The step-by-step telephone switching system: Digit absorbing selectors

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ABSTRACT AND INTRODUCTION

Digit absorbing selectors in a step-by-step telephone switching system perform the same roles in the switch train as “regular” selectors except that, for certain values of the digit dialed into the selector, rather than hunting on that “level” for an idle switch in the next stage, the selector resets to its “idle position” and is prepared to receive a subsequent dialed digit (said to have *absorbed* that first digit). For certain types, the same thing might happen on that subsequent digit.

A common use of digit absorbing selectors is to provide a more economical implementation of an expanded numbering plan than if a “canonical” implementation had been used.

This article describes several common types of digit absorbing selectors and how they work. An example is given of the use of these selectors in the implementation of a numbering plan change.

1 ASSUMED READER BACKGROUND

In this article I will assume the reader to have at least a basic knowledge of the step-by-step telephone switching system, of how a step-by-step switching machine is organized, and of the basic normal functions of the various kinds of switches (line finders, selectors, and connectors).

For the reader who needs to get or refresh that background, I suggest the article “The step-by-step telephone switching system: Overview”, by this same author, probably available wherever you got this.

2 THE CONTEXT

All the details discussed here are based on the practices used in the Bell Telephone System, generally with selectors made by Western Electric Company.

The same concepts were certainly employed by non-Bell telephone companies, but the details and terminology might differ slightly.

3 SCOPE AND APPROACH

There are many different types of digit absorbing selector, with often-subtle differences in their behavior. And there are many situations in which digit absorbing selectors are use, some very "tricky".

But my object here is just to develop a broad understanding of this creature, and to give a single (and artificially "tidy") example of their application. The selector

4 THE SELECTOR

In a step-by-step switching system, a switch called a *selector* appears in all stages of the switch train except the first (which is the *line finder*, by which a line wanting to place a call is "received" by the system) and the last (which is the *connector*, which makes the final connection to the called line).

From a dialed digit basis, in an ordinary step-by-step switch train (one not employing digit absorbing selectors), each dialed digit except the last two is handled by a selector in one "stage" of selectors of the switch train. The last two dialed digits are handled by the connector. Thus, the number of stages of selectors is two less than the number of digits in the telephone number. We see this illustrated in Figure 1 for an "intraoffice" call in a central office using 4-digit telephone numbers.

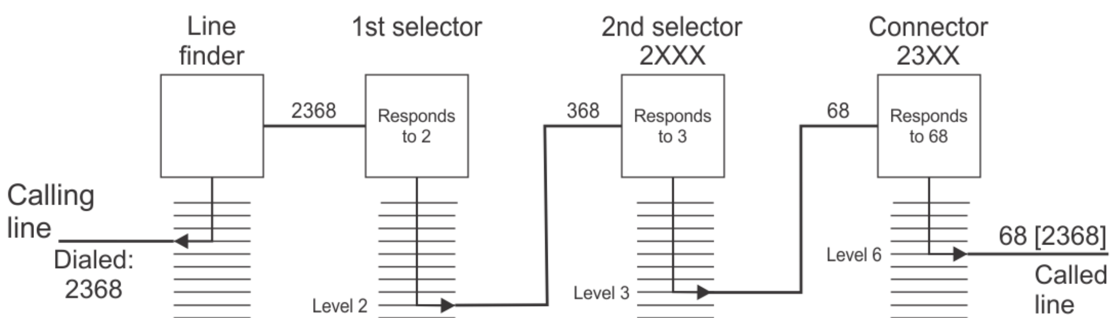

Figure 1. 4-digit step-by-step switch train

So if a caller here dials 2368, the 2, which operates the 1st selector, causes that selector to choose an idle trunk to a second selector in the "2XXX" group. And so forth.

5 ABOUT "TRUNKS"

We are accustomed, in the discussion of local telephone networks, to think of the term "trunk" as referring to:

- An *intraoffice trunk*, which leads from the originating part of the originating central office to the terminating part of the same central office, or
- An *interoffice trunk*, which leads from the originating part of the originating central office to the terminating part of a different central office.

But in discussing step-by-step switch systems, the term “trunk” has a broader meaning: a path that leads from an “outlet” on a selector level (of any stage) to a switch in the next stage (selector or connector).

In this article, I will use “trunk” to mean such paths.

Note that those actually include, but are not limited to, the two kinds of “trunk” spoken of above.

6 NUMBERING PLAN IMPLEMENTATION

6.1 Telephone numbers and switching system architecture

Suppose that as of, say, 1952, in an imaginary modest size town, there were three telephone central offices (COs), each handling several thousand lines, all using the step-by-step switching system. The telephone numbers all had five digits, presented in the directory thus: 2-7389, 3-4511, 4-2368.

The first digit was the *central office code* (CO code), indicating the central office that served that number. For the three central offices in this town, those were 2, 3, and 4. And of course that one digit was sufficient to discriminate among three central offices. And the remaining four digits (the station number) were certainly sufficient to discriminate among the numbers to be handled by one central office (not more than 10,000).

The usual way this was handled in a step-by-step office is seen (for the “4”office) in Figure 2.

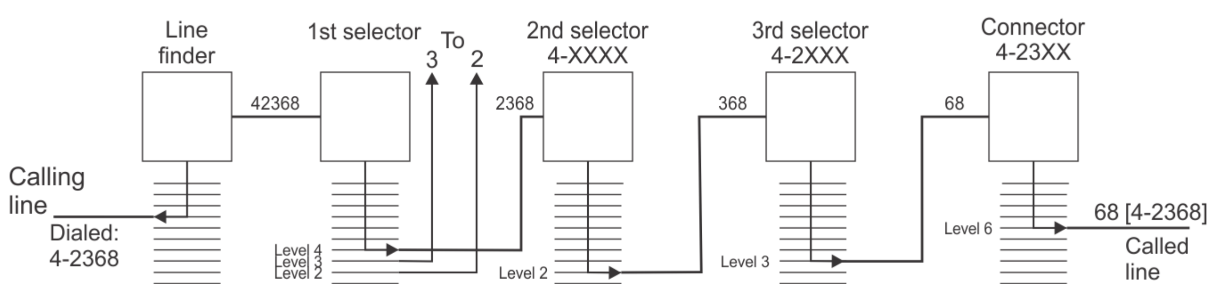

Figure 2. Switch train of the “4” office with 5-digit numbers

So if a caller in the “4” central office dials a number starting with “4” (which would be for a number in this same office) the 4, which operates a 1st selector, causes that selector to go to Level 4 and on that level choose an idle trunk to a second selector in this office, namely one in the “4-XXXX” group. And so forth.

If the caller dials a number beginning with “3”, which would be served in a different central office, that moves the 1st selector to its level 3, where it chooses an idle trunk to the “3” office.

In the example I show the number dialed as, for example, “4-2368”. The hyphen is of course not dialed, but is included here, and later, for clarity of the structure of the number

6.2 Meanwhile, in larger cities

By comparison, a fairly large city such as Cleveland had so many central offices that a 2-digit central office code was needed to distinguish them. (Metropolitan Cleveland was not served by step-by-step equipment; this mention is just to explain the evolution of the eventual uniform numbering plan.)

But those two digit central office codes were in fact “presented” in the directory and such in the form of a “central office name”, such as “Melrose”. So a number served by the Melrose office would be printed thus:

MElrose-0520 or even **ME** LROSE-0520

The capitalization (and often bolding), of the first two letters was a reminder that they were to be dialed, this of course being done by way of the now familiar assignment of the letters of the alphabet (except for Q and Z) to the digits 2 through 8 on the dial.

Thus a person dialing the above telephone number would actually dial 53-0520.

This structure and presentation of the telephone number was called “2L-4N”, for “2 letters and 4 numbers” (“2-4” for short).

In the really large cities, such as Chicago, there were so many central offices that a three digit central office code was needed. This was done by an enlargement of the scheme described above. So a hypothetical telephone number there would be printed thus:

COngress 6-2368[1]

A caller calling that number would actually dial 266-2368.

This structure and presentation of the telephone number was called “2L-5N”, for “2 letters and 5 numbers” (“2-5” for short). That notation did not illuminate the fact that the first **three** (relevant) characters were an “element” of the number, the “central office code”; only the printed appearance was described.

6.3 The adoption of a mandatory “2L-5N” numbering plan

Starting in about 1950, the local telephone networks of the US and Canada began moving toward a new norm: a uniform “local” telephone number size of 7 digits (to be presented in the “2L-5N” format) for all cities (regardless of the number of central offices involved).

Adopting this for the telephone network of a city was a precondition for that city being able to receive calls via the emerging Direct Distance Dialing program, under which telephone subscribers could

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[1] At an earlier time, that same telephone number would have been presented as **CON**gress-2368, the three letters “CON” being dialed in that same way.

dial their own long distance calls (that previously having to be done through a *long distance operator*).

Chicago was already there, with numbers such as **CO**ngress 6-2368. In Cleveland, the change to the user was small: the number **BO**ulevard 5569 became **BO**ulevard 2-5569. (That is not to suggest that the change to the central office equipment of the types then used in Cleveland was trivial; it was a massive change.)

6.4 Effect at our hypothetical little town

From a technical standpoint, for our hypothetical little town, the central office code, heretofore a single digit, became three digits (the specific choice of which, and the name used to present part of such, was governed by many factors we need not learn of here).

Indeed this was a big dislocation for many of the users (and a big technical change for the telephone companies). But it was required for "progress".

Perhaps that transformation was as follows:

Former	**New CO code**	
CO code	**As printed**	**As dialed**
2	**OR**chard 2	672
3	**PL**aza 3	753
4	**UNion** 4	864

I note that here I have chosen those "new" CO codes to make this story play out in the cleanest way, a convenience not always available in reality.

Thus the telephone number that was formerly 4-7389 was now technically 864-7389 (in terms of the actual digits that would be dialed).

This number was shown in the directory as **UN**ion 4-7389 (following the scheme that had been in use for many years in, for example, Chicago).

From here on, I will most often speak of the central office codes as numerical digits (which they actually are, and which is how the switches see them).

6.5 Implementation of the "2L-5N" numbering plan in step-by-step

What we might call the "canonical" implementation of this numbering plan in an SXS office is shown in Figure 3.

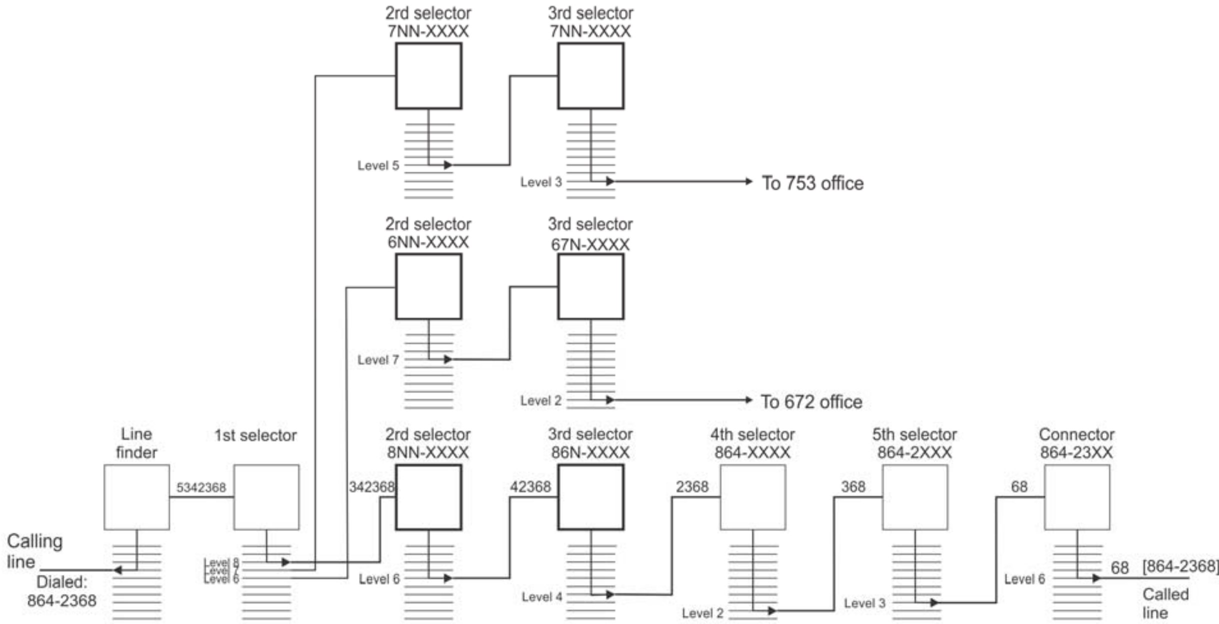

Figure 3. Canonical implementation in the "864" office

Again, I have shown the switches involved in a call to "864-2368" (in this same office) and to any numbers in the "672" and "753" offices.

The selectors whose boxes are shown with a bold line represent six groups of selectors (in two new stages) that had to be added to implement the new numbering plan.

The structure of the city's network has not changed at all, yet because of the new way that telephone numbers were to be represented and dialed, considerable new equipment needed to be added. The added switches could have usefully supported the needs in a much larger city network where there were dozens of central offices, but here they are just a "burden" of the new numbering plan.

In each of our three step-by-step central offices, the existing stage of 1st selectors (which handled the old single office code digit) would have to be joined by two new subsequent stages of selectors (each stage handling a further one of the three digits of the new central office code).

This "three stage" portion of the switching machine (if fully "fleshed out") could have handled all 540 then-legitimate three-digit CO codes, yet here it only needs to handle three. For example, the "676N-XXXX" selectors would never go to other than their level 2.

The added switches could have usefully supported the needs in a much larger city network where there were dozens of central offices, but here they are just a "burden" of the new numbering plan.

Of course, here, those three stages would not have to be "fully fleshed out", but they would require, at the least, two new selector frames and quite a few new selectors (and a lot of labor to install and connect all that) and a tricky "cutover" at zero hour.

6.6 Digit absorbing selector implementation

Much of this futile-seeming cost could have been avoided by the use of digit absorbing selectors. Indeed, for the example, I chose “new” central office codes such that this improvement would work out in the best possible way. In reality, the improvement could perhaps be less (although I do not show the details of such less ideal situations here).

Figure 4 shows our “864” central office with a digit absorbing selector implementation of the new numbering plan.

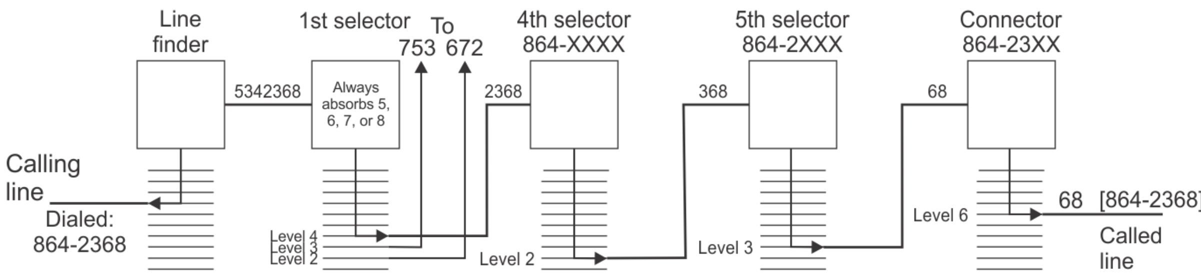

Figure 4. Digit absorbing selector implementation of the “864” office

We note that here no groups of selectors have been added, nor have any new selector stages needed to have been established. What was done was that the original 1st selectors were replaced with a certain type and configuration of digit absorbing selector.

These selectors were “programmed” (we will see later how this is done) so that on any digit received by the switch, if its value was 5, 6, 7, or 8, that digit would be absorbed (as if it had not even been dialed).

Note that in our repertoire of central office codes (672, 753, and 864), all of the first and second digits were either 5, 6, 7, or 8. Thus, for any of those codes, the first and second digits would have been absorbed. All that would survive to “steer” the connection to the proper central office would be the last digit of the CO code.

But, because of my “craft” in assigning the new CO codes for out fictional city, these last digits were all different (2, 3, and 4), and in fact were the same as the original CO codes for the respective offices.

The former of these two facts tells us that these “truncated” CO codes are sufficient to route the call to the proper of our three central offices. The second one tells us that, proceeding along that line, the wiring from the banks of the 1st selectors to trunks would not have to be changed.

I note that the last two stages of selectors are now designated “4th” and “5th” selectors, even though there are no “2nd” or “3rd” selectors here. This reflects that these two selector stages now respond to the 4th and 5th digits of the dialed number. (This relabeling was not always consistently done.)

6.7 Wait a minute

Now, the astute reader may say, “That only worked out because of the specific new central office codes assumed in the story.” Quite so, I confess. For convenience, I cheated and assumed that they had been assigned such that the first two digits of the CO code were never 2, 3, or 4. and the last digits were still distinct.

But the wonks who assigned all the new CO codes in the *numbering plan area* (NPA–what got an “area code”) of interest, within which all CO codes had to be distinct, might not have been able to provide that convenience to our little town.

6.8 A less-contrived example

Suppose that instead, the table of new CO codes looked like this:

Former	**New CO code**	
CO code	**As printed**	**As dialed**
2	**AD**ams 2	232
3	**GA**rfield 3	423
4	**DA**vis 4	324

Now the ploy I described above would not work. If the digit absorbing selectors we set to absorb all the digit values found in the first two positions of the CO codes (here that would be 2, 3, and 4), then when the “actually important” 3rd digit of the CO code came along (always 2, 3, or 4) it would also be absorbed, and the call would be doomed.

But there are “more clever” kinds of digit absorbing selectors (called “2-digit digit absorbing selectors”) that can work here. They would be programmed so that:

- When the selector is first seized, if the digit received is 2, 3, or 4, absorb that digit (reset the switch and make it wait for a subsequent digit).
- If that subsequent (2nd) digit is 2 or 3, absorb that digit (reset the switch and make it wait for a subsequent digit).
- For that next (3rd) digit, the digit dialed is always effective (never absorbed).

Figure 5 illustrates that implementation.

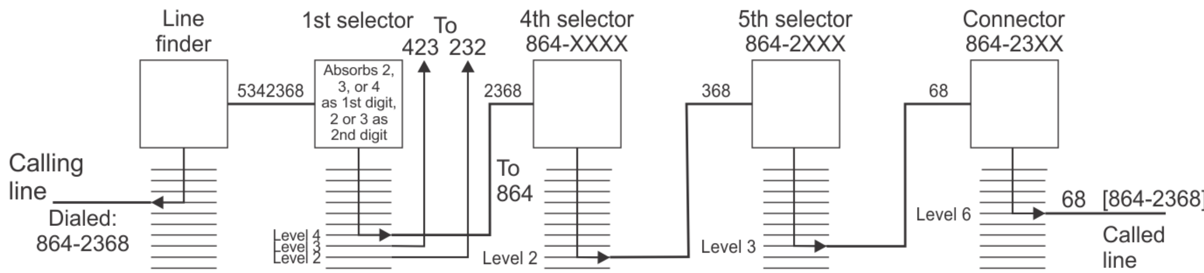

Figure 5. "2-digit" digit absorbing selector implementation

6.9 Not always even that tidy

But of course there are situations in which the CO codes had to be assigned in such a way that even the use of the "2-digt" digit absorbing selector could not lead to as "tidy" a solution as we have seen above., Nonetheless, digit absorbing selectors can often still be employed as part of a more economical implementation of a the new numbering plan than with the "canonical' implementation.

7 THE NORMAL POST SPRINGS

I have spoken above of "programming" a digit absorbing selector to give certain actions only when a certain digit has been dialed

This is actually implemented by an ingenious electromechanical assembly described as the "normal post springs", with which all digit absorbing selectors are equipped.[2]

This consists of two or four sets of contact springs, all mounted on, and descending from, a metal block that is fastened to the top of what is known as the *normal post* of the switch, a fixed circular shaft extending upward from the switch mechanism frame. (Every step-by-step switch has a *normal post*, but here it is longer than usual so as to have a place on it to which to fasten the normal post spring assembly.)

We see the arrangement in Figure 6 for the arrangement that has two sets of normal post springs (the most common).

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[2] Other special types of selectors, certain special types of line finder, certain special types of connectors, and all selector-connectors (a special kind of switch used in small private branch exchanges) also have normal post springs, used to control a wide array of special functions based on the digit(s) dialed.

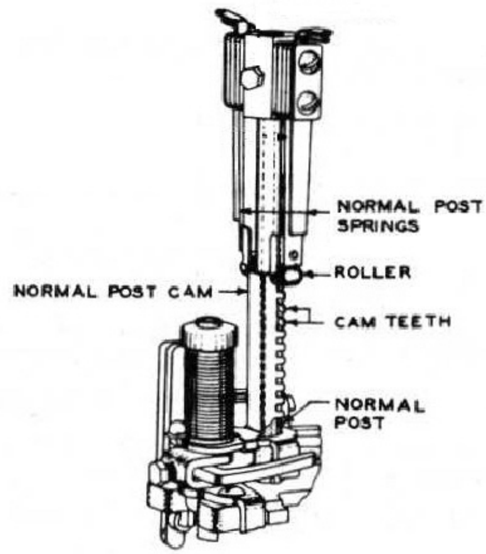

Figure 6. Normal post springs

The *normal post* itself gets its name from the fact that with the switch shaft in its idle (formally, “normal”) rotational position. a lever on the top end of the shaft, regardless of the vertical position of the shaft, rests someplace on this post to precisely establish the “normal” angular position of the shaft.

There is also a plate at the top of the shaft in which the shaft is free to rotate but which also rises and falls with the shaft. Its angular orientation, however, is fixed, since a slot on it rides on the normal post.

The main job of that plate is that the “fixed” end of the helical spring that urges the shaft toward the “normal” rotational position is fastened to that plate, and the reaction to its torque is passed to that plate and thence to the normal post on which it rides and thence to the frame.

But if the switch has a normal post spring assembly, there is also clipped to that plate a *normal post cam*. In the case of a normal post spring assembly with two spring sets, this is a channel-shaped sheet metal piece. In the case of a normal post spring assembly with four spring sets, this is an H-shaped assembly of two channel-shaped sheet metal pieces spot welded back-to-back.

The two (or four) “fins” of this cam are each shaped into ten round-end “tabs”, one for each “level” to which the shaft may be directed by the digit dialed into the switch. These tabs can individually be bent outward.

If the tab (on one of the fins) corresponding to a certain level is bent out, then when the switch is sitting on that level, the tab presses on a little roller at the bottom end of one of the normal post spring sets, operating that spring set; otherwise, that spring set is left non-operated.

Thus (if we have the “two contact spring set” form) this in effect provides a “table” which, for each of the ten levels to which the switch may be directed by the dialed digit, can return one of four “results”: neither spring set operated, the left (L) spring set operated, the right (R) spring set operated, and both spring sets (L and R) operated. If we have the “four contact spring set” form, for our purposes this can best be thought of as in effect providing two independent “tables” (the “front one” and the “rear one”), each of which, for each level, can independently return one of four “results”.

I will often speak metaphorically of a certain level as being “marked” for a certain behavior by the setting of the normal post spring cam tabs for that level.

8 BLOCKING

Although actually a wholly separate matter from digit absorbing, almost all of the digit absorbing selectors also offer a functionality described as *level blocking*. This is often a valuable ingredient of the overall task we look to the digit absorbing selector to do for us.

Briefly, that means that the switch can be “programmed” so that if any of certain digits is dialed, the connection does not advance and the caller is sent a tone sequence (spoken of as that level being “blocked”).

This is normally applied so that an invalid sequence of digits will lead to the caller receiving that tone signal to so advise.

9 DIGIT ABSORBING SELECTOR TYPES AND VARIANTS

9.1 Introduction

The general literature about this topic usually recognizes three “types” of digit absorbing selector, and for one type usually recognizes two major variants.

These four “creatures” all differ in the details of their behavior. In this section I will characterize each using a chart that synopsizes its behavior.

I will, for ease of reference, refer here to the three “types” as Types A, B, and C; these are not any form of official notation. And for Type A, I will refer to Variants O and R (again not any kind of official designation).

9.2 Notation

9.2.1 *“Switch”*

Often, for conciseness, I will refer to the selector of interest at just the “switch”. This is common in the formal documentation.

9.2.2 *First, second, etc digits.*

When I speak of the "first", "second", or "later" digit received by a switch, that is with respect to its participation in a particular connection.

9.2.3 *Digits and levels*

When I refer to the value of a certain dialed digit, I will speak of a certain *level* (since the digit dialed into the switch steps it to a *level* corresponding to the digit value).

When I refer to a certain digit in a sequence without specifying its value I will use the term *digit*.

9.2.4 *Marking*

As mentioned earlier, when a certain level has been set for a certain treatment by the programming of the normal post spring cam, I will sometimes refer to that level being "marked" for that treatment.

9.2.5 *The "lock" state of the switch*

For several of the selectors types and variants, there is the concept of the *lock state* of the switch. When the switch is first seized on a connection, its initial state is *locked*.

When a level has been dialed that is marked for one or more certain treatments, the state of the switch is changed to *unlocked*. With the switch *unlocked*, the treatments provided by various level makings may change.

9.3 The Type A digit absorbing selector ("absorb once or repeatedly"), Variant O ("absorb once")

9.3.1 *Behavior*

<table>
<tr><th colspan="2" rowspan="2">NPS tabs bent</th><th rowspan="2"></th><th>Action if switch is</th><th></th></tr>
<tr><th>locked</th><th rowspan="2">Un-locks switch</th></tr>
<tr><th>L</th><th>R</th><th>Formal name</th><th>unlocked</th></tr>
<tr><td rowspan="2"></td><td rowspan="2"></td><td rowspan="2">None, but can be considered "normal"</td><td>Selects idle trunk</td><td></td></tr>
<tr><td>Selects idle trunk</td><td></td></tr>
<tr><td rowspan="2">L</td><td rowspan="2"></td><td rowspan="2">Absorb (once only)</td><td>Reset switch, accept subsequent digit</td><td>U</td></tr>
<tr><td>Selects idle trunk ("normal")</td><td></td></tr>
<tr><td rowspan="2"></td><td rowspan="2">R</td><td rowspan="2">Block</td><td>Step to end of level, return "overflow" tone</td><td></td></tr>
<tr><td>Selects idle trunk ("normal")</td><td></td></tr>
<tr><td rowspan="2">L</td><td rowspan="2">R</td><td rowspan="2">[Not assigned]</td><td></td><td></td></tr>
<tr><td></td><td></td></tr>
</table>

NPS: normal post springs

By bending out various combinations of the tabs on the NPS cam on a certain level, one of three actions may be conferred on that level: *normal*, *block*, and *absorb*.

Normal—If the marking is normal, the switch hunts over the outlets on the level for an idle trunk to a switch in the next stage.

Block—If, with the switch still *locked*, a level is dialed that is marked as *block*, the switch is forced to hunt mindlessly over all the outlets on that level until it reaches the "11th rotary step" (just as it would have if actually hunting for a trunk to the next stage but all 10 on that level were busy.

As a result, the caller receives the tone signal that ordinarily would indicate that the connection was "blocked" because of lack of a trunk (often called generically the "overflow" or "all trunks busy" signal, sometimes implemented as a "fast busy" signal but other times just regular busy tone.

This is not ideal–it does not clearly alert the caller to what has gone wrong here: that he had dialed an invalid digit sequence..

Absorb—If, with the switch still *locked*, a level is dialed that is marked as *absorb*, the switch does not hunt for an idle trunk on that level to the next stage, but rather resets and remains receptive to a following dialed digit. (If this is a 1st selector, dial tone is removed). The switch is *unlocked*.

9.3.2 *Switch unlocked*

If, because a level had been dialed that was marked as absorb, the switch had been *unlocked*, then as to the subsequent dialed digit, all level markings of *block* or *absorb* are vacated. Thus for any level dialed (regardless of the marking via the normal post spring cam), the switch hunts over the outlets of that level for an idle trunk to the next stage.

9.3.3 *An alternate variant*

A different behavior can be configured for this type of switch through the appropriate options. With it, the *block* treatment of a level remains in effect even after the switch is unlocked.

9.4 The Type A digit absorbing selector ("absorb once or repeatedly"), Variant R ("absorb repeatedly")

9.4.1 *Behavior*

NPS tabs bent			Action if switch is	
			locked	Un-locks switch
L	R	Formal name	unlocked	
		None, but can be considered "normal"	Selects idle trunk	
			Selects idle trunk	
L		Absorb (repeatedly)	Reset switch, accept subsequent digit	U
			Reset switch, accept subsequent digit	
	R	Block	Step to end of level, return "overflow" tone	
			Selects idle trunk ("normal")	
L	R	[Not assigned]		

NPS: normal post springs

This behavior is the same as described above for the "absorb once" variant, except for the following.

9.4.2 *Switch unlocked*

If, because a level had been dialed that was marked as absorb, the switch had been *unlocked*, then as to the subsequent dialed digit, all level markings of *block* are vacated, but level markings of *absorb* remain in effect. Thus if that further dialed digit is for a level marked *absorb*, that digit will be absorbed as previously described.

9.4.3 *An alternate variant*

A different behavior can be configured for this type of switch through the appropriate options. With it, the *block* treatment of a level remains in effect even after the switch is unlocked.

9.5 The Type B digit absorbing selector ("absorb once and/or repeatedly")

9.5.1 *Behavior*

NPS tabs bent: L	NPS tabs bent: R	Formal name	Action if switch is locked	Action if switch is unlocked	Unlocks switch
		None, but can be considered "normal"	Selects idle trunk	Selects idle trunk	
L		Absorb repeatedly	Reset switch, accept subsequent digit	Selects idle trunk ("normal")	
	R	Block	Step to end of level, return "overflow" tone	Selects idle trunk ("normal"	
L	R	Absorb once only	Reset switch, accept subsequent digit	Selects idle trunk ("normal")	U

NPS: normal post springs

By bending out various combinations of the tabs on the NPS cam on a certain level, one of four actions may be conferred on that level: *normal*, *block*, *absorb once*, and *absorb repeatedly*.

Normal—If the marking is *normal*, the switch hunts over the outlets on the level for an idle trunk to a switch in the next stage.

Block—If, with the switch still *locked*, a level is dialed that is marked as *block*, the switch is forced to hunt mindlessly over all the outlets on that level until it reaches the "11th rotary step" (just as it would have if actually hunting for a trunk to the next stage but all 10 on that level were busy).

As a result, as before, the caller receives the "overflow" tone signal that ordinarily would indicate that the connection was "blocked" because of lack of a trunk.

Absorb once—If, with the switch still *locked*, a level is dialed that is marked as *absorb*, the switch does not hunt for an idle trunk on that level to the next stage, but rather resets and remains receptive to a following dialed digit. (If this is a 1st switch, dial tone is removed.) The switch is *unlocked*.

Absorb repeatedly—If, with the switch still *locked*, a level is dialed that is marked as *absorb*, the switch does not hunt for an idle trunk on that level to the next stage, but rather resets and remains receptive to a following dialed digit. (If this is a 1st switch, dial tone is removed). The switch is not *unlocked*.

9.5.2 *Switch unlocked*

If, because a level had been dialed that was marked as *absorb once*, the switch had been *unlocked*, then as to the subsequent dialed digit, all level markings of *block* or *absorb* are vacated. Thus for any level dialed (regardless of the marking via the normal post spring cam), the switch hunts over the outlets of that level for an idle trunk to the next stage.

9.6 The Type C digit absorbing selector (2-digit)

9.6.1 *Behavior*

The behavior of this selector is synopsized by this chart.

NPS tabs bent			
L	R	Formal name	Action
		[None, but can be considered "normal"]	Selects idle trunk
L		Block	Do not hunt, return "no such number" tone
	R	Absorb	Reset switch, accept subsequent digit
L	R	[Not assigned]	

NPS: normal post springs; for 1st digit, front pair; for 2nd digit, rear pair

Here, there are four normal post springs, two sets of two, the front set (L and R) and the rear set (L and R).

The setting of the cam tabs for the front set determines the action on each level for the first digit dialed into the switch (as seen in the table).

The setting of the cam tabs for the rear set determines the treatment of each level for the second digit dialed into the switch (only applicable if the first digit has been absorbed and so a second digit is possible).

If both the first and second digits are absorbed, and so a third digit is possible, it is always treated as “normal” for any level.

9.6.2 *Lock status*

There is no concept here of the *lock* status of the switch. The action on the second digit (if such is possible) is not affected by the marking of the first digit.

9.6.3 *Blocking*

In the other types of digit absorbing selector describe above, when a level is to be treated as *blocked*, this is implemented by forcing the switch to hunt mindlessly step across the entire level until the 11th rotary step is reached, which results in the caller getting whatever tone signal is normally used to indicate that the connection had been thwarted for lack of a trunk to the next stage.

That tone might be a "fast busy" or even just the regular busy signal. This does not really alert the caller as to exactly what has gone wrong: he has dialed an invalid digit sequence.

In the 2-digit digit absorbing selector, if the treatment for the level is *block*, the switch makes no further movement, and a relay sends to the caller a special tone signal (*no such number tone*) indicating that an invalid digit sequence has been dialed. This of course gives the caller a more explicit indication of what has gone wrong than with the tone signal sent by other types of digit absorbing selector.

10 SHORT DIALING

Harking back to Figure 4: It might seem from what I have said so far that a caller in the 964 office, wanting to reach **UN**ion 4-2368, could just dial 4-2368 and reach that number. And indeed, they could. This was often found in these two situations:

a. A customer who thought, "That confounded telephone company wants me to dial two more digits, which is certainly not necessary, and I'm just not going to do that!"

b. A teenager who discovered this by accident, and thought it was "neat" (and in fact less trouble) to dial that way.

And there was really no harm done by this ploy. So the telephone company might have no motivation to preclude it.

But suppose for some reason the last digits of the three new CO codes that were assigned were in fact distinct, but were not the same as the earlier 2-digit CO cods for the respective offices. Then the disgruntled customer in (a) above would not get the expected telephone numbers, a presumed nuisance to the people he did reach.

To avert this, we can draw upon the *digit blocking* functionality of the digit absorbing selectors. Holding to our original hypothetical repertoire of the "new" CO codes, we can set the selectors so as to block, when received as either the first or second digit received by the selector, digit values (levels) 2, 3, and 4.

Now if our disgruntled customer, wanting to reach **UN**ion 4-2368, insisted on dialing just 4-2368, when the digit 4 was dialed, since that was a *blocked* level on the new 1st selectors, the response to further digits would be halted, and the caller would receive a tone signal that meant (at least at this point in dialing) "that is not a valid number".

11 A MATTER OF NOMENCLATURE

11.1 Erroneous interpretation

If we take the terms "absorb once only" and "absorb repeatedly" at face value, we may (erroneously) be led to think that they mean as follows:

- **Absorb once only**: The first time this level is dialed, the digit is absorbed. Any later time **this same level** is dialed, the digit will not be absorbed.
- **Absorb repeatedly**: The first time this level is dialed, the digit is absorbed. Any later time **this same level** is dialed, the digit will be absorbed.

11.2 Correct interpretation

In fact, the correct interpretation of the two terms (in most kinds of digit absorbing selectors) is as follows:

- **Absorb once only**: The first time this level is dialed, the digit is absorbed. Then, any later time that **any level** marked *absorb* (whether *once only* or *repeatedly*) is dialed, the digit will not be absorbed.
- **Absorb repeatedly**: Any time this level is dialed, the digit is absorbed (unless earlier a level marked *absorb once only* had been dialed).

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