

COMMON SYSTEMS
CIVIL AIR RAID WARNING SYSTEM
DIAL PULSE RECEIVING AND
CODE DISTRIBUTING CIRCUIT
KEYPOINT TO WARNING STATIONS

CHANGES

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

C.1 The warning of Test Note 1 on each page of the circuit requirements table has been amplified to guard against the possibility of transmitting false alert signals to the civil air raid warning stations and siren stations when testing or adjusting any relay in this circuit.

C.2 Test Note 3 on page 1 of the circuit requirements table, which formerly read "Insert dummy plugs in jacks (C) and (PLS) before testing or readjusting (L) relay", has been removed. This information is now covered in the circuit description under heading "Taking Equipment out of Service".

C.3 "Block or Insulate" information has been added for the (AL), (All), and (Ll) relays to prevent the unnecessary sounding of the central office alarms and a locked in condition of the (ALM) lamp when working on these relays.

All other headings under Changes, no change.

1. PURPOSE OF CIRCUIT

1.1 This circuit is designed for use in a Civil Air Raid Warning Network for disseminating alert signals from keypoints to important warning stations. The circuit is arranged to receive and record dial pulses sent from a keypoint, to transmit alert information to a public signal control circuit, and to transmit code ringing alert signals to a maximum of 200 important warning stations.

2. WORKING LIMITS

	(L) RELAY	
	"S" Option	"T" Option
MAX. EXT. CKT. LOOP RES.	2,000 ω	1,200 ω
MIN. INSULATION RES.	15,000 ω	15,000 ω

3. FUNCTIONS

3.01 To count the number of dial pulses received in a digit.

3.02 To recognize the digit 4 as an indication to transmit the "Yellow" alert code ringing signal to the warning stations.

3.03 To recognize the digit 6 as an indication to transmit the "Blue" alert code ringing signal to the warning stations.

3.04 To recognize the digit 8 as an indication to transmit the "Red" alert code ringing signal to the warning stations.

3.05 To recognize the digit 0 as an indication to transmit the "White" alert code ringing signal to the warning stations.

3.06 To recognize the digit 2 as an indication to stop sending alert code ringing signals and to restore to normal.

3.07 To ground the "ST" lead to start the code generating circuit whenever an alert signal is to be sent to the warning stations.

3.08 To continuously check the loop incoming to this circuit for trouble conditions such as opens or grounds, and to bring in a central office alarm and lock in an alarm lamp within approximately one half minute after a trouble occurs.

3.09 To provide means for denying both the Blue and Yellow alert signals to any warning station.

3.10 To provide means for denying either the Blue or the Yellow alert signal to any warning station in the first group of 50 lines.

3.11 To transmit alert information to a public signal control circuit.

4. CONNECTING CIRCUITS

When this circuit is listed on a keysheet, the connecting information thereon is to be followed.

- 4.1 Code Generating Circuit - SD-95677-01
- 4.2 Auxiliary Ringing Supply and Battery Distributing Circuit - SD-81202-01
- 4.3 One Way Receiving Circuit, One Way Sending Circuit, Alarm Circuit, and Jack Circuits - SD-95683-01
- 4.4 Crossbar Office
 - 4.41 Aisle Pilot Circuit - SD-25087-01 (Crossbar No. 1)
 - 4.42 Alarm Circuit - SD-25671-01 (Crossbar No. 5)
- 4.5 Panel Office
 - 4.51 Audible Alarm Circuit for Floor Alarm Board - SD-21819-01
 - 4.52 Floor Alarm Board Miscellaneous and Auxiliary Alarm Circuit - SD-21203-01 (Battery Cut-Off)
 - 4.53 Miscellaneous Alarm Circuit - ES-226189 (Ground Cut-Off)
- 4.6 Step-by-Step Office
 - 4.61 Audible and Visual Alarm Circuit SD-96188-01 (SXS No. 1)
 - 4.62 Pilot Lamp Circuit - SD-31548-01 (SXS No. 1)
 - 4.63 Audible Alarm Circuit - SD-31551-02 (SXS No. 1 or 350A)
 - 4.64 Pilot Lamp and Power Alarm Lamp Circuit - SD-31573-01 (No. 350A)
 - 4.65 Miscellaneous Alarm Circuit for Aisle Pilots - SD-31970-01 (No. 355A)
 - 4.66 Miscellaneous Alarm Circuit for Alarm Control - SD-31980-01 (No. 355A)
- 4.7 Manual Office
 - 4.71 Annunciator Circuit - SD-15443-01 (Typical)
- 4.8 Application Schematic - SD-95684-01
- 4.9 Public Signal Control Circuit SD-95688-01

DESCRIPTION OF OPERATION

5. GENERAL METHOD OF OPERATION

5.1 When this circuit is normal the incoming loop is closed and the (L) relay is operated. When the

attendant at the keypoint sends an alert signal by dialing a single digit, relay (L) follows the dial pulses. The number of pulses in the digit are counted by means of relays (LC), (LD), (LE) and (P1) to (P6).

5.2 At the end of the train of pulses for the digit dialed, one of the register relays (Y), (B), (R) or (W) operates and locks under control of the release relay (RL).

5.3 The operation of one of the register relays starts the code generating circuit, closes a circuit to the public signal control circuit, and closes the circuit for operating the appropriate multicontact relays under control of the ground signals from the code generating circuit. Ringing current is applied through the make contacts of the multicontact relays to the line conductors of the warning stations; thereby transmitting the corresponding code ringing alert signals to the warning stations.

5.4 When the attendant at the keypoint sends the stop signal by dialing the digit two, the release relay (RL) operates which releases the operated register relay. The release of the register relay stops the code generator, opens the circuit to the multicontact relays, and restores the circuit to normal.

6. PULSE COUNTING - FIG. 1

6.1 When the keypoint attendant dials an alert signal, the loop to this circuit is opened a number of times corresponding to the digit dialed; four opens or impulses for the Yellow alert, six impulses for the Blue alert, eight impulses for the Red alert, and ten impulses for the White alert. The (L) relay releases when each open or pulse occurs and reoperates when the loop closes again. Relay (L1) follows the pulses of relay (L); when (L) releases (L1) operates, and when (L) reoperates (L1) releases. When (L1) operates on the first pulse, (RA) operates which in turn operates (RAL). (RA) is slow release so that it will hold operated during a train of pulses. The pulses from the front contact of relay (L1) are counted by relays (LC), (LD), (LE) and (P1) to (P6).

6.2 The first closure of contacts 3-4B of (L1) operates relay (LC). When (L1) releases, (LE) operates in series with (LC). Both relays hold to the locking ground supplied by (RA). The second closure of contacts 3-4B of (L1) operates (LD). This releases (LC), but (LE) holds in series with (LD). When (L1) releases (LD) and (LE) release. However, (LD) has a

holding circuit through a make contact of (LC), so that (LD) will keep the winding circuit of (LC) open until it has released. The third closure of contact 3-4B of (L1) will operate (LC) again and the cycle will be repeated. Pulses 1, 3, 5, 7 and 9 will cause (LE) to operate, and pulses 2, 4, 6, 8 and 10 will cause (LE) to release.

6.3 The first time (LE) operates, it closes a circuit thru contacts of (P4), (P2), (P3) and (P5) to the primary winding of (P1), operating (P1). Relay (P1) locks thru its secondary winding to ground supplied by (RA1). When pulse No. 2 releases (LE), (P2) operates and locks and (P1) releases. Pulse No. 3 operates (LE), thus operating (P3) which locks and releases (P2). On pulse No. 4 (LE) releases, operating (P4) which locks and releases (P3). Pulse No. 5 operates (LE), operating (P5) which locks and releases (P4). Pulse No. 6 releases (LE), operating (P6) which locks but does not release (P5). Pulse No. 7 operates (LE), operating (P1) which locks and releases (P5). Relay (P6) remains operated. Pulse No. 8 releases (LE), operating (P2) which locks and releases (P1). Pulse No. 9 operates (LE), operating (P3) which locks and releases (P2). Pulse No. 10 releases (LE), operating (P4) which locks and releases (P3). The following table shows the relays operated after any pulse.

Pulse No.	Relays Operated
1	LC, LE, P1
2	P2
3	LC, LE, P3
4	P4
5	LC, LE, P5
6	P5, P6
7	LC, LE, P1, P6
8	P2, P6
9	LC, LE, P3, P6
10	P4, P6

The pulse count will, of course, stop when the keypoint dial reaches its normal position, so that any (P-) relay or relays may remain operated as shown in the table.

6.4 When a train of pulses for a digit ends, the (L) relay will remain operated and (L1) will remain released. After a short interval (RA) will release. (RA) released connects ground thru the contacts of (P1) to (P6) to one of the leads connected to the register relays. (RA) released also opens the operating circuit to (RA1) and the holding circuit to (LC) and (LE). After a short interval (RA1) releases, releasing any operated (P-) relays. During the release time of the (RA1) and (P-) relays, ground is connected to one of the register leads.

7. REGISTERING ALERT SIGNALS - FIGS. 1 AND 2

7.1 Yellow Alert Registration

When the (RA) relay releases after the digit 4 has been dialed into this circuit, ground is connected thru a break contact of (P6) and a make of (P4) to operate register relay (Y) on its primary winding. (Y) operated connects ground to the "ST" lead to start the code generating circuit, connects battery to the "YB" lead to the public signal control circuit, and connects battery to the windings of the (Y1) and (Y2) multicontact relays.

7.2 Blue Alert Registration

When the (RA) relay releases after digit 6 has been dialed into this circuit, ground is connected thru a make contact of (P6) and a make of (P5) to operate register relay (B) on its primary winding. (B) locks operated on its secondary winding. (B) operated connects ground to the "ST" lead to start the code generating circuit, connects battery to the "YB" lead to the public signal control circuit, connects battery to the windings of the (B1) and (B2) multicontact relays, and operates (TR). (TR) operates (TR1). Where the warning stations are equipped with visual indicators, the operation of (TR1) transfers the ringing potential from negative to positive superimposing battery.

7.3 Red Alert Registration

When the (RA) relay releases after digit 8 has been dialed into this circuit, ground is connected thru a make contact of (P6) and a make of (P2) to operate register relay (R) on its primary winding. (R) locks operated on its secondary winding. (R) operated connects ground to the "ST" lead to start the code generating circuit, connects battery to the "R" lead to the public signal control circuit, and connects battery to the windings of the (RW1) and (RW2) multicontact relays.

7.4 White Alert Registration

When the (RA) relay releases after digit zero has been dialed into this circuit, ground is connected thru a make contact of (P6) and a make of (P4) to operate register relay (W) on its primary winding. (W) locks operated on its secondary winding. (W) operated connects ground to the "ST" lead to start the code generating circuit, connects battery to the "W" lead to the public signal control circuit, connects battery to the windings of the (RW1) and (RW2) multicontact relays, and operates (TR). (TR) operated transfers

the control of the (RW1) and (RW2) relays from the "R1" and "R2" leads to the "W1" and "W2" code generator leads, and also operates (TR1). Where the warning stations are equipped with visual indicators, the operation of (TR1) transfers the ringing potential from negative to positive superimposing battery.

8. CODE DISTRIBUTION - FIGS. 3, 4 AND 5

8.1 Yellow Alert Signal

With the (Y) register relay operated, battery is connected to one side of the windings of the (Y1) and (Y2) multicontact relays. When the code generating circuit starts functioning, the (Y1) and (Y2) relays follow the code ground signals on the "Y1" and "Y2" leads, respectively. (Y1) operated connects ringing potential thru resistance lamps 1 to 25 to the ring conductors of the odd numbered lines in the first group of 50 warning stations. Similarly, when (Y2) is operated ringing potential and generator ground are connected to the even numbered lines in the first group of 50 warning stations. The ground signals from the code generator circuit are arranged so that when (Y1) is operated (Y2) is released, and vice versa; so that ringing potential is applied to only half the number of lines in a group at any one time. Where the warning stations are equipped with both ringers and visual indicators ("Z" option), negative superimposed ringing potential is applied to the ring conductors for the Yellow alert signal. Where more than 50 warning station lines are required, one or more figs. 5 are provided. In this case, (YB3) and (YB4) follow the operation and release of the (Y1) and (Y2) relays respectively, and connect code ringing signals to the 2nd, 3rd and 4th groups of 50 warning station lines in a manner similar to that for the 1st group of 50 lines.

8.2 Blue Alert Signal

With the (B) register relay operated, battery is connected to one side of the windings of the (B1) and (B2) multicontact relays. When the code generating circuit starts functioning, the (B1) and (B2) relays follow the code ground signals on the "B1" and "B2" leads, respectively. (B1) operated connects ringing potential thru resistance lamps 1 to 25 to the ring conductors and generator ground to the tip conductors of the odd numbered lines in the first group of 50 warning stations. Similarly, when (B2) is operated ringing potential and generator ground are connected to the even numbered lines in the first group of

50 warning stations. The ground signals from the code generating circuit are arranged so that when (B1) is operated (B2) is released, and vice versa; so that ringing potential is applied to only half the number of lines in a group at any one time. Where the warning stations are equipped with both ringers and visual indicators ("Z" option), positive superimposed ringing potential is applied to the ring conductors for the Blue alert signal. Where more than 50 warning station lines are required, one or more figs. 5 are provided. In this case, (YB3) and (YB4) follow the operation and release of the (B1) and (B2) relays respectively, and connect code ringing signals to the 2nd, 3rd, and 4th groups of 50 warning station lines in a manner similar to that for the 1st group of 50 lines.

8.3 Red Alert Signal

With the (R) register relay operated, battery is connected to one side of the windings of the (RW1) and (RW2) multicontact relays. When the code generating circuit starts functioning, the (RW1) and (RW2) relays follow the code ground signals on the "R1" and "R2" leads, respectively. (RW1) operated connects ringing potential thru resistance lamps 1 to 25 to the tip conductors and generator ground to the ring conductors of the odd numbered lines in the first group of 50 warning stations. Similarly, when (RW2) is operated, ringing potential and generator ground are connected to the even numbered lines in the first group of 50 warning stations. The ground signals from the code generator circuit are arranged so that when (RW1) is operated (RW2) is released, and vice versa; so that ringing potential is applied to only half the number of lines in a group at any one time. Where the warning stations are equipped with both ringers and visual indicators ("Z" option), negative superimposed ringing potential is applied to the tip conductors for the Red alert signal. Where more than 50 warning stations are required, one or more figs. 5 are provided. In this case, (RW3) and (RW4) follow the operation and release of the (RW1) and (RW2) relays respectively, and connect code ringing signals to the 2nd, 3rd and 4th groups of 50 warning stations in a manner similar to that for the 1st group of 50 lines.

8.4 White Alert Signal

With the (W) register relay operated, battery is connected to one side of the windings of the (RW1) and (RW2) multicontact relays. When the code generating circuit starts functioning, the (RW1) and (RW2) relays

follow the code ground signals on the "W1" and "W2" leads, respectively. (RW1) operated connects ringing potential thru resistance lamps 1 to 25 to the tip conductors and generator ground to the ring conductors of the odd numbered lines in the first group of 50 warning stations. Similarly, when (RW2) is operated, ringing potential and generator ground are connected to the even numbered lines in the first group of 50 warning stations. The ground signals from the code generating circuit are arranged so that when (RW1) is operated (RW2) is released, and vice versa; so that ringing potential is applied to only half the number of lines in a group at any one time. Where the warning stations are equipped with both ringers and visual indicators ("Z" option), positive superimposed ringing potential is applied to the tip conductors for the White alert signal. Where more than 50 warning stations are required, one or more figs. 5 are provided. In this case, (RW3) and (RW4) follow the operation and release of the (RW1) and (RW2) relays respectively, and connect code ringing signals to the 2nd, 3rd, and 4th groups of 50 warning stations in a manner similar to that for the 1st group of 50 lines.

8.5 Denying Yellow and Blue Alert Signals

In the line connector circuit for the 1st group of 50 lines, optional arrangements are provided to deny certain alert signals to any warning station in the group. Omission of "N" option denies the Yellow alert signal; omission of "Q" option denies the Blue alert signal; omission of both "N" and "Q" option denies both the Yellow and Blue alert signals.

In the line connector circuit for the 2nd, 3rd and 4th groups of 50 lines, optional arrangements are provided to deny both the Yellow and Blue alert signals to any warning station in these groups by omitting "W" option and providing "V" option.

8.6 The following table shows the ringing codes transmitted to the warning stations for the various alert signals, together with the type of superimposed ringing current and the connections to the line conductors for proper operation of the visual indicators.

Alert Signal	Ringing Code	Type of Superimposed Ringing Current	Ringing Connected to the
Yellow	1/2 sec. on, 1/2 sec. off, 1/2 sec. on, 2-1/2 secs. off.	Negative	Ring
Blue	1/2 sec. on, 1/2 sec. off, 1/2 sec. on, 1/2 sec. off, 1-1/2 secs. off.	Positive	Ring
Red	1/2 sec. on, 1/2 sec. off. (60 IPM)	Negative	Tip
White	16 secs. on, 16 secs. off.	Positive	Tip

9. STOPPING ALERT SIGNALS

9.1 When the keypoint attendant dials the "Stop" signal (digit 2) into this circuit, the pulses are counted as covered in Paragraph 6. When the (RA) relay releases at the end of the digit, ground is connected thru a break contact of (P6) and a make of (P2) to operate the release relay (RL). (RL) operated opens the locking path for any operated register relay (Y), (B), (R) or (W). The register relay released disconnects battery from the corresponding multicontact relays in the line connector circuit for the 1st group of 50 lines, and disconnects ground from the "ST" lead to the code generator circuit, and disconnects battery from the lead to the public signal control circuit. The release of register relays (B) or (W) also releases (TR) which in turn releases (TR1). The release of the multicontact relays for the 1st group of 50 lines, releases the corresponding relays in the 2nd, 3rd and 4th groups of 50 lines, if provided.

10. MISCELLANEOUS MAINTENANCE FEATURES

10.1 Jack (TST) provides ready access to the windings of relay (L) when applying current flow requirements to this relay. A dummy plug inserted in the (C) jack disconnects the operating winding of (L) from the loop, to prevent interference with the current flow readings. A dummy plug

inserted in the (PLS) jack at this time, prevents (L1) from operating and falsely bringing in a loop failure alarm.

10.2 Jack (C) provides means of plugging a dial hand test set into this circuit to permit local dialing tests to check the performance of this circuit.

10.3 Jack (PLS), besides providing means for silencing the central office alarm (see 12.3), also provides means for connecting a per cent break meter across the contacts of relay (L) for checking the pulses coming into this circuit.

10.4 Key (ADJ) is provided for use when checking relay current flow requirements or when adjusting relays. Operation of this key prevents false ringing alert signals from being transmitted to any of the warning stations, and also disconnects battery from the springs of the register relays to avoid blowing fuses when adjusting these relays.

10.5 Key (RCO) is provided for use when making local dialing tests of this circuit. This key should be operated before any testing is started in order to prevent false alert signals being transmitted to the warning stations.

10.6 Lamp (CO) is provided as a monitor indication that the (ADJ-RCO) key is operated or that a dummy plug is inserted in the (PLS) jack.

10.7 Jacks (TLO) and (TLE) provide means of connecting a station signal indicator set to this circuit when making local maintenance operation tests. Jacks (TLO) provides access to an odd numbered test line and jack (TLE) provides access to an even numbered test line, so that both groups of code signals may be tested.

10.8 Resistor (TST) provides a marginal test of the ringing supply potential when making local maintenance operation tests.

11. TAKING EQUIPMENT OUT OF SERVICE

11.1 When this circuit is taken out of service, all the warning stations controlled by this circuit and all the siren stations controlled by the associated Public Signal Control

Circuit, if provided, are prevented from receiving warning alert signals from the keypoint control station. For this reason it is extremely important that the necessary work operations be completed with a minimum of delay and the circuit put back in service as quickly as possible.

11.2 In order that emergency arrangements may be made in case an air raid alert occurs while this equipment is out of service, the attendant at the keypoint control station and all telephone company personnel who may be concerned should be advised before any work is started.

11.3 To preserve continuity of service for the remainder of the civil air raid warning network and to avoid falsely sounding loop failure alarms at the various telephone central offices in the network, provision has been made for taking this equipment out of service in the following order: (a) By inserting a dummy plug (No. 258D) in the (PLS) jack; (b) Connecting terminal 20 to terminal 22 on the "B" terminal strip of the Code GEN and Dial PLS REC unit; and then (c) Inserting a plug in the (C) jack.

11.4 When the work operations are completed, the equipment should be restored to service in the reverse order by removing the plug from jack (C), removing the test connection from terminal strip "B", and then removing the plug from jack (PLS).

11.5 The attendant at the keypoint control station and the interested telephone company personnel should be informed when this equipment is restored to service.

12. DESCRIPTION OF ALARM FEATURES

12.1 When this circuit is normal, the incoming loop is closed and relay (L) is operated. If a trouble condition occurs on this loop, such as an open circuit or a false ground, relay (L) will release and operate (L1). After an interval of from 13 to 32 seconds, the thermal relay (AL) operates which in turn operates (AL1). (AL1) operated closes connections to the central office alarm equipment to bring in suitable audible and visual alarms, as described in the circuit descriptions for the central office alarm circuits listed under connecting circuits.