

STEP-BY-STEP SYSTEMS
NO. 1, 350A, 355A, 360A, CX30, CX60,
CX100, CX200, 32A32, 32A44, 35E97,
375A, 375B, 385A, 385B, 386A OR 386B
TYPE "B" EMERGENCY MANUAL CIRCUIT
FOR MANUAL OPERATION AND
INTERCEPTION OF SUBSCRIBER LINES
AND TRUNK CIRCUITS

1. PURPOSE OF CIRCUIT

1.1 This circuit provides facilities to be arranged as fixed circuit units whereby emergency service may be provided on a manual basis in step-by-step and most types of community dial offices. The services which may be provided permit manual operation in case of serious outside plant or central office equipment trouble or failure and at times when the office facilities may be extremely overloaded.

2. WORKING LIMITS

2.1 None.

3. FUNCTIONS

- 3.01 Permits removing trunks from service.
- 3.02 Permits intercepting outgoing trunk calls.
- 3.03 Permits intercepting incoming trunk calls.
- 3.04 Provides busy lamps for all trunks.
- 3.05 Permits completing intercepted outgoing calls to the same or other trunks.
- 3.06 Permits direct access to trunk conductors when office equipment is inoperative.
- 3.07 Permits operation of the emergency equipment from either office battery or emergency batteries.
- 3.08 Permits ringing with either office supply or a hand generator.
- 3.09 Provides an emergency cord for intercepting calls and contacting the operator office on a dispatch basis.
- 3.10 Permits intercepting calls and contacting the operator office on a dispatch basis from an off premise telephone.

3.11 Permits receiving calls from and completing calls to subscribers on a manual basis.

3.12 Permits interception of calls to subscribers which are operated on a manual basis.

3.13 Permits receiving and originating calls over the office facilities.

3.14 Permits ringdown operation of a trunk to the operator office.

3.15 Permits monitoring, splitting and two-way operation of twenty cycle ringdown toll lines looped through the emergency equipment.

3.16 Permits the release of connections which may be held in the busy condition.

3.17 Provides for connection to an emergency radio telephone link.

4. CONNECTING CIRCUITS

Circuit numbers shown are typical for a 355A office and the corresponding or similar circuits for all other types of office with which this circuit is arranged to operate apply as well.

- 4.1 Selector circuit SD-31836-01.
- 4.2 Trunk circuit SD-31747-01.
- 4.3 Connector circuit SD-31737-01.
- 4.4 Subscribers line circuit SD-31777-01.
- 4.5 Power ringing circuit SD-80780-01.
- 4.6 Miscellaneous alarm circuit SD-31974-01.
- 4.7 Trunk rotating selection circuit BC-4868. (CX type office)

DESCRIPTION OF OPERATION

5. GENERAL

To permit control of the operator office trunks, jacks are provided for the

manual operation of these facilities. The use of these jacks whose functions are described in subsequent paragraphs are shown in Figs. 5, 6, 7 and 8. Jacks designated (A) are located between the selector multiple and operator office trunk circuit facing the selector multiple and permit intercepting calls to the operator office. Jacks designated (B) are in the same location facing the trunk circuit and permit the emergency operator to originate a call to the operator office, make the trunk busy to outgoing calls or challenge on outgoing calls when the trunk is seized. Jacks designated (C) are located between the trunk circuit and incoming selector to permit intercepting calls incoming from the operator office. Jacks designated (D) are located between the trunk circuit and line to the operator office and face the line. They permit contacting the operator office over the trunk conductors when the office facilities are inoperative.

For using the above jack facilities on a limited basis the cord associated with the telephone set of Figure 1 is used. This cord permits intercepting calls and originating calls on a dispatch basis only. The cords of Figure 10 permit the completion of intercepted calls, ringing on either end, dialing on the calling end and provides lamp supervision on the answering end.

Power for the emergency equipment is obtained through Fig. 2. Either the regular office supply may be used or in case of power failure the emergency equipment may be operated from dry batteries. Figure 11 provides ringing current for the cord circuits of Figure 10 and the hand generator of Figure 3 provides emergency ringing current for the cord circuits as well as ringing current for the emergency cord of Figure 1.

The circuits of Figs. 12 to 19 inclusive show optional arrangements for various emergency functions. They are furnished as required for particular offices depending upon the office facilities and the type and amount of emergency service it is desired to provide for.

6. PREPARING THE CIRCUITS FOR EMERGENCY OPERATION

Each trunk circuit available for emergency operation has jacks associated with it, the number depending upon the type of trunk facility. Except in the small CX type offices two-way trunks are equipped with (A), (B), (C) and (D) jacks. One-way outgoing trunks are equipped with (A), (B) and (D) jacks and one-way incoming trunks are equipped with (C) and (D) jacks. In the CX30 to

CX200 type office no (C) jack is equipped since the (B) jack provides the functions of both the (B) and (C) jacks furnished in other offices.

Operation of the (BAT) key in Fig. 2 to the (REG) side connects office battery to the emergency equipment, connects ground to lead "MS" to start the ringing machine and operates relay (BY) in Fig. 4. Relay (BY) operated connects battery through a (BY) lamp to the sleeve of each trunk circuit. When a trunk is busy or locked up, its sleeve lead is grounded lighting the associated (BY) lamp. Operation of the (BAT) key to the (EMG) position connects emergency battery to the equipment so it may be used in case the office power has failed. Relay (BY) is not operated when the emergency battery is used for the office facilities are not operating if power has failed and a grounded sleeve would put an unnecessary drain on the emergency battery by lighting the (BY) lamp.

7. MAKING TRUNK BUSY TO OUTGOING CALLS - FIGS. 5 AND 8

To make a trunk busy to outgoing calls a dummy plug is inserted in jack (B). The dummy plug inserted in jack (B) of Fig. 5 opens the sleeve between the selector multiple and trunk circuit and grounds the selector multiple sleeve. This makes the trunk busy to outgoing calls but does not prevent incoming calls from being received from a distant end. When the trunk circuit is made busy by an incoming call the (BY) lamp will light from ground on the trunk sleeve.

A dummy plug inserted in jack (B) of Fig. 8 opens lead "P" between the connector multiple and trunk circuit and grounds lead "P" toward the connector multiple. This makes the trunk busy to outgoing calls but does not prevent incoming calls from being received. When the trunk is seized at the distant end, ground on lead "P" from the trunk circuit will light the (BY) lamp.

8. INTERCEPTING OUTGOING CALLS - FIGS. 5 AND 8

When the plug of an ANS cord is inserted in an (A) jack the multiple is disconnected from the trunk circuit and the cord circuit (A) relay is bridged across the transmission leads from the selector or connector multiple. When the multiple is seized for an outgoing call the transmission loop is closed operating the cord circuit (A) relay. Relay (A) operated operates relay (B) and lights the cord supervisory lamp (A). Relay (B) operated connects ground either directly or through resistance (B) to the sleeve lead. Operation of the cord TALK

key operates relay (E) in fig. 1 in turn releasing relay (F) connecting the telephone set circuit to the associated cord. In Fig. 5 ground on the sleeve of jack A holds the preceding selector and makes the multiple busy to other hunting selectors. In Fig. 8 ground on the sleeve of jack (A) operates relay (AA) to transfer the allotter leads making the trunk circuit busy to other outgoing calls and lead "P" is opened to permit incoming calls to be received.

9. MAKING OUTGOING CALLS - FIGS. 5 AND 8

When the plug of a CALL cord is inserted in a (B) jack the multiple is made busy and the cord (C) relay is connected across the transmission leads to the trunk circuit. Relay (D) does not operate and relay (C) remains in the loop condition. If relay (D) becomes operated from battery normally on the sleeve lead when the plug is connected to jack (B) preventing trunk seizure, the momentary operation of the (DIAL) key closes the trunk loop to provide trunk seizure and connects ground to the sleeve lead. This prevents the operation of relay (D) and the tip and ring remains in the loop condition to hold the trunk when the (DIAL) key is restored to normal. In Fig. 5 the tip and ring loop closure functions the trunk circuit to signal the distant end and in Fig. 8 ground on the sleeve or "P" lead through the 150 ohm combined resistance of relay (D) and resistance (A) functions the trunk circuit to signal the distant end. When the trunk is seized, ground is returned from the trunk (A) relay to light the (BY) lamp. Operation of the cord TALK key permits the operator to talk on the established connection.

On outgoing dial trunks in other than CX type offices it is possible to dial the distant office by operating the "DIAL" key associated with the "CALL" cords inserted in jack (B). In CX type offices it is not possible to dial on trunks from the (B) jack but dial trunk calls may be made by using the local service (CALL) jack as described below.

10. CHALLENGING OUTGOING CALLS - FIGS. 5 AND 8

If it is desired to challenge outgoing calls without denying subscribers access to trunk circuits, the (BY) lamps are observed. When a (BY) lamp lights indicating that the trunk has been seized the plug of a CALL cord may be inserted in the trunk (B) jack and the TALK key operated. The operator can then talk on the connection without breaking down the subscriber's connection to the seized trunk circuit.

11. INTERCEPTING INCOMING CALLS - FIGS. 6 AND 8

To intercept incoming calls the plug of an ANS cord is inserted in the (C) jack of Fig. 6 or the (B) jack of Fig. 8. In Fig. 6 the trunk circuit is disconnected from the incoming selector or line finder and the cord (A) relay is bridged across the trunk circuit incoming transmission leads. When the trunk is seized at the distant end, cord relay (A) operates lighting cord lamp (A) and operating relay (B). Relay (B) operated performs no useful function in Fig. 6. In Fig. 8 the connection of an ANS cord to jack (B) makes the trunk busy to outgoing calls. When the trunk is seized at the distant end cord relays (A) and (B) operate and the cord lamp lights. Relay (B) connects ground through resistance (B) to lead "P" lights the (BY) lamp and puts the trunk in the talking condition. The emergency cord of figure 1 may also be used to intercept incoming calls as explained in paragraph 14.

12. MAKING OUTGOING CALLS ON TRUNK CONDUCTORS - FIG. 7

When the office equipment is inoperative or it is desirable for other reasons to contact the operator office directly on the trunk conductors, jack (D) is used. The plug of a call cord is inserted in jack (D) which removes the office equipment from the line and connects cord relay (C) across the trunk conductors. Battery on the sleeve of jack (D) operates cord relay (D) which connects battery and ground to the windings of relay (C) signalling the incoming trunks at the operator office. Operation of the cord TALK key permits the operator to talk on the connection but no supervision is obtained under this condition.

13. CORD CIRCUIT - FIG. 10

The function of the cord circuits in connection with trunk circuit jacks (A), (B), (C) and (D) has been described in the preceding paragraphs. Each cord circuit unit is associated with the telephone set circuit of Fig. 1, ringing supply through Fig. 11 and battery supply through an auxiliary fuse of Fig. 9. TALK, DIAL and RING keys are associated with each cord circuit. Operation of the TALK key operates relay (E) in figure 1 in turn releasing relay (F) associating the telephone set with that cord. Operation of the DIAL key connects the telephone set dial to the call end of the cord. A RING key is associated with each end of the cord for ringing on a trunk or line connected to either end. When the office power supply is

off and the hand generator is provided the HAND GEN key is operated and when a RING key is operated the hand generator must be used to obtain ringing current. Operation of the RING ANS key holds relay B operated keeping the sleeve grounded to prevent the release of circuits held under control of the sleeve.

14. THE EMERGENCY CORD - FIG. 1

The emergency cord and telephone set of Fig. 1 provides for a limited amount of operation in an emergency. Its use is primarily for determining the extent of office difficulties, contacting the operator office and maintaining dispatch operation. When the hand generator of Fig. 3 is furnished, it is directly associated with the cord of Fig. 1. To use the emergency cord the hand set of the telephone set is removed from its switchhook closing the tip and ring loop. The plug of the emergency cord may be used in (B) jacks for making calls to the operator office or for challenging on calls originated by subscribers as described above in paragraphs 9 and 10. Used in (B) jacks relay (C) does not operate or may operate and release momentarily but slow release relay (F) remains operated and the cord remains in the loop condition through the telephone set. The cord may be used in (C) jacks for intercepting incoming calls. When used in (C) jacks of Fig. 6 battery on the sleeve of the jack operates relay (C) in turn releasing relay (F) which connects battery and ground through the windings of relay (A) to the telephone set. With the receiver off the switchhook relay (A) operates in turn operating relay (D). Relay (D) operated connects the transmission circuit from the telephone set through to the cord and battery and ground is supplied to the cord tip and ring through the windings of relay (B). To intercept incoming calls at the (B) jack of Fig. 8 the emergency cord should not be inserted in the jack until the trunk (BY) lamp lights to indicate that it has been seized. This is to prevent the prior insertion of the cord plug in the jack from originating an outgoing call. To ring on the emergency cord the hand generator of Fig. 3 is operated. When the hand generator is operated, the receiver should be returned to the switchhook to remove the telephone set shunt during ringing. The emergency cord and telephone set may also be used for making and answering local calls as explained in later paragraphs.

15. OFF PREMISE OPERATION - FIGS 14 AND 15

When it is desired to operate on a limited dispatch basis from an off premise location, the circuit of Fig. 15 is furnished at the desired location and associated with Fig. 14 over two trunk pairs. If the office facilities are operating the desirable method is to intercept subscribers making outgoing calls and to make calls to the operator office. To intercept outgoing calls

jack (A) of Fig. 14 is connected by a patching cord to an (A) jack of Fig. 5 or 8 associated with the trunk on which it is desired to intercept. To permit making outgoing calls jack (B) of Fig. 14 is patched to a (B) jack of 5 or 8 associated with the trunk circuit over which it is desired to call the operator office.

When the multiple associated with the patched (A) jack is seized, the loop is closed operating relay (A) in Fig. 14 in turn operating relay (B). Relay (B) operated connects ground to the sleeve of jack (A) to hold the preceding circuits and make the trunk busy as explained in paragraph 8. Relay (B) operated also connects battery to one winding of relay (C) and through contacts of relay (R) released which completes the battery and ground circuit to trunk conductors T1 and R1 to Fig. 15. Battery and ground on leads "T1" and "R1" operates a buzzer in Fig. 15 to signal the off premise attendant. When the hand set is removed from the switchhook the buzzer is disconnected and the telephone set is connected to leads "T1" and "R1" lowering the loops resistance to operate relay (C). Relay (C) operated operates relay (R) which removes the short circuit from one winding and the shunt from the other winding of relay (C) and closes the transmission circuit to permit talking.

To make an outgoing call from the off premise telephone the CALL OPR. key is operated. With the hand set removed from the switchhook the loop is closed over leads "T2" and "R2". In offices using "X" wiring the loop is closed directly to the trunk circuit patched to jack (B) functioning the trunk circuit to signal the distant end. In offices using "Y" wiring the closed loop operates relay (D) which connects ground to the sleeve of jack (B) through resistance (K) functioning the trunk circuit to signal the distant end. If an outgoing call is intercepted at this time the buzzer will operate to inform the attendant of a call waiting.

In case the office facilities are not operating it is not possible to establish connections through the trunk circuit (A) and (B) jacks. In this case it is possible to contact the operator office for off premise operation by patching the (D) jack of an operator office trunk to the (D) jack of Fig. 14. If the trunk used is arranged for loop signalling it will be possible to signal in both directions but if the trunk is arranged for composite operation it may not be possible to signal in one or both directions but a talking circuit can be established. If it is possible to pass supervision over the trunk, seizure at the distant end closes the loop or reduces the loop resistance to operate relay (A) in Fig. 14 in turn operating relay (B) which closes the circuit for operating the signal at the off premise telephone in Fig. 15. When the attendant answers, relay (C) operates in turn operating relay (R). Relay (R) operated reverses the battery and ground on the trunk conductors to signal the distant end and closes the transmission path as explained above

when a call is received at the (A) jack.

On an outgoing call from the office telephone the CALL OPR key is operated and the hand set is removed from the switchhook operating relay (D). Relay (D) operated operates relay (E) which closes the transmission circuit from jack (D) to trunk leads "T2" and "R2" and operates relay (R). Relay (R) operated reverses the battery and ground connection to the trunk to signal the distant end.

16. MANUAL SERVICE TO SUBSCRIBER TELEPHONES - FIGS. 12 AND 13

For providing manual service to subscribers lines when the office facilities are not working or when the line requires manual operation due to extreme load conditions, Fig. 12 is furnished. Operation of the EMG.MAN. key disconnects the subscriber's line from its line circuit and connects relay (A) in a battery and ground loop to the subscriber's line. When the subscriber's receiver is removed from the switchhook to make a call, the loop is closed for operating relay (A) and lighting lamp (SUB) signaling the emergency operator. The operator answers by plugging the ANS end of a cord circuit or the emergency cord of Fig. 1 into the SUB jack. This disconnects relay (A) from the line and talking battery is supplied to the subscriber from the cord. If a regular cord of Fig. 10 is used the call end may be used for completing the connection to another subscriber or to the operator office over available facilities. To call a subscriber the CALL end of a cord or the emergency cord is inserted in the subscriber's jack and the ringing key or hand generator is operated. This connects ringing current to the line to ring the subscribers bell.

When Fig. 13 is furnished if the office facilities are working and a call is received for a subscriber while being operated on a manual basis, ringing current from the connector will operate relay (R) in turn lighting the (INCPT) lamp. The call may be answered by inserting the ANS end of a cord or the emergency cord in the INCPT jack. Relay (R) is disconnected from the line and retardation coil (A) is connected across the tip and ring to trip ringing. If a regular cord of Fig. 10 is used the call can be completed to the subscriber by inserting the call end of the cord in the subscriber's jack and operating the ringing key in the CALL end of the cord.

17. TOLL LINE INTERCEPT - FIG. 16

Toll lines arranged for 20 cycles ringdown operation on which it is desired to provide emergency intercept service when the toll office facilities are inoperative are connected through the circuit of Fig. 16. If it is desired to intercept the line in both directions two Figs. 16 are furnished with one facing the line in either direction. If it is desired to intercept in only one direction one Fig. 16 is furnished to face the line in the desired direction. When the plug of a regular cord or the emergency cord is inserted in the MON jack it is possible to monitor on a connection which may be

established. To operate the line on an emergency basis the EMG TOLL key is operated. This splits the line and connects relay (R) and LINE jack across the line conductors to the distant toll center or the near toll office.

When the distant end rings on the line relay (R) is operated in turn lighting the (LINE) lamp. The call may be answered by connecting the plug of a cord to the LINE jack. To make a call on the line, the plug of a cord is connected to the LINE jack and the cord ringing key or the emergency cord hand generator is operated. This connects ringing current to the line to signal the distant end.

18. RINGDOWN OPERATION OF OPERATOR OFFICE TRUNKS - FIGS. 7 AND 16

When it is desired to operate on a ringdown basis one of the operator office trunks appearing on a (D) jack of Fig. 7, a patching cord is connected between the (D) jack of the trunk and the PATCH jack of a Fig. 16 which is not associated with a toll line. The PATCH key of Fig. 16 is operated and the connected trunk may then be operated on a ringdown basis from the LINE jack the same as explained above in paragraph 17.

19. LOCAL SERVICE - FIGS. 17 AND 18

Fig. 17 provides jacks for local service using the emergency cord or the cords of Fig. 10. If the jacks are provided for local telephone service Fig. 18 is provided while if they are provided as a multiple on an office telephone, Fig. 18 is omitted.

On an incoming call, ringing current is connected to the line from the connector operating relay (R) and lighting the line lamp in Fig. 18 or ringing the office telephone bell. Connection of a cord to the ANS jack disconnects relay (R) from the line if Fig. 18 is provided and retardation coil (B) is connected across the line to trip ringing. To make a call the plug of the emergency cord is inserted in the CALL jack and the desired number is dialed or the CALL end of a regular cord is inserted in the CALL jack and the cord DIAL key is operated. This connects the dial across the "T" and "R" leads and the desired number may be dialed after which the DIAL key is restored to normal and the TALK key operated to permit talking on the connection.

20. EMERGENCY RADIO TELEPHONE LINK - FIG. 19

The jacks of Fig. 19 are wired to binding posts or suitable connecting

blocks which are connected to the radio control unit by means of line or drop wire furnished with the emergency radio equipment. Either the emergency cord or cords of Fig. 10 may be used for connecting to the radio circuit at the (RADIO) jack or talking to the radio operator at the (OW) jack. If cords of Fig. 10 are used intercepted calls may be connected through to the (RADIO) jack for completing a connection over the radio link.

If cords of Fig. 10 are not available the following method may be used for connecting a subscriber through to the radio link. The emergency cord is used to challenge outgoing calls in jack (B) as explained in paragraph 10. If it is desired to connect the challenged call through to the radio link the emergency cord is removed from the (B) jack and a patch cord is connected

between the (B) jack and the (RADIO) jack of Fig. 19. The calling subscriber can then talk to the radio operator or over the radio link.

21. MISCELLANEOUS

In offices equipped with (A) and (B) jacks of Fig. 7 it is possible to connect the (A) jack of one trunk to the (B) jack of another trunk by means of a patching cord. This permits the subscriber to call an operator office without the emergency operator having to intercept the call with the ANS end of a cord and then completing it to the desired (B) jack with the CALL end of the same cord. In offices equipped with (A) and (B) jacks of Fig. 8 it is not possible to patch (A) and (B) jacks due to the reversal of tip and ring conductors between the two jacks.

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DEPT. 3350-PWW-RSW

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CHANGES

B. CHANGES IN APPARATUS

B.1 Added

5A Varistor, Fig. 15

C. CHANGES IN CIRCUIT REQUIREMENTS
OTHER THAN THOSE APPLYING TO ADDED
OR REMOVED APPARATUS

C.1 Electrical requirements for the
G108 relay (C), figure 10, were
formerly as follows; after soak 100
operate readjust 13.7, test 14.4; re-
lease readjust 7.9, test 7.5.

D. DESCRIPTION OF CIRCUIT CHANGES

D.1 Connection from ground through
contacts of relay (C) to the wind-
ing of relay (B) was added in figure 10
to provide joint holding from both
ends of the cord circuit.

D.2 A varistor was added in figure 15
to decrease the intensity of clicks
in the off premise operator's receiver
when the "Call Operator" key is operated.

D.3 Note 105 added.

All other headings, no change.

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