TRUNK NETWORK DESIGN—FIRST ROUTE AND ALTERNATE ROUTE SELECTIONS—RULES

TRUNK ENGINEERING

NETWORK OPERATIONS METHODS

1. GENERAL

1.01 This section face sheet is issued to assign its 9-digit number to Traffic Facilities Practices

Division G, Section 3-e(2), September 1976.

This is part of the conversion of all Traffic Facilities Practices (TFPs) to the 9-digit Bell System Practices (BSPs) series as described in GL-77-05-262 and GL-77-11-200.

1.02 When this section is reissued, all references to TFP numbers will be changed to the appropriate 9-digit BSP numbers.

1.03 Recommendations for changes, additions, or deletions to this section should be forwarded on Form E-3973 as specified in Section 000-010-015.

1.04 TFP to BSP cross-reference information can be found in GL-77-11-200 and in Section 780-400-005.

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TRUNK FACILITIES
TRUNK NETWORK DESIGN
FIRST ROUTE AND ALTERNATE ROUTE SELECTION
RULES

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TRUNK FACILITIES

TRUNK NETWORK DESIGN

FIRST ROUTE AND ALTERNATE ROUTE SELECTION

RULES

1. GENERAL

1.01 This section describes the rules to be observed when routing traffic in hierarchical alternate routing networks of two or more levels.

1.02 When this section is reissued, the reason for reissue will be listed in this paragraph.

1.03 References in this section to methods, planning, data requirements, service levels, and equipment quantities are based on American Telephone and Telegraph Company recommendations.

1.04 The title for each figure includes a number(s) in parentheses which identifies the paragraph(s) in which the figure is referenced.

1.05 The rules described herein have two applications. They are the basis of the routing discipline described in Traffic Facilities Practices (TFP) Division G, Section 3-e(3) of this division which provides the logic for accumulating point-to-point loads for the purpose of identifying trunk group candidates, and they specify how traffic should be routed in a network in which trunk groups and homing arrangements are known. This latter application is discussed in TFP, Division G, Section 3-e(4).

1.06 The rules are designed to route traffic in a consistent manner, while providing for orderly network growth. Utilizing trunk groups and homing arrangements established in accordance with economic criteria, these rules permit achieving the objective of standardized system-wide routing, and carrying traffic at lower levels in the network on the fewest practicable number of links, while meeting service and cost objectives. The rules have been developed in recognition of the need for standardized routing which permits mechanization of routing functions.

1.07 The rules recommended in this section will provide satisfactory solutions to most network routing problems. However, local situations may appear to justify deviation from these rules. Where this is the case, proposed deviations should be discussed with AT&T.

1.08 There are 12 basic rules that govern the selection of first routes and alternate routes in the network design process. Some of the rules required for the 5-level North American network may have little application to 2-level networks serving metropolitan areas. A list of the rules and their general applicability is shown below:

RULE	APPLICABLE TO TWO-LEVEL	APPLICABLE TO MORE THAN TWO-LEVEL
1. Two Ladder Limit	X	X
2. Two-Ladder Direction	—	X
3. Multiple Switching Function	X	X
4. One-Level Limit	—	X
5. Switch Low	—	X
6. Traffic Grouping	X	X
7. Single Route	X	X
8. Load Accumulation Sequence	X	X
9. Two-Way Interdependency	X	X
10. Alternate Route Selection	X	X
11. One-Switch Alternate Route	X	X
12. Six-Digit Translation	—	X

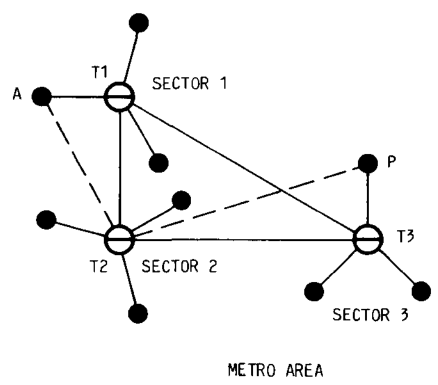
1.09 The definition and explanation of each of these rules are covered below. In most cases a sketch is used to illustrate the usual application. For clarity, only trunk groups significant to the rule illustration are shown on these sketches.

1.10 The rules discussed in this section assume that traffic between two points is comprised of two separate items, ie, traffic from A to Z is an identifiable item separate from the Z to A item. In the application of the rules, traffic from A to Z will, of course, always route over a path different from that used for the Z to A traffic if one-way trunk groups are employed. Where trunk groups are 2-way; however, the rules may result in the routing of both directions of traffic over the same path, or over separate paths, depending upon accumulated load volumes. Similarly, 2-way high-usage trunk groups have an alternate route at each terminal. These alternate routes are determined separately for each terminal as provided for in the rules which follow.

2. ROUTING AND ALTERNATE ROUTING RULES

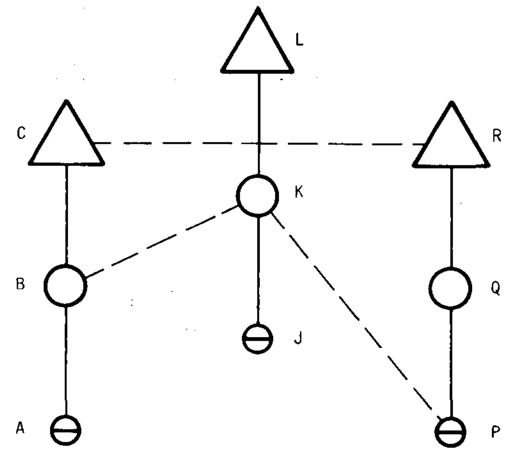
TWO-LADDER LIMIT RULE

2.01 ***Traffic must route only via the routing ladders of the originating and terminating switching systems.***



Sketch 1

2.02 As illustrated above in Sketch 1, traffic from end office A in sector 1 to end office P in sector 3 may route A → T1 → T3 → P. It is not permitted to route A → T2 → P since a third ladder is involved.



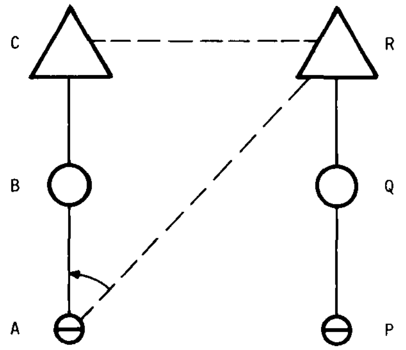
Sketch 2

2.03 As illustrated in Sketch 2, traffic from B to P may route B → C → R → Q → P. It is not permitted to route B → K → P since a third ladder is involved. This restriction applies to operator handled/serviced traffic as well as customer dialed traffic.

2.04 This rule, jointly with the Two-Ladder Direction Rule which follows, defines the permissible switching points for any given call and, additionally, the links which can be connected in tandem. These rules limit the number of available routes making it possible to engineer and manage the network. In multilevel networks, the rule also functions to help assure that transmission requirements will be met by limiting the number of links in tandem.

TWO-LADDER DIRECTION RULE

2.05 ***Switched traffic must only route toward the terminating location upward in direction on the originating ladder, and downward on the terminating ladder.***



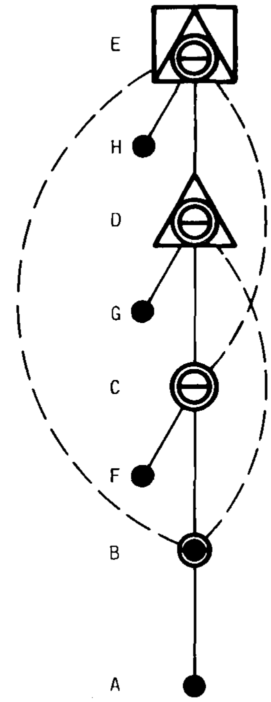
Sketch 3

2.06 As illustrated above in Sketch 3, traffic from B to Q may route up the originating ladder to C, across to R and down the terminating ladder to Q. It is ***not*** permitted to route B → A → R → Q. If this were allowed, traffic arriving at A could find the A-R high-usage trunk group busy. It would then be overflowed back to B where it would again be offered to A. This condition, sometimes called "shuttling" or "ring around rosy", would rapidly tie up all the trunks between A and B, a condition that must not be permitted.

2.07 This rule, in conjunction with the Two-Ladder Limit Rule, defines the permissible switching points for any given call.

MULTIPLE SWITCHING FUNCTION RULE

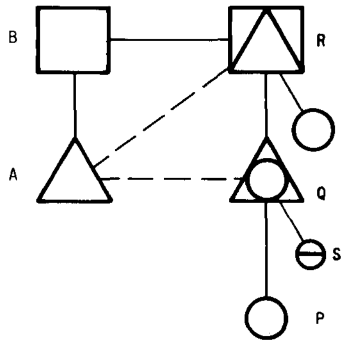
2.08 ***A switching system performing multiple switching functions must be assumed to have a routing ladder internal to the switching system extending from its lowest function to its highest function.***



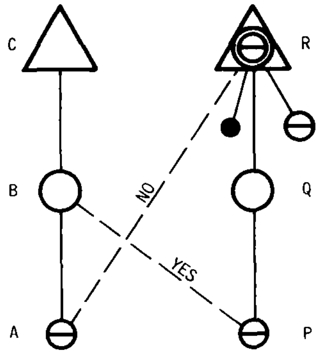
Sketch 4

2.09 This rule is applicable whenever a switching system performs multiple switching functions. If switching system B (illustrated in Sketch 4 above) serves customer lines in addition to serving as a class 4 tandem, the 5 function of the switching system can be said to home on the 4 function of that same system. Similarly, switching systems C, D, and E all perform multiple switching functions. In each of these cases, an "intraswitching system" routing ladder must be assumed from its lowest to highest function. For example, switching system E performs the 4, 3, 2, and 1 switching functions for end office H. Switching system D performs the 4, 3, and 2 switching functions for end office G, and switching system C performs the 4 and 3 switching functions for end office F. Since switching functions are determined by the final trunk groups in a routing ladder, the presence or absence of an intraladder high-usage trunk group such as B-E, B-D, or C-E does not, in any way, alter this switching function rule.

2.10 This rule is necessary to prevent the development of more than one route from one switching system to another in the application of a routing discipline based on switching function. It also serves to keep switching at lower levels in the network.



Sketch 5



Sketch 6

2.11 If the switching function were dependent upon the ***external*** routing ladder, class 4 switching system S (shown above in Sketch 5) would home on the function 3 of Q and, in turn, the function 2 of R. If a trunk group, A-R were developed, to handle that R function 2 traffic, A → S traffic would be included and the route A → S would be A → R → Q → S. Similarly, if a trunk group, A-Q, were developed for the Q function 2 traffic, that trunk group would include A → P traffic and the route A → P would be A → Q → P. This results in two different routes from A to Q, depending upon the switching function used at Q, an undesirable arrangement.

ONE-LEVEL LIMIT RULE

2.12 ***When evaluating potential candidate trunk groups, consider only those first route traffic items for which the switching functions performed at each end of the trunk group differ by no more than one level.***

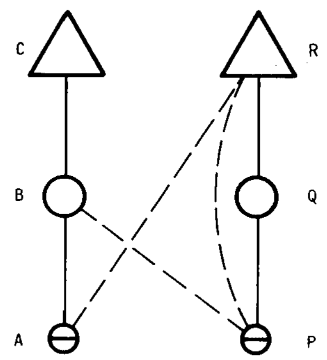
2.13 The illustrated trunk group in Sketch 6, A-R, should ***not*** be considered ***if*** it is dependent upon the 2 function load at R. The initial justification of skip-level trunk groups such as A-R must be based on the load resulting from the application of the One-Level Limit Rule, in this case the load between the 4 function at A and the 4 and 3 functions at R. The routing of the 2 function load cannot be determined until consideration is given to other trunk groups between A, B, or C, and the R class 2 area.

2.14 Note that this rule applies to the load which can be considered when ***evaluating potential candidate*** skip-level trunk groups. The subsequent rules in this section cover the traffic which may properly route over these trunk groups, once justified.

2.15 This rule is required to facilitate the establishment of trunk groups at lower levels in the hierarchy and to prevent distant higher class switching systems from becoming a "dumping ground" for traffic from remote lower class switching systems.

SWITCH LOW RULE

2.16 ***Switched traffic must route via tandems involving the lowest functional level of switching, considering both routing ladders.***

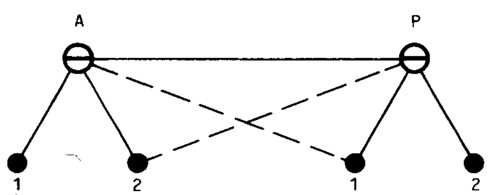


Sketch 7

2.17 As illustrated above in Sketch 7, traffic from A to P should route via B switching function 3 and not via R switching function 2, thereby keeping switching at the lowest functional level. This rule is required to insure that lower functional level switching is used for traffic that ***can*** switch at that lower level to make available higher functional level switching for traffic that ***must*** switch at that higher level. The presence of the R-P trunk group does not change the fact that R performs the function 2 switch for P.

TRAFFIC GROUPING RULE

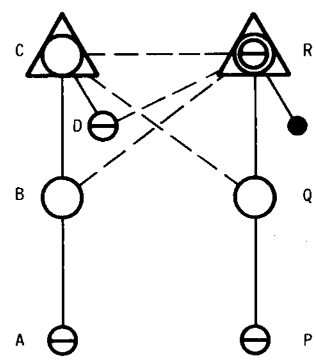
2.18 ***If there is a choice of routes involving switching at the same functional level in each of two routing ladders, the route using that functional level in the terminating ladder should be chosen.***



Sketch 8

2.19 In the trunking configuration shown in Sketch 8, traffic from A2 to P1 has the choice of a route via A or P, each involving a 4 function switch. Under the Traffic Grouping Rule, the preferred route is via the 4 function in the terminating ladder, or in this case the route is via P. In a similar manner, the preferred route from P1 to A2 is via A. This rule relates to the directional first routing of traffic from one switching system to another and is equally applicable to one-way and two-way trunk groups.

2.20 The rule is necessary to enable the determination of routing for point-to-point loads from a knowledge of homing arrangements and trunking configurations. It is important to note that the rule deals with the ***functional*** level of switching as illustrated below in Sketch 9.



Sketch 9

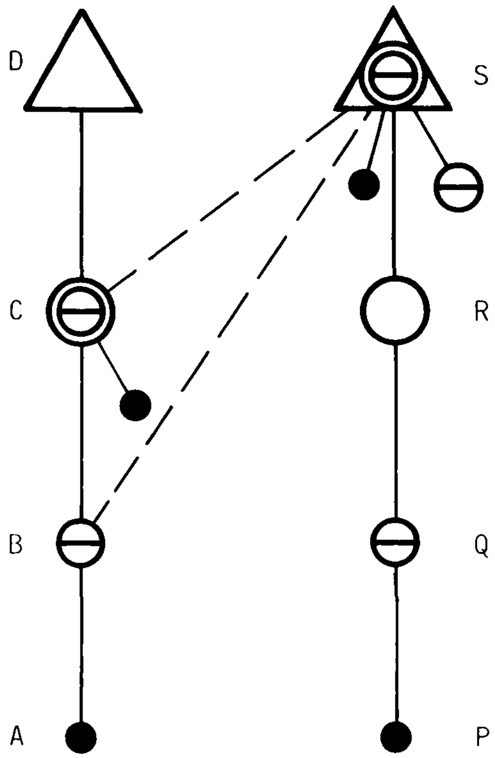
2.21 In the above trunking configuration, trunk group B-R must be offered all the traffic ***from*** B ***to*** R, Q, and P. The C-Q group must be offered all the traffic ***from*** Q ***to*** C, D, B, A. However, the D-R trunk group is only offered the traffic between the 4 functions at D and R. The traffic from D to Q and P will switch at C, with C performing a 3 switching function for this traffic; to switch at R would involve a 2 switching function.

SINGLE ROUTE RULE

2.22 ***Routes must be chosen so there is one and only one first choice route from one switching system to another,***

regardless of the switching functions performed by those switching systems.

2.23 In two level networks, this requirement is met through application of the Traffic Grouping Rule previously discussed.

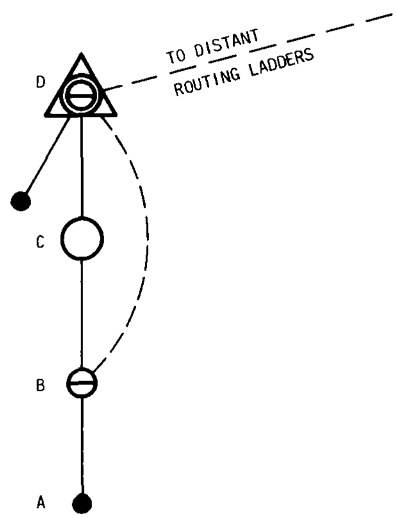


Sketch 10

2.24 In networks with more than two levels, this rule is necessary to insure that extra and unnecessary switching is not planned. As illustrated above in Sketch 10, it is not permitted to first route B to the 2 function at S via C if there is a direct B-S trunk group justified by the 4 and/or 3 function load. Routing via C would require an extra switch and trunk. The B-S trunk group is justified by the load between the 4 function at B and the 4 and/or 3 function at S. In accordance with the One-Level Limit Rule, it cannot be initially justified by inclusion of load requiring a 2 function switch at S.

2.25 The C-S trunk group may be justified by the load between the 4 and/or 3 function at C and the 4, 3, or 2 function at S. If there is not enough load to plan trunk groups from either B or C to P, Q, or R, it is apparent that all traffic from B to P, Q, R, and S will require a switch at class 2 switching system S. Since there is a direct trunk group between B and S, it provides the one and only first route from B to S, including all traffic that switches at S. It is important to note that the decision to add 2 function traffic to the B-S trunk group must not be made until it is determined that trunk groups C-R or C-Q are not planned.

2.26 This rule also applies to intraladder trunking as illustrated below in Sketch 11. Intraladder trunk group B-D may be justified by 4 function traffic between B and D. There may not be enough load to justify direct trunking between B or C and distant routing ladders, but such trunk groups are justified from class 2 switching system D. In such cases, traffic from B to these distant ladders should route over the direct intraladder trunk group B-D until such time as the lower level direct trunking can be justified.



Sketch 11

LOAD ACCUMULATION SEQUENCE RULE

2.27 ***In the evaluation of potential candidate high-usage trunk groups at each functional level in the routing ladder, loads must be accumulated in the following sequence.***

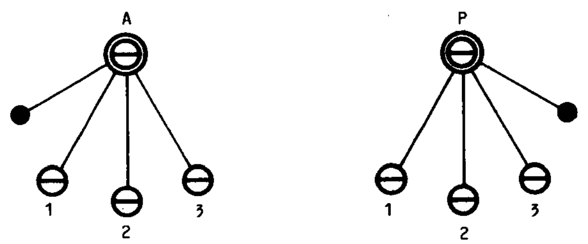
(1) Two-way loads between equal switching functions in different routing ladders. Identify this function as the base switching function.

(2) One-way loads from that base switching function in one ladder to the next higher

switching function in the distant ladder, ***plus*** two-way loads between the base switching functions of the two terminals of the trunk group being evaluated.

(3) Two-way loads between the base switching function in one ladder and the base ***plus*** next higher switching function in the distant ladder.

2.28 This rule is used to determine where sufficient first route load exists to support a trunk group. Its application can be illustrated using a diagram of two class 3 areas as following in Sketch 12. The logic, however, is equally applicable in dealing with other combinations of switching functions within the restrictions of the One-Level Limit Rule.



Sketch 12

2.29 Assuming all the switching systems shown here can accommodate two-way trunking, and assuming no end-office trunk groups between the two class 3 areas, the three steps of this rule are applied as follows:

(1) Evaluate each combination of base function (function 4 in this example) switching systems for sufficient load to support direct trunking. For example, evaluate a trunk group A3-P1, based on the 2-way 4 function load. Assume the establishment of those trunk groups with sufficient load. The remaining traffic should be examined per Step 2, involving the next higher level of concentration.

(2) For this remaining traffic, evaluate each combination of base function to the next higher function (function 3 in this example), one-way load ***plus*** the two-way load between the base functions of the terminals of the trunk group being considered. For example, evaluate a trunk group A2-P, based on one-way load from A2 to P1, 2, and 3 plus the two-way load between the 4 functions at A2 and P. Again assume the establishment of trunk groups with sufficient load. The remaining traffic should be examined per Step 3, involving 2-way traffic for the 3 function.

(3) For this remaining traffic, evaluate each combination of lower function and distant next higher function for sufficient ***2-way*** load to support direct trunking. For example, a trunk group P1-A, based on 2-way loads between P1 and A, A1, 2, and 3. Note that trunk groups supported by these 2-way loads may be interdependent and require further evaluation as explained under the Two-Way Interdependency Rule.

2.30 If the trunk group being evaluated must operate one-way only, Steps 1 and 2 utilize only one-way loads and Step 3 is not required. A more complete illustration of the Load Accumulation Sequence Rule and the Two-Way Interdependency Rule which follows is contained in Fig. 1.

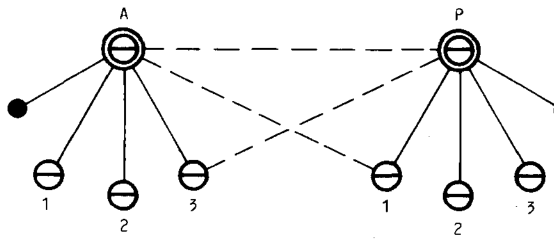
TWO-WAY INTERDEPENDENCY RULE

2.31 ***New trunk group candidates produced by the summation of 2-way loads between a switching function and the next higher switching function may be interdependent due to a "duplicate routing" of some traffic items. When some of these trunk group candidates fail to meet the minimum load criteria after removing the duplication, those to be retained must be determined in accordance with the following priorities:***

(1) Trunk groups in previous planning

(2) Trunk groups terminated at tandem of lowest class (for equal class tandems, trunk groups should be evaluated alternately)

(3) Trunk groups with highest load.



Sketch 13

2.32 In examining the 2-way loads summed in Step 3 of the Load Accumulation Sequence Rule, an interdependency exists that requires further elaboration. In the hypothetical case above (Sketch 13), suppose the A3-P trunk group appears justified on the basis of 2-way loads A3 $\longleftrightarrow$ P, P1, P2, and P3; and suppose a P1-A trunk group appears justified on the basis of 2-way loads P1 $\longleftrightarrow$ A, A1, A2, and A3. Note that the traffic between A3 and P1 is assumed to be offered to both these trunk groups, a condition that is not permitted. The duplication must be removed in a manner to meet the Traffic Grouping Rule: the traffic, as illustrated, must switch at the switching system in the terminating ladder. This means the one-way traffic from A3 to P1 must route over the A3-P trunk group and must be removed from the P1-A trunk group. It also means the one-way traffic from P1 to A3 must route over the P1-A trunk group and must be removed from the A3-P trunk group. The removal of traffic from these trunk groups may drop the load below minimum levels, indicating that one, but not both, should be planned.

2.33 The Two-Way Interdependency Rule is used to determine which trunk group(s) should be retained and which should be eliminated. The rule gives priority to:

(1) ***Trunk groups in previous planning***—These are trunk groups, developed in a previous general trunk forecast (GTF), that are planned for service during the time frame covered by the present analysis. This priority is designed to minimize changes in the GTF for marginal trunk groups.

(2) ***Trunk groups terminated at the lowest class tandem***—The application of this rule always relates to selecting either the home tandem or the distant tandem to perform the same switching function. If there is a difference in the class of these tandems, preference is given the tandem of lowest class. This keeps switching at lower levels in the network. If the tandems are the same class, the trunk groups should be considered alternately by tandem. This tends to balance switching among tandems of equal class.

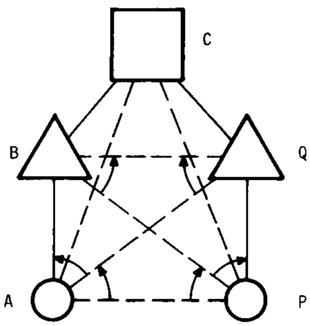
(3) ***Trunk groups with highest load***—This tends to maintain a higher level of network stability.

An illustration of the application of the Traffic Grouping Rule, Load Accumulation Sequence Rule, and Two-Way Interdependency Rule is contained in Fig. 1 of this section.

ALTERNATE ROUTE SELECTION RULE

2.34 ***The alternate route at each end of a high-usage trunk group must be the route the point-to-point item between the trunk group terminals would follow if the high-usage trunk group did not exist.***

2.35 Alternate routing is an extension of first choice routing. The considerations applicable to one are also applicable to the other. Just as first choice routing is done on a directional basis, it is also necessary to determine the alternate routes separately for each end of a 2-way high-usage trunk group as illustrated in Sketch 14.



Sketch 14

2.36 The alternate routes for the A-P trunk group are the routes the A → P and P → A traffic would follow if the A-P group did not exist. If that were the case, in accordance with the routing rules already discussed, A → P traffic would route via Q, and P → A would route via B. This situation, then, involves directional first routing as discussed under the Traffic Grouping Rule. Therefore, if the A-P trunk group did exist, the alternate routes for it would be via Q and B, a case of directional alternate routing.

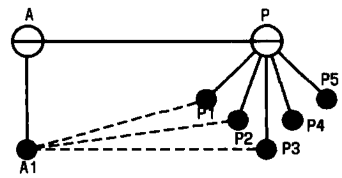
2.37 The alternate routes for the A-Q trunk group are the routes the A → Q and Q → A traffic would follow if the A-Q trunk group did not exist. If that were the case, in accordance with routing rules already discussed, A → Q traffic would route via B, and Q → A traffic would route via B. Therefore, if the A-Q trunk group did exist, the alternate routes would be via B, a case of triangular alternate routing.

2.38 The important thing to remember is that the rules used to determine first choice routes are also used to determine trunk group alternate routes. These alternate routes may be directional or triangular, just as first routes may be directional or triangular.

ONE-SWITCH ALTERNATE ROUTE RULE

2.39 ***In identifying potential trunk group candidates, the alternate route at either end of a high-usage trunk group must consist of no more than two trunk groups with one intermediate switch.***

2.40 This rule is necessary to insure consideration of trunk groups that are dependent upon overflow in meeting minimum load levels. As indicated in 1.05, the load accumulation application of the routing discipline identifies trunk group candidates and accumulates first route loads offered to each trunk group. These candidate trunk groups, then, go through a sizing process where overflows, as well as first route loads, are considered. Because of significant network interdependencies, it is not practical to determine overflow loads concurrently with first route loads as a part of the routing process.



Sketch 15

2.41 Based on first route loads in the example above (Sketch 15), trunk group candidates are developed A1-P1, A1-P2, and A1-P3. There is not enough load for candidate trunk groups between A1 and P4 or P5 and not enough total first route load for a candidate trunk group A1-P.

2.42 The One-Switch Alternate Route Rule indicates that a trunk group A1-P should be considered in order to provide a 2-link alternate route path for the high-usage trunk groups listed above. It is expected that in most cases such trunk groups will meet minimum size criteria when the sizing is complete. The disposition of trunk groups not meeting minimum size criteria is covered in TFP Division G, Section 8.

2.43 In certain cases, the One-Switch Alternate Route Rule can be satisfied by the provision of either of two trunk groups. In the sketch, for example, a one-switch alternate route for high-usage trunk group A1-P1 could be provided by trunk group A1-P or A-P1. The preferred trunk group is determined by the same process as discussed in 2.31, covering the Two-Way Interdependency Rule, namely:

(1) Trunk group in previous planning

(2) Trunk group terminated at tandem of lowest class

(3) Trunk group with highest load.

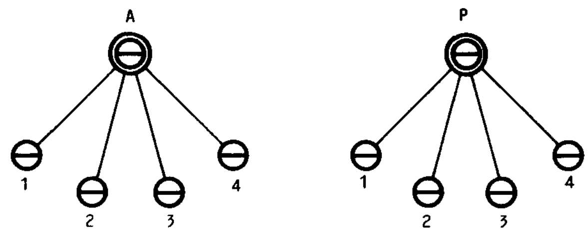
SIX-DIGIT TRANSLATION RULE

2.44 ***Switching systems having a 6-digit translation capability must perform that translation as required to properly route foreign numbering plan area traffic.***

2.45 It is expected that switching systems having the 6-digit capability will route calls in accordance with the discipline described in this section, performing 6-digit translation as required. Each company must provide foreign-area translation capability, capacity, and implementation as required to meet its obligations to the System for 6-digit translation in its common control switching systems. Such selective routing at the source is a major factor in saving switching and in helping to hold down overall switching system requirements.

Assume the following information is given:

(1) Homing Arrangement



(2) Point-to-Point Loads

	TO				
From	P	P1	P2	P3	P4
A	20	20	20	20	20
1	20	20	30	20	20
2	20	10	40	20	20
3	20	10	20	20	20
4	20	0	20	20	20

	TO				
From	A	A1	A2	A3	A4
P	20	20	20	20	20
1	20	30	20	20	20
2	20	40	20	20	20
3	20	20	10	20	20
4	20	20	20	0	20

(3) "Prove in" load for a trunk group = 180 (illustrative).

(4) No routing or trunking limitations.

(5) Trunk groups previously planned for service: A1 — P and P2 — A.

Problem: Determine the candidate trunk groups.

Problem Solution:

Step 1. No 4 — 4 function trunk groups are candidates based on 4 function load.

Step 2. No 4 — 3 function trunk groups are candidates based on two-way 4 function plus one-way 3 function traffic.

For example: The A1 — P trunk groups would have

A1 →P (20) + P →A1 (20)	=	40
+ A1 → P1 (20), A1 → P2 (30), A1 → P3 (20), A1 → P4 (20)	=	90
Total		130

Fig. 1—Logic for Determining Candidate Trunk Groups (Illustrative Example) Sheet 1 of 3 (2.30)

Step 3. Evaluate trunk groups on the basis of two-way loads.

Possible Trunk Group	Traffic Items	Load
A1 — P	A1 → P, P1, 2, 3, 4 + P, P1, 2, 3, 4, →A1	110 + 130 = 240
A2 — P	A2 → P, P1, 2, 3, 4 + P, P1, 2, 3, 4, →A2	110 + 90 = 200
A3 — P	A3 → P, P1, 2, 3, 4 + P, P1, 2, 3, 4, →A3	90 + 80 = 170
A4 — P	A4 → P, P1, 2, 3, 4 + P, P1, 2, 3, 4, →A4	80 + 100 = 180
P1 — A	P1 →A, A1, 2, 3, 4 + A, A1, 2, 3, 4, →P1	110 + 60 = 170
P2 — A	P2 →A, A1, 2, 3, 4 + A, A1, 2, 3, 4, →P2	120 + 130 = 250
P3 — A	P3 →A, A1, 2, 3, 4 + A, A1, 2, 3, 4, →P3	90 + 100 = 190
P4 — A	P4 →A, A1, 2, 3, 4 + A, A1, 2, 3, 4, →P4	80 + 100 = 180

The following trunk groups are then potential candidates:

A1 — P 240	P2 — A 250
A2 — P 200	P3 — A 190
A4 — P 180	P4 — A 180

These potential candidate trunk groups are then sequenced according to previous planning, class of switching system, and amount of load as follows:

Potential Candidate Trunk Group	In Previous Planning	Load
1. P2 — A	yes	250
2. A1 — P	yes	240
3. P3 — A	no	190
4. A2 — P	no	200
5. P4 — A	no	180
6. A4 — P	no	180

Note that the third trunk group is P3 — A even though A2 — P has a higher load since the Two-Way Interdependency Rule (pgh. 2.31) requires groups to be alternated at equal class tandems. This is done to maintain balance to the degree practicable in grouping loads at switching systems.

The next action is to determine which of the potential candidate trunk groups are still candidates after elimination of duplicate routing in accordance with the traffic grouping rule.

(1) Assume P2 — A is a candidate trunk group and route the following traffic on it: P2→A, A1, 2, 3, & 4 + A, A1, 2, 3, & 4 →P2.

(2) Assume A1 — P is a candidate trunk group if the P2 — A trunk group still meets minimum load criteria after removal of the A1 →P2 traffic, and if A1 — P trunk group meets minimum load criteria after removal of the P2 →A1 traffic to maintain the traffic grouping rule. Looking at the load information it can be determined that both trunk groups remain candidates.

Fig. 1—Logic for Determining Candidate Trunk Groups (Illustrative Example) Sheet 2 of 3 (2.30)

(3) Assume P3 — A is a candidate trunk group if the A1 — P trunk group still meets minimum load criteria after removal of the P3 → A1 traffic, and if P3 — A trunk group meets minimum load criteria after removal of the A1 → P3 traffic. Looking at the load information it can be determined that the A1 — P trunk group remains as a candidate, but the removal of the A1 → P3 traffic reduces the P3 — A trunk group below minimum load level. P3 — A, therefore, is not a candidate trunk group.

(4) Since the P3 — A trunk group is not a candidate, the next potential candidate trunk group to the A tandem, P4 — A should be evaluated. It is obvious that removal of the A1 → P4 traffic will reduce the P4 — A trunk group below minimum load levels, therefore, P4 — A is not a candidate trunk group.

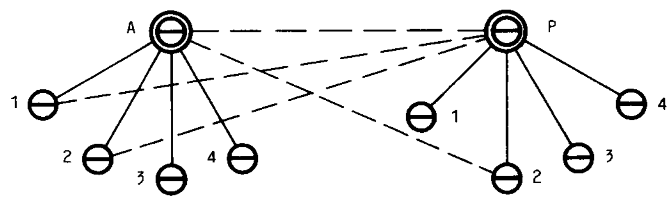
(5) Assume A2 — P is a candidate trunk group if the P2 — A trunk group still meets minimum load criteria after removal of the A2 → P2 traffic, and if A2 — P trunk group meets minimum load criteria after removal of the P2 → A2 traffic. Looking at the load information it can be determined that both trunk groups remain as candidates.

(6) The A4 — P trunk group is not a candidate since the removal of the P2 → A4 traffic reduces the load below minimum levels.

Therefore the candidate trunk groups are P2 — A, A1 — P, and A2 — P.

The remaining traffic is summed to determine the load offered to A — P using the 3 function at each end.

The configuration resulting from the application of those rules is shown below.



Trunk Group	Traffic Items	Load
A1 — P	A1 →P, P1, 2, 3, & 4 + P, P1, 3, 4 →A1	200
A2 — P	A2 →P, P1, 2, 3, & 4 + P, P1, 3, 4 →A2	180
P2 — A	P2 →A, A1, 2, 3, & 4 + A, A3, 4, →P2	180
A — P	A →P, P1, 3, & 4 + P →A, A3, & 4 +A3 →P, P1, 3, & 4 + P1 →A, A3, & 4 +A4 →P, P1, 3, & 4 + P3 →A, A3, & 4 +P4 →A, A3, & 4	430

Fig. 1—Logic for Determining Candidate Trunk Groups (Illustrative Example) Sheet 3 of 3 (2.30)