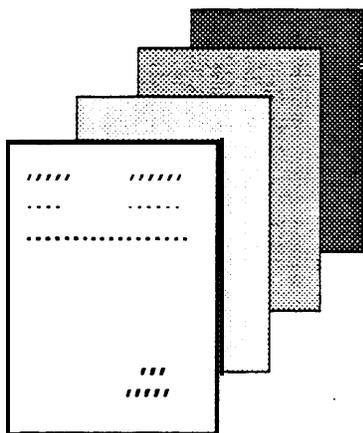


**Power Connections - Central Office Fuse
inspection and Tightening Procedures**



GTE
COMMUNICATION
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| | TABLE OF CONTENTS | PAGE |
|----|---|------|
| 1. | GENERAL | 4 |
| 2. | PRELIMINARY | 4 |
| 3. | SAFETY INSTRUCTIONS | 4 |
| 4. | TOOLS AND TEST APPARATUS | 5 |
| 5. | PROCEDURE, MAINTENANCE,AND INSTALLATION | 5 |
| | Guttertaps | 5 |
| | Fuse Panels and Miscellaneous | 5 |
| 6. | POWER EQUIPMENT | 7 |
| 7. | OFF-LINE FUSE CLIP FACTORY ADJUSTMENT PROCEDURE | 7 |
| 8. | ON-LINE FUSE CLIP ADJUSTMENT | 8 |
| 9. | CHARGER EQUIPMENT | 10 |

1. GENERAL

1.01 This practice provides information to be used for maintaining tight PRESSURE type connections in power systems.

1.02 This practice is reissued to update the text. Because of the extensive changes involved, change indicators are omitted. Remove the previous issue of this practice from the binder or microfiche file and replace it with this issue.

1.03 The procedures outlined in AGCS Practice 026-100-500 dealing with fuses and fuse panels should be followed in conjunction with this practice. The inspections covered in this practice should be performed during light traffic hours except when checking for hot fuses, which should be performed during peak load periods.

2. PRELIMINARY

2.01 Installation and maintenance of good tight power connections may mean the difference between good or poor telephone service. Poor power connections have caused service problems that cannot be duplicated when equipment is tested for faults. A loose connection may cause outages **when vibration momentarily opens the power supply to the equipment.**

2.02 Poor connections on discharge fuses and switch panels may result in blowing the discharge fuse and subsequently dropping an entire central office, or seriously crippling the office trunking capacity.

2.03 With the increased use of data switching service, any spurious noise or transient signal causes garbling of data transmission to the point that a message may become incoherent and many times cannot be deciphered without being transmitted **a second time.**

2.04 Persons assigned to power connection inspection or tightening should be

cautioned to observe all safety requirements presented in part 3.

2.05 This routine must be performed once every 2 years. If transmission noise is present and cannot be traced to faulty equipment, this routine may be performed at the in-charge supervisor's discretion.

2.06 End-aisle and Power Distribution Unit Frame (PDU) fuse assemblies may be exempted from this routine provided they **do** not give any indication of malfunction.

2.07 All work and tests covered in this practice must be performed during off-peak-traffic hours, normally between 11 :00 p.m. and 6:00 a.m.

2.08 For additional information on safeguards to observe while working on power equipment, refer to AGCS Practices 200-00 I-004 and 200-00 I-000.

3. SAFETY INSTRUCTIONS

3.01 The use of insulated or nonconductive wrenches is mandatory. Rings, wrist-watches, metal bracelets, necklaces, metal eyeglass frames, etc, should be removed. Refer to Practice 200-001-000. In addition, safety glasses must be worn at all times while working with power equipment.

3.02 Be sure "Danger" and "No Smoking" signs are adequately displayed on or around the power plant.

NOTE: This practice does not contain information or procedures to be used with a commercial power panel but rather for central office telephone equipment power panels only.

3.03 In situations where work must be performed near exposed commercial electrical systems that cannot be interrupted, rubber gloves must be worn. Rubber blankets must be used to guard the power.

Every possible means should be used to remove power from equipment to be worked on. When equipment to be worked on can be isolated without service interruption, power should be removed before repairs are made.

3.04 Protective rubber mats must be used to prevent accidental contact between the -MB and adjacent + MB (GRD) ground potentials when working on live dc power.

3.05 All tools must be insulated to prevent **shock** to personnel and damage to equipment when working with live power.

4. TOOLS AND TEST APPARATUS

4.01 The following tools and test apparatus should be used when performing the procedure presented in this practice:

- (a) Digital Volt-Ohmmeter (VOM) equipped with test cords.
- (b) Socket wrench set with sizes to meet office requirements. Short and long extension drives and a torque wrench should be available.
- (c) Open end or box wrench with sizes to meet office requirements.
- (d) Allen setscrew wrench with sizes to meet office requirements.
- (e) Installer's mat (drop cloth).
- (f) Friction or plastic electrical tape.
- (g) Six-inch screwdriver.
- (h) Plastic probe (stick), no oxide.
- (i) Grease (Thomas & Betts, #CP8Kopr-Shield).
- (j) Battery terminal wrench.
- (k) Protective rubber mat.

5. PROCEDURE MAINTENANCE, AND INSTALLATION

Gutterlaps

5.01 Use the installer's mat or rubber mat to provide a protective shield around the gutterlaps to be checked.

CAUTION

DO NOT PULL OR TWIST WITH EXCESSIVE FORCE, BECAUSE THE CABLE MAY DISCONNECT IF THE CONNECTION WAS POORLY JOINED.

5.02 Remove the gutterlap cover and examine visually for incorrect connections. Be certain that the leads are securely clamped in the connector.

5.03 Use the correct size Allen setscrew wrench to fit the connector screw and apply pressure to tighten these screws. Be careful to avoid over-tightening the screws since the threads may be stripped if excess pressure is exerted. If there is doubt that connections are tight, use the voltmeter on the 200 MV scale. Remove the connector cover, exposing the connector and cables. Insert the voltmeter probes across the connection (one probe on the feeder cable and one probe on the tap cable), and measure the voltage drop while the connector is carrying the load. The reading should be "80 mv" maximum.

Fuse Panels and Miscellaneous

5.04 Fuse panels should be checked for loose power terminals. Use a screwdriver and/or wrenches to apply tightening pressure. Care should be exercised not to cause a terminal lug to turn and come in contact with nearby battery or ground.

5.05 Tighten screws on all alarm-type fuses requiring tightening and verify that plug-in type fuses are securely seated.

5.06 Check battery and ground solder connections with a plastic probe stick by applying a slight pressure. Wire movement will be noticed on a loose connection.

NOTE: Do not apply pressure that may disconnect a poorly soldered connection. Solder loose connections by using all safety precautions necessary. Wires on the shelf switch jacks should also be checked at this time.

5.07 The screw-type connections at the power distributing fuse boards may be tightened by using the Allen setscrew wrench to fit the terminal lug setscrew, or the socket set for the cap-type screws.

5.08 Tighten power board terminal stud nuts with the proper socket or open end wrench according to the torque values shown in Table 1, and take care not to cause the fuse stud to turn. To avoid fuse stud turning, a second person should hold the wrench on the stud being tightened. For tightening compression lugs to the Disconnect Switch Unit (DSU), use the torque values shown in Table 2.

CAUTION

THE TORQUE VALUES GIVEN ARE TO BE USED ON CLEAN, DRY (NOT GREASED OR LUBRICATED) SCREWS, NUTS, AND BOLTS. ANY LUBRICANT OR GREASE ON THE THREADS ACTUALLY CAUSES A TRIPLING OF THE INTENDED TORQUE VALUE AS MEASURED BY A TORQUE WRENCH.

5.09 The main power board terminal connection should be tightened with appropriate wrenches. Again, personnel doing this routine should exercise caution not to allow fuse studs to turn in the panels.

5.10 **all** fuseholder receptacles should have a real fuse, dummy fuse, or fuseholder in place. Unequipped fuseholder recep-

Table 1. Torque Values for Fuse Connections.

| FUSE HOUSING | STUD SIZE | INCH-POUNDS | FOOT-POUNDS |
|-----------------|-----------|-------------|-------------|
| 0-30 Amperes | 1/4 | 72 | 6 |
| 3 I-60 Am peres | 5/16 | 132 | 11 |
| 100-600 Amperes | 3/4 | 660 | 55 |

Table 2. Torque Values for DSU Connections.

| DSU | BOLT SIZE | INCH-POUNDS | FOOT-POUNDS |
|----------------------|-----------|-------------|-------------|
| 1,000-4,000 Am PERES | 1/2 | 480 | 40 |

tacles may collect foreign substances which can cause problems over a period of time. When performing procedures in this practice, check all fuseholder receptacles to ensure that they are equipped as above.

5.11 The bus bar clamps and connectors should be tightened in accordance with Practice 205-705-201, by using a torque wrench and the appropriate socket to fit the bolt being tightened.

WARNING

WHEN CONNECTING A BUS BAR TO ANY POINT WHICH MAY BE AT A DIFFERENT POTENTIAL, A VOLTMETER SHOULD BE USED TO DETERMINE WHETHER A VOLTAGE EXISTS BETWEEN THE POINT AND THE BAR TO BE CONNECTED. IF VOLTAGE DIFFERENCE DOES EXIST, DO NOT MAKE A CONNECTION UNTIL IT IS DEFINITELY DETERMINED THAT A PERSONNEL OR SERVICE HAZARD IS NOT INVOLVED.

5.72 The battery intercell connectors should be tightened to the manufacturer's specifications using a torque wrench on initial installation of new batteries. Subse-

quent checking of torque values requires a slightly lower torque value to maintain connection integrity.

6. POWER EQUIPMENT

6.01 Before initial installation of power equipment, all nuts, bolts, and clips must be checked and tightened by the installer before being put in service (paragraph 5.09). All bus bars and cable connections must be securely tightened (AGCS Practice 205-705-201, paragraph 4).

6.02 On a 100-600 fuse housing, remove the pull-out fuse assembly and tighten the two screws holding the fuse in position. Make certain that the washers and lockwashers are in the correct position as shown in Figure 1.

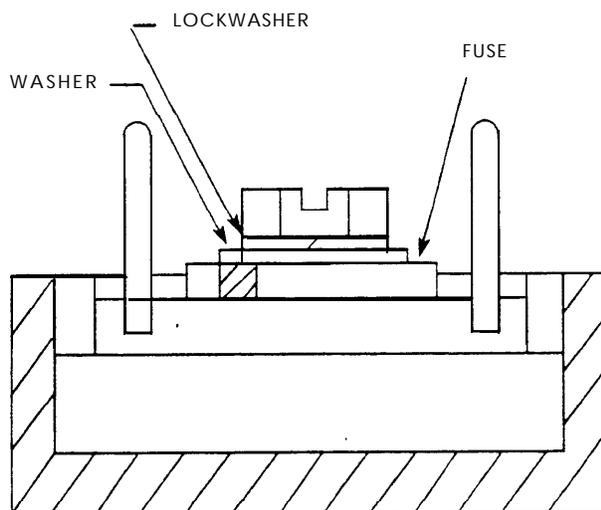


Figure 1. Typical Location of Fuse and Washers.

6.03 When reinserting the pull-out fuse assembly, be certain the assembly is all the way in and the blades are firmly held by the blade clips.

6.04 On 5-30 ampere and 31-60 ampere fuse housings, make sure that the fuse clips in the pull-out handle provide adequate pressure (10 ± 5 pounds pullout force by feel) to hold the cartridge-type fuse firmly.

6.05 Check the 30- and 60-ampere pull-out housing to ensure that a light push from side to side on the pull-out does not dislodge it from the fuse housing. Should the pull-out come out of the housing too easily, adjust blade clips by using factory off-line adjustment procedures

7. OFF-LINE FUSE CLIP FACTORY ADJUSTMENT PROCEDURE

7.01 Adjustment of the fuseholder (AGCS part No. FD-1021-DT and D U) specifies a 10 ± 5 pound extraction force for the male pull-out. The adjustment method described in the following steps will attain the adjustment by gauging the physical position of the blade clips and blades:

- (a) With the pullout removed from the fuseholder body, note the position of the blade clips and blades.
 - (1) See Figure 2 for of typical improper adjustments. See Figure 3 for the adjustment procedure and Figure 4 for illustrations of properly adjusted blade clips.
 - (2) See Figures 5 and 6, respectively, for typical illustrations of improper and proper blade adjustments.
- (b) If the blade clips are not parallel to the side of the housing and aligned with one another, they should be adjusted before the switch is on-line. The two parts of the clip must align with one another as shown in Figure 4.
- (c) Adjust the center portion of the blade clip with an insulated tool. See Figure 4 and section B-B for the proper position and dimension relative to the two-part portion of the clip. The dimensions shown are as judged by eye.

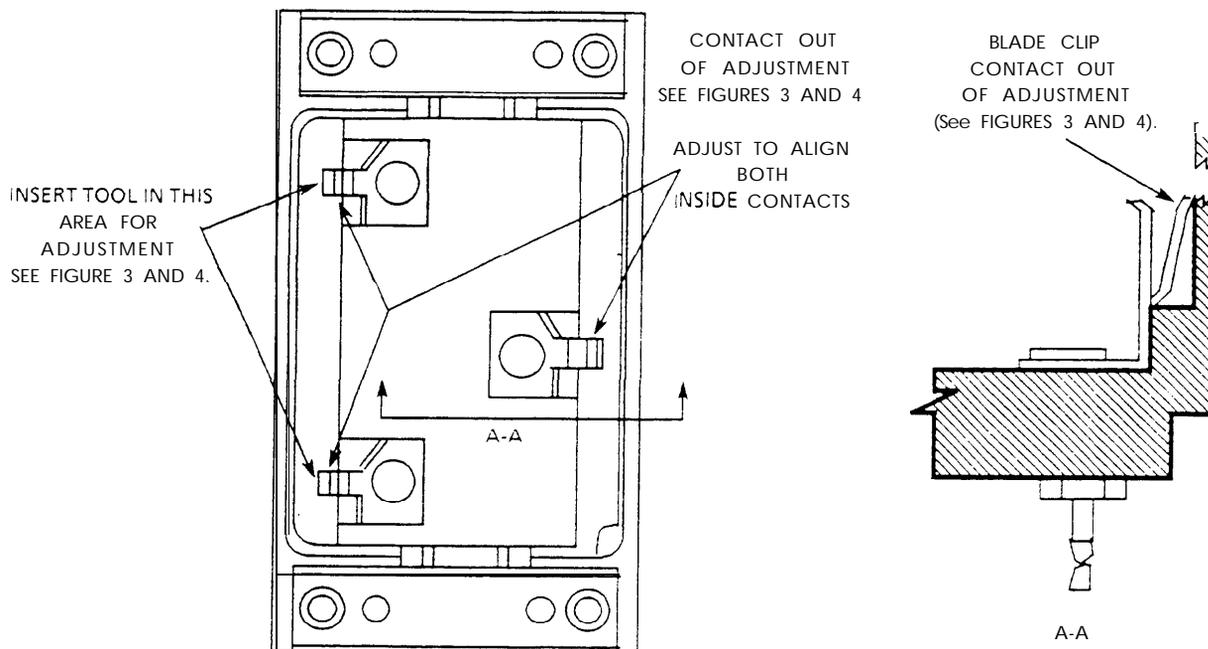


Figure 2. View of Blade Clips Showing Misaligned and Improper Contact Adjustment.

- (d) The blades in the pullout should be checked to ensure they are in proper alignment with the housing and one another. See Figure 5 for score mark identification of properly aligned clips. Improper alignment of the blades can cause deformation of the blade clip and loss of contact pressure (Figure 6).
- (e) After the adjustment is completed, reinstall the pull-out in the fuseholder body, and check for the 10 ± 5 pound pull-out force by feel.
- (f) Alignment and adjustment of the blade clips and blades should be visually checked each time the pull-out is removed. Note the approximate force it takes to remove the pull-out as another indication if adjustment is necessary. Some relaxation of the blade clips occurs with use, but should not adversely affect the retention force.

NOTE: An investigation is **in** progress to develop an improved method of

adjusting FD-1021-DT and -DU fuseholders. When the method is finalized, the information will be provided.

8. ON-LINE FUSE CLIP ADJUSTMENT

8.01 If the fuseholder to be adjusted is on a live circuit, the current must be shunted around the fuse before it is disconnected to expose the blades and blade clips for adjustment. Use the following methods and precautions to perform this task:

CAUTION

EXERCISE CAUTION WHEN PERFORMING THE FOLLOWING ADJUSTMENTS_ SAFETY GLASSES MUST BE WORN AT ALL TIMES. REFER TO THE SAFETY INSTRUCTIONS IN PART 3 FOR ADDITIONAL INFORMATION ON NECESSARY PRECAUTIONS.

- (a) Use a short length of power cable as a jumper. The power cable must have lugs compressed on each end and be of sufficient size to carry the

- current of the fuseholder being tested.
- (b) Attach the power cable to the load side of a spare fuse in the Power Distribution Unit Frame (PDUF). The spare fuse should be the same size as the fuse in question.
- (c) With the spare fuse removed, connect the other end of the power jumper cable to the exposed threads of the load side of the fuseholder in question_
- (1) Use an extra nut to tighten the jumper cable lug on top of the permanent cable.
- (2) The permanent cable must not be loosened or power will be lost to the associated equipment.
- (d) Next, plug in the spare fuse and remove the fuse to be tested.
- (e) Perform any tests and adjustments, as required, on the fuseholder in question. Be aware that this fuseholder is still hot.
- (f) When tests are finished, replace the original fuse or install a new fuse and pull the spare fuse.
- (g) Remove the jumper cable from the permanent fuse first and then the spare fuse.
- (h) When finished, ensure that the permanent cable nut is still tight after all the activity.
- 8.02 If the fuseholder stud does not have enough threads on it to allow the jumper cable to be attached, the jumper cable must be attached to the permanent cable or the shank end of the compression lug. Perform this procedure as follows:
- (a) Use a guttertap or similar connector to attach the jumper cable to the shank of the permanent compression lug. If this is not feasible, remove approximately 2 inches of sheath from the permanent cable and attach the guttertap to the exposed cable.
- (b) Proceed with the activities as outlined in paragraph 8.01.

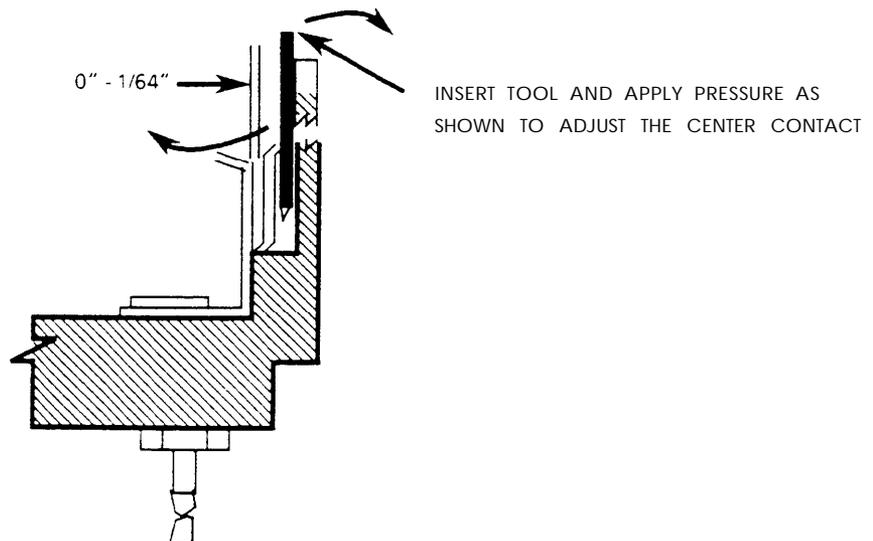


Figure 3. Adjustment of Blade Clip Center Contact.

- (c) When finished, cover any bare cable sections with sheath and tape.

9. CHARGER EQUIPMENT

WARNING

THE END-CELL SWITCH, IF APPLICABLE, SHOULD BE ELECTRICALLY DISABLED IN EACH POSITION TO AVOID PERSONNEL INJURY DURING THIS MAINTENANCE ROUTINE.

9.01 Periodically tighten the ac input leads and the dc output battery leads to the central office battery charger as follows:

- (a) Shut off the battery charger.
- (b) Shut off the ac power to the battery charger at the breaker panel.

- (c) Open the front door of the battery charger.

CAUTION

EXERCISE CAUTION WHEN TIGHTENING THE DC OUTPUT TERMINAL SINCE THE LEADS ARE CONNECTED TO BATTERY.

- (d) Using an insulated wrench, tighten the screws holding the output leads from the battery charger to the batteries.
- (e) Using an Allen wrench or screwdriver, tighten the ac power leads coming from the ac breaker panel.
- (f) Fasten the battery charger door, power-up from the breaker panel to the battery charger, and power-up the battery charger.

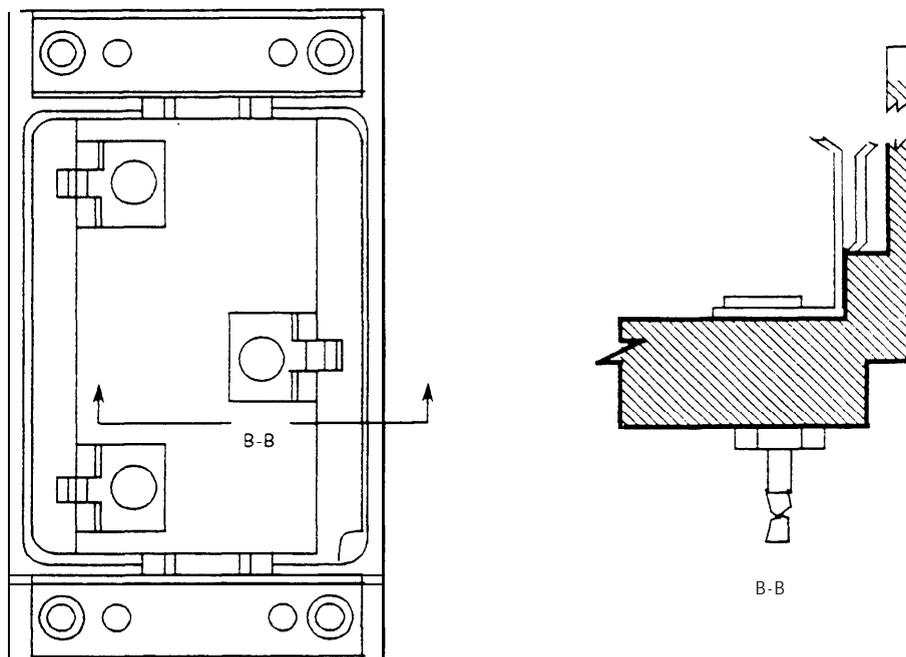


Figure 4. View of Blade Clips Showing Normally Aligned and Adjusted Position.

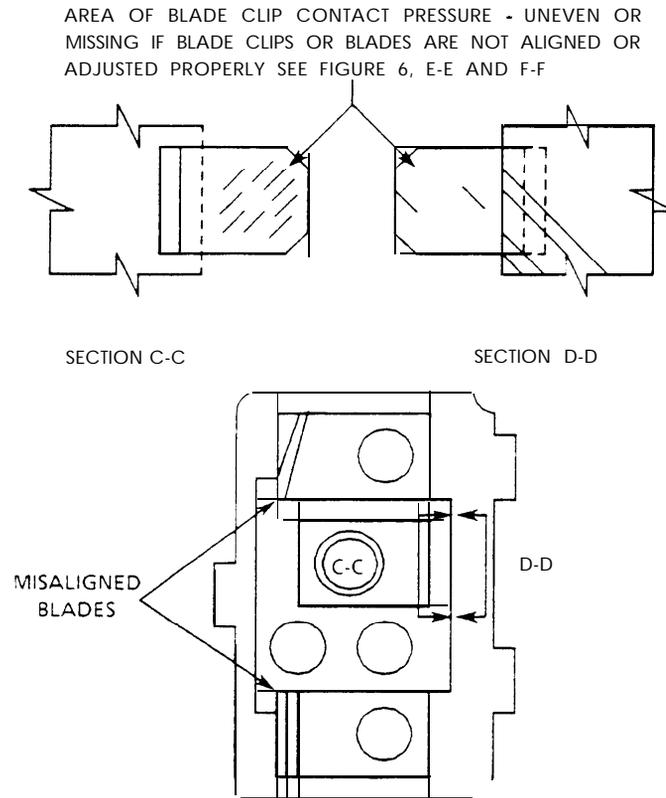


Figure 5. View of Pull-Out Showing Misaligned Blades.

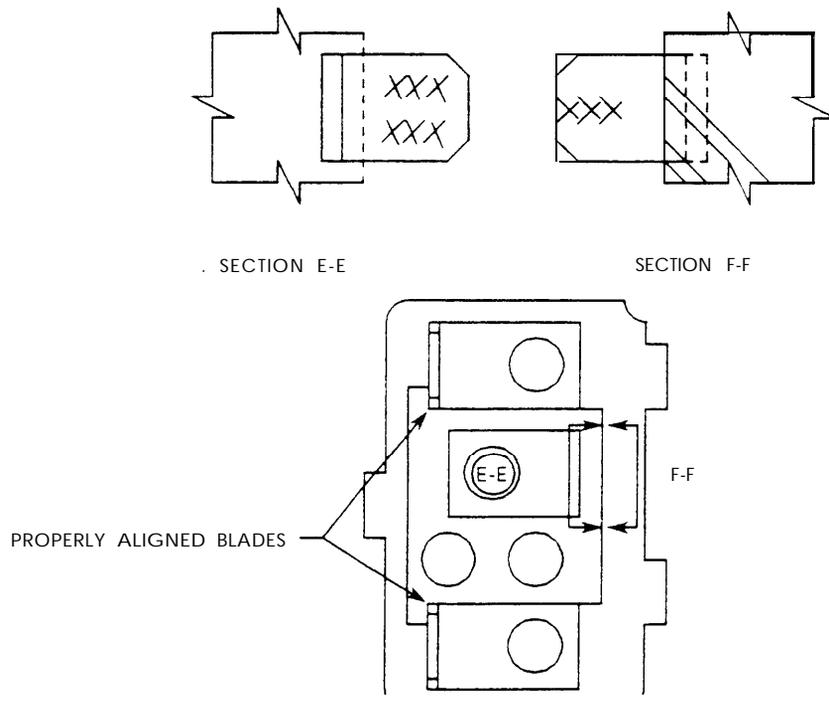


Figure 6. View of Pull-Out Showing Properly Aligned Blades.

