

Eastern Region Universal Concentrator

Notes and circuit description.

The first version, pages 1-7 are the text as a scanned image as received from Richard Pike. Some paragraphs were crossed through.

Page 8 is a diagram of the extension card, although the same diagram appears as Sheet 22 of Drawing 100999.

The second version, pages 9-15 was prepared using optical character recognition. The crossed through paragraphs have been restored. Compare it with the scanned image version in case of query.

1. Keyboard General

~~1.1. Before any circuit card is removed the battery must be turned off.~~

1.2. All line termination units must be in position for the concentrator to function effectively, extracting any of the cards will make all subsequent circuits inoperative.

1.3. All circuit cards are chain-locked for speech and for the steady indication lamp. The circuits nearest to the operators unit have the highest priority

1.4. All line termination units can be strapped to suit any of the following circuits :-

Omnibus, C.B., Magneto, Auto and Control, C.B. slave.

Details for strapping these circuits can be found on Drawing No. 100999, Sheets 5 - 10 (inclusive).

~~1.5. For assistance with fault finding, an extension card is provided enabling the faulty unit to be bench tested with it jacked-out.~~

1.6. In the following circuit explanatory, all contacts which are not mentioned at the time of operation or release of their relay can be considered ineffective at that particular stage of operation.

1.7. The following Drawings to be considered in conjunction with this explanatory are :-

100999 sheet 4	-	Line Termination Unit
100999 sheet 12	-	Operators Unit
100999 sheet 14	-	Delay/Tone/Flash

1.8. Abbreviations :-

The following abbreviations will be used throughout these notes :-

Pos.	-	Positive pole of the battery.
Neg.	-	Negative pole of the battery.
I/C	-	Incoming.
O/G	-	Outgoing.
Op.	-	Operated.
Nor.	-	Normal i.e. unoperated.

1.9. A number before the relay or resistor designated refers to the resistance value of that component, e.g., 1000H signifies the 1000 ohm winding of relay H.

1.10. All references to the A operators circuit also applies to the B operator both on the line termination unit and on the operator's module.

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2. General Circuit Description - Line Termination Unit Strapped As C.B. Termination.

2.1. Call-In.

The distant party calls-in by lifting the hand set and providing a loop across the line via the transmission bridge. The line relay L operates over the transmission bridge loop. The only contact of L relay (L1) operates LA relay. Contact LA1 applies the tone output to line over 500L. Contact LA2 applies a flashing Pos. to the indication lights and also to BZ1.

2.2. Answer.

On operation of KSA the lines are transferred from the line relay to the speaking bridge. Disconnecting the line relay releases L1 contact which releases the LA relay. LA contacts return to normal and the flashing feed to the lights and the buzzer is cut off. The negative via KSA keeps the buzzer inoperative for further calls. A continuous Pos. is applied via KSA to the A lamp, thus indicating the A position is in use. The same Pos. that applies the steady light on the A position also operates the F (A) relay.

2.3. Cleardown.

Upon completion of the call, KSA is restored and the hand-set of the calling instrument is replaced. The circuit restores to normal and is now ready for the next call.

3. General Circuit Description - Line Termination Unit Strapped As Omnibus Termination

3.1. Call-In.

To call in, the distant party presses his ring button and applies a battery to the lines. If the line termination unit is strapped to receive this particular polarity applied to the lines, the line relay will operate to the particular code sent along the line. The L1 contact feeds the coding buzzer BZ2 and also energises LA relay. LA relay operating, holds over its own LA1 contact which is supplied with a negative lasting for ten seconds. The contact LA2 also applies a flashing Pos. to the indication lights for ten seconds. The contact LA3 applies a Neg. to the delay unit which then operates for ten seconds (i.e., DL relay Op. for ten seconds). The Zener diodes in the line relay path ensure that the termination on Omnibus circuits is high impedance to speech.

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3.2. Answer.

On answering the call KSA is thrown. This transfers the speech path from the line relay to the speaking bridge. KSA thrown also applies a Neg. to re-set the delay circuit KSA will apply a Pos. to steady the A position engaged light and also operate the speaking bridge relays F and KH/F.

3.3. Cleardown.

Upon completion of the call KSA is restored. The circuit restores to normal and is ready for the next call.

General Circuit Description - Line Termination Unit Strapped as Magneto Termination.

4.1. Call-In.

To call in the distant party transmits a 25 Hz signal to which the line relay operates. The line relay will only stay energised whilst the 25 Hz signal is applied to the lines. The contact L1 operates LA relay and the LA relay holds over its own LA3 contact.

Contact LA1 applies tone to line via 500L. Contact LA2 applies a flashing Pos. to the Indication lights and to BZ1.

4.2. Answer.

To answer the call KSA is thrown. This transfers the speech path from the line relay to the speaking bridge. Throwing KSA releases LA relay and stops the flashing lights and the buzzer. KSA also applies a Pos. to the A steady lamp and this same Pos. operates the speaking bridge relays F and KH/F.

4.3. Cleardown.

On completion of the call, KSA is restored. The circuit restores to normal and is ready for the next call.

5. General Circuit Description - Line Termination Unit Strapped As Auto Extension Termination

5.1. Call-In.

On receipt of an auto call the line relay operates to the ring current from the Exchange (25 Hz). The contact L1 operates the LA relay. The contact LA2 extends a direct Pos. to the indication lamps and to buzzer BZ1, which operate in unison with the ring current.

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5.2. Answer.

To answer the call KSA is thrown. This transfers the speech path from the line relay to the operators circuit, which loops the line. KSA also applies a Pos. to the A steady lamp, but no supply is required to the speaking bridge relays.

5.3. Cleardown.

Upon completion of the call KSA is restored. The circuit restores to normal and is ready for the next call.

6. General Circuit Description - Line Termination Unit Strapped To Receive Control.

6.1. Call-In.

To call-in, the controller sends out a train of pulses and operates a way-station unit. This unit, upon receiving the correct code extends a Neg. along the way station wire (WS) and operates the LA relay, and BZ2.

Tone back is provided by the tone winding of L. relay.

6.2. Answer.

To answer the call KSA is thrown. This transfers the speech circuit from the line relay to the speaking bridge. KSA also applies a Pos. to steady the A lamp and operates relays F and KH/F.

6.3. Cleardown.

Upon completion of the call KSA is restored. The circuit restores to normal and is ready for the next call.

7. Additional Line Termination Unit For Use In Special Circumstances Described Below.

7.1. Where it is proposed to run a direct line between a universal concentrator and a universal/standard/ other type concentrator the usual magneto - magneto working will normally be employed. If, however, no magneto termination unit is available at the distant concentrator, then a special working has to be employed. This is the C.B. MASTER - C.B. SLAVE working. The termination at the distant concentrator (termed C.B. MASTER end) is a C.B. termination using an F ring for call out. The line termination unit at the universal concentrator (termed C.B. SLAVE end) is strapped as a C.B. Slave termination with F ring (Magneto) in and loop call out.

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8. General Circuit Description - Line Termination Unit
Strapped as C.B. Slave Termination.

8.1. Call-In.

To call in the distant party transmits a 25 Hz signal to which the line relay operates. The line relay will only stay energised whilst the 25 Hz signal is applied to the lines. The contact L1 operates LA relay and the LA relay holds over its own LA3 contact.

Contact LA1 applies tone to line via 500L. Contact LA2 applies a flashing Pos. to the indication lights and to BZ1.

8.2. Answer.

To answer the call KSA is thrown. This transfers the speech path from the line relay to the speaking bridge. Throwing KSA releases LA relay and stops the flashing lights and the buzzer. KSA also applies a Pos. to the A steady lamp, but no supply is required to the speaking bridge relays.

8.3. Cleardown.

Upon completion of the call KSA is restored. The circuit restores to normal and is ready for the next call.

8.4. Call-Out.

When KSA (or KSB) is thrown the speak bridge provides line loop. No other keys should be pressed.

9. Operators Unit Explanatory.

9.1. The Speech Circuit.

The speech lines are brought into the operators unit via T(A)PK and R(A)PK on the A position, and thence via the A ring position key and the A dial key to the operators circuit. To give the correct conditions for speech, either local battery, local battery and battery to lines, or exchange battery only is required. This is obtained by operation of either KH/F and/or F relays as below :-

- (1) Local battery but no battery to line F & KH/F
Op. (Control Omnibus Magneto).
- (2) Local battery and battery to line KH/F Nor. F.
Op. (CB).
- (3) Exchange battery only F & KH/F Nor. (Auto).

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The KH/F & F relays are situated on the plug-in card in this module and each relay is operated by an individual wire from the appropriate Line Termination Unit.

9.2. The Ring Circuit.

To ring out the operator must press the appropriate ring position key (A or B). This directs the output from the ring buttons to the A or B positions on the Line Termination Units. The operator then pushes the ring key (A, B, C, D or F) as required, thus applying ringing conditions to line. After ringing the operator must restore the ring position key to normal, restoring the line connection to the operators circuit.

9.3. Dial Circuit.

To dial out, the operator, having thrown the circuit key on the Line Termination Unit and received dial tone, must then throw the dial position key (Red) to the A or B position. This inserts the dial into the operators circuit loop and impulsing through a full loop is achieved by use of the dial-off-normal springs. The dial key should be restored to the normal position when dialling is completed.

9.4. Tone/Flash.

This is an astable multivibrator continuously oscillating at 1Hz approx.

The outputs from each collector of this multivibrator are differentiated and applied to the gates of the Thyristors. Each Thyristor when conducting is turned off by the 10 uf capacitor across the cathodes. The Thyristors switch the flashing lights and also apply an interrupted feed to operate another astable multivibrator working at approximately 1 KHz. This multivibrator provides the tone output back to the line relay 500 ohm winding on the Line Termination Unit card.

The tone/flash is kept running while any call is being answered via the feed along the re-set delay wire and diode D1, this enabling any other incoming call to be indicated.

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9.5. Delay Circuit.

The delay circuit mounted on the same card as the tone/flash is based on the use of the monostable multivibrator. The delay circuit, when triggered will operate the DL relay for 10 seconds, this giving a delayed flashing indication for omnibus circuits to indicate the calling circuit.

In its steady state TR8 is normally conducting and DL relay is de-energised, when the trigger pulse is applied, TR8 is switched off and TR9 and TR10 are turned on and held on until capacitor C9 has discharged, when the circuit will revert to its original steady state. If the call is answered a pulse applied down the re-set delay wire will turn off TR9 and hence TR10 and the circuit will again revert back to its original state, ready for another call.

E.R. Universal Concentrator - Notes and circuit description

1. Keyboard General

- 1.1. Before any circuit card is removed the battery must be turned off.
- 1.2. All line termination units must be in position for the concentrator to function effectively, extracting any of the cards will make all subsequent circuits inoperative.
- 1.3. All circuit cards are chain-looked for speech and for the steady indication lamp. The circuits nearest to the operators unit have the highest priority
- 1.4. All line termination units can be strapped to suit any of the following circuits :-

Omnibus, C.B., Magneto, Auto and Control, C.B. slave.

Details for strapping these circuits can be found on Drawing No. 100999, Sheets 5 - 10 (inclusive).
- 1.5. For assistance with fault finding, an extension card is provided, enabling the faulty unit to be bench tested with it jacked out.
- 1.6. In the following circuit explanatory, all contacts which are not mentioned at the time of operation or release of their relay can be considered ineffective at that particular stage of operation.
- 1.7. The following Drawings to be considered in conjunction with this explanatory are :-

100999 sheet 4	Line Termination Unit
100999 sheet 12	Operators Unit
100999 sheet 14	Delay/Tone/Flash
- 1.8. Abbreviations

The following abbreviations will be used throughout these notes :-

Pos.	Positive pole of the battery.
Neg.	Negative pole of the battery.
I/C	Incoming.
O/G	Outgoing.
Op.	Operated.
Nor.	Normal i.e. unoperated.

- 1.9. A number before the relay or resistor designated refers to the resistance value of that component, e.g., 1000H signifies the 1000 ohm winding of relay H.
- 1.10. All references to the A operators circuit also applies to the B operator both on the line termination unit and on the operator's module.

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2. General Circuit Description - Line Termination Unit Strapped As C.B. Termination.

2.1. Call-In.

The distant party calls-in by lifting the hand set and providing a loop across the line via the transmission bridge. The line relay L operates over the transmission bridge loop. The only contact of L relay (L1) operates LA relay. Contact LA1 applies the tone output to line ^{over} 500L. Contact LA2 applies a flashing Pos. to the indication lights and also to BZ1.

2.2. Answer.

On operation of KSA the lines are transferred from the line relay to the speaking bridge. Disconnecting the line relay releases L1 contact which releases the LA relay. LA contacts return to normal and the flashing feed to the lights and the buzzer is out off. The negative via KSA keeps the buzzer inoperative for further calls. A continuous Pos. is applied via KSA to the A lamp, thus indicating the A position is in use. The same Pos. that applies the steady light on the A position also operates the F (A) relay.

2.3. Cleardown.

Upon completion of the call, KSA is restored and the hand-set of the calling instrument is replaced. The circuit restores to normal and is now ready for the next call.

3. General Circuit Description - Line Termination Unit Strapped As Omnibus Termination

3.1. Call-In.

To call in, the distant party presses his ring button and applies a battery to the lines. If the line termination unit is strapped to receive this particular polarity applied to the lines, the line relay will operate to the particular code sent along the line. The L1 contact feeds the coding buzzer BZ2 and also energises LA relay. LA relay operating, holds over its own LA1 contact which is supplied with a negative lasting for ten seconds. The contact LA2 also applies a flashing Pos. to the indication lights for ten seconds. The contact LA3 applies a Neg. to the delay unit which then operates for ten seconds (i.e., DL relay Op. for ten seconds). The Zener diodes in the line relay path ensure that the termination on Omnibus circuits is high impedance to speech.

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3.2. Answer.

On answering the call KSA is thrown. This transfers the speech path from the line relay to the speaking bridge. KSA thrown also applies a Beg. to re-set the delay circuit KSA will apply a Pos. to steady the A position engaged light and also operate the speaking bridge relays 7 and KH/F.

3.3. Cleardown.

Upon completion of the call KBA is restored. The circuit restores to normal and is ready for the next call.

4. General Circuit Description - Line Termination Unit Strapped as Magneto Termination,

4.1 Call-In.

To call in the distant party transmits a 25 Hz signal to which the line relay operates. The line relay will only stay energised whilst the 25 Hz signal is applied to the lines. The contact L1 operates LA relay and the LA relay holds over its own LA3 contact.

Contact LA1 applies tone to line via 500L. Contact LA2 applies a flashing Po. to the Indication lights and to BZ1.

4.2. Answer.

To answer the call KSA is thrown. This transfers the speech path from the line relay to the speaking bridge. Throwing KSA releases LA relay and stops the flashing lights and the buzzer. KSA also applies a Pos. to the A steady lamp and this same Pos. operates the speaking bridge relays F and KE/F.

4.3. Cleardown.

On completion of the call, KSA is restored. The circuit restores to normal and is ready for the next call.

5. General Circuit Description - Line Termination Unit Strapped As Auto Extension Termination

5.1. Call-In.

On receipt of an auto call the line relay operates to the ring current from the Exchange (25 Hz). The contact L1 operates the LA relay. The contact LA2 extends a direct Po. to the indication lamps and to buzzer BZ1, which operate in unison with the ring current.

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5.2. Answer.

To answer the call KSA is thrown. This transfers the speech path from the line relay to the operators circuit, which loops the line. KSA also applies a Pos. to the A steady lamp, but no supply is required to the speaking bridge relays.

5.3. Cleardown.

Upon completion of the call KSA is restored. The circuit restores to normal and is ready for the next call.

6. General Circuit Description - Line Termination Unit Strapped To Receive Control.

6.1. Call-In.

To call-in, the controller sends out a train of pulses and operates a way-station unit. This unit, upon receiving the correct code extends a Neg. along the way station wire (WS) and operates the LA relay, and BZ2.

Tone back is provided by the tone winding of L. relay.

6.2. Answer.

To answer the call KSA is thrown. This transfers the speech circuit from the line relay to the speaking bridge. SSA also applies a Pos. to steady the A lamp and operates relays F and KH/F.

6.3. Cleardown.

Upon completion of the call KSA is restored. The circuit restores to normal and is ready for the next call.

7. Additional Line Termination Unit For Use In Special Circumstances Described Below.

7.1. Where it is proposed to run a direct line between a universal concentrator and a universal/standard/ other type concentrator the usual magneto - magneto working will normally be employed. If, however, no magneto termination unit is available at the distant concentrator, then a special working has to be employed. This is the C.B. MASTER - C.B. SLAVE working. The termination at the distant concentrator (termed C.B. MASTER end) is a C.B. termination using an F ring for call out. The line termination unit at the universal concentrator (termed C.B. SLAVE end) is strapped as a C.B. Slave termination with F ring (Magneto) in and loop call out.

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8. General Circuit Description - Line Termination Unit
Strapped as C.B. Slave Termination.

8.1. call-in.

To call in the distant party transmits a 25 Hz signal to which the line relay operates. The line relay will only stay energised whilst the 25 Hz signal is applied to the **lines**. The contact L1 operates LA relay and the LA relay holds over its own LA3 contact.

Contact LA1 applies tone to line via 500L. Contact LA2 applies a flashing Pos. to the indication lights and to BZ1.

8.2. Answer.

To answer the call KSA is thrown. This transfers the speech path from the line relay to the speaking bridge. Throwing KSA releases LA relay and stops the flashing lights and the buzzer. KSA also applies a Pos. to the A steady lamp, but no supply is required to the speaking bridge relays.

8.3. Cleardown.

Upon completion of the call KSA is restored. The circuit restores to normal and is ready for the next call.

8.4. Call-Out.

When KSA (or KSB) is thrown the speak bridge provides line loop. No other keys should be pressed.

9. Operators Unit Explanatory.

9.1. The Speech Circuit.

The speech lines are brought into the operators unit via T(A)PK and R(A)PK on the A position, and thence via the A ring position key and the A dial key to the operators circuit. To give the correct conditions for speech, either local battery, local battery and battery to lines, or exchange battery only is required. This is obtained by operation of either KH/F and/or F relays as below :-

- (1) Local battery but no battery to line F & KH/F Op. (Control Omnibus Magneto).
- (2) Local battery and battery to line KH/F Nor. F. Op. (CB).
- (3) Exchange battery only F & KH/F Nor. (Auto).

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The KH/F & F relays are situated on the plug-in card in this module and each relay is operated by an individual wire from the appropriate Line Termination Unit.

9.2. The Ring Circuit.

To ring out the operator must press the appropriate ring position key (A or B). This directs the output from the ring buttons to the A or B positions on the Line Termination Units. The operator then pushes the ring key (A, B, C, D or F) as required, thus applying ringing conditions to line. After ringing the operator must restore the ring position key to normal, restoring the line connection to the operators circuit.

9.3. Dial Circuit.

To dial out, the operator, having thrown the circuit key on the Line Termination Unit and received dial tone, must then throw the dial position key (Red) to the A or B position. This inserts the dial into the operators circuit loop and impulsing through a full loop is achieved by use of the dial-off-normal springs. The dial key should be restored to the normal position when dialling is completed.

9.4. Tone/Flash.

This is an astable multivibrator continuously oscillating at 1Hz approx.

The outputs from each collector of this multivibrator are differentiated and applied to the gates of the Thyristors. Each Thyristor when conducting is turned off by the 10 of capacitor across the cathodes. The Thyristors switch the flashing lights and also apply an interrupted feed to operate another astable multivibrator working at approximately 1 KHz. This multivibrator provides the tone output back to the line relay 500 ohm winding on the Line Termination Unit card.

The tone/flash is kept running while any call is being answered via the feed along the re-set delay wire and diode D1, this enabling any other incoming call to be indicated.

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9.5. Delay Circuit.

The delay circuit mounted on the same card as the tone/ flash is based on the use of the monostable multivibrator. The delay circuit when triggered will operate the DL relay for 10 seconds, this giving a delayed flashing indication for omnibus circuits to indicate the calling circuit.

In its steady state TR8 is normally conducting and DL relay is de-energised, when the trigger pulse is applied, TR8 is switched off and TR9 and TR10 are turned on and held on until capacitor C9 has discharged, when the circuit will revert to its original steady state. If the call is answered a pulse applied down the re-set delay wire will turn off TR9 and hence TR10 and the circuit will again revert back to its original state, ready for another call.