AD-A140 596 SPECIALIZED COMMON CARRIERS: LONG DISTANCE ALTERNATIVES FOR MILITARY INSTALLATIONS(U) NAVAL POSTGRADUATE SCHOOL MONTEREY CA S L KLINGLER MAR 84 1/3

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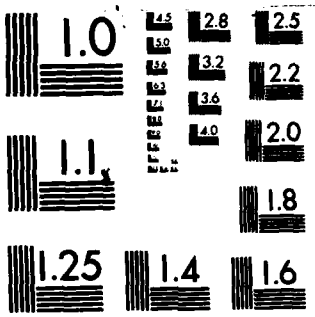

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THESIS

SPECIALIZED COMMON CARRIERS: LONG DISTANCE ALTERNATIVES FOR MILITARY INSTALLATIONS

by

Scott L. Klingler

March 1984

Thesis Advisor: Dan C. Boger

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REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER	2. GOVT ACCESSION NO. AD-A140 596	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Specialized Common Carriers: Long Distance Alternatives for Military Installations		5. TYPE OF REPORT & PERIOD COVERED Master's Thesis March 1984
		6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) Scott L. Klingler		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS Naval Postgraduate School Monterey, CA 93943		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS Naval Postgraduate School Monterey, CA 93943		12. REPORT DATE March 1984
		13. NUMBER OF PAGES 204
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)		15. SECURITY CLASS. (of this report)
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Telecommunications; Telephone; Cost Reduction; Specialized Common Carriers; Military Base Telephone Services; Long Distance Telecommunications.

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

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S/N 0102-LF-014-6601

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

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Specialized Common Carriers: Long Distance Alternatives for Military Installations

by

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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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ACKNOWLEDGMENTS

The author would like to express sincere thanks to Sam Telleson of AT&T Communications, Peter Hainsworth and Ken Sorenson of MCI Telecommunications Corporation, Renee Dunn of GTE Sprint Communications Corporation, Bill Weller of Western Division, Naval Facilities Engineering Command, Lois Gustie and Star Pelton of NAS Moffett Field's Public Works Department, and many, many others who were willing to provide information and discuss the topic of this thesis.

A special thanks goes to the author's wife, Teresa, and children, Susan, Randall, and Jonathan, for their patience, perseverance, love, and understanding through the long months of this effort.

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 manager[2] 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

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

[2]The 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.

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[3]Appendix 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.[4] Setting aside the arguments whether the telephone industry was a natural monopoly[5] 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)

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[4]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.

[5]A 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.[6]

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 CARTERFONE 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

---

[6]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 one[7] 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

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[7] The 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 forseeable 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 [illegible] satellite systems would not need the frequencies

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*The [illegible] of frequency measurement were changed from cycles [illegible] 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]

---

[9]This 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 DECISON

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

---

[10]This was an accustical 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 posess 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 MCI 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 MCI 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

	Revenues (millions)	Profits (millions)	Subscribers (thousands)
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

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[11] In 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 companies[12] 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) signalling[13] 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 dialing[14] 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 call[15] 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

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[12]References 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.

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

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

[15]This 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.

[16]A 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 access[17] 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

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[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.

[18] Although 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.

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

[19]No 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.

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[20]The 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

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[21]In 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.

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

[23]This 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).

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

[25]For 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 AUTOVON.)

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

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[26]A 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.

[27]The 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.

[28]The 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 Termination[30] and "Universal Termination."[31]

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[29]As 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).

[30]AT&T only offers Network-only Termination service, but <u>all</u> cities are on the AT&T network.

[31]The 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

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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).

[32]A complete listing of the area codes and prefixes on the MCI network is found in Appendix C.

TABLE IV

MCI Execunet Service Originating Cities

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

TABLE IV (Continued)

MCI Execunet Service Originating Cities

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

b. 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

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[33]SPRINT stands for Switched Private Network Telecommunications.

TABLE V

MCI 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
Boston, 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 accounts[34] 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.

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[34]The 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

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

TABLE VI (Continued)

SPRINT Originating Cities

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

TABLE VI (Continued)

SPRINT Originating Cities

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

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[35]There 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 billed 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 MCI and GTE Sprint Dedicated Access Services Monthly Recurring and Non-Recurring Charges

Direct Sprint

Monthly Recurring	
$350 per line minimum usage	
Termination at Rate Center	$ 5 per line
Termination within LDA (Local Distribution Area)	$35 per line
Termination outside LDA but within state boundaries	$35 per line + $4 per mile outside LDA boundary
Termination outside LDA and crossing state boundaries	$35 per line + $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.[36] 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.

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[36]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 DALs, 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	Orangeville, 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
*Lodi, 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.

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[37]Potential 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.[38] 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 diferent.)
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]

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[38]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 DALS 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

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[39]Local 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[40] 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,"[41] (from selected network cities) as well as DALs 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.[42] In fact, SCC use throughout the Department of

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[40]Most of these problems were already mentioned in Chapter II.

[41]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.

[42]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.[43] 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 potential savings may be as high as $125 million annually.... [Ref. 44]

2. Procuring SCC Services

Sensing a hesitancy on the part of military telecommunications 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 telecommunications 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 communications 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.

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[43]Per 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 DDD 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 of 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.[44]

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 distances calls.[45] This second method is reasonable since all of the carriers are tariffed and t

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[44]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.

[45]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-OPS-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 Massachussetts 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
P.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/PKZ
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.[47] 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.[48] 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

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[47]This 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.

[48]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.

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[49]If 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.

[50]Self 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 advantage[51] (cost savings) by using SCC services for completing either all[52] or part[53] 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 accomodate 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.

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[51]The 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.

[52]Can 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 MTS 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.

[53]If 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?

E. A CASE STUDY OF NAS MOFFETT FIELD

The following case study evaluating the potential use of SCC services at NAS Moffett 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 POTS--Plain Old Telephone Service. No WATS lines.[54] No tie lines. No FX lines. Nothing fancy or exotic. Just MTS. Just POTS.

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

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[54]In 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.

[55]ZUM 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.

[56]There 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)

Carrier	Cost
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.

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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%
SPRINT	$2686.04	19.8%
SPRINT plus Cost of Call to Access	$2776.73	17.1%

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

b. 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:

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

where B 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 <u>not</u> 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 DALs 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:

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

---

[57] Smith 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.

[58] If 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 Bells'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 Bell[60] 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.

---

[59]These 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.

[60]For 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.

[61]A 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 file[62] into an array (actually several arrays) and

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[62]The 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 ouput 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.)

[63]Common 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 COST 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 COST OF ACCESSING THE
SCC NETWORKS?          (Y OR N)

Y  WILL CONTINUE AND ASK FOR RATES
N  WILL PREVENT CALCULATON OF ACCESS COSTS
Y

FOR THE DAY RATE PERIOD:

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

WEAT 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                STATES
STEP
-----------------------------------------
 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
PROPOSED RATES, WHAT IS THE RATE STEP?

RATE                STATES
STEP
-----------------------------------------
 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 COST	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
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 COST (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 SPRINT COST = $   2666.04
AVERAGE COST PER MINUTE = $ 0.343

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


BASED ON  0.66 ERLANGS 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 COST (CURRENT RATES) = $   2433.76
AVERAGE COST PER MINUTE = $ 0.311

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

TOTAL MCI WATS COST = $   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 COST (CURRENT RATES) = $   2644.80
AVERAGE COST PER MINUTE = $ 0.338

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

TOTAL MCI WATS COST = $   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.

```
TOTAL NUMBER OF WATS LINES OR DEDICATED ACCESS LINES =    3

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

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

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

TOTAL 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 COST (CURRENT RATES) = $    2810.20
AVERAGE COST PER MINUTE = $ 0.359

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

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

TOTAL 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 <u>does not</u> 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. <u>Specialized Common Carrier Switched Voice Network Services</u>

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 dials 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 LATAs 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 CU 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 lines is a DAL to AT&T Long Lines.

Dial 9 Trunk - Dial Access Central Office Trunk - A direct circuit between a PBX 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 AUTOVON). 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.

AD-A140 596 SPECIALIZED COMMON CARRIERS: LONG DISTANCE ALTERNATIVES FOR MILITARY INSTALLATIONS(U) NAVAL POSTGRADUATE SCHOOL MONTEREY CA S L KLINGLER MAR 84 2/3

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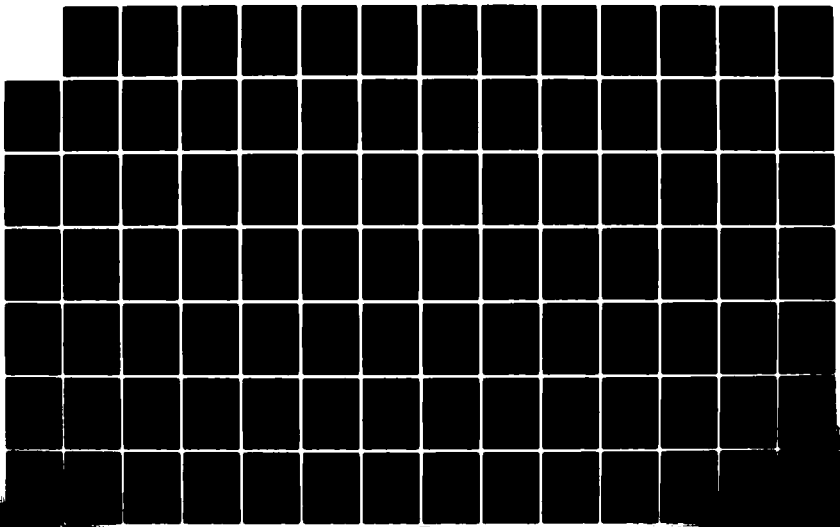

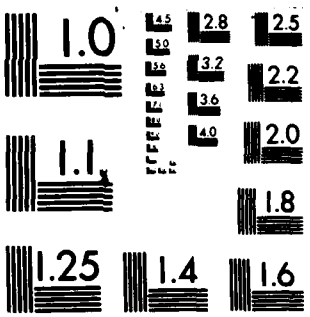

MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

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.

APPENDIX C

AREA CODE AND PREFIX LISTING FOR MCI NETWORK

<16 November 1983>

Area Code 201

201	221	224	225	226	227	228	231	232	233	235	238	239	241	242
243	245	246	247	248	249	251	254	256	257	259	261	262	263	265
266	267	268	272	273	276	277	278	279	283	284	285	287	288	289
297	299	321	322	324	325	326	328	330	332	333	334	335	336	338
339	340	342	343	344	345	348	351	352	353	354	355	356	360	361
365	366	368	371	372	373	374	375	376	377	379	381	382	384	385
386	387	388	390	393	394	399	420	423	427	428	429	430	432	433
434	435	436	437	438	440	441	442	444	445	447	450	451	455	456
457	460	461	463	464	465	467	468	469	470	471	472	473	474	478
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526	527	533	538	539	540	541	543	545	546	547	548	549	558	560
561	564	565	567	568	569	570	572	574	575	581	582	585	589	592
595	596	599	621	622	623	624	625	627	628	631	632	634	635	636
641	642	643	645	646	648	649	652	653	654	656	658	659	661	662
665	667	668	670	672	673	674	675	676	677	678	684	685	686	687
688	690	692	694	696	699	722	724	725	731	733	736	738	740	742
743	744	745	746	748	750	751	752	753	754	755	756	757	759	760
761	762	763	765	766	772	773	777	778	779	783	785	789	790	791
792	794	795	796	797	798	820	821	822	823	824	826	828	833	836
837	843	844	845	846	851	854	857	858	861	862	863	864	865	866
867	868	869	871	873	877	878	880	881	882	884	885	886	887	889
893	894	895	898	923	925	926	931	932	933	935	936	937	939	941
942	943	944	945	947	952	953	956	961	963	964	965	966	967	968
969	977	981	983	984	985	987	989	991	992	993	994	997	998	999

Area Code 202 ****Entire Area Code Is Served****

Area Code 203

222	223	224	225	226	227	229	232	233	234	235	236	237	238	239
241	242	243	244	246	247	248	249	252	254	255	259	261	265	268
269	271	272	273	277	278	279	281	282	284	285	286	288	289	322
323	324	325	327	328	329	332	333	334	335	336	348	356	357	358
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387	389	393	397	432	436	453	457	467	468	469	481	484	488	492
493	494	495	497	521	522	523	524	525	527	528	529	530	531	544
547	548	549	552	561	562	563	565	566	568	569	576	579	582	583
584	589	591	592	594	621	622	623	624	625	627	628	629	633	634
637	643	644	646	647	649	651	653	655	656	658	659	661	666	667
668	673	674	677	678	683	688	693	721	722	725	726	727	728	747
762	771	772	773	776	777	778	783	784	785	787	789	793	795	799
827	828	834	838	846	847	852	853	854	865	866	869	871	872	874
875	877	878	891	926	929	932	933	934	937	944	945	947	964	965
966	967	968	972	987										

Area Code 205

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453	456	457	460	470	471	473	476	477	478	479	491	497	532	533
534	535	536	539	567	569	583	591	592	595	599	626	631	633	640
645	647	648	649	653	655	660	661	663	664	665	666	668	669	672

674 675 678 679 681 690 694 699 741 744 772 776 780 781 783
785 786 787 788 791 798 822 823 828 830 832 833 834 836 837
838 841 849 852 853 854 856 859 868 870 871 876 877 879 881
882 883 895 923 925 928 933 934 938 939 942 945 950 951 956
967 969 972 973 979 987 988 991

Area Code 206

220 223 226 228 232 233 234 235 236 237 241 242 243 244 246
248 251 255 271 277 281 282 283 284 285 292 322 323 324 325
326 328 329 343 344 345 346 361 362 363 364 365 367 382 392
394 421 431 432 433 442 447 451 453 454 455 464 467 481 483
485 486 487 488 522 523 524 525 526 527 542 543 545 546 547
575 583 587 621 622 623 624 625 626 628 630 631 632 633 634
641 643 644 655 656 662 672 682 721 722 723 725 742 743 745
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955 977 991 994 995 996 997

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

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

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

Area Code 214

221 222 223 224 225 226 227 228 229 231 233 234 235 236 238
239 241 242 243 245 247 248 251 252 253 254 255 256 257 258
259 262 263 264 266 269 270 271 272 276 278 279 285 286 287
288 289 291 292 296 297 298 299 320 321 323 324 327 328 330
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531 534 539 541 542 548 553 556 557 559 561 565 566 570 573
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670 671 676 680 681 688 689 690 691 692 696 698 699 720 721
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993 995 996 997

Area Code 215

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988														

Area Code 216

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429	430	431	432	433	434	438	439	441	442	443	444	447	449	451
452	453	454	455	456	458	459	461	464	467	468	471	473	475	476
477	478	481	484	486	488	489	491	492	493	494	497	499	521	522
523	524	526	529	530	531	533	534	535	536	538	539	541	542	543
545	549	561	562	566	568	572	574	575	578	579	581	582	585	587
589	621	622	623	626	628	630	631	633	641	642	644	645	650	651
655	656	657	658	659	661	662	663	664	666	668	671	672	673	676
678	681	686	687	688	692	694	696	699	721	724	726	729	731	732
733	734	741	742	743	744	745	746	747	748	749	750	751	752	753
755	757	758	759	761	762	771	773	777	779	781	782	783	784	788
791	792	793	794	795	796	797	798	799	822	825	826	831	832	833
835	836	837	838	842	843	845	848	851	860	861	862	863	864	866
867	868	869	871	874	875	877	879	881	882	883	884	885	886	888
892	896	920	921	922	923	926	928	929	931	932	933	934	937	941
942	943	944	946	949	951	953	960	961	965	967	974	984	986	988
991														

Area Code 217

328	332	333	337	344	351	352	356	359	364	367	384	398	422	423
424	425	428	429	483	487	488	492	496	498	522	523	525	527	528
529	544	546	566	626	629	636	747	753	782	785	786	787	788	789
793	875	877	963											

Area Code 219

232	233	234	236	237	238	239	255	256	258	259	272	277	282	283
284	287	288	289	291	299	391	392	397	398	420	422	423	424	425
426	427	428	429	432	434	436	440	441	442	443	444	445	446	447
449	456	458	461	462	464	465	467	473	478	481	482	483	484	485
486	489	493	520	547	556	622	623	625	627	632	633	637	638	639
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
972 977 980 981 989

Area Code 301

221 222 223 224 225 226 227 228 229 231 232 233 234 235 236
237 238 239 242 243 244 247 248 249 251 252 253 254 255 256
258 260 261 262 263 265 266 267 268 269 270 271 272 273 276
277 278 279 282 283 284 285 286 288 289 291 292 293 294 295
296 297 298 299 320 321 322 323 325 327 328 329 332 335 336
337 338 340 341 342 343 344 345 350 352 353 354 355 356 357
358 362 363 364 365 366 367 368 371 372 374 376 377 379 383
384 385 386 388 390 391 393 394 396 397 420 421 422 423 424
426 427 428 429 431 432 433 434 435 436 437 439 441 442 443
444 445 447 448 449 452 454 455 457 459 460 461 462 464 465
466 467 468 469 472 473 474 476 477 479 481 482 483 484 485
486 488 490 492 493 494 495 496 497 498 521 522 523 524 525
526 528 529 530 531 532 534 536 537 539 542 543 544 546 547
549 551 552 557 559 561 563 564 565 566 567 568 569 572 574
575 576 577 578 582 583 585 587 588 589 592 593 594 595 596
597 598 599 621 622 623 624 625 627 628 629 630 632 633 634
636 641 643 644 646 647 649 651 652 653 654 655 656 657 659
661 662 663 664 665 666 667 668 669 671 672 673 674 675 676
677 678 679 681 682 685 686 687 688 692 694 695 699 721 723
725 727 728 730 731 732 733 734 735 736 739 741 742 744 745
747 748 749 751 752 753 754 757 758 760 761 762 763 764 765
766 768 770 771 772 773 774 775 776 779 781 784 787 788 789
790 791 792 793 794 795 796 797 798 799 820 821 822 823 824
825 827 828 829 831 833 834 835 836 837 838 839 840 841 842
843 844 845 846 847 848 849 850 851 852 853 854 855 856 857
858 859 861 864 865 866 867 868 869 870 871 873 874 875 876
877 878 879 881 882 883 886 888 889 890 891 894 896 897 898
899 921 922 923 924 925 926 927 929 933 935 936 937 939 942
943 944 945 946 947 948 949 951 952 953 954 955 956 957 962
963 964 967 968 969 972 973 974 977 981 982 983 984 986 987
988 992 995 997

Area Code 302

239 322 323 328 366 368 421 428 429 451 453 454 475 478 571
573 575 594 651 652 654 655 656 658 731 737 738 762 764 772
773 774 792 798 834 836 992 994 995 998 999

Area Code 303

221 223 224 226 229 230 231 232 233 234 235 237 238 239 273
277 278 279 284 287 288 289 291 292 293 294 295 296 297 298
299 320 321 322 329 330 333 337 339 340 341 343 344 350 351
352 353 355 356 360 361 363 364 366 367 370 371 373 377 382
388 390 392 393 394 398 399 420 421 422 423 424 425 426 427
428 429 430 431 433 440 441 442 443 444 447 449 450 451 452
454 455 457 458 465 466 469 471 472 473 475 477 480 481 482
484 488 491 492 493 494 495 497 499 526 530 532 534 535 542
543 544 545 546 547 549 551 560 561 564 566 568 570 571 572
573 574 575 576 577 578 579 584 587 590 591 592 593 594 595
596 597 598 599 620 623 624 628 629 630 631 632 633 634 635
636 639 642 649 650 651 652 654 659 663 665 666 667 669 670
671 673 674 678 681 684 685 686 687 688 690 691 692 693 694
695 696 697 698 699 722 733 737 740 741 744 750 751 752 753
755 756 757 758 759 761 762 770 771 772 773 776 777 778 779
780 781 785 789 790 791 793 794 795 797 798 799 820 821 823
825 826 830 831 832 834 837 839 841 850 851 855 861 863 866
869 890 892 893 894 896 898 922 934 935 936 937 938 947 948
958 966 972 973 976 977 978 979 980 985 986 987 988 989

Area Code 304

232	233	234	242	243	277	336	342	343	344	345	346	347	348	357
394	547	722	727	744	747	755	756	757	766	768	776	840	843	845
899	925	949	965	968	984	988								

Area Code 305

221	223	226	232	233	235	237	238	245	246	247	248	251	252	253
255	257	258	261	262	263	264	266	270	271	273	274	275	277	279
281	282	284	285	291	293	295	298	299	324	325	326	327	331	339
343	345	350	351	352	357	358	361	365	371	372	373	374	377	379
382	384	385	386	387	389	398	399	420	421	422	423	424	425	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	469	472	473	474	475
476	484	485	486	490	491	492	493	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	568	573
576	577	578	579	580	581	582	583	584	585	586	587	588	591	592
593	594	595	596	598	620	621	622	624	625	626	627	628	629	633
634	635	637	638	642	643	644	645	646	647	649	650	651	652	653
655	656	657	659	660	661	662	663	665	666	667	669	671	672	673
674	677	678	681	683	684	685	686	687	688	689	691	693	694	695
696	699	721	722	726	731	732	733	734	735	736	737	739	741	742
744	746	747	748	749	751	754	756	757	758	759	761	762	763	764
765	766	767	769	771	772	774	776	781	782	785	786	788	791	792
793	797	821	822	823	824	825	828	830	831	832	833	834	835	836
837	840	841	842	843	844	845	846	849	850	851	854	855	856	857
858	859	861	862	864	865	866	868	869	871	873	874	876	877	883
884	885	886	887	888	889	891	893	894	895	896	897	898	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	961	962	963	964	965
966	967	968	969	971	972	973	974	975	979	981	983	985	987	989

Area Code 307

632	634	635	637	638	662	771	772	775	777	778

Area Code 309

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	791	792	793	794	796	797	798	799						

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

Area Code 313

221	222	223	224	225	226	232	233	234	235	237	238	239	245	247
252	254	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	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	360	361	362	363	365	366	368	369	371	372	373	374
375	377	381	382	383	386	388	389	391	393	394	397	398	399	420
421	422	423	424	425	427	430	431	434	435	437	441	442	444	445
446	451	453	455	456	459	463	464	465	466	467	468	469	471	472
473	474	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	623	624	625	626	627
628	629	631	635	636	637	640	641	642	643	644	645	646	647	649
651	652	653	655	656	658	659	661	662	663	665	666	668	669	671
673	674	675	676	681	682	683	684	685	686	687	689	693	694	695
697	698	699	721	722	723	728	729	731	732	733	735	736	738	739
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	887	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	966	967	968	971	972	973	977	978	979	981	994	995	996

Area Code 314

225	227	231	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	753	761	768	771	772	773	776	777	781	821	822	823	825
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	232	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	282	283	284	285	286	288	289	291	293	297	298	299	326
335	352	353	354	356	357	358	359	372	378	396	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	456	459	631	632	635	636	670	671	674	683	686	687	688	742
746	747	757	798	837	852	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	398	399	626	644	645	679	683	842	846	848	849	851	854
857	895	958	959	983	984	987	988	989						

Area Code 401

224	231	232	245	246	247	252	253	255	272	273	274	275	276	277
278	331	333	334	336	351	353	379	397	399	421	431	433	434	437
438	456	457	461	463	464	467	521	525	528	572	574	621	647	722
723	724	725	726	727	728	732	737	738	739	751	761	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	253	271	280	281	289	291	292	293	294	330	331	332	333
334	339	341	342	344	345	346	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	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	894	895	896	962	977	978				

Area Code 404

221	223	225	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	355	361	362	363	366	371	372	373	377
378	391	392	393	394	396	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	541	556	564	565	572	577	581	586	587	588	592	622	624	627
631	633	634	636	653	656	658	659	681	688	691	696	699	722	724
733	736	737	738	739	752	753	755	758	761	762	763	765	766	767
768	790	791	792	793	794	796	798	799	823	828	843	860	863	868
871	872	873	874	875	876	881	885	890	892	894	897	898	899	921
922	923	925	926	928	929	934	936	938	939	941	942	943	944	945
946	948	949	951	952	953	955	957	961	962	963	964	968	969	971
972	973	974	975	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	387	390	391	392	396
399	424	427	460	478	491	495	521	523	524	525	528	556	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	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	462	463	475	476	484	491	496	554	559	575	578
629	633	662	663	675	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	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

260	272	361	589	684	693	696	722	724	727	735	736	737	740	744
752	753	755	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	892	898
899	925	935	938	942	945	948	962	963	982	983	985	986	989	

Area Code 412

221	222	223	225	227	228	231	232	234	237	241	242	243	244	245
246	247	255	256	257	261	262	263	264	266	269	271	273	276	277
279	281	282	283	284	285	287	288	321	322	323	325	327	328	329
331	333	335	337	339	341	343	344	345	351	355	356	359	361	362
363	364	366	367	371	372	373	374	375	378	381	391	392	393	394
396	421	422	423	429	430	431	433	434	437	438	439	441	442	445
446	456	461	462	464	466	468	469	471	481	482	484	486	487	488
495	521	523	527	531	533	537	539	553	561	562	563	564	565	566
569	571	573	578	583	586	587	596	621	622	624	626	628	633	636
637	642	643	644	647	653	655	661	663	664	665	668	672	673	675
677	678	681	682	683	687	725	728	731	734	737	741	745	746	751
754	761	765	766	767	771	773	774	775	777	778	781	782	784	785
787	788	789	793	795	821	822	823	824	828	829	830	831	832	833
834	835	836	837	838	840	843	846	847	854	855	856	857	859	863
864	865	869	872	873	881	882	884	885	892	921	922	923	925	928
931	936	937	941	948	961	963	967							

Area Code 413

442	443	445	447	448	494	499	525	532	533	534	536	538	539	543
547	557	562	566	567	568	569	575	583	589	592	593	594	596	598
623	637	655	684	698	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	269	271	272	273	274	276	277	278	281	282	289	291	321
327	332	334	338	342	344	347	351	352	353	354	355	357	358	367
372	374	375	377	383	384	399	421	422	423	425	438	442	444	445
447	449	452	453	456	457	458	459	461	462	463	464	466	467	475
476	477	481	482	483	527	529	533	535	541	542	543	544	545	546
547	548	549	551	552	553	554	562	564	565	583	626	629	631	632
633	634	636	637	639	643	644	645	647	649	652	654	656	657	658
662	668	671	672	675	677	678	679	681	688	691	692	693	694	697
744	747	753	761	762	764	765	768	769	771	774	778	781	782	783
784	785	786	795	797	798	799	835	843	844	857	859	871	872	873
878	886	921	922	923	929	931	933	935	936	937	961	962	963	964
999														

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

Area Code 417

623	624	625	649	673	725	732	736	742	743	744	753	759	765	781
782	831	833	836	862	864	865	866	869	881	882	883	885	887	

Area Code 419

240	241	242	243	244	245	246	247	248	249	255	259	359	381	382
385	389	433	470	471	472	473	474	475	476	478	531	534	535	536
537	625	626	627	661	666	684	691	693	698	726	727	729	825	826
829	836	837	838	841	855	865	866	867	872	874	875	877	878	882
885	891	893	936											

Area Code 501

223	224	225	227	370	371	372	373	374	375	376	378	433	455	490
562	565	568	569	660	661	663	664	666	753	758	771	821	834	835
847	851	868	888	897	945	961	982	985	988					

Area Code 502

222	228	229	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	540
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
933 935 937 955 957 964 966 968 969

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
278 279 282 283 286 288 291 292 293 334 340 341 342 343 344
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
436 441 443 454 455 456 464 466 467 468 469 482 483 484 486
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
670 676 682 684 686 689 721 722 729 733 734 737 738 749 766
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
891 895 897 899 922 923 924 925 926 927 928 942 943 944 945
947 948 949 950

Area Code 505

242 243 247 255 256 262 264 265 266 268 277 281 292 293 294
296 298 299 344 345 765 766 821 822 831 836 841 842 843 844
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
243 244 246 247 250 251 255 256 259 261 262 263 264 265 266
267 270 271 272 276 282 288 289 299 327 328 329 333 337 340
341 342 343 344 345 346 349 350 366 381 383 385 387 397 399
421 423 425 428 432 433 434 435 436 441 442 443 444 445 447
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
636 643 647 648 649 650 651 652 653 654 655 656 657 658 659
661 662 667 670 671 673 674 675 677 679 680 681 682 684 686
687 688 690 691 692 694 695 696 698 699 732 733 734 735 736
737 748 781 787 797 821 822 824 826 828 831 834 835 836 837
838 843 845 851 852 853 854 855 857 870 881 882 883 884 886
887 888 892 921 922 923 924 925 926 927 928 929 933 937 939
943 975 991 992 993

Area Code 513

220 221 222 223 224 225 226 227 228 229 231 232 233 234 236
237 241 242 243 244 245 247 248 251 252 253 254 255 256 257
258 259 262 263 265 267 268 271 272 274 275 276 277 278 281
290 293 294 296 297 298 299 321 322 323 324 325 327 328 331
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
522 527 528 530 531 533 536 539 541 542 551 553 554 557 559
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
885 895 899

Area Code 601
352 353 354 355 359 362 366 371 372 373 376 825 829 845 852
856 857 866 878 879 922 924 932 936 939 944 948 949 956 957
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
278 279 285 293 294 295 296 297 298 299 323 325 326 327 435
437 438 551 573 574 575 576 577 578 581 582 583 584 585 588
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
921 924 931 932 933 934 935 936 937 938 939 941 942 943 944
945 946 947 948 949 951 952 953 954 955 956 957 959 961 962
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	482	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	931
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	258	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	528	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	629	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	821	822	824	825	832	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	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	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	353	354	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	797	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	351	352	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	659	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	676	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	998			

Area Code 704

331	332	333	334	335	364	365	366	371	372	373	374	375	376	377
378	379	392	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	795
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	943	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	432	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	556	557	558
559	567	581	586	591	592	593	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	669	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	937	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	898	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	573	574	576	578	579	582	583	585	592	596
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
888 898 954

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
263 288 373 377 395 396 422 423 449 471 472 474 477 521 523
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
246 256 282 283 284 286 288 332 333 334 335 336 337 339 342
372 376 378 379 526 546 579 587 824 825 837 872 876 892 923
944 945 948 988

Area Code 813
221 223 224 225 226 227 228 229 231 232 234 236 237 238 239
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
593 595 596 621 622 623 626 634 645 677 681 684 685 689 725
726 733 734 736 738 784 785 786 796 797 799 821 822 823 824
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
623 624 629 633 645 654 722 723 725 726 727 729 740 741 744
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	236	237	244	246	249	261	265	267	268	273	274	275	277	280
281	282	283	284	292	293	294	295	297	322	332	334	335	336	338
346	355	356	379	382	383	387	390	429	430	431	439	441	443	444
447	448	451	452	457	460	461	465	467	469	473	477	478	481	483
485	488	489	491	493	496	498	525	528	529	531	534	535	536	538
540	541	544	551	560	565	566	569	571	572	574	577	586	588	589
592	595	624	625	626	633	640	649	654	656	662	666	679	691	692
696	723	731	732	735	737	738	752	753	754	755	756	757	761	763
766	767	772	776	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							

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

Area Code 901

272	274	275	276	278	320	321	323	324	327	332	342	345	346	348
353	357	358	362	363	365	369	372	377	382	386	388	392	393	396
397	398	422	423	424	427	452	454	458	521	522	523	524	525	526
527	528	529	535	577	664	668	682	683	685	721	722	725	726	728
729	732	735	743	744	745	754	755	756	761	762	765	766	767	774
775	781	785	789	794	795	797	829	853	867	872	876	922	935	942
946	947	948	988											

Area Code 904

241	246	249	251	262	264	266	268	269	272	282	285	289	350	353
354	355	356	358	359	384	387	388	389	393	396	398	399	432	433
434	436	438	452	453	455	456	474	476	477	478	492	631	632	633
634	636	641	642	646	721	723	724	725	731	733	737	739	743	744
751	757	764	765	768	771	772	777	778	781	783	786	791	798	932
944	968	994												

Area Code 912

232	233	234	236	238	352	354	355	356	474	477	598	741	742	743
744	745	746	748	781	784	786	788	897	922	923	925	926	927	929
944	964	966												

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	371	375	379	381
383	384	422	432	441	478	492	532	537	539	541	542	564	573	574
576	582	588	596	621	631	642	648	649	661	663	671	676	677	681
685	721	722	724	748	749	761	764	775	776	782	788	791	829	831
841	842	843	862	864	887	888	894	897	936	967				

Area Code 914

225	232	233	234	235	237	238	241	245	248	251	253	265	268	271
273	276	277	278	279	285	320	321	328	332	335	337	345	346	347
351	352	353	354	356	357	358	359	365	368	375	381	390	391	423
424	425	428	429	472	476	477	478	526	528	533	576	577	578	591
592	623	624	627	631	632	633	634	636	638	642	664	666	667	668
669	681	682	683	684	686	693	694	696	697	698	699	723	725	735
736	737	738	739	747	749	753	761	762	763	764	765	769	776	779
786	789	793	833	834	835	878	890	899	934	936	937	939	941	942
945	946	947	948	949	961	962	963	964	965	967	968	969	997	999

Area Code 915

332	333	334	335	337	362	363	366	367	368	381	385	465	468	459
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	678	679	682	683	684	685	686	687	688	689

691 692 694 695 696 697 698 699 747 751 755 757 772 775 778
779 821 833 851 852 855 858 859 874 877 886 942 944 949

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
379 595 621 622 643 656 668 674 680 685 697 698 721 722 723
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

APPENDIX D

AREA CODE AND PREFIX LISTING FOR GTE SPRINT NETWORK

<3 October 1983>

Area Code 201

221	222	224	225	226	227	228	229	231	232	233	235	238	239	241
242	245	246	247	249	251	254	256	257	259	261	262	263	265	266
267	268	272	273	276	277	278	279	283	284	285	287	288	289	291
297	298	299	321	324	325	326	327	328	329	330	332	333	334	335
338	339	340	342	343	344	345	348	351	352	353	354	355	356	358
359	360	361	365	366	368	371	372	373	374	375	376	377	379	381
382	384	385	386	387	388	389	390	391	392	393	394	399	420	423
427	428	429	430	432	433	434	435	436	437	438	440	441	442	444
445	447	450	451	455	456	457	460	461	463	464	465	467	468	469
470	471	472	473	474	478	480	481	482	483	484	485	486	487	488
489	493	494	495	499	522	523	524	526	527	530	531	533	538	539
540	541	542	543	544	545	546	547	548	549	558	560	561	564	565
567	568	569	570	571	572	573	574	575	581	582	585	589	592	595
596	599	621	622	623	624	625	627	628	631	632	634	635	636	641
642	643	645	646	648	649	652	653	654	656	658	659	661	662	664
665	666	667	668	670	671	672	673	674	675	676	677	678	679	684
685	686	687	688	690	692	694	695	696	699	721	722	724	725	727
731	733	736	738	740	741	742	743	744	745	746	747	748	750	751
752	753	754	755	756	757	759	760	761	762	763	765	766	767	768
772	773	777	778	779	783	784	785	787	789	790	791	792	794	795
796	797	798	820	821	822	823	824	825	826	828	833	834	836	837
842	843	844	845	846	851	854	857	858	861	862	863	864	865	866
867	868	869	870	871	873	874	877	878	880	881	882	884	885	886
887	890	893	894	895	898	923	925	926	930	931	932	933	934	935
936	937	939	941	942	943	944	945	946	947	949	952	953	956	957
961	963	964	965	966	967	968	969	975	976	977	981	983	984	985
989	991	992	993	994	997	998	999							

Area Code 202 ****Entire Area Code Is Served****

Area Code 203

222	223	224	225	226	227	229	232	233	234	236	239	241	242	243
244	246	247	248	249	252	254	255	259	261	262	263	264	265	266
268	269	270	271	272	273	274	275	277	278	279	281	282	283	284
285	286	288	289	322	323	324	325	326	327	328	329	332	333	334
335	336	348	354	355	356	357	358	359	366	367	368	371	372	373
374	375	377	378	382	384	385	386	387	389	393	397	426	431	432
436	438	452	467	468	469	481	484	488	492	493	494	495	497	521
522	523	524	525	527	528	529	531	544	547	548	549	552	561	562
563	565	566	568	569	573	574	575	576	579	582	583	584	589	591
593	594	621	622	623	624	625	627	628	629	633	637	643	644	647
649	651	653	655	656	658	659	661	666	667	668	673	674	677	678
683	688	693	721	722	723	724	725	726	727	728	729	743	744	746
747	748	753	754	755	756	757	758	762	771	772	773	775	776	777
783	784	785	786	787	789	792	793	794	795	796	797	799	827	828
834	838	846	847	852	853	854	865	866	869	871	872	874	875	877
878	879	891	892	893	926	929	932	933	934	937	938	944	945	947
964	965	966	967	968	972	976								

Area Code 205

226	250	251	252	254	261	262	263	264	265	269	271	272	277	279
281	284	285	288	293	320	321	322	323	324	325	326	327	328	342
343	344	361	365	399	424	425	426	428	431	432	433	436	438	452
456	457	460	470	471	473	476	477	478	479	491	497	567	569	583
591	592	595	599	626	631	633	640	645	647	648	649	653	655	660
661	663	664	665	666	668	669	672	674	675	676	678	679	681	690
694	699	741	744	770	780	781	783	785	786	787	788	791	798	822
823	832	833	834	836	838	841	849	853	854	856	860	868	870	871
877	879	923	925	928	933	934	938	939	942	945	951	956	967	969
972	973	979	987	988	991									

Area Code 206

223	226	228	232	233	235	236	237	241	242	243	244	246	248	251
255	271	272	277	281	282	283	284	285	292	322	323	324	325	326
328	329	340	343	344	345	346	361	362	363	364	365	367	382	383
392	394	421	431	432	433	442	447	451	453	454	455	464	467	472
473	474	475	481	483	485	486	487	488	522	523	524	525	526	527
531	535	537	542	543	545	546	547	564	565	572	575	581	582	583
584	587	588	591	593	594	597	621	622	623	624	625	626	627	628
630	631	632	633	634	641	643	644	655	656	662	672	682	721	722
723	725	742	743	745	746	747	751	752	756	759	762	763	764	767
771	772	773	774	775	776	778	782	783	784	788	789	821	822	823
824	827	828	838	839	841	842	843	845	847	848	852	854	859	862
863	872	874	878	881	882	883	885	922	924	927	932	935	937	938
941	946	947	952	955	964	967	977	984	991	994	995	996	997	

Area Code 207

688	761	766	767	772	773	774	775	780	781	797	799	829	839	846
854	856	865	871	883	892	955								

Area Code 208

286	322	323	333	334	336	338	342	343	344	345	362	375	376	377
378	383	384	385	386	887	888	922	939						

Area Code 209

221	222	224	225	226	227	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	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 212 ****Entire Area Code Is Served****

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

Area Code 214

221	222	223	224	225	226	227	228	229	231	233	234	235	236	238
239	241	242	243	245	247	248	251	252	253	254	255	256	257	258
259	262	263	264	266	269	270	271	272	276	278	279	285	286	287
288	289	291	292	296	297	298	299	320	321	323	324	327	328	330
331	333	337	339	340	341	343	347	348	349	350	351	352	353	357
358	361	363	368	369	370	371	372	373	374	375	376	377	380	381
385	386	387	388	391	392	398	399	420	421	422	423	424	426	428
429	434	436	437	438	442	445	446	450	453	454	455	456	457	458
462	463	464	465	466	471	475	482	484	487	492	494	495	521	522
523	526	528	530	531	532	534	539	541	542	548	553	556	557	559
561	564	565	566	570	573	574	578	579	581	589	592	593	595	596
597	620	630	631	634	637	638	641	642	643	644	647	650	651	652
653	655	658	659	660	661	663	669	670	671	673	676	679	680	681

688 689 690 691 692 696 698 699 720 721 724 732 733 739 741
742 744 745 746 747 748 749 750 753 754 757 758 759 760 761
767 780 783 784 785 786 787 788 790 792 793 794 798 820 821
823 824 825 826 827 828 830 832 837 838 839 840 844 849 851
858 862 867 868 869 871 872 874 877 880 881 882 883 888 890
892 893 894 920 922 931 933 934 935 938 939 941 942 943 944
946 948 949 954 960 969 976 980 982 983 984 985 986 987 988
991 992 993 995 996 997

Area Code 215

221 222 223 224 225 226 227 228 229 231 232 233 235 236 237
238 241 242 243 244 245 247 248 250 251 252 253 256 258 259
261 262 263 264 265 266 268 270 271 272 274 275 276 277 278
279 282 283 284 285 286 287 288 289 291 293 296 298 299 320
322 324 328 329 331 332 333 334 335 336 337 338 339 341 342
343 346 349 351 352 353 355 356 357 358 359 362 364 365 368
371 372 373 374 375 376 378 379 382 386 387 388 389 395 398
422 423 424 425 426 427 432 433 434 435 437 438 439 441 443
444 446 447 448 449 452 455 456 457 459 461 462 463 464 465
466 467 468 471 472 473 474 476 477 481 482 483 484 485 487
488 489 491 492 494 495 496 497 499 521 522 525 527 528 532
533 534 535 537 539 540 542 543 544 545 546 547 548 549 552
557 561 562 563 564 565 566 567 568 569 572 574 576 578 581
582 583 584 585 586 587 589 592 595 596 597 598 622 623 624
625 626 627 628 629 630 631 632 634 635 636 637 638 639 640
641 642 643 644 645 646 647 648 649 657 659 661 662 663 664
665 666 667 668 670 671 672 673 674 675 676 677 678 682 683
684 686 687 688 689 691 693 694 697 698 699 722 724 725 726
727 728 729 732 734 735 739 742 743 744 745 747 748 749 750
751 752 753 755 757 759 763 765 767 768 769 770 775 776 777
779 781 782 783 784 785 786 787 788 789 791 796 797 799 820
821 823 824 825 828 829 831 833 834 835 836 837 838 839 841
842 843 844 846 848 849 853 854 855 856 860 861 864 865 866
867 868 872 874 875 876 877 878 879 884 885 886 887 891 893
894 895 896 897 898 921 922 923 924 925 926 927 928 929 933
934 935 936 937 938 943 944 945 946 947 948 949 951 952 962
963 964 965 966 967 968 969 972 976 977 978 985 987 988

Area Code 216

221 225 226 228 229 231 232 233 234 235 236 237 238 241 243
244 245 246 247 248 249 251 252 253 255 257 261 265 266 267
268 271 273 277 278 281 282 283 288 289 291 292 295 299 321
322 323 324 327 329 331 333 334 335 336 338 341 344 348 349
351 352 354 355 356 357 361 362 363 365 366 368 369 370 371
372 373 374 375 376 379 381 382 383 384 391 392 393 394 395
398 399 421 423 425 429 430 431 432 433 434 438 439 441 442
443 444 447 449 451 452 453 454 455 456 458 459 461 464 467
468 471 473 475 476 477 478 481 484 486 488 489 491 492 493
494 497 499 521 522 523 524 526 529 530 531 533 534 535 536
538 539 541 542 543 545 549 561 562 566 568 572 574 575 578
579 581 582 583 585 587 589 621 622 623 626 628 630 631 633
637 638 641 642 644 645 650 651 655 656 657 658 659 661 662
663 664 666 668 671 672 673 676 678 681 686 687 688 692 694
696 699 721 724 726 729 731 732 733 734 741 742 743 744 745
746 747 748 749 750 751 752 753 755 757 758 759 761 762 771
772 773 777 779 781 782 783 784 788 791 792 793 794 795 796
797 798 799 822 824 825 826 831 832 833 835 836 837 838 841
842 843 845 847 848 851 856 860 861 862 863 864 866 867 868
869 871 872 874 875 876 877 879 881 882 883 884 885 886 888
889 892 896 898 920 921 922 923 926 928 929 931 932 933 934
937 941 942 943 944 946 949 951 953 960 961 965 967 974 984
986 991

Area Code 217

328	332	333	337	344	351	352	356	359	364	367	373	384	398	422
423	424	425	428	429	469	483	485	487	488	492	495	496	498	522
523	525	528	529	544	546	564	566	568	582	583	586	595	598	626
629	636	643	684	687	688	694	747	753	767	782	785	786	787	788
789	793	863	867	875	877	892	893	896	897	963				

Area Code 219

232	233	234	236	237	239	255	256	258	259	272	277	282	283	284
287	288	289	291	299	391	392	397	398	420	422	423	424	425	426
427	428	429	432	434	436	440	441	442	443	444	445	446	447	449
456	458	461	467	473	478	481	482	483	484	485	486	489	493	520
556	622	623	625	627	632	633	637	638	639	654	657	659	672	674
679	693	730	736	738	744	745	747	749	762	763	769	787	836	838
844	845	853	881	882	883	884	885	886	887	922	923	924	931	932
933	937	938	942	944	947	949	962	972	977	980	981	989		

Area Code 301

222	224	225	227	229	231	232	233	234	235	236	237	238	239	242
243	244	247	248	249	251	252	254	255	256	258	260	261	262	263
265	266	267	268	269	270	276	277	279	281	282	283	284	285	288
291	292	294	295	296	297	298	299	320	321	322	323	325	327	328
329	332	335	336	337	338	340	341	342	343	344	345	350	353	354
355	356	358	362	363	365	366	367	368	372	377	379	383	384	385
386	388	390	391	393	394	396	420	421	422	423	424	426	427	428
429	431	433	434	435	436	437	439	441	442	443	444	445	448	449
454	455	459	460	461	462	464	465	466	467	468	469	472	474	477
481	483	484	485	486	488	490	492	493	494	495	496	497	498	521
522	523	525	526	528	529	530	531	532	534	536	537	539	542	544
547	549	551	552	557	559	561	563	564	565	566	567	568	569	572
574	575	576	577	578	583	585	587	588	589	592	593	594	595	596
597	598	599	621	622	624	625	627	628	629	630	633	636	644	646
647	649	652	653	654	655	656	657	659	661	664	665	666	667	668
669	672	674	675	677	679	681	682	683	685	686	687	688	699	721
725	727	728	730	731	732	735	736	741	744	747	748	752	753	757
760	761	762	763	764	765	766	768	770	771	772	773	774	776	779
781	787	788	789	792	793	794	795	796	798	799	821	823	825	828
833	837	839	840	841	843	844	849	850	851	852	853	854	855	856
859	864	866	867	868	869	870	871	875	876	877	878	879	881	882
888	889	890	891	894	897	899	921	922	923	924	925	926	927	929
933	935	936	937	942	944	945	946	947	948	949	951	952	953	955
956	962	963	964	967	969	972	973	974	977	981	982	983	984	986
987	988	992	995	997										

Area Code 302

239	322	323	328	366	368	421	428	429	451	453	454	475	478	571
573	575	594	651	652	654	655	656	658	731	737	738	762	764	772
773	774	792	798	834	836	992	994	995	998	999				

Area Code 303

221	223	224	226	229	230	231	232	233	234	235	237	238	239	273
277	278	279	284	287	288	289	291	292	293	294	295	296	297	298
320	321	322	329	330	333	337	339	340	341	343	344	350	351	352
353	355	356	360	361	363	364	366	367	370	371	373	377	382	388
390	392	393	394	398	399	420	421	422	423	424	425	426	427	428
429	430	431	433	440	441	442	443	444	447	449	450	451	452	454
455	457	458	465	466	469	471	472	473	475	477	480	481	482	484
488	491	492	493	494	495	497	499	526	530	534	535	538	542	543
544	545	546	547	549	551	560	561	564	566	568	570	571	572	573
574	575	576	577	578	579	584	587	590	591	592	593	594	595	596
597	598	599	620	623	624	628	629	630	631	632	633	634	635	636
639	642	649	650	651	652	654	659	665	666	670	671	673	674	678
681	684	685	686	687	688	690	691	692	693	694	695	696	697	698
699	722	733	737	740	741	744	750	751	752	753	755	756	757	758

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
831 832 834 837 839 841 850 851 855 861 863 866 869 890 892
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
279 280 284 285 324 325 326 343 350 353 357 358 361 368 371
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
949 952 961 962 963 964 965 966 967 968 969 971 972 973 974
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
562 565 637 655 671 672 673 674 675 676 679 682 685 686 688
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
478 479 487 488 492 524 592 593 598 622 623 625 633 635 636
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

222 228 232 233 235 236 239 240 241 242 243 244 247 248 251
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
963 994 996

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	282	284	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	339	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	892	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	399	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	569	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	568	569	645	653	660	661	663	664	666	732	735	753	758
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	540	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	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	299	362	363	364	370	371	373	378	390
393	399	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
650	652	653	654	655	656	657	658	659	661	663	665	666	667	668
681	682	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	221	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	428	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	921
922	923	924	925	926	927	928	929	933	937	939	943	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	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	559	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
289 834 961 964 965 966 967 981 984 986 987 989 992 993 996
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
377 393 394 482 483 484 485 487 625 626 627 641 645 646 651
655 663 669 675 676 694 699 882 887

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	829	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	459	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	246	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	364	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	561	566	567	569
574	575	576	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	661	662
663	664	665	666	667	669	671	672	673	674	675	676	678	679	681
682	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	560	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	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	787	788	789	793	796	798	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	237	241	243	247	250	255	256	273	274	276	278	280	281
284	285	321	323	325	329	339	342	343	344	345	351	352	354	355
356	360	362	366	370	375	378	379	380	384	385	387	389	425	430
435	437	442	448	450	451	455	471	476	486	487	521	522	524	525
527	528	532	533	534	536	538	548	549	550	553	556	557	558	560
561	563	569	573	578	591	620	631	642	644	660	661	664	671	683
684	685	690	691	698	734	750	751	756	759	765	768	772	774	780
781	790	820	821	823	827	830	836	838	841	845	849	860	876	883
890	892	893	920	922	929	931	938	941	947	954	960	968	971	974
977	978	979	981	982	985	986	989	992	998					

Area Code 704

331	332	333	334	335	336	364	365	366	370	371	372	373	374	375
376	377	378	379	392	393	394	398	399	455	523	525	527	535	536
537	541	542	545	552	553	554	563	567	568	570	588	594	596	597
598	821	825	827	840	843	847	875	882	889	392				

Area Code 707

422	425	426	427	429	431	433	437	438	446	447	448	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	762	763	765	778	792
795	823	829	833	838	864	887								

Area Code 712

233	239	252	255	258	274	276	277	279	322	323	325	328	347	366
746	777	938	943											

Area Code 713

220	221	222	223	224	225	226	227	228	229	230	235	236	237	240
241	247	261	266	270	271	277	280	284	285	320	324	328	331	332
333	334	337	338	339	341	342	343	346	350	351	353	354	356	358
359	360	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	537	540	541	546	549
550	551	552	556	558	561	568	578	580	583	586	590	591	596	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	863	864	868	869	870	871	877	878	879	880	884	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	976	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	361	369	370	380	381
382	383	384	385	391	431	432	441	472	474	476	492	493	494	495
496	497	498	499	502	503	505	509	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	556
557	558	559	567	579	581	586	591	592	593	594	595	596	597	598
599	602	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	669	670	671	673	675	680	681	682	683

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

Area Code 716

222	223	225	227	232	235	236	238	244	247	248	254	258	262
265	266	271	275	278	282	283	286	288	293	297	323	325	328
337	338	342	352	359	377	381	385	392	395	398	422	423	424
426	427	428	433	434	436	439	442	454	457	458	461	464	467
475	477	482	494	496	533	537	538	542	544	546	549	582	586
592	594	621	624	625	626	627	631	632	633	634	635	636	637
647	648	649	652	654	655	656	662	663	668	671	674	675	681
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

263	265	266	271	275	278	282	283	286	288	293	297	323	325
334	337	338	342	352	359	377	381	385	392	395	398	422	423
425	426	427	428	433	434	436	439	442	454	457	458	461	464
473	475	477	482	494	496	533	537	538	542	544	546	549	582
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
724	726	731	741	745	751	754	759	773	791	821	822	823	824
826	827	828	831	832	833	834	835	836	837	838	839	842	843
846	847	849	852	853	854	855	856	862	865	872	873	874	875
877	878	879	881	882	883	884	885	886	887	889	890	891	892
894	895	896	897	898	921	924	937	941	947	955	964	974	976
992													

Area Code 717

225	232	233	234	236	238	244	246	252	255	266	283	284	285
288	291	292	295	299	333	342	343	344	346	347	348	354	378
392	393	394	397	457	464	469	472	474	489	533	534	545	558
561	562	563	564	566	569	586	587	599	626	627	639	652	653
655	656	657	663	664	665	675	678	687	689	691	693	696	697
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	829
843	845	846	848	854	868	872	876	896	898	921	938	939	944
948	957	961	969	975	986								

287	288	291	292	295	299	333	342	343	344	346	347	348	354
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
774	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
272	277	278	292	295	298	299	321	322	328	350	355	359	363
366	373	374	375	377	378	379	392	393	394	399	423	451	465
467	479	482	483	484	485	486	487	489	521	522	524	526	530
532	533	534	535	536	537	538	539	544	546	551	561	562	566
571	572	581	582	583	584	585	588	621	625	626	627	731	754
768	773	776	777	782	785	798	825	942	943	964	965	966	967
969	972	973	974	975									

268	269	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	588
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	588	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	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	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	595	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	282	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	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

356 358 361 363 364 373 374 391 421 436 444 452 453 454 455
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
354 355 356 358 359 384 387 388 389 390 393 396 398 399 432
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
724 761 764 775 782 788 791 829 831 862 887 888 894 897 967

Area Code 914
235 237 251 253 273 278 279 285 321 328 332 335 337 345 347
354 362 375 381 390 391 423 428 472 476 478 576 591 592 631
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	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	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 $25.82	=	$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

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

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

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

Mainland-Alaska

Per Minute Charges

Miles	Day		Evening (40% discount)		Night and Weekend (55% discount)	
			-------Approximations--------			
	1st min	Add. min	1st min	Add. min	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 MTS (Current Tariff Rates) (Continued)

Mainland-Hawaii

Per Minute Charges

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

Miles	Day		Evening (40% discount)		Night and Weekend (60% discount)	
			-------Approximations--------			
	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.

AT&T MTS (Proposed Tariff Rates) (Continued)

Mainland-Hawaii

Per Minute Charges

Band	Day		Evening (40% discount)		Night and Weekend (60% discount)	
			-------Approximations--------			
	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

*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, Massachussetts, Michigan, Mississippi, New Hampshire, New Jersey, New York, North Carolina, Ohio, Pennsylvania, Rhode Island, South Carolina, Tennessee, Vermont, Virginia, and West Virginia.

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

MCI Execunet

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 1st min	Day Add. min	Evening 1st min	Evening Add. min	Night and Weekend 1st min	Night and Weekend 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
71-124	.44	.336	.27	.1998	.18	.1299
125-292	.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

Rate Period	Total Usage $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	.3312	.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	.1364
926-1910	.4876	.3606	.2970	.2151	.1936	.1390
1911-3000	.5612	.4085	.3150	.2333	.2112	.1521
3001-4250	.5796	.4269	.3240	.2524	.2200	.1645
4251-5750	.5980	.4453	.3420	.2619	.2288	.1707

For Calls Originating from Hawaii

1911-3000	.3772	.3772	.2384	.2384	.1554	.1554
3001-4250	.4048	.4048	.2559	.2559	.1668	.1668
4251-5750	.4324	.4324	.2677	.2677	.1745	.1745

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 15 Hours Day	First 15 Hours Eve.	Next 25 Hours Day	Next 25 Hours Eve.	Next 40 Hours Day	Next 40 Hours Eve.	Over 80 Hours Day	Over 80 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	22.98	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

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(15,21), 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	First 15 Hours Eve.	Next 25 Hours Day	Next 25 Hours Eve.	Next 40 Hours Day	Next 40 Hours Eve.	Over 80 Hours Day	Over 80 Hours Eve.	All Hours Night and Weekend
14	19.40	12.62	17.27	11.23	15.15	9.84	12.81	8.33	6.74
15	19.60	12.74	17.47	11.35	15.30	9.96	12.94	8.41	6.81
16	19.83	12.89	17.65	11.48	15.47	10.06	13.09	8.51	6.89
17	20.06	13.03	17.85	11.61	15.65	10.17	13.23	8.61	6.97
18	20.45	13.30	18.19	11.82	15.95	10.37	13.48	8.77	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, Massachussetts, 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 WATS)*

Tier 1 (To Network Cities)

Per Minute Charges

0-900 min (First 15 Hours)		900.5-2400 min (Next 25 Hours)		2400.5-4800 min (Next 40 Hours)		Over 4800 min (Over 80 Hours)		All minutes *********
Day	Evening	Day	Evening	Day	Evening	Day	Evening	Night and Weekend
.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)		901-2400 min (Next 25 Hours)		2401-4800 min (Next 40 Hours)		Over 4800 min (Over 80 Hours)		All minutes *********
Day	Evening	Day	Evening	Day	Evening	Day	Evening	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	Denver, CO
Chicago, IL	Detroit, MI
Cincinnati, OH	Houston, TX
Cleveland, OH	Milwaukee, WI
Dallas, TX	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)		901-2400 min (Next 25 Hours)		2401-4800 min (Next 40 Hours)		Over 4800 min (Over 80 Hours)		All minutes *********
Day	Evening	Day	Evening	Day	Evening	Day	Evening	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) Day	0-900 min (First 15 Hours) Evening	901-2400 min (Next 25 Hours) Day	901-2400 min (Next 25 Hours) Evening	2401-4800 min (Next 40 Hours) Day	2401-4800 min (Next 40 Hours) Evening	Over 4800 min (Over 80 Hours) Day	Over 4800 min (Over 80 Hours) Evening
431-925	.3993	.2595	.3553	.2310	.3115	.2025	.2635	.1713
926-3000	.4303	.2797	.3830	.2490	.3357	.2182	.2840	.1847
3001-4250	.4493	.2920	.3998	.2598	.3505	.2278	.2965	.1927
4251-5750	.4840	.3147	.4308	.2800	.3775	.2453	.3195	.2077

Miles	All minutes Night and Weekend
431-925	.1398
926-3000	.1507
3001-4250	.1573
4251-5750	.1693

Based on average use per line per rate period.

GTE Sprint Communications Corporation Tariff FCC No. 10, pp 43-44, 5 Jan 1984.

APPENDIX F

ERLANG B TABLES

Erlangs	Grade of Service	No. of Trunks
0.20	0.167	1
0.20	0.016	2
0.20	0.001	3
0.40	0.286	1
0.40	0.054	2
0.40	0.007	3
0.60	0.375	1
0.60	0.101	2
0.60	0.020	3
0.60	0.003	4
0.80	0.444	1
0.80	0.151	2
0.80	0.039	3
0.80	0.008	4
0.80	0.001	5
1.00	0.500	1
1.00	0.200	2
1.00	0.063	3
1.00	0.015	4
1.00	0.003	5
1.20	0.545	1
1.20	0.247	2
1.20	0.090	3
1.20	0.026	4
1.20	0.006	5
1.20	0.001	6
1.40	0.583	1
1.40	0.290	2
1.40	0.119	3
1.40	0.040	4
1.40	0.011	5
1.40	0.003	6
1.60	0.330	2
1.60	0.150	3
1.60	0.056	4
1.60	0.018	5
1.60	0.005	6
1.60	0.001	7
1.80	0.367	2
1.80	0.180	3
1.80	0.075	4
1.80	0.026	5
1.80	0.008	6
1.80	0.002	7

Erlangs	Grade of Service	No. of Trunks
2.00	0.400	2
2.00	0.211	3
2.00	0.095	4
2.00	0.037	5
2.00	0.012	6
2.00	0.003	7
2.20	0.431	2
2.20	0.240	3
2.20	0.117	4
2.20	0.049	5
2.20	0.018	6
2.20	0.005	7
2.20	0.002	8
2.40	0.459	2
2.40	0.268	3
2.40	0.139	4
2.40	0.062	5
2.40	0.024	6
2.40	0.008	7
2.40	0.002	8
2.60	0.484	2
2.60	0.296	3
2.60	0.161	4
2.60	0.077	5
2.60	0.032	6
2.60	0.012	7
2.60	0.004	8
2.60	0.001	9
2.80	0.508	2
2.80	0.322	3
2.80	0.184	4
2.80	0.093	5
2.80	0.042	6
2.80	0.016	7
2.80	0.006	8
2.80	0.002	9
3.00	0.529	2
3.00	0.346	3
3.00	0.206	4
3.00	0.110	5
3.00	0.052	6
3.00	0.022	7
3.00	0.008	8
3.00	0.003	9

Erlangs	Grade of Service	No. of Trunks
3.20	0.549	2
3.20	0.369	3
3.20	0.228	4
3.20	0.127	5
3.20	0.064	6
3.20	0.028	7
3.20	0.011	8
3.20	0.004	9
3.20	0.001	10
3.40	0.568	2
3.40	0.392	3
3.40	0.250	4
3.40	0.145	5
3.40	0.076	6
3.40	0.036	7
3.40	0.015	8
3.40	0.006	9
3.40	0.002	10
3.60	0.585	2
3.60	0.412	3
3.60	0.271	4
3.60	0.163	5
3.60	0.089	6
3.60	0.044	7
3.60	0.019	8
3.60	0.008	9
3.60	0.003	10
3.80	0.432	3
3.80	0.291	4
3.80	0.181	5
3.80	0.103	6
3.80	0.053	7
3.80	0.025	8
3.80	0.010	9
3.80	0.004	10
3.80	0.001	11
4.00	0.451	3
4.00	0.311	4
4.00	0.199	5
4.00	0.117	6
4.00	0.063	7
4.00	0.030	8
4.00	0.013	9
4.00	0.005	10
4.00	0.002	11
4.50	0.493	3
4.50	0.357	4
4.50	0.243	5
4.50	0.154	6
4.50	0.090	7
4.50	0.048	8
4.50	0.024	9
4.50	0.010	10
4.50	0.004	11
4.50	0.002	12

Erlangs	Grade of Service	No. of Trunks
5.00	0.530	3
5.00	0.398	4
5.00	0.285	5
5.00	0.192	6
5.00	0.121	7
5.00	0.070	8
5.00	0.037	9
5.00	0.018	10
5.00	0.008	11
5.00	0.003	12
5.00	0.001	13
5.50	0.562	3
5.50	0.436	4
5.50	0.324	5
5.50	0.229	6
5.50	0.153	7
5.50	0.095	8
5.50	0.055	9
5.50	0.029	10
5.50	0.014	11
5.50	0.007	12
5.50	0.003	13
5.50	0.001	14
6.00	0.590	3
6.00	0.470	4
6.00	0.360	5
6.00	0.265	6
6.00	0.185	7
6.00	0.122	8
6.00	0.075	9
6.00	0.043	10
6.00	0.023	11
6.00	0.011	12
6.00	0.005	13
6.00	0.002	14
6.50	0.500	4
6.50	0.394	5
6.50	0.299	6
6.50	0.217	7
6.50	0.150	8
6.50	0.098	9
6.50	0.060	10
6.50	0.034	11
6.50	0.018	12
6.50	0.009	13
6.50	0.004	14
6.50	0.002	15
7.00	0.527	4
7.00	0.425	5
7.00	0.331	6
7.00	0.249	7
7.00	0.179	8
7.00	0.122	9
7.00	0.079	10
7.00	0.048	11
7.00	0.027	12
7.00	0.014	13
7.00	0.007	14
7.00	0.003	15
7.00	0.001	16

Erlangs	Grade of Service	No. of Trunks
8.00	0.575	4
8.00	0.479	5
8.00	0.390	6
8.00	0.308	7
8.00	0.236	8
8.00	0.173	9
8.00	0.122	10
8.00	0.081	11
8.00	0.051	12
8.00	0.031	13
8.00	0.017	14
8.00	0.009	15
8.00	0.005	16
8.00	0.002	17
9.00	0.525	5
9.00	0.441	6
9.00	0.362	7
9.00	0.289	8
9.00	0.224	9
9.00	0.168	10
9.00	0.121	11
9.00	0.083	12
9.00	0.054	13
9.00	0.034	14
9.00	0.020	15
9.00	0.011	16
9.00	0.006	17
9.00	0.003	18
9.00	0.001	19
10.00	0.564	5
10.00	0.485	6
10.00	0.409	7
10.00	0.338	8
10.00	0.273	9
10.00	0.215	10
10.00	0.163	11
10.00	0.120	12
10.00	0.084	13
10.00	0.057	14
10.00	0.036	15
10.00	0.022	16
10.00	0.013	17
10.00	0.007	18
10.00	0.004	19
10.00	0.002	20
11.00	0.597	5
11.00	0.523	6
11.00	0.451	7
11.00	0.383	8
11.00	0.319	9
11.00	0.260	10
11.00	0.206	11
11.00	0.159	12
11.00	0.119	13
11.00	0.085	14
11.00	0.059	15
11.00	0.039	16
11.00	0.025	17
11.00	0.015	18

Erlangs	Grade of Service	No. of Trunks
11.00	0.008	19
11.00	0.005	20
11.00	0.002	21
11.00	0.001	22
12.00	0.556	6
12.00	0.488	7
12.00	0.423	8
12.00	0.360	9
12.00	0.302	10
12.00	0.248	11
12.00	0.199	12
12.00	0.155	13
12.00	0.117	14
12.00	0.086	15
12.00	0.060	16
12.00	0.041	17
12.00	0.027	18
12.00	0.016	19
12.00	0.010	20
12.00	0.006	21
12.00	0.003	22
12.00	0.002	23
13.00	0.585	6
13.00	0.521	7
13.00	0.458	8
13.00	0.398	9
13.00	0.341	10
13.00	0.287	11
13.00	0.237	12
13.00	0.192	13
13.00	0.151	14
13.00	0.116	15
13.00	0.086	16
13.00	0.062	17
13.00	0.043	18
13.00	0.028	19
13.00	0.018	20
13.00	0.011	21
13.00	0.007	22
13.00	0.004	23
13.00	0.002	24
13.00	0.001	25
14.00	0.550	7
14.00	0.490	8
14.00	0.433	9
14.00	0.377	10
14.00	0.324	11
14.00	0.275	12
14.00	0.228	13
14.00	0.186	14
14.00	0.148	15
14.00	0.115	16
14.00	0.086	17
14.00	0.063	18
14.00	0.044	19
14.00	0.030	20
14.00	0.020	21
14.00	0.012	22
14.00	0.007	23
14.00	0.004	24
14.00	0.002	25
14.00	0.001	26

Erlangs	Grade of Service	No. of Trunks
15.00	0.576	7
15.00	0.519	8
15.00	0.464	9
15.00	0.410	10
15.00	0.359	11
15.00	0.310	12
15.00	0.263	13
15.00	0.220	14
15.00	0.180	15
15.00	0.145	16
15.00	0.113	17
15.00	0.086	18
15.00	0.064	19
15.00	0.046	20
15.00	0.032	21
15.00	0.021	22
15.00	0.014	23
15.00	0.008	24
15.00	0.005	25
15.00	0.003	26
15.00	0.002	27
16.00	0.599	7
16.00	0.545	8
16.00	0.492	9
16.00	0.441	10
16.00	0.391	11
16.00	0.342	12
16.00	0.296	13
16.00	0.253	14
16.00	0.213	15
16.00	0.175	16
16.00	0.142	17
16.00	0.112	18
16.00	0.086	19
16.00	0.064	20
16.00	0.047	21
16.00	0.033	22
16.00	0.022	23
16.00	0.015	24
16.00	0.009	25
16.00	0.006	26
16.00	0.003	27
16.00	0.002	28
16.00	0.001	29
17.00	0.569	8
17.00	0.518	9
17.00	0.468	10
17.00	0.420	11
17.00	0.373	12
17.00	0.328	13
17.00	0.285	14
17.00	0.244	15
17.00	0.206	16
17.00	0.171	17
17.00	0.139	18
17.00	0.110	19
17.00	0.086	20
17.00	0.065	21
17.00	0.048	22
17.00	0.034	23
17.00	0.024	24
17.00	0.016	25
17.00	0.010	26
17.00	0.006	27
17.00	0.004	28
17.00	0.002	29
17.00	0.001	30
18.00	0.590	8
18.00	0.541	9
18.00	0.493	10
18.00	0.447	11
18.00	0.401	12
18.00	0.357	13
18.00	0.315	14
18.00	0.274	15
18.00	0.236	16
18.00	0.200	17
18.00	0.166	18
18.00	0.136	19
18.00	0.109	20
18.00	0.086	21
18.00	0.065	22
18.00	0.049	23
18.00	0.035	24
18.00	0.025	25
18.00	0.017	26
18.00	0.011	27
18.00	0.007	28
18.00	0.004	29
18.00	0.003	30
18.00	0.002	31
19.00	0.563	9
19.00	0.517	10
19.00	0.472	11
19.00	0.427	12
19.00	0.385	13
19.00	0.343	14
19.00	0.303	15
19.00	0.264	16
19.00	0.228	17
19.00	0.194	18
19.00	0.163	19
19.00	0.134	20
19.00	0.108	21
19.00	0.085	22
19.00	0.066	23
19.00	0.050	24
19.00	0.036	25
19.00	0.026	26
19.00	0.018	27
19.00	0.012	28
19.00	0.008	29
19.00	0.005	30
19.00	0.003	31
19.00	0.002	32
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,NOLIST,NARR,L=80
C*********************************************************************
C
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     LONG DISTANCE ALTERNATIVES FOR MILITARY INSTALLATIONS, MASTER'S
C     THESIS, NAVAL POSTGRADUATE SCHOOL, MONTEREY, CA, MARCH 1984.
C
C*********************************************************************
C*********************************************************************
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 COSTS 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 (CONUS) 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
```

```
C     *  TENTHS OF A CENT ARE TRUNCATED FROM THE COSTS CALCULATED FOR EACH
C     AT&T MTS CALL AND ROUNDED FOR EACH MCI EXECUNET AND SPRINT CALL.
C
C     *  SINCE CALLS TO HAWAII MADE VIA AT&T MTS ARE BILLED BY BAND AND
C     NOT BY MILEAGE, THE PROGRAM CONVERTS BANDS TO MILEAGE RANGES FOR
C     USE IN CALCULATING THE COSTS VIA THE OTHER CARRIERS.  THE CORRECT-
C     NESS OF THESE CONVERSIONS HAS NOT BEEN DETERMINED EXCEPT FOR THE
C     WEST COAST.
C
C     *  COSTS FOR CALLS MADE VIA DIAL ACCESS SERVICES (MCI EXECUNET AND
C     SPRINT) IN THE 56-70 AND 71-124 MILE DISTANCE RANGES ARE CALCULATED
C     USING THE RATES FOR THE 71-124 MILE RANGE SINCE AT&T MTS HAS ONLY A
C     56-124 MILE RANGE (AND THE DISTANCE (RANGE OF DISTANCES) TO THE
C     CALLED NUMBER IS CALCULATED FROM THE DURATION, RATE PERIOD, AND COST
C     OF THE ORIGINAL AT&T MTS CALL.)
C
C     *  COSTS FOR CALLS MADE VIA MCI EXECUNET OVER 3000 MILES ARE
C     CALCULATED USING THE RATES FOR THE 1911-3000 MILE RANGE SINCE
C     THERE IS NO RATE SHOWN IN THE TARIFF FOR DISTANCES GREATER THAN
C     3000 MILES.
C
C     *  COSTS FOR CALLS MADE VIA SPRINT ARE CALCULATED USING THE RATES
C     WHICH ARE DISCOUNTED FOR OVER $200 USAGE PER MONTH.
C
C     *  THE PROGRAM CALCULATES THE COSTS OF ACCESSING THE DIAL ACCESS
C     SERVICES, IF ANY, USING FIRST MINUTE AND ADDITIONAL MINUTE RATES,
C     THE RATE PERIODS IN THE TABLE IN SUBROUTINE QUERY, AND ONLY THE
C     DURATION OF THE COMPLETED LONG DISTANCE CALL.
C
C     *  SINCE ORIGINAL CALL DATA IS IN ONE MINUTE INCREMENTS, WATS AND
C     DEDICATED ACCESS SERVICE COST CALCULATIONS DO NOT CONSIDER THE
C     LESS THAN ONE MINUTE INCREMENTS USED BY THESE CARRIERS OR THE ONE
C     MINUTE MINIMUM AVERAGE TIME REQUIREMENT OF THESE CARRIERS.
C
C     *  WATS AND DEDICATED ACCESS SERVICE COST CALCULATIONS INCLUDE THE
C     MONTHLY RECURRING CHARGES PER ACCESS LINE BUT NOT ORDER OR INSTALLA-
C     TION CHARGES.  THE MONTHLY RECURRING CHARGES USED IN THE PROGRAM
C     ARE THE BASIC CHARGES WHICH ASSUME THAT THE INSTALLATION IS CLOSE
C     ENOUGH TO THE CARRIER'S POINT OF TERMINATION SO AS TO AVOID
C     ADDITIONAL MILEAGE CHARGES.
C
C     *  COSTS FOR AT&T WATS (CURRENT TARIFF) ARE CALCULATED USING SERVICE
C     AREA 6 RATES.  THE RATES USED FOR CALCULATING COSTS OF AT&T WATS
C     (PROPOSED TARIFF) ARE FOR SERVICE AREAS 5 AND 6 (WHICH HAVE THE SAME
C     RATES).
C
C     *  THE PROGRAM DOES NOT ROUND THE TOTAL HOURS OF CALLS IN EACH RATE
C     PERIOD TO THE NEAREST TENTH OF AN HOUR FOR AT&T WATS COST
C     CALCULATIONS.
C
C     *  COSTS ARE CALCULATED FOR DEDICATED ACCESS SERVICES WITH
C     "UNIVERSAL TERMINATION" (MCI WATS AND DIRECT SPRINT WITH UNIVERSAL
C     CALLING), AND NOT FOR NETWORK-ONLY TERMINATION SERVICE.
C
C*****************************************************************************
C
C      THE FOLLOWING EXEC FILE WAS USED TO EXECUTE THE PROGRAM
C
C
C    &TRACE OFF
C    FILEDEF 8 DISK MCI DATA A (RECFM F LRECL 80 BLKSIZE 80
C    FILEDEF 9 DISK SPRINT DATA A (RECFM F LRECL 80 BLKSIZE 80
C    FILEDEF 10 DISK TOLL DATA A (RECFM F LRECL 80 BLKSIZE 80
C    FILEDEF 11 DISK DATAOUT DATA A (RECFM F LRECL 80 BLKSIZE 80
C    FILEDEF 12 DISK REJECT DATA A (RECFM F LRECL 80 BLKSIZE 80
C    FILEDEF 13 TERM (RECFM F LRECL 80 BLKSIZE 80
C    EXEC WATFIV SCCPRCJ &1
C    CLRSCRN
C    &TYPE DO YOU WANT TO BROWSE THE OUTPUT DATA FILE?  (Y OR N)
```

```
C    -RETURN &READ ARGS
C    &IF &1 EQ Y &GOTO -YESANS
C    &IF &1 EQ N &GOTO -NOANS
C    CLRSCRN
C    &TYPE &1 IS NOT A VALID RESPONSE (MUST BE Y OR N)
C    &GOTO -RETURN
C    -YESANS
C    BROWSE 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
C
C
C*************************************************************************
C
C    FILE DEFINITIONS
C
C
C      FILE 8 MCI DATA
C
C  ____ <COLUMN 1>
C  |
C  |
C  V
C  TOP OF FILE
C  201
C  221 222 224 225 226 227 228 229 231 232 233 235 238 239 241 242 243 245
C  246 247 248 249 251 254 256 257 261 262 263 265 266 267 268 271 272 273
C  <MORE DATA HERE>
C  202 1
C  END OF FILE
C
C
C
C
C      FILE 9 SPRINT DATA
C
C     <OF THE SAME TYPE DATA AS FILE 8>
C
C
C
C
C      FILE 10 TOLL DATA
C
C      (TOLL CALLS LISTED IN ANY ORDER USING THE FOLLOWING FORMAT)
C
C
C  ____ <COLUMN 1>
C  |
C  |
C  V
C  TOP OF FILE
C    2 1 BACKENSACK  NJ 201 368    1.23
C    3 1 WESTBROOK   ME 207 856    1.72
C    7 1 WASHINGTON  DC 202 697    3.68
C    3 1 LAS VEGAS   NV 702 734    1.43
C    5 1 RENO        NV 702 786    2.14
C    5 1 HIGHLD FLS  NY 914 938    2.70
C    2 1 NASHUA      NH 603 885    1.23
C    2 1 OMAHA       NE 402 221    1.08
C    1 1 HOUSTON     TX 713 526     .64
C    3 1 HUNTSVILLE  AL 205 882    1.72
C  END OF FILE
C
C
C
C
```

```
C     FILE 11 DATAOUT DATA
C     (THIS IS THE OUTPUT FILE)
C
C     FILE 12 REJECT DATA
C     (THIS OUTPUT FILE LISTS REJECTED DATA)
C
C     FILE 13 TERM
C     (TO THE TERMINAL FOR INTERACTIVE USE)
C
C*********************************************************************
C  SUBROUTINES (AS THEY APPEAR IN THE MAIN PROGRAM)
C
C     SCCLIS - THIS SUBROUTINE PLACES SCC NETWORK LISTINGS OF AREA
C       CODES AND PREFIXES ON EACH NETWORK INTO AN ARRAY, NUM.
C
C     SORT - THIS SUBROUTINE SORTS TELEPHONE CALL DATA BY AREA CODE
C       AND PREFIX FOR USE IN THE MAIN PROGRAM.
C
C     QUERY - THIS SUBROUTINE INTERACTIVELY QUERIES THE USER FOR INPUT
C        DATA USED TO CALCULATE COSTS OF ACCESSING THE SCC NETWORKS
C        AND TO CALCULATE THE AT&T WATS COSTS (USING CURRENT AND PROPOSED
C        RATES).
C
C     ASK - THIS SUBROUTINE TAKES A CHARACTER STRING WHICH IS GIVEN
C       AS THE SUBROUTINE ARGUMENT AND OUTPUTS IT TO THE TERMINAL.
C
C     DIST - THIS SUBROUTINE CALCULATES THE DISTANCE TO A CALLED CITY
C       FROM THE DURATION, RATE PERIOD, AND COST OF THE CALL.
C
C     CALC - THIS SUBROUTINE CALCULATES THE COST OF EACH CALL IF IT
C       WERE MADE VIA AT&T WTS, MCI EXECUNET, AND SPRINT (BASED ON
C       DURATION OF CALL, RATE PERIOD, MILEAGE, AND, FOR MCI EXECUNET,
C       NETWORK OR NON-NETWORK CITY), 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     LINES - THIS SUBROUTINE CALCULATES ERLANGS OF CALLS DURING THE
C        BUSY HOUR AND OUTPUTS NUMBERS OF LINES AND GRADES OF SERVICE
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     FACTOR - THIS FUNCTION CALCULATES FACTORIALS FOR USE IN
C       SUBROUTINE LINES.
C
C     CALC2 - THIS SUBROUTINE CALCULATES THE COST OF ALL CALLS IF THEY
C       WERE MADE VIA AT&T WATS, MCI WATS, AND DIRECT SPRINT (BASED ON
C       THE AVERAGE TIME PER ACCESS LINE PER RATE PERIOD).
C
C*********************************************************************
C
C  VARIABLE DEFINITIONS
C
C     ACCESS - A VARIABLE USED TO INDICATE IF CHARGES FOR CALLS TO
C        ACCESS THE SCC NETWORKS APPLY.
C
C     ACCDE - AREA CODE CALLED
```

```
C
C     ANS - A CHARACTER VARIABLE USED TO ANSWER QUESTIONS INTERACTIVELY
C
C     AVC0 - AVERAGE COST (PER MINUTE) OF AT&T MTS (ORIGINAL COST)
C     AVC1 - AVERAGE COST (PER MINUTE) OF AT&T MTS (PROPOSED RATES)
C     AVC1A - AVERAGE COST (PER MINUTE) OF AT&T WATS (CURRENT RATES)
C     AVC1B - AVERAGE COST (PER MINUTE) OF AT&T WATS (PROPOSED RATES)
C     AVC2 - AVERAGE COST (PER MINUTE) OF MCI EXECUNET
C     AVC2A - AVERAGE COST (PER MINUTE) OF MCI EXECUNET WITH ACCESS COSTS
C     AVC2B - AVERAGE COST (PER MINUTE) OF MCI WATS
C     AVC3 - AVERAGE COST (PER MINUTE) OF SPRINT
C     AVC3A - AVERAGE COST (PER MINUTE) OF SPRINT WITH ACCESS COSTS
C     AVC3B - AVERAGE COST (PER MINUTE) OF DIRECT SPRINT
C
C     AVTIME - AVERAGE TIME OF CALLS
C
C     COST - COST OF CALL
C
C     CSUM0 - SUM OF ORIGINAL AT&T MTS CALLS
C     CSUM1 - SUM OF COSTS OF CALLS MADE VIA AT&T MTS (PROPOSED RATES)
C     CSUM1A - SUM OF COSTS OF CALLS MADE VIA AT&T WATS (CURRENT RATES)
C     CSUM1B - SUM OF COSTS OF CALLS MADE VIA AT&T WATS (PROPOSED RATES)
C     CSUM2 - SUM OF COSTS OF CALLS MADE VIA MCI EXECUNET
C     CSUM2A - SUM OF COSTS OF CALLS MADE VIA MCI EXECUNET (INCLUDING
C        COSTS OF CALLS TO ACCESS)
C     CSUM2B - SUM OF COSTS OF CALLS MADE VIA MCI WATS
C     CSUM3 - SUM OF COSTS OF CALLS MADE VIA SPRINT
C     CSUM3A - SUM OF COSTS OF CALLS MADE VIA SPRINT (INCLUDING
C        COSTS OF CALLS TO ACCESS)
C     CSUM3B - SUM OF COSTS OF CALLS MADE VIA DIRECT SPRINT
C
C     FLAG(X) - AN ARRAY USED TO INDICATE IF THE AREA CODE AND PREFIX
C        OF THE CALL ARE ON THE SCC NETWORKS
C                 FLAG(1) = MCI
C                 FLAG(2) = GTE SPRINT
C
C     IREJ - TOTAL NUMBER OF REJECTED CALLS
C
C     ITCALL - TOTAL NUMBER OF CALLS
C
C     ITMIN - TOTAL MINUTES OF CALLS
C
C     ITMIN2 - TOTAL MINUTES OF CALLS LESS MINUTES OF CALLS UNABLE TO
C        BE PLACED VIA MCI (TO ALASKA)
C
C     LIMDIF - THE DIFFERENCE BETWEEN LIMHI AND LIMLO
C
C     LIMHI - (LIMIT HIGH) THE MAXIMUM NUMBER OF ACCESS LINES IN THE
C        RANGE OF NUMBERS OF LINES TO BE USED FOR SUBROUTINE CALC.
C
C     LIMLO - (LIMIT LOW) THE MINIMUM NUMBER OF ACCESS LINES IN THE
C        RANGE OF NUMBERS OF LINES TO BE USED FOR SUBROUTINE CALC.
C
C     MILES - DISTANCE (RANGE OF DISTANCES) TO CALLED CITY (CALCULATED
C        IN SUBROUTINE DIST)
C
C     MIN - LENGTH OF CALL IN MINUTES
C
C     NCALLS - TOTAL NUMBER OF CALL DATA SETS FROM THE FILE TOLL DATA
C
C     NLINES - NUMBER OF ACCESS LINES
C
C     NNX - PREFIX (NXX) CALLED
C
C     NOMCI - NUMBER OF CALLS UNABLE TO PLACED VIA MCI (TO ALASKA)
C
C     NOMIN - TOTAL MINUTES OF CALLS UNABLE TO BE PLACED VIA MCI
C        (TO ALASKA)
C
```

```
C     NUM(X,X,X) - AN ARRAY USED TO STORE AREA CODES AND
C        PREFIXES ON THE SCC NETWORKS
C           1ST POSITION - SCC
C              1 - MCI
C              2 - GTE SPRINT
C           2ND POSITION - TRANSLATED AREA CODE
C              EXAMPLE: 25 = AREA CODE 312
C           3RD POSITION - PREFIX (NNX)
C
C     NXA - A TRANSLATED VALUE FOR THE AREA CODE, ACODE.
C
C     OUTPUT - A VARIABLE USED TO INDICATE IF RESULTS OF SUBROUTINE CALC
C        ARE TO BE OUTPUT FOR EACH CALL DATA SET.
C
C     PERIOD - RATE PERIOD
C        1 = BUSINESS DAY
C        2 = EVENING
C        3 = NIGHT AND WEEKEND
C
C     PLACE - LOCATION CALLED
C
C     NOTE: VARIABLES USED AS SUBROUTINE ARGUMENTS, EVEN THOUGH THEY MAY
C     BE OUTPUT IN THE MAIN PROGRAM, ARE DEFINED IN THE SUBROUTINES.
C
C*********************************************************************
C
C
      INTEGER ACODE,RSTEPC,RSTEPP,REGION
      INTEGER*2 BAND,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)
C
      IREJ=ITCALI=ITMIN=0
C
      WRITE(13,100)
      CALL SCCLIS
      WRITE(13,101)
      CALL SORT(NCALIS)
      CALL QUERY(OUTPUT,ACCESS,RATE1,RATE1A,RATE2,RATE2A,RATE3,
     -RATE3A,RSTEPC,RSTEPP,REGION)
C
C
C
C     THE <IF(ACODE(I).EQ.    )THEN> STATEMENTS IN DO 10 TRANSLATE
C        THE AREA CODES TO SAVE SPACE IN THE ARRAY NUM, OTHERWISE
C        NUM WOULD NEED TO BE AT LEAST (2,919,999)
C
C
      DO 10 I=1,NCALIS
            IF(ACODE(I).EQ.201)THEN;NXA= 1;GO TO 20;END IF
            IF(ACODE(I).EQ.202)THEN;NXA= 2;GO TO 20;END IF
            IF(ACODE(I).EQ.203)THEN;NXA= 3;GO TO 20;END IF
            IF(ACODE(I).EQ.205)THEN;NXA= 4;GO TO 20;END IF
            IF(ACODE(I).EQ.206)THEN;NXA= 5;GO TO 20;END IF
            IF(ACODE(I).EQ.207)THEN;NXA= 6;GO TO 20;END IF
            IF(ACODE(I).EQ.208)THEN;NXA= 7;GO TO 20;END IF
            IF(ACODE(I).EQ.209)THEN;NXA= 8;GO TO 20;END IF
            IF(ACODE(I).EQ.212)THEN;NXA= 9;GO TO 20;END IF
            IF(ACODE(I).EQ.213)THEN;NXA=10;GO TO 20;END IF
            IF(ACODE(I).EQ.214)THEN;NXA=11;GO TO 20;END IF
            IF(ACODE(I).EQ.215)THEN;NXA=12;GO TO 20;END IF
            IF(ACODE(I).EQ.216)THEN;NXA=13;GO TO 20;END IF
            IF(ACODE(I).EQ.217)THEN;NXA=14;GO TO 20;END IF
```

```
IF(ACCDE(I).EQ.218)THEN;NXA=15;GO TO 20;END IF
IF(ACCDE(I).EQ.219)THEN;NXA=16;GO TO 20;END IF
IF(ACCDE(I).EQ.301)THEN;NXA=17;GO TO 20;END IF
IF(ACCDE(I).EQ.302)THEN;NXA=18;GO TO 20;END IF
IF(ACCDE(I).EQ.303)THEN;NXA=19;GO TO 20;END IF
IF(ACCDE(I).EQ.304)THEN;NXA=20;GO TO 20;END IF
IF(ACCDE(I).EQ.305)THEN;NXA=21;GO TO 20;END IF
IF(ACCDE(I).EQ.307)THEN;NXA=22;GO TO 20;END IF
IF(ACCDE(I).EQ.308)THEN;NXA=23;GO TO 20;END IF
IF(ACCDE(I).EQ.309)THEN;NXA=24;GO TO 20;END IF
IF(ACCDE(I).EQ.312)THEN;NXA=25;GO TO 20;END IF
IF(ACCDE(I).EQ.313)THEN;NXA=26;GO TO 20;END IF
IF(ACCDE(I).EQ.314)THEN;NXA=27;GO TO 20;END IF
IF(ACCDE(I).EQ.315)THEN;NXA=28;GO TO 20;END IF
IF(ACCDE(I).EQ.316)THEN;NXA=29;GO TO 20;END IF
IF(ACCDE(I).EQ.317)THEN;NXA=30;GO TO 20;END IF
IF(ACCDE(I).EQ.318)THEN;NXA=31;GO TO 20;END IF
IF(ACCDE(I).EQ.319)THEN;NXA=32;GO TO 20;END IF
IF(ACCDE(I).EQ.401)THEN;NXA=33;GO TO 20;END IF
IF(ACCDE(I).EQ.402)THEN;NXA=34;GO TO 20;END IF
IF(ACCDE(I).EQ.404)THEN;NXA=35;GO TO 20;END IF
IF(ACCDE(I).EQ.405)THEN;NXA=36;GO TO 20;END IF
IF(ACCDE(I).EQ.406)THEN;NXA=37;GO TO 20;END IF
IF(ACCDE(I).EQ.408)THEN;NXA=38;GO TO 20;END IF
IF(ACCDE(I).EQ.409)THEN;NXA=39;GO TO 20;END IF
IF(ACCDE(I).EQ.412)THEN;NXA=40;GO TO 20;END IF
IF(ACCDE(I).EQ.413)THEN;NXA=41;GO TO 20;END IF
IF(ACCDE(I).EQ.414)THEN;NXA=42;GO TO 20;END IF
IF(ACCDE(I).EQ.415)THEN;NXA=43;GO TO 20;END IF
IF(ACCDE(I).EQ.417)THEN;NXA=44;GO TO 20;END IF
IF(ACCDE(I).EQ.419)THEN;NXA=45;GO TO 20;END IF
IF(ACCDE(I).EQ.501)THEN;NXA=46;GO TO 20;END IF
IF(ACCDE(I).EQ.502)THEN;NXA=47;GO TO 20;END IF
IF(ACCDE(I).EQ.503)THEN;NXA=48;GO TO 20;END IF
IF(ACCDE(I).EQ.504)THEN;NXA=49;GO TO 20;END IF
IF(ACCDE(I).EQ.505)THEN;NXA=50;GO TO 20;END IF
IF(ACCDE(I).EQ.507)THEN;NXA=51;GO TO 20;END IF
IF(ACCDE(I).EQ.509)THEN;NXA=52;GO TO 20;END IF
IF(ACCDE(I).EQ.512)THEN;NXA=53;GO TO 20;END IF
IF(ACCDE(I).EQ.513)THEN;NXA=54;GO TO 20;END IF
IF(ACCDE(I).EQ.515)THEN;NXA=55;GO TO 20;END IF
IF(ACCDE(I).EQ.516)THEN;NXA=56;GO TO 20;END IF
IF(ACCDE(I).EQ.517)THEN;NXA=57;GO TO 20;END IF
IF(ACCDE(I).EQ.518)THEN;NXA=58;GO TO 20;END IF
IF(ACCDE(I).EQ.601)THEN;NXA=59;GO TO 20;END IF
IF(ACCDE(I).EQ.602)THEN;NXA=60;GO TO 20;END IF
IF(ACCDE(I).EQ.603)THEN;NXA=61;GO TO 20;END IF
IF(ACCDE(I).EQ.605)THEN;NXA=62;GO TO 20;END IF
IF(ACCDE(I).EQ.606)THEN;NXA=63;GO TO 20;END IF
IF(ACCDE(I).EQ.607)THEN;NXA=64;GO TO 20;END IF
IF(ACCDE(I).EQ.608)THEN;NXA=65;GO TO 20;END IF
IF(ACCDE(I).EQ.609)THEN;NXA=66;GO TO 20;END IF
IF(ACCDE(I).EQ.612)THEN;NXA=67;GO TO 20;END IF
IF(ACCDE(I).EQ.614)THEN;NXA=68;GO TO 20;END IF
IF(ACCDE(I).EQ.615)THEN;NXA=69;GO TO 20;END IF
IF(ACCDE(I).EQ.616)THEN;NXA=70;GO TO 20;END IF
IF(ACCDE(I).EQ.617)THEN;NXA=71;GO TO 20;END IF
IF(ACCDE(I).EQ.618)THEN;NXA=72;GO TO 20;END IF
IF(ACCDE(I).EQ.619)THEN;NXA=73;GO TO 20;END IF
IF(ACCDE(I).EQ.701)THEN;NXA=74;GO TO 20;END IF
IF(ACCDE(I).EQ.702)THEN;NXA=75;GO TO 20;END IF
IF(ACCDE(I).EQ.703)THEN;NXA=76;GO TO 20;END IF
IF(ACCDE(I).EQ.704)THEN;NXA=77;GO TO 20;END IF
IF(ACCDE(I).EQ.707)THEN;NXA=78;GO TO 20;END IF
IF(ACCDE(I).EQ.712)THEN;NXA=79;GO TO 20;END IF
IF(ACCDE(I).EQ.713)THEN;NXA=80;GO TO 20;END IF
IF(ACCDE(I).EQ.714)THEN;NXA=81;GO TO 20;END IF
IF(ACCDE(I).EQ.715)THEN;NXA=82;GO TO 20;END IF
IF(ACCDE(I).EQ.716)THEN;NXA=83;GO TO 20;END IF
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                IF(ACCDE(I).EQ.717)THEN;NXA=84;GO TO 20;END IF
                IF(ACCDE(I).EQ.801)THEN;NXA=85;GO TO 20;END IF
                IF(ACCDE(I).EQ.802)THEN;NXA=86;GO TO 20;END IF
                IF(ACCDE(I).EQ.803)THEN;NXA=87;GO TO 20;END IF
                IF(ACCDE(I).EQ.804)THEN;NXA=88;GO TO 20;END IF
                IF(ACCDE(I).EQ.805)THEN;NXA=89;GO TO 20;END IF
                IF(ACCDE(I).EQ.806)THEN;NXA=90;GO TO 20;END IF
                IF(ACCDE(I).EQ.808)THEN;NXA=91;GO TO 20;END IF
                IF(ACCDE(I).EQ.812)THEN;NXA=92;GO TO 20;END IF
                IF(ACCDE(I).EQ.813)THEN;NXA=93;GO TO 20;END IF
                IF(ACCDE(I).EQ.814)THEN;NXA=94;GO TO 20;END IF
                IF(ACCDE(I).EQ.815)THEN;NXA=95;GO TO 20;END IF
                IF(ACODE(I).EQ.816)THEN;NXA=96;GO TO 20;END IF
                IF(ACCDE(I).EQ.817)THEN;NXA=97;GO TO 20;END IF
                IF(ACCDE(I).EQ.818)THEN;NXA=98;GO TO 20;END IF
                IF(ACODE(I).EQ.901)THEN;NXA=99;GO TO 20;END IF
                IF(ACCDE(I).EQ.904)THEN;NXA=100;GO TO 20;END IF
                IF(ACCDE(I).EQ.906)THEN;NXA=101;GO TO 20;END IF
                IF(ACCDE(I).EQ.907)THEN;NXA=102;GO TO 20;END IF
                IF(ACCDE(I).EQ.912)THEN;NXA=103;GO TO 20;END IF
                IF(ACCDE(I).EQ.913)THEN;NXA=104;GO TO 20;END IF
                IF(ACCDE(I).EQ.914)THEN;NXA=105;GO TO 20;END IF
                IF(ACODE(I).EQ.915)THEN;NXA=106;GO TO 20;END IF
                IF(ACCDE(I).EQ.916)THEN;NXA=107;GO TO 20;END IF
                IF(ACCDE(I).EQ.918)THEN;NXA=108;GO TO 20;END IF
                IF(ACODE(I).EQ.919)THEN;NXA=109;GO TO 20;END IF
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
      WRITE(12,103)MIN(I),PERIOD(I),PLACE(I),ACODE(I),NNX(I),COST(I)
C
      IREJ=IREJ+1
C
      GO TO 10
20    CONTINUE
C*********************************************************************
C*********************************************************************
C
C     WHEN THE VARIABLE OUTPUT 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
      IF(I.EQ.1.AND.OUTPUT)THEN
         WRITE(11,104)ACODE(I),NNX(I)
         GO TO 30
      END IF
      IF(I.EQ.1)GO TO 30
      IF(ACCDE(I).NE.ACODE(I-1).AND.OUTPUT)THEN
         WRITE(11,105)ACODE(I),NNX(I)
         GO TO 30
      END IF
      IF(NNX(I).NE.NNX(I-1).AND.OUTPUT)WRITE(11,106)NNX(I)
C*********************************************************************
C*********************************************************************
30    CONTINUE
C
      CALL DIST(I,BAND,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     CONTINUED 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
           WRITE(12,107)MIN(I),PERIOD(I),PLACE(I),ACODE(I),NNX(I),COST(I)
           IREJ=IREJ+1
           GO TO 10
C*********************************************************************
C*********************************************************************
40       CONTINUE
C
        ITCALL=ITCALL+1
        ITMIN=ITMIN+MIN(I)
C
C
C       DO 50 SETS A FLAG (FLAG) IF THE AREA CODE (NXA) AND PREFIX (NNX(I))
C       IS ON 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
        FLAG(IN)=.FALSE.
        IF(NUM(IN,NXA,NNX(I)))FLAG(IN)=.TRUE.
50      CONTINUE
C*********************************************************************
C*********************************************************************
        CALL CALC(I,BAND,MILES,RATE1,RATE1A,RATE2,RATE2A,RATE3,
       -RATE3A,DISC2,DISC3,COST1,COST2,COST2A,COST3,COST3A,
       -CSUM0,CSUM1,CSUM2,CSUM2A,CSUM3,CSUM3A,
       -MIN11,MIN12,MIN13,MIN211,MIN221,MIN231,MIN212,MIN222,MIN232,
       -NCMCI,NOMIN,MIN311,MIN321,MIN331,MIN312,MIN322,MIN332,
       -MIN313,MIN323,MIN333)
C*********************************************************************
C*********************************************************************
C
C       WHEN THE VARIABLE OUTPUT IS .TRUE., THE DATA FOR EACH CALL IS
C       OUTPUT BY THE FOLLOWING STATEMENT.
C
        IF(OUTPUT)WRITE(11,108)MIN(I),PERIOD(I),PLACE(I),
       -COST(I),COST1,COST2,COST2A,COST3,COST3A
C
10      CONTINUE
C*********************************************************************
C*********************************************************************
C
C       THE FOLLOWING STATEMENTS CALCULATE THE AVERAGE TIME OF ALL CALLS
C       AND THE AVERAGE COSTS (PER MINUTE) OF EACH SERVICE
C
        AVTIME=(ITMIN+.0001)/ITCALL
        AVC0=CSUM0/ITMIN
        AVC1=CSUM1/ITMIN
        ITMIN2=ITMIN-NCMIN
        AVC2=CSUM2/ITMIN2
        AVC2A=CSUM2A/ITMIN2
        AVC3=CSUM3/ITMIN
        AVC3A=CSUM3A/ITMIN
C*********************************************************************
C*********************************************************************
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
        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    CONTINUE
      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)RSTEPC,RSTEPP,REGION
C
C*********************************************************************
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.LT.1)THEN
            CALL ASK('INCORRECT LIMITS HAVE BEEN INPUT       ')
            CALL ASK('                                       ')
            GO TO 70
         END IF
C*********************************************************************
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,RSTEPC,RSTEPP,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,
```

```
     -NCMCI,NOMIN,CSUM3B,AVC3B
80      CONTINUE
C
        GO TO 90
      END IF
C*********************************************************************
C*********************************************************************
C
C     IF THE CALCULATION OF COSTS IS FOR ONLY ONE VALUE OF NLINES THE
C     FOLLOWING STATEMENTS WILL CALCULATE AND OUTPUT THE COST FOR
C     THE ONE VALUE OF NLINES
C
      CALL CALC2(NLINES,RSTEPC,RSTEPP,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
C
C
C
      WRITE(11,112)NLINES,CSUM1A,AVC1A,CSUM1B,AVC1B,CSUM2B,AVC2B,
     -NCMCI,NOMIN,CSUM3B,AVC3B
C
90    CONTINUE
C*********************************************************************
C*********************************************************************
100   FORMAT(//1X,'EXECUTING.......................',///1X,
     -'THIS PROGRAM WAS CREATED BY SCOTT L. KLINGLER, CAPTAIN, USAF IN',
     -/1X,'MARCH 1984.  ADDITIONAL INFORMATION ABOUT THIS PROGRAM CAN BE
     -',/1X,'OBTAINED IN THE PROGRAM DOCUMENTATION ITSELF OR IN KLINGLER
     -, SCOTT L.',/1X,'SPECIALIZED COMMON CARRIERS LONG DISTANCE ALTERN
     -ATIVES FOR MILITARY',/1X,'INSTALLATIONS, MASTERS THESIS, NAVAL POS
     -TGRADUATE SCHOOL',/1X,'MONTEREY, CA, MARCH 1984.',///1X,
     -'READING SCC LISTS..............      IT WILL TAKE A WHILE......')
101   FORMAT(//1X,'SORTING CALL DATA................')
103   FORMAT(/1X,'INVALID AREA CODE IN INPUT DATA',/1X,
     -I3,1X,I1,1X,A13,1X,I3,1X,I3,1X,F6.2)
104   FORMAT(1X,'RATE PERIOD: 1 = DAY  2 = EVENING',
     -'  3 = NIGHT AND WEEKEND',/
     -80('*'),/1X,'AREA CODE ',I3,/1X,13('*'),/1X,'PREFIX ',I3,/1X,
     -10('-'),/57X,'MCI',12X,'SPRINT'/36X,'ORIG',3X,'NEW',11X,
     -'PLUS',12X,'PLUS',/12X,'RATE',20X,'AT&T',3X,'AT&T',3X,'MCI',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('-'))
105   FORMAT(/80('*'),/1X,'AREA CODE ',I3,/1X,13('*')/
     -57X,'MCI',12X,'SPRINT'/36X,'ORIG',3X,'NEW',11X,
     -'PLUS',12X,'PLUS',/12X,'RATE',20X,'AT&T',3X,'AT&T',3X,'MCI',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('-'),/1X,'PREFIX ',I3,/1X,10('-')/)
106   FORMAT(/1X,'PREFIX ',I3,/1X,10('-')/)
107   FORMAT(/1X,'DISTANCE CALCULATION UNSUCCESSFUL FOR INPUT DATA',/
     -1X,I3,1X,I1,1X,A13,1X,I3,1X,I3,1X,F6.2)
108   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)
109   FORMAT(///1X,'TOTAL 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 TOTAL AT&T MTS COST = $',F10.2,/
     -1X,'AVERAGE COST PER MINUTE = $',F6.3,//
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     -1X,'TOTAL 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,I3,1X,'CALLS UNABLE TO BE COMPLETED (TO ALASKA) ',
     -'(MINUTES = ',I5,')',//
     -1X,'TOTAL MCI EXECUNET COST (WITH COST OF CALL TO ACCESS) = $',
     -F10.2,/1X,'AVERAGE COST PER MINUTE = $',F6.3,/
     -1X,I3,1X,'CALLS UNABLE TO BE COMPLETED (TO ALASKA) ',
     -'(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) = $',
     -F10.2/,1X,'AVERAGE COST PER MINUTE = $',F6.3)
110   FORMAT(///1X,'TOTAL 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 TOTAL 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,'TOTAL MCI EXECUNET COST = $',F10.2,/
     -1X,'AVERAGE COST PER MINUTE = $',F6.3,/
     -1X,I3,1X,'CALLS UNABLE TO BE COMPLETED (TO ALASKA) ',
     -'(MINUTES = ',I5,')',//
     -1X,'TOTAL SPRINT COST = $',F10.2,/
     -1X,'AVERAGE COST PER MINUTE = $',F6.3)
111   FORMAT(////1X,'RATE STEP USED FOR AT&T WATS (CURRENT RATES) CALCUL
     -ATION = ',I3,/1X,'RATE STEP USED FOR AT&T WATS (PROPOSED RATES) CA
     -LCULATION = ',I3,/1X,'REGION USED FOR DIRECT SPRINT CALCULATION =
     -',I2)
112   FORMAT(//1X,'TOTAL NUMBER OF WATS LINES OR DEDICATED ACCESS ',
     -'LINES = ',I3,///1X,'TOTAL AT&T WATS COST (CURRENT RATES) = $',
     -F10.2,/1X,'AVERAGE COST PER MINUTE = $',F6.3,//
     -1X,'TOTAL AT&T WATS COST (PROPOSED RATES) = $',F10.2,/
     -1X,'AVERAGE COST PER MINUTE = $',F6.3,//
     -1X,'TOTAL MCI WATS COST = $',F10.2,/
     -1X,'AVERAGE COST PER MINUTE = $',F6.3,/
     -1X,I3,1X,'CALLS UNABLE TO BE COMPLETED (TO ALASKA) ',
     -'(MINUTES = ',I5,')',//
     -1X,'TOTAL DIRECT SPRINT COST = $',F10.2,/
     -1X,'AVERAGE COST PER MINUTE = $',F6.3)
      STOP
      END
$EJECT
      SUBROUTINE SCCIIS
C*********************************************************************
C
C     THIS SUBROUTINE PLACES SCC NETWORK LISTINGS OF AREA CODES AND
C     PREFIXES ON EACH NETWORK INTO AN ARRAY, NUM.
C
C*********************************************************************
C
C  VARIABLE DEFINITIONS
C
C     NNX1 - PREFIX ON SCC NETWORK IN AREA CODE NXA1
C
C     NXA - A TRANSLATED VALUE FOR THE AREA CODE, NXA1
C
C     NXACOD - A VARIABLE WHICH INDICATES, WHEN EQUAL TO 1, THAT ALL
C
C     NXA1 - AREA CODE ON SCC NETWORK
C
C*********************************************************************
C
C
      LOGICAL*1 NUM(2,109,999)
      COMMON /A/ NUM
      DIMENSION NNX1(999)
```

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C*********************************************************************
C*********************************************************************
C
C     DO 10 INITIALIZES ALL POSITIONS OF THE ARRAY NUM TO .FALSE.
C
C
      DO 10 IN=1,2
      DO 10 NXA=1,109
      DO 10 NNN=1,999
10    NUM(IN,NXA,NNN)=.FALSE.
C*********************************************************************
C*********************************************************************
C
C     DO 20 AND DO 30 READS THE AREA CODE (NXA1) AND A SPECIAL INDICATOR,
C     NXACOD FROM THE FILES MCI DATA AND SPRINT DATA.  AT END OF FILE IT
C     TRANSFERS OUT OF THE LOOP AND RETURNS TO THE CALLING PROGRAM.
C
C     THE <IF(NXA1.EQ.__)THEN;NXA=__...> STATEMENTS IN DO 30 TRANSLATE
C     THE AREA CODES TO SAVE SPACE IN THE ARRAY, NUM.
C
C
      DO 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
```

```
IF (NXA1.EQ.414) THEN;NXA=42;GO TO 40;END IF
IF (NXA1.EQ.415) THEN;NXA=43;GO TO 40;END IF
IF (NXA1.EQ.417) THEN;NXA=44;GO TO 40;END IF
IF (NXA1.EQ.419) THEN;NXA=45;GO TO 40;END IF
IF (NXA1.EQ.501) THEN;NXA=46;GO TO 40;END IF
IF (NXA1.EQ.502) THEN;NXA=47;GO TO 40;END IF
IF (NXA1.EQ.503) THEN;NXA=48;GO TO 40;END IF
IF (NXA1.EQ.504) THEN;NXA=49;GO TO 40;END IF
IF (NXA1.EQ.505) THEN;NXA=50;GO TO 40;END IF
IF (NXA1.EQ.507) THEN;NXA=51;GO TO 40;END IF
IF (NXA1.EQ.509) THEN;NXA=52;GO TO 40;END IF
IF (NXA1.EQ.512) THEN;NXA=53;GO TO 40;END IF
IF (NXA1.EQ.513) THEN;NXA=54;GO TO 40;END IF
IF (NXA1.EQ.515) THEN;NXA=55;GO TO 40;END IF
IF (NXA1.EQ.516) THEN;NXA=56;GO TO 40;END IF
IF (NXA1.EQ.517) THEN;NXA=57;GO TO 40;END IF
IF (NXA1.EQ.518) THEN;NXA=58;GO TO 40;END IF
IF (NXA1.EQ.601) THEN;NXA=59;GO TO 40;END IF
IF (NXA1.EQ.602) THEN;NXA=60;GO TO 40;END IF
IF (NXA1.EQ.603) THEN;NXA=61;GO TO 40;END IF
IF (NXA1.EQ.605) THEN;NXA=62;GO TO 40;END IF
IF (NXA1.EQ.606) THEN;NXA=63;GO TO 40;END IF
IF (NXA1.EQ.607) THEN;NXA=64;GO TO 40;END IF
IF (NXA1.EQ.608) THEN;NXA=65;GO TO 40;END IF
IF (NXA1.EQ.609) THEN;NXA=66;GO TO 40;END IF
IF (NXA1.EQ.612) THEN;NXA=67;GO TO 40;END IF
IF (NXA1.EQ.614) THEN;NXA=68;GO TO 40;END IF
IF (NXA1.EQ.615) THEN;NXA=69;GO TO 40;END IF
IF (NXA1.EQ.616) THEN;NXA=70;GO TO 40;END IF
IF (NXA1.EQ.617) THEN;NXA=71;GO TO 40;END IF
IF (NXA1.EQ.618) THEN;NXA=72;GO TO 40;END IF
IF (NXA1.EQ.619) THEN;NXA=73;GO TO 40;END IF
IF (NXA1.EQ.701) THEN;NXA=74;GO TO 40;END IF
IF (NXA1.EQ.702) THEN;NXA=75;GO TO 40;END IF
IF (NXA1.EQ.703) THEN;NXA=76;GO TO 40;END IF
IF (NXA1.EQ.704) THEN;NXA=77;GO TO 40;END IF
IF (NXA1.EQ.707) THEN;NXA=78;GO TO 40;END IF
IF (NXA1.EQ.712) THEN;NXA=79;GO TO 40;END IF
IF (NXA1.EQ.713) THEN;NXA=80;GO TO 40;END IF
IF (NXA1.EQ.714) THEN;NXA=81;GO TO 40;END IF
IF (NXA1.EQ.715) THEN;NXA=82;GO TO 40;END IF
IF (NXA1.EQ.716) THEN;NXA=83;GO TO 40;END IF
IF (NXA1.EQ.717) THEN;NXA=84;GO TO 40;END IF
IF (NXA1.EQ.801) THEN;NXA=85;GO TO 40;END IF
IF (NXA1.EQ.802) THEN;NXA=86;GO TO 40;END IF
IF (NXA1.EQ.803) THEN;NXA=87;GO TO 40;END IF
IF (NXA1.EQ.804) THEN;NXA=88;GO TO 40;END IF
IF (NXA1.EQ.805) THEN;NXA=89;GO TO 40;END IF
IF (NXA1.EQ.806) THEN;NXA=90;GO TO 40;END IF
IF (NXA1.EQ.808) THEN;NXA=91;GO TO 40;END IF
IF (NXA1.EQ.812) THEN;NXA=92;GO TO 40;END IF
IF (NXA1.EQ.813) THEN;NXA=93;GO TO 40;END IF
IF (NXA1.EQ.814) THEN;NXA=94;GO TO 40;END IF
IF (NXA1.EQ.815) THEN;NXA=95;GO TO 40;END IF
IF (NXA1.EQ.816) THEN;NXA=96;GO TO 40;END IF
IF (NXA1.EQ.817) THEN;NXA=97;GO TO 40;END IF
IF (NXA1.EQ.818) THEN;NXA=98;GO TO 40;END IF
IF (NXA1.EQ.901) THEN;NXA=99;GO TO 40;END IF
IF (NXA1.EQ.904) THEN;NXA=100;GO TO 40;END IF
IF (NXA1.EQ.906) THEN;NXA=101;GO TO 40;END IF
IF (NXA1.EQ.907) THEN;NXA=102;GO TO 40;END IF
IF (NXA1.EQ.912) THEN;NXA=103;GO TO 40;END IF
IF (NXA1.EQ.913) THEN;NXA=104;GO TO 40;END IF
IF (NXA1.EQ.914) THEN;NXA=105;GO TO 40;END IF
IF (NXA1.EQ.915) THEN;NXA=106;GO TO 40;END IF
IF (NXA1.EQ.916) THEN;NXA=107;GO TO 40;END IF
IF (NXA1.EQ.918) THEN;NXA=108;GO TO 40;END IF
IF (NXA1.EQ.919) THEN;NXA=109;GO TO 40;END IF
C
```

```
C     IF NXA1 IS NOT TRANSLATED ABOVE, ITS VALUE WILL BE OUTPUT TO THE
C     DATAOUT DATA FILE.  THIS WILL CAUSE A RETURN TO THE MAIN PROGRAM
C     AND MAY CAUSE A FATAL ERROR.
C
         WRITE(11,102)NXA1
         GO TO 90
C*********************************************************************
C*********************************************************************
40       CONTINUE
C
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 CODE (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 DO 70 AND DO 80.
C
C
         IF(NXACOD.EQ.1)THEN
            DO 50 NNN=1,999
50          NUM(IN,NXA,NNN)=.TRUE.
            GO TO 30
         END IF
C*********************************************************************
C*********************************************************************
C
C     IF NXACOD IS NOT EQUAL TO 1 OR 0, ITS VALUE (AND THE VALUE OF
C     NXA1) WILL BE OUTPUT TO THE DATAOUT DATA FILE.  THIS WILL CAUSE
C     A RETURN TO THE MAIN PROGRAM AND MAY CAUSE A FATAL ERROR.
C
        IF(NXACOD.EQ.1.OR.NXACOD.EQ.0)GO TO 60
           WRITE(11,103)NXA1,NXACOD
           GO TO 90
60      CONTINUE
C*********************************************************************
C*********************************************************************
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
      READ(I,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)
      DO 80 L=1,18
      N=L-1
      IF(NNX1(K+N).EQ.0)GO TO 30
      NUM(IN,NXA,NNX1(K+N))=.TRUE.
80    CONTINUE
70    CONTINUE
30    CONTINUE
20    CONTINUE
90    CONTINUE
C*********************************************************************
C*********************************************************************
100   FORMAT(I3,1X,I1)
101   FORMAT(18(I3,1X))
102   FORMAT(1X,'INCORRECT DATA INPUT IN SUBROUTINE SCCLIS *** NXA1 = ',
     -I3)
103   FORMAT(1X,'INCORRECT DATA INPUT IN SUBROUTINE SCCLIS *** NXA1 = ',
     -I3,2X,'NXACOD = ',I3)
      RETURN
      END
$EJECT
      SUBROUTINE SORT(NCALLS)
C*********************************************************************
```

```
C
C       THIS SUBROUTINE SORTS TELEPHONE CALL DATA BY AREA CODE
C       AND PREFIX FOR USE IN THE MAIN PROGRAM.
C
C***********************************************************************
C
C  VARIABLE DEFINITIONS
C
C       ACCDE - AREA CODE CALLED
C
C       COST - COST OF CALL
C
C       MIN - LENGTH OF CALL IN MINUTES
C
C       NCALLS - TOTAL NUMBER OF CALL DATA SETS FROM THE FILE TOLL DATA
C
C       NNX - PREFIX (NNX) CALLED
C
C       PERIOD - RATE PERIOD
C          1 = BUSINESS DAY
C          2 = EVENING
C          3 = NIGHT AND WEEKEND
C
C       PLACE - LOCATION CALLED
C
C       TEMP - A VARIABLE USED TO TEMPORARILY STORE VALUES OF MIN, PERIOD,
C          ACCDE, AND NNX DURING SORTING
C
C       TEMPC - A VARIABLE USE TO TEMPORARILY STORE VALUES OF COST
C          DURING SORTING
C
C       TEMPP - A VARIABLE USE TO TEMPORARILY STORE VALUES OF PLACE
C          DURING SORTING
C
C
      INTEGER ACCDE
      INTEGER*2 PERIOD,TEMP
      CHARACTER*13 PLACE,TEMPP
      LOGICAL*1 FLAG(2)
      COMMON /B/MIN(2000),PERIOD(2000),PLACE(2000),ACODE(2000),
     -NNX(2000),COST(2000),FLAG
      N=NN=0
      DO 10 I=1,2000
      READ(10,100)MIN(I),PERIOD(I),PLACE(I),ACODE(I),NNX(I),COST(I)
      AT END
         GO TO 20
      END AT END
      NCALLS=I
10    CONTINUE
20    N=NCALLS-1
      DO 30 I=1,N
      INC=I+1
          DO 40 J=INC,NCALLS
          IF(ACODE(I).LT.ACODE(J))GO TO 40
          IF(ACODE(I).GT.ACODE(J))GO TO 50
          IF(NNX(I).LE.NNX(J))GO TO 40
50            TEMP=MIN(I)
              MIN(I)=MIN(J)
              MIN(J)=TEMP
              TEMP=PERIOD(I)
              PERIOD(I)=PERIOD(J)
              PERIOD(J)=TEMP
              TEMPP=PLACE(I)
              PLACE(I)=PLACE(J)
              PLACE(J)=TEMPP
              TEMP=ACODE(I)
              ACCDE(I)=ACODE(J)
              ACODE(J)=TEMP
              TEMP=NNX(I)
```

```
                NNX(I)=NNX(J)
                NNX(J)=TEMP
                TEMPC=COST(I)
                COST(I)=COST(J)
                COST(J)=TEMPC
40          CONTINUE
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,RSTEPC,RSTEPP,REGION)
C*********************************************************************
C
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*********************************************************************
C
C  VARIABLE DEFINITIONS
C
C       ACCESS - A VARIABLE USED TO INDICATE IF CHARGES FOR CALLS TO
C          ACCESS THE SCC NETWORKS APPLY.
C
C       ANS - A CHARACTER VARIABLE USED TO ANSWER QUESTIONS INTERACTIVELY
C
C       DISC - A VARIABLE USED TO READ THE DISCOUNT APPLIED FOR EVENING
C          AND NIGHT AND WEEKEND RATE PERIODS
C
C       DISC2 - THE DISCOUNT FACTOR FOR EVENING RATE PERIOD
C
C       DISC3 - THE DISCOUNT FACTOR FOR NIGHT AND WEEKEND RATE PERIOD
C
C       OUTPUT - A VARIABLE USED TO INDICATE IF RESULTS OF SUBROUTINE CALC
C          ARE TO BE OUTPUT FOR EACH CALL DATA SET.
C
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
C       REGION - GEOGRAPHICAL AREA IN WHICH DIRECT SPRINT CALLS ARE
C          ORIGINATED
C
C       RSTEPC - RATE STEP (CURRENT AT&T WATS TARIFF)
C
C       RSTEPP - RATE STEP (PROPOSED AT&T WATS TARIFF)
C
        INTEGER RSTEPC,RSTEPP,REGION
        CHARACTER*1 ANS
        LOGICAL*1 OUTPUT,ACCESS
        RATE1=RATE1A=RATE2=RATE2A=RATE3=RATE3A=0.0
1       CALL ASK('                                          ')
        CALL ASK('DO YOU WANT OUTPUT FOR EACH CALL? (Y OR N) ')
        CALL ASK('                                          ')
        CALL ASK('Y  WILL GIVE DATA FOR EACH CALL PLUS TOTALS')
        CALL ASK('N  WILL GIVE TOTALS ONLY                  ')
        READ(13,100)ANS
        IF(ANS.NE.'Y'.AND.ANS.NE.'N')THEN
           CALL ASK('ANSWER MUST BE  Y  OR  N                  ')
           GO TO 1
        END IF
```

```
C
      IF(ANS.EQ.'Y')CUTPUT=.TRUE.
      IF(ANS.EQ.'N')CUTPUT=.FALSE.
C
C
C
2     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 CALCULATON 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
3     CALL ASK('                                                  ')
```

```
      CALL ASK('ARE THE CHARGES FOR THE OTHER RATE PERIODS ')
      CALL ASK('CALCULATED AS A PERCENTAGE OF THE DAY RATE?')
      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 3
      END IF
      IF (ANS.EQ.'N')GO TO 4
      CALL ASK('                                           ')
      CALL ASK('WHAT IS THE DISCOUNT FOR THE EVENING RATE  ')
      CALL ASK('PERIOD? (GIVE AS A REAL FRACTION.          ')
      CALL ASK('EXAMPLE: FOR A 30% DISCOUNT INPUT .3)      ')
      READ(13,*)DISC
      DISC2=1.-DISC
      CALL ASK('                                           ')
      CALL ASK('WHAT IS THE DISCOUNT FOR THE NIGHT AND     ')
      CALL ASK('WEEKEND RATE PERIOD? (GIVE AS A REAL       ')
      CALL ASK('FRACTION. EXAMPLE: FOR A 60% DISCOUNT      ')
      CALL ASK('INPUT .6)                                  ')
      READ(13,*)DISC
      DISC3=1.-DISC
      RATE2=RATE1*DISC2
      RATE2A=RATE1A*DISC2
      RATE3=RATE1*DISC3
      RATE3A=RATE1A*DISC3
      GO TO 5
4     CALL ASK('                                           ')
      CALL ASK('FOR THE EVENING RATE PERIOD:               ')
      CALL ASK('                                           ')
      CALL ASK('WHAT IS THE FIRST MINUTE RATE?             ')
      CALL ASK('(EXAMPLE: FOR $.01 PER MINUTE INPUT .01)   ')
      READ(13,*)RATE2
      CALL ASK('                                           ')
      CALL ASK('WHAT IS THE ADDITIONAL MINUTE RATE?        ')
      CALL ASK('(EXAMPLE: FOR $.01 PER MINUTE INPUT .01)   ')
      READ(13,*)RATE2A
      CALL ASK('                                           ')
      CALL ASK('FOR THE NIGHT AND WEEKEND RATE PERIOD:     ')
      CALL ASK('                                           ')
      CALL ASK('WHAT IS THE FIRST MINUTE RATE?             ')
      CALL ASK('(EXAMPLE: FOR $.01 PER MINUTE INPUT .01)   ')
      READ(13,*)RATE3
      CALL ASK('                                           ')
      CALL ASK('WHAT IS THE ADDITIONAL MINUTE RATE?        ')
      CALL ASK('(EXAMPLE: FOR $.01 PER MINUTE INPUT .01)   ')
      READ(13,*)RATE3A
C*****************************************************************
C*****************************************************************
C
C     THE RATE STEPS LISTED BELOW ARE FROM AMERICAN TELEPHONE AND
C     TELEGRAPH CO. FCC TARIFF NO. 259,  1 JAN 1984
C
C
5     CALL ASK('                                           ')
      CALL ASK('FOR CALCULATING THE AT&T WATS COSTS USING  ')
      CALL ASK('CURRENT RATES, WHAT IS THE RATE STEP?      ')
      CALL ASK('(THIS IS THE RATE STEP FOR SERVICE AREA 6) ')
      CALL ASK('                                           ')
      CALL ASK('RATE                STATES                 ')
      CALL ASK('STEP                                       ')
      CALL ASK('-------------------------------------------')
      CALL ASK(' 19  -  ID, OR, WA                         ')
      CALL ASK('-------------------------------------------')
      CALL ASK(' 20  -  AZ, CA, MT, NV, UT                 ')
      CALL ASK('-------------------------------------------')
      CALL ASK(' 21  -  AR, CO, IL, IN, IA, KS, LA, MI, MN,')
      CALL ASK('        MO, NE, NM, ND, OK, SD, TX, WI, WY ')
      CALL ASK('-------------------------------------------')
```

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      CALL ASK(' 22  -  AL, CT, DE, DC, FL, GA, KY, ME, MD,')
      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,*) RSTEPC
      IF(RSTEPC.LT.19.OR.RSTEPC.GT.22)THEN
         CALL ASK('NOT A VALID RATE STEP                 ')
         GO TO 5
      END IF
C*********************************************************************
C*********************************************************************
C
C     THE RATE STEPS LISTED BELOW ARE FROM AT&T COMMUNICATIONS
C     FCC TARIFF NO. 2,  ISSUED 3 OCT 1983, EFFECTIVE DATE POSTPONED
C     INDEFINITELY.
C
C
6     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,*) RSTEPP
      IF(RSTEPP.LT.14.OR.RSTEPP.GT.18)THEN
         CALL ASK('NOT A VALID RATE STEP                 ')
         GO TO 6
      END IF
7     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('NOT A VALID REGION                    ')
         GO TO 7
      END IF
100   FORMAT(A1)
      RETURN
```

```
      END
$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
      CHARACTER*43 QUEST
      WRITE(13,100) QUEST
      RETURN
100   FORMAT(1X,A43)
      END
$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
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
C  VARIABLE DEFINITIONS
C
C     ACODE - 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     ICOST _ INTEGERED COST OF CALL TIMES 100
C
C     ITCOST - INTEGERED 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
C     MILES - DISTANCE (RANGE OF DISTANCES) TO CALLED CITY
C       1        1-10     MILES
C       2       11-22     MILES
C       3       23-55     MILES
C      *4       56-124    MILES
C       5      125-292    MILES
C       6      293-430    MILES
C       7      431-925    MILES
C       8      926-1910   MILES
C       9     1911-3000   MILES
C      10     3001-4250   MILES
C      11     4251-5750   MILES
C
C     *NOTE: MCI AND GTE SPRINT USE DISTANCE RANGES OF 56-70 AND 71-124
C     WHILE AT&T USES 56-124.  COSTS FOR ALL MCI AND GTE SPRINT CALLS
C     IN THE 56-124 MILE RANGE ARE CALCULATED AT THE 71-124 RATES.
C
C     MIN - LENGTH OF CALL IN MINUTES
C
C     NMIN - ADDITIONAL MINUTES (TOTAL MINUTES LESS 1 MINUTE). THIS IS
C        NECESSARY SINCE AT&T AND SPRINT CALLS ARE BILLED BY FIRST
C        MINUTE TIMES FIRST MINUTE RATE PLUS ADDITIONAL MINUTES TIMES
C        ADDITIONAL MINUTE RATE
C
C     PERIOD - RATE PERIOD
C        1 = BUSINESS DAY
C        2 = EVENING
C        3 = NIGHT AND WEEKEND
C
C     ICCST - TEMPORARY COST (CALCULATED COST OF CALL)
C
C
C
      INTEGER ACCDE,ICOST,ITCCST
      INTEGER*2 BAND,PERIOD
      CHARACTER*13 PLACE
      LOGICAL*1 FLAG(2)
      COMMON /B/MIN(2000),PERIOD(2000),PLACE(2000),ACODE(2000),
     -NNX(2000),COST(2000),FLAG
C
C     THE FOLLOWING TWO STATEMENTS ADD .0001 TO COST TO ACCOUNT FOR
C     MACHINE ROUNDING ERROR AND CALCULATE AN INTEGERED VALUE OF COST
C     TIMES 100  (ICOST) TO COMPARE WITH CALCULATED VALUES OF ITCOST
C     TO DETERMINE THE DISTANCE RANGE.
C
      COST1=COST(I)+.0001
      ICCST=IFIX(COST1*100.)
C
      NMIN=MIN(I)-1
      MILES=0
C
      IF(PERIOD(I).EQ.1)DISC=1.
      IF(PERIOD(I).EQ.2)DISC=.6
      IF(PERIOD(I).EQ.3)DISC=.4
      IF((ACODE(I).EQ.808.OR.ACODE(I).EQ.907)
     -.AND.PERIOD(I).EQ.3)DISC=.45
C*********************************************************************
C*********************************************************************
C     THE RATES USED IN THIS SUBROUTINE MUST BE THOSE IN EFFECT WHEN
C     THE CALLS WERE ORIGINALLY MADE AND BILLED.
C
C*********************************************************************
C*********************************************************************
C
C     CALCULATION OF DISTANCE (BAND) FOR CALLS TO HAWAII.
C
C     SINCE CALLS TO HAWAII ARE BILLED BY BAND AND NOT MILES, THIS
C     PART OF THE SUBROUTINE MAKES AN ASSUMPTION CONVERTING BAND 1
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```
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(ACODE(I).EQ.808)THEN
C
        TCCST=(.74+(NMIN*.49))*DISC+.0001
        ITCOST=IFIX(TCCST*100.)
        IF(ITCOST.EQ.ICCST)THEN;BAND=1;MILES=9;END IF
C
        TCCST=(.76+(NMIN*.53))*DISC+.0001
        ITCOST=IFIX(TCCST*100.)
        IF(ITCOST.EQ.ICCST)THEN;BAND=2;MILES=10;END IF
C
        TCCST=(.79+(NMIN*.55))*DISC+.0001
        ITCOST=IFIX(TCCST*100.)
        IF(ITCOST.EQ.ICCST)THEN;BAND=3;MILES=11;END IF
C
        GO TO 10
        END IF
C
C
C
C***********************************************************************
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
        ITCOST=IFIX(TCCST*100.)
        IF(ITCOST.EQ.ICCST)MILES=7
C
        TCCST=(.64+(NMIN*.46))*DISC+.0001
        ITCOST=IFIX(TCCST*100.)
        IF(ITCOST.EQ.ICCST)MILES=8
C
        TCCST=(.74+(NMIN*.54))*DISC+.0001
        ITCOST=IFIX(TCCST*100.)
        IF(ITCOST.EQ.ICCST)MILES=9
C
        TCCST=(.79+(NMIN*.62))*DISC+.0001
        ITCOST=IFIX(TCCST*100.)
        IF(ITCOST.EQ.ICCST)MILES=10
C
        TCCST=(.87+(NMIN*.70))*DISC+.0001
        ITCOST=IFIX(TCCST*100.)
        IF(ITCOST.EQ.ICCST)MILES=11
C
        GO TO 10
        END IF
C***********************************************************************
C***********************************************************************
C
C       CALCULATION OF DISTANCE (MILES) FOR ALL CALLS EXCEPT TO HAWAII
C       AND ALASKA
C
        TCCST=(.32+(NMIN*.16))*DISC+.0001
        ITCOST=IFIX(TCCST*100.)
        IF(ITCOST.EQ.ICCST)MILES=1
C
        TCCST=(.40+(NMIN*.22))*DISC+.0001
        ITCOST=IFIX(TCCST*100.)
        IF(ITCOST.EQ.ICOST)MILES=2
C
        TCCST=(.48+(NMIN*.28))*DISC+.0001
        ITCOST=IFIX(TCCST*100.)
        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    CONTINUE
      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,
     -MIN11,MIN12,MIN13,MIN211,MIN221,MIN231,MIN212,MIN222,MIN232,
     -NCMCI,NOMIN,MIN311,MIN321,MIN331,MIN312,MIN322,MIN332,
     -MIN313,MIN323,MIN333)
C*****************************************************************
C
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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C
C
C*********************************************************************
C
C     METHODS OF APPLYING THE TARIFFS ARE DESCRIBED BELOW.
C
C     AT&T MTS AND SPRINT CHARGES ARE BASED ON A RATE FOR THE FIRST
C     MINUTE PLUS A RATE FOR ADDITIONAL MINUTES IN EACH RATE PERIOD,
C     WHILE MCI EXECUNET HAS A SINGLE RATE FOR ALL MINUTES IN A RATE
C     PERIOD.  ALL OF THESE SERVICES ROUND UP THE DURATION OF THE CALL
C     TO THE NEXT HIGHER MINUTE--THEY BILL IN ONE MINUTE INCREMENTS.
C     AT&T MTS COSTS ARE CALCULATED AT THE DAY RATE, REGARDLESS OF RATE
C     PERIOD, THEN DISCOUNTED ACCORDING TO THE RATE PERIOD IN WHICH THE
C     THE CALL WAS MADE.  (THE DISCOUNTS ARE 40 PERCENT FOR THE EVENING
C     RATE PERIOD AND 60 PERCENT FOR THE NIGHT AND WEEKEND RATE PERIOD.
C     A 55 PERCENT DISCOUNT IS APPLIED TO CALLS TO ALASKA AND HAWAII
C     DURING THE NIGHT AND WEEKEND RATE PERIOD UNDER THE CURRENT TARIFF.)
C     SPRINT SERVICE IS DISCOUNTED BASED UPON TOTAL DOLLAR AMOUNT OF THE
C     BILL.  MCI EXECUNET HAS SEPARATE RATES FOR CALLS TO NETWORK AND
C     NON-NETWORK CITIES.  TENTHS OF A CENT ARE TRUNCATED FROM THE COSTS
C     CALCULATED FOR EACH AT&T MTS CALL AND ARE ROUNDED FOR EACH MCI
C     EXECUNET AND SPRINT CALL.
C
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
C     COST1 - COST OF CALL IF MADE VIA AT&T MTS (PROPOSED RATES)
C     COST2 - COST OF CALL IF MADE VIA MCI EXECUNET
C     COST2A - COST OF CALL IF MADE VIA MCI EXECUNET (INCLUDING COST
C        OF CALL TO ACCESS)
C     COST3 - COST OF CALL IF MADE VIA SPRINT
C     COST3A - COST OF CALL IF MADE VIA SPRINT (INCLUDING
C        COST OF CALL TO ACCESS)
C
C     CSUM0 - SUM OF ORIGINAL AT&T MTS CALLS
C     CSUM1 - SUM OF COSTS OF CALLS MADE VIA AT&T MTS (PROPOSED RATES)
C     CSUM2 - SUM OF COSTS OF CALLS MADE VIA MCI EXECUNET
C     CSUM2A - SUM OF COSTS OF CALLS MADE VIA MCI EXECUNET (INCLUDING
C        COSTS OF CALLS TO ACCESS)
C     CSUM3 - SUM OF COSTS OF CALLS MADE VIA SPRINT
C     CSUM3A - SUM OF COSTS OF CALLS MADE VIA SPRINT (INCLUDING
C        COSTS OF CALLS TO ACCESS)
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
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     DISC2 - THE DISCOUNT FACTOR FOR EVENING RATE PERIOD
C
C     DISC3 - THE DISCOUNT FACTOR FOR NIGHT AND WEEKEND RATE PERIOD
C
C     FLAG(X) - AN ARRAY USED TO INDICATE IF THE AREA CODE AND PREFIX
C        OF THE CALL ARE ON THE SCC NETWORKS
C                FLAG(1) = MCI
C                FLAG(2) = GTE SPRINT
C
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C       I - THE NUMBER OF THE CALL IN THE ARRAY OF CALL DATA
C
C       ICOST1 - A TEMPORARY VALUE OF COST TIMES 100 USED TO TRUNCATE
C          TENTHS OF CENTS
C
C       MILES - DISTANCE (RANGE OF DISTANCES) TO CALLED CITY (CALCULATED
C          IN SUBROUTINE DIST)
C
C       MIN - LENGTH OF CALL IN MINUTES
C
C       MINXXX - SUM OF MINUTES
C          1ST DIGIT - CARRIER
C             1 - AT&T
C             2 - MCI
C             3 - GTE SPRINT
C          2ND DIGIT - RATE PERIOD
C             1 - BUSINESS DAY
C             2 - EVENING
C             3 - NIGHT AND WEEKEND
C          3RD DIGIT - NETWORK/NON-NETWORK
C             1 - TO NETWORK CITY
C             2 - TO NON-NETWORK CITY
C             3 - TO ALASKA OR HAWAII NON-NETWORK CITY (GTE SPRINT ONLY)
C             NO 3RD DIGIT - AT&T
C
C       NMIN - ADDITIONAL MINUTES (TOTAL MINUTES LESS 1 MINUTE) THIS IS
C          NECESSARY SINCE AT&T AND SPRINT CALLS ARE BILLED BY FIRST
C          MINUTE TIMES FIRST MINUTE RATE PLUS ADDITIONAL MINUTES TIMES
C          ADDITIONAL MINUTE RATE
C
C       NOMCI - NUMBER OF CALLS UNABLE TO PLACED VIA MCI (TO ALASKA)
C
C       NOMIN - TOTAL MINUTES OF CALLS UNABLE TO BE PLACED VIA MCI
C          (TO ALASKA)
C
C       PERIOD - RATE PERIOD
C          1 = BUSINESS DAY
C          2 = EVENING
C          3 = NIGHT AND WEEKEND
C
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
C
C
      INTEGER ACCDE
      INTEGER*2 BAND,PERIOD
      CHARACTER*13 PLACE
      LOGICAL*1 FLAG(2)
      COMMON /B/MIN(2000),PERIOD(2000),PLACE(2000),ACODE(2000),
     -NNX(2000),COST(2000),FLAG
      DIMENSION MIN313(4),MIN323(4),MIN333(4)
C*****************************************************************
C*****************************************************************
C
C       THE FOLLOWING <IF> STATEMENT INITIALIZES THE VARIABLES IF THE DATA
C       BEING TRANSFERRED TO THIS SUBROUTINE IS FOR THE FIRST CALL IN
C       THE SET OF DATA
C
C
      IF(I.EQ.1)THEN
         CSUM0=CSUM1=CSUM2=CSUM2A=CSUM3=CSUM3A=0.0
         MIN11=MIN12=MIN13=0
```

```
         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
C     CALCULATION OF ADDITIONAL MINUTES
C
      NMIN=MIN(I)-1
C*****************************************************************
C*****************************************************************
C*****************************************************************
C*****************************************************************
C**********  AT&T MTS COST CALCULATION (PROPOSED RATES)  **************
C
C
      IF(PERIOD(I).EQ.1)DISC=1.
      IF(PERIOD(I).EQ.2)DISC=.6
      IF(PERIOD(I).EQ.3)DISC=.4
C*****************************************************************
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
         IF(BAND.EQ.1)COST1=(.73+(NMIN*.43))*DISC
         IF(BAND.EQ.2)COST1=(.75+(NMIN*.45))*DISC
         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
         IF(FLAG(2))GO TO 10
            DO 2 J=1,4
            N=J+7
            IF(PERIOD(I).EQ.1.AND.MILES.EQ.N)MIN313(J)=MIN313(J)+MIN(I)
            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)
            GO TO 10
      END IF
C*****************************************************************
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
         IF(MILES.EQ.7)J=1
         IF(MILES.EQ.8)J=2
         IF(MILES.EQ.9)J=2
         IF(MILES.EQ.10)J=3
         IF(MILES.EQ.11)J=4
         IF(PERIOD(I).EQ.1)MIN313(J)=MIN313(J)+MIN(I)
         IF(PERIOD(I).EQ.2)MIN323(J)=MIN323(J)+MIN(I)
         IF(PERIOD(I).EQ.3)MIN333(J)=MIN333(J)+MIN(I)
```

```
      END IF
C
C*****COST CALCULATICN*****************************************************
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)COST1=(.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)COST1=(.75+(NMIN*.45))*DISC
      IF(MILES.EQ.11)COST1=(.78+(NMIN*.47))*DISC
10    CCNTINUE
C
C     THE FCLLOWING TWO STATEMENTS TRUNCATE TENTHS OF CENTS OF COST
C     CAICULATED FOR AT&T MTS (PROPOSED RATES)
C
      ICCST1=IFIX((CCST1+.0001)*100.)
      CCST1=ICOST1/1CC.
C*********************************************************************
C*****SUM OF ORIGINAL COSTS OF CALLS*********************************
C
      CSUM0=CSUM0+COST(I)
C*********************************************************************
C*********************************************************************
C*****SUM OF COSTS OF CALLS WITH PROPOSED AT&T MTS RATES*************
C
      CSUM1=CSUM1+COST1
C*********************************************************************
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*********************************************************************
C**********  TO A NETWORK CITY  ***************************************
C
C*********************************************************************
C*****COST CALCULATICN FOR DAY RATE PERIOD CALL**********************
C
      IF(FLAG(1))THEN
         IF(PERICD(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)CCST2=.3424*MIN(I)
            IF(MILES.EQ.6)COST2=.3632*MIN(I)
            IF(MILES.EQ.7)CCST2=.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     SUM OF MIN211 FOR USE IN SUBROUTINE CALC2
C
```

```
            MIN211=MIN211+MIN(I)
C
C     COST PLUS COST OF CALL TO ACCESS
C     THE (IFIX...) PORTION OF THIS STATEMENT TRUNCATES TENTHS OF CENTS
C     OF COST FOR CALL TO ACCESS
C
            COST2A=COST2+(IFIX((RATE1+(NMIN*RATE1A)+.0001)*100.)/100.)
            GO TO 20
         END IF
C*********************************************************************
C*****COST CALCULATION FOR EVENING RATE PERIOD CALL*******************
C
         IF(PERIOD(I).EQ.2) THEN
            IF(MILES.EQ.1)COST2=.0922*MIN(I)
            IF(MILES.EQ.2)COST2=.1260*MIN(I)
            IF(MILES.EQ.3)COST2=.1319*MIN(I)
            IF(MILES.EQ.4)COST2=.1536*MIN(I)
            IF(MILES.EQ.5)COST2=.1614*MIN(I)
            IF(MILES.EQ.6)COST2=.1728*MIN(I)
            IF(MILES.EQ.7)COST2=.1774*MIN(I)
            IF(MILES.EQ.8)COST2=.1816*MIN(I)
            IF(MILES.EQ.9)COST2=.2029*MIN(I)
            IF(MILES.EQ.10)COST2=.2029*MIN(I)
            IF(MILES.EQ.11)COST2=.2029*MIN(I)
C*********************************************************************
C     SUM OF MIN221 FOR USE IN SUBROUTINE CALC2
C
            MIN221=MIN221+MIN(I)
C
C     COST PLUS COST OF CALL TO ACCESS
C     THE (IFIX...) PORTION OF THIS STATEMENT TRUNCATES TENTHS OF CENTS
C     OF COST FOR CALL TO ACCESS
C
            COST2A=COST2+(IFIX((RATE2+(NMIN*RATE2A)+.0001)*100.)/100.)
            GO TO 20
         END IF
C*********************************************************************
C*****COST CALCULATION FOR NIGHT AND WEEKEND RATE PERIOD CALL*********
C
         IF(PERIOD(I).EQ.3) THEN
            IF(MILES.EQ.1)COST2=.0614*MIN(I)
            IF(MILES.EQ.2)COST2=.0840*MIN(I)
            IF(MILES.EQ.3)COST2=.1080*MIN(I)
            IF(MILES.EQ.4)COST2=.1194*MIN(I)
            IF(MILES.EQ.5)COST2=.1255*MIN(I)
            IF(MILES.EQ.6)COST2=.1344*MIN(I)
            IF(MILES.EQ.7)COST2=.1379*MIN(I)
            IF(MILES.EQ.8)COST2=.1412*MIN(I)
            IF(MILES.EQ.9)COST2=.1579*MIN(I)
            IF(MILES.EQ.10)COST2=.1579*MIN(I)
            IF(MILES.EQ.11)COST2=.1579*MIN(I)
C*********************************************************************
C     SUM OF MIN231 FOR USE IN SUBROUTINE CALC2
C
            MIN231=MIN231+MIN(I)
C
C     COST PLUS COST OF CALL TO ACCESS
C     THE (IFIX...) PORTION OF THIS STATEMENT TRUNCATES TENTHS OF CENTS
C     OF COST FOR CALL TO ACCESS
C
            COST2A=COST2+(IFIX((RATE3+(NMIN*RATE3A)+.0001)*100.)/100.)
            GO TO 20
         END IF
      END IF
C*********************************************************************
C*********************************************************************
C**********  TO A NON-NETWORK CITY  ******************************
C
C*********************************************************************
```

```
C*****COST CALCULATICN FOR DAY RATE PERIOD CALL*************************
C
C      SINCE MCI DOES NOT OFFER SERVICE TO ALASKA, THE FCLICWING <IF>
C      STATEMENT SUMS THE NUMBER AND TOTAL MINUTES OF CALLS UNABLE TO
C      BE COMPLETED TC ALASKA FOR OUTPUT
C
          IF(ACODE(I).EQ.907)THEN
             NOMCI=NOMCI+1
             NOMIN=NOMIN+MIN(I)
             COST2=0.C
             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)COST2=.2100*MIN(I)
             IF(MILES.EQ.3)CCST2=.2700*MIN(I)
             IF(MILES.EQ.4)CCST2=.3600*MIN(I)
             IF(MILES.EQ.5)COST2=.3800*MIN(I)
             IF(MILES.EQ.6)CCST2=.4100*MIN(I)
             IF(MILES.EQ.7)COST2=.4200*MIN(I)
             IF(MILES.EQ.8)CCST2=.4300*MIN(I)
             IF(MILES.EQ.9)CCST2=.4800*MIN(I)
             IF(MILES.EQ.10)COST2=.4800*MIN(I)
             IF(MILES.EQ.11)COST2=.4800*MIN(I)
C*********************************************************************
C      SUM OF MIN212 FCR USE IN SUBROUTINE CALC2
C
             MIN212=MIN212+MIN(I)
C
C      CCST PLUS COST CF CALL TC ACCESS
C      THE (IFIX...) FCRTION OF THIS STATEMENT TRUNCATES TENTHS OF CENTS
C      CF CCST FOR CALL TO ACCESS
C
             COST2A=CCST2+(IFIX((RATE1+(NMIN*RATE1A)+.0001)*100.)/100.)
             GO TO 20
          END IF
C*********************************************************************
C*****COST CALCULATICN FOR EVENING RATE PERIOD CALL*******************
C
          IF(PERIOD(I).EQ.2)THEN
             IF(MILES.EQ.1)COST2=.0922*MIN(I)
             IF(MILES.EQ.2)CCST2=.1260*MIN(I)
             IF(MILES.EQ.3)COST2=.1620*MIN(I)
             IF(MILES.EQ.4)COST2=.2160*MIN(I)
             IF(MILES.EQ.5)CCST2=.2280*MIN(I)
             IF(MILES.EQ.6)COST2=.2460*MIN(I)
             IF(MILES.EQ.7)CCST2=.2520*MIN(I)
             IF(MILES.EQ.8)CCST2=.2580*MIN(I)
             IF(MILES.EQ.9)COST2=.2880*MIN(I)
             IF(MILES.EQ.10)COST2=.2880*MIN(I)
             IF(MILES.EQ.11)COST2=.2880*MIN(I)
C*********************************************************************
C      SUM OF MIN222 FOR USE IN SUBROUTINE CALC2
C
             MIN222=MIN222+MIN(I)
C
C      CCST PLUS COST OF CALL TC ACCESS
C      THE (IFIX...) FCRTION OF THIS STATEMENT TRUNCATES TENTHS OF CENTS
C      CF CCST FOR CALL TO ACCESS
C
             COST2A=CCST2+(IFIX((RATE2+(NMIN*RATE2A)+.0001)*100.)/100.)
             GO TO 20
          END IF
C*********************************************************************
C*****COST CALCULATICN FOR NIGHT AND WEEKEND RATE PEBIOD CALL*********
C
          IF(PERIOD(I).EQ.3)THEN
             IF(MILES.EQ.1)CCST2=.0614*MIN(I)
```

```
            IF(MILES.EQ.2)COST2=.0840*MIN(I)
            IF(MILES.EQ.3)COST2=.1080*MIN(I)
            IF(MILES.EQ.4)COST2=.1440*MIN(I)
            IF(MILES.EQ.5)COST2=.1520*MIN(I)
            IF(MILES.EQ.6)COST2=.1640*MIN(I)
            IF(MILES.EQ.7)COST2=.1680*MIN(I)
            IF(MILES.EQ.8)COST2=.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)
C*********************************************************************
C     SUM OF MIN232 FOR USE IN SUBROUTINE CALC2
C
            MIN232=MIN232+MIN(I)
C
C     COST PLUS COST OF CALL TO ACCESS
C     TEF (IFIX...) PORTION OF THIS STATEMENT TRUNCATES TENTHS OF CENTS
C     OF COST FOR CALL TO ACCESS
C
            COST2A=COST2+(IFIX((RATE3+(NMIN*RATE3A)+.0001)*100.)/100.)
            GO TO 20
         END IF
20    CONTINUE
C*********************************************************************
C     SUM OF COSTS OF CALLS VIA MCI EXECUNET
C
      CSUM2=CSUM2+COST2
C
C     SUM OF COSTS OF CALLS PLUS ACCESS COSTS
C
      CSUM2A=CSUM2A+COST2A
C
C
C*********************************************************************
C*********************************************************************
C*********************************************************************
C*********************************************************************
C**********  SPRINT COST CALCULATION  ********************************
C
C     THIS CALCULATION ASSUMES THE LOWEST TARIFF RATE (OVER $200 TOTAL
C     LONG DISTANCE BILL).  THIS IS A VALID ASSUMPTION FOR NEARLY
C     ALL MILITARY INSTALLATIONS.
C
C*********************************************************************
C*********************************************************************
C*****COST CALCULATION FOR DAY RATE PERIOD CALL***********************
C
      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))
C
C     COST PLUS COST OF CALL TO ACCESS
C     TEF (IFIX...) PORTION OF THIS STATEMENT TRUNCATES TENTHS OF CENTS
C     OF COST FOR CALL TO ACCESS
C
            COST3A=COST3+(IFIX((RATE1+(NMIN*RATE1A)+.0001)*100.)/100.)
C*********************************************************************
C     SUM OF MIN311 FOR USE IN SUBROUTINE CALC2
C
            IF(FLAG(2))THEN
```

```
                MIN311=MIN311+MIN(I)
                GO 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
         IF(ACODE(I).EQ.808.OR.ACODE(I).EQ.907)GO TO 30
C*****************************************************************
C     SUM OF MIN312 FOR USE IN SUBROUTINE CALC2
C
         MIN312=MIN312+MIN(I)
C
         GO TO 30
      END IF
C
C*****************************************************************
C*****************************************************************
C*****COST CALCULATION FOR EVENING RATE PERIOD CALL*****************
C
      IF(PERIOD(I).EQ.2)THEN
         IF(MILES.EQ.1)COST3=(.1170+(NMIN*.0830))
         IF(MILES.EQ.2)COST3=(.1530+(NMIN*.1134))
         IF(MILES.EQ.3)COST3=(.1800+(NMIN*.1341))
         IF(MILES.EQ.4)COST3=(.2430+(NMIN*.1798))
         IF(MILES.EQ.5)COST3=(.2610+(NMIN*.1935))
         IF(MILES.EQ.6)COST3=(.2790+(NMIN*.2016))
         IF(MILES.EQ.7)COST3=(.2880+(NMIN*.2097))
         IF(MILES.EQ.8)COST3=(.2970+(NMIN*.2151))
         IF(MILES.EQ.9)COST3=(.3150+(NMIN*.2333))
         IF(MILES.EQ.10)COST3=(.3240+(NMIN*.2524))
         IF(MILES.EQ.11)COST3=(.3420+(NMIN*.2619))
C
C     COST PLUS COST OF CALL TO ACCESS
C     THE (IFIX...) PORTION OF THIS STATEMENT TRUNCATES TENTHS OF CENTS
C     OF COST FOR CALL TO ACCESS
C
            COST3A=COST3+(IFIX((RATE2+(NMIN*RATE2A)+.0001)*100.)/100.)
C*****************************************************************
C     SUM OF MIN321 FOR USE IN SUBROUTINE CALC2
C
            IF(FLAG(2))THEN
               MIN321=MIN321+MIN(I)
               GO 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
         IF(ACODE(I).EQ.808.OR.ACODE(I).EQ.907)GO TO 30
C*****************************************************************
C     SUM OF MIN322 FOR USE IN SUBROUTINE CALC2
C
         MIN322=MIN322+MIN(I)
C
         GO TO 30
      END IF
C
C*****************************************************************
C*****************************************************************
C*****COST CALCULATION FOR NIGHT AND WEEKEND RATE PERIOD CALL*******
C
      IF(PERIOD(I).EQ.3)THEN
         IF(MILES.EQ.1)COST3=(.0528+(NMIN*.0527))
         IF(MILES.EQ.2)COST3=(.0704+(NMIN*.0703))
         IF(MILES.EQ.3)COST3=(.1232+(NMIN*.0950))
         IF(MILES.EQ.4)COST3=(.1584+(NMIN*.1143))
         IF(MILES.EQ.5)COST3=(.1672+(NMIN*.1267))
         IF(MILES.EQ.6)COST3=(.1760+(NMIN*.1346))
```

```
         IF(MILES.EQ.7)COST3=(.1848+(NMIN*.1364))
         IF(MILES.EQ.8)COST3=(.1936+(NMIN*.1390))
         IF(MILES.EQ.9)COST3=(.2112+(NMIN*.1521))
         IF(MILES.EQ.10)COST3=(.2200+(NMIN*.1645))
         IF(MILES.EQ.11)COST3=(.2288+(NMIN*.1707))
C
C     CCST PLUS COST CF CALL TC ACCESS
C     THE (IFIX...) PCRTION OF THIS STATEMENT TRUNCATES TENTHS OF CENTS
C     CF CCST FOR CAIL TO ACCESS
C
            COST3A=CCST3+(IFIX((RATE3+(NMIN*RATE3A)+.0001)*100.)/100.)
C*********************************************************************
C     SUM OF MIN331 FOR USE IN SUBROUTINE CALC2
C
            IF(FLAG(2))THEN
               MIN331=MIN331+MIN(I)
               GO TO 30
            END IF
C*********************************************************************
C     IF CALL IS TO ALASKA CR HAWAII (NON-NETWORK) MINUTES HAVE
C     ALREADY BEEN SUMMED AT BEGINNING OF PROGRAM
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
         MIN332=MIN332+MIN(I)
C
         GO TO 30
      END IF
C
30    CONTINUE
C*********************************************************************
C     SUM OF COSTS OF CALLS VIA SPRINT
C
      CSUM3=CSUM3+COST3
C
C     SUM OF COSTS OF CALLS PLUS ACCESS COSTS
C
      CSUM3A=CSUM3A+CCST3A
C
      RETURN
      END
$EJECT
      SUBROUTINE LINES(MIN11)
C*********************************************************************
C
C     THIS SUBROUTINE CALCULATES ERLANGS OF CALLS DURING THE
C     BUSY HOUR AND CUTPUTS 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 HCW 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 MCNTH AND APPROXIMATELY 17 PERCENT OF ALL CALLS MADE DURING THE
C     BUSINESS DAY (6 HOURS) CCCUR DURING THE BUSY HCUR.
C
C     THE ERLANG B EQUATION IS:
C
C                                   N
C                              ERL   / N!
C            B = ----------------------------------------
C                                 2                   N
C                 1 + ERL + ERL   / 2! + ... + ERL   / N!
C
C*********************************************************************
C
```

```
C  VARIABLE DEFINITIONS
C
C      B - BLOCKAGE (GRADE OF SERVICE) - PERCENTAGE OF CALLS NOT COMPLETED
C
C      ERL - ERLANGS OF TRAFFIC DURING THE BUSY HOUR
C
C      FACTOR - A FUNCTION WHICH CALCULATES THE FACTORIAL OF THE ARGUMENT
C
C      MIN11 - TOTAL MINUTES OF CALLING DURING THE DAY RATE PERIOD
C
C      N - NUMBER OF WATS OR ACCESS LINES
C
C      X - A TEMPORARY VARIABLE USED IN THE B CALCULATION FOR SUMMING THE
C         SERIES IN THE DENOMINATOR OF THE ERLANG B EQUATION
C
C
       REAL*8 FACTOR
       ERL=((MIN11/60.)/22.)*.17
       WRITE(11,100)ERL
       WRITE(13,101)ERL
       CALL ASK('HOUR THE FOLLOWING NUMBERS OF LINES WILL    ')
       CALL ASK('GIVE THE FOLLOWING GRADES OF SERVICE.       ')
       CALL ASK('(EXAMPLE: GRADE OF SERVICE = 0.050 MEANS    ')
       CALL ASK('5 OUT OF 100 ATTEMPTED CALLS ARE NOT        ')
       CALL ASK('COMPLETED.)                                 ')
       CALL ASK('                                            ')
       X=0.
       DO 10 N=1,999
       X=X+(ERL**N/FACTOR(N))
       B=(ERL**N/FACTOR(N))/(1+X)
       IF(B.GT..3)GO TO 10
       IF(B.LT..001)GO TO 20
       WRITE(11,102)N,B
       WRITE(13,102)N,B
10     CONTINUE
20     CONTINUE
100    FORMAT(//1X,'BASED ON ',F5.2,' ERLANGS DURING THE BUSY HOUR THE F
      -OLLOWING',/1X,'NUMBER OF LINES WILL GIVE THE FOLLOWING GRADES OF S
      -ERVICE.',/1X,'(EXAMPLE: GRADE OF SERVICE = 0.050 MEANS 5 OUT OF 10
      -0',/1X,'ATTEMPTED CALLS ARE NOT COMPLETED.)'//)
101    FORMAT(//1X,'BASED ON ',F5.2,' ERLANGS DURING THE BUSY')
102    FORMAT(1X,'NUMBER OF LINES = ',I3,3X,'GRADE OF SERVICE = ',F5.3)
       RETURN
       END
       FUNCTION FACTOR(I)
C*********************************************************************
C
C      THIS FUNCTION CACULATES FACTORIALS FOR USE IN SUBROUTINE LINES
C
C
       REAL*8 FACTOR
       FACTOR=1.
       DO 10 N=1,I
          FACTOR=FACTOR*(N)
10     CONTINUE
       RETURN
       END
$EJECT
       SUBROUTINE CALC2(NLINES,RSTEPC,RSTEPP,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
C      THIS SUBROUTINE CALCULATES THE COST OF ALL CALLS IF THEY WERE MADE
C      VIA AT&T WATS (CURRENT AND PROPOSED TARIFF RATES), MCI WATS, AND
C      DIRECT SPRINT (BASED ON THE AVERAGE TIME PER ACCESS LINE PER RATE
C      PERIOD).
C
```

```
C     RATES USED IN THIS SUBROUTINE ARE FROM THE FOLLOWING TARIFFS:
C
C     AT&T WATS (CURRENT RATES)
C
C        AMERICAN TELEPHONE AND TELEGRAPH CO. TARIFF FCC NO. 259,
C          PP 13-14.1, 1 JAN 1984.
C
C     AT&T WATS (PROPOSED RATES)
C
C        AT&T COMMUNICATIONS TARIFF FCC NO. 2, PP 74-75, ISSUED
C           3 OCT 1983, EFFECTIVE DATE POSTPONED INDEFINITELY.
C
C     MCI WATS
C
C        MCI TELECOMMUNICATIONS CORPORATION TARIFF FCC NO.1, PP 19.6-
C           19.7, 1 APR 1983.
C
C     DIRECT SPRINT
C
C        GTE SPRINT COMMUNICATIONS CORPORATION TARIFF FCC NO. 10, PP 42-
C           49, 5 JAN 1984.
C
C*****************************************************************************
C
C     METHODS OF APPLYING THE TARIFFS ARE DESCRIBED BELOW.
C
C     AT&T WATS MEASURES THE DURATION OF A CALL IN ONE SECOND INCREMENTS,
C     MCI WATS USES THIRTY SECOND INCREMENTS, AND DIRECT SPRINT USES SIX
C     SECOND INCREMENTS.  ALL THREE OF THESE SERVICES HAVE A ONE MINUTE
C     MINIMUM AVERAGE TIME REQUIREMENT.  ALSO, ALL THREE HAVE THE SAME
C     POINTS AT WHICH THE RATES TAPER; 15, 40, AND 80 HOURS (OR EQUIV-
C     ALENT MINUTES).  COSTS ARE CALCULATED BASED ON AVERAGE USE PER LINE
C     PER RATE PERIOD.  IN OTHER WORDS, THE TOTAL USAGE IN EACH RATE
C     PERIOD FOR ALL LINES (WATS LINES OR DALS) IS DIVIDED BY THE NUMBER
C     OF LINES TO OBTAIN AN AVERAGE USE PER LINE PER RATE PERIOD.
C     (AT&T WATS ROUNDS THIS AVERAGE TO THE NEAREST TENTH OF AN HOUR.)
C     MCI WATS AND DIRECT SPRINT ALSO CALCULATE THE AVERAGE FOR CALLS TO
C     NETWORK AND NON-NETWORK CITIES.  THE AVERAGE USE PER LINE PER RATE
C     PERIOD AND THE PER LINE MONTHLY RECURRING CHARGES ARE USED TO
C     CALCULATE THE COST PER LINE.  THE COST PER LINE IS MULTIPLIED BY
C     THE TOTAL NUMBER OF LINES TO OBTAIN THE TOTAL COST.
C
C*****************************************************************************
C
C     THE RESULTS OF THESE CALCULATIONS WILL BE LARGER THAN ACTUAL FOR
C     THE SERVICES THAT ARE BILLED IN LESS THAN ONE MINUTE INCREMENTS.
C     (IN OTHER WORDS, COSTS FOR THE CALLS WOULD BE LESS THAN THESE
C     CALCULATIONS WOULD INDICATE.)
C
C     IF EXACT LENGTH OF CALL DATA IS AVAILABLE THIS SUBROUTINE WILL
C     NEED TO BE CHANGED SINCE AT&T WATS BILLS CALLS IN ONE SECOND
C     INCREMENTS, DIRECT SPRINT BILLS CALLS IN SIX SECOND INCREMENTS,
C     AND MCI WATS BILLS CALLS IN THIRTY SECOND INCREMENTS.
C
C*****************************************************************************
C
C  VARIABLE DEFINITIONS
C
C     CXXX - COST OF CALL
C        1ST DIGIT - CARRIER
C           1 - AT&T
C           2 - MCI
C           3 - GTE SPRINT
C        2ND DIGIT - RATE PERIOD
C           1 - BUSINESS DAY
C           2 - EVENING
C           3 - NIGHT AND WEEKEND
C        3RD DIGIT - NETWORK/NON-NETWORK
```

```
C           1 - TO NETWORK CITY
C           2 - TO NON-NETWORK CITY
C           3 - TO ALASKA OR HAWAII NON-NETWORK CITY (GTE SPRINT ONLY)
C           NO 3RD DIGIT - AT&T WATS (CURRENT RATES)
C           A - AT&T WATS (PROPOSED RATES)
C
C     CMFC1A - MONTHLY RECURRING CHARGES FOR AT&T WATS (CURRENT RATES)
C     CMFC1B - MONTHLY RECURRING CHARGES FOR AT&T WATS (PROPOSED RATES)
C     CMFC2B - MONTHLY RECURRING CHARGES FOR MCI WATS
C     CMFC3B - MONTHLY RECURRING CHARGES FOR DIRECT SPRINT
C
C     CSUM1A - SUM OF COSTS OF CALLS MADE VIA AT&T WATS (CURRENT RATES)
C     CSUM1B - SUM OF COSTS OF CALLS MADE VIA AT&T WATS (PROPOSED RATES)
C     CSUM2B - SUM OF COSTS OF CALLS MADE VIA MCI WATS
C     CSUM3B - SUM OF COSTS OF CALLS MADE VIA DIRECT SPRINT
C
C     HR11 - AVERAGE TIME (IN HOURS) PER ACCESS LINE FOR DAY RATE
C            PERIOD CALLS
C     HR12 - AVERAGE TIME (IN HOURS) PER ACCESS LINE FOR EVENING RATE
C            PERIOD CALLS
C     HR13 - AVERAGE TIME (IN HOURS) PER ACCESS LINE FOR NIGHT AND
C            WEEKEND RATE PERIOD CALLS
C
C     MXXX - AVERAGE TIME (IN MINUTES) PER ACCESS LINE
C        1ST DIGIT - CARRIER
C           2 - MCI
C           3 - GTE SPRINT
C        2ND DIGIT - RATE PERIOD
C           1 - BUSINESS DAY
C           2 - EVENING
C           3 - NIGHT AND WEEKEND
C        3RD DIGIT - NETWORK/NON-NETWORK
C           1 - TO NETWORK CITY
C           2 - TO NON-NETWORK CITY
C           3 - TO ALASKA OR HAWAII NON-NETWORK CITY (GTE SPRINT ONLY)
C
C     MINXXX - SUM OF MINUTES
C        1ST DIGIT - CARRIER
C           1 - AT&T
C           2 - MCI
C           3 - GTE SPRINT
C        2ND DIGIT - RATE PERIOD
C           1 - BUSINESS DAY
C           2 - EVENING
C           3 - NIGHT AND WEEKEND
C        3RD DIGIT - NETWORK/NON-NETWORK
C           1 - TO NETWORK CITY
C           2 - TO NON-NETWORK CITY
C           3 - TO ALASKA OR HAWAII NON-NETWORK CITY (GTE SPRINT ONLY)
C           NO 3RD DIGIT - AT&T
C
C     NLINES - NUMBER OF ACCESS LINES
C
C     RATEXX - RATE FOR AT&T WATS
C        1ST DIGIT - RATE PERIOD
C           1 - BUSINESS DAY
C           2 - EVENING
C           3 - NIGHT AND WEEKEND
C        2ND DIGIT - INTERVAL OF OF TOTAL USAGE TIME
C           1 - 15 HRS
C           2 - 25 HRS
C           3 - 40 HRS
C           4 - 80 HRS
C           NO 2ND DIGIT - NIGHT AND WEEKEND RATE
C
C     R3XXX - RATE FOR DIRECT SPRINT
C        1ST DIGIT - RATE PERIOD
C           1 - BUSINESS DAY
C           2 - EVENING
```

```
C           3 - NIGHT AND WEEKEND
C        2ND DIGIT - NON-NETWORK, OR ALASKA OR HAWAII NON-NETWORK CITY
C           2 - NON-NETWORK
C           3 - ALASKA OR HAWAII NON-NETWORK CITY
C        3RD DIGIT - INTERVAL OF OF TOTAL USAGE TIME
C           A -  900 MIN
C           B - 1500 MIN
C           C - 2400 MIN
C           D - 4800 MIN
C           NO 3RD DIGIT - NIGHT AND WEEKEND RATE
C
C     REGION - GEOGRAPHICAL AREA IN WHICH DIRECT SPRINT CALLS ARE
C        ORIGINATED
C
C     RSTEPC - RATE STEP (CURRENT AT&T WATS TARIFF)
C
C     RSTEPP - RATE STEP (PROPOSED AT&T WATS TARIFF)
C
C     TIME1 - TIME INTERVAL - 15 HRS OR  900 MIN
C     TIME2 - TIME INTERVAL - 25 HRS OR 1500 MIN
C     TIME3 - TIME INTERVAL - 15 HRS OR 2400 MIN
C     TIME4 - TIME INTERVAL - 15 HRS OR 4800 MIN
C
C
      INTEGER RSTEPC,RSTEPP,REGION
      REAL M211,M221,M231,M212,M222,M232,M311,M321,M331,M312,M322,M332,
     -M313,M323,M333
      DIMENSION MIN313(4),MIN323(4),MIN333(4)
      C313=C323=C333=0.0
      C3=0.0
      CSUM1A=CSUM1B=CSUM2B=CSUM3B=0.0
C*****************************************************************
C*****************************************************************
C*****************************************************************
C*****************************************************************
C**********  AT&T WATS  ******************************************
C
C*****************************************************************
C*****************************************************************
C*****CALCULATION OF AVERAGE TIME (IN HOURS) PER WATS LINE*********
C
      HR11=(MIN11/60.)/NLINES
      HR12=(MIN12/60.)/NLINES
      HR13=(MIN13/60.)/NLINES
C*****************************************************************
C
C     DESIGNATION OF TIME INTERVALS (IN HOURS) FOR AT&T WATS CALCULATIONS
C
C
      TIME1=15.
      TIME2=25.
      TIME3=40.
      TIME4=80.
C*****************************************************************
C*****************************************************************
C*****************************************************************
C*****************************************************************
C**********  AT&T WATS (CURRENT RATES)  **************************
C
C     THE FOLLOWING <IF> STATEMENTS DEFINE THE RATES TO BE USED IN THE
C     CALCULATION BASED ON THE INPUT VALUE OF RSTEPC.
C
C
      CMRC1A=31.65
C
      IF(RSTEPC.EQ.19)THEN;RATE11=23.96;RATE12=21.32;RATE13=18.69;
      RATE14=15.81;RATE21=15.57;RATE22=13.86;RATE23=12.15;RATE24=10.28;
      RATE3=8.39;END IF
C
```

```
      IF(RSTEPC.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
C
      IF(RSTEPC.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
C
      IF(RSTEPC.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
C*********************************************************************
C*********************************************************************
C*****COST CALCULATION FOR DAY RATE PERIOD CALLS*********************
C
      IF(HR11.LE.TIME1)C11A=HR11*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)
C*********************************************************************
C*********************************************************************
C*****COST CALCULATION FOR EVENING RATE PERIOD CALLS*****************
C
      IF(HR12.LE.TIME1)C12A=HR12*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)
C*********************************************************************
C*********************************************************************
C*****COST CALCULATION FOR NIGHT AND WEEKEND RATE PERIOD CALLS*******
C
      C13A=HR13*RATE3
C*********************************************************************
C*********************************************************************
C*****SUM OF COSTS IN ALL RATE PERIODS*******************************
C
      CSUM1A=(C11A+C12A+C13A+CMRC1A)*NLINES
C*********************************************************************
C*********************************************************************
C*********************************************************************
C*********************************************************************
C**********  AT&T WATS (PROPOSED RATES)  ******************************
C
C     THE FOLLOWING <IF> STATEMENTS DEFINE THE RATES TO BE USED IN THE
C     CALCULATION BASED ON THE INPUT VALUE OF RSTEPP.
C
      CMRC1B=56.65
C
      IF(RSTEPP.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
C
      IF(RSTEPP.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
C
      IF(RSTEPP.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
C
      IF(RSTEPP.EQ.17)THEN;RATE11=20.06;RATE12=17.85;RATE13=15.65;
      RATE14=13.23;RATE21=13.03;RATE22=11.61;RATE23=10.17;  TE24=8.61;
      RATE3=6.97;END IF
```

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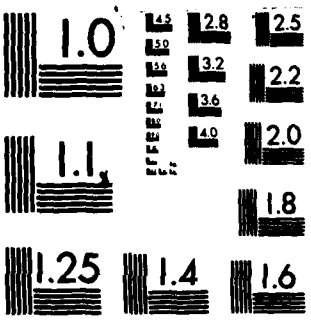

MICROCOPY RESOLUTION TEST CHART
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C
      IF(RSTEPP.EQ.16)THEN;RATE11=20.45;RATE12=18.19;RATE13=15.95;
      RATE14=13.48;RATE21=13.30;RATE22=11.82;RATE23=10.37;RATE24=8.77;
      RATE3=7.11;END IF
C*****************************************************************
C*****************************************************************
C*****COST CALCULATICN 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*****************************************************************
C*****COST CALCULATICN 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*****************************************************************
C*****COST CALCULATICN FOR NIGHT AND WEEKEND RATE PERIOD CALLS***
C
      C13=HR13*RATE3
C*****************************************************************
C*****************************************************************
C*****SUM OF COSTS IN ALL RATE PERIODS***************************
C
      CSUM1B=(C11+C12+C13+CNRC1B)*NLINES
C*****************************************************************
C
C     DESIGNATION OF TIME INTERVALS (IN MINUTES)
C     FOR MCI WATS AND DIRECT SPRINT CALCULATIONS
C
C
      TIME1=900.
      TIME2=1500.
      TIME3=2400.
      TIME4=4800.
C
C
C*****************************************************************
C*****************************************************************
C**********  MCI WATS  ***************************************
C
C*****************************************************************
C*****************************************************************
C*****CALCULATION OF AVERAGE TIME (IN MINUTES) PER ACCESS LINE***
C
      M211=MIN211/NLINES
      M221=MIN221/NLINES
      M231=MIN231/NLINES
      M212=MIN212/NLINES
      M222=MIN222/NLINES
      M232=MIN232/NLINES
C
      CNRC2B=100.
C*****************************************************************
C*****************************************************************
C*****COST CALCULATICN FOR DAY RATE PERIOD CALLS TO NETWORK CITIES*******
C
      IF(M211.LE.TIME1)C211=M211*.2721
```

```
      IF(M211.GT.TIME1.AND.M211.LE.TIME3)C211=((M211-TIME1)*.2420)
     -+(TIME1*.2721)
      IF(M211.GT.TIME3.AND.M211.LE.TIME4)C211=((M211-TIME3)*.2120)
     -+(TIME2*.2420)+(TIME1*.2721)
      IF(M211.GT.TIME4)C211=((M211-TIME4)*.1795)+(TIME3*.2120)
     -+(TIME2*.2420)+(TIME1*.2721)
C*********************************************************************
C*********************************************************************
C*****COST CALCULATION FOR EVENING RATE PERIOD CALLS TO NETWORK CITIES***
C
      IF(M221.LE.TIME1)C221=M221*.1767
      IF(M221.GT.TIME1.AND.M221.LE.TIME3)C221=((M221-TIME1)*.1572)
     -+(TIME1*.1767)
      IF(M221.GT.TIME3.AND.M221.LE.TIME4)C221=((M221-TIME3)*.1378)
     -+(TIME2*.1572)+(TIME1*.1767)
      IF(M221.GT.TIME4)C221=((M221-TIME4)*.1166)+(TIME3*.1378)
     -+(TIME2*.1572)+(TIME1*.1767)
C*********************************************************************
C*********************************************************************
C*****COST CALCULATION FOR NIGHT AND WEEKEND RATE PERIOD CALLS***********
C     TO NETWORK CITIES
C
      C231=M231*.1006
C*********************************************************************
C*********************************************************************
C*****COST CALCULATION FOR DAY RATE PERIOD CALLS TO NON-NETWORK CITIES***
C
      C212=M212*.340
C*********************************************************************
C*********************************************************************
C*****COST CALCULATION FOR EVENING RATE PERIOD CALLS*********************
C***************TO NON-NETWORK CITIES*********************************
C
      C222=M222*.248
C*********************************************************************
C*********************************************************************
C*****COST CALCULATION FOR NIGHT AND WEEKEND RATE PERIOD CALLS***********
C***************TO NON-NETWORK CITIES*********************************
C
      C232=M232*.152
C*********************************************************************
C*********************************************************************
C*****SUM OF COSTS IN ALL RATE PERIODS, NETWORK AND NON-NETWORK**********
C
      CSUM2B=(C211+C221+C231+C212+C222+C232+CMRC2B)*NLINES
C*********************************************************************
C*********************************************************************
C*********************************************************************
C*********************************************************************
C**********  DIRECT  SPRINT  *****************************************
C
C*********************************************************************
C*********************************************************************
C*****CALCULATION OF AVERAGE TIME (IN MINUTES) PER ACCESS LINE***********
C
      M311=MIN311/NLINES
      M321=MIN321/NLINES
      M331=MIN331/NLINES
      M312=MIN312/NLINES
      M322=MIN322/NLINES
      M332=MIN332/NLINES
C
      CMRC3B=100.
C*********************************************************************
C*********************************************************************
C*****COST CALCULATION FOR DAY RATE PERIOD CALLS TO NETWORK CITIES*******
C
      IF(M311.LE.TIME3)C311=M311*.257
      IF(M311.GT.TIME3.AND.M311.LE.TIME4)C311=((M311-TIME3)*.222)
```

```
     -+(TIME3*.257)
      IF(M311.GT.TIME4)C311=((M311-TIME4)*.194)+(TIME3*.222)
     -+(TIME3*.257)
C*********************************************************************
C*********************************************************************
C*****COST CALCULATION FOR EVENING RATE PERIOD CALLS TO NETWORK CITIES***
C
      IF(M321.LE.TIME1)C321=M321*.187
      IF(M321.GT.TIME1.AND.M321.LE.TIME3)C321=((M321-TIME1)*.165)
     -+(TIME1*.187)
      IF(M321.GT.TIME3.AND.M321.LE.TIME4)C321=((M321-TIME3)*.145)
     -+(TIME2*.165)+(TIME1*.187)
      IF(M321.GT.TIME4)C321=((M321-TIME4)*.123)+(TIME3*.145)
     -+(TIME2*.165)+(TIME1*.187)
C*********************************************************************
C*********************************************************************
C*****COST CALCULATION FOR NIGHT AND WEEKEND RATE PERIOD CALLS***********
C*********************TO NETWORK CITIES*********************************
C
      C331=M331*.108
C*********************************************************************
C*********************************************************************
C*****COST CALCULATIONS FOR CALLS TO NON-NETWORK CITIES*****************
C
C     THE FOLLOWING <IF> STATEMENTS DEFINE THE RATES TO BE USED IN THE
C     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(M312.LE.TIME1)C312=M312*R312A
      IF(M312.GT.TIME1.AND.M312.LE.TIME3)C312=((M312-TIME1)*R312B)
     -+(TIME1*R312A)
      IF(M312.GT.TIME3.AND.M312.LE.TIME4)C312=((M312-TIME3)*R312C)
     -+(TIME2*R312B)+(TIME1*R312A)
      IF(M312.GT.TIME4)C312=((M312-TIME4)*R312D)+(TIME3*R312C)
     -+(TIME2*R312B)+(TIME1*R312A)
C*********************************************************************
C*********************************************************************
C*****COST CALCULATION FOR EVENING RATE PERIOD CALLS*****************
C**************TO NON-NETWORK CITIES*********************************
C
      IF(M322.LE.TIME1)C322=M322*R322A
      IF(M322.GT.TIME1.AND.M322.LE.TIME3)C322=((M322-TIME1)*R322B)
     -+(TIME1*R322A)
      IF(M322.GT.TIME3.AND.M322.LE.TIME4)C322=((M322-TIME3)*R322C)
     -+(TIME2*R322B)+(TIME1*R322A)
      IF(M322.GT.TIME4)C322=((M322-TIME4)*R322D)+(TIME3*R322C)
     -+(TIME2*R322B)+(TIME1*R322A)
C*********************************************************************
C*********************************************************************
C*********************************************************************
C*****COST CALCULATION FOR NIGHT AND WEEKEND RATE PERIOD CALLS***********
C*****************TO NON-NETWORK CITIES********************************
C
      C332=M332*R332
C*********************************************************************
C*********************************************************************
C*********************************************************************
C*****COST CALCULATONS FOR ALASKA OR HAWAII NON-NETWORK CALLS
C
      DO 10 I=1,4
         M313=MIN313(I)/NLINES
         M323=MIN323(I)/NLINES
```

```
         M333=MIM333(I)/NLINES
C
C      THE FOLLOWING <IF> STATEMENTS DEFINE THE RATES TO BE USED IN THE
C      CALCULATION BASED ON THE VALUE OF I IN DO 10.
C
         IF(I.EQ.1)THEN;R313A=.3993;R313B=.3553;R313C=.3115;
      R313D=.2635;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=.3195;R323A=.3147;R323B=.2800;R323C=.2453;R323D=.2077;
      R333=.1693;END IF
C*****************************************************************
C*****************************************************************
C*****COST CALCULATION FOR DAY RATE PERIOD CALLS*****************
C*******TO ALASKA OR HAWAII NON-NETWORK CITIES*******************
C
      IF(M313.LE.TIME1)C313=M313*R313A
      IF(M313.GT.TIME1.AND.M313.LE.TIME3)C313=((M313-TIME1)*R313B)
     -+(TIME1*R313A)
      IF(M313.GT.TIME3.AND.M313.LE.TIME4)C313=((M313-TIME3)
     -*R313C)
     -+(TIME2*R313B)+(TIME1*R313A)
      IF(M313.GT.TIME4)C313=((M313-TIME4)*R313D)+(TIME3*R313C)
     -+(TIME2*R313B)+(TIME1*R313A)
C*****************************************************************
C*****************************************************************
C*****COST CALCULATION FOR EVENING RATE PERIOD CALLS*************
C*********TO ALASKA OR HAWAII NON-NETWORK CITIES******************
C
      IF(M323.LE.TIME1)C323=M323*R323A
      IF(M323.GT.TIME1.AND.M323.LE.TIME3)C323=((M323-TIME1)*R323B)
     -+(TIME1*R323A)
      IF(M323.GT.TIME3.AND.M323.LE.TIME4)C323=((M323-TIME3)
     -*R323C)
     -+(TIME2*R323B)+(TIME1*R323A)
      IF(M323.GT.TIME4)C323=((M323-TIME4)*R323D)+(TIME3*R323C)
     -+(TIME2*R323B)+(TIME1*R323A)
C*****************************************************************
C*****************************************************************
C*****COST CALCULATION FOR NIGHT AND WEEKEND RATE PERIOD CALLS***
C***********TO ALASKA OR HAWAII NON-NETWORK CITIES*****************
C
      C333=M333*R333
C
C     SUM OF COSTS CALCULATED IN DO 10
C
      C3=C3+C313+C323+C333
10    CONTINUE
C*****************************************************************
C*****************************************************************
C*****SUM OF COSTS IN ALL RATE PERIODS, NETWORK AND NON-NETWORK***
C
      CSUM3B=(C311+C321+C331+C312+C322+C332+C3+CHRC3B)*NLINES
C
      RETURN
      END
$ENTRY
```

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