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EXPLANATION  
OF  
TRUNK CIRCUIT  
ONE WAY OUTGOING FROM SX  
INTERTOLL SWITCHTRAIN OR  
TOLL SWBD.-ARRANGED FOR  
LOOP OR BAT. & GRD. OUTPULSING  
H-610075-A

FEATURES

- a) Provides service from simplex dialing Intertoll Selectors to a loop dial circuit.
- b) Provides optional access from type 20, 30, or 31 Toll Switchboard.
- c) Provides loop or battery and ground outpulsing.
- d) Converts loop reverse battery supervision to fourth wire supervision and Toll Switchboard supervision.
- e) Provides pulse shift facilities on Toll Switchboard.
- f) Provides repeat coil transmission bridge.
- g) Provides idle line termination.
- h) Optional 2DB fixed pad for VNL operation.

E-610075-A		SHEET 1		TOTAL 8	
SIZE	A	AUTOMATIC ELECTRIC COMPANY NORTH LAKE, ILL., U.S.A. O GEND., ILL., U.S.A. O WAUKESHA, WISC., U.S.A. O			
DR.	CK.				
APPRO.	DATE:				
<p>ISSUE 1 9-7-66 Changed Sections 1.1, 1.4.1 1.4.2 and 2.4 for H-5 2/69:11k J.W.King K. 8/7/69 Issue 2</p> <p>Changed Section 1.04.2 for H-6 8/69:11k Autowski J. F. A. 8-7-69 Issue 3</p>					
<p>8/7/69</p>					

S.H. Adams

AMN/9-7-66

E-610075-A

FX-2800-1(2-64)

E-610075-A		TOTAL	
SIZE	A	SHEET	2
APP'D.	OR.	CHK.	
DATE:			
ISSUE			
3			

AUTOMATIC ELECTRIC COMPANY  
NORTH LAKE, ILL., U.S.A.O. GENOA, ILL., U.S.A.O. WAUKESHA, WISC., U.S.A.O.

- (i) Arranged for busy or idle indicating control to Toll Switchboard.
- (j) Accessed from absence-of-ground or battery searching Selectors.
- (k) Provides ATB, PC and OS leads.
- (l) Provides test jack and pulse test facilities.

#### CIRCUIT OPERATION

1.00 OUTGOING FROM SX INTERTOLL SEL BKS ("S" WRG is provided - see TABLE A on H-610075-A)

##### 1.01 Seizure

Absence of ground or resistance (#2G) battery on lead C (see NOTE 54 on H-610075-A) marks this circuit idle to preceding equipment. When seized, ground is received via lead C and Simplex ground is received via leads +LINE and -LINE, repeat coil RC, and resistors R7, R8 and R9, closing #1A. Relay A operates, closes #1H and connects resistor R10 ("C" WRG & APP) and #1D ("C" APP) ("R" strap) or #1D ("A" APP) and resistor R5 in series with one section of repeat coil RC ("X" WRG or "Y" WRG & APP) across leads +SW OR +TRK and -SW OR -TRK, closing #1D ("A" APP or "C" APP) and the loop to the succeeding switch. Relay H operates, closes #2D and F via diode CR3 grounds leads C-SW and OS, via diode CR3, removes resistance (#2G) battery from lead C, connects resistance #2H, ground to lead C, short circuiting #2H, disconnects

the idle line termination ("T" strap - see NOTE 76 on H-610075-A) from across leads +SW OR TRK and -SW OR -TRK, and connects the pre-energizing circuit to #2A (see NOTE 55 on H-610075-A). Relay F operates, and removes ground from lead ATB for a possible all-trunks-busy registration. Relay D does not operate since its windings are energized in magnetic opposition.

#### 1.02 Pulse Repeating (Operated: Relays A, F and H)

Relay A follows the simplex ground pulses via leads +LINE and -LINE and, when at normal, closes E, and disconnects resistor R10 ("C" WRG & APP) and #1D ("C" APP) ("R" strap) or #1D ("A" APP) and resistor R5 in series with one Section of repeat coil RC ("X" WRG or "Y" WRG & APP) from across leads +SW OR +TRK and -SW OR -TRK, opening #1D ("A" APP or "C" APP) and the loop to the succeeding switch. Relay E operates on the first pulse, and closes #1G. Relay G operates and connects the line termination across leads +LINE and -LINE. At the end of each pulse, A re-operates, opens E, and connects resistance (resistor R2 and possibly resistor R1) ground and resistance (resistor R4 and possibly resistor R3) battery ("Y" WRG) or the loop resistance (resistor R24; "X" WRG or "Y" WRG & APP) (see NOTE 52 on H-610075-A) to leads -SW OR -TRK and +SW OR +TRK for ground and battery or loop pulsing respectively. Relay E remains operated during pulsing due to its slow-to-release characteristics.

At the end of each digit, E restores after its slow-to-release interval, opens #1G, and removes resistance (resistor R2 and possibly resistor R1) ground and resistance (resistor R4 and possibly resistor R3) battery ("Y" WRG) from leads -SW OR -TRK and +SW or +TRK, respectively. Relay G restores, disconnects the line termination from across leads +LINE and -LINE, disconnects the loop resistance (resistor R24; "X" WRG or "Y" WRG & APP) from across leads +SW OR +TRK and -SW OR -TRK, and connects resistor R10 ("C" WRG & APP) and #1D ("C" APP) ("R" strap) or #1D ("A" APP) and resistor R5 in series with one Section of repeat coil RC, closing #1D ("A" APP or "C" APP) and the loop to the succeeding switch.

#### 1.03 Answer Supervision (Operated: Relays A, F and H)

When the called party answers, battery polarity via leads +SW OR +TRK and -SW OR -TRK is reversed. Relay B operates (windings energized aiding), and transfers lead EC from lead EC-SW (when required) to ground for answer supervision. Conversation may now take place.

#### 1.04 Release (Operated: Relays A, F, D and H)

##### 1.04.1 Called Party Disconnects First

When the called party disconnects first, battery polarity is returned to normal via leads +SW OR +TRK and -SW OR -TRK. Relay D restores (windings energized in opposition) and transfers lead EC from ground to lead EC-SW (when required) for disconnect supervision.

When the calling party disconnects, #1A is opened. Relay A restores, closes E, and disconnects resistor R10 ("C" WRG & APP) and #1D ("C" APP) ("R" strap) or #1D ("A" APP) and resistor R5 in series with repeat coil RC ("X" WRG or "Y" WRG & APP) from across leads +SW OR +TRK and -SW OR -TRK, opening #1D and the loop to the succeeding switch. Removal of ground from lead C opens relay H. Relay E operates, and closes #1G. Relay G operates and connects the line termination across leads +LINE and -LINE. Relay H restores, opens E and #2D, disconnects the pre-energizing circuit from #2A, grounds leads C and PC1, removes ground from lead C-SW (when required) and connects the idle line termination ("T" strap - see NOTE 76 on H-610075-A) across leads +SW OR +TRK and -SW OR -TRK. After its slow-to-release interval, E restores, and opens #1G. Relay G restores, opens F, removes ground from leads OS and PC1, and disconnects the line termination from across leads +LINE and -LINE. After its slow-to-release interval, F restores, grounds lead ATB, removes ground from lead C, and connects resistance (#2G) battery to lead C (see NOTE 54 on H-610075-A) to mark this circuit idle. The circuit is now at normal.

##### 1.04.2 Calling Party Disconnects First

When the calling party disconnects first, #1A is opened. Relay A restores, disconnects #1D ("C" APP) ("R" strap) and resistor R10 ("C" WRG & APP) or #1D ("A" APP) and resistor R5 in series with repeat coil RC ("X" WRG or "Y" WRG & APP), opening #1D and the loop to the succeeding switch, and closes #1G. Relay G operates, removes ground from lead EC and connects the line termination across leads +LINE and -LINE. Relay D remains operated via its #2 winding. Removal of ground from lead C opens relay H. Relay H restores as described in Section 1.04.1. Relay D restores and connects lead EC to lead EC-SW (when required). Following restoration is the same as that described in section 1.04.1.

## 2.00 OUTGOING FROM TOLL SWITCHBOARD (FIG 5A is provided- see TABLE A on H-610075-A)

### 2.01 Seizure

When seized, resistance battery and ground are received via leads S and K respectively, closing #2S, via diode CR2. Relay S operates and closes S1. Relay S1 operates, closes JCA, removes ground from leads T, and disconnects the biasing network from leads R (see NOTE 58 on H-610075-A). Relay JCA operates, closes JC, and grounds lead BL. Relay JC operates, locks, closes #1A via resistors R9 and R12, connects low resistance (#1S) ground to leads S, closing #1S, connects the biasing network to #1A (see NOTE 58 on H-610075-A), and connects resistors R7 and R8, and one Section of repeat coil RC in series across leads T and R. Relay A operates and the following operation is similar to that described in Section 1.1 except that when F operates, it also connects resistance (resistor R13) battery to lead SBL.

### 2.02 Pulse Repeating (Operated: Relays A, F, H, S, S1, JCA and JC)

As the dial at the Operator's Position is rotated off-normal, resistance battery is removed from lead S, opening #1 and #2S. Relay S restores, opens S1, and removes low resistance (#1S) ground from lead S. Relay S1 restores, disconnects resistors R7 and R8 in series with one Section of repeat coil RC from across leads T and R, and transfers #1A from ground at S1 to ground via the dial impulse springs and leads T and R. Relay A follows the dial pulses and the following operation is similar to that described in Section 1.2 except that when G operates, the line termination is not connected across leads +LINE and -LINE (FROM SX INTERTOLL SEL BKS).

After the last pulse of each digit, resistance battery is again received via lead S, closing #2S; and A reoperates as described in Section 1.2. Relay S re-operates, closes S1, and connects low resistance (#1S) ground to lead S, closing #1S. Relay S1 re-operates, transfers #1A from ground at the dial impulse springs to ground at S1, and connects resistors R7 and R8 and one Section of repeat coil RC in series across leads T and R.

### 2.03 Answer Supervision (Operated: Relays A, F, H, S, S1, JCA, and JC)

When the called party answers, battery polarity via leads +SW OR +TRK and -SW OR -TRK is reversed. Relay D operates (windings energized aiding), transfers lead EC from lead EC-SW (when required) to ground, opens #1S, and removes low resistance (#1S) ground from lead S for answer supervision. Conversation may now take place.

### 2.04 Release (Operated: Relays A, F, D, H, S, S1, JCA and JC)

The release of this circuit is under the control of the Toll Operator. When the called party disconnects, battery polarity is returned to normal via leads +SW OR +TRK and -SW OR -TRK. Relay D restores (windings energized in opposition), transfers lead EC from ground to lead EC-SW (when required), closes #1S, and connects low resistance (#1S) ground to lead S for disconnect supervision.

When the Toll Operator disconnects, resistance battery and ground are removed from leads S and K respectively, opening #1 and #2S. Relay S restores, opens S1, and removes low resistance (#1S) ground from lead S. Relay S1 restores, opens #1A, grounds leads T, connects the biasing network via resistor R12 to leads R, and disconnects resistors R7 and R8 and one section of repeat coil RC from across leads T and R. Relay A restores, opens #1H, opens #2H and relay JC in series, closes relay E, removes resistance, #2H, ground from leads C and K, removes resistance (#2S) ground from leads S, and disconnects #1D ("C" APP) ("R" strap) and resistor R10 ("C" WRG & APP) or #1D ("A" APP) and resistor R5 in series with one section of repeat coil RC from across leads +SW OR +TRK and -SW OR -TRK, opening #1D and the loop to the succeeding switch. Relay JC restores, grounds leads S, disconnects the biasing network from #1A, and connects resistors R7 and R8, and one section of repeat coil RC in series across leads +LINE and -LINE. Relay E operates and closes #1G. Relay G operates and connects the line termination across leads +LINE and -LINE. Relay H restores, opens #2D and L, disconnects the pre-energizing circuit from #2A, removes ground from leads S, grounds leads C, PC2 and K, removes ground from lead C-SW (when required) connects resistance (#2S) ground via diode CR2 to leads S, and connects the idle line termination ("T" strap - see NOTE 76 on H-610075-A) across leads +SW OR +TRK and -SW OR -TRK. After its slow-to release interval, E restores, and opens #1G.

Relay G restores, opens F, removes ground from leads OS and PC2, and disconnects the line termination from across leads +LINE and -LINE. After its slow-to-release interval, F restores, opens JCA, closes JC, removes resistance (resistor R13) battery from lead SBL, grounds lead ATB, removes resistance (#2S) ground and ground from leads S and K respectively, and connects resistance (#2G) battery to lead C (see NOTE 54 on H-610075-A). Relay JCA restores, opens JC (not operated), and removes ground from lead BL. The circuit is now at normal.

#### 2.05 Service Observing Position Access

Leads T, R, S and SBL are multipled to the Service Observing Switchboard Position. This permits a Service Observing Operator to monitor this trunk when the call is handled by another Operator. Lead K is not multipled to the Service Observing Position to prevent the service observing operation from seizing an idle trunk.

#### 2.06 Pad Control

Leads R, RC, TC and T connected to the incoming side of the repeat coil RC are used in conjunction with FIGS 3A and 4A (see TABLE A on H-610075-A).

#### 2.07 Test Facilities

##### 2.07.1 Out-of-Service Busy

This trunk circuit can be placed out-of-service from the Test Panel by grounding lead OS. If the trunk is idle, ground via lead OS closes F. Relay F operates, removes ground from lead ATB for a possible all-trunks-busy indication, grounds lead BL to provide a busy indication at the Toll Switchboard, connects resistance (resistor R13) battery to lead SBL for a busy indication at the Service Observing Position, grounds lead K and connects resistance (#2S) ground via diode CR2 to leads S to prevent seizure from the Switchboard, and transfers lead C from resistance (#2G) battery (see NOTE 54 on H-610075-A) to ground to mark the trunk busy to the Selector Banks.

##### 2.07.2 Pulsing Testing

To mark this circuit busy, the BUSY KEY is operated to ground leads C and BL, and to remove ground from lead ATB.

To measure the percent break of A on calls (FROM SX INTERTOLL SEL BKS) using Toll Repeating Test Set Circuit (H 85388 or equivalent), a hand test telephone is inserted into RIGHT TEST JACK springs 1 and 2 to monitor the trunk to determine if it is idle. When the trunk is idle, the BUSY KEY and IPT KEY are operated. Pulses are introduced to #1A via RIGHT TEST JACK springs 1 and 2. Relay A follows the pulses and the repeated pulse is measured at RIGHT TEST JACK springs 7 and 8.

When tests are performed via the Toll Switchboard Access using Toll Pulse Repeating Test Set Circuit (H-85388 or equivalent), a hand test telephone is inserted into LEFT TEST JACK springs 1 and 2 to monitor the trunk if it is idle. When the trunk is idle, the BUSY KEY and IPT KEY are operated, and #2S is closed via leads K and S. Relay S operates momentarily, closing S1. Relay S1 operates and the following operation is the same as described in Section 2.1. When resistance battery is removed from lead S, #1 and #2S are opened. Relay S restores and opens S1. Relay S1 restores and transfers #1A from ground at S1 to ground via the LEFT TEST JACK dial impulse springs. Relay A follows the pulses received from LEFT TEST JACK springs 1 and 2 and the repeated pulse is measured at RIGHT TEST JACK springs 7 and 8.