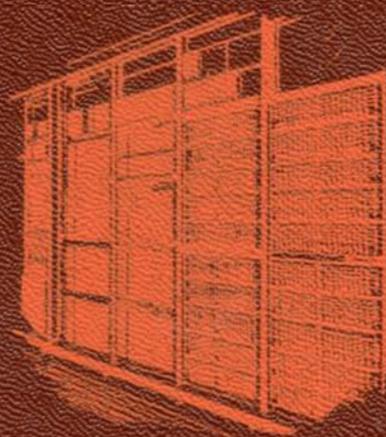


**NO. 1 CROSSBAR
DIAL TELEPHONE SYSTEM
COMPLETION OF A CALL**

EDUCATIONAL BULLETIN NO. 2.5-1

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Western Electric Company
INCORPORATED
HAWTHORNE WORKS

Personnel Service Branch

Training Department

CROSSBAR DIAL TELEPHONE SYSTEM

COMPLETION OF A CALL

THIS BULLETIN IS ISSUED TO PROVIDE CROSSBAR FRAME TERMINOLOGY AND THE SEQUENCE IN WHICH THESE FRAMES ARE USED IN COMPLETING A SUBSCRIBER CALL. INFORMATION CONTAINED HEREIN IS TO BE USED FOR EDUCATIONAL PURPOSES ONLY.

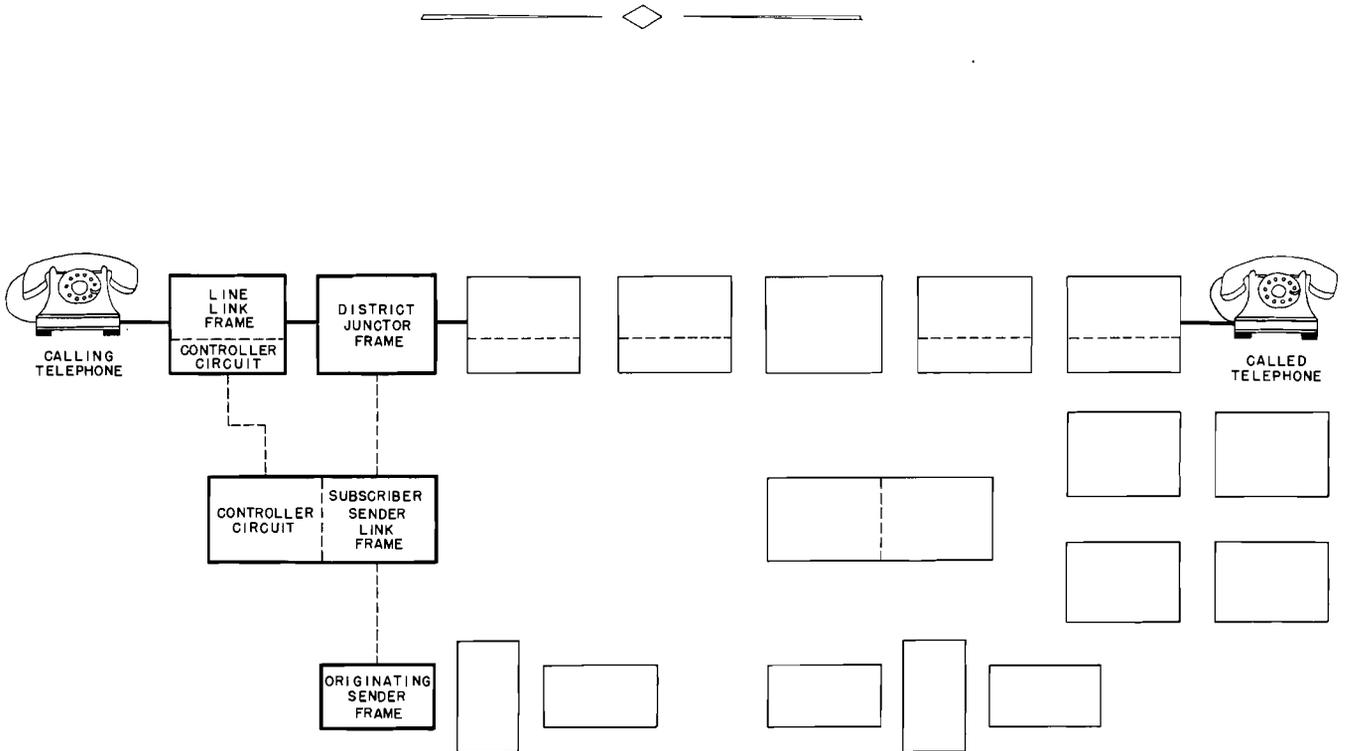
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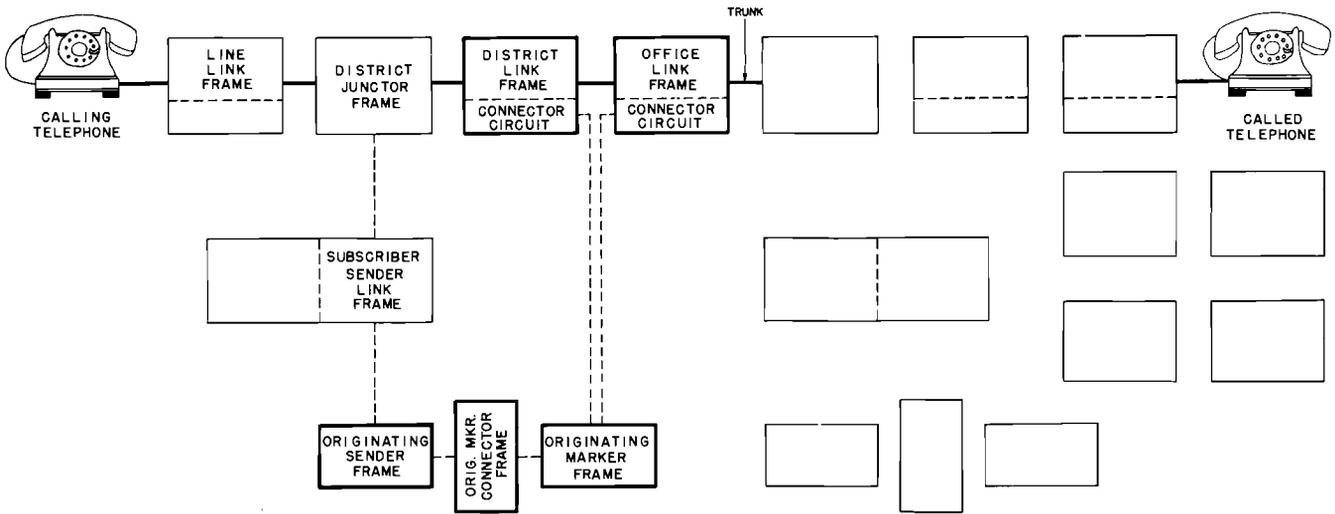
COMPLETION OF A CALL

SKETCHES ONE TO SIX DEPICT VARIOUS STAGES IN THE SETTING UP OF A CALL BETWEEN TWO SUBSCRIBERS IN A CROSSBAR DIAL TELEPHONE SYSTEM. THE TENTH SKETCH SHOWS ALL THE FRAMES IN SEQUENCE WHICH ARE REQUIRED IN COMPLETING A CALL. IN ORDER THAT THE READER MAY CONTINUALLY HAVE BEFORE HIM THE NAMES OF ALL FRAMES USED IT IS SUGGESTED THAT THE LAST PAGE CONTAINING SKETCH TEN BE LEFT OPEN WHEN FOLLOWING THRU THE VARIOUS STEPS.



SK. I
CALLING SUBSCRIBER REMOVES HANDSET

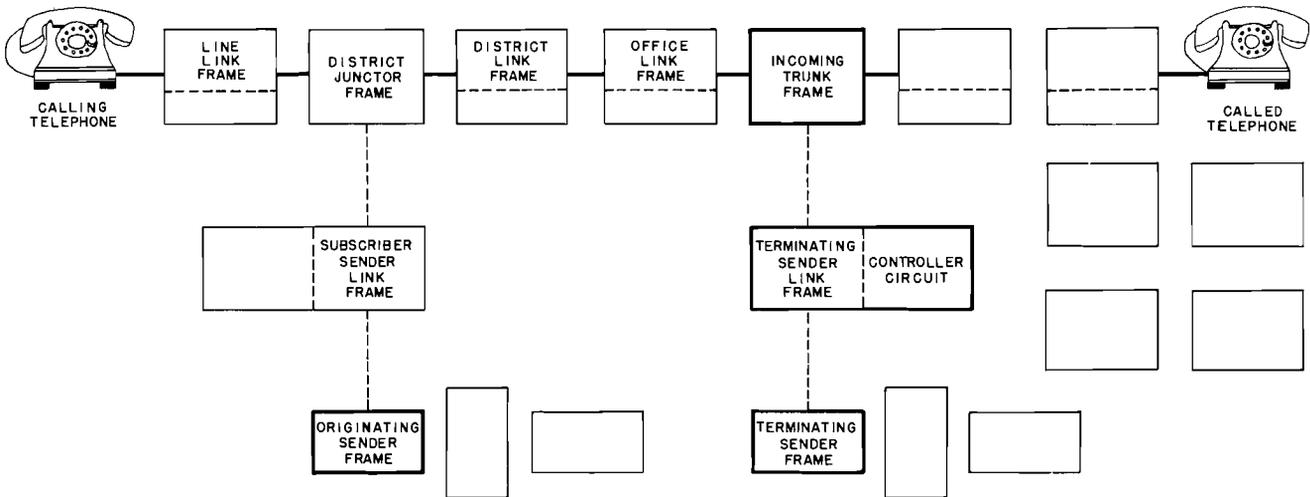
ON THE REMOVAL OF THE HANDSET BY THE CALLING SUBSCRIBER, THE LINE LINK FRAME CONTROLLER CIRCUIT FUNCTIONS TO LOCATE THE CALLING LINE AND IN CONJUNCTION WITH THE SUBSCRIBER SENDER LINK CONTROLLER CIRCUIT SELECTS AN IDLE DISTRICT JUNCTOR. THE SUBSCRIBER SENDER LINK CONTROLLER CIRCUIT ALSO SELECTS AN IDLE ORIGINATING SENDER. THE TWO CONTROLLER CIRCUITS EXTEND THE CALLING LINE TO THE SENDER BY SETTING UP IDLE PATHS THROUGH THE LINE LINK AND SUBSCRIBER SENDER LINK FRAME AND THEN RESTORE TO NORMAL. THE SENDER RETURNS DIAL TONE TO THE CALLING LINE AS AN INDICATION THAT DIALING CAN BE STARTED.



SK. 2

CALLING SUBSCRIBER DIALS THE OFFICE CODE--"0A4" FOR OAKLAND 4

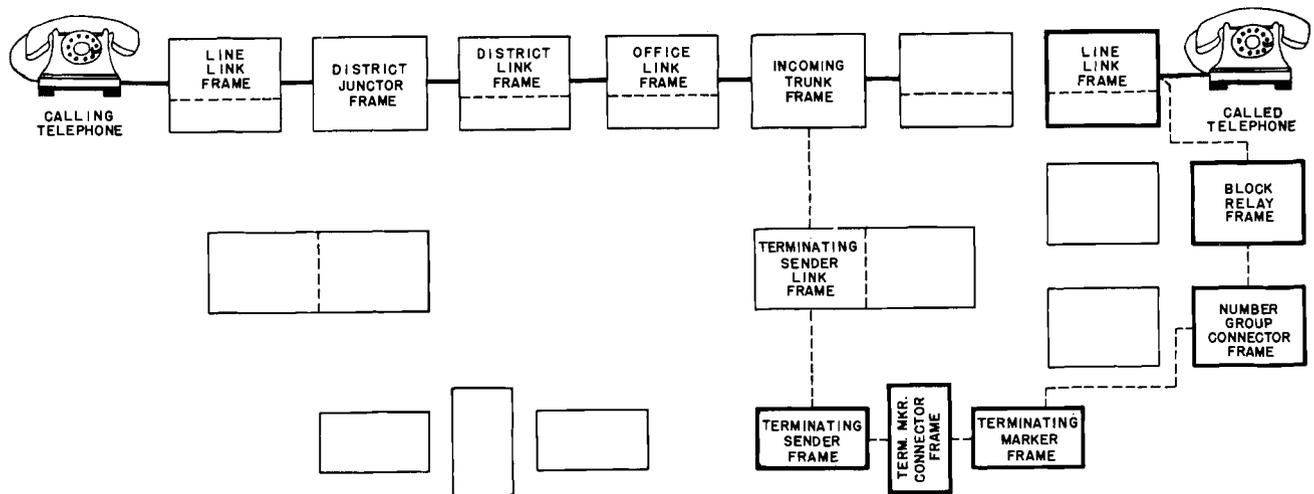
WHEN THE DIAL PULSES FOR THE OFFICE CODE ARE REGISTERED IN THE SENDER, THE SENDER WILL CALL ON AN ORIGINATING MARKER CONNECTOR TO PROVIDE AN IDLE ORIGINATING MARKER. THE SENDER THEN PASSES INFORMATION TO THE ORIGINATING MARKER AS TO THE OFFICE CODE DIALED, CLASS OF SERVICE OF THE CALLING LINE, ETC. THE ORIGINATING MARKER PROCEEDS TO SELECT AN IDLE TRUNK AND THEN SETS UP IDLE PATHS THROUGH AND BETWEEN THE DISTRICT LINK AND OFFICE LINK FRAMES TO CONNECT THE TRUNK TO THE DISTRICT JUNCTOR. THE CONNECTIONS BETWEEN THE ORIGINATING MARKER AND THESE FRAMES ARE THROUGH DISTRICT LINK AND OFFICE LINK CONNECTOR CIRCUITS. THE CONNECTOR CIRCUITS, ORIGINATING MARKER, AND ORIGINATING MARKER CONNECTOR THEN RELEASE.



SK. 3

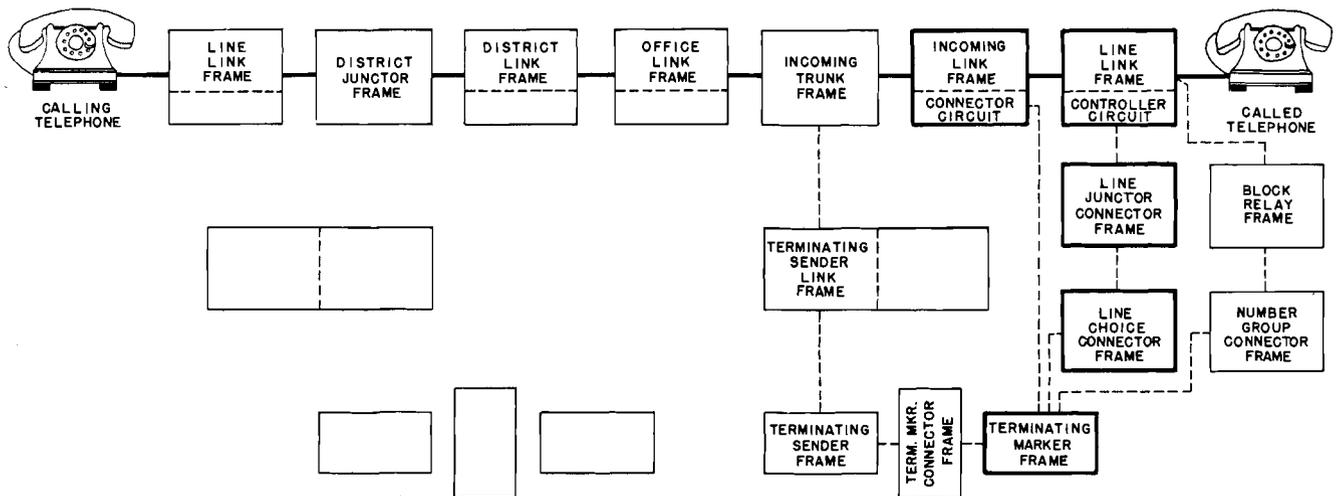
CALLING SUBSCRIBER DIALS THE NUMERICAL CODE-1234

WHEN THE THOUSANDS AND HUNDREDS DIGITS OF THE NUMERICAL CODE HAVE BEEN REGISTERED IN THE ORIGINATING SENDER THE SELECTED TRUNK IS CLOSED THROUGH THE INCOMING TRUNK TO THE TERMINATING SENDER LINK FRAME. THE ASSOCIATED CONTROLLER CIRCUIT SELECTS AN IDLE TERMINATING SENDER AND AN IDLE PATH THROUGH THE TERMINATING SENDER LINK FRAME, CONNECTING THE TERMINATING SENDER TO THE SELECTED TRUNK AND THEN THE CONTROLLER CIRCUIT RELEASES. THE THOUSANDS AND HUNDREDS DIGITS AS REGISTERED IN THE ORIGINATING SENDER ARE NOW TRANSFERRED AND REGISTERED IN THE TERMINATING SENDER. THE TENS AND UNITS DIGITS WHEN DIALED ARE ALSO TRANSFERRED TO THE TERMINATING SENDER. THE ORIGINATING SENDER AND SUBSCRIBER SENDER LINK NOW RELEASE FROM THE CALL.



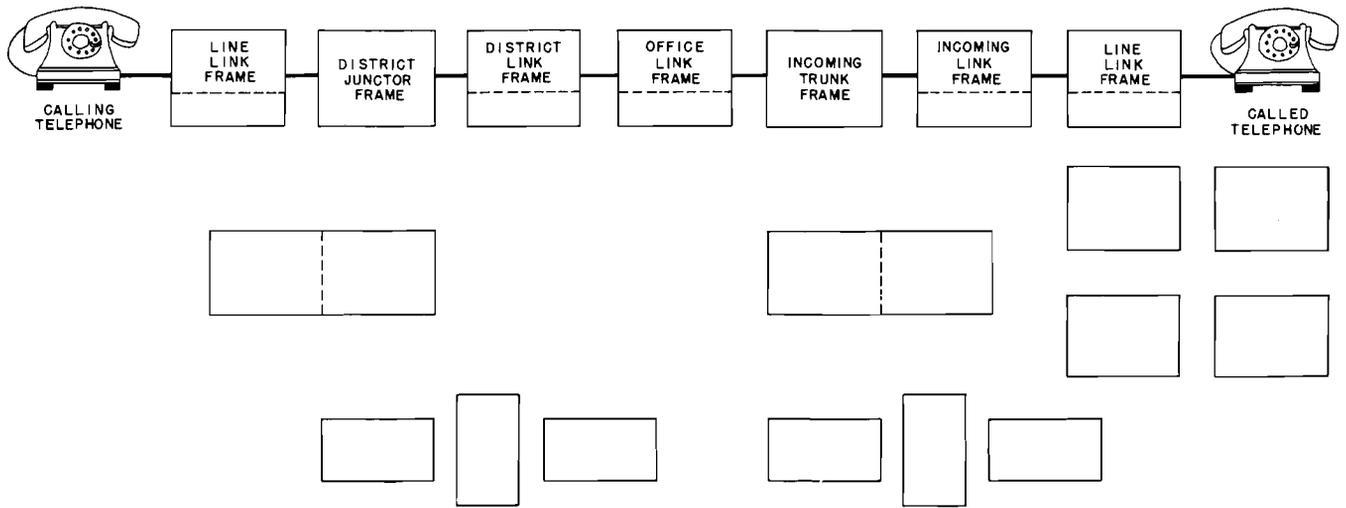
SK. 4
TESTING THE CALLED SUBSCRIBER LINE

AS SOON AS THE NUMERICAL CODE HAS BEEN TRANSFERRED AND REGISTERED IN THE TERMINATING SENDER, THE SENDER CALLS ON A TERMINATING MARKER CONNECTOR TO PROVIDE AN IDLE TERMINATING MARKER. THE TERMINATING SENDER THEN PASSES THE NUMERICAL CODE INFORMATION TO THE TERMINATING MARKER. THE TERMINATING MARKER SELECTS AND CONNECTS TO THE SLEEVE LEAD OF THE CALLED LINE, LOCATED ON A LINE LINK FRAME, THROUGH A NUMBER GROUP CONNECTOR AND BLOCK RELAY FRAME. A TEST IS NOW MADE BY THE TERMINATING MARKER FOR A BUSY OR IDLE CONDITION ON THE LINE. IF THE CALLED LINE IS BUSY THE INCOMING TRUNK IS SET BY THE TERMINATING MARKER TO SEND BUSY TONE TO THE CALLING SUBSCRIBER AND THE TERMINATING SENDER, TERMINATING MARKER CONNECTOR, TERMINATING MARKER, NUMBER GROUP CONNECTOR AND BLOCK RELAY CIRCUITS RESTORE TO NORMAL IMMEDIATELY. LET IT HOWEVER BE ASSUMED THAT THE CALLED LINE IS IDLE.



SK. 5
CONNECTING INCOMING TRUNK TO CALLED LINE

THE TERMINATING MARKER ON FINDING THE LINE IDLE SETS UP IDLE PATHS THROUGH AND BETWEEN THE INCOMING LINK AND LINE LINK FRAMES, CONNECTING THE INCOMING TRUNK TO THE CALLED LINE. THE TERMINATING MARKER ACCOMPLISHES THIS WITH THE AID OF THE INCOMING LINK CONNECTOR CIRCUIT, LINE CHOICE CONNECTOR, LINE JUNCTOR CONNECTOR AND LINE LINK CONTROLLER CIRCUIT. THE INCOMING TRUNK PROCEEDS TO RING THE CALLED SUBSCRIBER BELL. THE TERMINATING SENDER LINK, TERMINATING SENDER, TERMINATING MARKER CONNECTOR, TERMINATING MARKER, NUMBER GROUP CONNECTOR, BLOCK RELAY, LINE CHOICE CONNECTOR, LINE JUNCTOR CONNECTOR, LINE LINK CONTROLLER, AND INCOMING LINK CONNECTOR CIRCUITS RESTORE TO NORMAL.



SK. 6
SUBSCRIBER TALKING PATH

WHEN THE CALLED SUBSCRIBER ANSWERS, THE TALKING PATH IS COMPLETED BETWEEN THE CALLING AND CALLED LINES. TALKING BATTERY IS FURNISHED TO THE CALLING LINE BY THE DISTRICT JUNCTOR AND TO THE CALLED LINE BY THE INCOMING TRUNK.

TERMINATING EQUIPMENT COMMON TO TWO CROSSBAR
CENTRAL OFFICE UNITS - PLAN I

WHEN TWO OR MORE CROSSBAR CENTRAL OFFICE UNITS OF LOW OR MODERATE CALLING RATE ARE TO BE LOCATED IN THE SAME BUILDING, ARRANGEMENTS HAVE BEEN DEVELOPED WHICH PERMIT TWO UNITS OF 10,000 NUMBERS EACH TO UTILIZE COMMON TERMINATING EQUIPMENT. PROVISION HAS BEEN MADE TO OFFER TWO PLANS OF OPERATION DESIGNATED AS PLAN I AND PLAN II. EACH PLAN HAS CERTAIN ECONOMIC ADVANTAGES OVER THE OTHER, WHICH CAN ONLY BE DETERMINED BY CONSIDERING PROPOSED INSTALLATIONS INDIVIDUALLY.

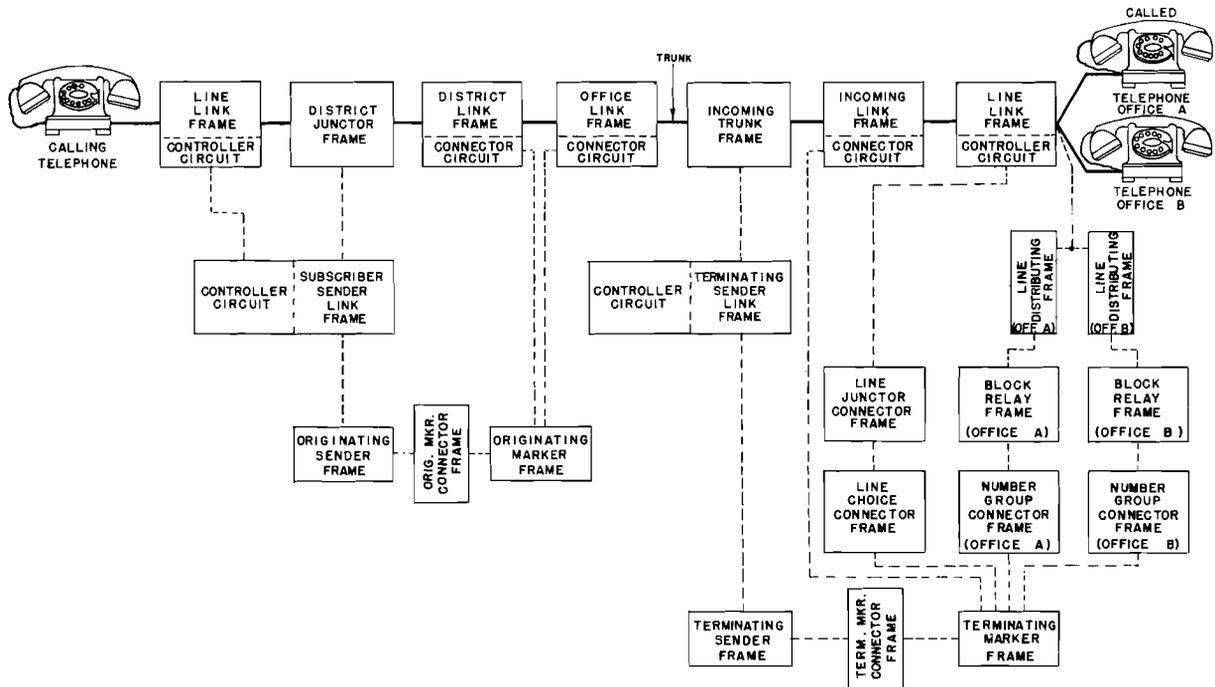
PLAN I AS ILLUSTRATED IN SKETCH NO. 7 PROVIDES INCOMING TRUNK, INCOMING LINK, TERMINATING SENDER LINK, AND LINE LINK FRAMES, AND TERMINATING SENDERS, TERMINATING MARKER CONNECTORS, TERMINATING MARKERS, LINE CHOICE CONNECTORS AND LINE JUNCTOR CONNECTORS, ALL OF WHICH ARE COMMON TO TWO CENTRAL OFFICE UNITS, EACH UNIT CONTAINING A MAXIMUM OF 10,000 NUMBERS. NUMBER GROUP CONNECTORS, BLOCK RELAY AND LINE DISTRIBUTING FRAMES ARE PROVIDED IN INDIVIDUAL GROUPS FOR EACH UNIT.

WITH COMMON LINE LINK FRAMES, SUBSCRIBER NUMBERS IN TWO DIFFERENT CENTRAL OFFICE UNITS MAY BE ASSIGNED TO THE SAME FRAME OR EVEN THE SAME PARTY LINE, THUS REDUCING NUMBER CHANGES AT TIME OF CUT-OVER; AND WILL FACILITATE INCREASING THE PARTY LINE FILL, WHICH IN TURN WILL ALLOW FOR A BETTER LOADING OF LINE LINK FRAMES FROM A TRAFFIC STANDPOINT.

COMMON INCOMING FRAME GROUPS WILL ALLOW INCOMING TRUNKS TO BE PROVIDED IN GROUPS EITHER INDIVIDUAL TO EACH OR COMMON TO BOTH OFFICE UNITS.

THE MARKER FUNCTION IN GENERAL, AS DESCRIBED IN SKETCHES NOS. 4 AND 5, CONSISTS OF SELECTING THE SUBSCRIBER LINE ASSOCIATED WITH THE CALLED SUBSCRIBER NUMBER, AND SETTING UP IDLE PATHS THROUGH THE TERMINATING EQUIPMENT, TO CONNECT AN INCOMING TRUNK CIRCUIT TO THE SUBSCRIBER LINE. WITH TERMINATING EQUIPMENT COMMON TO TWO OFFICE UNITS (A AND B), THE MARKER IS ABLE TO SELECT EITHER ONE OF TWO GROUPS OF 10,000 NUMBERS, AND ROUTE THE CALL THROUGH EITHER AN OFFICE A OR OFFICE B NUMBER GROUP CONNECTOR AND BLOCK RELAY FRAME PATH. INFORMATION FOR SELECTING EITHER OFFICE A OR B IS PROVIDED VIA THE SENDER IN THE FORM OF AN OFFICE A OR OFFICE B SIGNAL. THIS OFFICE SIGNALLING ARRANGEMENT IS DEPENDENT ON THE INCOMING TRUNK GROUP (COMMON OR INDIVIDUAL) AND ON THE TYPE OF CALL (FULL SELECTOR, B SWITCHBOARD, DIAL PULSING, OR KEY PULSING AC).

PLAN I SHOULD EFFECT A REDUCTION IN THE NUMBER OF FRAMES REQUIRED, PROVIDING NOT MORE THAN AN ULTIMATE OF TEN INCOMING LINK FRAMES ARE NEEDED. WHEN MORE THAN TEN INCOMING LINK FRAMES MUST BE PROVIDED, IT IS NECESSARY TO ADD INCOMING EXTENSION FRAMES INITIALLY. JOB CONDITIONS MUST BE ANALYZED AND EQUIPMENT PROVIDED TO CARE FOR THE TRAFFIC CONDITIONS WHICH HAVE TO BE MET.



SK. 7
COMMON TERMINATING EQUIPMENT-- PLAN-I

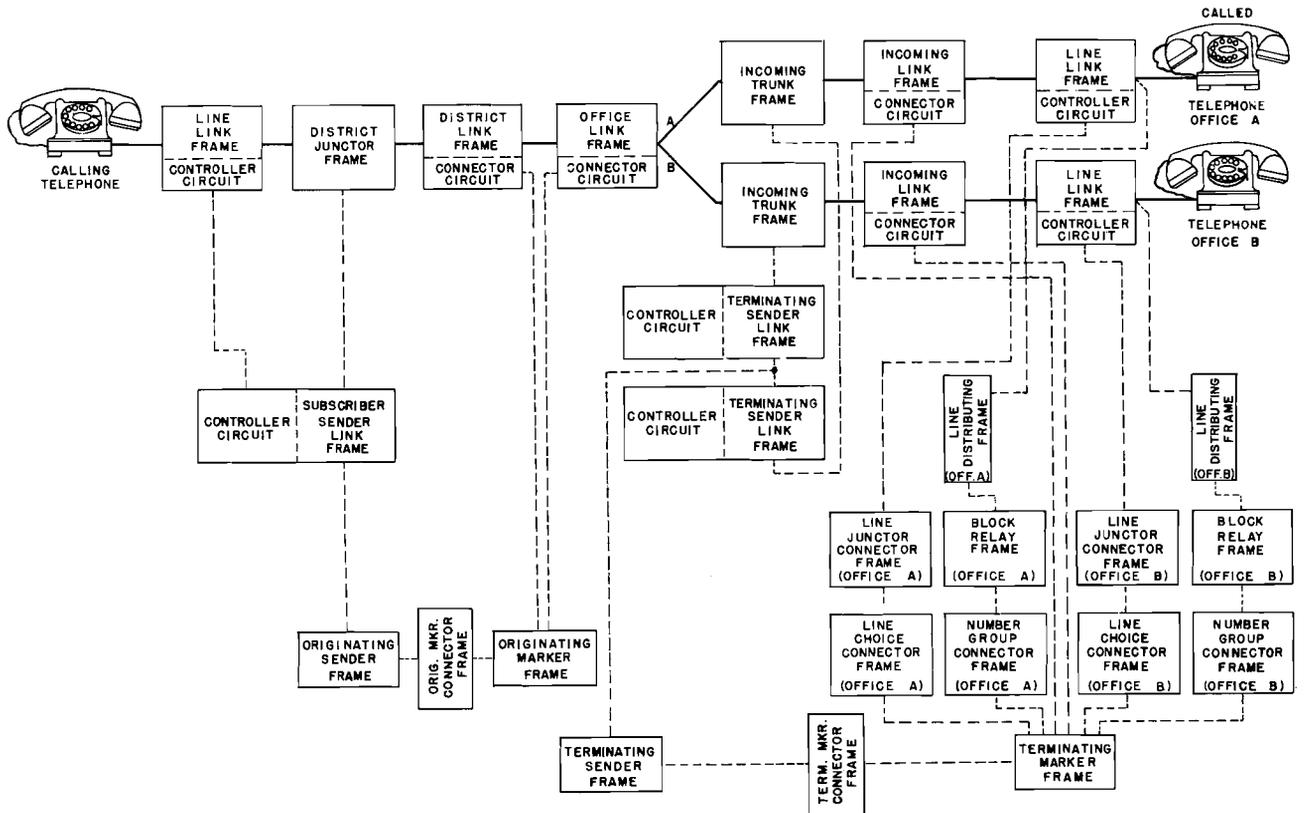
-CROSSBAR DIAL SYSTEM-

TERMINATING EQUIPMENT COMMON TO TWO CROSSBAR
CENTRAL OFFICE UNITS - PLAN II

PLAN II AS ILLUSTRATED IN SKETCH NO. 8 PROVIDES TERMINATING SENDERS, TERMINATING MARKER CONNECTORS, AND TERMINATING MARKERS COMMON TO TWO CENTRAL OFFICE UNITS, EACH UNIT CONTAINING A MAXIMUM OF 10,000 NUMBERS. INCOMING TRUNK, TERMINATING SENDER LINK, INCOMING LINK, LINE LINK, BLOCK RELAY AND LINE DISTRIBUTING FRAMES AND LINE CHOICE CONNECTORS, LINE JUNCTOR CONNECTORS AND NUMBER GROUP CONNECTORS ARE FURNISHED INDIVIDUALLY FOR EACH OF THE TWO UNITS. THE PROGRESS OF A CALL THROUGH THE TERMINATING EQUIPMENT IS MUCH LIKE THAT DESCRIBED FOR A REGULAR CALL (SKETCHES 4 AND 5) WITH THE EXCEPTION THAT THE TERMINATING MARKER ON RECEIVING THE OFFICE INDICATION FROM THE TERMINATING SENDER, ROUTES THE CALL THROUGH EITHER AN OFFICE A OR OFFICE B GROUP OF FRAMES. THE MAXIMUM NUMBER OF FRAMES FURNISHED INDIVIDUALLY FOR EACH UNIT CANNOT EXCEED THE TOTAL WHICH MIGHT BE PROVIDED FOR A SINGLE UNIT. FOR EXAMPLE, THE MAXIMUM OF 20 INCOMING LINK FRAMES ARE DIVIDED INTO TWO GROUPS, FRAMES 0 TO 9 BEING ASSOCIATED WITH OFFICE A AND FRAMES 10 TO 19 WITH OFFICE B; THE MAXIMUM OF 80 LINE LINK FRAMES OR 20 LINE CHOICES ARE ARRANGED SO THAT FRAMES 0 TO 39 OR LINE CHOICES 0 TO 9 ARE ASSOCIATED WITH OFFICE A AND FRAMES 40 TO 79 OR LINE CHOICES 10 TO 19 WITH OFFICE B; THE MAXIMUM OF TWENTY LINE CHOICE CONNECTORS ARE ARRANGED IN THE SAME WAY. SUCH AN ARRANGEMENT IS NECESSARY BECAUSE THE MARKER IS DESIGNED TO FUNCTION WITH ONLY A MAXIMUM NUMBER OF FRAMES, WHICH NUMBER MUST BE THE SAME FOR EITHER SINGLE OR DOUBLE UNIT OPERATION.

WITH PLAN II, ALL INCOMING TRUNK GROUPS MUST BE ON AN INDIVIDUAL OFFICE BASIS; EXTENSION FRAMES MAY BE PROVIDED FOR THE INCOMING LINK FRAMES, AND SUBSCRIBER LINES IN ONE CENTRAL OFFICE UNIT MUST BE LOCATED ON THE LINE LINK FRAMES ASSOCIATED WITH THAT UNIT.

PLAN II WILL PROBABLY FIND LESS ADAPTATION THAN PLAN I, ALTHOUGH SOME JOB REQUIREMENTS MAY BE BETTER MET WITH PLAN II THAN WITH PLAN I.

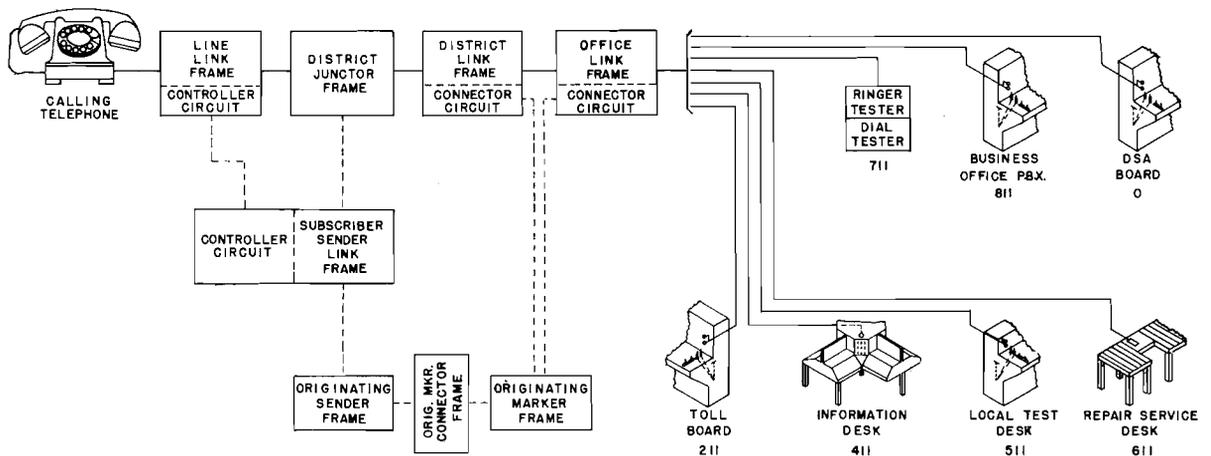


SK. 8
COMMON TERMINATING EQUIPMENT - PLAN-2

CALLS TO SWITCHBOARDS, DESKS, AND SPECIAL EQUIPMENT USED IN CROSSBAR OFFICES

SKETCH NO. 9 SHOWS THE CROSSBAR FRAMES REQUIRED TO ENABLE THE CALLING SUBSCRIBER TO GAIN ACCESS TO THE DIAL SYSTEM "A" BOARD, TOLL BOARD, INFORMATION DESK, REPAIR SERVICE DESK, AND BUSINESS OFFICE PBX, AND TO GIVE A TELEPHONE REPAIR MAN ACCESS TO THE TEST DESK AND RINGER AND DIAL TESTING EQUIPMENT. CALLS TO THESE POINTS ARE MADE BY DIALING THE NUMBERS AS SHOWN BELOW:

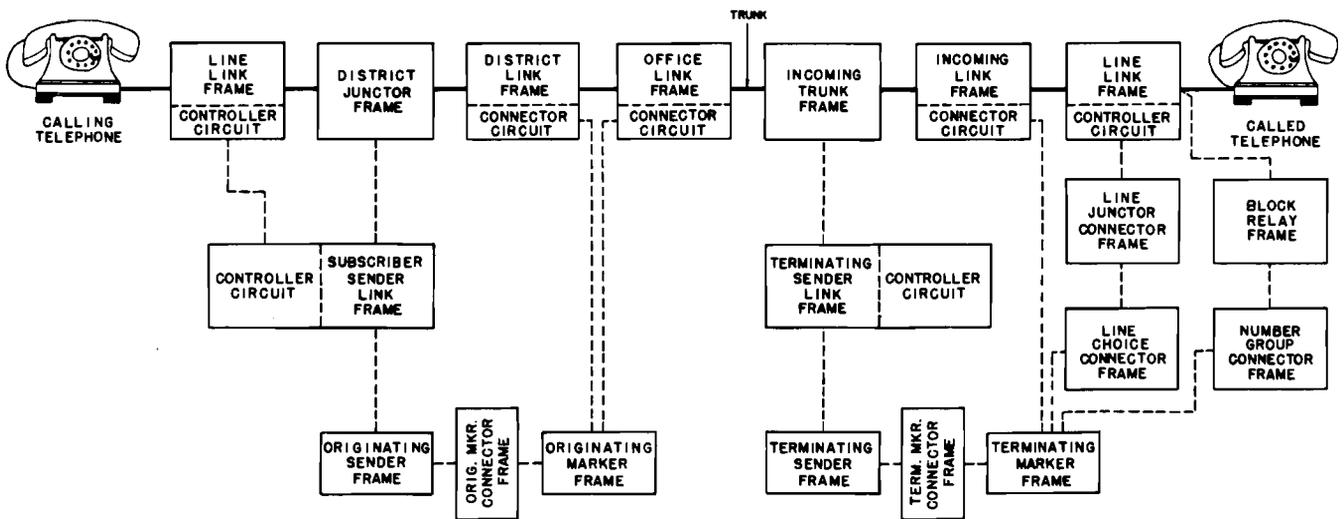
- 211 PROVIDES A CONNECTION TO THE TOLL OPERATORS AT THE TOLL BOARD, WHO WILL COMPLETE ANY CALL THAT MUST BE HANDLED ON A TOLL CHARGE BASIS.
- 411 PROVIDES CONNECTION TO THE OPERATORS AT THE INFORMATION DESK WHO WILL FURNISH INFORMATION ON CHANGED SUBSCRIBER NUMBERS OR NEW NUMBERS NOT LISTED IN THE DIRECTORY.
- 511 PROVIDES A CONNECTION WHEREBY A REPAIR MAN CAN CONNECT TO A TEST MAN AT A LOCAL TEST DESK WHEN REPAIRING TROUBLE ON THE LINE.
- 611 PROVIDES CONNECTION TO THE REPAIR CLERK AT THE REPAIR SERVICE DESK TO WHOM THE SUBSCRIBER MAY REPORT A TELEPHONE OUT OF ORDER OR MAKE ANY SERVICE COMPLAINTS.
- 711 PROVIDES A CONNECTION WHEREBY A REPAIR MAN AT A SUBSCRIBER STATION CAN OBTAIN ACCESS TO DIAL AND RINGER TESTING EQUIPMENT.
- 811 PROVIDES A CONNECTION TO THE BUSINESS OFFICE PBX FOR SERVICE INFORMATION OR COMPLAINTS.
- 0 PROVIDES A CONNECTION TO THE DSA OPERATOR AT THE DIAL SYSTEM "A" SWITCHBOARD WHO WILL HANDLE SHORT HAUL (AB) TOLL CALLS, EMERGENCY CALLS TO DOCTORS, HOSPITALS, POLICE OR FIRE STATIONS, AND CALLS ON WHICH ASSISTANCE IS NECESSARY DUE TO A SUBSCRIBERS INABILITY TO DIAL.



SK. 9

SEQUENCE OF FRAMES INVOLVED IN COMPLETING CALLS TO SWITCHBOARDS, DESKS & SPECIAL EQUIPMENT

CROSSBAR DIAL SYSTEM



SK. 10

SEQUENCE OF FRAMES INVOLVED IN COMPLETING A CALL BETWEEN TWO SUBSCRIBERS

- CROSSBAR DIAL SYSTEM -