SERIES 1000, TYPE 1001 CHANNELS

TRAFFIC NETWORK MANAGEMENT TELEMETERING CIRCUITS

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1. GENERAL

1.01 This Appendix outlines office responsibilities and special operating procedures required in connection with the maintenance of telemetering circuits used in the Traffic Network Management system.

1.02 An abbreviated description of the system is included. The telemetering system used on this network is equipped with ERX transceiver equipment and is covered by drawing WA 18015. Detailed equipment operation and maintenance procedures are discussed in other sections.

1.03 The drawings referred to are Long Lines issues and are available via lines of organization through the Long Lines District office.

2. OVERALL OPERATION (FIG. 1)

2.01 The telemetering control circuit for the Traffic Department Network Management system is designed to monitor switching machine display lamps at the machine location, to transmit these lamp indications to a distant location, and to light lamps on a display panel at the distant status center.

2.02 As a means of administering the message network used in the toll switching plan, each regional and sectional center switching office is equipped with a lamp display panel. This display indicates switching machine conditions and also indicates when all circuits in a particular group are busy. In general, a single lamp lights in the display panel when a group is busy.

2.03 The purpose of this control circuit is to transfer up to 80 of these lamp indications to a status center located at a distant station. The sectional center lamp display is transmitted to a status center at the regional office. The machine display at the regional center is transmitted to the New York Traffic Status Center status board. By observing the status display, the traffic department is aware of traffic conditions on the message network and may then institute remedial procedures to relieve the overloaded offices of circuit groups.

2.04 The function of the control office, and other telegraph offices involved, is to see that the telemetering circuits and equipment involved in providing this service are maintained in serviceable condition.

3. CIRCUIT OPERATION

3.01 The circuits used to provide this service are 0- to 15-Hz dc telegraph layouts. All circuits are nonregenerated 2-point half-duplex circuits.

3.02 This circuit transfers a lamp-on or lamp-off condition from a machine display cabinet

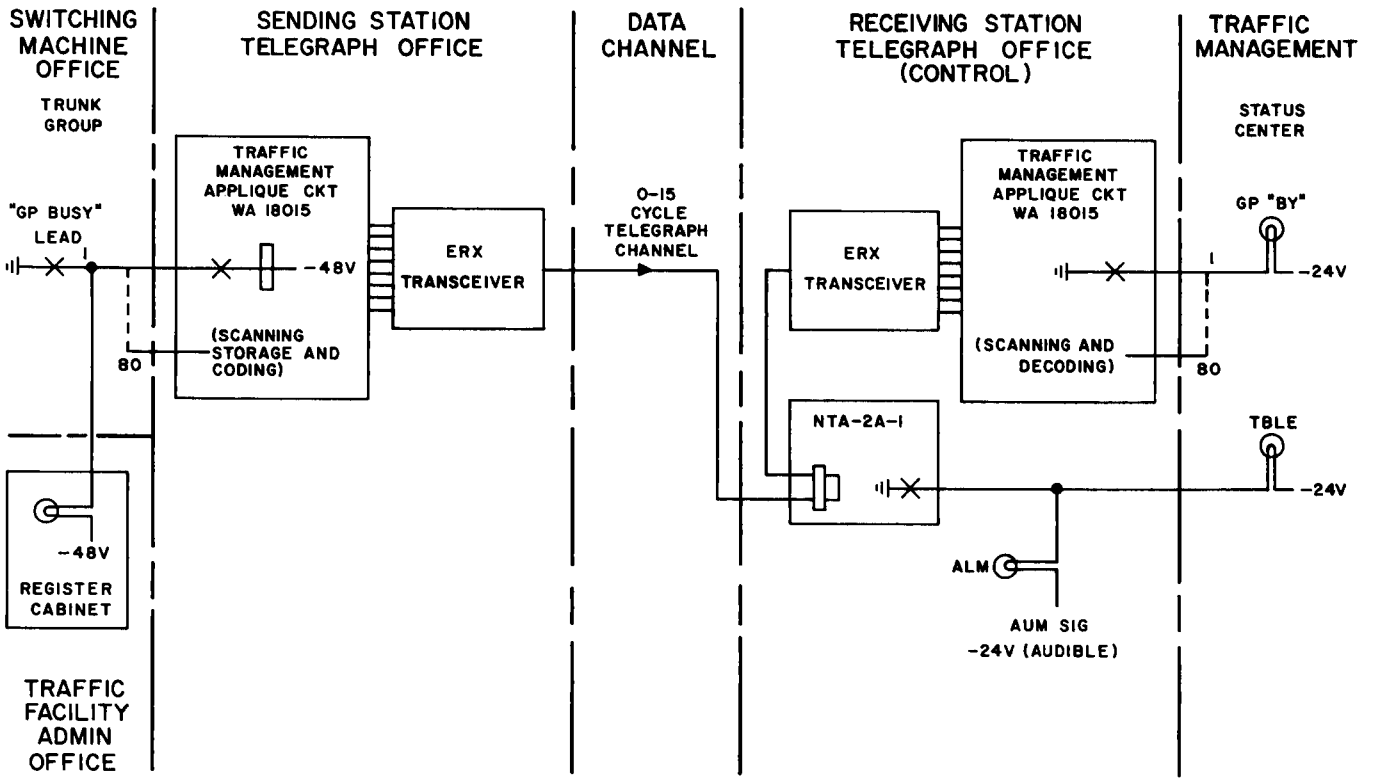

Fig. 1—Block Diagram of Traffic Management Telemetry System

(sending station) to a remotely located status center (receiving station). Based on the lamp indications at the sending station, applique circuitry (WA 18015) causes an ERX transceiver to send a coded pulse train to a distant transceiver. The receiving station transceiver and applique circuit then decode this signal train and present the proper lamp indication to the status board.

3.03 At the sending station, all group-busy leads are simultaneously sampled for an on and off condition at periodic intervals. The leads are sampled for 500 milliseconds at one-minute intervals. The condition is registered in a memory circuit and compared against the previous registration. To conserve reporting time, this system is designed to report those conditions that have changed since the previous sampling.

3.04 For signal transmission purposes, the 80 lamps are divided into two groups of up to 40 lamps each. The lamps are divided in the following manner:

GROUP 1 LAMPS	GROUP 2 LAMPS
1 to 10	11 to 20
21 to 30	31 to 40
41 to 50	51 to 60
61 to 70	71 to 80

Eighty identical ERX codes are assigned to the 40 lamps in each group. An individual lamp-on and a lamp-off code is assigned to each lamp. Duplicate ERX codes are used for lamps 1 and 11, 2 and 12, etc. Lamp numbers and their corresponding on and off codes are shown in Table A.

3.05 A pre-process code is assigned to each of the two groups. This group code precedes the individual lamp codes to be sent within that group. Once the group code has been sent, the codes for the lamps that have changed condition are sent in sequence.

3.06 Figure 2 illustrates some of the line signal pulse trains that are generated by the ERX transceiver. The ERX code consists of 11 pulses (6 spacing pulses interspersed with 5 marking pulses). The first pulse is always 150 milliseconds in length and the remaining 10 pulses are either 50 or 100 milliseconds long. The code information is contained in those pulses that are 100 milliseconds long. The codes are assigned so that there are always 2 long spacing and 2 long marking pulses in each signal train. This means that 2 out of 5 marking pulses and 2 out of 5 spacing pulses are always elongated from 50 to 100 milliseconds. Table A lists the long pulses assigned to each lamp condition.

3.07 The ERX codes are decoded at the receiving station where applique circuitry either lights or extinguishes the status board lamp assigned to the particular code. The receiving station then generates an answer-back signal (a 50- to 100-millisecond spacing signal). This answer-back code is sent following, interval X in Fig. 2 (d), reception of the code and operation of the applique circuit.

3.08 The sending station transmits the group and individual codes for all lamp leads that have changed condition since the previous sampling. As soon as a code is transmitted and an answer-back signal is received, the next code is generated. This process continues until all lamp changes have been forwarded to the receiving station and an acknowledgment is received from the receiving station. The receiving station transceiver is incapable of sending any code other than the answer-back.

3.09 The circuit continues to transmit the group-busy changes at periodic intervals. Each sampling operation is registered in a count circuit. After a predetermined number of registrations, adjustable from 1 to 9, a "wipe-out" or automatic recheck code is sent from the sending station. This code causes all lamps to be extinguished at the receiving station status board. Following the recheck code, all machine group-busy leads are again sampled and a "fresh" display is transmitted to the status center. This feature is provided in case of erroneous operation at the receiving station.

4. ASSIGNMENT AND RESPONSIBILITIES OF THE CONTROL OFFICE

4.01 The control office responsibilities should be assigned to the telegraph test center that serves the traffic management location. Since the system is an automatic one-way reporting system, the performance of the system is not observable at the sending station register cabinet. Trouble reports or suspected irregularities will originate from the status center at the receiving station. Reliable operation of the telemetry system will therefore be dependent upon close cooperation between the control office and the status center personnel.

4.02 The control office will assume all duties as listed in Section 660-202-010. These duties include the coordination of Private Line Service Orders (PLSOs) for changes on the circuit including changes in the assignment of lamp relays. PLSOs will be issued by the Official Communications (OC) group in Long Lines New York. All requests for change should be forwarded through channels to this group. PLSOs requiring a change in equipment will be forwarded to the appropriate plant design engineer.

4.03 The control office should ascertain that adequate restoration plans are available for those facilities assigned to these telemetry circuits. The circuits are categorized as essential test wires and should be restored in accordance with existing restoration practices. The Traffic Management system performs an important role during periods of major facility failure. It is desirable, therefore, that the restoration plans for these circuits be routed via alternate routes when they are available.

4.04 The control office may request special maintenance coverage for the equipment assigned to these circuits when advance information or past experience indicates a need for the additional protection. Such coverage may be desirable for

TABLE A

ERX TRANSCEIVER LAMP CODE ASSIGNMENT

GROUP 1 (CODE 2-4-9-11)		GROUP 2 (CODE 2-6-9-11)	
LAMP RELAY NO.	LAMP "ON" CODE	LAMP "OFF" CODE	LAMP RELAY NO.
1	2-3- 4- 5	2-3- 4- 7	11
2	2-3- 5- 6	2-3- 6- 7	12
3	3-4- 5- 6	3-4- 6- 7	13
4	2-3- 5- 8	2-3- 7- 8	14
5	3-4- 5- 8	3-4- 7- 8	15
6	3-5- 6- 8	3-6- 7- 8	16
7	2-3- 5-10	2-3- 7-10	17
8	3-4- 5-10	3-4- 7-10	18
9	3-5- 6-10	3-6- 7-10	19
10	3-5- 8-10	3-7- 8-10	20
21	2-4- 5- 7	2-3- 4- 9	31
22	2-5- 6- 7	2-3- 6- 9	32
23	4-5- 6- 7	3-4- 6- 9	33
24	2-5- 7- 8	2-3- 8- 9	34
25	4-5- 7- 8	3-4- 8- 9	35
26	5-6- 7- 8	3-6- 8- 9	36
27	2-5- 7-10	2-3- 9-10	37
28	4-5- 7-10	3-4- 9-10	38
29	5-6- 7-10	3-6- 9-10	39
30	5-7- 8-10	3-8- 9-10	40
41	2-4- 5- 9	2-4- 7- 9	51
42	2-5- 6- 9	2-6- 7- 9	52
43	4-5- 6- 9	4-6- 7- 9	53
44	2-5- 8- 9	2-7- 8- 9	54
45	4-5- 8- 9	4-7- 8- 9	55
46	5-6- 8- 9	6-7- 8- 9	56
47	2-5- 9-10	2-7- 9-10	57
48	4-5- 9-10	4-7- 9-10	58
49	5-6- 9-10	6-7- 9-10	59
50	5-8- 9-10	7-8- 9-10	60
61	2-3- 4-11	2-4- 5-11	71
62	2-3- 6-11	2-5- 6-11	72
63	3-4- 6-11	4-5- 6-11	73
64	2-3- 8-11	2-5- 8-11	74
65	3-4- 8-11	4-5- 8-11	75
66	3-6- 8-11	5-6- 8-11	76
67	2-3-10-11	2-5-10-11	77
68	3-4-10-11	4-5-10-11	78
69	3-6-10-11	5-6-10-11	79
70	3-8-10-11	5-8-10-11	80
Automatic Recheck Code — 8-9-10-11		Long pulse one common to all codes. (150ms)	
Circuit Assurance Code (when used) — 4-6-9-11			

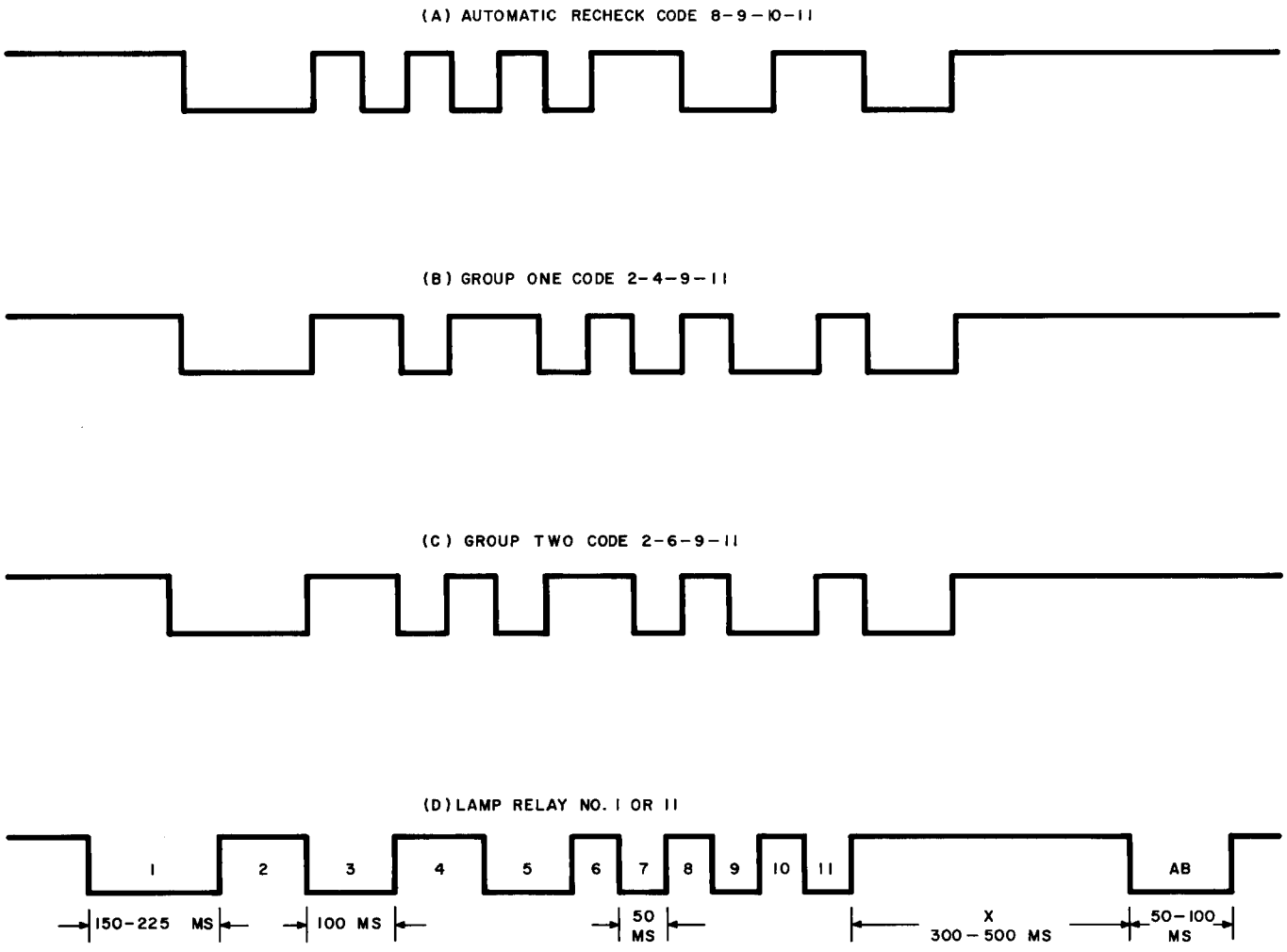

Fig. 2—Line Signal Pulse Trains Generated by the ERK Transceiver

holidays such as Mothers Day, Christmas, etc. Also, local events may indicate a potential traffic problem in which the telemetry system will be fully utilized. The control office should establish close liaison with the status center so that the periods of coverage may be kept to a minimum.

4.05 The control office should keep the status center informed of all problems affecting the telemetry circuits. If there are any doubts as to the validity of the status board information, the status center should be informed of the suspected trouble. Without this information, the Traffic Department might possibly institute unnecessary, and perhaps costly, rerouting procedures.

4.06 The control office should honor requests for releases of the circuits and equipment during light load periods upon approval of the status center. Light load periods are those periods of the day ***other than*** the following:

(a) Daily between 8:30 pm and 2:00 am Eastern time zone

(b) Special holidays that result in increased message traffic

(c) Special events that result in increased message traffic

(d) During periods of major facility failure of the plant.

4.07 The control office will receive reports of trouble, suspected trouble, or unusual traffic

conditions from status center personnel. These reports should be as complete and accurate as possible. Since many trouble types are easily analyzed by use of the display board indications, further interrogation may be required to assist in the clearance of the trouble. During unusually heavy load periods, the control office may elect to observe the board first hand. Mutual agreement with the traffic personnel will indicate when this procedure is necessary.

4.08 The control office is responsible for sectionalizing troubles to the receiving station, the line, or to the sending station. Once sectionalized, normal trouble-locating practices will be followed in locating and clearing the defective component.

4.09 Although each sending station is responsible for the pulse length of the ERX signals, the control office should make periodic measurements of the incoming pulses. These measurements should be made at least weekly or as the situation demands. Corrective action should be taken when pulses exceed a 5 percent deviation from normal values.

5. AUTOMATIC ALARM FEATURES

A. Sending Station

5.01 An alarm feature is furnished at each sending station that alarms the proper testboard whenever a code is sent and no answer back is received. The alarm operates in the following manner. During normal operation, an answer-back signal is sent from the receiving station for each valid code that is transmitted by the sending station. A failure in any portion of the circuit may cause this loss of the answer-back signal as registered in the sending equipment. If this should happen, the sending station will again transmit the lamp or group code. A total of three attempts will be made before the alarm feature functions. If an answer back is received for any one of the three attempts, the circuit will continue to function and no alarm action will occur. If no AB signal has been received, the scanning selector will tie up and the alarm lamp and audible signal will operate. The system will remain inoperative until the release key is operated by the sending station testboard. The release key releases the audible alarm and lamp. At the same time, the scanning selector will step to the next code to be generated. If the trouble condition still exists, similar action will occur on this code.

5.02 The alarm lamp and release key are mounted in a convenient testboard location (Telegraph, PL, or 17C). Since the system is inoperative under alarm conditions, it is important that the release key be operated as rapidly as possible. The cause of the alarm should be determined whenever possible. A trouble investigation should be started if the alarm is repeated within the next few minutes. The control office should be notified immediately. Investigations should also be made whenever the alarms appear to form a pattern. Brush recordings and the assistance of the control office will help in locating the source of trouble.

B. Receiving Station

5.03 The receiving station test center should be equipped so that an alarm is received for either an open circuit or the lack of the circuit assurance code. The circuit assurance code will be either a 4-6-9-11 pulse train or a 30-millisecond spacing pulse. This code will be sent each time the lamps are sampled at the sending station if there are no lamp indications to transmit.

5.04 The incoming assurance pulses are sensed by a No-Transition Alarm (NTA-2A-1) at the test center. This alarm monitors for two conditions: a spacing condition of the circuit in excess of 10 seconds and a marking condition of the circuit that exceeds 90 seconds. If either of the two conditions is exceeded, a visual and audible alarm is operated at the testboard. In some cases, the alarm function is multipled to the status center. The sampling interval adjustment at the sending station must be set for one-minute intervals so that the assurance code is received at the receiving station within the 90-second interval.

5.05 The alarm function of the NTA is self-healing. The first step in clearing the alarm condition is to determine which of the two conditions has been violated. The cause of the trouble may then be sectionalized and cleared. In those cases where the alarm lead is multipled to the traffic status center, care must be taken to ensure that the alarm lamp is ***not*** extinguished before the trouble is actually cleared. The status center relies upon this information as an indication that the display is probably inaccurate. Since the traffic personnel are aware that trouble clearance has started, trouble reports will not be made within a reasonable period.

6. SPECIAL TESTING PROCEDURES AND APPARATUS

6.01 The data channels used to interconnect the sending and receiving stations should be lined up with 45 baud signals (60 speed Fox). Normal distortion allowances apply. The sending and receiving stations should be cut during the line-up procedure. As required, routine channel line-ups will be scheduled by the control office.

6.02 In-service monitoring may be accomplished by the use of the Brush recorder. Sections 100-131-100 and 100-131-120 describe the procedure for using the MARK II and MARK 220 recorders. The signals that are observed on the recorder will appear similar to those shown in Fig. 2. The gating circuit will cause the No. 1 pulse to be shortened by an amount equal to the operating time of the gating circuit. See BSP Sections for the adjustment of the gating time. The adjustment specified for the SC2 system will be satisfactory for use on these circuits.

6.03 Trouble conditions caused by improper or defective ERX signals may be sectionalized by comparing the recorded results against the expected results as shown in the CLR card. The presence or absence of the answer-back signal can also be determined. A chart speed of 25 millimeters per second is recommended for all tests except those when the pulse length is to be determined. For measuring the pulse length, a chart speed of 125 millimeters per second is required.

6.04 The process of recording signals can be simplified when the sending station register cabinet is equipped with a lamp-check circuit. This circuit is provided to allow a simultaneous check of all lamps in the cabinet. When the outlying traffic office operates the circuit, all lamp-on codes will be sent following the next sample operation. When the circuit is released, all lamp-off codes will be generated. All codes and their corresponding responses may thus be examined in a single recording operation. This feature should be used sparingly as considerable circuit time is used to transmit the codes.

ERX Transceiver Monitoring Circuit

6.05 The ERX transceiver monitoring circuit provides the test center with a means of rapidly isolating trouble without the use of the Brush recorder. The circuit is comprised of three principle units. An ERX transceiver and an applique unit are bay-mounted in the office. The third component consists of a jack, lamp, and key strip that is mounted in the testboard. The circuit has the following features:

(a) Provides a lamp readout of the intelligence carrying pulses in an ERX pulse train as they are transmitted on the line. Lights the lamps corresponding to those pulses that are 100 milliseconds in length.

(b) Holds the display of long pulses lighted until a new pulse train is sent or until the display is manually released at the test position.

(c) Indicates the grouping of codes being received. Provides lamp readout of the group code.

(d) Lights an answer-back (AB) lamp (momentarily) to indicate that an answer-back signal has been sent in response to the received code.

Note: The above mentioned features are known as the ***monitoring*** condition.

(e) Provides for the transmitting of a particular ERX pulse train in accordance with a code that has been preprogrammed at the test position. Long marking and spacing pulses (four) are registered by the operation of buttons corresponding to the desired pulse train.

(f) Lights the AB lamp when an answer-back signal is received in response to the transmitted code.

Note: E and F represent the ***sending*** condition of the circuit.

(g) Provides for an audible and visual alarm at the test position when a preselected code is received from the line. The alarm (AL) lamp will remain lighted and the position alarm will sound until manually released at the test position. Preselection of a particular code is accomplished by operating buttons corresponding to the long pulses in the desired pulse train. It lights the readout lamps in accordance with this preselected code.

(h) Lights the AB lamp when an answer-back signal is sent in response to the selected

code. Holds the AB lamp lighted until manually released from the test position.

Note: G and H represent the selecting condition of the circuit.

(i) Operates the position alarm and lights the nonvalid (NV) lamp whenever a code is received that does not contain two long marking pulses and two long spacing pulses. Any deviation in this pattern will register as an alarm.

(j) Provides a pair of leads to remotely control the Brush recorder.

6.06 Figure 3 illustrates the main circuit functions for the three positions of the monitor key. The nonvalid check of codes and the recorder control feature are active in all cases. The circuit is arranged so that the input may be patch-cord connected to any half or full duplex circuit. When used at the No. 2, the No. 9B, or at the DOTC, a 144B coupling unit is required between the hub signal input jack and the monitoring circuit.

6.07 The functions of the various keys located in the testboard mounting are as follows:

(a) SEND-MONITOR-SELECT—This twist-type key arranges the circuit so that the sending, monitoring, or selecting function may be performed.

(b) RESET—The reset button will clear an alarm condition caused by operation of the AL lamp or the NV code lamp.

(c) CLEAR—Operation of the clear key will release all circuit functions including any preprogrammed information in the send or select mode.

(d) ST. SEND—Operation of the start-send key will cause the transceiver to send a pulse train in accordance with the preprogrammed code information. The key is active in the send mode only.

(e) 2 through 11 Code Keys—These keys are operated to select the long pulses in a particular code. This preselected information is then used in the sending or selecting modes. A total of four code keys are depressed for each ERX pulse train.

(f) G2—This key is operated for the select mode only. The key operation ensures that the pulse train selected will alarm following a group 2 code only.

6.08 ***Sending a Code to a Receiving Station:*** Place the SEND-MONITOR-SELECT key in the SEND position. Momentarily depress the ***CLEAR*** key. Momentarily depress four code keys in accordance with the code to be sent. Lamps corresponding to the code will light. Momentarily depress the ***ST SEND*** key. The code will be sent to the line. If an answer-back signal is returned from the station, the AB lamp will light. The NV lamp will light if an incorrect code has been programmed in the unit. To retransmit the same code, momentarily depress the ***ST SEND*** key. The AB lamp will go out and the code will again be sent to the line. To send another code, depress the ***CLEAR*** key and repeat as above. When the test has been completed, momentarily depress the ***CLEAR*** key and restore the SEND-MONITOR-SELECT key to the MONITOR position.

6.09 ***Monitoring the Incoming Signals:*** Place the SEND-MONITOR-SELECT key in the ***MONITOR*** position. Momentarily depress the ***CLEAR*** key. The lamp readout should read incoming signals from the line. If a series of signal transmissions is occurring at the time the monitor is patched to the line, the lamp readout may be in error until the circuit goes to rest. This is caused by the fact that the group code readout may have occurred previous to placing the set on the line. The set will read properly after the sending station has gone to rest. The AB lamp will flash momentarily in response to the answer-back signal that is sent from the receiving station. The NV lamp will operate if a code is received that does not have the proper code makeup. The lamp readout will be displaced approximately 2 seconds later if another code is sent on the line. Should the system tie up for lack of answer back or other reasons, the last code sent on the line will remain displayed. If a nonvalid code is received, the code that caused the NV alarm will be displayed.

6.10 ***Selecting an individual lamp code:*** Place the SEND-MONITOR-SELECT key in the ***SELECT*** position. Momentarily depress the ***CLEAR*** key. Momentarily depress four code keys in accordance with the code to be selected. If the desired code appears in group 1, no further action is necessary. When the code is included in group 2,

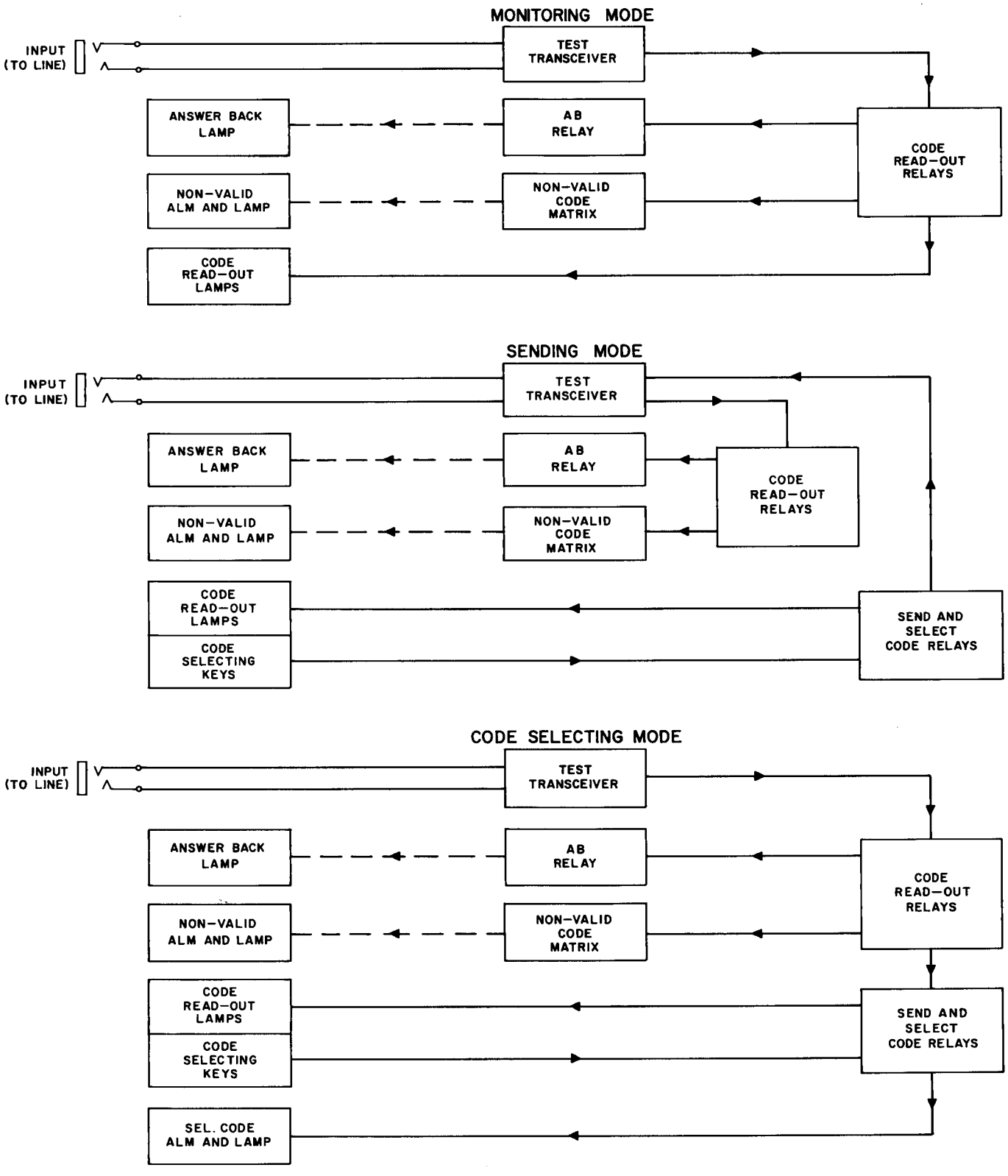

Fig. 3—Main Circuit Functions for the Three Positions of the MONITOR Key

momentarily operate the ***G2*** key. Lamps corresponding to the code to be selected will light. When the desired code has been received from the line, the AL lamp will light. Momentarily depress the RESET key to extinguish the lamp. The AB lamp will light to indicate that an answer back was sent in response to the code. If a nonvalid code is received prior to receipt of the selected code, the NV lamp will light. Operate the SEND-MONITOR-SELECT key back to the ***MONITOR*** position to determine the code that caused the alarm. Restore the key to ***SELECT.*** Momentarily operate the ***RESET*** key to extinguish the nonvalid alarm.

6.11 The ERX transceiver monitoring circuit uses an ERX transceiver as its basic decoding device. Therefore, a few types of trouble may have been caused by pulse problems that will affect the test transceiver in the same way as the receiving station transceiver. Although the unit serves a purpose for rapidly identifying trouble conditions, the Brush recorder may be required to identify the troubles caused by defective pulse makeup. Care should be exercised so that these problems are not incorrectly identified.

7. LIST OF DRAWINGS AND SECTION REFERENCES

100-131-100—Brush Recorder, Mark II

100-131-120—Brush Recorder, Mark 220

Drawings

WA 14046—ERX Control Circuit

WA 18015—Network Management Circuit

WA 18095—Test Sender at Receiving Stations

WA 19816—ERX TRANSCEIVER Model TRS 1BB

SM 16070—ERX Transceiver Monitoring Circuit