

21A COMMUNICATION SYSTEM

("COM KEY*" 2152)

DESCRIPTIVE AND ORDERING INFORMATION

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1. GENERAL

1.01 This section provides information for the 21A Communication System. Installation, connections, and maintenance are covered in Section 518-450-111.

1.02 This section is reissued to:

- Add information on 853AM and 2853AM telephone sets
- Add information on automatic and manual do-not-disturb (DND) feature
- Add information on 111A1 connecting unit
- Add information on 127A bracket
- Incorporate information from addendum

- Rate 101A1 connecting unit manufacture discontinued (MD).

Revision arrows are used to emphasize the more extensive changes.

1.03 The Bell System Practices listed below provide additional information on key telephone units (KTUs), related communication systems, and other pertinent subjects.

SECTION	TITLE
518-215-400	Line Service KTUs
518-215-401	Auxiliary Service KTUs
518-215-402	Intercom Service KTUs
518-215-403	Control Service KTUs
518-450-100	7A Communication System
518-450-102	14A Communication System
503-701-110	832- and 2832-Type Telephone Sets
503-702-110	833- and 2833-Type Telephone Sets
503-603-130	853AM and 2853AM Telephone Sets
518-010-105	KTS Grounding and Special Protection Requirements
463-341-102	33-Type Interface Arrangements for Music-On-Hold and Paging Amplifiers
981-251-100	Loudspeaker Paging Systems—General Description
1.04	This issue of the section is based on the following drawings:
	SD-69656-01, Issue 2—6B1 and 6C1 Consoles
	SD-69657-01, Issue 2—7B1 and 7C1 Consoles
	SD-69930-01, Issue 2—21A Communication System Equipped With 100A1 and 100B1 Connecting Units

SD-69941-01, Issue 1—21A Communication System Equipped With 101A1 (MD), 101A2, and 101B1 Connecting Units

SD-69932-01, Issue 2—128A3-, 128A4-, and 138A4-Type Console

SD-69934-01, Issue 1—128A6- and 138A6-Type Console

SD-69915-01, Issue 1—20A Apparatus Unit

SD-69924-01, Issue 1—22A Apparatus Unit

SD-69921-01, Issue 2—Audio Features, 451-Type and 498A KTUs

SD-69942-01, Issue 1—400H KTU.

1.05 After January 1, 1980, connection of customer-provided equipment (CPE) or telephone company-provided equipment to the 21A Communication System requires the use of a 33B voice coupler when providing music-on-hold. Also after January 1, 1980, the 415B, 454C, 460C, 471C, 479C, and 481B KTUs must be used when providing their related services. Previously connected or Class C voice couplers and KTUs may be used for additions and maintenance at grandfathered installations for the life of the equipment, provided they are not modified. Class C stock may also be used in new installations after January 1, 1980.

1.06 Incoming central office (CO) lines to be installed in compliance with the Federal Communications Commission (FCC) Registration Program must be routed through a standard network interface. Information on approved interfaces is contained in Sections 463-400-100 through 463-400-150.

2. SYSTEM FEATURES

2.01 The 21A Communication System (Fig. 1) is a modular Key Telephone System (KTS) which offers a wide choice of features and options in an arrangement which is flexible and expandable. Its basic purpose is to provide a system in which telephone stations in a customer location can originate and answer calls on CO/PBX lines and communicate among themselves; all other features support and augment these functions. The maximum size of COM KEY 2152 is 21 CO/PBX lines and 52 stations.

2.02 The system is designed to permit selection of mounting arrangements, power supply, and terminations for a variety of system sizes—depending on the number of lines and/or number of stations. Three basic units of hardware have been developed for COM KEY 2152 which permit this system flexibility:

- Feature panels—for mounting the required and optional KTUs
- Power panels—required in singular or combination depending on the number of lines and stations and the number of 10- and 20-button telephone sets
- Connecting units—provide the system terminations and optional wiring; selected by the size of the system and type of telephone sets.

2.03 The telephone sets used with COM KEY 2152 are the same as those developed for earlier COM KEY systems. Unlike the earlier systems, the 832- and 833-type or intercom-only sets can be intermixed in a COM KEY 2152 System to satisfy the customer needs. When expansion requires stations to be added, this can be accomplished by the addition of the required connecting unit to provide the necessary terminations. The original connecting unit need not be replaced. In some cases, additional terminations can be added to the 100B1 connecting unit to change the 10- or 20-button telephone set mix.

2.04 The COM KEY 2152 also provides flexibility in both the line and feature appearances at a given station. If desired, up to 14 lines can be square, ie, appear at all stations; or two of the button appearances, called multipurpose buttons, can be used to provide any of the following:

- Square line pickup
- Personal line pickup
- Automatic signaling intercom pickup
- Third intercom link pickup
- Automatic private line.

A personal or “nonsquare” line is a CO/PBX line which serves only a limited number of stations,

perhaps as few as one or two, and can be picked up only at those stations (and by the attendant). With personal lines, the caller has direct access to a line which is less likely to be busy than a square one. On outgoing calls, the station user does not have to compete with as many other users as he would on a square line. As far as operating methods and characteristics are concerned, square and personal lines are standard CO/PBX lines in all respects. If the attendant is not to pick up a personal line, the corresponding button must be blocked. In addition, if the line is not to ring at the attendant, the common audible diode must be removed.

In COM KEY 2152, lines 1 through 5 are square on **all** stations (10- or 20-button); lines 1 through 12 are square on 20-button telephone sets. All lines appear at attendant sets.

2.05 In COM KEY 2152, the attendant station (code 0) is factory-wired to receive tone ringing on all CO/PBX lines, square and personal (common audible feature). Other stations, instead of or in addition to the attendant, can be arranged to have common audible. The maximum number of station codes that can be signaled at one time is 10. The procedure for answering calls can vary between installations, depending on customer needs. Individual stations can be optionally wired for CO/PBX ringing (flexible station ringing feature) on a maximum of two lines in addition to the attendant. If two lines are to ring at a station other than the attendant, neither of the two lines can ring **alone** at another station, i.e. both lines must also ring at the second station. Additionally, if it is desired that one of the two lines not ring at the attendant station, the other line cannot ring at the attendant station either. Both common audible diodes would have to be removed.

2.06 In the case of a personal line, installer wiring options allow CO ringing to be connected to the served stations, in addition to the attendant positions or to the served station alone. A personal line is often used for a principal station and a secondary station (boss and secretary, eg), one of whom will usually answer incoming calls directly rather than receiving them through an attendant. However, an attendant can handle personal line calls that are not answered at the intended station within a reasonable time.

2.07 Three types of intercom are used with COM KEY 2152 and employ tone and voice signaling on the called station loudspeaker: (1) dial intercom among all stations on two or three paths; (2) optional automatic signaling intercom among selected stations; (3) at attendant positions, the DSS feature with a dedicated intercom path, if installed, can be used to signal stations without dialing. If the system is equipped with three intercom paths, all stations must be wired for the three paths.

2.08 Connection to the paging system from the stations is under control of the intercom circuit. Connections to the paging circuit from the attendant positions can be either through the common IC paths or the dedicated link, provided the attendant has DSS.

2.09 The hands-free answer on intercom (HFAI) feature allows any station so equipped to answer either a dial intercom or DSS call over a microphone circuit automatically turned on by the incoming call. This can be done without using the station handset and even while another call is in progress.

Note: The HFAI is not activated by the automatic signaling intercom circuit.

2.10 The DND feature permits a station user to block any incoming dial intercom or DSS call. This is accomplished by returning an audible (500 Hz) tone to the calling party whenever the automatic or manual DND feature is activated. A visual signal is also provided on the DSS console when the manual DND feature is in use so the attendant can see which station does not want to be disturbed. The DND feature does not block incoming CO/PBX line calls.

2.11 Depending on the size of the system and the features installed, the answering position(s) may use the same type of telephone set as the other stations (must have ring transfer) or may require one, two, or three of a new family of telephone and selector consoles developed for COM KEY 2152.

2.12 As factory-wired, the 21A Communication System furnishes common audible ringing at station code 0. All incoming lines will ring at that station unless otherwise arranged (see information on common audible and additional station ringing). The calls are answered by lifting the

handset (if using a telephone set) and depressing the flashing line pickup button. The method of forwarding the call may vary depending on the equipment at the attendant station, as follows:

- (a) With all arrangements, the answered call can be placed on hold using the HOLD key on the telephone set or console at which time the steady lamp will change to wink. The attendant then selects an idle intercom path, dials the desired station, and voice signals that there is a call on a particular CO/PBX line. If necessary to reenter the conversation, the pickup button must be depressed again.
- (b) If equipped with a DSS console, the attendant can voice signal the desired station by depressing the associated locking DSS button. When the DSS button is depressed, the CO/PBX line is automatically put on hold. Using the DSS does not require accessing an intercom path since the attendant uses the dedicated link which does not require the selector. If the intercom station is equipped with HFAI, 2-way conversation is possible. A call from a DSS console will preempt an automatic signaling intercom call, dial intercom call, or CO/PBX ringing. The attendant may then either go back to the held line by depressing the RE-ENT button on the DSS console or may pick up another CO/PBX line by depressing the associated button after depressing RST button to clear DSS console, leaving the held line to be picked up by the station.
- (c) At positions having an intercom/line conferencing console (128A3 or 138A4), incoming calls are answered using the line pickup buttons on the lower field. Calls can be forwarded in the usual manner by holding and using an intercom path or by DSS if so equipped. In addition, the intercom/line conferencing field can be used to connect a line that does not appear at a station, such as a nonsquare line, as follows:

- (1) Answer flashing line by depressing button; then place line on hold.
- (2) Select idle intercom path (lamp off) and signal desired station using dial intercom.

Note: DSS cannot be used here for conferencing.

- (3) When station answers, depress buttons in intercom/line conferencing field associated with held CO/PBX line and selected intercom link which will connect outside party with station.

- (4) Operate RLS button to remove attendant from conversation.

- (5) When the intercom station goes on-hook, the status lamp in the intercom/line conferencing field will light indicating the connection can be released by depressing the push-to-operate, push-to-release buttons. **Only one call at a time can be processed through the intercom/line conferencing field.**

2.13 The intercom/line conferencing field can also be used to set up a preset conference call. The procedure is the same as the previous steps except the attendant dials the preset conference code on the intercom. Once the conference stations are on the line, the CO/PBX line button in the intercom/line conferencing field is depressed. A third option permits the attendant to make a CO/PBX call for stations unable to do so, ie, an intercom-only station. To do this, the attendant first completes the CO/PBX call by depressing button in the lower field and dialing the desired number. The attendant then places that call on hold and calls the station on dial intercom using an idle path on the lower button field. The attendant then operates the intercom button, then the CO/PBX line button in the intercom/line conferencing field corresponding to the two parties. After operating the RLS button, the attendant is free to handle other calls.

Option Wiring

2.14 All option wiring has been assigned to blocks 1 and 2 of the 100-, 101-, and 111-type connecting units, except for some of the paging feature wiring and wiring for the 33-type voice coupler which appear on block 4 of the 100A1 and 101A1/101A2 connecting units. Blocks 1 and 2 are color-keyed, with the colors corresponding to those designated for centralized key system installations; ie, red for line service terminations, blue for telephone set terminations, and yellow for auxiliary and dial intercom terminations. Black lines are used to define the color segments.

2.15 In some instances it may be necessary to provide connections between a 100A1 and a 100B1 connecting unit or between a 101A-type, 111A1, and 101B1 connecting units. An example of this is an automatic signaling intercom in which one station appears in the 100A1 and the other station appears in the 100B1. Another example is an intercom-only station whose multipurpose button terminations appear in the 100B1 or 101B1 connecting unit, picking up the third intercom path—the leads of which appear only in the 100A1, 101A-type, and 111A1 connecting units.

2.16 To avoid running exposed jumpers between connecting units, eleven unassigned pairs are provided between a 100A1 and 100B1 or a 101A-type, 111A1, and 101B1, and are designated SP1-SP22 to be used as required.

3. COMMON APPARATUS

MOUNTING FACILITIES

3.01 Apparatus for mounting the power units, KTUs, and cross-connect terminal fields is selected from separately ordered components on the basis of required capacity (lines and stations) and the type of mounting (wall, floor, or relay rack). Preassembled packages are not provided for this purpose with the 21A Communication System.

A. Apparatus Box, Cabinet, and Cover

3.02 The 121C apparatus box (Fig. 2 and 3) has the following features:

- Consists of a molded plastic housing and hinged gate assembly
- Can be mounted on wall, using separately ordered 197A backboard, or on 23-inch relay rack, using D-180675 Kit of Parts
- Approximate dimensions are 34-1/4 inches high, 25-1/2 inches wide, and 16 inches deep.

Note: The 121C apparatus box replaces the 121B but either can be used with COM KEY 2152.

3.03 The 34-type cabinet provides the following features:

- Used in floor-mount installations

- Hinged carrier gate with caster to support weight when gate is opened
- Glides or optional casters (D-180780 Kit of Parts) on each corner of a 34C cabinet for easy movement.

Note: The 34C cabinet replaces the 34B cabinet but either 34C or 34B can be used with COM KEY 2152. (If equipping 34B with optional casters, use D-180700 Kit of Parts.)

3.04 The 154-type cover (Fig. 4) provides the following features:

- Used to cover 34-type cabinet and 121B apparatus box
- Provides finished appearance where required for office decor.

Note: The 154B cover replaces the 154A cover; however, either the 154A or 154B can be used in COM KEY 2152. The 154B has an improved airflow.

B. Feature Panels

3.05 The 702-type feature panel has the following features:

- Metal framework assembly with slots and prewired connectors for holding 400-series KTUs.
- "Basic" panel providing up to 7 CO/PBX lines, 2- or 3-path intercom, and various optional features.
- Holds fourteen 4-inch and seven 8-inch KTUs.
- KTU connectors are factory-wired to connectors which mate with cables from connecting unit and power panel. Panel supplied with connector hold-down bracket.
- Mounts in middle front area of gate.
- Approximate dimensions are 8-13/16 inches high, 22-5/16 inches long, and 9-5/8 inches deep.
- Fuseboard in far right position—has light emitting diode (LED) to indicate blown fuse.

- Wired for music-on-hold feature.

Note 1: The 400H KTU can be used in either a 702A (MD) or 702B feature panel. However, a 400H cannot be used in a 702A (MD) feature panel if music-on-hold is provided. In addition, when providing music-on-hold, a 451-type KTU must be used in a 702A (MD) feature panel and a 498A KTU equipped with a 116A1 CM must be used in a 702B feature panel. The KTUs are not electrically interchangeable.

Note 2: On the 702B feature panel, the appearances of codes 0 and 18 are changed on the 474A KTU (DSS diode matrix and preempt tone generator) so only one 474A is required on small systems (up to 17 stations plus paging).

3.06 The 703-type feature panel has the same physical features as the 702-type feature panel, plus:

- Mounts on lower front area of gate
- Holds twenty-two 4-inch and two 8-inch KTUs
- Provides 14 additional CO/PBX lines and various optional features.

Note: The 400H KTU can be used in either a 703A (MD) or 703B feature panel. However, a 400H cannot be used in a 703A (MD) feature panel if music-on-hold is provided. In addition, when providing music-on-hold, a 451-type KTU must be used in a 703A (MD) feature panel, and a 498A KTU equipped with a 116A1 CM in a 703B feature panel. The 498A KTU provides music-on-hold on four lines, 116A1 CM provides this feature on an additional three lines. The KTUs are not electrically interchangeable.

3.07 The B-coded feature panels can be mixed with A-coded feature panels in the same installation as long as the restrictions concerning the line circuits and music-on-hold circuits are observed in the individual panels.

C. Connecting Units

3.08 The 100A1 connecting unit (Fig. 5) provides the following features:

- The 66-type connecting blocks mounted on metal framework.
- Connecting blocks factory-wired to connector cables which mate with cables from panels, power panels, and other connecting units.
- All installer wiring on front of blocks.
- Mounts on backboard of 121-type apparatus box or 34-type cabinet.
- Provides terminations for incoming CO/PBX lines, station cables for twenty-eight 10-button and six 20-button telephone sets (two answering positions).
- All options for 34 stations are grouped in blocks 1 and 2, including multipurpose buttons and personal lines.

Danger: Before working on the C battery capacitors, remove the power plug and wait at least 20 seconds to allow capacitors to discharge.

3.09 The 100B1 connecting unit (Fig. 6) has the same physical features as 100A1, plus:

- Provides terminations for additional eighteen 20-button telephone sets.
- All interconnections to 100A1 connecting unit and power panel are through plug-ended connector cables.

3.10 The 101A1 (MD) connecting unit has the same physical features as 100A1, plus:

- Provides terminations for incoming CO/PBX lines and station cables for twenty-eight 20-button telephone sets.
- All option wiring appears in same manner as 100A1.

3.11 The 101A2 connecting unit has the same physical features as 100A1 (MD), plus:

- Provides terminations for incoming CO/PBX lines and station cables for twenty-eight 20-button telephone sets.
- Option blocks mounted on gate.
- Identical to the 101A1 (MD) except the T, R, L, and A leads of CO/PBX lines 6 through 12 appear on option block 1 of the 101A2 where they can be cross-connected to the station multipurpose buttons if required.

3.12 The 101B1 connecting unit has the same physical features of 100B1, plus:

- Provides terminations for additional twenty-four 20-button sets.
- All connections to 101A1 (MD) or 101A2 connecting unit and power panel are through plug-ended connector cables. See Section 518-450-111 for routing of ground wiring.

3.13 ♦The 111A1 connecting unit is directly interchangeable with the 101A2 connecting unit. All interconnections from the 111A1 connecting unit to other assemblies of the COM KEY 2152 are identical. The 111A1 connecting unit differs from the 101A2 connecting unit as follows:

- Ribbon connectors in place of the 66-type blocks numbered 5 through 12 on the 101A2 connecting unit.
- Blocks numbered 1 and 2 are identical on both units.
- Blocks numbered 3 and 4 on the 101A2 connecting unit have been combined into a single block number 3 on the 111A1 connecting unit.♦

3.14 ♦The 111B1 connecting unit is made to be the companion unit to the 111A1 connecting unit and to be directly interchangeable with the 101B1 connecting unit. All interconnections from the 111B1 connecting unit to other assemblies of the COM KEY 2152 are identical. The 111B1 connecting unit differs from the 101B1 connecting unit in the use of miniature ribbon connectors in place of quick connect blocks numbered 15 through 22 on the 101B1 connecting unit. Blocks numbered 13 through 14 on both units are identical.♦

D. Power Panels

3.15 Power panels are available for use with COM KEY 2152, the choice depending on the size of the installation. They differ primarily in the type of power units they contain. The **basic panel** has the following features:

- Metal framework 23-1/8 inches wide and 12 inches high
- Mounts on upper front area of hinged carrier gate
- Line status lamps
- Fuse panel with 70-type fuses (Fig. 7)
- Interrupter.

Note: In COM KEY 2152, the KS-15900, L3 interrupter runs continuously as long as power is applied to the system.

- Capacitor for A battery
- Resistors for C-battery
- Outputs wired to connectors mounted on power panel bracket.

(a) 2A Power Panel:

- 19C3 power unit
- 215C1 transformer to supply 15/18 volts ac.

(b) 2B Power Panel:

- 29E1 power unit.

(c) 2C Power Panel:

- 29E1 power unit
- 67E1 power unit for supplementary lamp power and for interrupter motor.

(d) 2D Power Panel:

- 67E1 power unit wired for use with the 101B1 connecting unit and in conjunction with the 2C power panel.

E. Key Telephone Units

3.16 The electronic control circuitry of COM KEY 2152 is contained in 400-series plug-in, printed circuit board KTUs. Table A provides a

list of all of these units with pertinent physical and functional data. The KTUs are mounted in the 702- and 703-type feature panels. There are dedicated slots in the panel for each type of KTU, except for the 457C and 481-type which are mounted in "option slots" in various combinations, depending on the requirements of specific installations. The arrangement of KTUs in the 702- and 703-type feature panels is shown in Fig. 8 and 9, respectively.

4. STATION APPARATUS

4.01 In COM KEY 2152, each nonattendant station utilizes a single telephone set. Each answering position (up to three per installation) will have a telephone set or a telephone console depending on the number of CO lines served, and it may also have one or two selector consoles providing the DSS/SB and MW/SB features. All telephones (except intercom-only sets) and consoles are available in an ivory colored housing only, with a choice of nine faceplate colors (Table B). The features that can be provided with each set are detailed in Table C. Some of the telephone sets used with COM KEY 2152 are shown in Fig. 10.

TELEPHONE SETS

(a) **832BM Telephone Set (11-button):**

- Rotary dial
- 10-button key with HOLD button, 7-line pickup buttons, and 2 intercom buttons
- May be equipped with third IC path
- RECALL button simulates switchhook flash
- Built-in amplifier and loudspeaker
- Automatic button restoration returns depressed buttons to unoperated position when handset is placed on-hook
- Conferencing of CO lines
- Equipped with modular handset components
- PRIV RLS, RECALL, and RING TRANSFER features **cannot** be provided.

(b) **832CM Telephone Set (13-button):**
Same as 832BM except as listed.

- 3-button key with RECALL, privacy release (PRIV RLS), and ring transfer (RING TR) buttons
- Factory-wired with privacy circuit; PRIV RLS button operational
- RING TR button not factory-connected.

(c) **832DM Telephone Set (11-button):**

Same as the 832BM except arranged for wall mounting. The line switch allows the handset to hang vertically to the left of the housing.

(d) **832EM Telephone Set (13-button):**

Same as the 832CM except arranged for wall mounting.

(e) **833BM Telephone Set (20-button):**

- Two 10-button keys with HOLD, 14 line pickup buttons, 3 intercom buttons, RECALL and PRIV RLS buttons

- Privacy circuit factory-provided and PRIV RLS operational

- Equipped with modular handset components

- Equipped with automatic button restoration.

(f) **833CM Telephone Set (20-button):**

Same features as 833BM as listed.

- Privacy circuit must be provided and connected in the field

- No provision for PRIV RLS

- RING TR button factory-provided but not connected.

(g) **833DM Telephone Set (20-button):**

Same as 833BM except arranged for wall mounting.

(h) **833EM Telephone Set (20-button):**

Same as the 833CM except arranged for wall mounting.

(i) **2832BM Telephone Set (11-button):**

Same as 832BM except equipped with a TOUCH-TONE® dial.

(j) **2832CM Telephone Set (13-button):**
Same as 832CM except equipped with a TOUCH-TONE dial.

(k) **2832DM Telephone Set (11-button):**
Same as 2832BM except arranged for wall mounting.

(l) **2832EM Telephone Set (13-button):**
Same as 2832CM except arranged for wall mounting.

(m) **2833BM Telephone Set (20-button):**
Same as 833BM except equipped with a TOUCH-TONE dial.

(n) **2833CM Telephone Set (20-button):**
Same as 833CM except equipped with a TOUCH-TONE dial.

(o) **2833DM Telephone Set (20-button):**
Same as 2833BM except arranged for wall mounting.

(p) **2833EM Telephone Set (20-button):**
Same as 2833CM except arranged for wall mounting.

(q) **575AM Telephone Set (6-button):**

- For use at stations which are to access intercom lines only
- Can be wired for 2- or 3-path intercom. Comes factory-wired for two intercom paths; the third path must be wired in the field.

(r) **2575AM Telephone Set (6-button):**
Same as 575AM except equipped with a TOUCH-TONE dial.

(s) **853AM Telephone Set (6-button):**

- Wall set with rotary dial
- Intercom only with three pickup keys
- Red message waiting button
- Loudspeaker with volume control for tone and voice signaling.

(t) **2853AM Telephone Set (6-button):**
Same as 853AM except equipped with TOUCH-TONE dial.♦

TELEPHONE CONSOLES

(a) **128A3T or 128A3R Console (Fig. 11):**

- Intercom/line conferencing key field with one button for each of the 14 lines and 3 intercom paths
- TOUCH-TONE (T suffix) dial or rotary (R suffix) dial
- 3 intercom buttons, RECALL button, PRIV RLS button, and ring transfer button
- 2 multipurpose buttons
- Release button to release any line or intercom button to unoperated position
- Handset cradle is not a functional switchhook
- 20-type PBX console housing
- Headset jack with amplifier
- Built-in amplifier and loudspeaker
- Handset jacks supplied with G15 handset
- 14-line capacity (includes 2 flexible lines).

(b) **128A4T or 128A4R Console:** Same as 128A3-type except as listed.

- 3-ring transfer buttons
- 21-line capacity (includes 2 flexible lines)
- No intercom/line conferencing field.

(c) **138A4T or 138A4R Console (Fig. 11):**

- Separate intercom/line conferencing key field with one button for each of the 21 lines and for each of the 3 intercom paths
- Similar to 128A4-type with addition of upper key field

- Used to couple any two pickups together without restricting use of associated 21-line telephone on other calls
- 30-type PBX console housing
- Supervision provided on CO/intercom conferences.

Note: No supervision or amplification provided on CO-to-CO calls.

SELECTOR CONSOLES

(a) **6B1 Console (MW With SB) (Fig. 12):**

- 18 station selection
- MW button field with SB lamps incorporated in MW buttons
- Same size housing as 830-series telephones.

(b) **7B1 Console (MW With SB) (Fig. 12):**

- Similar to 6B1
- 34 station selection.

(c) **6C1 Selector Console (DSS With SB) (Fig. 13):**

- 17 station selection
- DSS button field with SB lamps incorporated in DSS buttons
- Dedicated intercom link allows signaling of other stations regardless of status of intercom selector circuit and common intercom paths
- Automatic hold feature places incoming line on hold when attendant signals called station
- Does not tie up intercom selector circuit used by other stations
- When station signaled from this console is receiving signaling from some other source, that source will be preempted by console signal

- Beep tone sent to each preempted station (if system has HFAI)
- Same size housing as 830-type telephones
- Built-in chime tone generator and amplifier
- DND lamp signal superimposed on station busy lamps
- One each paging, restore, and reenter buttons.

(d) **7C1 Selector Console (DSS With SB) (Fig. 13):**

- Similar to 6C1
- 34 station selection
- 3 paging buttons.

(e) **128A6Y Console (DSS With SB) (Fig. 14):**

- Features similar to 6C1 and 7C1
- 52 station selection
- 20-type PBX console housing.

(f) **138A6Y Console (DSS and MW With SB) (Fig. 14):**

- Similar to 128A6Y with addition of upper key field
- Separate MW field without SB lamps
- 30-type PBX console.

5. OPTIONAL APPARATUS

5.01 **683A (MD) or 683AE Transmitter:**

- Provides microphone and other circuitry required for HFAI and the manual DND function when associated with HFAI
- On-Off switches for microphone and DND
- LED indicator that turns on when microphone amplifier is turned on by incoming call

- Freestanding, pedestal-type case similar to transmitter of 4A speakerphone
- Connects to terminals inside associated station telephone set via D8U-87 cord
- Requires a #127A bracket if used with wall sets. The #127A bracket replaces the 268A adapter.

Note: When the #127A bracket is used to mount the 683A (MD) or the 683AE transmitter at a wall set installation, a 468B KTU must be used to reduce feedback from loudspeaker to transmitter. If the wall telephone set is adjusted for maximum volume, speech distortion may occur. The station volume should be reduced until the distortion disappears. The 683A (MD) and the 683AE are functionally and physically the same; however, the 683AE does provide better static discharge protection than the 683A (MD).

5.02 #688A Key:

- Provides pushbutton switch and circuitry required for manual DND option on sets not equipped with HFAI option
- Fastens to side of telephone set
- Mechanical indicator when operated.

5.03 33A or 33B Voice Coupler:

- Interconnecting unit providing a point of connection for customer-provided (CP) music source used for music-on-hold and background music on paging system
- Wall mounted
- Potentiometer for adjusting background music level
- #Fused# for protection against hazardous voltages from music source.

5.04 KS-21880, L1 Loudspeaker:

- Indoor speaker used for paging (cabinet type)
- 11 inches high, 10 inches wide, 6-1/2 inches deep

- Volume control potentiometer
- 45-ohm impedance
- Walnut finish cabinet
- Intended for wall mounting.

5.05 KS-21939, L2 Loudspeaker:

- For use at indoor or outdoor locations with paging (horn type)
- 7-1/2 inches in diameter, 7 inches deep, weight 3-1/4 pounds
- Volume control potentiometer
- Provides armoured protection.

5.06 20A Apparatus Unit:

- Provides for connecting a customer-owned and maintained (COAM) or a separate telephone company paging system to the COM KEY 2152
- Mounted external to the system
- Potentiometer for volume control.

5.07 260A (MD), 260A2 Adapter: This adapter is a vertical jumper clip which consists of a series of 50 terminals connected in a vertical column and covered by a plastic housing. The terminals are designed to mate with the 66-type terminals used on the option blocks (blocks 1 and 2) of the connecting units. The adapter strip can be cut with standard diagonal pliers to any desired length. If a given flexible line is to be multiplied to 10 stations, the system should be configured with those 10 stations in numerical order. Then, the T, R, L, and A leads from that line should be connected to the T, R, L, and A leads of the first or last station in the group. The adapters can then be cut to length and used to multiple the other stations in the group. If the stations involved in a large line multiple cannot be arranged in numerical order, they should then be grouped as much as possible to permit the use of the 260A-type adapter within the group. The group should then be connected by jumpers from corresponding terminals at the beginning of one group to the other.

6. ORDERING GUIDE

6.01 The components required for COM KEY 2152 depend on the number of CO/PBX lines, the number of stations, and the size of the stations—ie, whether 10- or 20-button telephone sets. Table D can be used as a general guide in determining the major components required.

6.02 Table E lists the equipment and the assigned USOCs for all common apparatus and related items.

6.03 Table F lists the equipment that will be used at the station locations, such as telephone sets and consoles and their related items.

6.04 *Replaceable Components—Common Equipment*

(a) *121-Type Apparatus Box:*

- Kit of Parts, D-180675 (for rack mounting).

(b) *34-Type Cabinet:*

- Kit of Parts, D-180780 (casters for 34C)
- 197A Backboard
- 154-Type Cover
- Kit of Parts, D-180700 (casters for 34B).

(c) *702-Type Feature Panel:*

- Fuse, 70A (1-1/3 amperes)
- Label, L-179222
- Units, Telephone, Key—400-type, 415-type, 424C, 440A, 444-type, 452A, 453B, 454C, 455A, 460C, 473A, 474A, 478B, 457C, 481B, 451-type, 498A/116A1 CM, and 494A on 702B only
- Pack, Circuit, PY1B (polarity guards)
- Pack, Circuit, PY2 (selector counter relay networks).

(d) *703-Type Panel:*

- Fuse, 70A (1-1/3 amperes)

- Label, L-179223

- Units, Telephone, Key—400-type, 415-type, 444-type, 452A, 453A, 468-type, 474A, 457C, 481B, 451-type, or 498A/116A1 CM

- Pack, Circuit, PY1B (polarity guards).

(e) *100-, 101-, or 111-Type Connecting Unit:*

- Diode, 456F.

(f) *2A Power Panel:*

- Fuse, 70A (1-1/3 amperes)—fuseboard
- Fuse, 24C (2 amperes)—19C3 and 215C1 power units
- Fuse, 24F (5 amperes)—19C3 power unit.

(g) *2B Power Panel:*

- Fuse, 70A (1-1/3 amperes)—fuseboard
- Fuse, 70B (2 amperes)—fuseboard
- Fuse, 24B (3 amperes)—29E1 power unit
- Fuse, 24C (3 amperes)—29E1 power unit
- Fuse, 24F (5 amperes)—29E1 power unit.

(h) *2C Power Unit:*

- Fuse, 70A (1-1/3 amperes)—fuseboard
- Fuse, 70B (2 amperes)—fuseboard
- Fuse, 24B (3 amperes)—29E1 power unit
- Fuse, 24C (2 amperes)—29E1 power unit
- Fuse, 24F (5 amperes)—29E1 and 67E1 power unit.

(i) *2D Power Unit:*

- Fuse, 24F (5 amperes)—67E1 power unit.

(j) *33A Voice Coupler:*

- Fuse, 35P (3/4 amperes).

(k) **‡33B Voice Coupler:**

- Fuse, 24D (3/4 amperes)‡

6.05 Replaceable Components—Telephone Sets(a) **832- and 2832-Type Sets:**

- Housing, 832A-50 (desk-type sets)
- Housing, 6C1-50 (wall-type sets)
- Faceplate, 832B-† (11-button rotary)
- Faceplate, 833A-† (13-button rotary)
- Faceplate, 2832B-† (11-button TOUCH-TONE dial)
- Faceplate, 2833A-† (13-button TOUCH-TONE dial)
- Dial, 8C (rotary sets)
- Dial, 35AF3A (TOUCH-TONE sets)
- Key, 647G5 (10-button)
- Key, 651F (Recall)
- Key, 647S5 (Recall, Privacy Release, and Ring Transfer)
- Handset, G15A-50
- Cord, H4DU-50
- Lamp, 51A.

(b) **833- and 2833-Type Sets:**

- Housing, 832A-50 (desk-type sets)
- Housing, 6C1-50 (wall-type sets)
- Faceplate, 833A-† (rotary sets)
- Faceplate, 2833A-† (TOUCH-TONE dial)
- Dial, 8C or 8CA (rotary sets)

† Add color suffix from Table B.

- Dial, 35AF3A (TOUCH-TONE sets)

- Key, 647K5 (lower key)

- Key, 647N5C or 647P5C (upper key)

- Handset, G15A-50

- Cord, H4DU-50

- Lamp, 51A.

(c) **‡853AM and 2853AM Sets:**

- Housing, 853A-50

- Faceplate, 853A-80

- Faceplate, 2853A-80

- Handset, G15A-50

- Cord, Handset, H4DU-50

- Dial, 8RA

- Dial 35Y3A

- Key, 635A5

- Lamp, 51A.‡

6.06 Replaceable Components—Selector Consoles(a) **6B1 Console:**

- Faceplate, 6A2-†

- Cord, D50AD-50

- Housing, 6A1-50

- Key, 647AF5 or 647C5

- Lamp, 51A.

(b) **6C1 Console:**

- Faceplate, 6A2-†

- Cord, D150AD-50

- Cord, D6AJ-50

- Housing, 6A1-50
 - Key, 647AC5C
 - Lamp, 51A.
- (c) **7B1 Console:**
- Faceplate, 7A2-†
 - Cord, D100J-50
 - Housing, 6A1-50
 - Key, 647AF5 or 647C5
 - Lamp, 51A
 - Fuse, 70P (1/5 ampere).
- (d) **7C1 Console:**
- Faceplate, 7A2-†
 - Cord, D200AG-50
 - Cord, D6AJ-50
 - Housing, 6B1-50
 - Key, 647AC5C
 - Key, 647AB5C
 - Lamp, 51A
 - Fuse, 70P (1/5 ampere).
- (e) **128A6Y Console:**
- Faceplate, 128C-†
 - Housing, 840649503
 - Cord, D150AH-50
 - Cord, D200AH-50
 - Key, 635CB5C
 - Key, 635CC5C
- Lamp, 51A
 - Fuse, 70P (1/5 ampere).
- (f) **138A6Y Console:**
- Faceplate, 238D-† (lower section)
 - Faceplate, 238E-† (upper section)
 - Housing, 840494504
 - Cord, D200AH-50
 - Cord, D150AH-50
 - Cord, D150AG-50
 - Key, 647C5
 - Key, 635CB5C
 - Key, 635CC5C
 - Lamp, 51A
 - Fuse, 70P (1/5 ampere).
- 6.07 Replaceable Components—Telephone Consoles**
- (a) **128A3-Type Console:**
- Faceplate, 128E-† (rotary dial)
 - Faceplate, 128D-† (TOUCH-TONE dial)
 - Cord, D100AC-50
 - Key, 635BP5C
 - Key, 635CG5C
 - Key, 635BW5C
 - Key, 635BU5C
 - Handset, G15A-50
 - Housing, 840649503
 - Dial, 8CA (rotary dial)
 - Dial, 35AF3A (TOUCH-TONE sets)

†Add color suffix from Table B.

- Amplifier, 241B
- Tab, Key, Self-designating, 840711642
- Tab, Key, 840157259
- Lamp, 51A.

(b) **128A4-Type Console:**

- Faceplate, 128B-† (rotary dial)
- Faceplate, 128A-† (TOUCH-TONE dial)
- Cord, D150AE-50
- Key, 635CA5C
- Key, 635BY5C
- Key, 635BW5C
- Key, 635BU5C
- Handset, G15A-50
- Cord, H4DU-50
- Housing, 840649503
- Dial, 8R (rotary)
- Dial, 35F3A (TOUCH-TONE sets)
- Amplifier, 241B
- Tab, Key, Self-designating, 840711642
- Tab, Key, 840157259
- Lamp, 51A.

(c) **138A4-Type Console:**

- Faceplate 238A-† (lower section, TOUCH-TONE dial)
- Faceplate, 238B-† (lower section, rotary dial)
- Faceplate, 238C-† (upper section, TOUCH-TONE dial and rotary dial)

†Add color suffix from Table B.

- Cord, D150AF-50
- Key, †652F5‡
- Key, †652H5‡
- Key, 635CA5C
- Key, 635BY5C
- Key, 635BW5C
- Key, 635BU5C
- Handset, G15A-50
- Cord, H4DU-50
- Housing, 840691505
- Dial, 8R (rotary)
- Dial, 35AF3A (TOUCH-TONE sets)
- Amplifier, 840501696
- Tab, Key, Self-designating, 840711642
- Tab, Key, 840157259
- Lamp, 51A.

7. BASIC FEATURES**A. Multiline Pickup**

7.01 Each station will have either 7 or 14 buttons which may be used for line appearances. Button location is given in Fig. 15 for telephone sets.

7.02 The station with 7 line buttons (832- or 2832-type) will have 5 buttons dedicated to common lines (square lines) and 2 buttons (7 and 8) called multipurpose buttons. In the 702A or 703A feature panels, these buttons can be used for common lines, personal lines, private lines, or an automatic signaling intercom. Refer to Part 8, OPTIONAL FEATURES, for detailed applications and restrictions in the use of these buttons. Button 8 may also be used for a third intercom line, but only when all 832-type telephone sets in the system are so equipped. Buttons 9 and 10 of the 832- or 2832-type telephone set are dedicated to two common

intercom paths, and the first button on the telephone set is the HOLD button. Some 832- or 2832-type sets are equipped with 13 buttons. Buttons 11, 12, and 13 are dedicated to RECALL, PRIV RLS, and RING TR, respectively.

7.03 The stations with 14-line buttons (833- or 2833-type) will have 12 buttons (2 through 6 and 14 through 20) dedicated to common lines (square lines) and 2 buttons (7 and 13) called multipurpose buttons. The multipurpose buttons may be used for common lines, personal lines, private lines, or an automatic signaling intercom. Button 7 can also be used as a multiple appearance of the third intercom path for conferencing purposes. Buttons 8 through 10 are dedicated to 3 common intercom paths. The first button is the HOLD button, and button 11 is dedicated to RECALL and button 12 to RING TRANSFER or PRIVACY RELEASE.

B. Hold and Illumination

7.04 The COM KEY 2152 has the same CO/PBX HOLD operation and button illumination as a standard KTS, including wink hold. See paragraph 7.07 for intercom lamp signals.

C. Multipath Intercom

7.05 The intercom has either 2 or 3 paths. A path is selected by depressing one of the intercom buttons on the telephone set. There is no privacy on any path and any station may break into an existing conversation.

7.06 The intercom can individually signal up to 55 codes, 52 of which can be stations and 3 for paging or preset conferencing. The number of codes available for stations may vary; for instance, if 3 paging and 3 preset conferencing codes are both required, only 49 station codes are available. The system can also be equipped for configurations that permit 18 stations with one paging zone (424C selector only) or 34 stations with three paging zones. If a third intercom link is installed, all telephone sets must be equipped with this feature. ♦When a 702B panel is used, a♦ 494A KTU may be used to replace the 424C and the 440A ♦or 478B♦ KTU when TOUCH-TONE dialing on intercom is desired. When the 494A KTU is used, all intercom stations in the system must be equipped with TOUCH-TONE dials.

7.07 The selector used to select and alert the called stations is shared by all intercom paths. The alerting signal at the called station is tone burst (500 Hz—approximately 0.5 second) followed by a voice signal from the calling station. The lamp signals on the intercom are as follows: When the selector has seized a path, the lamp associated with the path will flash on all telephone sets. This shows the called party which path to answer. No other intercom path can seize the selector while the lamp is flashing. When the called party answers, the flashing intercom lamps change to steady. When an intercom path is idle, the associated lamp is off.

7.08 To place an intercom call:

- (a) Select idle intercom and depress associated button. None of the intercom buttons can be flashing (only one selector is supplied for station-to-station intercom calls).
- (b) Lift telephone handset.
- (c) Listen for intercom dial tone.
- (d) Dial selected station-tone burst signals called station.
- (e) Calling station makes announcement to called party. When called party answers by depressing flashing intercom button, the lamp associated with that button changes to steady.

7.09 Intercom is factory-wired and each intercom code is determined by the column on blocks 5 through 10 of the connecting units.

D. Tone and Voice Signaling

7.10 The CO/PBX signaling is a distinctive warbling tone (900-1100 Hz) heard through a speaker in the telephone set. Voice signaling is used in conjunction with tone signaling (500 Hz—approximately 0.5 second) when calling a station on the intercom. When the attendant receives incoming CO/PBX tone signals and is simultaneously signaled on the intercom, the intercom signal is given preference (see Table G).

E. Recall

7.11 Every telephone set used with COM KEY 2152, except intercom-only sets, is equipped

with a RECALL button. The momentary operation of the RECALL button simulates the switchhook flash without restoring depressed line buttons to normal.

F. Multiline Conferencing

7.12 Two or more CO/PBX lines may be conferenced together by simultaneously depressing the line buttons of the lines to be conferenced. When lines are conferenced using this manner of conferencing, transmission levels will be reduced and transmission is not guaranteed.



The CO/PBX and the third intercom path can only be conferenced when the third intercom path appears on one of the multipurpose buttons or at an attendant position with IC/CO conferencing. If the system is equipped with the third intercom path, it must appear at all stations.

7.13 All lines that are conferenced together may be put on hold simultaneously by depressing the HOLD button except when more than one station is off-hook on the same line.



Intercom lines cannot be placed on hold.

7.14 Conferencing is a mechanical function of the telephone set and requires no wiring.

7.15 To make a call during a conference:

- (a) Depress HOLD button—all buttons restored.
- (b) Select an idle line.
- (c) Dial call.
- (d) If it is desired to add this call to the conference, hold this CO/PBX line button down and depress the conference CO/PBX line buttons.
- (e) To reenter conference again after call is completed, simultaneously depress conferenced line buttons again.

7.16 If it is desired to add another call to the conference, while holding the conferenced CO/PBX line buttons down, depress button of CO/PBX line to be added. To prevent dropping one of the participants when setting up a conference, ensure that the conference line buttons are held down when adding another line.

G. Automatic Button Restoration (ABR)

7.17 Automatic button restoration is a feature on all 832-, 833-, 2832-, and 2833-type telephone sets used with COM KEY 2152. The ABR is not available on the 128A3, 128A4 or 138A4 answering positions, or intercom-only sets. When the handset is placed on the cradle, all depressed buttons return to the unoperated position. This prevents inadvertent intrusion on calls in progress and ensures that multiple buttons will not be left depressed on a set causing an undesired conference from the idle set.

7.18 The ABR is a mechanical function of the telephone set; no wiring is required and field adjustment of the mechanism is not to be done.



The CO/PBX lines may be disabled (lines bridged) if multiple CO/PBX buttons of a line in operation are depressed at an idle station.

H. Ring Transfer

7.19 Ring transfer permits switching the incoming CO/PBX signaling from the answering position(s) to an alternate location(s). If an 832-, 833-, 2832-, or 2833-type telephone set or a 128A3-type console is used at the attendant position, one button is provided for ring transfer. If a 128A4- or 138A4-type console is used, up to three choices of ring transfer can be supplied.

7.20 To effect ring transfer, the ring transfer button on the attendant telephone set or console must be depressed. To transfer ringing back to the attendant station, the ring transfer button is depressed again, allowing it to return to normal. During the time the button is depressed, the button will be illuminated. More than one station can receive transferred calls as long as the total does not exceed 10.

7.21 Additional ring transfer is also optionally available and is described under OPTIONAL FEATURES (paragraphs 8.58 and 8.59).

8. OPTIONAL FEATURES

A. Privacy

8.01 Privacy prevents a station from bridging into a CO/PBX call in progress. If a system has privacy, all stations must be equipped. Privacy is a station feature and each station that is to be excluded (locked out) must be equipped with a privacy circuit board.

8.02 The 832/2832CM, 832/2832EM, 833/2833BM, and 833/2833DM telephone sets are wired at the factory with the privacy circuit operational.

8.03 The privacy circuit operates only when the telephone set is off-hook. The circuit monitors the "A" lead to determine the status of the line. Ground (or positive potential) on the "A" lead indicates the line is busy, operates the privacy circuit, and the station attempting to bridge is excluded. A negative potential on the "A" lead causes the privacy circuit not to operate and the set is not excluded. There is no privacy on the intercom paths.

Note: Because of a conflict in the use of "A" lead control, a system equipped with a 471A KTU (MD) cannot have privacy and toll restriction at the same time. Systems equipped with a 471B KTU (MD) or 471C KTU (MD) can provide both these features.

B. Privacy Release

8.04 Privacy release, when operated at a station already off-hook, releases the privacy circuit in a privacy equipped (locked-out) telephone, permitting the locked-out telephone to bridge into a call on a CO/PBX line.

Note: When privacy release is provided, all stations in the system must be equipped.

8.05 The 832/2832CM, 832/2832EM, 833/2833BM, and 833/2833DM telephone sets are factory-equipped with a PRIV RLS button.

8.06 When a station is off-hook with CO/PBX line button depressed, any other station equipped

with a privacy circuit will be locked out from that CO/PBX line. To permit a second station that is privacy equipped to bridge into a call:

(a) Depress (and hold down) the PRIV RLS button at first station.

(b) Observe that line lamp changes from steady to wink (indicating the line has gone on hold). The privacy-equipped station may now bridge into the call.

(c) Observe the line lamp changes from wink to steady (indicating station has entered the call).

(d) Release the PRIV RLS button at the first station.

8.07 To allow a third privacy-equipped station to bridge into the call, both stations must depress their PRIV RLS buttons simultaneously. The line lamp will change from steady to wink. As the third station bridges into the call, the line lamp will become steady. The PRIV RLS buttons can then be released, and all three stations are bridged.

C. TOUCH-TONE Dialing

8.08 The TOUCH-TONE dialing on intercom may be supplied by two methods in the 21A Communication System as follows:

(a) If a 702B panel is used and all stations are equipped with TOUCH-TONE dials, a 494A KTU may be used in J12A and J12B of the 702B panel.

(b) If a 702B panel is used where all stations are not equipped with TOUCH-TONE dials, the 494A KTU cannot be used. The 424C KTU is then used as the basic intercom selector and either the 440A (MD) or the 478B KTU as the TOUCH-TONE adapter. The 424C plugs into J13A and J13B and the 440A (MD) or 478B plugs into J12A and J12B of the 702-type panel.

Note: When supplying TOUCH-TONE adapter, the RS1-CG1 strap must be removed from between 36A and 37A on block 2 of the 100A1, 101A1, or 101A2 connecting unit.

D. CO/PBX-Intercom/Line Conferencing

8.09 Intercom/line conferencing is a feature of the telephone sets and answering positions used in the system. Since there is no amplification involved, this type of conferencing is limited. Distant parties on the CO/PBX lines may have difficulty hearing each other.

8.10 Conferencing is accomplished by simultaneously depressing the CO/PBX line button(s) and the third intercom path button.



The CO/PBX lines and the third intercom path can only be conferenced when the third path appears on one of the flexible buttons.

E. Personal Lines

8.11 This feature permits a personalized arrangement of nonsquare CO/PBX lines to multipurpose buttons. Refer to paragraph 2.04 for a full explanation of feature.

8.12 The T, R, L, and A leads of the 7th and 8th pickup buttons of the 10-button set, or the 7th and 13th buttons of the 20-button set are terminated on block 1 of the connecting unit, depending on the station code assigned. As factory-wired, there will be nothing wired to these buttons and they may be wired as required to pick up a personal line, square line, automatic signaling intercom, private line, or third intercom path.

8.13 If a personal CO/PBX line is to appear on one of the multipurpose buttons, the T, R, L, and A leads of the line appearance on block 1 of the connecting units must be cross-connected to the proper button(s). Personal lines can appear on more than one telephone set. Where more than two consecutive station codes are to be multiplied, the 260A-type adapter may be used. The adapter can be cut to provide as many multiples as required.

8.14 At installations having only a 702-type panel (7-line capacity), lines 6 and 7 may be used as personal lines. At installations also equipped with a 703-type panel, lines 8 through 21 can be used as personal lines if the system is equipped with 10-button sets **only**. If **any** 20-button sets are used, only lines 13 through 21 can be personal lines because lines 1 through 12 appear on all 20-button sets as square lines.

F. Station Line Ringing

8.15 The CO/PBX lines can be arranged to ring at one to four stations (maximum of two in addition to the two attendants) by strapping the RC lead from the CO/PBX line to the station CO lead on block 2 of the connecting unit. If two lines are to ring at a station other than the attendant, neither of the two lines can ring **alone** at another station, ie, both lines must also ring at the second station. Also, if it is desired that one of the two lines not ring at the attendant station, neither of the lines can ring at the attendant station; ie, both common audible diodes would have to be removed.

An example would be where a personal line is to ring at station codes 7 and 8 but not at the attendant. In this case, the RC lead of the CO/PBX line must be strapped to the CO lead of station codes 7 and 8 and the common audible diode for the CO/PBX line removed on block 4 of the 100A1, 101A1 (MD), or 101A2 connecting unit or block 3 of the 111A1 connecting unit.

8.16 If two personal lines are to ring at station codes 7 and 8 but not at the attendant, the previous procedure must be completed for both lines.

Note: Both lines must ring at the attendant or neither line can ring at the attendant. Both diodes must be removed or both must be left in place.

G. Common Audible Ringing

8.17 The 21A Communication System is factory-wired so intercom code 0 receives tone ringing on all CO/PBX calls. The attendant answers all incoming calls and either takes a message or forwards the call to the desired party using the intercom or, if so equipped, on the console dedicated link (DSS).

8.18 Common audible is derived through diodes located on block 4 of the 100A1, 101A1 (MD), or 101A2 connecting unit or block 3 of 111A1 connecting unit. There is one diode per CO/PBX line. To remove a CO/PBX line from the common audible group, remove the corresponding diode.

8.19 Other stations besides or rather than code 0 may be arranged for common audible

ringing by running a strap from the common audible terminals (22F or 22G on block 2) to the station CO lead. Connections in the 101A1 (MD), 101A2, 111A1, and 101B1 connecting unit are made in a similar manner except the station code terminals appear in a slightly different manner. The maximum number of stations that can be signaled at the same time is 10. If code 0 is not to receive CO/PBX calls, remove the factory-wired strap. The limitations outlined under **Station Line Ringing** must also be observed.

H. Power Failure Transfer

8.20 This feature provides an audible indication of incoming CO/PBX calls any time commercial power is lost to the 21A Communication System. The tip and ring of all CO/PBX lines are wired through normally made contacts of one of the 452A KTUs. The relays in the KTU are operated as long as power is being supplied by the power panel. If this power is lost, the relays are released and the CO/PBX line is cut through to an external ringer at the desired station(s). The ringer(s) or auxiliary signal device are not part of the station sets and must be externally provided.

8.21 To provide power failure transfer, a 452A KTU (one per 7 CO/PBX lines) is required. For lines 1 through 7, install in J5A of the 702-type panel; for lines 8 through 14, in J5A of the 703-type panel; and for lines 15 through 21, in J10A of the 703-type panel. In addition, the EIC ringer or auxiliary signal device must be connected to the EXT and EXR leads of the line involved using separately run quad wire or cable.

I. Hands-Free Answer on Intercom (HFAI)

8.22 This optional station feature requires the installation of a 683A (MD) or 683AE transmitter at any station having the feature, including attendant stations. Each wall-type telephone set having HFAI also requires a Φ 127A bracket Φ which is used to mount the transmitter on the wall. When Φ 127A bracket Φ is used, a 468B KTU must be used to reduce feedback between the loudspeaker and transmitter. In addition, a 473A KTU must be installed in J10 of the 702-type panel. It permits HFAI stations to:

- Answer incoming intercom calls without going off-hook with 2-way conversation

- Respond to intercom call while engaged in a CO/PBX call
- Disable the HFAI feature if desired
- Activate the DND feature
- Answer dedicated link call (DSS).

8.23 Also required are the 474A KTUs installed as follows:

- 1st one in J8 of 702-type panel for stations 2 to 18 in a 702A panel or 0 to 17 in a 702B panel
- 2nd one in J9 of 702-type panel for stations 21 to 36 in a 702A or 702B panel
- 3rd one in J12 of 703-type panel for stations 35 to 52.

This unit is the DSS diode matrix and preempts tone generator which allows the attendant to preempt an HFAI call with a dedicated link call.

8.24 The HFAI is connected by terminating the cord from the 683A (MD) or 683AE transmitter on the telephone set terminals and modifying the set.



Option strap on the 468A KTU (MD) or option plug on the 468B must be removed.

8.25 When an HFAI-equipped station is called over the intercom selector, the station is signaled by the normal tone burst, and the HFAI microphone and LED are activated. The called station can now hear over the set loudspeaker and answer "hands free" until the calling station goes on-hook or the called station goes off-hook. Operating the OFF control disables all HFAI features, and the station operates like any intercom station until the ON control is operated. If the DND control is operated, stations calling an HFAI station over the multipath intercom will receive the DND tone. The DSS console will receive a DND lamp indication on the busy lamp field. Releasing the DND control permits incoming calls and signals to be received in the normal manner (see paragraph 8.26).

Note: The HFAI calls placed through the selector tie up the selector for the duration of the call.

J. Do Not Disturb (DND)

8.26 This feature prevents all incoming dial intercom and DSS calls from signaling a station when the feature is activated. This feature may be manual or automatic as follows:

(a) **Manual DND**—On stations equipped with HFAI, the DND activation button is located on the 683-type transmitter unit. All other stations need a 688A key to activate DND option. Manual DND in the COM KEY 2152 provides two signals.

(1) The **first** is a **visual signal** on the station busy lamp associated with the DSS button on the attendant console. This permits the attendant to instantly see which station does not want to be disturbed.

(2) The **second** is an **audible signal** which is sent to any station that is calling another station that does not want to be disturbed. The audible signal is continuous 500-Hz tone which the calling party will hear in the telephone set receiver.

(b) **Automatic DND**—This feature is activated whenever the station is off-hook. It automatically sends a 500-Hz tone to alert the calling party that the called party is busy and does not want to be disturbed. The automatic DND requires no hardware and is done with a wiring modification of the telephone set.

Note: The DND is only applicable to dial intercom and DSS calls. It does not effect automatic signaling intercom, private lines, or CO/PBX lines.

K. Intercom-Only Station

8.27 At locations that will only be making internal calls and do not require access to the CO/PBX lines, a 575AM or 2575AM telephone set for desk use or an 853AM or 2853AM set for wall use may be installed. With this arrangement, only the two or three intercom paths can be accessed. All other buttons are mechanically blocked including the red one which is equipped with a lamp for message

waiting where required. The telephone set is equipped with a plug which permits mating with a standard A25B connector cable. As supplied, the set is not wired for the third intercom path and the mounting cord leads must be terminated in the set to provide access. The pickup buttons and lamps operate in the same manner as for the intercom paths of a full service station.

L. Access to Supplementary Ringing Devices

8.28 Where external signaling devices (such as bells, gongs, chimes, lights, or buzzers) are to be connected to the 21A Communication System, a 22A-49 apparatus unit must be provided. The 22A-49 apparatus unit is externally mounted and connections are made to the 21A Communication System with inside wire. Also, an external power supply must be provided to operate the signaling devices. The 22A-49 apparatus unit may be used to activate external signal devices that are operated by an open circuit (through a relay break contact) or that are operated by a circuit closure (through a relay make contact).

Caution: The 22A-49 apparatus unit contains a nonadjustable, mercury-wetted sealed contact relay and must be mounted in a vertical upright position.

8.29 The 22A-49 apparatus unit is used to activate external signaling devices that are connected for:

- Station codes
- Common audible
- CO/PBX ringing
- Ring transfer.

Note: When an external signaling device is operated by a station code, the device will sound continuously until the calling party hangs up or a second station goes off-hook on the intercom path.

8.30 One 22A-49 apparatus unit is required for each station code or each CO/PBX line equipped with an external signaling device. The maximum resistance of each lead between the 21A Communication System and the 22A-49 apparatus unit is 25 ohms.

8.31 The KS-16301-type auxiliary signals are recommended as external signaling devices for use with COM KEY 2152. Refer to Section 463-110-100 for identification, installation, operation, maintenance, and ordering information on the KS-16301-type signals.

8.32 The external power supply used to operate the signaling devices must be properly fused and have the capacity to adequately power the signaling devices.

8.33 Information found in Section 167-416-201, 167-440-201, or 167-446-101 may be used as a guide toward selecting an appropriate power supply. Do not use a power supply that exceeds the contact rating of the 22A-49 apparatus unit which is 130 volts, 1.5 amps, 25 volts/amps.

M. Automatic Private Line

8.34 A 415-type KTU can be used to supply private line circuits (with optional hold and visual indication) for appearance in the following CO/PBX line positions if the system is equipped with music-on-hold:

- 702-type feature panel—J4A
- 703-type feature panel—J1B, J2A, J2B, J3A, J3B, or J4A.

If the system does not have music-on-hold, the 415-type KTU can be put in any connector of a 702-type or 703-type feature panel used for a CO/PBX line. A 415-type KTU or equivalent is required at the distant end.

8.35 To provide the private line circuit, install the 415-type KTU in place of a 400-type KTU in the proper jack and connect the T and R to the distant end on the normal CO/PBX incoming line termination. If the appearance is on one of the multipurpose buttons, cross-connection must be made on block 1 in the same manner as for a personal line appearance. The private line can appear at other stations by the use of vertical bridging on block 1 of the connecting units. In addition to these connections, the connection to the music-on-hold circuit, if so equipped, must be removed from the line position being used by the 415-type KTU.

8.36 Line positions 7, 9, 10, 11, 12, 13, and 14 have provision for removing music-on-hold circuit. If a 415-type KTU is used in any one of these positions, the corresponding factory-provided strap on block 2 of the 100A1, 101A1, 101A2, or 111A1 connecting unit must be removed. It should be noted that if a block of 7 line positions is to be equipped with 415-type KTUs, the music-on-hold feature can be eliminated by removing the 451B or 498A KTU associated with those 7 lines. Removal of the music-on-hold KTU eliminates the requirements for removing any straps on block 2.

N. Music-On-Hold

8.37 Music-on-hold requires one 33A or 33B voice coupler per system and a CP music source. In addition, KTUs are required as follows.

- 702A or 703A feature panel—one 451B KTU per each 7 CO/PBX lines.
- 702B or 703B feature panel—one 498A KTU (maximum of 4 circuits) equipped with a 116A1 CM (3 additional circuits) for each 7 CO lines.

Note: The 451B and 498A KTUs are not electrically compatible and cannot be interchanged between A-coded and B-coded feature panels.

8.38 The CP music source must have an output impedance low enough to drive an 8-ohm load without distortion. The music source must also be adjustable so the listening level of the music-on-hold may be adjusted.

Caution: *The output of the CP music source must furnish ac coupling only, thus blocking all direct current to the input terminals of the 33-type voice coupler. The CP music source should be able to deliver up to one watt into an 8-ohm load. The 33-type voice coupler will accept input from any CP apparatus that does not blow the fuses in the voice coupler. If the customer wants a copy of the technical reference covering the 33-type voice coupler, contact the local Telephone Company Business Office or the Marketing Representative. If a service call is caused by a malfunction of the CP equipment, billing should be made in accordance with Section 660-101-312.*

O. Loudspeaker Paging and Background Music

8.39 Paging may be provided in up to three separate zones with each zone having up to seven indoor or outdoor speakers. The system has the flexibility of allowing all paging amplifiers or any combination of amplifiers to be activated by dialing one of the codes (usually 37, 38, or 39). In an 18-station system, code 19 is used for paging. Only one paging call may be made at a time since paging uses the intercom selector. If any station picks up the intercom path, paging will be interrupted. The paging option straps must be placed before the amplifiers will operate.

8.40 A paging system should be loud enough to be heard, but not loud enough to annoy those working near speakers. The paging amplifiers (475C KTU) has a peak power output of 3 watts. The number and location of the speakers are influenced by the environment in which the speakers are used. Several samples of speaker placement are shown in Fig. 18. It may be necessary to experiment with speaker placement on site for proper results. General information on loudspeaker paging systems can be found in Section 981-251-100.

Note: To reduce feedback, no speaker should be closer than 60 feet to any station used for paging.

8.41 In COM KEY 2152, the paging amplifiers can be activated in three combinations as determined by the placement of the zone straps. Each amplifier can drive up to seven speakers. If more than seven speakers are required in a particular zone, additional amplifiers must be wired to be activated by that zone code. In addition, if combinations of zones are required to make up a zone, combinations of amplifiers must be activated by the same code. As an example, the first zone could include speakers 1 and 2 driven by the first amplifier and activated by dialing code 37. The second zone could include speakers 3, 4, and 5 driven by the second amplifier and activated by code 38. The third zone could include speakers 1, 2, 3, 4, and 5 driven by the first and second amplifiers and activated by code 39. Install the KTUs only in option slots J7A and J7B of the 702-type panel and J10B of the 703-type panel.

Do not use the other two option slots in the 703-type panel for a 475C KTU. Straps are factory-wired to the usable jacks for the PT, PR, PA, and PC leads but straps must be added to

activate the desired zones. In addition, straps must be added to wire the PC1, PC2, and PC3 leads to the proper intercom code.

8.42 On a DSS console, if provided, the location of the paging button(s) will not change regardless of the code assigned. Paging code 1 (PC1) will always appear on the first paging button, paging code 2 (PC2) on the second, and paging code 3 (PC3) on the third. When paging is provided, the 812365948 button stop, if provided, must be removed from the associated paging button of the DSS console.

8.43 If a code other than 37, 38, or 39 (code 19 in an 18-station system) is assigned for paging, an 812365948 button stop must be placed in the corresponding button of the DSS console to prevent depression. For instance, if code 6 is assigned for paging, the DSS button assigned to code 6 must have a button stop.

8.44 When one or more of the paging buttons on a DSS console is depressed, those buttons will flash. This notifies other attendants in a system having multiple consoles that paging is in use. Only one DSS console may page at a time, even if the system has more than one paging zone. Simultaneous operation of paging buttons from one DSS console is permissible. This results in paging connections to the associated zones. A page from a DSS console will preempt a page originating over the intercom.

8.45 Speakers used for paging in the 21A Communication System must be 45-ohm impedance. Use KS-218801, L1 loudspeaker for indoor locations and KS-21939, L2 loudspeakers for indoor or outdoor locations where a horn-type speaker is required. The KS-21880, L1 can be wall-mounted or hung over an outlet box. The KS-21880, L1 and KS-21939, L2 speakers are both equipped with an internal volume control.



Speaker volume level will be affected by changes in room content. The addition of furniture, draperies, carpeting or wall covering may necessitate increasing speaker volume.

When using outdoor speakers, the speaker leads must be protected in accordance with local instructions or Section 460-100-400.

8.46 Background music requires the installation and connection of a 33A or 33B voice coupler. If music-on-hold is also provided, the same music source and coupler are used.

P. External Paging System Access

8.47 A COAM paging system or a separate telephone company-provided paging system is connected to the 21A Communication System through a 20A-49 apparatus unit. The 20A-49 apparatus unit is mounted externally to the 21A Communication System. It does not provide contact closure to the customer-owned paging system.



The 20A-49 apparatus unit provides a nominal 300-ohm output to a customer-owned paging system. It does not provide a means to activate the customer equipment; therefore, customer equipment must be in the ON mode at all times.

Q. Preset Conference on Intercom

8.48 Preset conference on intercom allows up to three groups of preselected stations (maximum of five stations per group) to be alerted simultaneously. Individual stations can appear in only one group. Normally, codes 37, 38 and/or 39 are used for conferencing; but if these codes are used for paging, any other codes may be assigned but must be sacrificed for station use.

8.49 To connect preset conference, a strap must be run from the C1, C2, or C3 terminal to the preset conference terminal for the code assigned on block 2 in the 100A1, 101A1, 101A2, or 111A1 connecting unit. Another strap must be run from the PC1 to PC5 terminals to the preset conference terminals of the station codes in the group.

8.50 To use preset conference:

- (1) Lift handset.
- (2) Select idle intercom path and depress associated button.
- (3) Dial code assigned to signal desired group of stations.
- (4) Announcement is made to select stations simultaneously. If stations are equipped

with HFAI, they may reply to caller but other stations will not hear reply and cannot converse with each other. If an HFAI station has the DND feature operated, the station will not receive the tone and voice signaling, and the calling party will not receive the DND tone. If any station goes off-hook, the intercom line is seized and voice signaling stops at all other sets.

Note: The attendant will **NOT** have preset conference capability from a DSS console. If a preset conference code other than 37, 38, or 39 is used and the system is equipped with HFAI option, an 812365948 button stop must be placed under the DSS button of the preset conference code to prevent button depression.

R. Speakerphone

8.51 Full speakerphone service can be provided at all stations in the system using either 3B (MD) or 4A speakerphone components.

Note: Speakerphone does not prevent normal operation of the telephone set for originating or receiving calls.

If 4A speakerphone is provided, order a D-180508 Kit of Parts for each speakerphone location to provide the color-coded parts for the 4A components.

8.52 To originate a call using a speakerphone:

- (1) Depress CO/PBX button associated with an idle line.
- (2) Momentarily depress transmitter ON button. ON lamp lights and dial tone is heard through the loudspeaker.
- (3) Dial number in normal manner.
- (4) When called party answers, transmitter and loudspeaker are used to carry on the conversation. Adjust volume level as desired.

8.53 To answer an incoming call using speakerphone:

- (1) When audible tone signals an incoming call, depress CO/PBX or intercom key associated with flashing lamp.

(2) Momentarily depress transmitter ON button. Audible signal is silenced and the speakerphone is connected to the line.

(3) Answer call using transmitter and loudspeaker to carry on conversation.

8.54 To disable transmitter when it is desired not to transmit conversation from the surrounding area to the distant station:

(1) Depress transmitter ON button during entire period transmitter is to be disabled.

Note: With transmitter disabled, conversation will not be transmitted to the distant station; however, the distant party may be heard over the loudspeaker.

(2) Release transmitter ON button and system is restored to hands-free operation.

8.55 To transfer from handset to speakerphone operation:

(1) Put line on hold

(2) Hang up handset

(3) Turn speakerphone on

(4) Depress line button.

8.56 To transfer from speakerphone to handset operation, lift handset during speakerphone operation to automatically transfer to handset operation. When it is necessary to transfer back to speakerphone, refer to paragraph 8.55 to prevent disconnect. To terminate a call on speakerphone, momentarily depress transmitter OFF button. In the case of a 128A4 or 138A4 console, the release button must also be depressed.

5. Additional Ring Transfer

8.57 Additional ring transfer employs the use of a separately mounted 6041G key in conjunction with the ring transfer button on the attendant position(s) telephone set or console. The 6041G can be wired to permit transfer of incoming CO/PBX calls to one of up to five choices of station(s). The hold button of the key is used as a release button. This feature adds flexibility to ring transfer feature. Where only one button is available on

11-, 13-, and 20-button answering positions or three available on the 138A4- and 128A4-type consoles.

8.58 To effect additional ring transfer, the preferred button on the 6041G is depressed, locking it down, then the ring transfer button on the attendant station telephone set or console is depressed which also locks down. To return calls to the attendant, the ring transfer button is again depressed, releasing it, and the hold button on the 6041G key is depressed, releasing its button.

T. Toll Restriction

8.59 The toll restriction circuit used (471-type KTU) **requires that the CO line reverse the battery on the tip and ring of the line when a toll call is attempted.** Two arrangements can be provided:

- Restriction on a square line with all stations including attendants restricted
- Restriction on a personal line with some stations restricted and others unrestricted.

Note: Toll restriction and privacy cannot be offered at the same time if the 471A (MD) is used, both features can be provided with the 471B or 471C KTU.

8.60 Either arrangement requires a 471-type KTU per restricted line and a suitable mounting external to the 21A Communication System. A 620A modular panel should be used to mount the first eight 471-type KTUs and a 642A panel for each four additional KTUs. A 19B2 power unit and a 92A connecting block are required to power the panels, and additional 66-type connecting blocks may be required to provide sufficient multiples.

8.61 In both arrangements, the CO/PBX line is taken first to the T(CO) and R(CO) input of the 471-type KTU and the T(STA) and R(STA) from the 471-type KTU to the normal line input of the 21A Communication System.

U. Automatic Signaling Intercom

8.62 Automatic signaling intercom supplements the dial intercom circuitry in the COM KEY 2152 to provide a private voice and tone path between two stations such as a boss and secretary. Where required, the arrangement can also serve

several stations to one station, for instance, where more than one boss shares the same secretary. In this instance, however, the secretary can only signal one boss. Signaling can optionally be 1-way in either direction or 2-way.

8.63 Installation of each of the automatic signaling intercoms requires use of one of the two multipurpose button positions at each of the stations involved and a 481-type KTU per automatic signaling intercom circuit installed in the optional connectors of the 702- or 703-type panel. If automatic signaling intercom is supplied, the factory-placed paging straps to the connector used must be removed and the wiring for the automatic signaling intercom placed. It is preferable to use option slots 4 or 5 (Fig. 9) to provide this feature.

8.64 The intercom operates as follows.

- (a) The originating station goes off-hook and depresses the button associated with the automatic signaling intercom circuit.
- (b) The associated button lamp will flash at all stations on the circuits and the called station will receive a tone alert in the set speaker the same as for dial intercom.

Note: Other stations calling the called station by dial intercom will receive a steady preempt tone.

- (c) The calling station may now voice signal the called station. If 2-way conversation is required, the called station goes off-hook and depresses the flashing button which turns to steady. Conversation is now possible using the handsets.

Note: Automatic signaling intercom provides voice and tone signaling even if the station is equipped with HFAI and the DND is activated.

- (d) If only two stations are in the circuit, operation is exactly the same in the other direction.

V. Station Restriction

8.65 This feature prevents any outgoing CO/PBX calls from being made at a restricted station. The restricted station may receive CO/PBX calls

or place and receive intercom calls, but cannot call out on CO/PBX lines. This is accomplished by adding a diode (rotary dial sets only) and reversing one or two leads in the telephone set.

Note: Station restriction and CO/PBX intercom conferencing cannot be provided at the same station.

W. Answering Positions

8.66 The 21A Communication System provides terminations for two designated answering or attendant positions. As factory-wired, intercom code 0 is the first attendant and code 10 would normally be the second. Other stations may be designated if desired. The telephone set or console to be used at these positions will be dependent on the capacity of the system and the system features required. Each of the attendant positions will require one of the following for handling CO/PBX lines:

- Maximum 7 lines—832/2832CM or EM telephone set
- Maximum 14 lines—833/2833CM or EM telephone set and 128A3R or 128A3T telephone console
- Maximum 21 lines—128A4R, 128A4T, 138A4R, or 138A4T telephone console.

8.67 The **832C or 2832C** telephone sets have a hold, 7 line pickups (2 multipurpose), 2 intercom pickups, recall, privacy release, and ring transfer. In systems without privacy, the privacy circuit must be disabled. The **833C or 2833C** telephone sets have hold, 14 line pickups (2 multipurpose), 3 intercom pickups, recall, and ring transfer. In systems with privacy, a D-180486 Kit of Parts must be installed in the 833C- or 2833C-type telephone sets.

8.68 The **128A3-type** console has the following (Fig. 16): hold, 12 line pickups, 3 intercom pickups, 2 multipurpose line pickups, a release button, ring transfer, recall, and privacy release on the left side of the faceplate. On the right side of the faceplate is an intercom/line conferencing key field consisting of 12 line pickups, 2 multipurpose line pickups, 3 intercom pickups, and a status lamp which indicates when a call set up through the conferencing field has been terminated. The

consoles are provided with two sets of jacks for a head telephone set or handset which must be separately ordered. The handset cradle is inoperative. Also supplied is a privacy circuit which must be connected in systems with privacy.

8.69 The **128A4** console has the following (Fig. 16): hold, 21 line pickups, 3 intercom pickups, 2 multipurpose line pickups, a release button, 3 ring transfers, privacy release, and recall. The **138A4** has the same key layout on the lower portion but, in addition, has an upper intercom/line conferencing key field which contains 21 line pickups, 3 intercom pickups, and a status lamp which indicates when a conferencing call is completed. The consoles are equipped with jacks for a headset or handset which must be separately ordered. The handset cradle is inoperative. These consoles are supplied with a privacy circuit which must be connected in systems with privacy.

8.70 In addition to one of the line handling telephone sets or consoles listed above, another console may be required, the type depending on whether direct station selection with dedicated link (DSS/DL), station busy (SB), and/or message waiting (MW) are to be supplied. One of the following should be used:

- 6B1 console—MW control and SB lamps, maximum 18 stations
- 7B1 console—MW control and SB lamps, maximum 34 stations
- 6C1 console—DSS with SB, maximum 17 stations
- 7C1 console—DSS with SB, maximum 34 stations
- 128A6Y console—DSS with SB, maximum 52 stations
- 138A6Y console—DSS and MW with SB, maximum 52 stations.



If there is only one DSS console in the system, it must be cut down as console 1 on all cutdown blocks.

8.71 The **6B1** console (Fig. 17) contains a 20-button lamp field (two spare). The lamp under

the buttons light when the associated station is off-hook. The locking-type buttons are used to light the MW (Hold) lamp at the stations. The 7B1 console performs the same functions but has 40 buttons (six spare) for a system up to 34 stations.

8.72 The **6C1** console is a 20-button console made up of 17 DSS/SB buttons, one paging, one restore, and one reenter button (Fig. 13). The **7C1** console contains 40 buttons—34 DSS/SB, three paging, one restore, one reenter, and one spare. Any combination of DSS buttons may be depressed simultaneously for multistation signaling, but this feature should not be used for conferencing since the console is tied up for the duration of the call. Preset conferencing is not allowed from the DSS console. After a CO/PBX pickup button is depressed on the line answering telephone set or console, depressing any DSS button on the 6C1 or 7C1 console will automatically put that line on hold. The line pickup button does not restore and, if desired, the attendant can reconnect to the line by depressing the reenter button. When the attendant depresses a DSS button on a 6C1 or 7C1 console, the signaling path is over the dedicated link and does not involve the intercom selector, leaving it available for station-to-station calls. The restore button is used to mechanically release any DSS button(s) locked down.

Note: In systems using a 444B and a 6C1 console, 19 and 20 can be converted to 2 and 3 by moving the two option straps on the 444B to the storage position. In addition, on block 2 of the 100A1, 101A1 (MD), 101A2, or 111A1 connecting unit, move the factory-provided straps on 24F-25F and 24G-25G to 23F-24F and 23G-24G, respectively.

8.73 The **128A6Y** console (Fig. 13) offers the same features as the 6C1 or 7C1 but has a capacity of 52 stations. The **138A6Y** console has the same features as the 128A6Y and, in addition, has a field of 52 MW buttons. If both MW and SB are provided, the SB lamps are in the DSS field.

8.74 Terminations are provided in the 21A Communication System for two answering positions. These terminations appear on blocks 3, 4, 5, and 6 of the 100A1 and 101A1/A2 connecting units, blocks 5 and 6 of 100B1 connecting unit, blocks 3 and 4 of 101B1 connecting unit, and J53 through J70 of 111A1 connecting unit.

Caution: *Since multiple connector cables may be involved in supplying consoles, care should be taken to identify binder groups to assure terminations in the proper order. If a DSS console is used and the distance between the console and the KTU is over 100 feet, the leads in binders 3 and 5 must be run in separate cables to prevent noise pickup.*

X. Third Answering Position/Console Capability

8.75 Terminations are provided in the connecting units for two answering positions (codes 0 and 10). One additional answering position can be added but requires that the terminations be external to the connecting units. If a third console is required, the terminations for code 10 are used to provide the terminations for the cabling to the external connecting blocks. The connector cables from the second and third answering positions are then terminated on the external blocks.

8.76 Any code may be assigned to the third answering position, but the code assigned will not be available as a station code.

8.77 As factory-wired, the 21A Communication System furnishes common audible ringing at station code 0. All incoming lines will ring at that station unless otherwise arranged (see information on common audible and additional station ringing). The calls are answered by lifting the handset (if using telephone set) and depressing the flashing line pickup button. The method of forwarding the call may vary depending on the equipment at the answering station, as follows.

(a) With all arrangements, the answered call can be placed on hold using the HOLD key on the telephone set or console at which time the steady lamp will change to wink. The attendant then selects an idle intercom path, dials the desired station, and voice signals that there is a call on a particular CO/PBX line. If necessary to reenter the conversation, the pickup button must be depressed again.

(b) If equipped with a DSS console, the attendant can voice signal the desired station by depressing the associated locking DSS button. When the DSS button is depressed, the CO/PBX line is automatically put on hold. Using the DSS does not require accessing an intercom path

since the attendant uses the dedicated link which does not require the selector. If the intercom station is equipped with HFAI, 2-way conversation is possible. A call from a DSS console will preempt an automatic signaling intercom call, dial intercom call, or CO/PBX ringing. The attendant may then go back to the held line by depressing the REENTER button on the DSS console, leaving the held line to be picked up by the station, or may pick up another CO/PBX line by depressing the associated button after depressing RESTORE button to clear DSS console.

(c) At positions having an intercom/line conferencing console (128A3/138A4), incoming calls are answered using the 14/21 line pickup buttons on the lower field. Calls can be forwarded in the usual manner by holding and using an intercom path or by DSS if equipped. In addition, the intercom/line conferencing field can be used to connect a line that does not appear at a station, such as a nonsquare line, as follows:

- (1) Answer flashing line by depressing button on lower panel, place line on hold.
- (2) Select idle intercom path (button dark) and signal desired station using dial intercom.
- (3) When station answers, depress buttons in intercom/line conferencing field associated with held CO/PBX line and selected intercom link which will connect outside party with station.
- (4) Operate RLS button on lower field to remove attendant from conversation.
- (5) When the intercom station goes on-hook, the status lamp in the intercom/line conferencing field will light indicating the connection can be released by depressing the push-to-operate, push-to-release buttons. **Only one call at a time can be processed through the intercom/line conferencing field.**

8.78 The intercom/line conferencing field can also be used to set up a preset conference call. The procedure is the same as above except the attendant dials the preset conference code on the intercom. Once the conference stations are on the line, the CO/PBX line button in the intercom/line conferencing field is depressed. A third option

permits the attendant to make a CO/PBX call for stations unable to do so, ie, an intercom-only station. To do this, the attendant first completes the CO/PBX call by depressing button in the lower field and dialing the desired number. The attendant then places that call on hold and calls the station on dial intercom using an idle path on the lower button field. The attendant then operates the intercom button, then the CO/PBX line button in the intercom/line conferencing field corresponding to the two parties. After operating the RLS button, the attendant is free to make other calls.

Y. Station Telephone Set Options

8.79 All telephone sets used with the 21A Communication System are modular in design. Refer to Table B for faceplate colors.

8.80 The following sets can be used as station telephone sets:

- 832/2832BM, CM, DM, and EM
- 833/2833BM, CM, DM, and EM
- 575/2575AM (intercom only—desk)
- 853/2853 (intercom only—wall)

8.81 The 10- and 20-button telephone sets can be intermixed in COM KEY 2152, depending on the connecting unit(s) used as follows:

- 100A1—up to 34 stations (twenty-eight 10-button and six 10- or 20-button)
- 100B1—additional 18 stations (10- or 20-button)
- 100B1—additional 18 stations (10- or 20-button)
- 101A1 (MD), 101A2, or 111A1—up to 28 stations (10- or 20-button)
- 101B1—additional 24 stations (10- or 20-button)

Note: The number of 20-button sets served from a 100B1 connecting unit can be increased by 10 or 12 sets by installing two 66R1 connecting blocks in the blank spaces of the connecting unit. The blocks provide terminations for the second binder of the additional 20-button sets. The maximum growth of 10 or 12 sets is dependent on whether the station used to

provide the multiple is fed by a 50- or 25-pair connector cable, respectively. Refer to Section 518-450-111 for connection information. Power supply requirements should also be reviewed and added capacity provided if required.

Table C lists the features supplied with the telephone sets. All stations in a mixed system must have the same number of intercom paths.

8.82 Options for the station telephone sets should be provided as follows:

(a) Recall

- All 832-, 833-, 2832-, and 2833-type telephone sets are factory-wired for recall.

(b) Privacy

- 832/2832BM, DM—available (optionally)
- 832/2832CM, EM—factory-wired
- 833/2833BM, DM—factory-wired
- 833/2833CM, EM—available (optionally).

(c) Privacy Release

- 832/2832BM, DM—not available
- 832/2832CM, EM—factory-wired
- 833/2833BM, DM—factory-wired
- 833/2833CM, EM—not available.

(d) Ring Transfer

- 832/2832BM, DM—not available
- 832/2832CM, EM—factory-provided, field-wired
- 833/2833BM, DM—not available
- 833/2833CM, EM—factory-provided, field-wired.

(e) Speakerphone

- 832-, 833-, 2832-, and 2833-type telephone sets—require addition of separately ordered 3B (MD) or 4A speakerphone components.

(f) HFAI

- 832-, 833-, 2832-, and 2833-type telephone sets—refer to paragraph 8.22. Wall-type telephone sets also require use of a #127A bracket.♦

Z. Satellite Wiring Plan

8.83 The 21A Communication System is designed for Home-Run Cabling (direct cabling) from each telephone set to the 100-, 101-, or 111-type connecting unit. Where it is more practical to serve a group of stations from a secondary location, a satellite wiring plan can be used. The satellite wiring plan is a connecting block arrangement for station terminations and is served by a cable or cables from the 100-, 101-, or 111-type connecting unit. Two methods are covered for providing the proper amounts of terminations and leads at a satellite location. One method employs prewired 14A1-type terminal blocks. The second uses standard 66-type connecting blocks and a nomograph which help to determine the number of extra lamp and lamp ground leads required.

Note: Leads that are not common to all stations must be brought to the satellite location. This includes individual station code control leads such as A1, A GRD, VS, -24C, CO, DNDL, SB, L-, ET, and ER. In addition, each personal line involved in the satellited stations must be brought to the satellite location. If a personal line is multiplied to more than one satellite station, only one appearance is necessary.



The total distance from KSU to satellite field to furthest station, for fully loaded satellite block, is not to exceed 667 feet.

8.84 Satellite Plan Using 14A1-Type Terminal Blocks:

The 14A1-type terminal blocks consist of a 66-type connecting block factory-wired to KS connectors. Connector cables are used from the connectors to the KSU—the station telephone set cables being fed from the satellite are terminated on the 66-type connecting block. Each 14A1-type terminal block will accommodate eight 25-pair station cables. One 14A1-100 terminal block is required for the first binder of each eight satellite stations, and one 14A1-75 is required for the second binder. Station

codes assigned to group A and group B can be intermixed; or, if enough stations are fed from the satellite, group A stations can be bunched on one set of terminal blocks and group B on another.

8.85 Satellite Plan Using Nomograph:

The same basic rules apply for satellites using standard 66-type connecting blocks as with the 14A1-type terminal blocks. Sufficient conductors must be run to the satellite to provide a one-time appearance of all common station leads, individual code leads, and enough L and LG multiples. The number of additional conductors required per L and LG lead is determined using the nomograph shown in Section 518-450-111.

8.86 Lamp leads in the 21A Communication System are wired as follows.

- 100A1 and 100B1: Lamp leads for lines 1 to 5 of station codes 0 to 28 and lamp leads for lines 8 to 12 of station codes 33 to 36 are wired directly from the 400-type KTUs. This is group A. Lamp leads for lines 1 to 5 of station codes 29 to 59 and lamp leads of lines 8 to 12 of station codes 42 to 59 are wired from the 453B KTUs. This is group B. Lines 1 to 5 are in the first binder of the station connector cable (10- and 20-button sets) and lines 8 to 12 are in the second binder (20-button sets only).
- 101A1/A2, 111A1, and 101B1: Lamp leads for station codes 0 to 28 are wired from the 400D KTUs (group A). Codes 29 to 36 and 42 to 59 are wired from the 453B KTUs (group B).
- The lamp leads for the first two intercom paths are wired so that codes 0 to 28 are on one fuse and 29 to 36 and 42 to 59 are on a second fuse for each circuit. The third intercom path lamps are wired to terminals IL31 and IL32 on block 1 of the 100A1, 101A1/A2, and 111A1 connecting units.

Where possible, a station grouping arrangement should be used when satelliting. Station codes from group A and group B can be intermixed in the same satellite arrangement as long as the lamp leads from groups A and B are brought out to the satellite location independently and the station codes are wired to the leads depending on their group assignment. For instance, station code 21 should have its lamp leads connected to the group A lamp leads.

8.87 The limiting factors of a satellite type wiring plan are keeping the voltage drop in the lamp loop to less than 2 volts and maintaining a low resistance A lead.

AA. Adjunct Services

8.88 Miscellaneous services that can be provided at COM KEY 2152 stations include SPOKESMAN® loudspeaker, telephone answering sets, and repertory dialers. For information on these services, refer to Section 518-450-111 and/or the sections listed below.

- SPOKESMAN Loudspeaker—Section 463-221-100
- Telephone Answering Sets—514 Division
- KS-16844 Rapidual† (MD)—Section 512-115-100
- KS-19594 Magical† (MD)—Section 512-125-100, -200, -400, -410
- TOUCH-A-MATIC® Adjunct Automatic Dial—Section 501-164-201.

†Registered Trademark of McGraw-Edison Co.

◆ TABLE A ◆

KEY TELEPHONE UNITS

KTU	FUNCTION	QUANTITY	SD/CD
400D or 400G	CO/PBX pickup, hold, release, and related services in 702A (MD) or 703A (MD) feature panel.	1 per CO/PBX line	69513-01 69651-01
400H	CO/PBX pickup, hold, release, and related services in 702B or 703B feature panel.	1 per CO/PBX line	69942-01
415B	Automatic private line circuit.	1 per private line	69559-01
424C	Dial intercom 19-code selector circuit; basic selector required in all dial pulse intercom systems.	1 per intercom system	69567-01
440A or 478B	TOUCH-TONE® adapter circuit; required when TOUCH-TONE dialing is used in system using 424C KTU selector circuit.	1 per intercom system	69906-01 69931-01
494A	TOUCH-TONE intercom selector circuit — replaces 424C and 440A or 478B KTUs on 702B panel where all stations are equipped with TOUCH-TONE dial.	1 per intercom system	69567-01
444-Type	Selector extender circuit; required in addition to 424C KTU for dial codes 1 to 39.	1 per intercom system up to 34 stations; 2 per intercom with 35 to 52 stations	69636-01
451A/B	Music-on-hold circuit; used with externally mounted 33A voice coupler and customer-provided music source. Use with 400D, G only in 702A (MD), or 703A (MD) feature panels.	1 per 7 CO/PBX lines	69652-01
498A	Music-on-hold circuit; used with externally mounted 33A voice coupler and customer-provided music source. Use with 400H only in 702B or 703B feature panels.	1 per 7 CO/PBX lines when equipped with 116A1 CM	69922-01
452A	Power failure ringing circuit; automatically “cuts through” up to seven external ringers.	1 per 7 CO/PBX lines	69652-01
453B	Lamp driver; supplements lamp driving capacity of 400D KTUs; operates up to 26 lamps; 7 circuits per unit.	1 per 7 lines in excess of 26 lamps per line	69653-01
454C	3-path intercom access; provides stations with talk battery and access to selector.	1 per 3-path intercom system	69653-01
455A	Tone-ringing signal generator; supplies CO/PBX incoming line tone ringing.	1 per installation	69652-01

◆ TABLE A (Contd) ◆

KEY TELEPHONE UNITS

KTU	FUNCTION	QUANTITY	SD/CD
457C	Paging amplifier; drives up to seven 45-ohm paging loudspeakers.	1 per paging zone (maximum 3)	69652-01
460C	2-path intercom access; provides stations with talk battery and access to selector.	1 per 2-path intercom system	69652-01
468A/B	Voice and tone alerting on intercom; supplies ringing tone to calling party, tone alerting and voice signaling to called party, input to paging amplifier; also supplies do-not-disturb tone (468B must be used if wall mounted 683AE transmitter is being installed).	1 per installation	69652-01
471C	Battery reversal toll restriction.	1 per line to be restricted	69921-01
473A	Voice operated switch (VOX) for HFAI.	1 per intercom system equipped with HFAI	69930-01
474A	DSS diode matrix and preempt tone generator; allows attendant to preempt an HFAI call with a dedicated link call.	1 per 18 stations†	69930-01
479C	Toll restriction—digit absorption rotary only	1 per line to be restricted	69921-01
481B	Automatic signaling intercom; provides for direct intercom between two stations.	1 per pair of stations connected*	69930-01

*Can also be used between one station and a group of stations. Maximum five per system.

†In 702A two are required if HFAI and DSS features are both provided.

TABLE B

COLOR CODES FOR FACEPLATES,
TELEPHONE SETS, AND CONSOLES

CODE	COLOR
-100	Avocado
-108	Teak (wood grained)
-109	Walnut (wood grained)
-111	Gold
-112	Orange
-113	Brown
-114	Red
-115	Blue
-118	Black

TABLE C
TELEPHONE SET FEATURES

FEATURES	METHOD OF PROVIDING	11-BUTTON	13-BUTTON	20-BUTTON TEL SETS	
		832BM 2832BM 832DM 2832DM	832CM 2832CM 832EM 2832EM	833BM 2833BM 833DM 2833DM	833CM 2833CM 833EM 2833EM
RECALL	Factory Provided— Factory Connected	•	•	•	•
PRIVACY CIRCUIT	Factory Provided— Factory Connected		(Note 1) •	•	
	Field Provided Field Connected				(Note 2) •
PRIVACY RELEASE	Factory Provided— Factory Connected		•	•	
RING TRANSFER	Factory Provided		•		•
	Field Connected		(Note 3) •		(Note 3) •

Note 1: Must be disabled when used as an answering position in system without privacy.

Note 2: When used as answering position in systems with privacy.

Note 3: Must be connected at all answering positions.

◆TABLE D◆

EXAMPLE OF SYSTEM COMPONENTS AS RELATED TO SIZE OF SYSTEM (SEE NOTE 5)

SYSTEMS (NOTE 6)		1	2	3	4	5	6	7	8	9	10
MAXIMUM LINES		7	7	7	7	7	7	21	21	21	21
MAXIMUM STATIONS		18 (NOTE 1)	18 (NOTE 1)	34 (NOTE 2)	28 (NOTE 2)	52 (NOTE 2)	52 (NOTE 2)	34 (NOTE 2)	28 (NOTE 2)	52 (NOTE 2)	52 (NOTE 2)
MAXIMUM 20-BUTTON SETS		2	18	6	28	24*	52	6	28	24*	52
SYSTEM COMPONENTS	121 Apparatus Box or 34-Type Cabinet	1	1	1	1	2	2	1	1	2	2
	154A Cover	1	1	1	1	2	2	1	1	2	2
	Connecting Unit	100A1	101A1, 101A2, or 111A1	100A1	101A1, 101A2, or 111A1	100A1 and 100B1	101A1, 101A2, 111A1, or 101B1	100A1	101A1, 101A2, or 111A1	100A1, 100A2, and 100B1	101A1, 101A2, 111A1, or 101B1
	Panel	702-Type	702-Type	702-Type	702-Type	702- and 703-Type	702- and 703-Type	702- and 703-Type	702- and 703-Type	702- and 703-Type	702- and 703-Type
	Power Panel	2A	2A	2B	2B	2C	2C	2B	2C	2C	2C & 2D
	455A KTU	1	1	1	1	1	1	1	1	1	1
	453B KTU	None	None	(Note 3)	(Note 3)	(Note 3)	(Note 3)	(Note 3)	(Note 4)	(Note 4)	(Note 4)

Note 1: Station capacity is reduced by 1 for each paging zone and preset conference group in excess of 1.

Note 2: Station capacity is reduced by 1 for each paging zone and preset conference group in excess of 3.

Note 3: One (1) required if system has more than 26 stations.

Note 4: One (1) required if system has more than 26 stations; second 453B required if system has more than 7 square lines and more than 26 stations.

Note 5: Exact system components required will be determined by the USOCs listed on the service order.

Note 6: Complies with sales ordering guide.

*If 7C (34 station) DSS console is installed with more than six 20-button sets, 100A1 connecting unit cannot be used. Use 101A1 connecting unit.

◆ TABLE E ◆

ORDERING GUIDE FOR COMMON EQUIPMENT AND ASSOCIATED ITEMS

USO CODE	EQUIPMENT CODE	REMARKS
K21	Feature Panel 702B	Consists of one 702B feature panel. Order 1 per system for up to 7 lines and 34 stations (702A feature panel MD).
	Box, Apparatus, 121B	Order 1 for each 100-, 101-, or 111A-type connecting unit to be wall or relay rack mounted. Also order one 197A backboard for wall mounted only applications.
	Cabinet, 34-Type	Order 1 for each 100-, 101-, or 111A-type connecting unit to be floor mounted.
	Cover, 154-Type	Order 1 if required for each 121B apparatus box or 34-type cabinet.
	Kit of Parts, D-180675	Order 1 for each 121B apparatus box to be mounted on bulb-angle relay rack.
	Kit of Parts, D-180865	Order 1 for each 121B apparatus box to be mounted on channel-type relay rack.
	Kit of Parts, D-180780	Casters for 34C cabinet—order as required.
	Kit of Parts, D-180700(MD)	Casters for 34B cabinet (MD)—order as required.
K2X	Feature Panel 703B	Consists of one 703B feature panel. Order 1 per system to add 8 to 21 CO/PBX lines or when more than 34 stations are required—703A feature panel MD.
K1Q	Unit, Connecting, 100A1	Order 1 for up to 21 CO/PBX lines and 34 station codes. Provides terminations for up to twenty-eight 7-line and six 14-line sets. Order one 444-type KTU per connecting unit.
K1S	Unit, Connecting, 100B1	Order 1 to add up to eighteen 14-line sets to above. Order one 444-type KTU per connecting unit.
K1U	Unit, Connecting, 101A1 (MD), 101A2, or 111A	Order 1 for up to 21 CO/PBX lines and 28 station codes. Terminations for up to twenty-eight 14-line sets. Order one 444-type KTU per connecting unit.
K1V	Unit, Connecting, 101B1	Order 1 to add up to twenty-four 14-line sets to above. Order one 444-type KTU per connecting unit.

◆ TABLE E (Contd) ◆

ORDERING GUIDE FOR COMMON EQUIPMENT AND ASSOCIATED ITEMS

USO CODE	EQUIPMENT CODE	REMARKS
K1A	Panel, Power, 2A	Order 1 to power 702-type panel and 100A1 CU capacity of 7 lines, two 14-line and sixteen 7-line sets.
		Order 1 to power 702-type panel and 101A-/111A1 CU capacity of 7 lines and eighteen 14-line sets.
K1B	Panel, Power, 2B	Order 1 to power 702-type panel and 100A1 CU capacity of 7 lines, six 14-line and twenty-eight 14-line sets.
K1C	Panel, Power, 2B	Order 1 to power 702-type and 703-type panel and 100A1 CU capacity of 21 lines, six 14-line and twenty-eight 7-line sets.
K1D	Panel, Power, 2C	Order 1 to power 702-type and 703-type panel and 100A1 and 100B1 CU capacity for 21 lines, twenty-four 14-line and twenty-eight 7-line sets.
K1E	Panel, Power, 2B	Order 1 to power 702-type panel and 101A-/111A1 CU capacity of 7 lines and twenty-eight 14-line sets.
K1F	Panel, Power, 2C	Order 1 to power 702-type and 703-type panel and 100A1 and 100B1 CU capacity of 7 lines, twenty-four 14-line and twenty-eight 7-line sets.
		Order 1 to power 702-type and 703-type panel and 101A-/111A1 and 101B1 CU capacity of 7 lines and fifty-two 14-line sets.
K1G	Panel, Power, 2C	Order 1 to power 702-type and 703-type panel and 101A-/111A1 CU capacity for 21 lines and twenty-eight 14-line sets.
K1H	Panel, Power, 2D	Order 1 in addition to K1G to power 702-type and 703-type panel and 101A-/111A1 and 101B1 CU capacity with K1G of 21 lines and fifty-two 14-line sets.
	Unit, Key Telephone 468-type	Voice and Tone Signaling Circuit—order 1 per system.
	Unit, Key Telephone 424C	Intercom Selector Circuit—order 1 per system.
	Unit, Key Telephone 444B	Selector Extender Circuit—order 1 for each 100-, 101-, or 111A1-type connecting unit.
	Unit, Key Telephone 454C	Order 1 per system equipped with 3-path intercom—intercom access circuit.

◆ TABLE E (Contd) ◆

ORDERING GUIDE FOR COMMON EQUIPMENT AND ASSOCIATED ITEMS

USO CODE	EQUIPMENT CODE	REMARKS
K2M	Unit, Key Telephone 460C	Order 1 per system equipped with 2-path intercom—intercom access circuit.
K2N	Unit, Key Telephone 457C	Order 1 per paging amplifier required; drives up to 7 paging loudspeakers (max. 3 per system).
K2U	Unit, Key Telephone 440A, 478B, or 494A	Order 1 per system equipped with TOUCH-TONE dialing on intercom. (The 494A KTU can only be used with the 702B panel and is not compatible with the 702A panel.)
K3T	Unit, Key Telephone 455A	Tone Ringing Generator—order 1 per system.
K5Z	Unit, Key Telephone 471-type	Order 1 per line to be toll restricted.
K20	Unit, Key Telephone 481B	Order 1 per automatic signaling intercom—maximum of 5 per system.
K22	Unit, Key Telephone 400-type	Order 1 for each CO/PBX line.
K23	Unit, Key Telephone 451B or 498A/116A1 CM	Order 1 for each 7 CO/PBX lines equipped with music-on-hold. (702A (MD) or 703A only).
K25	Unit, Key Telephone 452A	Order 1 for each 7 CO/PBX lines equipped with power failure ringing.
K26	Unit, Key Telephone 453B	Lamp Driver—order 1 for each 7 lines having more than 26 lamps per line (systems having station codes 30 or higher).

◆ TABLE E (Contd) ◆

ORDERING GUIDE FOR COMMON EQUIPMENT AND ASSOCIATED ITEMS

USO CODE	EQUIPMENT CODE	REMARKS
K27	Unit, Key Telephone 473A	Order 1 per system equipped with HFAl-voice operated switch.
K28	Unit, Key Telephone 474A	DSS diode matrix and preempt tone generator. If using 702A or 703A, order 2 for up to 34 stations and 1 additional for up to 52 stations. If using 702B or 703B, order 1 for up to 7 stations, 2 for up to 34 stations or 3 for up to 52 stations. Required when system has both HFAl and dedicated link DSS console.
K62		Common equipment for restricting first 8 lines—consists of one 620A modular panel, one 19B2 power unit, and one 92A connecting block.
K63		Common equipment for restricting 4 additional lines—consists of one 642A modular panel and one 92A connecting block.
FTP	Coupler, Voice, 33B	Order 1 per system equipped with music-on-hold and/or paging background music.
KPA	Unit, Apparatus, 20A	Order 1 per system when connecting customer-provided paging system to 21A.

◆ TABLE F ◆

ORDERING GUIDE FOR TELEPHONE SETS, CONSOLES, AND ASSOCIATED ITEMS

USO CODE	EQUIPMENT CODE	REMARKS
K51†K	Set, Telephone, 832BM-50	Order as required — rotary desk-type tel set. Also order 1 Plate, Face, 832B-* and 1 Cable, Connector, A25B per tel set.
K53†K	Set, Telephone, 832CM-50	Order as required — rotary desk-type tel set. Also order 1 Plate, Face, 833A-* and 1 Cable, Connector, A25B per tel set. Equipped with privacy/privacy release.
K51†B	Set, Telephone, 832DM-50	Order as required — rotary wall-type tel set. Also order 1 Plate, Face, 832B-* and 1 Cable, Connector, A25B per tel set.
K53†B	Set, Telephone, 832EM-50	Order as required — rotary wall-type tel set. Also order 1 Plate, Face, 833A-* and 1 Cable, Connector, A25B per tel set. Equipped with privacy/privacy release.
K54†K	Set, Telephone, 833BM-50	Order as required — rotary desk-type tel set. Also order 1 Plate, Face, 833A-* and 1 Cable, Connector, A50B per tel set. Equipped with privacy/privacy release.
K52†K	Set, Telephone, 833CM-50	Order as required — rotary desk-type tel set. Also order 1 Plate, Face, 833A-* and 1 Cable, Connector, A50B per tel set.
K54†B	Set, Telephone, 833DM-50	Order as required — rotary wall-type tel set. Also order 1 Plate, Face, 833A-* and 1 Cable, Connector, A50B per tel set. Equipped with privacy/privacy release.
K52†B	Set, Telephone, 833EM-50	Order as required — rotary wall-type tel set. Also order 1 Plate, Face, 833A-* and 1 Cable, Connector, A50B per tel set.
K51†6	Set, Telephone, 2832BM-50	Order as required — TOUCH-TONE desk-type tel set. Also order 1 Plate, Face, 2832B-* and 1 Cable, Connector, A25B per tel set.
K53†6	Set, Telephone, 2832CM-50	Order as required — TOUCH-TONE desk-type tel set. Also order 1 Plate, Face, 2833A-* and 1 Cable, Connector, A25B per tel set. Equipped with privacy/privacy release.
K51†4	Set, Telephone, 2832DM-50	Order as required — TOUCH-TONE wall-type tel set. Also order 1 Plate, Face, 2832B-* and 1 Cable, Connector, A25B per tel set.
K53†4	Set, Telephone, 2832EM-50	Order as required — TOUCH-TONE wall-type tel set. Also order 1 Plate, Face, 2833A-* and 1 Cable, Connector, A25B per tel set. Equipped with privacy/privacy release.

◆ TABLE F (Contd) ◆

ORDERING GUIDE FOR TELEPHONE SETS, CONSOLES, AND ASSOCIATED ITEMS

USO CODE	EQUIPMENT CODE	REMARKS
K54†6	Set, Telephone, 2833BM-50	Order as required — TOUCH-TONE desk-type tel set. Also order 1 Plate, Face, 2833A-* and 1 Cable, Connector, A50B per tel set. Equipped with privacy/privacy release.
K52†6	Set, Telephone, 2833CM-50	Order as required — TOUCH-TONE desk-type tel set. Also order 1 Plate, Face, 2833A* and 1 Cable, Connector, A50B per tel set.
K54†4	Set, Telephone, 2833DM-50	Order as required — TOUCH-TONE wall-type tel set. Also order 1 Plate, Face, 2833A-* and 1 Cable, Connector, A50B per tel set. Equipped with privacy/privacy release.
K52†4	Set, Telephone, 2833EM-50	Order as required — TOUCH-TONE wall-type tel set. Also order 1 Plate, Face, 2833A-* and 1 Cable, Connector, A50B per tel set.
K56VK	Set, Telephone, 575AM-50	Order as required — rotary desk-type tel set for intercom-only station. Also order 1 Cable, Connector, A25B per tel set.
K56V6	Set, Telephone, 2575AM-50	Order as required — TOUCH-TONE desk-type tel set for intercom-only station. Also order 1 Cable, Connector, A25B per tel set.
K56VB	Set, Telephone, 853AM	Order as required — rotary wall-type tel set for intercom only station. Also order 1 cable, connector, A25B per tel set.
K56V4	Set, Telephone, 2853AM	Order as required — TOUCH-TONE wall-type tel set for intercom only station. Also order 1 cable, connector, A25B per tel set.
K57†K	Set, Telephone, 832CM-50	Order 1 for each rotary dial, 7-line answering position. Also order 1 Plate, Face, 833A-* and 1 Cable, Connector, A25B per tel set.
K57†6	Set, Telephone, 2832CM-50	Order 1 for each TOUCH-TONE, 7-line answering position. Also order 1 Plate, Face, 2833A-* and 1 Cable, Connector, A25B per tel set.
K58†K (Note)	Set, Telephone, 833CM-50	Order 1 for each rotary dial, 14-line answering position. Also order 1 Plate, Face, 833-* and 1 Cable, Connector, A50B per tel set.
K58†6 (Note)	Set, Telephone, 2833CM-50	Order 1 for each TOUCH-TONE, 14-line answering position. Also order 1 Plate, Face, 2833A-* and 1 Cable, Connector, A50B per tel set.

♦ TABLE F (Contd) ♦

ORDERING GUIDE FOR TELEPHONE SETS, CONSOLES, AND ASSOCIATED ITEMS

USO CODE	EQUIPMENT CODE	REMARKS
K5H	Console, Selector, 6B1-50	18-station MW console with station busy lamps. Also order 1 Plate, Face, 6A2-* and 1 Cable, Connector, A25B per console.
K5L	Console, Selector, 6C1-50	17-station DSS console with dedicated attendant intercom link and station busy lamps. Also order 1 Plate, Face, 6A2-* and 1 Cable, Connector, A75B per console.
K5M	Console, Selector, 7B1-50	34-station MW console with station busy lamps. Also order 1 Plate, Face, 7A2-* and 1 Cable, Connector, A50B per console.
K5N	Console, Selector, 7C1-50	34-station DSS console with dedicated attendant intercom link and station busy lamps. Also order 1 Plate, Face, 7A2-* and 1 Cable, Connector, A100C per console. ‡
K5O	Console, Telephone, 128A6Y-50	52-station DSS/SB console with dedicated attendant intercom link. Also order 1 Plate, Face, 128C-*; 1 Cable, Connector, A75A; and 1 Cable, Connector, A100C per console. ‡
K5Q	Console, Telephone, 138A6Y-50	52-station DSS/SB with dedicated attendant intercom link and MW. Also order 1 Plate, Face, 238D-*; 1 Plate, Face, 238E-*; 2 Cable, Connector, A75A; and 1 Cable, Connector, A100C per console. ‡
K9G†K	Console, Telephone, 128A3R-50	Rotary dial, 14-line attendant console with intercom/line conferencing. Also order 1 Plate, Face, 128E-* and 1 Cable, Connector, A50B per console.
K9G†6	Console, Telephone, 128A3T-50	TOUCH-TONE, 14-line attendant console with intercom/line conferencing. Also order 1 Plate, Face, 128D-* and 1 Cable, Connector, A50B per console.
K5F†K	Console, Telephone, 128A4R-50	Rotary dial, 21-line attendant console. Also order 1 Plate, Face, 128B-* and 1 Cable, Connector, A75A per console.
K5F†6	Console, Telephone, 128A4T-50	TOUCH-TONE, 21-line attendant console. Also order 1 Plate, Face, 128A-* and 1 Cable, Connector, A75A per console.
K5G†K	Console, Telephone, 138A4R-50	Rotary dial, 21-line attendant console with intercom/line conferencing. Also order 1 Plate, Face, 238B-*; 1 Plate, Face, 238C-*; and 1 Cable, Connector, A75A per console.
K5G†6	Console, Telephone, 138A4T-50	TOUCH-TONE, 21-line attendant console with intercom/line conferencing. Also order 1 Plate, Face, 238A-*; 1 Plate, Face, 238C-*; and 1 Cable, Connector, A75A per console.

◆ TABLE F (Contd) ◆

ORDERING GUIDE FOR TELEPHONE SETS, CONSOLES, AND ASSOCIATED ITEMS

USO CODE	EQUIPMENT CODE	REMARKS
K29	Diode, 446F	Order 1 for each rotary tel set to be restricted from dialing.
K5U	Key, 6041G-50	Order 1 per location equipped with additional ring transfer.
	Ringer, E1C or Equiv. Signaling Device	Order 1 for each CO/PBX line to be equipped for power failure ringing
K5Y	Loudspeaker, KS-21939, L2	Order 1 for each indoor or outdoor speaker location (horn-type).
K5X	Loudspeaker, KS-21880, L1	Order 1 for each indoor speaker location (cabinet type).
K5S	Transmitter, 683A-50 (MD) or 683AE-50	Order 1 for each station including attendants to be equipped with HFAI. Also requires a 127A bracket when used with wall sets.
KAS	Unit, Apparatus, 22A-49	Order 1 for each location where signal devices external to the tel set are to be used. External signals and power supply must be separately ordered.
	Speakerphone, 3B (MD)	Refer to Section 512-620-100 for ordering information.
	Speakerphone, 4A	Refer to Section 512-700-100 for ordering information.
K5R	Block, Connecting, 66B3-50	Order as required for third answering position console capability.
KG5	Block, Connecting, 66B3-50	Order as required for third 52-station console capability.

◆ TABLE F (Contd) ◆

ORDERING GUIDE FOR TELEPHONE SETS, CONSOLES, AND ASSOCIATED ITEMS

USO CODE	EQUIPMENT CODE	REMARKS
K5V		Wiring modification for station line ringing.
K5W		Wiring modification for preset conference on intercom.

Note: Order (1) D-180486 Kit of Parts for each telephone set of this type when system is equipped with privacy.

* Add color suffix from Table B.

† To be provided by Telephone Company Marketing.

‡ If distance between KSU and DSS console is over 100 feet, leads in binders 3 and 5 must be run in separate cables to prevent noise pickup.

TABLE G

SIGNAL PRIORITIES IN STATION SPEAKERS

PRIORITY	TYPE CALL
First	Direct Station Selection (DSS)
Second	Automatic Signaling Intercom
Third	Dial Intercom
Fourth	CO Tone Ringing

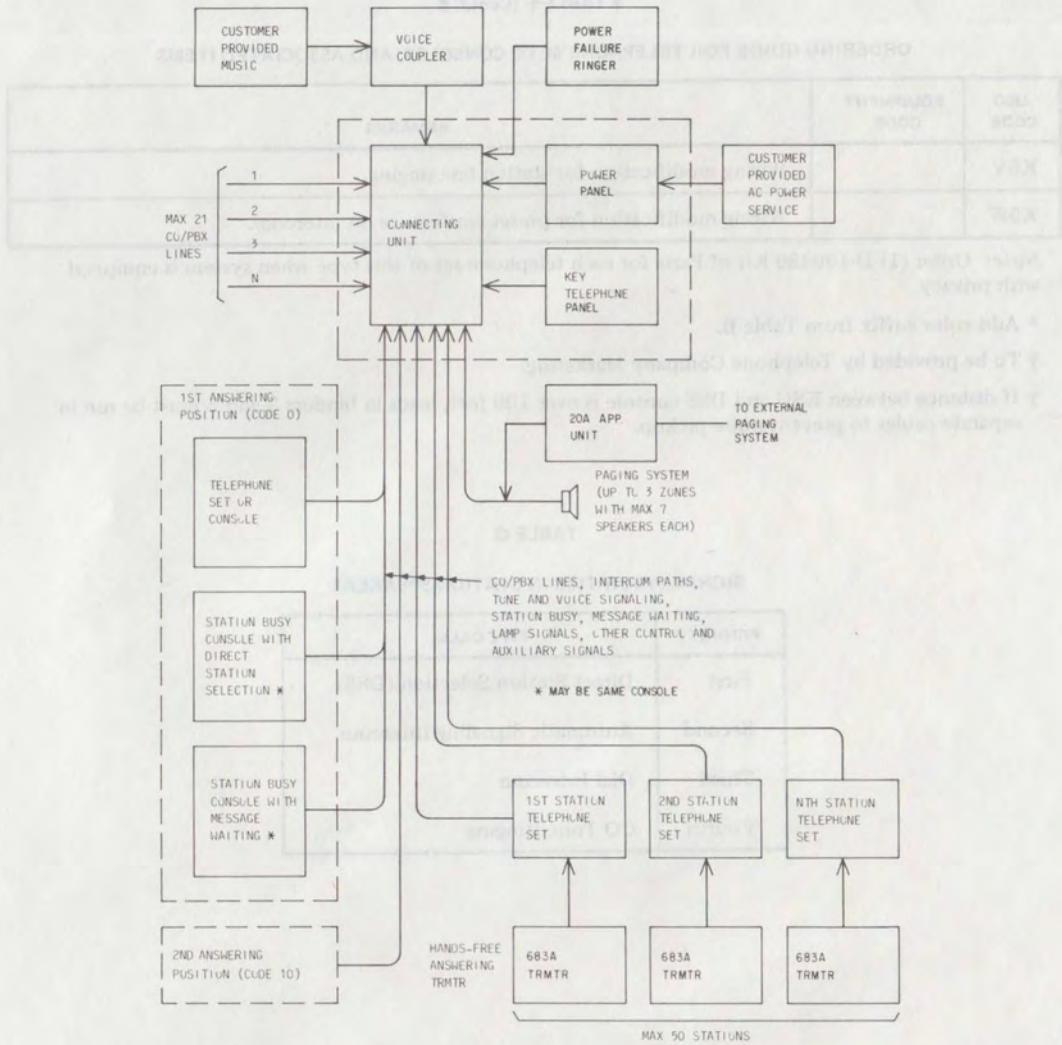


Fig. 1—Block Diagram of 21A Communication System

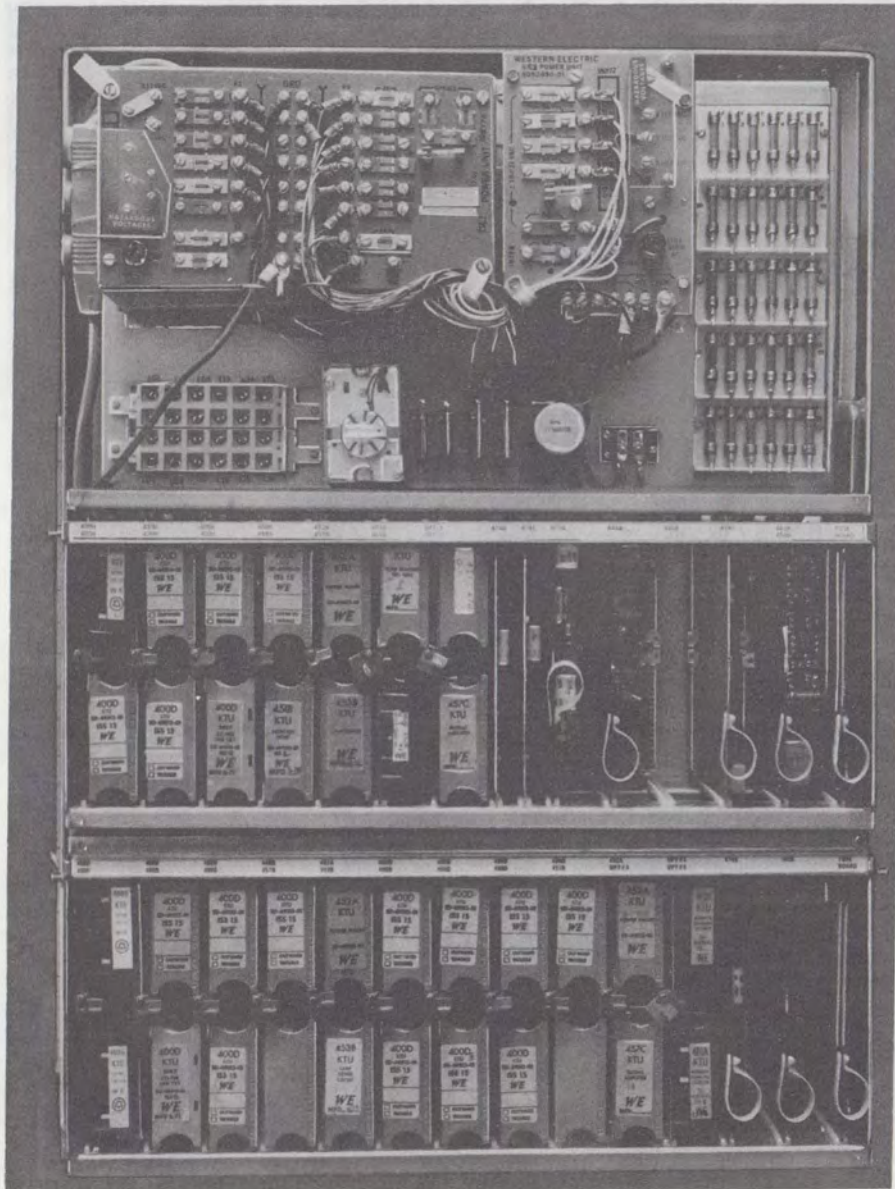


Fig. 2—121B Apparatus Box, Equipped With 2-Type Power Panel, 702- and 703-Type Feature Panels

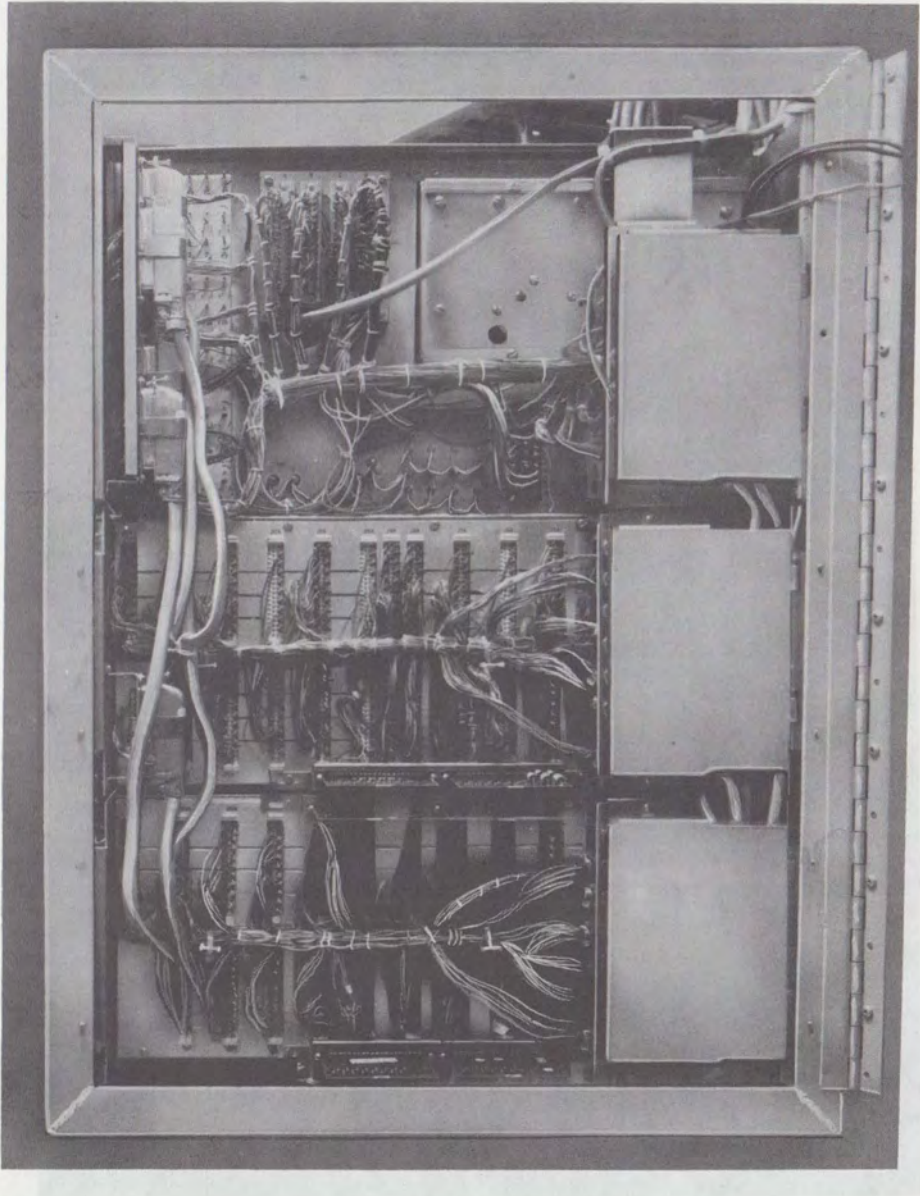


Fig. 3—121B Apparatus Box, Rear of Gate Assembly



Fig. 4—154-Type Cover

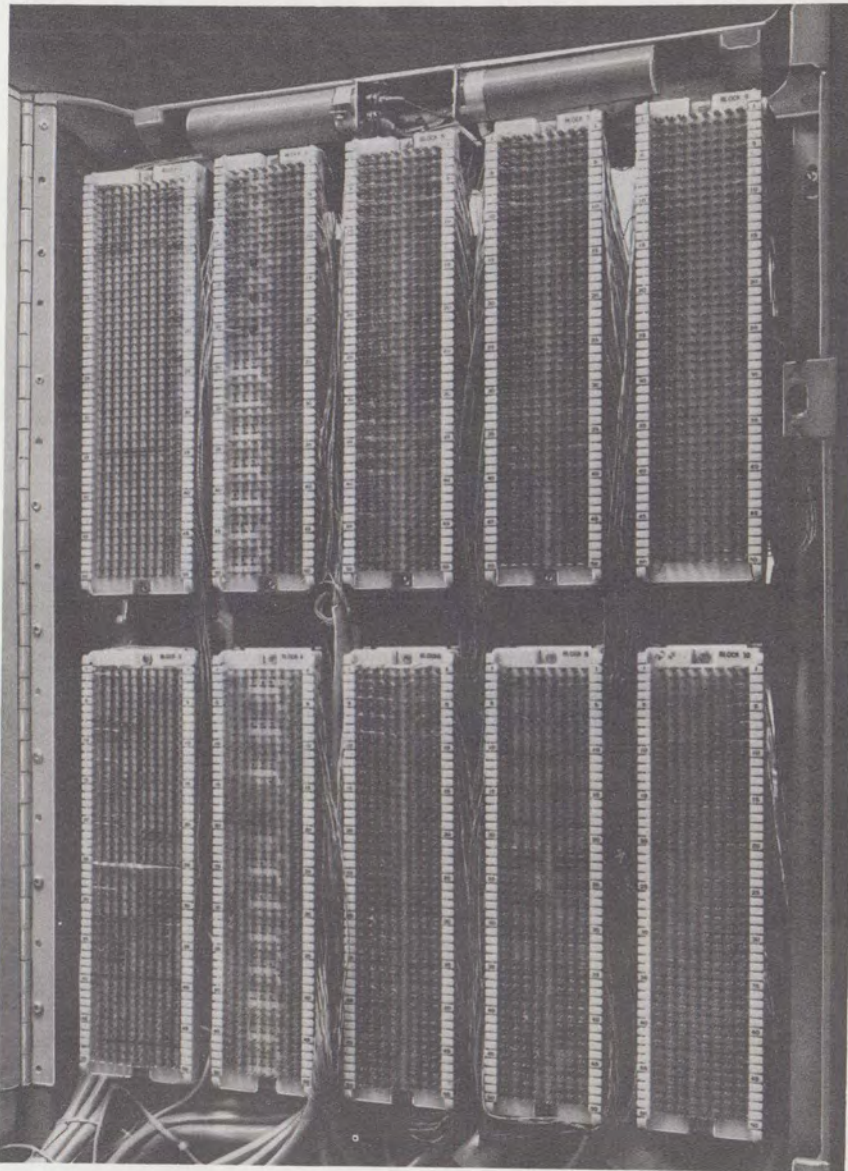


Fig. 5—100A1 (MD) Connecting Unit Mounted in 121B Apparatus Box

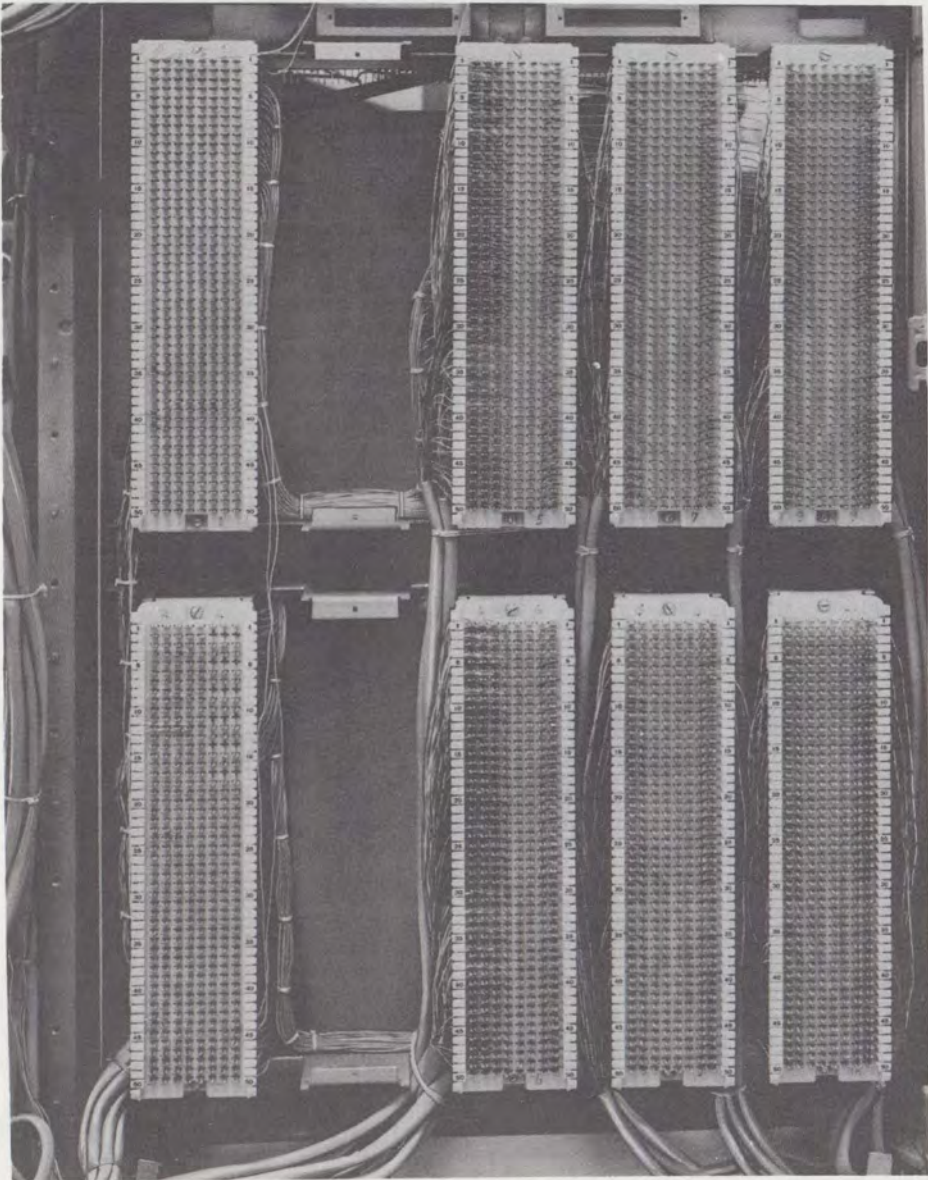


Fig. 6—100B1 Connecting Unit Mounted in 121B Apparatus Box

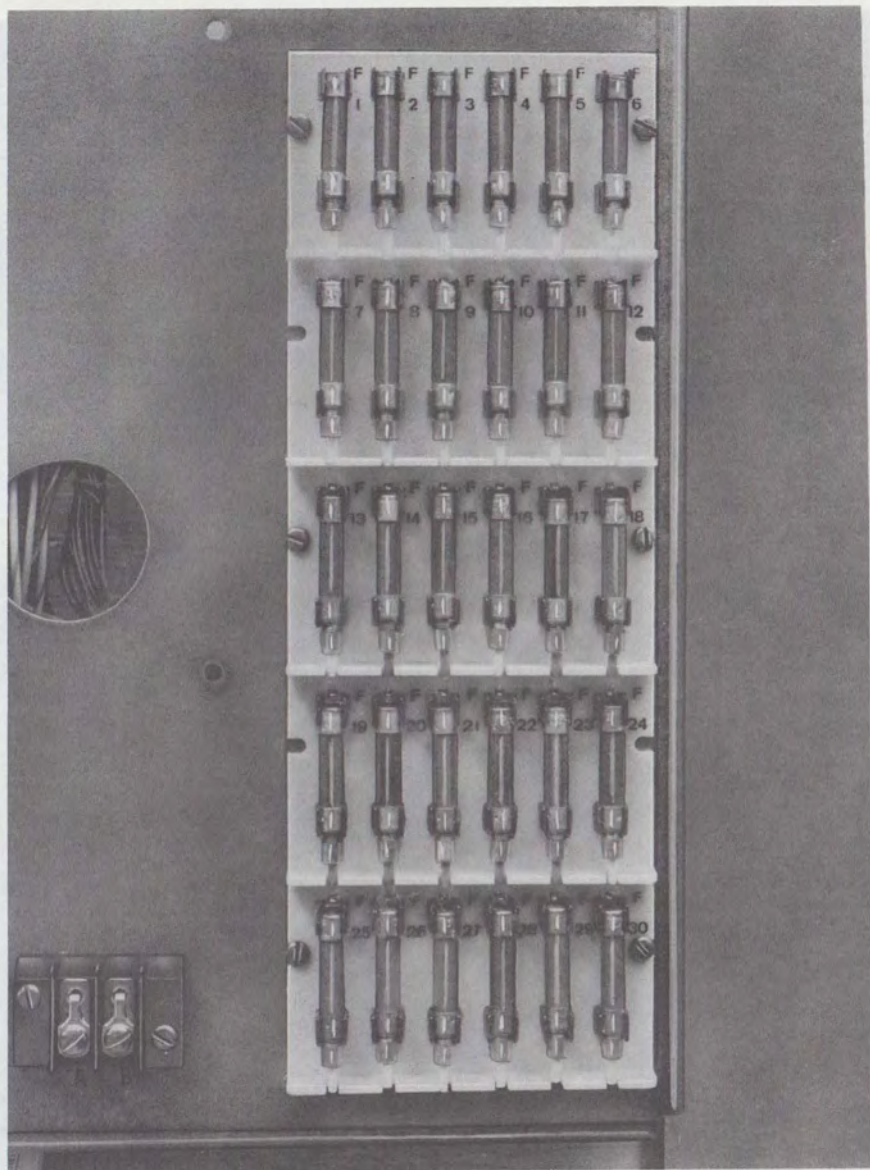


Fig. 7—Fuse Panel on 2-Type Power Panel

A. 702A PANEL (SEE NOTES)

J1A 400* (#1) 415C†	J2A 400* (#3) 415C†	J3A 400* (#5) 415C†	J4A (#7) 415C†	J5A 452A	J6A 455A	J7A OPT =1	J8A 474A	J9A	J10A 473A	J11A 473B	J12A 440A OR 478B	J13A 424C	J14A 460C OR 454C	F U S E R D
400* (#2) 415C†	400* (#4) 415C†	400* (#6) 415C†	451 TYPE J4B	453B J5B	468B J6B	OPT =2 J7B	J8B	J9B	J10B	J11B	J12B	J13B	J14B	

C. 702B PANEL (SEE NOTES)

J1A 400- TYPE (#1) 415C†	J2A 400- TYPE (#3) 415C†	J3A 400- TYPE (#5) 415C†	J4A 400- TYPE (#7) 415C†	J5A 452A	J6A 455A	J7A OPT =1	J8A 474A	J9A	J10A 473A	J11A 444B	J12A 140A OR 478B	J13A 424C OR 494A	J14A 460C OR 454C	F U S E R D
400- TYPE (#2) 415C†	400- TYPE (#4) 415C†	400- TYPE (#6) 415C†	498A J4B	453B J5B	468B J6B	OPT =2 J7B	J8B	J9B	J10B	J11B	J12B	J13B	J14	

400* - CO/PBX LINE

415C - AUTOMATIC PRIVATE LINE

424C - INTERCOM 19-CODE SELECTOR

440A - TOUCH-TONE ADAPTER

444B - SELECTOR EXTENDER

451B - MUSIC-ON-HOLD

452A - POWER FAILURE TRANSFER

453B - LAMP DRIVER

454C - 3-PATH INTERCOM ACCESS

455A - TONE RINGING GENERATOR

457C - PAGING AMPLIFIER

460C - 2-PATH INTERCOM ACCESS

468B - VOICE AND TONE ALERTING
(WITH DND TONE)

473A - VOICE OPERATED SWITCH (HFAI)

474A - DSS DIODE MATRIX AND PREEMPT
TONE GENERATOR

478B - TOUCH-TONE ADAPTER

481B - AUTOMATIC SIGNALING INTERCOM

494A - TOUCH-TONE INTERCOM SELECTOR

498A/116A1 CM - MUSIC-ON-HOLD

OPTION SLOTS - 457C, 481B

* WITH MUSIC-ON-HOLD, USE 400D OR G KTU WITH 451B KTU (MOH); NOT 400H.
WITHOUT MUSIC-ON-HOLD, USE 400D, G, OR H KTU WITH 451B KTU (MOH).

† IN SYSTEM WITH MUSIC-ON-HOLD, USE 415C KTU IN CONNECTOR POSITION 7 OR 9 THROUGH 14.

NOTES:

1. USE 451 TYPE KTU ONLY IN A 702A PANEL OR A 498A W/116A1 CM IN A 702B PANEL.

2. 494A KTU MAY ONLY BE USED IN 702B PANEL WHERE ALL STATIONS ARE EQUIPPED WITH TOUCH-TONE DIALS.

Fig. 8—Jack and KTU Assignments—702-Type Feature Panel

J1A	J2A	J3A	J4A	J5A	J6A	J7A	J8A	J9A	J10A	J11A	J12A	J13A	J14A
400-TYPE #8	400-TYPE OR 415C #10	400-TYPE OR 415C #12	400-TYPE OR 415C #14	452A	400-TYPE #5	400-TYPE #17	400-TYPE #19	400-TYPE	452A	OPT #5			
											474A	444A	F U S E
400-TYPE OR 415C #9	400-TYPE OR 415C #11	400-TYPE OR 415C #13	400-TYPE OR 498A	453A	400-TYPE #16	400-TYPE #18	400-TYPE #20	451A OR 498A	OPT #4	OPT #5			B O A R D
J1B	J2B	J3B	J4B	J5B	J6B	J7B	J8B	J9B	J10B	J11B	J12B	J13B	J14B

400-TYPE - CO/PBX LINE (NOTE 1)
 415C - AUTOMATIC TIE LINE (NOTE 3)
 444A - SELECTOR EXTENDER
 498A - MUSIC ON HOLD (NOTE 2)
 452A - POWER FAILURE TRANSFER
 453A - LAMP DRIVER
 474A - DSS DIODE MATRIX AND PRE-EMPT TONE GENERATOR
 481B - AUTOMATIC SIGNALING INTERCOM
 OPTION SLOTS - 457C, 481B

NOTES:
 1. USE A 400H KTU ONLY, EQUIPPED WITH A 114A1 ON AS A LINE CIRCUIT IN A 703B PANEL.
 2. USE A 451-TYPE KTU ONLY IN A 703A PANEL OR A 498A KTU ONLY IN A 703B PANEL.
 3. THE 415C KTU CAN BE PUT IN ANY CONNECTOR USED FOR CO/PBX LINE (READ PARAGRAPHS ON AUTOMATIC PRIVATE LINE).

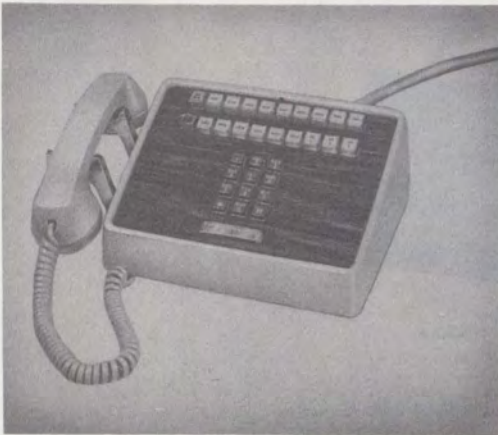
Fig. 9—Jack and KTU Assignments—703-Type Feature Panel



A. 832BM TELEPHONE SET



B. 2832CM TELEPHONE SET



C. 2833CM TELEPHONE SET

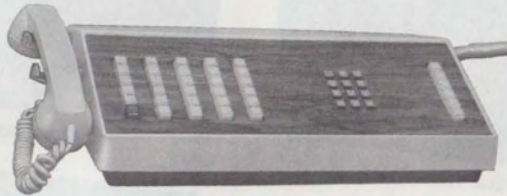


D. 832EM TELEPHONE SET

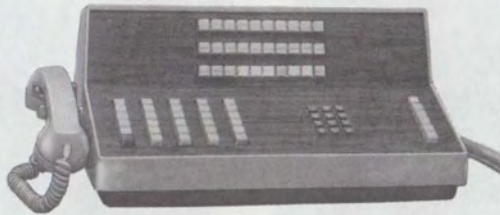
Fig. 10—Typical Telephone Sets Used With COM KEY 2152



A. 128A3 TYPE CONSOLE



B. 128A4 TYPE CONSOLE

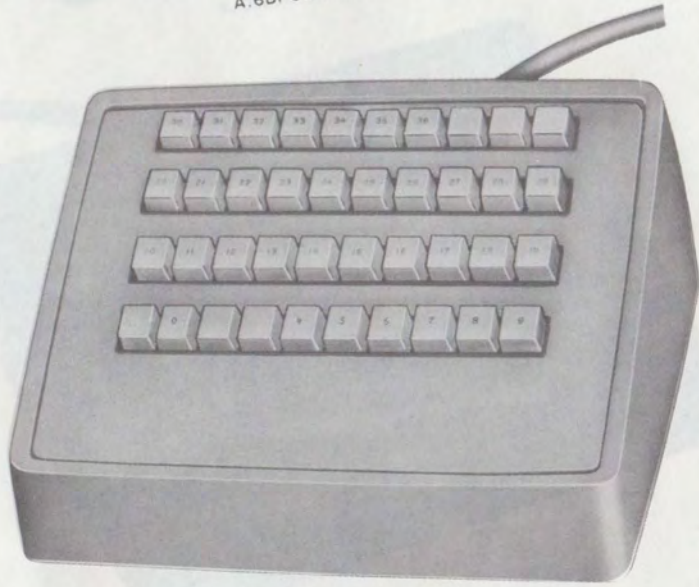


C. 138A4 TYPE CONSOLE

Fig. 11—128A3-, 128A4-, and 138A4-Type Consoles



A. 6B1 CONSOLE

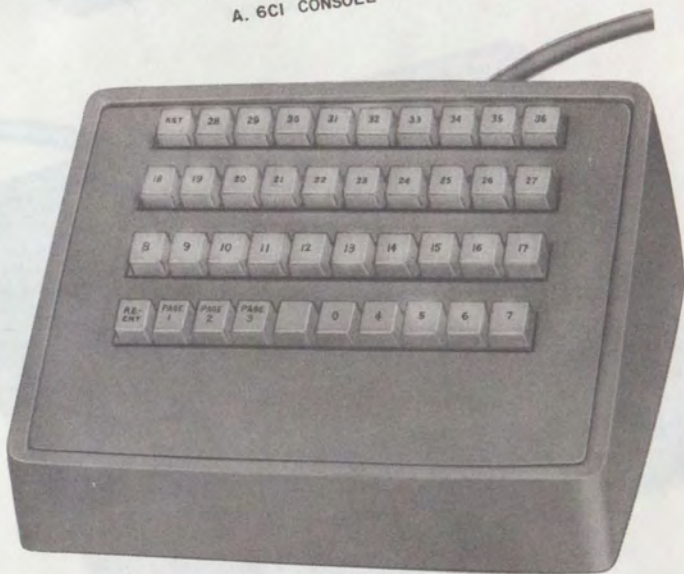


B. 7B1 CONSOLE

Fig. 12-6B1 and 7B1 Consoles

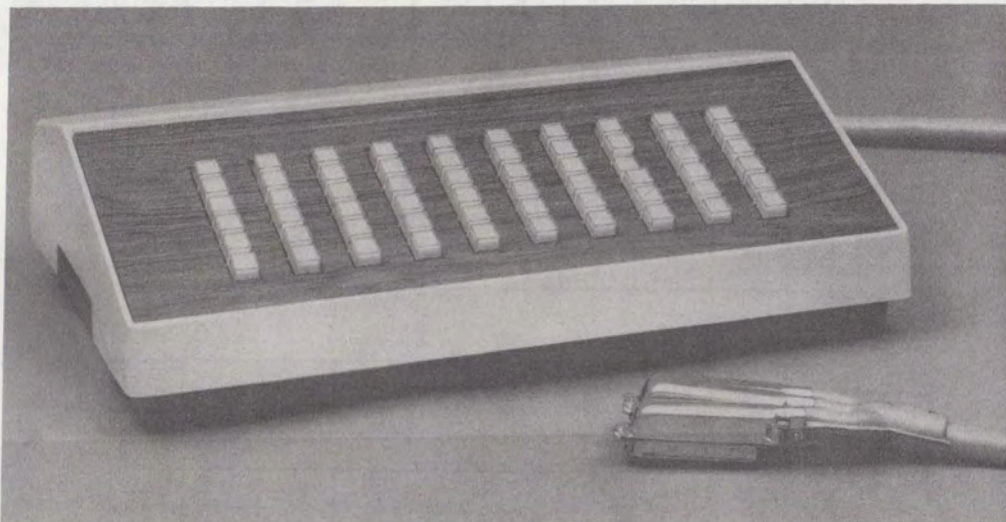


A. 6C1 CONSOLE

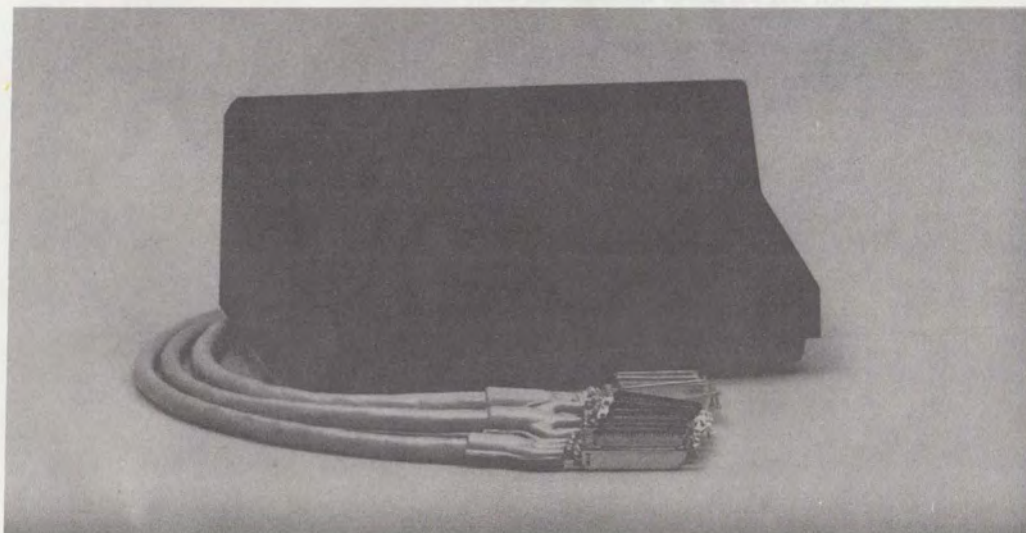


B. 7C1 CONSOLE

Fig. 13—6C1 and 7C1 Consoles



A. 128A6Y SELECTOR CONSOLE



B. 138A6Y SELECTOR CONSOLE

Fig. 14—128A6Y and 138A6Y Consoles

(1) HOLD	(2) LINE 1	(3) LINE 2	(4) LINE 3	(5) LINE 4	(6) LINE 5	(7) MP 1	(8) MP 2	(9) IC 1	(10) IC 2
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A. 852BM, DM, 2852BM, DM †

(11) RECALL	(12) PRIV RLS	(13) RING TR	
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(1) HOLD	(2) LINE 1	(3) LINE 2	(4) LINE 3	(5) LINE 4	(6) LINE 5	(7) MP 1	(8) MP 2	(9) IC 1	(10) IC 2
-------------	------------------	------------------	------------------	------------------	------------------	----------------	----------------	----------------	-----------------

B. 852CM, EM, 2852CM, EM

(11) RECALL	(12) *	(13) MP 2	(14) LINE 6	(15) LINE 7	(16) LINE 8	(17) LINE 9	(18) LINE 10	(19) LINE 11	(20) LINE 12
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(1) HOLD	(2) LINE 1	(3) LINE 2	(4) LINE 3	(5) LINE 4	(6) LINE 5	(7) MP 1	(8) IC 1	(9) IC 2	(10) IC 3
-------------	------------------	------------------	------------------	------------------	------------------	----------------	----------------	----------------	-----------------

C. 853BM, CM, DM, EM, 2853BM, CM, DM, EM TELEPHONE SET

* PRIVACY RELEASE (853BM, DM, 2853BM, DM) OR RING TRANSFER (853CM, EM, 2853CM, EM)

† THESE SETS ALSO EQUIPPED WITH SEPARATE RECALL BUTTON

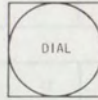
MP - MULTI-PURPOSE

NOTE:

NUMBERS IN PARENTHESIS INDICATE BUTTON NUMBER

Fig. 15—Button Locations and Designations, Telephone Sets†

5	11	ICM 3	RECALL
4	10	ICM 2	
3	9	ICM 1	
2	8	MP 2	RING TR
1	7	MP 1	PRIV REL.
HOLD	6	12	REL.

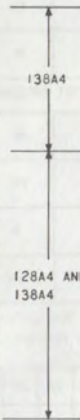


5	11	ICM 3
4	10	ICM 2
3	9	ICM 1
2	8	MP 2
1	7	MP 1
LAMP	6	12

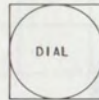
REL - RELEASE
 RING TR - RING TRANSFER
 PRIV. REL - PRIVACY RELEASE
 ICM - INTERCOM
 MP - MULTI-PURPOSE

A. 128A3

12	13	14	15	16	17	18	19	20	21
2	3	4	5	6	7	8	9	10	11
ICM 1	ICM 2	ICM 3				LAMP			I



5	11	17		MP 2
4	10	16		MP 1
3	9	15	21	ICM 3
2	8	14	20	ICM 2
1	7	13	19	ICM 1
HOLD	6	12	18	REL



REL - RELEASE
 RING TR - RING TRANSFER
 PRIV. REL - PRIVACY RELEASE
 ICM - INTERCOM

RING TR 3
RING TR 2
RING TR 1
PRIV. REL.
RECALL

B. 128A4 OR 138A4

Fig. 16—Button Locations, Telephone Consoles

10	11	12	13	14	15	16	17	18	
	0	2	3	4	5	6	7	8	9

A. 6B1 (MESSAGE WAITING)

RST	10	11	12	13	14	15	16	17	18
RE-ENT	PAGE	2	3	4	5	6	7	8	9

B. 6C1 (DIRECT STATION SELECTION)

30	31	32	33	34	35	36			
20	21	22	23	24	25	26	27	28	29
10	11	12	13	14	15	16	17	18	19
	0			4	5	6	7	8	9

C. 7B1 (MESSAGE WAITING)

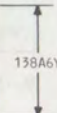
RST	28	29	30	31	32	33	34	35	36
18	19	20	21	22	23	24	25	26	27
8	9	10	11	12	13	14	15	16	17
RE-ENT	PAGE 1	PAGE 2	PAGE 3		0	4	5	6	7

D. 7C1 (DIRECT STATION SELECTION)

RST - RESTORE

20	21	22	23	24	25	26	27	28	29
10	11	12	13	14	15	16	17	18	19
				0	6	7	8	9	

50	51	52	53	54	55	56	57	58	59
40	41	42	43	44	45	46	47	48	49
30	31	32	33	34	35	36			



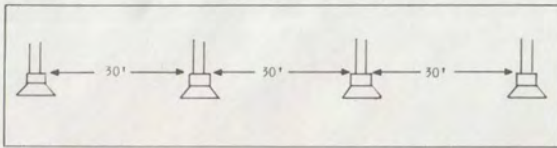
PAGE 3	10	16	22	28	34	43	49	55	
PAGE 2	9	15	21	27	33	42	48	54	59
PAGE 1	8	14	20	26	32	41	47	53	58
	7	13	19	25	31	40	46	52	57
	6	12	18	24	30	36	45	51	56
RE-ENT	0	11	17	23	29	35	44	50	RST



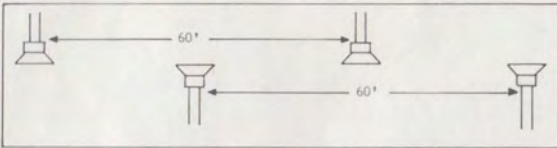
RST - RESTORE

E. 128A6Y (R 138A6Y)

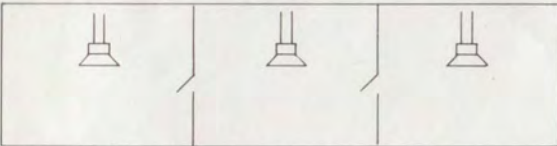
Fig. 17—Button Locations, Selector Consoles



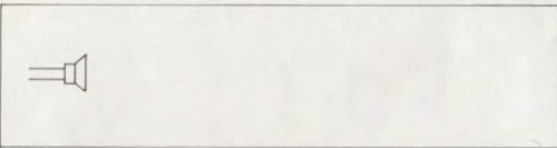
EXAMPLE A - SPEAKERS LOCATED ON ONE WALL OF ROOM (NOTES 1,2 AND 3)



EXAMPLE B - SPEAKERS LOCATED ON OPPOSITE WALLS OF ROOM (NOTES 1 AND 2)



EXAMPLE C - SPEAKERS LOCATED IN INDIVIDUAL ROOMS (NOTES 1,2 AND 4)



EXAMPLE D - OUTSIDE SPEAKER (HORN) LOCATION (NOTES 2 AND 5)

NOTES:

1. EXAMPLES A, B AND C ARE FOR QUIET OR OFFICE TYPE ENVIRONMENTS, LESS THAN 65 DB SOUND PRESSURE LEVEL (SPL). ALL SPEAKERS SHOULD BE LOCATED AT LEAST 60 FEET FROM ANY STATION USED FOR PAGING.
2. SPEAKER WIRING SHOULD BE RUN SEPARATELY, NOT PART OF A VOICE CABLE. QUAD CABLE SHOULD BE USED WITH BOTH PAIRS CONNECTED. SPEAKERS SHOULD BE HUNG AS CLOSE TO THE CEILING AS POSSIBLE. MAXIMUM SPEAKER DISTANCE FROM THE UNIT IS 980 FEET.
3. SPEAKERS REACH A DEPTH OF 30 FT. IF ROOM IS OVER 30 FT. WIDE, FACING SPEAKERS SHOULD BE USED.
4. ONE SPEAKER WILL SERVE A ROOM UP TO 25 FT. BY 25 FT.
5. ONE SPEAKER (HORN) MOUNTED 20 FT. ABOVE GROUND LEVEL WILL COVER AN AREA APPROXIMATELY 80 FT. BY 100 FT. IF THE HORN IS MOUNTED LESS THAN 20 FT. ABOVE GROUND LEVEL, TWO HORNS MUST BE USED. HORNS SHOULD NOT BE MOUNTED LESS THAN 15 FT. ABOVE GROUND LEVEL. IF MORE THAN ONE HORN IS USED, THEY SHOULD BE MOUNTED VERTICALLY, RATHER THAN SIDE-BY-SIDE.

Fig. 18—Example of Paging Speaker Locations