

52436

CIRCUIT DESCRIPTION  
SWITCHING SYSTEMS DEVELOPMENT DEPARTMENT

CD-21942-01  
Issue 1  
Appendix 3-B  
Dwg. Issue 4-B

PANEL SYSTEMS  
SENDER LOAD INDICATING CIRCUIT  
FOR USE WITH SENDERS THAT OPEN CONTACTS  
TO INDICATE BUSY AND FOR USE WITH  
SENDERS THAT CLOSE CONTACTS TO INDICATE  
BUSY WHEN THEY ARE IN THE SAME GROUP  
WITH SENDERS THAT OPEN CONTACTS

CHANGES

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

C.1 The test clip data for "P" winding of  
(K) relay formerly read: Conn. Bat.  
to TST-JK-T; Conn. grd. to TST-JK-R.

All other headings, no change.

BELL TELEPHONE LABORATORIES, INC.

DEPT. 3360-RGP-CGM-V2



PANEL SYSTEMS  
SENDER LOAD INDICATING CIRCUIT  
FOR USE WITH SENDERS THAT OPEN CONTACTS  
TO INDICATE BUSY AND FOR USE WITH  
SENDERS THAT CLOSE CONTACTS TO INDICATE  
BUSY WHEN THEY ARE IN THE SAME GROUP  
WITH SENDERS THAT OPEN CONTACTS

CHANGES

(K) relay was: operate -300 MA., re-  
lease 300 MA.

B. CHANGES IN APPARATUS

B.1 Superseded

Superseded By

"YE" option  
239KC rel.

"YF" option  
280BM rel.

C. CHANGES IN CIRCUIT REQUIREMENTS OTHER  
THAN THOSE APPLYING TO ADDED OR RE-  
MOVED APPARATUS

C.1 The soak previously specified  
for the primary winding of the

D. DESCRIPTION OF CIRCUIT CHANGES

D.1 The use of the 239KC rel. is rated  
mfr. disc. and is superseded by  
the 280BM relay to provide a polarized  
relay with improved adjustment stability.

D.2 Reference to "YE" and "YF" options  
is added to Note 103 and the op-  
tions used table.

All other headings, No change.

BELL TELEPHONE LABORATORIES, INC.

DEPT. 3310-RTD-AJB-ZO



PANEL SYSTEMS  
SENDER LOAD INDICATING CIRCUIT  
FOR USE WITH SENDERS THAT OPEN CONTACTS  
TO INDICATE BUSY, AND FOR USE WITH  
SENDERS THAT CLOSE CONTACTS TO INDICATE  
BUSY WHEN THEY ARE IN THE SAME GROUP  
WITH SENDERS THAT OPEN CONTACTS

CHANGES

A. CHANGED AND ADDED FUNCTIONS

A.1 Provisions are added for arranging the circuit to start the alarm and operate the load register when 82, 84 or 86 per cent of the senders are busy

in a group of sender selector type senders with random slip selection and 92, 94 or 96 per cent in all other type sender groups.

B. CHANGES IN APPARATUS

B.1 Optional (A), (B) and (C) resistances are added as follows:

| OPTION | (A) RESISTANCE  | (B) RESISTANCE  | (C) RESISTANCE |
|--------|-----------------|-----------------|----------------|
| ZK     | None            | None            | 18DR, 750 ohms |
| ZL     | None            | None            | 18FY, 510 ohms |
| ZM     | 44AD, 61.8 ohms | None            | 18BN, 340 ohms |
| ZN     | 44AD, 61.8 ohms | 19KB, 104 ohms  | 19PN, 124 ohms |
| ZO     | 44AD, 61.8 ohms | 19GB, 165 ohms  | 19PN, 62 ohms  |
| ZP     | 44AD, 61.8 ohms | 19KC, 106 ohms  | 19ND, 88 ohms  |
| ZQ     | 44AD, 61.8 ohms | None            | 19FF, 170 ohms |
| ZR     | 44AD, 61.8 ohms | 19GT, 111 ohms  | 19KC, 59 ohms  |
| ZS     | 44AD, 61.8 ohms | 18KE, 128 ohms  | 19LK, 146 ohms |
| ZT     | None            | None            | 19KA, 755 ohms |
| ZU     | None            | 19DS, 700 ohms  | 18DR, 750 ohms |
| ZV     | 44AD, 61.8 ohms | 19FB, 28.5 ohms | 19EK, 30 ohms  |
| ZW     | None            | None            | 19MR, 735 ohms |
| ZX     | 44AD, 61.8 ohms | 19FA, 41 ohms   | 19ED, 55 ohms  |
| ZY     | 44AD, 61.8 ohms | 19DL, 70 ohms   | 19LJ, 74 ohms  |
| ZZ     | 44AD, 61.8 ohms | None            | 19JB, 150 ohms |
| YA     | 44AD, 61.8 ohms | 18AW, 40 ohms   | 18KL, 112 ohms |
| YB     | 44AD, 61.8 ohms | 19LJ, 74 ohms   | 19LJ, 74 ohms  |
| YC     | 44AD, 61.8 ohms | 19KF, 56 ohms   | 19EJ, 68 ohms  |
| YD     | 44AD, 61.8 ohms | 19FH, 130 ohms  | 19LK, 146 ohms |

When code is underlined, it indicates that only one winding of the resistance is used.

B.2 A2G meter is removed, and replaced by the G2G meter.

D. DESCRIPTION OF CIRCUIT CHANGES

D.1 Title of Note 105 is changed to show the percentage of senders busy when the load alarm is given.

D.2 Options K, M, P and Z in Note 105 for panel link type senders are redesignated B, D, F and G, respectively. Note 107 is added and Note 103 is modified to cover this change.

D.3 Note 108 is added to provide sender load alarm tables for 82 and 92 per cent busy operation.

D.4 Note 109 is added to provide sender load alarm tables for 84 and 94 per cent busy operation.

D.5 Note 110 is added to provide sender load alarm tables for 86 and 96 per cent busy operation.

D.6 "Options Used" table is changed to include the options added in Notes 108, 109 and 110.

All other headings, no change.



PANEL SYSTEMS  
SENDER LOAD INDICATING CIRCUIT  
FOR USE WITH SENDERS THAT OPEN CONTACTS  
TO INDICATE BUSY, AND FOR USE WITH  
SENDERS THAT CLOSE CONTACTS TO INDICATE  
BUSY WHEN THEY ARE IN THE SAME GROUP  
WITH SENDERS THAT OPEN CONTACTS

1. PURPOSE OF CIRCUIT

1.1 This circuit provides a continuous visual indication of the number of idle senders in a group, and closes a circuit to start an alarm and to operate a register when a fixed percentage of the senders in a group are busy.

2. WORKING LIMITS

2.1 The meter circuit shall be adjusted to give the correct number of senders idle for any particular number of senders by connecting straps across the windings of the (E), (F), and (G) resistances as required. This adjustment is necessary to compensate for the wiring resistance.

3. FUNCTIONS

- 3.1 Provides a visual indication of the number of senders in a group that are idle.
- 3.2 Determines when a fixed percentage of the senders in a group are busy.
- 3.3 Connects a momentary ground once each second to operate a register during the time the number of senders busy equals or exceeds a fixed percentage of the total number of senders in the group.
- 3.4 Provides a flexible arrangement for enabling the circuit to be used with various size and type sender groups.

4. CONNECTING CIRCUITS

When this circuit is shown on a key-sheet, the connecting information thereon is to be followed.

4.1 Miscellaneous Register Circuit  
SD-20141-01, Fig. 16 or  
SD-21537-01, Fig. 13.

4.2 Panel Systems - Sender Circuit  
SD-21193-02, and all other senders that are arranged to open contacts to indicate busy.

DESCRIPTION OF OPERATION

5. ELEMENTS OF CIRCUIT

This circuit consists of a milliammeter (calibrated to read senders idle), the (K) relay and the compensating resistances (A), (B), (C), (D), (E), (F), and (G) common to a group of senders, and one (LR) resistance per sender mounted at the location of the (K) relay.

The meter circuit starts from battery at the (D) resistance and continues through the compensating resistances (D), (E), (F), and (G), primary winding of the (K) relay and senders idle meter to the (LR) resistances which are connected in parallel, each with an individual circuit to ground through a back contact on the sender-busy relay of one sender in the group.

When a sender becomes busy, its sender-busy relay operates and opens the circuit to ground through the associated (LR) resistance thereby increasing the resistance of the meter circuit.

When the circuit is installed, the resistance of the meter circuit shall be adjusted to compensate for the resistance of the wiring by strapping out windings of the (E), (F) and (G) resistances as required to give a correct senders idle reading on the meter when a particular number of senders are idle. For example, with sender groups of 60 to 130 senders, make all senders busy except 20 or 30 and then adjust the overall resistance of the meter circuit until the meter reads correctly. For smaller groups of 22 or 44 senders, make all senders busy except 10 or 12 and adjust the resistance until the meter reads the correct number of senders idle.

6. OPERATION

With all senders in the group idle, the meter circuit will be connected to ground through one 1900 ohm (LR) resistance for each sender in the group. Assuming a group of eighty senders, there will be eighty (LR) resistances

in parallel when all senders in the group are idle. Under this condition, the polarized relay (K) will be operated and the meter will read 80 senders idle. The (K) relay is electrically biased by its secondary winding to release the relay when the current through the primary winding is such that a fixed percentage of the senders in the associated group are busy.

The biasing current in the secondary winding is controlled by the (A), (B) and (C) resistances, the values for which are given in tables on the circuit drawing for different size and type sender groups. Assuming that the senders in the group under consideration are panel link type and that the alarm is to be given when 90 per cent of the senders are busy, the table on the circuit drawing specifies that the (A), (B) and (C) resistances shall have a total value of 233 ohms for a group of 80 senders.

As each sender becomes busy, it opens the circuit to ground through its associated (IR) resistance thereby increasing the total resistance in meter and (K) relay circuit and reducing the current. When 90 per cent of the senders in the group become busy, in this case 72, the current through the primary of the (K) relay is reduced to the point where the relay will be released by the biasing current through the secondary winding. The release of relay (K) closes a circuit from the (IR)

interrupter to the "MR" lead of the miscellaneous register circuit operating a register and locking in audible and visual alarms for the maintenance and traffic forces.

The (IR) interrupter momentarily closes its back contact once each second (approximately) operating the register once per second during the time that the (K) relay remains non-operated, thus providing a means for determining the total length of time that the sender load is 90 per cent or over.

The meter pointer moves back and forth over the meter scale as the sender load fluctuates, giving a visual indication of the number of senders in the group that are idle at any instant. The space between the meter scale graduations increases towards the "0" end, thus affording more accurate reading of the number of senders idle as the sender load increases.

#### 7. MIXED SENDER GROUPS

When a sender group has some senders that close a contact and some that open a contact to indicate busy, one Fig. 5 per sender is used in connection with each make contact sender to provide a break contact. By this arrangement all senders in the group are changed to open contacts to indicate busy.

BELL TELEPHONE LABORATORIES, INC.

DEPT. 3340 ACP-FJS