A DIGITAL ACCOUNT NUMBERING SYSTEM FOR ELECTRIC UTILITIES

by

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Introductory Summary

The rapidly expanding electrical economy of the United States demands that an electric utility maintain an up-to-date Engineering Load Study.

The gathering of pertinent information is one of the most time consuming portions of preparing such a load study. An important source of information is the meter reading books. Unfortunately, this information is not readily identifiable as to exact locations.

To facilitate an orderly assignment of account numbers, to make information more readily available, and to prepare for automatic machine operation, the following Digital Account Numbering System has been developed.

Essentially, the entire Digital Account Number consists of four parts and may be arranged as follows:

000	Substation Number
00	Line Number
00	Line Section Number
000	Consumer Number

Account Numbering Practices

An investigation of the various types of account numbering practices in general use by rural electric utilities indicates that there are two basic methods. These are the Grid method and the Route method. Each method has many variations and each has its advantages and disadvantages.

The Grid method generally is based upon township sections or a similar type of grid designation. The accounts within the section are numbered in a logical sequence consistant with the route of the distribution line within the township or grid. As new accounts are added, they are assigned an unused number in keeping with the previously assigned numbers. The basic account number will then consist of the following references:

1. General Area Number
2. Individual Grid Number
3. Consumer Number within the Grid Area

This method is also readily adaptable to small towns and communities since the account number actually becomes the street address.

The Route method follows the distribution line in a numerical progression of account numbers which are divided into convenient groups of consecutive numbers for ease in meter reading and billing. The basic account number will then consist of the following references:

1. Book Number
2. Consumer Number along the Distribution Lines

Of the two methods the Route method is more prevalent and is apparently the more easily adapted to the needs of system expansion and it is simpler to administer.

Requirements

It was apparent during this investigation that neither of these basic account numbering methods had been designed to allow the utmost use of the information contained in the meter reading records. Information concerning revenue, energy consumption, the total number of consumers in each class of service, and their distribution on the system along each one of the

supply lines is very important to the Engineering department in the preparation of load studies.

As an electrical distribution system grows, the number of consumers becomes larger and the consumption per consumer is increased. Thus, engineering studies become very important in planning for the economical expansion of facilities to provide adequate service. System improvements provided too late are expensive and do not offset the poor public relations experienced by the utility. System improvements that are provided too early may not be as expensive in original cost as those built too late, but the annual fixed costs may be excessive until the system load has increased enough to warrent these improvements.

An up-to-date System Load Study is one of the best guides a utility has to insure proper system expansion. One of the most time consuming items in any engineering study is the gathering of the basic information and data. Some of the most useful load study information is contained in the meter reading books. Therefore, any change in the account numbering system which will make this information more easily obtainable is of immense interest.

The further investigation into the requirements of a good account numbering system reveals that the

needs of the Accounting and the Engineering departments are very similar. Each department wishes to know the exact location, the power requirements, and the revenue produced for each account. In addition, the Accounting department requires that the system lend itself well to logical meter reading patterns and to automatic machine billing. The Engineering department must know the total number of consumers served by each transformer and their relationship to the various sources of supply. Adaptability to automatic machine sorting for statistical data gathering is also a necessity.

After considering these mutual requirements and other items, the following Digital Account Numbering System was developed to answer the needs of a rural electric utility.

Method of Design

The first major step in developing any Account Numbering System is to secure an up-to-date distribution line map for each individual substation service area. A study of these individual maps will readily

reveal the major distribution lines and the general method of serving all of the consumers within this area.

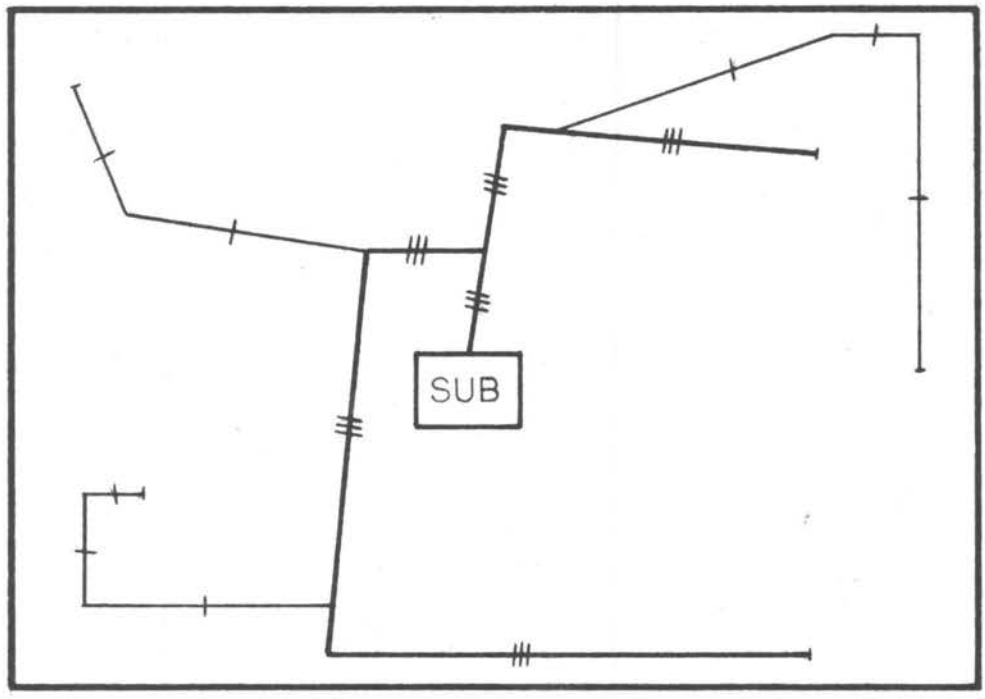


Figure 1: Substation Area Map

Substation Number

For service area identification each substation should be assigned an individual number. One identification number is adequate for each substation to

meet the requirements of the Engineering department. However, the Accounting department prefers that adequate provision be made for the allotment of several numbers which will be used to identify the various consumer meter books assigned to each substation service area.

Using present billing procedures the size of a meter book is generally restricted to approximately two or three hundred accounts. The number of accounts in each book is generally determined by:

1. The number of accounts that can be read in one day by a meter reader.
2. The number of accounts that can be easily checked in case of a billing error.

These substation numbering requirements can be met by one of two methods:

1. Assign a block of two digit numbers to each substation.

   The numerical size of the block will be determined by the total consumer potential of the substation.

Example: A substation with a potential of 1500 consumers would be assigned a numerical block of six numbers.

The total estimated potential consumers divided by the average number of consumer accounts per meter book (250) would be:

$$\frac{1500}{250} = 6 \text{ books}$$

1, 2, 3, 4, 5, and 6

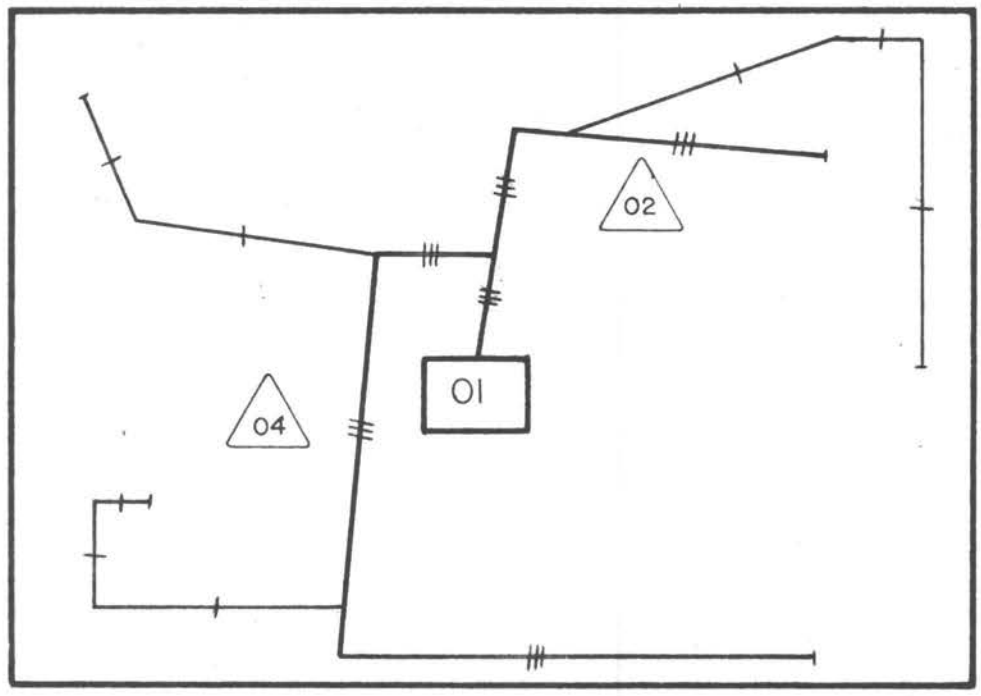


Figure 2: Two Digit Substation Number

2. Assign a three digit number to each substation.

The first two digits represent the substation number.

The third digit represents the meter book number.

Example: Substation "A" --

010, 011, 012, 013, to 019

This would allow a maximum of approximately 2500 to 3000 consumers.

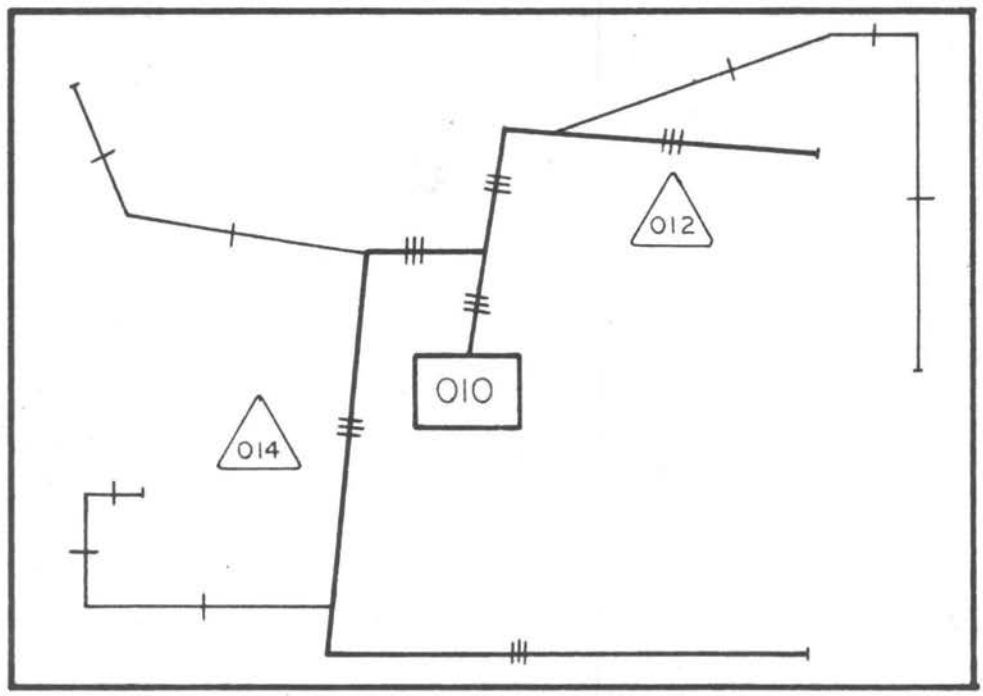


Figure 3: Three Digit Substation Number

Line Number

Having determined the type of substation area numbering method to be used, the next step will be to assign identifying numbers to the major distribution lines radiating from each substation. For ease in administration, identification, and utilization, it is suggested that a two digit number be used.

If the 100 azmuth method is used, the number 01 is assigned to North; number 25 to East; number 50 to South; number 75 to West; and number 100 to North again. Since only two digits are to be used, this will provide for a maximum of ninety-nine main distribution feeders and main taps to each substation.

Generally, the congestion of main distribution feeder lines leaving a substation does not permit these distribution lines to head directly toward their main load areas--due to easement, buildings, roads, terrain, timber, and other restrictions. So it is best to base the actual line number on the location of the line at some distance from the substation. One suggested method of assigning these line numbers is to draw a circle, with a radius of one or two miles,

around the substation as a center, and then, to assign the line number with reference to the line direction as it crosses this circle.

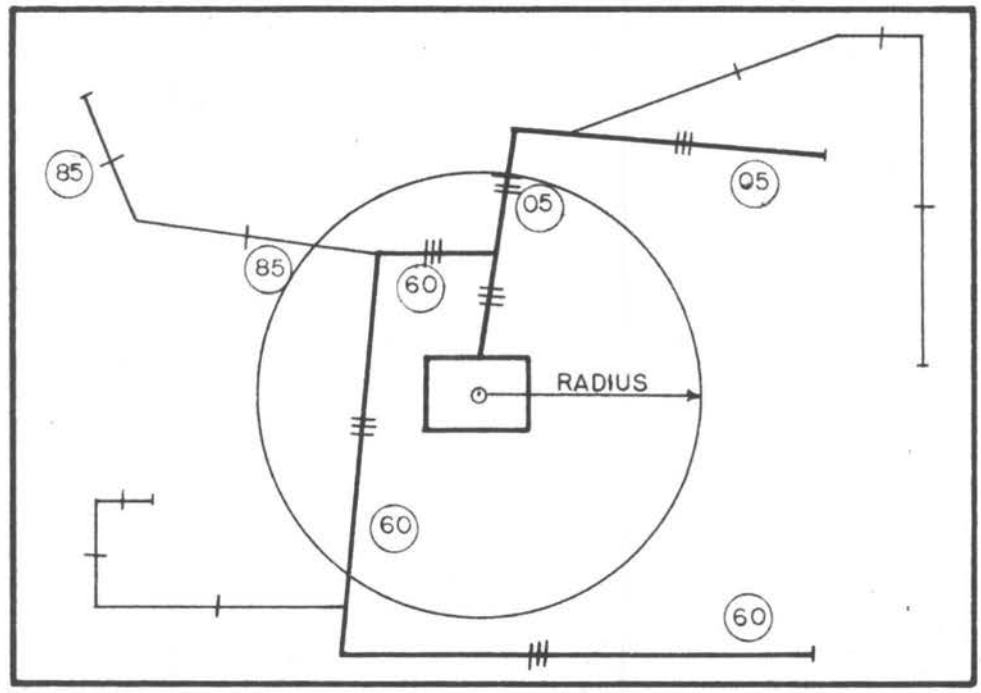


Figure 4: Distribution Line Numbers

In many cases the main distribution lines also have important tap lines which should also be given a separate line number. If the main distribution line numbers have been chosen carefully to allow for

future expansion, there will be adequate numbers available to assign adjacent numbers to these important tap lines.

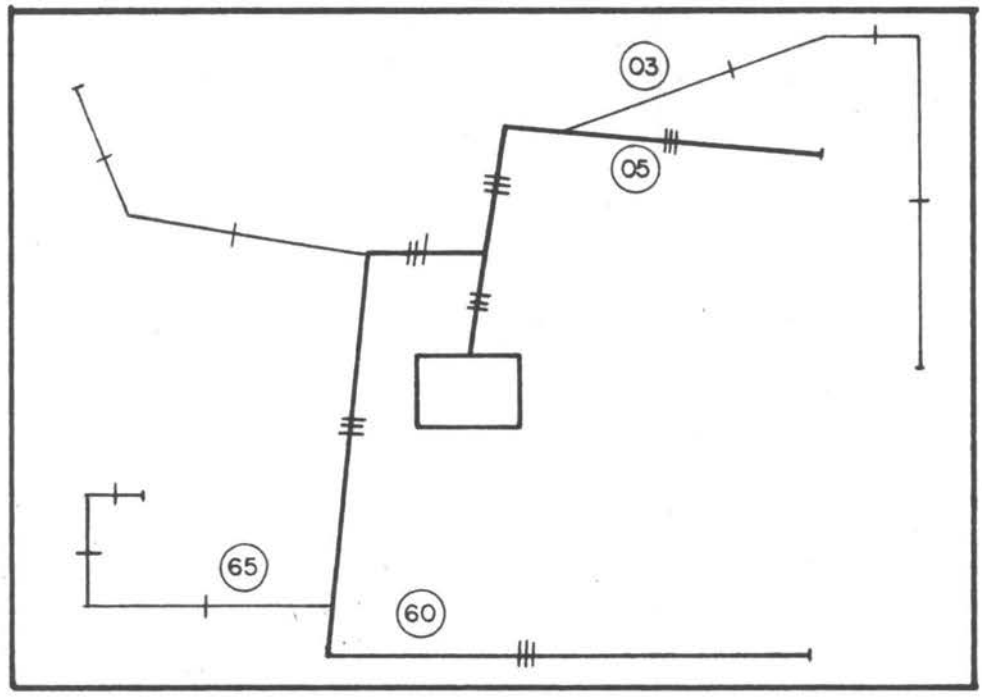


Figure 5: Important Tap Line Numbers

Section Numbers

After the main distribution lines and major tap lines have been assigned numbers, the next subdivision will be the sectionalizing of each separately numbered

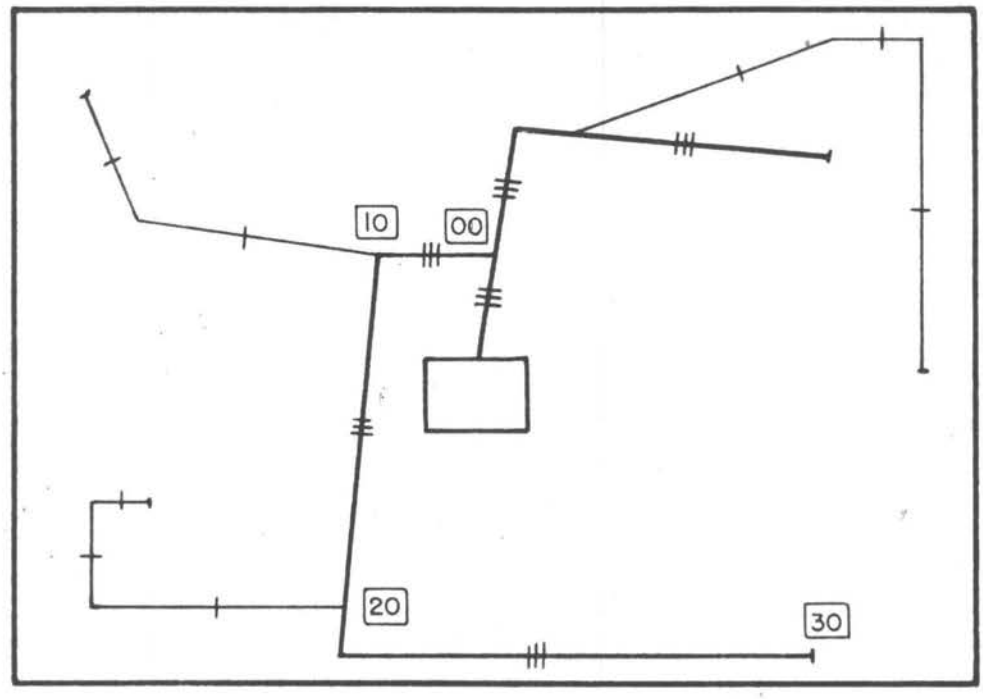
line. It is recommended that a two digit number be used. In the original assignment of section numbers, it is also recommended that there be at least a minimum of a five number separation between assigned numbers:

Example: 05, 10, 15, 20, 25

This separation will allow for the future load growth of new major taps and new concentrated consumer areas by merely assigning intermediate section numbers.

Section numbering points should be carefully chosen so that they will correspond to those section points used in an Engineering Load and Sectionalizing Study. A great deal of the value of this entire Digital Account Numbering System depends upon the coordination of these section points with the engineering studies.

Figure 6: Line Section Numbers



Consumer Numbers

After the assignment of the Substation, Line, and Section numbers, the final step will be to assign the individual consumer number. For adequate consumer growth a three digit number is used. This provides

for a maximum of 999 consumers in each line section. A consumer at the beginning of a section would be assigned the sequence 001; one at the center would be 500; while one at the very end would be 999.

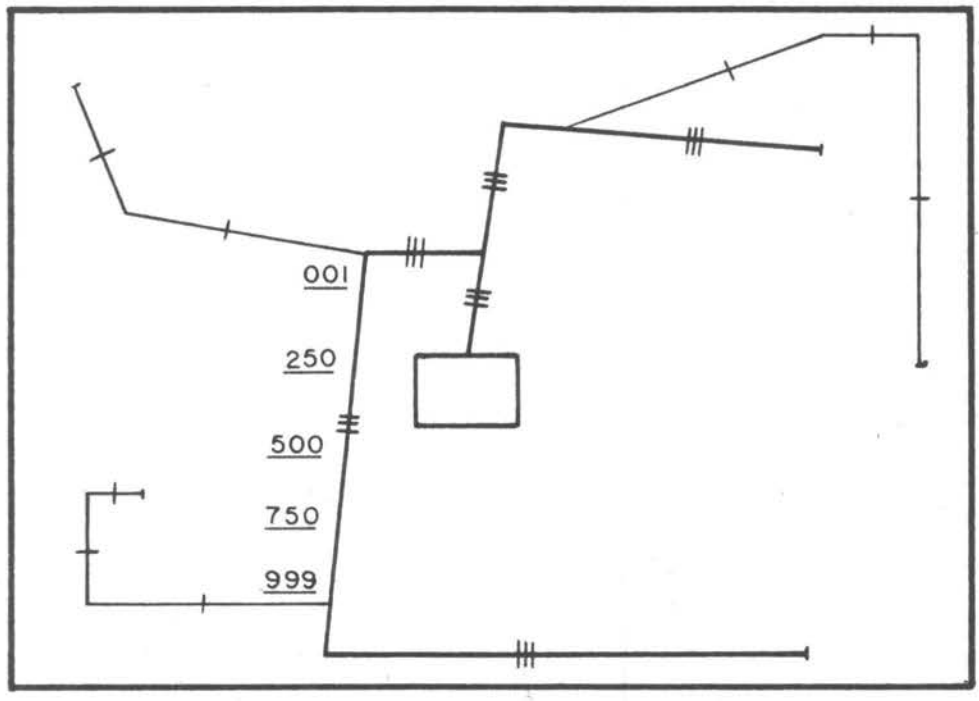


Figure 7: Consumer Numbers

The original assignment of consumer numbers should be made with a wide separation between numbers to allow for the addition of new consumers. In congested areas--such as suburban and city fringes--it is recommended

that the numbers be assigned at least five units apart.

Note that the assignment of each additional section number automatically makes available 999 more consumer numbers.

Results

Upon the completion of all of the above steps, the full Account Number is complete. It is composed of four parts:

1. Substation Number -- 00 or 000
2. Line Number -- 00
3. Section Number -- 00
4. Consumer Number -- 000

The Account Number of the consumer located at point "X", on Figure 8, would be:

04-60-20-750

or

014-60-20-750

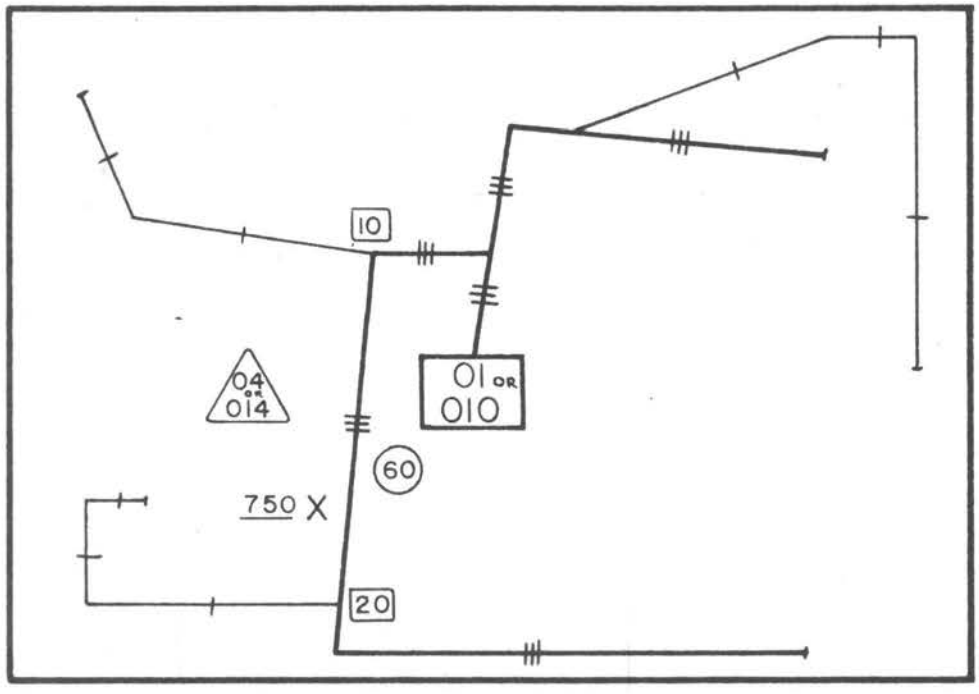


Figure 8: Composite Substation Service Area Numbering

This full Account Number will generally be arranged in one of the following three methods:

1. 000-00-00-000

2. 000
   00-00
   000

3. 000
   00
   00
   000

This composite Digital Account Number has --

definately identified the consumer;
grouped the consumer by substations;
arranged the consumer in a logical sequence;
definately located the consumer; and
is easily adaptable to automatic machine operation.

In addition, it has answered the operational requirements of both the Accounting and the Engineering departments in such a manner that it makes all of the necessary information available to each. Yet, it is not unwieldy nor impractical. It follows a logical development and is therefore easy to implement and the education of using personnel requires a minimum of time.

Conclusion

A well designed Digital Account Numbering System is well worth the expense of designing and installing. It produces the required results previously enumerated in a consumer inventory which often reveals additional benefits.

A Digital Account Numbering System is an important first step in the direction of automatic machine operation in both the billing and information fields. At the present high cost of labor and with even higher costs expected in the future, automation will not only save time and money but also allow an organization to utilize its labor force much more efficiently.

History of Development

The Digital Account Numbering System described is the direct result of a comprehensive Engineering System Study prepared for Consumers Power, Inc., Corvallis, Oregon, and completed in 1956.

This rural utility is composed of eleven individual substations serving approximately 5000 consumers

scattered along almost 1500 miles of distribution line in a 6600 square mile service area. This service area includes areas along the Pacific Ocean, in the Coast Range, through the Willamette Valley, and in the western slopes of the Cascade Mountains. The only factor in common throughout the entire area is that each consumer must be supplied electricity adequately and economically, and each rural consumer also expects the same continuity of service that his counterpart in an urban residencial area receives.

The System Study when completed was actually a compilation of several load and sectionalizing studies for each of the individual substation areas plus a master plan for intergrating all of the individual plans together.

This final report took over two years to complete. Much of this time was spent in gathering the necessary information and data to make an engineering report. One fact was outstanding during this entire period--the standard Route account numbering method then in use was inadequate. Some type of account numbering that was more easily understood and could be more easily applied had to be developed. This Digital method is the result of those observations.

Recently, there was cause to prepare a basic load study for a new proposed substation area. One man, who had worked on the comprehensive System Study gathered information from the meter books arranged under the previously used Route method of account numbering. Another man who had not worked on the System Study gathered the same information from the meter books as presently arranged under the Digital system. The first man required seven and one-half hours to obtain the same results that the second man had secured in two and one-fourth hours. Both men were equally skilled and both obtained their information by hand work.

At the present time the standard monthly billing is being converted to cycle billing. The shift is gradual and will be accomplished within six months without the necessity of any additional personnel or undue interruptions in billing. Under the Route method previously used the change would have required a considerably longer time to implement and quite extensive record shifting.

Previously, Consumer Account Numbering has been considered as strictly an Accounting department function. However, todays very rapidly expanding electric economy has made a properly designed and executed Consumer Account Numbering System an important and useful engineering tool.

Figure 9: Meter Slip

METER READINGS -- CONSUMERS POWER, INC.

DATE	D	INDEX	CONS	AMOUNT	DATE	D	INDEX	CONS	AMOUNT
DEC.					DEC.				
NOV.					NOV.				
OCT.					OCT.				
SEPT.					SEPT.				
AUG.					AUG.				
JULY					JULY				
JUNE					JUNE				
MAY					MAY				
APRIL					APRIL		7733	627	1005
MAR.					MAR.		7106	490	903
FEB.					FEB.		6616	589	977
JAN.					JAN.		6027	712	1069
					1958		5315		

CUT IN DATE	CUT IN C. O. NO.	CUT OUT DATE	CUT OUT O. O. NO.	METER CHANGE ORDER	METER NUMBER	AMPS SIZE	VOLTS
7/47	177				2824	15	240

MINIMUM CHARGE	RATE	MISCELLANEOUS BILLING INFORMATION	CLASS OF SERVICE
$1.00	A	C-734	Farm

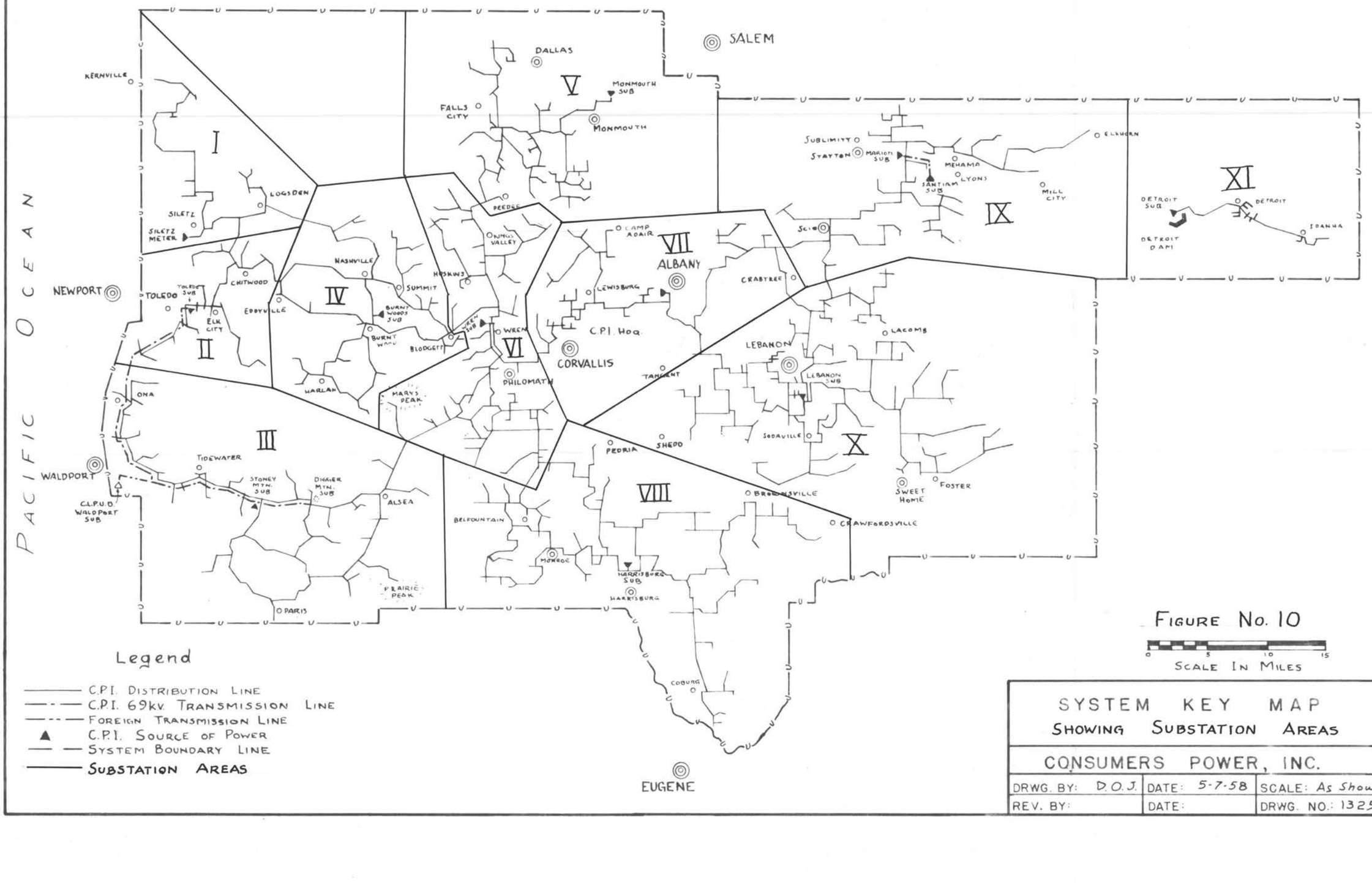
LOCATION OF METER: House

NAME, ADDRESS AND ACCOUNT NO.

Carl Toberer
Kernville, Oregon

20
04-40
700

FILE NO. E1007



Legend

- C.P.I. Distribution Line
- C.P.I. 69kv. Transmission Line
- Foreign Transmission Line
- ▲ C.P.I. Source of Power
- System Boundary Line
- Substation Areas

Figure No. 10

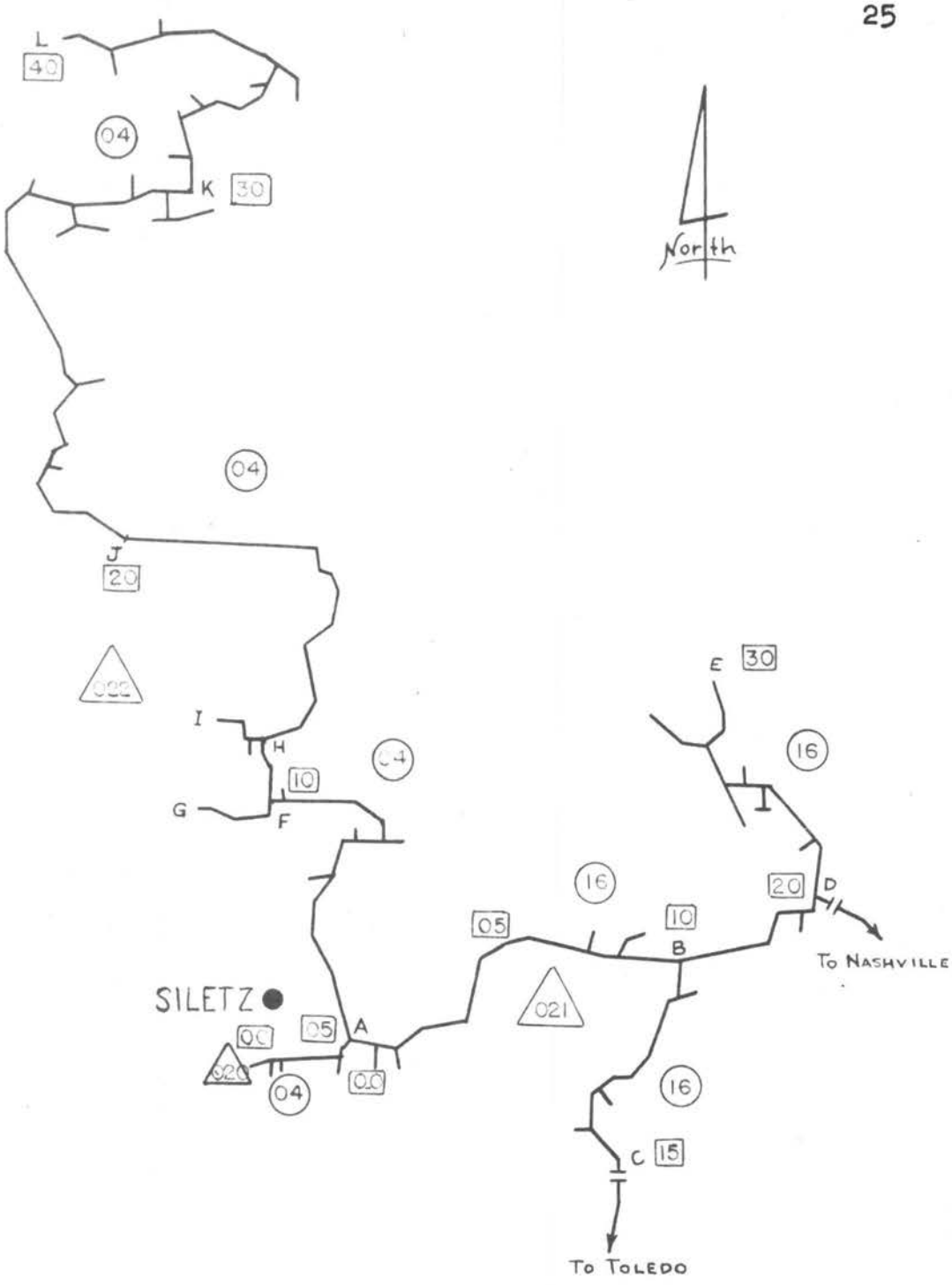
0 5 10 15

Scale In Miles

System Key Map
Showing Substation Areas

Consumers Power, Inc.

DRWG. BY: D.O.J.	DATE: 5-7-58	SCALE: As Shown
REV. BY:	DATE:	DRWG. NO.: 1325



SILETZ METER
Substation Area Map

CONSUMERS POWER, INC.

DRWG. BY: D. Johnson	DATE: May 8, 1958
SCALE: 1" = 2 MILES	DRWG. NO: 1284

Figure 11