

755-A DIAL P. B. X.

TOP LINE CIRCUIT CODE



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P. T. S. # 535

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INTRODUCTION

The 755-A P.B.X. is a small dial telephone system employing crossbar switches and U and Y type relays. It provides dial intercommunicating service and outside trunk service without an attendant. It is designed to serve small business houses and large residences, and replaces the 750-A P.B.X. The capacity of the 755-A P.B.X. is 20 station lines, 4 trunks, and 3 intercommunicating links.

The principal features of the equipment are summarized as follows:

- (a) Dial intercommunicating service.
- (b) A crossbar switch is used as a switching device, which eliminates all moving parts.
- (c) All incoming central office calls can be answered and transferred at any key station.
- (d) Key stations may or may not, as desired, be arranged for outgoing central office calls.
- (e) Provision of a combined dial hand telephone set with the necessary key buttons mounted in the base for establishing local and trunk service.
- (f) A control key arrangement is available for use at key stations to provide means for connecting keyless type stations to central office trunks without limiting the use of the key station.
- (g) One or more key stations may be connected as extensions of a main key station.
- (h) Arrangements are provided to permit line hunting on certain lines when required.
- (i) Local conference connections may be established by dialing.
- (j) Trunk lamps may be provided at the stations and are arranged to flash to indicate unanswered calls and to light steadily when their associated trunks are busy.
- (k) Lamp signals similar to those used for trunks may be provided for local lines.
- (l) Tie trunk service to other P.B.X.'s.
- (m) One station may pick up calls directed to another station by means of a special key.
- (n) Outgoing service on wiring plan trunks.
- (o) Trunk service to a disassociated telephone.

The following circuit code covers the main functions of the 755-A P.B.X. and does not take into consideration all the special features which may be used. Information on any item which is not covered in this book should be obtained from S.D. and C.D. sheets.

OUTWARD CALL TO CENTRAL OFFICE
FROM L.O. SERVICE LINE

Lift handset	Connect handset contacts + L
+ L	Locks (to BT lead)
+ Trunk key	+ T (CS & LO leads tied)
	+ Ll
+ Ll	+ N
	+ E (thru normal lower Ll's and IK's)
	Opens locking path higher Ll's
+ E	Locks E
	+ E1 & E2
	Locks Ll
+ N	+ M (slow operate; does not operate on normal call)
+ E1 & E2	+ MS (slow operate)
	- All Ll and IK operating paths
	(prevents any other call from proceeding at this time)
	- E operating path
+ MS	Locks MS to + N momentarily
	- M (if operated)
	+ Select magnet (S-0, S-1, S-2, or S-3, depending upon key which is operated)
	Holds E1 & E2
	- N (slow release)

EMERGENCY FEATURE

Functions if MS relay above fails to operate within required time.

+ N	+ M (slow operate)
+ M	Locks M
	- N (slow release)
- N	+ Select magnet (S-0, S-1, S-2 or S-3)

Double connections are possible if E1 and E2 relays do not operate and emergency feature functions to operate select magnet.

+ Select magnet	+ S (slow operate)
	+ S1 (slow operate)
	Moves finger into trap

S & S1 are slow operate to insure complete operation of select magnet and that the select fingers have stopped vibrating.

+ S or S1	Locks MS Locks E + CO / parallel holding path to sel. mag. (S-0)
+ CO	+ Hold magnet (station #20) - Ll (shunted) Holds T
+ Hold magnet	- L / cross points / T & R to trunk + B (trunk circuit) Locks CO / ground to CO lead (busy ground to incoming local calls)
- L	- T (trunk circuit)
- T	- Select magnet
- Select magnet	- S - S1
- S & S1	- E - MS
- MS	- E1 & E2
- E1 & E2	Allows next call to proceed
+ B	+ CT - CC (increases charging rate) Opens ringing bridge + Trunk lamp (when provided)
/ T & R to trunk	/ subscriber's short to central office + H1 which has no function at this time

Call completed to central office

Connect CS-LO for lockout service
Connect CS-NL for non-lockout service
Connect CS-RS for restricted service

L.O. SERVICE LINE ATTEMPTING TO
MAKE AN OUTGOING CALL ON A BUSY TRUNK

+ handset	+ L
+ L	+ BY (L1 does not operate due to 2500 ^W winding of BY)

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+ BY	+ T1
	- Shunt from 97A (A) repeating coil
+ T1	+ T
	+ A
+ A	+ B
+ B	+ D
+ D	- A
- A	- B
- B	- D
- D	+ A and cycle repeats
+ B	Busy tone to calling station through 97A repeating coil

N.L. SERVICE LINE ATTEMPTING TO
MAKE AN OUTGOING CALL ON A BUSY TRUNK

Circuit action will be the same as described for an L.O. station with the exception that the following circuit action is necessary to operate the T relay in trunk circuit.

+ Trunk key	+ T (NL & CS leads tied)
	+ L1

Circuit action from this point on will be the same as station to trunk call.

RESTRICTED SERVICE LINE ATTEMPTING TO MAKE A TRUNK CALL

+ handset	+ L
+ L	+ BY (L1 does not operate due to 2500W winding of BY) (CS & RS leads tied)
+ BY	+ T1
+ T1	+ T
	+ A
+ A	+ B
+ B	+ D
+ D	- A

- A
- B
- D
- ± B
- B
- D
- + A and cycle repeats
- ± Busy tone to calling station

TRUNK CIRCUIT - INCOMING CALL

Central office generator to tip and ring of central office trunk

- + R
- + Ringer B (if provided)

(- Central office generator - R)

- ± R
- + R1
- ± IK (timing circuit)
- Locks R1
- + CT - CC (increases charging rate)
- + A (timing circuit)
- + R (timing circuit) (no function on trunk call)
- ± IK
- ± local generator to common bells and buzzers
- + A
- + B (slow operate) + D - A - B - D + A
- ± B
- Flashes trunk lamp (if provided)

ANSWERING TRUNK CALL WITH RESTRICTED SERVICE LINE

- Lift handset
- + L
- Locks L (to BT lead ground)
- + L
- + Trunk key
- + T (over CS-RS lead)
- + L1
- + N (emergency feature)
- + E
- Opens locking path of higher L1's
- + N
- + M (slow operate)
- + E
- Locks E
- + E1 & E2
- Locks L1
- + E1 & E2
- + MS (slow operate)
- All L1 and IK operating paths (prevents any other call from proceeding at this time)

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+ MS	Locks to + N (momentarily) - M (if operated) - N (slow release) + Select magnet (S-0, S-1, S-2, or S-3) Holds E1 & E2
+ Select magnet	+ S (slow operate) + S1 (slow operate) Moves finger into trap
+ S or S1	Locks MS Locks E (under control of S) + CO (thru operated L1)
+ CO	+ Hold magnet (Station #?) - L1 (shunted) Holds T
+ Hold magnet	- L / Cross points / T & R to trunk + B (trunk circuit) Locks CO / Ground CO lead
- L	- T (trunk circuit)
- T	- Select magnet
- Select magnet	- S - S1
- S & S1	- E - MS
- MS	- E1 & E2
- E1 & E2	Allows next call to proceed
+ B	/ Ground CT lead (to hold CT operated) - Ringing bridge - R (if operated) - R1 Light trunk lamp steady (if provided)
- R	- LK (timing circuit)
- R1	- R (if operated) (timing circuit) - Common or individual bells or buzzers
/ T & R short	Trips central office ring
Central office / talk battery and ground	+ H1

HOLDING TRUNK CALL

+ H key

+ H relay
- Trunk key

+ H

Locks H
+ H2
Secondary winding H2 to central office T & R
as holding short
Opens tip to station

+ H2

Holding path for H1
Ground to CT lead to hold CT rel. oper.
Battery to trunk lamp

- Trunk key

- CO relay

- CO

- HM - cross points

- Cross points

- B

- B

- H
Locks H2RESEIZURE OF TRUNK

Lift handset

Connects handset contacts

+ handset

+ L

+ L

L locks

+ Trunk key

+ L1
+ T

+ L1

+ N
+ E
Opens locking path to higher L1 relays

+ E

Locks E
+ E1 & E2
L1 locks

+ E1 & E2

+ MS
- All LK, L1 and E operating paths (prevents
any other call from proceeding at this time)

+ MS

MS locks to N ground
- N (slow release)
+ Select magnet (S-0, S-1, S-2, or S-3)
Holds E1 & E2

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+ Select magnet	+ S and S1 Moves finger into trap
+ S & S1	Locks MS Locks E + CO
+ CO	+ HM - L1 (shunted) Holds T
+ HM	Connects cross points Connects busy ground to CO lead - L
+ Cross points	Connects T and R to trunk + B Locks CO
+ B	- H2 Transfers busy lamp Holds CT
- H2	- Holding short
- L	- T
- T	- Select magnet
- Select magnet	- S and S1
- S and S1	- E - MS
- MS	- E1 & E2
- E1 & E2	Allows next call to proceed
<u>DISCONNECTION</u>	
- Handset	- CO - H1
- CO	- HM
- HM	- Cross points
- Cross points	- B
- B	- Busy lamp - CT
- CT	+ CC if battery is fully charged

STATION TO STATION CALL

(Sta. #20 to Sta. #37)

Lift handset	Connects handset contacts + L
+ L key	+ ST (in link 1, 2 or 3, depending upon the condition of link allotter circuit)
	+ Ll
+ ST	+ T (interrupts to supply dial tone)
+ Ll	+ N
	+ E (thru normal LK1, LK2, LK3)
	opens locking path of higher Ll's
+ E	Locks E
	Locks Ll
	+ E1 (thru operated Ll) blocks start of next call
	+ E2
	Holds ST
+ E1	+ MS
+ E2	- All Ll operating paths (prevents any other call from proceeding at this time)
+ MS	Locks (to N ground)
	Holds E1 & E2
	+ Select magnet (S-5, S-7 or S-9, depending upon which ST is operated)
	- N (slow release)
+ Select magnet	+ S (slow operate)
	+ S1 (slow operate)
	Moves finger into trap
+ S	Locks MS
+ S1	Locks E
	+ CO (thru operated Ll)
	Holds sel. mag.
+ CO	+ Hold magnet (station #20)
	- Ll (shunted) .
	Holds ST
+ Hold magnet	- L
	(busies line to incoming local calls over CO lead)
	Connects cross points to link

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+ Cross points	/ T & R to link Locks CO Locks ST (under control of T2)
/ T & R thru cross point	+ A (from calling station short) / dial tone
+ A	+ B (link circuit)
+ B	Locks B - Select magnet - CH1, CH2, or CH3 + CT - CC (increase charging rate)
- CH1, CH2 or CH3	Transfers start lead to next link
- Select magnet	- S - S1
- S	- E
- S1	- MS
- MS	- E1 - E2
- E1	Allows next call to proceed
- E2	

PRELIMINARY PULSE

In case of a momentary opening of the line before the first digit is dialed.

- A	+ P1 + C Shunt P2
+ P1	+ SW
+ SW	Locks
+ A	+ P2 (shunt released) + P1 locks C holds on slow release
- C	- SW circuit is again normal - P1 - P2

DIALING (NUMBER 37)

Move dial off normal

Break of first pulse

+ P1

+ SW

Make of first pulse

Break of second pulse

+ P3

- P1

+ T2

- ST

Make of second pulse

- P3

Break of third pulse

+ P1

+ T3

Make of third pulse

- C

- SW

FIRST DIGITOpens receiver circuit
Shorts transmitter circuit- A + P1
+ C (slow release; does not release during
dial pulses)
Shunt P2

+ SW

Locks

+ A + P2 (shunt released)
P1 locks
C relay holds (slow release)- A + P3
P2 locks- P1
C locks

+ T2

T2 locks
- ST- T (tone circuit)
Transfers A relay ground from repeating coil to
solid ground - dial tone+ A - P3
- P2

C holds (slow release)

- A + P1
C holds
Shunt P2

+ T3

T3 locks

+ A + P2 (remove shunt)
P1 locks
- C (last pulse of digit after time interval)- SW
- P2
- P1

Transfers pulse leads to units register relays

FOUR OR MORE PULSES FOR FIRST DIGIT

Make of third pulse + A + P2 (shunt removed)
 P1 locks
 C holds (slow release)

Break of fourth pulse - A + P3
 P2 locks

+ P3 - P1
 C locks

- P1 + DC

+ DC Locks DC
 parallel hold path for SW

Make of fourth pulse + A - P2
 - P3

 - P3 - C (slow release)

Further pulsing is ineffective because DC & SW open dialing path.

SECOND DIGIT

Break of first pulse - A + P1
 + C
 Shunts P2

+ C + C1

+ C1 Locks

+ P1 + (1-7)

+ (1-7) Locks

Make of first pulse + A + P2 (shunt removed)
 + P1 locks
 C holds (slow release)

Break of second pulse - A + P3
 + P2 locks

+ P3 - P1
 C locks

- P1 + (2-8)

+ (2-8) Locks (2-8)
 - (1-7)

Make of second pulse

- P3

Break of third pulse

+ P1

+ (3-9)

Make of third pulse

Break of fourth pulse

+ P3

- P1

+ (4-0)

Make of fourth pulse

- P3

Break of fifth pulse

+ P1

+ (5-6)

Make of fifth pulse

Break of sixth pulse

+ P3

+ A - P3
- P2

C holds (slow release)

- A + P1
Shunts P2
Holds C

+ (3-9)

Locks (3-9)
- (2-8)

+ A + P2 (shunt removed)
P1 locks
C holds (slow release)

- A + P3
P2 locks
Holds C

- P1
Locks C

+ (4-0)

Locks (4-0)
- (3-9)

+ A - P3
- P2

C holds (slow release)

- A + P1
Shunts P2
Holds C

+ (5-6)

Locks (5-6)
- (4-0)

+ A + P2 (shunt removed)
P1 locks
C holds (slow release)

- A + P3
P2 locks
Holds C

- P1
Locks C

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- P1	+ (6)
+ (6)	Locks (6)
Make of sixth pulse	+ A - P3 - P2
- P3	C holds (slow release)
Break of seventh pulse	- A + P1 Shunts P2 Holds C
+ P1	+ (1-7)
+ (1-7)	- (5-6)
- (5-6)	Locks (1-7)
Make of seventh pulse	+ A + P2 Locks P1 - C (after a slow release interval)
- C	- P1 - P2 + DC
+ DC	Locks DC + SW

CALLER LINE BUSY

Operated hold magnet called line connects ground to CO lead.

End of last pulse second digit	- C
- C	+ DC
+ DC	Locks DC + SW + BY link circuit (by ground on CO lead)
+ BY	Locks BY + T1 (common timing circuit)
+ T1	+ T (common timing circuit) + A, B & D (timing circuit)
+ T	Connects busy tone to calling station

CALLER LINE IDLE (#37)

+ SW	+ LK1, LK2, or LK3 (depending upon link used)
+ LK1	+ B (call allotter) + E (call allotter) + N

+ E	Locks E Locks IK1, IK2, or IK3 + E1 blocks start of next call + E2
+ N	+ M (slow operate; does not operate on normal call)
+ E1	+ MS
+ E2	
+ MS	MS locks to N ground (momentarily) Holds E1 & E2 + Select magnet (S-4, S-6, or S-9) - N (slow release) - M (if operated)
+ Select magnet	+ S + S1
+ S	Shunts C1
+ S1	Connects parallel locking path for E & MS Transfers IK1 locking path
- C1	+ C0 (station 37) - B (call allotter - slow release)
+ C0	+ Hold magnet (station 37)
+ Hold magnet	Grounds C0 lead Closes cross points (S-4, S-6, or S-8 & #37) C0 holds on slow release
+ Cross point	Holds C0 (by S and S1 leads to calling station) + SP
- B	- Select magnet
- Select magnet	- S and S1
- S & S1	- IK1
- IK1	- E - MS
- MS	- E1 allows next call to proceed - E2

- + SP
 - + R (timing circuit)
 - / Generator to ring)
 - / Ground to tip) rings bell
 - + A (timing circuit)*
 - / Ring induction to calling station

*Circuit code of interrupted ringing will be found on Page-22.

KEY STATION ANSWERS

- Bell rings, subscriber answers
 - + R (link circuit)
- (L key at called station not operated)
- + R
 - Locks R
 - Ringing current
 - / Ringing induction to called station
- Subscriber operates L key
 - + HS
- + HS
 - Opens common ground
 - SW
 - DC
 - T2 & T3 (tens register)
 - Units register (1-7) & (6)
 - Holds CO
- T2
 - SP
- SP
 - + E (link circuit)
 - R (timing circuit)
 - A (timing circuit)
 - Audible ring
 - R (link circuit)
- + E
 - Furnishes talking batt. & grd. to called station

Calling station receives battery and ground through A relay.
 Called station receives battery and ground through E relay.
 Talking path is through T & R condensers.

KEYLESS STATION ANSWERS

- Bell rings, subscriber answers
 - + R (link circuit)
- + R
 - Locks R
 - Generator
 - + HS (thru H & L lead strap at line circuit)

- + HS
 - Opens common ground
 - SW
 - DC
 - T2 & T3 (tens register)
 - Units register
 - Holds CO
- T2
 - SP
- SP
 - R (timing circuit)
 - Audible ring
 - + E & batt. & grd. to called station
 - R (link circuit)
 - A (timing circuit)

- + E
 - Holds HS

DISCONNECTION

- Replace handset at called station
 - E - HS
- L
 - Called CO holds to calling station
- Calling station places handset on cradle
 - A
 - Calling CO (slow release)
- A
 - Called CO (slow release)
- Calling CO
 - Hold magnet - cross point (originating level) - B
- Called CO
 - Hold magnet - cross point (terminating level)
- B
 - CT + CC (if battery is up)
 - Operating path CH1

LINK ALLOTTER CIRCUIT

Two of the CH relays are always operated when three links are used, and the CH1 and CH2 relays can be operated when two links are used, unless the associated link is busy or out of service. The link that will be used will be according to the following table:

CH1 and CH2	operated Link 1
CH2 and CH3	" " 2
CH3 and CH1	" " 3
CH1	" " 1
CH2	" " 2
CH3	" " 3
CH1, CH2 and CH3	" " 1
(if one is operated by hand)	

If all CH relays are normal (as when all links are busy), the start lead is transferred to the BY in the tone circuit to furnish busy tone indicating all links busy.

CONFERENCE CIRCUIT

Replacing of handset
of first called station

- E
- HS

- E

CO of called station holds to calling station

CO is slow release to prevent release during dial pulses.

Calling party does not hang up and dials without dial tone.

DIAL SECOND STATION (#21)

Break of first pulse - A

+ P1
+ C
Shunt P2
CO holds on slow release (called station)

+ P1

+ SW

+ SW

Locks

Make of first pulse + A

+ P2 (shunt released)
P1 locks
CO holds
C holds on slow release

Break of second pulse - A

+ P3
P2 locks
Holds C
CO holds on slow release

+ P3

- P1
C locks

- P1

+ T2

+ T2

+ SP
T2 Locks

+ SP

+ R (timing circuit)
+ A + B + D, etc.
+ Ringer of first called station
/ Audible ring to calling station

Make of second pulse + A

- P3
- P2
- C (after slow release interval)
Holds CO

- C

- SW

- SW

Transfers pulse leads to units register

SECOND DIGIT

Break of first pulse - A

+ P1
+ C
Shunts P2
CO holds to slow release

+ C

+ C1

+ P1

+ (1-7)

+ (1-7)

Locks

+ C1

C1 Locks

Make of first pulse + A

+ P2 (shunt removed)
P1 locks
- C (after slow release interval)
Holds CO

- C

+ DC
- P1
- P2

+ DC

DC locks

+ SW

Busy test is made. If busy, see Page 14

+ SW

+ LK1

+ LK1

+ N
+ E (call allotter)
+ B (call allotter)

+ N

+ M (slow operate; does not fully operate on normal call)

+ E

Locks E
Locks LK1

+ E1 blocks start of next call
+ E2

+ E1

+ MS

+ E2

+ MS	MS locks to N ground momentarily Holds E1 & E2 + Select magnet (same one as used on first called station) - N (slow release) - M (if operated)
+ Select magnet	+ S + S1
+ S	Shunts C1
+ S1	Connects parallel locking path*for E and MS Transfers IK1 locking path
- C1	+ C0 (Station #21) - B (call allotter - slow release)
+ C0	+ Hold magnet (Station #21)
+ Hold magnet	+ Cross points Grounds C0 lead #21
+ Cross points	Holds C0 + Ringer Station #21
- B	- Select magnet
- Select magnet	- S and S1
- S and S1	- IK1
- IK1	- E - MS
- MS	- E1 & E2
+ Ringer	Subscriber answers + R (link circuit) + HS (by L key)
+ R	Locks R - Ringing current - Bells Station #21 - Bells first station
+ HS	Opens common ground - SW - DC - T2 - Units register (1-7)
- T2	Holds C0 - SP
- SP	- R (timing circuit) - Audible ring - R (link circuit) + E (by called station short) - A (timing circuit)

- ## LINE HUNTING

+ F Lights F lamp
+ CT + CT
+ Audible alarm
/ Short to central office pair (when provided)

+ CT - CC (increase charging rate)

To silence alarm:

+ A key + CO

+ CO CO locks (under control of F)
- Audible alarm

Change fuse:

- F
 - CO
 - F lamp
 - CT
 - CO short
- CT
 - + CC (slow operate)

TIMING CIRCUIT

Automatic Ring

- + SP
 - + R
 - + A
- + A
 - + B (slow operate)
- + B
 - + D
- + D
 - A (slow release)
- A
 - B
- B
 - D (slow release - one second pulse)
- D
 - + A

B relay provides one second pulses with one second interval for operation of timing circuit.

- | | | | |
|--------|-----|-----------|-------------------------|
| Step 1 | + B | + W | Shunts Z |
| | | + W | Locks W |
| Step 2 | - B | + Z | |
| | | - R | |
| | | - R | - Generator |
| | | | Trip battery and ground |
| | | | - Audible ring |
| Step 3 | + B | Shunts W | |
| | | + W | |
| | | Shunts Z1 | |
| | | Locks | |
| Step 4 | - B | - Z | |
| | | + Z1 | |
| Step 5 | + B | + W | |
| | | Shunt Z | |
| | | Locks W | |
| Step 6 | - B | + Z | |

Step 7	+ B	- W	Shunts W ² - W1 (shunted)
Step 8	- B	- Z - Z) - Z1) + R	- Z - Z1 + R Connects generator and audible ring - Trip battery and ground

Above circuit provides one cycle of generator and three cycles of silent period. Each cycle approximately one second.

ABANDONED CALL FEATURE

Central office generator to T & R of trunk	+ R + Ringer if provided
+ R	+ R + LK (timing circuit)
+ R1	Locks (to + W3 or - Z3 and - B) + A (timing circuit) + R (timing circuit - no function on trunk call).
+ LK	+ Bells or buzzers
+ A	+ B (slow operate)
+ B	+ D Lights trunk lamp (if provided) + W (locks to ST lead) Shunts Z
+ D	- A (slow release)
- A	- B
- B	- D (slow release)
- D	+ A

The operation of the timing circuit W, Z, W1 and Z1 relay is the same as shown on Page 22. The remaining portion of the circuit is controlled by the Z1 relay operating and releasing with the LK relay normal.

Calling station disconnects	- Central office generator
- Central office generator	- R (trunk circuit)
- R (trunk circuit	- LK (timing circuit)

24

Step 1	+ Z1 (Step 4, page 22)	+ W2 Shunts Z2
		+ W2 locks
Step 2	- Z1 (Step 8, page 23)	+ Z2
Step 3	+ Z1	- W2 (shunt) Holds Z2
		- W2 + W3 Shunts Z3
		+ W3 locks
Step 4	- Z1	- Z2
		- Z2 + Z3
Step 5	+ Z1	+ W2 Shunts Z2
		+ W2 locks
Step 6	- Z1	+ Z2
Step 7	+ Z1	- W2 (shunt) Holds Z2
		- W2 - W3 (shunt) Holds Z3
		- W3 - R1 (trunk circuit)

The release of the R1 (trunk circuit) removes ground from the ST and R1 leads allowing the entire timing circuit to restore to normal and extinguishes the trunk lamp. The release of the timing circuit in turn allows the charging circuit to function to decrease the charge.

KEYLESS STATION ORIGINATING TRUNK CALL
THROUGH CONTROL KEY STATION*

Lift handset	+ L
+ L	+ L1 + ST (through control key)
+ ST	+ T (Tone circuit)
+ L1	+ N + E
+ N	+ M (slow operate; may not completely operate)

* Use P.T.S. #536.

+ E	E locks Ll locks + E1 and E2
+ E1	+ MS
+ E2	
+ MS	- N + Originating select magnet Holds E1 and E2 - M (if operated)
+ Select magne	+ S and S1
+ S and S1	MS locks E locks + CO
+ CO	+ HM (Hold magnet)
+ HM	+ Cross points / busy ground to CO lead - L
- L	- Ll
+ Cross points	+ A ST locks / Dial tone
+ A	+ B / Talking battery and ground
+ B	Holds CO - Select magnet
- Select magnet	- S and S1
- S	- E
- S1	- MS
- MS	- E1 - E2

KEYLESS STATION DIALS CONTROL STATION

This circuit action is the same as a station to station call. See P.T.S. 535, Page 10. When key station answers, the keyless station asks for a central office trunk and the key station depresses a trunk key. This will disconnect the key station from the keyless station and connect to a trunk. (Key station may dial the called number or connect the keyless station to the trunk and permit that station to dial.)

26

- + Trunk key
- L key
- HS
- CO
- HM
- Cross points
- L key
- HS
- CO (key station)
- HM
- Cross points
- E
- Disconnects key station from link

Operated trunk key connects key station to trunk as per circuit action described in P.T.S. 535, Page 2.

KEY STATION OPERATES CONTROL KEY

(Hold operated for one second as
C.O. relay is slow releasing)

- + Control key
- CO
- HM
- Cross points
- + L
- + Ll
- + N
- + E
- + E1
- + E2
- + MS
- + Select magnet
- + S
- + Sl
- CO (keyless station)
- HM
- Cross points
- + L
- A
- B
- + Ll
- + T (Trunk) (Through operated control key)
- + N
- + E
- + M (slow operate; may not completely operate)
- E locks
- Ll locks
- + E1 and E2
- + MS
- Holds E1 and E2
- + Select magnet
- N
- M (if operated)
- + S and Sl
- E locks
- MS locks
- + CO

+ CO	+ HM (Hold magnet)
+ HM	+ Cross points
	+ Busy ground
	- L
+ Cross points	+ Keyless station to trunk
	Holds H1 (trunk)
	Holds CO (through % H1, N lead)
	Holds B (trunk)
- L	- L1
	- T
- T	- Select magnet
- Select magnet	- S and J1
- S	- E
- S1	- MS
- MS	- E1 and E2

Key station hangs up and the keyless station now holds the central office trunk.

An incoming central office call may be transferred to a keyless station by a control station by first holding the trunk, dialing the keyless station, informing them of trunk call and then operating control key with trunk key depressed. Key station hangs up and the keyless station is connected to the trunk.

U AND Y TYPE RELAYS

QUESTIONNAIRE









1. What is meant when a relay is said to operate?
What is meant when a relay is said to non-operate?
2. Which springs are bifurcated?
How many contacts on each spring?
3. What information is obtained from the figure number on the
CR drawing?
4. What is a balancing spring and its purpose? Buffer spring?
5. How is the tension of the A springs measured?
6. In what position should the armature be when in the unoperat-
ed position?

QUESTIONNAIRE

1. What prevents stations having lockout service from connecting to a busy trunk?
2. What permits stations having restricted service to pick up transfer calls and to answer incoming calls?
3. What provides a flashing signal on an incoming central office call and lights it steady when the trunk is answered?
4. What connects a holding condition across a trunk when the call is answered and the hold key depressed?
5. How is a station having non-lockout service connected to a busy trunk?
6. What means is provided for preventing double connections on simultaneous intercommunicating calls?
7. What means is provided for continuing service if the E relay of the call allotter fails to function normally?
8. When is the start lead extended to the next link?
9. From what points are talking battery and ground supplied the calling station on an intercommunicating call? The called station?
10. What makes the dialing of extra digits through the link circuit ineffective?
11. What happens on a preliminary pulse?
12. Explain what happens when a station attempts to originate an intercommunicating call when all links are busy.
13. What is the function of the following relays? T2, T3, E1 and E2, SP, DC, SW B (call allotter circuit), T (trunk circuit).
14. How is the amount of charge to the battery controlled?
15. How are the stations numbered?
16. Describe the 300W crossbar switch as used in the 755-A Dial P.B.X.
17. What is the function of the call allotter circuit?
18. What is the purpose of the 313A vacuum tube?
19. Why is the CO relay slow releasing?
20. What releases the R1 relay on an abandoned central office call?

FOR
755 A DIAL P. B. X.

-LEGEND-

	REL. OPERATES
	" OPERATED
	" CCT. CLOSED
	" " OPENED
	" RELEASES
	" HELD
	" LOCKED
	" REENERGIZED BUZZER

LINE	CIRCUIT DESCRIPTION	RELAY OPERATIONS						
		CHG. & DISCH. CCT.	RING & C.T.C.	LINK CIRCUIT		CALL ALLOTTER CCT.	LINE SW. CCT.	LINE CCT.
1	BATTERY FULLY CHARGED	CC						
2	+INST SHT +L							L
3	+L LOCKS							
4	+LOCAL KEY +ST +LI			ST		LI		
5	+ST +T +LI +E +N		T			E N		
6	+E LOCKS LI +N +M(SO)					E1 E2 M		
7	+(E1 & E2) +MS (SO)					Y MS		
8	+MS							
9	+MS -N(SR) -M LOCKS +SEL					X =	SEL	
10	+SEL + (S & SI) (SO) -N					Y Y		
11	+ (S & SI)					S SI		
12	+ (S & SI) LOCKS LI, E, MS +CO							CO
13	+CO -LI (SHUNTED) +HM						HM	
14	+HM LOCKS ST & CO +A -L			A				
15	+A +B			B				
16	+B +CT -SEL LOCKS -CH	CT						
17	+CT -CC -SEL - (S & SI)							
18	- (S & SI) -E -MS							
19	-MS - (E1 & E2)							
20	READY FOR DIALING	CT	T	ST A B			HM	CO
21	1 ST BREAK OF DIAL -A			A				
22	-A +C +PI P2 SHUNTED				C PI			
23	1 ST MAKE OF DIAL +A +PI LOCKS +SW			A	SW			
24	+A -C(SR) +SW LOCKS +P2				X P2			
25	2 ND BREAK OF DIAL -A			A				
26	-A +C LOCKS P2 +P3				P3			
27	+P3 LOCKS C -PI							
28	2 ND MAKE OF DIAL +A -PI +T2			A	T2			
29	+A -P2 -P3 +T2 -ST LOCKS							
30	-ST -T HOLDS A -P3 -C(SR)							
31	3 RD BREAK OF DIAL -A			A				
32	-A +C +PI				PI			
33	+PI LOCKS +T3					T3		
34	3 RD MAKE OF DIAL +A +T3 LOCKS			A				
35	+A -C(SR) +P2				P2			
36	-C							
37	-C -PI -SW -P2							
38	READY FOR DIALING UNITS	CT		A B	T2 T3		HM	CO
39	1 ST BREAK OF DIAL -A			A				
40	-A +C +PI				C PI			
41	1 ST MAKE OF DIAL +A +C +CI +PI LOCKS + (1-7)			A		CI (1-7)		
42	+A -C(SR) +CI LOCKS + (1-7) LOCKS				X P2			
43	2 ND BREAK OF DIAL -A			A				
44	-A +C LOCKS P2 +P3				P3			
45	+P3 LOCKS C -PI							
46	2 ND MAKE OF DIAL +A -PI + (2-8)			A		(2-8)		
47	+A -P2 -P3 + (2-8) - (1-7) LOCKS							
48	-P3 -C(SR)				X			
49	-C							
50	-C +DC					DC		
51	+DC +SW LOCKS				SW			
52	READY FOR BUSY TEST	CT		A B	SW T2 T3 CI (2-8) DC		HM	CO

SEQUENCE CHART

FOR
755A DIAL P.B.X.

-LEGEND-

A	REL. OPERATES
"	" OPERATED
>A	" CCT. CLOSED
x	" " OPENED
→	" RELEASES
⊥	" HELD
⊥	" LOCKED
⊥	" REENERGIZED
⊥	" BUZZER

LINE	CIRCUIT DESCRIPTION	CHG. & DISCHG CCT.	RINGING & COMMON TIMING CCT.	CALLED STA.		LINK CCT.	CALL ALLOTTER CCT.		CALLING STA.	
				LINE CCT.	LINE SW. CCT.		LINE CCT.	LINE SW. CCT.	LINE CCT.	LINE SW. CCT.
1	RELAYS OPERATED P.T.S. 534-3	CT				A SW T3 (2-8) B T2 CI DC			HM	CO
2	+ SW + LKI									
3	+ LKI + B + N									
4	+ E LOCKS LKI LOCKS LKI (E1 & E2) + N + M(SO)									
5	+(E1 & E2) + MS (SO)									
6	+ MS									
7	+ MS + SEL HOLDS(E1 & E2) LOCKS -N(SR) -M				SEL					
8	- N + SEL +(S & SI)(SO)									
9	+(S & SI)									
10	+ S & SI HOLDS SEL -CI(SHUNTED) LOCKS LKI, E, MS									
11	- CI + CO -B(SR)									
12	+ CO + HM -B									
13	+ HM HOLDS CO +SP -B-SEL									
14	+ SP +TIMING CCT FOR INTERRUPTED RING -SEL -(SI & S2) +R		A R							
15	+ INST SHT+R -(S & SI)-LKI									
16	+ R LOCKS +LOCAL KEY+HS -LKI -E -MS									
17	+ HS HOLD CO -SW. T2, T3, (2-8) DC -MS-(E1 & E2)									
18	- T2 -SP									
19	- SP -R +TIMING CCT +E									
20	RELAYS OPERATED WHILE TALKING	CT								
21	- CALLED STA -HS -E									
22	RELAYS HELD BY CALLING STA	CT								
23	- CALLING STA -A -CO(SR)									
24	- A -CO(SR) -CO									
25	- CO -CO -HM									
26	- CO -HM -HM -B									
27	- B-CT & CLOSES CH RELAY CIRCUIT									
28	- CT + CC	CC								
29	RELAYS OPERATED FOR BSY TST UPON +DC	CT								
30	+ DC + SW + BY (GRD AT BSY STA)									
31	+ BY + TI LOCKS									
32	+ TI + T + A									
33	+ A + B(SO)									
34	+ B									
35	+ B + D + TONE									
36	+ D -A(SR)									
37	- A									
38	- A -B									
39	- B -D(SR) -TONE									
40	- D									
41	- D + A									
42	+ A + B(SO)									
43	+ B -CALLING STA -A -CO(SR)									
44	+ B + D + TONE -CO									
45	+ D -A(SR) -CO -HM									
46	- A -HM -B									
47	- A -B -B-CT T2 CI DC -SW T3 (2-8) BY									
48	- CT + CC -B -D(SR) -TONE -BY -TI	CC								
49	- TI -T -D									

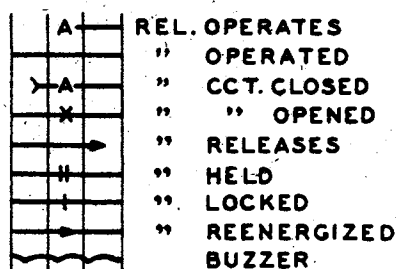
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-LEGEND-



SEQUENCE CHART

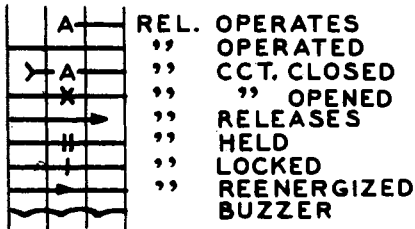
FOR .
755 A DIAL P.B.X.

LINE	CIRCUIT DESCRIPTION	RELAY OPERATIONS			
		RINGING AND COMMON TIMING CCT.		LINK CCT.	TRK. CCT.
1	RELAYS EFFECTING TIMING CCT.			SP	RI
2	+SP OR +RI +R +GENERATOR OUT ON LINE	R	A		
3	+A +B (SO)		Y		
4	+B		B		
5	+B +D		D		
6	+D -A (SR)	X			
7	-A				
8	-A -B				
9	-B -D (SR)		X		
10	-D				
11	-D +A	A			
12	AS ±B ABOVE, FOLLOWING CIRCUIT ACTION	R	B		
13	+B +W (Z SHUNTED)		W		
14	-B +W LOCKS				
15	-B +Z		Z		
16	+B +Z -R -GENERATOR ON LINE	B			
17	+B -W (SHUNTED)				
18	-W +W1 (Z1 SHUNTED)		W1		
19	-B +W1 LOCKS				
20	-B -Z				
21	+B -Z +Z1	B	Z1		
22	+B +W (Z SHUNTED)	W			
23	-B +W LOCKS				
24	-B +Z	Z			
25	+B	B			
26	+B -W (SHUNTED)				
27	-B -W -W1 (SHUNTED)				
28	-B -Z				
29	-Z -Z1				
30	-Z1 +R	R			
31	WITH -R +RI AND AS ABOVE CCT. ACTION TAKES PLACE ±Z1 CAUSES FOLLOWING		Z1		RI
32	+Z1 +W2 (Z2 SHUNTED)		W2		
33	-Z1 +W2 LOCKS				
34	-Z1 +Z2		Z2		
35	+Z1	Z1			
36	+Z1 -W2 (SHUNTED) HOLDS Z2				
37	-W2 +W3 (Z3 SHUNTED)		W3		
38	-Z1 +W3 LOCKS & HOLDS RI				
39	-Z1 -Z2				
40	+Z1 -Z2 +Z3	Z1	Z3		
41	+Z1 +W2 (Z2 SHUNTED)	W2			
42	-Z1 +W2 LOCKS				
43	-Z1 +Z2	Z2			
44	+Z1	Z1			
45	+Z1 -W2 (SHUNTED) HOLDS Z2				
46	-W2 -W3 (SHUNTED) HOLDS Z3				
47	-W3 -RI				
48	-Z1 -RI -Z2 -Z3				

-LEGEND-

SEQUENCE CHART

FOR
755A DIAL P.B.X.



LINE	CIRCUIT DESCRIPTION	RELAY OPERATIONS					
		CHG. & DICHG. CCT.	RING & COMMON TIMING CCT.	TRUNK CCT.	CALL ALLOTTER CCT	LINE SW. CCT.	LINE CCT.
1	RELAYS LEFT OPERATED P.T.S.534-1	CT	A B D	RI			
2	-A		A				
3	-A-B		B				
4	-B-TRK LP + INST SHT +L -D(SR)		D				L
5	-D +L LOCKS						
6	-D+A +TRK KEY +T +LI		A	T	LI		
7	+A+B(SO) +LI +E +N				E N		
8	+B +E LOCKS LI +E1&E2 LOCKS +N+M(SO)		Y B		E1 E2 M		
9	+B+D +TRK LP +E1&E2+MS(SO)		D		Y MS		
10	+D-A(SR) +MS		X				
11	-A +MS -N(SR) -M +SEL HOLDS E1&E2 LOCKS					SEL	
12	-A-B -N +SEL+(S&SI)(SO)						
13	-B-TRK LP +S&SI -D(SR)				Y S SI		
14	-D +S&SI LOCKS LI.E.MS +CO HOLDS SEL						CO
15	-D+A +CO HOLDS T +HM -LI(SHUNTED)		A			HM	
16	+A+B(SO) +HM +HI -L LOCKS CO		Y B	HI B			
17	+B -L-T +B HOLDS CT -RI +TRK. BSY. LP						
18	+B+D -T-SEL		D				
19	+D-A(SR) -SEL-(S&SI)		X				
20	-A -(S&SI)-E -MS						
21	-A-B -MS-(E1&E2)						
22	-B-D(SR)		X				
23	-D						
24	RELAYS OPERATED WHILE TALKING	CT		HI B		HM	CO
25	+HOLD KEY -TRK KEY +H			H			
26	+H HOLDS HI +H2 -TRK KEY -CO(SR) LOCKS			H2			X
27	+H2 HOLDS HI&CT -CO HOLDS TRK LP						
28	-CO-HM						
29	-HM-B						
30	-B-H LOCKS H2						
31	RELAYS OPERATED WHILE CALL HELD	CT		HI H2			
32	+INST SHT +L						L
33	+L LOCKS						
34	+TRK KEY +T +LI			T	LI		
35	+LI +E +N				E N		
36	+E LOCKS LI +E1&E2 LOCKS +N+M(SO)				E1 E2 M		
37	+E1&E2 +MS(SO)				Y MS		
38	+MS						
39	+MS -N(SR) -M +SEL HOLDS E1&E2 LOCKS					SEL	
40	+SEL +S&SI(SO) -N						
41	+S&SI				Y S SI		
42	+S&SI LOCKS LI.E.MS +CO HOLDS SEL						CO
43	+CO HOLDS T +HM -LI(SHUNTED)					HM	
44	+HM HOLDS HI -L LOCKS CO			B			
45	+B HOLDS CT&TRK LP -H2 -T(ON RS & LO)						
46	-T-SEL						
47	-SEL -(S&SI)						
48	-(S&SI)-E -MS						
49	-MS-(E1&E2)						
50	RELAYS OPERATED WHILE TALKING	CT		HI B		HM	CO
51	-INST SHT -HI -CO(SR)						X
52	-CO						
53	-CO-HM						
54	-HM-B						
55	-B-TRK LP -CT						
56	-CT+CC	CC					

755A DIAL P.B.X.

1010

1010

1010

-LEGEND-

A	REL. OPERATES
A	" OPERATED
A	" CCT. CLOSED
X	" " OPENED
→	" RELEASES
	" HELD
+	" LOCKED
~	" REENERGIZED
~	BUZZER

SEQUENCE CHART

FOR
755A DIAL P.B.X.

LINE	CIRCUIT DESCRIPTION	RELAY OPERATIONS					
		CHG. & DISCHG. CCT.	RING. & COMMON TIMING CCT.	TRK. CCT.	CALL ALLOTTER CCT.	LINE SW. CCT.	LINE CCT.
1	BATT FULLY CHGD +CC	CC					
2	+INST SHORT +L						L
3	+L LOCKS						
4	+TRK KEY +T +LI			T	LI		
5	+LI -LOCKING PATH OF HIGHER #LI'S				E N		
6	+E LOCKS +N+M(SO)				E1 E2		
7	+E1 & E2 -OPR PATH OF ALL LI'S				Y MS		
8	+MS						
9	+MS -N(SR) HOLDS (E1 & E2) LOCKS +SEL				X	SEL	
10	-N +SEL +S & S1(SO)				YY		
11	+S & S1				SS1		
12	+S & S1 LOCKS LI-E-MS HOLDS SEL						CO
13	+CO -LI(SHUNTED)					HM	
14	+HM -B LOCKS CO			HI B			
15	+B +CT +TRK LP -L-T	CT					
16	+CT-CC -T-SEL						
17	-SEL -(S & S1) -CC INCREASE CHG						
18	-(S & S1) -E -MS						
19	-MS -(E1 & E2)						
20	RELAYS OPERATED WHILE TALKING	CT		HI B		HM	CO
21	-INST SHORT -HI -CO(SR)						X
22	-CO						
23	-CO-HM						
24	-HM-B						
25	-B -CT -TRK LP						
26	-CT+CC IF BAT IS FULLY CHGD.	CC					
27	+INST SHT +L						L
28	+L LOCKS						
29	+TRK KEY +BY		BY				
30	+BY +TI L HOLDS TO "A" REP. COIL	F	TI				
31	+TI +T +R +A	T R A					
32	+A+B(SO)	Y B					
33	+B						
34	+B +TONE TO STA +D +W NOT EFFECTIVE	S B					
35	+D-A(SR)	R S					
36	-A	+C					
37	-A-B						
38	-B -D(SR) -TONE TO STA						X
39	-D						
40	-D+A						
41	CCT REPEATS UNTIL DISC						
42	+GEN TO TRK +R +AUDIBLE SIG	CC					
43	+R +LK +RI			LK			
44	+RI +CT +A LOCKS +R NOT EFFECTIVE +LK +AUDIBLE SIG	CT					
45	+CT-CC +A+B(SO)						
46	+B -CC INCREASE CHG						
47	+B +D +TRK LP +W CCT ACTION ON P.T.S. 534-5						
48	+D-A(SR)						
49	-A						
50	-A-B						
51	-B -D(SR) +Z CCT ACTION ON P.T.S. 534-5						
52	-D +Z-R						
53	-D+A						
54	+A+B(SO) -GEN -AUDIBLE SIG -R						
55	+B -R-LK						
56	+B +TRK LP +D -LK -AUDIBLE SIG						
57	+D-A(SR)						

0-90-29 C O C A L L F R O M L O O R N I S T A.

0-50022WU-

LO STA. ATTEMPTING A C.O. CALL ON A
BSY. TRK. OR RS STA. ATTEMPTING
TO MAKE A C.O. CALL

-2003-29 C C L L