EMERGENCY ALARM CIRCUITS

DESCRIPTION

1. GENERAL

1.01 This section describes emergency alarm circuits used in central office buildings to sound an alarm in case of fire, serious injury, or other emergency.

1.02 This section is reissued to include emergency alarm circuits using interconnections to commercial fire detection equipment.

TYPES OF EMERGENCY ALARM CIRCUITS

1.03 This section covers three systems. Two are systems used in multioffice buildings and in central offices large enough to warrant division of the alarmed area coverage into zones. A zone is that portion of a building or floor area treated as a unit by the alarm system. The third is a simpler system for use in offices small enough so that zoning is unnecessary.

1.04 In one of the multizone systems, the zone where the alarm originates is indicated by means of codes sounded on horns or single-stroke gongs. The sounding devices are operated under control of code sending devices, one of which is associated with each zone. The capacity of this system is 50 zones and 40 sounding devices.

1.05 In the other multizone system, lamps are used to indicate the zone in which the alarm originates. The zone indicating lamps are mounted in cabinets distributed throughout the installation so they can be readily observed by persons responding to an alarm. The alarm is sounded on continuously operated horns or vibrating bells. This system has a capacity of five zones and six sounding devices.

1.06 The system for use in unzoned offices uses two loud ringing bells operated from the central office ringing current supply. These ring continuously in the event of an alarm.

FEATURES

1.07 Although the provision of certain features is optional, all systems may be arranged so that an alarm can be originated by means of an automatic fire detection device, or manually in the event of urgent need for an employee to summon assistance. There are also arrangements whereby alarms may be sounded to indicate that an emergency condition exists in a distant office which may be unattended part of the time.

1.08 In all three systems, the arrangement is such that practically any trouble condition likely to interfere with the operation of the system gives immediate notice of its presence by causing an alarm to be sounded either by the regular sounding device or by supervisory alarms (except in the single zone system).

1.09 ***Automatic Fire Detection:*** This feature is implemented in all three systems by the use of commercial fire detecting equipment or in older installations by the use of an insulated fusible wire known as fire detection wire. In the event of fire, either detection system causes the circuit to be opened, thereby causing the alarm indicating equipment to function.

1.10 ***Manual Alarm:*** For manual operation, alarm boxes known as station boxes are provided. These are mounted at convenient locations to afford suitable means for an employee to cause the alarm system to function. Alarms may also be set off manually by cutting or breaking the fire detection wire where provided. In the system arranged for code signaling, alarms may also be set off manually by operating a trip finger in the code signal sending device. For second alarms and wherever a zone has neither station boxes nor fire detection loops, this is the only means for setting off the alarm.

1.11 ***Coding Signaling:*** The system arranged for code signaling is applicable where there are a number of zones, and is intended for use

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wherever an installation is divided into more than five zones. Each zone is assigned a distinctive code which is sounded four times when the alarm operates. The code sending equipment has noninterfering and successive features. If at the same time an alarm is being sounded in a zone, an alarm is originated in another zone, the code for the second zone will not be sounded until after the first code signal sending device has finished sending its four rounds of code.

1.12 ***Central Office Alarm System:*** The emergency alarm systems, other than the single zone system, are associated with the central office alarm system. Trouble or off-normal conditions are indicated by the various aisle pilots, annunciator cabinets, floor alarm boards, main alarm boards, etc. ⧫In addition, alarm indications may be present at the commercial fire detecting equipment, when provided.⧫

2. APPARATUS

STATION BOX

2.01 Each station box contains a single pole electric switch. The boxes are metal housings, either flush or surface mounted. The switch is held in its normally closed position by a slide which is pulled down to allow the switch to open the circuit. When an alarm is sent from a station box, the switch is locked in the operated position with the circuit open. In order to restore a station box to normal after an alarm has been sent, it is necessary to unlock the box, restore the switch to the unoperated position, and relock the b•x.

COMMERCIAL FIRE DETECTION EQUIPMENT

2.02 ⧫The commercial fire detection equipment furnishes a loop closure to the emergency alarm circuit. In series with the loop, one or more sensors are installed which open the loop if a fire is detected. Opening the loop activates various alarms and signals.

2.03 The sensing element used in this system utilizes the ionization chamber principle. In this chamber, air is made conductive by means of a minute source of radioactive material. Air molecules are ionized into positive ions and negative electrons. A voltage applied across the ionization chamber causes a minute electrical current to flow. When products of combustion, which are usually generated before any visible evidence of fire, enter the chamber, they also become ionized, but due to their relatively large size, move more slowly, thereby reducing current flow. The current that exists is extremely small and must be amplified. This is achieved by using two ionization chambers, and connecting a cold cathode tube in parallel with the chambers. With the outer chamber open to the air and the inner chamber virtually sealed, any reduction of current in the outer chamber increases the voltage at the trigger electrode of the tube. This causes the tube to operate and activate relays for various signals and alarms.

2.04 The detecting heads are mounted near the ceiling either directly on junction boxes attached to conduit or supported by fixtures attached to auxiliary framing. One or more detector leads are required in each building bay. The location of the detector leads is influenced by air conditioning ducts, air outlets, equipment, and other factors. Within each area served by the fire detection equipment, the associated control panels are located.

2.05 The control panels provide auxiliary indications in the event of trouble such as fire, detected by a sensor, or internal trouble in the equipment such as a blown fuse, crossed wiring, etc. If the commercial fire detection equipment is used to protect more than one zone, the zone number affected by trouble is also indicated at the control panel.⧫

FIRE DETECTION LOOP

2.06 the fusible fire detection wire consists of a lead-tin alloy conductor with a rosin core and covering of red cotton braid. The core increases the sensitivity to fire due to a fluxing effect which facilitates separation of the molten metal so that the circuit will be broken even though the braid is not completely burned through. This wire requires more care in handling than copper wire, and it is important that kinking or unnecessary bending be avoided as such strains may result in eventual wire failure.

2.07 Extra protection from possible grounds is afforded to the wire where it passes within 1/2 inch of, or is fastened to, metal work. For this purpose, except where fibre clips are used, impregnated varnished tubing is used. To guard against the possibility of short circuits shunting out a portion of a loop and thus preventing an open

therein from setting off an alarm, minimum limits of separation between wires have been set up.

2.08 When the automatic fire detection feature is provided, sections of fire detection wire are installed along the local cables of the various frames in such a way as to be in the path of a fire in its early stage. On relay rack, sequence switch, and similarly wired bays, the fusible elements are usually applied horizontally at two levels, one at the top of the bay and one approximately halfway down. In the latter case, the wire is placed over the skinners of the local forms. The wire at the top is similarly supported or, if there is a cable rack immediately over the bays, it is fastened to the underneath side of the cable rack.

2.09 The midpoint level of fire detection wire can be eliminated on surface wired bays, using plastic insulated wire. Other bays such as the line link, trunk link, number group, etc, that have local and switchboard cable forms, even though these are PVC wire, must be provided with top and midpoint levels of fire detection wire. The one exception being in the No. 5 Crossbar System where fire detection wire may be completely omitted when an entire lineup is composed of frames having both PVC switchboard and local cable wiring. Information covering these applications is on the drawings specific to each system.

2.10 In order to facilitate installation and minimize exposure to mechanical injury, fire detection wire is applied in short lengths and confined to the frame areas requiring protection. The methods of installing the wire are illustrated in Fig. 1, 2, 3, and 4.

2.11 All lengths of fire detection wire in the bays of a frame lineup are joined in series with red insulated 20 BH wire which is terminated on connecting blocks at one end of the lineup. All loops serving the various frame lineups in the same zone are connected in series and wired to a pair of zone relays of the alarm system. All junctions of the fire detection wire and the 20 BH wire are soldered using 100A sleeves.

ZONE RELAYS

2.12 In the single zone system and in each zone of the system using code signaling, the zone relays are located in a casing which is usually mounted on a wall or column. In the system having the code signaling feature, the relay casing is usually mounted above the code signal sending device. In the system using zone indicating lamps instead of code signaling, the two zone relays for each zone are located, together with other equipment, in a central control cabinet.

CODE SIGNAL SENDING DEVICE

2.13 In the system using code signaling, one code signal sending device is required for each zone and it is generally located within the limits of the zone served. This device is a springdriven mechanism with the principal part housed in a dustproof glass case. Holes in the case permit the winding key and trip finger to be operated from the outside. By operating the trip finger, the device can be operated manually. Usually a trip magnet and associated reset dial are provided outside the glass case. This external equipment provides means for the device to be tripped electrically when used in a zone having station boxes, fire detection loops ▶or commercial fire detection equipment.◀ The entire device is housed in a metal casing mounted in an accessible location on a wall or column. Figure 5 shows a sending device out of its casing. This is shown fully run down and in an off-normal position.

CENTRAL CONTROL UNIT

2.14 For multizone systems, a central control unit and auxiliary apparatus are located in a casing which is arranged for mounting on a 23-inch relay rack. In the system using code signaling, there are two arrangements of this equipment. One is arranged for a maximum of 30 zones and 20 sounding devices. The maximum capacity of the other is 50 zones and 40 sounding devices. A typical control cabinet for the system with code signaling is shown in Fig. 6. The wiring to the code signal sending devices and sounding devices, battery leads, and miscellanous wiring are connected to a wire termination panel above the central control unit.

2.15 Mounted in the central control cabinet of a code signaling system are the following:

(a) Multicontact relay or relays which open and close the operating circuits to the sounding devices.

(b) Milliammeter in the main line circuit.

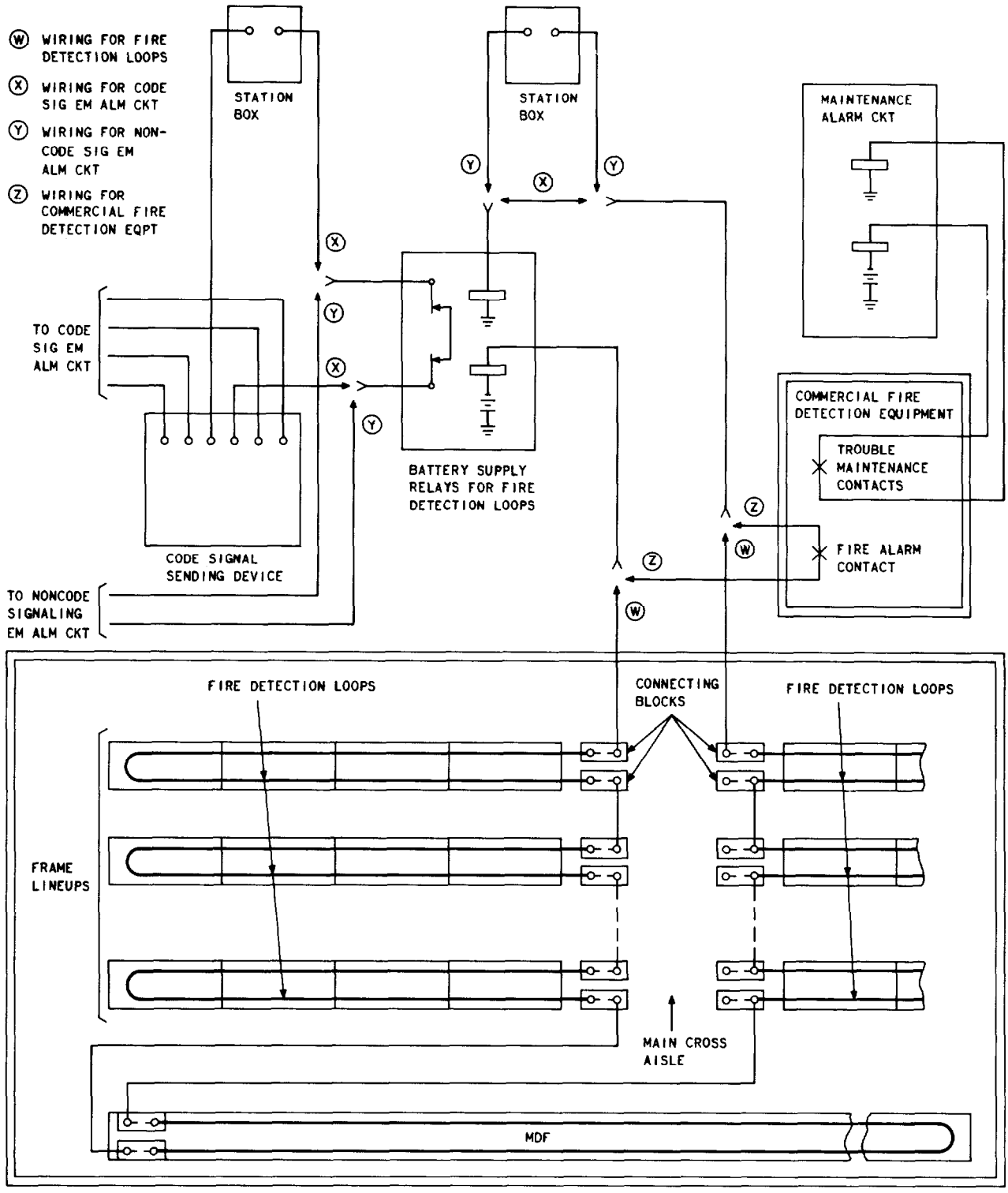
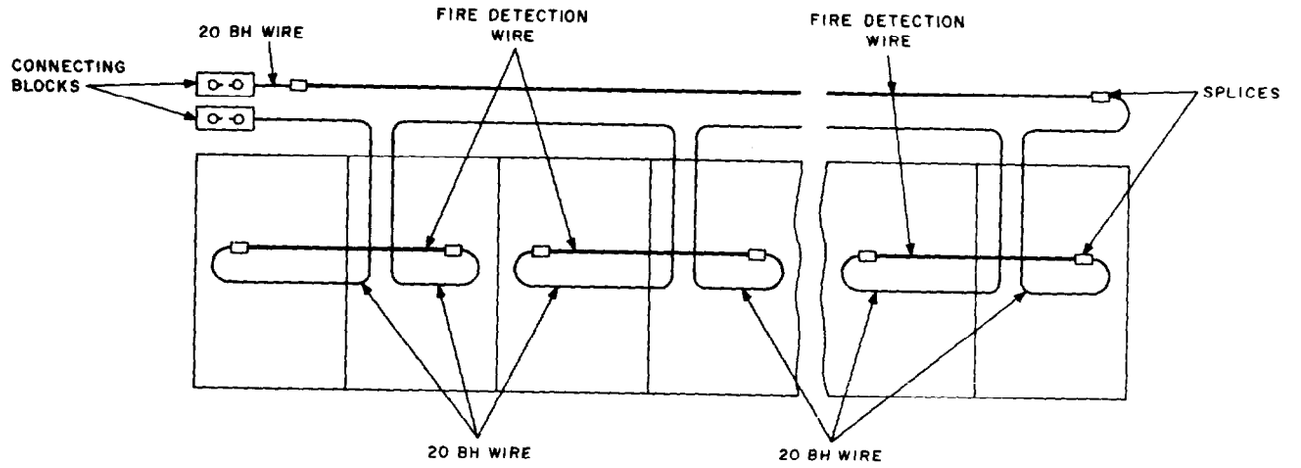
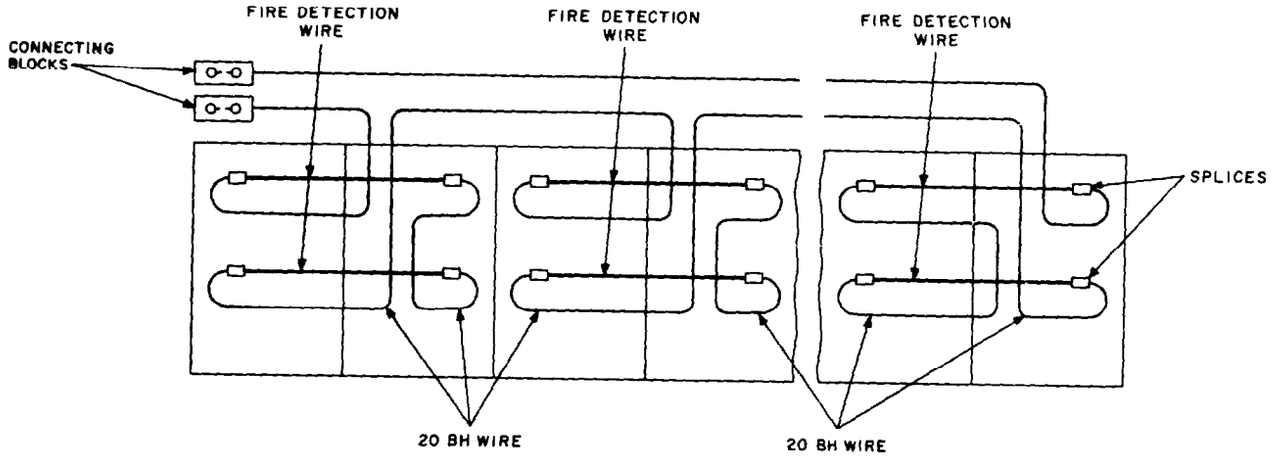


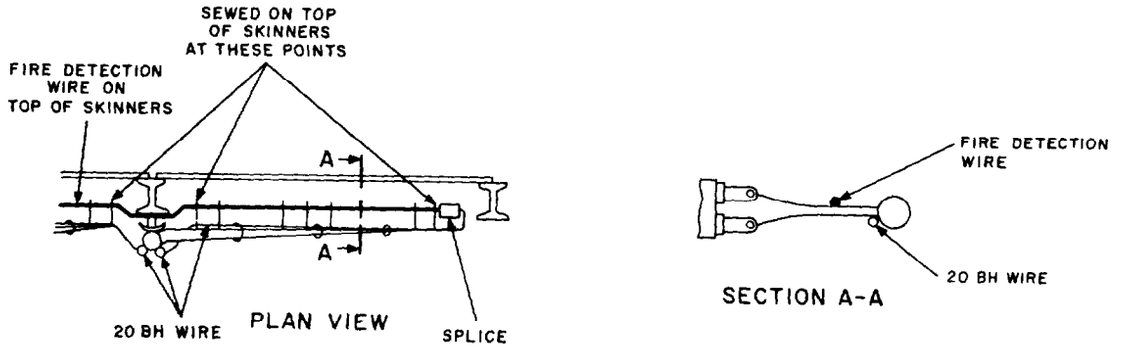
Fig. 1—Typical Zone Installation—Schematic



FRAME LINEUP HAVING CABLE RACK DIRECTLY OVER FRAMES
SUCH AS RELAY RACKS AND PANEL SYSTEM FRAMES



FRAME LINEUP NOT HAVING CABLE RACK DIRECTLY OVER FRAMES
SUCH AS RELAY RACKS AND TOLL SYSTEM FRAMES



TYPICAL LOCATION OF FIRE DETECTION WIRE
WITH REFERENCE TO SKINNERS IN
RELAY RACKS AND SIMILARLY WIRED BAYS

Fig. 2—Method of Applying Fire Detection Wire to Relay Racks and Similarly Wired Bays

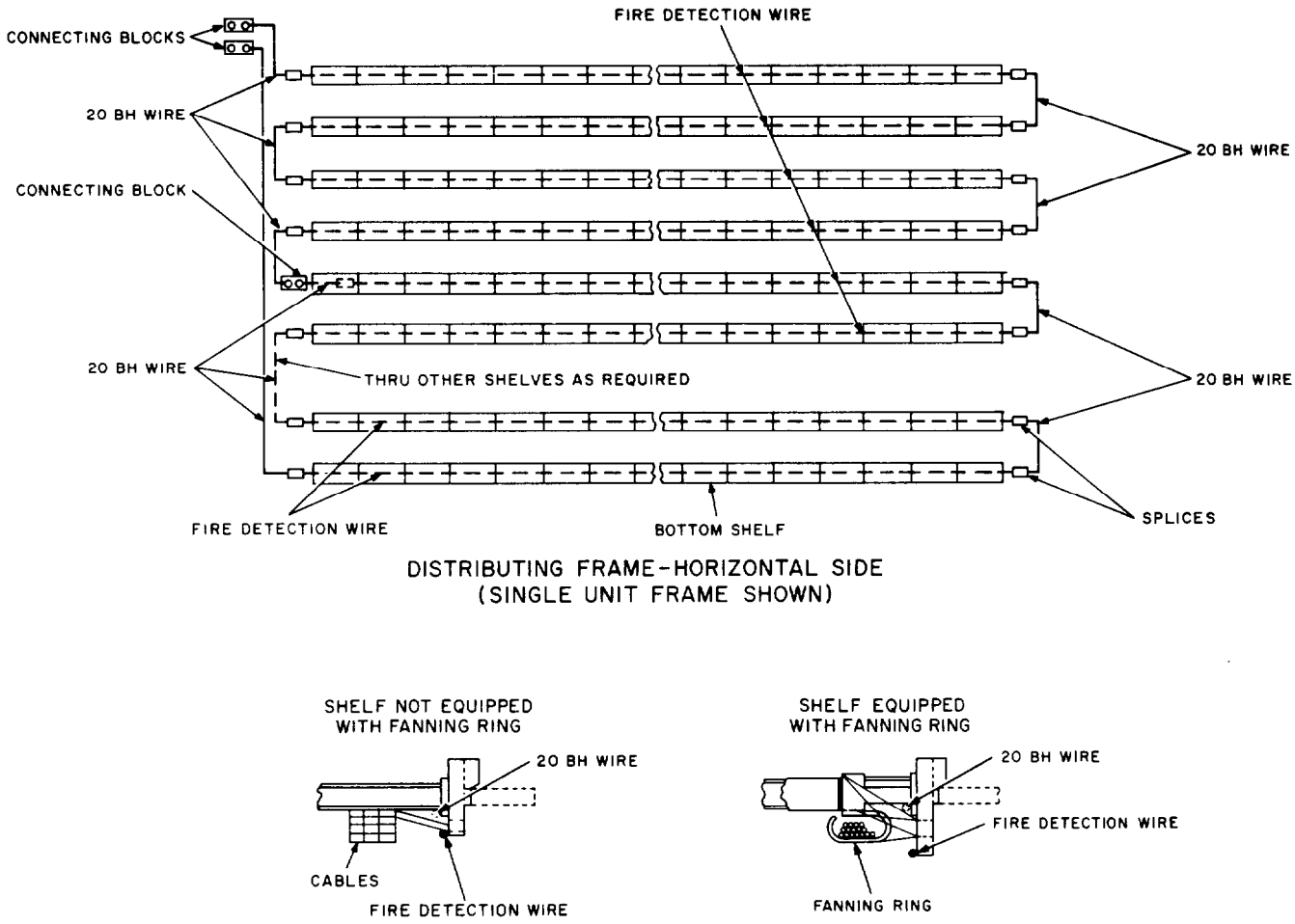


Fig. 3—Method of Applying Fire Detection Wire to Distributing Frame

(c) Equipment of the timing circuit.

(d) Relays, etc, associated with the various supervisory signals and alarms.

(e) Alarm lamps with designation strip.

(f) Fuse panel for circuits associated with the alarm system.

(g) Jacks for isolating the code signal sending devices into groups of ten or less (to facilitate locating wiring troubles in systems of more than ten zones).

(h) Key to activate all the sounding devices whenever it is desired to send a signal, such as a recall signal, manually.

2.16 For the system which uses zone indicating pilot lamps rather than code signaling to indicate the zone where an alarm has originated, a similar central control cabinet is used. This contains all equipment associated with the system except the sounding devices, zone indicating lamps, and supervisory alarm bells. Under this arrangement, the zone relays are mounted in the cabinet. As in the code signaling system, a key is provided in the cabinet for manually sounding special signals.

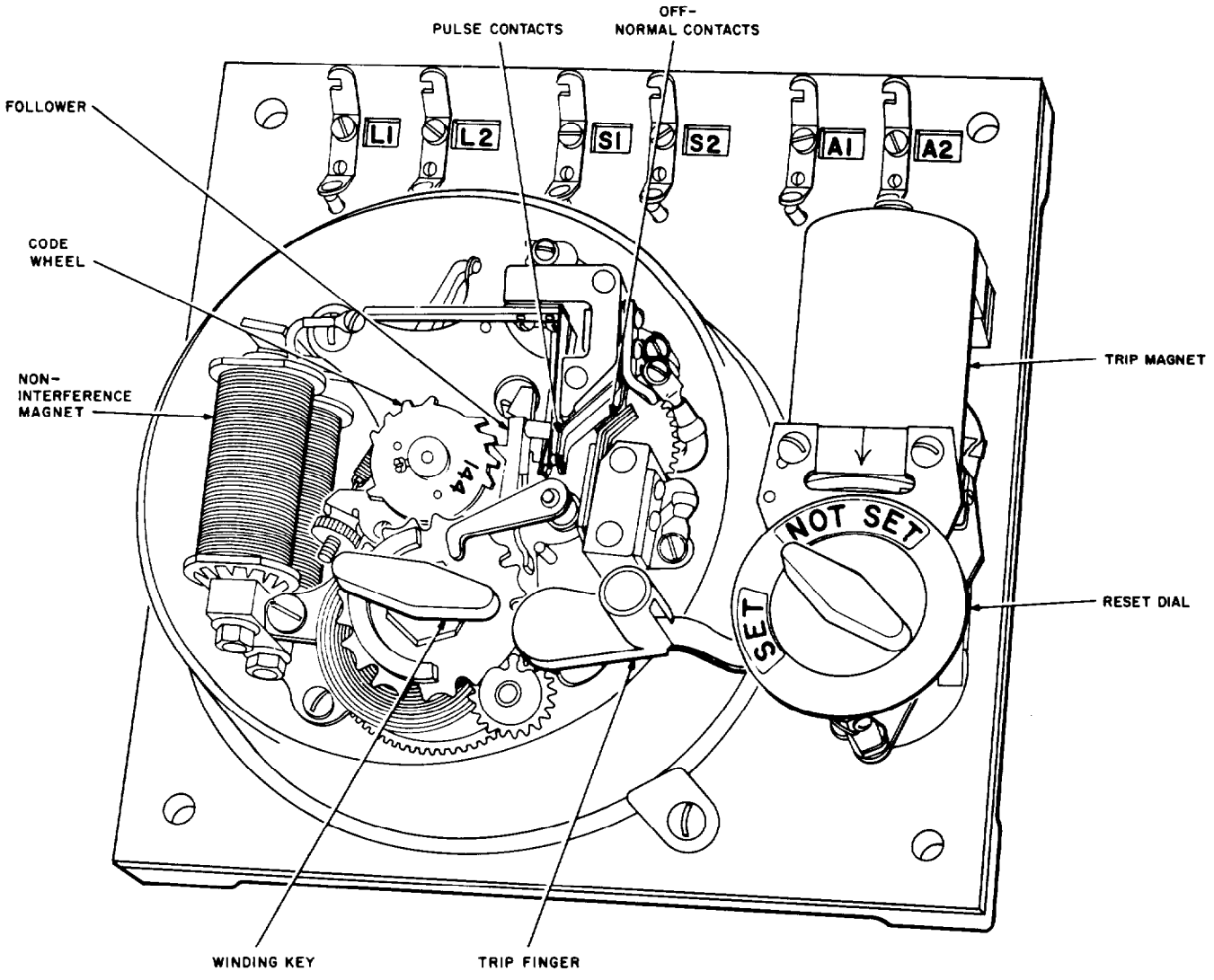


Fig. 5—Code Signal Sending Device

SOUNDING DEVICE

2.17 The sounding devices are located throughout the building as the conditions of each specific case require. The single zone system uses two loud ringing bells. The system with zone indicating lamps normally uses horns or 6-inch soft tone bells of the vibrating solenoid type. In the system which is arranged for code signaling, horns or solenoid single stroke gongs may be used. Gongs normally used with the latter system are a 6-inch soft tone gong and 6-inch, 8-inch, and 10-inch regular gongs.

2.18 Because of their distinctive sound, horns rather than gongs are commonly used in switchrooms, particularly where considerable machine noise is present. In general, gongs are used in operating rooms, rest rooms, and locker rooms. All sounding devices are mounted away from windows to avoid disturbance to adjacent properties.

VISUAL SIGNALS

2.19 Emergency alarm systems having two to five zones and not arranged for code signaling use visual signals to indicate the zone where the alarm originated. For this purpose, lamp cabinets having a capacity of five lamps are placed in suitable locations where they can be readily seen by those responding to an alarm.

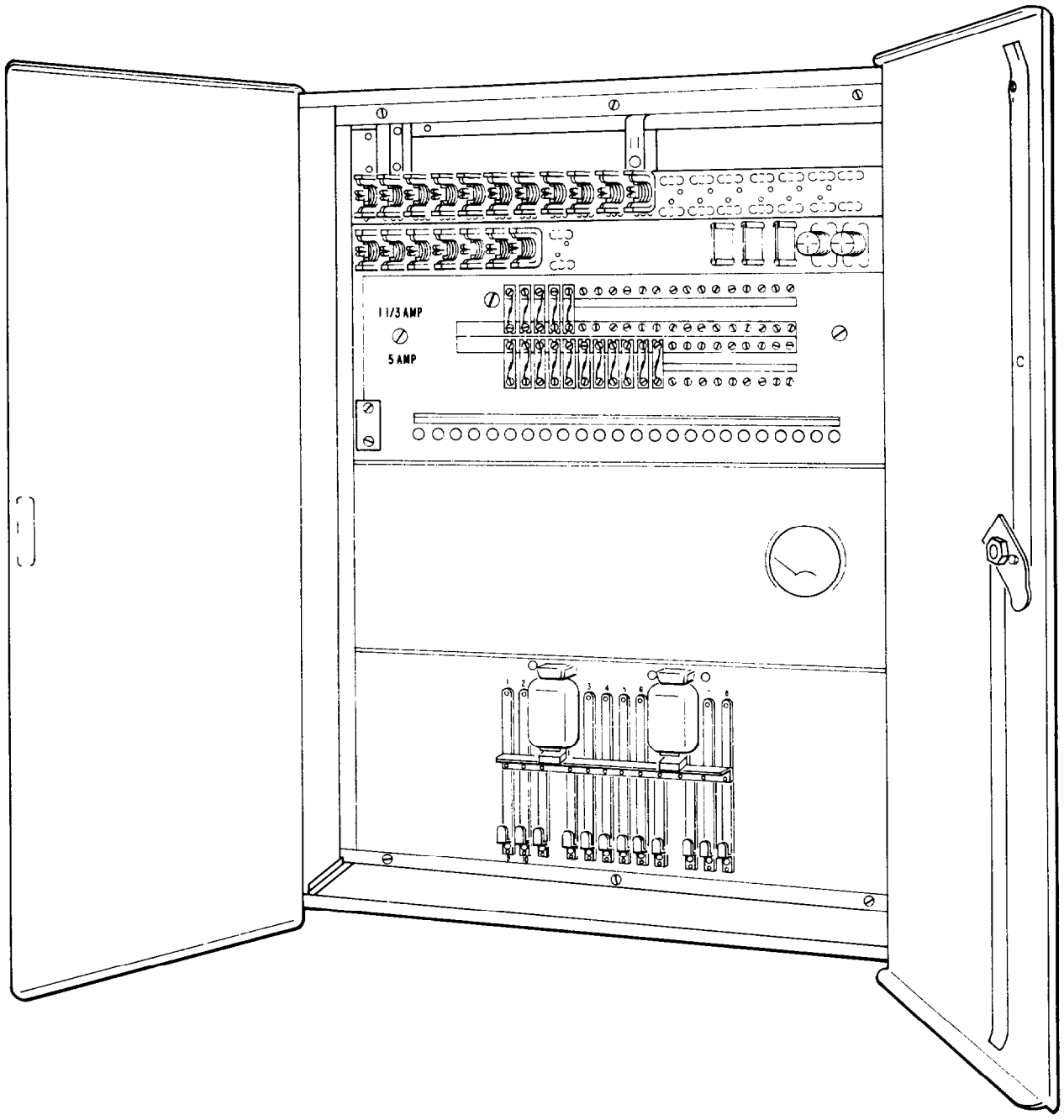


Fig. 6—Central Control Cabinet for Signaling System

SUPERVISORY ALARMS AND SIGNALS

2.20 To draw immediate attention to equipment trouble and off-normal conditions, supervisory alarms and lamp signals are provided in all emergency alarm systems having more than one zone. A vibrating dc bell and an ac bell are located above the cabinet in which the central control unit is mounted. Lamps designated to indicate the various conditions are also provided. The functions and location of these lamps are covered in Part 3.

WIRING, CABLING, AND CONDUIT

2.21 No. 14 flameproof power wire is used for connecting the station boxes, code signal

sending devices, horns, and gongs to the central control equipment. This wire is also used in fire detection loops for the runs between lineups of frames and from the frames to the zone relays. It is installed in the same manner as switchboard cable when it is run on frames and racks. In the case of runs on ceilings, walls, and columns, it is enclosed in conduit, metal molding, or given equivalent protection. The 20 BH wire is used in making up the local cable form which enters the central control cabinet.

3. CIRCUIT ARRANGEMENTS AND OPERATION

CODE SIGNALING SYSTEMS

3.01 The emergency alarm system having the code signaling feature is shown on SD-90437-01 and is designed to operate on the regular central office signaling battery supply and within a voltage range of 40 to 56 volts.

3.02 The code signal sending devices are connected in series. In the battery side of the circuit, known as the line circuit, are a 150-ohm current limiting resistor, a milliammeter, and a line relay. The milliammeter provides a means for checking trouble conditions to determine whether the trouble is due to a ground or an open. The relay is used to transfer the pulses sent by the code signal sending devices through a relay timing arrangement to the sounding devices. The relay timing arrangement holds the closures to the sounding devices to uniform timing and limits the sounding duration of these devices if circuit trouble should occur.

Station Box and Code Signal Sending Circuit

3.03 In order to start an alarm manually from any zone, one of the station boxes in the zone is operated by pulling down a slide which permits a switch in the box to release. This opens the series circuit through the station box, or boxes, in the zone and the zone relay contacts. The opening of this circuit removes a shunt across the trip magnet of the associated code signal sending device. The trip magnet operates and starts the mechanism of the code signal sending device, causing the code wheel to revolve. The code sending device may also be started manually by pulling down the trip finger.

3.04 The code wheel has projections matching the code of the zone. These projections operate contacts, causing the line circuit to open and close. This opening and closing of the circuit causes the line relay to function, which then pulses a multicontact relay. The pulsing of the multicontact relay alternately opens and closes the circuits to all the sounding devices, causing the code to be sounded throughout that part of the building associated with the system.

3.05 To render the sending device noninterfering and successive, there is an interval of about 1 second between the start of the first code wheel revolution and the point where the first projection and the armature is freed from being held mechanically the pulse contacts. During this interval, a continuity test is made of the line circuit to detect the possible sending of an alarm from another zone. At the beginning of each revolution (and also whenever the pulse contacts are open), the armature of the noninterference magnet is held mechanically in its operated position. When the device is tripped, the off-normal contacts open a shunt across the winding of this magnet which is in the line circuit, and the aramature is freed from being held mechanicall but remains held magnetically provided the line circuit is kept closed. An interruption of the current in the line circuit during the test interval due to code being sent from another sending device allows the armature to release, in which case it moves too far from the magnetic field to be brought up again on subsequent closures. In the released position of this armature, the code wheel follower is held in its normal position with the pulse contacts closed.

3.06 If the armature of the noninterference magnet is still held at the end of the test interval, the follower which actuates the pulse contacts is left free to move in accordance with the cuttings on the code wheel so that the pulse contacts open when the first projection of the code wheel is passed. As each succeeding projection passes under the follower, the pulse contacts are closed and reopened. Each opening of these contacts causes one stroke or blast to be given by the sounding devices. When the code wheel has made four revolutions sending out four rounds of the code, the mechanism recloses the line circuit and stops.

3.07 If the armature of the noninterference magnet falls off during any test interval,

the follower remains held in its normal position and the pulse contacts remain closed throughout the revolution. At the end of the revolution, the armature is returned mechanically to its operated position. The test is repeated during the first part of each subsequent revolution until the armature remains held throughout the test interval. Four rounds of code are sent in the regular way. It is not likely that the mechanism will run down and fail to send out its code, as this can occur only if alarms are originated in several different zones so that, due to the noninterfering feature, the device would be in operation for some time before beginning to send out its code.

3.08 After an alarm has been sent, the station box and the code signal sending device must be reset. After the circuit has been restored to normal, the code signal sending device can be reset by turning the dial in a clockwise direction to the end of its travel. The dial will then lock with the word SET under the arrow. The sending device will not lock in the SET position until an open circuit in a fire detection loop or station box has been closed. Although the spring mechanism of the sending device will run long enough to send out a complete alarm of four rounds of any code as many as four times (16 revolutions) without being rewound, each device should be completely rewound after every alarm by turning the winding key counterclockwise to the end of its travel.

3.09 The sending device is designed for a minimum of 30 complete revolutions of the code wheel from a fully wound condition to the rundown condition. After running 16 revolutions and before running 20 revolutions, the rewind alarm should operate.

3.10 If it is desired to send in a second alarm from any zone without resetting the station box or the code signal sending device, it is necessary to operate only the trip finger in the sending device associated with the zone.

Fire Detection Loops

3.11 Because of the resistance of the fusible wire comprising a fire detection loop, the series circuit through the station boxes does not include these loops but passes through normally closed contacts of zone relays which are held operated over a separate series circuit through all the sections of fire detection wire in each zone. An open circuit in a fire detection loop caused by breakage or fusing of the wire releases the zone relays. This opens the shunt around the trip magnet of the code sending device in that zone in the same manner as would result by pulling a station box.

3.12 To provide a continuous test for failures caused by opens, grounds, or battery crosses in the fire detection loops, two zone relays are provided in each zone. The winding of one relay is connected into the battery supply end of the series circuit through all the fire detection wire in the zone. The winding of the other relay is connected at the grounded end. These relay contacts are wired in series so that the release of either or both relays will open the circuit to the sending device and cause the code of the zone to be sounded by the alarm signal devices, as in case of fire. An open circuit will cause both relays to release. A ground will release the relay at the ground end of the circuit, and a cross with battery will cause the relay at the battery end to release.

Commercial Fire Detection Equipment

3.13 ◗The series circuit through the station boxes includes the connecting loop to alarm contacts of the commercial fire detecting equipment. When fire indications are present, the alarm contacts open. This opens the shunt around the trip magnet of the code sending device in the same manner as would result by pulling a station box.

3.14 A trouble ground or battery on the connecting loop to the fire alarm contacts of the commercial fire detection equipment will release relays in the emergency alarm circuit. This activates the appropriate signals and alarms.◖

Ventilating Fan Control

3.15 The ventilating fans in some zones are arranged for automatic shutdown by the emergency alarm system. The ventilating fan cutoff relay circuit is held under control of the reset alarm relay. Where multiple fan control relays would entail excessive current drain, an auxiliary multicontact relay is supplied.

SUPERVISORY ALARMS AND SIGNALS

3.16 Off-normal conditions or troubles in the emergency alarm system, other than those which result in regularly sounding the alarm, are

indicated by supervisory alarms and signals. The circuit arrangement and operation of these alarms and signals are described in the following paragraphs. These alarms cause lamps to light in the central control cabinet as well as the various aisle pilots, class pilots, and alarm bells of the central office alarm system. ▶When commerical fire detecting equipment is furnished, additional alarm indications may also be present at the equipment.◀

3.17 The designation and color of the associated lamp in the control cabinet are listed in Table A. The table also shows which of the supervisory alarm bells associated with the emergency alarm system is operated for each kind of supervisory alarm. Although many of these alarms and signals operate intermittently during the sending of a code alarm, this is not an indication of a trouble condition.

3.18 ▶***Maintenance Alarm:*** This alarm is used to detect a trouble indication which is derived from the commercial fire detecting equipment. A trouble such as a blown fuse, or loss of power would open a trouble maintenance contact which is in series with a constantly monitored maintenance loop. Maintenance alarm relays in series with the maintenance loop will release as a result of an opening of the trouble maintenance contacts, an open in the loop, or a cross with battery or ground. The release of the relay causes an associated lamp to light and enable alarms in the switching system as required. Alarm indications may also be present at the commercial fire detecting equipment.◀

3.19 ***Line Supervisory Alarm:*** The line circuit through the code signal sending devices is maintained under constant test. For this purpose, a line supervisory relay is provided at the ground end of the circuit. In case of an open or a low resistance ground, this relay will release and cause a supervisory alarm. In case of an open in the line circuit, there will be one round of operation of the sounding devices.

3.20 ***Rewind and Reset Alarm:*** This alarm is provided for a grouping of ten or less zones to ensure that circuits through the fire detection loops are closed, station boxes and code signal sending devices are reset, and the latter are rewound if more than halfway run down after an alarm. In this case, this supervisory alarm continues to sound until all sending devices have been reset and all are at least half wound.

3.21 ***Signal Supervisory Alarm:*** This alarm is used to detect an open circuit or a no-battery supply condition for each sounding device. A relay and lamp are provided for each sounding device; each relay is normally held operated over a path from battery through the windings of the sounding

TABLE A

SUPERVISORY ALARMS AND SIGNALS

KIND OF ALARM	PILOT LAMP		AUDIBLE SIGNAL
	DESIGNATION	COLOR	
Line Supervisory	LS	Red	DC Bell
Rewind and Reset	R	Green	DC Bell
Signal Supervisory	SS	White	DC Bell
Timing Circuit	LA & TP	White	DC Bell
No-Battery	None	—	AC Bell
Fuse Alarm	FA	Red	AC Bell
Trouble on Alarm Circuit Outgoing to Distant Office	ODO or DO	Red	AC Bell
Alarm Incoming from Distant Office	DO	Red	Code Alarm
Manual Cutoff of Incoming Alarm	GD	Green	None

device and the relay to ground. Because of the relay resistance, insufficient current flows to operate the sounding device. If an open, ground, or other trouble condition prevents current flow, release of the relay causes an alarm. A ground on the wiring beyond the sounding device will also cause the alarm to operate. Thus a single stroke gong will give one stoke while a horn or vibrating bell will sound continuously.

3.22 ***Timing Circuit Alarm:*** This alarm indicates, by release of normally operated relays, troubles in circuits through the windings of the T1 and T2 relays, the multicontact relay or associated wiring, and failure of certain normally closed contacts in the timing circuit. Troubles caused by opens or grounds in the operating circuit of the multicontact relay, the circuit through the secondary windings of the T1 or T2 relays, or contact failures of the front contacts of the L, TS, T1, or T2 relays are indicated by the LA lamp. The TP lamp indicates an open or ground on the circuit through the primary windings of the T1 and T2 relays.

3.23 ***No-Battery Alarm:*** This alarm is given by release of a normally operated relay which then closes a circuit from the central office ringing current supply to the supervisory ac bell. As in the case of other alarms, indications are also given in the associated central office alarm system. If there is battery failure, a pilot lamp could not function; therefore, no pilot lamp is provided for this alarm.

3.24 ***Fuse Alarm:*** The fuse alarm circuit is arranged so that when battery is placed on the alarm bus of the fuse panel by an operated fuse, a normally operated fuse alarm relay is shunted down. Since the operating circuit for the relay in the no-battery alarm passes through normally operated contacts of the fuse alarm relay, an alarm is given as in the case of battery failure but is distinguished as a fuse alarm by lighting of the FA lamp.

3.25 ***Supervisory Alarm on Alarm Transmitted to a Distant Office:*** Both sides of the outgoing loop to the distant office pass differentially through the windings of a relay. As there is normally no battery or ground connection at the distant office, the effects of these two windings balance each other and the relay remains unoperated. A ground or cross with another circuit would destroy this balance and operate the relay to give a supervisory alarm. To cause an alarm to be presented when an open appears in the loop to the distant office, a normally operated series relay is provided. When an open occurs, this relay releases and causes the supervisory alarm to function. Troubles on alarm circuits to a distant office, which cause the relay at the distant end to release, result in a regular emergency alarm being given at the distant office.

5-ZONE SYSTEM WITHOUT CODE SIGNALING

3.26 The emergency alarm system which uses lamps as indicators of the particular zone affected rather than sounding a code is shown on SD-90560-01. This system is designed for 20- to 28-volt operation. The horns or bells used with this system are of the vibrating type. Like the system arranged for code signaling, it may be operated manually by pulling a station box or automatically by the functioning of the fire detection feature. This system is also arranged for alarms to be sounded in a distant office or to sound in case an emergency alarm is received from a distant office.

3.27 Zone relays are used at the ends of the fire detection loop circuits, as in the case of the emergency alarm system arranged for code signaling. The release of either one or both of these relays lights the lamps to indicate which zone is affected and also operates a multicontact relay directly, which in turn operates the sounding devices. In this system, station boxes are in the series circuits through the fire detection loops. The alarm is sounded continuously and the lamps are lighted until the fire detection loop circuit is closed or, if the alarm is due to the operation of a station box, until the station box is restored to normal. No other means for silencing the alarm is provided, as it might be inadvertently left inoperative.

3.28 The fire detection loop circuits are selftesting against failures due to opens, grounds, or battery crosses. If a ground is present, the relay connected to ground will be shunted and will release. Similarly, a battery cross will cause the release of the relay which is connected to battery.

Supervisory Alarms

3.29 The multicontact relay and sounding device circuits are also kept under test at all times. Each is kept under test by a relay which is

normally operated through the circuit being tested. If the circuit becomes open or grounded, the relay will release, causing the dc bell to operate and a supervisory lamp to light. A supervisory relay and a red MC lamp are provided for the multicontact relay. For each sounding device circuit there is a supervisory relay and a white SS lamp.

3.30 A no-battery alarm is provided to sound an ac operated alarm bell in case a fuse operates or battery is disconnected from the emergency alarm circuit. A blown alarm-type fuse in any circuit of the emergency alarm system causes a red FA lamp to light.

3.31 Except in the case of battery failure, whenever a condition occurs which operates either the dc or ac bell, a class pilot will light and the major central office alarm bell and a red aisle pilot will be operated.

SINGLE ZONE SYSTEM

3.32 This system, which is shown on SD-90641-01, is arranged for 20- to 28-volt operation, and like the other systems it may be operated manually by pulling a station box or automatically by the functioning of the fire detection feature. It also has the same general arrangement to handle emergency alarms in a distant office. The system may be arranged for 20- to 28-volt operation (SD-90641-01) or 48-volt operation (SD-96052-01).

3.33 The system is arranged for a single fire detection loop circuit. As in other systems, there is a relay at each end of this circuit. If either of these relays releases due to an open, ground, or battery cross, the sounding devices are operated. The two loud ringing bells which are used for sounding devices are connected in parallel and operate from the central office ringing supply.

3.34 In the single zone system, no provision is made for supervisory alarms or connection to the central office alarm system ◆except for certain applications when commercial fire detecting equipment is provided.◆ Blown fuses or battery failures cause the release of one or more of the normally operated relays, any of which in releasing will result in an emergency alarm. Troubles on the circuit to or from a distant office also result in an emergency alarm being sounded.

3.35 The separate alarm provided for sounding emergency alarms in a distant office has essentially the circuit arrangement of the single zone emergency alarm system described in 3.32 through 3.34 with the fire detection loop and station boxes omitted.

EMERGENCY ALARM TRANSMITTAL TO DISTANT OFFICE

3.36 ***Outgoing:*** The circuit arrangement used when alarms are to be sounded in a distant office involves a normally closed 2-wire circuit between the two offices. A normally operated relay associated with the emergency alarm supervisory circuit in the originating office feeds battery and ground through its contacts to a relay in the distant office. An emergency alarm, a battery failure, or any condition which would cause operation of the alarm supervisory circuit in the originating office releases this associated relay, thus opening the circuit to the distant office and giving an alarm there. The alarm at the distant office may be connected to any one of the three emergency alarm systems listed in 1.03 or to the separate alarm provided for this specific purpose described in 3.35.

3.37 ***Incoming:*** An office provided with an emergency alarm system involving code signaling sending equipment and having incoming alarm circuits from one or more distant offices may be arranged so that an alarm at the distant office causes a code alarm to be sounded on the regular signals, or the arrangement may be such that a separate audible alarm is caused to function. When the incoming alarm circuit is associated with the code signaling system, a code signal sending device is required to sound the code which has been assigned to indicate the existence of an emergency in the distant office or offices. In the event that an alarm condition should occur in a distant office or the external loop between offices fail, a relay normally held operatd over the loop from the distant office is released. This in turn releases a second normally operated relay which opens the shunt from around the trip magnet of the associated code signal sending device and also lights a red ODO lamp in the office alarm board. When more then one distant office is served by a code signal sending device and reception of audible alarms from other distant offices is required during the interval between the time an alarm is received from one distant office and the time the necessary repairs are made, a CO key is provided. Operation of

the CO key will silence the audible alarm and light the associated GD lamp indicating the existence of an alarm condition.

4. MAINTENANCE FEATURES

4.01 Due to the rugged construction of the station boxes and dc sounding devices, there should be few occasions for repairs or adjustments. Volume adjustments of the horns will involve little or no difficulty. No testing equipment other than that normally required in the central office is necessary.

4.02 The standard loud ringing bells and other customer set ringers operating on 20-cps ringing current are adjusted in accordance with the usual methods applying to this apparatus. Requirements and adjusting procedures for the multicontact relays are covered in Bell System Practices Division 040.

4.03 Adjusting information is not being prepared to cover the code signal sending devices or ▶commercial fire detecting equipment. If any of these devices or this equipment◀ should fail to function properly, necessary repairs or adjustments should not be made by the local forces.

5. CIRCUIT REFERENCES

5.01 The circuit drawings pertaining to emergency alarm systems are listed in Table B.

TABLE B

TITLE	DRAWING
Emergency Alarm Circuit Arranged for Code Signaling	SD-90437-01
5-Zone Emergency Alarm Circuit	
Single-Zone Emergency Alarm Circuit	SD-90560-01
Emergency Alarm Circuit — Incoming from Distant Office	SD-90641-01
(For use where a separate alarm is used)	SD-90642-01
Distribution Fuse, and Miscellaneous Individual Alarm Circuit (24 Volt)	SD-95072-01
Distribution Fuse, Common Aisle, and Miscellaneous Individual Alarm Circuit (48 Volt)	SD-95380-01
Miscellaneous Fuse, Common-Aisle, and Miscellaneous Individual Alarm Circuit For Auxiliary Repeater Station (+152 Volt)	SD-95385-01
Emergency Alarm Circuit — Arranged for Code Signaling	SD-96023-01
Emergency Alarm Circuit — (Not arranged for code signaling, with provision for automatic fire detection, for use in 48-volt multizone office)	SD-96049-01
Emergency Alarm Circuit — (Not arranged for code signaling, with provision for automatic fire detection, for use in 48-volt single-zone office)	SD-96052-01
Commercial Fire Detection Equipment Application Schematic Associated Maintenance Alarm	SD-99375-01