly that while the introduction of competition into the telephone equipment business brought opportunities to secure the system and features best suited to the organization's needs, it also brought with it responsibility. It is the responsibility of the system designer to determine those features, and their relative value, which will most benefit the organization. One cannot depend upon the vendor of any system to do other than portray their equipment in the best possible light in order to make the sale and earn their sales commission.

The following is a typical specification in Request For Proposal format. While this can be used a guide, caution should be exercised to assure that only those features necessary for the organization are incorporated in the Request For Proposal. Incorporated in this RFP is:

Section 1 - General Information relative to the provision of a proposal.
Section 2 - General System Specification with an itemization of each inherent part contained in the specification.
Attendant Console Features
Switching System Features
Section 3 - Telephone Instruments and Station Apparatus.
Section 4 - Contains any Alternates.
Section 5 - Deals with Installation.
Section 6 - With System training.
Section 7 - With acceptance procedures.

REQUEST FOR PROPOSAL

The following specification details a main telephone system and a second telephone system to be installed at the locations of ABC Company.

ABC Company - Headquarters
123 Main Street
Anytown, Ohio

ABC Company - Sales Office
789 Center Street
Hometown, USA

These specifications are designed to minimize the investigative time in selecting both equipment and supplier. Thus, they are functional

in nature.

1.0.0. General Information

In system selection, consideration will be given to total system operating cost including trunk lines, operator cost and maintenance. For these purposes, a seven-year equipment life will be used. The vendor should anticipate meeting all specifications. Any exceptions must be noted in the proposal. The specification anticipates the installation of a PABX or key telephone system serving the various locations.

On the main system, key telephone equipment will be specified utilizing conventional electro-mechanical key telephone equipment. Should the bidder have available proprietary, electronic key telephone equipment, which in their opinion is more suitable for any reason, they are encouraged to quote it as an alternate. In addition, while these specifications anticipate a certain method of operation, the vendor is encouraged, as separate quoted alternates, to provide, as an alternate, other suggested methods of operation.

A portion of the overall system evaluation will decide whether the Purchaser or system vendor shall provide maintenance. Therefore, with the bid, the vendor shall supply a complete list of manufacture suggested spare parts and test equipment together with their respective cost. Also, they will quote the cost of a maintenance contract on the switching system only, a combination of switching system and telephone instruments, and total system. (This is only applicable in those instances where the system size is above some 1,000 to 1,500 stations.)

1.1.0. The proposal will be received by: _____, ABC Company, until 10:00 a.m. _____,198_. For purposes of evaluation, it is planned that negotiations will be completed within one hundred twenty (120) days of Bid Receipt with the successful vendor. It will require some period of time to evaluate the proposals and negotiate a contract with the successful supplier. Therefore, all prices shall remain firm for a period of one hundred twenty (120) days. All proposals should be submitted in (insert quantity necessary).

1.1.1. A mandatory meeting of all bidders planning to submit responses will be held on: _____ in _____ of the ABC Company at 10:00 a.m. At that time, all questions will be answered and a single site tour arranged. Bidders not attending this meeting will not receive any issued addendum and will be disqualified. (This bidders' meeting is found to materially reduce the amount of time necessary for site visits and vendor meetings. It is suggested for any system that is reasonably complex or in excess of 100 to 150 station lines.)

1.1.2. In anticipation of the fact that no vendor will be able to meet

all requirements of the specification, ABC Company reserves the sole right to decide whether a proposal does or does not substantially comply with the requirements of the RFP, to accept, reject or negotiate modifications in and terms of vendors' proposals or any parts thereof and also to waive any irregularity, informality, or non-compliance with or any non-response to the RFP or any part thereof. ABC Company reserves the right to accept and award a contract hereunder to other than the lowest bidder and to the lowest and best bidder or bidders.

Each party receiving and/or otherwise acquiring this bidding package acknowledges that, in the determination as to award of the ultimate contract, the ABC Company will exercise discretion in making the final decision. Each party submitting a bid does so recognizing that no cause of action or claim will arise in such party's favor in any way relating to the exercise of such discretion against the ABC Company, any consultant of the ABC Company, or any person, firm, corporation, or other legal entity engaged by the ABC Company to assist in making the final decisions.

1.1.3. Proposal shall be submitted in (insert quantity necessary). Included in this should be three copies of all General System Description Manuals and specifications being met (sales literature alone is not acceptable). In the absence of this additional detailed information, ABC Company reserves the right to reject the bid as non-responsive.

1.1.4. Bidding statements contained in proposals will become part of the contract for equipment and services. All questions under "Supplier's Questionnaire" should be answered as thoroughly as possible. Please avoid unclear, ambiguous statements.

1.1.5. These specifications are to be considered to be functional in nature. Therefore, suggestions and/or alternate operations made in addition to the requested proposals will be given careful consideration.

1.1.6. Technical evaluation of the proposals will include a comparison of the proposal to the requested features in the RFP. Unless otherwise stipulated by vendor, it will be assumed that specified features are provided. The response to the Supplier's Questionnaire, previous experience in systems of similar size by both manufacturer and supplier, plan for smooth installation, availability of service and acceptance of that responsibility, together with total impact, both economic and otherwise, will also be considered.

1.1.7. The telephone system must interface with the local telephone

company's central office for outgoing trunks, for incoming trunks, for WATS, Tie Lines, Foreign Exchange and other common carrier service lines. The interface point will be the terminating arrangements that the local telephone company will provide. The trunk interfaces must comply with the requirements specified by the local telephone company.

The system vendor will be responsible for coordination with the local telephone company to establish the demarcation point or points of connection within the building between vendor-provided equipment and that which is provided by the local telephone company. Cross-connects, connecting the vendor's equipment with that provided by the local telephone company, will be the responsibility of the vendor.

Each proposal must indicate and describe any arrangements which are expected to be required to connect the vendor's equipment with that of the local tariffed telephone company.

1.1.8. Proposals and other material submitted will become the property of the ABC Company. The ABC Company will bear no cost of proposal preparation.

1.1.9. A vendor proposing to subcontract any portion of the proposal will be responsible as prime vendor for the total proposal to the satisfaction of the Buyer. The ABC Company may require additional information onsubcontractors ata later date and reserves the right to reject any subcontractor.

1.1.10. Bidding statements contained in proposals will become part of the contract for equipment and services.

1.1.11. Proposal Instructions: Proposals in response to this request may be for lease, purchase, or lease/purchase combination. Each proposal must be complete within itself, i.e., all equipment and devices for interconnection with Common Carrier Companies must be included. A list of all component parts and features must be included. A vendor who sub-contracts any portion of this proposal will be responsible as prime contractor for the accomplishment and provision of the total proposal to the satisfaction of ABC Company.

1.1.11.(a) Lease Proposals (or Rentals): In submitting proposals for lease or rent, vendors shall indicate separately:

1. Installation Charges
2. Monthly Lease/Rental Payments for 84 months
3. Monthly Maintenance Provisions
4. Termination Liability

Vendors should submit pricing as F.O.B. installation site installed and fully tested (turn-key); including a maintenance proposal for the first year and an option for subsequent years with the rates which will be in effect for one year after cutover. Such maintenance proposal shall be quoted in two ways:

1. switching systems only;
2. switching systems, all station apparatus, and inside cable plant.

Options to renew after the first year shall be fully explained.

1.1.11.(b) Lease/Purchase: In addition to the items listed under "lease" the vendor should include:

1. The base purchase price
2. The percentage of rental fees which could be applied as credits at the time of purchase.

Vendors should submit pricing as F.O.B. installation site installed and fully tested (turn-key); including a maintenance proposal for the first year and an option for subsequent years with the rates which will be in effect for one year after cutover. Such maintenance proposal shall be quoted in two ways:

1. switching systems only;
2. switching systems, all station apparatus, and inside cable plant.

Options to renew after the first year shall be fully explained.

1.1.11.(c) Purchase proposals: In submitting proposals for purchase, vendors shall indicate:

1. Installation charges
2. Base purchase price
3. Maintenance provisions

Vendors should submit pricing as F.O.B. installation site installed and fully tested (turn-key); including a maintenance proposal for the first year and an option for subsequent years with the rates which will be in effect for one year after cutover. Such maintenance proposal shall be quoted in two ways:

1. switching systems only;
2. switching systems, all station apparatus, and inside cable

plant.

Options to renew after the first year shall be fully explained.

1.1.12. Included with the proposal shall be information outlining vendors' present service staff that is factory trained to maintain the equipment quoted, their location, availability, number of instruments and/or stations presently serviced by them and availability of spare parts.

1.2.0. Contract Terms and Conditions: Following are contractual terms and conditions. With respect to the contractual issues, the vendor must specify the commitments it is willing to make in each of the areas outlined. These commitments by vendor will be weighed along with the other factors outlined in this RFP in evaluating the proposals. While the ABC Company is willing to consider modifications to the precise wording of the terms, to be deemed responsive, a proposal must accept the substance of all mandatory provisions listed below.

1.2.1. Payment: Payment will be made only upon the occurrence of a specific event such as delivery of all equipment or acceptance. Final payment will not be made until satisfactory completion of the acceptance test.

Describe the type of payment schedule you propose. Include the amount or percentage of the total contract price that you propose for each payment.

1.2.2. Risk of Loss: For both purchase and lease options, specify when risk of loss will be borne by vendor.

1.2.3. Expansion: Will vendor agree to sell additional equipment to the ABC Company for ten years following acceptance at a price not greater than vendor's price for similar equipment components to its most preferred end customer in the United States.

1.2.4. Payment: ABC Company may withhold any payment if:

(a) work is found defective and not remedied;

(b) vendor does not make prompt and proper payments to subcontractors or for labor, materials, or equipment furnished him;

(c) the ABC Company or another party is damaged by an act for which the vendor is responsible;

(d) reasonable evidence indicates that the work cannot be

completed for the unpaid balance of the contract price;

(e) reasonable evidence indicates that the work will not be completed within the time specified by the contract documents;

(f) vendor fails to carry out the work in accordance with the contract documents; or

(g) vendor is not entitled to payment in the amount requested.

Progress payments do not indicate acceptance of any work not in accordance with the contract documents.

1.2.5. Warranty: Vendor warrants the system against mechanical, electrical, and workmanship defects for one (1) year following acceptance of the system. If the system fails to completely perform in accordance with this RFP and the contract documents, vendor will take all necessary action, at no additional cost, to restore the system to perform in accordance with this RFP and the contract documents.

1.2.6. Software Right to Use: If software is provided under a license rather than a direct sale, vendor grants, for no additional fee, a nonexclusive right to use any software and any modifications or additions thereto. The license for the software will always follow the system for the useful life of the equipment and will be available for all subsequent users. The license is transferable to allow maintenance, operation, and sale of equipment.

1.2.7. Confidentiality: Vendor expressly agrees that confidential information identified as such by either party obtained during the course of preparing its proposal or during performance under its contract shall not be divulged to any person or company outside authorized representatives of either party except upon receipt of prior written approval of the other.

1.2.8. Infringement Indemnity: Vendor agrees that it will indemnify and hold harmless the Buyer against any claims, damages, judgments, or expenses resulting from a claim that any equipment or other material provided by vendor under its proposal and the contract documents infringes a copyright, patent, trademark, or other proprietary right, or constitutes misuse of a trade secret or confidential information belonging to a third party, and will defend at its own expense any suit or proceeding brought against the Buyer alleging such infringement or misuse. If the Buyer's use of any such equipment or material is prevented by injunction, vendor will,

at its option and expense, either (i) procure for the Buyer the right to continue using such equipment or other material; or (ii) modify it in a manner acceptable to the Buyer to become noninfringing; or (iii) substitute other noninfringing equipment or other materials acceptable to the Buyer, or Refund Buyer's Purchase Price less any booked depreciation.

Buyer shall promptly notify vendor of any claim and shall cooperate with vendor in the defense of any such claim. The defense will be under the sole control of vendor.

1.2.9. Liability to Third Persons: Vendor shall indemnify and hold harmless the Buyer, its agents, and employees from and against all claims, damages, losses, and expenses (including attorneys' fees) arising out of vendor's performance under the contract documents, provided that any such claim, damage, loss, or expense (i) is attributable to bodily injury, emotional distress, sickness, disease or death, injury or damage to a person's reputation or civil rights, or to injury to or destruction of tangible property excluding the loss of use resulting therefrom, and (ii) is caused by any willful or negligent act or omission on the part of vendor, any subcontractor, or agent, or anyone directly or indirectly employed by any of them, or anyone for whose acts any of them may be liable.

In the event any such claim is filed, the indemnified party shall promptly notify the indemnifying party of such claim and shall cooperate with such indemnifying party in the defense of such claims.

1.2.10. Insurance: Vendor will take out, pay for, and maintain during the entire period that it is performing services under the contract documents: (i) Workman's Compensation and Employers' Liability Insurance as required by law; (ii) public liability insurance under a comprehensive coverage form of policy, including liability for theft by contractor emplyees, in amounts of not less than $1,000,000 for bodily injury, including death, to any one person and not less than $2,000,000 for any one occurrence; and (iii) property damage insurance under a comprehensive form of policy in amounts of not less than $2,000,000 for each accident and aggregate.

1.2.11. Assignments and Subcontracts: Vendor will not assign or subcontract any part of the work to be performed without the prior written consent of the Buyer. Any subcontractor so approved and used in connection with the work is the agent of vendor and not the agent of the Buyer.

1.2.12. Governing Law and Jurisdiction: The laws of the State of

_____ will govern to the interpretation, validity, and effect of this RFP and the contract documents.

1.2.13. Advertising: Vendor and/or its authorized dealers, representatives, or agents will not, without the Buyer's prior written consent, advertise or publish the fact that vendor, its authorized dealers, representatives, or agents have contracted to furnish, are furnishing, or have furnished items or services in connection with the contract documents.

2.0.0. Systems Specifications:

At the present time ABC's Headquarters utilizes a PABX while the Sales' Office uses a 1A2 type key telephone system. While this specification anticipates the use of customer premise switching systems, Central Office based, PABX or electronic key systems would be suitable. Also, an Automatic Call Distributor is planned for the Headquarters Location and a Call Sequencer for the Sales Office. The format of the specification is as follows:

2.1.0.-2.1.19.	PABX Attendant Console
2.2.0.-2.2.34.	PABX Switching System
2.3.0.-2.3.24.	Electronic Key System
2.4.0.-2.4.23.	Automatic Call Distributor
2.5.0.-2.5.7.	Call Sequencer
3.0.0.-3.1.11.	Telephone Instruments
4.0.0.-4.4.0.	Alternates
5.0.0.-5.1.8.	Installation
6.1.0.	Training
7.1.0.	Acceptance Procedure

The switching system will be of a stored program control type providing automatic call routing over a combination of local trunks, WATS lines, Foreign Exchange and tie-lines. The system shall be capable of handling a minimum of ten CCS per line at a P01 Grade of Service and consists of the equipment itemized in attached Schedule A.

2.1.0. Attendant Console: Attendant consoles, associated with the PABXs shall be capable of providing the following features:

2.1.1. Attendant Camp-on: An incoming outside call which the attendant attempts to complete to a busy station line is "held" on the busy line until it becomes free. When the attendant "camps" this call on a station, the busy station shall hear a short tone indicating that a call is waiting.

2.1.2. Automatic Recall: A call "camped-on" a line shall automatically return to the attendant indicating it is an

unanswered, camped-on call if it is not answered by the busy station within thirty seconds. It is preferable that the reason for the call return (i.e. line busy, no answer, etc.) and the desired terminating station number be indicated.

2.1.3. Trunk Termination: The attendant console will be equipped with a minimum of six release or switch loops. Separate and distinct indication as to trunk group being answered shall be provided.

2.1.4. Conference: The attendant shall have the ability to conference up to seven trunks, tie-lines and/or internal system stations in any combination. The conference circuit shall be equipped with suitable amplification equipment to minimize audio loss or degradation.

2.1.5. Transfer: The attendant shall have the ability to transfer incoming or outgoing calls received at the consoles.

2.1.6. Dual Tone-Multi-Frequency: Consoles shall be equipped with DTMF operator pads for call routing.

2.1.7. Call Splitting: Attendant shall have the ability for two-way trunk splitting.

2.1.8. Through Dialing: It shall be possible for the attendant to connect an internal station called from the console to a trunk or a call to the console on an "0" level trunk to any trunk and the station may then dial a call. Upon completion of such a call, both the trunks shall be automatically released. It shall be possible for the attendant to input a four-digit station identification code which will be captured by the Station Message Detail Recorder.

2.1.9. Trunk Testing: The console shall be capable of selecting each individual trunk or tie-line termination and testing them to be sure they are operational.

2.1.10. Busy Verification of Station: It shall be possible for an attendant to verify a station busy.

2.1.11. Attendant Loop Transfer: It shall be possible for an attendant receiving an incoming call on a trunk line, WATS line, FX line or attendant trunk to transfer that call between attendant positions.

2.1.12. Alphanumeric Display: Using either digital or alphabetical designations, the trunk circuit or circuit group to which the attendant is connected shall be indicated on the attendant's console. In the case of station users dialing "0" to reach the

attendant console, the originating station number and class of service shall be displayed.

2.1.13. Trunk Group Busy Lines: The supervisory console shall be equipped with lamps indicating when any trunk group has surpassed an "X" percentage of trunk fill.

2.1.14. Line Load Control: The attendant shall be able to activate keys which will deny preselected groups of stations the ability to initiate or receive incoming or outgoing calls. In the case of incoming calls, the incoming caller shall receive a busy signal.

2.1.15. Attendant Forced Release: An attendant shall be able to disconnect a call arriving at the attendant console from either an outgoing trunk or an internally dialed station. This release will free the attendant loop for reception of additional calls.

2.1.16. Attendant Call Waiting: A display shall indicate to the attendant the number of calls waiting in queue to be answered.

2.1.17. Automatic Hold: The attendant shall be able to move from one trunk call to another on the console without using a "hold" button.

2.1.18. Alarms: The supervisor's console shall be equipped with lamp indicators which will denote the presence of either a major or minor system fault.

2.1.19. Serial Call: The attendant shall be able to manually activate a feature which will hold, or return, a trunk circuit after disconnect by the terminating station.

2.2.0. Switching System: shall be capable of the following:

2.2.1. Intercom: Automatic dialing between all internal stations.

2.2.2. Dial Access to Trunks: The system shall provide dial access to local Dial Central Office outgoing trunks, tie lines, Foreign Exchange trunks and WATS lines

2.2.3. Dial "0": It shall be possible to reach the attendant console by dialing "0."

2.2.4. Direct Inward Dialing: Switching system, as indicated in Schedule A, shall be equipped with Direct Inward Dialing.

2.2.5. Direct Department Calling: Dedicated incoming Central Office trunks shall terminate directly on instruments. It shall be

possible to transfer calls to these numbers throughout the system.

2.2.6. Distinctive Ringing: Distinctive ringing will indicate to the station user whether a call is originating within the system or from the outside world.

2.2.7. Rotary Service: It shall be possible to have an unlimited number of rotary service groups. These rotary or "hunting" groups shall be capable of operating in a sequential or terminal basis, a circular master number to "Phantom" number or non-sequential basis.

2.2.8. DTMF: The entire system shall be equipped with DTMF dialing.

2.2.9. Classes of Service: A minimum of ten classes of service shall be provided as follows:

1. Intercom only.
2. Intercom plus local.
3. Intercom, local, Tie Lines and FX.
4. Intercom, local, Tie Lines, FX, and Band 0.
5. Intercom, local, Tie Lines, FX, Band 0, and Band 1 WATS.
6. Intercom, local, Tie Lines, FX, Band 0, Band 1 WATS, Band 5 WATS.
7. Intercom, local, Tie Lines, FX, Band 0, Band 1 WATS, Band 5 WATS and Toll.
8. Future.
9. Future.
10. Future.

A toll restricted station shall have the ability of placing a toll call through the attendant. In placing that call, the attendant shall have the capability of inserting a four-digit identification code into the call record generated by the SMDR in paragraph 4.1.0.

2.2.10. Night Service: It shall be possible to provide a mixture of fixed, universal and flexible night service on the system.

2.2.11. Automatic Station Release: Shall be activated with howler if the handset is removed from the cradle and dialing is not complete within thirty seconds. This will release the line from the system and prevent any tie-up of common equipment.

2.2.12. Add-On Conference: The ability to add a third party either within or external to the system shall be provided for all calls.

2.2.13. Station Transfer: It shall be possible for a station to

transfer any incoming or outgoing calls without operator assistance either within the system or to an external station.

2.2.14. Consultation Hold: It shall be possible for a station to activate consultation hold on all calls.

2.2.15. No-Answer Call Forwarding: Any call to a station line which is unanswered after three rings shall be automatically forwarded to a second number. It will be possible to move this call through at least four successive numbers if it goes unanswered. An unlimited number of station lines may be placed in a no-answer call forwarding condition at the same time. It shall be possible to call forward intercom and external calls to the same and/or different locations at the station user's option. A call that is unanswered after passing through the station forwarding shall revert to the attendant's console.

2.2.16. Busy Line Call Forwarding: It shall be possible to rotate a call to a busy line to pre-programmed alternate number. This differs from standard hunting in that an unlimited number of lines could be forwarded to the same number. An unlimited number of station lines may be placed in a busy line call forward condition at the same time. It shall be possible to call forward intercom and external calls to the same and/or different locations at the station user's option. A call that is unanswered after passing through the station forwarding shall revert to the attendant's console.

2.2.17. Variable Call Forwarding: It shall be possible for the station user to institute variable call forwarding. This shall immediately route an incoming call to the station line to an alternate location programmed by the station user. It shall be possible to place an unlimited number of station lines in variable call forwarding at the same time. It shall be possible to call forward intercom and external calls to the same and/or different locations at the station user's option.

2.2.18. Call Hold: Stations shall be capable of placing calls in a "hold" state. When placed in that condition, the calling party shall hear "music." Should the called party not return to the call within thirty seconds and the called party's line be free, the called party's station shall ring again.

2.2.19. Call Park: It shall be possible for a called party to place a call in a "park" state on a designated terminal number until it is retrieved. A maximum of 5 such "park" numbers shall be provided in each system. These "park" numbers shall not be in rotary sequence, but shall be accessed by using "step-call" capability. When placed in a "park" condition, the caller shall hear "music." If the "park" call is not retrieved within sixty seconds, the call should re-ring the attendant.

2.2.20. Call Pick-Up: An unlimited number of call pick-up groups shall be available. A station user assigned to a call pick-up group shall answer any call within that call pick-up group by dialing an access code.

2.2.21. Directed Call Pick-up: Any station shall be capable of answering any other station by dialing an access code plus the station number.

2.2.22. Call Waiting: It shall be possible on a station basis to originate call waiting originating and terminating signals to called stations which are busy. These signals shall indicate, if desired, a "standard" or "executive" waiting condition.

2.2.23. Do Not Disturb: It shall be possible for a station placed in either "variable call forwarding" or a "do not disturb condition" to still be reached by "intercom groups." Such intercom groups shall be capable of reaching a maximum of 20 stations within a predetermined group.

2.2.24. Speed Call: The main system shall be capable of one system list of 1,000 numbers and 100 station lists of 10 numbers each.

2.2.25. Dial Tone: A distinctive dial tone shall indicate to the station user that the system features have been accessed.

2.2.26. Data Privacy: This shall allow a station to deny any call waiting, camp-on, etc. tone origination.

2.2.27. Paging Access: It shall be possible to access a customer provided voice paging system from those stations so designated by class of service.

2.2.28. Dial Dictation: The system shall be capable of connecting to and operating with a dial dictation system to be provided by ABC Company.

2.2.29. WATS/FX Tie Line Access: It shall be possible, at the discretion of the Communications Manager, to institute timing signals heard only by the calling party on any WATS, FX line or

Tie Line.

2.2.30. Wide Tolerant Power Supply: The system shall tolerate frequency deviations as much as 3HZ or voltage variations of -15% to +10%.

2.2.31. Automatic Route Selection: The system shall be capable of selecting the least cost route using a six-digit (NPA and NXX code) for call screening for routing over WATS, FX and Specialized Common Carrier. It is antcipated that all trunk facilities, local and optional toll service will be accessed by dialing "9." A minimum of six-digit route patterns shall be provided. A call overflowing to Message Toll Service shall receive a tone warning signal. The caller shall have the option of queueing, abandoning the call or allowing the overflow to take place.

2.2.32. Call Queueing: An internal station dialing a busy line or trunk group can queue for access by dialing a code to activate the feature. When the busy line is free, the system shall test the waiting line. If it is free, the connection will be established. If it is not free, the call will be stored for later retry. A call stored in queue over twenty minutes shall automatically be removed.

2.2.33. Automatic Callback No Answer: An internal call reaching an unanswered station shall have the ability to activate a callback code. When the unanswered station is placed off-hook then on-hook, the system shall then attempt to connect the original party. If a connection is not achieved in twenty minutes, the call shall be cancelled.

2.2.34. Fail Safe: All outgoing, combination and dedicated trunks shall be installed as combination trunks and equipped with fail safe, automatic transfer to pre-determined stations in case of switch or power failure. Such switches shall have manual override.

2.3.0. Electronic Key System: The specification anticipates the use of an electronic key telephone system at the sales office.

2.3.1. Common Equipment: Shall be capable of the following:

2.3.2. Multi-Link/Single-Button Intercom: The internal dial intercom system shall be capable of a minimum of four talking paths. These talk paths shall be accessed by a single station button and an available link automatically provided.

2.3.3. Power Failure: Shall be provided on a station-per-line basis. In the event of system failure, each individual

business lines, OPX and tie lines shall be directly connected to predesignated telephone instruments. Such instruments shall be capable of receiving or placing external calls.

2.3.4. Off-Premise Extension: It shall be possible for the system to extend intercom station lines to remote off-premise locations.

2.3.5. Attendant Console: A single attendant console equipped with busy lamp field and line termination buttons sufficient to answer all trunks shall be provided.

2.3.6. Alternate Answer Position: In addition to the attendant console, it shall be possible for any station to answer incoming calls.

2.3.7. Restriction: The system shall be capable of denying long distance access to preprogrammed stations on an area code basis.

2.3.8. Personal Line Termination: It shall be possible to terminate a Central Office line on a specific instrument or instruments. Such line need not be terminated on all instruments.

2.3.9. Voice Calling: The system shall provide that predesignated instruments may be equipped with speakers to allow voice intercom calling. In those cases an internal call terminating at the instrument may respond in a "hands-free" manner.

Instruments so equipped shall be provided with a "privacy" button which allow the "hands-free" feature of the speaker to be disconnected. Also, at any time an incoming call arrives, a distinctive tone shall alert the called party to its arrival.

2.3.10. DTMF Signalling: The system shall be capable of accepting Dual Tone Multi Frequency signalling.

2.3.11. Telephone Instruments: The telephone instruments shall be equipped with a minimum of 20 buttons. These buttons shall be used for both line termination and feature activation. The instrument features shall consist of:

2.3.12. Hold: Each instrument shall be equipped with a hold button. Such buttons shall be non-locking and capable of placing any line termination on the instrument in a "hold" state.

2.3.13. Automatic Privacy: Upon answering any line the automatic privacy feature shall be invoked. This feature shall prevent any other telephone instrument from gaining access to that line while a conversation is in progress.

2.3.14. Privacy Release: Each instrument shall be equipped with a privacy release button which will be used to allow other instruments to gain access to the line thereby creating a conference with an external business line and one or more internal stations.

2.3.15. Intercom: The multi-channel intercom shall terminate on a single button.

2.3.16. Direct Line Terminations: It shall be possible to directly terminate business lines on station instruments. In those instances where the number of business lines exceed the instrument button quantity, dial access to the remaining lines shall be permitted.

2.3.17. Do-Not-Disturb: The instruments shall be equipped with a do-not-disturb button. This button shall disconnect the dial intercom path.

2.3.18. Ringer-Cutoff: Each instrument shall be equipped with a ringer-cutoff to prevent incoming calls on business lines from ringing on that particular instrument.

2.3.19. Priority-Hold: When a station user activates the hold button, the held line appearing on that instrument shall provide a distinctive visual signal indicating the hold state:

2.3.20. Add-On Conference: It shall be possible for any instrument to depress two line buttons simultaneously, thereby creating a conference between two internal locations and one business line or one internal station and two business lines.

2.3.21. LED Lamps: All lamp line signals on the telephone instruments shall be of LED type.

2.3.22. Non-Locking Buttons: All instrument buttons used for activation shall be of a non-locking type.

2.3.23. Standard Telephone Instruments: It shall be possible to uilize standard 2500 type DTMF instruments on the systems.

2.3.24. Automatic Ring-Back On Held Calls: Any call placed on hold for a period of time exceeding 45 seconds shall cause a tone signal to be emanated at the instrument originally placing the call on hold.

2.4.0. Automatic Call Distributor: An automatic call distributor shall be provided to serve the Customer Service Center to be located in the Headquarters Location. The system shall be

essentially non-blocking allowing for all agent positions to be connected in any mix of incoming or outgoing trunks or tie-lines with all remaining trunks being connected to answer recorders in queue. The ACD equipment shall incorporate the following features and be equipped as detailed in Schedule A., item C.

2.4.1. Intercom: Automatic dialing between all internal stations.

2.4.2. Trunks: The agent position shall have dial access to outgoing local, Central Office Tie Line, FX and WATS trunks contained on the PABX. All ACD and supervisory positions shall be capable of being assigned the classes of service previously indicated in the Specification (Paragraph 2.2.9.).

2.4.3. DTMF: The entire system shall be equipped with DTMF dialing.

2.4.4. Automatic Station Release: Shall be activated with howler if a handset is removed from the cradle and dialing is not completed within 30 seconds. This will release the line from the system and prevent any tie-up of common equipment.

2.4.5. Abandon Call Search: The system shall be equipped with abandon call search capability to automatically disconnect any abandoned call without passing it to an agent.

2.4.6. Add-On Conference: The ability to add a third party either within or external to the system shall be provided for all calls.

2.4.7. Station Transfer: It shall be possible for a station to transfer any incoming or outgoing call within the total ACD or between the PABX and the ACD.

2.4.8. Consultation Hold: It shall be possible for a station to activate consultation hold on all calls.

2.4.9. Dial Tone: A distinctive dial tone shall indicate to the station user that the system features have been accessed.

2.4.10. Wide Tolerant Power Supply: The system shall tolerate frequency deviations as much as 3HZ or voltage variations of -15% to +10%.

2.4.11. Agent Camp-On: In those cases where an agent attempts to transfer or complete a call to a busy agent position within the system, the call shall be priority queued against that specific station and automatically rung and connected upon completion of the call in progress.

2.4.12. Origin Indication: As indicated in Schedule A, the system shall be equipped with origin indication indicating to the agent the trunk group over which the call is received. It shall be possible for the agent to request a repeat of the origin indication. The origin indication shall not be heard by the calling party.

2.4.13. Agent Request for Assistance: The agent instrument shall be equipped with the ability to signal the appropriate supervisory position for assistance or of an existing emergency.

2.4.14. Delay Announcement: The system shall be equipped with the quantity of first answer announcements indicated in Schedule A. Each of these announcements shall be changeable from the respected split supervisor's position. A single common second announcement shall be provided for the system.

2.4.15. System Operation: It shall be possible to activate any individual incoming trunk split while the remainder of the trunk groups remain in a night service mode.

2.4.16. Service Observing: It shall be possible for any supervisory location to service observe any agent position within their area of responsibility. Such service observing shall be silent so that both the agent and caller will not be aware such observing is taking place.

2.4.17. Dynamic Reconfiguration: It shall be possible to reconfigue the call routing so as to allow interflow between ACD agent groups from master supervisory consoles. It shall be possible for an agent split to be located off premise.

2.4.18. Queueing: Queueing shall operate on a First-In-First-Out basis. It shall be possible for the supervisor to provide priority to specific trunk groups. The incoming calling sequence shall be as follows:

Three Rings
20-Second First Announcement
30-Second Delay
10-Second Second Announcement
Continued Queue or Interflow

Calls routed to the second announcement shall maintain their spot in queue until answered.

2.4.19. Night Recording: An individual night recording indicating operating hours shall be provided for each agent group.

2.4.20. Agent Position: All agent positions shall be equipped with

sufficient control keys (i.e. available, release, emergency assistance, etc.) to perform their operation. Dial access codes to perform these functions shall not be acceptable.

2.4.21. Supervisory Positions: Shall be identical to agent positions except that it shall be possible to perform service observing of agents assigned to their responsibility. Service observing ability shall be controlled by software from the master control console. The console shall have indication of the "status" of each agent position under their control. The supervisory console shall have the ability to signal any agent position under their control. Such signal shall be inaudible to the outside caller. The agent will be able to hold the outside caller and connect to the signaling supervisor.

A supervisory position shall be equipped with a CRT and printer. The CRT shall show constant status as to positions, lines available, calls queued, etc. Cumulative Force Administrative Data shall be printed upon command issued by the CRT or at preprogrammed intervals. It shall also be possible from this supervisory console to reconfigure routing, queue thresholds, agent splits and announcements.

2.4.22. Force Administrative Data: Sample copies together with description and explanation of their derivation shall be submitted with the bid. At minimum, the system shall be capable of displaying and printing the following reports on command or a programmed basis:

Trunk Group Activity
Agent Group Activity
Agent Activity

Reports shall be capable of being printed hourly, daily, weekly and monthly. The printing of any of the reports shall not inhibit the data being stored for the following reports (i.e. the printing of hourly reports shall not affect data stored for daily reports, etc.).

2.4.23. Circuit Assurance: It shall be possible for the Master Supervisor console to individually select and test every trunk and tie-line circuit.

2.5.0. Call Sequencer: An automatic call sequencer shall be provided to serve the customer service area. The system shall be equipped at installation to service 10 incoming Central Office lines and 9 multi-button instruments. It shall expand to a maximum of 20 lines and 20 instruments. The Call Sequencer shall incorporate the following features:

2.5.1. Message Tapes: A single tape answer message shall be provided. Such message shall be customer programmable and variable in length from 20 seconds to three minutes. Four spare tapes shall be provided. Tape length shall be selected by customer at later date.

2.5.2. System Answering: The Sequencer shall be programmable to allow a variable time before answering with the recorded message. This variable time shall range from zero to 30 seconds and be customer settable. Prior to Sequencer answering with recording, the indication of incoming call shall appear on the answer position. Such call can be answered by the agent thereby preventing the sequencer recording from answering.

2.5.3. Answer Modes: The Sequencer shall be capable of both a day and night answer mode. In the day mode, the answer sequence shall be as follows:

a. Incoming call is received at the Sequencer and a Lamp appearance shall indicate ringing condition on each agent telephone instrument.

b. If the call is not answered by an agent within the customer variable answer timing parameter, the Sequencer shall answer with the announcement recording. Such announcement recording shall start at the beginning of the recording. More than one incoming line can be connected to the answer recording simultaneously if call volume dictates.

c. Waiting calls shall be indicated on the agent telephone instruments in a clear, non-confusing manner. Should an agent answer a call connected to the answer recorder, the connection to the answer recorder shall be immediately disconnected.

d. After hearing the entire announcement, waiting calls shall be placed in queue. That call waiting, or having been in queue, the longest shall be clearly indicated on the agent answer position.

e. In the night, or announcement mode, an incoming call will be immediately connected to an answer recorder. In this instance, a "barge-in" capability is considered advantageous. In the announcement mode, an incoming call shall automatically be disconnected after hearing the complete announcement twice.

2.5.4. Call Transfer: It shall be possible to transfer a call both within the customer service group and throughout the City

Centrex system.

2.5.5. Abandon Call Search: The Sequencer shall be equipped with abandon call search capability to automatically disconnect any abandoned call from both the Sequencer and agent positions.

2.5.6. Service Observing: It shall be possible for the supervisory position to observe any agent position. Such observation shall be silent so that both the agent and caller will not be aware this is taking place.

2.5.7. Force Administrative Data: At minimum, the system shall be capable of displaying and/or printing (printer shall be a part of this contract) the following reports on command or a programmed basis:

a. Trunk Group Activity including quantity of incoming calls, connect CCS and quantity of abandoned calls within "T" seconds.

b. Agent Group Activity including number of calls answered, number of calls placed, CCS connect time separately indicated for incoming and outgoing calls, average speed of answer.

c. Individual Agent Activity. The same information relative to quantity of incoming and outgoing calls, connect time, hold time, etc. shall be available for the agent position.

d. Reports shall be capable of being printed hourly and daily. The printing of any reports shall not inhibit the data being stored for following reports (i.e., the printing of hourly reports shall not affect data stored for daily reports). Sample copies of all reports together with their description and explanation of their derivation shall be submitted with the bid.

2.5.8. Headsets: Each telephone instrument shall be provided with a jack to allow connection of a light weight headset/microphone combination. Both headset microphone and handset shall be provided with each instrument.

3.0.0. Telephone Instruments: In general, the telephone instruments shall be of a 2500 type as manufactured by Comdial, ITT, Northern Telecom or Western Electric. The telephone shall be equipped as follows:

3.1.1. Color: Color shall be selected at a later date.

3.1.2. DTMF: All sets shall be equipped with Dual Tone Multi-Frequency (Touchtone) dialing.

3.1.3. Dial Dictation: Access shall be provided for dial dictation. Dictation links and machines are not part of this quotation. However, all telephones shall be equipped with polarity guards so as to allow dial dictation.

3.1.4. Feature Access Button: Each instrument shall be equipped with a separate button which will simulate the switchhook flash necessary to activate station features.

3.1.5. Modular: instruments shall be installed and equipped with modular jacks on both line or mounting cord and the handset cord.

3.1.6. Key Service Units: Shall be enclosed in cabinets and sized as appropriate for the respective installation.

3.1.7. Line Illuminations: All lines terminating on key telephone sets shall be equipped to flash at 60 ipm when ringing, 120 ipm on hold and burn solid when in use. LED lamps will be preferred.

3.1.8. Speakerphones: Shall be SP4 type.

3.1.9. Line Status Indicator: Line Status Indicators shall be equipped with lamp quantities as indicated in Schedule A. Lamps shall be LED type. They shall glow steady to indicate a line in use and flash with ringing current to indicate a ringing line.

3.1.10. Operating Instructions: The vendor shall provide with each telephone instrument an instruction booklet indicating system/feature operation and each instrument shall be equipped with a template indicating feature operation. Spare quantities equaling 20% of the total shall be provided.

3.1.11. Miscellaneous Equipment: Shall be as itemized in the attached Schedule.

4.0.0. Alternates: The following alternates shall be quoted as separate prices:

4.1.0. Central Station Message Detail Recorder: The telephone system shall be equipped with an SMDR output and a tape capturing device suitable of holding a maximum of _____ call records. It shall be possible to selectively capture long distance and/or local calling. This shall include the cost of any program necessary to process these tapes. Sample reports

shall be included with the bid.

4.2.0. Battery Power: Contractor shall provide a 4-hour battery supply for the Headquarters PABX.

4.3.0. Redundant Processor: The PABX systems shall be equipped with a redundant central processing unit capable of driving the entire system. When in a standby mode, the processor shall monitor the status of the operating processor and automatically take-over in the event of operating processor failure. Every 24-hours the processor in standby mode shall take control of the system and the alternate unit will assume the standby role.

4.4.0. Customer Administration Console: A terminal shall be provided to allow the Telephone Administrator to secure the following traffic information either on a visual or printed basis on each discrete trunk group:

1. Number of calls in study period,
2. Quantity of minutes, seconds, CCS or Erlangs in the study period,
3. Number of times individual features are activated in the study period.

Such information shall be available on demand or on a pre-programmed automatic cycle basis. In addition, this terminal shall allow the Telephone Administrator to make changes in the telephone line operating parameters such as:

Class of Service change,
Hunt route change,
Station number,
Feature availability.

It shall be possible to make these changes or collect this data from the switch site or remotely.

5.0.0. Installation: All installation shall be performed in a neat and workmanlike manner in accordance with all applicable building codes and according to standard utility practices by tradesmen belonging to a union suitable to work on this project.

5.1.1. All cabling in buildings shall be new and concealed in existing conduit, existing raceways, false ceilings (all cable in plenum air return ceilings shall be approved by Underwriters Laboratories as having adequate fire resistance and low smoke producing characteristics such as Teflon or CLX) or similar areas unless otherwise agreed to in writing by the owner and be in accordance with applicable building codes and of a type suitable for its application.

5.1.2. All feeder cable to key service units and distribution terminals shall have a minimum of 50% spare cable.

5.1.3. All station wiring shall be a minimum of four pair.

5.1.4. All terminal strips shall be mounted in enclosed housings and be clearly labeled.

5.1.5. Bidders are expected to examine the specifications and installation sites. Failure to do so will be at the bidder's risk.

5.1.6. Two complete sets of "as installed" drawings indicating cable routes and MDF/IDF terminations, current technical manuals and spare parts lists will be supplied with the installation.

5.1.7. It shall be the responsibility of the successful contractor to assure that adequate volume levels are provided for all off-premise extensions and tie lines.

6.1.0. Training: Successful contractor shall provide station user training to all offices using the main telephone system and printed operating instructions with all telephone instruments. Instructions shall be a combination of visual media and hands-on demonstration, done in groups of twenty on schedule and at a location acceptable to ABC Company. A copy of the media program shall remain the property of ABC Company.

A minimum of 16 hours of separate training shall be done with the console operators.

At the morning of the first business day following system cutover, a minimum of three installation/repair personnel and six trainers shall be available on site during business hours and remain available until released by the Purchaser's Representative.

7.1.0. Acceptance Procedure: As part of the acceptance procedure contractor will provide hourly traffic studies indicating CCS load and Peg Count by trunk and tie-line group for the first

four hours on the first business day following cutover and hourly for one week commencing one week after cutover. Samples of such reports together with explanation shall be submitted with bid.

Schedule A

A. ABC Company Headquarters

	Equipped	Wired	Maximum
Trunks: Direct In Dial	37	43	64
Outgoing: Local	37	43	64
: WATS	10	12	16
Tie Lines	18	22	31
Station Lines	400	450	716
Attendant Consoles	1	1	2

Station Equipment:	
Single Line Instruments	303
6-Button Instruments	48
10-Button Instruments/w Indicators	9
20-Button Instruments/w Indicators	2
Line Illumination Relays	
8-Lamp Line Status Indicator	10
16-Lamp Line Status Indicator	16
32-Lamp Line Status Indicator	4
Volume Amplifying Handset	8
Panel Telephone	1
Princess Telephone	1
Speakerphone	22

B. ABC Company - Sales Office

	Equipped	Wired	Maximum
Business Lines:			
:Local	11	13	17
:Off Premise Extensions	2	3	4
Station Lines	27	31	48
Attendant Console	1	1	1

Station Equipment:	
Single Line Instrument	17
6-Button Instrument	10
Line Illumination	11

C. Automatic Call Distributor

	Equipped	Wired	Maximum
Trunks	60	75	106
Answer Announcement	2	3	4
2nd Answer Announcement	1	1	1
Origin Announcement	16	20	20
Agent Position	13	21	36
Supervisory Positions	1	2	3
Agent Splits	2	3	3

Supplier's Questionnaire

In order to assist in evaluating supplier's response, please complete the following questions. Use as much detail as possible and feel free to add any information which is deemed helpful in the evaluation.

1. Who is the manufacturer, and what is the model number of:

   a. Telephone Switch
   b. Key Telephone System
   c. Telephone Instruments
   d. Station Message Detail Recorder

2. What is the quantity of memory equipped in the system? Used in the system? Maximum in the system?

3. What is the manufacturer's estimate of Processor Occupancy at the equipped size? Wired size when equipped? Maximum size when equipped?

4. What can be considered the MTBF for major system failures? For set failures?

5. Can technically compatible, non-supplier equipment be added to the system if it is leased? Purchased?

6. What will be the completion date of installation? State as calendar days after receipt of order.

7. Include a drawing indicating floor space requirement for the main telephone system including floor loads, temperature requirement, power requirements, power consumption and environmental requirements.

8. What is the response time for service calls on major failures?

9. Where will service be dispatched from? What is the quantity of factory trained technicians available? What is the number of system station lines being serviced? Indicate for each switch location.

10. Where will service and spare parts be stocked?

11. During what hours is service available?

12. What is the cost of a service call?

13. How will on-going training be handled?

14. Will software changes necessary to change station features be made at no charge? For how long?

15. For what period after installation are unit prices guaranteed? Explain any long term escalator clauses.

Price Quotation

Base Price (Section 1.1.0. - 6.0.0.)

System A

Headquarters	Equipment	$_____	$_____	$_____
	Installation	_____	$_____	$_____
	Total	$_____	$_____	$_____

System B

Sales Office	Equipment	$_____	$_____	$_____
	Installation	_____	_____	_____
	Total	$_____	$_____	$_____

Alternates:

Central SMDR

(4.1.0.)	Equipment	$_____	$_____	$_____
	Installation	_____	_____	_____
	Total	$_____	$_____	$_____

Battery Power

(4.2.0.)	Equipment	$_____	$_____	$_____
	Installation	_____	_____	_____
	Total	$_____	$_____	$_____

Redundant Processor

(4.3.0.)	Equipment	$_____	$_____	$_____
	Installation	_____	_____	_____
	Total	$_____	$_____	$_____

Customer Administrative Console

(4.4.0.)	Equipment	$_____	$_____	$_____
	Installation	_____	_____	_____
	Total	$_____	$_____	$_____

Unit Installed Price: (to add or delete)	Before Installation	Afer Installation
1. Standard Touchtone Telephone		
2. 6-Button Telephone		
3. 10-Button Telephone		
4. 20-Button Telephone		
5. Line Illumination Card		
6. Speakerphone		
7. 13-Line Key Service unit		
8. 26-Line Key Service unit		
9. Trunk Card (a) PBX System per _____ Trunks (b) Key Telephone System per _____ Business Lines		
10. Station Line Card (a) PABX Line Card per _____ Lines (b) Key Telephone System Line Card per _____ Lines		
11. 6-inch Loud Bells		
12. 8-Lamp LSI		
13. 16-Lamp LSI		
14. 32-Lamp LSI		
15. ACD Agent Position		
16. ACD Supervisor's Console		
17. Headset		

A normal bid cycle from the time the RFP is delivered to potential vendors and their responses are received is 30 days. If the system is of any size (over 200 stations) or complexity it is suggested that a bidders meeting be scheduled midway during the bidding cycle (specification Section 1.1.1.). At that time all bidders, after reviewing the specifications, can ask any questions which they may have and they then will receive the same answers. The result of that meeting, if necessary, can then be distributed as an addendum. Also, during this process the vendors' installation personnel will undoubtedly want to perform a "walk through" to determine the cable installation price to be quoted. That can be performed, or scheduled during the bidders' meeting. Finally, while the bidding period is scheduled for 30 days, in planning the project schedule, it is best if the possibility of extending the due date for several weeks is built into the project schedule. Then if a vendor requests an extension, the due date can be extended without unduly pressuring the overall project schedule.

Chapter Five

Analysis of the Response

After the RFP responses are returned by the potential vendors, they should be ranked according to price. This is done partly out of curiosity and partly to allow the elimination of any vendors who are outrageously expensive or obviously do not meet the specifications. It is not unusual for either of these events to occur. Then the evaluation of lowest-cost proposal should be performed. Each proposal that apparently meets the specification and appears viable must be carefully reviewed. It is not unusual during this review to find that some areas of the response fall short of the specified requirements. If this response does not meet all the system and service needs of the business, it should be discarded. (A management decision can be made to allow the unresponsive vendors to correct their proposals.) This process continues until all proposals meeting all the predetermined needs are established. At this point it is necessary for cost comparisons to be prepared for all of the proposals including the present system.

Even though it may be necessary to replace the present system because of growth or for other reasons, this comparison is necessary simply to indicate to management the operating budget effect of a system change. In the face of moving to a new location where present system comparison would not necessarily be applicable, the present system is still projected for budgetary reasons. These projected operating cost comparisons are designed to make the telecommunication manager a financial analyst. (It is difficult enough to be a communication manager today.) Rather, it is the intent of these projections to portray, to the best of the manager's ability, all costs associated with ownership of each system.

If the support of top management is to be secured for the "single instrument" concept, the author has found it valuable to be able to portray actual cost differentials between this "single line" and duplication of present system concept. Therefore, two instrument configurations are used in the RFP. The first uses station apparatus that takes advantage of the system features and uses a high degree of standard, or single-line telephones. The second duplicates the key equipment as it exists today. When the cost difference is seen, support is usually forthcoming.

One of the driving forces in the system selection process is the perception of the reduction in long term operating cost. The implications of the words "long term" is that there is some ability to predict the location life, and system growth. Obviously, any system to be installed must reside in its installation location for some period of time. In fact, the common method of viewing the system's life today is that it is expected to have no more than a seven year system life. This is because in 1981 the FCC allowed operating telephone companies to begin to use a 6.6 year life for Customer Premise Equipment. For conservative cash flow projection, it would be best to view the system as having a zero residual value at the

conclusion of that time frame.

The telephone system can actually be divided into three separate components. The first, the telephone switching system, will have little residual or trade-in value. In the author's experience any trade-in value on the existing switching system can be considered a "windfall" profit. From the point of telephone instruments, if these are generic and can be used with the new switching system, their reuse will simply reduce the overall system acquisition cost. In that instance, only the switching system and its installation would be purchased. At that level the anticipated purchase cost per line could be lowered to approximately $600. However, in deciding to utilize the existing telephone instruments because they are generic it must be remembered that these will normally be the electro-mechanical 1A2 equipment. Therefore, they will be considerably more labor intensive, in terms of both move and change cost and mechanical breakdowns, than will the newer electronic instrument. However, the electronic instrument will generally be proprietary to the particular telephone system installed. If these type of instruments are presently in use, unless one is prepared to treat the existing vendor as a sole source in the replacement acquisition those instruments would adopt the same life as the switching equipment, or 6.6 years. In either instance, if the instrumentality is to be replaced one can expect little actual trade in. The cost of labor to remove and refurbish these units is generally higher than the cost of purchasing new equipment.

The third part of the system, that of cable distribution, is the only area that has any potential future value. Properly designed, using the previously mentioned 4-wire distribution this cable could be reused with a new installation. Therefore, in projecting any potential system operating cost the manager, as a discretionary choice, could indicate a longer depreciable life for this portion of the acquisition. That would have the effect of reducing the perceived operating cost.

While perceived savings are usually the main reason for investigating the purchase of a telephone system, by this time it is literally possible to prove anything in the Cash Flow environment. This is not intended to make a communication manager a financial analyst. However, it is the duty of the communication manager to accurately portray the perceived operating cost of the telephone sytem, including rate increases to the best of their ability. At the conclusion of that portrayal this projection should then be given to the organization's financial officers for review, discussion and ultimate support. An agreement between the two organizations, the Telecommunications Department and the Financial Department, as to the value of the investment to the organization is necessary prior to making final presentation to top management.

Any projected cash flow can be viewed in a multitude of ways. The attached* schedules indicate many of these together with the relative affect of selecting one method over another. Each of the Cash Flows anticipate that the Investment Tax Credit will be received by the purchaser. In order to

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* See page 75A

receive this tax credit a minimum of a five-year system life must be chosen. Otherwise, the 10% investment tax is reduced by 2% for every year's reduction in system life. All systems in the projection are compared to the present rented telephone system. This is consistent with the previously mentioned establishment of a comparative base. Also, only one system operating cost under the various scenarios is included. This same comparison would be done for every system that is considered a viable alternative.

The incorporated Cash Flow Projections illustrate the Present system and the three possible ways of acquiring the new system. The first of these, obviously, is simply a system cash purchase. The second method of acquiring the system would be utilizing a time-payment plan of some kind. This is normally referred to as a "lease/purchase" or "Conditional Sales Contract." In this type plan at the conclusion of the monthly payment period, title to the system is passed to the buyer. This is generally for the nominal payment of $1. The final method of securing the system is as an "Operating Lease." In this case at the conclusion of the monthly payments the system purchaser has an option of returning equipment to the leasing company or purchasing it for "fair market value." That is generally thought to be 10% of the original purchase price.

In today's environment, there are several advantages to the Operating Lease which must be considered:

1. With the perceived seven-year life the residual value "risk" is placed upon the leasing company rather than on the purchaser.

2. Under the terms of Rule 13 as prescribed by the Financial Accounting Standards Board, an operating lease does not appear on the organization's balance sheet as an obligation. This has some attraction to the organization's financial officer from the perspective of financial statement preparation.

If this approach is taken the potential of purchasing the actual cable and its installation while leasing the remainder of the system should be considered. This would allow the reuse of that cable with a future installation.

The first method of projecting the Cash Flow is to simply illustrate the total expenditure during the anticipated seven-year life. In doing that, all potential costs of service are illustrated. This includes, in this instance, applicable Telephone Utility charges even though those are consistent with all systems. The reason for the incorporation of these items is to provide management with some relative association of the total telecommunication expenditure and/or responsibility on the part of the telecommunication department. It should also be mentioned that those differentials and operating costs created by features on the various

systems are not illustrated at this time. Increasingly it is expected, as time passes, that these will be incorporated into Cash Flow Projections. At that time, the relative breakeven point on the systems will undoubtedly be reduced. That is because this additional savings is viewed by management as "soft" savings. Therefore, a degree of skepticism is exercised when viewing those "soft" dollars.

The initial portrayal, that of the simple outflow of dollars, is totaled for each year and a cumulative expenditure prepared. This exercise should be completed even if the conditional sales contract or operating lease will be used. The reason for that is it establishes the breakeven point for a system change. For example, in this illustration the cash acquisition, when compared to the Present System, indicates that the breakeven will occur in year four. This fact is important to know because it is one measure of the relative risk of the change. In other words, if all planning goes awry it is a good idea to know that, while the anticipated savings and/or return expected is not to be achieved, at least no loss will occur after the installation has been in place for four years. The same gross expenditure is also portrayed for the Lease/Purchase (Conditional Sales) Contract and the Operating Lease.

The second method of portraying the operating cost is to consider the effect after tax considerations are included. In this case both the Investment Cash Credit and the Internal Revenue Service prescribed five-year depreciation (15% in the first year, 22% in the second year, 21% in the third year, 21% in the fourth year and 21% in the fifth year) is used. For calculation purposes, a tax rate of 50% is used.

The final method is to view the system under Net Present Value conditions. This NPV attempts to recognize the fact that a dollar spent, or saved, in the future is worth less than that spent, or saved, today. In the illustration, this is done on an after tax basis. In this instance an 11% Net Present Value factor is used. Comparing each of those potential systems under the various scenarios, the following projected operating costs for the seven-year period are illustrated:

	Before Taxes	After Tax	After Tax/NPV
Present System	$1,985,253	$992,627	$646,599
Proposed System:			
Cash Purchase	1,154,210	700,203	628,714
Lease/Purchase	1,301,123	979,642	577,894
Operating Lease	1,261,662	606,517	392,651

One method of viewing this investment is on an Average Annual Return on Average Investment. The Average Annual Return is the difference in the seven-year operating cost for the two systems divided by seven. This would give the average return, or savings, each year. The average investment is then determined by dividing the initial investment in the system by two.

Assuming a straight line depreciation rate, this will provide the Average Investment. The average annual return is then calculated by dividing the average annual savings by the average investment. That calculation is:

A = Purchase Price
B = Present System seven-year cost
C = New System Operating Cost

((B - C) / 7) / (A/2) = Average Return on Average Investment

In this particular illustration, the Average Annual Return on Average Investment under the various scenarios can be determined to be:

	Before Tax	After Tax	After Tax/NPV
Cash Purchase	41.99%	14.77%	00.90%
Lease/Purchase	34.57%	00.65%	03.48%
Operating lease	36.56%	19.51%	12.83%

From the communication manager perspective, the desired return on the Cash Purchase basis should exceed 25% in order to justify the relative acquisition risk. This same Return comparison can be used to measure various systems projected in the Cash Flows to each other. As previously mentioned, this projection only illustrates one system. Typically, all systems capable of meeting the specifications would be illustrated in a like manner.

Obviously, with this range of Rate of Return, it is possible to prove, or justify virtually any action that is desired. It should not be the province of the communication manager to make the management and/or financial decision as to the wisdom of the organization's commitment of capital to the system acquisition or to the method of that acquisition. Rather, it should be the position of the communication professional to understand the implication of before, and after, tax considerations with or without net present value for the acquisition of the various system alternatives. With that basic understanding in mind, and the ability to project the potential rate case impact on the system, these numbers should be provided to the organization's financial officers for the decision as to the willingness of the organization to commit capital to this purchase and to determine the actual method of acquisition. It remains the duty of the communication professional to select the system that will meet the needs of the organization. The method of financing the acquisition of the system is a financial decision. However, this does not remove the responsibility for projecting all operating costs associated with the system.

Projected operating cost is only one ingredient of the overall system selection factor. It is advantageous to prepare a vendor comparison schedule which incorporates all of those items considered important in both the selection process and to achieve the desired long term, trouble free operation.

ABC COMPANY
TELEPHONE SYSTEM
PROJECTED OPERATING COST

SYSTEM CASH PURCHASE

YEAR	ZERO	ONE	TWO	THREE	FOUR	FIVE	SIX	SEVEN	TOTAL
CASH OUTFLOW									
PRESENT RENTED SYSTEM:									
Centrex		$166,997	$166,997	$166,997	$198,893	$210,827	$223,477	$236,885	$1,371,073
FCC Access Charge		19,704	19,704	19,704	39,360	39,360	39,360	39,360	216,552
Intra-State Access Charge		1,776	1,776	1,776	1,776	1,776	1,776	1,776	12,432
Station Equipment		31,994	35,193	38,713	42,584	46,842	51,527	56,679	303,532
State Tax		9,458	9,595	9,746	12,124	12,819	13,562	14,359	81,664
TOTAL	$0	$229,929	$233,266	$236,936	$294,737	$311,624	$329,702	$349,059	$1,985,253
CUMULATIVE TOTAL		$229,929	$463,195	$700,131	$994,868	$1,306,492	$1,636,194	$1,985,253	
AFTER TAX EXPENSE									
Tax Rate at 50%		$114,965	$116,633	$118,468	$147,369	$155,812	$164,851	$174,530	$992,627
NET COST		$114,965	$116,633	$118,468	$147,369	$155,812	$164,851	$174,530	$992,627
CUMULATIVE NET COST			$231,597	$350,065	$497,434	$653,246	$818,097	$992,627	
AFTER TAX NET PRESENT VALUE @ 11%									
NPV Multiplier		.900901	.811622	.731191	.658731	.593451	.534641	.481658	
Net Present Value		$103,572	$94,662	$86,623	$97,076	$92,467	$88,136	$84,064	$646,599
CUMULATIVE NET PRESENT VALUE			$198,234	$284,856	$381,933	$474,399	$562,535	$646,599	

YEAR	ZERO	ONE	TWO	THREE	FOUR	FIVE	SIX	SEVEN	TOTAL
CASH OUTFLOW									
SYSTEM CASH PURCHASE:									
Telephone Co. Service	$5,920	$17,302	$18,686	$20,181	$21,795	$23,539	$25,422	$27,455	$160,298
FCC Access Charge		6,912	6,912	6,912	9,216	9,216	9,216	9,216	57,600
Intra-State Access Chg.		4,032	4,032	4,032	4,032	4,032	4,032	4,032	28,224
State Tax		1,212	1,271	1,335	1,503	1,578	1,659	1,746	10,305
Purchase Price	565,470								565,470
Sales Tax	28,274								28,274
Insurance		565	565	565	565	565	565	565	3,958
Maintenance			16,381	18,019	19,821	21,803	23,983	26,382	126,389
Cost of Money @ 11%		65,963	51,229	36,468	20,032				173,692
TOTAL	$599,663	$95,986	$99,076	$87,513	$76,965	$60,733	$64,878	$69,397	$1,154,210
CUMULATIVE TOTAL		$695,649	$794,725	$882,238	$959,203	$1,019,936	$1,084,813	$1,154,210	
AFTER TAX EXPENSE									
Depreciation		-$84,821	-$124,403	-$118,749	-$118,749	-$118,749			-$565,470
Investment Tax Credit		-56,547							-56,547
COST	$599,663	-$45,382	-$25,327	-$31,236	-$41,784	-$58,015	$64,878	$69,397	$532,193
Tax Rate at 50%		22,691	12,663	15,618	20,892	29,008	32,439	34,698	$168,009
NET COST	$599,663	-$22,691	-$12,664	-$15,618	-$20,892	-$29,007	$97,316	$104,095	$700,203
CUMULATIVE NET COST		$576,972	$564,308	$548,690	$527,798	$498,791	$596,107	$700,203	
AFTER TAX NET PRESENT VALUE @ 11%									
NPV Multiplier	1.	.900901	.811622	.731191	.658731	.593451	.534641	.481658	
Net Present Value	$599,663	-$20,442	-$10,278	-$11,420	-$13,762	-$17,214	$52,029	$50,138	$628,714
CUMULATIVE NET PRESENT VALUE		$579,221	$568,943	$557,523	$543,761	$526,546	$578,575	$628,714	

Lease/Purchase also known as Conditional Sales Contract

YEAR	ZERO	ONE	TWO	THREE	FOUR	FIVE	SIX	SEVEN	TOTAL
CASH OUTFLOW									
SYSTEM LEASE/PURCHASE:									
Telephone Co. Service	$5,920	$17,302	$18,686	$20,181	$21,795	$23,539	$25,422	$27,455	$160,298
FCC Access Charge		6,912	6,912	6,912	9,216	9,216	9,216	9,216	57,600
Intra-State Access Chg.		4,032	4,032	4,032	4,032	4,032	4,032	4,032	28,224
State Tax		1,212	1,271	1,335	1,503	1,578	1,659	1,746	10,305
Purchase Price		124,313	124,313	124,313	124,313	124,313	124,313	124,313	870,191
Sales Tax		6216	6216	6216	6216	6216	6216	6216	43,510
Insurance		565	565	565	565	565	565	565	3,955
Maintenance			16,381	18,019	19,821	21,803	23,983	26,382	126,389
Cost of Money @ 11%		651							651
TOTAL	$5,920	$161,202	$178,375	$181,573	$187,461	$191,262	$195,406	$199,925	$1,301,123
CUMULATIVE TOTAL		$167,122	$345,497	$527,070	$714,531	$905,792	$1,101,198	$1,301,123	
AFTER TAX EXPENSE									
Depreciation		-$84,821	-$124,403	-$118,749	-$118,749	-$118,749			-$565,471
Investment Tax Credit		-54,547							-54,547
COST	$5,920	$21,834	$53,972	$62,824	$68,712	$72,513	$195,406	$199,925	$681,105
Tax Rate at 50%		22,691	12,663	15,618	20,892	29,008	97,703	99,963	$298,537
NET COST	$5,920	$44,525	$66,635	$78,442	$89,604	$101,521	$293,109	$299,888	$979,642
CUMULATIVE NET COST		$50,445	$117,080	$195,522	$285,126	$386,646	$679,755	$979,642	
AFTER TAX NET PRESENT VALUE @ 11%									
NPV Multiplier	1.	.900901	.811622	.731191	.658731	.593451	.534641	.481658	
Net Present Value	$5,920	$40,113	$54,083	$57,356	$59,025	$60,247	$156,708	$144,443	$577,894
CUMULATIVE NET PRESENT VALUE		$46,032	$100,115	$157,471	$216,496	$276,743	$433,451	$577,894	

Operating Lease Contract

YEAR	ZERO	ONE	TWO	THREE	FOUR	FIVE	SIX	SEVEN	TOTAL
CASH OUTFLOW									
SYSTEM OPERATING LEASE:									
Telephone Co. Service	$5,920	$17,302	$18,686	$20,181	$21,795	$23,539	$25,422	$27,455	$160,298
FCC Access Charge		6,912	6,912	6,912	9,216	9,216	9,216	9,216	57,600
Intra-State Access Chg.		4,032	4,032	4,032	4,032	4,032	4,032	4,032	28,224
State Tax		1,212	1,271	1,335	1,503	1,578	1,659	1,746	10,305
Purchase Price		110,877	110,877	110,877	110,877	110,877	110,877	110,877	776,139
Purchase								56,470	56,470
Sales Tax		5544	5544	5544	5544	5544	5544	8367	41,630
Insurance		565	565	565	565	565	565	565	3,955
Maintenance			16,381	18,019	19,821	21,803	23,983	26,382	126,389
Cost of Money @ 11%		651							651
TOTAL	$5,920	$147,094	$164,268	$167,465	$173,353	$177,154	$181,298	$245,111	$1,261,662
CUMULATIVE TOTAL		$153,014	$317,282	$484,746	$658,100	$835,253	$1,016,551	$1,261,662	
AFTER TAX EXPENSE									
Investment Tax Credit		-54,547							-54,547
COST	$5,920	$92,547	$164,268	$167,465	$173,353	$177,154	$181,298	$245,111	$1,207,115
Tax Rate at 50%		-46,274	-82,134	-83,732	-86,677	-88,577	-90,649	-122,555	-$600,598
NET COST	$5,920	$46,274	$82,134	$83,732	$86,677	$88,577	$90,649	$122,555	$606,517
CUMULATIVE NET COST		$52,193	$134,327	$218,059	$304,736	$393,313	$483,962	$606,517	
AFTER TAX NET PRESENT VALUE @ 11%									
NPV Multiplier	1.	.900901	.811622	.731191	.658731	.593451	.534641	.481658	
Net Present Value	$5,920	$41,688	$66,662	$61,224	$57,097	$52,566	$48,465	$59,030	$392,651
CUMULATIVE NET PRESENT VALUE		$47,607	$114,269	$175,493	$232,590	$285,156	$333,621	$392,651	

Typically that evaluation process would include evaluation of four major points:

1. Consideration of the manufacturer; their stability, willingness and ability to accept the responsibility for long-term equipment support.

2. The actual equipment itself in terms of its ability to both meet the specifications and the operational requirements of the organization.

3. The local support capability in terms of both long-term service capability and the acceptance of the responsibility for the success of the system's installation.

4. The actual equipment cost itself.

In preparing such an analysis any desired point scale that reflects the relative value of each item can be established. The following illustration utilizes a 100 point scale for a particular system and set of circumstances.

The determination of the relative point values is best done in conjunction with the specification preparation. In that way, it is possible to assure that this grading method is not influenced by vendor response. While any point scale can be used, the incorporated illustration uses a 100 point measure. To discuss each of the respective areas and some of the considerations: in the manufacturer analysis, the stability of the manufacturer must be considered. In doing this, it is well to remember that size alone does not guarantee stability. For example, during the past several years several large, well financed organizations, have decided it is not in their best interest to continue in the telephone system business and have, therefore, withdrawn from the market. This obviously leaves an "orphan" system in some degree of danger relative to the long term ability to secure service and expansion parts.

User responsiveness can generally be established by talking with existing users of that system. It reflects the manufacturer's willingness to work with the user to make specific hardware or software modifications to meet particular or unusual requirements. Market penetration is also some measure of stability. Simply, the more systems the vendor has successfully sold, the more likely they are to remain in the telephone business. Finally, the willingness of the manufacturer to provide training to the end user's service personnel is only of importance should the end user decide to perform "in-house" maintenance with their own staff. This is a separate, long-term management decision which must be faced.

Turning to the specific equiment involved, every system has a projected life cycle. There is relative danger in being on the forefront of that

Vendor Comparison

	Max Pts.	A	B	C	D
Manufacturer (20 points)					
Stability	6	6	6	5	6
User Responsiveness	4	1	3	3	3
Market Penetration	5	5	3	3	3
Training for Service	5	0	5	4	5
Equipment (35 points)					
Product Life Cycle Position	5	2	5	5	5
Traffic Capacity	4	3.7	3.6	4	3.3
Feature Operation	5	2	5	3	5
Least Cost Routing	3	1	2	3	5
Traffic Information	3	3	3	3	3
Reliability	6	3	6	4	6
Terminal Move and change	4	4	4	3	4
Integration of data/handset	3	0	3	2	3
Growth	2	2	2	2	2
Local Support (25 points)					
Experience Similar Systems	5	5	2	5	5
Presentation	3	1	3	3	2
Location	2	2	2	2	2
Service Depth	3	2	1	3	2
Training for User	7	2	7	7	7
Service Contract	5	2	2	5	5
Cost	20	20	18.8	19.2	18.1
Total	100	66.7	81.4	88.2	91.4

cycle. The purpose of the comparison chart is to force a disciplined, comparative review of each of the points considered important to the success of the installation. The specific detail included in any evaluation will vary by project needs and the perception of the value of those individual needs. At the same time, to secure the system at the conclusion of its life cycle reduces the potential long-term system life. Therefore, it would be ideal to secure a system that is either in the middle of its life cycle or has a proven track record relative to upgrading capability. In the case of traffic capacity, a decision must be made. The specification required a specific CCS level of service. The decision must be made relative to whether that vendor providing the maximum CCS level (potentially non-blocking) should be awarded maximum points with all other vendors scaled down in a relative manner from that; or, as an alternative, should all potential vendors meeting or exceeding the specified requirement be awarded maximum points with those not being requirements being scaled down from there. Remember, when determining this load it is necessary to not only examine the "Equipped" capability, but also the system in light of its projected "Maximum "size.

From a feature comparison point of view, this can be treated, as it is in the example, with a single point value provided for all features. As an alternative, each individual feature in the specification can be provided a point value and individual measures provided against those. If that is the case, generally a higher maximum rating than the 100 point scale would be used. In doing that, care must be taken that an inordinate amount of weight is not placed on the feature portion of the analysis. Specific necessary features within the system such as Least Cost Routing, the availability of on-site traffic information, potential of integrating data at the telephone handset, ease of customer generated move and changes, etc. can all, if warranted, be provided specific separate points for evaluation purposes. Reliability incorporates such items as redundant processors, memory, battery backup, etc. Finally, the ability for the system to grow to meet the maximum projected requirements must be evaluated. As a word of caution, each of these points must be specifically reviewed in each viable, vendor's response. This is important because, as stated previously, the feature and/or capability as specified with the vendor taking no exception in their response does not mean that the feature will be provided.

Turning to local support, experience installing similar systems of a size and complexity equal to the one being proposed must be considered. Some degree of weight is placed upon the vendor's presentation because it is indicative of local interest in the project. It is also important to determine the actual vendor location and service dispatch point evaluate their ability to support the equipment. Service depth is equally important. This is the quantity of technicians specifically trained and certified by the manufacturer on the specific system. This comparison is done by establishing a ratio of technicians to installed base. A ratio lower than 750:1 is probably at a level where the vendor is losing money and presents some degree of danger. A ratio much in excess of 1,000:1 would indicate that the staff is spread too thin and presents an equal risk

in ability to promptly respond. Finally, the method of user training should be considered. The quantity of this training will directly affect the success of the installation. User that are ill trained and uncomfortable with feature operation will not use them and find fault with the system. That fault will result in loss of system credibility. Once a system has lost credibility, it is most difficult, if not impossible, to recover that credibility. In this instance, the "Train The Trainer program" espoused by the utilities and ATT is considered absolutely unsatisfactory. It is an impossibility to expect the employer's staff, after 8 to 16 hours of training, to be able to answer many of the difficult questions posed by the end user during the training program. Representatives of the manufacturer must perform this training if it is to be successful.

Finally, the cost ingredient should be incorporated into the analysis. This is done by awarding the maximum point count to the system projecting the lowest cost in the selected method of cost projection. Each of other vendor's point count is reduced by an amount equal to their percentage cost increase of this low price. Obviously, the point scale used in the illustration can be termed "subjective." However, such an analysis is of value to the telecommunication manager for several reasons:

1. It enforces a discipline requiring the consideration of every one of the points necessary for successful system implementation and operation.
2. It can be later used to portray to management the fact that all possible items have been considered.

With the completion of this analysis, it is then possible to prepare a recommendation for top management. In the preparation of that presentation, it is well to keep in mind that top management is not intimately aware of all of the conditions presently affecting the telecommunication industry or of the potential vendors. Therefore, the presentation should begin with the state of the industry and progress through all of those points considered in specification preparation through system recommendation. While the analysis will clearly recommend a specific vendor, that recommendation should not be made to management. Rather, a recommendation requesting their approval to begin contract negotiations with the perceived best vendor should be requested. If successful long term contract negotiations cannot be competed with that vendor, latitude to move to the second most viable vendor should be granted. This does allow some flexibility in the contract negotiation process. This is important if the organization is to receive maximum protection of their investment.

Chapter Six

The Contract Negotiation

In today's environment, all systems are "interconnect" or purchased. Thus, the successful acquisition and operation of any communication system will be dependent upon the individual contract covering the acquisition, installation and maintenance support on the equipment.

These are generally best handled in two separate contracts. The Purchase Agreement details the expectations and responsibilities leading to installation and eventual acceptance of the system. With the acceptance, a much smaller, long term maintenance contract that is easier to administer should detail warranty, service and maintenance responsibilities.

These contracts are not intended to be the sole selection criterion. Many of the points raised in the contract should have been previously covered during the vendor selection process. This is done through the questions within the Request For Proposal and carefully doing the prior homework necessary for system selection.

It should be remembered that the sellers will present the buyer with their contracts, prepared by their attorneys, designed to protect them. The points raised in this Chapter are designed to protect the buyer. It is incumbent upon the buyer to take the necessary steps to contractually protect an investment of the magnitude incurred when purchasing telephone systems today. From these two opposite points of view comes "negotiation."

The methods of system acquisition can vary. Perhaps the most common is the cash purchase. In this case, for an immediate cash expenditure the buyer becomes the owner of the telephone system installed on his premises. In this instance, the primary concerns are system installation, system cutover and successful implementation. This is followed by the necessity to assure long term service response and support from the vendor. For that reason, both acquisition and long-term maintenance contracts should be written simultaneously. The best maintenance contract can be negotiated while the "carrot" of the system sale still exists.

The second method of acquisition is the conditional sale or "lease/purchase" contract. In this case, monthly payments are made to the leasing company and title to the equipment does not pass to the system buyer until the final payment is made. As before, it is necessary to protect the initial investment and the long-term operation or service capabilities of the system. Last, a pure operating lease is possible in which case title does not pass to the buyer at any time.

In these instances, the same implementation and service requirements exist. However, in the latter two cases (lease/purchase and operating lease), it is necessary to protect the financing source as well as the buyer. In most cases, this financing source is loaning the money for the system

acquisition based upon the credit worthiness of the buyer. There is little consideration given to the service capabilities and long-term support capabilities of the actual vendor. Therefore, it is necessary to keep this telephone system, an operating asset, functioning for the expected life of the lease or conditional sales contract. (Because the Federal Communication Commission has dictated a life of 6.6 years, it has been suggested that any selected payment plan not exceed seven years.) It is necessary to protect not only the system user but also the source of financing from supplier failure. For example, if the system ceases to operate, the lessor will still look to the buyer for payment. Therefore, in the event of failure since payment is not expected to stop, it is necessary to protect both individuals.

Recently, a number of landlords have begun to visualize a potential profit in the rental of telephone service to their tenants. The analysis process in evaluating that offer is no different from the previously detailed selection process. It is also necessary to negotiate the same contractual protections contained in this Chapter. In addition, since quantities of trunks and service vendors for the "master" switching system are under the control of the provider, not the end user, it is necessary to also commit:

....level of trunking (i.e., PO1, etc.)
....quality of transmission
....method of charging for local,
long distance and other usage
sensitive features

to contract.

One of the unfortunate aspects of purchasing a system is that it is purchased or secured from "friends." This means that while the usual buyer approaches system acquisition with some trepidation, during the investigative process the fears are generally laid to rest and a feeling of confidence and trust is placed in the seller. Unfortunately, in too many cases this confidence can be misplaced. This is particularly true when viewing the seven year, expected system life necessary to justify a system purchase. In the deregulated environment, the only recourse to possible performance default rests in the courts and litigation. There is no longer any Public Utility Commission or Regulatory Body to appeal to for help. Therefore, it is incumbent upon the buyer to take the steps necessary to protect the investment made in the system.

The following contractual clauses are a result of many years experience. While they are not all encompassing in nature and may require modification to fit particular situations, if all of these points can be covered contractually, the buyers investment should be well protected. These clauses will require some changes predicated upon method of acquisition (i.e., cash purchase, lease/purchase or operating lease) and may be used either as an addendum to the seller's usual contract (this is more prevalent in dealing with major companies) or used as a standard contract on a stand-alone basis. In either instance, it is wise to consult the buyer's legal counsel before ultimate signature.

The following provisions outline the philosophy behind the points in the contract for Purchase:

The Purchase Contract

A. Capacity/Features

This is the detailed definition of the system switching capacities, potential growth and system features. This normally can best be covered by incorporating as a contract addendum the manufacturer's "General System Description" manual (this details system architecture and features), literature, the buyer's Request For Proposal and the vendor's proposal and any correspondence relative to the purchase. In appending this material, the dates on each item and the literature identification (i.e., XYZ Manufacturing Company General System Description Practice 1234-5-6, dated September 15, 1983, etc.) should be specifically mentioned. In appending this quantity of material, there is always a potential conflict between the various items. It should be specifically spelled out that any conflict arising between the various materials will be left to the discretion of the buyer to select which of the items in conflict shall take precedence.

B. System Configuration

The Request For Proposal normally specifies specific switching system size and quantities of station apparatus (i.e., "X" number of 6-button key sets, "X" number of line illumination relays, etc.). Between the order and final delivery, there normally are changes in equipment configuration. This is particularly true when working with a new building where final system layout may not be complete. In these cases, the initial purchase and Request For Proposal were performed primarily to create an "apple-to-apple" comparison between potential vendors. In this initial phase, it is necessary to specifically detail the design as it is then understood. However, you can expect the design will change before installation. Therefore, unit pricing and specific milestone schedules should be discussed in the installation portion of the contract. These only become meaningful, however, with a detailed equipment itemization contained at this point. That itemization should contain not only station apparatus quantities, but also quantities of component parts within the switching system itself. For example, number of station line cards, trunk cards, and other system components should be itemized.

C. Documentation

The vendor should be willing to provide two sets of operating manuals explaining in detail the operation of the system features and attendant consoles, service manuals enabling service to be performed by a third party (if necessary), a complete parts list so that the third party could, in fact, secure spare parts, and last, "as installed" drawings. These "as installed" drawings should detail the complete wiring and inside plant

distribution of the system between the switching system, main distribution frame, and all floor distribution terminals, and/or key service units. This should indicate not only the cable routing, but also each individual terminal, its line assignments and capacity.

D. Changes and Attachments

This should allow the buyer to attach to the system technically compatible equipment provided by other vendors. A definite procedure for securing permission from the vendor for these attachments should be outlined. This would normally mean a set of specifications for the added equipment is provided the manufacturer for review. After review, the manufacturer may allow or disallow that connection. The authorization for connection should not be unreasonably withheld and normally can be denied only if the equipment is not technically compatible with that already being purchased. The fact that this equipment is being connected to the system should not breach or abrogate any other warranties associated with the system long-term operation. Nor, after manufacturer's approval should the buyer be liable for any damage.

E. Software Support

The vendor should agree to perform any equipment and/or software updates necessary to meet the original specifications at no cost to the buyer. Those software updates which enhance the present system should be announced to the buyer in a timely manner and made available at a minimal cost.

F. Unrestricted Use and Function

The buyer should have no restriction as to the use and function of the system or its location. This will be particularly important in the event the purchaser decides to move or sell the system. It should be possible to transfer both equipment and any software license to the new location or owner.

G. Conformance to Standards

The system shall be manufactured and installed in accordance with FCC Rule 68 to allow direct connection to telephone company lines without the use of interconnect devices. This conformance also assures that the installation technicians will be factory certified on the equipment.

H. Patent Infringement

The seller shall protect the buyer from any litigation resulting from patent infringement suits. In the event of loss, the manufacturer should either correct the infringement at no cost to the buyer or refund the undepreciated portion of the system.

I. Reliability

The Request For Proposal should have asked for the seller's estimate as to MTBF (mean time between failures), and this should be incorporated in this section of the contract. This simply prevents future arguments as to what is "excessive" service and protects the buyer from the "Monday morning" switching system.

PAYMENT SCHEDULE

A. Purchase Price

The full purchase price should be indicated with a breakdown of switching system cost, station apparatus cost, and installation cost on an attached Schedule (in those states where software is not taxable, this should be a separate item). This should then be broken into a specific payment schedule in a series of progress payments tied to the performance of specific events. The typical method of handling this is to make a down payment of approximately 10 percent and to withhold between 10 and 25 percent until system acceptance. The remaining percentage is paid according to a schedule predicated on system complexity during installation. This may be one single payment at the time of system cutover or a whole series of negotiated payments during the installation cycle. Each payment should be dependent upon a specific event and not referenced to any date.

B. Freight Charges

The system is normally sold FOB installation site. This precludes any problem relative to the transport of the equipment from the buyer's loading dock to the actual equipment room.

C. Insurance

It should be the responsibility of the vendor to maintain insurance on the system until that system is cutover and accepted by the buyer.

D. Unit Prices

Unit prices for all system components (i.e., station equipment, line cards, key service units, trunk cards, and switching components) should be contained within this schedule. This is done to permit the addition or deletion of items prior to or after the installation with a fixed value applied to those changes. This simply provides a ceiling for potential additions, changes, and rearrangements. This paragraph normally references an attached schedule. In many cases, two sets of unit prices, "pre" and "post" cutover are used.

E. Investment Tax Credit

In the event the system is an operating lease, it is necessary to state whether the buyer or the seller will retain the investment tax credit. This will have an effect on the monthly payment. It will be higher if the buyer retains the credit.

F. Property, Advalorum or other Taxes

In the event the system is an operating lease, it is necessary to detail whether there will or will not be any charges for property taxes, if these are applicable, how will they be computed.

G. Right to Withhold Payment

State under what conditions the buyer shall have the right to withhold future payments from the seller. For example, if milestones have not been reached, acceptance tests have not been passed, etc. Depletion allowance from a "reserve" may be included to compensate for replacement services until the vendor is in compliance.

H. Title

Specify at what point the title will pass to the buyer of the system.

I. Trade-In

In the event the system is outgrown, it should be possible for the buyer to trade in the system for a predetermined amount. This amount usually takes into consideration the purchase price contained in Paragraph A and applies a straight-line depreciation to the switching equipment and, if necessary, station apparatus. For example, in the second year of installation the trade-figure would be 80 percent of the original price of those items traded in.

DEFAULT/DAMAGES

A. Cancellation by the Buyer before Installation

If the system is cancelled by the buyer before installation completion, the buyer should be responsible for paying for work and costs incurred to date. This should not only include any installation on premises, but those costs unrecoverable that have been incurred on his behalf. This would normally take the form of some cancellation charges leveled on him by the manufacturer, but should not include any commissions paid on the system to the salesman. Also, the seller should make every effort to minimize these costs.

B. Cancellation by the Seller before Completion

It may be wise, depending upon the size of the seller, to require a performance bond. This is not normal practice in private industry as this bond is an expensive item and this cost is normally passed on to the buyer. However, in the event that the seller does cancel the system, any expenditures made by the buyer to that point should be refunded. As an alternative, it should be the buyer's option to pay for the work to date and take title to that completed work.

C. Default

This should be defined and require that any notification of default be provided to the opposite party in writing. It should also contain the stipulation that the waiver of any default by the buyer does not prevent the buyer from exercising their rights in any subsequent default. Most defaults are the result of the contractor not meeting the deadlines of the installation schedule. The buyer should have right of cancellation should that occur.

D. Damages

In the case of the installation itself, damages must be specified predicated upon the actual damage incurred. This could be as simple as no damage incurred, to loss of unrealized system savings, to payment of rent for two building locations because this system is not complete. It will vary in every instance.

INSTALLATION

A. Schedule

Amended to the contract should be a schedule detailing the expected completion date of each event necessary for system installation. It should indicate if it is the buyer's or seller's responsibility to perform that event. This will also serve to indicate the delivery or cutover date. Each event critical to the "on-schedule" completion of the project should be included.

B. Changes in Delivery Schedule

What options does the buyer have for either early or late delivery? This usually evolves into a schedule bearing no penalty providing the seller is notified of such delivery change during a predetermined period prior to expected system delivery. This period will vary with each installation and increases with system size.

C. Wiring

Normally, all wiring should be concealed unless specified otherwise and all feeder cable should contain at least 50 percent spare pairs. In some cases, it is advantageous to purchase the existing in-place cable from the telephone company. If this is done, it should be spelled out that the vendor is responsible for the service and maintenance on that cable including spare pairs in exactly the same manner as if it has been provided new. If telephone company cable is not purchased, it should be determined what the requirement for removal is, if any, and related cost. It may be necessary to specify unique requirements for installation i.e., safety hazards, licensing, union and trade association and after hour or security requirements for vendor personnel.

D. Building Codes

Specify that all cable and installation shall be in conformance with any applicable building codes and that it shall be the responsibility of the vendor to secure any construction permits necessary for the installation. This is particularly important since the National Electric code requires the installation of communication cable in conduit if it is installed in a plenum air return ceiling. Also, all cabling should be in conformance with FCC Rule 68 Part 3 to allow direct connection to the telephone company network.

E. Site Requirements

A drawing should be appended showing the necessary equipment room configuration, power requirements, and interior finishing both for the system at cutover and at maximum expected size. This room preparation is normally provided by the buyer. However, it is well to specify the requirements of the area.

F. Changes

This should indicate who on the buyer's staff is allowed to order or authorize changes to the original order. It should also provide that those changes requiring only software modification will be made until some time, usually 30 days, after installation at no charge to the buyer.

G. Approval of Contractor's Personnel

The buyer should retain the right to require the contractor to replace any of the contractor's personnel assigned to the implementation or installation of the system. Also the right to approve any subcontractors should be retained by the buyer.

H. Training

The vendor should provide trained customer service representatives to train the users in the system features. This should be done in groups of approximately 20 to 25 as close to cutover as possible using hands-on experience with working stations. In addition, the buyer should have some control over the audio/visual program to be used for training, and upon completion of the training cycle receive a copy of the training program. Also, the vendor should have service and training representatives on site for several days after system cutover to aid with those minor retraining problems and service problems which will occur. Retraining and upgrade training should be made available free or at nominal costs.

I. Acceptance Test

The steps that will be taken by the communication manager in order to accept the system and ultimately authorize payment should be detailed. Normally, this will require several weeks after installation presuming there are no inherent problems. It should consist of testing all operator console features, station features, and operating the system under traffic load. Hourly traffic studies should be provided for the first four business hours after cutover and for the next forty business hours the second week after cutover. Last, if Station Message Detail Recording is purchased it is necessary to process this output to final reports to determine if it is functioning properly. Also, to protect the seller it should be pointed out in a clause that final payment shall not be withheld because of minor items (i.e., line illumination, buzzer, intercom) that are not completed.

Further, a specific timeframe, from ten to thirty days, should be stipulated to allow the buyer to provide a written list of any deficiencies that must be corrected prior to acceptance. This prevents the acceptance procedure from being entangled in what are legitimately service calls.

Last, buyer and seller should perform a complete inventory of switching system and station equipment to justify the final invoice.

MISCELLANEOUS

A. Assignment

The contract cannot be assigned without the written permission of both parties.

B. Method of Notice

It should be stated that notice for any of these items must be mailed to the recipient. Such notice shall be considered received by the recipient

at the time it is placed in the U.S. mail.

C. Binding Arbitration

The parties should agree that any dispute in the contract shall be submitted to binding arbitration.

D. Sole Agreement

This should be the only agreement. Any amendments to the agreement must be in writing.

The Maintenance Contract should be negotiated at the same time as the Purchase Agreement. Since it is ideal to negotiate this as a long term contract with some escalator clause this negotiation is easier to carry out while the purchase is also at stake. The major points in this Contract are:

MAINTENANCE CONTRACT

A. Length of Time Period

The "free" warranty should be in effect for a period of 12 months after installation. (It is interesting to note that if the system is leased or leased/purchased it may be wise to delete any warranty from the system and begin immediately paying maintenance charges. This eliminates the cost of financing the first year's warranty, which is built into the system cost, over the life of the installation.) The on-going service contract cost should then continue for 72 months after the expiration of the warranty. This would normally contain an escalator clause related to some index such as the Consumer Price Index. Service cost should be specified on a cost per handset or port basis so that convenient additions and/or deletions can be made to the system.

B. Unit Prices

The Post Cutover Unit Price schedule from the Purchase Agreement should be incorporated to allow for additions during the anticipated life. This, too, should relate to the same index used for the Maintenance Contract in A above.

C. Major Service Calls

A definition of major service outages should be made. This normally is defined as the loss of an attendant console, the loss of some percentage of the call-carrying capacity of the system, total system down, or in certain cases loss of service to those departments which are vital to the operation of the organization could constitute an an emergency outage. The response time for a serviceman on these major outages should also be specified. Normally, this should not exceed four hours. Some "enforceable" standard

should be agreed upon as to what the vendor is expected to do during a major service outage. A complete schedule may be required detailing expected response, timeframes for escalation up to an including replacement.

D. Minor Service Calls

These should normally be defined as all service calls not defined as major and a response time not to exceed eight working hours should be specified.

E. Service Dispatch Point

It should be specified the hours that service is available on a major and minor basis and from where that service will be dispatched.

F. Level of Vendor Support

This should specify that the vendor's service personnel will be factory trained and that a given ratio of service personnel to installed system stations shall be maintained. it will also specify the location for the stocking of spare system parts and their necessary quantities. These quantities should again be in relationship to the total system installed base.

This should also specify that a traffic study will be made every six months at no charge to the buyer, and that on-going station user and operator training will be available from the vendor so long as the service contract remains in force.

The "as installed" drawings should be continually updated to indicate the system changes, additions or deletions made over time and the available cable in the cable distribution.

G. Conformance to Standards

Service personnel shall be factory trained and perform work in conformance with applicable FCC regulations.

H. Manufacturer Support

Ideally, the manufacturer should be a signator to this entire contract. However, at worst, the manufacturer should guarantee ongoing service support for this installation should this vendor cease to be either the authorized distributor or cease to exist as an organization. Also, availability of spare parts should be guaranteed for the expected life of the system.

I. Changes and Attachments

This should allow the buyer to attach to the system technically compatible equipment provided by other vendors. A definite procedure for securing permission from the vendor for these attachments should be outlined. This would normally mean a set of specifications for the equipment be provided the manufacturer for review. After review, the manufacturer may allow or disallow that conection. The authorization for connection should not be unreasonably withheld and normally can be denied only if the equipment is not technically compatible with that already being purchased. The fact that this equipment is being connected to the system should not breach or abrogate any other warranties or the Service Contract associated with the system.

J. Service on CPE (Customer Premise Equipment)

The system vendor normally becomes the interface between the customer and the telephone company. If a service fault reported to the Telephone Company is found to be that of the equipment vendor, the customer will receive a charge from the telephone company for service on customer provided equipment. It should be the responsibility of the system vendor to reimburse the buyer for that cost, providing they have reported the trouble to the Telephone Company.

K. Non-Performance

Should the vendor fail to perform, it should be possible for the buyer to cancel the contract. Of greater importance is the right of the buyer to immediately secure assistance from a third party. If this is necessary, neither the vendor or the manufacturer should be allowed to cancel the contract or warranty.

L. Damages

It is difficult to negotiate any damages that would force performance. However, this should not preclude a penalty for each hour major service response times are not met.

M. Assignment

The contract cannot be assigned without the written permission of both parties.

N. Favored Nation Clause

The seller should agree that should the seller sell any of the same products, or provide service, to any other buyer within the local trading area at a price more favorable than that contained in this contract, the same lower prices will be provided to this buyer.

O. Cancellation

The contract should be non-cancellable except by the buyer, for the expected system life of 84 months.

P. Sole Agreement

This should be the only agreement. Any amendments to the agreement must be in writing.

CONCLUSION

Obviously, the ideal situation in purchasing a system would be that both the seller or distributor and manufacturer jointly sign the contract. However, in most instances this does not take place. While every point in this contract serves to protect the buyer, it is obviously possible to purchase a system without incorporating all of the contractual provisions. If that is done, however, it is done as a "management decision" and can increase the risk of system acquisition to the buyer. Therefore, we recommend that if the seller refuses to accept any of these contract clauses, the buyer should carefully weigh the potential risk against any long-term anticipated saving.

Purchase Agreement

This Agreement is made this _____day of _____, 19__, by and between _____(hereinafter called CONTRACTOR) and _____ (hereinafter called PURCHASER or OWNER).

GENERAL TERMS

1. Purchase of Equipment

In consideration of the mutual agreements contained herein, CONTRACTOR agrees to sell to PURCHASER and PURCHASER agrees to purchase from CONTRACTOR the telephone system and other equipment including complete installation set forth in the CONTRACTOR's proposal attached as Schedule A and described in the Manufacturers' General System Description Manual, D1573 in full force and effect at the time of installation. This proposal and General Description Manual and all pages contained therein shall be considered part of this agreement. The total purchase price of the equipment, including shipping charges and installation, is $_____ plus applicable State sales tax. The CONTRACTOR shall allow a trade-in of $_____ on the existing OWNER'S equipment. The PURCHASER agrees to pay for the equipment per the following schedule:

20% ($_____) upon execution of this agreement by CONTRACTOR and PURCHASER.
30% ($_____) upon delivery of the equipment.
40% ($_____) upon the cutover of the system.
10% ($_____) within 30 days after the acceptance of the system.

The purchase price of the equipment shall be subject to adjustment up until cutover, in the event of any mutually agreeable changes made to the purchased equipment schedule, including the addition or deletion of items of equipment and any specification, attachments, or features of the system. The prices contained in the attached Schdedule B shall be used as an add or delete price for purposes of this paragraph.

In the event that PURCHASER decides to finance the equipment, all deposit monies paid to the CONTRACTOR shall be refunded to PURCHASER in full and PURCHASER's payment obligations under this Purchase Agreement shall then be null and void.

2. Acceptance Test

Acceptance tests shall be run and CONTRACTOR's Customer Cutover Approval Form shall be signed expeditiously providing all other terms of this contract are fulfilled (minor exceptions such as line illumination features, buzzer-signal systems and those components not affecting the

operation of individual stations or trunks in the reception or placing of incoming or outgoing calls will not affect the signing of the Cutover Approval Form).

One complete set of service and technical manuals, parts lists, and "as installed" drawings showing cable routing and terminals used and spare shall be provided to PURCHASER. CONTRACTOR shall, at its expense, keep another set at the switching system location.

3. Title to Equipment: Security Interest; Risk of Loss

PURCHASER shall acquire title to the equipment upon payment in full of the purchase price to CONTRACTOR. As long as any part of the purchase price due remains outstanding, title to the equipment shall remain with CONTRACTOR and CONTRACTOR shall retain a security interest in the equipment until all amounts due are paid in full. PURCHASER agrees to execute any documents which may be necessary or appropriate to perfect CONTRACTOR's security interest in the equipment.

CONTRACTOR shall bear the risk of loss of, or damage to, the equipment: (a) while it is in transit to the customer's premise; and (b) while at the premises until cutover except for loss or damage caused by PURCHASER's negligence or from storage of the equipment or storage in areas accessible to unauthorized personnel. After cutover all risk of loss of, or damage to, the equipment shall be borne by PURCHASER not withstanding CONTRACTOR's retention of title as provided above.

CONTRACTOR agrees that upon the completion of the performance of this Agreement, the above-described premises shall be free and clear of any mechanics' liens, not only of CONTRACTOR but also of any and all of the subcontractors, materialmen, laborers, or subcontractors who may have furnished any labor, material, services, fixtures, apparatus, machinery, improvements, repairs, or alterations in connection with, or to, the above-described premises, in connection with the improvements referred to in this Contract, whether such liens relate to the above-described premises or to any monies or other considerations which may be due at any time hereafter from the PURCHASER to CONTRACTOR, or from him to any of the subcontractors or to any of the subcontractors.

Upon the making of final payment under this Agreement, title to all parts, materials inventories, the Work in process theretofore acquired or produced by CONTRACTOR for the performance of the Work, the properly chargeable thereto under sound accounting practice, shall forthwith vest in the PURCHASER; and title to all like property thereafter acquired or produced by CONTRACTOR for the performance of the Work and properly chargeable thereto as aforesaid shall vest in the PURCHASER forthwith upon said acquisition or production.

It is mutually agreed that no payment made under this Agreement shall be evidence of the performance by CONTRACTOR hereunder, either wholly

or in part, and that no payment or vesting of title under the above paragraph shall be construed to be an acceptance of defective or improper materials or workmanship.

The obligation of the PURCHASER to make any of the payment required under this Agreement shall be subject to: (1) any unsettled claims against CONTRACTOR for labor or materials; (2) reasonable deductions on account of defects in material or workmanship; and (3) any claims which the PURCHASER may have against CONTRACTOR under or in connection with this Agreement. Any overpayments to CONTRACTOR shall, unless otherwise adjusted, be repaid to the PURCHASER upon demand.

Inspection by the PURCHASER or by any of their duly authorized representatives; any order, measurement, or certificate by the PURCHASER or Architect; any order by PURCHASER for the payment of money; acceptance of any work or any extension of time; or any possession taken by the PURCHASER shall not operate as a waiver of any provision of the Contract Documents or any power therein reserved to the PURCHASER, or any right to damages therein provided. Any waiver by PURCHASER of any breach of the sub-Contract Documents shall not be held to be a waiver of any other or subsequent breach, and any waiver by PURCHASER of any right to terminate the Agreement shall not be held to be a waiver of any breach of the Contract Documents, but PURCHASER retains all its rights to recover damages thereof.

4. Installation

Installation and cutover of the Equipment shall be in accordance with CONTRACTOR's quoted in-service date, provided that PURCHASER has arranged access to the premises to CONTRACTOR and premises are in proper condition for installation of the Equipment per the attached floor plan and Milestone Chart as mutually agreed upon by CONTRACTOR and PURCHASER. All installation programs and schedules will be performed in accordance with a prearranged plan mutually agreed upon by both PURCHASER and CONTRACTOR prior to the initiation of installation activities.

Installation methods and techniques will be in accordance with standard telephone industry practices and conform to standards as outlined by Federal Communications Commission Rule Number 68 for direct connection of telephone equipment to Telephone Company lines and be in accordance with all applicable local and state building codes. CONTRACTOR will employ suitable personnel for the installation of the telephone system as ordered herein. Such personnel will be of a union, if necessary, acceptable in the area.

CONTRACTOR shall provide an on-site training program acceptable to the PURCHASER and for a minimum of three days after cutover CONTRACTOR will provide at least two on-site trainers and service personnel.

For two weeks following system cutover, CONTRACTOR shall make no

charge for on-site, programmable computer changes in the system.

5. Warranty

CONTRACTOR warrants the equipment against defective parts and workmanship for a period of one year after the acceptance date. Upon notification of a defect, CONTRACTOR shall have the option to repair or replace the defective part or the equipment, and such repair or replacement shall be PURCHASER's sole and exclusive remedy. All replaced parts will become the property of CONTRACTOR. In addition, for a period of one year after the acceptance date, CONTRACTOR shall perform, free of charge, all necessary maintenance to keep the equipment in good working condition and repair, including the furnishing of all necessary labor and materials. All warranties shall be void as to equipment damaged or rendered unserviceable by negligence of non-CONTRACTOR personnel, misuse, theft, vandalism, fire, water, or other peril, or moving, repair, relocation, or alteration not authorized by CONTRACTOR.

6. Miscellaneous

a. Protection from Patent Infringements

CONTRACTOR will render and hold harmless PURCHASER from any losses or claims arising from patent infringements as a result of using this equipment.

b. Method of notice

Any notice required under this Contract must be provided to CONTRACTOR or PURCHASER at their place of business, meaning headquarters, in writing using certified mail with return receipt requested. Such notice is deemed transmitted when deposited in United States Mail.

c. Acceptance Tests

System shall be deemed accepted upon testing all station features, console features, and operating the system under load for typical peak hours for at least three days using system-generated traffic studies for confirmation.

d. Price Protection

CONTRACTOR warrants the cost of parts and/or additions made to the system prior to the installation, and for two months after the installation shall bear the add or deduct prices as contained in the Schedule B previously mentioned.

e. Manufacturer's Support

CONTRACTOR warrants to the PURCHASER that they shall obtain a

written commitment from the manufacturer of the equipment, specifically stating to the PURCHASER, "In the event that CONTRACTOR should for any reason be unable to perform the necessary warranty service or offer the continuing maintenance options, the manufacturer shall furnish warranty service and maintenance until satisfactory local arrangements are completed by the manufacturer."

Trade-In

During the first five years of the system installation, the CONTRACTOR warrants that should the PURCHASER desire to trade-in the system for a larger CONTRACTOR provided system, thefollowing schedule shall apply to such trade-in:

2nd year 70%
3rd year 55%
4th year 40%
5th year 35%

f. Arbitration

CONTRACTOR and PURCHASER specifically agree that should any dispute arise in the performance of this Contract, such dispute shall be submitted to binding arbitration. Such arbitration shall take place according to the rules of, but not necessarily by, the American Arbitration Association.

g. Training

CONTRACTOR warrants that they shall provide onsite training to all station users and console attendant in the operation of the system and its features. Immediately following system cutover and for some days, as required by the PURCHASER, such training personnel and service personnel, shall be available on the CUSTOMER'S site to handle additional training or other system acceptance problems.

h. Sole Agreement

This Agreement, including its attachments and exhibits, represents the entire Agreement between CONTRACTOR and PURCHASER with respect to the sale and installation of equipment on customer's premise. The Agreement may be amended at any time by mutual consent of the parties in writing. This Agreement shall be governed by and construed in accordance with the laws of the State of _____. CONTRACTOR and PURCHASER each represent that they have the power and authority to enter into this Agreement and this Agreement constitutes a valid and binding obligation of each party.

ATTEST:

_____ BY: _____

ATTEST:

_____ BY: _____

Maintenance Contract

This contract made and entered into at _____ is for the Maintenance of Telephone Equipment (hereinafter referred to as "Equipment").

Equipment is to be located in _____, and consists of _____. The parties to it are _____ (hereinafter called CONTRACTOR) and _____ (hereinafter called CUSTOMER), do hereby covenant and agree as set forth in this Agreement.

CONTRACTOR shall, upon the terms and conditions hereinafter set forth, provide such personnel as required to properly service, maintain and repair equipment. CUSTOMER shall buy from CONTRACTOR those services as stated herein.

1. Maintenance Service by CONTRACTOR

1.1. The system preventive maintenance will consist of running a periodic maintenance program during CUSTOMER's regular work week. Such preventive maintenance shall be performed during the scheduled Principal Period of Maintenance and at which is mutually acceptable to the CUSTOMER and CONTRACTOR. CONTRACTOR shall specify the preventive maintenance required for the system.

1.2. Parts replaced by CONTRACTOR in either mechanical or electrical components will be furnished on an exchange basis without extra charge to the CUSTOMER when such replacement is effected on the CUSTOMER's premises by ordinary maintenance personnel and equipment.

1.3. In addition to the aforementioned maintenance activities, CONTRACTOR will perform such repair and maintenance service as may be required to keep the equipment in an operating condition and as can be reasonably performed on the CUSTOMER's premises. All remedial maintenance shall be performed after notification that the equipment is inoperative and CONTRACTOR shall always be responsive to the maintenance requirements of the CUSTOMER.

1.4. Limitations - This Agreement does not provide for maintenance, repairs, or replacement parts required due to loss or damage to the equipment caused by fire, lightening, water, tornado, windstorm, hail, earthquake, explosion, smoke, smudge, aircraft, motor vehicle, collapse of building, strike, riot, vandalism, power failure or fluctuations, air conditioning failure, or other cause beyond the control of CONTRACTOR. CONTRACTOR's service does not include the painting or refinishing or material services connected with relocation of equipment; nor adding or removing accessories, attachments or other devices. Any maintenance or repair service originating by reason of other than normal operation of the equipment including, without limitation, service required by reason of any

of the factors set forth in the first sentence of this paragraph, or of CUSTOMER's negligence or misuse of the Equipment, or of CUSTOMER's failure to provide the necessary facilities, will be billed to the CUSTOMER in addition to all other charges incurred under this Agreement.

1.5. CONTRACTOR, at its expense, will maintain a supply of spare parts, as it deems necessary, for the maintenance activity and the CUSTOMER will provide adequate storage space therefore on the customer's premises at no expense to CONTRACTOR, if they desire to store such spare parts on CUSTOMER's premise.

1.6. CONTRACTOR, at its expense, will maintain test equipment for the testing and maintenance of the equipment and the CUSTOMER will provide adequate space on its premises for the same and adequate working space on its premises for maintenance personnel of CONTRACTOR at no expense to CONTRACTOR.

1.7. CONTRACTOR shall dispatch qualified personnel to repair equipment within two hours after receiving CUSTOMER's call or trouble which constitutes a major interruption of service. Examples of major interruptions include, but are not limited to, such basic system failures as where the operator's position is out of service, the operator cannot receive incoming calls, or no station-to-station calls can be made, or 20% of the stations or 20% of the total call-carrying capacity of the system in CCS load is inoperable. CONTRACTOR shall provide twenty-four (24) hour a day service, seven days per week, on major trouble, and will provide all other service during normal working hours (8:00 a.m. to 5:00 p.m. Monday through Friday.

CONTRACTOR shall supply at no charge, as requested, trained instructors to teach both station users and console attendants in equipment operation as long as this contract is in force.

1.8. CONTRACTOR shall provide, at no charge, so long as this contract is in force, traffic studies indicating the adequacy of incoming and outgoing local trunks.

2. Responsibilities of Customer

2.1. CUSTOMER specifically agrees that CONTRACTOR shall have the right of entry to CUSTOMER's equipment room in order that service and maintenance may be performed as set forth in this contractual Agreement.

2.2. CUSTOMER specifically agrees that all such service and maintenance as described herein pertains to normal equipment failure caused by deterioration or failure of components, and not failure of equipment caused by outside sources, including, but not limited to, fire, theft, storms, misuse, intentional or unintentional damage by CUSTOMER, CUSTOMER's employees, guests, or invitees. CUSTOMER further agrees that service calls to repair or replace equipment failing from causes by outside sources as

aforementioned, will be invoiced to CUSTOMER and paid for by CUSTOMER at CONTRACTOR's prevailing rates. Repair units provided under this Section which would be billed above and beyond what is provided in the Maintenance Contract must be approved by CUSTOMER'S Administrative Manager or Communications Consultant prior to their installation.

2.3. CUSTOMER specifically agrees that service calls, made by CONTRACTOR upon the CUSTOMER's request, after 5:00 p.m. or before 8:00 a.m. Monday through Friday and on Saturday, Sunday or Holidays, that are not major equipment failures, as mentioned previously herein, will be invoiced to CUSTOMER at CONTRACTOR's prevailing overtime differential rate with a minimum of two (2) hours charge per visit by serviceman.

2.4. CUSTOMER specifically agrees to pay or reimburse CONTRACTOR for all federal, state or local taxes including, without limitations, sales, use, excise, occupation, gross receipts, and similar taxes, but excluding income taxes, which may be levied on or with respect to installation, servicing, maintenance, replacement parts or components.

3. Payment by Customer to Contractor

3.1. In consideration for the covenants and agreements by CONTRACTOR, CUSTOMER hereby agrees to pay CONTRACTOR, as stated contract price the sum of $_____ per telephone instrument per month, $_____ per operator console per month and $_____ per Central Office trunk per month for maintenance of equipment as previously described. This rate shall be subject to increases on its anniversary in an amount not to exceed the percentage increase in the Cost of Living Index as published by the U. S. Department of Commerce using January 1, 19__ as base year. In no event will more than one such increase be added to each item of equipment hereunder in any one calendar year prior to the expiration of the initial term of this Agreement nor will the adjusted Maintenance Charge exceed CONTRACTOR's then currently published Commercial Charges for like services.

This Agreement shall remain in full force and effect for a period of 108 months commencing twelve (12) months after the date of system acceptance. The first twelve months following acceptance, the system shall be serviced under similar agreement at no charge to CUSTOMER.

4. Customer's Option

4.1. CUSTOMER may, at his option, terminate this Contract by providing sixty (60) days written notice of such termination to CONTRACTOR at the location specified previously in this Contract.

ATTEST:

_____ BY: _____

ATTEST:

_____ BY: _____

CONCLUSION

Embarking into this new era of Deregulation and Divestiture brings with it certain experiences gained over the past 13 years of "interconnect." An anlysis of present industry environment coupled with the experiences gained in the past is necessary to successfully design, select and acquire the communication system. While new problems, or opportunities dependent upon ones viewpoint, will certainly arise in this environmet, one must carry over the lessons of the past to the world of the future. No amount of "new technology" or "future promises" will bring dialtone or stability to the present acquisition.

As it was stated in the beginning, one can, if he chooses, abdicate the responsibility of expending the corporate communication dollar to the system vendor. With increased dependence upon the timely movement of information throughout the organization, so vital to make today's management decisions in a competitive world, is to "shoot craps" with the organization's destiny. The responsibility for selection and operation must rest with the telecommunication manager. It is hoped that in this increasing era of uncertainty, this manual has assisted, in some small way, the manager to successfully complete that process.

Bibliography

All books are available from The Telecom Library, 205 West 19 Street, New York, N.Y. 10011. 212-691-8215. Ask for our latest catalog. It's free.

THE TELECOM LIBRARY GUIDE TO KEY SYSTEMS & MINI-PBXs.
by The Telecom Library Research Group - 350 pages - $39.95

This book was written to help users acquire a small telephone system -- one that could work for up to 100 people. This book answers five questions users ask: What's available? How do I choose from features, equipment and purchase options? How do I make the best deal with my chosen vendor? How do I keep my maintenance costs low? Where do I get my equipment? This book is updated every 6-12 months, depending on new product introductions.

LONG DISTANCE FOR LESS - How to Choose Between Bell & Those "Other" Carriers
by Dr. Robert Self - 423 pages - $75

This is a very extensive guide to buying the long distance services of Bell, Western Union, MCI, SPCcommunications, U.S. Telephone and dozens of others. Of a typical corporate telephone bill, 60% to 80% is long distance. The purpose of this book is very simple: It's to help you save money on your long distance calling.

BUSINESS COMMUNICATIONS REVIEW MANUAL OF PBXs - Latest Revised Edition
by Lee Goeller and Gerald Goldstone - 250 pages - $145

This book describes in great detail which PBXs (interconnect & Bell) are currently available in the U.S. It shows what each PBX offers, how it is technically constructed and its major benefits and disadvantages. This book includes the latest third generation digital switches, and a big chapter on PBXs and Office Automation, and how to plan one for the other.

TELECOMMUNICATIONS MANAGEMENT FOR BUSINESS & GOVERNMENT
by Larry Arredondo, published by The Telecom Library - 240 pages - $30

This non-technical book is written to help anyone learn the tools and management techniques necessary to accomplish two tasks: (1) To make a rapid and significant dent in your organization's telephone and telex bills, and (2) To use the telephone in a productive way to win more business and keep your customers satisfied.

DESIGNING OPTIMAL VOICE NETWORKS FOR BUSINESS, GOVERNMENT & TELEPHONE COMPANIES
by Jim Jewett & Jackie Schrago - 240 pages - $39.95

This book is the most comprehensive guide ever published on how

best to design a single node (one PBX or one telephone menagement system) or multinode (tandem or CCSA-type) network for long distance calling.

This book requires no prior knowledge of traffic engineering. It logically builds the reader's working knowledge of the basics of how different phone systems handle long distance calls. It explains how to spot your organization's characteristics and it details step-by-step approaches to providing your organization with the best telephone service for the least possible cost.

PROFIT AND CONTROL THROUGH CALL ACCOUNTING

by Daniel I. Stusser - 614 pages -- $95

This book is sub-titled "How to select, buy and use the telephone accounting system that's right for you."

This book will tell you have to save money and how to make money on your phone calls. Call accounting is a system of hardware and software that does two things: It collects information on all the phone calls made by your people, and it presents that information in any way and for whatever purpose your want to use it. Call Accounting gives you reports which will help you: * Control employee abuse * Allocate your telephone costs to different departments * Help you choose the best long distance service for you * Bill your clients for calls you make for them * Evaluate, motivate and reward your employees * Verify your long distance bills and get refunds for over-billing.