

**GFELLER LINE CONCENTRATOR**  
**49-9-2, 49-11+1-2, 49-12-2**  
**PIECE-PART DATA, REPLACEMENT PROCEDURES,**  
**COMPONENT PARTS, AND MAINTENANCE EQUIPMENT**

**1. GENERAL**

**1.01** This section covers the information necessary for the ordering and replacement of parts used in the maintenance of the Gfeller line concentrator models 49-9-2, 49-11+1-2, and 49-12-2.

**1.02** This section is reissued to cover replacement of the 15-uf and 1750-uf capacitors used in the control unit and remote unit, respectively, and to generally bring the section up to date.

**1.03** Part 2 of this section covers the piece-part numbers and corresponding names of replacement parts that may be ordered. Drawings are included showing the different parts. This information is referred to as piece-part data.

**1.04** Part 3 specifies the replacement procedures for those parts for which the method to be used is not obvious.

**1.05** Part 4 covers ordering information for capacitors, resistors, rectifiers, and miscellaneous component parts and test equipment.

**1.06** When used in the tables, ES (exchange side) refers to the central office unit and SS (subscriber side) refers to the remote unit.

**2. PIECE-PART DATA**

**2.01** Figures 1 and 2 illustrate the various parts of the relay and switch, respectively. Each part is labeled with a number for cross reference to the parts list (Table A or B).

**2.02** Tables A and B provide the parts lists for the relays and switches, respectively, and give the number relative to Figure 1 or 2, name of part, part number, and a view of each part.

**ORDERING INFORMATION**

**2.03 *Parts Other Than Relays:*** When ordering parts other than relays, specify part name. If the part has a number, it must be preceded by the part name "Gfeller" and the model of the Gfeller line concentrator must be specified. For example: Armature Angle, Gfeller K9747/3 for the Gfeller Line Concentrator 49-9-2. When the table indicates that the part is for the exchange side (ES) or for the subscriber side (SS), this should be specified after the part name in the ordering information.

**2.04 *K and RA Through RF Relays:*** When ordering relays, specify the functional designation, which model it is for, and whether it is for the central office or remote unit. For example: Relay RA, SS, for the Gfeller Line Concentrator 49-12-2. If the relay ordered is located in the Gfeller Line Concentrators 49-9-2, also indicate the serial number.

*Note:* If replacing one of the RA through RF relays in line concentrator 49-9-2, serial numbers 2 through 447, which have been modified to extend the signaling range, order that relay and also a coil for the corresponding relay in line concentrator 49-9-2 with serial numbers 448 and over. Change the coil for the relay ordered before placing in service.

**2.05 *Other Relays:*** When ordering other relays, it will only be necessary to use the functional designation, since the Gfeller Company has standardized all relays of the same functional designation in all concentrator models except the K and RA through RF relays. For example: Relay PA for the Gfeller line concentrator. Follow the same procedure when ordering a coil for a particular relay.

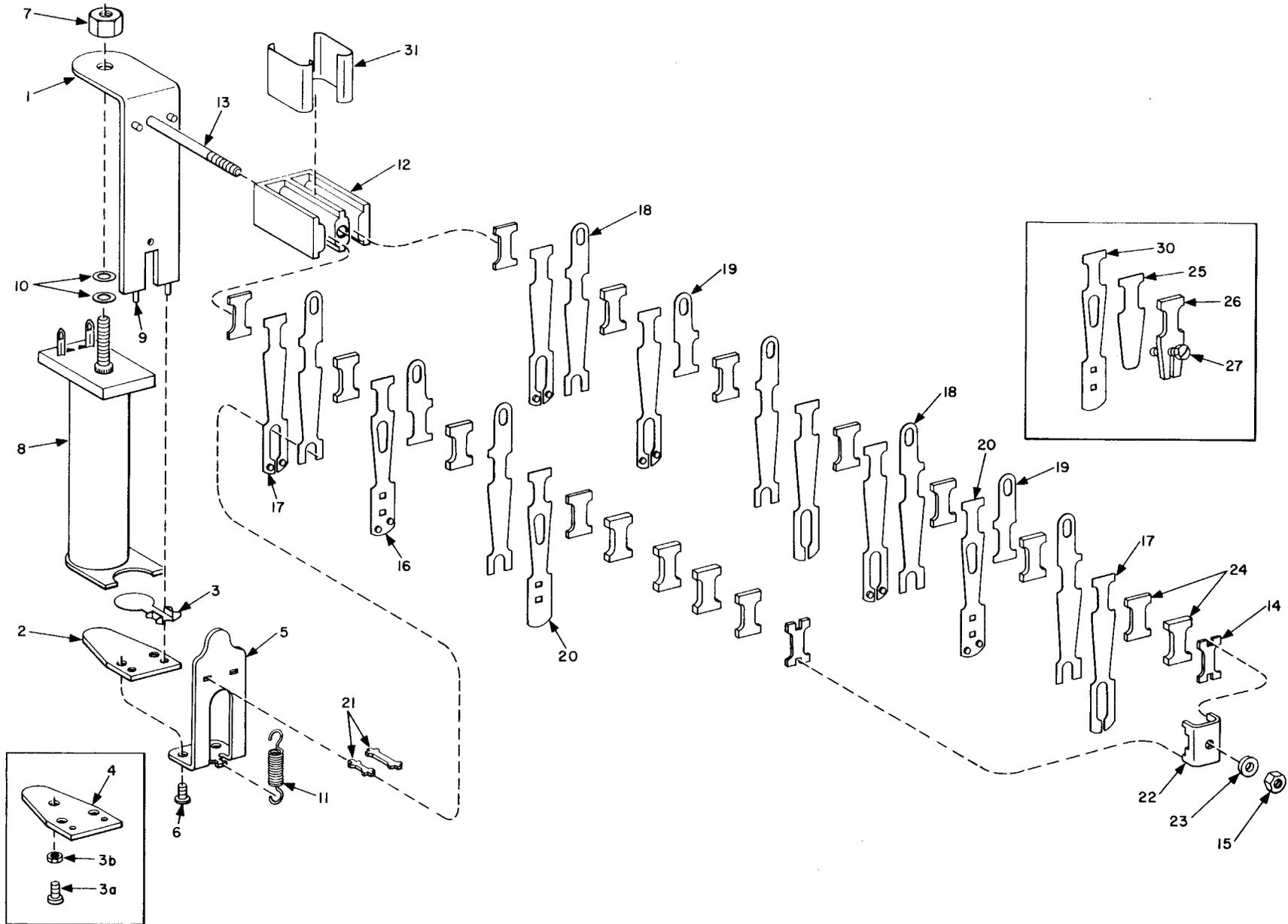


Fig. 1 — Gfeller Relay

**Note:** In some cases, because of the standardization of relays, there will be an additional set of contacts on the relay received for replacement. This will occur when these additional contacts are required in a concentrator model other than the one for which the relay was ordered. In these cases, the additional contacts should be disregarded

and the relay wired in accordance with the appropriate drawing.

**2.06** When ordering parts, do not include any of the descriptive information shown in parentheses in the tables or make any reference to this section.

**TABLE A — PIECE PARTS FOR LINE CONCENTRATOR RELAYS**

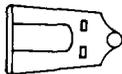
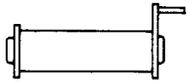
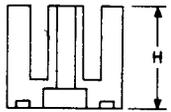
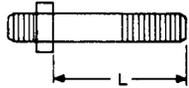
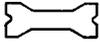
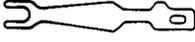
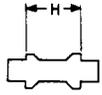
NO.	PART NAME (See Fig. 1)	PART NO.	VIEW
1	Yoke	K11027-2	
2	Armature (Multipurpose relays)	K11027-1/1	
2a	Armature (2) and armature angle (5) riveted	K11027-7/2	
3	Residual (For relay) 0.002 in. Residual (For relay) 0.004 in. Residual (For relay) 0.006 in. Residual (For relay) 0.008 in.	K13650-1/1 K13650-1/2 K13650-1/4 K13650-1/3	
3a	Residual screw	K11027-4	
3b	Nut	K11027-5	
4	Armature (Drilled for residual screw) (Relays RA, RB, RC, RD, RE, RF)	K11027-1/2	
4a	Armature (4) and armature angle (5) riveted	K11027-7/1	
5	Armature angle	K9747/3	
6	Screw M 2x3	WK11027-6	
7	Nut	K11027-8/2	

TABLE A — PIECE PARTS FOR LINE CONCENTRATOR RELAYS (Cont)

NO.	PART NAME (See Fig. 1)	PART NO.	VIEW
8	Coil for relay, ES or SS		
9	Armature stud	WK4052	
10	Feran washer 0.002 in. Feran washer 0.004 in. Feran washer 0.008 in.	K11027-8/7a K11027-8/7b K11027-8/7c	
11	Armature spring	K16611	
12	Spring assembly block H0.394 in. Spring assembly block H0.551 in. Spring assembly block H0.709 in.	K9747/9-10 K9747/9-14 K9747/9-18	
13	Spring assembly bolt L0.551 in. Spring assembly bolt L0.709 in. Spring assembly bolt L0.866 in.	K9747/16-14 K9747/16-18 K9747/16-22	
14	Pressure plate	K9747/15	
15	Spring assembly nut	K9747/30	
16 16a	Transfer spring Gs (See Note) Transfer spring Pt	K9747/10-1 K9747/10-3	
17 17a	Contact spring Gs (See Note) Contact spring Pt	K9747/11-1 K9747/11-2	
18	Tension spring	K9747/12	
19	Terminal lugs	K9747/13	
20 20a	Contact spring Gs (See Note) Contact spring Pt	K9747/10-2 K9747/10-4	

**Note:** For item number 16, 17, or 20, reference should be made to Gfeller handbook relay chart T8598-2, T8598-5, T9967, or T9889 for correct contact metal, Gs or Pt, for specific relay.

TABLE A — PIECE PARTS FOR LINE CONCENTRATOR RELAYS (Cont)

NO.	PART NAME (See Fig. 1)	PART NO.	VIEW
21	Fiber separator H0.0788 in. Fiber separator H0.118 in. Fiber separator H0.157 in. Fiber separator H0.217 in.	K9747/19-2 K9747/19-3 K9747/19-4 K9747/19-5	
22	Spring assembly bridge	K9747/17	
23	Spring assembly washer	K9747/20	
24	Fiber pilespace 0.0394 in. Fiber pilespace 0.0197 in. Metal pilespace 0.0788 in. Metal pilespace 0.0394 in. Metal pilespace 0.0197 in.	WK9747/14 WK9747/14a WK9747/23a WK9747/23b WK9747/23c	
25	Covering plate	K11027-16/3	
26	Steel plate	K11027-16/2	
27	Adjusting screw	K11027-16/4	
28	Nut M 4 (For mounting relay)	K11027-8/6	
29	Washer (For mounting relay)	K11027-8/5	
30	Auxiliary spring 0.0118 in. Auxiliary spring 0.0197 in.	K11027-16/1a K11027-16/1c	
31	Holder H 0.406 in. Holder H 0.563 in. Holder H 0.721 in.	K11027-20-10, 3 K11027-20-14, 3 K11027-20-18, 3	

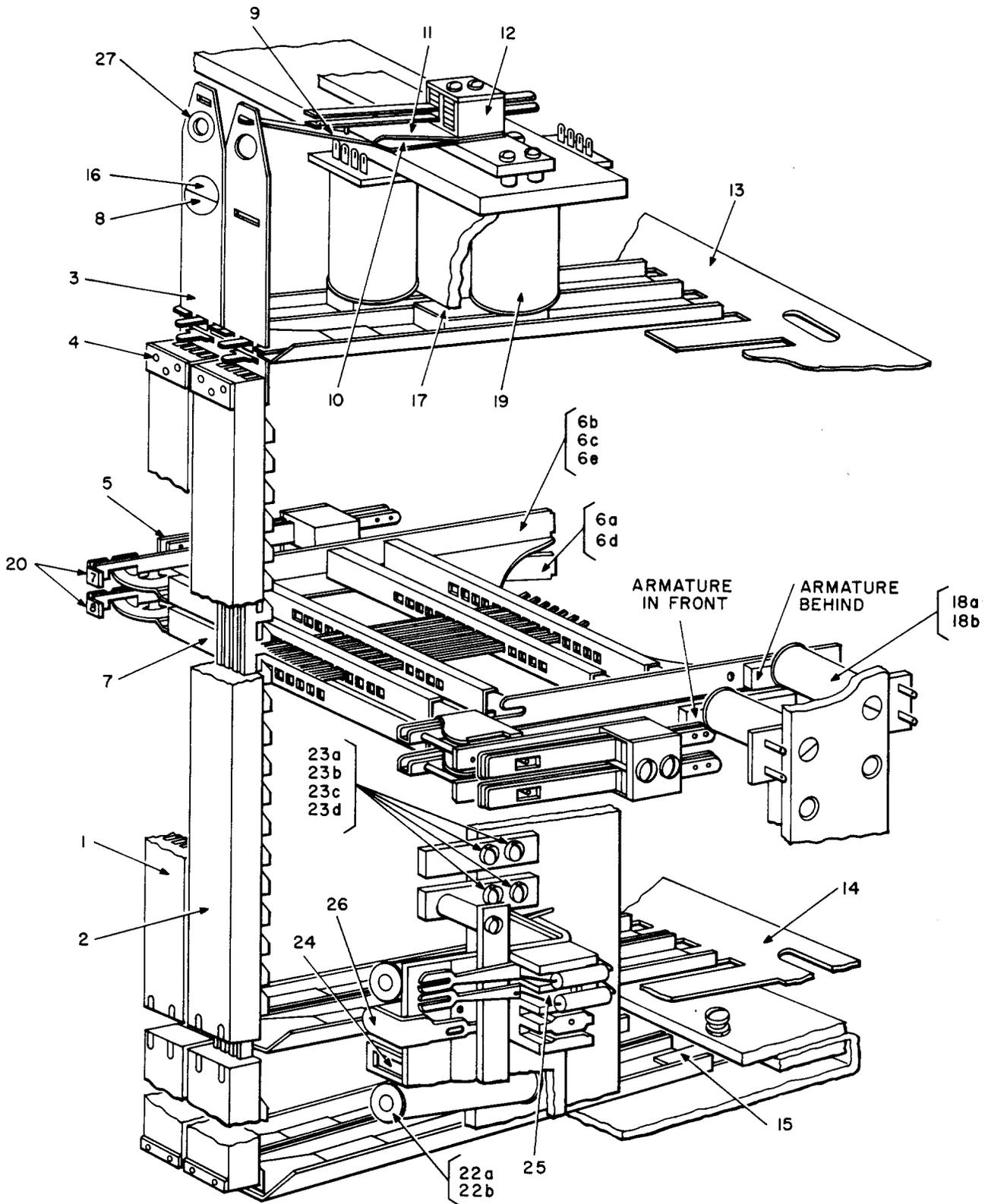


Fig. 2 — Gfeller Switch

TABLE B — PIECE PARTS FOR LINE CONCENTRATOR SWITCHES

NO.	PART NAME (See Fig. 2)	PART NO.	VIEW
1	Vertical bar, ES (49-9-2)	WK18514-1	
1	Vertical bar, ES (49-11 + 1-2, 49-12-2)	K18364/50er abc	
1a	Vertical bar, ES (BES)	K18356-2/50er abc	
2	Vertical bar, SS (49-9-2)	WK18514-2	
2	Vertical bar, SS (49-11 + 1-2, 49-12-2)	K18364/50er ac	
3	Link (49-9-2)	K16031	
3	Link (49-11 + 1-2, 49-12-2)	K16039-1	
3a	Link (BES)	K16039-2	
4	Link rivet	K16027	
5	Spring assembly (tr contacts)	K20001-1	
6a 6b 6c 6d 6e	(49-9-2) Horizontal bar, ES (Odd position) Horizontal bar, ES (Even position) Horizontal bar, ES (T-50 position) Horizontal bar, SS (Odd position) Horizontal bar, SS (Even position)	WK16029-1 WK16029-2 WK16029-3 WK16029-4 WK16029-5	
6a 6b 6c 6d 6e	(49-11 + 1-2) Horizontal bar, ES (Odd position) Horizontal bar, ES (Even position) Horizontal bar, ES (T-50 position) Horizontal bar, SS (Odd position) Horizontal bar, SS (Even position)	K21532-1/1 K21532-1/2 K21532-2/1 K21533-1/1 K21533-1/2	
6a 6b 6c 6d 6e	(49-12-2) Horizontal bar, ES (Odd position) Horizontal bar, ES (Even position) Horizontal bar, ES (T-50 position) Horizontal bar, SS (Odd position) Horizontal bar, SS (Even position)	K21532-1/1 K21532-1/2 K21532-2/1 K21532-3/1 K21532-3/2	

TABLE B — PIECE PARTS FOR LINE CONCENTRATOR SWITCHES (Cont)

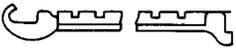
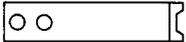
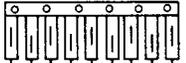
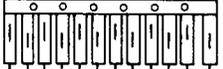
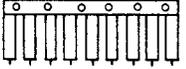
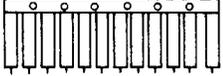
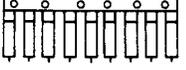
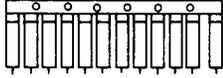
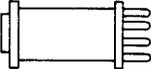
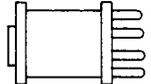
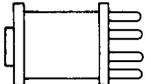
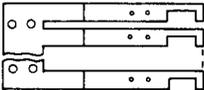
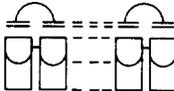
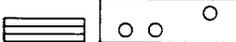
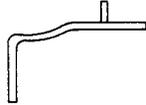
NO.	PART NAME (See Fig. 2)	PART NO.	VIEW
7	Disconnect bar	K16029-6	
8	Movable stop	K16012-2	
9	Reduction spring	K16019	
10	Support spring	K16708	
11	Hold spring	K16713	
12	Spring assembly	K20001-2	
12a	Spring assembly (BES contacts)	WK20001-2-1	
13	Hinge spring with armature (9 bars)	K16694	
13	Hinge spring with armature (11 + 1, 12 bars)	K15999-2	
14	Hinge spring (9 bars)	K15977	
14	Hinge spring (11 + 1, 12 bars)	K15999-1	
15	Hinge spring below (9 bars)	K17296	
15	Hinge spring below (11 + 1, 12 bars)	K15999-3	
16	Movable stop washer	K18045	
17	Residual (Vertical lift magnet)	K16699	

TABLE B — PIECE PARTS FOR LINE CONCENTRATOR SWITCHES (Cont)

NO.	PART NAME (See Fig. 2)	PART NO.	VIEW
18a 18b	Coil, 260 ohm (Horizontal bar 1-49) Coil, 1200 ohm (Horizontal bar 50)	WK2002-1 WK2002-2	
19	Coil, 56/300 ohm (Vertical bars)	WK20003	
19	Coil, 110 ohm (Vertical bar BES)	WK20003-1	
20	Spring plate with indicator (Set of 10)	WK20005	
21a 21b	Subscriber relay, ES (Set of 10) Subscriber relay, ES (Set of 10)	WK15207-1 WK15207-2	
22a 22b	Coil, TN, ES (Sub relay) Coil, TN, SS (Sub relay)	WK15207-3 WK15207-4	
23a 23b	Post (Old) Bracket (Old)	WK17857-1 WK17857-2	
23c 23d	Post (New) Bracket (New)	WK17857-3 WK17857-4	
24	Residual (For set of 10 sub relays)	WK15204	
25	Contact set complete for sub relay	WK15207-6	
26	Armature (For subscriber relay)	K15207-7	
27	Grommet	K16002	
28	Kit (Nuts, bolts, and screws for Gfeller relays)	WK20004	

### 3. REPLACEMENT PROCEDURES

#### 3.01 List of Tools

CODE OR SPEC NO.	DESCRIPTION
------------------	-------------

*Note:* The following tools are a part of the Gfeller T7413-1A tool kit.

LD1A	Open End Wrench
LD2	Socket Wrench
LD3	Socket Wrench
NR3295	Duckbill Pliers
—	Tweezers

*Note:* The following tools are Bell System Standard.

KS-6320	Orange Stick
KS-6854	Screwdriver
—	Long Nose Pliers
—	3-Inch C Screwdriver

**3.02** No procedure is specified for replacement of parts where the method to be used is obvious.

**3.03** After replacing part(s) of a relay or a switch, the part(s) replaced shall meet the requirements specified in Section 067-201-701.

#### SWITCHES

**3.04 Vertical Bar:** Remove the ES or SS vertical bar (Fig. 3), working from the front of switch as follows:

- (a) Press together the two tangs (1) associated with lower hinge spring (2). This will allow the vertical bar to be disengaged from the lower hinge spring.
- (b) Depress the two tangs (3) associated with center hinge spring (4) and disengage vertical bar.
- (c) Press the two tangs (5) associated with upper hinge spring (6) and disengage vertical bar.
- (d) Disengage movable stop bar (7).

(e) Disengage link (8) from support spring (9). The vertical bar is now free with the exception of connecting wire. If the bar is to be completely removed, unsolder the wiring.

(f) Replace the vertical bar in reverse order of removal.

*Caution: Sticking of the vertical bar during the operated position may be eliminated by proper seating of the movable stop or tensioning of the link away from its stop bar, using the proper spring bender.*

**3.05 Horizontal Bar:** Remove the ES or SS horizontal bar, working from the rear of switch as follows:

(a) Using the long nose pliers, grasp the left corner. Using an orange stick, depress the locking pin.

(b) Using the long nose pliers, pull the bar outward.

(c) Unhook the clip on the right side of the bar and pull the bar from its mounting. The horizontal bar is now free with the exception of the connecting wire. If the bar is to be completely removed, unsolder the wiring.

(d) Replace the horizontal bar in reverse order of removal.

#### CAPACITORS

##### ↳ 15-UF

**3.06** The replacement procedure for the 15-uf original equipment capacitor with 15-uf KS-19524, List 4 capacitor is given in 3.07 through 3.09.

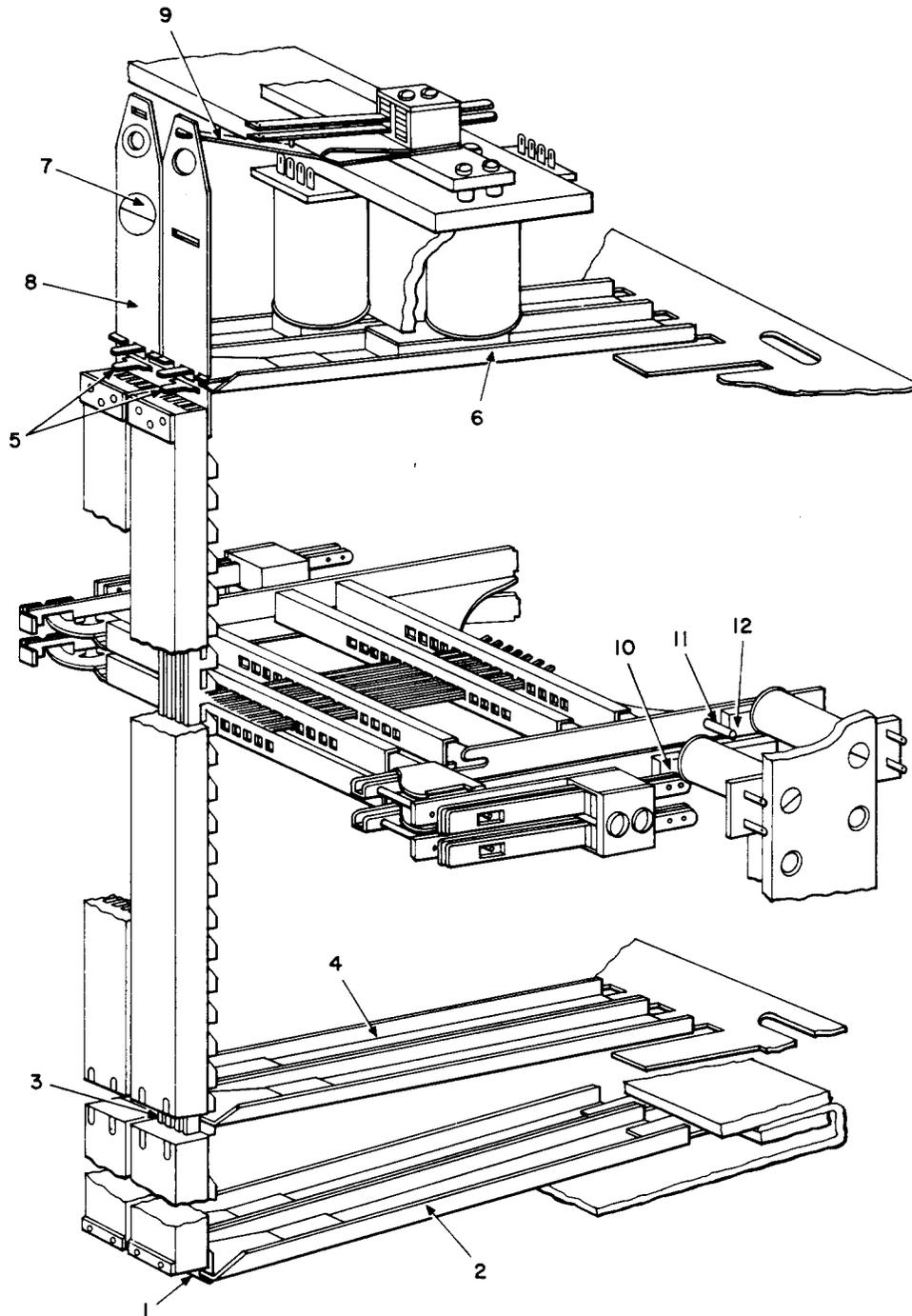


*Prior to removing wires from electrolytic capacitors, tag the wires to indicate polarity.*

**3.07** Disconnect the wires from the existing 15-uf capacitor. Remove and discard the capacitor.

**3.08** The original capacitor was rectangular and mounted in a vertical channel at the back of the concentrator cabinet. The KS-19524 replacement capacitor is cylindrical and smaller, thus requiring a spacer to maintain other components in the stack at the same position for wiring purposes. See Figure 4 for suggested mounting arrangements.

↳



- |                        |                       |
|------------------------|-----------------------|
| 1. TANGS               | 7. STOP BAR           |
| 2. LOWER HINGE SPRING  | 8. LINK               |
| 3. TANGS               | 9. SUPPORT SPRING     |
| 4. CENTER HINGE SPRING | 10. FRONT OF ARMATURE |
| 5. TANGS               | 11. LOCKING PIN       |
| 6. UPPER HINGE SPRING  | 12. REAR OF ARMATURE  |

**Fig. 3 — Gfeller Switch**

↗ 3.09 After mounting the KS-19524, 15-uf capacitor, connect tagged wires to capacitor terminals of correct polarity.

**1750-UF**

3.10 The replacement procedure for the 1750-uf original equipment capacitor with 1700-uf, KS-19568, List 1 capacitor is given in 3.11 through 3.13.



*Prior to removing wires from electrolytic capacitors, tag the wires to indicate polarity.*

3.11 Disconnect the wires from the 1750-uf capacitor. Remove and discard the capacitor.

3.12 The original component was rectangular and mounted flat on a shelf located on the remote unit gate. The KS-19568 replacement capacitor is cylindrical and may be mounted horizontally by using split sleeve clamp AT-7747. See Figure 5 for suggested mounting arrangement and note.

3.13 After mounting KS-19568, List 1, 1700-uf capacitor, connect tagged wires to capacitor terminals of correct polarity.

**4. COMPONENT PARTS AND MAINTENANCE EQUIPMENT**

4.01 Table C provides a parts list for component parts including miscellaneous maintenance equipment.

4.02 When ordering resistors and capacitors, give the part name, code designation (if any), and value. Specify which Gfeller line concentrator model the part is for. For example: Resistor, P1, 9 ohms for the Gfeller Line Concentrator 49-12-2. The KS-19524, List 4 and KS-19568, List 1 capacitors are available from Western Electric Company for replacement of the 15-uf and 1750-uf capacitors.

4.03 All other items should be ordered as shown in the list followed by "for the Gfeller Line Concentrator," and then the model number. For example: Short Circuit Plug, Red, for the Gfeller Line Concentrator 49-9-2.

*Note:* When ordering a mounting strip, indicate whether it is for the exchange side (ES) or subscriber side (SS). Designate the group of relays for which the strip is intended. For example: Mounting Strip, ES, relays C through PIRT for the Gfeller Line Concentrator 49-9-2.

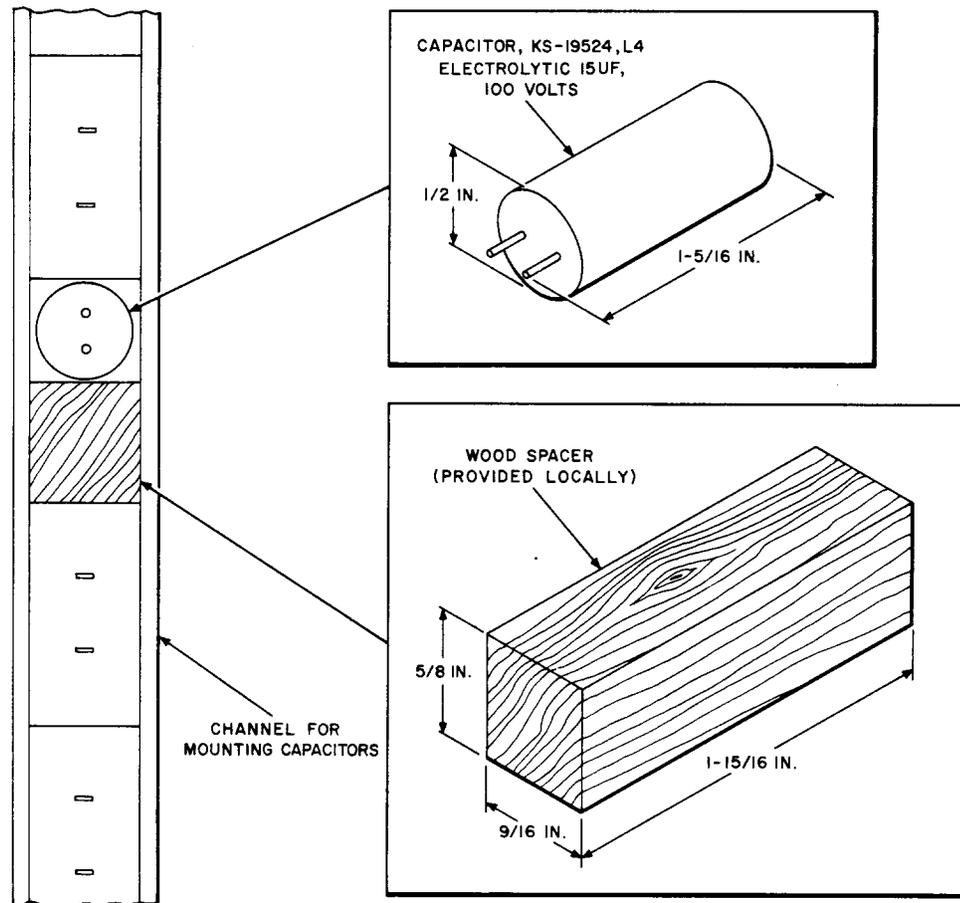
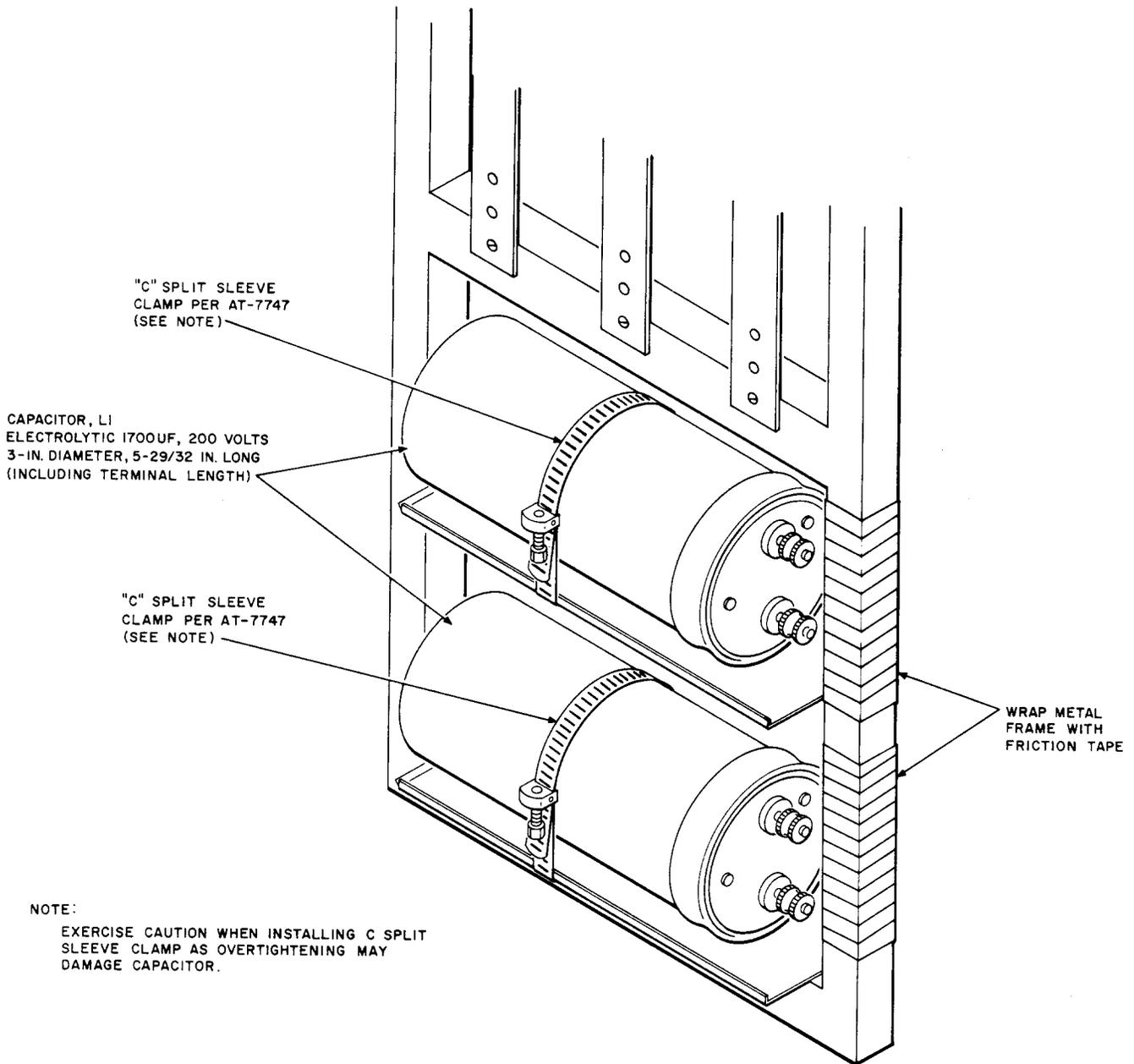


Fig. 4 — Mounting Arrangement for Replacement of 15-UF Capacitor — Central Office Unit



**Fig. 5 — Mounting Arrangement for Replacement of 1750-UF Capacitor — Line Concentrator Remote Unit**



TABLE C—COMPONENT PARTS AND MAINTENANCE EQUIPMENT

PART NO.	VALUE	SEE NOTE
Capacitors :		
—	0.1 UF	
—	0.5 UF	
—	2 UF	
—	3 UF	
—	6 UF	
KS-19524, L4	15 UF	4
—	30 UF	
—	45 UF	
—	100 UF	
KS-19568, L1	1700 UF	5
Resistors :		
P1	9 ohms	
P1	20 ohms	3
P1	50 ohms	
P1	150 ohms	
P1	250 ohms	
P1	400 ohms	
P2	450 ohms	3
P1	500 ohms	3
P2	500 ohms	1
P2	600 ohms	3
P2	700 ohms	3
P2	800 ohms	
P2	2000 ohms	
—	150 ohms, 1 watt	
—	1000 ohms, 1 watt	
—	2000 ohms, 1/2 watt	
—	20 to 1250 ohms	2

TABLE C — COMPONENT PARTS AND MAINTENANCE EQUIPMENT (Cont)

PART NO.	VALUE	SEE NOTE
Feeler Gauge, 0.10 mm Fuse, 1 ampere Kit, Tool, T7413-1A, with case Mounting Strip (Refer to 4.03.) Rectifier, V27931 Short Circuit Plug, Green Short Circuit Plug, Red Short Circuit Plug, Yellow Stop Gate, K19092 (Used to prevent switch gate swinging too far when opened) Test Leads, pair Clamp, C split sleeve		5

**Notes:**

1. Resistor, P2, 500 ohms used in the 49-9-2 model should be replaced with Resistor, P2, 700 ohms. (Refer to Section 067-201-103.)
2. Resistor, 20 to 1250 ohms, is of insufficient wattage rating for short lengths of cable; therefore, it should be replaced with Resistor, P2, 600 ohms. (Refer to Section 067-201-103.)
3. When replacement resistor must be equipped with a slider, it must be stated on the requisition. For example:  
 Resistor, P2, 600 ohms, each with slider, for the Gfeller Line Concentrator 49-11+1-2.
4. Capacitor, electrolytic KS-19524, L4, 15-uf, 100 volts is the recommended maintenance replacement for original equipment 15-uf capacitor. Wood spacer, 5/8 by 9/16 by 1-15/16 inches, is used when mounting this capacitor and is furnished locally. (See Fig. 4.)
5. Capacitor, electrolytic, KS-19568, L1, 1700-uf, 200 volts is the recommended maintenance replacement for original equipment 1750-uf capacitor. Use clamp AT-7747 when mounting this capacitor. (See Fig. 5.)