TIE LINE CONNECTION WITH E&M SIGNALLING Version 1.3

SIGNAL (state)	Dir.	Calling exchange		Called exchange		
		M	E	a1,b1	M	E
1. Idle						
2. Seizure	→	60 ms				
3. Seizure ack and w. f. first digit: a)state 8 after 7s b)unlimited	←			tone		
4. Dialling (First digit at least 800 ms after seizure. Interdigit time-out 7 s.)	→	pulse 60 ms pause off 40 ms pause off 600 ms				
5. Wait for answer a)state 8 or 9 after time out b)unlimited	←			tone		
6. Answer	←				60 ms	
7. State after answer						
8. Clear forward	→	600 ms				
9. Clear back	←				600 ms	
10.Extention busy: a) unlimited b) state 9 c) "a" followed by "b" after 7 s				tone		
11.Blocking	→	continuous				
12.Blocking	←				continuos	

Internal blocking for outgoing seizure after the end of "Clear forward", "Clear back", and "Blocking" - 1 s.

APPENDIX 4/FIG.4.2

INDUCTIVE TRUNK TYPE 1.

Version 1.4

SIGNAL (state)	Dir	Calling exchange a,b	Called exchange a,b
1. Idle	-	-	-
2. Seizure	→	20 60	The first negative pulse is ignored (may absent).
3. Seizure acknoledgement and waiting for first digit: a)state 8 after 7 s b)unlimited	←		tone
4. Dialling First digitat least 800 msafter seizure. Interdigit time-out 7 s	→	60 40 60 interdigit interval 800 ms	
5. Wait for answer a)state 8 or 9 after 5 minutes b)unlimited	←		tone
6. Answer	←		60
7. State after answer	-		
8. Clear forward	→		
9. Clear backward	←		
10.Extention busy: a)unlimited b) state 9 c) "a" followed by "b" after 7s	←		tone

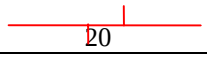
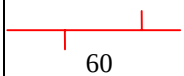
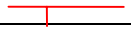
Internal blocking for outgoing seizure after the end of "Clear forward" and "Clear back" - 1 s.

APENDIX 4/FIG.4.3-1

INDUCTIVE TRUNK TYPE 2B.

Version 1.2

Part 1. Outgoing connection

SIGNAL (state)	Dir.	Calling exchange a,b	Called line a,b
1. Idle	-	-	-
2. Outgoing seizure	→		
3. Seizure ack. and waiting for first digit: a)state 8 after 7 s b)unlimited	←		tone
4. Dialling	→	60 40 60 	
5. Wait for answer a)state 8 after 20 s b)unlimited	←		tone
6. Answer	←		
7. State after answer	-		
8. Clear forward	→		
9. Clear back	←		
10.Extention busy: a) unlimited b) state 9 c) "a" followed by "b" after 7s	←		tone

Peak voltage >110 V/600 Ohm.
Internal blocking for outgoing seizure after the end of "Clear forward" and "Clear back" - 1 s.

Part 2. Incoming connection

SIGNAL (state)	Dir	Called exchange a ,b	Calling line a ,b
1. Idle	-	-	-
2. Seizure	◄	The first negative pulse is ignored (may absent).	20
3. Waiting for first digit state 11 after7 s			
4. Dialling	◄		60 40 60
5a. The first two received digits are code of incoming connectiond state 11 after7 s.	►	tone	
6. Dialling of the following digits	◄		60 40 60
7. Wait for answer: a)state 11after 20 s b)unlimited	►	tone	
8. Answer	►	60	
9. State after answer	-		
10. Clear forw	◄		
11. Clear back	►		
12.Extention busy: a)unlimited b) state 11 c) "a" followed by "b" after 7 s	►	tone	
5b.The first two received digits are not code of incom ing connection - waiting for state 10.			

Internal blocking for outgoing seizure after the end of "Clear forward" and "Clear back" - 1 s.

APPENDIX 4/FIG.4.4

OPERATOR'S TRUNK WITH E&M SIGNALLING.

Version 1.2

Signal (state)	*Direction*	*a1,b1* *a2,b2*	*M*	*E*
1. Outgoing call	→		500 ms	
2. Incoming call	←			>30 ms
3. Ring back control	→	Tone		
4. Blocking forward	→		continuous	>2500 ms
5. Blocking backward	←		>2500 ms	continuous

APPENDIX 4/FIG 4.5

OPERATOR'S LB TRUNK

Version 1.3

Signal (state)	*Direction*	*a,b*
1. Outgoing call	→	Signal 16 - 50 Hz, 110 V Code Morse (.)300 ms,(-)900 ms
2. Incoming call	←	Signal 16 - 50 Hz, 12 V min Code Morse any symbol,or pulse > 2.5 s. Other symbols are ignored
3. Ring back tone	→	Tone 425 Hz, cadence 1/4 s

The operator, subscriber or trunk seizes the LB trunk in outgoing direction by dialling of access code. After the seizure the originator sends the code Morse signal by dialling “3” for dot (.) and “9” for dash (-).

3 WIRE INCOMING TRUNK FROM CO A-29 TO RAILWAY PABX. OPERATOR CONNECTION.

Version 5.2

Signal (State)	Dir.	A-29			RAILWAY PABX		
		a	b	c	a	b	c
Idle				isol.	-1000	+1000	-800
Seizure	→			+60	-1000	+1000	-800
Seizure acknowledgement	←			+60	-1000	+1000	-1400
Dialling: pulse pause	→	+0/60 ms isol/40ms	-500 or isol.	+60	-1000	+1000	-1400
State between the end of last pulse and end of selection -180ms			-500 or isol.	+60	-1000	+1000	-1400
End of selection	←		-500	+60	+1000 400 ms	+1000	-1400
State after EOS (No ringing,, no RB tone)			-500 (first 200 ms only)	+60	-1000	+1000	-1400
Start ringing the railway operator (The PTT operator pushes the call button)	→		-500 (while the button is pressed)	+60	-1000	+1000	-1400
Ringing (Wait for answer)				+60	-1000	+1000	-1400
Answer	←			+60	+100k	-50k	-1400
B goes on hook (Clear back)	←			+60	-1000	+1000	-1400
Operator recall (The PTT operator pushes the call button)	→		-500 (while the button is pressed)	+60	-1000	+1000	-1400
Ringing (Wait for answer)				+60	-1000	+1000	-1400
Answer	←			+60	+100k	-50k	-1400
Release	→			isol.	+100k	-1000	-1400
Release acknowledgement (Idle)	←			isol.	-1000	+1000	-800
Blocking	←						isol.

Notes: 1. No-dial, interdigit, no-answer or busy time-outs are followed by the state Blocking" for 1 s.

2. "Release" may happen in any state and shall cause immediate breaking of the connection.

3 WIRE INCOMING TRUNK FROM CO A-29 TO RAILWAY PABX.
AUTOMATIC CONNECTION

Version 2.1

Signal (State)	Dir.	A-29			RAILWAY PABX		
		a	b	c	a	b	c
Idle				isol	-1000	+1000	-500
Seizure	→			+60	-1000	+1000	-500
Seizure acknowledgement	←			+60	-1000	+1000	-1100
Dialling: pulse pause	→	+0/60 ms isol/40ms		+60	-1000	+1000	-1100
State between the end of last pulse and end of selection - 180 ms				+60	-1000	+1000	-1100
End of selection	←			+60	+1000 400ms	-200k	-1100
Wait for answer or busy B	←	-4500		+60	+200k	-200k	-1100
Answer	←	-4500		+60	+1000	-200k	-1100
B goes on hook first (Clear back)	←			+60	+200k	-1000	-1100
Release (Clear back ack.)	→			isol	+200k	-1000	-1100
Release acknowledgement (Idle)	←			isol	-1000	+1000	-500
A goes on hook first	→	-440		+60	+1000	-200k	-1100
Malicious call activation time-out 5 s				+60	+1000	-200k	-1100
MCA TO end (B stays off hook)	←			+60	+1000	-1000	-1100
B goes on hook after end of MCA TO (Clear back)	←			+60	+200k	-1000	-1100
Release (Clear back ack.)	→			isol	+200k	-1000	-1100
Release acknowledgement (Idle)	←			isol	-1000	+1000	-500
A goes on hook first	→	-440		+60	+1000	-200k	-1100
Malicious call activation time-out 5 s				+60	+1000	-200k	-1100
B goes on hook before the end of MCA TO	←			+60	+200k	-1000	-1100
Release (Clear back ack.)	→			isol	+200k	-1000	-1100
Release acknowledgement (Idle)	←			isol	-1000	+1000	-500
A goes on hook first	→	-440		+60	+1000	-200k	-1100
Malicious call activation time-out 5 s				+60	+1000	-200k	-1100
B activates malicious call tracing before the end of MCA TO	←			+60	+1000	-200k	-1100
Tracing of the malicious call connection				+60	+1000	-200k	-1100
End of malicious call tracing	←			+60	+200k	-1000	-1100
Release	→			isol	+200k	-1000	-1100
Release acknowledgement (Idle)	←			isol	-1000	+1000	-500
Blocking	←						isol.

Notes: 1. No-dial, interdigit, no-answer, busy or clear back time-outs are followed by "Blocking" for 1 s.

2. "Release" may happen in any state and shall cause immediate breaking of the connection.

CO TRUNK /2-WIRES/.

Version 1.4.

Signal /state/	Dir.	BDZ exchange a , b	CO exchange a , b
1.Idle		No DC loop min 800 ms	DC supply
2. Seizure	→	DC loop	DC supply
3. Seizure ack.	←	DC loop	DC supply, dial tone
4. Dialling	→	No DC loop 60 ms DC loop 40 ms Interdigit 800 ms	DC supply
5. State after dialling		DC loop	DC supply, ring back tone
6a. Answer	←	DC loop	DC supply, voice
7a. Clear forward	→	No DC loop min 2 s	DC supply
8. Blocking	←		No DC supply
9. Incoming call	←	No DC loop	DC supply 25/50 Hz, 60 V, 1+9 s
6b. Answer	←	DC loop	Reverced DC supply
7b. Clear forward	→	No DC loop min 800 ms	Reverced DC supply

Notes:

1. States 6a7a or 6b7b take place depending on the type of the public axchange.
2. 16 kHz tax pulse may be received at begining of state 6 or state 7, depending on the type of the public exchange.
3. Some PTT switches operate with cadence 1+4s (state 9).

APPENDIX 4 / FIG.8

TIE LINE CONNECTION WITH EXTENDED E&M SIGNALLING

Version 1.1

SIGNAL	Dir.	Forward		Backward	
(state)		a1,b1	M	a2,b2	E
1. Idle					
2. Seizure	-->		60 ms on		
3. Proceed to send	<--				300 ms on
4. Sending digits	-->	DTMF			
5a. Extention free	<--			r.b. tone	200 ms on
5b. Extention busy	<--			busy tone	2 pulses 60 ms on 120 ms off
5c. Congestion	<--				3 pulses 60 ms on 120 ms off
6. Answer	<--				60 ms on
7. Clear forward	-->		600 ms on		
8. Clear back	<--				600 ms on
9. Blocking	<--				cont. on

Notes:

1. Internal blocking for outgoing seizure after the end of "Clear forward", "Clear back", and "Blocking" - 1 s.
2. Station identification tone is sent back after receiving the local area code of the called party.
3. Digits (state 4) include:
   - local area code of the calling party;
   - number of the calling party;
   - separation (*);
   - local area code of the called party;
   - number of the called party