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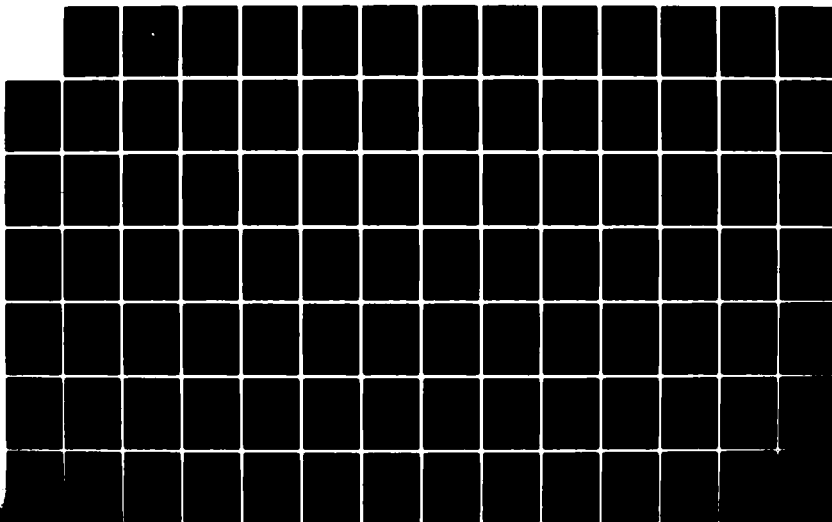
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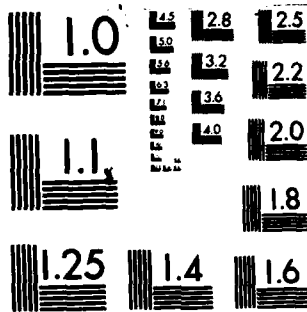
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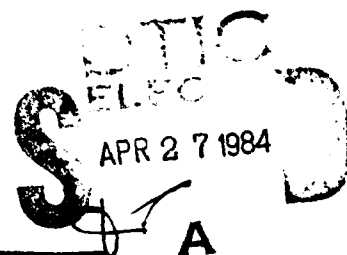
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NAVAL POSTGRADUATE SCHOOL
Monterey, California



THESIS



SPECIALIZED COMMON CARRIERS: LONG DISTANCE
ALTERNATIVES FOR MILITARY INSTALLATIONS

by

Scott L. Klingler

March 1984

Thesis Advisor:

Dan C. Boger

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**Specialized Common Carriers:
Long Distance Alternatives for Military Installations**

by

Scott L. Klingler
Captain, United States Air Force
B.S., Brigham Young University, 1979

Submitted in partial fulfillment of the
requirements for the degree of

MASTER OF SCIENCE IN TELECOMMUNICATIONS SYSTEMS MANAGEMENT

from the

**NAVAL POSTGRADUATE SCHOOL
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ABSTRACT

Specialized Common Carriers, communications carriers which came into existence offering private line microwave service, are now significant competitors in the long distance telecommunications industry. This thesis provides military installation telecommunications managers with a basic knowledge of how Specialized Common Carriers entered the telecommunications market, what services Specialized Common Carriers offer, and how to obtain these services for a military installation. It includes a case study evaluation of the potential use of long distance services of two of these competing common carriers at Naval Air Station Moffett Field, California. A computer program used to calculate the costs of using these two alternative long distance carriers is included as part of the case study.

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I. INTRODUCTION

This thesis addresses Specialized Common Carriers (SCCs), those communications carriers which entered the market offering special communications services not adequately being provided by existing common carriers.¹ Initially, the special services offered by SCCs were primarily point-to-point private line microwave links for data or other custom transmission needs, but today SCCs are competing in markets that have historically been open only to the large domestic carriers such as American Telephone and Telegraph (AT&T) and Western Union. Today SCCs are succeeding, not in the private line market in which they started, but in the long distance, switched network services market in direct competition with AT&T. In fact, the offerings of SCCs today are so "un"-special that some authors refer to these carriers as Other Common Carriers (as in other than AT&T). This thesis will refer to these carriers as Specialized Common Carriers, the name attached to them when they first entered the market.

Before the advent of SCCs the base telecommunications manager² would rely heavily on the local telephone company representative to fill any long distance telephone needs since: 1) no other companies were in a position to offer service; and 2) the telephone company representative was glad to do it. Today, amidst fierce competition in the long

¹Some other classes of common carriers are Community Antenna Television (CATV), packet switching networks of Value Added Networks (VANs), mobile radio-telephone, marine radio-telephone, radio paging, domestic, and international carriers.

²The term "base telecommunications manager" is used throughout this thesis to refer to telecommunications managers at all types of military installations whether bases, posts, stations, or whatever.

distance market, the base telecommunications manager must recognize that this attitude is no longer economically sound. The purpose of this thesis is to assist base telecommunications managers in understanding how SCCs came into existence, what long distance switched voice network services SCCs offer, how to evaluate the potential use of SCC services at their installations, and how to begin the process to procure these services.

This thesis is organized as follows: Chapter II discusses the major events leading up to and following the Federal Communications Commission (FCC) ruling which authorized SCCs to openly compete in the private line microwave field.³ Chapter III gives information on the services offered by SCCs and compares these services to those offered by AT&T. This chapter also discusses competitive procurement of SCC services and the current use of SCC services at various military installations and Department of Defense activities. Chapter IV is a case study analysis of a specific military installation (Naval Air Station Moffett Field, California) for the potential use of SCC long distance telephone services instead of or in addition to AT&T services. A computer program which calculates the costs of using services of two of these alternative long distance carriers is included as part of the case study. Chapter V summarizes the thesis.

³Appendix A contains a chronology of major events affecting Specialized Common Carriers.

II. SPECIALIZED COMMON CARRIERS--A HISTORY

A. THE LONG DISTANCE MONOPOLY

Since Alexander Graham Bell's patent was issued in 1876, the Bell Telephone Company and the American Telephone and Telegraph Company (AT&T) have had a nearly continuous monopoly on providing local and long distance telephone service in the United States.* Setting aside the arguments whether the telephone industry was a natural monopoly⁵ in the beginning, except during a few years between 1894 and 1907, and from 1968 until today, an approved monopoly it was.

The first period of exception to the monopoly was caused by the expiration of the Bell patent in 1894. As a result of the ensuing competition, the independent telephone companies owned 44 percent of all telephones by 1902 and 51 percent by 1907 [Ref. 4]. The period ended with the recall of Theodore Vail as the president of AT&T as he changed the company's policy from one of meeting competition to one of buying (or forcing) competitors out of the market.

In 1910 the Interstate Commerce Commission was given regulatory authority over the telephone industry, but it was not until the passage of the Communications Act of 1934 and the formation of the Federal Communications Commission (FCC)

*The Bell Telephone Company was formed from the Bell Patent Association in 1877 and the American Telephone and Telegraph Company was formed in 1885 by the Bell Telephone Company to operate its long distance system. For an in depth review of the telephone industry's history see references 1, 2, and 3.

⁵A natural monopoly is an economic concept based on the principle that in certain industries one company can provide services more economically and efficiently than several companies in a competitive environment. Reference 5 is an excellent reference on this subject.

that the telephone industry was subject to any real regulation.*

The period of FCC regulation is very significant in the history of Specialized Common Carriers and is discussed in the following sections of this chapter.

B. THE ABOVE 890 AND CARTERPHONE DECISIONS

Three FCC actions considered as landmarks in preparing the way for new entrants into the common carrier private line microwave field are the 1959 and 1960 FCC rulings commonly referred to as the Above 890 decisions and the 1968 FCC ruling dubbed the Carterfone decision.

1. Above 890 Decisions

Microwave radio, an outgrowth of the invention of the klystron tube by Bell Laboratories and the M.I.T. Instrumentation Lab, was developed during World War II for radar applications. It was modified and began being used as a transmission medium for point-to-point communications because of its increased capacity, better quality, and higher reliability over wire or cable transmission systems. Shortly after World War II, Western Union built a microwave system connecting New York City and Philadelphia as an experiment to see if it was suitable for use as a common carrier system [Ref. 6]. By 1956 microwave transmission accounted for 22 percent of the 10.5 million circuit miles of the telephone system [Ref. 7].

The 1959 and 1960 FCC Above 890 decisions opened the microwave field to private firms and individuals allowing them to install microwave systems utilizing the frequency

*Even with the FCC regulating the telephone industry there is some question as to who regulated whom between the FCC and AT&T. In the FCC's first twenty-five years of existence there was no regulation which significantly decreased AT&T's monopolistic position.

spectrum above 890 MHz for their own use. While this decision did not authorize new companies to compete with established common carriers, it was certainly a step in that direction. Since the FCC prohibited sharing facilities and systems, only companies or users needing a large volume of circuits between two points were economically able to take advantage of building their own systems instead of leasing from the common carriers.

The Above 890 decisions were not the result of petitions of companies seeking entrance into the microwave carrier market, as one would expect, but instead were the result of the persistence of microwave equipment manufacturers and potential users of private microwave links [Ref. 8].

The proceedings which led to the Above 890 decisions began in 1956 with an FCC review of microwave frequency allocations which included a look at letting private users construct their own microwave systems when common carrier facilities were already available. The idea of private microwave systems was not a new one⁷ for there were already tens of thousands of route miles of microwave systems in existence to serve railroads, mining operations, pipelines, and other right-of-way companies at the time of the Above 890 proceedings. [Ref. 7] However, the prevailing FCC policy was to grant microwave licenses only to common carriers and right-of-way companies due to a perceived shortage of frequencies available to allocate.

The opposition by established common carriers (specifically AT&T, Western Union, and the independent telephone companies) was fierce. Their arguments against permitting private concerns to build their own microwave

⁷The first application for a private microwave system was submitted in 1948 by a railroad company as an experiment to compare the service and cost of their own system with the circuits they were leasing from common carriers [Ref. 6].

systems were based on claims that the frequency spectrum was limited and that the FCC had a responsibility to protect the economic interests of the established common carriers by prohibiting competition. They also argued that licenses for private microwave facilities should be given only when common carrier services were unavailable and should be revoked when common carrier facilities became available. [Ref. 7] Furthermore:

The Bell System witnesses contended that to permit the licensing of private systems where common carrier facilities are available would cause irreparable harm to the telephone company's ability to provide a basic nationwide communications service, which is vital in times of peace but indispensable in times of national emergency. Also, they claimed that widespread licensing of private systems would not only increase the cost of communications to the Nation's economy as a whole but would cast an added burden upon the individual and the small businessman who would continue to rely on common carriers. [Ref. 9]

The arguments of AT&T and the others failed, because, "...the fact remained, the private applicants pointed out, that if permitted to construct their own facilities, they would provide for their needs at much lower costs than the carrier tariffs" [Ref. 10]. The FCC made their decision in July 1959 concluding: "...there are now available adequate frequencies above 890 Mc* to take care of the present and reasonably foreseeable future needs of both the common carriers and private users for point-to-point communications systems" [Ref. 11].

Not ready to give in without a fight, the common carriers asked the FCC to take another look at the frequency spectrum question stating that with communications satellites coming into existence the FCC should wait until it was certain that satellite systems would not need the frequencies

*The units of frequency measurement were changed from cycles to Mc after these decisions.

above 890 MHz. The FCC reaffirmed their original decision in 1960.

2. Carterfone Decision

From its beginning, AT&T had a policy of refusing interconnection with anyone and everyone. This was their way of ensuring their monopoly status. However, this stand was changed when antitrust litigation in 1913 forced AT&T to promise to allow independent telephone companies to interconnect with the AT&T long distance network.⁹ Connection of equipment or attachments by customers was quite another matter--they were strictly prohibited by AT&T. In fact, AT&T maintained they had the right to remove the equipment or stop service to the customer. [Ref. 12 , 13]

In 1921 the Hush-A-Phone Corporation began manufacturing a simple non-electronic device to place over the telephone mouthpiece to prevent room noises from being picked up, as well as to provide some privacy for the telephone user so his/her conversation would not be heard by others in the room. AT&T sought prohibition of use of the device. In 1955 the FCC weakened the AT&T interconnection position by ruling:

The provisions ...shall not be construed or applied to bar a customer from using devices which serve his convenience in his use of the facilities of the Telephone Company ...provided any such device so used would not endanger the safety of Telephone Company employees or the public; damage, require change in or alteration of, or involve direct electrical connection to the equipment or other facilities of the Telephone Company; or interfere with the proper functioning of such equipment or facilities; or impair the operation of the telephone system or otherwise injure the public in its use of the Telephone Company's services. [Ref. 14]

⁹This promise is known as the "Kingsbury Commitment," named after N.C. Kingsbury, then Vice-President of AT&T.

In spite of this decision, AT&T still generally refused interconnection.

AT&T next took on the Carter Electronics Corporation when they began marketing the Carterfone, a device which acoustically coupled a mobile radio system with the telephone system through the telephone handset.¹⁰ AT&T insisted that they "must control every element of the [telephone] system" to insure that it works best for all. In the 1968 Carterfone decision the FCC concluded:

...a customer desiring to use an interconnecting device to improve the utility to him of both the telephone system and a private radio system should be able to do so, as long as the interconnection does not adversely affect the telephone company's operations or the telephone system's utility for others [Ref. 14].

The Carterfone decision, that the Bell System had to permit interconnection of non-Bell equipment as long as the interconnection would not harm the system or disrupt the ability of others to use the system, was important since it would allow for the future interconnection of Specialized Common Carrier (SCC) switching equipment.

C. MCI DECISION

The development of computers and their widespread acceptance and use in the 1960s created a need for data communications that was essentially unavailable from the established common carriers. The AT&T and Western Union systems were designed using analog technology primarily intended for voice transmission not data. In 1963, Microwave Communications, Incorporated (MCI) applied for FCC certification for public common carrier point-to-point microwave communications service between Chicago and St Louis and intermediate

¹⁰This was an acoustical modem arrangement, but instead of transmitting data it coupled voice signals.

points. MCI's proposal was to provide simply a microwave link between the two locations. The subscribers would be required to provide their own terminal equipment and connections with the MCI system.

AT&T, General Telephone, Illinois Bell, Southwestern Bell, and Western Union opposed the application (as would be expected) contending that:

...the service would meet no demonstrated need, that it would result in wasteful duplication of facilities, that MCI did not possess the legal, technical, and financial qualifications to install and operate the system, and that the system would cause radio interference to existing and future facilities of the established common carriers [Ref. 15].

Besides these arguments, they contended that it was a waste of the FCC's time to consider the application since MCI would not be able to provide local service (since this industry was already monopolized) and existing carriers would refuse to provide interconnection [Ref. 15].

Probably more as an experiment than any other reason, the FCC approved the MCI application in 1969 in what is called the MCI decision. Kahn explains the basis for the approval thusly:

MCI offered two things that the Bell companies and Western [Union] did not: first, low rates - its proposed charges were less than half those of the established carriers - and second, far greater freedom and flexibility in use of the service: customers could attach such equipment as they saw fit and up to five of them could share the use of a single channel, thus further reducing the cost of each. And it was this proposed contribution that, in the last analysis, induced the FCC to approve the application. [Ref. 16]

D. SPECIALIZED COMMON CARRIER DECISION

Following the HCI decision new entrants were jumping on the private line microwave system bandwagon in spite of the FCC statement that their decision would not be considered as a binding precedent for future applications. By 1971 there were applications on file with the FCC for 1,977 microwave stations in 46 separate proposals from 33 new carriers. [Ref. 17] The FCC was not particularly interested in reviewing each of these applications individually and therefore set out to establish a ruling applicable to all of them. The resulting June 1971 ruling, the Specialized Common Carrier decision, opened the SCC field to open competition. The FCC said:

We find that: there is a public need and demand for the proposed facilities and services and for new and diverse sources of supply, competition in the specialized communications field is reasonably feasible, there are grounds for a reasonable expectation that new entry will have some beneficial effects, and there is no reason to anticipate that new entry would have any adverse impact on service to the public by existing carriers such as to outweigh the considerations supporting new entry. We further find and conclude that a general policy in favor of the entry of new carriers in the specialized communications field would serve the public interest, convenience, and necessity. [Ref. 18]

E. AFTER THE SPECIALIZED COMMON CARRIER DECISION

As with the preceding decisions, the Specialized Common Carrier decision met with strong opposition from the existing common carriers. In addition to asking the FCC to reconsider its decision based on the arguments previously used while fighting the HCI decision, the existing common carriers refused to interconnect the SCCs through the local telephone exchanges knowing that, if it were difficult for potential users to access the SCC systems, the SCC market

would be restricted. The FCC had upheld that AT&T and the others must provide interconnection from the beginning, but the regulatory and legal processes precluded full interconnection rights to the SCCs for five years after the Specialized Common Carrier decision. [Ref. 19]

During this period MCI continued to create difficulties for the established common carriers by introducing its Execunet service. Touted as a "shared" private line service, Execunet very closely resembled the long distance voice service offered by AT&T with the exception that Execunet had only a very small number of cities in its network. Instead of leasing a private line full-time for a monthly rate, Execunet subscribers could dial into the system when required and be charged on a time and mileage basis, with connect and monthly minimum charges. Thus users that could not afford a full-time private line could afford this "shared" private line.

AT&T quickly asked the FCC to bar MCI from offering Execunet since it was obviously (obvious to AT&T with their long distance switched network monopoly) not authorized by the Specialized Common Carrier decision. The FCC did order MCI to discontinue Execunet, but their action was later reversed by an appeals court.

1. Switched Voice Networks: The SCC's Money Maker

While SCCs continue to offer private line point-to-point service, which is what the FCC Specialized Common Carrier decision originally permitted them to provide, their "bread and butter" business is now their switched voice network offerings. Revenues in 1983 from the long distance services provided by MCI, GTE Sprint, and ITT United States Transmission Systems (USTS) totaled \$2.44 billion. (See Table I.) While only seven percent of AT&T's \$35 billion,

TABLE I
1983 Long Distance Service Revenues

	<u>Revenues</u> <u>(millions)</u>	<u>Profits</u> <u>(millions)</u>	<u>Subscribers</u> <u>(thousands)</u>
AT&T	\$35,000	\$1,430	85,000
MCI	\$ 1,520	\$ 203	1,550
GTE Sprint	\$ 750	\$ 66	920
ITT	\$ 170	\$ 8	95

this market is exhibiting exceedingly rapid growth.¹¹ [Ref. 20] Analysts predict that this may increase to 10 to 20 percent of a more than \$100 billion per year industry by 1990 [Ref. 21].

When the SCCs started up, the number of cities to which they offered services was very small and all (or nearly all) were large metropolitan areas. Today MCI, GTE Sprint, ITT, and other SCCs have networks that extend from coast to coast. MCI's system, begun as a single microwave system between St Louis and Chicago, has evolved into a nationwide network connecting thousands of cities in hundreds of metropolitan areas. (See Appendix C for a listing of all the area codes and prefixes currently on the MCI network.)

In spite of the success that the SCCs have had in getting favorable regulations and establishing a position in the common carrier market, they are still faced with problems. They may have nearly overcome the regulatory problems

¹¹In 1980 MCI, Southern Pacific Communications (now GTE Sprint), ITT USTs, and Western Union had \$400 million in revenues (only two percent of AT&T's \$20 billion in the same year). In 1975, these companies had only \$30 million in revenues. [Ref. 21]

(particularly since AT&T has lost control of its operating companies¹² and is primarily in the competitive long distance or long-lines business) but there are technical problems that must be resolved.

The first technical problem is that dual tone multi-frequency (DTMF) signalling¹³ is required to access the SCC's network. If a potential customer is among the majority that own rotary or pulse dial telephone instruments the potential customer is currently not able to use the SCCs' long distance networks. This is a serious disadvantage to the SCCs since they are trying to reach as much of the long distance telephone market as possible. Next, to make calls on the SCC's network requires dialing¹⁴ twelve or more extra digits (besides the ten digit number of the party to be called): a seven digit telephone number to access the SCC switch (the local access number), then a five or more digit accounting code. Third, the SCC's systems have been known to recognize noise on the line as a completed call¹⁵ so that a customer could be billed for calls that actually never went through [Ref. 26].

The first two problems can be eliminated through the use of dedicated access lines (DALs)¹⁶ or least cost routing

¹²References 22, 23, 24, and 2 are good references which discuss the AT&T divestiture. Reference 25 deals with the impact of the AT&T divestiture on telecommunications services to the Department of Defense, but, in this author's opinion, it is neither objective nor current.

¹³Touch tone is the Bell registered trademark for this type of signalling.

¹⁴Even with DTMF signalling the process of inputting a telephone number is called "dialing" although no dialing is actually done.

¹⁵This is due to the fact that the SCCs are not able to directly connect to the local telephone exchange to receive call completion signals and must rely on their computers recognizing a change in the ringing pattern.

¹⁶A dedicated access line (DAL) is basically a tie line to the SCC switch which eliminates the need to dial the local access number or an authorization code to make a call on the SCC network.

devices (available for a monthly fee from MCI and GTE Sprint), but these solutions are not for the small user since the money saved by using the SCCs services would not compensate for the cost of the DAL or least cost routing device. The SCCs will be remedying these problems for even the small user beginning in the fall of 1984 as a result of AT&T's divestiture of its operating companies. After the divestiture, MCI and the others will be able to connect directly to the local telephone exchange for access¹⁷ as well as for recording billing information. A glimpse of the coming changes was seen in 1981 when the Northwest Iowa Telephone Company, one of the nearly 1,500 independent telephone companies in the United States, offered MCI service to all of its customers. Now their customers can dial "6" (using rotary or pulse dial, or touch tone telephones) to make long distance calls via MCI's circuits, just as dialing "1" accesses the AT&T long distance system. [Ref. 27 , 28] Other digits for access or billing codes are unnecessary since these functions are done electronically by the telephone company's central office equipment.

Another major disadvantage of using SCC services was that the user could complete calls only to other cities within the SCCs network (assuming the user was in a city served by an SCC; this is still the major problem of using SCCs services). An FCC ruling in 1980 permitting the resale of Wide Area Telecommunications Service (WATS) changed all that.¹⁸ Now SCCs offer the capability to place calls to

¹⁷"Equal access" is the term being given to this issue--where all carriers are to receive "equal access" to the long distance market. Starting in September 1984 local companies must begin offering their telephone users the opportunity to choose the long distance carrier they want to give their business. One third of a local companies' access lines must enter the realm of "equal access" by September 1985 and the remainder by September 1986.

¹⁸Although not the subject of this paper, this ruling also led to the creation of "resellers"--those who lease circuits from common carriers and resell these circuits (or

anywhere in the continental United States but only from selected network cities. The rates are usually higher for calls to these non-network cities, but are still cheaper in most cases than the same call placed with AT&T.

2. Changes Taking Place

SCCs are still pressing forward regardless of problems. In 1980 an FCC study proclaimed that telephone competition is "speeding innovation and meeting unsatisfied communications needs" [Ref. 29]. Now that SCCs are confident they are not going to be regulated or dominated out of existence, they are making significant plans and changes to their offerings. Besides continuing to expand their networks, SCCs are installing fiber optic cables and using communications satellites for their networks. They are even investigating using cable television networks to provide local telephone service.¹⁹ [Ref. 30]

What will the future bring? The FCC ruling in 1980 permitting the resale of WATS suggests the possibility of the formation of what Johnson describes as:

... 'carrier's carriers,' whose express objective would be to build transmission facilities for use by other common carriers. ... While AT&T is itself a common carrier, one could imagine in the future a firm whose entire business consists of leasing facilities to other common carriers. [Ref. 31]

Perhaps this is in the future for one of the SCCs.

use of the circuits in the case of switched type services) to customers.

¹⁹No doubt the SCCs will be going after the still monopolized local telephone service market if their test results are promising.

F. CONCLUSION

This chapter has presented a brief history of the SCCs from the invention of microwave radio to the use of fiber optic cables and communications satellites. Fortunately, the early FCC decisions on matters such as using microwave frequencies for private microwave systems (different from private line) and interconnection were favorable for SCCs. Even with the favorable regulations, it was a very risky undertaking for very small companies such as MCI to take on the corporate giants such as AT&T and its cohorts in the common carrier industry, for AT&T and the others were ready and able to fight for their previously well-protected monopoly.²⁰ But the SCCs survived the AT&T self-preservation tactics and have established themselves as small but rapidly growing competitors.

²⁰The chairman of the board of MCI later said it had cost MCI \$10 million in legal and other regulatory costs in their effort to get their network approved--a high price to pay considering the total cost of their St Louis to Chicago microwave link was \$2 million [Ref. 32]. Data Transmission Co. (DATRAN) paid an even higher price--they lost their struggle to compete and filed for bankruptcy only a couple of years after they began.

III. SPECIALIZED COMMON CARRIER SWITCHED VOICE NETWORK SERVICES

This chapter discusses the switched voice network offerings of AT&T, MCI, and GTE Sprint, and the use and procurement of SCC services within the Department of Defense.

A. AT&T'S SERVICES--THE MARKET STANDARD

The long distance telephone service that everyone is intimately familiar with is AT&T's Long Distance Message Telecommunications Service (LDMTS), or MTS for short. MTS is the composite service of direct distance dialing and operator assisted calling (person-to-person, collect, third number, etc.). With MTS a telephone user (who is willing to pay for it, of course) can place a call to anywhere in the world. AT&T's MTS is billed according to the duration of the call, the rate period (day of week and time of day)²¹ in which the call was made, and the distance to the called number.²²

Wide Area Telecommunications Service (WATS) is another AT&T service that most have come in contact with.²³ Some contend that WATS differs from MTS only by the method of billing. While it is true that WATS calls are routed over the same AT&T circuits as MTS calls, one major difference

²¹In 1982 AT&T changed their method of considering the rate period in calculating the cost of a call. Previously, the entire call was billed according to the rate period of the first minute. Now calls are billed at the rate of the rate period in which each minute of the call occurs.

²²This is referred to as usage sensitive pricing. It is also referred to as time and/or distance (or mileage) sensitive pricing.

²³This discussion is about outward WATS. Inward WATS (800 Service) is basically the same as outward WATS except the calling is inward.

exists. WATS calls may be originated only via a limited number of WATS trunks connected to the PBX.²⁴

Interstate WATS is offered in the form of six geographical areas called Service Areas (formerly Bands). Service Area 1 includes the states adjacent to the state in which the call is originated and each higher numbered Service Area adds a larger geographical area to the lower numbered Service Area(s). Service Area 5 WATS permits calling to anywhere within the continental United States (outside of the state in which the call was originated). Service Area 6 adds Alaska and Hawaii.

In June 1981 there was a significant restructuring of how WATS is billed. Before that time WATS was available in either full business day WATS lines (up to 240 hours of usage per month per line at a flat rate with hours over 240 billed at an additional hourly rate)²⁵ or measured time WATS lines (up to ten hours of usage per month per line at a flat rate with hours over ten billed at an additional hourly rate). Today, WATS has no minimum usage requirement (but there is a monthly recurring charge per line) and every call contributes to the monthly bill. WATS costs are calculated from the average use per WATS line per rate period (and the distance as determined by the Service Area capability of the WATS line). Calls are measured in one second increments and the total number of minutes must be greater than or equal to the total number of calls in each rate period during the billing period (minimum average time requirement--MATR).

²⁴The number of WATS calls that can be made simultaneously is also limited by the number of dial 9 trunks, but these are usually more numerous than WATS lines.

²⁵For 240 hours of usage in an average 22 business day month the circuit must be in use almost 11 hours per business day. That's definitely a full business day! This is the source of the "WATS is free" syndrome. Companies were underutilizing their WATS lines and permitted, if not encouraged, personal calls via the company's WATS lines. (This sounds a lot like the rationale for non-official use of AUDIOVCN.)

B. SCC SWITCHED VOICE NETWORK SERVICES

SCCs offer basically two types of services which look remarkably like AT&T's services: dial access service and dedicated (or direct) access service.²⁶ The dial and direct access services offered by MCI and GTE Sprint are described below.²⁷

1. Dial Access Services

Dial access service most closely resembles AT&T's MTS (without operator assistance--as actor Cliff Robertson has pointed out in the recent AT&T television commercials). A customer dials a local access (telephone) number and a billing code to access the SCC network and, finally, the desired number to be called. Like AT&T's MTS, the customer is billed for SCC dial access service according to the duration of the call, the rate period, and the distance to the called number. The rate periods used by AT&T, MCI, and GTE Sprint are listed in Table II.²⁸ Non-recurring and monthly recurring charges for AT&T MTS, and MCI and GTE Sprint dial access services are shown in Table III. (AT&T's current and proposed MTS tariff rates, and the current tariff rates for MCI Execunet and GTE Sprint's SPRINT are found in

²⁶A third service is also offered by some of the SCCs which provides inward calling capability. This service will not be discussed in this thesis as most base telecommunications managers will not have a requirement for such service. Installations or activities (such as recruiting units) currently using In-WATS (800 Service) may want to obtain information on SCC inward calling service offerings.

²⁷The services of MCI and GTE Sprint were investigated since 1) they are the two biggest SCCs and 2) efforts to obtain information from ITT and Western Union were discouragingly unfruitful. A base telecommunications manager investigating SCC services should be cautioned not to call the toll free number for the SCCs and expect to have his/her questions answered. The best bet is to contact the nearest sales office for the SCC and know what information is needed.

²⁸The rate periods, rates, and recurring and non-recurring charges which appear in this chapter are from references 33, 34, 35, 36, 37, 38, and 39.

Appendix E.) Unlike AT&T's MTS, SCC dial access service currently requires dialing many digits to access the network.²⁹

TABLE II
AT&T, MCI, and GTE Sprint Rate Periods

Business Day

8:00 am to but not including 5:00 pm Monday-Friday

Evening

5:00 pm to but not including 11:00 pm Sunday-Friday

Night and Weekend

11:00 pm to but not including	8:00 am	All days
8:00 am to but not including	11:00 pm	Saturday
8:00 am to but not including	5:00 pm	Sunday

a. MCI Execunet Service

MCI offers dial access service in two flavors: Network-only Termination³⁰ and "Universal Termination."³¹

²⁹As mentioned in Chapter II, customers of the Northwest Iowa Telephone Company can dial a single digit to access MCI's Execunet service. As SCCs are given "equal access" to the long distance market, more customers will be provided single digit access to the SCCs (assuming they are in an area in which an SCC offers service). Another way to beat the extra digits is by using an autodialer or a least cost routing device (particularly for a big user).

³⁰AT&T only offers Network-only Termination service, but all cities are on the AT&T network.

³¹The term "Universal Termination" is misleading. While "Universal Termination" service offers coverage which is greater than that provided by Network-only Termination, it, too, has its limitations. MCI's "Universal Termination" service allows a user to complete calls to anywhere in the continental United States, Hawaii, and Puerto Rico and to

TABLE III

AT&T MTS, and MCI and GTE Sprint Dial Access Services
Monthly Recurring and Non-recurring Charges

AT&T MTS

No Monthly Recurring or Non-recurring Charges

MCI Execunet

Monthly Recurring

\$75 minimum usage or \$10 charge

SPRINT

Monthly Recurring

\$ 5 minimum usage

Network, or Execunet Service, calling can be originated from the cities in Table IV and can be completed to any network city.³² Calls to non-network cities (or "Universal Termination" calling) can be originated only from cities listed in Table V. MCI calls this Execunet Service with Nationwide Calling. Calls made via Execunet Service with Nationwide Calling may be completed to anywhere in the continental United States, Hawaii, and Puerto Rico and to some locations in Canada. Calls to Alaska cannot be made

some locations in Canada. MCI does not offer calling to Alaska. "Universal Termination" with GTE Sprint permits calling to anywhere in the continental United States, Hawaii, Alaska, Puerto Rico, and the U.S. Virgin Islands. (See the subsection in this chapter on "Intrastate Service" for a discussion on intrastate calling.) AT&T's MTS service can be regarded as the only truly "Universal Termination" service since a user can call anywhere in the world (...perhaps with some difficulty).

^{32A} complete listing of the area codes and prefixes on the MCI network is found in Appendix C.

TABLE IV

NCI Execunet Service Originating Cities

Abilene, TX	Denison, TX
Akron, OH	Denton, TX
Albany, NY	Denver, CO
Albuquerque, NM	Des Moines, IA
Allentown, PA	Detroit, MI
Altoona, PA	Downers Grove, IL
Amarillo, TX	Durham, NC
Anaheim, CA	Easton, MD
Ann Arbor, MI	Edgemont, IL
Annapolis, MD	Edinburg, TX
Atlanta, GA	El Paso, TX
Augusta, GA	Elyria, OH
Austin, TX	Erie, PA
Bakersfield, CA	Eugene, OR
Baltimore, MD	Flint, MI
Bartlesville, OK	Florence, NJ
Baton Rouge, LA	Forest Park, IL
Beaumont, TX	Ft Collins, CO
Bel Air, MD	Ft Lauderdale, FL
Bensonville, IL	Ft Wayne, IN
Birmingham, AL	Ft Worth, TX
Bloomington, IN	Frederick, MD
Blue Island, IL	Fredericksburg, VA
Boise, ID	Fresno, CA
Boston, MA	Frisco, TX
Bridgeport, CT	Galveston, TX
Bristol, TN	Garden City, NY
Brownsville, TX	Gary, IN
Bryan, TX	Geneva, IL
Buffalo, NY	Glenview, IL
Butler, PA	Grand Rapids, MI
Cambridge, MD	Greeley, CO
Camden, NJ	Greensboro, NC
Capistrano Valley, CA	Greensburg, PA
Carlisle, PA	Greenville, SC
Cedar Rapids, IA	Greenwich, CT
Champaign, IL	Hackensack, NJ
Channahon, TX	Hagerstown, MD
Charleston, WV	Harlingen, TX
Charlotte, NC	Harrisburg, PA
Chattanooga, TN	Hartford, CT
Cheyenne, WY	Houma, LA
Chicago, IL	Houston, TX
Cincinnati, OH	Huntsville, AL
Clearwater, FL	Huntsville, TX
Cleveland, OH	Indianapolis, IN
Collegeville, PA	Iowa City, IA
Colorado Springs, CO	Jackson, MS
Colton, CA	Jacksonville, FL
Columbia, SC	Johnstown, PA
Columbus, OH	Joliet, IL
Corpus Christi, TX	Joplin, MO
Creve Coeur, MO	Kalamazoo, MI
Dallas, TX	Kansas City, MO
Danbury, CT	Kenosha, WI
Davenport, IA	Killeen, TX
Dayton, OH	Knoxville, TN
Deer Park, NY	Lafayette, LA

TABLE IV (Continued)

MCI Execunet Service Originating Cities

Lancaster, CH	Orlando, FL
Lancaster, IA	Painesville, OH
Langhorne, PA	Palo Alto, CA
Lansing, MI	Palm Desert, CA
Las Vegas, NV	Pensacola, FL
Lawrence, KS	Peoria, IL
Leesburg, VA	Petersburg, VA
Lexington, KY	Philadelphia, PA
Lexington, MA	Phoenix, AZ
Lincoln, NE	Pittsburgh, PA
Little Rock, AR	Pittsfield, MA
Laredo, TX	Pleasanton, CA
Long Branch, NJ	Pontiac, MI
Longmont, CO	Portland, OR
Longview, TX	Prairie View, TX
Lorain, OH	Providence, RI
Los Angeles, CA	Provo, UT
Louisville, KY	Pueblo, CO
Lowell, MA	Racine, WI
Lubbock, TX	Rahway, NJ
Macon, GA	Raleigh, NC
Madison, WI	Randolph, MA
Manassas, VA	Reading, PA
Manchester, NH	Reno, NV
Manhattan, KS	Richmond, VA
Marion, OH	Roanoke, VA
Marshall, TX	Rochester, MN
Matawan, NJ	Rochester, NY
Memphis, TN	Rochester, PA
Miami, FL	Rockford, IL
Midland, MI	Round Lake, IL
Milwaukee, WI	Sacramento, CA
Minneapolis, MN	Saginaw, MI
Mobile, AL	St Charles, MO
Modesto, CA	St Cloud, MN
Montgomery, AL	St Joseph, MO
Morristown, NJ	St Louis, MO
Muncie, IN	Salem, OR
Nashua, NH	Salisbury, MD
Nashville, TN	Salt Lake City, UT
Natick, MA	San Angelo, TX
Nederland, TX	San Antonio, TX
Newark, NJ	Sandusky, OH
New Bedford, MA	San Diego, CA
New Braunfels, TX	San Francisco, CA
New Brunswick, NJ	San Jose, CA
New City, NY	San Rafael, CA
New Haven, CT	Santa Barbara, CA
New Orleans, LA	Santa Rosa, CA
Newport News, VA	Savannah, GA
New York, NY	Scranton, PA
Norfolk, VA	Seattle, WA
Morristown, PA	Sergeant Bluff, IA
Norwalk, CT	Shreveport, LA
Ogden, UT	Sioux City, IA
Oklahoma City, OK	South Bend, IN
Omaha, NE	Spartanburg, SC
Ontario, CA	Springfield, IL

TABLE IV (Continued)
MCI Execunet Service Originating Cities

Springfield, MA	Valley Park, MO
Springfield, MO	Ventura, CA
Springfield, OH	Vista, CA
Stamford, CT	Waco, TX
Stockton, CA	Washington, DC
Syracuse, NY	Washington, PA
Tampa, FL	Waterloo, IA
Temple, TX	West Palm Beach, FL
Terminal, TX	Wheeling, WV
Texarkana, TX	White Plains, NY
Toledo, OH	Wichita, KS
Topeka, KS	Wichita Falls, KS
Trenton, NJ	Williamstown, NJ
Tucson, AZ	Wilmington, DE
Tulsa, OK	Winston-Salem, NC
Tyler, TX	Worcester, MA
Uniontown, PA	York, PA
Utica, NY	Yorktown Heights, NY
Vallejo, CA	Youngstown, OH

via MCI. Calls completed to cities on the MCI network are billed at a lower rate than calls completed to non-network cities. MCI refers to this as a two-tiered system--Tier 1 to network cities and Tier 2 to non-network cities. The duration of an Execunet call (with or without Nationwide Calling) is rounded to the next higher full minute for calculating the cost of the call.

k. SPRINT Service

GTE Sprint's latest tariff revision (Jan 1984) combined two services, Residential Sprint and Business Sprint, into one service now called SPRINT.³³ Now all calls, network and non-network, are billed at the same rate. Previously, Residential and Business Sprint services had separate, two-tiered rate structures as Execunet. SPRINT calls may be originated in any of the cities in Table VI and

³³SPRINT stands for Switched Private Network Telecommunications.

TABLE V
NCI Execunet Service with Nationwide Calling
Originating Cities

Akron, OH	Lexington, MA
Allentown, PA	Longmont, CO
Amarillo, TX	Los Angeles, CA
Anaheim, CA	Louisville, KY
Ann Arbor, MI	Lowell, MA
Atlanta, GA	Lubbock, TX
Austin, TX	Memphis, TN
Baltimore, MD	Miami, FL
Bartlesville, IL	Minneapolis, MN
Beaumont, TX	Muncie, IN
Bensonville, IL	Natick, MA
Bloomington, IN	Nederland, TX
Blue Island, IL	Newark, NJ
Ecstun, MA	New Braunfels, TX
Butler, PA	New Brunswick, NJ
Canton, OH	New Haven, CT
Capistrano Valley, CA	New York, NY
Chicago, OH	Norristown, PA
Cincinnati, OH	Oklahoma City, OK
Cleveland, OH	Omaha, NE
Collegeville, PA	Painesville, OH
Colorado Springs, CO	Philadelphia, PA
Columbus, OH	Phoenix, AZ
Corpus Christi, TX	Pittsburgh, PA
Creve Couer, MO	Pleasanton, CA
Dallas, TX	Pontiac, MI
Denver, CO	Randolph, MA
Des Moines, IA	Reading, MA
Detroit, MI	Rochester, NY
Downers Grove, IL	Round Lake, IL
Elyria, OH	Sacramento, CA
Forest Park, IL	San Antonio, TX
Ft Collins, CO	San Diego, CA
Ft Lauderdale, FL	San Francisco, CA
Ft Worth, TX	San Rafael, CA
Galveston, TX	Sioux City, IA
Geneva, IL	St Charles, MO
Glenview, IL	St Joseph, MO
Greeley, CO	St Louis, MO
Greensburg, PA	Terminal, TX
Hackensack, NJ	Toledo, OH
Hartford, CT	Tucson, AZ
Houston, TX	Uniontown, PA
Indianapolis, IN	Vallejo, CA
Johnstown, PA	Ventura, CA
Kansas City, MO	Washington, DC
Lancaster, OH	Washington, PA
Langhorne, PA	Worcester, MA

may be completed to anywhere in the continental United States, Hawaii, Alaska, Puerto Rico, and the U.S. Virgin

Islands. (Calls originated in Hawaii cannot be completed to Puerto Rico or the U.S. Virgin Islands.) The duration of SPRINT calls are also rounded to the next higher full minute for calculating charges. The rate for SPRINT service is varied according to the total amount of the bill so that higher usage has a higher discount. (See Appendix E.)

c. Additional Features with MCI and GTE Sprint Dial Access Services

MCI and GTE Sprint offer several additional features with their dial access services. These are least cost routing, group billing, speed dialing, travel/credit card service, and magnetic tape billing. Least cost routing enables the use of rotary or pulse dial telephones to complete calls via the SCC dial access services. (It's a must at most military installations.) Probably the feature of most interest to a military installation, besides least cost routing, would be the group billing. This feature permits bills itemized according to billing (authorization) code. MCI's Corporate Account Service offers 50 accounts³⁴ at no monthly service charge if the combined monthly bill is at least \$2,500. There is no charge for each additional code for every \$50 added to the total monthly bill. GTE Sprint's group billing service is called Corporate Billing Arrangement. It offers 50 codes at no monthly charge with a minimum of \$1,500 usage per month and each additional code (up to 200) is free for every \$20 of usage added to the monthly bill. With a bill of \$15,000 per month 2500 codes can be provided at no cost. Both MCI and GTE offer additional accounting codes (up to 99 accounting codes per authorization code) for a small monthly fee.

³⁴The numbers of accounts which are given here are provided as examples of the service offered. Other quantities, smaller and larger, are available per the SCC's established rates.

TABLE VI
SPRINT Originating Cities

Arlene, TX	Davenport, CT
Akron, OH	Dayton, OH
Albany, GA	Decatur, IL
Albany, NY	Denton, TX
Albuquerque, NM	Denver, CO
Allentown, PA	Des Moines, IA
Altoona, PA	Detroit, MI
Amarillo, TX	Durham, NC
Anaheim, CA	Elk Grove, IL
Anderson, IN	El Monte, CA
Annapolis, MD	El Paso, TX
Ann Arbor, MI	El Segundo, CA
Antioch/Pittsburg, CA	Elyria, OH
Atlanta, GA	Encinitas, CA
Athens, GA	Escondido, CA
Atlantic City, NJ	Erie, PA
Austin, TX	Eugene, OR
Baltimore, MD	Evansville, IN
Bakersfield, CA	Fair Oaks
Baton Rouge, LA	/Roseville, CA
Beaumont, TX	Fall River, MA
Bedford, MA	Farmington, MI
Beverly Hills, CA	Feasterville, PA
Binghamton, NY	Flint, MI
Birmingham, AL	Ft Collins, CO
Birmingham, MI	Ft Lauderdale, FL
Bloomington, IN	Ft Wayne, IN
Boca Raton, FL	Ft Worth, TX
Bolton, ID	Fremont/Newark, CA
Boulder, CO	Fresno, CA
Bridgeport, CT	Gary, IN
Buffalo, NY	Glen Burnie, MD
Burlington, CA	Glendale, CA
Camden, NJ	Grand Rapids, MI
Canoga Park, CA	Greeley, CO
Canton, OH	Green Bay, WI
Capistrano Valley, CA	Greensboro, NC
Casper, WY	Greenville, SC
Cedar Rapids, IA	Hammond, IN
Champaign/Urbana, IL	Harrisburg, PA
Charleston, SC	Hartford, CT
Charleston, WV	High Point, NC
Charlotte, NC	Honolulu, HI
Chattanooga, TN	Houma, LA
Cheyenne, WY	Houston, TX
Chicago, IL	Huntington, WV
Cincinnati, OH	Indianapolis, IN
Clearwater, FL	Inglewood, CA
Cleveland, OH	Jackson, MS
Colorado Springs, CO	Jacksonville, FL
Columbia, SC	Jersey City, NJ
Columbus, GA	Kalamazoo, MI
Columbus, OH	Kansas City, MO
Compton, CA	Kaysville/Clearfield
Conshohocken, PA	/Ogden, UT
Corpus Christi, TX	Kenosha, WI
Dallas, TX	Knoxville, TN
Danbury, CT	Kokomo, IN

TABLE VI (Continued)
SPRINT Originating Cities

Lafayette, IA	Odessa, TX
La Grange, IL	Oklahoma City, OK
La Jolla, CA	Omaha, NE
Lake Charles, LA	Ontario, CA
Lancaster, CA	Orange/E Orange
Lansing, MI	/W Orange, NJ
Las Vegas, NV	Orangeville, NY
Lawrence, MA	Orlando, FL
Leonia, NJ	Palm Desert, CA
Lexington, KY	Palm Springs, CA
Lincoln, NE	Palo Alto, CA
Linden, NJ	Passaic, NJ
Little Rock, AR	Pensacola, FL
Livermore, CA	Peoria, IL
Lodi, CA	Petaluma, CA
Long Island, NY	Philadelphia, PA
Longmont, CO	Phoenix, AZ
Lorain, OH	Pinole/Vallejo, CA
Los Angeles, CA	Pittsburgh, PA
Louisville, KY	Portland, ME
Lowell, MA	Portland, OR
Lubbock, TX	Princeton
Macon, GA	/Penns Neck, RI
Madison, WI	Providence, RI
Manchester, NH	Provo/Oram, UT
Mansfield, CH	Pueblo, CO
Melrose, MA	Queens, NY
Memphis, TN	Racine, WI
Mentor, OH	Raleigh, NC
Metuchen, NJ	Randolph, MA
Miami, FL	Reading, PA
Midland, TX	Red Bank, NJ
Middleton, CH	Reno, NV
Milwaukee, WI	Richmond, VA
Minneapolis, MN	Roanoke, VA
Mobile, AL	Rochester, MN
Modesto, CA	Rochester, NY
Montgomery, AL	Rockford, IL
Morristown, NJ	Roseville, MI
Morton Grove, IL	St Charles, MO
Muncie, IN	St Joseph, MO
Nashua, NH	St Louis, MO
Nashville, TN	Sacramento, CA
Natick, MA	Salem, OR
New Bedford, MA	Salinas, CA
New Britain, CT	Salt Lake City, UT
New Brunswick, NJ	San Antonio, TX
New Haven, CT	San Bernardino, CA
New Orleans, LA	San Diego, CA
Newport, CA	San Francisco, CA
Newport News, VA	San Jose, CA
New York, NY	San Rafael, CA
Niagra Falls, NY	Santa Ana, CA
Norfolk, VA	Santa Barbara, CA
Norristown, PA	Santa Cruz, CA
Norwalk, CT	Santa Rosa, CA
Oakland, CA	Sarasota, FL
Oak Lawn, IL	

TABLE VI (Continued)
SPRINT Originating Cities

Saticoy/Oxnard	Tucson, AZ
/Ventura, CA	Tulsa, OK
Scranton, PA	Tyler, TX
Seattle, WA	Vacaville, CA
Shreveport, LA	Van Nuys, CA
Sioux City, IA	Waco, TX
Sioux Falls, SD	Walnut Creek, CA
South Bend, IN	Warren, OH
Spartanburg, SC	Washington, DC
Springfield, IL	Waterbury, CT
Springfield, MA	Wayne, MI
Springfield, OH	West Palm Beach, FL
Stamford, CT	Westport, CT
Stockton, CA	Westwood, NJ
Syracuse, NY	White Plains, NY
Tacoma, WA	Wichita Falls, TX
Tampa, FL	Wichita, KS
Terminal, TX	Wilkes-Barre, PA
Terre Haute, IN	Wilmington, DE
Thousand Oaks, CA	Winston-Salem, NC
Toledo, OH	Worcester, MA
Topeka, KS	York, PA
Trenton, NJ	Youngstown, OH

d. Advantages and Disadvantages of Dial Access Service

Dial access service offers the following advantages:

1. With additional billing numbers, bills are automatically sorted for verification.
2. Some dial access services are billed in less than one minute increments--a potential cost savings.
3. The number of possible simultaneous calls is only limited by the number of dial 9 trunks.

Some of the disadvantages of dial access service are:

1. If the SCC has a lot of customers in the area there may be access problems. These access problems may depend upon how often the SCC upgrades their equipment to provide the necessary levels of circuits/service.

2. Currently, unless the customer uses an autodialer or has speed dialing or a similar capability, there are a lot of numbers which must be dialed because of the local access number and the billing code. (This problem will disappear with "equal access.")
3. Since there are no operators, there are no person-to-person, collect, or third number calls (most base telecommunications managers would be glad not to have to worry about these, anyway).
4. Every call which results in getting the SCC dial tone will cost (if there is a charge for the local or long distance call to access the SCC network), not just the ones which result in a completed long distance call.
5. Basically, there is no overseas calling capability.

e. When to Consider Using Dial Access Service

When should a base telecommunications manager consider using dial access service?

- When it costs less than the service currently being used!
- If local calls are free and the local access number truly is local.
- If a lot of calls must be made at the same time. (Only limited by the number of dial 9 trunks.)
- If single digit access to the SCC is available, or, if not available, autodialing or speed dialing capability is available.
- If DTMF signalling is available (either at the switchboard or at each call station). (Not necessary if single digit access is available.)

2. Dedicated Access Services

Dedicated access service is the SCC's marketing answer to AT&T's WATS. The customer accesses the SCC network through a dedicated access line (DAL), eliminating the need to dial the local access number or billing code. Dedicated access services also use usage sensitive pricing. Table VII lists the non-recurring and monthly recurring charges for AT&T WATS, and MCI and GTE Sprint dedicated access services. (AT&T's current and proposed WATS tariff rates, and the current tariff rates for MCI WATS and GTE Sprint's Direct Sprint are found in Appendix E.)

a. MCI Network Service and MCI WATS

MCI offers dedicated access service in the same two flavors as their dial access service: Network-only Termination and "Universal Termination." MCI Network Service allows calling only to network cities, while calls made via MCI Network Service with Universal Termination can be completed to anywhere in the continental United States, Hawaii, and Puerto Rico and to some locations in Canada. MCI has attached the name MCI WATS to their MCI Network Service with Universal Termination. Although the name suggests it, MCI WATS cannot be viewed as equivalent service with AT&T WATS since calls cannot be completed to Alaska. Table VIII lists the cities from which both of these services may be originated. Durations of calls via these services are rounded to the next higher thirty second increment,³⁵ and, like AT&T WATS, MCI's dedicated access services have a one minute minimum average time requirement.

³⁵There is a savings when billing is in less than one minute increments. Self states for an average call length of five minutes that one second, six second, 30 second, and initial minute then 30 second increment billing will save 10, 9, 5, and 3.8 percent, respectively, of the cost of a call filled in full minute increments (like AT&T MTS, MCI Execunet, and GTE Sprint's SPRINT) [Ref. 40].

TABLE VII

**AT&T WATS, and MCI and GTE Sprint Dedicated Access
Services Monthly Recurring and Non-Recurring Charges**

AT&T WATS (Current Tariff Rates)

Monthly Recurring

\$31.65 per line

Non-Recurring

Order	\$ 51.80 per order
Installation	\$123.00 per line

AT&T WATS (Proposed Tariff Rates)

Monthly Recurring

\$56.65 per line

Non-Recurring

Order	\$ 51.80 per order
Installation	\$123.00 per line

MCI Network Service

Monthly Recurring

\$75 minimum charge for all usage
\$85 per line

Non-Recurring

Order	\$ 50 per order
Installation	\$120 per line
Cancel Order	\$130

MCI WATS
(MCI Network Service With Universal Termination)

Monthly Recurring

\$75 minimum charge for all usage
\$100 per line termination charge
(or cost + \$10, whichever is greater)

Non-Recurring

Order	\$ 50 per order
Installation	\$120 per line
Cancel Order	\$130

TABLE VII (Continued)

AT&T WATS, and HCI and GTE Sprint Dedicated Access
Services Monthly Recurring and Non-Recurring Charges

Direct Sprint

Monthly Recurring

\$350 per line minimum usage

Termination at Fate Center \$ 5 per line

Termination within LDA \$35 per line
(Local Distribution Area)

Termination outside LDA \$35 per line
but within state boundaries + \$4 per mile
outside LDA
boundary

Termination outside LDA \$35 per line
and crossing state boundaries + \$4 per mile
from customer
premise to switch
location

Circuit Termination \$65 per line

No Non-Recurring Charges

b. Direct Sprint Service

GTE Sprint's Direct Sprint service is also available in Network-only Termination and "Universal Termination." Calls for both types of service may be originated from the cities in Table IX.^{3*} Direct Sprint calls are measured in six second increments (the duration of the call is rounded up to the next higher six second increment). The rate structure is complicated by the fact that, in addition to network and non-network rates which are mileage independent, there are mileage sensitive rates for calls to Alaska and to and from Hawaii (other than Honolulu). Direct Sprint also uses a one minute minimum average time requirement.

^{3*}Appendix D provides a complete listing of area codes and prefixes on GTE Sprint's network.

TABLE VIII

MCI Network Service and MCI WATS Originating Cities

Akron, OH	Memphis, TN
Anaheim, CA	Miami, FL
Atlanta, GA	Minneapolis, MN
Baltimore, MD	Newark, NJ
Boston, MA	New York, NY
Chicago, IL	Oklahoma City, OK
Cincinnati, OH	Omaha, NE
Cleveland, OH	Philadelphia, PA
Columbus, OH	Phoenix, AZ
Dallas, TX	Pittsburgh, PA
Dayton, OH	St. Louis, MO
Denver, CO	San Antonio, TX
Des Moines, IA	San Diego, CA
Detroit, MI	San Francisco, CA
Ft. Worth, TX	San Jose, CA
Hartford, CT	Stamford, CT
Houston, TX	Toledo, OH
Indianapolis, IN	Tulsa, OK
Kansas City, MO	Washington, DC
Los Angeles, CA	Wilmington, DE
Louisville, KY	

c. Additional Features with MCI and GTE Sprint
Dedicated Access Service

Least cost routing, accounting codes, and magnetic tape billing are additional features offered with MCI Network Service, MCI WATS, and Direct Sprint Service. The least cost routing offering is a boon for those locations that do not have a sophisticated switch with least cost routing capability--which, unfortunately, includes nearly all military installations. Microprocessors leased from the carrier permit completing calls via the most economical method whether via AT&T MTS, WATS lines, SCC LALs, FX lines, or whatever. The accounting codes are also noteworthy. Rather than getting a bulk bill as with AT&T WATS, the accounting codes allow itemizing all calls by accounting code, making it easier to control the costs of

TABLE IX
Direct Sprint Originating Cities

Atlanta, GA	Los Angeles, CA
Baltimore, MD	Miami, FL
Boston, MA	Milwaukee, WI
Buffalo, NY	New Orleans, LA
Chicago, IL	New York, NY
Charlotte, NC	*Omaha, NE
Cincinnati, OH	Orangerville, NY
Cleveland, OH	Philadelphia, PA
Dallas, TX	Phoenix, AZ
Denver, CO	Rochester, NY
Detroit, MI	San Francisco, CA
Honolulu, HI	San Jose, CA
Houston, TX	Seattle, WA
*Icidi, CA	Washington, DC

*Direct Sprint with Universal Calling not available

the calls. Accounting codes should be viewed as essential items for most military installations.

d. Advantages and Disadvantages of Dedicated Access Service

The following are some of the advantages of using dedicated access service:

1. No local access number or billing code to dial.
2. Usually less expensive than the carrier's dial access service.³⁷
3. May permit removing local lines (dial 9 trunks) and thereby save money.
4. Call detail billing is available itemizing each call.

³⁷Potential users must recognize that there is a break-even point since there are fixed costs (monthly recurring as well as order and installation costs) associated with dedicated access services. The combined sum of the fixed costs and the usage costs must be less than the costs of the service currently being used. Also, it is possible that the rates themselves may not be lower than the dial access service rates.

Some of the disadvantages of dedicated access service are:

1. Only one call at a time per DAL. If the circuit is busy, it's busy! DALs create the same problem as WATS--when the circuits are busy telephone users call via AT&T MTS anyway so it costs more.^{3*} This situation actually costs more twice because of lower overall usage of the WATS lines or DALs, which costs a higher rate for all calls, plus a higher cost for the MTS call. (Note that with least cost routing, telephone users do not realize they are using anything different.)
2. If the service is referred to as a WATS or WATS-type service, remember that many people have the misconception that WATS is free. WATS or WATS-type service is not free; in fact, it can be very expensive unless it is managed properly. Newton suggests replacing WATS lines with LATS (Limited Access Telephone Service) lines as a money saving measure:

....send a memo around the company to all employees saying, "We have cancelled our WATS lines because of the expense. We have now subscribed to a brand new telephone company service, called LATS--Limited Access Telephone Service. LATS lines are cheaper than WATS lines (which is why we got the LATS lines), but now all our LATS calls--each and every one--are billed and charged by the length of the call in minutes and seconds and by time of day."

What have we done? We have killed the myth that WATS lines are free by cancelling our WATS lines. We have introduced the correct logic that calls cost money based on the time of day they were made and the length of the call. There is, of course, no such animal as a LATS line.
[Ref. 41]

^{3*}Sometimes the amount of traffic which is being diverted to MTS (or other dial access service) is an indicator that there are insufficient WATS lines or DALs installed.

e. When to Consider Using Dedicated Access Service

When should a base telecommunications manager consider using direct access service?

- Again, when it costs less than the service currently being used. (Remember to consider fixed costs.)
- If WATS is already being used at the installation.
- If the number of long distance calls justifies several DAIS.
- If local lines (dial 9 trunks) can be removed when DAIS are installed.
- When call detail billing is needed.

3. Intrastate Service

SCCs are interstate carriers. Prior to the AT&T divestiture they were able to provide intrastate service only in those states where they were authorized by the state's Public Utilities Commission (PUC). One of the changes mandated by the AT&T divestiture agreement was that the divested operating companies (or BOCs for Bell Operating Companies) would provide long distance service within the LATAs (Local Access and Transport Areas),³⁹ or intra-LATA calling, and calling between LATAs (inter-LATA) would be provided by AT&T and other carriers like the SCCs and resellers. Even so, all calls within a state are still subject to regulation by the state PUC. So far, SCCs have

³⁹Local Access and Transport Areas, or LATAs, were created as a method of defining the boundaries within which the divested operating companies could provide "local" service. There are 161 LATAs. Idaho, Maine, New Mexico, and the District of Columbia each have one LATA for the entire state or district. All other states have more than one LATA.

been authorized to offer (at least partial) intrastate calling in six states [Ref. 20]. Simon and Whalen point out that:

The PUCs also have the right, if they wish, to allow the "interexchange carriers" (also called "inter-LATA carriers") like AT&T, MCI, ITT, etc. to carry calls within LATAs in the states, though the BOCs are expected to object to this [Ref. 42].

Historically, calls which originate and terminate on the SCC network within a state have been completed. Calls within the State of California made via MCI's dial access and dedicated access services with "Universal Termination" are completed only if the called locations are on the network. Although they are not shouting it from the rooftops, GTE Sprint does not restrict intra-state (inter- or intra-LATA) calling via SPRINT or Direct Sprint with Universal Calling. They cannot offer or advertise service (in California) for solely intra-LATA calls, but no one checks.

The bottom line is: Potential users must check with the SCCs concerning their service offerings in a particular state.

C. USE AND PROCUREMENT OF SCC SERVICES IN THE DEPARTMENT OF DEFENSE

1. Use of SCC Services in the Department of Defense

In 1980, the author conducted an Air Staff (Headquarters USAF) directed study of the potential use of SCC services at all Strategic Air Command (SAC) installations in the continental United States. At that time the SCC marketing people seemed reluctant to provide information and assistance in spite of the potential to get part of the several hundred thousand dollars that are spent by SAC installations annually for long distance telephone service.

The major problems^{*0} with using SCC services at that time were:

a. SCC systems presently serve only major metropolitan areas. Calls can only be placed to and from cities within the SCC's network.

(1) Most SAC bases are not within the calling areas of the metropolitan cities served.

(2) Bases with SCC system accessibility will need to develop and maintain directories listing the cities and/or area and NNX codes served by the SCC because of the limited service.

b. Dual tone multi-frequency (DTMF or touch tone) signalling is needed to access the SCC systems. At most bases, this would require operator assistance to dial a seven digit access number, a multiple digit billing number, plus the ten digit telephone number to be called [Ref. 43].

But, as was mentioned in the previous chapter, most of these problems no longer exist since SCCs offer "Universal Termination,"^{*1} (from selected network cities) as well as LALs or least cost routing devices which enable calls to be completed without dialing the local access number or the billing code and from a rotary or pulse dial telephone instrument. Also, with the growth of the SCC networks more and more military installations are within their reach. Even with these problems corrected, SCC usage in the Department of Defense has been slow in getting started.^{*2} In fact, SCC use throughout the Department of

^{*0}Most of these problems were already mentioned in Chapter II.

^{*1}MCI plans to offer "universal origination" to its credit card customers in March 1984, providing access to the MCI network from any city in the United States through AT&T WATS or MCI circuits for an additional per minute charge.

^{*2}In 1982 MCI was providing service to only one Department of Defense activity, the Defense Telephone Service-Washington. It is highly likely that this was the only Department of Defense activity using any SCC services at that time.

Defense is currently limited to just a handful of places.*3
Worse yet (in the author's opinion), direction on their
procurement and use is virtually non-existent. Why should
the Department of Defense be concerned? Because there is
money to be saved! According to MCI:

...While we have been unable to obtain an accurate
figure for DoD's current cost for [administrative long
distance telephone services,] estimates place these
costs at a minimum of \$500 million annually. The poten-
tial savings may be as high as \$125 million annually....
[Ref. 44]

2. Procuring SCC Services

Sensing a hesitancy on the part of military telecommu-
nications managers to move away from AT&T into the
uncharted waters (as far as the Department of Defense was
concerned) of the SCCs, MCI's Director of Government
Marketing sent a letter to the Deputy Under Secretary of
Defense (C3I) in August 1982 urging a stronger position for
competitive procurement of long distance services. An
attachment to this letter discussed the Federal Government's
policy on competitive procurement of telecommunications
services. An excerpt follows:

The U. S. Government has specific, established policies
which require agencies to compete their telecommunica-
tions requirements. The Defense Acquisition Regulations
clearly state this duty in DAR 22-1005.1(b) which states
that:

...there are locations at which no single communi-
cations common carrier has the exclusive right to
provide the required service. When this is the case
and more than one common carrier is authorized and
can provide the required service, the procurement
shall be made from the source offering the lowest
cost to the Government, if practicable.

*3Per the author's conversations with offices in the
Department of Defense and with SCC marketing personnel.

Similarly, DAR 1-300.1 requires all procurements to be performed competitively to the maximum practicable extent. In other words, an agency must compete its requirements for telecommunications service when it is able to do so. And since MCI's service now covers virtually the entire country, there is no excuse not to compete telecommunications service needs as the DAR requires.

Numerous DoD components have taken action to implement the fundamental policy position set forth in the DAR. The Defense Commercial Communication Office (DECCO) recently issued a "Policy for Seeking Competition for CONUS Private Line Services." The effective date is May 7, 1981. DECCO policy provides that increasing degrees of competition shall be used as the requirement expands....

.....
...DECCO clearly requires competition in private line services. The same policy considerations also apply to procurement of DDL or WATS equivalent message service, including MCI's Network Service.

The policy expressed in these documents is simply a reiteration of a competitive communications policy which DoD has stressed for many years. For example, by memorandum dated December 23, 1978, for the Secretaries of the Military Departments, the Chairmen, Joint Chiefs of Staff, and numerous other DoD officials, Gerald Dineen stated that it is DoD policy that procurements for base telephone systems "will be completed to the maximum extent possible..." (Emphasis in the original.)

More recently, Deputy Secretary Frank Carlucci issued a memorandum for broad dissemination within DoD urging DoD managers to increase the use of competition in the procurement process. Mr. Carlucci's memorandum, dated July 27, 1981, stated categorically that:

The value of competition in the acquisition process is one of the most widely accepted concepts. We believe that it reduces the costs of needed supplies and services, improves contractor performance, helps to combat rising costs, increases the industrial base, and ensures fairness of opportunity for award of government contracts. Despite our beliefs and efforts at furthering competition, there is a serious concern that our achievements are not adequate. Many in government and industry believe that we award too many contracts without adequate competition.

I am therefore asking that managers in all levels review their efforts to obtain maximum competition in their contractual requirements. (Emphasis added.)

This last statement is particularly applicable to DoD base communications managers. For years, DoD base requirements have been sole sourced to AT&T. Mr.

Carlucci's memorandum clearly requires reevaluation of this practice, and the injection of more competition into local communications procurements.

.....

In summary, established federal policy mandates competition in all procurements to the fullest extent practicable. This policy is well established in communications and all other areas of federal procurement. There is no justification for a base communications manager to continue sole sourcing AT&T. Such a practice is clearly prohibited by the policies and regulations set forth above. [Ref. 44]

Subsequent to receiving this letter, the Assistant Deputy Secretary of Defense (Telecommunications) sent a memorandum to the Services' senior communicators requesting: "Your comments on the advisability and feasibility of using MCI metered use service...and like offerings are solicited." [Ref. 45]. Apparently the Services paid some credence to the tasking, as there are a few more installations using SCC services now than there were at the time of the tasking.

One method, of several being used (on a very limited basis) in the Department of Defense to procure SCC services, is through a strictly competitive procurement process. The Air Force is currently pursuing long distance telephone services this way. The Air Force Communications Command's Continental Communications Division has been publishing Requests for Quotation (RFQs) in the Commerce Business Daily as well as through the mail to marketing representatives of the major carriers. The winner is determined, as in any other contract, based on the quote provided by the carrier and other factors which are weighted by the contracting office. So far only two bases have obtained services by this method; Kelly Air Force Base, Texas and Tinker Air Force Base, Oklahoma. Kelly Air Force Base replaced ten WATS lines (Service Area 5) and one intrastate Texas WATS line with 14 MCI WATS DALS in August 1983. As a result of

this change Kelly Air Force Base is spending less money for more circuits (and more capability since all of the MCI DALS are capable of completing calls within Texas) and the quality of the circuits is comparable to that had previously.**

The Navy is also getting underway with several activities in the San Diego area recently competitively procuring SCC services. While there is no Navy-wide guidance on obtaining SCC services, the Western Division of the Naval Facilities Engineering Command requires a minimum of three quotes from competing carriers.

Apparently not willing to accept the experience of other test areas, the Army plans to competitively procure SCC services to conduct its own test at an Army activity in the metropolitan St Louis area within the next several months. The Army is the slowest of the military services to implement SCC service usage.

Another method of procurement is for the base telecommunications manager to obtain the carriers' tariffs and other information describing their services and to perform his/her own evaluation to determine the least expensive and the best (or maybe a combination of both). This is the method used by the Defense Telephone Service-Washington (DTS-Washington). DTS-Washington first obtained MCI DALS in May 1979. Currently DTS-Washington has 102 MCI Network-only DALS, 209 WATS (Service Area 6) lines, and 65 FX lines for completing long distance calls.** This second method is reasonable since all of the carriers are tariffed and t

**Another Air Force installation, Offutt Air Force Base, is "testing" one DAL from both MCI and GTE Sprint--not an effective way, in the author's opinion, to test either cost savings or quality of service.

**DTS-Washington provides all administrative telephone service to all DoD components in the Washington, DC area. All long distance calls by DoD offices in the Washington, DC area are routed through the DTS-Washington electronic switch for least cost routing.

base telecommunications manager is capable of comparing rates and services. (In a sense, this method is competitive, too.) Thirty days is the standard minimum length of service required by the SCCs, so, unlike long term agreements, the risk in trying their services is minimal.

A third method is just to continue to allow AT&T to provide the service without regard to any competing carriers. This is by far the easiest method, but this method should become obsolete at all but the locations where there are no competing carriers.

3. Where to Go for Military Service Guidance and/or Assistance

Base telecommunications managers interested in obtaining SCC services should contact the appropriate office listed below for guidance and/or assistance.

Army

7th Signal Command/CCN-CPS-PL
Ft Ritchie, MD 21719

Navy**

Commanding Officer
Northern Division
Naval Facilities Engineering Command
Philadelphia, PA 19112

Commanding Officer
Chesapeake Division
Naval Facilities Engineering Command
Washington Navy Yard
Washington, DC 20390

**Responsibility for local telephone service at Naval installations will be changing hands from the Naval Facilities Engineering Command to the Commander, Naval Telecommunications Command, 4401 Massachusetts Avenue, N.W., Washington, DC 20390 in October 1984.

Commander
Atlantic Division
Naval Facilities Engineering Command
Norfolk, VA 23511

Commanding Officer
Southern Division
Naval Facilities Engineering Command
F.O. Box 10068
Charleston, SC 29411

Commanding Officer
Western Division
Naval Facilities Engineering Command
San Bruno, CA 94066

Commander
Pacific Division
Naval Facilities Engineering Command
Pearl Harbor, HI 96860

Air Force

CCD/PK2
Griffiss AFB, NY 13441

D. SUMMARY

As has been presented in this chapter, SCC services appear like and function similar to AT&T MTS and WATS. There is sufficient evidence both inside and outside of the Department of Defense that shows that SCCs provide as good quality services which can be less expensive than those provided by AT&T. There should be no more need for testing SCC services. The military services must establish policies and provide direction to base telecommunications managers to begin the process of evaluating and, where feasible, procuring SCC services.

IV. ANALYSIS OF ALTERNATIVES

Having presented discussions in earlier chapters about the history of SCCs and the services they offer, this chapter provides, first, a general outline of questions which can be used in analyzing the use of SCC services at military installations.*7 Then, an actual case study is presented which evaluates the potential use of MCI and GTE Sprint services at Naval Air Station (NAS) Moffett Field, California. The final section of this chapter describes a computer program which was developed by the author for use in calculating the costs of using SCC dial access and dedicated access services from actual telephone bill data.

A. EVALUATING THE POTENTIAL USE OF SCC SERVICES

The first step that a base telecommunications manager must take to evaluate his/her installation for potential use of SCC services is to know what type of services the installation has and what the costs are for these services.** It is difficult to assess replacing or augmenting services without first knowing what is already in use. The next step is to determine if the installation is in an area served by an SCC. Do any of the SCCs have a switch serving this area or could the installation access SCC networks in a nearby city via an FX line or DAL? (Tables IV, V, VI, VIII, and IX show the origination cities for accessing the MCI and GTE

*7This rationale can also be used to evaluate the potential use of reseller services, but since this thesis is about SCCs that exercise is left to the reader.

**This first step is useful even if there are no SCCs which offer services in the area (which is to be determined in the next step) as it will help the base telecommunications manager to see if there are other services offered by the incumbent carrier which may be cost saving.

Sprint networks.)⁴⁹ If not, there is no reason to continue the evaluation at this time, but considering the way that the SCCs are growing, a periodic re-evaluation is absolutely necessary. However, a base telecommunications manager should be skeptical about planned or projected SCC service in his/her area since a "projected" availability of service is never a sure thing until it actually becomes available.

Next the base telecommunications manager must answer the question, "What is the cost of accessing the SCC network?" Does the installation have a per call per minute charge (measured service or zone usage measurement service or other usage sensitive billing)? This charge will apply each time the local access number is called (for off-network access) in addition to the long distance charges. In fact, all calls which result in the SCC dial tone but result in a busy signal or otherwise uncompleted call will also incur these charges.⁵⁰ These costs are real and must be kept in mind in the evaluation. If the local access number is off an exchange in a nearby city, what will an FX line cost? What are the costs for a DAL to connect directly to the SCC network? Will installing DALs permit removal of dial 9 trunks and, as a result, save the cost of these trunks? If local lines can be removed when installing FX lines or DALs these savings should be considered.

⁴⁹If the specific location being evaluated is not listed, perhaps it is considered a part of a larger nearby city. For example: NAS Moffett Field is in Mountain View, California which is not listed in the SCC network lists of cities, but Palo Alto and San Francisco are.

⁵⁰Self estimates that an additional 45 percent of the actual long distance connect time must be added to calls made during the Business Day rate period to account for these uncompleted long distance calls (as well as the time required to input the access code and telephone number to be called, the time spent waiting while ringing, etc.) [Ref. 46].

The next step is to determine if there is an economic advantage⁵¹ (cost savings) by using SCC services for completing either all⁵² or part⁵³ of the long distance calls placed by the military installation. First, what are the calling trends of the installation? (This may lead to some other considerations such as: calls placed to or near military installations that could be placed over AUTOVON; recurrent, periodic abuse; sufficient calls to nearby cities which may warrant considering installing an FX line other than to access the SCC network.) Second, what would it cost to complete the installation's long distance calls via the SCC services? Then, assuming that the cost of completing calls via the SCC is less than the existing method(s), is the cost of accessing the SCC's service (whether dial or dedicated) less than the difference?

Lastly, the base telecommunications manager must answer the question, "Are there any technical considerations that might affect the potential use of SCC services?" For example, can the installation's PBX accommodate additional trunks? To effectively use an SCC's network-only dedicated access service, least cost routing should be considered. Is least cost routing available on the PBX? A summary of these questions is listed in Table X.

⁵¹The computer program described in the following section of this chapter and which is listed in Appendix G can be very useful in this part of the evaluation.

⁵²Can all of an installation's long distance calling needs be met solely by an SCC? In certain situations, yes. These situations are where no international, person-to-person, collect, third number, etc. calling is required. But as long as AT&T provides NTS service with no monthly service charges and no monthly minimums there is no reason not to have it handy just in case it's needed.

⁵³If SCC services are used to supplement rather than replace existing WATS or dedicated access service, the base telecommunications manager should be aware that the hours which are shifted from the existing service are those hours which are in the lowest rate category. In other words, if 40 hours out of 120 hours per access line are shifted to another service, the 40 hours being shifted are those hours which were being charged at the over 80 hour rate.

TABLE X

Evaluating the Potential Use of SCC Services

- What type of long distance telephone services does the installation have, and what are the costs of these services?
- Does the SCC (or SCCs) have a switch serving this area or could the installation access the SCC network in a nearby city via an FX line or DAL?
- What is the cost of accessing the SCC network?
- Does the installation have a per call per minute charge (usage sensitive pricing--measured service or zone usage measurement service or other usage sensitive billing)?
- If the local access number is off an exchange in a nearby city, what will an FX line cost?
- What are the costs for a DAL to connect directly to the SCC network?
- Will installing DALs permit removal of dial 9 trunks, and as a result save the cost of those trunks?
- What are the calling trends of calls from the installation?
- What would it cost to complete the installation's long distance calls via the SCC services?
- If the cost of completing long distance calls via the SCC is less than the existing method(s), is the cost of accessing the SCC service less than the cost difference?
- Are there any technical considerations that might affect the potential use of SCC services?

B. A CASE STUDY OF NAS MOFFETT FIELD

The following case study evaluating the potential use of SCC services at NAS Mcffett Field, California is provided to assist a base telecommunications manager in performing a similar analysis at his/her installation.

1. Type and Cost of Long Distance Service at NAS Moffett Field

NAS Moffett Field is located in Mountain View, California which is in the metropolitan San Francisco area and is served by all of the major SCCs. The two biggest SCCs, MCI and GTE Sprint, were investigated as potential providers of long distance telephone service at NAS Moffett Field.

NAS Moffett Field has what is referred to as FOTS--Plain Old Telephone Service. No WATS lines.⁵⁴ No tie lines. No FX lines. Nothing fancy or exotic. Just MTS. Just FOTS.

NAS Moffett Field is charged for zone usage measurement service for calls in the local area.⁵⁵ The bill for long distance and zone usage measurement (ZUM) services is about \$15,000 per month.

2. Cost of Accessing the SCC Network

The MCI and GTE Sprint local access numbers for NAS Moffett Field are Zone 1 calls (to Palo Alto, California). Calls to these networks (through dial access) would incur a ZUM charge of \$.03 per minute for the first minute and \$.01 per minute for each additional minute during the Business Day rate period.⁵⁶ That's \$.07 for a five minute call during

⁵⁴In June 1983 Pacific Telephone recommended installation of two interstate WATS lines (service area 5) and three intrastate WATS lines (two statewide WATS lines and one Northern California WATS line). On 24 January 1984 NAS Moffett Field had the recommended number of lines installed. Since the telephone bill data being used for the case study is pre-WATS, this discussion will proceed as if they weren't installed.

⁵⁵ZUM calls are local calls (within 16 miles) which are billed in zones with Zone 1 being the area closest to the location where the call was originated. Zone 1 calls are lumped together and appear on the monthly bill as totals for first and additional minutes in each rate period. Each Zone 2 and Zone 3 call is itemized.

⁵⁶There is a 30 percent discount for calls made during

the business day just to connect to the SCC network, not to make the long distance call itself. Table XI compares the cost of a five minute call to the East Coast from Moffett Field via AT&T MTS, MCI Execunet, and SPRINT.

Since calls to the MCI Execunet and SPRINT networks are Zone 1 calls, FX lines need not be considered. The proximity of Moffett Field to the SCC switches permits easy installation of SCC DALS. Not considering installation charges or monthly usage minimums, an MCI Network-only DAL would cost \$85 per month, an MCI WATS DAL would cost \$100 per month, and a Direct Sprint DAL would cost \$100 per month (from Table VII). Moffett Field is billed \$.70 per month per each base telephone number for dial 9 trunks. This charge is independent of the number of trunks, therefore, the use of DALS will not affect this charge.

TABLE XI

Cost of a Five Minute Call from NAS Moffett Field to East Coast (Including Cost to Access SCC Network)

<u>Carrier</u>	<u>Cost</u>
AT&T MTS (Current Rates)	\$2.70
AT&T MTS (Proposed Rates)	\$2.45
MCI Execunet (Network City)	\$2.23
SPRINT (Network City)	\$2.32*

*Includes 8% discount for total bill \$200 or over.

the Evening rate period, and a 60 percent discount for calls made during the Night and Weekend rate period. The rate periods for ZUM calls are the same as in Table II except the Night and Weekend rate period includes all day Sunday.

3. Calling Trends of NAS Moffett Field

The total cost of the installation's long distance and ZUM calls for the period between 20 September 1983 and 20 October 1983 was \$17,990.16. There were 15,117 long distance calls at a total cost of \$15,045.06. Of these calls, 1583 were interstate calls at a cost of \$3424.02, nine were international calls (including to Canada) at a cost of \$64.85, and the remainder were long distance calls within the state of California (1267 inter-LATA and 12,216 intra-LATA calls). The majority of Moffett Field's long distance calls are made to the eastern United States, primarily to Washington, DC, Maryland, Virginia, and New York, and, of course, within the state of California. There is also a need to call Hawaii and Alaska from Moffett Field.

4. Cost to Complete NAS Moffett Field's Long Distance Calls via SCCs

The computer program in Appendix G was used to analyze the cost of completing Moffett Field's interstate long distance calls. Twenty-one of the 1593 interstate calls were not used in the analysis because they were multiple rate period or operator assisted calls. The original cost of the remaining 1562 calls was \$3348.41.

a. Dial Access Services

The costs calculated for placing these calls via AT&T MTS (proposed rates), MCI Execunet, and SPRINT are listed in Table XII. This table shows that, even (partially) considering the costs of calls to access the SCC networks, there is a significant potential cost savings by using SCC dial access services.

TABLE XII

Calculated Costs for Interstate Long distance Calls via Dial Access Services

Service	Cost	Percent Savings over AT&T MTS
Original AT&T MTS	\$3348.41	-----
AT&T MTS (Proposed Rates)	\$3010.79	10.1%
*MCI Execunet	\$2655.92	20.7%
*MCI Execunet plus Cost of Call to Access	\$2745.62	18.0%
SERINT	\$2686.04	19.8%
SERINT plus Cost of Call to Access	\$2776.73	17.1%

*Does not include eight calls to Alaska (134 minutes).

k. A Method of Estimating the Number of WATS lines or DALs Needed

The following paragraphs describe a method of estimating the number of WATS lines or DALs that may be needed.

An Erlang, a unit used to measure telephone traffic, is expressed in units of call hours per hour. An Erlang is related to CCS (hundred call seconds), another unit of traffic measurement, by a factor of 36 (1 Erlang = 36 CCS). (There are 3600 call seconds (36 CCS) in one hour.) A single telephone circuit can be in use a maximum of 1 Erlang (1 call hour per hour or 100 percent in use). The Erlang B equation is:

$$B = \frac{E^N / N!}{1 + E + E^2 / 2! + \dots + E^N / N!},$$

where E is the probability that N trunks are simultaneously busy with a traffic load of E Erlangs. B is also referred to as the grade of service as it can be viewed as an expression of how many calls out of 100 are not completed. For example, a B value of 0.05 means that five out of 100 calls are blocked, or there is a five percent probability that all trunks will be in use at any one moment in time. [Ref. 47]

To approximate the number of WATS lines or DALs that may be required if the total minutes of calling which occur during the busy hour is known:

1. Divide this number by 60 to obtain hours of calling in the busy hour. This value is in the same units as Erlangs.

2. Look up the value closest to this in the Erlang B tables found in Appendix F and read the required number of trunks for the desired grade of service.⁵⁷

To calculate an approximation of the total minutes of calling in the busy hour and the number of WATS lines or DAIs that may be required:

1. Take the total number of minutes of calling during the Business Day rate period for a month.
2. Divide this number by 60 to obtain hours of calling.
3. Divide the result by 22 (average number of business days in one month) to obtain average hours of calling per business day.
4. Multiply this number by .17 (an approximation that 17 percent of all calls made during the business day (8 hours) occur during the busy hour) to obtain hours of calling during the busy hour.⁵⁸ This value is in the same units as Erlangs.
5. Look up the value closest to this in the Erlang B tables (Appendix F) and read the required number of trunks for the desired grade of service.

An example of the second method is shown next, using the data from NAS Moffett Field's interstate calls. There were 5157 minutes of calls placed during the Business Day rate period. This is converted to hours as follows:

$$\frac{5157 \text{ minutes}}{60 \text{ minutes/hour}} = 85.95 \text{ hours.}$$

⁵⁷Smith suggests that a grade of service of .005 is a typical practical value [Ref. 48]. The standard for the AUTOVCN system is a grade of service of .05 (for inward calling), but there are many installations throughout the Department of Defense with much worse grades of service. Remember that this grade of service is based on the busiest hour of usage during the day--so it represents worst case.

⁵⁸If the base telecommunications manager feels that service is more or less peak loaded than this, the .17 can be increased or decreased. This should be changed only if the manager feels competent at traffic measurement and management.

Next, the number of hours of calling during the business day are calculated.

$$\frac{89.95 \text{ hours}}{22 \text{ bus. days/month}} = 3.91 \text{ hours/bus. day.}$$

The number of hours during the busy hour are calculated as follows:

$$3.91 \text{ hours/bus. day} \times .17 = .66 \text{ hours/busy hour. (Erlangs)}$$

One, two, three, and four lines will provide grades of service of .375, .101, .020, and .003, respectively, with .60 Erlangs of traffic during the busy hour (from Appendix F).

c. Dedicated Access Services

The costs calculated for completing Moffett Field's interstate long distance calls via AT&T WATS, MCI WATS, and Direct Sprint, based on using three access lines, are listed in Table XIII. Costs calculated for four access lines are found in Table XIV.

Tables XIII and XIV show that the SCC dedicated access services can save over 30 percent of the cost of completing the calls via AT&T MTS (current rates) and over 20 percent of the calculated cost of completing the calls via AT&T WATS (current rates). That's an impressive potential savings.

TABLE XIII

Calculated Costs for Interstate Long Distance Calls via Dedicated Access Services (Three Access Lines)

Service*	Cost	Percent Savings over AT&T MTS	Percent Savings over AT&T WATS (Current Rates)
Original AT&T MTS	\$3348.41	-----	-----
AT&T WATS (Current Rates)	\$2735.95	18.3%	-----
AT&T WATS (Proposed Rates)	\$2260.08	32.5%	17.4%
**MCI WATS	\$2111.76	36.9%	22.8%
Direct Sprint	\$2145.04	35.9%	21.6%

*AT&T WATS, MCI WATS, and Direct Sprint costs are based on using three access lines which are calculated to provide a grade of service of .025 during the busy hour. The costs include the per line monthly recurring charges but not order or installation charges.

**Does not include eight calls to Alaska (134 minutes).

TABLE XIV
Calculated Costs for Interstate Long Distance Calls via Dedicated Access Services (Four Access Lines)

Service*	Cost	Percent Savings over AT&T MTS	Percent Savings over AT&T WATS (Current Rates)
Original AT&T MTS	\$3348.41	-----	-----
AT&T WATS (Current Rates)	\$2810.20	16.1%	-----
AT&T WATS (Proposed Rates)	\$2350.63	29.8%	16.4%
**MCI WATS	\$2238.11	33.2%	20.4%
Direct Sprint	\$2243.91	33.0%	20.2%

*AT&T WATS, MCI WATS, and Direct Sprint costs are based on using four access lines which are calculated to provide a grade of service of .004 during the busy hour. The costs include the per line monthly recurring charges but not order or installation charges.

**Does not include eight calls to Alaska (134 minutes).

d. Intrastate Calling

Although this case study was oriented toward evaluating the costs of completing interstate calls via MCI and GTE Sprint services, intrastate calls could be completed via these services as well. As stated in the previous chapter, MCI will complete calls within the state (California) only if they terminate on their network, and GTE Sprint will complete all calls within the state. Pacific Bell's rates for intrastate calls are such that nearly all calling to locations more than 40 miles away is less expensive via MCI Execunet, MCI Network Service (without Universal Termination), SPRINT, or Direct Sprint (to network cities). For Direct Sprint to non-network cities, the distance must be greater than 110 miles before a call is less expensive than via Pacific Bell.⁵⁹ Therefore, at Moffett Field most intra-LATA calls would probably be less expensive to complete via Pacific Bell⁶⁰ and inter-LATA calls would be less expensive via the SCCs.⁶¹

Exactly how much can be saved by completing intrastate calls via SCCs was not determined. It is reasonable to assume that some cost savings would result but, unless the installation has (or can obtain) least cost routing, the telephone user would have too many decisions to make for completing a call.

⁵⁹These comparisons are based on a five minute call during the Business Day rate period and, for MCI Network Service and Direct Sprint, an average use per line in the Business Day rate period of less than 900 minutes.

⁶⁰For many installations, some intra-LATA calls will be less expensive if placed via the SCCs since some locations within the LATA may be rather distant.

⁶¹A semi-random inspection of the inter-LATA calls on Moffett Field's telephone bill showed that about 70 percent of these calls could be completed on MCI's network.

5. Technical Considerations

The Centrex system at Moffett Field has room for additional trunk terminations and least cost routing is available (for a price, of course) if the installation desires to take advantage of this capability to make the routing choices for the telephone user. There are no other known technical considerations at NAS Moffett Field.

C. A COMPUTER PROGRAM USED TO CALCULATE COSTS OF USING SCC SERVICES

The computer program in Appendix G was created by the author to analyze the costs of completing interstate calls via AT&T MTS and WATS (at current and proposed tariff rates), MCI Execunet and MCI WATS, and SPRINT and Direct Sprint. A description of this program is given below.

1. Computer Program Description

Basically, this program takes telephone bill data and calculates the cost of each call as if it were made via AT&T (with current and proposed rates), MCI, and GTE Sprint. It was written for interactive computing using the WATFIV facilities of the IBM 3033 at the Naval Postgraduate School.

Files containing listings of area codes and prefixes that are on the MCI and GTE Sprint networks are read into an array. This permits comparison with the area code and prefix of a telephone call (from the input data) to determine if that area code and prefix are on the SCC networks.

Telephone bill data for a one month period is read from a file⁶² into an array (actually several arrays) and

⁶²The format of the telephone call data in the input file was arbitrarily chosen since the data used for the case study in the previous section of this chapter was entered manually from the telephone bill. The computer program can easily be modified to accept data from magnetic tapes. (After obtaining and processing three magnetic tapes with

sorted by area code and prefix to permit a readable output, if output is requested for each call. Data for calls outside of the United States (all 50 States and the District of Columbia), in multiple rate periods, or in a rate class other than direct dial (i.e., person-to-person, station-to-station, collect, third party, etc.) is automatically rejected.

The program calculates the distance (actually a range of distances) to the called number for each call from the duration, rate period, and cost of the call.⁶³ Data for calls for which the distance calculation does not properly calculate a distance is also rejected.

Costs of completing each call via AT&T MTS (proposed rates), MCI Execunet, and SPRINT are calculated based on the duration, rate period, distance (range of distances) to called number, and, for MCI Execunet, whether it is a network or non-network call. Also, the minutes of calls which occur within each rate period to network and non-network locations are summed for use in calculating the WATS and dedicated access services costs. This program will account for the cost of a call to access MCI Execunet and SPRINT, based on first minute and additional minute rates. Costs for each individual call are calculated and can be output, if the user desires. The results can be output as total costs for all calls or the costs of each call can be output individually followed by total costs for all calls. Figure 4.1 shows the interactive queries and responses which produced the output shown in Figure 4.2.

only a handful of calls on each, the author resorted to the manual input method. The author highly recommends inputting the telephone bill data from magnetic tape.)

⁶³Common carriers actually calculate the distance to the called number from the coordinates of the calling and called locations, requiring a very large data base.

DO YOU WANT OUTPUT FOR EACH CALL? (Y OR N)
Y WILL GIVE DATA FOR EACH CALL PLUS TOTALS
N WILL GIVE TOTALS ONLY
Y

IS THERE A CHARGE FOR THE CALL TO ACCESS
THE MCI EXECUNET AND SPRINT NETWORKS?
(Y OR N)
Y

THIS PROGRAM ASSUMES:
* MCI AND SPRINT LOCAL ACCESS NUMBERS ARE
IN THE SAME AREA
* THE CCST OF ACCESS IS BASED ON A FIRST
MINUTE RATE AND AN ADDITIONAL MINUTE RATE
* THE RATE PERIODS ARE AS FOLLOWS:

BUSINESS DAY		
8AM TO BUT NOT INCLUDING 5PM	MON-FRI	

EVENING		
5PM TO BUT NOT INCLUDING 11PM	SUN-FRI	

NIGHT AND WEEKEND		
11PM TO BUT NOT INCLUDING 8AM	ALL DAYS	
8AM TO BUT NOT INCLUDING 11PM	SAT	
8AM TO BUT NOT INCLUDING 5PM	SUN	

DO YOU STILL WANT TO CONTINUE TO ENTER DATA
FOR CALCULATING THE CCST OF ACCESSING THE
SCC NETWORKS? (Y OR N)
Y WILL CONTINUE AND ASK FOR RATES
N WILL PREVENT CALCULATION OF ACCESS COSTS
Y

FOR THE DAY RATE PERIOD:
WHAT IS THE FIRST MINUTE RATE?
(EXAMPLE: FOR \$.03 PER MINUTE INPUT .03)
.03

WHAT IS THE ADDITIONAL MINUTE RATE?
(EXAMPLE: FOR \$.01 PER MINUTE INPUT .01)
.01

ARE THE CHARGES FOR THE OTHER RATE PERIODS
CALCULATED AS A PERCENTAGE OF THE DAY RATE?
(Y OR N)
Y

WHAT IS THE DISCOUNT FOR THE EVENING RATE
PERIOD? (GIVE AS A REAL FRACTION.
EXAMPLE: FOR A 30% DISCOUNT INPUT .3)
.3

Figure 4.1 Interactive Computer Queries and User Responses.

WHAT IS THE DISCOUNT FOR THE NIGHT AND
WEEKEND RATE PERIOD? (GIVE AS A REAL
FRACTION. EXAMPLE: FOR A 60% DISCOUNT
INPUT .6)
.6

FOR CALCULATING THE AT&T WATS COSTS USING
CURRENT RATES, WHAT IS THE RATE STEP?
(THIS IS THE RATE STEP FOR SERVICE AREA 6)

RATE STEP	STATES
19	ID, OR, WA
20	AZ, CA, MT, NV, UT
21	AR, CO, IL, IN, IA, KS, LA, MI, MN, MO, NE, NM, ND, OK, SD, TX, WI, WY
22	AL, CT, DE, DC, FL, GA, KY, ME, MD, MA, MS, NH, NJ, NY, NC, OH, PA, RI, SC, TN, VT, VA, WV

INPUT RATE STEP (19, 20, 21, OR 22)
20

FOR CALCULATING THE AT&T WATS COSTS USING
PRCPSED RATES, WHAT IS THE RATE STEP?

RATE STEP	STATES
14	IA, KS, NE
15	AR, IL, MN, MO, ND, OK, SD
16	CO, IN, LA, MS, TX, WI, WY
17	AL, KY, MI, MT, NM, OH, TN
18	AZ, CA, CT, DE, DC, FL, GA, ID, ME, MD, MA, NV, NH, NJ, NY, NC, OR, PA, RI, SC, UT, VT, VA, WA, WV

INPUT RATE STEP (14, 15, 16, 17, OR 18)
18

Figure 4.1 (Continued) Interactive Computer Queries
and User Responses.

FOR CALCULATING THE DIRECT SPRINT COSTS,
WHAT IS THE REGION OF ORIGINATION?

REGION	STATES
1	CO, GA, IL, LA, MO, OH, TX, WI
2	AZ, CA, DC, FL, MA, MD, NC, NY, PA, WA

(NOTE: ONLY SPECIFIC LOCATIONS IN THESE
STATES ARE CAPABLE OF DIRECT SPRINT CALL
ORIGINATION)

INPUT REGION (1 OR 2)
2

BASED ON 0.66 ERLANGS DURING THE BUSY
HOUR THE FOLLOWING NUMBERS OF LINES WILL
GIVE THE FOLLOWING GRADES OF SERVICE.
(EXAMPLE: GRADE OF SERVICE = 0.050 MEANS
5 OUT OF 100 ATTEMPTED CALLS ARE NOT
COMPLETED.)

NUMBER OF LINES =	2	GRADE OF SERVICE =	0.117
NUMBER OF LINES =	3	GRADE OF SERVICE =	0.025
NUMBER OF LINES =	4	GRADE OF SERVICE =	0.004

HOW MANY TOTAL WATS LINES OR DEDICATED
ACCESS LINES DO YOU WANT TO USE TO
CALCULATE DEDICATED ACCESS SERVICE COSTS?

(A RESPONSE OF 999 WILL ALLOW CALCULATION
OF COSTS FOR A RANGE OF NUMBERS OF LINES)
999

WHAT IS THE SMALLEST NUMBER IN THE RANGE OF
NUMBERS OF LINES?
1

WHAT IS THE LARGEST NUMBER IN THE RANGE OF
NUMBERS OF LINES?

(MUST BE WITHIN 10 LINES OF THE SMALLEST)
4

Figure 4.1 (Continued) Interactive Computer Queries
and User Responses.

RATE PERIOD: 1 = DAY 2 = EVENING 3 = NIGHT AND WEEKEND

 AREA CODE 201

 PREFIX 234

MINUTES	RATE PERIOD	PLACE	ORIG AT&T COST	NEW AT&T COST	MCI COST	MCI PLUS ACCESS CCST	SPRINT COST	SPRINT PLUS ACCESS COST
2	2	PEAPACK NJ	0.73	0.69	0.58	0.60	0.55	0.57
PREFIX 245								
3	1	ROSELLE NJ	1.72	1.59	1.30	1.35	1.38	1.43
PREFIX 265								
1	1	ORADELL NJ	0.74	0.73	0.43	0.46	0.56	0.59
5	1	ORADELL NJ	2.70	2.45	2.16	2.23	2.20	2.27
PREFIX 267								
1	1	MORRISTOWN NJ	0.74	0.73	0.43	0.46	0.56	0.59
PREFIX 284								
3	1	NUTLEY NJ	1.72	1.59	1.30	1.35	1.38	1.43
2	1	NUTLEY NJ	1.23	1.16	0.86	0.90	0.97	1.01
.								
.								
.								

Figure 4.2 An Example of the Computer Program Output.

```

. .
TOTAL CALLS = 1562      7825 MINUTES
TOTAL MINUTES = 7825 MINUTES
AVERAGE TIME PER CALL = 5.0 MINUTES PER CALL
NUMBER OF CALLS REJECTED = 21

ORIGINAL TOTAL AT&T MTS COST = $ 3348.41
AVERAGE COST PER MINUTE = $ 0.428

TOTAL AT&T MTS CCST (PROPOSED RATES) = $ 3010.79
AVERAGE COST PER MINUTE = $ 0.385

TOTAL MCI EXECUNET COST = $ 2655.92
AVERAGE COST PER MINUTE = $ 0.345
8 CALLS UNABLE TO BE COMPLETED (TO ALASKA) (MINUTES = 134)

TOTAL MCI EXECUNET COST (WITH COST OF CALL TO ACCESS) = $ 2745.62
AVERAGE COST PER MINUTE = $ 0.357
8 CALLS UNABLE TO BE COMPLETED (TO ALASKA) (MINUTES = 134)

TOTAL SERINT COST = $ 2666.04
AVERAGE COST PER MINUTE = $ 0.343

TOTAL SERINT COST (WITH CCST OF CALL TO ACCESS) = $ 2776.73
AVERAGE COST PER MINUTE = $ 0.355

EASEL ON 0.66 ERIANGS DURING THE BUSY HOUR THE FOLLOWING
NUMBER OF LINES WILL GIVE THE FOLLOWING GRADES OF SERVICE.
(EXAMPLE: GRADE OF SERVICE = 0.050 MEANS 5 OUT OF 100
ATTEMPTED CALLS ARE NOT COMPLETED.)

NUMBER OF LINES = 2    GRADE OF SERVICE = 0.117
NUMBER OF LINES = 3    GRADE OF SERVICE = 0.025
NUMBER OF LINES = 4    GRADE OF SERVICE = 0.004

```

Figure 4.2 (Continued) An Example of the Computer Program Output.

RATE STEP USED FOR AT&T WATS (CURRENT RATES) CALCULATION = 20
 RATE STEP USED FOR AT&T WATS (PROPOSED RATES) CALCULATION = 18
 REGION USED FOR DIRECT SPRINT CALCULATION = 2

TOTAL NUMBER OF WATS LINES OR DEDICATED ACCESS LINES = 1

TOTAL AT&T WATS CCST (CURRENT RATES) = \$ 2433.76
 AVERAGE COST PER MINUTE = \$ 0.311

TOTAL AT&T WATS CCST (PROPOSED RATES) = \$ 1957.53
 AVERAGE COST PER MINUTE = \$ 0.250

TOTAL MCI WATS CCST = \$ 1811.11
 AVERAGE COST PER MINUTE = \$ 0.235
 8 CALLS UNABLE TO BE COMPLETED (TO ALASKA) (MINUTES = 134)

TOTAL DIRECT SPRINT COST = \$ 1881.80
 AVERAGE COST PER MINUTE = \$ 0.240

TOTAL NUMBER OF WATS LINES OR DEDICATED ACCESS LINES = 2

TOTAL AT&T WATS CCST (CURRENT RATES) = \$ 2644.80
 AVERAGE COST PER MINUTE = \$ 0.338

TOTAL AT&T WATS CCST (PROPOSED RATES) = \$ 2156.20
 AVERAGE COST PER MINUTE = \$ 0.276

TOTAL MCI WATS CCST = \$ 1984.41
 AVERAGE COST PER MINUTE = \$ 0.258
 8 CALLS UNABLE TO BE COMPLETED (TO ALASKA) (MINUTES = 134)

TOTAL DIRECT SPRINT COST = \$ 2045.53
 AVERAGE COST PER MINUTE = \$ 0.261

Figure 4.2 (Continued) An Example of the Computer Program Output.

TCTAL NUMBER OF WATS LINES OR DEDICATED ACCESS LINES = 3

TOTAL AT&T WATS CCST (CURRENT RATES) = \$ 2735.95
AVERAGE COST PER MINUTE = \$ 0.350

TCTAL AT&T WATS CCST (PROPOSED RATES) = \$ 2260.08
AVERAGE COST PER MINUTE = \$ 0.289

TCTAL MCI WATS CCST = \$ 2111.76
AVERAGE COST PER MINUTE = \$ 0.275
8 CALLS UNABLE TO BE COMPLETED (TO ALASKA) (MINUTES = 134)

TCTAL DIRECT SPRINT COST = \$ 2145.04
AVERAGE COST PER MINUTE = \$ 0.274

TOTAL NUMBER OF WATS LINES OR DEDICATED ACCESS LINES = 4

TOTAL AT&T WATS CCST (CURRENT RATES) = \$ 2810.20
AVERAGE COST PER MINUTE = \$ 0.359

TCTAL AT&T WATS CCST (PROPOSED RATES) = \$ 2350.63
AVERAGE COST PER MINUTE = \$ 0.300

TCTAL MCI WATS CCST = \$ 2238.11
AVERAGE COST PER MINUTE = \$ 0.291
8 CALLS UNABLE TO BE COMPLETED (TO ALASKA) (MINUTES = 134)

TCTAL DIRECT SPRINT COST = \$ 2243.91
AVERAGE COST PER MINUTE = \$ 0.287

Figure 4.2 (Continued) An Example of the Computer Program Output.

Since charges for the dedicated access services (AT&T WATS, MCI Network Service with Universal Termination (MCI WATS), and Direct SPRINT) are based on average usage per line, the total number of WATS lines or DALs must be entered. The computer program estimates the Erlangs of call traffic during the busy hour (using the second method of approximating the number of WATS lines or DALs described in the previous section of this chapter) and displays the calculated numbers of lines and grades of service on the visual display terminal to allow the user to decide how many access lines should be used in the WATS and dedicated access services cost calculations. If the user desires, a range of numbers of access lines may be entered and calculations will be performed and results given for each number of access lines in the range of numbers. Also, if the user desires, the number of access lines which is used in the calculation can be an existing or carrier-proposed number of WATS lines or DALs or a number derived from any reliable source.

2. Computer Program Assumptions and Limitations

The following are assumptions and limitations of the program:

- This program can be used only for calculating costs of calls (via AT&T MTS and WATS, MCI Execunet and MCI WATS, and SPRINT and Direct Sprint with Universal Calling) originated within the continental United States (CONUS) and completed to CONUS, Hawaii, and Alaska. It also assumes that the user knows if the location being evaluated is in an area which permits originating calls via these services.
- Telephone bill data from a one month period is used for the input data. (The user should consider using an average month's bill and a peak month's bill to evaluate the costs and number of WATS and DALs for average and peak months of

telephone usage in order to determine if there is a significant difference.)

- Tenths of a cent are truncated from the costs calculated for each AT&T MTS call and are rounded for each MCI Execunet and SPRINT call.

- Since calls to Hawaii made via AT&T MTS are billed by Band and not by mileage (see Appendix E), the program converts Bands to mileage ranges for use in calculating the costs via the other carriers. The correctness of these conversions has not been determined except for the West Coast.

- Costs for calls made via dial access services (MCI Execunet and SPRINT) in the 56-70 and 71-124 mile distance ranges are calculated using the rates for the 71-124 mile range since AT&T MTS has only a 56-124 mile range (and the distance (range of distances) to the called number is calculated from the duration, rate period, and cost of the original AT&T MTS call).

- Costs for calls made via MCI Execunet over 3000 miles are calculated using the rates for the 1911-3000 mile range since there is no rate shown in the tariff for distances greater than 3000 miles.

- Costs for calls made via SPRINT are calculated using the rates which are discounted for over \$200 usage per month.

- The program calculates the costs of accessing the dial access services, if any, using first minute and additional minute rates, the rate periods in Table II, and only the duration of the completed long distance call.

- Since original call data is in one minute increments, WATS and dedicated access service cost calculations do not

consider the less than one minute increments used by these carriers or the one minute minimum average time requirement of these carriers.

- WATS and dedicated access service cost calculations include the monthly recurring charges per access line but not order or installation charges. The monthly recurring charges used in the program are the basic charges which assume that the installation is close enough to the carrier's point of termination so as to avoid additional mileage charges.

- Costs for AT&T WATS (current tariff) are calculated using Service Area 6 rates. The rates used for calculating costs of AT&T WATS (proposed tariff) are for Service Areas 5 and 6 (which have the same rates).

- The program does not round the total hours of calls in each rate period to the nearest tenth of an hour for AT&T WATS cost calculations.

- Costs are calculated for dedicated access services with "Universal Termination" (MCI WATS and Direct Sprint with Universal Calling), and not for network-only termination service.

V. SUMMARY AND RECOMMENDATIONS

A. SUMMARY

1. Specialized Common Carriers--A History

Following an introductory chapter, the second chapter of this thesis presents a brief history of Specialized Common Carriers (SCCs). Several Federal Communications Commission (FCC) actions were particularly significant in preparing the way for SCCs; the 1959 and 1960 Above 890 decisions, the 1968 Carterfone decision, the 1969 MCI decision, and the 1971 Specialized Common Carrier decision.

The Above 890 decisions opened the microwave field to private firms and individuals allowing them to install microwave systems utilizing the frequency spectrum above 890 MHz for their own use. Since the FCC prohibited sharing facilities and systems, this decision did not allow competition with established common carriers.

The Carterfone decision required the Bell System to permit interconnection of non-Bell equipment as long as the interconnection would not harm the system or disrupt the ability of others to use the system.

In 1963, Microwave Communications, Incorporated (MCI) applied for FCC certification for public common carrier point-to-point microwave service between Chicago and St Louis and intermediate points. After several years, and in spite of vigorous opposition by AT&T, General Telephone, Illinois Bell, Southwestern Bell, and Western Union, the FCC approved this application in 1969 in what is called the MCI decision.

By 1971 there were applications on file with the FCC for 1,977 microwave stations in 46 separate proposals from 33 new carriers. To avoid reviewing each of these applications individually, the FCC opened the SCC field to open competition in their June 1971 Specialized Common Carrier decision.

While SCCs continue to offer private line point-to-point service, which is what the FCC Specialized Common Carrier decision originally permitted them to provide, they are now making their money by offering long distance, switched network services in direct competition with AT&T. Revenues in 1983 from the long distance services provided by MCI, GTE Sprint, and ITT United States Transmission Systems (USTS) totaled \$2.44 billion, seven percent of AT&T's \$35 billion. Analysts predict that this may increase to 10 to 20 percent of a more than \$100 billion per year industry by 1990.

2. Specialized Common Carrier Switched Voice Network Services

Chapter III describes MCI and GTE Sprint dial access and dedicated access services, discussing the costs, additional features, advantages, and disadvantages of these services. Dial access service is similar to AT&T's MTS (without operator assistance). A customer dia a local access (telephone) number and a billing code to access the SCC, and, finally, the desired number to be called. Calls via MCI Execunet and GTE Sprint's SPRINT can be originated only in a limited, but large and growing, number of locations. Both services offer "Universal Termination" which permits completing calls to non-network cities. Billing is based on the duration of the call, rate period, distance to called number, and whether to a network or non-network city. MCI and GTE Sprint offer least cost routing, group billing,

speed dialing, travel/credit card service, and magnetic tape billing as additional features with their dial access services.

Dedicated access service is the SCC's marketing answer to AT&T's WATS. The customer accesses the SCC network through a dedicated access line (DAL), eliminating the need to dial the local access number or billing code. Again, calls via these services can be originated only from specific areas. MCI Network Service and Direct Sprint allow calling only to network cities, while calls made via MCI Network Service with Universal Termination (MCI WATS) and Direct Sprint with Universal Calling can be completed to non-network cities. Both companies bill their dedicated access services based on average use per line per rate period to network or non-network cities. Also, both have a one minute minimum average time requirement. Least cost routing, accounting codes, and magnetic tape billing are additional features offered with these services.

While SCCs are interstate carriers, the AT&T divestiture agreement mandated that long distance service between IATAs would be provided by AT&T and other carriers like the SCCs. So far, SCCs have been authorized to offer (at least partial) intrastate calling in six states. Potential SCC users must check with the SCCs concerning their service offerings in a particular state.

SCC use throughout the Department of Defense is currently limited to just a handful of places. The Department of Defense should be concerned because there is money to be saved. According to MCI:

...While we have been unable to obtain an accurate figure for DoD's current cost for [administrative long distance telephone services,] estimates place these costs at a minimum of \$500 million annually. The potential savings may be as high as \$125 million annually....

One method, of several being used (on a very limited basis) in the Department of Defense to procure SCC services, is through a strictly competitive procurement process. Using this method, Kelly Air Force Base, Texas replaced ten WATS lines (Service Area 5) and one intrastate WATS line with 14 MCI WATS DALS in August 1983. As a result of this change Kelly Air Force Base is spending less money for more circuits (and more capability since all of the MCI DALS are capable of completing calls within Texas) and the quality of the circuits is comparable to that had previously.

Another method is for the base telecommunications manager to obtain the carriers' tariffs and other information describing their services and to perform his/her own evaluation to determine the least expensive and best carrier.

A third method is just to continue to allow AT&T to provide the service without regard to any competing carriers. This method should be used only at locations where there are no competing carriers.

The offices which base telecommunications managers should contact for guidance and/or assistance on obtaining SCC services are listed in the chapter.

3. Analysis of Alternatives

Chapter IV outlines a method of evaluating the potential use of SCC services at military installations and applies this method in a case study evaluating the potential use of MCI and GTE Sprint services at Naval Air Station Moffett Field, California. Table XV is a summary of the questions that a base telecommunications manager must answer in evaluating SCC usage at his/her installation.

The case study shows a potential cost savings of about 20 percent using MCI and GTE Sprint dial access services and over 30 percent using their dedicated access

TABLE XV
Evaluating the Potential Use of SCC Services

- What type of long distance telephone services does the installation have, and what are the costs of these services?
- Does the SCC (or SCCs) have a switch serving this area or could the installation access the SCC network in a nearby city via an FX line or DAL?
- What is the cost of accessing the SCC network?
- Does the installation have a per call per minute charge (usage sensitive pricing--measured service or zone usage measurement service or other usage sensitive billing)?
- If the local access number is off an exchange in a nearby city, what will an FX line cost?
- What are the costs for a DAL to connect directly to the SCC network?
- Will installing DALs permit removal of dial 9 trunks, and as a result save the cost of those trunks?
- What are the calling trends of calls from the installation?
- What would it cost to complete the installation's long distance calls via the SCC services?
- If the cost of completing long distance calls via the SCC is less than the existing method(s), is the cost of accessing the SCC service less than the cost difference?
- Are there any technical considerations that might affect the potential use of SCC services?

services for completing long distance calls at Moffett Field. Exactly how much could be saved by completing intrastate calls via SCCs was not determined, but at Moffett Field most intra-LATA calls would probably be less expensive to complete via Pacific Bell and inter-LATA calls would be less expensive via the SCCs.

The last section of this chapter describes a computer program (in Appendix G) which was created by the

author to analyze the costs of completing interstate calls (originated within the continental United States (CONUS) and completed to CONUS, Hawaii, and Alaska) via AT&T MTS and WATS (at current and proposed tariff rates), MCI Execunet and MCI WATS, and SPRINT and Direct Sprint. Basically, this program takes telephone bill data and calculates the cost of each call as if it were made via AT&T (with current and proposed rates), MCI, and GTE Sprint. It was written for interactive computing using the WATFIV facilities of the IBM 3033 at the Naval Postgraduate School. Figures giving examples of the interactive queries and user responses and the outputted results are provided in the chapter. Assumptions and limitations of the computer program are also presented.

SCCs are rapidly growing competitors in a multi-billion dollar long distance telecommunications market. They are viable alternative long distance carriers for military installations. Several military installations are currently using SCC services and receiving excellent service at less cost than for comparable AT&T offerings. More installations must evaluate the potential use of SCC services and begin realizing the cost savings that are currently possible.

B. RECOMMENDATIONS

The Department of Defense and the Military Services must provide guidance to base telecommunications managers on procuring and using SCC services. A restatement and reemphasis of the federal government's policy on competitive procurement of local telecommunications services, including long distance services, by the Office of the Secretary of Defense is in order. Military Service regulations and instructions must state the Service's policy on the use of SCC services and provide guidance on methods of procurement.

Training on long distance alternatives should be included in base telecommunications manager training programs such as the Air Force's Basic and Staff Telecommunications Officer courses at the Keesler Technical Training Center, Keesler Air Force Base, Mississippi. Also, a primer on SCCs, such as this thesis, should be published and made available to all base telecommunications managers in the United States.

NAS Moffett Field should seriously consider using SCC services due to the significant potential cost savings that could be realized as shown by the case study.

Several thesis research topics are suggested by this study:

- Long distance resellers--history, regulation, and services.

- (Adequacy of) Department of Defense and Military Service guidance on procurement and use of telecommunications services.

- Use of microcomputers to analyze the use of SCC and/or reseller services at military installations.

- An analysis of the economic feasibility of the use of dynamic least cost routers and software defined systems.

- Additional research on the topic of this thesis to include:

- Modifying the computer program to calculate the installation's busy hour and hours of calling during the busy hour from time of day and duration of call data. Also, use of the computer program to provide more statistical information about the installation's monthly telephone bill, i.e., total cost of calls within each area code.

- Implementation of SCC services at an installation which has been evaluated using the computer program and

subsequent monitoring to see if the evaluation was an accurate estimation of cost savings to be realized using SCC services.

APPENDIX A
CHRONOLOGY OF SPECIALIZED COMMON CARRIERS

1959/1960 - FCC Above 890 decisions allowing private microwave systems to be developed using the frequency spectrum above 890 MHz.

1963 - MCI applied to FCC for microwave link between St Louis and Chicago.

1968 - FCC Carterfone decision allowing connection of non-Bell telephone equipment to the telephone system.

August 1969 - FCC MCI decision authorized MCI to provide private line microwave service between St Louis and Chicago.

November 1969 - Datran Transmission Co. (DATRAN) applied to FCC for microwave system linking 35 metropolitan areas with a switched circuit high-speed data network.

July 1970 - FCC staff recommended policy of open Specialized Common Carrier competition.

October 1970 - Justice Department urged FCC to adopt policy of open competition in Specialized Common Carrier field.

May 1971 - FCC Specialized Common Carrier decision opened Specialized Common Carrier field to competition.

1972 - MCI authorized by FCC to build New York to Chicago microwave link. DATRAN authorized by FCC to begin construction on its microwave system between 35 major cities.

February 1973 - Southern Pacific Communications Co. (SPC) authorized by FCC to begin building its microwave network.

July 1973 - ITT's United States Transmissions Systems, Inc. (USTS) applied to FCC to build a microwave network between New York and Houston via Philadelphia, Washington, DC, and Atlanta.

October 1973 - AT&T petitioned the FCC to stop licensing Specialized Common Carriers.

September 1974 - ITT's USTS authorized by FCC to build microwave network.

May 1975 - AT&T objected to MCI sales of long-distance type voice service with Execunet stating that it was outside the FCC authorization for MCI to provide private line service.

July 1975 - FCC ruled MCI Execunet service did not fit the definition of private-line service, which was what MCI was authorized to provide.

July 1976 - FCC reaffirmed its ruling that MCI's Execunet was not lawful.

August 1976 - DATRAN decided to end operations and filed for bankruptcy.

1976 - MCI and SPC filed with FCC to offer switched voice network services: Switched Private Line Service and SPRINT, respectively.

July 1977 - Court of Appeals reversed FCC decision on the legality of MCI's Execunet service.

1978 - ITT's USTS filed to offer switched voice network service City-Call.

October 1980 - FCC approved resale of Wide Area Telecommunications Service (WATS) by other common carriers.

June 1981 - Northwest Iowa Telephone Co. offered MCI long-distance calling to all its customers.

January 1982 - U. S. Department of Justice and AT&T agreed to drop government's 1974 anti-trust charges and 1956 anti-trust settlement barring AT&T from engaging in unregulated business. AT&T agreed to divest itself of 22 local Bell operating companies.

November 1982 - MCI announced plans to test the use of cable TV for telephone service in Omaha, Nebraska.

December 1982 - MCI bought railroad rights of way to install fiber optic cable.

February 1983 - MCI arranged to buy two satellite transponders.

June 1983 - GTE Corporation acquired SPC and formed GTE Sprint.

APPENDIX B
GLOSSARY OF TERMS

Area Code - A three digit code which precedes the NNX code or prefix and is used for calling from one geographical area to another. Also known as Number Plan Area (NPA).

Automatic Voice Network (AUTOVON) - A worldwide switched voice network used by the Department of Defense.

Busy Hour - The peak 60 minute period of telephone usage during the day.

Centrex - A PBX in which incoming calls are dialed direct to the extensions without operator assistance. Centrex CO has switching equipment on-premise with the switchboard. Centrex CO has switching equipment in the commercial telephone exchange (Central Office).

Communications Common Carrier - A company which provides communications services, or classes of communications services to the public and whose services and rates are subject to public regulation.

Dedicated (or Direct) Access Line (DAL) - A circuit connecting a phone system directly to the terminal of a long distance carrier. A WATS line is a DAL to AT&T Long Lines.

Dial 9 Trunk - Dial Access Central Office Trunk - A direct circuit between a FEX and a telephone Central Office to which all stations have access by dialing a given digit (9).

Direct Distance Dialing - An AT&T service which permits the telephone user to dial his/her own long distance telephone calls without operator assistance.

Dual Tone Multi-Frequency (DTMF) Signalling - A signalling method which uses combinations of two frequencies to indicate telephone number digits (and precedence, in the case of AUTOVCN). Also known as touch tone dialing.

Foreign Exchange Line (FX) - A trunk, paid for on a flat monthly rate, connecting a PBX to a remote telephone exchange.

Least Cost Routing - Also referred to as Automatic Route Selection (ARS) and Route Optimization - Automatic selection of the most economical route for an outgoing call.

Least Cost Routing Device - An electronic device which routes a call over the most economical telecommunications path available.

Line - A common term used to denote any circuit connecting two or more telecommunications devices.

Local Access Number - A telephone number which is dialed to access an SCC switch to make calls via the SCC's network.

Local Access and Transport Area (LATA) - A geographical area within which a telephone company may provide "local" service. There are 161 LATAs. Idaho, Maine, New Mexico, and the District of Columbia each have one LATA for the entire state or district. All other states have more than one LATA.

Message Telecommunications Service (MTS) - Long Distance Message Telecommunications Service (LDMTS) - AT&T's composite service of direct distance dialing (DDD) and operator assisted calling.

Minimum Average Time Requirement (MATR) - A requirement that the average duration of calls placed via a carrier's service must be at least a specified minimum. AT&T WATS, MCI WATS, and Direct Sprint each have a one minute minimum average time requirement.

NNX Code - The first three digits of a seven digit telephone number.

Other Common Carrier (OCC) - A communications common carrier other than AT&T.

Plain Old Telephone Service (POTS) - Ordinary long distance telephone service (AT&T MTS).

Prefix - The first three digits of a seven digit telephone number.

Private Branch Exchange or Private Automatic Branch Exchange (PBX) - A private phone system connected to the public telephone network which permits internal routing and switching of calls.

Private Line - A point-to-point circuit with no connection to a PBX or network. Usually a special circuit such as a fire or guard telephone, or a circuit used to interconnect computers.

Rotary or Pulse Dial - A signalling method which generates pulses (a pulse being defined as a single impulse of a telephone dial) to indicate telephone digits.

Service Areas - A geographical area within which AT&T WATS calls may be completed (outward WATS) or originated (inward WATS). Interstate WATS is offered in the form of six geographical areas called Service Areas (formerly Bands). Service Area 1 includes the states adjacent to the state in which the call is originated and each higher numbered Service Area adds a larger geographical area to the lower numbered Service Area(s). Service Area 5 WATS permits calling to anywhere within the continental United States (outside of the state in which the call was originated). Service Area 6 adds Alaska and Hawaii.

Specialized Common Carrier (SCC) - A communications common carrier offering telecommunications services between two or more points to large volume users.

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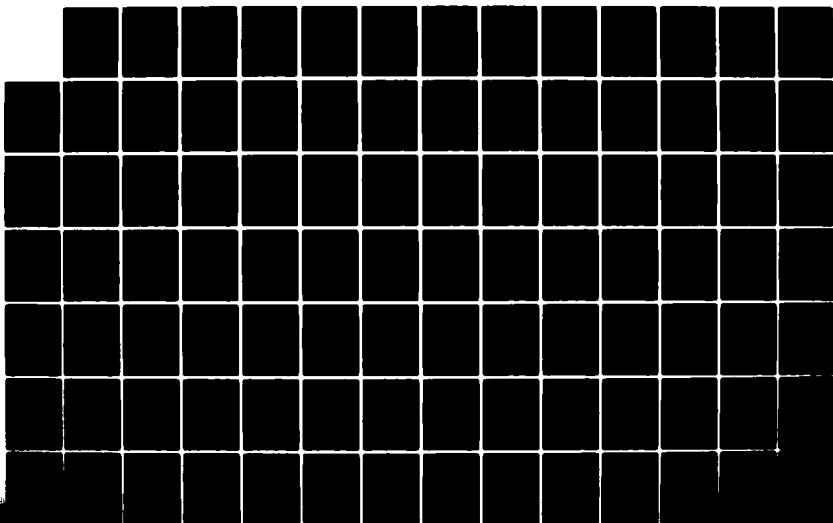
SPECIALIZED COMMON CARRIERS: LONG DISTANCE ALTERNATIVES
FOR MILITARY INSTALLATIONS(U) NAVAL POSTGRADUATE SCHOOL
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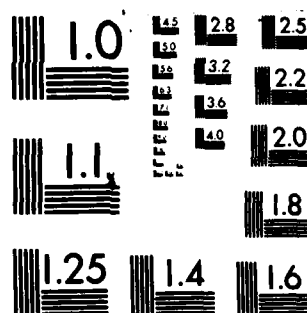
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MICROCOPY RESOLUTION TEST CHART
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Switched Network - A network consisting of customers or subscribers connected to switching centers (central offices) which are interconnected by a series of other switches. Rather than using a full-time physical connection between two users or locations (such as a private line), a call is completed via temporary connections between switching centers and switches.

Tariff - The published rate for a specific unit of equipment, facility, or type of service provided by a communications common carrier.

Tie Line - A direct circuit between two PBXs.

Trunk - A circuit between switchboards or PBXs or between a switchboard/PBX and a telephone Central Office.

Universal Termination - An SCC term for the capability to call any location in the continental United States and some other locations from specific cities that are on the SCC network. Sometimes referred to as Universal Calling.

Usage Sensitive Pricing - A pricing system that charges for calls based on one or more of the following: duration of call, rate period, mileage, or total usage.

Wide Area Telecommunications Service (WATS) - An AT&T service which provides a special line allowing the subscriber to make calls to any location within a specific zone or Service Area on a direct distance dialing basis at a reduced rate.

AREA CODE AND PREFIX LISTING FOR MCI NETWORK

[illegible][illegible]

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[illegible]

Area Code 208
286 322 334 336 338 342 343 344 345 362 375 376 377 378 383
384 385 386 422 888 939

Area	Code	209																
221	222	223	225	226	229	228	229	233	237	247	251	252	255	264				
266	268	275	276	291	292	294	297	298	299	431	432	435	436	439				
441	442	443	445	449	453	462	463	464	465	466	467	473	474	477				
478	481	484	485	486	487	488	521	522	523	524	526	527	529	537				
538	545	571	572	575	576	577	578	579	834	864	869	883	888	931				
941	942	943	944	946	948	951	952	957	982	983								

Area Code 213 **Entire Area Code Is Served******

Area	Code	214	225	226	227	228	229	233	233	234	235	236	238
221	222	223	224	225	226	227	228	229	233	233	234	235	236
239	240	241	242	243	244	245	246	247	253	254	255	256	258
88	89	90	91	92	93	94	95	96	97	98	99	00	01
357	358	359	360	361	362	363	364	365	373	374	375	376	378
581	582	583	584	585	586	587	588	589	593	594	595	596	598
426	427	428	429	430	431	432	433	434	443	444	445	446	448
464	465	466	467	468	469	470	471	472	483	484	485	486	488
531	532	533	534	535	536	537	538	539	543	544	545	546	548
574	575	576	577	578	579	580	581	582	593	594	595	596	598
641	642	643	644	645	646	647	648	649	653	654	655	656	658
700	701	702	703	704	705	706	707	708	713	714	715	716	718
724	725	726	727	728	729	730	731	732	743	744	745	746	748
753	754	755	756	757	758	759	760	761	773	774	775	776	778
790	791	792	793	794	795	796	797	798	803	804	805	806	808
837	838	839	840	841	842	843	844	845	853	854	855	856	858
882	883	884	885	886	887	888	889	890	893	894	895	896	898
943	944	945	946	947	948	949	950	951	953	954	955	956	958
993	994	995	996	997	998	999	000	001	003	004	005	006	008

Area	Code	215													
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Area	Code	219																
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654	657	659	672	674	679	683	684	693	733	736	738	744	745	747				
749	759	762	763	769	787	836	838	844	845	853	881	882	883	884				

885 886 887 923 924 931 932 933 937 938 942 944 947 949 962
 572 577 580 981 989

Area	Code	301
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237	238	225
258	259	226
277	278	227
296	297	228
337	338	229
358	359	230
384	385	231
426	427	232
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636	637	240
661	662	241
677	678	242
725	726	243
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766	767	245
790	791	246
825	826	247
843	844	248
858	859	249
877	878	250
899	900	251
943	944	252
963	964	253
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Area	Code	302
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373	374	367
773	774	368
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Area	Code	303
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352	353	229
388	389	230
428	429	231
454	455	232
484	485	233
543	544	234
596	597	235
636	637	236
671	672	237
695	696	238
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780	781	240
825	826	241
869	870	242
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Area	Code	304	243	277	336	342	343	344	345	346	347	348	357
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899	925	949	965	968	988								

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966	967	969	971	972	973	974	975	979	981	983	985	987	989

Area	Code	307	637	638	662	771	772	775	777	778
632	634	635	637	638	662	771	772	775	777	778

Area	Code	309	671	672	673	674	675	676	679	682	685	686	688	690	691
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692	693	694	697	698	699	745	751	752	755	757	762	764	786	787	
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Area Code 312 ****Entire Area Code Is Served****

Area	Code	313	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309	310	311	312																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309	310	311	312																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450	451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500	501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522	523	524	525	526	527	528	529	530	531	532	533	534	535	536	537	538	539	540	541	542	543	544	545	546	547	548	549	550	551	552	553	554	555	556	557	558	559	560	561	562	563	564	565	566	567	568	569	570	571	572	573	574	575	576	577	578	579	580	581	582	583	584	585	586	587	588	589	590	591	592	593	594	595	596	597	598	599	600	601	602	603	604	605	606	607	608	609	610	611	612	613	614	615	616	617	618	619	620	621	622	623	624	625	626	627	628	629	630	631	632	633	634	635	636	637	638	639	640	641	642	643	644	645	646	647	648	649	650	651	652	653	654	655	656	657	658	659	660	661	662	663	664	665	666	667	668	669	670	671	672	673	674	675	676	677	678	679	680	681	682	683	684	685	686	687	688	689	690	691	692	693	694	695	696	697	698	699	700	701	702	703	704	705	706	707	708	709	710	711	712	713	714	715	716	717	718	719	720	721	722	723	724	725	726	727	728	729	730	731	732	733	734	735	736	737	738	739	740	741	742	743	744	745	746	747	748	749	750	751	752	753	754	755	756	757	758	759	760	761	762	763	764	765	766	767	768	769	770	771	772	773	774	775	776	777	778	779	780	781	782	783	784	785	786	787	788	789	790	791	792	793	794	795	796	797	798	799	800	801	802	803	804	805	806	807	808	809	810	811	812	813	814	815	816	817	818	819	820	821	822	823	824	825	826	827	828	829	830	831	832	833	834	835	836	837	838	839	840	841	842	843	844	845	846	847	848	849	850	851	852	853	854	855	856	857	858	859	860	861	862	863	864	865	866	867	868	869	870	871	872	873	874	875	876	877	878	879	880	881	882	883	884	885	886	887	888	889	890	891	892	893	894	895	896	897	898	899	900	901	902	903	904	905	906	907	908	909	910	911	912	913	914	915	916	917	918	919	920	921	922	923	924	925	926	927	928	929	930	931	932	933	934	935	936	937	938	939	940	941	942	943	944	945

766	767	768	769	771	772	773	774	775	776	777	778	779	785	787
789	791	792	821	822	823	824	826	827	828	831	832	833	834	835
836	837	838	839	841	842	843	846	847	848	849	851	852	853	855
856	857	858	861	862	863	864	865	866	867	868	869	871	872	873
874	875	876	879	881	882	883	884	885	886	887	888	889	892	893
894	895	896	897	898	899	921	922	923	924	925	926	927	928	931
932	933	934	935	937	939	941	942	943	946	949	956	961	962	963
964	965	966	967	968	971	972	973	977	978	979	981	994	995	996

Area	Code	314												
225	227	228	232	233	234	241	247	253	261	263	273	275	278	287
289	291	296	298	321	326	342	343	344	351	352	353	355	361	362
367	371	375	376	381	382	383	385	388	389	391	394	421	423	425
426	427	428	429	432	434	436	441	447	454	458	464	465	467	469
481	487	521	522	524	525	527	531	532	533	534	535	536	544	553
554	561	567	569	572	576	577	595	621	622	623	631	638	644	645
647	652	658	664	677	679	694	721	723	724	725	726	727	731	739
741	752	761	768	771	772	773	776	777	781	821	822	823	825	826
826	831	832	837	838	839	842	843	846	849	851	854	855	862	863
865	867	868	869	872	878	889	892	894	895	899	921	922	925	928
936	938	942	946	947	948	957	961	962	964	965	966	968	969	975
982	991	993	994	997										

Area	Code	315												
421	422	423	424	425	426	428	432	433	437	445	446	451	452	454
455	456	457	458	463	468	469	470	471	472	473	474	475	476	477
478	479	487	488	492	622	623	625	633	635	636	637	638	640	652
655	656	662	668	672	673	675	676	677	678	682	683	685	687	689
695	696	697	699	890	963									

Area	Code	316												
261	262	263	264	265	266	267	268	269	436	522	524	526	529	574
681	682	683	684	685	686	687	688	689	721	722	733	744	755	772
773	775	776	777	778	788	794	796	799	832	838	942	943	945	946

Area	Code	317												
222	228	229	233	235	236	237	239	240	241	242	243	244	247	248
251	252	253	255	257	259	261	262	263	264	265	266	267	269	271
272	273	274	283	284	285	286	288	289	291	293	297	298	299	326
335	332	333	334	335	336	337	339	342	372	378	422	462	467	468
485	533	534	535	536	539	542	543	545	546	547	549	552	556	560
562	630	631	632	633	634	635	636	637	638	639	642	643	644	646
649	724	734	736	738	741	745	747	754	755	759	768	769	773	774
776	778	779	782	783	784	786	787	788	789	823	831	835	838	839
842	844	845	846	848	849	852	856	861	862	871	872	873	875	877
878	881	882	887	888	892	894	896	897	898	899	923	924	925	926
927	928	929	994	996										

Area	Code	318												
221	222	226	227	231	232	233	234	235	237	261	264	269	294	424
425	436	459	631	632	635	636	670	671	674	683	686	687	688	742
746	747	757	798	837	856	861	865	868	869	873	896	925	929	933
938	949	965	981	984	987	988	989							

Area	Code	319												
225	232	233	234	235	236	266	268	273	277	282	284	285	289	291
296	322	323	324	326	332	337	338	344	351	353	354	355	356	359
362	363	364	365	366	369	373	377	381	383	386	388	390	391	393
395	396	397	399	426	644	645	679	683	842	846	848	849	851	854
857	895	898	959	983	984	987	988	989						

Area	Code	401
224	223	245
278	233	246
438	426	247
723	724	252
821	822	253
941	942	255
		272
		273
		274
		275
		276
		277

Area	Code	402
221	238	280
334	335	281
399	422	289
471	472	291
551	553	292
742	779	293
794	795	294
		330
		331
		332
		333

Area	Code	404
221	223	231
257	261	233
329	344	237
378	391	238
432	433	239
455	457	241
487	489	243
533	541	244
631	633	247
733	736	252
768	790	255
871	872	256
922	923	257
946	948	258
972	973	259
999		260

Area	Code	405
231	232	236
341	348	239
399	422	270
631	632	271
732	733	272
794	795	278
		292
		321
		324
		325
		329
		340

Area	Code	408
224	225	226
272	274	227
295	296	228
374	377	229
446	448	230
629	633	231
734	735	232
754	756	233
846	847	234
994	995	235

Area	Code	409
260	272	261
752	753	262
796	822	263
899	922	264
		265
		266
		267
		268
		269
		270
		271
		272
		273
		274
		275
		276
		277

589 634 635 636 637 772 774 775 776 778 893 895 896 897 922
 533 535 537 955 957 964 966 968 969

Area Code 503
 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234
 235 236 237 238 239 240 241 242 243 244 245 246 248 249 251
 252 253 254 255 256 257 280 281 282 283 284 285 286 287 288
 289 292 293 294 295 297 341 342 343 344 345 362 363 364 370
 371 373 378 390 393 399 461 465 484 485 581 585 588 620 621
 625 626 627 628 629 630 631 632 635 636 637 638 639 640 641
 642 643 644 645 646 647 648 649 652 653 654 655 656 657 658
 659 661 663 665 666 667 668 681 682 683 684 685 686 687 688
 689 721 726 741 743 746 747 749 760 761 771 774 775 777 790
 796 844 850 896 933 935 937 995 998

Area Code 504
 241 242 244 245 246 254 255 260 261 262 271 272 273 275 277
 278 279 282 283 286 288 291 292 293 334 340 341 342 344
 346 347 348 349 355 356 357 358 359 361 362 363 364 366
 368 377 379 381 382 383 387 388 389 391 392 393 394 399
 436 441 443 454 455 456 464 466 467 468 469 482 483 484
 488 521 522 523 524 525 527 528 529 561 563 566 569 575
 581 586 587 588 589 594 595 596 627 642 654 656 662 664
 670 676 682 684 686 689 721 722 729 733 734 737 738 749
 767 769 771 774 775 778 821 822 826 827 831 832 833 834
 837 838 851 861 865 868 872 873 876 879 885 887 888
 891 895 897 899 922 923 924 925 926 927 928 942 943
 947 948 949 950

Area Code 505
 242 243 247 255 256 262 264 265 266 268 277 281 292 293 294
 296 298 299 344 345 765 766 821 822 831 836 841 842 843
 845 846 848 865 867 869 873 877 881 883 884 888 892 897 898

Area Code 507
 281 282 284 285 286 287 288 289 356 365 367 533 545 753 775
 867 876 932

Area Code 512
 220 221 222 223 224 225 226 227 228 229 230 231 233 241 242
 243 244 246 247 250 251 255 256 259 261 262 263 264 266
 267 270 271 272 276 282 288 289 299 327 328 329 333 337
 341 342 343 344 345 346 349 350 366 381 383 385 387 397
 421 422 423 428 432 433 434 435 436 441 442 443 444 447
 448 451 452 453 454 458 459 464 465 467 469 470 471 473
 474 475 476 477 478 479 480 482 492 493 494 495 496 497
 532 533 534 536 541 542 544 546 548 560 572 573 575 576
 581 585 621 622 623 624 625 626 627 628 629 630 631 633
 636 643 647 648 649 650 651 652 653 654 655 656 657 658
 661 662 667 670 671 673 674 675 677 679 680 681 682 684
 687 688 690 691 692 694 695 696 698 699 732 733 734 735
 737 748 781 787 797 821 822 824 826 828 831 834 835 836
 838 843 845 851 852 853 854 855 857 870 881 882 883 884
 887 888 892 921 922 923 924 925 926 927 928 929 933 937
 943 975 991 992 993

Area Code 513
 220 221 222 223 224 225 226 227 228 229 231 232 233 234 236
 237 241 242 243 244 245 247 248 251 252 253 254 255 257
 258 259 262 263 265 267 268 271 272 274 275 276 277 281
 290 293 296 297 298 299 321 322 323 324 325 327 328 331
 346 347 351 352 353 367 369 381 385

420	421	422	423	424	425	426	429	433	434	435	439	443	445	449
451	454	457	461	462	467	471	474	475	476	481	482	489	499	521
522	527	528	530	531	533	536	539	541	542	551	553	554	557	559
561	562	563	565	566	568	569	574	575	576	579	583	589	591	595
598	621	624	625	629	631	632	641	647	651	659	661	662	665	671
677	681	683	684	721	722	724	729	731	732	733	734	737	738	741
742	743	745	746	748	749	751	752	753	755	756	761	762	763	765
769	771	772	777	779	782	786	787	791	793	794	797	820	821	822
825	828	829	831	832	835	836	837	841	845	848	849	851	852	853
854	859	861	862	863	864	865	866	867	868	870	871	872	873	874
878	879	882	885	890	891	896	898	921	922	923	931	941	943	948
950	961	964	969	972	977	979	984	988						

Area Code 515

223	224	225	232	233	239	242	243	244	245	246	247	255	262	263
265	266	270	271	274	276	277	278	279	280	281	282	283	284	285
286	287	288	289	292	294	296	834	958	959	961	964	965	966	967
981	984	986	987	989	992	993	996	999						

Area Code 516

****Entire Area Code Is Served****

Area Code 517

321	322	323	332	337	339	349	351	353	355	363	371	372	373	374
377	393	394	482	483	484	485	487	489	496	624	625	626	627	631
636	641	642	643	645	646	651	652	655	662	663	667	675	676	684
686	687	689	694	695	699	752	753	754	755	770	771	776	777	781
790	791	792	793	799	832	835	839	865	868	882	887	892	893	894
895														

Area Code 518

235	237	266	270	271	272	273	274	279	283	286	346	355	356	370
371	372	374	377	381	382	383	384	385	386	393	399	434	436	438
439	445	447	449	453	454	455	456	457	458	459	462	463	465	470
471	472	473	474	475	476	477	482	489	584	587	663	664	674	732
753	756	765	766	767	768	783	785	797	861	864	869	872	877	882
885	885	899												

Area Code 601

352	353	354	355	359	362	366	371	372	373	376	825	829	845	852
856	857	866	878	879	882	924	932	936	939	944	948	949	956	957
960	961	968	969	981	982	987	992							

Area Code 602

224	231	233	234	235	236	237	238	239	241	242	243	244	245	246
247	248	249	251	252	253	254	255	256	257	258	259	260	261	262
263	264	265	266	267	268	269	270	271	272	273	274	275	276	277
278	279	280	293	294	295	296	297	298	299	323	325	326	327	435
437	438	439	573	574	575	576	577	578	581	582	583	584	585	588
589	621	622	623	624	626	628	629	721	741	742	743	744	745	746
747	748	749	790	791	792	795	820	829	830	831	832	833	834	835
837	838	839	840	841	842	843	846	848	849	853	856	860	861	862
863	864	866	867	869	872	873	876	877	878	879	880	881	882	883
884	885	886	887	888	889	890	891	892	893	894	895	897	898	899
921	924	925	932	933	934	935	936	937	938	939	941	942	943	944
945	946	947	948	949	951	952	953	954	955	956	957	959	961	962
963	964	965	966	967	968	969	971	972	973	974	975	977	978	979
981	982	983	984	985	986	987	988	990	991	992	993	994	995	996
997	998													

Area	Code	606														
223	231	232	233	252	253	254	255	257	258	259	261	266	268	269		
272	273	276	277	278	283	291	292	293	299	331	341	342	344	356		
359	371	384	397	431	441	485	491	493	525	565	566	572	581	586		
628	635	689	727	781	846	858	873	885	887	936	939					

Area	Code	608														
221	222	231	233	238	241	244	246	249	251	252	255	256	257	258		
262	263	264	266	267	271	273	274	275	291	362	364	365	424	437		
455	592	635	655	676	752	754	755	756	764	767	798	829	831	832		
833	835	836	837	838	839	845	846	849	868	873	876	879	883	884		
936	993															

Area	Code	609														
227	228	234	235	292	295	298	338	342	346	354	365	392	393	394		
396	424	428	429	435	445	456	462	488	541	546	547	561	567	573		
581	582	585	586	587	589	590	596	599	627	629	633	662	663	665		
667	694	695	728	736	742	755	757	767	768	771	772	778	779	783		
784	786	795	829	854	858	863	866	881	882	883	888	890	896	921		
933	936	939	962	963	964	966	983	984	989							

Area	Code	612														
221	222	223	224	225	226	227	228	251	252	253	255	259	291	292		
293	296	297	298	330	331	332	333	334	335	336	338	339	340	341		
342	343	344	347	348	349	355	356	363	370	371	372	373	374	375		
376	377	378	379	387	393	420	421	422	423	424	425	426	427	428		
429	430	431	432	433	434	435	436	437	438	439	441	443	445	446		
447	448	450	451	452	454	455	456	457	458	459	460	461	462	463		
464	469	471	472	473	474	475	476	477	478	479	481	482	483	484		
487	488	489	492	497	498	499	520	521	522	529	533	534	535	536		
537	538	540	541	542	544	545	546	553	558	559	560	561	566	571		
572	574	588	620	622	623	631	633	636	638	641	642	644	645	646		
647	681	685	690	696	698	699	721	722	724	725	726	727	729	731		
733	735	736	738	739	743	746	753	755	757	770	771	772	774	776		
777	778	779	780	781	784	786	788	789	822	823	824	825	827	828		
830	831	835	853	854	858	861	866	869	870	871	872	874	881	884		
885	887	888	890	893	894	920	921	922	924	925	926	927	929	931		
932	933	934	935	936	937	938	941	944	968	977	989					

Area	Code	614														
221	222	223	224	225	227	228	229	231	235	236	237	238	239	251		
252	253	255	261	262	263	265	267	268	272	274	275	276	278	279		
281	291	294	297	299	362	363	369	382	383	387	389	421	422	424		
431	436	438	443	444	445	451	457	459	460	461	462	463	464	465		
466	467	468	469	471	475	476	481	486	488	491	492	494	497	499		
524	526	536	548	569	595	653	654	666	687	726	746	747	756	764		
766	771	821	833	836	837	846	855	860	861	862	863	864	866	868		
870	871	875	876	877	878	879	881	882	885	888	889	890	891	895		
927	965	969	997													

Area	Code	615														
226	227	228	236	238	242	244	248	251	252	254	255	256	259	262		
265	266	267	269	292	297	298	320	321	322	323	326	327	329	331		
332	333	344	352	353	356	358	360	361	362	366	367	373	377	383		
385	386	387	396	431	435	439	457	466	482	483	494	521	522	523		
524	525	538	544	546	552	558	573	574	576	577	579	584	588	622		
624	625	632	637	642	645	646	647	648	656	669	673	687	688	689		
690	691	693	694	697	698	737	741	742	747	748	749	751	752	754		
755	756	757	758	764	766	776	778	780	782	790	791	793	794	798		
799	811	812	824	825	826	833	834	838	842	843	847	855	859	860		
865	867	868	870	875	876	877	878	883	885	886	889	892	894	899		
922	933	938	945	947	966	968	970	971	974	992						

Area	Code	616													
241	242	243	245	246	247	281	323	327	329	342	343	344	345	349	
361	362	364	372	375	381	382	383	384	385	388	451	452	453	454	
455	456	457	458	459	530	531	532	534	538	623	624	626	628	629	
649	657	664	665	668	669	671	676	677	679	681	682	685	691	692	
694	698	731	770	774	784	791	866	868	874	877	878	887	891	896	
897	942	949	957												

Area	Code	617													
223	225	227	229	231	232	233	235	236	237	241	242	243	244	245	
246	247	250	251	253	254	256	258	259	261	262	265	266	267	268	
269	272	273	274	275	276	277	282	284	286	287	288	289	292	296	
298	321	322	323	324	325	326	327	328	329	331	332	333	335	337	
338	339	344	357	358	359	361	364	365	366	367	368	376	381	383	
387	389	391	392	393	395	396	421	422	423	424	426	427	429	431	
434	436	437	438	439	442	444	445	449	451	452	453	454	455	458	
459	461	463	466	469	471	472	479	482	483	484	488	489	491	492	
494	495	497	498	522	523	524	527	536	542	547	552	561	566	567	
569	574	576	577	578	579	581	589	592	593	594	595	596	598	599	
620	623	625	628	633	635	637	638	641	642	643	646	647	648	649	
651	653	654	655	657	658	661	662	663	665	666	667	671	684	692	
696	698	720	721	722	723	725	726	727	729	731	732	734	735	738	
739	740	742	743	749	752	753	754	755	756	757	762	767	769	770	
773	776	781	782	783	785	786	787	788	791	792	793	798	799	821	
825	828	829	832	835	839	842	843	845	846	848	849	851	852	853	
855	856	860	861	862	863	864	865	868	869	870	872	875	876	877	
879	881	882	884	885	886	889	890	891	892	893	894	895	899	923	
924	925	926	929	931	933	935	936	937	938	942	944	955	956	957	
961	963	964	965	967	969	973	986	987							

Area	Code	618												
234	235	256	271	274	277	332	337	344	345	397	398	399	451	452
482	624	632	744	746	757	874	875							

Area	Code	619													
221	222	223	224	225	226	229	230	231	232	233	234	235	236	237	
238	239	260	262	263	264	265	266	267	268	270	271	272	273	274	
275	276	277	278	279	280	281	282	283	284	286	287	289	290	291	
292	293	294	295	296	297	298	299	320	321	323	324	325	327	328	
340	341	342	343	345	346	347	393	396	397	398	399	420	421	422	
423	424	425	426	427	428	429	430	433	434	435	436	437	438	439	
440	442	443	444	445	447	448	449	450	451	452	453	454	455	456	
457	458	459	460	461	462	463	464	465	466	469	470	471	474	475	
477	479	480	481	483	484	485	486	487	488	489	560	561	562	563	
564	565	566	568	569	570	571	573	574	575	576	578	579	580	582	
583	584	586	588	589	690	691	692	693	695	697	698	699	721	722	
723	724	725	726	727	728	729	741	742	743	744	745	746	747	748	
749	753	755	756	757	758	789	940	941	942						

Area	Code	702													
246	293	294	295	322	323	329	331	342	343	345	348	356	358	359	
361	362	363	367	368	369	381	382	383	384	385	386	389	399	451	
452	453	454	456	457	458	459	564	565	566	634	642	643	644	645	
646	647	648	649	673	677	731	732	733	734	735	736	737	739	747	
784	785	786	788	789	793	796	798	825	826	827	831	832	844	847	
849	851	852	853	870	871	873	876	877	878	882	883	885	887	926	
928	972														

Area	Code	703													
221	222	235	237	241	243	247	250	255	256	273	274	276	278	280	
281	284	285	321	323	325	327	329	332	335	338	339	342	343	344	
345	346	347	354	356	360	361	362	366	367	368	369	370	371	373	
375	378	379	380	384	385	387	389	425	430	435	437	442	448	450	

451	455	471	476	486	487	490	491	494	521	522	524	525	527	528
532	533	534	536	538	548	549	550	553	556	557	558	560	561	563
569	573	578	582	590	591	594	620	631	640	642	643	644	655	660
661	664	668	670	671	680	683	684	685	687	690	691	698	734	750
751	752	754	756	759	765	768	774	777	780	781	786	790	791	820
821	822	823	827	830	836	838	841	845	849	860	876	882	883	890
892	893	898	899	920	922	929	931	938	941	947	954	960	968	971
972	974	977	978	979	981	982	985	986	989	992				

Area Code 704

331	332	333	334	335	364	365	366	371	372	373	374	375	376	377
378	379	380	393	394	398	399	455	523	525	527	535	536	537	541
542	545	552	553	554	563	567	568	588	594	596	597	598	821	825
827	840	843	847	875	882	889	892							

Area Code 707

433	523	525	526	527	528	538	539	542	544	545	546	552	553	554
557	575	576	578	584	585	642	643	644	646	648	664	745	746	755
823	829	833	838	887										

Area Code 712

232	233	239	252	255	258	274	276	277	279	322	323	325	328	347
366	428	543	946											

Area Code 713

220	221	222	223	224	225	226	227	228	229	230	232	235	236	237
241	251	255	256	259	266	270	271	277	280	284	285	288	292	320
324	328	331	332	333	334	337	338	339	341	342	343	346	350	351
353	354	356	358	359	363	367	370	371	373	376	383	388	390	391
392	393	420	422	424	425	426	427	428	431	432	433	434	436	437
438	439	440	441	442	443	444	445	446	447	448	449	450	451	452
453	454	455	456	457	458	459	460	461	462	463	464	465	466	467
468	469	470	471	472	473	474	475	476	477	479	480	481	482	483
484	485	486	487	488	489	490	491	492	493	494	495	496	497	498
499	520	521	522	523	524	525	526	527	528	529	530	531	533	534
537	538	540	541	545	546	550	551	552	554	556	558	559	571	573
574	577	578	580	581	583	585	590	591	599	620	621	622	623	626
627	629	630	631	633	635	640	641	643	644	645	649	650	651	652
654	656	658	659	660	661	662	663	664	665	666	667	668	669	670
671	672	673	674	675	676	678	679	680	681	682	683	686	688	690
691	692	694	695	697	699	720	721	723	726	728	729	731	733	734
738	739	741	747	748	749	750	751	754	757	759	771	772	774	776
777	778	780	781	782	783	784	785	788	789	790	791	792	795	797
799	820	821	827	840	841	844	847	850	852	859	861	862	864	868
869	870	871	877	879	880	881	888	890	893	895	896	920	921	923
924	926	928	929	930	931	932	933	937	939	940	941	943	944	946
947	951	952	953	954	955	956	957	960	961	965	966	972	973	974
975	977	978	980	981	984	987	988	991	993	995	996	997	998	999

Area Code 714

220	240	241	250	261	321	350	351	354	359	369	370	380	381	382
383	384	385	391	431	442	441	467	472	474	476	491	492	493	494
495	496	497	498	499	502	517	520	521	522	523	524	525	526	527
528	529	530	531	532	533	534	535	536	537	538	539	540	541	542
543	544	545	546	547	548	549	550	551	552	553	554	555	557	558
559	567	568	569	571	572	573	594	595	596	597	598	599	620	621
622	623	624	625	626	627	628	629	630	631	632	633	634	635	636
637	638	639	640	641	642	643	644	645	646	649	650	651	660	661
662	667	668	670	671	673	675	680	681	682	683	684	685	686	687
688	689	720	730	731	732	738	739	740	742	750	751	752	754	756
759	760	761	768	770	771	772	773	774	775	776	777	778	779	780
781	783	784	785	786	787	788	790	792	793	794	795	796	797	798
820	821	822	823	824	825	826	827	828	829	830	831	832	833	834

835	836	837	838	839	840	841	842	846	847	848	850	851	852	855
856	857	859	861	863	865	870	871	874	875	877	879	880	881	882
883	884	885	886	887	888	889	891	892	893	894	895	896	897	898
921	933	945	946	947	951	952	953	954	955	956	957	960	961	962
963	964	966	968	969	970	971	972	973	974	975	977	978	979	980
981	982	983	984	985	986	987	988	989	990	991	992	993	994	995
996	997	998	999											

Area	Code	716												
221	222	223	225	227	232	235	236	238	244	247	248	254	258	262
263	265	266	271	275	278	282	283	284	285	286	288	293	297	323
325	328	334	337	338	342	352	359	377	381	385	392	395	398	422
423	424	425	426	427	428	433	434	436	439	442	454	457	458	461
464	467	473	475	477	482	494	496	533	537	538	542	544	546	549
582	586	588	592	594	621	624	625	626	627	631	632	633	634	636
637	643	644	647	648	649	652	654	655	662	663	668	671	674	675
681	683	684	685	686	687	688	689	690	691	692	693	694	695	696
722	724	726	731	741	745	751	754	759	772	773	791	821	822	823
824	825	826	827	828	831	832	833	834	835	836	837	838	839	842
843	844	845	846	847	849	852	853	854	855	856	862	865	872	873
874	875	876	877	878	879	881	882	883	884	885	886	887	889	890
891	892	893	894	895	896	897	898	921	924	937	941	947	955	964
974	987	992												

Area	Code	717												
225	232	233	234	236	238	243	244	245	246	249	252	255	258	266
283	284	285	287	288	291	292	295	299	342	343	344	346	347	348
354	378	383	392	393	394	397	428	457	464	469	472	486	489	533
534	545	558	560	561	562	563	564	566	569	586	587	599	626	627
652	653	654	655	656	657	664	665	687	689	691	693	697	698	732
737	741	755	757	761	763	764	766	767	768	771	774	776	780	782
783	786	787	790	792	822	823	824	825	826	829	842	843	845	846
848	854	872	876	896	858	921	938	939	944	948	957	961	963	969
986														

Area	Code	801												
224	225	226	227	237	250	254	255	261	262	263	264	265	266	268
272	277	278	292	295	298	321	322	328	350	355	359	363	364	373
374	375	377	378	379	392	393	394	399	423	451	465	466	467	479
482	483	484	485	486	487	489	521	522	524	526	530	531	532	533
534	535	537	539	544	546	561	566	571	572	581	582	583	584	585
621	625	626	627	731	745	754	756	768	773	774	776	777	782	785
798	825	942	943	964	965	966	967	968	969	972	973	974		

Area	Code	803												
232	233	235	239	242	243	244	246	252	254	256	268	269	271	277
281	282	288	292	294	295	297	298	299	345	353	356	359	433	439
461	463	472	474	476	477	478	479	480	481	482	483	485	487	496
731	732	733	735	736	738	748	751	754	755	758	765	771	772	776
777	779	781	782	783	786	787	788	791	794	796	798	799	834	836
845	855	859	862	877	879	895	963	967						

Area	Code	804												
222	225	226	230	231	232	233	244	245	247	254	257	261	262	264
265	266	268	270	271	272	274	275	276	281	282	284	285	288	289
320	321	323	328	329	340	343	345	346	353	355	358	359	363	379
380	393	396	397	398	399	420	421	422	423	424	425	426	427	428
433	440	441	444	445	446	452	455	458	460	461	463	464	465	466
467	468	469	480	481	482	483	484	485	486	487	488	489	490	491
494	495	496	497	499	520	526	533	541	543	545	547	583	587	588
590	592	595	596	599	622	623	625	627	628	629	643	644	648	649
666	667	686	721	722	723	727	728	730	732	733	734	737	739	740
741	743	744	745	746	747	748	749	752	764	771	772	775	780	781

782	784	786	788	790	794	795	796	798	825	826	827	838	840	850
851	853	855	857	858	861	862	865	867	868	872	874	877	878	887
888	888	888	888											

Area Code 805

482	483	484	485	486	487	488	525	565	569	642	643	644	646	647
648	649	652	653	654	656	658	659	682	683	684	685	687	933	961
962	963	964	966	967	968	969	982	983	984	985	986	987		

Area Code 806

320	335	352	353	355	358	359	372	373	374	376	378	381	383	622
655	656	741	742	743	744	745	746	747	762	763	765	792	793	794
795	796	797	799	828	829	832	842	863	866	873	885	892		

Area Code 808

263	286	373	377	395	396	422	423	449	471	472	474	477	521	523
524	525	526	527	528	531	533	536	537	538	543	544	546	547	548
595	624	653	672	732	734	735	737	833	834	836	839	841	842	845
847	848	922	923	926	941	942	943	944	945	946	947	948	949	955
988														

Area Code 812

246	256	262	283	284	286	288	332	333	334	335	336	337	339	342
372	376	378	379	526	546	579	587	824	825	837	872	876	892	923
944	945	948	988											

Area Code 813

221	222	224	225	226	227	228	229	231	232	234	236	237	238	239
240	241	242	247	248	251	253	254	256	257	258	259	272	273	280
321	323	327	340	343	344	345	347	360	363	367	381	384	391	392
393	397	398	441	442	443	446	447	448	461	462	521	522	525	526
527	530	531	535	536	541	544	545	546	576	577	581	584	585	586
593	595	606	621	622	623	626	634	645	677	681	684	685	689	725
726	733	734	736	738	764	785	786	796	797	799	821	822	823	824
825	830	831	832	833	834	835	837	839	840	855	864	866	867	870
871	872	875	876	877	879	883	884	885	886	887	893	894	895	896
898	920	932	933	934	935	937	938	949	961	962	963	969	971	972
973	974	977	985	986	988	989	990	996	999					

Area Code 814

255	266	269	288	322	446	451	452	453	454	455	456	459	467	474
476	479	487	495	533	535	536	538	539	684	695	696	725	732	734
739	742	774	796	825	833	838	864	866	868	871	875	886	898	899
942	943	944	946	949										

Area Code 815

226	229	234	282	332	335	337	338	344	385	389	397	398	399	423
424	436	439	455	459	465	467	468	469	475	476	478	485	544	547
523	624	629	633	645	654	722	723	725	726	727	729	740	741	744
765	773	774	834	838	874	877	885	886	923	962	963	964	965	966
968	987													

Area Code 816

221	224	228	229	231	232	233	234	238	241	242	243	245	251	252
253	254	257	271	274	275	276	279	283	322	331	333	346	348	353
356	358	361	363	364	373	374	391	421	436	443	444	452	453	454
455	459	461	464	468	471	474	478	483	523	524	525	531	532	537
556	561	572	576	578	587	623	667	685	688	734	737	741	753	756
757	761	763	765	774	781	792	795	796	833	836	842	844	861	873
881	891	921	923	924	926	931	932	941	942	966	968	995	997	

Area	Code	817
232	233	237
231	232	244
346	347	284
447	448	379
485	486	382
540	541	383
592	593	387
696	697	390
766	767	429
836	837	467
877	878	469
	879	473
	880	477
	881	478
	882	481
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	996	596
	997	597
	998	598
	999	599

Area Code 818 ****Entire Area Code Is Served****

Area	Code	901
272	273	276
353	354	278
397	398	320
427	428	321
729	730	322
775	776	323
946	947	324
	948	327
	949	332
	950	342
	951	345
	952	346
	953	348
	954	350
	955	353
	956	355
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	994	393
	995	394
	996	395
	997	396
	998	397
	999	398

Area	Code	904
241	242	251
354	355	262
434	435	264
634	635	266
751	752	268
944	945	269
	946	272
	947	282
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Area	Code	912
232	233	234
744	745	236
944	945	238
	946	352
	947	354
	948	355
	949	356
	950	474
	951	477
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	953	741
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	991	779
	992	780
	993	781
	994	782
	995	783
	996	784
	997	785
	998	786
	999	787

Area	Code	913
232	233	234
289	290	235
383	384	236
576	577	237
685	686	238
841	842	239
	843	240
	844	241
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	846	243
	847	244
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691 692 694 695 696 697 698 699 747 751 755 757 772 775 778
 779 821 833 851 852 855 858 859 874 877 886 942 944 949

Area Code 916

322 323 324 325 328 329 331 332 334 338 344 361 362 363 364
 366 369 371 372 381 383 386 388 391 392 393 395 421 422 423
 424 427 428 440 441 442 443 444 445 446 447 448 449 451 452
 453 454 455 456 457 481 482 483 484 485 486 487 488 489 635
 638 643 648 665 682 685 687 689 722 723 725 726 728 731 736
 739 766 771 781 782 783 786 791 797 920 921 922 924 925 927
 929 933 944 961 962 965 966 967 969 971 972 973 985 988 989
 991

Area Code 918

224 227 234 241 245 250 251 252 254 258 266 272 288 299 333
 335 336 337 366 369 425 428 437 438 445 446 451 455 460 477
 481 492 493 494 495 496 532 534 560 561 581 582 583 584 585
 586 587 588 592 599 622 627 628 660 661 662 663 664 665 742
 743 744 745 747 749 831 832 834 835 836 838

Area Code 919

271 272 273 274 275 279 282 288 292 294 299 373 375 377 378
 379 395 621 622 643 656 668 674 680 685 697 698 721 722 723
 724 725 727 730 744 748 750 760 761 764 765 766 767 768 769
 770 773 777 784 785 788 852 854 855 922 924 945 969 983 993
 994 996 998

Note: MCI also offers service to the following metropolitan areas in Canada. Listings for these area codes are not found in this appendix.

Area Code 403 - Calgary, Alberta

Area Code 416 - Toronto, Ontario

Area Code 514 - Montreal, Quebec

Area Code 613 - Ottawa, Ontario

AREA CODE AND PREFIX LISTING FOR GTE SPRINT NETWORK

Area	Code	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450	451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500	501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522	523	524	525	526	527	528	529	530	531	532	533	534	535	536	537	538	539	540	541	542	543	544	545	546	547	548	549	550	551	552	553	554	555	556	557	558	559	560	561	562	563	564	565	566	567	568	569	570	571	572	573	574	575	576	577	578	579	580	581	582	583	584	585	586	587	588	589	590	591	592	593	594	595	596	597	598	599	600	601	602	603	604	605	606	607	608	609	610	611	612	613	614	615	616	617	618	619	620	621	622	623	624	625	626	627	628	629	630	631	632	633	634	635	636	637	638	639	640	641	642	643	644	645	646	647	648	649	650	651	652	653	654	655	656	657	658	659	660	661	662	663	664	665	666	667	668	669	670	671	672	673	674	675	676	677	678	679	680	681	682	683	684	685	686	687	688	689	690	691	692	693	694	695	696	697	698	699	700	701	702	703	704	705	706	707	708	709
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Area	Code	205
226	250	252
281	254	253
343	254	253
456	254	253
591	254	253
661	254	253
694	254	253
823	254	253
877	254	253
972	254	253

Area	Code	206
223	228	232
255	271	277
288	271	277
392	394	421
473	474	475
531	535	537
584	587	588
630	631	632
723	725	742
771	772	773
824	827	828
863	872	874
941	946	947

Area	Code	207
688	761	766
854	856	865

Area	Code	208
286	322	323
378	322	323

Area	Code	209
221	222	224
266	268	275
441	442	443
478	485	486
571	572	575
943	944	946

Area Code 212 ****Entire Area Code Is Served****

Area Code 213 ****Entire Area Code Is Served****

Area	Code	214
221	222	223
239	241	243
259	262	264
288	289	292
331	333	337
358	361	363
385	386	387
429	434	436
462	463	464
523	526	530
611	626	630
697	697	697
653	653	653

Area	Code	216	228	229	231	232	233	234	235	236	237	238	241	243
221	222	226	228	229	231	232	233	234	235	236	237	238	241	243
222	223	227	229	230	232	233	234	235	236	237	238	239	242	244
223	224	228	230	231	233	234	235	236	237	238	239	240	243	245
224	225	229	231	232	234	235	236	237	238	239	240	241	244	246
225	226	230	232	233	235	236	237	238	239	240	241	242	245	247
226	227	231	233	234	236	237	238	239	240	241	242	243	246	248
227	228	232	234	235	237	238	239	240	241	242	243	244	247	249
228	229	233	235	236	238	239	240	241	242	243	244	245	248	250
229	230	234	236	237	239	240	241	242	243	244	245	246	249	251
230	231	235	237	238	240	241	242	243	244	245	246	247	250	252
231	232	236	238	239	241	242	243	244	245	246	247	248	251	253
232	233	237	239	240	242	243	244	245	246	247	248	249	252	254
233	234	238	240	241	243	244	245	246	247	248	249	250	253	255
234	235	239	241	242	244	245	246	247	248	249	250	251	254	256
235	236	240	242	243	245	246	247	248	249	250	251	252	255	257
236	237	241	243	244	246	247	248	249	250	251	252	253	256	258
237	238	242	244	245	247	248	249	250	251	252	253	254	257	259
238	239	243	245	246	248	249	250	251	252	253	254	255	258	260
239	240	244	246	247	249	250	251	252	253	254	255	256	259	261
240	241	245	247	248	250	251	252	253	254	255	256	257	260	262
241	242	246	248	249	251	252	253	254	255	256	257	258	261	263
242	243	247	249	250	252	253	254	255	256	257	258	259	262	264
243	244	248	250	251	253	254	255	256	257	258	259	260	263	265
244	245	249	251	252	254	255	256	257	258	259	260	261	264	266
245	246	250	252	253	255	256	257	258	259	260	261	262	265	267
246	247	251	253	254	256	257	258	259	260	261	262	263	266	268
247	248	252	254	255	257	258	259	260	261	262	263	264	267	269
248	249	253	255	256	258	259	260	261	262	263	264	265	268	270
249	250	254	256	257	259	260	261	262	263	264	265	266	269	271
250	251	255	257	258	260	261	262	263	264	265	266	267	270	272
251	252	256	258	259	261	262	263	264	265	266	267	268	271	273
252	253	257	259	260	262	263	2							

Area	Code	217
228	333	337
423	333	428
623	525	529
789	633	684
	633	867
		344
		429
		469
		466
		688
		677
		352
		483
		564
		694
		892
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		485
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		963
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		595
		786
		398
		498
		599
		787
		422
		522
		626
		788

Area	Code	219
232	233	236
287	286	291
427	428	432
456	458	467
556	553	625
679	693	736
844	845	881
933	937	942
		237
		299
		434
		473
		627
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		449
		520
		674
		838
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Area	Code	301
222	224	225
243	244	247
265	266	267
329	329	334
355	355	358
386	386	390
429	429	431
454	454	455
481	481	483
547	547	549
574	574	576
597	597	599
647	647	649
669	669	671
725	725	727
760	760	761
781	781	783
833	833	835
859	859	861
888	888	890
933	933	936
956	956	964
987	987	992
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		777
		825
		855
		881
		927
		953
		984
		242
		263
		288
		328
		354
		385
		428
		449
		477
		521
		544
		572
		596
		646
		668
		721
		757
		779
		828
		856
		882
		929
		955
		986

Area	Code	302
239	322	328
573	575	651
773	774	798
		366
		652
		634
		368
		654
		636
		421
		655
		992
		426
		656
		994
		429
		658
		995
		451
		731
		998
		453
		737
		999
		454
		738
		475
		762
		478
		764
		571
		772

Area	Code	303
221	223	226
277	278	284
320	321	329
353	354	360
390	392	394
429	430	433
455	457	465
488	490	493
544	545	547
574	575	577
607	608	620
639	642	650
681	682	686
699	722	737
		229
		287
		330
		361
		398
		440
		466
		494
		549
		578
		623
		657
		687
		740
		230
		288
		337
		364
		420
		442
		471
		497
		560
		584
		628
		654
		690
		744
		231
		291
		339
		366
		421
		443
		472
		495
		561
		585
		629
		659
		691
		750
		232
		292
		340
		367</

759	761	762	770	771	772	773	776	777	778	779	781	785	789	790
791	792	793	794	795	796	797	798	799	820	821	823	825	826	830
831	832	833	837	839	841	850	851	855	861	863	866	869	890	892
893	894	896	898	922	934	935	936	937	938	947	948	972	973	976
977	978	979	980	985	986	987	988	989						

Area Code 304														
342	343	344	345	346	347	348	357	429	453	486	522	523	526	529
696	697	722	727	733	736	743	744	746	747	755	756	757	762	766
768	776	840	925	949	954	965	968	984						

Area Code 305														
221	223	226	232	233	235	238	241	243	245	246	247	248	251	252
253	255	257	258	261	262	263	264	266	270	271	272	274	276	278
279	280	284	324	325	326	343	343	350	353	357	358	361	368	371
372	373	374	377	379	381	382	384	385	386	387	389	391	392	393
395	398	399	421	426	427	428	429	431	432	433	434	435	439	441
442	443	444	445	446	447	448	449	454	456	457	458	462	463	467
471	472	473	474	475	476	482	483	484	485	486	487	488	490	491
492	493	495	498	499	521	522	523	524	525	526	527	528	529	531
532	533	534	537	538	541	543	544	545	547	548	550	551	552	553
554	556	557	558	559	561	563	564	565	566	573	576	577	578	579
580	581	582	583	584	585	586	587	588	591	592	593	594	595	596
598	620	621	622	623	624	625	626	627	633	634	635	637	638	642
643	649	650	651	652	653	655	659	661	662	665	666	667	672	673
674	681	683	684	685	686	687	688	689	691	693	694	696	721	722
726	731	732	733	734	735	736	737	739	741	742	744	746	747	748
749	751	752	753	754	755	756	757	758	759	761	762	763	764	765
766	769	771	772	776	781	782	785	786	791	792	793	797	798	821
822	823	825	829	832	833	835	836	837	838	840	842	844	845	848
854	856	858	861	863	864	865	866	868	871	873	874	883	884	885
887	888	891	893	895	899	920	921	922	923	925	926	927	928	929
931	932	935	936	937	939	940	941	942	943	944	945	946	947	948
949	952	953	962	963	964	965	966	967	968	969	971	972	973	974
975	979	981	983	985	987	989	994	997	998					

Area Code 307														
234	235	237	261	265	266	268	472	473	577	632	634	635	637	638
771	772	775	777	778										

Area Code 309														
362	565	637	655	671	672	673	674	675	676	679	682	685	686	688
690	691	692	693	694	697	698	699	745	751	752	755	757	762	764
786	787	788	792	793	794	796	797	798	799	822				

Area Code 312 ****Entire Area Code Is Served****

Area Code 313														
222	223	224	225	226	232	233	234	235	237	238	239	245	246	252
255	256	257	259	261	263	264	267	268	270	271	272	273	274	275
276	277	278	280	281	282	283	284	285	286	287	288	291	292	293
294	295	296	297	298	321	322	323	326	331	332	333	334	335	336
337	338	341	342	343	344	345	348	349	351	352	353	354	355	356
357	358	361	362	365	366	368	369	371	372	373	374	377	381	382
383	386	388	389	391	393	397	398	399	420	421	422	423	424	425
426	427	428	429	430	434	435	437	439	442	444	445	446	449	451
453	455	456	459	463	464	465	466	467	468	469	471	472	473	474
475	476	477	478	479	481	482	483	484	485	486	487	491	492	493
494	495	496	497	499	521	522	523	524	525	526	527	528	531	532
533	534	535	536	537	538	539	540	541	542	543	544	545	546	547
548	549	551	552	553	554	556	557	559	561	562	563	564	565	566
567	568	569	571	572	573	574	575	576	577	579	581	582	583	584

585	588	589	591	592	593	594	595	621	624	626	629	631	635	636
637	640	641	642	643	644	645	646	647	649	653	655	658	659	661
662	663	665	668	669	671	675	676	681	682	683	686	687	689	694
695	697	699	721	722	723	728	729	732	733	735	736	738	742	743
744	750	751	754	755	756	757	758	759	761	762	763	764	766	767
768	769	771	772	773	774	775	776	777	778	779	785	787	789	791
792	821	822	823	824	826	827	828	831	832	833	834	835	836	837
838	839	841	842	843	846	847	848	849	851	852	853	855	856	857
858	861	862	863	864	865	866	867	868	869	871	872	873	874	875
876	879	881	882	883	884	885	886	888	891	892	893	894	895	896
897	898	899	921	922	923	924	925	926	927	928	931	932	933	934
935	937	939	941	942	943	946	949	956	961	962	963	964	965	967
968	971	972	973	976	977	978	979	981	994	995	996			

Area	Code	314												
225	227	231	232	233	234	241	247	253	261	263	275	289	291	296
321	342	343	344	351	352	353	355	361	367	371	381	382	383	385
388	389	391	394	421	423	425	426	427	428	429	432	434	436	441
444	447	454	458	464	469	481	487	521	522	524	525	531	532	533
534	535	544	553	554	567	569	572	576	577	595	621	622	631	638
644	645	647	652	658	664	671	677	679	694	721	723	724	725	726
727	731	739	741	752	768	771	772	773	776	777	781	821	822	823
826	831	832	837	838	839	842	843	846	849	851	854	855	862	863
865	867	868	869	872	878	889	892	894	895	899	921	922	925	928
938	942	946	947	957	961	962	964	965	966	968	969	982	991	993
994	997													

Area	Code	315												
421	422	423	424	425	426	428	432	433	437	445	446	451	452	454
455	456	457	458	463	468	469	470	471	472	473	474	475	476	477
478	479	487	488	492	494	592	593	598	622	623	625	633	635	636
637	638	640	652	655	656	662	668	672	673	675	676	677	678	682
683	685	687	689	695	696	697	699	724	732	733	735	736	737	738
768	792	793	797	798	822	831	839	841	853	859	865	890	896	963
986														

Area	Code	316												
261	262	263	264	265	266	267	268	269	436	522	524	526	529	574
681	682	683	684	685	686	687	688	689	721	722	733	744	755	772
773	775	776	777	778	788	794	796	799	832	838	942	943	945	946

Area	Code	317												
222	228	231	233	235	236	239	240	241	242	243	244	247	248	251
252	253	255	256	257	259	261	262	263	264	265	266	267	269	271
272	273	282	283	284	285	286	288	289	291	293	297	298	299	326
335	352	353	354	356	357	358	359	378	395	396	422	452	453	455
456	457	459	462	467	468	485	533	534	535	536	539	542	543	545
546	547	549	552	556	560	562	566	630	631	632	633	634	635	636
637	638	639	642	643	644	646	648	649	689	724	734	736	738	741
745	747	754	755	759	768	769	773	774	776	778	779	782	783	784
786	787	788	789	823	831	835	838	839	842	844	845	846	848	849
852	856	861	862	871	872	873	875	877	878	881	882	883	887	888
892	894	896	897	898	899	923	924	925	926	927	928	929	945	947
963	964	996												

Area	Code	318												
221	222	226	227	231	232	233	234	235	236	237	261	264	269	294
424	425	433	436	439	456	459	474	477	478	491	494	527	528	582
598	625	631	632	635	636	670	674	683	686	687	688	742	746	747
797	798	837	855	856	861	865	868	869	873	882	896	925	929	933
938	949	965	981	984	987	988	989							

Area	Code	319														
225	222	224	285	289	322	323	324	326	332	344	349	355	359	362		
363	364	365	366	369	373	378	381	383	386	388	390	391	393	395		
396	398	399	438	455	842	846	848	849	851	854	857	895				

Area	Code	401														
224	231	232	245	246	247	253	255	272	273	274	275	276	277	278		
331	333	334	351	353	397	421	431	433	434	437	438	456	457	461		
463	464	467	521	525	528	572	574	621	624	625	635	647	722	723		
724	725	726	727	728	732	737	738	739	751	776	781	785	821	822		
823	825	826	827	828	831	861	863	865	884	885	886	934	941	942		
943	944	949	955													

Area	Code	402														
221	238	241	253	271	280	289	291	292	293	294	330	331	332	333		
334	335	341	342	344	345	346	347	348	359	390	391	392	393	397		
398	399	421	422	423	435	444	449	451	453	455	457	464	466	467		
470	471	472	473	474	475	476	477	483	488	489	493	494	496	498		
536	541	551	553	554	556	558	559	571	572	592	593	633	691	731		
733	734	742	779	780	781	782	783	784	785	786	787	788	789	790		
791	792	794	795	796	797	798	799	894	895	896	962	977	978	987		

Area	Code	404														
221	223	231	233	237	238	239	241	243	244	247	252	255	256	257		
261	262	266	284	286	288	289	292	294	296	299	320	321	325	329		
344	346	349	351	352	353	354	355	361	362	363	366	371	373	377		
378	391	393	394	396	398	399	420	422	424	425	426	427	428	429		
432	433	434	435	436	441	442	445	446	447	448	449	451	452	454		
455	457	458	461	463	466	469	471	474	475	476	477	478	482	483		
487	489	491	493	496	498	521	522	523	524	525	526	527	529	530		
533	542	543	546	548	549	564	572	577	581	586	587	588	622	624		
627	633	634	636	653	656	658	659	681	688	691	696	699	725	739		
741	742	743	752	753	755	758	759	761	762	763	765	766	767	768		
769	783	788	789	792	794	795	797	799	843	871	872	873	874	875		
876	879	881	885	890	892	894	897	898	899	921	922	923	925	926		
928	929	931	934	935	936	937	938	939	941	942	943	944	945	946		
948	949	951	952	953	955	956	957	961	962	963	964	968	969	971		
972	973	974	976	977	979	981	982	987	991	992	993	996	997	998		
999																

Area	Code	405														
231	232	235	236	239	270	271	272	278	292	321	324	325	329	340		
341	348	350	354	360	364	366	373	376	381	390	391	396	399	424		
427	460	478	491	495	521	523	524	525	528	556	557	599	630	631		
632	634	636	670	672	677	681	682	685	686	691	721	722	728	732		
733	734	736	737	745	751	752	755	769	771	781	787	789	793	794		
799	840	841	842	843	848	942	943	946	947	948	949	990	996			

Area	Code	408														
224	225	226	227	238	241	243	244	245	246	247	248	249	251	252		
253	255	256	257	258	259	262	263	264	265	266	267	268	269	270		
272	274	275	277	279	280	281	284	286	287	288	289	291	292	293		
294	295	296	297	298	299	335	336	338	353	354	356	358	365	370		
371	374	377	378	379	395	399	422	423	424	425	426	427	429	438		
443	446	448	449	455	458	462	463	475	476	479	484	491	496	554		
559	575	578	629	633	662	663	675	679	688	720	721	723	725	727		
729	730	732	733	734	735	736	737	738	739	741	742	743	744	745		
746	747	748	749	754	755	756	757	758	773	865	866	867	920	923		
925	926	942	943	945	946	947	970	971	972	973	977	978	980	984		
985	986	987	988	993	994	995	996	997	998							

Area	Code	409															
231	260	264	268	272	273	291	294	295	361	362	539	560	564	569			
582	588	589	684	693	696	722	724	727	735	736	737	740	744	752			
753	755	756	760	761	762	763	764	765	766	768	769	775	779	786			
794	796	822	823	832	833	835	838	839	842	845	846	860	866	882			
883	886	889	898	899	925	935	938	942	945	948	962	963	982	983			
985	986	989															

Area	Code	412															
221	227	231	232	234	237	241	242	243	244	247	255	256	257	261			
262	263	264	269	271	273	276	279	281	288	321	322	323	331	333			
341	343	344	351	355	359	361	362	363	364	366	367	371	372	373			
374	381	391	392	393	394	421	422	429	431	433	434	441	442	456			
461	462	464	466	469	471	481	486	487	488	521	531	546	553	561			
562	563	565	566	571	578	596	621	622	624	633	636	642	644	647			
648	653	655	661	664	665	672	673	675	678	681	682	683	687	731			
734	741	751	754	761	765	766	767	771	777	778	781	782	784	787			
788	793	795	821	822	823	824	825	828	829	831	833	835	840	854			
855	856	859	863	864	881	882	884	885	892	921	922	923	928	931			
936	937	961	963	967	976												

Area	Code	413															
525	532	533	534	536	538	539	543	547	557	562	566	567	568	569			
575	583	589	592	593	594	596	598	730	732	733	734	736	737	739			
781	782	783	785	786	787	788	789	955									

Area	Code	414															
224	225	226	228	241	242	243	246	251	252	255	257	258	259	263			
264	265	271	272	273	274	276	277	278	281	282	289	291	321	327			
332	336	337	342	344	347	351	352	353	354	355	357	358	367	372			
374	375	377	383	384	395	421	422	423	425	432	433	434	435	436			
437	438	442	444	445	447	449	453	456	461	462	463	464	465	466			
468	469	475	476	481	482	483	494	497	498	499	527	529	535	541			
542	543	544	545	546	547	548	549	551	552	553	554	562	631	632			
633	634	636	637	639	643	645	647	649	652	654	656	657	658	662			
671	672	678	679	681	691	694	697	744	747	761	762	764	765	768			
769	771	774	778	781	782	783	784	785	786	797	798	799	822	826			
833	835	843	844	845	857	859	863	864	865	866	869	871	873	878			
886	899	931	933	935	936	937	961	962	963	964							

Area Code 415 ****Entire Area Code Is Served****

Area	Code	419															
240	241	242	243	244	245	246	247	248	249	255	259	381	382	385			
389	470	471	472	473	474	475	476	478	521	522	524	525	526	529			
531	534	535	536	537	589	661	666	691	693	698	726	727	729	747			
755	756	825	826	829	836	837	838	841	855	862	865	866	867	872			
874	877	878	882	883	884	885	886	891	892	893	895	896	936				

Area	Code	501															
223	224	225	227	370	371	372	373	374	375	376	378	433	455	490			
562	565	566	569	645	653	660	661	663	664	666	732	735	753	756			
771	772	773	774	821	834	835	847	851	868	888	897	945	961	982			
985	988																

Area	Code	502															
222	228	231	239	241	244	245	267	361	363	366	367	368	423	425			
426	429	447	448	449	451	452	454	456	458	459	491	499	548	560			
561	562	566	568	569	571	580	581	582	583	584	585	587	588	589			
634	635	636	637	772	774	775	776	778	893	895	896	897	922	933			
935	937	955	957	964	966	967	968	969									

Area	Code	503													
220	2221	222	223	224	225	226	227	228	229	230	231	232	233	234	
235	2226	227	238	239	240	241	242	243	244	245	246	248	249	251	
252	2233	254	255	256	257	280	281	282	283	284	285	286	287	288	
289	2292	293	294	295	296	299	362	363	364	370	371	373	378	390	
393	2399	581	585	588	620	621	625	626	627	628	629	630	631	632	
635	6336	637	638	639	640	641	642	643	644	645	646	647	648	649	
650	6532	653	654	655	656	657	658	659	661	663	665	666	667	668	
681	6822	684	685	692	695	741	743	749	760	761	771	774	775	777	
790	796	844													

Area	Code	504												
241	242	244	245	246	254	255	260	261	262	271	272	273	275	277
278	279	282	283	286	288	291	292	293	334	340	341	342	343	344
346	347	348	349	355	356	357	358	359	361	362	363	364	366	367
368	377	379	381	382	383	387	388	389	391	392	393	394	399	431
436	441	443	450	454	455	456	464	466	467	468	469	482	483	484
486	488	521	522	523	524	525	527	528	529	561	563	566	568	569
575	581	586	587	588	589	594	595	596	627	642	654	656	662	664
665	676	682	684	686	689	733	734	737	738	749	766	767	769	771
774	775	778	821	822	826	827	831	832	833	834	835	837	838	851
861	865	866	868	872	873	876	879	885	887	888	889	891	895	896
897	899	922	923	924	925	926	927	928	942	943	944	945	947	948
949	976													

Area	Code	505												
242	243	247	255	256	262	265	266	268	277	281	291	292	293	294
296	298	299	344	345	678	679	765	766	821	822	823	824	831	836
841	842	843	844	846	848	865	867	869	873	877	881	883	884	888
892	893	897	898											

Area	Code	507												
281	282	284	285	286	287	288	289	356	365	367	533	545	597	753
755	775	867	876	932										

Area	Code	512												
220	2221	222	223	224	225	226	227	228	229	230	231	233	241	242
243	244	246	247	250	251	255	258	259	261	262	263	264	265	266
267	270	271	272	276	281	282	288	289	299	327	328	329	333	337
340	341	342	343	344	345	346	349	350	366	372	379	381	383	385
387	390	397	399	421	423	425	426	432	433	434	435	436	441	442
443	444	445	447	448	451	452	453	454	458	459	464	465	467	469
470	471	472	473	474	475	476	477	478	479	480	482	492	493	494
495	496	497	531	532	533	534	536	541	542	544	546	548	560	572
573	575	576	578	581	585	621	622	623	624	625	626	627	628	629
630	631	633	635	636	639	643	647	648	649	650	651	652	653	654
655	656	657	658	659	661	662	667	670	671	673	674	675	677	679
680	681	682	684	686	687	688	690	691	692	694	695	696	698	699
722	723	724	726	727	732	733	734	735	736	737	748	781	787	797
820	821	822	824	826	828	831	834	835	836	837	838	843	845	851
852	853	854	855	857	870	881	882	883	884	886	887	888	892	893
922	923	924	925	926	927	928	929	933	937	939	943	991	992	993

Area	Code	513												
220	2221	222	223	224	225	226	227	228	229	231	232	233	234	236
237	241	242	243	244	245	247	248	251	252	253	254	255	256	257
258	259	262	263	265	267	268	271	272	274	275	276	277	278	281
290	293	294	296	297	298	299	321	322	323	324	325	327	328	346
347	351	352	353	367	369	381	385	388	389	390	396	397	399	420
421	422	423	424	425	426	429	433	434	435	439	443	445	449	451
454	457	461	462	467	471	474	475	476	481	482	489	499	521	522
527	528	530	531	533	536	539	541	542	551	553	554	555	561	562
563	565	566	568	569	574	575	576	579	583	589	591	595	598	621

624	625	627	629	631	632	641	651	659	661	662	667	671	677	681
683	684	721	722	724	729	731	732	733	734	738	741	742	743	745
746	748	749	751	752	753	756	761	762	763	765	769	771	772	777
779	782	786	787	791	793	797	820	821	822	825	828	829	831	832
835	836	837	841	845	848	849	851	852	853	854	859	861	862	863
864	865	866	867	868	870	871	872	873	874	878	879	882	885	890
891	896	898	921	922	923	931	941	943	948	961	964	969	972	977
984	988													

Area Code 515

223	224	225	242	243	244	245	246	247	255	262	263	265	266	270
271	274	276	277	278	279	280	281	282	283	284	285	286	287	288
289	834	861	964	965	966	967	981	984	986	987	989	992	993	996
999														

Area Code 516 ****Entire Area Code Is Served****

Area Code 517

321	322	323	332	337	339	349	351	353	355	363	371	372	373	374
377	393	394	482	483	484	485	487	625	626	627	641	645	646	651
655	663	669	675	676	684	699	882	887						

Area Code 518

235	237	266	270	271	272	273	274	279	283	286	346	355	356	370
371	372	374	377	381	382	383	384	385	386	393	399	434	436	438
439	445	447	449	453	454	455	456	457	458	459	462	463	465	470
471	472	473	474	475	476	477	482	489	584	587	663	664	674	731
732	753	756	765	766	767	768	783	785	797	861	864	869	872	877
882	885	890	895	899										

Area Code 601

342	352	353	354	355	359	362	366	371	372	373	376	393	641	781
825	829	845	851	852	856	857	866	878	879	922	923	924	932	936
939	944	948	949	956	957	960	961	968	969	981	982	987	992	

Area Code 602

224	231	233	234	235	236	237	238	239	241	242	243	244	245	246
247	248	249	251	252	253	254	255	256	257	258	259	260	261	262
263	264	265	266	267	268	269	270	271	272	273	274	275	276	277
278	279	285	292	293	294	295	296	297	298	299	323	325	326	327
435	551	569	573	574	575	576	577	578	581	582	583	584	585	588
589	620	621	622	623	624	626	628	629	721	741	742	743	744	745
746	747	748	749	790	791	792	795	820	827	829	830	831	832	833
834	835	837	838	839	840	841	842	843	846	848	849	853	856	860
861	862	863	864	866	867	869	870	872	873	876	877	878	879	880
881	882	883	884	885	886	887	888	889	890	891	892	893	894	895
897	898	899	921	924	931	932	933	934	935	936	937	938	939	941
942	943	944	945	946	947	948	949	951	952	953	954	955	956	957
961	962	963	964	965	966	967	968	969	971	972	973	974	975	976
977	978	979	981	982	983	984	985	986	987	988	990	991	992	993
994	995	996	997	998										

Area Code 603

424	429	432	434	463	465	472	483	485	487	497	529	622	623	624
625	627	635	645	666	668	669	673	880	881	882	883	884	885	886
888	889	890	893	894	898	955								

Area Code 605

331	332	333	334	335	336	338	339	361	371	477	528	529	543	582
594	743	757												

Area	Code	606														
223	231	232	233	252	253	254	255	257	258	259	261	266	268	269		
272	273	276	277	278	283	291	292	293	299	331	334	341	342	344		
356	371	384	397	431	441	485	491	525	565	566	572	581	586	628		
635	689	727	781	846	858	873	885	887	936	939						

Area	Code	607														
648	655	669	692	722	723	724	729	748	751	752	754	755	757	770		
771	772	773	774	775	785	797	798	862	890							

Area	Code	608														
221	222	231	233	238	241	244	246	249	251	252	255	256	257	258		
262	263	264	266	267	271	273	274	275	283	291	424	437	455	592		
635	655	764	767	798	829	831	832	833	835	836	837	838	839	845		
846	849	873	936	993												

Area	Code	609														
234	235	259	266	275	292	298	338	340	342	344	345	347	348	354		
365	391	392	393	394	395	396	398	399	424	426	428	429	441	443		
448	452	456	466	482	484	487	488	541	546	547	573	581	585	586		
587	590	599	633	639	641	645	646	652	653	655	662	663	665	667		
683	695	734	737	742	755	757	771	772	778	779	786	795	799	822		
823	839	854	858	866	882	883	888	890	896	921	924	927	931	933		
936	939	962	963	964	966	976	984	987	989	999						

Area	Code	612														
221	222	224	225	226	227	228	291	292	293	296	297	298	330	331		
332	333	338	339	340	341	343	344	347	348	349	370	371	372	373		
374	375	376	377	378	379	420	421	422	423	424	425	426	427	428		
429	430	431	432	433	434	435	436	437	438	439	441	443	444	445		
446	447	448	450	451	452	454	455	456	457	458	459	460	461	462		
463	464	469	471	472	473	474	475	476	477	478	479	481	482	483		
484	487	488	489	492	497	498	520	521	522	529	533	534	535	536		
537	538	540	541	542	544	545	546	553	559	560	561	566	571	572		
574	588	620	622	623	631	633	635	636	638	641	642	644	645	646		
647	648	681	690	696	698	699	721	722	724	725	726	727	729	731		
733	735	736	738	739	742	753	755	757	770	771	772	774	776	777		
778	779	780	781	784	786	788	789	822	823	824	825	827	828	830		
831	835	851	853	854	858	861	866	869	870	871	872	874	881	884		
885	887	888	890	893	894	920	921	922	924	925	926	927	929	931		
932	933	934	935	936	937	938	941	944	989							

Area	Code	614														
221	222	223	224	225	227	228	229	231	235	236	237	238	239	251		
252	253	258	261	262	263	265	267	268	272	274	275	276	278	279		
281	291	294	297	299	421	422	424	431	436	438	443	444	445	451		
457	458	460	461	462	463	464	466	469	471	475	476	481	486	488		
491	492	497	548	764	766	771	821	833	836	837	846	855	860	861		
863	864	866	867	868	870	871	875	876	877	878	879	881	882	885		
886	888	889	890	891	894	895	927	965								

Area	Code	615														
226	227	228	236	238	242	244	248	251	254	255	256	259	262	265		
266	267	269	292	297	298	320	321	322	327	329	331	332	333	344		
352	353	356	360	361	366	367	373	377	383	385	386	396	521	522		
523	524	525	544	546	558	573	577	579	584	588	622	624	629	632		
637	642	646	656	673	687	688	689	690	691	693	694	697	698	737		
741	742	747	748	749	751	752	754	755	756	757	758	776	778	780		
782	790	791	793	794	799	821	822	824	825	832	833	834	842	843		
847	855	859	860	865	867	868	870	875	876	877	883	885	886	889		
892	894	899	922	933	938	945	947	966	971	974	992					

Area	Code	616														
241	242	243	245	246	247	281	323	327	329	342	343	344	345	349		
361	363	364	372	375	381	382	383	384	385	388	451	452	453	454		
455	456	457	458	459	530	531	532	534	538	623	624	626	628	629		
649	657	664	665	668	669	671	676	677	679	681	685	691	692	694		
698	731	746	770	774	784	791	837	866	868	874	877	878	887	891		
895	896	897	899	942	949	957										

Area	Code	617														
222	223	225	226	227	229	231	232	233	235	236	237	241	242	243		
244	245	247	247	250	251	252	253	254	256	258	259	262	265	266		
267	268	269	271	272	273	274	275	276	277	282	284	285	286	287		
288	289	292	296	298	321	322	323	324	325	326	327	328	329	331		
332	333	335	336	337	338	339	341	344	351	352	353	354	357	358		
361	363	365	366	367	368	369	370	371	376	379	381	383	387	389		
391	392	393	395	396	399	421	422	423	424	426	427	429	431	434		
436	437	438	442	444	445	449	451	452	453	454	458	459	461	463		
466	469	470	471	472	475	479	482	483	484	488	489	491	492	494		
495	497	498	522	523	524	527	536	542	547	552	556	557	559	569		
574	575	577	577	578	579	580	581	583	584	586	587	588	589	592		
593	594	595	596	598	599	620	623	625	628	633	636	637	638	641		
642	643	644	646	647	648	649	651	653	654	655	657	658	659	662		
663	664	665	666	667	669	671	672	673	674	675	676	678	679	681		
683	683	684	685	686	687	688	689	692	695	696	698	699	720	721		
722	723	725	726	727	729	731	732	734	735	738	739	740	742	743		
749	752	753	754	755	756	757	758	761	762	763	767	769	770	773		
776	781	782	783	785	786	787	788	791	792	793	794	798	799	821		
825	828	829	832	835	839	842	843	845	846	847	848	849	851	852		
853	855	856	858	860	861	862	863	864	865	868	869	870	872	875		
876	877	879	881	882	884	885	886	889	890	891	892	893	894	895		
899	923	924	925	926	929	931	933	935	936	937	938	942	944	955		
956	957	961	963	964	965	967	969	973	986	987	990	991	992	993		
994	995	996	997	998	999											

Area	Code	618			
271	274	337	451	452	797

Area	Code	619														
221	222	223	224	225	226	229	230	231	232	233	234	235	236	237		
238	239	260	262	263	264	265	266	267	268	270	271	272	273	274		
275	276	277	278	279	280	281	282	283	284	286	287	289	290	291		
292	293	294	295	296	297	298	299	320	321	323	324	325	327	328		
340	341	342	343	345	346	347	393	396	397	398	399	420	421	422		
423	424	425	426	427	428	429	430	433	434	435	436	437	438	439		
440	442	443	444	445	447	448	449	450	451	452	453	454	455	456		
457	458	459	460	461	462	463	464	465	466	469	470	471	474	475		
477	479	480	481	483	484	485	486	487	488	489	507	514	516	561		
562	563	564	565	566	568	569	570	571	573	574	575	576	578	579		
580	582	583	584	586	588	589	601	690	691	692	693	695	696	697		
698	699	701	702	717	721	722	724	725	726	727	729	741	742	743		
744	745	746	747	748	749	753	755	756	757	758	789	940	941	942		

Area	Code	702														
246	293	294	295	321	322	323	329	331	342	343	345	348	355	356		
358	359	361	362	363	367	368	369	381	382	383	384	385	386	387		
389	399	451	452	453	454	456	457	458	459	475	476	504	565	566		
634	642	643	644	645	646	647	648	649	673	677	731	732	733	734		
735	736	737	739	747	784	785	786	787	788	789	793	796	799	825		
826	827	829	831	832	833	844	847	849	851	852	853	870	871	873		
876	877	878	882	883	884	885	887	926	928	971	972					

Area	Code	703
222	235	241
284	235	243
356	360	323
435	442	325
527	542	370
61	633	450
684	690	455
781	790	534
890	893	578
977	979	591
		698
		750
		830
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		947
		954
		960
		968
		971
		974

Area	Code	704
331	334	334
376	377	335
537	541	336
598	621	364
	625	365
	627	366
	840	370
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684	685	686	687	688	689	707	708	710	712	720	730	731	732	738
739	740	742	750	751	752	754	756	758	759	760	761	768	770	771
772	773	774	775	776	777	778	779	780	781	783	784	785	786	787
788	790	792	793	794	795	796	797	798	820	821	822	823	824	825
826	827	828	829	830	831	832	833	834	835	836	837	838	839	840
841	842	846	847	848	850	851	852	855	856	857	859	861	863	865
870	871	874	875	877	879	880	881	882	883	884	885	886	887	888
889	891	892	893	894	895	896	897	898	899	921	937	946	947	951
952	953	954	955	956	957	960	961	962	963	964	966	968	969	970
971	972	973	974	975	977	978	979	980	981	982	983	984	985	986
987	988	989	990	991	992	993	994	995	996	997	998	999		

Area Code 716

222	223	225	232	235	236	238	244	247	248	254	258	262	263
265	266	271	275	278	283	286	288	293	297	323	325	328	334
337	338	342	352	359	377	381	385	392	398	422	423	424	425
426	427	428	433	434	436	439	442	454	458	461	464	467	473
475	477	482	494	496	533	537	538	542	544	549	582	586	588
592	594	621	624	625	626	627	631	632	633	634	635	636	644
647	648	649	652	654	655	656	662	663	668	671	674	675	683
684	685	686	687	688	689	690	691	692	693	694	695	696	722
726	731	741	745	751	754	759	773	791	821	822	823	824	825
827	828	831	832	833	834	835	836	837	838	839	842	843	845
847	849	852	853	854	855	856	862	865	872	873	874	875	876
878	879	881	882	883	884	885	886	887	889	890	891	892	893
895	896	897	898	921	924	937	941	947	955	964	974	976	987

Area Code 717

225	226	234	236	238	244	246	252	255	266	283	284	285	287
288	291	292	295	299	333	342	343	344	347	348	354	378	383
392	393	394	397	457	464	469	472	474	489	533	534	545	560
561	562	563	564	566	569	586	587	599	626	627	639	652	654
655	656	657	663	664	665	675	678	687	689	691	693	696	698
732	735	736	737	741	755	757	761	763	764	766	767	768	771
779	780	782	783	786	787	790	792	822	823	824	825	826	842
843	845	846	848	854	868	872	876	896	898	921	938	939	945
948	957	961	969	975	986								

Area Code 801

224	225	226	227	237	250	254	255	261	262	263	264	265	266	268
272	277	278	292	295	298	299	321	322	328	350	355	359	363	364
366	373	374	375	377	378	379	392	393	394	399	423	451	465	466
467	479	482	483	484	485	486	487	489	521	522	524	526	530	531
532	533	534	535	536	537	538	539	544	546	551	561	562	566	569
571	572	581	582	583	584	585	621	625	626	627	731	754	756	
768	773	776	777	782	785	798	825	942	943	964	965	966	967	968
969	972	973	974	975										

Area Code 803

232	233	235	239	242	243	244	246	252	254	256	268	269	271	277
281	282	288	292	294	295	297	298	299	345	353	355	356	359	433
439	461	463	472	474	476	552	553	554	556	559	571	572	573	574
576	577	578	579	582	583	585	586	592	596	722	723	724	731	732
733	735	736	738	742	743	744	745	747	748	751	754	755	758	762
763	764	765	766	767	768	771	772	776	777	779	781	782	783	786
787	788	791	792	794	795	796	797	798	799	831	834	836	845	855
859	862	871	873	875	877	879	881	883	884	886	889	895	945	963
967														

Area Code 804

222	225	226	230	231	232	233	237	244	245	247	254	257	261	262
264	266	268	270	271	272	274	275	276	281	282	284	285	286	288
289	293	295	296	320	321	323	328	329	340	343	344	345	346	353

355	356	359	363	379	380	393	396	397	398	399	420	421	422	423
424	425	426	427	428	433	440	441	444	445	446	455	460	461	463
464	465	466	467	468	480	481	482	483	484	485	486	487	488	489
490	494	495	496	497	499	533	543	545	547	583	587	588	592	595
596	599	622	623	624	625	627	628	629	643	644	648	649	666	667
686	721	722	723	727	728	730	737	739	740	741	743	744	745	746
747	748	749	752	764	771	772	775	780	781	782	784	786	788	790
794	795	796	798	823	825	826	827	838	840	850	851	853	855	857
858	865	867	868	872	874	877	878	887	888	898	924	954	971	973
977	978	979												

Area Code 805

213	322	323	324	325	326	327	329	366	373	388	392	393	395	397
398	399	482	483	484	485	486	487	488	492	493	494	495	496	497
498	499	522	523	525	526	527	529	581	583	584	589	629	642	643
644	647	648	649	652	653	654	656	658	659	831	832	833	834	835
842	845	854	858	861	871	872	933	982	983	984	985	986	987	

Area Code 806

320	335	352	353	355	358	359	372	373	374	376	378	381	383	622
655	656	741	742	743	744	745	746	747	762	763	765	792	793	794
795	796	797	799	828	829	832	842	863	866	873	885	892		

Area Code 808

235	237	239	247	254	257	259	261	262	263	293	373	377	395	396
422	423	433	438	449	455	456	471	474	477	486	487	488	499	521
523	524	525	526	527	528	531	533	536	537	538	543	544	545	546
547	548	555	621	622	623	624	625	637	638	653	655	668	671	672
676	677	681	682	684	687	689	695	696	732	734	735	737	833	834
836	839	841	842	845	847	848	922	923	926	941	942	943	944	945
946	947	948	949	955	988									

Area Code 812

246	256	262	283	284	288	332	333	334	335	336	337	339	422	423
424	425	426	428	429	451	464	473	474	476	477	479	556	637	775
776	824	825	837	838	853	858	867	872	876	892	897	923	925	944
945	948	949	963	983	985	988								

Area Code 813

221	223	224	225	226	227	228	229	231	232	234	236	237	238	239
241	242	247	248	251	253	254	256	257	258	259	272	273	621	622
623	626	634	645	650	659	677	681	684	685	689	830	831	832	833
834	835	837	839	840	855	870	871	872	873	875	876	877	879	883
884	885	886	887	920	932	933	935	949	961	962	963	969	971	972
973	974	977	985	986	988	989	990	996						

Area Code 814

451	452	453	454	455	456	459	474	476	684	695	696	725	732	734
739	742	774	796	825	833	838	864	866	868	871	875	886	898	899
942	943	944	946	949										

Area Code 815

226	229	234	282	332	335	344	385	389	397	398	399	436	439	455
459	469	478	485	489	544	547	623	624	629	633	645	654	722	723
725	726	727	729	740	741	744	765	773	774	834	838	874	877	885
886	962	963	964	965	966	968	967							

Area Code 816

221	224	228	229	231	232	233	234	238	241	242	243	245	251	252
253	254	257	271	274	275	276	279	283	322	331	333	346	348	353

356	358	361	363	364	373	374	391	421	436	444	452	453	454	455
459	461	464	468	471	474	478	483	523	524	525	531	532	537	556
561	576	578	587	667	685	688	734	737	741	753	756	757	761	763
765	781	792	795	796	833	836	842	844	861	881	891	921	923	924
926	931	932	941	942	966	968	995	997						

Area Code 817														
232	236	237	244	246	249	261	265	267	268	273	274	275	277	280
281	282	283	284	292	293	294	295	297	322	325	328	332	334	335
336	338	346	355	356	379	382	383	387	390	429	430	431	439	441
443	444	447	448	451	452	456	457	460	461	465	467	469	473	477
478	481	483	485	488	489	491	493	496	498	499	523	524	525	528
529	531	534	535	536	538	540	541	544	551	560	565	566	569	571
572	574	577	586	588	589	592	594	595	599	624	625	626	633	640
649	654	656	662	666	679	682	691	692	696	723	731	732	735	737
738	752	753	754	755	756	757	761	763	766	767	771	772	773	774
776	777	778	780	787	788	792	794	795	799	822	826	829	831	834
836	838	840	844	848	851	853	855	857	859	860	863	870	875	876
877	881	921	923	924	926	927	930	938	939	982	983	984	985	986

Area Code 818 ****Entire Area Code Is Served****

Area Code 901														
272	274	276	278	320	323	324	327	332	345	346	348	353	357	358
362	363	365	369	372	377	382	386	388	396	398	452	454	458	521
522	523	524	525	526	527	528	529	535	577	578	682	683	685	721
722	725	726	728	729	743	744	745	754	755	756	761	762	765	766
767	774	775	785	789	794	795	797	829	853	867	872	873	876	922
942	946	947	948											

Area Code 904														
241	246	249	251	262	264	266	268	269	272	282	285	289	350	353
354	355	356	358	359	364	387	388	389	390	393	396	398	399	432
433	434	436	438	452	453	455	456	474	476	477	478	492	632	633
634	636	641	642	646	721	723	724	725	731	733	737	739	743	744
751	757	764	765	766	768	771	772	777	778	781	783	786	791	798
932	944	968	994											

Area Code 912														
431	432	435	436	439	474	477	734	741	742	743	744	745	746	759
776	781	784	787	788	792	883	888	922	923	926	929	932	935	953
956	986													

Area Code 913														
232	233	234	235	236	262	266	267	268	272	273	281	286	287	288
289	295	296	299	321	334	341	342	354	357	362	365	371	375	379
381	383	384	422	432	441	478	492	541	564	573	574	576	582	588
596	621	631	642	648	649	661	663	671	676	677	681	685	721	722
724	761	764	775	782	768	791	829	831	862	887	888	894	897	967

Area Code 914														
235	237	251	253	273	278	279	285	321	328	332	335	337	345	347
354	362	375	381	390	391	423	426	472	476	478	576	591	592	631
632	633	636	642	664	667	668	681	682	683	684	686	693	694	696
697	698	699	723	725	738	747	761	764	765	769	776	779	789	793
833	834	835	890	899	934	937	939	946	948	949	961	963	964	965
967	968	969	976	997										

Area	Code	915														
332	333	334	335	337	362	366	367	368	381	385	465	468	469	529		
532	533	537	541	542	543	544	545	546	548	561	562	563	564	565		
566	568	569	581	584	591	592	593	594	598	653	655	657	658	672		
673	675	676	677	682	683	684	685	686	687	688	689	691	692	694		
695	696	697	698	699	747	751	755	757	772	775	778	779	821	833		
851	852	855	858	859	860	877	886	942	944	949						

Area	Code	916														
322	323	324	325	328	329	331	332	334	338	344	351	355	361	362		
363	364	366	369	371	372	381	383	386	388	391	392	393	395	421		
422	423	424	427	428	440	441	442	443	444	445	446	447	448	449		
451	452	453	454	455	456	457	481	482	483	484	485	486	487	488		
489	635	636	638	641	642	648	665	682	685	687	689	722	723	725		
726	728	731	736	739	766	771	781	782	783	786	791	797	920	921		
922	924	925	927	929	933	944	961	962	965	966	967	969	971	972		
973	985	988	989	991												

Area	Code	918														
224	227	234	241	245	250	251	252	254	258	266	272	288	299	366		
369	425	428	437	438	445	446	451	455	460	477	481	492	493	494		
495	496	560	561	581	582	583	584	585	586	587	588	592	599	622		
627	628	660	663	664	665	742	743	744	745	747	749	831	832	834		
835	836	838														

Area	Code	919														
248	266	269	271	272	273	274	275	279	282	286	288	292	294	299		
362	365	370	373	375	377	378	379	383	429	431	434	454	467	469		
471	472	475	476	477	489	493	528	541	543	544	549	552	553	556		
575	595	596	598	621	622	639	643	656	668	674	680	681	682	683		
684	685	688	697	698	721	722	723	724	725	727	730	733	737	744		
748	750	755	760	761	764	765	766	767	768	769	770	772	773	777		
779	781	782	784	785	787	788	821	828	829	832	833	834	836	839		
847	848	851	852	854	855	859	860	869	872	876	878	882	883	884		
885	886	887	888	889	890	922	924	945	969	983	993	994	996	998		

APPENDIX E
AT&T, MCI, AND GTE SPRINT TARIFF RATES

Tariff rates for AT&T MTS (current and proposed), MCI Execunet, and GTE Sprint's SPRINT appear first in this appendix followed by the tariff rates for AT&T WATS (current and proposed), MCI WATS, and Direct Sprint. Methods of applying the tariffs are described below.

AT&T MTS, MCI Execunet, and SPRINT

AT&T MTS and SPRINT charges are based on a rate for the first minute plus a rate for additional minutes in each rate period, while MCI Execunet has a single rate for all minutes in a rate period. All of these services round up the duration of the call to the next higher minute--they bill in one minute increments. AT&T MTS costs are calculated at the day rate, regardless of rate period, then discounted according to the rate period in which the call was made. (The discounts are 40 percent for the Evening rate period and 60 percent for the Night and Weekend rate period. A 55 percent discount is applied to calls to Alaska and Hawaii during the Night and Weekend rate period under the current tariff.) SPRINT service is discounted based upon total dollar amount of the bill. (See the SPRINT rate table below.) MCI Execunet has separate rates for calls to network and non-network cities. Tenths of a cent are truncated from the costs calculated for each AT&T MTS call and are rounded for each MCI Execunet and SPRINT call.

AT&T WATS, MCI WATS, and Direct Sprint

AT&T WATS measures the duration of a call in one second increments, MCI WATS uses thirty second increments, and Direct Sprint uses six second increments. All three of

these services have a one minute minimum average time requirement. Also, all three have the same points at which the rates taper; 15, 40, and 80 hours (or equivalent minutes). Costs are calculated based on average use per line per rate period. In other words, the total usage in each rate period for all lines (WATS lines or DALS) is divided by the number of lines to obtain an average use per line per rate period. (AT&T WATS rounds this average to the nearest tenth of an hour.) MCI WATS and Direct Sprint also calculate the average for calls to network and non-network cities. (See rate tables below.) The average use per line per rate period and the per line monthly recurring charges are used to calculate the cost per line. The cost per line is multiplied by the total number of lines to obtain the total cost. An example follows:

Two AT&T WATS lines (Service Area 6) are used as follows during a one month period:

Rate Period	Hours
Business Day	100
Evening	40.45
Night and Weekend	10

The average use per line per rate period is:

Rate Period	Hours
Business Day	100 / 2 = 50
Evening	40.45 / 2 = 20.225 (rounded to the nearest tenth of an hour = 20.2)
Night and Weekend	10 / 2 = 5

The cost per line per rate period (assuming rate step 20 for Service Area 6 calling from California for AT&T WATS (current rates)) is:

Business Day Rate Period (50 hours total per line average)

15 hours	X	\$25.62	=	\$387.30
25 hours	X	\$22.98	=	\$574.50
10 hours	X	\$21.03	=	\$210.30
Total				\$1172.10

Evening Rate Period (20.2 hours total per line average)

15	hours	X	\$16.78	=	\$251.70
5.2	hours	X	\$14.94	=	\$ 77.69
Total					\$329.39

Night and Weekend Rate Period (5 hours total per line average)

5 hours X 9.04 = \$ 45.20

Total cost per line:

Business Day Rate Period	\$1172.10
Evening Rate Period	\$ 329.39
Night and Weekend Rate Period	\$ 45.20
Per line Monthly Recurring Charges	\$ 31.65
Total Cost per line	\$1578.34

Total cost:

\$1578.34 per line X 2 lines = \$3156.68

The process is the same for MCI WATS and Direct Sprint except the average use per line per rate period is not rounded.

AT&T MTS (Current Tariff Rates)

Intra-Mainland

Per Minute Charges

-----Approximations-----

Miles	Day		Evening		Night and Weekend (60% discount)	
	1st min	Add. min	1st min	Add. min	1st min	Add. min
1-10	.32	.16	.192	.096	.128	.064
11-22	.40	.28	.240	.132	.160	.088
23-55	.48	.37	.288	.168	.192	.112
56-124	.57	.39	.342	.222	.228	.148
125-292	.58	.42	.348	.234	.232	.156
293-430	.59	.43	.354	.252	.236	.168
431-925	.62	.44	.372	.258	.248	.172
926-1910	.64	.49	.384	.264	.256	.176
1911-3000	.74	.51	.444	.294	.296	.196
3001-4250	.76	.53	.456	.306	.304	.204
4251-5750	.79		.474	.318	.316	.212

American Telephone and Telegraph Co. Tariff FCC No. 263, p 19, 1 Feb 1984.

AT&T NTS (Current Tariff Rates) (Continued)

Mainland-Alaska

Per Minute Charges

-----Approximations-----

Miles	Day		Evening		Night and Weekend	
	1st min	Add. min	1st min	Add. min	(55% discount) 1st min	Add. min
431-925	.62	.43	.372	.258	.279	.194
926-1910	.64	.46	.384	.276	.288	.207
1911-3000	.74	.54	.444	.324	.333	.243
3001-4250	.79	.62	.474	.372	.356	.279
4251-5750	.87	.70	.522	.420	.392	.315

American Telephone and Telegraph Co. Tariff FCC No. 263, p 20.1, 1 Feb 1984.

AT&T NIS (Current Tariff Rates) (Continued)

Mainland-Hawaii

Per Minute Charges

-----Approximations-----

Band	Day	Evening		Night and Weekend	
		1st min	Add. min	(40% discount) 1st min	Add. min
1*		.74	.49	.444	.294
2**		.76	.53	.456	.306
3***		.79	.55	.474	.318
					(55% discount) 1st min
					.333
					.342
					.356
					.221
					.239
					.248

*Band 1: Arizona, California, Idaho, Nevada, Oregon, Utah, and Washington.

**Band 2: Arkansas, Colorado, Illinois, Iowa, Kansas, Louisiana, Minnesota, Missouri, Montana, Nebraska, New Mexico, North Dakota, Oklahoma, South Dakota, Texas, Wisconsin, and Wyoming.

***Band 3: Alabama, Connecticut, Delaware, District of Columbia, Florida, Georgia, Indiana, Kentucky, Maine, Maryland, Massachusetts, Michigan, Mississippi, New Hampshire, New Jersey, New York, North Carolina, Ohio, Pennsylvania, Rhode Island, South Carolina, Tennessee, Vermont, Virginia, and West Virginia.

American Telephone and Telegraph Co. Tariff FCC No. 263, p 20.2, 1 Feb 1984.

AT&T MTS (Proposed Tariff Rates)
Intra-Mainland and Mainland-Alaska

Per Minute Charges

-----Approximations-----

Miles	Day		Evening		Night and Weekend	
	1st min	Add. min	1st min	Add. min	1st min	Add. min
1-10	.31	.16	.186	.096	.124	.064
11-22	.39	.22	.234	.132	.156	.088
23-55	.47	.28	.282	.168	.188	.112
56-124	.56	.32	.336	.192	.224	.128
125-292	.57	.34	.342	.204	.228	.136
293-430	.58	.35	.348	.210	.232	.140
431-925	.61	.35	.366	.210	.244	.140
926-1910	.63	.38	.378	.228	.252	.152
1911-3000	.73	.43	.438	.258	.292	.172
3001-4250	.75	.45	.450	.270	.300	.180
4251-5750	.78	.47	.468	.282	.312	.188

AT&T Communications Tariff FCC No. 1, p 56, Issued 3 Oct 1983 to be effective 1 Jan 1984, but postponed indefinitely.

A16T HTS (Proposed Tariff Rates) (Continued)

Mainland-Hawaii

Per Minute Charges

Band	Day		Evening		Night and Weekend	
			(40% discount)	(60% discount)	(60% discount)	
	1st min	Add. min	1st min	Add. min	1st min	Add. min
1*	.73	.43	.438	.258	.292	.172
2**	.75	.45	.450	.270	.300	.180
3***	.78	.47	.468	.282	.312	.188

-----Approximations-----

*Band 1: Arizona, California, Idaho, Nevada, Oregon, Utah, and Washington.

**Band 2: Arkansas, Colorado, Illinois, Iowa, Kansas, Louisiana, Minnesota, Missouri, Montana, Nebraska, New Mexico, North Dakota, Oklahoma, South Dakota, Texas, Wisconsin, and Wyoming.

***Band 3: Alabama, Connecticut, Delaware, District of Columbia, Florida, Georgia, Indiana, Kentucky, Maine, Maryland, Massachusetts, Michigan, Mississippi, New Hampshire, New Jersey, New York, North Carolina, Ohio, Pennsylvania, Rhode Island, South Carolina, Tennessee, Vermont, Virginia, and West Virginia.

A16T Communications Tariff FCC No. 1, p 59, Issued 3 Oct 1983 to be effective 1 Jan 1984, but postponed indefinitely.

MCI Executnet

Tier 1 (To Network Cities)

Per Minute Charges

Miles	Day	Evening	Night and Weekend
1-10	1536	0922	0614
11-22	2100	1260	0840
23-55	2700	1319	1080
56-70	3280	1463	1137
71-124	3280	1536	1194
125-292	3424	1614	1255
293-430	3632	1728	1344
431-925	3744	1774	1379
926-1910	3840	1816	1412
1911-3000	4320	2029	1579

Tier 2 (To Non-network Cities)

1-10	1536	0922	0614
11-22	2100	1260	0840
23-55	2700	1620	1080
56-70	3600	2160	1440
71-124	3600	2160	1440
125-292	3800	2280	1520
293-430	4100	2460	1640
431-925	4200	2520	1680
926-1910	4300	2580	1720
1911-3000	4800	2880	1920

MCI Telecommunications Corporation Tariff FCC No. 1, p 19 , 1 Apr 1983.

SPRINT

Per Minute Charges

Miles	Day		Evening		Night and Weekend	
	1st min	Add. min	1st min	Add. min	1st min	Add. min
1-10	.22	.155	.13	.0922	.06	.0599
11-22	.29	.216	.17	.1260	.08	.0799
23-55	.36	.276	.20	.1490	.14	.1080
56-70	.44	.336	.27	.1998	.18	.1299
71-122	.44	.336	.27	.1998	.18	.1299
123-292	.46	.352	.29	.2150	.19	.1440
293-430	.48	.369	.31	.2240	.20	.1530
431-925	.52	.382	.32	.2330	.21	.1550
926-1910	.53	.392	.33	.2390	.22	.1580
1911-3000	.61	.444	.35	.2592	.24	.1728
3001-4250	.63	.464	.36	.2804	.25	.1869
4251-5750	.65	.484	.38	.2910	.26	.1940

For Calls Originating from Hawaii

1911-3000	.41	.410	.2649	.2649	.1766	.1766
3001-4250	.44	.440	.2843	.2843	.1895	.1895
4251-5750	.47	.470	.2974	.2974	.1983	.1983

Usage Discounts

Total Usage

Rate Period	\$25-\$74.99	\$75-\$199.99	\$200 and Over
Day	2%	5%	8%
Evening	7%	8%	10%
Night and Weekend	8%	10%	12%

GTE Sprint Communications Corporation Tariff FCC No. 11, P 34, 5 Jan 1984.

SPRINT (Continued)

Approximations For Over \$200 Usage Per Month
Per Minute Charges

Miles	Day		Evening		Night and Weekend	
	1st min	Add. min	1st min	Add. min	1st min	Add. min
1-10	.2024	.1426	.1170	.0830	.0528	.0527
11-22	.2668	.1987	.1530	.1134	.0704	.0703
23-55	.3112	.2539	.1800	.1341	.1232	.0950
56-70	.4048	.3091	.2430	.1798	.1584	.1143
71-124	.4048	.3091	.2430	.1798	.1584	.1143
125-292	.4232	.3238	.2610	.1935	.1672	.1267
293-430	.4416	.3395	.2790	.2016	.1760	.1346
431-925	.4784	.3514	.2880	.2097	.1848	.1390
926-1910	.4876	.3606	.2970	.2151	.1936	.1521
1911-3000	.5612	.4085	.3150	.2333	.2112	.1645
3001-4250	.5796	.4269	.3240	.2524	.2200	.1707
4251-5750	.5580	.4453	.3420	.2619	.2288	
1911-3000	.3772	.3772	.2384	.2384	.1554	.1554
3001-4250	.4048	.4048	.2559	.2559	.1668	.1668
4251-5750	.4324	.4324	.2677	.2677	.1745	.1745

For Calls Originating from Hawaii

GTE Sprint Communications Corporation Tariff FCC No. 11, P 38, 5 Jan 1984.

AT&T WATS (Current Tariff Rates) (Service Areas 5 and 6)

Per Hour Charges

Rate Step	First Day	15 Hours Eve.	Next 25 Hours Day	Hours Eve.	Next 40 Hours Day	Hours Eve.	Over 80 Hours Day	Hours Eve.	All Hours Night and Weekend
14	21.73	14.13	19.34	12.58	16.96	11.02	14.34	9.33	7.55
15	21.95	14.27	19.56	12.71	17.13	11.15	14.49	9.42	7.63
16	22.21	14.44	19.77	12.85	17.32	11.26	14.66	9.53	7.71
17	22.46	14.59	19.99	13.00	17.52	11.39	14.82	9.64	7.80
18	22.90	14.89	20.37	13.24	17.86	11.61	15.10	9.82	7.96
19	23.96	15.57	21.32	13.86	18.69	12.15	15.81	10.28	8.39
20	25.82	16.78	22.96	14.94	20.14	13.09	17.04	11.08	9.04
21	26.96	17.52	23.99	15.59	21.03	13.67	17.79	11.56	9.44
22	29.04	18.88	25.85	16.80	22.65	14.72	19.17	12.46	10.16

(Per Minute Approximations For Rate Step 20)

.4303	.2797	.3830	.2490	.3357	.2182	.2840	.1847	.1507
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Rate Step Table

[In the form: State(Rate step for Service Area 5, Rate Step for Service Area 6)]

Alabama (17, 22), Arizona (18, 20), Arkansas (15, 21), California (18, 20), Colorado (16, 21), Connecticut (18, 22), Delaware (18, 22), District of Columbia (18, 22), Florida (18, 22), Georgia (18, 22), Idaho (18, 19), Illinois (15, 21), Indiana (16, 21), Iowa (14, 21), Kansas (14, 21), Kentucky (17, 22), Louisiana (16, 21), Maine (18, 22), Maryland (18, 22), Massachusetts (18, 22), Michigan (17, 21), Minnesota (15, 21), Mississippi (16, 22), Missouri (15, 21), Montana (17, 20), Nebraska (14, 21), Nevada (18, 20), New Hampshire (18, 22), New Jersey (18, 22), New Mexico (17, 21), New York (18, 22), North Carolina (18, 22), North Dakota (15, 21), Ohio (17, 22), Oklahoma (15, 2), Oregon (18, 19), Pennsylvania (18, 22), Rhode Island (18, 22), South Carolina (18, 22), South Dakota (15, 21), Tennessee (17, 22), Texas (16, 21), Utah (18, 20), Vermont (18, 22), Virginia (18, 22), Washington (18, 19), West Virginia (18, 22), Wisconsin (16, 21), Wyoming (16, 21).

Based on average use per line per rate period and rounded to the nearest tenth of an hour.

American Telephone and Telegraph Co. Tariff FCC No. 259, pp 13-14.1, 1 Jan 1984.

AT&T WATS (Proposed Tariff Rates) (Service Areas 5 and 6) *

Per Hour Charges

Rate Step	First 15 Hours Day	Next 25 Hours Day	Next 40 Hours Day	Over 80 Hours Day	All Hours Night and Weekend
14	15.40	17.27	15.15	12.81	6.74
15	15.60	17.47	15.30	12.94	6.81
16	19.83	17.65	15.47	13.09	6.89
17	20.06	17.85	15.65	13.23	6.97
18	20.45	18.19	15.95	13.48	7.11

(Per Minute Approximations For Rate Step 18)

.3408 .2217 .3032 .1970 .2658 .1728 .2247 .1462 .1185

Rate Step 14 - Iowa, Kansas, Nebraska

Rate Step 15 - Arkansas, Illinois, Minnesota, Missouri, North Dakota, Oklahoma, South Dakota

Rate Step 16 - Colorado, Indiana, Louisiana, Mississippi, Texas, Wisconsin, Wyoming

Rate Step 17 - Alabama, Kentucky, Michigan, Montana, New Mexico, Ohio, Tennessee

Rate Step 18 - Arizona, California, Connecticut, Delaware, District of Columbia, Florida, Georgia, Idaho, Maine, Maryland, Massachusetts, Nevada, New Hampshire, New Jersey, New York, North Carolina, Oregon, Pennsylvania, Rhode Island, South Carolina, Utah, Vermont, Virginia, Washington, West Virginia

*Service areas 5 and 6 have the same rates.

Based on average use per line per rate period and rounded to the nearest tenth of an hour.

AT&T Communications Tariff FCC No. 2, pp 74-75, Issued 3 Oct 1983 to be effective 1 Jan 1984, but postponed indefinitely.

MCI Network Service with Universal Termination (MCI NATS) *

Tier 1 (To Network Cities)

Per Minute Charges				
0-900 min (First 15 Hours) Day	900.5-2400 min (Next 25 Hours) Day	2400.5-4800 min (Next 40 Hours) Day	Over 4800 min (Over 80 Hours) Day	All minutes ***** Night and Weekend
Evening	Evening	Evening	Evening	
-----	-----	-----	-----	-----
.2721	.1767	.2420	.1572	.2120
			.1378	.1795
				.1166
				.1000

Tier 2 (To Non-Network Cities)

All Minutes		
Day	Evening	Night and Weekend
-----	-----	-----
.340	.248	.152

*MCI Network Service (without Universal Termination) is billed at Tier 1 Rates.
Based on average use per line per rate period.
MCI Telecommunications Corporation Tariff FCC No. 1, pp 19.6-19.7, 1 Apr 1983.

Direct Sprint

To Network Cities

Per Minute Charges

0-900 min (First 15 Hours) Day Evening	901-2400 min (Next 25 Hours) Day Evening	2401-4800 min (Next 40 Hours) Day Evening	Over 4800 min (Over 80 Hours) Day Evening	All minutes ***** Night and Weekend
.257	.187	.257	.165	.222
			.145	.194
				.123
				.108

Based on average use per line per rate period.

GTE Sprint Communications Corporation Tariff FCC No. 10, p 42, 5 Jan 1984.

Direct Sprint (Continued)

To Non-Network Cities*

Per Minute Charges				
0-900 min (First 15 Hours) Day Evening	901-2400 min (Next 25 Hours) Day Evening	2401-4800 min (Next 40 Hours) Day Evening	Over 4800 min (Over 80 Hours) Day Evening	All minutes ***** Night and Weekend
.3658 .2378	.3260 .2118	.2855 .1858	.2415 .1570	.1271

*Applicable to calls originated from:
 Atlanta, GA
 Chicago, IL
 Cincinnati, OH
 Cleveland, OH
 Dallas, TX
 Denver, CO
 Detroit, MI
 Houston, TX
 Milwaukee, WI
 New Orleans, LA

Based on average use per line per rate period.

GTE Sprint Communications Corporation Tariff FCC No. 10, p 42, 5 Jan 1984.

Direct Sprint (Continued)

To Non-Network Cities**

Per Minute Charges

0-900 min (First 15 Hours) Day Evening	901-2400 min (Next 25 Hours) Day Evening	2401-4800 min (Next 40 Hours) Day Evening	Over 4800 min (Over 80 Hours) Day Evening	All minutes ***** Night and Weekend
.3816 .2481	.3395 .2206	.2976 .1935	.2516 .1636	.1326

**Applicable to calls originated from:

Baltimore, MD	Philadelphia, PA
Boston, MA	Phoenix, AZ
Buffalo, NY	Rochester, NY
Charlotte, NC	San Francisco, CA
Los Angeles, CA	San Jose, CA
Miami, FL	Seattle, WA
New York, NY	Washington, DC
Orangeville, NY	

Based on average use per line per rate period.

GTE Sprint Communications Corporation Tariff FCC No. 10, P 43, 5 Jan 1984.

Direct Sprint (Continued)

Calls To Alaska and To and From Hawaii (except Honolulu)

Per Minute Charges							
Miles	0-900 min (First 15 Hours)		901-2400 min (Next 25 Hours)		2401-4800 min (Next 40 Hours)		Over 4800 min (Over 80 Hours)
	Day	Evening	Day	Evening	Day	Evening	
431-925	.3993	.2595	.3553	.2310	.3115	.2025	.2635
926-3000	.4303	.2797	.3830	.2490	.3357	.2182	.2840
3001-4250	.4493	.2920	.3998	.2598	.3505	.2278	.2965
4251-5750	.4840	.3147	.4308	.2800	.3775	.2453	.3195

		Miles	All minutes Night and Weekend				

		431-925	.1398				
		926-3000	.1507				
		3001-4250	.1573				
		4251-5750	.1693				

APPENDIX F
ERLANG B TABLES

Erlangs	Grade of Service	No. of Trunks	Erlangs	Grade of Service	No. of Trunks
0.20	0.167	1	2.00	0.400	2
0.20	0.016	2	2.00	0.211	3
0.20	0.001	3	2.00	0.095	4
			2.00	0.037	5
0.40	0.286	1	2.00	0.012	6
0.40	0.054	2	2.00	0.003	7
0.40	0.007	3			
0.60	0.375	1	2.20	0.431	2
0.60	0.101	2	2.20	0.240	3
0.60	0.020	3	2.20	0.117	4
0.60	0.003	4	2.20	0.049	5
			2.20	0.018	6
0.80	0.444	1	2.20	0.005	7
0.80	0.151	2	2.20	0.002	8
0.80	0.039	3			
0.80	0.008	4	2.40	0.459	2
0.80	0.001	5	2.40	0.268	3
			2.40	0.139	4
1.00	0.500	1	2.40	0.062	5
1.00	0.200	2	2.40	0.024	6
1.00	0.063	3	2.40	0.008	7
1.00	0.015	4	2.40	0.002	8
1.00	0.003	5			
1.20	0.545	1	2.60	0.484	2
1.20	0.247	2	2.60	0.296	3
1.20	0.090	3	2.60	0.161	4
1.20	0.026	4	2.60	0.077	5
1.20	0.006	5	2.60	0.032	6
1.20	0.001	6	2.60	0.012	7
			2.60	0.004	8
			2.60	0.001	9
1.40	0.583	1			
1.40	0.290	2	2.80	0.508	2
1.40	0.119	3	2.80	0.322	3
1.40	0.040	4	2.80	0.184	4
1.40	0.011	5	2.80	0.093	5
1.40	0.003	6	2.80	0.042	6
			2.80	0.016	7
1.60	0.330	2	2.80	0.006	8
1.60	0.150	3	2.80	0.002	9
1.60	0.056	4			
1.60	0.018	5	3.00	0.529	2
1.60	0.005	6	3.00	0.346	3
1.60	0.001	7	3.00	0.206	4
			3.00	0.110	5
1.80	0.367	2	3.00	0.052	6
1.80	0.180	3	3.00	0.022	7
1.80	0.075	4	3.00	0.008	8
1.80	0.026	5	3.00	0.003	9
1.80	0.008	6			
1.80	0.002	7			

Erlangs	Grade of Service	No. of Trunks	Erlangs	Grade of Service	No. of Trunks
3.200	0.549	2	5.00	0.530	3
3.200	0.369	3	5.00	0.398	4
3.200	0.228	4	5.00	0.285	5
3.200	0.127	5	5.00	0.192	6
3.200	0.064	6	5.00	0.121	7
3.200	0.028	7	5.00	0.070	8
3.200	0.011	8	5.00	0.037	9
3.200	0.004	9	5.00	0.018	10
3.200	0.001	10	5.00	0.008	11
			5.00	0.003	12
			5.00	0.001	13
3.400	0.568	2	5.50	0.562	3
3.400	0.392	3	5.50	0.436	4
3.400	0.250	4	5.50	0.324	5
3.400	0.145	5	5.50	0.229	6
3.400	0.076	6	5.50	0.153	7
3.400	0.036	7	5.50	0.095	8
3.400	0.015	8	5.50	0.055	9
3.400	0.006	9	5.50	0.029	10
3.400	0.002	10	5.50	0.014	11
			5.50	0.007	12
			5.50	0.003	13
			5.50	0.001	14
3.600	0.585	2	6.00	0.590	3
3.600	0.412	3	6.00	0.470	4
3.600	0.271	4	6.00	0.360	5
3.600	0.163	5	6.00	0.265	6
3.600	0.089	6	6.00	0.185	7
3.600	0.044	7	6.00	0.122	8
3.600	0.019	8	6.00	0.075	9
3.600	0.008	9	6.00	0.043	10
3.600	0.003	10	6.00	0.023	11
			6.00	0.011	12
			6.00	0.005	13
			6.00	0.002	14
3.800	0.432	3	6.50	0.500	4
3.800	0.291	4	6.50	0.394	5
3.800	0.181	5	6.50	0.299	6
3.800	0.103	6	6.50	0.217	7
3.800	0.053	7	6.50	0.150	8
3.800	0.025	8	6.50	0.098	9
3.800	0.010	9	6.50	0.060	10
3.800	0.004	10	6.50	0.034	11
3.800	0.001	11	6.50	0.018	12
4.000	0.451	3	6.50	0.009	13
4.000	0.311	4	6.50	0.004	14
4.000	0.199	5	6.50	0.002	15
4.000	0.117	6	7.00	0.527	4
4.000	0.063	7	7.00	0.425	5
4.000	0.030	8	7.00	0.331	6
4.000	0.013	9	7.00	0.249	7
4.000	0.005	10	7.00	0.179	8
4.000	0.002	11	7.00	0.122	9
			7.00	0.079	10
4.500	0.493	3	7.00	0.048	11
4.500	0.357	4	7.00	0.027	12
4.500	0.243	5	7.00	0.014	13
4.500	0.154	6	7.00	0.007	14
4.500	0.090	7	7.00	0.003	15
4.500	0.048	8	7.00	0.001	16
4.500	0.024	9			
4.500	0.010	10			
4.500	0.004	11			
4.500	0.002	12			

Erlangs	Grade of Service	No. of Trunks	Erlangs	Grade of Service	No. of Trunks
8.00	0.575	4	11.00	0.008	19
8.00C	0.479	5	11.00	0.005	20
8.00CC	0.390	6	11.00	0.002	21
8.00C	0.308	7	11.00	0.001	22
8.00C	0.236	8			
8.00CC	0.173	9	12.00	0.556	6
8.00C	0.122	10	12.00	0.488	7
8.00C	0.081	11	12.00	0.423	8
8.00C	0.051	12	12.00	0.360	9
8.00C	0.031	13	12.00	0.302	10
8.00C	0.017	14	12.00	0.248	11
8.00C	0.009	15	12.00	0.199	12
8.00C	0.005	16	12.00	0.155	13
8.00C	0.002	17	12.00	0.117	14
			12.00	0.086	15
			12.00	0.060	16
9.00	0.525	5	12.00	0.041	17
9.00C	0.441	6	12.00	0.027	18
9.00C	0.362	7	12.00	0.016	19
9.00C	0.289	8	12.00	0.010	20
9.00C	0.224	9	12.00	0.006	21
9.00C	0.168	10	12.00	0.003	22
9.00CC	0.121	11	12.00	0.002	23
9.00CC	0.083	12			
9.00C	0.054	13	13.00	0.585	6
9.00C	0.034	14	13.00	0.521	7
9.00C	0.020	15	13.00	0.458	8
9.00C	0.011	16	13.00	0.398	9
9.00C	0.006	17	13.00	0.341	10
9.00C	0.003	18	13.00	0.287	11
9.00C	0.001	19	13.00	0.237	12
			13.00	0.192	13
			13.00	0.151	14
10.00	0.564	5	13.00	0.116	15
10.00C	0.485	6	13.00	0.086	16
10.00C	0.409	7	13.00	0.062	17
10.00C	0.338	8	13.00	0.043	18
10.00C	0.273	9	13.00	0.028	19
10.00C	0.215	10	13.00	0.018	20
10.00C	0.163	11	13.00	0.011	21
10.00C	0.120	12	13.00	0.007	22
10.00C	0.084	13	13.00	0.004	23
10.00C	0.057	14	13.00	0.002	24
10.00C	0.036	15	13.00	0.001	25
10.00C	0.022	16			
10.00C	0.013	17	14.00	0.550	7
10.00C	0.007	18	14.00	0.490	8
10.00C	0.004	19	14.00	0.433	9
10.00C	0.002	20	14.00	0.377	10
			14.00	0.324	11
			14.00	0.275	12
11.00	0.597	5	14.00	0.228	13
11.00C	0.523	6	14.00	0.186	14
11.00C	0.451	7	14.00	0.148	15
11.00C	0.383	8	14.00	0.115	16
11.00C	0.319	9	14.00	0.086	17
11.00C	0.260	10	14.00	0.063	18
11.00C	0.206	11	14.00	0.044	19
11.00C	0.159	12	14.00	0.030	20
11.00C	0.119	13	14.00	0.020	21
11.00C	0.085	14	14.00	0.012	22
11.00C	0.059	15	14.00	0.007	23
11.00C	0.039	16	14.00	0.004	24
11.00C	0.025	17	14.00	0.002	25
11.00C	0.015	18	14.00	0.001	26

Erlangs	Grade of Service	No. of Trunks	Erlangs	Grade of Service	No. of Trunks
15.00	0.576	7	17.00	0.034	23
15.00	0.519	8	17.00	0.024	24
15.00	0.464	9	17.00	0.016	25
15.00	0.410	10	17.00	0.010	26
15.00	0.359	11	17.00	0.006	27
15.00	0.310	12	17.00	0.004	28
15.00	0.263	13	17.00	0.002	29
15.00	0.220	14	17.00	0.001	30
15.00	0.180	15			
15.00	0.145	16			
15.00	0.113	17	18.00	0.590	8
15.00	0.086	18	18.00	0.541	9
15.00	0.064	19	18.00	0.493	10
15.00	0.046	20	18.00	0.447	11
15.00	0.032	21	18.00	0.401	12
15.00	0.021	22	18.00	0.357	13
15.00	0.014	23	18.00	0.315	14
15.00	0.008	24	18.00	0.274	15
15.00	0.005	25	18.00	0.236	16
15.00	0.003	26	18.00	0.200	17
15.00	0.002	27	18.00	0.166	18
			18.00	0.136	19
16.00	0.599	7	18.00	0.109	20
16.00	0.545	8	18.00	0.086	21
16.00	0.492	9	18.00	0.065	22
16.00	0.441	10	18.00	0.049	23
16.00	0.391	11	18.00	0.035	24
16.00	0.342	12	18.00	0.025	25
16.00	0.296	13	18.00	0.017	26
16.00	0.253	14	18.00	0.011	27
16.00	0.213	15	18.00	0.007	28
16.00	0.175	16	18.00	0.004	29
16.00	0.142	17	18.00	0.003	30
16.00	0.112	18	18.00	0.002	31
16.00	0.086	19			
16.00	0.064	20			
16.00	0.047	21	19.00	0.563	9
16.00	0.033	22	19.00	0.517	10
16.00	0.022	23	19.00	0.472	11
16.00	0.015	24	19.00	0.427	12
16.00	0.009	25	19.00	0.385	13
16.00	0.006	26	19.00	0.343	14
16.00	0.003	27	19.00	0.303	15
16.00	0.002	28	19.00	0.264	16
16.00	0.001	29	19.00	0.228	17
			19.00	0.194	18
17.00	0.569	8	19.00	0.163	19
17.00	0.518	9	19.00	0.134	20
17.00	0.468	10	19.00	0.108	21
17.00	0.420	11	19.00	0.085	22
17.00	0.373	12	19.00	0.066	23
17.00	0.328	13	19.00	0.050	24
17.00	0.285	14	19.00	0.036	25
17.00	0.244	15	19.00	0.026	26
17.00	0.206	16	19.00	0.018	27
17.00	0.171	17	19.00	0.012	28
17.00	0.139	18	19.00	0.008	29
17.00	0.110	19	19.00	0.005	30
17.00	0.086	20	19.00	0.003	31
17.00	0.065	21	19.00	0.002	32
17.00	0.048	22	19.00	0.001	33

Erlangs	Grade of Service	No. of Trunks
20.00	0.582	9
20.00	0.538	10
20.00	0.494	11
20.00	0.452	12
20.00	0.410	13
20.00	0.369	14
20.00	0.330	15
20.00	0.292	16
20.00	0.256	17
20.00	0.221	18
20.00	0.189	19
20.00	0.159	20
20.00	0.131	21
20.00	0.107	22
20.00	0.085	23
20.00	0.066	24
20.00	0.050	25
20.00	0.037	26
20.00	0.027	27
20.00	0.019	28
20.00	0.013	29
20.00	0.008	30
20.00	0.005	31
20.00	0.003	32
20.00	0.002	33
20.00	0.001	34

APPENDIX G **COMPUTER PROGRAM LISTING**

```

$JOB ID, NCIIST, NARR, I=80
*****
C THIS PROGRAM WAS CREATED BY SCOTT L. KLINGLER, CAPTAIN, USAF IN
C MARCH 1984. IT WAS WRITTEN FOR INTERACTIVE COMPUTING USING THE
C WATFIV FACILITIES OF THE IBM 3033 AT THE NAVAL POSTGRADUATE
C SCHOOL. ADDITIONAL INFORMATION ABOUT THIS PROGRAM CAN BE
C OBTAINED IN KLINGLER, SCOTT L., SPECIALIZED COMMON CARRIERS:
C ICNG DISTANCE ALTERNATIVES FOR MILITARY INSTALLATIONS, MASTER'S
C THESIS, NAVAL POSTGRADUATE SCHOOL, MONTEREY, CA, MARCH 1984.
*****
C
C THIS PROGRAM PERFORMS THE FOLLOWING FUNCTIONS:
C
C 1. PUTS AREA CODES AND PREFIXES OF SPECIALIZED COMMON
C CARRIER (SCC) NETWORKS FROM FILES INTO AN ARRAY NUM
C
C 2. COMPARES CALLED NUMBER (AREA CODE AND PREFIX) TO SCC
C NETWORKS. (NOTE: IF AREA CODE IS NOT ONE OF THOSE LISTED
C IN DO 10 (ALL AREA CODES IN UNITED STATES) DATA FOR THE
C CALLED NUMBER WILL BE REJECTED.)
C
C 3. CALCULATES DISTANCE (RANGE OF DISTANCES) TO CALLED CITY FROM
C THE DURATION, RATE PERIOD, AND ORIGINAL COST OF THE CALL.
C (NOTE: IF DISTANCE WILL NOT CALCULATE (DUE TO INCORRECT
C DATA, MULTIPLE RATE PERIOD, DISTANCES FURTHER THAN LONGEST
C RANGE OF DISTANCES ALLOWED IN PROGRAM, ETC.) CALL DATA WILL
C BE REJECTED.)
C
C 4. CALCULATES CHARGES FOR MTS-TYPE CALLS (DIAL ACCESS SERVICE
C - AT&T MTS, MCI EXECUNET, AND SPRINT) BASED ON DURATION OF
C CALL, RATE PERIOD, AND MILEAGE AND TOTALS MINUTES OF CALLS
C IN EACH RATE PERIOD TO NETWORK AND NON-NETWORK CITIES.
C
C 5. CALCULATES CHARGES FOR WATS-TYPE CALLS (DEDICATED ACCESS
C SERVICE - AT&T WATS, MCI WATS (NETWORK SERVICE WITH UNIVERSAL
C TERMINATION), AND DIRECT SPRINT) BASED ON THE AVERAGE TIME
C PER ACCESS LINE PER RATE PERIOD.
C
C *****
C
C ASSUMPTIONS AND LIMITATIONS
C
C * THIS PROGRAM CAN BE USED ONLY FOR CALCULATING CCIS OF CALLS (VIA
C AT&T MTS AND WATS, MCI EXECUNET AND MCI WATS, AND SPRINT AND DIRECT
C SPRINT WITH UNIVERSAL CALLING) ORIGINATED WITHIN THE CONTINENTAL
C UNITED STATES (CCNUS) AND COMPLETED TO CONUS, HAWAII, AND ALASKA.
C IT ALSO ASSUMES THAT THE USER KNOWS IF THE LOCATION BEING EVALUATED
C IS IN AN AREA WHICH PERMITS ORIGINATING CALLS VIA THESE SERVICES.
C
C * TELEPHONE BILL DATA FROM A ONE MONTH PERIOD IS USED FOR THE
C INPUT DATA. (THE USER SHOULD CONSIDER USING AN AVERAGE MONTH'S
C BILL AND A PEAK MONTH'S BILL TO EVALUATE THE COSTS AND NUMBER OF
C WATS AND DEDICATED ACCESS LINES (DALS) FOR AVERAGE AND PEAK MONTHS
C OF TELEPHONE USAGE IN ORDER TO DETERMINE IF THERE IS A SIGNIFICANT
C DIFFERENCE.)
C

```

* TENTHS OF A CENT ARE TRUNCATED FROM THE COSTS CALCULATED FOR EACH AT&T MTS CALL AND ROUNDED FOR EACH MCI EXECUNET AND SPRINT CALL.

* SINCE CALLS TO HAWAII MADE VIA AT&T MTS ARE BILLED BY BAND AND NOT BY MILEAGE, THE PROGRAM CONVERTS BANDS TO MILEAGE RANGES FOR USE IN CALCULATING THE COSTS VIA THE OTHER CARRIERS. THE CORRECTNESS OF THESE CONVERSIONS HAS NOT BEEN DETERMINED EXCEPT FOR THE WEST COAST.

* COSTS FOR CALLS MADE VIA DIAL ACCESS SERVICES (MCI EXECUNET AND SPRINT) IN THE 56-70 AND 71-124 MILE DISTANCE RANGES ARE CALCULATED USING THE RATES FOR THE 71-124 MILE RANGE SINCE AT&T MTS HAS ONLY A 56-124 MILE RANGE (AND THE DISTANCE (RANGE OF DISTANCES) TO THE CALLED NUMBER IS CALCULATED FROM THE DURATION, RATE PERIOD, AND COST OF THE ORIGINAL AT&T MTS CALL.)

* COSTS FOR CALLS MADE VIA MCI EXECUNET OVER 3000 MILES ARE CALCULATED USING THE RATES FOR THE 1911-3000 MILE RANGE SINCE THERE IS NO RATE SHOWN IN THE TARIFF FOR DISTANCES GREATER THAN 3000 MILES.

* COSTS FOR CALLS MADE VIA SPRINT ARE CALCULATED USING THE RATES WHICH ARE DISCOUNTED FOR OVER \$200 USAGE PER MONTH.

* THE PROGRAM CALCULATES THE COSTS OF ACCESSING THE DIAL ACCESS SERVICES, IF ANY, USING FIRST MINUTE AND ADDITIONAL MINUTE RATES, THE RATE PERIODS IN THE TABLE IN SUBROUTINE QUERY, AND ONLY THE DURATION OF THE COMPLETED LONG DISTANCE CALL.

* SINCE ORIGINAL CALL DATA IS IN ONE MINUTE INCREMENTS, WATS AND DEDICATED ACCESS SERVICE COST CALCULATIONS DO NOT CONSIDER THE LESS THAN ONE MINUTE INCREMENTS USED BY THESE CARRIERS OR THE ONE MINUTE MINIMUM AVERAGE TIME REQUIREMENT OF THESE CARRIERS.

* WATS AND DEDICATED ACCESS SERVICE COST CALCULATIONS INCLUDE THE MONTHLY RECURRING CHARGES PER ACCESS LINE BUT NOT ORDER OR INSTALLATION CHARGES. THE MONTHLY RECURRING CHARGES USED IN THE PROGRAM ARE THE BASIC CHARGES WHICH ASSUME THAT THE INSTALLATION IS CLOSE ENOUGH TO THE CARRIER'S POINT OF TERMINATION SO AS TO AVOID ADDITIONAL MILEAGE CHARGES.

* COSTS FOR AT&T WATS (CURRENT TARIFF) ARE CALCULATED USING SERVICE AREA 6 RATES. THE RATES USED FOR CALCULATING COSTS OF AT&T WATS (PROPOSED TARIFF) ARE FOR SERVICE AREAS 5 AND 6 (WHICH HAVE THE SAME RATES).

* THE PROGRAM DOES NOT ROUND THE TOTAL HOURS OF CALLS IN EACH RATE PERIOD TO THE NEAREST TENTH OF AN HOUR FOR AT&T WATS COST CALCULATIONS.

* COSTS ARE CALCULATED FOR DEDICATED ACCESS SERVICES WITH "UNIVERSAL TERMINATION" (MCI WATS AND DIRECT SPRINT WITH UNIVERSAL CALLING), AND NOT FOR NETWORK-ONLY TERMINATION SERVICE.

THE FOLLOWING EXEC FILE WAS USED TO EXECUTE THE PROGRAM

STRACE OFF
FILEDEF 8 DISK MCI DATA A (RECFM F LRECL 80 BLKSIZE 80
FILEDEF 9 DISK SPRINT DATA A (RECFM F LRECL 80 BLKSIZE 80
FILEDEF 10 DISK TOLL DATA A (RECFM F LRECL 80 BLKSIZE 80
FILEDEF 11 DISK TATAOUT DATA A (RECFM F LRECL 80 BLKSIZE 80
FILEDEF 12 DISK SEJECT DATA A (RECFM F LRECL 80 BLKSIZE 80
FILEDEF 13 TERM (RECFM F LRECL 80 BLKSIZE 80
EXEC WAIFIV SCCPBCJ 81
CIBSCFN
STTYPE DO YOU WANT TO BROWSE THE OUTPUT DATA FILE? (Y OR N)

```

C -RETURN GREAT ARGS
C IF 81 EQ Y EGOTO -YESANS
C IF 81 EQ N EGOTO -NOANS
C IRSCRM
C TYPE 81 IS NOT A VALID RESPONSE (MUST BE Y OR N)
C EGOTO -RETURN
C -YESANS
C EROWSE DATAOUT DATA
C EXIT
C -NOANS
C TYPE THE OUTPUT IS WRITTEN TO THE FILE 'DATAOUT DATA.'
C TYPE REJECTED DATA (IF ANY) IS WRITTEN TO 'REJECT DATA.'
C EXIT

```

FILE DEFINITIONS

FILE 8 MCI DATA

<COLUMN 1>

TOP OF FILE

```

201
221 222 224 225 226 227 228 229 231 232 233 235 238 239 241 242 243 245
246 247 248 249 251 254 256 257 261 262 263 265 266 267 268 271 272 273
<MORE DATA HERE>
202 1
END OF FILE

```

FILE 9 SPRINT DATA

<OF THE SAME TYPE DATA AS FILE 8>

FILE 10 TOLL DATA

(TOLL CALLS LISTED IN ANY ORDER USING THE FOLLOWING FORMAT)

<COLUMN 1>

TOP OF FILE

```

2 1 PACKENSACK NJ 201 368 1.23
3 1 WESTBROOK ME 207 856 1.72
7 1 WASHINGTON DC 202 697 3.68
3 1 LAS VEGAS NV 702 734 1.43
5 1 BENO NV 702 786 2.14
5 1 HIGHLD FLS NY 914 938 2.70
2 1 NASHUA NH 603 885 1.23
2 1 CHAHA NE 402 221 1.08
3 1 HCUSTON TX 713 526 .64
3 1 HUNTSVILLE AL 205 882 1.72
END OF FILE

```

FILE 11 DATAOUT DATA
(THIS IS THE OUTPUT FILE)

FILE 12 REJECT DATA
(THIS OUTPUT FILE LISTS REJECTED DATA)

FILE 13 TERM
(TO THE TERMINAL FOR INTERACTIVE USE)

SUBROUTINES (AS THEY APPEAR IN THE MAIN PROGRAM)

SCCLIS - THIS SUBROUTINE PLACES SCC NETWORK LISTINGS OF AREA
CODES AND PREFIXES ON EACH NETWORK INTO AN ARRAY, NUM.

SOFT - THIS SUBROUTINE SORTS TELEPHONE CALL DATA BY AREA CODE
AND PREFIX FOR USE IN THE MAIN PROGRAM.

QUERY - THIS SUBROUTINE INTERACTIVELY QUERIES THE USER FOR INPUT
DATA USED TO CALCULATE COSTS OF ACCESSING THE SCC NETWORKS
AND TO CALCULATE THE AT&T WATS COSTS (USING CURRENT AND PROPOSED
RATES).

ASK - THIS SUBROUTINE TAKES A CHARACTER STRING WHICH IS GIVEN
AS THE SUBROUTINE ARGUMENT AND OUTPUTS IT TO THE TERMINAL.

DIST - THIS SUBROUTINE CALCULATES THE DISTANCE TO A CALLED CITY
FROM THE DURATION, RATE PERIOD, AND COST OF THE CALL.

CALC - THIS SUBROUTINE CALCULATES THE COST OF EACH CALL IF IT
WAS MADE VIA AT&T WATS, MCI EXECUNET, AND SPRINT (BASED ON
DURATION OF CALL, RATE PERIOD, MILEAGE, AND, FOR MCI EXECUNET,
NETWORK OR NON-NETWORK CITY). SUMS THE COSTS OF CALLS (WITHIN
EACH RATE PERIOD, NETWORK OR NON-NETWORK CITY) FOR EACH CARRIER
FOR USE IN THE AT&T WATS, MCI WATS, AND DIRECT SPRINT COST
CALCULATIONS PERFORMED IN SUBROUTINE CALC2.

LINES - THIS SUBROUTINE CALCULATES ERLANGS OF CALLS DURING THE
BUSY HOUR AND OUTPUTS NUMBERS OF LINES AND GRADES OF SERVICE
FOR USE IN DETERMINING HOW MANY WATS OR ACCESS LINES TO USE
IN CALCULATING THE COSTS OF AT&T WATS, MCI WATS, AND DIRECT
SPRINT.

FACTOR - THIS FUNCTION CALCULATES FACTORIALS FOR USE IN
SUBROUTINE LINES.

CALC2 - THIS SUBROUTINE CALCULATES THE COST OF ALL CALLS IF THEY
WERE MADE VIA AT&T WATS, MCI WATS, AND DIRECT SPRINT (BASED ON
THE AVERAGE TIME PER ACCESS LINE PER RATE PERIOD).

VARIABLE DEFINITIONS

ACCESS - A VARIABLE USED TO INDICATE IF CHARGES FOR CALLS TO
ACCESS THE SCC NETWORKS APPLY.

ACCODE - AREA CODE CALLED

ANS - A CHARACTER VARIABLE USED TO ANSWER QUESTIONS INTERACTIVELY

AVCO - AVERAGE COST (PER MINUTE) OF AT&T MTS (ORIGINAL COST)
 AVC1 - AVERAGE COST (PER MINUTE) OF AT&T MTS (PROPOSED RATES)
 AVC1A - AVERAGE COST (PER MINUTE) OF AT&T WATS (CURRENT RATES)
 AVC1B - AVERAGE COST (PER MINUTE) OF AT&T WATS (PROPOSED RATES)
 AVC2 - AVERAGE COST (PER MINUTE) OF MCI EXECUNET
 AVC2A - AVERAGE COST (PER MINUTE) OF MCI EXECUNET WITH ACCESS COSTS
 AVC2B - AVERAGE COST (PER MINUTE) OF MCI WATS
 AVC3 - AVERAGE COST (PER MINUTE) OF SPRINT
 AVC3A - AVERAGE COST (PER MINUTE) OF SPRINT WITH ACCESS COSTS
 AVC3B - AVERAGE COST (PER MINUTE) OF DIRECT SPRINT

AVTIME - AVERAGE TIME OF CALLS

COST - COST OF CALL

CSUM0 - SUM OF ORIGINAL AT&T MTS CALLS
 CSUM1 - SUM OF COSTS OF CALLS MADE VIA AT&T MTS (PROPOSED RATES)
 CSUM1A - SUM OF COSTS OF CALLS MADE VIA AT&T WATS (CURRENT RATES)
 CSUM1B - SUM OF COSTS OF CALLS MADE VIA AT&T WATS (PROPOSED RATES)
 CSUM2 - SUM OF COSTS OF CALLS MADE VIA MCI EXECUNET
 CSUM2A - SUM OF COSTS OF CALLS MADE VIA MCI EXECUNET (INCLUDING
 COSTS OF CALLS TO ACCESS)
 CSUM2B - SUM OF COSTS OF CALLS MADE VIA MCI WATS
 CSUM3 - SUM OF COSTS OF CALLS MADE VIA SPRINT
 CSUM3A - SUM OF COSTS OF CALLS MADE VIA SPRINT (INCLUDING
 COSTS OF CALLS TO ACCESS)
 CSUM3B - SUM OF COSTS OF CALLS MADE VIA DIRECT SPRINT

FLAG(X) - AN ARRAY USED TO INDICATE IF THE AREA CODE AND PREFIX
 OF THE CALL ARE ON THE SCC NETWORKS
 FLAG(1) = MCI
 FLAG(2) = GTE SPRINT

IREJ - TOTAL NUMBER OF REJECTED CALLS

ITCALL - TOTAL NUMBER OF CALLS

ITMIN - TOTAL MINUTES OF CALLS

ITMIN2 - TOTAL MINUTES OF CALLS LESS MINUTES OF CALLS UNABLE TO
 BE PLACED VIA MCI (TO ALASKA)

LINDIF - THE DIFFERENCE BETWEEN LIMHI AND LIMLC

LIMHI - (LIMIT HIGH) THE MAXIMUM NUMBER OF ACCESS LINES IN THE
 RANGE OF NUMBERS OF LINES TO BE USED FOR SUBROUTINE CALC.

LIMLO - (LIMIT LOW) THE MINIMUM NUMBER OF ACCESS LINES IN THE
 RANGE OF NUMBERS OF LINES TO BE USED FOR SUBROUTINE CALC.

MILES - DISTANCE (RANGE OF DISTANCES) TO CALLED CITY (CALCULATED
 IN SUBROUTINE DIST)

MIN - LENGTH OF CALL IN MINUTES

NCALLS - TOTAL NUMBER OF CALL DATA SETS FROM THE FILE TOLL DATA

NLINES - NUMBER OF ACCESS LINES

NNI - PREFIX (NNX) CALLED

NMCI - NUMBER OF CALLS UNABLE TO BE PLACED VIA MCI (TO ALASKA)

NOHIN - TOTAL MINUTES OF CALLS UNABLE TO BE PLACED VIA MCI
 (TO ALASKA)

NUM(X,Y,X) - AN ARRAY USED TO STORE AREA CODES AND
PREFIXES ON THE SCC NETWORKS

1ST POSITION - SCC

1 - MCI

2 - GTE SPRINT

2ND POSITION - TRANSLATED AREA CODE

EXAMPLE: 25 = AREA CODE 312

3RD POSITION - PREFIX (NNX)

NXA - A TRANSLATED VALUE FOR THE AREA CODE, ACODE.

OUTPUT - A VARIABLE USED TO INDICATE IF RESULTS OF SUBROUTINE CALC
ARE TO BE OUTPUT FOR EACH CALL DATA SET.

PERIOD - RATE PERIOD

1 = BUSINESS DAY

2 = EVENING

3 = NIGHT AND WEEKEND

PLACE - LOCATION CALLED

NOTE: VARIABLES USED AS SUBROUTINE ARGUMENTS, EVEN THOUGH THEY MAY
BE OUTPUT IN THE MAIN PROGRAM, ARE DEFINED IN THE SUBROUTINES.

INTEGER ACCDE, FSTEP, BSTEPP, REGION

INTEGER*2 PERIOD

CHARACTER*13 PLACE

CHARACTER*1 ANS

LOGICAL*1 NUM(2,109,999)

LOGICAL*1 FLAG(2), OUTPUT, ACCESS

COMMON /A/ NUM

COMMON /B/ MIN(2000), PERIOD(2000), PLACE(2000), ACODE(2000),

-NNX(2000), COST(2000), FLAG

DIMENSION MIN313(4), MIN323(4), MIN333(4)

IREJ=ITCAL=ITEMIN=0

WRITE(13,100)

CALL SCCALIS

WRITE(13,101)

CALL SORT(NCALIS)

CALL QUERY(OUTPUT, ACCESS, RATE1, RATE1A, RATE2, RATE2A, RATE3,
-RATE3A, BSTEPC, BSTEPP, REGION)

THE <IF(ACODE(I).EQ.-) THEN> STATEMENTS IN DO 10 TRANSLATE
THE AREA CODES TO - SAVE SPACE IN THE ARRAY NUM, OTHERWISE
NUM WOULD NEED TO BE AT LEAST (2,919,999)

DO 10 I=1, NCALIS

```
IF(ACCDE(I).EQ.201) THEN: NXA= 1: GO TO 20: END IF
IF(ACCDE(I).EQ.202) THEN: NXA= 2: GO TO 20: END IF
IF(ACCDE(I).EQ.203) THEN: NXA= 3: GO TO 20: END IF
IF(ACCDE(I).EQ.205) THEN: NXA= 4: GO TO 20: END IF
IF(ACCDE(I).EQ.206) THEN: NXA= 5: GO TO 20: END IF
IF(ACCDE(I).EQ.207) THEN: NXA= 6: GO TO 20: END IF
IF(ACCDE(I).EQ.208) THEN: NXA= 7: GO TO 20: END IF
IF(ACCDE(I).EQ.209) THEN: NXA= 8: GO TO 20: END IF
IF(ACCDE(I).EQ.212) THEN: NXA= 9: GO TO 20: END IF
IF(ACCDE(I).EQ.213) THEN: NXA=10: GO TO 20: END IF
IF(ACCDE(I).EQ.214) THEN: NXA=11: GO TO 20: END IF
IF(ACCDE(I).EQ.215) THEN: NXA=12: GO TO 20: END IF
IF(ACCDE(I).EQ.216) THEN: NXA=13: GO TO 20: END IF
IF(ACCDE(I).EQ.217) THEN: NXA=14: GO TO 20: END IF
```

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```
C
C IF ACCDE(I) IS NOT TRANSLATED ABOVE, THE CALL DATA WILL BE REJECTED
C AND OUTPUT TO THE FILE, REJECT DATA. THE PROGRAM WILL CONTINUE AND
C PERFORM THE CALCULATIONS FOR THE NEXT CALL.
C
C (IF THE CALL DATA FOR I = 1 IS REJECTED CERTAIN VARIABLES IN
C SUBROUTINE CALC WILL NOT BE INITIALIZED. THIS WILL CAUSE A
C FATAL ERROR.)
C
C WRITE(12,103) MIN(I),PERIOD(I),PLACE(I),ACODE(I),NNX(I),COST(I)
C
C IREJ=IREJ+1
C
C GC TO 10
C CCNTINUE
C *****
C *****
C
C WHEN THE VARIABLE CUTEUT IS .TRUE., THE RESULTS OF SUBROUTINE CALC
C ARE OUTPUT FOR EACH CALL DATA SET. THE FOLLOWING STATEMENTS ARE
C USED TO CONTROL THE HEADINGS FOR THIS OUTPUT.
C
C IF (I.EQ.1.AND.CUTPUT) THEN
C   WRITE(11,104) ACODE(I),NNX(I)
C   GO TO 30
C END IF
C IF (I.EQ.1) GO TC 30
C IF (ACCDE(I).NE.ACOCDE(I-1).AND.OUTPUT) THEN
C   WRITE(11,105) ACODE(I),NNX(I)
C   GO TO 30
C END IF
C IF (NNX(I).NE.NNX(I-1).AND.OUTPUT) WRITE(11,106) NNX(I)
C *****
C *****
C 30 CCNTINUE
C
C CALL DIST(I,BANK,MILES)
C *****
C *****
C
C IF THE DISTANCE CALCULATION IS SUCCESSFUL (INDICATED BY A VALUE
C OF MILES OTHER THAN 0) THE FOLLOWING <IF> STATEMENT WILL ALLOW
C CCNTINUED PROCESSING OF THIS CALL DATA. IF THE DISTANCE
```

```

C      CALCULATION IS UNSUCCESSFUL, THE CALL DATA IS OUTPUT TO THE FILE,
C      REJECT DATA AND THE PROGRAM WILL GO ON TO PROCESS THE DATA FOR
C      THE NEXT CALL.
C
C      IF (MILES.NE.0) GO TO 40
C      WRITE (12,107) MIN(I),PERIOD(I),PLACE(I),ACODE(I),NNX(I),COST(I)
C      IREJ=IREJ+1
C      GO TO 10
C*****
C40  CCNTINUE
C
C      ITCALL=ITCALL+1
C      ITMIN=ITMIN+MIN(I)
C
C      DO 50 SETS A FLAG (FLAG) IF THE AREA CODE (NXA) AND PREFIX (NNX(I))
C      IS CN THE SCC NETWORK DESIGNATED BY IN (IN = 1 FOR MCI,
C      IN = 2 FOR GTE SPRINT) (IN OTHER WORDS, IF NUM(IN,NXA,NNX(I))
C      = .TRUE. A FLAG IS SET.)
C
C      DO 50 IN=1,2
C      FLAG(IN) = .FALSE.
C      IF (NUM(IN,NXA,NNX(I))) FLAG(IN) = .TRUE.
C50  CCNTINUE
C*****
C      CALL CALC(I,BANC,MILES,RATE1,RATE1A,RATE2,RATE2A,RATE3,
C      -RATE3A,DISC2,DISC3,COST1,COST2,COST2A,COST3,COST3A,
C      -CSUM0,CSUM1,CSUM2,CSUM2A,CSUM3,CSUM3A,
C      -MIN11,MIN12,MIN13,MIN211,MIN221,MIN231,MIN212,MIN222,MIN232,
C      -NCMCI,NOMIN,MIN11,MIN321,MIN331,MIN312,MIN322,MIN332,
C      -MIN313,MIN323,MIN333)
C*****
C      WHEN THE VARIABLE OUTPUT IS .TRUE., THE DATA FOR EACH CALL IS
C      OUTPUT BY THE FOLLOWING STATEMENT.
C
C      IF (OUTPUT) WRITE (11,108) MIN(I),PERIOD(I),PLACE(I),
C      -COST(I),COST1,CCST2,CCST2A,COST3,COST3A
C10  CCNTINUE
C*****
C      THE FOLLOWING STATEMENTS CALCULATE THE AVERAGE TIME OF ALL CALLS
C      AND THE AVERAGE COSTS (PER MINUTE) OF EACH SERVICE
C
C      AVTIME=(ITMIN+.0001)/ITCALL
C      AVC0=CSUM0/ITMIN
C      AVC1=CSUM1/ITMIN
C      ITMIN2=ITMIN-NCMIN
C      AVC2=CSUM2/ITMIN2
C      AVC2A=CSUM2A/ITMIN2
C      AVC3=CSUM3/ITMIN
C      AVC3A=CSUM3A/ITMIN
C*****
C      WHEN THE VARIABLE ACCESS IS .TRUE., THE COSTS OF ACCESSING THE
C      SCC NETWORKS ARE CALCULATED. THE FOLLOWING STATEMENTS PERMIT
C      THESE COSTS TO BE OUTPUT WITH THE REST OF THE CALCULATED COSTS.
C      (OTHERWISE THESE COSTS WILL BE ZERO AND NOT OUTPUT WITH THE REST
C      OF THE CALCULATED COSTS.)
C
C      IF (ACCESS) THEN

```

```

        WRITE(11,109)ITCALL,ITMIN,AVTIME,IREJ,CSUM0,AVC0,CSUM1,AVC1,
        -CSUM2,AVC2,NOMCI,NOMIN,CSUM2A,AVC2A,NOMCI,NOMIN,CSUM3,AVC3,
        -CSUM3A,AVC3A
        GO TO 60
    END IF
    WRITE(11,110)ITCALL,ITMIN,AVTIME,IREJ,CSUM0,AVC0,CSUM1,AVC1,
    -CSUM2,AVC2,NOMCI,NOMIN,CSUM3,AVC3
C*****
C*****
60    CCNTINUE
    CALL LINES(MIN11)
C
C    THE FOLLOWING <WRITE> STATEMENT OUTPUTS THE RATE STEPS AND REGION
C    WHICH WERE INPUT FOR USE IN SUBROUTINE CALC2
C
    WRITE(11,111)RSTPC,RSTPF,REGION
C*****
C*****
C    THE FOLLOWING STATEMENTS QUERY THE USER FOR THE NUMBER OF
C    ACCESS LINES TO BE USED TO CALCULATE THE WATS AND DEDICATED
C    ACCESS SERVICE COSTS.
C
70    CALL ASK('
    CALL ASK('HOW MANY TOTAL WATS LINES OR DEDICATED
    CALL ASK('ACCESS LINES DO YOU WANT TO USE TO
    CALL ASK('CALCULATE DEDICATED ACCESS SERVICE COSTS?
    CALL ASK('
    CALL ASK(' (A RESPONSE OF 999 WILL ALLOW CALCULATION
    CALL ASK(' OF COSTS FOR A RANGE OF NUMBERS OF LINES)
    READ(13,*)NLINES
    IF(NLINES.EQ.999) THEN
        CALL ASK('
        CALL ASK('WHAT IS THE SMALLEST NUMBER IN THE RANGE OF
        CALL ASK(' NUMBERS OF LINES?
        READ(13,*)LIMLO
        CALL ASK('
        CALL ASK('WHAT IS THE LARGEST NUMBER IN THE RANGE OF
        CALL ASK(' NUMBERS OF LINES?
        CALL ASK('
        CALL ASK(' (MUST BE WITHIN 10 LINES OF THE SMALLEST)
        READ(13,*)LIMHI
        LIMDIF=LIMHI-LIMLO
        IF(LIMDIF.GT.10.OR.LIMHI.LE.LIMLO.OR.LIMLO.IT.1) THEN
            CALL ASK('INCORRECT LIMITS HAVE BEEN INPUT
            CALL ASK('
            GO TO 70
        END IF
C*****
C*****
C    IF THE CALCULATION OF COSTS IS FOR A RANGE OF VALUES OF NLINE
C    DO 80 CALCULATES AND OUTPUTS THE COSTS FOR EACH VALUE OF NLINE.
C
        DO 80 NLINES=LIMLO,LIMHI
            CALL CALC2(NLINES,RSTPC,RSTPF,REGION,MIN11,MIN12,MIN13,
            -CSUM1A,CSUM1B,MIN211,MIN221,MIN231,MIN212,MIN222,MIN232,
            -CSUM2B,MIN311,MIN321,MIN331,MIN312,MIN322,MIN332,
            -MIN313,MIN323,MIN333,CSUM3B)
C
C    CALCULATION OF AVERAGE COST (PER MINUTE) FOR EACH WATS OR
C    DEDICATED ACCESS SERVICE.
C
        AVC1A=CSUM1A/ITMIN
        AVC1B=CSUM1B/ITMIN
        AVC2B=CSUM2B/ITMIN2
        AVC3B=CSUM3B/ITMIN
        WRITE(11,112)NLINES,CSUM1A,AVC1A,CSUM1B,AVC1B,CSUM2B,AVC2B,

```

```
EO      -NCMCI,NOMIN,CSUM3B,AVC3B  
C       CCNTINUE  
  
          GO TO 90  
        ENI IF  
*****  
*****  
IF THE CALCULATION OF COSTS IS FOR ONLY ONE VALUE CF NLINES THE  
FOLLOWING STATEMENTS WILL CALCULATE AND OUTPUT THE COST FOR  
THE ONE VALUE CF NLINES  
  
CALL CALG2(NLINES,RSTFC,RSTEPP,REGIOX,MN11,MN12,MN13,CSUM1A,  
-CSUM1E,MN211,MN221,MN231,MN212,MN222,MN232,CSUM2B,  
-MN311,MN321,MN331,MN312,MN322,MN332,  
-MN313,MN323,MN333,CSUM3E)  
  
CALCULATION OF AVERAGE CCST (PER MINUTE) FOR EACH WATS OR  
DEDICATED ACCESS SERVICE.  
  
    AVC1A=CSUM1A/IIMIN  
    AVC1B=CSUM1B/IIMIN  
    AVC2B=CSUM2B/IIMIN2  
    AVC3B=CSUM3B/IIMIN  
  
WRITE(11,112)NLINES,CSUM1A,AVC1A,CSUM1B,AVC1B,CSUM2E,AVC2B,  
-NCMCI,NOMIN,CSUM3B,AVC3B  
  
CCNTINUE  
*****  
*****  
FORMAT(/1X,'EXECUTING.....'//1X,  
-'THIS PROGRAM WAS CREATED BY SCOTT L. KLINGER, CAPTAIN, USAF IN'  
-/1X,'MARCH 1984. ADDITIONAL INFORMATION ABOUT THIS PROGRAM CAN BE'  
-/1X,'OBTAINED IN THE PROGRAM DOCUMENTATION ITSELF OR IN KLINGER '  
-'SCOTT L.'//1X,'SPECIALIZED COMMON CARRIERS LONG DISTANCE ALTERN'  
-'IVES FOR MILITARY'//1X,'INSTALLATIONS, MASTERS THESIS, NAVAL PCS'  
-'TECHNICAL SCHOOL'//1X,'MONTEREY, CA, MARCH 1984.'//1X,  
-'READING SCC LISTS..... IT WILL TAKE A WHILE.....')  
FORMAT(/1X,'SCFTNG CALL DATA.....')  
FORMAT(/1X,'INVALID AREA CODE IN INPUT DATA'//1X,  
-I3,I1,I1,1X,A13,1X,I3,1X,I3,1X,F6.2)  
FORMAT(I1,X,'RATE PERIOD: 1 = DAY 2 = EVENING',  
-I3,I1,I1,1X,'AREA CODE'//1X,I3,1X,I3('*)'/1X,PREFIX'I3,/1X,  
-I0('*-')//57X,'MCJ',12X,'SPRINT',36X,'ORIG',3X,'NEW',11X,  
-'FIUS',12X,'PLUS',12X,'RATE',20X,'AT&T',3X,'AT&T',3X,'MCJ',3X,  
-'ACCESS',2X,'SPRINT',2X,'ACCESS',1X,'MINUTES',3X,'PERIOD',5X,  
-'PLACE',9X,'COST',3X,'COST',3X,'COST',3X,'COST',4X,'COST',4X,  
-'CCST',80('-'))/  
FORMAT(/80('*')//1X,'AREA CODE' I3,/1X,I3('*)'/  
-57X,'MCJ',12X,'SPRINT',36X,'ORIG',3X,'NEW',11X,  
-'FIUS',12X,'PLUS',12X,'RATE',20X,'AT&T',3X,'AT&T',3X,'MCJ',3X,  
-'ACCESS',2X,'SPRINT',2X,'ACCESS',1X,'MINUTES',3X,'PERIOD',5X,  
-'PLACE',9X,'COST',3X,'CCST',3X,'COST',3X,'COST',4X,'COST',4X,  
-'CCST',80('-')//1X,PREFIX'I3,/1X,I0('*-')/  
FORMAT(/1X,PREFIX'I3,/1X,I0('*-')/  
FORMAT(/1X,'DISTANCE CALCULATION UNSUCCESSFUL FOR INPUT DATA',//  
-IX,I3,IX,I1,1X,A13,IX,I3,IX,I3,IX,F6.2)  
FORMAT(2X,I3,9X,I1,4X,A13,3X,F5.2,2X,F5.2,2X,F5.2,2X,F5.2,3X,  
-F5.2,3X,F5.2)  
FORMAT(/1X,'TOTAL CALLS =' ,I5,/  
-IX,'TOTAL MINUTES =' ,I8,' MINUTES',/  
-IX,'AVERAGE TIME PER CALL =' ,F5.1,' MINUTES PER CALL',/  
-IX,'NUMBER OF CALLS REJECTED =' ,I3,/  
-IX,'ORIGINAL TCIAL AT&T MTS COST =' $ ,F10.2,/  
-IX,'AVERAGE COST PER MINUTE =' $ ,F6.3,/  

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-1X,'TCTAL AT&T MTS COST (PROPOSED RATES) = $',F10.2,/  

-1X,'AVERAGE COST PER MINUTE = $',F6.3,/  

-1X,'TOTAL MCI EXECUNET COST = $',F10.2,/  

-1X,'AVERAGE COST PER MINUTE = $',F6.3,/  

-1X,I3,I3,'CALLS UNABLE TO BE COMPLETED (TO ALASKA) ',  

-1X,'(MINUTES = ',I5,')',/  

-1X,'TOTAL MCI EXECUNET CCST (WITH COST OF CALL TO ACCESS) = $',  

-1X,I3,I3,'AVERAGE COST PER MINUTE = $',F6.3,/  

-1X,I3,I3,'CALLS UNABLE TO BE COMPLETED (TO ALASKA) ',  

-1X,'(MINUTES = ',I5,')',/  

-1X,'TOTAL SPRINT COST = $',F10.2,/  

-1X,'AVERAGE COST PER MINUTE = $',F6.3,/  

-1X,'TOTAL SPRINT COST (WITH COST OF CALL TO ACCESS) = $',  

-1X,I3,I3,'AVERAGE COST PER MINUTE = $',F6.3,/  

110 FORMAT(///1X,'TCTAL CALLS = ',I5,/  

-1X,'TOTAL MINUTES = ',I8,' MINUTES',/  

-1X,'AVERAGE TIME PER CALL = ',F5.1,' MINUTES PER CALL',/  

-1X,'NUMBER OF CALLS REJECTED = ',I3,/  

-1X,'ORIGINAL TCTAL AT&T MTS COST = $',F10.2,/  

-1X,'AVERAGE COST PER MINUTE = $',F6.3,/  

-1X,'TOTAL AT&T MTS COST (PROPOSED RATES) = $',F10.2,/  

-1X,'AVERAGE COST PER MINUTE = $',F6.3,/  

-1X,'TCTAL MCI EXECUNET CCST = $',F10.2,/  

-1X,'AVERAGE COST PER MINUTE = $',F6.3,/  

-1X,I3,I3,'CALLS UNABLE TO BE COMPLETED (TO ALASKA) ',  

-1X,'(MINUTES = ',I5,')',/  

-1X,'TCTAL SPRINT COST = $',F10.2,/  

-1X,'AVERAGE COST PER MINUTE = $',F6.3,/  

111 FORMAT(///1X,'RATE STEP USED FOR AT&T WATS (CURRENT RATES) CALCUL  

-1X,'ATION = ',I3,/  

-1X,'RATE STEP USED FOR AT&T WATS (PROPOSED RATES) CA  

-1X,'LCULATION = ',I3,/  

-1X,'REGION USED FOR DIRECT SPRINT CALCULATION = ',  

-1X,'I2,/  

112 FORMAT(///1X,'TCTAL NUMBER OF WATS LINES OR DEDICATED ACCESS ',  

-1X,'LINES = ',I3,/  

-1X,I3,I3,'TOTAL AT&T WATS COST (CURRENT RATES) = $',  

-1X,I3,I3,'AVERAGE COST PER MINUTE = $',F6.3,/  

-1X,'TCTAL AT&T WATS COST (PROPOSED RATES) = $',F10.2,/  

-1X,'AVERAGE COST PER MINUTE = $',F6.3,/  

-1X,'TCTAL MCI WATS COST = $',F10.2,/  

-1X,'AVERAGE COST PER MINUTE = $',F6.3,/  

-1X,I3,I3,'CALLS UNABLE TO BE COMPLETED (TO ALASKA) ',  

-1X,'(MINUTES = ',I5,')',/  

-1X,'TCTAL DIRECT SPRINT COST = $',F10.2,/  

-1X,'AVERAGE COST PER MINUTE = $',F6.3,/  

STCP  

END  

$EJECT  

SUBROUTINE SCCNIS  

*****  

C THIS SUBROUTINE PLACES SCC NETWORK LISTINGS OF AREA CODES AND  

C PREFIXES ON EACH NETWORK INTO AN ARRAY, NUM.  

C *****  

C  

C VARIABLE DEFINITIONS  

C  

C NNX1 - PREFIX ON SCC NETWORK IN AREA CODE NXA1  

C NXA - A TRANSLATED VALUE FOR THE AREA CODE, NXA1  

C NXACOD - A VARIABLE WHICH INDICATES, WHEN EQUAL TO 1, THAT ALL  

C NXA1 - AREA CODE ON SCC NETWORK  

C *****  

C  

C LOGICAL*1 NUM(2,109,999)  

C COMMON /A/ NUM  

C DIMENSION NNX1(999)

```

```

*****
*****
DO 10 INITIALIZES ALL POSITIONS OF THE ARRAY NUM TO .FALSE.

DO 10 IN=1,2
DO 10 NXA=1,109
DO 10 NNN=1,999
10 NUM(IN,NXA,NNN)=.FALSE.
*****
*****
DO 20 AND DO 30 READS THE AREA CODE (NXA1) AND A SPECIAL INDICATOR,
NXACCL FROM THE FILES MCI DATA AND SPRINT DATA. AT END OF FILE IT
TRANSFERS OUT OF THE LOOP AND RETURNS TO THE CALLING PROGRAM.

THE <IF(NXA1.EQ.____) THEN:NXA=____> STATEMENTS IN DO 30 TRANSLATE
THE AREA CODES TO SAVE SPACE IN THE ARRAY, NUM.

DC 20 IN=1,2
I=IN+7
DO 30 J=1,999
  READ(I,100) NXA1,NXACOD
  AT END
  GO TO 20
  END AT END
  IF (NXA1.EQ.201) THEN:NXA= 1:GO TO 40:END IF
  IF (NXA1.EQ.202) THEN:NXA= 2:GO TO 40:END IF
  IF (NXA1.EQ.203) THEN:NXA= 3:GO TO 40:END IF
  IF (NXA1.EQ.205) THEN:NXA= 4:GO TO 40:END IF
  IF (NXA1.EQ.206) THEN:NXA= 5:GO TO 40:END IF
  IF (NXA1.EQ.207) THEN:NXA= 6:GO TO 40:END IF
  IF (NXA1.EQ.208) THEN:NXA= 7:GO TO 40:END IF
  IF (NXA1.EQ.209) THEN:NXA= 8:GO TO 40:END IF
  IF (NXA1.EQ.212) THEN:NXA= 9:GO TO 40:END IF
  IF (NXA1.EQ.213) THEN:NXA=10:GO TO 40:END IF
  IF (NXA1.EQ.214) THEN:NXA=11:GO TO 40:END IF
  IF (NXA1.EQ.215) THEN:NXA=12:GO TO 40:END IF
  IF (NXA1.EQ.216) THEN:NXA=13:GO TO 40:END IF
  IF (NXA1.EQ.217) THEN:NXA=14:GO TO 40:END IF
  IF (NXA1.EQ.218) THEN:NXA=15:GO TO 40:END IF
  IF (NXA1.EQ.219) THEN:NXA=16:GO TO 40:END IF
  IF (NXA1.EQ.301) THEN:NXA=17:GO TO 40:END IF
  IF (NXA1.EQ.302) THEN:NXA=18:GO TO 40:END IF
  IF (NXA1.EQ.303) THEN:NXA=19:GO TO 40:END IF
  IF (NXA1.EQ.304) THEN:NXA=20:GO TO 40:END IF
  IF (NXA1.EQ.305) THEN:NXA=21:GO TO 40:END IF
  IF (NXA1.EQ.307) THEN:NXA=22:GO TO 40:END IF
  IF (NXA1.EQ.308) THEN:NXA=23:GO TO 40:END IF
  IF (NXA1.EQ.309) THEN:NXA=24:GO TO 40:END IF
  IF (NXA1.EQ.312) THEN:NXA=25:GO TO 40:END IF
  IF (NXA1.EQ.313) THEN:NXA=26:GO TO 40:END IF
  IF (NXA1.EQ.314) THEN:NXA=27:GO TO 40:END IF
  IF (NXA1.EQ.315) THEN:NXA=28:GO TO 40:END IF
  IF (NXA1.EQ.316) THEN:NXA=29:GO TO 40:END IF
  IF (NXA1.EQ.317) THEN:NXA=30:GO TO 40:END IF
  IF (NXA1.EQ.318) THEN:NXA=31:GO TO 40:END IF
  IF (NXA1.EQ.319) THEN:NXA=32:GO TO 40:END IF
  IF (NXA1.EQ.401) THEN:NXA=33:GO TO 40:END IF
  IF (NXA1.EQ.402) THEN:NXA=34:GO TO 40:END IF
  IF (NXA1.EQ.404) THEN:NXA=35:GO TO 40:END IF
  IF (NXA1.EQ.405) THEN:NXA=36:GO TO 40:END IF
  IF (NXA1.EQ.406) THEN:NXA=37:GO TO 40:END IF
  IF (NXA1.EQ.408) THEN:NXA=38:GO TO 40:END IF
  IF (NXA1.EQ.409) THEN:NXA=39:GO TO 40:END IF
  IF (NXA1.EQ.412) THEN:NXA=40:GO TO 40:END IF
  IF (NXA1.EQ.413) THEN:NXA=41:GO TO 40:END IF

```

C

```

C      IF NXA1 IS NOT TRANSLATED ABOVE, ITS VALUE WILL BE CUTOUT TO THE
C      DATAOUT DATA FILE. THIS WILL CAUSE A RETURN TO THE MAIN PROGRAM
C      AND MAY CAUSE A FATAL ERROR.
C
C      WRITE(11,102)NXA1
C      GO TO 90
C*****
C40  CONTINUE
C
C      IF NXACOD = 1 THE FOLLOWING <IF> STATEMENT SETS ALL POSITIONS OF
C      THE ARRAY NUM(IN,NXA,---) TO .TRUE. INDICATING THAT ALL PREFIXES
C      IN THIS AREA CCIE (NXA= TRANSLATED FROM NXA1) ARE ON THE SCC
C      NETWORK DESIGNATED BY IN (IN = 1 FOR MCI, IN = 2 FOR GTE SPRINT)
C      AND BYPASSES DC 70 AND DC 80.
C
C      IF (NXACOD.EQ.1) THEN
50      DO 50 NNN=1,999
          NUM(IN,NXA,NNN) =.TRUE.
          GO TO 30
      END IF
C*****
C      IF NXACOD IS NOT EQUAL TO 1 OR 0, ITS VALUE (AND THE VALUE OF
C      NXA1) WILL BE CUTOUT TO THE DATAOUT DATA FILE. THIS WILL CAUSE
C      A RETURN TO THE MAIN PROGRAM AND MAY CAUSE A FATAL ERROR.
C
C      IF (NXACOD.EQ.1.OR.NXACOD.EQ.0) GO TO 60
C      WRITE(11,103) NXA1,NXACOD
C      GO TO 90
60  CONTINUE
C*****
C      DO 70 AND DO 80 READ THE PREFIXES (NNX1) OF AN AREA CODE (NXA)
C      THAT ARE ON THE SCC NETWORK (EXCEPT IF NXACOD = 1) AND SETS
C      THE VALUE OF NUM(IN,NXA,NNX1) TO .TRUE..
C
C      DO 70 K=1,999,18
C      READ(1,101) NNX1(K), NNX1(K+1), NNX1(K+2), NNX1(K+3), NNX1(K+4),
- NNX1(K+5), NNX1(K+6), NNX1(K+7), NNX1(K+8), NNX1(K+9), NNX1(K+10),
- NNX1(K+11), NNX1(K+12), NNX1(K+13), NNX1(K+14), NNX1(K+15), NNX1(K+16),
- NNX1(K+17)
C      DO 80 L=1,18
C      N=L-1
C      IF (NNX1(K+N).EQ.0) GO TO 30
C      NUM(IN,NXA,NNX1(K+N)) =.TRUE.
80  CCNTINUE
70  CCNTINUE
30  CCNTINUE
20  CCNTINUE
90  CCNTINUE
C*****
C      FORMAT(I3,1X,I1)
100  FCENAT(18(I3,1X))
101  FCENAT(1X,'INCORRECT DATA INPUT IN SUBROUTINE SCCIIS *** NXA1 = ',
- I3)
102  FCENAT(1X,'INCORRECT DATA INPUT IN SUBROUTINE SCCIIS *** NXA1 = ',
- I3,2X,'NXACOD = ',I3)
103  FCENAT(1X,'INCORRECT DATA INPUT IN SUBROUTINE SCCIIS *** NXA1 = ',
- I3,2X,'NXACOD = ',I3)
C      RETURN
C      ENCL
SEJECT
SUBROUTINE SORT(MCALLS)
C*****

```

THIS SUBROUTINE SORTS TELEPHONE CALL DATA BY AREA CODE
AND PREFIX FOR USE IN THE MAIN PROGRAM.

VARIABLE DEFINITIONS

ACCDE - AREA CODE CALLED

COST - COST OF CALL

MIN - LENGTH OF CALL IN MINUTES

NCALLS - TOTAL NUMBER OF CALL DATA SETS FROM THE FILE TOLL DATA

NNX - PREFIX (NNX) CALLED

PERIOD - RATE PERIOD

1 = BUSINESS DAY

2 = EVENING

3 = NIGHT AND WEEKEND

PLACE - LOCATION CALLED

TEMP - A VARIABLE USED TO TEMPORARILY STORE VALUES OF MIN, PERIOD,
ACCDE, AND NNX DURING SORTING

TEMPC - A VARIABLE USE TO TEMPORARILY STORE VALUES OF CCST
DURING SORTING

TEMPF - A VARIABLE USE TO TEMPORARILY STORE VALUES OF PLACE
DURING SORTING

INTEGER ACCDE

INTEGER*2 PERIOD, TEMP

CHARACTER*13 PLACE, TEMPF

LOGICAL*1 FLAG (2)

COMMON /B/MIN(2000), PERIOD(2000), PLACE(2000), ACCDE(2000),

NNX(2000), COST(2000), FLAG

N=NN=0

DO 10 I=1, 2000

READ(10, 100) MIN(I), PERIOD(I), PLACE(I), ACCDE(I), NNX(I), CCST(I)

AT END

GO TO 20

END AT END

NCALLS=I

CCONTINUE

N=NCALLS-1

DO 30 I=1, N

INC=I+1

DO 40 J=INC, NCALLS

IF (ACCDE(I) .LT. ACCDE(J)) GO TO 40

IF (ACCDE(I) .GT. ACCDE(J)) GO TO 50

IF (NNX(I) .LE. NNX(J)) GO TO 40

TEMP=MIN(I)

MIN(I)=MIN(J)

MIN(J)=TEMP

TEMP=PERIOD(I)

PERIOD(I)=PERIOD(J)

PERIOD(J)=TEMP

TEMPF=PLACE(I)

PLACE(I)=PLACE(J)

PLACE(J)=TEMPF

TEMP=ACCDE(I)

ACCDE(I)=ACCDE(J)

ACCDE(J)=TEMP

TEMP=NNX(I)

```

NNX(I) = NNX(J)
NNX(J) = TEMF
TEMPC = COST(I)
COST(I) = COST(J)
COST(J) = TEMPC
40      CCNTINUE
30      CONTINUE
100     FORMAT(I3,1X,I1,1X,A13,1X,I3,1X,I3,1X,F6.2)
        RETURN
        END

$EJECT  SUBROUTINE QUERY(OUTPUT, ACCESS, RATE1, RATE1A, RATE2, RATE2A, RATE3,
        -RATE3A, RSTEP, RSTEPP, REGION)
*****
C      THIS SUBROUTINE INTERACTIVELY QUERIES THE USER FOR INPUT DATA
C      USED TO CALCULATE COSTS OF ACCESSING THE SCC NETWORKS AND TO
C      CALCULATE THE AT&T WATS COSTS (USING CURRENT AND PROPOSED RATES).
C      *****
C      VARIABLE DEFINITIONS
C      ACCESS - A VARIABLE USED TO INDICATE IF CHARGES FOR CALLS TO
C      ACCESS THE SCC NETWORKS APPLY.
C      ANS - A CHARACTER VARIABLE USED TO ANSWER QUESTIONS INTERACTIVELY
C      DISC - A VARIABLE USED TO READ THE DISCOUNT APPLIED FOR EVENING
C      AND NIGHT AND WEEKEND RATE PERIODS
C      DISC2 - THE DISCOUNT FACTOR FOR EVENING RATE PERIOD
C      DISC3 - THE DISCOUNT FACTOR FOR NIGHT AND WEEKEND RATE PERIOD
C      OUTPUT - A VARIABLE USED TO INDICATE IF RESULTS OF SUBROUTINE CALC
C      ARE TO BE OUTPUT FOR EACH CALL DATA SET.
C      RATEXX - RATE FOR CALL TO ACCESS MCI EXECUNET OR SPRINT
C      1ST POSITION - RATE PERIOD
C      1 - BUSINESS DAY
C      2 - EVENING
C      3 - NIGHT AND WEEKEND
C      2ND POSITION - FIRST OR ADDITIONAL MINUTE RATE
C      NO VALUE - FIRST MINUTE RATE
C      A - ADDITIONAL MINUTE RATE
C      REGION - GEOGRAPHICAL AREA IN WHICH DIRECT SPRINT CALLS ARE
C      ORIGINATED
C      RSTEP - RATE STEP (CURRENT AT&T WATS TARIFF)
C      RSTEPP - RATE STEP (PROPOSED AT&T WATS TARIFF)
C
C      INTEGER RSTEP, RSTEPP, REGION
C      CHARACTER*1 ANS
C      LOGICAL*1 OUTPUT, ACCESS
C      RATE1=RATE1A=RATE2=RATE2A=RATE3=RATE3A=0.0
1      CALL ASK('DO YOU WANT OUTPUT FOR EACH CALL? (Y OR N) ')
      CALL ASK('Y WILL GIVE DATA FOR EACH CALL PLUS TOTALS')
      CALL ASK('N WILL GIVE TOTALS ONLY')
      READ(13,100) ANS
      IF (ANS.EQ.'Y'.AND.ANS.NE.'N') THEN
          CALL ASK('ANSWER MUST BE Y OR N ')
          GO TO 1
      END IF

```

C

CCC
2

```
IF (ANS.EQ.'Y') COUTPUT=.TRUE.
IF (ANS.EQ.'N') COUTPUT=.FALSE.
```

```
CALL ASK('
CALL ASK(' IS THERE A CHARGE FOR THE CALL TO ACCESS
CALL ASK(' THE MCI EXECUNET AND SPRINT NETWORKS?
CALL ASK(' (Y OR N)
READ(13,100)ANS
IF (ANS.NE.'Y'.AND.ANS.NE.'N') THEN
CALL ASK('ANSWER MUST Y OR N
GO TO 2
END IF
```

```
ACCESS=.TRUE.
IF (ANS.EQ.'N') THEN
ACCESS=.FALSE.
GO TO 5
END IF
```

```
CALL ASK('
CALL ASK(' THIS PROGRAM ASSUMES:
CALL ASK(' * MCI AND SPRINT LOCAL ACCESS NUMBERS ARE
CALL ASK(' IN THE SAME AREA
CALL ASK('
CALL ASK(' * THE COST OF ACCESS IS BASED ON A FIRST
CALL ASK(' MINUTE RATE AND AN ADDITIONAL MINUTE RATE
CALL ASK('
CALL ASK(' * THE RATE PERIODS ARE AS FOLLOWS:
CALL ASK('-----
CALL ASK(' BUSINESS DAY
CALL ASK(' 8AM TO BUT NOT INCLUDING 5PM MON-FRI
CALL ASK('-----
CALL ASK(' EVENING
CALL ASK(' 5PM TO BUT NOT INCLUDING 11PM SUN-FRI
CALL ASK('-----
CALL ASK(' NIGHT AND WEEKEND
CALL ASK(' 11PM TO BUT NOT INCLUDING 8AM ALL DAYS
CALL ASK(' 8AM TO BUT NOT INCLUDING 11PM SAT
CALL ASK(' 8AM TO BUT NOT INCLUDING 5PM SUN
CALL ASK('-----
```

```
CALL ASK('
CALL ASK(' DO YOU STILL WANT TO CONTINUE TO ENTER DATA
CALL ASK(' FOR CALCULATING THE COST OF ACCESSING THE
CALL ASK(' SCC NETWORKS? (Y OR N)
CALL ASK('
```

```
CALL ASK(' Y WILL CONTINUE AND ASK FOR RATES
CALL ASK(' N WILL PREVENT CALCULATION OF ACCESS COSTS
READ(13,100)ANS
```

```
IF (ANS.NE.'Y'.AND.ANS.NE.'N') THEN
CALL ASK('ANSWER MUST Y OR N
GO TO 2
END IF
```

```
ACCESS=.TRUE.
IF (ANS.EQ.'N') THEN
ACCESS=.FALSE.
GO TO 5
END IF
```

```
CALL ASK('
CALL ASK(' FOR THE DAY RATE PERIOD:
CALL ASK('
CALL ASK(' WHAT IS THE FIRST MINUTE RATE?
CALL ASK(' (EXAMPLE: FOR $.03 PER MINUTE INPUT .03)
READ(13,*) RATE1
CALL ASK('
CALL ASK(' WHAT IS THE ADDITIONAL MINUTE RATE?
CALL ASK(' (EXAMPLE: FOR $.01 PER MINUTE INPUT .01)
READ(13,*) RATE1A
CALL ASK('
```

3


```

CALL ASK(' 22 - AL, CT, DE, DC, FL, GA, KY, ME, MI,
CALL ASK(' MA, MS, NH, NJ, NY, NC, OH, PA, RI,
CALL ASK(' SC, TN, VT, VA, WV
CALL ASK('
CALL ASK('
CALL ASK(' INPUT RATE STEP (19, 20, 21, OR 22)
READ(13,*) RSTEEC
IF(RSTEEC.LT.19.OR.RSTEEC.GT.22) THEN
CALL ASK('NCT A VALID RATE STEP
GO TO 5
END IF

```


THE RATE STEPS LISTED BELOW ARE FROM AT&T COMMUNICATIONS
FCC TARIFF NO. 2, ISSUED 3 OCT 1983, EFFECTIVE DATE POSTPONED
INDEFINITELY.

```

CALL ASK('
CALL ASK(' FOR CALCULATING THE AT&T WATS COSTS USING
CALL ASK(' PROPOSED RATES, WHAT IS THE RATE STEP?
CALL ASK('
CALL ASK(' RATE STATES
CALL ASK(' STEP
CALL ASK('
CALL ASK(' 14 - IA, KS, NE
CALL ASK('
CALL ASK(' 15 - AR, IL, MN, MO, ND, OK, SD
CALL ASK('
CALL ASK(' 16 - CO, IN, LA, MS, TX, WI, WY
CALL ASK('
CALL ASK(' 17 - AL, KY, MI, MT, NM, OH, TN
CALL ASK('
CALL ASK(' 18 - AZ, CA, CT, DE, DC, FL, GA, ID, ME,
CALL ASK(' MD, MA, NV, NH, NJ, NY, NC, OR, PA,
CALL ASK(' RI, SC, UT, VT, VA, WA, WV
CALL ASK('
CALL ASK('
CALL ASK(' INPUT RATE STEP (14, 15, 16, 17, OR 18)
READ(13,*) RSTEEF
IF(RSTEEF.LT.14.OR.RSTEEF.GT.18) THEN
CALL ASK('NCT A VALID RATE STEP
GO TO 6
END IF

```

```

CALL ASK('
CALL ASK(' FOR CALCULATING THE DIRECT SPRINT COSTS,
CALL ASK(' WHAT IS THE REGION OF ORIGINATION?
CALL ASK('
CALL ASK(' REGION STATES
CALL ASK('
CALL ASK(' 1 - CO, GA, IL, LA, MO, OH, TX, WI
CALL ASK('
CALL ASK(' 2 - AZ, CA, DC, FL, MA, MD, NC, NY,
CALL ASK(' PA, WA
CALL ASK('
CALL ASK('
CALL ASK(' (NOTE: ONLY SPECIFIC LOCATIONS IN THESE
CALL ASK(' STATES ARE CAPABLE OF DIRECT SPRINT CALL
CALL ASK(' ORIGINATION)
CALL ASK('
CALL ASK(' INPUT REGION (1 OR 2)
READ(13,*) REGION
IF(REGION.NE.1.AND.REGION.NE.2) THEN
CALL ASK('NCT A VALID REGION
GO TO 7
END IF
FORMAT(A1)
RETURN

```

```

      ENL
$EJECT
SUBROUTINE ASK(QUEST)
C*****
C
C   THIS SUBROUTINE TAKES A CHARACTER STRING WHICH IS GIVEN
C   AS THE SUBROUTINE ARGUMENT AND OUTPUTS IT TO THE TERMINAL.
C
C   CHARACTER*43 QUEST
C   WRITE(13,100) QUEST
C   RETURN
100  FORMAT(1X,A43)
      ENL
$EJECT
SUBROUTINE DIST(I,BAND,MILES)
C*****
C
C   THIS SUBROUTINE CALCULATES THE DISTANCE TO A CALLED CITY FROM
C   THE DURATION, RATE PERIOD, AND COST OF THE CALL.
C   THE RATES USED IN THIS SUBROUTINE ARE FROM AMERICAN TELEPHONE
C   AND TELEGRAPH CO. FCC TARIFF NO. 263, 1 FEB 1984.
C
C   NOTE: THE RATES USED IN THIS SUBROUTINE MUST BE THOSE FROM THE AT&T
C   TARIFF IN EFFECT WHEN THE CALLS WERE ORIGINALLY MADE AND BILLED.
C*****
C
C   AT&T MTS CHARGES ARE BASED ON A RATE FOR THE FIRST MINUTE PLUS A
C   RATE FOR ADDITIONAL MINUTES IN EACH RATE PERIOD. THE DURATION OF
C   A CALL IS ROUNDED UP TO THE NEXT HIGHER MINUTE. COSTS ARE
C   CALCULATED AT THE DAY RATE, REGARDLESS OF THE RATE PERIOD, THEN
C   DISCOUNTED ACCORDING TO THE RATE PERIOD IN WHICH THE CALL WAS MADE.
C   TENTHS OF A CENT ARE TRUNCATED FROM THE COSTS CALCULATED FOR EACH
C   AT&T MTS CALL.
C*****
C
C   VARIABLE DEFINITIONS
C
C   ACCDE - AREA CODE CALLED
C
C   BAND - BAND (GEOGRAPHICAL REGION) FROM WHICH CALLS TO HAWAII ARE
C   ORIGINATED
C
C   COST - COST OF CALL
C   NOTE: .0001 IS ADDED TO COST TO CORRECT FOR MACHINE ROUNDING
C   ERROR.
C
C   COST1 - A VARIABLE USED TO ADD .0001 TO COST TO CORRECT FOR
C   MACHINE ROUNDING ERROR
C
C   DISC - DISCOUNT FACTOR. AT&T OFFERS THE FOLLOWING DISCOUNTS FOR
C   CALLS:
C       EVENING 40 PERCENT (OR COST TIMES .6)
C       NIGHT AND WEEKEND 60 PERCENT (OR COST TIMES .4)
C       NIGHT AND WEEKEND TO ALASKA AND HAWAII 55 PERCENT (OR COST
C       TIMES .45) (AT&T CURRENT RATES ONLY)
C
C   (NOTE: AT&T CALCULATES THE COST OF ALL CALLS BY APPLYING THE
C   DAY RATES, MULTIPLYING BY DISCOUNT FACTOR, AND TRUNCATING
C   TENTHS OF A CENT.)
C
C   ICCST - INTEGER COST OF CALL TIMES 100
C
C   ITCOST - INTEGRATED TEMPORARY COST (TCOST) TIMES 100
C
C   (NOTE: ICOST AND ITCOST ARE USED TO TRUNCATE TENTHS OF CENTS FOR
C   COMPARISON BETWEEN ORIGINAL COST (+ .0001) (ICOST) AND CALCULATED
C   COST (ITCOST) OF CALL)

```


C TO MILES=9, BAND 2 TO MILES=10, BAND 3 TO MILES=11 TO PERMIT
C CALCULATING THE COSTS OF THESE CALLS VIA OTHER CARRIERS IN
C SUBROUTINE CALC AND CALC2

C IF (ACCDE (I) .EQ. 808) THEN
C TCCST = (.74 + (NMIN*.49)) *DISC+.0001
C ITCOST=IFIX(TCCST*100.)
C IF (ITCOST.EQ.ICCST) THEN; BAND=1; MILES=9; END IF
C TCCST = (.76 + (NMIN*.53)) *DISC+.0001
C ITCOST=IFIX(TCCST*100.)
C IF (ITCOST.EQ.ICCST) THEN; BAND=2; MILES=10; END IF
C TCCST = (.79 + (NMIN*.55)) *DISC+.0001
C ITCOST=IFIX(TCCST*100.)
C IF (ITCOST.EQ.ICCST) THEN; BAND=3; MILES=11; END IF
C GO TO 10
C END IF

C*****
C*****

C CALCULATION OF DISTANCE (MILES) FOR CALLS TO ALASKA

C IF (ACODE (I) .EQ. 907) THEN
C TCCST = (.62 + (NMIN*.43)) *DISC+.0001
C ITCOST=IFIX(TCCST*100.)
C IF (ITCOST.EQ.ICCST) MILES=7
C TCCST = (.64 + (NMIN*.46)) *DISC+.0001
C ITCOST=IFIX(TCCST*100.)
C IF (ITCOST.EQ.ICCST) MILES=8
C TCCST = (.74 + (NMIN*.54)) *DISC+.0001
C ITCOST=IFIX(TCCST*100.)
C IF (ITCOST.EQ.ICCST) MILES=9
C TCCST = (.79 + (NMIN*.62)) *DISC+.0001
C ITCOST=IFIX(TCCST*100.)
C IF (ITCOST.EQ.ICCST) MILES=10
C TCCST = (.87 + (NMIN*.70)) *DISC+.0001
C ITCOST=IFIX(TCCST*100.)
C IF (ITCOST.EQ.ICCST) MILES=11
C GO TO 10
C END IF

C*****
C*****

C CALCULATION OF DISTANCE (MILES) FOR ALL CALLS EXCEPT TO HAWAII
C AND ALASKA

C TCCST = (.32 + (NMIN*.16)) *DISC+.0001
C ITCOST=IFIX(TCCST*100.)
C IF (ITCOST.EQ.ICCST) MILES=1
C TCCST = (.40 + (NMIN*.22)) *DISC+.0001
C ITCOST=IFIX(TCCST*100.)
C IF (ITCOST.EQ.ICCST) MILES=2
C TCCST = (.48 + (NMIN*.28)) *DISC+.0001
C ITCOST=IFIX(TCCST*100.)
C IF (ITCOST.EQ.ICCST) MILES=3

```

C      TCCST=(.57+(NMIN*.37))*DISC+.0001
      ITCOST=IFIX(TCCST*100.)
      IF (ITCOST.EQ.ICCST) MILES=4
C      TCCST=(.58+(NMIN*.39))*DISC+.0001
      ITCOST=IFIX(TCCST*100.)
      IF (ITCOST.EQ.ICCST) MILES=5
C      TCCST=(.59+(NMIN*.42))*DISC+.0001
      ITCOST=IFIX(TCCST*100.)
      IF (ITCOST.EQ.ICCST) MILES=6
C      TCCST=(.62+(NMIN*.43))*DISC+.0001
      ITCOST=IFIX(TCCST*100.)
      IF (ITCOST.EQ.ICCST) MILES=7
C      TCCST=(.64+(NMIN*.44))*DISC+.0001
      ITCOST=IFIX(TCCST*100.)
      IF (ITCOST.EQ.ICCST) MILES=8
C      TCCST=(.74+(NMIN*.49))*DISC+.0001
      ITCOST=IFIX(TCCST*100.)
      IF (ITCOST.EQ.ICCST) MILES=9
C      TCCST=(.76+(NMIN*.51))*DISC+.0001
      ITCOST=IFIX(TCCST*100.)
      IF (ITCOST.EQ.ICCST) MILES=10
C      TCCST=(.79+(NMIN*.53))*DISC+.0001
      ITCOST=IFIX(TCCST*100.)
      IF (ITCOST.EQ.ICCST) MILES=11
C 10  CCNTINUE
      RETURN
      END
$EJECT
SUBROUTINE CALC (I, BAND, MILES, RATE1, RATE1A, RATE2, RATE2A, RATE3,
-RATE3A, DISC2, DISC3, COST1, COST2, COST2A, COST3, COST3A,
-CSUM0, CSUM1, CSUM2, CSUM2A, CSUM3, CSUM3A,
-MIN1, MIN12, MIN13, MIN21, MIN22, MIN23, MIN212, MIN222, MIN232,
-NCMCI, NCMIN, MIN31, MIN32, MIN33, MIN312, MIN322, MIN332,
-MIN313, MIN323, MIN333)
*****
C      THIS SUBROUTINE CALCULATES THE COST OF EACH CALL IF IT WERE MADE
C      VIA AT&T MTS (PROPOSED RATES), MCI EXECUNET, AND SPRINT (BASED
C      ON DURATION OF CALL, RATE PERIOD, MILEAGE, AND, FOR MCI EXECUNET,
C      NETWORK OR NON-NETWORK CITY), AND SUMS THE COSTS OF CALLS (WITHIN
C      EACH RATE PERIOD, NETWORK OR NON-NETWORK CITY) FOR EACH CARRIER
C      FOR USE IN THE AT&T WATS, MCI WATS, AND DIRECT SPRINT COST
C      CALCULATIONS PERFORMED IN SUBROUTINE CALC2.
C
C      RATES USED IN THIS SUBROUTINE ARE FROM THE FOLLOWING TARIFFS:
C
C      AT&T MTS (PROPOSED RATES)
C
C          AT&T COMMUNICATIONS TARIFF FCC NO. 1, PP 56, 59, ISSUED
C          3 OCT 1983, EFFECTIVE DATE POSTPONED INDEFINITELY.
C
C      MCI EXECUNET
C
C          MCI TELECOMMUNICATIONS CORPORATION TARIFF FCC NO.1, P 19,
C          1 APR 1983.
C
C      SPRINT
C
C          GTE SPRINT COMMUNICATIONS CORPORATION TARIFF FCC NO. 11, P 34,
C          5 JAN 1984.

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 METHODS OF APPLYING THE TARIFFS ARE DESCRIBED BELOW.

AT&T MTS AND SPRINT CHARGES ARE BASED ON A RATE FOR THE FIRST MINUTE PLUS A RATE FOR ADDITIONAL MINUTES IN EACH RATE PERIOD, WHILE MCI EXECUNET HAS A SINGLE RATE FOR ALL MINUTES IN A RATE PERIOD. ALL OF THESE SERVICES ROUND UP THE DURATION OF THE CALL TO THE NEXT HIGHER MINUTE--THEY BILL IN ONE MINUTE INCREMENTS. AT&T MTS COSTS ARE CALCULATED AT THE DAY RATE, REGARDLESS OF RATE PERIOD, THEN DISCOUNTED ACCORDING TO THE RATE PERIOD IN WHICH THE CALL WAS MADE. (THE DISCOUNTS ARE 40 PERCENT FOR THE EVENING RATE PERIOD AND 60 PERCENT FOR THE NIGHT AND WEEKEND RATE PERIOD. A 55 PERCENT DISCOUNT IS APPLIED TO CALLS TO ALASKA AND HAWAII DURING THE NIGHT AND WEEKEND RATE PERIOD UNDER THE CURRENT TARIFF.) SPRINT SERVICE IS DISCOUNTED BASED UPON TOTAL DOLLAR AMOUNT OF THE BILL. MCI EXECUNET HAS SEPARATE RATES FOR CALLS TO NETWORK AND NCN-NETWORK CITIES. TENTHS OF A CENT ARE TRUNCATED FROM THE COSTS CALCULATED FOR EACH AT&T MTS CALL AND ARE ROUNDED FOR EACH MCI EXECUNET AND SPRINT CALL.

 VARIABLE DEFINITIONS

ACCDE - AREA CODE CALLED

EAND - BAND (GEOGRAPHICAL REGION) FROM WHICH CALLS TO HAWAII ARE ORIGINATED

COST - COST OF CALL

COST1 - COST OF CALL IF MADE VIA AT&T MTS (PROPOSED RATES)

COST2 - COST OF CALL IF MADE VIA MCI EXECUNET

COST2A - COST OF CALL IF MADE VIA MCI EXECUNET (INCLUDING COST OF CALL TO ACCESS)

COST3 - COST OF CALL IF MADE VIA SPRINT

COST3A - COST OF CALL IF MADE VIA SPRINT (INCLUDING COST OF CALL TO ACCESS)

CSUM0 - SUM OF ORIGINAL AT&T MTS CALLS

CSUM1 - SUM OF COSTS OF CALLS MADE VIA AT&T MTS (PROPOSED RATES)

CSUM2 - SUM OF COSTS OF CALLS MADE VIA MCI EXECUNET

CSUM2A - SUM OF COSTS OF CALLS MADE VIA MCI EXECUNET (INCLUDING COSTS OF CALLS TO ACCESS)

CSUM3 - SUM OF COSTS OF CALLS MADE VIA SPRINT

CSUM3A - SUM OF COSTS OF CALLS MADE VIA SPRINT (INCLUDING COSTS OF CALLS TO ACCESS)

DISC - DISCOUNT FACTOR. AT&T OFFERS THE FOLLOWING DISCOUNTS FOR CALLS:

EVENING 40 PERCENT (OR COST TIMES .6)
 NIGHT AND WEEKEND 60 PERCENT (OR COST TIMES .4)

(NOTE: AT&T CALCULATES THE COST OF ALL CALLS BY APPLYING THE DAY RATES, MULTIPLYING BY DISCOUNT FACTOR, AND TRUNCATING TENTHS OF A CENT.)

DISC2 - THE DISCOUNT FACTOR FOR EVENING RATE PERIOD

DISC3 - THE DISCOUNT FACTOR FOR NIGHT AND WEEKEND RATE PERIOD

FLAG(X) - AN AFFIX USED TO INDICATE IF THE AREA CODE AND PREFIX OF THE CALL ARE ON THE SCC NETWORKS

FLAG(1) = MCI

FLAG(2) = GTE SPRINT


```

MIN211=MIN221=MIN231=0
MIN212=MIN222=MIN232=0
MIN311=MIN321=MIN331=0
MIN312=MIN322=MIN332=0
NOMCI=0
NOMIN=0
DO 1 J=1,4
1 MIN313(J)=MIN323(J)=MIN333(J)=0
END IF
C*****
C*****
C      CALCULATION OF ADDITIONAL MINUTES
C
C      NMIN=MIN(I)-1
C*****
C*****
C*****
C***** AT&T MTS COST CALCULATION (PROPOSED RATES) *****
C
C      IF (PERIOD(I).EQ.1) DISC=.1.
C      IF (PERIOD(I).EQ.2) DISC=.6
C      IF (PERIOD(I).EQ.3) DISC=.4
C*****
C*****
C      THE FOLLOWING CALCULATION APPLIES IF THE CALL IS (MADE VIA AT&T
C      MTS) TO HAWAII.
C
C      IF (ACCDE(I).EQ.808) THEN
C      IF (BAND.EQ.1) COST1={.73+(NMIN*.43)}*DISC
C      IF (BAND.EQ.2) COST1={.75+(NMIN*.45)}*DISC
C      IF (BAND.EQ.3) COST1={.78+(NMIN*.47)}*DISC
C
C*****SUM OF MINUTES IN EACH RATE PERIOD*****
C*****FOR USE IN DIRECT SPRINT CALCULATION*****
C*****FOR NON-NETWORK CALLS TO HAWAII*****
C
C      IF (FLAG(2)) GO TO 10
C      DO 2 J=1,4
C      N=J+7
C      IF (PERIOD(I).EQ.1.AND.MILES.EQ.N) MIN313(J)=MIN313(J)+MIN(I)
C      IF (PERIOD(I).EQ.2.AND.MILES.EQ.N) MIN323(J)=MIN323(J)+MIN(I)
2      IF (PERIOD(I).EQ.3.AND.MILES.EQ.N) MIN333(J)=MIN333(J)+MIN(I)
C      GO TO 10
C
C      END IF
C*****
C*****
C      THE FOLLOWING CALCULATION APPLIES IF THE CALL IS (MADE VIA AT&T
C      MTS) TO ALASKA.
C
C*****SUM OF MINUTES IN EACH RATE PERIOD*****
C*****FOR USE IN DIRECT SPRINT CALCULATION*****
C*****FOR CALLS TO ALASKA*****
C
C      IF (ACCDE(I).EQ.907) THEN
C      IF (MILES.EQ.7) J=1
C      IF (MILES.EQ.8) J=2
C      IF (MILES.EQ.9) J=2
C      IF (MILES.EQ.10) J=3
C      IF (MILES.EQ.11) J=4
C      IF (PERIOD(I).EQ.1) MIN313(J)=MIN313(J)+MIN(I)
C      IF (PERIOD(I).EQ.2) MIN323(J)=MIN323(J)+MIN(I)
C      IF (PERIOD(I).EQ.3) MIN333(J)=MIN333(J)+MIN(I)

```

```

      END IF
C
C*****COST CALCULATICK*****
C
      IF (MILES.EQ.1) CCST1= (.31+ (NMIN*.16)) *DISC
      IF (MILES.EQ.2) CCST1= (.39+ (NMIN*.22)) *DISC
      IF (MILES.EQ.3) CCST1= (.47+ (NMIN*.28)) *DISC
      IF (MILES.EQ.4) CCST1= (.56+ (NMIN*.32)) *DISC
      IF (MILES.EQ.5) CCST1= (.57+ (NMIN*.34)) *DISC
      IF (MILES.EQ.6) CCST1= (.58+ (NMIN*.35)) *DISC
      IF (MILES.EQ.7) CCST1= (.61+ (NMIN*.35)) *DISC
      IF (MILES.EQ.8) CCST1= (.63+ (NMIN*.38)) *DISC
      IF (MILES.EQ.9) CCST1= (.73+ (NMIN*.43)) *DISC
      IF (MILES.EQ.10) CCST1= (.75+ (NMIN*.45)) *DISC
      IF (MILES.EQ.11) CCST1= (.78+ (NMIN*.47)) *DISC
10  CCNTINUE
C
C      THE FOLLOWING TWO STATEMENTS TRUNCATE TENTHS OF CENTS OF COST
C      CALCULATED FOR AT&T MTS (PROPOSED RATES)
C
      ICCST1=IFIX((CCST1+.0001)*100.)
      CCST1=ICOST1/100.
C*****
C*****SUM OF ORIGINAL COSTS OF CALLS*****
C
      CSUM0=CSUM0+CCST1(I)
C*****
C*****SUM OF COSTS OF CALLS WITH PROPOSED AT&T MTS RATES*****
C
      CSUM1=CSUM1+CCST1
C*****
C*****SUM OF MINUTES IN EACH RATE PERIOD*****
C
      IF (PERIOD(I).EQ.1) MIN11=MIN11+MIN(I)
      IF (PERIOD(I).EQ.2) MIN12=MIN12+MIN(I)
      IF (PERIOD(I).EQ.3) MIN13=MIN13+MIN(I)
C
C*****
C*****
C*****
C*****
C***** MCI EXECUNET COST CALCULATION *****
C*****
C*****
C*****
C***** TO A NETWORK CITY *****
C*****
C*****COST CALCULATION FOR DAY RATE PERIOD CALL*****
C
      IF (FLAG(1)) THEN
        IF (PERIOD(I).EQ.1) THEN
          IF (MILES.EQ.1) COST2=.1536*MIN(I)
          IF (MILES.EQ.2) COST2=.2100*MIN(I)
          IF (MILES.EQ.3) COST2=.2700*MIN(I)
          IF (MILES.EQ.4) COST2=.3280*MIN(I)
          IF (MILES.EQ.5) COST2=.3424*MIN(I)
          IF (MILES.EQ.6) COST2=.3632*MIN(I)
          IF (MILES.EQ.7) COST2=.3744*MIN(I)
          IF (MILES.EQ.8) COST2=.3840*MIN(I)
          IF (MILES.EQ.9) COST2=.4320*MIN(I)
          IF (MILES.EQ.10) COST2=.4320*MIN(I)
          IF (MILES.EQ.11) COST2=.4320*MIN(I)
C*****
C*****
C      SUM OF MIN211 FOR USE IN SUBROUTINE CALC2
C

```

```

C      MIN211=MIN211+MIN(I)
C
C      COST PLUS COST CF CALL TO ACCESS
C      THE (IFIX...) PORTION OF THIS STATEMENT TRUNCATES TENTHS OF CENTS
C      CF COST FOR CALL TO ACCESS
C
C      COST2A=COST2+(IFIX((RATE1+(NMIN*RATE1A)+.0001)*100.)/100.)
C      GO TO 20
C      END IF
C*****COST CALCULATION FOR EVENING RATE PERIOD CALL*****
C
C      IF (PERIOD(I).EQ.2) THEN
C      IF (MILES.EQ.1) COST2=.0922*MIN(I)
C      IF (MILES.EQ.2) COST2=.1260*MIN(I)
C      IF (MILES.EQ.3) COST2=.1319*MIN(I)
C      IF (MILES.EQ.4) COST2=.1536*MIN(I)
C      IF (MILES.EQ.5) COST2=.1614*MIN(I)
C      IF (MILES.EQ.6) COST2=.1728*MIN(I)
C      IF (MILES.EQ.7) COST2=.1774*MIN(I)
C      IF (MILES.EQ.8) COST2=.1816*MIN(I)
C      IF (MILES.EQ.9) COST2=.2029*MIN(I)
C      IF (MILES.EQ.10) COST2=.2029*MIN(I)
C      IF (MILES.EQ.11) COST2=.2029*MIN(I)
C*****
C      SUM OF MIN221 FOR USE IN SUBROUTINE CALC2
C
C      MIN221=MIN221+MIN(I)
C
C      CCST PLUS COST CF CALL TO ACCESS
C      THE (IFIX...) PORTION OF THIS STATEMENT TRUNCATES TENTHS OF CENTS
C      CF CCST FOR CALL TO ACCESS
C
C      COST2A=CCST2+(IFIX((RATE2+(NMIN*RATE2A)+.0001)*100.)/100.)
C      GO TO 20
C      END IF
C*****COST CALCULATION FOR NIGHT AND WEEKEND RATE PERIOD CALL*****
C
C      IF (PERIOD(I).EQ.3) THEN
C      IF (MILES.EQ.1) COST2=.0614*MIN(I)
C      IF (MILES.EQ.2) CCST2=.0840*MIN(I)
C      IF (MILES.EQ.3) COST2=.1080*MIN(I)
C      IF (MILES.EQ.4) COST2=.1194*MIN(I)
C      IF (MILES.EQ.5) CCST2=.1255*MIN(I)
C      IF (MILES.EQ.6) COST2=.1344*MIN(I)
C      IF (MILES.EQ.7) COST2=.1379*MIN(I)
C      IF (MILES.EQ.8) COST2=.1412*MIN(I)
C      IF (MILES.EQ.9) COST2=.1579*MIN(I)
C      IF (MILES.EQ.10) COST2=.1579*MIN(I)
C      IF (MILES.EQ.11) COST2=.1579*MIN(I)
C*****
C      SUM OF MIN231 FOR USE IN SUBROUTINE CALC2
C
C      MIN231=MIN231+MIN(I)
C
C      CCST PLUS COST CF CALL TO ACCESS
C      THE (IFIX...) PORTION OF THIS STATEMENT TRUNCATES TENTHS OF CENTS
C      CF CCST FOR CALL TO ACCESS
C
C      COST2A=CCST2+(IFIX((RATE3+(NMIN*RATE3A)+.0001)*100.)/100.)
C      GO TO 20
C      END IF
C      END IF
C*****
C***** TO A NON-NETWORK CITY *****
C*****

```

```

C*****COST CALCULATION FOR DAY RATE PERIOD CALL*****
C
C SINCE MCI DOES NOT OFFER SERVICE TO ALASKA, THE FOLLOWING <IF>
C STATEMENT SUMS THE NUMBER AND TOTAL MINUTES OF CALLS UNABLE TO
C BE COMPLETED TO ALASKA FOR OUTPUT
C
      IF (ACODE(I).EQ.907) THEN
        NOMCI=NOMCI+1
        NOMIN=NOMIN+MIN(I)
        COST2=0.0
        COST2A=0.0
        GO TO 20
      END IF
      IF (PERIOD(I).EQ.1) THEN
        IF (MILES.EQ.1) CCST2=.1536*MIN(I)
        IF (MILES.EQ.2) CCST2=.2100*MIN(I)
        IF (MILES.EQ.3) CCST2=.2700*MIN(I)
        IF (MILES.EQ.4) CCST2=.3600*MIN(I)
        IF (MILES.EQ.5) CCST2=.3800*MIN(I)
        IF (MILES.EQ.6) CCST2=.4100*MIN(I)
        IF (MILES.EQ.7) CCST2=.4200*MIN(I)
        IF (MILES.EQ.8) CCST2=.4300*MIN(I)
        IF (MILES.EQ.9) CCST2=.4800*MIN(I)
        IF (MILES.EQ.10) CCST2=.4800*MIN(I)
        IF (MILES.EQ.11) CCST2=.4800*MIN(I)
C*****
C SUM OF MIN212 FOR USE IN SUBROUTINE CALC2
C
      MIN212=MIN212+MIN(I)
C
C CCST PLUS COST OF CALL TO ACCESS
C THE (IFIX...) PORTION OF THIS STATEMENT TRUNCATES TENTHS OF CENTS
C OF CCST FOR CALL TO ACCESS
C
      COST2A=CCST2+(IFIX((RATE1+(NMIN*RATE1A)+.0001)*100.)/100.)
      GO TO 20
    END IF
C*****COST CALCULATION FOR EVENING RATE PERIOD CALL*****
C
      IF (PERIOD(I).EQ.2) THEN
        IF (MILES.EQ.1) CCST2=.0922*MIN(I)
        IF (MILES.EQ.2) CCST2=.1260*MIN(I)
        IF (MILES.EQ.3) CCST2=.1620*MIN(I)
        IF (MILES.EQ.4) CCST2=.2160*MIN(I)
        IF (MILES.EQ.5) CCST2=.2280*MIN(I)
        IF (MILES.EQ.6) CCST2=.2460*MIN(I)
        IF (MILES.EQ.7) CCST2=.2520*MIN(I)
        IF (MILES.EQ.8) CCST2=.2580*MIN(I)
        IF (MILES.EQ.9) CCST2=.2880*MIN(I)
        IF (MILES.EQ.10) CCST2=.2880*MIN(I)
        IF (MILES.EQ.11) CCST2=.2880*MIN(I)
C*****
C SUM OF MIN222 FOR USE IN SUBROUTINE CALC2
C
      MIN222=MIN222+MIN(I)
C
C COST PLUS COST OF CALL TO ACCESS
C THE (IFIX...) PORTION OF THIS STATEMENT TRUNCATES TENTHS OF CENTS
C OF CCST FOR CALL TO ACCESS
C
      COST2A=CCST2+(IFIX((RATE2+(NMIN*RATE2A)+.0001)*100.)/100.)
      GO TO 20
    END IF
C*****COST CALCULATION FOR NIGHT AND WEEKEND RATE PERIOD CALL*****
C
      IF (PERIOD(I).EQ.3) THEN
        IF (MILES.EQ.1) CCST2=.0614*MIN(I)

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      IF (MILES.EQ.2) COST2=.0840*MIN(I)
      IF (MILES.EQ.3) CCST2=.1080*MIN(I)
      IF (MILES.EQ.4) COST2=.1440*MIN(I)
      IF (MILES.EQ.5) CCST2=.1520*MIN(I)
      IF (MILES.EQ.6) COST2=.1640*MIN(I)
      IF (MILES.EQ.7) COST2=.1680*MIN(I)
      IF (MILES.EQ.8) CCST2=.1720*MIN(I)
      IF (MILES.EQ.9) COST2=.1920*MIN(I)
      IF (MILES.EQ.10) COST2=.1920*MIN(I)
      IF (MILES.EQ.11) COST2=.1920*MIN(I)
*****
      SUM CF MIN232 FOR USE IN SUBROUTINE CALC2
      MIN232=MIN232+MIN(I)
      CCST PLUS COST CF CALL TC ACCESS
      TEE (IFIX...) PORTION OF THIS STATEMENT TRUNCATES TENTHS OF CENTS
      CF CCST FOR CALL TO ACCESS
      COST2A=CCST2+(IFIX((RATE3+(NMIN*RATE3A)+.0001)*100.)/100.)
      GO TO 20
    END IF
20  CCNTINUE
*****
      SUM OF COSTS OF CALLS VIA MCI EXECUNET
      CSUM2=CSUM2+COST2
      SUM OF COSTS OF CALLS PLUS ACCESS COSTS
      CSUM2A=CSUM2A+CCST2A
*****
      SPRINT CCST CALCULATION *****
      THIS CALCULATION ASSUMES THE LOWEST TARIFF RATE (OVER $200 TOTAL
      LONG DISTANCE BILL). THIS IS A VALID ASSUMPTION FOR NEARLY
      ALL MILITARY INSTALLATIONS.
*****
*****COST CALCULATION FOR DAY RATE PERIOD CALL*****
      IF (PERIOD(I).EQ.1) THEN
        IF (MILES.EQ.1) COST3={.2024+(NMIN*.1426)}
        IF (MILES.EQ.2) COST3={.2668+(NMIN*.1987)}
        IF (MILES.EQ.3) COST3={.3312+(NMIN*.2539)}
        IF (MILES.EQ.4) COST3={.4048+(NMIN*.3091)}
        IF (MILES.EQ.5) COST3={.4232+(NMIN*.3238)}
        IF (MILES.EQ.6) COST3={.4416+(NMIN*.3395)}
        IF (MILES.EQ.7) COST3={.4784+(NMIN*.3514)}
        IF (MILES.EQ.8) COST3={.4876+(NMIN*.3606)}
        IF (MILES.EQ.9) COST3={.5612+(NMIN*.4085)}
        IF (MILES.EQ.10) COST3={.5796+(NMIN*.4269)}
        IF (MILES.EQ.11) COST3={.5980+(NMIN*.4453)}
      CCST PLUS COST CF CALL TC ACCESS
      TEE (IFIX...) PORTION OF THIS STATEMENT TRUNCATES TENTHS OF CENTS
      CF COST FOR CALL TO ACCESS
      COST3A=CCST3+(IFIX((RATE1+(NMIN*RATE1A)+.0001)*100.)/100.)
*****
      SUM OF MIN311 FOR USE IN SUBROUTINE CALC2
      IF (FLAG(2)) THEN

```

```

MIN311=MIN311+MIN(I)
GC TO 30
END IF
C*****
C IF CALL IS TO ALASKA OR HAWAII (NON-NETWORK) MINUTES HAVE
C ALREADY BEEN SUMMED AT BEGINNING OF PROGRAM
C
C IF (ACODE(I).EQ.808.OR.ACODE(I).EQ.907) GO TO 30
C*****
C SUM OF MIN312 FOR USE IN SUBROUTINE CALC2
C
C MIN312=MIN312+MIN(I)
C
C GO TO 30
C END IF
C*****
C*****CCST CALCULATION FOR EVENING RATE PERIOD CALL*****
C
C IF (PERIOD(I).EQ.2) THEN
C   IF (MILES.EQ.1) COST3= (.1170+ (NMIN*.0830) )
C   IF (MILES.EQ.2) COST3= (.1530+ (NMIN*.1134) )
C   IF (MILES.EQ.3) COST3= (.1800+ (NMIN*.1341) )
C   IF (MILES.EQ.4) COST3= (.2430+ (NMIN*.1798) )
C   IF (MILES.EQ.5) COST3= (.2610+ (NMIN*.1935) )
C   IF (MILES.EQ.6) COST3= (.2790+ (NMIN*.2016) )
C   IF (MILES.EQ.7) COST3= (.2880+ (NMIN*.2097) )
C   IF (MILES.EQ.8) COST3= (.2970+ (NMIN*.2151) )
C   IF (MILES.EQ.9) COST3= (.3150+ (NMIN*.2333) )
C   IF (MILES.EQ.10) COST3= (.3240+ (NMIN*.2524) )
C   IF (MILES.EQ.11) COST3= (.3420+ (NMIN*.2619) )
C
C CCST PLUS COST OF CALL TO ACCESS
C THE (IFIX...) PORTION OF THIS STATEMENT TRUNCATES TENTHS OF CENTS
C OF CCST FOR CALL TO ACCESS
C
C COST3A=CCST3+ (IFIX ((RATE2+ (NMIN*RATE2A) +.0001)*100.) /100.)
C*****
C SUM OF MIN321 FOR USE IN SUBROUTINE CALC2
C
C IF (FLAG(2)) THEN
C   MIN321=MIN321+MIN(I)
C   GC TO 30
C   END IF
C*****
C IF CALL IS TO ALASKA OR HAWAII (NON-NETWORK) MINUTES HAVE
C ALREADY BEEN SUMMED AT BEGINNING OF PROGRAM
C
C IF (ACODE(I).EQ.808.OR.ACODE(I).EQ.907) GO TO 30
C*****
C SUM OF MIN322 FOR USE IN SUBROUTINE CALC2
C
C MIN322=MIN322+MIN(I)
C
C GO TO 30
C END IF
C*****
C*****CCST CALCULATION FOR NIGHT AND WEEKEND RATE PERIOD CALL*****
C
C IF (PERIOD(I).EQ.3) THEN
C   IF (MILES.EQ.1) COST3= (.0528+ (NMIN*.0527) )
C   IF (MILES.EQ.2) COST3= (.0704+ (NMIN*.0703) )
C   IF (MILES.EQ.3) COST3= (.1232+ (NMIN*.0950) )
C   IF (MILES.EQ.4) COST3= (.1584+ (NMIN*.1143) )
C   IF (MILES.EQ.5) COST3= (.1672+ (NMIN*.1267) )
C   IF (MILES.EQ.6) COST3= (.1760+ (NMIN*.1346) )

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C      IF (MILES.EQ.7) COST3= (.1848+ (NMIN*.1364) )
C      IF (MILES.EQ.8) COST3= (.1936+ (NMIN*.1390) )
C      IF (MILES.EQ.9) COST3= (.2112+ (NMIN*.1521) )
C      IF (MILES.EQ.10) COST3= (.2200+ (NMIN*.1645) )
C      IF (MILES.EQ.11) COST3= (.2288+ (NMIN*.1707) )
C
C      CCST FLUS COST CF CALL TO ACCESS
C      THE (IFIX...) PORTION OF THIS STATEMENT TRUNCATES TENTHS OF CENTS
C      CF COST FOR CALL TO ACCESS
C
C      COST3A=CCST3+(IFIX((RATE3+(NMIN*RATE3A)+.0001)*100.)/100.)
C*****
C      SUM OF MIN331 FOR USE IN SUBROUTINE CALC2
C
C      IF (FLAG(2)) THEN
C        MIN331=MIN331+MIN(I)
C        GO TO 30
C      END IF
C*****
C      IF CALL IS TO ALASKA OR HAWAII (NON-NETWORK) MINUTES HAVE
C      ALREADY BEEN SUMMED AT BEGINNING OF PROGRAM
C
C      IF (ACODE(I).EQ.808.OR.ACODE(I).EQ.907) GO TO 30
C*****
C      SUM OF MIN332 FOR USE IN SUBROUTINE CALC2
C
C      MIN332=MIN332+MIN(I)
C
C      GO TO 30
C      END IF
C
C      30 CONTINUE
C*****
C      SUM OF COSTS OF CALLS VIA SPRINT
C
C      CSUM3=CSUM3+COST3
C
C      SUM OF COSTS OF CALLS PLUS ACCESS COSTS
C
C      CSUM3A=CSUM3A+CCST3A
C
C      RETURN
C      END
C
C$EJECT
C      SUBROUTINE LINES(MIN11)
C*****
C      THIS SUBROUTINE CALCULATES ERLANGS OF CALLS DURING THE
C      BUSY HOUR AND OUTPUTS NUMBERS OF LINES AND GRADES OF SERVICE
C      (CALCULATED USING THE ERLANG B EQUATION (SEE SMITH, SYDNEY F.
C      TELEPHONY AND TELEGRAPHY, OXFORD UNIVERSITY PRESS, P 180, 1978.))
C      FOR USE IN DETERMINING HOW MANY WATS OR ACCESS LINES TO USE
C      IN CALCULATING THE COSTS OF AT&T WATS, MCI WATS, AND DIRECT
C      SPRINT.
C
C      NOTE: THIS SUBROUTINE ASSUMES AN AVERAGE OF 22 BUSINESS DAYS IN
C      A MONTH AND APPROXIMATELY 17 PERCENT OF ALL CALLS MADE DURING THE
C      BUSINESS DAY (8 HOURS) OCCUR DURING THE BUSY HOUR.
C
C      THE ERLANG B EQUATION IS:
C
C      B = 
$$\frac{\text{ERL}^N / N!}{1 + \text{ERL} + \text{ERL}^2 / 2! + \dots + \text{ERL}^N / N!}$$

C*****

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RATES USED IN THIS SUBROUTINE ARE FROM THE FOLLOWING TARIFFS:

AT&T WATS (CURRENT RATES)

AMERICAN TELEPHONE AND TELEGRAPH CO. TARIFF FCC NO. 259,
FP 13-14.1, 1 JAN 1984.

AT&T WATS (PROPOSED RATES)

AT&T COMMUNICATIONS TARIFF FCC NO. 2, PP 74-75, ISSUED
3 OCT 1983, EFFECTIVE DATE POSTPONED INDEFINITELY.

MCI WATS

MCI TELECOMMUNICATIONS CORPORATION TARIFF FCC NO.1, PP 19.6-
19.7, 1 APR 1983.

DIRECT SPRINT

GTE SPRINT COMMUNICATIONS CORPORATION TARIFF FCC NO. 10, PP 42-
49, 5 JAN 1984.

METHODS OF APPLYING THE TARIFFS ARE DESCRIBED BELOW.

AT&T WATS MEASURES THE DURATION OF A CALL IN ONE SECOND INCREMENTS,
MCI WATS USES THIRTY SECOND INCREMENTS, AND DIRECT SPRINT USES SIX
SECOND INCREMENTS. ALL THREE OF THESE SERVICES HAVE A ONE MINUTE
MINIMUM AVERAGE TIME REQUIREMENT. ALSO, ALL THREE HAVE THE SAME
POINTS AT WHICH THE RATES TAPER: 15, 40, AND 80 HOURS (OR EQUIV-
ALENT MINUTES). COSTS ARE CALCULATED BASED ON AVERAGE USE PER LINE
PER RATE PERIOD. IN OTHER WORDS, THE TOTAL USAGE IN EACH RATE
PERIOD FOR ALL LINES (WATS LINES OR DALS) IS DIVIDED BY THE NUMBER
OF LINES TO OBTAIN AN AVERAGE USE PER LINE PER RATE PERIOD.
(AT&T WATS ROUNDS THIS AVERAGE TO THE NEAREST TENTH OF AN HOUR.)
MCI WATS AND DIRECT SPRINT ALSO CALCULATE THE AVERAGE FOR CALLS TO
NETWORK AND NON-NETWORK CITIES. THE AVERAGE USE PER LINE PER RATE
PERIOD AND THE PER LINE MONTHLY RECURRING CHARGES ARE USED TO
CALCULATE THE COST PER LINE. THE COST PER LINE IS MULTIPLIED BY
THE TOTAL NUMBER OF LINES TO OBTAIN THE TOTAL COST.

THE RESULTS OF THESE CALCULATIONS WILL BE LARGER THAN ACTUAL FOR
THE SERVICES THAT ARE BILLED IN LESS THAN ONE MINUTE INCREMENTS.
(IN OTHER WORDS, COSTS FOR THE CALLS WOULD BE LESS THAN THESE
CALCULATIONS WOULD INDICATE.)

IF EXACT LENGTH OF CALL DATA IS AVAILABLE THIS SUBROUTINE WILL
NEED TO BE CHANGED SINCE AT&T WATS BILLS CALLS IN ONE SECOND
INCREMENTS, DIRECT SPRINT BILLS CALLS IN SIX SECOND INCREMENTS,
AND MCI WATS BILLS CALLS IN THIRTY SECOND INCREMENTS.

VARIABLE DEFINITIONS

CNXX - COST OF CALL
1ST DIGIT - CARRIER
1 - AT&T
2 - MCI
3 - GTE SPRINT
2ND DIGIT - RATE PERIOD
1 - BUSINESS DAY
2 - EVENING
3 - NIGHT AND WEEKEND
3RD DIGIT - NETWORK/NCN-NETWORK


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IF (RSTPEP.EQ.20) THEN; RATE11=25.82; RATE12=22.98; RATE13=20.14;
RATE14=17.04; RATE21=16.78; RATE22=14.94; RATE23=13.09; RATE24=11.08;
RATE3=9.04; END IF

IF (RSTPEP.EQ.21) THEN; RATE11=26.96; RATE12=23.99; RATE13=21.03;
RATE14=17.79; RATE21=17.52; RATE22=15.59; RATE23=13.67; RATE24=11.56;
RATE3=9.44; END IF

IF (RSTPEP.EQ.22) THEN; RATE11=29.04; RATE12=25.85; RATE13=22.65;
RATE14=19.17; RATE21=18.88; RATE22=16.80; RATE23=14.72; RATE24=12.46;
RATE3=10.16; END IF

*****
*****
*****COST CALCULATION FOR DAY RATE PERIOD CALLS*****
*****
IF (HR11.LE.TIME1) C11A=HP11*RATE11
IF (HR11.GT.TIME1.AND.HR11.LE.TIME3) C11A=((HR11-TIME1)*RATE12)
-+(TIME1*RATE11)
IF (HR11.GT.TIME3.AND.HR11.LE.TIME4) C11A=((HR11-TIME3)*RATE13)
-+(TIME2*RATE12)+(TIME1*RATE11)
IF (HR11.GT.TIME4) C11A=((HR11-TIME4)*RATE14)+(TIME3*RATE13)
-+(TIME2*RATE12)+(TIME1*RATE11)
*****
*****
*****COST CALCULATION FOR EVENING RATE PERIOD CALLS*****
*****
IF (HR12.LE.TIME1) C12A=HP12*RATE21
IF (HR12.GT.TIME1.AND.HR12.LE.TIME3) C12A=((HR12-TIME1)*RATE22)
-+(TIME1*RATE21)
IF (HR12.GT.TIME3.AND.HR12.LE.TIME4) C12A=((HR12-TIME3)*RATE23)
-+(TIME2*RATE22)+(TIME1*RATE21)
IF (HR12.GT.TIME4) C12A=((HR12-TIME4)*RATE24)+(TIME3*RATE23)
-+(TIME2*RATE22)+(TIME1*RATE21)
*****
*****
*****COST CALCULATION FOR NIGHT AND WEEKEND RATE PERIOD CALLS*****
*****
C13A=HR13*RATE3
*****
*****
*****SUM OF COSTS IN ALL RATE PERIODS*****
*****
CSUM1A=(C11A+C12A+C13A+CMRC1A)*NLines
*****
*****
***** AT&T WAIS (PROPOSED RATES) *****
*****

THE FOLLOWING <IF> STATEMENTS DEFINE THE RATES TO BE USED IN THE
CALCULATION BASED ON THE INPUT VALUE OF RSTPEP.

CMRC1E=56.65

IF (RSTPEP.EQ.14) THEN; RATE11=19.40; RATE12=17.27; RATE13=15.15;
RATE14=12.81; RATE21=12.62; RATE22=11.23; RATE23=9.84; RATE24=8.33;
RATE3=6.74; END IF

IF (RSTPEP.EQ.15) THEN; RATE11=19.60; RATE12=17.4; RATE13=15.30;
RATE14=12.94; RATE21=12.74; RATE22=11.35; RATE23=9.96; RATE24=8.41;
RATE3=6.81; END IF

IF (RSTPEP.EQ.16) THEN; RATE11=19.83; RATE12=17.65; RATE13=15.47;
RATE14=13.09; RATE21=12.89; RATE22=11.48; RATE23=10.06; RATE24=8.51;
RATE3=6.89; END IF

IF (RSTPEP.EQ.17) THEN; RATE11=20.06; RATE12=17.85; RATE13=15.65;
RATE14=13.23; RATE21=13.03; RATE22=11.61; RATE23=10.17; RATE24=8.61;
RATE3=6.97; END IF

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AD-A140 596

SPECIALIZED COMMON CARRIERS: LONG DISTANCE ALTERNATIVES
FOR MILITARY INSTALLATIONS(U) NAVAL POSTGRADUATE SCHOOL
MONTEREY CA S L KLINGLER MAR 84

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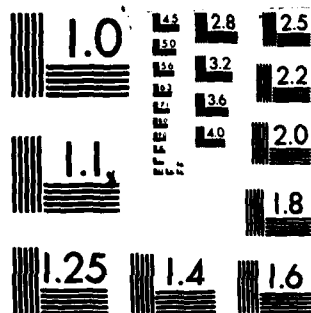
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NATIONAL BUREAU OF STANDARDS-1963-A

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C      IF (RSTEEP.EQ.16) THEN: RATE11=20.45; RATE12=18.19; RATE13=15.95;
      RATE14=13.48; RATE21=13.30; RATE22=11.82; RATE23=10.37; RATE24=8.77;
      RATE3=7.11; END IF
C*****
C*****COST CALCULATION FOR DAY RATE PERIOD CALLS*****
C      IF (HR11.LE.TIME1) C11=HR11*RATE11
      IF (HR11.GT.TIME1.AND.HR11.LE.TIME3) C11=((HR11-TIME1)*RATE12)
      -+(TIME1*RATE11)
      IF (HR11.GT.TIME3.AND.HR11.LE.TIME4) C11=((HR11-TIME3)*RATE13)
      -+(TIME2*RATE12)+(TIME1*RATE11)
      IF (HR11.GT.TIME4) C11=((HR11-TIME4)*RATE14)+(TIME3*RATE13)
      -+(TIME2*RATE12)+(TIME1*RATE11)
C*****
C*****COST CALCULATION FOR EVENING RATE PERIOD CALLS*****
C      IF (HR12.LE.TIME1) C12=HR12*RATE21
      IF (HR12.GT.TIME1.AND.HR12.LE.TIME3) C12=((HR12-TIME1)*RATE22)
      -+(TIME1*RATE21)
      IF (HR12.GT.TIME3.AND.HR12.LE.TIME4) C12=((HR12-TIME3)*RATE23)
      -+(TIME2*RATE22)+(TIME1*RATE21)
      IF (HR12.GT.TIME4) C12=((HR12-TIME4)*RATE24)+(TIME3*RATE23)
      -+(TIME2*RATE22)+(TIME1*RATE21)
C*****
C*****COST CALCULATION FOR NIGHT AND WEEKEND RATE PERIOD CALLS*****
C      C13=HR13*RATE3
C*****
C*****SUE OF COSTS IN ALL RATE PERIODS*****
C      CSUM1E=(C11+C12+C13+CHRC1B)*NLines
C*****
C      DESIGNATION OF TIME INTERVALS (IN MINUTES)
      FOR MCI WATS AND DIRECT SPRINT CALCULATIONS
C
      TIME1=900.
      TIME2=1500.
      TIME3=2400.
      TIME4=4800.
C
C*****
C*****MCI WATS*****
C*****
C*****CALCULATION OF AVERAGE TIME (IN MINUTES) PER ACCESS LINE*****
C      M211=M1N211/NLines
      M221=M1N221/NLines
      M231=M1N231/NLines
      M212=M1N212/NLines
      M222=M1N222/NLines
      M232=M1N232/NLines
C      CHRC2E=100.
C*****
C*****COST CALCULATION FOR DAY RATE PERIOD CALLS TO NETWORK CITIES*****
C      IF (M211.LE.TIME1) C211=M211*.2721

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      + (TIME3*.257)
      IF (H311.GT.TIME4) C311 = ((H311-TIME4)*.194) + (TIME3*.222)
      + (TIME3*.257)
C*****
C*****COST CALCULATION FOR EVENING RATE PERIOD CALLS TO NETWORK CITIES***
C
      IF (H321.LE.TIME1) C321 = H321*.187
      IF (H321.GT.TIME1.AND. H321.LE.TIME3) C321 = ((H321-TIME1)*.165)
      + (TIME1*.187)
      IF (H321.GT.TIME3.AND. H321.LE.TIME4) C321 = ((H321-TIME3)*.145)
      + (TIME2*.165) + (TIME1*.187)
      IF (H321.GT.TIME4) C321 = ((H321-TIME4)*.123) + (TIME3*.145)
      + (TIME2*.165) + (TIME1*.187)
C*****
C*****COST CALCULATION FOR NIGHT AND WEEKEND RATE PERIOD CALLS*****
C*****TO NETWORK CITIES*****
C
      C331 = H331*.108
C*****
C*****COST CALCULATIONS FOR CALLS TO NON-NETWORK CITIES*****
C
      THE FOLLOWING <IF> STATEMENTS DEFINE THE RATES TO BE USED IN THE
      CALCULATION BASED ON THE INPUT VALUE OF REGION.
C
      IF (REGION.EQ.1) THEN: R312A = .3658; R312B = .3260; R312C = .2855;
      R312D = .2415; R322A = .2378; R322B = .2118; R322C = .1858; R322D = .1570;
      R332 = .1271; END IF
      IF (REGION.EQ.2) THEN: R312A = .3816; R312B = .3395; R312C = .2976;
      R312D = .2516; R322A = .2481; R322B = .2206; R322C = .1935; R322D = .1636;
      R332 = .1326; END IF
C*****
C*****COST CALCULATION FOR DAY RATE PERIOD CALLS TO NON-NETWORK CITIES***
C
      IF (H312.LE.TIME1) C312 = H312*R312A
      IF (H312.GT.TIME1.AND. H312.LE.TIME3) C312 = ((H312-TIME1)*R312B)
      + (TIME1*R312A)
      IF (H312.GT.TIME3.AND. H312.LE.TIME4) C312 = ((H312-TIME3)*R312C)
      + (TIME2*R312B) + (TIME1*R312A)
      IF (H312.GT.TIME4) C312 = ((H312-TIME4)*R312D) + (TIME3*R312C)
      + (TIME2*R312B) + (TIME1*R312A)
C*****
C*****COST CALCULATION FOR EVENING RATE PERIOD CALLS*****
C*****TO NON-NETWORK CITIES*****
C
      IF (H322.LE.TIME1) C322 = H322*R322A
      IF (H322.GT.TIME1.AND. H322.LE.TIME3) C322 = ((H322-TIME1)*R322B)
      + (TIME1*R322A)
      IF (H322.GT.TIME3.AND. H322.LE.TIME4) C322 = ((H322-TIME3)*R322C)
      + (TIME2*R322B) + (TIME1*R322A)
      IF (H322.GT.TIME4) C322 = ((H322-TIME4)*R322D) + (TIME3*R322C)
      + (TIME2*R322B) + (TIME1*R322A)
C*****
C*****COST CALCULATION FOR NIGHT AND WEEKEND RATE PERIOD CALLS*****
C*****TO NON-NETWORK CITIES*****
C
      C332 = H332*R332
C*****
C*****COST CALCULATIONS FOR ALASKA OR HAWAII NON-NETWORK CALLS
C
      DO 10 I=1,4
      H313 = H1H313(I)/N1LINES
      H323 = H1H323(I)/N1LINES

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H333=H1H333 (I) /N LINES
C
C
C
THE FOLLOWING <IF> STATEMENTS DEFINE THE RATES TO BE USED IN THE
CALCULATION BASED ON THE VALUE OF I IN DO 10.
      IF (I.EQ.1) THEN:R313A=.3993;R313B=.3553;R313C=.3115;
R313D=.2633;R323A=.2595;R323B=.2310;R323C=.2025;R323D=.1713;
R333=.1398;END IF
      IF (I.EQ.2) THEN:R313A=.4303;R313B=.3830;R313C=.3357;
R313D=.2840;R323A=.2797;R323B=.2490;R323C=.2182;R323D=.1847;
R333=.1507;END IF
      IF (I.EQ.3) THEN:R313A=.4493;R313B=.3998;R313C=.3505;
R313D=.2965;R323A=.2920;R323B=.2598;R323C=.2278;R323D=.1927;
R333=.1573;END IF
      IF (I.EQ.4) THEN:R313A=.4840;R313B=.4308;R313C=.3775;
R313D=.3185;R323A=.3147;R323B=.2800;R323C=.2453;R323D=.2077;
R333=.1693;END IF
C*****
C*****COST CALCULATION FOR DAY RATE PERIOD CALLS*****
C*****TO ALASKA OR HAWAII NON-NETWORK CITIES*****
C
      IF (H313.LE.TIME1) C313=H313*R313A
      IF (H313.GT.TIME1.AND. H313.LE.TIME3) C313=((H313-TIME1)*R313B)
      -+(TIME1*R313A)
      IF (H313.GT.TIME3.AND. H313.LE.TIME4) C313=((H313-TIME3)
      -*R313C)
      -+(TIME2*R313B) + (TIME1*R313A)
      IF (H313.GT.TIME4) C313=((H313-TIME4)*R313D) + (TIME3*R313C)
      -+(TIME2*R313B) + (TIME1*R313A)
C*****
C*****COST CALCULATION FOR EVENING RATE PERIOD CALLS*****
C*****TC ALASKA OF HAWAII NON-NETWORK CITIES*****
C
      IF (H323.LE.TIME1) C323=H323*R323A
      IF (H323.GT.TIME1.AND. H323.LE.TIME3) C323=((H323-TIME1)*R323B)
      -+(TIME1*R323A)
      IF (H323.GT.TIME3.AND. H323.LE.TIME4) C323=((H323-TIME3)
      -*R323C)
      -+(TIME2*R323B) + (TIME1*R323A)
      IF (H323.GT.TIME4) C323=((H323-TIME4)*R323D) + (TIME3*R323C)
      -+(TIME2*R323B) + (TIME1*R323A)
C*****
C*****COST CALCULATION FOR NIGHT AND WEEKEND RATE PERIOD CALLS*****
C*****TO ALASKA OR HAWAII NON-NETWORK CITIES*****
C
      C333=H333*R333
C
C
C
      SUM OF COSTS CALCULATED IN DO 10
      C3=C3+C313+C323+C333
10  CCNTINUE
C*****
C*****SUM OF COSTS IN ALL RATE PERIODS, NETWORK AND NON-NETWORK*****
C
      CSUN3B=(C311+C321+C331+C312+C322+C332+C3+CHRC3B)*N LINES
C
      RETURN
      END
SENTEY

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LIST OF REFERENCES

1. Ericck, Gerald W., The Telecommunications Industry The Dynamics of Market Structure, Harvard University Press, 1981.
2. Evans, David S., Breaking Up Bell - Essays on Industrial Organization and Regulation, Elsevier Science, 1983.
3. Meyer, John S., and others, The Economics of Competition in the Telecommunications Industry, Delgeschlager, Gunn, & Hain, 1980.
4. Breaking Up Bell - Essays on Industrial Organization and Regulation, Op. cit., pp 11-13, 1983.
5. Kahn, Alfred E., The Economics of Regulation: Principles and Institutions, Volume 2, Wiley, 1971.
6. Mathison, Stuart L. and Walker, Philip M., Computers and Telecommunications: Issues in Public Policy, Prentice-Hall, p 181, 1970.
7. The Telecommunications Industry The Dynamics of Market Structure, Op. cit., p 203.
8. McGillen, Clare D. and McLauchlan, William P., Hermes Bound: The Policy and Technology of Telecommunications, Purdue University, p 171, 1978.
9. U.S. Federal Communications Commission, 27 FCC 388, 1959.
10. Kahn, Alfred E., The Economics of Regulation: Principles and Institutions, Volume 2, Wiley, p 129, 1971.
11. U.S. Federal Communications Commission, In the Matter of Allocation of Frequencies in the Bands Above 890 MC, 27 FCC 359, 1959, and 29 FCC 823, 1960.
12. The Economics of Regulation: Principles and Institutions, Volume 2, Op. cit., pp 140-145.
13. Hermes Bound: The Policy and Technology of Telecommunications, Op. cit., pp 167-169.
14. U.S. Federal Communications Commission, In the Matter of Use of the Carterfone Device in Message TCM

Service, 13 FCC 2d 420, 1968.

15. The Telecommunications Industry The Dynamics of Market Structure, Op. cit., p 211.
16. The Economics of Regulation: Principles and Institutions, Volume 2, Op. cit., p 133.
17. U.S. Federal Communications Commission, Annual Report Fiscal Year 1971, p 77.
18. U.S. Federal Communications Commission, Specialized Common Carrier Services, 29 FCC 2d 870, 1971.
19. The Telecommunications Industry The Dynamics of Market Structure, Op. cit., p 218.
20. "Why AT&T Will Lose More Long-Distance Business," Business Week, p 102+, February 13, 1984.
21. Sherr, Burt and Crock, Stan, "Bell System's Long Distance Service Faces Loss of Business to Host of Competitors," Wall Street Journal, p 35, October 14, 1980.
22. White, James A., Langley, Monica, Carrington, Tim, "Bell's Legacy," Wall Street Journal, p 1, November 17, 1983.
23. "The Breakup of AT&T," Wall Street Journal, pp 24-27, November 17, 1983.
24. Simon, Samuel A. and Whalen, Michael J., Teleconsumers and the Future--A Manual on the AT&T Divestiture, Telecommunications Research and Action Center, 1983.
25. U.S. Department of Defense., Department of Defense Analysis of the Impact of the Department of Justice - American Telephone and Telegraph Company Antitrust Settlement Agreement upon the Provision of Telecommunications Services to the Department of Defense, April 1982.
26. White, James A., "At Ma Bell's Rivals the Computers Decide Static is as Good as Talk," Wall Street Journal, p 31, March 30, 1982.
27. "MCI's Challenge to AT&T is Aided by Tiny Iowa Firm," Wall Street Journal, p 32, June 26, 1981.
28. "MCI Agrees to Buy Gear from Unit of Hughes Aircraft," Wall Street Journal, p 8, February 4, 1983.

29. "FCC Study Refutes Telephone Firm's Fears Over Some Rivalries," Wall Street Journal, p 3, January 10, 1980.
30. "MCI to Test Cable System for Telephone Service," Wall Street Journal, p 8, November 19, 1982.
31. Johnson, Leland L., Problems of Regulating Specialized Telecommunications Common Carriers, Rand Corp., p 14, May 1976.
32. The Telecommunications Industry The Dynamics of Market Structure, Op. cit., p 213.
33. American Telephone and Telegraph Co. Tariff FCC No. 263, 1 February 1984.
34. AT&T Communications Tariff FCC No. 1, Issued 3 October 1983, Effective date postponed indefinitely.
35. American Telephone and Telegraph Co. Tariff FCC No. 259, 1 January 1984.
36. AT&T Communications Tariff FCC No. 2, Issued 3 October 1983, Effective date postponed indefinitely.
37. MCI Telecommunications Corporation Tariff FCC No. 1, 1 April 1983.
38. GTE Sprint Communications Corporation Tariff FCC No. 10, 5 January 1984.
39. GTE Sprint Communications Corporation Tariff FCC No. 11, 5 January 1984.
40. Self, Robert, Long Distance for Less, Telecomm Library, p 4-8, 1982.
41. Newton, Harry, 101 Money-Saving Secrets Your Phone Company Won't Tell You, Telecomm Library, pp 47-48, 1982.
42. Teleconsumers and the Future--A Manual on the AT&T Divestiture, Op. cit., p 5-8, 1983.
43. HQ Strategic Air Command/DCOM letter to HQ USAF/XORC, Subject: Specialized Common Carrier Services, 21 Jul 1980.
44. Director of Government Marketing MCI Telecommunications Corporation letter to Deputy Under Secretary of Defense (Communications, Command and Control, and Intelligence), 19 August 1982.

45. Assistant Deputy Under Secretary (Telecommunications)
Office of the Secretary of Defense letter to DIRECTOR,
C* (DAMO-C*), U.S. Army, DIRECTOR, Naval
Communications Division (NOP-941), CNO, DIRECTOR, C2T
(AFXOK), USAF, Subject: Utilization of MCI Service,
26 August 1982.
46. Long Distance for Less, Op. cit., p 8-20.
47. Smith, Sydney F., Telephony and Telegraphy, Oxford
University Press, p 180, 1978.
48. Telephony and Telegraphy, Op.cit., p 181.

BIBLIOGRAPHY

Broad, William J., "Ma Bell Losing Grip on Old Markets," Science, Vol 209, pp 787-790, 15 Aug 1980.

Connolly, Ray, "Special Carriers Face New Crises," Electronics, Vol 48, p 79, October 30, 1975.

Dunn, John F., Defense Telecommunications and the Management Environment, Master's Thesis, Naval Postgraduate School, Monterey, CA, March 1980.

Flowers, Philip R., Effects of Deregulation in the Telecommunications Industry on Military Base Telephone Communications, Master's Thesis, Naval Postgraduate School, Monterey, CA, March 1983.

Griesinger, Frank K., "Alternatives in Long-Distance Telephone Service," Administrative Management, Vol 43, pp 33-34+, August 1982.

Griesinger, Frank K., "What the AT&T Breakup Means to Management," Administrative Management, Vol 43, pp 24-26+, March 1982.

Griesinger, Frank K., "Tradeoffs in Planning Communications Networks," Administrative Management, Vol 40, October 1979 p 32-34+.

Hardeman, Lyman and Sideris, George, "The Specialized Carriers are Setting up Shop," Electronics, Vol 46, pp 71-72, July 5, 1973.

Kuehn, Richard A., Cost-Effective Telecommunications, AMACOM, 1975.

Levin, Leonard, Telecommunications in the U. S.: Trends and Policies, Artech, 1981.

Mayo, Richard W. and Wittmann, William W., The Structure, Conduct and Performance of the United States Telecommunications Industry, Master's Thesis, Naval Postgraduate School, Monterey, CA, March 1977.

McNichol, John, "Hour of Decision at the FCC," Electronic Engineer, Vol 29, pp 22-24+, November 1970.

Mead, R. B. and Stark, R. J., Description and Analysis of Trends in CONUS Common Carrier Offerings, ARINC Research Corp., June 1980 (revised November 1980).

Mosher, Lawrence, "New Competitors with New Technology are Giving Ma Bell a Scare," National Journal, Vol 11, p691, April 28, 1979.

Terrell, Russell W., Methods of Cost Reduction for United States Coast Guard Telephone Systems, Master's Thesis, Naval Postgraduate School, Monterey, CA, March 1981.

U.S. Congress, House, Committee on Interstate and Foreign Commerce, Competition in the Telecommunications Industry, September 28, 29, and 30, 1976.

U.S. Congress, House, Committee on Interstate and Foreign Commerce, Domestic Common Carrier Regulation, November 10, 11, 13, 17, and 18, 1975.

U.S. Congress, Senate, Committee on Commerce, Science, and Transportation, Domestic Telecommunications Common Carrier Policies, March 21 and 22, 1977.

U.S. Federal Communications Commission, Annual Reports, (See year of Interest).

U.S. Office of Telecommunications Policy, Federal Use of Commercial Telecommunication Services, OTP circular NO. 13, June 21, 1974.

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