

## The Simple Pleasures of a Step Office

There are still more than a few step offices in the United States today. Most of them are in rural areas, but there are still a few cities (mostly in the south, southwest, and west areas of the country) that have step. These antiquated telephone systems can best be described as a bunch of relays and wires—clicking and stumbling over themselves.

It's easy to find out if you're in a step office—especially if you're using a rotary dial phone. (In many step areas, that's all you *can* have, particularly on the east coast since they don't have what's known as common control, which allows for touch tones®. Some offices have been converted, however, using some sort of tone to pulse converter—every time you hit a tone, you hear it being pulsed out.) With a rotary dial phone, you can hear the actual switching. If, say, you're dialing 675-9112—you'd dial a 6 and you'd hear what's known as the selector kick in (more on that later) with a kind of a clunk. Then you'd dial 7, and hear a second thing kick in with a mild click—that's what's known as the digit absorbing relay. Depending on the office, this relay can kick in on any or none of the numbers. What it does basically is absorb an extra digit which is only needed to make the telephone number 7 digits long. So, in this case, the second digit of the number, which is 7, is the extra digit. You would probably be able to substitute any number for the 7 and still have the call go through, since that digit is ignored. Some offices absorb two of their digits, which means that they had five digit phone numbers before uniformity struck. To continue with our demonstration, you'd next dial a 5, and hear another click at the end of your dialing sequence. After dialing 9, you'd hear click, pop, snap—several things kicking in, then the 1, clunk-clunk, and then the last two digits which wouldn't produce any sounds at the end of them. Then it will go into a ring cycle, assuming that's a valid number in the office.

Step offices usually have a very mechanical sounding ring, similar to crossbar. Ring generators, though, can make step sound like ESS. Often you hear what sounds like a busy signal or static in the background as the number rings. An easy way to tell if you're dialing into a step office is to try dialing XXX-1111 and see how long it takes to get a ring or reorder or whatever. Then try calling XXX-0000. If it takes more time to get to the same point, it's a step office because step is the only system that actually pulses out the numbers all over again.

### A Phreaker's Delight

It's much safer to blue box and phreak from a step office because they're very basic, crude offices with no safety features (safety for them, that is). And if you're lucky enough to live in a fairly large metropolitan area that's still on step, you might dial up a number that you know is ESS from your step area and flash the switchhook. You'll get what's known as a wink. That's the equivalent of whistling 2600 hertz for about a half second to reset the trunk. You'll hear a click-click. That's your cue to put in various multifrequency tones (KP+number+ST). 2600 hertz is not needed at all, and since that's the tone that usually sets off alarms, this is a very safe way to blue box. (Incidentally, this occurs more through a flaw with ESS and not step.)

If you *really* know what you're doing and you know a few things about step switching, you can, on a touch tone® phone, dial up a number and listen in the background for the switch level. Let's say you're dialing 941-0226. You won't hear it rotary dial *those* numbers, but you *will* hear another number or series of numbers in rotary step pulses. That's the selector we mentioned earlier. Let's say that after you dialed 941-0226, you heard a 5 being pulsed out. What does that mean? The selector is the decision-making part of the phone call. Different prefixes are stored in different levels in each central office. In this particular case, 941 happens to be stored in level 5 in whatever office you're calling from. There's no rhyme or reason to it; the selector level could be anything up to three digits in length. (If it was three digits, you'd hear each individual digit get pulsed out.) The toll center is usually level 1 and the operator is usually level 0. So what can be done with this information? If, after dialing 941-0226, you enter your *own* rotary five, you'll once again hear the click-click which is your cue for MF tones.

While step offices have no special phone phreak trapping capabilities,

they are just as dangerous as any other office as far as being traced. They have what's known as trap and trace. If a certain person (or computer) is being harassed, they'll put a trap plug on that particular line. If you happen to call into that number, you won't be able to hang up until the other party does.

### Some More Tricks

In some step areas, local calls are limited to certain exchanges that have the same first digit as yours. For example, the 222 exchange can dial 235 and 263 as local calls. But in order to call the 637 exchange, you must first dial a 1 which makes the call non-local. If you dial a 6, you'll get an immediate reorder. But somewhere between you and the 637 exchange, is the 231, 233, 235, and 239 exchanges. There's no 237. So you dial 2. Clunk-clunk. You dial 3. Click. And then you dial 7. Ching-clunk. It goes to the 637 exchange! Similarly, a 281 from the 287 exchange could wind up in 471. Why? Because these numbers are all coming from the same switching center. That just happens to be the way step works (and in some cases crossbar). If you could seize the 222 trunk, you'd enter KP+25500+ST to reach 222-5500. To reach 637-5500, you'd enter KP+75500+ST.

Then there's "step crashing"—if the number you're calling is 675-2888, and it's busy, you can dial 675-2887, and in between the last pulse of your rotary dial and the time it would start to ring, you can flash your switchhook extremely fast. If you time it right, you'll hear an enormous loud click on your end. Then, all of a sudden, you'll cut into your party's conversation. (This works because of step's relay system. One relay has determined that the line you dialed is open. Then, before a second relay sends along the ring pulse, you throw in a 1, which jumps the number you dialed up by one, and fools the system into connecting you to a busy number.) There is one drawback to this, though. You, the party you've crashed in on, and the party they were talking to are all stuck together until you all hang up at the same time.

If you're in a step office where 411 is used for directory assistance, chances are that there are test codes in the format of 11XX. 1191 might be ringback, etc. In such places, dialing 1141 will also get you directory assistance, but at no charge! In some of the newer step offices, 410X is the format for tests. There, you can dial 4101 for free directory assistance. Other test numbers are (usually): 4100—off-the-hook recording, 4102—test board, 4103—miscellaneous, 4104—ringback, 4105—disconnects your line for about 5 minutes, 4106—various tests, 4107—pulse test, 4108—test board, and 4109—your telephone number in touch tones®.

### Different Varieties of Step

There's more than one kind of step office. We've been talking about the most common type, used by both GTE and Western Electric (Bell). It was invented by Automatic Electric early in the century. 214-381 is a typical Bell step office (note the reorder in the background of the ring) while 214-256 is a typical GTE step office (the ring sounds like it's underwater). For both of these, a suffix of 1798 will always provide a busy signal, free of charge.

There is also something known as XY step, which is strange, unusual, and for the most part put together very poorly. It looks similar to a crossbar in appearance. Instead of a round switch, it's tall and rectangular-shaped. To dial a number, it moves up and across a ladder of contacts, as if it was a piece of graph paper, hence the name XY. On these systems, the last digit in the phone number is usually up for grabs. You can accept collect calls on a number with a different last digit from yours. The calls will still reach your number, but it won't show up on your bill. Also, suffixes beginning with 9 and 2 are usually interchangeable. A typical XY step office is 518-789. A suffix of 3299 will get you a standard step test.

Great Britain uses the Stroger system and there is also the all-relay step, which is *very* rare. It was developed presumably to save switches. One such system exists in Heath Canyon, Texas with only 36 subscribers at 915-376. A neighboring town that's also all-relay can be found at 915-386.

*If you'd like us to tell you something about a particular exchange anywhere, send us the info. We'll investigate and print the results.*

## IBM'S AUDIO DISTRIBUTION SYSTEMS SURE CAN BE FUN!

One day several years ago, a hacker was doing some routine 800 number scanning on his touch-tone® telephone. This has become a very popular pastime because it's totally free and not easily defined as illegal in itself. Usually, what somebody does is zero in on a particular 800 exchange and dial many different numbers (often in sequential order), jotting down the interesting ones. That's exactly what this person was doing when he made a most interesting discovery. After hearing literally dozens of modem tones, and "Doo-Dooo-DOOOO! The number you have reached," "Eastern Airlines, can I help you?" and "Special operator, what number did you dial?" messages, he heard a recorded female voice say, "Please keypress your last name." After a millisecond or two, he looked at the letters on his touch-tone® buttons (never get a phone without those letters), and started to spell out a name. Another recorded voice read back someone's full name and then the old voice came back and said, "Please keypress your password." He suddenly got an idea and spelled out the person's first name. It worked! He had broken in—to something.

What this person found that day (and what many others have been discovering ever since) was an IBM Audio Distribution System or ADS. Nearly every IBM regional office has at least one of them. Operating out of an IBM Series I computer interfaced with a telephone switchboard, their original purpose was to provide a fast, easy way for IBMers to contact each other without playing "telephone tag." All a subscriber has to do is call the system, login, and leave or receive aural messages. Commands are entered using touch-tone® keys (\*R—record a message, \*T—transmit a message, \*L—listen to a message, \*C—customize certain features, \*D—disconnect are the main commands. By pressing a 9 or a #, brief help messages can also be heard.). No computer terminals were needed here. Nearly *anybody* could figure out how to use the system.

Fortunately for hackers, IBM people were both careless and apathetic. Many of them had very easy passwords and others never used the system at all, even though they had been assigned accounts.

So guess what happened? Friendly tech enthusiasts found their way into these systems and grabbed accounts left and right. Many of them set up impromptu networks where they would exchange technical information, phreaking news, stories, anything! (Sort of like a computer bulletin board, except that your voice is your keyboard. This proved very beneficial to those phone phreaks that hadn't integrated themselves into the world of computers—here was a computer that could be played with without the requirement of a terminal and modem, as well as the means to communicate with computer hackers for the first time.) Messages could be as long as eight minutes or as short as three seconds. Users could, by entering commands, adjust volume and speed, classify their messages (personal, confidential, personal *and* confidential, or internal use only), create distribution lists, change their status, etc. In short, the ADS has become a favorite toy of phreaker and hacker alike.

There are hundreds of ADS's all around the world, with more being plugged in every day. IBM is selling the systems to other companies, who then use them for their own employees, or lease accounts out to other people. IBM tells us that the price for a system with a 1000 user capacity is about \$110,000. Financing terms are available, they say.

It is quite reasonable to assume that every ADS that is presently operational has at least a few usurped accounts on it. Even systems in Italy and England are being mercilessly invaded by American crackers. What's particularly funny about all this is that IBM has no way of knowing whether the users of the system are legitimate or not, since the software is

written to prevent eavesdropping, even from the system operator's account. It is also impossible to find out what somebody's password is, without being in that person's account. As one IBM executive told us, "As long as they don't do anything outrageous [like send abusive messages to other users] and the legitimate user doesn't tell us that his/her account is being used by someone else, we'll *never* know they're in there."

Needless to say, some high-level administrative meetings dealt with this problem. For IBM, things were starting to get out of control. One group of phreakers had so many different systems under control that they started to color code them. Rumour has it that they ran out of colors and were forced to buy a jumbo box of Crayola Crayons® to find out the names of more. On the East Coast, a system was so heavily inundated with unauthorized users that it was commonly believed that there were more of them than legitimate users. And, somewhere in Italy, Midwest accents slowly started to abound on that country's sole system.

IBM began to make some drastic changes. To prevent intrusions from occurring in the first place, many of the systems were programmed to delete an account if it wasn't used within a certain period of time or if the password had not been changed from the system default (the first letter of the last name repeated three times). In an attempt to get rid of those that had already broken in, they started to look at their 800 number userlogs, to see which accounts were constantly being logged into on the toll-free line instead of the local number or the IBM internal tie-line number. A company employee wouldn't have to use the 800 number unless he was on the road. But, they reasoned, a phone phreak would.

On this, of course, they were completely wrong. A phone phreak can make a call to anywhere he damn well pleases without spending a cent. A few even managed to access the IBM tie-line! Good phreaks, to avoid suspicion stopped using the toll-free numbers.

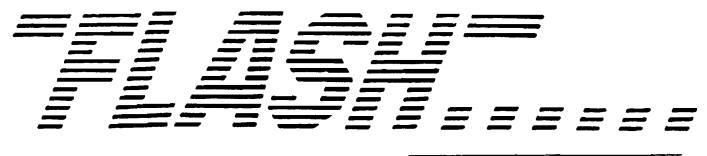
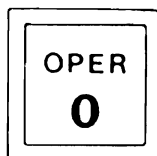
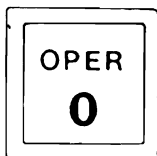
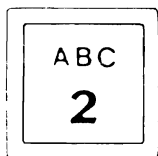
IBM reset passwords on suspect accounts and then went in to see what other names were linked by "reading" distribution lists and seeing what other names were being communicated with. The intruders answered this by deleting their distribution lists and erasing all old messages.

This battle of wills is continuous. One system operator in Los Angeles attached a recording that told anyone who failed to login after three tries that their call had been traced. She later admitted to 2600 that this was simply a scare tactic used out of desperation.

Ironically enough, some of the worst offenders—as far as leaving doors wide open—are the system operators themselves. A few operators have left their privileged accounts' passwords set to the default (three zeroes). This allowed an intruder to come in and use the special "star-zero" command, which allows *system* messages to be changed. (These are the messages that tell the subscriber what to do next, etc.) "Please keypress your last name," could easily become "What the hell do you want?" There are hundreds of messages and oftentimes pranksters would change only the most rarely heard ones, to add to the surprise of the user who wound up hearing it; "Your message has reached the maximum length" was reportedly replaced by "You have spoken for too long and you may not speak again." Any user's password can be reset to the default from the operator account, so entry to all accounts is indirectly possible after cracking the operator account. Brand new accounts, though, are created offline.

If you like keeping in touch, an ADS may be just what you're looking for. With this system, your phriends are always reachable, no matter where they are.

Unless they've left the magical land of touch-tones®.



## A 414 is Sentenced—Others Indicted

Combined News Sources

Twenty-one year old Gerald Wondra of West Allis, Wisconsin, was placed on two years' probation after pleading guilty to two misdemeanor counts involving computer cracking. Wondra, a member of the 414's, was accused of gaining access last summer to computers at the Security Pacific National Bank in Los Angeles and the Memorial Sloan-Kettering Cancer Center in New York, by using Telenet.

U.S. District Judge Terence T. Evans, in handing down the sentence, said, "It's important to send a message to Mr. Wondra and all others that this is a serious offense. . . with serious consequences." In other words, someone might go to jail the next time.

That next time may be coming soon. Four indictments were handed down on May 7th against people who allegedly were hacking the Telemail system last year. The four are located in California, Iowa, Illinois, and New York. Each is being charged with up to ten counts of wire fraud. Reliable sources say this is the first time that the wire fraud charge has been used to prosecute computer hackers.

## Long Distance Option Timetable

USA Today

On July 15, Charleston, West Virginia will become the first city in the United States to offer equal access to alternate long distance companies. Equal access is part of the court-ordered breakup of the Bell system—most parts of the country should have it within three years.

What the people in Charleston will do is decide on a long distance company they want to use. Every long distance call they make will then be billed through that company. If the company they picked isn't AT&T, they can still use AT&T by notifying an operator first.

The main advantage here for the other companies is that they will no longer be getting inferior lines and that customers with rotary dial phones will be able to use their system without installing extra equipment.

Some cities and when they'll be doing this: Minneapolis, August 19; Mobile, Alabama, August 27; Indianapolis, August 30; Houston and Chicago, August 31; Milwaukee, New York City, Philadelphia, Baltimore, Washington, and Detroit, September 1.

## Intelpost an Astronomical Failure

Jack Anderson

Intelpost was announced in 1978 by the U.S. Postal Service as an experiment to test delivery of electronic messages overseas by satellite. It was supposed to give businesses and individuals a quick, cheap way to send letters abroad from five major cities: New York, Washington, Chicago, Houston, and San Francisco.

The service is quick enough. But it is far from cheap. At a cost to the sender of \$5 a page, customer reaction was predictable—to everyone but the Postal Service, that is.

A report issued by investigators for a House Government Operations subcommittee says, "To date, Intelpost has been a complete failure. Through the end of 1983, cumulative Intelpost revenues were \$58,080. No zeroes have been omitted from this figure. . . A service that generated so little revenue must be considered a failure by any measure of performance."

Since 1978, development, testing, and operation of Intelpost have cost \$6.2 million. This means the system has taken in less than one percent of its cost.

The House investigators were particularly exasperated at the Postal Service's lack of the most elementary records. It couldn't even tell them the number of messages that had been sent by Intelpost. The investigators wrote, "The committee is mystified that the Postal Service has not routinely compiled and made use of this basic management information."

The bottom line: the committee urges the board of governors to "terminate Intelpost as soon as practicable."

## Victory for Wiretap Victims

The Associated Press

A \$1.75 million settlement has tentatively been reached in a police wiretapping case involving more than 1000 plaintiffs and the city of New Haven, Connecticut [see "Wiretap City" in 2600, March, 1984]. The settlement still needs the approval of two city boards and a Federal judge.

"This is a complete, 100 percent victory," said John Williams, the coordinating counsel for the 1,233 plaintiffs. He said the settlement provides each plaintiff with at least \$1,000 and as much as \$6,000.

## Bank Records Aren't So Private

The New York Times

How much information should a bank divulge over the telephone about a customer's accounts? That question came up recently when a Manhattan real estate broker called a major bank's customer service number and, in less than two minutes, was told exactly how much a client had on deposit at a branch on the Upper West Side.

"That's information of the most confidential nature," said Gary Walker of the New York City Department of Consumer Affairs. "It shouldn't be given out without your permission, and probably not over the phone at all."

The bank the broker called, Citibank, says it does not routinely release detailed information about accounts by telephone and says it makes disclosures to outsiders only with the customer's written consent. In this particular case, Citibank said the customer service representative might have believed that the broker had the client's permission to obtain the balances.

But two weeks later, the same customer telephoned the bank and quickly obtained the balance in his checking account. The service representative asked when and where the customer had made his last deposit, saying the information was needed "for security reasons." As a test, the customer said he had deposited a check in the cash machine at Penn Station—Citibank has no machine there—and deliberately overstated the size of his last deposit. Despite the erroneous information, the bank's representative promptly told the customer how much money he had.

Norma Rollins, a lawyer with the New York Civil Liberties Union, said that one of her group's priorities for 1984 was a state law prohibiting unauthorized disclosures by banks. She said, "Banks can tell a pretty good story of your life—where you've been, what you've been spending. If you go to the corner liquor store every week to cash a check for spending money, think about what someone could say about your life style if they think you're spending \$150 a week on booze."

## THE WOES OF HAVING A SMALL-TIME RURAL PHONE COMPANY

*This story is for those of you who hate Ma Bell with a passion. In many parts of the country, Bell is not the company that provides you with telephone service. There are lots of tiny telephone companies out there and some of them make Bell (and her children) look pretty terrific. The following is from one of our readers who has to put up with a rural telephone company.*

I had a problem with my telephone company. I picked up my line, and there was a dial tone there. I began to make a long distance call. After the tenth digit went through, I heard: "do weee doo..." We're sorry, your call cannot be completed as dialed. Please check the number before dialing again or call your business office for assistance."

So I switched to my good phone which makes clean crisp tones and dialed the same number again. I got the same message again! I said, "What the hell?!" (It was an 800 number, of course.) So I switched over and dialed a regular "1 plus" number—I started dialing the number direct: the same recording came on!

So I dialed my local business office which is the repair service. It was a local seven digit number. Again, all I got was: "do weee doo..." Then I dialed up the operator and waited a second or two and the recording came back on.

I had an idea. "I know what they've done; they've made a mistake in the central office and changed my touch tone rating to rotary!" Doing that would certainly produce the effect I was getting. If you tried to break the dialtone, you couldn't call anything because it's not programmed in. They must have made an error somewhere. I picked up my rotary dial phone and I dialed the local repair service again. But it did the exact same thing on the rotary phone!

So I tried calling a local number (local to my exchange) and got the recording. *I dialed my own number!* "Your call cannot be completed as dialed." I tried 411—same thing. I dialed 611, the old centralized repair service that had been phased out in my area but which rings in a distant city served by the same telephone company. An operator said, "Can I have the number you're speaking from?" and I told her; "Thank you," ring, ring, click, "This is telephone repair service. Can I have the number you're reporting, please?" I gave her the number. "Oh sir, I'm sorry, that number is no longer served by our repair service. You'll have to call your local repair service number," which was the one I couldn't get through to. I said, "Operator, I tried calling that and I got a recording saying the number I called cannot be completed as dialed." And she said, "Well, I'm sorry, you'll just have to call and report it to your office." I said, "I cannot! Can you pass this information along to my repair service? There's something wrong with the phone line—it only dials you." "I'm sorry, I'm not allowed to do that. I *can't* do that."

So I hung up and called 611 again and the first operator popped on the line again, and I said, "Operator, I'm not going to give you the number I'm calling from—I'm having a very difficult time. I called repair service, they were nasty and hateful and wouldn't respond to getting my phone fixed." I told her I had to call my local repair service, but was physically unable to. I asked if she could call it for me. "Certainly, I'll be glad to. What's your phone number and I'll call you back." I gave her the phone number, waited about 40 seconds and called her back. I asked, "What happened?" She said, "I got a recording when calling your number saying that my call couldn't be completed as dialed." "OK, that's the problem, anybody trying to call my number gets that recording—anything I try to call gives me that recording." "Well, let me try to ring repair again."

We ring repair service and get the *same lady* again. "Sir, I *told* you you're going to have to call your own repair service. Don't bother me with this anymore! I've told you we cannot

help you here." I said, "Don't you have a phone there?" "Yeah." "Can't you pick it up and call my local repair service number? It's a seven digit listed number, can you not call it?" "No, I cannot! It's not my duty; it's not my job. You should be able to do this yourself. You're going to have to go down to the repair service or use a [semi]-convenient pay phone," which is 10 miles away. Hell, the repair center is closer!

I got in the car, red-faced with hysteria, and I drove in and called repair service from inside the telephone building. I went into a door marked "Employees only!" I just picked up the phone; no one was there. A person picked up and said, "Can I have the number you are reporting, please?" I yelled, "NO!" "What are you calling me for?" "I want to talk to somebody in person about my problem. I've got a terrible problem and it cannot be handled over the phone. Please come down the hallway—I'm somewhere in your building."

She came in and I explained to her the rude treatment I got from centralized repair service. "I'm terribly sorry that happened... OK, you're going to have to come into the business office. Just go down the hall. Talk to one of our well trained service representatives, and they will help you." "Why can't *you* help me—you're the repair service!" "Just take this form and hand it to the lady at the desk."

I went to one of the service reps and went over the whole story again. While I was telling her this, I noticed a 75-year-old senior citizen right next to me talking to *his* rep. He had a very similar problem. He was getting nowhere. And I said to him, "You might as well take your telephone and throw it in the river, because you're not gonna get any service out of these people! They are the sorriest human beings that ever drew a breath. They don't give a damn about you. They certainly don't give a damn about me!" (I'm now yelling at the top of my lungs, by the way.) I said, "These people don't give a shit about anything except collecting their paychecks. You might as well just leave!"

All of the people in the telephone company were looking at me: all the customers, all the business reps. And I told them, any time I report anything there, I get treated like some sort of an asshole. For instance, two weeks earlier I had reported that pay phones in this particular prefix wouldn't dial 800 numbers. If you dialed an 800 number, you got a request to put in a 25¢ deposit. When I reported *that*, they said, "Yes, you must pay for your 800 number, like it was a local call." (You won't get your money back from the phone—they are Northern Telecom phones that don't have a return coin slot, so it can't give you your coin back.) I had told them, "It is a *toll-free* 800 number, hence the word 'toll-free'. You do not have to put in a quarter." All of the representatives said, "No, you've got to put in a quarter. You must pay for a toll-free 800 number."

Well, to make a long story short, the young lady was so upset that I was yelling and screaming at everyone in there, that she took my record, dashed out of the room, came back and said, "I'm terribly sorry to have inconvenienced you. I'm sorry that you're upset—I notice you're red in the face. Your phone will be turned back on before you get home. It was just an error. Someone didn't pay their bill and it was one digit away from your number and it was all a mistake."

The next day, I spoke to the vice president of the phone company and told him about my problem and the 800 incident, as well as a whole collection of other things that shocked and upset him. He said he was very grateful to me, and would consider hiring me as a consultant.

Since that episode, things have gotten better. 800 numbers are now toll-free from payphones and the repair service is a little bit better. But there are still plenty of problems almost every time you dial.

You might say that it takes a phone phreak to straighten out a phone company. You might also say that Bell never looked so good.

The following is a list of networks currently available on the Defense Data Network, including the base address of each. This is a complete, and up-to-date listing.

|                |             |                |            |
|----------------|-------------|----------------|------------|
| SATNET         | 4.0.0.0     | YPG-NET-TEMP   | 6.0.0.0    |
| EDN-TEMP       | 7.0.0.0     | BBN-NET-TEMP   | 8.0.0.0    |
| ARPANET        | 10.0.0.0    | DODIIS         | 11.0.0.0   |
| ATT            | 12.0.0.0    | PDN            | 14.0.0.0   |
| MIT            | 18.0.0.0    | DDN-TC-NET     | 23.0.0.0   |
| MINET          | 24.0.0.0    | RSRE-EXP       | 25.0.0.0   |
| MILNET         | 26.0.0.0    | NOSC-LCCN-TEMP | 27.0.0.0   |
| WIDEBAND       | 28.0.0.0    | UCL-TAC-NET    | 32.0.0.0   |
| SU-NET-TEMP    | 36.0.0.0    | SRI-LOCAL      | 39.0.0.0   |
| BBN-TEST-A     | 41.0.0.0    | AMPRNET        | 44.0.0.0   |
| C3-PR          | 45.0.0.0    | BERKELEY       | 46.0.0.0   |
| SAC-PR-TEMP    | 47.0.0.0    | BBN-TEST-B     | 128.1.0.0  |
| CMU-NET        | 128.2.0.0   | LBL-CSAM       | 128.3.0.0  |
| DCNET          | 128.4.0.0   | FORDNET        | 128.5.0.0  |
| RUTGERS        | 128.6.0.0   | DFVLR          | 128.7.0.0  |
| UMDNET         | 128.8.0.0   | ISI-NET        | 128.9.0.0  |
| PURDUE-CS      | 128.10.0.0  | BBN-CRONUS     | 128.11.0.0 |
| SU-NET         | 128.12.0.0  | MATNET         | 128.13.0.0 |
| BBN-SAT-TEST   | 128.14.0.0  | SINET          | 128.15.0.0 |
| UCLNET         | 128.16.0.0  | MATNET-ALT     | 128.17.0.0 |
| SRINET         | 128.18.0.0  | EDN            | 128.19.0.0 |
| BRLNET         | 128.20.0.0  | SF-PR-1        | 128.21.0.0 |
| SF-PR-2        | 128.22.0.0  | BBN-PR         | 128.23.0.0 |
| ROCKWELL-PR    | 128.24.0.0  | BRAGG-PR       | 128.25.0.0 |
| SAC-PR         | 128.26.0.0  | DEMO-PR-1      | 128.27.0.0 |
| C3-PR-TEMP     | 128.28.0.0  | MITRE          | 128.29.0.0 |
| MIT-NET        | 128.30.0.0  | MIT-RES        | 128.31.0.0 |
| UCB-ETHER      | 128.32.0.0  | BBN-NET        | 128.33.0.0 |
| NOSC-LCCN      | 128.34.0.0  | CISLTESTNET1   | 128.35.0.0 |
| YALE-NET       | 128.36.0.0  | YPG-NET        | 128.37.0.0 |
| NSWC-NET       | 128.38.0.0  | NTANET         | 128.39.0.0 |
| UCL-NET-A      | 128.40.0.0  | UCL-NET-B      | 128.41.0.0 |
| RICE-NET       | 128.42.0.0  | CRANET         | 128.43.0.0 |
| WSMR-NET       | 128.44.0.0  | DODIIS-S1      | 128.45.0.0 |
| DODIIS-S2      | 128.46.0.0  | TACTNET        | 128.47.0.0 |
| NOSC-ETHER     | 128.49.0.0  | BBN-TEST-C     | 192.0.1.0  |
| BBN-FIBRENET   | 192.1.2.0   | BBN-JERICO-NET | 192.1.3.0  |
| BBN-FIBER-TEST | 192.1.4.0   | BBN-ENET       | 192.1.7.0  |
| BBN-STEAMER    | 192.1.128.0 | CISLHYPERNET   | 192.5.1.0  |
| WISC           | 192.5.2.0   | HP-DESIGN-AIDS | 192.5.3.0  |
| HP-TCG-UNIX    | 192.5.4.0   | DEC-MRNET      | 192.5.5.0  |
| DEC-MRRAD      | 192.5.6.0   | CIT-CS-NET     | 192.5.7.0  |
| WASHINGTON     | 192.5.8.0   | AERONET        | 192.5.9.0  |
| ECLNET         | 192.5.10.0  | CSS-RING       | 192.5.11.0 |
| UTAH-NET       | 192.5.12.0  | CCNET          | 192.5.13.0 |
| RAND-NET       | 192.5.14.0  | NYU-NET        | 192.5.15.0 |
| LANLLAND       | 192.5.16.0  | NRL-NET        | 192.5.17.0 |
| IPTO-NET       | 192.5.18.0  | UCIICS         | 192.5.19.0 |
| CISLTTYNET     | 192.5.20.0  | BRLNET1        | 192.5.21.0 |
| BRLNET2        | 192.5.22.0  | BRLNET3        | 192.5.23.0 |

|              |            |               |             |
|--------------|------------|---------------|-------------|
| BRLNET4      | 192.5.24.0 | BRLNET5       | 192.5.25.0  |
| NSRDCOA-NET  | 192.5.26.0 | DTNSRDC-NET   | 192.5.27.0  |
| RSRE-NUL     | 192.5.28.0 | RSRE-ACC      | 192.5.29.0  |
| RSRE-PR      | 192.5.30.0 | CISLTESTNET2  | 192.5.32.0  |
| CISLTESTNET3 | 192.5.33.0 | CISLTESTNET4  | 192.5.34.0  |
| RIACS-NET    | 192.5.35.0 | CORNELL-CS    | 192.5.36.0  |
| UR-CS-NET    | 192.5.37.0 | SRI-C3ETHER   | 192.5.38.0  |
| UDEL-EECIS   | 192.5.39.0 | PUCC-NET-A    | 192.5.40.0  |
| WISLAN       | 192.5.41.0 | AFDSC-HYPER   | 192.5.42.0  |
| CUCSNET      | 192.5.43.0 | FARBER-PC-NET | 192.5.44.0  |
| AIDS-NET     | 192.5.45.0 | NTA-RING      | 192.5.46.0  |
| NSRDC        | 192.5.47.0 | PURDUE-CS-IL  | 192.5.48.0  |
| UCSF         | 192.5.49.0 | CTH-CS-NET    | 192.5.50.0  |
| THEORYNET    | 192.5.51.0 | NLM-ETHER     | 192.5.52.0  |
| UR-CS-ETHER  | 192.5.53.0 | AERO-A6       | 192.5.54.0  |
| UCLA-CECS    | 192.5.55.0 | UDEL-CC       | 192.5.57.0  |
| CSNET-PDN    | 192.5.58.0 | AMES-NAS-NET  | 192.5.64.0  |
| NPRDC-ETHER  | 192.5.65.0 | HARV-NET      | 192.5.66.0  |
| CECOM-ETHER  | 192.5.67.0 | AERO-130      | 192.5.68.0  |
| UIUC-NET     | 192.5.69.0 | SCRC-ETHERNET | 192.10.41.0 |

|           | CITY          | BAUD RATE | CONNECT NUMBER |
|-----------|---------------|-----------|----------------|
| EASYLEINK | NEW YORK      | 110       | 212-608-7313   |
|           |               | 300       | 212-608-7332   |
|           |               | 1200      | 212-608-7480   |
|           | PHILADELPHIA  | 110       | 215-582-4379   |
|           |               | 300       | 215-582-4455   |
|           |               | 1200      | 215-582-4377   |
|           | DETROIT       | 110       | 313-962-4390   |
|           |               | 300       | 313-962-4417   |
|           |               | 1200      | 313-962-4393   |
|           | CHICAGO       | 110       | 312-263-2314   |
|           |               | 300       | 312-263-3723   |
|           |               | 1200      | 312-263-2347   |
|           | CINCINNATI    | 110       | 513-241-2488   |
|           |               | 300       | 513-241-2819   |
|           |               | 1200      | 513-241-2901   |
|           | WASHINGTON DC | 110       | 202-638-7694   |
|           |               | 300       | 202-638-7579   |
|           |               | 1200      | 202-638-7659   |
|           | ST LOUIS      | 110       | 314-241-5440   |
|           |               | 300       | 314-241-5601   |
|           |               | 1200      | 314-241-3141   |
|           | ATLANTA       | 110       | 404-659-3637   |
|           |               | 300       | 404-659-3583   |
|           |               | 1200      | 404-659-3506   |
|           | HOUSTON       | 110       | 713-237-0361   |
|           |               | 300       | 713-237-0431   |
|           |               | 1200      | 713-237-1254   |
|           | SAN FRANCISCO | 110       | 415-989-6310   |
|           |               | 300       | 415-989-6383   |
|           |               | 1200      | 415-989-6300   |
|           | LOS ANGELES   | 110       | 213-624-3213   |
|           |               | 300       | 213-624-3227   |
|           |               | 1200      | 213-624-4248   |