

# CENTRAL OFFICE EQUIPMENT

**Procedures for Cross-  
Connecting (Jumpering) Central  
Office Distributing Frames  
Description**



**AG Communication Systems**

A Joint Venture of AT&T and GTE

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**1. GENERAL**

1.01 This practice provides general information on procedures for cross-connecting (jumping) Central Office (CO) distributing frames.

1.02 This practice is reissued to designate this practice as an AGCS Practice and to incorporate other changes and additions. Remove the previous issue of this practice from the binder or microfiche file and replace it with this issue.

1.03 Cross-connection work is one of the most important operations performed in the CO. In the interest of good service and economical maintenance, personnel performing frame work must be familiar with the methods described in this section.

**2. JUMPER WIRE**

2.01 Jumpers are of 22- or 24-gauge solid tinned copper wire with plastic insulation and nylon jacketed in various colors. Each color is identified with a particular use. (Refer to Table 1.)

2.02 The tip connects to the positive side (+) of the line. The ring connects to the negative side (-) of the line.

2.03 Two-conductor jumpers of blue and black are used when it is necessary to separate transmission from control leads.

2.04 In three-conductor jumpers, the third wire is called the sleeve or control lead and controls the holding, guarding, and releasing of equipment.

2.05 Four-conductor jumpers of white, red, blue and black are used for cross-connecting any four wire circuit, except composite (CX) groups, which have two talking paths requiring a twisted pair for each path. The fourth wire is an extra control lead and is used in circuits requiring fourth Wire supervision.

2.06 Four-conductor jumpers of white, black, red, and green are known as QUAD jumpers. They are used for cross-connecting CX groups only. This type of jumper must always be connected as shown in Table 1. Note that the second pair is labeled (+) and (-).

2.07 Use white, single conductor jumper wire for all miscellaneous single leads.

**3. TOOLS**

3.01 The following tools are required when running jumpers:

**Table 1. Color Code for Standard Jumper Wire.**

JUMPER WIRE	TIP (+)	RING (-)	CONTROL (C)	EXTRA CONTROL (EC)
2-CONDUCTOR	WHITE	RED		
2-CONDUCTOR		-   -	BLUE	BLACK
3-CONDUCTOR	WHITE	RED	BLUE	
4-CONDUCTOR	WHITE	RED	BLUE	BLACK
4-CONDUCTOR	WHITE	BLACK	RED (+)	GREEN(-)
QUAD	SEE NOTE			

**NOTE:** SEE PARAGRAPH 2.07.

- (a) Soldering iron, American Electric #3138 e/w #3920 Fiber Heat and Safety Shield, or equivalent.
- (b) Soldering iron holder, W.E.Co. 504A, or equivalent.
- (c) Probing stick(orange stick), Bates #325, or equivalent.
- (d) Long nose, 6-inch plier, Klein D 303-6, or equivalent.
- (e) Oblique cutting plier, S-inch Klein 528-V, or equivalent.
- (f) Measured cut off stripper, MCO #22, or equivalent.
- (g) Rubberset brush #912, or equivalent.
- (h) Tool pouch, Buhrke #1045, or equivalent.
- (g) Wrapping tool holder, W.E. Co., (to hold wrapping tool on a ladder seat or frame transverse arms)

3.03 For description and use of wrapping tools, and maintenance of the bits, refer to the AGCS 075-630 series of practices.

#### 4. CENTRAL OFFICE EQUIPMENT

4.01 In certain COs, two distributing frames are use in making cross-connections between switching equipment and cable pairs leading to customer's premises. The Main Distributing Frame (MDF) is used, primarily, to cross-connect any piece of line equipment to any customer's cable pair terminating in that CO. The Line Intermediate Distributing, Frame (LIDF) is used, primarily, to cross-connect any telephone number in an office to any piece of line equipment or bunch block in that office. In some COs, the functions of the MDF and the LIDF are provided through the use of a combined distributing frame (CDF).

4.02 Telephone lines (cables) generally enter the CO through the cable vault. in

3.02 The following tools will be required when making solderless wrapped connections such as on the Cook Type 6800 protector and wire wrap terminal blocks:

- (a) Electric wrapping tool, Gardner-Denver 14BI-A30, or equivalent.
- (b) Hand wrapping toll, Gardner-Denver 14H-IC-4, or equivalent.
- (c) Combination 22-24 gauge bit, Gardner-Denver 500131, or equivalent
- (d) Combination 22-24 gauge sleeve, Gardner-Denver 18840, or equivalent.
- (e) Combination 22-24 gauge wire stripper, OK (Cooper) Tools, OK-3907, or equivalent.
- (f) Unwrap tool, AGCS part number F-12012-C, or equivalent.

Figure 1. Method of Fanning Cables Entering a CO with Type B Protection.

switch rooms using Type B protection, the cables terminate on one side of the protector on the vertical main distributing frame (VMDF) (Figure 1).

**4.03** On the other side of the protector, &conductor (red and white) jumpers (Figure 2) are run to extend the lines to line equipment connecting blocks on the horizontal side of the main distributing frame (HMDF).

Figure 2. Two-Conductor Jumpers.

**4.04** In switch rooms where Type A protection is used, cables terminate on terminal blocks on the horizontal side of the MDF. Two-conductor jumpers are then run to protectors on the vertical side of the MDF. The protectors are permanently cabled to the line equipment.

**4.05** Permanent cabling connects the line equipment blocks on the MDF to the line intermediate distributing frame (VLIDF). Additional permanent cabling connects the line equipment blocks to the line equipment.

**4.06** Three conductor jumpers connect the connector blocks on the LIDF to the line

equipment blocks on the LIDF. Permanent cabling, terminating on connectors, completes the circuits.

**4.07** In the case of 4-party service, jumpers connect the connector blocks on the HLIDF or CDF to bunch blocks on the VLIDF or CDF, and the bunch blocks to the line equipment blocks on the VLIDF or CDF.

**NOTE:** To prevent damaging blocks when running jumpers, workmen should not stand on or otherwise put their weight on HMDF or HLIDF blocks.

## 5. RUNNING JUMPERS

**5.01** Avoid tangling, kinking, or catching any jumpers on terminals or other objects.

**5.02** Run jumpers in the most direct way. Do not allow them to catch or twist around other jumpers. Jumpers run through rings should pull against the rings after being tied down.

**NOTE:** Many distributing frames are equipped with single jumper rings. These rings tend to loosen up with continued jumper activity. If allowed to remain loose, they may shift position and complicate running jumpers. Record any loose jumper. This will help to assure that the rings do not remain loose for a long period of time. Tighten loose rings as soon as possible.

**5.03** Figure 3 is a line drawing of jumpers entering and leaving a ring. It illustrates the distribution of jumpers to different sections of the ring, depending on the direction of origin and termination. For the sake of simplicity, Figure 3 does not show slack in the jumpers.

**5.04** Figures 4 through 6 illustrate the correct use of rings when running jumpers, to provide acceptable results.

5.05 Most of the unacceptable (crossed and poorly placed) jumpers are those run from right to left on the horizontal side. Such jumpers are run through rings on their particular horizontal levels, then to connecting blocks on the vertical side. Proper procedures are as follows:

- (a) Run the jumper into a ring on the same horizontal level, with the jumper wire entering near the top, inside edge. See Figure 4.
- (b) If the jumper is to go to a connecting block (or protector) three or more levels above its horizontal level, proceed as in (a) above. Then bring the jumper out in front of existing jumpers on the vertical side and run it as directly as possible into the proper fanning strip hole.
- (c) If the jumper is to go from its horizontal level straight across (or less than three levels up or down) proceed as in the (a) above. Then bring the jumper around the inside edge of the ring to a point where it can run as directly as possible into the proper fanning strip hole.
- (d) If the jumper is to go to a connecting block (or protector) three or

Figure 3. Ideal Method of Jumpers Entering and Leaving Rings.

Figure 5. Left Hand Placed Under and Back of Ring to Receive Jumper.

Figure 4. Right Hand Placing a Right-to-Left Jumper Into Ring.

Figure 6. Jumper Correctly Placed Against Bottom Edge of Ring.

more levels below its horizontal level, use the right hand to bring it around inside the ring to the bottom of the ring. Place the left hand under and in back of the ring to receive the jumper (Figure 5) and place it in a down position (Figure 6). Such a jumper may be run in front of existing jumpers on the vertical side. Run as directly as possible into the proper fanning strip hole.

5.06 Jumpers running from left to right should be run as described in Paragraph 5.05. Jumpers should be placed in front of existing jumpers on the vertical side. And, as stated in Paragraph 5.02, the jumpers should pull on the jumper rings when they have been run and tied down.

5.07 Run short horizontal jumpers (within three verticals to right or to left of point of termination) underneath all other jumpers, (but on top of the ironwork) of their respective levels (see Figure 7). In most instances, they will then cause the least possible interference with other jumpers in the rings they are run through. As in other cases, run such jumpers through the ring so that they pull on the inside edge of the rings and go as directly as possible to the proper fanning strip holes.

Figure 7. Correct Method of Running Straight Across Jumpers.

5.08 A service order may require that a jumper be run from one block on a horizontal level to another block on the same level. Run such a jumper through a ring at least one vertical to the right of the right-hand block of the two on which it is to be terminated. The jumper will then pull against the ring when it is tied down to the connecting blocks.

5.09 In another case, an order may require that a jumper be run from one block on a vertical to another block on the same vertical. Run such a jumper through a ring at least one level above the higher of the two blocks on which it is to terminate. The jumper will then pull against the ring when it is tied down to the connecting blocks.

5.10 Avoid weaving jumpers through existing jumpers or between the individual conductors of an existing jumper. Be sure to keep jumpers above the horizontal ironwork and inside the vertical ironwork of the frames (See Figure 8).

5.1 Run line-switch-to-X-block or bunching block jumpers as required. Allow approximately five inches of slack, measured from the tying down point. This slack is important for tracing jumpers due to error or absence of records.

5.12 When running used jumpers, remove all kinks and knots. Inspect the wire and discard any with damaged insulation.

5.13 Be sure to run the jumpers through the correct holes in the fanning strips of connecting blocks (Figure 9). Avoid crossing jumpers at the holes of blocks on the vertical side of the LIDF. If a jumper comes to a block (vertical) from a higher (horizontal) level, do not run it around existing jumpers in the outer row of holes (see Figure 9) to get to the inner row. Pull existing jumpers in the outer row toward the outer edge of the block. This will clear a straight run to the hole in the inner row. Make every effort to avoid running a jumper

so that the insulation comes just to the notch of the terminal (Figure 10). In the case of plastic insulation, allow for insulation stretch.

6.03 Retwist the jumper back of the block if necessary. When the jumper is tied down, the last twist should come directly behind the jumper hold of the block. This will prevent any jumpers run later from accidentally being run between wires of the tied down jumpers.

6.04 Strip the insulation from the wire and terminate it in a notch of the terminal. Be careful not to nick the wire. To terminate wires on a terminal strip provided with terminals having more than one notch, and where only one set of leads is required, connect to the uppermost notch unless it is necessary to reserve these notches for service changes. The two notch pin was designed for half-tapping purposes.

6.05 Be sure each pin is clean and free of solder. Wrap the wire tightly around the lug, making contact at all points. The wire should not assume an oval shape around the pin.

6.06 The workman on the vertical side should, when possible, tie down all jumpers as he receives them. If jumpers cannot be tied down at the time they are run, tie them in the wood or fanning strip. Pull the the loose ends out for easy visibility, as illustrated in Figure 1, except when jumpers are hold sheet items. In such cases, tie the jumpers in the wood and tuck the loose ends back in existing jumpers. (The workman should be able to look down the frame and easily detect the jumpers to be tied and the tails of jumpers to be cleaned off.)

6.07 Tie a knot in the loose end when a jumper is to be terminated on the back pins. If more than two jumpers are to be tied down on the same row of terminals, tie one knot in the second jumper (counted

Figure 8. Jumper Runs on Vertical Iron-work.

in such a way that it will interfere with another jumper.

## 6. TYING DOWN JUMPERS

6.01 Before stripping insulation from jumper wire, make sure that there will be approximately five inches of slack in the jumper when it is tied. Measure the slack by making sure the jumper length will extend a hand width beyond the front edge of the block. An exception to the five inch slack requirement applies to jumpers run directly across on the horizontal side. In this case, allow only enough slack for pulling and to prevent binding.

6.02 Untwist the jumper far enough back so the wires will come through the fanning strip parallel to each other. Wrap the wires

Figure 9. Correct and Incorrect Jumper Runs Through Fanning Strip.

## 7. SOLDERING JUMPERS

7.01 Inspect soldering irons, and form and dress the tips, at the beginning of the first shift each day.

7.02 The iron should be hot before an attempt is made to solder a connection. Test for heat by touching a piece of solder to the tip, never by holding the iron near your hand or face.

7.03 Be careful not to melt the plastic insulation on the jumper wire with the iron. Place the soldering iron tip against the terminal and wire. Hold the tip against the terminal until solder flows freely on the pin. Use as little solder as you can and still cover the wire and weld it to the terminal. The use of excessive heat and solder causes solder runs on terminals.

7.04 Never flip solder from the iron because of the potential trouble from solder splashes.

7.05 Examine the terminals and blocks around your work for excess solder and splashes. Remove any excess solder and correct any potential trouble.

7.06 Take particular care to see that loose solder on pieces of wire is not left on terminals or blocks.

## 8. WORKING SERVICE ORDERS

### In Orders

8.01 As a general rule, In orders are run in advanced of the due date. If this is not possible, they should be run in as soon as the installer is ready to prevent any unnecessary delays.

### Out Orders

8.02 If two people work together on Out orders, errors are more likely to be found and corrected, thus reducing the possibility of customer complaints. If a

Figure 10. Correct Method of Making a Jumper Termination.

from front to back of block), two knots in the third jumper, etc.

6.08 If solderless wrapped connections, such as on the Cook Type 6800 Protector, are to be made, connect the equipment end first, if possible. Otherwise, the protector pins may be bent, or the plastic fanning strip broken when slack is taken up from the equipment side.

Figure 11. Tying Jumper to the Wood or Fanning Strip.

worker is working alone, he or she can pull up the slack on one side to the mark the jumpers to be cut. Or they can set up the test turret on the connector terminal and short the pins at the X-block or line switch before cutting the jumpers.

**8.03** Remove all dead jumpers from distributing frames.

#### Removing Jumpers

**8.04** When removing jumpers, make sure that the jumper to be cut is clear of other jumpers.

**8.05** Before cutting a jumper, monitor the line to make sure it is not busy. Do not cut a jumper if the line is in use.

**8.06** When cutting other jumpers, leave a tail at least three inches long attached to those pins which are not to be cleaned immediately. Pull such tails out from the block so that they can be seen easily. Remove tails each day (with a hot iron), and clean the pins.

**8.07** Remove (pull) long jumpers after cutting them from the horizontal rather than the vertical side. If a long jumper is removed from the vertical side, it may rub and melt the plastic coating on the conductors of a working circuit.

#### Hold Orders

**8.08** Any order may be designated "HOLD" (to be completed at a specified time). Do the preparatory work (running jumpers, etc.) on the hold orders as soon as possible. Do not complete a hold order until the Installer calls in and requests it.

**8.09** Correct any errors found at once when working or trying to work hold orders. Call assignment and get corrections as soon as possible.

**8.10** Complete all work on orders designated as on hold at the time specified on the order to prevent disconnection in error.

#### Intercept Service

**8.11** Place all disconnected connector terminals on intercepting service (operator or mechanical, depending on the service order being worked). This action is important to reduce no-ring complaints, and is a requirement for Direct Distance Dialing (DDD).

**8.12** Orders requiring intercept service will state the method to be used in intercepting disconnected connector terminals. Do not solder intercept straps. Make a good mechanical connection. All excess solder must be cleaned from terminals before placing intercept straps or clips.

#### 9. TESTING

**9.01** Test all distributing frame work upon completion. Testing procedures will vary in non-SATT and SATT offices. Test should include all distributing frame connections, protector springs and heat coils.

**9.02** In offices that use the test turret as a common piece of test equipment, shorting of the circuit being tested should be on the cable side of the protector

**9.03** For testing in SATT offices with a detection circuit and a special number to dial for detection, the hand test set should be connected to the cable side of the protector.

**9.04** Upon completion of testing, all distributing frame work should have the following information recorded: the date, time and workman's identification.

#### 10. CABLE TRANSFERS

**10.01** Cable transfers are normally half-tapped in a central office on a scheduled

basis, well in advance of the cable splicer's requirements.

**10.02 Half-tapping provides the following advantages during cable transfers:**

- (a) **Reduced service interruptions.**
- (b) **Central office personnel not required during actual cable pair transfer operations.**
- (c) **No testing is required by test personnel.**
- (d) **Reduces number of outside plant personnel required to complete the transfer.**
- (e) **Permits around-the-clock operations by outside plant personnel.**

**10.03 New cable pairs should be picked out before half-tapping is started. The following is a recommended procedure for half-tapping:**

- (a) **At the line equipment block, monitor the customer's line.**
- (b) **If the line is free, use a soldering iron and unwrap the old jumper wire from the lugs.**
- (c) **Clean the solder from the lugs. Clean any loose solder from the block.**
- (d) **Skin and connect the new jumper.**
- (e) **Solder the connection. Use a minimum of solder.**

(f) **With long nose pliers, wrap the bare ends of the old jumper on top of the newly soldered connection.**

(g) **Apply the soldering iron to the bare wire and the lugs. Use additional solder if necessary.**

**NOTE:** The old jumper need only be tacked (lightly soldered) because it is temporary.

**10.04 All half-taps are to be tested in accordance with the office testing procedures.**

**10.05 At the request of the cut control personnel, the old cable pairs are picked out. When the half-taps are removed, the bare ends of the old jumper can be unwrapped "cold" without leaving any indication of a poor job.**

## **11. SPECIAL CONDITIONS**

**11.01 Write up on the rack sheet special cuts or trouble cuts received from the test board. Show the date, time and test personnel numbers. Also indicate who received the information and who is to do the work.**

**11.02 If the testboard requests that a jumper be reversed at a protector to compensate for a reversed pair, inform the supervisor and place a tag on the pair. On the tag put the date, the reason for reversal and the test personnel number. Do not allow these reversal to become permanent. Follow up so the jumpers can be restored to normal.**