

DECODER EQUIPMENT DESCRIPTION PANEL OFFICES

1. GENERAL

- 1.01 This section describes the decoder equipment for use in 3 digit and 3-2 digit panel offices.
- 1.02 The decoder equipment consists of three main elements: namely, the decoder sender, the decoder-connector and the decoder. In addition, there is a decoder test frame, trouble indicator frame, alarms and make-busy features to facilitate maintenance. This equipment supersedes the translator equipment of the sender and the translators in panel installations with 3 digit and 3-2 digit subscriber senders.
- 1.03 The outstanding features of the decoder equipment as compared with the translator equipment are as follows:
 - (a) The power-drive equipment of the pulse machines and translator frames is eliminated.
 - (b) The brush rod, brushes, commutators, commutator brushes, and banks of the translator frames, the commutator and commutator brushes of the pulse machine and the 200 or 206-type selectors of the senders are replaced by relatively simple relay structures.
 - (c) The number of sequence switches in the sender has been reduced to three.
 - (d) No cross-connections to provide routes are necessary in the sender. The cross-connection facilities are individual to a decoder circuit and the cross-connections made in each decoder circuit are identical with those made in every other decoder circuit of the group.
 - (e) The sender is arranged to handle a maximum of four classes of service.
- 1.04 The decoder performs the same functions as the translator and pulse machine which it replaces and in addition can handle 800 codes and eight classes of service. It is arranged to receive a record of the code and class of service from the sender and to transmit back to the sender the full information required for completing the call.
- 1.05 A feature is incorporated in the decoder equipment which tests the connections be-

tween the decoder sender and decoder, and in the event that irregular circuit conditions are encountered, a second trial is made for a translation usually with a different decoder than that used initially.

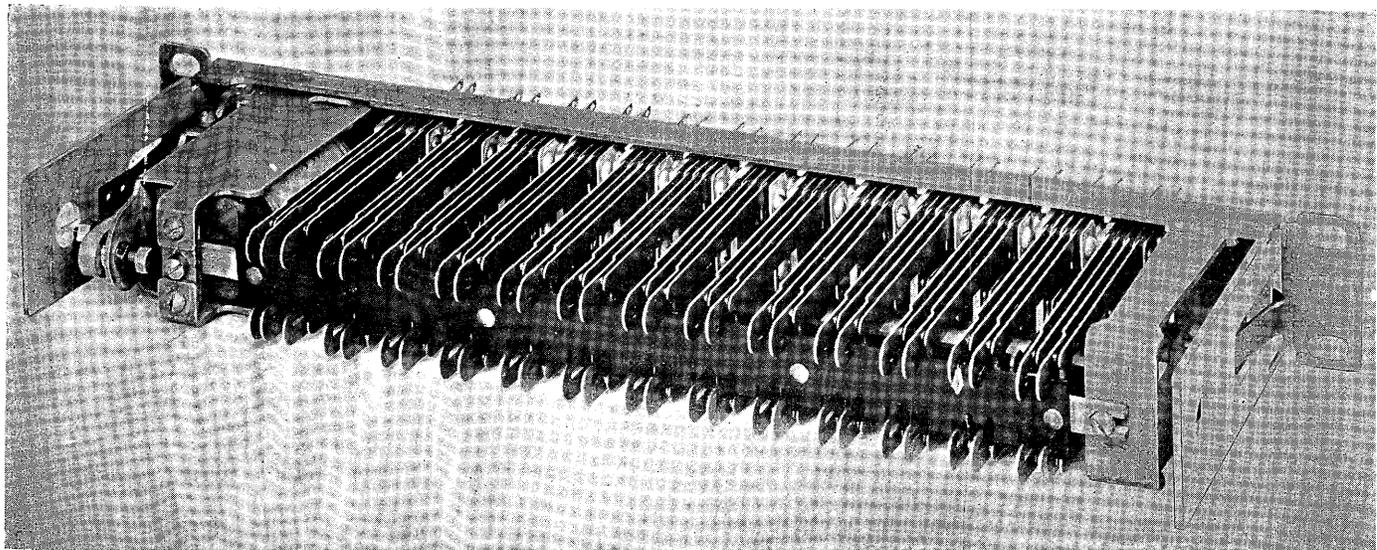
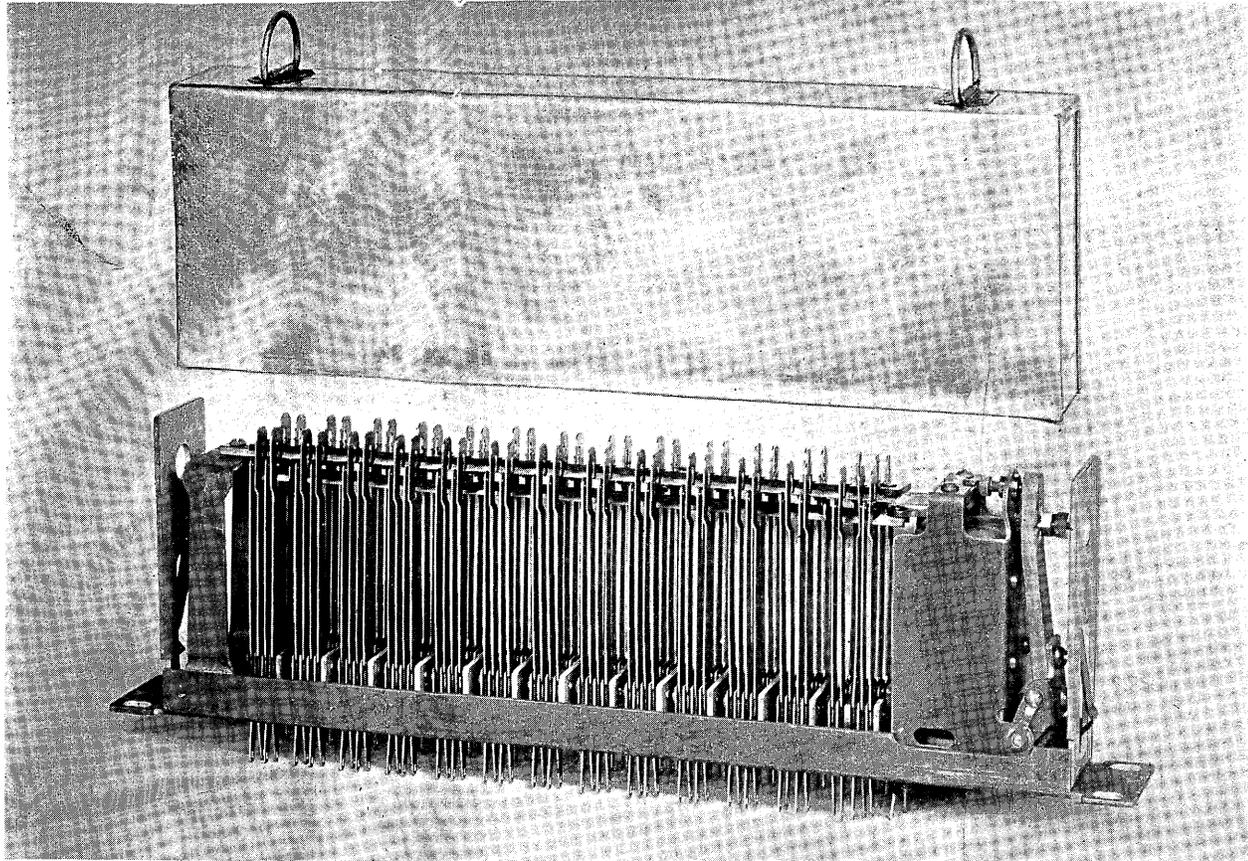
2. MULTI CONTACT RELAYS

- 2.01 The decoder-connector and the decoder are provided with multi-contact relays. The multi-contact relay consists of an electromagnet with a horizontal actuating bar operating a multiplicity of contact springs.
- 2.02 The 229-B relay used in the decoder circuit is shown in Fig. 1. It consists of one operating unit on a steel mounting plate under a single can cover. The electromagnet is located at the left and controls 50 sets of single-make contacts and two sets of transfer contacts.
- 2.03 The 230-A relay which is used in the decoder connector and test frame circuits consists of two independently operating units on a steel mounting plate under a common can cover. The electromagnet for each unit controls 40 sets of single-make contacts and two sets of transfer contacts. The electromagnets are located at the extreme ends of the mounting plate; the actuating bar for the left unit therefore travels toward the left and that for the right unit toward the right when the associated electromagnet is energized.
- 2.04 The contact springs are assembled in nests of 8 or 12 springs and mounted on the plate in somewhat the same manner as "E" type relay structures. All contacts are heavy contact points of No. 1 contact metal.

3. EQUIPMENT FEATURES

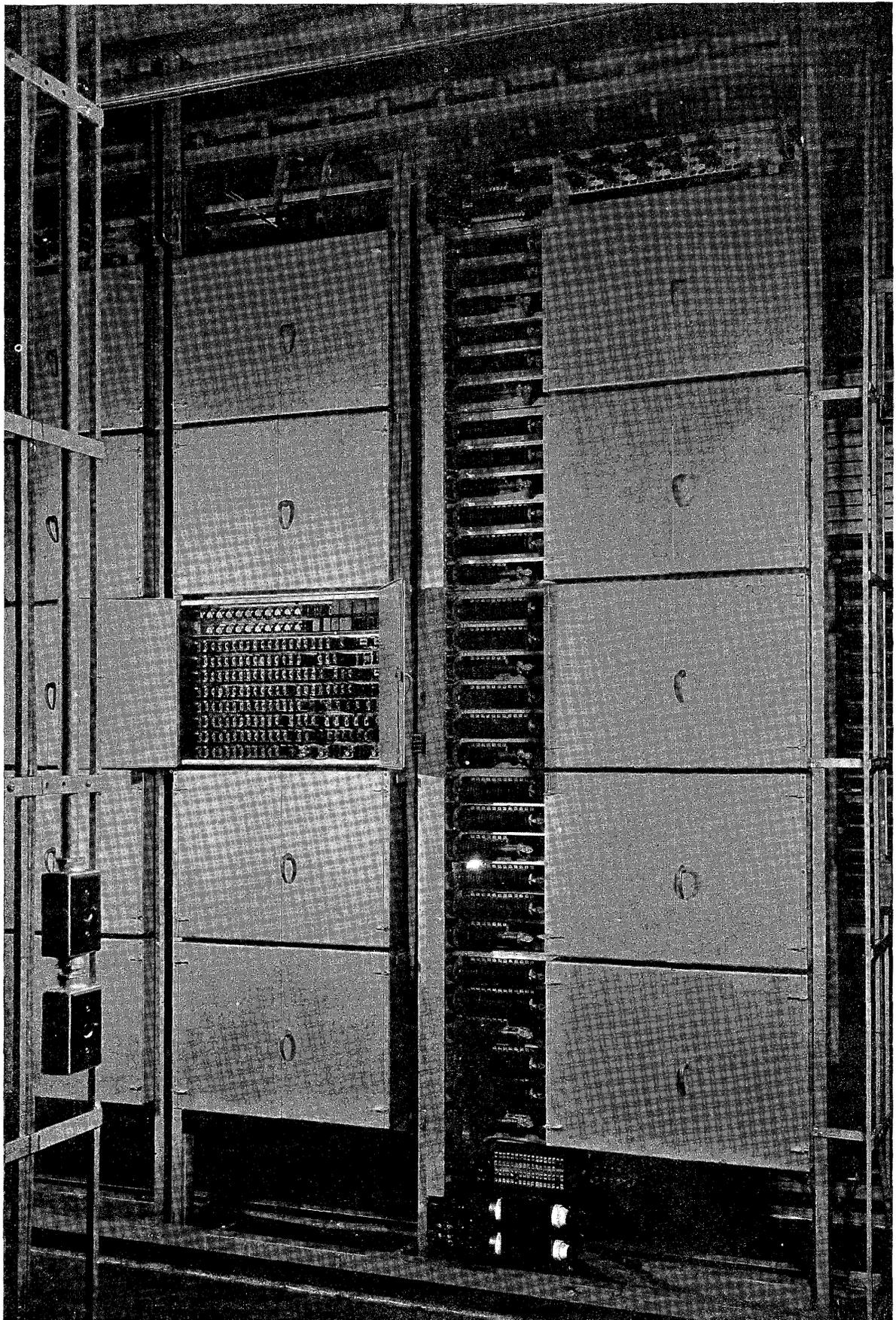
Sender Frame

- 3.01 The 3 and 3-2 digit sender frame is arranged to accommodate five sender units and one interrupter unit. Two senders are accommodated on one unit, thus providing a sender frame with a capacity of ten senders.
- 3.02 Each sender consists of ten mounting plates accommodating the relays, resistances and condensers and three sequence switches mounted on a sender unit. The 44-type resistances and two interrupter contacts together with the miscellaneous



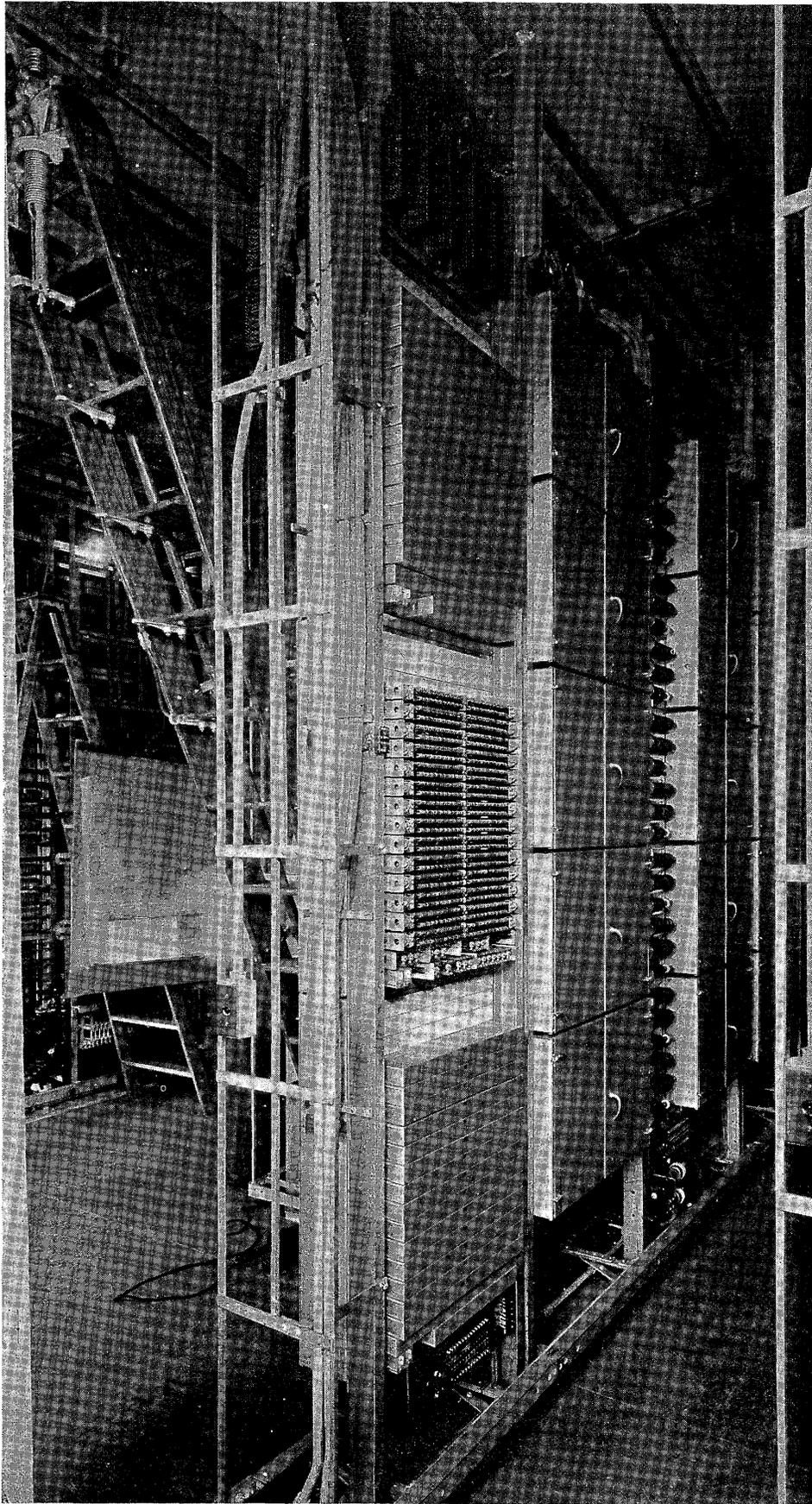
229-B RELAY

Fig. 1.



SUBSCRIBERS SENDER FRAME
FRONT VIEW

Fig. 2.



DECODER CONNECTOR FRAME
FRONT VIEW

Fig. 3.

frame equipment are mounted on a common interrupter unit. The apparatus on the sender unit is mounted in three bays, each of the outside bays accommodating the relays of a sender and the central bay mounting the sequence switches for the two senders. Fig. 2 shows a fully equipped sender frame with the casing doors for one sender open.

- 3.03 For equipment and operating reasons each sender frame is definitely associated with only one decoder connector and no decoder connector is associated with more than one sender frame. The senders on a sender frame may, however, be in different sender groups, have different class functions or may be both coin and non-coin. The pair of senders comprising a unit will, however, be either coin or non-coin.

Decoder-Connector Frame

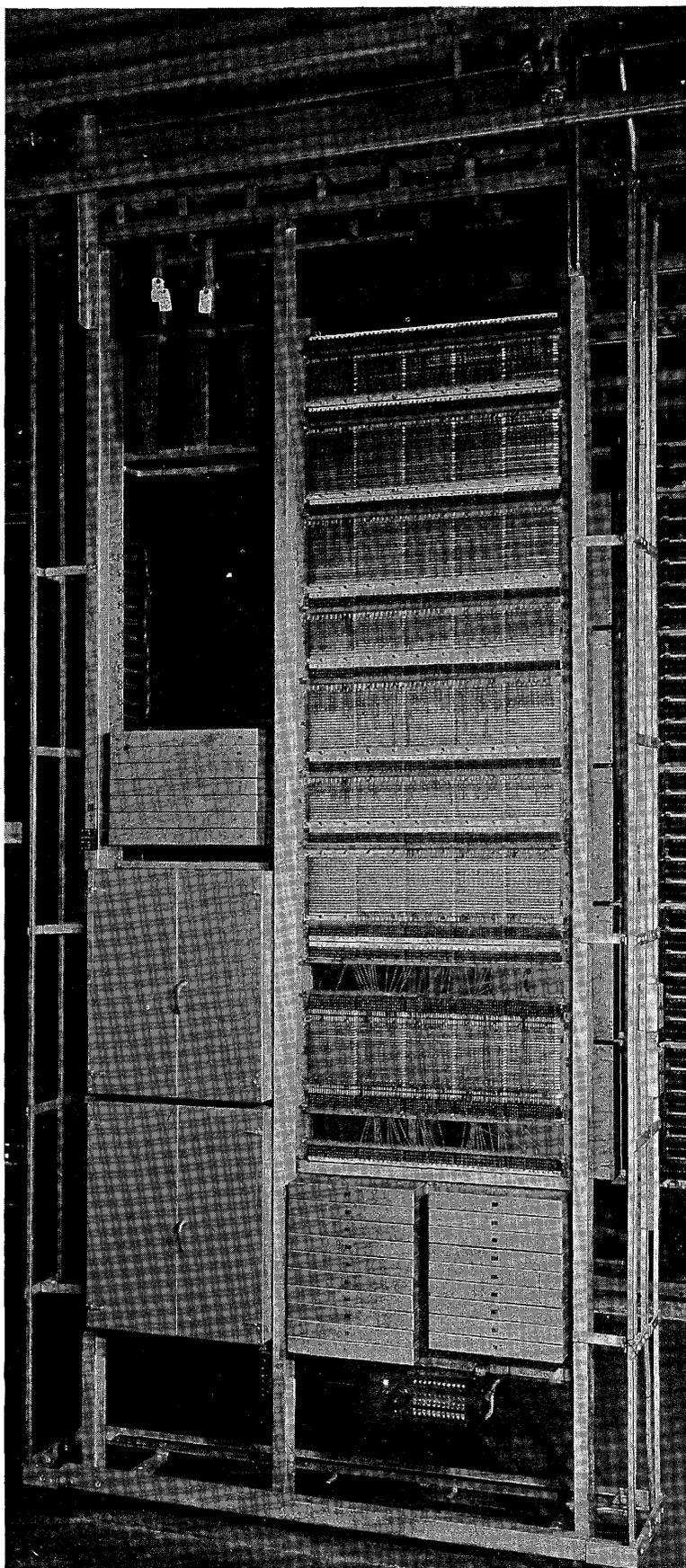
- 3.04 The decoder-connector frame is essentially a single bay relay rack having a capacity of three decoder-connectors. As a decoder connector provides facilities for connecting any one of ten senders to an idle decoder and since some 50 leads are required for this purpose, multi-contact relays described in part 2 are used.
- 3.05 Each decoder-connector on the frame is wired for ten senders, six decoders and the necessary testing facilities, the number of relays equipped agreeing with the sender and decoder equipment. Beneath the multi-contact relays in each connector are two mounting plates of control relays. A casing is provided to enclose the wiring of each decoder-connector. The equipment arrangement is shown in Fig. 3.
- 3.06 The leads connecting the decoders to the decoder-connector multi-contact relays are run in switchboard cable between the respective frames. From the terminal strips on the decoder-connector frame the leads are carried in local cable to the multi-contact relays. The various decoder-connector frames are multiplied together by means of switchboard cable.

Decoder Frame

- 3.07 The apparatus making up the decoder is mounted on a two-bay frame. In the left-hand bay are placed the route relays, service group relays, code register relays, transmitting relays and control relays of the decoder. In the right-hand bay are the cross-connecting facilities and the multi-contact relays. The route and service group relays, which are of the R type, are placed at the top of the left-hand bay 15 per mounting plate under common can covers. Below them are the code register,

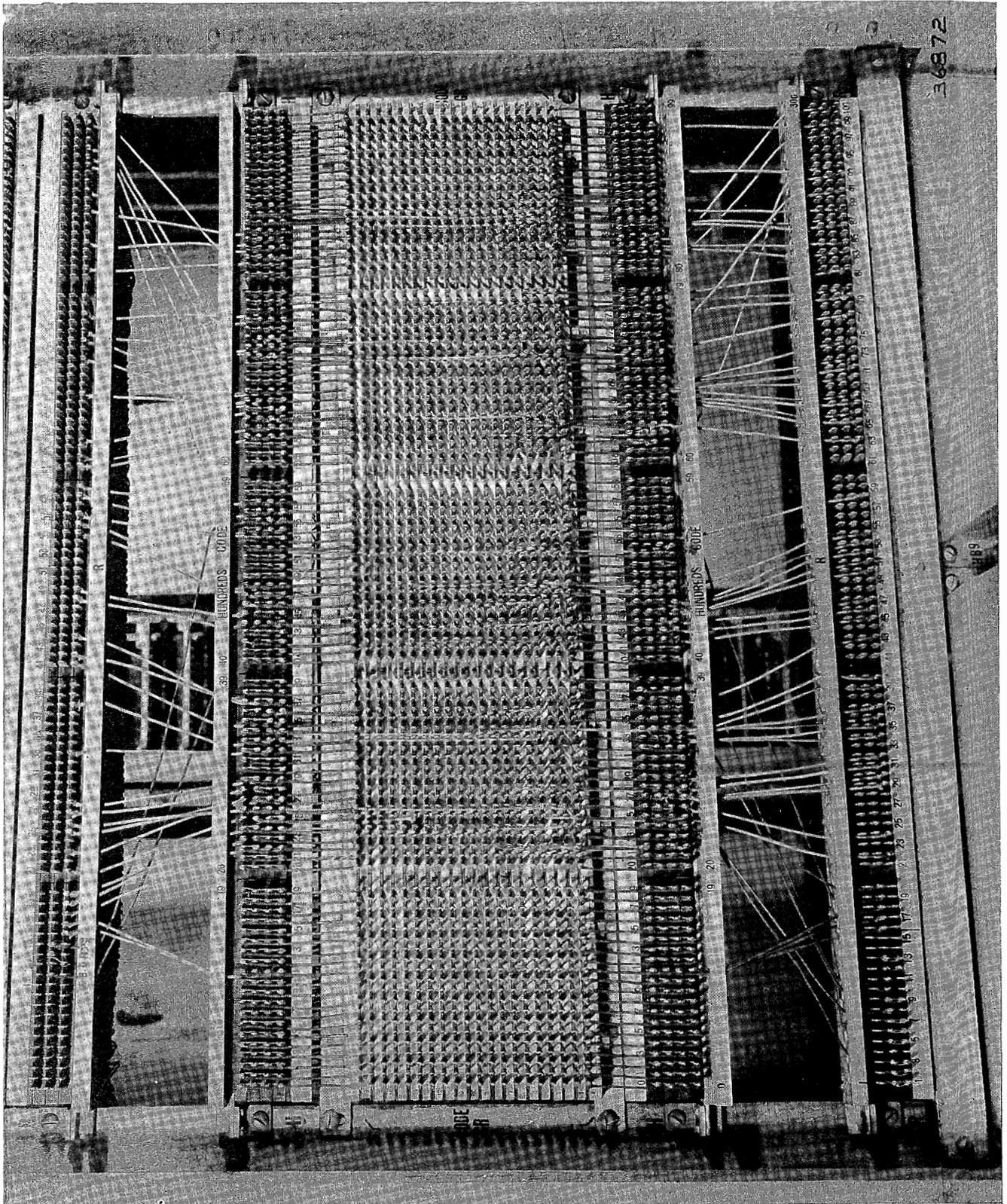
service and transmitting relays, largely "R" and "L" types, under two casings of the type used on senders.

- 3.08 The multi-contact relays are mounted in the lower part of the cross-connecting bay of the decoder frame. Inasmuch as 100 sets of contacts are required for each "hundreds" group of code points, two of these relays are mounted in line horizontally with the operating magnets connected in parallel.
- 3.09 Each decoder is wired for nine connector busy relays and eight pairs of service relays (SA and SB) with space provided for ten. As a connector busy relay serves six decoder connectors or two decoder-connector frames, a maximum of 51 decoder connectors or 510 senders can be served by a group of six decoders (the last relay serving only three decoder-connectors). These relays are equipped as required. The service relays are equipped as specified.
- 3.10 Provision is made for 14 service group SG relays numbered 1 to 14 and 299 route R relays numbered 1 to 14 and 16 to 300. Each service group relay is permanently associated with a like numbered route relay which will be provided with each service group relay specified. The balance of the route relays (285) are equipped in multiples of 15 beginning with relays numbered 103 to 120 and then relays numbered 16 to 105 and 121 to 300. Route relays numbered 106 to 120 are always equipped when less than 105 route relays are provided.
- 3.11 The general arrangement of the standard decoder frame is shown in Fig. 4.
- 3.12 Fig. 5 shows the type of terminal strip used for making the cross-connections required between the different elements of the decoder. The strip is built up of insulators, metal separators and metal punchings having 20 soldering terminals. Five of these punchings are placed in line horizontally and strapped together so as to form a series of 100 soldering terminals all electrically interconnected. A complete terminal strip consists of either 12 or 20 sets of the 100 soldering terminals with insulators and metal separators clamped together in the form of a bank. Associated with this type of terminal strip is another terminal strip of the general design used on distributing frames, except that it is 100 points in length and three or four points high. This terminal strip provides 300 or 400 punchings in one assembly.
- 3.13 With the aid of these two types of terminal strips a large proportion of the cross-



DECODER FRAME
FRONT VIEW

Fig. 4.



DECODER FRAME
VIEW OF CODE POINT CROSS CONNECTING FIELD
Fig. 5.

connection associated with the decoder frame can be run vertically and the crossing of jumpers thereby avoided. This arrangement also permits the use of jumpers of three colors, which, together with having in general only one jumper on a punching, simplifies maintenance to a considerable degree. By avoiding the congestion of jumpers, the possibility of trouble occurring at this point is also minimized.

3.14 The jumper wire for cross-connecting the various fields is No. 22 B. & S. gauge tinned with double silk and cotton braided insulation and is supplied in three colors.

3.15 The color scheme for the various cross-connections excluding the straps is as follows:

- (a) White jumpers are used for connections to all terminals in the lower row of all 3-point terminal strips and for rows 1 to 8 and 10 to 17 of the CG terminal strip.
- (b) Black jumpers are used for connections to all jumpers in the middle row of all 3-point terminal strips and the row designated RC on the CG terminal strip.
- (c) Red jumpers are used for connections to all terminals in the upper row of all 3-point terminal strips and rows designated 9 on the CG terminal strip.

In case two or more terminals are strapped together the color of the jumper is controlled by the terminal to which it connects.

Supplementary Decoder Frame

3.16 To care for offices whose future requirements exceed 285 route relays a supplementary frame of one bay is provided. This frame consists of the necessary cross-connection facilities, similar to those on the decoder frame, below which are mounted a maximum of 300 route relays. These relays mount 20 per mounting plate and are always equipped in this multiple.

3.17 The cross-connecting fields are located at the same height as on the originating frame primarily to simplify multiplying the common terminal strips together. The first supplementary frame is usually located adjacent to and at the right of the originating frame. Similarly the second supplementary frame is usually located adjacent to and at the right of the first supplementary frame.

Frame and Circuit Numbering

3.18 In order to simplify the test frame design each group of decoder and decoder-con-

necter frames are assigned numbers in a different hundred series. For example, the second group of decoder frames might be numbered 101 to 106 and the associated decoder-connector frames numbered 101 up. Sender frames are numbered as required.

3.19 The connector circuits on each frame are lettered "A," "B" and "C" from the bottom up. Sender circuits are lettered "A" to "K" (the letter "I" being omitted) from left to right and bottom up.

4. DECODER SENDER CIRCUIT

General

4.01 The sender used with the decoder equipment may be of the non-coin or combination coin and non-coin type. Optional wiring and apparatus is provided to arrange these senders for either 3 or 3-2 digit operation and for use with either panel or rotary link equipment. Combination coin and non-coin senders may be arranged to operate initially as non-coin senders without affecting the number of classes of service that may be handled. Decoder senders are designed to operate with either ground cutoff relay equipment or battery cutoff relay equipment or with both types. Decoder senders can also be used in common groups with translator type senders.

Apparatus

4.02 The apparatus making up a decoder sender circuit consists of three sequence switches and approximately 185 relays. The sequence switches are the selection switch, the call indicator impulser switch and the time measure switch. The relays may be considered in groups according to their functions, the principal relay groups being the following: dial pulse receiving, dial pulse counting, eight groups of digit register relays, six groups of selection register relays, and the usual revertive pulse receiving and counting relay groups. There are in addition, small groups of relays for controlling the link circuit, calling in the decoder, controlling the time measure switch, testing for coin, registering the service indication received from the panel link circuit, etc.

Digit Registration

4.03 Digit registration is effected through the medium of relays. The pulses for each digit dialed are received by the pulse receiving relay and are repeated into a group of six pairs of pulse counting relays. The setting of the latter group for each digit dialed is transferred immediately, following the completion of a digit, to the cor-

responding group of digit register relays. Thus the 3-digit code, four numerals and, if dialed, the station suffix or fifth numeral are registered on their respective digit register relay groups. The settings of the "A," "B" and "C" digit register relay groups are subsequently transferred to the decoder; those of the "TH," "H," "T" and "U" are used to set four of the six groups of selection register relays for controlling the incoming and final selections, when these are required. Arrangements are provided for absorbing preliminary pulses.

- 4.04 The setting of each group of digit register relays including the "STA" group also controls the pattern of the call indicator pulses subsequently transmitted on those classes of call which require the sending of call indicator pulses. Senders are normally wired to permit a zero in the second or third digit of a 3-digit code being transmitted to a full selector tandem sender or a panel call indicator tandem position as a six, on the assumption that the calling party dialed the numeral zero by mistake in place of the letter "O." When this feature is not desired or when numerical codes using zero in the second or third digit are required the sender is arranged to transmit the digits as dialed.

Two-Digit Codes

- 4.05 Senders arranged for 3-2 digit operation contain three additional relays in the "A" digit register relay group. These relays permit any one or more of the "A" digits, two to nine inclusive, to be set aside as an index digit for 2-digit office codes by a simple strapping operation at the sender unit terminal strip. All codes beginning with an "A" digit corresponding to an index digit will then be treated as 2-digit codes.
- 4.06 When an "A" digit of a 2-digit code is registered on the "A" digit register relay group, the "C" digit register relay group is next presented to the pulse counting relay group and therefore receives the "B" digit dialed. The numerical digits which follow are registered on the "TH," "H," "T," "U" and "STA" digit register relay groups as in 3-digit operation.
- 4.07 Although the "B" digit register relay group receives no digit, its normal setting corresponds to the digit zero so that the code subsequently transferred to the decoder or transmitted to a sender or manual tandem office is a 3-digit code; that is, each 2-digit code is built up to a 3-digit code by means of the sender introducing a zero between the first and second digits dialed.

For example, the number GLencourt 1234 and also a 3-digit operator code whose first digit corresponds to an index digit of a 2-digit code, 411 in this case, will therefore be displayed at a tandem call indicator position as 01234 and 01000, respectively.

Calling in a Decoder

- 4.08 The sender proceeds to call in a decoder as soon as the "A" digit register relay group registers zero or the "C" digit register relay group registers the third digit (or second digit of 2-digit office codes) or after an interval of time if no digit has been dialed. When a decoder is obtained through the medium of the decoder-connector circuit, the setting of the "A," "B" and "C" digit register relay groups, together with the setting of the service register relays, which indicate the class of subscriber calling, is transferred to corresponding register relays in the decoder which translates or decodes this information. The decoder transmits the required information back to the sender where it is registered on the six groups of selection register relays. The sender then releases the decoder-connector and decoder simultaneously and proceeds with the call.

Selection Register Relays:

- 4.09 The selection register relays control the six major and six minor selections required to properly route the call. These selections and the associated relay group are as follows:

Selection Register Relay Group	Major Selection	Minor Selection
CL	Class of call	Cancel coin test
CR	Compensating resistance	Trunk guard relay
DB	District brush	Talking
DG	District group	TW Relay
OB	Office brush	Stations delay
OG	Office group	Skip Office

The last four groups control the setting of the revertive pulse counting relays. When these four groups are set initially from the decoder they control the district and office selections and, on panel direct class of calls, when subsequently reset from the four numerical groups of digit register relays, they control the incoming and final selections.

Supervisory Features and Time Measure Switch

- 4.10 The usual supervisory equipment located at the sender monitor position in the "A" switchboard is provided. The associated sender time measure switch is an 18-position A type sequence switch which starts

from position 1 when the sender is seized by the link and makes one revolution on each call. Between certain positions it is controlled by pulses from power driven interrupters, thus providing definite time intervals within which the dialing and sender operations must be completed. When these are performed within the allotted time the switch will advance to the beginning of the succeeding time interval. If certain operations are not completed within the time allowed because of delay in dialing or troubles encountered during selections, the switch stops at the end of the interval. The subsequent action taken by the sender in this event and the time intervals measured by the switch are as follows:

Time Interval and Subsequent Action

	Time in Seconds	
	Min.	Max.
Await dialing of first digit of code.	30*	60*
District routed to permanent signal holding line and sender released.		
Await dialing of units digit following registration of first digit of code.	30	60
Sender lamp flashes (60 per min.).		
Await dialing of stations digit following registration of units digit. (Effective only on calls to certain manual offices.)	3.3	4.5
** Await deposit of coin following registration of units digit with no stations delay interval or following registration of stations digit during stations delay interval. (Effective only on calls requiring coin deposit.)	2.6	3.9
Coin lamp lights.		
** Await deposit of coin following registration of units digit with a station delay interval but no stations digit dialed. (Effective only on calls requiring coin deposit.)	6.5	7.7
Coin lamp lights.		

* Three seconds less in combination coin and non-coin senders.

** These intervals omitted in non-coin senders.

Await completion of selections following registration of units or stations digit or following deposit of coin after dialing.

- (a) On calls to manual and those routed through panel or manual tandem office. 60 90
- (b) On other calls 30 60

Sender lamp flashes (60 per min.).

- 4.11 When the sender receives a "trouble release" from a decoder during a second trial the time measure switch rotates to position 18 immediately and flashes the sender lamp (60 per min.).

Selection Switch

- 4.12 The selection switch is an 18-position "B" type sequence switch which starts from position 1 following registration of the first digit or following "timing out" for the first digit of the code and makes one revolution per call. The various positions of this switch control different functions of selection and as each is completed the switch advances one or more positions as required.

Call Indicator Impulser Switch

- 4.13 The impulser switch is the usual 20-position "B" type sequence switch. It makes two revolutions on each call requiring the transmittal of call indicator pulses. In areas which are arranged for distant office selector operation this switch is arranged to send a final heavy positive pulse.

5. DECODER-CONNECTOR CIRCUIT

General

- 5.01 A decoder-connector is common to ten senders and acts as a link to connect some 50 leads between any one of the 10 senders it serves and one of a group of from three to six decoders. The apparatus in a circuit consists essentially of a pair of multi-contact relay units and one R-type relay for each associated sender circuit, a pair of multi-contact relay units and two R-type relays for each equipped decoder circuit and a pair of multi-contact relay units and three R-type relays for the decoder test circuit.
- 5.02 A connector multiple consisting of approximately 50 leads is multiplied at each pair of the multi-contact relay units mentioned above. A decoder multiple individual to a decoder is multiplied at the

associated pair of decoder multi-contact relay units in each connector. A schematic of these connections is shown on Drawing 706-544.

Connector Subgroups and Decoder Choice

5.03 For the purpose of making decoder choice assignments a group of connectors serving one or more central office units and having access to a group of decoders is divided into as many subgroups as there are equipped decoders and each such subgroup of connectors is assigned a different decoder as its first, second, third, etc., choice. An example of this arrangement for an installation of 12 connectors and three decoders, is indicated in the following table.

Connector Subgroup	Connector Frame. Ckt.		Decoder Circuit		
			1	2	3
1	1	A	12	4	8
	1	B	11	3	7
	1	C	10	2	6
2	2	A	9	1	5
	2	B	8	12	4
	2	C	7	11	3
3	3	A	6	10	2
	3	B	5	9	1
	3	C	4	8	12
4	4	A	3	7	11
	4	B	2	6	10
	4	C	1	5	9

5.04 The letters, "a," "b" and "c" in the same horizontal row under the caption "Decoder Circuit" denote the decoder choice for a given connector subgroup. For example, if all decoders are idle when connector 3-C calls it will obtain decoder No. 3, or if this decoder is busy, it will obtain decoder No. 1, and so on. When only one decoder is idle it becomes in effect the first choice of all connectors. For this case the numerals in the same vertical row under the caption "Decoder Circuit" indicate the order of preference of all connectors for that decoder. For example, assume all decoders are busy and calls are waiting on connectors 3-A and 4-B. If now decoder No. 3 becomes idle it will be seized by connector 3-A since this connector has preference over connector 4-B.

5.05 When a sender calls for a decoder, it connects battery to the start lead causing the associated SS relay in the connector to operate and in turn the associated pair of multi-contact relay units which connect the sender circuit to the connector multiple.

5.06 Each SS relay obtains its operating ground through the back contacts of lower lettered SS relays in the chain. It may also obtain ground from a higher lettered operated SS

relay through the back contacts of the intervening unoperated relays in the chain. The SS relay, therefore, can operate when the connector is idle and also when it is held busy by a higher lettered sender but not when the connector is held busy by a lower lettered sender. Each sender start relay obtains the ground for operating its associated pair of multi-contact relay units through back contacts of higher lettered relays in the chain. Therefore, only the pair of multi-contact relay units which are associated with the highest lettered operated sender start relay will be energized. Senders calling within the holding time of a connector will be satisfied in the reverse order of their letter designations beginning with the highest lettered sender next lower than the sender holding the connector.

5.07 The operation of the sender multi-contact relays extend the sender start lead to the DS relay of the first choice decoder for the connector calling. The decoder start relay operates and causes the associated pair of decoder multi-contact relay units to operate which connects the decoder circuit to the connector multiple. Thus some 50 leads are closed through from the sender to the decoder; 16 receiving leads over which the decoder receives a record of the office code and class of service indicating the class of subscriber calling, 30 transmitting leads for transmitting to the sender the decoded information, and 4 leads for miscellaneous control purposes.

5.08 Whenever the decoder is attached to a connector, the CB relays of other connectors operate and extend the start lead of those connectors to their next choice decoder.

6. DECODER CIRCUIT

General

6.01 The decoder is arranged to receive a record of the code and class of service from the sender and to transmit back to the sender the full information required for completing the call.

6.02 The decoder circuit operates on a 3-digit basis. However, it is designed to function with the 3-digit decoder sender when that sender operates on a 2-digit or combined 3 and 2-digit basis. The same decoder is used in central offices of the ground cutoff relay or battery cutoff relay type. From a circuit standpoint a group of decoders can be associated with a maximum of 510 senders which may serve two or more central office units, provided common office code routings are used.

PANEL SYSTEM
3 DIGIT DECODER EQUIPMENT
 Schematic Diagram

706-544
 Information

Engineer *ARB*
 Draftsman *PH*
 Checked by *omk*

Log No. P20854 12,8,27
 ISSUE 1

Trouble Indicator and
 Connections shown.
 "Channel" changed to
 read "Connector"; Class
 changed to read "Service"
ARB
 Log No. P-22058 7,22,29
omk ISSUE 2

SECTION 215-141-101

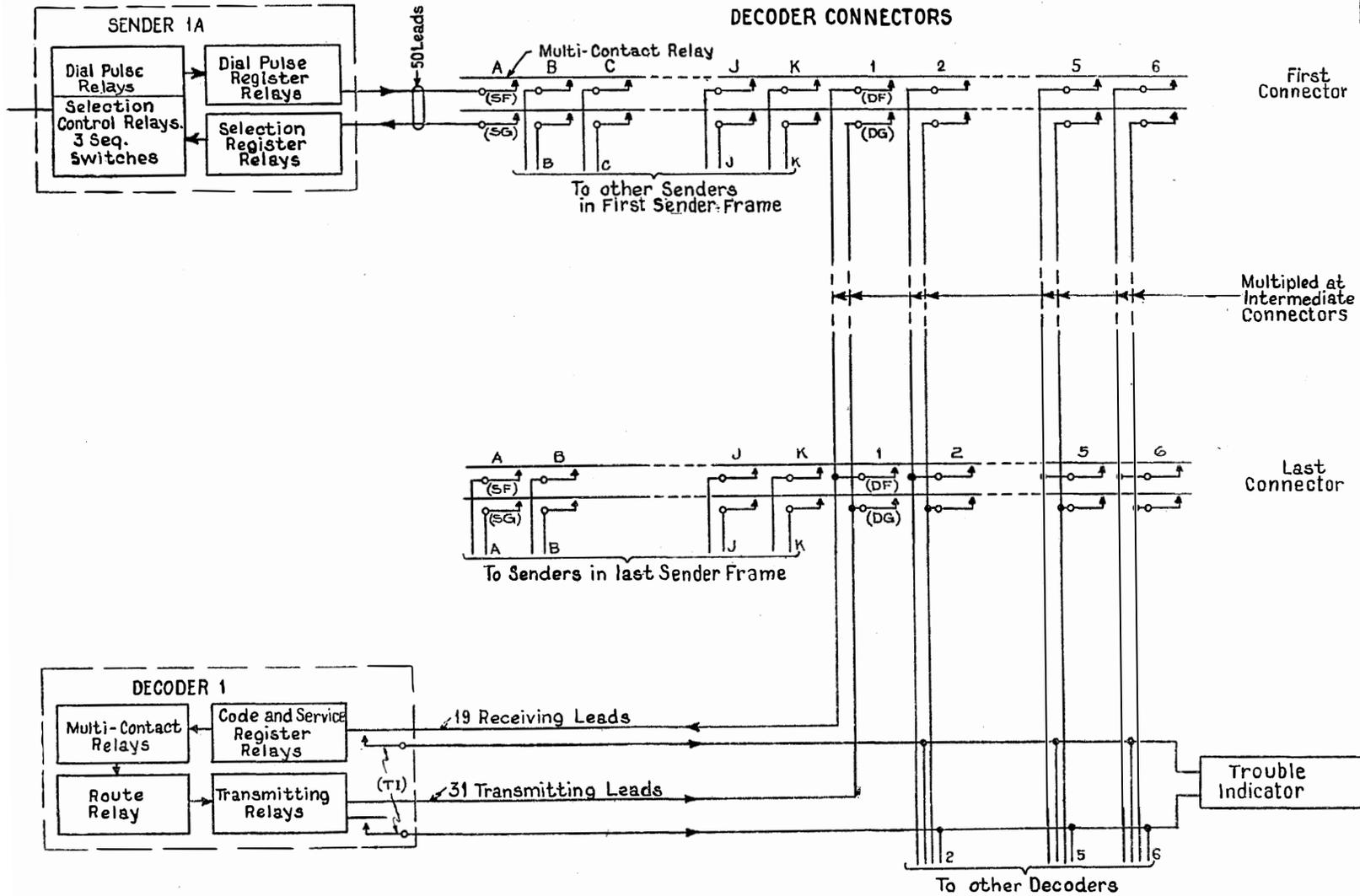


Fig. 6.

Code Capacity 3 and 2-Digit

- 6.03 The decoder is arranged for eight hundred 3-digit codes numbered 200 to 999 inclusive. These include the 512 possible three-letter codes and 288 numerical codes obtained by dialing zero or one for the second digit or the third digit or both. For convenience those which contain a zero in either or both the second or third digits are usually referred to as "letter-zero" codes. One additional code "O" (special service operator) is also provided. These codes together with "PS" (permanent signal) provide a total of 802 separate indications that the decoder may receive from the sender and each such indication is represented in the decoder by a terminal punching called a "code point."
- 6.04 No special arrangements in the decoder are necessary to care for 2-digit codes as a 2-digit code is built up to a 3-digit code by the sender introducing a zero between the first and second digit dialed. Two-digit codes are therefore registered in the decoder as "letter-zero" codes. This is also true of a 3-digit operator code when the first digit corresponds to an index digit of a 2-digit code.
- 6.05 The decoders are normally arranged to translate a zero registered in the "B" or "C" digit or both register relay groups as a 6 (letter O), in order that, should the calling party make a mistake by dialing the numeral "zero" instead of the letter "O" for the office code, the call will be completed in the same manner as if no mistake had been made. For this reason the "letter-zero" codes are not available for assignment nor do the corresponding code points represent 2-digit codes. Instead, a 2-digit office code 45 (GLencourt) and the operator code 411, for example, would be represented by the code points 465 and 461, respectively.
- 6.06 In the event "letter-zero" codes are assigned optional wiring, provided in both the sender and decoder for this purpose, is connected to make such codes available. In this event, 2 digit codes will be represented by code points corresponding numerically to the "letter-zero" code received from the sender. The code points 405 and 401 would therefore correspond to the codes 45 and 411, respectively.

Apparatus

- 6.07 The decoder circuit is made up of 19 multi-contact relays and an approximate minimum of 160 relays mostly of the R-type. These may be grouped according to their functions as follows:

Three groups of digit register relays.
 Service register relay group.
 Hundreds relay group (16 multi-contact relays).
 Tens relay group.
 Six groups of transmitting relays.
 Service relays as required (maximum of 8 single or pairs of relays).
 Service group relays as required (maximum of 14 relays).
 Route relays as required (from 15 to 785 relays).
 Peg-count counting relays.

There are in addition small groups of relays which control the timing circuit, the release of sender, calling in the trouble indicator, etc.

Check of Receiving Leads and Registration

- 6.08 When the decoder is associated with a sender by means of the decoder connector, it proceeds to check the integrity of the receiving leads. A continuity test is first made by supplying ground over the CK-1 lead back to the sender where it is connected through the back contact of each unoperated register relay to the associated receiving lead. The receiving leads, over which the office code and service indication are received, are grounded locally in the sender through the front contact of the associated operated register relays. Thus each receiving lead is grounded at the sender end. If all leads are continuous between the sender register relays and decoder register relays, all of the decoder register relays will operate and complete a chain circuit to operate the CK-1 relay. A check for crossed receiving leads is then made. The CK-1 relay operating from the chain circuit removes the ground from the CK-1 lead and, therefore, from all unused receiving leads; i.e., those not required for the call. This permits all decoder register relays except those held from operated sender register relays to release, thus breaking the chain circuit and permitting the decoder to proceed with its functions.
- 6.09 An open receiving lead prevents the completion of the chain circuit. A cross between a used and unused receiving lead or an unused lead falsely grounded results in ground being retained on all receiving leads and thus prevent the chain circuit from subsequently breaking. In either case, the call is blocked and the decoder times out.

Translating Code

- 6.10 The method by which the decoder translates or decodes the information received from the sender is shown schematically on Drawing 706-563. The "A," "B" and "C" digits received from the sender are registered on the "A," "B" and "C" register relay groups, respectively, in the decoder following the preliminary check of receiving leads. The setting of the "A" register relay group operates one of eight pairs of hundreds or "H" multi-contact relays designated HA-2 and HB-2 to HA-9 and HB-9 inclusive, each pair acting as a unit. Each pair of "H" relays has 100 traveling springs and associated front contact springs. The total of 800 traveling springs on the eight pairs of H relays are called the code points and these are brought out to terminals for cross-connecting purposes. The 100 front contact springs numbered 0 to 99 are multiplied at each pair of H relays and at the contact springs of 10 pairs of T relays, one pair of which is caused to operate in accordance with the setting of the "B" register relay group. Each pair of T relays, when operated, extends a particular 10-lead subgroup of the 100 leads to the contacts of the "C" register relay group where one of the 10 leads is grounded; the particular lead depending on the setting of the "C" register relay group.
- 6.11 The result of operating one pair of "H" relays and one pair of "T" relays and of grounding one contact on the latter is to ground one of the 800 code points. On dial zero calls and permanent signals the "A" register relay group alone grounds the "O" code point and "PS" code point, respectively.
- 6.12 Each code point is cross-connected to the winding of a route relay (R). When one of the 800 3-digit code points is grounded, the associated route relay operates, except as covered under "service features" and grounds six functional leads designated CL, CR, DB, DG, OB and OG. These leads are cross-connected to the windings of six transmitting relays (one relay in each of the six transmitting relay groups) the particular relay and winding in each group being determined by the requirements of the code and route under consideration and in accordance with the decoder translation chart.
- 6.13 The operation of one transmitting relay in each group usually connects ground to the associated transmitting leads in different combinations. The ground when connected is fed through the windings of series relays (one for each lead grounded). Each

of these operates in series with a selection register relay in the sender associated with the transmitting lead grounded. One combination for each group does not require the operation of any selection register relay; therefore, in such cases no transmitting lead of a group will be grounded. In this manner six groups of sender selection register relays are set in the proper combination for selecting a group of trunks and completing all functions required over the route called for by the office code.

Release of Decoder

- 6.14 The operation of six transmitting relays and the proper series relay or relays establishes a chain circuit for operating the release relay. This relay grounds the release lead (RL) causing the sender to lock all operated selection register relays and release the decoder.

Check of Transmitting Leads

- 6.15 During the time the decoder is associated with the sender and before the release relay (which is slow operating) operates, the decoder checks the integrity of the transmitting leads. All unused transmitting leads are normally connected through the back contacts of associated transmitting relays to the winding of an X relay to battery. This relay will operate and block the release if any unused lead is either falsely grounded or crossed with some lead having ground. Furthermore, the failure of a series relay to operate due to an open in the transmitting lead with which it is associated prevents the completion of the release chain and also blocks the release. In either case the release relay is prevented from operating and the decoder times out.

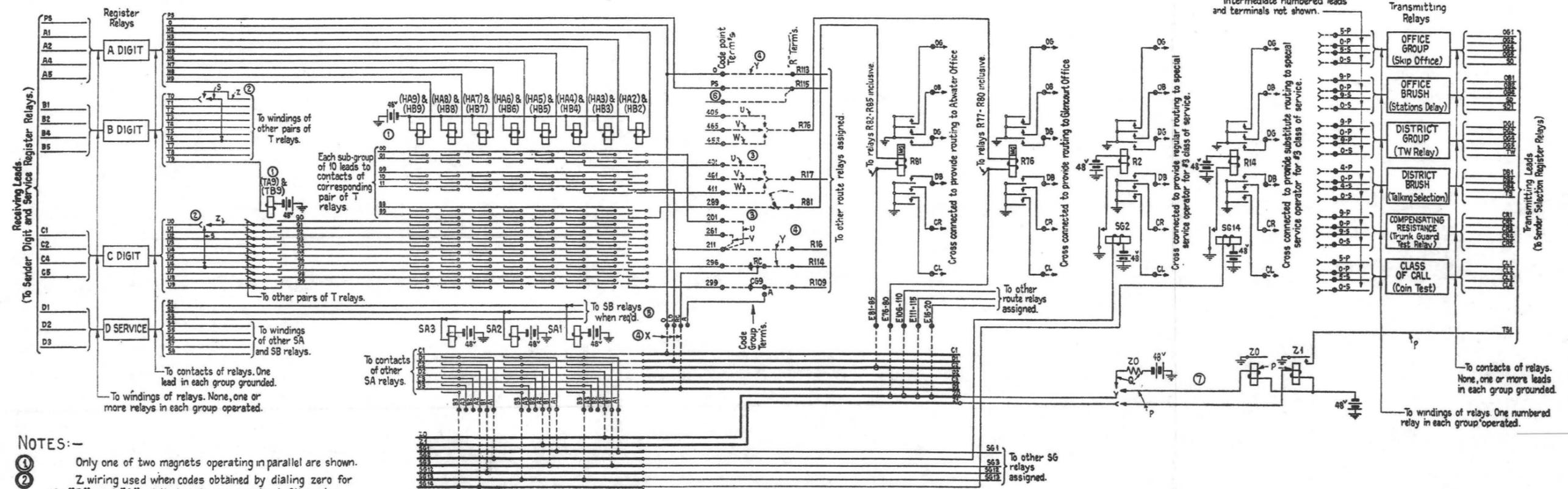
Trouble Release

- 6.16 When the decoder is not released within 1.0 to 2.3 seconds after seizure due to trouble encountered in the preliminary check of receiving leads or transmitting leads or to any cross which causes the operation of two route relays, two service relays, or two transmitting relays in the same functional group; the trouble indicator is called in and takes a record of the call, after which it dismisses the decoder. The decoder in this case grounds the TRL lead to the sender which in turn dismisses the connector and decoder simultaneously. When the connector is normal, the sender makes a second trial, usually obtaining a different decoder from that obtained on the first trial. In this case the sender grounds the CK-2 lead indicating to the decoder that the preliminary check of receiving leads is to be dispensed with.

PANEL SYSTEM
3 DIGIT DECODER EQUIPMENT
Decoder Circuit
Simplified Schematic

706-563
Information
Replacing 706-545.

Engineer
Draftsman
Checked by
Log # P22051 7/18/29
ISSUE 1



NOTES:-

- ① Only one of two magnets operating in parallel are shown.
- ② Z wiring used when codes obtained by dialing zero for the "B" and "C" digit or both are required. Otherwise S wiring is used.
- ③ When the "A" digit dialed denotes a 3-digit code W wiring is used. When the "A" digit dialed denotes a 2-digit code U wiring is used with Z wiring or V wiring with S wiring.
- ④ X wiring provides different routes for different classes of service. Y wiring provides a route common to all classes of service.
- ⑤ When additional service relay contacts are required SB relays are equipped. These control connections between

the common leads C4, C5, C6, D4, D5 and D6 and individual terminals A4, A5, A6, B4, B5 and B6 respectively.

⑥ This code point corresponds to code assigned as "Sender Monitor Code."

⑦ P wiring and apparatus used when decoder serves a flat rate class of service permitted direct dialing to certain AB toll points for a single charge which is mechanically registered. Otherwise Q wiring and apparatus is used.

Fig. 7.

- 6.17 If this decoder encounters no trouble, translation will be completed and the sender will receive the regular "release." If, however, the decoder times out for any reason, the sender will receive a second "trouble release," after which it dismisses the connector and decoder and lights the sender lamp at the sender monitor's position.
- 6.18 Inasmuch as the preliminary check of receiving leads is not made on the second trial, under certain conditions, wrong offices may occasionally be selected by the sender. For example, if a receiving lead associated with an operated sender register relay is open in the sender or connector, its indication will be lacking on the second trial and the code or service indication registered in the decoder will be modified accordingly. When, however, a receiving lead, not associated with an operated sender register relay is grounded, all decoder register relays operate during the second trial. For this condition the decoder provides a routing to a permanent signal holding line.

7. SERVICE FEATURES

Service Relays

- 7.01 The number of classes of service that may be accommodated by a group of decoders depends primarily on the differences in treatment that must be cared for in the decoder. It should be noted that although the operator class is not strictly a class of service, it must be considered as such where the operator is served by subscriber senders, or where the operator senders have access to decoders. In general, classes of service may differ with respect to either or both:
- (a) Treatment received on calls to one or more office codes.
 - (b) Routing to one or more operator codes, particularly special service and long distance operator.
- 7.02 Differences with respect to (b) may be cared for by subgrouping the district multiple or both the district and office multiples. Where this is done for two or more classes of service which do not differ with respect to (a), they may be assigned the same service relay in the decoder. Where differences with respect to (b) must be cared for in the decoder or where classes of service differ with respect to (a), separate service relays are assigned. The decoder can, therefore, accommodate as many

classes of service as require, in the aggregate, a maximum of eight service relays. A sender group can accommodate as many classes of service as require, in the aggregate, four service relays. Two such sender groups may be provided or eight sender groups, each having access to a different service relay, or other combinations of sender groups requiring a maximum of eight service relays may be provided.

- 7.03 When it is necessary that any one class of service receives different treatment as to routing or charging for certain groups of office codes or for certain operator codes, service relays (SA and in some cases SB) are used and assigned individually to the different classes of service.
- 7.04 For each class of subscriber originating a call, the service relay assigned to that class operates and provides the proper treatment for each office and operator code.
- 7.05 For assignment and cross-connection purposes the office codes are considered by groups, each group differing in the type of treatment provided some one class of service. These groups will be referred to hereafter as "office code groups." The number of "office code groups" for which different classes of service can receive different treatment plus the number of operator codes requiring more than one route, that can be accommodated, depend on the number of contacts carried by each service relay. Either of two arrangements may be provided, giving six or twelve contacts. When more than six contacts are required SB relays should be specified. One contact on each equipped service relay (or pair of relays if SB relays are specified) is required for:
- (a) Each operator code for which the decoder provides two or more routes.
 - (b) Each "office code group" for which different classes of service receive different talking selections. (There may be more than one such group differing in the talking selection provided any one class of service.)
 - (c) Each "office code group" to which one or more (but not all) classes of service are denied dialing privileges. Each class of service allowed access to this group may obtain either talking selection as required. (There may be more than one such group differing in the treatment accorded any one class of service.)

(d) The "restricted code group," when the decoder provides different routes to the special service operator for different classes of service.

Service Indications and Assignment

7.06 Where a sender group serves from two to four classes of service, each of which is assigned a separate service relay, distinctive service indications are provided in the associated panel link groups. A group of links serving a given class of service can apply one of four possible conditions to the fundamental tip and ring leads. These conditions, are combinations of ground or open on the fundamental tip with ground or open on the fundamental ring. The sender on each call records this indication on its service register relays FT and FR, and these relays pass it to the decoder by duplicating the same condition on any two or three receiving leads, the condition on the remaining lead being fixed at the sender.

7.07 These three receiving leads are designated "D-1," "D-2" and "D-3." The conditions that may exist are combinations of direct ground or open on the "D-1" lead with direct ground or open on the "D-2" lead. These four possible conditions combined with direct ground or open on the "D-3" lead provide a maximum of eight distinct service indications, one for each service relay. The four possible conditions that may obtain on the "D-1" and "D-2" leads correspond to service relays 1 to 4 when the "D-3" lead is open and to service relays 5 to 8 when the "D-3" lead is grounded.

7.08 By making the proper cross-connections, certain combinations of service relays can be chosen and made available for assignment to the classes of service in a particular sender group. The chart shown on Drawing 706-561, lists the combinations of service relays that can be assigned the classes of service in each of the possible single and combined class sender group arrangements. A table of the cross-connections necessary to obtain each combination of service relays is shown at the bottom of the chart.

7.09 The use of the chart shown in Drawing 706-561 may best be illustrated by the following example. Let it be assumed that eight classes of service are provided in three sender groups as indicated below:

(1) Sender Group Number	(2) Classes of Service	(3) Sender Group Arrangement and Service Relay Comb.	(4) Service Relays Assigned Each Class
1	Coin—Single Slot	3C1-A	2 4 3
	Coin—Multi. Slot		
	Flat Rate— Restricted		
2	Operator	3A3-D	1 6 5
	Mess. Rate— Restricted		
	Mess. Rate— Unrestricted		
3	Flat Rate—AB	2AT-E	7 8
	Toll		
	Flat Rate— Unrestricted		

7.10 The cross-connections required to provide the specified arrangements are taken from the "Table of Cross-connections for D Leads" shown on drawing 706-561 and are as follows:

Sender Group Numbers	Sender Group Arrangement and Service Relay Combination	Cross-Connect Lead		
		D1 to	D2 to	D3 to
1	3C1-A	CK3	CK4	CK1
2	3A3-D	CK4	CK1	CK3
3	2AT-E	CK3	D5	D5

7.11 Where two classes of service served by different sender groups do not require separate service relays, the same service relay may be made available to both classes of service when desired. Assume that in the above illustration it was desired to assign the same service relay to the "flat rate—restricted" and "message rate—restricted" classes. This may be accomplished by providing for the second sender group an arrangement which includes the No. 3 service relay. Referring to the chart it will be seen that the "3A4" arrangement with the "F" combination provides service relays 1, 5 and 3. It is then only necessary to provide the proper service indication in links serving the "message rate—restricted" class of service to assign to that class of service the No. 3 service relay which has already been assigned to the "flat rate—restricted" class of service in the first sender group.

7.12 In rotary link-type offices, only the single class sender arrangements "1A" and "1B" can be used, because rotary links are not arranged to provide distinctive service indications.

PANEL SYSTEM
3-DIGIT DECODER EQUIPMENT
ASSIGNMENT OF DECODER SERVICE RELAYS TO CLASSES
OF SERVICE IN SINGLE AND COMBINED CLASS SENDER GROUPS

706-561
Information
Log No. P 21890, 5-1-22
ARK
Log No. P 22399 3, 6, 30
ISSUE 2
ARK

Possible Arrangements of Combination Coin And Non-Coin Sender Groups	Number of Coin and Non-Coin Classes of Service in Sender Group	Sender Group Arrangement ④	Relays Equipped in Sender	Relays Operated From Link ①	Class of Service ②	Combinations of Service Relays Available to Different Sender Group Arrangements Showing the Assignment of Each Service Relay to Each Class of Service.																					
						Combination																					
						A	B	C	D	E	F	G	H	J	K	L	M										
Possible Arrangements of Coin And Non-Coin Sender Groups	2 Coin 2 Non-Coin	4C	FT FR	None	Non-Coin # 1 (Oper)	1	1																				
				FT	Coin # 1	2	3																				
				FR	Non-Coin # 2	3	2																				
	2 Coin 1 Non-Coin	3C3	FT FR	None	Non-Coin # 1 (Oper)	1	1																				
				FT	Coin # 1	2	3																				
				FR	Non-Coin # 2	3	2																				
		3C1	FT FR	None	Non-Coin # 1 (Oper)	1	1																				
				FT	Coin # 1	2	3																				
				FR	Non-Coin # 2	3	2																				
	2 Coin 1 Coin	2CR	FR	None	Coin # 1	1	1															3	2				
				FR	Coin # 2	3	2																4	4			
	1 Coin	1B	None	None	Coin	1	2	3	4																		
Possible Arrangements of Coin And Non-Coin Sender Groups	1 Coin 1 Non-Coin	2BT	FT	None	Non-Coin # 1 (Oper)	1	1														3	2					
				FT	Coin	2	3																4	4			
				FR	Non-Coin # 2	3	2																				
	1 Coin 2 Non-Coin	3B4	FT FR	None	Non-Coin # 1 (Oper)	1	1	1														3	2				
				FT	Coin	2	3	2			3												4	4			
				FR	Non-Coin # 2	3	2	5			5												7	6			
		3B3	FT FR	None	Non-Coin # 1 (Oper)	1	1	1															3	2			
				FT	Coin	2	3	2			3												4	4			
				FR	Non-Coin # 2	3	2	5			5												7	6			
	3B1	FT FR	None	Non-Coin # 1 (Oper)	1	1	1															3	2				
			FT	Coin	2	3	2			3												4	4				
			FR	Non-Coin # 2	3	2	5			5												7	6				
Possible Arrangements of Non-Coin Sender Groups	1 Coin 3 Non-Coin	4B	FT FR	None	Non-Coin # 1 (Oper)	1	1	1													3	2					
				FT	Coin	2	3	2			3												4	4			
				FR	Non-Coin # 2	3	2	5			5												7	6			
	Possible Arrangements of Non-Coin Sender Groups	4 Non-Coin	4A	FT FR	None	Non-Coin # 1 (Oper)	1	1	1	1	1	1	5	5	3	3	2	2					6	8			
					FT	Non-Coin # 2	2	3	2	5	3	5	6	7	4	7	4	6									
					FR	Non-Coin # 3	3	2	5	2	5	3	7	6	7	4	6	4									
		3 Non-Coin	3A4	FT FR	None	Non-Coin # 1 (Oper)	1	1	1	1	1	1	5	5	3	3	2	2									
					FT	Non-Coin # 2	2	3	2	5	3	5	6	7	4	7	4	6									
					FR	Non-Coin # 3	3	2	5	2	5	3	7	6	7	4	6	4									
			3A3	FT FR	None	Non-Coin # 1 (Oper)	1	1	1	1	1	1	5	5	3	3	2	2									
					FT	Non-Coin # 2	2	3	2	5	3	5	6	7	4	7	4	6									
					FR	Non-Coin # 3	3	2	5	2	5	3	7	6	7	4	6	4									
3A2		FT FR	None	Non-Coin # 1 (Oper)	1	1	1	1	1	1	5	5	3	3	2	2											
			FT	Non-Coin # 2	2	3	2	5	3	5	6	7	4	7	4	6											
			FR	Non-Coin # 3	3	2	5	2	5	3	7	6	7	4	6	4											
3A1	FT FR	None	Non-Coin # 1 (Oper)	1	1	1	1	1	1	5	5	3	3	2	2												
		FT	Non-Coin # 2	2	3	2	5	3	5	6	7	4	7	4	6												
		FR	Non-Coin # 3	3	2	5	2	5	3	7	6	7	4	6	4												
2 Non-Coin	2AR	FR	None	Non-Coin # 1 (Oper)	1	1	1	4	6	7	5	5	3	3	2	2											
			FR	Non-Coin # 2	3	2	5	8	8	8	7	6	7	4	6	4											
1 Non-Coin	1A	None	None	Non-Coin (Oper)	1	1	4	6	7	5	5	3	3	2	2												
			FT	Non-Coin # 2	2	3	8	8	8	8	7	6	7	4	6	4											

NOTES:

- ① In all subscriber panel links (see circuit) serving a given class of service provide the proper wiring arrangement that furnishes the required combination of grounds on the FT and FR leads for operating the relays indicated
- ② Dialing operator when using subscriber sender can be assigned only to certain non-coin classes of service as indicated
- ③ Optional wiring in sender (see circuit) provides non-coin operation
- ④ The first numeral denotes the number of classes of service. The letters A, B and C denote respectively 'all non-coin', 'one coin' and 'two coin'. The second numeral denotes one of several optional arrangements. It also indicates which link indication is omitted as "None", "2" "FT", etc.
- ⑤ When combination coin and non-coin senders serve only non-coin classes provide necessary wiring (see sender circuit). The same arrangements shown for non-coin senders may then be provided.
- ⑥ When service relay combinations which include relays 1, 2, 3 or 4 are chosen for non-coin sender groups and coin classes of service are provided the "CL4" resistance (See Non-Coin Sender circuit) shall be equipped.

In Each Sender Connect the D1, D2 And D3 Leads to Terminals CK1, CK3, CK4 And D5 As Indicated For the Particular Sender Group Arrangement And Combination Chosen.

3A1, 3A2, 3A3, 3A4, 3B1, 3B3, 3B4, 3C1, 3C3, 4A, 4B, 4C.	D1 To	CK3CK4CK3CK4CK1CK1CK3CK4CK3CK4	D5	D5									
2AT, 2BT	D2 To	CK4CK3CK1CK1CK3CK4CK4CK3	D5	D5CK3CK4									
	D3 To	CK1CK1CK4CK3CK4CK3	D5	D5CK4CK3CK4CK3									
2AR, 2CR	D1 To	CK3CK1D5CK1CK3D5CK3CK1CK3CK1D5D5											
	D2 To	CK1CK3D5CK1D5CK3CK1CK3D5D5CK3CK1											
	D3 To	CK1CK1CK3CK3D5D5D5D5CK1CK3CK1CK3											
1A, 1B	D1 To	CK1CK4CK1D5D5CK4CK1CK4CK1CK4D5D5											
	D2 To	CK4CK1CK1D5CK4D5CK4CK1D5D5CK1CK4											
	D3 To	CK1CK1CK1CK1D5D5D5D5											
Sender Group Arrangement	Cross Connect	A	B	C	D	E	F	G	H	J	K	L	M

Fig. 8.

Regular Operator Code Routing

- 7.13 Where an operator code (3-digit of zero) is reached over a route common to all classes of service served by a group of decoders it may be treated the same as an office code, and be assigned a route relay. This arrangement is shown on drawing 706-563 as Y wiring for code points 0 and 211. It is also provided where separate routes are required for different classes of service but which are cared for by separate groups of trunks at the same location in the multiple of the respective district selector groups or office selector groups.
- 7.14 Where the decoder alone must provide two or more routes for an operator code, the required number of service group relays are furnished and one relay is assigned for each route per operator code. In this event, service relays must be assigned to the classes of service, and the necessary cross-connections made so that each service relay selects the service group relay controlling the routing allotted to the associated class or classes of service. (See X wiring for code points 0 and 211 on drawing 706-563.)

Substitute Operator Code Routing to Special Service Operator

- 7.15 When one or more classes of service dial an office code from which they are denied dialing privileges, but which is accessible to some other class of service, it is necessary to cancel the routing of the office code dialed and substitute a routing to the special service operator. Different classes of service may obtain different substitute routings. For each such routing to the special service operator a service group relay is provided. Although these routings may involve the same trunk groups used on a "dial zero" call, different service group relays from those providing the regular routing to special service operator are assigned. This is necessary because the information provided by a service group relay not only includes the district and office selections but also other items of information required by the sender. The service group relay controlling the substitute routing provides a "class of call" setting requiring the sender to await the numerical portion of the number before completing selections.
- 7.16 Substitute routing is also necessary where the "restricted code group" is provided. In this group are the codes of all offices in the numbering area for which all classes of service (including operator), in the central office under consideration, are denied dialing privileges. Where only one route

to the special service operator is required for all classes of service a route relay is assigned to this group. (See Y wiring for terminal RC on drawing 706-563.) Where different routes for different classes of service are necessary a service group relay is assigned for each route. (See X wiring for terminal RC.)

Office Code Groups

- 7.17 On calls to office codes each service relay can be cross-connected to provide, for the classes of service to which it is assigned, one of three kinds of treatment as follows:
- Routing to special service operator following the dialing of an office code for which the class of service is not allowed direct dialing privileges. (Each class of service may receive a separate routing.)
 - Routing to the office dialed with the district selector in the "no charge" talking position. (No. 0 talking selection.)
 - Routing to the office dialed with the district selector in the "charge" talking position. (No. 1 talking selection.)
- 7.18 Typical examples of service treatment are shown on Drawing 706-563. An explanation of one case follows: On calls to 289 (ATWater) the three classes of service represented by service relays SA-1, SA-2 and SA-3 each receives different treatment. When the first class calls this code the SA-1 relay operates and connects the Z-0 battery to the windings of route relays R-81 to R-85. Relay R-81 is assigned to 289 and the other relays to other office codes in the same "office code group." The R-81 relay operates alone when the associated code point is grounded and provides among other items of information required by the sender, the No. 0 "no charge" talking selection. When the second class calls, the SA-2 relay operates and connects relay Z-1 in series with relay R-81. Both relays operate, the former providing the No. 1 "charge" talking selection. When the third class calls, the SA-3 relay operates and connects the high resistance SG-14 relay in series with the route relays. In this case the R-81 relay, being marginal, does not operate. The SG-14 relay does operate and in turn operates relay R-14 which provides a substitute routing to the special service operator.
- 8. ROUTE RELAY AND SERVICE GROUP RELAY REQUIREMENTS**
- 8.01 Each route relay (R) and service group relay (SG) provides 12 items of informa-

tion required by the sender to properly complete the call over the route called for. Of these, six are termed major selections and six minor selections. The major selections are (1) class of call, (2) compensating resistance, (3) district brush, (4) district group and, when required, (5) office brush and (6) office group. The minor selections indicate to the sender, (1) whether a coin is required (this affects only a combination coin and non-coin sender and then only when a coin class of service is calling), (2) which of two trunk guard test relays is to be used, (3) the district talking selection, (4) whether the "TW" relay is required, (5) the type of station delay and (6) whether office selections are to be skipped. The requirements of each selection are determined by the code and route and are provided by cross-connections made in accordance with the decoder translation chart.

- 8.02 It should be noted that two or more relays may involve the same trunk group but differ in some other major or minor selection. For example, it will usually be necessary, because of the four types of station delay to assign four route relays for each sender tandem or manual tandem office, irrespective of the number of offices reached through these tandem offices, provided, however, all such offices are in the same "office code group." Where the offices reached through these tandem offices lie in different "office code groups," or where the routing involves a different setting of any one major or minor selection from that required by other offices reached through the same tandem offices, additional route relays are required. Assume that offices "K" to "R," inclusive, are reached through the same tandem office, require different types of station delay and lie in different "office code groups" as shown below. For this case, it is apparent that a minimum of six route relays will be required as indicated.

Office	Station Delay	Office Code Group	No. of Route Relays Required
K	D	1	3
L	A	1	
M	C	1	
N	D	1	
O	A	2	2
P	B	2	
Q	D	3	1
R	D	3	
Total			6

- 8.03 One route relay is required for each office reached over a direct trunk group, or

reached through an office selector tandem center. One route relay is also required for each operator code for which the decoder provides only one routing.

- 8.04 One service group relay is required for each routing per operator code for which the decoder provides two or more routings. Additional service group relays may be required to care for substitute routings.

9. REGISTER CIRCUITS

Decoder Peg Count Register

- 9.01 A register per decoder is provided and is located together with an associated relay in the traffic register rack. This register is operated from the group of peg count counting relays in the decoder circuit and scores once for every ten calls on which an office or operator code is dialed (or sent by the test frame) or when the sender requests a "permanent signal" routing. Calls on which the sender is forced to make a second trial are not recorded. A key, also located in the traffic register rack, when operated, places the register in service.

Decoder Trouble Release Peg Count Register

- 9.02 A register and associated relay per decoder are located on the decoder test frame. The register scores whenever the decoder, due to trouble conditions, is held for from 1.0 to 2.3 seconds. A sender attached to the decoder during this interval will be released for the purpose of making a second trial or calling in the sender monitor. In general, the number of such registrations indicates the number of calls on which a sender was required to make a second trial.

Stuck Sender Peg Count Register

- 9.03 A peg count register per sender group is provided to automatically record the number of stuck senders occurring. The register and associated relay are located on the sender make-busy frame. The register scores once when a sender in the group lights the sender lamp following a second "trouble release" or after timing out for completion of selections.

10. MAINTENANCE FEATURES

General

- 10.01 The general maintenance facilities consist of a sender test frame, a decoder test frame for testing the decoders and decoder-connectors, a trouble indicator, time and fuse alarms, and means for making the equipment busy.
- 10.02 The same sender test frame used for testing the panel translator senders in panel

link offices can also test the decoder senders.

- 10.03 The procedure to be followed in making routine tests of the decoder equipment will be found in Division 215. The requirements and methods for maintaining the adjustable apparatus are to be found in the circuit requirement tables and in Division 215.

Decoder Test Frame

- 10.04 By means of the decoder test frame, tests can be made of any or all decoders using all codes or any particular code. When testing with all codes, one of the service decoders is used as a master decoder and the remaining service decoders in the same group are matched against it. When using a particular code on a single test basis, the use of the master decoder is not required. Tests of decoders can be made whether or not they are made busy by means of a make-busy plug. The decoder-connector wiring of any or all decoder-connectors can be tested through to any or all decoders.
- 10.05 The test frame is arranged to test a maximum of 12 (two groups of 6) decoders and 102 (two groups of 51) decoder-connectors. Where there are two groups of decoders, a master decoder is used in each group, the first decoder in the group being used for the purpose.
- 10.06 A detailed description of the decoder test frame will be found in Division 215.

Trouble Indicator

- 10.07 The trouble indicator consists of a panel of indicating lamps and associated equipment mounted on a frame adjacent to the decoder test frame. This arrangement serves as a means for giving the maintenance people the following information regarding connections on which a trouble release has occurred:
- (a) The decoder number.
 - (b) The decoder-connector number.
 - (c) The sender number.
 - (d) The code dialed into the sender.
 - (e) The receiving leads which were grounded or open, and, in the event of trouble in the transmitting circuit, the point at which the transmitting relay chain failed.
- 10.08 A detailed description of the trouble indicator will be found in Division 215.

Time Alarms

- 10.09 The alarm circuits consist of decoder and decoder-connector time alarms, decoder test frame and trouble indicator time alarms, decoder and decoder-connector fuse alarms, test frame and trouble indicator fuse alarms and a test frame motor stop alarm.
- 10.10 The decoder time alarm operates if a decoder fails to release within 2.3 to 3.6 seconds. This alarm operates the large d-c. bell on the trouble indicator frame, lights a master pilot at the floor alarm board, a white aisle pilot, a white class pilot on the decoder test frame, and a white lamp in the fuse panel of the decoder frame.
- 10.11 The decoder-connector time alarm operates if a decoder-connector is not released within 5.0 to 11.8 seconds. This alarm operates the large d-c. bell on the trouble indicator frame, lights a master pilot on the floor alarm board and a white class pilot on the decoder test frame. The circuit in trouble is located by identification lamps located on the decoder test frame. These lamps which light upon the operation of the battery key (BAT) are not under control of the time alarm circuit but light momentarily as each connector is used on a call. The circuit in trouble will cause the associated lamps to light steadily. The time alarm circuit is arranged to make busy the senders which have access to the connector circuit in trouble, in order to prevent these senders being used and thereby delaying the calling subscribers.
- 10.12 The test frame time alarm operates the large d-c. bell on the trouble indicator frame, lights a master pilot in the floor alarm board and a class pilot on the test frame.
- 10.13 The trouble indicator time alarm operates the small d-c. bell on the trouble indicator frame, lights the master pilot at the floor alarm board and a white class pilot on the trouble indicator frame.
- 10.14 The decoder and decoder-connector, test frame and trouble indicator fuse alarms operate the large d-c. bell on the trouble indicator frame, light a master pilot at the floor alarm board, a red aisle pilot, a red class pilot on the decoder test frame and a red lamp on the fuse panel of the frame on which the fuse is operated.
- 10.15 The test frame motor stop alarm arrangement is of the usual type, except that it operates the large d-c. bell on the trouble indicator frame and lights a red pilot lamp on the decoder test frame.
- 10.16 A transfer key is provided on the decoder test frame designated TR which when op-

erated will cause the d-c. bell at the floor alarm board to operate as well as the d-c. bell on the trouble indicator frame except in the case of the trouble indicator time alarm.

Make-Busy Features

- 10.17 The make-busy facilities for the decoder consist of make-busy jacks mounted on the frame with the trouble indicator. By inserting standard make-busy plugs into these jacks, decoders can be made busy to any or all decoder connectors. Make-busy jacks are also provided for making the trouble indicator busy to any or all decoders.
- 10.18 The make-busy facilities for the decoder connectors consist of one make-busy jack for each decoder-connector. These jacks are mounted on the sender make-busy frame. A make-busy plug in one of these jacks makes busy all of the senders associated with the decoder-connector. Since all of these senders will be on one sender frame, these make-busy jacks really constitute sender frame make-busy jacks.

- 10.19 The usual make-busy jacks for making individual senders busy are located on the sender make-busy frame.

11. CIRCUIT AND CIRCUIT DESCRIPTION

- 11.01 Table 1 is a list of circuit drawings pertaining to the decoder equipment. Detailed circuit descriptions will be found in the corresponding CD sheets.

TABLE 1

Title	Drawing
Subscriber Sender Circuit 3 or 3-2 Digit, Non-Coin	SD-21193-011
Subscriber Sender Circuit 3 or 3-2 Digit. Combination Coin and Non-Coin	SD-21194-011
Decoder Connector Circuit	SD-21187-011
Decoder Circuit 3-Digit 800-Code Capacity	SD-21277-011
Miscellaneous Circuits for Sender Make-Busy Frame	SD-21236-01
Miscellaneous Circuits for 3-digit Subscriber Sender Frame for Use with Decoder	SD-21234-01
Miscellaneous Circuits for Decoder Frame	SD-21249-01
Miscellaneous Circuits for Decoder Connector Frame	SD-21252-01

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