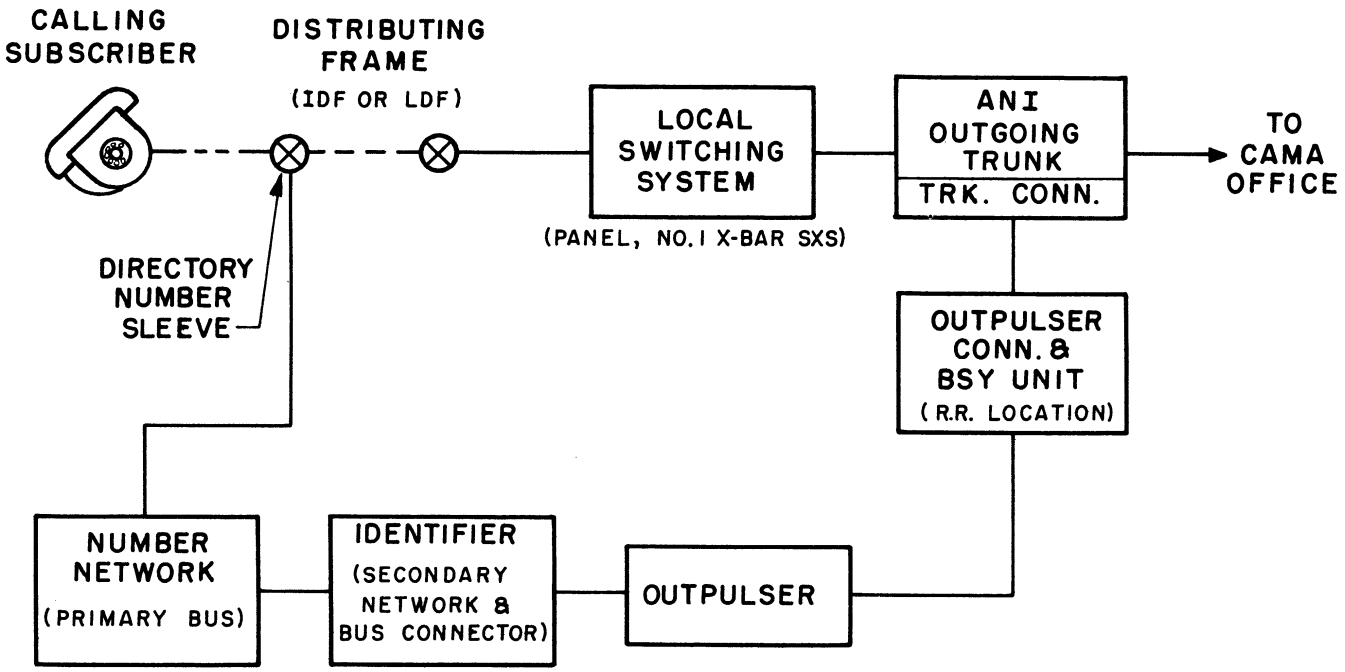
AUTOMATIC NUMBER IDENTIFICATION

Automatic number identification (ANI) is a means for automatically determining the calling numbers, for charging purposes, on toll calls. It combines some of the features of message register charging, operator number checking, centralized automatic message accounting (CAMA), operator identification and local automatic message accounting (LAMA). Initially ANI will be used on #1 crossbar and panel office subscriber dialed 1-1 calls to the 201 area of northern New Jersey and Direct Distance Dialing (DDD) calls to all of the United States.

The automatic number identification system consists of a maximum of three identifier groups in any building depending on the CAMA tandem traffic density. The identifier group consists of four major types of frames used to identify a calling subscriber number, on a one at a time basis, to the CAMA tandem equipment. The frames and trunks of the identifier group are individual to each respective identifier group. To verify the cross-connection work on the ANI frames required for each subscriber, a line verification circuit is provided per identifier group. In addition, two test frames, which may be common to three identifier groups, are provided per building.



BLOCK DIAGRAM

AUTOMATIC NUMBER IDENTIFICATION

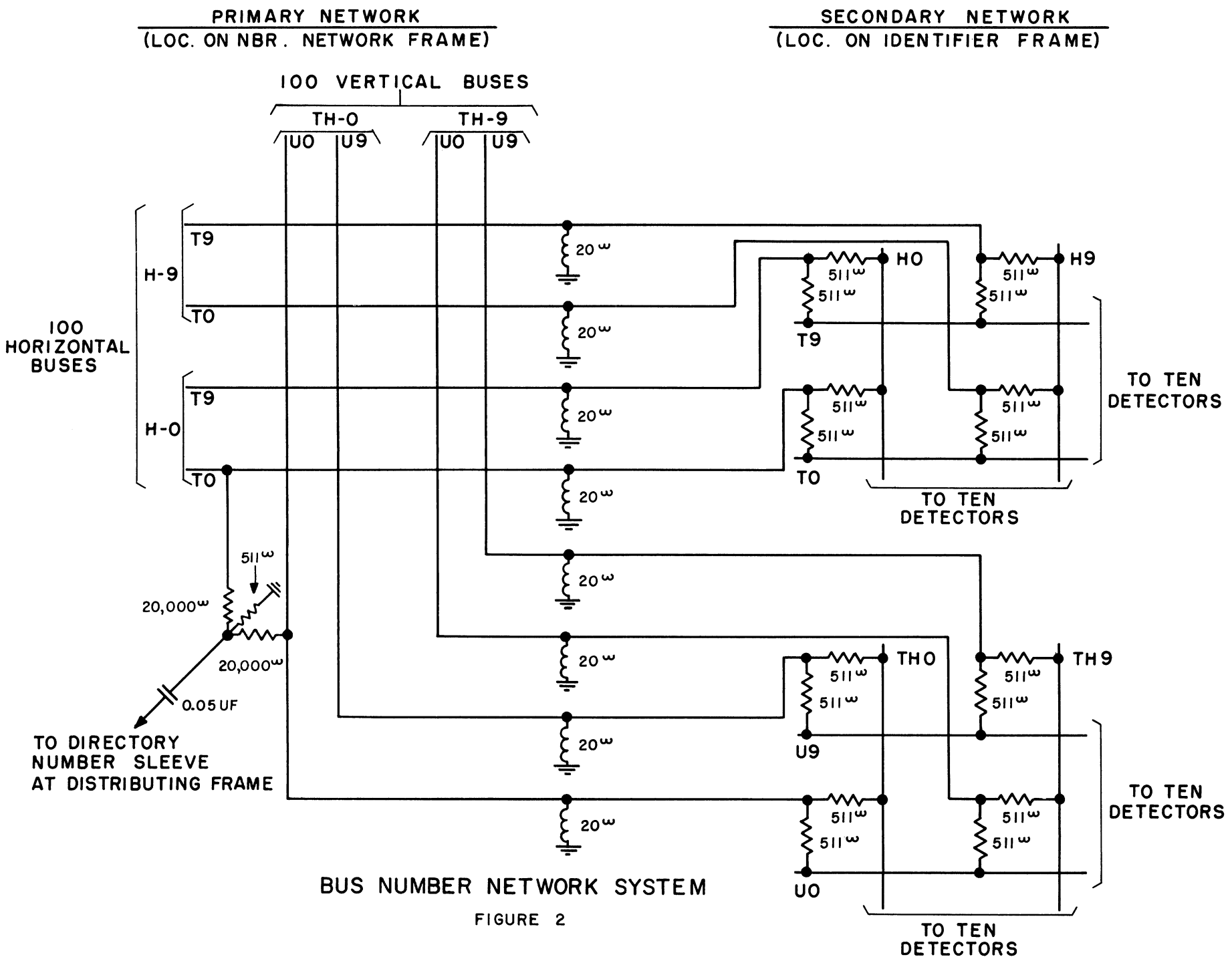
FIGURE 1

Message unit calls to the Metropolitan Exchange Area (MEA) are charged to the calling number automatically. Each call is scored on a message register which is provided for each line but the call, however, loses its individual identity. The registers are read once a month and show the total number of message units used. Operator number checking results in specific identification of the calling number and since the operator makes out a ticket for each call, charges can be shown on the monthly bill for each individual call. CAMA operator identification also results in individual charges for each call, but positive identification of the calling number is not possible. LAMA is really ANI as presently used in #5 crossbar offices.

METHOD OF OPERATION

Figure 1 is a block diagram of the major frames required for automatic number identification, exclusive of test and verification equipment.

The function of the ANI outgoing trunk is to provide a talking and signaling path from a local office to a CAMA tandem office when both are arranged for automatic number identification. When the called number has been pulsed (PCI or MF) forward by the local office, the CAMA office signals the ANI trunk to initiate calling number identification. Through its appearance in an outpulser connector, the trunk seizes an outpulser which in turn seizes an identifier. The identifier



BUS NUMBER NETWORK SYSTEM

FIGURE 2

causes the trunk to superimpose a 5800 cycle signal of approximately two volts on its sleeve lead. This signal passes through the local office switch train to the sleeve of the calling line. The sleeve leads of all directory numbers are connected to number networks on the number network frames. The signal then continues from the primary number network and its directory number cross-connections into the secondary number network which is used by the identifier in determining the calling office and number.

This information, office and directory number together with an information digit, is registered in the outpulser which MF outpulses all information to the CAMA office through the trunk for entry on the CAMA tape. All local ANI equipment is then released except the trunk which is held for the duration of the call.

PRIMARY AND SECONDARY BUS SYSTEM

Figure 2 represents the electrical equivalent of the network bus system. The directory number sleeve wires are cabled from the distributing frame to the terminals on the number networks, in panels on the primary bus system. The sleeve terminations are arranged in a square pattern of 100 rows (10 on each of 10 panels) and 100 columns (20 columns on each of five frames). Each directory sleeve wire is connected through a 0.05 microfarad capacitor and 511 ohm resistor to ground. The junction of these elements is connected through a 20,000 ohm resistor to one vertical and one horizontal bus in the grid. Thus, each sleeve lead is associated with one of the 10,000 coordinate points in the grid and may be identified in terms of the vertical and horizontal buses to which it is attached.

Further to concentrate the primary bus system, two secondary bus systems are used, each arranged in a square pattern of 10 rows and 10 columns. The secondary buses are located on the identifier frame and are shop-wired. The vertical buses of the primary bus system are connected to one secondary grid and the horizontals of the primary bus system to the other secondary grid. With this arrangement, an identifier equipped with 10 detectors may be switched from one group of 10 secondary buses to another. With an input signal at one of the directory networks, an output signal will appear on one bus in each of the four secondary groups of 10. The buses so marked correspond to the numerical digits of the directory number. The identifier makes four successive tests to identify a number completely in a 10,000 line unit.

The office identification is accomplished by the identifier recognizing the particular thousands group in which a signal is found. A maximum of six central offices, each having a maximum of 10,000 directory numbers, may be tested by an identifier group.

In offices with two-party service, the tip party is connected to the tip primary buses. Before the identifier connects to the secondary buses, it is provided with information from the outpulsers as to whether the calling line is a tip party and if so, it transfers the two secondary grids from the primary that contains the ring party numbers to the one that contains the tip parties. In this way, it differentiates between the two parties on a line in spite of the fact that the signal is present in the number networks for both parties.

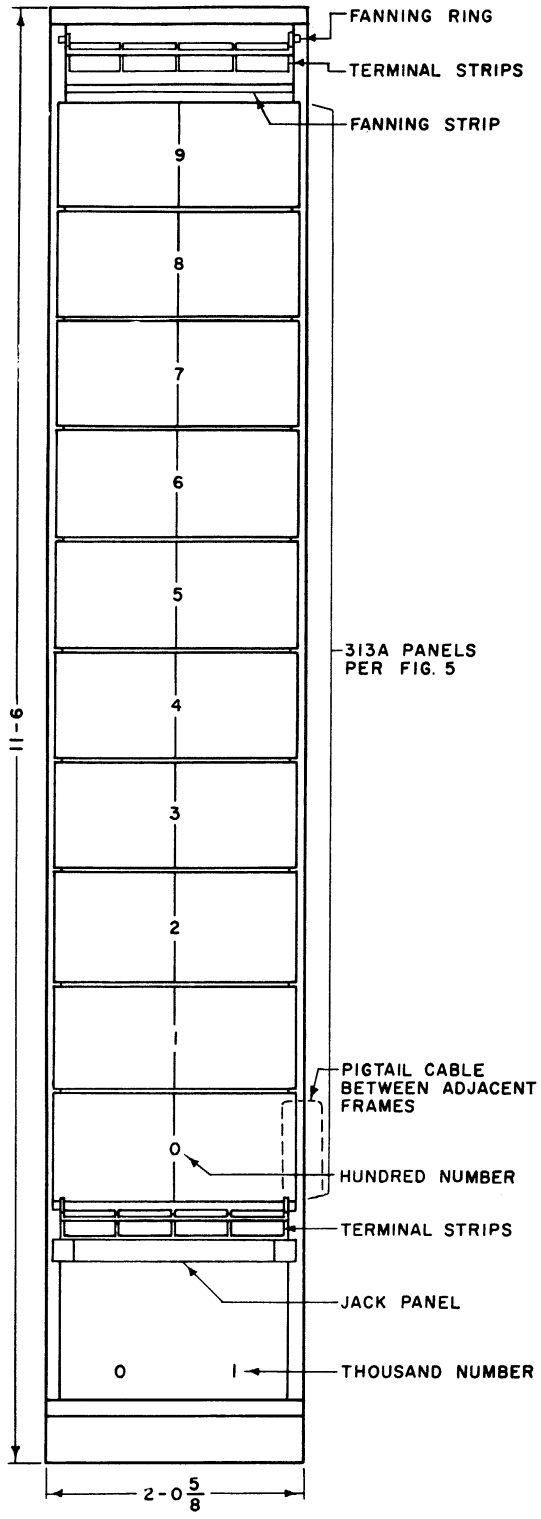
In a PBX, only the directory number is connected to the bus system; all other lines have their networks multipled to this directory network. In order to minimize the resultant variation in primary bus voltage, a 20 ohm termination to ground is provided on each primary bus. This makes it easier for the detectors to discriminate between the wanted signal and the unwanted signals which result from backup paths through other networks. The input signal of approximately two volts at the directory number network falls to about 90 microvolts at the input to the amplifier detectors.

The high attenuation of this signal has made it necessary to introduce some rather rigid cabling limitations in the path from the distributing frame to the secondary networks. The maximum cabling length of the sleeve leads to the number network frames is 400 feet, with not in excess of 100 feet of this path in parallel with other cable and not over 50 feet on a cable rack with other central office cable. A minimum clearance of six inches is required from cable runs of other central office equipment. To meet this condition all sleeve lead cable from the distributing frame will be run on separate cable rack. To minimize cable run lengths, additional identifier groups were established. A maximum of 300 feet of cable is allowed on the input leads to the secondary buses. This has been cared for by placing the identifier frames as close as possible to the number network frames.

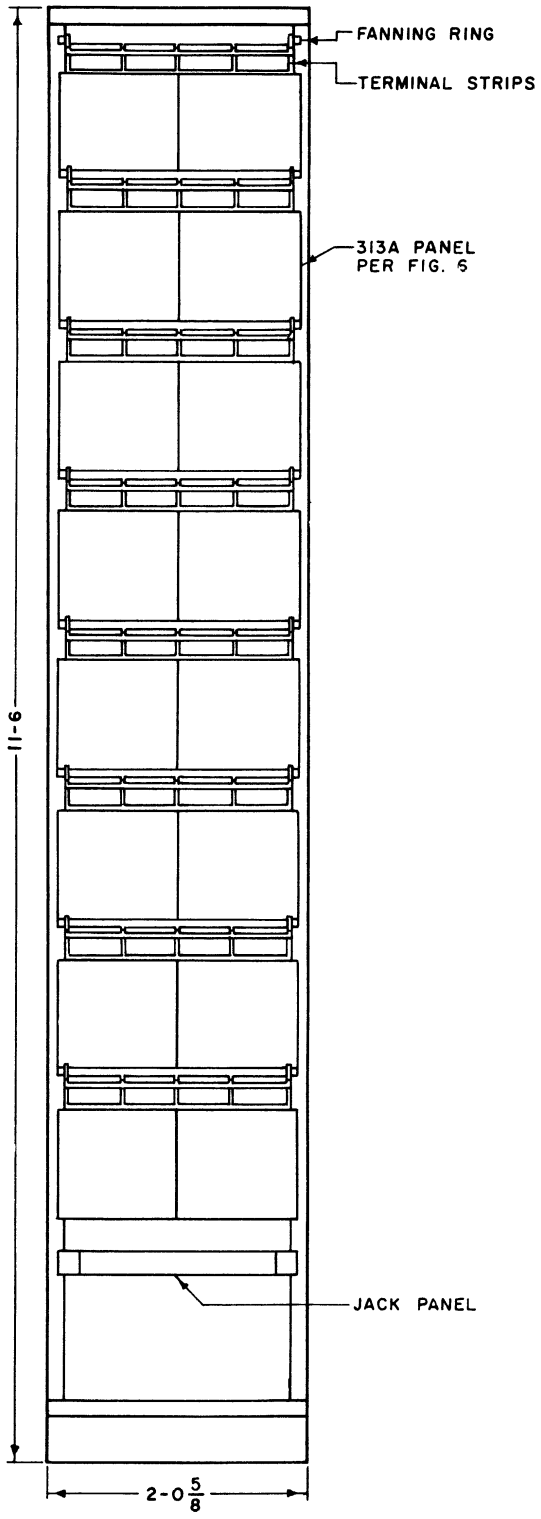
MAJOR FRAMES

Number Network Frame (NN-)

The number network frame (Figure 3) contains 2000 primary networks which are arranged within a bus system. Each network consists of three pigtail resistors and a 0.05 microfarad



Number Network Frame



"X" Number Network Frame

FIGURE 3

condenser cabled to the sleeve of the directory Number. The frame has two vertical groups of 1000 numbers, each arranged on 10 panels. Each panel is equipped with 20 vertical cards, each card having 10 networks for 10 numbers, or a total of 200 numbers. A separation in the middle of the panel divides the cards into two groups of 10 each. The 10 cards on the left of each of the 10 panels on a frame are in the even numbered thousand series and the 10 cards on the right 10 panels are in the odd numbered thousand series. Five of these number network frames of 2000 numbers provide the ANI facilities for a 10,000 number office. Each number network frame has tie lines to all other number network frames. To provide for coded lines an "X" number network frame with a capacity of 1600 coded lines is equipped as required in groups of 200 numbers. Tie lines are provided from the number network frames to their associated "X" number network frame.

Figure 4 shows a sketch of a number network panel and also one of a small section of such a panel to show the cross-connections required. There are three vertical buses for each digit 0-9. The vertical buses are used to indicate the directory number units digit and the class of subscriber: tip party, multiparty and ring party. Multiparty will be used in the Manhattan area for the billing of calls to an extension user. The top lug of the directory number network is strapped to a vertical bus according to the units digit and class of subscriber. There are two horizontal buses. The horizontal buses are used to indicate the class of subscriber, tip or ring party, and the tens digit of the directory number. The lower lug of the directory network is connected to a horizontal bus according to the class and tens digit of the directory number. Multiparty indication requires only that the top lug of the directory network be wired. Only directory number networks are wired to the buses. All lines in the same PBX have their number networks connected in multiple with the network of the directory number. If these PBX lines are on other network frames or "X" number network frames, the tie lines provided are used to extend the network of the PBX line to the directory number network. All cross-connections made on the number network and "X" number network frames will be wrapped with a spring-operated tool.

IDENTIFIER FRAME (I-)

The identifier is the circuit which detects the 5800 cycle signal on the sleeve of the directory number.

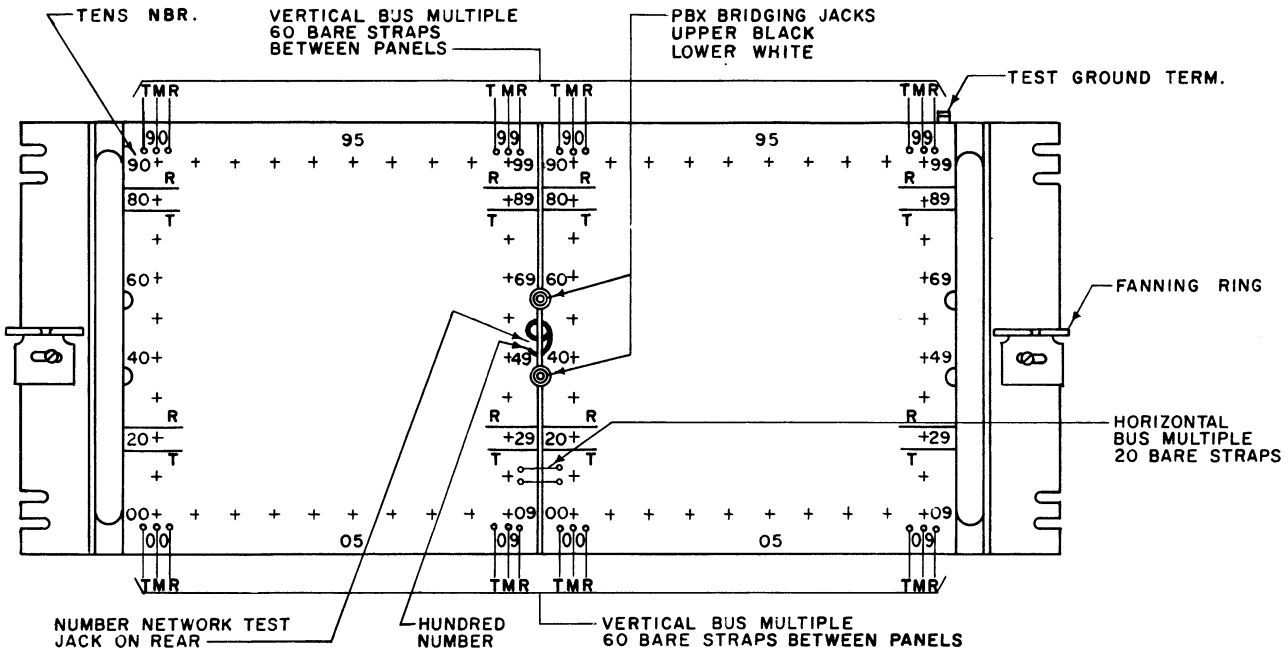
The identifier frame is equipped with one identifier and with secondary networks for three groups of 10,000 numbers. Two frames are provided in an identifier group. Either identifier functions with a maximum of six groups of 10,000 numbers.

Transfer relays are provided to permit the association of the secondary network units with the proper primary outputs (ring or tip party) as controlled by party determination. The multiparty outputs have a separate termination in the secondary network units.

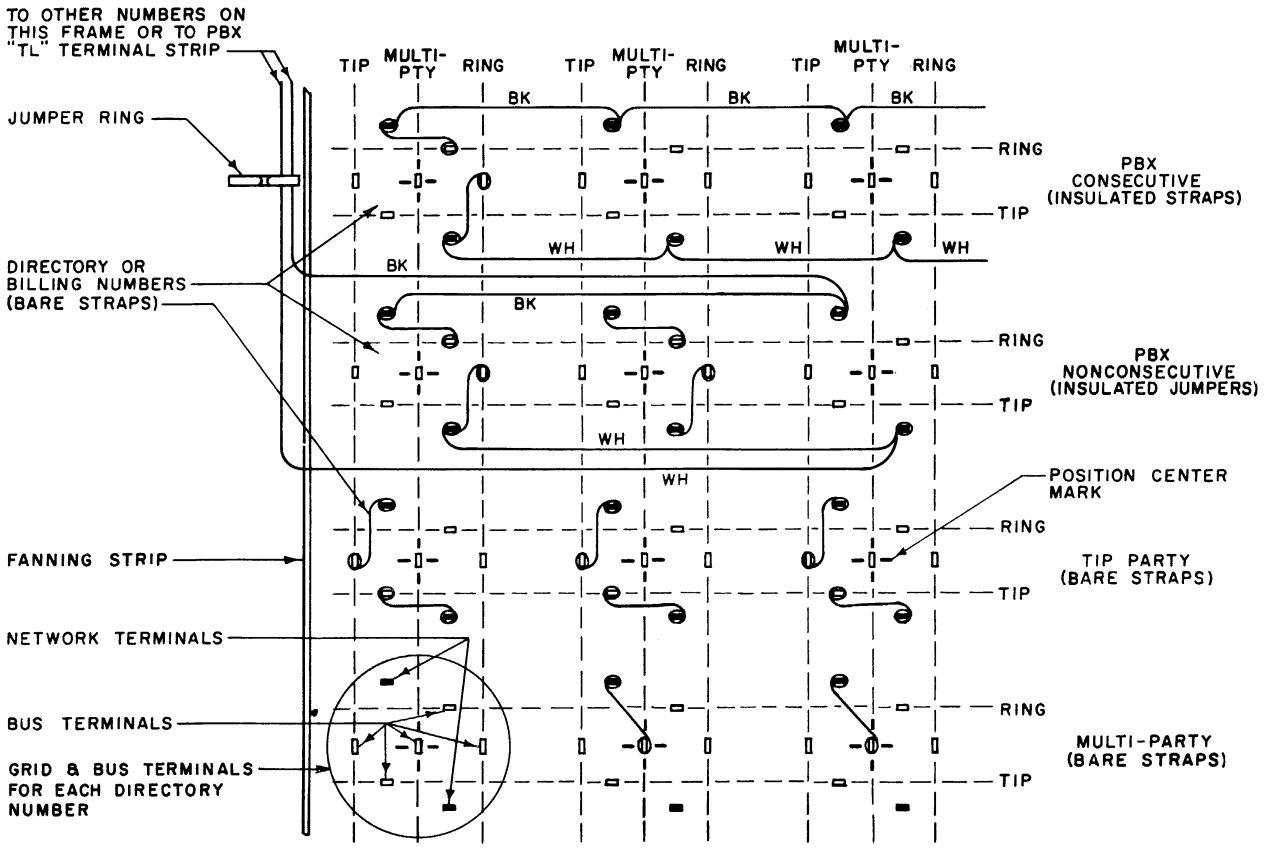
The identifier connects its 0-9 electron tube detectors to the 0-9 thousand lead of each office secondary network in turn, always starting with the first office. When a tone is found, both the central office and the thousand digit are determined in the identifier and registered in the outpulser. The central office is registered as a single digit, 0 to 5. In three additional steps the identifier similarly examines the 0-9 hundreds, 0-9 tens, and 0-9 units leads of the calling office. For multiparty lines no attempt is made by the identifier to detect further signals on the secondary grids once a multiparty signal is recognized. When the multiparty signal is recognized by the identifier, it is registered in the outpulser as an information digit. If the line being identified is under service observing, the service observing network unit registers an information digit in the outpulser. The information digits indicate the following conditions:

Type Call	Digit
Line Automatically Identified	0
Line Automatically Identified on Service Observing	3
Multiparty - Requires Operator Identification	1
Multiparty - Requires Operator Identification on Service Observing	4
Trouble in Equipment - No Identification; Requires Operator Identification	2
Trouble in Equipment - No Identification; Requires Operator Identification on Service Observing	5

The average identifier holding time is approximately 0.27 seconds for an identifier group of six central offices and is less where fewer central offices are involved. Although only one identifier functions at any one time, the outpulser has a preference circuit for the identifiers.



Number Network Panel (313A) - 200 Numbers



PORTION OF NBR. NETWORK PANEL
TO SHOW CROSS - CONNECTIONS

FIGURE 4

Features in the detectors for discriminating between real and spurious signals require that the detectors be connected to the buses for 12 to 15 milliseconds for each test. Additional time for operating the register relays in the outpulser and for transferring detectors between tests, as well as for the initial circuit preparation, bring the overall time up to the value quoted.

The identifying signal may be blocked temporarily in the panel system if the brushes of a hunting selector bridge a grounded terminal to a terminal carrying a signal. This condition can result in a failure to identify one or more digits of the calling number. To care for this situation, the identifier is arranged so that if digits are missing, it will make a retest to fill in the missing digit or digits. If a retest is successful, no trouble record will be made. If the identifier is unable to make an identification in two tests, a trouble is assumed. The outpulser is notified of trouble and it calls in the trouble ticketer frame and transmits information for a trouble record. The outpulser then releases the identifier and makes a second trial, using the second identifier. In the event that a second trial should fail in two tests, the outpulser sends out the information digit to call in a CAMA operator for identification.

OUTPULSER FRAME (O -)

The outpulser frame has a capacity of two outpulsers. In an identifier group a maximum of seven outpulsers may be provided. The chief function of the outpulser is to receive and check the registration from the identifier and to outpulse the information into the CAMA equipment. This outpulsing is done on a multifrequency basis at the rate of approximately seven digits per second. The office digit is translated in the outpulser to the three digit central office code. The central office code and number are preceded by the information digit during outpulsing.

Where a 10,000 line panel unit is equipped for party service, the outpulser will make the party test. This is done by a party test unit on the outpulser frame which recognizes the ringer ground through the switch-hook to indicate a tip party. The panel district selector also has the party test information but it is not feasible to pass the information forward to the ANI trunk. In crossbar units the party test is made by the subscriber sender and registered in the originating marker. The party information is passed on to the outpulser via the ANI trunk and outpulser connector.

The outpulser has access to the trouble ticketer frame to record any trouble it encounters. A trouble ticket is printed by a number 1A message ticketer at the trouble ticketer frame. Equipment to aid in the identification of subscriber lines held by permanent signal holding trunks is provided on the outpulser frame.

TRUNK FRAMES (T-)

The ANI trunk frame has a capacity of 28 trunks in two subgroups. Four types of trunks are used in the panel and #1 crossbar systems, two types per system according to the kind of pulsing (multifrequency or PCI) used for transmitting the called number. The calling number is transmitted by multifrequency pulsing. Two oscillators to generate the 5800 cycle signal are provided for each three adjacent frames. The oscillators, numbered 0 and 1, are normally used by correspondingly designated identifiers. If either oscillator fails, a plug inserted in the MB jack causes the other oscillator to function with either identifier and removes the defective oscillator from service. The output of the oscillators is multipled to all trunks on a frame and the adjacent frames.

The trunk connector unit, which is a part of the outpulser connector equipment, is located near the top of the trunk frame. The line verification and the permanent signal connectors are furnished on the first trunk connector. The outpulser connector unit and outpulser busy unit, which constitute the remainder of the outpulser connector equipment, are located on a relay rack near the trunk frames.

TEST AND VERIFICATION EQUIPMENT

Trouble Ticketer Frame (TTKT-)

The trouble ticketer frame is the trouble indicator of the ANI system. This frame receives trouble information from the outpulser and prints a trouble record with a #1A message ticketer. An option is provided for locking up a connection for trouble tracing purposes.

The trouble ticketer frame can be used for automatically identifying lines on permanent signal holding trunks. A maximum of 600 permanent signal holding trunks can be accommodated on this frame.

The frame also accommodates outpulser and identifier usage lamps, jacks for making individual outpulsers busy, jacks for making identifiers busy to specific outpulsers, registers for recording identification and outpulser failures, miscellaneous trouble and alarm lamps and control jacks and keys.

OUTPULSER - IDENTIFIER - TRUNK TEST FRAME (OITT-)

The outpulser identifier trunk test frame, as its name indicates, is arranged to test outpulsers, identifiers and ANI trunks. The capacity of the test frames is seven outpulsers and two identifiers in each of three identifier groups and it is presently arranged to test 1000 ANI trunks. The test connectors for the trunks are located on a relay rack. The test connections to the trunks are actually established through contacts on relays in the trunks themselves and in the ANI trunk frame miscellaneous circuit. These relays for a specific trunk are controlled by a single contact on the trunk test connector.

The ANI trunks are tested automatically in sequence or on a particular circuit basis. Each trunk is tested in conjunction with an outpulser and an identifier, selected as on regular service calls. Outpulsers may be tested individually, in conjunction with either of the associated identifiers on a random or preselected basis. Particular identifier group, outpulser and identifier selections for this purpose are key controlled.

LINE VERIFICATION EQUIPMENT

Line verification equipment per identifier group provides a means of access to the subscriber number, identifies these numbers one at a time through the ANI equipment and checks the accuracy of the cross-connections at the number network frames. An OK check is indicated by a lamp display of the subscriber central office and number. The central office will be displayed as a single digit (0-5) being the same as its location in the secondary networks (0-5) on the identifier frames. The four digits displayed will be the billing number since only the billing number is connected to the primary buses. A multifilament lamp ("Nixie" lamp) is used with five or ten 3/4 inch filaments. Other lamp indications are provided to indicate idle or busy conditions, faulty connections or failure properly to identify numbers.

The line verification test will be made from the message register rack. A multiple of the test facilities is provided in the number network frames with a lamp display panel. In crossbar units the present incoming trunk from the line message register rack is modified for use in line verification. In panel units, a new panel line verification trunk is provided per message register rack location. The present method of connecting to panel subscribers by patching the T and T-1 jacks to the required line is continued. Access in crossbar units is obtained by dialing over the modified incoming trunk from the line message register rack. Where provision is made for more than one message register location, the display lamp will light only at the location where the verification originated and in the number network frame location. The display will last 20 to 40 seconds. After it wipes out, other waiting displays will be made in turn. Verification equipment is provided on an identifier group basis; hence there will be no interference with test calls made in other identifier groups.

For additional references, please see

BTL Monograph 3147	ANI and its Application by D.H. Pennoyer
BSP Equip. Engr. Practices	AA388.096 Identifier Frame
" "	AA388.098 Outpulser Frame
" "	AA388.099 Trunk Frame
" "	AA388.100 Nbr. Network Frame
" "	AA388.102 OIT Test Frame
" "	AA388.103 Trouble Ticketer Frame
" "	AA388.104 Line Verification

TRAFFIC CONSIDERATIONS

Each central office in a building has a certain number of calls which will require ANI. The traffic department must determine the volume of these calls and estimate the amount of call carrying equipment that will be needed to handle them.

The identifier group is the basic large unit of ANI equipment in a building. Six 10,000 directory number offices may be served by one group. An identifier group has a capacity of 9,000 to 10,300 B.H. calls. Several of our buildings have more than six offices and most of the others have or will have more than 10,300 B.H. calls requiring ANI. Two identifier groups must therefore be provided in most of our buildings. The 36th Street Building will have three identifier groups.

A tentative association of offices and identifier groups was prepared by Traffic and submitted to the Chief Engineer. This list was checked for possible cable length and floor space restrictions and after a few changes returned to Traffic. Traffic was then ready and able to estimate the number of trunks and outpulsers required in each identifier group.

Let us take a look at the Broad Street Building, which contains four panel and one crossbar central offices. The panel offices are on the eighth floor and above and the crossbar office is on the third and fourth floors. Cabling limitations dictate that the crossbar office should not be in the same identifier group as the panel offices. Here is an estimate of the 1975 ANI busy hour calls originating in the panel offices:

Hanover 2	2540
Bowling Green 9	2600
Whitehall 3	2320
Whitehall 4	2520
Total	9980

As pointed out above, the capacity of an identifier group containing crossbar or panel offices without party lines is 10,300 busy hour attempts.

We can, therefore, serve the four panel offices in one identifier group. After 1975 there is a strong possibility that some panel offices will be replaced by the electronic central office.

Today many buildings have a number of offices served by common trunk groups. In Manhattan we have about 105 physical offices served by 58 trunk groups. In some cases it would be impossible or expensive to separate offices to provide separate trunk groups. We are therefore forced to consider offices served by the same trunk group as one unit for placement in identifier groups.

Which offices should be combined in each identifier group? To determine this we would have to estimate the ultimate ANI traffic (1970-75) originating in each office. This traffic would include present 1-1 and DDD, future DDD and person-to-person and all operator traffic from MR telephones.

The number of outpulsers in an identifier group depend on the number of calls to be handled, but there is no regular record of the number of calls from each office or over each trunk group to the 1-1 and DDD tandems. Accordingly the Division of Revenue point-to-point record was used to estimate the number of ANI calls originating in each office. This record was also used to estimate the number of trunks to the DDD tandems.

The Division of Revenue point-to-point record is taken every two years for determining the proper Division of Revenues on interstate calls between the 21 Bell System partners (the Long Lines Department and the associated companies). It is a five day count of messages taken during the month of August. Since the messages are multiplied by two it is commonly called a ten day count.

The 1956 count was a complete count and was summarized in a form that could readily be used for other purposes. (The 1958 count was not complete and the 1954 count was not in a readily usable form.) Of course this record has to be modified by many factors before we get ANI equipment attempts.

Let us take a theoretical example. For Digby 4 we will find the message rate station-to-station paid messages to be:

Area	Mess.
1-1	5000
914	4000
516	3500
203	2000
315	1000
717	500
Remainder	4000

This basic point-to-point count must be modified by a number of factors to get design period ANI attempts. These factors are based on the per cent that areas are dialable, the busy hour to day ratio, the charges required, the conversion of person-to-person to station-to-station, the change in number of main stations, the introduction of new central offices, the ten high days, the toll rate increase, the ratio of August calls to busy season calls and the ratio of messages to ANI equipment attempts. When trunks are considered the holding time must also be taken into account.

Here is a sample of the number of areas that were detailed. These areas may not now be dialable. In order to be dialable, an area must be arranged for two letter five number directory numbers or seven digits. (The 2-5 numbering plan). Now what do we have?

Area	Mess.	% Dialable	Dial Mess.
1-1	5000	100	5000
914	4000	100	4000
516	3500	100	3500
203	2000	100	2000
315	1000	50	500
717	500	0	0
Remainder	4000	50	2000
	Total		17000

We now have 10 day messages. This must be reduced to busy hour needs since all our equipment requirements are based on the busiest hour of the day. In our downtown Manhattan offices this is from 10 to 11 A.M. In uptown Manhattan an evening busy hour (7-8 or 8-9 P.M.) frequency has as many and sometimes even a few more calls than the morning busy hour.

The ratio of busy hour traffic also varies from office to office and the type of call. It varies from 16 per cent in some downtown offices to 10 per cent in northern Manhattan. In the Vesey 1-1 tandems it was 12 per cent.

The point-to-point record shows station paid messages, but all except the 1-1 calls were operator handled. Even though the calling subscriber pays for the call, he may wish to know what the charges are immediately after he made it. Such calls are not dialable and hence will not use ANI equipment. They amount to approximately 10 per cent of the station-to-station traffic. On the other hand some calls that have in the past been placed as person-to-person calls will, when the subscriber has DDD available, be dialed. This conversation from person to station paid has been estimated at ten per cent. It has therefore been assumed that for these two types of call, the charges required and conversation of person to station paid will cancel each other.

Another factor to be considered is the change in main stations working in each office. For the design period, 1963, the basic data for the General Trunk Estimate was used. The actual main stations in service during August 1956 were obtained and the two figures used to obtain a factor. At times an office may have fewer main stations or more main stations than its normal capacity. Main station additions and trunking of main stations from one building to another will affect this factor.

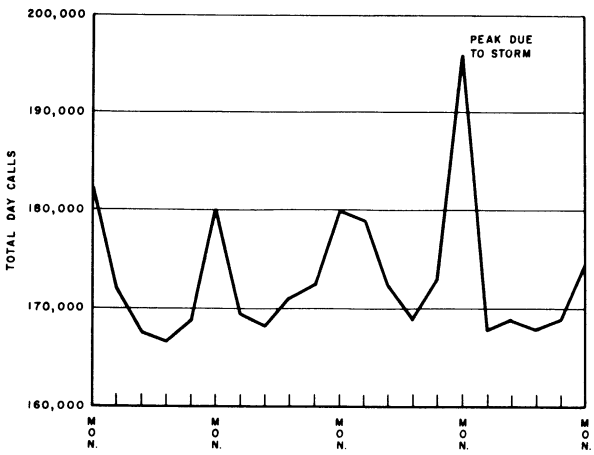
New offices are taken into account by comparing the number and type of main stations to be served by the new office with an existing office or offices in the building having similar main stations.

The point-to-point record was taken during August but our busiest time of year is between September and April. In the 1-1 tandems the busiest time is between September 15 and Christmas. This is the busy season. A 5 per cent upward adjustment was made for this factor.

Several times a year events occur which cause unusually high volumes of calls. These include snow or ice storms, hurricanes and special holidays. We know from experience with the 1-1 tandems that the calls on the ten highest days are about 10 per cent above the busy season average. (Please see the table, Figure 5.)

Since World War II a large number of people have settled in different parts of the United States. Children have left their home towns and families have separated. As a result the average number of toll calls per main station has increased which gives rise to still another factor.

Whether a subscriber has received a busy signal, a no answer, or has talked to the called party, ANI equipment will have been used on his call. We must arrive at a ratio of messages to ANI equipment attempts. Relying on experience



FOUR TYPICAL WEEKS OF 1-1 TANDEM TRAFFIC ON BUSINESS DAYS - THE STORM OCCURED ON A SUNDAY NIGHT

FIGURE 5

with our 1-1 tandems and the #5 crossbar office, a factor was determined.

The last factor to be considered is the increase in calls between 1956 and 1963. Toll traffic has been increasing an average of 5 per cent a year for many years and no variance is expected in the near future.

Now let us take the 1700 ten day messages of Digby 4 and modify them:

	Digby 4	New Unit
10 day messages	17000	
1 day message	1700	
Busy hour messages (14%)	230	
Charges requested (-10%)	210	
Person converted to station (10%)	230	
Main station increase (.95)	220	
New Unit $\left(\left(\frac{3000\ MS-New}{9000\ MS-Dig.4}\right) \times 220\right)$		70
10 high days (10%)	240	80
Toll call rate increase (1%)	240	80
Ratio of August to B.S. (10%)	260	90
Ratio mess. to att. (1.6)	420	140
1963 attempts (1.40)	588	196

Now that we have the number of ANI attempts for the disign period the number of outpulsers required can be determined.

Our theoretical identifier group will have:

	ANI Attempts
Digby 4	588
New Unit	196
Total	784

Checking the outpulser capacity table we find that we need two outpulsers to handle the traffic.

Outpulser Capacity

Number of Outpulsers	Panel, X-B	Panel Pty.
1	700	600
2	2100	1800
3	3600	3100
4	5200	4500
5	6800	5900
6	8500	7400
7	10300	9000

There are four types of trunks: panel PCI, panel MF, XB PCI, XB MF. An identifier group may have all four types or just the two panel or XB types. If any office in the identifier group has party numbers, all trunks in the identifier group must be arranged for party operation. PCI trunks are used for 1-1 dialing to northern New Jersey via the Vesey tandems. MF trunks are used for calls to all parts of the country via the new DDD tandems.

Since ANI would be used initially only on subscriber dialed toll calls and since these calls are presently either 1-1 or DDD calls, the Traffic trunk estimate was based on the present in service or design trunk estimates of 1-1 and DDD trunks. There will be about 112 trunk groups from Manhattan offices to the 1-1 and DDD tandems for subscriber dialed traffic. Of these, 95 are in service today, the remaining 17 will be put in service when the Bronx CAMA cuts over. (DDD for zones 2 and 3 Manhattan - except 79th Street).

Since requirements through the 1962-3 busy season will have to be met the present trunks had to be increased. The CCS were increased 5,5, 6 and 7 per cent a year for 1959, 1960, 1961 and 1962. Trunks for new units had to be estimated differently, but since the General Trunk Estimate already takes care of trunks to 1-1 and the DDD tandems, the ANI trunks are easily determined.

Next let us take a look at the trunk requirements. We need two types of trunks, crossbar PCI and crossbar MF. Since the PCI trunks are used for calls to the 1-1 tandems and since these tandems have been in existence for a number of years, we will ignore the PCI trunks. We start again with the point-to-point record. Since there is no point-to-point record for the new unit we must make an assumption. We will assume that the ANI attempts are proportional. It will again be necessary to convert from 1956 ten day messages to 1963 messages. We must use message holding times whereas with attempts we would use attempt holding times. We know that on message unit calls, the attempt holding time is about 160 to 170 seconds, on calls to New Jersey (1-1 dialing) it is about 230 seconds, and the greater the distance of the call the longer the holding time.

Taking our theoretical example:

Dialable B.H. Attempts (1963)

	Digby 4			New Unit		
Area	Att.	H.T.	C.C.S.	Att.	H.T.	C.C.S.
914	140	230	320	46	230	106
516	120	230	276	40	230	92
203	65	250	163	22	250	55
315	20	270	54	7	270	19
717	-	-	-	-	-	-
Remain	65	450	293	22	450	99
			1106			371

We now have the C.C.S. (call hundred seconds) for each office. Assuming that each office has its own trunk group and since all the C.C.S. will be routed to the DDD tandem, we would now look up the number of trunks required on the crossbar graded multiple trunk capacity table. A portion of this table is shown here:

Trunks per Group	C.C.S.
17	320
18	346
19	373
20	399
44	1082
45	1112
46	1142

We can see that we need 45 trunks for Digby 4 and 19 for the new unit. This makes a total of 64 trunks of the MF crossbar type required for traffic. We must add 5 per cent space for maintenance and administration, bringing the requirement up to 67. Since ANI trunks should, for the sake of economy, be provided in complete subgroups of 13, 78 trunks will be provided.

We have, of course, only mentioned the major concerns of the Traffic Department in connection with ANI. Many other details must be looked into, such as traffic registers, tandem office requirements and others.

Then again, once the equipment is installed, the traffic forces must continually keep an eye on ANI. Once the first job is installed the Traffic Department will be watching to see that sufficient equipment has been installed to handle the traffic offered. Register readings will be collected to determine the number of calls handled, and the provision of outpulsers will be checked. Trunk groups will be serviced - trunks added or removed depending upon the number of overflows received. These readings are taken weekly. When the number of overflows continually goes above the allowable, trunks are added, and when there are no overflows, trunks will be removed from the group.

Some offices such as West #4 will have Traffic Usage Recorder readings. These will show, after processing, the number of C.C.S. handled by each trunk group. Tables are available to service on the basis of the C.C.S. carried or handled.

If we are using Table 10 - 10 delays per 1,000 calls and have a crossbar trunk group containing 50 trunks, we find we should add or remove trunks according to this table:

Trunk Adjustment Table (Measured Usage)

Add or remove Trks.	-6	-4	-2	0	2	4	6
C.C.S.	1112	1171	1231	1291	1352	1412	
Normal load C.C.S.				1261			

Of course when additional equipment such as new outpulsers, trunk frames or network frames is required, it is not a matter of weeks but of months before the new equipment can be installed.

The use of ANI will undoubtedly grow. The first major increase in its use will be for person-to-person dialing, which will be fully developed in the next few years. As the use of ANI grows, adjustments will be made in the quantities of equipment installed to take advantage of the experience gained from observing the initial installations.

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Manhattan Engineering

(Ed. Note - We tackled Pete and Walter's opus on a cold day and almost came up with a middle of July sunstroke with any number of unidentified spots before our eyes. Questions anyone? Call Peter or Walter.)

●TEST - LOGIC AND PERCEPTION
(Answers on page 38)

1. I went to bed at eight o'clock in the evening and set the alarm to get up at nine in the morning. How many hours of sleep would this allow me?
2. Do they have a fourth of July in England?
3. How many birthdays does the average man have?
4. Why can't a man living in Winston-Salem be buried west of the Mississippi?
5. Some months have thirty days; some have thirty-one; how many months have twenty-eight days?
6. If you had only one match and entered a room where there was a lamp, an oil heater and some kindling wood, which would you light first?
7. If a doctor gave you three pills and told you to take one every half hour, how long would they last?
8. A man builds a house with four sides to it, a rectangular structure, each side having a Southern exposure. A big bear comes wandering by. What color was the bear?
9. How far can a dog run into the woods?
10. What four words appear on every U.S. coin?
11. How many men on a baseball team? How many outs in each inning?
12. I have in my hand two U.S. coins which total 55¢. One is not a nickel. What are the two coins?
13. A farmer had 17 sheep; all but nine died. How many did he have left?
14. Divide 30 by 1/2; add 10. What's the answer?
15. Two men play checkers. They play five games and each man wins the same number of games. How do you figure that out?
16. Take two apples from three apples. What do you have?
17. The archaeologist who said he found a gold coin marked 46 B.C. was either lying or kidding. Why?
18. How many animals of each species did Moses take aboard the ark?
19. A woman gave a beggar fifty cents. The woman is the beggar's sister, but the beggar is not the woman's brother. Why?
20. Is it legal in North Carolina for a man to marry his widow's sister?

(Ed. Note - The above was brought in by Bill Elliott, who got it from a friend who got it from who knows where. We and a bunch of other wise guys didn't do too well with it - and some, who we thought wouldn't do too good, made us look like dopes.)