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 SYSTEAS
SENDER LOAD INDICATING CIRCUIT FOR USE WITH SENDERS THAT OPEN CONTACTS

TO INDICATE BUSY AND FOR USE WITH SENDERS THAT CLOSE CONTACTS TO INDICATE BUSI WHEN THEI ARE IN THE SAME GROUP WITH SENDERS THAT OPEN CONTACTS

CHANGES
B. CHANGES IN APPARATUS

(K) relay was: operate -300 MA., release 300 MA .
D. DESCRIPTION OF CIRCUIT CHANGES
D. 1 The use of the 239 KC rel. is rated mfr. disc, and is superseded by the 280 BM relay to provide a polarized relay with improved adjustment stability. D. 2 Reference to " $\mathrm{IE}^{\text {" }}$ and "YF" options is added to Note 103 and the options used table.
All other headings, No change.

BELL TELEPHONE LABORATORIES, INC.

DEPT. 3310-RTD-AJB-Z0

PANEL SYSTEMS
SKNDER LOAD INDICATING CIRCUIT FOR USE WITH SENDERS THAT OPEN CONTACTS

- TO INDICATE BUSY, AND FOR USE W IIH SENDERS THAT CLOSE CONTACTS TO INDICATE

BUSY WHEN THEY ARE IN THE SAME GROUP WIFH SENDERS THLAT OPEN CONTACTS

## CHANGES

## A. CEANGED 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 sendors 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:

OFTION
ZK
ZI
ZM
ZN
ZO
ZP
ZQ
ZR
ZS
ZT
ZD
ZV
ZW
ZX
$Z Y$
$Z Z$
$Y A$
$Y B$
$Y C$
$Y D$
(A) RESISTANCE

## None None

 $44 A D, 61.8$ ohms 44AD, 61.8 ohms 44AD, 61.8 ohms $44 \mathrm{AD}, 61.8$ ohms44AD, 61.8 ohms
44AD, 61.8 ohms
$44 \mathrm{AD}, 61.8$ ohms
None
None
44AD, 61.8 ohms None
44AD, 61.8 ohms
$44 \mathrm{AD}, 61.8$ ohms $44 \mathrm{AD}, 61.8$ ohms $44 \mathrm{AD}, 61.8$ ohms $44 \mathrm{AD}, 61.8$ ohms $44 \mathrm{AD}, 61.8$ ohms 44AD, 61.8 ohms
(B) RESISTANCE

| NoneNone |  |
| :---: | :---: |
|  |  |
| None |  |
| 19KB, | 104 ohms |
| 19GB, | 165 ohms |
| 19 KC , | 106 ohms |
| None |  |
| 19GT, | 111 ohms |
| 1859, | 128 ohms |
| None |  |
| 19DS, | 700 ohms |
| None |  |
|  |  |
| 19FA, | 41 ohms |
| 19DI, | 70 ohms |
| None |  |
| 18AW, | 40 ohms |
| 19LJ, | 74 ohms |
| 19KF. | 56 ohms |
| 19 FH , | , 130 ohms |

(C). RESISTANCE

| 18DR, | 750 ohms |
| :---: | :---: |
| 18PY, | 510 ohms |
| 18BN, | 340 ohms |
| 19PN, | 124 ohms |
| 19 PN, | 62 ohms |
| 12ND, | 88 ohms |
| 19 FF , | 170 ohms |
| 19 KC , | 59 ohms |
| 19LK, | 146 ohms |
| 19 KA , | 755 ohms |
| 18DR, | 750 ohms |
| 19EK, | 30 ohms |
| 19MR, | 735 ohms |
| 19ED, | 55 ohms |
| 19LJ, | 74 ohms |
| 19JB, | 150 ohms |
| 18ES, | 112 ohms |
| 19LJ, | 74 ohms |
| 19EJ, | 68 ohms |
| 19LK, | 146 ohms |

```
When code is underlined, it indieates 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 CHENGIES

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 par 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.

411 other headings, no change.

DEPP. 3340-ACP-FJS
BELL TEKLEPHONE LABORATORIES, INC.

PANEL SYSTEMS<br>SENDERR LOAD INDICATING CIRCUIT<br>FOR USE WITH SENDERS THAT OPEN CONTACTS<br>TO INDICATE BUSY, AND FOR USE WITH<br>SENDERS THAT CLOSE CONTACTS TO INDICATE<br>BUSY YHEN THEY ARE IN THE SANE GROUP<br>WITH SENDERS THAT OPEN CONTACTS

## 1. PURPOSE OF CIRCUIT

1.I This circuit provides a continuous visual indication of the number of ide senders in a group, and closes a cirouit 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 cannecting straps across the windings of the (B), (F), and (G) resistanoes 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 busyo
3.3 Connects a momentary ground once each second to operate a register during the time the number of senders busy equals or exceads 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 oircuit is shown on a keysheet, the conneoting information thereon is to be followed.
4.1 Miscellaneous Register Cirouit SD-20141-01, Fig. 16 or
SD-21537-01, Fig. 13.
4.2 Panel Systems - Sender Cirouit 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 conneoted 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 oircuit 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 idie.

## 6. OPERATION

With all senders in the group idle, the meter circuit will be conneoted to ground through one 1900 ohm (LR) resistance for each sender in the group. Assuming a group of eighty senders, there will be eighty (IR) resistances
in parallel when all senders in the group are iule. Under this condition, the polarized relay (K) will be operated and the meter will read 80 senders idie. The (K) relay is eleotrically biased by its secondary winding to release the relay when the current through the primary winding is such that a fixed percontage 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 oircuit drawing specilies that the (A), (B) and (C) resistances shall have a total value of 233 ohms for a groug of 80 senders.

As each sender becomes busy, it opens the circuit to ground through its assooiated (LR) resistance thereby inoreasing the total resistance in meter and ( $K$ ) relay cirouit and reduoing the ourrent. When 90 per cent of the senders in the group become busy, in this case 72, the ourrent through the primary of the (K) relay is reduced to the point where the relay will be released by the biasing ourrent 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 looking 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 nonoperated, thus providing a means for determining the total length of time that the sender loed is 90 per oent or over.

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

## 7. NIXEA SEMNER 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.

BELI, TELEPEONE LABORATORIES, INC.

DEPT. 3340 ACP-FJS

