BELL SYSTEM PRACTICES
Outside Plant Construction and Maintenance

SECTION G50.213.4
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AT&T Co Standard

CABLE TESTING—GENERAL
IDENTIFYING CONDUCTORS—79-TYPE TEST SET

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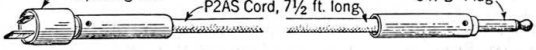
1. GENERAL

1.01 This Section outlines the use of the 79-type test set in identifying pairs that are used for battery feeders or for P.B.X. extensions.

These pairs generally have low resistance to ground and may be interconected through straps or signal lamps. The low resistance of the interconnections may make it impossible to identify the pairs by the usual tone methods.

1.02 The 79-type test set consists of a small exploring coil equipped with a cord and plug. The end of the coil has two prongs to facilitate its use on conductors and cross-connections.



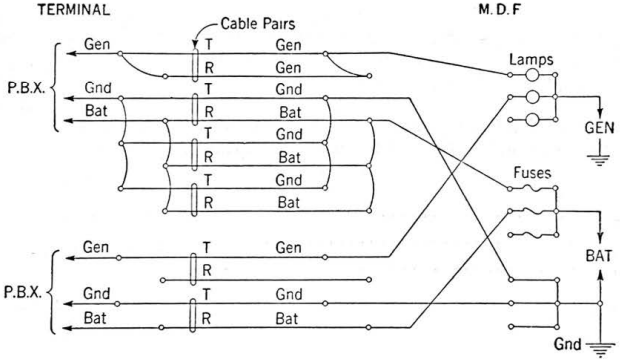
1.03 The coil has a low electrical pickup and should always be used with a 107-type amplifier to make the tone audible.

2. BATTERY FEEDERS

2.01 When identifying pairs in exchange cables, pairs that can not be identified by the usual tone methods are set aside for further test. Such pairs are generally the battery feeders and an occasional defective or transposed pair. Battery

feeders are usually connected with the battery supply on the ring conductor and the ground return on the tip conductor. At the central office the battery supply conductors are connected through fuses to the central office battery, and the ground return conductors are connected to the central office ground.

2.02 Small P.B.X.'s generally require only one cable pair for the battery feeder. Larger P.B.X.'s may make use of several cable pairs in parallel to provide satisfactory battery voltage at the P.B.X. If the battery current requirements are small enough for one fuse, the parallel arrangement is obtained by strapping the pairs together, tip to tip and ring to ring, at the main frame and at the cable terminal. In this case there will be only one cross-connection from the straps. If the battery current is large, more than one fuse will be used and the cable pairs will be divided into strapped groups at the main frame and at the terminal. Each strapped group will have a cross-connection. The following illustration shows the battery and generator supply arrangements for two typical P.B.X.'s.



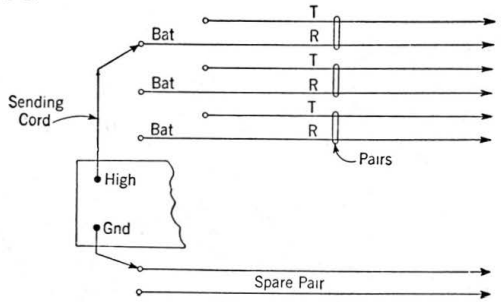
2.03 The pairs that have been set aside, because they cannot be identified by the usual tone methods, should be tested for battery and ground, and all conductors that have battery potential should be temporarily separated from the others or marked in some way. It may also be advisable to check the total number of such conductors against the battery feeder listings given on the work sheets for the job, or against the termination markings.

2.04 **Identification at Main Frame:** In most cases it is advisable to send identification tone from the splice and to identify the battery conductors with the 79-type test set

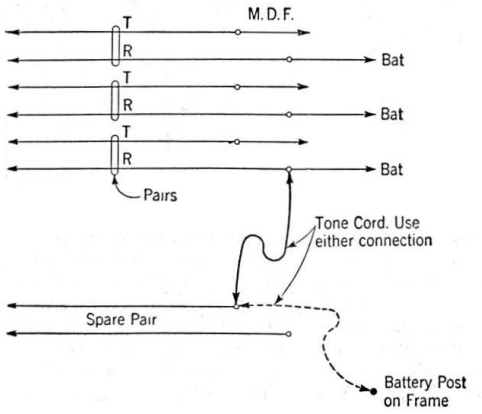
at the main frame. For simplicity the talking circuit is omitted from the illustrations. The general procedure is as follows:

(1) Select and identify a good spare pair between the splice and the main frame. One conductor in this pair is used to complete the tone circuit.

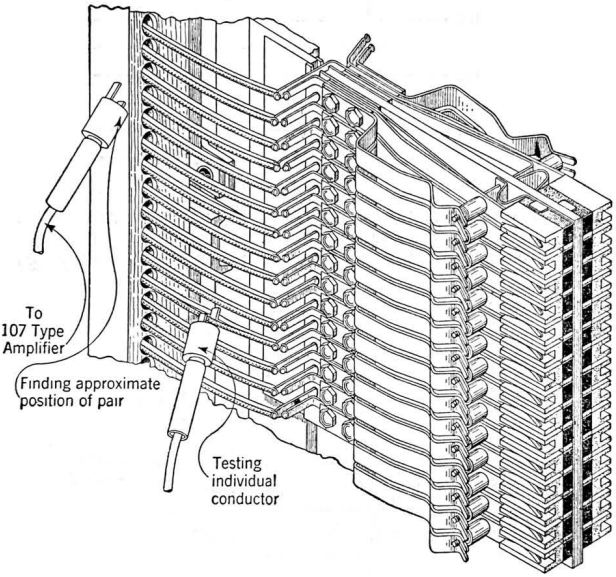
(2) At the splice, connect the tone source between the selected spare conductor and one of the battery conductors, as illustrated below. If the 76-type test set is used, make the connections to the HIGH and GND posts. If the modified 43A test set is used, make the connections to Posts 1 and 5.



(3) At the main frame connect the selected spare conductor to one of the battery conductors or to one of the battery posts that are usually provided along the main frame.

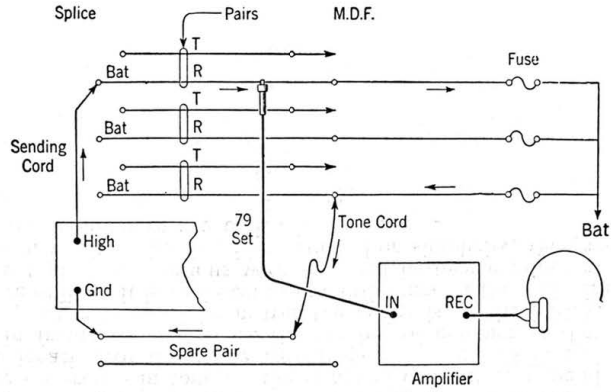


(4) Using the 79-type test set and a 107-type amplifier, listen along the fanning strip over the conductors for the presence of tone. The typical positions in which the 79 set should be held are shown in the following illustration. The positions may be varied slightly depending on how the conductors pass through the fanning strip to the soldering lugs. The presence of tone can be checked by listening over the tone cord connection from the selected spare conductor.



Non-Strapped Battery Conductors

2.05 If there are no strapped battery conductors, no difficulty should be experienced. Referring to the following illustration, the path of the tone current can be traced from the HIGH post along the battery conductor and cross-connection to the non-grounded side of the central office battery, and then back on a cross-connection, the tone cord and the spare conductor to the GND post. The indicated splice may be in a main cable, at the end of a stub cable or in a branch cable.



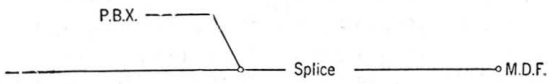
2.06 The battery conductor with tone is identified by listening with the 79-type set as shown in Paragraph 2.04(4). It is necessary to listen along the fanning strip over all of the conductors to make sure that tone is heard on only one battery conductor. After the first battery conductor has been identified, transfer the tone sending cord at the splice to another battery conductor and repeat the process. The connections to the spare conductor are not changed at either the splice or the main frame. If tone is heard on more than one conductor at the frame, it may be desirable to select another conductor at the splice in order to dispose of the non-strapped conductors before identifying the strapped conductors. By repeating the process it is generally possible to identify and eliminate all of the non-strapped battery conductors.

Strapped Battery Conductors

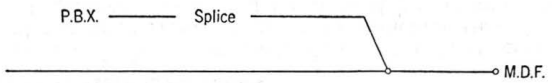
2.07 If tone is heard on more than one battery conductor at the main frame, it generally indicates that they are strapped together. This should be verified by referring to the transfer sheets or preferably by inspecting the cross-connections and straps on the conductors at the main frame. The procedure in identifying the strapped conductors depends to some extent on whether the splice is located between the P.B.X. and the central office, or is located beyond the P.B.X.

2.08 **Splice between P.B.X. and Central Office:** If the splice is located between the P.B.X. and the central office, as indicated in the following diagrams, it may be possible to identify the strapped conductors at the main frame.

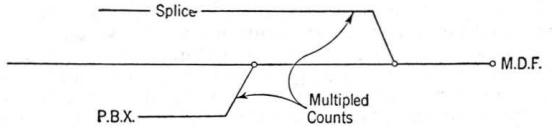
(a) Splice in main cable.



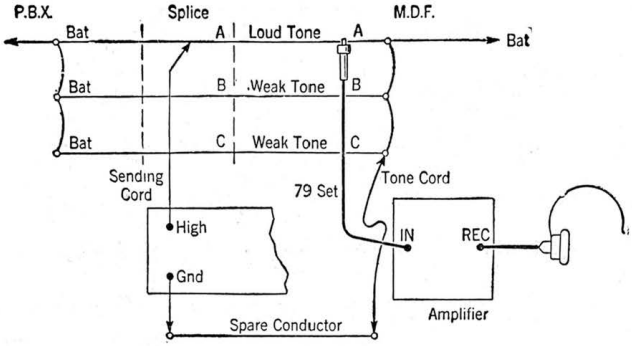
(b) Splice in P.B.X. branch cable.



(c) Splice in multipled branch cable originating between the M.D.F. and the P.B.X.



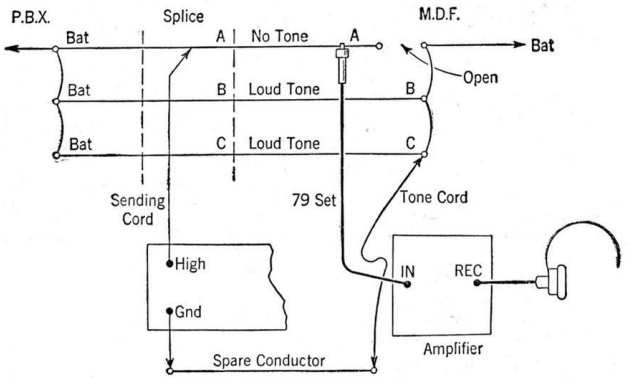
2.09 The procedure is to listen carefully with the 79-type set over the conductors on which tone is heard. If one of the conductors has a louder tone than the others, it indicates that it is the one on which tone is being sent from the splice. The difference in tone on the strapped conductors depends on the location of the splice with respect to the P.B.X. and the main frame, as well as on the number of conductors that are strapped together. The nearer the splice is to the P.B.X. the more difficult it is to detect a tone difference at the main frame. The typical connections with strapped battery conductors are shown in the following illustration. For simplicity, the ground supply conductors are omitted.



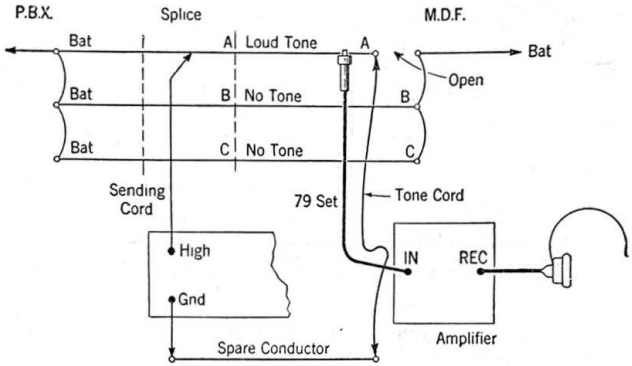
2.10 The correctness of the identification of the conductor with the loud tone can be checked in the following ways.

(a) Referring to the illustration in Paragraph 2.09, if tone is sent on conductor A the pickup at the frame on A should be louder than on B or C. If sent on B the pickup on B should be louder than on A or C. If sent on C the pickup on C should be louder than on A or B.

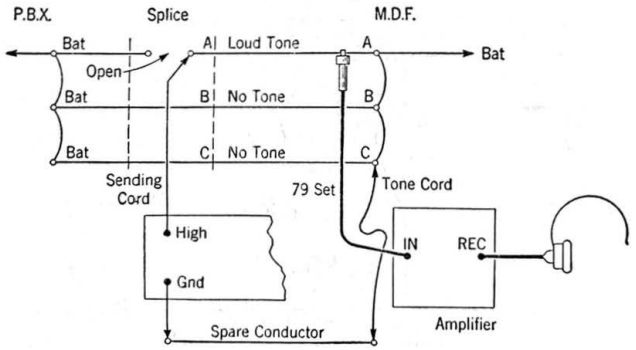
(b) If the battery conductor with the loud tone is opened momentarily at the frame by removing the heat coil, the tone on this conductor should stop and that on the other interconnected conductors should increase.



(c) If the tone cord from the spare conductor is then connected to the opened battery conductor, the tone on the other interconnected conductors should stop.

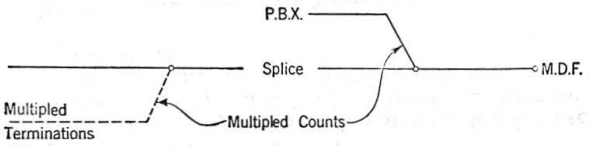


2.11 If the splice is in the main cable or in the branch cable feeding the P.B.X. with strapped battery conductors, the conductor on which tone is sent can be opened temporarily at the splice to clear it from the strap at the P.B.X. Loud tone should then be heard on only one conductor at the main frame, as shown in the following illustration. If the splice is in a multipled branch, as shown in Paragraph 2.08(c), opening the conductor will not clear it from the strap at the P.B.X.

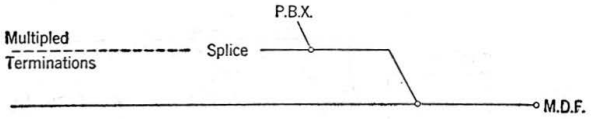


2.12 **Splice beyond the P.B.X.:** If the tone at the main frame is found to be equal in volume on all the strapped battery conductors for a P.B.X., it generally indicates that the splice is beyond the P.B.X. and that the tone is equally divided on all the conductors by the strap at the P.B.X. In this case it is advisable to determine the exact location of the P.B.X. and also determine if the battery conductors are terminated anywhere beyond the splice. The typical positions of the splice and the P.B.X. are shown in the following diagrams in which multipled terminations beyond the splice are indicated by dashed lines.

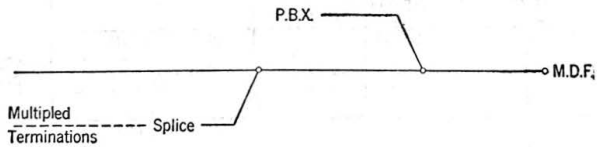
(a) Splice in main cable.



(b) Splice in P.B.X. branch cable.



(c) Splice in multipled branch cable originating beyond the P.B.X.

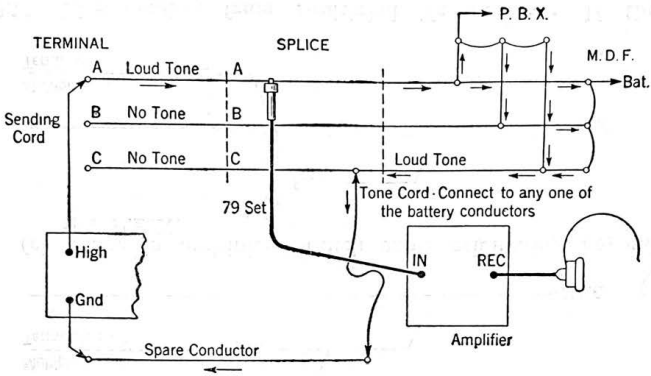


2.13 **Identification from Multipled Termination:** If the strapped battery conductors are terminated beyond the splice it is advisable to identify them in the following way:

(1) Establish a talking circuit from the splice to the terminal. Select and identify a good spare conductor.

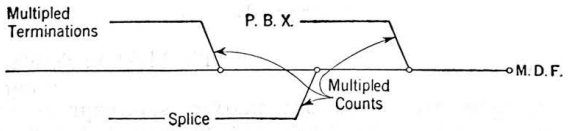
(2) At the terminal send tone between one of the battery conductors and the spare conductor.

(3) At the splice connect the spare conductor to one of the battery conductors. Listen over each battery conductor, on the side of the splice toward the terminal, and make sure that tone is heard on only one conductor. The connections and the path of the tone current are shown in the following illustration.



(4) If both the sending cord and the tone cord are connected to the same conductor, there will be no tone current on the side toward the P.B.X.

Note: The above method is **not** intended for use with the following multipled termination because tone current sent from the terminal will not pass through the splice.



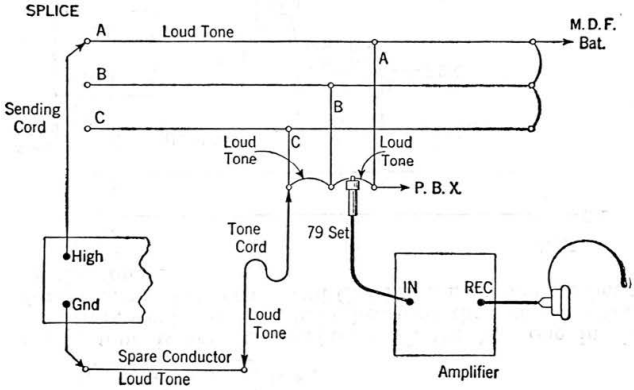
2.14 **Identification from P.B.X. Termination:** If the P.B.X. is between the splice and the central office, and there are no satisfactory multipled terminations of the battery conductors beyond the splice, it is necessary to identify the strapped conductors at the termination from which the P.B.X. works. The procedure will then depend on the type of termination. Where the feeder cable is terminated by means of a form

with skinners it is possible to use the same methods as when identifying at the central office main frame. Where the feeder cable is terminated in sealed chambers or on lug type blocks, it is necessary to use the 79-type test set to listen on the strap wires between the binding posts or the soldering lugs. This is more difficult than listening on the skinners because of the limited space and the possibility of grounding a battery conductor and blowing a fuse. The procedure is as follows:

(1) Establish a talking circuit from the splice to the P.B.X. terminal. Select and identify a good spare conductor.

(2) At the splice, send tone between one of the battery conductors and the spare conductor.

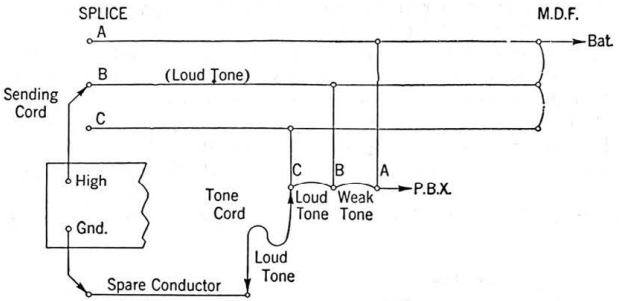
(3) At the P.B.X. terminal, connect the spare conductor to the last strapped binding post or lug of the battery conductors. Listen carefully with the 79 set over the strap between the posts or lug, as illustrated below.



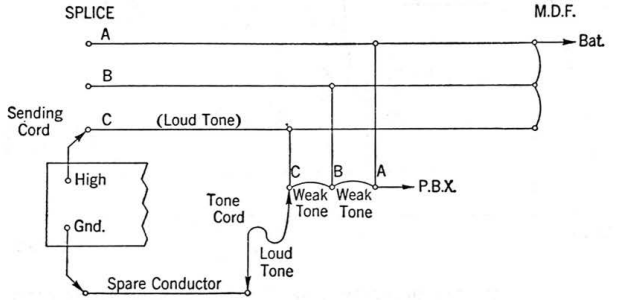
2.15 The theory of the identification is outlined in the following explanation and illustrations.

(a) Referring to the illustration in Paragraph 2.14, if tone is sent on conductor A, the first one in the strap, loud tone should be heard on all the straps to the last conductor, to which the tone cord from the spare conductor is connected. Loud tone should be heard over the tone cord.

(b) If tone is sent on conductor B, weak tone should be heard on the strap between A and B, and loud tone should be heard between B and C and over the tone cord.



(c) If tone is sent on conductor C, the last one in the strap, weak tone should be heard on the straps between A and B, and between B and C. Loud tone should be heard on the tone cord.



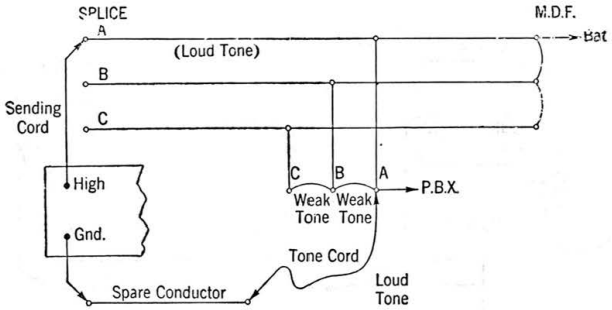
2.16 The following rules can be used if the last conductor in the strap is connected to the tone cord.

(a) If loud tone is heard on the strap wires. the tone is being sent on the first conductor in the strap.

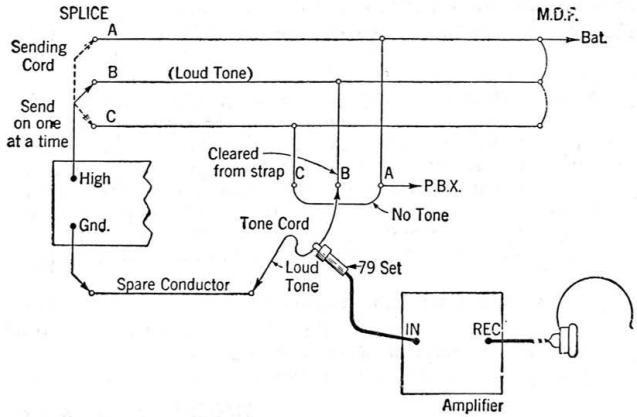
(b) If weak tone is heard on the strap wires, the tone is being sent on the last conductor in the strap.

(c) If there is a noticeable difference in tone on the two sides of a specific post or lug, the tone is being sent on the conductor that is connected to that post or lug.

2.17 The identification can be checked by touching the tone cord to the post or lug that is thought to be the one with the conductor on which tone is being sent. If the identification is correct, weak tone should be heard on the strap wires. An example of this is given in the following illustration that can be compared with the one given in Paragraph 2.14.



2.18 **Opening Strapped Conductors:** If it is impossible to identify the strapped battery conductors with the 79-type test set by any of the methods given in the previous paragraphs in this Section, it will be necessary to open the straps at the P.B.X. terminal and to clear one battery conductor at a time. The cleared conductor should be connected to the spare conductor through the tone cord, as illustrated below. The 79-type test set is then used to listen on the tone cord while at the splice the tone is sent in succession on each of the battery conductors. When tone is sent on the correct conductor at the splice, loud tone should be heard over the tone cord but there should be **no** tone on the remaining strap wires. The connections are shown in the following illustration.



3. P.B.X. EXTENSIONS

3.01 Short P.B.X. extensions that cannot be identified by the usual tone methods may be identified with the 79-type test set in the following way:

(1) Establish a talking circuit between the splice and the P.B.X. termination.

(2) If the 76-type test set is being used to supply the tone, strap the HIGH and LOW posts together. This will permit using the HIGH tone and retain the listening feature to make sure that tone is not sent on a busy extension. Connect the GND post to ground. It the modified 43A test set is used to supply the tone, connect the sending cord to Post 1, and Post 5 to ground.

(3) Select a pair that is used for an extension, make the listening test and, if the pair is idle, send grounded tone on the tip conductor.

(4) At the P.B.X. termination use the 79 set and the 107A amplifier. Run the 79 set along the fanning strip through which the cross-connections pass, until tone is heard at some point. Separate the individual wires in the cross-connections at this point and listen on each wire with the 79 set until the correct one is found. Trace the cross-connection back to the binding posts or lugs and determine the pair number. The connections are shown in the following illustration.