RINGING GENERATOR CALCULATIONS
EQUIPMENT DESIGN REQUIREMENTS
POWER SYSTEMS

1. GENERAL

Scope

1.01 This specification, together with the supplementary information listed herein, covers general information on the methods of determining the capacity of ringing generators and replaces the information covered in J86721.

Description

1.02 The ringing drain calculations covered herein are based on certain assumptions and the availability of traffic data as outlined below. (See Note A)

(1) The ringing generators will be subject to 20 per cent or more overload during one out of 100 calls in the busy hour. (It is felt that overloads of this magnitude for short duration will not result in sufficient loss of voltage to produce ringer reaction.)

(2) On machine ringing calls, the terminating traffic is uniformly distributed among the available brushes if more than one is provided.

(3) The busy-hour terminating calls on each traffic item (ring 1, ring 2, code ringing, manual ringing, etc.) can be determined or are available from traffic data previously taken. (See Note B.)

(4) The per cent of party-line fill and the per cent of extensions is known for each traffic item. (See Note C.)

(5) The average answering time for each traffic item is known. If this cannot be determined, assume the values outlined under Procedure I, Note 2.

(6) The type of ringers for each class of service is known. (See Note D.)

(7) Toll ringing drains are not included in these calculations and are covered in other information as shown below, under Supplementary Information.

Notes:

A. All the data required may not be available from traffic data regularly taken. In this case the best estimates will have to be used. Suggestions for estimating are outlined in the following notes. It can be readily seen from the calculations and illustrative examples how each factor affects the over-all result (Illustrative Example No. 4 shows the high drains imposed by code ringing) and proper weighting should be given to each item that has to be estimated.

B. In some cases the ring-1 busy-hour terminating calls cannot be allocated between individual and 4-party semiselective lines. In this case assume that the ring-1 calls required for 4-party lines are the same as the ring-2 calls (which can be determined). Then the ring-1 calls applicable to individual lines equals the total ring-1 calls minus the ring-1 calls for 4-party lines (equal to the ring-2 calls). Similarly, for 8-party semiselective lines, if the total busy-hour terminating calls are known, assume that one half requires ring 1 and one half, ring 2, and subtract these ring-1 calls from the total ring-1 calls to determine the number to be used for individual lines.

C. If the per cent of party-line fill is not known, it is suggested that 100 per cent fill be assumed. This will result in the maximum ringing drain. In some areas the number of stations on 5-code, 10-party service is limited to six or eight. In these cases, of course, the party-line fill would be 60 per cent or 80 per cent respectively as a maximum. If the per cent of extensions for a particular office is not known, the average for the area might be used, or an estimated per cent will have to be used.

D. The type of ringers for each class of service is important due to the much higher drain of low-impedance ringers. New offices will probably have practically all high-impedance ringers. Old offices may be expected to have a mixture of low- and high-impedance ringers. The over-all nationwide picture is approximately 75 per cent high-impedance ringers. If the percentage is not known for a particular office, it is suggested that two sets of calculations be made, one assuming 100 per cent low impedance and the second assuming 100 per cent high impedance. The results of the two calculations may then be compared to determine the limits within which the office falls. Code ringing lines

require high-impedance ringers in all cases. The 4-party full-selective and 8-party semiselective lines are equipped with tube sets in most later type offices but may have relay sets in older offices.

2. SUPPLEMENTARY INFORMATION

802-000-000 - Power Systems Index
AA128.006 - List of General Equipment Requirements Sections
PEM35 - Capacity of Ringing Machines for Toll Installations

3. DRAWINGS

ED-80394-01 - Characteristic Curve - PBX Ringing Drains

4. RINGING DRAIN CALCULATIONS

General

4.01 The terminating traffic in local central offices is usually rung by the machine ringing interrupters furnished with the ringing machines. Fig. 1 (attached) illustrates some of the types of machine ringing that are available. Other types of code ringing are shown on the circuits of the various ringing power plants.

4.02 In individual and 2-party service, if the connectors in step by step, final frames in panel, and line link frames in crossbar offices are divided equally as far as possible among the three brushes, an approach to an ideal distribution of load will be achieved since no overlapping exists. In 4-party selective superimposed ringing this same condition can be obtained providing the terminating equipment is divided among the three positive and three negative brushes. (No. 5 crossbar has only one positive brush and in some of the smaller offices such as 355A dial there may be only one negative and one positive brush.) In 4-party semiselective service there may be one, two, or three brushes of ring 2 depending on the power plant furnished.

Procedures

4.03 The procedure of calculating the total ringing drain consists of three general steps.

(a) Calculating the average number of simultaneous calls (for the assumed "answer" interval) for each traffic item having a different drain per call.

(b) Calculating from (a), the average ringing drain for each traffic item.

(c) Combining the results of (b), by means of a simplified statistical approximation, in order to determine the "rating" of the ringing generator.

These steps are outlined below and it is recommended that they be made in the tabular form as shown.

PROCEDURE I

Preliminary Calculations for Each Traffic Item

Note: The results thus obtained for each traffic item are then combined statistically as shown under Procedure II.

Step		Source
(1)	No. of Busy-hour Terminating Calls	Traffic Data (Note 1)
(2)	(A+D)/3600	(Note 2)
(3)	Average No. of Simultaneous Busy-hour Calls	(1) x (2)
(4)	Brush Factor	Ringing Code Table (Note 3)
(5)	Average No. of Simultaneous Busy-hour Calls (Weighted by Brush Factor)	(3) x (4)
(6)	Average Ringing Drain per Call	(Note 4)
(7)	Average Ringing Drain	(5) x (6)
(8)	Additional Computation Required for Combination of Drains	(6) x (7)

Notes

1. On new jobs, this figure may be included in the fundamental traffic data, if not, it should be estimated in consultation with the traffic engineer. On additions, this information can be obtained by the traffic engineer from certain traffic registers, depending upon the type of system.

2. "A" is the average "answer" time in seconds, including "don't answers." This information can be obtained from service-observing records or must be estimated. The following estimates are suggested.

Class of Service	Answer Time
Business	10 seconds
Residential	20 seconds
Combined Business & Residential	15 seconds
Code Ringing	25 seconds

"D" is the average waiting time for first closure of ringing current. Values are:

Type of Ringing	Average Delay (6-second Cycle)
Ring 1 Not Using "Pick-up"	1.3 seconds
Ring 1 Using "Pick-up" (for example 8-party Semiselective)	3.0 seconds
Ring 2	3.0 seconds
Code	3.0 seconds
Manual (Continuous)	0.0 seconds

3. The brush factor for each traffic item is determined from the proper ringing code table by selecting that portion of the ringing cycle in which the greatest number of traffic items is drawing current from the ringing generator. The brush factor to be used for each traffic item except manual ringing (see Note below) is then the number of brushes closed for that item during this interval, divided by the total number of brushes available for that item.

Note: Continuously supplied manual ringing does not have any brush factor as the term applies to machine ringing. However, the ringing habits of operators result in a brush loading factor of .40 which may then be used as the brush factor for this type of ringing.

To illustrate refer to Fig. 1, Table E as used for ac-dc ringing in No. 5 crossbar offices.

It is assumed that ring-1 calls are equally distributed over the three CODE-1 brushes; ring-2 calls use the CODE-2 brush; code calls are equally distributed over all code brushes except CODE 1 GEN BR2, and CODE 1 GEN BR3. It is obvious that the heaviest drain occurs during the first second of the 6-second cycle, under the assumptions given above. The brush factors then are:

Type of Ring	Brushes Closed During Heavy-Drain Interval	Brushes Available	Brush Factor
Ring-1 (Code 1)	1	3	0.33
Ring-2 (Code 2)	1	1	1.0
Code	5	5	1.0

4. The average ringing drain per call for each traffic item except those involving "relay" ringers depends upon the average number of ringers rung on each call, multiplied by the drain per ringer. For relay ringers the average ringing drain per call depends upon the number of stations on the line (taking into consideration the percentage of party-line fill), multiplied by the drain per station. Thus, the average ringing drain per call takes into account:

(a) class of service
(b) the percentage of extension stations
(c) the per cent of party-line fill (in the case of party-line ringing other than full-selective)

The following formulae apply:

$$A = RNP\ (1 + E)$$

where, for relay ringers

A = Average ringing drain per call, in milliamperes.
R = Drain per station, in milliamperes (See Table I below.)
N = Number of stations on the line, assuming 100 per cent party-line fill.
P = Actual per cent of party-line fill, expressed as a fraction.
E = Per cent of extension stations, expressed as a fraction.

or, for semiselective and code ringing other than relay

A = Average ringing drain per call in milliamperes.
R = Drain per ringer, in milliamperes (See Table I below).
N = Number of ringers actually rung per call, bearing in mind the type of party line involved, and assuming 100 per cent party-line fill.
P = Actual per cent of party-line fill, expressed as a fraction.
E = Per cent of extension stations, expressed as a fraction.

It is suggested that, if the per cent of party-line fill is not known, 100 per cent fill be assumed.

For individual or full-selective ringing, N is unity and P does not apply, so the formula above reduces to:

$$A = R\ (1 + E)$$

where the symbols are as defined for semiselective ringing other than relay.

The drain per ringer or per station may be read from the Table below.

TABLE I

Type of Ringer	Drain per Ringer*
High Impedance	10 ma
Low Impedance	17 ma
Tube	6 ma
Type of Ringer	**Drain per Station***
Relay	12 ma

* For PBX ringers supplied from the central office generator, multiply the drain values given by 1.25 to allow for voltage differences. This same figure should be used for toll drains.

PROCEDURE II

Combination of Ringing Drains From Procedure I

Note: The steps shown below combine the drains for the various traffic items, calculated by means of Procedure I, in order to determine the normal-load rating of the ringing generator which is required to supply these drains.

Step	Description
(9)	Add the average ringing drains (Step (7) of Procedure I) for all of the traffic items.
(10)	Square the result of Step (9), above.
(11)	Add the additional computations (Step (8) of Procedure I) for all of the various traffic items.
(12)	Divide the results of Step (10) above by the results of Step (11) above.
(13)	Entering the nomogram ringing drain calculation, Fig. 2, locate the results of Step (11) on the scale, "Results of Step (11)," locate the results of Step (12) on the scale, "Results of Step (12)," place a straight edge on the two points thus determined, and where the straight edge crosses the "Generator Rating" scale, read the rating of the generator required.

Notes

1. For very large offices, the rating of the generator obtained in Step (13) above should be compared with the total average ringing drain found in Step (9) above. If the rating of the generator is less than the total average ringing drain, the total average ringing drain should be taken as the rating of the generator.
2. For very small offices, the rating of the generator obtained in Step (13) above should be compared with the value of Step (6) of Procedure I for each traffic item. If the rating of the generator is less than the value of Step (6) of Procedure I for any traffic item, the largest value of Step (6) of Procedure I should be taken as the rating of the generator.

5. ILLUSTRATIVE EXAMPLES

General

5.01 The following examples illustrate the method of calculating ringing generator drains. The examples have been worked out for varying degrees of complexity and illustrate the flexibility of the method. All calculations made with slide rule.

5.02 The main features of each example are outlined below for ready reference.

Examples

1. 18,300 busy-hour calls, all high-impedance ringers, 3-brush distribution, short answering time. Generator rating 255 ma.
2. 24,000 busy-hour calls, 70 per cent low-impedance ringers, 30 per cent high-impedance ringers, 3-brush distribution, short answering time. Generator rating 475 ma.
3. 14,540 busy-hour calls, high- and low-impedance ringers, extension stations, ring 1 and ring 2 and manual ringing, part 3-brush and part 1-brush distribution, short answering time. Generator rating 490 ma.
4. 2000 busy-hour calls, 355A dial office, all high-impedance ringers, extension stations, individual and code ringing, longer answering time especially for code ringing, part 2-brush and part 1-brush distribution. Generator rating 220 ma. Illustrates the high drain for code ringing.
5. 23,500 busy-hour calls, No. 5 crossbar, high- and low-impedance ringers, extension stations, individual, 4-party, 8-party, and code ringing, longer answering time especially for code ringing, part 3-brush and part 1-brush distribution, double calculations for two parts of ringing cycle to determine point of maximum drain. Generator rating 900 ma. Compare with example No. 2.
6. 50,000 busy-hour calls, all high-impedance ringers, extension stations, part 3-brush and part 2-brush distribution, medium answering time. Generator rating 1000 ma.

   Note: The effect of the various components may be observed from Step (6) Average Ringing Drain per Call and Step (7) Average Ringing Drain in Procedure I for the examples illustrated.

ILLUSTRATIVE EXAMPLE NO. 1

Individual or 2-party Selective Ringing All Ringers the Same

Traffic Data

Total busy-hour terminating machine ring calls - 18,300
Average answering time - 10 seconds
All ringers are high-impedance (10 ma) ringers
No extension, party, or PBX ringing
All traffic is Ring 1, equally distributed over three brushes
See Fig. 1, Table A

Calculation of Constants

Delay for Ring 1 = 1.3 seconds (Note 2 of Procedure I)
(A+D)/3600 = (10 + 1.3)/3600 = .00314
Brush Factor = 1/3 = 0.33

Procedure I

Steps	Source	
(1) No. of Busy-hour Terminating Calls		18300
(2) (A+D)/3600	(Note 2)	.00314
(3) Av. No. Simultaneous Busy-hour Calls	(1)x(2)	57.5
(4) Brush Factor	(Note 3)	.33
(5) Av. No. Simultaneous Busy-hour Calls (Weighted)	(3)x(4)	19
(6) Av. Ringing Drain per Call	(Note 4)	10
(7) Av. Ringing Drain	(5)x(6)	190
(8) Additional Computation	(6)x(7)	1900

Procedure II

Steps	Source		
(9) Total Av. Ringing Drain	Sum of (7)'s Procedure I	190	
(10) (Total Av. Ringing Drain)^2	$(9)^2$	36100	
(11) Total Additional Computations	Sum of (8)'s Procedure I	1900	
(12) (10)/(11)		19	
(13) Rating of Generator (from nomogram, Fig. 2)		255	ma

This example shows a low-ringing load as all ringers are hign impedance and answering time is a minimum.

ILLUSTRATIVE EXAMPLE NO. 2

Individual or 2-party Selective Ringing Two Types of Ringers

Traffic Data

Total busy-hour terminating machine ring calls - 24,000
Average answering time - 10 seconds
70 per cent of calls for low-impedance (17 ma) ringers = 16800 busy-hour calls
30 per cent of calls for high-impedance (10 ma) ringers = 7200 busy-hour calls
No extension, party or PBX ringing
All traffic is Ring 1, equally distributed over three brushes.
See Fig. 1, Table A.

Calculation of Constants

Delay for Ring 1 = 1.3 seconds (Note 2 of Procedure I)
A+D)/3600 = (10+1.3)/3600 = 0.00314
Brush Factor = 0.33

Procedure I

Steps	Source	17 ma	10 ma
(1) No. of Busy-hour Terminating Calls		16800	7200
(2) (A+D)/3600	(Note 2)	.00314	.00314
(3) Av. No. Simultaneous Busy-hour Calls	(1)x(2)	52.7	22.6
(4) Brush Factor	(Note 3)	.33	.33
(5) Av. No. Simultaneous Busy-hour Calls (Weighted)	(3) x(4)	17.4	7.4
(6) Av. Ringing Drain per Call	(Note 4)	17	10
(7) Av. Ringing Drain	(5)x(6)	296	74
(8) Additional Computation	(6)x(7)	5032	740

Procedure II

Steps	Source	
(9) Total Av. Ringing Drain	Sum of (7)'s Procedure I	370
(10) (Total Av. Ringing Drain)^2	$(9)^2$	136900
(11) Total Additional Computations	Sum of (8)'s Procedure I	5772
(12) (10)/(11)		23.7
(13) Rating of Generator (from nomogram, **Fig.** 2)		475 ma

This example shows a higher-ringing drain due to a large percentage of low-impedance ringers.

ILLUSTRATIVE EXAMPLE NO. 3

Individual, 2-party Selective, and 4-party Semiselective Ringing

Traffic Data

Total busy-hour terminating machine-ring calls - 14,540

Item	No. Busy-hour Terminating Calls
(A)	Ring 1 Low Impedance, Individual = 9600 (plus 20 per cent extension stations)
(B)	Ring 1 High Impedance, 4-party Semiselective = 2100 (plus 10 per cent extension stations)
(C)	Ring 2 High Impedance, 4-party Semiselective = 2100 (no extensions)
(D)	Manual Low Impedance, PBX = 740 (plus 10 per cent extension stations)

Ring-1 calls are equally distributed over three brushes.
Ring-2 calls all appear on one brush.
Manual supply is continuous.
Average answering time = 10 seconds.
75 per cent party-line fill.
See Fig. 1, Table E for ac-dc.

Calculation of Constants

Term		Ring 1	Ring 2	Manual
D	=	1.3	3.0	0
(A+D)/3600	=	0.00314	0.00361	.00278
Brush Factor	=	0.33	1.0	0.40

Average Ringing Drain per Call = A = RNP (1 + E)

(A) A = 17 x (1 + 20) = 20.4 ma
(B) A = 10 x 2 x .75 (1 + .10) = 16.5 ma
(C) A = 10 x 2 x .75 (1 + 0.0) = 15.0 ma
(D) A = (17 x 1.25) x (1 + .10) = 23.4 ma

Procedure I

Steps	Source	(A)	(B)	(C)	(D)
(1) No. of busy-hour Terminating Calls		9600	2100	2100	740
(2) (A+D)/3600	(Note 2)	.00314	.00314	.00361	.00278
(3) Av. No. Simultaneous Busy-hour Calls	(1)x(2)	30.1	6.6	7.6	2.1
(4) Brush Factor	(Note 3)	.33	.33	1.0	.40
(5) Av. No. Simultaneous Calls (Weighted)	(3)x(4)	9.9	2.2	7.6	.8
(6) Av. Ringing Drain per Call	(Note 4)	20.4	16.5	15.0	23.4
(7) Av. Ringing Drain	(5)x(6)	202	36	114	19
(8) Additional Computation	(6)x(7)	4121	594	1710	445

Procedure II

Steps	Source	
(9) Total Av. Ringing Drain	Sum of (7)'s Procedure I	371
(10) (Total Av. Ringing Drain)^2	(9)^2	137641
(11) Total Additional Computations	Sum of (8)'s Procedure I	6870
(12) (10)/(11)		20.0
(13) Rating of Generator (from nomogram, Fig. 2)		490 ma

This example shows the effect of single brush distribution, low-impedance ringers and extension stations.

ILLUSTRATIVE EXAMPLE NO. 4

Individual & Code Ringing - 355A Dial Office

Traffic Data

Total busy-hour terminating machine-ring calls - 2000

Item	No. Busy-hour Terminating Calls
(A)	Ring 1 High Impedance, Individual = 1800 (plus 10 per cent extension stations)
(B)	Code Ringing High Impedance = 200 (no extensions)

Ring-1 calls are equally distributed over two brushes.
Code-ringing lines have 80 per cent fill.
Average answering time = 15 seconds for ring 1.
Average answering time = 25 seconds for code ring.
See Fig. 1, Table F.

Calculation of Constants

Term	Ring 1	Code Ring
D	1.3	3
(A+D)/3600	0.00453	0.00778
Brush Factor	0.5	1

Average Ringing Drain per Call = A = RNP (1 + E)

(A) A = 10 x (1 + 0.1) = 11 ma
(B) A = 10 x 5 x 0.8 (1 + 0) = 40 ma

Procedure I

Steps	Source	(A)	(B)
(1) No. of Busy-hour Terminating Calls		1800	200
(2) (A+D)/3600	(Note 2)	.00453	.00778
(3) Av. No. Simultaneous Busy-hour Calls	(1)x(2)	8.15	1.556
(4) Brush Factor	(Note 3)	.5	1
(5) Av. No. Simultaneous Calls (Weighted)	(3)x(4)	5.075	1.556
(6) Av. Ringing Drain per Call	(Note 4)	11	40
(7) Av. Ringing Drain	(5)x(6)	44.825	62.24
(8) Additional Computation	(6)x(7)	493	2490

Procedure II

Steps	Source	
(9) Total Av. Ringing Drain	Sum of (7)'s Procedure I	107.1
(10) (Total Av. Ringing Drain)^2	(9)^2	11500
(11) Total Additional Computations	Sum of (8)'s Procedure I	2983
(12) (10)/(11)		3.86
(13) Rating of Generator (from nomogram, Fig. 2)		220 ma

Note: Following Procedure II for the 1800 individual busy-hour calls and 200-code ringing busy-hour calls separately gives the following:

Busy-hour Calls	Rating of Generator
1800 Individual	90 ma
200 Code	185 ma
Combined as Above	220 ma

This example shows the relatively high load imposed by code ringing with longer answering time and higher ringing drain per call compared to individual lines with more than one-brush distribution.

ILLUSTRATIVE EXAMPLE NO. 5

Individual, 4-party Full-selective, 8-party Semiselective and Code Ringing - No. 5 Crossbar

Traffic Data

Total busy-hour terminating machine-ring calls - 23,500

Item		No. Busy-hour Terminating Calls	
(A)	Ring 1 Low Impedance, Individual Assumed connected to Sup-	20,000	(plus 10 per cent extension stations)
(B)	Ring 1 Tube, 4-party Full Selective	2,000	(no extensions)
(C)	Ring 1 Tube, 8-party Semiselective	500	(no extensions)
(D)	Ring 2 Tube, 8-party Semiselective	500	(no extensions)
(E)	Code-Ringing High Impedance	500	

Ring-1 individual calls are equally distributed over three brushes.

Ring-1 4-party calls are equally distributed between Sup- and Sup+. As code 1+ is at end of cycle only the Sup- at 1000 busy-hour call distributed over three brushes are considered.

Ring-1 8-party calls are equally divided between Sup- and Sup+. As code 1+ is at end of cycle only busy-hour calls distributed over three brushes are considered.

Ring-2 as code 2- and code 2+ occur in the first part of the cycle 500 busy-hour calls with one-brush distribution are considered.

100 per cent party-line fill and 80 per cent code ringing-line fill.
Answering time 25 seconds for code ringing and 15 seconds for all other.
See Fig. 1, Table E for Sup.

Note: If the code ringing busy-hour calls are small, a check should be made for the last part of the cycle. In this case the following would be calculated.

Ring 1 Individual	20,000 Busy-hour calls	3-brush Distribution
Ring 1- 4-party	1,000 Busy-hour calls	3-brush Distribution
Ring 1+ 4-party	1,000 Busy-hour calls	1-brush Distribution
Ring 1+ 8-party	250 Busy-hour calls	1-brush Distribution

For this example this gives a lower figure as the code ringing load is a material factor.

ILLUSTRATIVE EXAMPLE NO. 5 - CONTD.

Calculation of Constants

Term	A	B	C	D	E
D	1.3	1.3	3	3	3
(A+D)/3600	0.00453	0.00453	0.005	0.005	0.00778
Brush Factor	0.33	0.33	0.33	1	1

Average Ringing Drain per Call = A = RNP (1 + E)

(A) A = 17 x (1 + 0.1) = 18.7
(B) A = 6 (1 + 0) = 6
(C) A = 6 x 2 (1 + 0) = 12
(D) A = 6 x 2 (1 + 0) = 12
(E) A = 10 x 5 x 0.8 (1 + 0) = 40

Procedure I

Steps	Source	(A)	(B)	(C)	(D)	(E)
(1) No. of Busy-hour Terminating Calls		20000	1000	250	500	500
(2) (A+D)/3600	(Note 2)	.00453	.00453	.005	.005	.00778
(3) Av. No. Simultaneous Busy-hour Calls	(1)x(2)	90.6	4.53	1.25	2.5	3.89
(4) Brush Factor	(Note 3)	.33	.33	.33	1	1
(5) Av. No. Simultaneous Calls (Weighted)	(3)x(4)	29.9	1.49	.412	2.5	3.89
(6) Av. Ringing Drain per Call	(Note 4)	18.7	6	12	12	40
(7) Av. Ringing Drain	(5)x(6)	560	8.9	4.9	30	155.6
(8) Additional Computation	(6)x(7)	10500	53.5	59	360	6220

Procedure II

Steps	Source	
(9) Total Av. Ringing Drain	Sum of (7)'s Procedure I	759.4
(10) (Total Av. Ringing Drain)^2	(9)^2	575000
(11) Total Additional Computations	Sum of (8)'s Procedure I	17192
(12) (10)/(11)		33.5
(13) Rating of Generator (from nomogram, Fig. 2)		900 ma

Note: The generator rating calculated for the end of the cycle as previously noted is 730 ma.

This example illustrates a more complex problem as part of the busy-hour calls are not included in the computations since they fall in a different part of the ringing cycle. Compare with Example No. 2 where 24,000 busy-hour calls require only 475 ma.

ILLUSTRATIVE EXAMPLE NO. 6

Individual, 2-party and 4-party Semiselective

Traffic Data

Total busy-hour terminating machine-ring calls - 50,000

Item		No. Busy-hour Terminating Call	
(A)	Ring 1 High Impedance, Individual and 2-party	40,000	(plus 10 per cent extensions)
(B)	Ring 1 High Impedance 4-party	5,000	(no extensions)
(C)	Ring 2 High Impedance 4-party	5,000	(no extensions)

Ring-1 calls are equally distributed over three brushes.
Ring-2 calls are equally distributed over two brushes.
70 per cent party-line fill.
15-second answering time.
See Fig. 1, Tables A and C.

Calculation of Constants

Term	A	B	C
D	1.3	1.3	3.
(A+D)/3600	0.00453	0.00453	0.005
Brush Factor	0.33	0.33	0.5

Average Ringing Drain per Call = A = RNP (1 + E)

(A) A = 10 x (1 + 0.1) = 11
(B) A = 10 x 2 x 0.7 (1 + 0) = 14
(C) A = 10 x 2 x 0.7 (1 + 0) = 14

Procedure I

Steps	Source	(A)	(B)	(C)
(1) No. of Busy-hour Terminating Calls		40000	5000	5000
(2) (A+D)/3600	(Note 2)	.00453	.00453	.005
(3) Av. No. Simultaneous Busy-hour Calls	(1)x(2)	181.2	22.65	25
(4) Brush Factor	(Note 3)	.33	.33	.5
(5) Av. No. Simultaneous Calls (Weighted)	(3)x(4)	59.8	7.45	12.5
(6) Av. Ringing Drain per Call	(Note 4)	11	14	14
(7) Av. Ringing Drain	(5)x(6)	657.8	104.3	175
(8) Additional Computation	(6)x(7)	7235.8	1464	2450

Procedure II

Steps	Source	
(9) Total Av. Ringing Drain	Sum of (7)'s Procedure I	937.1
(10) (Total Av. Ringing Drain)^2	(9)^2	877000
(11) Total Additional Computations	Sum of (8)'s Procedure I	11150
(12) (10)/(11)		78.7
(13) Rating of Generator (from nomogram, Fig. 2)		1000 ma

This example illustrates the requirements for a relatively high-ringing load with all high-impedance ringers and no code ringing. The one-ampere 804C ringing power plant with 2-brush distribution of ring 2 will just meet this load requirement.

6. MISCELLANEOUS DRAIN INFORMATION

Coin Control

6.01 In 803C ringing power plants the following 120-volt busy-hour coin-control calls can be carried in addition to the ringing load.

General Frame Size	Ringing Capacity	D-C Coin Capacity	Busy-hour Coin Calls
BY108	2 Amps	0.25 Amps	1500
BY109	4 Amps	0.38 Amps	3000
BY144	6 Amps	0.50 Amps	7000

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Attached: Figs. 1 and 2

6.02 The 120-volt coin-control supply covered in specification J86726 consists of metallic disc rectifiers with dry cell reserve. The rating of this equipment is covered in the specification.

6.03 The 130-volt coin-control supply for No. 5 crossbar is covered in specification J86428 and is rated at 10,000 busy-hour calls.

6.04 The rating of dry-cell battery supplies is covered in specification J86212.

TABLE A

SECONDS 0 1 2 3 4 5 6

RI BRI.	
RI BR2	
RI BR3	

MACH. RING. RI

TABLE B

SECONDS 0 1 2 3 4 5 6

R2 BRI	
R2 BR2	
R2 BR3	

MACH. RING. R2 - 3 BRUSH DISTR.

TABLE C

SECONDS 0 1 2 3 4 5 6

R2 BRI	
R2 BR2	

MACH. RING. R2 - 2 BRUSH DISTR.

TABLE D

SECONDS 0 1 2 3 4 5 6

SUP-BRI	
SUP-BR2	
SUP-BR3	
SUP+ BRI	
SUP+ BR2	
SUP+ BR3	

MACH. RING. SUP - & +, 3 BRUSH DISTR.

TABLE E

SECONDS 0 1 2 3 4 5 6

AC/DC OR SUP.	CODE 1 GEN. BRI
	CODE 1 GEN. BR2
	CODE 1 GEN. BR3
	CODE 2 GEN.
	CODE 3 GEN.
	CODE 4 GEN.
	CODE 5 GEN.
SUP. ONLY	CODE 1 +
	CODE 2 +

NO. 5 CROSSBAR

TABLE F

SECONDS 0 1 2 3 4 5 6

CODE 1	GEN. OR GRD.
CODE 2	
CODE 3	
CODE 4	
CODE 5	
CODE 1 GEN. BR2	

355A DIAL - 5 CODE TYPE A
2 BRUSH DISTR. OF CODE 1

TABLE G

SECONDS 0 1 2 3 4 5 6

CODE 1	GEN. OR GRD.
CODE 2	
CODE 3	
CODE 4	
CODE 5	
CODE 6	GRD.
CODE 7	
CODE 8	
CODE 9	
CODE 10	
RI & RI GRD.	
R2 GEN. & GRD.	
CODE 1 GEN. BR2 OR CODE 1 +	
CODE 1 GEN. BR3 OR CODE 1 -	

355A DIAL - 10 CODES TYPE A
3 BRUSH DISTR. OF CODE 1
FOR AC-DC

TABLE H

SECONDS 0 1 2 3 4 5 6

CODE 1	
CODE 2	
CODE 3	
CODE 4	
CODE 5	

SXS NO. 1 & 350A - 5 CODES TYPE D

TYPE OF RINGING	TABLE
INDIVIDUAL AND 2 PARTY SEL. AC/DC	A
4 PARTY SEMI-SEL. AC/DC	A & B OR A & C
4 PARTY FULL SEL. SUPERIMPOSED	D
NO. 5 CROSSBAR AC/DC OR SUPERIMPOSED	E
355A DIAL - 5 CODE-AC/DC	F
355A DIAL - 10 CODE-AC/DC OR SUPERIMPOSED	G
SXS NO. 1 AND 350A - 5 CODE TYPE D	H
8 PARTY SEMI-SEL.	CODES 1 & 2 GEN. OR GRD.

NOTE:
OTHER COMBINATIONS OF RINGING INTERRUPTIONS ARE SHOWN ON POWER RINGING CIRCUITS FOR THE VARIOUS RINGING PLANTS.

FIG. 1
TYPICAL MACHINE & CODE RINGING
INTERRUPTER TIMING

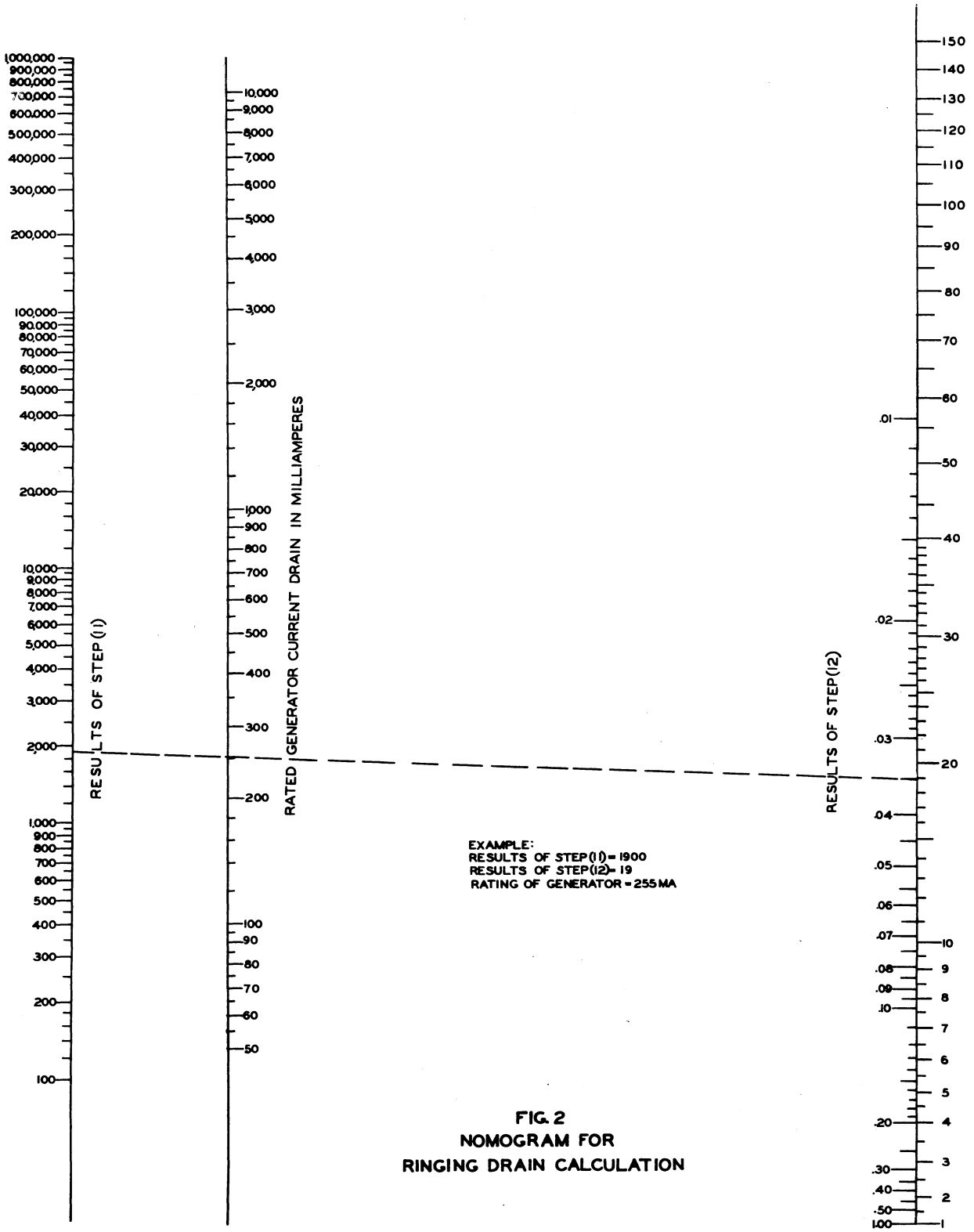

FIG. 2
NOMOGRAM FOR
RINGING DRAIN CALCULATION

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