ASSOCIATION OF AMERICAN RAILROADS
COMMUNICATION AND SIGNAL SECTION

TYPICAL CIRCUITS REPRESENTING CURRENT PRACTICE FOR RAILWAY SIGNALING

CONTENTS

1971

These plans represent schemes used by some Member Roads; however, there are other variations used which function equally well. It is to be understood they are in no sense working drawings. In applying any of the principles shown the designer should take into account local conditions and type of equipment to be used.

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1967

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TYPICAL CIRCUITS REPRESENTING CURRENT PRACTICE FOR RAILWAY SIGNALING

1967

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ADDENDUM TO A.A.R. SIG.SEC. 8000A

TYPICAL THREE AND FOUR-ASPECT COLOR LIGHT AUTOMATIC SIGNAL CIRCUITS.

These circuits make use of the retained neutral polarized relay when pole changing does not open its neutral contacts and thus avoids momentary change of aspects during pole change periods.

Double break and shunt of the HD line circuit over contacts of the track relays are shown, illustrating a method of checking the shunt jumper. To prevent a momentary flash of the clear aspect when a short high-speed train vacates the block, the positive energy for the HD line circuit is selected through a front contact of the track relay in approach to the signal.

Full-block approach lighting is provided by use of an AER relay in series with the HD line circuit. The AER relay is slow release to bridge the momentary opening of its control during the pole change of the HD line circuit. Light out protection is not shown and should be added as required.

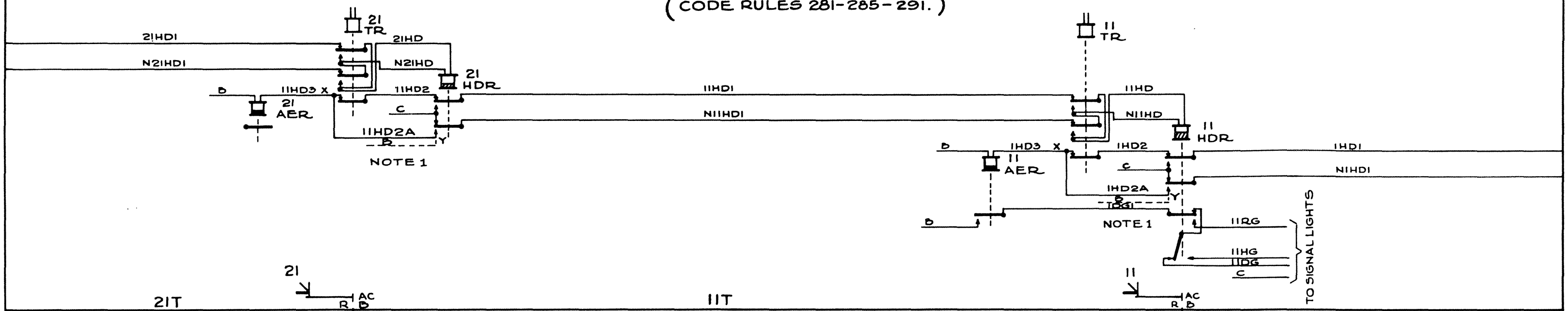
In the three-block signal circuit the DR relays are slow release to avoid an undesirable display of an approach medium aspect, as the signal changes from clear to stop with the passing of a train.

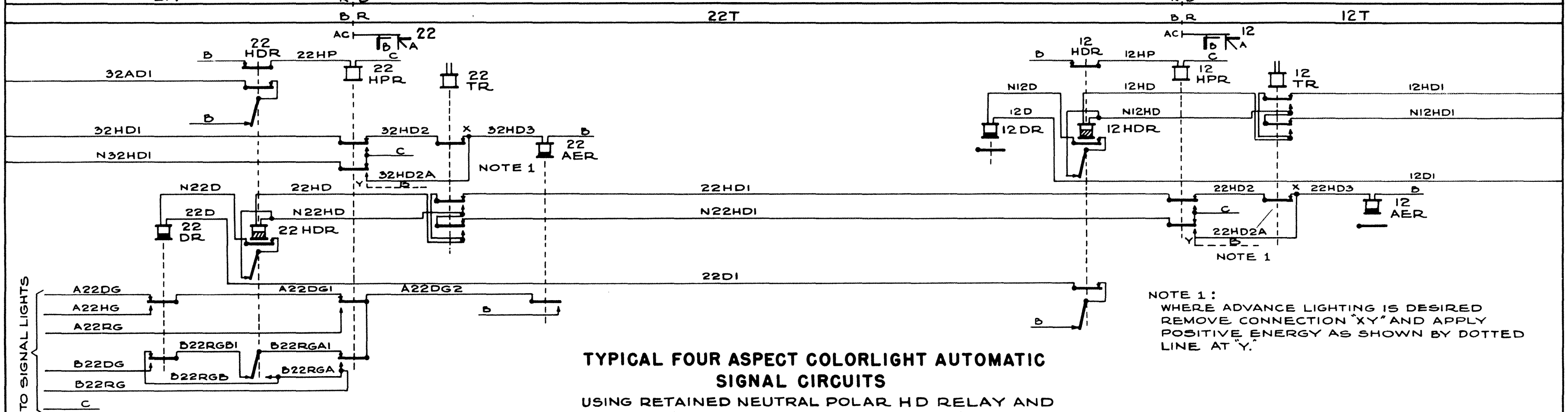
The 22D relay control wires are not shunted when energy is removed by 12HD relay. The shunt is omitted because there is a possibility of stepping up a signal indication from approach medium to clear in case of a break in N22HD wire.

TYPICAL THREE ASPECT COLORLIGHT AUTOMATIC SIGNAL CIRCUITS

USING RETAINED NEUTRAL POLAR LINE RELAY

(CODE RULES 281-285-291.)





NOTE 1:
WHERE ADVANCE LIGHTING IS DESIRED REMOVE CONNECTION "XY" AND APPLY POSITIVE ENERGY AS SHOWN BY DOTTED LINE AT "Y."

TYPICAL FOUR ASPECT COLORLIGHT AUTOMATIC SIGNAL CIRCUITS

USING RETAINED NEUTRAL POLAR HD RELAY AND NEUTRAL SLOW RELEASE D RELAY

(CODE RULES 281-282-285-291.)

SEPT. 1947

AAR
SIG. SEC.
8000A

ADDENDUM TO AAR SIGNAL 8000B

TYPICAL THREE AND FOUR-ASPECT COLOR LIGHT AUTOMATIC SIGNAL CIRCUITS.

These circuits make use of the retained neutral polarized line relay which when pole changing does not open its neutral contacts and thus avoids momentary change of aspects during pole change periods.

Double break of the HD line circuit through contacts of the track relays are shown. To prevent a momentary flash of a clear aspect when a short high-speed train vacates a block, positive energy for the HD line circuit is selected through a front contact of the track relay in advance of the signal. If protection against joint hopping is required, slow pick up retained neutral HDR can be used.

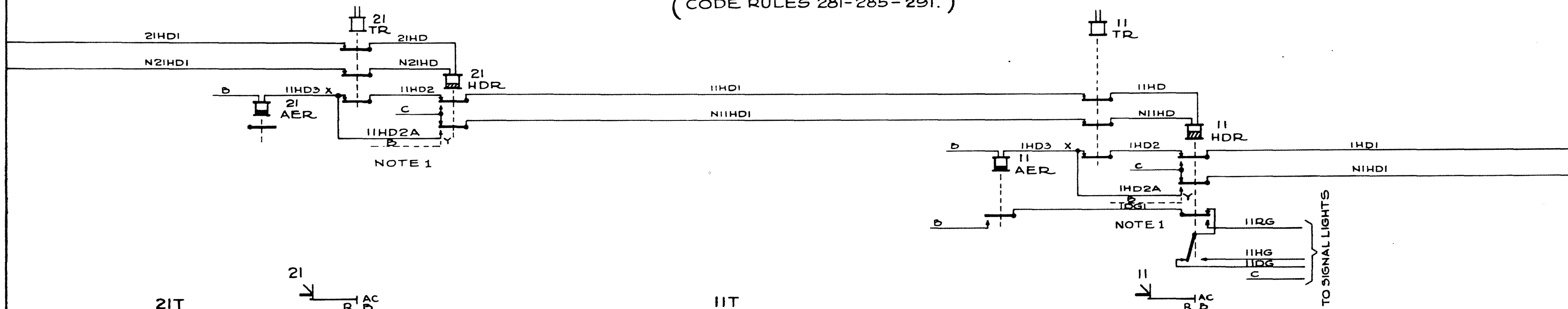
Full-block approach lighting is provided by use of an AER in series with the HD line circuit. The AER is slow release to bridge the momentary opening of its control during the pole change of the HD line circuit, Light out protection is not shown and should be added as required.

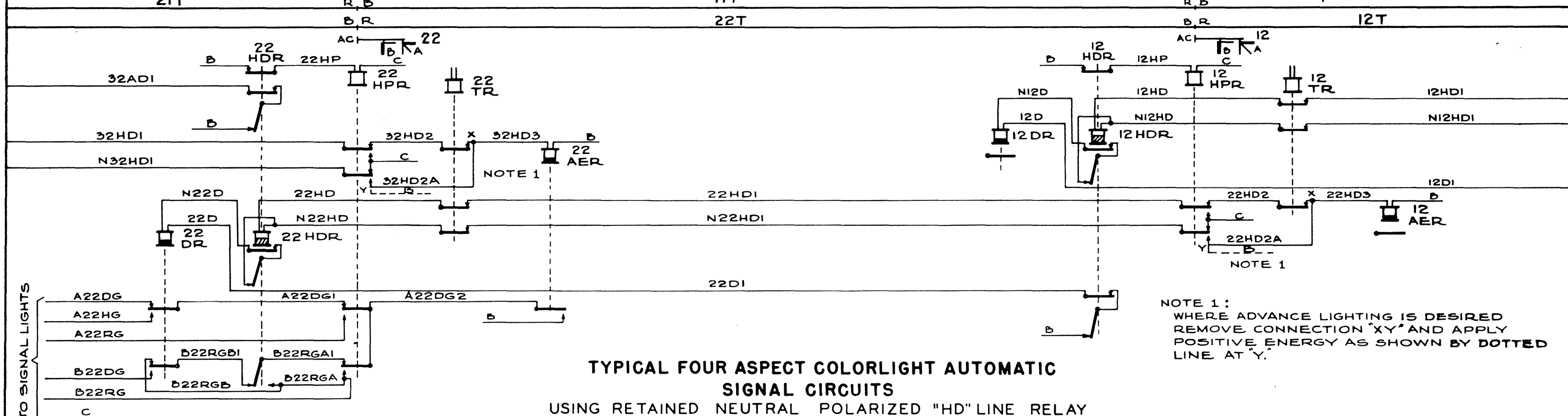
In the four-aspect signal circuit the DR is slow release to avoid a momentary display of an approach medium aspect, as the signal changes from clear to stop with the passing of a train.

TYPICAL THREE ASPECT COLORLIGHT AUTOMATIC SIGNAL CIRCUITS

USING RETAINED NEUTRAL POLARIZED LINE RELAY

(CODE RULES 281-285-291.)





TYPICAL FOUR ASPECT COLORLIGHT AUTOMATIC SIGNAL CIRCUITS

USING RETAINED NEUTRAL POLARIZED "HD" LINE RELAY AND NEUTRAL SLOW RELEASE "D" RELAY

(CODE RULES 281-282-285-291.)

NOTE 1:
WHERE ADVANCE LIGHTING IS DESIRED REMOVE CONNECTION "XY" AND APPLY POSITIVE ENERGY AS SHOWN BY DOTTED LINE AT "Y."

OCT. 1967	SEPT. 1947	AAR SIGNAL 8000B

ADDENDUM TO A.A.R. SIG.SEC. 8001A

TYPICAL THREE AND FOUR-ASPECT COLOR LIGHT AUTOMATIC SIGNAL CIRCUITS.

These circuits make use of the biased neutral line relay in combination with a non-biased neutral relay. A full-wave rectifier is shown in the control of the HR relay causing energy to flow through the relay in the same direction with either polarity of line voltage. This rectifier also causes the HR relay to be sufficiently slow in releasing to avoid a momentary change in aspect during the open circuit pole change period.

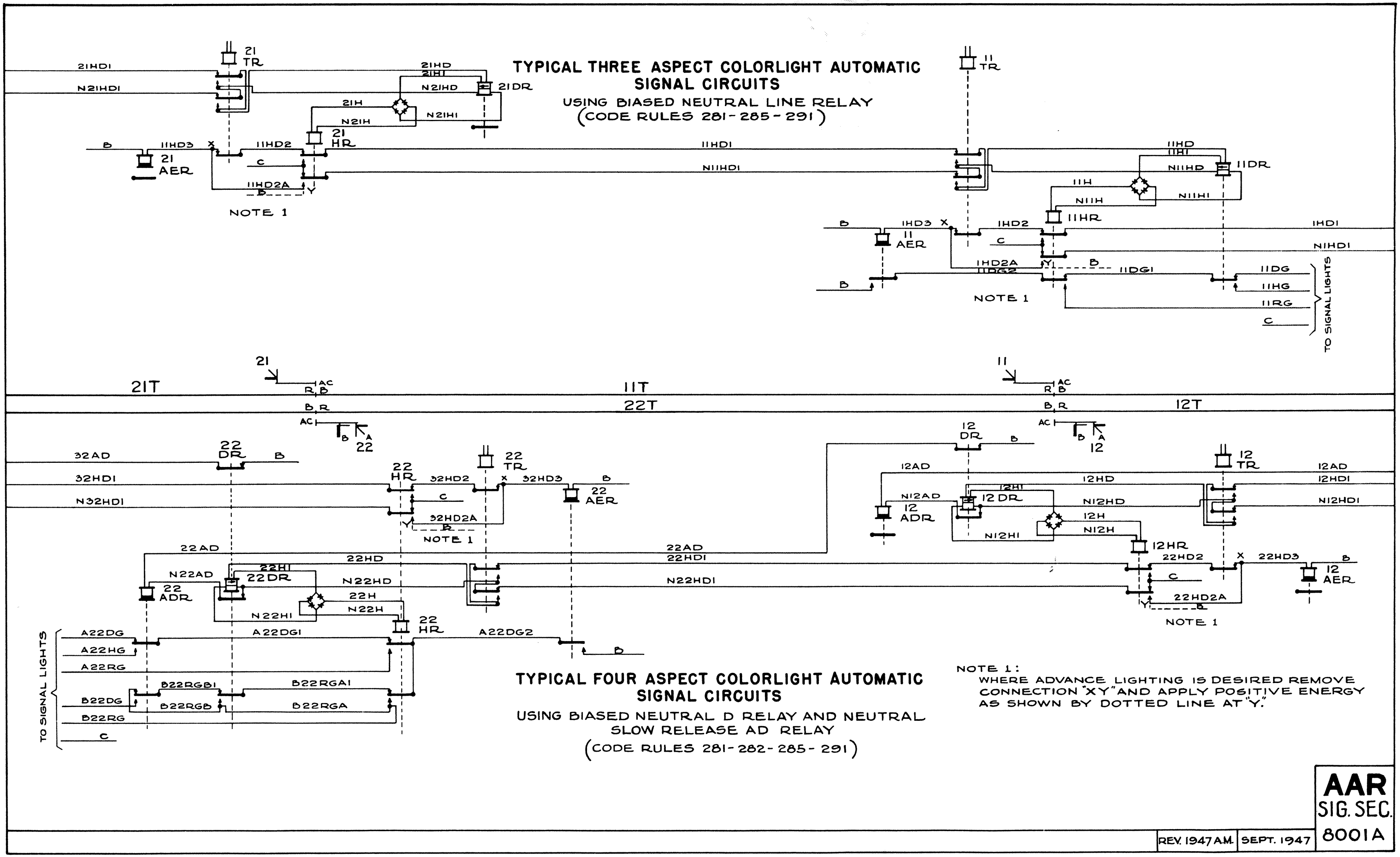
This circuit shows double break and shunt of the HD line circuit over contacts of the track relays, illustrating a method of checking the shunt jumper. To prevent a momentary flash of the clear aspect when a short high-speed train vacates the block, the positive energy for the HD line circuit is selected through a front contact of the track relay in advance of the signal.

Full-block approach lighting is provided by use of an AER relay in series with the HD line circuit. The AER relay is slow release to bridge the momentary opening of its control during the pole change of the HD line circuit. Light out protection is not shown and should be added as required.

The rectifier is connected to the line between the two coils of the biased neutral relay to eliminate direct exposure of the rectifier to lightning, and also to prevent induced a.c. energy, if present in the HD line circuit, from falsely energizing the HR relay.

In the four-aspect signal circuit the ADR relays are slow release to avoid the display of a momentary aspect other than stop, when a train passes the signal.

The shunt is omitted from the 22ADR relay control wire when the 12DR relay is de-energized, due to the possibility of obtaining a less restrictive indication with a break in the N22HD wire.


TYPICAL THREE ASPECT COLORLIGHT AUTOMATIC SIGNAL CIRCUITS
USING BIASED NEUTRAL LINE RELAY
(CODE RULES 281-285-291)
21 TR
21 DR
21 HR
21 AER
11 TR
11 DR
11 HR
11 AER
NOTE 1
TO SIGNAL LIGHTS
21T
11T
22T
12T
22 DR
22 HR
22 TR
22 AER
22 ADR
12 DR
12 TR
12 ADR
12 HR
12 AER
TO SIGNAL LIGHTS
TYPICAL FOUR ASPECT COLORLIGHT AUTOMATIC SIGNAL CIRCUITS
USING BIASED NEUTRAL D RELAY AND NEUTRAL SLOW RELEASE AD RELAY
(CODE RULES 281-282-285-291)
NOTE 1:
WHERE ADVANCE LIGHTING IS DESIRED REMOVE CONNECTION "XY" AND APPLY POSITIVE ENERGY AS SHOWN BY DOTTED LINE AT "Y."
AAR
SIG. SEC.
8001A
REV. 1947 A.M.
SEPT. 1947

<u>ADDENDUM TO AAR SIGNAL 8001B</u>

TYPICAL THREE AND FOUR-ASPECT COLOR LIGHT AUTOMATIC SIGNAL CIRCUITS.

These circuits make use of the biased neutral line relay in combination with a non-biased neutral relay. A full-wave rectifier is shown in the control of the HR causing energy to flow through the relay in the same direction with either polarity of line voltage. This rectifier also causes the HR to be sufficiently slow in releasing to avoid a momentary change in aspect during the open circuit pole change period.

This circuit shows double break of the HD line circuit through contacts of the track relay. To prevent a momentary flash of a clear aspect when a short high-speed train vacates the block, positive energy for the HD line circuit is selected through a front contact of the track relay in advance of the signal.

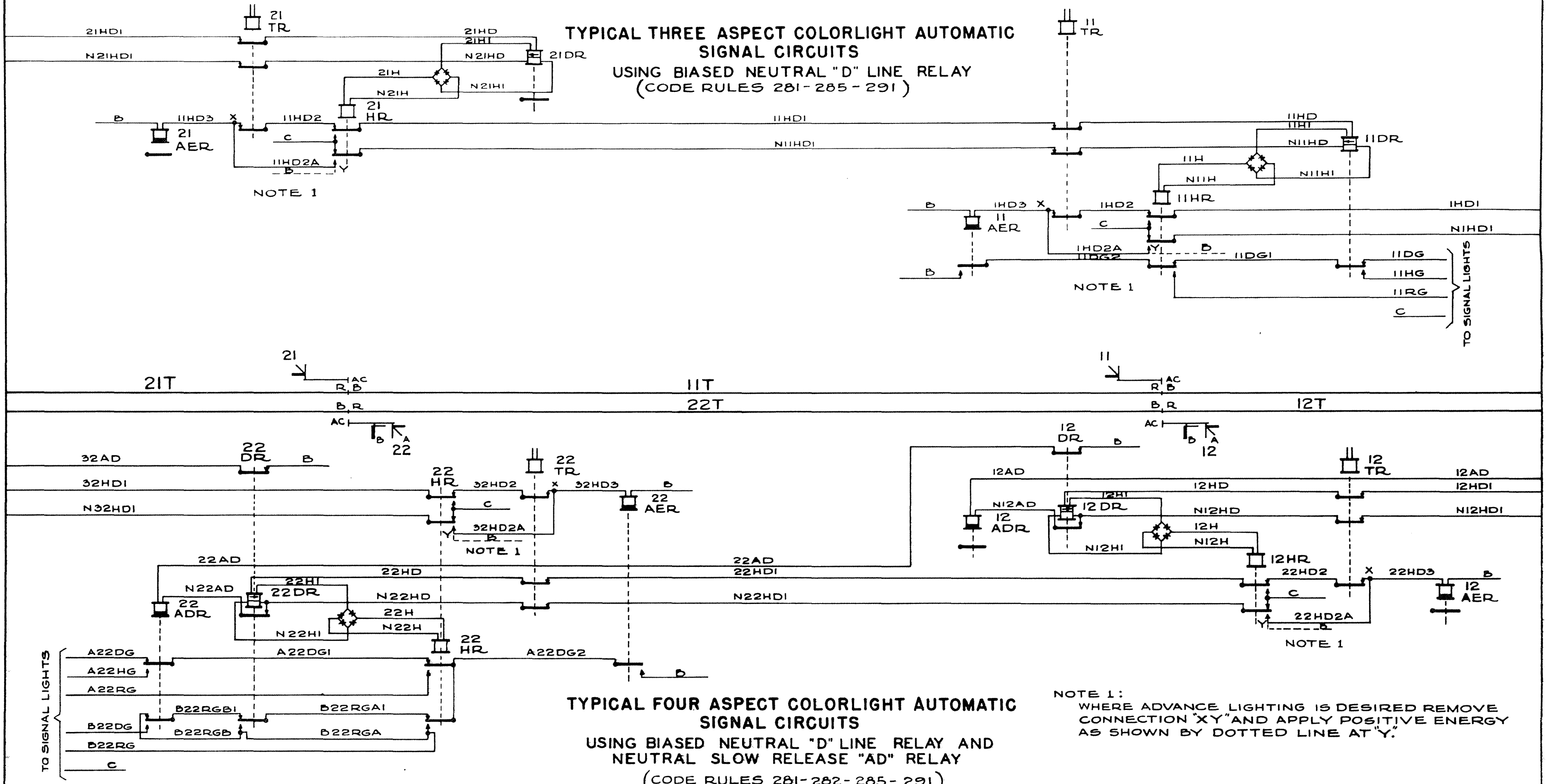
Full-block approach lighting is provided by use of an AER in series with the HD line circuit. The AER is slow release to bridge the momentary opening of its control during the pole change of the HD line circuit. Light out protection is not shown and should be added as required.

The rectifier is connected to the line between the two coils of the biased neutral relay to eliminate direct exposure of the rectifier to lightning, and also to prevent induced a-c energy, if present in the HD line circuit, from falsely energizing the HR.

In the four-aspect signal circuit the ADR is slow release to avoid the display of a momentary aspect other than stop, when a train passes the signal.

TYPICAL THREE ASPECT COLORLIGHT AUTOMATIC SIGNAL CIRCUITS

USING BIASED NEUTRAL "D" LINE RELAY
(CODE RULES 281-285-291)



TYPICAL FOUR ASPECT COLORLIGHT AUTOMATIC SIGNAL CIRCUITS

USING BIASED NEUTRAL "D" LINE RELAY AND
NEUTRAL SLOW RELEASE "AD" RELAY
(CODE RULES 281-282-285-291)

NOTE 1:
WHERE ADVANCE LIGHTING IS DESIRED REMOVE CONNECTION "XY" AND APPLY POSITIVE ENERGY AS SHOWN BY DOTTED LINE AT "Y."

OCT. 1967	REV. 1947 A.M.	SEPT. 1947	AAR SIGNAL 8001B

ADDENDUM TO A.A.R. SIG.SEC. 8002A

TYPICAL THREE AND FOUR-ASPECT COLOR LIGHT AUTOMATIC SIGNAL CIRCUITS.

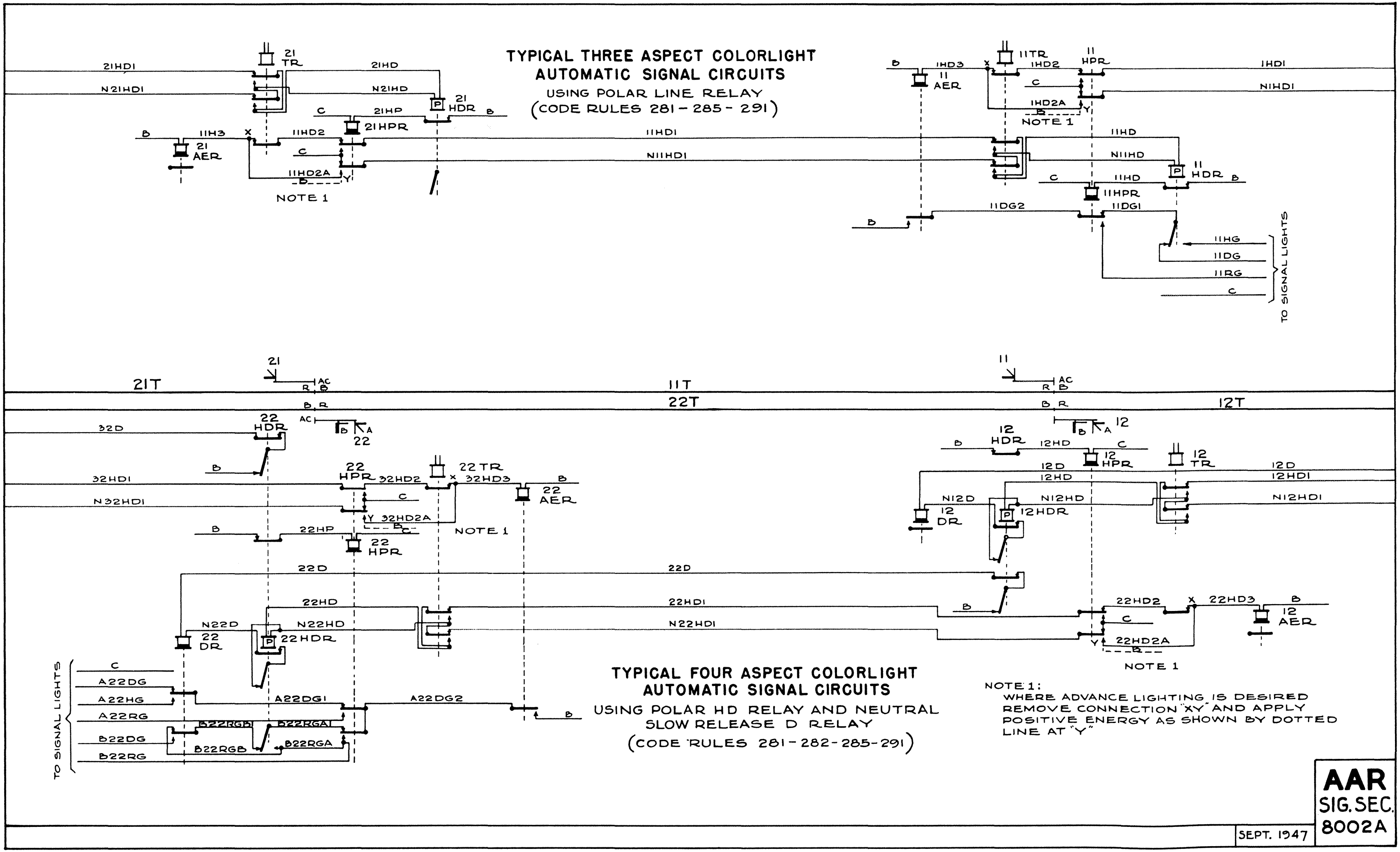
These circuits make use of the ordinary acting polarized relay in combination with a slow release neutral repeater relay. The relay repeating the neutral contact of the HDR relay must be sufficiently slow release in releasing to bridge the maximum open-circuit interval during the pole changing period, thus avoiding a momentary change in aspect.

This circuit shows double break and shunt of the HD line circuit over contacts of the track relays, illustrating a method of checking the shunt jumper. To prevent a momentary flash of the clear aspect when a short high-speed train vacates the block, the positive energy for the HD line circuit is selected through a front contact of the track relay in advance of the signal.

Full-block approach lighting is provided by use of an AER relay in series with the HD line circuit. The AER relay is slow release to bridge the momentary opening of its control during the pole change of the HD line circuit. Light out protection is not shown and should be added as required.

In the four-aspect signal circuit the DR relays are slow release to avoid the display of a momentary aspect other than stop, when a train passes the signal.

The shunt is omitted from the 22DR relay control wire when the 12HDR relay is de-energized, due to the possibility of obtaining a less restrictive indication with a break in the N22HD wire.


TYPICAL THREE ASPECT COLORLIGHT
AUTOMATIC SIGNAL CIRCUITS
USING POLAR LINE RELAY
(CODE RULES 281 - 285 - 291)
TYPICAL FOUR ASPECT COLORLIGHT
AUTOMATIC SIGNAL CIRCUITS
USING POLAR HD RELAY AND NEUTRAL
SLOW RELEASE D RELAY
(CODE RULES 281 - 282 - 285 - 291)
NOTE 1:
WHERE ADVANCE LIGHTING IS DESIRED
REMOVE CONNECTION "XY" AND APPLY
POSITIVE ENERGY AS SHOWN BY DOTTED
LINE AT "Y"
TO SIGNAL LIGHTS
AAR
SIG. SEC.
8002A
SEPT. 1947

ADDENDUM TO AAR SIGNAL 8002B

TYPICAL THREE AND FOUR-ASPECT COLOR LIGHT AUTOMATIC SIGNAL CIRCUITS.

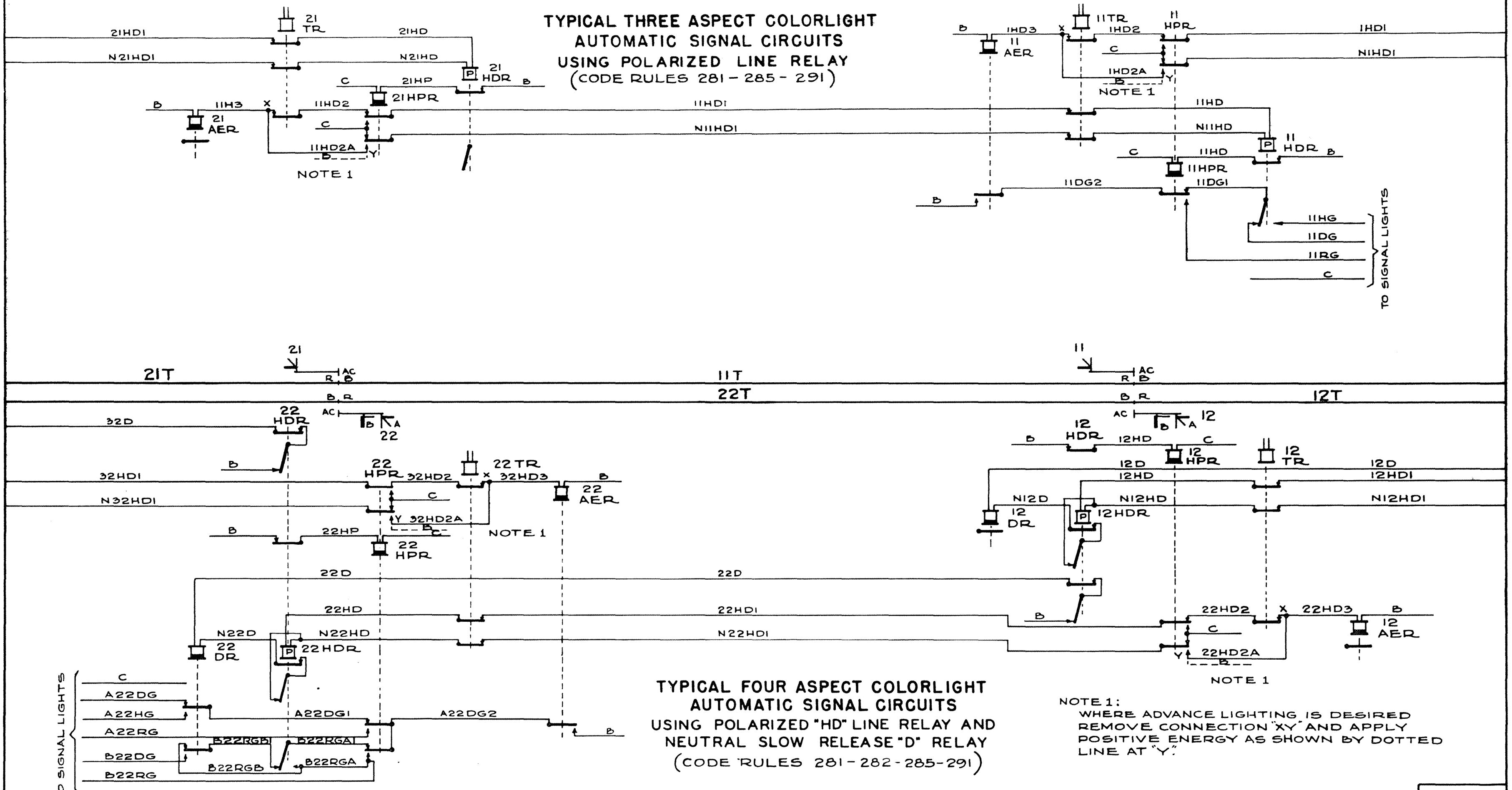
These circuits make use of the ordinary acting polarized line relay in combination with a slow release neutral repeater relay. The relay repeating the neutral contact of the HDR must be sufficiently slow release to bridge the maximum open-circuit interval during the pole changing period, thus avoiding a momentary change in aspect.

This circuit shows double break of the HD line circuit through contacts of the track relays. To prevent a momentary flash of a clear aspect when a short high-speed train vacates a block, positive energy for the HD line circuit is selected through a front contact of the track relay in advance of the signal. If protection against joint hopping is required, slow pick up and release HPR can be used.

Full-block approach lighting is provided by use of an AER in series with the HD line circuit. The AER is slow release to bridge the momentary opening of its control during the pole change of the HD line circuit. Light out protection is not shown and should be added as required.

In the four-aspect signal circuit the DR is slow release to avoid the display of a momentary aspect other than stop, when a train passes the signal.

TYPICAL THREE ASPECT COLORLIGHT AUTOMATIC SIGNAL CIRCUITS USING POLARIZED LINE RELAY
(CODE RULES 281 – 285 – 291)



TYPICAL FOUR ASPECT COLORLIGHT AUTOMATIC SIGNAL CIRCUITS USING POLARIZED "HD" LINE RELAY AND NEUTRAL SLOW RELEASE "D" RELAY
(CODE RULES 281 - 282 - 285 - 291)

NOTE 1:
WHERE ADVANCE LIGHTING IS DESIRED REMOVE CONNECTION "XY" AND APPLY POSITIVE ENERGY AS SHOWN BY DOTTED LINE AT "Y".

AAR SIGNAL 8002B

OCT. 1967 | SEPT. 1947

TYPICAL FOUR-ASPECT COLOR LIGHT AUTOMATIC SIGNAL CIRCUITS.

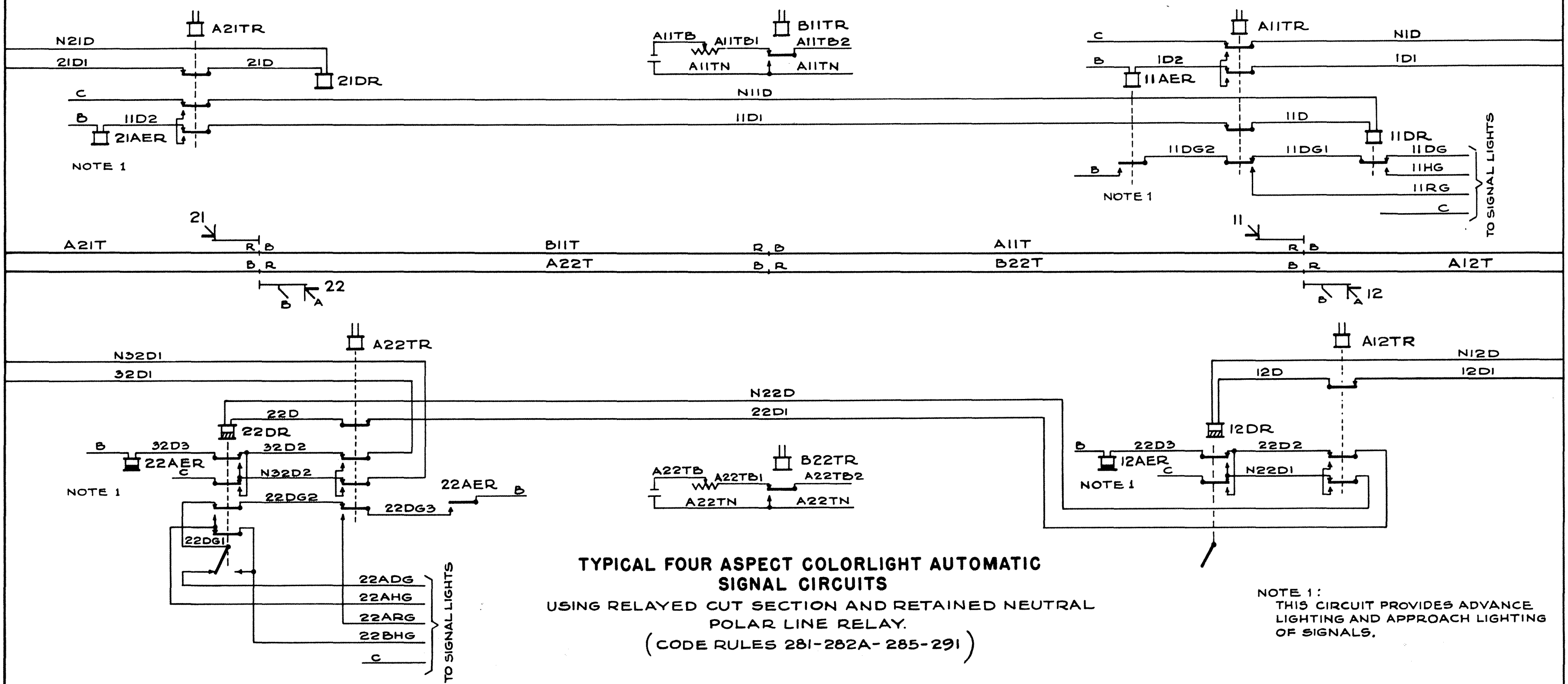
These circuits utilize two different types of "D" relays. The neutral line circuit shown at the top utilizes a neutral relay, and the polarized line circuit shown at the bottom utilizes a retained polar relay. The retained neutral polar line relay's neutral contacts do not open when the polarity changes, thus preventing momentary change of aspect during this period.

AE relays are used in series with the D relays to provide full block approach and advance lighting. The AE relays used in series with the retained neutral polar line relays are slow release to bridge the momentary opening of their controls during the polarity change of the D line circuit.

Information pertaining to the relayed cut-sections utilized between signals will be found in Chapter VII–Non-Coded Direct Current Track Circuits, American Railway Signaling Principles and Practices, published by the Communication and Signal Section, AAR.

TYPICAL THREE ASPECT COLORLIGHT AUTOMATIC SIGNAL CIRCUITS

USING RELAYED CUT SECTION AND NEUTRAL LINE RELAY
(CODE RULES 281-285-291)



TYPICAL FOUR ASPECT COLORLIGHT AUTOMATIC SIGNAL CIRCUITS

USING RELAYED CUT SECTION AND RETAINED NEUTRAL POLAR LINE RELAY.
(CODE RULES 281-282A-285-291)

NOTE 1:
THIS CIRCUIT PROVIDES ADVANCE LIGHTING AND APPROACH LIGHTING OF SIGNALS.

SEPT. 1947

AAR SIG.SEC. 8003A

ADDENDUM TO AAR SIGNAL 8003B

TYPICAL THREE AND FOUR-ASPECT COLOR LIGHT AUTOMATIC SIGNAL CIRCUITS.

These circuits utilize two different types of D relays. The line circuit shown at the top utilizes a neutral line relay, and the line circuit shown at the bottom utilizes a retained neutral polarized line relay. The retained neutral contacts do not open when the polarity changes, thus preventing momentary change of aspect during this period.

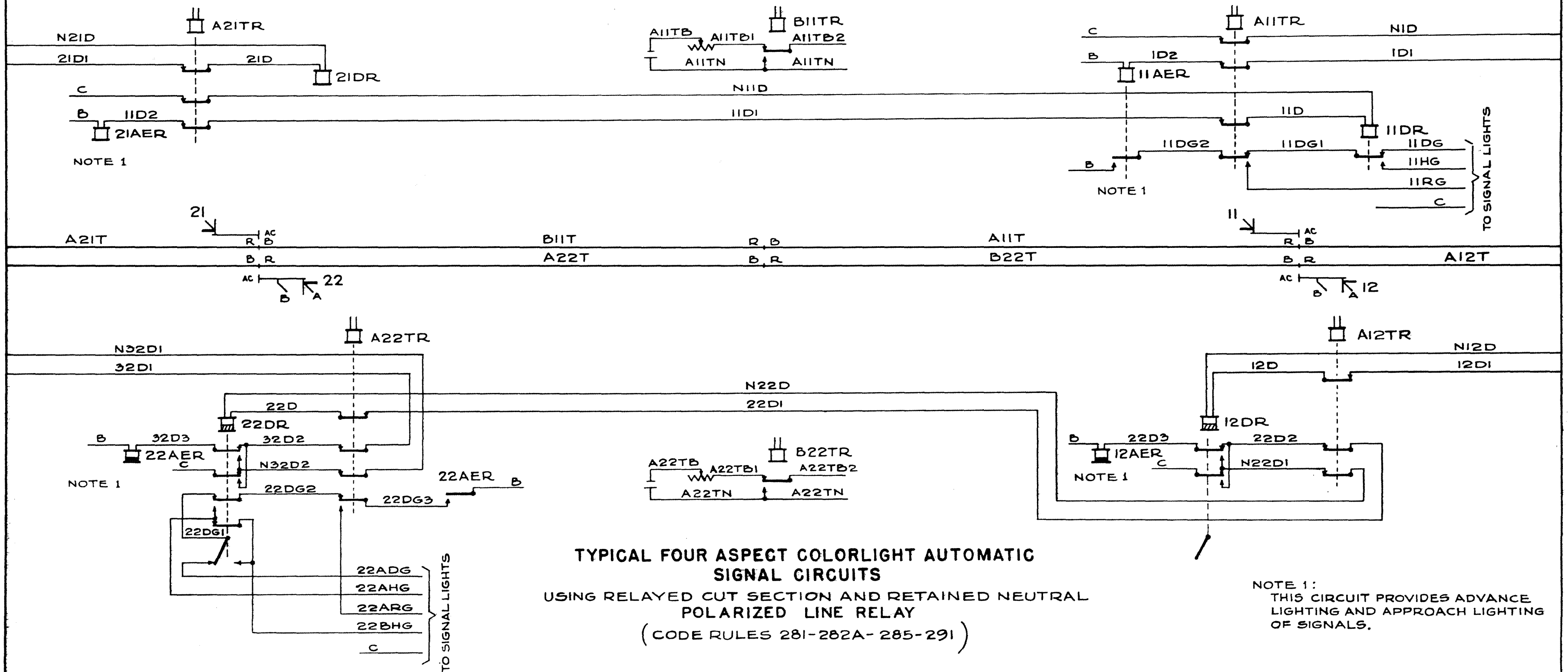
AER is used in series with the DR to provide full-block approach and advance lighting. The AER used in series with the retained neutral polarized line relay is slow release to bridge the momentary opening of the control during the polarity change of the D line circuit.

Information pertaining to the relayed cut-sections utilized between signals will be found in Chapter VII--Non-Coded Direct Current Track Circuits, American Railway Signaling Principles and Practices, published by the Communication and Signal Section, AAR.

TYPICAL THREE ASPECT COLORLIGHT AUTOMATIC SIGNAL CIRCUITS

USING RELAYED CUT SECTION AND NEUTRAL LINE RELAY

(CODE RULES 281-285-291)



TYPICAL FOUR ASPECT COLORLIGHT AUTOMATIC SIGNAL CIRCUITS

USING RELAYED CUT SECTION AND RETAINED NEUTRAL POLARIZED LINE RELAY

(CODE RULES 281-282A-285-291)

NOTE 1:
THIS CIRCUIT PROVIDES ADVANCE LIGHTING AND APPROACH LIGHTING OF SIGNALS.

OCT. 1967	SEPT. 1947	AAR SIGNAL 8003B

ADDENDUM TO AAR SIG. SEC. 8004A

TYPICAL FOUR-ASPECT COLOR LIGHT AUTOMATIC SIGNAL CIRCUITS.

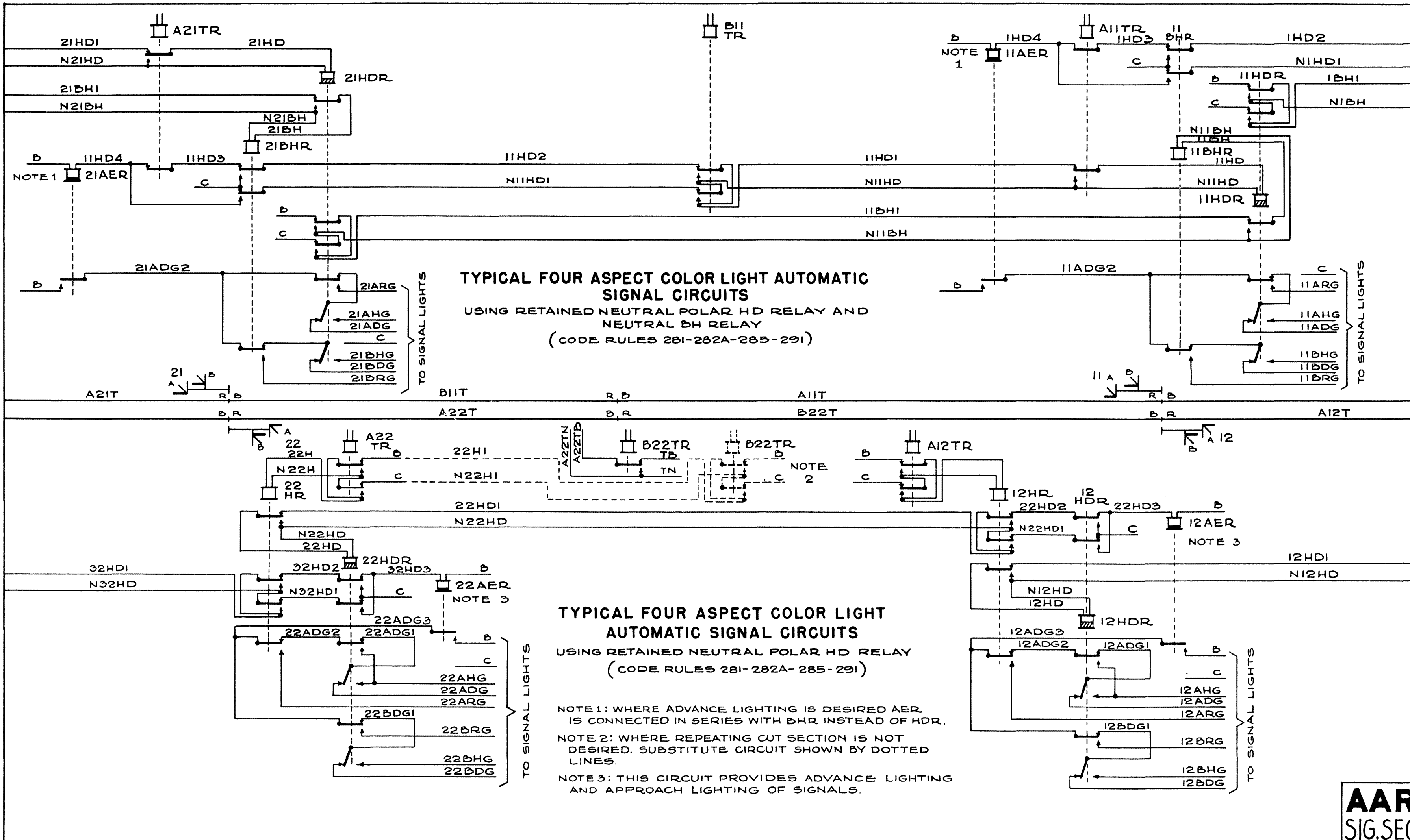
These circuits utilize the retained neutral polar line relay HD whose neutral contacts do not open when its polarity changes, thus preventing momentary change of aspects during this period.

The line circuits shown double broken and shunted through the contacts of some track and line relays, illustrate a method of checking the shunt jumper.

To prevent a momentary display of the green aspect at signal 11, when a short high-speed train vacates the block at signal 21, the 11HD circuit is selected through a front contact of the A21TR.

The circuits shown at the top provide for full block approach lighting while those shown at the bottom provide for both full block approach and advance lighting. The AE relays used in series with the HD circuits are slow release to bridge the momentary opening of their controls during the polarity change of the HD circuit.

For information pertaining to the relayed cut-section (B22TR), refer to Chapter VII–Non-Coded Direct Current Track Circuits, American Railway Signaling Principles and Practices, published by the Communication and Signal Section, AAR.



TYPICAL FOUR ASPECT COLOR LIGHT AUTOMATIC SIGNAL CIRCUITS

USING RETAINED NEUTRAL POLAR HD RELAY AND NEUTRAL BH RELAY

(CODE RULES 281-282A-285-291)

TYPICAL FOUR ASPECT COLOR LIGHT AUTOMATIC SIGNAL CIRCUITS

USING RETAINED NEUTRAL POLAR HD RELAY

(CODE RULES 281-282A-285-291)

NOTE 1: WHERE ADVANCE LIGHTING IS DESIRED AER IS CONNECTED IN SERIES WITH BHR INSTEAD OF HDR.

NOTE 2: WHERE REPEATING CUT SECTION IS NOT DESIRED, SUBSTITUTE CIRCUIT SHOWN BY DOTTED LINES.

NOTE 3: THIS CIRCUIT PROVIDES ADVANCE LIGHTING AND APPROACH LIGHTING OF SIGNALS.

SEPT. 1947

AAR SIG.SEC 8004A

ADDENDUM TO AAR SIG. SEC. 8005A

TYPICAL FOUR-ASPECT COLOR LIGHT AUTOMATIC SIGNAL CIRCUITS.

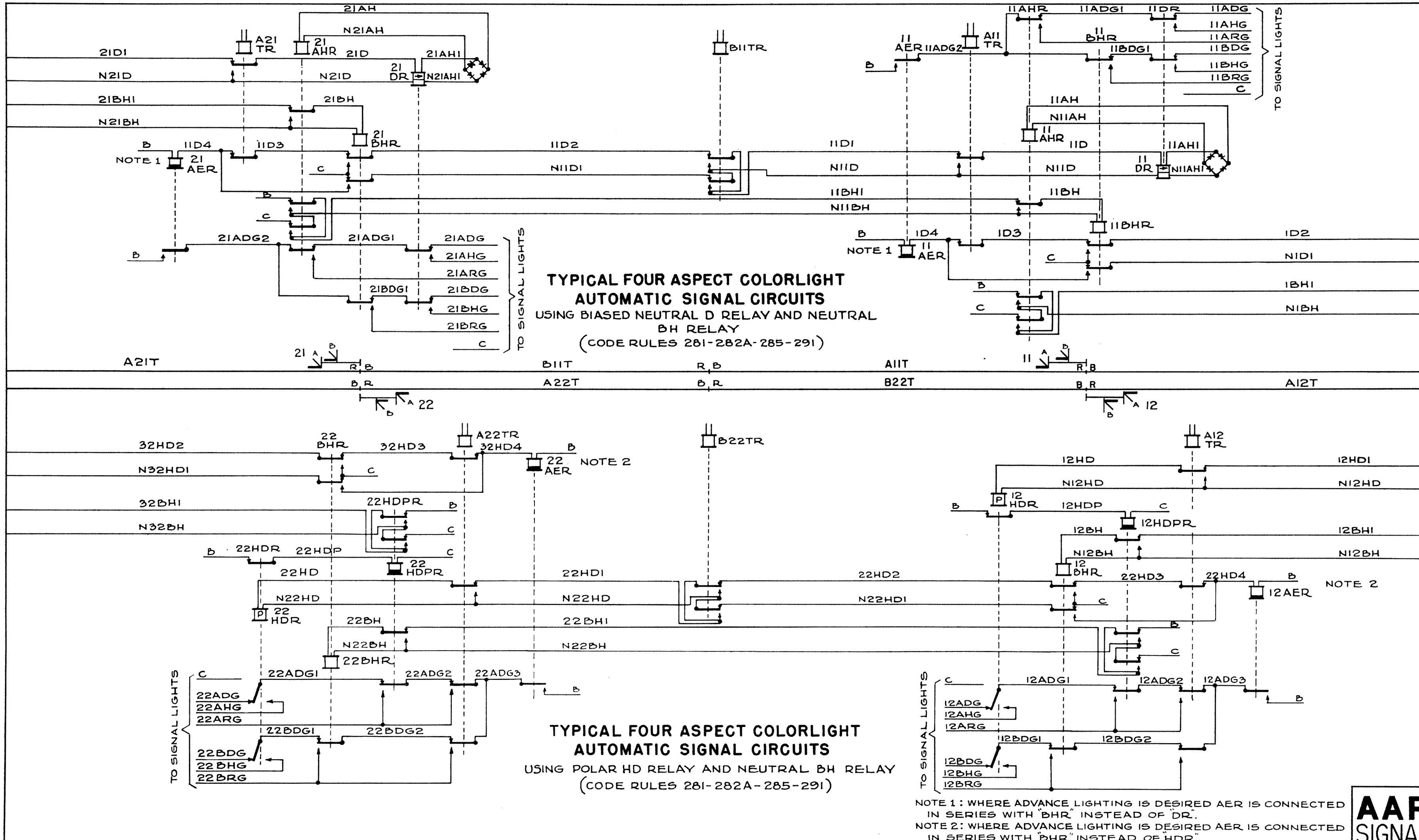
The circuits shown at the top of this plan utilize the biased neutral line relay D in combination with a non-biased neutral relay AH. A full wave rectifier is shown in the control of the AH relay causing current to flow through it in the same direction with either polarity of line voltage. The rectifier also causes the AH relay to be sufficiently slow in releasing to avoid a momentary change in aspect during the open circuit polarity change period. The rectifier is connected between the coils of the biased neutral relay and non-biased relay to eliminate direct exposure of the rectifier to lightning, and also to prevent induced a-c if present in the D circuit, from picking up the AH relay.

The circuits shown at the bottom utilize the ordinary acting polar line relay HD in combination with a slow release neutral repeating relay HDP. The HDP relay repeating the neutral contact of the HD relay must be sufficiently slow in releasing to bridge the maximum open circuit interval during the polarity change period, thus avoiding a momentary change in aspect.

The line circuits shown double broken and shunted through the contacts of some track and line relays illustrate a method of checking the shunt jumper.

To prevent a momentary display of the green aspect when a short high-speed train vacates the block, the D and HD line circuits are selected through a front contact of the track relay in advance of the signal.

Full block approach lighting is provided by use of an AE relay in series with the D and HD line circuits. The AE relay is slow release to bridge the momentary opening of its control during the polarity change of the D and HD line circuits.



TYPICAL FOUR ASPECT COLORLIGHT AUTOMATIC SIGNAL CIRCUITS

USING BIASED NEUTRAL D RELAY AND NEUTRAL BH RELAY

(CODE RULES 281-282A-285-291)

TYPICAL FOUR ASPECT COLORLIGHT AUTOMATIC SIGNAL CIRCUITS

USING POLAR HD RELAY AND NEUTRAL BH RELAY

(CODE RULES 281-282A-285-291)

NOTE 1: WHERE ADVANCE LIGHTING IS DESIRED AER IS CONNECTED IN SERIES WITH "BHR" INSTEAD OF "DR".

NOTE 2: WHERE ADVANCE LIGHTING IS DESIRED AER IS CONNECTED IN SERIES WITH "BHR" INSTEAD OF "HDR".

SEPT. 1966	SEPT. 1947	AAR SIGNAL 8005B

ADDENDUM TO A.A.R. SIG.SEC. 8006A

TYPICAL THREE AND FOUR-ASPECT SEARCHLIGHT AUTOMATIC SIGNAL CIRCUITS.

The circuits shown on the upper portion of the plan, for three-aspect signals, make use of a two-wire polarized line control circuit, being taken directly to the searchlight signal mechanism, without the use of local control relays. The circuits provide that if a signal fails to display either an approach or clear indication, the signal in the rear cannot display a less restrictive indication than approach, since the pole changing HDGPR relays repeat the signal mechanism contacts in the proceed position. The HDGPR relay is slow release to bridge the transfer period of the signal mechanism contacts.

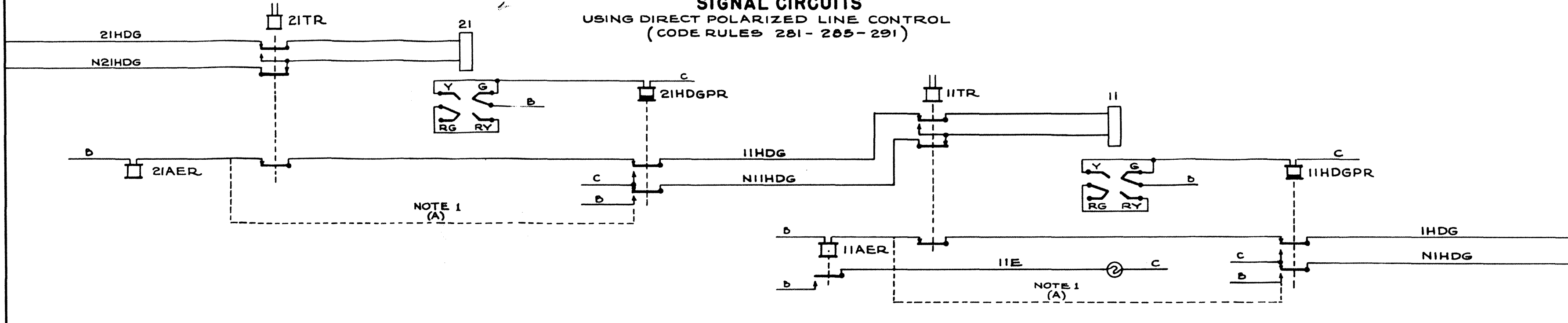
The circuits on the lower portion of the plan for four-aspect signals, show the use of retained neutral polarized line control relays, which when pole changing do not open their neutral contacts and thus avoids momentary change of aspects during pole change periods. The DGPR relay is slow release to bridge the open circuit period during change of signal aspects between yellow over green and green over red.

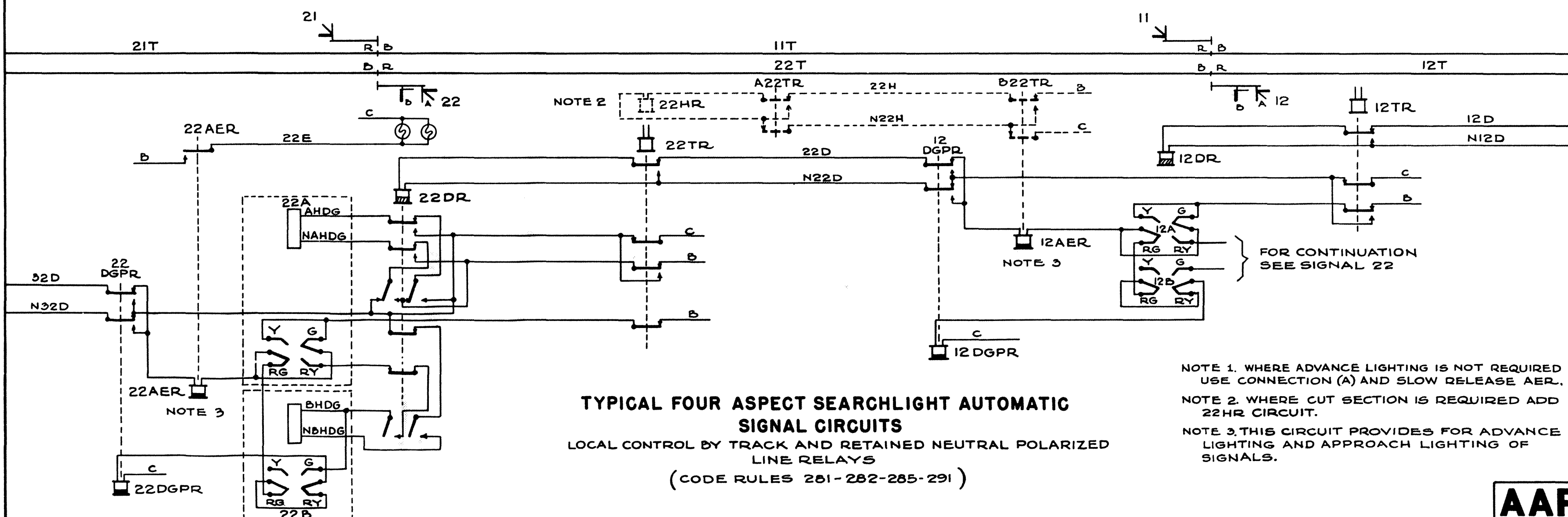
These circuits show double break and shunt of the line circuits over contacts of the track relays. To prevent a momentary flash of the clear indication when a short high-speed train vacates the block, the positive energy for the line circuits are selected through front contacts of the track relays in advance of the signal.

Full block approach and advance lighting is provided by use of an AER relay in series with the line circuit. The AER relay should be made slow release when required to bridge the momentary opening of its control during the pole change period. Light out protection is not shown and should be added as required.

TYPICAL THREE ASPECT SEARCHLIGHT AUTOMATIC SIGNAL CIRCUITS

USING DIRECT POLARIZED LINE CONTROL
(CODE RULES 281 - 285 - 291)





TYPICAL FOUR ASPECT SEARCHLIGHT AUTOMATIC SIGNAL CIRCUITS

LOCAL CONTROL BY TRACK AND RETAINED NEUTRAL POLARIZED LINE RELAYS
(CODE RULES 281-282-285-291)

NOTE 1. WHERE ADVANCE LIGHTING IS NOT REQUIRED USE CONNECTION (A) AND SLOW RELEASE AER.

NOTE 2. WHERE CUT SECTION IS REQUIRED ADD 22HR CIRCUIT.

NOTE 3. THIS CIRCUIT PROVIDES FOR ADVANCE LIGHTING AND APPROACH LIGHTING OF SIGNALS.

SEPT. 1947

AAR
SIG. SEC.
8006A

ADDENDUM TO A.A.R. SIG.SEC. 8007A

TYPICAL THREE AND FOUR-ASPECT SEARCHLIGHT AUTOMATIC SIGNAL CIRCUITS.

These circuits make use of the biased neutral line relay in combination with a non-biased neutral relay. A full-wave rectifier is shown in the control of the HR relay causing energy to flow through the relay in the same direction with either polarity of line voltage. This rectifier also causes the HR relay to be sufficiently slow in releasing to avoid a momentary change in aspect during the open circuit pole change period.

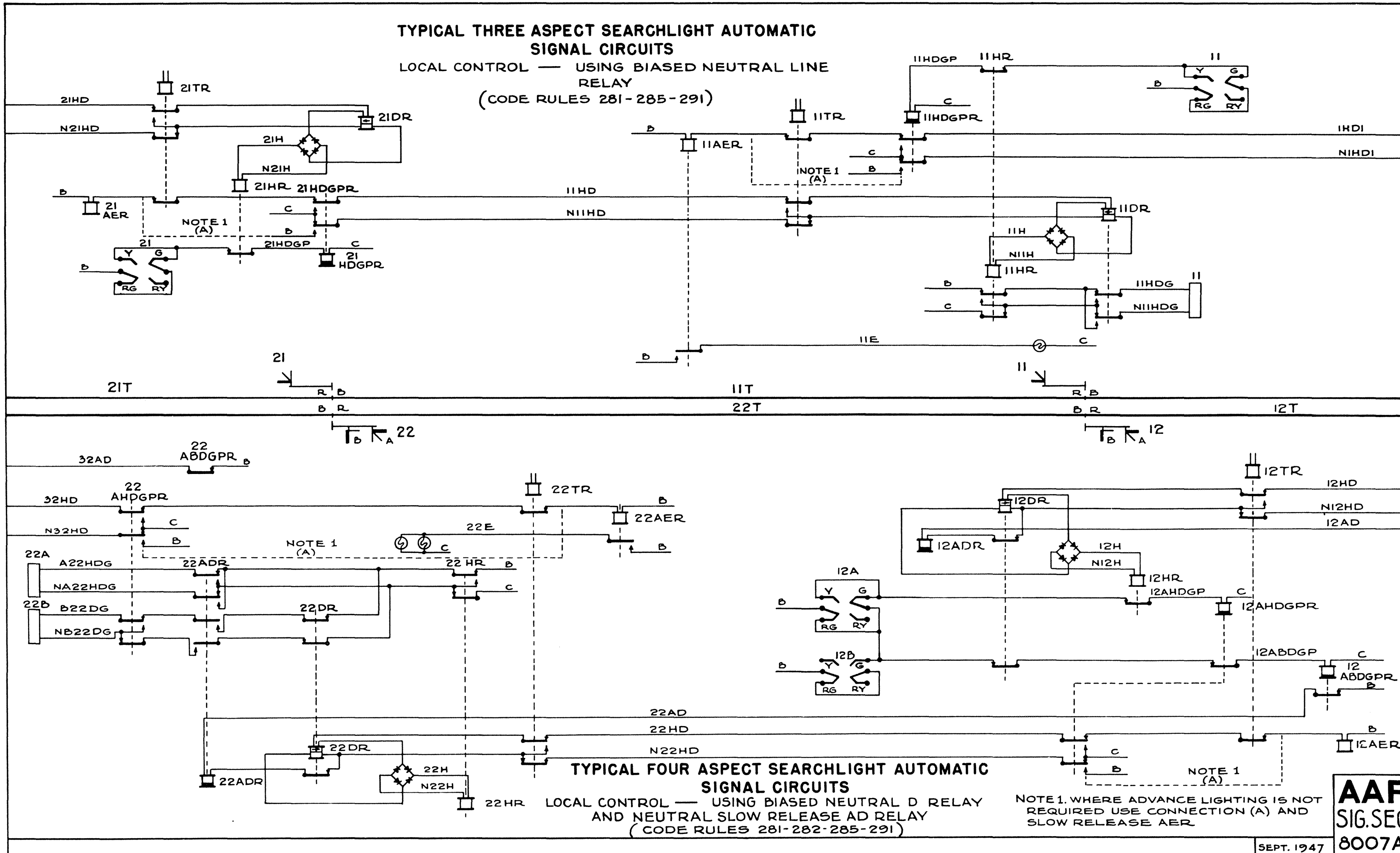
This circuit shows double break and shunt of the HD line circuit over contacts of the track relays. To prevent a momentary flash of the clear indication when a short high-speed train vacates the block, the positive energy for the HD line circuit is selected through a front contact of the track relay in advance of the signal.

Full block approach lighting is provided by the use of an AER relay in series with the HD line circuit. The AER relay may be slow release to bridge the momentary opening of its control during the pole change of the HD line circuit. Light out protection is not shown and should be added as required.

The rectifier is connected to the line between the two coils of the biased neutral relay to eliminate direct exposure of the rectifier to lightning, and also to prevent induced a.c. energy, if present in the HD line circuit, from falsely energizing the HR relay.

In the four-aspect signal circuit the ADR relays are slow release to avoid the momentary display of an indication other than stop, when a train passes the signal.

The shunt is omitted from the 22AD relay control wire when the 12ABDGPR relay is de-energized, due to the possibility of obtaining a less restrictive indication with a break in the N22HD wire.



TYPICAL THREE ASPECT SEARCHLIGHT AUTOMATIC SIGNAL CIRCUITS

LOCAL CONTROL — USING BIASED NEUTRAL LINE RELAY

(CODE RULES 281-285-291)

TYPICAL FOUR ASPECT SEARCHLIGHT AUTOMATIC SIGNAL CIRCUITS

LOCAL CONTROL — USING BIASED NEUTRAL D RELAY AND NEUTRAL SLOW RELEASE AD RELAY

(CODE RULES 281-282-285-291)

NOTE 1. WHERE ADVANCE LIGHTING IS NOT REQUIRED USE CONNECTION (A) AND SLOW RELEASE AER.

SEPT. 1947

AAR SIG. SEC. 8007A

ADDENDUM TO AAR SIGNAL 8007B

TYPICAL THREE AND FOUR-ASPECT SEARCHLIGHT AUTOMATIC SIGNAL CIRCUITS.

These circuits make use of the biased neutral line relay in combination with a non-biased neutral relay. A full-wave rectifier is shown in the control of the HR causing energy to flow through the relay in the same direction with either polarity of line voltage. This rectifier also causes the HR to be sufficiently slow in releasing to avoid a momentary change in aspect during the open circuit pole change period.

This circuit shows double break of the HD line circuit over contacts of the track relays. To prevent a momentary flash of the clear indication when a short high-speed train vacates the block, the positive energy for the HD line circuit is selected through a front contact of the track relay in advance of the signal.

Full-block approach lighting is provided by the use of an AER in series with the HD line circuit. The AER may be slow release to bridge the momentary opening of its control during the pole change of the HD line circuit. Light out protection is not shown and should be added as required.

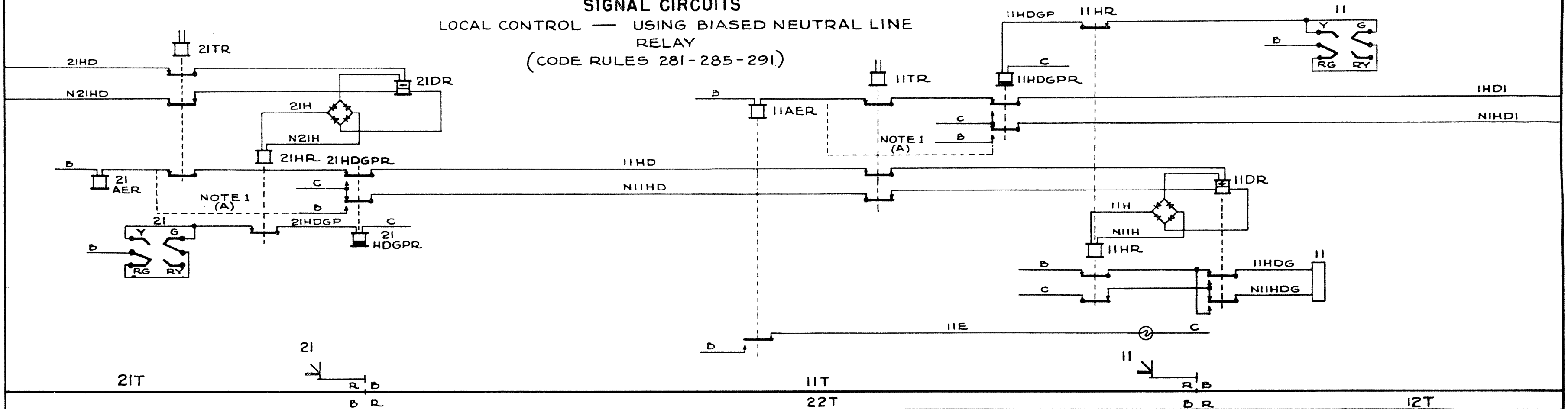
The rectifier is connected to the line between the two coils of the biased neutral relay to eliminate direct exposure of the rectifier to lightning, and also to prevent induced a-c energy, if present in the HD line circuit, from falsely energizing the HR.

In the four-aspect signal circuit the ADR is slow release to avoid the momentary display of an indication other than stop, when a train passes the signal.

TYPICAL THREE ASPECT SEARCHLIGHT AUTOMATIC SIGNAL CIRCUITS

LOCAL CONTROL — USING BIASED NEUTRAL LINE RELAY

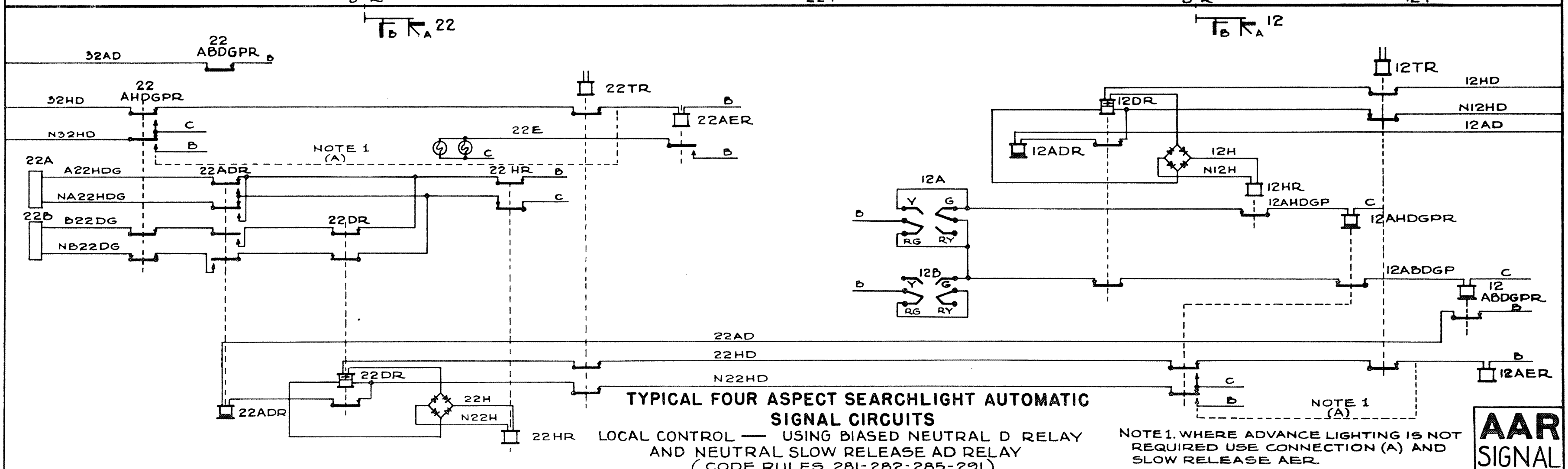
(CODE RULES 281-285-291)



TYPICAL FOUR ASPECT SEARCHLIGHT AUTOMATIC SIGNAL CIRCUITS

LOCAL CONTROL — USING BIASED NEUTRAL D RELAY AND NEUTRAL SLOW RELEASE AD RELAY

(CODE RULES 281-282-285-291)



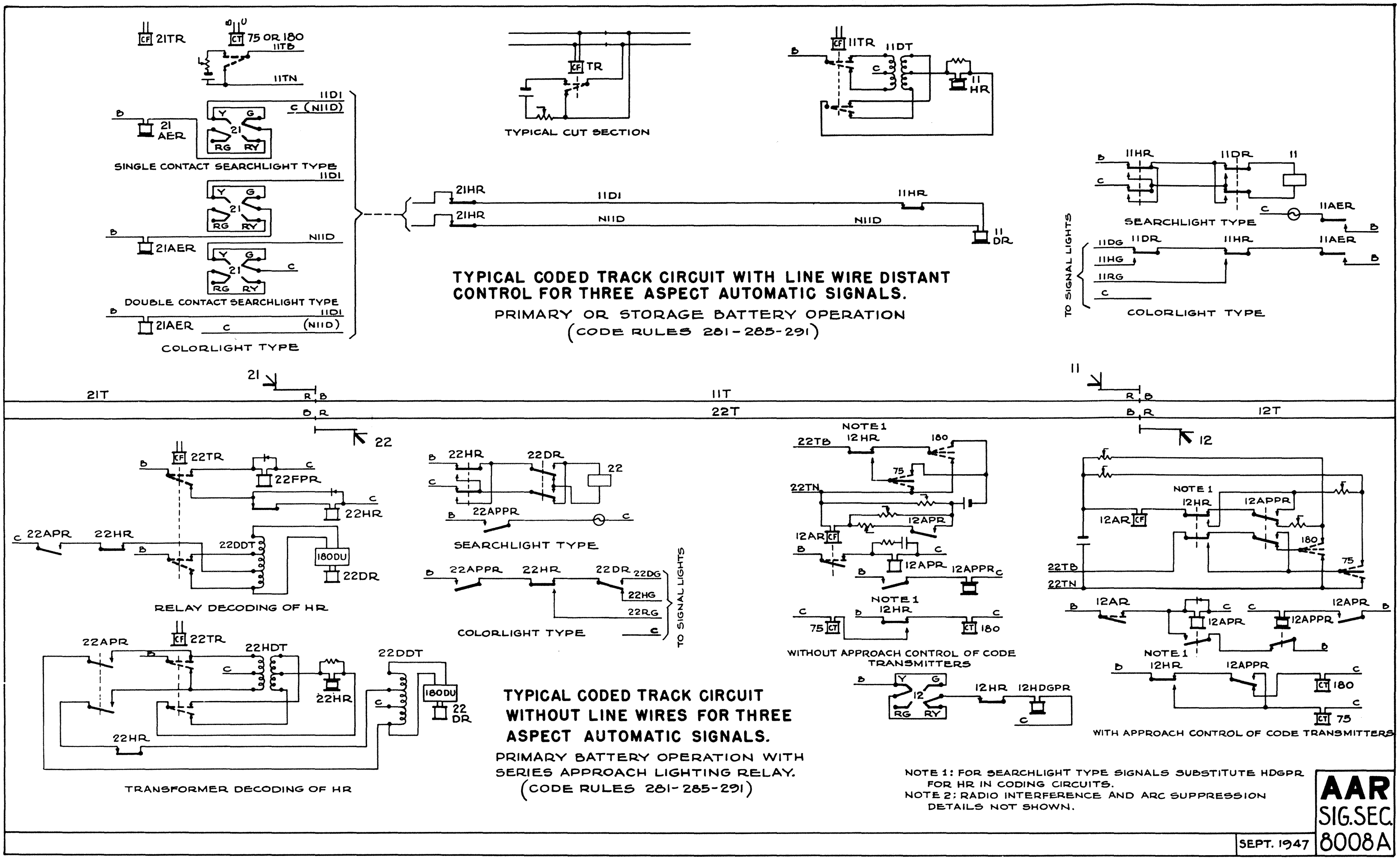
NOTE 1. WHERE ADVANCE LIGHTING IS NOT REQUIRED USE CONNECTION (A) AND SLOW RELEASE AER.

OCT. 1967	SEPT. 1947	AAR SIGNAL 8007B

TYPICAL CODED TRACK CIRCUIT WITHOUT LINE WIRES FOR THREE-ASPECT AUTOMATIC SIGNALS.

The circuits shown with line wire for distant control employ coded track circuits for track occupancy detection. These coded track circuits are continuously coding and are shunted during the off-period to dissipate any energy stored in the rail track circuit with resultant improvement in the code pattern. The track feed limiting resistor should not be included as part of the shunt circuit. If the block is too long for one coded track circuit, a front contact coding cut-section is used. If additional cut-sections are required, a back contact coding cut-section (circuits for which are not shown) may be required to correct for code distortion. Transformer decoding for the control of the HR is shown. This type of decoding provides immunity to single stroke decoding due to the use of a slow pick-up HR. Examples are shown for controls of both color light and searchlight type signals with series line approach relays used in both cases. This circuit provides full block approach lighting as well as full block advance lighting.

The circuits shown without line wire for distant control employ 75 and 180 coded track circuits, display of the green aspect being dependent on reception of 180 code. The track circuits are shunted during the off-period of the code transmitters. Alternates are shown to provide approach control of code transmitters, along with the usual HR control of the transmitters. In either case, approach lighting is provided by means of a series approach track relay and associated repeaters. The repeaters are required to assure that the relay used for approach lighting will remain up during approach of a train while 75 code is being transmitted. To insure that the 12AR will continue to follow the code, on approach of a train, a front contact of 12APR decreases the resistance in the circuit, thus increasing the current in the AR. The APPR is used to prevent a momentary display of the yellow aspect during the time required to pick up the DR upon approach of a train. An example of relay decoding of the HR with tuned decoding unit for 180 decoding is shown. The 22HR is selected through a front contact of 22FPR to insure that the code following track relay is operating at either of the code rates provided. The rectifier snubbing circuit for the 22HR is arranged as shown to provide quick release of the HR when the 22FPR is released. Also shown is transformer decoding of the HR with tuned decoding unit for 180 decoding. In both the relay decoding and transformer decoding examples, the tuned decoding units remain de-energized until the approach repeater relay APR picks up so as to provide power savings and longer contact life in the code following TR.



TYPICAL CODED TRACK CIRCUIT WITH LINE WIRE DISTANT CONTROL FOR THREE ASPECT AUTOMATIC SIGNALS.

PRIMARY OR STORAGE BATTERY OPERATION
(CODE RULES 281-285-291)

TYPICAL CODED TRACK CIRCUIT WITHOUT LINE WIRES FOR THREE ASPECT AUTOMATIC SIGNALS.

PRIMARY BATTERY OPERATION WITH SERIES APPROACH LIGHTING RELAY.
(CODE RULES 281-285-291)

NOTE 1: FOR SEARCHLIGHT TYPE SIGNALS SUBSTITUTE HDGPR FOR HR IN CODING CIRCUITS.
NOTE 2: RADIO INTERFERENCE AND ARC SUPPRESSION DETAILS NOT SHOWN.

SEPT. 1947

AAR SIG.SEC. 8008A

ADDENDUM TO A.A.R. SIG.SEC. 8009A

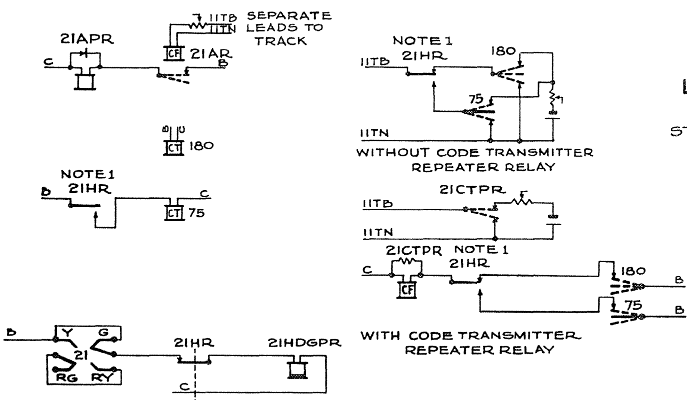
TYPICAL CODED TRACK CIRCUIT WITHOUT LINE WIRES FOR THREE AND FOUR-ASPECT AUTOMATIC SIGNALS.

These circuits show the use of coded track circuits to provide the control for three and four-aspect automatic block signals. Approach lighting of the signals is accomplished by the use of a code following AR relay and a neutral APR relay. The AR relay is connected by separate leads to the track to improve shunting characteristics. This relay stops coding when the train approaches the battery end of the track circuit, the distance being dependent upon the track circuit adjustment. The rectifier is placed across the coils of the APR to hold over the off period of the code.

The mechanically rectified relay type of decoding circuit is shown as one possible means of decoding any code frequency with tuned decoding units for decoding the 120 and 180 code. The track circuit is shunted during the off period of code transmitting relay to improve the code pattern. The track feed limiting resistance should not be included as part of the shunt circuit.

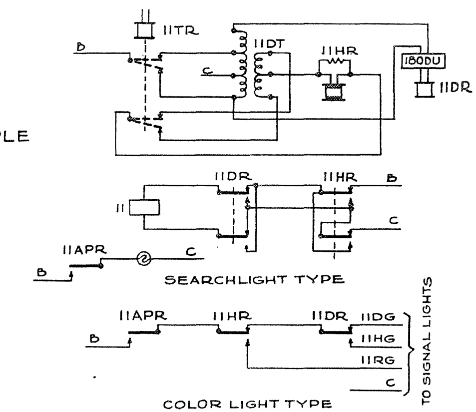
This plan shows two methods of supplying coded energy to the track circuits; one by direct insertion of code transmitter contacts into track feed and an alternate method of using a code transmitter repeating relay. The code repeating relay permits use of additional coding contacts in multiple to reduce contact resistance and to prolong the life of the coding contacts.

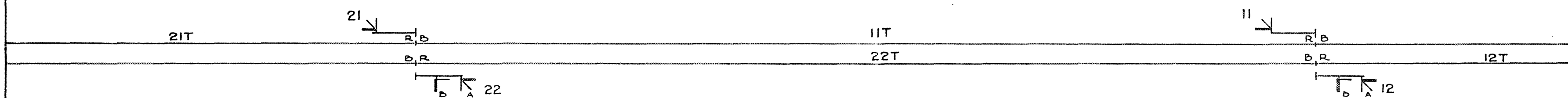
In the upper portion of the plan, the 21HDGPR relay is slow release to bridge the signal mechanism transfer period. The 22BDR relay shown in the lower portion of the plan is controlled through the 22ADR relay to insure that the 22BDR relay remains energized when the 180 code is received.

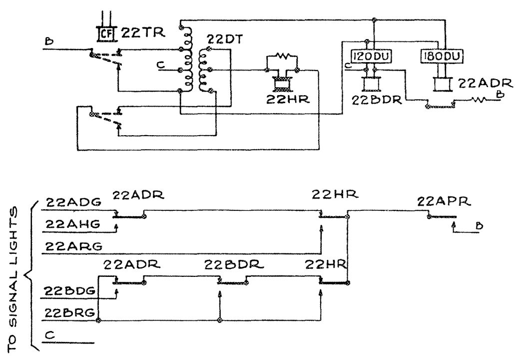


TYPICAL CODED TRACK CIRCUIT WITHOUT LINE WIRES FOR THREE ASPECT AUTOMATIC SIGNALS

STORAGE BATTERY OPERATION WITH MULTIPLE APPROACH LIGHTING RELAY
(CODE RULES 281-285-291)

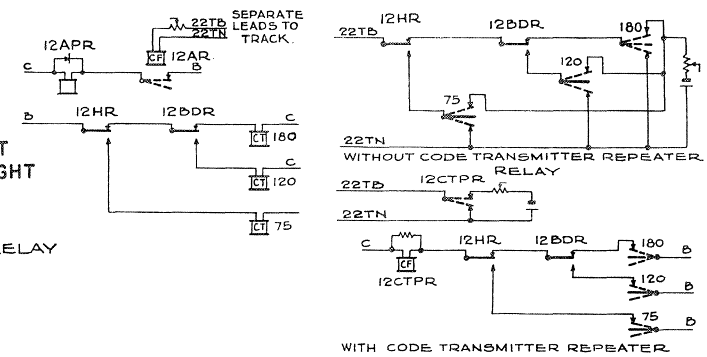






TYPICAL CODED TRACK CIRCUIT WITHOUT LINE WIRES FOR FOUR ASPECT COLORLIGHT AUTOMATIC SIGNALS,

STORAGE BATTERY OPERATION
WITH MULTIPLE APPROACH LIGHTING RELAY
(CODE RULES 281-282-285-291)



NOTE 1: FOR SEARCHLIGHT TYPE SIGNALS SUBSTITUTE HDGPR FOR HR IN CODING CIRCUITS.

NOTE 2: RADIO INTERFERENCE AND ARC SUPPRESSION DETAILS NOT SHOWN.

SEPT. 1966	SEPT. 1947	AAR SIGNAL 8009B

ADDENDUM TO AAR SIGNAL 8009C

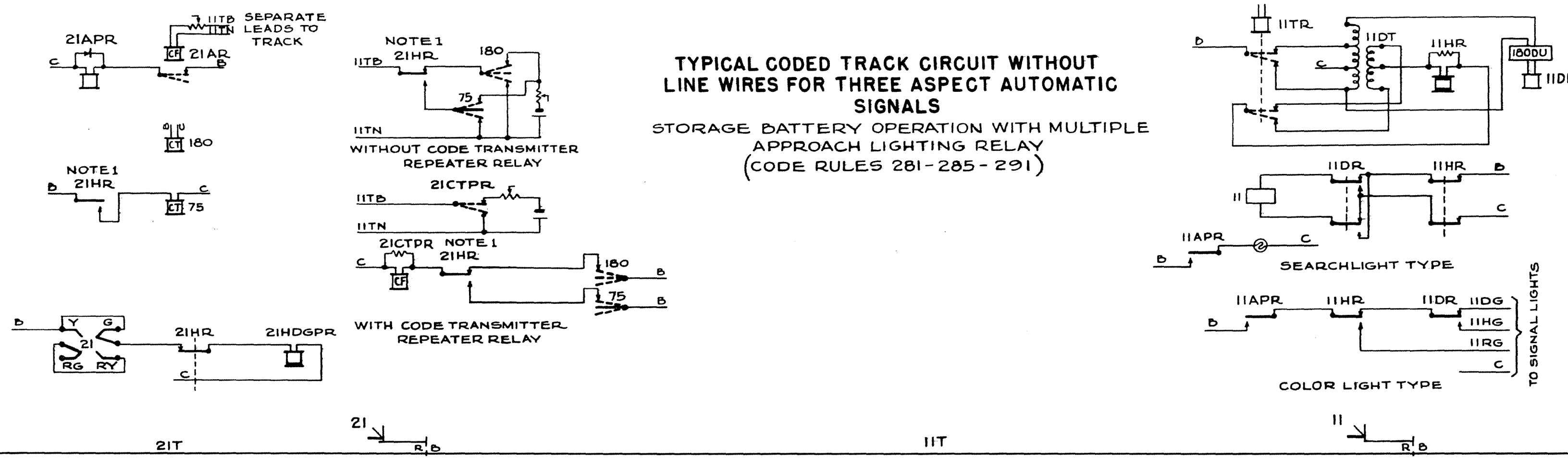
TYPICAL CODED TRACK CIRCUIT WITHOUT LINE WIRES FOR THREE AND FOUR-ASPECT AUTOMATIC SIGNALS.

These circuits show the use of coded track circuits to provide the control for three and four-aspect automatic block signals. Approach lighting of the signals is accomplished by the use of a code following AR and a neutral APR. The AR is connected by separate leads to the track to improve shunting characteristics. This relay stops coding when the train approaches the battery end of the track circuit, the distance being dependent upon the track circuit adjustment. The rectifier is placed across the coils of the APR to hold over the off period of the code.

The mechanically rectified relay type of decoding circuit is shown as one possible means of decoding any code frequency with tuned decoding units for decoding the 120 and 180 code. The track circuit is shunted during the off period of code transmitting relay to improve the code pattern. The track feed limiting resistance should not be included as part of the shunt circuit.

This plan shows two methods of supplying coded energy to the track circuits; one by direct insertion of code transmitter contacts into track feed and an alternate method of using a code transmitter repeating relay. The code repeating relay permits use of additional coding contacts in multiple to reduce contact resistance and to prolong the life of the coding contacts.

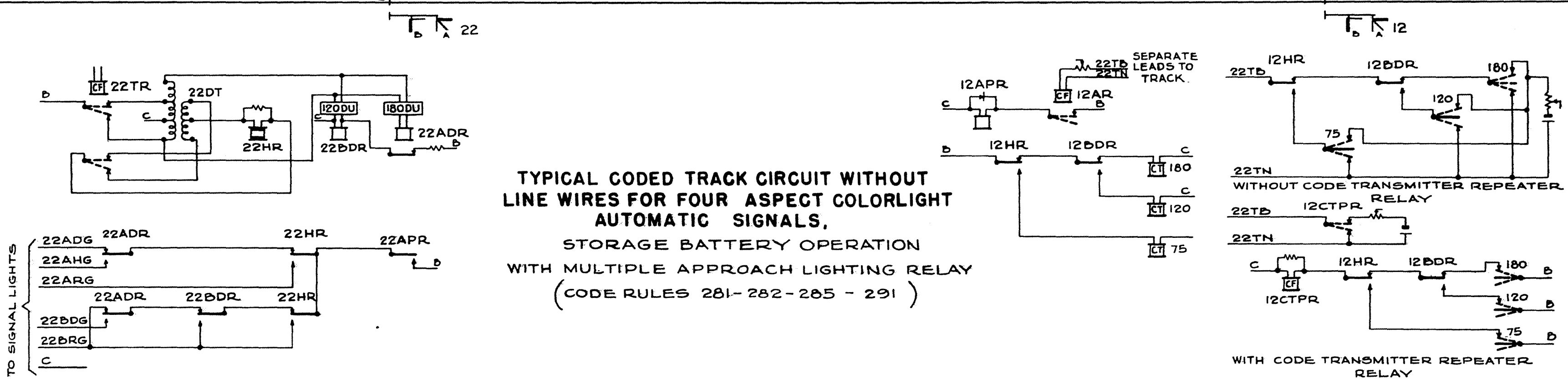
In the upper portion of the plan, the 21HDGPR is slow release to bridge the signal mechanism transfer period. The 22BDR shown in the lower portion of the plan is controlled through the 22ADR to insure that the22BDR remains energized when the 180 code is received.



TYPICAL CODED TRACK CIRCUIT WITHOUT LINE WIRES FOR THREE ASPECT AUTOMATIC SIGNALS

STORAGE BATTERY OPERATION WITH MULTIPLE APPROACH LIGHTING RELAY

(CODE RULES 281-285-291)



TYPICAL CODED TRACK CIRCUIT WITHOUT LINE WIRES FOR FOUR ASPECT COLORLIGHT AUTOMATIC SIGNALS.

STORAGE BATTERY OPERATION

WITH MULTIPLE APPROACH LIGHTING RELAY

(CODE RULES 281-282-285-291)

NOTE 1: FOR SEARCHLIGHT TYPE SIGNALS SUBSTITUTE HDGPR FOR HR IN CODING CIRCUITS.

NOTE 2: RADIO INTERFERENCE AND ARC SUPPRESSION DETAILS NOT SHOWN.

OCT. 1967	SEPT. 1966	SEPT. 1947

AAR SIGNAL 8009C

ADDENDUM TO A.A.R. SIG.SEC. 8010~~4~~B

TYPICAL RELAY TYPE INTERLOCKING CIRCUITS.

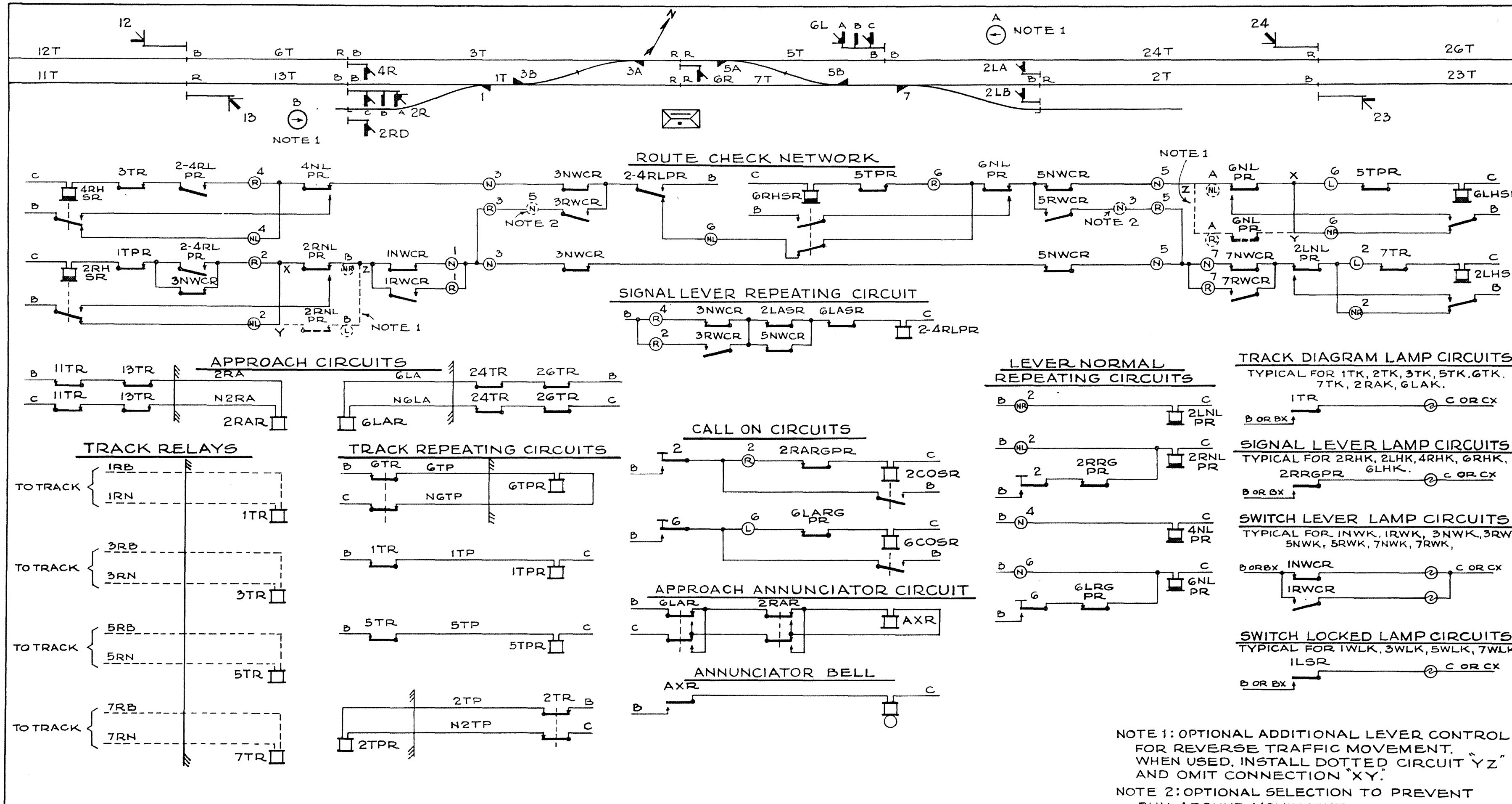
These circuits have been designed to control switches and signals by levers that are not mechanically interlocked and are not provided with electric locks or other mechanical means to restrict their movements. The use of relays provides the equivalent protection usually provided by mechanical and electric locking of levers.

The route check network shown on Sheet 1 provides a preliminary route check before a signal may be cleared, insuring that switch levers are in the proper positions to assure a complete route for the signal to be cleared; also that switches in the route correspond in position to levers controlling them, that opposing signal levers are not in a position to clear opposing signals and that opposing signals are in the stop position. A relay is provided for each signal lever in the route check circuits, that must pick up before circuit is completed to clear signal. These relays are designated HSR, and each is provided with a holding circuit that may only be released by restoring the lever of signal affected to the normal position, or by a train passing the signal and shunting the track relay. This prevents changing a cleared signal to "stop" indication should an operator inadvertently move a switch lever in route or the opposing signal lever. Slow release relays designated NLPR, on Sheet 1, which repeat the normal position of the signal levers are provided to prevent the storage for the control of a signal until a route is established; also to prevent the storage for the control of a signal if the signal lever controlling an opposing signal has been operated.

The signal control network shown on Sheet 2 consists of circuits for direct control of searchlight signals while the network shown on Sheet 3 consists of circuits for control of relays for color light signals. Both networks check all the switch repeating relays in the route energized, the switch locking and approach locking relays de-energized, also that the opposing approach locking relay is energized. Restricting signals are controlled through first track section only. When a call-on aspect is desired, on signals 2 and 6, for a following move into an occupied block, the call-on button is pushed, which momentarily energizes the NLPR, thus re-energizing the HSR, and energizing the COSR.

The switch locking relays designated LSR shown on Sheet 4 are controlled by track relays, route locking relays and approach locking relays. The approach locking relays lock switches as soon as route has been established and HSR relay has picked up. The common side of the circuit for each switch locking relay is selected over its own front contact and in multiple are agreement circuits, a normal polar contact of switch repeater relay and normal switch lever contact and a reverse polar contact of switch repeater relay and reverse switch lever contact. With this arrangement, if a switch lever is moved when its locking relay is de-energized, the relay will not pick up until switch lever has been restored to its initial position to agree with the position of switch which completes pick-up circuit of switch locking relay. This prevents the storage of switch control when the switch is locked.

Circuits that are not entirely in operating tower are double wire double break, except signal repeating relay circuits.



NOTE 1: OPTIONAL ADDITIONAL LEVER CONTROL FOR REVERSE TRAFFIC MOVEMENT. WHEN USED, INSTALL DOTTED CIRCUIT "YZ" AND OMIT CONNECTION "XY".

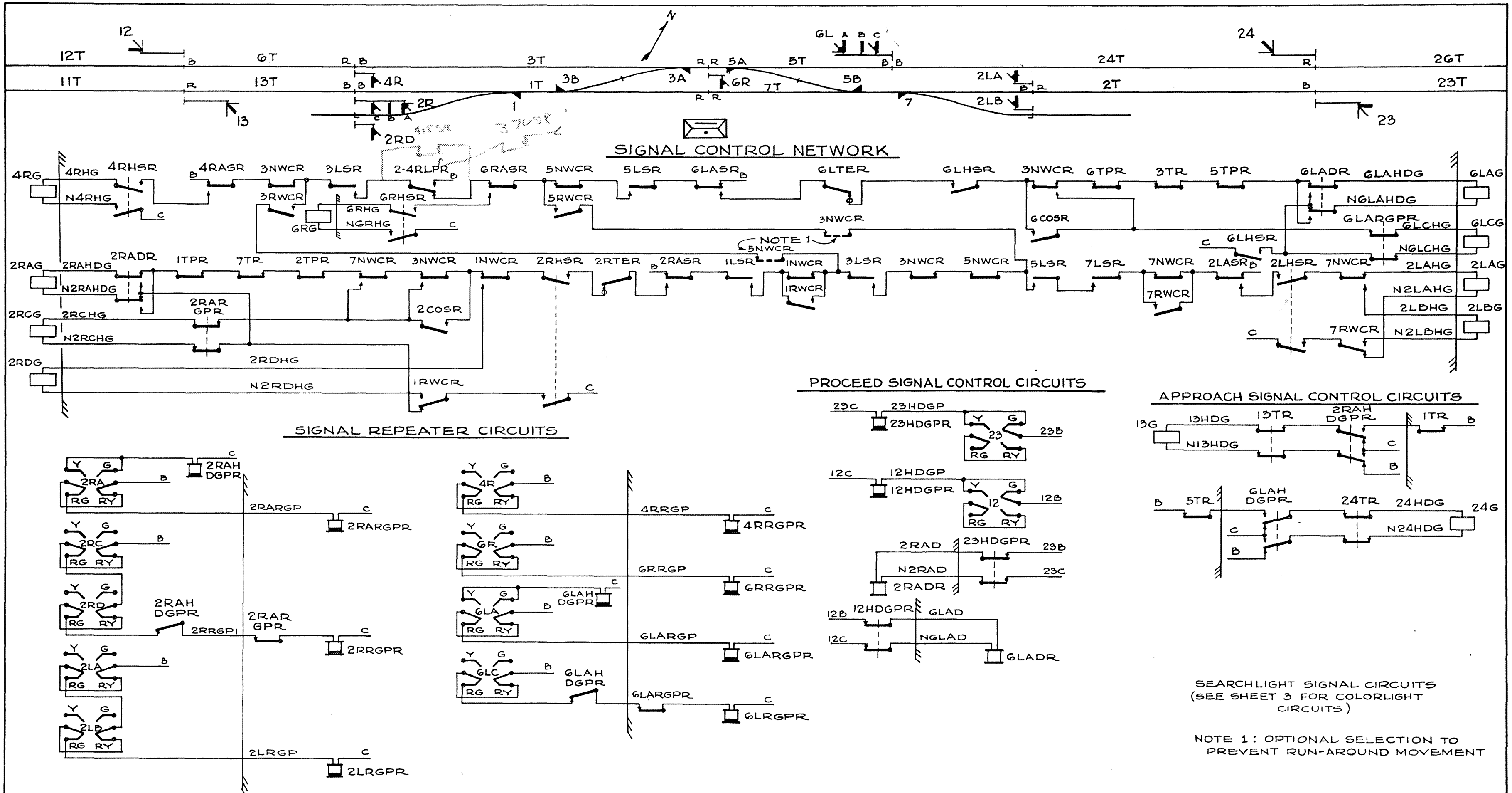
NOTE 2: OPTIONAL SELECTION TO PREVENT RUN-AROUND MOVEMENT

TYPICAL RELAY TYPE INTERLOCKING CIRCUITS

LOCAL CONTROL–FUNCTIONS INDIVIDUALLY CONTROLLED–NO LEVERS IN TRACK DIAGRAM
SEMI-AUTOMATIC STICK SIGNALS–RESTRICTING SIGNALS CONTROLLED THROUGH FIRST TRACK SECTION ONLY.

AAR SIGNAL 8010B

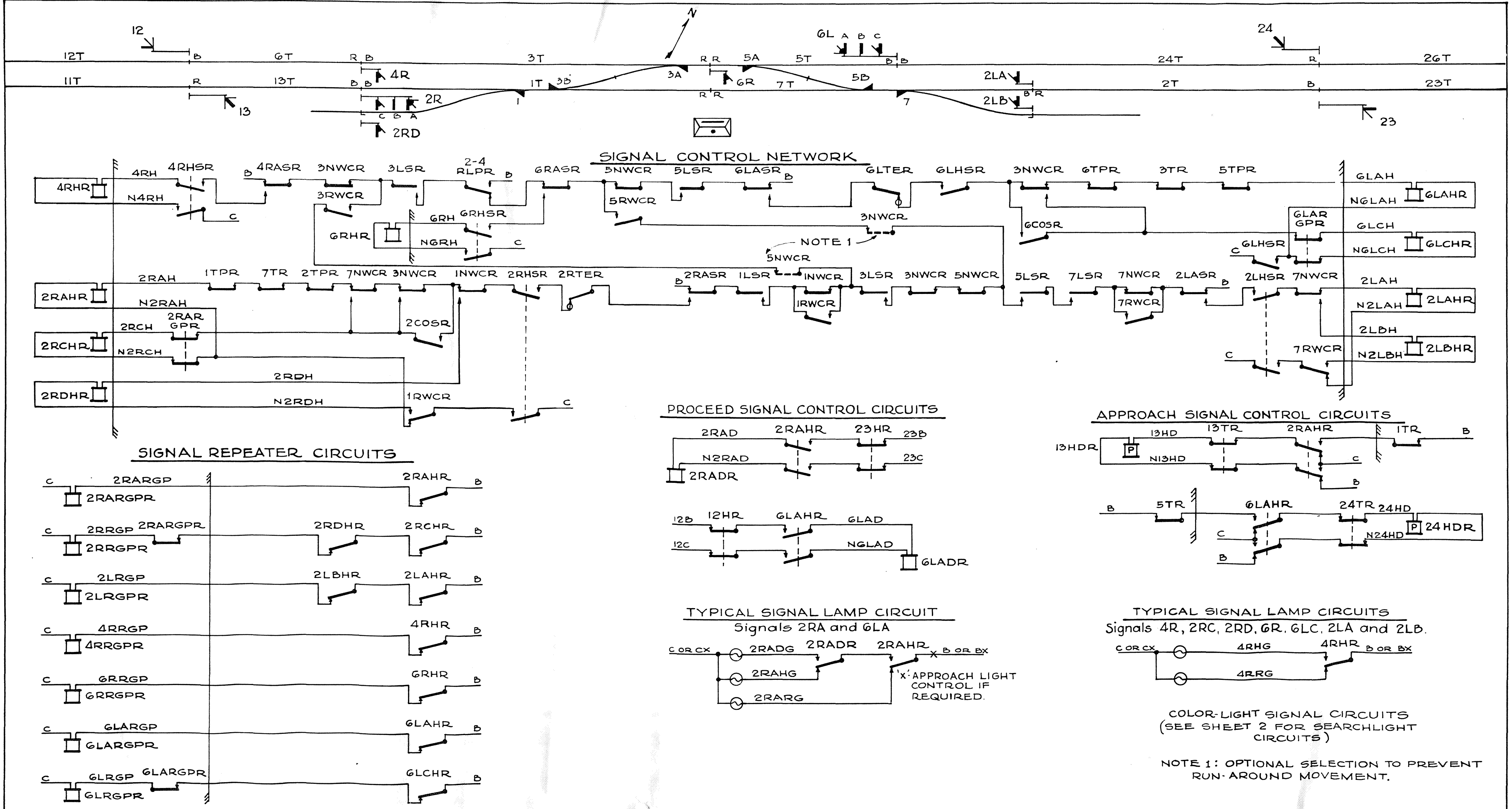
SEPT. 1947



TYPICAL RELAY TYPE INTERLOCKING CIRCUITS

LOCAL CONTROL – FUNCTIONS INDIVIDUALLY CONTROLLED – NO LEVERS IN TRACK DIAGRAM
SEMI-AUTOMATIC STICK SIGNALS – RESTRICTING SIGNALS CONTROLLED THROUGH FIRST TRACK SECTION ONLY.

SEPT. 1966	REV. 1947 A.M.	SEPT. 1947	AAR SIGNAL 8010 B

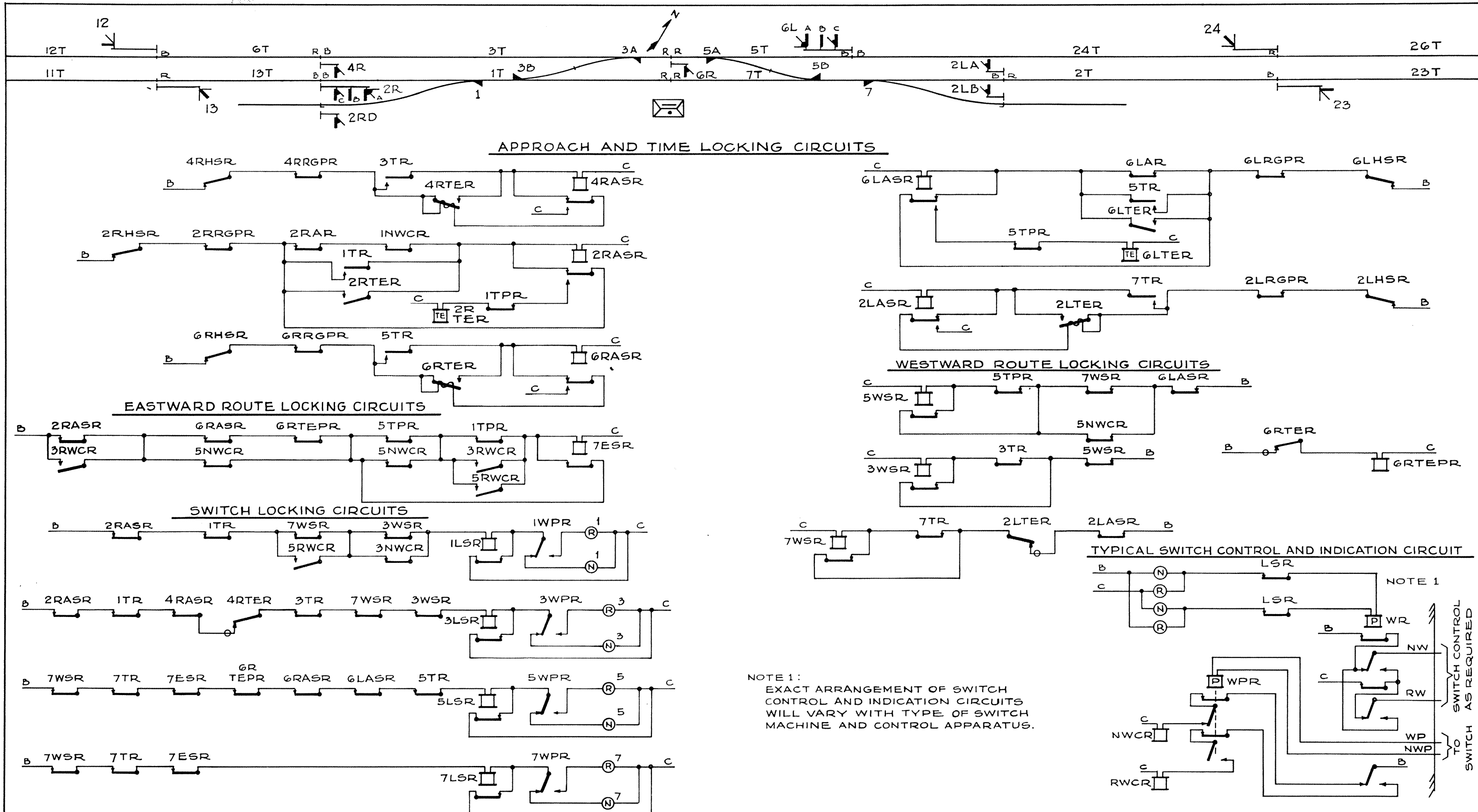


TYPICAL RELAY TYPE INTERLOCKING CIRCUITS

LOCAL CONTROL– FUNCTIONS INDIVIDUALLY CONTROLLED– NO LEVERS IN TRACK DIAGRAM

SEMI-AUTOMATIC STICK SIGNALS– RESTRICTING SIGNALS CONTROLLED THROUGH FIRST TRACK SECTION ONLY

SEPT. 1966	SEPT. 1947	AAR SIGNAL 8010B



TYPICAL RELAY TYPE INTERLOCKING CIRCUITS

LOCAL CONTROL—FUNCTIONS INDIVIDUALLY CONTROLLED—NO LEVERS IN TRACK DIAGRAM

SEMI-AUTOMATIC STICK SIGNALS—RESTRICTING SIGNALS CONTROLLED THROUGH FIRST TRACK SECTION ONLY.

SEPT. 1947

AAR
SIGNAL
8010 B

ADDENDUM TO AAR SIG. SEC. 8011A

TYPICAL CIRCUITS FOR HIGHWAY GRADE CROSSING SIGNALS.

Typical circuits on this plan show basic requirements to automatically or manually control highway grade crossing signals.

A train occupying an approach circuit of 3rd Street will release the approach control relay 3WTPR or 3ETPR, which in turn will release the XR causing the crossing protection to operate. A directional stick relay circuit is employed, which provides for picking up the receding directional stick relay at the time a train enters the island track section 3T with the approach control circuit occupied and the receding control circuit unoccupied. Thus, when the entire train has progressed across the island track section onto the receding control circuit, the receding stick relay up provides an alternate path for the pick-up of the XR causing the crossing protection to cease operating.

Contacts of the island track section relay 3TR are inserted in the TPR circuit to assure that the receding directional stick relay will be energized when a short wheel base train moves across the island track section. The stick contact of the TPR is used to prevent the pick-up of the directional stick relays due to a momentary release of the island section.

Directional stick relays are slow release to bridge the open circuit time that may be caused by relay contact transfer time of the 3TR-5TR and TPR's, in addition to joint hopping.

A time circuit is employed as a means of detecting slower speed movements within the approach limit. Occupancy of 1T energizes the TER, through contacts of 1TR and TESR. After a predetermined time has expired, TER picks up TESR, which in turn provides an alternate path through TESR picked up, TER check contact closed, assuring TER has completed a full cycle, to pick up 3WTPR, allowing crossing protection to cease operation until such time as train enters restart section 2T.

An interlocking relay is used at 5th Street. For detailed description of the features of this relay, see Chapter VI- Direct Current Relays, American Railway Signaling Principles and Practices, published by the Communication and Signal Section, AAR.

The interlocking relay coils 5WXR and 5EXR serve as control relays of their respective approaches. The occupancy of the eastward approach will cause the 5WXR to be released, thereby releasing the control relay 5XR and actuating the crossing protection. With the occupancy of the island track section 5T, the 5EXR is released, but due to the interlocking feature, the armature will only drop to its intermediate position retaining front contacts marked X closed. When the entire train has receded from the island section, 5WXR is picked up, allowing control relay 5XR to pick up, through 5ZR, 5WXR and with 5EXR at intermediate position. When the train has cleared the receding approach 5EXR picks up, releasing the interlocking feature.

ADDENDUM TO AAR SIG. SEC. 8011A - Continued

A switch stick circuit 7TSR is provided to cut out the crossing protection in the event movements are made through switch A.

Manual control.

A panel is provided equipped with indication lights, push buttons and switches for manual supervisory control.

The lights are provided to indicate occupancy of various approaches and island track sections. An additional light is employed as a means of indicating that 5th Street's crossing protection is operating.

Two push buttons for each street are used to energize the ZSR relays should the operator deem it necessary to cut out various approach sections while same are occupied by a train which has stopped.

Switches for each street provide a means of releasing the XR relays or the ZSR manual stick relays, thereby actuating the crossing protection.

Shown on Sheet 2 are various types of highway grade crossing protection signals which may be used in conjunction with control circuits as described.

ADDENDUM TO AAR SIGNAL 8011B

TYPICAL CIRCUITS FOR HIGHWAY GRADE CROSSING SIGNALS.

Typical circuits on this plan show basic requirements to automatically or manually control highway grade crossing signals.

A train occupying an approach circuit of 3rd Street will release the approach control relay 3WTPR or 3ETPR, which in turn will release the XR causing the crossing protection to operate. A directional stick relay circuit is employed, which provides for picking up the receding directional stick relay at the time a train enters the island track section 3T with the approach control circuit occupied and the receding control circuit unoccupied. Thus, when the entire train has progressed across the island track section onto the receding control circuit, the receding stick relay up provides an alternate path for the pick-up of the XR causing the crossing protection to cease operating.

Contacts of the island track section relay 3TR are inserted in the TPR circuit to assure that the receding directional stick relay will be energized when a short wheel base train moves across the island track section. The stick contact of the TPR is used to prevent the pick-up of the directional stick relays due to a momentary release of the island section.

Directional stick relays are slow release to bridge the open circuit time that may be caused by relay contact transfer time of the 3TR-5TR and TPR's, in addition to joint hopping.

A time circuit is employed as a means of detecting slower speed movements within the approach limit. Occupancy of 1T energizes the TECSR through back contact of the 1TR and TER check contact. This circuiting insures that the timing relay has returned to its de-energized position before positive energy is applied to the TER through a front contact of the TECSR. After the predetermined time has expired, TER picks up, providing an alternate path through TECSR and TER contacts closed to pick up 3WTPR. This allows crossing protection to cease operation until such time as train enters restart section 2T.

An interlocking relay is used at 5th Street. For detailed description of the features of this relay, see Chapter VI--Direct Current Relays, American Railway Signaling Principles and Practices, published by the Communication and Signal Section, AAR.

ADDENDUM TO AAR SIGNAL 8011B--Continued

The interlocking relay coils 5WXR and 5EXR serve as control relays of their respective approaches. The occupancy of the eastward approach will cause the 5WXR to be released, thereby releasing the control relay 5XR and actuating the crossing protection. With the occupancy of the island track section 5T, the 5EXR is released, but due to the interlocking feature, the armature will only drop to its intermediate position retaining front contacts marked X closed. When the entire train has receded from the island section, 5WXR is picked up, allowing control relay 5XR to pick up, through 5ZR, 5WXR and with 5EXR at intermediate position. When the train has cleared the receding approach 5EXR picks up, releasing the interlocking feature.

A switch stick circuit 7TSR is provided to cut out the crossing protection in the event movements are made through switch A.

Manual control.

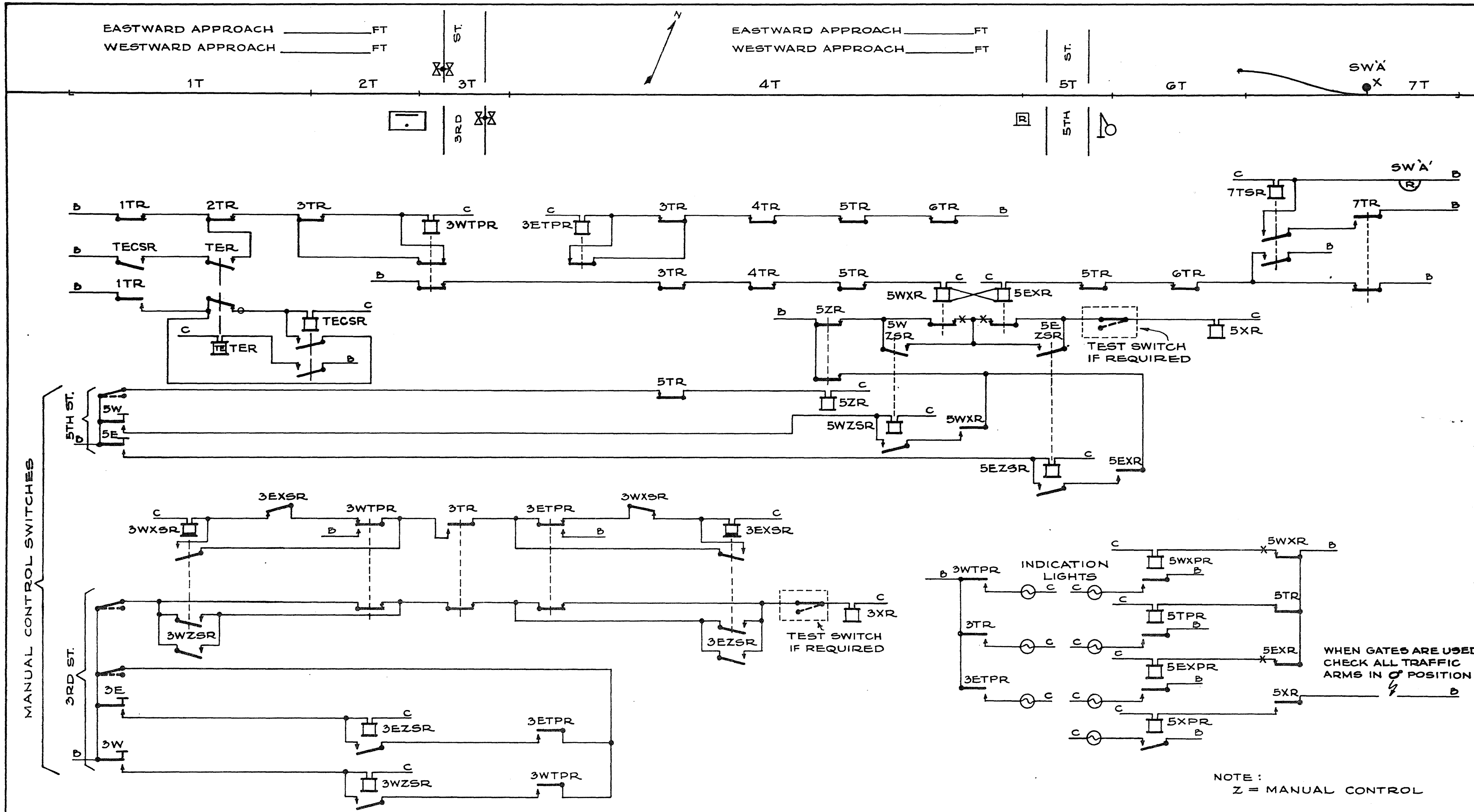
A panel is provided equipped with indication lights, push buttons and switches for manual supervisory control.

The lights are provided to indicate occupancy of various approaches and island track sections. An additional light is employed as a means of indicating that 5th Street's crossing protection is operating.

Two push buttons for each street are used to energize the ZSR relays should the operator deem it necessary to cut out various approach sections while same are occupied by a train which has stopped.

Switches for each street provide a means of releasing the XR relays or the ZSR manual stick relays, thereby actuating the crossing protection.

Shown on Sheet 2 are various types of highway grade crossing protection signals which may be used in conjunction with control circuits as described.



TYPICAL CIRCUITS FOR HIGHWAY GRADE CROSSING SIGNALS

AAR
SIGNAL
8011B

SEPT. 1966 | SEPT. 1947

SHEET 1 OF 2 SHEETS.

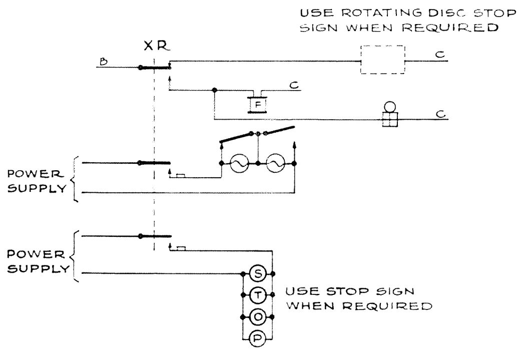


FIG. 1

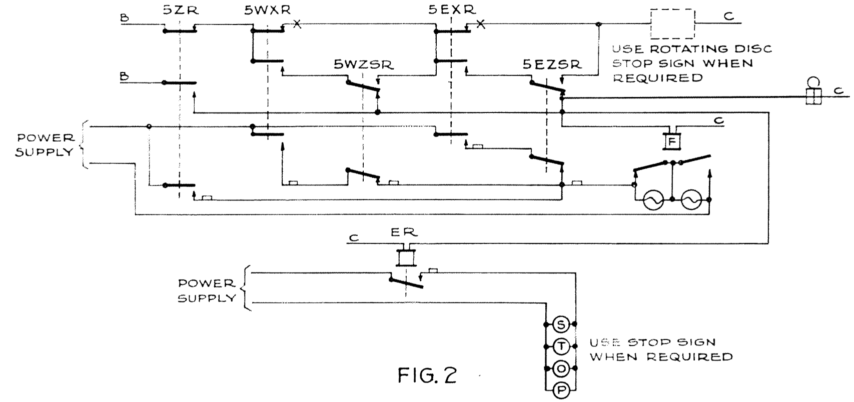


FIG. 2

FLASHING LIGHT SIGNALS

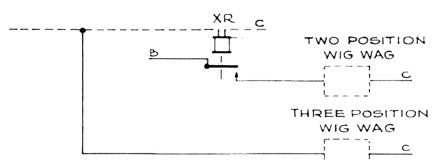


FIG. 3

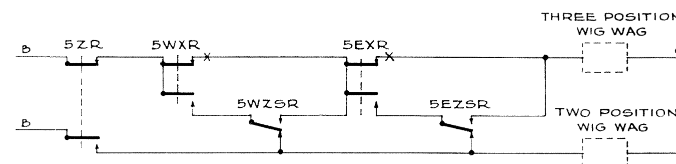


FIG. 4

NOTE:
Z = MANUAL CONTROL

AUTOMATIC FLAGMAN

TYPICAL CIRCUITS FOR HIGHWAY GRADE CROSSING SIGNALS

SEPT. 1947

AAR
SIGNAL
8011B

ADDENDUM TO A.A.R. SIG.SEC. 8012A

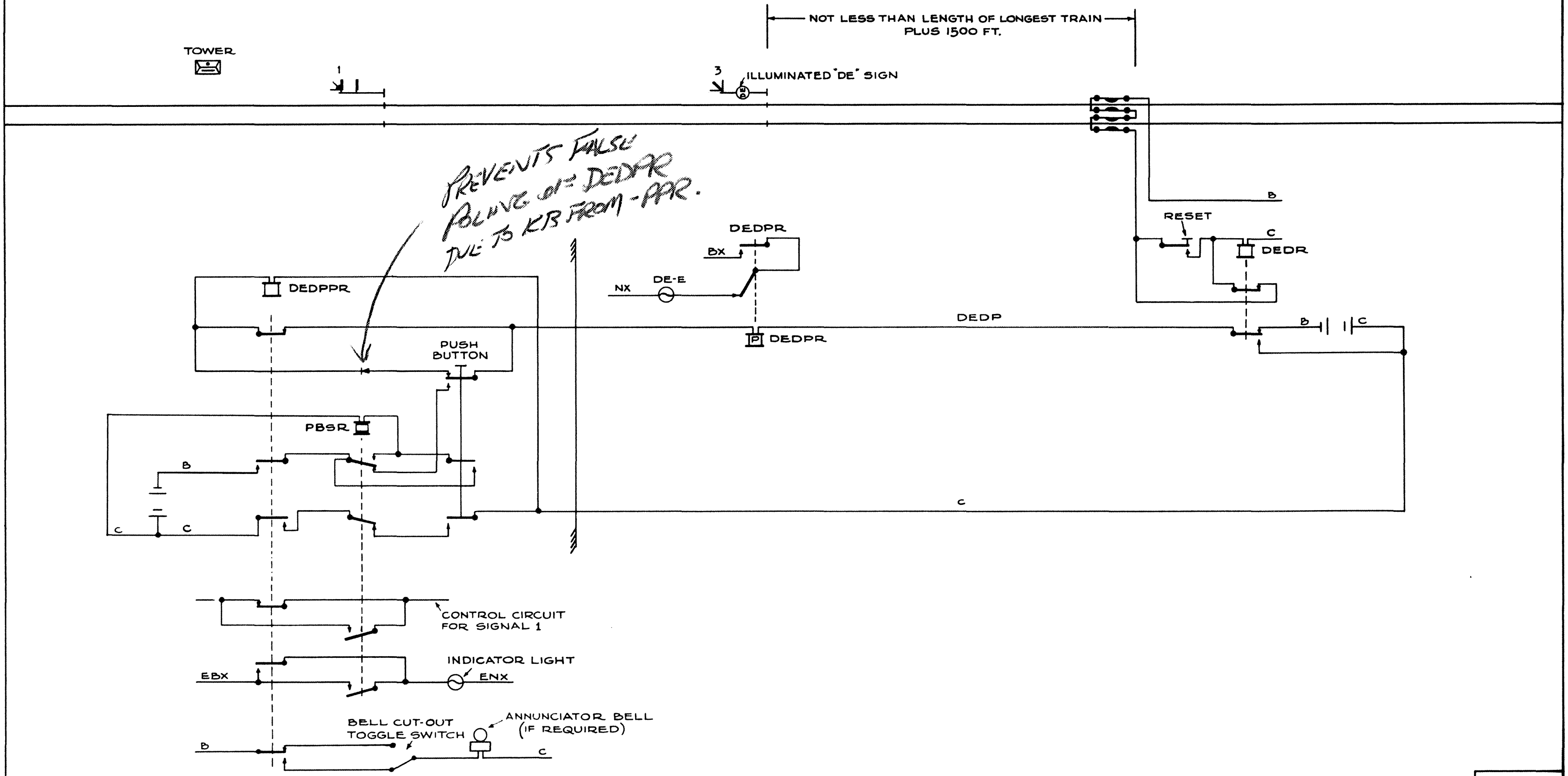
TYPICAL CIRCUITS FOR BREAKABLE TYPE DRAGGING EQUIPMENT DETECTOR WITH ILLUMINATED SIGN ON APPROACH SIGNAL.

The circuits shown on this plan provide for the use of a dragging equipment detector of the breakable type to be located as indicated on plan, assuming proper braking distance is provided between signals 1 and 3.

When the detector is actuated, an illuminated sign is lighted at signal 3 and a light and annunciator bell is actuated at the interlocking. Home signal 1 is automatically placed to stop causing signal 3 to display an approach indication. After it is proper for the train to proceed, the leverman operates a push button which permits signal 1 to be cleared and extinguishes the light in sign on signal 3. After repairs have been made to the damaged detector, the operation of a push button at that location restores the circuits to normal, ready for the next operation.

A half-wave rectifier is placed in the DEDPR circuit to prevent the polar contacts of DEDPR from operating to the reverse position when energy is removed from the DEDPP relay.

The PBS relay is slow pick-up to provide sufficient time for DEDPR to reverse when the push button is actuated. The PBSR is slow release to prevent interruption of signal 1 control when the dragging equipment detector is reset.



TYPICAL CIRCUITS FOR BREAKABLE TYPE DRAGGING EQUIPMENT
DETECTOR WITH ILLUMINATED SIGN ON APPROACH SIGNAL

SEPT. 1948

AAR
SIG.SEC
8012A

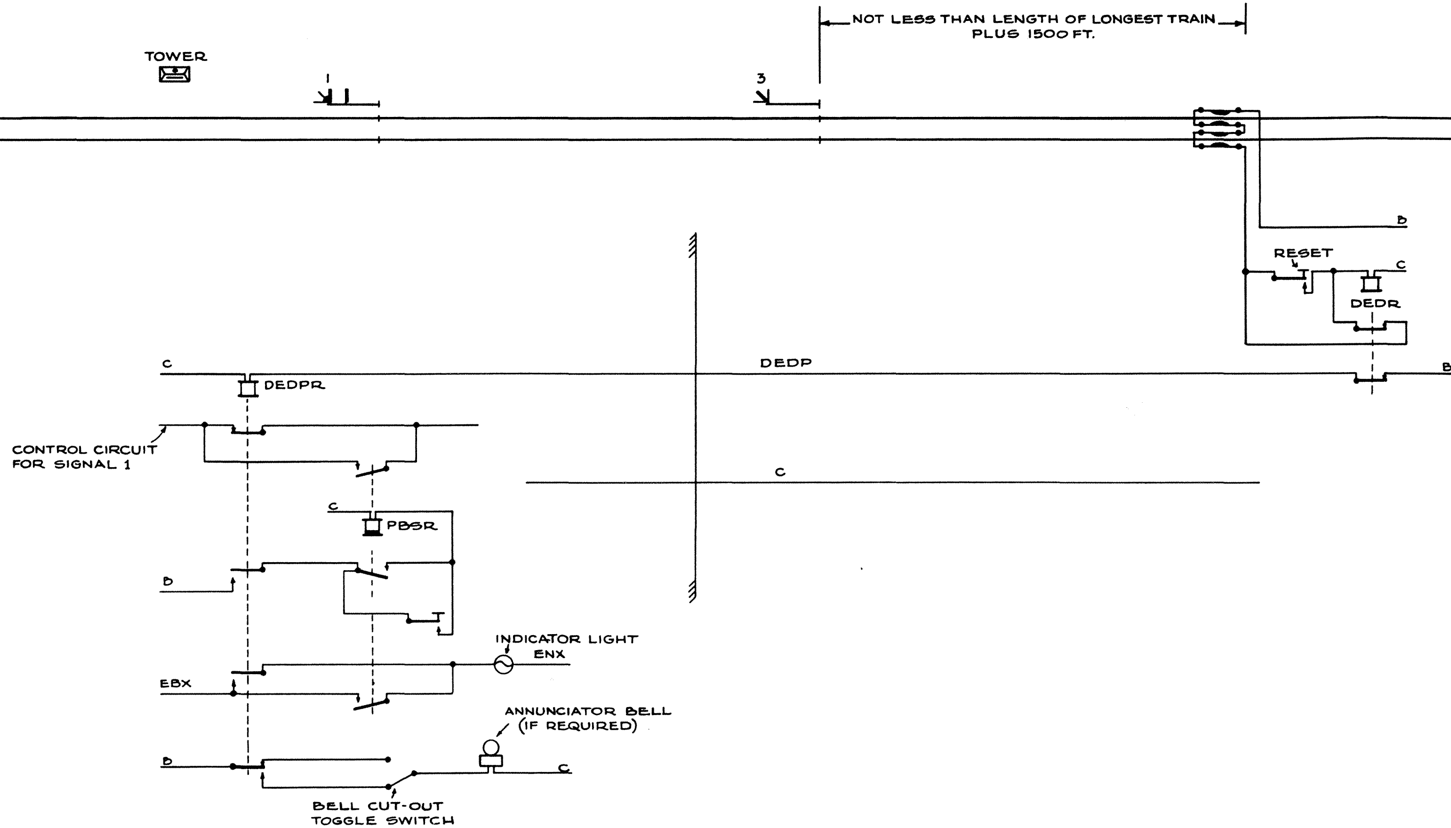
ADDENDUM TO A.A.R. SIG.SEC. 8013A

TYPICAL CIRCUITS FOR BREAKABLE TYPE DRAGGING EQUIPMENT DETECTOR.

The circuits shown on this plan provide for the use of a dragging equipment detector of the breakable type, to be located as indicated on the plan, assuming proper braking distance is provided between signals 1 and 3.

When the detector is actuated, a light and annunciator bell is also actuated at the interlocking. Home signal 1 is automatically placed to stop causing signal 3 to display an approach indication. After it is proper for the train to proceed, the leverman operates a push button, which permits signal 1 to be cleared. After repairs have been made to the damaged detector, the operation of a push button at that location restores the circuit to normal, ready for the next operation.

The PBSR relay is slow release to prevent interruption of signal 1 control when the dragging equipment detector is reset.



TYPICAL CIRCUITS FOR BREAKABLE TYPE DRAGGING EQUIPMENT DETECTOR

AAR SIG. SEC. 8013A

SEPT. 1948

ADDENDUM TO A.A.R. SIG.SEC. 8014A

TYPICAL CIRCUITS FOR SPRING SWITCH AT END OF SIDING, TRACK SIGNALED IN ONE DIRECTION.

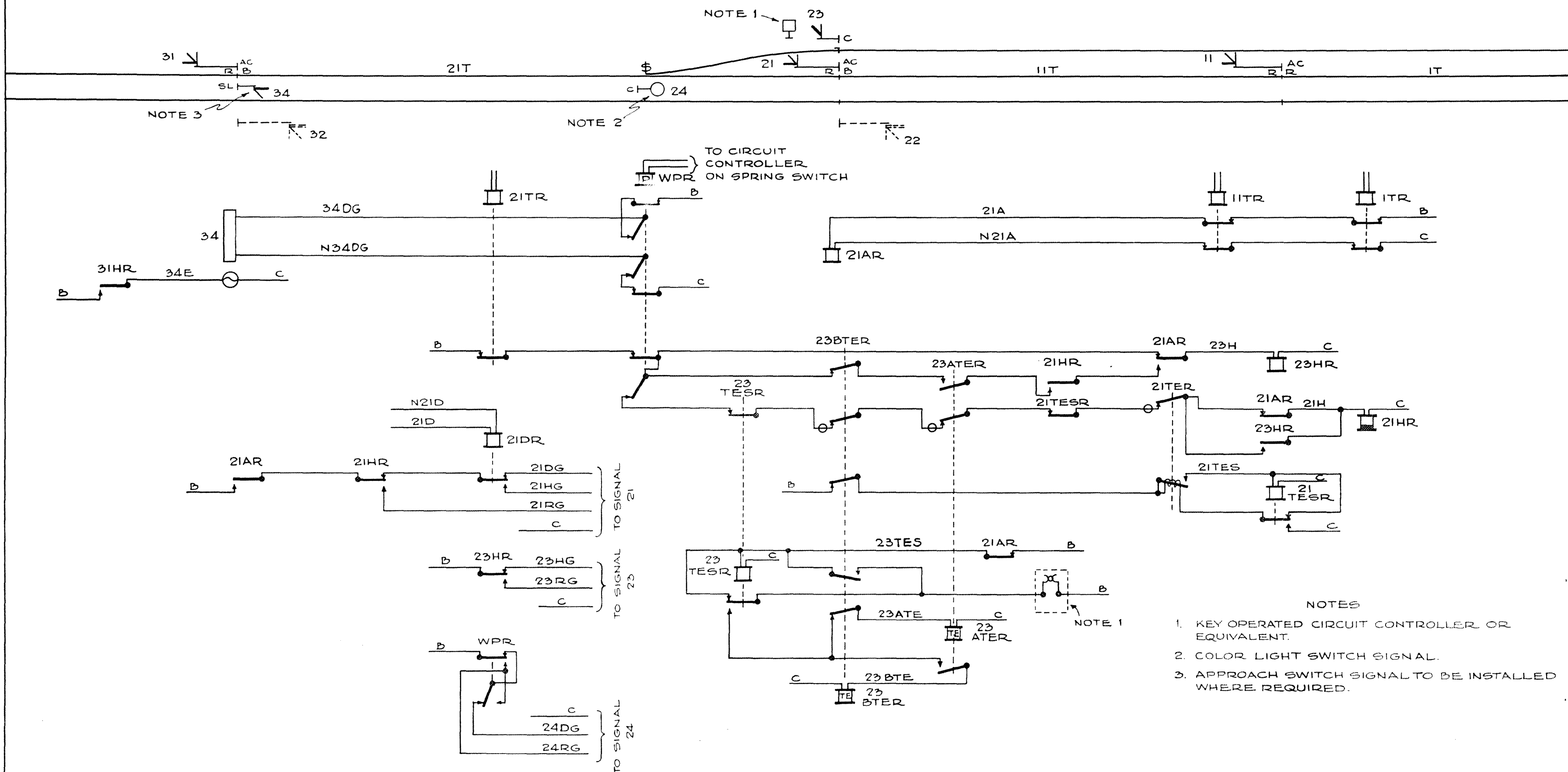
These circuits provide for normally clear signals governing trailing movements over the spring switch. This arrangement eliminates the necessity of approach or manual clearing of the siding signal when the main track approach is unoccupied. Main track signal is approach lighted.

Train upon entering the main track approach section will cause the siding signal to display Stop. If the main track approach is occupied and a movement is to be made from the siding, actuation of manual controller will cause main track signal to display Stop, and after predetermined time interval (determined by 23 ATER) the siding signal will clear. In event that the train on the siding does not accept the signal and proceed within a certain time period (determined by 23 BTER), the siding signal will display Stop, and the main track signal will clear after expiration of another time interval (determined by 21 TER). When spring switch is hand-operated to full reverse position, signal 23 will display Clear when the main track approach is unoccupied; if occupied, manual controller must be operated as previously described.

Polarized relay WPR checks the spring switch in the full normal or full reverse position.

Signal protection is also provided for facing point movements. A switch signal located at the spring switch checks that the normal switch point is fully closed. In territory where no speed restrictions are imposed over spring switches, an approach switch signal may be installed.

Relay 21H is slow release to prevent a momentary change of aspect when a train enters the main track approach section.



NOTES

1. KEY OPERATED CIRCUIT CONTROLLER OR EQUIVALENT.
2. COLOR LIGHT SWITCH SIGNAL.
3. APPROACH SWITCH SIGNAL TO BE INSTALLED WHERE REQUIRED.

TYPICAL CIRCUITS FOR SPRING SWITCH AT END OF SIDING

TRACK SIGNALED IN ONE DIRECTION WITH NORMALLY CLEAR SIGNALS AND WITH APPROACH LOCKING

SEPT. 1966	REV. 1948 A.M.	SEPT. 1948	AAR SIGNAL 8014B

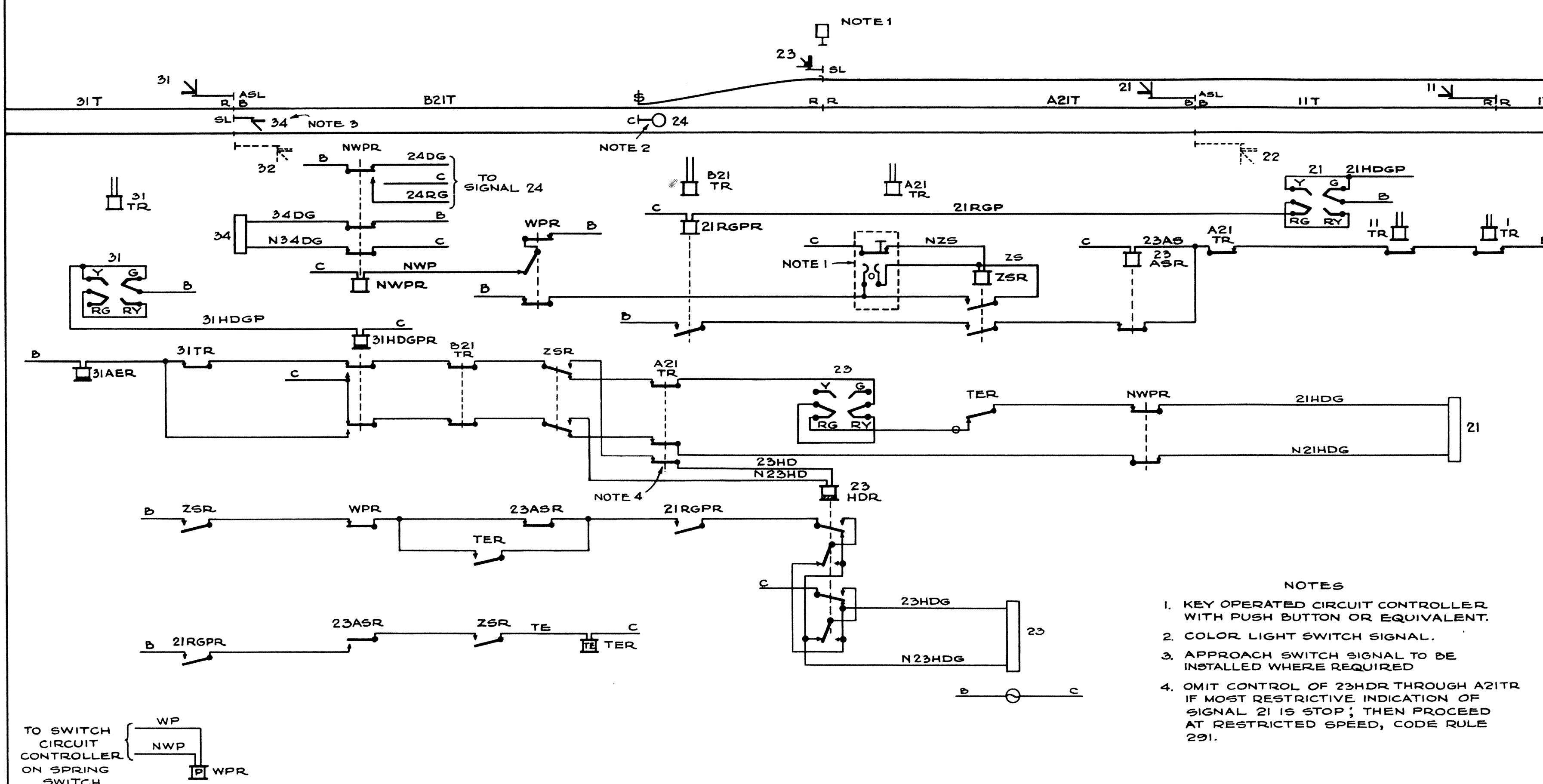
ADDENDUM TO A.A.R. SIG.SEC. 8015A

TYPICAL CIRCUITS FOR SPRING SWITCH, TRACK SIGNALED IN ONE DIRECTION.

These circuits provide for manual clearing of siding signal which is normally lighted. The main track signal is normally in the clear position and approach lighted.

If it is desired to enter main track from siding, a key-operated circuit controller with push button or equivalent is operated. When the key controller is operated, the main track signal 21 will display stop and the siding signal will clear. However, if the main track approach is occupied the siding signal will not clear until after a predetermined time interval. After the siding signal has been cleared it will remain in the clear position until a train passes the signal or the push button is operated placing siding signal to stop. The main track signal and siding signal controls check that each other displays stop. The main track signal is controlled through the spring switch in the normal position. The siding signal is controlled through the spring switch in the full normal or reverse position.

Switch signal protection is provided for normal facing point movements. An approach switch signal may be installed if required. If signal 23 authorizes higher than restricted speed, approach or time locking must be provided.



NOTES

1. KEY OPERATED CIRCUIT CONTROLLER WITH PUSH BUTTON OR EQUIVALENT.
2. COLOR LIGHT SWITCH SIGNAL.
3. APPROACH SWITCH SIGNAL TO BE INSTALLED WHERE REQUIRED
4. OMIT CONTROL OF 23HDR THROUGH A21TR IF MOST RESTRICTIVE INDICATION OF SIGNAL 21 IS STOP; THEN PROCEED AT RESTRICTED SPEED, CODE RULE 291.

TYPICAL CIRCUITS FOR SPRING SWITCH

TRACK SIGNALED IN ONE DIRECTION WITH MANUAL CLEARING OF SIDING SIGNAL BY TRAIN CREW AND WITH APPROACH LOCKING.

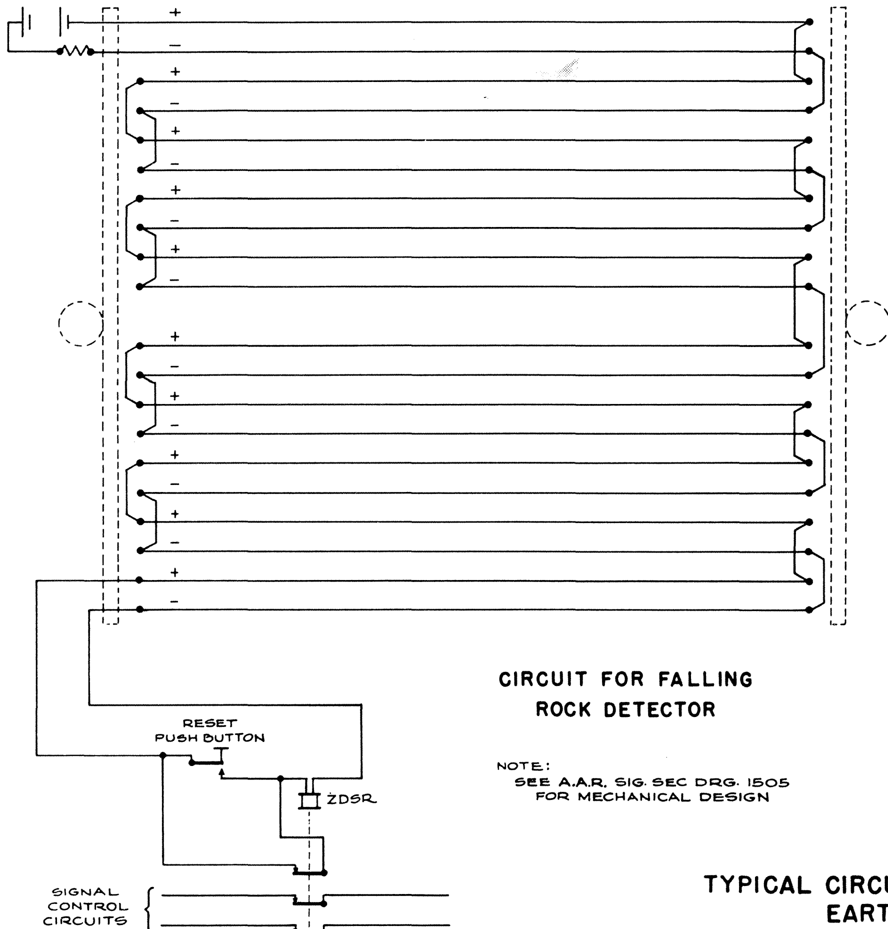
REV. 1948 A.M.	SEPT. 1948	AAR SIG.SEC. 8015A

ADDENDUM TO A.A.R. SIG.SEC. 8016A

TYPICAL CIRCUITS FOR FALLING ROCK AND EARTH SLIDE DETECTOR.

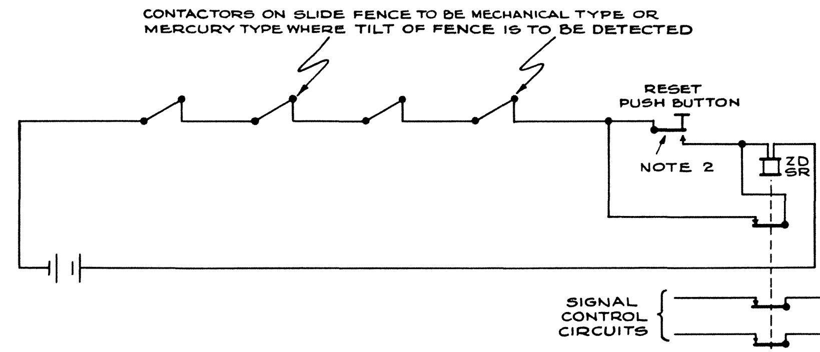
These circuits provide for protection against falling rock or earth slides causing signal governing the approach to the protected location to display a stop indication.

For falling rock protection, any object that breaks one or more of the horizontal wires will cause the detector relay (ZDSR) to become de-energized. For rock or earth slide protection, any object that causes the slide detector fence to tilt will open the contactors, thus de-energizing the detector relay. The front contacts of the detector relay are in the control circuit of each signal in the approach to the protected section. The detector relay will remain de-energized until it is energized by manually operating the reset button. The reset button and stick circuit are omitted where contactors are manually reset.



CIRCUIT FOR FALLING ROCK DETECTOR

NOTE:
SEE A.A.R. SIG. SEC DRG. 1505 FOR MECHANICAL DESIGN



CIRCUIT FOR ROCK OR EARTH SLIDE DETECTOR

NOTES:
1. SEE A.A.R. SIG. SEC. DRG. 1506 & 1507 FOR MECHANICAL DESIGN OF SLIDE FENCE & LOCATION OF CIRCUIT CONTROLLERS.
2. PUSH BUTTON AND STICK CIRCUIT IN ZDSR ARE NOT REQUIRED WHERE CONTACTORS USED MUST BE MANUALLY RESET.

TYPICAL CIRCUITS FOR FALLING ROCK AND EARTH SLIDE DETECTOR

SEPT. 1948

AAR
SIG. SEC.
8016 A

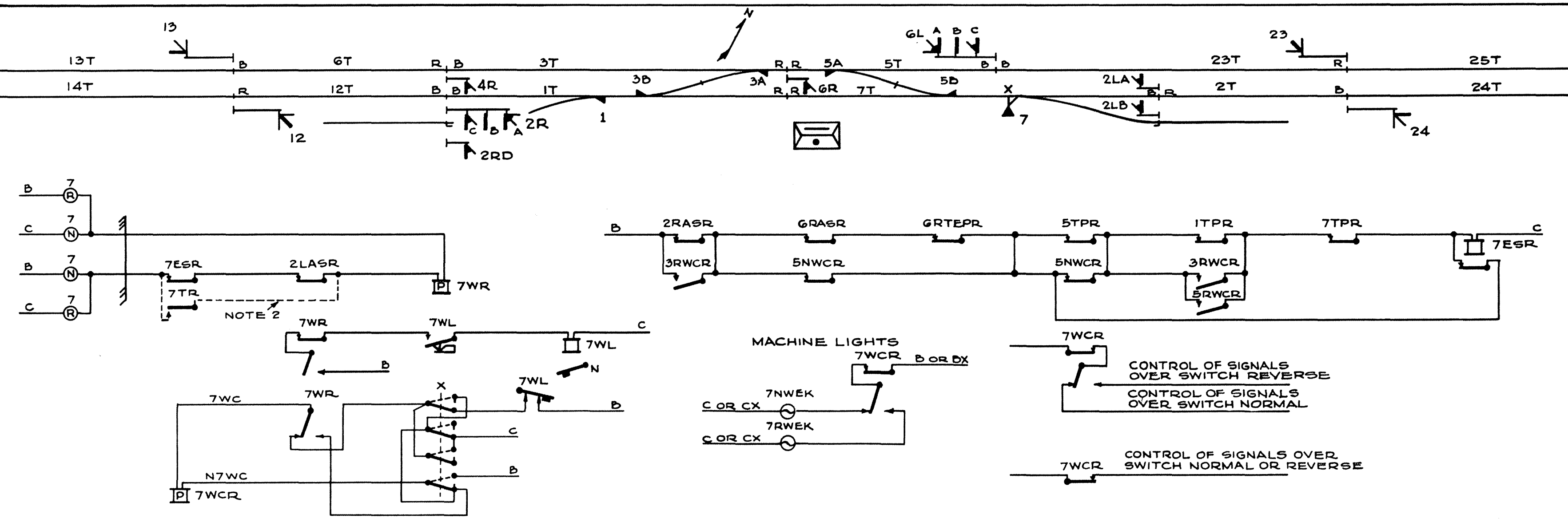
ADDENDUM TO A.A.R. SIG.SEC. 8018A

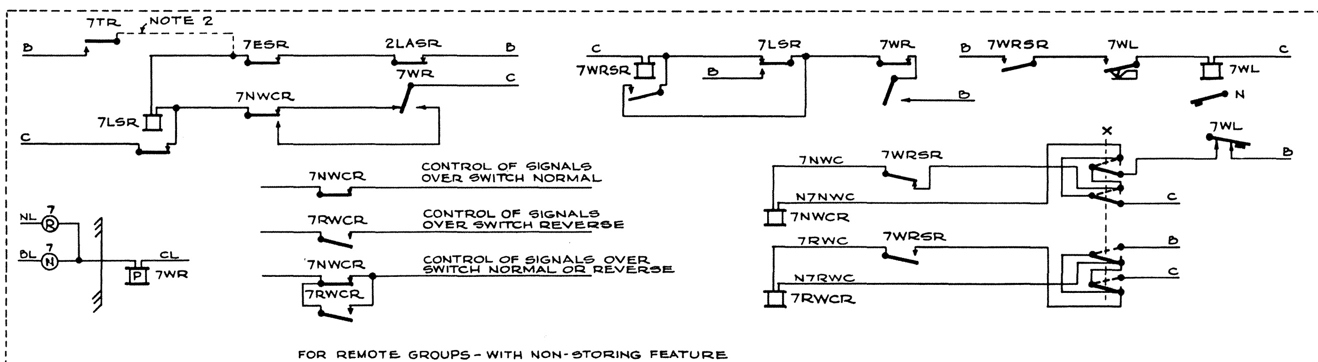
TYPICAL CIRCUITS FOR LEVER CONTROL OF ELECTRIC SWITCH LOCK WITHIN INTERLOCKING LIMITS.

These circuits provide a method of lever control with time and approach locking for electric switch locks within interlocking limits. When the switch control lever is operated, the 7WR relay will be energized and the polar contacts will assume the position depending upon the position of the lever providing the approach and route locking relays controlled by the signals governing movements over route established are energized. After 7WR relay is energized, the electric lock on the switch will become energized when the padlock on the switch is removed from the keeper. A correspondence relay identified as 7WCR is provided to check the position of switch lever and switch correspondence. The signal controls are selected through the correspondence relay in the normal or reverse position. Lights are provided on the machine showing the switch and lever in correspondence both in the normal and reverse position. An optional circuit is shown which permits the unlocking of the switch lock while a train or engine is at the switch.

The circuits shown within the dotted line section on the bottom of the plan provide a method with a non-storing feature for remote groups, that is, if the switch control lever is reversed while the approach and route locking is effective, the electric switch lock will not be released after the approach and route locking relays are energized until the switch control lever is placed normal and then reversed.

It should be noted that the WCR relay control is dependent on the polar contacts of the WR to maintain contact pressure with the relay de-energized, as the relay is de-energized when the approach and route locking is effective.





NOTES
1. FOR APPROACH & TIME LOCKING CIRCUITS 2LASR, 2RASR, 6RASR, SEE A.A.R. DRAWING 8010A.
2. OPTIONAL CIRCUIT TO PERMIT RELEASE OF 7 LOCK WITH TRAIN OR ENGINE AT SWITCH.

TYPICAL CIRCUITS FOR LEVER CONTROL OF ELECTRIC SWITCH LOCK WITHIN INTERLOCKING LIMITS.

REV. 1948 A.M.	SEPT. 1948	AAR SIG. SEC. 8018 A

ADDENDUM TO A.A.R. SIG.SEC. 8019A

TYPICAL ELECTRIC SWITCH LOCK CIRCUITS.

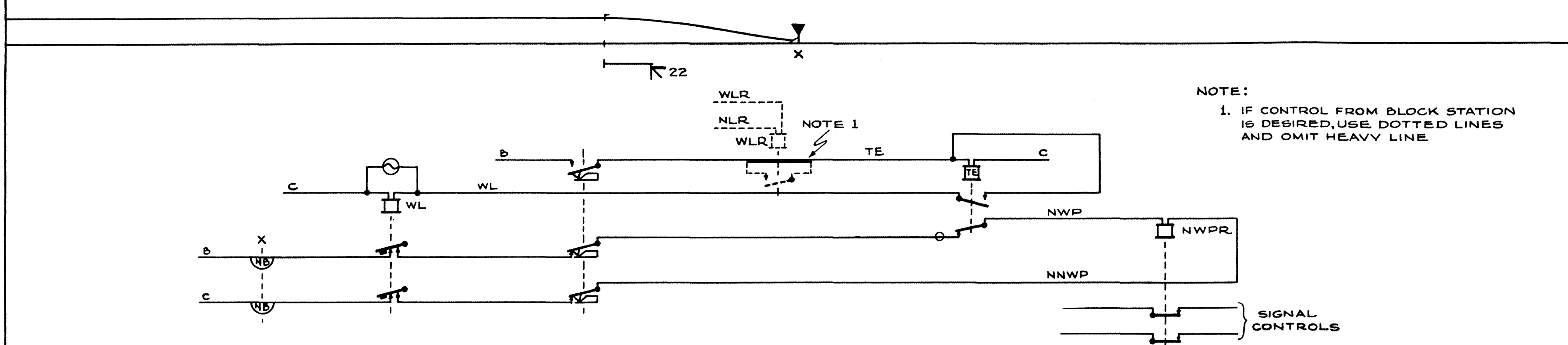
The circuit on the top half of the plan is a typical switch lock circuit with time locking only, and contemplates use of a latch type electric lock.

When the padlock is removed from the keeper, contacts are actuated in the lock which closes the TE circuit and opens the NWPR circuit. After a time interval, the lock magnet coil is energized and an unlock indication lamp is lighted. The switch may then be operated. After the switch is returned to normal position and padlock is placed in keeper an additional check is provided that the lock magnet armature is in the de-energized position before the normal switch repeating relay is energized.

If it is desired to control the lock from a block station an arrangement is shown. However, if it is desired not to open the NWPR control when the padlock is removed until the block station releases the lock, the circuits would have to be modified.

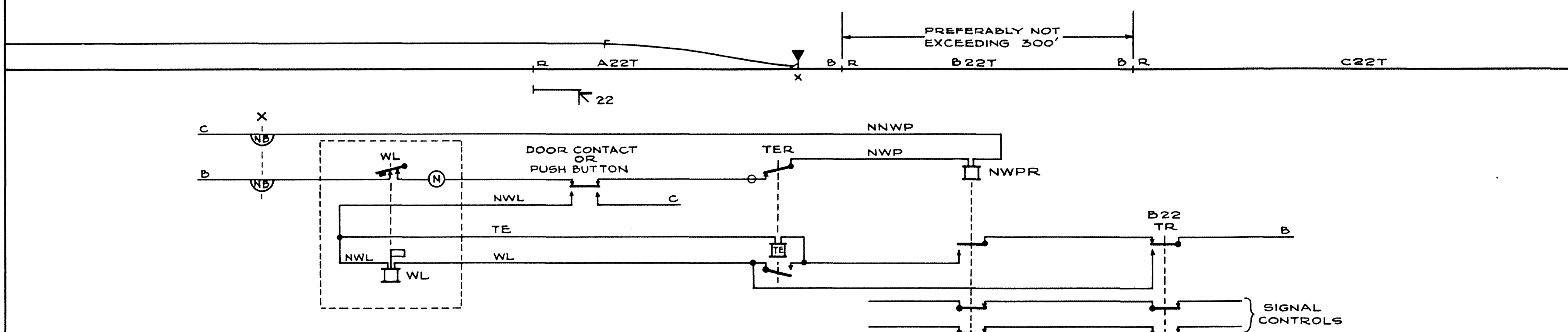
The circuit on the lower half of the plan is a typical switch lock circuit with time locking and automatic releasing track section, and contemplates the use of a pedestal type lock.

To enter siding from main track the door contact or push button must be operated. If the train occupies the releasing track section, the electric lock will be immediately energized. If the train does not occupy the releasing track section in order to unlock switch, door contact or push button must be operated and then after a time interval, the switch will become unlocked.



TYPICAL ELECTRIC SWITCH LOCK CIRCUITS

WITH TIME LOCKING ONLY



TYPICAL ELECTRIC SWITCH LOCK CIRCUITS

WITH TIME LOCKING AND AUTOMATIC RELEASING TRACK SECTION

SEPT. 1948

AAR
SIG. SEC.
8019A

ADDENDUM TO A.A.R. SIG.SEC. 8020A

TYPICAL CIRCUITS FOR YARD TRACK INDICATOR DIRECT WIRE CONTROL.

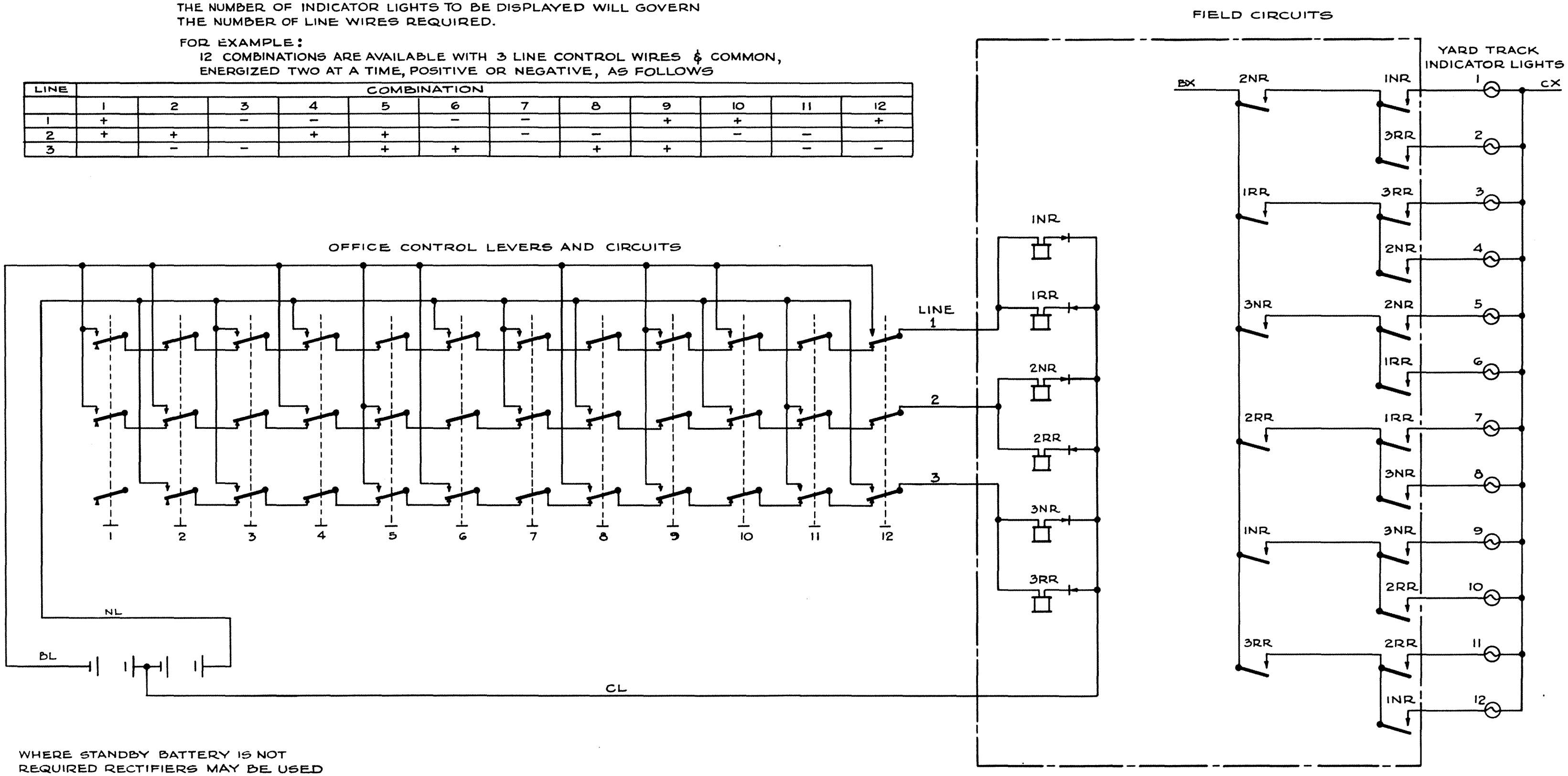
By using three line wires and a common return, this scheme provides for the display of 12 indications in the field. The control lever contacts are so arranged that a certain polarity of energy is sent over two of the line wires to energize two relays. The circuits are so arranged that only one control can be sent at a time; however, if more than one lever is reversed, the higher numbered lever will take precedence. Each relay circuit is blocked by a half-wave rectifier so that it responds only to a certain polarity. The indication light control circuit is selected through the two relays that are energized.

Where stand-by batteries are not required the circuits may be fed from full-wave rectified energy.

NOTE:
THE NUMBER OF INDICATOR LIGHTS TO BE DISPLAYED WILL GOVERN THE NUMBER OF LINE WIRES REQUIRED.

FOR EXAMPLE:
12 COMBINATIONS ARE AVAILABLE WITH 3 LINE CONTROL WIRES & COMMON, ENERGIZED TWO AT A TIME, POSITIVE OR NEGATIVE, AS FOLLOWS

LINE	COMBINATION											
	1	2	3	4	5	6	7	8	9	10	11	12
1	+		−	−		−	−		+	+		+
2	+	+		+	+		−	−		−	−	
3		−	−		+	+		+	+		−	−



WHERE STANDBY BATTERY IS NOT REQUIRED RECTIFIERS MAY BE USED

TYPICAL CIRCUITS FOR YARD TRACK INDICATOR DIRECT WIRE CONTROL

SEPT. 1948

AAR SIG. SEC. 8020A

ADDENDUM TO A.A.R.SIG.SEC. 8021A

TYPICAL CIRCUITS FOR YARD TRACK INDICATOR, CODE CONTROL.

This system provides a means by which an operator at an office can remotely control a yard track indicator. Code control equipment is used to obtain a large number of indications over a two-wire circuit.

The control point apparatus consists of a control panel, coding unit, and a power supply. The equipment at the remote station consists of a coding unit, yard track indicator signal, and a power supply. The code control system is all-relay, operating on the counting principle. Each code is a series of line impulses, the number determined by the indication selected. The full code is 21 impulses. The first impulse prepares the equipment for coding. The following impulses establish the desired indication. Only the number of pulses are transmitted (in addition to the first) that are required to count the number representing the selected indication. For example, lamp 1 is obtained by two impulses and lamp 20 by 21 impulses.

The control panel consists of 10 three-position keys. Normally the keys are on center. The upper position of the keys selects indicator lights 1 to 10, inclusive, and the lower position selects indicator lights 11 to 20, inclusive. When any key is moved, a circuit is closed to energize the ST relay, which in turn starts transmission of a code by the action of the office T relay. When the required number of pulses have been sent, a stick circuit on the T relay stops the coding action.

Listed below is a description of the functions of the various relays:

R	- Line relay	- Follows the coding action.
ST	- Code starting relay	- Relay which starts the code.
T	- Line transmitting relay	- Transmits the code generated to the line.
LC	- Line closed relay	- Repeats the line relay when line circuit is closed.
LO	- Line open relay	- Repeats the line relay when line circuit is open.
Y & Z	- Half cycle relays	- Act to select even and odd counting relays.
1 to 10 & 20	- Counting chain relays	- Count the code pulses as transmitted. The 20 relay is also used to register the preparation step in addition to step 20.
CR	- Chain repeat relay	- Used to recount chain relays 1 to 9 for codes over 10 pulses.

ADDENDUM TO A.A.R. SIG.SEC. 8021A - Continued

It should be noted that relays ST and T function only in the office unit. They are included in the field unit to make these units interchangeable. A code light is provided to indicate:

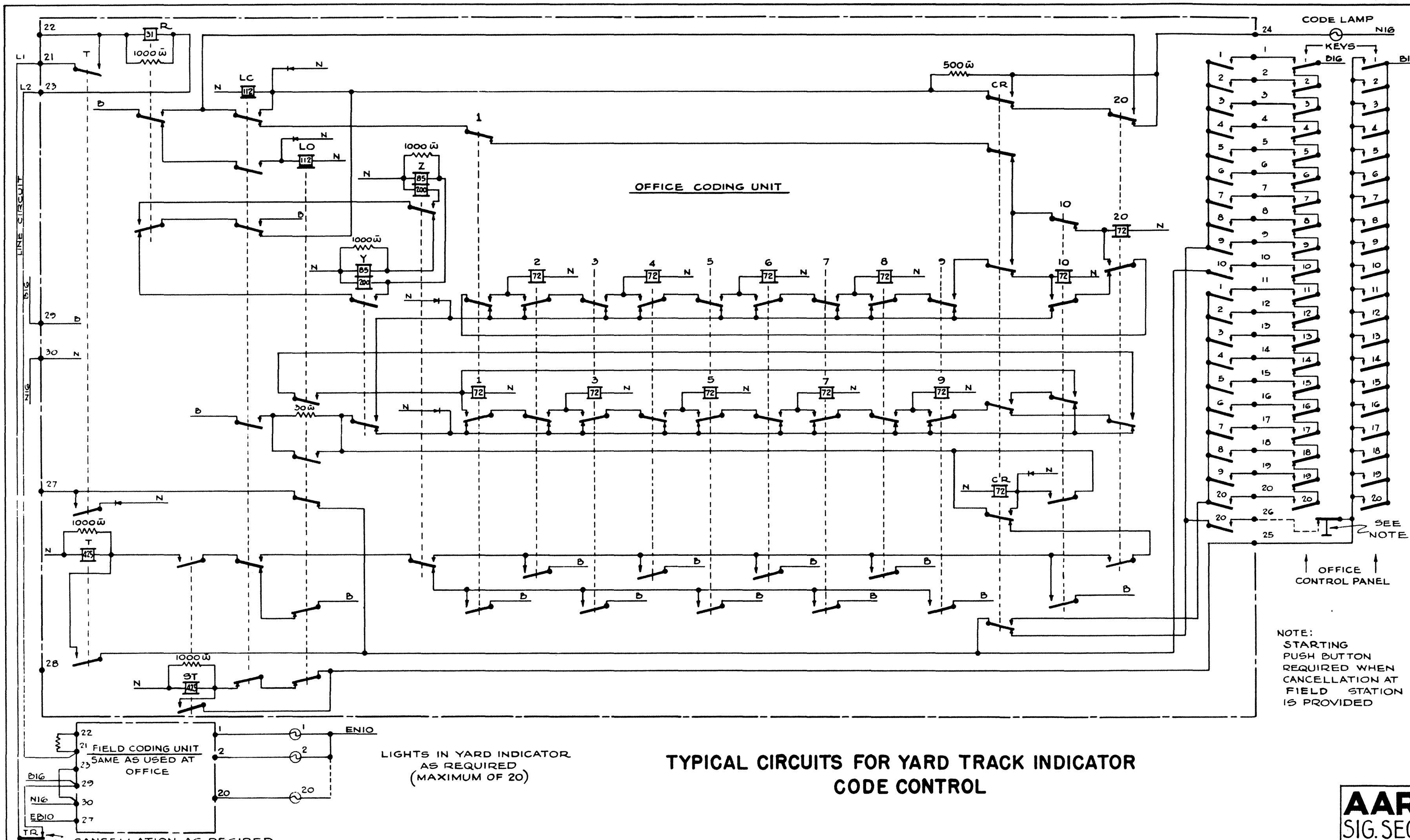
(a) Line in normal condition, or if a key is operated that a.c. power may be off at control office or field station. Line circuit may be broken, or a train occupying the trip section. - Light out

(b) A.C. power is on at control office and field station. That line circuit is intact and track section is clear. - Light dim

(c) Line coding. - Light flashing

(d) Indicator being displayed. - Light bright

A starting push button is required at the office, when field cancellation is involved, to prevent reclearing the cancelled indication.



NOTE:
STARTING PUSH BUTTON REQUIRED WHEN CANCELLATION AT FIELD STATION IS PROVIDED

TYPICAL CIRCUITS FOR YARD TRACK INDICATOR CODE CONTROL

REV. 1948 A.M.	SEPT. 1948	AAR SIG. SEC 8021A

ADDENDUM TO A.A.R. SIG.SEC. 8022A

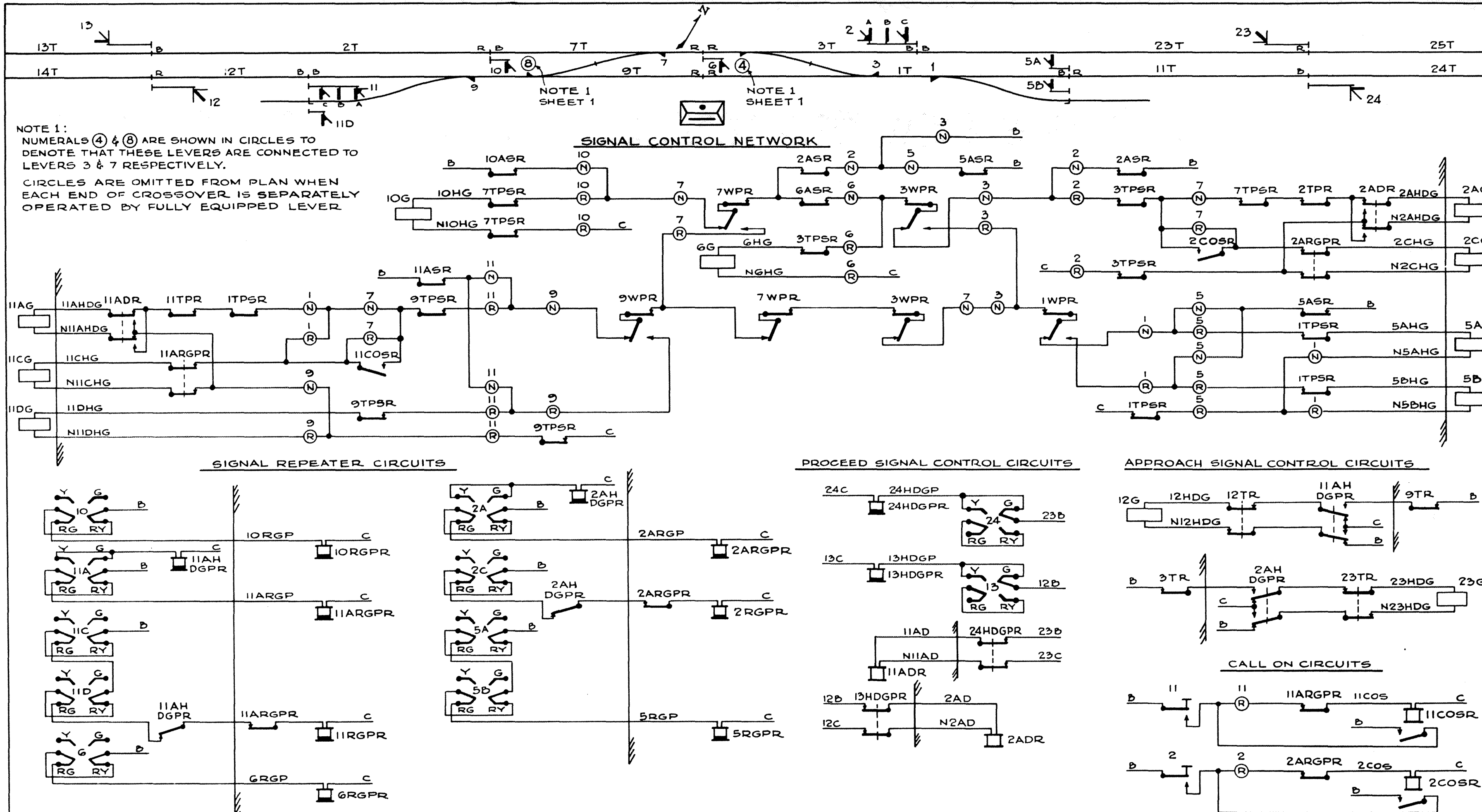
TYPICAL CIRCUITS FOR ELECTRIC INTERLOCKING WITH MECHANICAL LOCKING AND DYNAMIC SWITCH INDICATION.

These plans provide for the control of switches and signals by an electric interlocking machine. Switches are dynamically indicated and checked in the over and locked position by switch repeater relays.

The signal control network shown on Sheet 1 consists of circuits for direct control of searchlight signals which check that the switch levers and switch repeater relays are in correspondence and that the opposing approach locking relay is energized. Signal levers are not equipped with indication locks. Signals are semiautomatic stick. Restricting signals are controlled through first track section only.

Electric switch locking is provided by using an electric lock on the switch lever securing the lever in the locked position when the approach locking, route locking or detector track relays are de-energized.

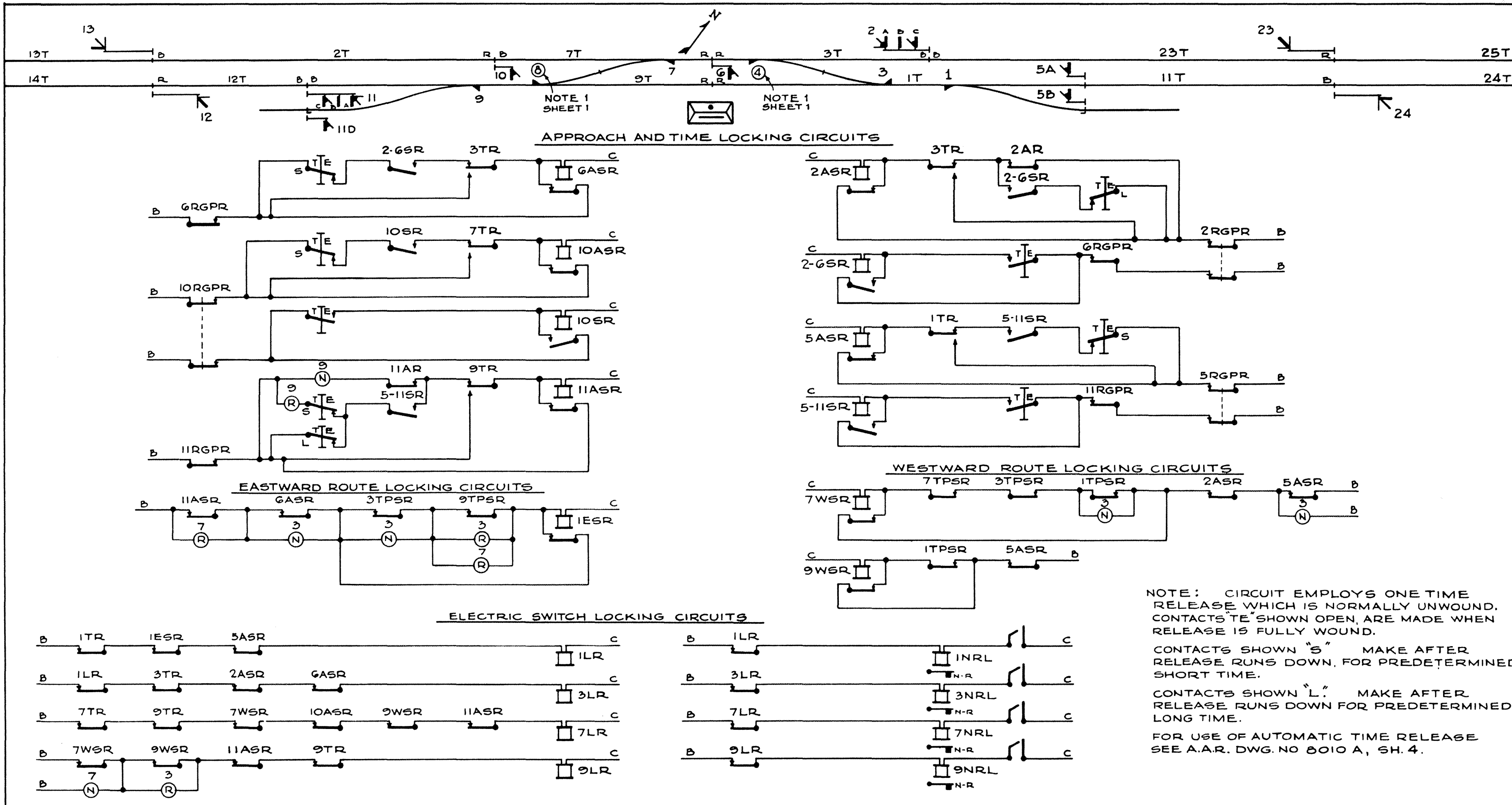
Sheet 4 shows the switch control and indication circuits. These switch machines each require two control (NW and RW) and an individual return (CW) wire for their operation. These same wires are also used for dynamic indication purposes, i.e., the normal control (NW) wire is used for reverse dynamic indication and the reverse control (RW) wire for normal dynamic indication. When a switch lever is moved to the next operating position the control circuit is completed from the positive bus through the safety magnet, one coil of indication selector, lever contact over (NW or RW) control wire to the switch machine and back over individual return (CW) wire through the cross-protection relay contact to the negative bus. After the switch machine has operated to the position called for by the lever and is locking up, the pole changer contacts in the switch machine are mechanically moved to the opposite position, opening the operating circuit and closing the dynamic indicating circuit. The motor is then connected to act as a generator and the dynamic circuit is closed from the switch machine over the (CW) wire, through cross-protection relay, indication magnet, indication selector contacts and lever contact, back to switch machine over the opposite control wire. The dynamic current generated by the motor snubs it to a stop and energizes the indication magnet thus permitting lever movement to be completed. In addition to being mechanically operated, contact bars A & B are under the control of two sets of solenoids, so that should the switch not complete its movement the switch lever may be moved to opposite position and, through the energizing of one set of solenoid coils, cause the pole changer to set up the circuit for the operation of the switch in the opposite direction. Cross-protection is provided to prevent the unauthorized movement of the switch due to energy being improperly applied to the circuit through a cross between wires. This is accomplished by the use of the polarized cross-protection relay.



TYPICAL CIRCUITS FOR ELECTRIC INTERLOCKING WITH MECHANICAL LOCKING AND DYNAMIC SWITCH INDICATION

AAR SIG. SEC. 8022 A

SEPT. 1948



NOTE: CIRCUIT EMPLOYS ONE TIME RELEASE WHICH IS NORMALLY UNWOUND. CONTACTS "TE" SHOWN OPEN, ARE MADE WHEN RELEASE IS FULLY WOUND.

CONTACTS SHOWN "S" MAKE AFTER RELEASE RUNS DOWN, FOR PREDETERMINED SHORT TIME.

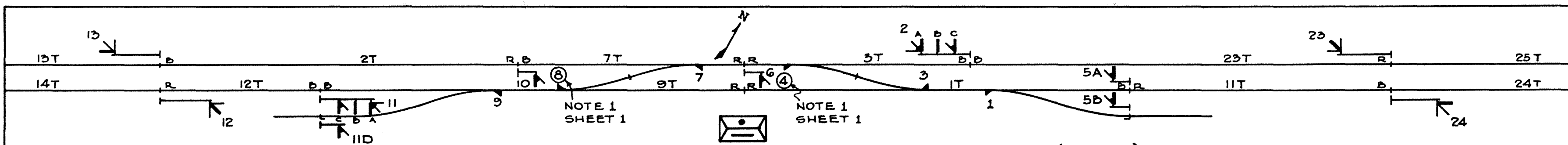
CONTACTS SHOWN "L" MAKE AFTER RELEASE RUNS DOWN FOR PREDETERMINED LONG TIME.

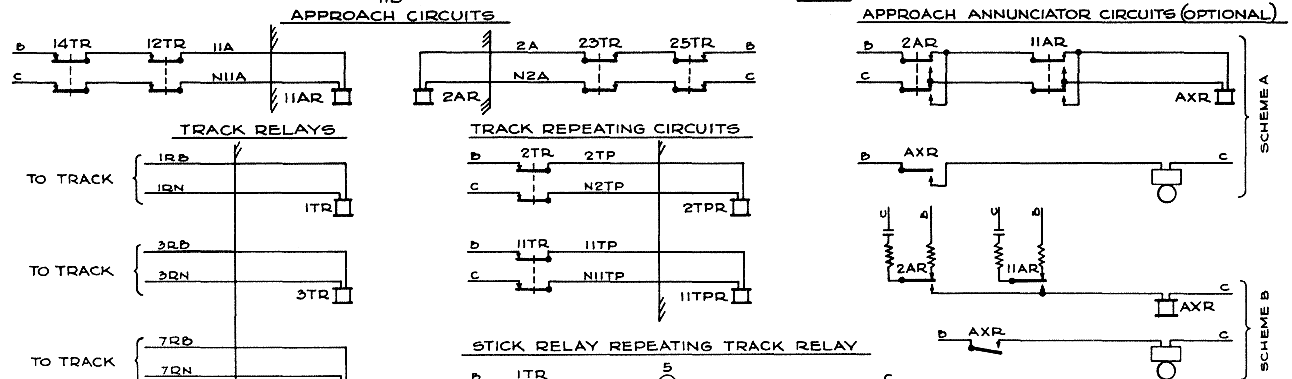
FOR USE OF AUTOMATIC TIME RELEASE SEE A.A.R. DWG. NO 8010 A, SH. 4.

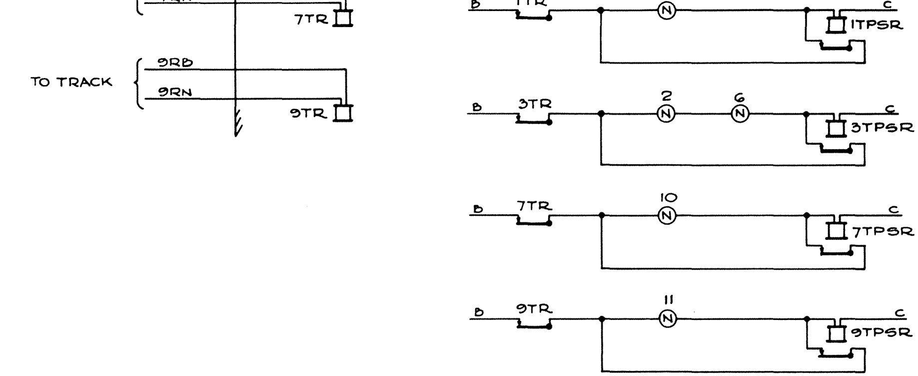
TYPICAL CIRCUITS FOR ELECTRIC INTERLOCKING WITH MECHANICAL LOCKING AND DYNAMIC SWITCH INDICATION

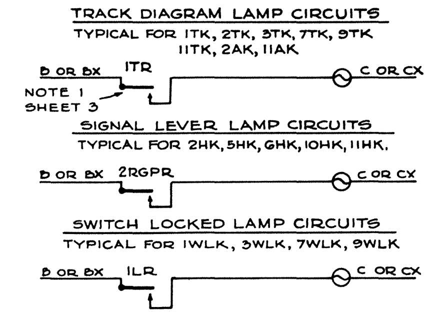
SEPT. 1948

AAR SIG. SEC. 8022 A









LEVER	WHEN	LOCKS
1		
2		3 6 7 ⑦ 10
	⑦	9 ⑨ 11
3		
4		STUB-NOTE 1, SHEET 1
5		1 ① 3 ③ 11
	3	7 9 ⑨
	③	6 7 ⑦ 10
	③⑦	9 ⑨
6		3 ③
	③	1 ①
7		
8		STUB-NOTE 1, SHEET 1
9		
10		7
11		7 ⑦ 9 ⑨
	7	1 ① 3
12		SPARE

NOTE 1:
BY USE OF CONTACT IN TPSR IN LIEU OF TR; TK LIGHTS WILL INFORM OPERATOR THAT SIGNAL LEVER MUST BE RESTORED TO NORMAL, AND BE REVERSED AGAIN FOR FOLLOWING MOVEMENT.

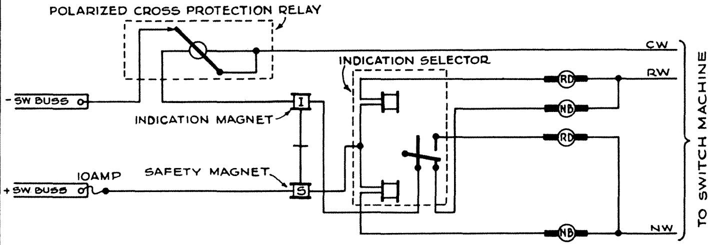
TYPICAL CIRCUITS FOR ELECTRIC INTERLOCKING WITH MECHANICAL LOCKING AND DYNAMIC SWITCH INDICATION

SEPT. 1948

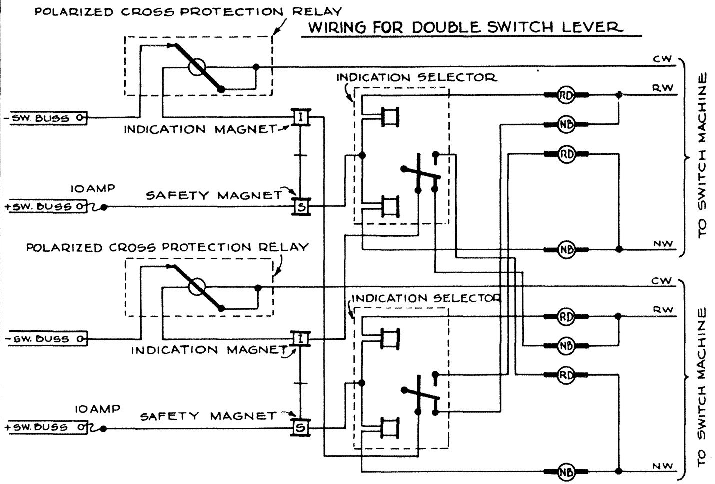
AAR SIG. SEC. 8022 A

SWITCH CONTROL AND INDICATION CIRCUITS

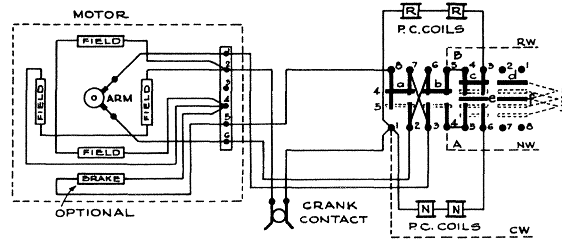
WIRING FOR SINGLE SWITCH LEVER



WIRING FOR DOUBLE SWITCH LEVER

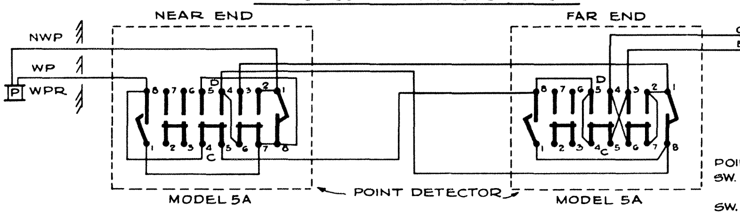


WIRING FOR MODEL 5A SWITCH MACHINE



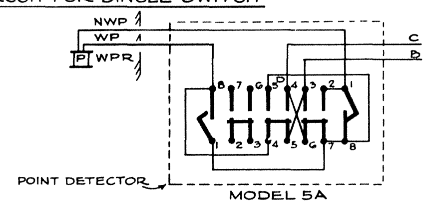
NOTE:
SEQUENCE OF OPERATION FOR MODEL 5A SWITCH MACHINE WITH ELECTRIC POLE CHANGER.
CONTACT BARS c, d, e, AND f, MOVE FROM POSITION 1 TO POSITION 2 AS THE MACHINE UNLOCKS FROM ITS NORMAL POSITION; THEY THEN MOVE FROM POSITION 2 TO POSITION 3 AS THE MACHINE COMPLETES ITS LOCKING STROKE GOING TOWARD REVERSE.
CONTACT BARS a AND b MOVE FROM POSITION 4 TOWARD 5 JUST AFTER BARS c, d, e AND f START MOVING FROM 2 TO 3. CONTACT BARS a AND b WILL ALSO MOVE FROM 4 TO 5 OR VICE VERSA, DUE TO THE ATTRACTION OF THE POLE-CHANGER COILS IF THE MACHINE IS REVERSED IN MIDSTROKE.
CONTACT BARS MOVE IN A SIMILAR MANNER WHEN MACHINE IS OPERATED FROM REVERSE TO NORMAL; THAT IS, BARS c, d, e AND f, GO FROM 3 TO 2 TO 1; AND BARS a AND b GO FROM 5 TO 4.

WP CIRCUIT FOR CROSSOVER



POINT DETECTOR CONTACTS CLOSED
SW. FULL NORMAL—2C-3C, 4C-5C, 6C-7C 1D-8C
SW. ON CENTER— 1C-8D, 1D-8C
SW. FULL REVERSED—2D-3D, 4D-5D 6D-7D, 1C-8D

WP CIRCUIT FOR SINGLE SWITCH



TYPICAL CIRCUITS FOR ELECTRIC INTERLOCKING WITH MECHANICAL LOCKING AND DYNAMIC SWITCH INDICATION

SEPT. 1948

AAR
SIG. SEC.
8022A

ADDENDUM TO AAR SIG. SEC. 8023A

TYPICAL CIRCUITS FOR POWER INTERLOCKING WITH MECHANICAL LOCKING USING BATTERY SWITCH INDICATION.

The circuits shown on these plans provide for the control of switches and signals by means of a power interlocking machine with mechanical locking. The signal control levers are equipped with locking segments and electric magnets to provide approach and/or time locking. The switch control levers are equipped with locking segments and electric magnets to provide both indication and detector locking.

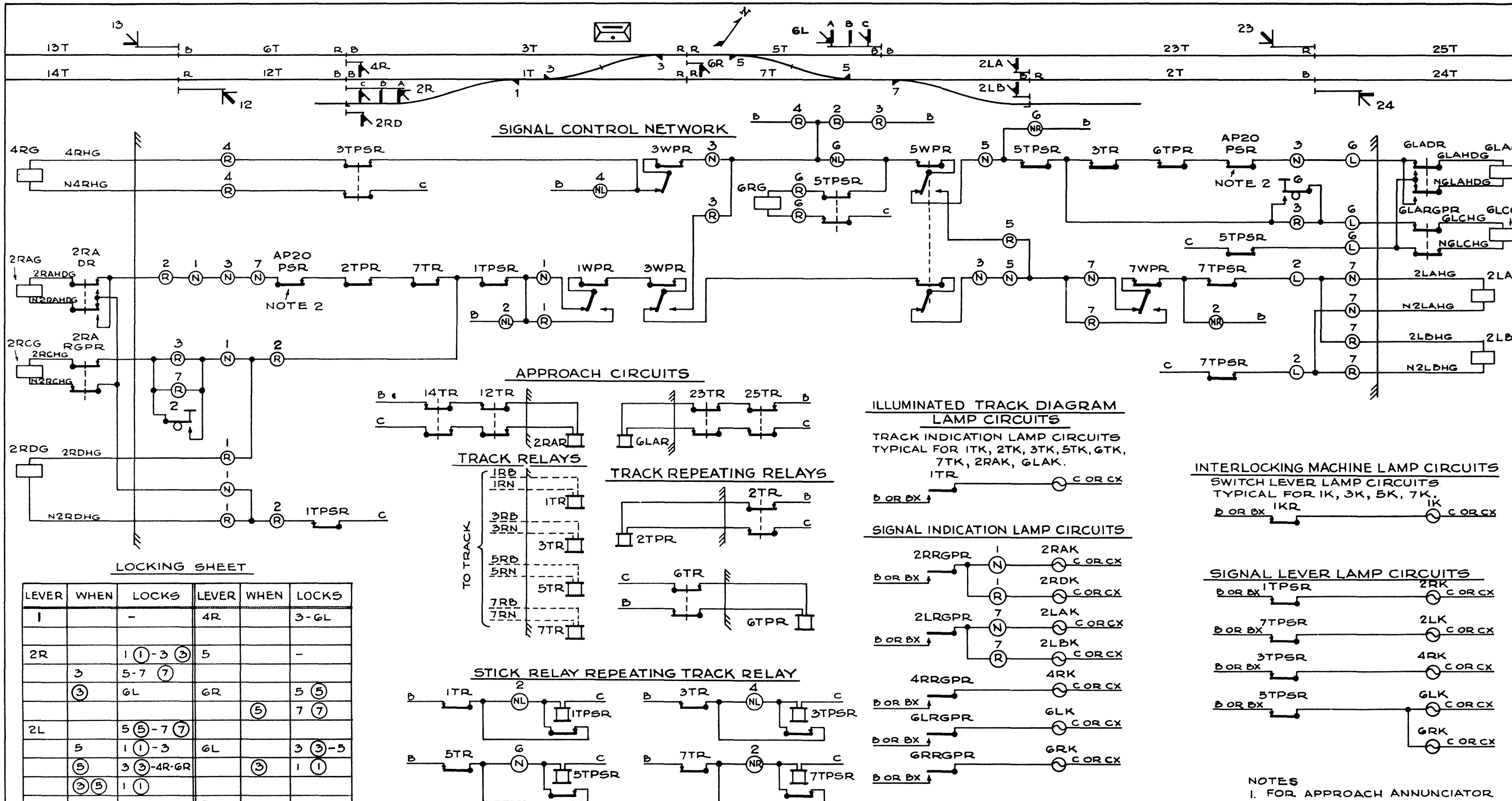
Sheet 1 shows the signal control network for searchlight signals and provides for agreement of switch control lever with indicated switch position. Opposing signal protection is provided where necessary by means of opposing signal lever position check. Stick type, semi-automatic signaling is provided by means of TPSR relays controlled through appropriate track relay contacts, which require restoration of signal lever to the normal position before the signal can be recleared. The circuits for control of the track diagram lighting are shown, along with the control of the machine indicating circuits. The switch lever lamp circuit provides indication, when extinguished, that the switch is locked by detector or route locking. The signal lever lamp circuit provides indication, when extinguished, that the signal is at stop, and the lever must be restored to normal to either reclear that signal or to clear an opposing signal. Restricting signals are controlled through the first track section only.

The approach and time locking circuits shown on Sheet 2 provide for approach locking release of signals. A predetermined long time interval provided by operation of a clockwork time release is required to obtain release of signal locking for 2R and 6L should these signals be restored to stop after their respective approach sections are occupied (2RAR and 6LAR down). Other signals, for which no approach sections are provided, require a predetermined shorter time interval to obtain release of locking in every instance that these signals are set to stop. A quick release of signal locking is obtained after a train movement passes a signal by use of a back contact of the appropriate TPSR in the signal locking circuit. The route and switch locking circuits provide for continuous switch locking for the entire movement through a cleared route.

Sheet 3 shows control of electro-pneumatic switch-and-lock movements with CP valves–searchlight signals. The lock valve is energized only during the disagreement between the "called-for" position of the lever and the indicated switch position, remaining energized until the switch is in the proper position and is indicating locked. The construction of the CP valve is such that the lock valve magnet must be energized before compressed air can reach the pin valve chamber of the normal or reverse operating magnets. The normal or reverse operating magnet is continuously energized, and to allow magnets of like resistance to be used for either single or crossover switches, a current limiting resistor is used in single switch control circuits. The valve-operated circuit controller (marked with an asterisk on the plan) is connected to the walking beam of the valve which is moved by the two plunger pistons associated with the normal and reverse pin valve chambers. The agreement check between the valve-operated circuit controller and the switch movement circuit controller in the WPR circuit provides a positive check of the completed air operation, along with the completed movement of the operating switch-and-lock movement before the switch locked position is indicated. The reception of the proper switch position indication releases the electric locking of the switch lever in its indicating position to allow completion of the movement of the lever to its fully operated position. A restoring circuit is shown for both single switch and crossover. This circuit is provided through contacts 5, 6, 7 and 8 of the switch movement controller and is so designed that should the movement be improperly moved out of its locked position, the lock valve is energized to provide for momentary operation of the air system to admit air to the cylinder. The resistor in the restoring circuit of the far end lock valve of a crossover switch is provided to prevent the shunting of the lock valve magnet at the near end during normal simultaneous operation of both ends of the crossover. Switch lever indication circuits are shown for the situation in which a separate detector lock segment and magnet are provided for the switch lever and for the situation where the indication locking segments are also used for detector locking.

Sheet 4 shows control of Style M2 switch-and-lock movements–searchlight signals. Both the armature and field of the switch-and-lock movement are opened until a movement of the switch is required. The motor control circuit passes through movement-operated, segmental type contacts; one pair opening the circuit when the movement is in its full reverse position, another pair opening the circuit when the movement is in its full normal position.

The indication contacts of the circuit controller are jointly operated by the lock bar and point detector mechanism with which the switch-and-lock movement is provided. This joint operation is so arranged that the movement, checked by the lock bar, must be in its proper position; and the switch points, checked by the point detector, must be closed before an indication can be obtained. Overload protection is provided by means of an overload relay which will not pick up when energized with normal operating current, but will pick up when energized with above normal operating current as occurs when the switch point is obstructed. A holding circuit for the overload relay is provided so that when operated the motor remains cut out until the switch is operated toward the unobstructed position, after which another operation toward the obstructed position can be made. The switch lever indication circuits on Sheet 4 are similar to those described on Sheet 3.



LOCKING SHEET

LEVER	WHEN	LOCKS	LEVER	WHEN	LOCKS
1		–	4R		3-6L
2R		1 1-3 3	5		–
	3	5-7 7			
	3	6L	6R		5 5
				5	7 7
2L		5 5-7 7			
	5	1 1-3	6L		3 3-5
	5	3 3-4R-6R		3	1 1
	3 5	1 1			
			7		–
3		–			

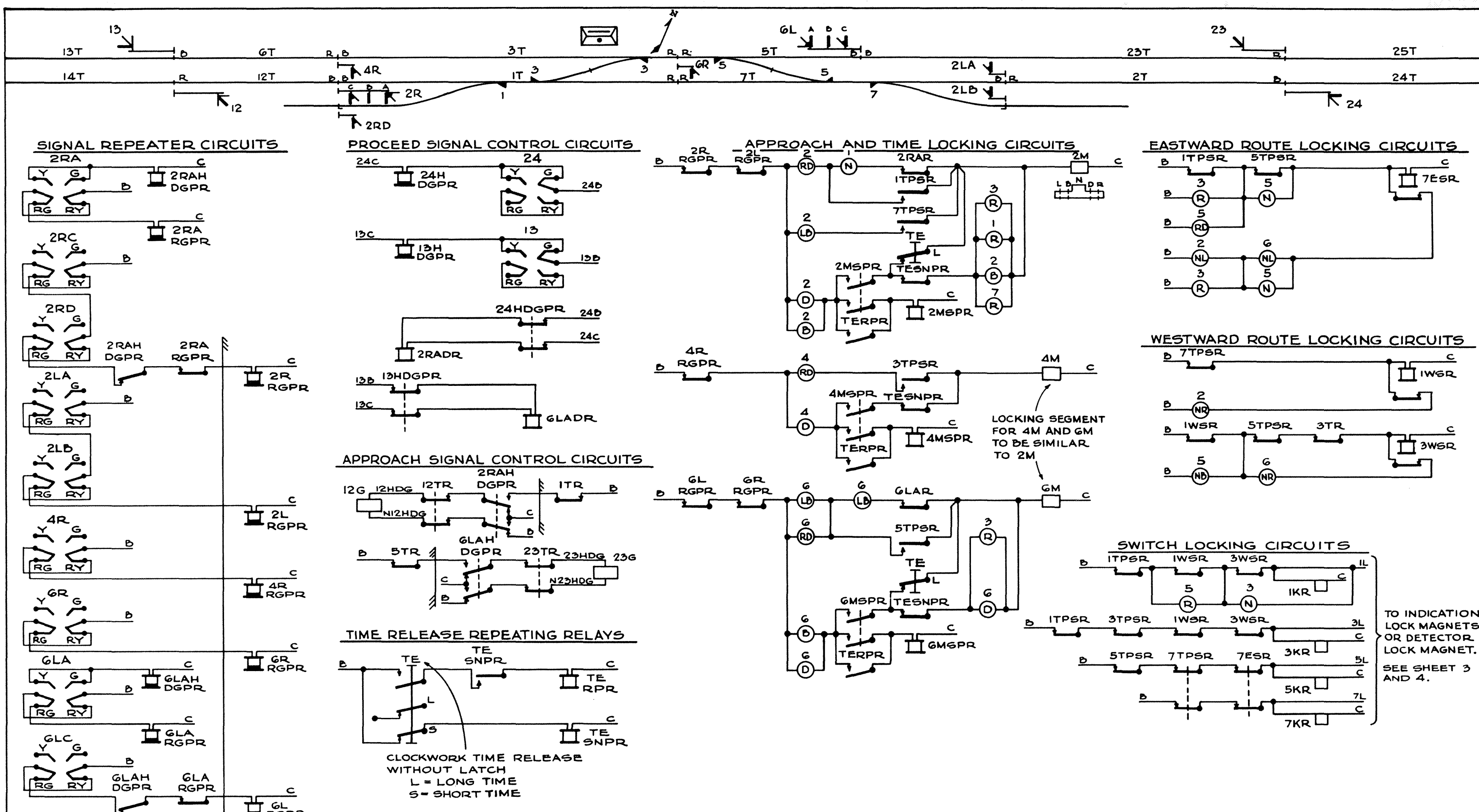
NOTES
1. FOR APPROACH ANNUNCIATOR SEE PLAN 8010A, SHEET 1.
2. CONTACT IN AP20PSR REQUIRED FOR EP INTERLOCKING ONLY.

TYPICAL CIRCUITS FOR POWER INTERLOCKING WITH MECHANICAL LOCKING USING BATTERY SWITCH INDICATION.

POWER OPERATED SWITCH AND LOCK MOVEMENTS — SEARCHLIGHT SIGNALS

SEPT. 1948

AAR SIG. SEC 8023A

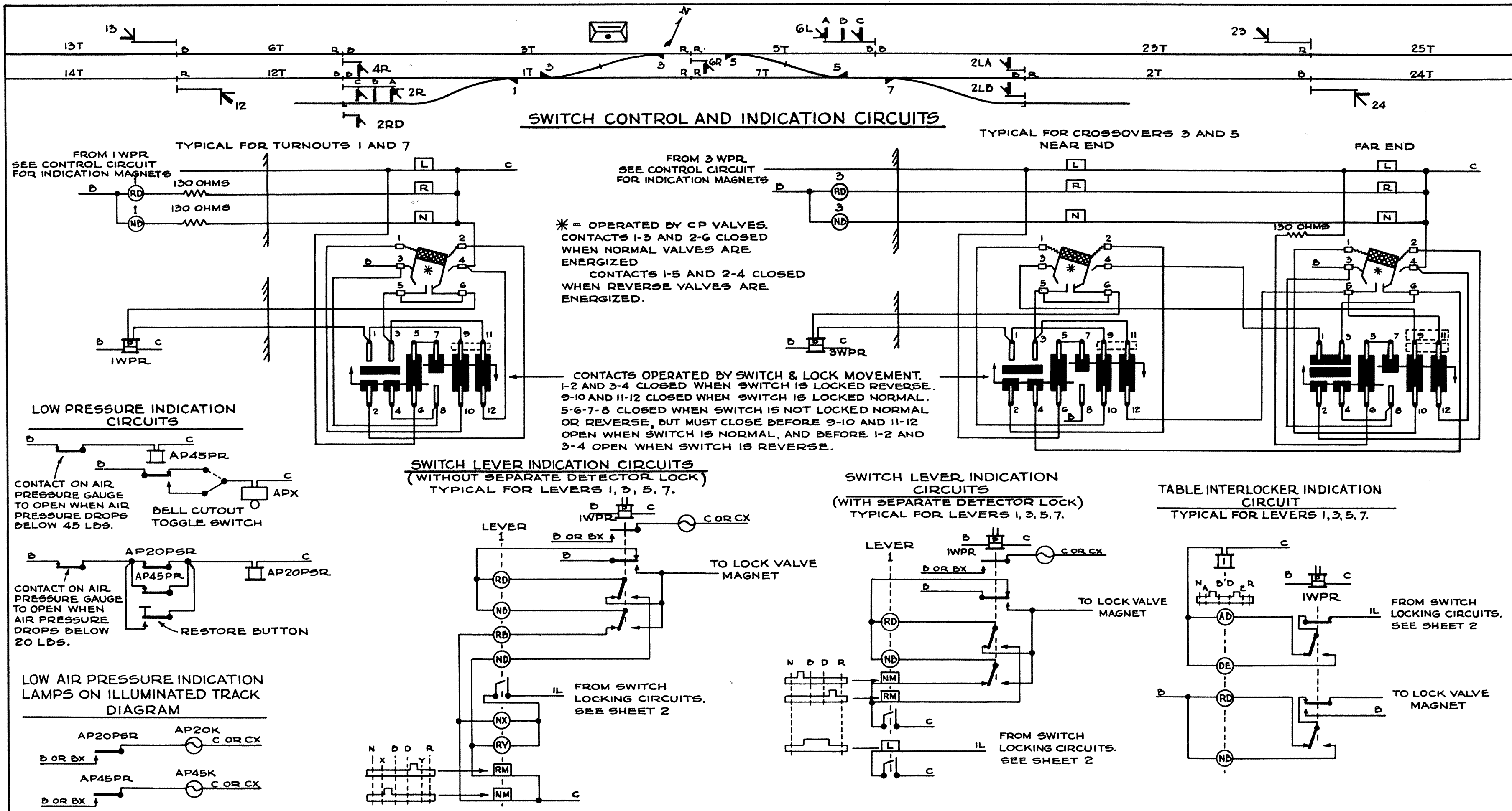


TYPICAL CIRCUITS FOR POWER INTERLOCKING WITH MECHANICAL LOCKING USING BATTERY SWITCH INDICATION

POWER OPERATED SWITCH AND LOCK MOVEMENTS — SEARCHLIGHT SIGNALS

REV. 1948 A.M.	SEPT. 1948	AAR SIG. SEC. 8023A

SHEET 2 OF 4

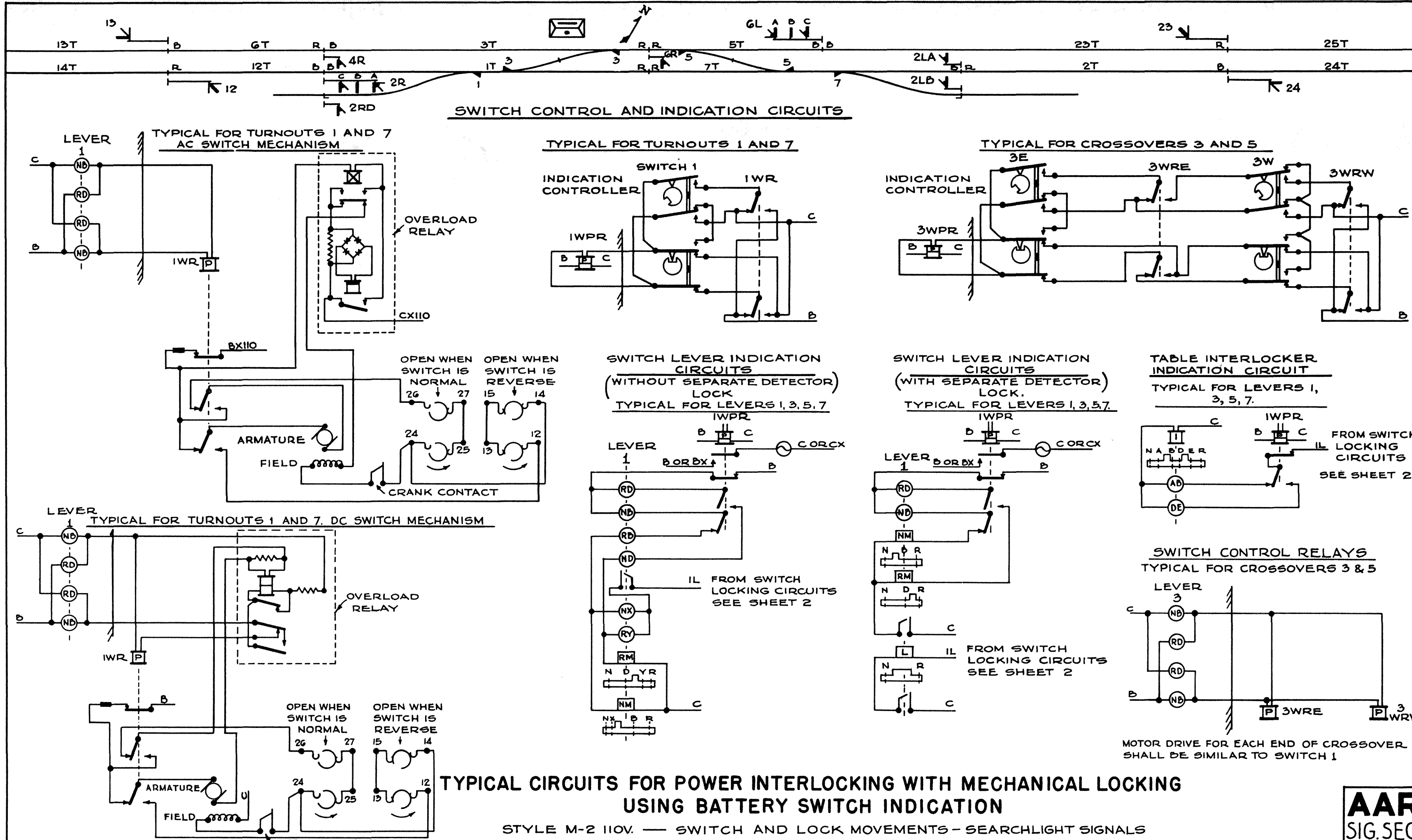


TYPICAL CIRCUITS FOR POWER INTERLOCKING WITH MECHANICAL LOCKING USING BATTERY SWITCH INDICATION

STYLE A-5 ELECTRO-PNEUMATIC SWITCH AND LOCK MOVEMENTS WITH CP VALVES – SEARCHLIGHT SIGNALS

REV. 1948 A.M. | SEPT. 1948

AAR SIG. SEC. 8023A



TYPICAL CIRCUITS FOR POWER INTERLOCKING WITH MECHANICAL LOCKING USING BATTERY SWITCH INDICATION

STYLE M-2 110V. — SWITCH AND LOCK MOVEMENTS – SEARCHLIGHT SIGNALS

AAR SIG. SEC. 8023A

REV. 1948 A.M. | SEPT. 1948

ADDENDUM TO A.A.R.SIG. SEC. 8024A

TYPICAL CODED TRACK CIRCUITS WITHOUT LINE WIRES USING DIRECT CODE FOR THREE-ASPECT AUTOMATIC SIGNALS, AND USING REVERSE CODE FOR FULL BLOCK APPROACH LIGHTING AND OTHER APPROACH CONTROLS.

The two-block, three-indication coded track circuit control shown on Sheets 1 and 2 are similar to those shown on the upper portion of A.A.R.Sig.Sec. 8009A, except that a full block approach control is substituted for 4,000-foot approach control. The slight variation necessary to make this a safety control is shown and the means of carrying both the direct code and reverse code through a cut-section are illustrated. The direct code is sometimes referred to as the normal code, whereas the reverse code is called an inverse code or a return code.

Sheets 1 and 2 are similar except the means of generating the reverse code on Sheet 1 differs from the means of generating the reverse code on Sheet 2.

Inasmuch as the reverse code must be transmitted during the "off" period of the direct code, it is essential that the reverse code be synchronized with the direct code irrespective of the frequency of the direct code. In the Sheet 1 circuit the so-called slow method of generating the reverse code is used. At the end of the "on" period of the direct code, the track relay drops. When the track relay back contact is made, energy is applied to the TPAR which picks up faster than the TPBR which is slightly slow pick-up, thus closing the front contacts of TPAR to apply a reverse code pulse during the "off" period of the direct code before TPBR can pick up to release the circuit.

In the case of the circuit shown on Sheet 2, reverse code energy is applied to the track circuit the instant the track relay closes its back contact and remains for a period of time equal to the release of the track repeater relay.

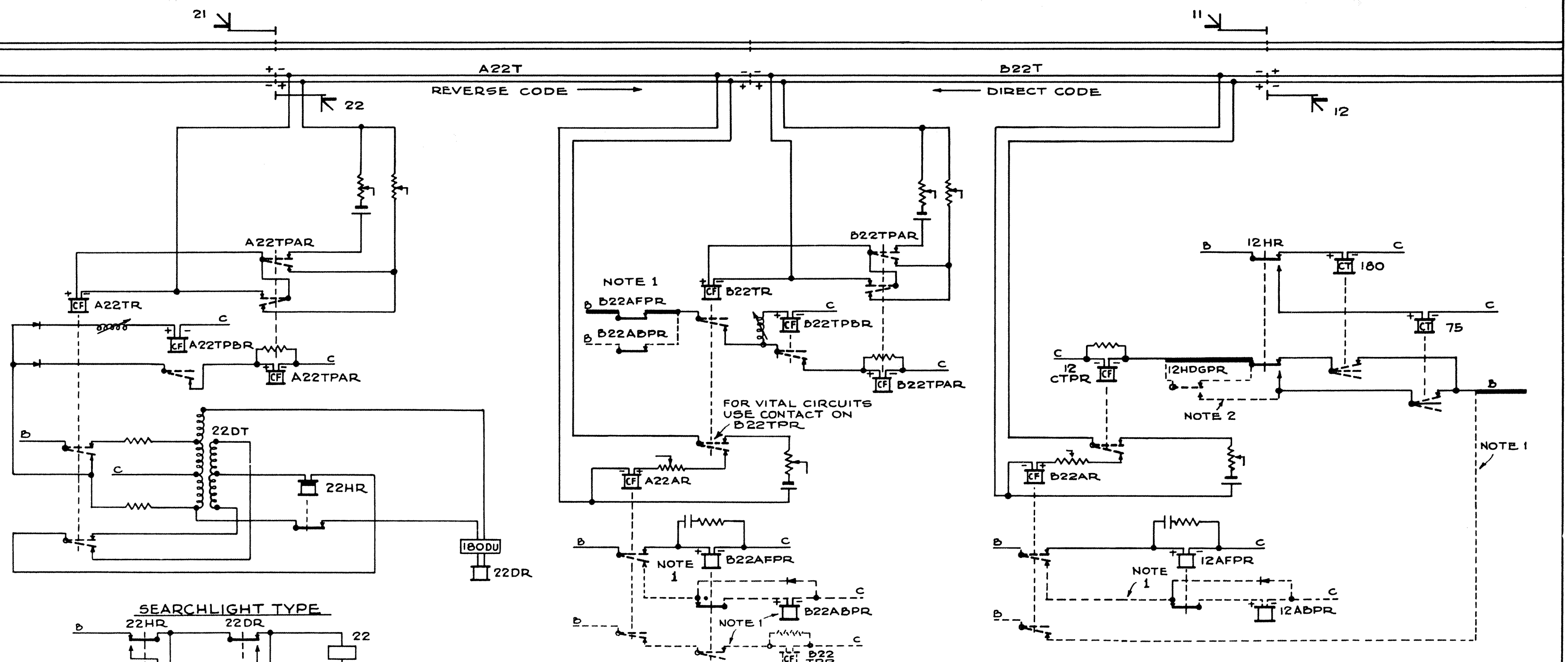
The circuits shown on both Sheets 1 and 2 incorporate the so-called lock-out circuit to prevent the possibility of foreign current giving a false clear failure on the approach circuit. This, of course, is necessary only if the reverse code is being employed for a safety or vital function. The lock-out feature is obtained by using a code repeater relay and by controlling that relay over a back contact of the approach relay. In case foreign current of proper polarity is present in the rail circuit, the approach relay AR will not be de-energized at the end of the reverse code impulse, and consequently the direct code cannot be continued.

The reverse pulse is necessarily short in length so that it may be fitted into the "off" period of the direct code when that "off" period is its shortest. The "on" period of the reverse code is not too small a percentage of the total code cycle in the case of 180 code, but is quite a small

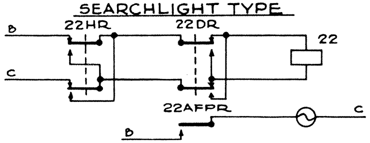
ADDENDUM TO A.A.R.SIG. SEC. 8024A - Continued

factor of the total code period in the case of the 75 code frequency. It is because of this relatively short "on" period of the reverse code that the reverse code front contact repeater relay must be snubbed by an electrolytic condenser snub.

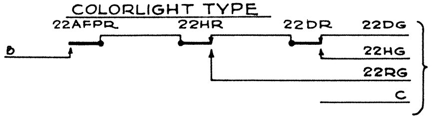
Means of relaying the reverse code through the cut-section is shown with lock-out protection. It will be obvious that the lock-out protection may be applied only to the forward track circuit where approach locking starts at the cut-section or the entire reverse code feature may be omitted from the second section when half block approach lighting is also acceptable.

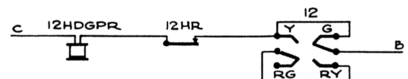


SEARCHLIGHT TYPE



COLORLIGHT TYPE



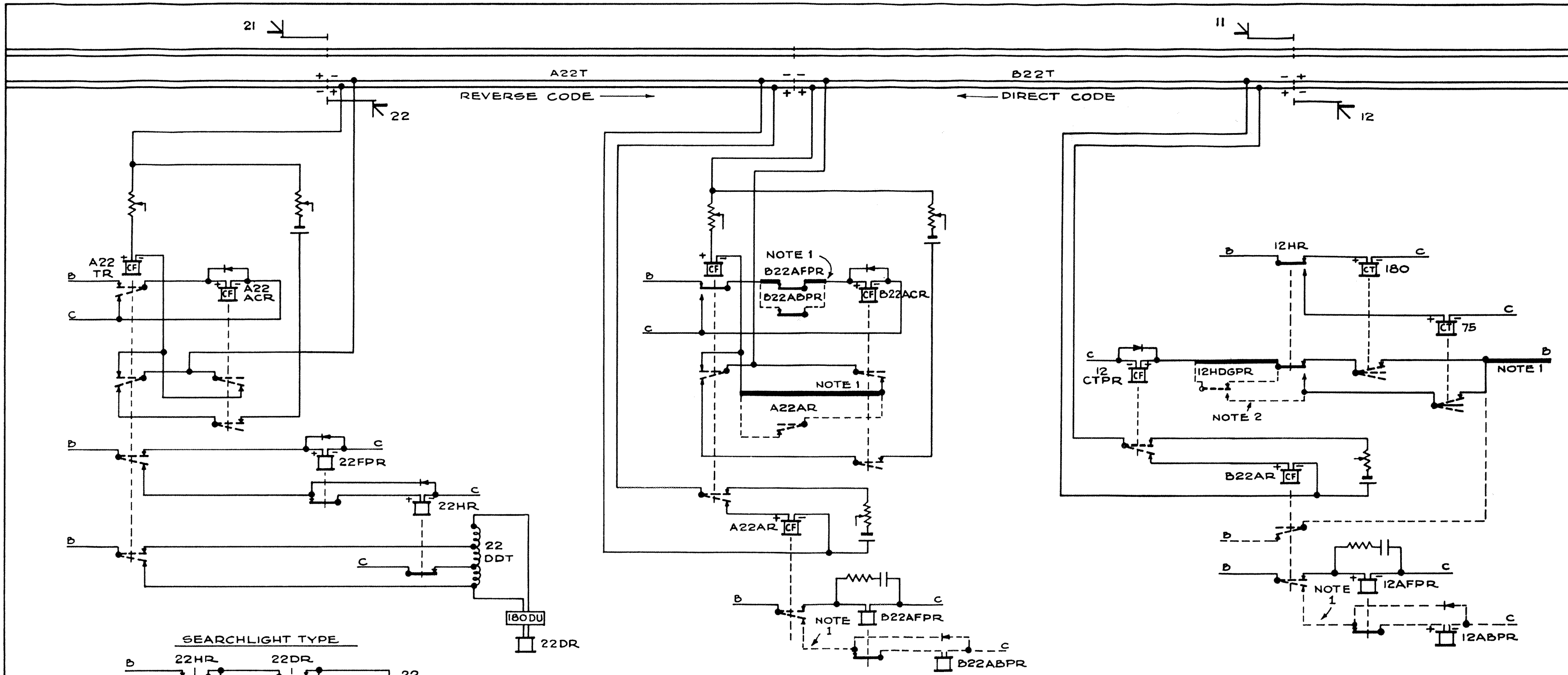


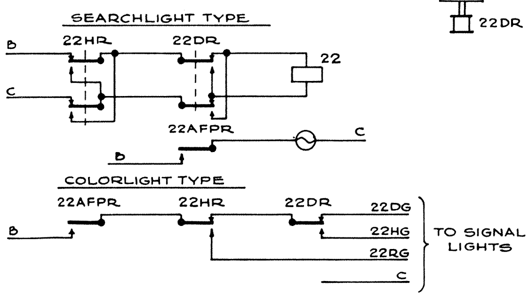
1. WHERE REVERSE CODE IS USED FOR NON-VITAL CIRCUITS OMIT DOTTED LINE CIRCUITS. WHERE REVERSE CODE IS USED FOR VITAL CIRCUITS (APPLICATIONS NOT SHOWN), OMIT HEAVY LINE CIRCUITS AND ADD DOTTED LINE CIRCUITS.
2. FOR SEARCHLIGHT TYPE SIGNALS INCLUDE HDGPR CONTACT AS SHOWN, OMITTING HEAVY LINE CIRCUITS.
3. RADIO INTERFERENCE AND ARC SUPPRESSION DETAILS NOT SHOWN.

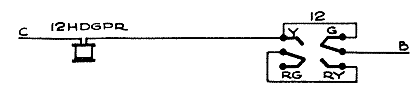
SCHEME I

TYPICAL CODED TRACK CIRCUITS WITHOUT LINE WIRES USING DIRECT CODE FOR THREE ASPECT AUTOMATIC SIGNALS (CODE RULES 281–285–291) AND USING REVERSE CODE FOR FULL BLOCK APPROACH LIGHTING AND OTHER APPROACH CONTROLS

REV. 1948A.M.	SEPT. 1948	AAR SIG. SEC. 8024A







NOTES:

1. WHERE REVERSE CODE IS USED FOR NON-VITAL CIRCUITS OMIT DOTTED LINE CIRCUITS. WHERE REVERSE CODE IS USED FOR VITAL CIRCUITS (APPLICATIONS NOT SHOWN) OMIT HEAVY LINE CIRCUITS AND ADD DOTTED LINE CIRCUITS.
2. FOR SEARCHLIGHT TYPE SIGNALS INCLUDE HDGPR CONTACT AS SHOWN, OMITTING HEAVY LINE CIRCUITS.
3. RADIO INTERFERENCE AND ARC SUPPRESSION DETAILS NOT SHOWN.

SCHEME 2

TYPICAL CODED TRACK CIRCUITS WITHOUT LINE WIRES USING DIRECT CODE FOR THREE ASPECT AUTOMATIC SIGNALS (CODE RULES 281-285-291,) AND USING REVERSE CODE FOR FULL BLOCK APPROACH LIGHTING AND OTHER APPROACH CONTROLS

REV. 1948 A.M.	SEPT. 1948	AAR SIG. SEC. 8024A

ADDENDUM TO A.A.R. SIG. SEC. 8025A

TYPICAL RELAY TYPE INTERLOCKING CIRCUITS.

This is a local control system with the route selecting push buttons in the track diagram, line of light indication, semiautomatic stick signals, with the restricting signals not track circuit controlled.

Two push buttons operated in sequence set up a route and clear the signal. After operation of the first route button, a red light appears at that button thereby marking the entrance to the route and indicating that a route has been initiated, but the signal has not yet cleared, also a white light appears in the last track section of each available route showing points to which a train may be routed. The operation of the second route button (at one of the designated illuminated sections) completes the route selection and extinguishes the lights marking other possible destinations. After the second button has been pushed, a flashing red light appears at each switch which is not in position for the route, indicating that switch is in transit. When no flashing red lights appear, all switches are in proper position. Upon completion of the route a white line of light indicates that the route is set up and that it is locked. Following completion of the route the signal will clear, and this will be indicated by a green light at the route button at the same time the red light is extinguished. Attempting to set up a conflicting route cannot disturb a route once established. An occupied route may be reestablished for a call-on move by again operating the first and second route buttons. Call-on control is effected by the operation of a call-on button after the route is completed. Through-route control is provided by the operation of two buttons, one button at the entrance end and the second at the exit end of the route. A route to an intermediate signal in the through-route may be set up by the operation of a button at the entrance and the second button at the intermediate signal. Automatic release of the route is provided in the rear of the train. Means is provided for non-stick control. Also means is provided for manual cancellation of a route. Automatic selection of alternate routes is effected under normal operation with provisions for manual selection.

The route selection circuits are shown on Sheet 1. To initiate a route from signal 14 to signal 4, the following is the sequence of operation: the operator pushes route control button 14 which picks up route selecting relay 7ANWR by the circuit which includes a push button contact of button 14, a back contact of 7ANER, a back contact of 14XSR, coil of relay 7ANWR, and back contacts of 7RWKR and 7RWR. The 7ANER relay is used to transfer the circuit when 14 is used as an exit button. 14XSR relay selects the entrance and exit pick-up circuits. The circuit is selected over the back contact of 7RWR which checks that no route has been selected over 7 reverse. The back contact of 7RWKR is used to prevent the selection of any route over crossover 7 normal while crossover 7 is locked in the reverse position. Relay 7ANWR sticks over a front contact of 7 track relay, to provide automatic restoration, a pull contact of 14 is used for manual restoration.

ADDENDUM TO A.A.R. SIG. SEC. 8025A - Continued

The energizing of 7ANWR connects battery to the coil of relays 5ANWR and 5RWR. The negative side of 5ANWR includes back contacts of 5RER and 5RWKR. The back contact of 5RER checks that no route has been selected eastward which may include crossover 5 reverse. The negative side of 5RWR includes back contacts of 5ANER, 5BNWR and 5NWKR. The back contact of 5ANER opens the circuit if a route has been selected eastward on the upper track over 5 normal and the back contact of 5BNWR opens the circuit if a route has been selected westward on the lower track over 5 normal. The back contacts of 5NWKR and 5RWKR prevent the selection of conflicting routes when crossover 5 is locked.

The energizing of 5ANWR connects battery to the coils of 3RWR and 3NWR. The negative side of these relays includes checks similar to those described for crossover 5 above. Relay 3RWR up prepares the pick-up circuit for relay 6XSR in case button 6 is to be used as an exit. Relay 3NWR up, picks up the 1ANWR which includes the usual checks in the negative side. Energizing 1ANWR prepares the pick-up circuit for relay 4XSR when button 4 is pushed. Relay 5RWR connects battery to the coil of 1BNWR which prepares the pick-up of relay 2XSR in case button 2 is to be used as an exit.

Referring to Sheet 2, it can be seen that with relays 3RWR, 1ANWR and 1BNWR up, the white light in sections 3K, 1K and 5K are lighted indicating the available exits. The energizing of 7ANWR when the route was initiated, illuminated the red light at the entrance signal button.

To complete the route 14 to 4, the operator pushes button 4 which picks up 4XSR over the back contacts of 1RER and 1ANER, and front contacts of 4ASR and FR if traffic control is provided. 1RER and 1ANER prevents energizing relay 4XSR when an entrance has been established at 4. 4ASR prevents completing a route at 4 if approach locking is in effect and the FR contact is used to check that traffic is properly established. Relay 4XSR sticks over front contacts of 1ANWR, 1RWR and 1ANER or 1RER. This is to open the circuit when the route is cancelled by pulling button 14. Contacts in 1ANER and 1RER hold 4XSR up until relays 1ANWR and 1RWR open, thereby preventing 1ANER and 1RER from sticking up over 4XSR down.

The picking up of relay 4XSR energizes relay 1ANER which opens the negative side of 1RWR and 1RER; 1ANER up picks the 3NER which drops relay 3RWR. 3NER up picks the 5ANER which opens relay 5RWR. 5ANER up picks relay 7ANER which completes the route and at the same time all relays not involved in the route are released. Lights in sections 1K and 5K are extinguished. Section 7KB is illuminated when relay 7ANER is energized.

ADDENDUM TO A.A.R. SIG. SEC. 8025A - Continued

Referring to Sheet 6, it can be seen that the ANER and ANWR relays up will energize the NLPR relays for the switches involved which in turn pick the NWSR relays if the switches are unlocked. The NWSR relays energized, operate switches to their normal position. The NWKR relays which pick up when the switch completes its movement, energize relay 14RR (Sheet 3).

Energizing 14RR drops relay 14ASR causing route locking relays 1WSR, 3WSR and 7WSR (Sheet 5) to drop and the route indication relays 1SPR, 3SPR, and 7SPR to pick up. The energizing of the NWKR and SPR relays will complete the line of light indication on the control panel.

Sheet 3 shows the clearing circuit for 14AG. When signal 14 clears, relay 14RGPR drops which extinguishes the red light and illuminates the green light at the entrance button 14.

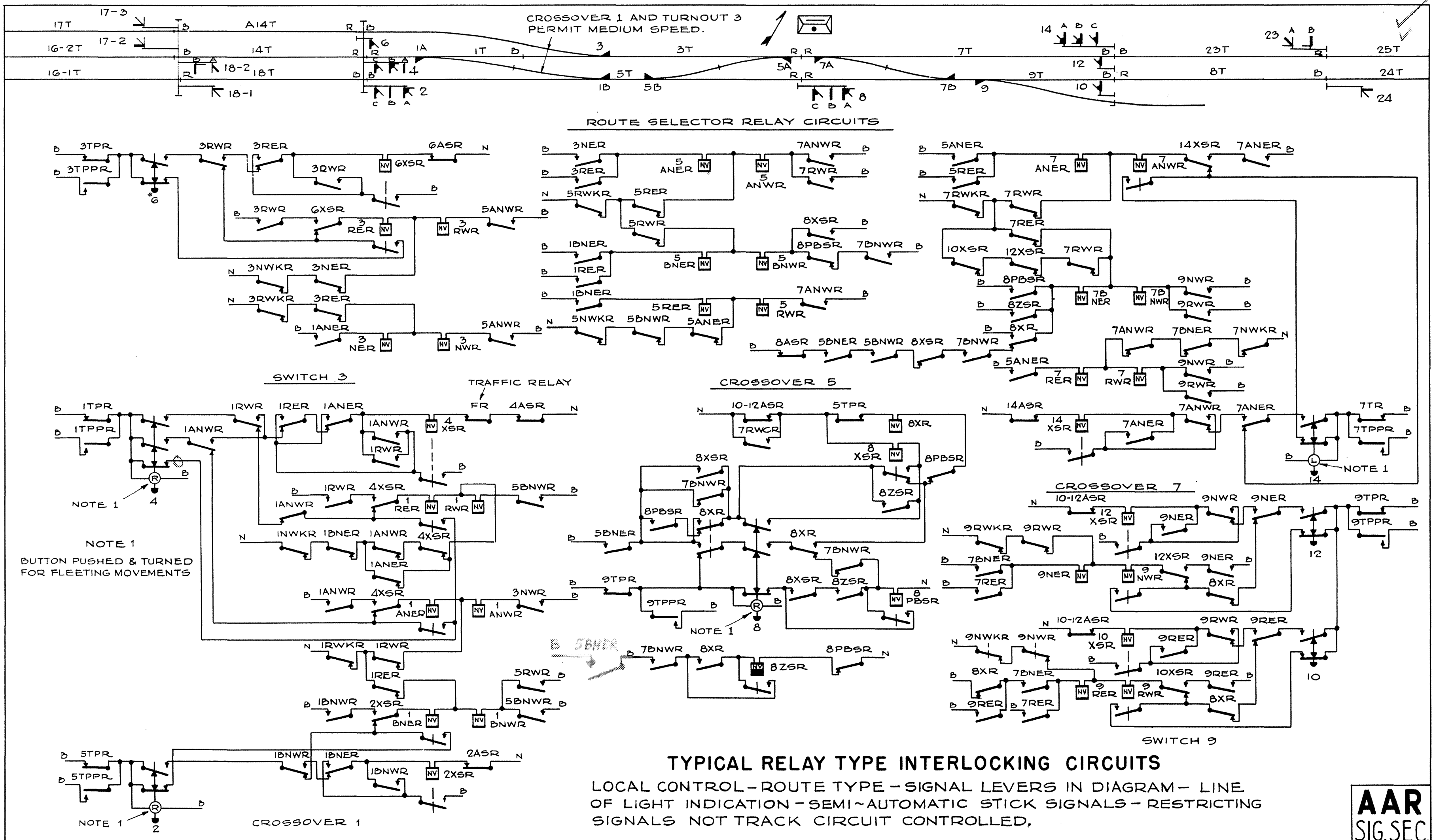
On Sheet 1, route 4 to 12 is an example of a through route selection. Two routes are provided, one over 1 reverse and the other over 1 normal and 7 reverse. The route over 1 reverse is the preferred route and is the route normally selected. However, with a train being held by signal 8, the route over 7 reverse would be automatically selected. The operation of route button 4 and the route selecting relays are as previously described. The 8XR relay is controlled through the front contacts of 5BNER, 5TPR, 10-12ASR by-passed with a front contact of 7RWCR and through back contacts of 7BNWR, 8XSR, 8PBSR. 5TPR prevents clearing of signal 8 with a train occupying the section approaching 8 when route buttons 4 to 12 are pushed. 10-12ASR by-passed with 7RWCR prevents picking the 8XR and 8XSR if time locking is in effect for signals 10 and 12. The back contact of 7BNWR is used to prevent picking up relays 8XR and 8XSR if buttons 10 or 12 have been pushed as an entrance. Front contacts of 8XR and 8XSR are used to by-pass 7BNWR to prevent relays 8XR and 8XSR from becoming de-energized as a result of completing a route from 8 to 12 or 8 to 10 at which time 7BNWR is up. 8XR up picks 7BNER which in turn picks the 9NER converting button 12 into an exit. No through route is provided over 9 reverse. The route is then completed by pushing button 12. With the front contacts of relays 7BNWR and 8XR closed and 8PBSR down, relay 8ZSR is energized. 8ZSR picking up picks the 8XSR which in turn picks up 8PBSR which cancels 8XR and 8ZSR. 8XSR is held up over 5BNER and 8PBSR is held up over 9TPR.

To illustrate the selection of a secondary route, assume that a train is moving from signal 2 to signal 8. Relay 1NWKR would then be up preventing 1RER from picking when button 4 is pushed to initiate the route. The route selection would then be completed over 7 reverse. With no train occupying section 2 to 8 this alternate route is cancelled when 7BNER picks resulting in the cancelling of the 7RER relay.

ADDENDUM TO A.A.R. SIG. SEC. 8025A - Continued

Should it be desirable to provide run-around movements over crossovers 1 and 5 reverse or 5 and 7 reverse, the switch control of the second crossover in the route should be manually operated to the reverse position to control the route selection circuit. For example, if movements are provided eastward over crossovers 1 and 5 reverse, a reverse contact on lever 5 in series with a front contact of relay 1RER would be in the control for 5RER.

On Sheet 6 a scheme is shown for cascading the control of switch motor circuits, the purpose of which is to introduce a time element between the starting of successive switch operations in order to limit the flow of current in the d.c. mains, otherwise any number of switch motors could be energized simultaneously. This feature is obtained by using slow pick-up relays designated WZR. The circuits are so arranged that these relays are operated in proper sequence. Front contacts of this relay are placed in the switch control circuits.

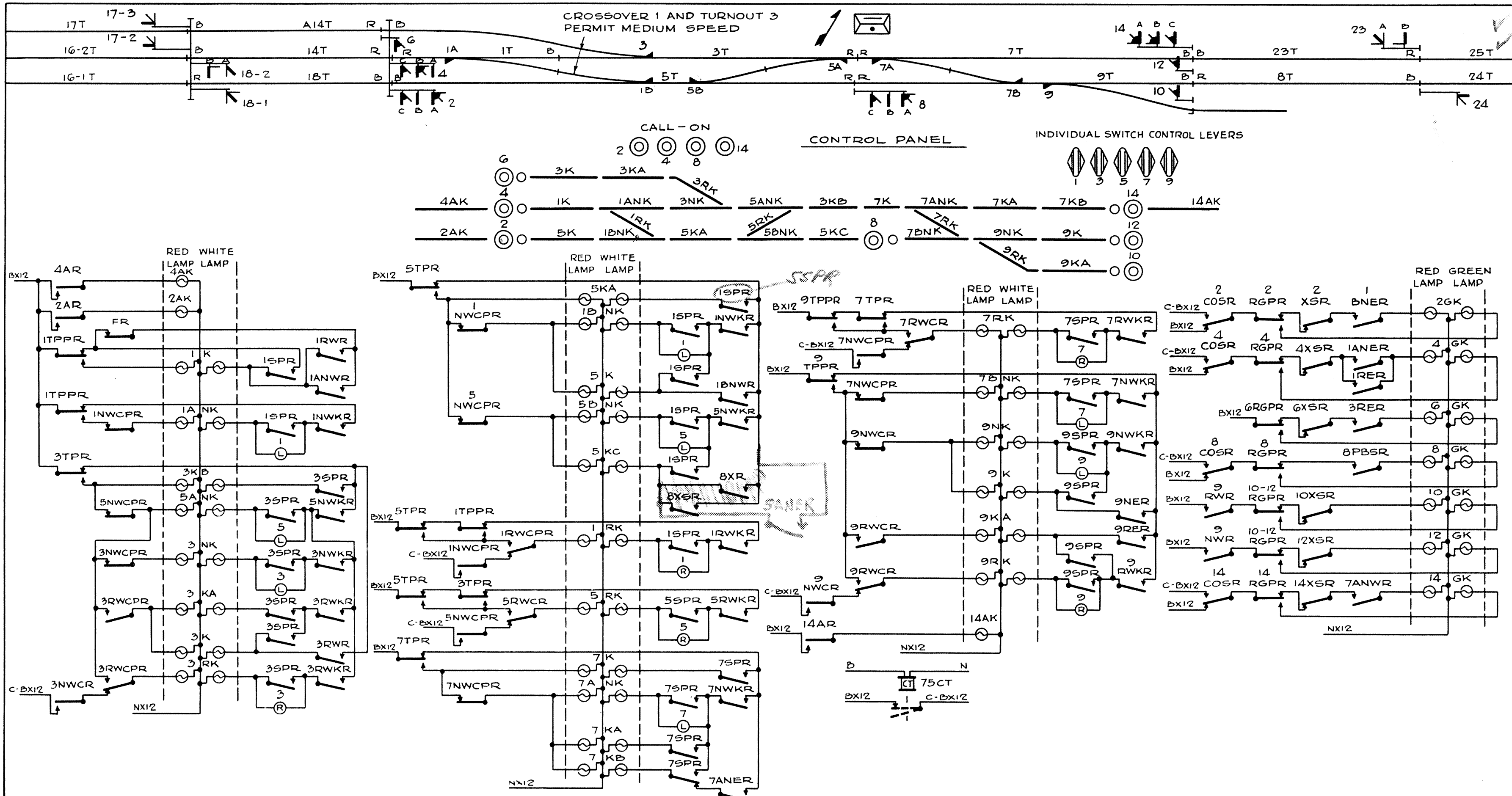


TYPICAL RELAY TYPE INTERLOCKING CIRCUITS

LOCAL CONTROL – ROUTE TYPE – SIGNAL LEVERS IN DIAGRAM – LINE OF LIGHT INDICATION – SEMI-AUTOMATIC STICK SIGNALS – RESTRICTING SIGNALS NOT TRACK CIRCUIT CONTROLLED.

SEPT. 1950

AAR SIG. SEC. 8025A

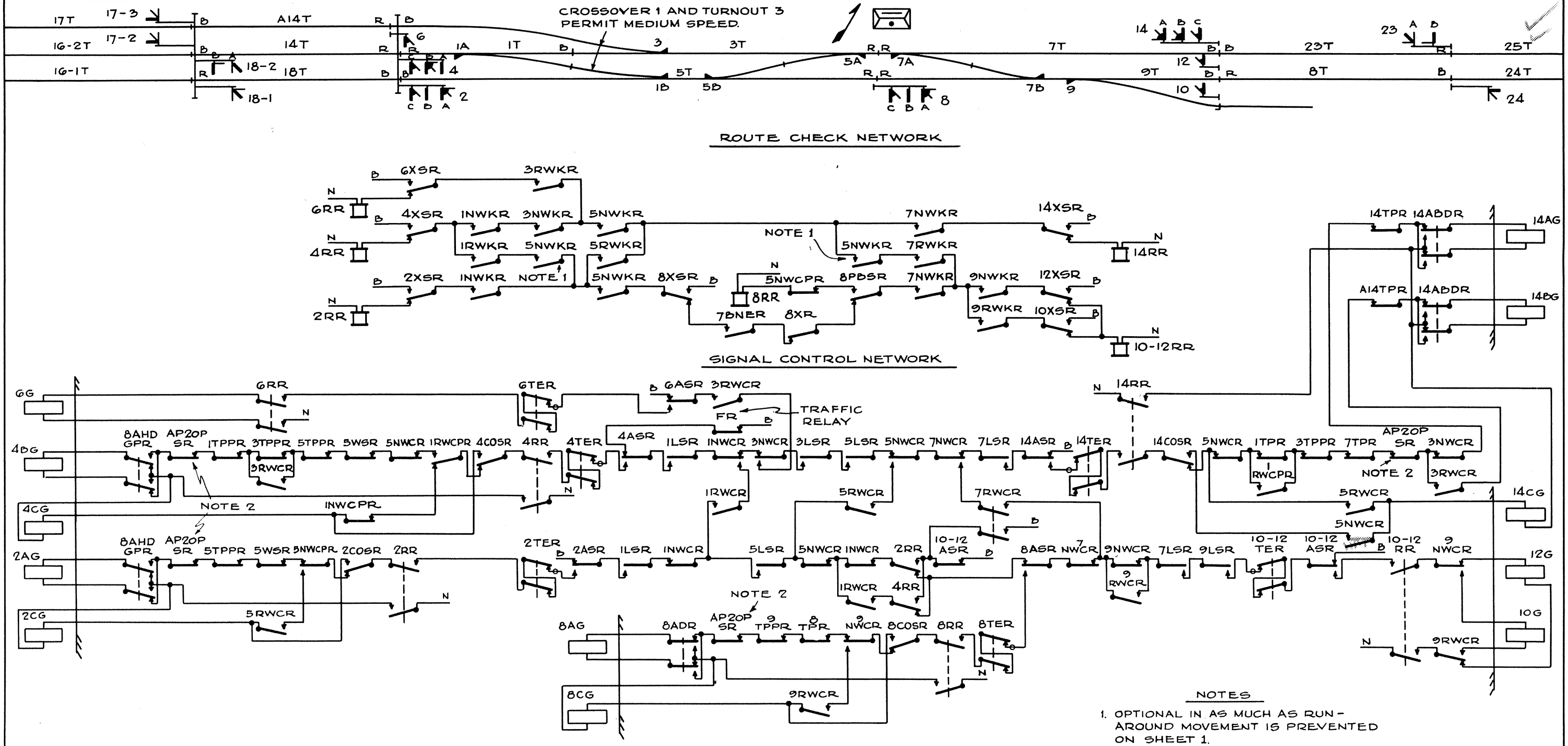


TYPICAL RELAY TYPE INTERLOCKING CIRCUITS

LOCAL CONTROL – ROUTE TYPE – SIGNAL LEVERS IN DIAGRAM – LINE OF LIGHT INDICATION – SEMI-AUTOMATIC STICK SIGNALS – RESTRICTING SIGNALS NOT TRACK CIRCUIT CONTROLLED.

SEPT. 1950

AAR SIG. SEC. 8025A



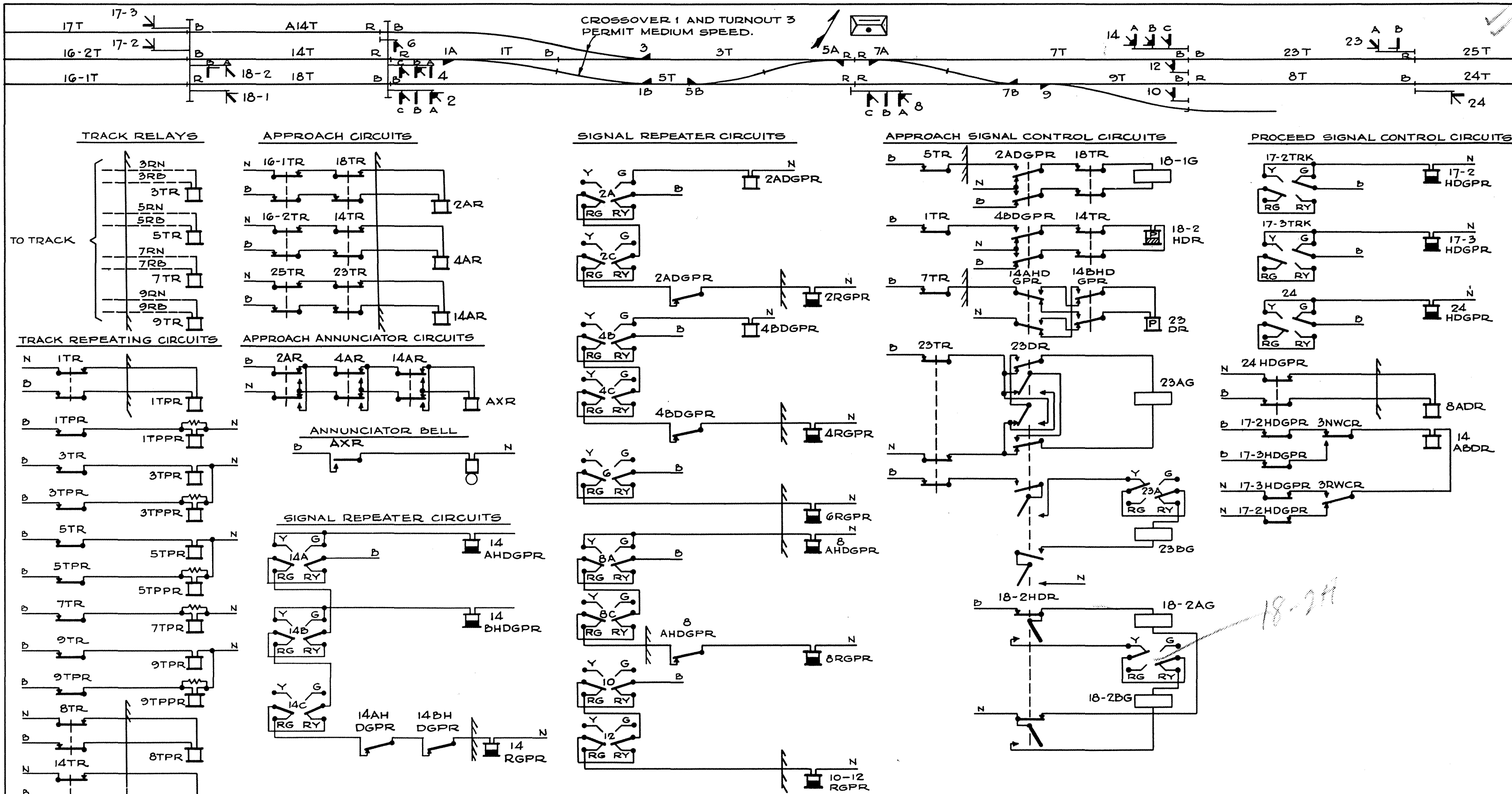
NOTES

1. OPTIONAL IN AS MUCH AS RUN-AROUND MOVEMENT IS PREVENTED ON SHEET 1.
2. CONTACT AP2OPSR REQUIRED FOR ELECTRO-PNEUMATIC INTERLOCKING ONLY.

TYPICAL RELAY TYPE INTERLOCKING CIRCUITS

LOCAL CONTROL - ROUTE TYPE - SIGNAL LEVERS IN DIAGRAM - LINE OF LIGHT INDICATION - SEMI - AUTOMATIC STICK SIGNALS - RESTRICTING SIGNALS NOT TRACK CIRCUIT CONTROLLED.

SEPT. 1950	AAR SIG. SEC. 8025A

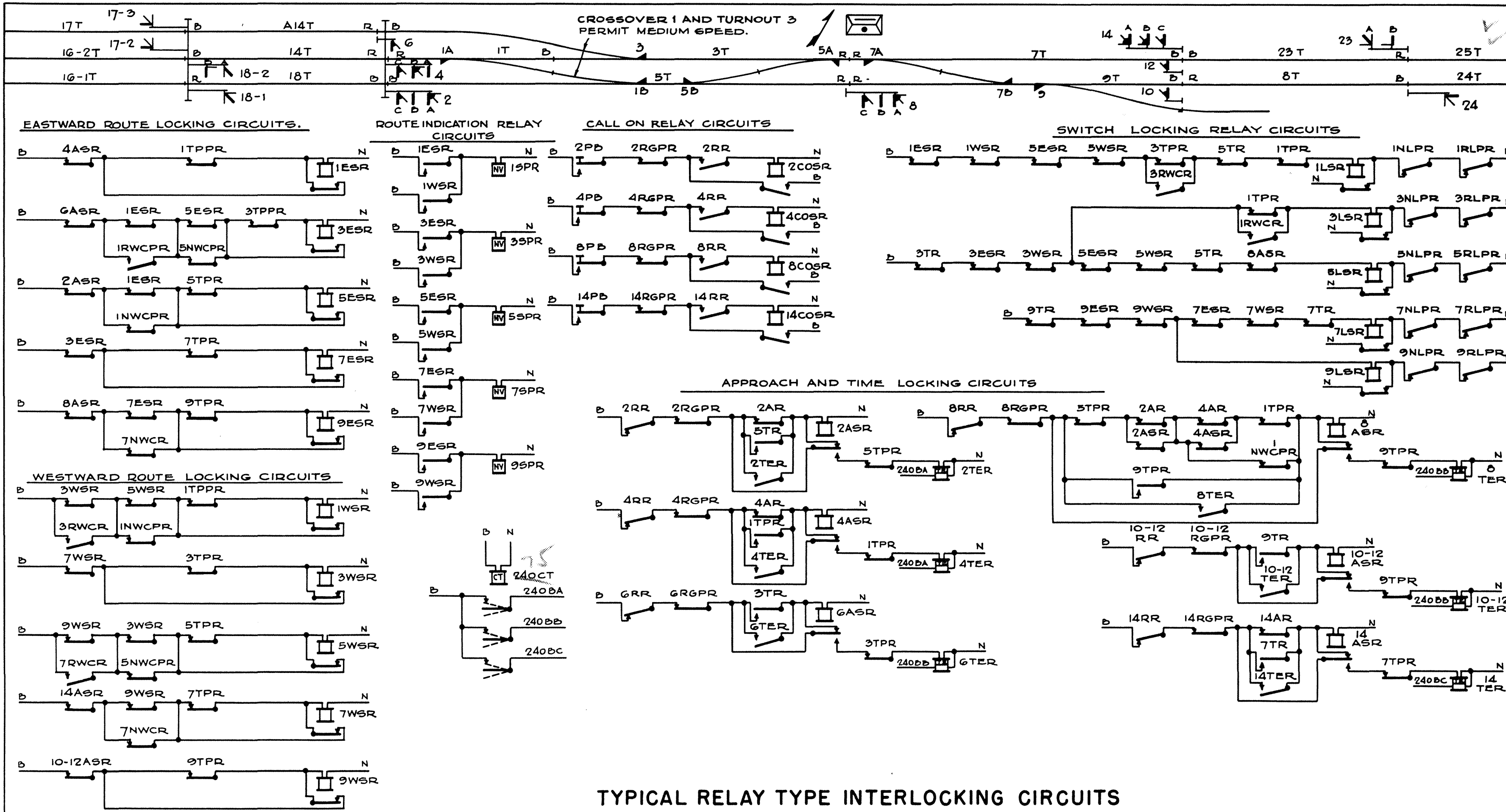


TYPICAL RELAY TYPE INTERLOCKING CIRCUITS

LOCAL CONTROL – ROUTE TYPE – SIGNAL LEVERS IN DIAGRAM – LINE OF LIGHT INDICATION – SEMI-AUTOMATIC STICK SIGNALS – RESTRICTING SIGNALS NOT TRACK CIRCUIT CONTROLLED

SEPT. 1950

AAR
SIG. SEC.
8025A

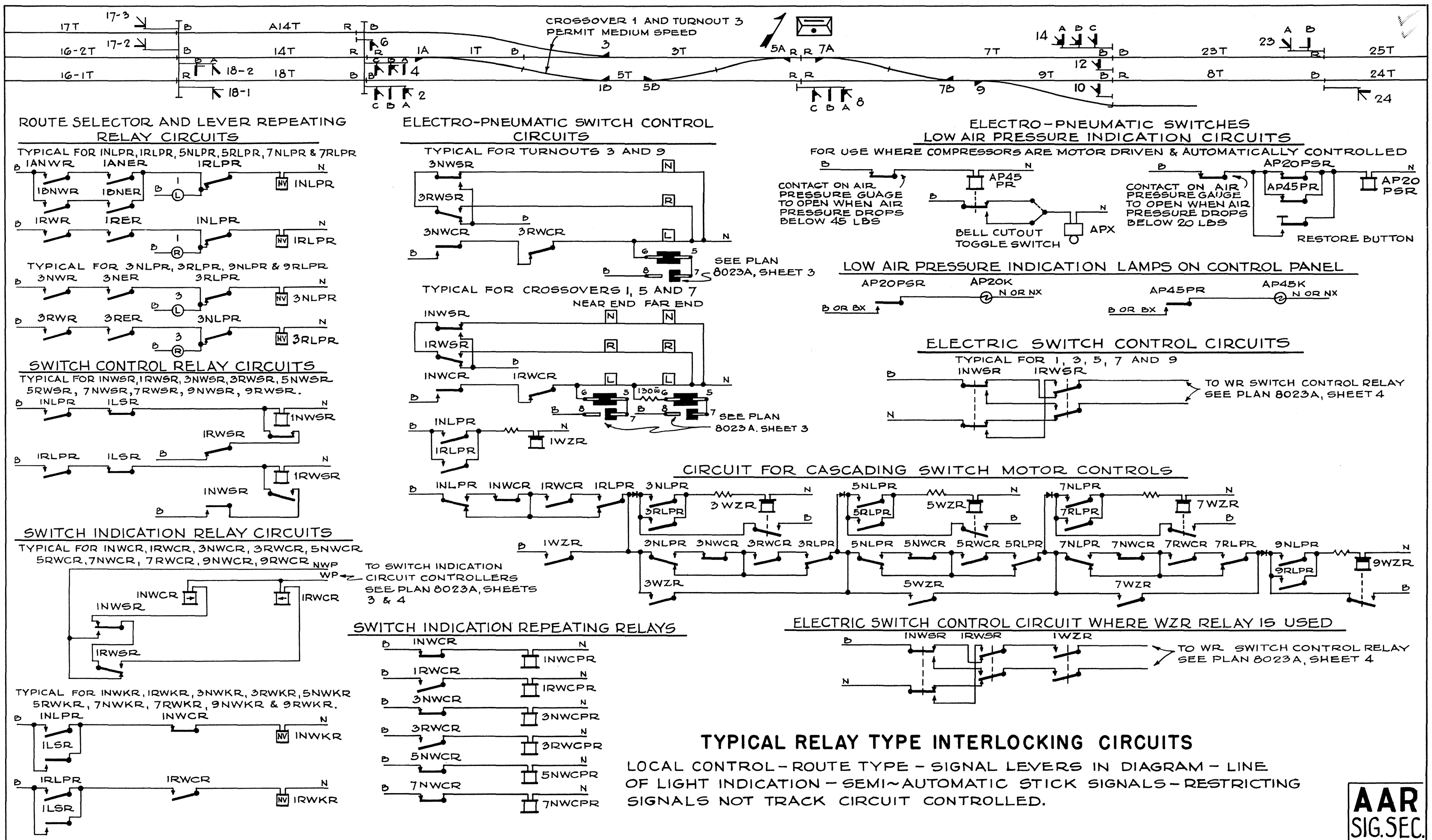


TYPICAL RELAY TYPE INTERLOCKING CIRCUITS

LOCAL CONTROL – ROUTE TYPE – SIGNAL LEVERS IN DIAGRAM – LINE OF LIGHT INDICATION – SEMI-AUTOMATIC STICK SIGNALS – RESTRICTING SIGNALS NOT TRACK CIRCUIT CONTROLLED.

AAR SIG. SEC. 8025A

SEPT 1950



TYPICAL RELAY TYPE INTERLOCKING CIRCUITS

LOCAL CONTROL – ROUTE TYPE – SIGNAL LEVERS IN DIAGRAM – LINE OF LIGHT INDICATION – SEMI~AUTOMATIC STICK SIGNALS – RESTRICTING SIGNALS NOT TRACK CIRCUIT CONTROLLED.

AAR SIG. SEC. 8025A

SEPT. 1950

SHEET 6 OF 6 SHEETS.

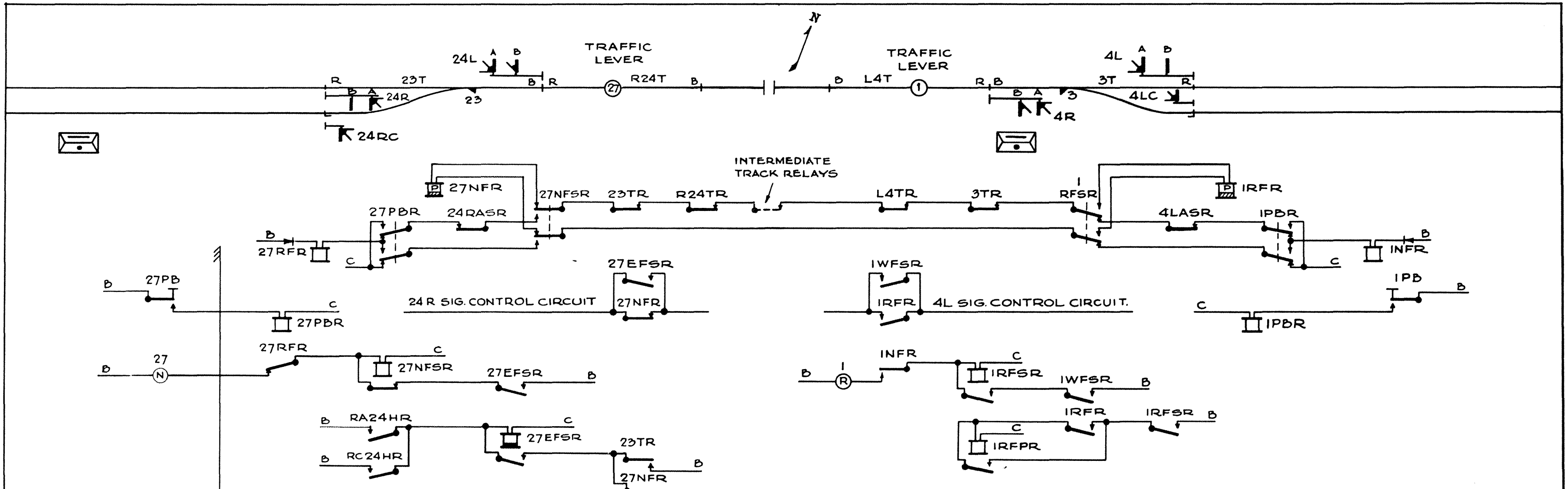
ADDENDUM TO A.A.R. SIG. SEC. 8026A

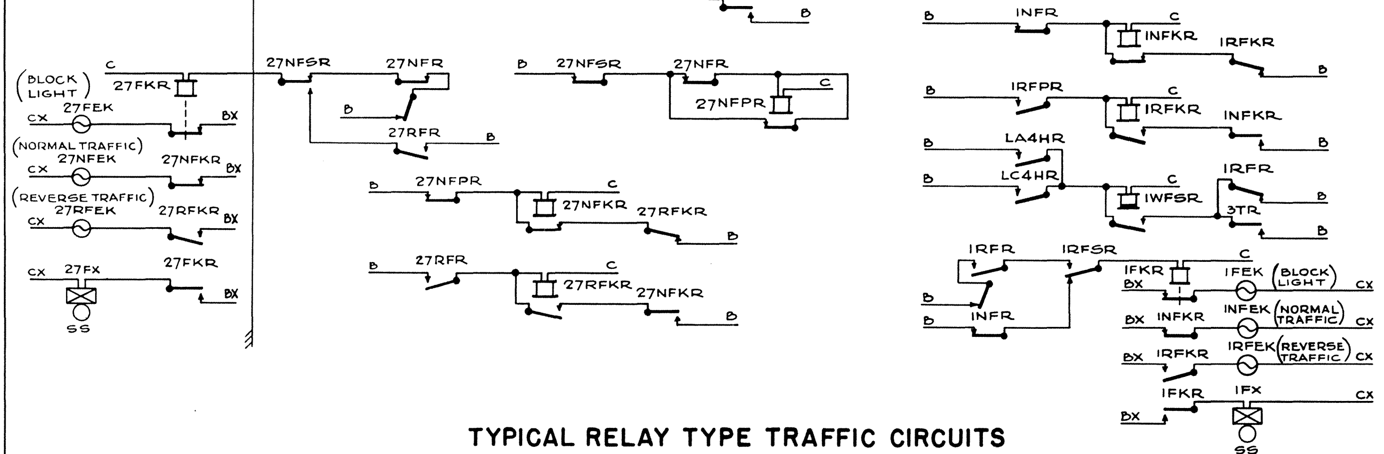
TYPICAL TRAFFIC CIRCUITS BETWEEN ATTENDED OFFICES.

These circuits provide a two-wire traffic control arrangement shown normally set for train movement eastward, requiring the traffic levers at both interlockings to be in the normal position. When traffic is established westward, both traffic levers are in the reverse position. Lights are provided to show block occupancy, direction of established traffic, and a bell is provided to indicate that the adjacent interlocking desires to change established traffic. Provisions are made for following moves into an occupied block. If a Proceed indication on the entering signal is displayed, the operation of the traffic lever at the adjacent interlocking will not affect the signal indication.

Blocking rectifiers are provided in the control of the FR relay to prevent discharge of one battery into the other in case of unequal potential.

The sequence of operation is fully described on the circuit plan.





SEQUENCE OF OPERATION

TRAFFIC IS NORMALLY LINED FOR AN EASTWARD MOVE. TO REVERSE TRAFFIC DIRECTION, REQUIRES THE FOLLOWING OPERATIONS.

1. EAST END PUSHES TRAFFIC BUTTON WHICH RINGS THE BELL AND FLASHES THE BLOCK LIGHT AT THE WEST END

2. WEST END REVERSES TRAFFIC LEVER 27. RELAY 27NFSR IS RELEASED, PLACING THE TRAFFIC BATTERIES IN OPPOSITION AND DROPPING RELAY INFR. THE BELL AT EAST END RINGS AND THE BLOCK LIGHT IS EXTINGUISHED.

3. OPERATOR AT EAST END NOW REVERSES LEVER 1 WHICH ENERGIZES 1 RFSR. RELAY 1 RFR IS NOW ENERGIZED ALLOWING SIGNALS TO BE DISPLAYED FOR WESTWARD MOVEMENT.

TYPICAL RELAY TYPE TRAFFIC CIRCUITS BETWEEN ATTENDED OFFICES

SEPT. 1948

AAR SIG. SEC. 8026A

ADDENDUM TO A.A.R. SIG. SEC. 8027A

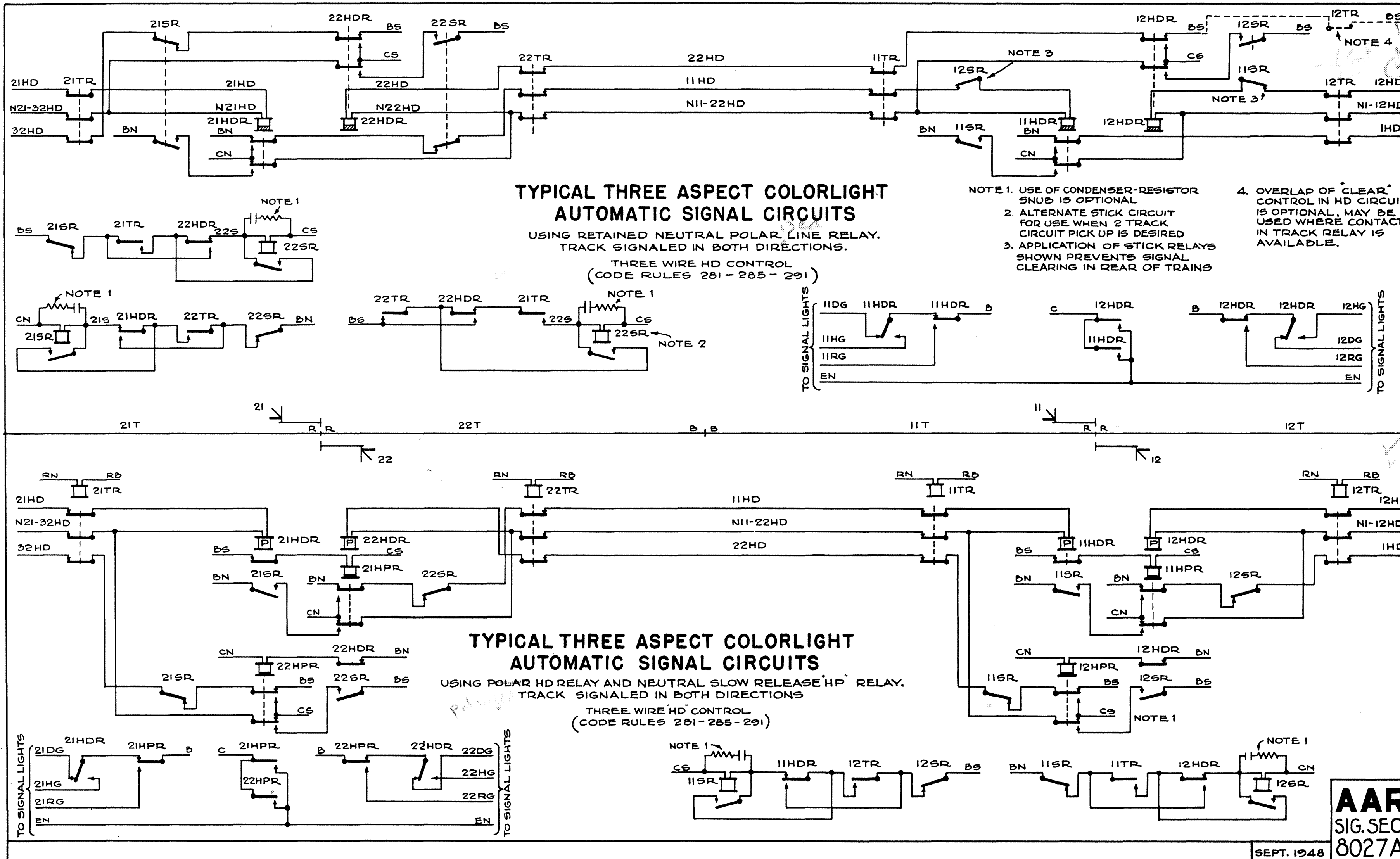
TYPICAL THREE-ASPECT COLOR LIGHT AND SEARCHLIGHT TYPE AUTOMATIC SIGNAL CIRCUITS.

The circuits shown provide for track signaled in both directions, using three wire control. The circuit arrangement at the top of Sheet 1 uses retained neutral polar relay and, therefore, has a number of characteristics in common with A.A.R. Sig. Sec. 8000A. The circuit at the bottom of the sheet uses the ordinary polar line control relay, with slow drop-away repeater relay, and therefore, has a number of characteristics in common with A.A.R. Sig. Sec. 8002A.

Two types of directional stick relay control are shown. One scheme provides for single-track circuit pre-pick-up, while an alternate scheme provides for two-track pick-up. With the two-track circuit pick-up, the stick relay will not pick up when the train passes the cut-section to the rear, but can only be energized at the time of passing the signal location. The two-track pick-up scheme prevents picking a stick if a hand-throw switch, located in the approach track, shunts the track in lieu of opening and shunting the line circuit when reversed, also where signals are staggered and a single-track circuit is used between signals.

When the single-track circuit in the approach of the signal is used to pre-pick the stick relay, the opposing stick should be checked in the de-energized position. The stick relay must have sufficient slow release time to avoid the loss of the directional stick relay when a short high-speed train passes the signal, allowing the approach track relay to pick up before the HDR relay is de-energized. The use of a slugged slow release relay in lieu of a condenser to provide this slow release avoids the possibility of failing to pick the proper stick relay due to a condenser failure; this is very essential whenever the pre-picked stick circuit is used with color light signals.

The opposing stick relay may be checked in either the relay circuit for the signal in the opposite direction or in the feed circuit for the opposing signal to the rear. If the former arrangement is used, the opposing signal will not clear in the rear of a train movement. This arrangement is generally used on railroads where the rule which prohibits a reversal of direction of train movement, is in effect.



TYPICAL THREE ASPECT COLORLIGHT AUTOMATIC SIGNAL CIRCUITS

USING RETAINED NEUTRAL POLAR LINE RELAY.
TRACK SIGNALED IN BOTH DIRECTIONS.

THREE WIRE HD CONTROL
(CODE RULES 281 – 285 – 291)

NOTE 1. USE OF CONDENSER-RESISTOR SNUB IS OPTIONAL
2. ALTERNATE STICK CIRCUIT FOR USE WHEN 2 TRACK CIRCUIT PICK UP IS DESIRED
3. APPLICATION OF STICK RELAYS SHOWN PREVENTS SIGNAL CLEARING IN REAR OF TRAINS
4. OVERLAP OF "CLEAR" CONTROL IN HD CIRCUIT IS OPTIONAL, MAY BE USED WHERE CONTACT IN TRACK RELAY IS AVAILABLE.

TYPICAL THREE ASPECT COLORLIGHT AUTOMATIC SIGNAL CIRCUITS

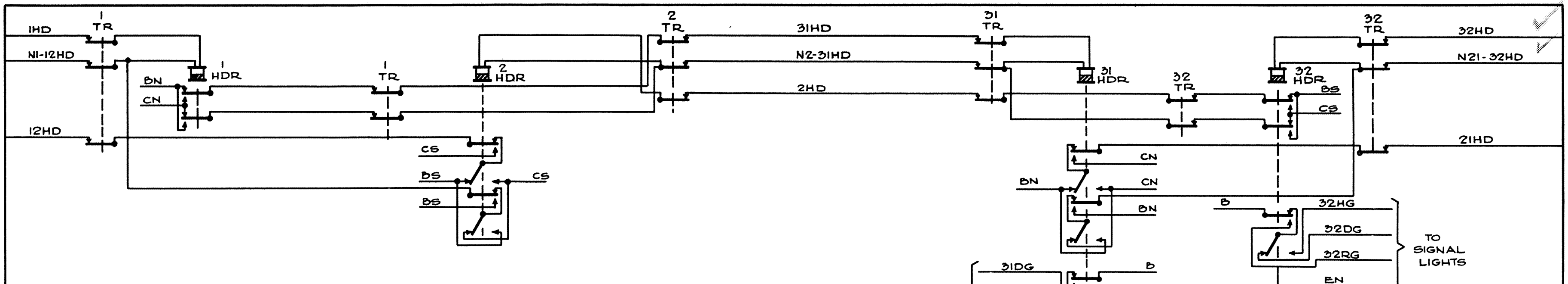
USING POLAR HD RELAY AND NEUTRAL SLOW RELEASE "HP" RELAY.
TRACK SIGNALED IN BOTH DIRECTIONS

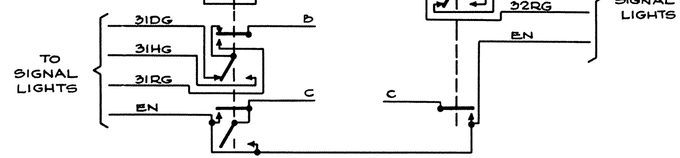
THREE WIRE "HD" CONTROL
(CODE RULES 281 - 285 - 291)

AAR
SIG. SEC.
8027A

SEPT. 1948

SHEET 1





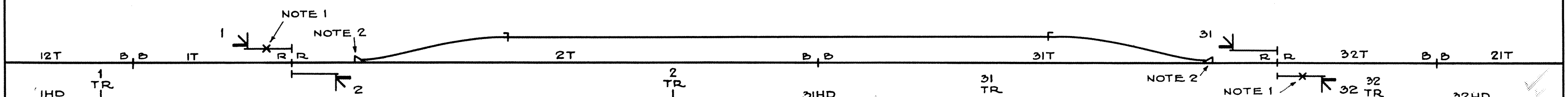
TYPICAL THREE ASPECT COLORLIGHT AUTOMATIC SIGNAL CIRCUITS AT ENDS OF SIDING

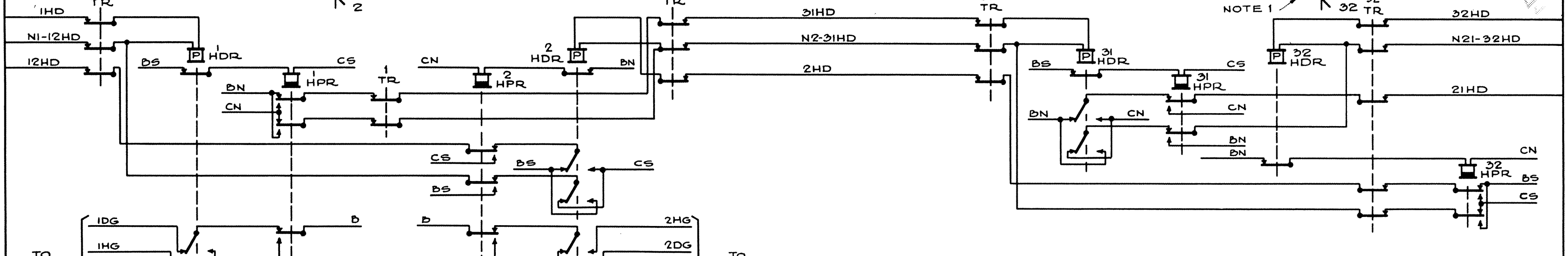
USING RETAINED NEUTRAL POLAR RELAY

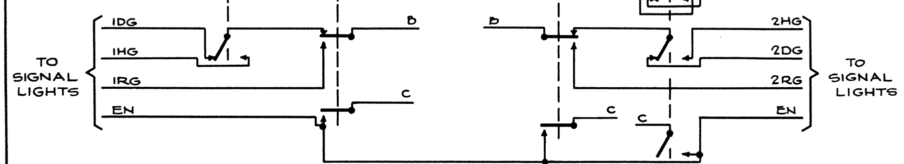
TRACK SIGNALED IN BOTH DIRECTIONS

THREE WIRE "HD" CONTROL BETWEEN SIDINGS

(CODE RULES 281-285-291-292)







TYPICAL THREE ASPECT COLORLIGHT AUTOMATIC SIGNAL CIRCUITS AT ENDS OF SIDING

USING POLAR "HD" RELAY & NEUTRAL SLOW RELEASE "HP" RELAY

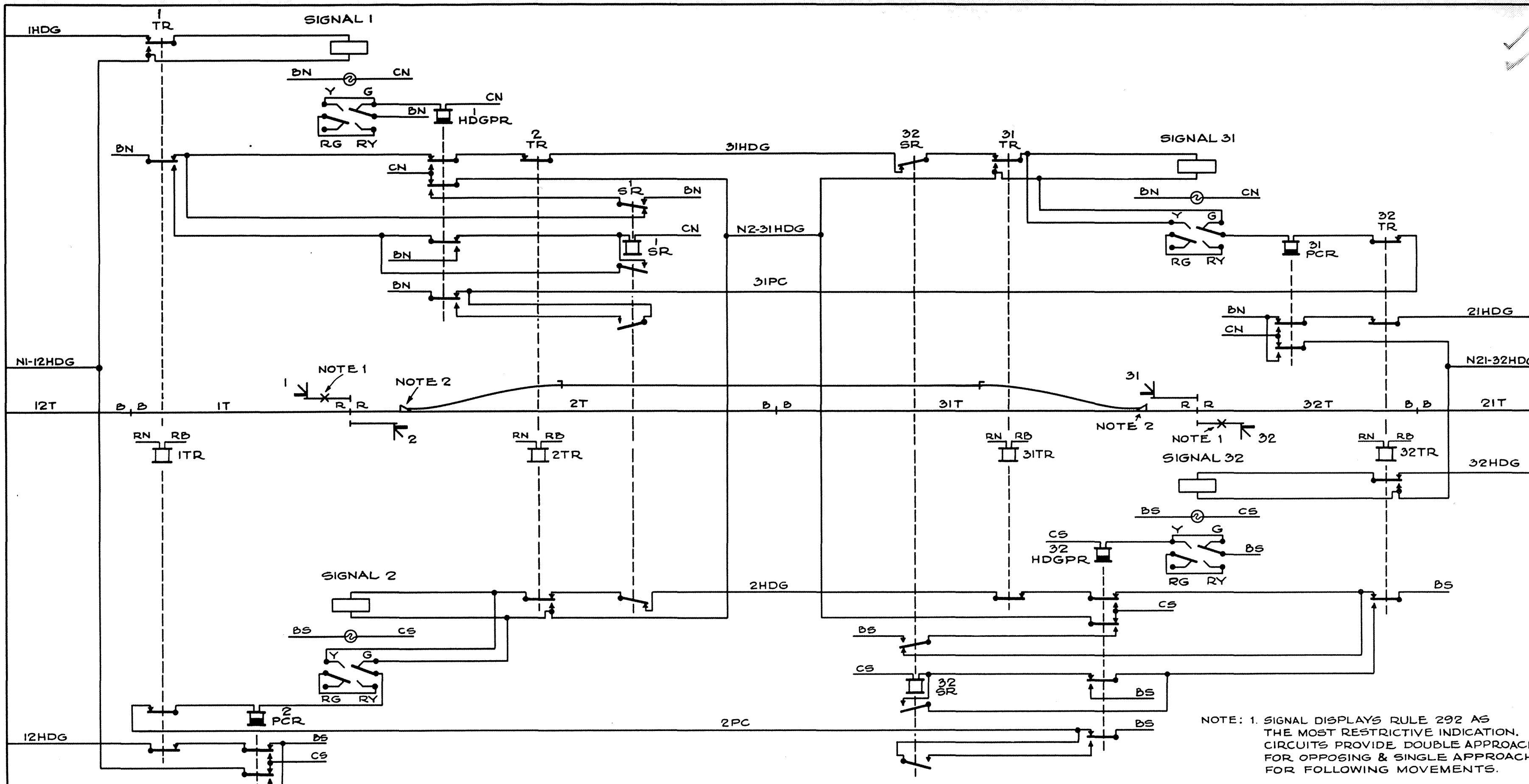
TRACK SIGNALED IN BOTH DIRECTIONS

THREE WIRE "HD" CONTROL BETWEEN SIDINGS

(CODE RULES 281-285-291-292)

NOTE 1. SIGNAL DISPLAYS RULE 292 AS THE MOST RESTRICTIVE INDICATION. CIRCUITS PROVIDE DOUBLE APPROACH FOR OPPOSING AND FOLLOWING MOVEMENTS.

2. DETAILS OF SWITCH PROTECTION NOT SHOWN.



TYPICAL THREE ASPECT SEARCHLIGHT AUTOMATIC SIGNAL CIRCUITS AT ENDS OF SIDING

USING DIRECT POLARIZED LINE CONTROL
TRACK SIGNALED IN BOTH DIRECTIONS
THREE WIRE "HD" CONTROL BETWEEN SIDINGS
(CODE RULES 281-285-291-292)

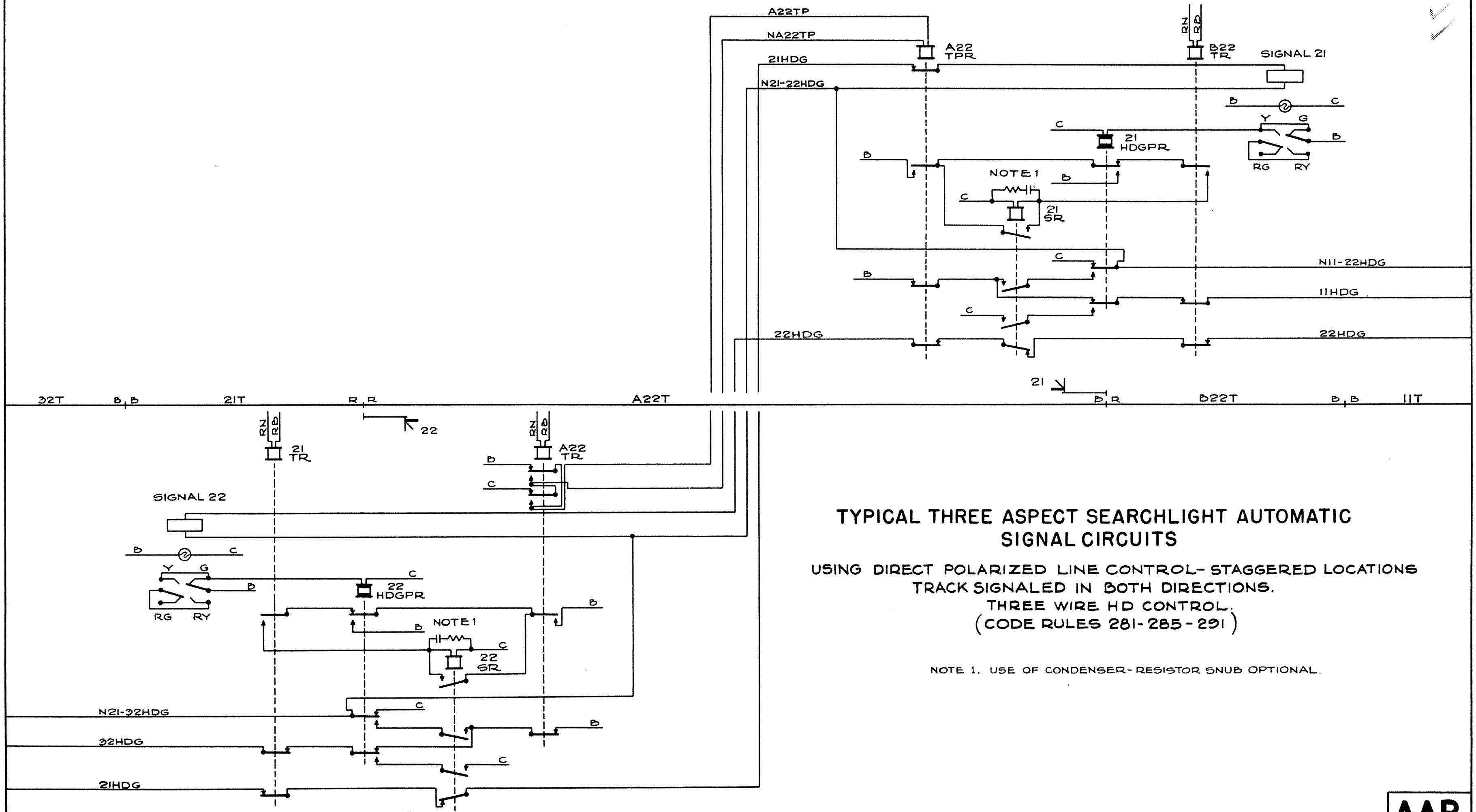
NOTE: 1. SIGNAL DISPLAYS RULE 292 AS THE MOST RESTRICTIVE INDICATION. CIRCUITS PROVIDE DOUBLE APPROACH FOR OPPOSING & SINGLE APPROACH FOR FOLLOWING MOVEMENTS.

2. DETAILS OF SWITCH PROTECTION NOT SHOWN.

SEPT. 1949

AAR SIG.SEC. 8027A

SHEET 3



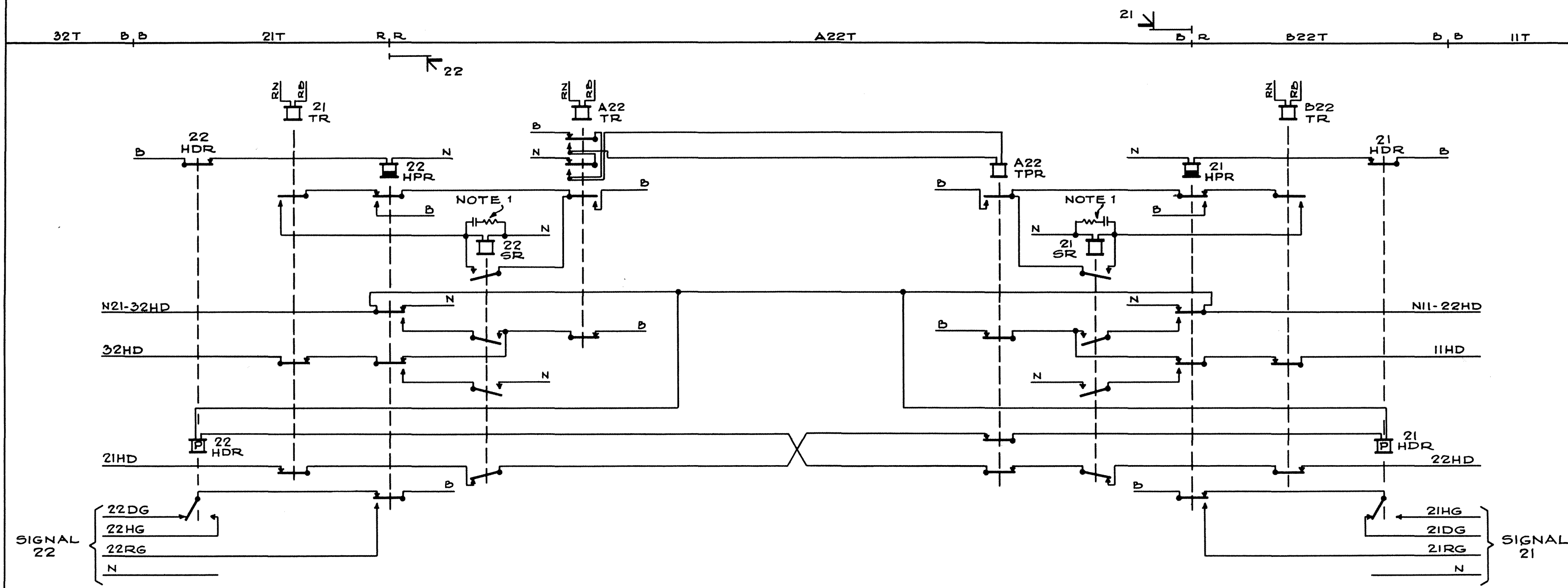
TYPICAL THREE ASPECT SEARCHLIGHT AUTOMATIC SIGNAL CIRCUITS

USING DIRECT POLARIZED LINE CONTROL- STAGGERED LOCATIONS
TRACK SIGNALED IN BOTH DIRECTIONS.
THREE WIRE HD CONTROL.
(CODE RULES 281-285-291)

NOTE 1. USE OF CONDENSER-RESISTOR SNUB OPTIONAL.

SEPT. 1949

AAR SIG. SEC. 8027A



NOTE 1

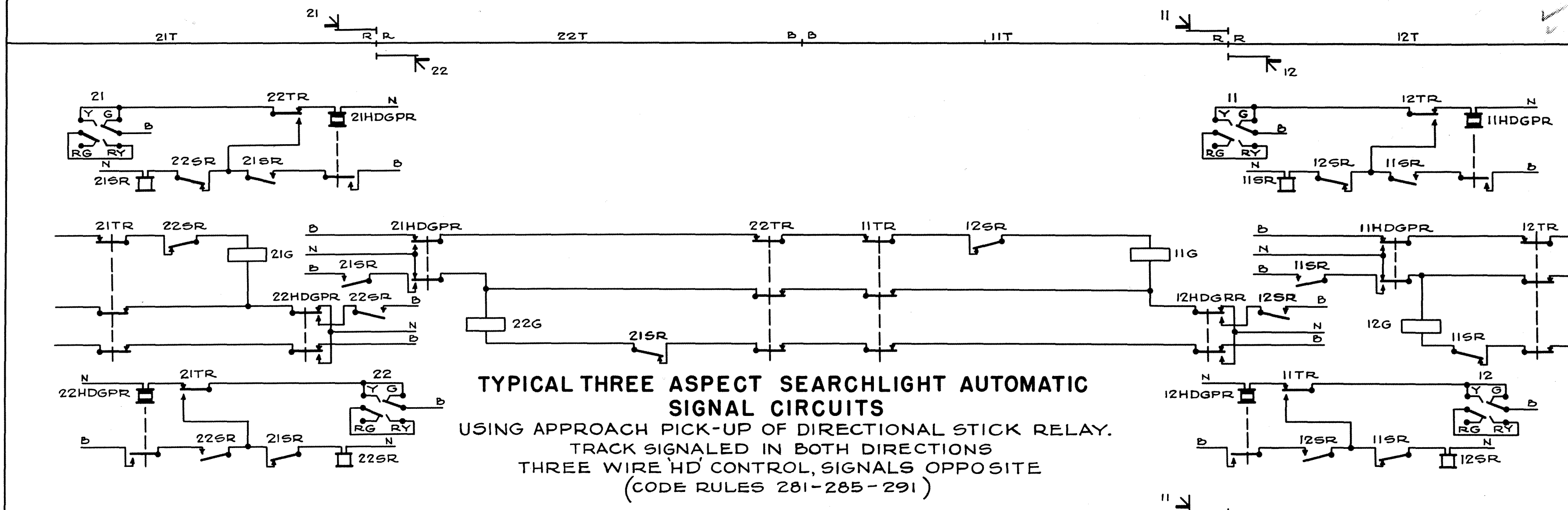
USE OF CONDENSER-RESISTOR SNUB OPTIONAL.

TYPICAL THREE ASPECT COLORLIGHT AUTOMATIC SIGNAL CIRCUITS

USING DIRECT POLARIZED LINE CONTROL — STAGGERED LOCATIONS
TRACK SIGNALED IN BOTH DIRECTIONS
THREE WIRE 'HD' CONTROL
(CODE RULES 281-285-291)

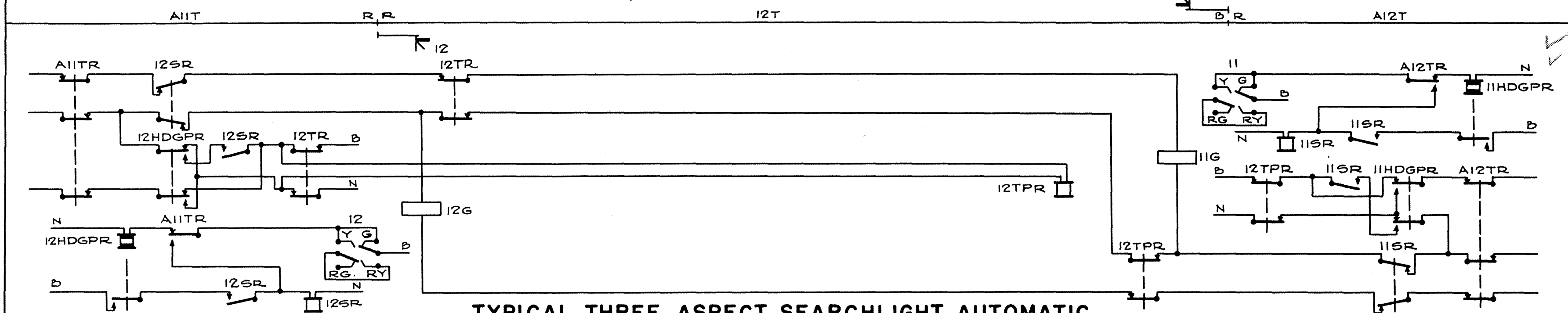
SEPT 1950

AAR SIG. SEC. 8027A



TYPICAL THREE ASPECT SEARCHLIGHT AUTOMATIC SIGNAL CIRCUITS

USING APPROACH PICK-UP OF DIRECTIONAL STICK RELAY.
TRACK SIGNALED IN BOTH DIRECTIONS
THREE WIRE 'HD' CONTROL, SIGNALS OPPOSITE
(CODE RULES 281-285-291)

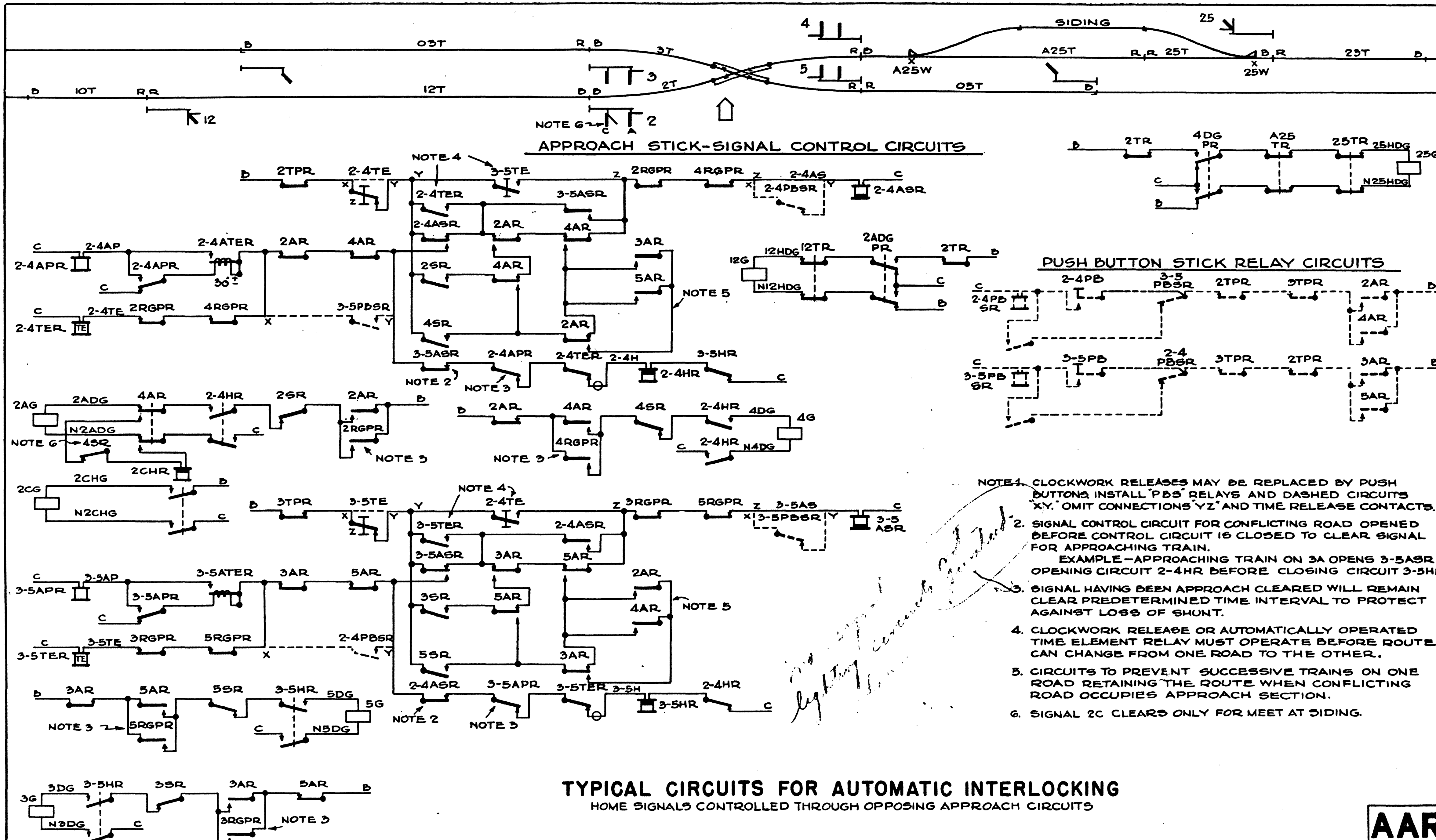


TYPICAL THREE ASPECT SEARCHLIGHT AUTOMATIC SIGNAL CIRCUITS

USING APPROACH PICK-UP OF DIRECTIONAL STICK RELAY
TRACK SIGNALED IN BOTH DIRECTIONS
THREE WIRE 'HD' CONTROL, SIGNALS STAGGERED
(CODE RULES 281-285-291)

SEPT. 1950

AAR SIG. SEC. 8027A



NOTE 1. CLOCKWORK RELEASES MAY BE REPLACED BY PUSH BUTTONS. INSTALL "PBS" RELAYS AND DASHED CIRCUITS "XY." OMIT CONNECTIONS "YZ" AND TIME RELEASE CONTACTS.

2. SIGNAL CONTROL CIRCUIT FOR CONFLICTING ROAD OPENED BEFORE CONTROL CIRCUIT IS CLOSED TO CLEAR SIGNAL FOR APPROACHING TRAIN.
EXAMPLE—APPROACHING TRAIN ON 3A OPENS 3-5ASR OPENING CIRCUIT 2-4HR BEFORE CLOSING CIRCUIT 3-5HR.

3. SIGNAL HAVING BEEN APPROACH CLEARED WILL REMAIN CLEAR PREDETERMINED TIME INTERVAL TO PROTECT AGAINST LOSS OF SHUNT.

4. CLOCKWORK RELEASE OR AUTOMATICALLY OPERATED TIME ELEMENT RELAY MUST OPERATE BEFORE ROUTE CAN CHANGE FROM ONE ROAD TO THE OTHER.

5. CIRCUITS TO PREVENT SUCCESSIVE TRAINS ON ONE ROAD RETAINING THE ROUTE WHEN CONFLICTING ROAD OCCUPIES APPROACH SECTION.

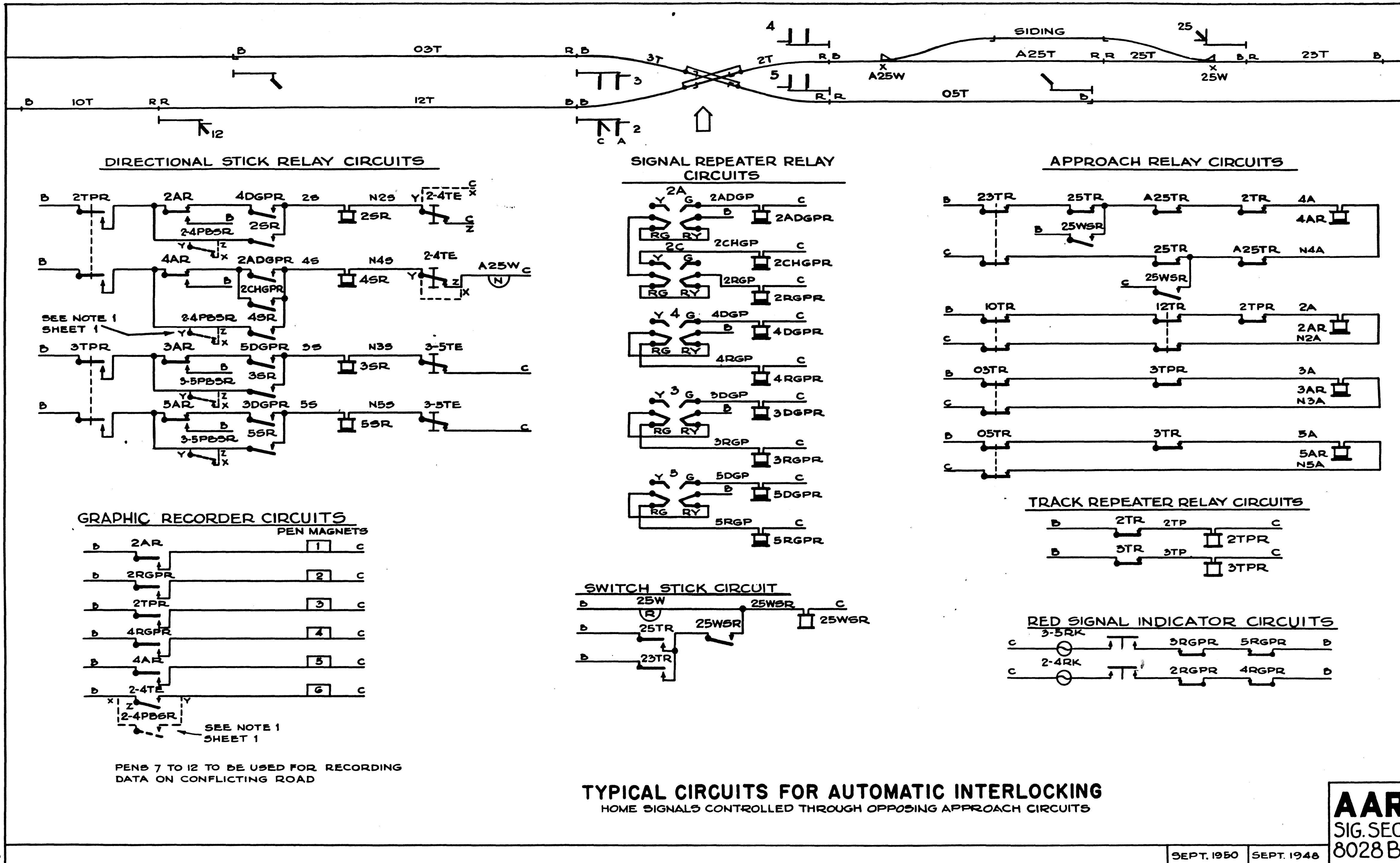
6. SIGNAL 2C CLEARS ONLY FOR MEET AT SIDING.

TYPICAL CIRCUITS FOR AUTOMATIC INTERLOCKING

HOME SIGNALS CONTROLLED THROUGH OPPOSING APPROACH CIRCUITS

SEPT. 1950	SEPT. 1948	AAR SIG. SEC. 8028B

SHEET 1 OF 2


DIRECTIONAL STICK RELAY CIRCUITS
SIGNAL REPEATER RELAY CIRCUITS
APPROACH RELAY CIRCUITS
SEE NOTE 1 SHEET 1
GRAPHIC RECORDER CIRCUITS
PEN MAGNETS
SEE NOTE 1 SHEET 1
PENS 7 TO 12 TO BE USED FOR RECORDING DATA ON CONFLICTING ROAD
SWITCH STICK CIRCUIT
TRACK REPEATER RELAY CIRCUITS
RED SIGNAL INDICATOR CIRCUITS
TYPICAL CIRCUITS FOR AUTOMATIC INTERLOCKING
HOME SIGNALS CONTROLLED THROUGH OPPOSING APPROACH CIRCUITS
SEPT. 1950
SEPT. 1948
AAR
SIG. SEC.
8028 B

TYPICAL CIRCUITS FOR AUTOMATIC INTERLOCKING.

These circuits are so arranged that the first train to occupy an approach section will establish its route by releasing ASR. The release of the ASR to establish a route assures that a conflicting signal cannot be cleared. This is covered by Note 2.

A back contact of the conflicting roads AR is inserted in the ASR circuit to prevent successive follow-up movements. This is covered by Note 5.

To permit the route to be changed from one road to another, timing releases have been provided as covered by Note 4.

To protect against loss of shunt in the approach section after a signal has been cleared, back contact of the AR is shunted by a back contact of the RGPR. This is covered by Note 3.

A brief description as to the operation follows:

Assume a movement occupies the 2 approach. This will release 2AR. Front contact of the 2AR in the stick circuit of the 2ASR will cause it to release. Energy is then taken over a front contact of the 2TPR, back contact of 2-4ASR, front contact of 3-5ASR, back contact of 2-4APR, check contact of 2-4TER to the coil of 2-4HR. Negative energy is applied to the coil of the 2-4HR, over a back contact of the 3-5HR which will complete the circuit causing the 2-4HR to pick up. Signal 2 is then cleared by energy taken over a back contact of 2AR, a back contact of 2SR, a front contact of 2-4HR and a front contact of 4AR to the signal mechanism. Negative energy is taken over similar relay contacts for double break protection.

Should the approach become unoccupied momentarily due to a loss of shunt, or movements recede from approach circuit, the 2AR will pick up causing the 2-4TER to operate for a predetermined time after which the 2-4APR will pick opening the circuit for the 2-4HR causing the signal to assume a stop aspect. Should the movement continue through the plant, the following will take place. When track section 2 is occupied, energy is removed from all paths of the ASR circuit as well as the HR circuit causing the HR to release, resulting in signal 2 assuming a stop aspect, as well as establish directional receding stick circuits as follows: The 2TPR released, 4AR and 2ADGPR picked up will pick relay 4SR. A stick circuit will be maintained over a back contact of the 2TPR and finally over a back contact of the 4AR. Relay 4SR being picked with the receding approach occupied, prevents signal 4 from clearing during a receding move. With 4SR, 2TPR and 2AR picked, 4AR released, 2RGPR and 4RGPR picked up, a pick-up circuit is provided for the 2-4ASR. Due to the 2-4HR having a slow pick-up feature, it will not pick up as a train completes its move through the interlocking. ASR picked releases the route for conflicting movements.

Should a movement be delayed in route and a conflicting movement desires to establish a route, trainmen on conflicting route must operate either the push button or clockwork release, depending on which type of release is being employed, thereby causing signal on established route to assume a stop aspect and after a predetermined time has expired a route can be established for the desired movement.

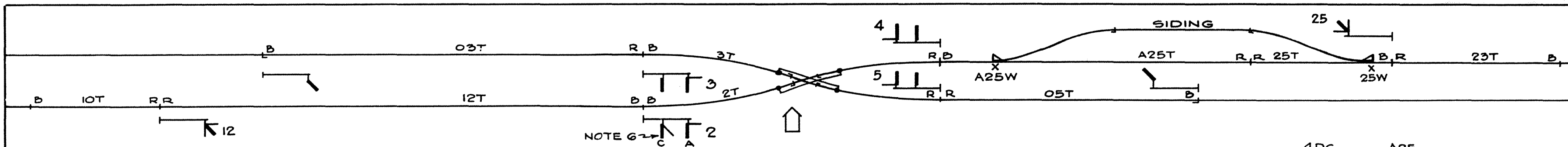
The circuit description for operating the time locking release circuit is as follows:

With either conflicting approach, 3 or 5AR occupied, the plant section relays (2TPR-3TPR) picked up and the push button 3-5 depressed, 3-5PBSR will pick which in turn will release 3-5ASR, a circuit to operate the 2-4TER over contacts of 2TPR, 2-4ASR, 3-5PBSR, 4RGPR and 2RGPR is established. After a predetermined time, 2-4TER will pick, completing a circuit to energize the 2-4ASR. This is established over contacts of 2TPR, 2-4TER, 3-5ASR (which was released by operating the 3-5 push button), 2RGPR and 4RGPR. The pick-up of 2-4ASR opens the circuit to the 2-4TER causing it to release.

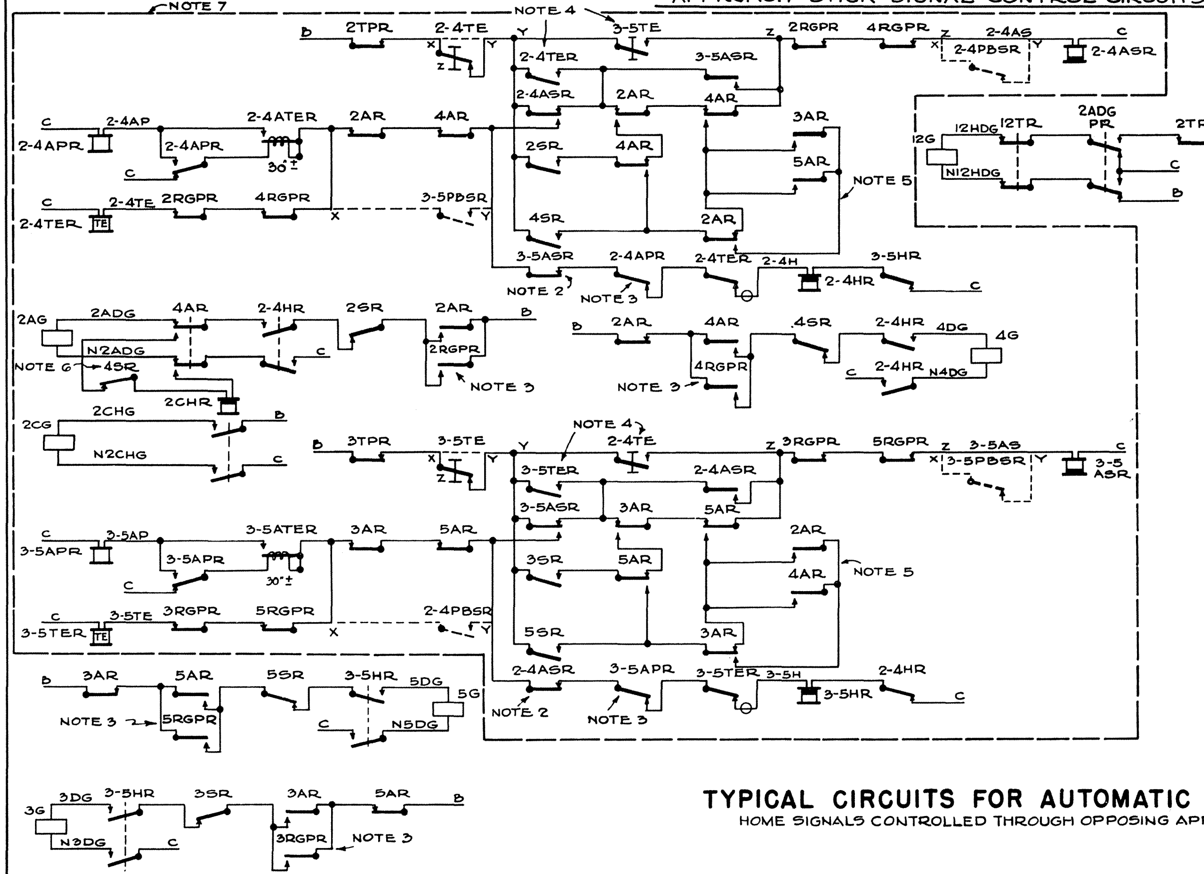
The 2-4ASR energized provides a circuit to pick 3-5HR establishing the route for conflicting movement.

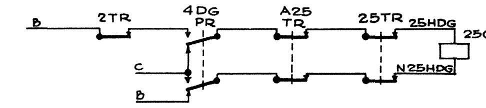
The circuits shown on Sheet 3 employ supervisory control on signals 2 and 4. The clearing of 2 or 4 is the same as previously described with the exception of function control relays (2GZR-4GZR) which are controlled from a remote location. The circuits used for receiving controls and transmitting indications will vary with the type of code system employed. 2-4AZR has been provided to prevent a route from being established unless the function control relay 2GZR or 4GZR has been picked up, as well as the approach occupied. 2-4AZR will also prevent misrouting in the event an incorrect function control relay has been selected. 2-4TZR is provided for indicating when the 2-4TER is timing.

Provisions have been made for the use of a pen graph recorder which provides a graphic monitoring of train operation through the interlocking.

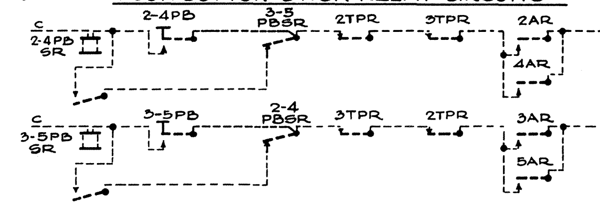


APPROACH STICK-SIGNAL CONTROL CIRCUITS





PUSH BUTTON STICK RELAY CIRCUITS



NOTE 1. CLOCKWORK RELEASES MAY BE REPLACED BY PUSH BUTTONS, INSTALL "PBS" RELAYS AND DASHED CIRCUITS "XY." OMIT CONNECTIONS "YZ" AND TIME RELEASE CONTACTS.

2. SIGNAL CONTROL CIRCUIT FOR CONFLICTING ROAD OPENED, BEFORE CONTROL CIRCUIT IS CLOSED TO CLEAR SIGNAL FOR APPROACHING TRAIN.
   EXAMPLE—APPROACHING TRAIN ON 3A OPENS 3-5ASR OPENING CIRCUIT 2-4HR BEFORE CLOSING CIRCUIT 3-5HR.

3. SIGNAL HAVING BEEN APPROACH CLEARED WILL REMAIN CLEAR PREDETERMINED TIME INTERVAL TO PROTECT AGAINST LOSS OF SHUNT.

4. CLOCKWORK RELEASE OR AUTOMATICALLY OPERATED TIME ELEMENT RELAY MUST OPERATE BEFORE ROUTE CAN CHANGE FROM ONE ROAD TO THE OTHER.

5. CIRCUITS TO PREVENT SUCCESSIVE TRAINS ON ONE ROAD RETAINING THE ROUTE WHEN CONFLICTING ROAD OCCUPIES APPROACH SECTION.

6. SIGNAL 2C CLEARS ONLY FOR MEET AT SIDING.

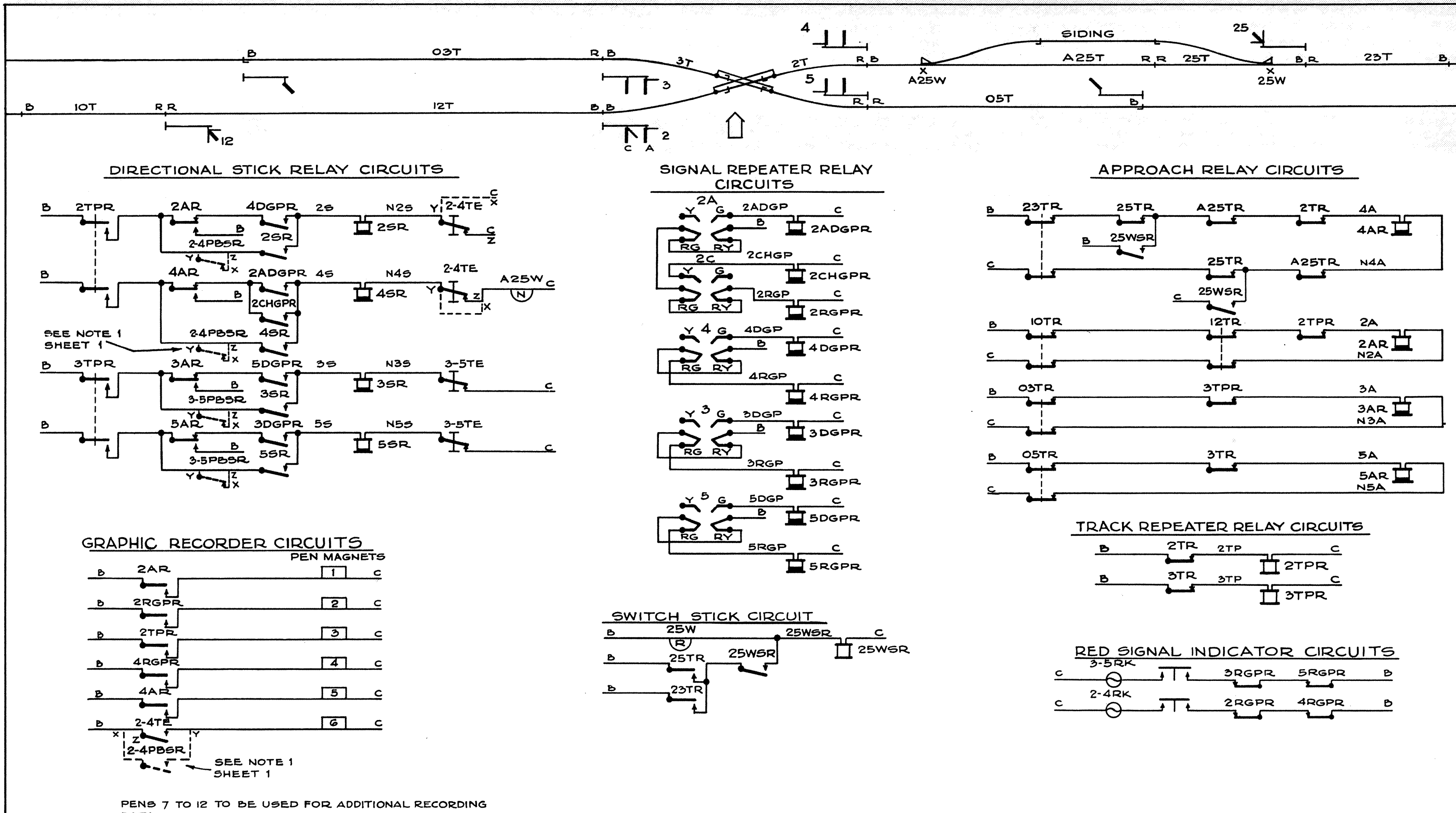
7. WHERE SUPERVISORY CONTROL IS DESIRED ON SIGNALS 2 & 4 OMIT CIRCUITS SHOWN INSIDE DOTTED LINES AND INCLUDE CIRCUITS SHOWN ON SHEET 3.

TYPICAL CIRCUITS FOR AUTOMATIC INTERLOCKING

HOME SIGNALS CONTROLLED THROUGH OPPOSING APPROACH CIRCUITS

SEPT. 1957	SEPT. 1950	SEPT. 1948	AAR SIG. SEC. 8028C

SHEET 1



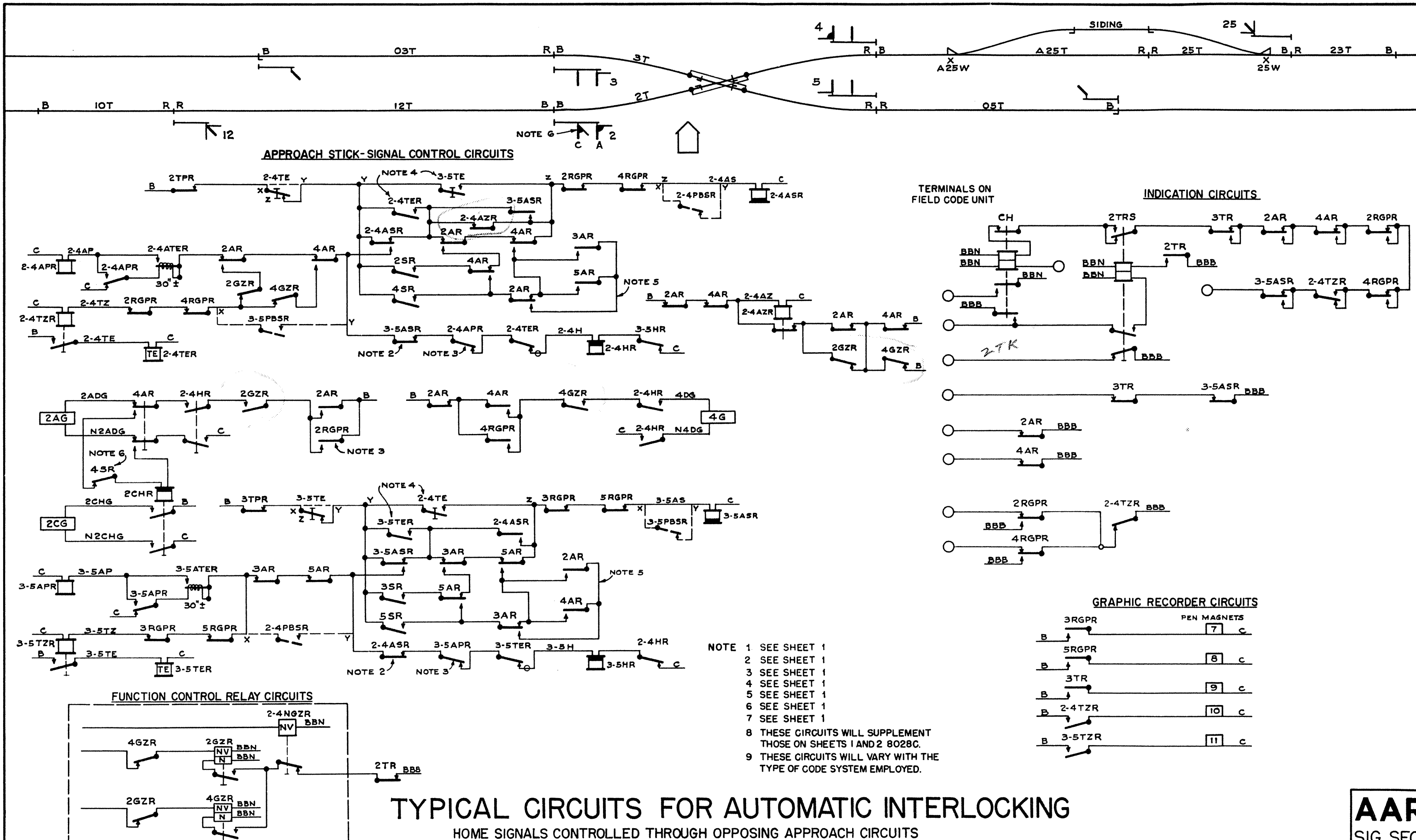
PENS 7 TO 12 TO BE USED FOR ADDITIONAL RECORDING DATA.

TYPICAL CIRCUITS FOR AUTOMATIC INTERLOCKING

HOME SIGNALS CONTROLLED THROUGH OPPOSING APPROACH CIRCUITS

SEPT. 1957	SEPT. 1950	SEPT. 1948	AAR SIG. SEC. 8028C

SHEET 2



TYPICAL CIRCUITS FOR AUTOMATIC INTERLOCKING

HOME SIGNALS CONTROLLED THROUGH OPPOSING APPROACH CIRCUITS
(SUPERVISORY CONTROL OF SIGNALS 2 & 4)

SEPT. 1957

AAR
SIG. SEC.
8028C

SHEET 3

ADDENDUM TO A.A.R. SIG. SEC. 8029A

TYPICAL THREE AND FOUR-ASPECT COLOR LIGHT AUTOMATIC SIGNAL CIRCUITS.

These circuits provide for track signaled in both directions using the ordinary acting polarized relay in combination with a slow release neutral repeater relay and, therefore, has a number of characteristics in common with A.A.R. Sig. Sec. 8002A.

A.A.R. Sig. Sec. 8029A is arranged for two-block, three-indication signaling westward and three-block, four-indication signaling eastward, and the eastward and westward line control are entirely separated.

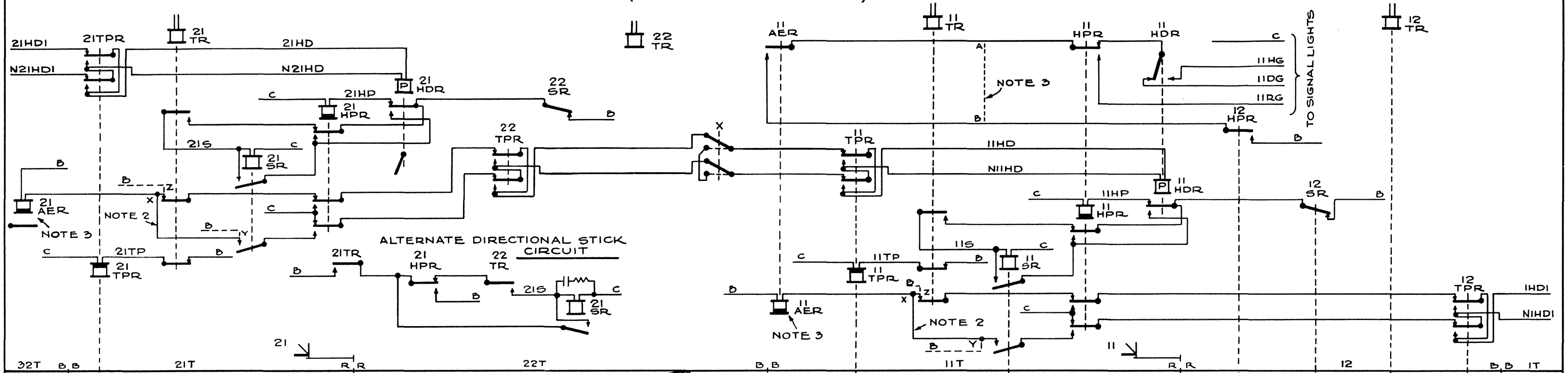
Attention is called to the arrangement of the stick portion of the directional stick relay circuit whereby the stick relay is held over back contacts of either the HDR or the HPR relay. This assists in preventing the loss of the stick relay in hopping the joints at the cut-section and also eliminates the need of any slow release time on the stick relay itself. This circuit arrangement, however, does require an additional contact on the HPR relay and is not suitable for use with the retained neutral polar relay.

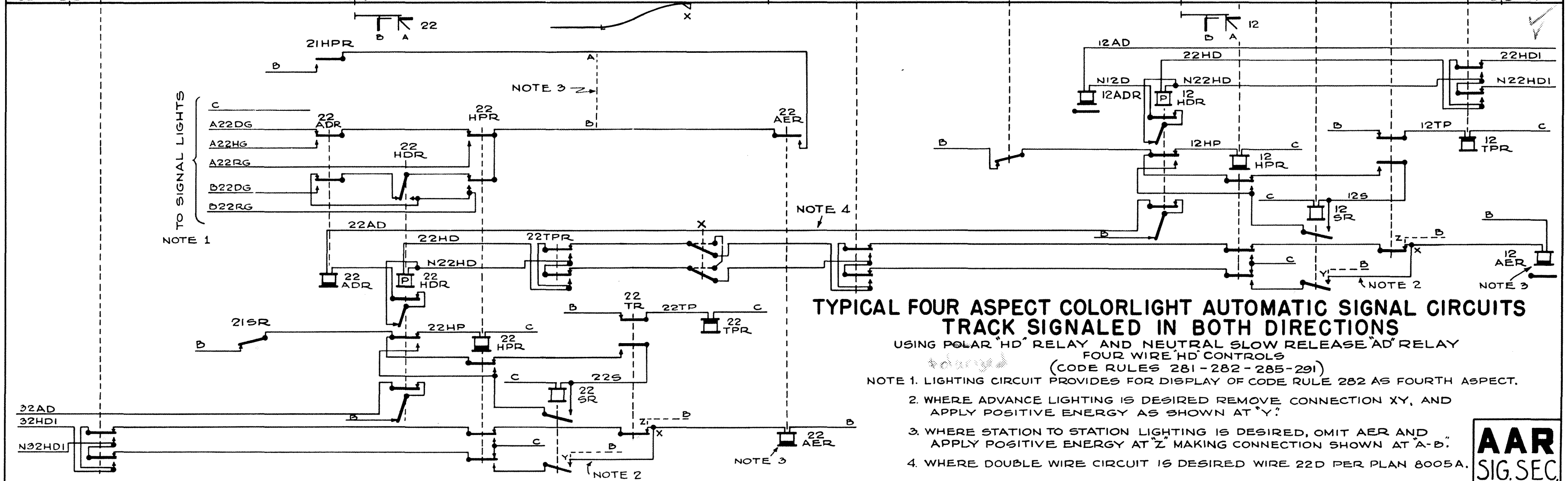
While it is not feasible to show the variations in directional stick relay control for this type of signaling, particular care should be exercised in the design of the directional stick relay circuits where signals are staggered and a single-track circuit is used between signals. Circuits should be checked to avoid the possibility of opposing stick relays being energized simultaneously due to track circuit failures, the operation of hand-throw switches, etc.

TYPICAL THREE ASPECT COLORLIGHT AUTOMATIC SIGNAL CIRCUITS–TRACK SIGNALED IN BOTH DIRECTIONS

USING POLAR LINE RELAY

(CODE RULES 281-285-291)





TYPICAL FOUR ASPECT COLORLIGHT AUTOMATIC SIGNAL CIRCUITS TRACK SIGNALED IN BOTH DIRECTIONS

USING POLAR "HD" RELAY AND NEUTRAL SLOW RELEASE "AD" RELAY

FOUR WIRE "HD" CONTROLS

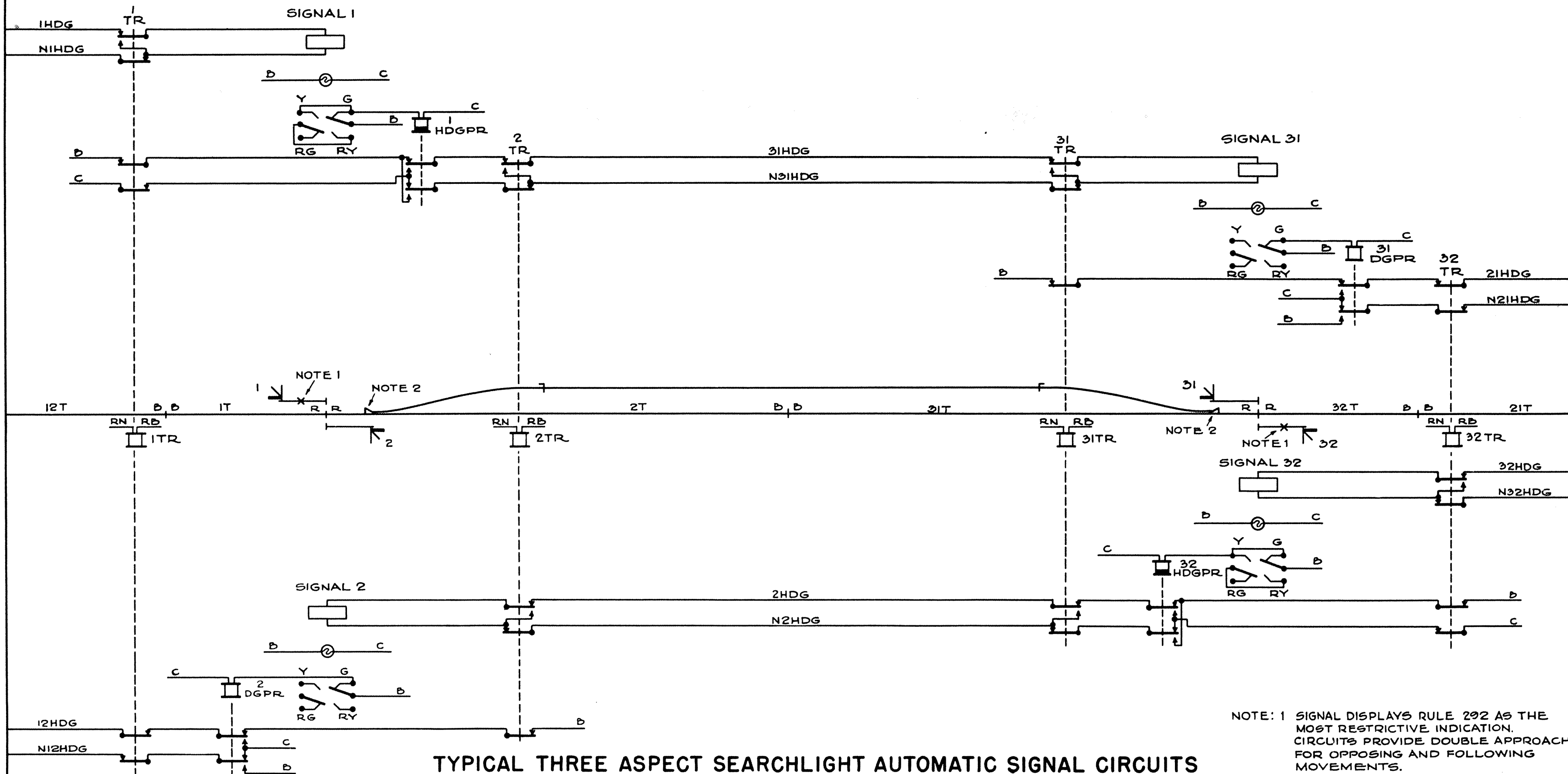
(CODE RULES 281-282-285-291)

NOTE 1. LIGHTING CIRCUIT PROVIDES FOR DISPLAY OF CODE RULE 282 AS FOURTH ASPECT.

2. WHERE ADVANCE LIGHTING IS DESIRED REMOVE CONNECTION XY, AND APPLY POSITIVE ENERGY AS SHOWN AT "Y."

3. WHERE STATION TO STATION LIGHTING IS DESIRED, OMIT AER AND APPLY POSITIVE ENERGY AT "Z" MAKING CONNECTION SHOWN AT "A-B."

4. WHERE DOUBLE WIRE CIRCUIT IS DESIRED WIRE 22D PER PLAN 8005A.



TYPICAL THREE ASPECT SEARCHLIGHT AUTOMATIC SIGNAL CIRCUITS AT ENDS OF SIDING

USING DIRECT POLARIZED LINE CONTROL.
TRACK SIGNALED IN BOTH DIRECTIONS.
FOUR WIRE "HD" CONTROL BETWEEN SIDINGS
(CODE RULES 281-285-291-292)

NOTE: 1. SIGNAL DISPLAYS RULE 292 AS THE MOST RESTRICTIVE INDICATION. CIRCUITS PROVIDE DOUBLE APPROACH FOR OPPOSING AND FOLLOWING MOVEMENTS.

2. DETAILS OF SWITCH PROTECTION NOT SHOWN.

SEPT. 1949

AAR SIG. SEC. 8029A

SHEET 2

ADDENDUM TO A.A.R. SIG.SEC. 8030A AND 8031A

TYPICAL REMOTE CONTROL SWITCH AND SIGNAL CIRCUITS, DIRECT WIRE CONTROL.

Two schemes of control are shown, both being arranged to provide for the remote control and indication of a layout consisting of a single switch and associated signals, such as the end of a passing siding. Both Schemes 1 and 2 are direct wire schemes, using a split battery with three line wires and common for basic controls and indications. Scheme 2 requires an additional line wire for approach indication.

The major difference between the two schemes is in principle of operation. Scheme 1 requires that the operator wait until the switch in the field is in correspondence with the switch lever before turning the signal lever. Scheme 2 does not require switch machine to be in correspondence with switch lever before signal lever is turned. In either scheme the subsequent operation of the switch lever will not affect the signal control once it has been established, even though the signal itself has not yet cleared.

Both schemes prevent the storage of switch control. In Scheme 1 it is provided in the field on relay 3LSR. In Scheme 2 it is accomplished in the control office through the polar contacts on relay 3CWR and the stick contacts on relay 3LKR.

In Scheme 1 the lock relays are de-energized when the signal clears, no provision being made for preliminary drop and check of these relays. In Scheme 2 the lock relays are de-energized when the signal lever is positioned and are checked in the de-energized position in the signal control circuit.

Scheme 1 does not provide for a continuous visual indication of the locked condition of a switch, but an audible and visual indication of the expiration of time locking is provided by a flash of light 3TK and a tap on gong 3TX. Scheme 2 provides a continuous visual indication of switch locking.

The methods of providing switch and signal indication shown are different for the two schemes, Scheme 1 being a normally lighted panel and Scheme 2 having a normally dark panel. In so far as these local circuits are concerned, the two principles are interchangeable for either scheme.

In Scheme 2 contacts of 3WKR and 3CWR in 3TK circuit prevent track indication during operation of the switch, and contact of 3LKR prevents track indication when switch is operated by hand.

ADDENDUM TO A.A.R. SIG.SEC. 8030A AND 8031A - Continued

On Scheme 2, 3WK is a switch correspondence light. It is lighted under the following conditions:

(a) When switch lever and switch machine do not agree in position.

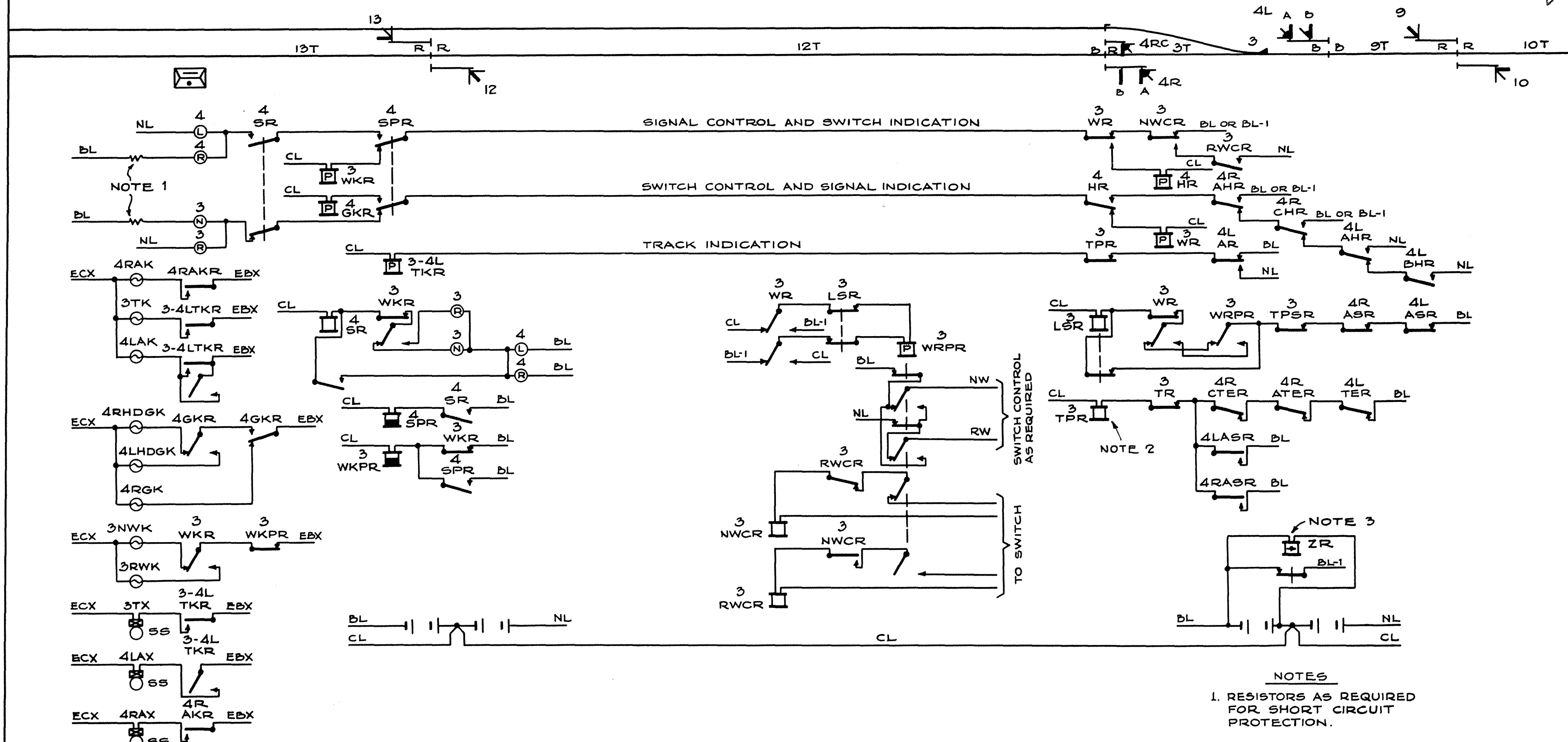
(b) When switch is in transit.

(c) When the switch is operated by hand. This is obtained by front contact of the 3LKR and a back contact of the 3WTKR.

(d) When operator changes switch lever position after route has been established.

With Scheme 1 the signal "clear" indication on the panel is removed and the signal "stop" indication displayed when the signal lever is restored to normal. With Scheme 2 the signal "clear" indication is retained on the panel until the signal in the field goes to stop.

Scheme 1 provides a means for combining one approach indication with the detector track indication, but this approach indication will be displayed whenever the detector track is occupied.



NOTES

1. RESISTORS AS REQUIRED FOR SHORT CIRCUIT PROTECTION.
2. 3TPR CIRCUIT ARRANGED TO FLASH 3TK AND RING 3TX AT EXPIRATION OF TIME OPERATION.
3. FOR INFORMATION ON POLARITY CHECKING CIRCUIT. SEE A.A.R. DWG. 8033A.

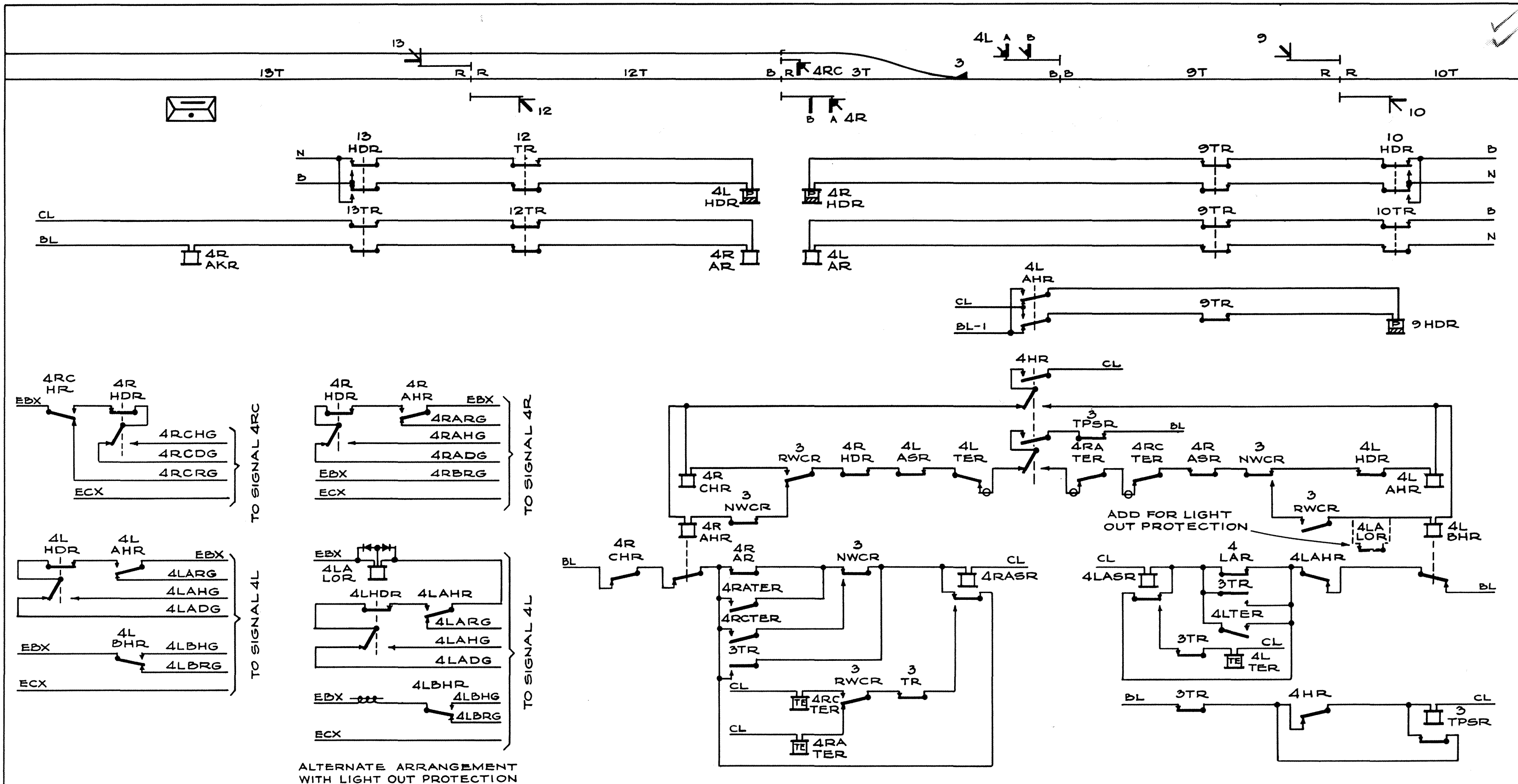
TYPICAL REMOTE CONTROL SWITCH AND SIGNAL CIRCUITS
DIRECT WIRE CONTROL

~~SCHEME 1~~

Four Wires

AAR SIG. SEC. 8030A

SEPT. 1950



TYPICAL REMOTE CONTROL SWITCH AND SIGNAL CIRCUITS
DIRECT WIRE CONTROL.

~~SCHEME 1~~
Four Wires

SEPT. 1950

AAR SIG. SEC. 8030A

SHEET 2 OF 2 SHEETS

ADDENDUM TO A.A.R. SIG.SEC. 8030A AND 8031A

30703-9

TYPICAL REMOTE CONTROL SWITCH AND SIGNAL CIRCUITS, DIRECT WIRE CONTROL.

Two schemes of control are shown, both being arranged to provide for the remote control and indication of a layout consisting of a single switch and associated signals, such as the end of a passing siding. Both Schemes 1 and 2 are direct wire schemes, using a split battery with three line wires and common for basic controls and indications. Scheme 2 requires an additional line wire for approach indication.

The major difference between the two schemes is in principle of operation. Scheme 1 requires that the operator wait until the switch in the field is in correspondence with the switch lever before turning the signal lever. Scheme 2 does not require switch machine to be in correspondence with switch lever before signal lever is turned. In either scheme the subsequent operation of the switch lever will not affect the signal control once it has been established, even though the signal itself has not yet cleared.

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The methods of providing switch and signal indication shown are different for the two schemes, Scheme 1 being a normally lighted panel and Scheme 2 having a normally dark panel. In so far as these local circuits are concerned, the two principles are interchangeable for either scheme.

In Scheme 2 contacts of 3WKR and 3CWR in 3TK circuit prevent track indication during operation of the switch, and contact of 3LKR prevents track indication when switch is operated by hand.

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ADDENDUM TO A.A.R. SIG.SEC. 8030A AND 8031A - Continued

On Scheme 2, 3WK is a switch correspondence light. It is lighted under the following conditions:

(a) When switch lever and switch machine do not agree in position.

(b) When switch is in transit.

(c) When the switch is operated by hand. This is obtained by front contact of the 3LKR and a back contact of the 3WTKR.

(d) When operator changes switch lever position after route has been established.

With Scheme 1 the signal "clear" indication on the panel is removed and the signal "stop" indication displayed when the signal lever is restored to normal. With Scheme 2 the signal "clear" indication is retained on the panel until the signal in the field goes to stop.

Scheme 1 provides a means for combining one approach indication with the detector track indication, but this approach indication will be displayed whenever the detector track is occupied.

If approach locking is desired refer to AAR Dwg. No. 8055 Shts. 1 & 3.
For switch machine circuits refer to AAR Dwg. No. 8089.

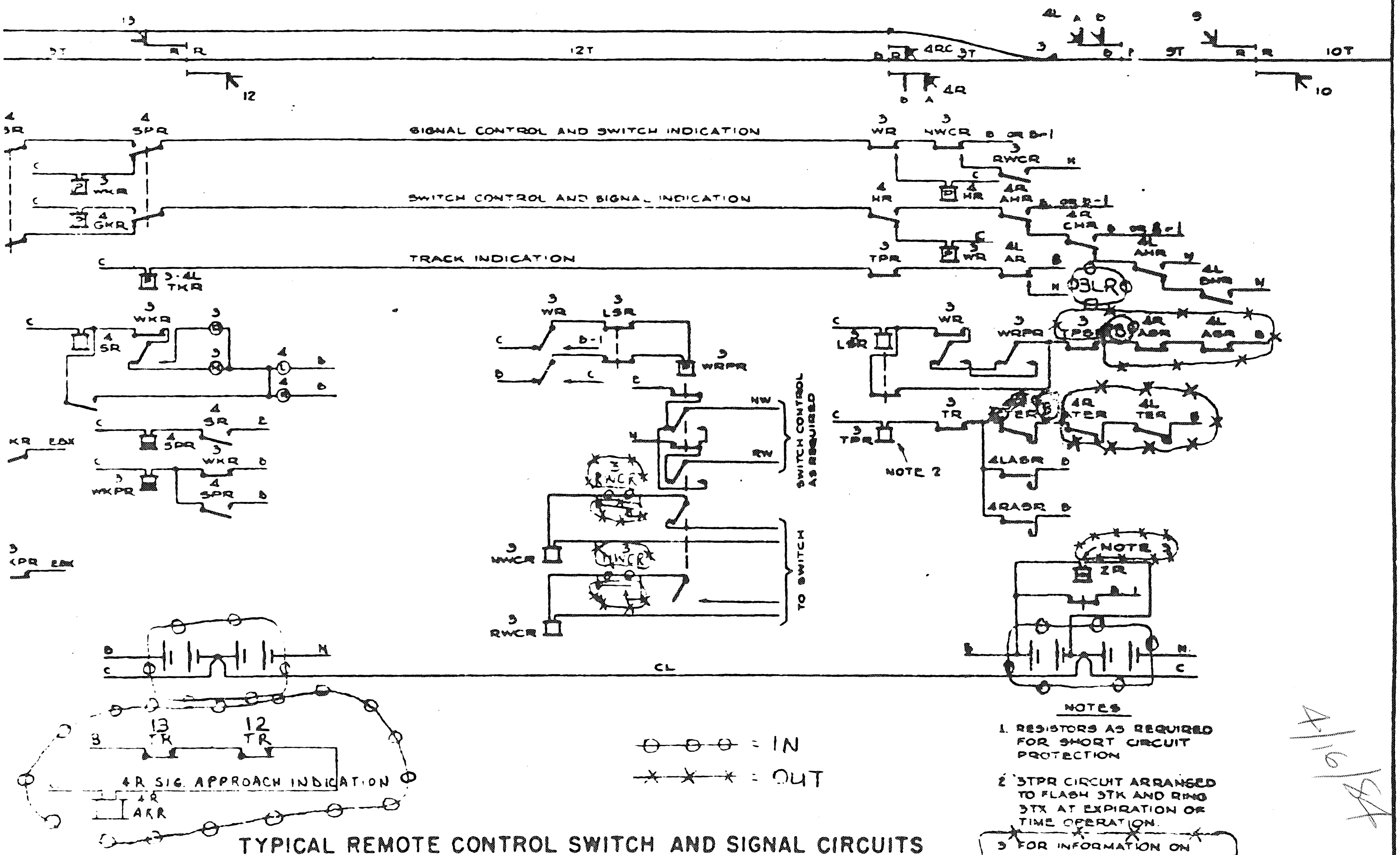
Vital polar circuits should be controlled through contacts of a polarity checking relay. This is required to prevent a wrong polarity from being applied to the polar circuits should its section of battery become opened. The wrong polarity would be supplied from the unopened section of battery in series with the load across the entire battery.

4SPR contacts in the signal and switch control and indication circuits holds the circuits intact after the signals are set back to stop in the tower so that 4HR can de-energize and 3WR energize to prevent complete series battery B to N from being impressed upon the circuits.

= 1N (Sheet 2 of 2)

4/16/84

C&S Division, AAR Committee Reports & Technical Papers 1983



TYPICAL REMOTE CONTROL SWITCH AND SIGNAL CIRCUITS
DIRECT WIRE CONTROL
SCHEME 1

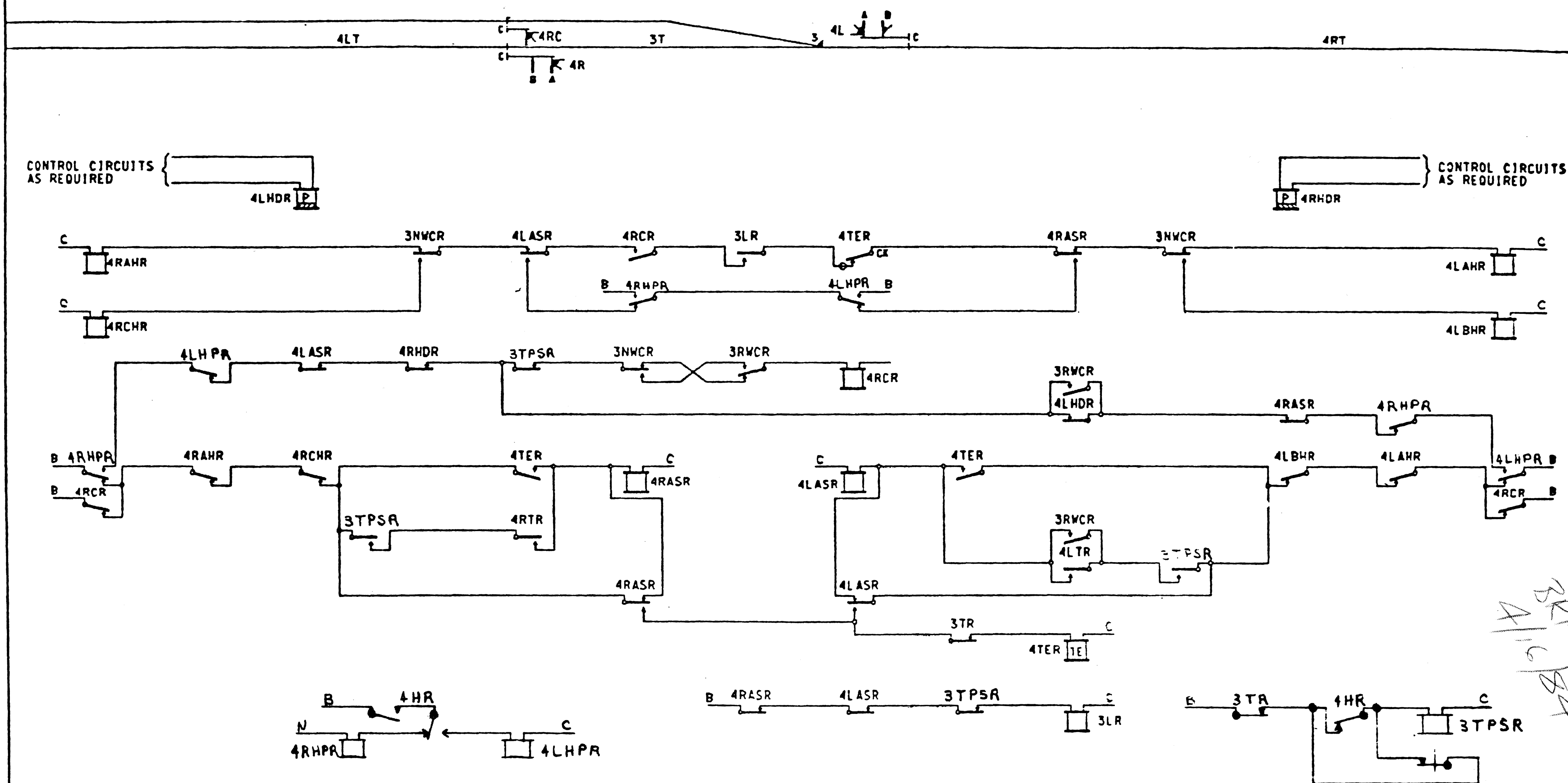
NOTES

1. RESISTORS AS REQUIRED FOR SHORT CIRCUIT PROTECTION
2. 3TPR CIRCUIT ARRANGED TO FLASH 3TK AND RING 3TX AT EXPIRATION OF TIME OPERATION.
3. FOR INFORMATION ON POLARITY CHECKING CIRCUIT. SEE A.A.R. DWG. 8033A.

4/16/84

APRIL 1983	SEPT 1950	AAR SIG SEC 8030A

SHEET 1 OF 2 SHEETS

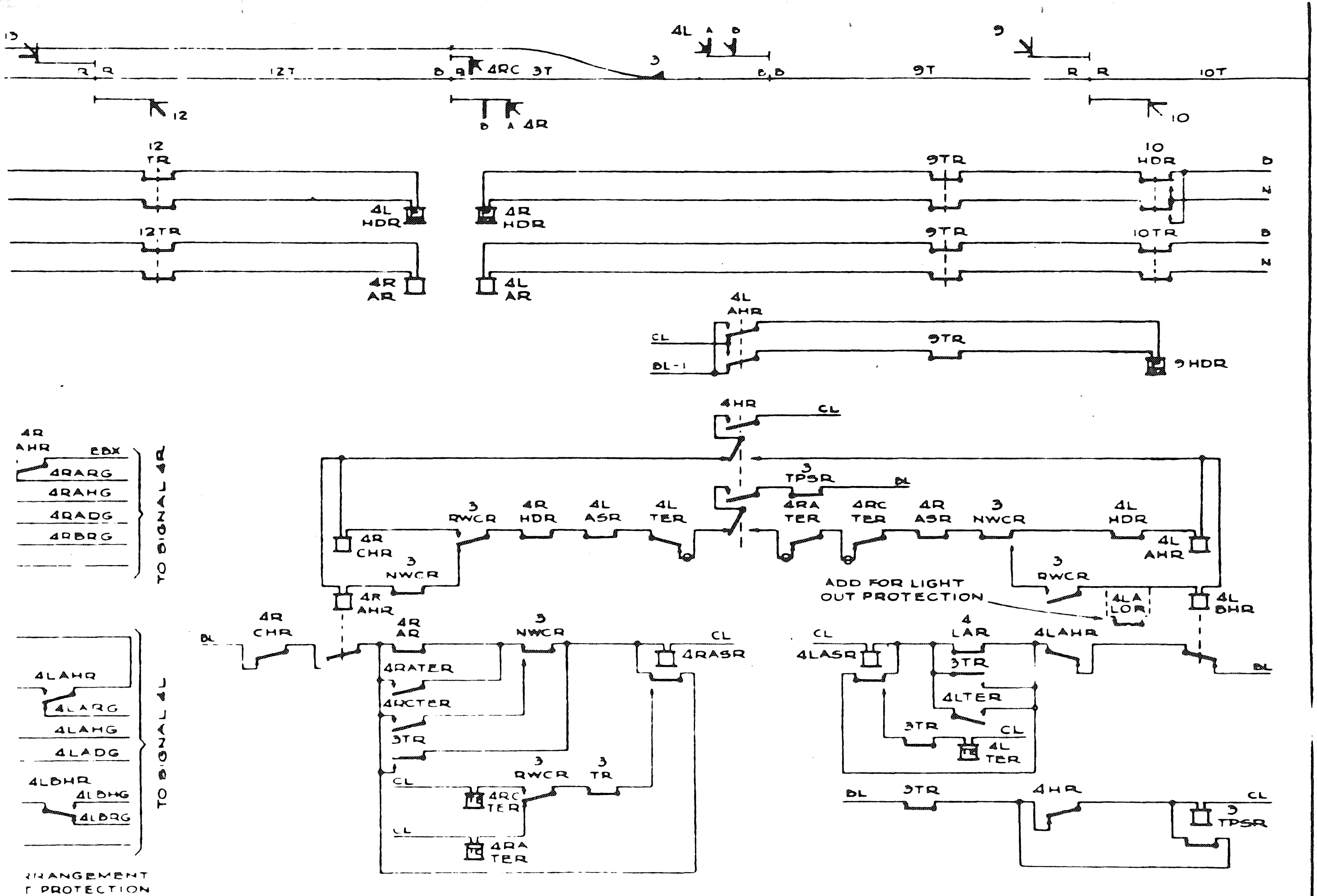


SCHEME Nº 1

TYPICAL CIRCUITS REMOTE CONTROL SWITCH AND SIGNALS - DIRECT WIRE

APRIL 1983

AAR SIGNAL 8030



TYPICAL REMOTE CONTROL SWITCH AND SIGNAL CIRCUITS
DIRECT WIRE CONTROL
SCHEME 1

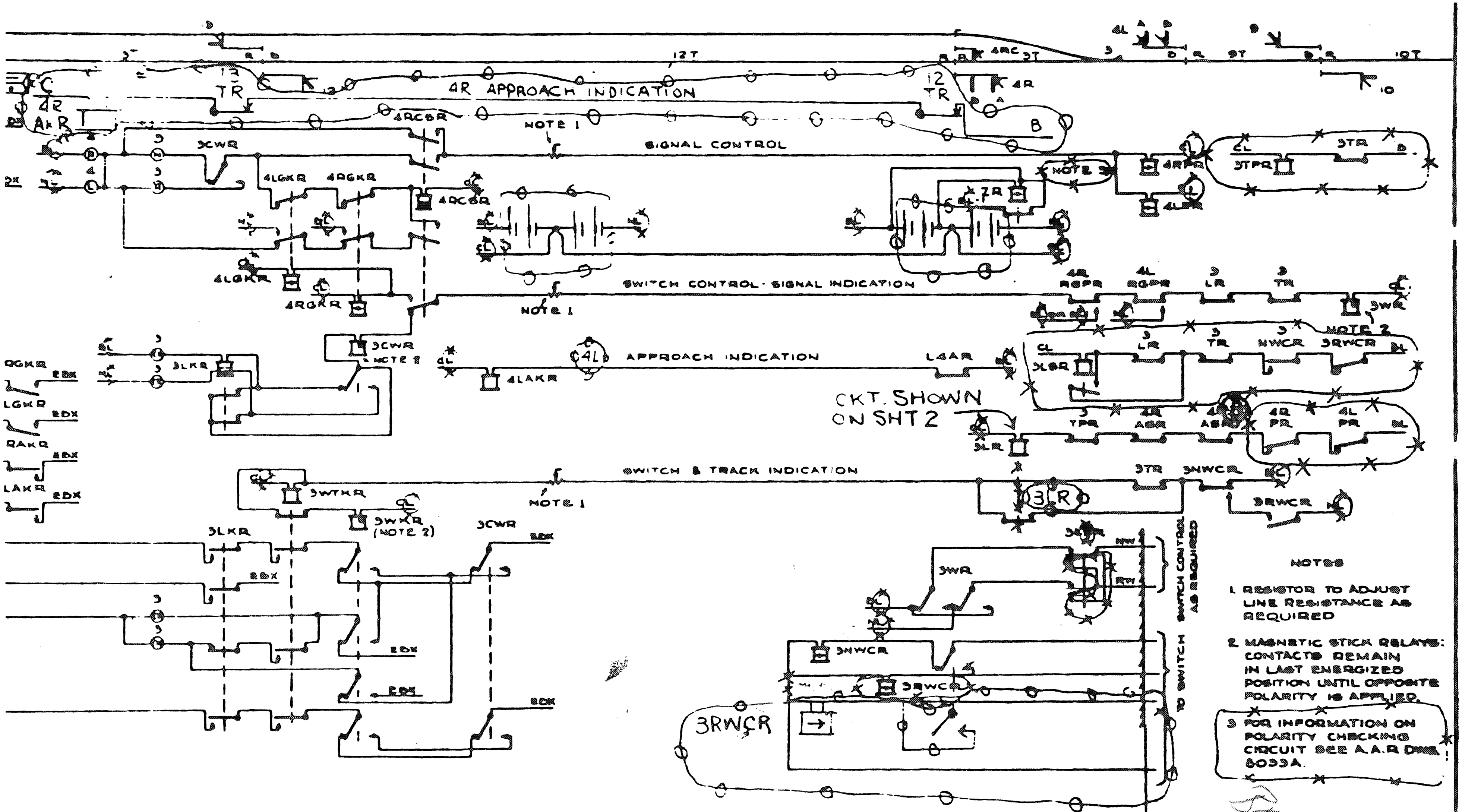
VOID

AAR
SIG. SEC.
8030A

SEPT 1950

SHEET 2 OF 2 SHEETS

4/16/84



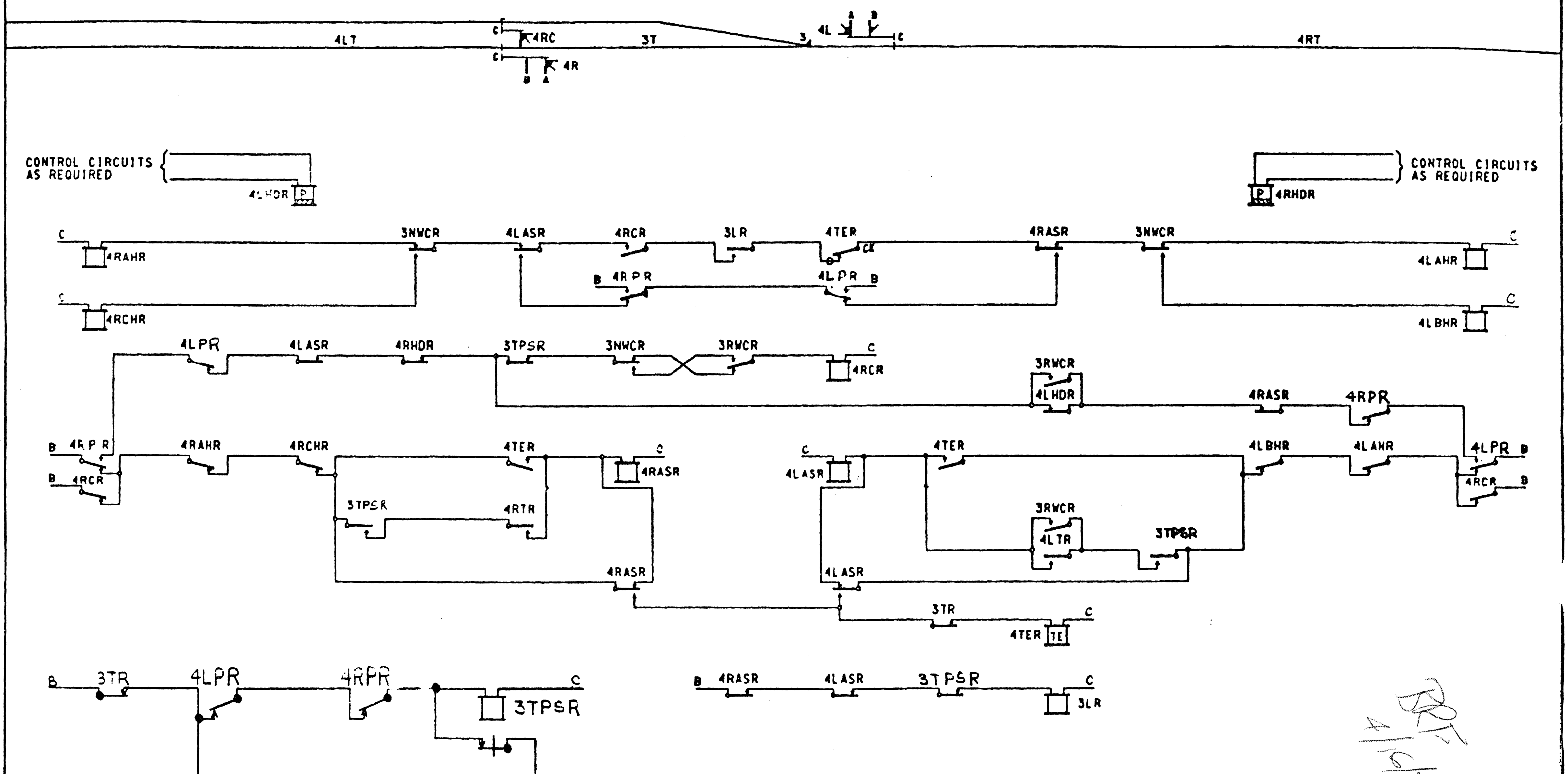
NOTES

1. RESISTOR TO ADJUST LINE RESISTANCE AS REQUIRED
2. MAGNETIC STICK RELAYS: CONTACTS REMAIN IN LAST ENERGIZED POSITION UNTIL OPPOSITE POLARITY IS APPLIED.
3. FOR INFORMATION ON POLARITY CHECKING CIRCUIT SEE A.A.R DWG. 8033A.

TYPICAL REMOTE CONTROL SWITCH AND SIGNAL CIRCUITS
DIRECT WIRE CONTROL
SCHEME 2

AAR SIG. SEC. 803?A

APR. 1983 | SEPT 1930



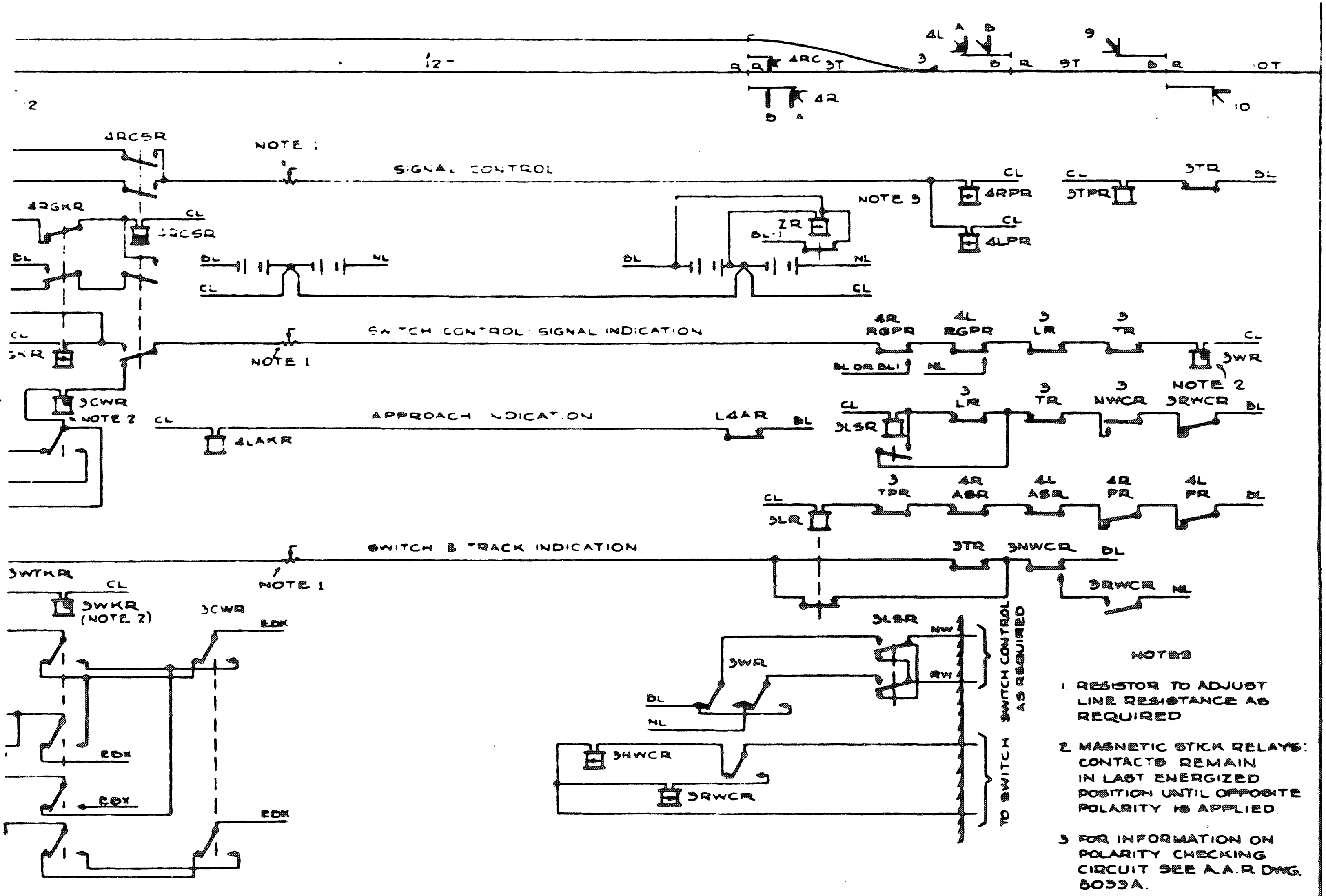
SCHEME Nº 2

TYPICAL CIRCUITS REMOTE CONTROL SWITCH AND SIGNALS DIRECT WIRE

BRT 4/16/84

APRIL 1983

AAR SIGNAL 8031



NOTES

1. RESISTOR TO ADJUST LINE RESISTANCE AS REQUIRED
2. MAGNETIC STICK RELAYS: CONTACTS REMAIN IN LAST ENERGIZED POSITION UNTIL OPPOSITE POLARITY IS APPLIED.
3. FOR INFORMATION ON POLARITY CHECKING CIRCUIT SEE A.A.R. DWG. 8033A.

TYPICAL REMOTE CONTROL SWITCH AND SIGNAL CIRCUITS
DIRECT WIRE CONTROL
SCHEME 2

VOID

BRF 4/16/84

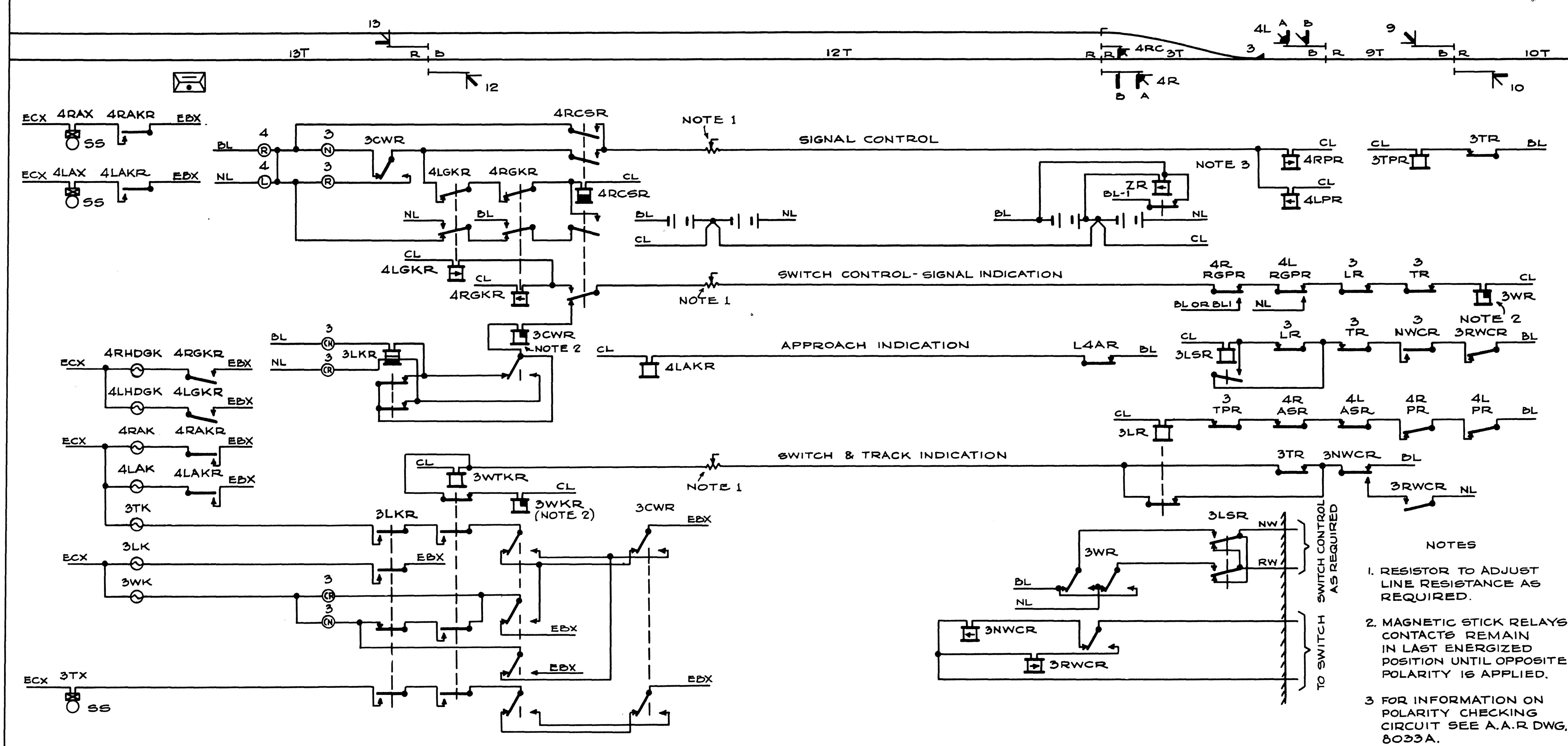
AAR SIG.SEC. 8031A

SEPT 1930

SHEET 1 OF 2 SHEETS

ADDENDUM TO A.A.R.SIG.SEC. 8030A and 8031A

SEE ADDENDUM SHEETS FACING A.A.R.SIG.SEC. 8030A



NOTES

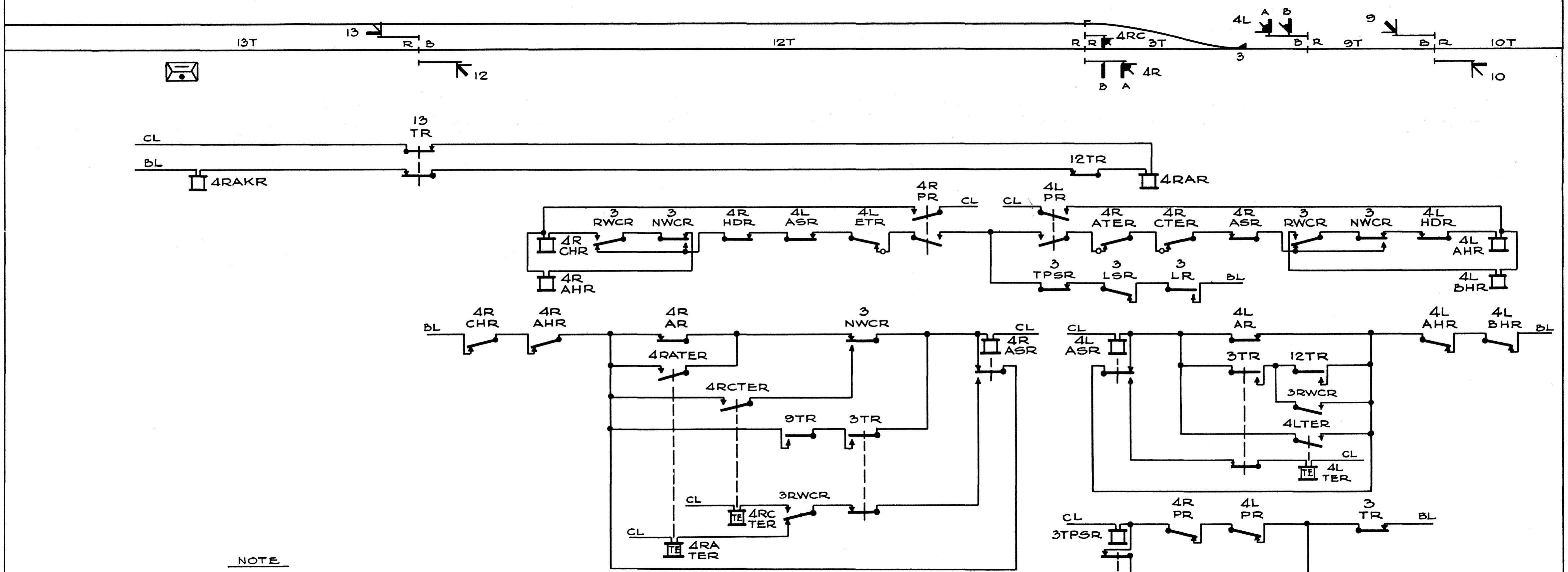
1. RESISTOR TO ADJUST LINE RESISTANCE AS REQUIRED.
2. MAGNETIC STICK RELAYS: CONTACTS REMAIN IN LAST ENERGIZED POSITION UNTIL OPPOSITE POLARITY IS APPLIED.
3. FOR INFORMATION ON POLARITY CHECKING CIRCUIT SEE A.A.R DWG. 8033A.

TYPICAL REMOTE CONTROL SWITCH AND SIGNAL CIRCUITS
DIRECT WIRE CONTROL

~~SCHEME 2~~

SEPT. 1950	AAR SIG.SEC. 8031 A

SHEET 1 OF 2 SHEETS



NOTE

CIRCUITS FOR 4 LAR, 4LHDR, 4RHDR AND SIGNAL LIGHTING SHOWN ON SHEET 2, OF A.A.R. SIG. SEC. DWG. 8030A.

TYPICAL REMOTE CONTROL SWITCH AND SIGNAL CIRCUITS
DIRECT WIRE CONTROL

~~SCHEME 2~~

Four Wires

SEPT. 1950

AAR
SIG. SEC.
8031A

ADDENDUM TO A.A.R. SIG.SEC. 8032A

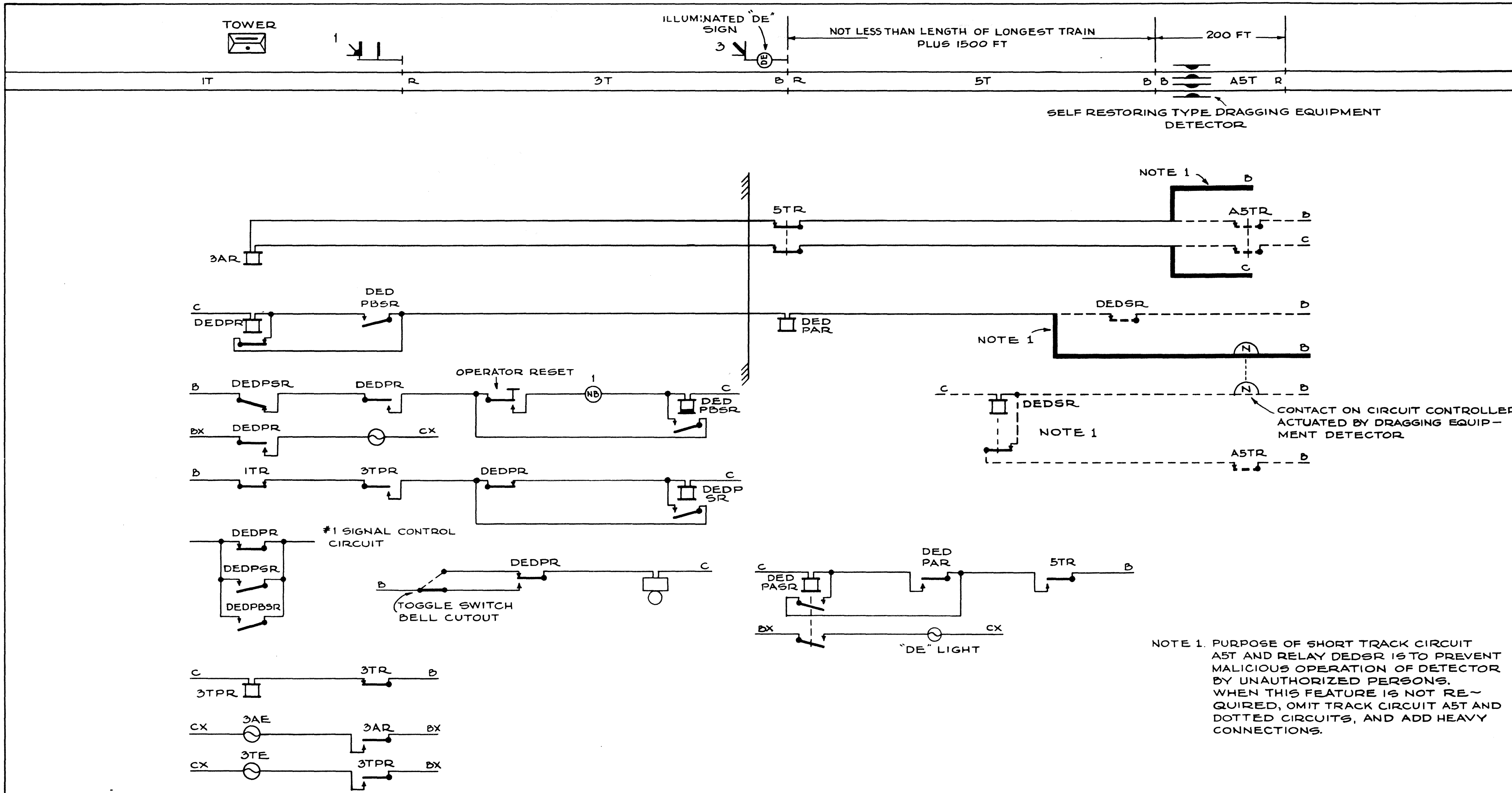
TYPICAL CIRCUITS FOR SELF-RESTORING TYPE DRAGGING EQUIPMENT DETECTOR WITH ILLUMINATED SIGN ON APPROACH SIGNAL.

The circuits shown on this plan provide for the use of a self-restoring type dragging equipment detector, to be located as indicated on the plan, and assuming that proper braking distance is provided between signals 1 and 3.

When the detector is actuated, an illuminated "DE" sign, located on mast of signal 3, is lighted and a light and annunciator bell is actuated at the interlocking tower. Home signal 1 will automatically display stop indication and signal 3 approach indication. Leverman must restore signal lever 1 to normal, after which he may push "Operator Reset" button if it is proper for train to proceed and then reverse signal lever 1 in the usual manner.

Relay DEDPSR is provided so that if dragging equipment detector is actuated by second train, signal 1 will remain clear for first train.

Toggle switch is provided to cut out annunciator bell after dragging equipment is actuated. After the system is restored, toggle switch must be placed in normal position to cut out bell.



NOTE 1. PURPOSE OF SHORT TRACK CIRCUIT A5T AND RELAY DEDSR IS TO PREVENT MALICIOUS OPERATION OF DETECTOR BY UNAUTHORIZED PERSONS. WHEN THIS FEATURE IS NOT REQUIRED, OMIT TRACK CIRCUIT A5T AND DOTTED CIRCUITS, AND ADD HEAVY CONNECTIONS.

TYPICAL CIRCUITS FOR SELF RESTORING TYPE DRAGGING EQUIPMENT DETECTOR WITH ILLUMINATED SIGN ON APPROACH SIGNAL

SEPT. 1948

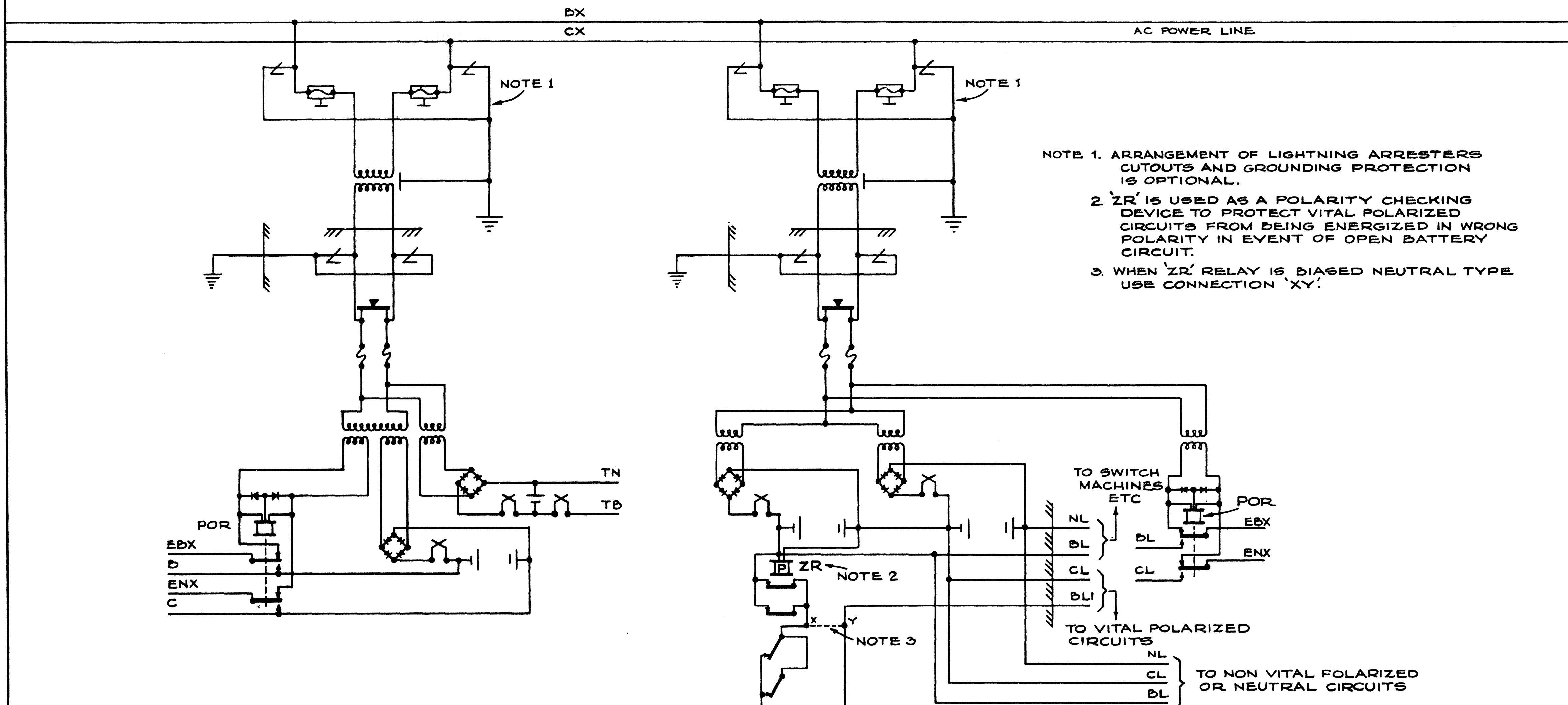
AAR SIG. SEC. 8032A

ADDENDUM TO A.A.R. SIG.SEC. 8033A

TYPICAL CIRCUITS FOR POWER DISTRIBUTION.

Two power distribution circuits are shown, one for a signal location and the other where in addition low-voltage switch machines are to be operated. When the entire battery is used for switch machine power, the split portions may be used for operation of polar or neutral circuits.

Vital polar circuits should be controlled through contacts of a polarity checking relay. This is required to prevent a wrong polarity from being applied to the polar circuits should its section of battery become opened. The wrong polarity would be supplied from the unopened section of battery in series with the load across the entire battery.



NOTE 1. ARRANGEMENT OF LIGHTNING ARRESTERS CUTOUTS AND GROUNDING PROTECTION IS OPTIONAL.

2. 'ZR' IS USED AS A POLARITY CHECKING DEVICE TO PROTECT VITAL POLARIZED CIRCUITS FROM BEING ENERGIZED IN WRONG POLARITY IN EVENT OF OPEN BATTERY CIRCUIT.

3. WHEN 'ZR' RELAY IS BIASED NEUTRAL TYPE USE CONNECTION 'XY'.

TYPICAL CIRCUITS FOR POWER DISTRIBUTION

SEPT. 1949

AAR
SIG. SEC.
8033A

ADDENDUM TO A.A.R. SIG.SEC. 8034A

TYPICAL RELAY TYPE INTERLOCKING CIRCUITS FOR MOVABLE BRIDGE.

These circuits provide for control of signals which are interconnected with bridge devices by levers that are not mechanically interlocked nor provided with electric locks or other means to restrict their movements.

Signals are so interlocked with bridge devices that bridge device cannot be operated unless all signal devices have properly functioned to release the bridge.

Circuits are shown with rails normally locked for rail traffic. The signal control network shown on Sheet 1 checks that the rails are locked for rail traffic, that bridge lever is normal and bridge lock relay is de-energized; also, that the opposing approach locking relay is energized.

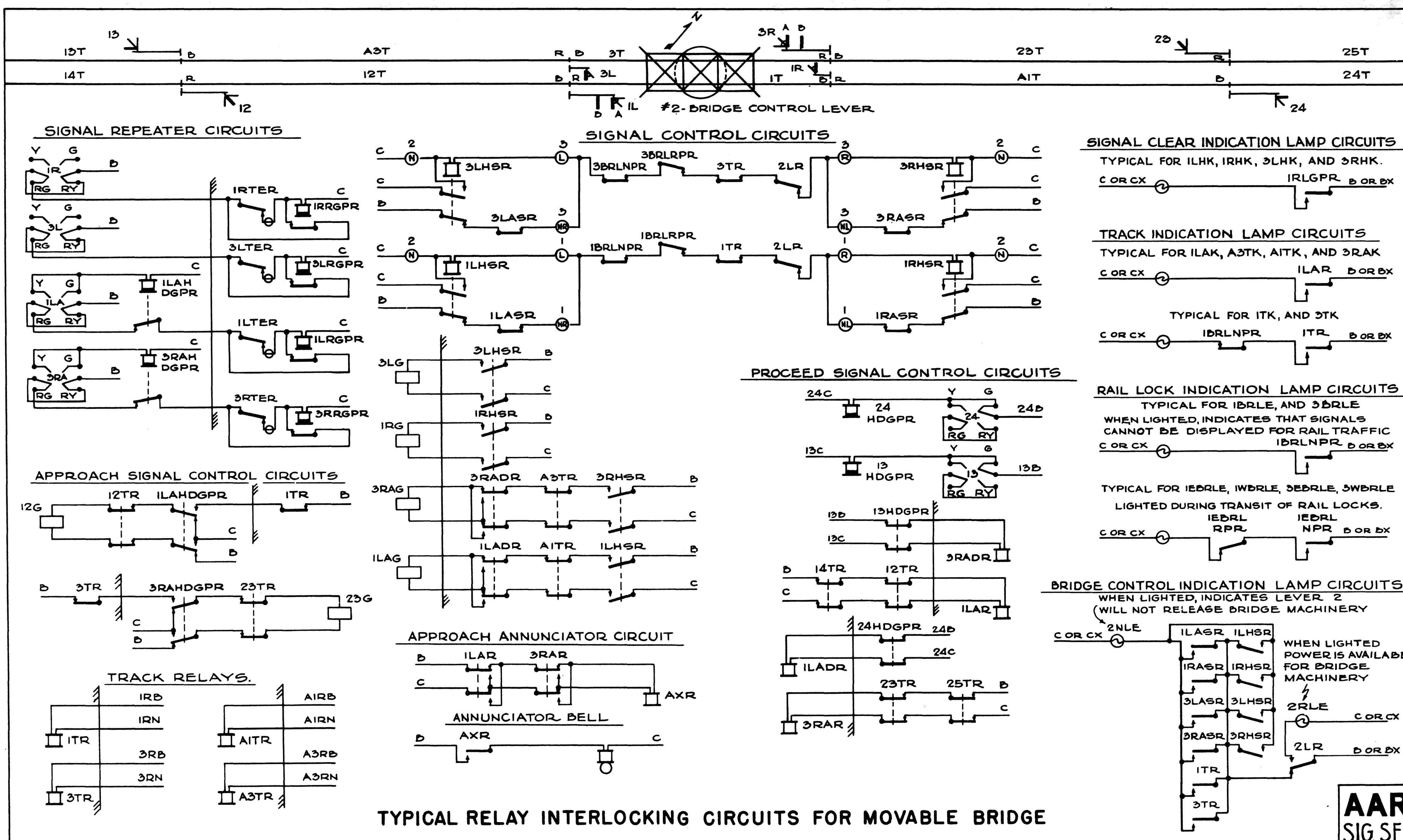
Approach locking relays, bridge lock relay and relays which check the position of the bridge are shown on Sheet 2.

Circuit controllers 1ENBRLCC, etc., are not mechanically connected to rail locks, but are actuated by rail locking devices to close normal contacts providing a check, in signal circuits, that rails are locked for rail traffic. When rail locks are withdrawn normal contacts in WNBRLCC, etc., are opened and reverse contacts are closed by a spring device which forms a part of the circuit controllers.

Circuit controllers EBCC and WBCC are connected mechanically to bridge rail locking machinery with contact closed when this machinery is in the rail locking position.

Circuits as shown pre-suppose that the several intermediate operations of the bridge machinery itself are interlocked with each other, either mechanically or electrically, to insure proper sequence, and that it is sufficient to check the final operation of bridge machinery that rails are locked, at which time power may be cut off from the bridge machinery and the signal devices made free to establish rail traffic.

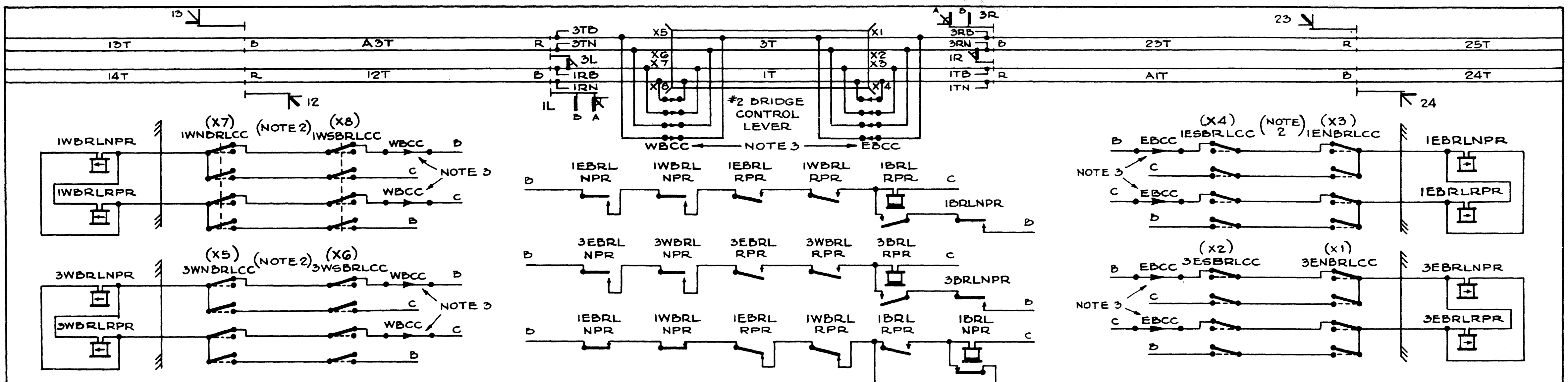
Where a movable bridge is to be signaled and the intermediate functions of bridge operating devices are not designed to operate in proper sequence, additional apparatus will be necessary to accomplish such sequence.

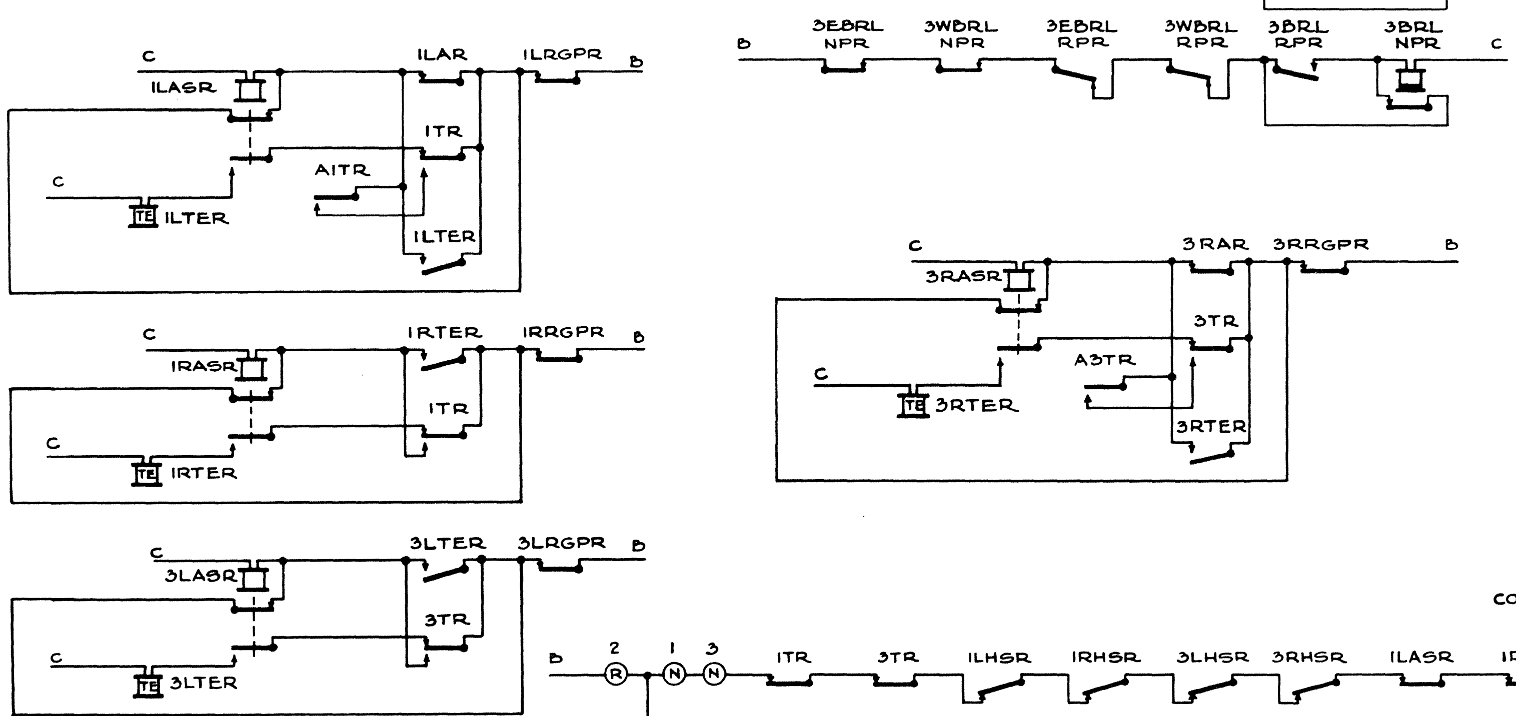


TYPICAL RELAY INTERLOCKING CIRCUITS FOR MOVABLE BRIDGE

AAR SIG. SEC. 8034A

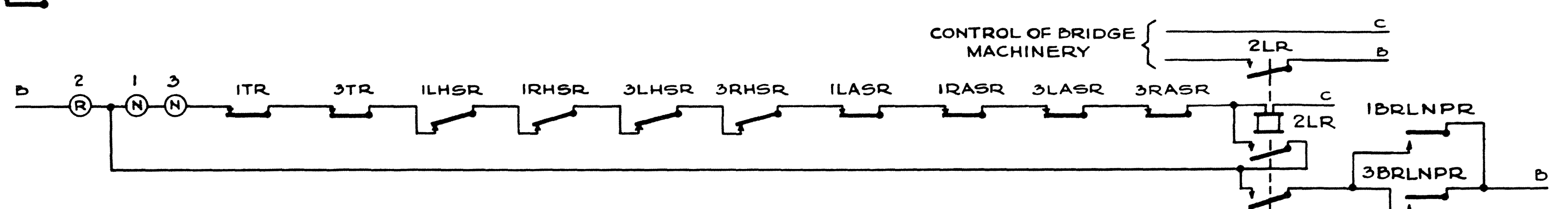
SEPT. 1949





NOTES

1. CIRCUITS AS SHOWN, NORMAL FOR RAIL TRAFFIC.
2. CIRCUIT CONTROLLERS IENBRLCC ETC. ARE NOT MECHANICALLY CONNECTED TO RAIL LOCKS BUT ARE ACTUATED BY RAIL LOCKING DEVICES TO CLOSE NORMAL CONTACTS SHOWN AS A CHECK, IN SIGNAL CIRCUITS, THAT RAILS ARE LOCKED FOR RAIL TRAFFIC. WHEN RAIL LOCKS ARE WITHDRAWN NORMAL CONTACTS IN WNBRLCC ETC. ARE OPENED AND REVERSE CONTACTS CLOSED BY SPRING DEVICE WHICH FORMS A PART OF THE CIRCUIT CONTROLLERS.
3. CIRCUIT CONTROLLERS EBCC & WBCC ARE MECHANICALLY CONNECTED TO BRIDGE RAIL LOCKING MACHINERY WITH CONTACT CLOSED WHEN THIS MACHINERY IS IN THE RAIL LOCKING POSITION.
4. CIRCUITS AS SHOWN PRE-SUPPOSE THAT THE SEVERAL INTERMEDIATE OPERATIONS OF THE BRIDGE MACHINERY ITSELF ARE INTERLOCKED WITH EACH OTHER EITHER MECHANICALLY OR ELECTRICALLY TO INSURE PROPER SEQUENCE, AND THAT IT IS SUFFICIENT TO CHECK THE FINAL OPERATION OF BRIDGE MACHINERY THAT RAILS ARE LOCKED AT WHICH TIME POWER MAY BE CUT OFF FROM BRIDGE MACHINERY AND THE SIGNAL DEVICES MADE FREE TO ESTABLISH RAIL TRAFFIC.
WHERE A MOVEABLE BRIDGE IS TO BE SIGNALED AND THE INTERMEDIATE FUNCTIONS OF BRIDGE OPERATING DEVICES ARE NOT DESIGNED TO OPERATE IN PROPER SEQUENCE, ADDITIONAL APPARATUS WILL BE NECESSARY TO ACCOMPLISH SUCH SEQUENCE.



TYPICAL RELAY INTERLOCKING CIRCUITS FOR MOVABLE BRIDGE

SEPT. 1949

AAR SIG.SEC. 8034A

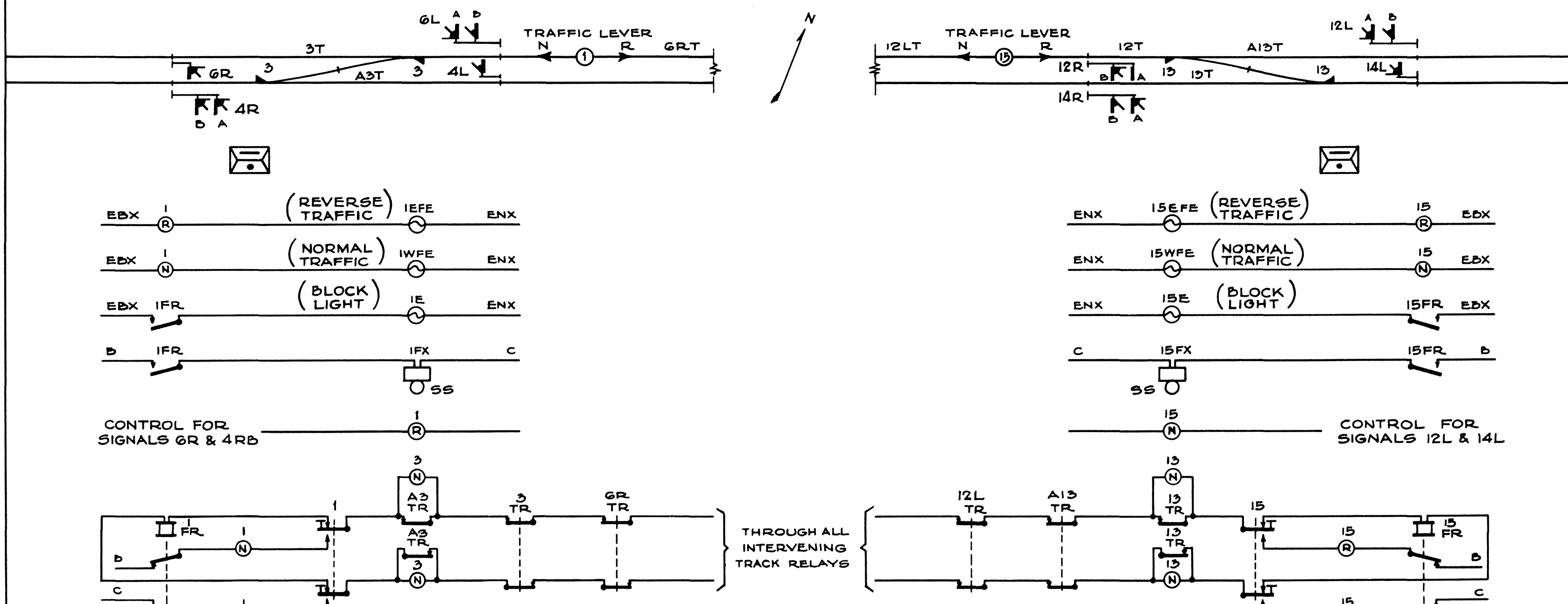
SHEET 2 OF 2 SHEETS

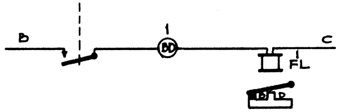
ADDENDUM TO A.A.R. SIG.SEC. 8035A

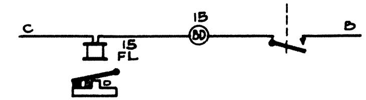
TYPICAL TRAFFIC LOCKING CIRCUITS BETWEEN ATTENDED OFFICES USING ELECTRIC LEVER LOCKING.

This circuit provides a two-wire traffic control arrangement using electric lever locks on the traffic lever at each attended office. Traffic levers at both offices are indicated in their normal position for westward movements. When traffic is established eastward, both traffic levers are in the reverse position. Lights are provided to indicate block occupancy, direction of established traffic and an audible indication when the adjacent office desires to establish a change in the direction of traffic. Arrangement permits following movements into occupied block between attended offices.

The sequence of operation is described on the circuit plan.







SEQUENCE OF OPERATION

THE NORMAL DIRECTION OF TRAFFIC IS WESTWARD.
TO REVERSE TRAFFIC:

1. OPERATOR AT WEST END PUSHES BUTTON NO. 1 WHICH ENERGIZES 15FR, FLASHING BLOCK LIGHT 15E AND RINGING BELL 15FX. Nº 1 BUTTON MUST BE HELD DOWN TO ALLOW REVERSAL OF LEVER 15.
2. EAST END REVERSES LEVER 15 AND PUSHES BUTTON Nº 15 WHICH ENERGIZES 1FR, FLASHING BLOCK LIGHT 1E AND RINGING BELL 1FX. Nº 15 BUTTON MUST BE HELD DOWN TO ALLOW REVERSAL OF LEVER 1.
3. LEVER 1 CAN NOW BE REVERSED, ESTABLISHING EASTWARD TRAFFIC.

LEVER	WHEN	LOCKS
GR		1
4R	3	1

LEVER	WHEN	LOCKS
12L		15
14L	13	15

TYPICAL TRAFFIC LOCKING CIRCUITS BETWEEN ATTENDED OFFICES

USING ELECTRIC LEVER LOCKING

SEPT. 1949

AAR SIG. SEC. 8035A

ADDENDUM TO A.A.R. SIG.SEC. 8036A

TYPICAL REMOTE CONTROL RELAY TYPE INTERLOCKING CIRCUITS, DIRECT WIRE CONTROL.

These circuits have been designed to control switches and signals by unit type levers that are not mechanically interlocked. Relays are used to provide the equivalent protection usually provided by mechanical and electric locking of levers.

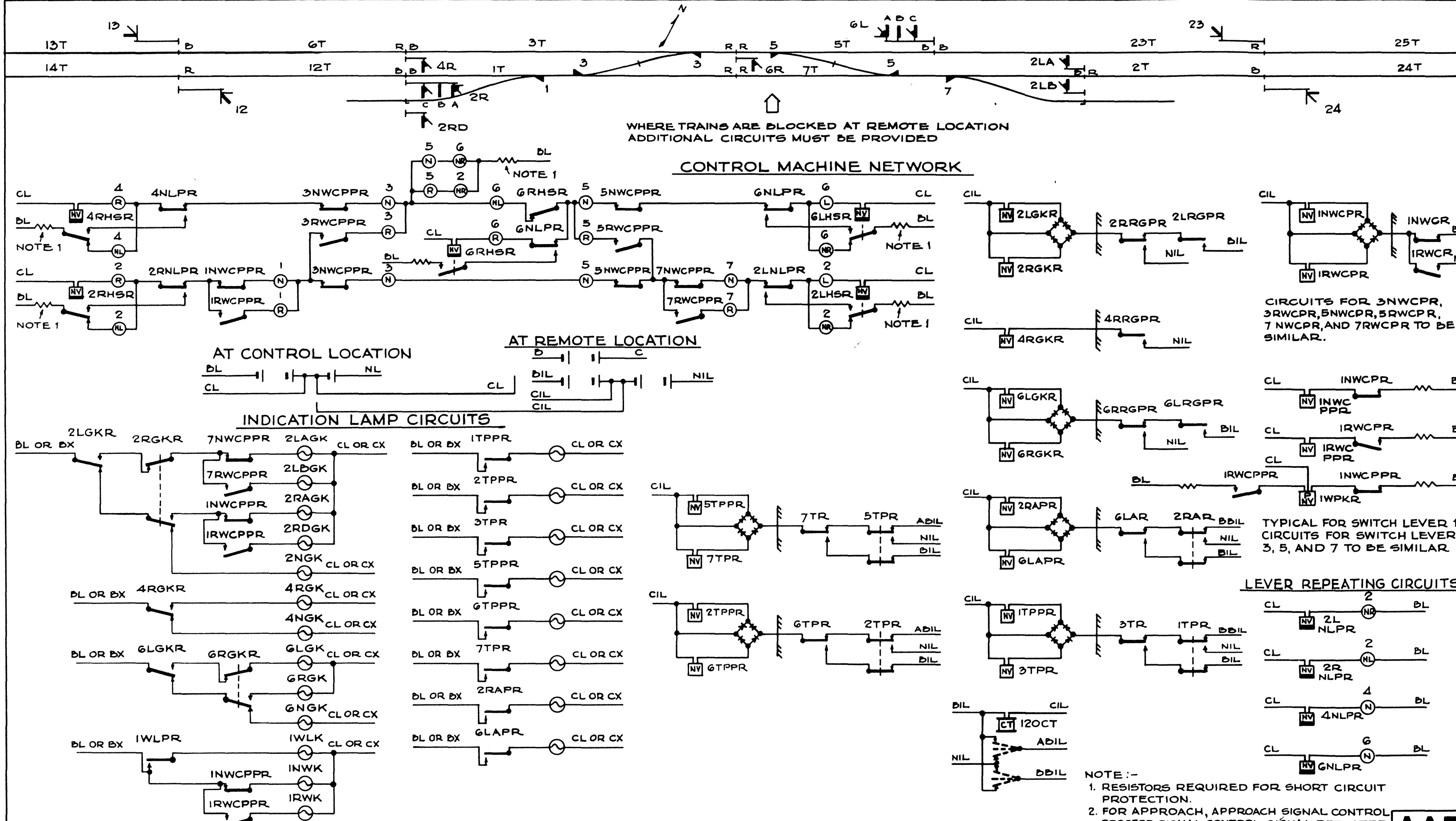
The route check network in the machine, shown on Sheet 1, provides a check that the route is lined in the field and indicated into the office before the signal control relay is allowed to pick up in the field. A relay is provided for each signal lever and designated HSR, which is energized when signal lever is turned, providing the route is lined. Each HSR relay is provided with a holding circuit that may only be released by restoring the signal lever affected to the normal position. A slow release relay, designated NLPR, which repeats the normal position of the signal lever, is provided to prevent storage of the signal control until a route is established; also, to prevent the storage for the control of a signal if the signal lever controlling an opposing signal has been operated.

The signal control network shown on Sheet 2 consists of circuits for direct control of searchlight signals. This network checks the switch correspondence relays energized, switch locking relays de-energized, and the opposing approach locking relays energized. Restricting signals are controlled through the first track section only. When a call-on aspect is desired on signal 2R or 6L for a following move into an occupied block, a call-on button is pushed, which energizes relay CO, which in turn energizes the relay COS. The call-on push button, being of the spring return type, a stick circuit is provided for relay COS.

The switch control relays designated WR are controlled by switch lever in series with switch agreement relay WLPR. With this arrangement, if the switch lever is moved when its locking relay is de-energized, relay WR and switch agreement relay WLPR will not pick up until the switch lever has been restored to its initial position to agree with the position of the switch. This prevents storage of switch control.

Circuits are arranged to provide two separate indications on a single wire by the use of a full-wave rectifier in the office and a split battery in the field to pole change the control. With this circuit arrangement, both indications can also be brought in simultaneously by alternately coding the polarity of the control circuit through contacts of a 120 code transmitter.

Route locking stick relays provide switch locking as a signal is being cleared over a route. This provides sectional release locking of switches as train proceeds through the interlocking.



NOTE :-
1. RESISTORS REQUIRED FOR SHORT CIRCUIT PROTECTION.
2. FOR APPROACH, APPROACH SIGNAL CONTROL, PROCEED SIGNAL CONTROL, SIGNAL REPEATER, TRACK REPEATING, AND SWITCH INDICATION CIRCUITS, SEE A.A.R. SIG. SEC. DRAWING 8010A.

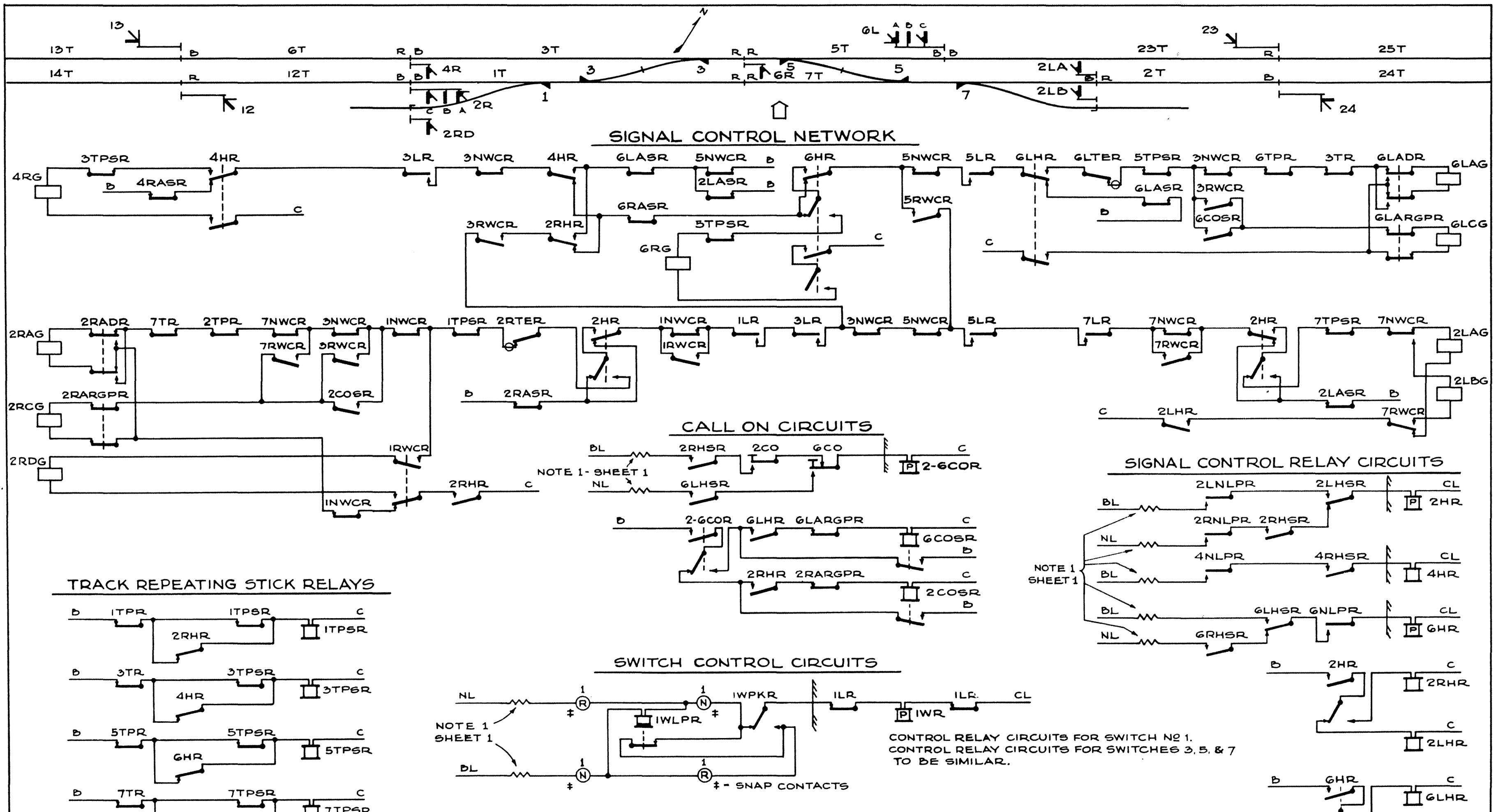
TYPICAL REMOTE CONTROL RELAY TYPE INTERLOCKING CIRCUITS

DIRECT WIRE CONTROL

AAR SIG. SEC. 8036A

SEPT. 1949

SHEET 1 OF 3 SHEETS



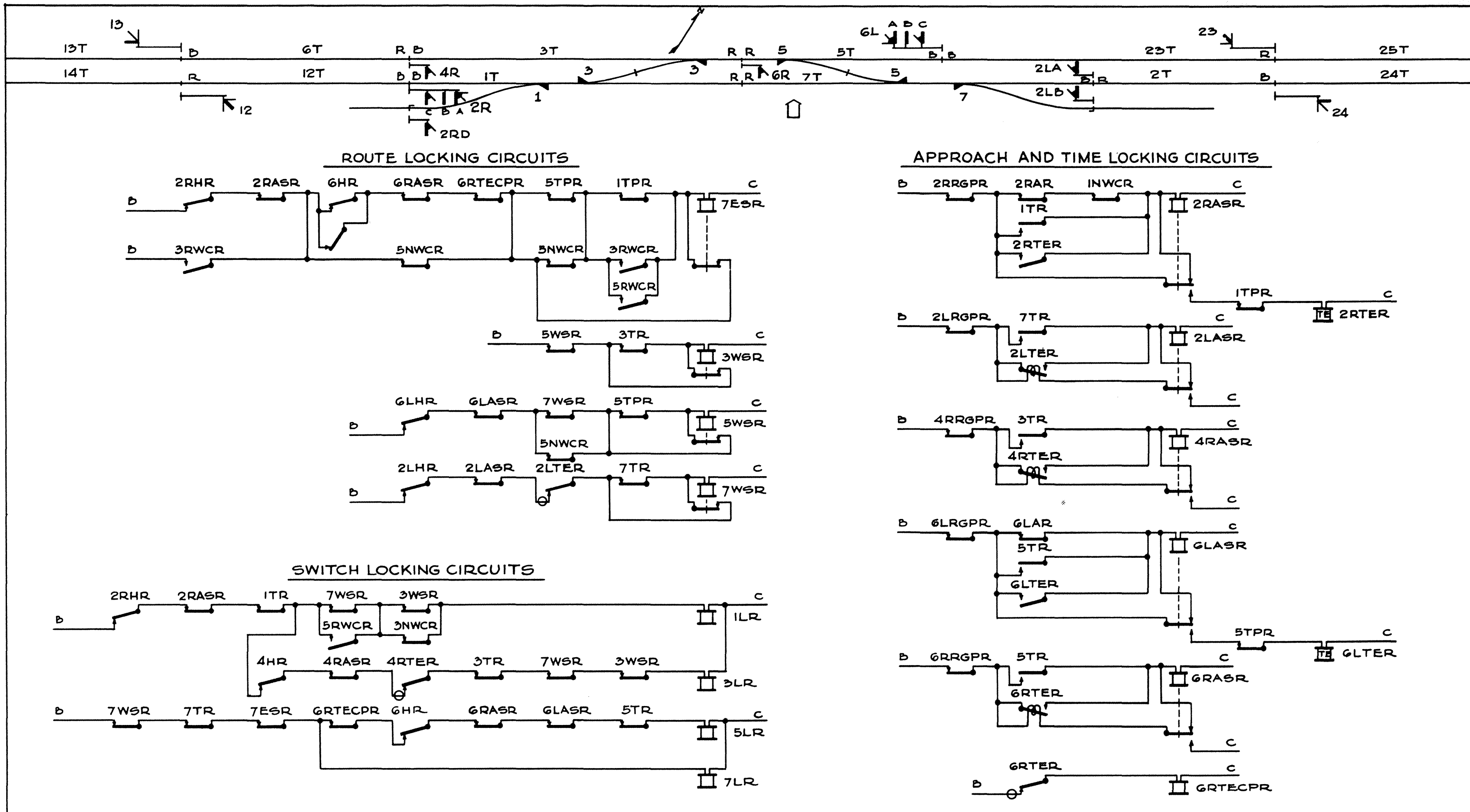
TYPICAL REMOTE CONTROL RELAY TYPE INTERLOCKING CIRCUITS

DIRECT WIRE CONTROL

AAR SIG.SEC 8036A

SEPT. 1949

SHEET 2 OF 3 SHEETS



TYPICAL REMOTE CONTROL RELAY TYPE INTERLOCKING CIRCUITS

DIRECT WIRE CONTROL

SEPT. 1949

AAR SIG. SEC 8036A

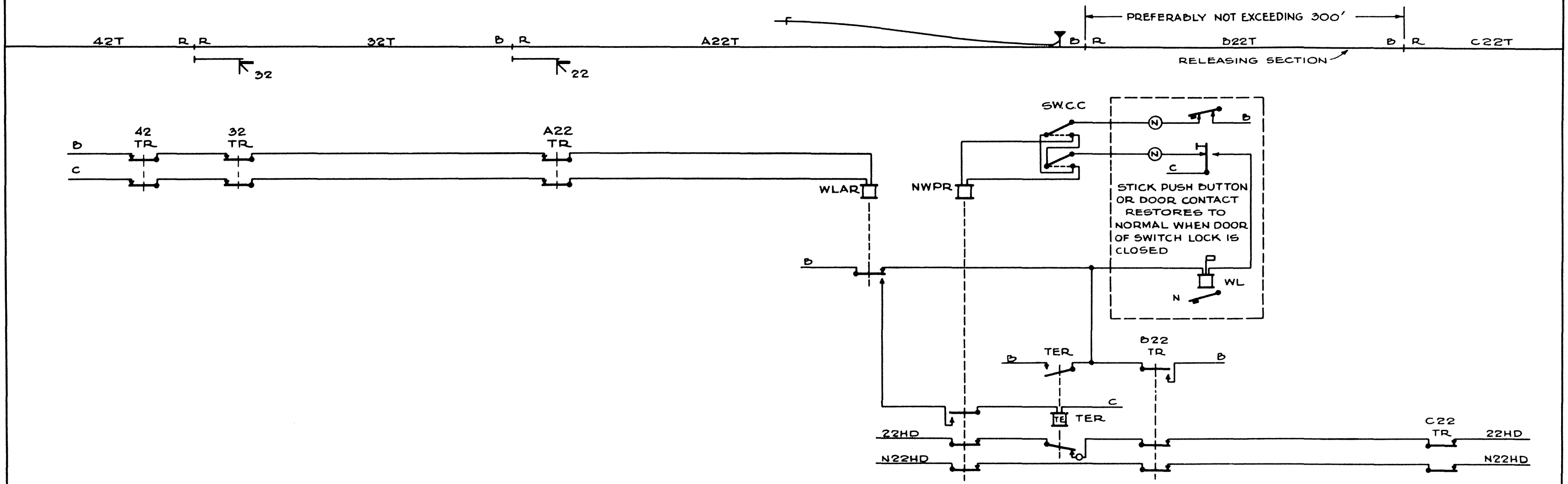
ADDENDUM TO A.A.R. SIG.SEC. 8037A

TYPICAL ELECTRIC SWITCH LOCK CIRCUIT, AUTOMATICALLY RELEASED, TIME AND APPROACH LOCKING, TRACK SIGNALED IN ONE DIRECTION.

This circuit provides for control of an electric lock on a hand-operated switch with track signaled in one direction. A short release track circuit is provided on main track which, when occupied by a train, allows the electric lock to become energized, permitting the train movement from main track to siding without delay.

Energizing of lock coil is at all times dependent upon either the closing of a door-operated contact, or actuating a stick push button.

If movement is desired to be made from siding to main track and approach circuit is occupied, opening of door or actuating stick push button will initiate time. After a predetermined time has elapsed, lock will be released.



TYPICAL ELECTRIC SWITCH LOCK CIRCUITS

AUTOMATICALLY RELEASED, TIME AND APPROACH LOCKING

TRACK SIGNALED IN ONE DIRECTION

SEPT. 1949

AAR
SIG. SEC
8037A

ADDENDUM TO A.A.R. SIG.SEC. 8038A

TYPICAL CIRCUITS TO SUPERIMPOSE CODED CAB SIGNAL CONTROLS ON D.C. TRACK CIRCUITS. TRACK SIGNALED IN ONE DIRECTION.

The upper portion of this plan shows the use of 75 and 180 code transmitters which codes the a.c. energy to track transformer to provide two-block three-aspect cab signal control. 75 coded a.c. energy applied to the leaving end of block provides the approach indication, while 180 coded a.c. energy provides the clear indication.

The lower portion of this plan shows an additional 120 code transmitter which is used to provide the approach medium indication. This arrangement provides three-block, four-aspect cab signal control in the same manner as mentioned above.

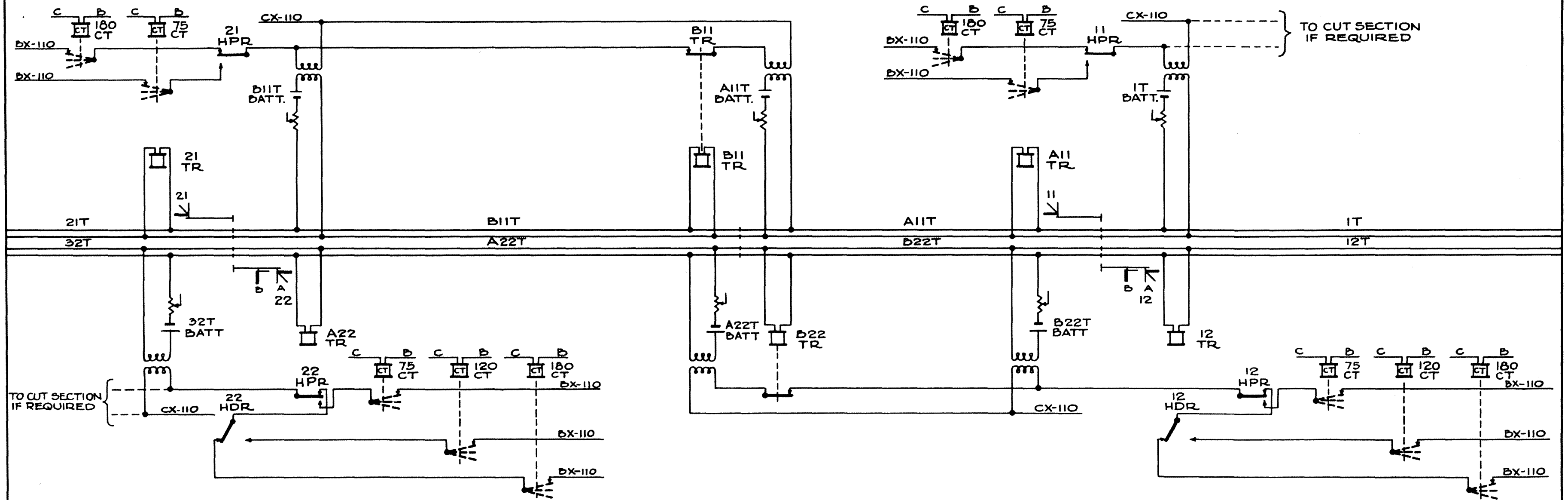
Circuits are arranged to remove coded cab signal energy from the first track circuit in the block as a train proceeds through the block and enters the second track circuit. This provides that when a second train enters the occupied block, it will receive the restrictive speed indication.

If it is desired, the neutral contact of relay HDR may be used in place of relay HPR in the cab signal control. This will avoid interrupting a.c. energy on the polar contact.

TYPICAL CIRCUITS TO SUPERIMPOSE CODED CAB SIGNAL CONTROLS ON D.C. TRACK CIRCUITS

TRACK SIGNALED IN ONE DIRECTION

(CODE RULES 281-285-291)



NOTE 1. CIRCUITS SHOWN ARE IN ADDITION TO THOSE REQUIRED FOR WAYSIDE SIGNALING SIMILAR TO PLAN Nº 8002A.

2. RADIO INTERFERENCE AND ARC SUPPRESSION DETAILS NOT SHOWN.

TYPICAL CIRCUITS TO SUPERIMPOSE CODED CAB SIGNAL CONTROLS ON D.C. TRACK CIRCUITS

TRACK SIGNALED IN ONE DIRECTION

(CODE RULES 281-282-285-291)

SEPT. 1949

AAR SIG. SEC. 8038A

ADDENDUM TO A.A.R. SIG.SEC. 8039A

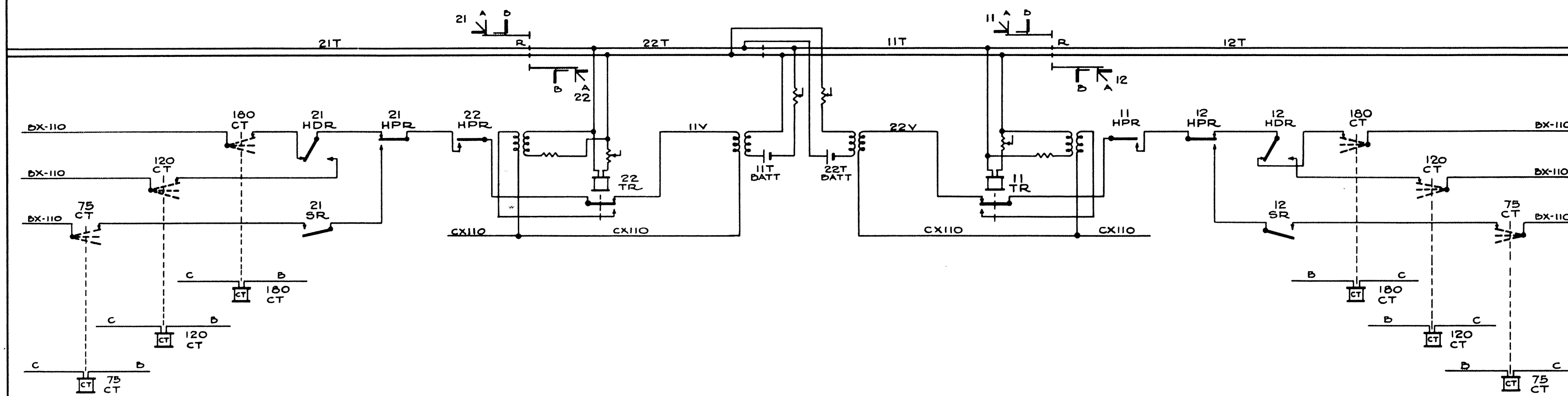
TYPICAL CIRCUITS TO SUPERIMPOSE CODED CAB SIGNAL CONTROLS ON D.C. TRACK CIRCUITS. TRACK SIGNALED IN BOTH DIRECTIONS.

This plan shows the use of 75, 120 and 180 code transmitters which codes the a.c. energy to track transformers to provide three-block, four-aspect cab signal control.

Circuits provide for approach energization of cab signal energy. When a train enters the block de-energizing opposing relays HPR, coded energy is applied for the direction of traffic.

Circuits are arranged to remove coded cab signal energy from the first track circuit in the block as a train proceeds through the block and enters the second track circuit. This provides that when a second train enters the occupied block, it will receive the restricted speed indication.

If it is desired, the neutral contact of relay HDR may be used in place of relay HPR in the cab signal control. This will avoid interrupting a.c. energy on the polar contact.



NOTE 1. CIRCUITS SHOWN ARE IN ADDITION TO THOSE REQUIRED FOR WAYSIDE SIGNALING SIMILAR TO PLAN NO. 8029A.

2. RADIO INTERFERENCE AND ARC SUPPRESSION DETAILS NOT SHOWN.

TYPICAL CIRCUITS TO SUPERIMPOSE CODED CAB SIGNAL CONTROLS ON D.C. TRACK CIRCUITS

TRACK SIGNALED IN BOTH DIRECTIONS

(CODE RULES 281-282-285-291)

SEPT. 1949

AAR SIG.SEC. 8039A

ADDENDUM TO A.A.R. SIG.SEC. 8040A

TYPICAL CIRCUIT FOR BRIDGE ALIGNMENT DETECTOR.

A circuit controller connected to the bridge girder is used to check the bridge alignment. Relay BDR control is a double break circuit through contacts on the bridge circuit controller. A contact of relay BDR relay is inserted in the signal control circuits to provide the check that bridge is in alignment.

TYPICAL CIRCUIT FOR HIGH WATER DETECTOR.

This circuit uses a circuit controller actuated by a water level indicator to control stick relay DSR, contacts of which are inserted in the signal control circuits.

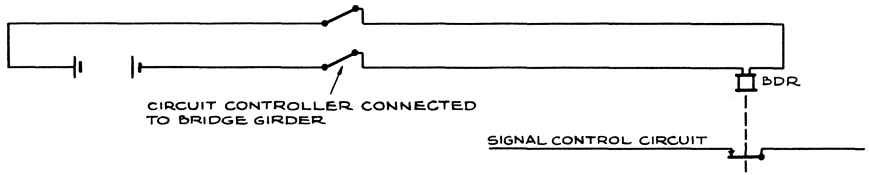
A manual reset push button is used to energize relay DSR and restore signal control circuits to normal, after high water has receded.

TYPICAL CIRCUIT FOR FIRE DETECTOR.

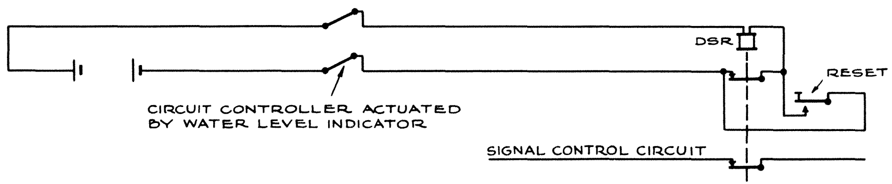
This circuit uses a twisted pair of wires which short circuit at predetermined temperatures to shunt relay DSR and interrupt the signal control circuits. An alternate scheme shows the use of fuse links which open at predetermined temperatures to de-energize relay DSR.

A manual reset push button is used to energize relay DSR and restore signal control circuits to normal after circuit is repaired.

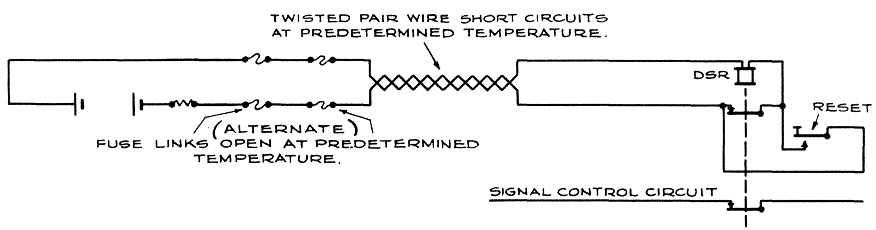
The resistor shown in the battery feed limits the current flow in the circuit when using the twisted pair to detect a fire.



TYPICAL CIRCUITS FOR BRIDGE ALIGNMENT DETECTOR



TYPICAL CIRCUITS FOR HIGH WATER DETECTOR



TYPICAL CIRCUITS FIRE DETECTOR

ADDENDUM TO A.A.R. SIG.SEC. 8041A

TYPICAL CIRCUITS FOR OSING DEVICE.

The upper portion of this plan illustrates a typical circuit for non-directional OSing device with time cut-out.

This circuit transmits an intermittent telephone signal over a pair of telephone wires to annunciate the occupancy at OSing point. The buzzer provides an audio frequency signal; the flasher relay provides the interruptions, and the induction coil applies the audible tone to the telephone line.

The timer relay TER and timer stick relay TESR cut out the OSing device after the track is occupied for a predetermined time interval.

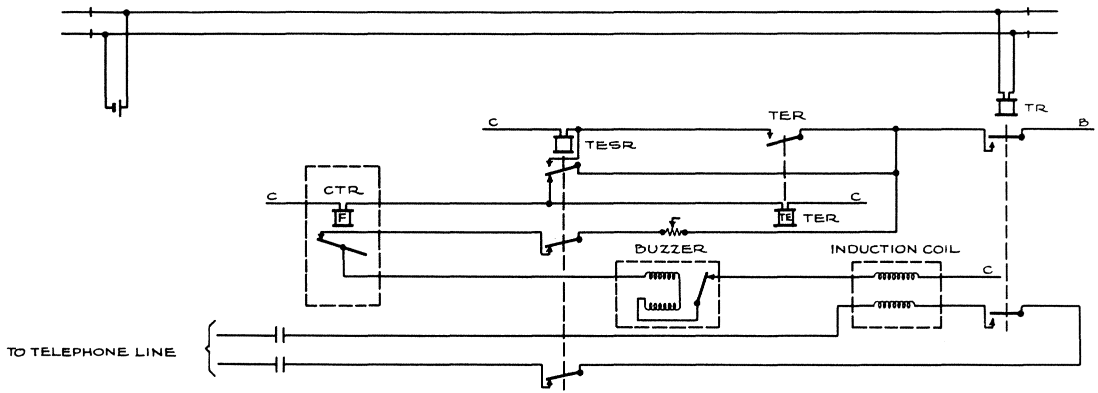
The condensers are used to avoid shunting the telephone line.

The lower portion of this plan illustrates a typical circuit for directional OSing device for use in non-signaled territory.

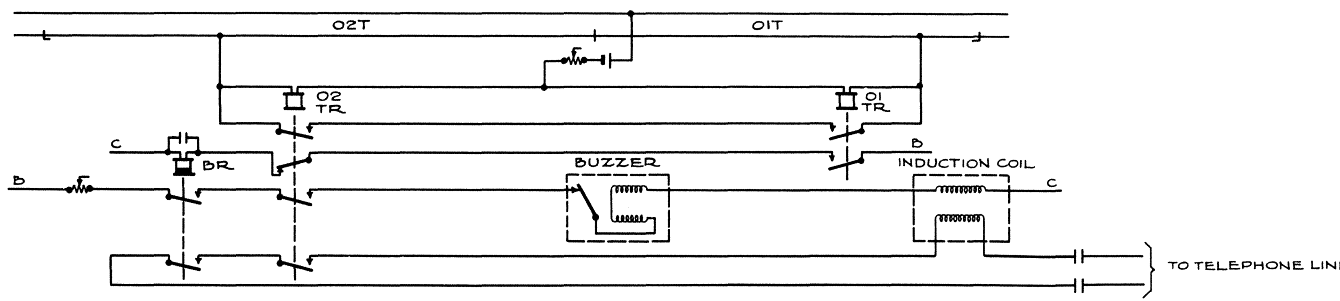
Train entering track circuit 01 first energizes relay BR. Then as train enters track circuit 02, track relay 02 becomes energized causing the audio frequency signal to be transmitted over the telephone wires until relay BR drops out. The length of time the signal is transmitted is determined by release time relay BR.

A train moving in the opposite direction energizes track relay 02 first. Then when train enters track circuit 01, relay BR cannot be energized, therefore no signal will be transmitted over the telephone line.

The application of the buzzer, induction coil and capacitors used in this arrangement is similar to those described above for the non-directional OSing device.



TYPICAL CIRCUITS FOR NON-DIRECTIONAL OS ING DEVICE
WITH TIME CUTOUT



TYPICAL CIRCUITS FOR DIRECTIONAL OS ING DEVICE.
FOR USE IN NON-SIGNAL TERRITORY

SEPT. 1949

AAR
SIG. SEC.
8041A

ADDENDUM TO A.A.R. SIG.SEC. 8042A

TYPICAL TRAP CIRCUITS.

Figure 1 uses three individual track circuits, the two outside track circuits being the conventional type, while the center track relay XTSR is circuited so that after having been shunted, it cannot be re-energized unless one of the outside track circuits is occupied.

Figure 2 uses one approach track circuit and one center track circuit with a normally energized stick relay. The approach track or the center track may be shunted individually and the circuit will self-restore. However, if the approach and center track are both shunted, then the circuit cannot be restored unless the approach track is the last to be occupied.

Figure 3 uses a normally energized stick relay for each direction. Whenever one of these stick relays becomes de-energized, it can only re-energize when the train occupies the receding track section.

Figure 4 uses two individual track circuits, one for each approach, which are arranged to remain de-energized once shunted until train proceeds into the receding track section, energizing relay XTSR to release the track stick as shunt is removed. An emergency release with time delay is also shown, using a push button repeater stick relay and timer relay.

Figure 5 uses two track circuits with the center track circuit so arranged that it cannot re-energize unless the approach track is occupied. This circuit is similar to Fig. 2 without the self-restoring feature.

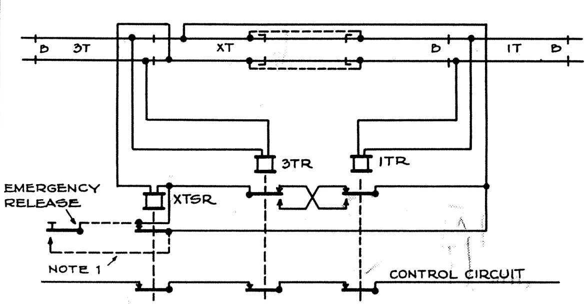


FIG. 1

USING THREE TRACK CIRCUITS
PICK UP OVER OUTER TRACK CIRCUITS

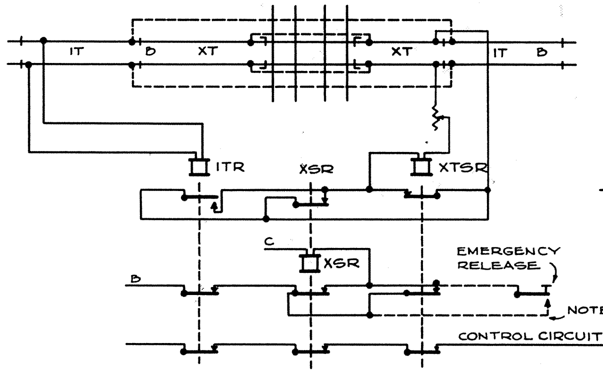


FIG-2

SELF RESTORING IN EVENT XTSR
IS INDEPENDENTLY DE-ENERGIZED

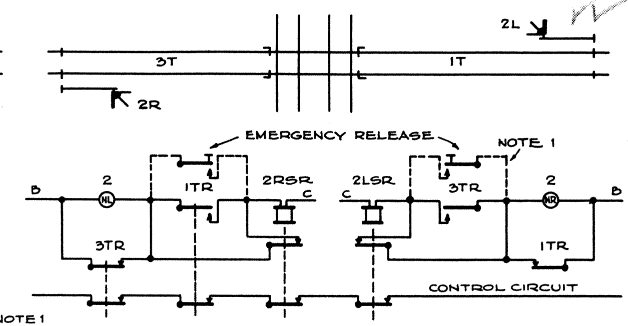


FIG. 3

FOR USE AT INTERLOCKINGS
PICK UP OVER RECEDING TRACK SECTIONS

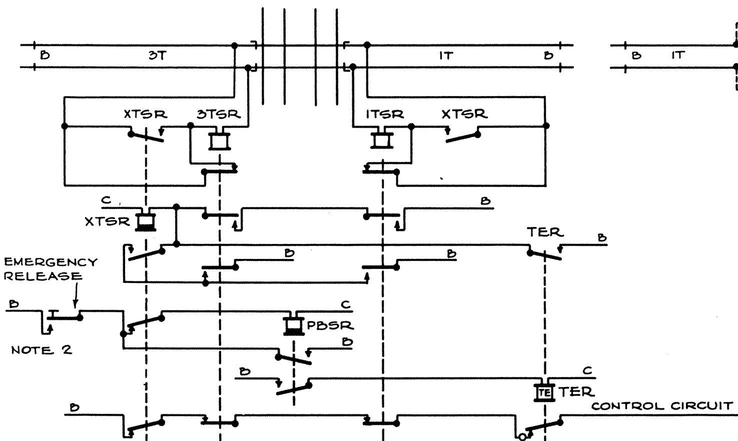


FIG.- 4

PICK UP OVER RECEDING TRACK SECTION

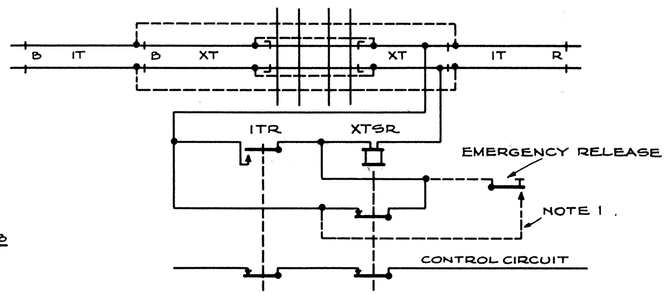


FIG. 5

USING TWO TRACK CIRCUITS
PICK UP OVER OUTER TRACK CIRCUIT

NOTE 1 EMERGENCY RELEASE SHOWN IN DOTTED LINE IS OPTIONAL. TIME DELAY IN FIG. 4 MAY BE INCLUDED IN EMERGENCY RELEASE CIRCUITS WHEN REQUIRED.

2. EMERGENCY RELEASE WITH OR WITHOUT TIME DELAY FEATURE IS OPTIONAL.

TYPICAL TRAP CIRCUITS

SEPT. 1949

AAR
SIG. SEC.
8042A

ADDENDUM TO A.A.R. SIG.SEC. 8043A

TYPICAL RELAY TYPE INTERLOCKING CIRCUITS.

This is a local control system with the functions individually controlled with signal levers in the track diagram, semi-automatic stick signals, with the restricting signals not track circuit controlled.

The signal levers are the push-pull-turn type, while the switch levers are toggle type.

The route check network on Sheet 1 provides a preliminary route check before a signal may be cleared, insuring that switch levers and switch call relays CWR are in proper positions to assure a complete route for signal to be cleared; also that opposing signal levers are not in a position to clear opposing signals. A relay designated HSR is provided for each signal, in the route check network, that must pick up before circuit is completed to clear signal unless a move is to be made into an occupied block from signals 4 and 10 in which case the call on stick relay COSR is used.

To energize the HSR for signals 2, 6, 8, 12 and 14, a signal lever is turned. Once the HSR picks up it is provided with a holding circuit that may only be released by restoring signal lever to normal position.

The HSR for signals 4 and 10 is energized by pushing the signal lever if the first track circuit in advance of the signal is unoccupied; these are provided with a holding circuit that will be released by pulling the signal lever, or by a train passing the signal.

Signals 4 and 10 are provided with a call-on aspect for clearing a restricting signal into an occupied block. In this case, a call-on stick relay COSR is energized when the signal lever is turned. When energized, the COSR is held up through one of its front contacts, and it will not become de-energized until the signal lever is returned to its normal position.

The signal control network shown on Sheet 2 consists of circuits for control of relays for color light signals. This network checks all switch correspondence relays in route energized, the switch locking relays de-energized, also that opposing approach locking relay is energized.

The approach and time locking circuits are shown on Sheet 3. Signals 6, 8, 12 and 14 have time locking only without automatic release. Signals 4 and 10 have approach locking with automatic release. Signal 2 has time locking only with automatic release.

ADDENDUM TO A.A.R. SIG.SEC. 8043A - Continued

The switch control and indication circuits are shown on Sheet 3. If the lock relay is energized and the switch lever is moved, switch relay WR and switch call relay CWR are energized in the opposite direction and their contacts move to the other position. This causes NWCR or RWCR to be de-energized because the switch lever is out of correspondence with switch position. This causes the LSR to pick up and apply power to the switch to bring the switch position into correspondence with the switch lever. Then, RWCR or NWCR will be energized depending on switch position and switch lever position. This, in turn, causes LSR to be de-energized and removes power from the switch machine.

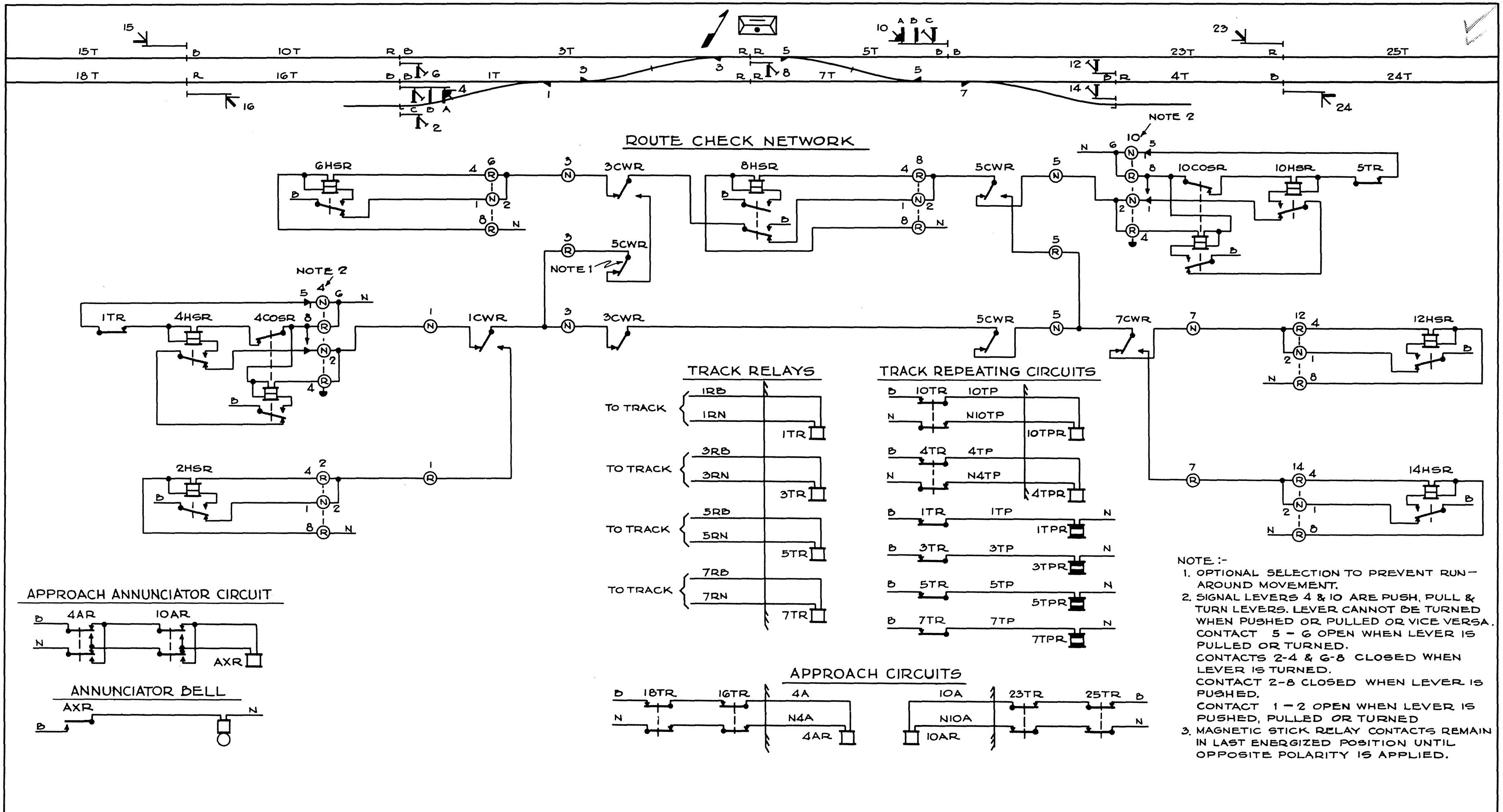
Storage of switch control is prevented. It is accomplished in the control of the WR relay through the contacts of relays CWR and LPR.

The switch locking circuits are shown on Sheet 4 and are controlled by track relays, route locking relays, approach locking relays, relay COS and relays HSR. The HSR and COSR contacts are added to the switch locking relays to provide preliminary locking which de-energizes the relays to complete signal control circuits and also prevent a misroute by the movement of a switch lever after a route is established before signal is cleared.

The lock stick circuits insure that switch will complete its movement after the lock relay is de-energized by pick-up of relay HSR or the relays COS.

The control panel and indication circuits are shown on Sheet 4. The route lined up is shown by movable point indicators which snap into the position called for when the switch lever is operated. The route locked up is shown by the illumination of the lock lights located above the switch levers.

Signal levers are provided with two indication lamps in the barrel of the lever. A red light indicates that relay HSR or COSR is energized, calling for the signal. A white light indicates that the signal is clear.

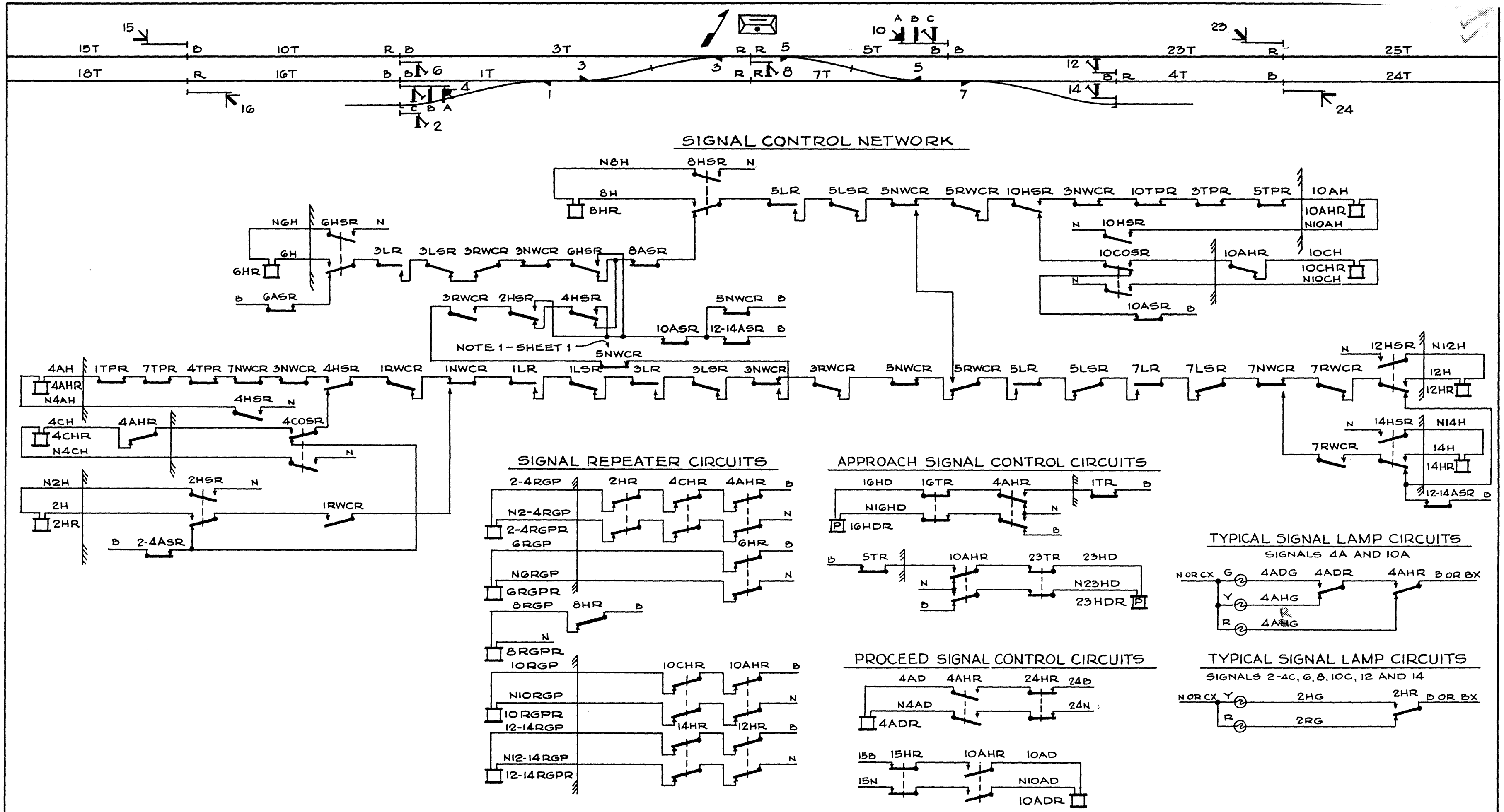


TYPICAL RELAY TYPE INTERLOCKING CIRCUITS

LOCAL CONTROL - FUNCTIONS INDIVIDUALLY CONTROLLED - SIGNAL LEVERS IN TRACK DIAGRAM.

SEPT. 1950

AAR SIG. SEC. 8043A



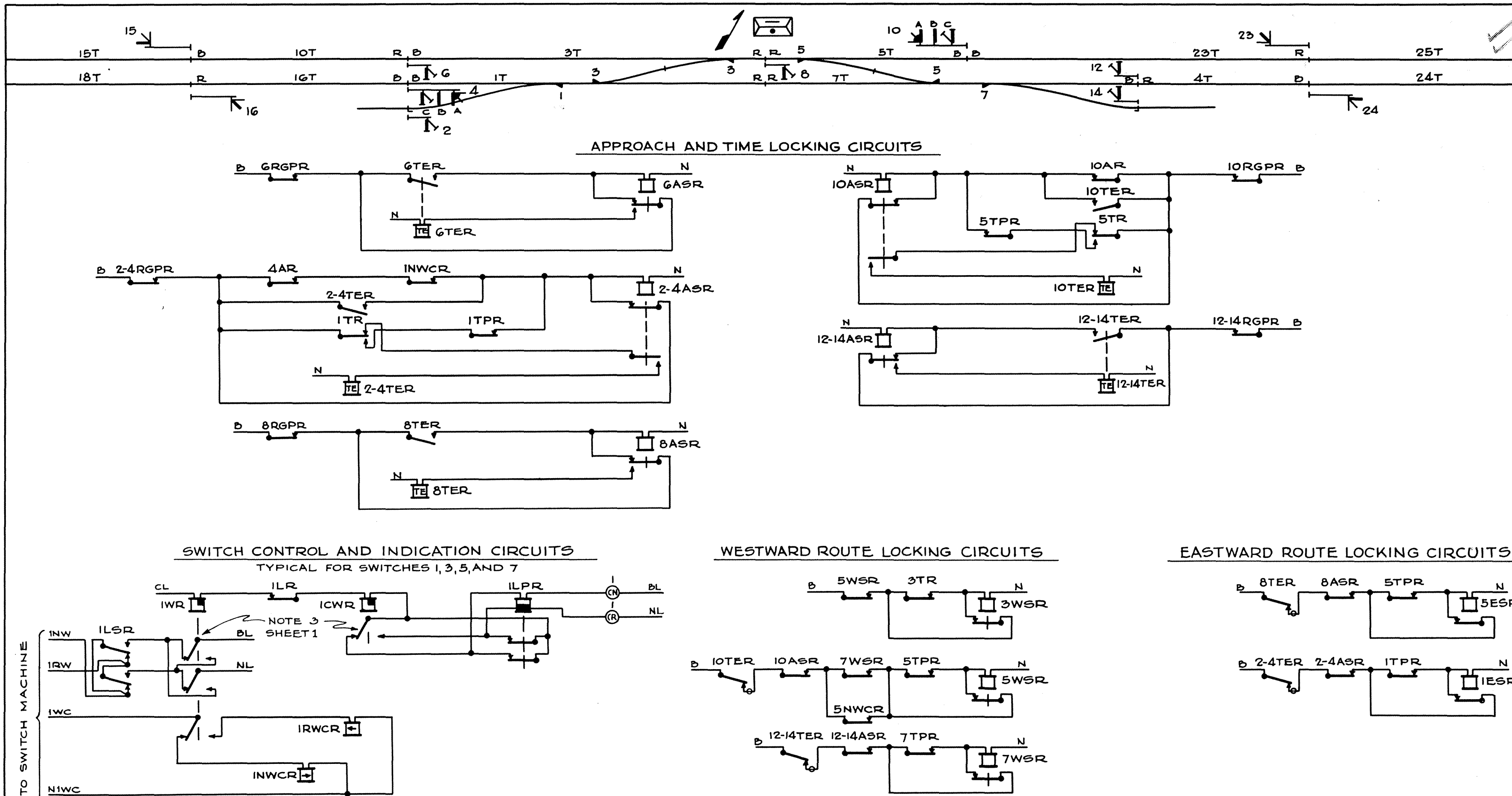
TYPICAL RELAY TYPE INTERLOCKING CIRCUITS

LOCAL CONTROL-FUNCTIONS INDIVIDUALLY CONTROLLED-SIGNAL LEVERS IN TRACK DIAGRAM

SEPT. 1950

AAR SIG. SEC 8043 A

SHEET 2 OF 4 SHEETS



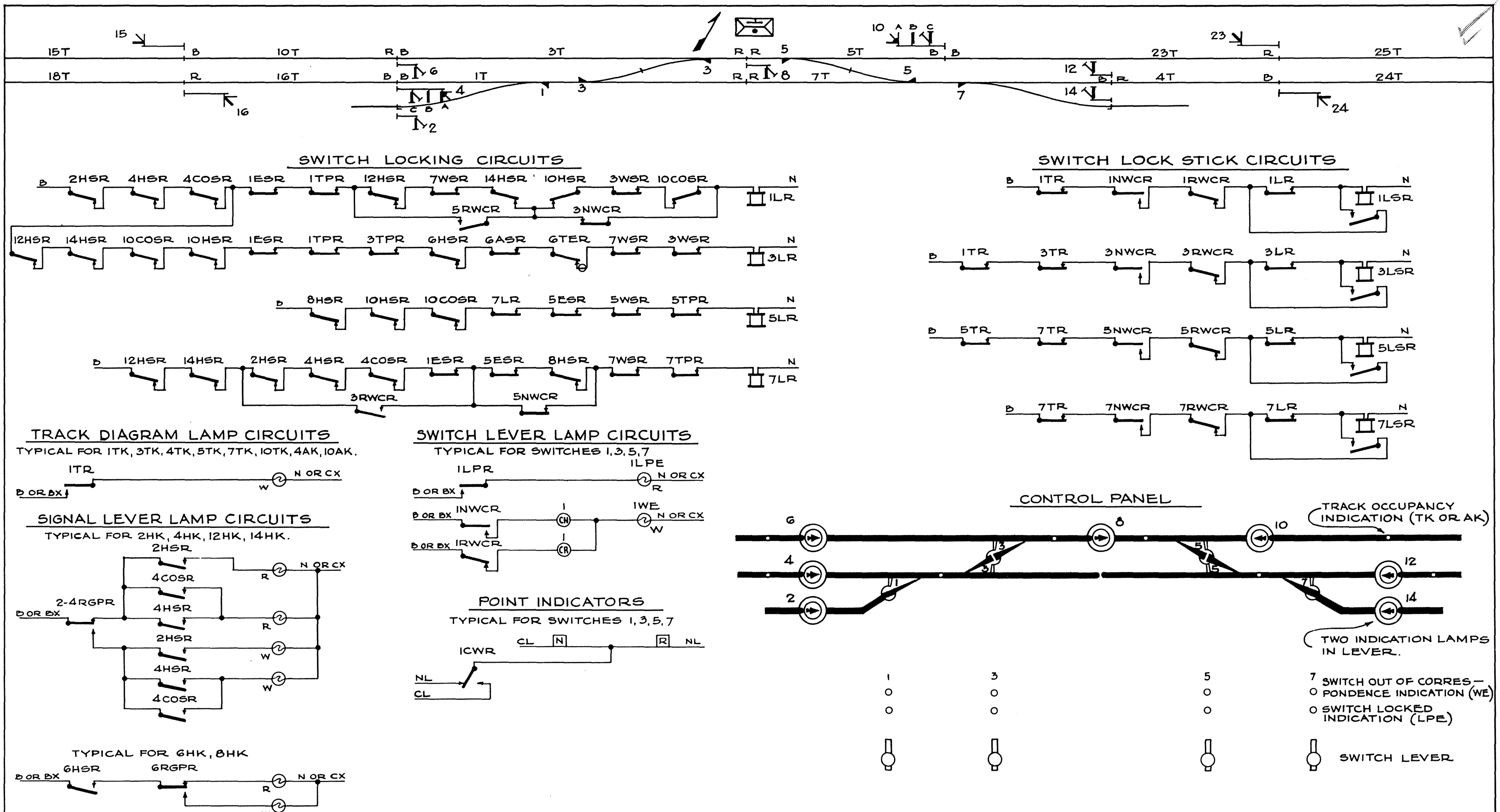
TYPICAL RELAY TYPE INTERLOCKING CIRCUITS

LOCAL CONTROL—FUNCTIONS INDIVIDUALLY CONTROLLED—SIGNAL LEVERS IN TRACK DIAGRAM.

SEPT. 1950

AAR SIG. SEC. 8043A

SHEET 3 OF 4 SHEETS



TYPICAL RELAY TYPE INTERLOCKING CIRCUITS

LOCAL CONTROL - FUNCTIONS INDIVIDUALLY CONTROLLED - SIGNAL LEVERS IN TRACK DIAGRAM

AAR SIG. SEC. 8043A

SEPT. 1950

ADDENDUM TO A.A.R. SIG.SEC. 8044A

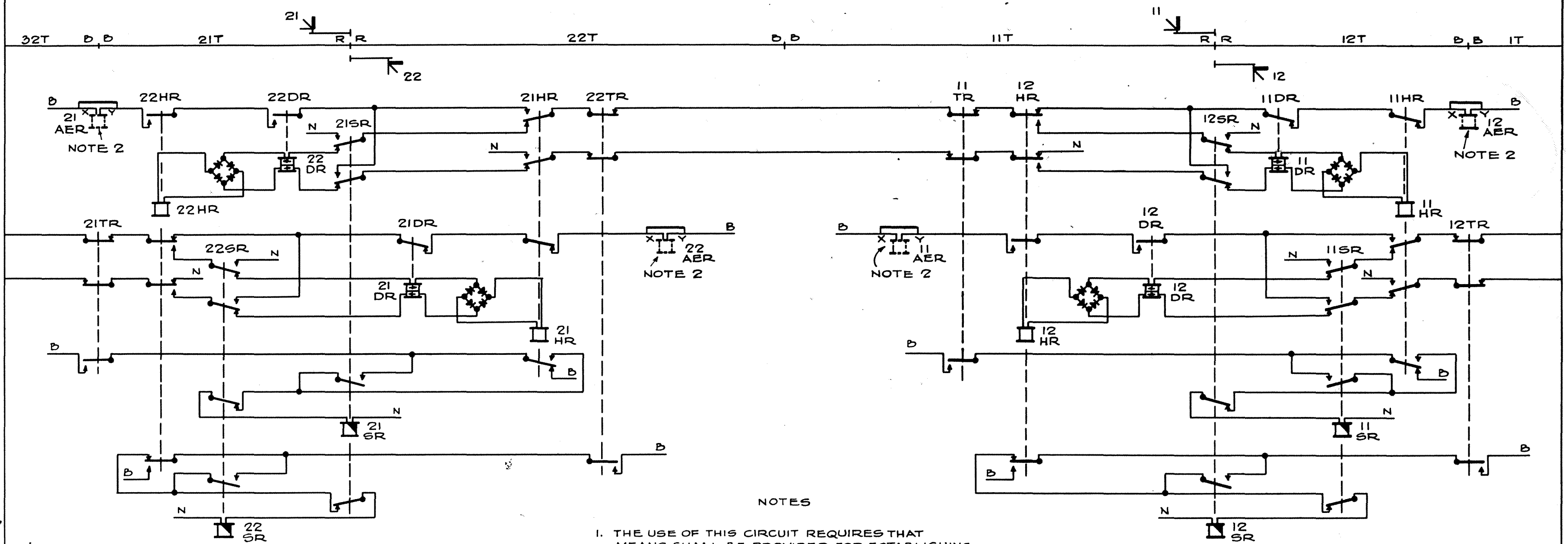
TYPICAL THREE-ASPECT COLOR LIGHT AUTOMATIC SIGNAL CIRCUITS.

These circuits provide for track signaled in both directions using two-wire polarized line control circuit, with biased neutral line relay D and non-biased relay H. The selection of relay H through a rectifier maintains current through the coils in one direction only, which prevents relay from dropping out during pole changing.

Pick-up of the stick relay as the train passes the signal necessitates the use of a quick pick-up stick relay to insure it is energized before relay H opens. The stick relays are also selected over the opposite stick relay de-energized to prevent both relays being de-energized.

When relay AER is not used in circuit HDR, a resistor should be used to limit the current when batteries at adjacent locations are connected in series.

This circuit is only usable where some form of manual control is available for establishing, maintaining and changing direction of traffic. It is necessary to provide an interlock on the control machine. If opposite ends of block are under control of two separate operators, the circuit must be supplemented by traffic locking.



NOTES

1. THE USE OF THIS CIRCUIT REQUIRES THAT MEANS SHALL BE PROVIDED FOR ESTABLISHING, MAINTAINING & CHANGING THE DIRECTION OF TRAFFIC BETWEEN STATIONS.

2. WHERE APPROACH LIGHTING RELAY IS REQUIRED, OMIT HEAVY-LINE CIRCUIT & INSTALL CIRCUIT "XY" AS SHOWN ON DOTTED LINES.

3. FOR LIGHTING CIRCUITS SEE PLAN 8046A.

TYPICAL THREE ASPECT COLORLIGHT AUTOMATIC SIGNAL CIRCUITS

USING BIASED NEUTRAL 'D' RELAY AND NEUTRAL 'H' RELAY.
TRACK SIGNALED IN BOTH DIRECTIONS
TWO WIRE 'HD' CONTROL
(CODE RULES 281-285-291)

SEPT. 1950

AAR SIG. SEC. 8044A

ADDENDUM TO A.A.R. SIG.SEC. 8045A

TYPICAL THREE-ASPECT SEARCHLIGHT AUTOMATIC SIGNAL CIRCUITS.

These circuits provide for track signaled in both directions using a polarized line. At double signal locations this polarized line is connected directly to the signal mechanisms. At a single signal location the proper line is connected to the signal for one direction, and to a retained neutral polarized relay in the other direction. This relay is used to transfer the signal control from one line circuit to the next one.

Relay HDR used with the staggered intermediates is slow pick-up with retained neutral contacts to prevent flashing a red indication on the signal in the rear during the pole changing of circuit HDR. It also prevents energizing the circuit in the rear account of "joint hopping" effect when light engine or train pass over insulated joints at a cut-section or signal.

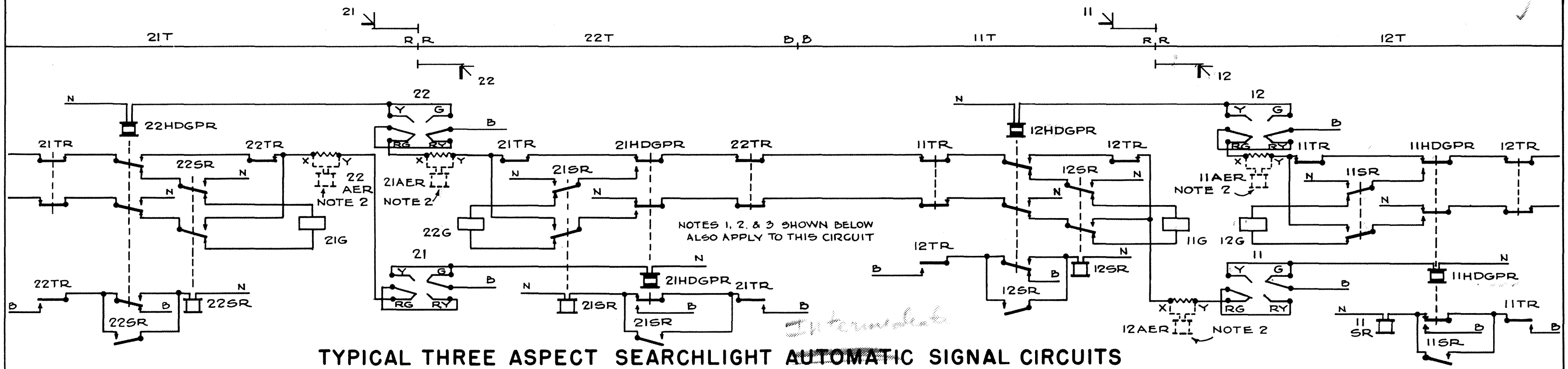
The use of a slow pick-up slow-release relay for the HDGPR prevents the relay dropping out when the signal changes from yellow to green and also prevents the signal in the rear displaying a momentary green indication due to "joint hopping" effect by a short light train operating in the block.

To prevent a momentary flash of the clear aspect when a short high-speed train vacates the block, the positive energy for line circuit HD is selected through a front contact of the track relay in advance of the signal.

The resistor is used in the signal control circuit to limit the current when traffic is reversed and the batteries at adjacent locations are momentarily connected in series.

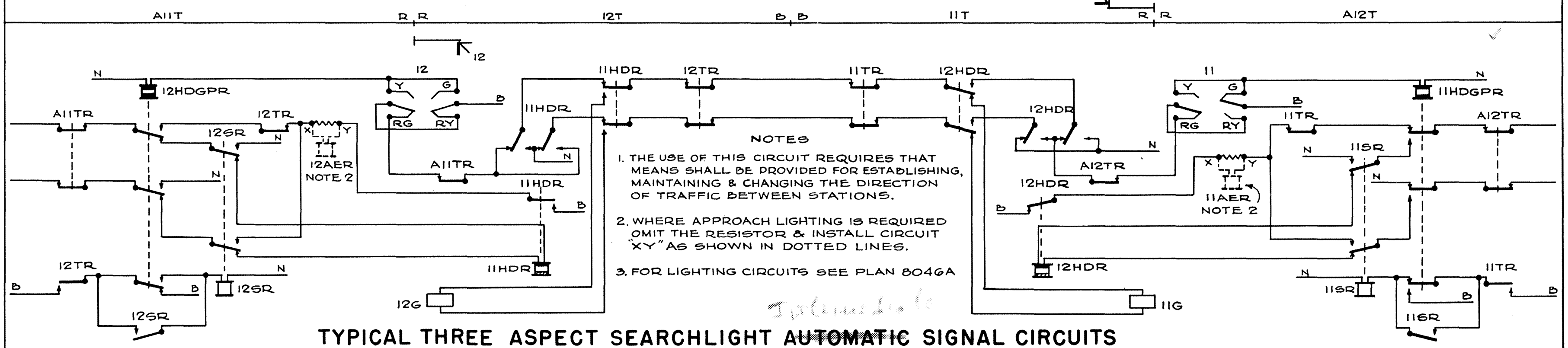
Full block approach lighting is provided when approach lighting relay is used as indicated under Note 2.

This circuit is only usable where some form of manual control is available for establishing, maintaining and changing direction of traffic. It is necessary to provide an interlock on the control machine. If opposite ends of block are under control of two separate operators, the circuit must be supplemented by traffic locking.



TYPICAL THREE ASPECT SEARCHLIGHT ~~AUTOMATIC~~ Intermediate SIGNAL CIRCUITS

USING DIRECT POLARIZED LINE CONTROL
TRACK SIGNALED IN BOTH DIRECTIONS
TWO WIRE CONTROL – SIGNALS OPPOSITE
(CODE RULES 281-285-291)



NOTES

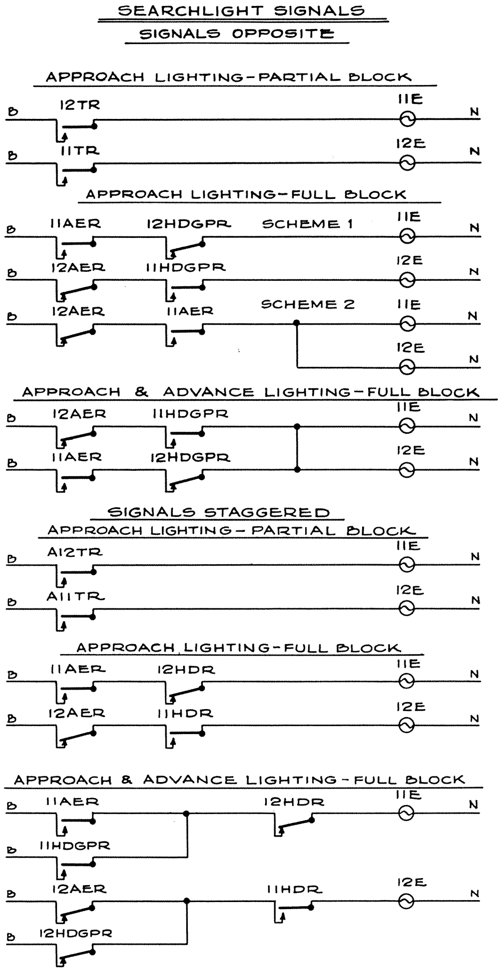
1. THE USE OF THIS CIRCUIT REQUIRES THAT MEANS SHALL BE PROVIDED FOR ESTABLISHING, MAINTAINING & CHANGING THE DIRECTION OF TRAFFIC BETWEEN STATIONS.
2. WHERE APPROACH LIGHTING IS REQUIRED OMIT THE RESISTOR & INSTALL CIRCUIT "XY" AS SHOWN IN DOTTED LINES.
3. FOR LIGHTING CIRCUITS SEE PLAN 8046A

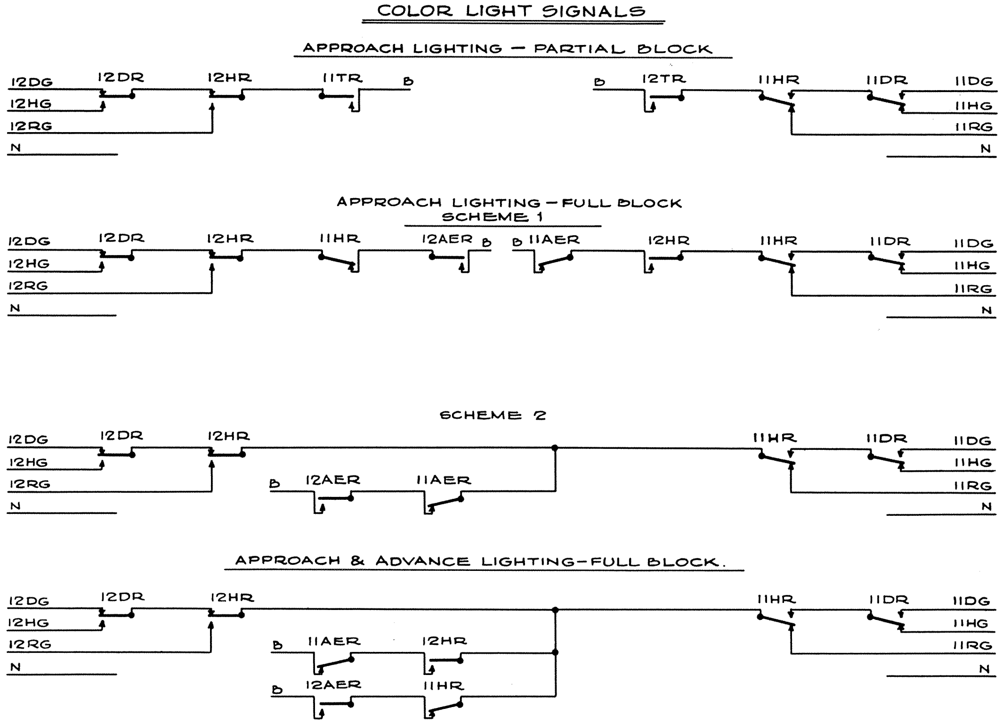
TYPICAL THREE ASPECT SEARCHLIGHT ~~AUTOMATIC~~ Intermediate SIGNAL CIRCUITS

USING DIRECT POLARIZED LINE CONTROL AND RETAINED
NEUTRAL POLAR LINE RELAYS
TRACK SIGNALED IN BOTH DIRECTIONS
TWO WIRE CONTROL – SIGNALS STAGGERED
(CODE RULES 281-285-291)

SEPT. 1950

AAR SIG. SEC. 8045A





APPROACH LIGHTING CIRCUITS

FOR PLANS 8044A & 8045A

SEPT. 1950

AAR
SIG. SEC.
8046A

ADDENDUM TO AAR SIG. SEC. 8047A

TYPICAL CODED TRACK CIRCUITS FOR FOUR-ASPECT AUTOMATIC SEARCHLIGHT SIGNALS RECTIFIED A-C OPERATION—TRACK SIGNALED IN ONE DIRECTION.

These circuits show the use of half wave rectified d-c coded track circuits to provide the control for four-aspect automatic block signals. Reverse or inverse code (full wave rectified d-c) is used to provide approach lighting and approach locking.

180 code provides for the G/G Rule 281; 120 code, the Y/Y Rule 282A; 75 code, the Y/R Rule 285, and no code R/R Rule 291.

The mechanically rectified relay type decoding circuit is used for decoding all code rates while electrically tuned decoding units are used to decode the 120 and 180 code rates.

The track relay and the reverse code energy are connected to the track by separate leads so inverse energy expended in the track relay is kept to a minimum.

The track feed and the reverse code detecting relay are connected to the track on the same pair of leads to facilitate the selecting or commutating circuits which alternately connect track feed energy to the rails and the reverse detecting relay to receive the reverse code during the off time.

Two coil track relays are used with the second coil shunted with rectifier snub to provide chatter free operation on half wave d-c.

The 26AER (Sheet 1) shows the second coil shunted by its own front contact to provide additional slow release over that provided by the snubbing rectifier. This increases the front contact closure time to provide more even balance between the front and back closure time.

The 24AR (Sheet 2) shows the second coil connected to the master transformers to provide additional slow release time. As the front contact of the 24AR closes, energy flows in the upper half of the winding, setting up an induced voltage in the lower portion of this winding which feeds the second coil of the 24AR and holds the relay up for a short interval.

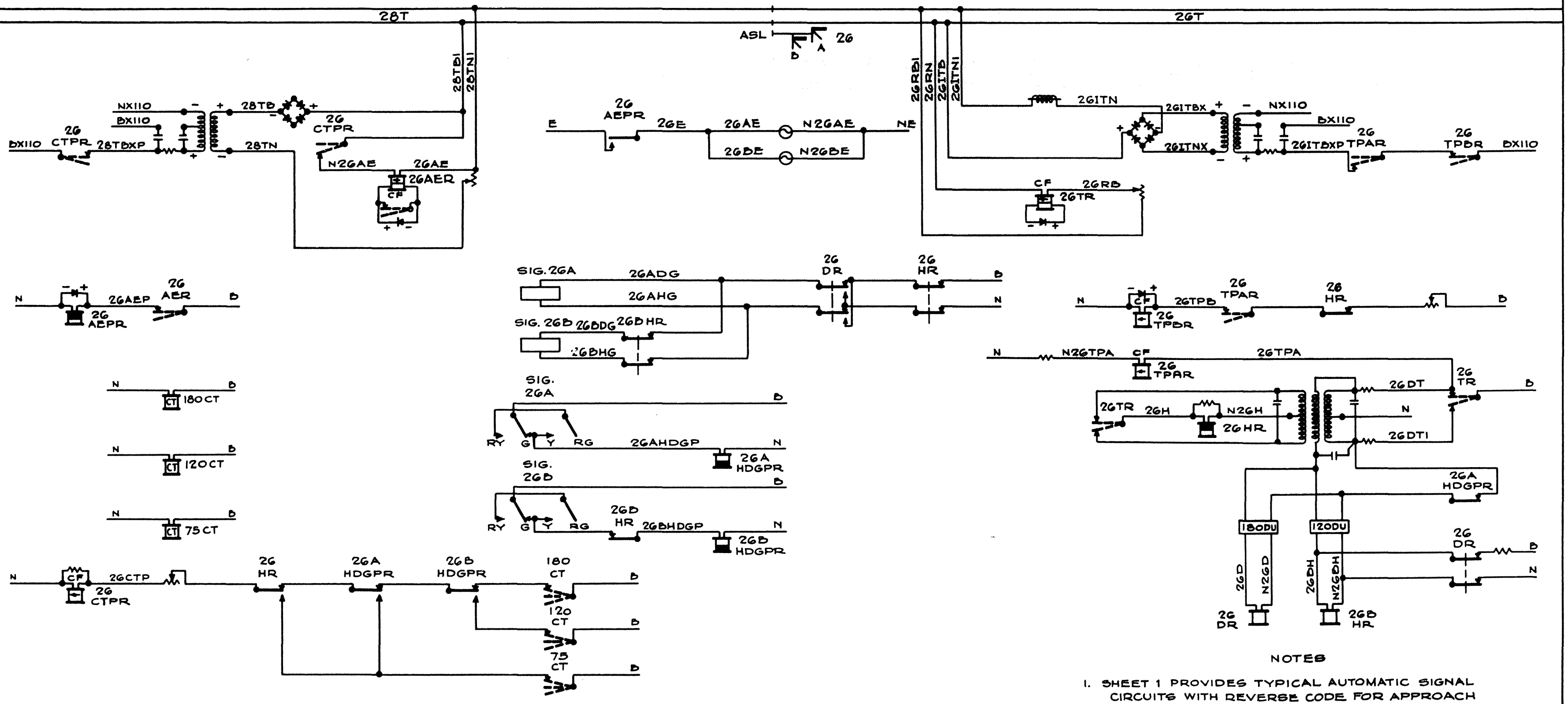
Sheet 1 illustrates the use of a front contact repeater (26AEPR) of the 26AER snubbed by a rectifier to provide approach lighting.

Reverse code is applied to the rails as follows: The 26TR, 26TPAR and 26TPBR (with 26HR up) picks up in sequence as shown. Then, as the 26TR is de-energized dropping the 26TPAR, reverse code will be applied to the rails through the 26TPAR back contact and 26TPBR front contact. The 26TPBR being snubbed by a rectifier provides the proper "on" time of the reverse code.

When reverse code is used for approach locking the mechanically rectified relay type decoding is used which requires that the AR be coding to maintain the APR energized.

Approach signals 24 and 22 remain at their most restrictive indication even though the home signal 2 may be cleared, clearing to a less restrictive indication after the train enters the approach circuit and 2APR (Sheet 4) is de-energized. This provides a check that the approach locking is in effect before allowing the approach signals to clear to their less restrictive indication.

Sheet 3 illustrates the use of 75 code to maintain the approach control should the regular code originating from 2CTPR at signal 2 be interrupted with resultant loss of the regular inverse code. This provides a means for maintaining the approach indication for movements against normal direction of traffic until the train actually occupies the block.



TYPICAL CODED TRACK CIRCUITS

FOR FOUR ASPECT AUTOMATIC SEARCHLIGHT SIGNALS
RECTIFIED AC OPERATION
TRACK SIGNALED IN ONE DIRECTION
(CODE RULES 281-282A-285-291)

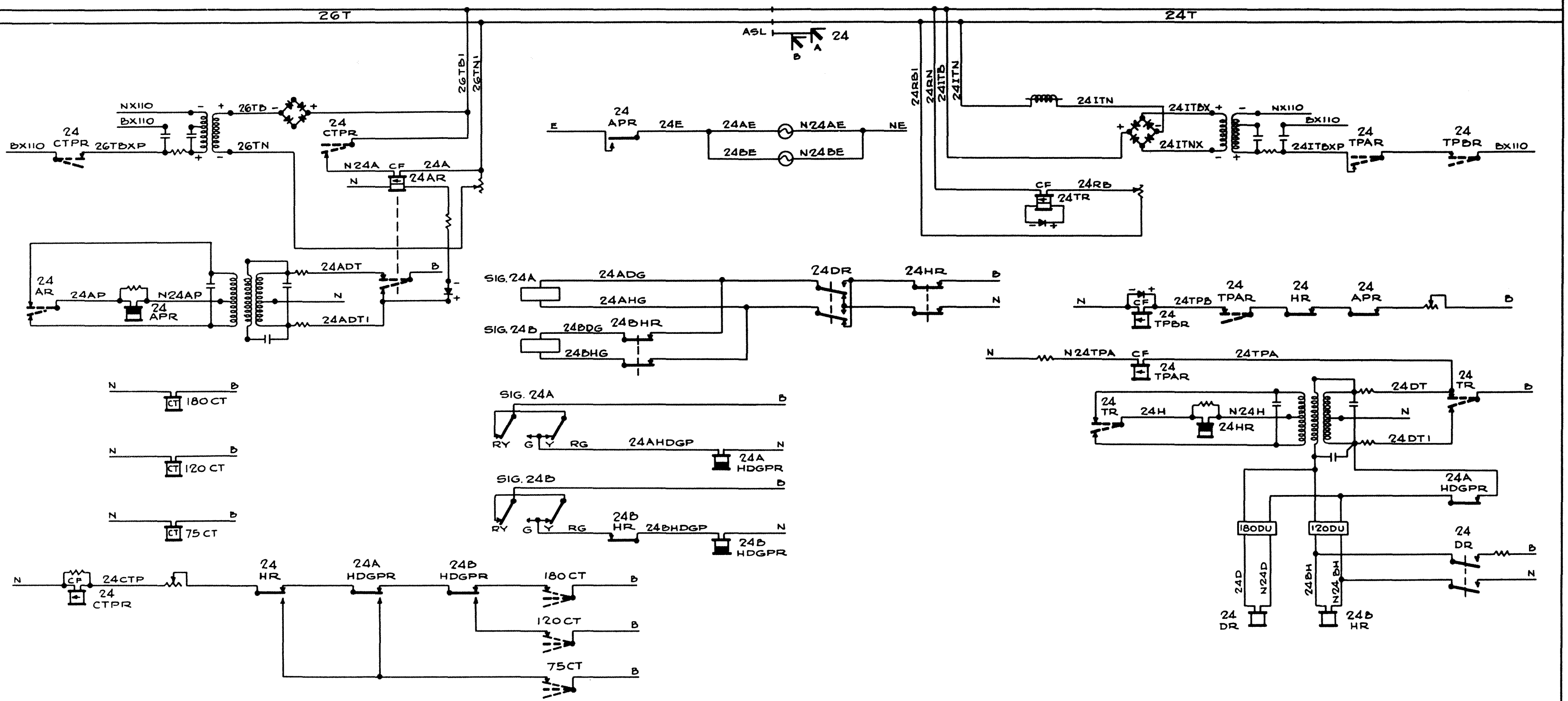
NOTES

1. SHEET 1 PROVIDES TYPICAL AUTOMATIC SIGNAL CIRCUITS WITH REVERSE CODE FOR APPROACH LIGHTING.

2. SHEETS 2, 3, AND 4 PROVIDE TYPICAL AUTOMATIC SIGNAL CIRCUITS APPROACHING INTERLOCKING WITH REVERSE (INVERSE) CODE FOR APPROACH LOCKING AND OTHER REQUIRED FUNCTIONS.

AAR SIG. SEC. 8047A

SEPT. 1950

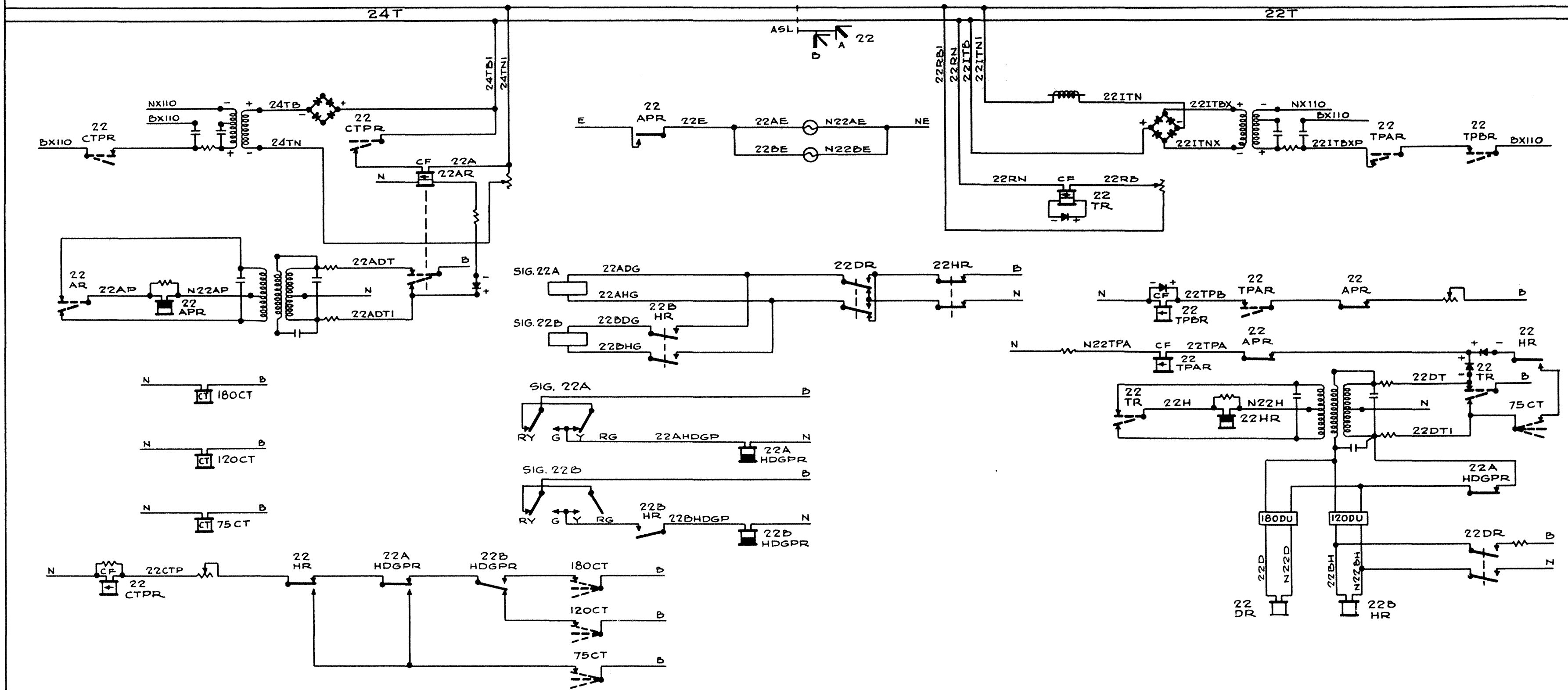


TYPICAL CODED TRACK CIRCUITS

FOR FOUR ASPECT AUTOMATIC SEARCHLIGHT SIGNALS
RECTIFIED AC OPERATION
TRACK SIGNALED IN ONE DIRECTION
(CODE RULES 281-282A-285-291)

SEPT. 1950

AAR
SIG. SEC
8047A



TYPICAL CODED TRACK CIRCUITS

FOR FOUR ASPECT AUTOMATIC SEARCHLIGHT SIGNALS
RECTIFIED AC OPERATION
TRACK SIGNALED IN ONE DIRECTION
(CODE RULES 281-282A-285-291)

SEPT. 1950

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SIG. SEC
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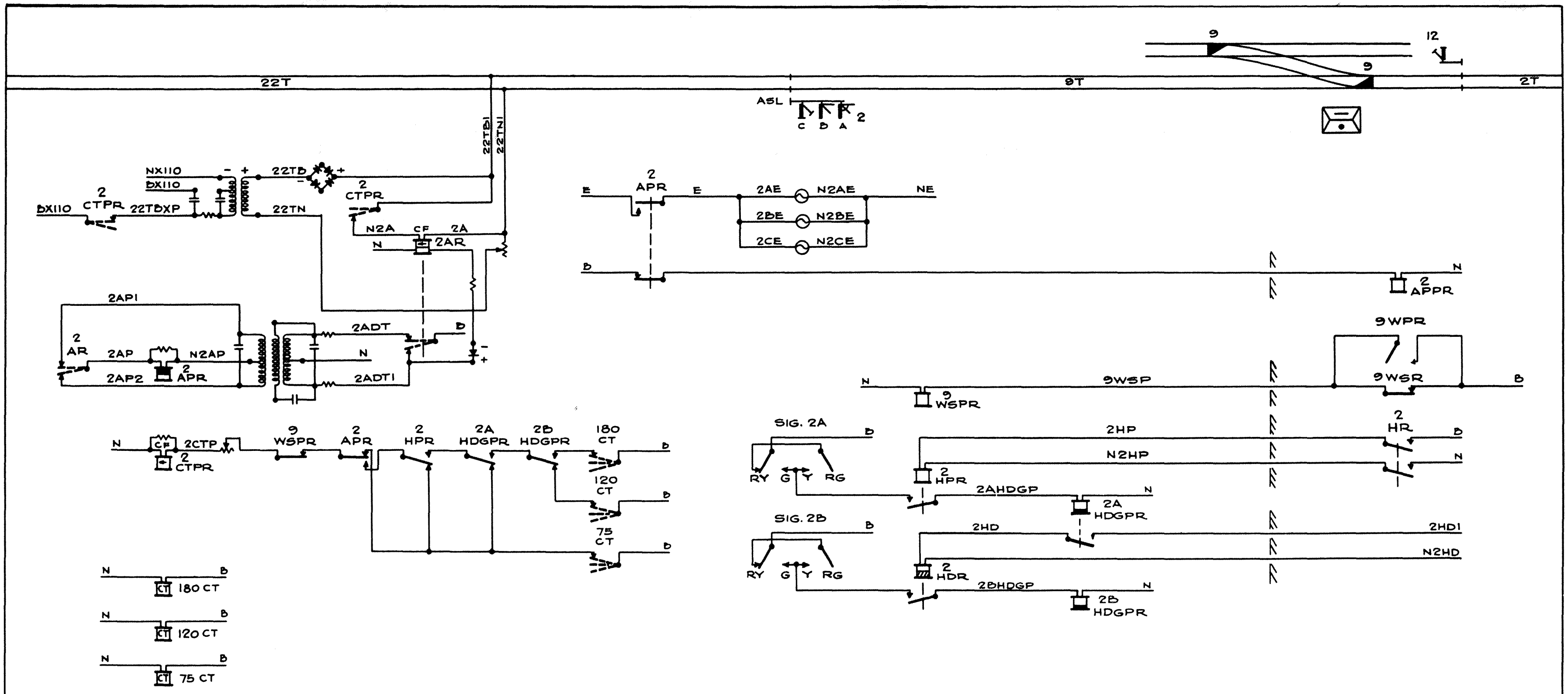


TYPICAL CODED TRACK CIRCUITS

FOR FOUR ASPECT AUTOMATIC SEARCHLIGHT SIGNALS
RECTIFIED AC OPERATION
TRACK SIGNALED IN ONE DIRECTION
(CODE RULES 281-282A-285-291.)

SEPT. 1950

AAR SIG. SEC. 8047A

ADDENDUM TO AAR SIG. SEC. 8048A (SHEET 1)

TYPICAL ELECTRIC SWITCH LOCK CIRCUITS -AUTOMATIC OPERATION WITH TIME AND APPROACH LOCKING.

Circuits as shown provide a means for automatic operation of electric switch lock with time and approach locking. A short track circuit releasing section B22T allows moves to be made into the nonsignaled track without time locking.

Four schemes are shown to obtain approach circuits. In the event that the signal control circuits do not provide adequate approach locking, other means must be provided.

The NWPR checks the switch circuit controller, door contact and lock normal, and TER down. Actuating the door or latch contact releases the NWPR, which transfers the signal control energy to EHPR and WHPR (with the exception to Scheme 2). When both approach relays are picked up, the lock coil WL is energized which allows the switch to be unlocked.

If either approach relay is down, time element TER is energized, and after expiration of predetermined time, the lock coil is energized.

To provide restoration of circuits to their normal condition, the TER and lock coil are de-energized by the door or latch contact.

ADDENDUM TO AAR SIG. SEC. 8048A (SHEET 2)

ELECTRIC SWITCH LOCK--MANUAL CONTROL, WITH OVERLAY LINE CIRCUITS.

The system is based on the use of audio frequency overlay apparatus for the control of a hand-operated switch equipped with electric lock.

The d-c line circuit, used for signal control, provides a channel for use by the overlay circuit.

Contacts controlling the d-c line circuit are not included in the overlay circuit; however, such contacts may be used when it is desired to include that portion of d-c line circuit for the purpose of interrupting the overlay circuit.

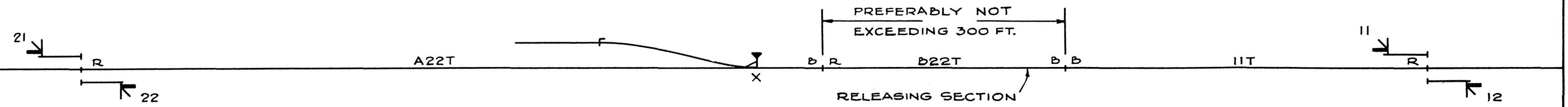
Control of the overlay circuit is obtained through the use of a contact of control relay WLSR.

The AFO transmitter located at the control point transmits an electronic source of audio frequency power to the AFO receiver located at the controlled switch. The AFO receiver is an audio frequency amplifier which receives the signal transmitted, amplifies and rectifies this signal into a d-c control voltage, which is used to energize relay WLR. The transmitter and receiver are tuned to a particular frequency as specified.

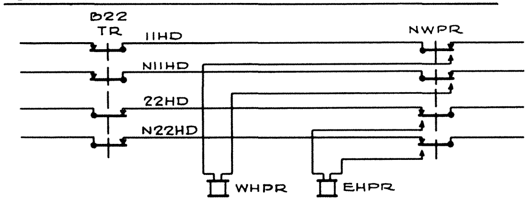
The AFO coupling unit is a device used to bridge the two independent line circuits which must be kept isolated from each other with respect to d-c. However, the use of this device permits the overlay circuit to pass.

Reactors (Note 2) are connected in series at all battery connections on the line circuit. The d-c battery has the effect of a short circuit on the audio frequency overlay equipment, therefore a reactor is necessary to block the flow of this current, but permits the flow of d-c current to the d-c line. Reactors are not necessary at the relay end of the circuit since the relay has sufficient impedance to block the flow of audio frequency current.

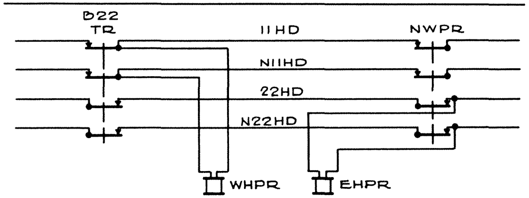
Additional audio frequency overlay circuits may be applied to conventional two-wire line circuits when desired to control and/or indicate additional functions. This is accomplished by the use of transmitters and receivers tuned to operate on frequencies that will prevent interaction of the equipment.



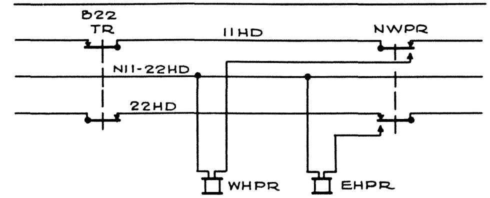
SCHEME Nº 1. FOUR WIRE TRANSFER METHOD



SCHEME Nº 2. FOUR WIRE MULTIPLE RELAY METHOD

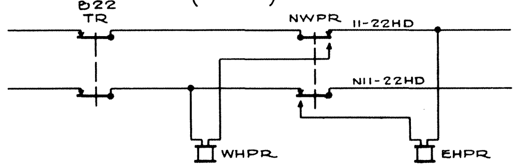


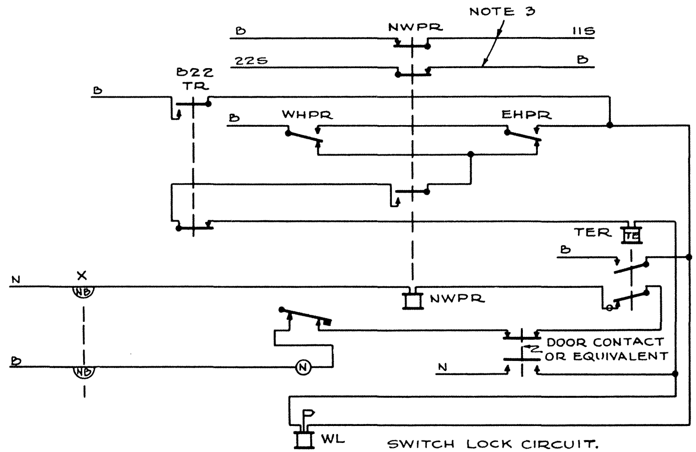
SCHEME Nº 3. THREE WIRE TRANSFER METHOD



SCHEME Nº 4. TWO WIRE TRANSFER METHOD

(NOTE 2)





SWITCH LOCK CIRCUIT.

NOTES

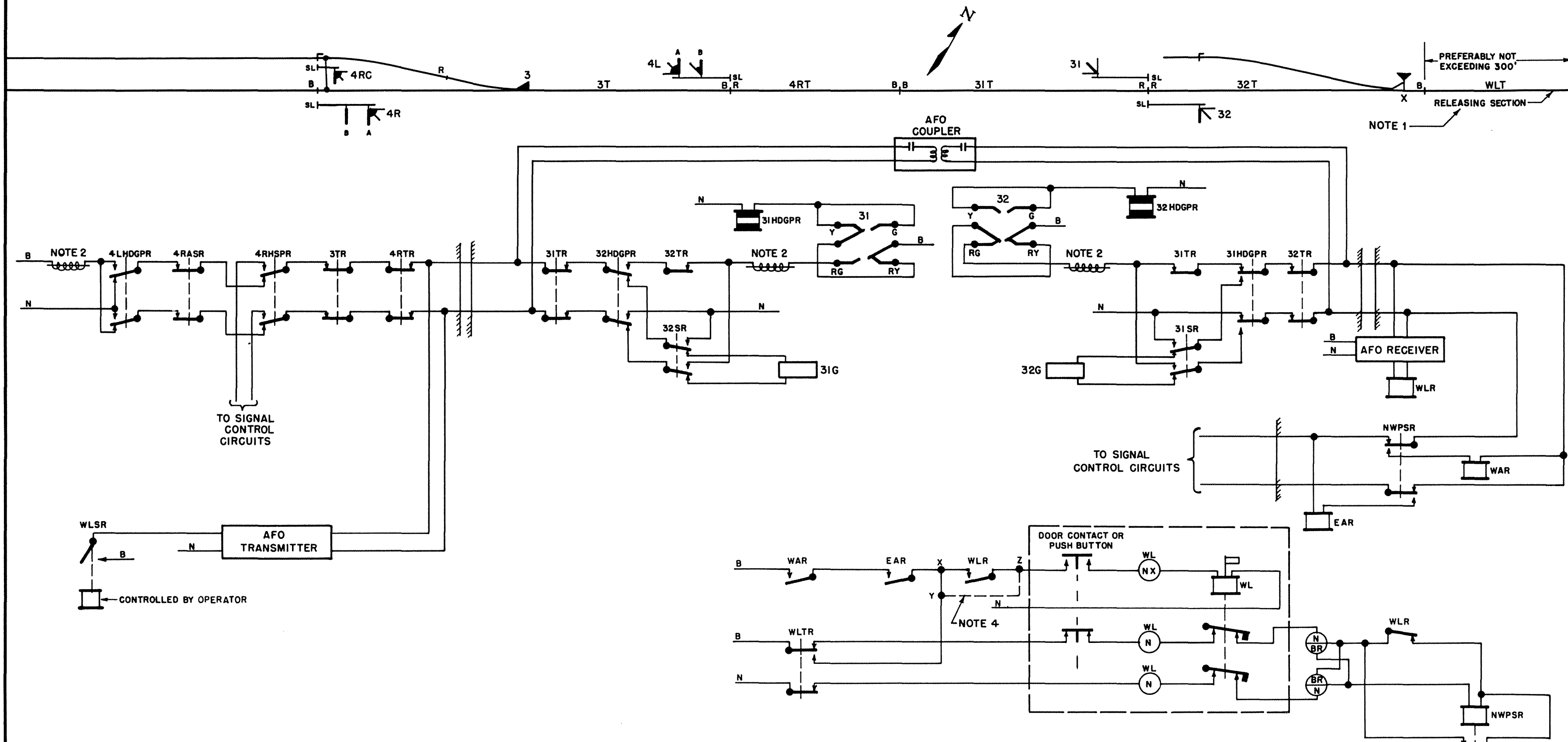
1. EHPR AND WHPR CONTROLS MUST PROVIDE ADEQUATE STOPPING DISTANCE. WHERE CIRCUITS AS SHOWN DO NOT SO PROVIDE, APPROPRIATE CONTROLS MUST BE SUBSTITUTED.

2. THE USE OF CIRCUIT, SCHEME 4, REQUIRES THAT MEANS SHALL BE PROVIDED FOR ESTABLISHING, MAINTAINING AND CHANGING THE DIRECTION OF TRAFFIC BETWEEN STATIONS.

3. DIRECTIONAL STICK RELAYS FOR ADJACENT AUTOMATIC SIGNALS, SHOULD BE SE-LECTED AS SHOWN WHERE REQUIRED BY OPERATING CONDITIONS.

TYPICAL ELECTRIC SWITCH LOCK CIRCUITS

TIME AND APPROACH LOCKING WITH RELEASING TRACK SECTION
AUTOMATIC OPERATION
TRACK SIGNALED IN BOTH DIRECTIONS



NOTES:

1. RELEASING CIRCUIT MAY BE CONVENTIONAL TRACK CIRCUIT, OR AFO WITHOUT INSULATED JOINTS.
2. BLOCKING REACTOR.
3. LIGHTNING PROTECTION DETAILS NOT SHOWN.
4. OPTIONAL CIRCUIT TO RELEASE ELECTRIC SWITCH LOCK WITH TRAIN OR ENGINE AT SWITCH, OMIT CONNECTIONS XY AND CONNECT DASHED CIRCUIT YZ.
5. COMMUNICATION CIRCUITS SHOULD HAVE ADEQUATE TPANSPOSITION TO PREVENT INTERFERENCE BY AFO CURRENT.

ELECTRIC SWITCH LOCK

MANUAL CONTROL, WITH OVERLAY LINE CIRCUITS

OCT. 1960

AAR
SIG. SEC.
8048A

SHEET 2

ADDENDUM TO AAR SIG. SEC. 8048A (SHEET 1)

TYPICAL ELECTRIC SWITCH LOCK CIRCUITS - AUTOMATIC OPERATION WITH TIME AND APPROACH LOCKING.

Circuits as shown provide a means for automatic operation of electric switch lock with time and approach locking. A short track circuit releasing section B22T allows moves to be made into the nonsignaled track without time locking.

Four schemes are shown to obtain approach circuits. In the event that the signal control circuits do not provide adequate approach locking, other means must be provided.

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If either approach relay is down, time element TER is energized, and after expiration of predetermined time, the lock coil is energized.

To provide restoration of circuits to their normal condition, the TER and lock coil are de-energized by the door or latch contact.

Length of releasing section may be increased if visibility is adequate.

= IN

ADDENDUM TO AAR SIG SEC 8048A (SHEET 2)   3235.14

ELECTRIC SWITCH LOCK - MANUAL CONTROL, WITH OVERLAY LINE CIRCUITS

The system is based on the use of audio frequency overlay apparatus for the control of a hand-operated switch equipped with electric lock.

The d-c line circuit, used for signal control, provides a channel for use by the overlay circuit.

Contacts controlling the d-c line circuit are not included in the overlay circuit; however, such contacts may be used when it is desired to include that portion of d-c line circuit for the purpose of interrupting the overlay circuit.

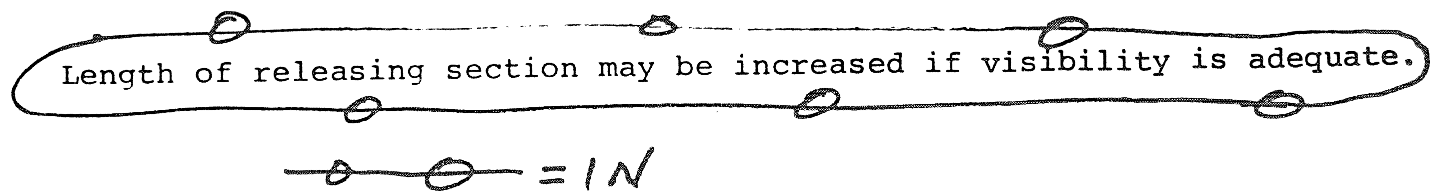
Control of the overlay circuit is obtained through the use of a contact of control relay WLSR.

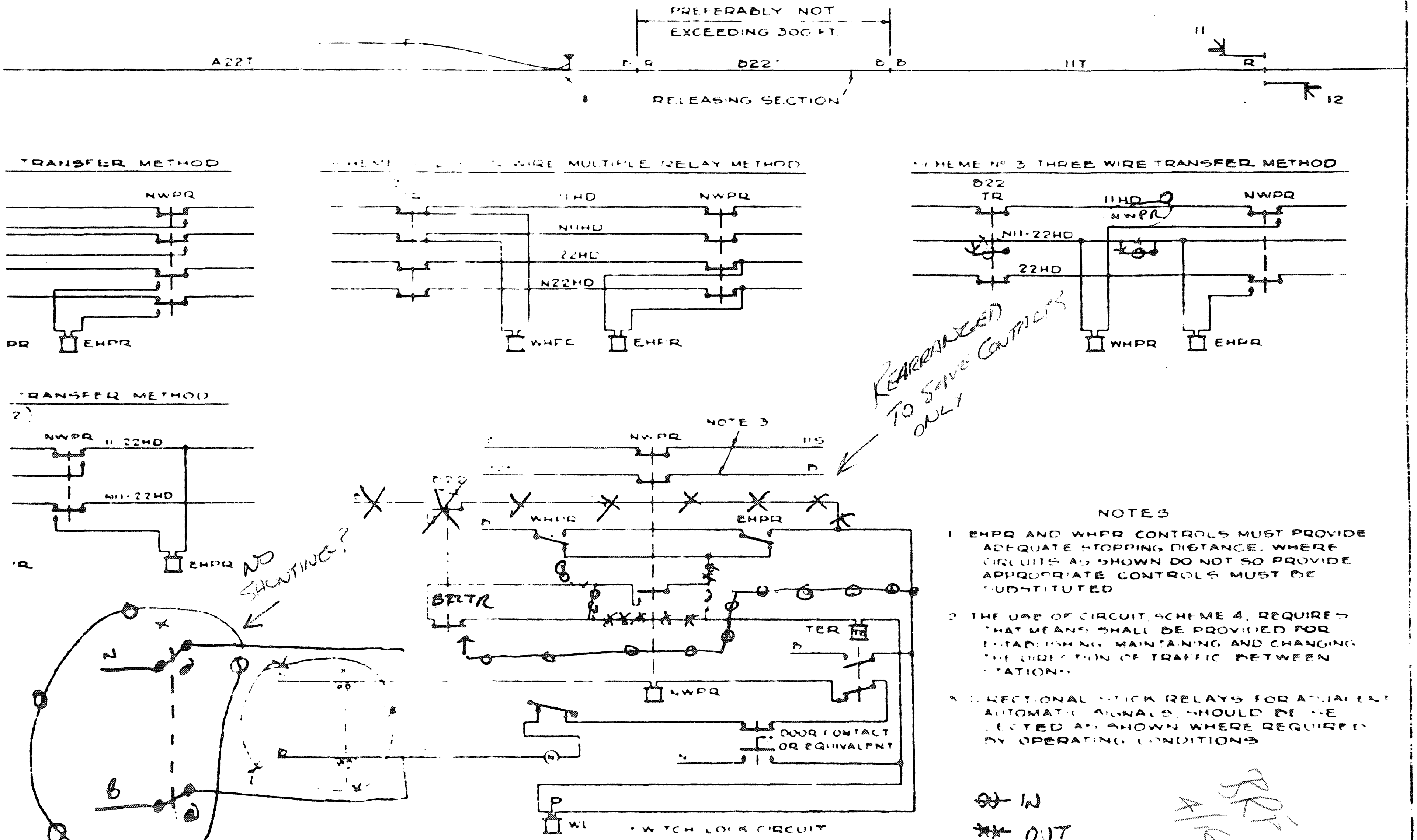
The AFO transmitter located at the control point transmits an electronic source of audio frequency power to the AFO receiver located at the controlled switch. The AFO receiver is an audio frequency amplifier which receives the signal transmitted, amplifies and rectifies this signal into a d-c control voltage, which is used to energize relay WLR. The transmitter and receiver are tuned to a particular frequency as specified.

The AFO coupling unit is a device used to bridge the two independent line circuits which must be kept isolated from each other with respect to d-c. However, the use of this device permits the overlay circuit to pass.

Reactors (Note 2) are connected in series at all battery connections on the line circuit. The d-c battery has the effect of a short circuit on the audio frequency overlay equipment, therefore a reactor is necessary to block the flow of this current, but permits the flow of d-c current to the d-c line. Reactors are not necessary at the relay end of the circuit since the relay has sufficient impedance to block the flow of audio frequency current.

Additional audio frequency overlay circuits may be applied to conventional two-wire line circuits when desired to control and/or indicate additional functions. This is accomplished by the use of transmitters and receivers tuned to operate on frequencies that will prevent interaction of the equipment.





NOTES

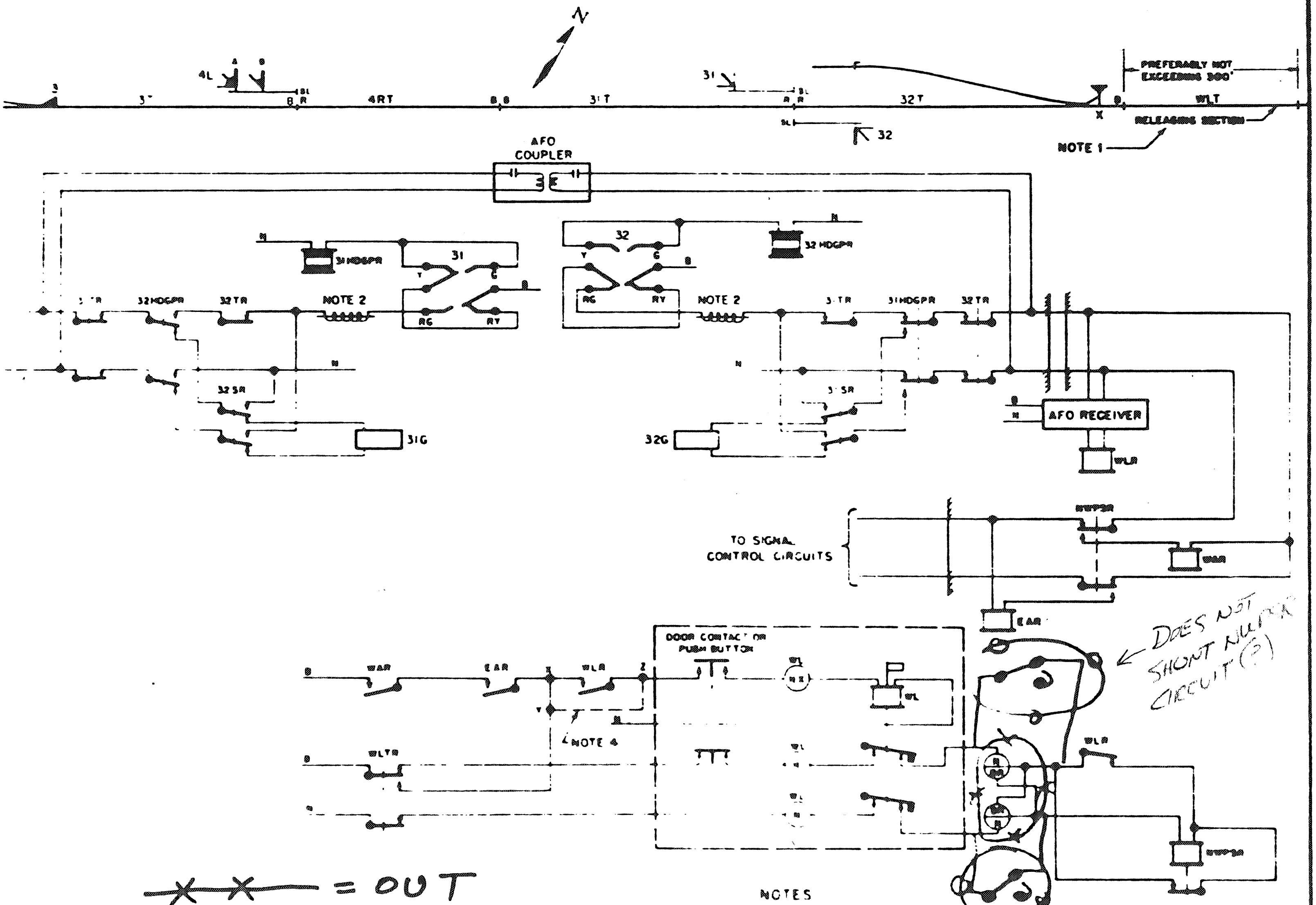
1. EHPR AND WHPR CONTROLS MUST PROVIDE ADEQUATE STOPPING DISTANCE. WHERE CIRCUITS AS SHOWN DO NOT SO PROVIDE APPROPRIATE CONTROLS MUST BE SUBSTITUTED
2. THE USE OF CIRCUIT SCHEME 4, REQUIRES THAT MEANS SHALL BE PROVIDED FOR ESTABLISHING, MAINTAINING AND CHANGING THE DIRECTION OF TRAFFIC BETWEEN STATIONS
3. DIRECTIONAL STICK RELAYS FOR ADJACENT AUTOMATIC SIGNALS SHOULD BE SELECTED AS SHOWN WHERE REQUIRED BY OPERATING CONDITIONS

TYPICAL ELECTRIC SWITCH LOCK CIRCUITS

TIME AND APPROACH LOCKING WITH RELEASING TRACK SECTION
AUTOMATIC OPERATION
TRACK SIGNALED IN BOTH DIRECTIONS

Sheet 1

AAR SIG. SEC. 8C48A



—×—×— = OUT

—O—O— = IN

NOTES

1. RELEASING CIRCUIT MAY BE CONVENTIONAL TRACK CIRCUIT OR AFO WITHOUT INSULATED JOINTS
2. BLOCKING REACTOR
3. LIGHTNING PROTECTION DETAILS NOT SHOWN
4. OPTIONAL CIRCUIT TO RELEASE ELECTRIC SWITCH LOCK WITH TRAIN OR ENGINE AT SWITCH. OMIT CONNECTIONS XY AND CONNECT DASHED CIRCUIT, YZ.
5. COMMUNICATION CIRCUITS SHOULD HAVE ADEQUATE TRANSPOSITION TO PREVENT INTERFERENCE BY AFO CURRENT

ELECTRIC SWITCH LOCK

MANUAL CONTROL, WITH OVERLAY LINE CIRCUITS

AAR SIG SEC. 8048A

OCT 1960

SHEET 2

TYPICAL CIRCUITS FOR SPRING SWITCH AT END OF SIDING, TRACK SIGNALED IN ONE DIRECTION.

The circuits depicted on this plan provide for semi-automatic control of signals for trailing movements over a spring switch.

A direct wire control and indication arrangement is employed.

Signals are cleared by positioning 21 lever to the desired R or L position, and 21RHR or 21LHR are controlled through front and polar contacts of lever repeater 21ZR. The signals are made stick by means of A21TPSR.

The 21RASR provides approach and time locking with two-track circuit release for signal 21R, and 21LASR provides for time locking with two-track circuit release for signal 21L.

The check contact of TER is inserted in the control of 21ZR to check that the TER has returned to its normal position, thereby insuring a full time cycle.

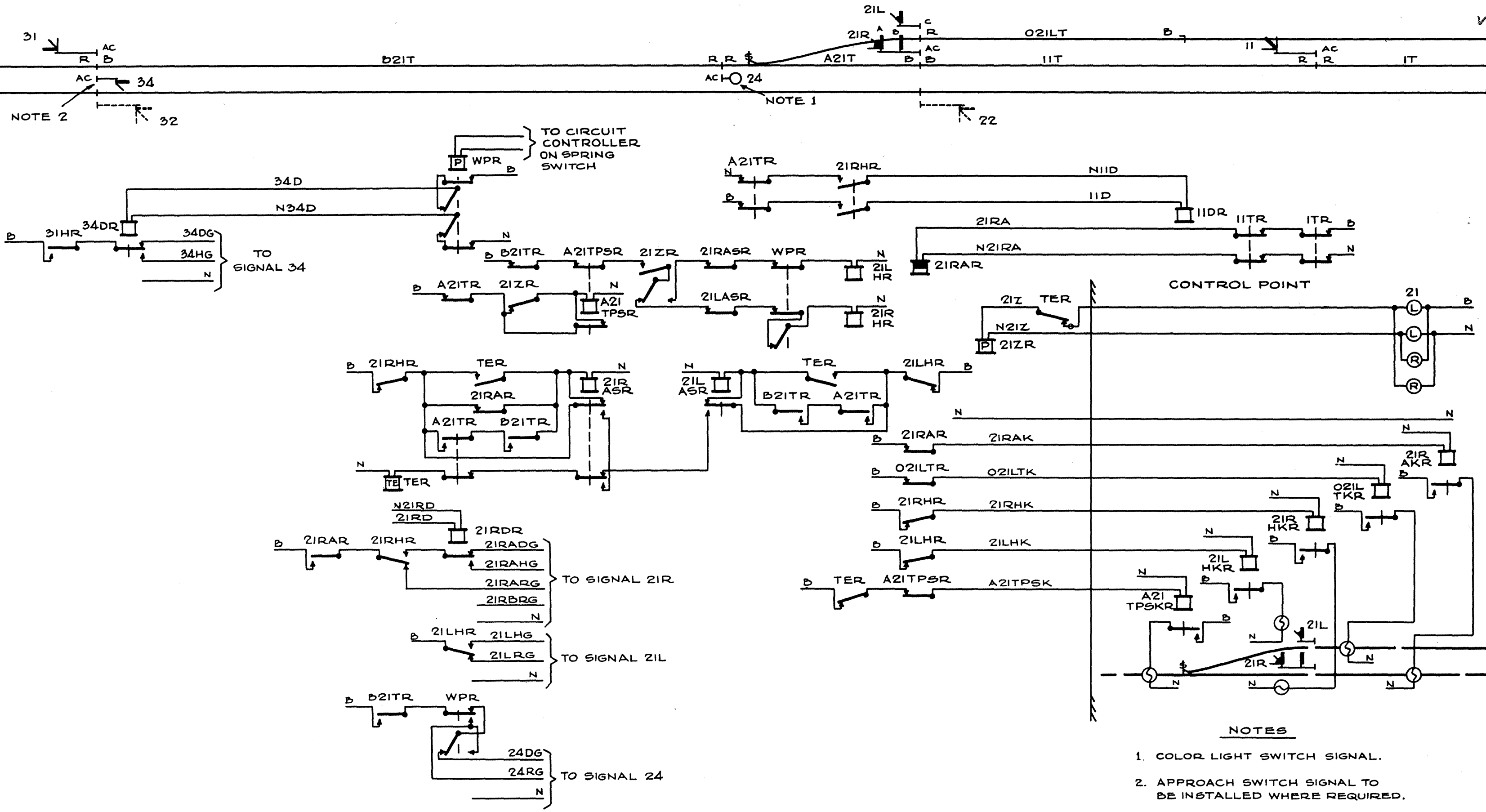
To clear signal 21L, with 21RAR de-energized due to the approach being occupied and signal 21R clear, the signal lever is placed in the L position which de-energizes 21RHR and causes signal 21R to assume a stop aspect. The control circuit for TER is then completed through a back contact of 21RHR, and after the expiration of a predetermined time, 21RASR is energized and 21ZR energized in the reversed position. Then the control circuit for 21LHR is completed.

If signal 21L is cleared and subsequently control lever returned to center position, signal 21R cannot be cleared until after 21LASR is energized by the expiration of a predetermined time interval, as provided by TER.

All signals are approach lighted except signal 21L and 21RB.

Switch signal 24 checks that the switch is normal. An approach switch signal (34) may be installed where required.

To indicate that TER has completed a full cycle, a back contact of TER is inserted in the control of A21TPSKR, which will cause A21 track indication light to be illuminated momentarily.



NOTES

1. COLOR LIGHT SWITCH SIGNAL.
2. APPROACH SWITCH SIGNAL TO BE INSTALLED WHERE REQUIRED.

TYPICAL CIRCUITS FOR SPRING SWITCH AT END OF SIDING

TRACK SIGNALED IN ONE DIRECTION.

SEMI-AUTOMATIC CONTROL OF SIGNALS AT SWITCH.

SEPT. 1950

AAR SIG. SEC. 8049A

ADDENDUM TO AAR SIG. SEC. 8050A

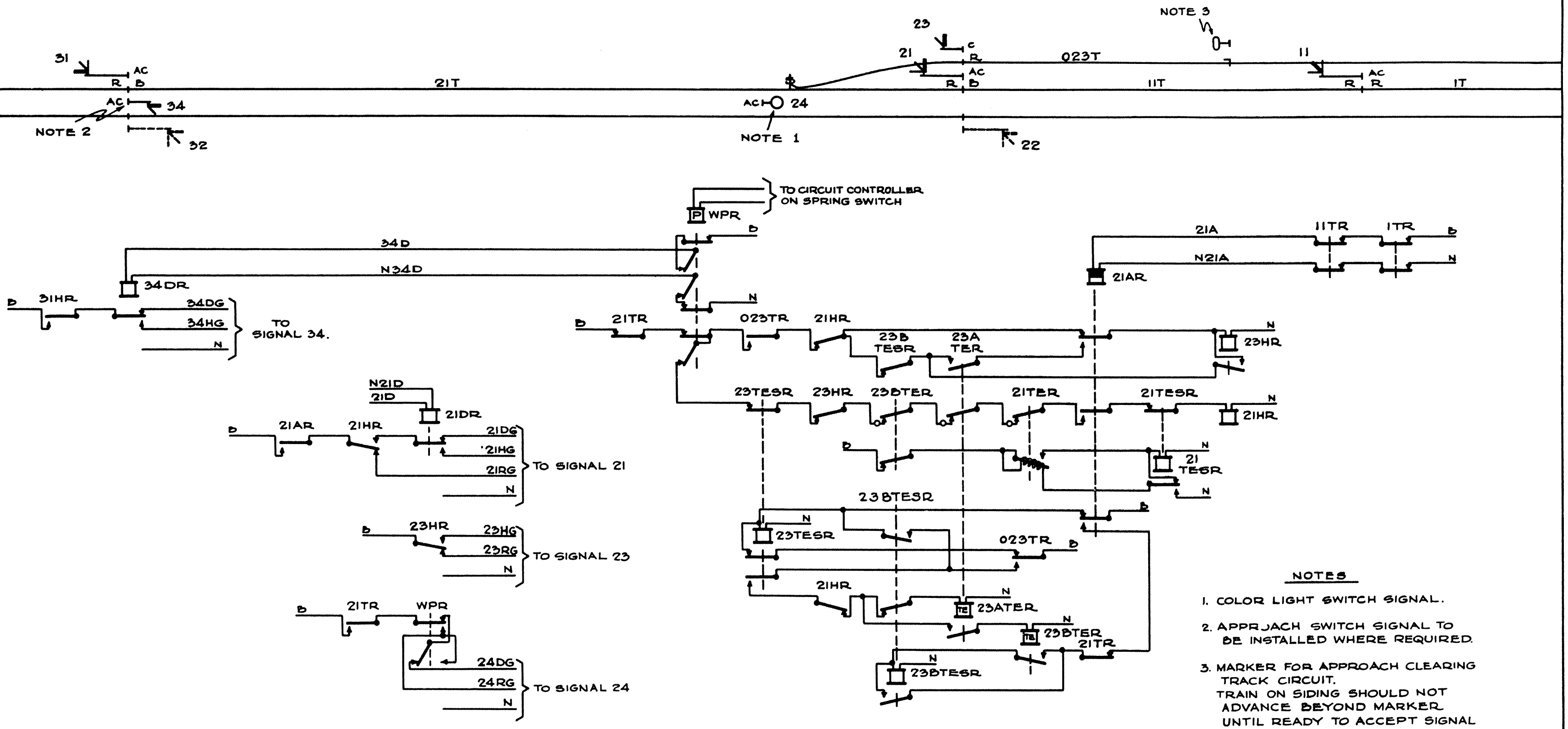
TYPICAL CIRCUITS FOR SPRING SWITCH AT END OF SIDING.

This plan provides a means of signal protection for train movements over a spring switch onto track signaled in one direction.

The 21AR provides approach clearing for signal 21 as well as approach locking for signal 23. The 1T of the 21AR circuit must be of sufficent distance to clear signal 21 and allow signal 11 to display a clear aspect upon the approach of a train.

Circuits are so arranged that occupancy of 023T will approach clear signal 23 if 21 approach is unoccupied.

Should 21 approach be occupied and signal 21 clear, a movement onto 023T will cause signal 21 to assume a stop aspect; after the expiration of a predetermined time 23ATER will pick completing circuit to energize 23HR clearing signal 23. Should the movement not be completed from the siding to the main line and 023T remain occupied for a predetermined time, 23BTER will pick 23BTESR which will release 23HR causing signal 23 to assume a stop aspect. 23BTESR up also provides a pick-up circuit for 23TESR which will release 23ATER and 23BTER. The release of 23BTER provides a circuit to operate 21TER for a predetermined time, allowing 21TESR to pick and thereby energizing 21HR allowing signal 21 to clear for the movement on the main track.



NOTES

1. COLOR LIGHT SWITCH SIGNAL.
2. APPROACH SWITCH SIGNAL TO BE INSTALLED WHERE REQUIRED.
3. MARKER FOR APPROACH CLEARING TRACK CIRCUIT. TRAIN ON SIDING SHOULD NOT ADVANCE BEYOND MARKER UNTIL READY TO ACCEPT SIGNAL 23.

TYPICAL CIRCUITS FOR SPRING SWITCH AT END OF SIDING

TRACK SIGNALED IN ONE DIRECTION

SIGNALS AT SWITCH APPROACH CLEARED — WITH APPROACH LOCKING.

SEPT. 1950

AAR SIG. SEC 8050A

TYPICAL CIRCUITS TO SUPERIMPOSE FOUR-INDICATION CODED CAB SIGNAL CONTROLS ON D.C. TRACK CIRCUITS AT INTERLOCKING.

Cab signals superimposed on interlocking track circuits are usually a part of a cab signal system. In this connection cab signals would also be superimposed on the track circuits approaching and leaving the interlocking in the normal direction of traffic.

Each cab signal indication (Code Rule 281, 282, 285 or 290) is arranged to agree with the aspect displayed by the interlocking home signal as a train passes the signal.

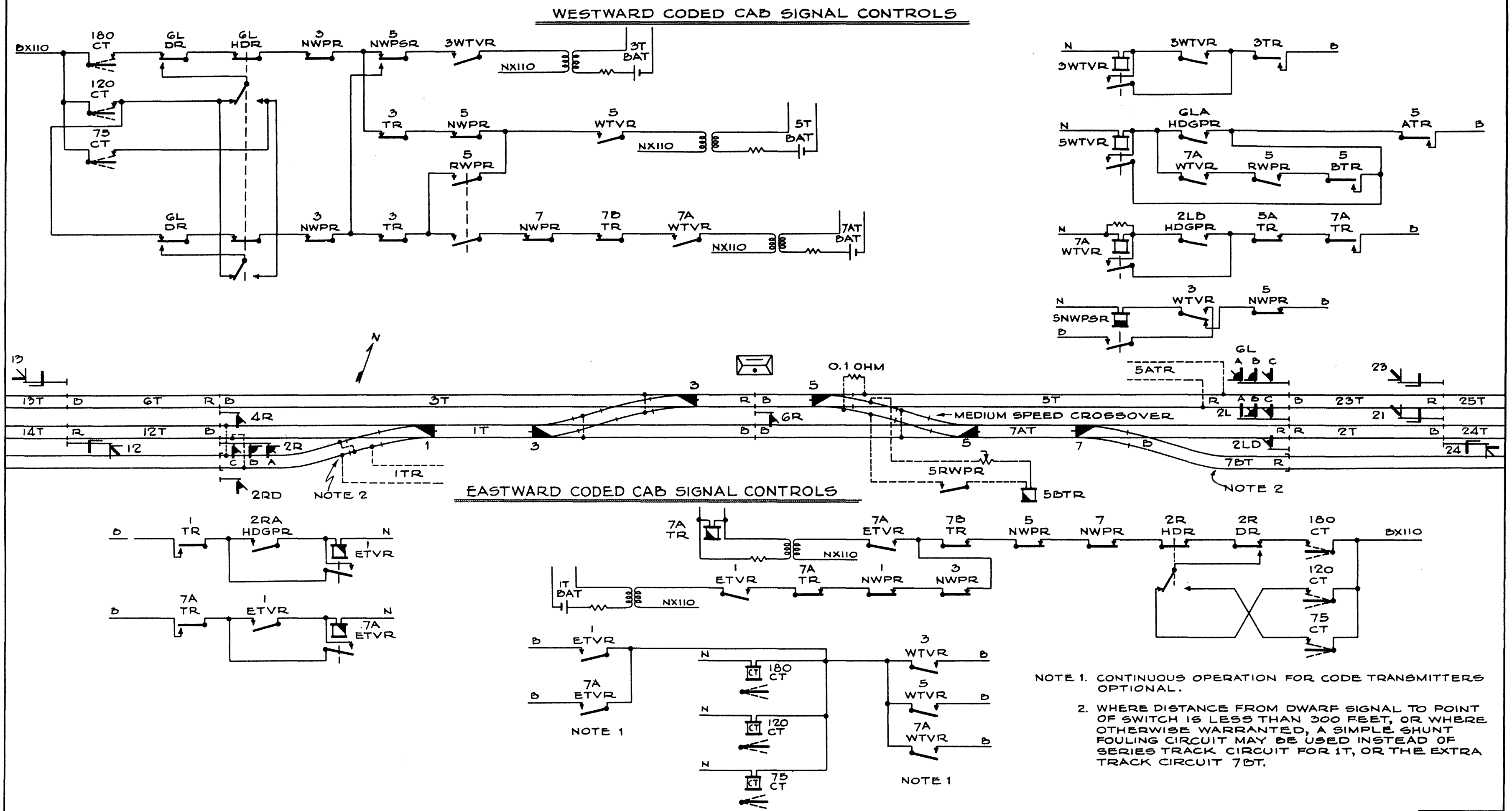
Energizing the V relay connects a.c. energy to the rails. The current is applied at the leaving end of the track circuit and flows down one rail, through the locomotive axle, and returns through the opposite rail. The various cab signal indications are obtained by interrupting the alternating current in the rails at the rate of 75, 120, or 180 cycles per minute.

The energy is inductively coupled with the cab signal apparatus on the locomotive through a receiver mounted over each rail. This energy is amplified and decoded to display the proper indication in the locomotive cab. The absence of a.c. energy or steady (non-coded) a.c. energy will cause a restricting signal to be displayed in the cab of the locomotive.

The frequency of the a.c. energy may vary to meet the requirement of the system. It may come from commercial power, railroad's a.c. source or battery-operated inverter. The inverter may be used as a normal source or as stand-by when the normal a.c. source fails.

Stick V relays are provided so that the cab signal indication will not change to a less restricting indication after a train has passed a home signal displaying an aspect more restricting than Code Rule 285. Relay 5BTR is connected to 5T battery when number 5 crossover is reverse to insure that an unauthorized movement by signal 5L will not pick up the cab signal intended for the train moving over the crossover. The 5NWPSR relay prevents the interruption of the flow of cab signal energy to 3T track circuit by the reversing of 5 switch as a westward train is moving through 3T track circuit.

Track relays are quick-releasing and V relay quick pick-up to reduce the momentary loss of cab signal, as a train moves from one track section to another.



NOTE 1. CONTINUOUS OPERATION FOR CODE TRANSMITTERS OPTIONAL.

2. WHERE DISTANCE FROM DWARF SIGNAL TO POINT OF SWITCH IS LESS THAN 300 FEET, OR WHERE OTHERWISE WARRANTED, A SIMPLE SHUNT FOULING CIRCUIT MAY BE USED INSTEAD OF SERIES TRACK CIRCUIT FOR 1T, OR THE EXTRA TRACK CIRCUIT 7BT.

TYPICAL CIRCUITS TO SUPERIMPOSE FOUR INDICATION CODED CAB SIGNAL CONTROLS ON DC TRACK CIRCUITS AT INTERLOCKING

SEPT. 1950

AAR SIG. SEC. 8051 A

ADDENDUM TO A.A.R. SIG.SEC. 8052

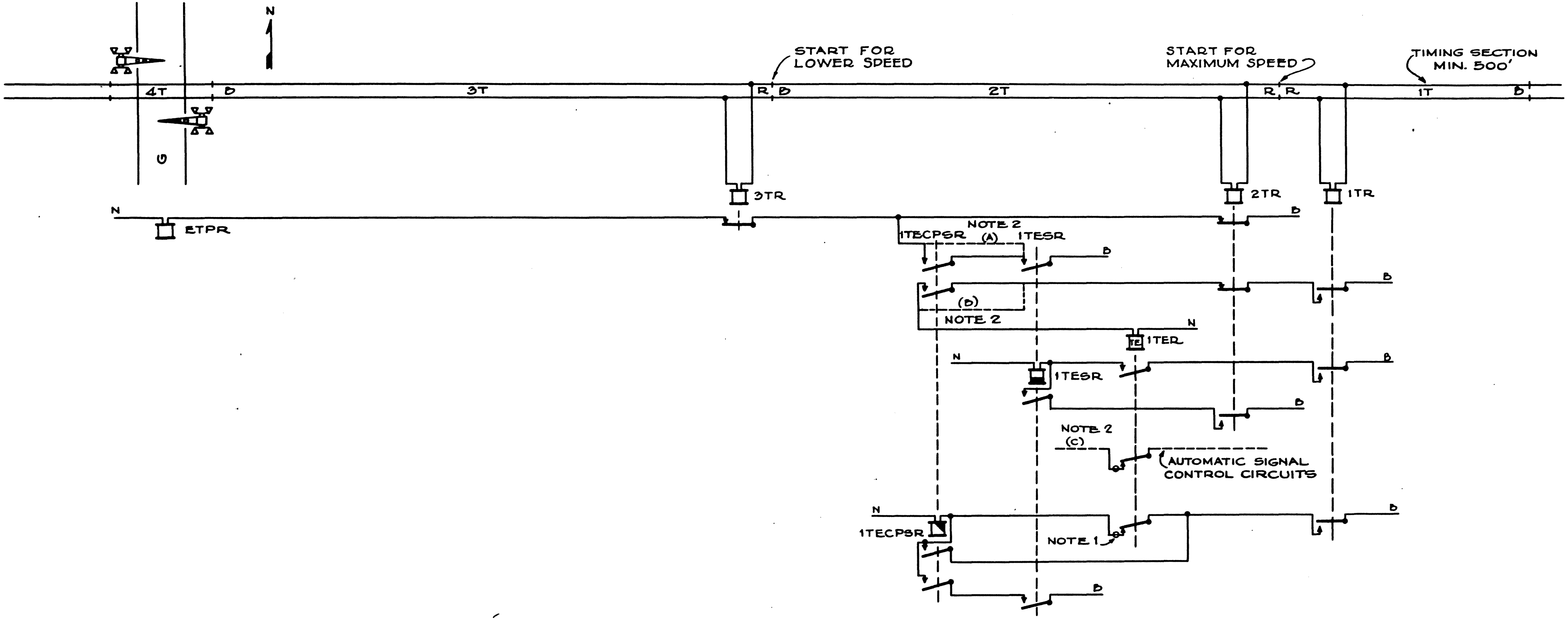
TYPICAL CIRCUITS FOR SELECTIVE SPEED CONTROL FOR AUTOMATIC HIGHWAY CROSSING SIGNAL PROTECTION.

This plan provides a means of reducing the approach warning time of the crossing protection for a slow or medium speed train in high-speed single-direction running territory.

The circuit shown provides a separate start for maximum speed trains and lower speed trains by means of a timing section 1T which initiates the start of a timing relay. This timing section is in approach to the maximum speed start and if a train uses more time moving through this timing section (1T) than the time calculated for such movement by the lower speed train, the timing relay completes its cycle of operation and energy is maintained to the control relay ETPR until train enters 3T track section.

The circuit provides for a complete time cycle for the timing relay by means of the use of the 1TECPSR relay or selection of the roadway signal circuit through the check contact of the timing relay.

When this circuit arrangement is used in non-signaled territory a means of checking the proper operation of 1T track circuit should be provided. Consideration should be given to acceleration, variation in train speeds and reverse running when using this plan.



NOTE 1. CHECKING CONTACT ~~AT~~ 1TER INSURES A COMPLETE TIMING CYCLE FOR FOLLOWING TRAINS.

NOTE 2. IF CHECK REFERRED TO IN NOTE 1 IS NOT REQUIRED, USE CONNECTIONS (A) AND (B), AND CHECK CONTACT SELECTION (C) AND OMIT RELAY 1TECPSR.

TYPICAL CIRCUITS FOR SELECTIVE SPEED CONTROLS

AUTOMATIC HIGHWAY CROSSING SIGNAL PROTECTION

SEPT. 1950

AAR
SIG. SEC.
8052A

ADDENDUM TO AAR SIG. SEC. 8052B - Continued

A time element cut-out circuit is provided for trains standing in the 3T or 4T track circuit with an additional selection of the 4THSR relay through the reverse repeater relay of switch circuit controller on the switch shown in this track section.

The 4THSR, 2TESR and 1TESR stick relays are arranged to pick up directly on receding moves. This will provide crossing protection if a reverse move is required.

The WXR relay for control of the crossing signals for westward moves shows the selection of this relay through the 8TR relay by-passed with a front contact of the 8LASR approach locking relay. This will prevent the crossing signals from operating for a train approaching the crossing in the 8T track section if the 8LA signal has not been cleared.

The 8LHSPR relay circuit is used to make certain that full approach warning time will be provided before the 8LA signal is permitted to clear.

The 7TSR relay circuit is provided to prevent crossing signal operation for a receding move through the 7T track circuit after a westward train movement to a point just west of signal 8R and a return movement eastward on either the main track or siding is to be made.

The signal controls are selected through the respective time element and stick relay back contacts to check that relay contacts return to normal positions before allowing additional moves by signal indication. Consideration should also be given to acceleration or variation in train speeds.

With either plan, the length of the timing sections will depend upon the speeds of trains for which the different speed starts are being provided.

ADDENDUM TO AAR SIG. SEC. 8052B

CONTROL CIRCUITS FOR AUTOMATIC HIGHWAY GRADE CROSSING SIGNALS.

The circuits on Sheet 1 provide a means of reducing the approach warning time of the crossing protection for a slow or medium speed train in high-speed single-direction running territory.

The circuit provides a separate start for maximum speed trains and lower speed trains by means of a timing section 1T which initiates the start of a timing relay. This timing section is in approach to the maximum speed start and if a train uses more time moving through this timing section (1T) than the time calculated for such movement by the lower speed train, the timing relay completes its cycle of operation and energy is maintained to the control relay WXR until train enters 3T track section.

The circuit provides for a complete time cycle for the timing relay by means of the use of the 1TECPSR relay or selection of the roadway signal circuit through the check contact of the timing relay (1TER) and the back contact of the timing stick relay (1TESR).

When this circuit arrangement is used, consideration should be given to acceleration, variation in train speeds and reverse running when using this plan.

Sheet 2 illustrates selective speed control circuits with time and special cut-out features as used in traffic control signal territory or a remote control signal location.

The circuit is arranged to provide a maximum, intermediate or low speed start so as to maintain the approach warning time for the highway crossing protection within reasonable limits for trains operating below maximum speed.

When an eastward train enters advance timing circuit 1T, the 1TZR relay is energized and positive battery is applied to the 1TER timing relay through the front contact of the maximum speed start section relay 2TR and the front contact of the 1TZR relay. If the time of the train passing through the 1T timing section is greater than the time calculated to provide an intermediate speed start, the timing relay will complete its cycle and the 1TESR relay will be energized through a front contact of the 1TER timing relay. The selection of the EXR relay through the front contact of the 2TR relay is then by-passed with a front contact of the 1TESR relay and prevents the crossing signals from operating when train enters the maximum speed start circuit.

In a similar manner, the maximum speed start circuit 2T is used as the timing section for the low speed start. If the train occupies the circuit longer than the time calculated for a low speed start, the 2TER and 2TESR relays will close their front contacts in the same sequence, as explained above for an intermediate speed start, and a front contact of the 2TESR relay by-passes the selection of the EXR relay through the 3TR relay. The crossing signals will then not operate until the train has entered the low speed start circuit, 4T.

ADDENDUM TO AAR SIG. SEC. 8052B - Continued

A time element cut-out circuit is provided for trains standing in the 3T or 4T track circuit with an additional selection of the 4THSR relay through the reverse repeater relay of switch circuit controller on the switch shown in this track section.

The 4THSR, 2TESR and 1TESR stick relays are arranged to pick up directly on receding moves. This will provide crossing protection if a reverse move is required.

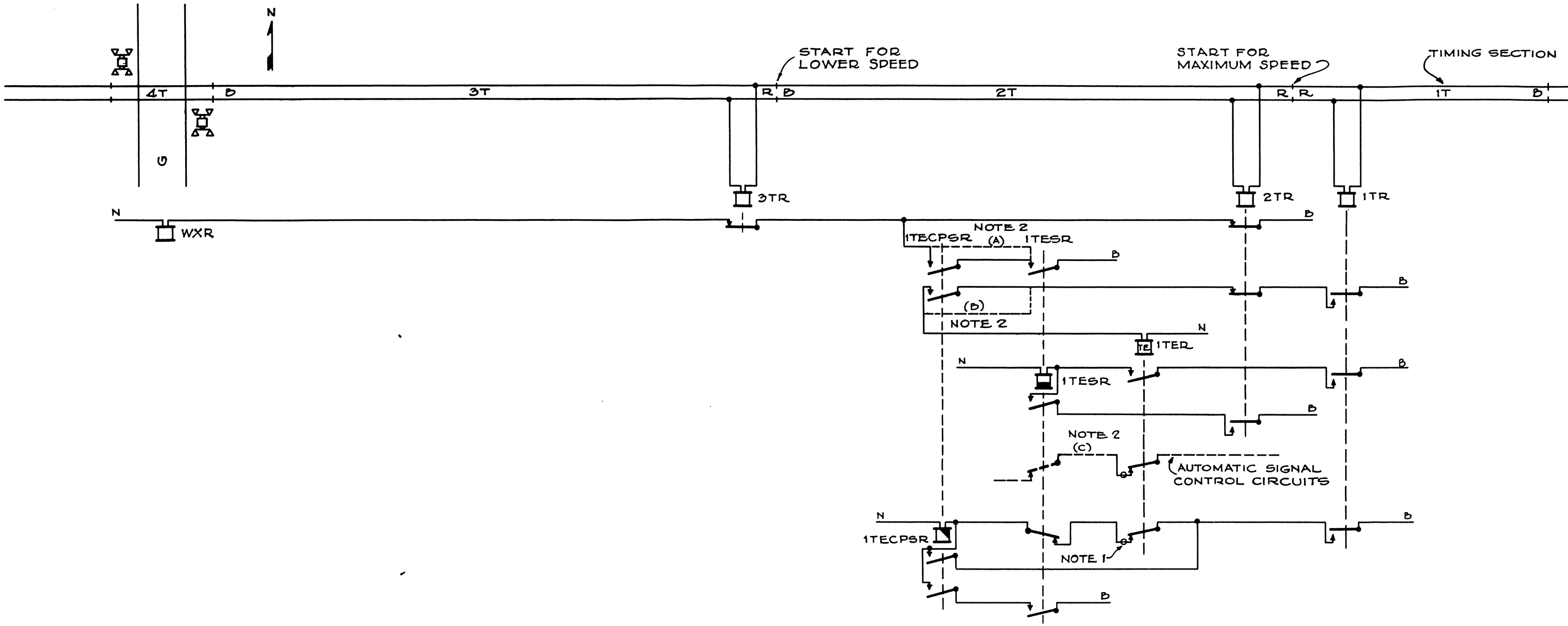
The WXR relay for control of the crossing signals for westward moves shows the selection of this relay through the 8TR relay by-passed with a front contact of the 8LASR approach locking relay. This will prevent the crossing signals from operating for a train approaching the crossing in the 8T track section if the 8LA signal has not been cleared.

The 8LHSPR relay circuit is used to make certain that full approach warning time will be provided before the 8LA signal is permitted to clear.

The 7TSR relay circuit is provided to prevent crossing signal operation for a receding move through the 7T track circuit after a westward train movement to a point just west of signal 8R and a return movement eastward on either the main track or siding is to be made.

The signal controls are selected through the respective time element and stick relay back contacts to check that relay contacts return to normal positions before allowing additional moves by signal indication. Consideration should also be given to acceleration or variation in train speeds.

With either plan, the length of the timing sections will depend upon the speeds of trains for which the different speed starts are being provided.



NOTE 1. CHECKING CONTACT IN 1TER INSURES A COMPLETE TIMING CYCLE FOR FOLLOWING TRAINS.

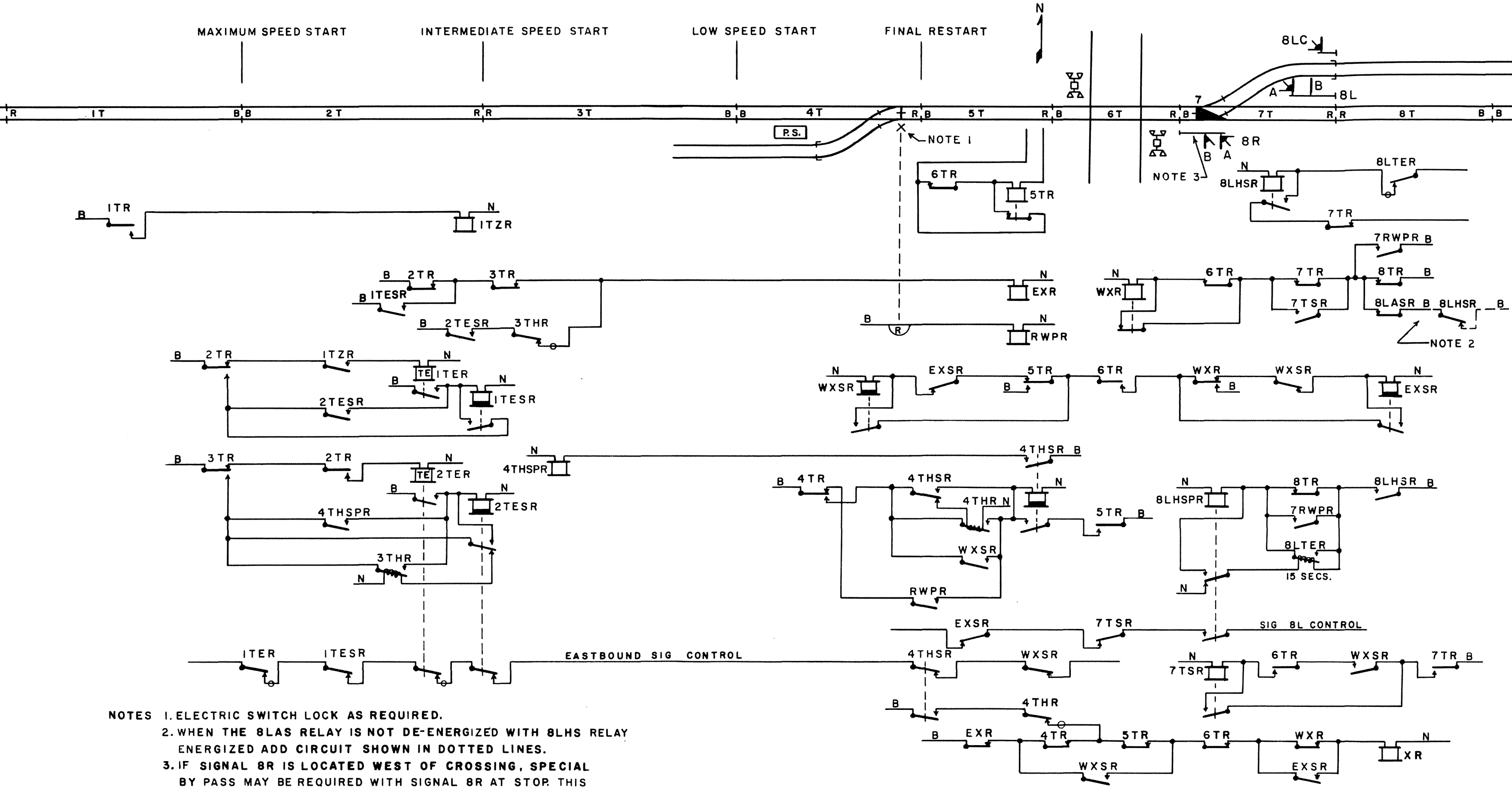
NOTE 2. IF CHECK REFERRED TO IN NOTE 1 IS NOT REQUIRED, USE CONNECTIONS (A) AND (B), AND CHECK CONTACT SELECTION (C) AND OMIT RELAY 1TECPSR.

CONTROL CIRCUITS FOR AUTOMATIC HIGHWAY GRADE CROSSING SIGNALS

ILLUSTRATING MAXIMUM AND LOWER SPEED STARTS

OCT. 1959	SEPT. 1950	AAR SIG.SEC. 8052B

SHEET 1



NOTES
1. ELECTRIC SWITCH LOCK AS REQUIRED.
2. WHEN THE 8LAS RELAY IS NOT DE-ENERGIZED WITH 8LHS RELAY ENERGIZED ADD CIRCUIT SHOWN IN DOTTED LINES.
3. IF SIGNAL 8R IS LOCATED WEST OF CROSSING, SPECIAL BY PASS MAY BE REQUIRED WITH SIGNAL 8R AT STOP. THIS CAN BE PROVIDED SIMILAR TO THAT SHOWN FOR SIG. 8L.

CONTROL CIRCUITS FOR AUTOMATIC HIGHWAY GRADE CROSSING SIGNALS

ILLUSTRATING MAXIMUM, INTERMEDIATE, AND LOW SPEED STARTS WITH TIME AND SPECIAL CUTOUTS

OCT. 1959

AAR SIG. SEC. 8052B

SHEET 2

ADDENDUM TO AAR SIG. SEC. 8052C

CONTROL CIRCUITS FOR AUTOMATIC HIGHWAY GRADE CROSSING SIGNALS

The circuits on Sheet 1 provide a means of reducing the approach warning time of the Highway Grade Crossing Signals for a slow or medium speed train in high-speed single-direction running territory.

The circuit provides a separate start for maximum speed trains and lower speed trains by means of a timing section 1T which initiates the start of a timing relay. This timing section is in approach to the maximum speed start and if a train uses more time moving through this timing section (1T) than the time calculated for such movement, the timing relay completes its cycle of operation and energy is maintained to the control relay WXR until train enters 3T track section.

The circuit provides for a complete time cycle for the timing relay by means of the use of the 1TECPSR relay, or in signal territory, by selection of the roadway signal circuit through the check contact of the timing relay (1TER) and the back contact of the timing stick relay (1TESR).

When these control circuits are used, consideration should be given to acceleration, variation in train speeds and reverse running.

Sheet 2 illustrates selective speed control circuits with time and special cut-out features as used in traffic control signal territory or a remote control signal location.

The circuit is arranged to provide a maximum, intermediate or low speed start so as to maintain the approach warning time of the highway grade crossing signals within reasonable limits for trains operating below maximum speed.

When an eastward train enters advance timing circuit 1T, the 1TZR relay is energized and positive battery is applied to the 1TER timing relay through the front contact of the maximum speed start section relay 2TR and the front contact of the 1TZR relay. If the time of the train passing through the 1T timing section is greater than the time calculated to provide an intermediate speed start, the timing relay will complete its cycle and the 1TESR relay will be energized through a front contact of the 1TER timing relay. The selection of the EXR relay through the front contact of the 2TR relay is then by-passed with a front contact of the 1TESR relay and prevents the crossing signals from operating when train enters the maximum speed start circuit.

In a similar manner, the maximum speed start circuit 2T is used as the timing section for the low speed start. If the train occupies the circuit longer than the time calculated for a low speed start, the 2TER and 2TESR relays will close their front contacts in the same sequence, as explained above for an intermediate speed start, and a front contact of the 2TESR relay by-passes the selection of the EXR relay through the 3TR relay. The crossing signals will then not operate until the train has entered the low speed start circuit, 4T.

A time element cut-out circuit is provided for trains standing in the 3T or 4T track circuit with an additional selection of the 4THSR relay through the reverse repeater relay of switch circuit controller on the switch shown in this track section.

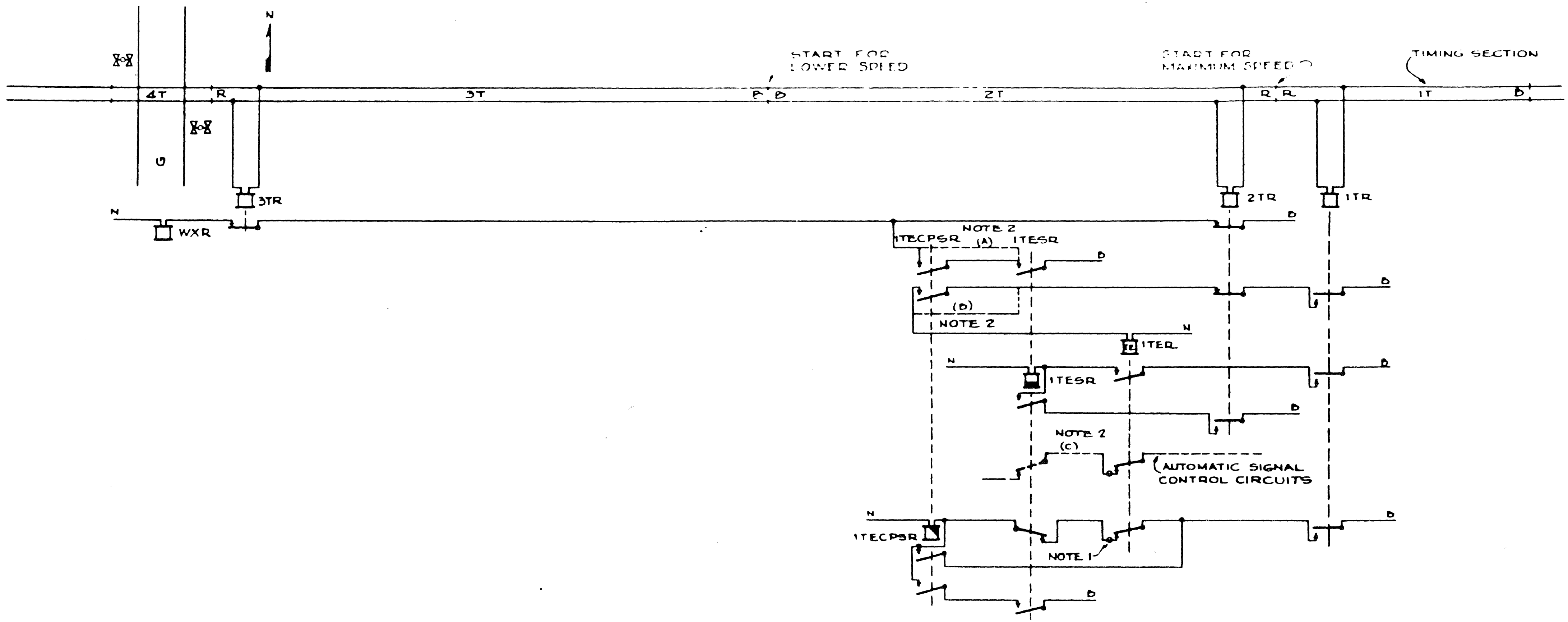
The 4THSR, 2TESR and 1TESR stick relays are arranged to pick up directly on receding moves. This will provide crossing signal operation if a reverse move is required.

The WXR relay for control of the crossing signals for westward moves shows the selection of this relay through the 8TR relay by-passed with a front contact of the 8LASR approach locking relay. This will prevent the crossing signals from operating for a train approaching the crossing in the 8T track section if the 8LA signal has not been cleared.

The 8LHSPR relay circuit is used to make certain that full approach warning time will be provided before the 8LA signal is permitted to clear.

The 7TSR relay circuit is provided to prevent crossing signal operation for a receding move through the 7T track circuit after a westward train movement to a point just west of signal 8R and a return movement eastward on either the main track or siding is to be made.

The signal controls are selected through the respective time element and stick relay back contacts to check that relay contacts return to normal positions before allowing additional moves by signal indication. Consideration should also be given to acceleration or variation in train speeds.



NOTE 1 CHECKING CONTACT IN 1TER INSURES A COMPLETE TIMING CYCLE FOR FOLLOWING TRAINS

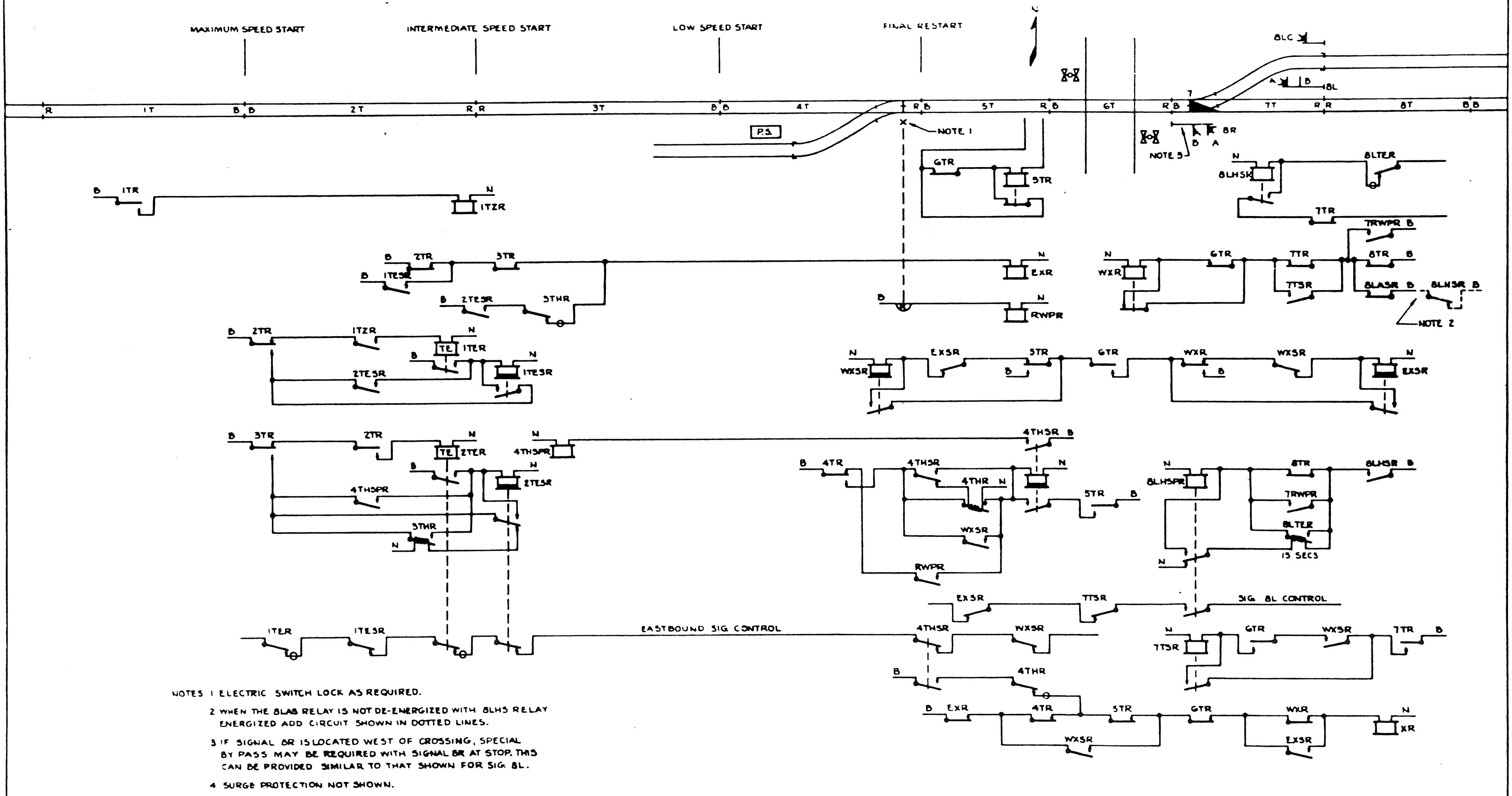
NOTE 2 IF CHECK REFERRED TO IN NOTE 1 IS NOT REQUIRED, USE CONNECTIONS (A) AND (B), AND CHECK CONTACT SELECTION (C) AND OMIT RELAY 1TECPSR

NOTE 3 SURGE PROTECTION NOT SHOWN.

CONTROL CIRCUITS FOR AUTOMATIC HIGHWAY GRADE CROSSING SIGNALS

ILLUSTRATING MAXIMUM AND LOWER SPEED STARTS

OCT 1971	OCT 1959	SEPT. 1950	AAR SIG. SEC. 8052C



NOTES 1 ELECTRIC SWITCH LOCK AS REQUIRED.

2 WHEN THE 8LAS RELAY IS NOT DE-ENERGIZED WITH 8LHS RELAY ENERGIZED ADD CIRCUIT SHOWN IN DOTTED LINES.

3 IF SIGNAL 8R IS LOCATED WEST OF CROSSING, SPECIAL BY PASS MAY BE REQUIRED WITH SIGNAL 8R AT STOP. THIS CAN BE PROVIDED SIMILAR TO THAT SHOWN FOR SIG. 8L.

4 SURGE PROTECTION NOT SHOWN.

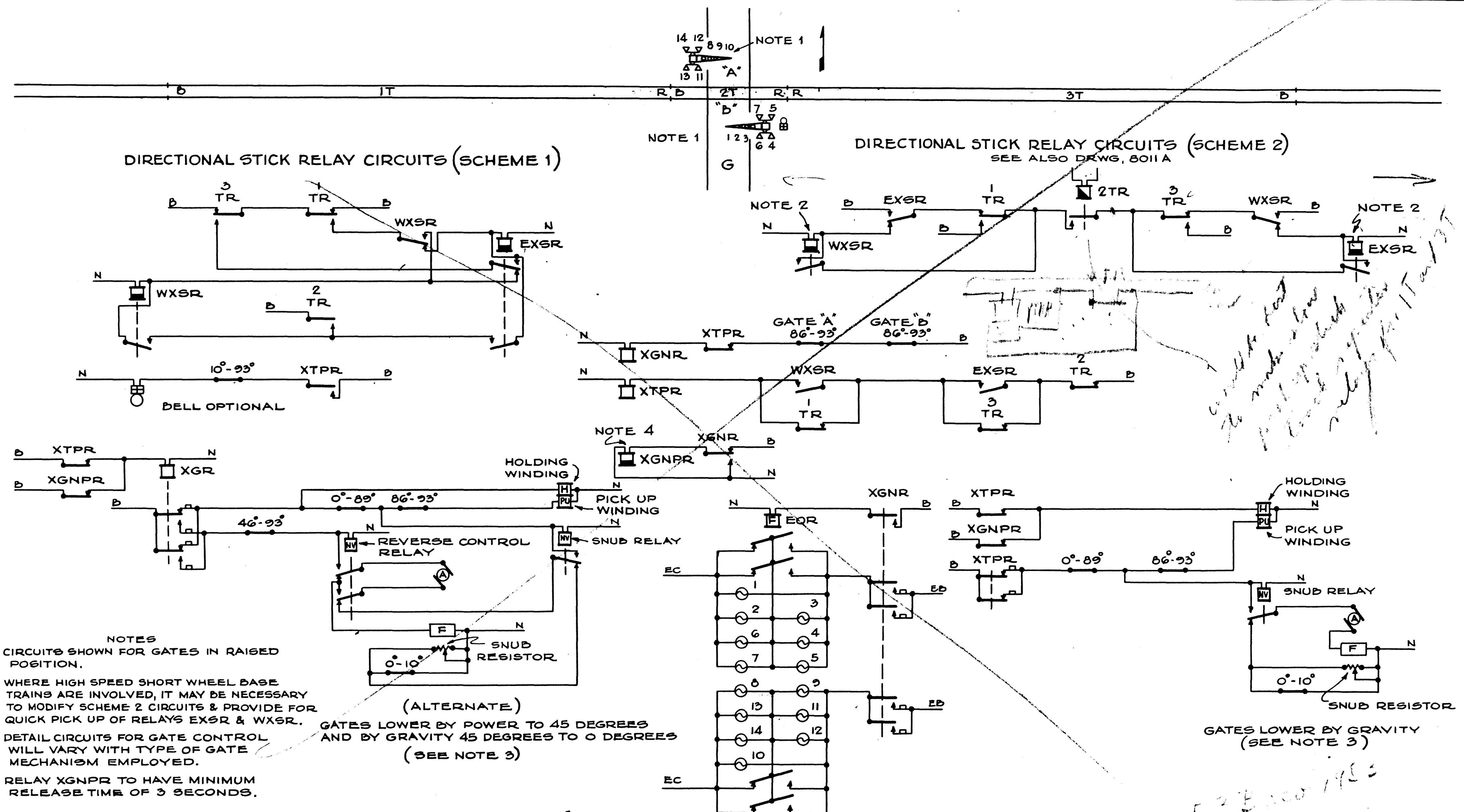
CONTROL CIRCUITS FOR AUTOMATIC HIGHWAY GRADE CROSSING SIGNALS

ILLUSTRATING MAXIMUM, INTERMEDIATE, AND LOW SPEED STARTS WITH TIME AND SPECIAL CUTOUTS

OCT. 1971 | OCT 1959

AAR SIG. SEC. 8052C

SHEET 2 OF 2



NOTES

1. CIRCUITS SHOWN FOR GATES IN RAISED POSITION.
2. WHERE HIGH SPEED SHORT WHEEL BASE TRAINS ARE INVOLVED, IT MAY BE NECESSARY TO MODIFY SCHEME 2 CIRCUITS & PROVIDE FOR QUICK PICK UP OF RELAYS EXSR & WXSR.
3. DETAIL CIRCUITS FOR GATE CONTROL WILL VARY WITH TYPE OF GATE MECHANISM EMPLOYED.
4. RELAY XGNPR TO HAVE MINIMUM RELEASE TIME OF 3 SECONDS.

TYPICAL CIRCUITS FOR AUTOMATIC HIGHWAY CROSSING GATES

SEPT. 1950

AAR SIG. SEC. 8053A

TYPICAL CIRCUITS FOR AUTOMATIC HIGHWAY CROSSING GATES.

Typical circuits show basic requirements to automatically control highway crossing gates with flashing light signals.

Approach track circuits 1T and 3T must be of sufficient length to provide adequate warning for the fastest train to be operated over the crossing.

XTPR is the control relay and checks the approaches and center track section, with the approach track relays being by-passed by front contacts of their respective directional stick relays.

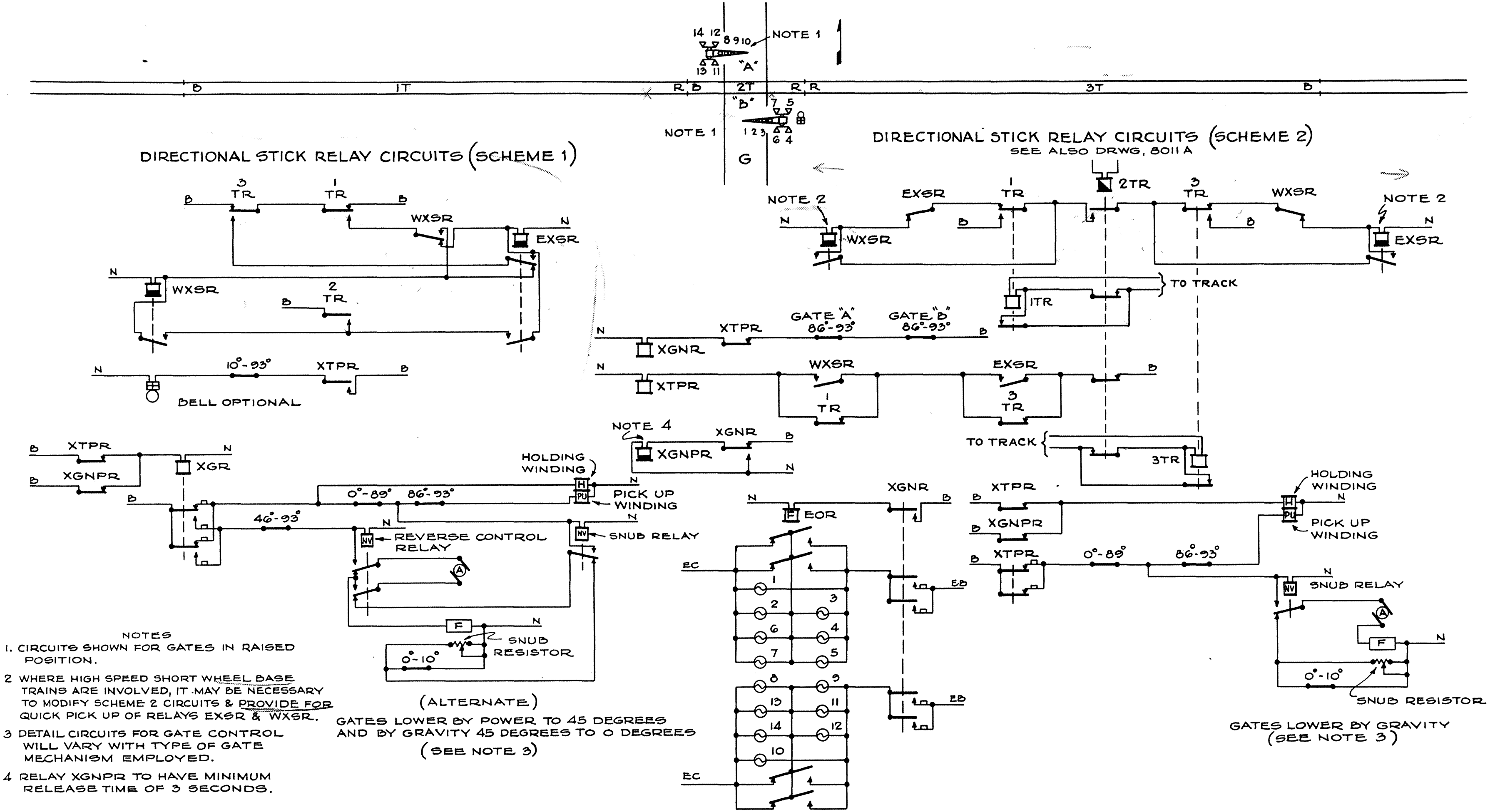
A train entering either track circuit 1T or 3T, de-energizes XTPR which in turn de-energizes flashing light control relay XGNR. XGNR also checks the gate arms to provide operation of the flashing light signals until the gates are in their normally raised position.

Slow release gate control relay XGNPR provides prewarning time after the flashing lights and bell begin to operate before the gates start to descend. The shunt circuit through back contacts of XGNR provides a longer release time for XGNPR.

XTPR, when de-energized, operates the bell until the gates are 10 degrees from the horizontal. XGNR, when de-energized, operates the flashing light relay EOR. All lights are arranged to flash in unison with respect to their relative location. The two inside lights on each gate arm flash in unison with the mast-mounted flashing light signals while the tip light burns steady. Relays XGNR, XGR and XTPR are provided with high current contacts.

When XGNPR releases, the holding winding in the gate mechanism is de-energized, allowing the gates to descend by gravity. An alternate circuit is shown to lower the gates by power to 45 degrees. For the power down arrangement, relay XGR energizes reverse control relay to operate the gate motor to drive the gate down. The snub relay is de-energized to provide dynamic motor braking when the gate is descending by gravity and is adjustable by snub resistor. Full dynamic braking is applied from 10 to 40 degrees.

Two schemes are shown to provide control of the directional stick relays: Scheme 1 provides for energizing the receding directional stick relay at the time the train enters the approach control circuit and the receding control circuit is unoccupied. Directional stick relays are slow release to bridge the open circuit time that may be caused by relay contact transfer time and momentary loss of shunt. Scheme 2 provides for energizing the receding directional stick relay at the time the train enters the center track section 2T with the approach control circuit occupied and the receding control circuit unoccupied. Directional stick relays are slow release to provide bridging time as mentioned for scheme 1. For scheme 2 the approach relay remains de-energized by 2TR to hold the directional stick relay when a short train or engine occupies only section 2T. Relay 2TR should be quick release to insure pick-up of the directional stick relay with a fast short train or engine movement.



NOTES

1. CIRCUITS SHOWN FOR GATES IN RAISED POSITION.
2. WHERE HIGH SPEED SHORT WHEEL BASE TRAINS ARE INVOLVED, IT MAY BE NECESSARY TO MODIFY SCHEME 2 CIRCUITS & PROVIDE FOR QUICK PICK UP OF RELAYS EXSR & WXSR.
3. DETAIL CIRCUITS FOR GATE CONTROL WILL VARY WITH TYPE OF GATE MECHANISM EMPLOYED.
4. RELAY XGNPR TO HAVE MINIMUM RELEASE TIME OF 3 SECONDS.

TYPICAL CIRCUITS FOR AUTOMATIC HIGHWAY CROSSING GATES

SEPT. 1953	SEPT. 1950	AAR SIG. SEC. 8053B

ADDENDUM TO AAR SIG. SEC. 8053C

TYPICAL CIRCUITS FOR AUTOMATIC HIGHWAY CROSSING GATES.

Typical circuits show basic requirements to automatically control highway crossing gates with flashing light signals.

Approach track circuits 1T and 3T must be of sufficient length to provide adequate warning for the fastest train to be operated over the crossing.

XTPR is the control relay and checks the approaches and center track section, with the approach track relays being bypassed by front contacts of their respective directional stick relays.

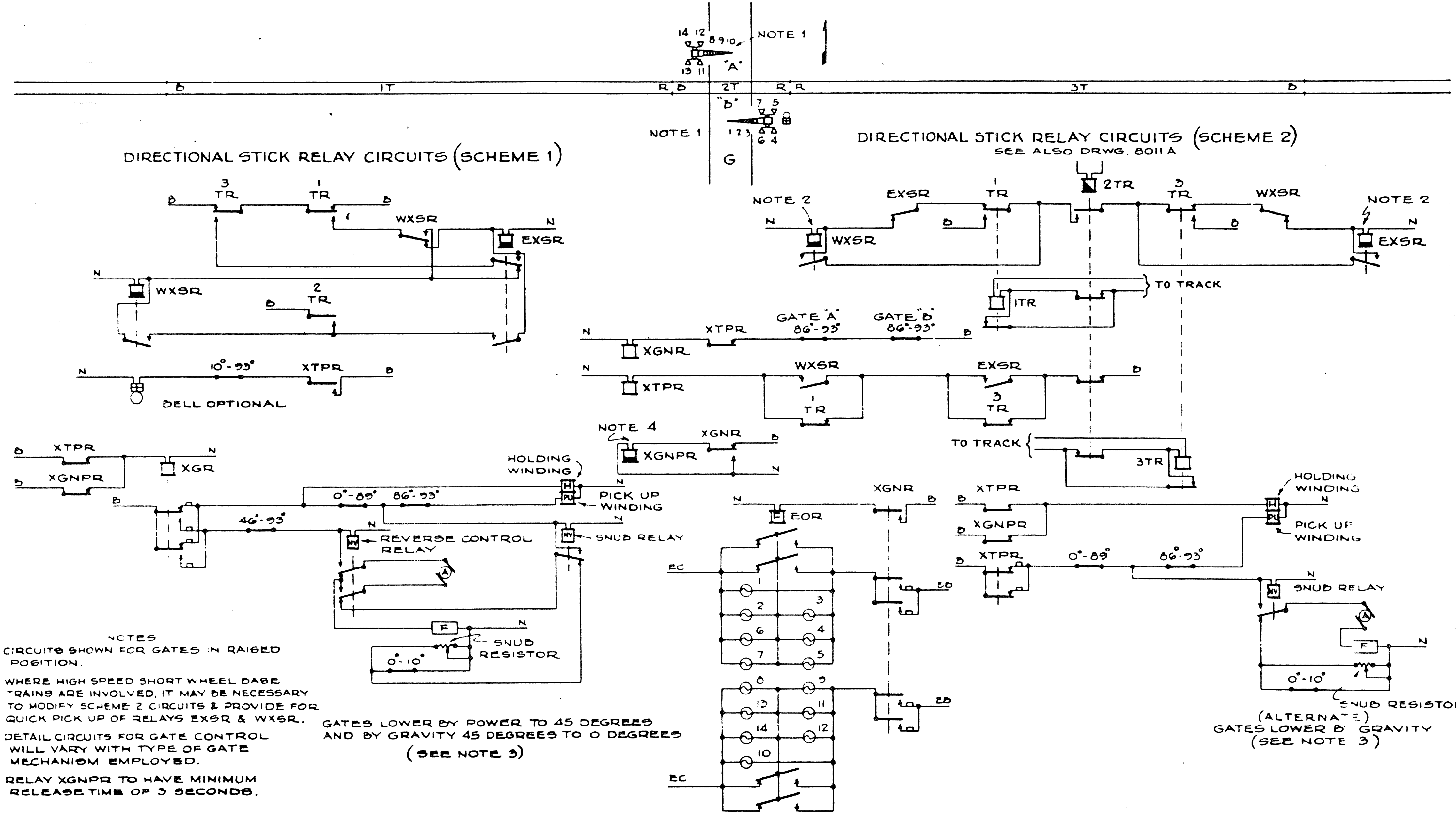
A train entering either track circuit 1T or 3T, de-energizes XTPR which in turn de-energizes flashing light control relay XGNR. XGNR also checks the gate arms to provide operation of the flashing light signals until the gates are in their normally raised position.

Slow release gate control relay XGNPR provides prewarning time after the flashing lights and bell begin to operate before the gates start to descend. The shunt circuit through back contacts of XGNR provides a longer release time for XGNPR.

XTPR, when de-energized, operates the bell until the gates are 10 degrees from the horizontal. XGNR, when de-energized, operates the flashing light relay EOR. All lights are arranged to flash in unison with respect to their relative location. The two inside lights on each gate arm flash in unison with the mast-mounted flashing light signals while the tip light burns steady. Relays XGNR, XGR and XTPR are provided with high current contacts.

When XGNPR releases, the holding winding in the gate mechanism is de-energized, allowing the gates to descend. For the power down arrangement, relay XGR energizes reverse control relay to operate the gate motor to drive the gate down to 45 degrees. The snub relay is de-energized to provide dynamic motor braking when the gate is descending by gravity and is adjustable by snub resistor. Full dynamic braking is applied from 10 to 0 degrees. An Alternate Circuit is Shown Allowing the Gates to Descend by Gravity Only.

Two schemes are shown to provide control of the directional stick relays: Scheme 1 provides for energizing the receding directional stick relay at the time the train enters the approach control circuit and the receding control circuit is unoccupied. Directional stick relays are slow release to bridge the open circuit time that may be caused by relay contact transfer time and momentary loss of shunt. Scheme 2 provides for energizing the receding directional stick relay at the time the train enters the center track section 2T with the approach control circuit occupied and the receding control circuit unoccupied. Directional stick relays are slow release to provide bridging time as mentioned for Scheme 1. For Scheme 2 the approach relay remains de-energized by 2TR to hold the directional stick relay when a short train or engine occupies only section 2T. Relay 2TR should be quick release to insure pick-up of the directional stick relay with a fast short train or engine movement.



NOTES

1. CIRCUITS SHOWN FOR GATES IN RAISED POSITION.
2. WHERE HIGH SPEED SHORT WHEEL BASE TRAINS ARE INVOLVED, IT MAY BE NECESSARY TO MODIFY SCHEME 2 CIRCUITS & PROVIDE FOR QUICK PICK UP OF RELAYS EXSR & WXSR.
3. DETAIL CIRCUITS FOR GATE CONTROL WILL VARY WITH TYPE OF GATE MECHANISM EMPLOYED.
4. RELAY XGNPR TO HAVE MINIMUM RELEASE TIME OF 3 SECONDS.

TYPICAL CIRCUITS FOR AUTOMATIC HIGHWAY CROSSING GATES

SEPT. 1970	SEPT 1953	SEPT 1950	AAR SIG. SEC. 8053C

TYPICAL CIRCUITS FOR ELECTRIC SEMAPHORE AND COLOR LIGHT TRAIN ORDER SIGNALS.

These circuits illustrate means of controlling and indicating the position of various types of train order signals.

Figure 1, searchlight type, illustrates the use of a light out relay in series with the signal lamp. The indicating lights are controlled through contacts of the signal mechanism. A contact of the LOR in the control of the indicating lights will cause these lights to be dark in the event the signal lamp is burned out.

Figure 2, unit light type, has the control lever contact, indication light and signal lamp in series. A failure of a signal lamp will extinguish the corresponding indication light. Resistance units in multiple with the indication lights will allow the signal lamp to remain illuminated in the event of a burned out indication light.

Figure 3, electric semaphore type, uses the same basic circuit for light out detection and indication purposes as the searchlight type, Fig. 1. A switch is provided for the control of the signal lamp and can also be used to obtain an indication of the position of the semaphore signal when the signal light is not being displayed.

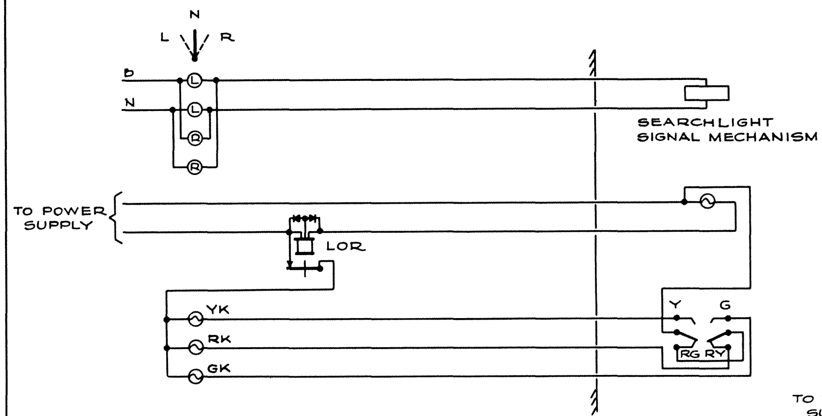


FIG.1 - SEARCHLIGHT TYPE

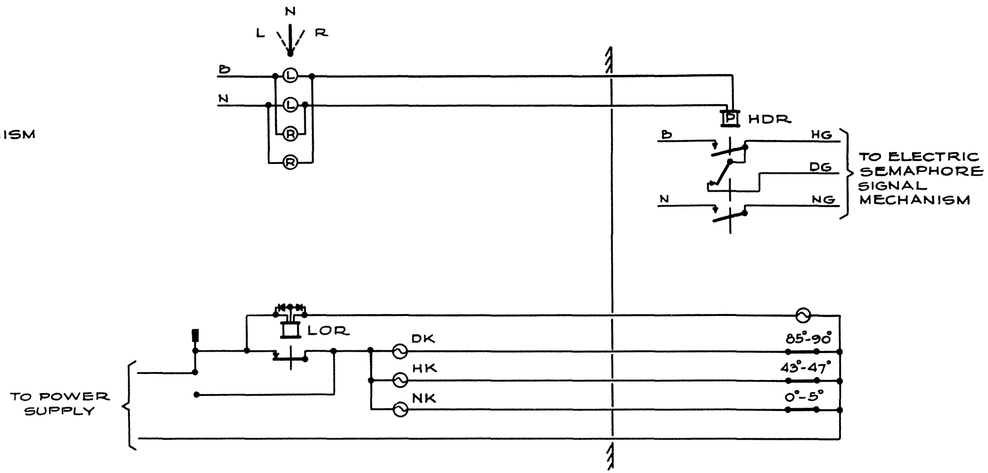


FIG. 3 - ELECTRIC SEMAPHORE SIGNAL

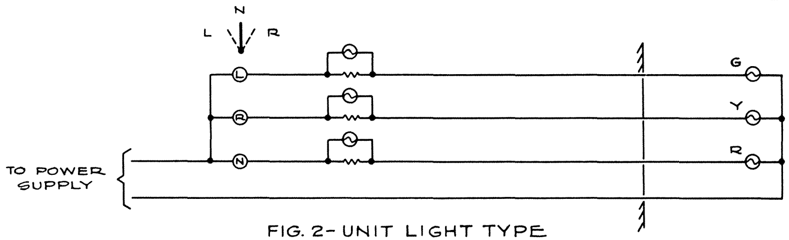


FIG. 2 - UNIT LIGHT TYPE

TYPICAL CIRCUITS FOR ELECTRIC SEMAPHORE AND COLORLIGHT TRAIN ORDER SIGNALS

SEPT. 1950

AAR
SIG. SEC.
8054A

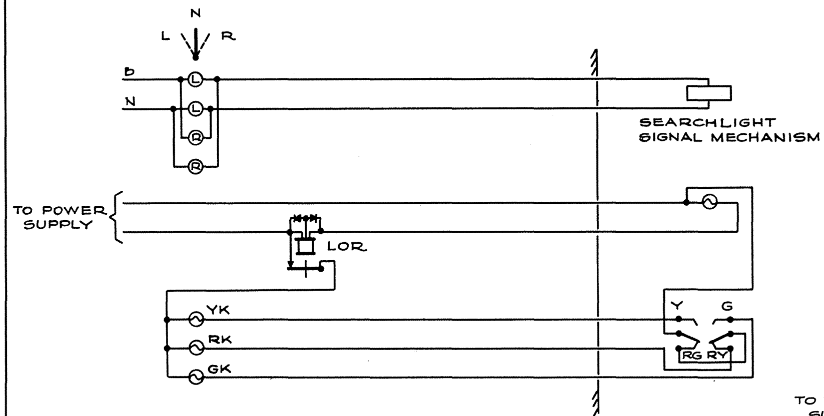


FIG. 1 - SEARCHLIGHT TYPE

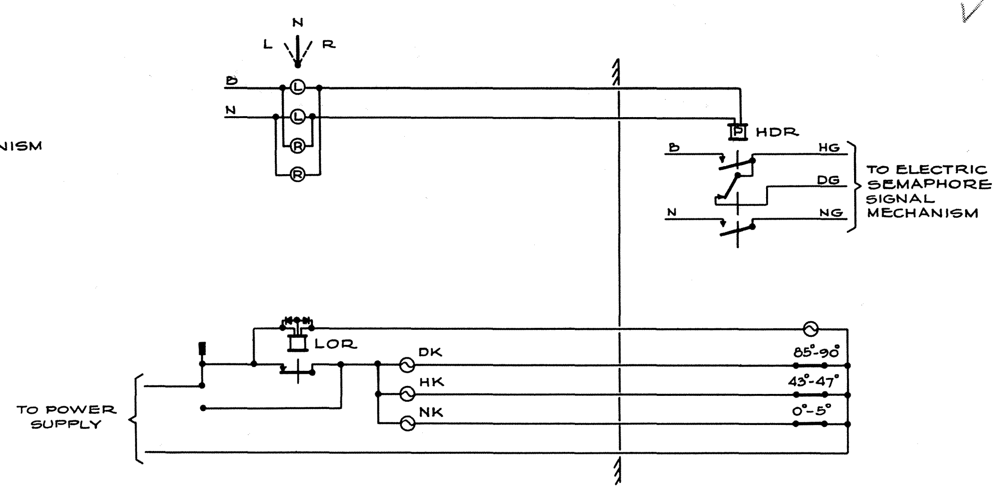


FIG. 3 - ELECTRIC SEMAPHORE SIGNAL

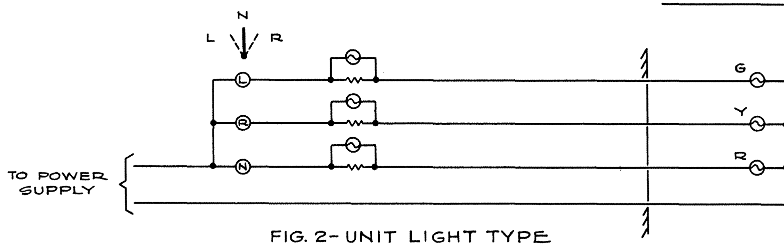


FIG. 2 - UNIT LIGHT TYPE

TYPICAL CIRCUITS FOR ELECTRIC SEMAPHORE AND COLORLIGHT TRAIN ORDER SIGNALS

SEPT. 1950

AAR SIG. SEC. 8054A

ADDENDUM TO A.A.R. SIG.SEC. 8055A

TYPICAL RELAY TYPE INTERLOCKING CIRCUITS.

This is a coded remote control system with the functions individually controlled. The signals are semi-automatic stick with the restricting signals controlled through the first track section only.

Route check network circuits are not provided in the control machine. Field circuits prevent storage of switch control. Storage of signal control is permitted. Indication circuits indicate track occupancy, switch position, signal clear, signal stop, and signal in time.

A "call on" function is provided for high signal movements when the interlocking section is unoccupied and the advance section occupied. The "call" function is also required for movements against normal traffic.

If trains are blocked at this remote location additional circuits are required.

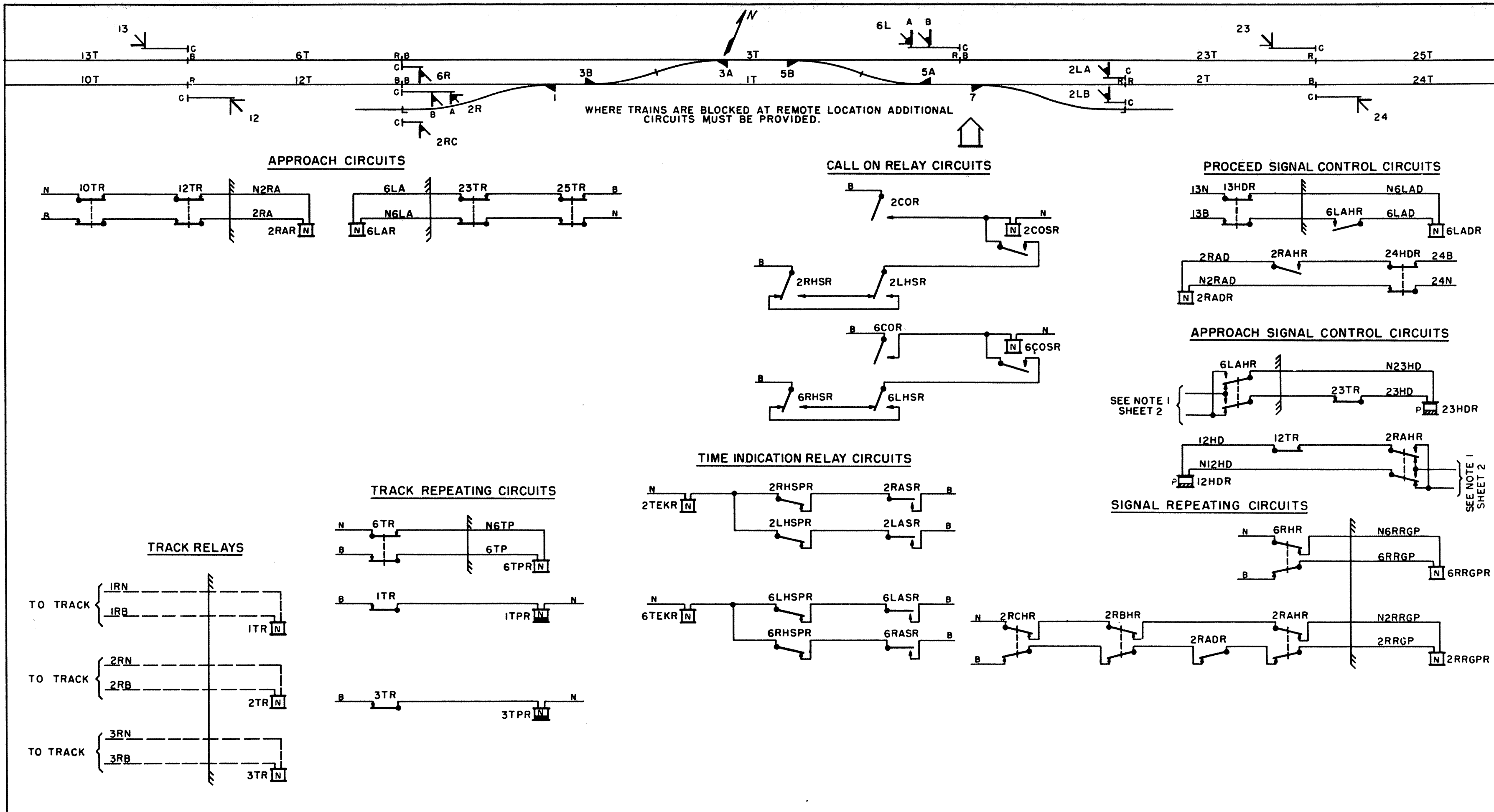
Switches are controlled by polar switch relays. Switch position and correspondence with control relay is provided by neutral relays. Route locking with sectional release of switches is provided. Approach locking is arranged for high signals only.

Signal and switch operation begins with the function control relays shown on Sheet 4. Switch function relays 1WSR, 3WSR, 5WSR and 7WSR are polar stick and remain in the last coded position until a code impulse is received to pole the relay to the oposite position.

The signal function relays 2RHSR, 2LHSR, 6RHSR and 6LHSR operate in a similar manner except that one coil is used to reset the relay to normal position after each train movement. This is accomplished by energy over its own polar reverse contact and an impulse from a back contact of the track relay and a front contact of the slow releasing track repeater relay. Operation of "call on" function relays 2COR and 6COR is similar to signal function relays.

Indication code starting circuits provide for initiation of a code and contacts in the indication circuits determine the character of the code. These circuits are also shown on Sheet 4.

The route check network shown on Sheet 2 is a non-stick neutral circuit and checks that switches are in position and in correspondence with control relays, that track circuits in the route are unoccupied and that opposing signals are at stop and not in time. For example, on Sheet 3, a back contact of the route check relay 2RHSPR would open the control for approach and time locking relay 2RASR. A front contact of 2RASR would open the control for switch locking relay 3-5LR. ~~Back~~ Front contacts of switch locking relays also open the control to switch function relays, Sheet 4. Thus an inadvertent sending of a code calling for a switch in an opposite position would not interfere with a previously cleared signal.



TYPICAL RELAY TYPE INTERLOCKING CIRCUITS

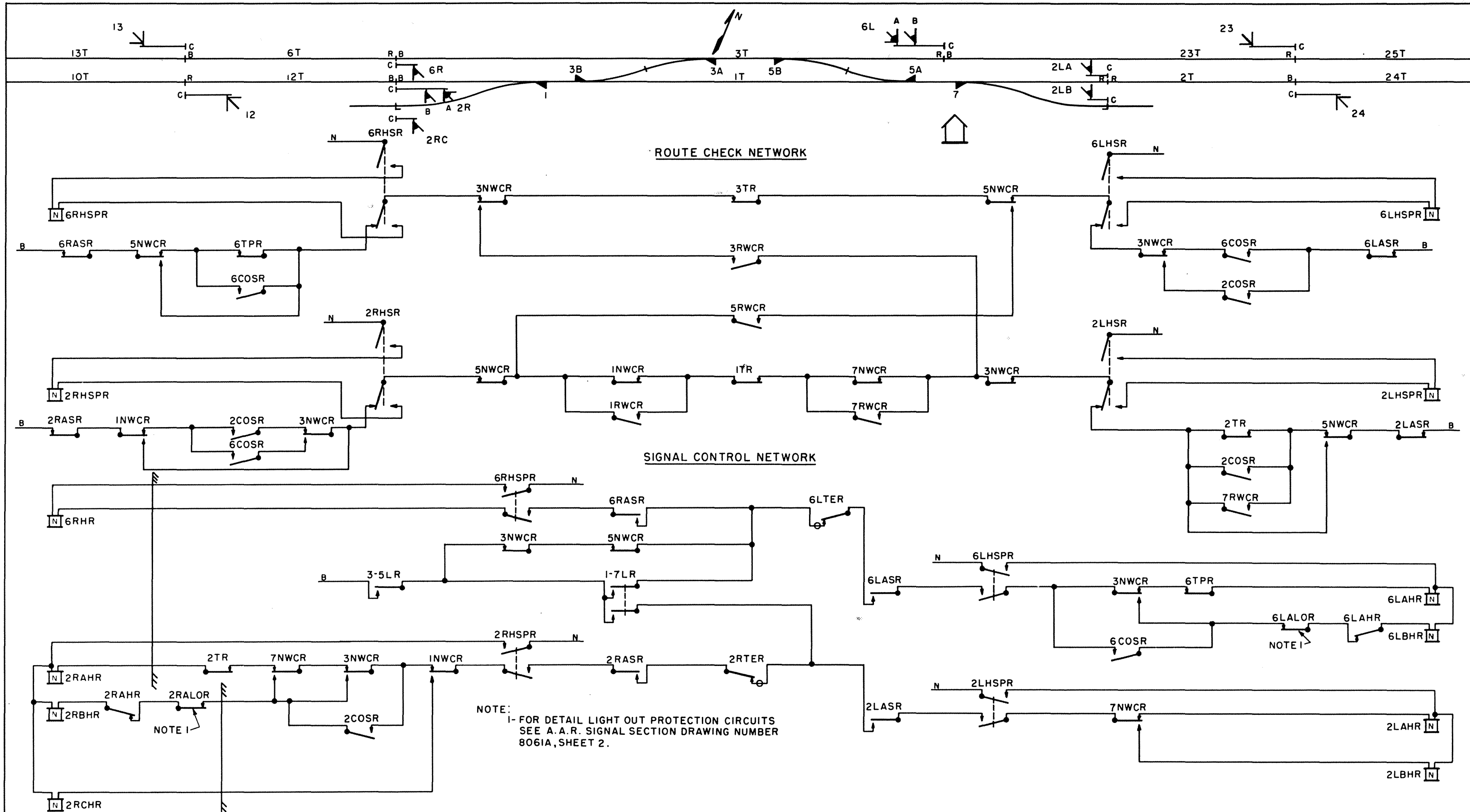
CODED REMOTE CONTROL – FUNCTIONS INDIVIDUALLY CONTROLLED

SEMI-AUTOMATIC STICK SIGNALS – RESTRICTING SIGNALS CONTROLLED THROUGH FIRST TRACK SECTION ONLY.

AAR SIG. SEC. 8055A

SEPT. 1951

SHEET 1 OF 4 SHEETS

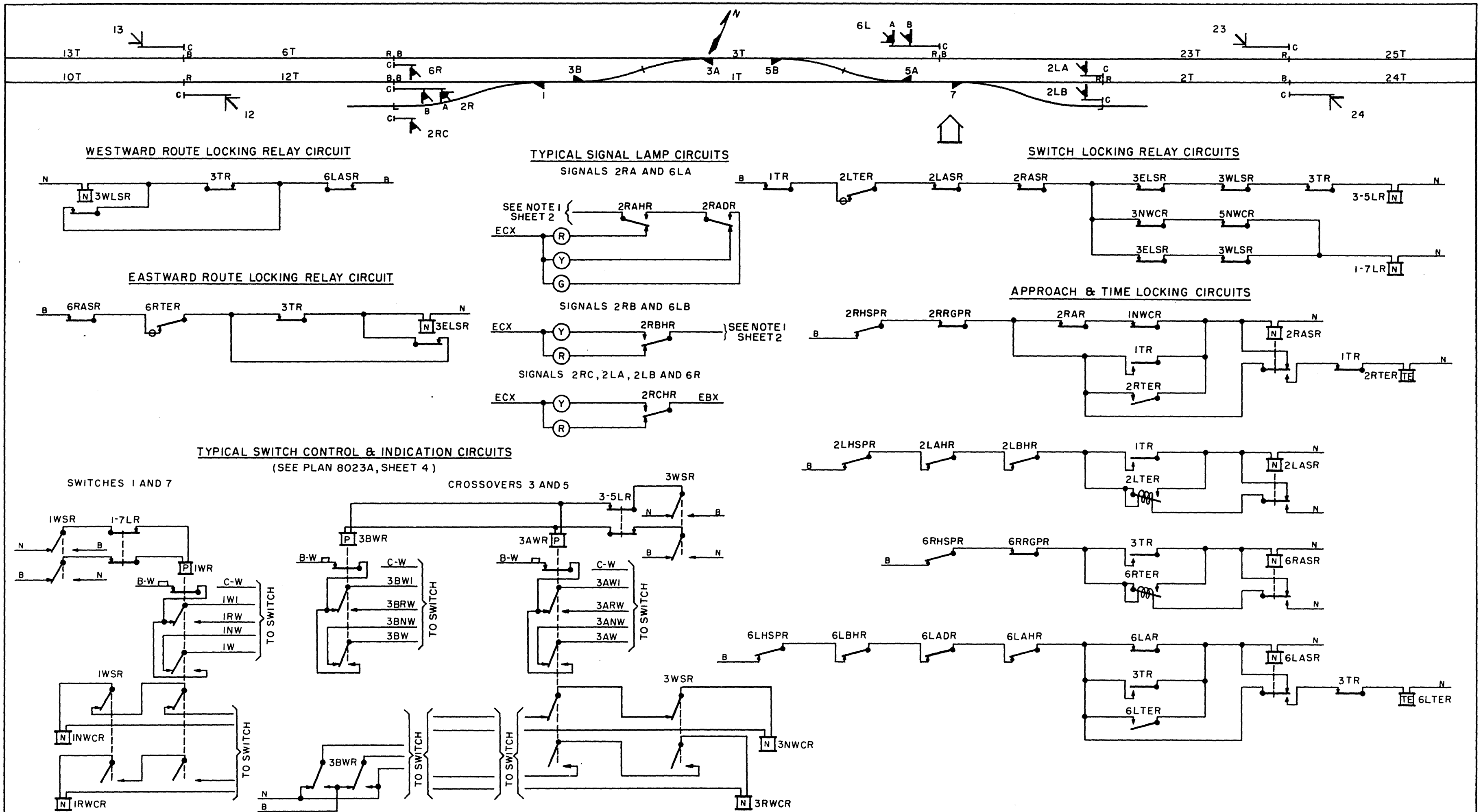


TYPICAL RELAY TYPE INTERLOCKING CIRCUITS

CODED REMOTE CONTROL - FUNCTIONS INDIVIDUALLY CONTROLLED
SEMI-AUTOMATIC STICK SIGNALS - RESTRICTING SIGNALS CONTROLLED THROUGH FIRST TRACK SECTION ONLY.

SEPT. 1951

AAR SIG.SEC. 8055A



TYPICAL RELAY TYPE INTERLOCKING CIRCUITS

CODED REMOTE CONTROL – FUNCTIONS INDIVIDUALLY CONTROLLED
SEMI-AUTOMATIC STICK SIGNALS – RESTRICTING SIGNALS CONTROLLED THROUGH FIRST TRACK SECTION ONLY.

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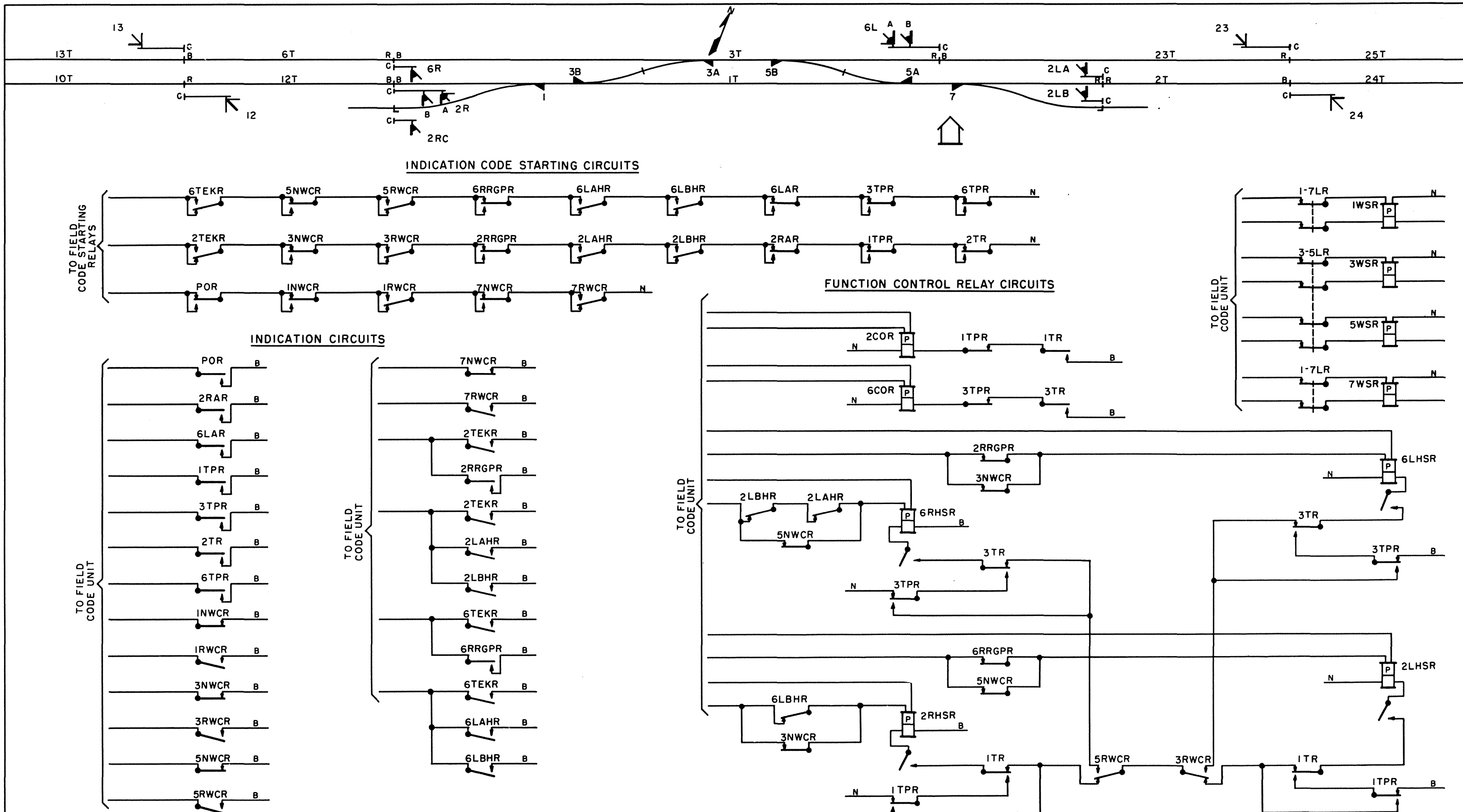
SIG.SEC.
8055A



TYPICAL RELAY TYPE INTERLOCKING CIRCUITS

CODED REMOTE CONTROL - FUNCTIONS INDIVIDUALLY CONTROLLED

SEMI-AUTOMATIC STICK SIGNALS - RESTRICTING SIGNALS CONTROLLED THROUGH FIRST TRACK SECTION ONLY.

SEPT. 1951

AAR SIG. SEC. 8055A

SHEET 4 OF 4 SHEETS

ADDENDUM TO A.A.R. SIG. SEC. 8055

TYPICAL RELAY TYPE INTERLOCKING CIRCUITS - CODED REMOTE CONTROL.

This is a coded remote control system with the functions individually controlled. The signals are semi-automatic stick with restricting signals controlled through the track circuits of the Interlocking only. Main tracks signaled in one direction only.

Relays designated HSR are provided at the Interlocking which are equivalent to signal lever repeater relays. The HSR relay is energized by a pulse received from the field code unit after a signal lever is operated by control operator and a control code is sent to the Interlocking. Once the HSR relay is energized, contacts of this relay will close and remain closed until the Interlocking track circuit between home signals is de-energized or signal is coded to stop. This feature prevents storage of a signal control when a train occupies the Interlocking track circuits and also cancels storage of signal control when a train enters the Interlocking.

Relays designated RCR provide a check that a route is available before de-energizing the ASR relay. A back contact of ASR relay is included in the signal control to provide a check that time locking is in effect before allowing a signal to clear. The route check network checks switch correspondence relays in the proper position, Interlocking track relays energized, opposing RCR de-energized and opposing ASR energized.

Relays designated NWSR or RWSR are used to control the position of power-operated switches. The NWSR or RWSR is energized by a code pulse received from the field code unit, providing lock relay LR is energized. Once the NWSR or RWSR is energized, contacts of this relay will close and remain closed until the switch lever on the control machine is operated to the opposite position and a control code is sent to the Interlocking. In this scheme, storage of a switch control or pre-conditioning is not permitted. If any Interlocking track circuit in the route lined is de-energized while the switch is in transit, the switch machine will stop operating. A contact of the NWSR or RWSR is checked in the NWCR or RWCR to insure that switch control and switch position are in correspondence.

A relay designated RWSR is also used to provide unlock control of an electrically locked hand-operated switch. This relay functions similar to the RWSR used to control a power-operated switch, except, the RWSR used for an electric switch lock may be energized by a code pulse received from the field code unit when lock relay LR is de-energized, if the track circuit in which the hand-operated switch is located is occupied. In this scheme, the control circuit of the electric switch lock is so arranged that an immediate unlock of the hand-operated switch may be obtained when all signals governing train movement over this switch are at stop, time locking is not in effect, and Interlocking track circuits in the route are unoccupied, or when the track circuit in which the switch is located is occupied, providing the RWSR is energized and padlock is removed from the electric switch lock.

ADDENDUM TO A.A.R. SIG. SEC. 8055 - Continued

Two arrangements are shown for an electrically locked hand-operated switch located within Interlocking limits. Sheets 4, 5 and 6 show an arrangement where a signal is provided to govern train movement from the hand-operated switch to the main track. Sheets 7, 8 and 9 show an arrangement without a signal to govern train movement from the hand-operated switch to the main track.

Two track restoring of ASR is provided for all train movements, except straight through movements against the normal direction of traffic and for signals 2R and 2L when routing into non-track circuited track.

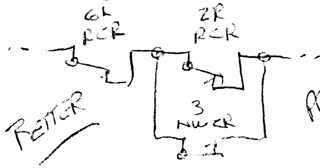
When an electronic timer is used for time element relay TER and the electronic timer is not provided with the equivalent of a check contact, the circuit shown in dashed lines, covered by Note 3, is recommended.

The following conditions are indicated from the Interlocking: Switches in the normal or reverse position and out of correspondence, signals clear, signals at stop, or time running, approach, and detector track circuits.

Slow pick-up TPR relays provide momentary loss of shunt protection.

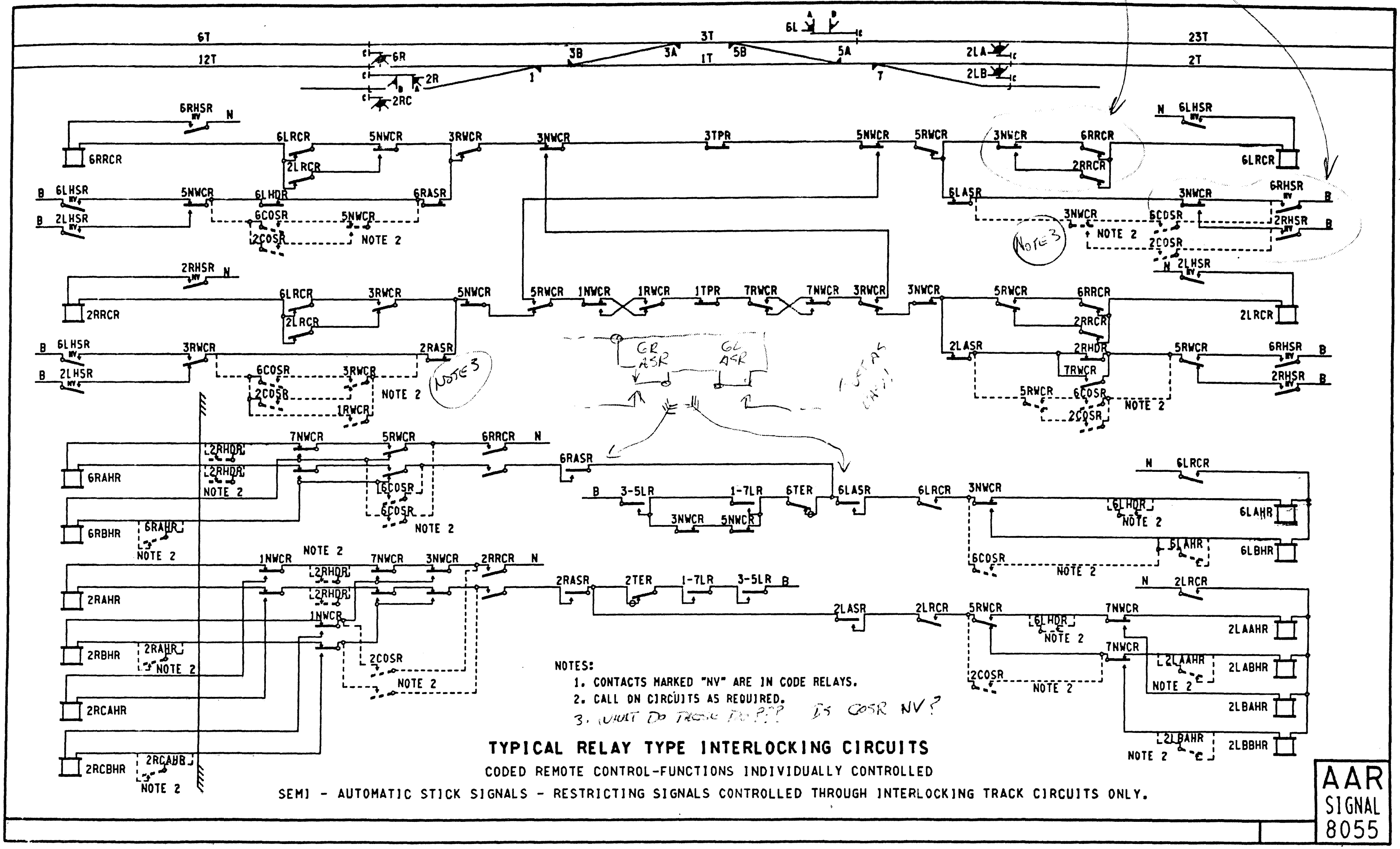
Vital line circuits as required. Shown on other typical circuit drawings.

Signal lighting and light-out protection circuits as required.



PROBLEMS DEVELOP WHEN APPLIED TO 3 OR MORE TRACKS - EXCESSIVE CONTACT COUNTS,

KEEPING NV CONTACTS AT END OF CIRCUIT IS A GOOD IDEA.



NOTES:
1. CONTACTS MARKED "NV" ARE IN CODE RELAYS.
2. CALL ON CIRCUITS AS REQUIRED.
3. WHAT DO THESE DO??? IS COSR NV?

TYPICAL RELAY TYPE INTERLOCKING CIRCUITS

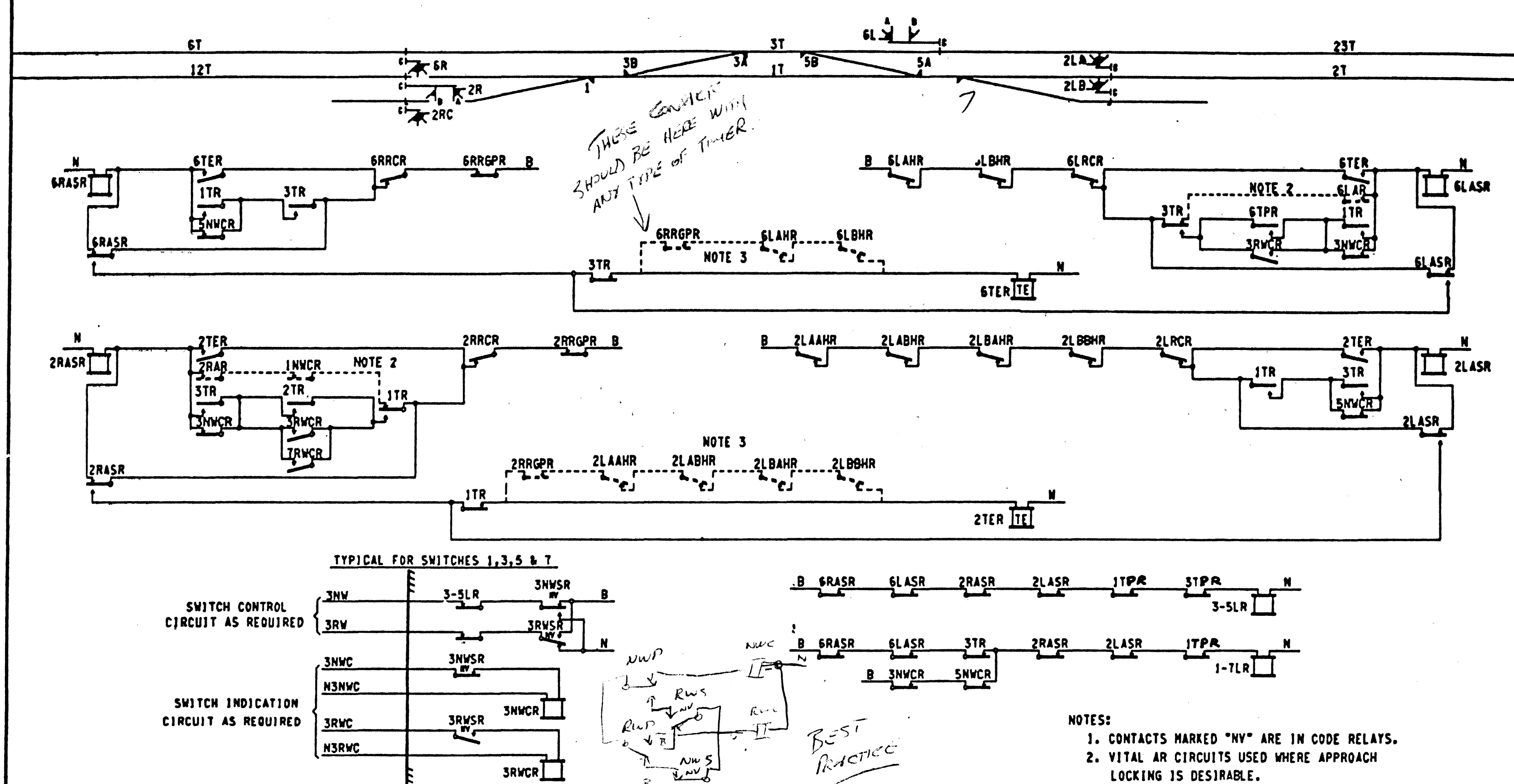
CODED REMOTE CONTROL-FUNCTIONS INDIVIDUALLY CONTROLLED

SEMI - AUTOMATIC STICK SIGNALS - RESTRICTING SIGNALS CONTROLLED THROUGH INTERLOCKING TRACK CIRCUITS ONLY.

AAR SIGNAL 8055

SHEET 1 OF 9

NEED TO DOUBLE BREAK WITH HSR CONTACTS IS DOUBTFUL AND ELIMINATION OF THESE WOULD GREATLY SIMPLIFY CIRCUIT DESIGN.



NOTES:

1. CONTACTS MARKED "NV" ARE IN CODE RELAYS.
2. VITAL AR CIRCUITS USED WHERE APPROACH LOCKING IS DESIRABLE.
3. USED WHEN TER IS AN ELECTRONIC TIMER.

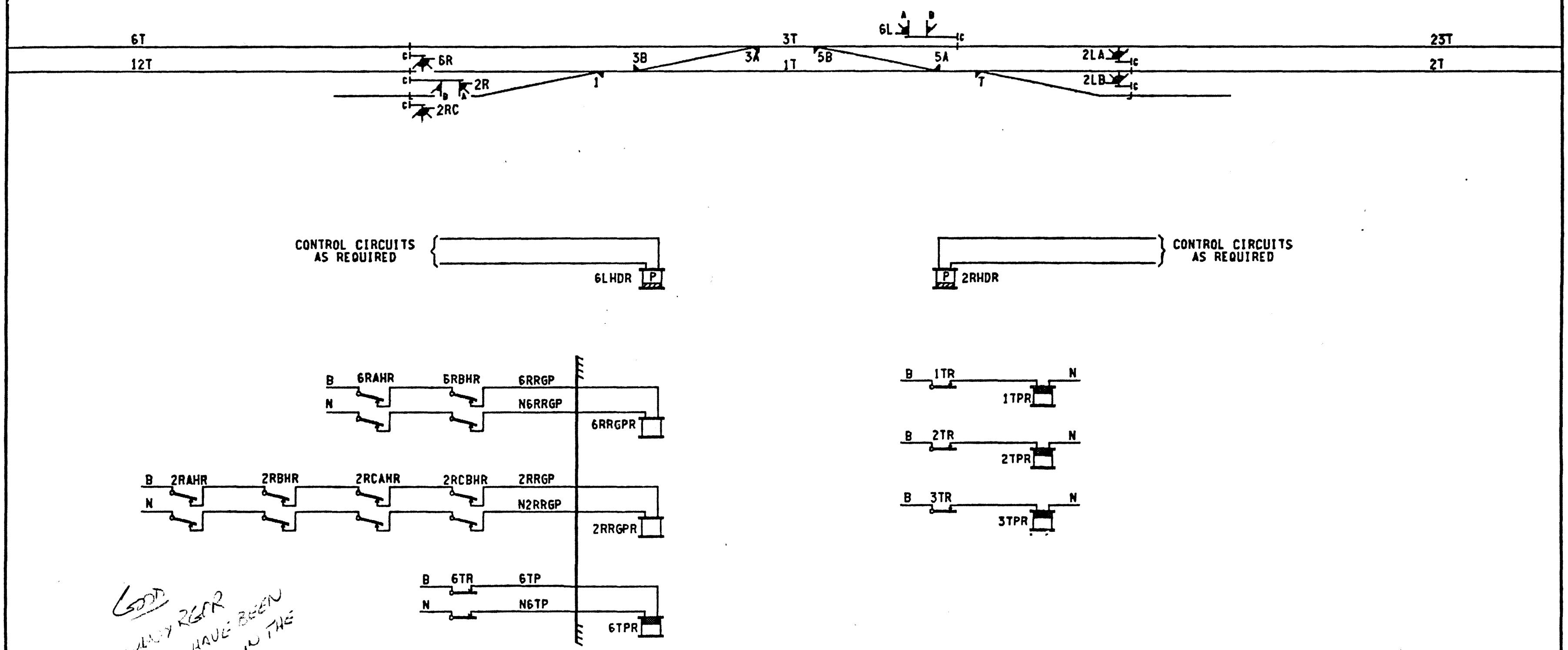
TYPICAL RELAY TYPE INTERLOCKING CIRCUITS

CODED REMOTE CONTROL-FUNCTIONS INDIVIDUALLY CONTROLLED

SEMI - AUTOMATIC STICK SIGNALS - RESTRICTING SIGNALS CONTROLLED THROUGH INTERLOCKING TRACK CIRCUITS ONLY.

AAR SIGNAL 8055

SHEET 2 OF 9



GOOD
MANY RGPR CIRCUITS HAVE BEEN SINGLE BREAK IN THE PAST.

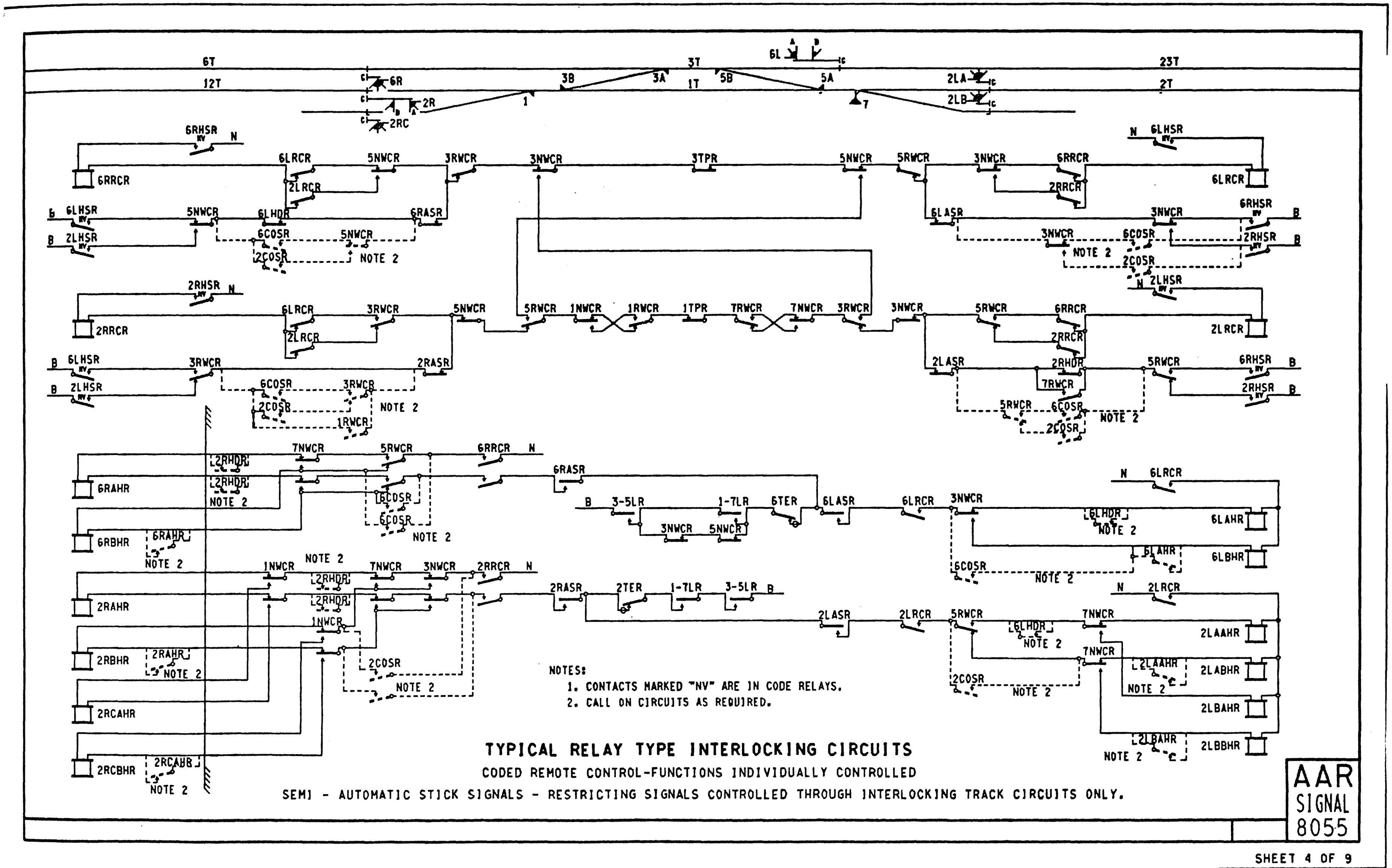
TYPICAL RELAY TYPE INTERLOCKING CIRCUITS

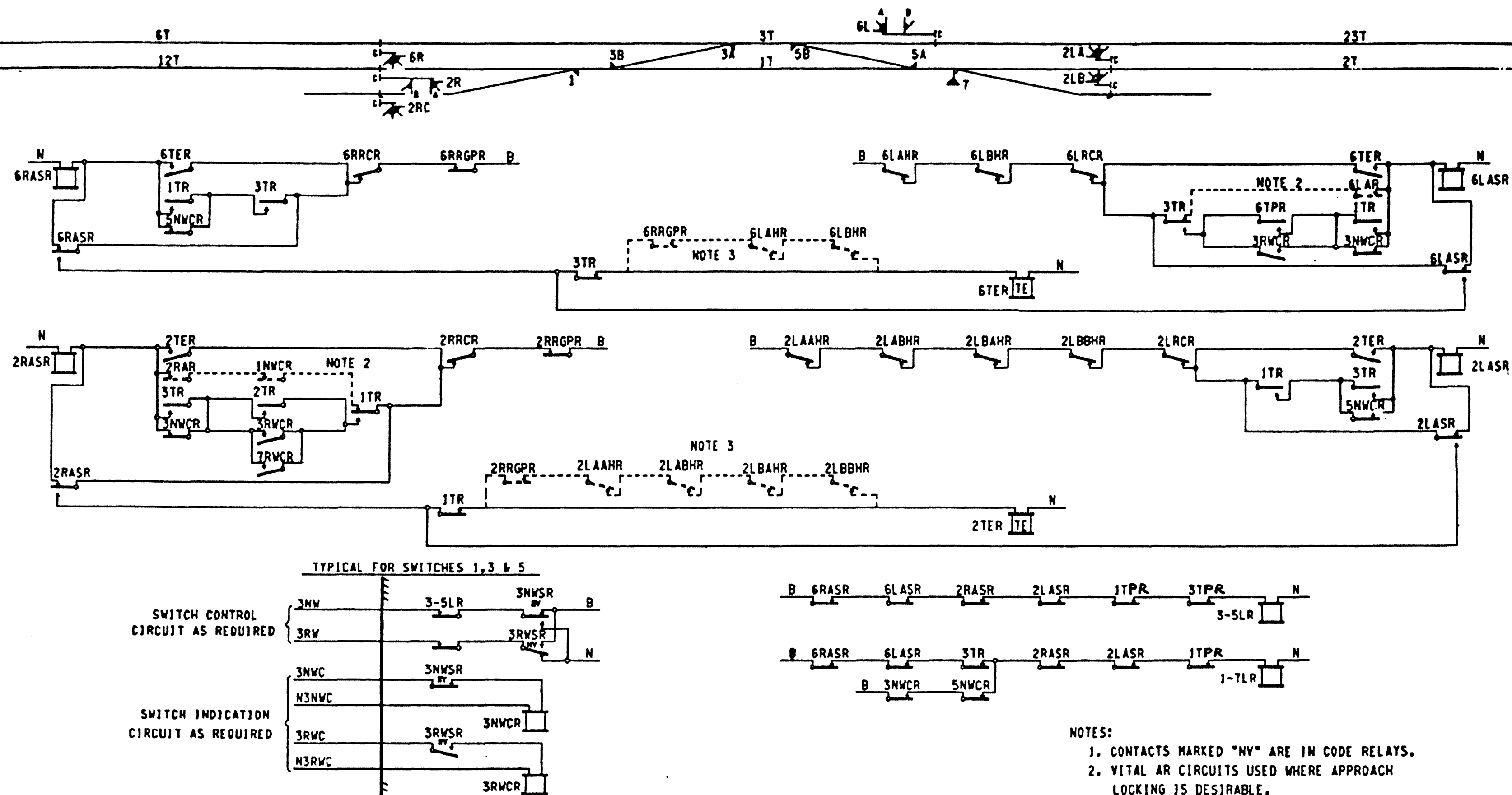
CODED REMOTE CONTROL-FUNCTIONS INDIVIDUALLY CONTROLLED

SEMI - AUTOMATIC STICK SIGNALS - RESTRICTING SIGNALS CONTROLLED THROUGH INTERLOCKING TRACK CIRCUITS ONLY.

AAR SIGNAL 8055

SHEET 3 OF 9


NOTES:
1. CONTACTS MARKED "NV" ARE IN CODE RELAYS.
2. CALL ON CIRCUITS AS REQUIRED.
TYPICAL RELAY TYPE INTERLOCKING CIRCUITS
CODED REMOTE CONTROL-FUNCTIONS INDIVIDUALLY CONTROLLED
SEMI - AUTOMATIC STICK SIGNALS - RESTRICTING SIGNALS CONTROLLED THROUGH INTERLOCKING TRACK CIRCUITS ONLY.
AAR SIGNAL 8055

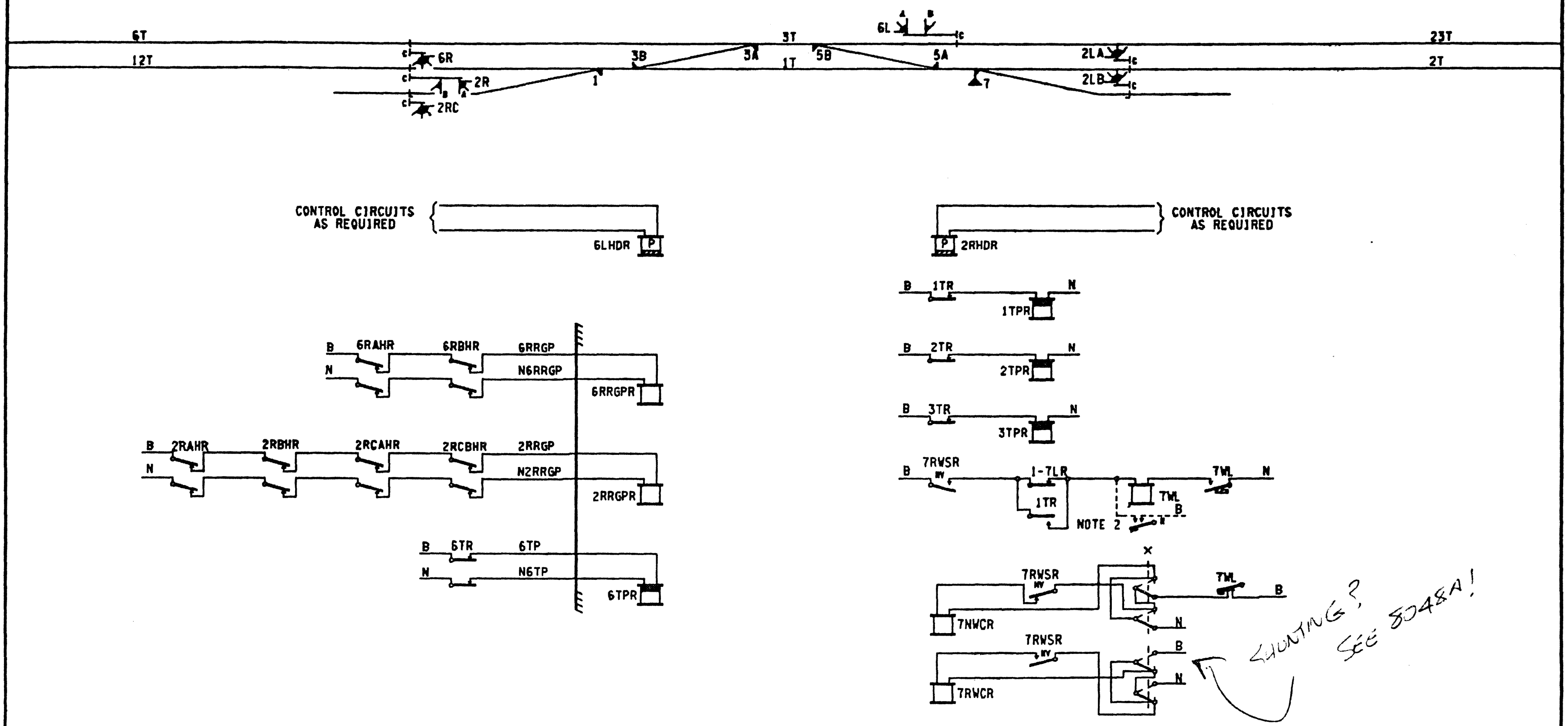


NOTES:
1. CONTACTS MARKED "NV" ARE IN CODE RELAYS.
2. VITAL AR CIRCUITS USED WHERE APPROACH LOCKING IS DESIRABLE.
3. USED WHEN TER IS AN ELECTRONIC TIMER.

TYPICAL RELAY TYPE INTERLOCKING CIRCUITS

CODED REMOTE CONTROL-FUNCTIONS INDIVIDUALLY CONTROLLED
SEMI - AUTOMATIC STICK SIGNALS - RESTRICTING SIGNALS CONTROLLED THROUGH INTERLOCKING TRACK CIRCUITS ONLY.

AAR SIGNAL 8055



NOTES:

1. CONTACTS MARKED "NV" ARE IN CODE RELAYS.
2. OPTIONAL CIRCUIT TO PERMIT RESTORING SWITCH LOCK CONTROL LEVER TO NORMAL AFTER UNLOCK HAS BEEN OBTAINED.

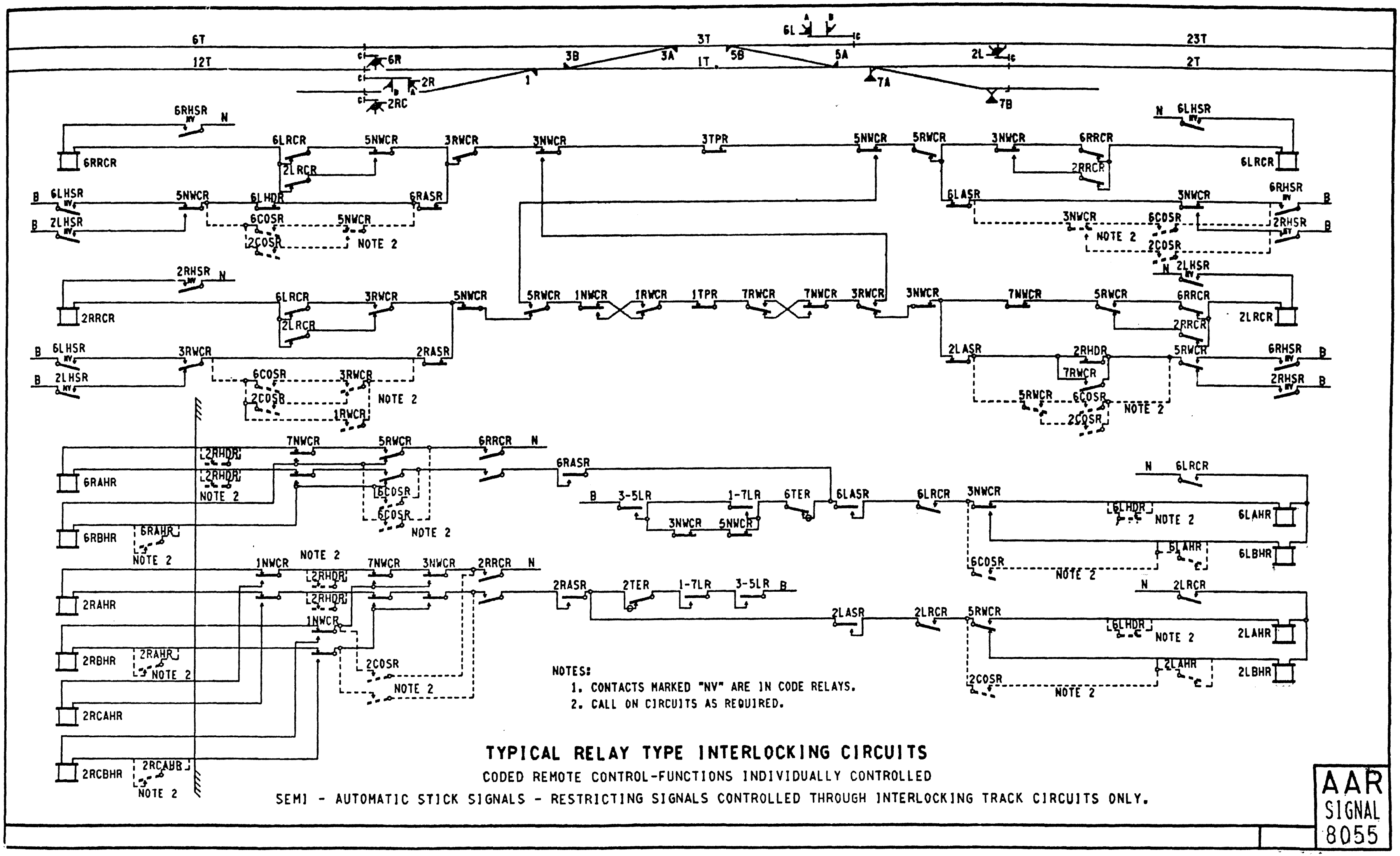
TYPICAL RELAY TYPE INTERLOCKING CIRCUITS

CODED REMOTE CONTROL-FUNCTIONS INDIVIDUALLY CONTROLLED

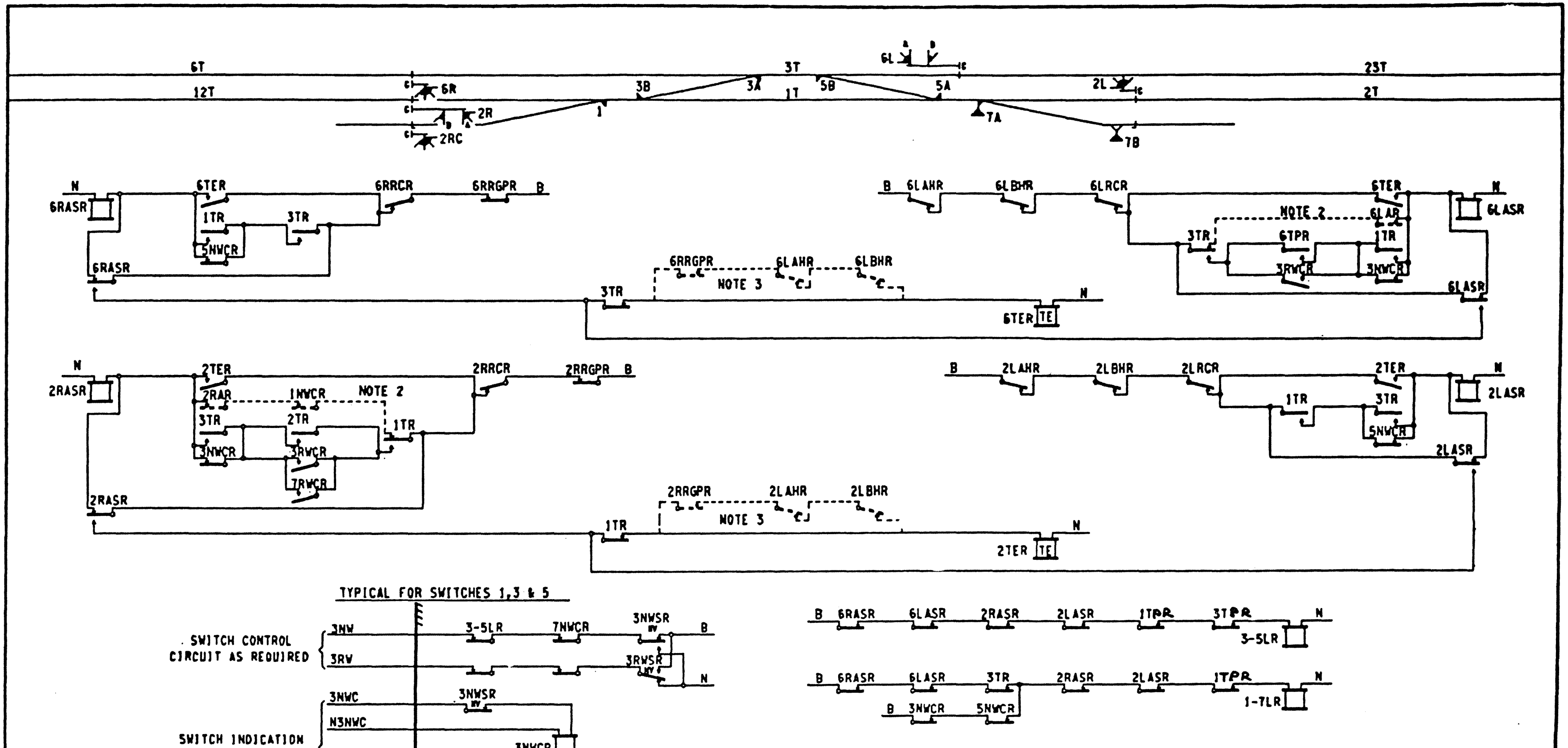
SEMI - AUTOMATIC STICK SIGNALS - RESTRICTING SIGNALS CONTROLLED THROUGH INTERLOCKING TRACK CIRCUITS ONLY.

AAR SIGNAL 8055

SHEET 6 OF 9


NOTES:
1. CONTACTS MARKED "NV" ARE IN CODE RELAYS.
2. CALL ON CIRCUITS AS REQUIRED.
TYPICAL RELAY TYPE INTERLOCKING CIRCUITS
CODED REMOTE CONTROL-FUNCTIONS INDIVIDUALLY CONTROLLED
SEMI - AUTOMATIC STICK SIGNALS - RESTRICTING SIGNALS CONTROLLED THROUGH INTERLOCKING TRACK CIRCUITS ONLY.
AAR
SIGNAL
8055

SHEET 7 OF 9



NOTES:
1. CONTACTS MARKED "NV" ARE IN CODE RELAYS.
2. VITAL AR CIRCUITS USED WHERE APPROACH LOCKING IS DESIRABLE.
3. USED WHEN TER IS AN ELECTRONIC TIMER.

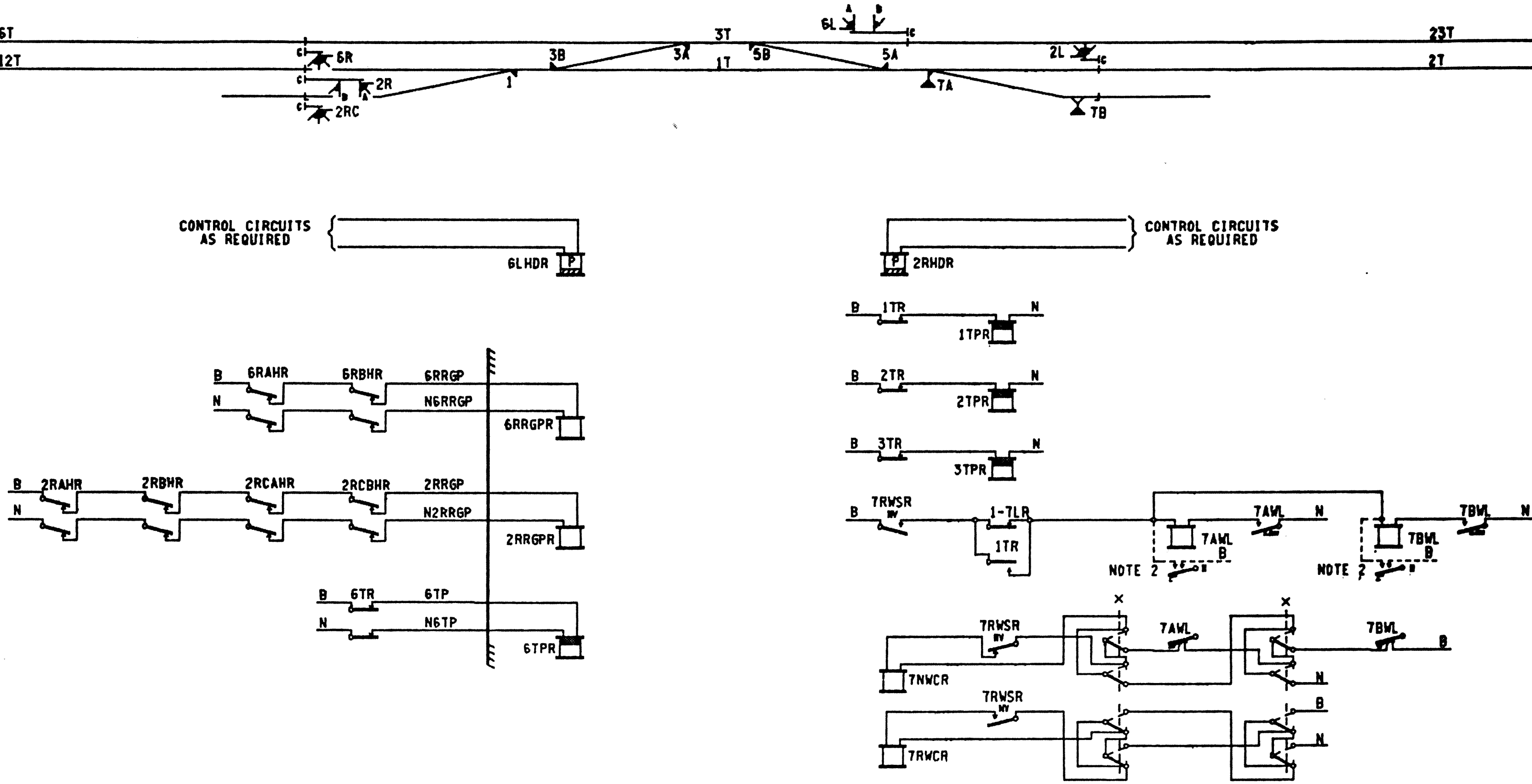
TYPICAL RELAY TYPE INTERLOCKING CIRCUITS

CODED REMOTE CONTROL-FUNCTIONS INDIVIDUALLY CONTROLLED

SEMI - AUTOMATIC STICK SIGNALS - RESTRICTING SIGNALS CONTROLLED THROUGH INTERLOCKING TRACK CIRCUITS ONLY.

AAR SIGNAL 8055

SHEET 8 OF 9



NOTES:

1. CONTACTS MARKED "NV" ARE IN CODE RELAYS.
2. OPTIONAL CIRCUIT TO PERMIT RESTORING SWITCH LOCK CONTROL LEVER TO NORMAL AFTER UNLOCK HAS BEEN OBTAINED.

TYPICAL RELAY TYPE INTERLOCKING CIRCUITS

CODED REMOTE CONTROL-FUNCTIONS INDIVIDUALLY CONTROLLED

SEMI - AUTOMATIC STICK SIGNALS - RESTRICTING SIGNALS CONTROLLED THROUGH INTERLOCKING TRACK CIRCUITS ONLY.

AAR SIGNAL 8055

ADDENDUM TO A.A.R. SIG.SEC. 8056A

TYPICAL RELAY TYPE INTERLOCKING CIRCUITS.

These circuits have been designed to control switches and signals by levers that are not mechanically interlocked and are not provided with electric locks or other mechanical means to restrict their movements. The use of relays provides the equivalent protection usually provided by mechanical and electric locking of levers.

The route check network shown on Sheet 1 provides a preliminary route check before a signal may be cleared, insuring that switch levers are in the proper positions to assure a complete route for the signal to be cleared; also that switches in the route correspond in position to levers controlling them, that opposing and conflicting signal levers are not in a position to clear opposing or conflicting signals and that opposing and conflicting signals are in the stop position. A relay is provided for each signal lever in the route check circuits, that must pick up before circuit is completed to clear signal. These relays are designated HSR, and each is provided with a holding circuit that may only be released by restoring the lever of signal affected to the normal position, or by a train passing the signal and shunting the track relay. This prevents changing a cleared signal to Stop indication should an operator inadvertently move a switch lever in route or the opposing signal lever. Slow release relays designated NLPR, on Sheet 1, which repeat the normal position of the signal levers are provided to prevent the storage for the control of a signal until a route is established; also to prevent the storage for the control of a signal if the signal lever controlling an opposing signal has been operated.

The signal control network shown on Sheet 2 consists of circuits for direct control of searchlight signals while the network shown on Sheet 3 consists of circuits for control of relays for color light signals. Both networks check all the switch repeating relays and track relays in the route energized, the switch locking and approach locking relays de-energized, also that the opposing and conflicting approach locking relays are energized. Restricting signals are controlled through first track section only. When a restricting signal is to be displayed on signals 2,4 or 6, for a following move into an occupied block, a push button is pushed, which momentarily energizes the NLPR, thus re-energizing the HSR, and energizing the COSR.

The route check and signal control network circuits are selected through the track relays for all conflicting movements.

ADDENDUM TO A.A.R. SIG.SEC. 8056A - Continued

For movements from signal 8R there is an intermediate signal 4RA which affects the controls of the above mentioned signal. Relay 8RLPR, shown on Sheet 1, is used to take care of this condition, eliminating complicated selections in circuits of both networks.

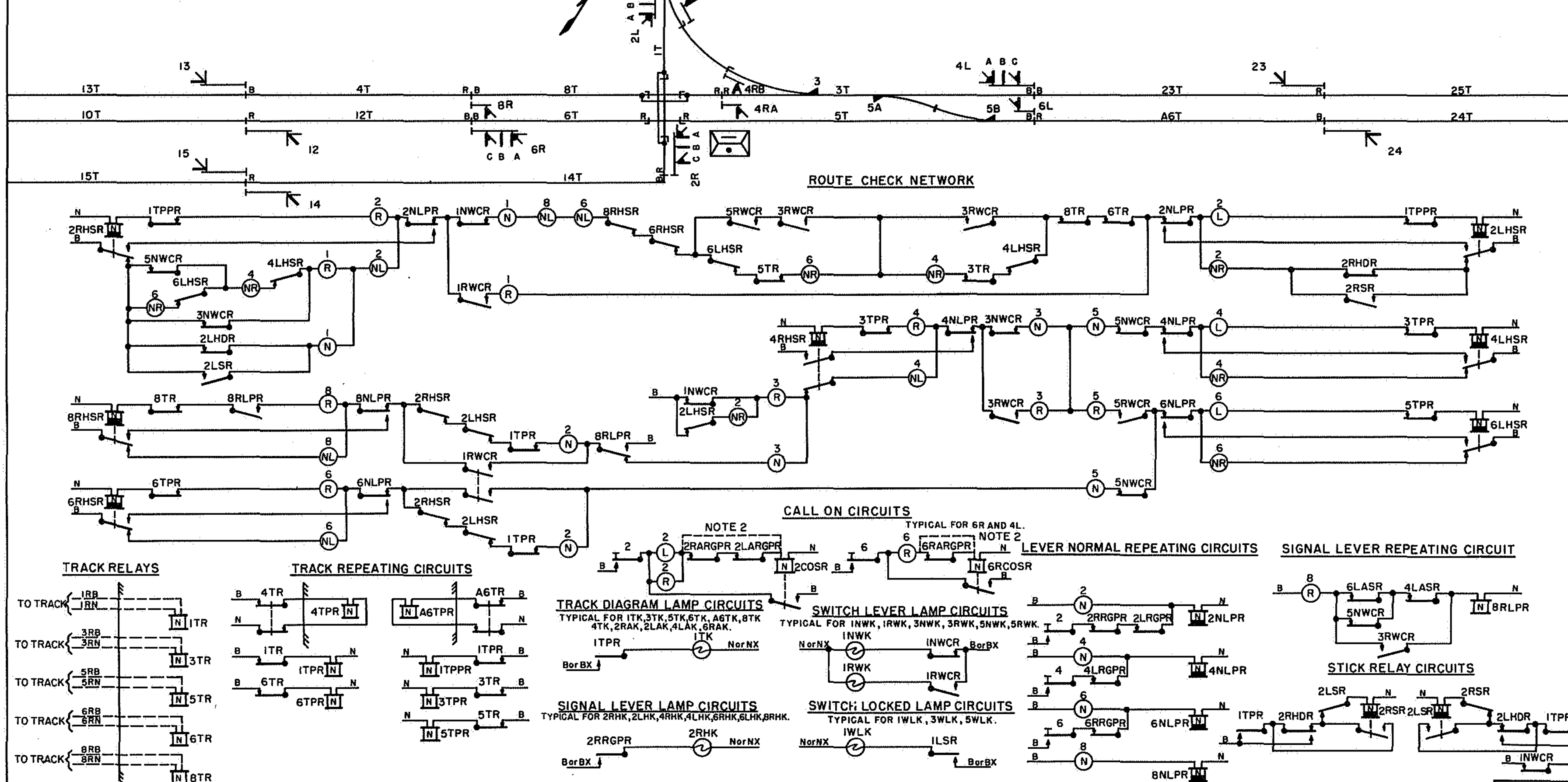
The switch locking relays designated LSR, shown on Sheet 4, are controlled by track relays, route locking relays and approach locking relays. The approach locking relays lock switches as soon as route has been established and HSR relay has picked up. The common side of the circuit for each switch locking relay is selected over its own front contact and in multiple are agreement circuits, a normal polar contact of switch repeater relay and normal switch lever contact and a reverse polar contact of switch repeater relay and reverse switch lever contact. With this arrangement, if a switch lever is moved when its locking relay is de-energized, the relay will not pick up until switch lever has been restored to its initial position to agree with the position of switch which completes pick-up circuit of switch locking relay. This prevents the storage of switch control when the switch is locked.

Circuits that are not entirely in operating tower are double wire, double break, except signal repeating relay circuits.

NOTES:

1- WHERE DEAD SECTION OVER CROSSING IS OF SUCH LENGTH THAT SPECIAL CIRCUIT IS REQUIRED.-SEE AAR SIGNAL SECTION DRAWING NO. 8042A.

2-"CALL ON CIRCUITS" FOR COLOR LIGHT SIGNAL USE CIRCUIT SHOWN IN BROKEN LINE.



TYPICAL RELAY TYPE INTERLOCKING CIRCUITS

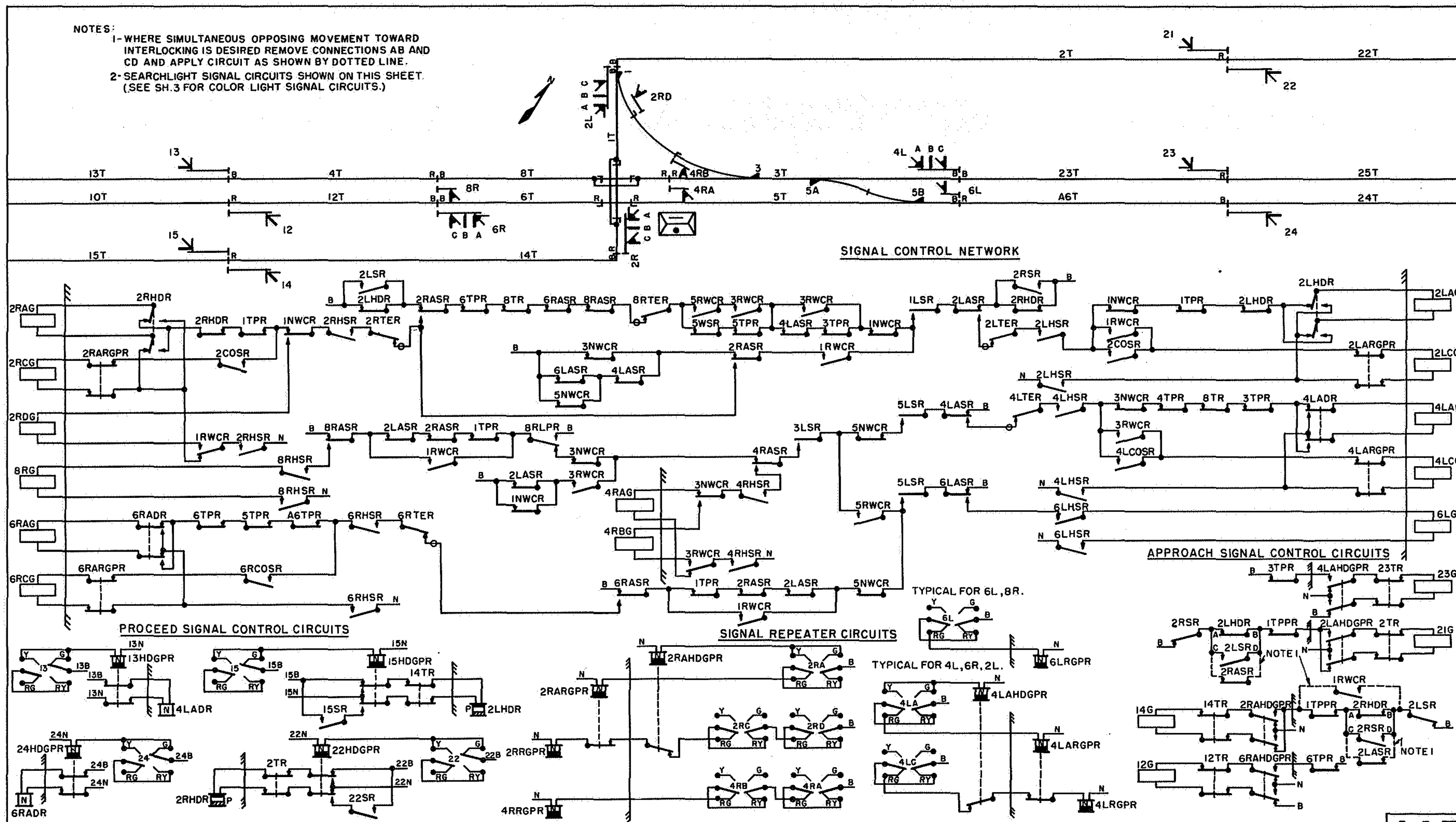
RAILROAD CROSSING - LOCAL CONTROL.

SEPT. 1951

AAR SIG. SEC. 8056A

SHEET 1 OF 4 SHEETS

NOTES:
1- WHERE SIMULTANEOUS OPPOSING MOVEMENT TOWARD INTERLOCKING IS DESIRED REMOVE CONNECTIONS AB AND CD AND APPLY CIRCUIT AS SHOWN BY DOTTED LINE.
2- SEARCHLIGHT SIGNAL CIRCUITS SHOWN ON THIS SHEET. (SEE SH.3 FOR COLOR LIGHT SIGNAL CIRCUITS.)



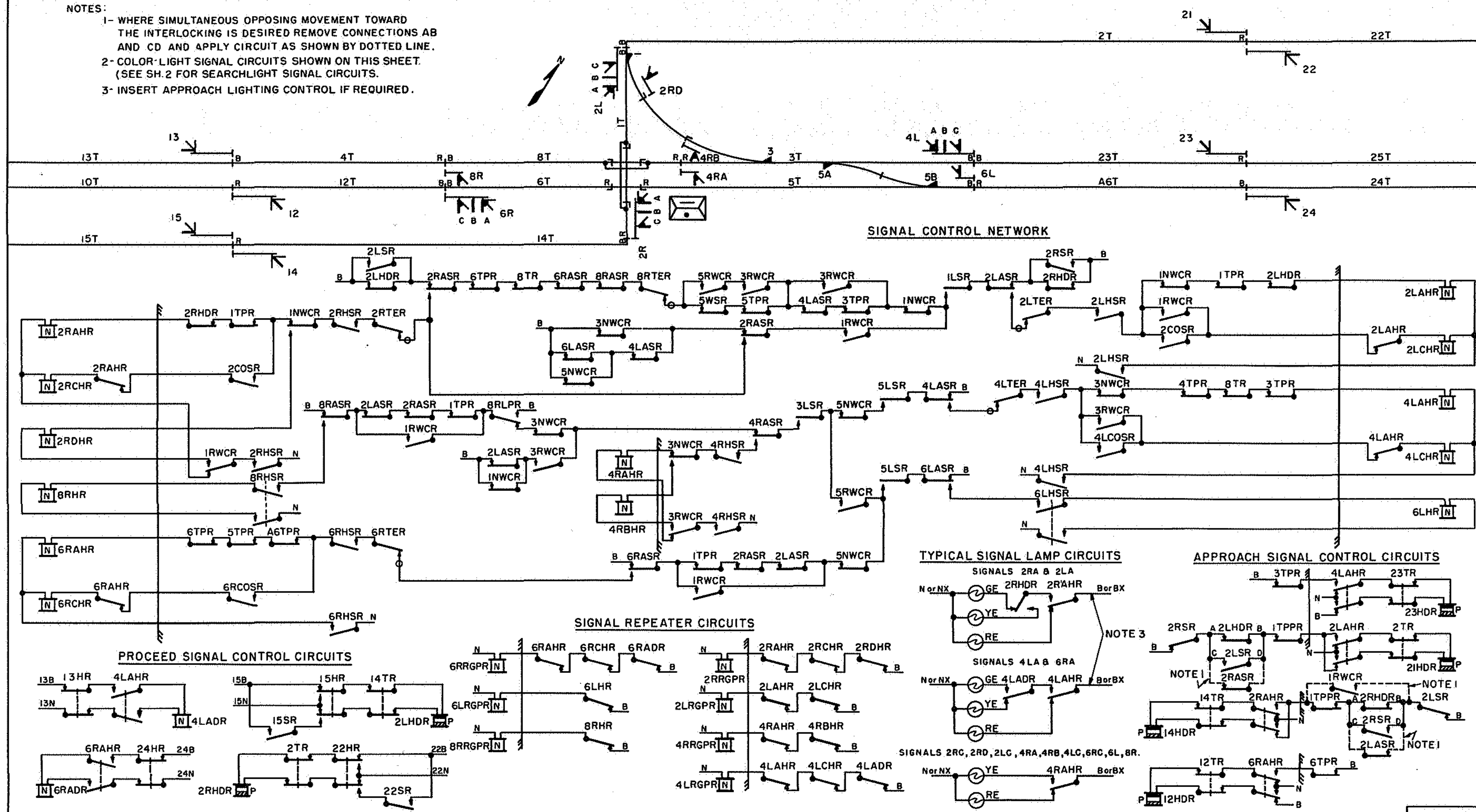
TYPICAL RELAY TYPE INTERLOCKING CIRCUITS
RAILROAD CROSSING - LOCAL CONTROL.

SEPT. 1951

AAR
SIG. SEC.
8056A

SHEET 2 OF 4 SHEETS

NOTES:
1- WHERE SIMULTANEOUS OPPOSING MOVEMENT TOWARD THE INTERLOCKING IS DESIRED REMOVE CONNECTIONS AB AND CD AND APPLY CIRCUIT AS SHOWN BY DOTTED LINE.
2- COLOR-LIGHT SIGNAL CIRCUITS SHOWN ON THIS SHEET. (SEE SH. 2 FOR SEARCHLIGHT SIGNAL CIRCUITS.
3- INSERT APPROACH LIGHTING CONTROL IF REQUIRED.



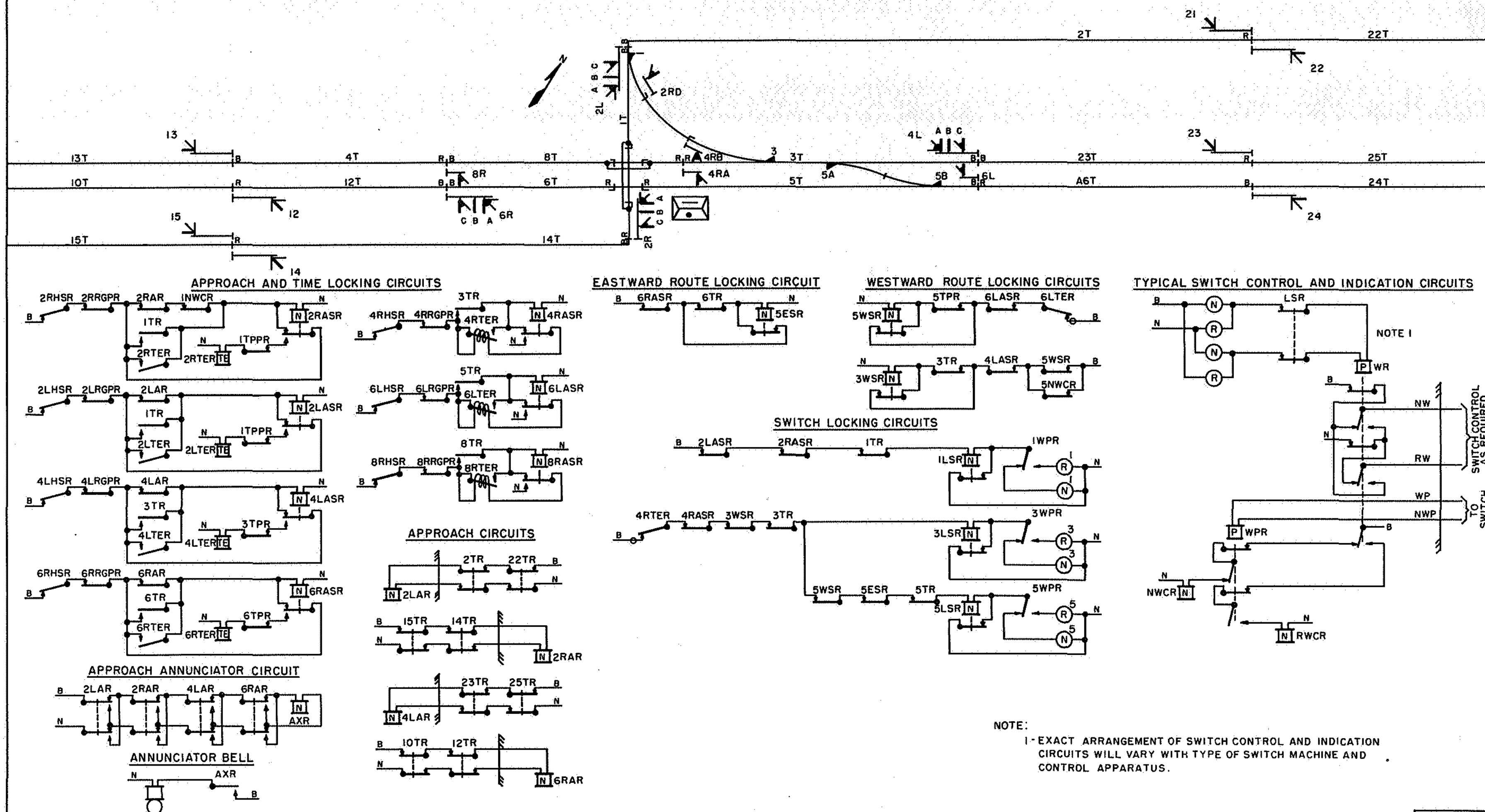
TYPICAL RELAY TYPE INTERLOCKING CIRCUITS

RAILROAD CROSSING - LOCAL CONTROL.

AAR SIG. SEC. 8056A

SEPT. 1951

SHEET 3 OF 4 SHEETS



NOTE:

1 - EXACT ARRANGEMENT OF SWITCH CONTROL AND INDICATION CIRCUITS WILL VARY WITH TYPE OF SWITCH MACHINE AND CONTROL APPARATUS.

TYPICAL RELAY TYPE INTERLOCKING CIRCUITS

RAILROAD CROSSING - LOCAL CONTROL.

SEPT. 1951

AAR SIG.SEC. 8056A

TYPICAL INTERLOCKING CIRCUITS FOR MOVABLE BRIDGE.

This arrangement is adaptable to both swing and lift type bridges using a full complement of power-operated interlocking signals, with smashboards for movements of traffic in normal direction, rail locks, and bridge locks. Mechanical locking is provided.

The circuits shown on Sheet 1 represent standard signal control, signal repeater, approach and time locking, approach annunciator, and interlocking machine lamp circuits. The mechanical locking sheet is shown on Sheet 1. The circuits shown on Sheet 2 are applicable to the lift type bridge while the circuits shown on Sheet 3 are applicable to the swing type bridge.

The circuits on this plan are adaptable to interlocking machines where the center position of the signal lever governs the stop indication while the right or left position of the signal levers governs the proceed aspect of signals governing train movements to the right or left direction. All signals are circuited to go to stop after a train passes signal and will not clear until signal lever is restored to normal position and again operated to right or left position.

All signal levers are equipped with an electric lock and provided with time or approach locking. It will be noted that the approach signals are controlled through the track circuit within the interlocking, thus overlapping the approach signal control.

Circuits are shown with rails normally unlocked (lever 3 in the normal position). In order to lock lift span and display proceed signals, the following sequence is required, as shown on Sheet 2. Lever 3 is moved from its normal to normal indication position. Relay 3NPR de-energized, removing power from bridge operating mechanism. The back contact of power contactor completes the circuit to relay BGPR. This permits lever 3 to be moved to the reverse indication (D) position. The circuit is now closed to the rail lock motor-operating mechanism located at each end of span, driving these mechanisms to the reverse position. This will drive the bridge rail locks, the bridge plunger locks which lock the lift span in surface and alignment with the fixed span, and close the electric bridge couplers. With the rails locked, plunger locks driven, and the electric bridge couplers closed, circuit will be completed to energize relays WBRLRPR and EBRLRPR, permitting lever 3 to be moved to its full reverse position. Relay 3RWCR will then pick up and its front contact is used in the signal control circuits (Sheet 1) to continuously check condition of bridge apparatus when wayside signals are displayed for movements of trains.

With lever 3 reversed, lever 6 may be reversed to raise smashboards.

After smashboards are raised, relays 6ARDGPR and 6BRDGPR will operate to the reverse position, checking the smashboards are raised; signal levers 2 and 4 may then be operated.

To Operate Lift Span To The Raised Position

Signal levers must be returned to their normal position, approach and time locking being provided. With track between opposing home signals unoccupied, smashboard lever may be returned to its normal position which returns smashboards to their horizontal position.

Lever 3 may then be moved to its normal indication position, driving rail lock operating mechanisms to their normal position to unlock rails, withdraw bridge plunger lock, and electric bridge couplers. This will complete circuits to energize relays WBRLNPR and EBRLNPR, permitting lever 3 to be returned to its full normal position. With lever 3 normal, relay 3NPR is energized, reclosing circuit to bridge operating mechanism for raising the lift span.

To Operate Swing Span To The Open Position

After signal levers and smashboard levers have been returned to their normal position in a manner previously described for the lift span, lever 3 may be moved to its normal indication (B) position. This will close circuit to drive rail lock operating mechanisms to their normal position, causing rails to unlock and electric bridge couplers to open. When rails are unlocked and couplers open, circuits will be completed to energize relays WBRLNPR and EBRLNPR. This will permit lever 3 to be moved to its full normal position.

The wedge controller may then be moved to position to withdraw wedges, causing relay WMR to pick up, closing power supply to wedge motor to withdraw wedges, raise the lift rails and the bridge latches. When wedges are withdrawn, a contactor on the wedge limit switch opens, causing relay WMR to de-energize, cutting off power from the wedge motor.

With wedges withdrawn, lift rails and latches up, relays WBRPR and EBRPR will energize to pick up relay SMR, closing power supply to swing motor.

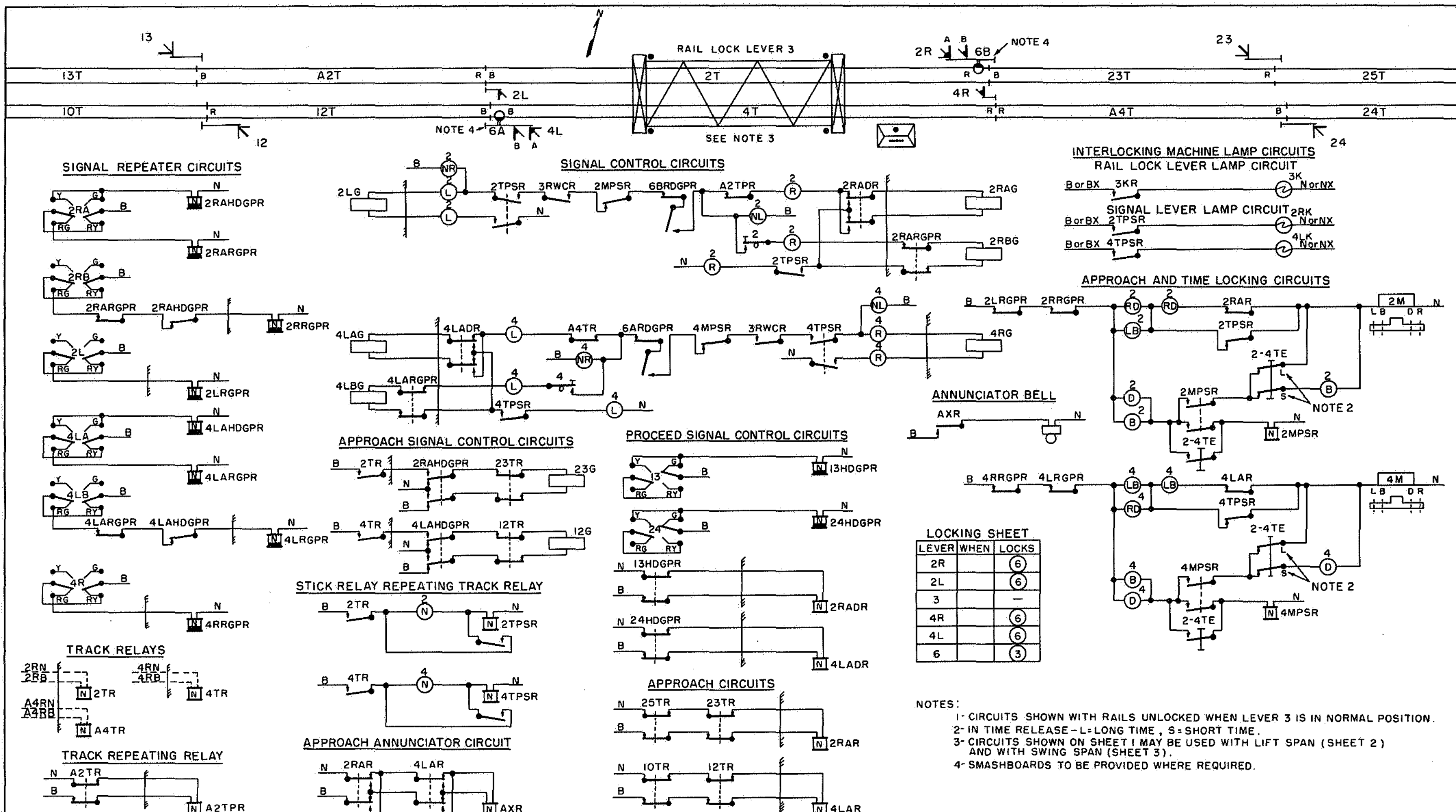
To Return Swing Span To Closed Position

When swing span returns to its closed position, the bridge latches will drop when bridge is properly lined. The wedge controller is then moved to position to drive the wedges. This will energize relay WMR. When wedges are driven, contractor on wedge limit switch will open, de-energizing relay WMR to cut power off the wedge motor. The rail locks are lowered as the wedges are driven. The span may then be locked.

To Lock Swing Span and Display Proceed Signals

Lever 3 is moved from its normal to reverse indicating position. This causes the rail lock operating mechanisms to operate to their reverse position, driving the rail locks and closing the electric bridge couplers.

With rails locked and electric bridge couplers driven, circuits are completed to energize relays WBRLRPR and EBRLRPR, permitting lever 3 to be moved to its full reverse position. The smashboard lever and signal levers may then be operated in a manner previously described for the lift span.



LOCKING SHEET

LEVER	WHEN	LOCKS
2R		6
2L		6
3		—
4R		6
4L		6
6		3

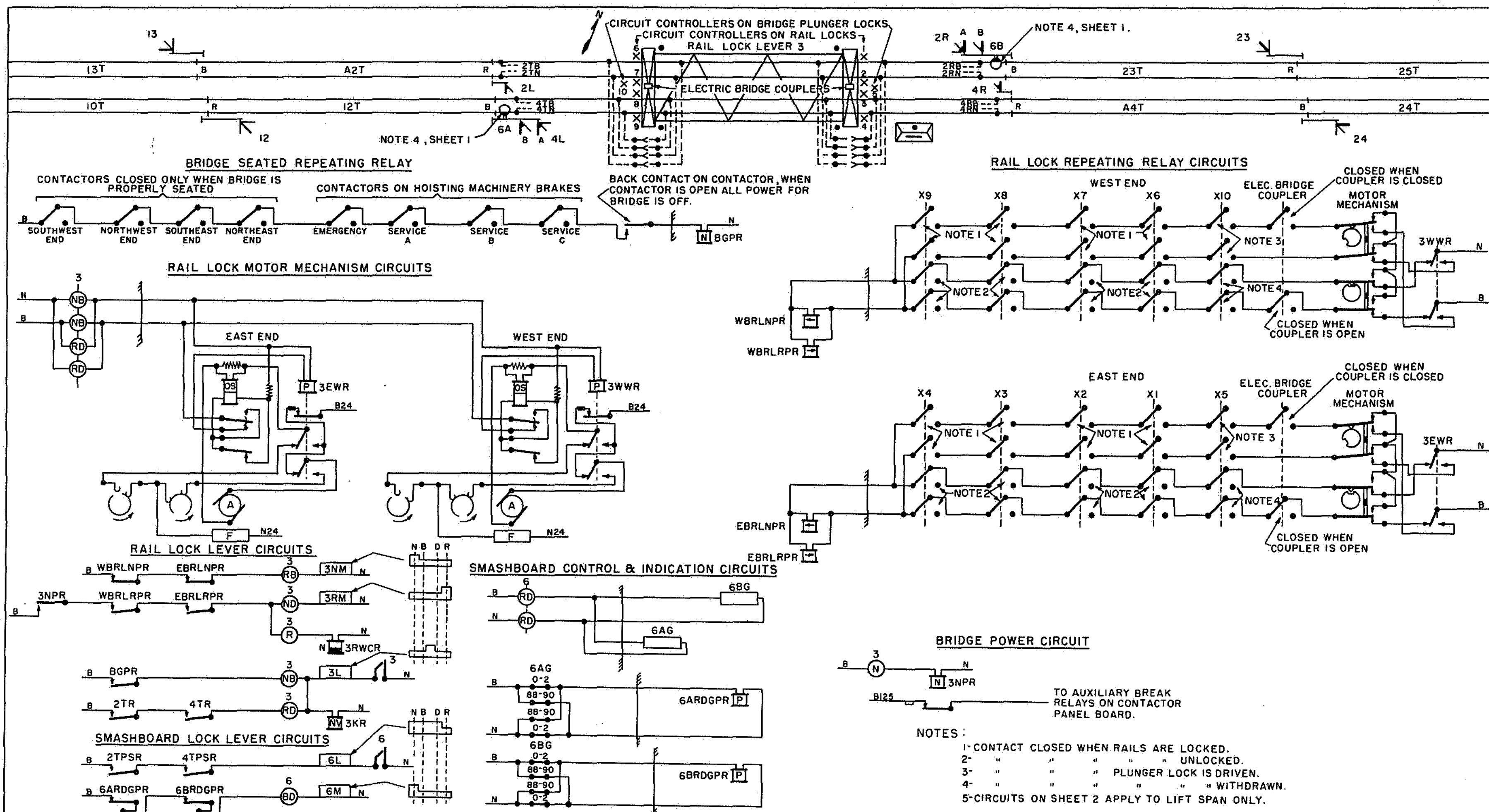
NOTES:

1- CIRCUITS SHOWN WITH RAILS UNLOCKED WHEN LEVER 3 IS IN NORMAL POSITION.
2- IN TIME RELEASE - L= LONG TIME, S= SHORT TIME.
3- CIRCUITS SHOWN ON SHEET 1 MAY BE USED WITH LIFT SPAN (SHEET 2) AND WITH SWING SPAN (SHEET 3).
4- SMASHBOARDS TO BE PROVIDED WHERE REQUIRED.

TYPICAL INTERLOCKING CIRCUITS FOR MOVABLE BRIDGE
USING MECHANICAL LOCKING.

SEPT. 1951

AAR SIG. SEC. 8057A



NOTES:

1- CONTACT CLOSED WHEN RAILS ARE LOCKED.
2- " " " " " UNLOCKED.
3- " " " PLUNGER LOCK IS DRIVEN.
4- " " " " " WITHDRAWN.
5- CIRCUITS ON SHEET 2 APPLY TO LIFT SPAN ONLY.

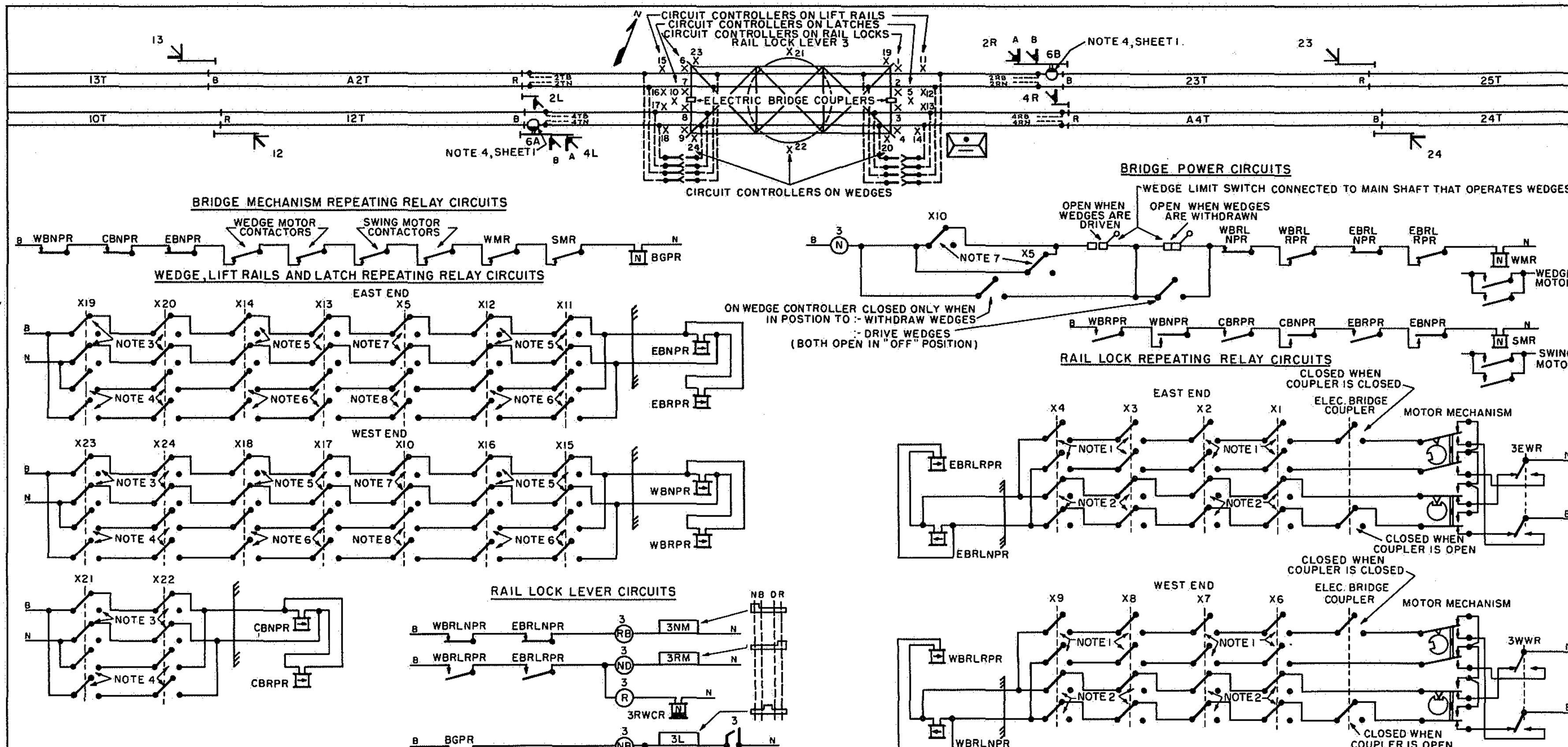
TYPICAL INTERLOCKING CIRCUITS FOR MOVABLE BRIDGE

USING MECHANICAL LOCKING.

SEPT. 1951

AAR SIG. SEC. 8057A

SHEET 2 OF 3 SHEETS



NOTES:

1- CONTACT CLOSED WHEN RAILS ARE LOCKED.
2- " " " " UNLOCKED.
3- " " " WEDGES ARE DRIVEN.
4- " " " " " WITHDRAWN
5- " " " LIFT RAILS ARE DOWN.
6- " " " " " " UP.
7- " " " LATCHES ARE IN.
8- " " " " " OUT.
9- SMASHBOARD CONTROL AND INDICATION CIRCUITS SHALL BE SIMILAR TO SHEET 2.
10- RAIL LOCK MOTOR MECHANISM CIRCUITS SHALL BE SIMILAR TO SHEET 2.
11- CIRCUITS ON SHEET 3 APPLY TO SWING SPAN ONLY.

TYPICAL INTERLOCKING CIRCUITS FOR MOVABLE BRIDGE

USING MECHANICAL LOCKING

SEPT. 1951

AAR SIG.SEC. 8057A

SHEET 3 OF 3 SHEET

ADDENDUM TO A.A.R. SIG.SEC. 8058A

TYPICAL CIRCUITS REMOTE CONTROL SWITCH AND COLORLIGHT SIGNALS.

This is a coded remote control system with the functions individually controlled, single switch layout, track signaled in both directions.

A relay designated as HSR is provided at the field location which is equivalent to a signal lever repeater at an attended interlocking. These HSR relays are energized by a pulse received from the field code unit after a signal lever is operated by the control operator. Once the HSR relay picks up, it is provided with a holding circuit that may only be released when the interlocking track circuit is de-energized or the signal lever is moved to another position. This feature prevents storage of a signal control with a train within the interlocking limits and also cancels the established route when a train passes through the interlocking.

The NWSR and RWSR relays are used to control the position of the power-operated switch, and also used in the control of the switch correspondence relay, which checks that the switch control and switch machine are in correspondence before a signal may be cleared. The NWSR and RWSR relays are energized by a code pulse received from the field code unit, providing lock relay LR is energized. This feature prevents storage of the switch control. Once the NWSR or RWSR relays are energized the holding circuit retains the relay energized until the switch lever is operated in the opposite position, providing the lock relay is energized. The switch control in this scheme is so arranged that if the interlocking track circuit is de-energized while the switch is in transit, the machine will stop operating.

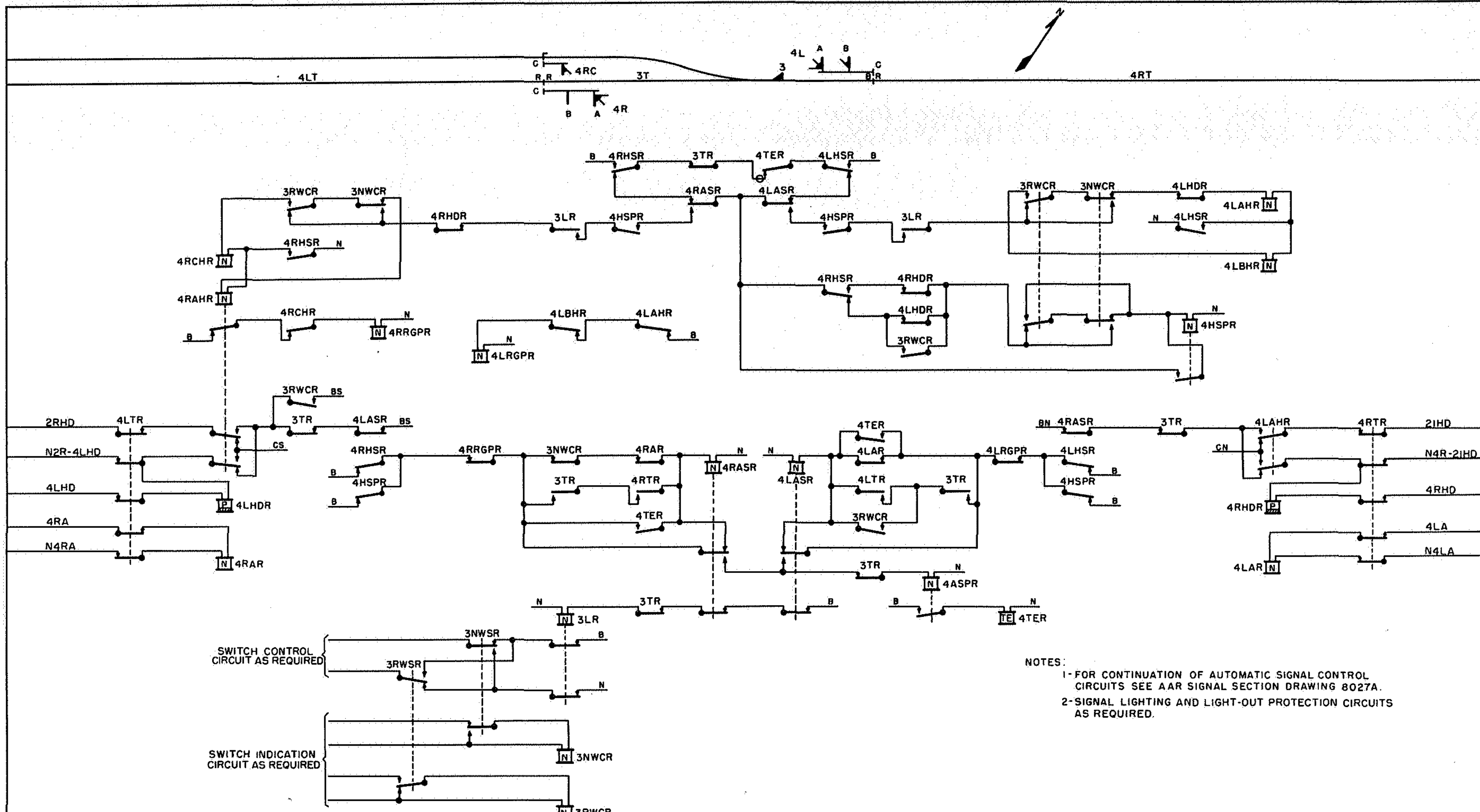
The use of relay 4HSPR provides a check that a route is available before de-energizing the approach stick relay which is included in the signal control to provide a check that the approach locking is in effect before allowing a signal to clear.

The signal control network checks switch correspondence relay energized, the switch locking relay de-energized, also that the opposing approach locking relay is energized.

Two track approach locking release is provided for through train movements on the main track.

The following conditions are indicated from the field: switches in the normal or reverse position, signals clear, signals at stop, or time relay functioning approach, and interlocking track circuits.

The automatic signal circuits used in conjunction with this plan are based on those shown on A.A.R. Sig. Sec. 8027.



NOTES:

1- FOR CONTINUATION OF AUTOMATIC SIGNAL CONTROL CIRCUITS SEE AAR SIGNAL SECTION DRAWING 8027A.

2- SIGNAL LIGHTING AND LIGHT-OUT PROTECTION CIRCUITS AS REQUIRED.

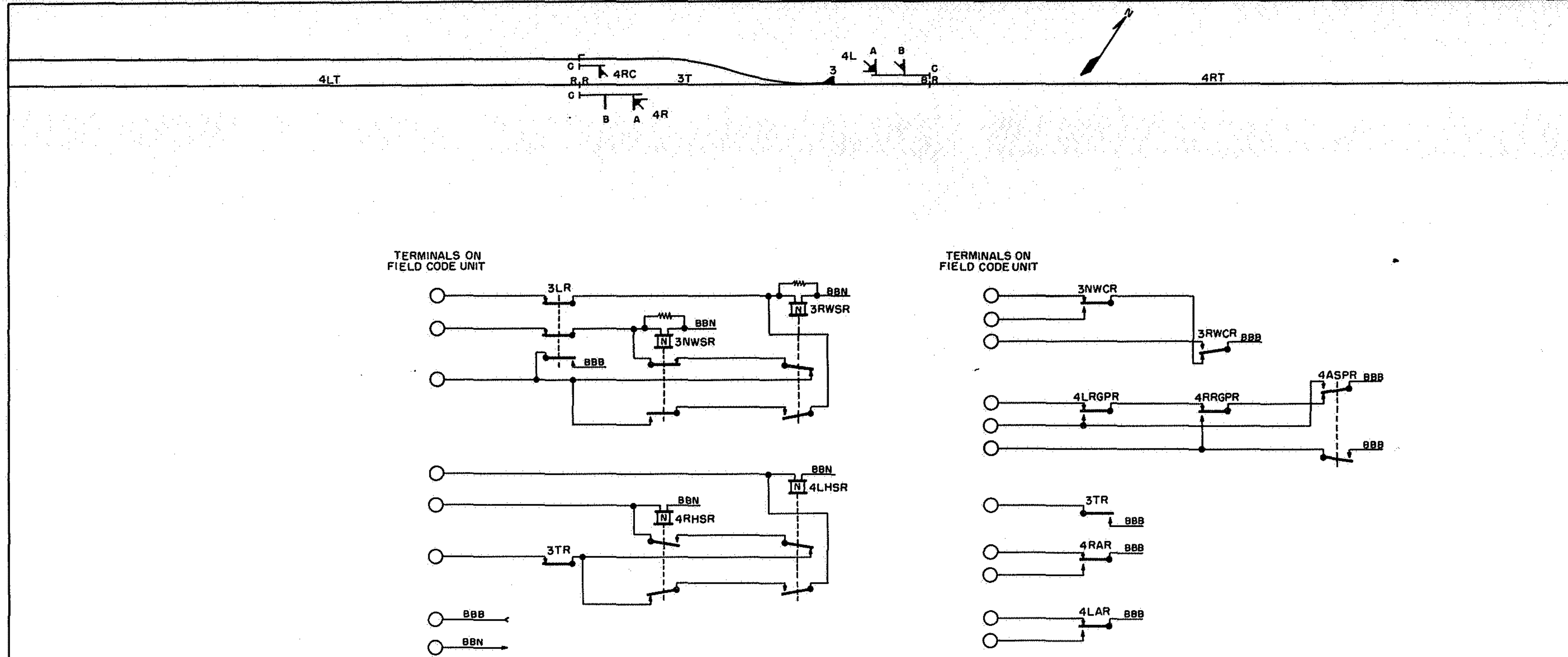
TYPICAL CIRCUITS REMOTE CONTROL SWITCH AND COLORLIGHT SIGNALS

CODE CONTROL USING 3 WIRE HD LINE CIRCUITS

SEPT. 1951

AAR SIG. SEC. 8058A

SHEET 1



NOTE:
THESE CIRCUITS WILL VARY WITH THE TYPE OF CODE SYSTEM EMPLOYED.

TYPICAL CIRCUITS REMOTE CONTROL SWITCH AND COLORLIGHT SIGNALS

CODE CONTROL USING 3 WIRE HD LINE CIRCUITS

SEPT. 1951

AAR
SIG.SEC.
8058A

SHEET 2

ADDENDUM TO A.A.R. SIG. SEC. 8058

TYPICAL CIRCUITS REMOTE CONTROL SWITCH AND COLORLIGHT SIGNALS.

This is a coded remote control system with the functions individually controlled, single switch layout, main track signaled in both directions.

A relay designated as HSR is provided at the field location which is equivalent to a signal lever repeater relay. These HSR relays are energized by a pulse received from the field code unit after a signal lever is operated by the control operator and a control code is sent to the field location. Once the HSR relay is energized, contacts of this relay will close and remain closed until the track circuit between home signals is de-energized or signal is coded to stop. This feature prevents storage of a signal control when a train occupies the track circuit between home signals and also cancels storage of signal control when a train enters this track circuit.

The NWSR and RWSR relays are used to control the position of the power-operated switch, and also used in the control of the switch correspondence relay, which checks that the switch control and switch machine are in correspondence before a signal may be cleared. The NWSR and RWSR relays are energized by a code pulse received from the field code unit, providing lock relay LR is energized. This feature prevents storage of the switch control. Once the NWSR or RWSR relay is energized, contacts of this relay will close and remain closed until the switch lever is operated to the opposite position and a control code is sent to the field location providing the lock relay is energized. The switch control in this scheme is so arranged that if the track circuit between home signals is de-energized while the switch is in transit, the machine will stop operating.

The use of relay 4RCR provides a check that a route is available before de-energizing the ASR relay. A back contact of the ASR relay is included in the signal control to provide a check that time locking is in effect before allowing a signal to clear.

The signal control network checks switch correspondence relay energized, the switch locking relay de-energized, also that the opposing ASR relay is energized.

Two track restoring of ASR is provided for through train movements on the main track.

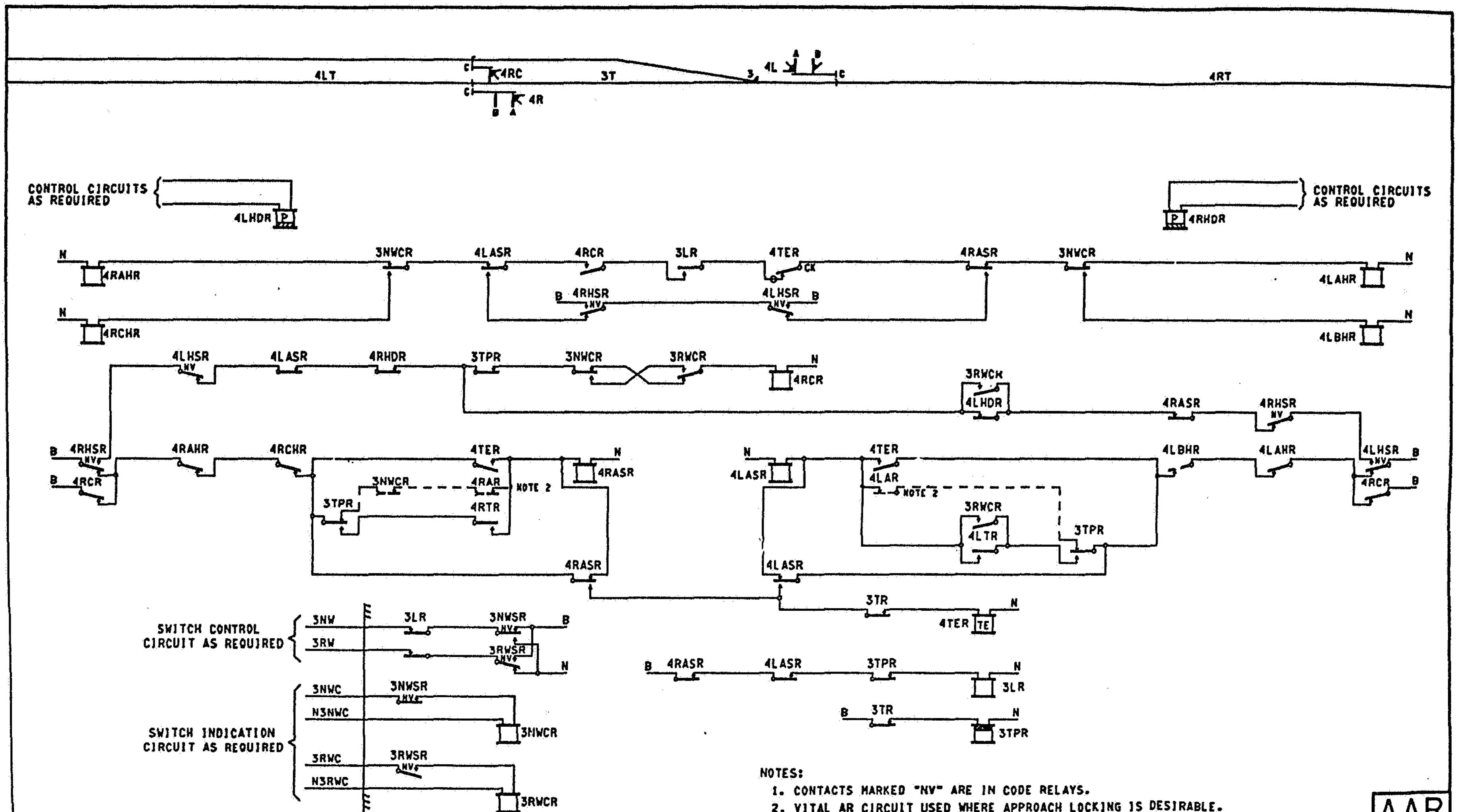
The following conditions are indicated from the field: Switches in the normal or reverse position and out of correspondence, signals clear, signals at stop, or time running, approach, and detector track circuits.

3TPR is slow pick-up to provide momentary loss of shunt protection.

Vital line circuits as required. Shown on other Typical Circuit Drawings.

Signal lighting and light-out protection circuits as required.

Exhibit E-22



NOTES:
1. CONTACTS MARKED "NV" ARE IN CODE RELAYS.
2. VITAL AR CIRCUIT USED WHERE APPROACH LOCKING IS DESIRABLE.

TYPICAL CIRCUITS REMOTE CONTROL SWITCH AND COLOR LIGHT SIGNALS - CODE CONTROL

AAR SIGNAL 8058

SHEET 1 OF 1

TYPICAL NORMALLY DE-ENERGIZED CODED TRACK CIRCUITS AND TRAFFIC CONTROL WITHOUT LINE WIRES.

The objective of these circuits is to provide a traffic control system where the use of line wires is not feasible or economical.

Sheet 1.
This sheet shows the circuits for a double intermediate signal location.

The H relay is operated from pulsating d.c. obtained by mechanically rectifying the a.c. output of a master transformer. The H relay will respond any time a track relay is coding. The D relay is operated from the output of electrically tuned decoding units which are connected to a secondary winding on the master transformer. When the transmitter code frequency matches the rate of the tuned unit, the D relay will respond. Since the master transformer output and frequency are a function of the rate at which the track relay operates, both H and D relays cannot respond unless the track relay is operating.

The use of front contact repeater relays (one FPR for each direction) permits the use of a common "H" and "D" decoding circuit. This also provides a means of removing energy from master transformer while the system is at rest, thus reducing energy consumption.

This circuit provides the means for tumbling down the signal control through the entire block in case a train overruns an absolute signal with traffic set up in the opposite direction. This is accomplished by the use of code following series approach and approach repeater relays (actuated as a train approaches the signal) to pick the directional stick relays.

The series approach also provides approach lighting of the signals while the stick relay provides for advance lighting.

Track polarity at signal locations should be so arranged that adjoining rails around insulated joints are opposing, thus a failure of the insulated joints will not pick the biased track relays.

Sheet 2.
This sheet shows the circuits of a repeating cut location combined with a switch lock location.

Release of the switch lock for a train leaving the main line is obtained by shunting the short release track section (WT) located directly in front of the switch.

Release of the switch lock for a train entering the main line is obtained when coded track energy is detected from both ends of the block to the switch lock location. This permits manual or supervisory control of all movements to the main line at outlying switch lock locations. It being necessary for the operator to initiate the switch unlock control by turning the switch lock lever and actuating the push button which automatically applies coded track energy to both ends of the block.

Sheet 2 - Continued.

Front contact repeater relays (22FPR and 11FPR) are used to detect coded track energy from both directions before switch unlock is obtained.

The WLPR switch normal repeater is used to stop the coded energy (for normal traffic) at the lock location allowing coded energy (for unlock) from opposite end of block to reach the location, thus providing the unlock.

Sheet 3.
This sheet shows the circuits for two staggered intermediate signal locations.

The operation of the circuits on this sheet are similar to those on Sheet 1 with the exception that the code is fed past the opposing intermediate signal similar to that of a relayed cut-section.

Sheet 4.
Figure 1 shows a coded line circuit arranged to by-pass the non-coded track circuits at a highway crossing control.

Figure 2 shows a relayed cut-section used when the distance between signals exceeds the operable length of an individual coded track circuit when the number and length of coded track circuits does not result in code distortion.

Track polarity at relayed cut-sections should be so arranged that adjoining rails around the insulated joints are alike. Thus a failure of the insulated joints will cause a lock up of the signal system as the track relay remains energized through the front contact.

Sheet 5.
This sheet shows the circuits for the control of entering and leaving signals, also the power switch at the end of a siding.

Separate master transformers and H relays are required for each direction. However, it is possible to use common 120D and 180D relays by selecting the proper master transformer through the 4RHR relay up or down.

The 4GZPR relay permits a check that a route is available before dropping the time stick locking relay (4LASR or 4RASR) which in turn are included in the signal control to provide a check that the time locking is in effect before allowing a signal to clear. The 4GZPR is slow pick-up to prevent dropping the time locking relay before the new route is established if a composite switch and signal control is sent out.

Selecting the signal controls through the check contact of the timing relay prevents a signal being cleared if timing relay fails to return to normal position, but does permit switch operation.

Sheet 6.
This sheet shows the CTC function control and indication circuits.

Traffic control relays 4RTFZR or 4LTFZR check that the corresponding GZR (signal control relay) is down before being allowed to pick up. This is to avoid applying coded energy to a block to unlock a switch or clear an opposing signal from the opposite end of block while a GZR is cleared into said block.

Sheets 7 and 8.
This traffic control system, the function of which is controlled from one machine, provides for control of entering and leaving signals, also the power switch, at each end of a siding. Coded track circuits furnish the control for the wayside signals with intermediate signals arranged for following moves. Lever control of outlying switch locks is also incorporated.

The use of normally de-energized coded track circuits to control the signaling for double direction running requires that a means be provided on the control machine for establishing, maintaining and changing direction of traffic between control stations as well as shutting down the system automatically after the train has proceeded out of the block and no following movements are contemplated.

The following is a description of the circuits and manipulation of control machine.

Assume all functions at rest, and 4R signal is to be cleared for a train movement to the right. The usual lever manipulation is all that is required. That is, lever 4 is turned to the right and its start button pushed. This will pick up the 4CHR relay which in turn picks up the 4LCR relay creating cycle #1 sending the control to pick the 4RGZR relay in the field. This control cycle (while the 4CHR and 4LCR relays are both up) will pick the 6ACHR which in turn picks the 6LCR creating an automatic control cycle to the opposite end of the block to pick the 6LTFZR relay in the field. The 6LTFZR up energizes the code transmitter relays and starts coded energy back through rails toward 4R signal. When this coded energy reaches 4R location, having cleared all automatic signals in the block, 4R signal will clear creating the indication cycle (#3) which will indicate the block is clear (4RBKR up with 4R6LBE light still dark) that 4R signal is clear (4RGKR up). Picking the 4RBKR will pick the 4-6RFSR to establish and maintain the direction of traffic as 4 signal lever is turned to the right. (Indicated by 4-6RFE being illuminated.) The 4-6RFSR is then stuck up as long as 4R signal is clear. As train accepts 4R signal and moves into the block it will continue to be stuck up first by 3TKR up and eventually by 4RBKR down which also indicates that the block is occupied.

After the train proceeds entirely out of the block (passed 6L signal) an indication cycle which picks up the 4RBKR relay, will then be transmitted from the 4R location when the 18ODR relay in the field picks up, indicating that the block is clear. As the 4RBKR (clear block indication) picks up, providing signal lever 4 is not still turned to the right, the 6ACHR will pick up before the 4-6RFSR relay drops, sending an automatic control cycle to location 6 dropping the traffic relay 6LTFZR which in turn removes the coded track energy from the rails. When the 18ODR relay

Sheets 7 and 8 - Continued.
drops at the opposite end of the block an indication cycle will be sent in from location 4 dropping the 4RBKR relay removing the traffic light indication (4-6RFE).

The manipulation for 4R signal as outlined above is typical for opposing signal 6L as well as all signals located at power switch locations governing into the normally de-energized code track.

Before sending an unlock control to outlying switch lock 3A, the operator should first determine which direction the train expects to proceed after entering the block. When this direction is established the switch lock lever 3A should be turned in the same direction and the start button pushed. This will pick up the 3APBPR relay which will pick up both the 4ACHR and the 6ACHR relays causing an automatic start to be sent to each end of the block. It will also pick up the 3ALPSR relay which in turn will pick up the 4-6LFSR or 4-6RFSR traffic stick relays depending on whether the switch lock lever is turned left or right. If the 4-6LFSR relay is picked up then when 4ACHR sends the control to the 4 location, the 4RTFZR relay will pick up and traffic will be set up to the left and coded track energy will be established in the block from left to right. Then as the 3ALPSR relay is up when 6ACHR sends the control to the 6 location, the 6LTFZR relay will pick up applying coded track energy to the block in the opposite direction.

The indications on the machine reminding the operator that an unlock has been sent out, consist of a red block light, (4R-6LBE), an opal traffic light, left or right, and a red light above the lever depending also on which direction the switch lock lever is turned.

There will be times when it will be necessary to bring a train out of a lock location (after another train has passed by) and allow the train after coming out of the locked switch to proceed either way. This can be done. However, if the train goes against the direction of traffic as set up for the first train, then the operator should refrain from cancelling the unlock control until the train has cleared the block. Otherwise the automatic signals governing the reverse movement of the train will be put to stop when the unlock control is cancelled and an APB directional stick might be left up in the field. If this should occur, the operator can restore the circuits to normal by sending out the unlock control again and then cancelling the unlock.

The switch lock door may be opened any time after unlock has been sent out, dropping the LP relay which will stop the regular coded track energy from being transmitted beyond the lock location. This will allow the coded track energy from the opposite end to come up to the lock location. Then when coded track is detected from both ends, picking up both FPR relays, the lock will be released.

This circuit has been designed to give instantaneous lockout of opposing signal levers, also between the switch unlock and signal levers. That is, if two opposing signal levers are turned into the same block an incomplete control cycle will result, indicated by an intermittent audible buzz. This is also true if an attempt is made to

Sheets 7 and 8 - Continued.

clear a signal after an unlock has been given. If a switch unlock is attempted after a signal control has been sent out the switch lock relays will not respond and no unlock can be given.

The ACHPR relay is required to prevent a signal control from being transmitted on an automatic control cycle. The pick-up coil of the ACHPR is connected in series with the pick-up coil of each LC relay in the section and is picked up whenever the ACH relay picks up and is stuck up for the duration of the cycle. The 8 and LV control buss are then selected through the ACHP relay to disconnect the buss from the regular selections and apply SS code to 8 and LV control steps causing no change in signal control in the field as signal left, right or stop requires an LS or SL code.

Nomenclature and function of relay:

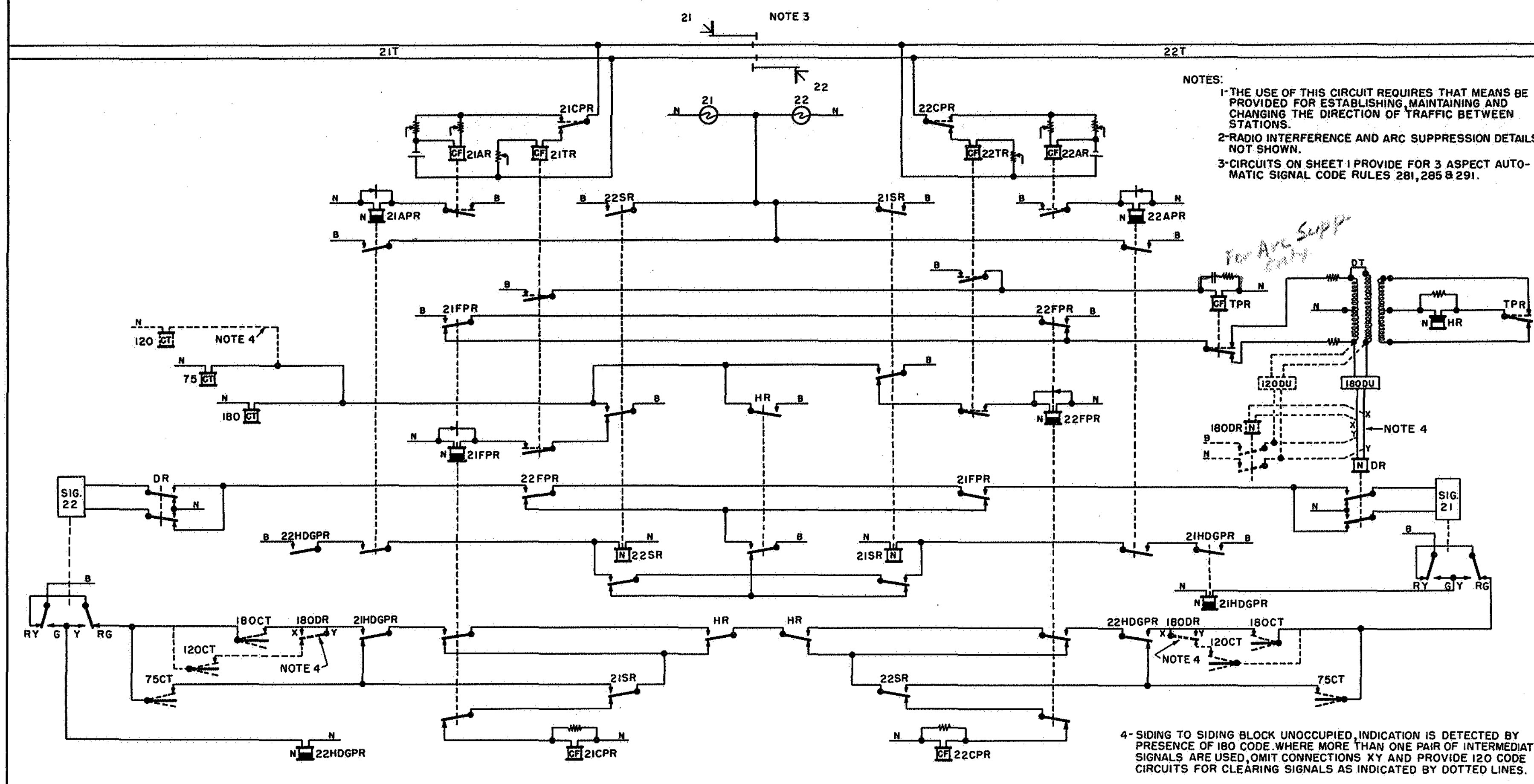
CHR - control cycle start relay. They initiate a control start, or store it if a cycle is in progress.

ACHR - automatic control cycle start relay. Initiated automatically to control the traffic relays in the field.

LCR - control code make-up relay. Selects the station code and control levers for the control code.

LFSR - left traffic relay. Once established it holds until block is clear in the field.

RFSR - right traffic relay.



NOTES:

1- THE USE OF THIS CIRCUIT REQUIRES THAT MEANS BE PROVIDED FOR ESTABLISHING, MAINTAINING AND CHANGING THE DIRECTION OF TRAFFIC BETWEEN STATIONS.

2- RADIO INTERFERENCE AND ARC SUPPRESSION DETAILS NOT SHOWN.

3- CIRCUITS ON SHEET I PROVIDE FOR 3 ASPECT AUTOMATIC SIGNAL CODE RULES 281, 285 & 291.

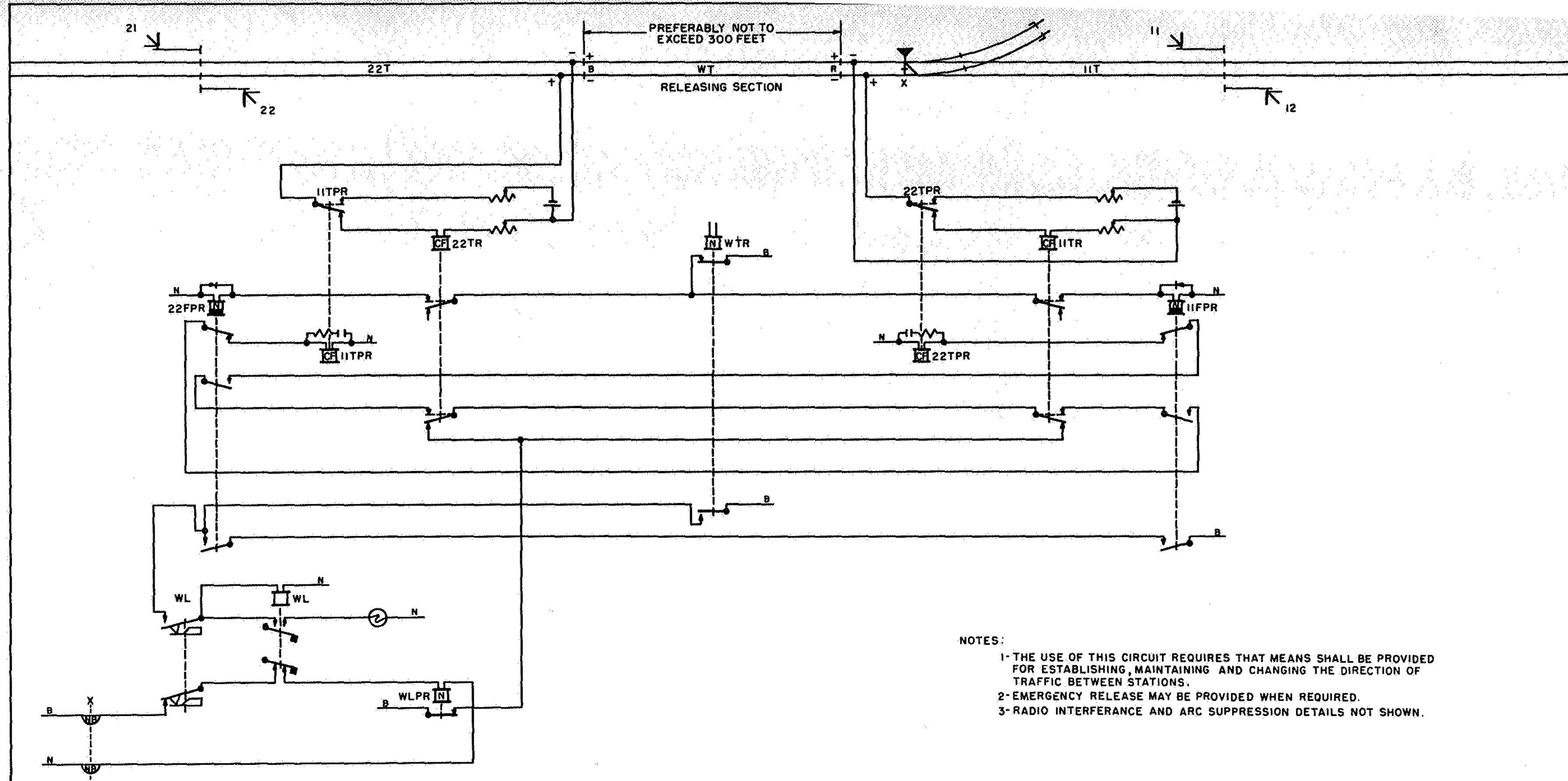
4- SIDING TO SIDING BLOCK UNOCCUPIED, INDICATION IS DETECTED BY PRESENCE OF 180 CODE. WHERE MORE THAN ONE PAIR OF INTERMEDIATE SIGNALS ARE USED, OMIT CONNECTIONS XY AND PROVIDE 120 CODE CIRCUITS FOR CLEARING SIGNALS AS INDICATED BY DOTTED LINES.

TYPICAL NORMALLY DE-ENERGIZED CODED TRACK CIRCUITS & TRAFFIC CONTROL WITHOUT LINE WIRES

SEPT. 1951

AAR SIG. SEC. 8059A

SHEET I



NOTES:

1- THE USE OF THIS CIRCUIT REQUIRES THAT MEANS SHALL BE PROVIDED FOR ESTABLISHING, MAINTAINING AND CHANGING THE DIRECTION OF TRAFFIC BETWEEN STATIONS.

2- EMERGENCY RELEASE MAY BE PROVIDED WHEN REQUIRED.

3- RADIO INTERFERANCE AND ARC SUPPRESSION DETAILS NOT SHOWN.

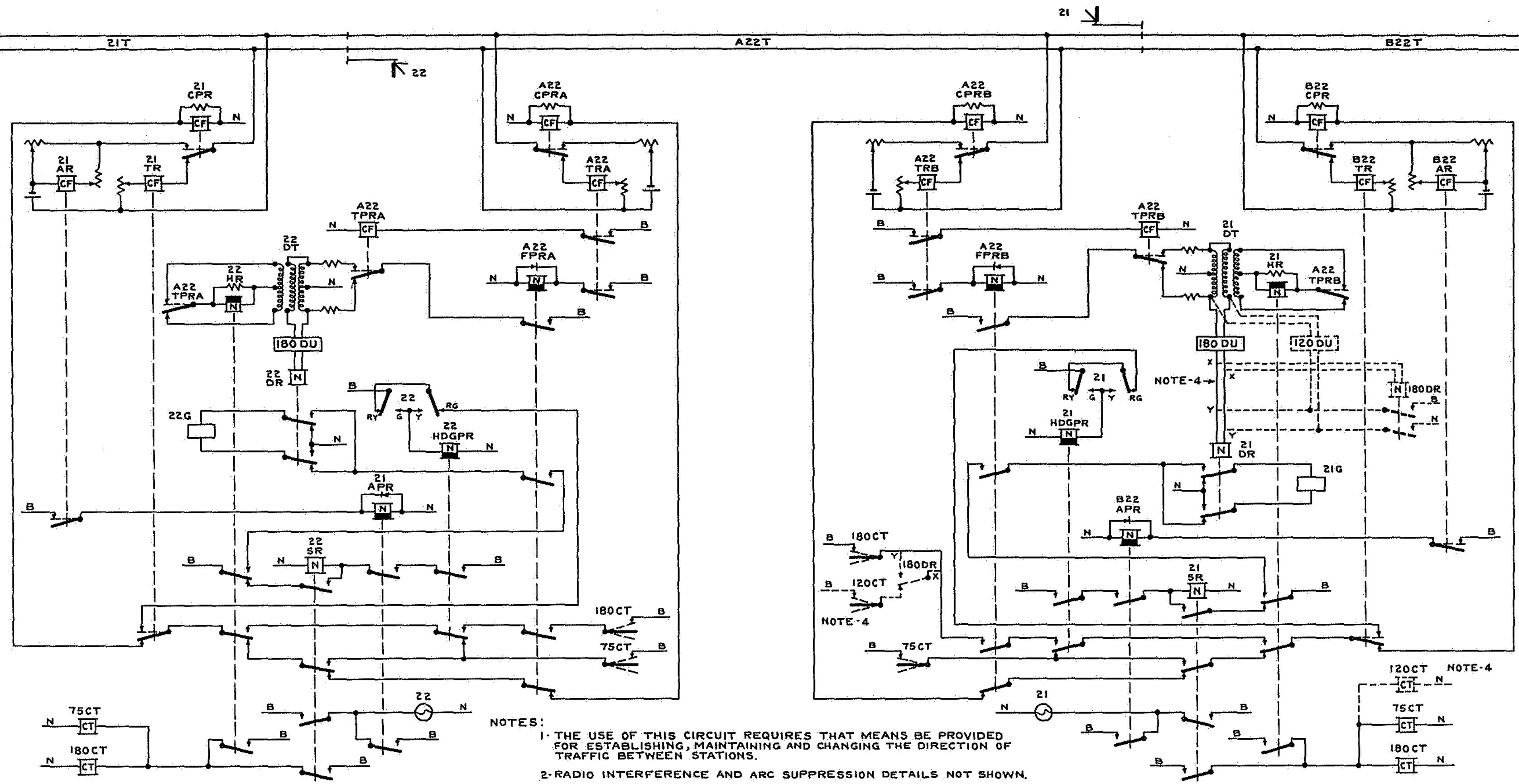
TYPICAL NORMALLY DE-ENERGIZED CODED TRACK CIRCUITS & TRAFFIC CONTROL WITHOUT LINE WIRES

(ELECTRIC SWITCH LOCK LOCATION)

SEPT. 1951

AAR SIG. SEC. 8059A

SHEET 2



NOTES:

1- THE USE OF THIS CIRCUIT REQUIRES THAT MEANS BE PROVIDED FOR ESTABLISHING, MAINTAINING AND CHANGING THE DIRECTION OF TRAFFIC BETWEEN STATIONS.

2- RADIO INTERFERENCE AND ARC SUPPRESSION DETAILS NOT SHOWN.

3- CIRCUITS ON SHEET 3 PROVIDE FOR 3 ASPECT AUTOMATIC SIGNAL CODE RULES 281, 285 AND 291.

4- SIDING TO SIDING BLOCK UNOCCUPIED INDICATION IS DETECTED BY THE PRESENCE OF 180 CODE AT THE ENTERING HEADBLOCK. WHERE MORE THAN ONE PAIR OF INTERMEDIATE SIGNALS ARE USED OMIT CONNECTIONS X-Y AS REQUIRED AND PROVIDE 120 CODE CIRCUITS FOR CLEARING SIGNALS, AS SHOWN BY DOTTED LINES.

TYPICAL NORMALLY DE-ENERGIZED CODED TRACK CIRCUITS AND TRAFFIC CONTROL WITHOUT LINE WIRES

(STAGGERED INTERMEDIATE SIGNAL LOCATION)

SEPT. 1952

AAR SIG. SEC. 8059A

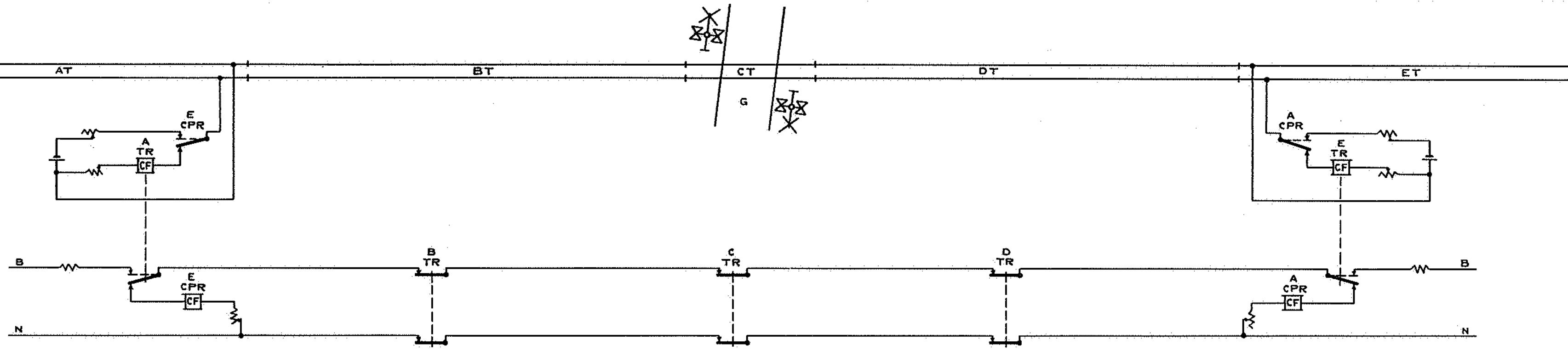


FIG. 1
CODED LINE CIRCUITS FOR BY-PASSING NON-CODED TRACK CIRCUITS

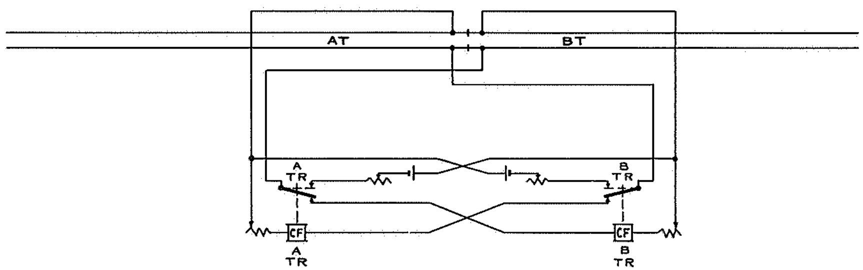


FIG. 2
RELAYED CUT-SECTION

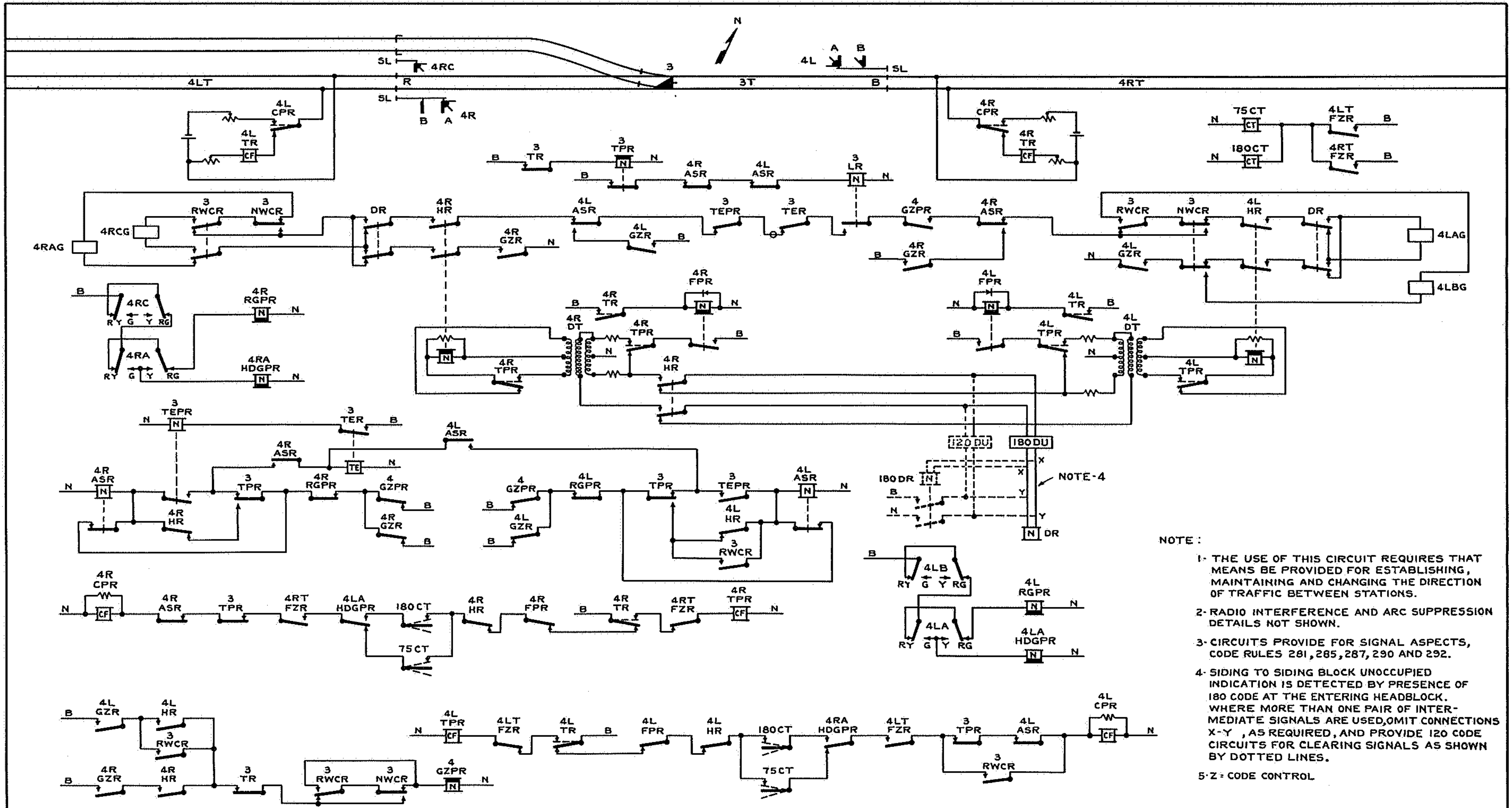
NOTE:
RADIO AND ARC SUPPRESSION DETAILS NOT SHOWN.

TYPICAL NORMALLY DE-ENERGIZED CODED TRACK CIRCUITS AND TRAFFIC CONTROL WITHOUT LINE WIRES

SEPT. 1952

AAR SIG. SEC. 8059A

SHEET 4



NOTE:

1- THE USE OF THIS CIRCUIT REQUIRES THAT MEANS BE PROVIDED FOR ESTABLISHING, MAINTAINING AND CHANGING THE DIRECTION OF TRAFFIC BETWEEN STATIONS.

2- RADIO INTERFERENCE AND ARC SUPPRESSION DETAILS NOT SHOWN.

3- CIRCUITS PROVIDE FOR SIGNAL ASPECTS, CODE RULES 281, 285, 287, 290 AND 292.

4- SIDING TO SIDING BLOCK UNOCCUPIED INDICATION IS DETECTED BY PRESENCE OF 180 CODE AT THE ENTERING HEADBLOCK. WHERE MORE THAN ONE PAIR OF INTERMEDIATE SIGNALS ARE USED, OMIT CONNECTIONS X-Y, AS REQUIRED, AND PROVIDE 120 CODE CIRCUITS FOR CLEARING SIGNALS AS SHOWN BY DOTTED LINES.

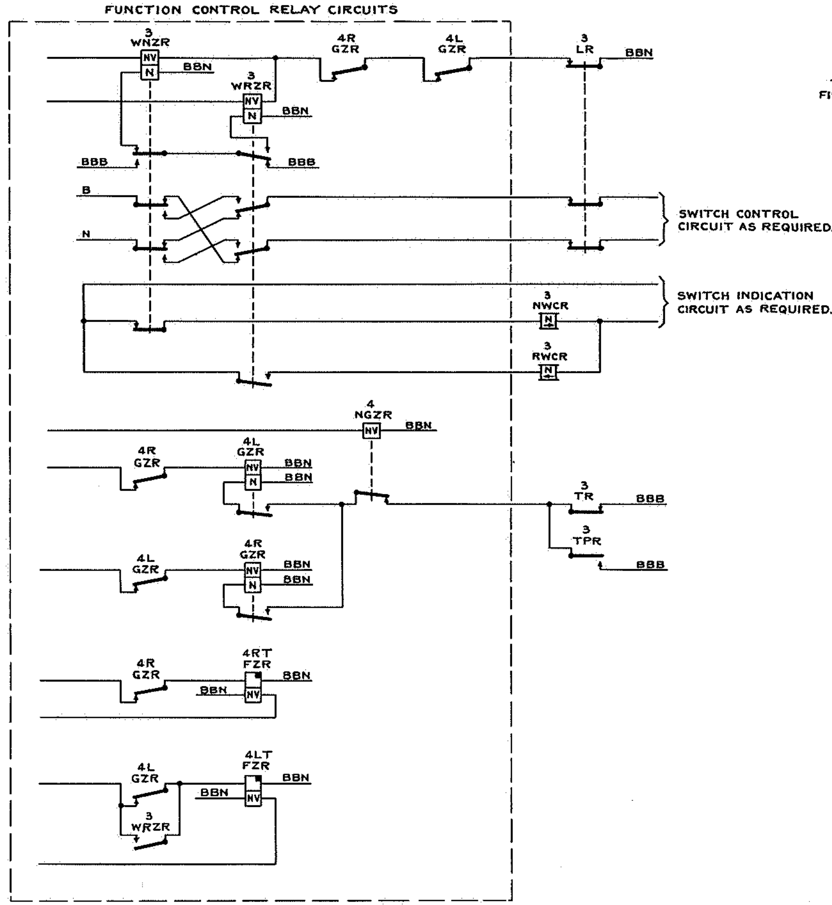
5- Z = CODE CONTROL.

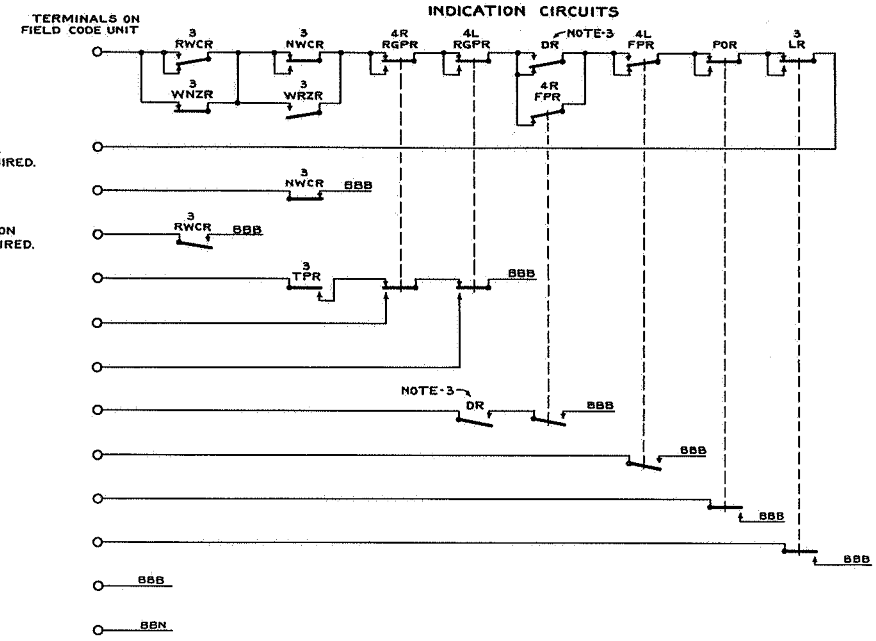
TYPICAL NORMALLY DE-ENERGIZED CODED TRACK CIRCUITS AND TRAFFIC CONTROL WITHOUT LINE WIRES

(END OF SIDING LOCATION)

SEPT. 1953

AAR SIG. SEC. 8059A





NOTE :

1.- THESE CIRCUITS WILL VARY WITH THE TYPE OF CODE SYSTEM EMPLOYED.

2.- Z = CODE CONTROL.

3.- WHERE MORE THAN ONE PAIR OF INTERMEDIATE SIGNALS ARE USED SELECT THROUGH 180 DR INSTEAD OF DR.

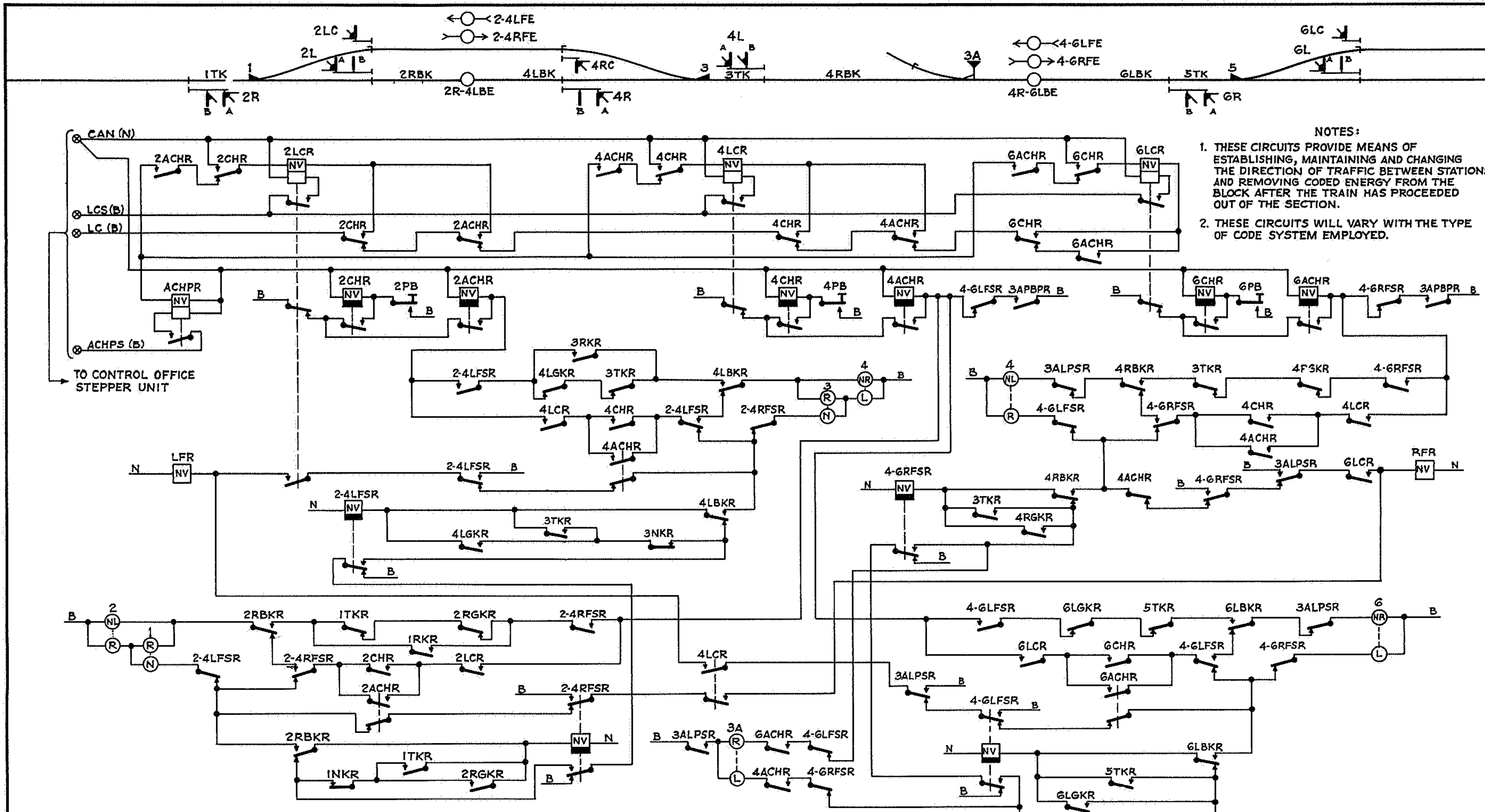
TYPICAL NORMALLY DE-ENERGIZED CODED TRACK CIRCUITS AND TRAFFIC CONTROL WITHOUT LINE WIRES

(END OF SIDING LOCATION)

SEPT. 1953

AAR SIG. SEC. 8059A

SHEET 6



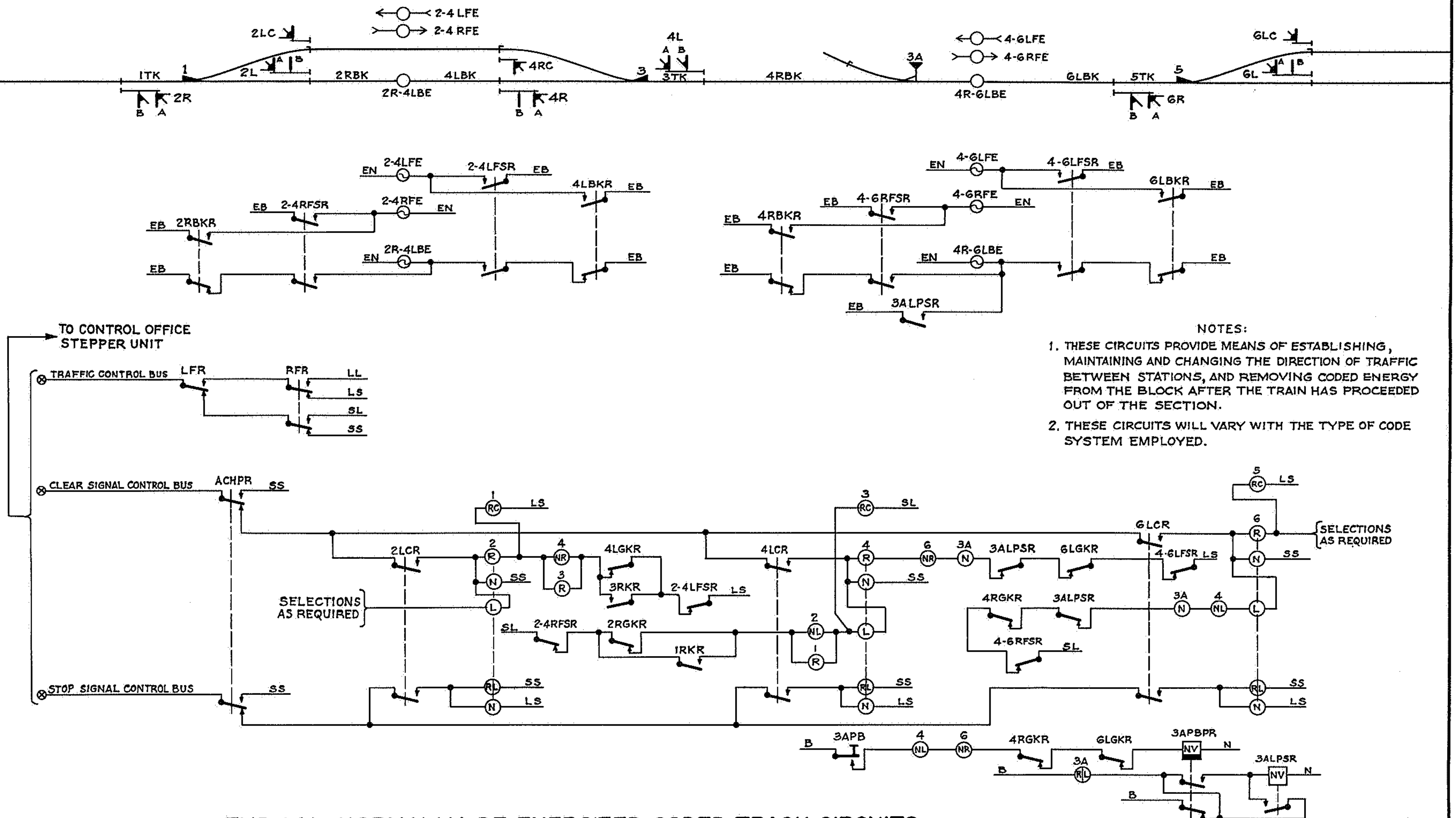
1. THESE CIRCUITS PROVIDE MEANS OF ESTABLISHING, MAINTAINING AND CHANGING THE DIRECTION OF TRAFFIC BETWEEN STATIONS, AND REMOVING CODED ENERGY FROM THE BLOCK AFTER THE TRAIN HAS PROCEEDED OUT OF THE SECTION.
2. THESE CIRCUITS WILL VARY WITH THE TYPE OF CODE SYSTEM EMPLOYED.

TYPICAL NORMALLY DE-ENERGIZED CODED TRACK CIRCUITS AND TRAFFIC CONTROL WITHOUT LINE WIRES

(CONTROL MACHINE CIRCUITS)

SEPT. 1956

AAR SIG. SEC. 8059A



NOTES:

1. THESE CIRCUITS PROVIDE MEANS OF ESTABLISHING, MAINTAINING AND CHANGING THE DIRECTION OF TRAFFIC BETWEEN STATIONS, AND REMOVING CODED ENERGY FROM THE BLOCK AFTER THE TRAIN HAS PROCEEDED OUT OF THE SECTION.
2. THESE CIRCUITS WILL VARY WITH THE TYPE OF CODE SYSTEM EMPLOYED.

TYPICAL NORMALLY DE-ENERGIZED CODED TRACK CIRCUITS AND TRAFFIC CONTROL WITHOUT LINE WIRES

(CONTROL MACHINE CIRCUITS)

SEPT. 1956

AAR SIG. SEC. 8059A

TYPICAL THREE AND FOUR ASPECT COLOR LIGHT AUTOMATIC SIGNAL CIRCUITS.

These circuits make use of the biased neutral D relay, retained neutral H relay and neutral slow release AD relay.

The retained neutral H relay prevents momentary changing of signal aspects during pole change periods. In the four aspect signal circuit the ADR relays are slow release to avoid the display of a momentary aspect other than Stop, when a train passes the signal.

Two-wire, double break HD line circuits without line shunts are shown. Line shunt is omitted so as to prevent a possible signal flash with a short high speed train. The shunt is also omitted from the 22ADR relay control wire when the 12DR relay is de-energized because of the possibility of obtaining a less restrictive indication with a break in the N22HD wire.

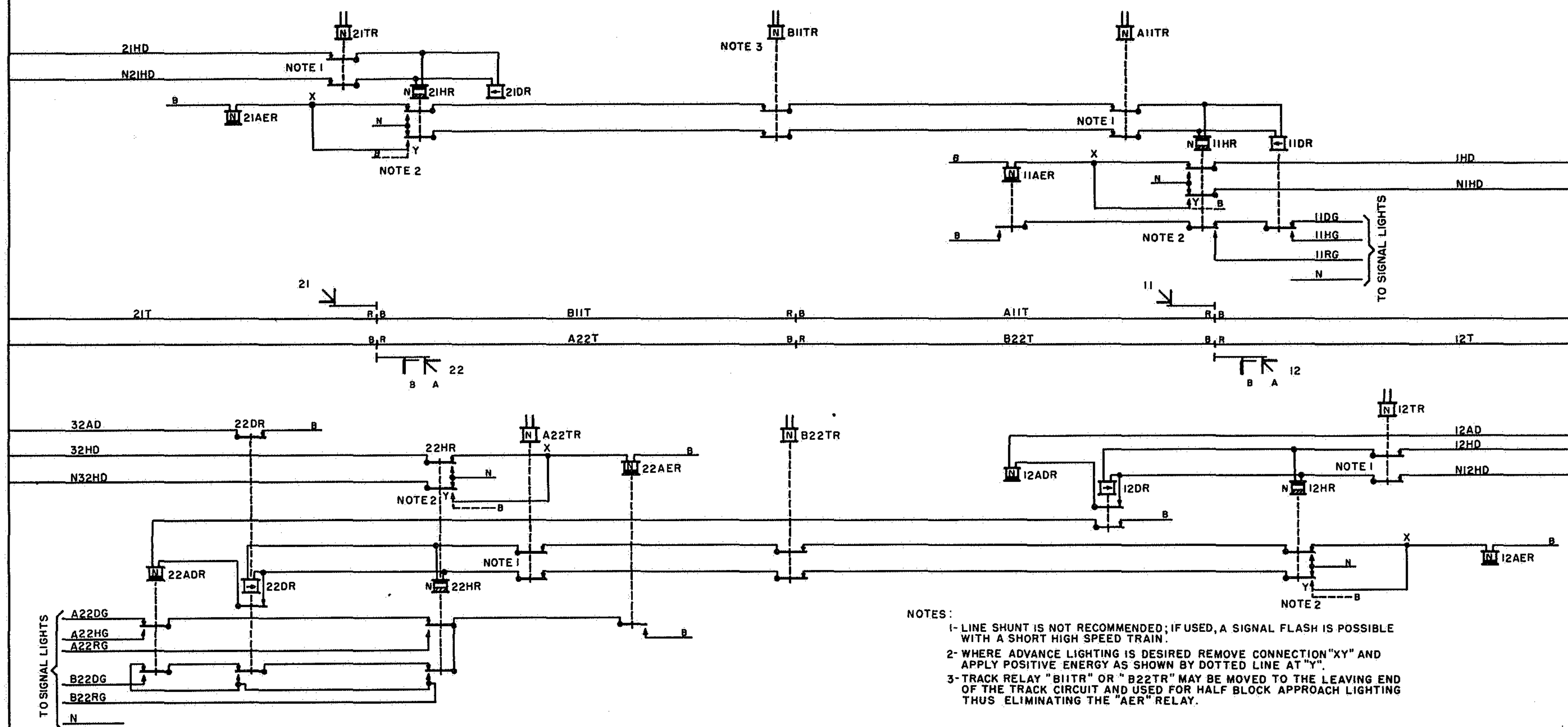
Full block approach lighting is provided if desired by use of an AER relay in series with the HD line circuit. The AER relay is slow release so as to bridge the momentary opening of its control during the pole change of the HD line circuit.

Light out protection is not shown and should be added as required.

TYPICAL THREE ASPECT COLORLIGHT AUTOMATIC SIGNAL CIRCUITS

USING BIASED NEUTRAL D RELAY AND RETAINED NEUTRAL H RELAY

(CODE RULES 281-285-291)



NOTES:

1- LINE SHUNT IS NOT RECOMMENDED; IF USED, A SIGNAL FLASH IS POSSIBLE WITH A SHORT HIGH SPEED TRAIN.

2- WHERE ADVANCE LIGHTING IS DESIRED REMOVE CONNECTION "XY" AND APPLY POSITIVE ENERGY AS SHOWN BY DOTTED LINE AT "Y".

3- TRACK RELAY "B11TR" OR "B22TR" MAY BE MOVED TO THE LEAVING END OF THE TRACK CIRCUIT AND USED FOR HALF BLOCK APPROACH LIGHTING THUS ELIMINATING THE "AER" RELAY.

TYPICAL FOUR ASPECT COLORLIGHT AUTOMATIC SIGNAL CIRCUITS

USING BIASED NEUTRAL D RELAY, RETAINED NEUTRAL H RELAY AND NEUTRAL SLOW RELEASE AD RELAY

(CODE RULES 281-282-285-291)

SEPT. 1951

AAR SIG. SEC. 8060A

TYPICAL LIGHT OUT PROTECTION CIRCUITS TO PREVENT DISPLAY OF LESS RESTRICTIVE ASPECTS.

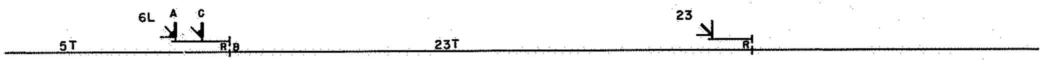
The circuits shown on Sheets 1, 2 and 3 illustrate light out protection for searchlight and color light type signals with approach lighting circuits.

There are two lengths of approach lighting circuits shown, extending in one to the approach signal only and in the other beyond the approach signal.

When the approach lighting does not extend beyond the approach signal it is necessary to use the double coil light out relay as shown so as to provide proper indication on the approach signal.

Where approach lighting circuits are not required single coil light out relays can be used.

Full block approach lighting is provided by use of an AER relay in series with the signal control line circuit. The AER relay is slow release so as to bridge the momentary opening of its control during the pole change of the signal control line circuit.



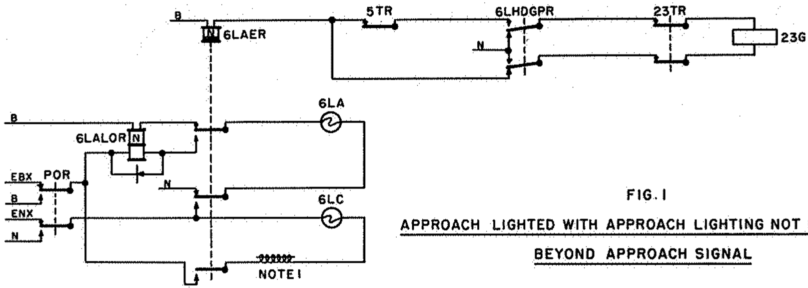


FIG. I

APPROACH LIGHTED WITH APPROACH LIGHTING NOT EXTENDING BEYOND APPROACH SIGNAL

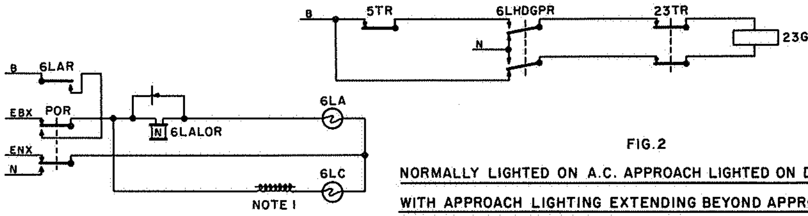


FIG. 2

NORMALLY LIGHTED ON A.C. APPROACH LIGHTED ON D.C. RESERVE WITH APPROACH LIGHTING EXTENDING BEYOND APPROACH SIGNAL

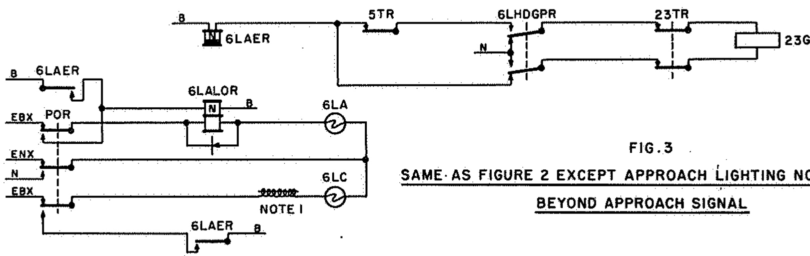


FIG. 3

SAME AS FIGURE 2 EXCEPT APPROACH LIGHTING NOT EXTENDING BEYOND APPROACH SIGNAL

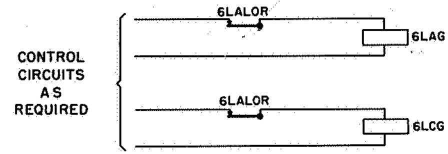


FIG. 4

NOTE:

I - THE USE OF REACTOR OR RESISTOR TO COMPENSATE FOR VOLTAGE DROP ACROSS LOR IN 6LA LAMP CIRCUIT IS OPTIONAL.

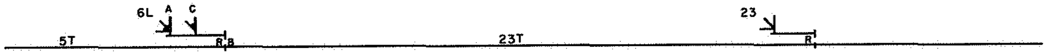
TYPICAL LIGHTOUT PROTECTION CIRCUITS TO PREVENT DISPLAY OF LESS RESTRICTIVE ASPECTS

SEARCHLIGHT TYPE SIGNALS

SEPT. 1951

AAR SIG. SEC. 8061A

SHEET I



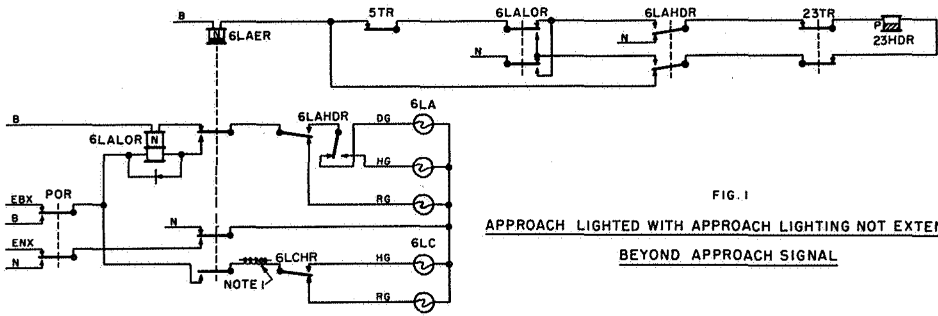


FIG. I

APPROACH LIGHTED WITH APPROACH LIGHTING NOT EXTENDING BEYOND APPROACH SIGNAL

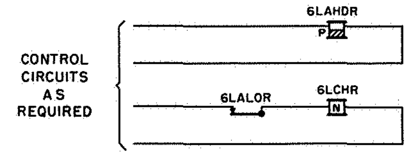


FIG. 4

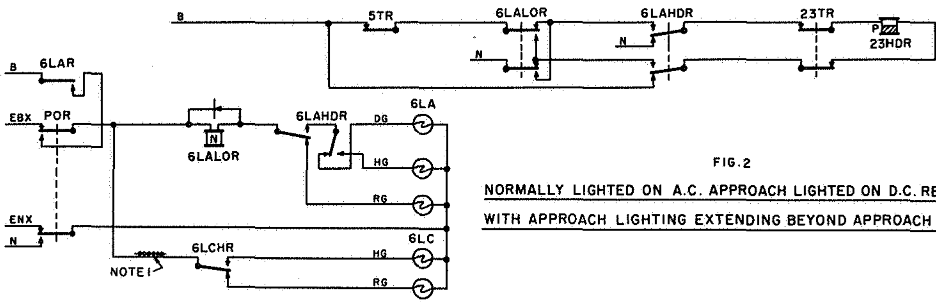


FIG. 2

NORMALLY LIGHTED ON A.C. APPROACH LIGHTED ON D.C. RESERVE WITH APPROACH LIGHTING EXTENDING BEYOND APPROACH SIGNAL

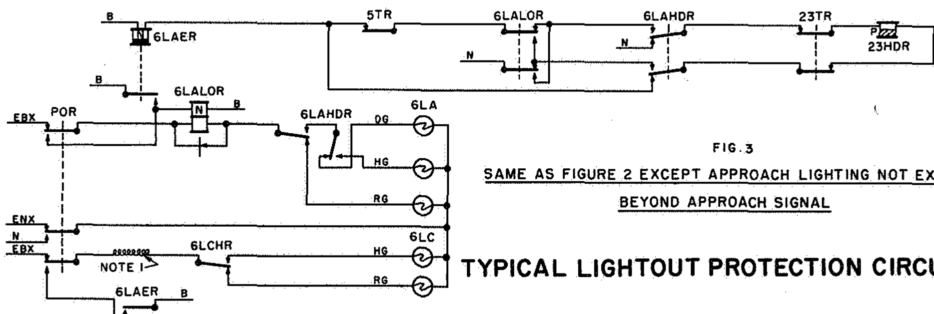


FIG. 3

SAME AS FIGURE 2 EXCEPT APPROACH LIGHTING NOT EXTENDING BEYOND APPROACH SIGNAL

NOTE:

I- THE USE OF REACTOR OR RESISTOR TO COMPENSATE FOR VOLTAGE DROP ACROSS LOR IN 6LA LAMP CIRCUIT IS OPTIONAL.

TYPICAL LIGHTOUT PROTECTION CIRCUITS TO PREVENT DISPLAY OF LESS RESTRICTIVE ASPECTS

COLORLIGHT TYPE SIGNALS

SEPT. 1951.

AAR SIG. SEC. 8061A

SHEET 2

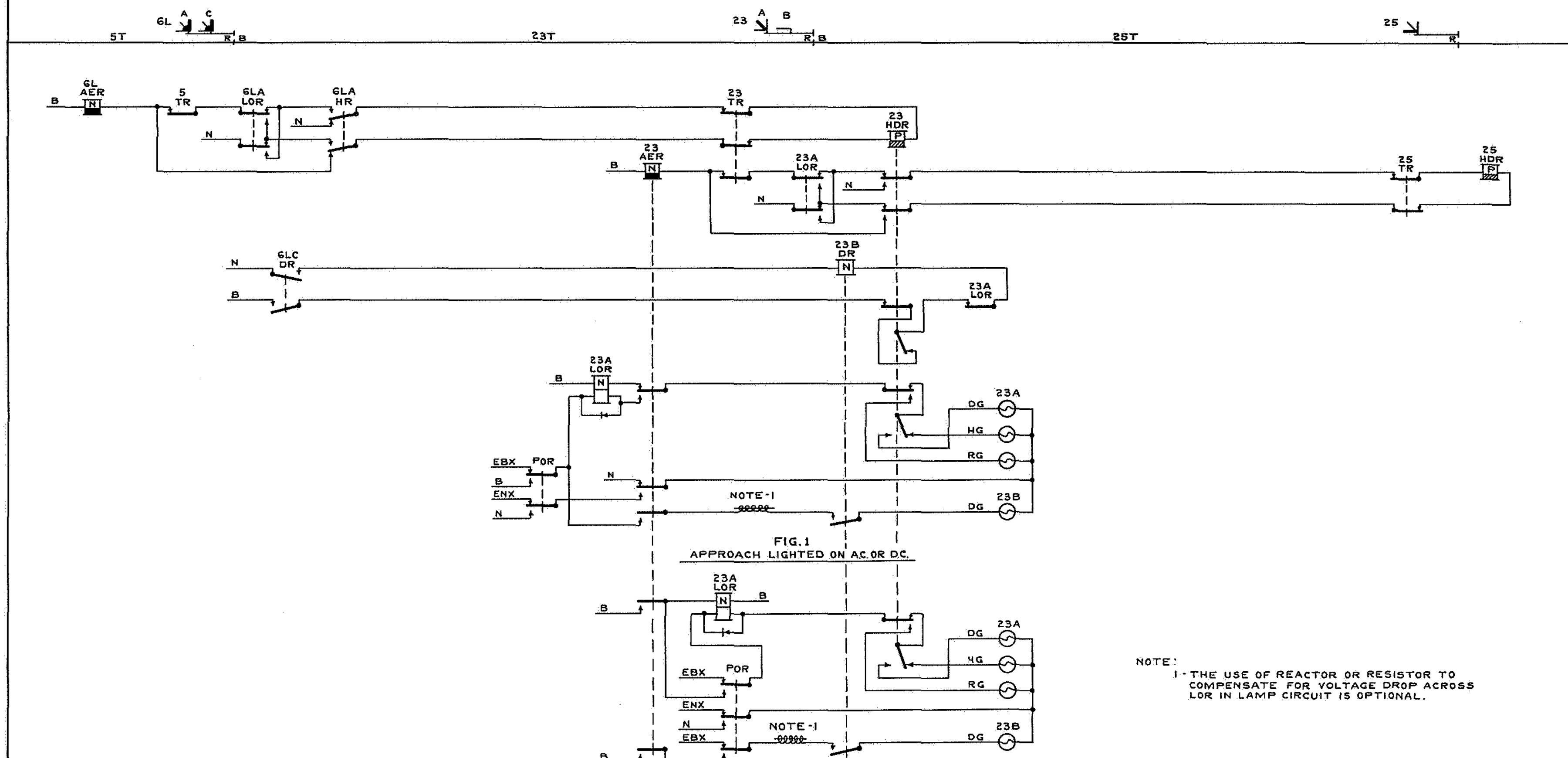


FIG. 1
APPROACH LIGHTED ON A.C. OR D.C.

FIG. 2
NORMALLY LIGHTED ON A.C. APPROACH LIGHTED ON D.C. RESERVE

NOTE:
1 - THE USE OF REACTOR OR RESISTOR TO COMPENSATE FOR VOLTAGE DROP ACROSS LOR IN LAMP CIRCUIT IS OPTIONAL.

TYPICAL LIGHTOUT PROTECTION CIRCUITS TO PREVENT DISPLAY OF LESS RESTRICTIVE ASPECTS

COLORLIGHT TYPE SIGNALS

SEPT. 1953

AAR SIG. SEC. 8061A

SHEET 3

TYPICAL CIRCUITS FOR CONTROL AND INDICATION OF REMOTE BLOCK SIGNAL USING CODED CARRIER FREQUENCY OVER EXISTING TELEPHONE LINE.

Outbound (control) and inbound (indication) carrier must be of different frequencies.

Signal No. 1 normally displays a Stop aspect. This is indicated from the field to the control office by keying the inbound carrier transmitter at the rate of 180 per minute. The carrier receiver at the control office is tuned to respond to the inbound carrier frequency which causes code following relay 1RHGPR to respond to the 180 code rate. A front and back contact of 1RHGPR alternately applies energy to the transformer to produce an a.c. voltage which is impressed on the terminals of the 180 decoding unit where the code rate is decoded and rectified picking up relay 1RGPPR. Relay 1RGPPR picked up will cause a stop indication to be displayed on the control panel.

Description of operation to obtain a permissive aspect:

Lever No. 1, positioned to the center position, picks up 1CRLPSR and energizes the 120 code transmitter. 1CRLPSR is picked up over lever contact CR and a front contact of 1NLPR. Positioning lever No. 1 to the center position removes the pick-up source of energy from relay 1NLPR; however, 1NLPR will not release due to stick energy being applied over a front contact of 1RGPPR. 1RGPPR will remain up until the 180 coded carrier in the field is interrupted, indicating that the signal in the field is displaying an aspect other than Stop. The 120 code transmitter keys the outbound carrier at the rate of 120 per minute. The field receiver is tuned to respond to the outbound carrier frequency causing code following relay 1HDR to follow the coded carrier at the 120 rate. A front and back contact of relay 1HDR alternately applies energy to the transformer to produce an a.c. voltage which is impressed on the terminals of the 120 decoding unit where the code rate is decoded and rectified picking up relay 1HR. With 1HR up, 1TPSR up, 1HPR will pick up. Light energy over back contact of 1DPR and front contact of 1HPR causes the signal to display a permissive aspect. With 1HPR picked up the keying of the inbound 180 carrier is stopped causing relay 1RGPPR in the control office to release, establishing a stick circuit for the 1CRLPSR. The permissive aspect is indicated to the office by the 120 code transmitter in the field keying the inbound carrier transmitter at the rate of 120 per minute. Keying circuit is taken over a contact of the 120 code transmitter, a back contact of the 1DPR, and a front contact of the 1HPR. The 120 code rate is received at the control office as previously described, energizing the 1HGPPR causing the permissive indication to be displayed on the control panel through 1RGPPR, 1CRLSPR up, and 1HGPPR up.

Description of the operation to obtain a clear aspect:

No. 1 lever is positioned to the right, picks up the 1CRLSPR and energizes the 180 code transmitter. The circuit for picking relay 1CRLPSR is the same as previously described. The 180 code transmitter keys the outbound carrier at the rate of 180 per minute. This code is received in the field as previously described where it is decoded, picking up the 1DR. The 1DR up, picks up the 1DPR. The 1DPR up, causes the signal to display a clear aspect. The clear aspect is indicated in the office by the absence of inbound coded carrier due to the 1DPR being picked up. The absence of inbound coded carrier releases 1RHGPR and as a result releases 1RGPPR and 1HGPPR. A clear indication is then indicated on the control panel through a back contact of 1RGPPR, and a front contact of 1CRLSPSR, and a back contact of 1HGPPR. Relay 1CRLPSR was previously picked up by positioning the lever to the right and remains up by virtue of a stick circuit over a back contact of relay 1RGPPR.

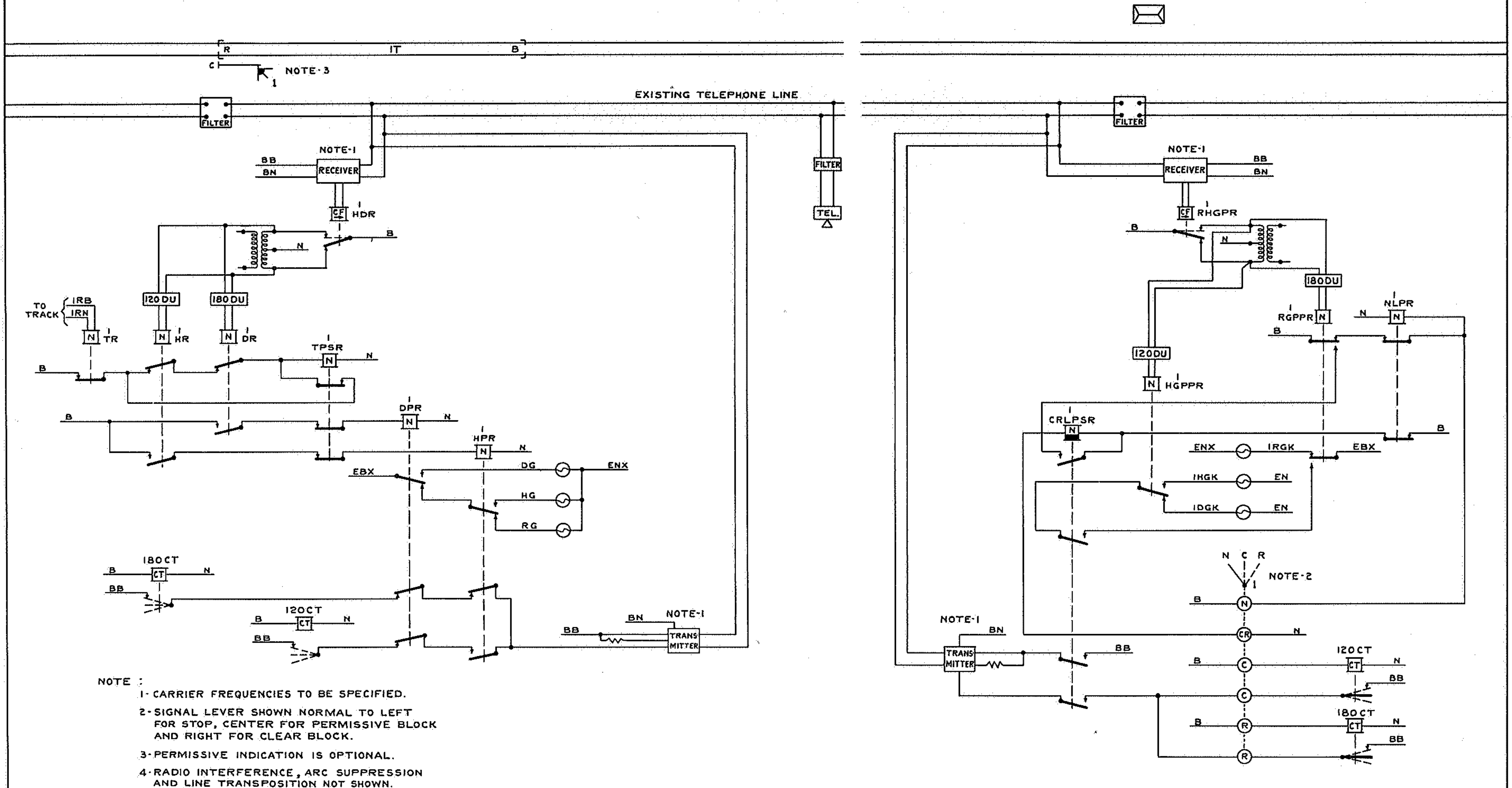
Description of setting signal to stop by train movement:

A short track circuit immediately beyond signal No. 1 is provided to slot the signal when a movement occupies this section. The occupancy of 1T track circuit releases the 1TR relay causing the 1TPSR to release. 1TPSR down releases relay 1DPR or 1HPR, causing the signal to assume its most restrictive aspect. With both the 1DPR and 1HPR down, a circuit is established to key the inbound carrier at the rate of 180 per minute. The 180 coded carrier rate is received by the office receiver causing the Stop indication to be displayed on the control panel as previously described.

The signal cannot be recleared until the lever is returned to the normal position which picks up relay 1NLPR, conditioning the system for the next operation.

Description of setting the signal to stop by the control lever:

Signal No. 1 can be placed to stop by positioning the lever to the normal position which will remove outbound carrier frequency from the line causing relay 1HDR to release which in turn will release the 1HR or the 1DR and in turn release the respective repeater relays. The signal will then display a Stop aspect over a back contact of relays 1DPR and 1HPR.



NOTE :

1- CARRIER FREQUENCIES TO BE SPECIFIED.

2- SIGNAL LEVER SHOWN NORMAL TO LEFT FOR STOP, CENTER FOR PERMISSIVE BLOCK AND RIGHT FOR CLEAR BLOCK.

3- PERMISSIVE INDICATION IS OPTIONAL.

4- RADIO INTERFERENCE, ARC SUPPRESSION AND LINE TRANSPOSITION NOT SHOWN.

TYPICAL CIRCUITS FOR CONTROL AND INDICATION OF A REMOTE BLOCK SIGNAL, USING CODED CARRIER FREQUENCY OVER EXISTING TELEPHONE LINE

SEPT. 1952

AAR SIG. SEC. 8063A

ADDENDUM TO AAR SIG. SEC. 8064A

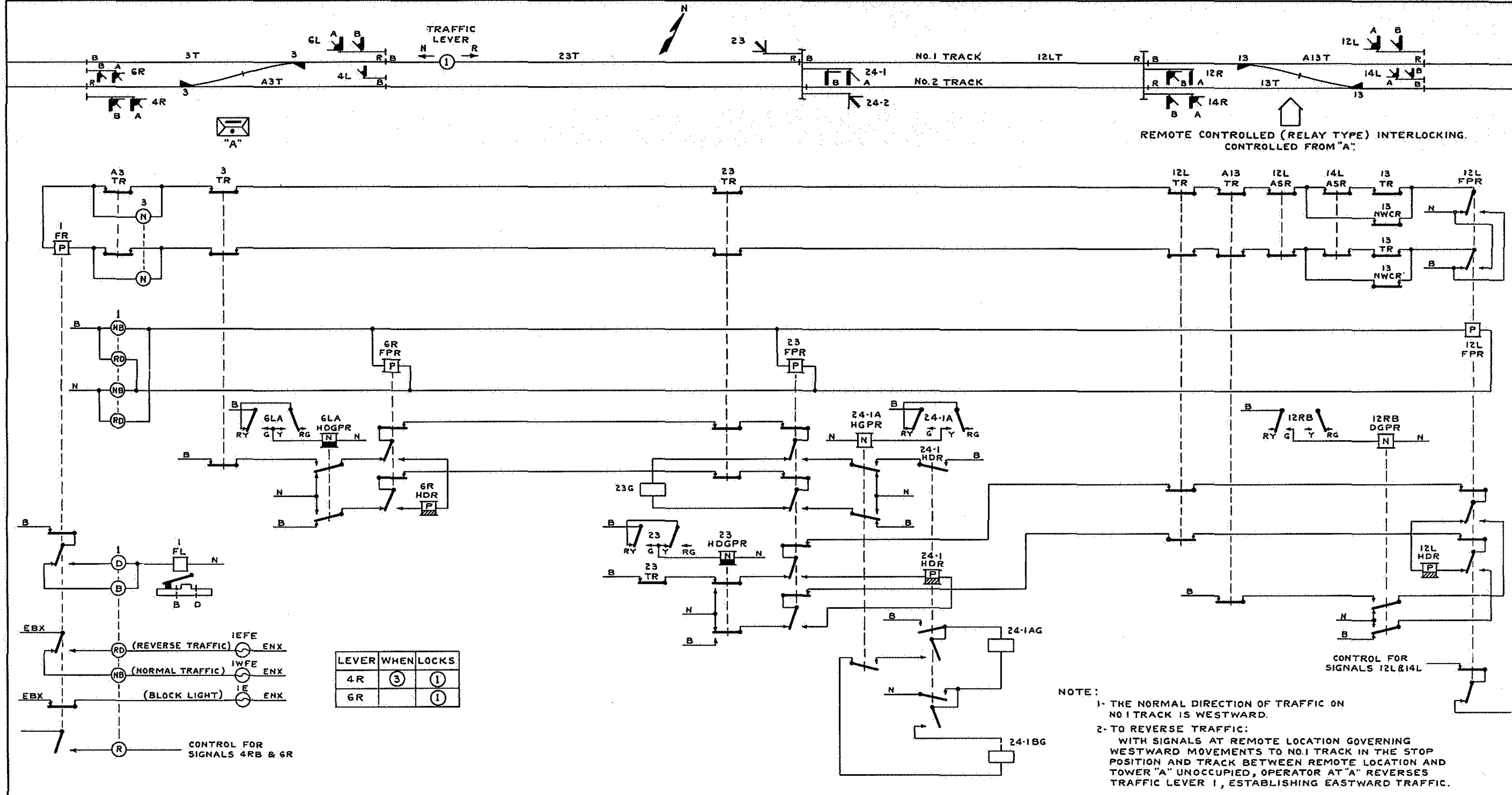
TYPICAL TRAFFIC CONTROL CIRCUITS BETWEEN ATTENDED AND DIRECT WIRE REMOTE CONTROLLED INTERLOCKINGS.

This plan provides mechanical locking at the attended location and circuit locking at the remote location.

A two-wire traffic circuit (1FR) for control of electric lock on traffic lever 1 at Tower A and separate two-wire traffic repeater circuit FPR for selection of the reversible two-wire signal control circuit are used.

The normal direction of traffic on No. 1 track is westward. To reverse traffic, the signals at the remote controlled location governing westward movements on No. 1 track must be in the stop position and the track between the remote controlled location and Tower A unoccupied. The 1FR at Tower A will then be energized and the operator will be able to reverse lever 1 and establish eastward traffic by positioning the FPR at each signal location for selection of eastward signals on No. 1 track.

After the eastward train has completed its movement over the interlockings and track circuits are unoccupied, the traffic lever can be restored to its normal position, thus re-establishing traffic circuits for normal westward movements.



LEVER	WHEN	LOCKS
4R	3	1
6R		1

NOTE:
1- THE NORMAL DIRECTION OF TRAFFIC ON NO. 1 TRACK IS WESTWARD.
2- TO REVERSE TRAFFIC:
WITH SIGNALS AT REMOTE LOCATION GOVERNING WESTWARD MOVEMENTS TO NO. 1 TRACK IN THE STOP POSITION AND TRACK BETWEEN REMOTE LOCATION AND TOWER "A" UNOCCUPIED, OPERATOR AT "A" REVERSES TRAFFIC LEVER 1, ESTABLISHING EASTWARD TRAFFIC.

TYPICAL TRAFFIC CONTROL CIRCUITS BETWEEN ATTENDED AND DIRECT WIRE REMOTE CONTROLLED INTERLOCKINGS

MECHANICAL LOCKING AT ATTENDED LOCATION
CIRCUIT LOCKING AT REMOTE LOCATION

SEPT. 1952

AAR SIG. SEC. 8064A

ADDENDUM TO AAR SIG. SEC. 8065A

TYPICAL TRAFFIC CONTROL CIRCUITS BETWEEN ATTENDED AND CODED REMOTE CONTROLLED INTERLOCKINGS.

This plan provides mechanical locking at the attended location "A" and circuit locking at the remote controlled location.

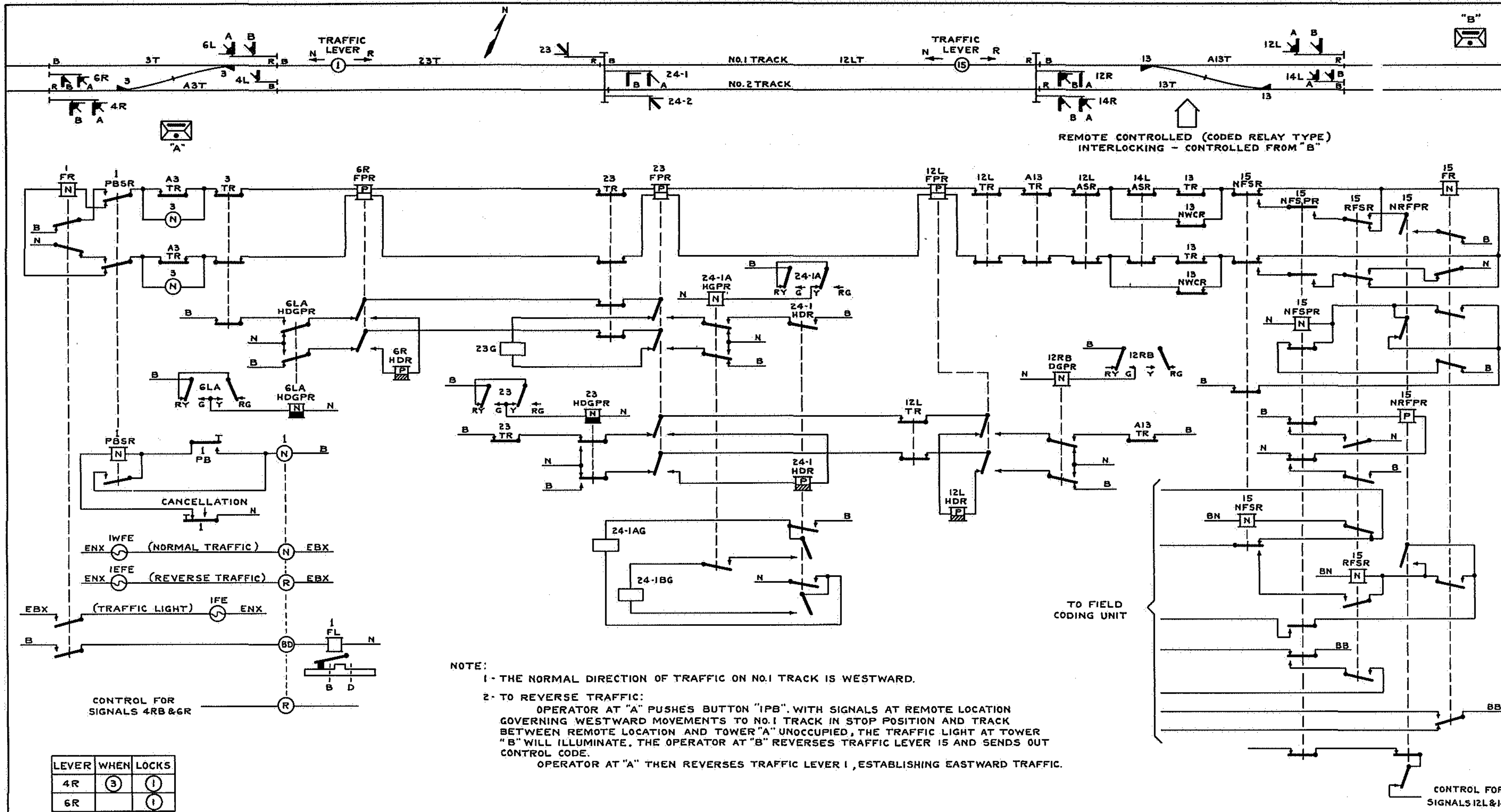
A two-wire traffic circuit for control of the FR and FPR for selection of the reversible two-wire signal control circuit is used. Coordination between operators at Tower A and Tower B is required for reversing traffic.

The normal direction of traffic on No. 1 track is westward. To reverse traffic, the operator at Tower A pushes 1PB which energizes the PBSR. With the signals at the remote controlled location governing westward movements on No. 1 track in the stop position and the track between Tower A and the remote controlled location unoccupied, 15FR will be energized and complete a circuit to send an indication code to Tower B illuminating the traffic light. The operator at Tower B will reverse traffic lever 15 and send out a control code to energize the 15RFSR establishing the reverse traffic circuits at the remote controlled location.

On the initial movement of the traffic lever, energy will be removed from the PBSR which allows the 1FR to pick up and the operator at Tower A can then reverse the lever. The circuit through the PBSR down will also position the FP relays for selection of the eastward signals on No. 1 track.

After the eastward train has completed its movement over the interlockings and the track circuits are unoccupied, the 1FR at Tower A will be energized and light the 1FE, indicating that traffic lever 1 can be restored to its normal position. Traffic lever 15 can then be returned to its normal position. The traffic circuits will be set up for normal westward moves by operator at Tower A pressing 1PB and energizing 1PBSR. This will also energize 15FR at the remote location to provide code circuit to light indicator at Tower B indicating traffic circuit is again normal.

Operator at Tower A will then press cancellation button to de-energize the 1PBSR and remove energy from the traffic line circuit.



NOTE:

1 - THE NORMAL DIRECTION OF TRAFFIC ON NO.1 TRACK IS WESTWARD.

2 - TO REVERSE TRAFFIC:

OPERATOR AT "A" PUSHES BUTTON "1PB". WITH SIGNALS AT REMOTE LOCATION GOVERNING WESTWARD MOVEMENTS TO NO.1 TRACK IN STOP POSITION AND TRACK BETWEEN REMOTE LOCATION AND TOWER "A" UNOCCUPIED, THE TRAFFIC LIGHT AT TOWER "B" WILL ILLUMINATE. THE OPERATOR AT "B" REVERSES TRAFFIC LEVER 15 AND SENDS OUT CONTROL CODE.

OPERATOR AT "A" THEN REVERSES TRAFFIC LEVER 1, ESTABLISHING EASTWARD TRAFFIC.

LEVER	WHEN	LOCKS
4R	3	1
6R		1

TYPICAL TRAFFIC CONTROL CIRCUITS BETWEEN ATTENDED AND CODED REMOTE CONTROLLED INTERLOCKINGS

MECHANICAL LOCKING AT ATTENDED LOCATION

CIRCUIT LOCKING AT REMOTE LOCATION

SEPT. 1952

AAR SIG. SEC. 8065A

ADDENDUM TO AAR SIG. SEC. 8066A

TYPICAL TRAFFIC CONTROL CIRCUITS USING 2-WIRE HD LINE CONTROL.

This traffic control system, the functions of which are controlled from one machine, provides for control of the entering and leaving signals at each end of a passing siding with intermediate signals arranged for following movements.

The use of this system requires that circuits be provided in the control machine for establishing, maintaining and changing direction of traffic between control stations, to avoid placing a signal to stop by inadvertently attempting to clear an opposing signal.

TYPICAL TRAFFIC CONTROL MACHINE CIRCUITS.

Sheet 3 shows a method which employs a magnetic polar stick relay for each block to allow the clearing of one signal only into a given block.

After the clearing of a signal has been initiated or the signal has cleared, or a train has entered the block, any attempt to clear an opposing signal will result in an incomplete control cycle which is indicated by an intermittent audible buzz and continuous code cycling until the opposing signal lever is turned to the proper position which will allow the control cycle to be completed.

The traffic locking in the machine is dependent on leaving the switch and signal control levers in the position called for until the indications have been received.

The following is a description of the circuit and manipulation of control machine for a typical movement: Assume all functions are at rest and 1L signal is to be cleared. Lever 1L is turned to the left and push button 1 pushed. This will pick up 1CHR which in turn picks up 1LCR to send a control cycle to the field to pick up the 1LGZR. While the 1CHR is up momentarily a circuit is completed to the 1-3FR lower coil to position the polar contacts to the reverse position which completes the L-SIG control bus. Control of the 1-3FR includes back contacts of 4TKR, 3RGKR, 3LAKR and 1RAKR, thus providing a check that an opposing signal is not cleared or an opposing movement is not occupying the block before allowing a signal control code to be delivered.

TYPICAL TRAFFIC CONTROL CIRCUITS (END OF SIDING LOCATION) - SHEETS 1 AND 2.

The following explanations indicate reasons for certain circuit arrangements indicated on the plan:

The front contacts of 4TR are used in the opposing HD controls for overlap.

A front contact of 4TPR is used in control of slow pick-up 3RFR to insure the release of directional stick relay at the approach signal when the direction of traffic is being changed.

The 4TPR is slow pick-up to prevent releasing the switch and traffic locking in the event of momentary loss of shunt.

The purpose of 3GZPR is to insure a route is lined before locking becomes effective. This relay is slow pick-up to prevent any possibility of dropping the lock relay before the route is in agreement.

The 3LHDR provides approach locking for 3RASR in place of a separate approach relay.

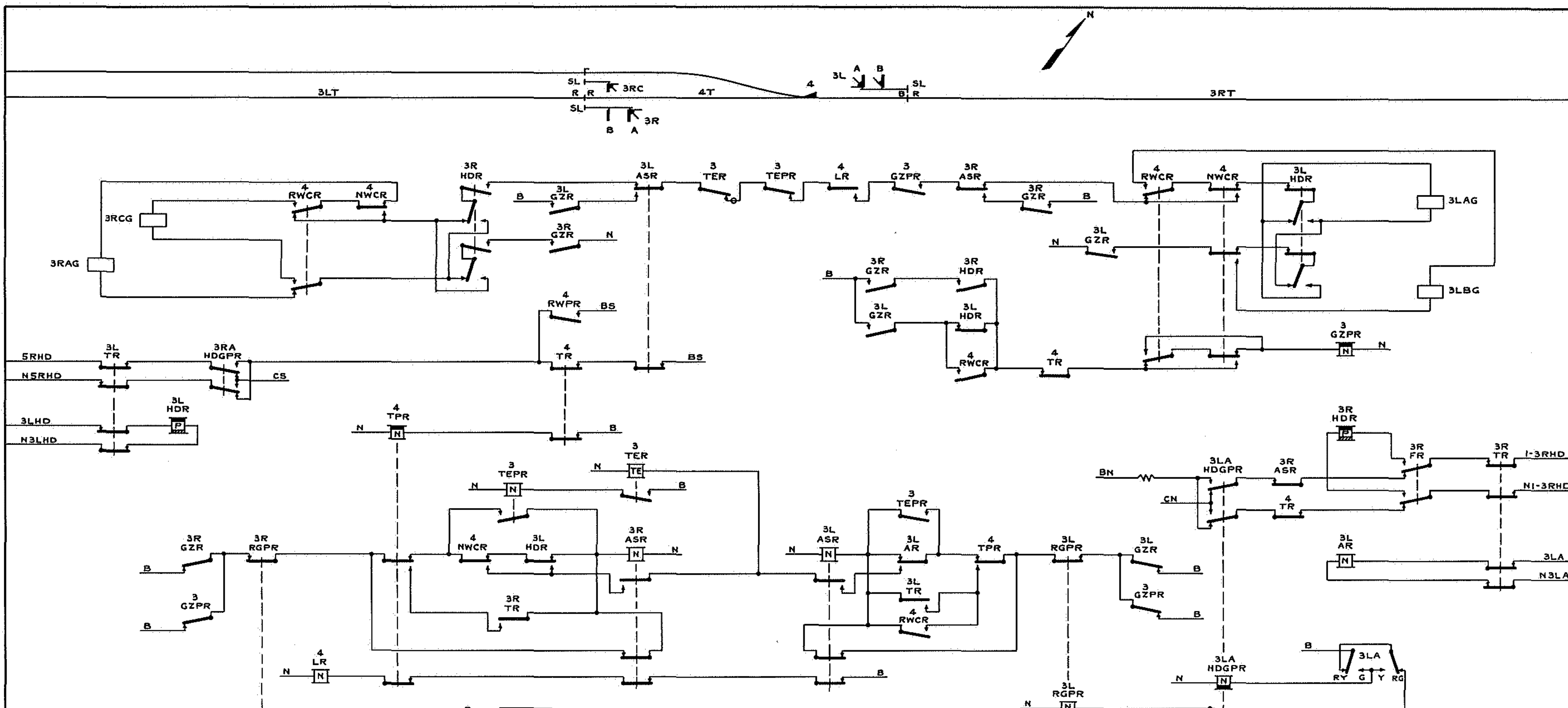
When preconditioning is not permitted, a contact of the reverse switch correspondence relay may be used in selection for opposing HD control. Resistance is required in the HD line circuit to limit the flow of current when batteries at adjacent locations are connected in series.

Selecting the signal control through the back contact of its own approach stick relay provides a check that time or approach locking is in effect before allowing the signal to clear.

Selecting the signal controls through the check contact of the time relay prevents a signal from being cleared if time relay fails to restore, but will permit switch operation.

For intermediate signals using two-wire HD line circuits, see AAR Sig. Sec. 8044 and 8045.

For electric switch lock circuits for use with two-wire HD line circuits, see AAR Sig. Sec. 8048, Scheme No. 4.



NOTE:
1- THE USE OF THIS CIRCUIT REQUIRES THAT MEANS SHALL BE PROVIDED FOR ESTABLISHING, MAINTAINING AND CHANGING THE DIRECTION OF TRAFFIC BETWEEN STATIONS.
2- CIRCUITS PROVIDE FOR SIGNAL ASPECTS, CODE RULES 281, 285, 287, 290 & 292.
3- FOR INTERMEDIATE SIGNALS USING 2 WIRE HD LINE CIRCUITS SEE PLAN 8045A.
4- SIGNAL LIGHTING, APPROACH CIRCUITS & LIGHT-OUT PROTECTION AS REQUIRED.
5- Z = CODE CONTROL.

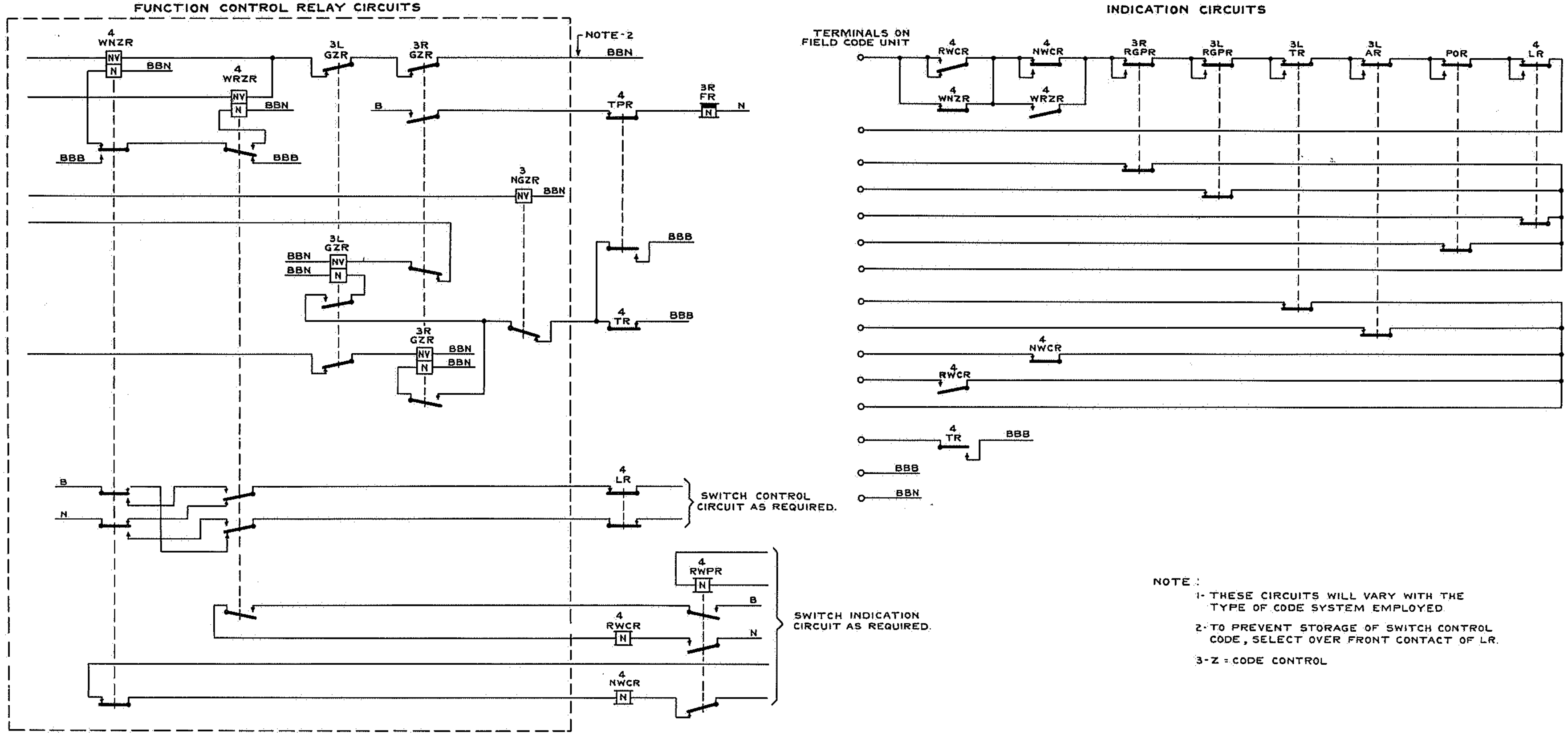
TYPICAL TRAFFIC CONTROL CIRCUITS

USING 2 WIRE HD LINE CONTROL (END OF SIDING LOCATION)

SEPT. 1952

AAR SIG. SEC. 8066 A

SHEET-1



NOTE:
1- THESE CIRCUITS WILL VARY WITH THE TYPE OF CODE SYSTEM EMPLOYED.
2- TO PREVENT STORAGE OF SWITCH CONTROL CODE, SELECT OVER FRONT CONTACT OF LR.
3- Z = CODE CONTROL

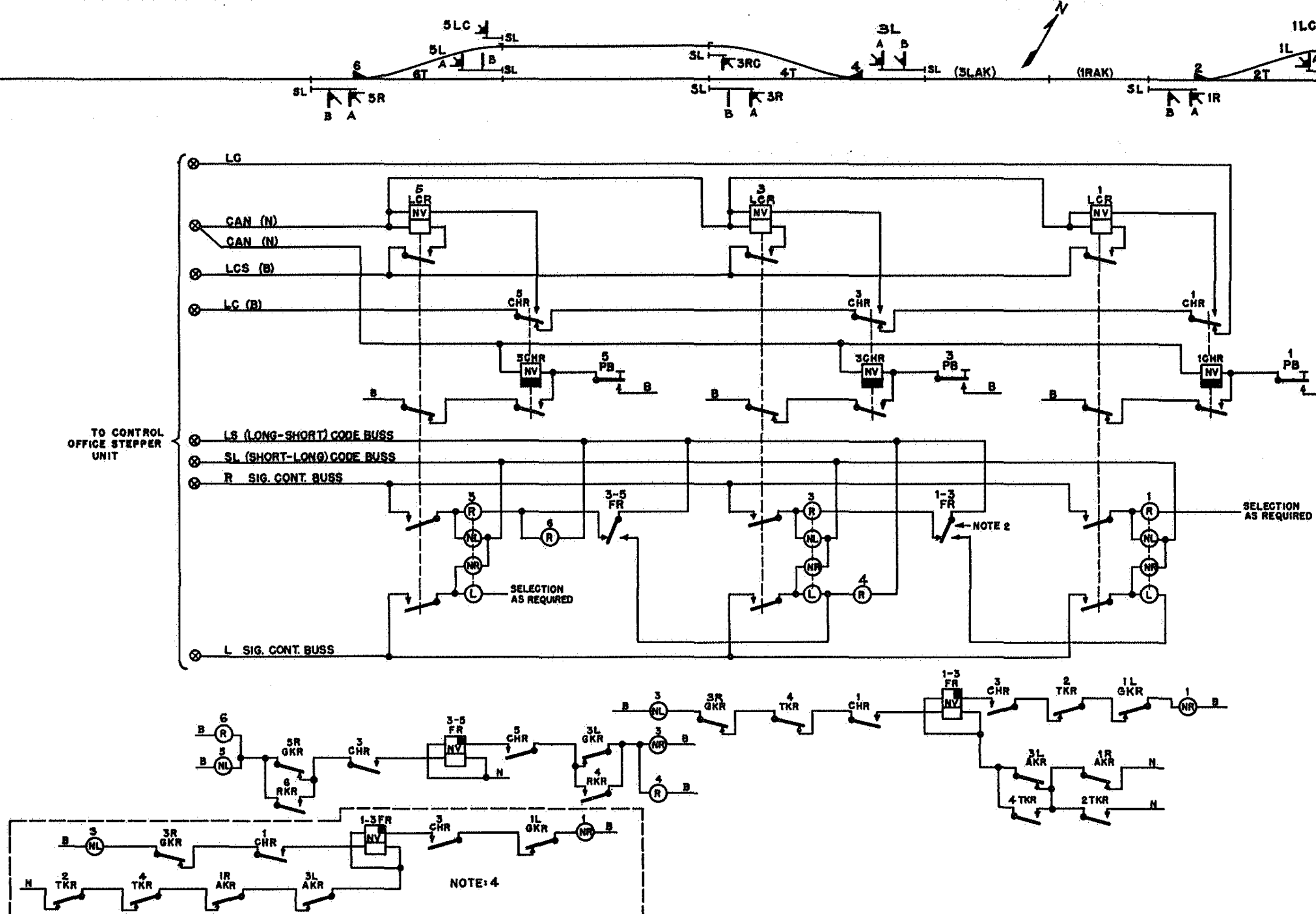
TYPICAL TRAFFIC CONTROL CIRCUITS

USING 2 WIRE HD LINE CONTROL (END OF SIDING LOCATION)

SEPT. 1952

AAR SIG. SEC. 8066A

SHEET 2



NOTE:

1—THESE CIRCUITS PROVIDE THE MEANS OF ESTABLISHING, MAINTAINING AND CHANGING THE DIRECTION OF TRAFFIC BETWEEN STATIONS FOR FIELD CIRCUITS SHOWN ON PLAN 8066A AND WILL VARY WITH THE TYPE OF CODE SYSTEM EMPLOYED.

2—AN ATTEMPT MADE TO CLEAR OPPOSING SIGNALS WILL RESULT IN AN INCOMPLETE CONTROL CYCLE (INDICATED BY AN AUDIBLE BUZZ).

3—TRAFFIC RELAY 3-5 FR REQUIRED WHEN 2 WIRE HD LINE CONTROL IS USED WITHIN SIDING LIMITS.

4—IF STORAGE OF SWITCH CONTROL IS PREVENTED REPLACE 1-3 FR CIRCUIT WITH CIRCUIT SHOWN IN DOTTED BOX.

TYPICAL TRAFFIC CONTROL CIRCUITS

CONTROL MACHINE CIRCUITS

OCT. 1955

AAR SIG. SEC. 8066A

SHEET 3

TYPICAL CIRCUITS FOR SPRING SWITCH TRACK SIGNALED IN BOTH DIRECTIONS WITH MANUAL CLEARING OF SIDING SIGNAL AND APPROACH LOCKING.

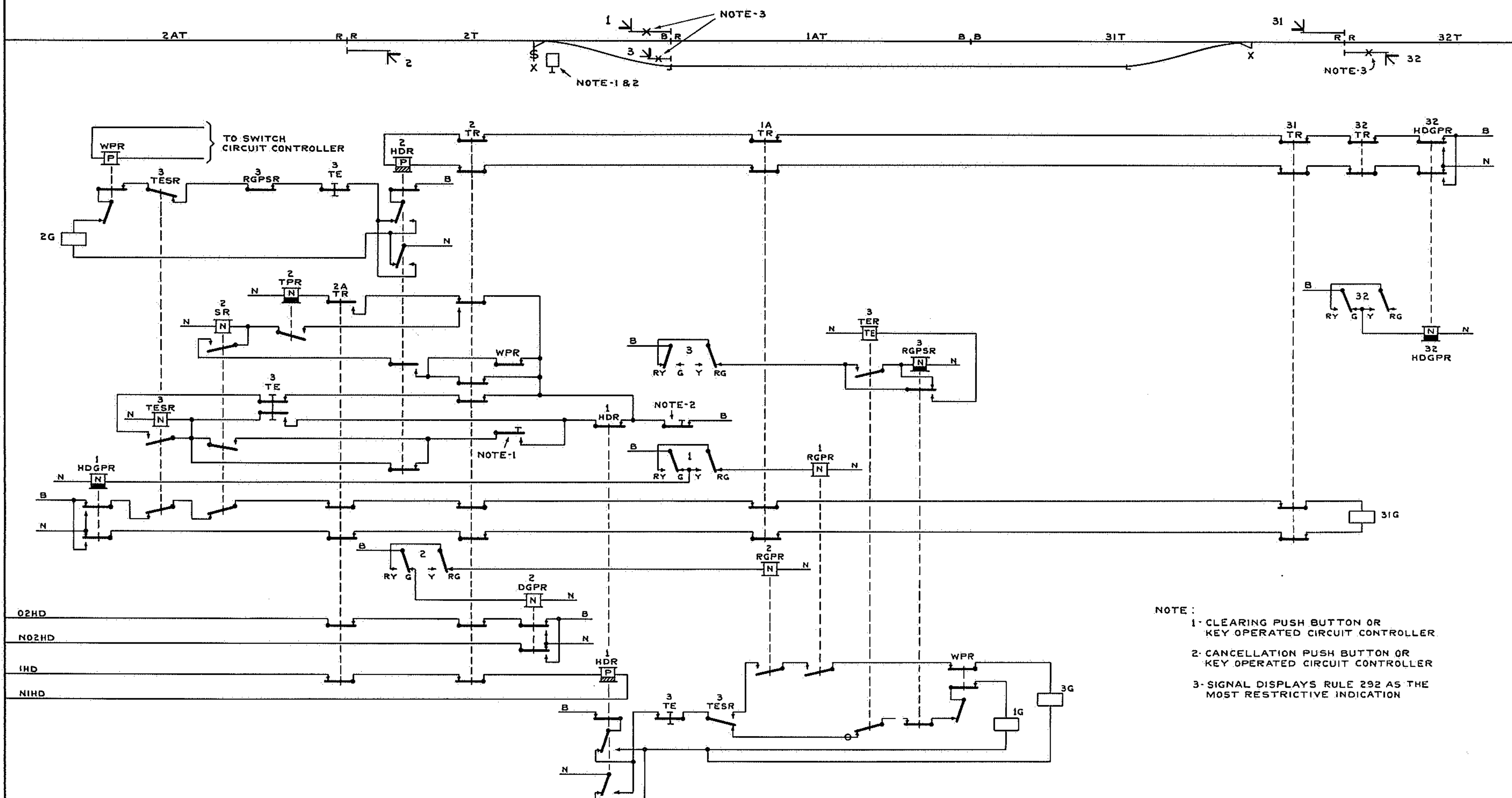
These circuits provide for the control of a signal to govern train movement over a spring switch from a siding to the main track in territory where the main track is signaled for movements in both directions.

A train in siding desiring to enter the main track through the spring switch will operate the clearing push button or key-operated circuit controller located near the spring switch. If relays 1HDR and 2HDR are picked up, this operation will pick up relay 3TESR and open the control of signals 1, 2 and 31. When signals 1 and 2 display a stop aspect (relays 1RGPR and 2RGPR picked up), signal 3 will display a proceed aspect if polar line relay 1HDR is picked up.

In event relay 2HDR is down at the time the push button is operated, relay 3TESR will not pick up. Under this condition, clockwork time release 3TE must be operated and after expiration of the time interval, signal 3 will clear as described above.

In event a train is in the siding to meet an opposing train, directional stick relay 2SR will pick up when the opposing train enters track section 2T. With 2SR picked up, the contact in 2HDR is bridged out of the control of signal 3 and train may secure a proceed signal to leave the siding, by operating the clearing push button, when the opposing train clears track section 2T.

Cancellation push button is provided to place signal 3 at stop when desired. Relay 3TER is used to provide a time interval between the placing of signal 3 at stop and the clearing of signal 1.



TYPICAL CIRCUITS FOR SPRING SWITCH

TRACK SIGNALED IN BOTH DIRECTIONS
WITH MANUAL CLEARING OF SIDING SIGNAL AND APPROACH LOCKING.

SEPT. 1952

AAR SIG. SEC. 8067A

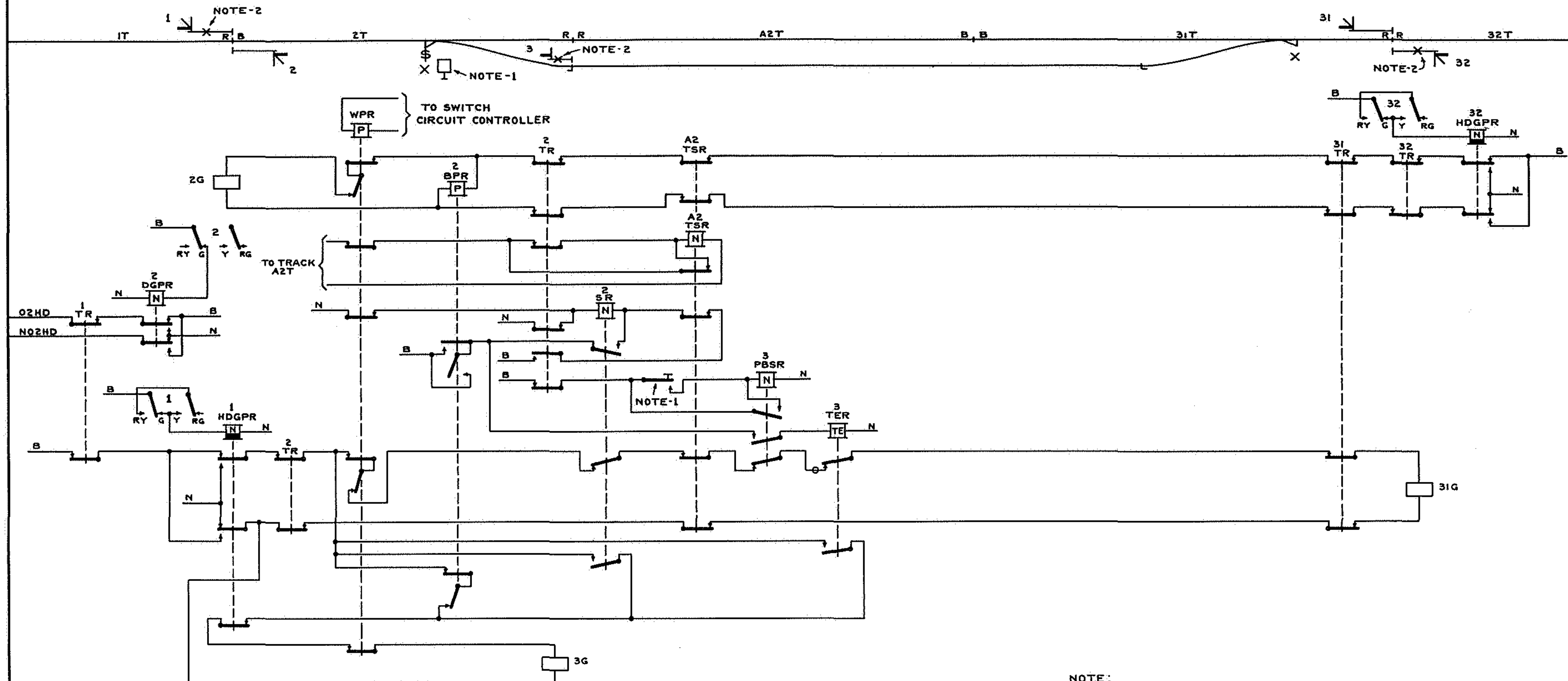
TYPICAL CIRCUITS FOR SPRING SWITCH TRACK SIGNALED IN BOTH DIRECTIONS WITH SIDING SIGNAL NORMALLY CLEAR AND APPROACH LOCKING.

These circuits provide for the control of a signal to govern train movement over a spring switch from a siding to the main track in territory where the main track is signaled for movements in both directions.

Signal 3 normally displays a proceed aspect.

In event a train is in the siding to meet an opposing train, directional stick relay 2SR will pick up when the opposing train enters track section 2T. With 2SR picked up, the contact in 2BPR is bridged out of the control of signal 3 and train may secure a proceed signal to leave the siding when the opposing train clears track section 2T.

In event relay 2BPR is down and train desires to enter main track at signal 3, emergency push button must be operated to energize time element relay 3TER and open the line control of signal 31. After expiration of the time interval signal 3 will clear.



NOTE:
1- EMERGENCY PUSH BUTTON OR KEY OPERATED CIRCUIT CONTROLLER.
2- SIGNAL DISPLAYS RULE 292 AS THE MOST RESTRICTIVE INDICATION.

TYPICAL CIRCUITS FOR SPRING SWITCH
TRACK SIGNALED IN BOTH DIRECTIONS
WITH SIDING SIGNAL NORMALLY CLEAR AND APPROACH LOCKING.

SEPT. 1952

AAR SIG. SEC. 8068A

TYPICAL CIRCUIT FOR CODED SELECTIVE OSING DEVICE.

This circuit provides for a coded selective OSing device for either non-directional or directional train movements.

A self-interrupted rotary stepping switch is used to generate the code which is transmitted to a pair of telephone wires through an induction coil.

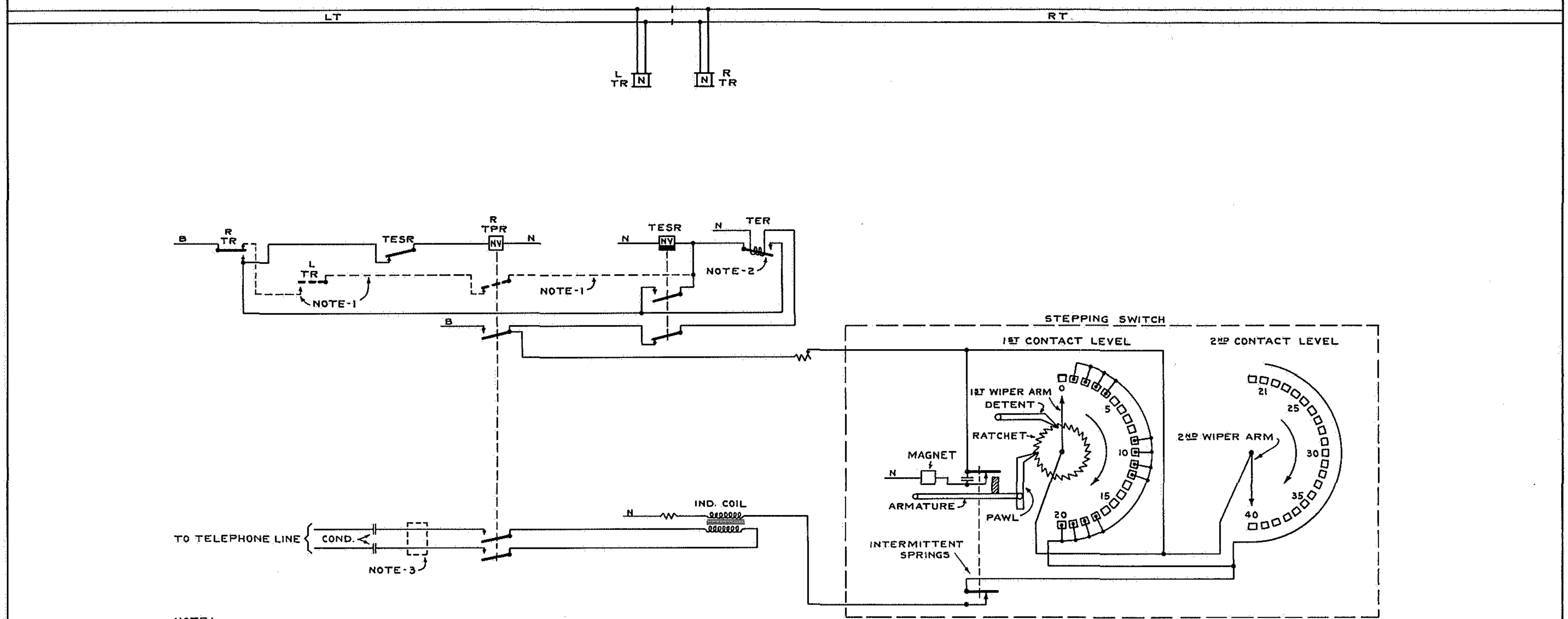
Condensers are used to avoid shunting the telephone line and when a carrier circuit is present on the telephone line a filter should be installed.

A timing relay TER and timing stick relay TESR may be adjusted to cut out the OSing device after a predetermined time.

When the OSing device is used non-directional, only one track relay RTR is required and the circuit shown in solid lines is installed. Directional OSing requires two track relays RTR and LTR and the additional portion of the circuit shown in dotted lines is installed.

A train from the right entering track circuit RT releases track relay RTR which picks up repeater relay RTPR. Relay RTPR applies energy to the rotary stepping switch, the TER relay and closes the circuit to the telephone line. Operation of the rotary stepping switch applies the code to the telephone line.

A train from the left will enter LT track circuit first and release track relay LTR picking up relay TESR. Relay TESR when picked up will prevent the pick-up of relay RTPR thereby preventing the code being generated or transmitted. When the train enters track circuit RT and releases track relay RTR, relay TESR will remain up until the train clears the circuit.



NOTE:

1- DIRECTIONAL FEATURE CAN BE PROVIDED BY ADDITION OF CIRCUITS INDICATED BY DOTTED LINES.

2- SETTING OF TIME ELEMENT RELAY TO BE ADJUSTED AS CONDITION REQUIRES.

3- FILTER TO BE INSTALLED IF CARRIER CIRCUIT IS PRESENT ON DISPATCHERS LINE.

TYPICAL CIRCUIT FOR CODED SELECTIVE OSING DEVICE.

SEPT. 1952

AAR
SIG. SEC.
8069A

ADDENDUM TO A.A.R. SIG.SEC. 8070B

TYPICAL CIRCUITS FOR AUTOMATIC INTERLOCKING.

These circuits are so arranged that the first train entering an approach section receives the clear signal. The circuits are also arranged to prevent successive trains on one road retaining route when conflicting road occupies an approach section.

A relay designated as RR is provided for each road. The purpose of this relay is to provide a preliminary route check before a signal may be cleared, insuring that the signal controls on the conflicting road are open, and that the conflicting signals are in the stop position.

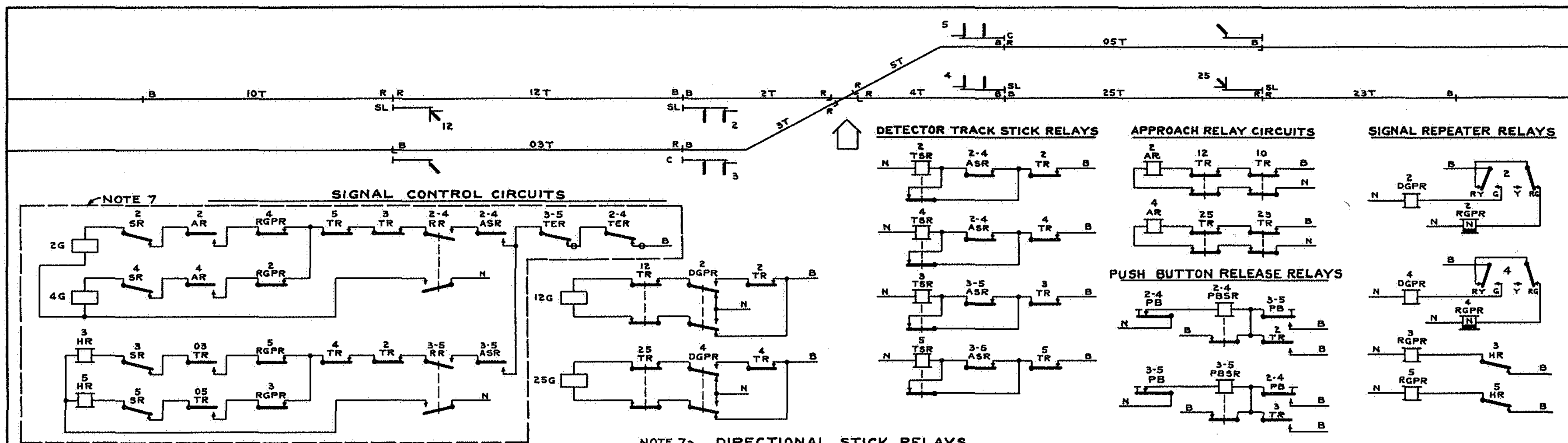
The signal control circuits are arranged to check that all track circuits within the interlocking limits are energized, that its approach locking stick is de-energized, and that both time element relays are de-energized.

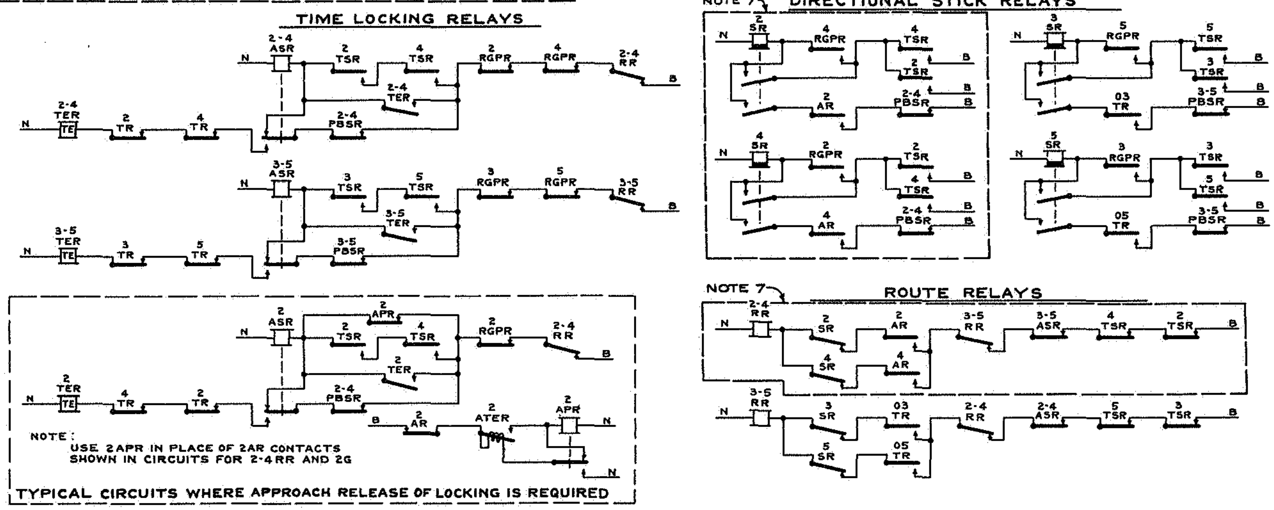
Directional stick relays are provided to prevent the reverse signal from automatically clearing after a move has been completed through the interlocking. Directional sticks are made slow release to protect against their becoming de-energized by short high-speed train movements.

If a reverse or back-up move is required, the push button associated with its own track must be operated to release the directional stick before reverse signal will clear for a back-up move.

If it is desired to change an established route, a push button associated with the conflicting route must be operated. This will de-energize the PBSR and ASR relays for the conflicting route, which will in turn de-energize the RR route relay and the signal of the established route. After the predetermined time interval the time locking will be released, allowing the signal on the conflicting route to clear. PBSR push button stick relays are automatically restored by the passage of a train.

Time locking on the established route is provided with two-track release to protect against release of a route in the event of a momentary shunt of one of the detector track circuits. Detector track stick relays are also used to provide additional protection against changing of a route due to momentary loss of shunt within the interlocking limits. A momentary shunt of either one of the detector tracks in front of an approaching train will put signal to stop until time locking is released by expiration of time interval.





NOTE:

1- HOME SIGNALS MAY BE CONTROLLED THROUGH OPPOSING APPROACH CIRCUIT IF DESIRED.

2- SIGNAL CONTROL CIRCUIT FOR CONFLICTING ROAD OPEN BEFORE CONTROL CIRCUIT IS CLOSED TO CLEAR SIGNAL FOR APPROACHING TRAIN.

3- HOME SIGNAL WILL RETURN TO STOP IN EVENT OF LOSS OF SHUNT BUT ROUTE CANNOT BE CHANGED UNTIL EXPIRATION OF FULL TIME INTERVAL. IF SHUNT IS RETURNED PRIOR TO EXPIRATION OF TIME INTERVAL THE SIGNAL WILL RECLEAR.
WHEN APPROACH LOCKING IS USED SIGNAL WILL REMAIN CLEAR A PREDETERMINED TIME INTERVAL IN EVENT OF LOSS OF SHUNT.

4- CIRCUITS PREVENT SUCCESSIVE TRAINS ON ONE ROAD RETAINING ROUTE WHEN CONFLICTING ROAD OCCUPIES APPROACH SECTION.

5- DOUBLE TRACK CIRCUIT RELEASE PROTECTS AGAINST RELEASE OF ROUTE IN EVENT ONE DETECTOR TRACK IS MOMENTARILY DE-ENERGIZED.

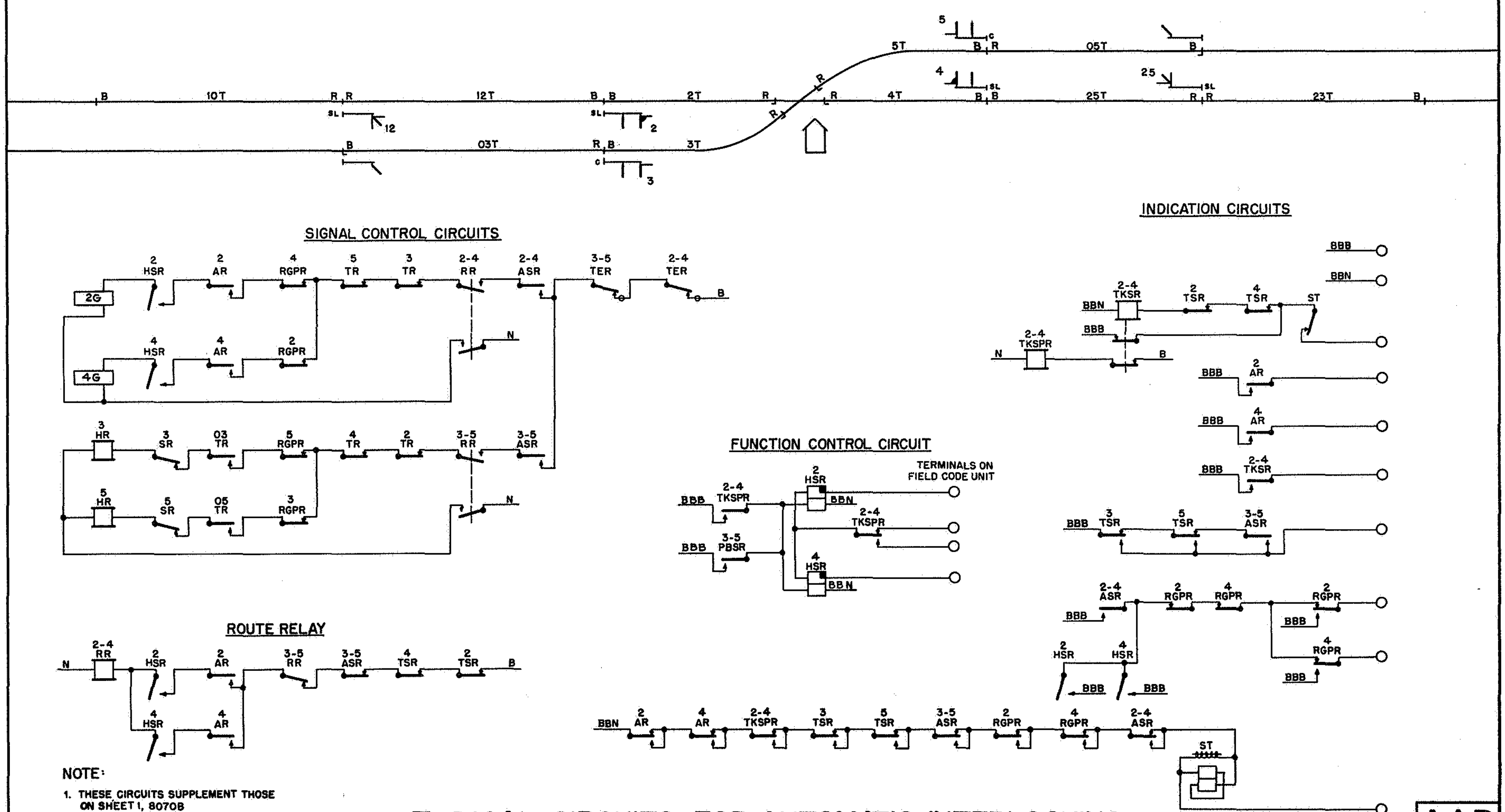
6- HOME SIGNAL CONTROLS SELECTED THROUGH CHECK CONTACTS OF TIME ELEMENT RELAYS TO INSURE FULL TIME INTERVAL FOR CHANGE OF ROUTE.

7. WHERE SUPERVISORY CONTROL IS DESIRED ON SIGNALS 2 & 4 OMIT CIRCUITS SHOWN INSIDE DOTTED LINE AND INCLUDE CIRCUITS SHOWN ON SHEET 2.

TYPICAL CIRCUITS FOR AUTOMATIC INTERLOCKING
USING ROUTE RELAYS

SEPT. 1957	SEPT. 1952	AAR SIG. SEC. 8070B

SHEET 1



NOTE:

1. THESE CIRCUITS SUPPLEMENT THOSE ON SHEET 1, 8070B
2. THESE CIRCUITS WILL VARY WITH THE TYPE OF CODE SYSTEM EMPLOYED.

TYPICAL CIRCUITS FOR AUTOMATIC INTERLOCKING

USING ROUTE RELAYS (WITH SUPERVISORY CONTROL OF SIGNALS 2 & 4)

SEPT. 1957

AAR SIG. SEC. 8070B

SHEET 2

ADDENDUM TO A.A.R. SIG.SEC. 8071A

TYPICAL RELAY TYPE INTERLOCKING CIRCUITS.

This is a local control system with the route selecting buttons located in the track diagram. The signals are semi-automatic stick or non-stick with the restricting signal not track circuit controlled. Indication is provided by a combination of lights and movable indicators.

An entrance and exit button is operated in sequence to set up a route and clear the signal. Each entrance button is physically represented in the field by a wayside signal. A stationary arrow in the middle of the button indicates the direction in which the signal governs. The exit button is a spring return type with an arrow engraved on its face to show the direction in which the train leaves the route. The entrance button is arranged to push, pull, turn clockwise or turn counter-clockwise. When a route is set up by pushing the entrance and exit buttons the passage of the first train causes the signal to display a stop aspect and cancels the route selection network. This route may be cancelled in advance of a train movement by pulling the entrance button. Conventional route locking circuit with approach or time locking will determine release of the route. When a route is set up by turning the entrance button up and pushing the exit button the route is held for a succession of trains. This route may be cancelled by turning the entrance button to center. Restricting signals are displayed by turning the entrance button down and pushing the exit button. This route may also be cancelled by turning the entrance button to center.

A route initiated by pushing the entrance button or by turning the entrance button up will be indicated by a steady red light in the entrance button. Clearing of the signal will be indicated by a steady green light in the entrance button. A flashing red light in the entrance button indicates that a route has been initiated by turning the entrance button down, also if the button is manually restored to normal before train accepts signal and time locking is in effect. A flashing green light in the entrance button will indicate that a slow speed signal has been displayed.

A route called for is shown on the diagram by movable route indicators. The route locked up is indicated by the illumination of lock lights located at the points of the movable route indicators. Switch correspondence lights, located below the test key for its respective switch, when lighted indicates the switch is out of correspondence with the position called for by the route. The light will remain lighted while the switch is in transit. Track occupancy is indicated by the illumination of track occupancy lights located in its respective track section on the diagram. Test keys are located on the control panel enabling its respective switch or crossover to be operated individually. They are not used generally in regular operation. The handle of the test key moves in a vertical plane in three positions. The center position is the inoperative position; the downward position calls for its respective switch normal; and the upward position calls for the switch reverse. Test keys are normally left in the center position. A switch cannot be operated by the test key if it is locked by an established route. Likewise, if a switch is operated to a given position by its test key, a route can be given only over that position of the switch. Run around moves over switches 1 and 5 reverse, also switches 5 and 7 reverse, is prevented except by test key operation.

The function of the initiation circuits, one network for each direction is one of exploration, sending out branches to determine the available exit points. These circuits are shown on Sheet 1. To initiate a route from signal 14 to signal 4, the following is the sequence of operation: the operator pushes entrance button 14, which energizes signal lever relay 14GLPR over an N contact, closed when the button is pushed, and a front contact of 7TR. The front contact of 7TR provides for making the signal stick. Relay 14GLPR is stuck up by an N contact on 14 button. This route may be cancelled in advance of a train movement by pulling 14 entrance button. A steady red light is illuminated in 14 button over front contacts of 14GLPR, 14ASR and 14RGPR, as shown on Sheet 7. Operator now pushes exit button 4 and the circuit to exit relay 4XR is completed over an N contact of 14 entrance button, front contacts 14GLPR, 7TR, 14GLPR and back contacts 14XR, 7RR, 7AYR, 5RR, 3RR, 1RR and 1AYR. A back contact of 4XR prevents an eastward initiation circuit from signal 4. Thus the operation of 4 entrance button will not disturb the route initiated.

In the completion networks as shown on Sheet 2, the front contact of 4XR closes the westward completion network from signal 4. Relay 1ANR is energized by a front contact of 4XR and a back contact of 1AYR. Relay 1ANR has three independent windings and its function is to call for switch 1 normal. A front contact of 1ANR connects battery to one of the windings of switch operating relay 1NWZR over front contacts of 1LR and 5LR, as shown on Sheet 6. If switch 1 is reverse it is operated to normal position. Negative energy NL is connected to 1 movable route indicator by a front contact of 1NWZR and a back contact of 1RWZR, as shown on Sheet 7, and the indicator snaps into position called for by the route. Switch lock light 1ALE is illuminated by front contacts of 1ANR and 1LR. If the switch operates from reverse to normal, switch out of correspondence light 1WE is lighted by back contacts of 1NWCR and 1RWCR, also shown on Sheet 7. The procedure for controlling movable route indicators, lock, and out of correspondence lights, and operating the switch machine as described for switch 1, is similar for all switches. Referring again to the westward completion network it will be noted that battery is now connected to one coil of 3NR over a front contact of 4XR and a back contact of 1AYR and front contacts of 1ANR and 1NWZR. Battery is relayed to 5ANR by front contacts of 3NR and 3NWZR and in a similar manner to 7ANR by front contacts of 5ANR and 4NWZR and a back contact of 7AYR. From this point, battery is connected to relay 14GZR by front contacts of 7ANR and 7NWZR. Referring again to the westward initiation network, it will be observed that a back contact of 1ANR has opened the control to 1AYR, a back contact of 3NR has opened the control to 6XR, a back contact of 5ANR has released 5BYR and a back contact of 7ANR has opened the control to 7AYR. Back contacts of these same relays performed similar function in the eastward initiation network thus preventing the initiation of any route over crossovers 1, 5 and 7 and turnout 3 in the reverse position.

ADDENDUM TO A.A.R. SIG.SEC. 8071A - Continued

In the signal control network, Sheet 3, a front contact of 14GZR has closed the circuit to 14AHR and a back contact has opened the control for any eastward signal to signal 14. However, signal 14 will not clear until all switches in the route which are not normal have moved into that position as called for by the route. This condition is represented by normal switch correspondence relays 1NWCR, 3NWCR, 5NWCR and 7NWCR. It is also necessary to check that all switches in the route are electrically locked. This condition is represented by back contacts of switch locking stick relays 1LSR, 3LSR, 5LSR and 7LSR. Releasing of switch locking stick relays is accomplished by switch locking circuits as shown on Sheet 4. Referring specifically to the 1LSR circuit, it can be seen that a front contact of 1LR will open the control, unless by-passed by the stick circuit which includes back contacts of 1NWCR and 1RWCR. This insures that 1LSR will not be released while the switch is in transit. Since turnout 3 and crossover 5 are normal, relay 1LR is released by opening of a back contact of 3WGZLR in its control. Relay 3WGZLR is a preliminary switch locking relay, as shown on Sheet 4, and in this instance is energized by a front contact of 14GZR.

The releasing of relays 3LSR, 5LSR and 7LSR is brought about in a somewhat similar manner and completes the circuit to signal control relay 14AHR, as shown on Sheet 3. A back contact of 14AHR releases approach locking relay 14ASR, shown on Sheet 4. A front contact of 14ASR opens the control for westward route locking relay 7WSR, which in turn releases 3WSR. The release of 14ASR also completes the circuit to signal mechanism 14AG (see Sheet 3), and signal 14 clears releasing signal repeating relay 14RGPR (see Sheet 5). It can be seen on Sheet 7, that the release of 14RGPR extinguishes the steady red light in 14 entrance button and lights the steady green.

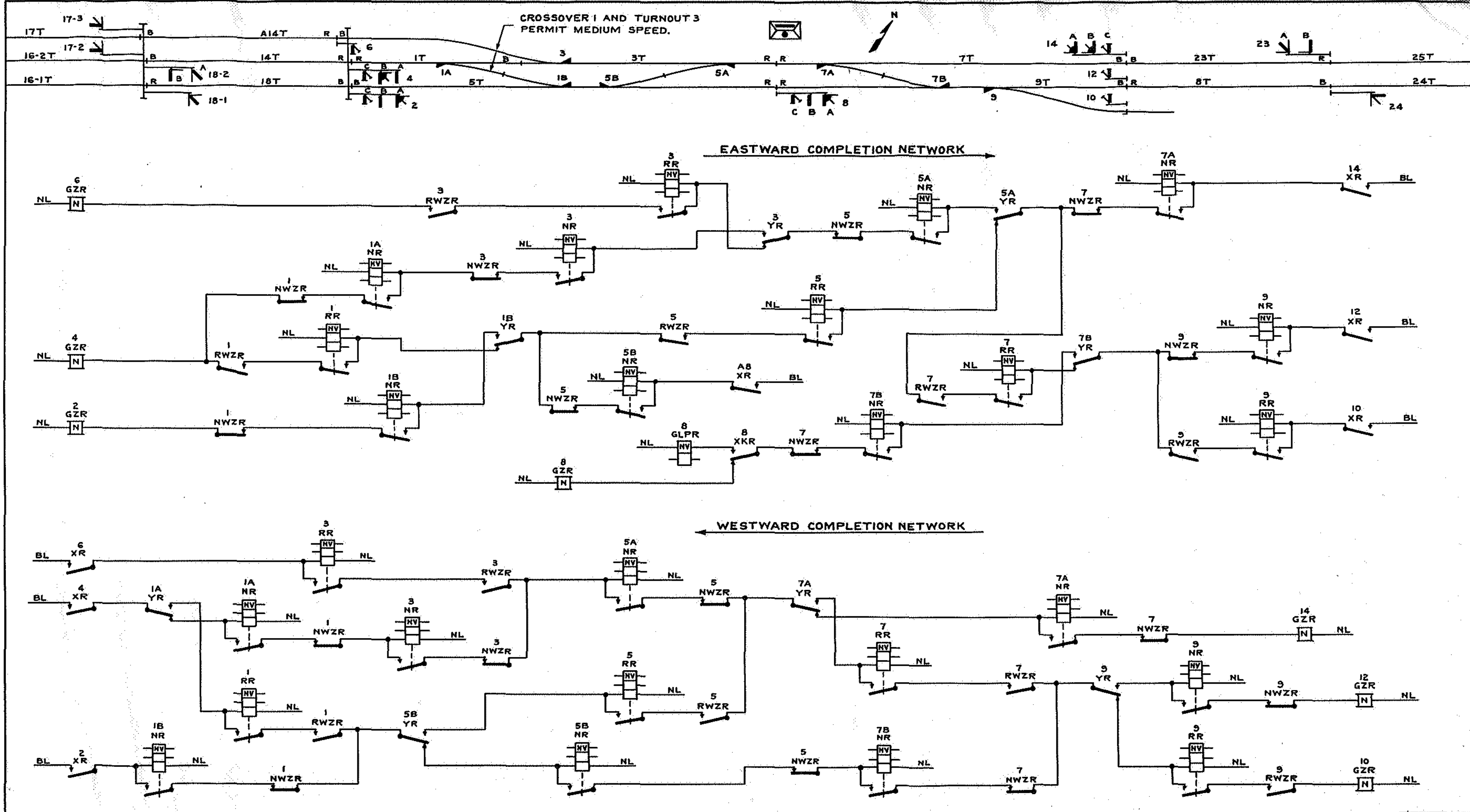
For a restricting signal for the route previously described or to a diverging route, relay 14GLPR remains de-energized, as can be seen by referring to Sheet 1. To initiate a route from signal 14 to signal 2, the operator turns the entrance button down. This picks up relay 5BYR with negative energy of contact R on 14 entrance button and back contacts of 14GLPR, 14XR, 7RR, 7AYR, 5BNR and 5ANR. A front contact of 5BYR relays energy to 2XR over a back contact of 1RR. It can be seen by referring to Sheet 7, that flashing red light will be illuminated in 14 entrance button by conducting interrupted energy to the filament by an R contact on 14, a back contact of 14GLPR and front contacts of 14ASR and 14RGPR. When the signal clears and 14RGPR releases, the flashing red will be changed to flashing green. In the completion network, relay 1BNR is energized by a front contact of 2XR. This in turn picks up relay 5RR over a front contact of 1BNR, 1NWZR and 5BYR. Relay 5RWZR is then energized by front contacts of 5RR, 3LR, 8ASR and 5LR, which operates switch 5 to the reverse position. In the westward completion network, energy is relayed to 7ANR over front contacts of 5RR and 5RWZR and a back contact of 7AYR. From this point signal clearing action is similar to that previously described.

ADDENDUM TO A.A.R. SIG.SEC. 8071A - Continued

Automatic route selection is provided. For example, the preferred route from signal 12 to signal 4 is over medium speed crossover 1 and the route would be selected as follows: operator turns entrance button 12 down and negative energy is conducted to the coil of 1AYR over an R contact of 12 entrance button, back contacts 12XR, 9RR, relay 9YR picks up, front contacts 9YR, backs 7RR, 8XKR, A8XR, 8XR picks up, front 8XR, backs 5RR, 5BYR, 1BNR, 1ANR, relay 1AYR picks up, front 1AYR and 4XR picks up when 4 exit button is pushed. However, if a route previously had been cleared from signal 2 to intermediate signal 8, switch 1 would be locked normal and a back contact of A8XR opened the circuit for the preferred route. The secondary route would automatically be selected over crossover 7 reverse as follows: negative energy over R contact on 12 entrance button, back 12XR, back 9RR, relay 9YR picks up, front 9YR, back 7BNR, back 7ANR, relay 7AYR picks up, front 7AYR, back 5RR, back 3RR, back 1RR and back 1AYR.

End to end, or through routing, arranges for clearing of signals 2 and 8 without the use of intermediate push buttons. This is accomplished by the operator pushing entrance button at signal 2 which initiates the route by energizing relay 2GLPR. A front 2GLPR relays energy to 1BYR over back 2XR, back 1RR and relay 1BYR picks up and over its front relays energy to 8XKR over back 5RR, back 8XR, front 5LR, back A8XR, back 8GZR, back 8GLPR, relay 8XKR picks up. A front contact of 8XKR closes the circuit to 7BYR over an N contact on 8 entrance button, front 9TR, front 8XKR, back A8XR, back 8XR, back 7RR and relay 7BYR picks up and completes circuit to 12XR when exit button is operated. In the eastward completion network, energy over a front contact of 12XR picks up relay 9NR and its front contact closes circuit to 7BNR over front 9NWZR, front 7BYR and 7BNR picks up, front 7BNR relays energy to 8GLPR over front 7NWZR and front 8XKR and relay 8GLPR picks up. Referring again to the eastward initiation network a front contact of 8GLPR closes the circuit to A8XR which picks up and releases slow release relay 8XKR. In the completion network, release of 8XKR closes the circuit to 8GZR. Closing of a front contact A8XR picks up 5BNR which relays energy to 1BNR over front 5NWZR and back 1BYR, relay 1BNR picks up and closes circuit to 2GZR. In the signal control network, picking up of 2GZR and 8GZR will clear both signals.

Special switch locking is provided to prevent the clearing of signal 8 unless crossover 5 is normal. Also the clearing of signal 8 locks 5 in the normal position by including a front contact of 8ASR in the control of 5NWZR and 5RWZR, as shown on Sheet 6. To indicate that the switch is locked, a dependent contact of 8ASR is in the 5BLE lamp circuit, as shown on Sheet 7.

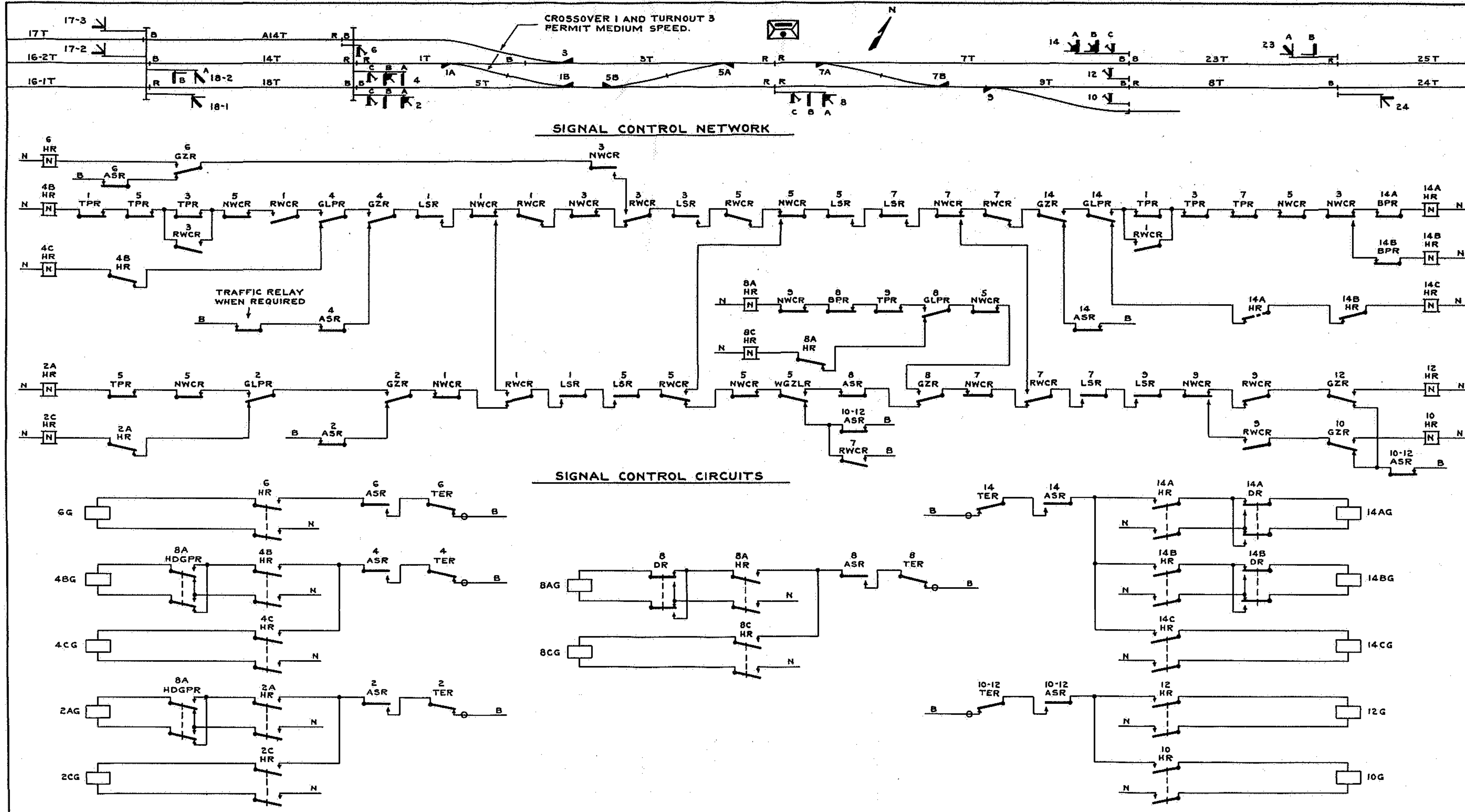


TYPICAL RELAY TYPE INTERLOCKING CIRCUITS

LOCAL CONTROL-ROUTE TYPE-SIGNAL LEVERS AND MOVABLE POINT ROUTE INDICATORS IN DIAGRAM

AAR SIG. SEC. 8071A

SEPT. 1953

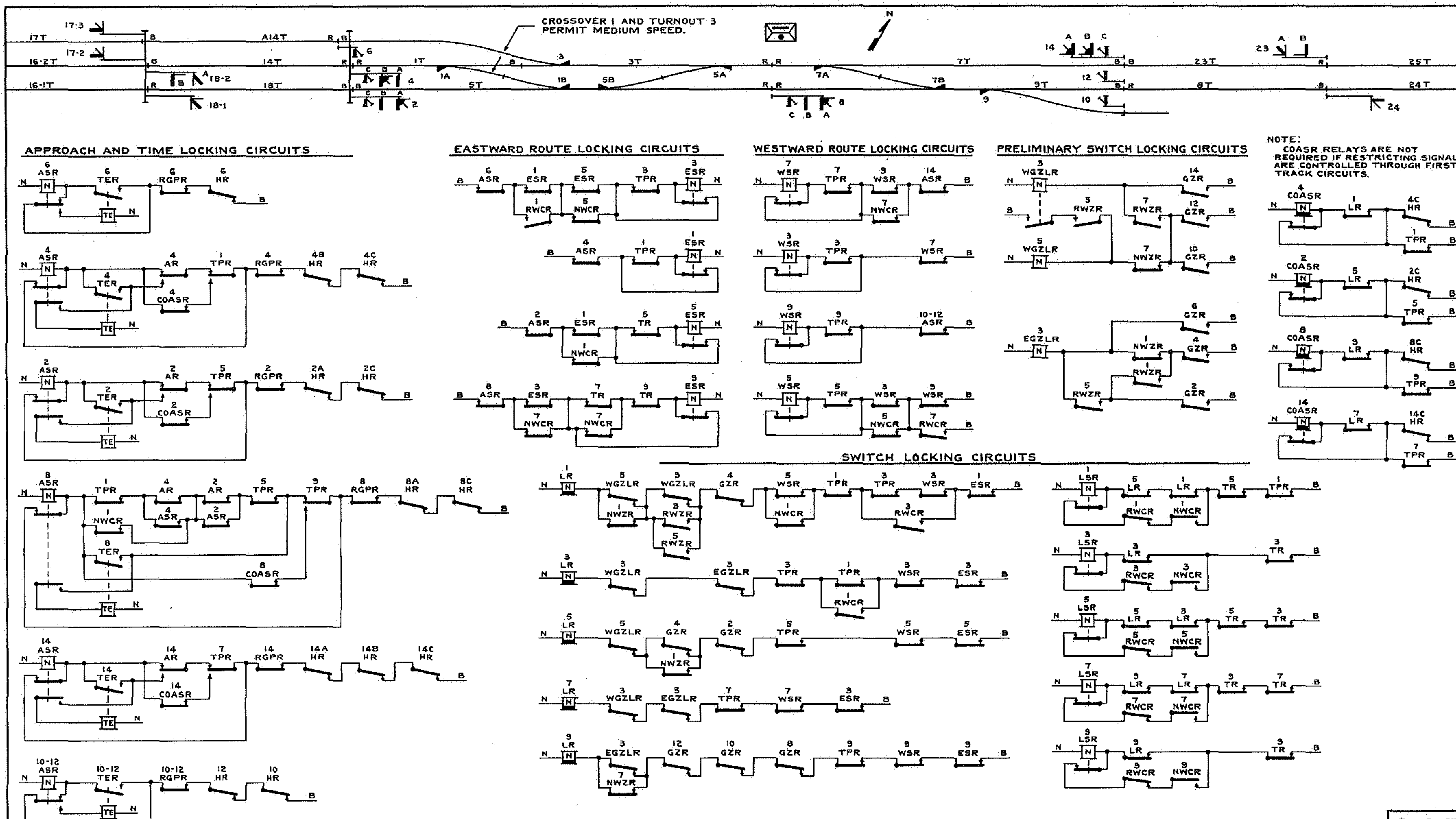


TYPICAL RELAY TYPE INTERLOCKING CIRCUITS

LOCAL CONTROL - ROUTE TYPE - SIGNAL LEVERS AND MOVABLE POINT ROUTE INDICATORS IN DIAGRAM

SEPT. 1953

AAR SIG. SEC. 8071A



TYPICAL RELAY TYPE INTERLOCKING CIRCUITS

LOCAL CONTROL - ROUTE TYPE - SIGNAL LEVERS AND MOVABLE POINT ROUTE INDICATORS IN DIAGRAM

SEPT. 1953

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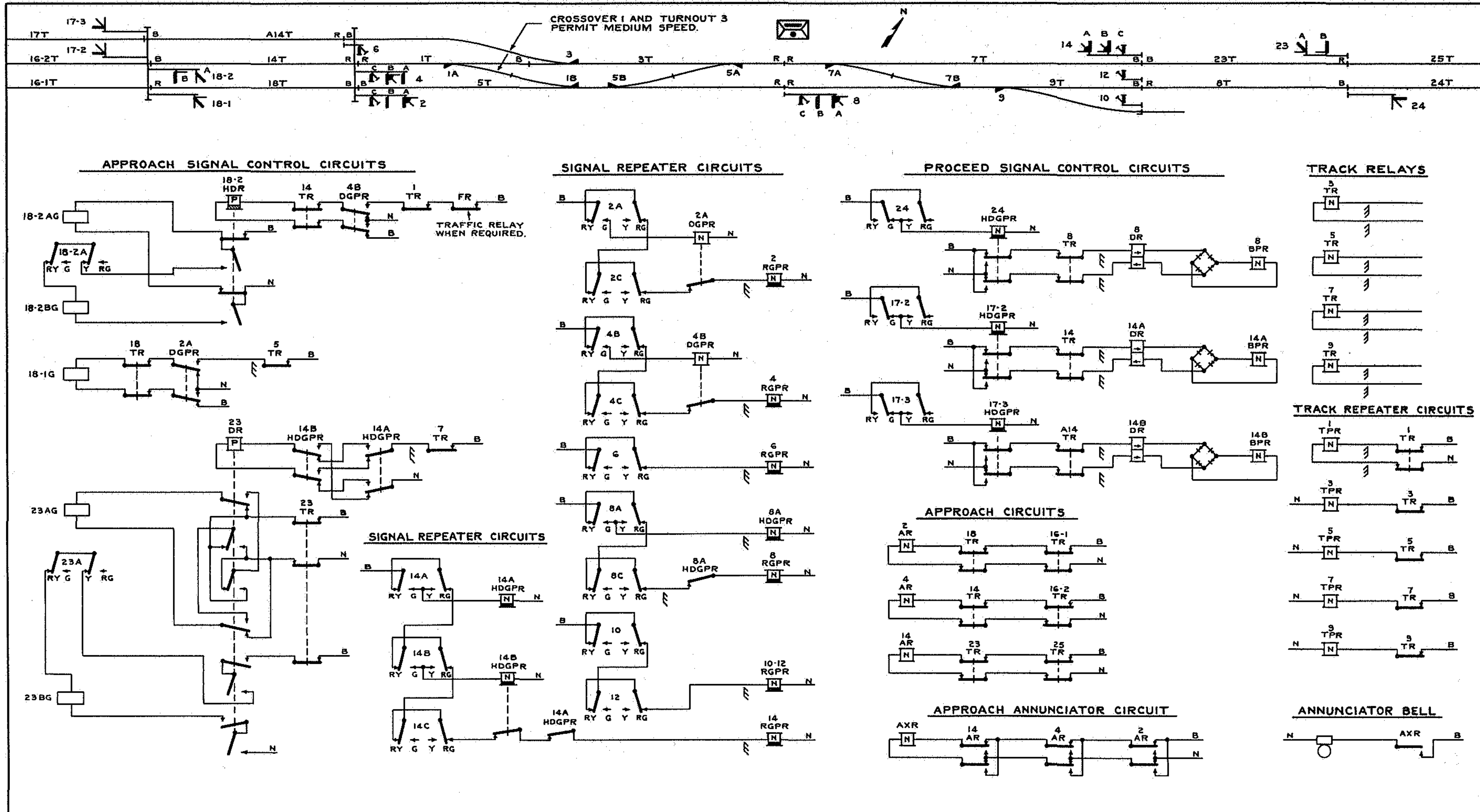

TYPICAL RELAY TYPE INTERLOCKING CIRCUITS

LOCAL CONTROL - ROUTE TYPE - SIGNAL LEVERS AND MOVABLE POINT ROUTE INDICATORS IN DIAGRAM

SEPT. 1953

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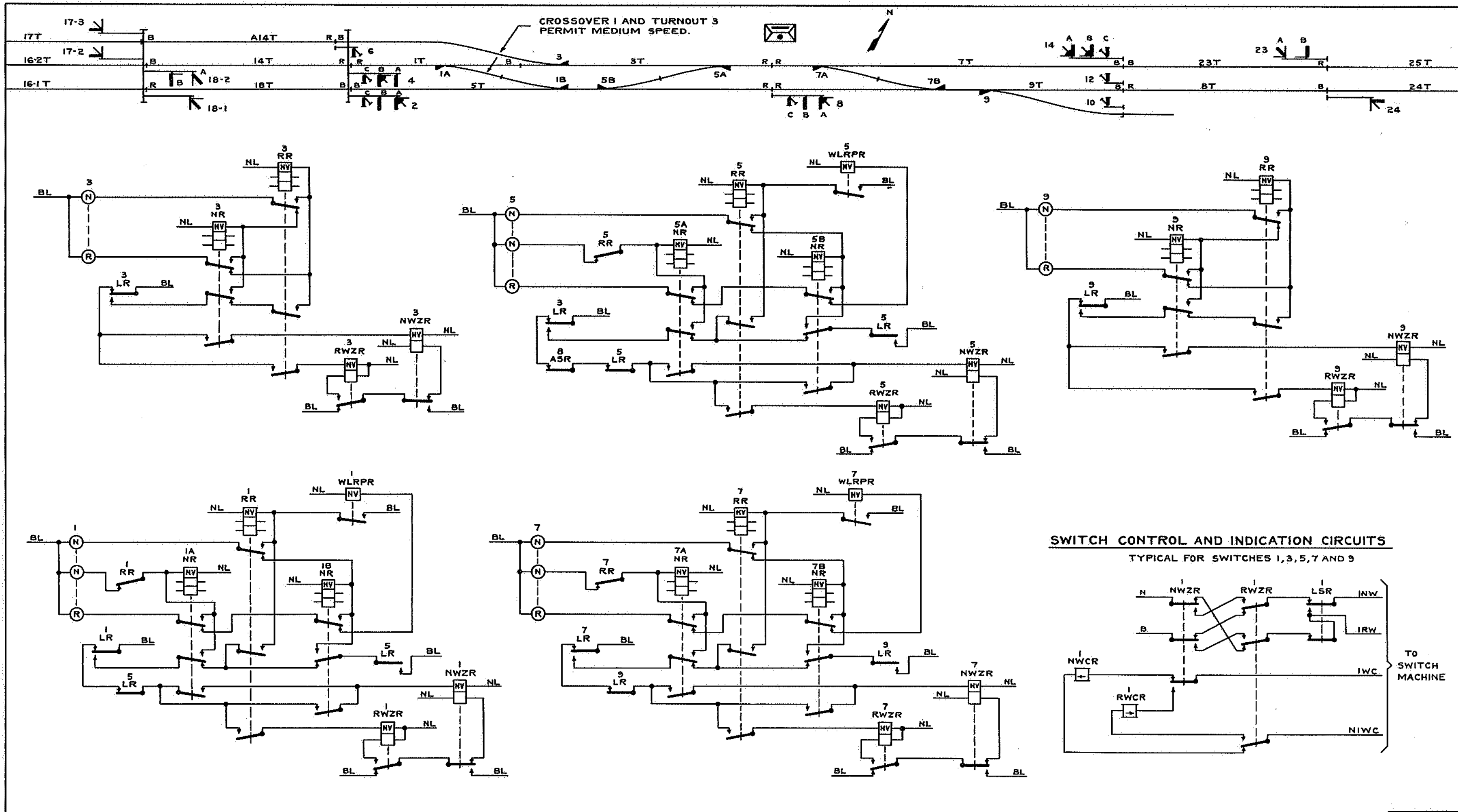
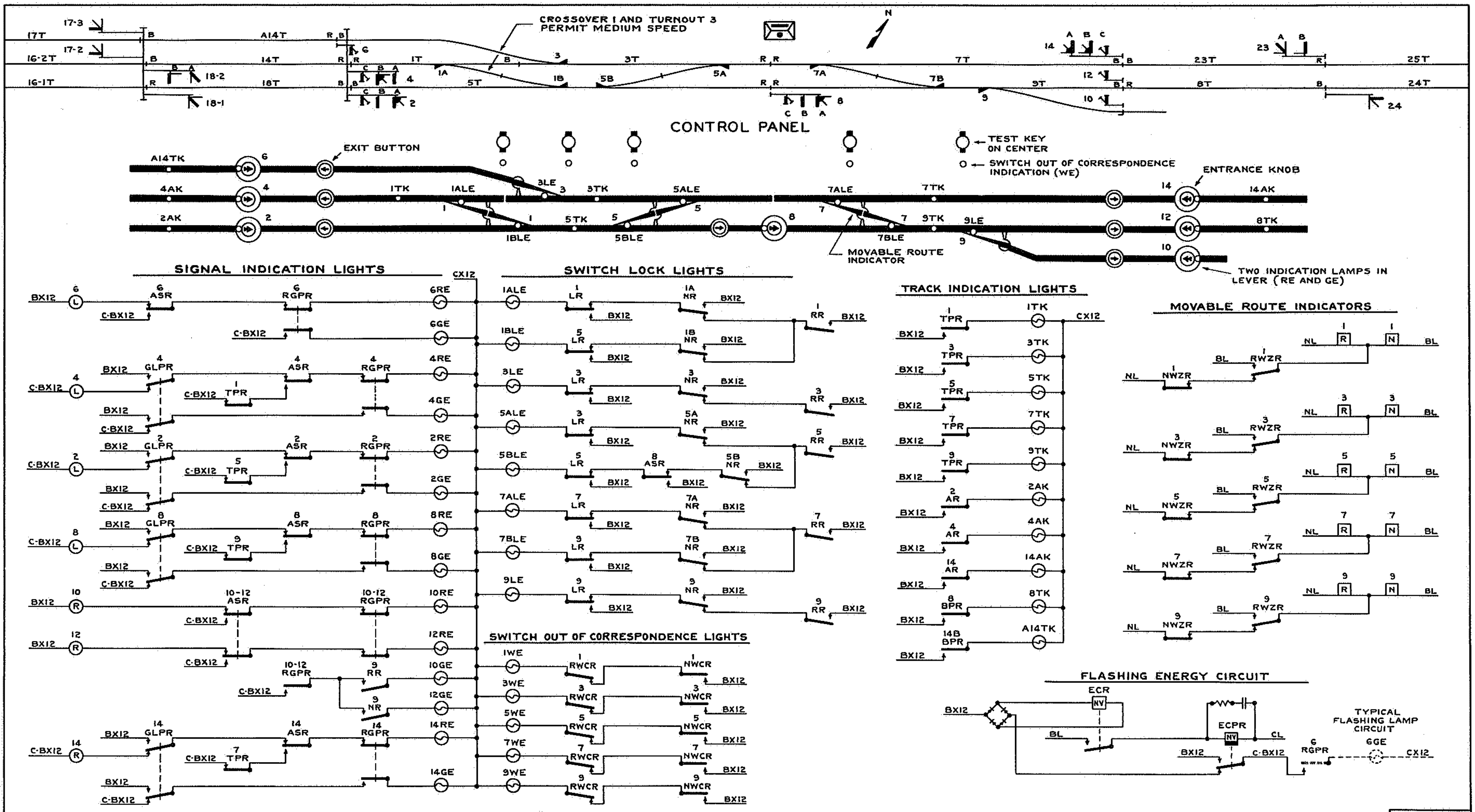


TYPICAL RELAY TYPE INTERLOCKING CIRCUITS

LOCAL CONTROL–ROUTE TYPE–SIGNAL LEVERS AND MOVABLE POINT ROUTE INDICATORS IN DIAGRAM

SEPT. 1953	AAR SIG. SEC. 8071A



TYPICAL RELAY TYPE INTERLOCKING CIRCUITS

LOCAL CONTROL - ROUTE TYPE - SIGNAL LEVERS AND MOVABLE POINT ROUTE INDICATORS IN DIAGRAM

SEPT. 1953

AAR SIG. SEC. 8071A

SHEET 7 OF 7 SHEETS

CIRCUITS FOR CLASSIFICATION YARD SYSTEM.

Sheets 1 and 2 show typical circuits for hump and trimmer signals. Simultaneous indications to trim and hump can be displayed until hump movement approaches crest of hump and occupies O-TR circuit. Hump signal will change to Stop, and Medium or Slow hump signal can be displayed by depressing special push button. Circuit is so arranged that in addition to hump operator control hump conductor can place or hold hump signal in Stop position.

Sheet 3 shows typical control and indication circuits for electro-pneumatic or electric switches. The over-all track circuit length is based on minimum length of inner wheel base of cars to be humped. The track circuit must be sufficiently long so that a car cannot span the circuit without fouling it. The circuit must be as short as practicable to reduce required headway between cars being humped and thus increase the humping speed.

The length of track circuit ahead of the switch point is dependent on the speed of operation of the switch. It must be of sufficient length to permit operation of the points between the time track relay is de-energized and wheel of car arrives at the switch point.

Sheet 4 shows typical retarder control circuits with manual operation.

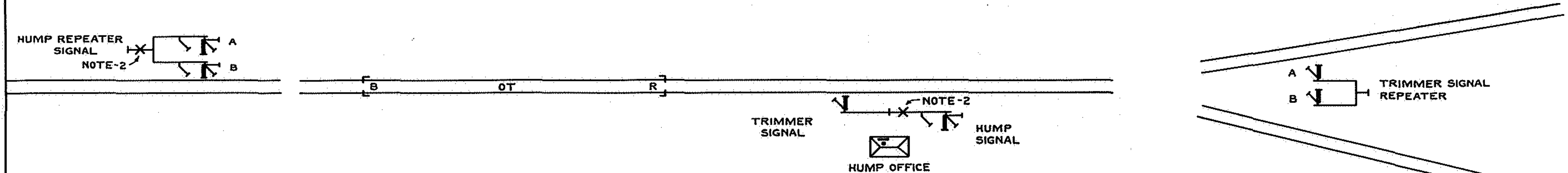
Sheets 5 through 19 show circuits for control of switches and retarders for automatic classification yard systems.

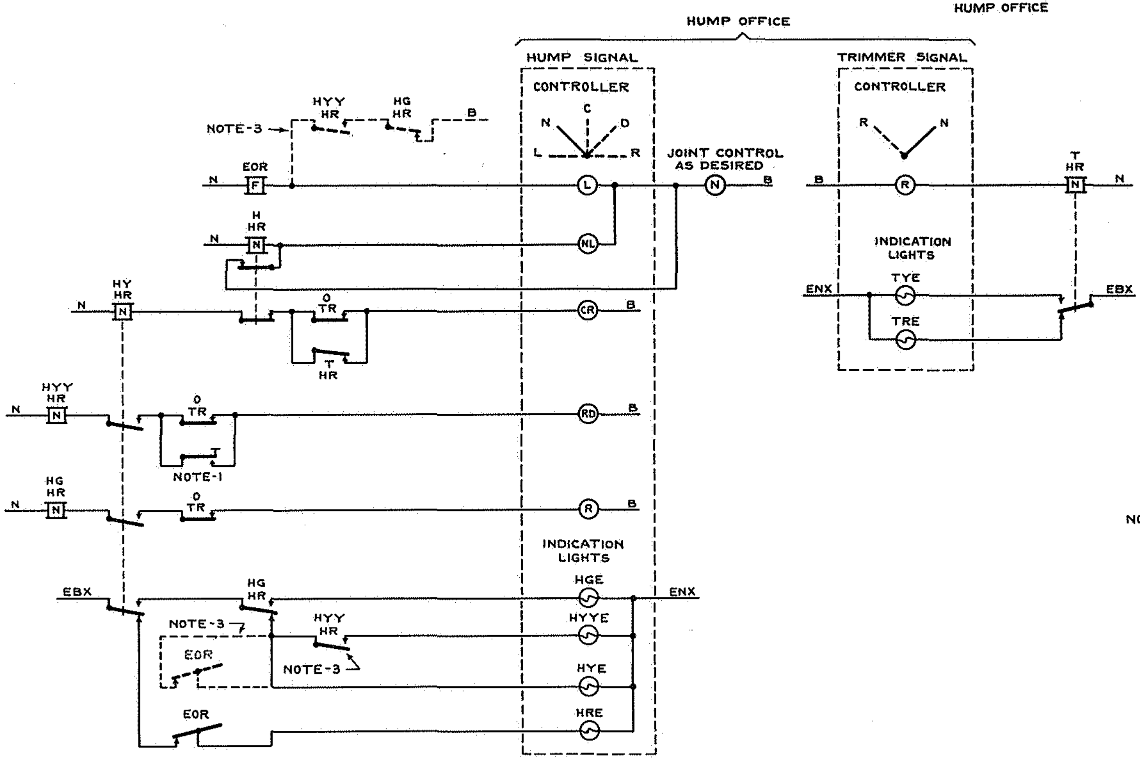
Sheets 5 through 9 show automatic switching circuits for electric switch operation. The track layout and control panel are shown on Sheet 5. The routing of a car is initiated by pushing a button numbered to correspond with the yard track to be used. This routing is automatically controlled by code selection, transfer and storage, and switch control circuits to position each switch immediately in advance of each car.

The switches can be operated manually to override the automatic operation and for trimming operation.

Sheets 10 through 13 show automatically operated electro-pneumatic retarder circuits. The running rail through the retarder is divided into a series of equal length track circuits. By means of a relay type counting system the speed of a car wheel progressing through the retarder is measured. The retarder is automatically operated to produce a pre-selected leaving speed by checking the measured speed against the selected speed. The speed is pre-selected by a series of miniature levers on the control panel. Levers are also provided for manual control of the retarder with selection for light and heavy cars.

Sheets 14 through 19 show automatic switching control circuits using electro-pneumatic switch machines. The operation is similar to that for electric switch machines. The track layout and control panel are shown on Sheet 14. An initial storage system with indicator panel permits advance storage of car routes; these can be cancelled individually or as a group. Individual cancellation is also possible at each switch. The relay operation is automatic with control and transfer circuits operating in sequence as the car progresses through the switching area.





ASPECTS AND INDICATIONS

HUMP SIGNAL

CONTROLLER POSITION	INDICATIONS	ASPECTS
L	BACK UP	FLASHING R
N	STOP	R
C	PROCEED AT SLOW HUMP SPEED	Y
D	PROCEED AT MEDIUM HUMP SPEED	Y OVER Y OR FLASHING Y
R	PROCEED AT NORMAL HUMP SPEED	G

TRIMMER SIGNAL

CONTROLLER POSITION	INDICATIONS	ASPECTS
N	STOP	R
R	TRIM	Y

NOTE :

1- TO PROVIDE PROCEED AT MEDIUM HUMP SPEED INDICATION WHEN OT IS OCCUPIED; LOCATE WHERE REQUIRED.

2- DENOTES FLASHING INDICATION, OMIT LOWER UNIT WHEN FLASHING YELLOW INDICATION IS USED.

3- WHEN FLASHING YELLOW IS DESIRED OMIT HYYE CIRCUITS AND ADD CIRCUITS SHOWN DOTTED.

CLASSIFICATION YARD SYSTEM

HUMP AND TRIMMER SIGNAL CONTROL AND INDICATION CIRCUITS

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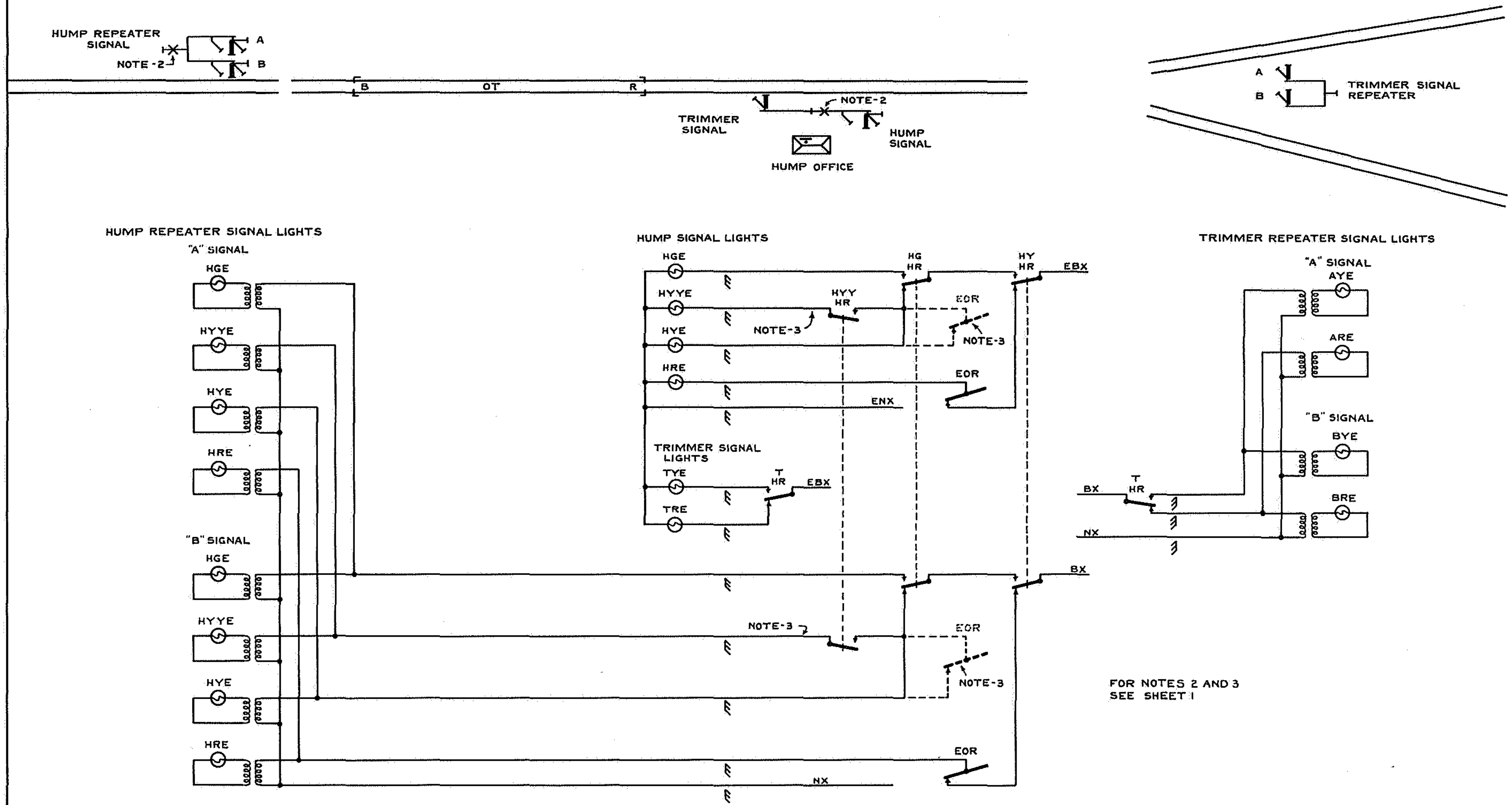
AAR SIG. SEC. 8072A

SHEET 1



CLASSIFICATION YARD SYSTEM

SIGNAL LIGHTING CIRCUITS

SEPT. 1953

AAR SIG. SEC. 8072A

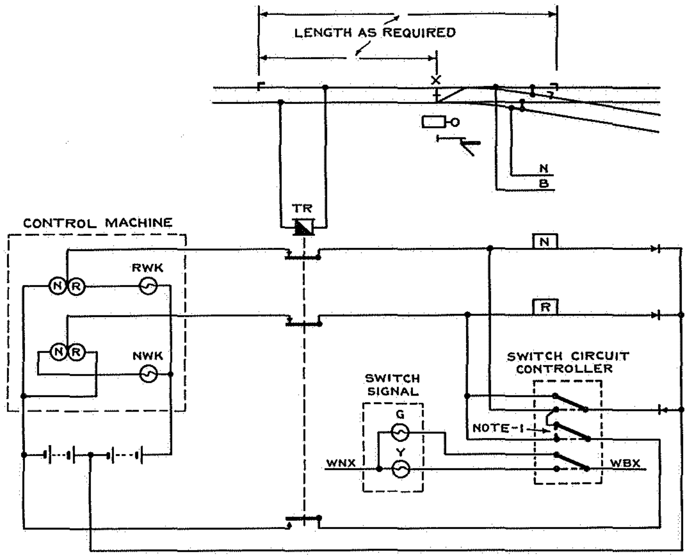


FIG. 1
ELECTRO-PNEUMATIC SWITCH CONTROL

NOTE :

1- TWO POSITION CAM TO MAKE AND BREAK AT MIDSTROKE.

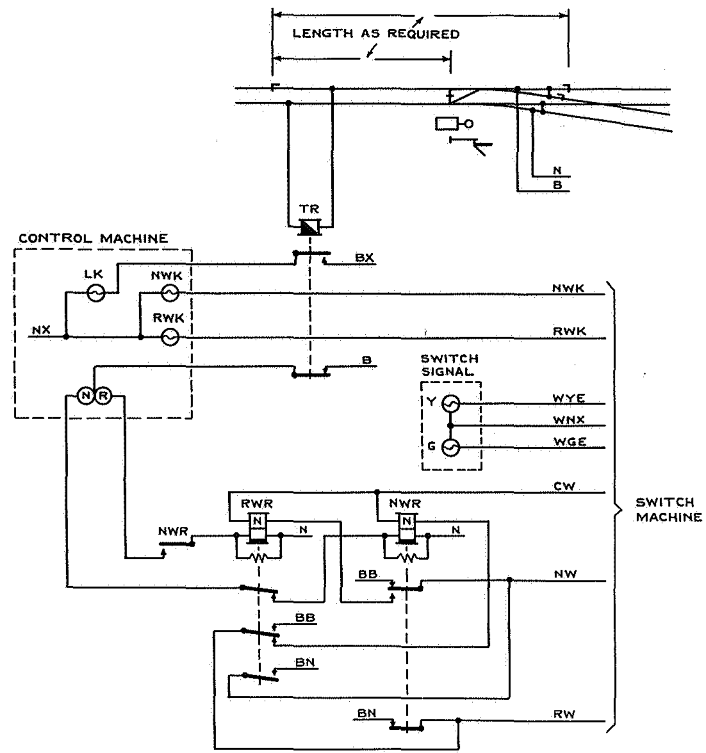


FIG. 2
ELECTRIC SWITCH CONTROL

CLASSIFICATION YARD SYSTEM

SWITCH CONTROL AND INDICATION CIRCUITS

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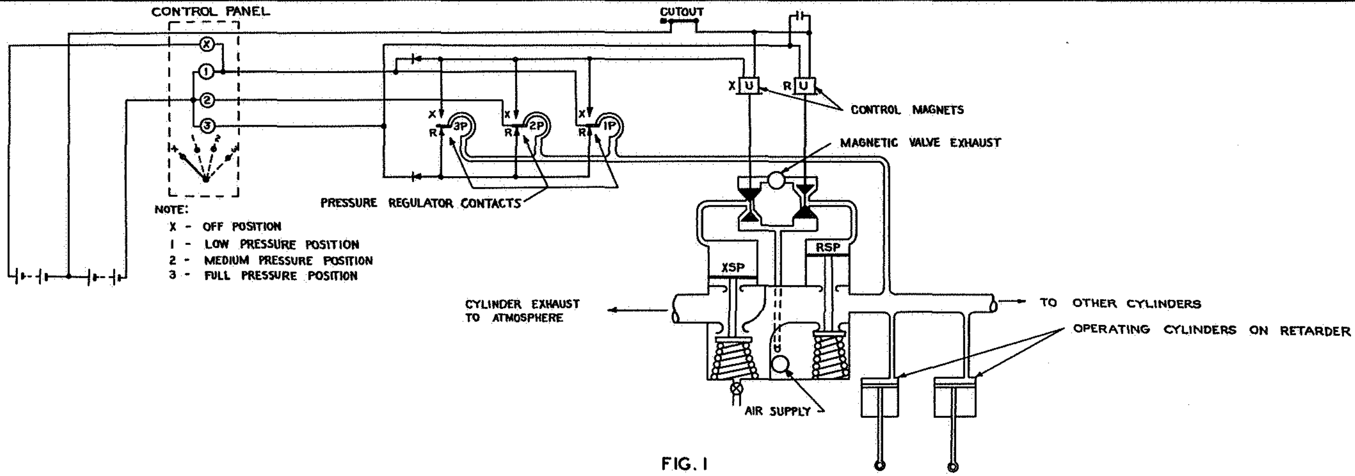


FIG. 1

ELECTRO-PNEUMATIC RETARDER CONTROL

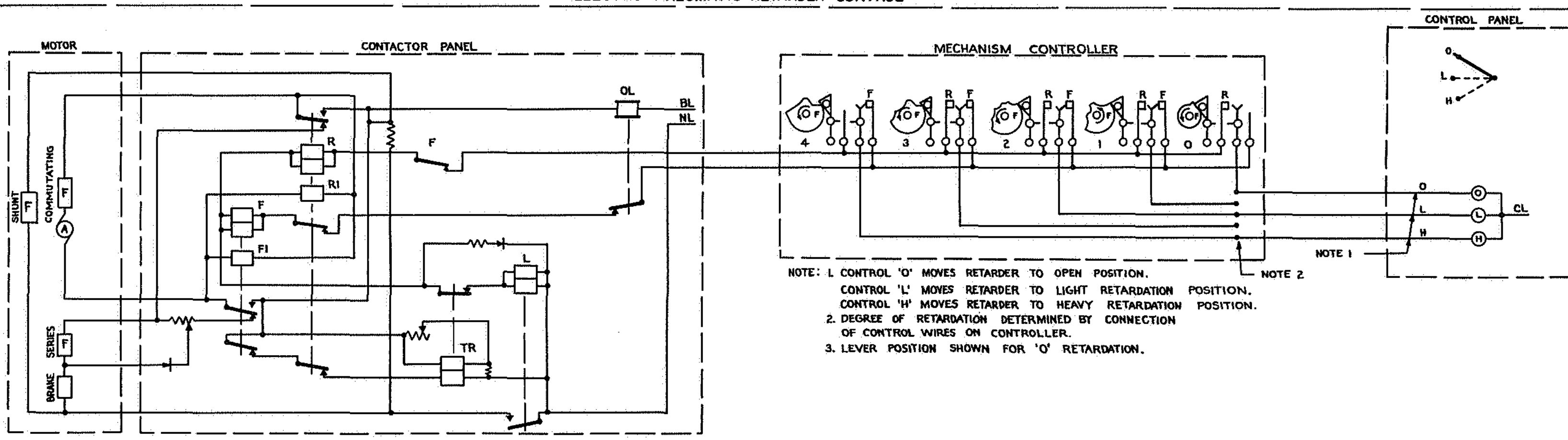


FIG. 2

ELECTRIC RETARDER CONTROL

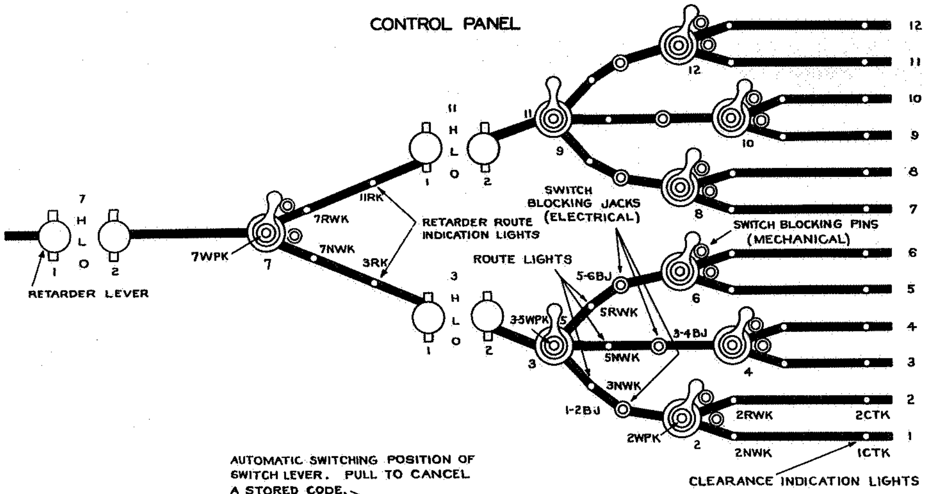
CLASSIFICATION YARD SYSTEM

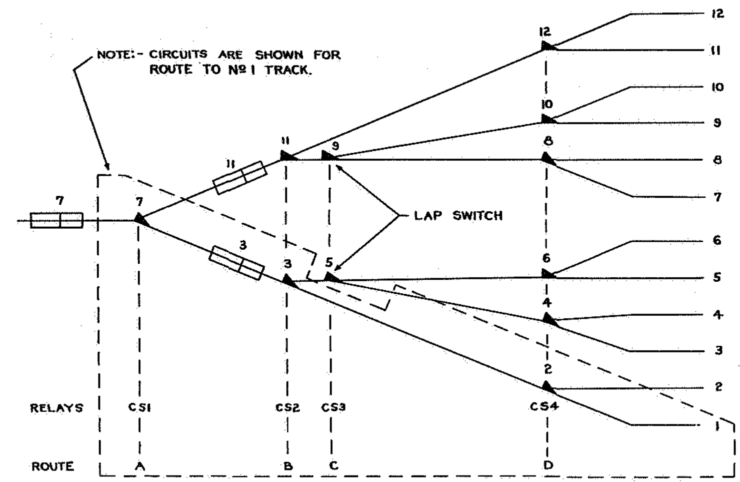
RETARDER CONTROL CIRCUITS - MANUALLY OPERATED

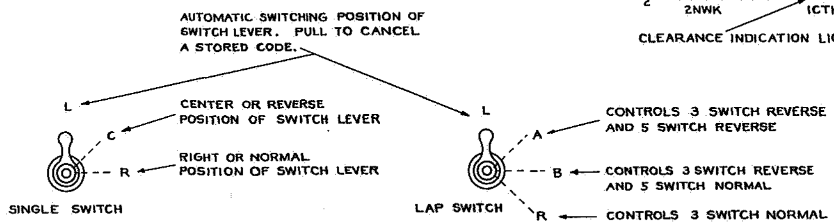
OCT. 1954

AAR SIG. SEC. 8072A

SHEET 4







TRACK Nº	CODE TO RELAY SEQUENCE				ROUTE			
	CS1	CS2	CS3	CS4	A	B	C	D
1	P	P	O	P	7N	3N	-	2N
2	P	P	O	O	7N	3N	-	2R
3	P	O	P	P	7N	3R	5N	4N
4	P	O	P	O	7N	3R	5N	4R
5	P	O	O	P	7N	3R	5R	6N
6	P	O	O	O	7N	3R	5R	6R
7	O	P	P	P	7R	11N	9N	8N
8	O	P	P	O	7R	11N	9N	8R
9	O	P	O	P	7R	11N	9R	10N
10	O	P	O	O	7R	11N	9R	10R
11	O	O	O	P	7R	11R	-	12N
12	O	O	O	O	7R	11R	-	12R

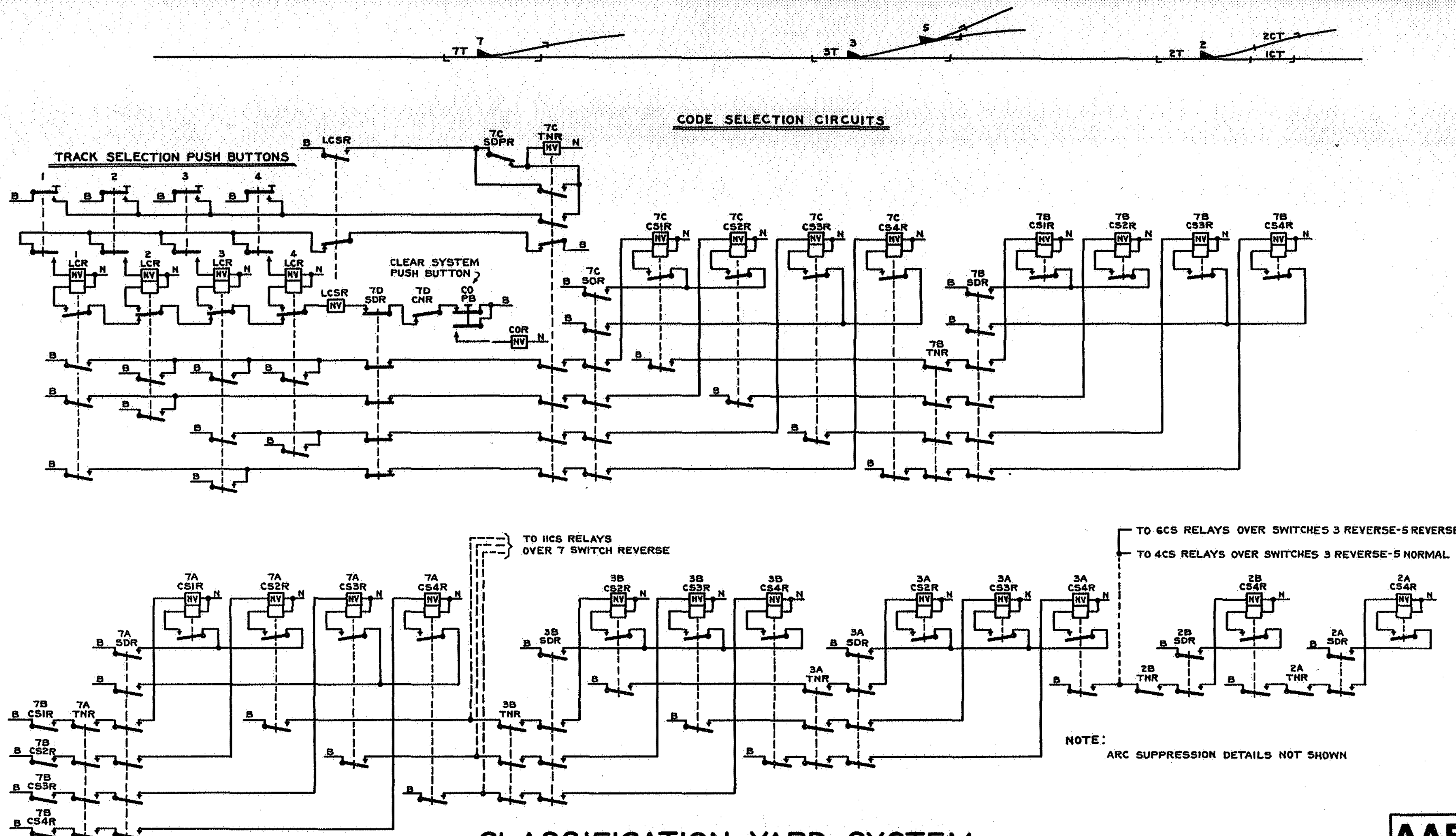
P = CODE SELECTION RELAYS (C.S.) PICKED UP TO CONTROL SWITCH NORMAL
O = CODE SELECTION RELAYS (C.S.) OPEN TO CONTROL SWITCH REVERSE

CLASSIFICATION YARD SYSTEM

AUTOMATIC SWITCHING CONTROL CIRCUITS USING ELECTRIC SWITCH MACHINES

OCT. 1954

AAR SIG. SEC. 8072A



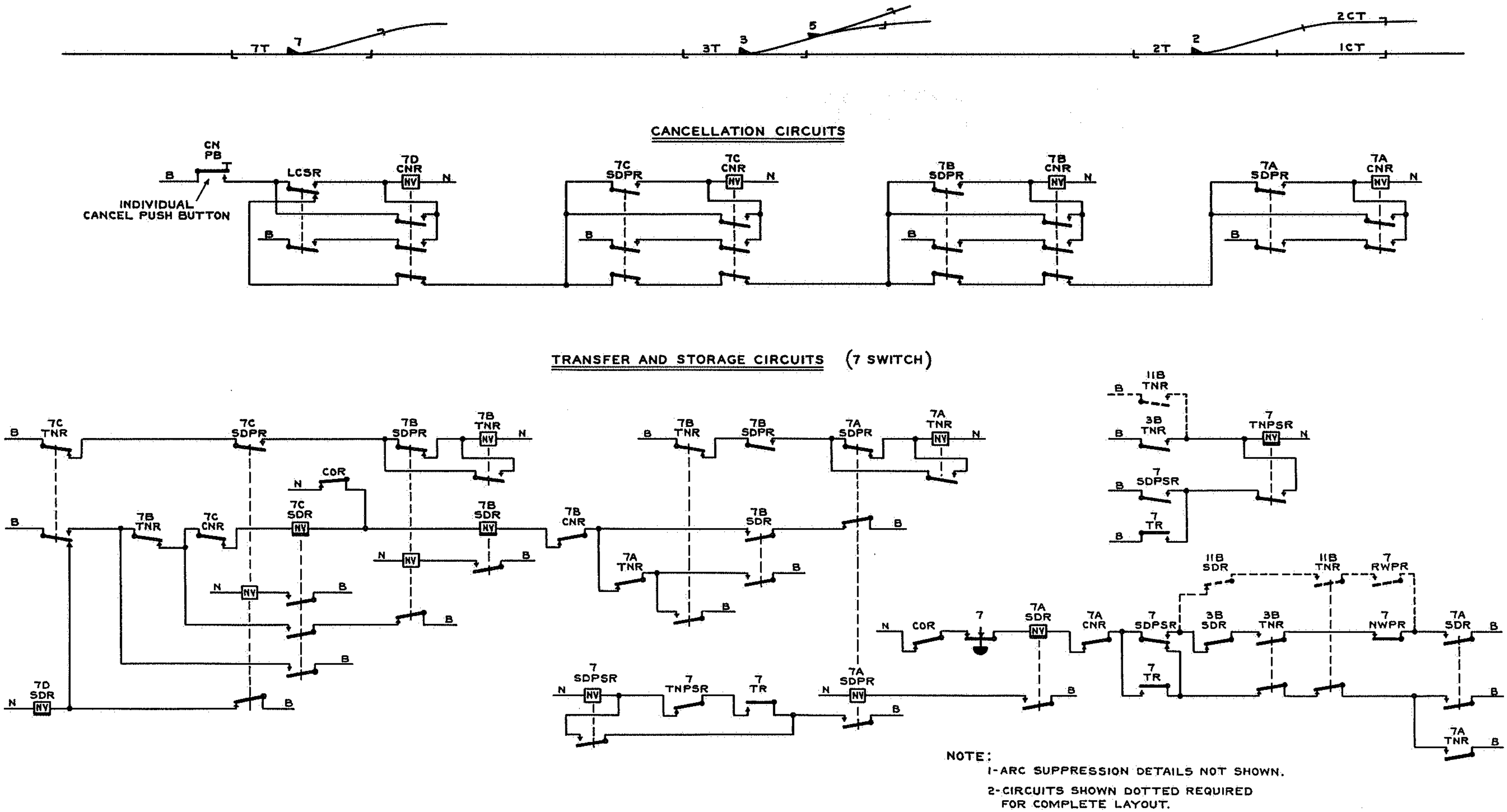
CLASSIFICATION YARD SYSTEM

AUTOMATIC SWITCHING CONTROL CIRCUITS USING ELECTRIC SWITCH MACHINES

OCT. 1954

AAR SIG. SEC. 8072A

SHEET 6



NOTE:
1-ARC SUPPRESSION DETAILS NOT SHOWN.
2-CIRCUITS SHOWN DOTTED REQUIRED FOR COMPLETE LAYOUT.

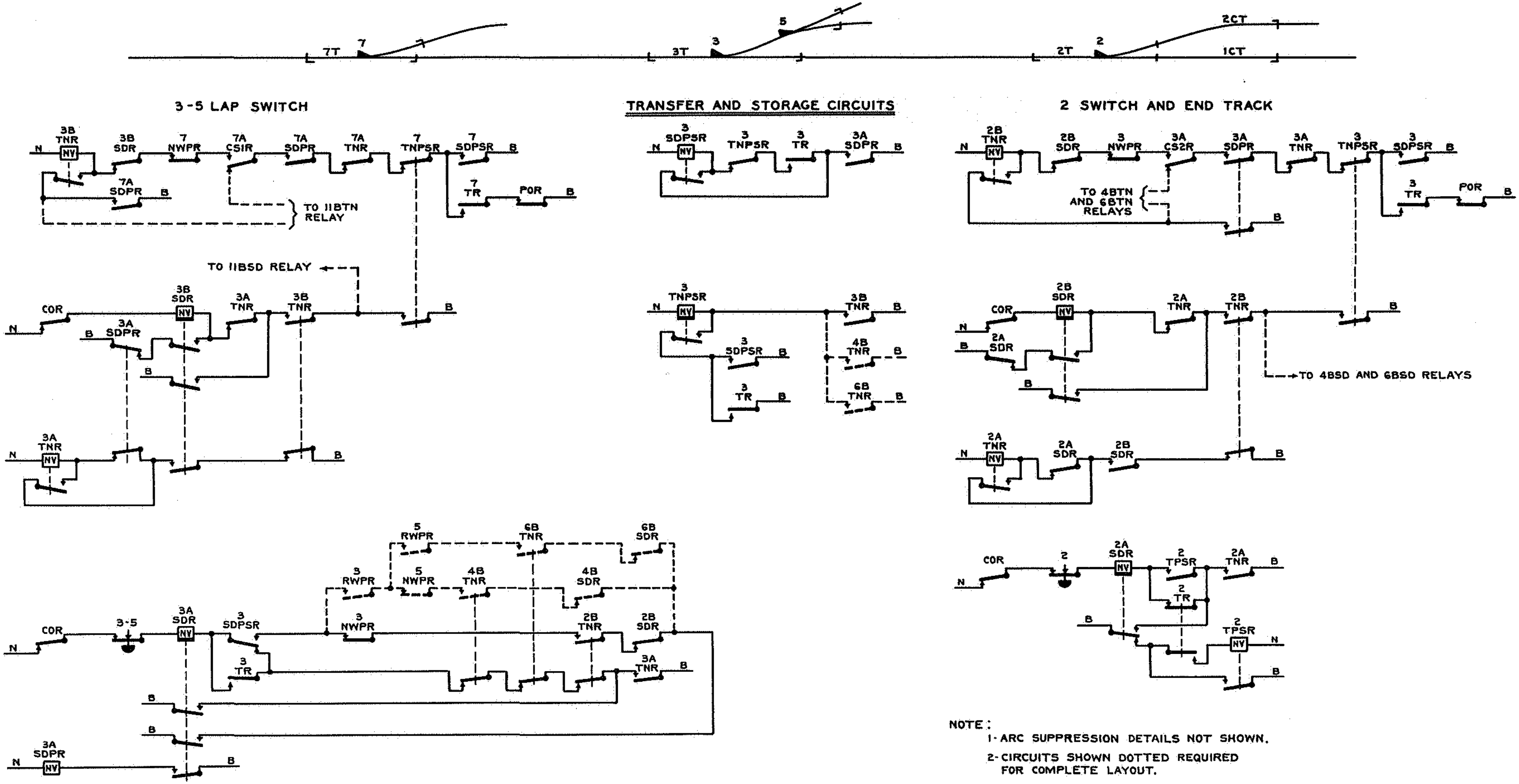
CLASSIFICATION YARD SYSTEM

AUTOMATIC SWITCHING CONTROL CIRCUITS USING ELECTRIC SWITCH MACHINES

OCT. 1954

AAR SIG. SEC. 8072A

SHEET 7



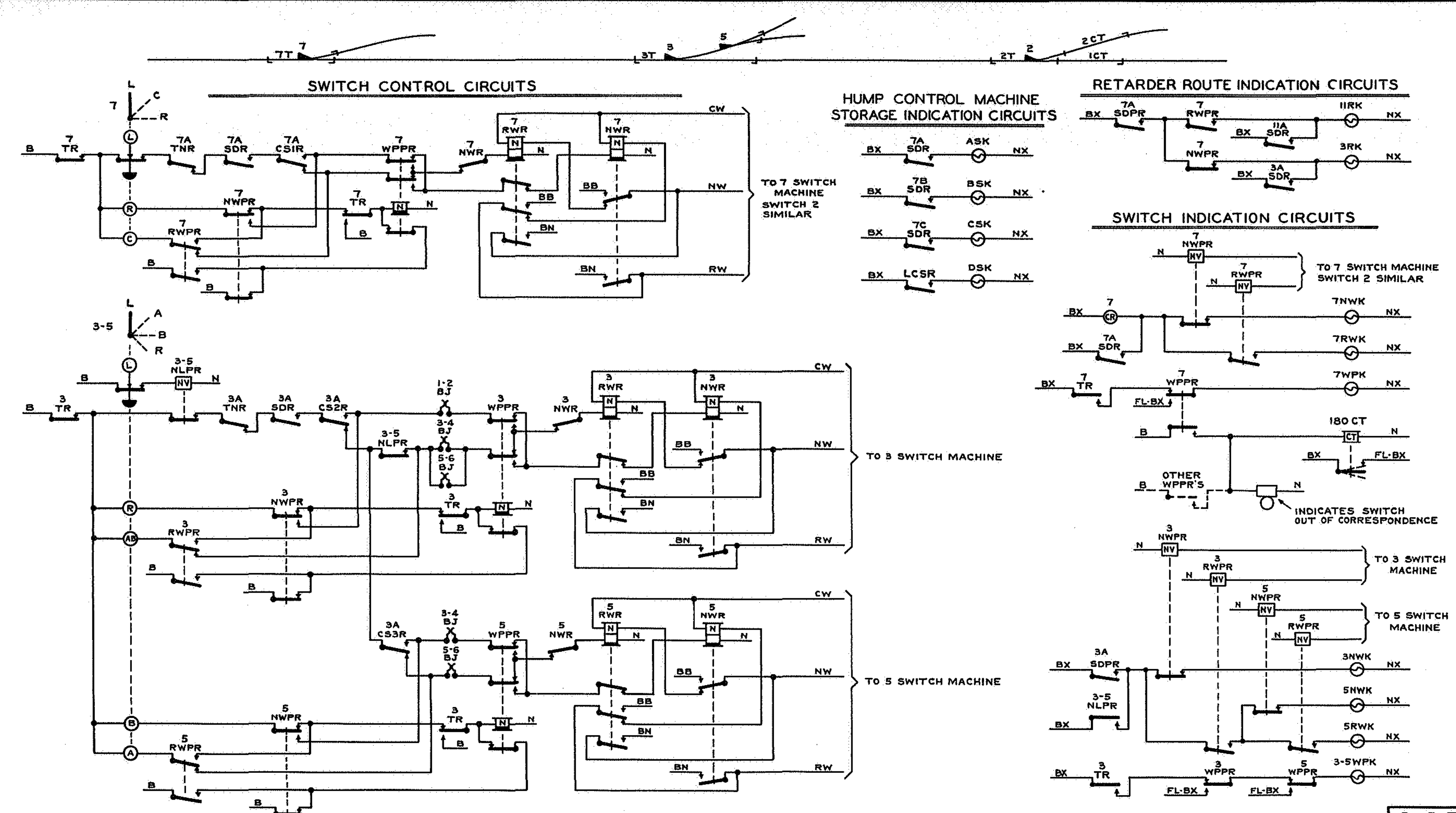
NOTE:
1- ARC SUPPRESSION DETAILS NOT SHOWN.
2- CIRCUITS SHOWN DOTTED REQUIRED FOR COMPLETE LAYOUT.

CLASSIFICATION YARD SYSTEM

AUTOMATIC SWITCHING CONTROL CIRCUITS USING ELECTRIC SWITCH MACHINES

OCT. 1954 | AAR SIG. SEC. 8072A

SHEET 8

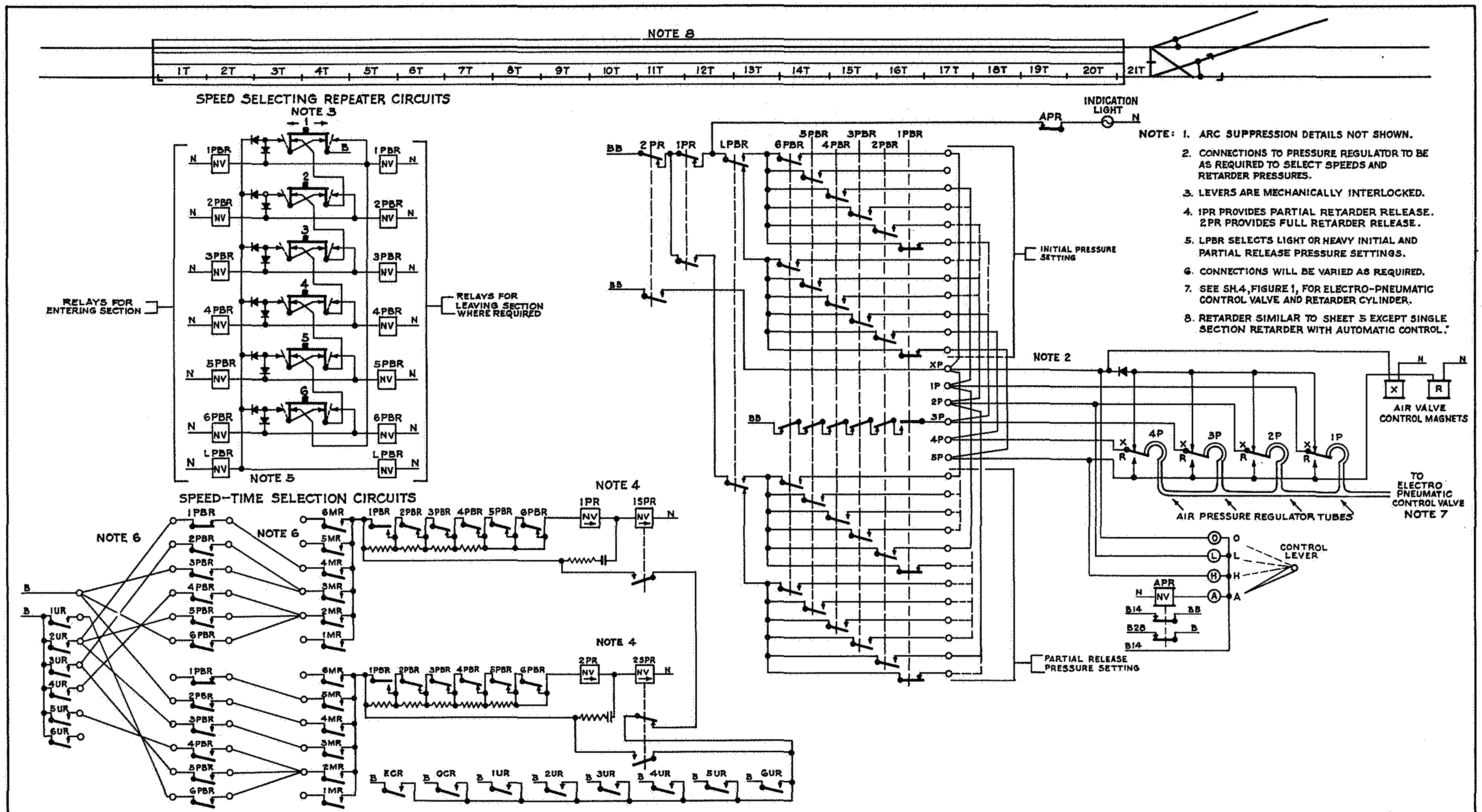


CLASSIFICATION YARD SYSTEM

AUTOMATIC SWITCHING CONTROL CIRCUITS USING ELECTRIC SWITCH MACHINES

OCT. 1954

AAR SIG. SEC. 8072A



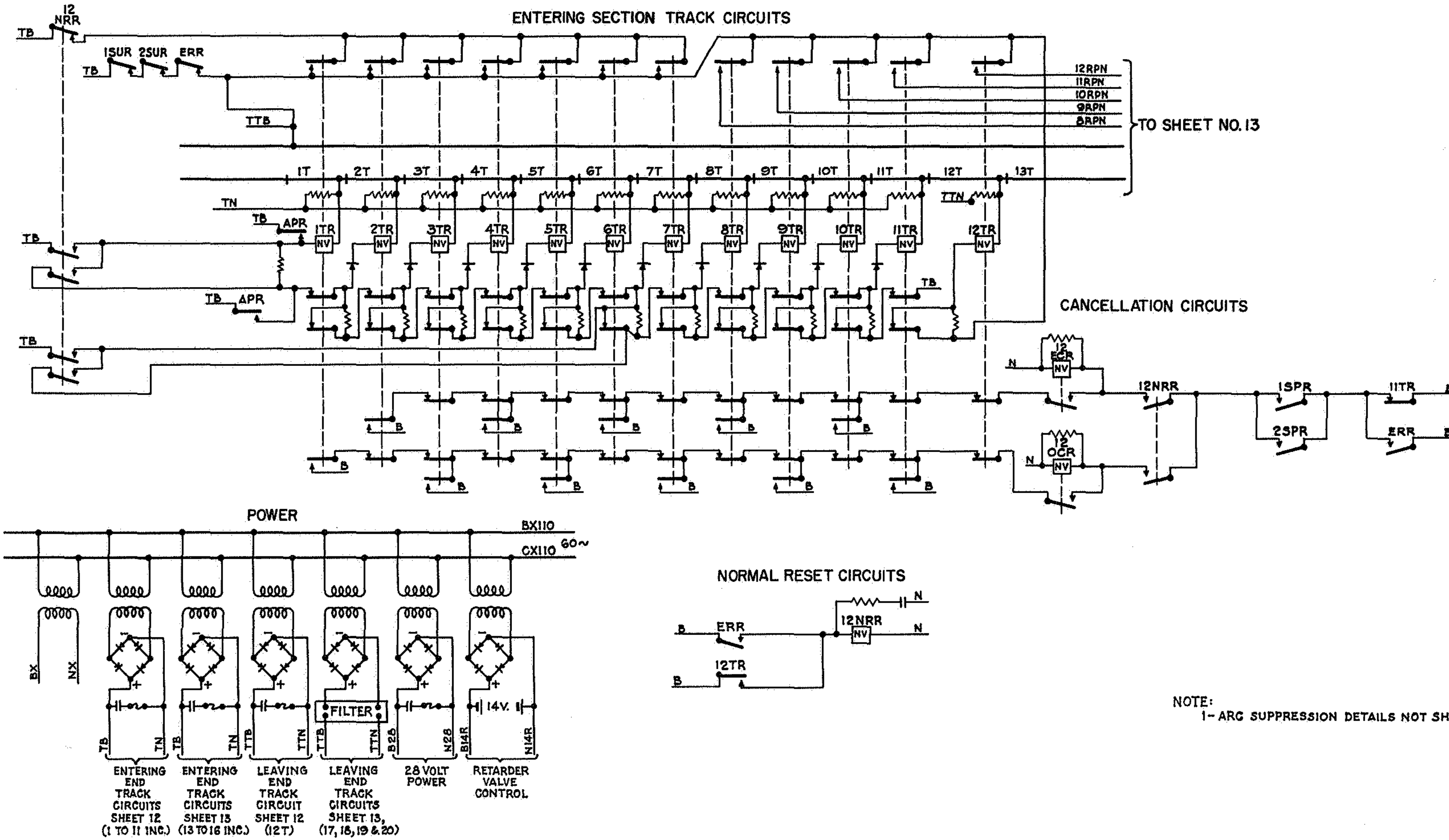
NOTE:
1. ARC SUPPRESSION DETAILS NOT SHOWN.
2. CONNECTIONS TO PRESSURE REGULATOR TO BE AS REQUIRED TO SELECT SPEEDS AND RETARDER PRESSURES.
3. LEVERS ARE MECHANICALLY INTERLOCKED.
4. 1PR PROVIDES PARTIAL RETARDER RELEASE. 2PR PROVIDES FULL RETARDER RELEASE.
5. LPBR SELECTS LIGHT OR HEAVY INITIAL AND PARTIAL RELEASE PRESSURE SETTINGS.
6. CONNECTIONS WILL BE VARIED AS REQUIRED.
7. SEE SH.4, FIGURE 1, FOR ELECTRO-PNEUMATIC CONTROL VALVE AND RETARDER CYLINDER.
8. RETARDER SIMILAR TO SHEET 5 EXCEPT SINGLE SECTION RETARDER WITH AUTOMATIC CONTROL.

CLASSIFICATION YARD SYSTEM

RETARDER CONTROL CIRCUITS - AUTOMATICALLY OPERATED - ELECTRO PNEUMATIC

OCT. 1955

AAR SIG. SECT. 8072A



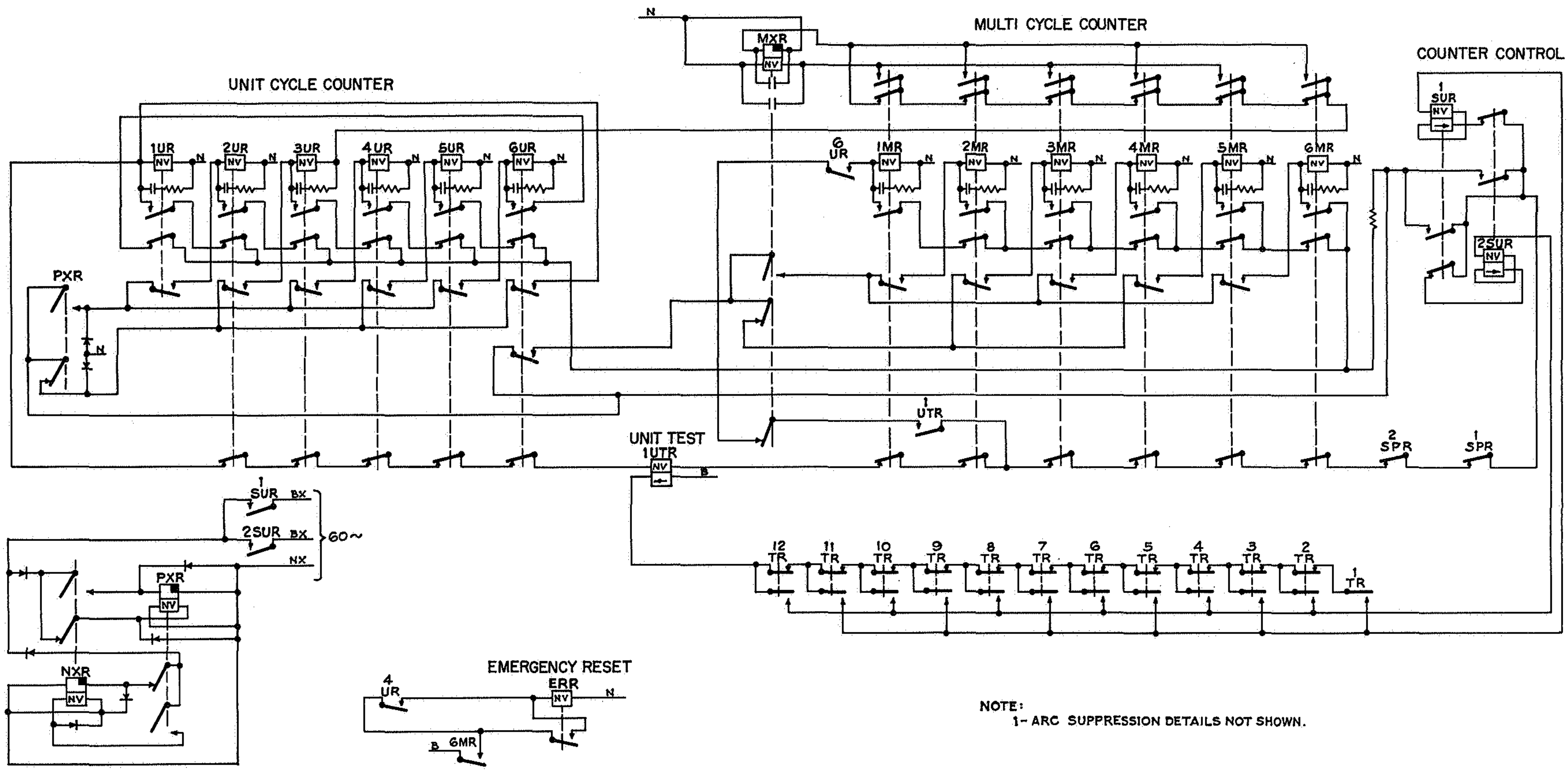
NOTE:
1 - ARC SUPPRESSION DETAILS NOT SHOWN.

CLASSIFICATION YARD SYSTEM

RETARDER CONTROL CIRCUITS - AUTOMATICALLY OPERATED - ELECTRO PNEUMATIC

AAR SIG. SECT. 8072A

OCT. 1955

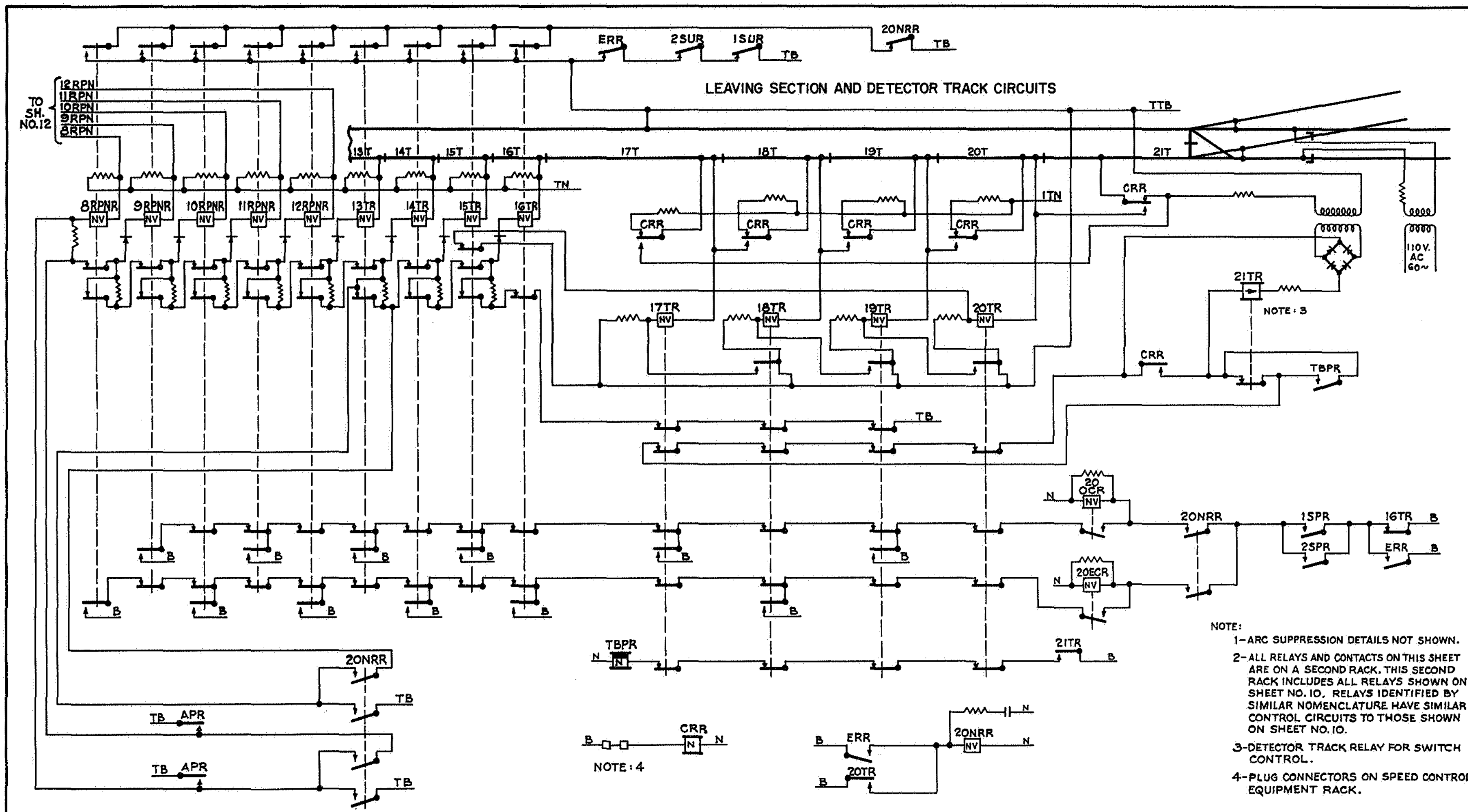


CLASSIFICATION YARD SYSTEM

RETARDER CONTROL CIRCUITS–AUTOMATICALLY OPERATED–ELECTRO PNEUMATIC

OCT. 1955

AAR SIG. SECT. 8072A



NOTE:

1–ARC SUPPRESSION DETAILS NOT SHOWN.

2–ALL RELAYS AND CONTACTS ON THIS SHEET ARE ON A SECOND RACK. THIS SECOND RACK INCLUDES ALL RELAYS SHOWN ON SHEET NO. 10. RELAYS IDENTIFIED BY SIMILAR NOMENCLATURE HAVE SIMILAR CONTROL CIRCUITS TO THOSE SHOWN ON SHEET NO. 10.

3–DETECTOR TRACK RELAY FOR SWITCH CONTROL.

4–PLUG CONNECTORS ON SPEED CONTROL EQUIPMENT RACK.

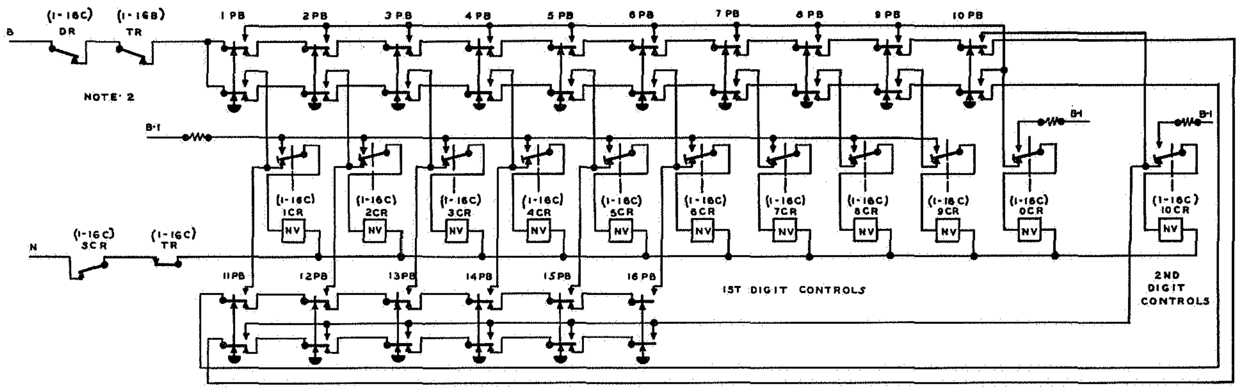
CLASSIFICATION YARD SYSTEM

RETARDER CONTROL CIRCUITS–AUTOMATICALLY OPERATED–ELECTRO PNEUMATIC

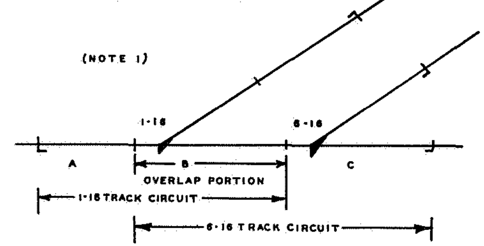
OCT. 1955

AAR SIG. SECT. 8072 A

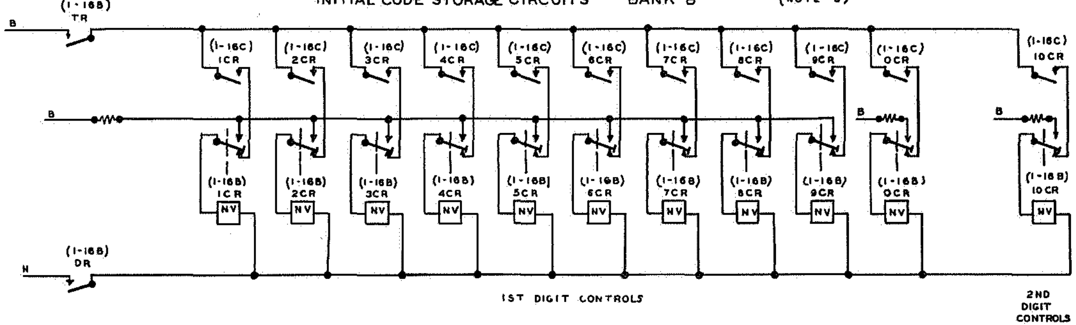
INITIAL CODE STORAGE CIRCUITS BANK C
ROUTE SELECTION PUSH BUTTONS



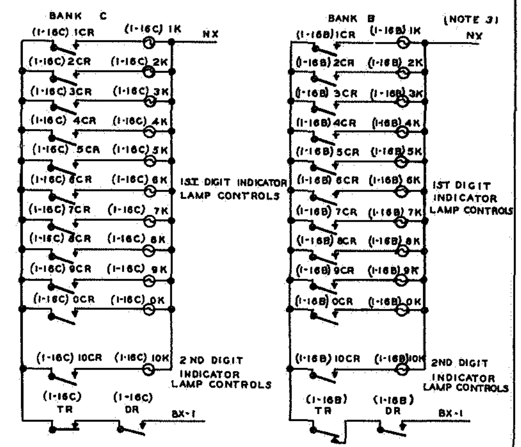
LAP SWITCH 1-16 AND 6-16



INITIAL CODE STORAGE CIRCUITS BANK B (NOTE 3)



ROUTE STORAGE INDICATOR CIRCUITS



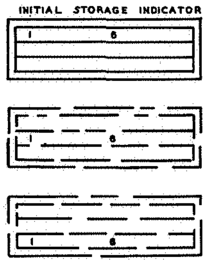
NOTES
1. FOR TRACK CIRCUIT DETAILS, SEE SHEET NO. 16
2. NOMENCLATURE IN PARENTHESIS INDICATES STORAGE BANK AND/OR FUNCTION NUMBERING.
3. CIRCUITS FOR INITIAL CODE STORAGE AND INDICATOR LAMPS FOR BANK A ARE IDENTICAL TO THOSE SHOWN FOR BANK B
4. ARC SUPPRESSION DETAILS NOT SHOWN

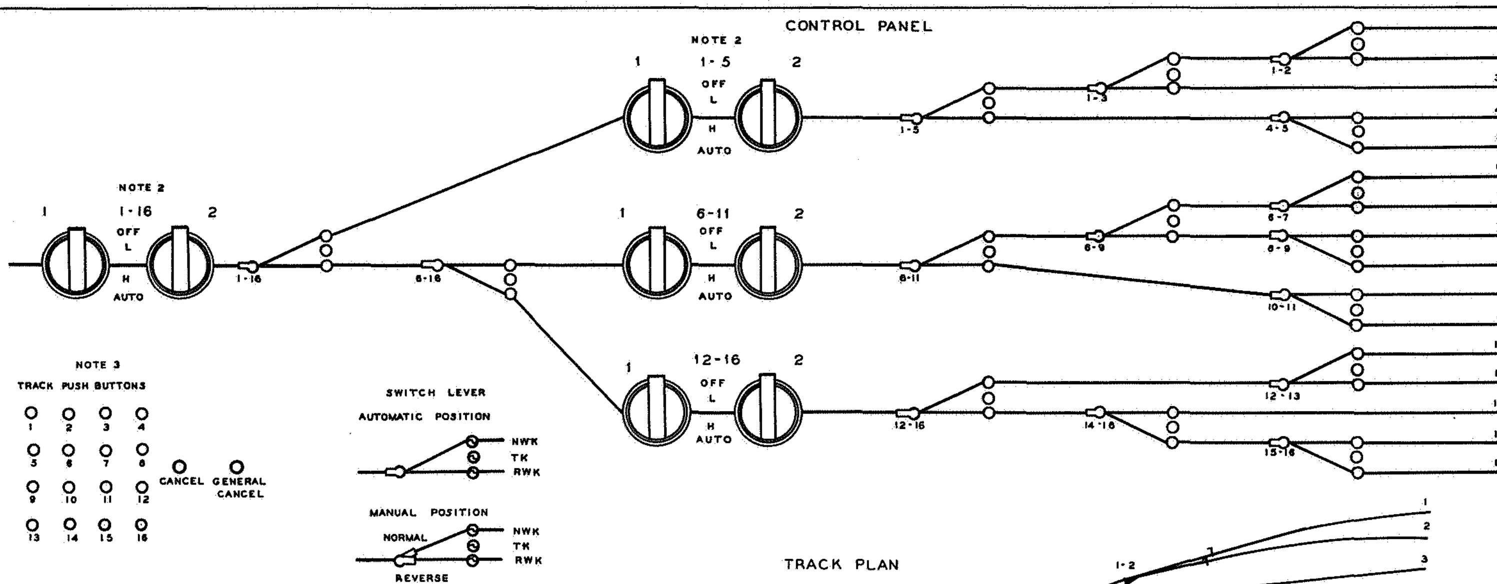
CLASSIFICATION YARD SYSTEM

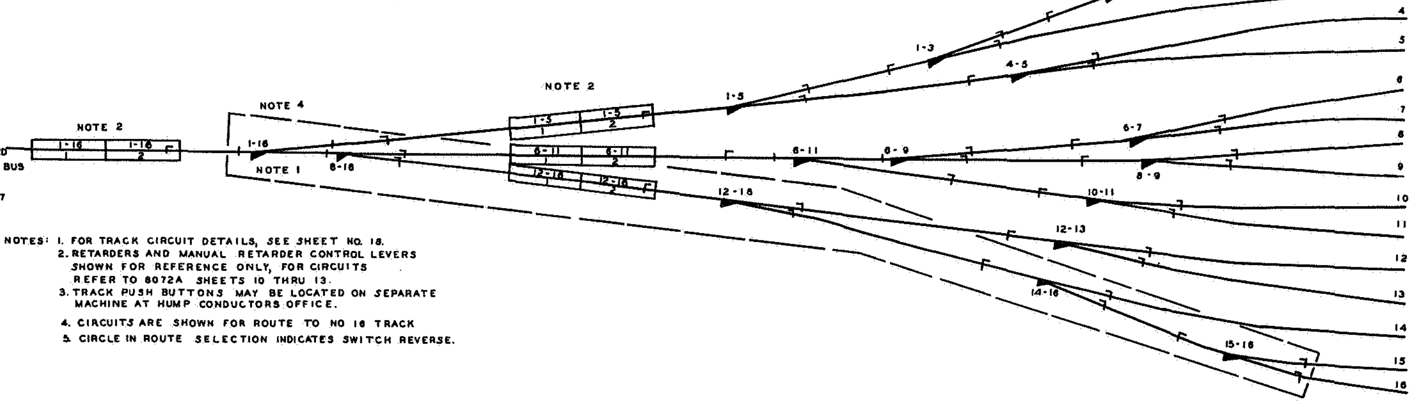
AUTOMATIC SWITCHING CONTROL CIRCUITS, USING ELECTRO-PNEUMATIC SWITCH MACHINES

SEPT. 1956

AAR SIG. SEC. 8072A







TABULATION

BUS CONNECTIONS FOR ROUTE SELECTION AND STORAGE SWITCH NORMAL: ROUTE SELECTION BUS IS NOT ENERGIZED. SWITCH REVERSE: ROUTE SELECTION BUS IS ENERGIZED. SEE SHEET 17 ROUTE SELECTION AND STORAGE CIRCUITS

ROUTE					TRACK
ROUTE SELECTION BUS NO					NO
1	2	3	4	5	
1-16	1-5	1-3	1-2		1
1-16	1-5	1-3	1-2		2
1-16	1-5	1-3			3
1-16	1-5	4-5			4
1-16	1-5	4-5			5
1-16	6-16	6-11	6-9	6-7	6
1-16	6-16	6-11	6-9	6-7	7
1-16	6-16	6-11	6-9	8-9	8
1-16	6-16	6-11	6-9	8-9	9
1-16	6-16	6-11	10-11		10
1-16	6-16	6-11	10-11		11
1-16	6-16	12-16	12-13		12
1-16	6-16	12-16	12-13		13
1-16	6-16	12-16	14-16		14
1-16	6-16	12-16	14-16	15-16	15
1-16	6-16	12-16	14-16	15-16	16

NOTE 5

NOTES:
1. FOR TRACK CIRCUIT DETAILS, SEE SHEET NO. 18.
2. RETARDERS AND MANUAL RETARDER CONTROL LEVERS SHOWN FOR REFERENCE ONLY, FOR CIRCUITS REFER TO 8072A SHEETS 10 THRU 13.
3. TRACK PUSH BUTTONS MAY BE LOCATED ON SEPARATE MACHINE AT HUMP CONDUCTORS OFFICE.
4. CIRCUITS ARE SHOWN FOR ROUTE TO NO 16 TRACK
5. CIRCLE IN ROUTE SELECTION INDICATES SWITCH REVERSE.

CLASSIFICATION YARD SYSTEM

AUTOMATIC SWITCHING CONTROL CIRCUITS, USING ELECTRO-PNEUMATIC SWITCH MACHINES

SEPT. 1956

AAR SIG. SEC. 8072A

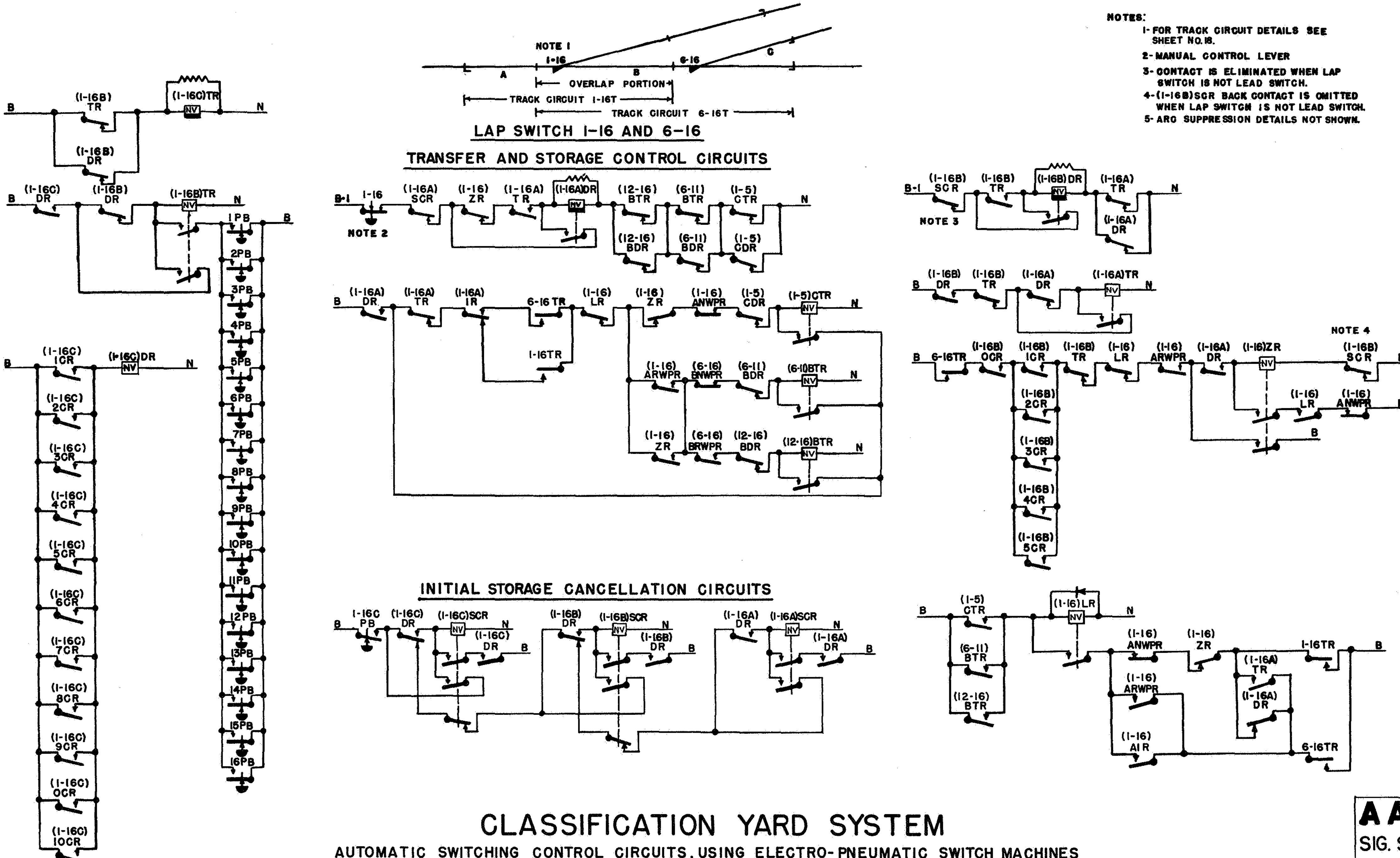
SHEET 14

NOTES:
1- FOR TRACK CIRCUIT DETAILS SEE SHEET NO. 18.
2- MANUAL CONTROL LEVER
3- CONTACT IS ELIMINATED WHEN LAP SWITCH IS NOT LEAD SWITCH.
4- (1-16B) SCR BACK CONTACT IS OMITTED WHEN LAP SWITCH IS NOT LEAD SWITCH.
5- ARC SUPPRESSION DETAILS NOT SHOWN.

LAP SWITCH 1-16 AND 6-16

TRANSFER AND STORAGE CONTROL CIRCUITS

INITIAL STORAGE CANCELLATION CIRCUITS



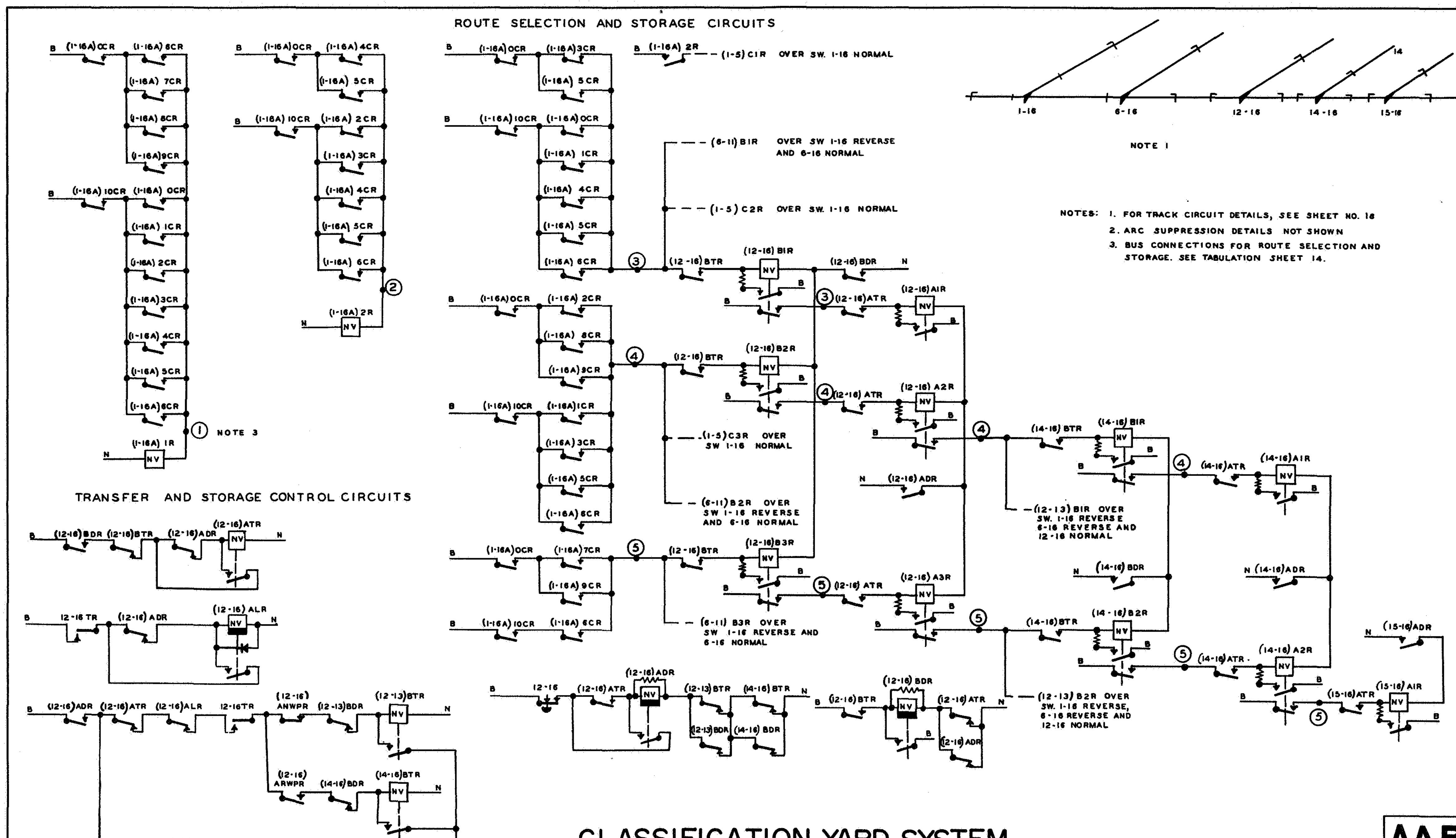
CLASSIFICATION YARD SYSTEM

AUTOMATIC SWITCHING CONTROL CIRCUITS, USING ELECTRO-PNEUMATIC SWITCH MACHINES

AAR
SIG. SEC.
8072A

SEPT. 1956

SHEET 16



CLASSIFICATION YARD SYSTEM

AUTOMATIC SWITCHING CONTROL CIRCUITS, USING ELECTRO-PNEUMATIC SWITCH MACHINES

SEPT. 1956

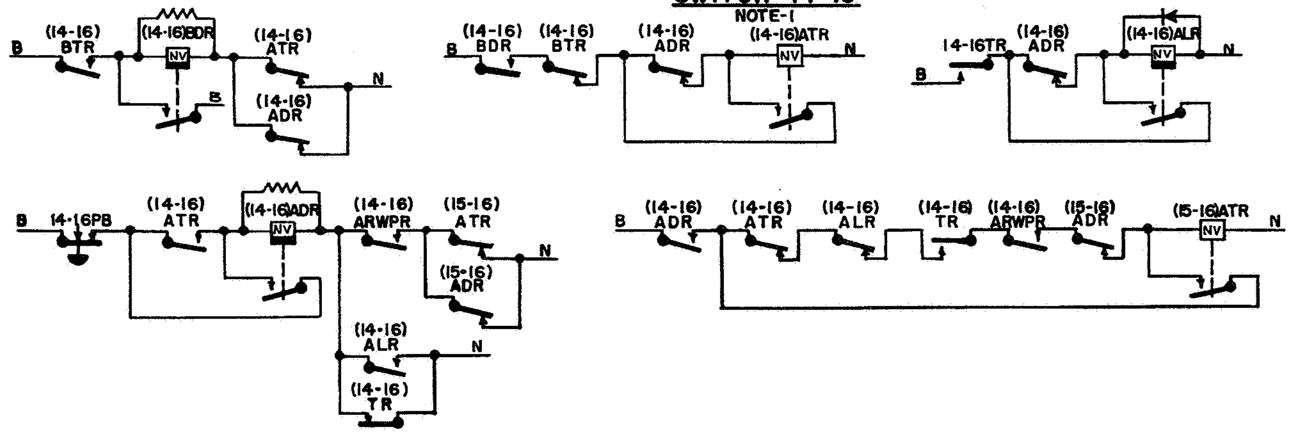
AAR
SIG. SEC.
8072A

SHEET 17

TRANSFER AND STORAGE CONTROL CIRCUITS

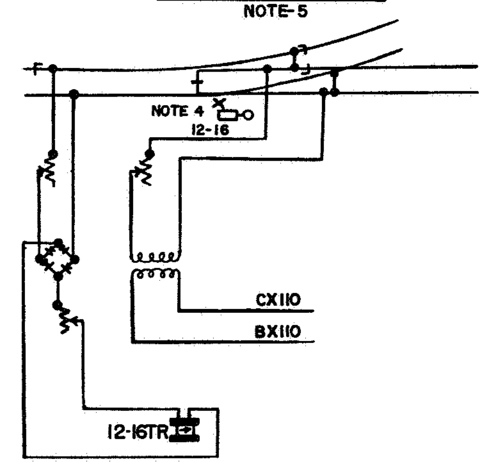
SWITCH 14-16

NOTE-1



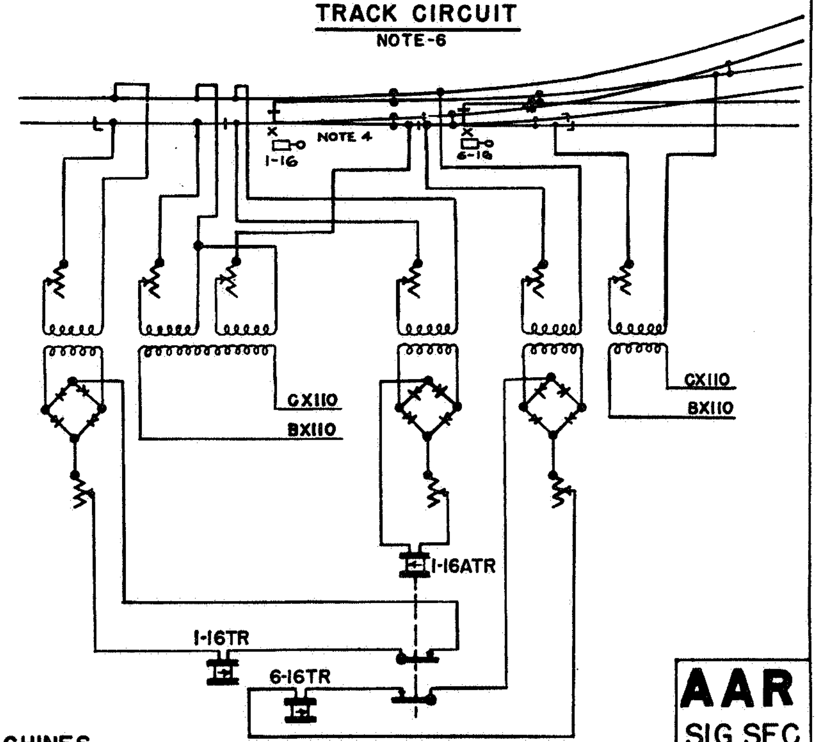
TRACK CIRCUIT

NOTE-5



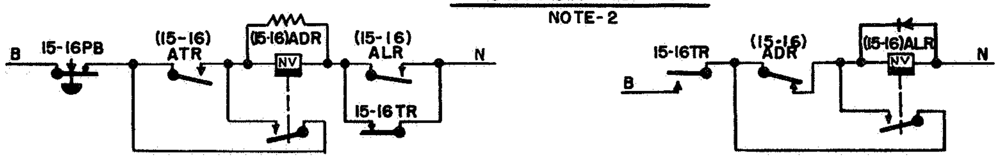
TRACK CIRCUIT

NOTE-6



SWITCH 15-16

NOTE-2



NOTES:

1- TO A SWITCH AND AN END TRACK.

2- TO TWO END TRACKS.

3- CANCELS ALL INITIAL STORAGE.

4- WHERE SWITCH SIGNAL IS REQUIRED REFER TO SHEET 3.

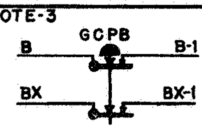
5- TYPICAL FOR SINGLE SWITCHES.

6- TYPICAL FOR LAP SWITCHES.

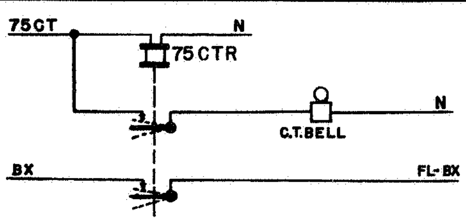
7- ARC SUPPRESSION DETAILS NOT SHOWN.

STORAGE CANCELLATION PUSH BUTTON

NOTE-3



OBSTRUCTED SWITCH ALARM CIRCUIT



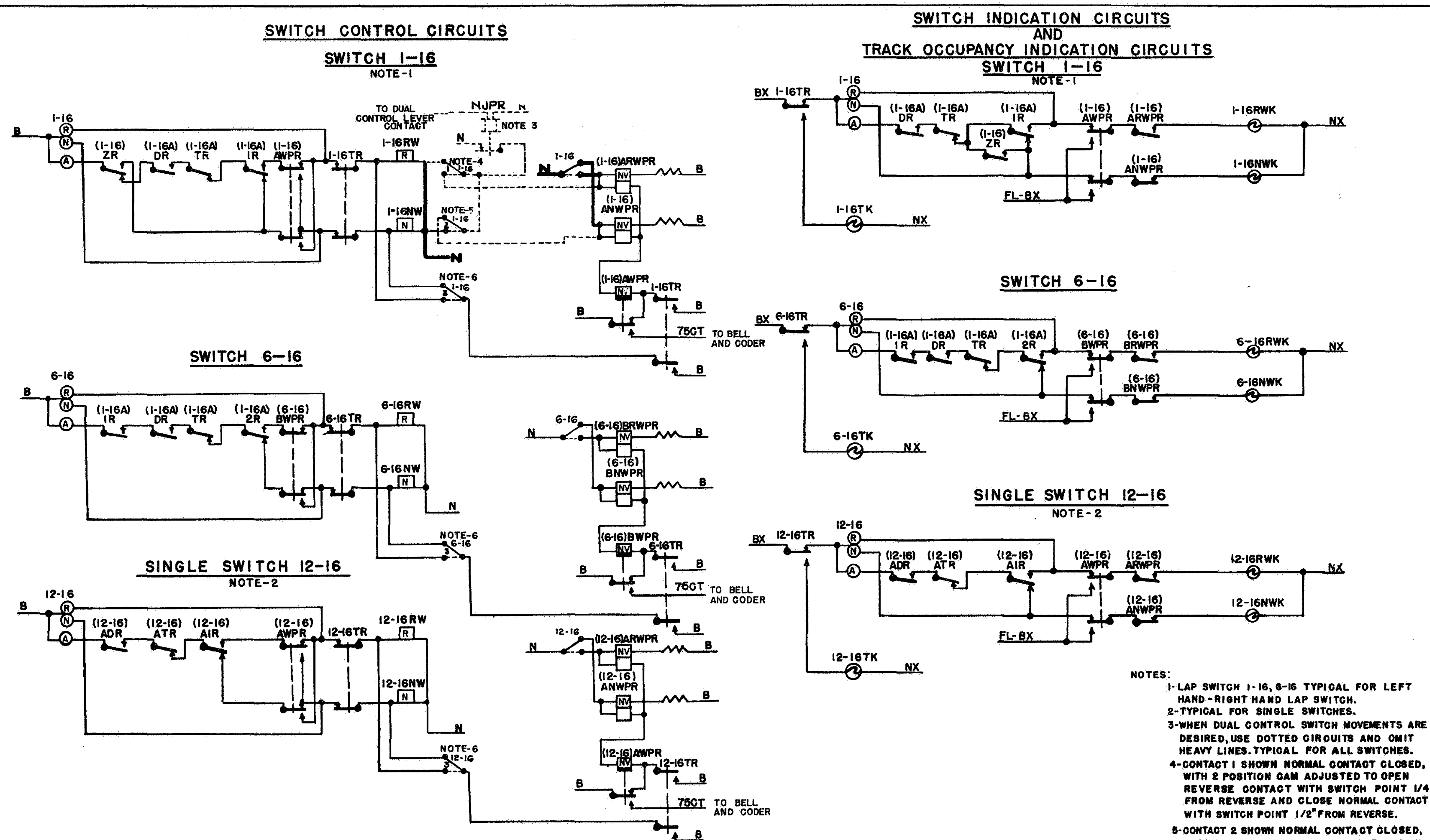
CLASSIFICATION YARD SYSTEM

AUTOMATIC SWITCHING CONTROL CIRCUITS, USING ELECTRO-PNEUMATIC SWITCH MACHINES

SEPT. 1956

AAR SIG. SEC. 8072A

SHEET 18



NOTES:

1- LAP SWITCH 1-16, 6-16 TYPICAL FOR LEFT HAND-RIGHT HAND LAP SWITCH.
2- TYPICAL FOR SINGLE SWITCHES.
3- WHEN DUAL CONTROL SWITCH MOVEMENTS ARE DESIRED, USE DOTTED CIRCUITS AND OMIT HEAVY LINES. TYPICAL FOR ALL SWITCHES.
4- CONTACT 1 SHOWN NORMAL CONTACT CLOSED, WITH 2 POSITION CAM ADJUSTED TO OPEN REVERSE CONTACT WITH SWITCH POINT 1/4" FROM REVERSE AND CLOSE NORMAL CONTACT WITH SWITCH POINT 1/2" FROM REVERSE.
5- CONTACT 2 SHOWN NORMAL CONTACT CLOSED, WITH 2 POSITION CAM ADJUSTED TO OPEN NORMAL CONTACT WITH SWITCH POINT 1/4" FROM NORMAL AND CLOSE REVERSE CONTACT WITH SWITCH POINT 1/2" FROM NORMAL.
6- 2 POSITION CAM 3 ADJUSTED TO MAKE AND BREAK AT MID STROKE.

CLASSIFICATION YARD SYSTEM

AUTOMATIC SWITCHING CONTROL CIRCUITS, USING ELECTRO-PNEUMATIC SWITCH MACHINES

SEPT. 1956

AAR SIG. SEC. 8072A

CIRCUITS FOR CONTROL AND INDICATION OF A REMOTE BLOCK SIGNAL, USING CODED CARRIER FREQUENCY. INDICATIONS ARE TRANSMITTED BY INVERSE (REVERSE) CODED CARRIER FREQUENCY.

The purpose of this plan is to control a block signal from a remote point over two line wires, which are used for other purposes.

This plan employs a carrier frequency coded at 120 or 180 rate to clear signal to approach or clear position, respectively. With the control lever normal (signal at Stop) the carrier is coded at 75 rate. A second carrier frequency is employed for indications. This is keyed at the code rate being transmitted for controls, if the position of the signal agrees with the code rate being received.

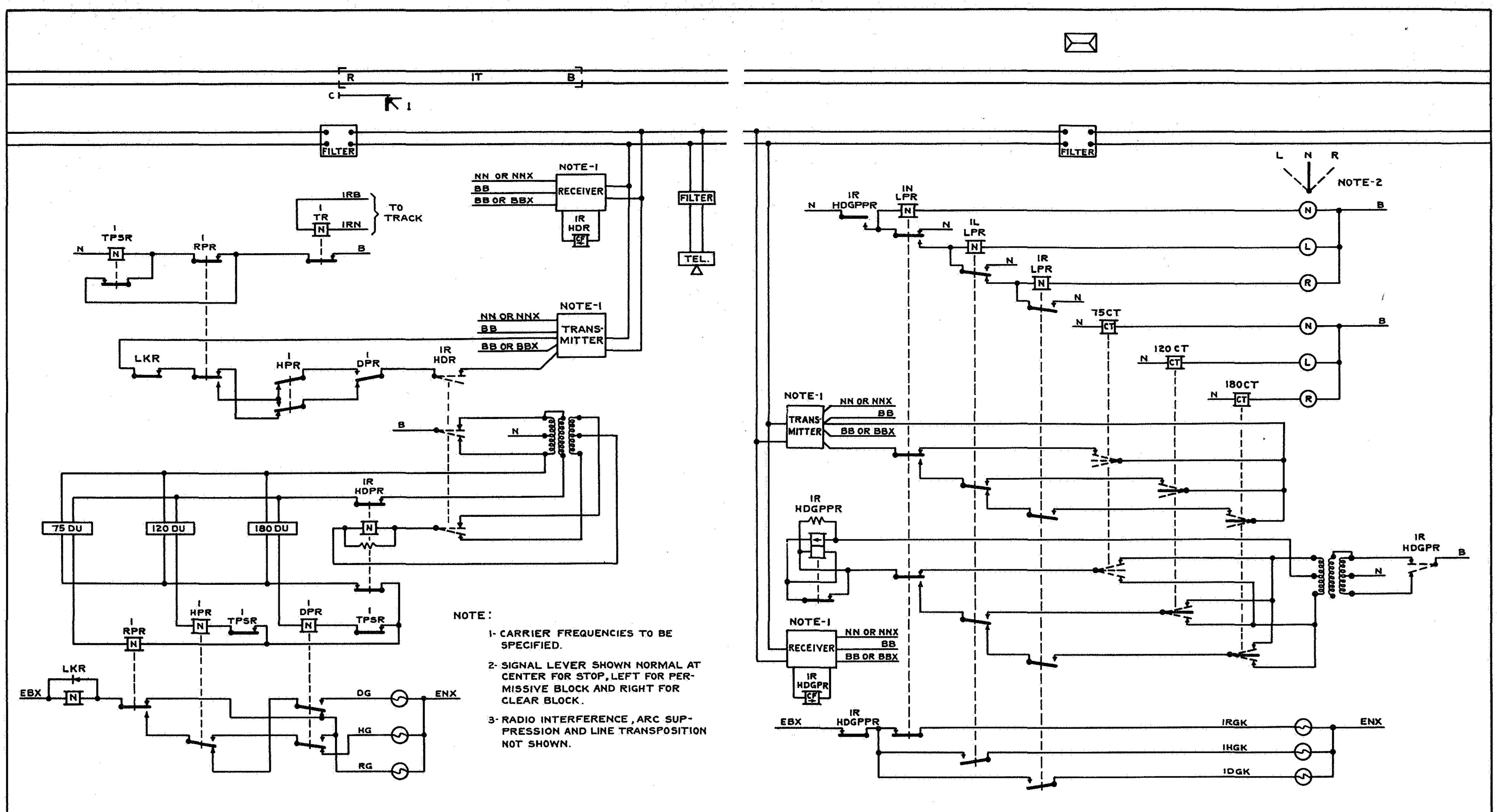
All coding is originated at the control office and employs the use of a biased code detecting relay (1RHDGPPR) to receive the indication. This requires that the 1RHDGPR code following relay, being controlled from office receiver, operate in unison with the code being transmitted to the field to provide the proper polarity for the 1RHDGPPR relay to pick up.

Should the office carrier receiver be driven by the office transmitter, due to crossfire, the 1RHDGPR relay would be de-energized when code transmitter contact is closed to transmit the carrier frequency to the field, that is, the transmitter and 1RHDGPR relay would be operating 180 degrees out of phase. The resultant polarity to the 1RHDGPPR relay would be reversed and the relay will remain de-energized. The circuit arrangment provides that any power or equipment failure in the control portion will result in a stop signal being displayed. Any such failure in either the control or indication portions will result in the absence of an indication light at the control point. Therefore, the appearance of an indication light guarantees that the control and indication circuits are intact and that the signal is displaying the aspect called for by the lever.

Relay 1RHDGPPR is slow release and must be down to permit lever repeater relays to follow. This time delay allows each code detecting relay (1RPR, 1HPR, 1DPR) to drop between code changes, thereby eliminating any tendency of a code detecting relay to pick up on a code rate higher than its own.

The control circuits of the code rate detector relay provide a circuit check to insure that a stop aspect will result in the event that a control relay did not drop out when the code rate is changed to call for a change in signal aspects. This also provides a means of opening the keyed circuit to the indication carrier transmitter.

Track circuit 1T provides stick signal operation. Relay LKR provides a means of opening the keying circuit to the indication transmitter in the event the proper signal lamp circuit or filament is open.



NOTE:

1- CARRIER FREQUENCIES TO BE SPECIFIED.

2- SIGNAL LEVER SHOWN NORMAL AT CENTER FOR STOP, LEFT FOR PERMISSIVE BLOCK AND RIGHT FOR CLEAR BLOCK.

3- RADIO INTERFERENCE, ARC SUPPRESSION AND LINE TRANSPOSITION NOT SHOWN.

CIRCUITS FOR CONTROL AND INDICATION OF A REMOTE BLOCK SIGNAL, USING CODED CARRIER FREQUENCY

INDICATIONS TRANSMITTED BY INVERSE (REVERSE) CODED CARRIER FREQUENCY

SEPT. 1953

AAR SIG. SEC. 8073A

TRAFFIC CONTROL CIRCUITS USING NORMAL STEADY ENERGY CODED TRACK.

General.
The circuits shown on Sheets 1 to 12, inclusive, provide a means of traffic control which uses reversible coded track circuits normally energized with steady energy for signal control in the single track area. Track circuits in the siding area are normally coded with polarized reverse code for signal control.

The traffic control system is based on a siding layout with power-operated switches at both ends, electric switch locks on hand-throw switches with a lever on the control machine for the control of leaving moves, searchlight signals, and following moves.

Sheet 1 (End-of-Siding Location).
This sheet shows the code transmitting relays, decoding circuits, signal control circuits, and route check relay circuits.

Relay 42IATR is the reverse code receiving relay used for the control of signal 42IA and is a code following three-position relay, having two sets of contacts operated by independent armatures so arranged that positive code will operate the normal armature to close its front contacts, and negative code will operate the reverse armature to close its front contacts. Positive and negative code is detected by 42IATNFPR and 42IATRFPR, respectively. Receipt of negative reverse code operates the reverse armature of 42IATR, which picks up relay 42IATRFPR. With front contact of the 42IATRFPR closed and back contact of 42IATR closed, the 42IAHR relay is picked up and signal 42IA may be operated to display a Yellow aspect. Through proper decoding circuits when the normal armature of 42IATR is operated by positive code, the 42IATNFPR is picked up and pole-changing contacts of this relay allows signal 42IA to be operated to display a Green aspect. Nonreceipt of either positive or negative reverse code causes signal 42IA to remain at stop.

Relay 42RTR is also a three-position code following relay. Receipt of either positive or negative 180 code, by proper decoding circuits, will allow signal 42R to display a Green aspect, while receipt of positive 180 code will allow signal 42R to display a Green aspect and also will indicate that the block between sidings is unoccupied. Receipt of steady positive energy will also provide a block unoccupied indication, from either one end of the block or the other, depending on direction of last movement of train in the block.

When an electric switch lock exists in the single track area with control of the unlock for leaving move, and automatic unlock for the entering move, then if the control circuits for the lock are as shown on Sheet 6, the alternate connection which inserts a contact of the 42RFHPR in the 42RCR control must be made. This alternate connection provides a timed period of steady energy to be applied to the track circuit for operation of unlocking circuits at the lock location. (See Sheet 6.)

Sheet 2 (End-of-Siding Location).
This sheet shows the circuit connections to the CTC code apparatus, switch control and indication circuits and OS track indication circuits. All of these circuits are conventional traffic control type.

Sheet 3 (Intermediate Signals Opposite).
This sheet shows a double intermediate location on which signal 31 is the distant signal to 42L. The code feed on 31T is polarized for the block indication as previously explained.

The coding relay circuits (31CR and32CR) are arranged to transmit either non-coded or coded energy of the proper frequency when the block is cleared. Coding frequency is determined by the aspect of the signal.

The circuits are arranged to provide approach lighting under two conditions: first, when steady energy is removed for the track circuits and code substituted, the condition obtained when the block is cleared for movement at which time the proper signal or signals are lighted; and secondly, when a train has occupied the block or there is a following train, at which time both signals are lighted.

The proper directional stick relay is picked up whenever coded energy for movement in that direction is present on the track circuits. The stick circuit is obtained by a back contact of the proper TFP relay, which releases the stick relay when steady energy is next received.

Sheet 4 (Staggered Intermediate Signal Location).
This sheet shows the circuits required for two single intermediate signals, and the operation is similar to that discussed above.

Sheet 5 (Intermediate Signals Opposite).
This sheet is similar to Sheet 3 except that signal 12 is the distant signal to 2R.

Sheet 6 (Electric Switch Lock Location Between Passing Sidings).
This sheet shows the operation of an electric switch lock in the single track area. The circuits as shown are so arranged that the removal of the padlock or opening of the door will not result in putting an established signal to stop with train approaching. This feature is obtained by making an initial check that steady energy is present on the track circuits before permitting the switch repeater relay to become de-energized.

Operation of the unlocking lever to the unlocked position on the control machine positions traffic relays at both passing siding ends for movement toward the sidings and conditions the coding relays (42RCR and A2LCR) to transmit coded energy to the lock. First, consider the operation wherein permission is received to remove the padlock at the lock prior to positioning of the control lever on the machine. In this case, when the padlock is removed and

Sheet 6 - Continued.
steady energy is received at the lock location, the TER is energized; and after a time interval, the TEPSR relay is picked up, which releases the NWPSR. When the NWPSR is released, the B2LCR relay removes steady energy from track circuit B2LT, which causes relay A2LCR to transmit coded energy to the lock location. If the lock control lever on the machine is now operated to the unlock position, the 42RFSR relay will be operated to the normal position and relay 42RCR will also transmit coded energy to the lock location. When coded energy is received from both directions at the lock location, relay WLSR is energized and the timing cycle (TER and TEPSR) is again operated, after which the switch unlock is obtained.

Now consider the case in which the lock control lever is operated to the unlock position prior to removal of the padlock at the lock location. If this condition exists, then the B2LCR at the lock location transmits coded energy as a back contact coding section to the B2LT track circuit. Receipt of this coded energy by the A2LTR is decoded which picks up the 2LHR. A back contact of the 2LHR releases the 2LFHPR, which positions the A2LCR to apply steady energy toward the lock location. This steady energy condition exists until the time relay 2LFHTER closes its time contact which picks up the 2LFHPR and removes steady energy from the track circuit. If during this steady energy period the padlock is removed at the lock location, then the operation of the circuits is as previously described. If the padlock is not removed during this steady energy period, then receipt of steady energy by 42RTR will remove the coded energy from the track and conditions the 42RTR to receive the coded energy from the A2LCR which occurs when the 2LFHPR is picked up. The receipt of coded energy by the 42RTR is decoded and picks up the 42RHR, which in turn releases the 42RFHPR (previously referred to on Sheet 1). Steady energy is then applied from that location in a similar manner to that described for the 2LFHPR. This reversal of ends of coding and steady energy continues until the padlock at the lock location is removed.

Sheet 7 (Cut-Sections and Coded Line Circuits).
This sheet shows the various types of cut-sections which are required when the block length exceeds the operable length of the track circuits.

This sheet also shows a method of providing a coded line by-pass for those areas where conventional track circuits are used to provide highway crossing control.

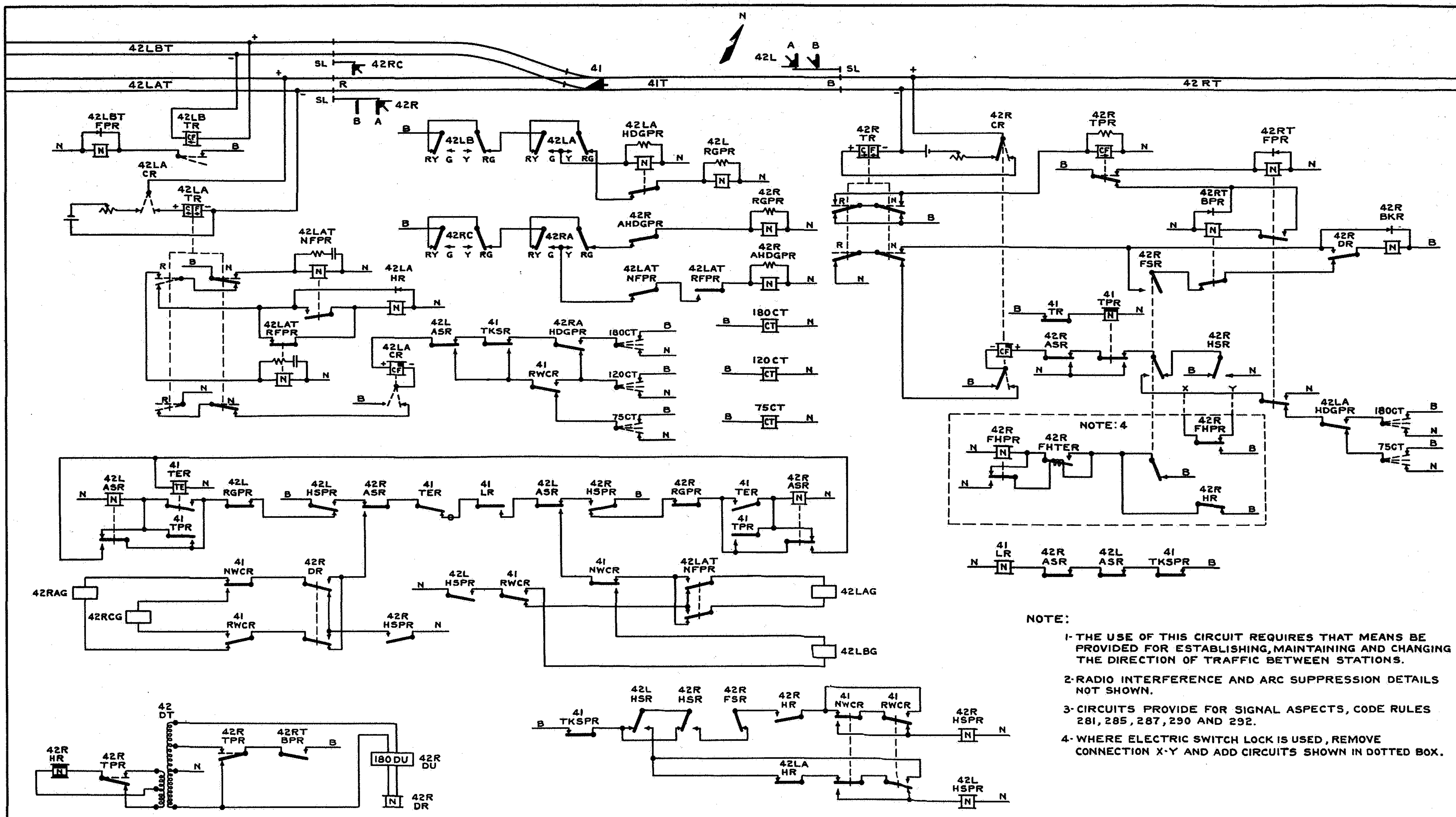
Sheet 8 (End-of-Siding Location).
This sheet shows the opposite end of the siding from Sheet 1 and is similar to it in all respects with the exception of the track circuit for the siding area. At this end of the track circuit, normal code is received and reverse code transmitted. Opposing signal control is obtained since the reverse code is removed when signal 2R is to be cleared; and, as stated on Sheet 1, nonreceipt of reverse code will cause signal 42LA to remain at Stop. It should be noted that signal 2R cannot be cleared or its approach locking relay de-energized unless A2RTR is receiving either 120 or 180 code. The clearing of signal 42LA at the opposite end changes the frequency of the normal code transmitted

Sheet 8 - Continued.
at that end from 120 to 75. The 75 code acts as a carrier channel for the proper polarity reverse code to retain the correct aspect at signal 42LA. Should signal 42LB be cleared, 120 code is applied to allow signal 2R to clear for movement to the other end of the siding.

Sheet 9 (End-of-Siding Location).
This sheet is the same as Sheet 2.

Sheet 10 (Electric Switch Lock Location Within Passing Siding Limits).
This sheet shows the control of an electric switch lock in the siding area where normally coded track circuits are used for signal control. The switch repeater relay is prevented from becoming de-energized by the removal of the padlock if either 120 or 180 normal code and reverse code are not both present on the track circuit, which prevents putting an established signal to stop with train approaching. Operation of the switch lock lever on the control machine, used for leaving moves, positions the WLSR so as to transmit 75 code instead of the reverse code in order to permit the unlock of the switch, since the reverse code is removed when the NWPSR relay is released. The circuit to provide this 75 code is shown as an alternate circuit in Note 5 on Sheet 8.

Sheets 11 and 12 (Control Machine Circuits).
These sheets show machine circuits which provide means for establishing, maintaining, and changing the direction of traffic between sidings as required by circuits shown on Sheets 1 through 10. Also shown on these sheets are machine circuits required in the operation of the electric switch locks in both the siding area and the single track area.



NOTE:

1- THE USE OF THIS CIRCUIT REQUIRES THAT MEANS BE PROVIDED FOR ESTABLISHING, MAINTAINING AND CHANGING THE DIRECTION OF TRAFFIC BETWEEN STATIONS.

2- RADIO INTERFERENCE AND ARC SUPPRESSION DETAILS NOT SHOWN.

3- CIRCUITS PROVIDE FOR SIGNAL ASPECTS, CODE RULES 281, 285, 287, 290 AND 292.

4- WHERE ELECTRIC SWITCH LOCK IS USED, REMOVE CONNECTION X-Y AND ADD CIRCUITS SHOWN IN DOTTED BOX.

TRAFFIC CONTROL CIRCUITS

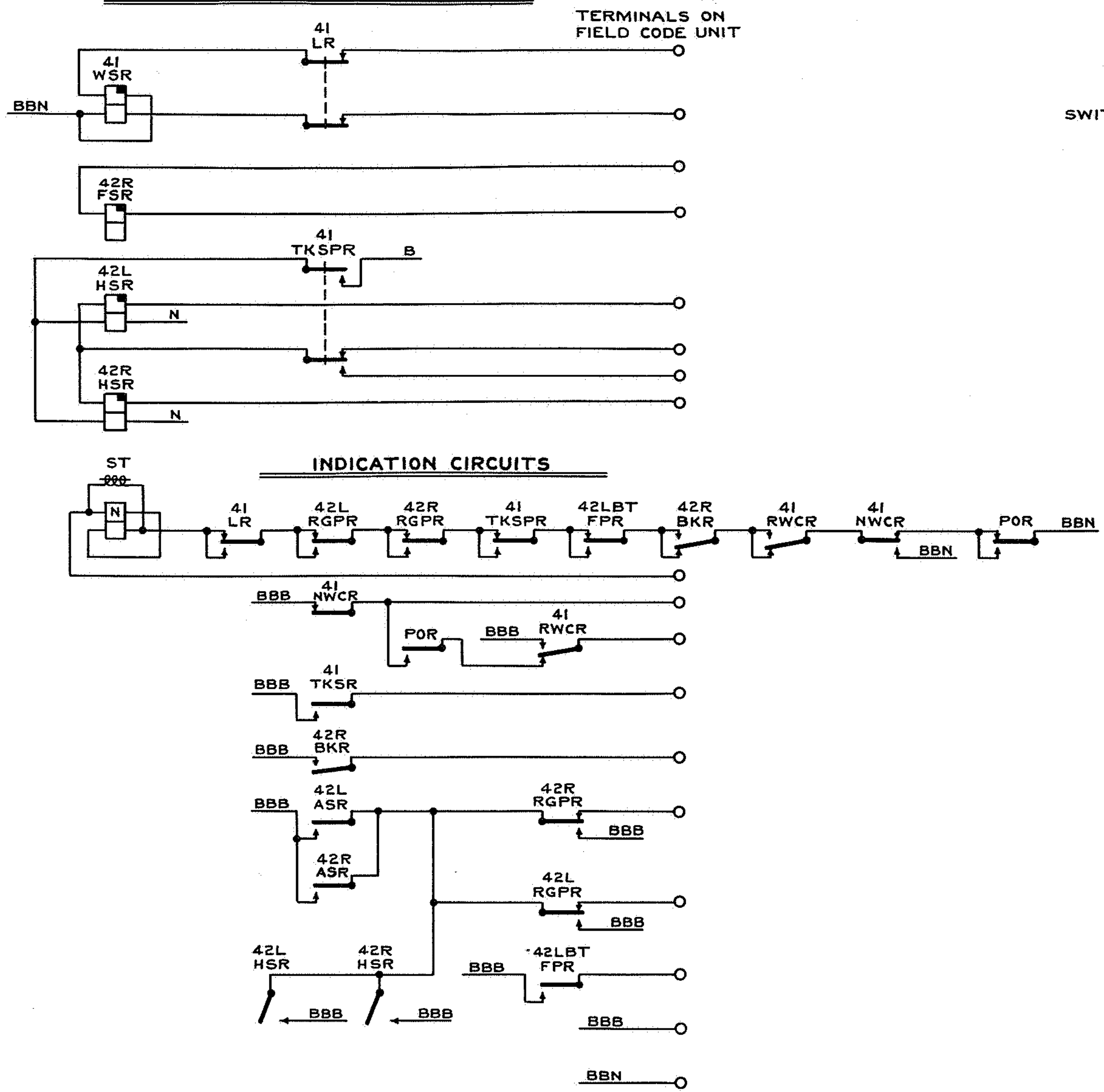
USING NORMAL STEADY ENERGY CODED TRACK (END OF SIDING LOCATION)

SEPT. 1953

AAR SIG. SEC. 8074A

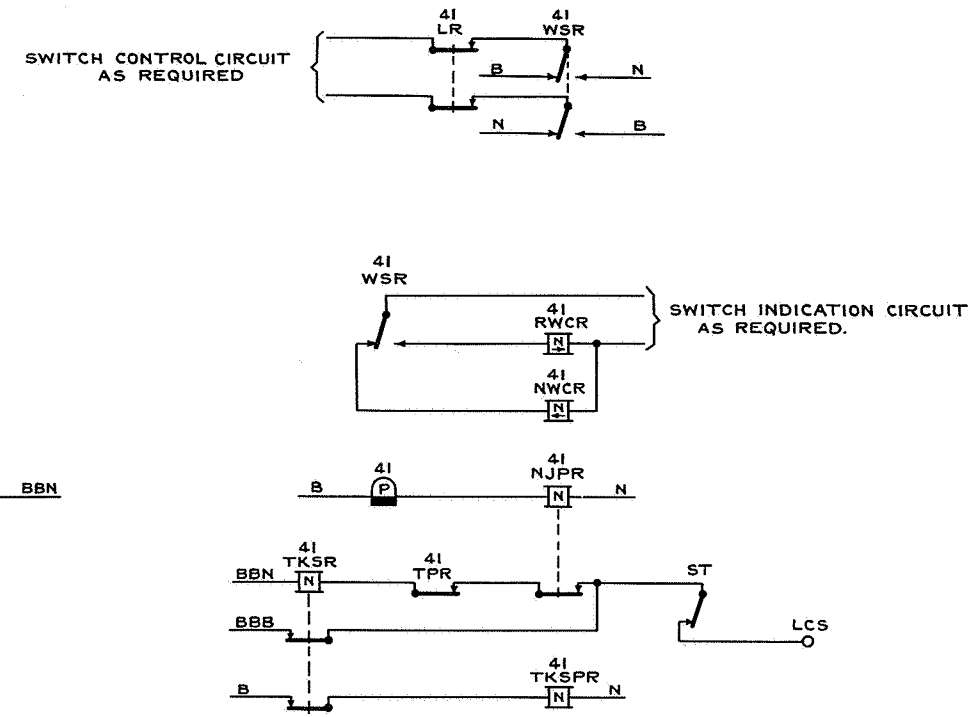
SHEET 1

FUNCTION CONTROL CIRCUIT



SWITCH CONTROL RELAY CIRCUIT

ELECTRIC MOVEMENT



NOTE : THESE CIRCUITS WILL VARY WITH THE TYPE OF CODE SYSTEM EMPLOYED.

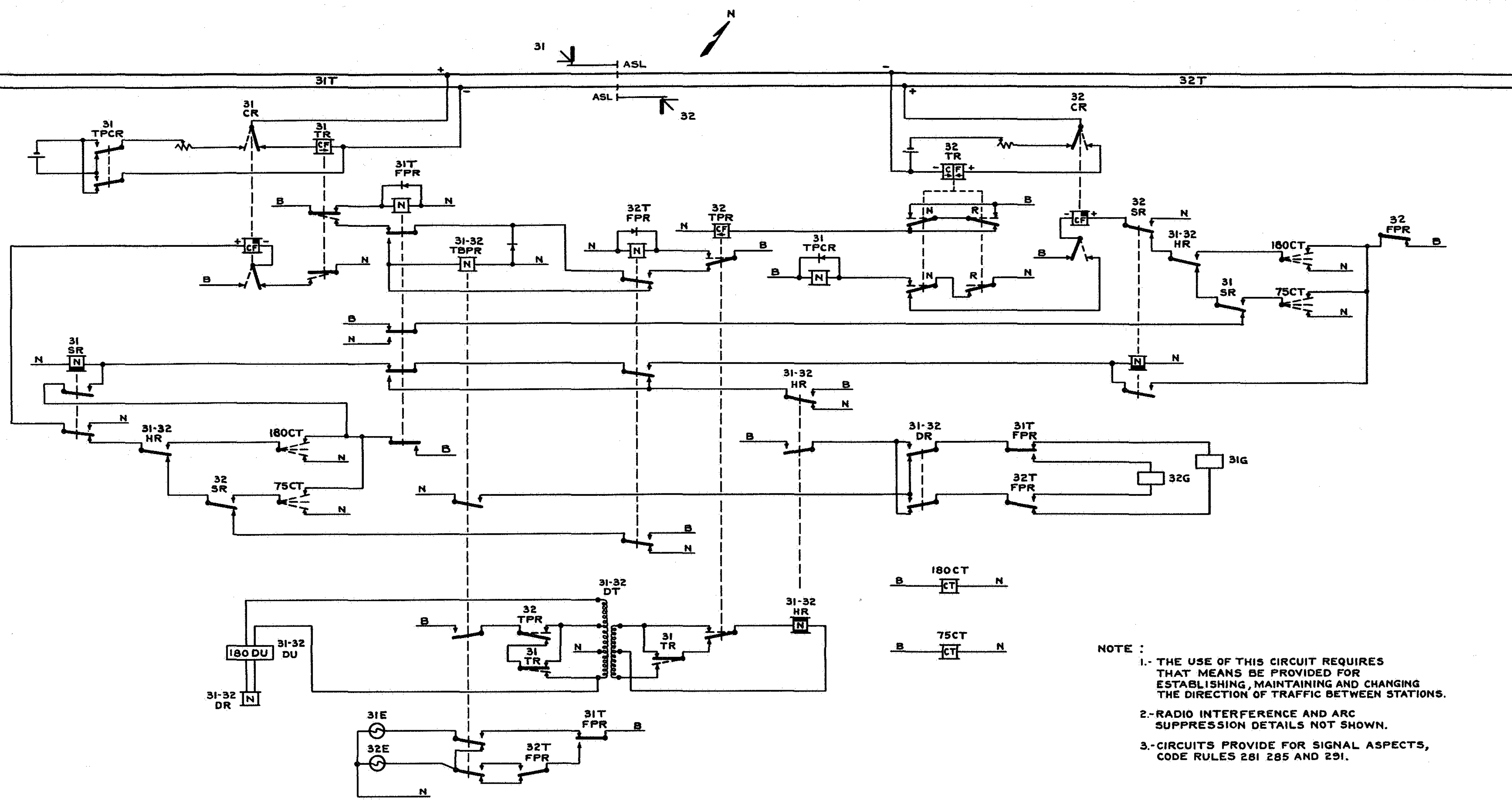
TRAFFIC CONTROL CIRCUITS

USING NORMAL STEADY ENERGY CODED TRACK (END OF SIDING LOCATION)

SEPT. 1953

AAR SIG. SEC. 8074A

SHEET 2



NOTE :

1.- THE USE OF THIS CIRCUIT REQUIRES THAT MEANS BE PROVIDED FOR ESTABLISHING, MAINTAINING AND CHANGING THE DIRECTION OF TRAFFIC BETWEEN STATIONS.

2.- RADIO INTERFERENCE AND ARC SUPPRESSION DETAILS NOT SHOWN.

3.- CIRCUITS PROVIDE FOR SIGNAL ASPECTS, CODE RULES 281 285 AND 291.

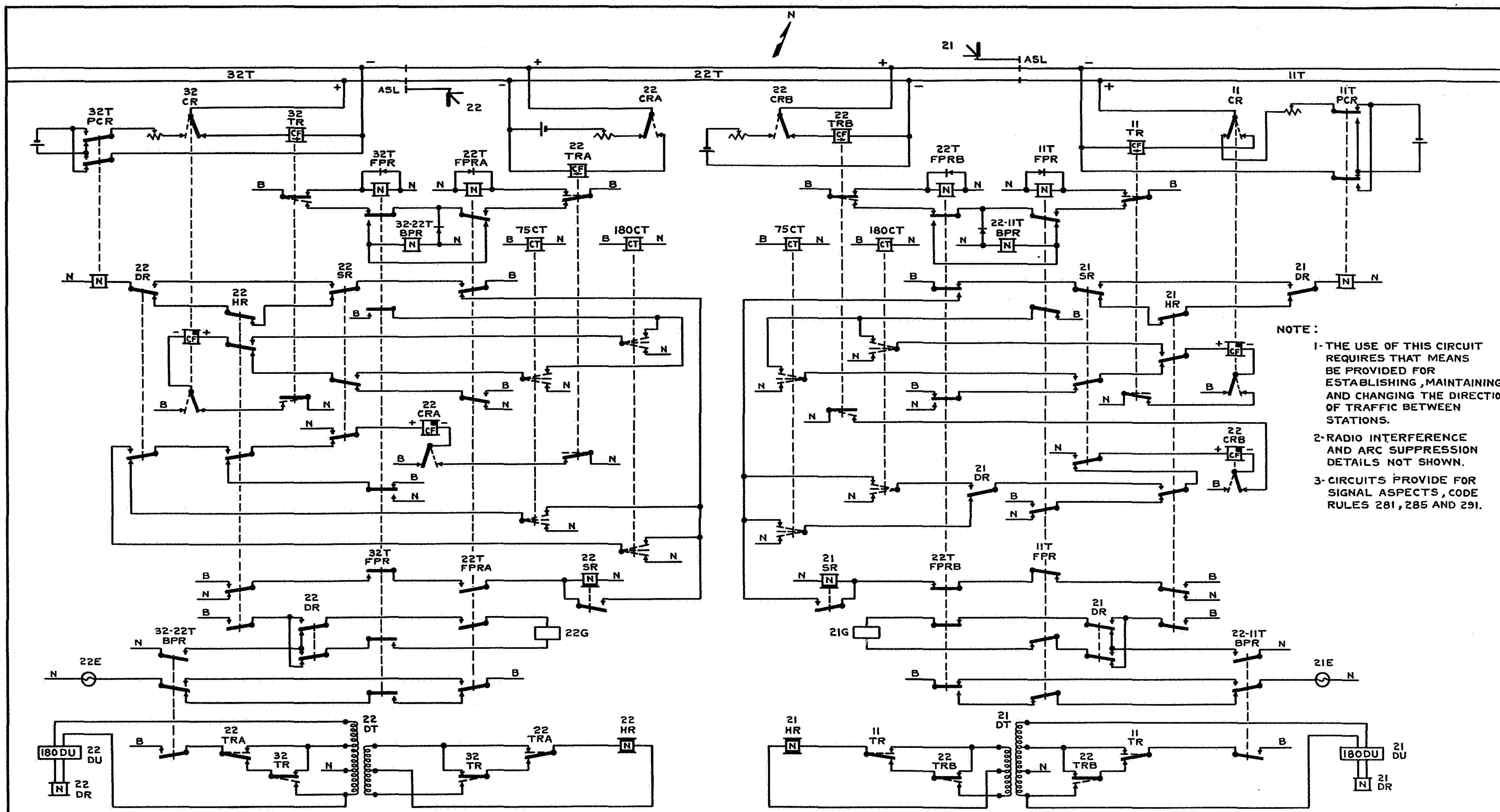
TRAFFIC CONTROL CIRCUITS

USING NORMAL STEADY ENERGY CODED TRACK (INTERMEDIATE SIGNALS OPPOSITE)

SEPT. 1953

AAR SIG. SEC. 8074A

SHEET 3



NOTE:

1- THE USE OF THIS CIRCUIT REQUIRES THAT MEANS BE PROVIDED FOR ESTABLISHING, MAINTAINING AND CHANGING THE DIRECTION OF TRAFFIC BETWEEN STATIONS.

2- RADIO INTERFERENCE AND ARC SUPPRESSION DETAILS NOT SHOWN.

3- CIRCUITS PROVIDE FOR SIGNAL ASPECTS, CODE RULES 281, 285 AND 291.

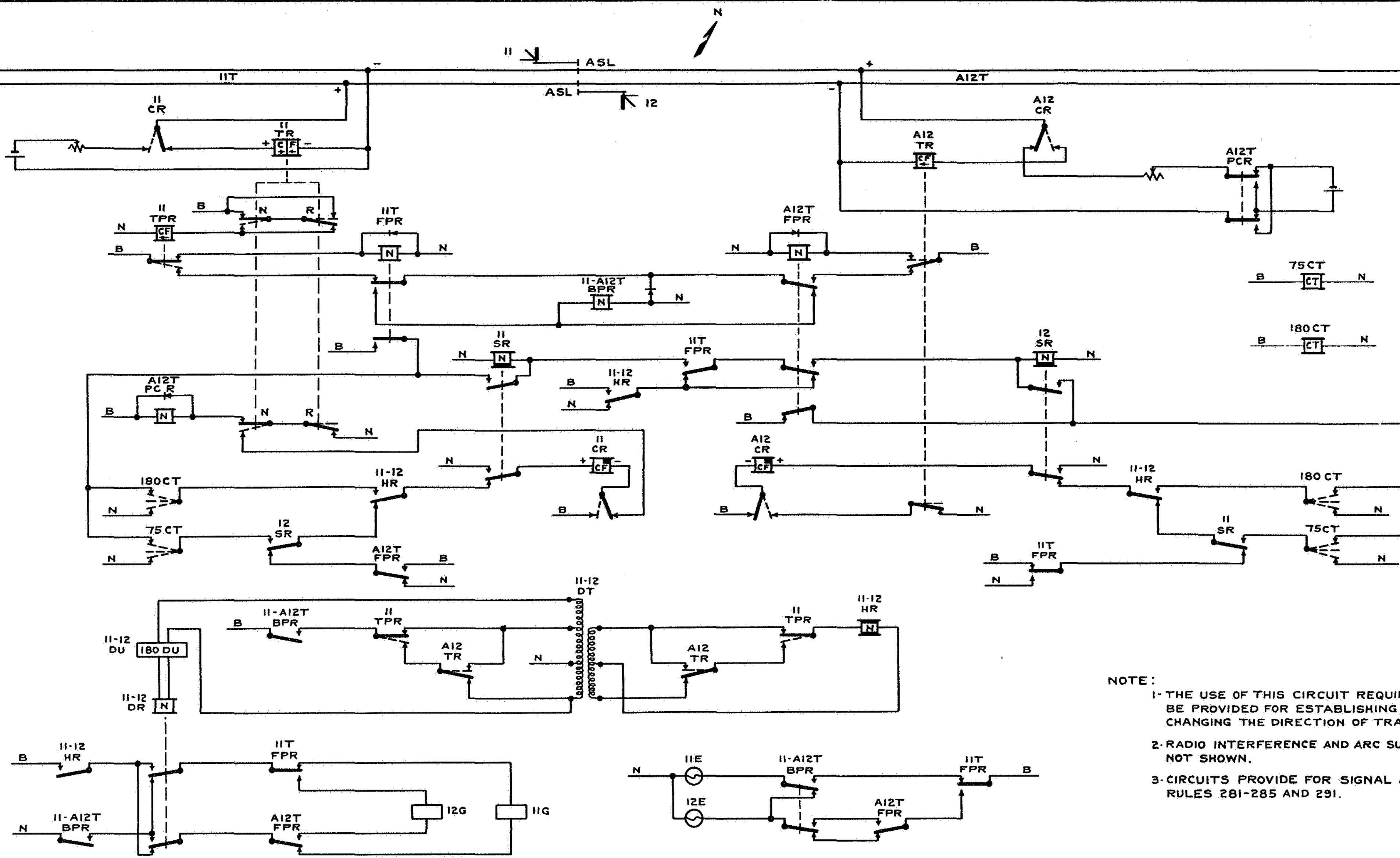
TRAFFIC CONTROL CIRCUITS

USING NORMAL STEADY ENERGY CODED TRACK (STAGGERED INTERMEDIATE SIGNAL LOCATION)

OCT. 1954

AAR SIG. SEC. 8074A

SHEET 4



NOTE:

1- THE USE OF THIS CIRCUIT REQUIRES THAT MEANS BE PROVIDED FOR ESTABLISHING, MAINTAINING AND CHANGING THE DIRECTION OF TRAFFIC BETWEEN STATIONS.

2- RADIO INTERFERENCE AND ARC SUPPRESSION DETAILS NOT SHOWN.

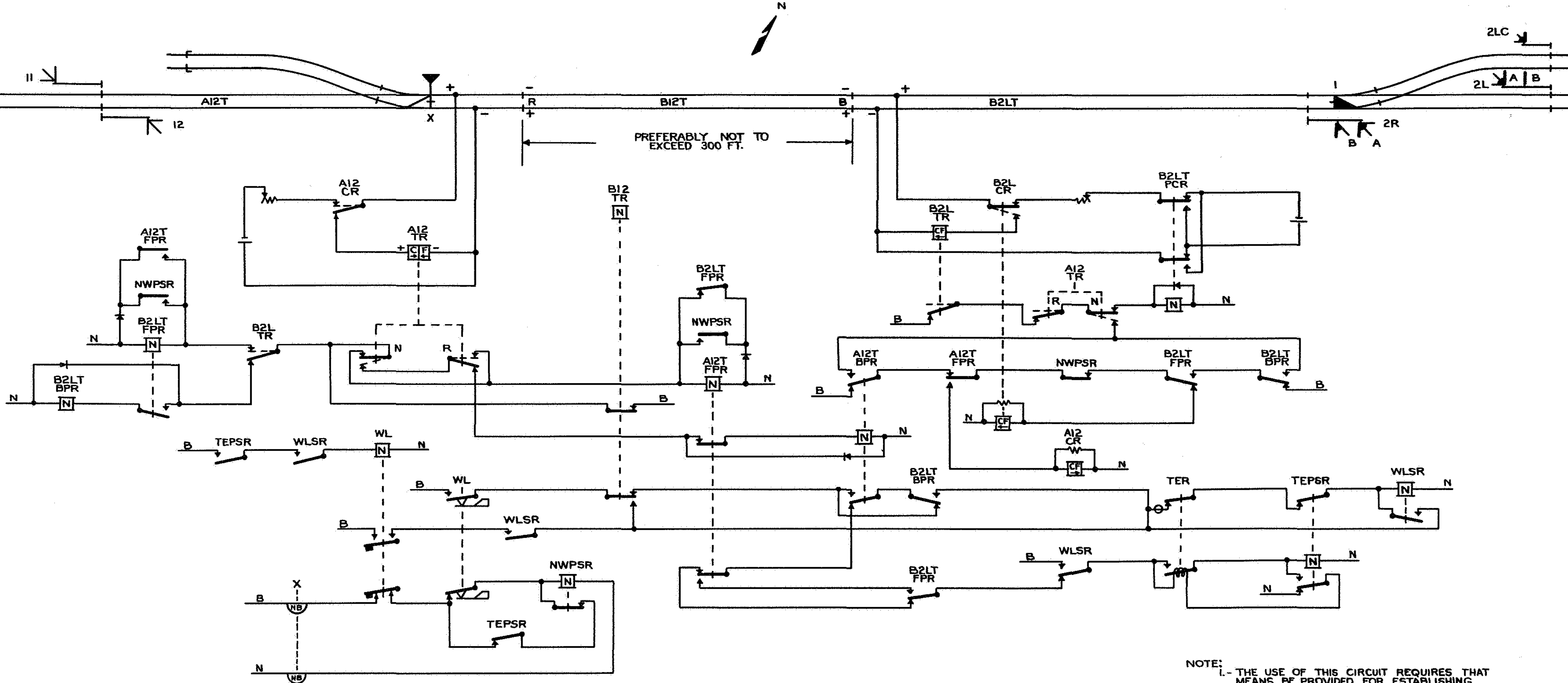
3- CIRCUITS PROVIDE FOR SIGNAL ASPECTS, CODE RULES 281-285 AND 291.

TRAFFIC CONTROL CIRCUITS

USING NORMAL STEADY ENERGY CODED TRACK (INTERMEDIATE SIGNALS OPPOSITE)

OCT. 1954

AAR SIG. SEC. 8074A



NOTE:
1.- THE USE OF THIS CIRCUIT REQUIRES THAT MEANS BE PROVIDED FOR ESTABLISHING, MAINTAINING AND CHANGING THE DIRECTION OF TRAFFIC BETWEEN STATIONS.

2.- RADIO INTERFERENCE AND ARC SUPPRESSION DETAILS NOT SHOWN.

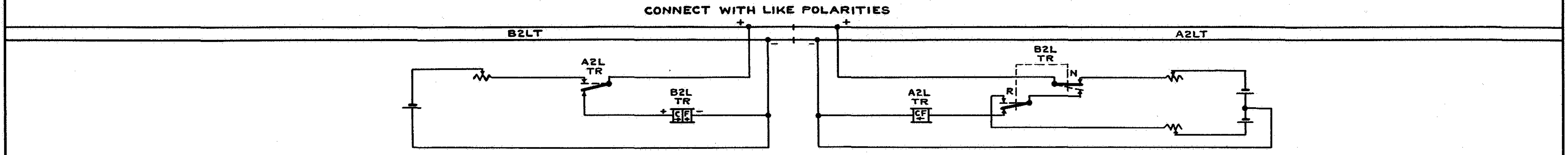
TRAFFIC CONTROL CIRCUITS

USING NORMAL STEADY ENERGY CODED TRACK

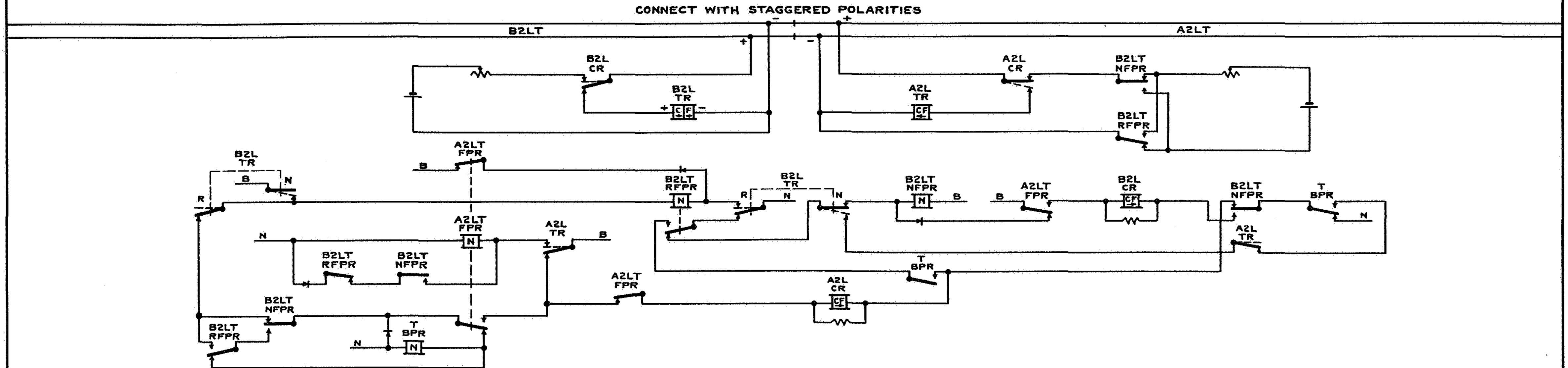
(ELECTRIC SWITCH LOCK LOCATION BETWEEN PASSING SIDINGS)

OCT. 1954

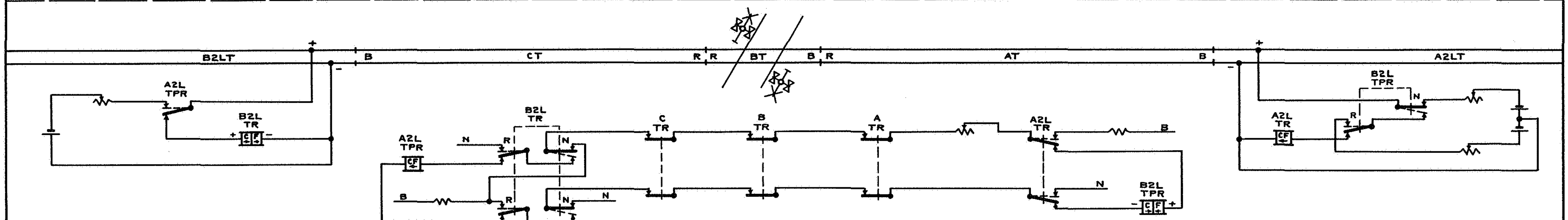
AAR SIG. SEC. 8074A



FRONT CONTACT CODING CUT SECTION – TRACK CIRCUITS POLARIZED IN ONE DIRECTION



BACK CONTACT CODING CUT SECTION-TRACK CIRCUITS POLARIZED IN ONE DIRECTION



CODED LINE CIRCUIT BY-PASSING NON-CODED TRACK CIRCUIT

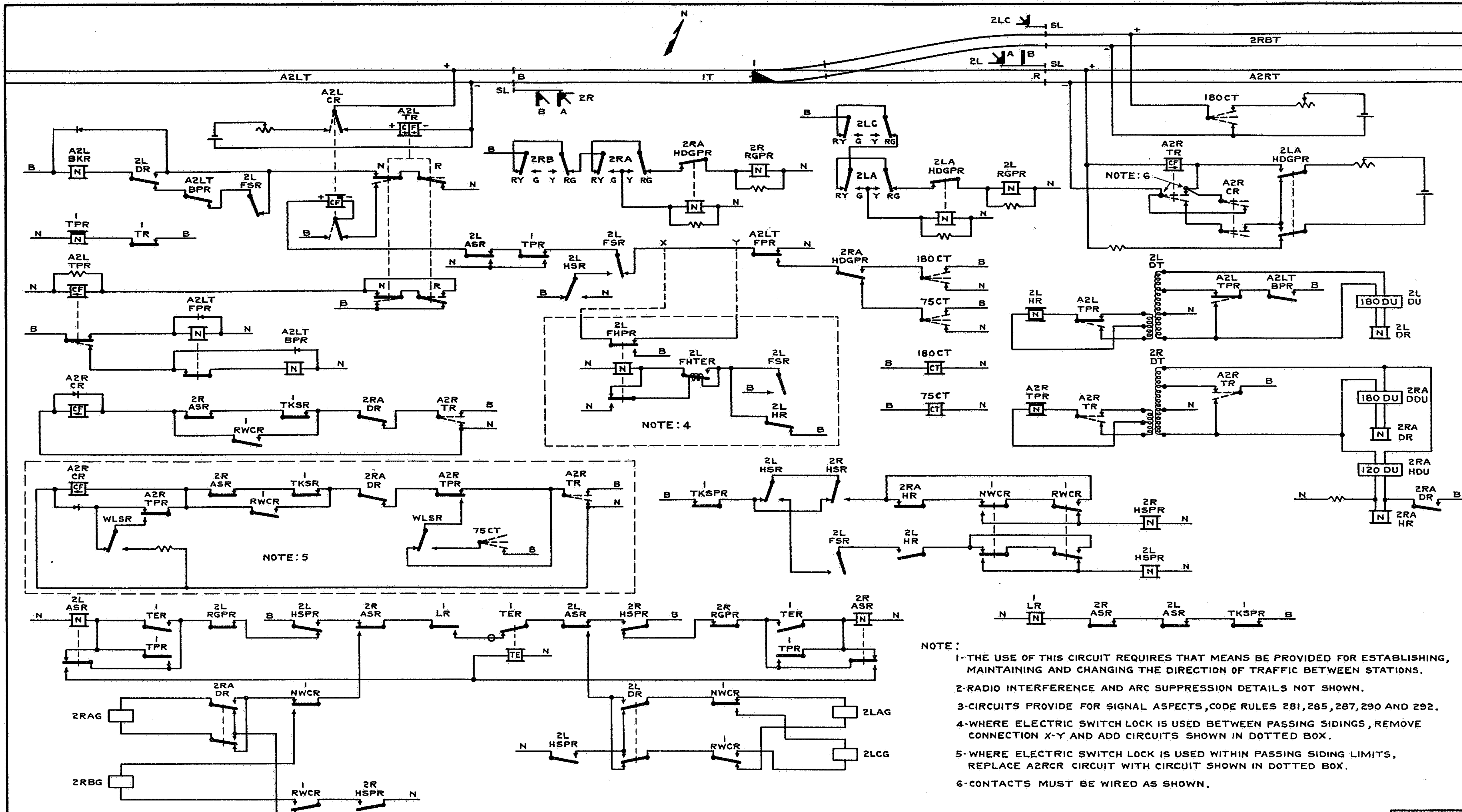
NOTE:
RADIO INTERFERENCE AND ARC SUPPRESSION DETAILS NOT SHOWN.

TRAFFIC CONTROL CIRCUITS

USING NORMAL STEADY ENERGY CODED TRACK
(CUT SECTIONS AND CODED LINE CIRCUITS)

AAR SIG. SEC. 8074A

OCT. 1954



NOTE:

1- THE USE OF THIS CIRCUIT REQUIRES THAT MEANS BE PROVIDED FOR ESTABLISHING, MAINTAINING AND CHANGING THE DIRECTION OF TRAFFIC BETWEEN STATIONS.

2- RADIO INTERFERENCE AND ARC SUPPRESSION DETAILS NOT SHOWN.

3- CIRCUITS PROVIDE FOR SIGNAL ASPECTS, CODE RULES 281, 285, 287, 290 AND 292.

4- WHERE ELECTRIC SWITCH LOCK IS USED BETWEEN PASSING SIDINGS, REMOVE CONNECTION X-Y AND ADD CIRCUITS SHOWN IN DOTTED BOX.

5- WHERE ELECTRIC SWITCH LOCK IS USED WITHIN PASSING SIDING LIMITS, REPLACE A2RCR CIRCUIT WITH CIRCUIT SHOWN IN DOTTED BOX.

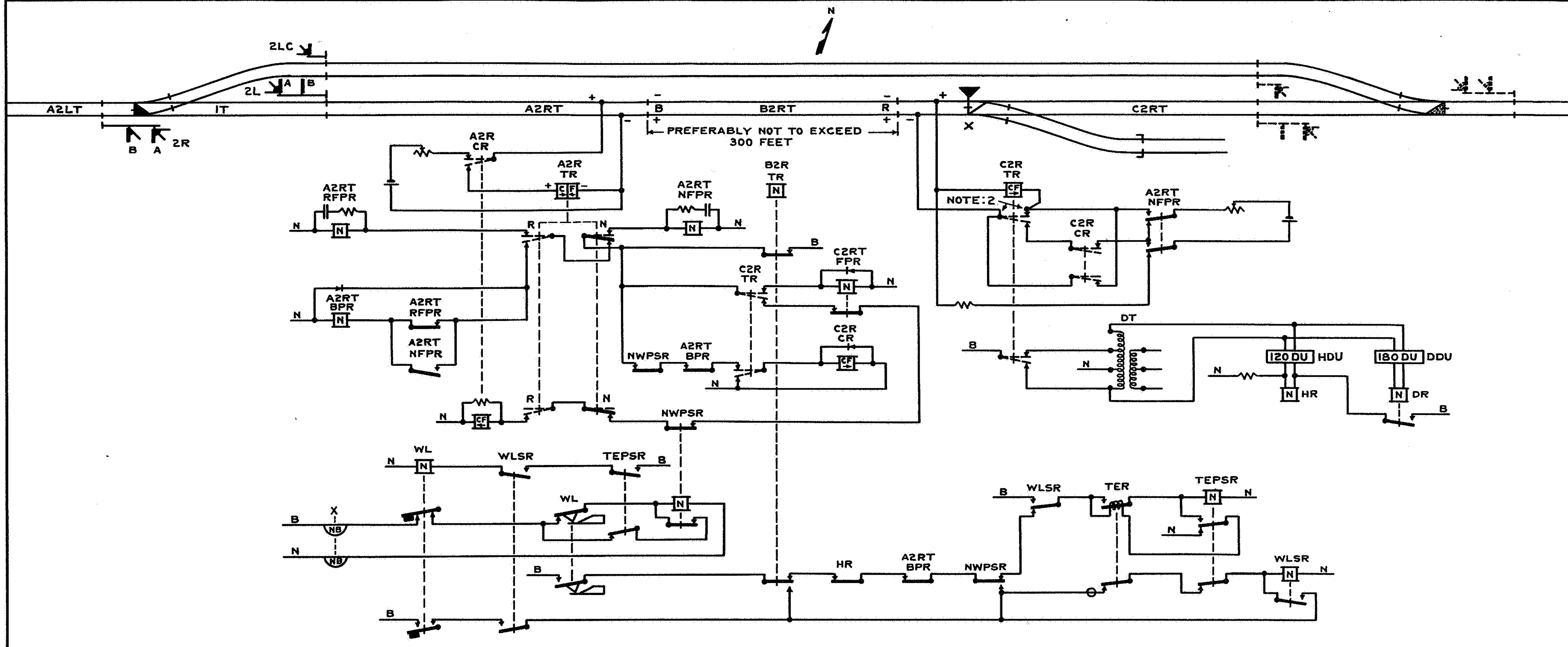
6- CONTACTS MUST BE WIRED AS SHOWN.

TRAFFIC CONTROL CIRCUITS

USING NORMAL STEADY ENERGY CODED TRACK (END OF SIDING LOCATION)

OCT. 1954

AAR SIG. SEC. 8074A



NOTE:

1- RADIO INTERFERENCE AND ARC SUPPRESSION DETAILS NOT SHOWN.

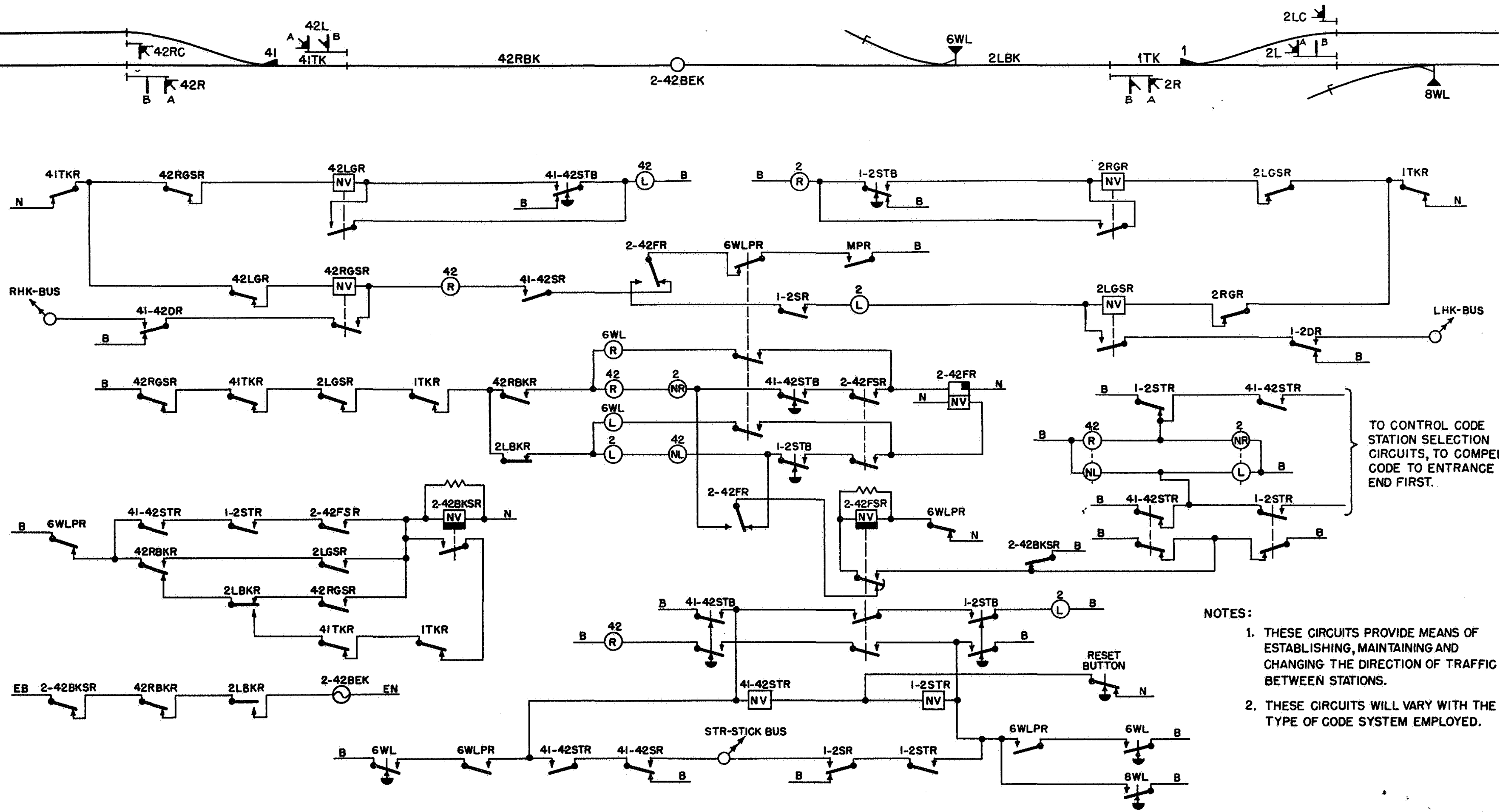
2- CONTACTS MUST BE WIRED AS SHOWN.

TRAFFIC CONTROL CIRCUITS

USING NORMAL STEADY ENERGY CODED TRACK (ELECTRIC SWITCH LOCK LOCATION WITHIN PASSING SIDING LIMITS)

OCT. 1954

AAR
SIG. SEC.
8074A



NOTES:

1. THESE CIRCUITS PROVIDE MEANS OF ESTABLISHING, MAINTAINING AND CHANGING THE DIRECTION OF TRAFFIC BETWEEN STATIONS.
2. THESE CIRCUITS WILL VARY WITH THE TYPE OF CODE SYSTEM EMPLOYED.

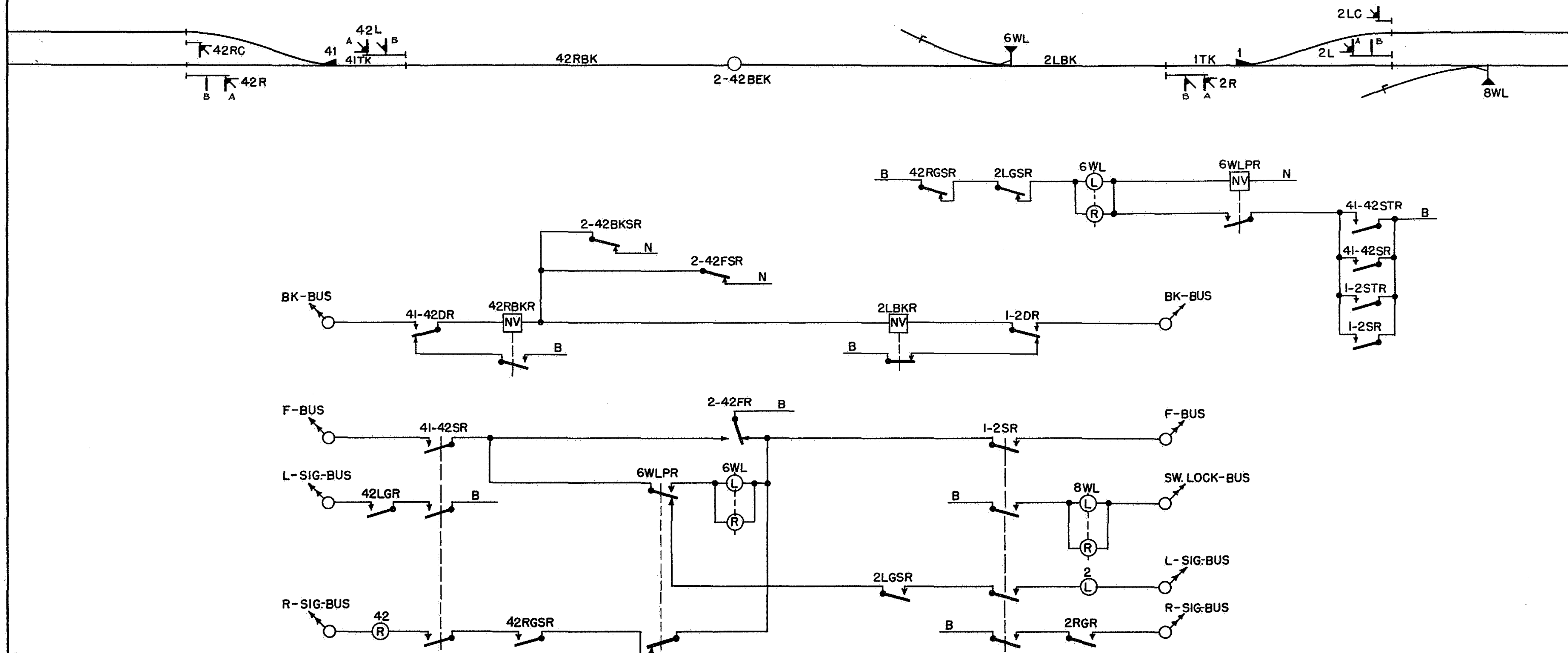
TRAFFIC CONTROL CIRCUITS

USING NORMAL STEADY ENERGY CODED TRACK (CONTROL MACHINE CIRCUITS)

SEPT. 1956

AAR SIG. SEC. 8074A

SHEET 11



TRAFFIC CONTROL CIRCUITS

USING NORMAL STEADY ENERGY CODED TRACK (CONTROL MACHINE CIRCUITS)

SEPT. 1956

AAR SIG. SEC. 8074A

SHEET 12

WAYSIDE TRAIN STOP CIRCUITS--USING INTERMITTENT INDUCTIVE SYSTEM.

An intermittent inductive train stop system employs inductors placed in advance of all signals so placed that they will cause the engine equipment to respond.

Sheets 1 and 2 show typical circuits for the inductors used with this system. These circuits show the inductor circuits closed for a proceed indication on the signal, whereas a restrictive signal will cause the inductor circuit to be open and an engineman passing a restrictive signal must acknowledge this restrictive signal by forestalling or receive an automatic brake application.

FIG. 1

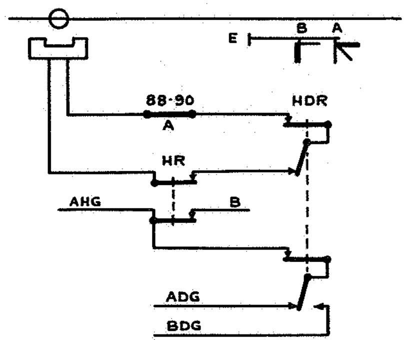


FIG. 2

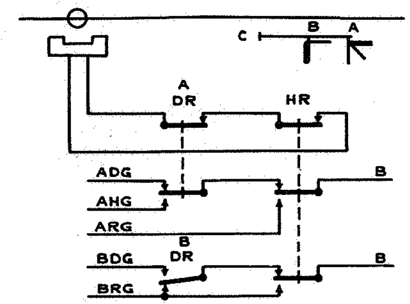


FIG. 3

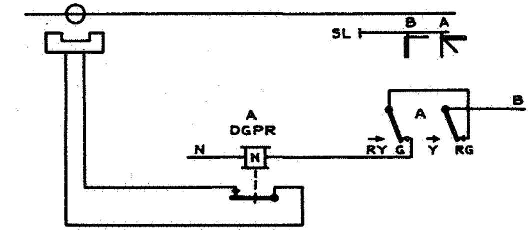


FIG. 1 FIG. 2 & FIG. 3 = INDUCTOR CIRCUT FOR CODE RULE 281 FIG. B. SIGNAL ALSO DISPLAYS CODE RULES 282 FIG. B, 285 FIG. B, 291 FIG. A

FIG. 4

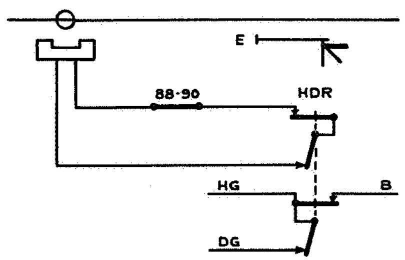


FIG. 5

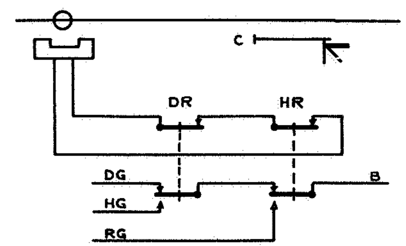


FIG. 6

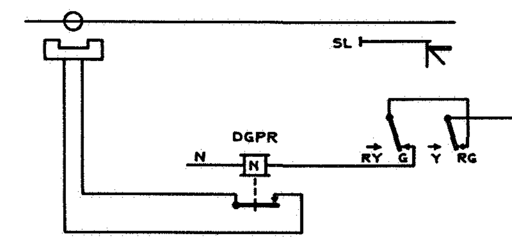


FIG. 4 FIG. 5 & FIG. 6 = INDUCTOR CIRCUIT FOR CODE RULE 281 FIG. C. SIGNAL ALSO DISPLAYS CODE RULES 285 FIG. C, 291 FIG. B

FIG. 7

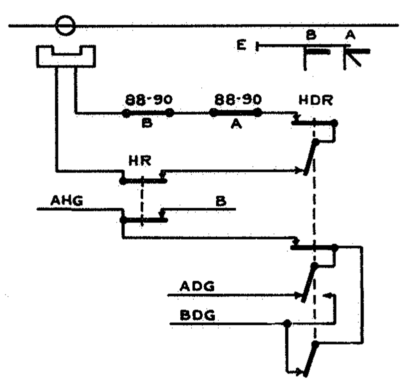


FIG. 8

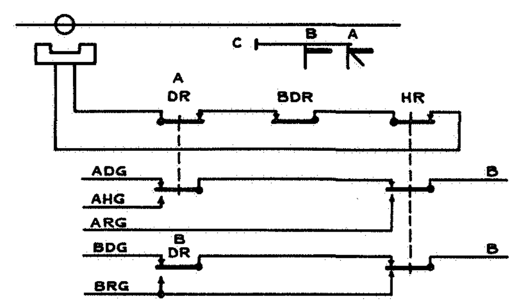


FIG. 9

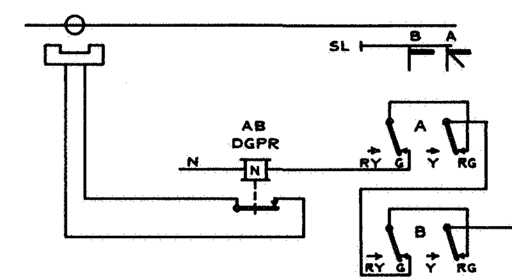


FIG. 7 FIG. 8 & FIG. 9 = INDUCTOR CIRCUIT FOR CODE RULE 281 FIG. E. SIGNAL ALSO DISPLAYS CODE RULES 282 FIG. B, 285 FIG. B, 291 FIG. A

WAYSIDE TRAIN STOP CIRCUITS

USING INTERMITTENT INDUCTIVE SYSTEM

SEPT. 1953

AAR SIG. SEC. 8075A

SHEET 1

FIG. 1

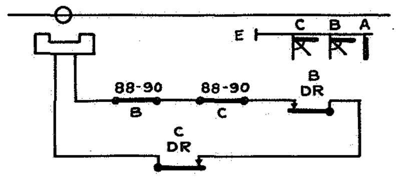


FIG. 2

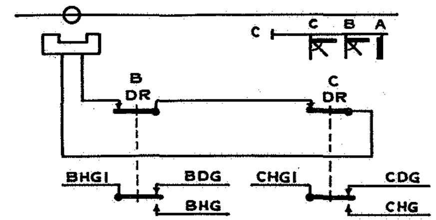


FIG. 3

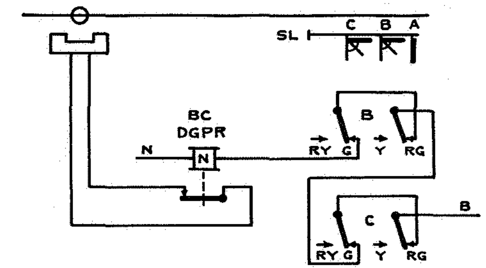


FIG. 1 FIG. 2 & FIG. 3 = INDUCTOR CIRCUIT FOR CODE RULE 281C. SIGNAL ALSO DISPLAYS CODE RULES 286, 290 FIG. A, 292 FIG. A

FIG. 4

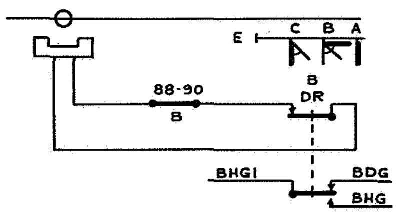


FIG. 5

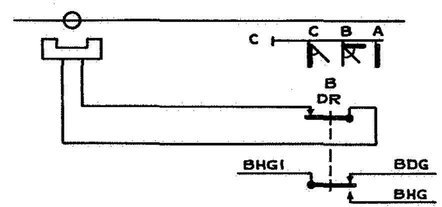


FIG. 6

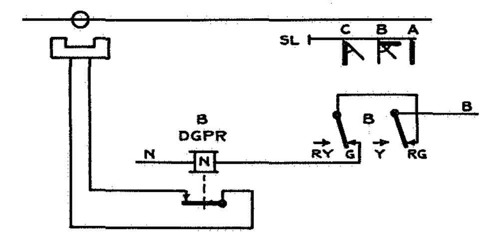


FIG. 4 FIG. 5 & FIG. 6 = INDUCTOR CIRCUIT FOR CODE RULE 283 FIG. A. SIGNAL ALSO DISPLAYS CODE RULES 286, 290 FIG. A, 292 FIG. A

FIG. 7

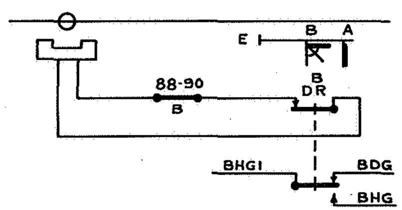


FIG. 8

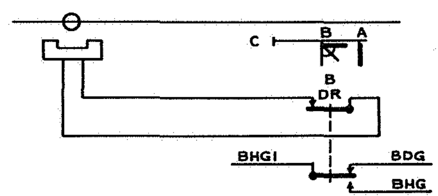


FIG. 9

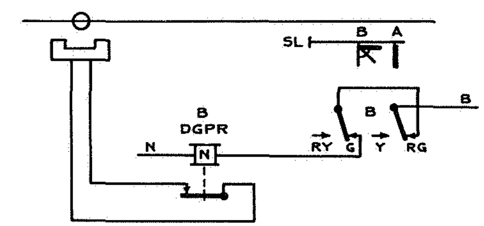


FIG. 7 FIG. 8 & FIG. 9 = INDUCTOR CIRCUIT FOR CODE RULE 283 FIG. B. SIGNAL ALSO DISPLAYS CODE RULES 290 FIG. B, 292 FIG. B

FIG. 10

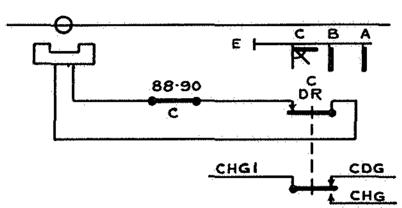


FIG. 11

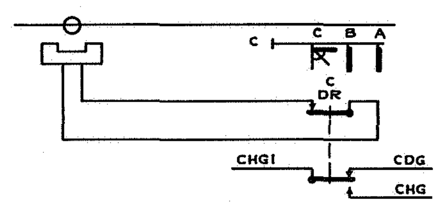


FIG. 12

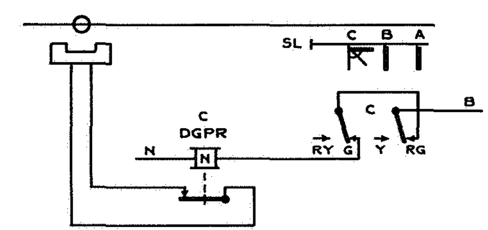


FIG. 10 FIG. 11 & FIG. 12 = INDUCTOR CIRCUIT FOR CODE RULE 287 FIG. A. SIGNAL ALSO DISPLAYS CODE RULES 290 FIG. A, 292 FIG. A

WAYSIDE TRAIN STOP CIRCUITS

USING INTERMITTENT INDUCTIVE SYSTEM

SEPT. 1953 | AAR SIG. SEC. 8075A

ELECTRIC SWITCH LOCK CIRCUITS FOR CROSSOVER--TIME AND APPROACH LOCKING WITH AUTOMATIC CONTROL AND RELEASING TRACK SECTIONS--TRACKS SIGNALED IN BOTH DIRECTIONS.

This plan provides automatic circuits in lieu of lever controlled circuits for releasing electric switch locks at an outlying crossover between main tracks signaled for traffic in both directions.

Pedestal type electric switch locks are contemplated with door-operated contacts or equivalent, for initiating circuits. Switch circuit controllers check position of the switch points.

Time and approach locking are provided and in addition short releasing sections are used in the track immediately in approach of the electric switch locks.

A train on either main track desiring to use the crossover will occupy the releasing section of the track and by opening the door of either electric switch lock will obtain immediate unlock of the electric switch locks, provided no train occupies or is approaching on, the other main track.

When the train is on the eastward main track occupying releasing section A24T, track relay A24TR will release closing a contact in circuit of electric switch locks WLA and WLB. Opening the door of either electric switch lock operates the door contacts releasing relay NWPR and closing a contact in circuit of timing relay TER, a front contact of which is in circuit of the electric switch locks. Relay NWPR when released closes a contact in circuit of timing relay TER and also transfers line controls of adjacent signals on both main tracks to the HPR relays causing the adjacent signals to display a Stop indication.

Assuming that no train occupies or is approaching on, the westward main track, relays 11HPR and 22HPR will pick up completing circuit for unlock of electric switch locks WLA and WLB. The unlock circuit is completed through door contact closed, relays A11TR picked up, A24TR released, 11HPR and 22HPR picked up.

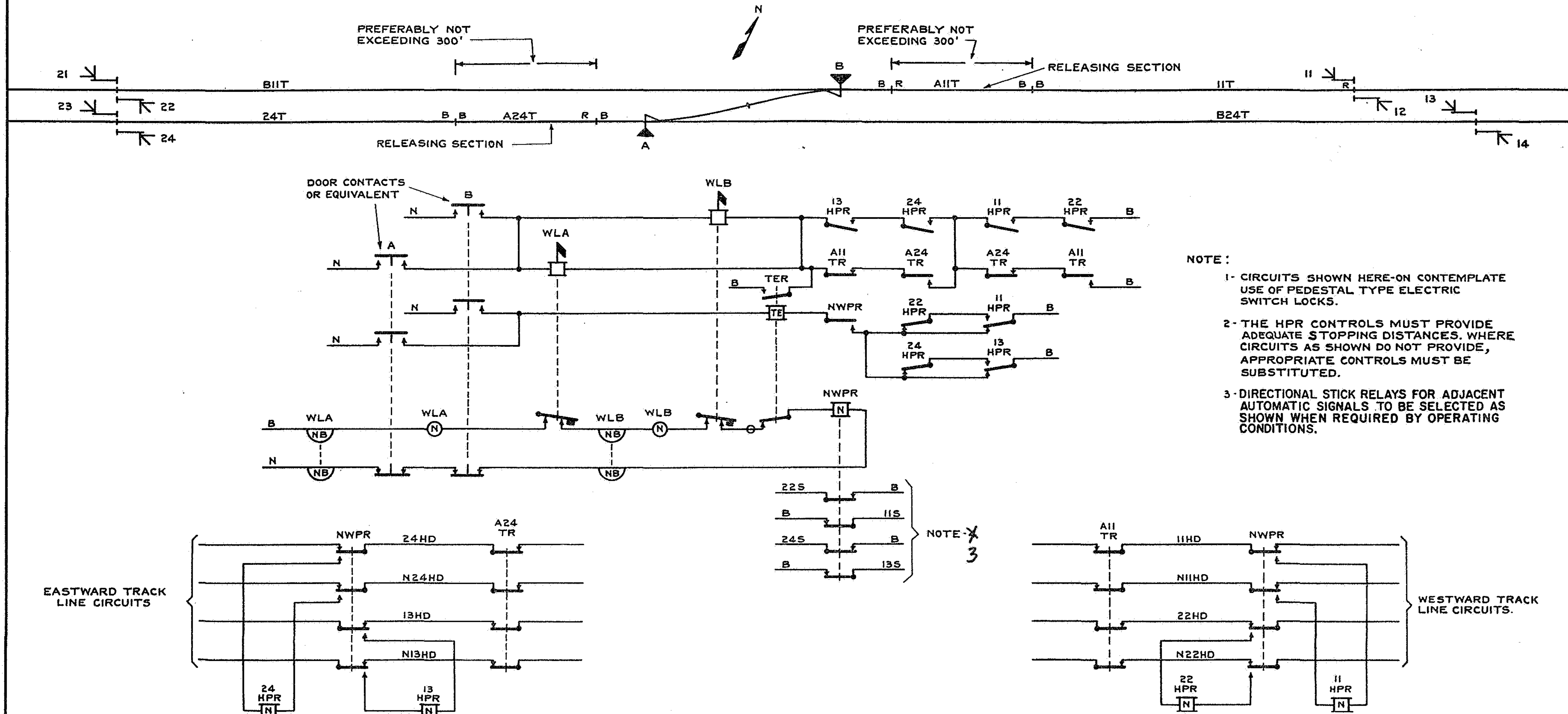
A train on the westward main track desiring to use the crossover will occupy releasing section A11T to release track relay A11TR. The procedure and circuit operation for unlock of the electric switch locks is similar to procedure and circuit operation to unlock for a train on the eastward main track desiring to use the crossover. In this case, assuming no train occupies or is approaching on the eastward main track, relays 13HPR and 24HPR will pick up completing circuit for unlock of the electric switch locks through door contact closed, relays 13HPR-24HPR-A24TR picked up and relay A11TR released.

In the event a train attempts to use the crossover with the opposite main track occupied, line controls of adjacent signals on the opposite main track will be opened and the HPR relays checking line controls of the signals, cannot pick up preventing immediate unlock of the electric switch locks. An unlock will be obtained, however, at expiration of the time interval.

The timing relay TER operates at any time the door of either electric switch lock is open and a train occupies either main track. When a train occupies either main track, one or more of the HPR relays cannot pick up and circuit of timing relay TER will be completed through a door contact closed, relay NWPR released, and one or more of the HPR relays released. At expiration of the time interval, contact of the timing relay TER closes applying energy to unlock the electric switch locks through door contact closed and contact TER picked up.

In the typical circuits shown, controls of the HPR relays are assumed to provide adequate stopping distances. When applying the typical circuits to working drawings, consideration must be given to provide controls for adequate stopping distances. The time interval must be adjusted to suit the stopping distances provided.

Provision is made in the circuits for selecting controls of directional stick relays located at adjacent signals as explained in Note 3.



NOTE:

1- CIRCUITS SHOWN HERE-ON CONTEMPLATE USE OF PEDESTAL TYPE ELECTRIC SWITCH LOCKS.

2- THE HPR CONTROLS MUST PROVIDE ADEQUATE STOPPING DISTANCES. WHERE CIRCUITS AS SHOWN DO NOT PROVIDE, APPROPRIATE CONTROLS MUST BE SUBSTITUTED.

3- DIRECTIONAL STICK RELAYS FOR ADJACENT AUTOMATIC SIGNALS TO BE SELECTED AS SHOWN WHEN REQUIRED BY OPERATING CONDITIONS.

ELECTRIC SWITCH LOCK CIRCUITS FOR CROSSOVER

TIME AND APPROACH LOCKING WITH AUTOMATIC CONTROL AND RELEASING TRACK SECTIONS
TRACKS SIGNALED IN BOTH DIRECTIONS

JAN. 1961	SEPT. 1953	AAR SIG. SEC. 8076B

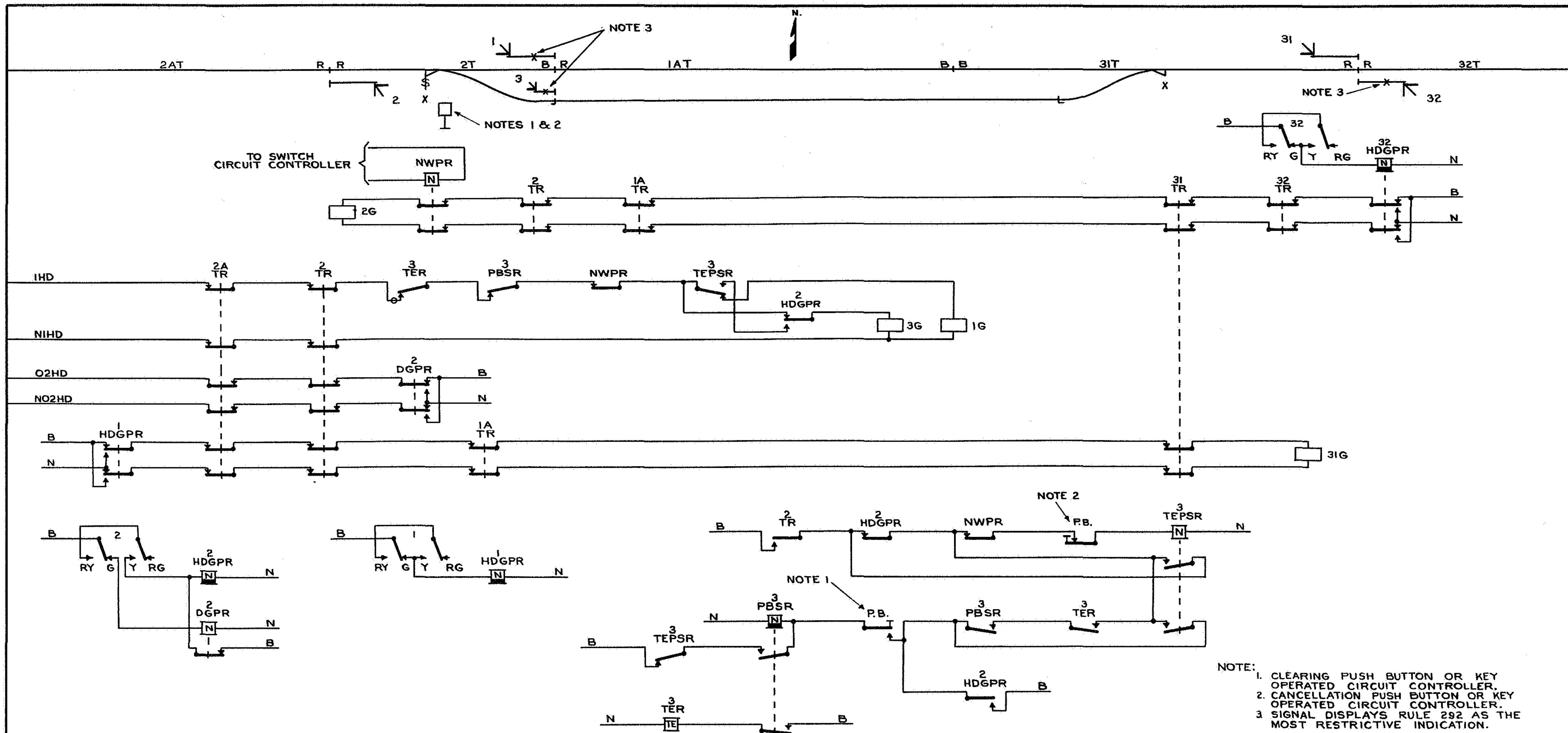
ADDENDUM TO AAR SIG. SEC. 8077A

CIRCUITS FOR SPRING SWITCH, TRACK SIGNALED IN BOTH DIRECTIONS WITH SIDING SIGNAL NORMALLY CLEAR.

These circuits provide for a spring switch installation at the end of a siding in single-track territory. The entering and leaving signals are staggered to provide fouling protection, and a dwarf signal governs movements from the siding to the main track. All signals are normally clear. Approach and time locking are provided.

These circuits presuppose that adequate stopping distance is provided between signals 31 and 1. A directional stick circuit is provided to allow dwarf signal 3 to display an indication permitting train to leave the siding after an eastward train has passed. The operation of the clearing push button or key-operated circuit controller restores signal 1 to Stop, thus permitting signal 3 to clear after a predetermined time interval, if a westward train is occupying approach circuit to signal 1. A cancellation push button or key-operated circuit controller permits signal 1 to be cleared if it is held at Stop by the directional stick relay. No time locking is provided when cancellation button is used to signal 3 at Stop to permit main line signal 1 to reclear.

If a facing point lock is used in connection with this installation, consideration should be given to permit signals 1 and 2 to clear in event of an overlock on the facing point lock.



NOTE:
1. CLEARING PUSH BUTTON OR KEY OPERATED CIRCUIT CONTROLLER.
2. CANCELLATION PUSH BUTTON OR KEY OPERATED CIRCUIT CONTROLLER.
3. SIGNAL DISPLAYS RULE 292 AS THE MOST RESTRICTIVE INDICATION.

CIRCUITS FOR SPRING SWITCH

TRACK SIGNALED IN BOTH DIRECTIONS WITH SIDING
SIGNAL NORMALLY CLEAR AND APPROACH LOCKING

OCT. 1954

AAR SIG. SEC. 8077A

CIRCUITS FOR CONTINUOUS TYPE SPEED CONTROL--TRACK SIGNALED IN ONE DIRECTION.

Arrangements of circuits provide for:

1. Two-indication, one-speed control--low speed limit, superimposed on d.c. neutral track circuits.
2. Two-indication, one-speed control--low speed limit, superimposed on d.c. coded track circuits.
3. Three-indication, two-speed control--low and medium speed limit, superimposed on d.c. coded track circuits.
4. Four-indication, two-speed control--low and medium speed limit, superimposed on d.c. coded track circuits.

All arrangements may be used with or without high speed limit. This high speed limit is not affected by roadway circuits or apparatus and is confined to the locomotive equipment and, where provided, causes an automatic brake application whenever the predetermined maximum speed limit is exceeded.

When conditions are such as to cause a more restrictive cab signal to be displayed, a warning whistle will sound when locomotive speed is above the limit imposed by the cab signal indication and is a warning to reduce speed. A manual brake suppresion must be initiated. The delay time between the sounding of the whistle and the application of the brakes must not exceed 8 seconds and is usually about 6 seconds. The change to a more restrictive cab signal indication must also be acknowledged by the operation of an acknowledging switch although some variation in this practice is used by some roads.

When speed of train is above the limit imposed by the cab signal indication, a failure of the engineman to suppress and (where required) to acknowledge the change in indication, will result in an automatic brake application causing the train to come to a stop.

After making proper suppression of the brakes and acknowledgment (where required), when speed has been reduced below the limit imposed by the cab signal indication and the timing valve pressure has been restored to normal as indicated by the pressure gage, the brakes may be released and train operated at or below speed imposed by the cab signal indication. If brakes are released before speed has been reduced to that permitted by the cab signal indication, another brake application will result.

Sheet 1.
Circuits shown on this sheet cover two-indication cab signals with one-speed control--low speed limit. With this system, when train movement is governed by clear roadway signals the cab signal will indicate G (Green) or H (High), permitting movement to be made at maximum authorized speed.

Sheet 1 - Continued.
In circuits shown at top of sheet, the engine equipment is responsive to a.c. energy and its presence in the rails results in a G or H cab signal being displayed. In territory where there is a possibility of foreign a.c. energy being present in the rails, it is desirable to use coded energy to protect against false energization from foreign currents. Where coded energy is used with the two-indication cab signal system the locomotive equipment is tuned to be responsive only to 180 coded a.c. energy. Some roads provide frequencies other than 60 cycles in order to obtain immunity from interference from commercial frequencies.

When train passes a roadway signal displaying clear indication, the G or H cab signal is displayed permitting movement to be made at maximum authorized speed. As the train passes a roadway signal displaying approach indication, the cab signal will change to R (Red) or L (Low). If train is moving at speed in excess of that imposed by the cab signal, a manual suppression of the brakes must be made and the change in cab signal acknowledged, (where required,) or an automatic application of the brakes will result.

In circuits shown at bottom of sheet, a train passing a roadway signal displaying clear indication will receive a G or H cab signal permitting train movement to be made at maximum authorized speed. In passing a roadway signal displaying approach indication, cab signal will change to R or L due to the absence of 180 coded a.c. energy. If train is moving at speed above the low speed limit, a manual suppression of the brakes must be made and the change in cab signal acknowledged (where required) to prevent an automatic application of the brakes. The R or L cab signal will be continued when train passes cut-section approaching stop roadway signal.

Sheet 2.
With the circuits shown at top of sheet, 180 coded a.c. energy causes a G or H cab signal to be displayed, 75 coded a.c. energy causes the Y (Yellow) or M(Medium) cab signal to be displayed and imposes the medium speed limit. The absence of code results in the R or L cab signal being displayed imposing the low speed limit.

Train passing a roadway signal displaying clear indication receives a G or H cab signal permitting movement to be made at maximum authorized speed. As train passes roadway signal displaying approach indication, the cab signal changes to Y or M. If speed of train is above the medium speed limit, a manual suppression of the brakes must be made and change in cab signal acknowledged (where required) to prevent an automatic brake application. On passing cut-section approaching roadway signal at stop, the cab signal changes to R or L. If speed of train is above the low speed limit, a manual suppression of the brakes must be made and change in cab signal acknowledged (where required) to prevent an automatic brake application.

With the circuits shown at bottom of the sheet, 180 coded a.c. energy causes a G or H cab signal to be displayed, 120 coded a.c. energy causes a Y/Y (Yellow over Yellow) or M cab signal to be displayed and imposes the medium speed limit, 75 coded a.c. energy causes a Y or L cab signal to be displayed and imposes the low speed limit and the absence of code results in the R or L cab signal, imposing the low speed limit.

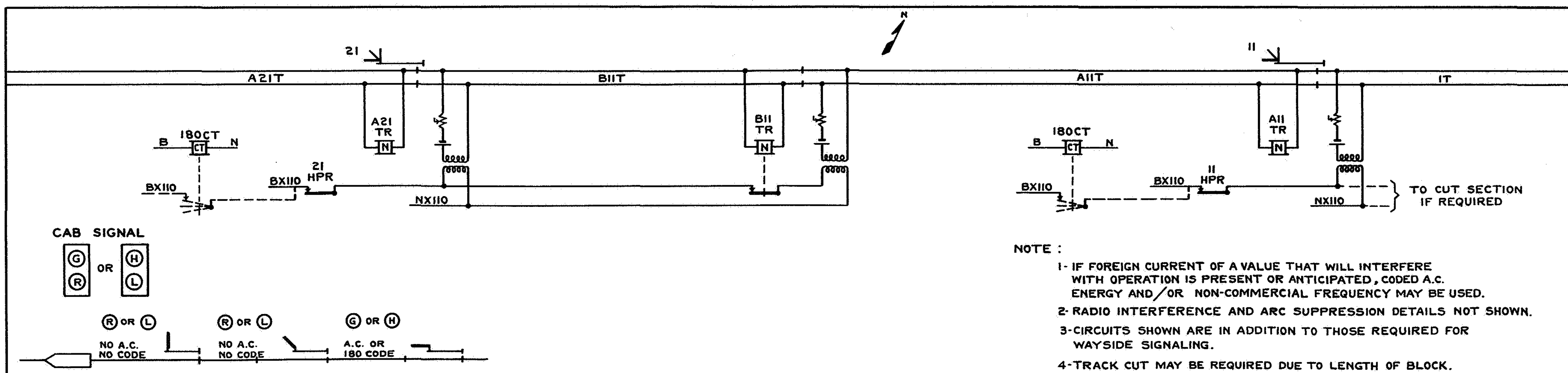
Sheet 2 - Continued.

Train passing a roadway signal displaying clear indication receives a G or H cab signal permitting movement to be made at maximum authorized speed. As train passes roadway signal displaying advance-approach indication, the cab signal changes to Y/Y or M. If speed of train is above the medium speed limit, a manual suppression of the brakes must be made and change in cab signal acknowledged (where required) to prevent an automatic brake application.

On passing a roadway signal displaying approach indication the cab signal changes to Y or L. If speed of train is above the low speed limit, a manual suppression of the brakes must be made and change in cab signal acknowledged (where required) or automatic brake application will result. This system provides a distinct indication when entering an occupied block, the absence of code causing the cab signal to change to R or L, imposing the low speed limit.

Where desirable, in order to conserve a.c. power, approach control may be provided and so arranged that a.c. energy will not be applied to a track circuit until train enters the track circuit involved.

Where a.c. energy is supplied by tuned reed alternators, they may be approach controlled and circuits so arranged that energy will not be supplied to the alternators until train enters the track circuit involved.



TWO INDICATION, ONE SPEED CONTROL - LOW SPEED LIMIT
SUPERIMPOSED ON D.C. NEUTRAL TRACK CIRCUITS.

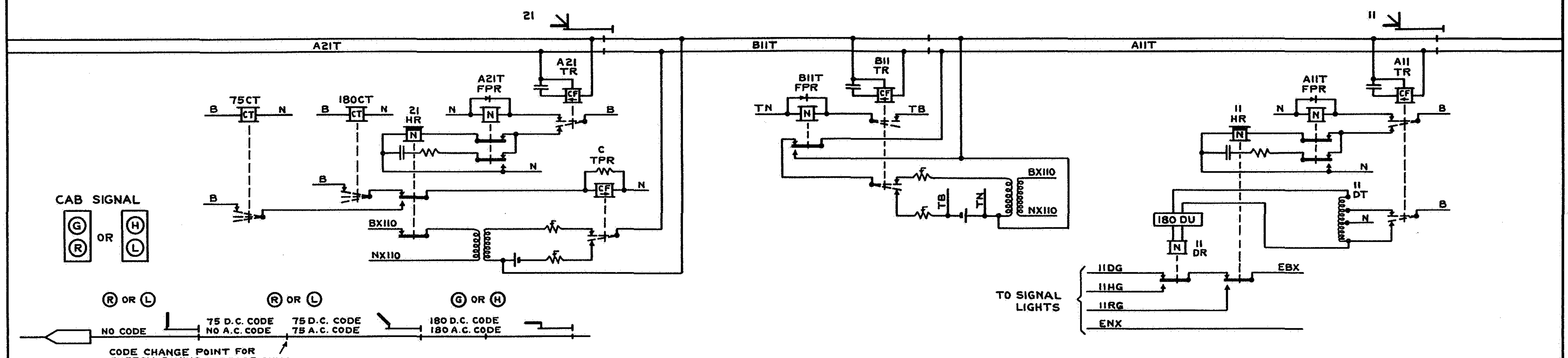
NOTE :

1- IF FOREIGN CURRENT OF A VALUE THAT WILL INTERFERE WITH OPERATION IS PRESENT OR ANTICIPATED, CODED A.C. ENERGY AND/OR NON-COMMERCIAL FREQUENCY MAY BE USED.

2- RADIO INTERFERENCE AND ARC SUPPRESSION DETAILS NOT SHOWN.

3- CIRCUITS SHOWN ARE IN ADDITION TO THOSE REQUIRED FOR WAYSIDE SIGNALING.

4- TRACK CUT MAY BE REQUIRED DUE TO LENGTH OF BLOCK.



TWO INDICATION, ONE SPEED CONTROL - LOW SPEED LIMIT
SUPERIMPOSED ON D.C. CODED TRACK CIRCUITS.

NOTE :

1- RADIO INTERFERENCE AND ARC SUPPRESSION DETAILS NOT SHOWN.

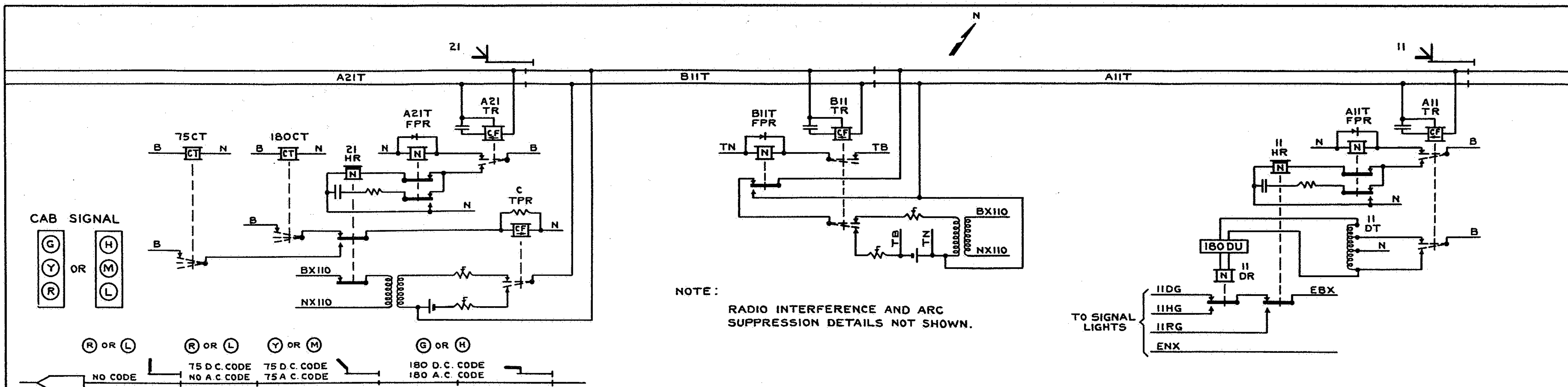
CIRCUITS FOR CONTINUOUS TYPE SPEED CONTROL

TRACK SIGNALED IN ONE DIRECTION

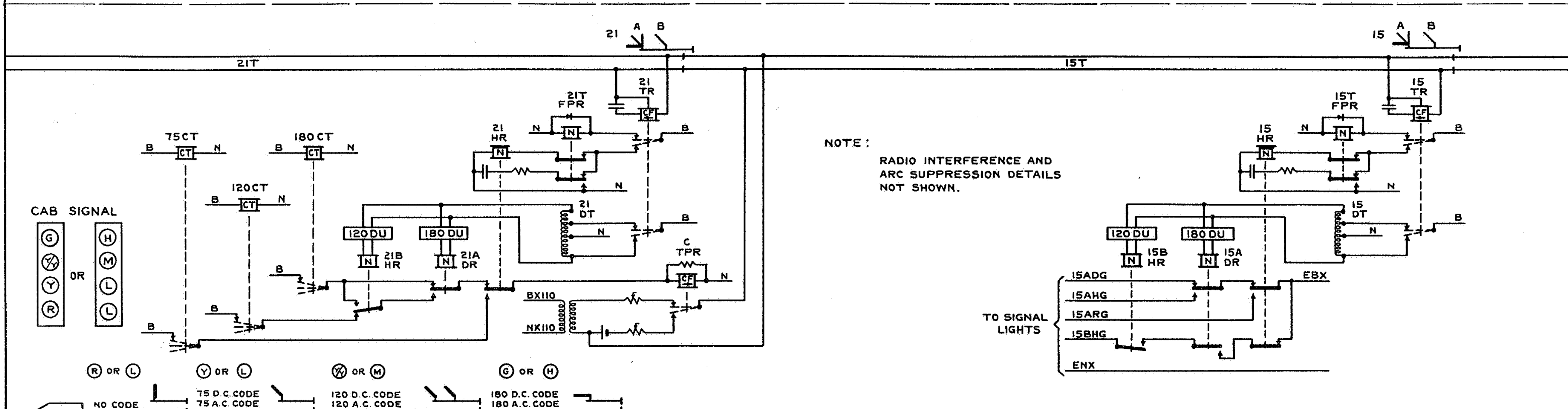
OCT. 1954

AAR SIG. SEC. 8078A

SHEET 1



THREE INDICATION, TWO SPEED CONTROL – LOW AND MEDIUM SPEED LIMIT.
SUPERIMPOSED ON D.C. CODED TRACK CIRCUITS



FOUR INDICATION, TWO SPEED CONTROL – LOW AND MEDIUM SPEED LIMIT.
SUPERIMPOSED ON D.C. CODED TRACK CIRCUITS

CIRCUITS FOR CONTINUOUS TYPE SPEED CONTROL

TRACK SIGNALED IN ONE DIRECTION

OCT. 1954

AAR SIG. SEC. 8078A

SHEET 2

CIRCUITS FOR APPROACH SIGNAL USING TWO-WIRE LINE CIRCUIT CODED FOR FOURTH ASPECT.

This circuit illustrates the coding of a standard two-wire polarized line circuit to provide a fourth, or approach medium, aspect at the approach signal, the coding being provided by a flasher relay contact in the line control circuit.

This circuit contemplates the use of biased neutral relays at the approach signal location, the decoding being accomplished by the use of front and back contact repeaters snubbed by condensers to hold them up over the coding interval.

When the circuit is de-energized by the opening of any one of the track relay contacts, the biased neutral relays 8HR and 8ADR are both down and signal 8 is Red-over-Red.

When all the track relays are picked up and signal 4R is Red-over-Red, steady reverse battery energy is fed to the line circuit over the back contacts of relay 4RPCR. This is steady energy because relay 4FIR is de-energized. This steady energy of reverse polarity picks up relay 8HR and relay 8ADR remains down and signal 8 is Yellow-over-Red.

When all the track relays are picked up and signal 4R is Red-over-Green, relay 4FIR is energized and is opening and closing its contact continuously. Relay 4RPCR is down, thus coded reverse battery energy is fed to the line circuit and relay 8HR is picking up and dropping in step with the coded energy and signal 8 is Yellow-over-Green.

When all the track relays are up and signal 4R is Yellow-over-Red or Green-over-Red, relay 4RPCR is picked up and steady normal polarity battery energy is fed to the line circuit and relay 8ADR is picked up and 8HR is down and signal 8 is Green-over-Red.

The resistors shown in this circuit are used to prevent a short circuit on the battery in event of failure of the condenser as well as to limit the current flow through back contacts of relays 8TR and 8AHR during condenser discharge.

The bleeder circuit through back contacts of relays 8TR and 8AHR provide for discharging the condensers and prevent the possible picking up of relay 8AHR through front contact of relay 8TR under condenser charged conditions. The same applies to relay 8BDR through a front contact of relay 8AHR.

There are three relays at signal 8 (8AHR, 8BDR and 8BDPR) which are required because the line circuit is coded.

Relay 8AHR is picked up when relay 8HR is picked up steadily, also when relay 8HR is following code.

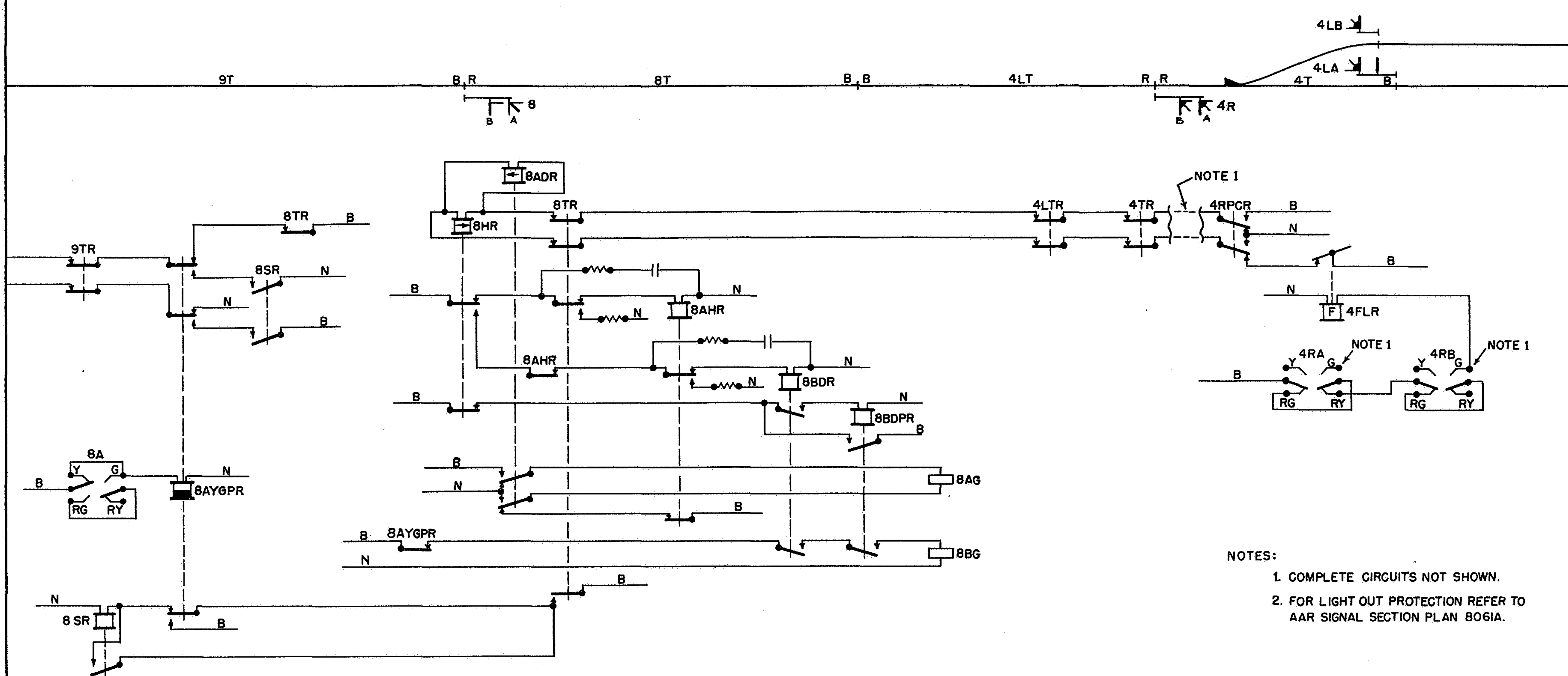
Relay 8BDR is picked up only when relay 8HR is following code.

Relay 8BDPR is used to require that after the line circuit is opened it must be reclosed within the release time of relay 8BDR before the approach medium aspect can be displayed.

The front contact of 8TR in the control of relay 8AHR is used so that signal 8 will change to Red-over-Red promptly when a train moves past this signal onto track circuit 8T when signal 8 is showing Yellow-over-Red or Yellow-over-Green.

It is recognized that, if at the time the approach signal is displaying a Yellow indication, a loose connection or anything that will cause the line control circuit to be opened and closed within the timing range of the decoding relays will cause the Yellow-over-Green fourth aspect to be displayed.

Biased neutral relays 8HR and 8ADR as well as flasher relay 4FIR are standard relays and not designed for continuous coding. For this reason it is recommended that this circuit be used only in such a manner that the relays will not be coding as a normal condition.



NOTES:

1. COMPLETE CIRCUITS NOT SHOWN.
2. FOR LIGHT OUT PROTECTION REFER TO AAR SIGNAL SECTION PLAN 8061A.

CIRCUIT FOR APPROACH SIGNAL USING TWO WIRE LINE CIRCUIT CODED FOR FOURTH ASPECT

SEPT. 1956

AAR SIG. SEC. 8079A

ADDENDUM TO AAR SIG. SEC. 8080B

CIRCUITS FOR AUTOMATIC SIGNAL PROTECTION OF MOVABLE BRIDGE (BRIDGE NOT EQUIPPED WITH MECHANICAL LOCKING DEVICE)--TRACK SIGNALED FOR MOVEMENT IN BOTH DIRECTIONS.

These sheets show the circuits for a movable bridge in automatic signal or traffic control territory, which have the feature that the siding to siding signal control is independent of bridge movement. This feature is obtained by controlling the automatic approach signal circuits over front contacts of relay 3TPSR, which relay will remain energized over its front contact whenever BNPSR relay is released. Thus, when the bridge tender positions R.R.-River lever for river traffic, and the lock lever to the unlock position, to withdraw the rail contactors, releasing 3T track circuit, means are provided for maintaining circuit continuity for the automatic signals beyond the limits of the bridge.

The track circuit, which is located between the home signals and over the fixed span and the movable part of the bridge, is coupled through bridge circuit controllers which are power-driven to withdraw the plunger from the female end of the circuit controller fastened to the movable part of the bridge, thus providing a means for uncoupling the track circuit before bridge is lined for river traffic.

Route check circuits 2RR and 4RR are used so that a back contact of these relays can be inserted in the 2ASR-4ASR circuit to release the ASR relay when a route relay has been selected. This then allows a back contact of the ASR relay to be inserted in the signal network to assure that the locking is in effect before the signal can be cleared. The approach stick relays 2ASR-4ASR are so circuited that if a train occupying the approach, which will establish a route and thereby release the ASR relay, backs off the approach, the signal will go to stop and a predetermined time will have to expire before the bridge mechanism will be released. The ASR's are provided with a two track section pick-up for normal movements.

Circuit NRC is provided to assure that a specified tolerance is met in the vertical alignment of rails on both the fixed and movable spans.

Circuit NBC is provided to assure that a specified tolerance is met in the horizontal alignment of rails on both the fixed and movable spans. Among other contacts, a front contact of relays NRCR and NBCR is included in the BNPS circuit to assure that the alignment, both vertical and horizontal, is normal before BNPSR can pick up.

Optional circuits RRC-RBC are provided if deemed necessary, to electrically check the mechanical features of the circuit controller. This circuit is so arranged that the NRCR once released cannot be picked up until RRCR relay has picked up. Relay RRCR will release when relay NRCR has picked up. This assures that the contacts have moved from normal to reverse and back to normal.

Circuit BN is provided to assure that the bridge mechanism has been restored to normal and the power control relay as well as the bridge lock relay is released. A front contact of this relay is included, among others, in the NWS circuit to prevent the plunger movement of the male portion of the bridge circuit controllers from being driven back to their normal position, after a reverse movement has been made, until power has been removed from the bridge power control relay.

ADDENDUM TO AAR SIG. SEC. 8080B - Continued

The bridge tender is provided with two levers mounted on a small panel. Appropriate indication lamps are also provided on the panel. One lever is used to establish rail or river traffic. The other is used to control the mechanisms which drive the bridge circuit controllers.

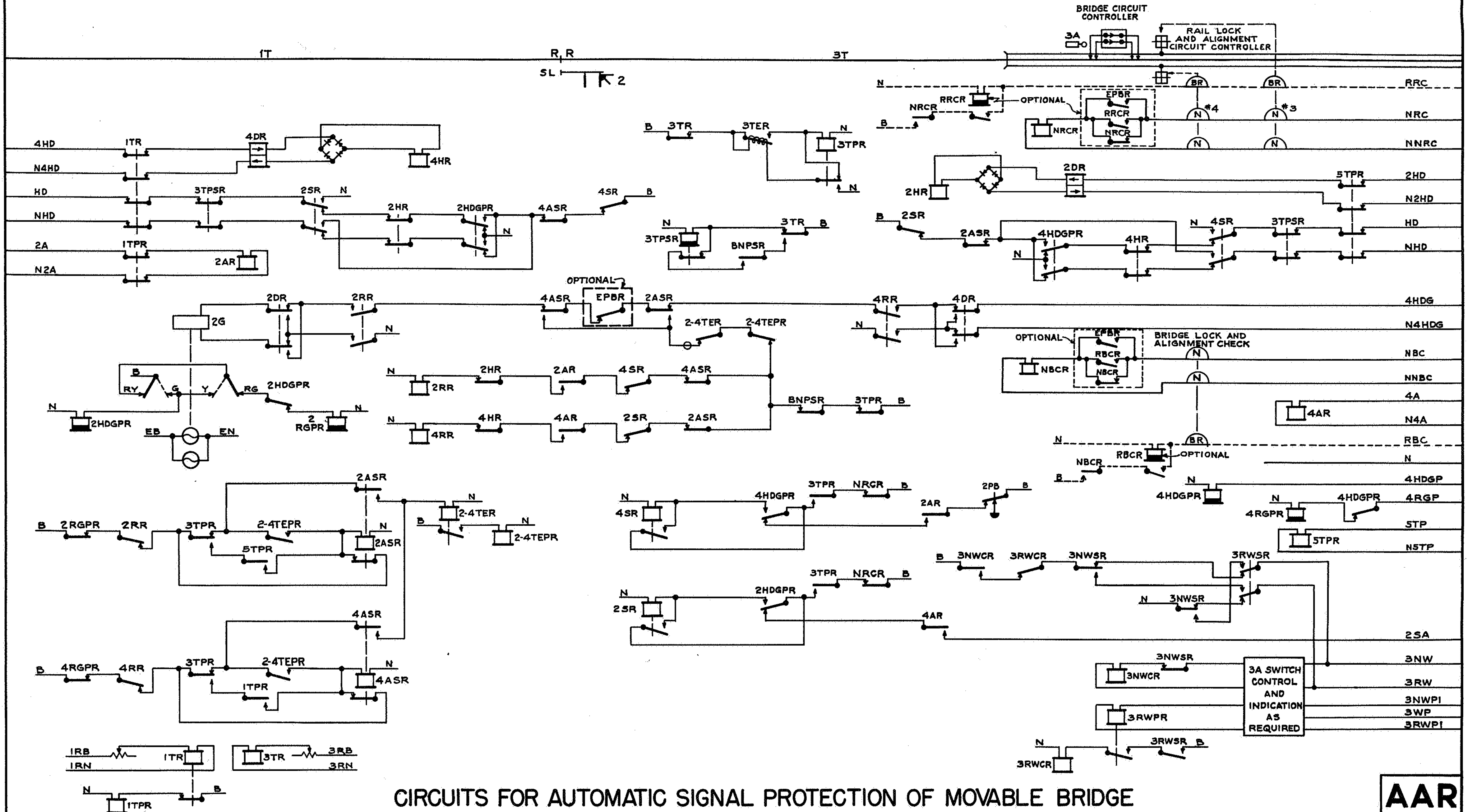
The procedure for operating the bridge is as follows:

1. Position R.R.-River lever to river position.

2. Position lock and unlock lever to unlock position.
   (a) If signal was clear, a predetermined time will have to expire before ASR relay picks up completing the circuit to pick-up relay RWSR.
   (b) RWSR picked up completes circuit to drive bridge circuit controllers to reverse position which withdraws the plungers.
   (c) RWPR picked up indicates on the control panel that the plungers have been withdrawn and completes a circuit to pick up relay BLR.
   (d) RWCR picked up removes energy from the circuit controlling the switch machines which drive the bridge circuit controllers.
   (e) BLR picked up will energize an a.c. relay (PCR) which prepares circuits for controlling the bridge.

Push buttons conveniently located on each end of bridge are provided for actuation by trainmen, to obtain reverse movements over the bridge. Contacts on these buttons are included in the directional stick release circuit. When push button is depressed, it will release the directional stick relay permitting a reverse move by signal indication.

An optional emergency release button may be provided at a strategic point to restore system to normal in the event that power or a circuit is momentarily interrupted.



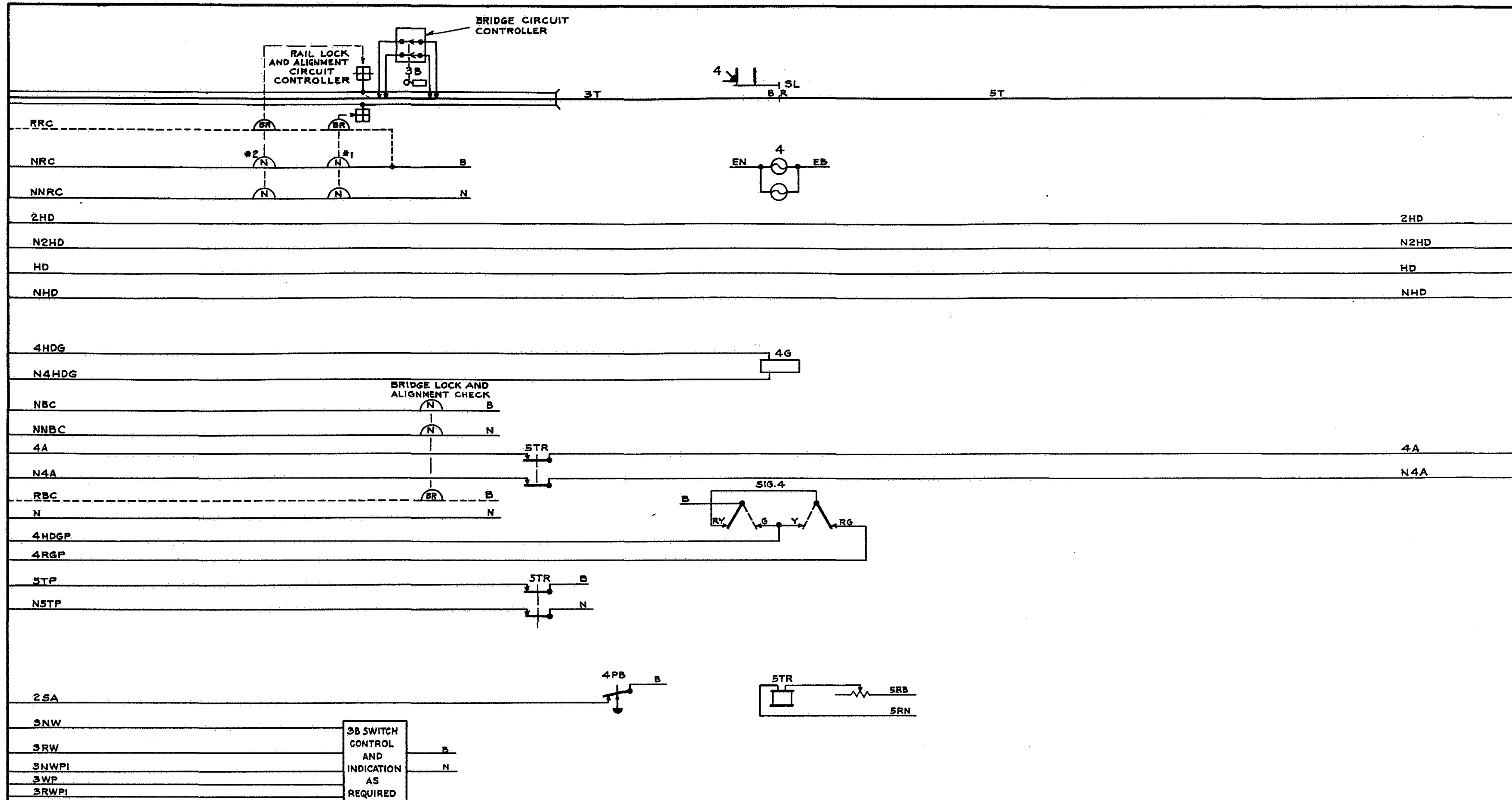
CIRCUITS FOR AUTOMATIC SIGNAL PROTECTION OF MOVABLE BRIDGE

TRACK SIGNALED FOR MOVEMENT IN BOTH DIRECTIONS

OCT. 1959 | SEPT. 1957

AAR SIG. SEC. 8080B

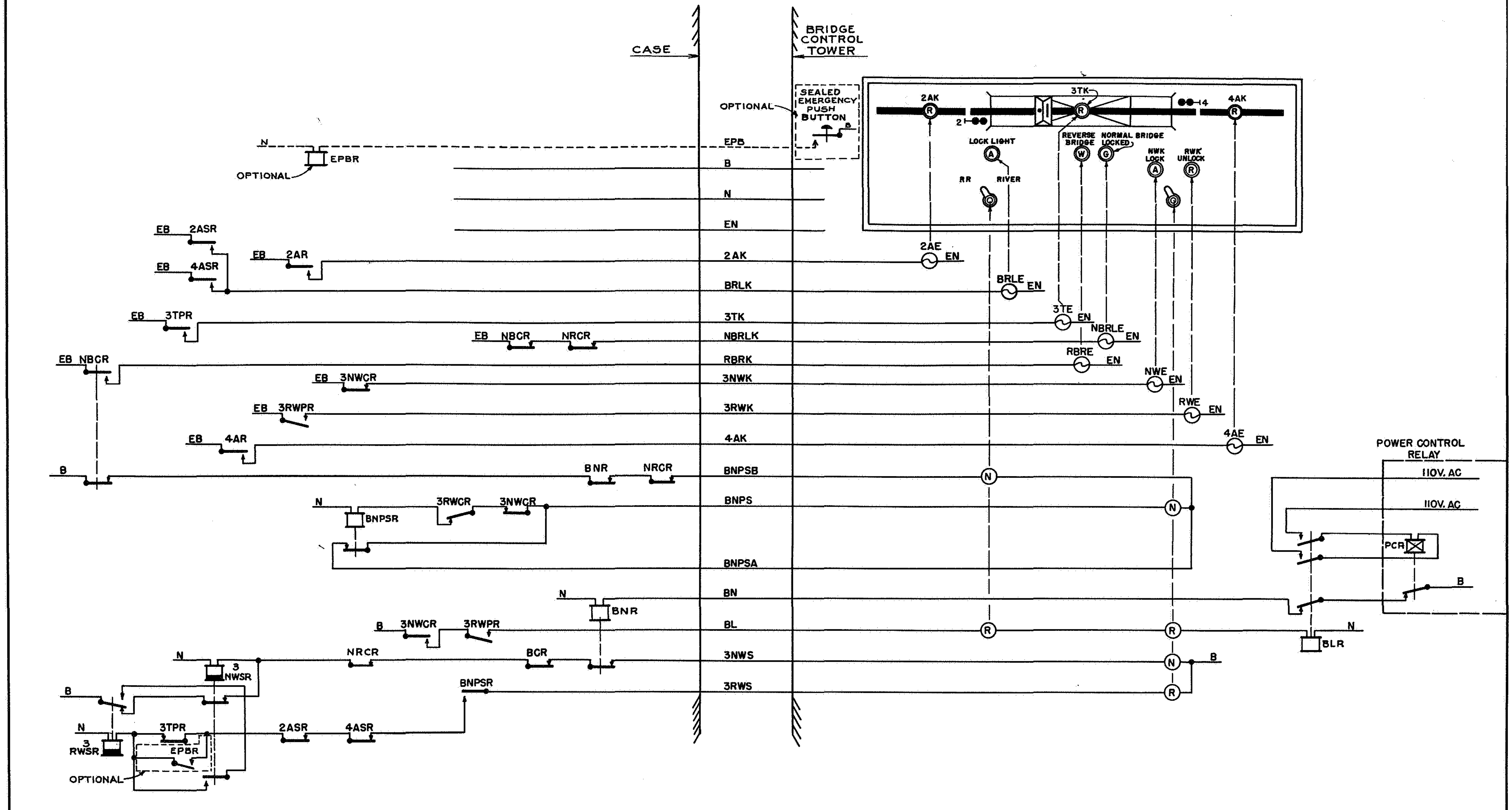
SHEET 1



CIRCUITS FOR AUTOMATIC SIGNAL PROTECTION OF MOVABLE BRIDGE

TRACK SIGNALED FOR MOVEMENT IN BOTH DIRECTIONS

OCT. 1959	SEPT. 1957	AAR SIG. SEC. 8080B



CIRCUITS FOR AUTOMATIC SIGNAL PROTECTION OF MOVABLE BRIDGE

TRACK SIGNALED FOR MOVEMENT IN BOTH DIRECTIONS

OCT. 1959	SEPT. 1957	AAR SIG. SEC. 8080B

SHEET 3

ADDENDUM TO AAR SIG. SEC. 8081A

TRAFFIC CONTROL CIRCUITS USING NORMAL ALTERNATELY REVERSING POLAR CODED TRACK-SLOW CODE.

This traffic control system utilizes polarized track circuits, pulsating at a slow rate and alternately reversing to provide a means of controlling wayside signals without the use of line wire. Leaving and entering signals at each end of the block may be controlled by any CTC system without the need for traffic locking circuits in the machine as this protection is obtained in the field by a traffic stick (FSR) relay which checks that code is being received in the block before allowing the signal to clear. Once picked up, it prevents a code from being transmitted to the opposite end of block, thus protecting against simultaneous clearing of two opposing signals into the block. Intermediate automatic signals are arranged for following moves.

Transmitting a short pulse (approximately 0.250 second) from one end of a block to the other with a long de-energized period (approximately 1.5 seconds) allows the opposite end of the block to transmit information in a like manner during this long de-energized period.

Four distinct code characters are provided with this type of coding: (-), (+), (±) and (∓). Composite codes (±) and (∓) are made by extending the energized period from 0.250 second to 0.500 second. The first half of the code is of one polarity and the second half the opposite polarity. The fact that the energized period is followed by the long de-energized period makes the composite codes possible.

Rates at which the codes are transmitted are determined by the adjustment of the release time of the pulse length (PL) relays at each end of the block. As a rule, one end of a block is adjusted to transmit at a rate of 29 pulses per minute while the opposite end would be adjusted for 33 pulses per minute. This rate variation permits the two ends of the block to synchronize with each other. The circuits are usually arranged to allow the 33 rate end to be a driver if the block is unoccupied and thus control the rate while the opposite end would be a follower when dependent coding is in effect. The transmission rate at the intermediate signals with directional stick relay energized is set at 40 rate, as the transmission circuit is always arranged to be a driver to control the 33 rate end as well as the 29 rate end.

Condenser decoding is used to detect the various codes. Each code requires a separate decoding unit where safety circuits are concerned. The track relay must be pulsing in order to maintain the code detecting relay in the energized position.

Minus (-) pulse or code is used to control a signal to the approach or yellow aspect while a positive (+) pulse is used to control a signal to the proceed or green aspect.

Block indication, if no intermediate signals are used, is controlled by either the minus (-) or positive (+) pulse. If one set of intermediate signals is used, the block indication is controlled by the (+) pulse. When more than one set of intermediate signals are involved, then block indication is obtained by using the composite or double code (±) in the track sections behind the second intermediate signal in the block.

With no controlled signals cleared in to a given block, the system will be operating on what is termed dependent coding. That is, a pulse applied to a track circuit at one end of a block is received at the first intermediate signal or repeating cut location and is repeated immediately to the next track circuit in succession until it reaches the opposite end of the block at which time a return pulse will be transmitted through each successive track circuit in the block. Reception of this pulse at the original end of block will de-energize the PL relay controlling the length of the off time between each pulse to transmit a new pulse as soon as the opposing pulse is completed. Thus under normal conditions the two ends of the block will alternately apply pulses to the track circuit.

The character of pulse repeated by a signal will depend on the position of the signal, that is, whether or not the signal is displaying a clear aspect. This manner of transmission allows the controlled absolute signal to be cleared to its proper and safe aspect to provide train movements into a block by signal indication even though an intermediate signal may have failed to clear due to a local defect.

When a controlled signal is being cleared into a block, a pulse from opposite end of block must first be detected which allows the FS relay to pick up. This in turn prevents the transmission of pulses to the opposite end of block which ends dependent coding and puts all the opposing signals in block to stop almost simultaneously. However, apparatus at opposite end of block will continue to transmit pulses at a fixed rate governed by the release time of the PL relay to provide proper signal indication to the train. This type of a transmission is termed independent coding.

As the train progresses through the block, it will set up and maintain the direction of traffic at each intermediate signal location. The directional stick relays, which provide for follow up moves are conditioned as the train is approaching each signal by the pulsing of the approach relay.

When the rear of the train passes an intermediate signal, (-) code will be transmitted, usually at 40 pulses per minute, to control the H relay associated with the signal in the rear, to cause the signal to display a yellow aspect for a following move.

The following is a list of relay nomenclature and functions for using four polarity codes:

AR — The SERIES APPROACH RELAY is a code responsive relay which is connected in series with the track feed. When the track is occupied, the current increase causes the AR to operate, thus the approach of the train is detected. At a double intermediate signal location, the AR is a double armature relay, with one armature energized for each direction of traffic. At a single intermediate signal location, AR is a single armature relay to detect the approach of a train in the direction of the signal control. It picks up the directional (APB stick) relay on the approach of a train.

BKR — The BLOCK INDICATION RELAY is a neutral repeater of the D and H relays. It provides uninterrupted block indication.

ADDENDUM TO AAR SIG. SEC. 8081A - Continued

CPR The CODE PULSE RELAY is a code responsive double armature relay. It applies a pulse of either polarity to the rails. The normal contacts apply a (+) pulse while the reverse contacts apply a (-) pulse.

DR The DISTANT RELAY is a biased neutral relay which is used at signal locations to provide a green signal. It is usually operated from a decoding unit energized by track relay response to a positive code. DR may also be used to decode a (∓) or (±) code.

FSR The TRAFFIC STICK RELAY is a quick pick-up neutral relay located at controlled locations. It checks that code is being received in the block before allowing the signal to clear. Once picked up, it prevents a code from being transmitted to the opposite end of block, thus protecting against simultaneous clearing of two opposing signals into a block. FSR also prevents a code from being transmitted into the rear of a train until it has passed the next signal and directional stick is properly established. FSR releases when HR picks up in response to detection of a code at the controlled location.

HR The HOME RELAY is a biased neutral relay operated from a decoding unit. It remains energized as long as negative code is operating the associated code responsive track relay.

NCPPR The NORMAL CODE PULSE REPEATER RELAY is a code responsive relay used at automatic signal locations where (±) code is transmitted. It repeats the normal armature of CPR and governs the length of the negative part of a (±) pulse.

PLR The PULSE LENGTH RELAY is a code responsive relay used at all automatic signal locations. Together with the condenser unit and CPR, it controls the length of pulses and the rate of coding. When the directional stick relay is energized, PLR provides code for clearing the following signal to the approach aspect. PLR is also used at controlled locations where only single pulse codes are transmitted.

SR The STICK RELAY is a neutral directional (APB stick) relay. It is picked up by the AR on the approach of a train. A condenser is connected across the coil to provide pulse bridging as well as an 8-second release time.

TDR The TRANSFER DELAY RELAY is a code responsive relay which provides a delay between the time a pulse is removed from the rails and the time the track relay is connected to the rails to receive a pulse. This delay allows the induced rail potential, created by removal of energy from the rails, to dissipate through the track ballast and bleeder resistor so that the track relay will not be improperly energized.

TR The TRACK RELAY is a code responsive relay. It is equipped with two separate armatures, both actuated from the same magnetic structure. Each armature actuates its own set of contacts and is magnetically as well as spring biased to the de-energized position. The N armature picks up when positive energy is connected to the (+) terminal and minus is connected to the (-) terminal of the coil, while the R armature responds when minus energy is connected to the (+) terminal and positive is connected to the (-) terminal of the coil.

TPR The TRACK REPEATER RELAY is a code responsive relay. It is used to repeat either the normal or reverse contacts of the track relay where additional contacts are required.

Pulse timing--direct driver.

42LPLR timing circuit (Sheet 1) is a typical driver, that is, it controls the pulse rate whether on dependent or independent coding.

Pulse timing involves two timing operations. First, the length of time energy is on the rails to make up one pulse, and secondly the length of time energy is removed from rails between succeeding pulses. The first timing operation begins as soon as 42LCPR (R) picks up and releases 42LTDR to apply a (-) pulse to the 42LT track circuit. Battery being connected to the rails through the front (R) contacts of 42LCPR and the back contacts of 42LTDR. At the same time 42LPLR is energized through the 42LCPR (R) front contact. However, energy is maintained on the rails until 42LPLR (which is slow pick-up) picks up and releases the 42LCPR (R) armature, which is condenser snubbed to provide slow release time. Thus the length of any one pulse is determined by the pick-up time of the 42LPLR and the release time of the 42LCPR.

The second timing operation is determined by the length of time the 42LPLR remains energized. The 42LPLR, being a direct driver, is held energized by the stored energy in the 42LPL-COND. N energy is connected to the 42LPL-COND through the back contact of the 42LPLR to charge it. Then as the 42LPLR is energized the condenser is connected across the coil through its front contact. As the 42LCPR is released, the 42LPL condenser will discharge through 42LPLR coil, thereby holding the relay up until this stored energy is dissipated at which time the 42LPLR will be de-energized ending the off time period.

The length of time the 42LPLR relay remains energized is controlled by the adjustable resistor in multiple with the condenser. Increasing the resistance slows up the discharge to increase the holding time and lower the pulse rate, while decreasing the resistance speeds up the discharge to decrease the holding time and raise the pulse rate.

Pulse timing--straight follower.

2RPLR timing circuit (Sheet 7) is a typical follower, that is, during dependent coding it initiates a return pulse immediately at the end of a pulse reception in the following manner. As the 2RTR (R) armature picks up, the (R) back contact opens the condenser snubbed 2RPLR circuit. This releases the 2RPLR immediately to condition the circuit to initiate a return pulse. Then as the 2RTR releases, at the end of the pulse, the 2RCPR will be energized to apply a return pulse to 2RT track circuit.

Decoding at power switch.

42LHR decoding circuit (Sheet 1) is typical of those used at the controlled locations. Closing of the (R) front contacts of the 42LTR during the on time of a pulse connects B energy to the (+) terminal of 42LHCDU decoding condenser and N energy to the (-) terminal to charge the condenser. As the 42LTR releases, between transmitted pulses, a circuit is closed through the (R) back contacts from the (+) terminal of the decoding condenser to the (+) terminal of the 42LHR coil energizing the relay as this condenser is discharged. The condenser resistor snub (R+ and - terminals) across the 42LHR coil, is also charged at this time and holds the relay energized during the interval a pulse is being received. Thus if coding ceases, condensers will not be recharged and relay will be released.

Decoding at intermediate signal.

31 and 32HR and DR decoding circuit (Sheet 3) is typical of those used at intermediate signal locations. Decoding is accomplished the same as previously explained for 42LHR (Sheet 1) except the B energy which energizes 31H and 31D condenser units is selected through the (N) and (R) back contacts of adjacent track relay 32TR and conversely the N energy which energizes the 32H and 32D condenser units is selected through the (N) and (R) back contacts of the opposite 42RTR track relay. This protects against decoding and holding an H or D relay energized should both track relays (32 and 42RTR) operate at the same instant due to broken-down insulated joints.

Transmission circuits on the main line within the siding area.

Track circuit 42LT (Sheet 1) illustrates a transmission circuit arranged to always be a driver and thus control the pulse code rate at 33 per minute when no signals are cleared into the main line of siding, while track circuit 2RT (Sheet 7) illustrates the opposite end of this track circuit arranged to always be a follower.

Assuming signal 42RA is at stop, a (-) pulse will be applied to the 42LT track circuit by energizing the 42LCPR in the following manner. The reverse (lower) coil connected directly to negative N energy, while positive B energy is selected through the 42RAHDGPR back contact, 42LPLR back contact which controls on time of pulse being inherently slow pick up, 41TR and 42LASR front contacts and 42LFSR back contact, which check that a signal is not cleared into the section or a train has not entered the detector track and finally the (N) and (R) back contacts of the 42LTR relay, which checks that a pulse is not being received from the opposite end of the track circuit. As the 42LCPR picks up it releases the 42LTDR relay, its back contacts closing the circuit to the rails to apply the negative pulse (- to lower rail, + to upper rail). The pick-up of the 42LCPR completes the circuit to the 42LPLR relay which picks up opening the circuit to the 42LCPR reverse coil which, after its release time expires, de-energizes to terminate the pulse.

Closing of the 42LCPR (R) back contact completes the circuit to the slow pick-up 42LTDR which when it picks up connects the 42LTR track coil to the rails, conditioning this end of the track circuit for receiving a pulse from the opposite end.

As the (-) pulse is received at the opposite end (Sheet 7), 2RTR (R) armature will respond, due to the 2RTDR front contacts being closed, to close the (R) front contacts energizing the decoding condenser 2RHCDU, B energy to the (+) terminal, N energy to the (-) terminal.

As the 2RT end of the track circuit is arranged to always be a follower, the picking up of the (R) contacts of the 2RTR also opens the circuit controlling the condenser snubbed 2RPLR (pulse length relay) which then releases immediately. At the end of the pulse reception, the 2RTR will again be de-energized at which time the 2RCPR (code pulse relay) will be picked up to apply a (-) pulse to 2RT. B energy being applied through the 2RTR (N) and (R) back contacts, the 2RASR and 1TR front contacts, the 2RFSR back contact, 2RPLR back contact, 2LAHDGPR back contact, through the (R) coil to N energy. A second circuit continuing from the heel of the back contact of 2RPLR through its own coil, selecting N energy through (N) or (R) front contacts of the 2RCPR completes the circuit to pick up the 2RPLR which releases the 2RCPR to end the pulse. The 2RPLR is also condenser snubbed to hold up until the next pulse is received, at which time the picking up of the 2RTR track relay will again release the 2RPLR to repeat the above described cycle of operation.

As the return (-) pulse is received at the 42LT end of the track circuit (Sheet 1), the (R) armature of the 42LTR will pick up, being connected to the rails through the 42LTDR front contacts. The closing of the (R) front contacts of the 42LTR relay will recharge the 42LHCDU decoding condenser which controls the 42LHR relay.

This end being a driver, the picking up of the 42LTR has no effect on the 42LPLR which will remain energized until the 42LPL-condenser is completely discharged, at which time it will release, re-energizing the 42LCPR relay to apply a (-) pulse to the rail.

The transmission of a (+) pulse through the siding area is accomplished the same as the (-) pulse previously described (Sheet 1). It is controlled by the front contact 42RAHDGPR, which picks up as the 42RA signal is cleared, selecting the 42LCPR normal (upper) coil which controls the (N) contacts to apply a positive (+) pulse to the 42LT track (+ to lower rail, - to upper rail). This will cause the 2RTR (N) contacts to be actuated instead of the (R) contacts (Sheet 7) causing the 2RDR to pick up while the 2RHR will release.

If 42LA signal (Sheet 1) is to be cleared, the 42LGZR will be energized. This will close the negative circuit to the 42LFSR traffic relay. N energy being applied through the front contact of the 42LGZR, front contact of the 41NWCR, front contact of the 42LHR if a (-) pulse is being received or the 42LDR if a (+) pulse is being received, through the rectifier to the 42LFSR coil. The positive energy is selected through the (N) or (R) front contacts of the 42LTR relay which checks that a pulse is being received at this end of the block. The 42LFSR, being quick pick-up, will pick up on the first track pulse to be received.

The picking up of the 42LFSR opens the 42LCPR control circuit terminating transmission to the opposite end of track circuit. At this time the 2RPLR circuit (Sheet 7) takes over to control the code rate, continuing to transmit (-) or (+) pulses (at 29 rate) depending on whether 2LA signal has been cleared.

Transmission circuits in the single track area between controlled sidings.

Track circuit 42RT (Sheet 1) illustrates a transmission circuit arranged to always be a follower, while track circuit 2LT (Sheet 7) illustrates the track circuit at opposite end of the block arranged to be a conditional driver, to control the code rate of 33 pulses per minute when 2L signal is not cleared into or no train is occupying the block and system is on dependent coding.

Assuming 2RA signal to be at stop, a minus (-) pulse will be applied to 2LT track circuit by energizing the 2LCPR lower (R) coil. N energy is selected through the back contact of 2LTPR which checks that a pulse is not being received. B energy is selected through 2RAHDGPR back contact, 2LPLR back contact, 1TR front contact, 2LASR front contact, 2LFSR back contact and finally 2LBKR front contact, which gives this end preference and makes it a driver when the block is unoccupied. In multiple with the front contact of 2LBKR is a back contact of 2LTPR which conditions the 2LPLR (pulse length relay) to be a follower when the block is occupied and 2LBKR is de-energized. As the 2LCPR (R) armature picks up to apply a pulse to the track, it releases the 2LTDR, its back contact closing the circuit to the rails (- to lower rail and + to upper rail). The pick up of the 2LCPR completes the circuit to the 2LPLR, N energy being applied to the coil through the (R) front contact when the 2LPLR picks up; this de-energizes 2LCPR, which in turn terminates the pulse.

As the (-) pulse is received at 11 and 12 signal location (Sheet 6), the 2LTR (R) armature will respond, closing its front contacts energizing the 12HCDU decoding condenser. Also as 2LTR (R) picks up, a third front contact completes the circuit to the 11CPR, B energy being applied through the 11SR back contact, the 11TR (N) and (R) back contacts, 11SR back contact, 12SR back contact, 2LTR (R) front contact, 12 searchlight signal if at stop through the RG contact, 12SR back contact, to the reverse (R) coil of the 11CPR relay to apply a (-) pulse to the 11T track circuit. If signal has cleared to yellow, the control would be selected through the Y contact, the 11CPR (R) back contact to the normal (N) coil of the 11CPR to apply a (+) pulse to the 11T track circuit.

As this (+) pulse is received at 21 signal location (Sheet 5), the 11TR (N) armature will respond, closing a circuit to 11TFPR relay, N energy being applied through the 11TR (R) back contact and (N) front contact while B energy is selected through the 22TR (N) and (R) back contacts. This relay is condenser snubbed to hold up as long as pulses are being received and takes the place of the usual H and D decoded relays for the opposite direction at a single intermediate signal to provide block to block lighting and also condition the AR approach circuit. Also as 11TR (N) picks up, the front contact completes the circuit to the 22CPR relay. B energy being applied through 21SR back contact, 22TR (N) and (R) back contacts, 21SR back contact, 11TR (R) back contact and (N) front contact to the (N) coil of the 22CPR relay which picks up to apply a (+) pulse to track circuit 22T.

As the (+) pulse is received at 22 signal location (Sheet 4), the 22TR (N) armature will respond, closing its front contacts to charge the 22DCDU condenser. Also as the 22TR (N) picks up, a circuit is completed to the 32CPR relay, B energy is applied through the 32TR (N) and (R) back contacts, 22SR back contact, 22TR (R) back contact and (N) front contact, 22 searchlight signal G contact, 32CPR (R) back contact to the (N) coil of the 32CPR which picks up to apply a (+) pulse to the 32T track circuit.

The reception of a (+) pulse by 22TR indicates that no train is occupying the block between 22 signal and 2L signal, consequently a (-) pulse is applied to 32T track circuit as soon as the (+) pulse is terminated, thus transmitting a composite (±) code from this point to the signal 42R, to pick up 42RBKR and provide information that the block is clear. This is accomplished as follows: as the 32CPR (N) armature picks up to apply a (+) pulse to 32T track circuit, it picks up the 32NCPR relay, B energy being applied through the 32CPR (N) front contact and 22DR front contact. Then as the 32CPR (N) armature is de-energized, B energy is applied through the 32CPR (N) back contact, 32NCPR front contact, (32NCPR relay is rectifier snubbed to remain up for the length of a regular pulse to provide the (-) second half of the pulse) through the 22SR back contact to the (R) coils of the 32CPR relay which picks up to apply a (-) pulse to 32T track circuit.

As the (±) pulse is received at 31 and 32 signal location (Sheet 3), the 32TR (N) armature will respond first, closing its front contacts to charge the 32DCDU condenser and immediately after the (+) pulse is completed the (R) armature will respond closing its front contacts to charge the 32HCDU condenser. Also, as 32TR (N) picks up, a circuit is completed to the 42RCPR (N) coil, B energy being applied through 31SR back contact, 42RTR (N) and (R) back contacts, 31SR back contact, 32SR back contact, 32TR (R) back contact and (N) front contact, 32 signal G contact, 42RCPR (R) back contact to the (N) coil of 42RCPR which picks up to apply a (+) pulse to 42RT track circuit. As the 42RCPR (N) armature picks up, it picks up 42RNCPR, which is also rectifier snubbed to remain up for the length of a regular pulse, B energy being applied through the 42RCPR (N) front contact. Also, as a (-) pulse is received immediately after the termination of the (+) pulse, the 32TR (R) armature will respond completing a circuit to pick up the 32BPR, through the above explained circuit for 42RCPR (N) coil, which is common to both, the 32TR (R) front contact, 32DR front contact, 42RNCPR front contact. Then as the 42RCPR (N) armature is de-energized, at termination of the (+) pulse, a circuit is completed to pick up the 42RCPR (R) to apply (-) pulse to the 42RT track circuit. B energy being applied through 42RCPR (N) back contact, 32BPR front contact which checks block is clear, 42RNCPR front contact and 32SR back contact to the (R) coil of the 42RCPR.

As the (±) pulse is received at the controlled location (Sheet 1), the 42RTR (N) armature will respond first, closing its front contacts to charge the 42RDCDU condenser to hold 42RDR up and also pick up the 42RNTPR relay, which is rectifier snubbed to hold up until the (-) second half of the pulse is completed. As the second half (-) pulse is received, the 42RT (R) armature will respond, closing its front contacts to charge the 42RHCDU condenser and hold 42RHR up. Also to pick up the 42RBKR indicating block is unoccupied; B energy is applied through the 42RTR (R) front contact, 42RNTPR front contact, 42RHR and 42RDR front contacts.

The 42RPLR, pulse length relay, is arranged to always be a follower on dependent coding. The opening of 42RNTPR or 42RTR (R) back contacts releases the 42RPLR to condition the circuit to initiate a return pulse as soon as the (±) pulse being received is completed. B energy being applied to the 42RCPR and 42RPLR through 42RTR (R) back contact, 42RNTPR back contact, 42RFSR back contact, 42RASR and 41TR front contacts, 42RPLR back contact, 42LAHDGPR back contact to the 42RCPR (R) coil, closing the (R) front contacts to apply a (-) pulse to the 42RT track circuit. Also, the 42RCPR (R) front contact closed completes the circuit to pick up the 42RPLR and de-energize the 42RCPR which terminates the pulse. Transmission from 42L and R location to 2L and R signal location is accomplished in the same manner as previously described.

Transmission circuit originating at intermediate signal location.

Assume a train has proceeded past 32 signal and is occupying 32T track circuit (Sheet 3) with 32SR directional stick up. 42RCPR (R) armature will respond to apply a (-) pulse to the 42RT track circuit. B energy being applied to the transmission circuit through 31SR back contact, 42RTR (N) and (R) back contacts, 31SR back contact, PLR back contact, 32SR front contact to the (R) coil of the 42RCPR relay. As the 42RCPR picks up, B energy is applied to the PLR (condenser snubbed) pulse length relay through the 42RCPR (R) front contact, 32SR front, 32TR (R) and (N) back contacts, 32SR front contact to the coil of the PLR relay which as it picks up, its back contact opens the control of the 42RCPR to terminate the pulse. As the stored energy in the PL condenser is dissipated, the PLR will be released reclosing the circuit to the 42RCPR to initiate a new (-) pulse to 42RT track circuit. This sequence will continue as long as 32SR remains up.

As train advances beyond signal 22 (Sheet 4), this location will start transmitting (-) pulses to track circuit 32T. As the (-) pulse is received at 32 signal (Sheet 3), 32TR (R) armature will respond picking up 32HR which will release 32SR after which 42RCPR will follow 32TR (R) relay. B energy being applied through the 31SR back contact, 42RTR (N) and (R) back contacts, 31SR back contact, 32SR back contact, 32TR (R) front contact, 32DR back contact, 32 signal RG contact until signal clears, 42RNCPR back contact, 32SR back contact to the (R) coil of 42RCPR relay. When signal clears to yellow the above circuit will be selected through the 32 signal Y contact, 42RCPR (R) back contact to energize the 42RCPR (N) coil and thus apply a (+) pulse to 42RT track circuit.

Relayed cut-section.

Sheet 9, Fig. 1, illustrates a repeating cut-section to be used as required where signals are spaced so far apart that the distance between them is greater than the practical operating length of a coded track circuit.

Two track relays, each having double armatures, are used at each cut-section. A pulse is received by one track relay on condition that the other track relay is not receiving a pulse from the opposite direction. The relay receiving the pulse then operates its (N) or (R) armature in response to the polarity of the pulse received and in turn applies energy of the same polarity to the rails of the adjacent track circuit.

Electric switch lock.

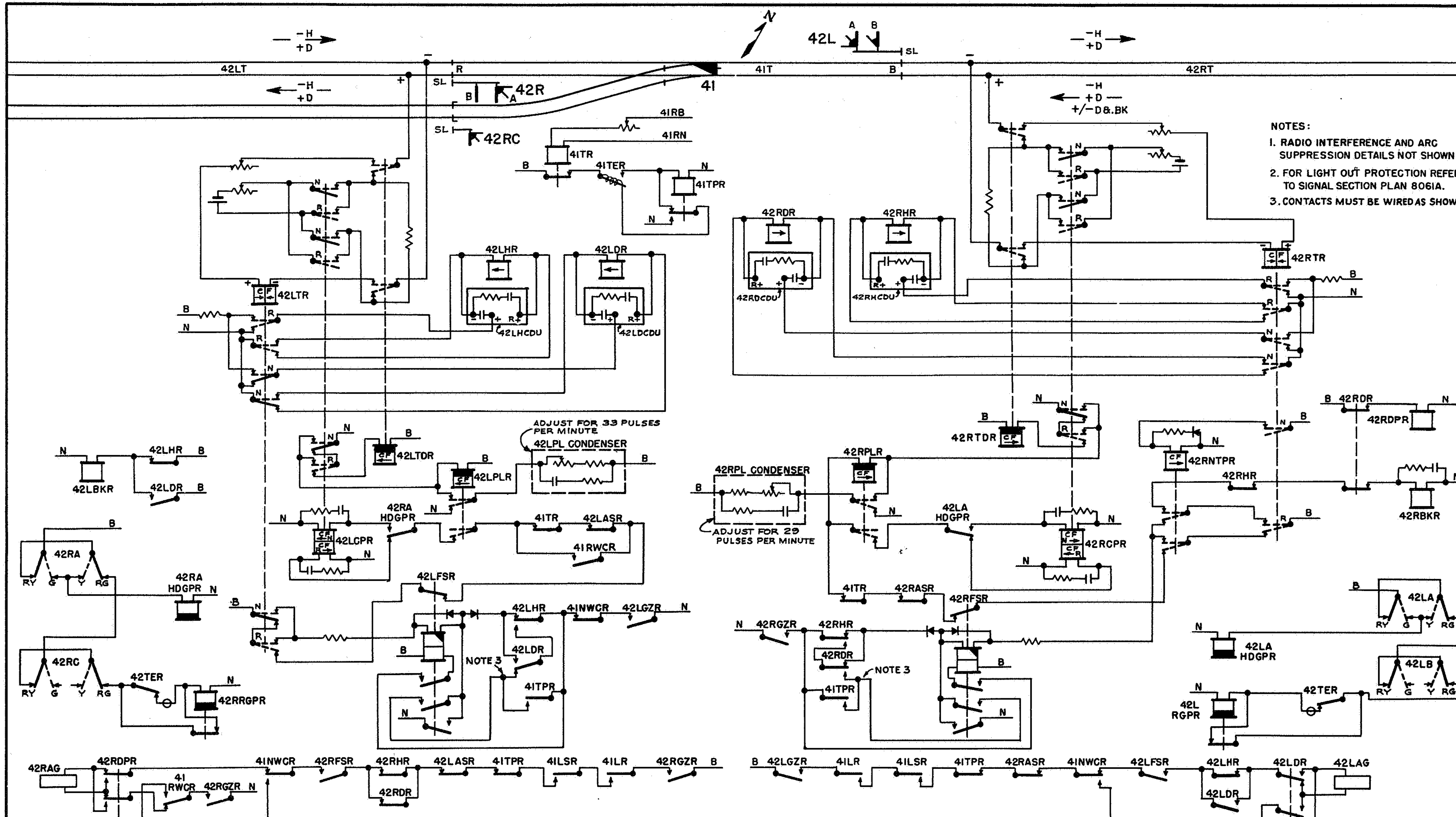
Sheet 9, Fig. 2, illustrates circuits for control of a switch lock location.

Release of the switch lock, for a train leaving the main line, is obtained by shunting the short release track section located directly in front of the switch.

Time locking is used to release the switch lock for a train entering the main line.

Coded line circuits by-passing non-coded track circuits.

Sheet 9, Fig. 3, illustrates a code line circuit arrangement used to by-pass the non-coded track circuits at a highway crossing.



NOTES:

1. RADIO INTERFERENCE AND ARC SUPPRESSION DETAILS NOT SHOWN.
2. FOR LIGHT OUT PROTECTION REFER TO SIGNAL SECTION PLAN 8061A.
3. CONTACTS MUST BE WIRED AS SHOWN.

TRAFFIC CONTROL CIRCUITS

USING NORMAL ALTERNATELY REVERSING POLAR CODED TRACK-SLOW CODE (END OF SIDING LOCATION)

SEPT. 1958

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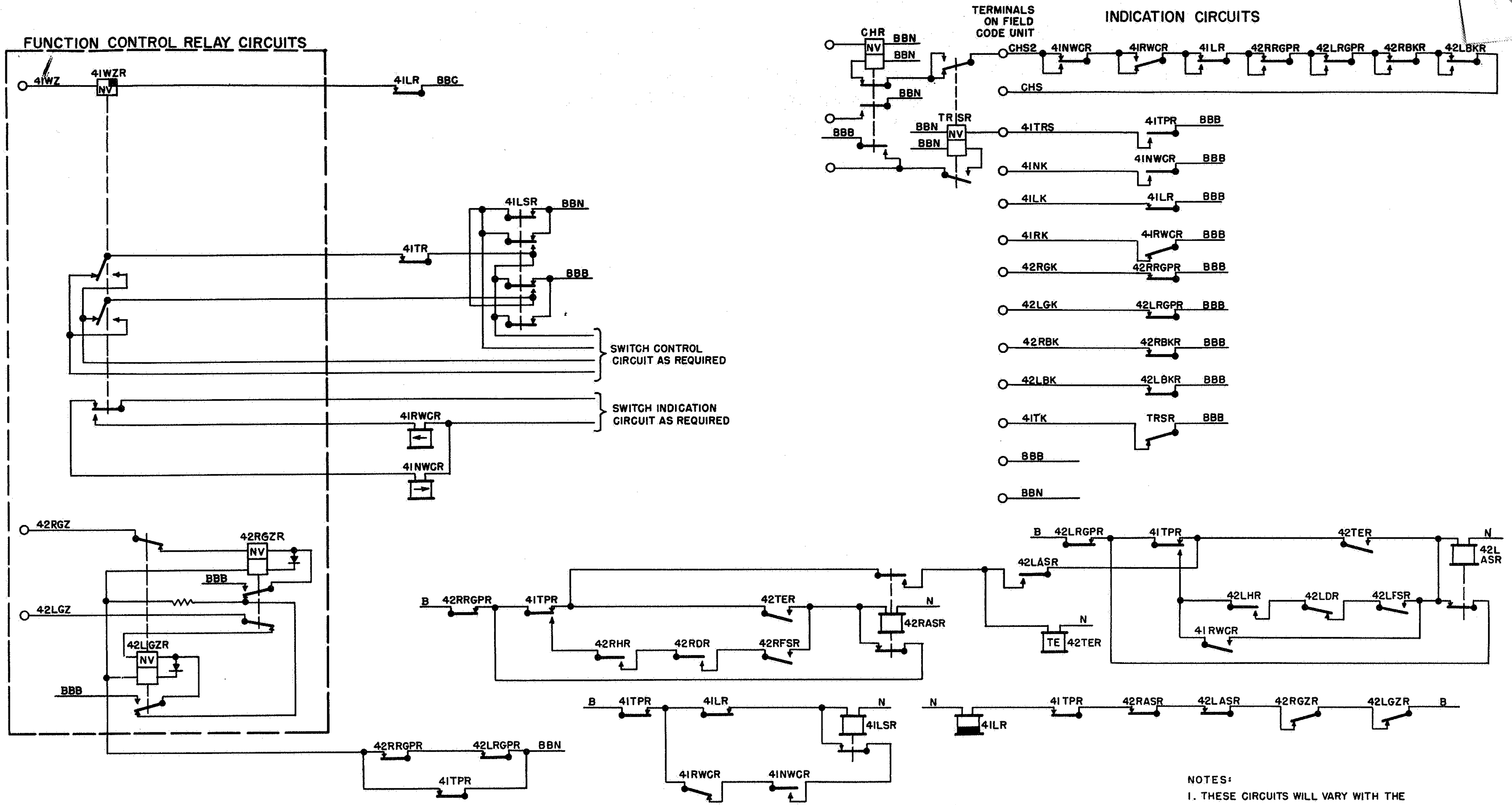
SHEET 1



NOTES:

1. THESE CIRCUITS WILL VARY WITH THE TYPE OF CODE SYSTEM EMPLOYED.
2. Z= CODE CONTROL.

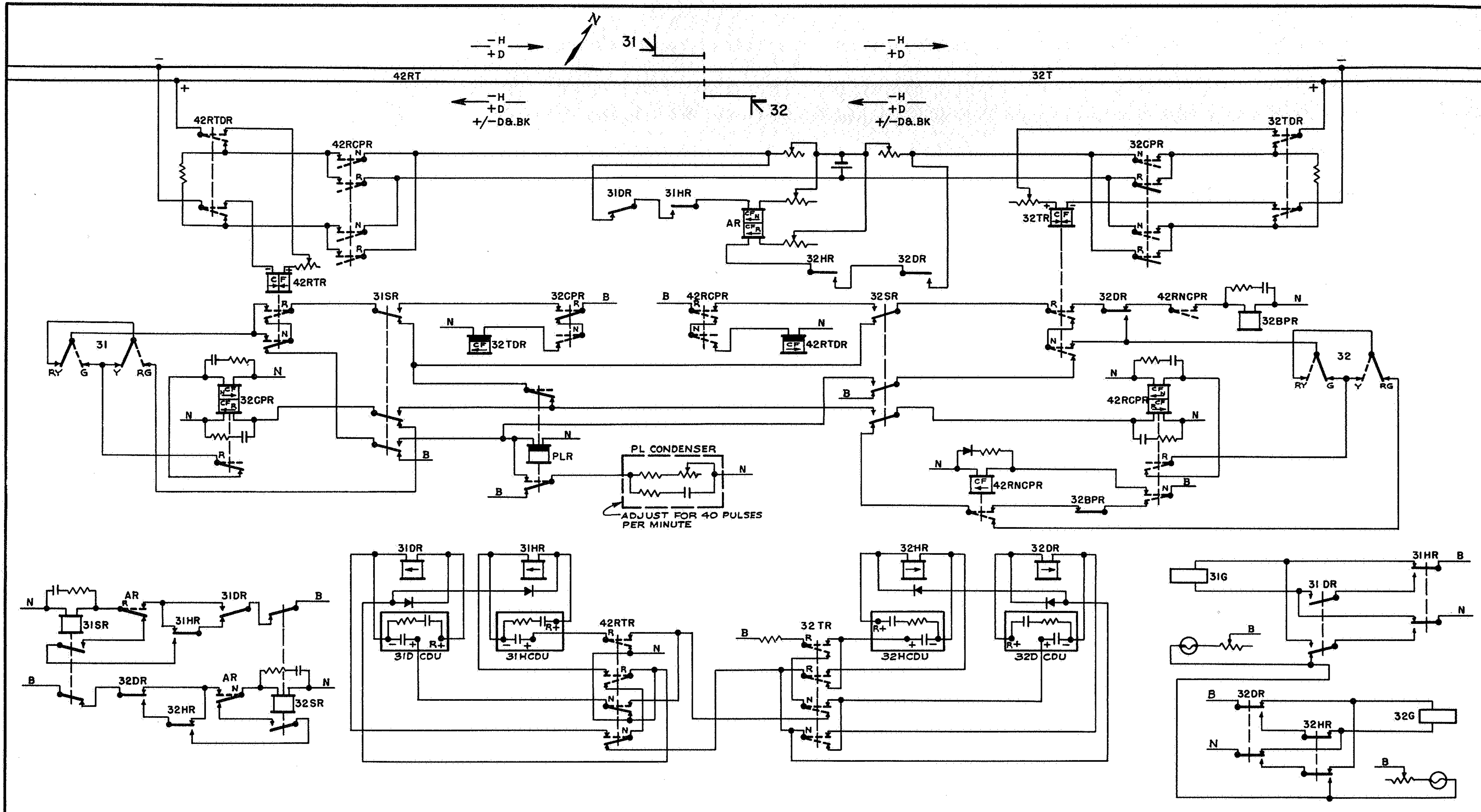
TRAFFIC CONTROL CIRCUITS

USING NORMAL ALTERNATELY REVERSING POLAR CODED TRACK-SLOW CODE (END OF SIDING LOCATION)

SEPT. 1958

AAR SIG. SEC. 8081A

SHEET 2



TRAFFIC CONTROL CIRCUITS

USING NORMAL ALTERNATELY REVERSING POLAR CODED TRACK-SLOW CODE (INTERMEDIATE SIGNALS OPPOSITE)

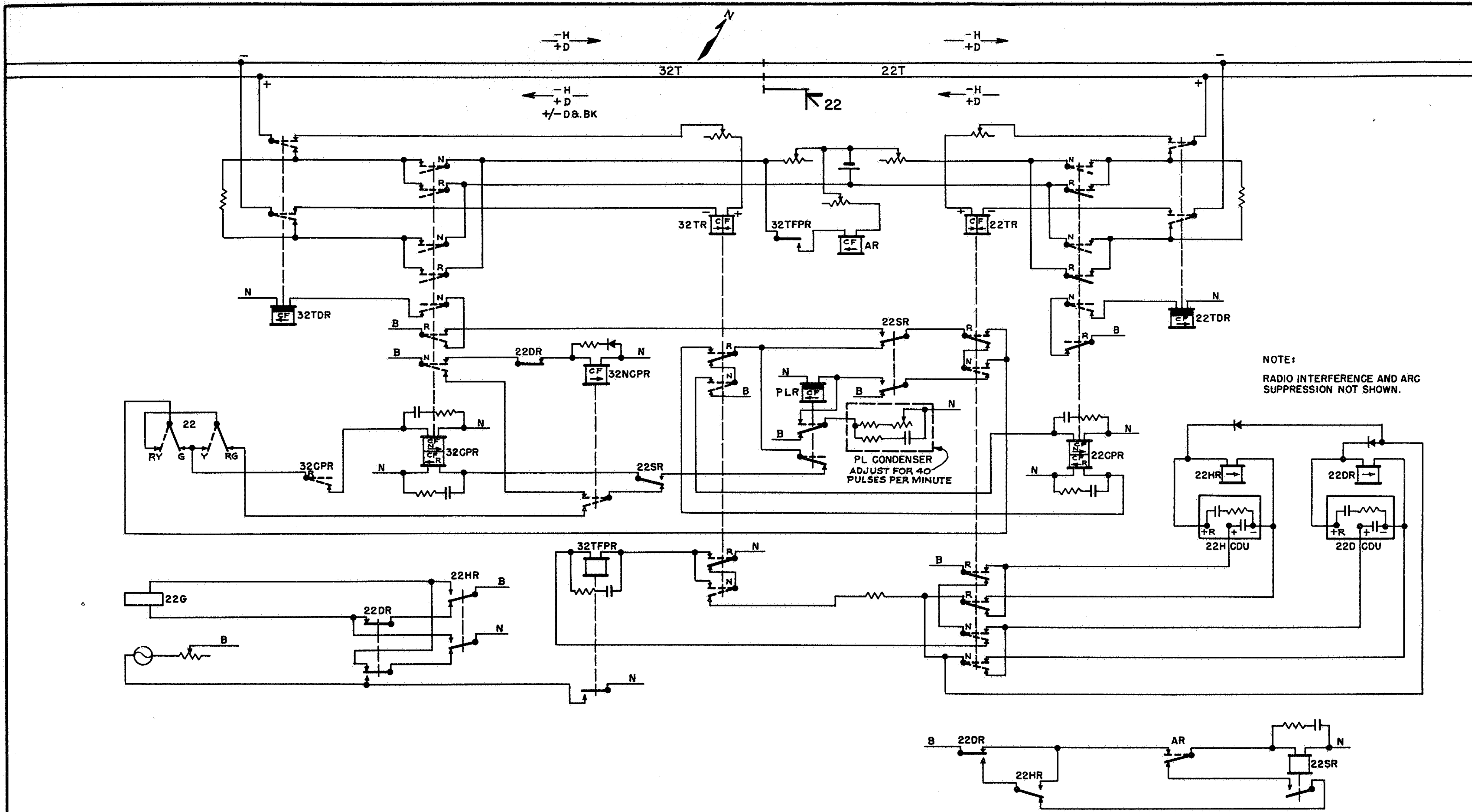
NOTE

RADIO INTERFERENCE AND ARC SUPPRESSION DETAILS NOT SHOWN.

SEPT. 1958

AAR SIG. SEC. 8081A

SHEET 3



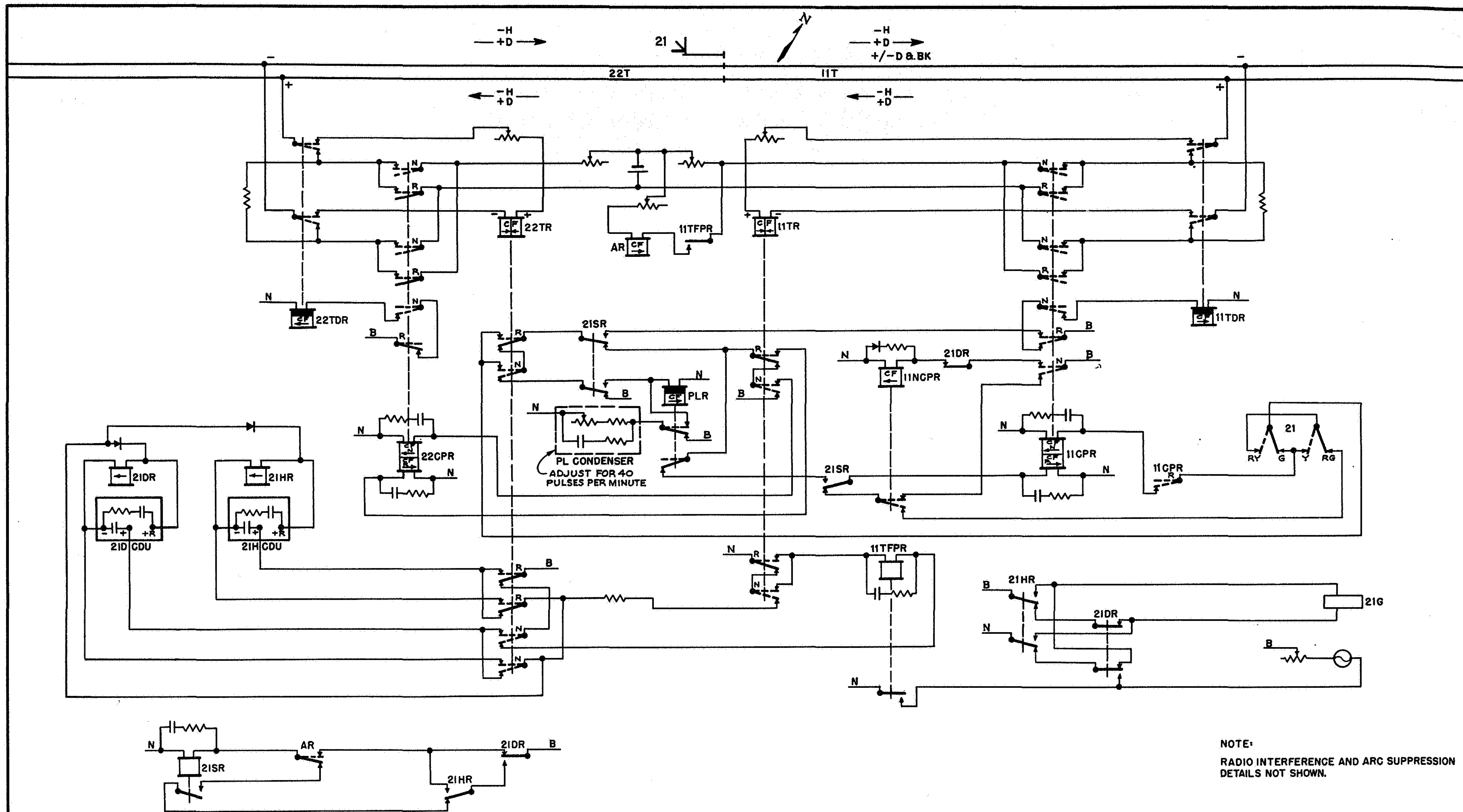
TRAFFIC CONTROL CIRCUITS

USING NORMAL ALTERNATELY REVERSING POLAR CODED TRACK-SLOW CODE (STAGGERED INTERMEDIATE SIGNAL LOCATION)

SEPT. 1958

AAR
SIG. SEC.
8081A

SHEET 4



NOTE:
RADIO INTERFERENCE AND ARC SUPPRESSION DETAILS NOT SHOWN.

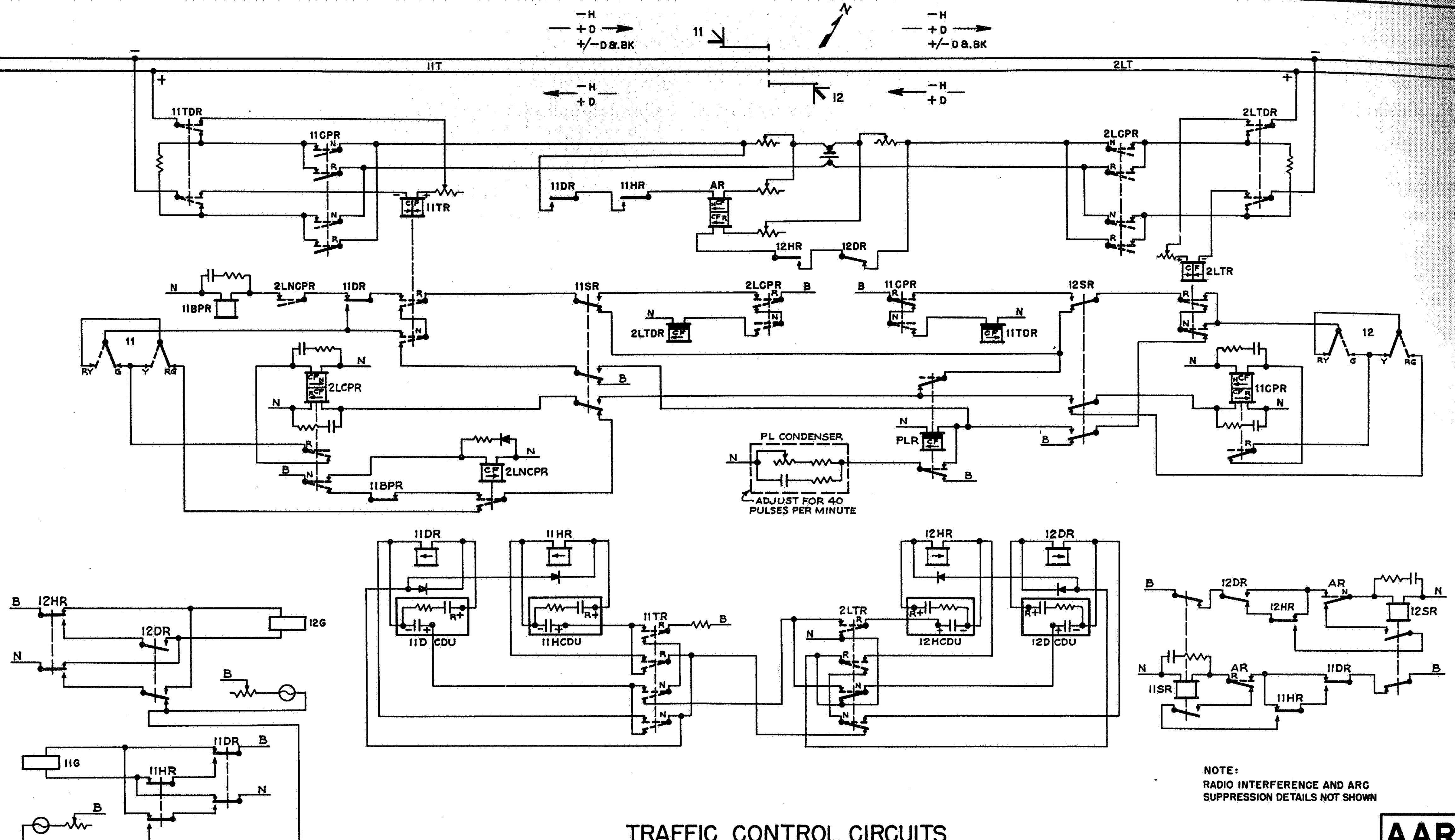
TRAFFIC CONTROL CIRCUITS

USING NORMAL ALTERNATELY REVERSING POLAR CODED TRACK-SLOW CODE (STAGGERED INTERMEDIATE SIGNAL LOCATION)

SEPT. 1958

AAR
SIG. SEC.
8081A

SHEET 5



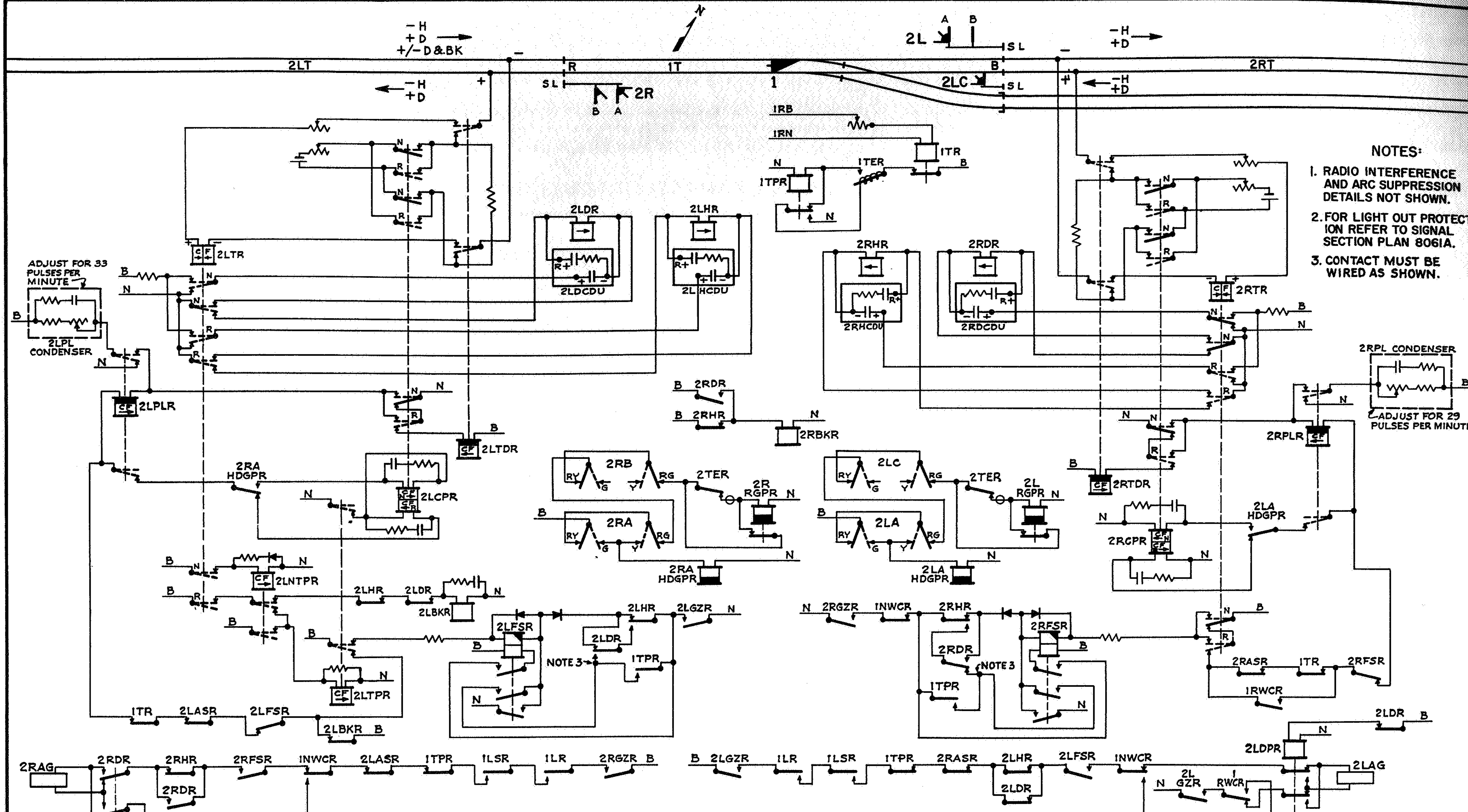
NOTE:
RADIO INTERFERENCE AND ARC SUPPRESSION DETAILS NOT SHOWN

TRAFFIC CONTROL CIRCUITS

USING NORMAL ALTERNATELY REVERSING POLAR CODED TRACK-SLOW CODE (INTERMEDIATE SIGNALS OPPOSITE)

SEPT. 1958

AAR SIG. SEC. 8081A



NOTES:

1. RADIO INTERFERENCE AND ARC SUPPRESSION DETAILS NOT SHOWN.
2. FOR LIGHT OUT PROTECTION REFER TO SIGNAL SECTION PLAN 8061A.
3. CONTACT MUST BE WIRED AS SHOWN.

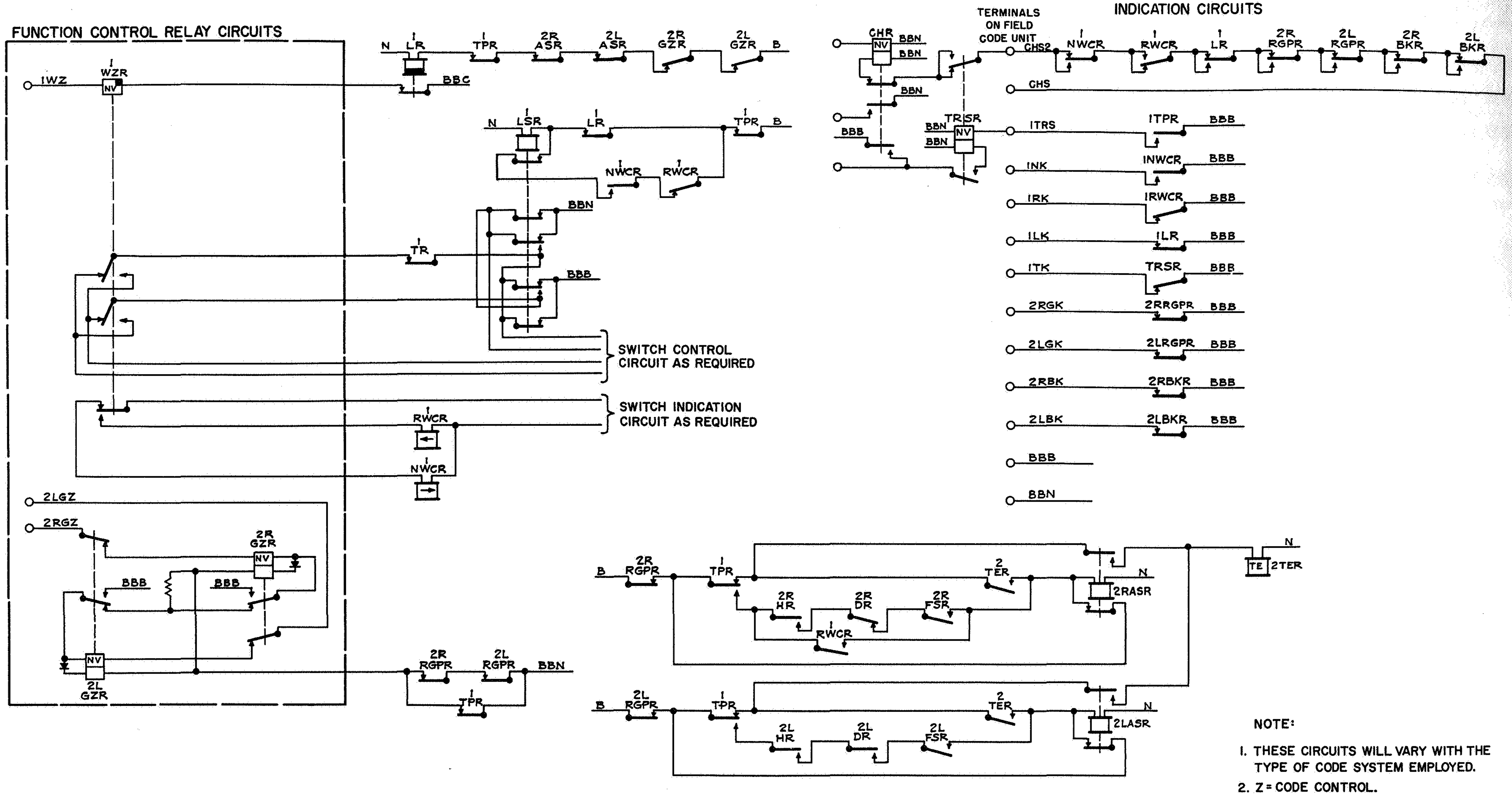
TRAFFIC CONTROL CIRCUITS

USING NORMAL ALTERNATELY REVERSING POLAR CODED TRACK-SLOW CODE (END OF SIDING LOCATION)

SEPT. 1958

AAR SIG. SEC. 8081A

SHEET 7



NOTE:

1. THESE CIRCUITS WILL VARY WITH THE TYPE OF CODE SYSTEM EMPLOYED.
2. Z = CODE CONTROL.

TRAFFIC CONTROL CIRCUITS

USING NORMAL ALTERNATELY REVERSING POLAR CODED TRACK-SLOW CODE (END OF SIDING LOCATION)

SEPT. 1958

AAR SIG. SEC. 8081A

SHEET 8

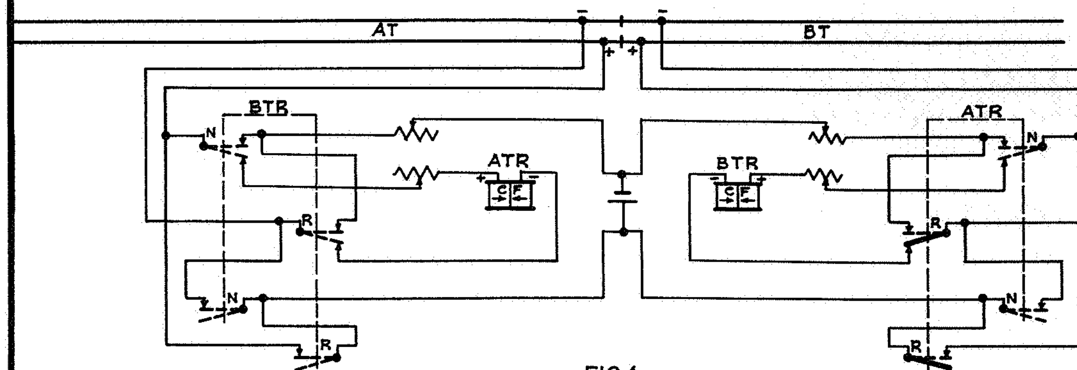


FIG. 1
RELAYED CUT SECTION

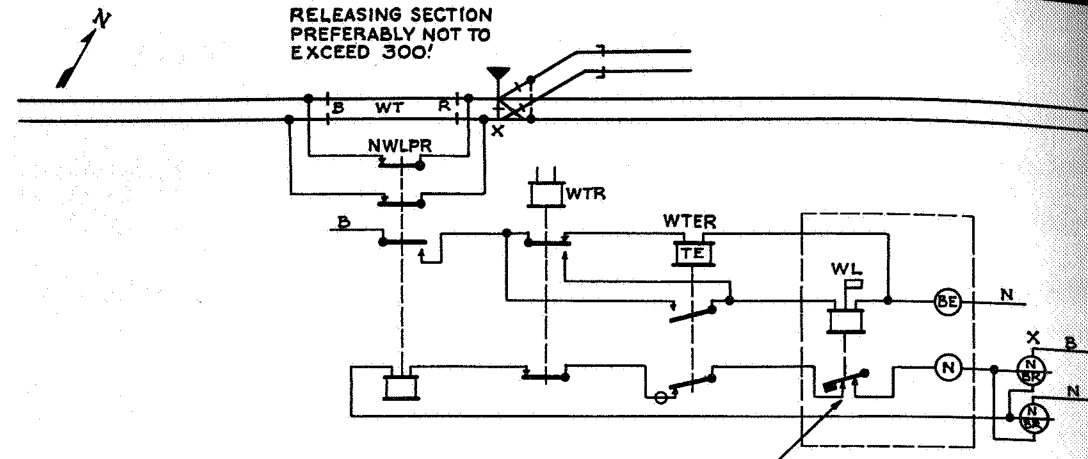


FIG. 2
ELECTRIC SWITCH LOCK

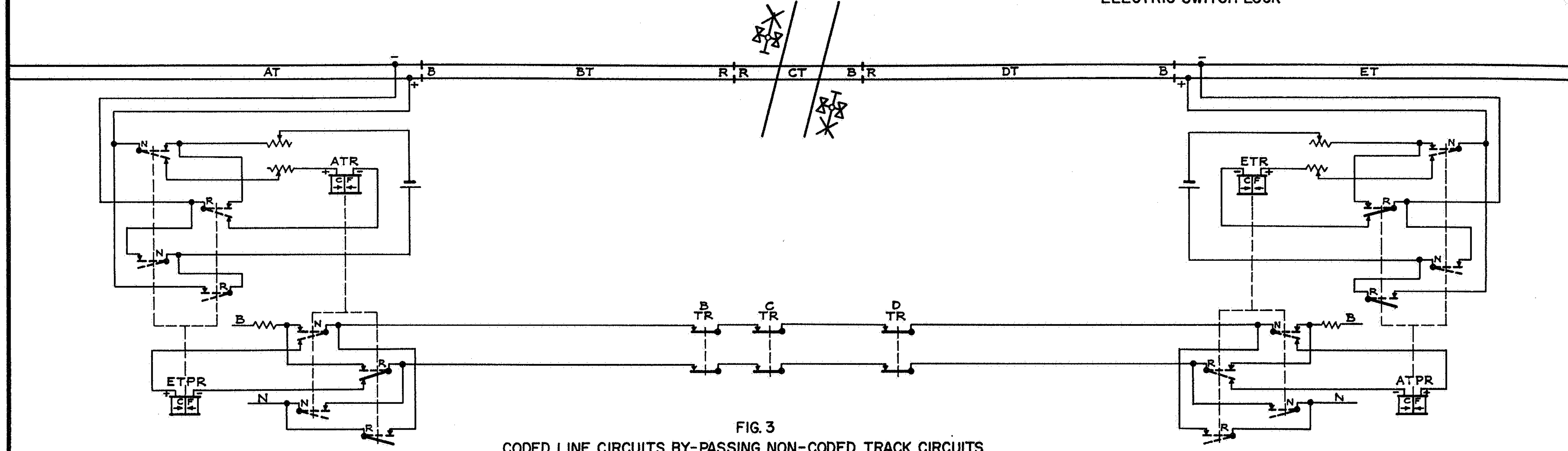


FIG. 3
CODED LINE CIRCUITS BY-PASSING NON-CODED TRACK CIRCUITS

TRAFFIC CONTROL CIRCUITS

USING NORMAL ALTERNATELY REVERSING POLAR CODED TRACK–SLOW CODE
(CUT SECTION, ELECTRIC SWITCH LOCK AND CODED LINE CIRCUITS)

NOTE:
RADIO INTERFERENCE AND ARC SUPPRESSION DETAILS NOT SHOWN

SEPT. 1958

AAR
SIG. SEC.
8081A

ADDENDUM TO AAR SIG. SEC. 8082A

CIRCUITS FOR MODIFIED TRAFFIC CONTROL SYSTEM USING TWO-WIRE LINE CONTROL AND SPRING-POWER ENDS OF SIDING.

Introduction.

The system is based on the use of a power-operated switch with the usual complement of signals at one end of the siding, and a spring switch with a dwarf signal governing the siding-leaving movements at the other end of the siding. A block which may be occupied by only one train at a time, extends from one power switch location to the adjacent power switch location. Provision is not made to permit a train on the siding to move out onto the main track at the spring switch end following a meet while the other train is still on the main track in the siding area. Signal controls are provided by a reversible two-wire line circuit. In the siding area only, an additional two-wire line circuit controls the leave siding signal at the spring switch end of siding.

The system is so arranged that the power switch can be at either end of the siding; however, on these plans the power switch is located on the left hand end as illustrated on machine circuits, Sheet 6, for both signal 4 location and signal 8 location. The field circuits for power switch 3 and signal 4 are shown on Sheets 1 and 2. Circuits for power switch 7 signal 8 are not shown, but would be identical. In studying this addendum it is then necessary to assume that Sheets 1 and 2 apply to both locations and the function numbers 7 and 8 should be substituted for 3 and 4 respectively when using these sheets for location 7-8.

Train movement on main track between sidings when traffic reversal is not required.

(Signal 4R clear and switch 3 normal)

The line circuit is assumed to be as shown with energy feeding from right to left. Signal lever 4 is moved to the right with switch lever 3 normal and starting button 3-4 STPB is pushed. 3-4STR (Sheet 6) picks up and sticks to initiate a control code. This in turn picks up station relay 3-4SR (control circuit not shown) to prepare circuits to feed energy to the proper terminals of the office line coding unit. 4RGR picks up over a circuit checking that 3 "OS" track is unoccupied and sticks over the same circuit when the starting button is released. When the 3-4STR and 4RGR become energized, they energize 4RGSAR (and stick it up over the D relay down) over a circuit, selected by switch lever 3 normal, check that traffic is established rightward, (4-8FR normal); that no switch lock control has been sent out, (4-8WLPR down); and that no conflicting signal is being cleared or is time locked, (4LGSR, 4RGSBR and 6RGSR down). 4RGSAR, 4RGR and 3-4SR being up puts battery on coding unit terminals 1A and 7A (Sheet 6) making steps 9 and 15 long.

Step 15 long reverses 4RHSR (Sheet 2) at the field location by putting battery on terminal 15 and negative on terminal 21 of the field line coding unit. Positive energy will also be applied to post 9 of the coding unit to retain 3NRWSR normal. The indication code to the office will have steps 9, 12, 13 and 15 (office) long since 4RHSR reverse puts battery on terminals 5 and 7 of the field line coding unit; the switch being normal has 3NWCR (Sheet 2) up putting battery on post 1 and 4LHR down puts battery on post 4 (Sheet 2). This retains 3NWKR and 4LBKR, and picks up 4LGKR and 4RGKR (Sheet 7),

ADDENDUM TO AAR SIG. SEC. 8082A - Continued

extinguishing the indication lights over the signal lever, thus indicating that a signal control character is stored in the field. The stick circuit for 4RGSAR (Sheet 6) is maintained when the D relay picks up since step 15 long results in battery over terminal 15D.

4RHSR reverse releases 4RASR (Sheet 1) which releases 4RARR and 3LR. 4RARR down opens the battery feed to the line circuit to the spring switch end, to prevent clearing an opposing or converging signal. 3LR dropping opens the circuit from the line coding unit to relay 3NRWSR (Sheet 2) preventing a change in the position of this relay due to coding action; also opens control to switch machine and completes pick-up circuit for signal mechanism 4RAG which then displays green.

Signal 4RAG clear drops 4RRGPR, removing battery from terminal 5 (Sheet 2), leaving it on terminal 7, and opening the ST circuit momentarily. An indication code will be transmitted having steps 9, 12 and 15 long and step 13 short. This retains 3NWKR, 4LBKR, 4RGKR energized in the machine (Sheet 7) and releases 4LGKR, lighting the right signal clear indication light. The signal mechanism clear picks up 4RADGPR (Sheet 1) which pole-changes the line circuit to the approach signal 22 (Sheet 5), clearing it from yellow to green if 22T and 22AT are not occupied.

Train accepts signal and enters block.

When the train passes signal 4R, track 3T is shunted and 3TR, 3TPR and 3TKSR release in succession (Sheets 1 and 2). 3TPR down opens the signal mechanism circuit (Sheet 1), which drops 4RADGPR and picks up 4RRGPR: 3TKSR down puts battery on terminal 2 of the line coding unit (Sheet 2) and terminal 4 of the extension unit, thus making steps 10 and 20 long in the indication code, opens the ST circuit initiating the indication code, places 4RHSR normal by the circuit to the lower coil and changes the circuit for the upper coil from post 21 to post 23 so that succeeding control codes can operate the relay to normal only. 4RHSR normal and 3TPR and 11TR down close the pick-up circuit for 4RASR (Sheet 1). 4RRGPR up and 4RHSR normal remove battery from terminal 7 of the line coding unit (Sheet 2) making step 15 short. The indication code will have steps 9, 10, 12 and 20 long and step 15 short. In the machine this retains 3NWKR and 4LBKR energized, picks up 3TKR and 4RBKR, and releases 4RGKR, lighting the "OS" indication light, block indication light between signal 4 and 8, and signal 4 stop indication light, (Sheets 6 and 7). 3TKR picking up releases 4RGR and step 15 short releases 4RGSAR by interrupting its stick circuit.

When the train advances into track circuit 11T, 11TR is shunted, and 11TKSR, 4RBPR and 4RHR release. 11TKSR dropping opens the ST circuit momentarily to send an indication code having step 18 long, picking up 11TKR in the machine. When the rear end of the train clears the "OS" track circuit, 3TR and 3TPR pick up; 3TKSR also picks up providing the "OS" occupied indication code had been transmitted (if this has not occurred, MSTPR (Sheet 2) will be down since ST is down, and the TKSR pick-up circuit is held open until this "OS" occupied code is transmitted and ST and MSTPR pick up). When 3TR picks up, energy of reverse polarity is fed on the line circuit to the approach signal to cause it to display yellow. 3TPR up energizes 3LR, removes battery from terminal 2 of the coding unit and interrupts the ST circuit. The indication code is transmitted with step 10 short releasing 3TKR and extinguishing the "OS" indication light.

The train next enters track circuit A11T at signal 11 location (Sheet 4) and shunts A11TR. This releases the BPR relays at both signal 11 and the spring switch locations, the latter taking energy off the line circuit to the power switch end of siding. When the rear end of the train clears 11T, 11TR and 11TKSR pick up (the latter when MSTPR is up) interrupting the ST circuit to send an indication code having step 18 short and releasing 11TKR in the machine. The 11TKSR circuit enforces the sending of an 11TKR occupied indication to the control machine even though this track circuit may be occupied only for a short period of time.

If signal 8RA (same as 4RA) (Sheet 1) is displaying proceed, the line circuit to the approach signal will be energized with normal polarity and signal 22 will be green. If signal 8R is displaying other than proceed, the line circuit polarity will be reverse, and signal 22 will be yellow.

Train clears block.

When the rear end of the train clears the track circuit at the power switch location (Sheet 1) and 7TR (same as 3TR) picks up, the line circuit to the approach signal is closed. Signal 22 (Sheet 5) clears and 22HDGPR picks up, energizing the line circuit to the rear. At signal 11 and spring switch end of siding (Sheet 4) the BPR relays pick up which in turn energizes the line circuit to the power switch end of siding.

At the power switch location, 4RBPR and 4RHR pick up. 4RBPR interrupts the ST circuit (Sheet 2) and removes battery from terminal 4 of the extension unit. An indication code is transmitted to the machine with step 20 short; this releases 4RBKR (Sheet 7), extinguishing the block indication light between signals 4 and 8 (Sheet 6).

Train entering siding over power switch reverse.

(Signal 4R restricting and switch 3 reverse)

Switch lever 3 is placed reverse, signal lever 4 to the right and starting button 3-4STPB pushed. 4RGR and 3-4STR (Sheet 6) pick up, which picks up 4RGSBR over a circuit selected by switch lever 3 reverse, and 4LGSR and 4RGSAR down. This puts battery on terminals 3A and 7A of the coding unit, making steps 11 and 15 long.

When the control code is received at the field location (Sheet 2), battery on terminals 11 and 15 reverses 3NRWSR and 4RHSR. 3NRWSR reverse opens the circuit of 3NWCR (Sheet 2) which drops before 4RHSR goes reverse, thus retaining 4RASR energized. 3NRWSR pole-changes the circuit to switch control relay, starting the switch machine operating to its reverse position. 3NWCR dropping interrupts the ST circuit, and the indication code will have steps 9 and 11 short and 13 and 15 long. This releases 3NWKR and energizes 4LGKR and 4RGKR in the machine (Sheet 7), extinguishing the normal switch and signal stop indication lights. When the switch machine locks up reverse, 3RWCR picks up (Sheet 2), and

ADDENDUM TO AAR SIG. SEC. 8082A - Continued

4RASR and 3LR drop. 4RBHR picks up, 4RRGPR drops and signal 4R displays restricting. With 3RWCR up, and 4RRGPR down, an indication code will be transmitted to pick up 3RWKR and release 4LGKR leaving 4RGKR up; the reverse switch indication and signal clear right indication lights will be lighted.

When the train accepts signal 4R, the action is similar to that of a through movement described above, except that the block indication, terminal 4 of the extension unit (Sheet 2) is not disturbed since 4RARR remains up.

Train leaving siding over spring switch.

(Signal 6R clear)

Signal lever 6 is moved to the right and starting button 6STPB pushed. 6RGR and 3-4STR pick up (Sheet 6), which picks up 6RGSR. 3-4SR picks up and puts battery on coding unit connection A1, making step 17 long (Sheet 6). 6RHSR (Sheet 2) is reversed and 6RHR picks up (Sheet 1). An indication code is sent having steps 17 and 19 long, picking up 6LGKR and 6RGKR in the machine (Sheet 7) and extinguishing the signal stop indication light. 6RHR up closes the line circuit to the spring switch end of siding.

At the spring switch location (Sheet 4) 6RHPR picks up, 6RASR drops, signal 6R displays green, and 6RRGPR drops. When 6RASR drops, the polarity on the line circuit to the power switch end of siding is changed from normal to reverse.

At the power switch end of siding (Sheet 2) 4RHR drops and 4RBPR drops and picks up again interrupting the ST circuit. The indication code will have step 17 short and step 19 long which will release 6LGKR and retain 6RGKR (Sheet 7) thus lighting the right signal clear indication light.

When the train accepts signal 6R, 11TR (Sheet 1) and 11TKSR (Sheet 2) drop, and the line circuit to the spring switch is opened releasing 4RBPR (Sheet 1). 11TKSR dropping opens the ST circuit, places 6RHSR normal over the lower coil circuit and transfers the upper coil circuit from terminal 21 to 23. The indication code transmitted will have step 18 long which picks up 11TK releasing 6RGR, 20 long which picks up 4RBKR lighting 4-8 block indication, and 19 short which releases 6RGSR by interrupting its stick circuit and releasing 6RGKR thereby lighting the signal stop indication light over lever 6. When the line circuit to the spring switch is opened by 11TR dropping, 6RHR (Sheet 1) and 6RHPR (Sheet 4) drop, signal 6R goes to stop, and 6RRGPR picks up. 6RASTER is energized and after the heating time, 6RASR picks up.

When the rear end of the train clears 11T, 11TR (Sheet 1) and 11TKSR (Sheet 2) pick up, the latter when MSTPR is up. 11TKSR picking up transmits an indication code to the machine to release 11TKR. The action at other locations as the train proceeds is described above.

Train movement between sidings requiring traffic reversal.

(Signal 8LA (same as 4LA) clear)

Signal lever 8 is moved to the left with switch lever 7 normal and starting button 7-8STPB pushed. 8LGR (Sheet 7) and 7-8STR and 3-4STR (Sheet 6) are picked up, 4-8FR is energized reverse over a circuit which checks the block unoccupied and opposing signals at stop and not in time. 8LGSR picks up after 7-8STR (Sheet 7) and sends the control code to a new entrance end of the block, formerly an exit end. This code will have step 12 short (since 4-8FR is now reverse) and 13 long. At the field location, 8LFSR is placed normal and 8LHSR reverse (Sheet 2). 8LFSR normal disconnects the feed to the line circuit (Sheet 1). Signal 22 (Sheet 5) goes to stop, 22HDGPR drops and opens the line circuit to the rear. At signal 11 and the spring switch locations (Sheet 4) the BPR relays drop, opening the line circuit to the power switch location (Sheet 1) and 4RHR and 4RBPR drop. 4RBPR down puts battery on terminal 4 of the extension unit and sends an indication code to pick up 4RBKR (Sheet 7).

The control code to the new exit end of the block will have step 14 long since 4-8FR reverse puts battery on terminal 6A (Sheet 2). This code received at the field location reverses 4RFSR (Sheet 2). This connects energy to the line circuit to the spring switch location and picks up relay HPR which in turn applies energy to the line circuit to signal 11 location.

Signal 11 clears, and 11HDGPR picks up, applying energy to the line circuit in the rear. At signal 22 (Sheet 5), BPR picks up and connects battery to the line circuit feeding toward the power switch location (Sheet 1) where 8LHR picks up. 8LHR picking up initiates an indication code with the block clear indication, step 12 short; also when 8LHR picks up, it energizes 8RLHPR which permits signal 8LA to clear. Succeeding action is similar to that described above.

Electric switch lock operation.

The electric switch lock circuits are shown on Sheets 3 and 5. Train on main line stopping within approximately 150 feet of the switch shunts the AFO circuit and WLRR and NWLPR release. When the door of the lock is opened the lock magnet is energized; the switch may then be unlocked and operated.

When a movement is to be made to the main line, the control machine operator positions the switch lock control lever, 4-8WL, to the left or right depending on the direction that the train will take after leaving the lock location. In this case, assume the train movement will be to the left after leaving the lock location and that traffic was last established to the right. Pushing 4-8WL push-turn lever picks up 3-4STR and 7-8STR (Sheet 6) to send control codes to each end of the block. 4-8WL to the left picks up 4-8WLPR over a circuit that checks that no opposing signal is being cleared or is in time, and that the block is unoccupied. The control codes to each end of the block will have long traffic steps, step 14 station 3-4 (Sheet 6) and step 12 station 7-8 (Sheet 7). This leaves the right-hand end of the block as a feed point with 8LFSR reverse and converts the left-hand end of the block from a receiving to a feed point by reversing 4RFSR. When the door of the switch lock is opened, NWLPR drops and connects EBPR and WBPR to the line circuit. When energy is received from both directions, the relays (EBPR and WBPR) pick up and energize the lock magnet. The switch may then be unlocked and operated.

When the train has entered the main line the switch is placed normal, locked and the door closed. The operator may place the push-turn lever in its center position, which picks up 3-4STR and 7-8STR and releases 4-8WLPR (Sheet 6). The code to station 3-4 will continue to have step 14 long since 4-8FR remains reverse, and this maintains a line circuit feed from left to right. The code to station 7-8 will have step 12 short, and the line circuit feed from right to left will be cut off.

Had the train direction been to the right after leaving the electric lock location, the operation would be the same except that no traffic reversal would have been necessary and 4-8FR would have remained normal, and after putting the 4-8WL lever normal, the line circuit feed would have again been left to right in the block.

When the switch lock is located in track circuit 11T (Sheet 3), the EBPR relay fed from the direction of the spring switch is biased so that it will pick up only when the leave siding signal is at stop and the locking released. Otherwise the circuit operation is the same as described above.

Replacing signal at power switch to stop before having been accepted by train.

(Signal 4R clear)

Signal lever 4 is returned to its center position and starting button 3-4STPB pushed. 4RGR drops and 3-4STR picks up (Sheet 6). The control code is transmitted with step 15 short since 4RGR is down (Sheet 6). At the field location (Sheet 2) 4RHSR is positioned normal, opening the signal control circuit (Sheet 1), signal 4R going to stop, drops 4RADGPR and picks up 4RRGPR. 4RHSR normal and 4RRGPR up picks up 4RLASPR to start the operation of time element relay 4TER. The indication code returned to the office will have steps 13 and 15 long since 4RLASPR is up. In the machine, this picks up 4LGKR and retains 4RGKR (Sheet 7) and 4RGSAR (Sheet 6). 4LGKR and 4RGKR up, extinguish the signal clear indication light. At the expiration of the time interval, 4RASR (Sheet 1) picks up, dropping 4RLASPR, and picking up 3LR. 4RLASPR interrupts the ST circuit to send an indication code having steps 13 and 15 short which releases 4LGKR, 4RGKR and 4RGSAR in the machine, lighting the signal stop indication light.

Replacing signal at spring switch to stop before having been accepted by train.

(Signal 6R clear)

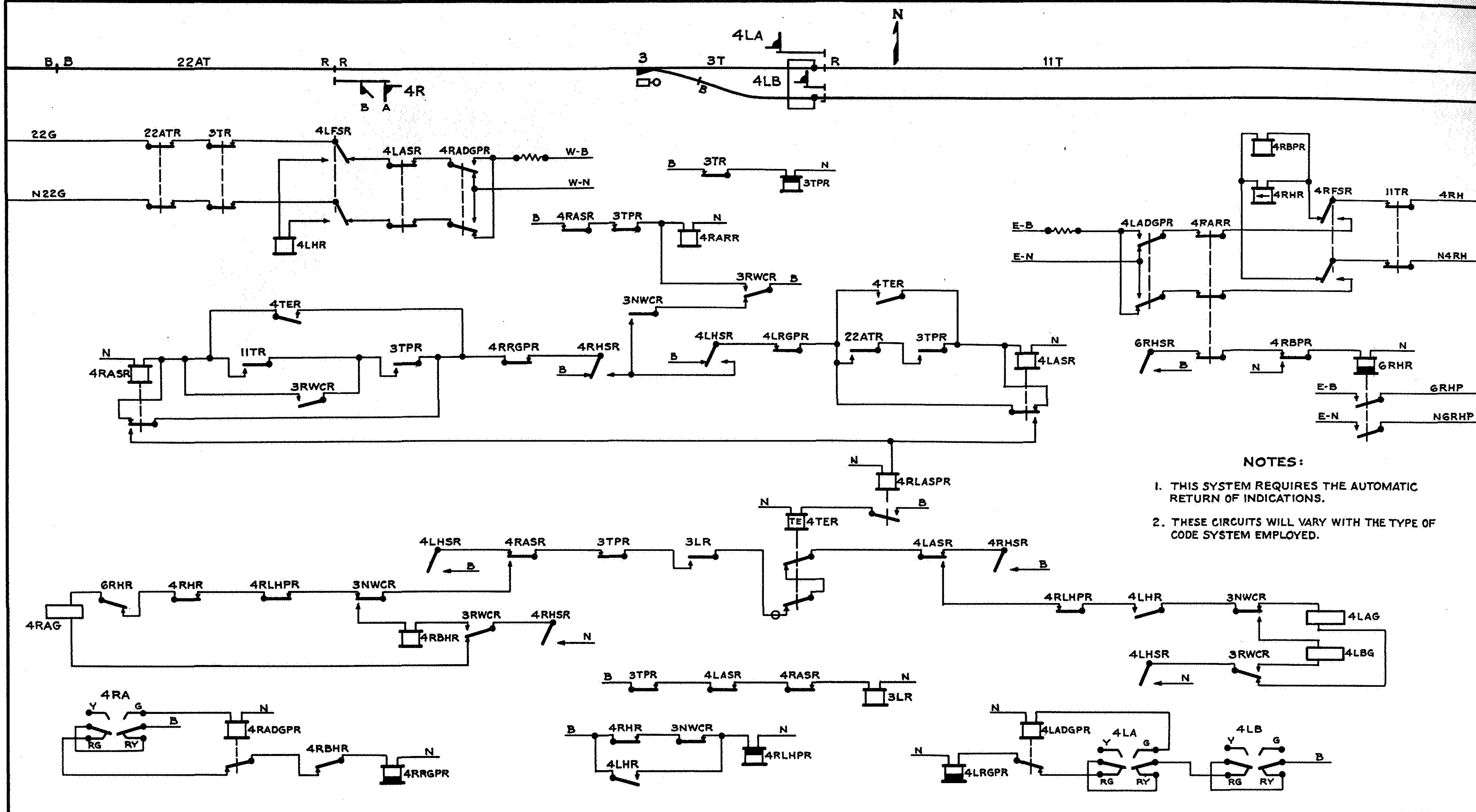
Signal lever 6 is placed normal and starting button 6STPB pushed. 6RGR drops and 3-4STR picks up (Sheet 6). The control code will have step 17 short since 6RGR down takes battery off connection A1 (Sheet 6). At the field location (Sheet 2), 6RHSR is positioned normal, dropping 6RHR (Sheet 1) thereby opening the line circuit to relay 6RHPR at the spring switch location. An indication code is transmitted with steps 17 and 19 long, picking up 6LGKR and retaining 6RGKR (Sheet 7), extinguishing the signal clear indication light. Signal 6R goes to stop, 6RRGPR picks up and energizes thermal time element relay 6RASTER. Reverse polarity continues to be fed to the line circuit to the power switch end. At the end of the time interval, 6RASR picks up, which changes the polarity of the feed to the line circuit from reverse to normal. At the power switch location, 4RBPR drops and picks up again, and 4RHR picks up (Sheet 1), initiating an indication code having steps 17 and 19 short. In the machine this releases 6LGKR and 6RGKR and lights the signal stop indication light.

General.

The series resistors in the line circuits shown on Sheet 1 are necessary in order to limit the current in the line when the battery at the home signal location becomes momentarily connected in series with the battery at the distant signal location when traffic is being reversed.

With reference to Note 1 on Sheet 1, this system requires the automatic return of indications. This means that whenever a control code is transmitted means must be provided to get an immediate response of indications. This is necessary in order to maintain the locking in the machine circuits and also to display indications on the machine to inform the operator that such locking exists.

For example, when transmitting a control code to clear a signal, a GSR relay in the machine (Sheet 6) is picked up and held up by its stick circuit over the indication delivery relay D. A subsequent indication code, which will contain either "signal stored" or "signal clear" information, will maintain the GSR relay energized when the D relay picks up because energy is supplied to the coding unit terminal connected to the front contact of the D relay. In the event the signal has not yet cleared or for some reason cannot clear the "signal stored" indication would be received. The indication for this condition is displayed by darkening all indication lights over the signal lever and this in conjunction with the lever itself being either in the left or right position is interpreted by the operator that the signal character has arrived at the field and that locking exists in the machine. It is also a reminder that in order to remove this condition (in the event the signal does not or cannot clear) the operator must place the lever normal and send a stop signal character.



NOTES:

1. THIS SYSTEM REQUIRES THE AUTOMATIC RETURN OF INDICATIONS.
2. THESE CIRCUITS WILL VARY WITH THE TYPE OF CODE SYSTEM EMPLOYED.

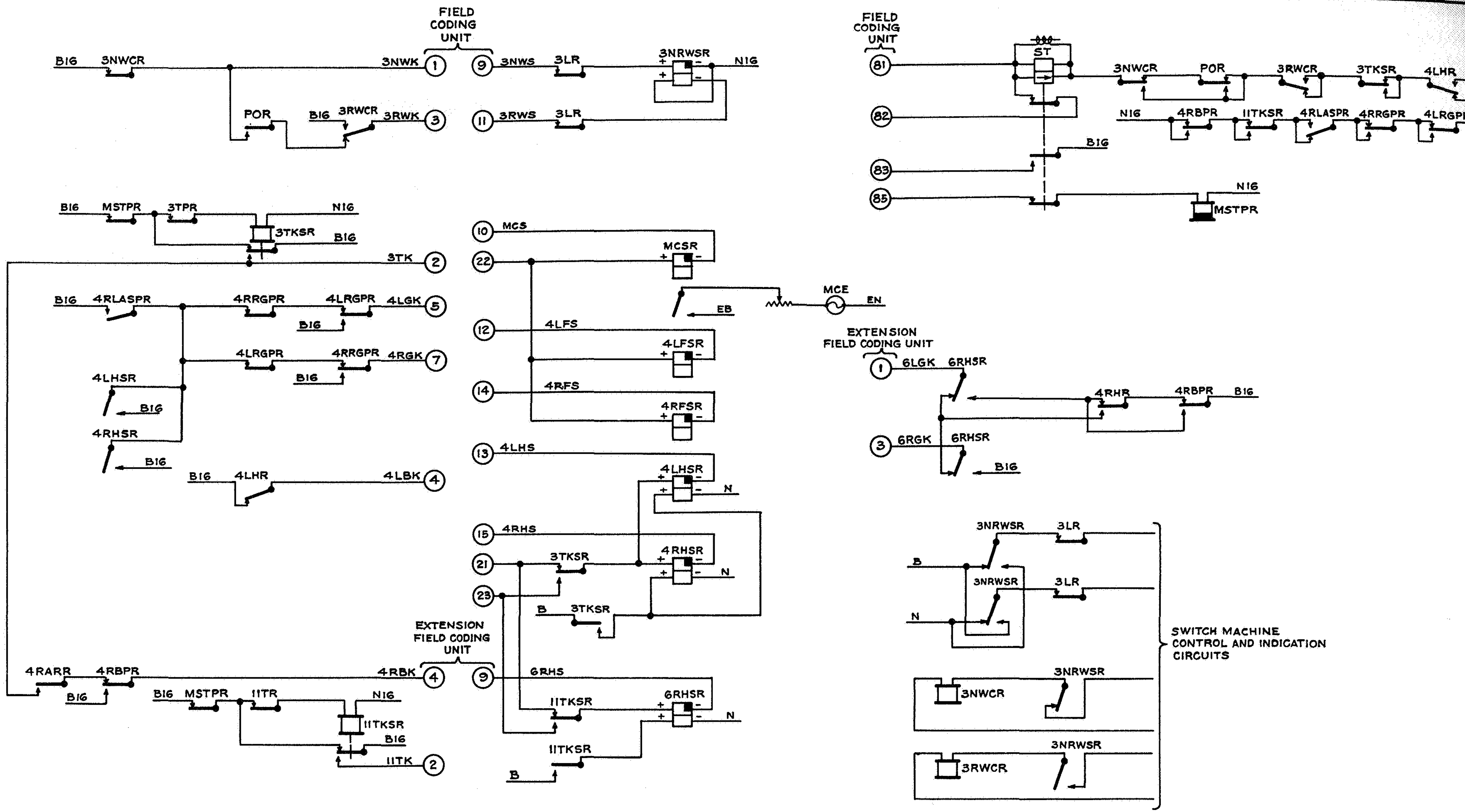
CIRCUITS FOR MODIFIED TRAFFIC CONTROL SYSTEM

USING TWO WIRE LINE CONTROL AND SPRING-POWER ENDS OF SIDING (POWER SWITCH LOCATION)

AAR SIG. SEC. 8082A

SEPT. 1958

SHEET 1



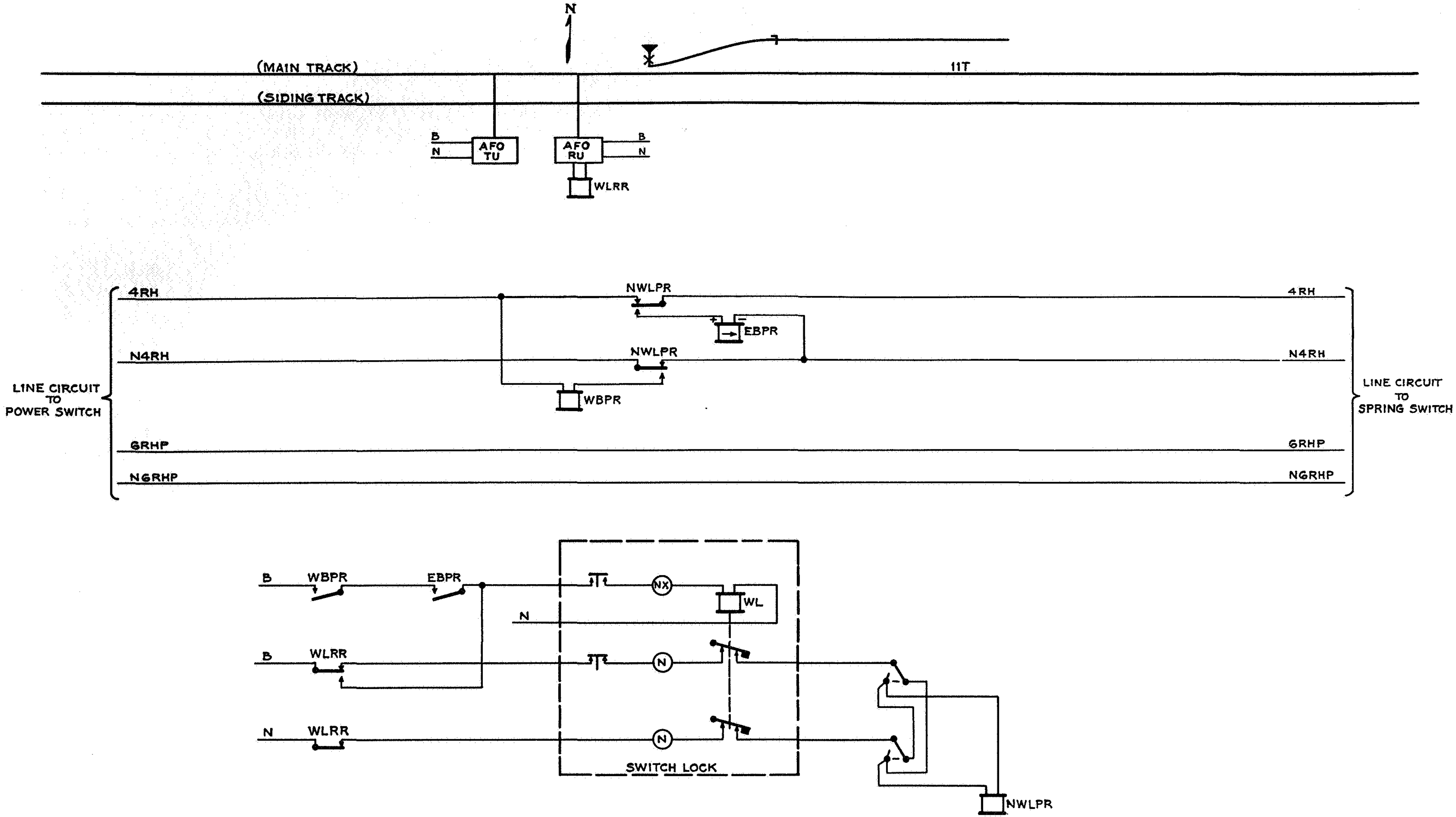
CIRCUITS FOR MODIFIED TRAFFIC CONTROL SYSTEM

USING TWO WIRE LINE CONTROL AND SPRING-POWER ENDS OF SIDING (POWER SWITCH LOCATION)

SEPT. 1958

AAR SIG. SEC. 8082A

SHEET 2



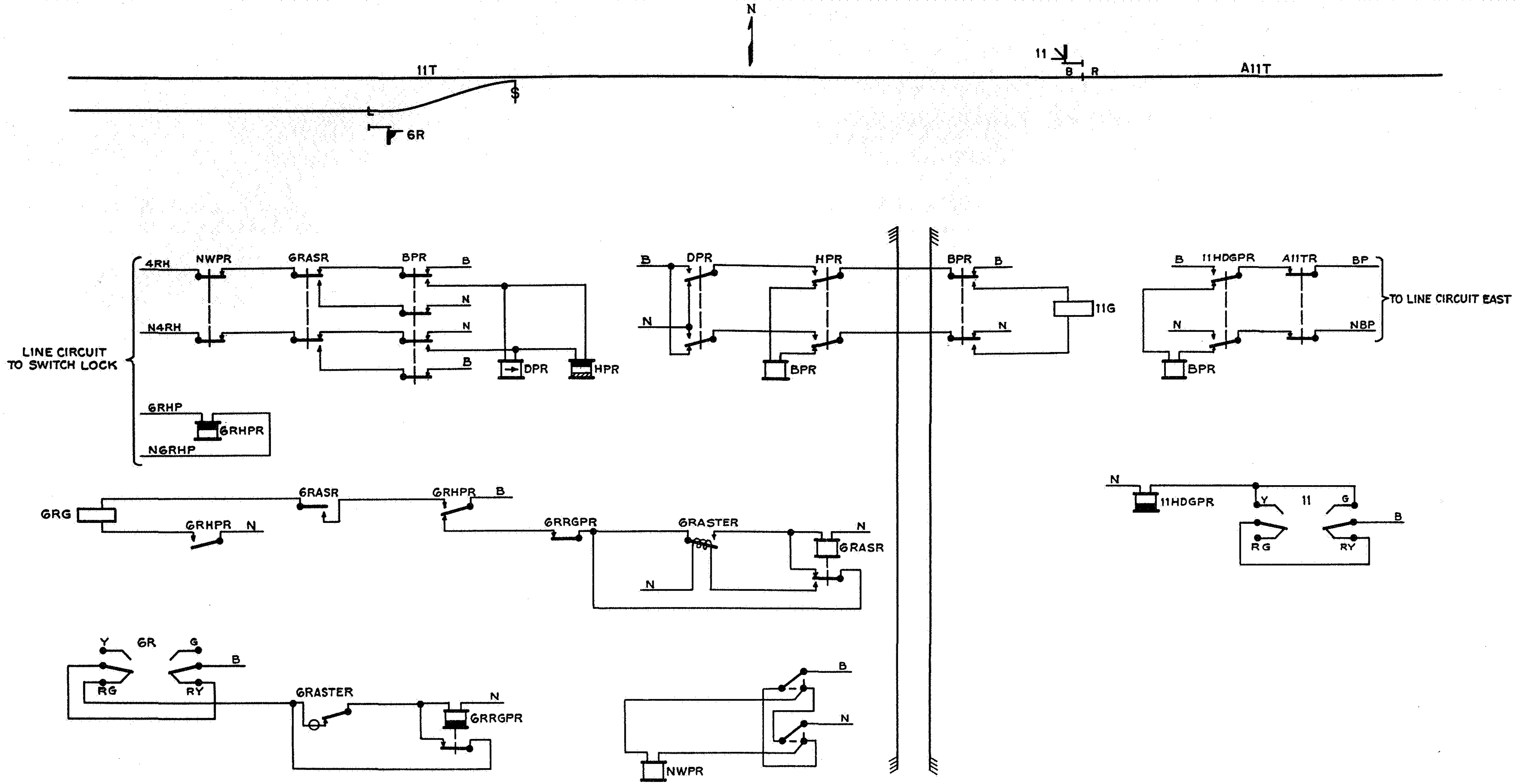
CIRCUITS FOR MODIFIED TRAFFIC CONTROL SYSTEM

USING TWO WIRE LINE CONTROL AND SPRING-POWER ENDS OF SIDING (ELECTRIC SWITCH LOCK LOCATION WITHIN SIDING AREA)

SEPT. 1958

AAR SIG. SEC. 8082A

SHEET 3

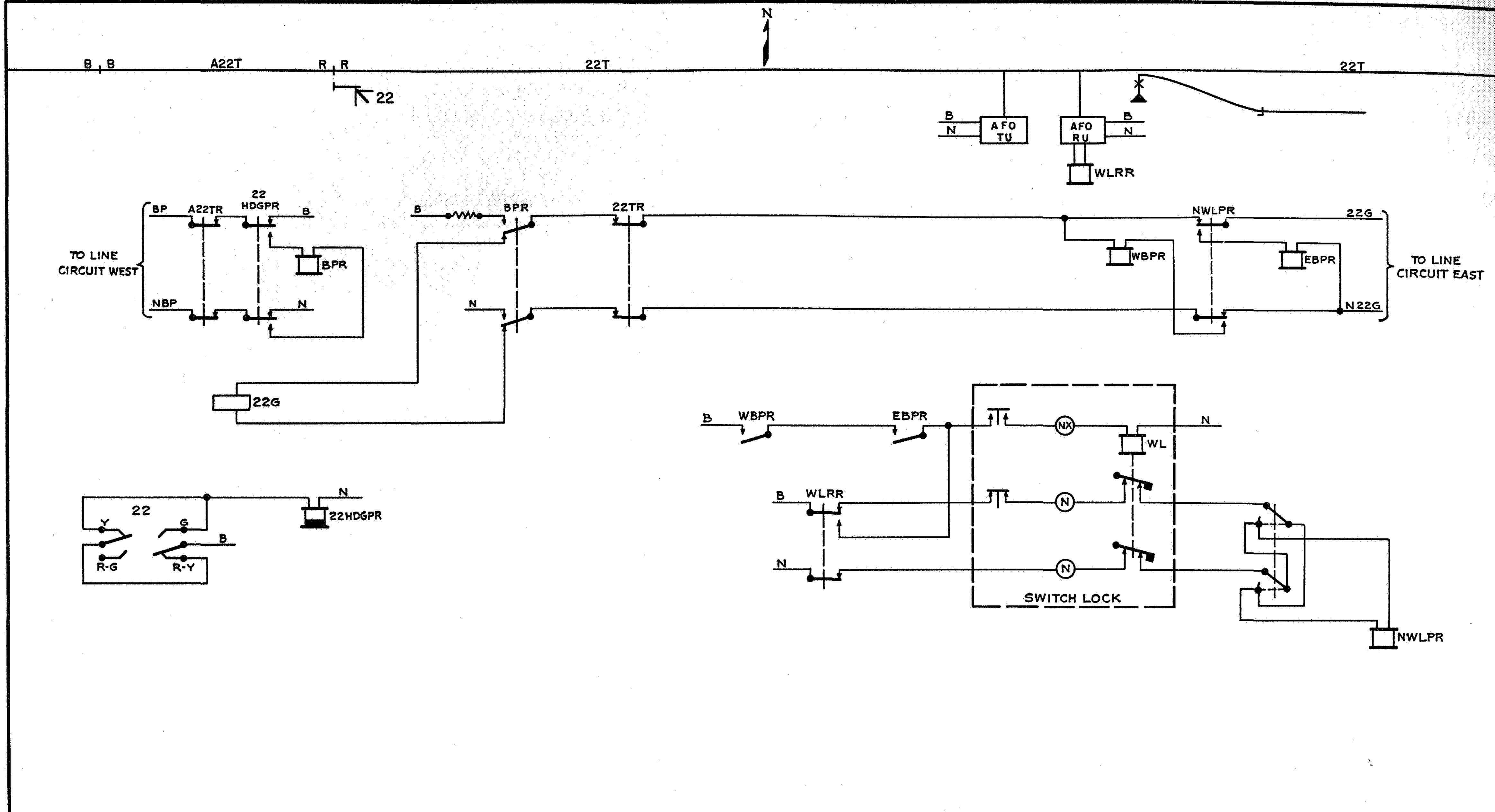


CIRCUITS FOR MODIFIED TRAFFIC CONTROL SYSTEM

USING TWO WIRE LINE CONTROL AND SPRING-POWER ENDS OF SIDING (SPRING SWITCH AND APPROACH SIGNAL TO POWER SWITCH)

SEPT. 1958

AAR SIG. SEC. 8082A



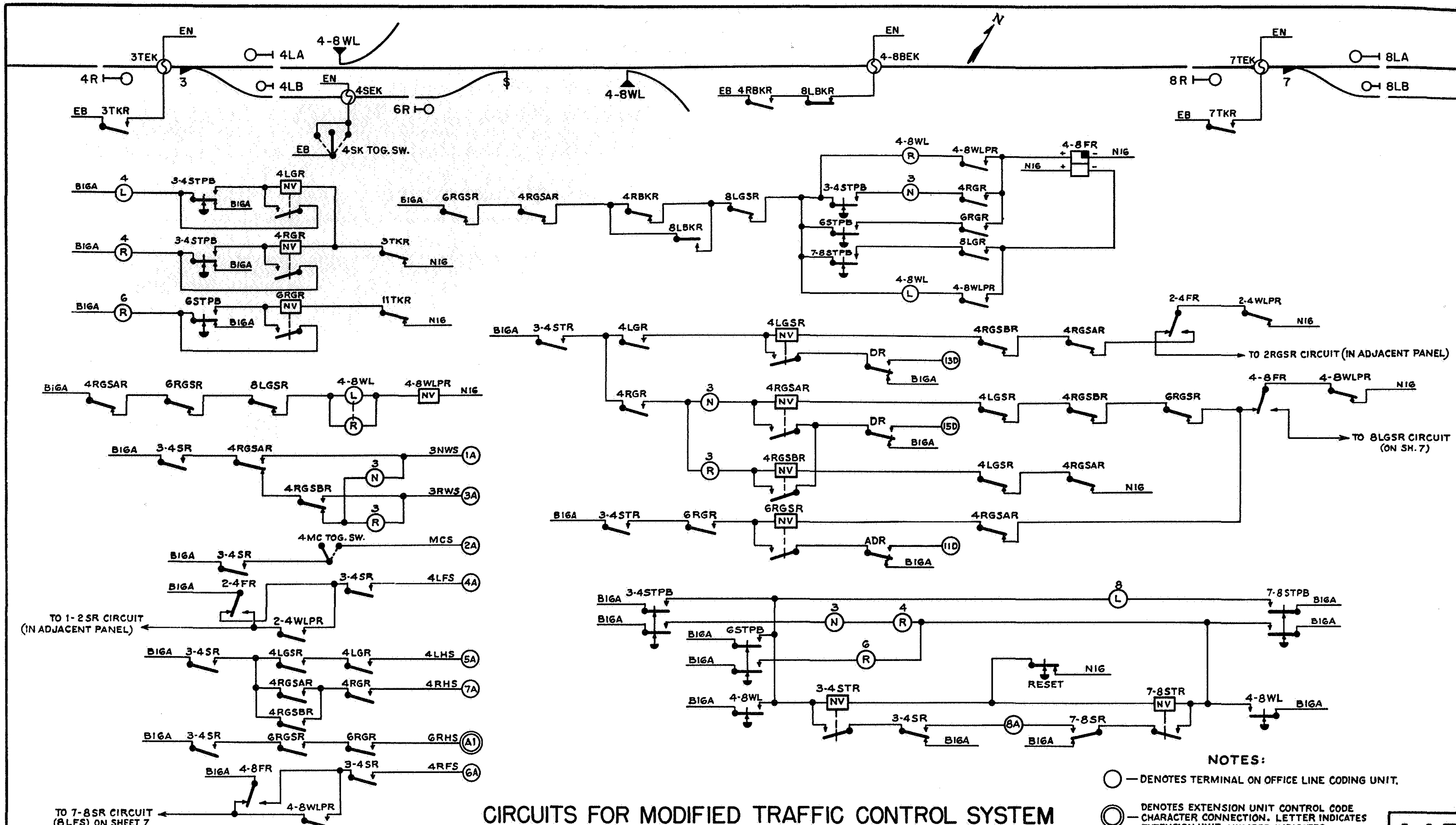
CIRCUITS FOR MODIFIED TRAFFIC CONTROL SYSTEM

USING TWO WIRE LINE CONTROL AND SPRING-POWER ENDS OF SIDING (APPROACH SIGNAL TO POWER SWITCH AND SWITCH LOCK)

SEPT. 1958

AAR
SIG. SEC.
8082A

SHEET 5



NOTES:

◯ — DENOTES TERMINAL ON OFFICE LINE CODING UNIT.

◎ — DENOTES EXTENSION UNIT CONTROL CODE CHARACTER CONNECTION. LETTER INDICATES EXTENSION UNIT, NUMBER INDICATES RESPECTIVE FUNCTION ASSIGNMENT.

CIRCUITS FOR MODIFIED TRAFFIC CONTROL SYSTEM

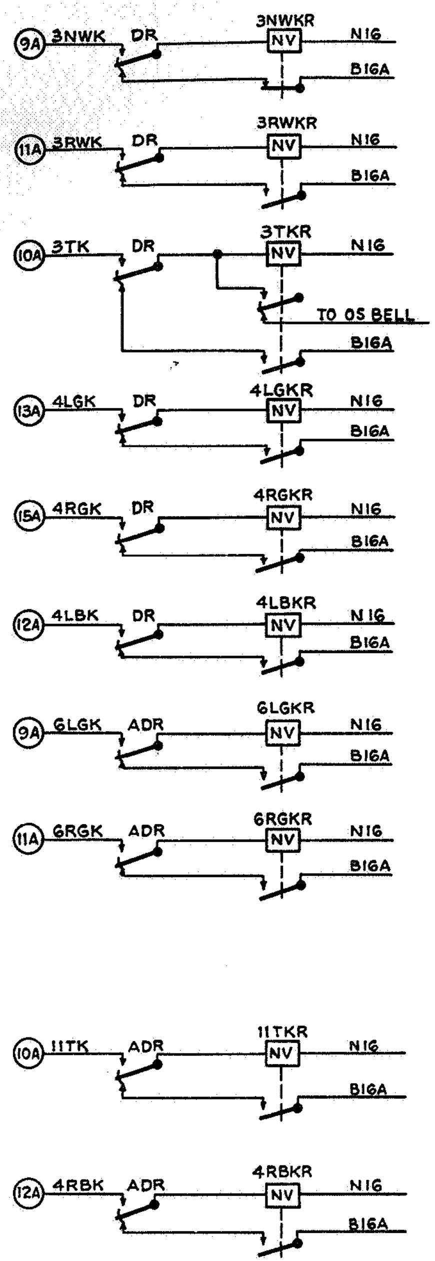
USING TWO WIRE LINE CONTROL AND SPRING-POWER ENDS OF SIDING

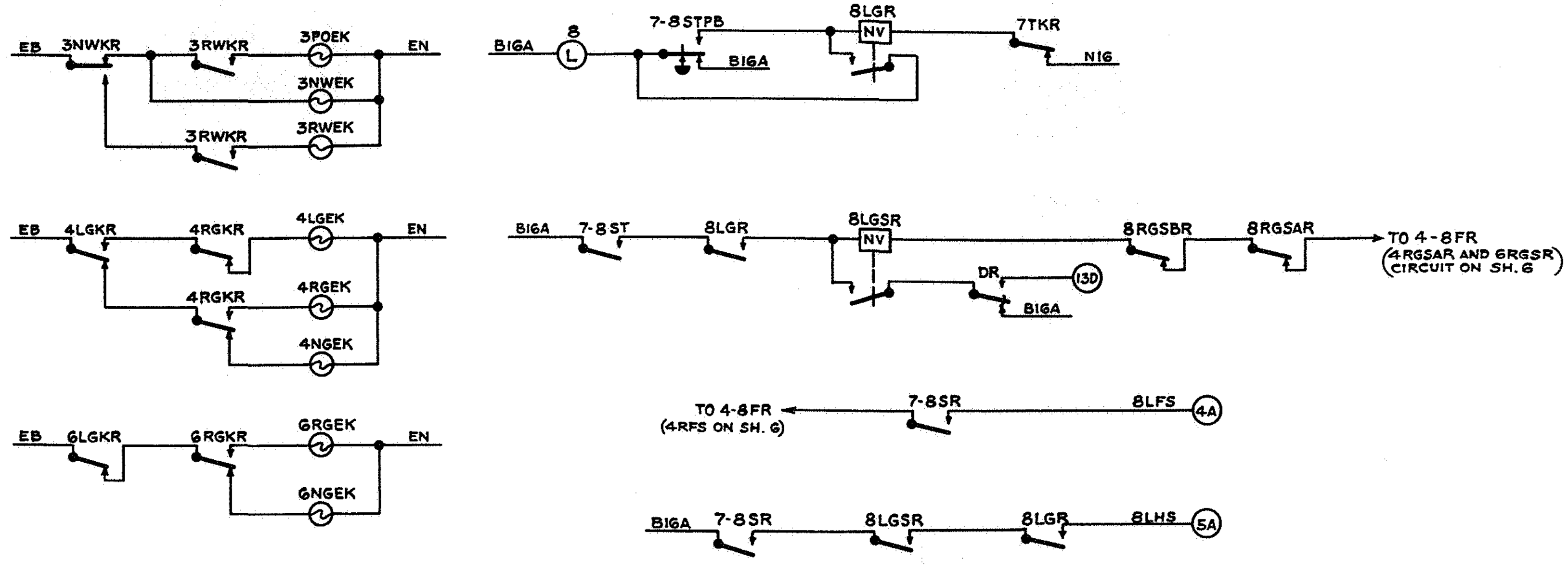
(CONTROL MACHINE CIRCUITS)

SEPT. 1958

AAR
SIG. SEC.
8082A

SHEET 6





	CODE AND FUNCTION ASSIGNMENTS														
	CONTROL CODE								INDICATION CODE						
OFFICE POST	LCS OR EXT.	1	2	3	4	5	6	7	9	10	11	12	13	14	15
FIELD POST		9	10	11	12	13	14	15	1	2	3	4	5	6	7
FUNCTION ASSIGNMENT	LCS	3NWS	MCS	3RWS	4LFS	4LHS	4RFS	4RHS	3NWK	3TK	3RWK	4LBK	4LGK		4RGK
	EXT.	6RHS							6LGK	11TK	6RGK	4RBK			

CIRCUITS FOR MODIFIED TRAFFIC CONTROL SYSTEM

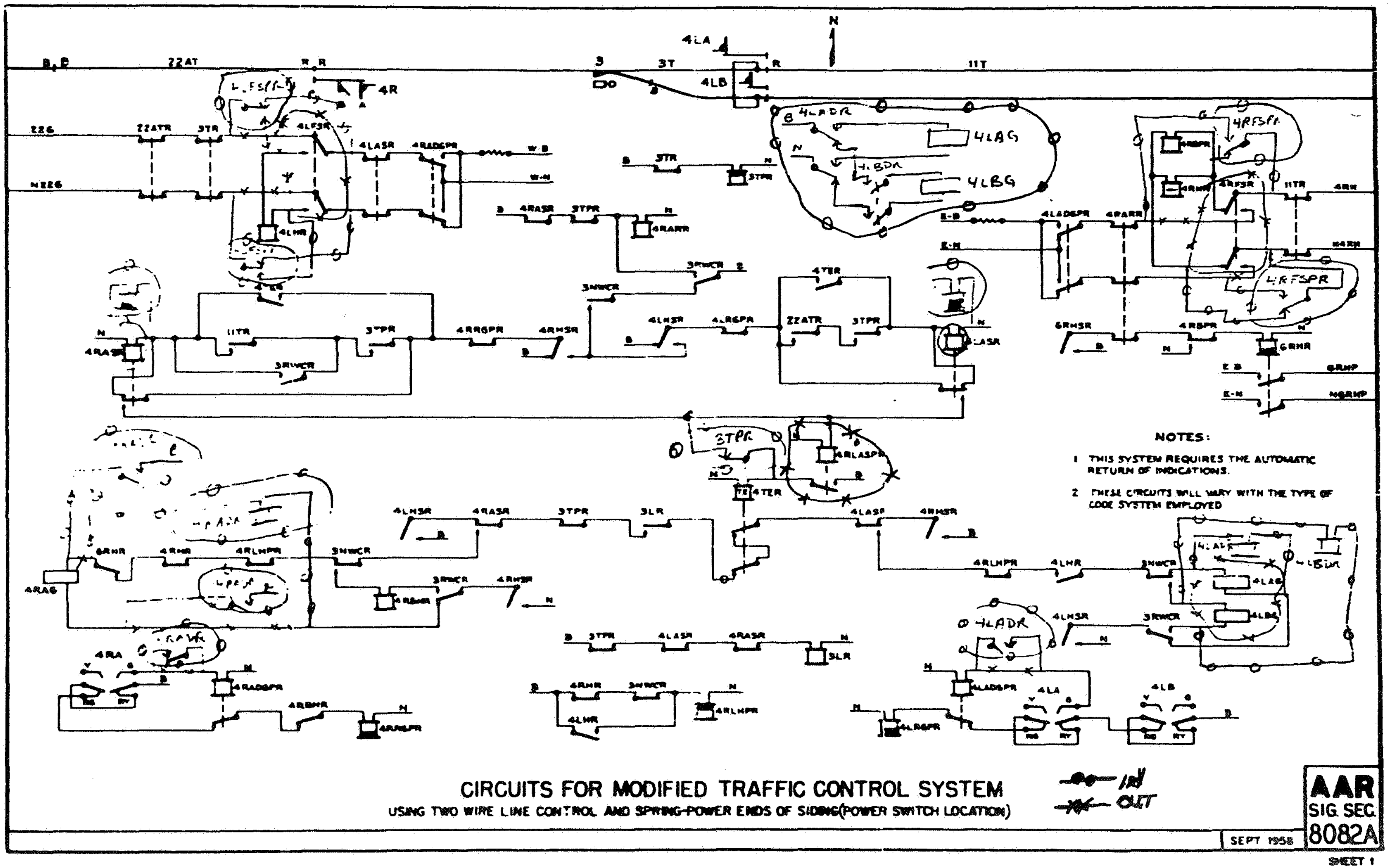
USING TWO WIRE LINE CONTROL AND SPRING-POWER ENDS OF SIDING
(CONTROL MACHINE CIRCUITS)

SEPT. 1958

AAR SIG. SEC. 8082A

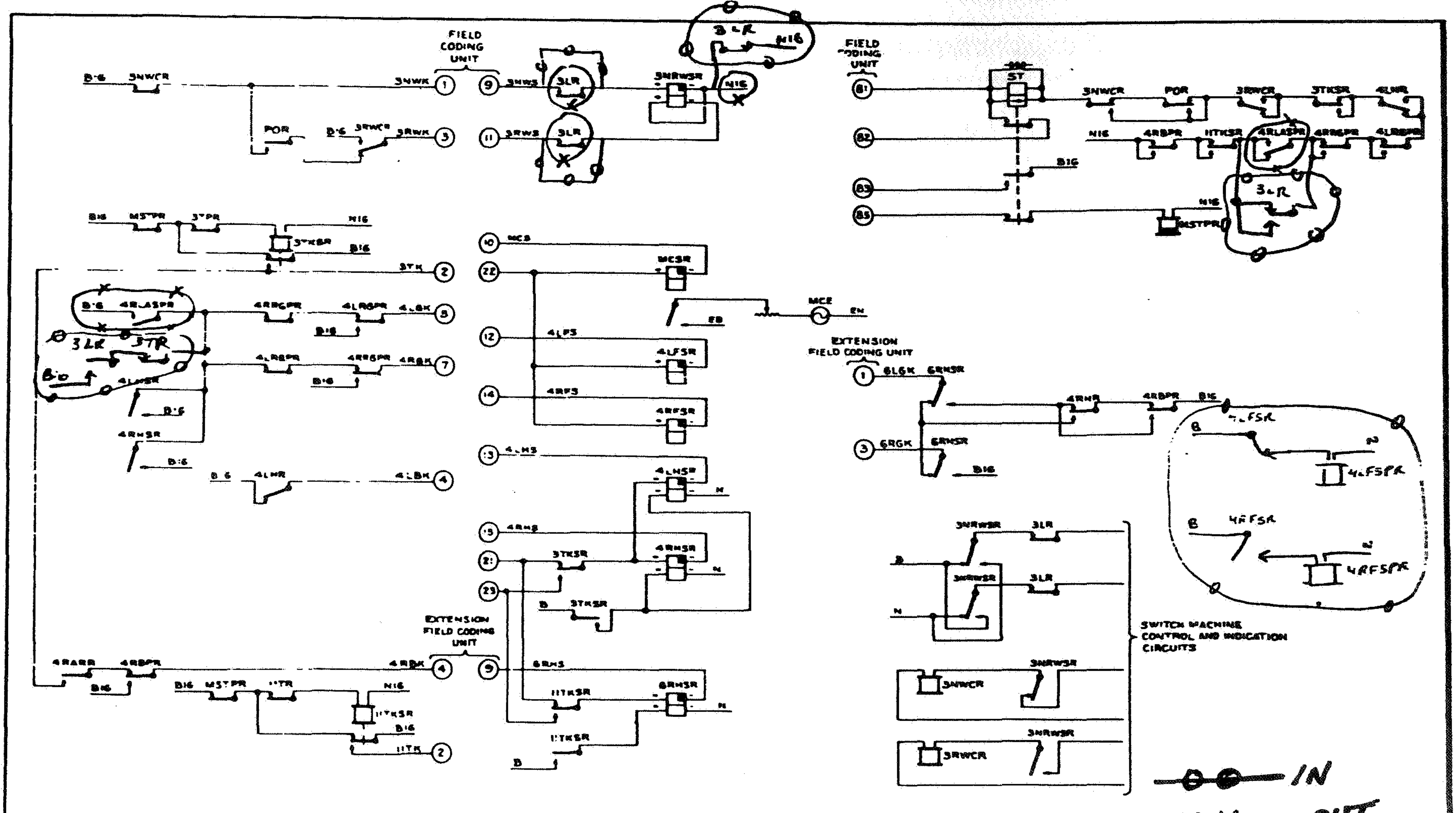
SHEET 7

Exhibit E-37 Revised Drawing 8082A



CIRCUITS FOR MODIFIED TRAFFIC CONTROL SYSTEM

USING TWO WIRE LINE CONTROL AND SPRING-POWER ENDS OF SIDING (POWER SWITCH LOCATION)



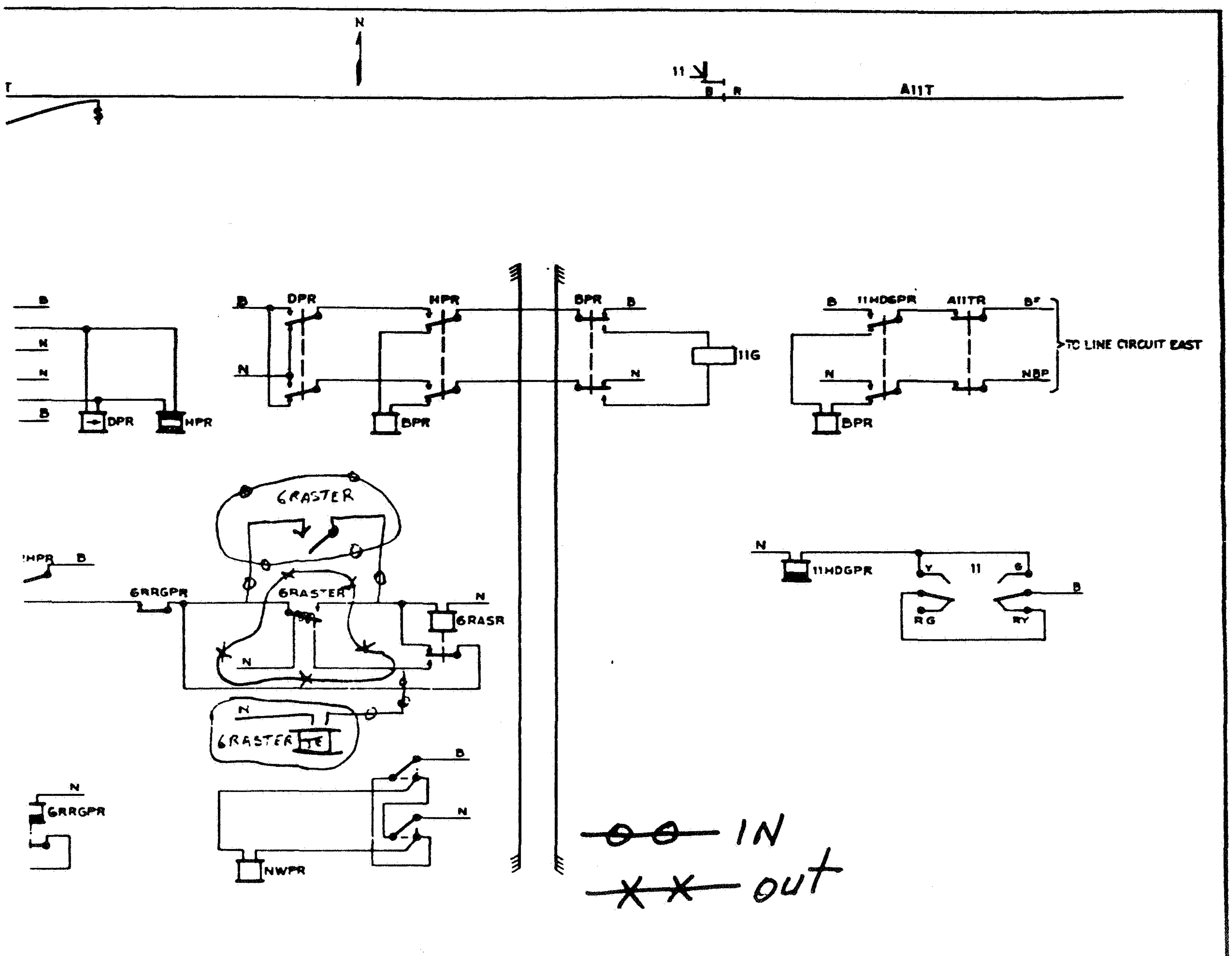
CIRCUITS FOR MODIFIED TRAFFIC CONTROL SYSTEM

USING TWO WIRE LINE CONTROL AND SPRING-POWER ENDS OF SIDING (POWER SWITCH LOCATION)

SEPT 1958

AAR SIG. SEC. 8082A

SHEET 2



CIRCUITS FOR MODIFIED TRAFFIC CONTROL SYSTEM

ND SPRING-POWER ENDS OF SIDING (SPRING SWITCH AND APPROACH SIGNAL TO POWER SWITCH)

SEPT 1958

AAR
SIG. SEC.
8082A

SHEET 4

ADDENDUM TO AAR SIG. SEC. 8082A - Continued

The train next enters track circuit A11T at signal 11 location (Sheet 4) and shunts A relays at both signal 11 and the spring switch locations, the latter taking energy of switch end of siding. When the rear end of the train clears 11T, 11TR and 11TKSR pic up) interrupting the ST circuit to send an indication code having step 18 short and r The 11TKSR circuit enforces the sending of an 11TKR occupied indication to the contro circuit may be occupied only for a short period of time.

If signal 8RA (same as 4RA) (Sheet 1) is displaying proceed, the line circuit to the with normal polarity and signal 22 will be green. If signal 8R is displaying other t polarity will be reverse, and signal 22 will be yellow.

Train clears block.

When the rear end of the train clears the track circuit at the power switch location (picks up, the line circuit to the approach signal is closed. Signal 22 (Sheet 5) clea gizing the line circuit to the rear. At signal 11 and spring switch end of siding (Sh which in turn energizes the line circuit to the power switch end of siding.

At the power switch location, 4RBPR and 4RHR pick up. 4RBPR interrupts the ST circuit from terminal 4 of the extension unit. An indication code is transmitted to the machir releases 4RBKR (Sheet 7), extinguishing the block indication light between signals 4 ar

Train entering siding over power switch reverse.

(Signal 4R restricting and switch 3 reverse)

Switch lever 3 is placed reverse, signal lever 4 to the right and starting buttor 3-4ST (Sheet 6) pick up, which picks up 4RGSBR over a circuit selected by switch lever 3 reve This puts battery on terminals 3A and 7A of the coding unit, making steps 11 and 15 lon

When the control code is received at the field location (Sheet 2), battery on terminals 4RHSR. 3NRWSR reverse opens the circuit of 3NWCR (Sheet 2) which drops before 4RHSR go energized. 3NRWSR pole-changes the circuit to switch control relay, starting the switc reverse position. 3NWCR dropping interrupts the ST circuit, and the indication code wi 13 and 15 long. This releases 3NWKR and energizes 4LGKR and 4RGKR in the machine (Shee switch and signal stop indication lights. When the switch machine locks up reverse, 3N

4RASR is made slow release in case 4RHSR opens its normal contacts before 3NWCR makes its back contacts.

(Sheet 3 of 7)

68150.26

ADDENDUM TO AAR SIG. SEC. 8082A - Continued

uiring traffic reversal.

drops the vital 8LFSPR relay which

. with switch lever 7 normal and starting button 7-8STPB pushed. 8LGR (Sheet 7) and
ked up, 4-8FR is energized reverse over a circuit which checks the block unoccupied
t in time. 8LGSR picks up after 7-8STR (Sheet 7) and sends the control code to a
erly an exit end. This code will have step 12 short (since 4-8FR is now reverse)
, 8LFSR is placed normal and 8LHSR reverse (Sheet 2). 8LFSR normal disconnects the
Signal 22 (Sheet 5) goes to stop, 22HDGPR drops and opens the line circuit to the
switch locations (Sheet 4) the BPR relays drop, opening the line circuit to the
4RHR and 4RBPR drop. 4RBPR down puts battery on terminal 4 of the extension unit
up 4RBKR (Sheet 7).

i of the block will have step 14 long since 4-8FR reverse puts battery on terminal
the field location reverses 4RFSR (Sheet 2). This connects energy to the line
on and picks up relay HPR which in turn applies energy to the line circuit to sig-

up, applying energy to the line circuit in the rear. At signal 22 (Sheet 5), BPR
line circuit feeding toward the power switch location (Sheet 1) where 8LHR picks
dication code with the block clear indication, step 12 short; also when 8LHR picks
s signal 8LA to clear. Succeeding action is similar to that described above.

e shown on Sheets 3 and 5. Train on main line stopping within approximately 150
rcuit and VLRR and NWLFR release. When the door of the lock is opened the lock
then be unlocked and operated.

main line, the control machine operator positions the switch lock control lever,
g on the direction that the train will take after leaving the lock location. In
will be to the left after leaving the lock location and that traffic was last
-8WL push-turn lever picks up 3-4STR and 7-8STR (Sheet 6) to send control codes to
left picks up 4-8WLPR over a circuit that checks that no opposing signal is being

(Sheet 5 of 7)

which picks the 4RFSPR

and 8LFSPR up,

ADDENDUM TO AAR SIG. SEC. 8082A - Continued

cleared or is in time, and that the block is unoccupied. The control codes to ea traffic steps, step 14 station 3-4 (Sheet 6) and step 12 station 7-8 (Sheet 7). block as a feed point with 8LFSR reverse and converts the left-hand end of the bl by reversing 4RFSR. When the door of the switch lock is opened, NWLPR drops and circuit. When energy is received from both directions, the relays (EBPR and WBPR net. The switch may then be unlocked and operated.

When the train has entered the main line the switch is placed normal, locked and place the push-turn lever in its center position, which picks up 3-4STR and 7-8ST code to station 3-4 will continue to have step 14 long since 4-8FR remains revers feed from left to right. The code to station 7-8 will have step 12 short, and the will be cut off.

Had the train direction been to the right after leaving the electric lock locatior except that no traffic reversal would have been necessary and 4-8FR would have rer 4-8WL lever normal, the line circuit feed would have again been left to right in t

When the switch lock is located in track circuit 11T (Sheet 3), the EBPR relay fed switch is biased so that it will pick up only when the leave siding signal is at s wise the circuit operation is the same as described above.

Replacing signal at power switch to stop before having been accepted by train.

(Signal 4R clear)

Signal lever 4 is returned to its center position and starting button 3-4STPB pushe (Sheet 6). The control code is transmitted with step 15 short since 4RGR is down (Sheet 2) 4RHSR is positioned normal, opening the signal control circuit (Sheet 1), 4RADGPR and picks up 4RRGPR. 4RHSR normal and 4RRGPR up picks up 4RLASPR to start 4TER. The indication code returned to the office will have steps 13 and 15 long si this picks up 4LGKR and retains 4RGKR (Sheet 7) and 4RGSAR (Sheet 6). 4LGKR and 4F indication light. At the expiration of the time interval, 4RASR (Sheet 1) picks up 3LR. 4RLASPR interrupts the ST circuit to send an indication code having steps 13 4RGKR and 4RGSAR in the machine, lighting the signal stop indication light.

(Sheet 6 of 7)

ADDENDUM TO AAR SIG. SEC. 8083A

CIRCUITS FOR INTER-CONNECTION OF RAILWAY-HIGHWAY GRADE CROSSING AND HIGHWAY TRAFFIC CONTROL SIGNALS.

1. Traffic lights operate in normal sequence, Green to Yellow to Red, until train enters approach circuit. Controller contacts are shown in position for signals 2 and 4 to display Green and signals 1, 3 and 5 to display Red.

2. A train entering an approach circuit drops relay XR which in turn drops relays 1XR and 2-3-4XR. The Red light on signal 1 is maintained through controller contact 1, back contact of 1XR and front contact of 1XPR. The Green lights in signals 2 and 4 are extinguished by the opening of front contact in 2-3-4XR. Timing relays 15TER and 18TER are picked up through a back contact of 2-3-4XR and their front contacts remain closed for the time setting of each relay. Yellow lights in signals 2 and 4 are lighted through controller contact 6, back contact of 2-3-4XR, front contact of 2-4XPR and front contact of 2-3-4XPSR.

3. Three seconds after the train enters the approach circuit relay XPR drops, starts operation of flashing light signals and drops relays 1XPR, 2-4XPR, 3XPR and 2-3-4XPSR. Red light on signal 1 goes out and its green light is lighted through controller contact 1, back contact of 1XR, back contact of 1XPR and front contact of 15TER. Yellow lights in signals 2 and 4 are extinguished when relay 2-4XPR opens its front contact. Signals 3 and 5 continue to display Red.

4. The Green light in signal 1 is displayed for a predetermined period of time as indicated in Note 5 on the drawing, after which relay 15TER drops and completes a circuit through controller contact 1, back contacts of relays 1XR, 1XPR, 15TER and front contact of relay 18TEPR to light the Yellow light. The Yellow light is maintained for a period of 3 seconds at which time relay 18TEPR drops to complete a circuit through controller contact 1 and back contacts of relays 1XR, 1XPR, 15TER and 18TEPR to light the Red light in signal 1. At the same time a circuit is established through controller contact 6 and back contacts of relays 2-3-4XR, 2-4XPR and 18TEPR to light the directional arrows in traffic signals 2 and 4.

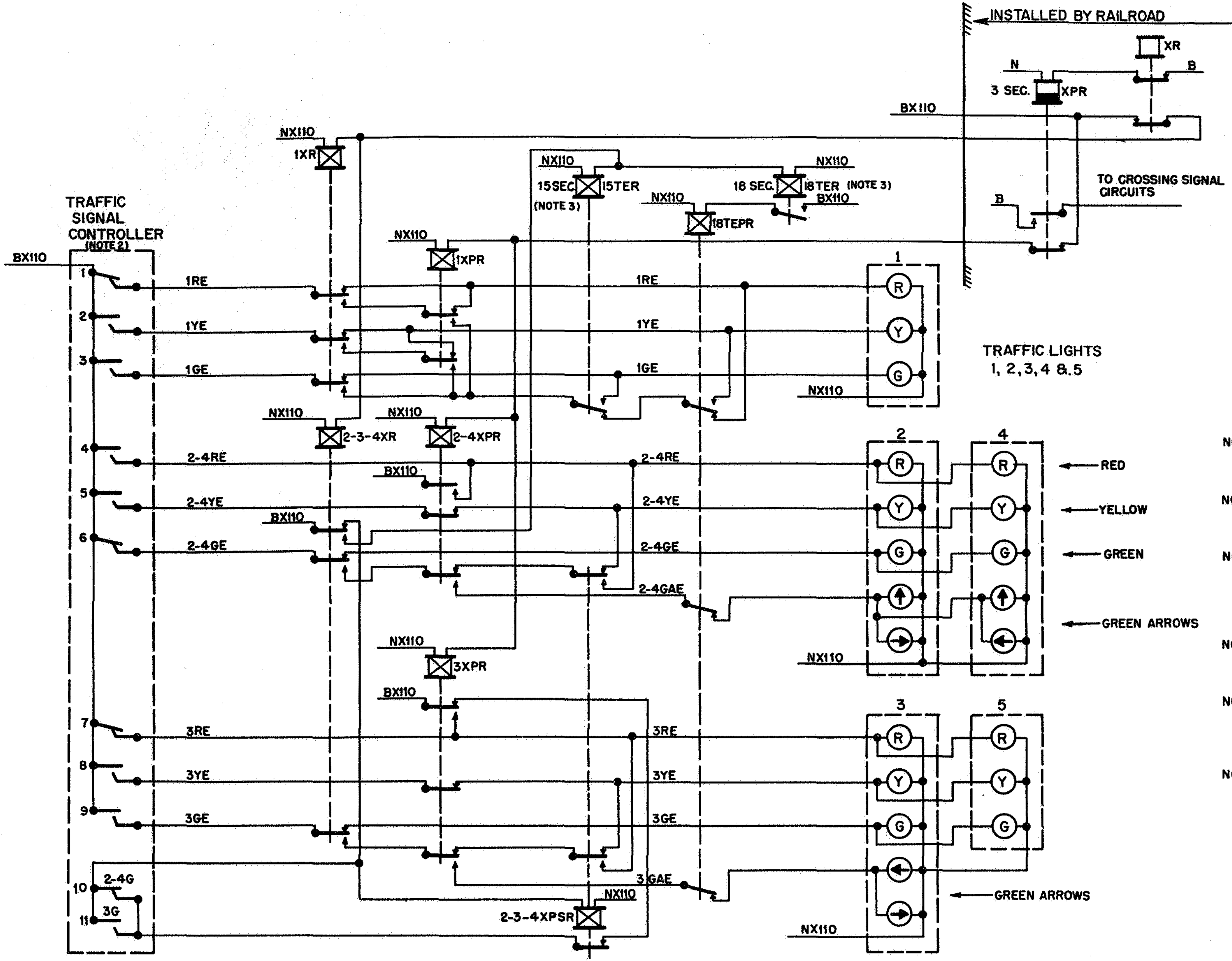
5. As the traffic controller continues to operate through its normal cycle, signals 2, 3 and 4 will display directional arrow lights and Red during the same period they normally show Green. No Yellow lights will be displayed during this period. Signals 1 and 5 will display Red throughout this period.

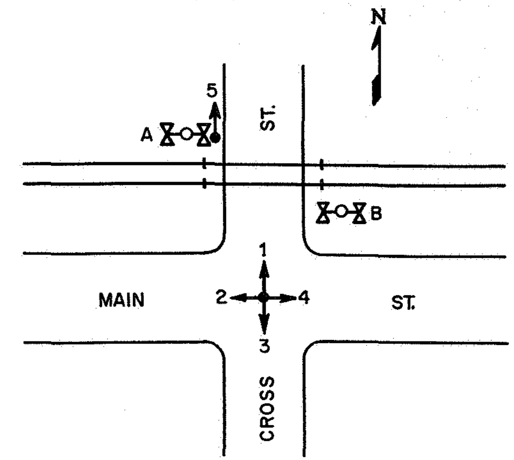
6. In event signal 1 was Green at the time a train entered the approach circuit, it will continue Green through controller contact 3, back contact of 1XR and front contact of 15TER. At the end of a 15-second period, if controller contact 3 is still closed, signal 1 will display Yellow through controller contact 3, back contact of 1XR, back contact of 15TER and front contact of 18TEPR. At the end of 3 additional seconds relay 18TEPR will drop and signal 1 will change from Yellow to Red. If signal 1 was Yellow, or changed from Green to Yellow shortly after a train entered the approach circuit, it will continue Yellow through controller contact 2, back contact of 1XR and front contact of 1XPR. When relay 1XPR drops, the signal will change to Green as described in paragraph 5. If signal 1 was Red, or changed from Yellow to Red shortly after the train entered the approach

circuit, it will continue Red through controller contact 1, back contact of 1XR and front contact of relay 1XPR. When relay 1XPR drops, the signal will change to Green as described in paragraph 5.

7. If signals 3 and 5 are Green at the time a train enters the approach circuit, they will change to Yellow through controller contact 9, back contact of 2-3-4XR and front contacts of 3XPR and 2-3-4XPSR. After 3 seconds, relay 3XPR drops, completing circuit through its back contact to display Red in signals 3 and 5. If signals 3 and 5 were Yellow at the time train enters the approach circuit, they will continue to display Yellow, through controller contact 8 and front contact of 3XPR, for a period of 3 seconds when 3XPR drops to display Red on these signals.

8. Relay 2-3-4XPSR is used to prevent a flash to Green in signals 2, 3, 4 or 5 in event a train entered the approach section while one of these signals is displaying Yellow. This is accomplished by sticking this relay up through 3XPR and contacts 10 or 11 of the traffic signal controller. When this relay drops, it completes a circuit through controller contact 6 or 9, back contact 2-3-4XR, front contact 2-4XPR or 3XPR and back contact 2-3-4XPSR to hold the Red lights and cut off the Yellow control.





NOTES:

NOTE 1. HIGHWAY GRADE CROSSING SIGNALS BEGIN TO OPERATE THREE SECONDS AFTER TRAIN ENTERS APPROACH CIRCUIT AND CONTINUE TO OPERATE UNTIL TRAIN CLEARS THE CROSSING.

NOTE 2. TRAFFIC SIGNAL CONTROLLER CAN BE SYNCHRONOUS OR OTHER TYPE. CONTACTS ARE SHOWN IN POSITION TO DISPLAY GREEN FOR MAIN STREET AND RED FOR CROSS STREET.

NOTE 3. 15TER AND 18TER ARE NORMALLY DE-ENERGIZED SYNCHRONOUS TIME RELAYS ADJUSTABLE 0 TO 35 SECONDS. WHEN ENERGIZED, IT CLOSES FRONT CONTACT FOR THE TIME SET THEN OPENS FRONT CONTACT AND CLOSES BACK CONTACT. WHEN THE RELAY IS AGAIN DE-ENERGIZED IT RESETS FOR NEXT OPERATION.

NOTE 4. OTHER AC RELAYS SHOWN ARE ORDINARY QUICK ACTING, USUALLY HAVING 3 FB CONTACTS OF NOT LESS THAN 5 AMP. CAPACITY AND COILS CONSUMING NOT MORE THAN 5 WATTS AT 115 VOLTS.

NOTE 5. DURATION OF GREEN CLEARING PERIOD ON TRAFFIC LIGHT 1 NEEDS TO BE VARIED ACCORDING TO THE DISTANCE BETWEEN SIGNAL "A" AND TRAFFIC LIGHT 1. SEE REPORT OF COMMITTEE 8 ON THIS SUBJECT IN THE 1955 AND SUBSEQUENT ADVANCE NOTICES.

NOTE 6. SHOULD IT BE DESIRABLE TO ARRANGE SIGNAL 5 ALWAYS TO GO TO RED BEFORE SIGNAL 1, THIS CAN BE DONE BY REARRANGING THE CONTROL OF CONTACTS 1, 2 AND 3 OF THE TRAFFIC SIGNAL CONTROLLER. THIS WILL KEEP TRAFFIC CLEAR OF THE RAILROAD TRACKS WHEN TRAFFIC IS LINED CLEAR FOR SIGNALS 2 AND 4.

CIRCUITS FOR INTER-CONNECTION OF RAILWAY-HIGHWAY GRADE CROSSING AND HIGHWAY TRAFFIC CONTROL SIGNALS

SEPT. 1958

AAR SIG. SEC. 8083A

CONTROL CIRCUITS FOR AUTOMATIC HIGHWAY GRADE CROSSING SIGNALS ILLUSTRATING TIME CUT-OUTS, RECEDING CUT-OUT AND MEETING TRAINS CIRCUITS.

The circuits on this plan illustrate various means of effecting cut-outs for highway crossing protection for switching moves, meeting trains, and for trains entering or leaving the passing siding.

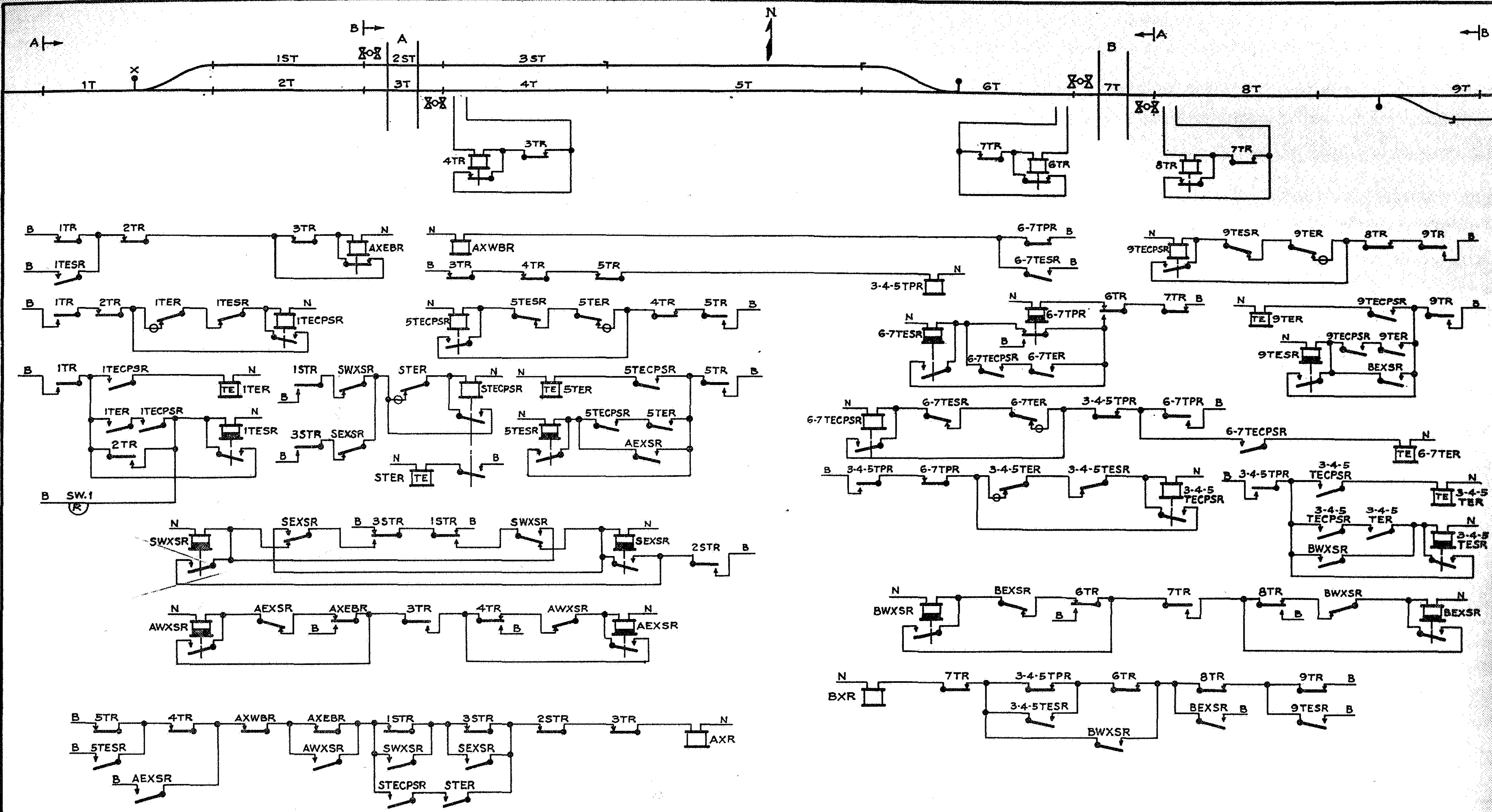
Time element check repeater stick relays are used throughout to protect against an incomplete timing cycle.

A typical time cut-out would occur when an eastward train enters track circuit 1. 1TR de-energized opens the AXEB circuit and operates the highway crossing protection at crossing "A." At the same time energy is applied to the 1TECPSR relay through the check contact of the timing relay and front contact of the 2TR relay. The timing relay 1TER is then energized and after a predetermined time the timing stick relay 1TESR will pick up and a by-pass of the 1TR break in the AXEB circuit is closed. This will cut out the crossing signals at crossing "A." The crossing signals are restarted when the train enters track circuit 2, approaching the crossing. If the train enters track 2 before 1TER time interval has elapsed and then reverses direction and moves away from the crossing, the 1TESR is picked up direct and when 2TR becomes unoccupied the crossing signals are cut out immediately. The pick-up of the 1TESR relay through switch 1 reversed is one method of effecting a receding cut-out for a train leaving the passing siding.

Another receding cut-out circuit is illustrated at the east end of the passing siding. A slow release repeater relay, 6-7TPR, is used to provide a directional selection for energizing the 6-7TESR relay when a train is eastbound and enters track circuit 6. This circuit is best suited for a spring switch location because a train leaving the siding will de-energize the track circuit before the switch points are reversed.

The meeting train or nonlock-out circuit is illustrated at crossing "B." By limiting the controls of the directional stick relays, BWZSR and BEXRS, to short track circuits adjacent to the crossing, a restart is provided for a train approaching the crossing after the meet with another train has been made.

The optional type of directional stick circuit is illustrated for the siding. Circuits are provided to permit a train in the siding at crossing "A" to cut the crossing. If a cut is made at the crossing, neither SWXSR or SEXSR relays will be energized when the 2ST track circuit is unoccupied and the track circuits on both sides of the crossing are occupied. After a predetermined time delay, the highway crossing protection is cut out until the island track circuit, 2ST, becomes occupied.



CONTROL CIRCUITS FOR AUTOMATIC HIGHWAY GRADE CROSSING SIGNALS

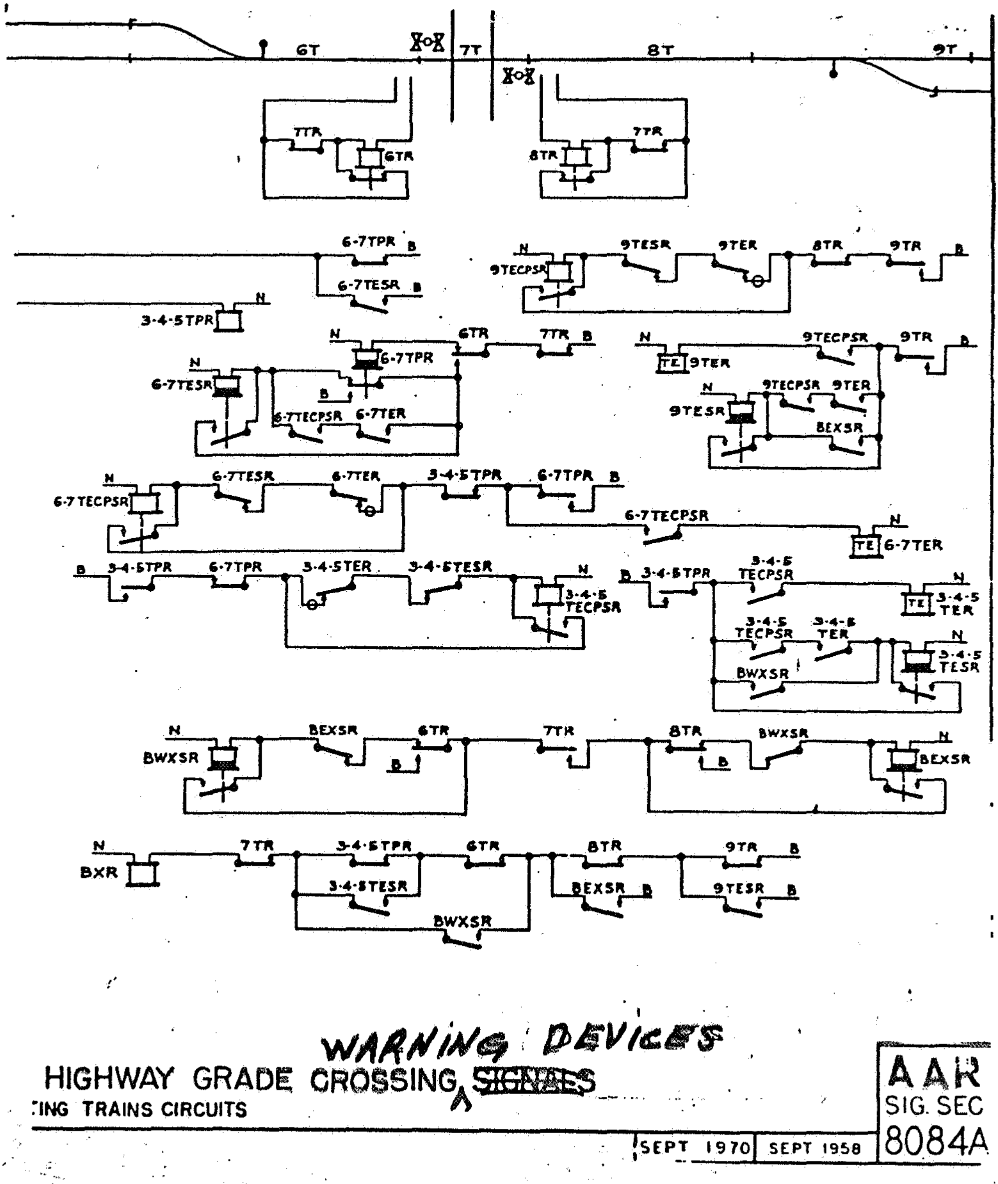
ILLUSTRATING TIME CUT-OUTS, RECEDING CUTOUT AND MEETING TRAINS CIRCUITS

SEPT. 1958

AAR
SIG. SEC.
8084A

Exhibit D-28 Drawing 8084A Control Circuits for Automatic Highway Grade Crossing Signals Illustrating Time Cut-Outs, Receding Cut-Outs and Meeting Trains Circuits

NOTE: Only portion of circuit shown where changes made.



CIRCUITS FOR AUTOMATIC INTERLOCKING USING AUTOMATICALLY TIMED ROUTE SELECTION WITH RECLEARING CIRCUITS.

General.
These circuits are so arranged that the first train entering an approach section will received a proceed home signal.

The circuit arrangement shown on Sheets 1 and 2 provide that successive trains on the same road will not retain the route when approach section is occupied on conflicting road.

Circuits provide that a home signal, displaying a proceed aspect for train movement, will retain the proceed aspect for a predetermined time interval provided the train movement has not advanced to the reclearing track section. Should the train movement occupy the reclearing track section, and not occupy the interlocking track circuit, the home signal will retain a proceed aspect after completion of time cycle until approach section is occupied on conflicting road, or opposing approach section is occupied on the same road. Such an opposing or conflicting movement will cause the home signal to restore to stop, with the exception as indicated by Note 3 on Sheet 1.

After the expiration of the time locking interval, the home signal governing movement over the conflicting route will display a proceed aspect for a predetermined time interval as outlined above.

Reclearing track circuits are primarily used as a means of automatically reestablishing a proceed signal following completion of approach occupancy time, and preferably should be limited to a length of 200 feet.

Sheet 3 shows an alternate arrangement, providing supervisory control of signals 2 and 4. Reclearing track sections are not used. Action on the part of the control operator is required when it is desired to reclear home signal following completion of approach timing cycle.

Sheet 4 is another alternate arrangement, using reclearing track circuits, and provides supervisory control of signals 2 and 4. Approach clearing of home signals is accomplished in same manner as in Sheet 1, provided control is received from control operator.

Description of circuit operation.

1. Train approaching signal 24 pole changes approach relay 4AR, releasing relay 4APR which allows relay 4RCR (route check circuits) to become energized.

2. Relay 4RCR energized closes circuit to relay 2-4RR (route control circuits).

3. Relays 4RCR and 2-4RR energized releases relay 4ASR (time locking circuits), thus locking out conflicting route by opening circuit to relay 3-5RR (Sheet 2) and closing circuit to energize signal control relay 4DR, permitting a proceed aspect to be displayed on signal 4.

4. With the release of relays 4APR and 4ASR, route selection timing is accomplished as follows:

5. Relay 2-4ATECPSR is energized, closing circuit to relay 2-4ATER. After occupancy of track circuit 024T, or 24T, for a predetermined time interval relay 2-4ATER will be energized, closing circuit to relay 2-4ATEPR (approach timing circuits).

6. Should operation 5 be completed before track circuit A24T is occupied, relay 4APSR will be energized. This will allow relay 4TSPR to be energized through front contact of 4APSR and front contact, or polar contact of relay 4AR (approach stick circuits).

7. Relay 4APSR energized releases route check relay 4RCR, which in turn releases signal control relay 4DR, which restores signal 4 to stop.

8. Relay 4DR, de-energized, closes circuit to relay 2-4ASPR, in turn energizing time relay 2-4TER. Pick-up of time relay 2-4TER closes circuit to relay 4ASR (time locking circuits).

9. Relay 4TSPR energized (step 6) closes circuit to relay 4APR, thus restoring the interlocking to normal operation with the exception that the control of relay 4APR includes only track circuit A24T.

10. Should train have proceeded to and occupied track circuit A24T before time interval (step 6) is completed, the operation described in steps 7, 8 and 9 would not have taken place in the manner described due to relay A24TR holding relay 4APSR control circuit open, thus preventing relay 4APSR from picking up after approach time relay 2-4ATER had completed the time cycle.

11. Under this condition relay 4APSR would be energized only when a train on the crossline road entered an approach circuit and energized either the 3 or 5RCR relay (Sheet 2) or a train on the same road had occupied the 2AR circuit, thus de-energizing relay 2APR. Relay 4APSR picking up will cause operations described in steps 7, 8 and 9 to take place; however, the pick-up of relay 4APR will be prevented due to the occupancy of track circuit A24T.

12. Relay 4APSR will be retained in the energized position through a contact in either of relays 3RCR, 5RCR or 2APR until relay 3-5RR on the crossline road is energized, or until relay 2DR, controlling the clear aspect on signal 2 is energized. Relay 4APSR is released under this condition so that a clear aspect will again be displayed on signal 4 after the conflicting movement has been completed, or had the opportunity to do so. (Alternate circuit arrangement for relay 4APSR is provided when it is desired to retain a proceed signal for train occupying the re-clearing track section A24T. Note 3, Sheet 1.)

13. Train passing signal 4 releases relay 4TR, which releases relay 2-4TPSR and 4DR, and also energizes relay 2-4RSR. The purpose of route stick relay 2-4RSR is to enforce a two-track pick-up of the ASR relays to release the route locking.

14. Relay 2-4TPSR de-energized closes circuit to relay 4APSR and opens circuit controlling relays 2-4RR and also 3-5RR, also the holding circuit of relay 2-4RSR is completed. Relay 4APSR picking up allows relay 4TSPR to become energized as in step 6.

15. Relay 2-4TPSR down and relay 4APSR up, closes circuit to relay 4SR. Front contact of relay 4SR in circuit of relay 2RCR prevents signal 2 from clearing behind train.

16. Train proceeding from 4T to 2T closes circuit to energize relay 4ASR. When movement occupies track circuit A22T, circuit controlling relay 2TSPR is closed through back contact of A22TR and front contact of relays 2AR and 4SR. Relay 2APR is now released; however, signal 2 will not clear, as explained in step 15.

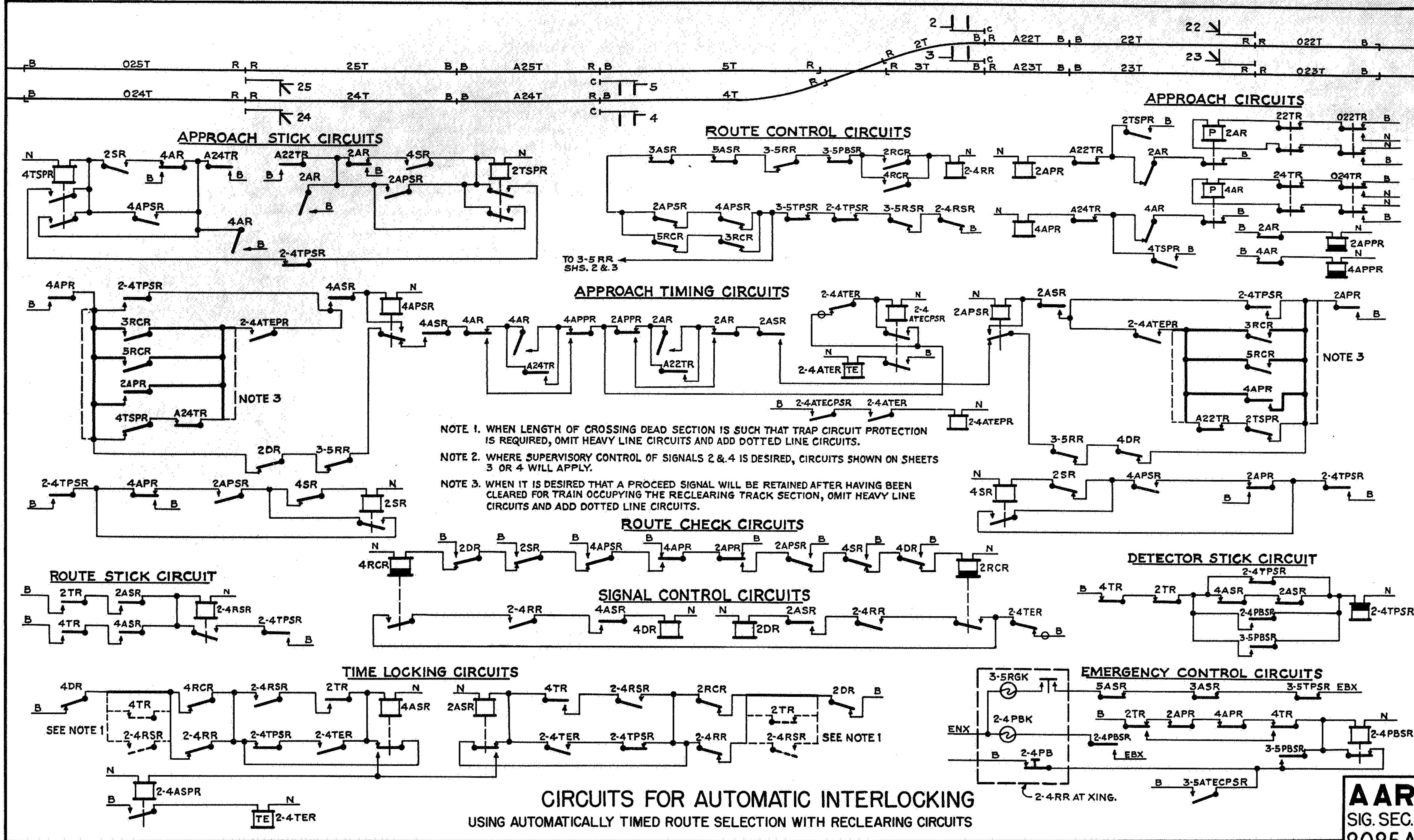
17. Relay 2TSPR up cancels that portion of control circuit for relay 2APR with the exception of contact in A22TR, thus relay 2APR will pick up when train proceeds beyond track A22T. This allows relay 4SR to release and signal 2 will clear should train again occupy track A22T.

18. Had the train moved through the interlocking beyond the A22T, after leaving a portion of train standing on the 24T and/or O24T, relays 4TSPR and 2TSPR will be energized. Under this condition the approach clearing circuits will be reduced to the A22T in the approach to signal 2 and the A24T in the approach to signal 4, in so far as operation of the automatic interlocking is concerned.

19. This condition will be obtained due to rear portion of train retaining energy on relay 4TSPR and a holding circuit through front contacts of relays 4TSPR, 2-4TPSR and 2TSPR holding energy on relay 2TSPR. This to allow head end of train to perform switching moves from and to the 2AR circuit without the releasing of relay 2TSPR.

20. Relays 2APPR and 4APPR (approach circuits) are for the purpose of reestablishing the approach time to the full predetermined time cycle when train passes the approach signal indicating proceed. Energy is applied to relay 2-4ATECPSR by the approach clearing of signal 4 (approach timing circuits). As train passes signal 24, relay 4AR is released (approach circuits). Slow release of relay 4APPR allows relay 2-4ATECPSR to release and pick again, thus allowing timing relay 2-4ATER to reset and reestablish the approach time to the full time cycle.

21. Push button 2-4 is used for emergency operation through the automatic interlocking. Operation of the push button removes energy from the holding circuit of relay 2-4 PBSR, allowing relay to release. With relay 2-4PBSR de-energized, energy cannot be applied to relay 3-5RR should approach circuit on crossline railroad be occupied prior to train passing signal 4, displaying a stop aspect.



NOTE 1. WHEN LENGTH OF CROSSING DEAD SECTION IS SUCH THAT TRAP CIRCUIT PROTECTION IS REQUIRED, OMIT HEAVY LINE CIRCUITS AND ADD DOTTED LINE CIRCUITS.

NOTE 2. WHERE SUPERVISORY CONTROL OF SIGNALS 2 & 4 IS DESIRED, CIRCUITS SHOWN ON SHEETS 3 OR 4 WILL APPLY.

NOTE 3. WHEN IT IS DESIRED THAT A PROCEED SIGNAL WILL BE RETAINED AFTER HAVING BEEN CLEARED FOR TRAIN OCCUPYING THE RECLEARING TRACK SECTION, OMIT HEAVY LINE CIRCUITS AND ADD DOTTED LINE CIRCUITS.

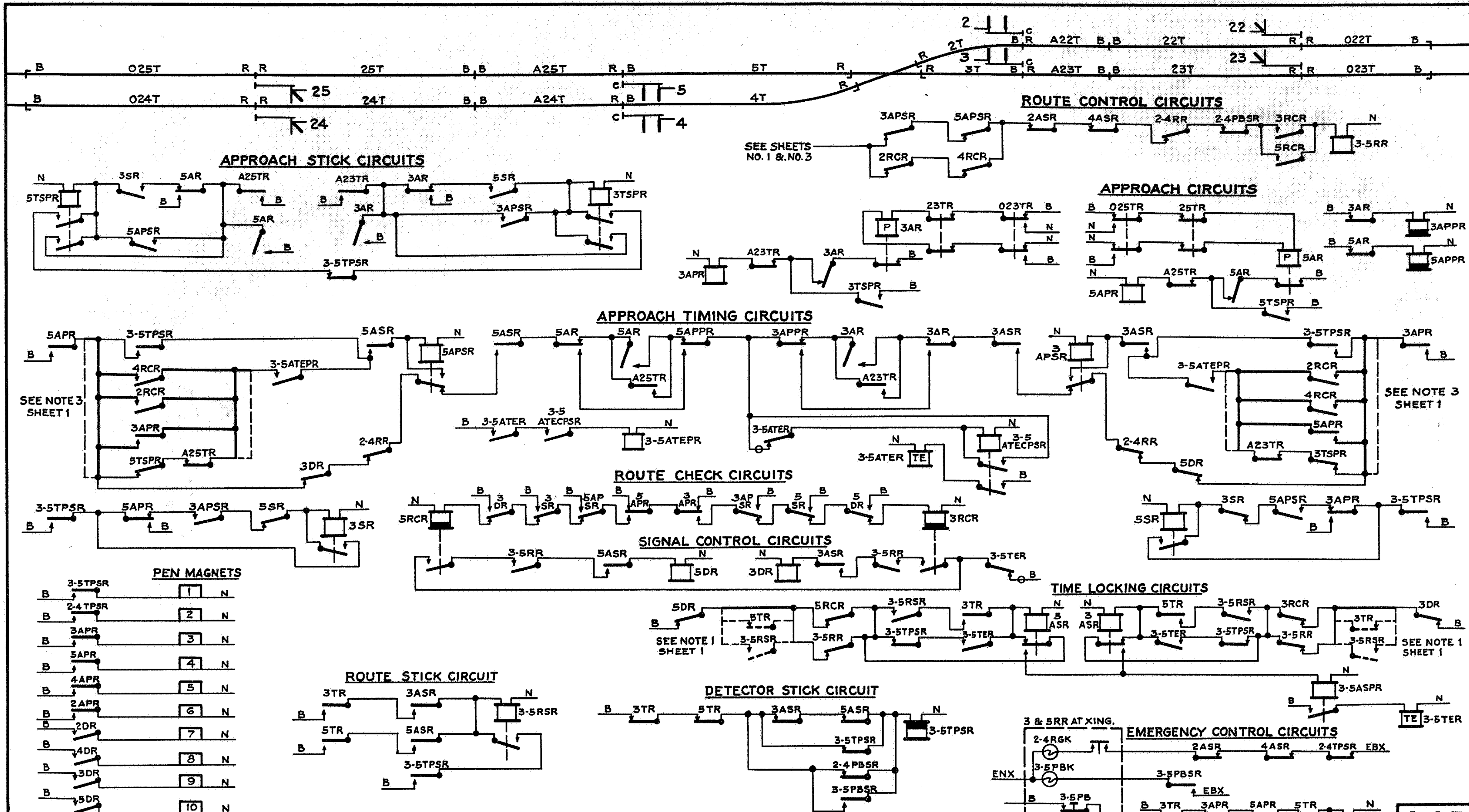
CIRCUITS FOR AUTOMATIC INTERLOCKING

USING AUTOMATICALLY TIMED ROUTE SELECTION WITH RECLEARING CIRCUITS

SEPT. 1958

AAR SIG. SEC. 8085A

SHEET 1



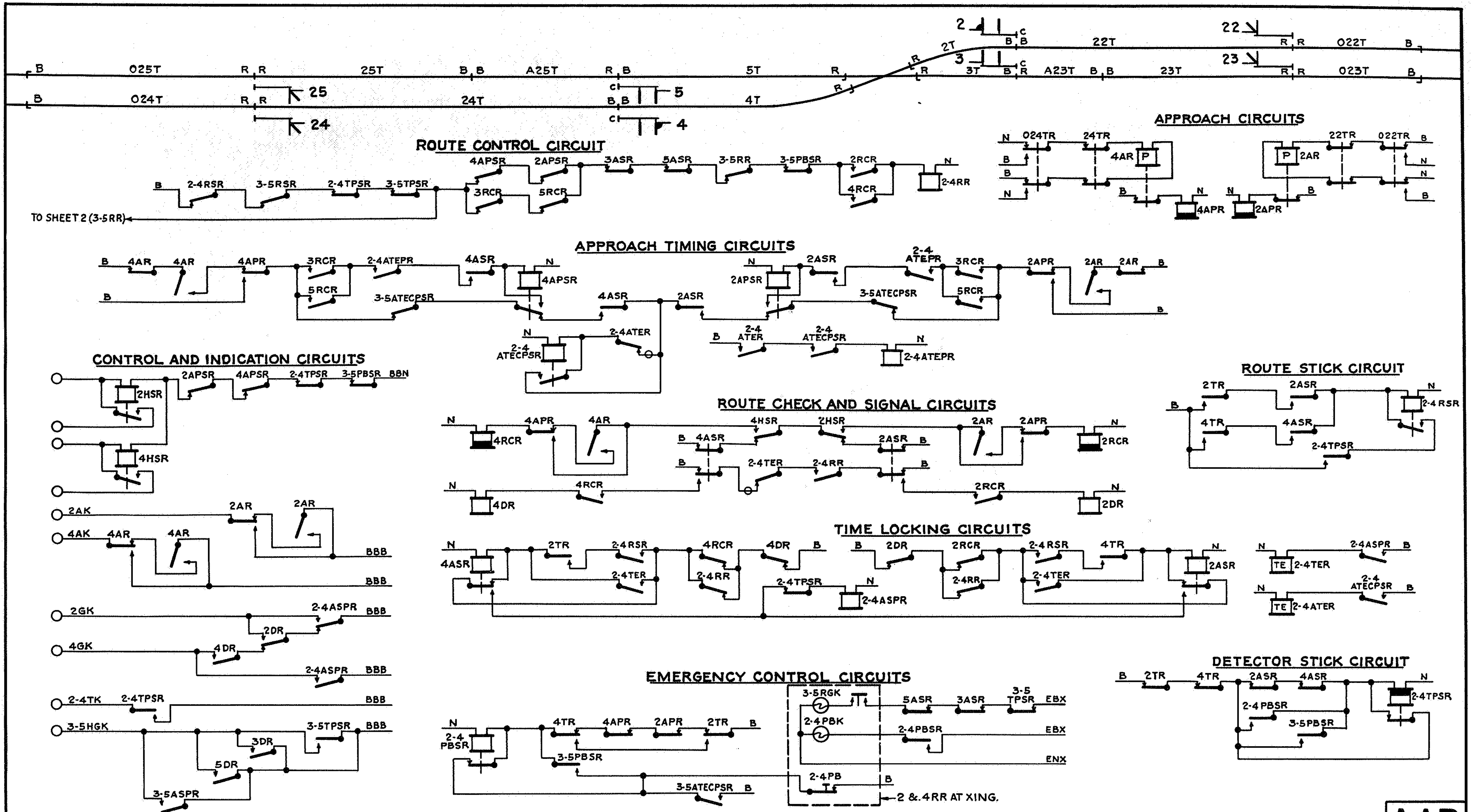
CIRCUITS FOR AUTOMATIC INTERLOCKING

USING AUTOMATICALLY TIMED ROUTE SELECTION WITH RECLEARING CIRCUITS

SEPT. 1958

AAR SIG. SEC. 8085A

SHEET 2



NOTE 1: THESE CIRCUITS WILL VARY WITH THE TYPE OF CODE SYSTEM EMPLOYED.

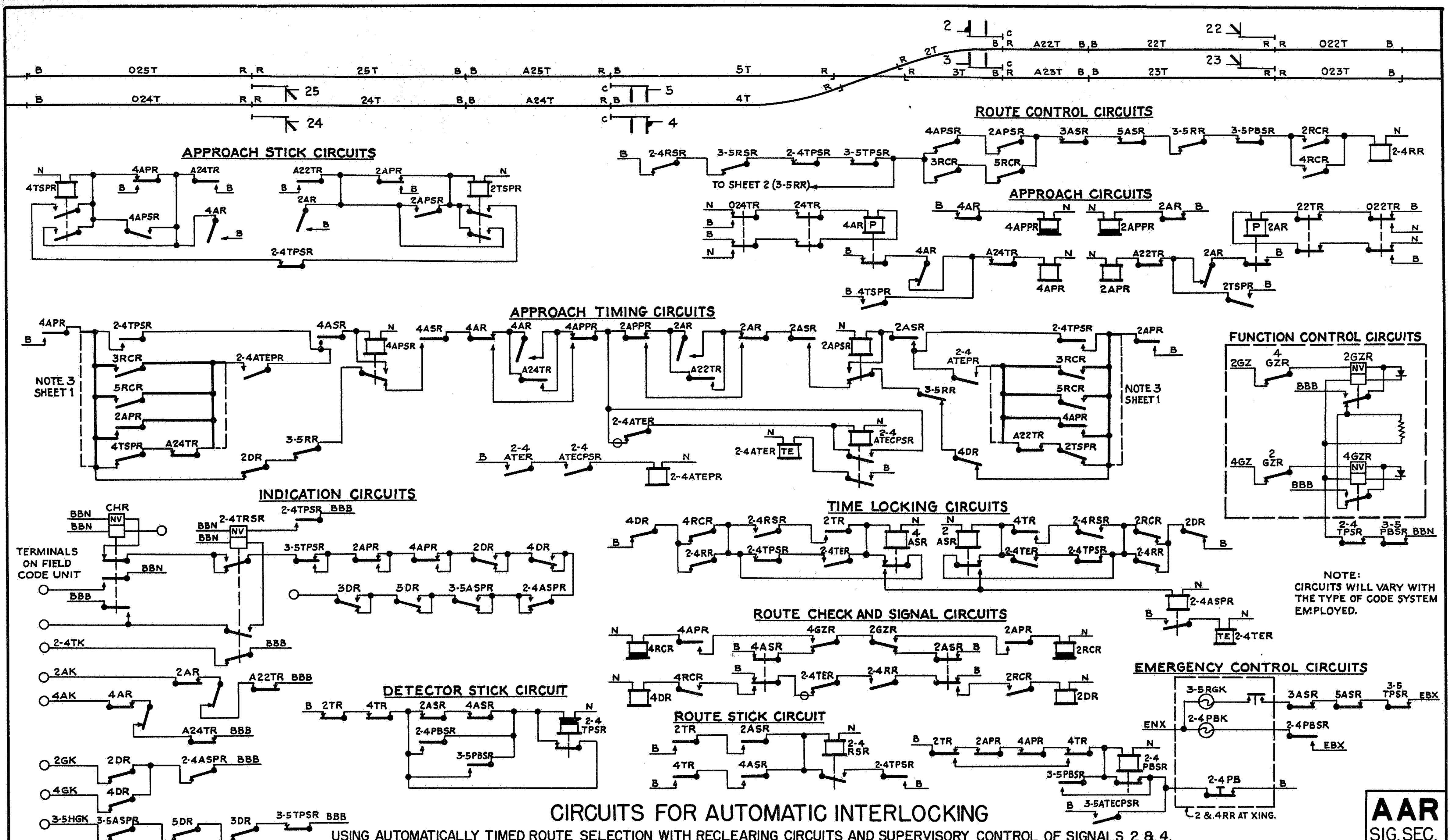
CIRCUITS FOR AUTOMATIC INTERLOCKING

USING AUTOMATICALLY TIMED ROUTE SELECTION WITHOUT AUTOMATIC RECLEARING CIRCUIT, AND WITH SUPERVISORY CONTROL OF SIGNALS 2 & 4.

SEPT. 1958

AAR SIG. SEC. 8085A

SHEET 3



CIRCUITS FOR AUTOMATIC INTERLOCKING

USING AUTOMATICALLY TIMED ROUTE SELECTION WITH RECLEARING CIRCUITS AND SUPERVISORY CONTROL OF SIGNALS 2 & 4.

SEPT. 1958

AAR SIG. SEC. 8085A

ADDENDUM TO AAR SIG. SEC. 8086A

CIRCUITS FOR AUTOMATIC CONTROL OF SIGNALS AND SWITCHES FOR SINGLE TRACK OPERATION BETWEEN ADJACENT ENDS OF DOUBLE TRACK.

Introduction.

The system is based on the use of power-operated switches with the usual complement of signals at each end of double track. Train entering an approach circuit automatically selects the proper route and signal. Provision is made for manual release and reclear of any signal.

Switch and signal selection circuits.

Provide automatic selection of proper route for any approach section occupied.

Directional hold out circuits.

Prevent signals from clearing behind a train after passing through single track. Also used for manual release of a signal as desired.

Manual release circuits.

Provide method for reversing movement of train having passed through single track section.

Loss of shunt circuits.

Prevent loss or changing of established route, by momentary loss of shunt of train on approach circuit with the signal clear.

Description of the circuit operation

1. Train approaching signal 4 releases 4AR which allows 4RCSR to become energized in the switch and signal selection circuits.

2. Relay 4RCSR in order to line the route for signal 4 calls for switch 3 reverse by energizing the 3RWSR in the switch control circuits. Switch 1 remains normal which is the proper route for signal 4.

3. After switch 3 is reverse and 3RWPR is energized, the 4-8RSR in the route check network will become energized.

4. With the 4-8RSR up the 4-8ASR is released in the time locking circuits, also NTEPR is released in the loss of shunt circuits.

5. The 4RCSR is now stuck up through the NTEPR down, 8RCSR down and 1TR up, in the switch and signal selection circuits.

6. In the lock circuit the 1-3LR now will be de-energized, locking the route for signal 4.

7. In the signal control circuits with the 4-8RSR up, the 1-3LR, NTEPR and 4-8ASR down, energy is fed to the mechanism of signal 4.

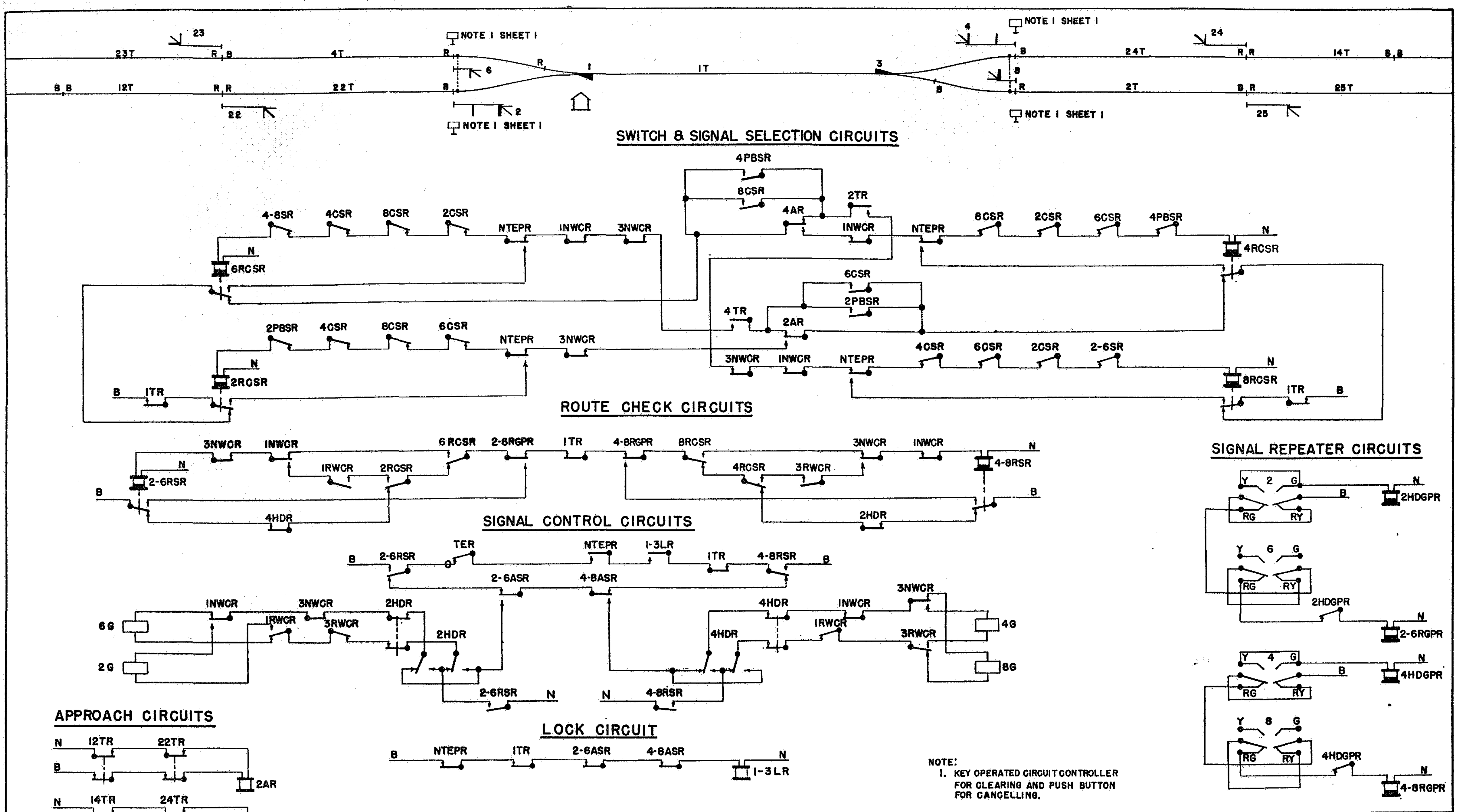
8. When train passes signal 4, 1TR will be de-energized thus opening the signal control circuit and restoring signal 4 to stop. In the directional hold out circuits the 4-8SR will be energized through the 4-8RSR up and 1TR down.

9. After train has passed through single track section the 4-8SR will stick up through 4TR down; this prevents signal 6 from clearing behind train by opening the 6RCSR circuit in the switch and signal selection network.

10. Should train now desire to re-enter single track by clearing signal 6, 6 key controller must be operated. This will energize 6CSR in the manual release circuits. The 6CSR up will open the stick circuit for 4-8SR in the directional hold out circuit releasing the 4-8SR to provide the stick circuits for 6CSR through 4TR and 4-8SR down.

11. In the switch and signal selection circuits with 4-8SR and 4TR down the 6RCSR will pick up and signal will clear for train movement similar to Steps 1 to 9.

12. Should a train for instance occupy 4AR, clearing signal 4 and then not proceed, signal 4 may be cancelled by operating 4 push button which will energize, 4PBSR, 4PBSR sticking up with 4CSR and 4AR down. The 4PBSR up will open the 4RCSR in the switch and signal selection circuits and cause signal 4 to return to stop. When train is ready to proceed, 4 key controller must be operated, which energizes 4CSR. 4CSR up will open the stick circuit for 4PBSR, releasing the relay. With 4PBSR down, circuit for 4RCSR is closed and signal will reclear for train movement as in Steps 1 to 9.



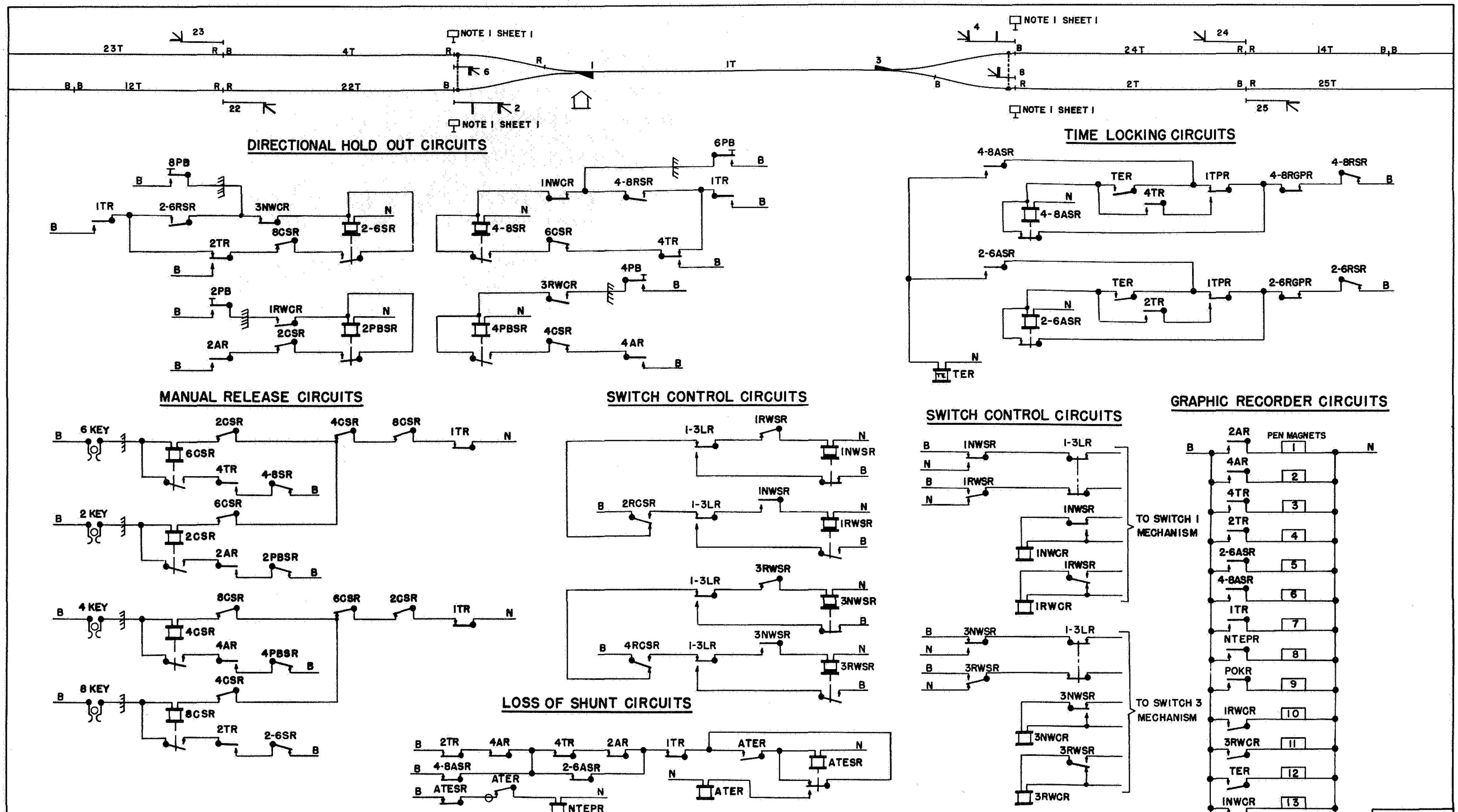
CIRCUITS FOR AUTOMATIC CONTROL OF SIGNALS AND SWITCHES

FOR SINGLE TRACK OPERATION BETWEEN ADJACENT ENDS OF DOUBLE TRACK

OCT. 1959

AAR SIG. SEC. 8086 A

SHEET 1



CIRCUITS FOR AUTOMATIC CONTROL OF SIGNALS AND SWITCHES

FOR SINGLE TRACK OPERATION BETWEEN ADJACENT ENDS OF DOUBLE TRACK

OCT. 1959

AAR SIG. SEC. 8086A

SHEET 2

BLOCK INDICATION USING OVERLAY LINE CIRCUITS.

The system is based on a two-wire reversible signal control circuit in a centralized traffic control system using audio frequency overlay circuit superimposed for obtaining block indications in the single track areas between adjacent ends of sidings.

The d.c. line circuit, used for signal control, provides a channel for use by the overlay circuit.

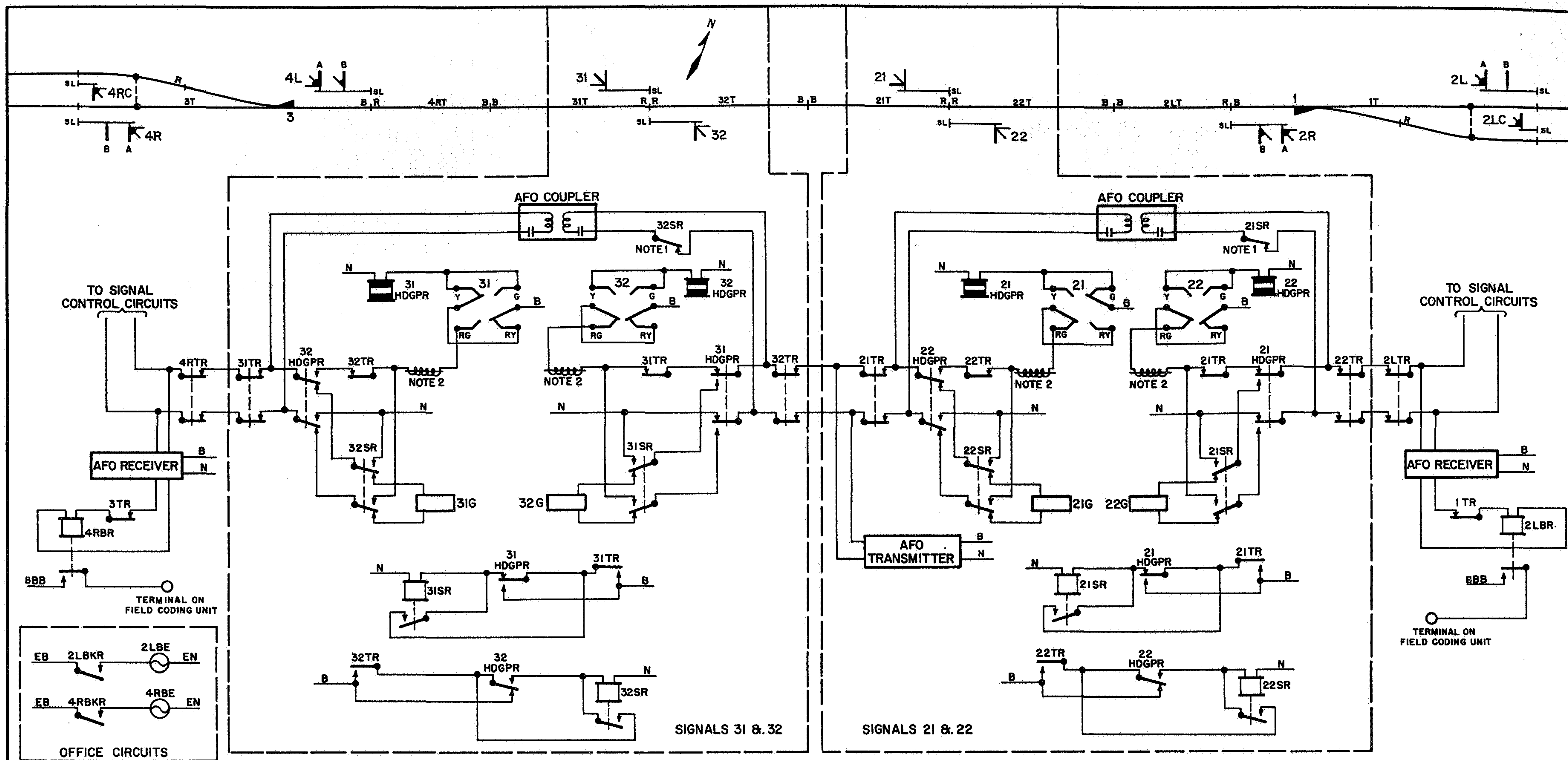
Two block indications for the single track area are obtained by placing the AFO transmitted in the middle of the block, feeding a.c. of specified frequency to receivers at each end. The receiver is an audio frequency amplifier tuned to receive the signal at the particular frequency transmitted, amplifies and rectifies this signal into a control voltage, which is used to energize relays 4RBR and 2LBR. Should one indication light only be desired for the single track area, the AFO transmitter would be located at one end of the block, one receiver located at the other end.

The AFO coupling unit is used at intermediate signal locations to bridge the independent line circuits which must be kept isolated from each other with respect to d.c. However, the use of this device permits the audio frequency overlay circuit to pass.

Blocking reactors are connected in series at all battery connections on the line circuit. The d.c. battery has the effect of a short circuit on the audio frequency overlay equipment, therefore a reactor is necessary to block the flow of this current, but permits the flow of d.c. current to the line. Reactors are not necessary at intermediate signal locations where series approach relays are used, since the relay has sufficient impedance to block the flow of current on the overlay line circuit.

The overlay line circuit in this application includes the use of track contacts in the two-wire signal control circuits to indicate block occupancy conditions.

Additional audio frequency overlay circuits may be applied to conventional two-wire line circuits when desired to control and/or indicate additional functions. This is accomplished by the use of transmitters and receivers tuned to operate on frequencies that will prevent interaction of the equipment.



NOTES:

1. TO PREVENT POSSIBLE LOSS OF BLOCK INDICATION.
2. BLOCKING REACTOR.
3. LIGHTNING PROTECTION DETAILS NOT SHOWN.
4. COMMUNICATION CIRCUITS SHOULD HAVE ADEQUATE TRANSPOSITION TO PREVENT INTERFERENCE BY AFO CURRENT.

BLOCK INDICATION

USING OVERLAY LINE CIRCUITS

OCT. 1960

AAR SIG. SEC. 8087A

CONTROL CIRCUITS FOR SWITCH HEATERS AND SNOW BLOWERS.

These circuits provide a means of controlling switch heaters and snow blowers at remote locations by direct wire control. A pull stick button at the control point operates the control relay in the field and when the field apparatus functions properly an indication light is illuminated at the control point.

Code control systems may be used to operate and indicate the field apparatus in lieu of direct wire remote control, if desired.

Operation of the electric switch heaters, as shown on Sheet 1, is initiated when the switch heater control relay WHCR becomes energized from the control point. The WHCPR relay, which is controlled through the WHCR relay, energizes the magnetic contactor WHZ which in turn applies a.c. energy through its closed front contacts to the individual switch heaters. The control point receives an indication upon energization of the WHZ contactor.

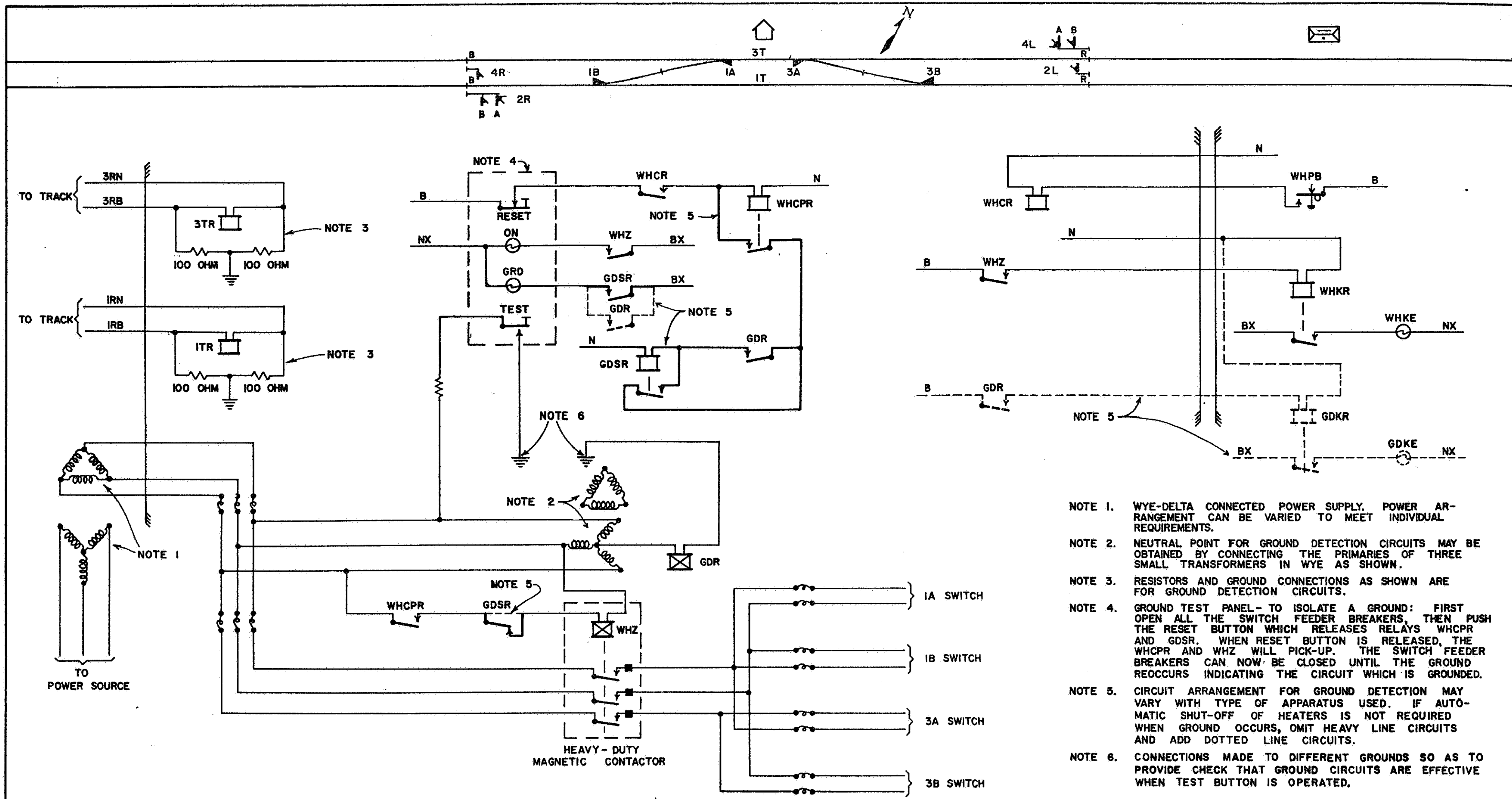
In event of a ground in any of the switch heater circuits, the ground detector relay GDR is energized. This in turn energizes the GDSR relay which releases the WHZ contactor and opens the circuit to the switch heaters.

Operation of the gas and oil type switch heaters, as shown on Sheet 2, is initiated when the switch heater control stick relay WHCSR becomes energized from the control point. This relay opens the solenoid valves supplying fuel to the switch heaters, energizes the igniter coils and completes the circuit to the switch heater time element relay WHTER.

Under normal operation the switch heaters will ignite closing the thermo-couple contacts to energize the switch heater indicator relays 1 and 3WHKR. These relays open the circuit to the igniter coils, send in a switch heater indication and open the circuit to the WHTER relay.

In the event any heater in the group fails to ignite and indicate before the time cycle of the WHTER relay is completed, the WHTESR relay becomes energized. This relay then opens the control to the igniter coils and solenoid valves to whichever group of heaters fail to operate. This feature prevents the continued energization of the igniter coils and closes the solenoid valves in the group where the defective heater is located.

Operation of the pneumatic snow blower, as shown on Sheet 2, is initiated from the control point when the snow blower control relay SBCR becomes energized. The SBCR relay operates the compressor motor which supplies air to the cycling tank. When adequate air pressure is attained, the air pressure valve contact closes, energizing the snow blower indicator relay SBKR at the control point illuminating the indication lamp.



NOTE 1. WYE-DELTA CONNECTED POWER SUPPLY. POWER ARRANGEMENT CAN BE VARIED TO MEET INDIVIDUAL REQUIREMENTS.

NOTE 2. NEUTRAL POINT FOR GROUND DETECTION CIRCUITS MAY BE OBTAINED BY CONNECTING THE PRIMARIES OF THREE SMALL TRANSFORMERS IN WYE AS SHOWN.

NOTE 3. RESISTORS AND GROUND CONNECTIONS AS SHOWN ARE FOR GROUND DETECTION CIRCUITS.

NOTE 4. GROUND TEST PANEL- TO ISOLATE A GROUND: FIRST OPEN ALL THE SWITCH FEEDER BREAKERS, THEN PUSH THE RESET BUTTON WHICH RELEASES RELAYS WHCPR AND GDSR. WHEN RESET BUTTON IS RELEASED, THE WHCPR AND WHZ WILL PICK-UP. THE SWITCH FEEDER BREAKERS CAN NOW BE CLOSED UNTIL THE GROUND REOCCURS INDICATING THE CIRCUIT WHICH IS GROUNDED.

NOTE 5. CIRCUIT ARRANGEMENT FOR GROUND DETECTION MAY VARY WITH TYPE OF APPARATUS USED. IF AUTOMATIC SHUT-OFF OF HEATERS IS NOT REQUIRED WHEN GROUND OCCURS, OMIT HEAVY LINE CIRCUITS AND ADD DOTTED LINE CIRCUITS.

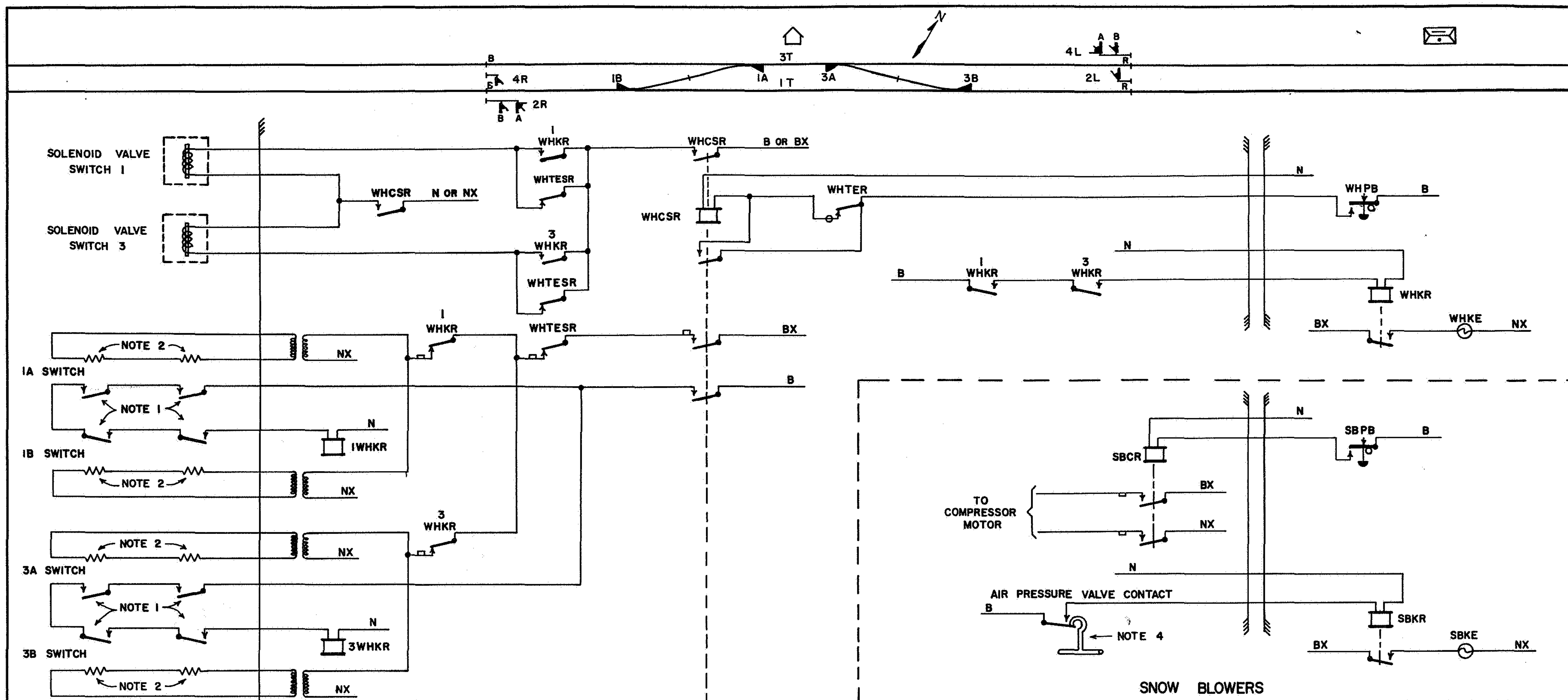
NOTE 6. CONNECTIONS MADE TO DIFFERENT GROUNDS SO AS TO PROVIDE CHECK THAT GROUND CIRCUITS ARE EFFECTIVE WHEN TEST BUTTON IS OPERATED.

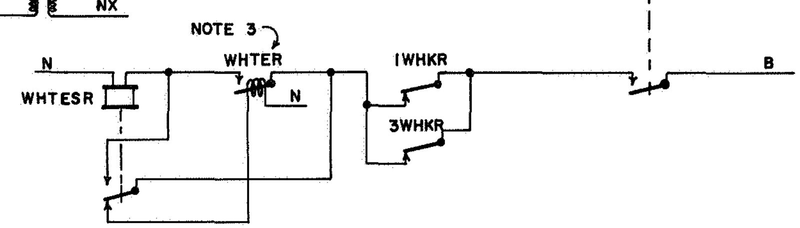
SWITCH HEATERS AND SNOW BLOWERS

DIRECT WIRE REMOTE CONTROL – ELECTRIC TYPE SWITCH HEATERS

NOV. 1960	OCT. 1960	AAR SIG. SEC. 8088A

SHEET 1





SWITCH HEATERS - GAS OR OIL TYPE

NOTE 1. THERMOCOUPLE CONTACTS OPEN WHEN COLD, CLOSED WHEN HOT.

NOTE 2. LOW VOLTAGE IGNITER COIL.

NOTE 3. TIME ELEMENT RELAY TO BE SET TO PROVIDE SUFFICIENT IGNITING TIME.

NOTE 4. AIR PRESSURE VALVE CONTACT MOUNTED ON AIR SUPPLY LINE BETWEEN COMPRESSOR AND CYCLING TANK. CONTACT TO INDICATE ADEQUATE AIR PRESSURE FROM COMPRESSOR.

SWITCH HEATERS AND SNOW BLOWERS

DIRECT WIRE - REMOTE CONTROL

OCT. 1960

AAR SIG. SEC. 8088A

SHEET 2

CIRCUITS FOR CHECKING POSITION OF DUAL SELECTOR LEVER OF POWER-OPERATED SWITCH MACHINE.

The method of circuitry as shown on this plan is designed to include the "P" position (closed in power position) of the selector lever of a dual power-operated switch machine in the switch correspondence circuit when it is desired to maintain signals at stop or cause a clear signal to assume a stop position in the event a dual power-operated switch machine is operated by hand.

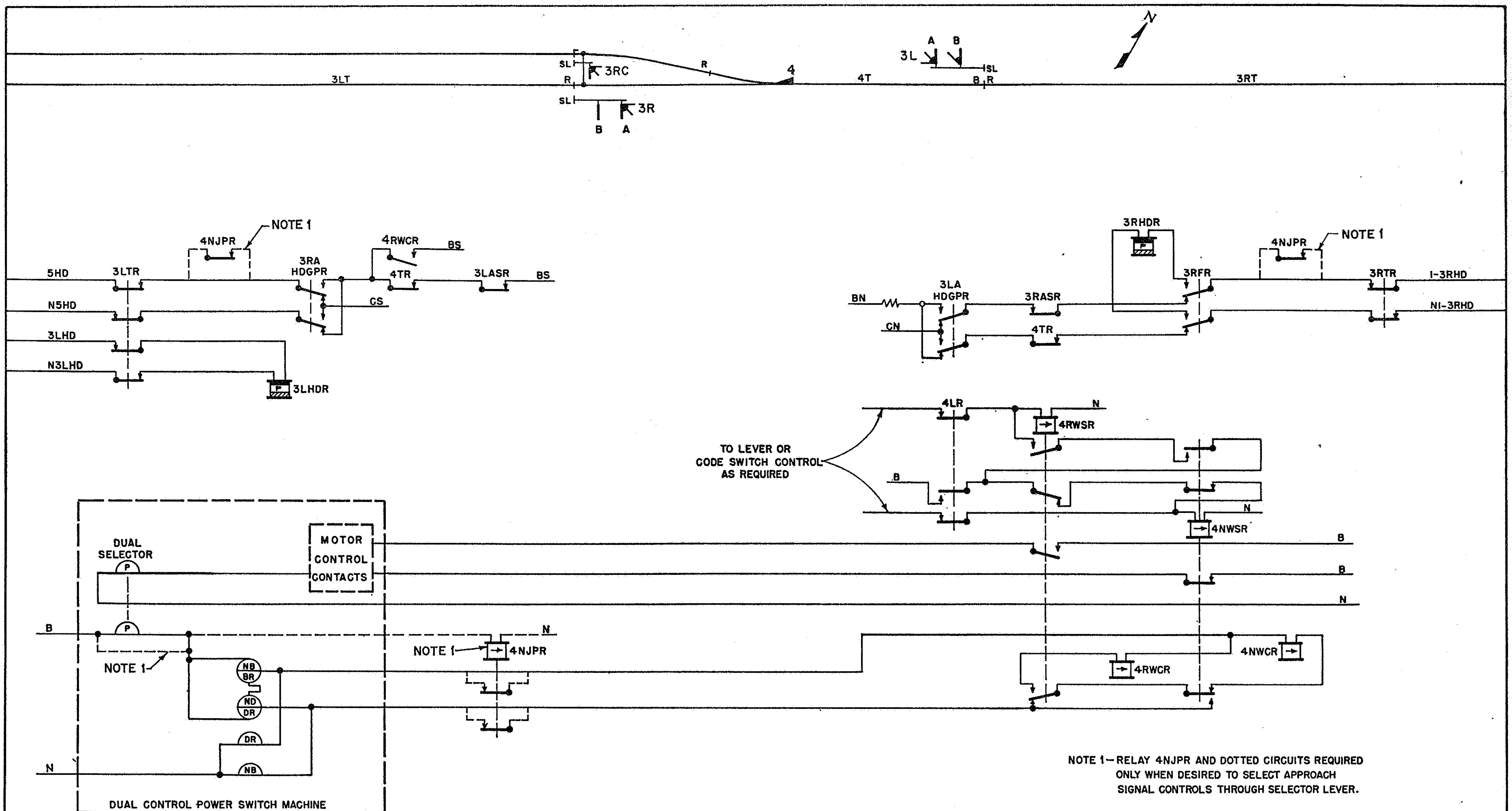
Energy is selected through the "P" position of the dual selector lever, NB or DR contacts of the point detector, depending on position of switch, in turn energizing desired correspondence relay 4NWCR-4RWCR. Should the dual selector lever be operated from the "P" position, energy will be removed from the correspondence relay, thus de-energizing both 4NWCR and 4RWCR. A combination of front and back contacts of relays 4NWCR and 4RWCR in the 3L-3R network will prevent the signals from clearing, or if a signal is clear, will cause this signal to assume a stop position.

An alternate scheme, as covered by Note 1, is also shown for use when it is desired to establish absolute block protection by preventing opposing signals at the other end of block from being cleared or if they have been cleared, cause them to assume a stop position in the event a dual power-operated switch machine is operated by hand.

Relay 4NJPR is energized through "P" position of the dual selector lever. The control circuits of the 4NWC-4RWC relays are now slightly modified from that previously described to the extent that energy will be selected through the NB or DR contact of the point detector then selected through front contacts of relay 4NJPR. The remainder of the switch correspondence circuit is as previously described.

Front contacts of relay 4NJPR are inserted in the overlap network of the 1-3RD and 5HD circuits. Insertion of these contacts in the overlap network will establish absolute block protection by preventing opposing signals at the other end of the block from being cleared, or if they have been cleared, cause them to assume a stop position whenever the power-operated dual control switch machine is operated by hand.

By selecting the overlap circuits through front contacts, the 4NJPR, the opposing signals at the other end of the block cannot be inadvertently cleared should a movement unoccupy the track circuits while performing switching movements.



NOTE 1—RELAY 4NJPR AND DOTTED CIRCUITS REQUIRED ONLY WHEN DESIRED TO SELECT APPROACH SIGNAL CONTROLS THROUGH SELECTOR LEVER.

POWER OPERATED SWITCH MACHINE
DUAL CONTROL

OCT. 1960

AAR SIG. SEC. 8089A

ADDENDUM TO AAR SIGNAL 8090A

TYPICAL CIRCUITS FOR AUTOMATIC HIGHWAY CROSSING PROTECTION.

Sheet 1 illustrates shunt type overlay track circuit to provide the island track circuit where conventional d-c approach track circuits are in use. A minimum of two insulated joints is required on one side of the highway to separate the two approach track circuits.

The operation of the circuit is as follows: Assume a train moving from right to left enters 2T track circuit. 2TR releasing, opens the circuit to relay XR, and also establishes a pickup circuit to stick relay 1XSR.

As the train approaches the transmitter and enters the overlay track circuit, the transmission of the overlay energy to the receiver is shunted out and overlay track OTR releases providing a stick circuit to 1XSR. When the train has moved past the insulated joints separating 1T and 2T track circuits, 2TR picks up to establish a second stick circuit to 1XSR through 2TR front, 1TR back and 1XSR front contacts.

Also as the rear of the train moves beyond the track connection of the receiver and the insulated joints, the overlay signal is again received and OTR is energized. The pickup of OTR establishes a pickup circuit to XR through front contacts of 2TR, OTR and 1XSR, which bypasses 1TR front contact now released. The pickup of XR cancels the highway crossing indication. When the train clears the track circuit 1T, 1TR picks up, 1XSR releases and the crossing circuits return to normal.

Sheet 2 illustrates the use of shunt type overlay track circuits for approach control for highway crossing protection on single track with double-direction running without the use of insulated joints.

Transmitters of sufficiently different frequencies are required to eliminate interference between track circuits. The receivers tuned to the proper frequency are inductively coupled to the track by means of a wire loop, which provides a sharp cut-off as train enters or leaves the crossing area. The coupling loops usually consist of multiple-conductor cable fastened to the web of the rail. The length of loop is dependent on the number of turns. Also the number of turns is dependent on the frequency being used. Higher frequencies may require a greater number of turns. Where sharp cut-off is not required, a direct connection of the receiver to the rail may be made.

Two types of stick circuits are shown. In both circuits the receding stick is picked up as soon as the train enters the approach. Scheme 2 uses one additional relay (XPR) to provide protection against picking up the wrong stick should the proper stick relay fail to pick up.

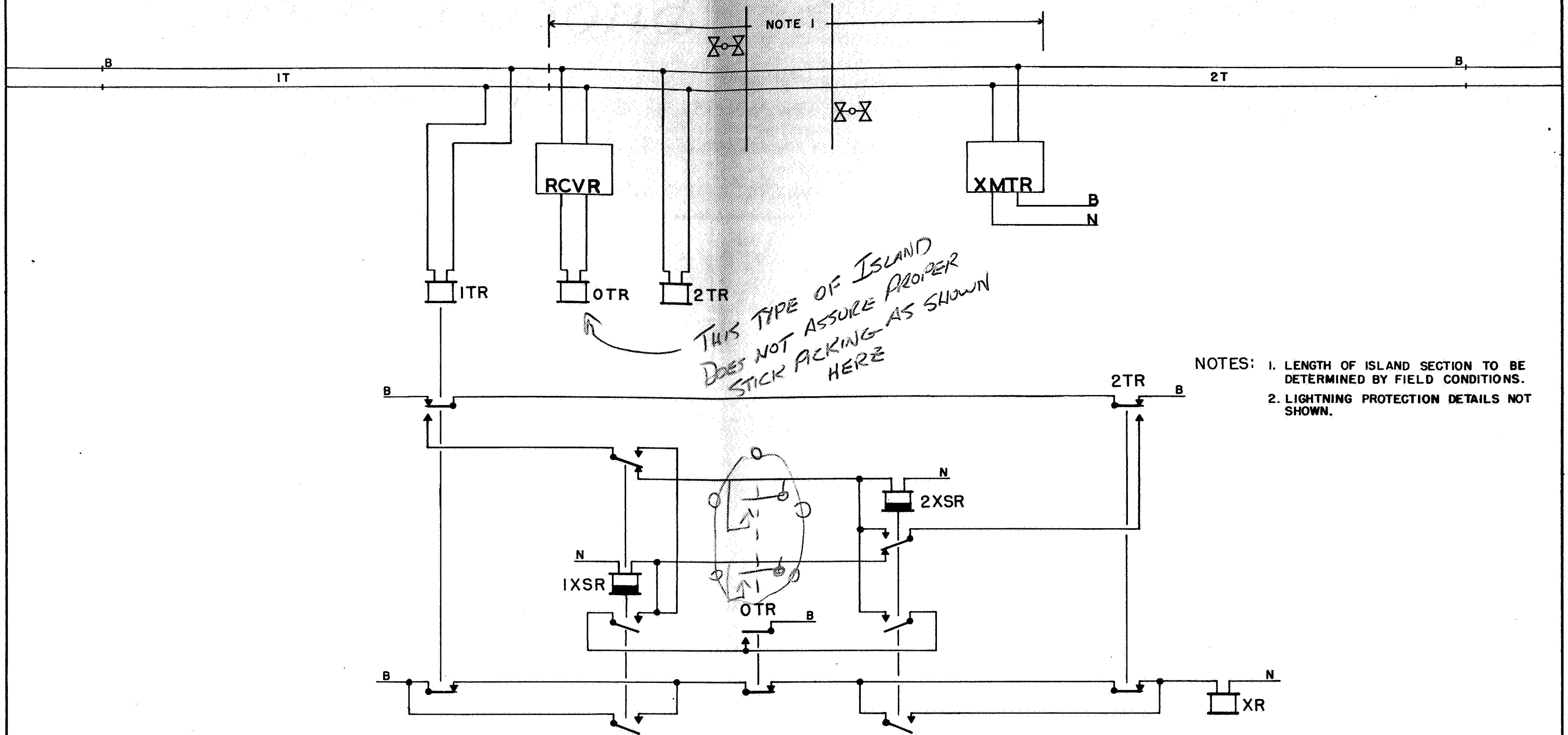
ADDENDUM TO AAR SIGNAL 8090A - Continued

Sheet 3 illustrates the use of shunt type overlay track circuits for approach control with a third shunt type overlay circuit for island track circuit.

The island track circuit provides a more flexible arrangement of stick circuit control as it may be used to delay the pick-up of the receding stick relay until the train actually enters the highway crossing area. This circuit arrangement also provides the means for dropping out the stick relay should both approaches be occupied.

The use of the island overlay track circuit allows the use of the stick circuit schemes 1 and 2 shown on AAR Signal Plan 8053

When overlay receivers are connected directly to the rails, the area outside the receiver connections where train shunt is effective generally varies less for short overlay circuits than for long overlay circuits. On Sheet 3 coupling loops are used in connection with the approach receivers for the same reason as on Sheet 2; however, the island receiver is connected direct to the rails. Variation of the effective length of the island overlay track circuit with direct connected receiver will usually not exceed acceptable limits.



NOTES:
1. LENGTH OF ISLAND SECTION TO BE DETERMINED BY FIELD CONDITIONS.
2. LIGHTNING PROTECTION DETAILS NOT SHOWN.

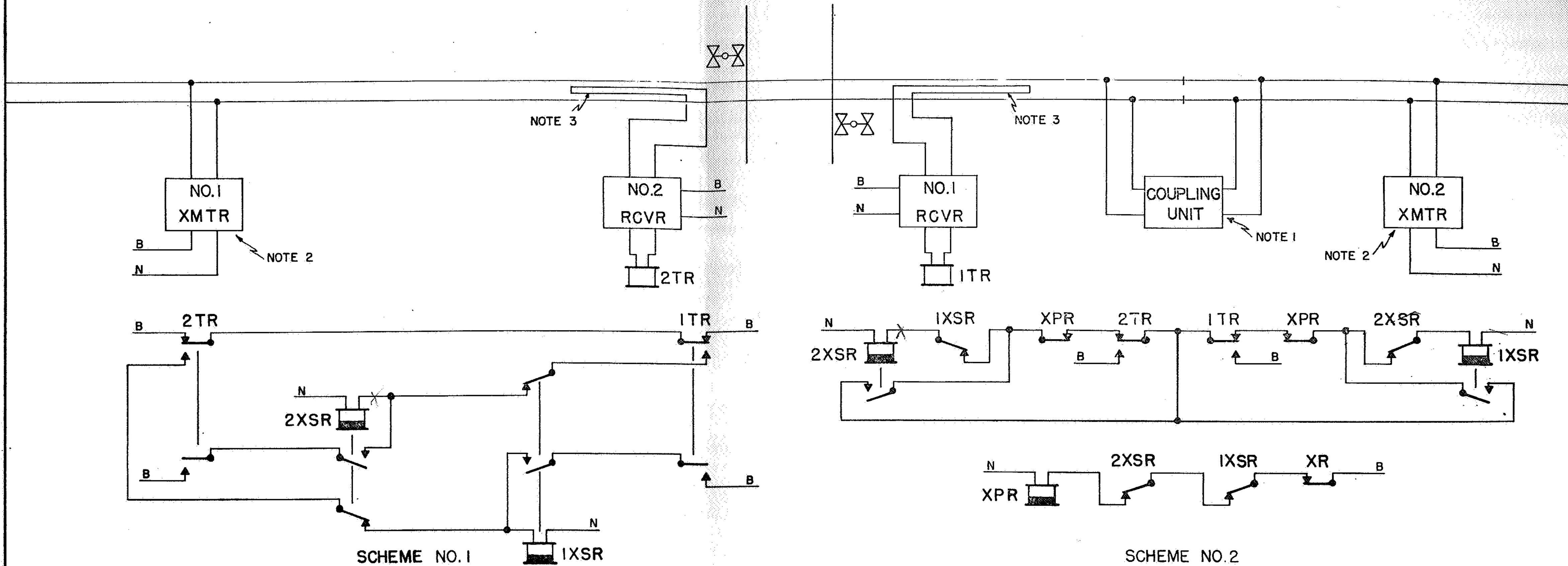
TYPICAL CIRCUITS FOR AUTOMATIC HIGHWAY CROSSING PROTECTION

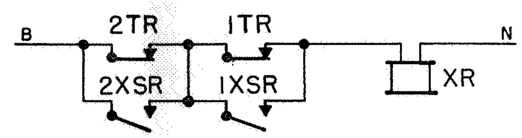
USING FREQUENCY OVERLAY TRACK CIRCUIT TO OBTAIN ISLAND CIRCUIT ON EXISTING HIGHWAY CROSSING INSTALLATION

OCT. 1962

AAR
SIG. SEC.
8090A

SHEET 1 OF 2 SHEETS





COMMON TO SCHEME NO. 1 AND NO. 2

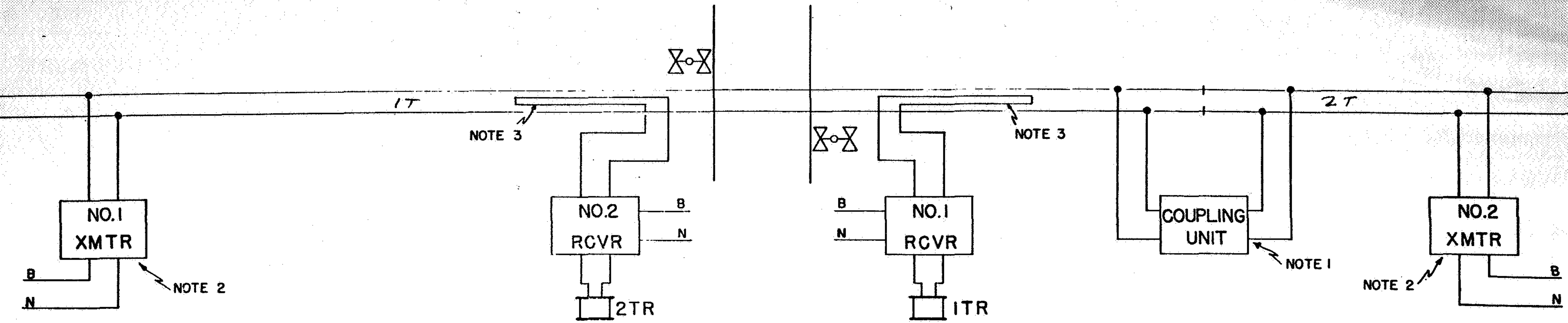
NOTES:

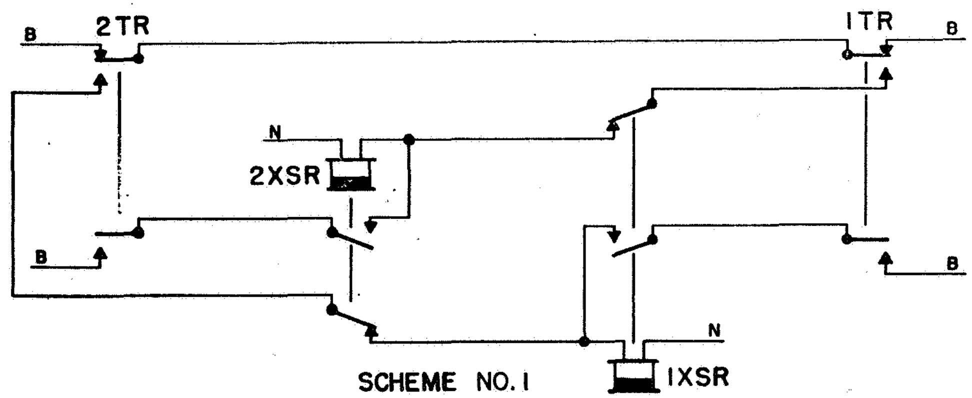
1. COUPLING UNIT IS USED TO PASS FREQUENCY OVERLAY TRACK ENERGY AROUND INSULATED JOINTS WITHIN APPROACH LIMITS.
2. ADEQUATE FREQUENCY SEPARATION IS REQUIRED BETWEEN XMTR NO. 1 AND XMTR NO. 2.
3. LOOP CIRCUIT WILL VARY WITH TYPE EQUIPMENT EMPLOYED.
4. LIGHTNING PROTECTION DETAILS NOT SHOWN.

TYPICAL CIRCUITS FOR AUTOMATIC HIGHWAY CROSSING PROTECTION

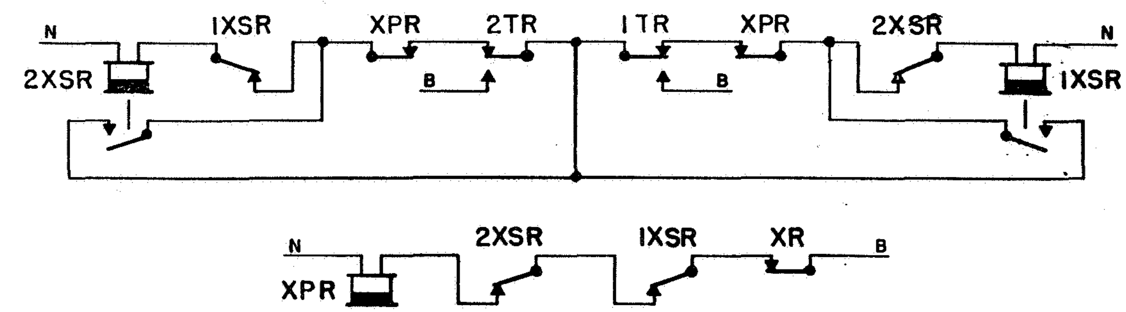
USING FREQUENCY OVERLAY TRACK CIRCUITS FOR APPROACH CONTROL

JULY 1964	OCT. 1962	AAR SIGNAL 8090A





SCHEME NO.1



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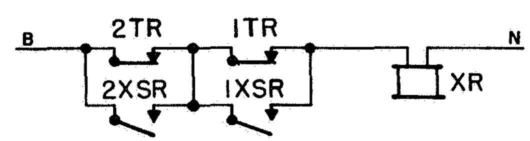


COMMON TO SCHEME NO.1 AND NO.2

NOTES:
1. COUPLING UNIT IS USED TO PASS FREQUENCY OVERLAY TRACK ENERGY AROUND INSULATED JOINTS WITHIN APPROACH LIMITS.
2. ADEQUATE FREQUENCY SEPARATION IS REQUIRED BETWEEN XMTR NO.1 AND XMTR NO.2.
3. LOOP CIRCUIT WILL VARY WITH TYPE EQUIPMENT EMPLOYED.
4. LIGHTNING PROTECTION DETAILS NOT SHOWN.

XPR is used to prevent stick from picking before in case original stick fails to pick or stick

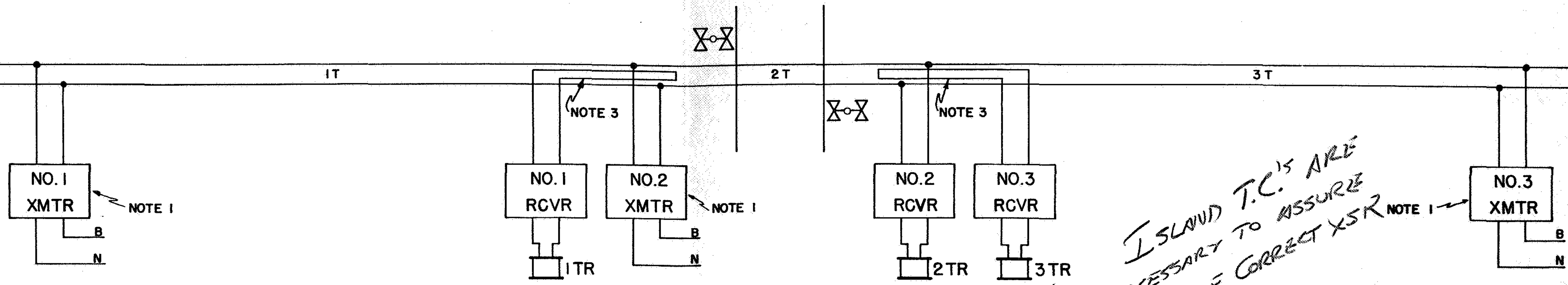
Failure to pick or stick 2XSR

TYPICAL CIRCUITS FOR AUTOMATIC HIGHWAY CROSSING PROTECTION

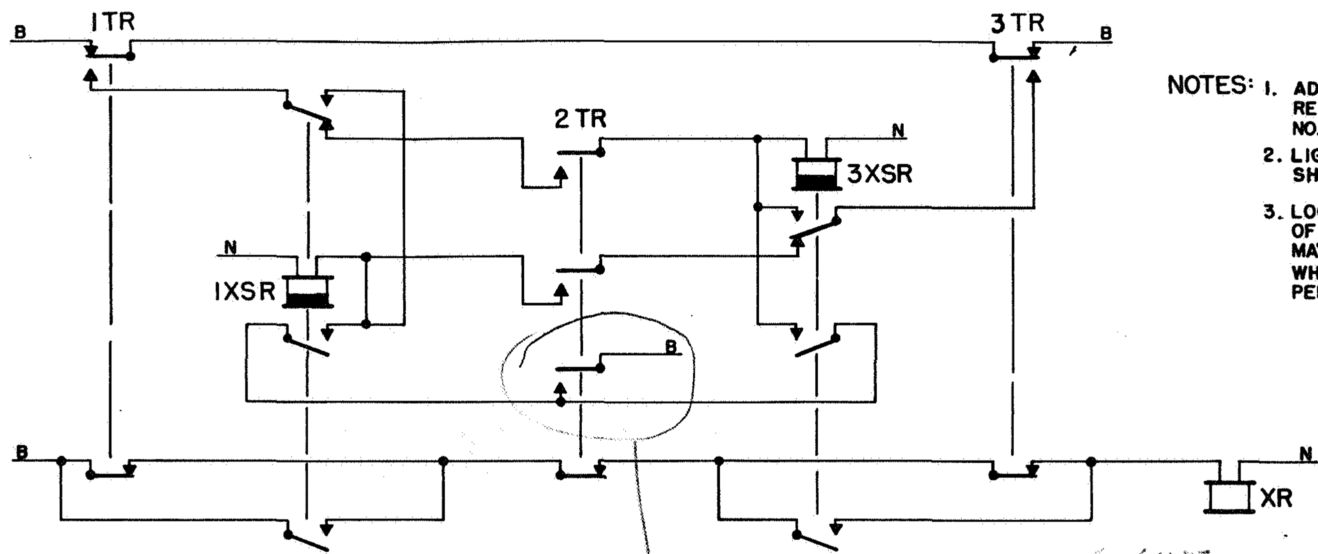
USING FREQUENCY OVERLAY TRACK CIRCUITS FOR APPROACH CONTROL

JULY 1964	OCT. 1962	AAR SIGNAL 8090A

SHEET 2 OF 3 SHEETS



ISLAND T.C.'S ARE NECESSARY TO ASSURE PICKING OF CORRECT XSR



NOTES:
1. ADEQUATE FREQUENCY SEPARATION IS REQUIRED BETWEEN XMTRS NO. 1 NO. 2 AND NO. 3.
2. LIGHTNING PROTECTION DETAILS NOT SHOWN
3. LOOP CIRCUIT WILL VARY WITH TYPE OF EQUIPMENT EMPLOYED. RECEIVER MAY BE DIRECTLY CONNECTED TO RAIL WHERE EQUIPMENT AND CONDITIONS PERMIT.

TO ACCOMODATE LIGHT ENGINE OR JOINT HOPPER - HOLDS STICK WHILE BOTH 1 & 3TR'S ARE UP

TYPICAL CIRCUITS FOR AUTOMATIC HIGHWAY CROSSING PROTECTION

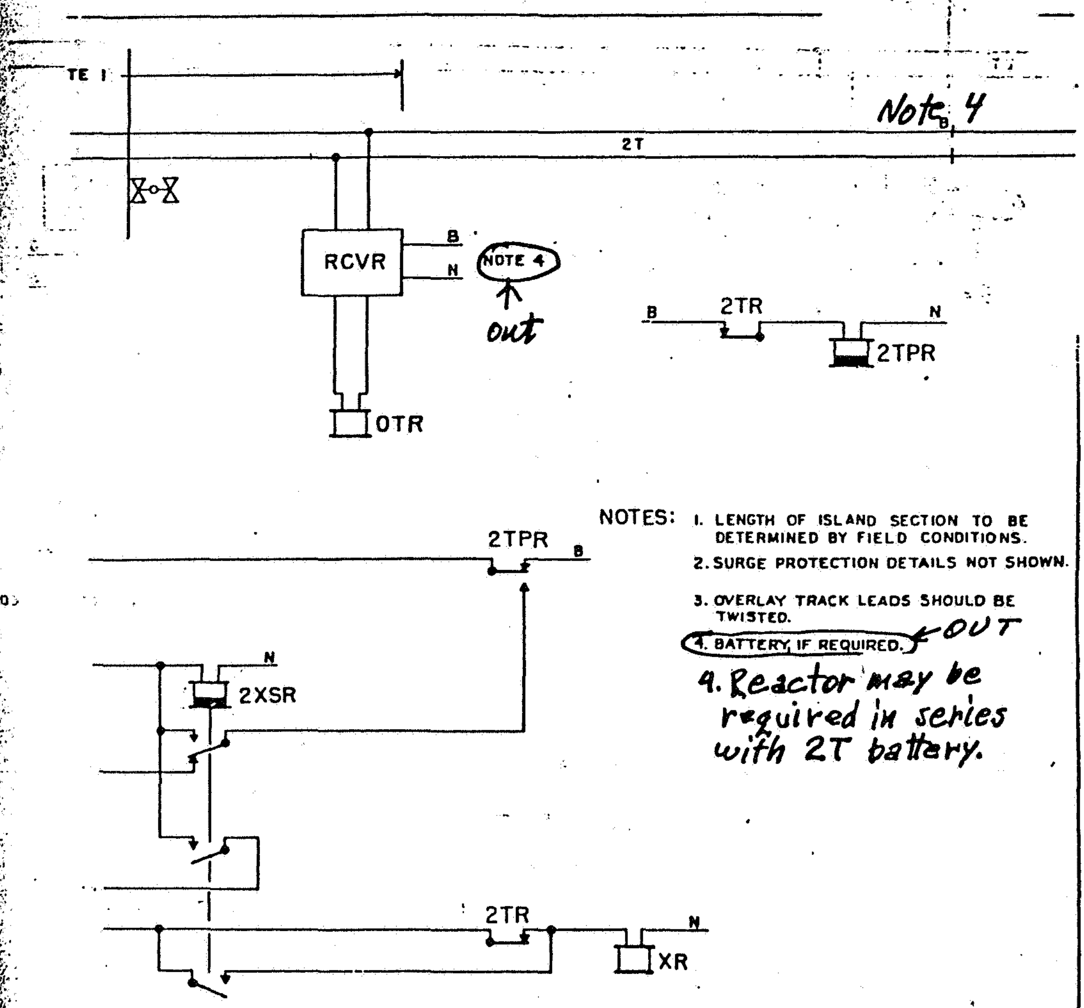
USING FREQUENCY OVERLAY TRACK CIRCUITS FOR APPROACH CONTROL AND ISLAND CIRCUIT

AAR SIGNAL 8090A

OCT. 1963

Exhibit D-29 Drawing 8090B, Sheet 1 Typical Circuits for Automatic Highway Grade Crossing Warning Devices Using Frequency Overlay Track Circuit to Obtain Island Circuit on Existing Highway Crossing Installation

NOTE: Only portion of circuit shown where changes made.



NOTES:
1. LENGTH OF ISLAND SECTION TO BE DETERMINED BY FIELD CONDITIONS.
2. SURGE PROTECTION DETAILS NOT SHOWN.
3. OVERLAY TRACK LEADS SHOULD BE TWISTED.
4. BATTERY, IF REQUIRED. OUT
4. Reactor may be required in series with 2T battery.

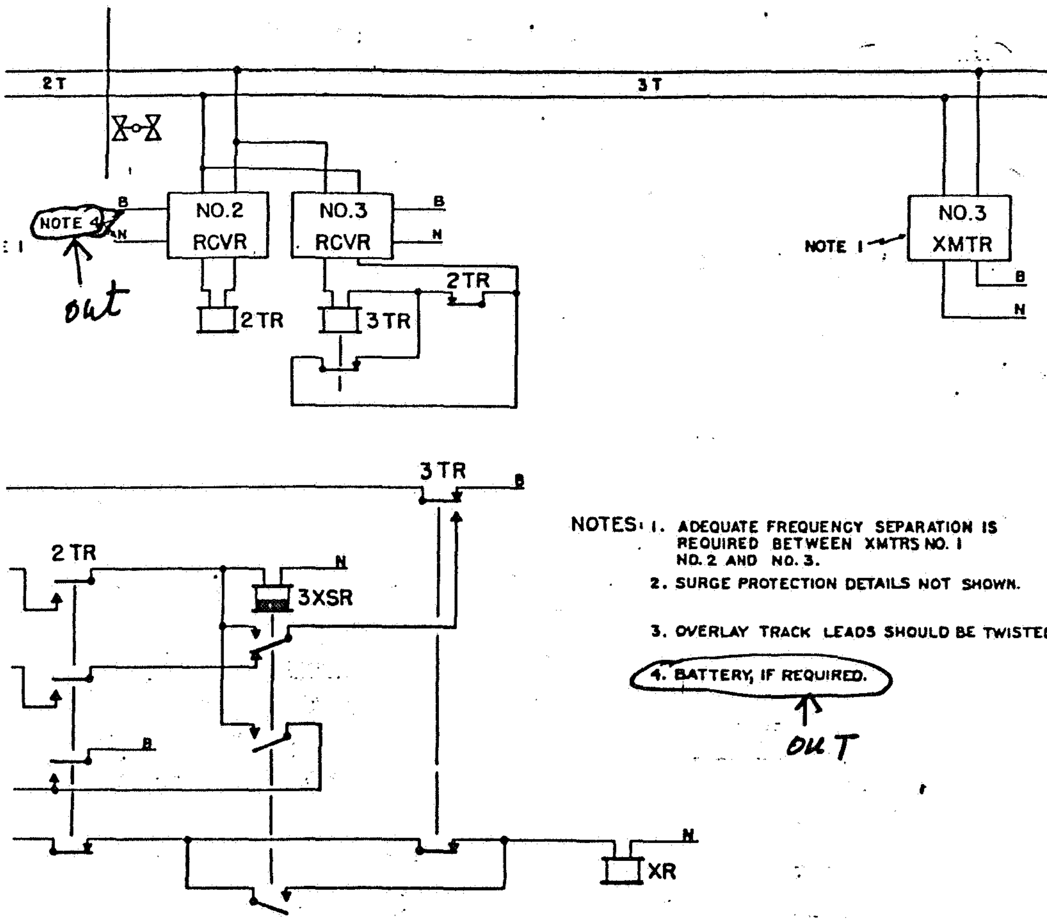
GRADE CROSSING WARNING DEVICES

ISLAND CIRCUIT ON EXISTING HIGHWAY CROSSING INSTALLATION

AAR

Exhibit D-30 Drawing 8090B Sheet 2 Typical Circuits for Automatic Highway Grade Crossing Warning Devices Using Frequency Overlay Track Circuits for Approach Control and Island Circuit

NOTE: Only portion of circuit shown where changes made.



NOTES: 1. ADEQUATE FREQUENCY SEPARATION IS REQUIRED BETWEEN XMTRS NO. 1 NO. 2 AND NO. 3.
2. SURGE PROTECTION DETAILS NOT SHOWN.
3. OVERLAY TRACK LEADS SHOULD BE TWISTED.
4. BATTERY, IF REQUIRED.

ouT

GHWAY GRADE CROSSING WARNING DEVICES
R APPROACH CONTROL AND ISLAND CIRCUIT
AAR

ADDENDUM TO AAR SIGNAL 8090B

TYPICAL CIRCUITS FOR AUTOMATIC HIGHWAY CROSSING PROTECTION.

Sheet 1 illustrates shunt type overlay track circuit to provide the island track circuit conventional dc approach track circuits are in use. A minimum of two insulated joints is required on one side of the highway to separate the two approach track circuits.

The operation of the circuit is as follows: Assume a train moving from right to left enters 2T track circuit. 2TR releasing, opens the circuit to relay XR, and also establishes a pickup circuit to stick relay 1XSR.

As the train approaches the receiver and enters the overlay track circuit, the transmission of the overlay energy to the receiver is shunted out and overlay track OTR releases providing a stick circuit to 1XSR. When the train has moved past the insulated joints separating 1T and 2T track circuits, 2TR picks up to establish a second stick circuit to 1XSR through 2TR front, 1TR back and 1XSR front contacts.

Also as the rear of the train moves beyond the track connection of the transmitter and the insulated joints, the overlay signal is again received and OTR is energized. The pickup of OTR establishes a pickup circuit to XR through front contacts of 2TR, OTR and 1XSR, which bypasses 1TR front contact now released. The pickup of XR cancels the highway crossing indication. When the train clears the track circuit 1T, 1TR picks up, 1XSR releases and the crossing circuits return to normal.

Sheet 2 illustrates the use of shunt type overlay track circuits for approach control for highway crossing protection on single track with double-direction running without the use of insulated joints.

Two types of stick circuits are shown. In both circuits the receding stick is picked up as soon as the train enters the approach. Scheme 2 uses one additional relay (XPR) to provide protection against picking up the wrong stick should the proper stick relay fail to pick up.

Sheet 3 illustrates the use of shunt type overlay track circuits for approach control with a third shunt type overlay circuit for island track circuit.

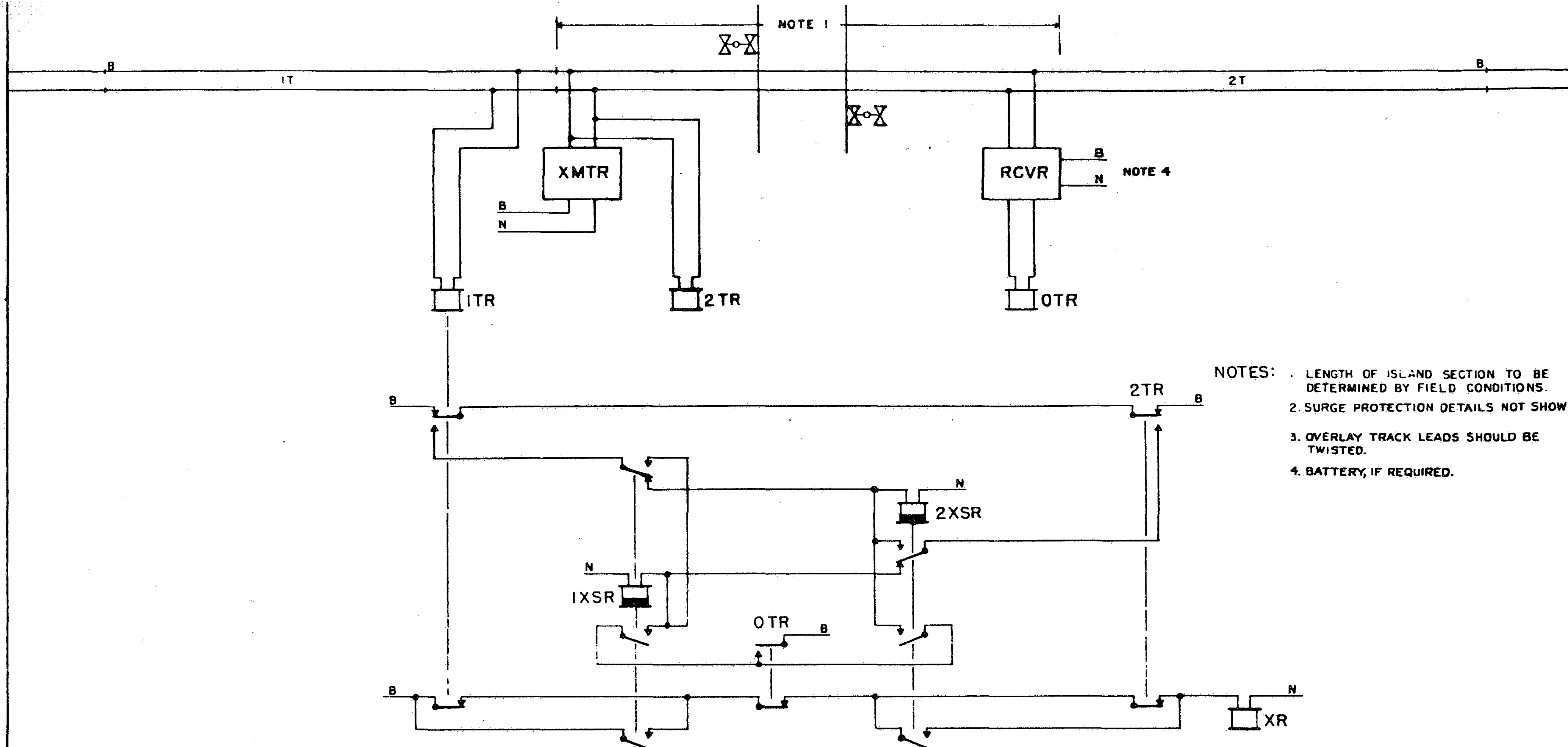
The island track circuit provides a more flexible arrangement of stick circuit control as it may be used to delay the pick-up of the receding stick relay until the train actually enters the highway crossing area. This circuit arrangement also provides the means for dropping out the stick relay should both approaches be occupied.

The use of the island overlay track circuit allows the use of the stick circuit schemes 1 and 2 shown on AAR Signal Plan 8053.

GENERAL

Transmitter and receiver pairs of sufficiently different frequencies are required to eliminate interference between track circuits. The receivers are coupled and adjusted to the track to provide a sharp cut-off, as train enters or leaves the crossing area.

When overlay track circuits are used in signal territory, adequate lockout protection is desirable.



NOTES: . LENGTH OF ISLAND SECTION TO BE DETERMINED BY FIELD CONDITIONS.

2. SURGE PROTECTION DETAILS NOT SHOWN.

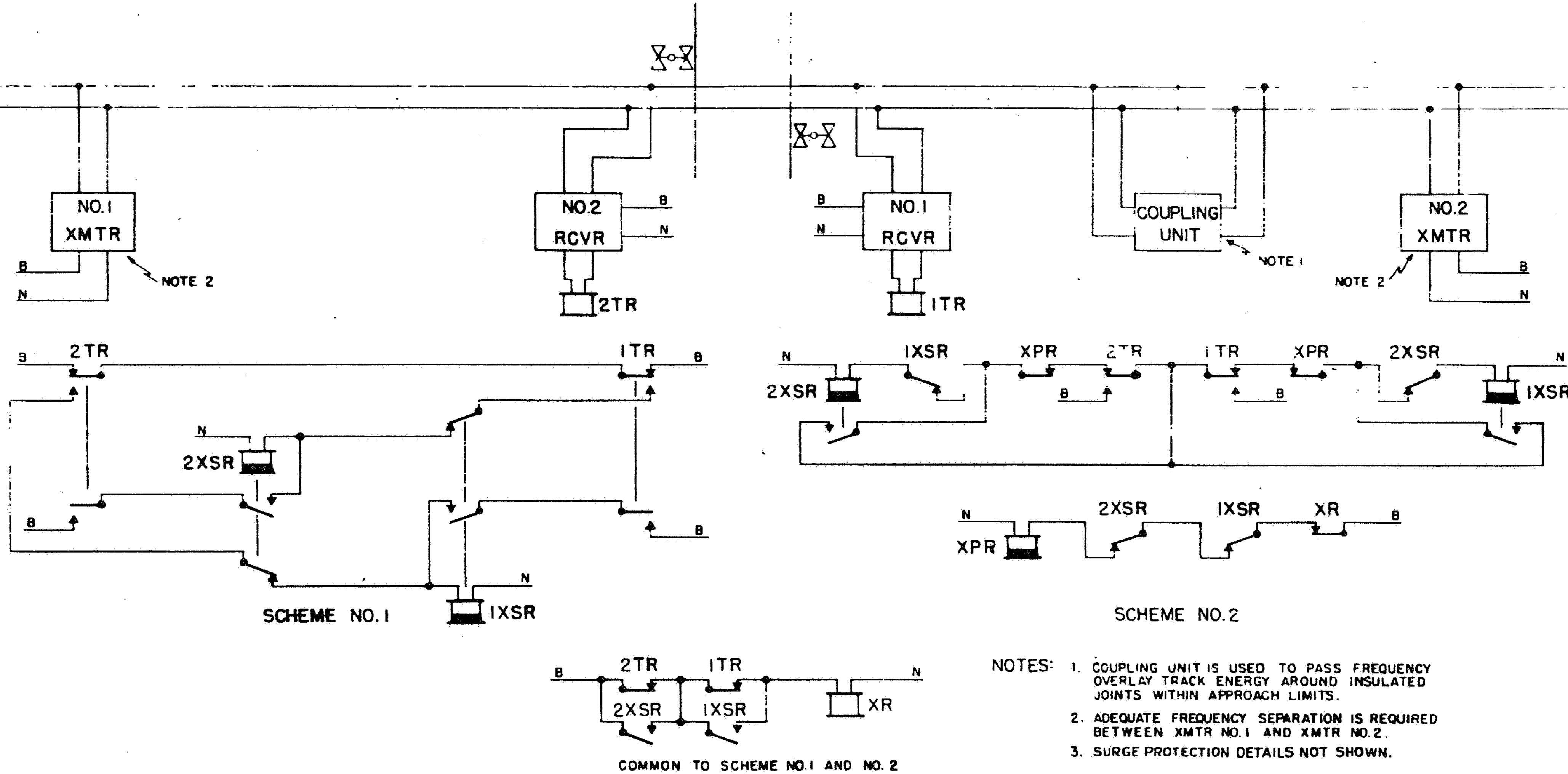
3. OVERLAY TRACK LEADS SHOULD BE TWISTED.

4. BATTERY, IF REQUIRED.

TYPICAL CIRCUITS FOR AUTOMATIC HIGHWAY CROSSING PROTECTION

USING FREQUENCY OVERLAY TRACK CIRCUIT TO OBTAIN ISLAND CIRCUIT ON EXISTING HIGHWAY CROSSING INSTALLATION

SEPT. 1970	OCT. 1962	AAR SIG. SEC. 8090B



NOTES:

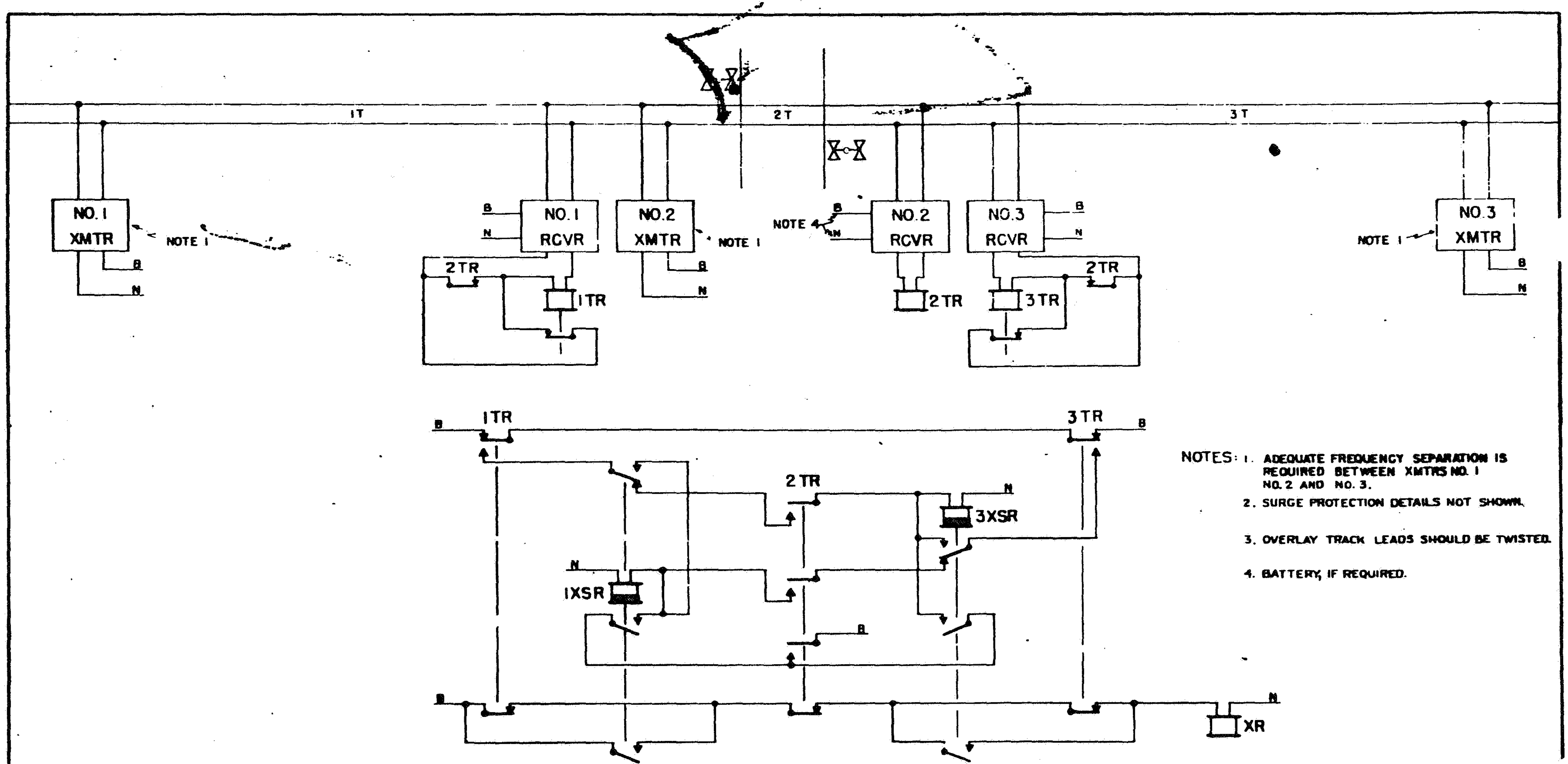
1. COUPLING UNIT IS USED TO PASS FREQUENCY OVERLAY TRACK ENERGY AROUND INSULATED JOINTS WITHIN APPROACH LIMITS.
2. ADEQUATE FREQUENCY SEPARATION IS REQUIRED BETWEEN XMTR NO.1 AND XMTR NO.2.
3. SURGE PROTECTION DETAILS NOT SHOWN.
4. OVERLAY TRACK LEADS SHOULD BE TWISTED.

TYPICAL CIRCUITS FOR AUTOMATIC HIGHWAY CROSSING PROTECTION

USING FREQUENCY OVERLAY TRACK CIRCUITS FOR APPROACH CONTROL

AAR SIGNAL 8090B

SEPT. 1970	JULY 1964	OCT 1962



NOTES:
1. ADEQUATE FREQUENCY SEPARATION IS REQUIRED BETWEEN XMTRS NO. 1 NO. 2 AND NO. 3.
2. SURGE PROTECTION DETAILS NOT SHOWN.
3. OVERLAY TRACK LEADS SHOULD BE TWISTED.
4. BATTERY, IF REQUIRED.

TYPICAL CIRCUITS FOR AUTOMATIC HIGHWAY CROSSING PROTECTION

USING FREQUENCY OVERLAY TRACK CIRCUITS FOR APPROACH CONTROL AND ISLAND CIRCUIT

SEPT. 1970	OCT 1963	AAR SIGNAL 8090B

SHEET 3 OF 3 SHEETS

Exhibit D-27 New Drawing 8091 Typical Circuits for Automatic Highway Grade Crossing Warning Devices Showing Stick Release Timer and Test Switch

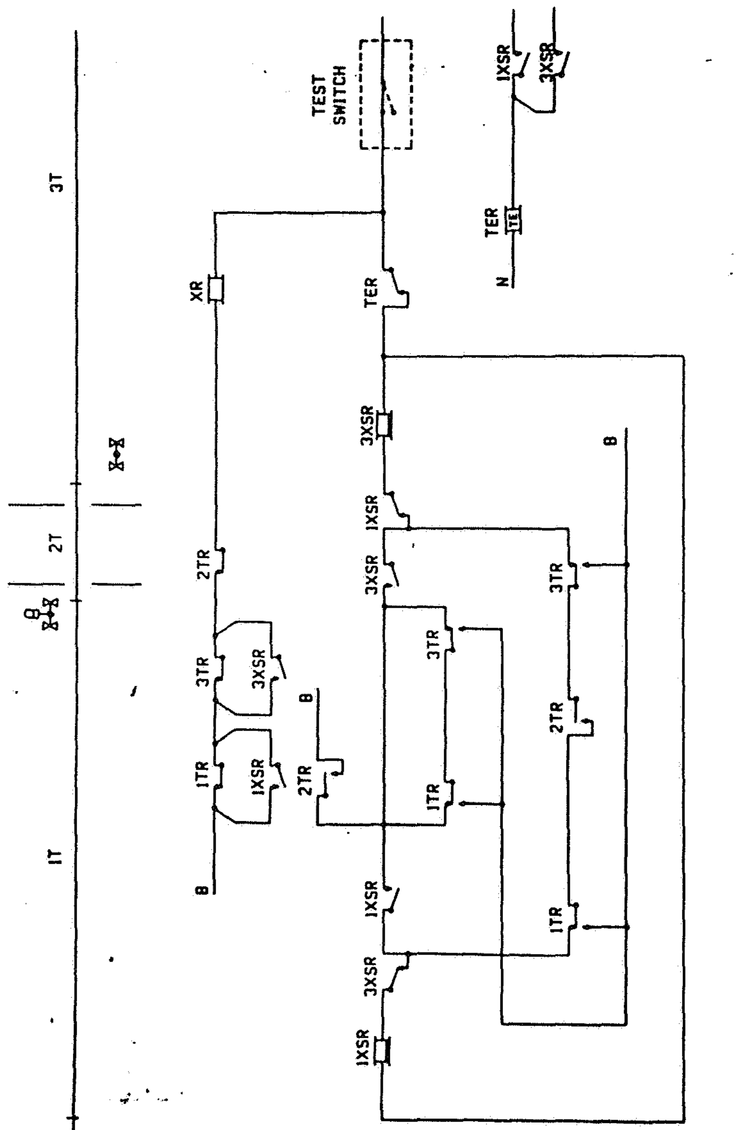


Exhibit D-27 continued

ADDENDUM TO A.A.R. SIGNAL 8091

Typical Circuits for Automatic Highway Grade Crossing Warning Device Showing Stick Release Timer and Test Switch

1. Operation of test switch will cause the release of either stick relay.

2. Timer begins timing on the pickup of either stick relay. Under normal operation the stick relays will drop before the timer expires. If there should be a fault in the track circuit, which then holds up a stick, the timer will run and on expiration of the time period, cause the stick relays to release. This will cause continuous operation of the warning system.

3. Timer should be set for a time long enough for normal train operation and to permit completion of switching moves. Time should not exceed the time required for the arrival of a train in the opposing direction.