CIRCUIT DESCRIPTION
FEB 16 1972

PANEL SYSTEMS
OUTGOING TRUNK CIRCUIT
MF PULSING
TO NON-AMA CROSSBAR TANDEM,
NO. 1 AND NO. 5 CROSSBAR LOCAL OFFICES
AND NO. 1 ESS OFFICES

CHANGES

B. Changes in Apparatus (Components)

B.1 Added
Diode SL, Option M, Code 446F

D. Description of Changes

D.1 Option K is added to provide a make-busy arrangement which
eliminates the need to monitor trunks, wired per option T,
during the make-busy procedure.

D.2 Option M is added to reduce the unguarded sleeve interval
between overlapping calls.

F. Changes in Description of Operation

F.1 Changes in description, required by addition of options K
and M, are shown in Issue 3AC.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 5223-JFT-MR
CIRCUIT DESCRIPTION

SECTION I - GENERAL DESCRIPTION

1. PURPOSE OF CIRCUIT

1.01 This circuit is intended for use in panel offices which are arranged to complete on a multifrequency basis direct distance dialed calls through non-AMA crossbar tandem offices, local calls to ESS No. 1 offices, or local calls to No. 1 or No. 5 crossbar local offices. It provides trunk closure during district talking selections to hold the incoming trunk during these selections.

SECTION II - DETAILED DESCRIPTION

1. SEIZURE

1.01 When this circuit is seized by a district or office selector, battery and ground from the tandem or local office incoming trunk, through the windings of relay WK, are connected to the district or office selector circuit. Tip and ring continuity for the operation of WK relay is under the control of the SL relay. This relay is operated by the district sleeve ground. Relay WK does not operate at this time because the incoming trunk is in the off-hook condition.

1.02 On seizure, the district or office selector also connects ground to lead S to make this circuit test busy to other hunting selectors.

2. WINK SIGNAL

2.01 When the incoming trunk goes to the off-hook condition at the start of the wink signal, relay WK operates, and in turn, operates relay PW. Relay PW locks to the sleeve. When the incoming trunk goes back to the on-hook condition at the end of the wink signal, relay WK releases, and, in turn, operates relay PZ. With relays PW and PZ both operated, inductor TC is bridged across the tip and ring to hold the incoming trunk during district talking selections.

3. CALLED SUBSCRIBER ANSWERS

3.01 If option S or V is wired, when the called subscriber answers and the incoming trunk goes to an off-hook condition, relay WK operates. If option T is wired, the answer reversal permits WK to operate when the district selector closes its CS relay bridge after talk selection. The operated WK relay releases relay PW, which in turn opens the inductance bridge across the tip and ring. Option R (resistor TC) is required when option T is wired. Resistor TC increases the impedance of the TC bridge to provide sufficient current for WK operation.

4. DISCONNECT

4.01 When the called subscriber disconnects, relay WK releases. When the calling subscriber disconnects, ground is removed from the sleeve lead, releasing the PZ relay and making the circuit available for other calls. However, tip and ring leads are held open until relay SL1 releases.

4.02 On calling subscriber disconnect from a no-answer call, ground is removed from the sleeve lead, releasing the PW and PZ relays which were locked in parallel. The RL diode (option W) prevents the surge from the PZ relay from entering the PW relay winding and delaying its release.

4.03 Option M reduces the unguarded sleeve interval between overlapping calls. Option M changes the shunt ground on relay SL1 from MK of SL to the district sleeve. Thus, SL1 operates when district release removes ground from the sleeve, eliminating the release time of relay SL. Diode SL of option M prevents an increase in release time of SL and prevents SL lockup over the K option make-busy lead.

SECTION III - REFERENCE DATA

1. WORKING LIMITS

1.01 Combined originating and terminating circuits:

(a) Maximum external circuit loop resistance: 4,000 ohms.

(b) Minimum insulation resistance: 30,000 ohms.

1.02 Working voltage: 45 to 50 volts.
1.03 Earth potential: ±20 volts.

2. FUNCTIONAL DESIGNATIONS

2.01 Relays

Designation | Meaning | Primary Function
--- | --- | ---
WK | Wink | Registers on-hook or off-hook conditions of incoming trunk
PW | Pulse W | Counts polarity reversals of incoming trunk
PZ | Pulse Z | Counts polarity reversals of incoming trunk
SL | Sleeve | Closes T and R leads
SLI | Sleeve | Opens T, R, and S leads

2.02 Inductor

Designation | Meaning | Primary Function
--- | --- | ---
TC | Trunk Closure | Applies bridge across incoming trunk during district talking selection

2.03 Jack

Designation | Meaning | Primary Function
--- | --- | ---
TST | Test | Used to test relay WK

2.04 Diode

Designation | Meaning | Primary Function
--- | --- | ---
RL | Release | Reduces delay in release of relay PW

2.05 Resistor

Designation | Meaning | Primary Function
--- | --- | ---
TC | Trunk Closure | Applies bridge (in part) across incoming trunk during district talk selection

3. FUNCTIONS

3.01 Recognizes on-hook and off-hook conditions presented by the tandem or local office incoming trunk.

3.02 Places an inductor across the tip and ring conductors to maintain closure while district talk selection is being completed.

4. CONNECTING CIRCUITS

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

(a) District Selector Circuit - SD-21630-01.
(b) Office Selector Circuit - ES-240252.
(c) Tandem Office Incoming Trunk Circuit - SD-25887-01.
(d) OGT Test and MB Jack Circuit - SD-96376-01.
(e) No. 1 Crossbar Incoming Trunk Circuit - SD-26204-01.
(f) No. 5 Crossbar Incoming Trunk Circuit - SD-26070-01.
(g) ESS No. 1 Incoming Trunk - SD-1A166-01.

5. MANUFACTURING TESTING REQUIREMENTS

5.01 This circuit shall be capable of performing the functions outlined in this circuit description and shall meet the requirements listed in the Circuit Requirements Tables.

5.02 The capacitance of capacitors T and R shall not differ by more than 0.11 uF.

6. TAKING EQUIPMENT OUT OF SERVICE

6.01 On trunks wired per option T, without option K, to prevent holding an unanswered called line out of service, do not make busy while call is in audible ring stage.

6.02 Option K provides a make-busy arrangement which eliminates the need to monitor trunks, wired per option T, during the make-busy procedure. With option K, insertion of a make-busy plug operates relay SL1 when district release removes ground from the sleeve. SL1 operated grounds the sleeve as a make-busy condition in addition to opening the operate paths of relays SL, PW, and PZ.

6.03 On trunks wired per option K, blanking pins are required to be permanently inserted into the make-busy jack associated with the district or office bank multiple.

SECTION IV. - REASONS FOR REISSUE

B. Changes in Apparatus (Components)

B.1 Added

Resistor TC - Option R - KS-13492, L1 - 620 Ohms
D. Description of Changes

D.1 Options T and V are added to permit insertion of the TC transformer bridge in the outgoing or incoming side of the T and R capacitors. Option T avoids false disconnects on calls to ESS No. 1 or No. 5 crossbar offices in which the answer reversal is received before the district selector closes its CS relay bridge after talk selection.

D.2 Resistor TC (option R) is added to increase the current over the district loop for operation of relay CS in the district circuit.

D.3 Option S is added to indicate the connecting wiring to transformer TC prior to Issue 9AC.

D.4 The title of the circuit is expanded to include connection to ESS No. 1 offices.

D.5 Paragraphs 4.03 and 6.02 are added to describe changes of Appendix 1B, Drawing Issue 10B.
6.1 PROJECT: None

6.2 This change for TELCO consideration, is to add an improvement to an existing feature. Called lines can be held out of service. On trunks wired per option T, insertion of a make-busy plug during a call that is unanswered, will hold the connection to the called line.

6.21 This condition can occur when T option is furnished, because the TC transformer bridge is connected to the outgoing side of the transmission capacitors. When the calling customer abandons the unanswered call, the district selector releases and removes its GS relay bridge, which is required to operate relay WK for release of the TC transformer bridge. The TC transformer bridge is maintained by two operated relays (PW and PZ) which are held operated by the make-busy plug. Subsequent answer of the called line fails to remove the TC since relay WK cannot operate without a district selector.

6.22 This condition is prevented from occurring by addition of a separate make-busy lead and jack (option K). This arrangement delays the effect of the make-busy plug until the trunk is released.

6.23 This change requires addition of one lead to the outgoing trunk test (OGT) board, minor rewiring in this circuit and provision of a separate make-busy jack.

6.24 This change is not necessary if precaution is taken to insure that the trunk is not off-normal before making it busy.

6.3 This circuit can be reseized during release and possibly hold the previous connection to the terminating office. As a result the panel sender associated with the second call times out.

6.31 This condition can occur because of an unguarded sleeve interval during release.
6.32 The probability of this occurrence is reduced by a wiring change that shortens the unguarded interval by approximately 20 milliseconds. The change eliminates the control of an intermediate relay (SL) on the operation of the relay (SL1) which delays closure of the trunk loop until the trunk is otherwise normal.

6.33 This change requires addition of a 446 type diode and minor rewiring (option M).

6.4 This B change does require WECO notification to TELCO.

6.5 Direct Current Drain Data is not affected by this issue.

6.6 Equipment information is affected and will be covered by WECO drawing J29201AP-1.

6.7 Equipment Design Requirements are not affected.
PANEL SYSTEMS
OUTGOING TRUNK CIRCUIT
MF PULSING
TO NON-AMA CROSSBAR TANDEM,
NO. 1 AND NO. 5 CROSSBAR LOCAL OFFICES
AND 'NO. 1 ESS OFFICES

CHANGES

B. Changes in Apparatus (Components)

B.1 Added
Diode SL, Option M, Code 446P

D. Description of Changes

D.1 Option K is added to provide a make-busy arrangement which eliminates the need to monitor trunks, wired per option T, during the make-busy procedure.

D.2 Option M is added to reduce the unguarded sleeve interval between overlapping calls.

F. Changes in Description of Operation

F.1 Changes in description, required by addition of options K and M, are shown in Issue 3AC.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 5223-JFT-MR
Panel Systems - Outgoing Trunk Circuit - MF Pulsing - To Non-AMA Crossbar
Tandem - No. 1 And No. 5 Crossbar Local - Offices And No. 1 ESS Offices

DESCRIPTION

6.1 PROJECT: None

6.2 This change is to correct a trouble condition. Calls can be falsely disconnected when the customer answers.

6.21 In ESS #1 and #5 Crossbar Offices, the called line can be connected and answered before the district selector in the panel office completes talk selection. At this point in operation, the trunk is open since the answer signal causes the removal of the holding bridge in this trunk, and the district selector is not in talk position. The open interval is long enough to be interpreted as a disconnect signal by the ESS #1 or #5 crossbar office.

6.22 The trouble is corrected by relocating connections of the bridge (TC transformer) to the trunk side of the transmission capacitors. The relocation will maintain the bridge to the terminating office until the district selector completes talk selection and closes its bridge (relay CS). Closure of the district bridge permits a relay (WK) to operate which indirectly removes the TC bridge in this trunk.

6.23 This change requires addition of a pigtail type resistor, and minor rewiring.

6.24 This change is to be applied to trunks connected to ESS #1 or #5 crossbar offices.

6.25 A related change is shown on Issue 10B of SD-20746-01.

6.26 Transmission is not affected by changes in this issue.

6.27 Direct Current Drain Data is not affected by this issue.

6.28 Equipment information is affected and will be covered by WECO drawing J29201AP-1.
CIRCUIT DESCRIPTION

PANEL SYSTEMS
OUTGOING TRUNK CIRCUIT
MF PULSING
TO NON-AMA CROSSBAR TANDEM
AND NO. 1 AND NO. 5 CROSSBAR LOCAL OFFICES
AND NO. 1 ESS OFFICES

SECTION I - GENERAL DESCRIPTION

1. PURPOSE OF CIRCUIT

1.01 This circuit is intended for use in panel offices which are arranged to complete on a multifrequency basis direct distance dialed calls through non-AMA crossbar tandem offices, local calls to ESS No. 1 offices, or local calls to No. 1 or No. 5 crossbar local offices. It provides trunk closure during district talking selections to hold the incoming trunk during these selections.

SECTION II - DETAILED DESCRIPTION

1. SEIZURE

1.01 When this circuit is seized by a district or office selector, battery and ground from the tandem or local office incoming trunk, through the windings of relay WK, are connected to the district or office selector circuit. Tip and ring continuity for the operation of WK relay is under the control of the SL relay. This relay is operated by the district sleeve ground. Relay WK does not operate at this time because the incoming trunk is in the on-hook condition.

1.02 On seizure, the district or office selector also connects ground to lead S to make this circuit test busy to other hunting selectors.

2. WINK SIGNAL

2.01 When the incoming trunk goes to the off-hook condition at the start of the wink signal, relay WK operates, and in turn, operates relay PW. Relay PW locks to the sleeve. When the incoming trunk goes back to the on-hook condition at the end of the wink signal, relay WK releases, and, in turn, operates relay PZ. With relays PW and PZ both operated, inductor TC is bridged across the tip and ring to hold the incoming trunk during district talking selections.

3. CALLED SUBSCRIBER ANSWERS

3.01 If option S or V is wired, when the called subscriber answers, the incoming trunk goes to an off-hook condition, relay WK operates. If option T is wired, the answer reversal permits WK to operate when the district selector closes its CS relay bridge after talk selection. The operated WK relay releases relay PW, which in turn opens the inductance bridge across the tip and ring. Option R (resistor TC) is required when option T is wired. Resistor TC increases the impedance of the TC bridge to provide sufficient current for WK operation.

4. DISCONNECT

4.01 When the called subscriber disconnects, relay WK releases. When the calling subscriber disconnects, ground is removed from the sleeve lead, releasing the PW relay and making the circuit available for other calls. However, tip and ring leads are held open until relay SL1 releases.

4.02 On calling subscriber disconnect from a no-answer call, ground is removed from the sleeve lead, releasing the PW and PZ relays which were locked in parallel. The RL diode (option W) prevents the surge from the PZ relay from entering the PW relay winding and delaying its release.

4.03 Option M reduces the unguarded sleeve interval between overlapping calls. Option M changes the shunt ground on relay SL1 from OFM of SL to the district sleeve. Thus, SL1 operates when district release removes ground from the sleeve, eliminating the release time of relay SL. Diode SL of option M prevents an increase in release time of SL and prevents SL lockup over the K option make-busy lead.

SECTION III - REFERENCE DATA

1. WORKING LIMITS

1.01 Combined originating and terminating circuits:

(a) Maximum external circuit loop resistance: 4,000 ohms.

(b) Minimum insulation resistance: 30,000 ohms.

1.02 Working voltage: 45 to 50 volts.
2. FUNCTIONAL DESIGNATIONS

2.01 Relays

<table>
<thead>
<tr>
<th>Designation</th>
<th>Meaning</th>
<th>Primary Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>WK</td>
<td>Wink</td>
<td>Registers on-hook or off-hook conditions of incoming trunk</td>
</tr>
<tr>
<td>PW</td>
<td>Pulse W</td>
<td>Counts polarity reversals of incoming trunk</td>
</tr>
<tr>
<td>PZ</td>
<td>Pulse Z</td>
<td>Counts polarity reversals of incoming trunk</td>
</tr>
<tr>
<td>SL</td>
<td>Sleeve</td>
<td>Closes T and R leads</td>
</tr>
<tr>
<td>SLI</td>
<td>Sleeve</td>
<td>Opens T, R, and S leads</td>
</tr>
</tbody>
</table>

2.02 Inductor

<table>
<thead>
<tr>
<th>Designation</th>
<th>Meaning</th>
<th>Primary Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>TC</td>
<td>Trunk Closure</td>
<td>Applies bridge across incoming trunk during district talking selection</td>
</tr>
</tbody>
</table>

2.03 Jack

<table>
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<tr>
<th>Designation</th>
<th>Meaning</th>
<th>Primary Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>TST</td>
<td>Test</td>
<td>Used to test relay</td>
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2.04 Diode

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<th>Designation</th>
<th>Meaning</th>
<th>Primary Function</th>
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<tbody>
<tr>
<td>RL</td>
<td>Release</td>
<td>Reduces delay in release of relay</td>
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2.05 Resistor

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<tr>
<th>Designation</th>
<th>Meaning</th>
<th>Primary Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>TC</td>
<td>Trunk Closure</td>
<td>Applies bridge (in part) across incoming trunk during district talk selection</td>
</tr>
</tbody>
</table>

3. FUNCTIONS

3.01 Recognizes on-hook and off-hook conditions presented by the tandem or local office incoming trunk.

3.02 Places an inductor across the tip and ring conductors to maintain closure while district talk selection is being completed.

4. CONNECTING CIRCUITS

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

(a) District Selector Circuit - SD-21630-01.

(b) Office Selector Circuit - ES-240252.

(c) Tandem Office Incoming Trunk Circuit - SD-25887-01.

(d) OGT Test and MB Jack Circuit - SD-96376-01.

(e) No. 1 Crossbar Incoming Trunk Circuit - SD-26204-01.

(f) No. 5 Crossbar Incoming Trunk Circuit - SD-26070-01.

(g) ESS No. 1 Incoming Trunk - SD-1A166-01.

5. MANUFACTURING TESTING REQUIREMENTS

5.01 This circuit shall be capable of performing the functions outlined in this circuit description and shall meet the requirements listed in the Circuit Requirements Tables.

5.02 The capacitance of capacitors T and R shall not differ by more than 0.11 uF.

6. TAKING EQUIPMENT OUT OF SERVICE

6.01 On trunks wired per option T, without option K, to prevent holding an unanswered called line out of service, do not make busy while call is in audible ring stage.

6.02 Option K provides a make-busy arrangement which eliminates the need to monitor trunks, wired per option T, during the make-busy procedure. With option K, insertion of a make-busy plug operates relay SL when district release removes ground from the sleeve. SL operated grounds the sleeve as a make-busy condition in addition to opening the operate paths of relays SL, PW, and PZ.

6.03 On trunks wired per option K, blanking pins are required to be permanently inserted into the make-busy jack associated with the district or office bank multiple.

SECTION IV - REASONS FOR REISSUE

B. Changes in Apparatus (Componental)

B.1 Added

Resistor TC - Option R - KS-13492, L1 - 620 Ohms
**D. Description of Changes**

D.1 Options T and V are added to permit insertion of the TC transformer bridge in the outgoing or incoming side of the T and R capacitors. Option T avoids false disconnects on calls to ESS No. 1 or No. 5 crossbar offices in which the answer reversal is received before the district selector closes its CS relay bridge after talk selection.

D.2 Resistor TC (option R) is added to increase the current over the district loop for operation of relay CS in the district circuit.

D.3 Option S is added to indicate the connecting wiring to transformer TC prior to Issue 9AC.

D.4 The title of the circuit is expanded to include connection to ESS No. 1 offices.

D.5 Paragraphs 4.03 and 6.02 are added to describe changes of Appendix 1B, Drawing Issue 10B.
Panel Systems - Outgoing Trunk Circuit - MF Pulsing - To Non-AMA Crossbar Tandem - And No. 1 And No. 5 Crossbar Local Offices

DESCRIPTION

6.1 The following changes is made to correct a drafting error on issue 5B. The WECo drawings are correct, so this is a "no record" change.

6.12 The R Lead from the OCT test board is removed from the 2 contact SL relay X option, and placed on the 2 make contact SL relay X option. This will agree with sketch shown in LDI 4A.

6.2 The Current Drain Data for this circuit is not affected by changes in this issue.

6.3 D change. Does not require WECo notification to Telco.

6.4 Equipment information is not affected.

6.5 Equipment Design Requirements are not affected.
CIRCUIT DESCRIPTION

PANEL SYSTEMS
OUTGOING TRUNK CIRCUIT
MF PULSING
TO NON-AMA CROSSBAR TANDEM
AND NO. 1 AND NO. 5 CROSSBAR LOCAL OFFICES

CHANGES

D. Description of Changes

D.1 The following change was made on a no-record basis to agree with WECO drawings. The R lead from the OGT board test and make-busy jack is removed from the 2-contact SL relay, option X, and placed on the 2-make contact SL relay, option X.

DEPT 5323-EV-MR

BELL TELEPHONE LABORATORIES, INCORPORATED
TITLE
Panel Systems - Outgoing Trunk Circuit - MF Pulsing - To Non-AMA Crossbar Tandem -
And No. 1 And No. 5 Crossbar Local Offices

DESCRIPTION

5.1 This change provides wiring information in CAD figure 4 which was omitted on issue 5B of this drawing. This change applies to jobs having issue 5B or 6D.

6.2 The Current Drain Data for this circuit is not affected by changes in this issue.

6.3 This change does not affect the plug-in units and does not require the Telco to notify WECo as to number and location of products to be changed.

6.4 Equipment information is not affected.

5 Equipment Design Requirements are not affected.
CIRCUIT DESCRIPTION

PANEL SYSTEMS
OUTGOING TRUNK CIRCUIT
MF PULSING
TO NON-AMA CROSSBAR TANDEM
AND NO. 1 AND NO. 5 CROSSBAR LOCAL OFFICES

CHANGES

D. Description of Changes

D.1 CAD Fig. 4 is changed on circuit drawing to show fuse board ground and punching which was not required prior to Issue 5B.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 5643-EV-MR
Panel Systems - Outgoing Trunk Circuit - MF Pulsing - To Non-A&MA Crossbar Tandem - And No. 1 And No. 5 Crossbar Local Offices

The "SLl" resistor is changed on this issue from $619^W$ to $1100^W$. When trk is held off normal for long periods of time, the new resistor will be cooler to the touch than the former. Neither resistance is subject to excessive heating from a circuit or fire hazard standpoint. No change in circuit operation is occasioned by this substitution. This change is on a no record basis by agreement between Mr. G. Schmalz for WECO and Mr. E. Vanderveer for BTL.

The Current Drain Data for this circuit is not affected by changes in this issue.

D change. Does not require WECO notification to Tel Co.

Equipment information is affected and will be covered by drawing J29201AP.

Equipment Design Requirements are not affected.
CIRCUIT DESCRIPTION

PANEL SYSTEMS
OUTGOING TRUNK CIRCUIT
MF PULSING
TO NON-AMA CROSSBAR TANDEM
AND NO. 1 AND NO. 5 CROSSBAR LOCAL OFFICES

CHANGES

B. Changes in Apparatus

B.1 Removed

Resistor 619ω

Replaced By

Resistor 1100ω

D. Description of Changes

D.1 The SL1 resistance shown on issue 5B of this drawing is changed from 619ω to 1100ω. The previous resistance was hot to touch, and the new one, while cooler, does not degrade performance of the circuit.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 5643-EV-RM

Printed in U.S.A.
Panel Systems - Outgoing Trunk Circuit - M F Pulsing - To Non-AMA Crossbar Tandem - And No. 1 And No. 5 Crossbar Local Offices

DESCRIPTION

6.1 If trunk conditions are such as to cause the WX relay of this circuit to chatter prior to completion of district talking selection, this circuit may release and reseize forward, causing a stuck sender in the remote office. X wiring and apparatus are added on this issue to overcome this malfunction. Greater protection is also obtained in respect to the unguarded interval at the Panel office, when trunk is released before called party answered.

6.11 This change will require the addition of an AK 24 relay, a 600W resistor and an AC 33 relay to replace the present PW relay.

6.2 The Current Drain Data for this circuit is not affected by changes in this issue.

6.3 B change. Requires WECO notification to Tel Co.

6.4 Equipment information is affected and will be covered by drawing J29201AP-().

6.5 Equipment Design Requirements are not affected.

This change was not added to older Seattle circuits. A 400W diode across winding of (PW) relay accomplished same purpose. See Eng. Complaint 975PTW.
CIRCUIT DESCRIPTION

PANEL SYSTEMS
OUTGOING TRUNK CIRCUIT
MF PULSING
TO NON-AMA CROSSBAR TANDEM
AND NO. 1 AND NO. 5 CROSSBAR LOCAL OFFICES

CHANGES

B. Changes in Apparatus

B.1 Added

SL, SL1 - AK24 Relay
SL1 - Resistor KS-14603,L2

B.2 Removed Replaced By

PW-AF531 Relay PW-AG33 Relay

D. Description of Changes

D.1 FS 1 has been revised to show the addition of X wiring and apparatus. Wiring formerly not designated has been designated W option and rated Mfr Disc.

D.2 Y option is also rated Mfr Disc.

F. Changes in CD Section

F.1 In 1.01 add after first sentence: tip and ring continuity for the operation of WK relay is under the control of the SL relay. This relay is operated by the district sleeve ground.

F.2 In 4.01 add to paragraph: However tip and ring leads are held open until SL1 relay releases. SL1 relay in turn is held operated by slower releasing relays involved in the release of trunk.

F.3 Under Section III, 2.01 add:

<table>
<thead>
<tr>
<th>Relays</th>
<th>Designation</th>
<th>Meaning</th>
<th>Primary Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>SL</td>
<td>Sleeve</td>
<td>Close T&amp;R Lead</td>
<td></td>
</tr>
<tr>
<td>SL1</td>
<td>Sleeve Aux</td>
<td>Open T&amp;R Lead</td>
<td></td>
</tr>
</tbody>
</table>

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 5641-EV-RMW
TITLE

Panel Systems - Outgoing Trunk Circuit - MF Pulsing - To Non-AMA Crossbar Tandem - And No. 1 And No. 5 Crossbar Local Offices

DESCRIPTION

6.1 The change applied in Issue 3AR changed the locking circuit of the PZ relay which removes the necessity of the PW relay being slow release.

6.11 The slow release AG9 relay is replaced by an AF531 relay to provide a faster release relay to reduce the unguarded interval on disconnect from unanswered calls.

6.2 The Current Drain Data for this circuit is not affected by changes in this issue.

6.3 B change. Requires WECO notification to Tel Co.

6.4 Equipment information is affected and will be covered by drawing J29201AP.

6.5 Equipment Design Requirements are not affected.

No engineering letter will be issued.
TITLE
Panel Systems - OUTGOING TRUNK CIRCUIT - MF Pulsing - To Non-AMA Crossbar Tandem -
And No. 1 and No. 5 Crossbar Local Offices.

DESCRIPTION
6.1 This circuit is reissued to correct a trouble condition which occurred on high usage trunk groups when the circuit was immediately reseized after calling subscriber disconnect from a previous don't answer call. The PW relay which in slow release held upon the succeeding call changing the sequence of operation of the PW and PZ relays and preventing the proper transmission of the wink signal and trunk test condition. This resulted in stuck senders at the originating office.

6.11 A 400E diode is added in the locking circuit of the PW relay to reduce its release time.

6.12 A minor wiring change is made in the locking circuit of the PZ relay to prevent its release on a called subscribers flash.

6.2 The Current Data for this circuit is not affected by changes in this issue.

6.3 Equipment information is affected and will be covered by drawing J29201AP-( ).

6.4 Equipment Design Requirements are not affected.

No engineering letter will be issued.
OUTGOING TRUNK CIRCUIT
MF PULSING
TO NON-AMA CROSSBAR TANDEM
AND NO. 1 AND NO. 5 CROSSBAR LOCAL OFFICES

CHANGES

B. Changes in Apparatus

B.1 REMOVED

Relay PW, AG9, Z Option

REPLACED BY

Relay PW, AP531, Y Option

D. Description of Changes

D.1 Due to the change in the locking circuit of the PZ relay made on Issue 3AR, the PW relay is no longer required to be slow release. The slow release AG9 relay PW is designated Z option and is rated Mfr Disc. It is replaced by the Y option, AP531, relay which is faster release and reduces the unguarded interval on the sleeve lead of the trunk.
CIRCUIT DESCRIPTION

PANEL SYSTEMS
OUTGOING TRUNK CIRCUIT
MF PULSING
TO NON-AMA CROSSBAR TANDEM
AND NO. 1 AND NO. 5 CROSSBAR LOCAL OFFICES

CHANGES

B. Changes in Apparatus

B.1 ADDED
Diode RL, 400E

D. Description of Changes

D.1 This circuit is reissued to eliminate a trouble condition which caused originating senders to stick when the circuit was seized, immediately after calling subscriber disconnect from a previous no-answer call. This was due to the slow release PW relay holding operated from the previous call. To correct this condition, a diode is inserted in the locking path of the PW relay to reduce its release time. The locking circuit of the PZ relay is changed to connect directly to the sleeve instead of through make contact 6 of the PW relay.

F. Changes in CD Sections

F.1 In 2, Section II, add:

2.04 Diode

<table>
<thead>
<tr>
<th>Designation</th>
<th>Meaning</th>
<th>Primary Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>RL</td>
<td>Release</td>
<td>Prevents delay in release of PW relay.</td>
</tr>
</tbody>
</table>

F.2 Change 4, Section II, to read as follows:

4.01 When the called subscriber disconnects, relay WK releases. When the calling subscriber disconnects, ground is removed from the sleeve lead releasing the PZ relay and making the circuit available for other calls.

4.02 On calling subscriber disconnect from a no-answer call, ground is removed from the sleeve lead releasing the PW and PZ relays which were locked in parallel. The RL diode prevents the surge from the PZ relay from entering the PW relay winding and delaying its release.
TITLE
Panel Systems - OUTGOING TRUNK CIRCUIT - MF Pulsing - To Non-AMA Crossbar Tandem - And No. 1 and No. 5 Crossbar Local Offices

DESCRIPTION
6.1 Reissued sheets 1, 2, 3
Total reissued sheets 3

6.2 This circuit is reissued to standardize its use in completing local calls from a Panel Office on an MF basis to No. 1 or No. 5 Crossbar local office.

6.21 This requires only a change in circuit title.

The circuit title formerly read:
Panel Systems
Outgoing Trunk Circuit
For Direct Distance Dialing
For Non-AMA Offices

6.3 To insure toll grade transmission in this trunk, a limit is applied to the allowable unbalance between the capacitors in the tip and ring leads. This is covered by a circuit note which is added.

6.4 The Current Drain Data for this circuit is not affected by changes on this issue.

6.5 D change. Does not require WECo notification to Tel Co.

6.6 Equipment information will be covered by drawing J-29201AP.

6.7 Equipment Design Requirements are not affected.

No engineering letter will be issued.
CIRCUIT DESCRIPTION

PANEL SYSTEMS
OUTGOING TRUNK CIRCUIT
MF PULSING
TO NON-AMA CROSSBAR TANDEM
AND NO. 1 AND NO. 5 CROSSBAR LOCAL OFFICES

SECTION I - GENERAL DESCRIPTION

1. PURPOSE OF CIRCUIT

1.01 This circuit is intended for use in panel offices which are arranged to complete on a multifrequency basis either direct distance dialed calls through non-AMA crossbar tandem offices or local calls to No. 1 or No. 5 crossbar local offices. It provides trunk closure during district talking selections to hold the incoming trunk during these selections.

SECTION II - DETAILED DESCRIPTION

1. SEIZURE

1.01 When this circuit is seized by a district or office selector, battery and ground from the tandem or local office incoming trunk, through the windings of relay WK, is connected to the district or office selector circuit. Relay WK does not operate at this time because the incoming trunk is in the on-hook condition.

1.02 On seizure, the district or office selector also connects ground to lead 8 to make this circuit test busy to other hunting selectors.

2. WINK SIGNAL

2.01 When the incoming trunk goes to the off-hook condition at the start of the wink signal, relay WK operates, and in turn, operates relay PW. Relay PW locks to the sleeve. When the incoming trunk goes back to the on-hook condition at the end of the wink signal, relay WK releases and in turn, operates relay PZ. With relays PW and PZ both operated, inductor TC is bridged across the tip and ring to hold the incoming trunk during district talking selections.

3. CALLED SUBSCRIBER ANSWERS

3.01 When the called subscriber answers, the incoming trunk goes to an off-hook condition and operates relay WK. Relay WK operated, releases relay PW which in turn, opens the inductance bridge across the tip and ring.

4. DISCONNECT

4.01 When the called subscriber disconnects, relay WK releases which in turn, releases relay PZ restoring this circuit to normal. When the calling subscriber disconnects, ground is removed from the sleeve lead making the circuit available for other calls.

SECTION III - REFERENCE DATA

1. WORKING LIMITS

1.01 Combined originating and terminating circuits:

Maximum external circuit loop resistance 4,000 ohms
Minimum insulation resistance 30,000 ohms

1.02 Working voltage 45 to 50 volts

1.03 Earth potential ±20 volts

2. FUNCTIONAL DESIGNATIONS

2.01 Relay

Designation Meaning Primary Functions
WK Wink Registers on-hook or off-hook conditions of incoming trunk.
PW Pulse W Counts polarity reversals of incoming trunk.
PZ Pulse Z Counts polarity reversals of incoming trunk.

2.02 Inductor

Designation Meaning Primary Functions
TC Trunk Closure Applies bridge across incoming trunk during district talking selections.

2.03 Jack

Designation Meaning Primary Functions
TST Test Used to test relay WK.
FUNCTIONS

3.01 Recognizes on-hook and off-hook conditions presented by the tandem or local office incoming trunk.

3.02 Places an inductor across the tip and ring conductors to bridge an opening which occurs while district talking selections are being completed.

4. CONNECTING CIRCUITS

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

(a) District Selector Circuit - SD-21630-01.

(b) Office Selector Circuit - ES-240252.

(c) Tandem Office Incoming Trunk Circuit - SD-25887-01.

(d) OOT Test and MB Jack Circuit - SD-96376-01.

(e) No. 1 Crossbar Incoming Trunk Circuit - SD-26204-01.

(f) No. 5 Crossbar Incoming Trunk Circuit - SD-26070-01.

5. MANUFACTURING TESTING REQUIREMENTS

5.01 This circuit shall be capable of performing the functions outlined in this circuit description and shall meet the requirements listed in the Circuit Requirements tables.

5.02 The capacitance of capacitors T and R shall not differ by more than 0.11 µf.

SECTION IV - REASONS FOR REISSUE

A. Changed and Added Functions

A.1 The use of this circuit is expanded to include completion of local calls from a panel office to a crossbar No. 1 or 5 office on a multifrequency basis.

B. Changes in Apparatus

B.1 REPLACED REPLACED BY

T and R Capacitors, T and R Capacitors, 437A 437QA

D. Description of Changes

D.1 Prior to this issue the circuit title read as follows:

PANEL SYSTEMS
OUTGOING TRUNK CIRCUIT
FOR DIRECT DISTANCE DIALING
FOR NON-AMA OFFICES

D.2 The code of the T and R capacitors is changed without record to agree with WECs drawings.

D.3 Circuit Note 105 is added to limit the unbalance of the T and R capacitors to insure toll grade transmission in this trunk.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 2364-JLB-JEM
Panel Systems - Outgoing Trunk Circuit - For Direct Distance Dialing - To Non-AMA Offices

DESCRIPTION

6.1 This outgoing trunk circuit is intended for use in panel offices which are arranged to complete direct distance dialing calls through non-AMA crossbar tandem offices. It provides trunk closure during district talking selections to hold the incoming trunk during these selections.

6.11 This circuit consists of:
- 1 - AG Type Relay
- 1 - AF Type Relay
- 1 - 280 Type Relay
- 1 - 274 Type Inductor
- 1 - 290 Type Jack
- 2 - 4UF Capacitors

6.2 Current Drains will be available about 4-1-57.

6.3 Equipment information will be covered by J-29201AP.

6.4 Equipment Design Requirements are covered in BSP Section AA220.010 (J-29201), Iss. 12.

No engineering letter will be issued.
Panel Systems - Outgoing Trunk Circuit - For Direct Distance Dialing - To Non-AMA Offices

DESCRIPTION

6.1 This outgoing trunk circuit is intended for use in panel offices which are arranged to complete direct distance dialing calls through non-AMA crossbar tandem offices. It provides trunk closure during district talking selections to hold the incoming trunk during these selections.

6.11 This circuit consists of:

1 - AG Type Relay
1 - AF Type Relay
1 - 280 Type Relay
1 - 274 Type Inductor
1 - 290 Type Jack
2 - 4UF Capacitors

6.2 Current Drains will be available about 4-1-57.

6.3 Equipment information will be covered by J-29201AP.

6.4 Equipment Design Requirements are covered in BSP Section AA220.010 (J-29201), Iss. 12.

No engineering letter will be issued.
CIRCUIT DESCRIPTION
SWITCHING SYSTEMS DEVELOPMENT DEPARTMENT

PANEL SYSTEMS
OUTGOING TRUNK CIRCUIT
FOR DIRECT DISTANCE DIALING
TO NON-AMA OFFICES

SECTION I - GENERAL DESCRIPTION

This circuit is intended for use in panel offices which are arranged to complete direct distance dialing calls through non-AMA crossbar tandem offices. It provides trunk closure during district talking selections to hold the incoming trunk during these selections.

SECTION II - DETAILED DESCRIPTION

1. SEIZURE

1.1 When this circuit is seized by a district or office selector, battery and ground from the crossbar tandem trunk, through the windings of relay WK, is connected to the district or office selector circuit. Relay WK does not operate at this time because the tandem trunk is in the "on hook" condition.

1.2 On seizure, the district or office selector also connects ground to lead S to make this circuit test busy to other hunting selectors.

2. WINK SIGNAL

2.1 When the tandem trunk goes to the "off-hook" condition at the start of the wink signal, relay WK operates, and in turn operates relay PW. Relay PW locks to the sleeve. When the tandem trunk goes back to the "on-hook" condition at the end of the wink signal, relay WK releases and in turn operates relay PZ. With relays PW and PZ both operated, inductor TC is bridged across the tip and ring to hold the tandem trunk during district talking selections.

3. CALLED SUBSCRIBER ANSWERS

3.1 When the called subscriber answers, the tandem trunk goes to an "off-hook" condition and operates relay WK. Relay WK operated releases relay PW which in turn opens the inductance bridge across the tip and ring.

4. DISCONNECT

4.1 When the called subscriber disconnects, relay WK releases which in turn releases relay PZ restoring this circuit to normal. When the calling subscriber disconnects, ground is removed from the sleeve lead making the circuit available for other calls.

SECTION III - REFERENCE DATA

1. WORKING LIMITS

1.1 Combined originating and terminating circuits

Max. external circuit loop resistance 4,000 ohms
Min. insulation resistance 30,000 ohms

1.2 Working voltage 45-50 volts

1.3 Earth potential ± 20 volts

2. FUNCTIONAL DESIGNATIONS

<table>
<thead>
<tr>
<th>Relay</th>
<th>Meaning</th>
<th>Primary Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>WK</td>
<td>Wink</td>
<td>Registers &quot;on-hook&quot; or &quot;off-hook&quot; conditions of tandem trk.</td>
</tr>
<tr>
<td>PW</td>
<td>Pulse W</td>
<td>Counts polarity reversals of tandem trunk.</td>
</tr>
<tr>
<td>PZ</td>
<td>Pulse Z</td>
<td>Counts polarity reversals of tandem trunk.</td>
</tr>
<tr>
<td>Inductor</td>
<td>Trunk Closure</td>
<td>Applies bridge across tandem trunk during district talking selections.</td>
</tr>
<tr>
<td>TC</td>
<td>Test</td>
<td>Used to test relay WK.</td>
</tr>
<tr>
<td>Jack</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TST</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Printed in U.S.A.
3. FUNCTIONS

3.1 Recognizes "on-hook" and "off-hook" conditions presented by the crossbar tandem trunk.

3.2 Places an inductor across the tip and ring conductors to bridge an opening which occurs while district talking selections are being completed.

4. CONNECTING CIRCUITS

4.1 District Selector Circuit - SD-21630-01

4.2 Office Selector Circuit - ZS-240252

4.3 Incoming Trunk Circuit - SD-25887-01

4.4 OGT Test and MB Jack Circuit - SD-96376-01

5. MANUFACTURING TEST REQUIREMENTS

This circuit shall be capable of performing the functions outlined in this circuit description and shall meet the requirements listed in the Circuit Requirements tables.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT. 2314-NL-CGM-GM
AMERICAN TELEPHONE AND TELEGRAPH COMPANY

195 BROADWAY, NEW YORK, N.Y. 10007

DRAWING NOTICE

TITLE

Panel Systems - Outgoing Trunk Circuit - MF Pulsing - To Non-AMA Crossbar Tandem - And No. 1 And No. 5 Crossbar Local Offices

DESCRIPTION

6.1 The following changes is made to correct a drafting error on issue 5B. The WECO drawings are correct, so this is a "no record" change.

6.12 The R Lead from the OCT test board is removed from the 2 contact SL relay X option, and placed on the 2 make contact SL relay X option. This will agree with sketch shown in LDI 4A.

6.2 The Current Drain Data for this circuit is not affected by changes in this issue.

6.3 D change. Does not require WECO notification to Telco.

6.4 Equipment information is not affected.

6.5 Equipment Design Requirements are not affected.

Call from Petroski - WECO, 11-20-71

To prevent false die:

T option to #5YB or 8SS

V option to all other
CIRCUIT DESCRIPTION

PANEL SYSTEMS
OUTGOING TRUNK CIRCUIT
MF PULSING
TO NON-AMA CROSSBAR TANDEM
AND NO. 1 AND NO. 5 CROSSBAR LOCAL OFFICES

CHANGES

P. Description of Changes

D.1 The following change was made on a no-record basis to agree with WECo drawings. The R lead from the OUT board test and make-busy jack is removed from the 2-contact SL relay, option X, and placed on the 2-make contact SL relay, option X.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 5323-EV-MR

Printed in U.S.A.
TITLE
Panel Systems - Outgoing Trunk Circuit - MF Pulsing - To Non-AMA Crossbar Tandem -
And No. 1 And No. 5 Crossbar Local Offices

DESCRIPTION
6.1 This change provides wiring information in CAD figure 4 which was omitted on issue 5B of this drawing. This change applies to jobs having issue 5B or 6D.

6.2 The Current Drain Data for this circuit is not affected by changes in this issue.

6.3 This change does not affect the plug-in units and does not require the Telco to notify WECo as to number and location of products to be changed.

6.4 Equipment information is not affected.

6.5 Equipment Design Requirements are not affected.
CIRCUIT DESCRIPTION

PANEL SYSTEMS
OUTGOING TRUNK CIRCUIT
MF PULSING
TO NON-AMA CROSSBAR TANDEM
AND NO. 1 AND NO. 5 CROSSBAR LOCAL OFFICES

CHANGES

D. Description of Changes

D.1 CAD Fig. 4 is changed on circuit drawing to show fuse board ground and punching which was not required prior to Issue 5B.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 5643-EV-MR

Printed in U.S.A.
Panel Systems - Outgoing Trunk Circuit - MF Pulsing - To Non-Ama Crossbar Tandem - And No. 1 And No. 5 Crossbar Local Offices

DESCRIPTION

6.1 The "SLL" resistor is changed on this issue from 619W to 1100W. When trk is held off normal for long periods of time, the new resistor will be cooler to the touch than the former. Neither resistance is subject to excessive heating from a circuit or fire hazard standpoint. No change in circuit operation is occasioned by this substitution. This change is on a no record basis by agreement between Mr. G. Schmalz for WECo and Mr. E. Vanderveer for BTL.

6.2 The Current Drain Data for this circuit is not affected by changes in this issue.

6.3 D change. Does not require WECo notification to Tel Co.

6.4 Equipment information is affected and will be covered by drawing J29201AP.

6.5 Equipment Design Requirements are not affected.
CIRCUIT DESCRIPTION

PANEL SYSTEMS
OUTGOING TRUNK CIRCUIT
MF PULSING
TO NON-AMA CROSSBAR TANDEM
AND NO. 1 AND NO. 5 CROSSBAR LOCAL OFFICES

CHANGES

B. Changes in Apparatus

B.1 Removed              Replaced By
   Resistor 619ω          Resistor 1100ω

D. Description of Changes

D.1 The S1t resistance shown on issue 5B of this drawing is changed from 619ω to 1100ω. The previous resistance was hot to touch, and the new one, while cooler, does not degrade performance of the circuit.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 5643-EV-RM

Printed in U.S.A.
Panel Systems - Outgoing Trunk Circuit - M F Pulsing - To Non-AMA Crossbar
Tandem - And No. 1 And No. 5 Crossbar Local Offices

DESCRIPTION

6.1 If trunk conditions are such as to cause the WK relay of this circuit
to chatter prior to completion of district talking selection, this
circuit may release and reseize forward, causing a stuck sender in the re-
ome office. X wiring and apparatus are added on this issue to overcome
this malfunction. Greater protection is also obtained in respect to the
unguarded interval at the Panel office, when trunk is released before
called party answered.

6.11 This change will require the addition of an AK 24 relay, 600W resistor
and an AG 33 relay to replace the present PW relay.

6.2 The Current Drain Data for this circuit is not affected by changes in
this issue.

6.3 B change. Requires WECo notification to Tel Co.

6.4 Equipment information is affected and will be covered by drawing
J29201AP-().

6.5 Equipment Design Requirements are not affected.
CIRCUIT DESCRIPTION

CD-20746-01
ISSUE 2D
APPENDIX 3B
DWG ISSUE 5B

PANEL SYSTEMS
OUTGOING TRUNK CIRCUIT
MF PULSING
TO NON-AMA CROSSBAR TANDEM
AND NO. 1 AND NO. 5 CROSSBAR LOCAL OFFICES

CHANGES

B. Changes in Apparatus

B.1 Added

SL, SL1 - AK24 Relay
SL1 - Resistor KS-14603,L2

B.2 Removed

FW-AF531 Relay

B.2 Replaced By

FW-AG33 Relay

D. Description of Changes

D.1 FS 1 has been revised to show the addition of X wiring and apparatus. Wiring formerly not designated has been designated W option and rated Mfr Disc.

D.2 Y option is also rated Mfr Disc.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 5641-EV-RMW

F. Changes in CD Section

F.1 In 1.01 add after first sentence: tip and ring continuity for the operation of WK relay is under the control of the SL relay. This relay is operated by the district sleeve ground.

F.2 In 4.01 add to paragraph: However tip and ring leads are held open until SL1 relay releases. SL1 relay in turn is held operated by slower releasing relays involved in the release of trunk.

F.3 Under Section III, 2.01 add:

<table>
<thead>
<tr>
<th>Relays</th>
<th>Designation</th>
<th>Meaning</th>
<th>Primary Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>SL</td>
<td>Sleeve</td>
<td>Close Ti’ Lead</td>
<td></td>
</tr>
<tr>
<td>SL1</td>
<td>Sleeve Aux</td>
<td>Open T&amp;R&amp;S Lead</td>
<td></td>
</tr>
</tbody>
</table>
Panel Systems - Outgoing Trunk Circuit - MF Pulsing - To Non-AMA Crossbar Tandem - And No. 1 And No. 5 Crossbar Local Offices

DESCRIPTION

6.1 The change applied in Issue 3AR changed the locking circuit of the PZ relay which removes the necessity of the PW relay being slow release.

6.11 The slow release AG9 relay is replaced by an AF531 relay to provide a faster release relay to reduce the unguarded interval on disconnect from unanswered calls.

6.2 The Current Drain Data for this circuit is not affected by changes in this issue.

6.3 B change. Requires WECo notification to Tel Co.

6.4 Equipment information is affected and will be covered by drawing J29201AP.

6.5 Equipment Design Requirements are not affected.

No engineering letter will be issued.
TITLE
Panel Systems - OUTGOING TRUNK CIRCUIT - MF Pulsing - To Non-AMA Crossbar Tandem - And No. 1 and No. 5 Crossbar Local Offices.

DESCRIPTION
6.1 This circuit is reissued to correct a trouble condition which occurred on high usage trunk groups when the circuit was immediately reallocated after calling subscriber disconnect from a previous don't answer call. The PW relay which in slow release held upon the succeeding call changing the sequence of operation of the PW and PZ relays and preventing the proper transmission of the wink signal and trunk test condition. This resulted in stuck senders at the originating office.

6.11 A 400E diode is added in the locking circuit of the PW relay to reduce its release time.

6.12 A minor wiring change is made in the locking circuit of the PZ relay to prevent its release on a called subscriber's flash.

6.2 The Current Data for this circuit is not affected by changes in this issue.

6.3 Equipment information is affected and will be covered by drawing J29201AP-( )

6.4 Equipment Design Requirements are not affected.

No engineering letter will be issued.
Panel Systems
Outgoing Trunk Circuit
MF Pulsing
To Non-AMA Crossbar Tandem
and No. 1 and No. 5 Crossbar Local Offices

Changes

B. Changes in Apparatus

B.1 Removed

Relay PW, A09, Z Option

Replaced By

Relay PW, AF531, Y Option

D. Description of Changes

D.1 Due to the change in the locking circuit of the PZ relay made on Issue 3AR, the PW relay is no longer required to be slow release. The slow release A09 relay PW is designated Z option and is rated Mfr Disc. It is replaced by the Y option, AF531, relay which is faster release and reduces the unguarded interval on the sleeve lead of the trunk.
CIRCUIT DESCRIPTION

PANEL SYSTEMS
OUTGOING TRUNK CIRCUIT
MF PULSING
TO NON-AMA CROSSBAR TANDEM
AND NO. 1 AND NO. 5 CROSSBAR LOCAL OFFICES

CHANGES

B. Changes in Apparatus

B.1 ADDED

Diode RL, 400E

D. Description of Changes

D.1 This circuit is reissued to eliminate a trouble condition which caused originating senders to stick when the circuit was seized, immediately after calling subscriber disconnect from a pervious no-answer call. This was due to the slow release PW relay holding operated from the previous call. To correct this condition, a diode is inserted in the locking path of the PW relay to reduce its release time. The locking circuit of the PZ relay is changed to connect directly to the sleeve instead of through make contact 6 of the PW relay.

F. Changes in CD Sections

F.1 In 2, Section II, add:

2.04 Diode

<table>
<thead>
<tr>
<th>Designation</th>
<th>Meaning</th>
<th>Primary Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>RL</td>
<td>Release</td>
<td>Prevents delay in release of PW relay.</td>
</tr>
</tbody>
</table>

F.2 Change 4, Section II, to read as follows:

4.01 When the called subscriber disconnects, relay WK releases. When the calling subscriber disconnects, ground is removed from the sleeve lead releasing the PZ relay and making the circuit available for other calls.

4.02 On calling subscriber disconnect from a no-answer call, ground is removed from the sleeve lead releasing the PW and PZ relays which were locked in parallel. The RL diode prevents the surge from the PZ relay from entering the PW relay winding and delaying its release.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 2364-WMS-JEM
TITLE
Panel Systems - OUTGOING TRUNK CIRCUIT - MF Pulsing - To Non-AMA Crossbar Tandem - And No. 1 and No. 5 Crossbar Local Offices

DESCRIPTION
6.1 Reissued sheets 1, 2, 3
Total reissued sheets 3

6.2 This circuit is reissued to standardize its use in completing local calls from a Panel Office on an MF basis to No. 1 or No. 5 Crossbar local office.

6.21 This requires only a change in circuit title.
The circuit title formerly read:

Panel Systems
Outgoing Trunk Circuit
For Direct Distance Dialing
For Non-AMA Offices

6.3 To insure toll grade transmission in this trunk, a limit is applied to the allowable unbalance between the capacitors in the tip and ring leads. This is covered by a circuit note which is added.

6.4 The Current Drain Data for this circuit is not affected by changes on this issue.

6.5 D change - Does not require WECO notification to Tel Co.

6.6 Equipment information will be covered by drawing J-29201AP.

6.7 Equipment Design Requirements are not affected.

No engineering letter will be issued.
SECTION I - GENERAL DESCRIPTION

1. PURPOSE OF CIRCUIT
1.01 This circuit is intended for use in panel offices which are arranged to complete on a multifrequency basis either direct distance dialed calls through non-AMA crossbar tandem offices or local calls to No. 1 or No. 5 crossbar local offices. It provides trunk closing during district talking selections to hold the incoming trunk during these selections.

SECTION II - DETAILED DESCRIPTION

1. SEIZURE
1.01 When this circuit is seized by a district or office selector, battery and ground from the tandem or local office incoming trunk, through the windings of relay WK, is connected to the district or office selector circuit. Relay WK does not operate at this time because the incoming trunk is in the on-hook condition.

1.02 On seizure, the district or office selector also connects ground to lead S to make this circuit test busy to other hunting selectors.

2. WINK SIGNAL
2.01 When the incoming trunk goes to the off-hook condition at the start of the wink signal, relay WK operates, and in turn, operates relay FW. Relay FW locks to the sleeve. When the incoming trunk goes back to the on-hook condition at the end of the wink signal, relay WK releases and in turn, operates relay PZ. With relays FW and PZ both operated, inductor TC is bridged across the tip and ring to hold the incoming trunk during district talking selections.

3. CALLED SUBSCRIBER ANSWERS
3.01 When the called subscriber answers, the incoming trunk goes to an off-hook condition and operates relay WK. Relay WK operated, releases relay FW which in turn, opens the inductance bridge across the tip and ring.

4. DISCONNECT
4.01 When the called subscriber disconnects, relay WK releases which in turn, releases relay PZ restoring this circuit to normal. When the calling subscriber disconnects, ground is removed from the sleeve lead making the circuit available for other calls.

SECTION III - REFERENCE DATA

1. WORKING LIMITS
1.01 Combined originating and terminating circuits:
- Maximum external circuit loop resistance: 4,000 ohms
- Minimum insulation resistance: 30,000 ohms
- Working voltage: 45 to 50 volts
- Earth potential: ±20 volts

2. FUNCTIONAL DESIGNATIONS

2.01 Relay

<table>
<thead>
<tr>
<th>Designation</th>
<th>Meaning</th>
<th>Primary Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>WK</td>
<td>Wink</td>
<td>Registers on-hook or off-hook conditions of incoming trunk.</td>
</tr>
<tr>
<td>FW</td>
<td>Pulse W</td>
<td>Counts polarity reversals of incoming trunk.</td>
</tr>
<tr>
<td>PZ</td>
<td>Pulse Z</td>
<td>Counts polarity reversals of incoming trunk.</td>
</tr>
</tbody>
</table>

2.02 Inductor

<table>
<thead>
<tr>
<th>Designation</th>
<th>Meaning</th>
<th>Primary Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>TO</td>
<td>Trunk Closure</td>
<td>Applies bridge across incoming trunk during district talking selections.</td>
</tr>
</tbody>
</table>

2.03 Jack

<table>
<thead>
<tr>
<th>Designation</th>
<th>Meaning</th>
<th>Primary Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEST</td>
<td>Test</td>
<td>Used to test relay WK.</td>
</tr>
</tbody>
</table>
3. FUNCTIONS

3.01 Recognizes on-hook and off-hook conditions presented by the tandem or local office incoming trunk.

3.02 Places an inductor across the tip and ring conductors to bridge an opening which occurs while district talking selections are being completed.

CONNECTING CIRCUITS

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

(a) District Selector Circuit - SD-21630-01.
(b) Office Selector Circuit - ES-240252.
(c) Tandem Office Incoming Trunk Circuit - SD-25887-01.
(d) OGT Test and MB Jack Circuit - SD-96376-01.
(e) No. 1 Crossbar Incoming Trunk Circuit - SD-26204-01.
(f) No. 5 Crossbar Incoming Trunk Circuit - SD-26070-01.

MANUFACTURING TESTING REQUIREMENTS

5.01 This circuit shall be capable of performing the functions outlined in this circuit description and shall meet the requirements listed in the Circuit Requirements tables.

5.02 The capacitance of capacitors T and R shall not differ by more than 0.11 μF.

SECTION IV - REASONS FOR REISSUE

A. Changed and Added Functions

A.1 The use of this circuit is expanded to include completion of local calls from a panel office to a crossbar No. 1 or 5 office on a multifrequency basis.

B. Changes in Apparatus

B.1 REPLACED BY

T and R Capacitors, T and R Capacitors, 437A

D. Description of Changes

D.1 Prior to this issue the circuit title read as follows:

PANEL SYSTEMS
OUTGOING TRUNK CIRCUIT
FOR DIRECT DISTANCE DIALING
FOR NON-AMA OFFICES

D.2 The code of the T and R capacitors is changed without record to agree with WECo drawings.

D.3 Circuit Note 105 is added to limit the unbalance of the T and R capacitors to insure toll grade transmission in this trunk.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 2364-JLB-JEM
Title
Panel Systems - Outgoing Trunk Circuit - For Direct Distance Dialing - To Non-AMA Offices

Description
6.1 This outgoing trunk circuit is intended for use in panel offices which are arranged to complete direct distance dialing calls through non-AMA crossbar tandem offices. It provides trunk closure during district talking selections to hold the incoming trunk during these selections.

6.11 This circuit consists of:
1 - AG Type Relay
1 - AF Type Relay
1 - 280 Type Relay
1 - 274 Type Inductor
1 - 290 Type Jack
2 - 4UF Capacitors

6.2 Current Drains will be available about 4-1-57.

6.3 Equipment information will be covered by J-29201AP.

6.4 Equipment Design Requirements are covered in BSP Section AA220.010 (J-29201), Iss. 12.

No engineering letter will be issued.
SECTION I - GENERAL DESCRIPTION

This circuit is intended for use in panel offices which are arranged to complete direct distance dialing calls through non-AMA crossbar tandem offices. It provides trunk closure during district talking selections to hold the incoming trunk during these selections.

SECTION II - DETAILED DESCRIPTION

1. SEIZURE

1.1 When this circuit is seized by a district or office selector, battery and ground from the crossbar tandem trunk, through the windings of relay WK, is connected to the district or office selector circuit. Relay WK does not operate at this time because the tandem trunk is in the "on hook" condition.

1.2 On seizure, the district or office selector also connects ground to lead S to make this circuit test busy to other hunting selectors.

2. WINK SIGNAL

2.1 When the tandem trunk goes to the "off-hook" condition at the start of the wink signal, relay WK operates, and in turn operates relay PW. Relay PW locks to the sleeve. When the tandem trunk goes back to the "on-hook" condition at the end of the wink signal, relay WK releases and in turn operates relay PZ. With relays PW and PZ both operated, inductor TC is bridged across the tip and ring to hold the tandem trunk during district talking selections.

3. CALLED SUBSCRIBER ANSWERS

3.1 When the called subscriber answers, the tandem trunk goes to an "off-hook" condition and operates relay WK. Relay WK operated releases relay PW which in turn opens the inductance bridge across the tip and ring.

4. DISCONNECT

4.1 When the called subscriber disconnects, relay WK releases which in turn releases relay PZ restoring this circuit to normal. When the calling subscriber disconnects, ground is removed from the sleeve lead making the circuit available for other calls.

SECTION III - REFERENCE DATA

1. WORKING LIMITS

1.1 Combined originating and terminating circuits

Max. external circuit loop resistance 4,000 ohms

Min. insulation resistance 30,000 ohms

1.2 Working voltage 45-50 volts

1.3 Earth potential ± 20 volts

2. FUNCTIONAL DESIGNATIONS

<table>
<thead>
<tr>
<th>Relay</th>
<th>Meaning</th>
<th>Primary Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>WK</td>
<td>Wink</td>
<td>Registers &quot;on-hook&quot; or &quot;off-hook&quot; conditions of tandem trk.</td>
</tr>
<tr>
<td>PW</td>
<td>Pulse W</td>
<td>Counts polarity reversals of tandem trunk.</td>
</tr>
<tr>
<td>PZ</td>
<td>Pulse Z</td>
<td>Counts polarity reversals of tandem trunk.</td>
</tr>
<tr>
<td>Inductor</td>
<td>Trunk Closure</td>
<td>Applies bridge across tandem trunk during district talking selections.</td>
</tr>
<tr>
<td>TC</td>
<td>Trunk Closure</td>
<td>Used to test relay WK.</td>
</tr>
<tr>
<td>Jack</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TST</td>
<td>Test</td>
<td></td>
</tr>
</tbody>
</table>

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3. FUNCTIONS

3.1 Recognizes "on-hook" and "off-hook" conditions presented by the crossbar tandem trunk.

3.2 Places an inductor across the tip and ring conductors to bridge an opening which occurs while district talking selections are being completed.

4. CONNECTING CIRCUITS

4.1 District Selector Circuit - SD-21630-01

4.2 Office Selector Circuit - BS-240252

4.3 Incoming Trunk Circuit - SD-25887-01

4.4 OGT Test and MB Jack Circuit - SD-96376-01

5. MANUFACTURING TEST REQUIREMENTS

This circuit shall be capable of performing the functions outlined in this circuit description and shall meet the requirements listed in the Circuit Requirements tables.
PANEL SYSTEMS
OUTGOING TRUNK CIRCUIT
MF PULSING
TO NON-AMA CROSSBAR TANDEM,
NO. 1 AND NO. 5 CROSSBAR LOCAL OFFICES
AND NO. 1 ESS OFFICES

CHANGES

B. Changes in Apparatus (Components)

B.1 Added
Diode SL, Option M, Code 446F

D. Description of Changes

D.1 Option K is added to provide a make-busy arrangement which eliminates the need to monitor trunks, wired per option T, during the make-busy procedure.

D.2 Option M is added to reduce the unguarded sleeve interval between overlapping calls.

F. Changes in Description of Operation

F.1 Changes in description, required by addition of options K and M, are shown in Issue 3AC.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 5223-JPT-MR
CIRCUIT DESCRIPTION

SECTION I - GENERAL DESCRIPTION

1. PURPOSE OF CIRCUIT

1.01 This circuit is intended for use in panel offices which are arranged to complete on a multifrequency basis direct distance dialed calls through non-AMA crossbar tandem offices, local calls to ESS No. 1 offices, or local calls to No. 1 or No. 5 crossbar local offices. It provides trunk closure during district talking selections to hold the incoming trunk during these selections.

SECTION II - DETAILED DESCRIPTION

1. SEIZURE

1.01 When this circuit is seized by a district or office selector, battery and ground from the tandem or local office incoming trunk, through the windings of relay WK, are connected to the district or office selector circuit. Tip and ring continuity for the operation of WK relay is under the control of the SL relay. This relay is operated by the district sleeve ground.

1.02 On seizure, the district or office selector also connects ground to lead S to make this circuit test busy to other hunting selectors.

2. WINK SIGNAL

2.01 When the incoming trunk goes to the off-hook condition at the start of the wink signal, relay WK operates, and in turn, operates relay PW. Relay PW locks to the sleeve. When the incoming trunk goes back to the on-hook condition at the end of the wink signal, relay WK releases, and, in turn, operates relay PZ. With relays PW and PZ both operated, inductor TC is bridged across the tip and ring to hold the incoming trunk during district talking selections.

3. CALLED SUBSCRIBER ANSWERS

3.01 If option T or V is wired, when the called subscriber answers and the incoming trunk goes to an off-hook condition, relay WK operates. If option T is wired, the answer reversal permits WK to operate when the district selector closes its CS relay bridge after talk selection. The operated WK relay releases relay PW, which in turn opens the inductance bridge across the tip and ring. Option R (resistor TC) is required when option T is wired. Resistor TC increases the impedance of the TC bridge to provide sufficient current for WK operation.

4. DISCONNECT

4.01 When the called subscriber disconnects, relay WK releases. When the calling subscriber disconnects, ground is removed from the sleeve lead, releasing the PW relay and making the circuit available for other calls. However, tip and ring leads are held open until relay SL1 releases.

4.02 On calling subscriber disconnect from a no-answer call, ground is removed from the sleeve lead, releasing the PW and PZ relays which were locked in parallel. The RL diode (option W) prevents the surge from the PZ relay from entering the PW relay winding and delaying its release.

4.03 Option M reduces the unguarded sleeve interval between overlapping calls. Option M changes the shunt ground on relay SL1 from 4M of SL to the district sleeve. Thus, SL1 operates when district release removes ground from the sleeve, eliminating the release time of relay SL. Diode SL of option M prevents an increase in release time of SL and prevents SL lockup over the X option make-busy lead.

SECTION III - REFERENCE DATA

1. WORKING LIMITS

1.01 Combined originating and terminating circuits:

  (a) Maximum external circuit loop resistance: 4,000 ohms.

  (b) Minimum insulation resistance: 30,000 ohms.

1.02 Working voltage: 45 to 50 volts.
D. Description of Changes

D.1 Options T and V are added to permit insertion of the TC transformer bridge in the outgoing or incoming side of the T and R capacitors. Option T avoids false disconnects on calls to ESS No. 1 or No. 5 crossbar offices in which the answer reversal is received before the district selector closes its CS relay bridge after talk selection.

D.2 Resistor TC (option R) is added to increase the current over the district loop for operation of relay CS in the district circuit.

D.3 Option S is added to indicate the connecting wiring to transformer TC prior to Issue 9AC.

D.4 The title of the circuit is expanded to include connection to ESS No. 1 offices.

D.5 Paragraphs 4.03 and 6.02 are added to describe changes of Appendix 1B, Drawing Issue 10B.