SWITCHING SYSTEM NO. 400

INSTALLATION

1.00 GENERAL

1.01 This section covers the general requirements and methods to be followed in the installation of switching system No. 400.

1.02 For connecting information see section entitled Switching System No. 400, Connections and Maintenance.

2.00 TOOLS

In addition to standard tools required for installation work, the following tools or their equivalent are required:

- R-1257 adjustable bench level.
- R-2384 30-inch pinch bar.
- 19/32-inch wrench for removing nut holding L-shaped steel bracket attached to top front and bottom front of each slide.

3.00 PLANNING

3.01 Fig. 1 shows floor space requirements for the cabinet and required maintenance space.

3.02 Inspect location and surrounding area in which the customer desires equipment.

3.03 Location should meet the following general requirements:

- Floor strong enough to support cabinet.

  (1) Cabinet equipped with 20 lines weighs 740 pounds, and with 40 lines, 820 pounds.

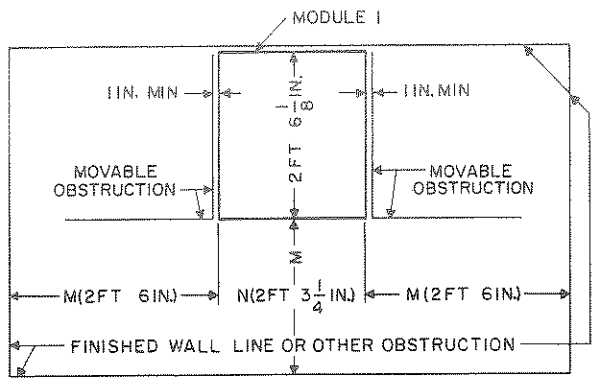
- Accessible without difficulty.

  (1) Dimensions of cabinet in crate are as follows: 40-1/2 inches deep, 35-1/2 inches wide, and 72 inches high.

- Dry and reasonably clean.
- Reasonably well lighted.

3.04 Avoid locations:

- Near windows, skylights, etc, where rain might enter.
- Near sweating water pipes, steam pipes, sprinkler systems, etc.
- Subject to extreme heat or cold.
- Near a hoist, stairway, trap door, pit, moving machinery, etc.
- In passageways used by trucks or other locations where traffic is heavy.
- Where oil mist from machinery, dust, corrosive fumes, exhaust from steam vents, etc, are present.
- Subject to excessive vibration due to operation of machinery or other causes.



NOTE 1: DIMENSION M IS AREA NEEDED DURING MAINTENANCE VISITS AND SHOULD NOT BE LESS THAN 2FEET 6INCHES.

NOTE 2: HEIGHT 5FEET 3-5/8INCHES, WITH TOP FULLY OPENED 7FEET 8-1/2INCHES.

Fig. 1 - Floor Space Requirements

3.05 Customer should provide commercial power wiring as follows:

- 105- to 125-volt 60-cycle ac service on a separate 15-amp fuse not controlled by a switch.
- 3-wire circuit with third wire grounded in distribution cabinet.
- Hubbell No. 5261 (3-wire) or equivalent receptacle.
- Receptacle should be located adjacent to cabinet and in a position readily accessible for removal of plug for maintenance purposes. (Locate receptacle at a height above normal to prevent accidental removal of power cord plug.) Where local regulations permit, an ES-528772 cord clamp bracket together with a Tinnerman cord clamp of proper size may be used to prevent accidental removal of power cord plug.

4.00 INSTALLATION OF CABINET

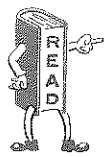
4.01 Uncrate cabinet as near as possible to its final location.

4.02 Level cabinet and if necessary, shim the base with hardwood or metal shims. Use a sufficient number of shims to ensure equal weight distribution at base.

4.03 To prevent damage to slides in shipping, a 2-inch-wide L-shaped steel bracket is attached to top and bottom front of the supporting framework of each slide. These brackets must be removed before slide can be opened. To remove bracket proceed as follows:

- Remove front panel.
- Remove 19/32-inch hex nut and washer holding bracket, see Fig. 2.

Remove bracket.



Avoid dropping nut, washer, or bracket inside equipment.

Turn bracket over (flange facing right) and remount for future shipping use. See Fig. 3.

4.04 To open a slide, the latch located at the top front edge must be released. Only one slide can be opened at a time.

4.05 Ground for the cabinet is normally furnished by the third wire in power cord. However, to ensure that the cabinet remains grounded should power cord be removed, a local ground must be provided. Connect a 14-gauge wire or equivalent from an approved ground to ground connector located in right front of crown.

4.06 To gain access to crown, raise hinged top cover and engage brace.

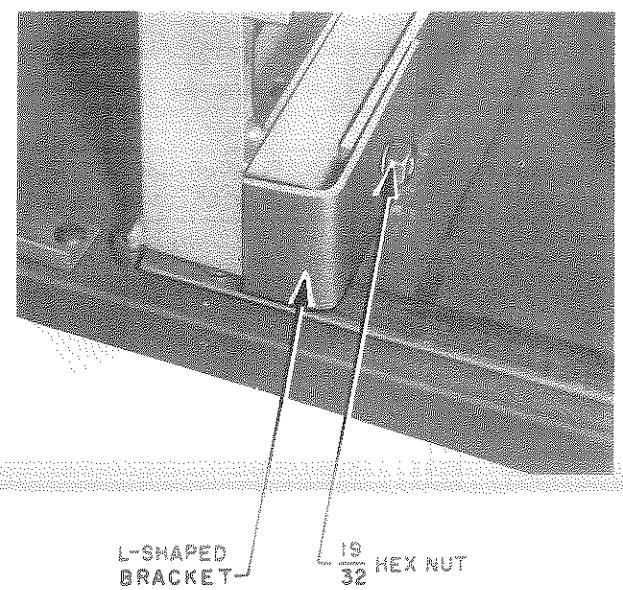


Fig. 2 - Bottom Bracket Holding Slide

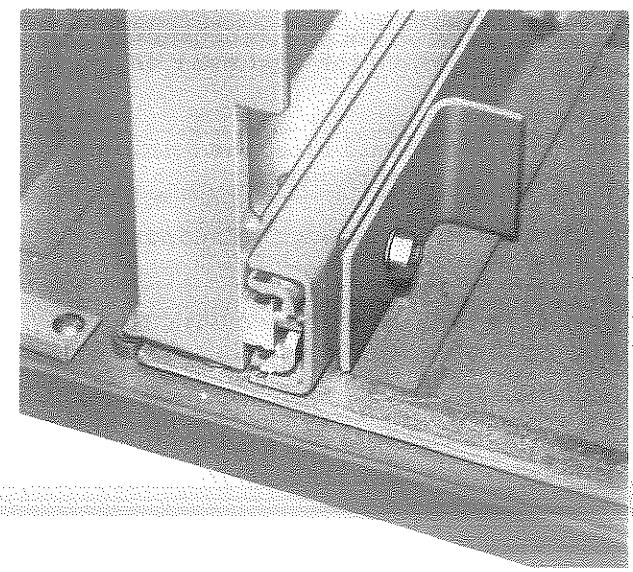


Fig. 3 - Position of Bracket for Future Shipping Use

5.00 CABLING AND WIRING

5.01 Place station cable and wire in accordance with existing practices.

5.02 Cables and wires enter cabinet at top rear, left or right. Wiring should be dressed along sides to the front and then to right or left side of appropriate connecting block.

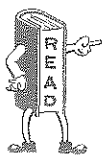
5.03 Raise hinged bracket holding connecting blocks and engage braces.

5.04 Use 714A tool to terminate wires in clips.

6.00 GENERAL INFORMATION FOR INITIAL INSTALLATION

6.01 All options for following equipment are shop wired:

- Universal line units.
- Add-on line units.
- Key telephone units.
- Auxiliary register unit for Direct Station Selection (DSS).
- Alarm Circuit



Only when placing these units in service do options not required have to be removed; see section entitled Switching System No. 400 Connections and Maintenance for specific equipment.

6.02 All station lines must be strapped for assigned or unassigned service.

6.03 Tens digits 4 to 0 are wired to busy-tone trunks. These digits are assigned for the following:

- 4 and 5 for station lines 40-49 and 50-59.
- 6, 7, and 8 for universal lines 6, 7, and 8.
- 9 and 0 unassigned.

To remove these digits from the busy condition, see section entitled Switching System No. 400, Connections and Maintenance, Line, Link, and Connector Units and Universal Lines.

6.04 All fuses are provided in fuse panel. Remove fuse and replace with dummy fuse in all unused circuits.

7.00 INSTALLATION OF AUXILIARY EQUIPMENT IN CABINET ASSEMBLY

Line, Link, and Connector Units

7.01 Mount line, link, and connector unit for station line group 40-49 on mounting spaces 1 through 6 of slide 1 with four mounting screws provided.

Note: If mounting space 6 is occupied by a DSS unit, remove DSS unit and install in an external cabinet.

Attach shop-wired connectors 1, 2, and 3 to plugs 1, 2, and 3 located on left of switch as viewed from the rear. This connects line, link, and connector unit into the system and extends the necessary leads to the terminal field in crown.

7.02 Stamp designations on line, link, and connector unit as shown in Fig. 4.

7.03 Mount line, link, and connector unit for station line group 50-59, on mounting spaces 7 through 12 and stamp designations as covered in 7.01 and 7.02, respectively.

Note: When this unit is added, all DSS units must be installed in an external cabinet.

Auxiliary Register and Relay Units for DSS

List 1 Cabinet Assembly

7.04 The list 1 cabinet assembly is not equipped with internal wiring or connecting blocks in crown for internal mounting of J53035BC, List 1 auxiliary relay units associated with direct station selection. These units should be mounted externally.

7.05 The J53035CB, List 1 auxiliary register unit, however, must be mounted in slide No. 2, mounting space 10, if DSS is desired. Local cabling is provided to wire the unit into the system and extend the necessary leads to externally mounted auxiliary relay units via DSS register connecting block in crown of cabinet.

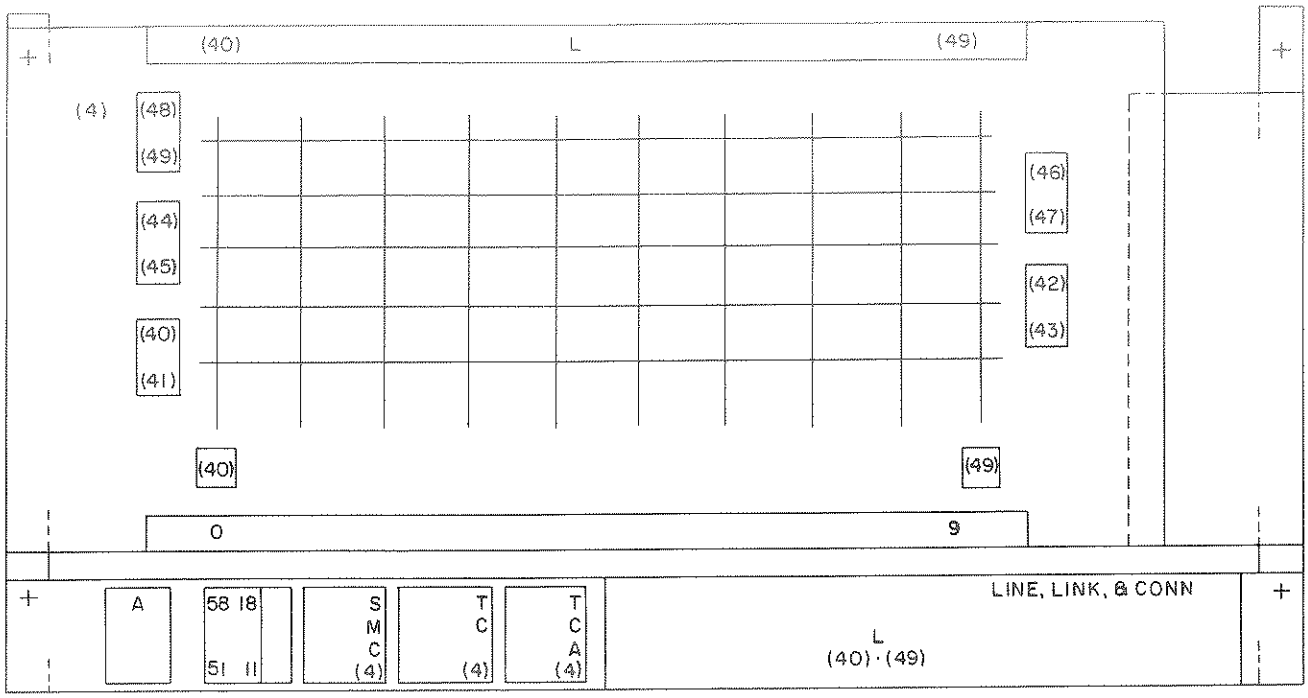


Fig. 4 - Line, Link, and Connector Unit Designation

7.06 A J53035BC, List 2 plug-in diode assembly must be ordered separately for each station line arranged for DSS. Plug assembly into appropriate jack on auxiliary relay unit.

7.07 Stamp number designations on relays K and SC and mounting plate of auxiliary relay units as shown in Fig. 5.

List 2 Cabinet Assembly

7.08 The list 2 cabinet assembly comes equipped and wired with the following:

- J53035CB, List 1 auxiliary register unit mounted in slide No. 2, mounting space 10.
- Two J53035BC, List 1 auxiliary relay units (four circuits per unit) equipped with eight J53035BC, List 2 plug-in diode assemblies mounted in slide No. 1 mounting spaces 15 through 12.
- Connecting blocks in crown for terminating 20 DSS stations.
- Local wiring for three additional auxiliary relay units.

7.09 Mount additional auxiliary relay units in slide No. 1 on mounting spaces 11 through 6 as required.

Note: If station line group 40-49 is provided, the auxiliary relay unit normally mounted on spaces 7 and 6 must be installed in an external cabinet. If

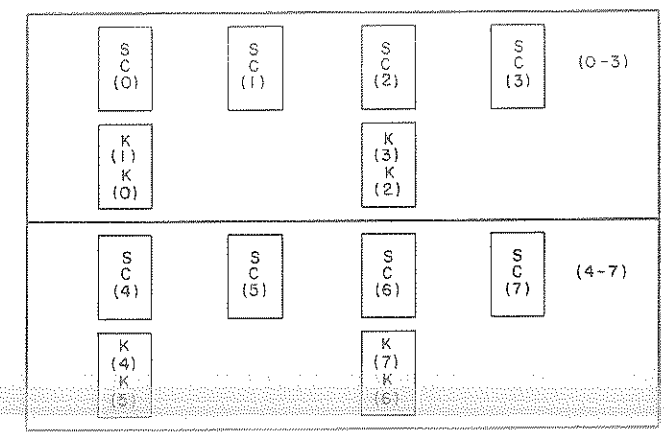


Fig. 5 - Auxiliary Relay Unit Designations

station line group 50-59 is provided, all auxiliary relay units must be externally mounted.

7.10 A J53035BC, List 2 plug-in diode assembly must be ordered separately for each additional station line arranged for DSS. Plug assembly into appropriate jack on auxiliary relay unit.

7.11 Stamp number designations on relays K and SC and right side of mounting plates in numerical order using units (0-3) and (4-7) as a guide.

Add-on Line Units

7.12 Two J53035CF, List 1 add-on line units are furnished and wired with list 1 and list 2 cabinet assemblies. Units are mounted in slide No. 2 on mounting spaces 6 and 5.

7.13 Four additional units may be mounted in slide No. 2 on mounting spaces 4 through 1 as required. Local wiring is provided to extend the necessary leads to the telephone sets via connecting blocks in crown of cabinet.

Note: Mounting spaces 4 through 1 can also be used for strip-mounted key telephone units (see 7.15). When add-on requirements exceed the available space within the cabinet, panel-mounted key telephone units coded 249A and 250A must be ordered and mounted in an external cabinet. Two 249A and one 250A key telephone units are the equivalent of a J53035CF, List 1 add-on line unit.

7.14 Stamp number designation on additional J53035CF, List 1 add-on line units in numerical order using units 0 and 1 as a guide.

Key Telephone Units

7.15 Four strip-mounted J53035CG, List 1 key telephone units (three line circuits per unit) may be mounted in slide No. 2 on mounting spaces 1 through 4. (See Fig. 5.) Local wiring is provided to extend necessary leads to telephone sets via connecting blocks in crown of cabinet.

Note: If mounting spaces 1 through 4 are occupied by add-on line units, standard panel-mounted 1A1 key telephone units must be ordered and installed in an external cabinet.

7.16 Stamp number designations on H relays and designation strips as shown in Fig. 6.

8.00 INSTALLATION OF AUXILIARY EQUIPMENT IN EXTERNAL CABINET

8.01 Due to space limitations within the cabinet provided with switching system No. 400, the following equipment may be mounted externally when necessary:

- Auxiliary relay units for DSS, strip-mounted on 4-inch by 23-inch mounting plates.
- Add-on line units, panel-mounted, 24-volt version of strip-mounted unit supplied with system.
- Key telephone units, standard panel-mounted units.
- Two-way tie trunk units.
- 3A code call.
- Telephone dictation trunk units.

8.02 Equipment cabinets for housing the units are covered in section entitled Equipment Cabinets and Apparatus Mountings, Identification.

9.00 TESTS

Table A lists the tests to be made before system is turned over to customer for use.

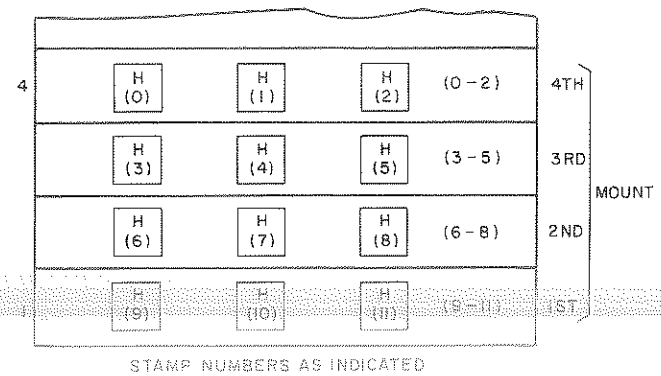


Fig. 6 - Key Telephone Unit Designations

TABLE A

INSTALLATION TESTS

Circuits	Section Number	Required Tests
Alarm	C71.861.10	All
Key Telephone Units and Add-On Units	C71.861.11	All
Line, Link, and Marker	C71.861.12	All
Dial Pulse Register	C71.861.14	C and F
Busy-Tone Trunk	C71.861.15	All

10.00 INSPECTIONS

10.01 The completed installation shall be in accordance with all job information and practices covering equipment installed.

10.02 Spare fuses, tools, lamps, and test leads for maintenance use should be stored in the equipment on the shelf provided in slide 2.

10.03 The SD drawings, CD sheets, and any connecting records prepared should be stored in the crown of the equipment cabinet.

SWITCHING SYSTEM NO. 400

ALARM CIRCUIT

OPERATION TESTS

1.00 GENERAL

1.01 This section covers the following tests:

A. Fuse Alarms Test: Checks that an operated fuse will light a trouble indicating lamp at the equipment and cause an alarm to be sent to the central office if this feature is provided.

B. Marker Release and Alarm Circuit Test: Checks the ability of the alarm circuit to operate when marker timing has failed to function in approximately 16 seconds.

1.02 If alarm-sending feature is provided, the central office should be notified before starting and completing the test so that alarms caused by performing the tests can be verified.

1.03 Number enclosed in parentheses, following the apparatus designation, designates the mounting plate location of the apparatus: ie, TR (16) lamp is located on mounting plate 16.

2.00 APPARATUS REQUIRED

Test A

W1AF test cord (8 feet 6 inches) equipped with two 360A tools.

1 - KS-6278 connecting clip.

1 - 411A tool (test pick, for use in connecting battery to alarm terminal of 70-type fuses).

Note: The W1AF test cord provides a protective resistance of 188 ohms. To apply test battery to alarm terminal of 70-type fuse (from front of equipment and without dismounting fuse cap), connect KS-6278 connecting clip to test battery, then carefully insert 411A tool alongside colored bead to a point where contact is made with alarm surface of fuse cap.

Test B

Dial hand set, 1011 type or equivalent.

Blocking and insulating tools, as required. See Section 069-020-801.

3.00 METHOD

STEP	ACTION	VERIFICATION
	A. Fuse Alarms Test	
1	In slide 1: Connect -48 volt battery to alarm terminal of A (16) fuse. See note under Test A, APPARATUS REQUIRED.	In slide 1: TR (16) lamp lighted. If alarm sending is provided, alarm is transmitted to central office.
2	Disconnect -48 volt battery from alarm terminal of A (16) fuse.	TR (16) lamp extinguished. If alarm sending is provided, alarm is retired at central office.
3	In slide 1: Connect +48 volt battery to alarm terminal of +48 volt (17) fuse. See note under Test A.	In slide 1: TR (16) lamp lighted. If alarm sending is provided, alarm is transmitted to central office.

STEP	ACTION	VERIFICATION
4	Disconnect +48 volt battery from alarm terminal of +48 volt (17) fuse.	
5	Depress and release AR (16) key.	TR (16) lamp extinguished. If alarm sending is provided, alarm is retired at central office.
6	In slide 1: Connect 10-volt ac potential to terminal 2T of FAC (16 rear) varistor.	In slide 1: TR (16) lamp lighted. If alarm sending is provided, alarm is transmitted to central office.
7	Disconnect 10-volt ac potential from terminal 2T of FAC (16 rear) varistor.	TR (16) lamp extinguished. If alarm sending is provided, alarm is retired at central office.

B. Marker Release and Alarm Circuit Test

1	Operate hand test set key to MON.	
2	In slide 2: Connect hand test set to test line.	
3	Block nonoperated HMK (19), TR (24), and BTT (14) relays.	
4	Operate hand test set key to TALK.	Dial tone heard. Within 7.5 to 16 seconds, dial tone is temporarily removed. TR (16) lamp in slide 1 lights. If alarm sending is provided, alarm is transmitted to central office.
5	Operate hand test set key to MON.	Dial tone removed.
6	Remove blocking tools from HMK (19), TR (24), and BTT (14) relays.	
7	In slide 1: Operate AR (16) key momentarily.	TR (16) lamp extinguished. If alarm sending is provided, alarm is retired in central office.

SWITCHING SYSTEM NO. 400

KEY TELEPHONE LINE AND ADD-ON CIRCUIT

OPERATION TESTS

1.00 GENERAL

1.01 This section covers the following tests:

A. Central Office Line Test, Using Key Telephone Unit Not Associated with Add-On Circuit: Checks that the key telephone equipment is selected by the key telephone set and holds properly.

B. Station Line Test, Using Key Telephone Unit Not Associated with Add-On Circuit: Checks that the key telephone equipment is selected by the key telephone set and holds properly.

C. Add-On Circuit Test, Outgoing Call by Station: Checks the following features: (a) seizure of attendant station line, (b) holding of station line, (c) seizure of central office line, and (d) transfer of station line to central office line.

D. Add-On Circuit Tests, Incoming Call to Station: Checks the following features: (a) seizure of attendant central office line, (b) holding of central office line, (c) seizure of station line, (d) transfer of central office line to station line, and (e) disconnect control by called station.

1.02 Tests C and D require action and verification at an attendant station (a key telephone set where a central office line, associated station line, hold key, and transfer key appear) and a nearby station.

1.04 Test D requires action and verifications at a location where an incoming central office call can be placed.

2.00 METHOD

STEP	ACTION	VERIFICATION
	A. Central Office Line Test, Using Key Telephone Unit Not Associated with Add-On Circuit	
1	At key telephone set: Depress CO line pickup key.	
2	Remove handset from switchhook.	CO dial tone heard. CO line lamp lights steadily.
3	If testing CO line in nonhunting group, dial number of CO line under test.	Busy tone heard.
	OR	
	If testing CO line in hunting group, dial CO test line.	Test line seized.
4	Depress and release HOLD key.	CO line lamp starts winking. Handset goes dead.
5	Hang up handset.	
6	Depress CO line pickup key.	

STEP	ACTION	VERIFICATION
7	Remove handset from switchhook.	Busy tone or test line heard. CO line lamp lights steadily.
8	Hang up handset.	CO line lamp extinguished.

B. Station Line Test, Using Key Telephone Unit Not Associated with Add-On Circuit

1	At key telephone set: Depress station line pickup key.	
2	Remove handset from switchhook.	Dial tone heard. Station lamp lights steadily.
3	Dial number of station line under test.	Busy tone heard.
4	Depress and release HOLD key.	Station lamp starts winking. Handset goes dead.
5	Hang up handset.	
6	Depress station line pickup key.	
7	Remove handset from switchhook.	Busy tone heard.
8	Hang up handset.	Station lamp extinguished.

C. Add-On Circuit Test, Outgoing Call by Station

1	At nearby station: Place call to attendant station.	At attendant station: Audible signal heard. Station lamp flashes.
2	At attendant station: Depress station line pickup key, remove handset from switchhook.	At attendant station: Station lamp lights steadily. Audible signal silenced. Talking connection established.
3	At attendant station: Depress and release HOLD key.	Station lamp starts winking.
4	At attendant station: Depress associated CO line pickup key.	CO dial tone heard. CO line lamp lights steadily.
5	If CO line is in nonhunting group, dial number of CO line under test. OR If CO line is in hunting group, dial CO test line.	Busy tone heard. Test line seized.
6	Depress TRANSFER key.	Trunk lamp remains lighted.
7	Release TRANSFER key.	Station lamp lights steadily. At attendant station and nearby station: Busy tone or test line heard.

STEP	ACTION	VERIFICATION
8	At attendant station: Hang up handset.	CO line, station lamps remain lighted. At nearby station: Busy tone or test line heard.
9	At nearby station: Hang up handset.	At attendant station: CO line, station line lamps extinguished.

D. Add-On Circuit Test, Incoming Call to Station

1	At attendant station: Obtain incoming call over CO line.	When incoming call is received, audible signal heard. CO line lamp flashes.
2	Depress CO line pickup key, remove handset from switchhook.	CO line lamp lights steadily. Talking connection established.
3	Request CO call to remain connected.	
4	Depress and release HOLD key.	CO line lamp starts winking.
5	Depress station line pickup key.	Dial tone heard. Station lamp lights steadily.
6	Dial number of nearby station.	At nearby station: Audible signal heard.
7	At attendant station: When audible tone is heard, depress and release TRANSFER key, hang up handset.	At attendant station: Station line lamp flashes.
8	At nearby station: Remove handset from switchhook.	Talking connection established with CO line. At attendant station: Station line lamp lights steadily. CO line lamp lights steadily.
9	At nearby station: Request central office call to disconnect after interval of 30 seconds, then hang up handset.	At attendant station: When nearby station hangs up, CO line, station lamps extinguished.

SWITCHING SYSTEM NO. 400

LINE, LINK, AND MARKER CIRCUITS

OPERATION TESTS

1.00 GENERAL

1.01 This section covers the following tests:

A. Register Allotter Test: Checks function of marker RA0 and RA1 relays in allotting calls to registers and that alternate register will be seized if preferred register is in trouble.

B. Ability to Seize All Junctors Test: Checks that all junctors can be seized, and checks marker action when all junctors are busy.

C. Ability to Seize All Links Test

D. All Links Busy and Link Shifting Feature Test

E. Units Sequence Test

F. Second Trial and No-Connection Features Test

G. Trouble Release Feature Test

H. Time-Out Check Feature Test

1.02 Test B requires verifications from a nearby station to answer necessary test calls.

1.03 During part of Test B, all junctors are made busy.

1.04 Number enclosed in parentheses, following the apparatus designation, designates the mounting plate location of the apparatus; ie, ON (8) relay is located on mounting plate 8.

2.00 APPARATUS REQUIRED

Tests A Through H

Dial hand set, 1011 type or equivalent.

Test A

1 - 258C plug (dummy for use in making equipment busy).

Tests B, C, D, and G

Blocking and insulating tools as required. See Section 069-020-801.

3.00 METHOD

STEP	ACTION	VERIFICATION
	A. Register Allotter Test	
1	Operate hand test set key to MON.	
2	In slide 2: Connect hand test set to test line.	
3	Operate hand test set key to TALK.	In slide 2: Off-normal relay operates in register seized. Dial tone heard. Note: Off-normal relay Register 0, ON (8) Register 1, ON (12)

STEP	ACTION	VERIFICATION
4	Operate hand test set key to MON.	ON relay releases in register seized. Dial tone removed.
5	Operate hand test set key to TALK.	ON relay operates in alternate register. Dial tone heard.
6	Operate hand test set key to MON.	ON relay releases in alternate register. Dial tone removed.
7	Repeat Steps 5, 6, as required, to observe marker's alternate seizure of register 0, 1.	
8	When register 0 is idle, ON (8) relay normal, insert dummy plug into TST (9) jack.	In register 0: RT (9) lamp lights.
9	Block SR (8) relay nonoperated.	
10	Operate hand test set key to TALK.	In register 1: ON (12) relay operates. Dial tone heard.
11	In register 0: Remove dummy plug from TST (9) jack.	In register 0: RT (9) lamp extinguished.
12	Operate hand test set key to MON.	In register 1: ON (12) relay releases. Dial tone removed.
13	Operate hand test set key to TALK.	Marker attempts to seize register 0, finally seizes register 1, ON (12) relay operates. Dial tone heard.
14	Operate hand test set key to MON.	ON (12) relay releases. Dial tone removed.
15	In register 0: Remove blocking tool from SR (8) relay.	
16	When register 1 is idle, ON (12) relay normal, insert dummy plug into TST (13) jack.	In register 1: RT (13) lamp lights.
17	Block SR (12) relay nonoperated.	
18	Operate hand test set key to TALK.	In register 0: ON (8) relay operates. Dial tone heard.
19	In register 1: Remove dummy plug from TST (13) jack.	In register 1: RT (13) lamp extinguished.
20	Operate hand test set key to MON.	In register 0: ON (8) relay releases. Dial tone removed.

STEP	ACTION	VERIFICATION
21	Operate hand test set key to TALK.	Marker attempts to seize register 1, finally seizes register 0, and ON(8) relay operates. Dial tone heard.
22	Operate hand test set key to MON.	ON(8) relay releases. Dial tone removed.
23	In register 1: Remove blocking tool from SR(12) relay.	
24	Disconnect hand test set.	

B. Ability to Seize All Junctors Test

1	Operate hand test set key to MON.	
2	In slide 2: Connect hand test set to test line.	
3	Close slide 2, open slide 3.	
4	Operate hand test set key to TALK.	Dial tone heard.
5	Dial number of nearby station, note which junctor is seized.	Audible ringing heard. When nearby station answers, conversation satisfactory.
	Note: To determine junctor seized, trace link used in connecting vertical of test line to originating vertical of juncture (see Table A).	
6	Request called station to disconnect, operate hand test set key to MON.	Connection released.
7	Block D relay operated of junctor seized in Step 5.	
8	Repeat Steps 4 through 7 until all junctors (0-5) are tested and made busy.	
9	Operate hand test set key to TALK.	Dial tone heard.
10	Dial number of nearby station.	Busy tone heard.
11	Operate hand test set key to MON.	
12	Remove blocking tools from all junctor D relays.	
13	In slide 2: Disconnect hand test set from test line.	

STEP ACTION VERIFICATION

TABLE A

JUNCTOR AND TEST LINE LOCATIONS
IN SLIDE 3

Junctor		Switch No.	Vert No.	Hold Magnet Desig	D Relay Mtg Plt
0	Orig Term.	0	0 1	HM00 HM01	1
1	Orig Term.		2 3	HM02 HM03	
2	Orig Term.		4 5	HM04 HM05	2
3	Orig Term.		6 7	HM06 HM07	
4	Orig Term.	1	1 2	HM11 HM12	8
5	Orig Term.		3 4	HM13 HM14	
Test Line		3	9	HM39	

C. Ability to Seize All Links Test

1	Operate hand test set key to MON.	
2	In slide 2: Connect hand test set to test line.	
3	Block WL, ZL, WIL, ZIL(14) relays operated in marker.	
4	Block WLG, ZLG(14) relays nonoperated in marker.	
5	Operate hand test set key to TALK.	Dial tone heard. LT-(15) relays in marker operate.
6	Block lowest numbered LT- relay nonoperated that operated in Step 5.	
7	Operate hand test set key to MON.	Dial tone removed.
8	Repeat Steps 5 through 7 until all LT- relays have been blocked nonoperated.	
9	Remove blocking tools from all LT- relays.	

STEP	ACTION	VERIFICATION
10	Remove blocking tools from WLG, ZLG relays.	
11	Block WLG, ZLG relays operated.	
12	Repeat Steps 5 through 7 until all LT-relays are again blocked nonoperated.	
13	Remove blocking tools from WLG, ZLG, WL, ZL, WIL, ZIL, LT-relays.	
14	Operate hand test set key from MON to TALK several times.	Each time hand test set key is operated, WL, ZL, WIL, ZIL, WLG, ZLG relays operate, release.
15	Disconnect hand test set from test line.	

D. All Links Busy and Link Shifting Feature Test

1	Operate hand test set key to MON.	
2	In slide 2: Connect hand test set to test line.	
3	Block LTC (15) relay nonoperated.	
4	Operate hand test set key to TALK.	TRL (14) relay pulses.
5	Remove blocking tool from LTC (15) relay.	Dial tone heard.
6	Operate hand test set key to MON.	Dial tone removed.
7	Disconnect hand test set from testline.	

E. Units Sequence Test

1	Operate hand test set key to MON.	
2	In slide 2: Connect hand test set to test line.	
3	Perform Steps 4 through 7 as conditions apply: If WU (19), ZU (19) relays are released	
4	Operate hand test set key to TALK.	WU (19), ZU (19) relays operate.
5	Operate hand test set key to MON.	WU (19), ZU (19) relays remain operated.
6	Operate hand test set key to TALK.	WU (19), ZU (19) relays released.
7	Operate hand test set key to MON.	WU (19), ZU (19) relays remain released.

OR

STEP	ACTION	VERIFICATION
	If WU (19), ZU (19) relays are operated	
4	Operate hand test set key to TALK.	WU (19), ZU (19) relays released.
5	Operate hand test set key to MON.	WU (19), ZU (19) relays remain released.
6	Operate hand test set key to TALK.	WU (19), ZU (19) relays operate.
7	Operate hand test set key to MON.	WU (19), ZU (19) relays remain operated.
8	Disconnect hand test set from test line.	

F. Second Trial and No-Connection Features Test

1	In slide 1 or 3: Select unassigned station line, open associated S1 to G strap. OR If all stations are assigned, open strap between S to S1 terminal on selected station.	
2	Operate hand test set key to MON.	
3	In slide 2: Connect hand test set to test line.	
4	Operate hand test set to TALK.	Dial tone heard.
5	Dial station number selected in Step 1.	Busy tone heard.
6	Operate hand test set key to MON.	Connection released.
7	Replace strap opened in Step 1.	
8	Disconnect hand test set from test line.	

G. Trouble Release Feature Test

1	In slide 3: Block RA (8) relay of busy-tone trunk nonoperated.	
2	Operate hand test set key to MON.	
3	In slide 2: Connect hand test set to test line.	
4	Operate hand test set key to TALK.	Dial tone heard.
5	Dial 39.	In slide 2: RLS (22), RLSA (22) relays operate, after which dial tone is heard.

STEP	ACTION	VERIFICATION
6	Operate hand test set key to MON.	Connection released.
7	Disconnect hand test set from test line.	
8	In slide 3: Remove blocking tool from RA (8) relay of busy-tone trunk.	

H. Time-Out Check Feature Test

1	Operate hand test set key to MON.	
2	In slide 2: Connect hand test set to test line.	
3	Operate hand test set key to TALK.	Dial tone heard.
4	Dial 39.	Busy tone heard. In slide 3: ST (21), NC (21), TR (21) relays operin this order only once, release upon release of MTA (21), MTB (21).
5	Operate hand test set key to MON.	Busy-tone connection released.
6	In slide 2: Disconnect hand test set from test line.	

SWITCHING SYSTEM NO. 400

JUNCTOR CIRCUITS

OPERATION TESTS

1.00 GENERAL

1.01 This test requires that actions and verifications be performed at the equipment and at a dial station.

1.02 This section covers the following tests:

- Junctor seizure.
- Ringing to called station.
- Audible ringing tone to calling station.
- Reverse battery supervision (click), and cut through when called station answers.
- Talking battery supply.
- Busy indication to marker until both stations disconnect.

1.03 Directing a call to a specific junctor requires that all junctors other than the one selected for test be made busy. This will result in the inability of the system to establish a junctor-type call during the time required to perform Steps 3 through 6.

1.04 Table A provides switch and relay mounting plate locations required for testing a junctor.

TABLE A

JUNCTOR LOCATIONS IN SLIDE 3

Junctor		Switch No.	Vert No.	Hold Magnet Desig	Relay Mtg Plt
0	Orig Term.	0	0 1	HM00 HM01	1
1	Orig Term.		2 3	HM02 HM03	
2	Orig Term.		4 5	HM04 HM05	2
3	Orig Term.		6 7	HM06 HM07	
4	Orig Term.	1	1 2	HM11 HM12	8
5	Orig Term.		3 4	HM13 HM14	

2.00 APPARATUS REQUIRED

Dial hand set, 1011 type or equivalent.

Blocking and insulating tools, as required. See Section 069-020-801.

3.00 METHOD

STEP	ACTION	VERIFICATION
1	Operate hand test set key to MON.	
2	In slide 2: Connect hand test set to test line. Note: Perform Steps 3 through 6 as quickly as possible (see 1.03).	
3	In slide 3: Make all idle junctors busy except junctor required for test by blocking associated D relays operated.	In slide 3: Terminating hold magnets of all busy junctors operated.

STEP	ACTION	VERIFICATION
3 (Cont)	Note: Check that no select magnet is operated on switch, where junctor appears, before operating D relay.	
4	Operate hand test set key to TALK.	Dial tone heard.
5	Dial station.	Dial tone removed. Audible ringing tone heard. When called station answers, audible ringing removed. Battery reversal click heard in hand test set. Conversation satisfactory. D, TP relays operated in junctor under test.
6	Remove blocking tools from relays blocked operated in Step 3.	
7	Request called station to disconnect for 30 seconds, then return to line.	D relay releases in junctor under test. When called station returns to line, D relay reoperates. Battery reversal click heard in hand test set. Conversation with station normal.
8	Block B relay operated of junctor under test.	
9	Operate hand test set key to MON for 30 seconds, then return to line.	A relay releases in junctor under test. When hand test set returns to line, A relay reoperates. Battery reversal click heard. At station: Conversation with test line normal.
10	Remove blocking tool from B relay of junctor under test.	
11	Request called station to hang up.	When called station hangs up, D relay released in junctor under test.
12	Operate hand test set key to MON.	A, B, TP relays release in junctor under test.
13	Operate hand test set key to TALK.	Dial tone heard.
14	Operate hand test set key to MON.	
15	In slide 2: Disconnect hand test set from test line.	

SWITCHING SYSTEM NO. 400

DIAL PULSE REGISTER CIRCUITS

OPERATION TESTS

1.00 GENERAL

1.01 This section covers the following tests:

A. Make Busy Test: Checks that when a register is made busy, a visual signal is lighted.

B. Pulse Counting Test

C. Time-Out Test: Checks register permanent signal and partial dial time-out.

D. Unequipped Tens Digits 4 and 5 (20-line system) Test: Checks a 20-line system to ascertain that a call to the unequipped 40 and 50 group of stations will receive busy tone.

E. Unassigned Tens Digit 6, 7, 8, 9, or 0 Test: Checks that when universal line circuits are unassigned, any call to code 6, 7, 8, 9, or 0 will receive busy tone.

F. Register Return of Busy Tone Test: Checks that the register will return busy tone if the busy-tone trunk is busy.

1.02 Tests C through F are made with register not under test made busy. Register to be tested is seized in competition with regular service calls by means of test line. During the time register under test is attached to test line, the system will be unable to complete a call.

1.03 During a part of Test F, the system will be unable to complete calls to busy-tone trunk.

1.04 Register 0 is located in slide 2 on mounting plates 7, 8, 9, and part of 10.

1.05 Register 1 is located in slide 2 on mounting plates 11, 12, 13, and part of 10.

2.00 APPARATUS REQUIRED

Test B

Dial hand set, 1011 type or equivalent, equipped with a 2W38A cord assembly consisting of W2CK cord, 471A jack, and 310 plug.

Tests B and F

Blocking and insulating tools, as required. See Section 069-020-801.

Tests A and C through F

258C plug (dummy).

Tests C through F

Dial hand set, 1011 type or equivalent.

3.00 METHOD

STEP	ACTION	VERIFICATION
	A. Make Busy Test	
1	In slide 2: When register to be tested is idle (ON relay normal), insert dummy plug into TST jack.	In slide 2: In register under test, RT lamp lights.
2	Remove dummy plug from TST jack.	RT lamp extinguished.

STEP	ACTION	VERIFICATION
	B. Pulse Counting Test	
1	Operate dial hand test set key to MON.	
2	In slide 2: When register to be tested is idle (ON relay normal), insert plug of hand test set into TST jack.	In slide 2: In register under test, RT lamp lights.
3	Block RA relay operated.	
4	Block PU relay nonoperated.	
5	Operate hand test set key to TALK.	Dial tone heard.
6	Dial digit to be counted per Table A.	Dial tone removed on any digit except 1. P relays operate per Table A.
7	Operate hand test set key to MON.	P relays release.
8	Repeat Steps 5 through 7 for other digits to be counted.	Same as Steps 5 through 7.
9	Remove blocking tools from RA, PU relays.	
10	Remove hand test set plug from TST jack.	RT lamp extinguished.

TABLE A

P RELAYS ASSOCIATED
WITH UNIT DIGIT DIALED

Digit Dialed	P Relays Operated
1	P1, P2
2	P3, P2A
3	P1, P2, P3, P4, P2A
4	P3, P4, P2A
5	P1, P2, P4, P2A
6	P4, P5, P2A
7	P1, P2, P4, P5, P2A
8	P3, P4, P5, P2A
9	P1, P2, P3, P5, P2A
0	P3, P5, P2A

	C. Time-Out Test	
1	Operate dial hand test set key to MON.	
2	In slide 2: Connect hand test set to test line.	

STEP	ACTION	VERIFICATION
3	When register not under test is idle (ON relay normal), insert dummy plug into TST jack.	In slide 2: In register not under test, RT lamp lights.
4	Operate hand test set key to TALK.	When register under test is seized, dial tone is heard. After an interval of 8 to 16 seconds, register times out, releases. Dial tone removed. When register is reseized, dial tone is heard.
5	Operate hand test set key to MON.	Dial tone removed.
6	Operate hand test set key to TALK.	Dial tone heard.
7	Dial digit 3.	Dial tone removed. After an interval of 8 to 16 seconds, register times out, releases. When register is reseized, dial tone is heard.
8	Operate hand test set key to MON.	Dial tone removed.
9	Removed dummy plug from TST jack in register not under test.	In register not under test, RT lamp extinguished.
10	Disconnect hand test set from test line.	

D. Unequipped Tens Digits 4 and 5 (20-line system) Test

1	Operate dial hand test set key to MON.	
2	In slide 2: Connect hand test set to test line.	
3	When register not under test is idle (ON relay normal), insert dummy plug into TST jack.	In slide 2: In register not under test, RT lamp lights.
4	Operate hand test set key to TALK.	When register under test is seized, dial tone is heard.
5	Dial digit 4.	Busy tone heard.
6	Operate hand test set key to MON.	Busy tone removed.
7	Operate hand test set key to TALK.	Dial tone heard.
8	Dial digit 5.	Busy tone heard.
9	Operate hand test set key to MON.	Busy tone removed.
10	Remove dummy plug from TST jack in register not under test.	In register not under test, RT lamp extinguished.
11	Disconnect hand test set from test line.	

STEP	ACTION	VERIFICATION
	E. Unassigned Tens Digit 6, 7, 8, 9, or 0 Test	
1	Operate dial hand test set key to MON.	
2	In slide 2: Connect hand test set to test line.	
3	When register not under test is idle (ON relay normal), insert dummy plug into TST jack.	In slide 2: In register not under test, RT lamp lights.
4	Operate hand test set key to TALK.	When register under test is seized, dial tone is heard.
5	Dial lowest unassigned tens digit 6, 7, 8, 9, or 0.	Busy tone heard.
6	Operate hand test set key to MON.	Busy tone removed.
7	Repeat Steps 4 through 6 for each unassigned digit to be tested.	Same as Steps 4, 5, 6.
8	Remove dummy plug from TST jack in register not under test.	In register not under test, RT lamp extinguished.
9	Disconnect hand test set from test line.	
	F. Register Return of Busy Tone Test	
1	In slide 3, mounting plate 9: Make busy-tone trunk busy by blocking RA relay operated in busy-tone trunk.	
2	Operate dial hand test set key to MON.	
3	In slide 2: Connect hand test set to test line.	
4	When register not under test is idle (ON relay normal), insert dummy plug into TST jack.	In slide 2: In register not under test, RT lamp lights.
5	Operate hand test set key to TALK.	When register under test is seized, dial tone is heard.
6	Dial 39.	Busy tone heard. In register under test, BY relay operated.
7	Operate hand test set key to MON.	Busy tone removed. In register under test, BY relay released.
8	Remove dummy plug from TST jack.	In register not under test, RT lamp extinguished.
9	Disconnect hand test set from test line.	
10	In slide 3, mounting plate 9: Remove blocking tool from RA relay in busy-tone trunk.	

SWITCHING SYSTEM NO. 400

BUSY-TONE TRUNK

OPERATION TESTS

1.00 GENERAL

1.01 This section covers the following tests:

- Seizure of busy-tone trunk.
- Extension of holding ground to originating hold magnet.
- Holding feature of trunk if dialing is continued after seizure.

2.00 APPARATUS REQUIRED

Dial hand set, 1011 type or equivalent.

Blocking and insulating tools as required. See Section 069-020-801.

3.00 METHOD

STEP	ACTION	VERIFICATION
1	Operate hand test set key to MON.	
2	In slide 2: Connect hand test set to test line.	
3	Operate hand test set key to TALK.	Dial tone heard.
4	Dial 39.	Busy tone heard. In slide 3: RA relay (mounting plate 9) operated.
5	Block RA relay operated.	
6	Operate hand test set key to MON.	Busy tone still heard.
7	Operate hand test set key to TALK.	Busy tone still heard.
8	Remove blocking tool from RA relay.	
9	Dial digit 0.	A relay (mounting plate 9) follows dial pulses. RA relay remains operated. Busy tone still heard.
10	Operate hand test set key to MON.	A, RA relays released. Busy tone not heard.
11	In slide 2: Disconnect hand test set from test line.	

SWITCHING SYSTEM NO. 400

CALL PROGRESS INDICATOR SET

OPERATING METHODS

1.00 GENERAL

1.01 This section describes a method for utilizing the call progress indicator set in the switching system No. 400 which consists of two parts:

- A portable box equipped with indicating lamps and a plug-ended cable.
- Mating connectors in the switching system No. 400 with wiring from make contacts of relays in the marker and the connector portions of the register and line, link, and connector circuits.

2.00 OPERATING METHOD

2.01 Connect the plug-ended cable from the call progress indicating unit to the correspondingly numbered jacks in the equipment located at the top of slide 2.

2.02 A lamp on the indicating unit will light when a correspondingly designated relay in the system operates.

Note: Due to speed of relay operation and release, the HMK lamp operation cannot normally be detected unless a release failure of the relay is encountered.

2.03 The indicating lamps will shown the progress of each service or test call handled by the system.

2.04 The grouping arrangement of the lamps, which relate to a particular connecting circuit function, are shown in Fig. 1.

2.05 Red, green, and white lamp caps are provided on the unit lamp panel to make lamps within a group more readily distinguishable from one another. In some instances, a green lamp will indicate the start of a particular marker function (LSA - link start) and a red lamp the end of a function (LE - link end).

2.06 The indicating lamps are to be regarded as a maintenance aid but will not substitute for a thorough knowledge of the method of operation of the circuits which the lamps monitor.

2.07 A list of the lamps and their functional meaning are shown in Table A.

2.08 For additional information, refer to CD-and SD-69472-01.

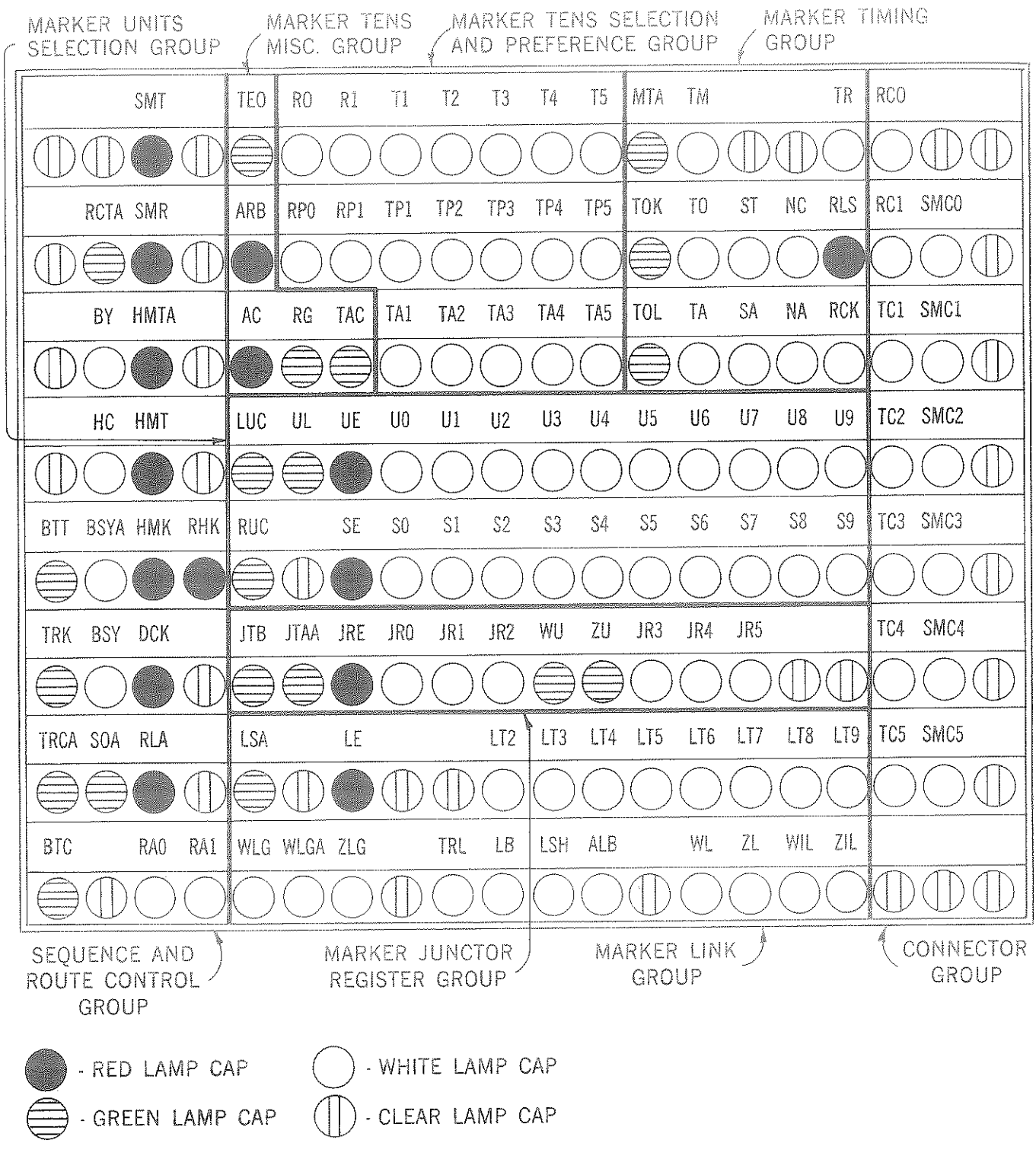


Fig. 1 - Call Progress Lamps, Front View

TABLE A

CALL PROGRESS LAMPS

LAMP DESIGNATION	FUNCTIONAL MEANING
MARKER TENS SELECTION AND PREFERENCE GROUP	
R (0, 1)	Register
RP (0, 1)	Register preference
T (1-5)	Line tens
TA (1-5)	Line tens auxiliary
TP (1-5)	Tens preference
MARKER TENS MISCELLANEOUS GROUP	
AC	Abandoned call
ARB	All registers busy
RG	Register group
TAC	Tens auxiliary connector
TEO	Tens end
MARKER UNITS SELECTION GROUP	
LUC	Line units connector
RUC	Register units connector
S (0-9)	Sleeve
SE	Sleeve end
U (0-9)	Units
UE	Units end
UL	Units lock
MARKER JUNCTOR REGISTER GROUP	
JR (0-5)	Junctor register
JRE	Junctor register end
JTAA, JTB	Junctor terminating
WU, ZU	Units sequence W-Z
MARKER LINK GROUP	
ALB	All link busy
LB	Link busy
LE	Link end
LSA	Link start auxiliary
LSH	Link shift
LT (2-9)	Link test
TRL	Transfer links
WIL, WL, ZIL, ZL	Link sequence W-2
WLG, ZLG	Units sequence W-Z
KLGA	W auxiliary
MARKER TIMING GROUP	
MTA	Marker timing
NA	No connection auxiliary
NC	No connection
RCK	Release check
RLS	Trouble release
SA	Second trial auxiliary
ST	Second trial
TA	Time-out auxiliary
TM	Timing
TO	Time-out
TOK	Time-out check
TOL	Time-out lock
TR	Trouble relay
MARKER SEQUENCE AND ROUTE CONTROL GROUP	
BSY, BSYA	Circuits busy
BTC	Busy tone trunk connector
BTT	Busy tone
BY	Busy test
DCK	Down check
HC	Hunt connector
HMK	Hold magnet check
HMT, HMTA	Hold magnet timing
RA (0, 1)	Register allotter
RCTA	Register cut-through auxiliary
RHK	Register hold magnet check
RLA	Release auxiliary
SMR	Select magnet register
SMT	Select magnet timing
SOA	Sleeve operate auxiliary
TRCA	Terminating route complete auxiliary
TRK	Terminating route check
CONNECTOR GROUP	
RC (0, 1)	Register connector
SMC (0-5)	Selector magnet connector
TC (1-5)	Tens connector