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Nippon Electric Co.,Ltd.

ELECTRA-28 TECHNICAL INFORMATION
(SE-0001)

REVISION SHEET FOR

ELECTRA-28 INSTALLATION SERVICE MANUAL

1. GENERAL

This technical information describes corrections in the ELECTRA-28 INSTALLATION SERVICE MANUAL (ND-16526 ISSUE II).

2. DESCRIPTION

Please change the Note 1 in Fig. 2-11 Connection of Ext. High Power Amplifier for Ext. Paging to as follows.

Note 1 When external amplifier is used, remove C1 and C2 on EP card and insert EP card.

Printed in Japan

Patrician Electra-28 EKTS
INSTALLATION SERVICE MANUAL

TABLE OF CONTENTS

FIGURE LIST

1. INTRODUCTION

1.01 This manual covers the identification, installation, connection, method of operation and testing procedure, and maintenance of the NEC Patrician Electra-28 Electronic Key Telephone System (EKTS). Reference is made to the ES-14-2 Key Service Unit (KSU), the PSU-14-3 Power Supply Unit (PSU) the Key Telephone Units (KTUs), the ET-14-2 Key Telephone Sets, and the ED-28-2 Direct Station Selection with Busy Lamp Field Console (DSS/BLF). (Associated Manuals: General Description - ND-16525; Circuit Description - ND-16527; Schematic Drawings - ND-16528)

2. IDENTIFICATION

2.01 The Electra-28 EKTS provides up to 12 CO/PBX lines and up to 4 intercom (ICM) paths, to a total of 14 lines and paths. In addition to these lines and paths, up to 2 dedicated DSS/BLF paths may be installed. The EKTS may include up to 28 station telephone sets and 2 DSS/BLF consoles.

A. BASIC FEATURES

2.02 The following are standard features:

- 3-pair ordinary telephone station cable
- Multi-line service to a total of 14 appearances (12 CO/PBX max., 4 ICM max.)
- Non-locking buttons
- LED illumination

- Manual hold on CO/PBX lines and ICM paths.
- Privacy on CO/PBX lines and ICM paths.
- Multi-path dial intercom which allows up to 4 simultaneously originated intercom calls.
- Selective intercom call indication - only the called station gets visual indication of incoming ICM call.
- Tone burst followed by voice signaling on ICM call, for tone signaling caller dials any third digit.
- Automatic time-out on uncompleted ICM calls (before, during, and after dialing) unless call waiting tone is heard by caller.
- Call waiting tone on an ICM path means the called station is busy. Time-out is disabled and calling party can wait until called party hangs up or notices selective visual indication and answers.
- Dial "0" ICM access to system attendants [Station #14 (27) with overflow to station #28 (47)] NOTE
- Common audible at attendants stations [#14 (27) and #28 (47)] NOTE
- ADD-ON button for add-on or multi-line conference (2 circuits per system)

NOTE: Since an option gives Flexible ICM number assignment, specific telephones are referred to with cable address number using # symbol. Standard ICM numbers follow in parentheses.

- ON/OFF button for "hands-free" dialing and monitoring.
- Push-button dial with conversion for CO/PBX lines to dial pulses or Dual Tone Multi-Frequency (DTMF) signals. Up to 12 simultaneous conversions.
- Timed release of CO/PBX lines to make switch-hook flashing possible.
- All Call Page over all station speakers with Meet-Me Answer
- "Don't Disturb" by depressing ON/OFF button—all visual indications continue as normal but only DSS/BLF has an audible path to the station. LED indication of status of ON/OFF button.
- Music-on-hold (music source is optional)
- Automatic hold recall when attendants place a call on hold for longer than a predetermined time.

B. OPTIONAL FEATURES

2.03 The following are optional features:

- DSS/BLF consoles : up to 2 in a system, no additional cabling, non-locking button operation.
- Dedicated paths for DSS/BLFs with no interperence with other circuitry.
- Automatic CO/PBX Line hold when DSS/BLF station button is depressed (one step call transfer).
- No re-seizure of attendant's talk path to make any number of DSS/BLF station calls or pages.

. DSS/BLF has priority over signaling at station speaker, if a called station is "off-hook" it receives a split tone (not heard by other party) over the handset.

. Handset answer back to DSS/BLF.

. BLF of DSS/BLF shows all conditions :

station busy - solid LED

originating or receiving
ICM or DSS signal - Flashing LED

idle - unlit LED

. Night Transfer non-locking button on DSS/BLF with LED status indication.

. Alerting Buzzer in DSS/BLF for CO/PBX line incoming call in off-hook condition or hold recall tone with ON/OFF control non-locking button and LED status indication.

. Non-locking button access to All Call Page with Meet-Me Answer from DSS/BLF. Non-locking button access to Internal Zone Paging with Meet-Me Answer and External Zone Paging with Meet-Me Answer (when equipped) from DSS/BLF.

. Internal Three Zone Paging with Meet-Me Answer (3 zones, stations assigned to any one or none of 3 zones).

. External Three Zone, All Zone Paging with Meet-Me Answer.

. Music On Hold Synthesizer (choice of tunes).

. Outgoing Call Restriction by station.

. Outgoing Call Restriction by line.

. Toll Call Restriction by station.

. Toll Call Restriction by line.

. Flexible CO/PBX Ring Assignment.

. Flexible Intercom Number Assignment (no.s 10 ~ 59).

. Power Failure Transfer Unit.

. External Tone Ringer.

. Automatic Hold Release (from certain central offices).

. Externally provided equipment may be connected:
External MOH source, external BGM source, external high-power amplifier.

2.04 All options are assigned by:

(a) Plugging KTUs into pre-wired connectors.
(some options use miniature slide switches mounted on the KTUs for flexibility)

(b) Quick-connection of external units (external tone ringer, power failure unit, external paging speakers, etc.)

(c) Connecting station equipment with connector-ended cable (DSS/BLF and attendant's telephone)

2.05 Do not insert other key telephone equipment into an Electra-28 Electronic Key Telephone System.

C. KSU

2.06 The ES-14-2 KSU provides the following features:

(a) Floor or wall mounting (avoid floor mounting where possible to avoid accidental damage from flooding, cleaning, etc.)

(b) Removable metal cover

(c) Pre-wired amphenol type connectors for connection to CO/PBX lines and MDF (main distribution frame)

(d) Pre-wired and labeled connectors for KTUs. Connectors have a key plug to prevent improper insertion and consequent damage or mis-operation.

(e) Common KTUs shipped with KSU.

D. KTUs

2.07 Each KTU has a key slot to prevent incorrect insertion.

2.08 CPI-Central Processor and Interface

The CPI KTU is 11.4" x 9.1" and has 120 contacts for connection.

The CPI KTU contains main control circuitry for the Patrician Electra-28 EKTS, such as the central processor, the read only memory, input and output interface, and clock source circuitry. The clock source serves as the basic clock to another clock circuit.

2.09 DPC - Data Processing Logic and Clock

The DPC KTU is 11.4" x 9.1" and has 120 contacts for connection.

The DPC KTU contains data transmission circuitry between the CPI and telephone sets, such as the data sender, data receiver and clock circuitry. Clock circuitry in the DPC provides the clock needed for data transmission between central processor and telephone sets by modifying the clock generated in CCI KTU.

2.10 TST - Tone Source and Trunk

The TST KTU is 11.4" x 9.1" and has 120 contacts for connection.

The TST KTU contains tone circuitry which generates CO/PBX ring tone, intercom dial tone, busy tone, call waiting tone, and other service tones for system operation by using the clock generated by the CCI.

The TST also contains 6 tone trunk circuits to transmit these tones to the switching network, including operational amplifiers and control circuitry for the switching network.

2.11 CCI - Conference and Control Interface

The CCI KTU is 11.4" x 9.1", and has 120 contacts for connection.

The CCI KTU contains conference circuitry and control interface circuitry for the switching network and central processor.

Conference circuitry provides paths for internal and external paging and also for 2 conferences between 2 CO/PBX lines and 1 telephone set.

The CCI KTU also contains clock generator which supplies the clock signal to DPC KTU and TST KTU.

2.12 TK - Trunk

The TK KTU is 4.9" x 9.1" and has 60 contacts for connection.

The TK KTU contains circuitry for CO/PBX ring detection, for hold and for control of the switching matrix in the LSW KTU. Each TK KTU provides 4 trunk circuits which can be selected by a switch for use as CO/PBX, ICM, or DSS/BLF trunks.

2.13 DC - Dial Pulse Converter

The DC KTU is 4.9" x 9.1" and has 60 contacts for connection.

The DC KTU sends dial pulses to CO/PBX lines in accordance with dialing at station sets. Each DC KTU serves 4 CO/PBX lines.

2.14 MFC - Multi-Frequency Converter

The MFC KTU is 4.9" x 9.1" and has 60 contacts for connection.

The MFC sends DTMF (Dual Tone Multi-Frequency) signals to CO/PBX lines in accordance with dialing at station sets. Each MFC KTU serves 4 CO/PBX lines.

2.15 TRC - Data Transmitter and Receiver

The TRC KTU is 4.9" x 9.1" and has 60 contacts for connection.

The TRC KTU contains interface circuitry for data transmission between KSU and station sets.

The battery for telephone sets is supplied from this KTU by a phantom power supply system. Each TRC serves 7 station sets.

2.16 LSW - Line Interface and Switch Matrix

The LSW KTU is 4.9" x 9.1" and has 60 contacts for connection.

The LSW KTU contains switch matrix circuitry for connection between telephone sets and trunks and also battery supply circuits for telephone network circuitry. Each LSW serves 7 station sets.

2.17 SW - Switch Matrix

The SW KTU is 4.9" x 9.1" and has 60 contacts for connection.

The SW KTU contains switch matrix circuitry which is used for expansion of LSW KTU when the number of CO/PBX lines and intercom and DSS/BLF paths are more than 8 (TK3 and/or TK4 is used)

Each SW serves 14 station sets (2 LSWs).

2.18 UPA - Universal Programming Assignment

The UPA KTU is 4.9" x 9.1" and has 60 contacts for connection.

The UPA KTU is used for programming the data for flexible CO/PBX ring assignment, flexible intercom number assignment, internal zone paging assignment and toll and outgoing call restriction. Programming is done with switches mounted on the KTU.

2.19 EP - External Paging

The EP KTU is 4.9" x 9.1" and has 60 contacts for connection.

The EP KTU contains an amplifier and control circuitry for external zone paging.

2.20 MOH - Music On Hold Synthesizer

The MOH KTU is 4.9" x 9.1" and has 60 contacts for connection.

The MOH KTU is a music-on-hold music source. Music is generated by electronic circuitry including a P-ROM (programming read only memory) IC.

2.21 AHR - Automatic Hold Release

The AHR KTU is 4.9" x 9.1" and has 60 contacts for connection.

The AHR KTU contains detector circuitry for disconnect signals from some types of CO/PBX lines on hold and releases the held line automatically.

2.22 PFU - Power Failure Transfer

The PFU KTU is 4.7" x 7.0" and has 2 amphenol connectors. The PFU contains relay circuitry to provide transfer of CO/PBX lines from EKTS to ordinary single line telephone sets in case of power failure.

E. PSU

2.23 The PSU-14-3 power supply unit provides the following features:

(a) Floor or wall mounting (avoid floor mounting where possible to avoid accidental damage from flooding, cleaning etc.)

(b) Removable metal cover.

(c) Plug ended cord to supply power to KSU.

(d) Labeled fuse pannel.

F. TEL

2.24 The telephone set (ET-14-2) has 17 buttons.

. 14 line pick-up buttons

. HOLD button

. ADD-ON button

. ON-OFF button

2.25 The telephone has the following features

. Desk type (can be modified for wall mounting)

. Push-button dialing

. Colored inserts available (6 colors)

G. DSS/BLF

2.26 The DSS/BLF console (ED-28-2) has 40 buttons

. 28 direct station selection buttons

. 4 internal zone paging quick access buttons

. 4 external zone paging quick access buttons

. Night transfer button

. Buzzer-off button

. 2 spare buttons

2.27 The DSS/BLF console has 32 LEDs

. 28 station busy LED

. Internal zone paging busy LED

. External zone paging busy LED

. Night transfer LED

. Buzzer-off LED

2.28 The DSS/BLF console has the following features

. Desk type (can be modified for wall mounting)

. Colored inserts available (6 colors)

3. INSTALLATION

A. PRE-INSTALLATION

3.01 Choose a location for mounting the KSU and PSU distribution blocks that :

(a) Is removed from office traffic and is acceptable to the end-user.

(b) Is centrally located to minimize cabling (maximum cable run with twisted 3-pair non-shielded cable 22 or 24 AWG is 500 ft).

(c) Provides enough space and light for installation and maintenance (KSU dimensions are 20.8 "H x 191" W x 11.1" D and PSU dimensions are 20.8" H x 6.8" W x 11.1" D)

(d) Avoids environmental extremes of temperature, dampness, direct sunlight, etc.

(e) Avoids air-borne corrosive, insulative or flammable agents.

(f) Is safe from flooding or cleaning damage.

(g) Has an acceptable AC outlet.

3.02 An acceptable AC outlet is one that

(a) Is separately fused for 5 amperes.

(b) Is not switch controlled.

(c) Is a three-prong type with an acceptable ground.

(d) Supplies the required power 117V ±10%, 60Hz AC.

3.03 Caution is advised while unpacking and handling KSU and KTUs to avoid damage.

B. INSTALLATION

KSU and PSU

3.04 To install ES-14-2 KSU and PSU-14-3 PSU proceed as follows:

NOTE: AT NO TIME DURING INSTALLATION IS THE KSU TO BE POWERED.

(a) Use the template provided to locate fastener positions. Install appropriate fasteners.

(b) Remove KSU cover and mount KSU on fasteners.

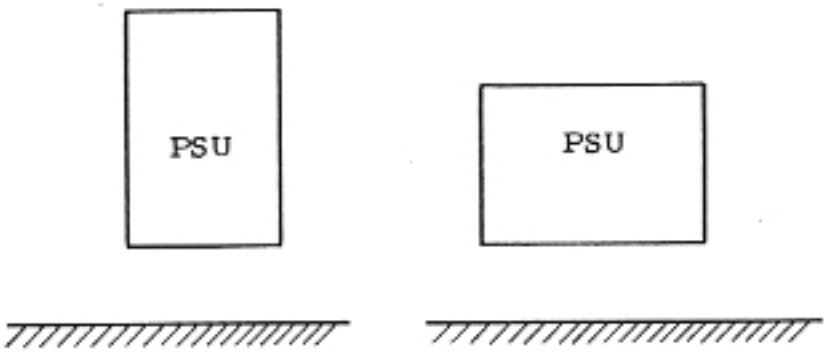
NOTE: EVEN IF KSU AND PSU ARE FLOOR MOUNTED, ANCHORING IT WILL PREVENT ACCIDENTAL DAMAGE.

(c) Connect single amphenol type connector (female) ended cable (25-pr) to P1 amphenol type plug in the KSU. This is the P1 cable and is to be connected to incoming CO/PBX lines at the P1 terminal block (see Section 4.01).

(d) Connect single amphenol type connector (male) ended cable (from 25 to 100-pr) to J1 ~ J4 amphenol type jacks in the KSU. This is the J1 ~ J4 cable(s) and is to be connected to station cables at the J1 ~ J4 terminal blocks (MDF) (see Section 4.04).

(e) Connect the plug ended-cord of the PSU to the jack connector inside the KSU.

(f) Note: Don't install the PSU horizontally as this will prevent air convection.



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(g) To set the 24-hour Time Switch for PS-14-3 Power Supply Unit, proceed as follows: (Refer to Fig. 1-3)

1) Remove the cover (7) of the Time Switch from the body (5).

2) Lightly pushing the red "ON" slide setting piece (1), turn it clockwise and set it to a desired time mark on the dial (4) which indicates the time when the Power Supply Unit is to be turned on.

3) Likewise, turn the white "OFF" slide setting piece (2) clockwise and set it to a desired time mark on the dial (4) which indicates the time when the Power Supply Unit is to be turned off.

4) Turn the dial (4) clockwise and set a time mark on the dial (4) which indicates the present time to the present time mark (3) on the body.

CAUTION: Be careful with the "A.M." and "P.M." indications on the dial (4), when setting the time.

5) Put the front cover (7) to the body (5) and turn on the power switch of the Power Supply Unit. The time switch will begin to operate.

NOTE:

1) Always turn the dial clockwise when setting the present time.
2) Make sure that the sliding pieces are set to the dial firmly.
3) Don't move the sliding setting piece counter

clockwise by force at the present time mark.

4) When finishing the setting of the time, always turn the dial clockwise to make sure that the operation of the time switch.

BASIC KTUs

3.05 All common control KTUs are already equipped in the KSU. In addition some KTUs must be installed for system operation.

TRC

3.06 The TRC KTU is the Data Transmitter and Receiver Unit Each TRC has the capacity to provide data access to and from the common control section for 7 stations.

TRC	telephones	standard ICM numbers
1	# 1 ~ # 7	11 ~ 17
2	# 8 ~ #14	21 ~ 27
3	#15 ~ #21	31 ~ 37
4	#22 ~ #28	41 ~ 47

TRCs do not have to be sequentially installed (i.e. TRC2 may be installed without TRC1 being installed - since DSS/BLF stations are telephones #14 and #28 this allows installation of DSS/BLFs even in a small system). A maximum of 4 TRCs may be installed.

LSW

3.07 The LSW KTU is the Line Interface and Switch Matrix Unit. Each LSW has the capacity to provide switching paths for 7 stations. Install a matching LSW for every TRC (i.e. if TRC2 is installed, install LSW2 etc.). A maximum of 4 LSWs can be installed.

TK

3.08 The TK KTU is the Trunk Unit. Each TK has the capacity to provide access to 4 lines and/or paths. There are switches on the TK KTUs which must be positioned correctly for the types of trunks it will offer (CO/PBX, ICM, or DSS/BLF). Due to the configuration of KSU circuitry, however, certain trunks are not flexible, TK2 trunk 3 and trunk 4 and TK4 trunk 3 and trunk 4 must be either ICM or DSS/BLF trunks. TK3 trunk 1 and trunk 2 must be CO/PBX trunks.

3.09 TK KTUs do not have to be installed sequentially, (TK3 may be installed without TK2 installed, etc.) but installation of TK3 or TK4 requires installation of SW KTUs (see section 3.14). Provision has been made so that the first CO/PBX trunk installed in the trunking sequence will appear at all telephones at the first CO/PBX line button etc., the same applies to ICM trunks and ICM path buttons. No gaps will exist within the CO/PBX appearances nor within the ICM appearances. The trunking sequence is from TK1, trunk 1 to TK4, trunk 4.

3.10 Before installing TK KTUs read the TK configuration Table below:

Table 3-1 TK Configuration

TK	trunk	assignment
1	1	CO/PBX 1
1	2	CO/PBX 2
1	3	CO/PBX 3
1	4	CO/PBX 4
2	1	CO/PBX 5
2	2	CO/PBX 6
2	3	ICM or DSS/BLF *
2	4	ICM or DSS/BLF *
3	1	CO/PBX 7 *
3	2	CO/PBX 8 *
3	3	CO/PBX 9
3	4	CO/PBX 10
4	1	CO/PBX 11
4	2	CO/PBX 12
4	3	ICM or DSS/BLF *
4	4	ICM or DSS/BLF *

* cannot be re-assigned

NOTE: 1. If a TK trunk has been assigned for ICM or DSS/BLF use, do not terminate a CO/PBX line to the corresponding position in the P1 cable connection.
(e.g. If TK 1, trunk 1 has been assigned for ICM use, do not connect an incoming CO/PBX line to CO/PBX 1 position at the incoming CO/PBX line terminal block P1.)

2. Trunking sequence reads from top to bottom and controls the appearance of lines and paths at telephones.

3.11 TK KTUs come with all assignment switches off and must be assigned before installation. For switch assignment of TKs see Fig. 3-1 and 3-2.

DC

3.12 The DC KTU is the Dial Pulse Converter Unit. The push-button dial of the ET-14-2 telephone is not a Dual Tone Multi-Frequency (DTMF) dial. Each DC has the capacity to provide simultaneous conversion on 4 CO/PBX lines. DCs can be mixed in a system with MFCs (section 3.13). DC1 converts on CO/PBX lines 1 - 4, DC2 on CO/PBX lines 5, 6, 11 and 12, DC3 on CO/PBX lines 7 ~ 10. A maximum of 3 DCs can be installed.

MFC

3.13 The MFC KTU is the Multi-Frequency Converter Unit. The push-button dial of the ET-14-2 telephone is not a Dual Tone Multi-Frequency (DTMF) dial. Each MFC has the capacity to provide simultaneous conversion on 4 CO/PBX lines. MFCs can be mixed in a system with DCs (section 3.12). MFC1 converts on CO/PBX lines 1 - 4, MFC2 on CO/PBX lines 5, 6, 11 and 12, MFC3 on lines 7 ~ 10. A maximum of 3 MFCs can be installed.

SW

3.14 The SW KTU is the Switch Matrix Unit and is used to expand the switching matrix when the capacity of the LSW is exceeded. The LSW has the capacity to provide switching on 8 lines and/or paths. The SW has the capacity to provide switching on 8 lines and/or paths. Install a matching SW for two LSWs installed when:

1. there are more than 8 lines and paths.
2. there are more than 6 CO/PBX lines.
3. TK3 or TK4 is installed.

A maximum of 2 SWs can be installed.

The SW install position is as follows.

Telephones	LSW	SW
#1 - #7	1	1
#8 - #14	2	1
#15 - #21	3	2
#22 - #28	4	2

3.15 Install the required amounts of the Basic KTUs (TRC, LSW, SW, TK, DC, MFC) ensuring that switch assignment on TK KTUs is correct. (See Fig. 3-2).

NOTE: INSERTION OR REMOVAL OF KTUs WITH POWER ON CAN RESULT IN DAMAGE TO COMPONENT CIRCUITRY.

TELEPHONE SETS

3.16 Install telephone sets at desired locations. Avoid heat sources. Connection instructions for telephones are in sections 4.04 and 4.05.

OPTIONAL FEATURES

DIRECT STATION SELECTION WITH BUSY LAMP FIELD CONSOLE (DSS/BLF)

3.17 When only one DSS/BLF is installed in the system, it must be connected to station #14 (standard ICM number 27). When two DSS/BLFs are installed in the system, the first DSS/BLF console installed must be connected to station #14 (standard ICM number 27). The second DSS/BLF console installed must be connected to station #28 (standard ICM number 47). To install DSS/BLF perform the following:

a) Remove the clear plastic face panel from the attendants telephone by inserting a small screw-driver tip into the notch at top of face panel, separating the locking tabs, and lifting the face panel off.

b) Remove the colored face sheet.

c) Remove the screw directly above the HOLD button.

d) Pull out at the rear center of housing to free plastic latch and lift housing off.

e) Plug DSS/BLF 20-conductor cable jack onto plug at right rear of telephone on Main Circuit Unit printed circuit board (the plug is labeled "DS").

f) Cut off the plastic plug on housing which masks the DSS/BLF cable entry.

g) Slip DSS/BLF cable holder over stand-up plastic lug at cable entry.

h) Close housing.

FLEXIBLE CO/PBX RING ASSIGNMENT

3.18 To install Flexible CO/PBX Ring Assignment requires one or two Universal Programming Assignment (UPA) KTUs. A UPA installed in UPA-1 connector gives Flexible CO/PBX Ring Assignment to telephones #1 ~ #14 (standard ICM numbers 11 ~ 17, 21 ~ 27). A UPA installed in UAP-2 connector gives this option to telephones #15 #28 (standard ICM numbers 31 ~ 37, 41 ~ 47). There is no limitation on how many lines ring at a telephone, nor on how many telephones ring on a line. Standard CO/PBX ring assignment is for common audible at telephones #14 and #28 (standard ICM number 27 and 47, DSS/BLF attendant telephones).

3.19 Before installing the KTU(s) it is necessary to perform ring assignment by correct positioning of the switches mounted on the UPA (s). See Fig. 3-3, 3-4, 3-5.

FLEXIBLE INTERCOM NUMBER ASSIGNMENT

3.20 To install Flexible Intercom Number Assignment, a Universal Programming Assignment (UPA) KTU is required. Standard intercom numbers are:

telephones #1 ~ # 7 - ICM nos. 11 ~ 17

telephones #8 ~ #14 - ICM nos. 21 ~ 27

telephones #15 ~ #21 - ICM nos. 31 ~ 37

telephones #22 ~ #28 - ICM nos. 41 ~ 47

A UPA installed in UPA-3 connector gives flexible ICM Number Assignment using any numbers 10 ~ 59. Before installing the UPA KTU it is necessary to perform ICM number assignment by correct positioning of the switches mounted on the UPA. See Fig. 3-3 and 3-6.

THREE ZONE INTERNAL PAGING WITH MEET-ME ANSWER

3.21 To install Three Zone Internal Paging with Meet-Me Answer, a Universal Programming Assignment (UPA) KTU is required. Intercom access codes for 3 zone internal paging are 81 for zone 1, 82 for zone 2, 83 for zone 3. Momentary buttons are provided on the DSS/BLF for quick access to this option for the attendant(s). The "Meet-Me" access code to release the internal paging circuitry and allow an intercom conversation with the pager is *8. Installing a UPA KTU in UPA-4 connector allows you to place a station in any, or none, of the three zones. There is no limitation to the number of stations that are placed in a zone: a station cannot be in two zones however. This option in no way affects the standard All Call Paging with Meet-Me Answer feature. See Fig. 3-3 and 3-7 for instructions on arrangement of zones by means of switches mounted on the UPA card. Besides providing this feature, installation of this UPA (in UPA connector 4) provides for Toll and Outgoing Call Restriction (See section 3.22).

TOLL AND OUTGOING CALL RESTRICTION

3.22 To install Toll and Outgoing Call Restriction a Universal Programming Assignment Unit (UPA) KTU is required. Outgoing restriction denies CO/PBX dial tone - busy tone is heard instead; toll call restriction will release a CO/PBX line if 1 or 0 is dialed as the first or second digit and busy tone will be heard by the restricted dialer. It is possible to allow a first digit to pass before the toll call restriction circuitry begins inspecting digits (for use behind a PBX).

3.23 It is possible to restrict by station or by line but the restriction process can be more sophisticated. Three groups of lines may be assigned and 16 classes of stations, allowing flexibility. For instructions on switch control of toll and outgoing call restriction on this UPA KTU, which is installed in UPA-4 connector, see Fig. 3-3, 3-8 and 3-9. This same UPA KTU provides Three Zone Internal Paging with Meet-Me Answer (see section 3.21).

MUSIC ON HOLD SYNTHESIZER

3.24 The Music On Hold Synthesizer (MOH) KTU is a plug-in music source for music-on-hold. Changing the tune is done by replacing an integrated circuit mounted on the KTU. Variable resistors are provided to control pitch, tempo, and volume. (Use of an externally provided MOH music source is possible, see section 3.29).

THREE ZONE, ALL ZONE EXTERNAL PAGING WITH MEET-ME ANSWER

3.25 Installation of the External Paging (EP) KTU and connection of 600 ohm speakers provides Three Zone, All Zone External Paging with Meet-Me Answer. The ICM access codes are 71, 72, 73 and 70 for zone 1, zone 2, zone 3, and all zones, respectively. Momentary buttons are provided on the DSS/BLF for quick access to this option for the attendant(s). The "Meet-Me" access code to release the external paging circuitry and allow an intercom conversation with the pager is *7. The EP amplifier output is 3W, 200 ohms. For connection instructions for speaker installation, see Fig. 2-10. (Use of a high power external amplifier is possible, see section 3.31 ; provision of BGM over paging speaker is possible, see section 3.30).

POWER FAILURE TRANSFER

3.26 To install this option, proceed as follows:

(a) Mount PFU KTU on the base plate inside the KSU.

(b) Connect single amphenol type connector (female) ended cable (25 pr) to P61 amphenol type plug on the PFU KTU. This is to be connected to row C of P1 terminal block (see Fig. 2-4).

(c) Connect single amphenol type connector (male) ended cable (25 pr) to J61 amphenol type jack on the PFU KTU. This is to be connected to row D of P1 terminal block.

(d) Connect single line telephones (not supplied) to row E of P1 terminal block.

NOTE: WHEN THIS OPTION IS INSTALLED, 66 B4-50 TYPE CONNECTING BLOCK MUST BE INSTALLED FOR P1 TERMINAL BLOCK. (66 B4-50 TYPE IS DIVIDED IN 2, ROW A THRU C AND ROW D THRU F.)

In case of power failure incoming CO/PBX lines are switched to single line telephones (not supplied). Note that when this option is installed in an Electra-28 system which is separated from the network by Voice Connecting Arrangements (VCA), it will not work if the power failure affects the VCA. The connection information given in Fig. 2-3 and 2-4 is for use with no VCA or STP VCA. STC VCA would require different connections.

AUTOMATIC HOLD RELEASE

3.27 To install automatic hold release of CO/PBX lines an Automatic Hold Release (AHR) KTU is required. When a distant party who has been placed on hold abandons the call some central offices will send as a signal a timed disconnection. This optional unit (AHR) recognizes this signal and releases the CO/PBX line (it will not recognize a reversal of polarity).

EXTERNALLY PROVIDED OPTIONS

EXTERNAL TONE RINGER

3.28 The External Tone Ringer is an externally mounted unit which provides common audible to supplement the standard ring assignment (common audible at telephones #14 and #28-normal

ICM numbers 27 and 47). Mount where desired and connect as shown in Fig. 2-10.

EXTERNAL MOH MUSIC SOURCE

3.29 To install an externally provided music-on-hold source connect as shown in Fig. 2-10. The MOH KTU is not installed. Required input to KSU is approx. 1 mW, 8 ohms.

BGM WHEN EP KTU IS USED

3.30 To provide BGM over paging speakers when the EP KTU is used, connect as shown in Fig. 2-10. The external BGM source output is recommended to be 3W, 200 ohms. Note that when external high power amplifier is used for external paging, connection is to be done as shown in Fig. 2-11. The BGM source output is equal to external high power amplifier output.

EXTERNAL HIGH POWER AMPLIFIER

3.31 To install an external high power amplifier, see Fig. 2-11. Provision has been made, as shown on that drawing, to provide control of an external relay rack (not supplied) for external switching of amplified signal. This same external relay rack can be used to control a BGM source. Input to the external amplifier is 10^{-2}mW, 600 ohms.

3.32 To provide this option the EP KTU must be installed and two red straps removed from the KSU.

Remove : CCI lower A29 (RD) ..... EP. B25

CCI lower B29 (RD) ..... EP. B26

NOTE: DO NOT ALLOW AMPLIFIED SIGNAL TO ENTER THE KSU.

4. CONNECTION

NOTE: AT NO TIME DURING CONNECTION IS THE KSU TO BE POWERED

CO/PBX LINE TERMINATION

4.01 Terminate incoming CO/PBX lines as shown in Fig. 2-3, 2-4 and 3-2 using the P1 cable (see section 3.04) and 66 B4-50 type connecting block (66 B4-50 or 66 M1-50 type if power failure unit is not installed). If TK1 trunks 1 ~ 4, TK2 trunks 1 and 2, TK3 trunks 3 and 4, or TK4 trunks 1 ~ 4 have been arranged as an ICM or DSS path trunk, refer to Table 3-1 in section 3.10; do not connect an incoming CO/PBX line to a trunk which is not a CO/PBX trunk.

4.02 Connection information provided in section 4.01 is for connection with no Voice Connecting Arrangement (VCA) or STP VCA. When STP VCA is used, tip will be labeled CT, ring will be labeled CR. If STC VCA is installed refer to section 4.03. Information on connection of other VCAs is available but it is recommended only STP or STC be used.

4.03 When STC VCA is used (refer to Fig. 2-5), connect each CO/PBX line according to the following :

STC	P1 Cable
CT	R
CR	T
RU1	E

It is necessary to cut printed patterns of P1 connector on back panel for each STC :

P1 Cable Desig.	Cut Printed Patterns
CO/PBX 1	P1 1 - 27
CO/PBX 2	P1 3 - 29
CO/PBX 3	P1 5 - 31
CO/PBX 4	P1 7 - 33
CO/PBX 5	P1 9 - 35
CO/PBX 6	P1 11 - 37
CO/PBX 7	P1 13 - 39
CO/PBX 8	P1 15 - 41
CO/PBX 9	P1 17 - 43
CO/PBX10	P1 19 - 45
CO/PBX11	P1 21 - 47
CO/PBX12	P1 23 - 49

If TK1 trunks 1 ~ 4, TK2 trunks 1 and 2, TK3 trunks 3 and 4, or TK4 trunks 1 ~ 4 have been arranged as an ICM or DSS path trunk, refer to Table 3-1 in section 3.10; do not connect an incoming CO/PBX line to a trunk which is not a CO/PBX trunk.

STATION TERMINATION

4.04 Terminate station cables as shown in Fig. 2-6 ~ 2-9 using the J1 J4 cables (see section 3.04), 66 B4-50 or 66 M1-50 connecting blocks, and individual 3-pair station cables. A recommended practice is to label the cable with the ICM number, which is flexible, and the MDF cabling telephone # which is not.

4.05 Connect telephone sets to station cables as follows:

(a) Open screw terminal housing.

(b) Connect according to the following;

TABLE 4-1

STATION CONNECTION		
STATION SIDE	CKT. DESIG.	CABLE SIDE
YL	VT (L_1)	WH-BL
BR	VR (E)	BL-WH
BL	ST (L_2)	WH-OR
BK	SR (G)	OR-WH
RD	RT (H_1)	WH-GN
WH	RR (H_2)	GN-WH

NOTE: The letters shown in parenthesis denote designation marked on the screw terminal block.

MOUNTING A TELEPHONE SET ON A WALL

4.06 To mount a telephone set on a wall, the wall mount unit is used. Installation is described below. See Fig. 1-8.

1) Attach the hanger to the telephone set by using the two tapping screws. The screw positions on the telephone housing are thinner plastic to ease installing the tapping screws.

2) Push the cover on the hanger to mask the screws.

3) Attach the bracket to the desired position on the wall by using 3 wood screws (or suitable screws).

4) Hang the telephone set on the bracket.

OPTION CONNECTION

4.07 Option connection information is covered in section 3.17 - 3.32.

5. TESTING PROCEDURES

5.01 STATION USER'S GUIDE

Operation	LED Status
STANDARD FEATURES	
1. Making an Outside Call (CO/PBX)	
(a) Depress an idle CO/PBX line button.	CO/PBX line LED not lit.
(b) Lift the handset or depress ON/OFF button.	CO/PBX line LED lights. (ON/OFF LED lights.)
(c) Dial the number desired.	
(d) If ON/OFF button has been used, lift the handset to talk.	ON/OFF LED goes off.
(e) To terminate call, restore the handset.	CO/PBX line LED goes off.
2. Answering an Incoming Call (CO/PBX)	
When audible incoming CO/PBX call signal is heard:	CO/PBX line LED is flashing.
(a) Depress CO/PBX line button with flashing LED.	CO/PBX line LED is flashing.
(b) Lift the handset.	CO/PBX line LED goes steady.
(c) Talk to caller.	
(d) To terminate call, restore the handset.	CO/PBX line LED goes off.

NOTE 1: In this section wherever it says depress an idle CO/PBX or ICM button and then lift the handset, the order of this procedure can be reversed.

Operation	LED Status
3. Making an Intercom Call (ICM)	
(a) Depress an idle ICM path button.	ICM path LED not lit.
(b) Lift the handset or depress ON/OFF button.	ICM path LED lights steady. (ON/OFF LED lights.)
(c) Dial two-digit station number (if busy tone is heard there is no station corresponding to the number you have dialed, if call waiting tone is heard wait until it stops and proceed).	ICM path LED flashes.
(d) Make a voice signal over the handset if desired.	
(e) To produce tone signal dial any third digit.	
(f) Talk to called party when answered.	ICM path LED lights.
(g) To terminate call, restore the handset.	ICM line LED goes off.
4. Answering an Intercom Call (ICM) When intercom voice signal or tone signal is heard:	ICM path LED is flashing.
(a) Depress ICM button with flashing LED.	ICM path LED is flashing.
(b) Lift the handset.	ICM path LED goes steady.
(c) Talk to caller.	

Operation	LED Status
When a call is in progress and an ICM LED begins flashing:	
(a) Place call in progress on hold.	Held line LED starts winking.
(b) Depress ICM button with flashing LED.	ICM path LED goes steady.
(c) Talk to caller.	
(d) To terminate call, restore the handset or, if there is a line on hold depress the line button with winking LED.	ICM path LED goes out. (Line LED goes steady.)
5. Using the Hold Feature (CO/PBX and ICM)	
To place a call on hold:	Line LED is steady.
(a) Depress the Hold button.	Line LED starts winking.
To take a call off hold:	Line LED is winking.
(b) Depress line button with winking LED.	Line LED is winking.
(c) Lift the handset.	Line LED goes steady.
(d) Talk to caller.	

NOTE 2: When the attendant leaves a call on hold for longer than a predetermined time the line LED changes its winking rate. If a DSS/BLF is installed with the attendants telephone set, an alarm tone is heard from the buzzer in the DSS/BLF console.

Operation	LED Status
6. Using the Monitorphone Function (CO/PBX and ICM)	
(a) During call depress ON/OFF button.	ON/OFF LED lights.
(b) Restore the handset to cradle.	
(c) To talk lift the handset.	ON/OFF LED goes off.
7. Using Don't Disturb Feature	
(a) Depress ON/OFF button without depressing a line button.	ON/OFF LED goes on.
8. Terminating a Call (CO/PBX and ICM)	
(a) Restore the handset to the cradle, or, if monitorphone feature is being used, depress ON/OFF button.	Line LED goes off.
9. Transfering a Call (CO/PBX and ICM)	
(a) Place the call on hold.	Line LED starts winking.
(b) Depress idle ICM path button.	ICM path LED lights steady.
(c) Dial station number desired.	ICM path LED flashes at called and calling station.
(d) Inform called station of line on hold.	
(e) Wait for response or for held line LED to go steady.	

Operation	LED Status
(f) Restore the handset to the cradle.	ICM path LED goes off.
10. Voice Paging All Stations	
(a) Depress idle ICM path button.	ICM path LED not lit.
(b) Lift the handset.	ICM path LED lights steady.
(c) Dial "80".	ICM path LED starts flashing.
(d) Make the voice page over handset.	
11. Answering a Voice Page to All Station	
(a) Lift handset.	
(b) Dial *8.	
(c) Talk to pager on intercom path.	
12. Adding a Party to a CO/PBX Conversation	
(a) Place the CO/PBX call on hold.	CO/PBX line LED starts winking.
(b) Depress an idle CO/PBX line or ICM path button (as required).	CO/PBX line or ICM path LED lights.
(c) Dial the desired number.	If ICM path, LED flashes.
(d) When the called party answers, inform him of conference.	If ICM path, LED goes steady.

Operation	LED Status
(e) Depress ADD-ON button.	ADD-ON LED flashes.
(f) Depress the winking button held earlier.	CO/PBX line and ADD-ON LEDs go steady. (ICM path LED goes off.)
(g) Proceed with conference.	
13. Answering an Intercom Call to an Unattended Station (Call Pick-Up)	
When a voice signal or intercom tone signaling is heard at an unattended station:	
(a) Lift the handset.	
(b) Dial * and the unattended station number.	
(c) Talk to caller.	
OPTIONAL FEATURES	
14. Calling the DSS/BLF Attendant	
(a) Depress an idle ICM path button.	ICM path LED not lit.
(b) Lift the handset.	ICM path LED lights steady.
(c) Dial "0".	ICM path LED flashes at calling and attendants station.
(d) Voice signal, or provide tone signaling by dialing any second digit.	

Operation	LED Status
(e) Talk to attendant when answered.	ICM path LED goes steady.
(f) To terminate call restore the handset.	ICM path LED goes off.
15. Answering in Call from DSS/ BLF Attendant	
When Voice Signal is heard:	
(a) Lift the handset.	No LED indication.
(b) Talk to attendant.	
When warning tone is heard on handset:	
(a) Put call in progress on hold.	Line LED starts winking.
(b) Talk to attendant.	
16. Using the DSS/BLF Busy Lamp Field	
Station status is indicated by the following:	
(a) Call in progress or Don't Disturb mode.	Station LED lit steadily.
(b) Receiving or originating ICM voice or tone signaling. Receiving or originating DSS/all BLF console call.	Station LED flashes.
(c) Idle.	Station LED off.

Operation	LED Status
17. Making a DSS/BLF Call	
(a) Lift the handset.	
(b) Momentarily depress non-locking station button.	Station LED on DSS/BLF flashes.
(c) Make voice signal.	
NOTE: If station is busy, called station receives a warning tone over the handset and attendant receives call waiting tone. When call waiting tone stops make voice signal.	
18. Transfering a Call from DSS/BLF Station	
After answering a CO/PBX Call in the normal manner (NOTE 3):	CO/PBX line LED is steady.
(a) Checking station status on the busy lamp field, decide to whom the caller should speak.	CO/PBX line LED is steady.
(b) Momentarily depress the desired station button on the DSS/BLF. This automatically puts the CO/PBX call on hold and provides voice signaling access to the station (If station is off hook a warning tone is heard over the stations handset).	CO/PBX line LED winks. Station LED on DSS/BLF flashes.
(c) Alert the station to the held call.	
(d) Wait for response or for the CO/PBX line LED to go steady.	Station LED goes steady.

Operation	LED Status
(e) Restore the handset.	
19. Using Night Transfer Feature	
When leaving DSS/BLF station the attendant:	
Depress non-locking Night Transfer button.	Night Transfer LED lights.
20. Controlling Buzzer ON/OFF	
When CO/PBX incoming call signaling in off-hook condition from the buzzer in the DSS/ BLF console is not needed:	
Depress the non-locking Buzzer-off button. NOTE 4	Buzzer-off LED lights.
21. Voice Paging One of Three Internal Zones from a Station	
(a) Depress an idle ICM path button.	ICM path LED not lit.
(b) Lift the handset.	ICM path LED lights steadily.
(c) Dial 81, 82, or 83 to access Zone 1, Zone 2, or Zone 3, respectively.	ICM path LED flashes at calling station.
(d) Make the voice page over handset.	

NOTE 3: When the attendant is in off-hook condition, a CO/PBX line incoming call is indicated by the alerting buzzer in the DSS/BLF console.

NOTE 4: When Buzzer-off LED is lit, the Hold Recall Tone will not be heard.

Operation	LED Status
21. From the DSS/BLF console:	
(a) Depress desired internal zone paging button when internal paging circuitry is idle.	Internal paging LED not lit.
(b) Lift the handset.	Internal paging LED lights.
(c) Make voice page over handset.	
22. To Answer an Internal Zone Page	
(a) Lift the handset.	
(b) Dial *8.	DSS/BLF Internal paging LED goes off.
(c) Talk to pager.	
23. Paging One or All of Three External Zones	
From a Station:	
(a) Depress an idle ICM path	ICM path LED not lit.
(b) Lift the handset.	ICM path LED lights.
(c) Dial 71, 72, 73 or 70 to access Zone 1, Zone 2, Zone 3 or all 3 Zones, respectively.	ICM path LED flashes at your station.
(d) Page over the handset.	

Operation	LED Status
From the DSS/BLF Console:	
(a) Depress desired external zone paging button on DSS/BLF when external paging circuitry is idle.	External paging LED not lit.
(b) Lift the handset.	External paging LED lights.
(c) Page over the handset.	
24. To answer an External Page	
(a) Lift the handset.	
(b) Dial *7.	DSS/BLF External paging LED goes off.
(c) Talk to pager.	

POST INSTALLATION TESTING

5.02 After installation, test all telephones, all features, and all options to ensure correct operation. Section 5.03 is a suggested testing procedure. To facilitate testing it is recommended that one man remain at the DSS/BLF attendant's station (where installed) to observe the BLF function, to test the DSS/BLF at the same time intercom is being tested, and to coordinate testing activity. Before using the suggested test procedure read it through.

5.03 TESTING PROCEDURES

OPERATION	RESULT
FROM ALL TELEPHONES	
1. CO/PBX LINES	
(a) Lift the telephone handset.	(a) None.
(b) Depress CO/PBX line 1 button.	(b) The line LED lights, dial tone is heard (unless outgoing restricted-then busy tone).
(c) Dial 1.	(c) End of dial tone (busy tone heard if toll restricted).
(d) Depress CO/PBX line 2 button.	(d) Line 1 LED goes off, line 2 LED lights, dial tone is heard (unless outgoing restricted-then busy tone).
(e) Dial 2.	(e) End of dial tone.
(f) Dial 1.	(f) If toll restricted busy tone.
(g) Depress CO/PBX line 3.	(g) Line 2 LED goes off, line 3 LED lights, dial tone is heard unless outgoing restricted-then busy tone.
(h) Dial 3.	(h) End of dial tone.
(i) Continue this process until all lines and all dial digits have been tested. Check for proper restriction in each case.	(i) Correct audible and visual results.
(j) After finishing step (i) restore handset.	(j) The line LED for line you were on goes out after maximum of 2 seconds

OPERATION	RESULT
	(this delay is to allow switchhook flashing).
(k) Lift handset and depress any CO/PBX line button, then hold button.	(k) Hold button and LED indication are functioning correctly.
2. ICM PATHS	
(a) Lift the telephone handset.	(a) None.
(b) Depress ICM 1 button.	(b) ICM 1 LED lights, dial tone is heard.
(c) Dial associates intercom number ("0" if he is at attendants position).	(c) End of dial tone after first digit. After "0" or 2 digit ICM number, tone burst heard. Voice signal can be made. ICM LED flashes at calling and called station.
(d) Dial any other digit.	(d) Tone signaling.
(e) Associate answers.	(e) End of tone signaling, conversation possible. ICM LED goes steady.
(f) Tell associate your ICM number (if he is at DSS/ BLF he tells you) and have him call you on ICM. (n) Restore the handset.	(f) After terminating the call ICM LED goes off.
(g) Associate calls you.	(g) ICM LED flashes, tone burst then voice signal heard.
(h) Answer associate.	(h) ICM LED goes steady.

OPERATION	RESULT
(i) Seize all ICM paths installed.	(i) Dial tone heard on all ICM lines. LED indication correct.
(j) Restore the handset.	(j) All ICM LEDs Out. Intercom number is correct. All ICM buttons have been tested. LED indications correct.
3. STATION FEATURES	
(a) Depress ON/OFF button.	(a) ON/OFF LED lights.
(b) Depress ICM button.	(b) ICM LED lights, dial tone heard from speaker.
(c) Turn volume control.	(c) Volume of dial tone varies.
(d) Depress CO/PBX button.	(d) CO/PBX LED lights and ICM LED goes off.
(e) Depress ADD-ON button.	(e) ADD-ON LED flashes.
(f) Depress ON-OFF button.	(f) ON/OFF, ICM, and ADD-ON LEDs go off.
4. OPTION FEATURES	
DSS/BLF	
(a) Depress an ICM button.	(a) None.
(b) Lift the handset.	(b) ICM LED lights. Dial tone is heard.
(c) Dial 0.	(c) Tone burst and flashing ICM LED at attendants station. Associate answers.

OPERATION	RESULT
(d) Ask associate the intercom number of your station.	(d) Associate tells you using BLF function.
(e) Restore handset so associate can call you with DSS/BLF.	(e) ICM LED goes off.
(f) Associate (off hook) depresses your station button on DSS/BLF and voice signals.	(f) Your station receives tone burst and voice signal. Your station LED on DSS/ BLF flashes.
(g) Lift the handset and talk to associate.	(g) Station LED goes steady, conversation possible.
(h) Restore the handset.	(h) Station LED goes out.
(i) Lift the handset of the attendants telephone set.	(i) Your own station LED on DSS/BLF lights.
(j) Depress a CO/PBX button.	(j) CO/PBX LED lights.
(k) Depress the hold button.	(k) CO/PBX LED goes winking.
(l) Wait for 30 seconds in that state.	(l) CO/PBX LED goes intermittent winking and interrupted tone is heard through the buzzer of DSS/BLF console.
(m) Depress the Buzzer-Off button of DSS/BLF console.	(m) Buzzer-Off LED goes steady and buzzer tone stops.
(n) Depress the Buzzer-Off button again.	(n) The Buzzer-Off LED goes off and the buzzer works again.
(o) Depress the held CO/PBX button.	(o) The CO/PBX LED goes steady and the buzzer stops.

OPERATION	RESULT
FROM ONE TELEPHONE	
1. CO/PBX LINES	
(a) Use line 1 to call line 2.	(a) Line 2 audible incoming ring signal as assigned. (See 3.18) LED 1 is steady, LED 2 flashes.
(b) Associate answers.	(b) End of audible incoming ring signal. LED 2 goes steady.
(c) Put associate on hold, take associate of hold.	(c) Holding bridge functions; held line LED winks, then goes steady; MOH heard (if equipped) by associate.
(d) Go to another station and try to enter the lines.	(d) Privacy is maintained, busy tone is heard.
(e) Terminate the call and use line 2 to call line 3. Go through steps (a) - (d). Test all lines in this manner. using the last to call the first.	(e) When step (e) is completed all CO/PBX lines have been tested for incoming, outgoing, hold and privacy functions. Also MOH has been tested (if equipped).
Note: When the flexible ring assignment with UPA KTU is not done, incoming ringing tone can be heard only through the telephone sets which are connected to the DSS/BLF position. When a telephone at the DSS/BLF position is busy, the ringing tone can be heard from the buzzer in the DSS/BLF console.	

OPERATION	RESULT
2. ICM PATHS	
(a) Call associate on ICM 1.	(a) Associate's ICM 1 LED flashes. Tone burst is heard.
(b) Voice signal associate.	(b) Voice signal is heard.
(c) Dial any digit.	(c) Tone signal is heard.
(d) Associate lifts handset.	(d) Associate's ICM LED goes lit.
(e) Put associate on hold, take associate off hold.	(e) ICM 1 LED winks then goes steady.
(f) Go to another station and try to enter the ICM path.	(f) Privacy is maintained.
(g) Terminate the call and perform steps (a) (e) on all ICM paths.	(g) When step (f) is completed all ICM paths have been tested.
3. SYSTEM FEATURES	
(a) Call Pick-Up : have associate call unattended station on ICM path.	(a) You hear tone burst at called station.
(b) Lift a different stations handset, dial * and the called station ICM number.	(b) You and associate can talk on the ICM path.
(c) All Call Page with Meet-Me Answer: Lift the handset and depress an ICM button Dial 80 and request associate "meet you".	(c) ICM path LED on calling station flashes, voice page is heard from station speakers.

OPERATION	RESULT
(d) Associate lifts handset and dials *8.	(d) ICM path LED on calling station goes steady, you and associate can talk on ICM path.
(e) Tones and timing circuits: Seize an ICM path and dial an ICM number which is not assigned in system.	(e) Busy tone heard.
(f) Seize an ICM path and do not dial.	(f) Busy tone heard 10 seconds after seizure.
(g) Seize an ICM path and dial one digit.	(g) Busy tone heard 10 seconds after dialing.
(h) Seize an ICM path and call an unattended station.	(h) Busy tone heard 30 seconds after dialing. ICM path LED goes solid 30 seconds after dialing.
(i) Seize an ICM path and call a busy station.	(i) Call waiting tone heard.
(j) Have associate terminate busy stations call.	(j) End of call waiting tone, you can voice or tone signal.
(k) Depress a CO/PBX button, wait over 10 seconds, lift the handset.	(k) No dial tone, no CO/PBX line LED action.
(l) ADD-ON circuits: Use CO/PBX line 1 to call an outside party. Put the call on hold. Use CO/PBX line 2 to call an outside party. Depress ADD-ON button and depress line 1. Do not terminate these calls.	(l) You and both outside parties can carry on a 3-way conversation.

OPERATION	RESULT
(m) At a different station use CO/PBX line 3 to call outside party. Put the call on hold. Call associate on ICM path. After he answers, depress ADD-ON button and take line 3 off hold.	(m) You, associate, and outside party can carry on a 3-way conversation.
(n) Terminate all calls.	
4. OPTION FEATURES	
Internal 3-Zone Paging with Meet-Me Answer	
(a) Seize an ICM path and dial 81. Request associate to "meet you".	(a) You can voice page over zone 1 telephone speakers.
(b) Associate lifts a station handset and dials *8.	(b) Internal paging circuitry is released, intercom conversation possible.
(c) Repeat steps (a) and (b) on zones 2 and 3. Access codes are 82 and 83.	(c) Station assignment is correct, internal paging circuitry works.
(d) If DSS/BLF(s) is equipped, lift handset and depress internal zone paging button.	(d) Voice page is made. Internal paging LED lights.
(e) Have associate "meet you" as in step (b).	(e) Associate meets you.
(f) Repeat on all internal zones.	(f) All internal paging circuitry functions properly.

OPERATION	RESULT
External 3-Zone, All Zone Paging with Meet-Me Answer	
(a) Seize an ICM path and dial 70. Page associate to "meet you"	(a) You page through all external speakers.
(b) Associate lifts a station handset and dials *7.	(b) External paging circuitry is released, intercom conversation possible.
(c) Repeat steps (a) and (b) on zones 1 ~ 3. Access codes are 71 ~ 73.	(c) Speaker assignment is correct. External paging circuitry functions correctly.
(d) If DSS/BLF(s) is equipped, lift handset and depress external all zone paging button.	(d) Page is made. External paging LED lights.
(e) Have associate "meet you" as in step (b).	(e) Associate meets you.
(f) Repeat on all external zones.	(f) All external paging circuitry functions properly.
FROM DSS/BLF TELEPHONE	
(a) Lift the handset and depress CO/PBX line button.	(a) CO/PBX line LED lights.
(b) Depress a station button on DSS/BLF.	(b) CO/PBX line is automatically put on hold, line LED winks.
(c) Depress Night Transfer button.	(c) Night Transfer LED lights.
(d) Call in on every CO/PBX line.	(d) Common audible at all stations.

OPERATION	RESULT
AT KSU	
(e) Power Failure Transfer: Turn switch on power unit off.	(e) Single line telephones are connected.
(f) Call out on all CO/PBX lines, call in on all CO/PBX lines.	(f) All single line telephones function correctly.
All other options have been tested to include:	
(a) External Tone Ringer.	
(b) Flexible CO/PBX Ring Assignment.	
(c) Flexible Intercom Number Assignment.	
(d) Toll and Outgoing Call Restriction.	
(e) DSS/BLF.	
(f) Music on Hold.	

6. MAINTENANCE

6.01 Field maintenance of the Electra-28 EKTS is not to exceed replacement of units. It is not recommended that field repairs be attempted on printed circuit boards.

6.02 KTUs in the table 6-1 can be connected or disconnected under the conditions shown in the table.

TABLE 6-1 CONDITIONS FOR KTUs CONNECTION and DISCONNECTION

KTU	Condition for connecting and disconnecting KTUs.
EP	LED off
MOH	None
AHR	All TKs' LEDs off
TK (Note 1)	LED off
LSW	LED off
UPA1	No incoming call
UPA2	No incoming call

Note 1. Trunk assignment must not be changed. If the assignment is changed, power must be off until the TK is connected.

6.03 KTUs except the ones shown in the Table 6-1 can not be connected or disconnected with power on.
Turn power off in case of connection or disconnection of these KTUs.

6.04 The station sets and DSS/BLF consoles also can not be connected or disconnected with power on.
To do so can result in misoperation of the system.

6.05 The first step in maintenance is to define the problem, then check appropriate connections.

ET-14-2 Telephone Set.

. Check fuses at TRC KTU in KSU and at PSU.

. Check connections at MDF.

. Check the telephone connector.

ES-14-2 KSU

. Check Fuses at PSU.

. Check AC power cord at PSU.

. Check power switch on front panel of PSU.

. Check for power at receptacle.

KTUs

. Check for proper insertion.

Replace a suspect KTU with one known to be good. If trouble remains, re-insert original KTU.

PSU

. Check power cord.

. Check fuses.

. Check voltage of power output.

6.06 Use the flow charts as an aid in troubleshooting. Before using them have a clear understanding of the trouble.

STATION DISASSEMBLY

6.07 (a) Remove the clear plastic face panel from the telephone by inserting a small screwdriver in the notch at top of face panel, separating the locking tabs, and lifting the face panel off.

(b) Remove the colored face sheet.

(c) Remove the screw directly above the hold button.

(d) Pull out at the rear center of housing to free plastic latch and lift off.

6.08 All assemblies in the telephone are connected with plug-ended cables. See Fig. 1-6.

VOLUME CONTROL

6.09 All tones from the built-in speaker in a telephone set are controlled at the station by adjusting volume dial in the front of the telephone set.

6.10 CO and ICM service tones are controlled by adjusting volumes on the TST KTU. Tone level becomes louder when turning unticlockwise. These volumes are adjusted in manufacture.

CO Ring Tone	:	VR5 (CO)
ICM Dial Tone	:	VR1 (DT)
ICM Tone Signal	:	VR2 (ICM)
ICM Ring Back Tone	:	VR2 (ICM)
ICM Call Waiting Tone	:	VR4 (CWT)
Busy Tone	:	VR3 (BT)

NOTE 1) ICM voice signal level is controlled only by the telephone volume dial.

2) Voice level on internal zone paging and all call is controlled only by the telephone volume dial.

6.11 Voice level on external paging becomes louder by turning the volume VR1 on EP KTU unticlockwise.

6.12 Music-on-Hold is adjusted as follows when MOH music synthesizer is used.

NOTE: All volumes on MOH KTU are adjusted in manufacture, volumes should not be adjusted except when changing music memory chips.

MOH tone level	:	VR3 (VOL) louder by turning clockwise
Rhythm tempo	:	VR1 (TEMPO) slower by turning clockwise
Tone pitch	:	VR2 (PITCH) lower by turning clockwise
Tone reverberations	:	VR4 (SLOPE) more gradual by turning clockwise

FUSE REPLACEMENT

6.13 When a fuse is blown, replace the fuse according to the Table 6-2.

NOTE: DON'T USE OTHER VALUED FUSES FOR DAMAGE TO THE KSU OR PSU WILL RESULT.

Table 6-2 FUSE SPECIFICATIONS

DESIG.	SPECIFICATION	DESCRIPTION
F1	250V, 5A	AC Input
F2	139°C (282.2°F)	Thermal Fuse For Power Unit (NOTE 2)
F3	250V, 10A	DC + 30V For Tel Set Main Battery
F4	250V, 3A	DC + 30V For Talk Battery
F5	250V, 2A	DC + 24V For Relay Battery
F6	250V, 1A	DC + 12V For Logic Circuit Battery
F7	250V, 20A	DC + 5V For Logic Circuit Battery
F8	250V, 1A	DC - 5V For Logic Circuit Battery
TRC-F1	250V, 3A	Power Supply to Each Station (NOTE 3)

NOTE 1. F1, F8 and F3 thru F6 are 1/4" x 1-1/4" size normal blown glass tube or ceramic fuses.
F7 is 13/32" x 1-1/2" size normal blown glass tube fuse.

2. F2 is a 139°C (282.2°F) thermal fuse which is equipped on the power transformer.

3. TRC-F1 is located on TRC KTU and 13/64" x 45/64" (5mm x 20mm) size normal blown glass tube fuse.

Fig. 1-1 ES-144-2 USD OUTSIDE VIEW & WIDTH

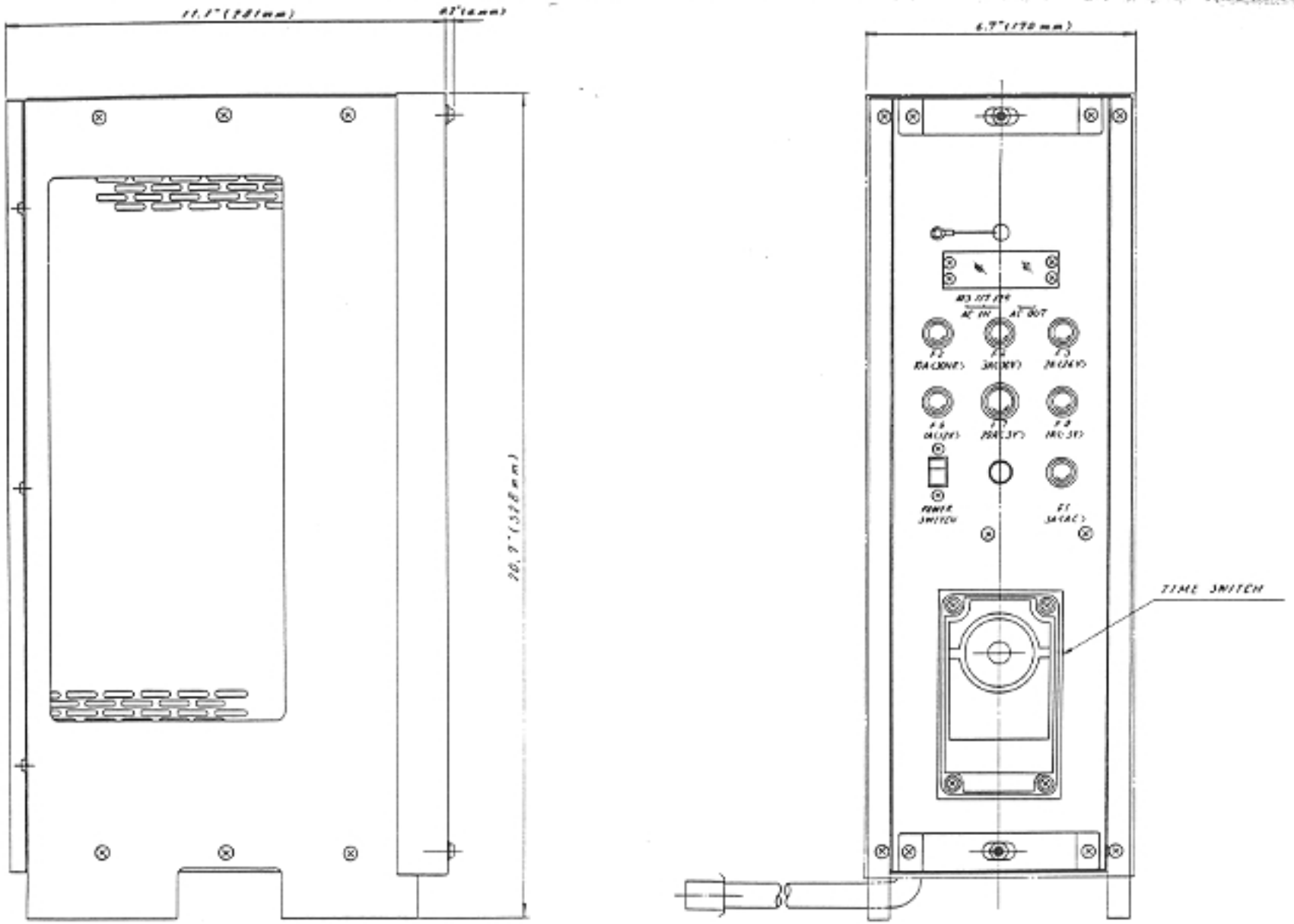


Fig. 1-2 PSU-14-3 Power Supply Unit Outside View

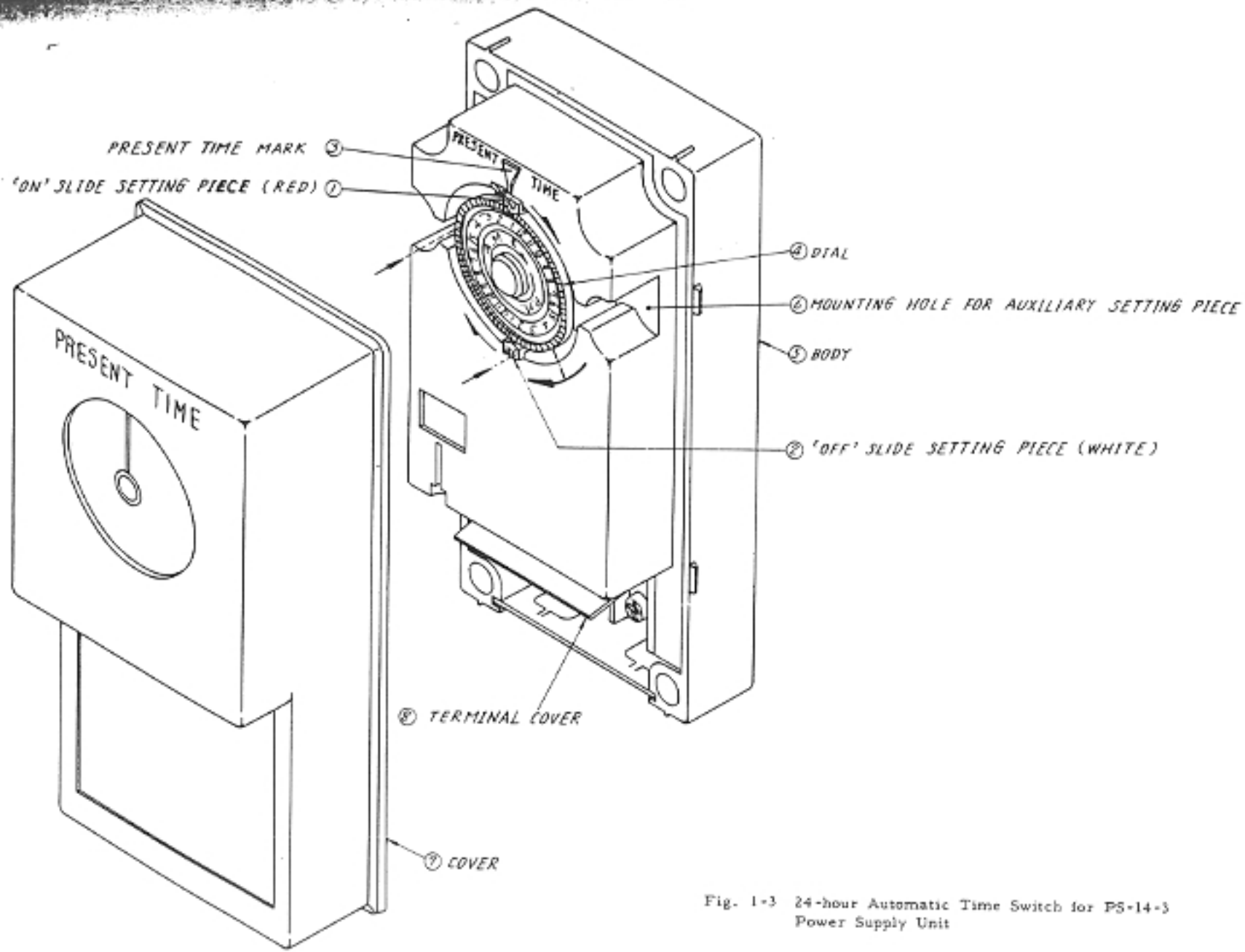


Fig. 1-3 24-hour Automatic Time Switch for PS-14-3 Power Supply Unit

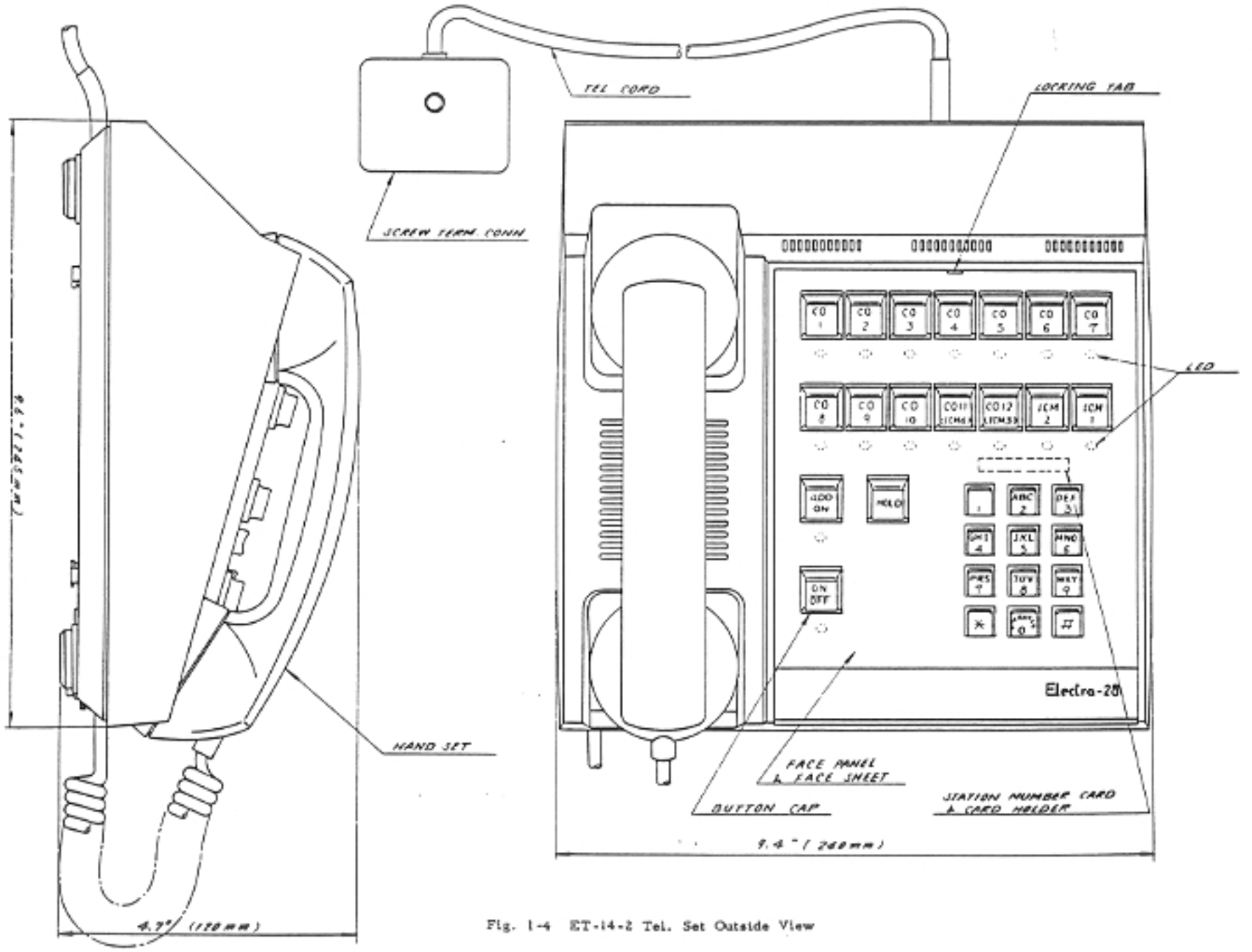


Fig. 1-4 ET-14-2 Tel. Set Outside View

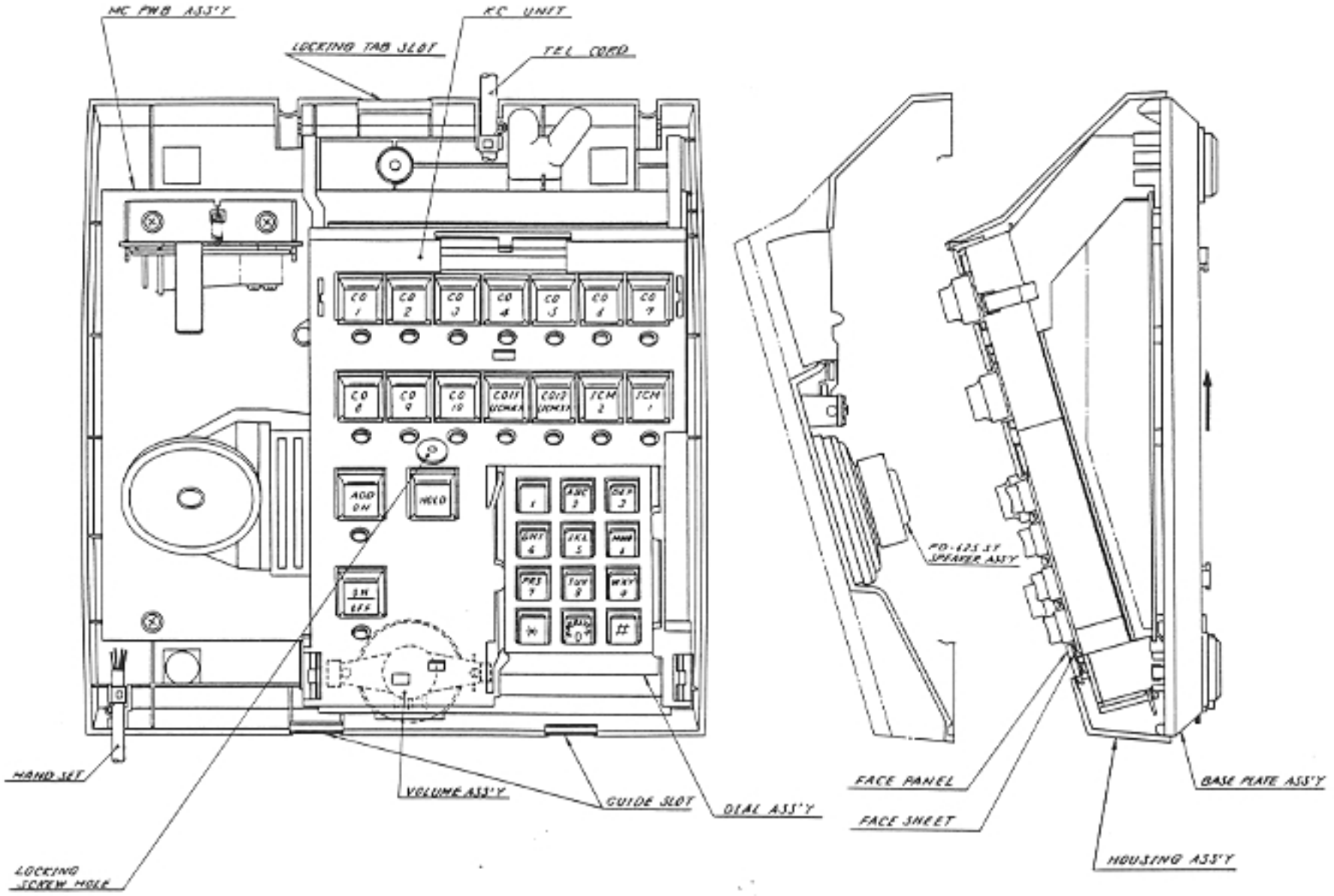


Fig. 1-5 ET-14-2 Tel. Set Layout

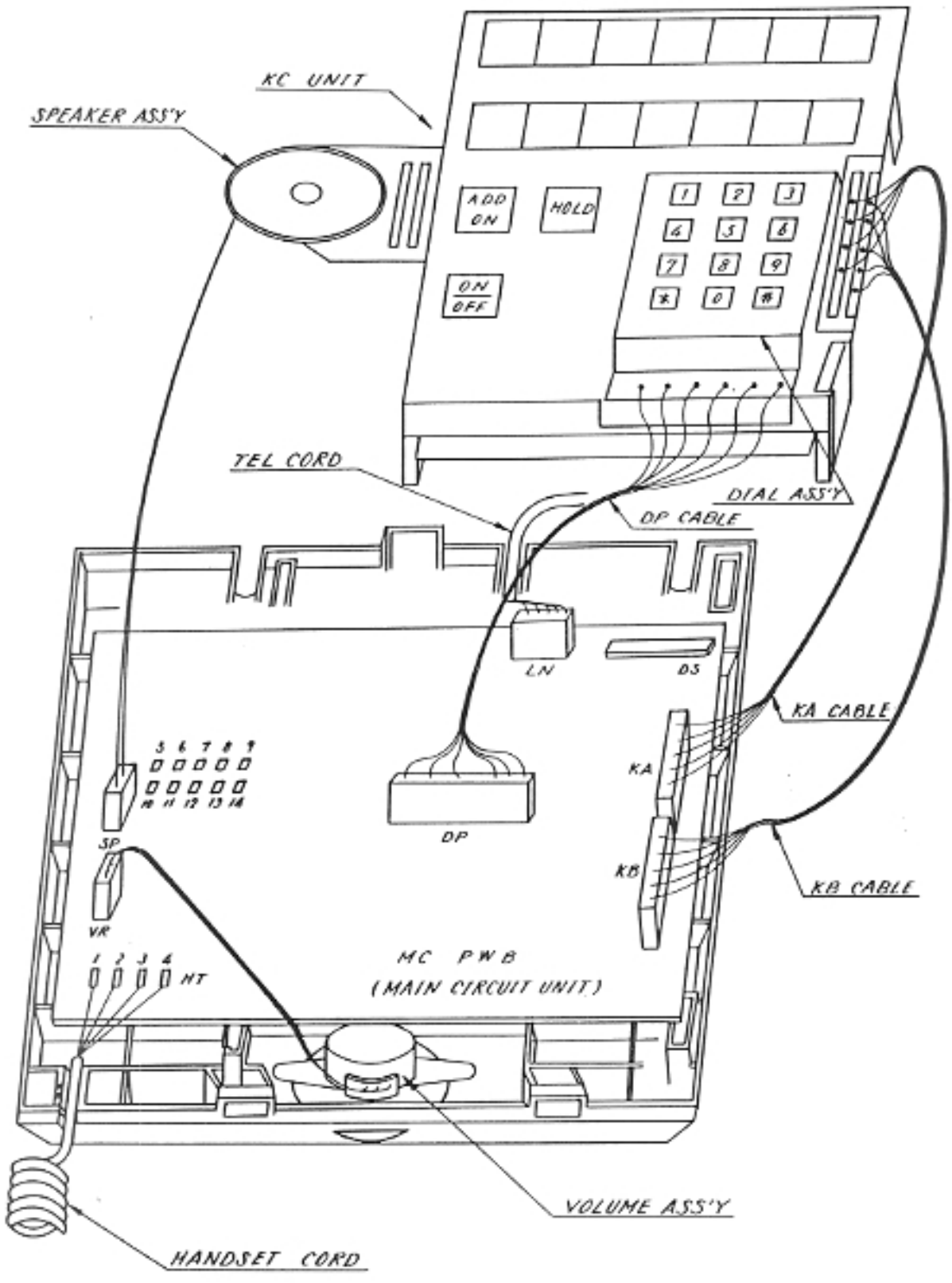


Fig. 1-6 Connection of Assemblies in Tel. Set.

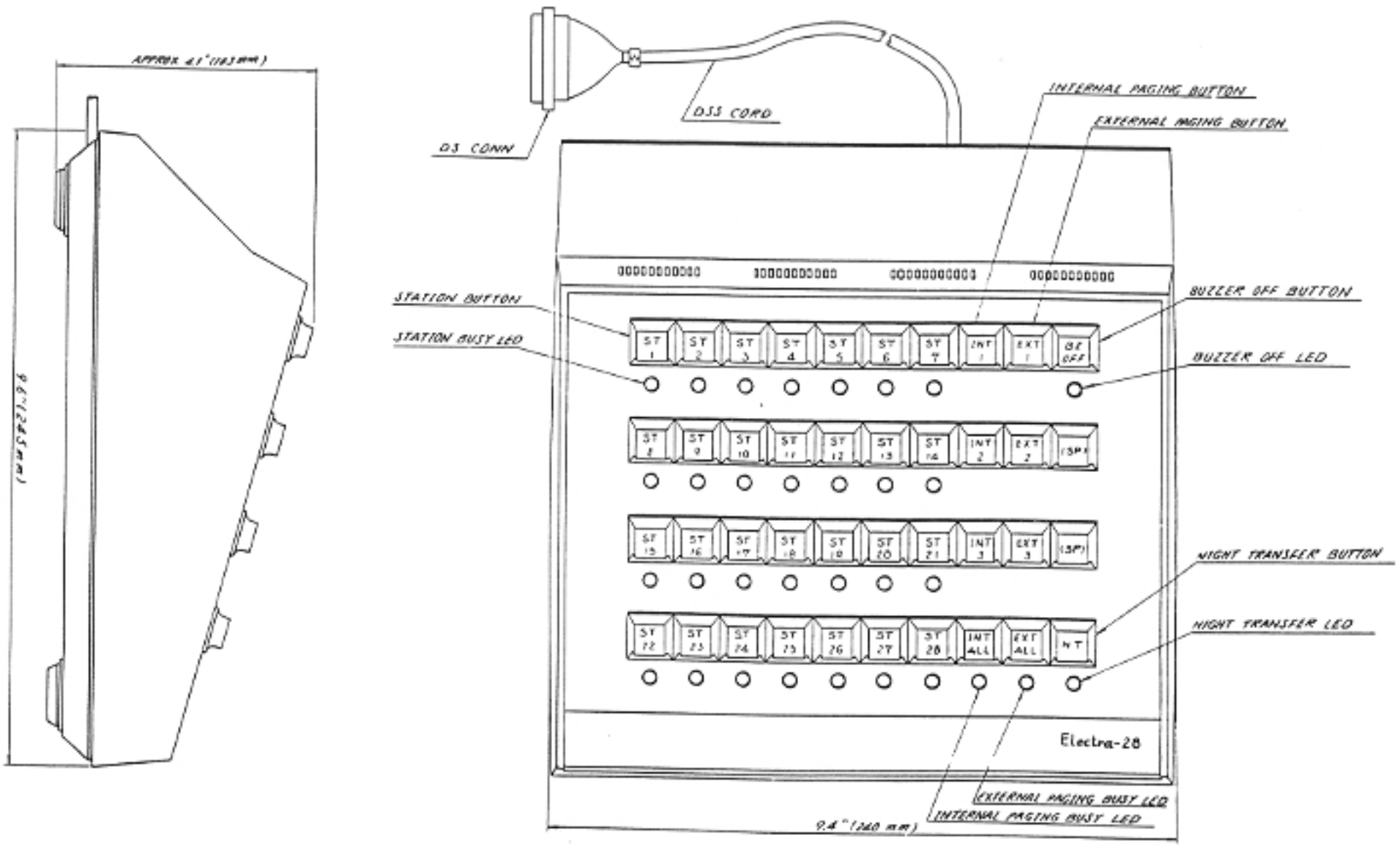
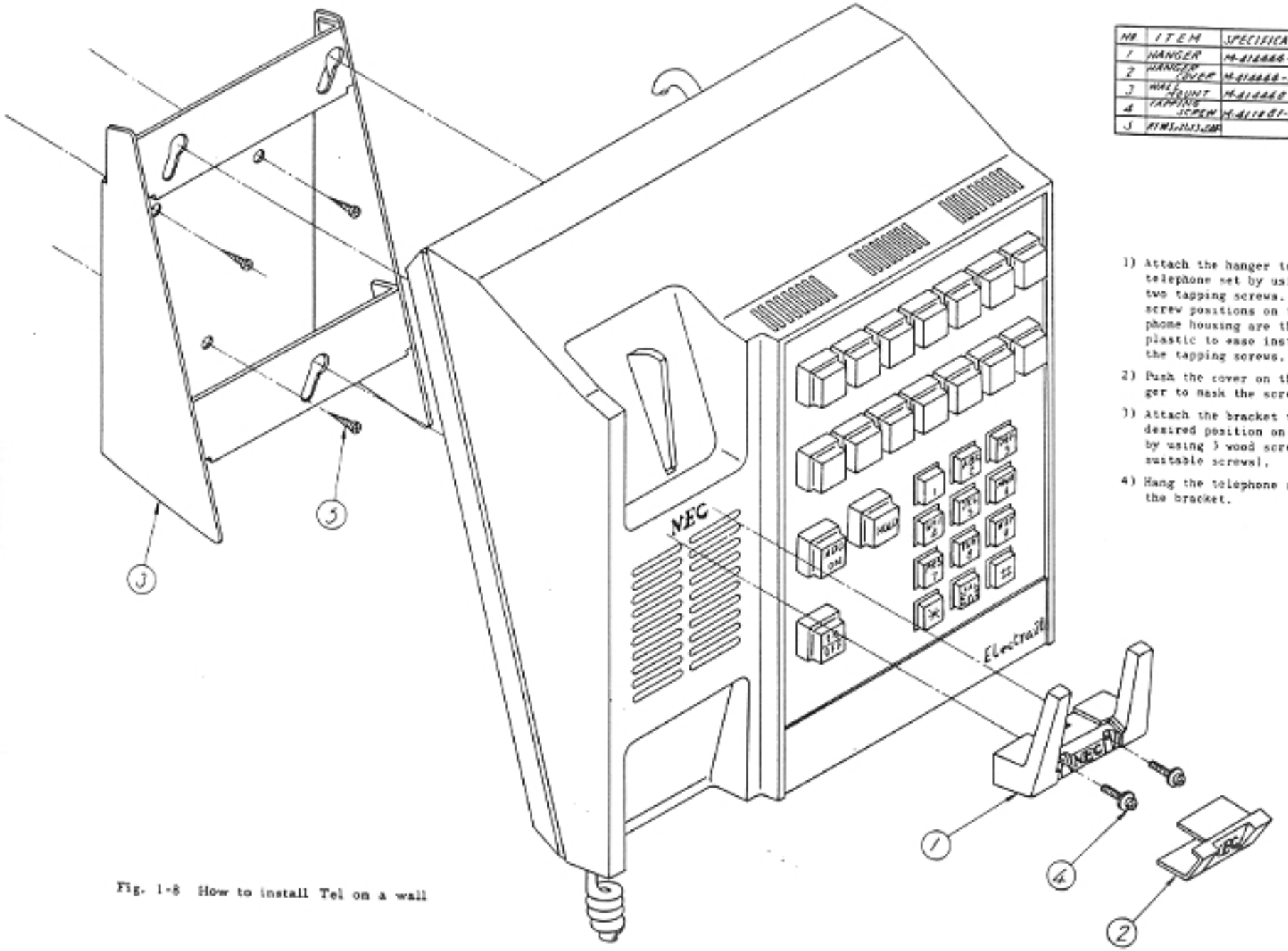


Fig. 1-7 ED-28-2 DSS/BLF Console Outside View



NO	ITEM	SPECIFICATION	NOTE	QTY
1	HANGER	M-414446-001		1
2	HANGER COVER	M-414446-002		1
3	WALL MOUNT	M-414440		1
4	TAPPING SCREW	M-4116 01-116		2
5	[illegible]			3

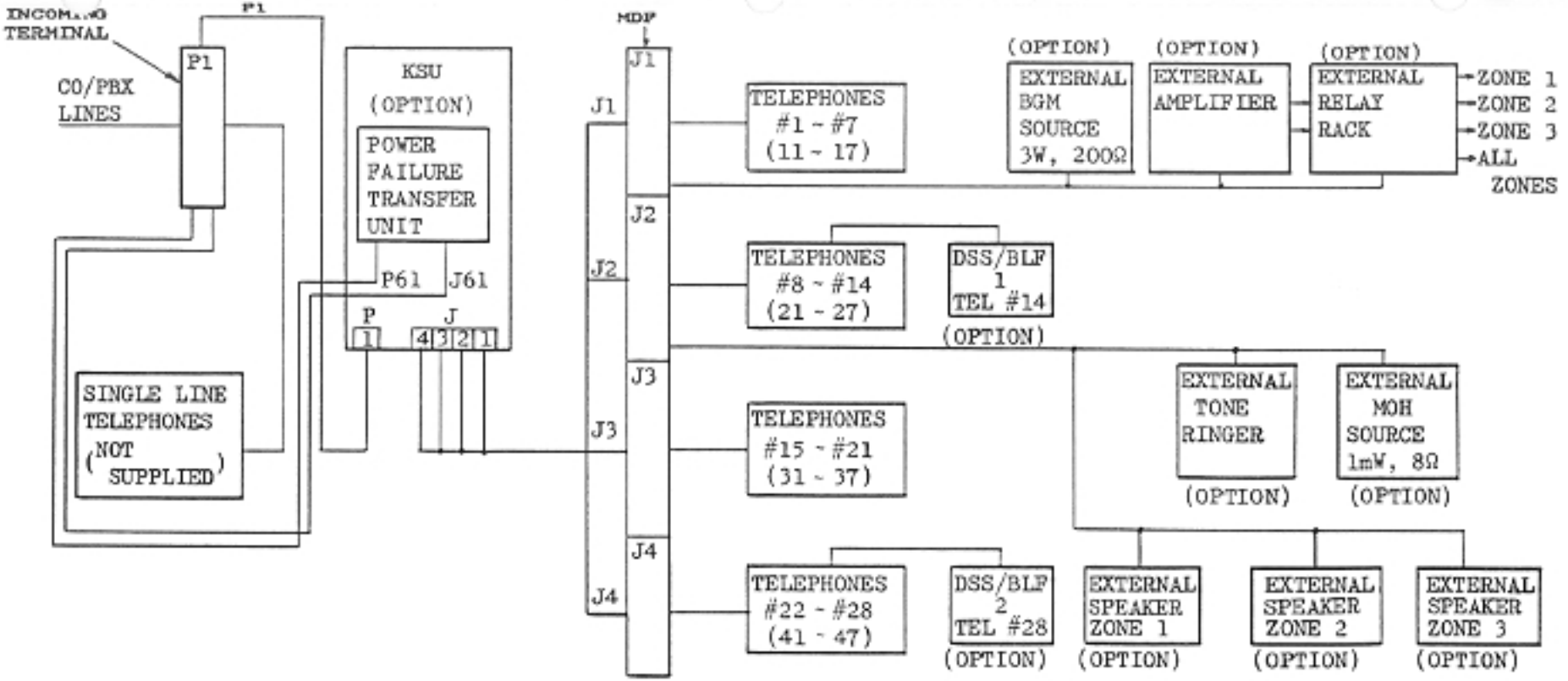
1) Attach the hanger to the telephone set by using the two tapping screws. The screw positions on the telephone housing are thinner plastic to ease installing the tapping screws.

2) Push the cover on the hanger to mask the screws.

3) Attach the bracket to the desired position on the wall by using 3 wood screws (or suitable screws).

4) Hang the telephone set on the bracket.

Fig. 1-8 How to install Tel on a wall



1. P1 BLOCK IS 66 B4-50 TYPE IF POWER FAILURE UNIT IS INSTALLED. IF POWER FAILURE UNIT IS NOT INSTALLED 66 B4-50 OR 66 M1-50 TYPES MAY BE USED (WITH BRIDGING CLIPS)
2. P1 CABLE IS 25-PAIR WITH FEMALE AMPHENOL-TYPE CONNECTOR AT ONE END
3. J1 - J4 CABLES ARE EACH 25-PR CABLES WITH MALE AMPHENOL-TYPE CONNECTOR AT ONE END. THERE IS NO REASON WHY A SINGLE 100-PR, 2 50-PR., ETC CABLE(S) COULD NOT BE USED.
4. J1 - J4 BLOCKS ARE 66 B4-50 or 66 M1-50 TYPES (WITH BRIDGING CLIPS)

Fig. 2-1 System Connection Layout

P1 (CO/PBX)			
PIN	LEAD DESIG	CABLE COLOR	CKT DESIG
26	1T	WH-BL	CO1
1	1R	BL-WH	
27	1E	WH-OR	
2		OR-WH	
28	2T	WH-GN	CO2
3	2R	GN-WH	
29	2E	WH-BR	
4		BR-WH	
30	3T	WH-SL	CO3
5	3R	SL-WH	
31	3E	RD-BL	
6		BL-RD	
32	4T	RD-OR	CO4
7	4R	OR-RD	
33	4E	RD-GN	
8		GN-RD	
34	5T	RD-BR	CO5
9	5R	BR-RD	
35	5E	RD-SL	
10		SL-RD	
36	6T	BK-BL	CO6
11	6R	BL-BK	
37	6E	BK-OR	
12		OR-BK	
38	7T	BK-GN	CO7
13	7R	GN-BK	
39	7E	BK-BR	
14		BR-BK	
40	8T	BK-SL	CO8
15	8R	SL-BK	
41	8E	YL-BL	
16		BL-YL	
42	9T	YL-OR	CO9
17	9R	OR-YL	
43	9E	YL-GN	
18		GN-YL	
44	10T	YL-BR	CO10
19	10R	BR-YL	
45	10E	YL-SL	
20		SL-YL	
46	11T	VI-BL	CO11
21	11R	BL-VI	
47	11E	VI-OR	
22		OR-VI	
48	12F	VI-GN	CO12
23	12R	GN-VI	
49	12E	VI-BR	
24		BR-VI	
50	+24	VI-SL	
25	G	SL-VI	

J1 (TEL)				
PIN	LEAD DESIG	CABLE COLOR KSU	CABLE COLOR TEL	CKT DESIG
26	1VT	WH-BL	WH-BL	TEL1
1	1VR	BL-WH	BL-WH	
27	1ST	WH-OR	WH-OR	
2	1SR	OR-WH	OR-WH	
28	1RT	WH-GN	WH-GN	
3	1RR	GN-WH	GN-WH	
29	2VT	WH-BR	WH-BL	TEL2
4	2VR	BR-WH	BL-WH	
30	2ST	WH-SL	WH-OR	
5	2SR	SL-WH	OR-WH	
31	2RT	RD-BL	WH-GN	
6	2RR	BL-RD	GN-WH	
32	3VT	RD-OR	WH-BL	TEL3
7	3VR	OR-RD	BL-WH	
33	3ST	RD-GN	WH-OR	
8	3SR	GN-RD	OR-WH	
34	3RT	RD-BR	WH-GN	
9	3RR	BR-RD	GN-WH	
35	4VT	RD-SL	WH-BL	TEL4
10	4VR	SL-RD	BL-WH	
36	4ST	BK-BL	WH-OR	
11	4SR	BL-BK	OR-WH	
37	4RT	BK-OR	WH-GN	
12	4RR	OR-BK	GN-WH	
38	5VT	BK-GN	WH-BL	TEL5
13	5VR	GN-BK	BL-WH	
39	5ST	BK-BR	WH-OR	
14	5SR	BR-BK	OR-WH	
40	5RT	BK-SL	WH-GN	
15	5RR	SL-BK	GN-WH	
41	6VT	YL-BL	WH-BL	TEL6
16	6VR	BL-YL	BL-WH	
42	6ST	YL-OR	WH-OR	
17	6SR	OR-YL	OR-WH	
43	6RT	YL-GN	WH-GN	
18	6RR	GN-YL	GN-WH	
44	7VT	YL-BR	WH-BL	TEL7
19	7VR	BR-YL	BL-WH	
45	7ST	YL-SL	WH-OR	
20	7SR	SL-YL	OR-WH	
46	7RT	VI-BL	WH-GN	
21	7RR	BL-VI	GN-WH	
47	EPC1	VI-OR		EXT. AMP. ZONE PAGING
22	EPC2	OR-VI		
48	EPC3	VI-GN		
23	+24	GN-VI		
49	BGM	VI-BR		BGM
24	G	BR-VI		
50	EPI	VI-SL		EXT. AMP. INPUT
25	EPIG	SL-VI		

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Fig. 2-2 Patrician

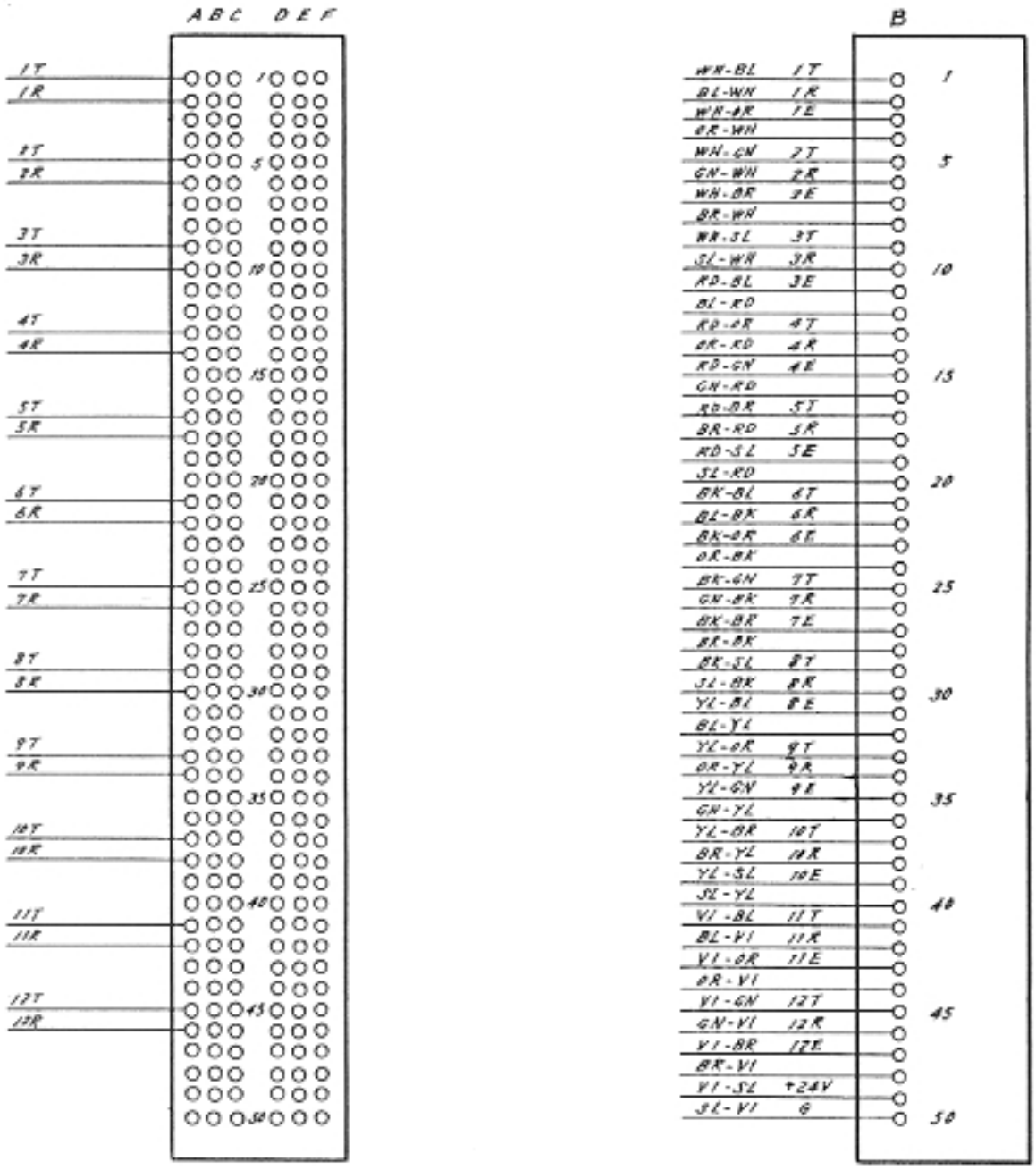
J2 (TEL)			
LEAD DES	CABLE COLOR KSU	CABLE COLOR TEL	CKT DESIG
3VT	WH-BL	WH-BL	TEL8
3VR	BL-WH	BL-WH	
3ST	WH-OR	WH-OR	
3SR	OR-WH	OR-WH	
3RT	WH-GN	WH-GN	
3RR	GN-WH	GN-WH	
9VT	WH-BR	WH-BL	TEL9
9VR	BR-WH	BL-WH	
9ST	WH-SL	WH-OR	
9SR	SL-WH	OR-WH	
9RT	RD-BL	WH-GN	
9RR	BL-RD	GN-WH	
10VT	RD-OR	WH-BL	TEL10
10VR	OR-RD	BL-WH	
10ST	RD-GN	WH-OR	
10SR	GN-RD	OR-WH	
10RT	RD-BR	WH-GN	
10RR	BR-RD	GN-WH	
11VT	RD-SL	WH-BL	TEL11
11VR	SL-RD	BL-WH	
11ST	BK-BL	WH-OR	
11SR	BL-BK	OR-WH	
11RT	BK-OR	WH-GN	
11R	OR-BK	GN-WH	
12V	BK-GN	WH-BL	TEL12
12VR	GN-BK	BL-WH	
12ST	BK-BR	WH-OR	
12SR	BR-BK	OR-WH	
12RT	BK-SL	WH-GN	
12RR	SL-BK	GN-WH	
13VT	YL-BL	WH-BL	TEL13
13VR	BL-YL	BL-WH	
13ST	YL-OR	WH-OR	
13SR	OR-YL	OR-WH	
13RT	YL-GN	WH-GN	
13RR	GN-YL	GN-WH	
14VT	YL-BR	WH-BL	TEL14
14VR	BR-YL	BL-WH	
14ST	YL-SL	WH-OR	
14SR	SL-YL	OR-WH	
14RT	VI-BL	WH-GN	
14RR	BL-VI	GN-WH	
ST	VI-OR		EXT. RING
ER	OR-VI		
MDH	VI-GN		EXT. MOH
MG	GN-VI		
PG1	VI-BR		EXT. PAG-ING SPEAK-ER
PG2	BR-VI		
PG3	VI-SL		
PG	SL-VI		

J3 (TEL)				
PIN	LEAD DESIG	CABLE COLOR KSU	CABLE COLOR TEL	CKT DESIG
26	15VT	WH-BL	WH-BL	TEL15
1	15VR	BL-WH	BL-WH	
27	15ST	WH-OR	WH-OR	
2	15SR	OR-WH	OR-WH	
28	15RT	WH-GN	WH-GN	
3	15RR	GN-WH	GN-WH	
29	16VT	WH-BR	WH-BL	TEL16
4	16VR	BR-WH	BL-WH	
30	16ST	WH-SL	WH-OR	
5	16SR	SL-WH	OR-WH	
31	16RT	RD-BL	WH-GN	
6	16RR	BL-RD	GN-WH	
32	17VT	RD-OR	WH-BL	TEL17
7	17VR	OR-RD	BL-WH	
33	17ST	RD-GN	WH-OR	
8	17SR	GN-RD	OR-WH	
34	17RT	RD-BR	WH-GN	
9	17RR	BR-RD	GN-WH	
35	18VT	RD-SL	WH-BL	TEL18
10	18VR	SL-RD	BL-WH	
36	18ST	BK-BL	WH-OR	
11	18SR	BL-BK	OR-WH	
37	18RT	BK-OR	WH-GN	
12	18RR	OR-BK	GN-WH	
38	19VT	BK-GN	WH-BL	TEL19
13	19VR	GN-BK	BL-WH	
39	19ST	BK-BR	WH-OR	
14	19SR	BR-BK	OR-WH	
40	19RT	BK-SL	WH-GN	
15	19RR	SL-BK	GN-WH	
41	20VT	YL-BL	WH-BL	TEL20
16	20VR	BL-YL	BL-WH	
42	20ST	YL-OR	WH-OR	
17	20SR	OR-YL	OR-WH	
43	20RT	YL-GN	WH-GN	
18	20RR	GN-YL	GN-WH	
44	21VT	YL-BR	WH-BL	TEL21
19	21VR	BR-YL	BL-WH	
45	21ST	YL-SL	WH-OR	
20	21SR	SL-YL	OR-WH	
46	21RT	VI-BL	WH-GN	
21	21RR	BL-VI	GN-WH	
47	-	VI-OR	- -	SPARE
22	-	OR-VI	- -	
48	-	VI-GN	- -	
23	-	GN-VI	- -	
49	-	VI-BR	- -	
24	-	BR-VI	- -	
50	-	VI-SL	- -	
25	-	SL-VI	- -	

J4 (TEL)				
PIN	LEAD DESIG	CABLE COLOR KSU	CABLE COLOR TEL	CKT DESIG
26	22VT	WH-BL	WH-BL	TEL22
1	22VR	BL-WH	BL-WH	
27	22ST	WH-OR	WH-OR	
2	22SR	OR-WH	OR-WH	
28	22RT	WH-GN	WH-GN	
3	22RR	GN-WH	GN-WH	
29	23VT	WH-BR	WH-BL	TEL23
4	23VR	BR-WH	BL-WH	
30	23ST	WH-SL	WH-OR	
5	23SR	SL-WH	OR-WH	
31	23RT	RD-BL	WH-GN	
6	23RR	BL-RD	GN-WH	
32	24VT	RD-OR	WH-BL	TEL24
7	24VR	OR-RD	BL-WH	
33	24ST	RD-GN	WH-OR	
8	24SR	GN-RD	OR-WH	
34	24RT	RD-BR	WH-GN	
9	24RR	BR-RD	GN-WH	
35	25VT	RD-SL	WH-BL	TEL25
10	25VR	SL-RD	BL-WH	
36	25ST	BK-BL	WH-OR	
11	25SR	BL-BK	OR-WH	
37	25RT	BK-OR	WH-GN	
12	25RR	OR-BK	GN-WH	
38	26VT	BK-GN	WH-BL	TEL26
13	26VR	GN-BK	BL-WH	
39	26ST	BK-BR	WH-OR	
14	26SR	BR-BK	OR-WH	
40	26RT	BK-SL	WH-GN	
15	26RR	SL-BK	GN-WH	
41	27VT	YL-BL	WH-BL	TEL27
16	27VR	BL-YL	BL-WH	
42	27ST	YL-OR	WH-OR	
17	27SR	OR-YL	OR-WH	
43	27RT	YL-GN	WH-GN	
18	27RR	GN-YL	GN-WH	
44	28VT	YL-BR	WH-BL	TEL28
19	28VR	BR-YL	BL-WH	
45	28ST	YL-SL	WH-OR	
20	28SR	SL-YL	OR-WH	
46	28RT	VI-BL	WH-GN	
21	28RR	BL-VI	GN-WH	
47	-	VI-OR	- -	SPARE
22	-	OR-VI	- -	
48	-	VI-GN	- -	
23	-	GN-VI	- -	
49	-	VI-BR	- -	
24	-	BR-VI	- -	
50	-	VI-SL	- -	
25	-	SL-VI	- -	

VT	Voice Tip
VR	Voice Ring
ST	Data Sending Tip
SR	Data Sending Ring
RT	Data Receiving Tip
RR	Data Receiving Ring
EPC1 - 3	External Paging Control 1 - 3
+24	Other Side of Control (paging control circuit)
BGM	Background Music Input
G	Other Side of BGM Input
EPI	External Amplifier Input
EPIG	External Amplifier Input (ground)
ET	External Tone Ringer Tip
ER	External Tone Ringer Ring
MOH	External MOH Source Input
MG	External MOH Source Input (ground)
PG1	Paging Output to Zone 1
PG2	Paging Output to Zone 2
PG3	Paging Output to Zone 3
PGG	Paging Output (ground)

Fig. 2-2 Patrician Electra-28 EKTS Conductor Running List (Continue)



P1 BLOCK (66 B4-50 TYPE)

ROW A INCOMING CO/PBX LINES

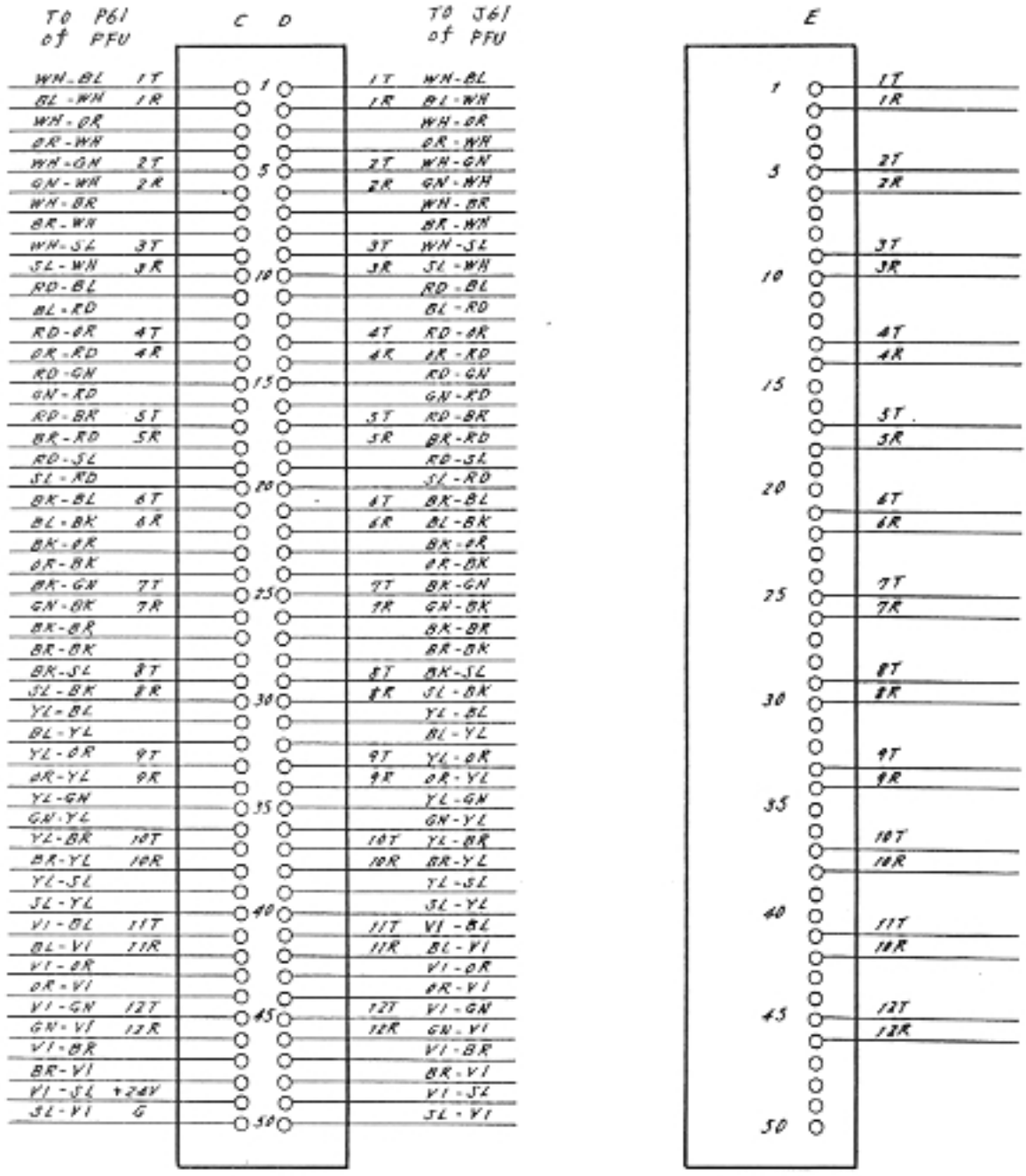
P1 BLOCK

ROW B P1 CABLE TO P1 PLUG IN KSU

NOTES 1. THIS CONNECTION INFORMATION IS FOR USE WITH NO VCA (VOICE CONNECTING ARRANGEMENT) OR WITH STP VCA. IF STC VCA IS USED REFER TO SECTION 403.

2. IF POWER FAILURE UNIT IS NOT INSTALLED THIS TERMINAL BLOCK CAN BE 66 B4-50 OR 66 M1-50 TYPE (WITH BRIDGING CLIPS)

Fig. 2-3 Termination of Incoming CO/PBX Lines



P1 BLOCK (66 B4-50 TYPE)

ROW C INPUT TO POWER FAILURE TRANSFER UNIT

ROW D OUTPUT FROM POWER FAILURE TRANSFER UNIT

P1 BLOCK

ROW E TO SINGLE LINE TELEPHONES

Fig. 2-4 Installation of Power Failure Transfer Unit (Option)

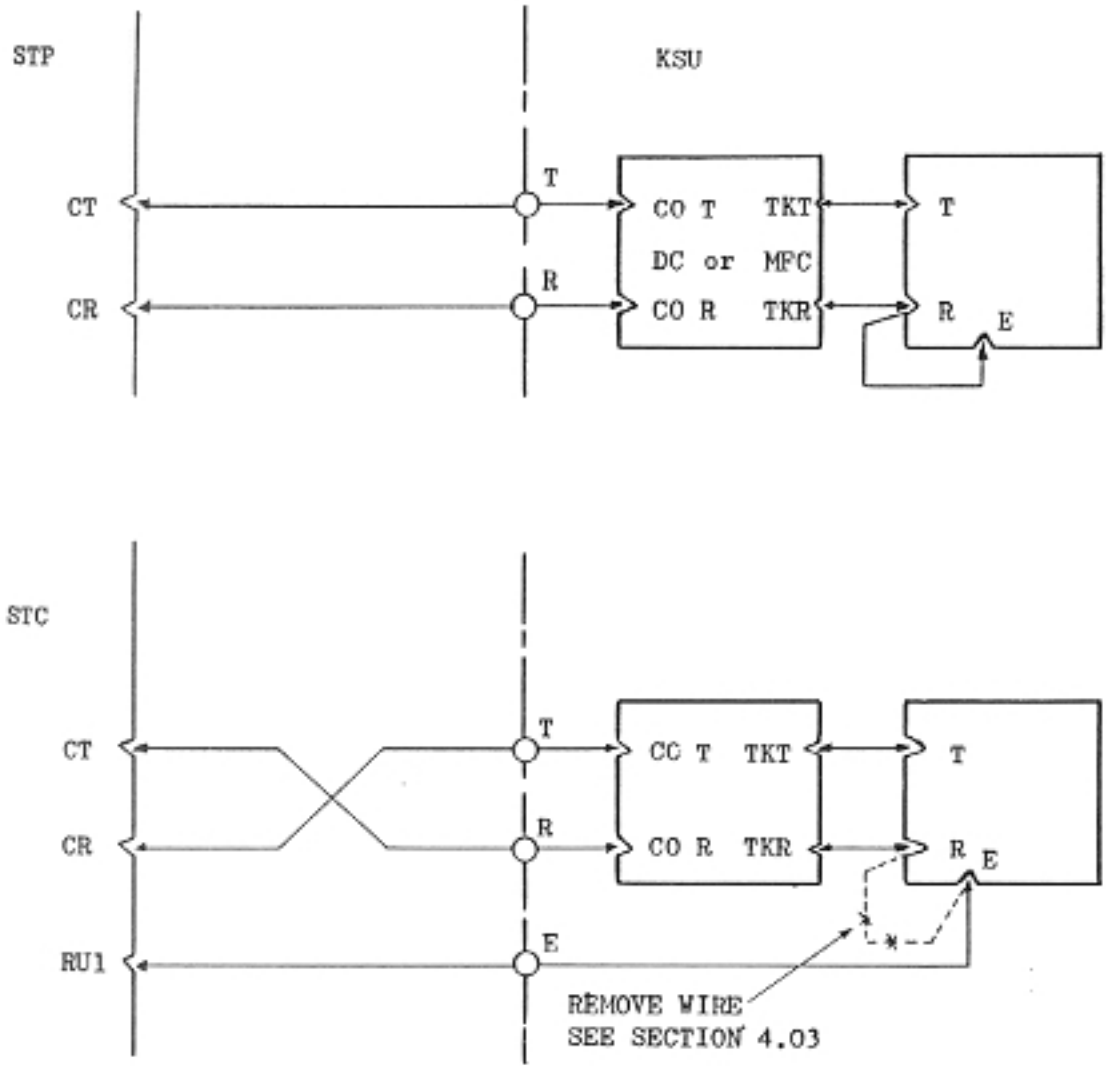
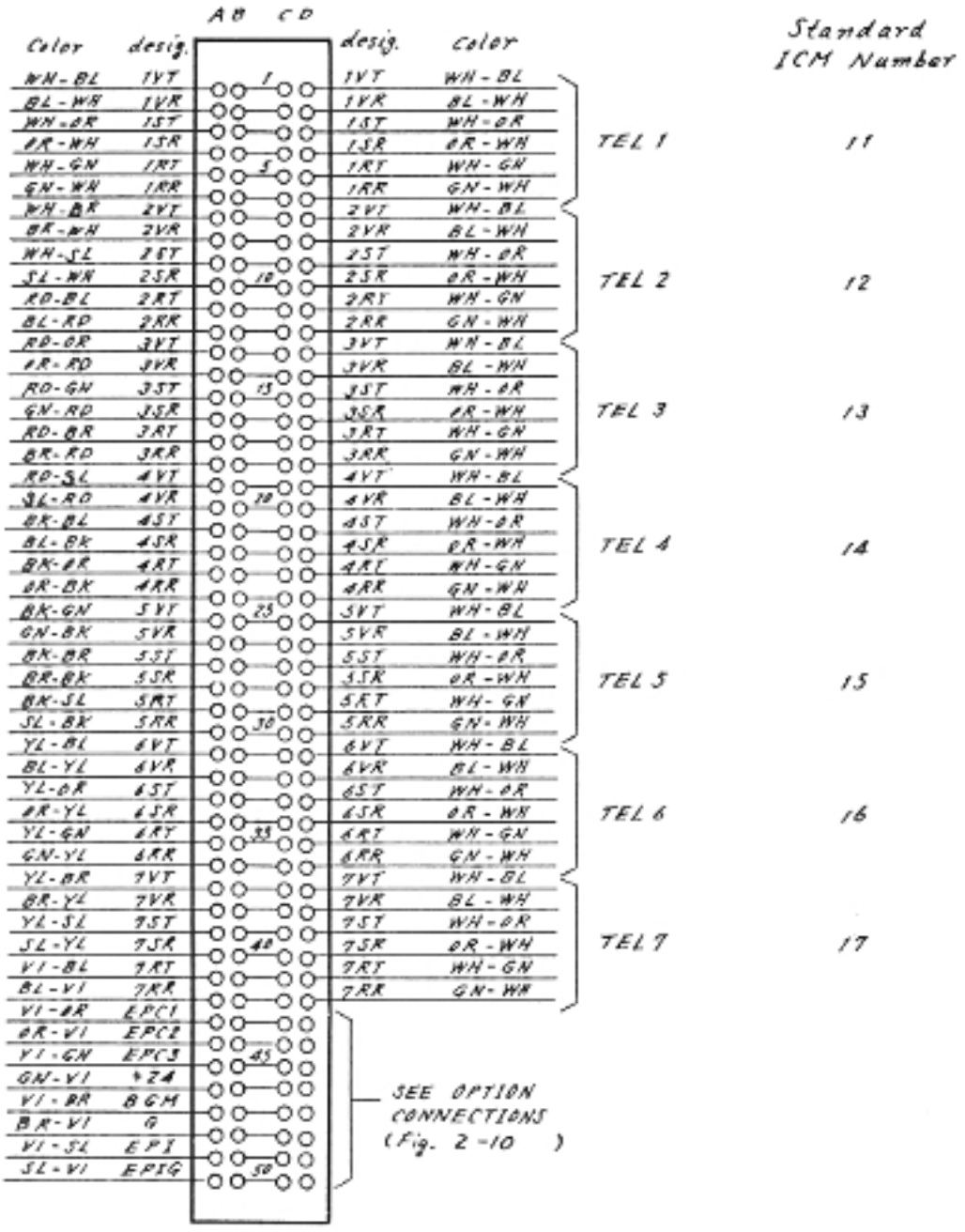


Fig. 2-5 Connection to Voice Connecting Arrangements (VCA)



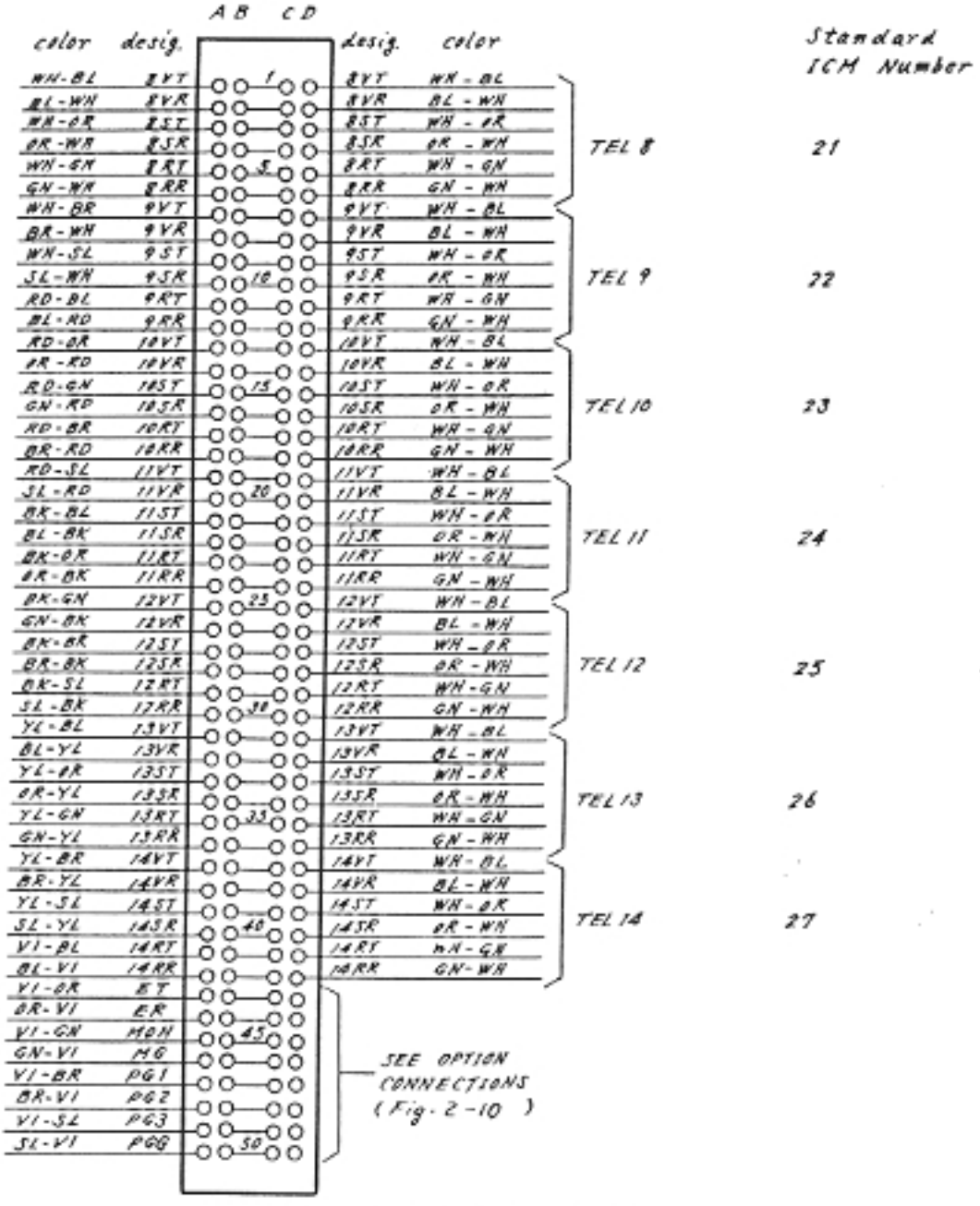
J1 BLOCK OF MDF (66 B4-50 OR 66 M1-50 TYPE

ROW A FROM J1 JACK IN KSU

ROW B AND ROW C BRIDGED

ROW D STATION CABLES AND OPTION CONNECTIONS

Fig. 2-6 Connection of Tels. #1 - #7



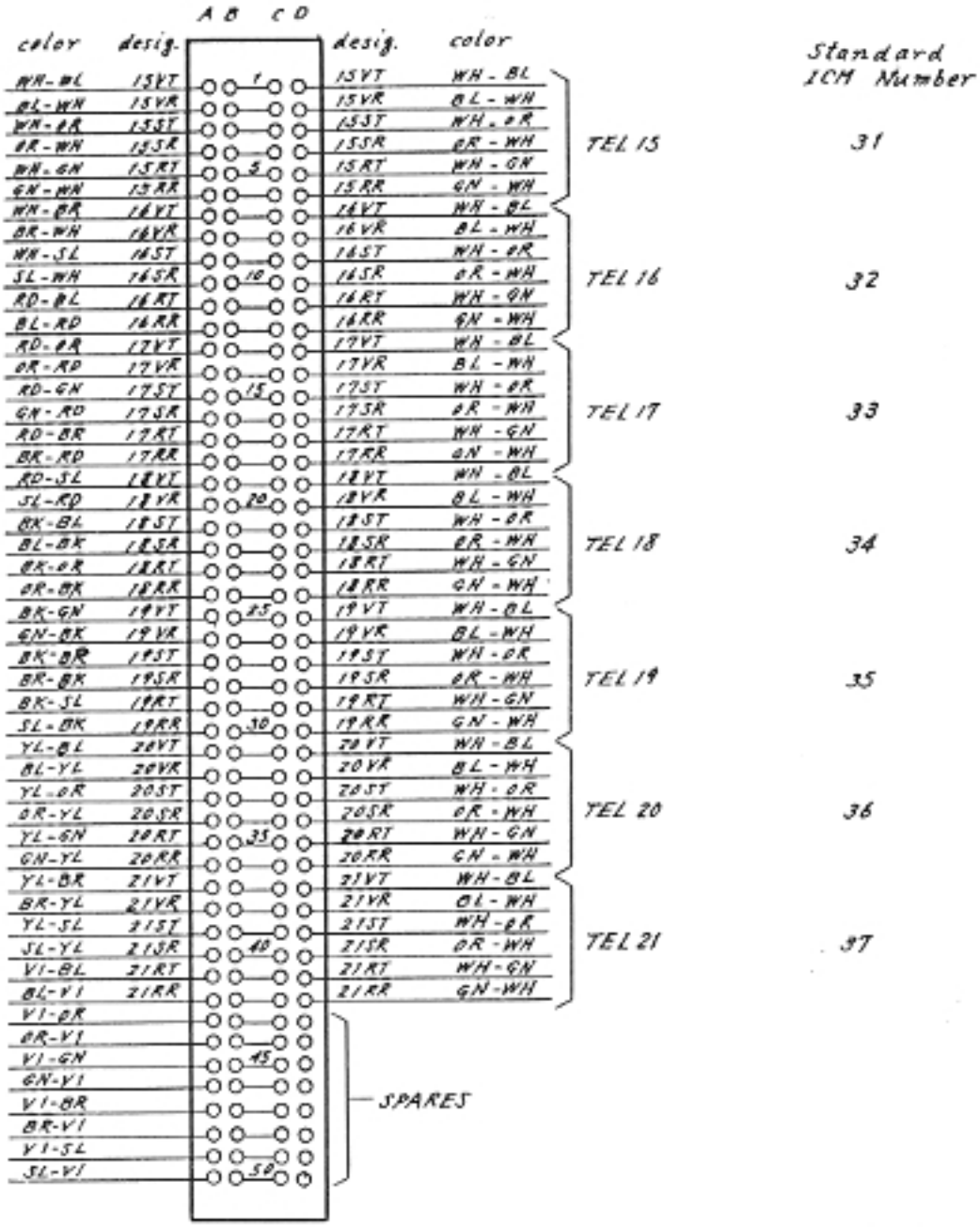
J2 BLOCK OF MDF (66 B4-50 OR 66 M1-50 TYPE)

ROW A FROM J2 JACK IN KSU

ROW B AND ROW C BRIDGED

ROW D STATION CABLES AND OPTION CONNECTIONS.

Fig. 2-7 Connection of Tels. #8 - #14



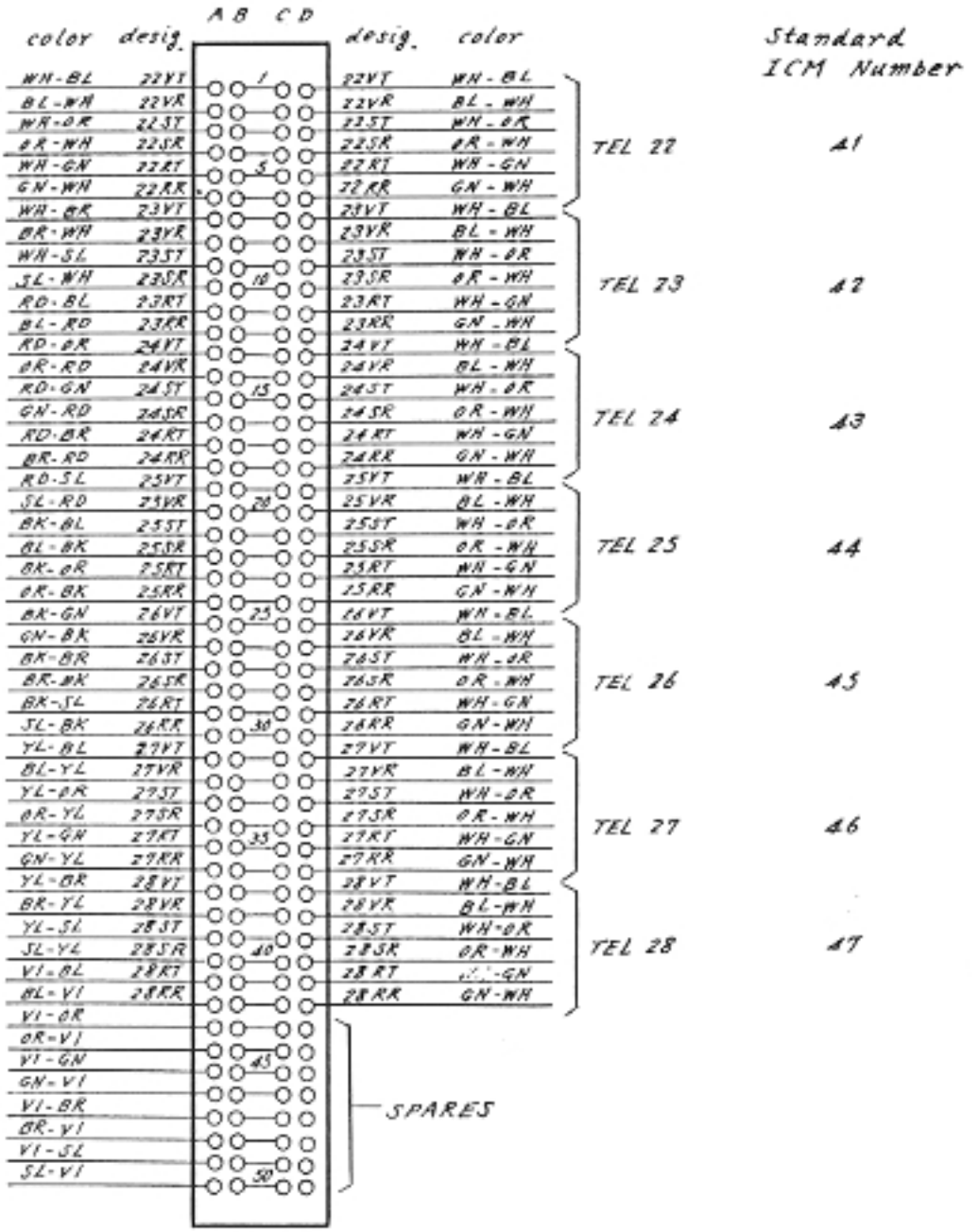
33 BLOCK OF MDF (66 BA-50 OR 66 MI-50 TYPE)

ROW A FROM 33 JACK IN KSU

ROW B AND ROW C BRIDGED

ROW D STATION CABLES

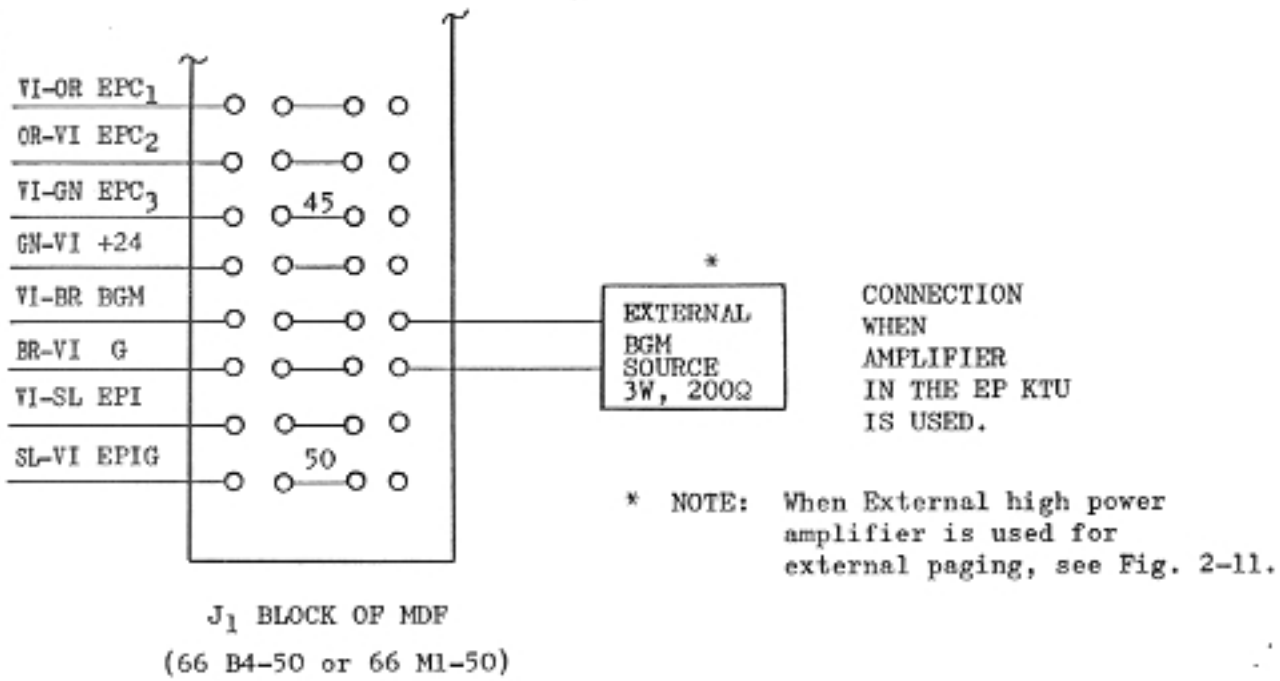
Fig. 2-8 Connection of Tels. #15 - #21



J4 BLOCK OF MDF (66.84-50 OR 66 M1-50 TYPE)

ROW A FROM J4 JACK IN KSU
ROW B AND ROW C BRIDGED
ROW D STATION CABLES

Fig. 2-9 Connection of Tels. #22 ~ #28



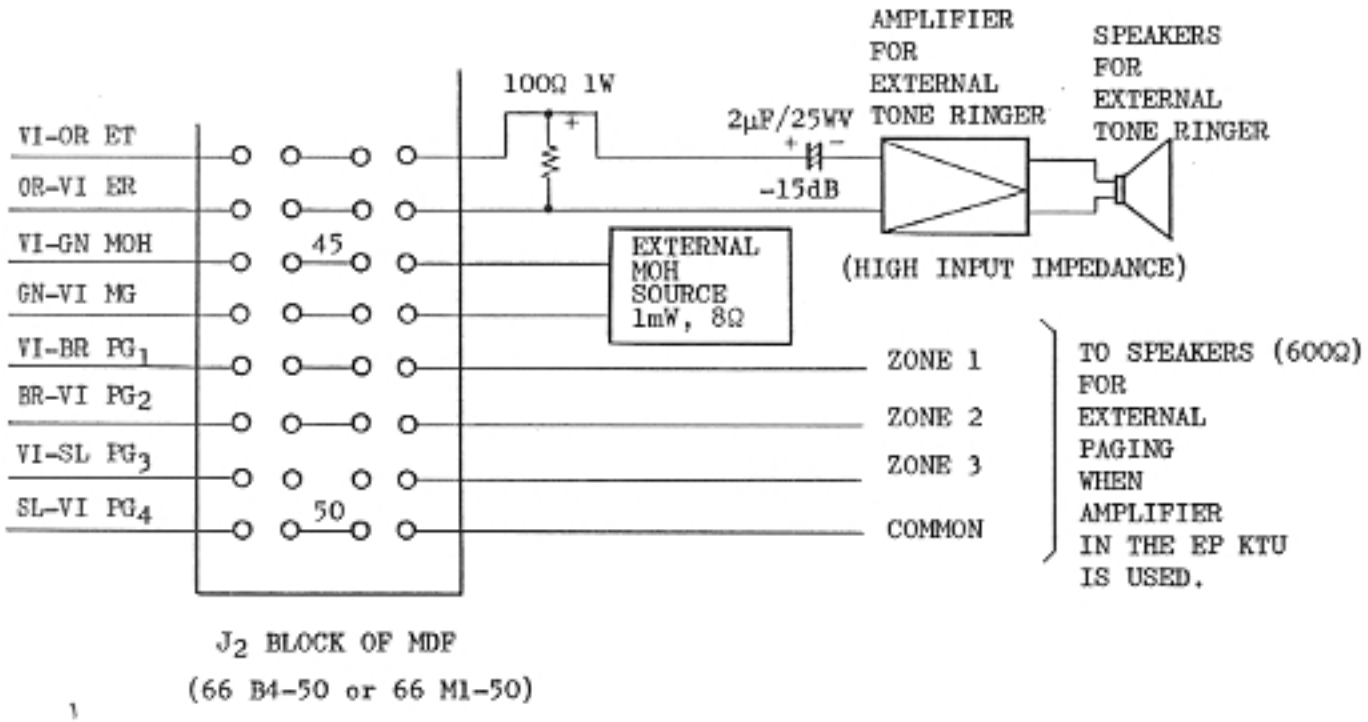
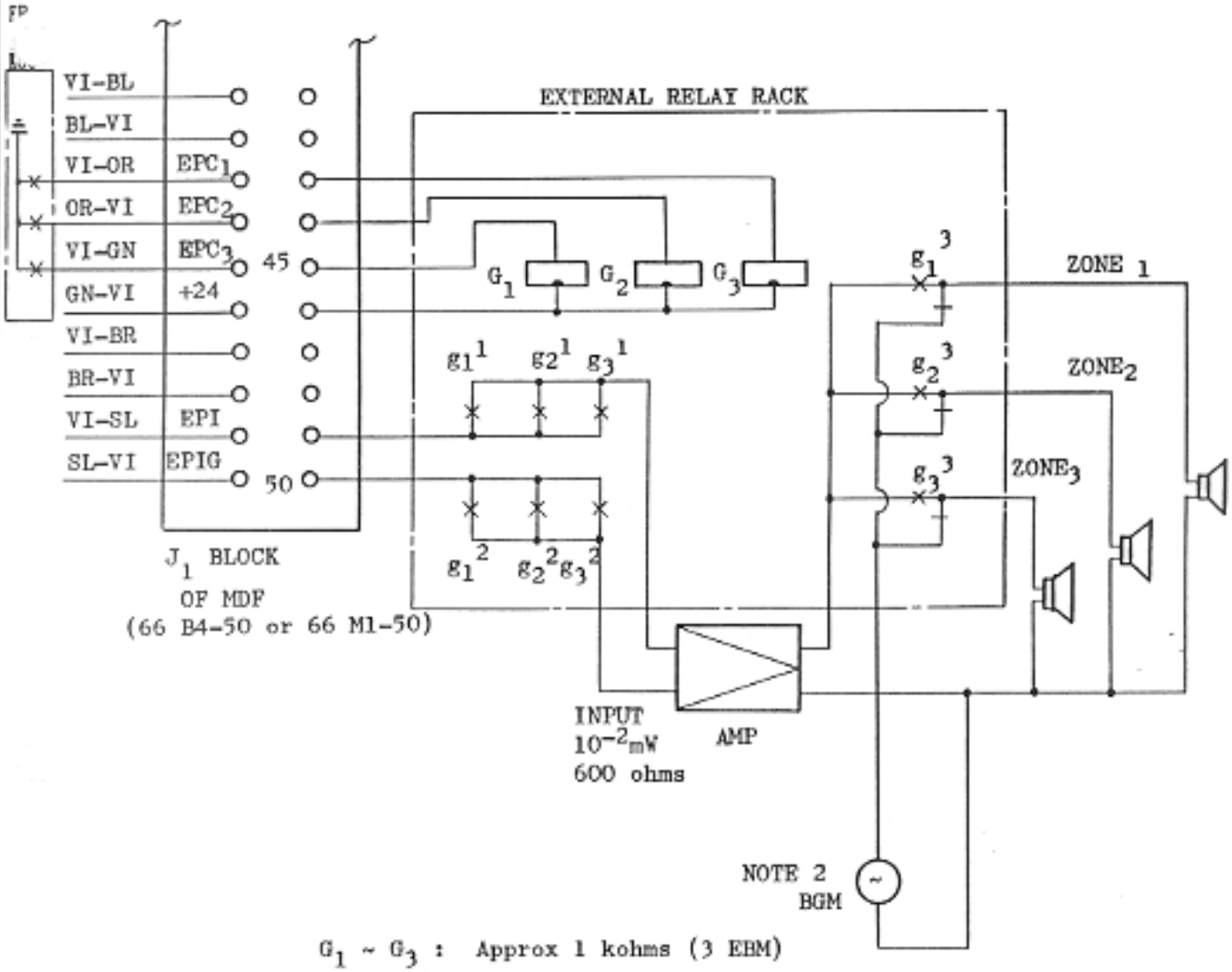


Fig. 2-10 Connection of Options at the MDF
(Main Distribution Frame)



$G_1 \sim G_3$: Approx 1 kohms (3 EBM)

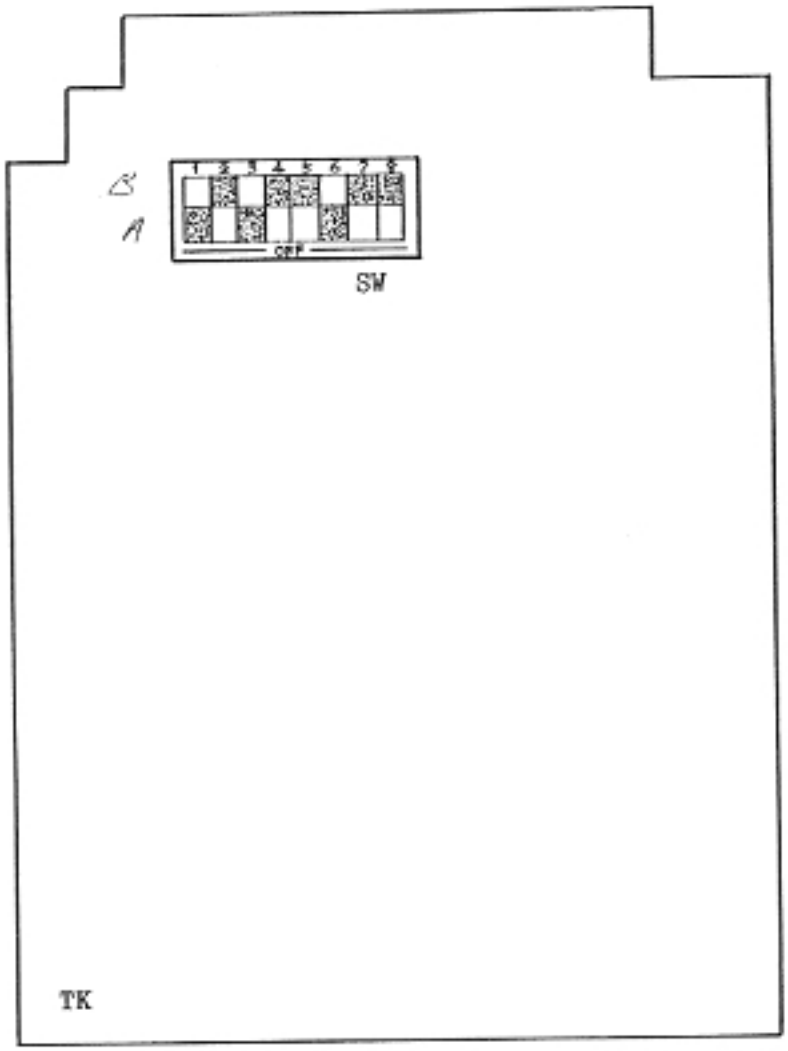
Note 1 When external amplifier is used, insert EP card and remove these two red straps:

CCI LOWER A29 —— EP. B25

CCI LOWER B29 —— EP. B26

Note 2 When external amplifier is used, BGM source, if required, is connected as above. The output power and impedance of BGM source are equal to those of ext. amplifier.

Fig. 2-11 Connection of Ext. High Power Amplifier for Ext. Paging.



SW	TRUNK NUMBER	
1 2	NO.1	A B
3 4	NO.2	A B
5 6	NO.3	A B
7 8	NO.4	A B

ASSIGN-MENT	A	B
CO/PBX	OFF	ON
ICM	ON	OFF
DSS	ON	ON
	OFF	OFF

Example Trunk 1 and 2 CO/PBX
Trunk 3 ICM
Trunk 4 DSS

Fig. 3-1 Trunk Assignment on TK KTU

No. of CO Lines	Max. No. of ICM & DSS Paths	CO/PBX Lines Connection (P1)												Assignment of TK KTU																DC/MFC KTU Install. Position			SW KTU Require
														TK 1				TK 2				TK 3				TK 4						
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	
1	3	O												C	I	I	I	-	-	-	-	-	-	-	-	-	-	-	-	O	-	-	NO
1	6	O												C	N	I	I	I	I	I	I	-	-	-	-	-	-	-	-	O	-	-	NO
2	2	O	O											C	C	I	I	-	-	-	-	-	-	-	-	-	-	-	-	O	-	-	NO
2	6	O	O											C	C	I	I	I	I	I	I	-	-	-	-	-	-	-	-	O	-	-	NO
3	1	O	O	O										C	C	C	I	-	-	-	-	-	-	-	-	-	-	-	-	O	-	-	NO
3	5	O	O	O										C	C	C	I	I	I	I	I	-	-	-	-	-	-	-	-	O	-	-	NO
3	6	O	O	O										C	C	C	I	I	I	I	I	-	-	-	-	N	N	N	I	O	-	-	YES
4	0	O	O	O	O									C	C	C	C	-	-	-	-	-	-	-	-	-	-	-	-	O	-	-	NO
4	4	O	O	O	O									C	C	C	C	I	I	I	I	-	-	-	-	-	-	-	-	O	-	-	NO
4	6	O	O	O	O									C	C	C	C	I	I	I	I	-	-	-	-	N	N	I	I	O	-	-	YES
5	3	O	O	O	O	O								C	C	C	C	C	I	I	I	-	-	-	-	-	-	-	-	O	O	-	NO
5	6	O	O	O	O	O								C	C	C	C	C	I	I	I	-	-	-	-	N	I	I	I	O	O	-	YES
6	2	O	O	O	O	O	O							C	C	C	C	C	C	I	I	-	-	-	-	-	-	-	-	O	O	-	NO
6	6	O	O	O	O	O	O							C	C	C	C	C	C	I	I	-	-	-	-	I	I	I	I	O	O	-	YES
7	5	O	O	O	O	O	O					O		C	C	C	C	C	C	I	I	-	-	-	-	C	I	I	I	O	O	-	YES
7	6	O	O	O	O	O	O					O		C	C	C	C	C	C	I	I	N	N	N	I	C	I	I	I	O	O	-	YES
8	4	O	O	O	O	O	O					O	O	C	C	C	C	C	C	I	I	-	-	-	-	C	C	I	I	O	O	-	YES
8	6	O	O	O	O	O	O					O	O	C	C	C	C	C	C	I	I	N	N	I	I	C	C	I	I	O	O	-	YES
9	3	O	O	O	O	O	O	O	O	O				C	C	C	C	C	C	I	I	C	C	C	I	-	-	-	-	O	O	O	YES
9	6	O	O	O	O	O	O	O	O	O				C	C	C	C	C	C	I	I	C	C	C	N	I	I	I	I	O	O	O	YES
10	2	O	O	O	O	O	O	O	O	O	O			C	C	C	C	C	C	I	I	C	C	C	C	-	-	-	-	O	O	O	YES
10	6	O	O	O	O	O	O	O	O	O	O			C	C	C	C	C	C	I	I	C	C	C	C	I	I	I	I	O	O	O	YES
11	5	O	O	O	O	O	O	O	O	O	O	O		C	C	C	C	C	C	I	I	C	C	C	C	C	I	I	I	O	O	O	YES
12	4	O	O	O	O	O	O	O	O	O	O	O	O	C	C	C	C	C	C	I	I	C	C	C	C	C	C	I	I	O	O	O	YES

C : CO/PBX

I : ICM or DSS

N : No Assign

- : No KTU

NOTE :

The number of DSS paths must be equal to the number of DSS/BLF console.

Fig. 3-2 Trunk Assignment

Example : When the system consists of 8 CO/PBX lines, (DTMF dialing), 2 intercom paths and 2 DSS paths:

Ttermination of CO/PBX lines;

No.1 line	-	WH-BL, BL-WH pair on P1 Block	
No.2 line	-	WH-GN, GN-WH	"
No.3 line	-	WH-SL, SL-WH	"
No.4 line	-	RD-OR, OR-RD	"
No.5 line	-	RD-BR, BR-RD	"
No.6 line	-	BK-BL, BL-BK	"
No.7 line	-	VI-BL, BL-VI	"
No.8 line	-	VI-GN, GN-VI	"

Assignment on TK KTU;

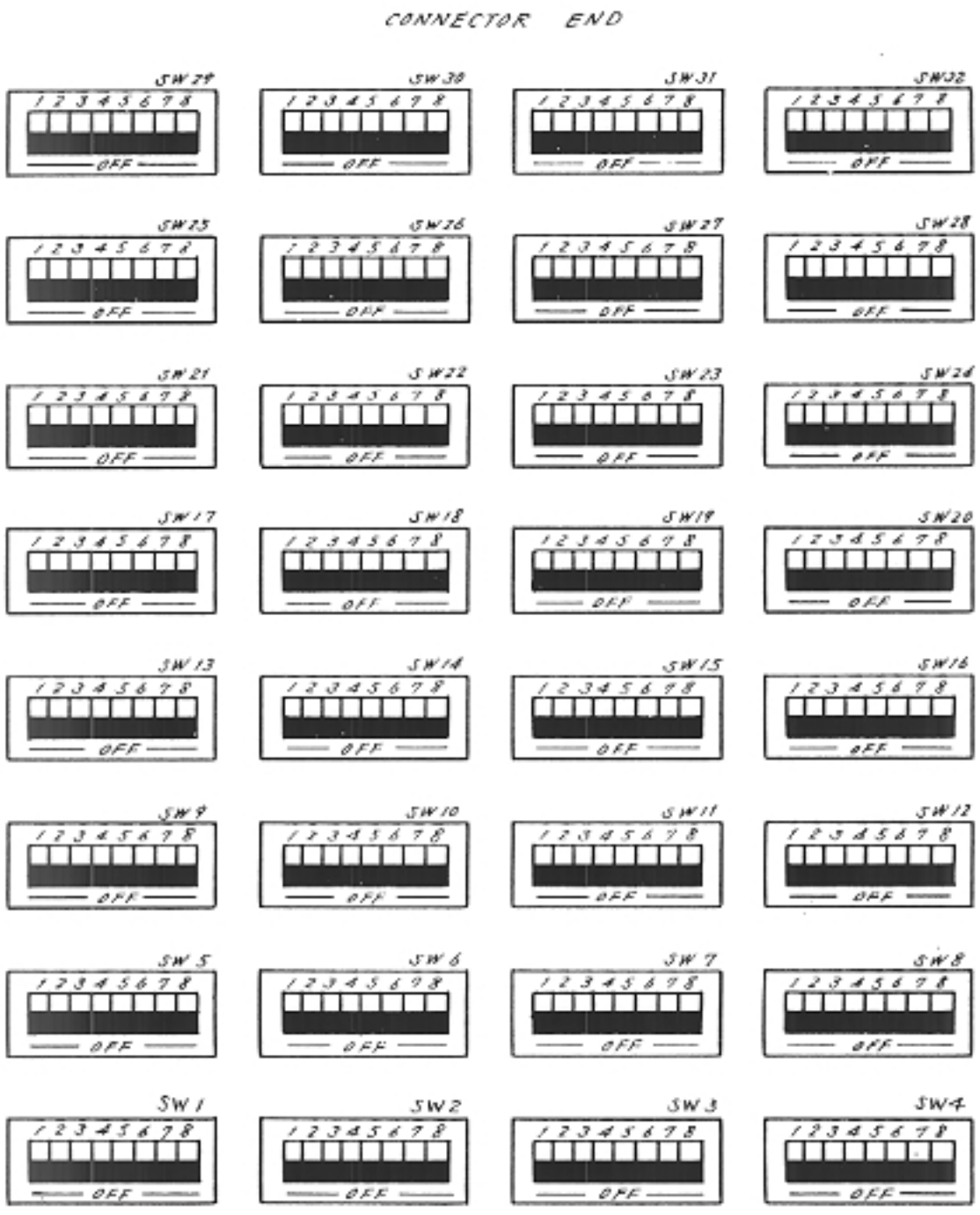
TK 1.1	-	CO	TK 4.1	-	CO
TK 1.2	-	CO	TK 4.2	-	CO
TK 1.3	-	CO	TK 4.3	-	DSS
TK 1.4	-	CO	TK 4.4	-	DSS
TK 2.1	-	CO			
TK 2.2	-	CO	TK3 KTU is not installed		
TK 2.3	-	ICM			
TK 2.4	-	ICM			

MFC/DC KTU installation position;

MFC KTUs are inserted into No.1 and No.2 MFC/DC position.

SW KTUs are required in this case.

Fig. 3-2 Trunk Assignment (Continued)



NOTE:

1. Switch assemblies 1 thru 32 (SW 1 thru SW32) are shown in OFF position.

Fig. 3-3 Layout of Switches on UPA KTU

UPA CONNECTOR 1

CO/PBX lines are represented by a horizontal group of 2 switch assemblies. The number of the CO/PBX line corresponds to the number it has in the P1 cable at the incoming CO/PBX terminal block. Telephone stations are represented by individual switches on the switch assemblies (vertically arranged). Their assigned switches are given below (with their normal intercom number). A switch ON means that telephone will ring on that CO/PBX line, OFF means it won't. Switch assemblies not shown are not used. For explanation of example shown in this system see following figure.

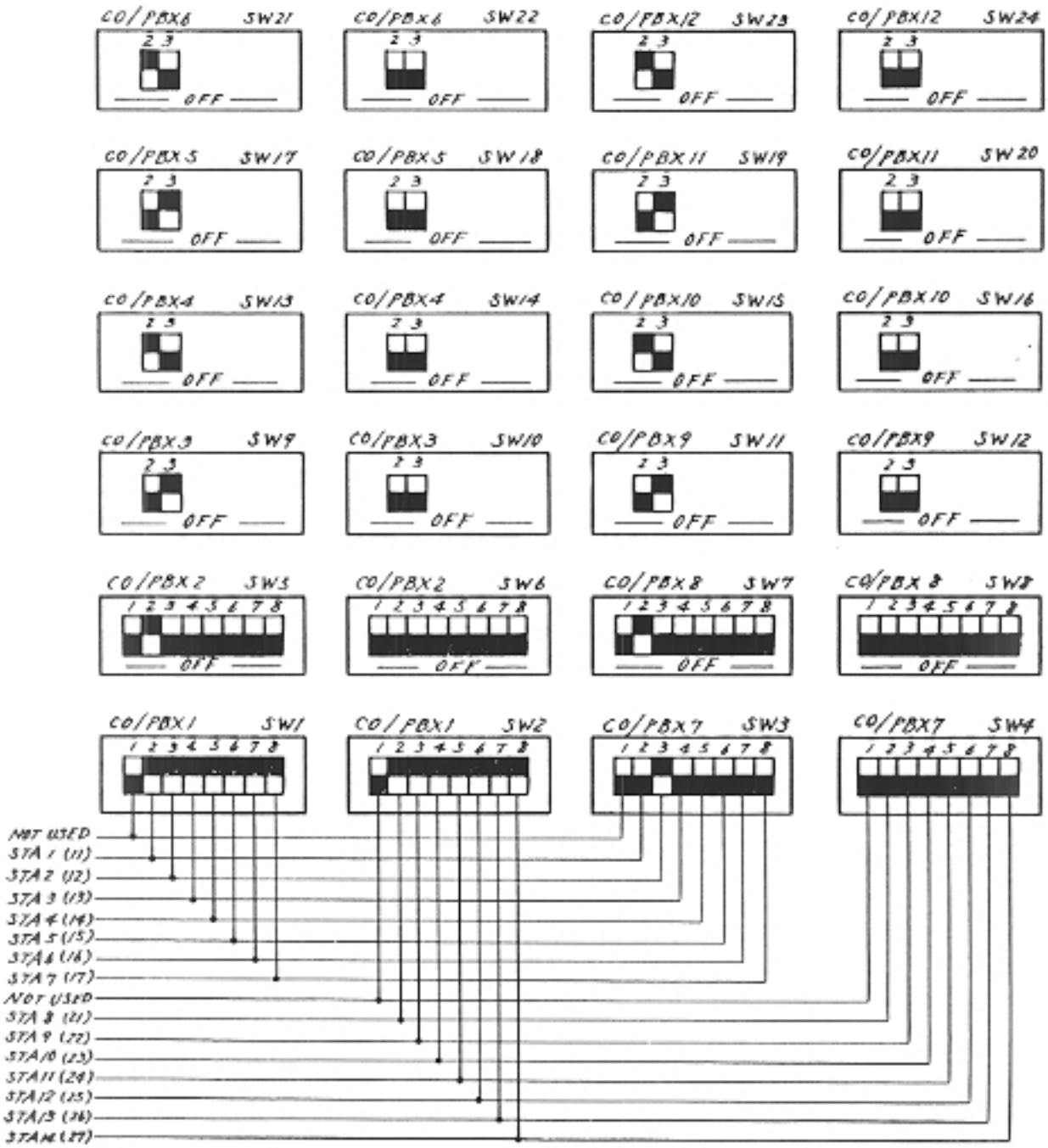


Fig. 3-4 Flexible CO/PBX Ring Assignment Tels. #1 - #14

UPA CONNECTOR 2

For an explanation of CO/PBX Flexible ring assignment, see preceding figure.

Explanation of Example :

Line 1 rings at all stations.
Even numbered lines ring at sta 1 (11)
Odd numbered lines ring at sta 2 (12)
Lines 2~5 ring at sta 21 (37)
Lines 6~8 ring at sta 22 (41)
Lines 9~10 ring at sta 15 (31)
Lines 11 and 12 ring at sta 26 (45)

Switch assemblies not shown are not used

Individual switches not shown are "OFF"

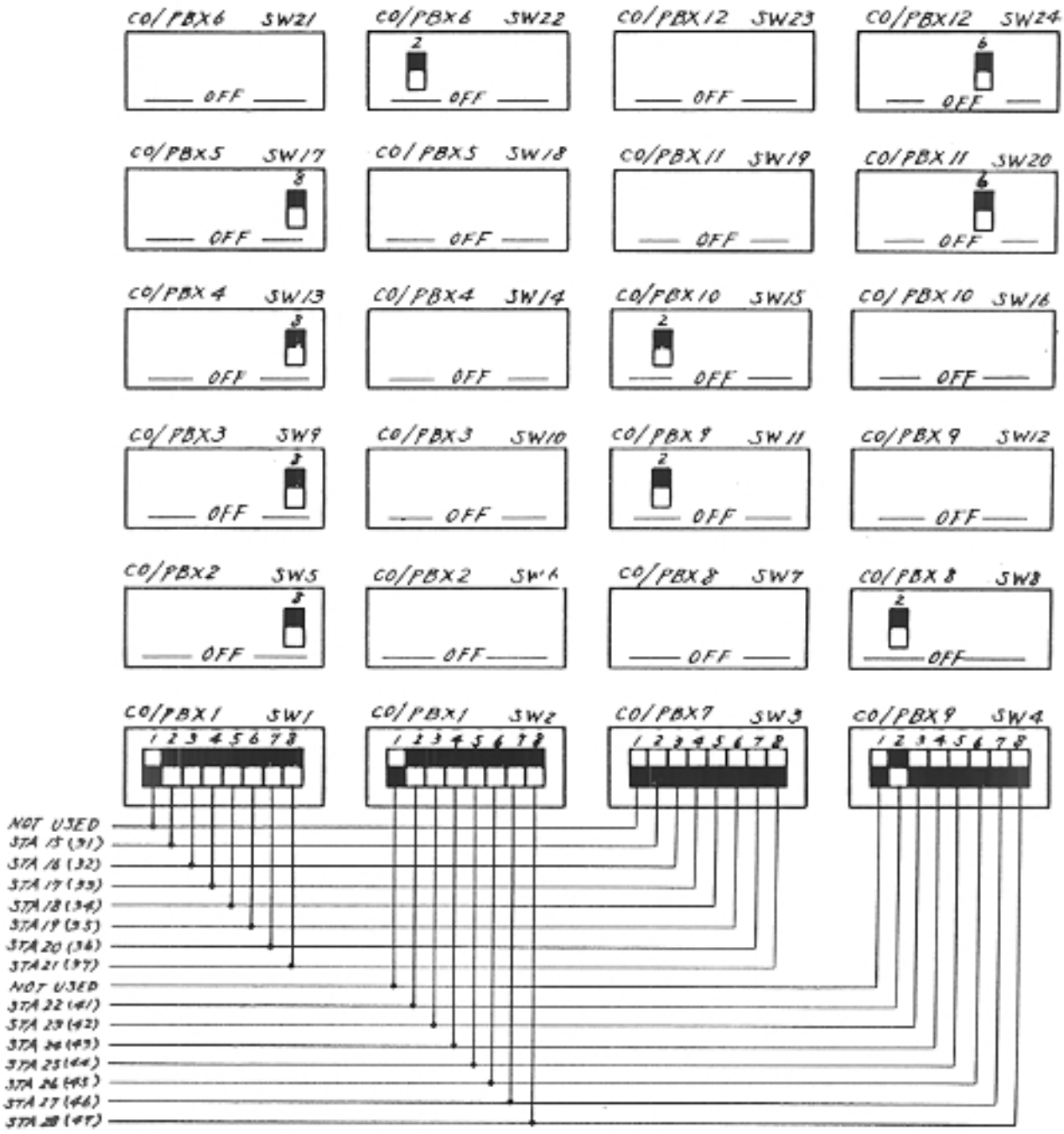
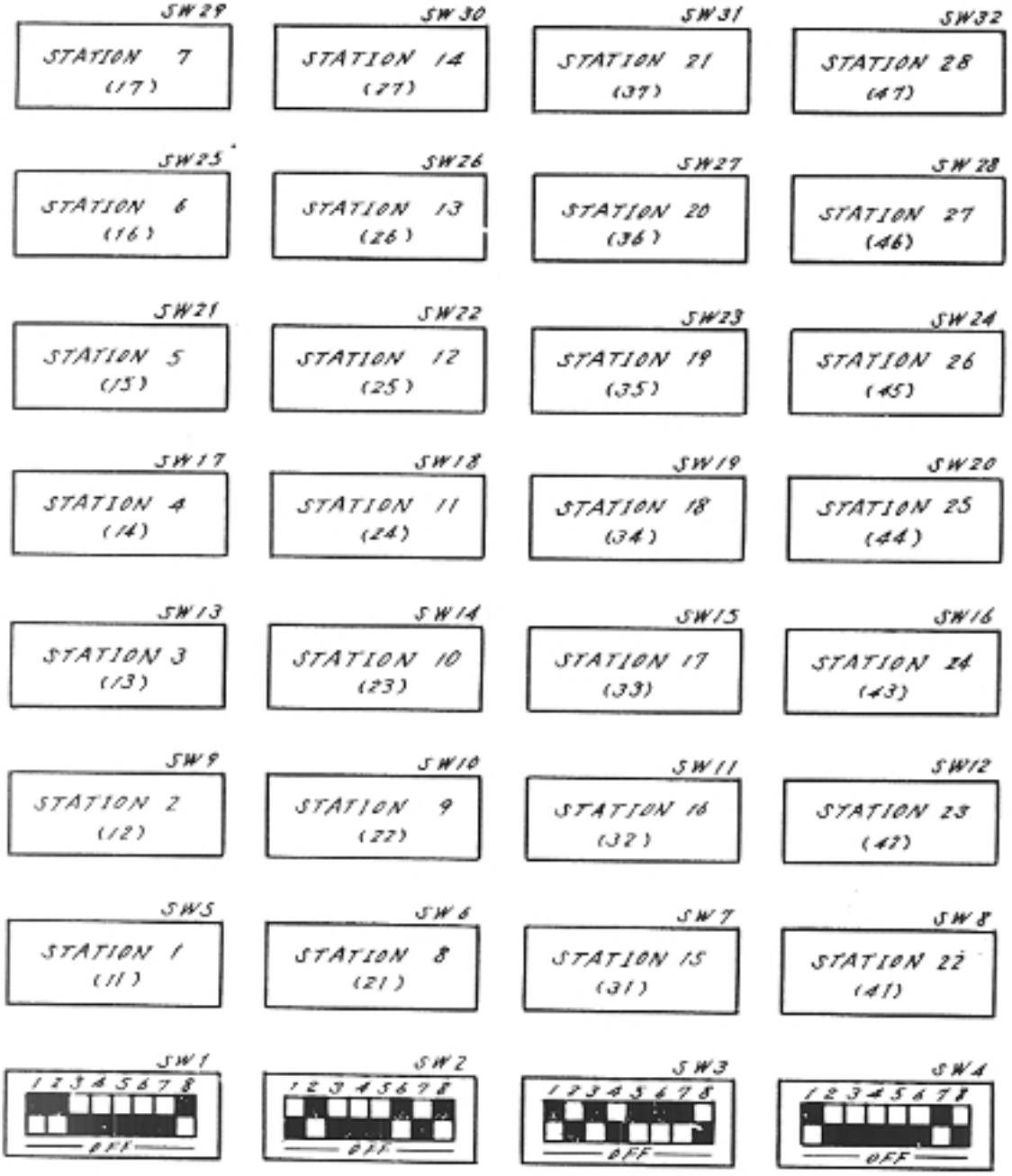


Fig. 3-5 Flexible CO/PBX Ring Assignment Tels. #15 ~ #28

UPA CONNECTOR 3

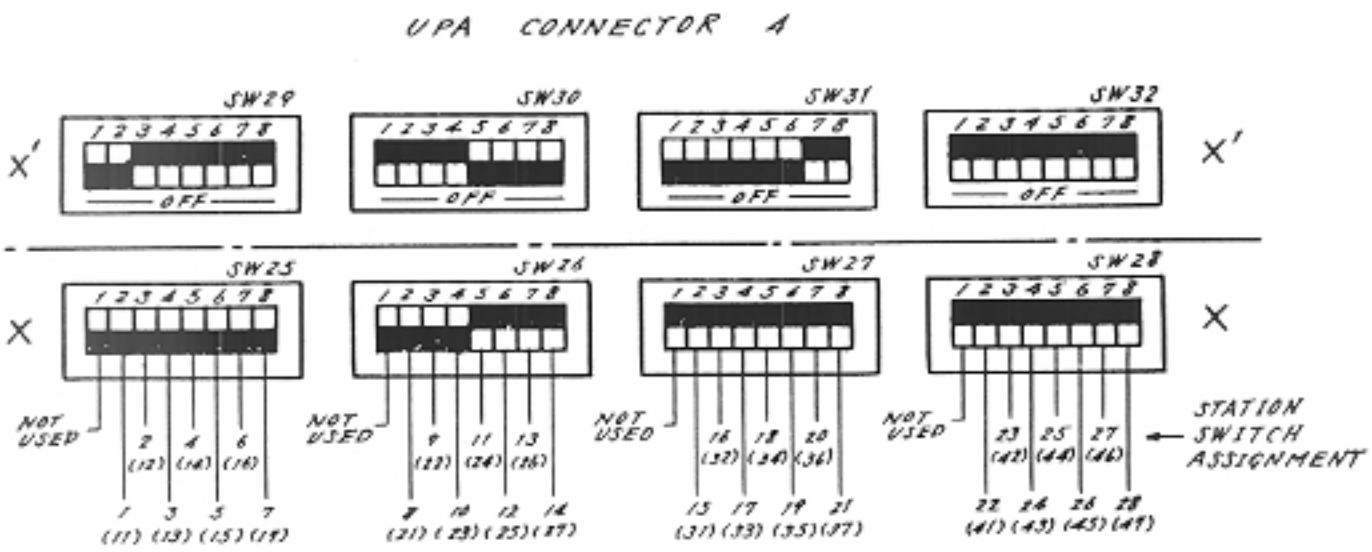


NO.	SWITCH POSITIONS
1	1 0 0 0
2	0 1 0 0
3	1 1 0 0
4	0 0 1 0
5	1 0 1 0
6	0 1 1 0
7	1 1 1 0
8	0 0 0 1
9	1 0 0 1
0	0 1 0 1

Since switch assembles 1-4 are not assigned for this option they are used as examples. The first 4 connections on a stations switch assembly assign its first digit 1-5. The last 4 connections assign its last digit 1-0. Nos. 10-59 are available. A switch in on position is a 1 in the chart to the left. A switch in OFF position is a 0. switch assemblies are labeled with station number that they affect.

EXS. SW1 = 38, SW2 = 20, SW3 = 57, SW4 = 14.

Fig. 3-6 Flexible Intercom Number Assignment



X	X'	ZONE
0	0	NONE
0	1	1
1	0	2
1	1	3

Station assignment to a zone or to no zone is done vertically on the 8 switch assemblies closest to the connector. Each station is assigned one individual switch in the X group of switch assemblies and the corresponding switch in the X' group. The status of these switches determines the zone assignment of the station. In the table to the left, ON is represented by 1, OFF by 0.

Explanation of Example:

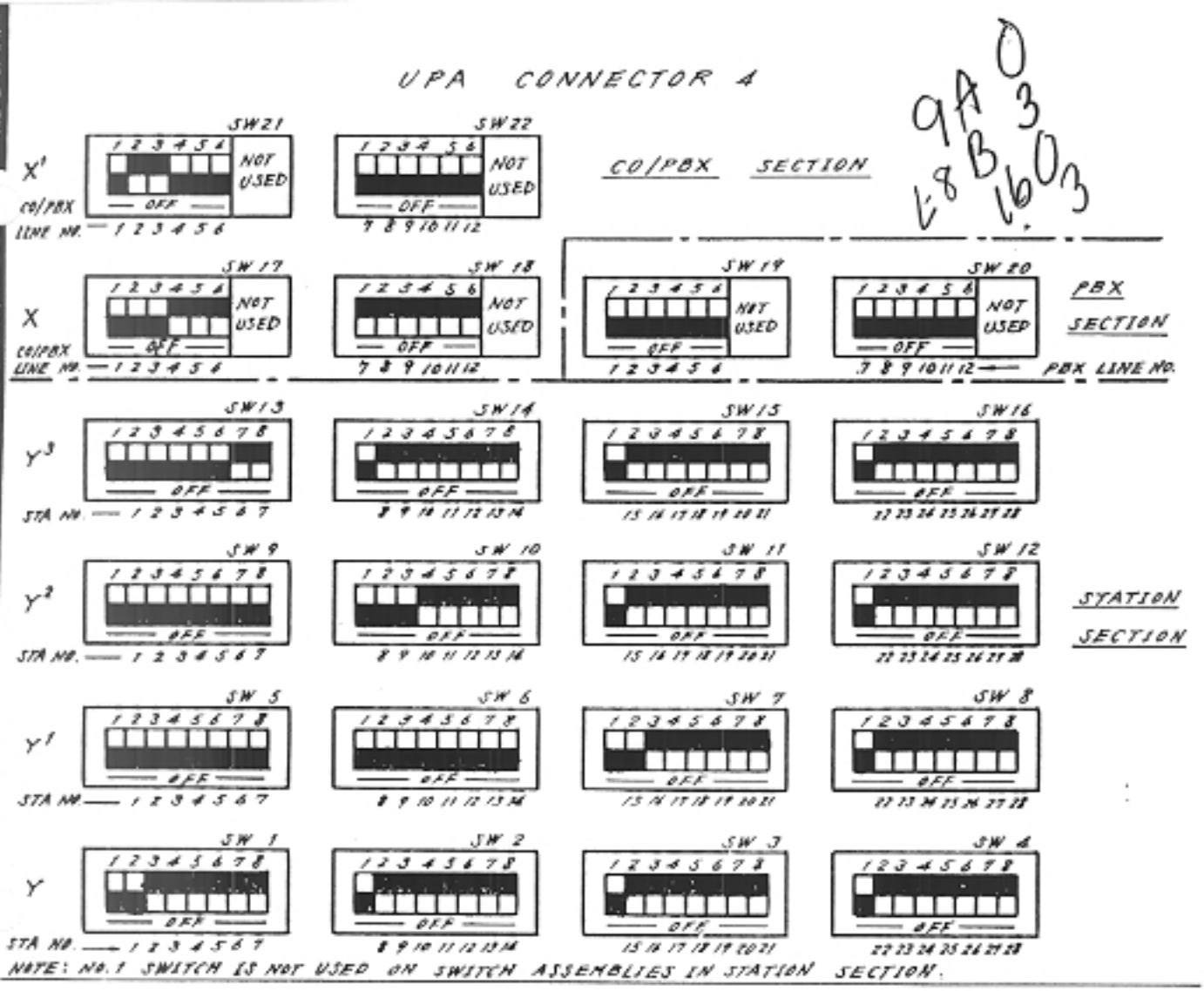
STA 1 (11) is in no zone.

STA 2 (12) ~ 10 (23) are in zone 1.

STA 11 (24) ~ 19 (35) are in zone 2.

STA 20 (36) ~ 28 (47) are in zone 3.

Fig. 3-7 Internal 3-Zone Paging Assignment



SWITCH ASSIGNMENTS: 1 indicates switch is ON, 0 indicates switch is OFF

CO/PBX SECTION: SEE FOLLOWING FIGURE FOR EXPLANATION

X	X'	CO PBX GROUP
0	0	C
0	1	B
1	0	A
1	1	NOT USED

PBX SECTION: A switch in the ON position allows the first digit dialed to pass before restriction begins. This allows a PBX access code or attendant call, etc. before digits are inspected for toll restriction.

STATION SECTION: SEE FOLLOWING FIGURE FOR EXPLANATION

STATION CLASS	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Y3	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1
Y2	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1
Y1	0	0	0	0	1	1	1	1	0	0	0	0	1	1	1	1
Y	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

Fig. 3-8 Toll and Outgoing Call Restriction Assignment

NOTES ON TOLL AND OUTGOING RESTRICTION

STATION CLASS	CO/PBX GROUP		
	A	B	C
0	N	N	N
1	N	T	N
2	N	O	N
3	O	T	N
4	T	N	N
5	T	T	N
6	T	O	N
7	O	O	N
8	N	N	O
9	N	T	O
10	N	O	O
11	O	T	O
12	T	N	O
13	T	T	O
14	T	O	O
15	O	O	O

LINE GROUP/STATION CLASS INTERSECTION TABLE.

N-Non-Restricted

T-Toll Restricted

O-Outgoing Restricted

To program UPA card for restriction:

1. Compare actual installation needs to table at left.
2. After deciding necessary CO/PBX line groups and necessary station classes, prepare a list.
3. Go to preceding Figure "Toll and Outgoing Restriction Assignment on UPA Card 4" and use switch assignment tables to prepare a list of switch positions on UPA card.
4. Perform required switch manipulation and retain lists in installation records.

NOTE: Some Line Group/Station Class Intersections can not be programmed (i.e. ONN, ONO, and all intersections in which group C is toll restricted).

Explanation of example on Fig. 3-8.

(a) Station 1 has non-restriction on all lines. Line 1 is reserved for his use (all other stations have outgoing restriction on line 1).

Fig. 3-9 Notes on Toll and Outgoing Restriction

(b) Stations 2 ~ 5 are non-restricted on all lines except line 1 (outgoing restricted).

(c) Stations 6 - 9 are non-restricted on lines 2 and 3, toll restricted on lines 4 ~ 12, outgoing restricted on line 1.

(d) Stations 10 ~ 15 are toll restricted on all lines except line 1 (outgoing restricted).

(e) Stations 16 ~ 23 are outgoing restricted on all lines.

Line 1 is group C
Line 2 - 3 are group B
Line 4 ~ 12 are group A

Station 1	-	Class 0
Stations 2 ~ 5	-	Class 8
Stations 6 ~ 9	-	Class 12
Stations 10 ~ 15	-	Class 13
Stations 16 ~ 28	-	Class 15

Fig. 3-9 Notes on Toll and Outgoing Restriction (Continue)

NOTES ON TROUBLESHOOTING FLOW CHARTS

Before using the following charts as an aid in troubleshooting, check the following.

1. Power cord is connected to AC outlet ?
2. Power switch on face panel of power unit is on ?
3. Fuses are blown ?
4. KTUs are correctly installed in designated position ?
5. Connections at MDF are right ?
6. Terminal connection of telephone(s) is right ?

NOTE: Turn off AC power before removing or installing KTUs.

Fig. 4-1 Notes on Troubleshooting Flow Chart

LED Does Not Light When Depress CO/PBX, ICM or ADD-ON Button

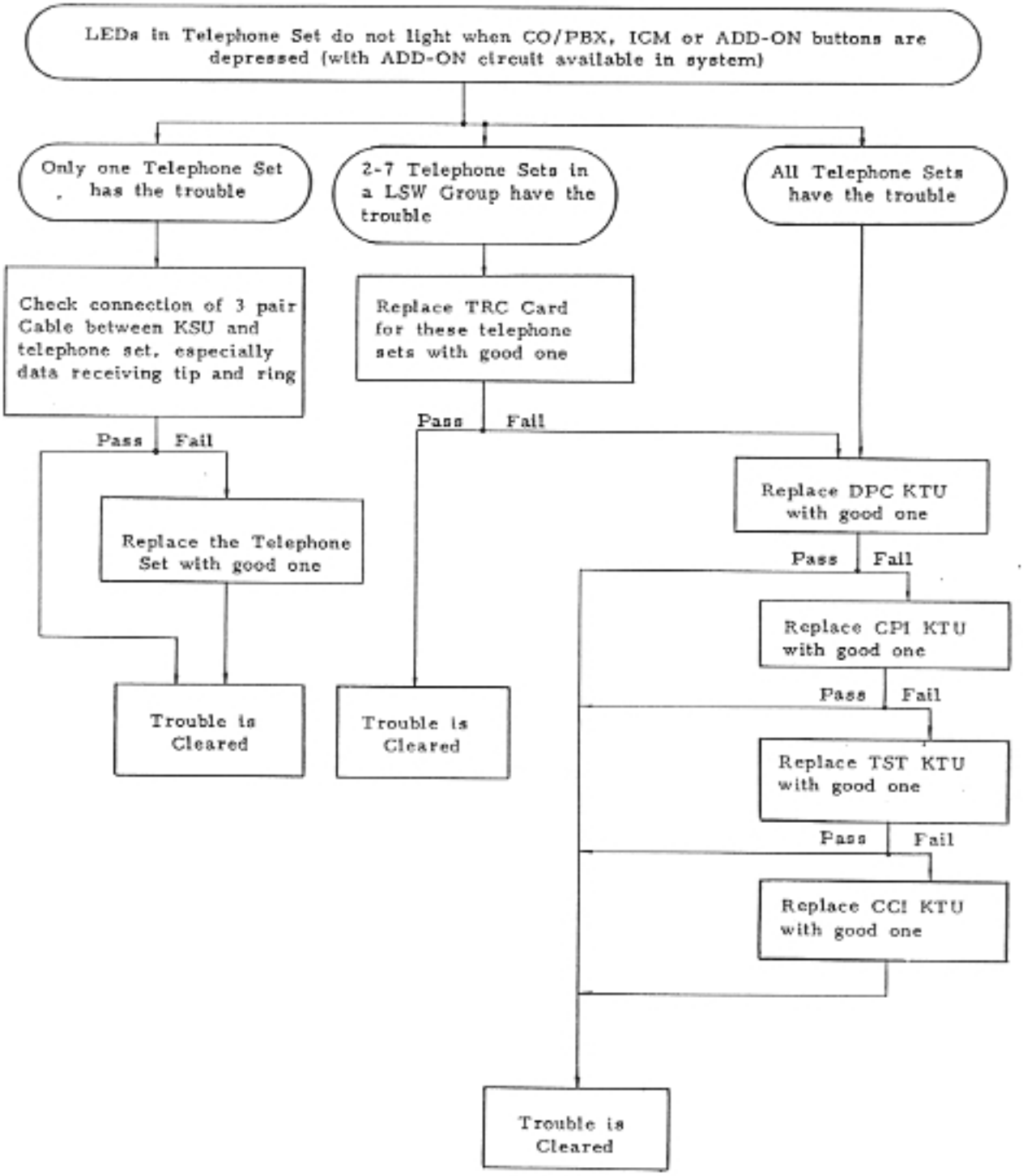


Fig. 4-2 Troubleshooting Flow Chart 1

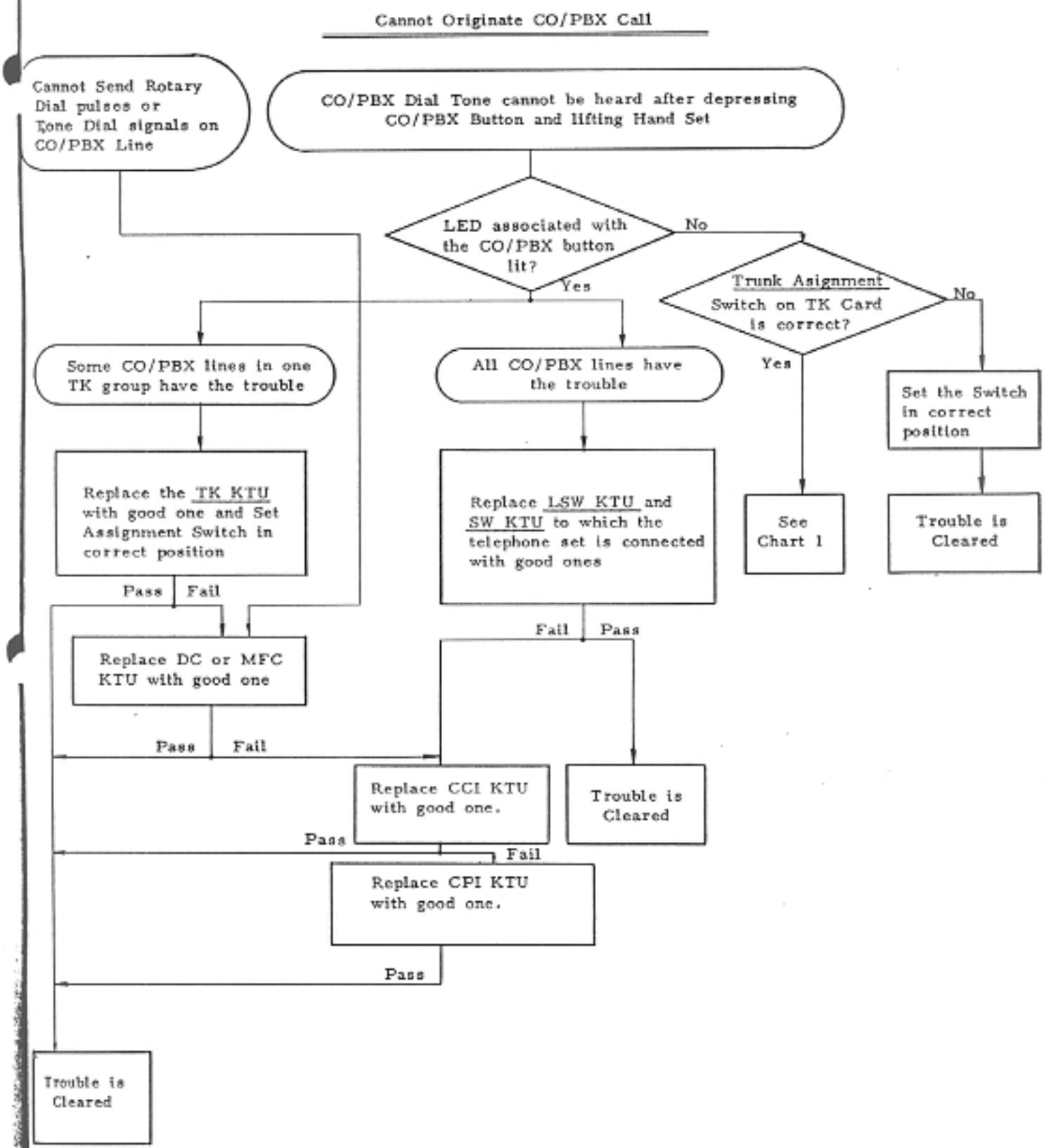


Fig. 4-3 Troubleshooting Flow Chart 2

Hold Button Does Not Operate On CO/PBX

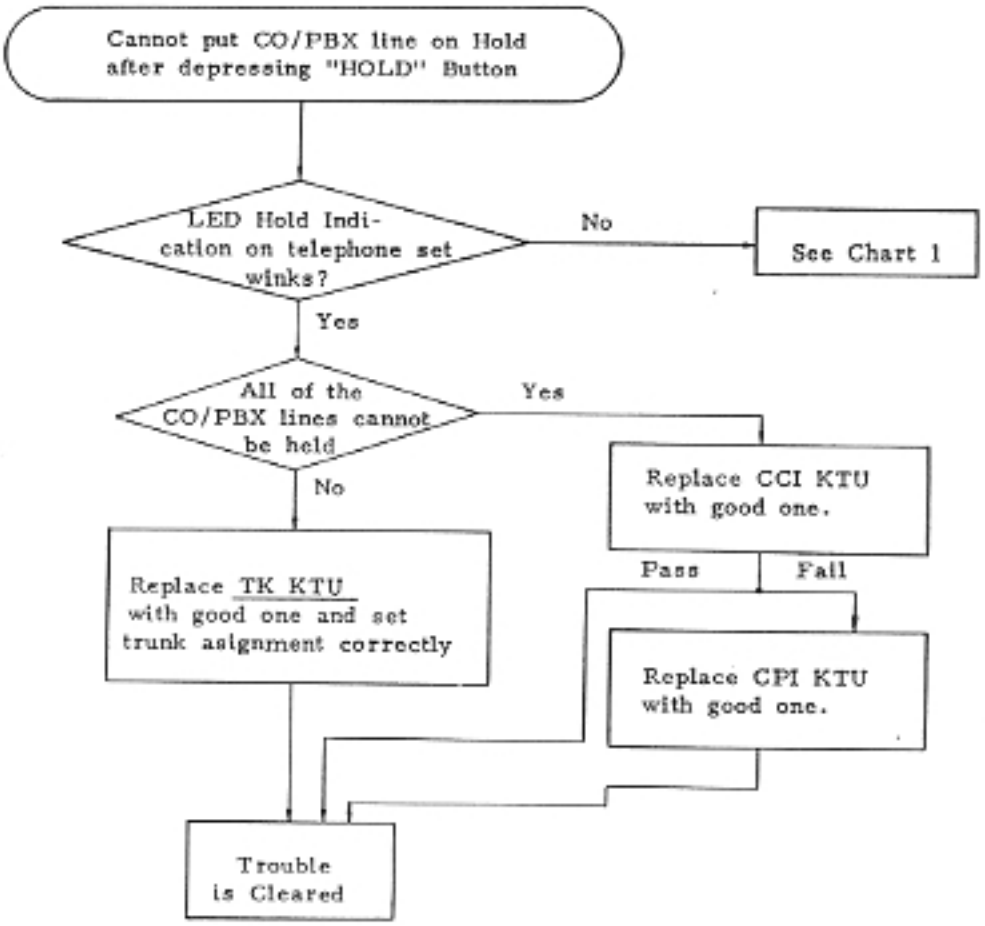


Fig. 4-4 Troubleshooting Flow Chart 3

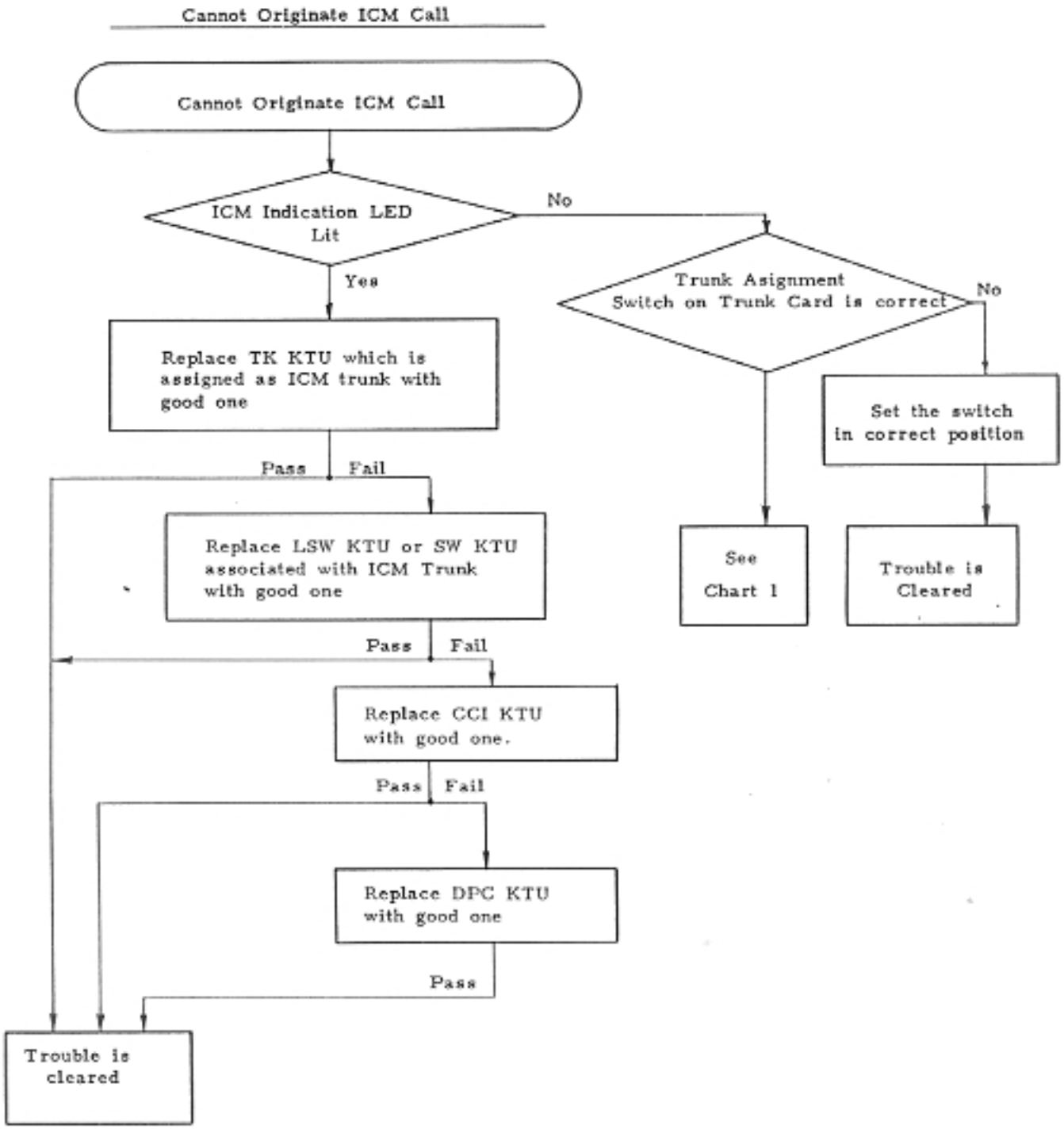


Fig. 4-5 Troubleshooting Flow Chart 4

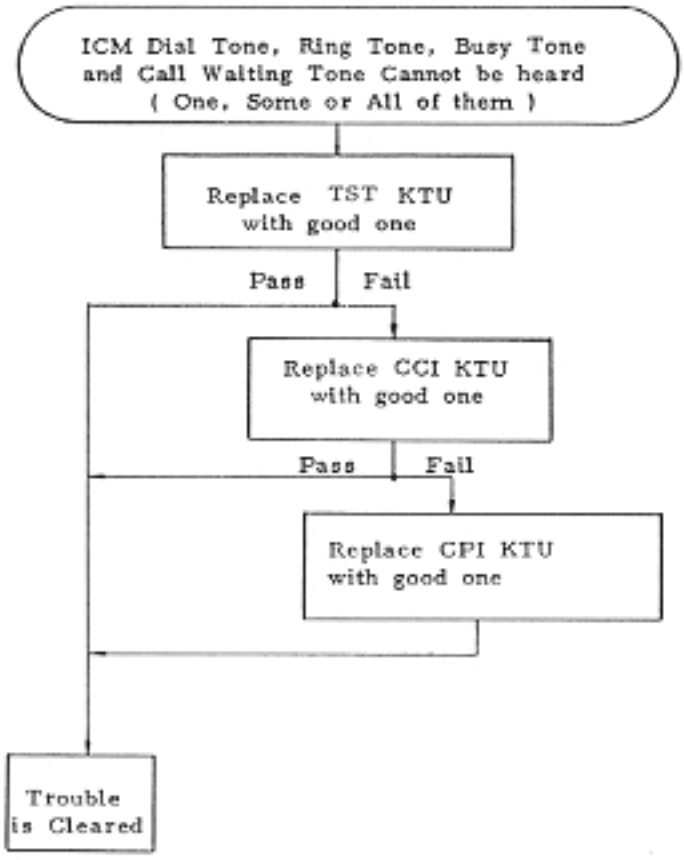


Fig. 4-6 Troubleshooting Flow Chart 5

Cannot Use ADD ON

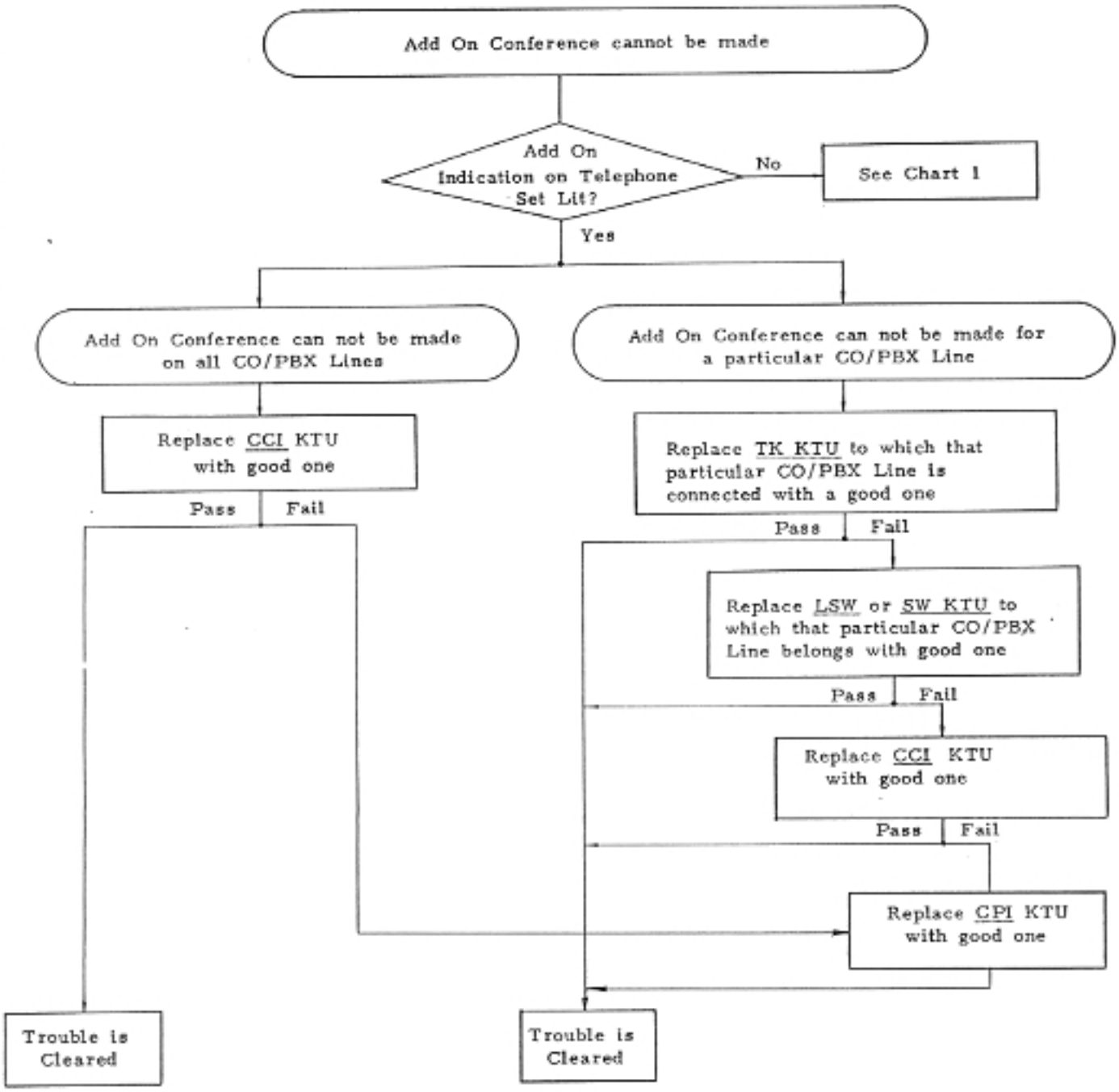


Fig. 4-7 Troubleshooting Flow Chart 6

CO/PBX Tone Ringer Does Not Work

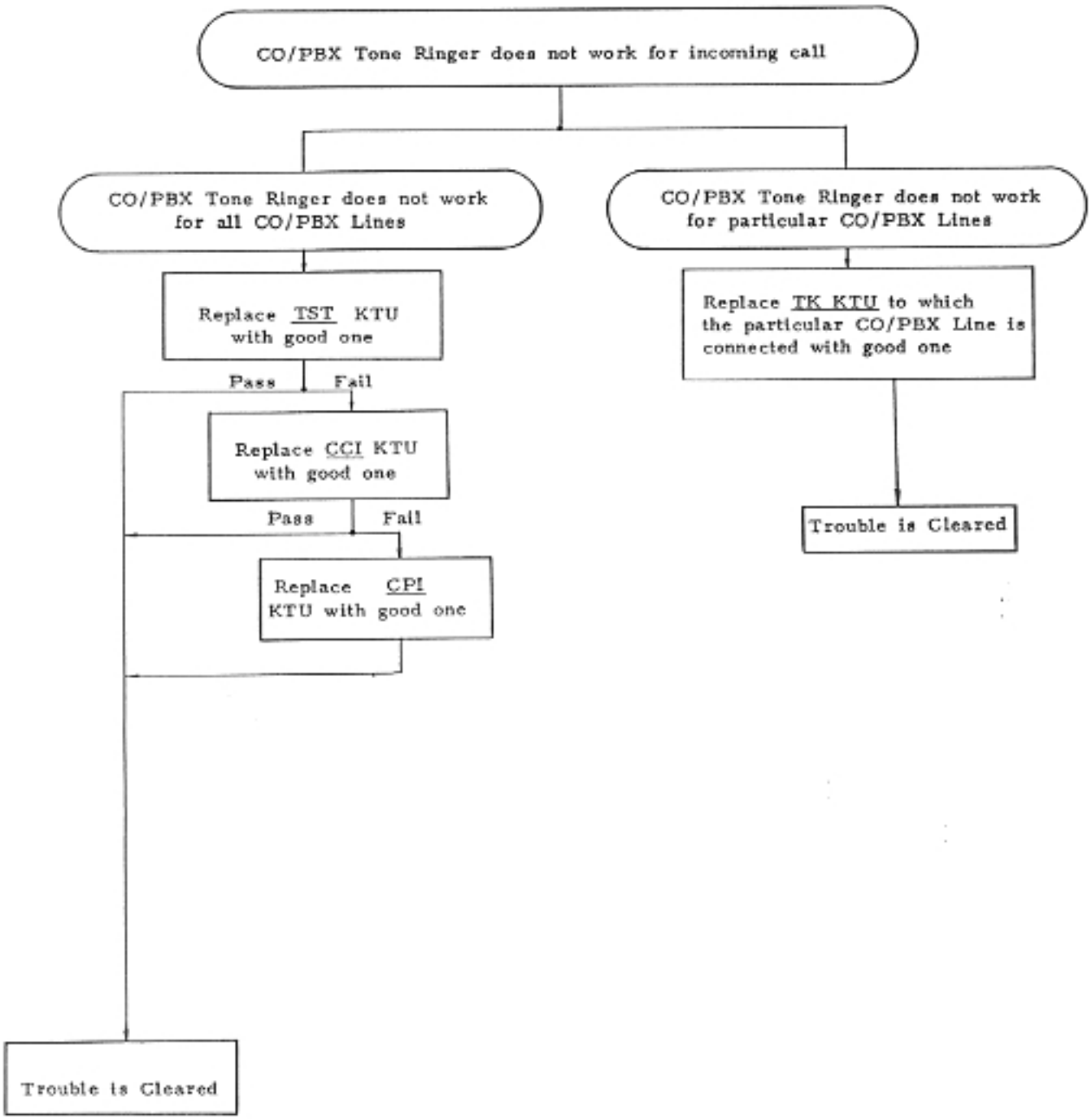


Fig. 4-8 Troubleshooting Flow Chart 7

Chapter 3 System Configuration

1. General

1.1 The Patrician Electra-28 is a microprocessor controlled, space division electronic key telephone system. It can handle up to 12 CO/PBX lines, 4 intercom paths, 2 DSS dedicated intercom paths, 28 key telephone sets and 2 DSS/BLF consoles.

1.2 The Patrician Electra-28 can be used with two types of the key telephone set, one is with hands free answer back feature on intercom and the other is without the feature.

1.3 The required cable between telephone set and key service unit (KSU) is a twisted 3 or 4 pairs. A twisted 3 pair cable is required to connect a telephone without hands free answer back on intercom. A twisted 4 pair cable is required to connect a telephone with hands free answer back on intercom.

1.4 Most of the system construction is a plug-in module type which reduces installation and rearrangement time. Some units use miniature slide switches mounted on the KTUs to assign their operation.

1.4 The Patrician Electra-28 system consists of a key service unit (KSU), a power supply unit (PSU), key telephone sets, DSS/ BLF consoles, optional KTUs and other installation material.

1.5 The typical system configuration of the Electra-28 is shown in Fig. 3-1, and its equipment list is shown in Table 3-3.

2. Electra-28 Equipment Description :

2.1 Key Service Unit

. ES-14-4 KSU (Key Service Unit) is the main equipment of the Patrician Electra-28.

. The KSU is a steel cabinet which has a printed circuit back plane, 4 dummy NBU KTUs (Termination Unit) and the following 4 common control KTUs.

Table 3-1 Common Control KTU

Equipment	Q'ty	Description
HCI KTU	1	Conference and Control Interface Unit
HTT KTU	1	Tone Source and Trunk Unit
HCP KTU	1	Central Processor and Interface Unit
HDP KTU	1	Data Processing Logic and Clock Unit

- The KSU is designed to be mounted on a floor or a wall.
- The KSU has ribbon cable type connectors to provide quick connections to CO/PBX lines, stations and customer provided optional equipments (ex. external speakers, external "music on hold" source, external amplifier, etc.) at main distribution terminal.
- The flexible service assignments of the system can be made on the optional Universal Programming Assignment KSUs.
- The KSU has a 12 pin jack connector to provide quick connection of separate power supply unit (PSU).
- The KSU provides a total of 34 slots to mount interface and option KTUs.
- Each KTU connector on the KSU has a key to avoid incorrect KTU insertion.

2.2 Power Supply Unit

- PSU-14-7 (Power Supply Unit) is a separate power supply unit for KSU and station set, which supplies 6 kinds of DC powers necessary for Patrician Electra-28 operation.

Table 3-2 Power Supply for System Operation

Voltage	Purpose
+30V DC	Station set CKT operation
+30V DC	Talk Battery
+24V DC	Relay CKTs operation
+12V DC	Logic CKTs operation
+5V DC	Logic CKTs operation
-5V DC	Logic CKTs operation

- The PSU has a plug connector to provide quick connection to the key service unit and to commercial the AC power source. The outlet of the commercial power source should be a standard 125V AC three-prong type.

- The PSU also is a steel cabinet which can be either floor mounted or wall mounted.

2.3 Basic KTUs

a) HTK KTU (Trunk Unit)

The HTK KTU contains the circuitry for CO/PBX line ring detection, hold and control of the switching matrix in the LSW KTU.

Each HTK KTU provides four trunk circuits for CO/PBX line, intercom or dedicated DSS intercom trunks, which can be selected by switches on the KTU. A maximum of 4 HTK KTUs can be installed in a key service unit.

b) DC KTU (Dial Pulse Converter Unit)

The DC KTU sends dial pulses to CO/PBX lines in accordance with dialing at station sets. Each DC KTU serves four dial pulses CO/PBX lines. A total of 3 KTUs of DC and MFC KTUs can be installed in a key service unit at maximum. (Refer to section 2.3.c)

c) MFC KTU (Dual Tone Multi-Frequency Converter Unit)

The MFC KTU sends a dual tone multi-frequency dialing signal to CO/PBX lines in accordance with dialing at station sets. Each MFC KTU serves four DTMF CO/PBX lines.

A total of 3 KTUs of MFC and DC KTU can be installed in a key service unit at maximum. (Refer to section 2.3 b).

d) LSW KTU (Line Interface and Switch Matrix Unit)

The LSW KTU contains the switch matrix circuitry for connection between telephone sets and trunks and also contains talk battery supply circuits for telephone network circuitry.

Each LSW KTU serves 7 station sets and 8 trunks. A maximum of 4 LSW KTUs can be installed in a key service unit.

Required numbers of LSW KTU and TRC KTU are the same.

e) HSW KTU (Switch Matrix "Hands Free" Unit)

The HSW KTU contains the switch matrix circuitry to provide the 2nd path, which is used for hands free answer back on intercom call and connection between telephone sets and trunks. It also contains talk battery supply circuits for a telephone hybrid circuitry for a telephone set with hands free answer back.

Each HSW KTU serves 7 station sets and 7 trunk paths (6: secondary path 1: dial tone trunk path) for hands free answerback feature on intercom.

A maximum of 4 HSW KTUs can be installed in a key servi unit. The HSW KTU is required only when telephone sets with hands free answer back feature on intercom are connected in the system.

f) SW KTU (Switch Matrix Unit)

The SW KTU contains the switch matrix circuitry to be used for expansion of LSW KTU, which will be required when HTK3 and/or HTK4 is used.

Each SW KTU serves 14 station sets and 8 trunks. A maximum 2 SW KTUs can be installed in a key service unit.

g) TRC KTU (Data Transmitter and Receiver Unit)

The TRC KTU contains the interface circuitry for data transmission between key service unit and station sets. The operation power for station sets is supplied from this KTU by a phantom power supply technique.

Each TRC KTU serves 7 station sets. A maximum of 4 TRC KTUs can be installed in a key service unit. The same numbers of TRC KTU and LSW KTU are required.

h) HST KTU (Switch Matrix and Trunk "Hands Free" Unit)

The HST KTU contains the switch matrix circuitry for hands free answer back on intercom. The HST KTU is required only when the system is connected to telephone sets with hands free answer back on intercom. A maximum of one HST KTU can be installed in a key service unit.

i) HLS KTU (Line Interface and Switch Matrix "Hands Free" Unit)

The HLS KTU contains the switch matrix circuitry to be used for expansion of HST KTU, which is required for more than 8 trunks, to provide connection for hands free answer back on intercom. The HLS KTU is required only when the trunks on HTK3 and/or HTK4 are assigned to hands free answer back feature on intercom.

A maximum of one HLS KTU can be installed in a key service unit.

2.4 Station Set

The Patrician Electra-28 key telephone system has ET-14-2M, ET-14-3, ET-14-4, ET-14-5 telephone set.

These telephone set:

- are equipped with a loudspeaker for voice and tone signaling with a volume control and are equipped with a push button dial pad to allow push button dialing even if the CO/PBX line is arranged for rotary dial pulses (either rotary pulses or dial tone multi-frequency signals may be produced).
- have two colors available, which are white and beige.
- have colored inserts available by option for face plate appearance (5 colors).
- are either a desk type or a wall mounted.

The specific feature of these telephone set is described as follows.

a) ET-14-2M Telephone Set

- The ET-14-2M telephone set is equipped with 17 non-locking buttons which are 14 line buttons for CO/PBX line and intercom paths, ADD ON button, HOLD button and ON/OFF button.
- The ET-14-2M telephone set requires 3 pair cable to be connected to a key service unit.

b) ET-14-4 Telephone Set

- The ET-14-4 telephone set is full modular key telephone set whose feature is the same as ET-14-2M telephone set.

c) ET-14-3 Telephone Set

- The ET-14-3 telephone set is equipped with 18 non-locking buttons which are 14 line button for CO/PBX line and intercom paths, ADD ON button, HOLD button, ON/OFF button and MIC ON button.

- The ET-14-3 telephone set is equipped with a microphone for hands free answer back on intercom call.

- The ET-14-3 telephone set requires switch assignment on the HMC-L UNIT. Normally the switch is slided to the (N) side. When the telephone set is connected via BUC-L KTU to KSU, the switch must be slided to the (B) side.

- The ET-14-3 telephone set requires 4 pair cable to be connected to a key service unit.

d) ET-14-5 Telephone Set

- The ET-14-5 telephone set is full modular key telephone set whose feature is the same as ET-14-3 telephone set.

2.5 Option KTUs

a) UPA KTU (Universal Programming Assignment Unit)

The UPA KTU is equipped with 32 DIP type slide switch assemblies to program the following optional features.

A maximum 4 UPA KTUs can be installed in a key service unit depending on the features required.

Feature assignment for each UPA KTU is as follows:

Position UPA - 1:

- Flexible CO/PBX line ring assignment for station No.1 through No.14 (Standard intercom number is 11 through 17 and 21 through 27).

- Prime Line Pick Up Assignment for station No.1 through No.14 (Standard intercom number is 11 through 17, and 21 through 27).

Position UPA - 2:

- Flexible CO/PBX line ring assignment for station No.15 through No.28 (Standard intercom number is 31 through 37, and 41 through 47).

- Prime Line Pick-Up Assignment for station No.15 through No.28 (Standard intercom number is 31 through 37 and 41 through 47).

Posistion UPA - 3:

- Flexible intercom station number assignment (Assigned intercom station number can be any numbers 10 through 59).

- Speed dialing assignment for any station(s) equipped with automatic last number dialed function. (up to 28 stations).

Position UPA - 4:

- Internal three zone paging assignment.
- Toll and ougoing call restriction assignement.
- Flexible time-out assignment for hold recall and voice paging.
- Speed dial of preset toll numbers, access for toll call restricted station.

b) EP KTU (External Paging Unit)

The EP KTU contains a paging amplifier and control circuitry for external 3 zone paging. The maximum paging output is 3 watts. This feature requires an EP KTU and external speakers (non-supplied item by NEC*) for outside mounting.

A maximum one EP KTU can be installed in a key service unit.

* Local supplied speakers are required for this feature.

c) MOH KTU (Music On Hold Synthesizer Unit)

The MOH KTU is a music-on-hold music source. Music is generated by an electronic circuitry.

A maximum of one MOH KTU can be installed in a key service unit.

Note: Local supplied external music source is required for music-on-hold, if MOH KTU is not used.

d) AHR KTU (Automatic Hold Release Unit)

The AHR KTU contains a detector circuitry to release the held CO/PBX line automatically by detecting a disconnect signal from CO/PBX line. The AHR KTU can handle maximum 12 CO/PBX lines.

A maximum of one AHR KTU can be installed in a key service unit.

Note: For this feature, the connected CO/PBX line must have the capability to send a timed disconnect signal.

e) PFU KTU (Power Failure Transfer Unit)

The PFU KTU contains a relay circuitry to switch CO/PBX lines from the key telephone system to ordinary single line telephone set in case of power failure.
The PFU KTU can handle maximum 12 CO/PBX lines.

A maximum of one PFU KTU can be installed in a key service unit.

Note: Single line telephones should be supplied locally.

f) BUB KTU (Back Up Battery Unit)

The BUB KTU contains battery holders and circuitry to prevent the memory of speed dialing and automatic last number dialed from erasing in case of power failure.

The BUB KTU does not contain batteries. 7 rechargable double A size batteries (KR-15-51 battery, 450 mAh) should be provided locally.

This back-up battery has reserved up to 15 hours, if fully charged.

g) BUC KTU (Balance - Unbalance Converter Unit)

The BUC KTU contains 7 balance to unbalance converter circuitry to reduce the noise which may be generated when more than 30 feet of multi-conductor cable is needed for a part of the wiring.

The number of BUC KTUs depends on the number of multi-conductor cables installed.

Maximum of 4 BUC KTUs can be installed in a key service unit.

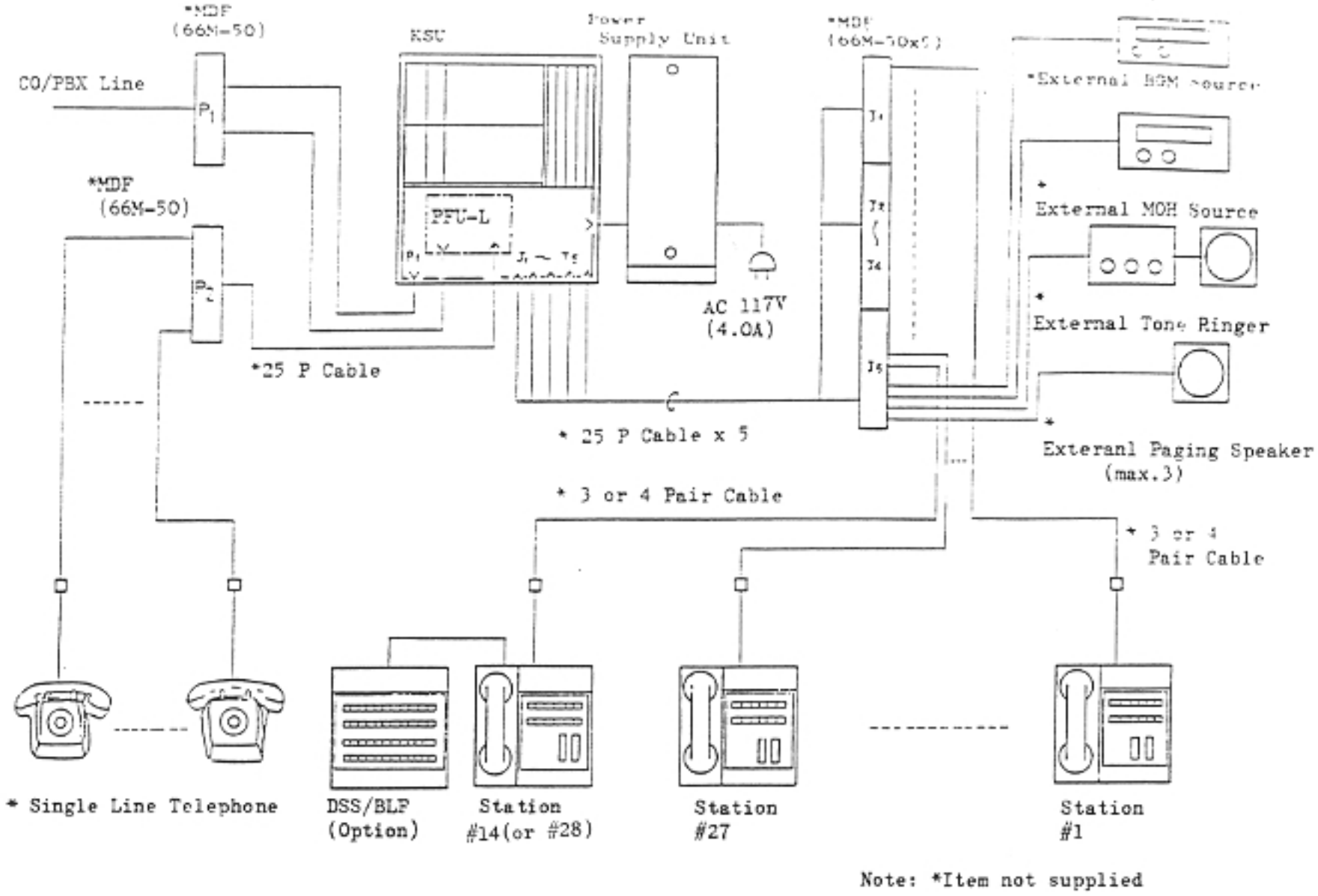
2.6 Station Option

a) ED-28-3 DSS/BLF Console

- The ED-28-3 DSS/BLF Console can be connected to pre-assigned station set in the Electra-28 key telephone system. (Station # 14 and # 28)

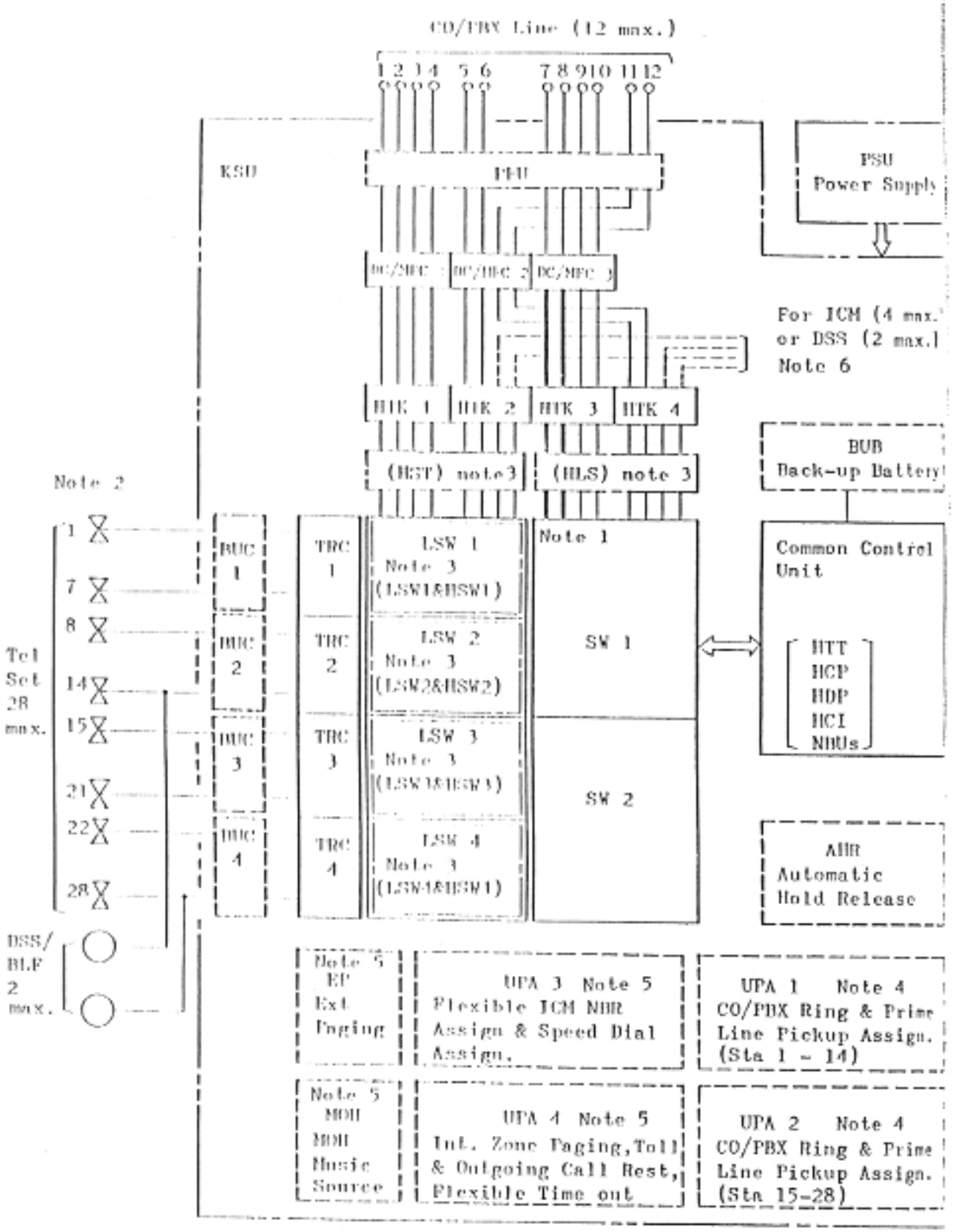
- The DSS/BLF Console provides the features of direct station selection and busy lamp filed.

- The DSS/BLF Console is equipped with a transistor buzzer for hold recall and CO/PBX ringing in a off hook state, and has 40 non-locking buttons which are 28 station buttons for direct station selection, 4 external zone paging access buttons, 4 internal zone paging access buttons, one button for Night Transfer of incoming CO/PBX line ring, one button for buzzer ON-OFF and 2 spare buttons.



Note: *Item not supplied

Fig. 3-1 Typical System Configuration



Please refer to the following page for some notes and abbreviation mentioned or used in the above.

Fig. 3-2 Equipment Composition for Electra-28

Note of Fig. 3-2

Note 1. These two positions, indicated with heavy lines over HTK3, must be connected to CO/PBX lines. They can not be connected to ICM or DSS paths.

Note 2. Station numbers shown in the above can be changed as desired for numbers 11 ~ 17, 21 ~ 27, 31 ~ 37 and 41 ~ 47 as a standard, or for numbers 10 ~ 59 by adding UPA KTU for flexible station number assignment.

Note 3. Shows the circuitry for the secondary path.

Note 4. UPA 1 KTU is used for CO/PBX ring assignment of those stations which are connected to TRC 1 and TRC 2 KTUs.

UPA 2 KTU is used for CO/PBX ring assignment of those stations which are connected to TRC 3 and TRC 4 KTUs.

Note 5. [ ] shows optional KTUs.

Note 6. Shows if HTK2 and/or HTK4 are installed positions 3 and 4 must be programed for ICM paths or DSS paths.

Legend of Fig. 3-2

AHR	Automatic Hold Release Unit
BUB	Backup Battery Unit
BUC	Balance, Un-balance Converter Unit
DC	Dial Pulse Converter Unit
EP	External Paging Unit
HLS	Line Interface and Switch Matrix (Hands Free) Unit
HST	Switch Matrix and Trunk (Hands Free) Unit
HSW	Switch Matrix (Hands Free) Unit
HTK	Trunk Unit
LSW	Line Interface and Switch Matrix Unit
MFC	Multi-frequency Converter Unit
MOH	Music On Hold Synthesizer
PFU	Power Failure Transfer Unit
PSU	Power Supply Unit
SW	Switch Matrix Unit
TRC	Data Transmitter and Receiver Unit
UPA	Universal Programming Assignment Unit

Table 3-3 Equipment List for Patrician Electra-28

Item	Equipment	Description	Max. Number of a Sys	Notes
1.	ES-14-4 KSU	Key Service Unit of the Electra-28 Contains the 4 common KTUs which are HCI, HTT, HCP, HDP and 4 NBU KTUs.	1	
2.	PSU-14-7	Power Supply Unit for Electra-28	1	For ES-14-4 KSU
3.	Basic KTUs			
3.1	HTK KTU	Trunk Unit	4	4 trunks per KTU, which are CO/PBX, Intercom or DSS intercom.
3.2	DC KTU	Dial Pulse Converter Unit	3	4 CO/PBX lines per KTU. For rotary dial pulse on CO/PBX line
3.3	MFC KTU	Multi-frequency Converter Unit	3	4 CO/PBX lines per KTU. For DTMF signalling on CO/PBX line
3.4	LSW KTU	Line Interface and Switch Matrix Unit	4	7 stations and 8 trunks per KTU.
3.5	HSW KTU	Switch Matrix (Hands Free) Unit	* 4	7 stations for hands free answer back on intercom per KTU

Item	Equipment	Description	Max. Number of a Sys	Notes
3.6	SW KTU	Switch Matrix Unit	2	. 14 stations and 8 trunks per KTU. Required when HTK3 and/ or HTK 4 are installed. . Need LSW KTUs.
3.7	TRC KTU	Data Transmitter and Receiver Unit	4	7 stations per KTU.
3.8	HST KTU	Switch Matrix and Trunk (Hands Free) Unit	* 1	. 1st 8 trunks (HTK1, HTK2) of hands free answer back.
3.9	HLS KTU	Line Interface and Switch Matrix (Hands Free) Unit	* 1	. Required when HTK 3 and/ or HTK 4 are installed. . 2nd 8 trunks (HTK3, HTK4) of hands free answer back. . Needs HST KTU.
4.	Station Set			
4.1	ET-14-2M( ) TEL	Key Telephone Set	28	Without hands free answer back on intercom.
4.2	ET-14-4( ) TEL	Full Modular Key Telephone Set	28	ditto
4.3	ET-14-3( ) TEL	Key Telephone Set	* 28	With hands free answer back on intercom.
4.4	ET-14-5( ) TEL	Full Modular Key Telephone Set	* 28	ditto ( ) shows the color of telephone set.

Item	Equipment	Description	Max. Number

					telephone set.

Item	Equipment		Description	Max. Number of a Sys	Notes
5.	Option Unit				
5.1	UPA	KTU	Universal Programming Assignment Unit	4	As required. See Table 5-8.
5.2	EP	KTU	External Paging Unit	1	1 for external paging
5.3	MOH	KTU	Music On Hold Synthesizer Unit	1	1 for music source
5.4	AHR	KTU	Automatic Hold Release Unit	1	1 per 12 CO/PBX lines
5.5	PFU	KTU	Power Failure Transfer Unit	1	1 per 12 CO/PBX line
5.6	BUB	KTU	Back Up Battery Unit	1	1/system. 7 batteries must be supplied locally.
5.7	BUC	KTU	Balance, Un-balance Converter Unit	4	7 stations per KTU Need when multi conducts cable is installed.
6.	Station Option				
6.1	ED-28-3( ) DSS/BLF		Direct Station Selection with Busy Lamp Field Console	2	( )shows the color of DSS/BLF
6.2	WMU( ) ET-14		Wall Mounting Unit for Electra-28	As required	1 unit/station for wall mounting
6.3	Face Sheet ( ) ET-14-2/4		Face Sheet for ET-14-2M and ET-14-4 Telephone Set	As required	( ) shows the color of sheet

Item	Equipment	Description	Max. Number of a Sys	Notes
6.4	Face Sheet ( ) ET-14-3/5	Face Sheet for ET-14-3 and ET-14-5 Telephone Set	As required	( ) shows the color of sheet
6.5	Face Sheet ( ) ED-28	Face Sheet for ED-28-3 DSS/BLF Console	As required	( ) shows the color of sheet

Note * shows the equipment which are required for a system with hands free answer back feature on intercom.

Table 3-10 Required KTUs for Options

Feature	Required KTU						
	UPA	EP	MOH	AHR	PFU	BUB	BUC
Outgoing Call Restriction	v						
Toll Call Restriction							
External Zone Paging							
Flexible Time-Out Assignment							
Speed Call Access for Toll Call Restricted Station Assignment							
CO/PBX Line Ring Assigment for Station 1 - 14	v						
Prime Line Pickup for Station 1 - 14							
CO/PBX Line Ring Assignemt for Station 15 - 28	v						
Prime Line Pickup for Station 15 - 28							
Flexible Station Number Assignment (10 ~ 59)	v						
Expanded Number of Speed Dial Access							
External Zone Paging		v					
Music On Hold Synthesizer			v				
Automatic Hold Release				v			
Power Failure Transfer					v		
Backup Battery for Dial Memory						v	
Balance-Unbalance Conversion							v Note

Note The required quantities of BUC KTUs are the same as that of TRC KTUs.

Example When CO/PBX Line Ring Assignment option is required and the system contains 20 telephones, 2 UPA KTUs are required.

J1 (CO/TRK)		
PAIR	CABLE COLOR	CKT DESIG
26	WH-BL	CO 1
1	BL-WH	
27	WH-OR	
2	OR-WH	
28	WH-GN	CO 2
3	GN-WH	
29	WH-BR	
4	BR-WH	
30	WH-SL	CO 3
5	SL-WH	
31	RD-BL	
6	BL-RD	
32	RD-OR	CO 4
7	OR-RD	
33	RD-GN	
8	GN-RD	
34	RD-BR	CO 5
9	BR-RD	
35	RD-SL	
10	SL-RD	
36	BK-BL	CO 6
11	BL-BK	
37	BK-OR	
12	OR-BK	
38	BK-GN	CO 7
13	GN-BK	
39	BK-BR	
14	BR-BK	
40	BK-SL	CO 8
15	SL-BK	
41	YL-BL	
16	BL-YL	
42	YL-OR	CO 9
17	OR-YL	
43	YL-GN	
18	GN-YL	
44	YL-BR	CO 10
19	BR-YL	
45	YL-SL	
20	SL-YL	
46	VI-BL	CO 11
21	BL-VI	
47	VI-OR	
22	OR-VI	
48	VI-GN	CO 12
23	GN-VI	
49	VI-BR	
24	BR-VI	
50	VI-SL	
25	SL-VI	

J1 (TEL)				
PIN	LEAD DESIG	CABLE KSU	COLOR TEL	CKT DESIG
26	1VT	WH-BL	WH-BL	TEL 1
1	1VR	BL-WH	BL-WH	
27	1ST	WH-OR	WH-OR	
2	1SR	OR-WH	OR-WH	
28	1RT	WH-GN	WH-GN	
3	1RR	GN-WH	GN-WH	
29	1HT	WH-BR	WH-BR	
4	1HR	BR-WH	BR-WH	
30	2VT	WH-SL	WH-BL	TEL 2
5	2VR	SL-WH	BL-WH	
31	2ST	RD-BL	WH-OR	
6	2SR	BL-RD	OR-WH	
32	2RT	RD-OR	WH-GN	
7	2RR	OR-RD	GN-WH	
33	2HT	RD-GN	WH-BR	
8	2HR	GN-RD	BR-WH	
34	3VT	RD-BR	WH-BL	TEL 3
9	3VR	BR-RD	BL-WH	
35	3ST	RD-SL	WH-OR	
10	3SR	SL-RD	OR-WH	
36	3RT	BK-BL	WH-GN	
11	3RR	BL-BK	GN-WH	
37	3HT	BK-OR	WH-BR	
12	3HR	OR-BK	BR-WH	
38	4VT	BK-GN	WH-BL	TEL 4
13	4VR	GN-BK	BL-WH	
39	4ST	BK-BR	WH-OR	
14	4SR	BR-BK	OR-WH	
40	4RT	BK-SL	WH-GN	
15	4RR	SL-BK	GN-WH	
41	4HT	YL-BL	WH-BR	
16	4HR	BL-YL	BR-WH	
42	5VT	YL-OR	WH-BL	TEL 5
17	5VR	OR-YL	BL-WH	
43	5ST	YL-GN	WH-OR	
18	5SR	GN-YL	OR-WH	
44	5RT	YL-BR	WH-GN	
19	5RR	BR-YL	GN-WH	
45	5HT	YL-SL	WH-BR	
20	5HR	SL-YL	BR-WH	
46	6VT	VI-BL	WH-BL	TEL 6
21	6VR	BL-VI	BL-WH	
47	6ST	VI-OR	WH-OR	
22	6SR	OR-VI	OR-WH	
48	6RT	VI-GN	WH-GN	
23	6RR	GN-VI	GN-WH	
49	6HT	VI-BR	WH-BR	
24	6HR	BR-VI	BR-WH	
50	-	VI-SL	-	Spare
25	-	SL-VI	-	

J2 (TEL)				
PIN	LEAD DESIG	CABLE KSU	COLOR TEL	CKT DESIG
26	7VT	WH-BL	WH-BL	TEL 7
1	7VR	BL-WH	BL-WH	
27	7ST	WH-OR	WH-OR	
2	7SR	OR-WH	OR-WH	
28	7RT	WH-GN	WH-GN	
3	7RR	GN-WH	GN-WH	
29	7HT	WH-BR	WH-BR	
4	7HR	BR-WH	BR-WH	
30	8VT	WH-SL	WH-BL	TEL 8
5	8VR	SL-WH	BL-WH	
31	8ST	RD-BL	WH-OR	
6	8SR	BL-RD	OR-WH	
32	8RT	RD-OR	WH-GN	
7	8RR	OR-RD	GN-WH	
33	8HT	RD-GN	WH-BR	
8	8HR	GN-RD	BR-WH	
34	9VT	RD-BR	WH-BL	TEL 9
9	9VR	BR-RD	BL-WH	
35	9ST	RD-SL	WH-OR	
10	9SR	SL-RD	OR-WH	
36	9RT	BK-BL	WH-GN	
11	9RR	BL-BK	GN-WH	
37	9HT	BK-OR	WH-BR	
12	9HR	OR-BK	BR-WH	
38	10VT	BK-GN	WH-BL	TEL 10
13	10VR	GN-BK	BL-WH	
39	10ST	BK-BR	WH-OR	
14	10SR	BR-BK	OR-WH	
40	10RT	BK-SL	WH-GN	
15	10RR	SL-BK	GN-WH	
41	10HT	YL-BL	WH-BR	
16	10HR	BL-YL	BR-WH	
42	11VT	YL-OR	WH-BL	TEL 11
17	11VR	OR-YL	BL-WH	
43	11ST	YL-GN	WH-OR	
18	11SR	GN-YL	OR-WH	
44	11RT	YL-BR	WH-GN	
19	11RR	BR-YL	GN-WH	
45	11HT	YL-SL	WH-BR	
20	11HR	SL-YL	BR-WH	
46	12VT	VI-BL	WH-BL	TEL 12
21	12VR	BL-VI	BL-WH	
47	12ST	VI-OR	WH-OR	
22	12SR	OR-VI	OR-WH	
48	12RT	VI-GN	WH-GN	
23	12RR	GN-VI	GN-WH	
49	12HT	VI-BR	WH-BR	
24	12HR	BR-VI	BR-WH	
50	-	VI-SL	-	Spare
25	-	SL-VI	-	

J3 (TEL)				
PIN	LEAD DESIG	CABLE KSU	COLOR TEL	CKT DESIG
26	13VT	WH-BL	WH-BL	TEL
1	13VR	BL-WH	BL-WH	
27	13ST	WH-OR	WH-OR	
2	13SR	OR-WH	OR-WH	
28	13RT	WH-GN	WH-GN	
3	13RR	GN-WH	GN-WH	
29	13HT	WH-BR	WH-BR	
4	13HR	BR-WH	BR-WH	
30	14VT	WH-SL	WH-BL	TEL
5	14VR	SL-WH	BL-WH	
31	14ST	RD-BL	WH-OR	
6	14SR	BL-RD	OR-WH	
32	14RT	RD-OR	WH-GN	
7	14RR	OR-RD	GN-WH	
33	14HT	RD-GN	WH-BR	
8	14HR	GN-RD	BR-WH	
34	15VT	RD-BR	WH-BL	TEL
9	15VR	BR-RD	BL-WH	
35	15ST	RD-SL	WH-OR	
10	15SR	SL-RD	OR-WH	
36	15RT	BK-BL	WH-GN	
11	15RR	BL-BK	GN-WH	
37	15HT	BK-OR	WH-BR	
12	15HR	OR-BK	BR-WH	
38	16VT	BK-GN	WH-BL	TEL
13	16VR	GN-BK	BL-WH	
39	16ST	BK-BR	WH-OR	
14	16SR	BR-BK	OR-WH	
40	16RT	BK-SL	WH-GN	
15	16RR	SL-BK	GN-WH	
41	16HT	YL-BL	WH-BR	
16	16HR	BL-YL	BR-WH	
42	17VT	YL-OR	WH-BL	TEL
17	17VR	OR-YL	BL-WH	
43	17ST	YL-GN	WH-OR	
18	17SR	GN-YL	OR-WH	
44	17RT	YL-BR	WH-GN	
19	17RR	BR-YL	GN-WH	
45	17HT	YL-SL	WH-BR	
20	17HR	SL-YL	BR-WH	
46	18VT	VI-BL	WH-BL	TEL
21	18VR	BL-VI	BL-WH	
47	18ST	VI-OR	WH-OR	
22	18SR	OR-VI	OR-WH	
48	18RT	VI-GN	WH-GN	
23	18RR	GN-VI	GN-WH	
49	18HT	VI-BR	WH-BR	
24	18HR	BR-VI	BR-WH	
50	-	VI-SL	- -	SP
25	-	SL-VI	- -	

Fig.4-3 Patrician Ele

J3	
COLOR TEL	CKT DESIG
WH-BL	TEL 13
BL-WH	
WH-OR	
OR-WH	
WH-GN	
GN-WH	
WH-BL	
BL-WH	
WH-BL	TEL 14
BL-WH	
WH-OR	
OR-WH	
WH-GN	
GN-WH	
WH-BR	
BR-WH	
WH-BL	TEL 15
BL-WH	
WH-OR	
OR-WH	
WH-GN	
GN-WH	
WH-BR	
BR-WH	
WH-BL	TEL 16
BL-WH	
WH-OR	
OR-WH	
WH-GN	
GN-WH	
WH-BR	
BR-WH	
WH-BL	TEL 17
BL-WH	
WH-OR	
OR-WH	
WH-GN	
GN-WH	
WH-BR	
BR-WH	
WH-BL	TEL 18
BL-WH	
WH-OR	
OR-WH	
WH-GN	
GN-WH	
WH-BR	
BR-WH	
-	Spare
-	

J4 (TEL)				
PIN	LEAD DESIG	CABLE KSU	COLOR TEL	CKT DESIG
26	19VT	WH-BL	WH-BL	TEL 19
1	19VR	BL-WH	BL-WH	
27	19ST	WH-OR	WH-OR	
2	19SR	OR-WH	OR-WH	
28	19DT	WH-GN	WH-GN	
3	19DR	GN-WH	GN-WH	
29	19BT	WH-BR	WH-BL	
4	19BR	BR-WH	BL-WH	
30	20VT	WH-SL	WH-BL	TEL 20
5	20VR	SL-WH	BL-WH	
31	20ST	RD-BL	WH-OR	
6	20SR	BL-RD	OR-WH	
32	20DT	RD-OR	WH-GN	
7	20DR	OR-RD	GN-WH	
33	20BT	RD-GN	WH-BR	
8	20BR	GN-RD	BR-WH	
34	21VT	RD-BR	WH-BL	TEL 21
9	21VR	BR-RD	BL-WH	
35	21ST	RD-SL	WH-OR	
10	21SR	SL-RD	OR-WH	
36	21DT	BK-BL	WH-GN	
11	21DR	BL-BK	GN-WH	
37	21BT	BK-OR	WH-BR	
12	21BR	OR-BK	BR-WH	
38	22VT	BK-GN	WH-BL	TEL 22
13	22VR	GN-BK	BL-WH	
39	22ST	BK-BR	WH-OR	
14	22SR	BR-BK	OR-WH	
40	22DT	BK-SL	WH-GN	
15	22DR	SL-BK	GN-WH	
41	22BT	YL-BL	WH-BR	
16	22BR	BL-YL	BR-WH	
42	23VT	YL-OR	WH-BL	TEL 23
17	23VR	OR-YL	BL-WH	
43	23ST	YL-GN	WH-OR	
18	23SR	GN-YL	OR-WH	
44	23DT	YL-BR	WH-GN	
19	23DR	BR-YL	GN-WH	
45	23BT	YL-SL	WH-BR	
20	23BR	SL-YL	BR-WH	
46	24VT	VI-BL	WH-BL	TEL 24
21	24VR	BL-VI	BL-WH	
47	24ST	VI-OR	WH-OR	
22	24SR	OR-VI	OR-WH	
48	24DT	VI-GN	WH-GN	
23	24DR	GN-VI	GN-WH	
49	24BT	VI-BR	WH-BR	
24	24BR	BR-VI	BR-WH	
50	-	VI-SL	-	Spare
25	-	SL-VI	-	

J5 (TEL)				
PIN	LEAD DESIG	CABLE KSU	COLOR TEL	CKT DESIG
26	25VT	WH-BL	WH-BL	TEL 25
1	25VR	BL-WH	BL-WH	
27	25ST	WH-OR	WH-OR	
2	25SR	OR-WH	OR-WH	
28	25DT	WH-GN	WH-GN	
3	25DR	GN-WH	GN-WH	
29	25BT	WH-BR	WH-BL	
4	25BR	BR-WH	BL-WH	
30	26VT	WH-SL	WH-BL	TEL 26
5	26VR	SL-WH	BL-WH	
31	26ST	RD-BL	WH-OR	
6	26SR	BL-RD	OR-WH	
32	26DT	RD-OR	WH-GN	
7	26DR	OR-RD	GN-WH	
33	26BT	RD-GN	WH-BR	
8	26BR	GN-RD	BR-WH	
34	27VT	RD-BR	WH-BL	TEL 27
9	27VR	BR-RD	BL-WH	
35	27ST	RD-SL	WH-OR	
10	27SR	SL-RD	OR-WH	
36	27DT	BK-BL	WH-GN	
11	27DR	BL-BK	GN-WH	
37	27BT	BK-OR	WH-BR	
12	27BR	OR-BK	BR-WH	
38	28VT	BK-GN	WH-BL	TEL 28
13	28VR	GN-BK	BL-WH	
39	28ST	BK-BR	WH-OR	
14	28SR	BR-BK	OR-WH	
40	28DT	BK-SL	WH-GN	
15	28DR	SL-BK	GN-WH	
41	28BT	YL-BL	WH-BR	
16	28BR	BL-YL	BR-WH	
42	-	YL-OR	-	Spare
17	-	OR-YL	-	
43	EPC 1	YL-GN		Ext. Zone Paging AMP
18	EPC 2	GN-YL		
44	EPC 3	YL-BR		
19	+24	BR-YL		
45	BGM	YL-SL		BGM
20	BGMG	SL-YL		
46	EP1	VI-BL		Ext. Zone Paging
21	EP1G	BL-VI		
47	ET	VI-OR		Ext. Ring
22	ER	OR-VI		
48	MOH	VI-GN		Ext. MOH
23	MG	GN-VI		
49	PG 1	VI-BR		Ext. Paging
24	PG 2	BR-VI		
50	PG 3	VI-SL		
25	PGG	SL-VI		

VT	Voice Tip
VR	Voice Ring
ST	Data Sending Tip
SR	Data Sending Ring
RT	Data Receiving Tip
RR	Data Receiving Ring
HT	Hands Free Tip
HR	Hands Free Ring
EPC1 ~ 3	External Paging Control 1 ~ 3
+24	Other Side of Control (paging control circuit)
BGM	Background Music Input
BGMG	Other Side of BGM Input
EP1	External Amplifier Input
EP1G	External Amplifier Input (ground)
ET	External Tone Ringer Tip
ER	External Tone Ringer Ring
MOH	External MOH Source Input
MG	External MOH Source Input (ground)
PG1	Paging Output to Zone 1
PG2	Paging Output to Zone 2
PG3	Paging Output to Zone 3
PGG	Paging Output (ground)

3.2 Cabling

Connect the flat ribbon female ended cable (25 pair) to P1 flat ribbon connector which is mounted bottom left in the key service unit (KSU). This is called P_1 cable and is to be connected to incoming CO/PBX lines at the P_1 terminal block on the main distribution frame (MDF) Connections are shown in Fig. 4-3.

Connect the flat ribbon male connector ended cables (25 pair x maximum 5) to J_1 through J_5 flat ribbon connectors which are mounted at bottom portion the key service unit (KSU). They are called J_1, J_2, J_3, J_4 and J_5 cable, and are to be connected to station cable at J_1 through J_5 terminal brocks on the main distribution frame (MDF). Connections are shown in Fig. 4-3 and 4-6 through 4-10.

4. CO/PBX Line Connections

4.1 Terminate incoming CO/PBX lines as shown in Fig. 4-3, Fig. 4-12 and Fig. 4-13 using the P_1 cable and 66B3-50 type connecting block (66B4-50 or 66M1-50 type connecting block, if power failure unit is not installed). Refer to the trunk assignment (Table 4-3 and Fig. 4-19)

Note: If HTK 1 trunks (1 through 4), HTK 2 trunks (1 and 2), HTK 3 trunks (3 and 4), or HTK 4 trunks (1 through 4) have been arranged as an intercom (ICM) or DSS dedicated intercom path, do not connect an incoming CO/PBX line to that trunk position.

For ET-14-2M Telephone Set

Table 4-1 Connection for ET-14-2M TEL

Installation Cable	CKT Deign.	Term. Number	Station Set (Cord)
WH-BL	VT	L1	YL
BL-WH	VR	E	BR
WH-OR	ST	L_2	BL
OR-WH	SR	G	BK
WH-GN	RT	H_1	RD
GN-WH	RR	H_2	WH

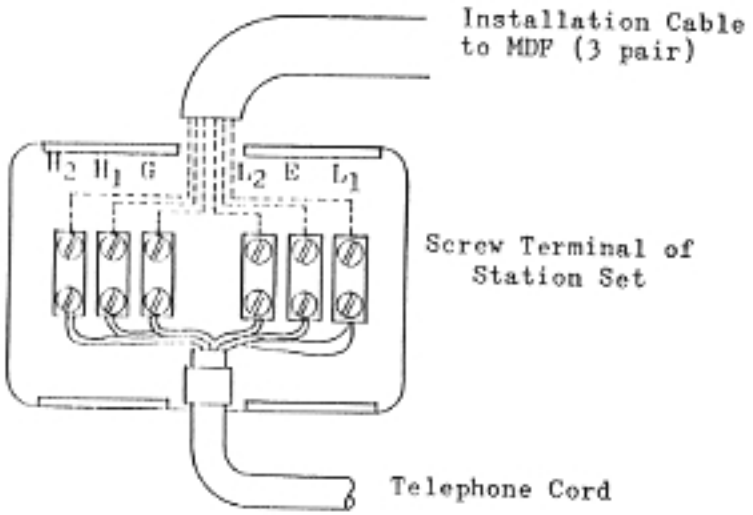


Fig. 4-4 View of Screw Terminal Block of ET-14-2M TEL

For ET-14-3 Telephone Set

Table 4-2 Connection for ET-14-3 TEL

Installation Cable	CKT Design.	Term. Number	Station Set (Cord)
WH-BL	VT	3	YL
BL-WH	VR	1	BR
WH-OR	ST	9	BL
OR-WH	SR	10	BK
WH-GN	RT	11	RD
GN-WH	RR	12	WH
WH-BR	HT	5	GN
BR-WH	HR	6	OR

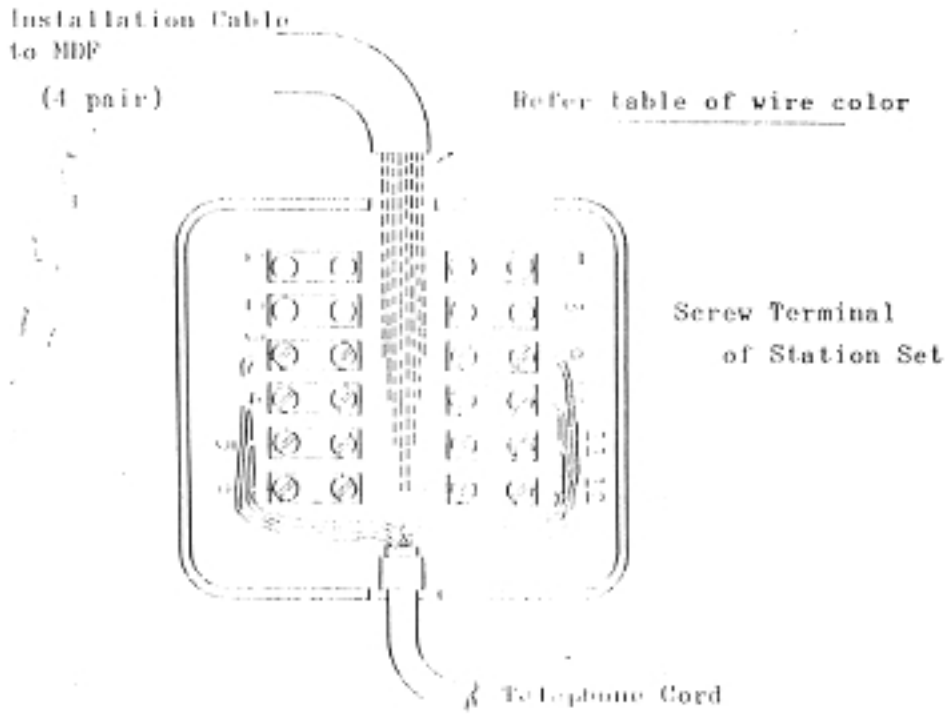


Fig. 4-5 View of Screw Terminal Block of ET-14-3 TEL

(2) ET-14-4 and ET-14-5 Modular Telephone Set

a) The ET-14-4 requires 3 pair cable and the ET-14-5 requires 4 pair cable which are used to connect these telephone sets to the main distribution frame (MDF).

b) Connect these telephones via screw terminal to modular jack connecting apparatus adaptors
(Refer Table 4-1' and 4-2', Fig. 4-4' and 4-5'.)

c) Parts required

For ET-14-4

Any standard 6-pin modular connecting apparatus, such as NT625QA6 jack assembly, etc.

For ET-14-5

Armiger & Associates AA635 A/B data and voice station connecting apparatus (See Limitations). Suttle Apparatus Corp. SE 697B8.

d) Limitations

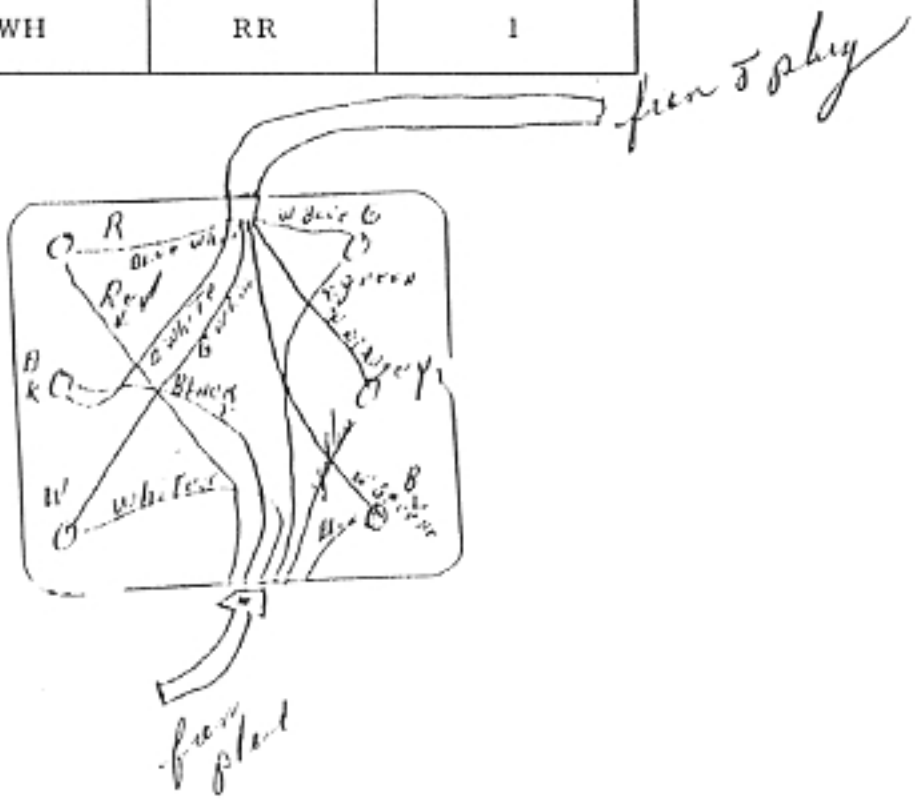
The AA 635 A/B connecting apparatus available from NEC Telephones has been modified by the manufacturer at our request. The AA 635 A/B connecting apparatus available elsewhere has 2 shorting bars which may affect operation of the system if telephones are left disconnected from a system with power on. The SE 697B8 does not have these shorting bars.

e) Application

For ET-14-4 Telephone Set

Table 4-1' Connection for ET-14-4 TEL

Installation Cable	CKT Design.	Modular Terminal
WH-BL	VT	4
BL-WH	VR	3
WH-OR	ST	5
OR-WH	SR	2
WH-GN	RT	6
GN-WH	RR	1



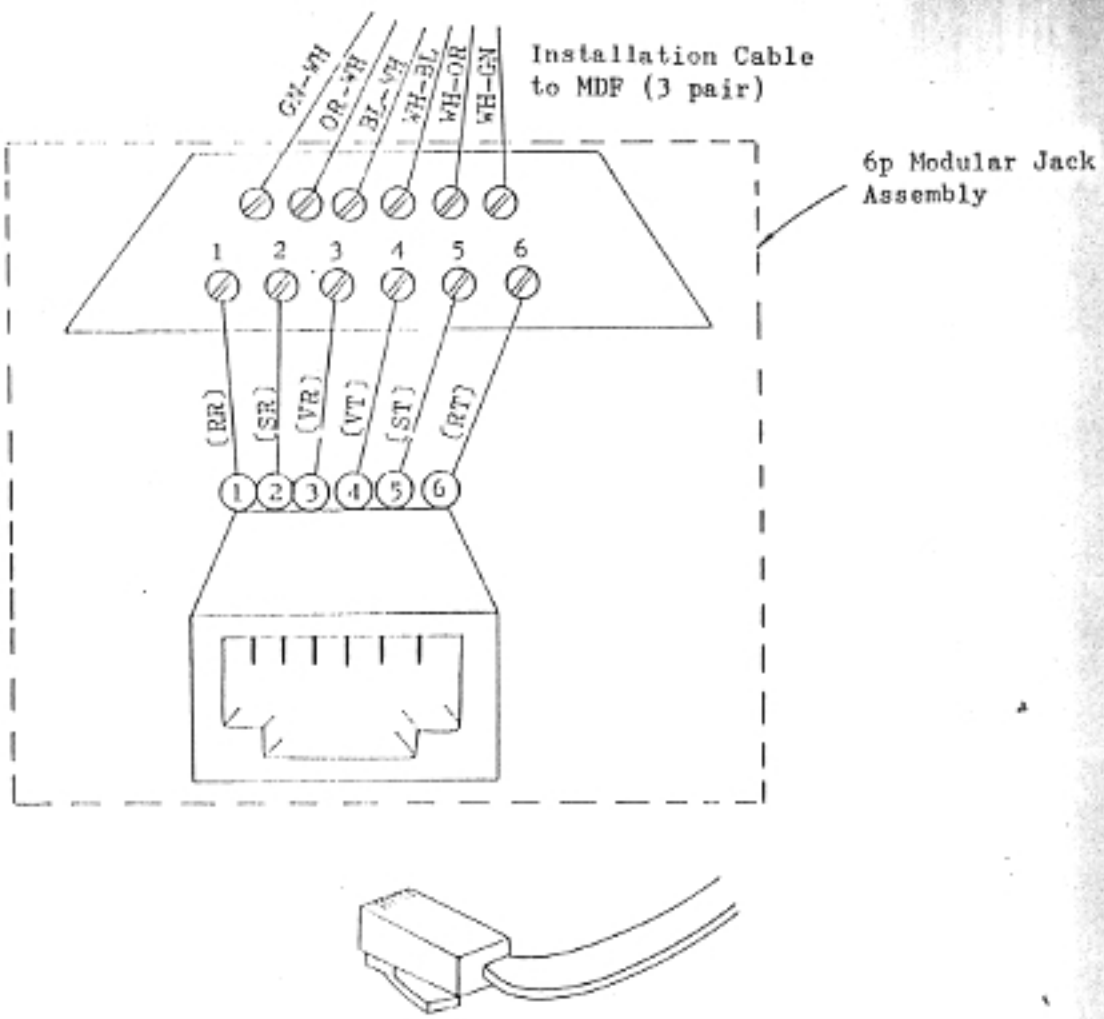


Fig. 4-4' View of Modular Jack Connecting Apparatus of ET-14-4 TEL

' For ET-14-5 Telephone Set

Table 4-2' Connection for ET-14-5 TEL

Installation Cable	CKT Design.	Modular Terminal
WH-BL	VT	5
BL-WH	VR	4
WH-OR	ST	6
OR-WH	SR	3
WH-GN	RT	7
GN-WH	RR	2
WH-BR	HT	8
BR-WH	HR	1

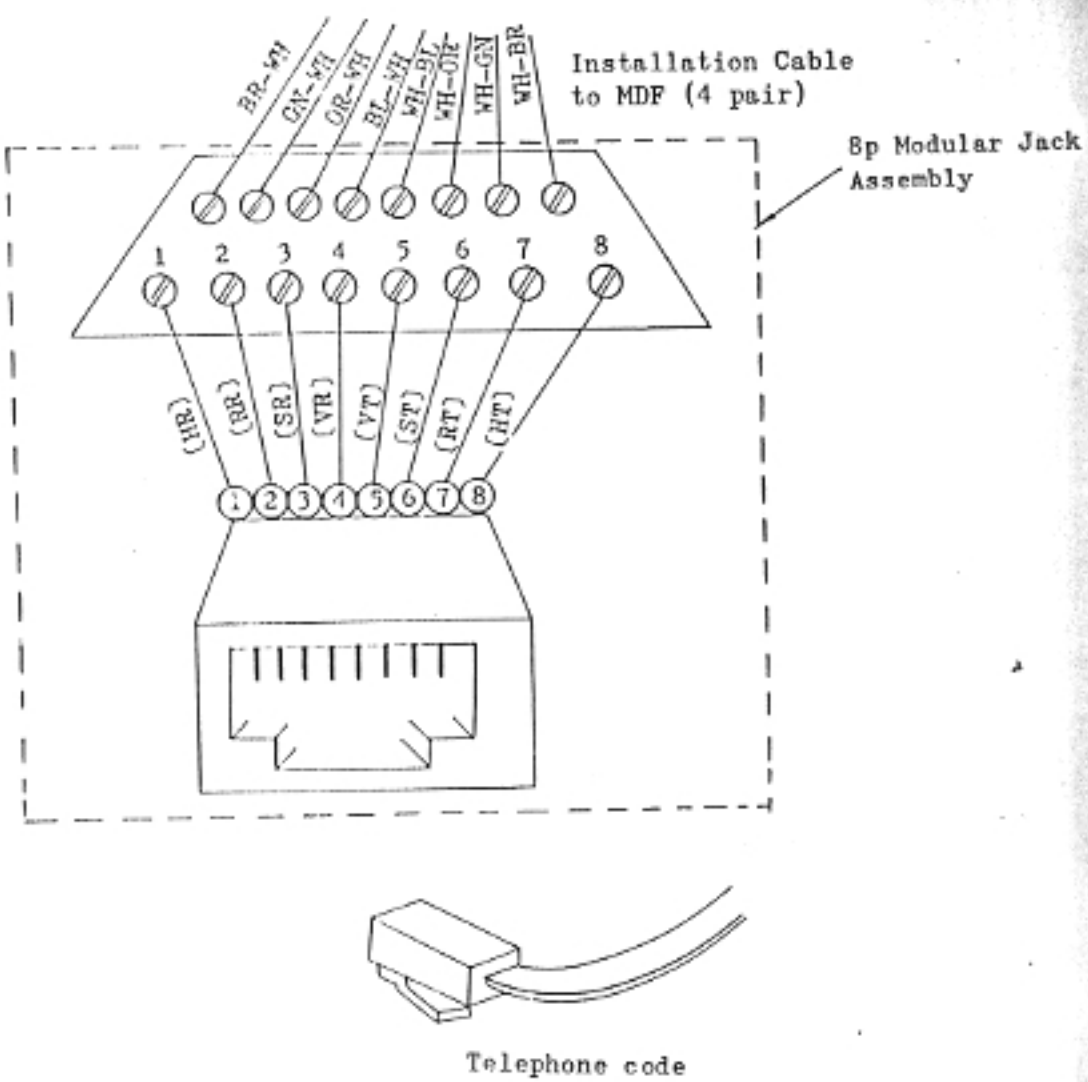


Fig. 4-5' View of Modular Jack Connecting Apparatus of ET-14-5 TEL

t. DSS/BLF Console

6.1 When only one DSS/BLF console is installed in the system, it must be connected to the station #14 (Standard intercom number 27).

6.2 When two DSS/BLF consoles are installed in the system, the first DSS/BLF console must be connected to station #14 (Standard intercom number 27). The second DSS/BLF console must be connected to station #28 (Standard intercom number 47).

6.3 To install DSS/BLF console, take the following steps.

a) Remove the screw on base of the telephone.

b) Remove the face sheet.

c) Remove the clear plastic face panel from attendant's telephone by inserting a small screw-driver tip into the notch at top of the face panel, separating the locking tabs, and lifting the face panel off.

d) Pull out at the rear center of housing to free plastic latch and lift housing off.

e) Plug DSS/BLF cable jack onto at right near of the telephone on Main Circuit Unit. (Plug is labeled "DS")

f) Cut-off the plastic plug on housing which masks the DSS/BLF cable entry.

g) Slip DSS/BLF cable holder over stand-up plastic lug at cable entry in the telephone.

h) Close housing.

j) Install screws.

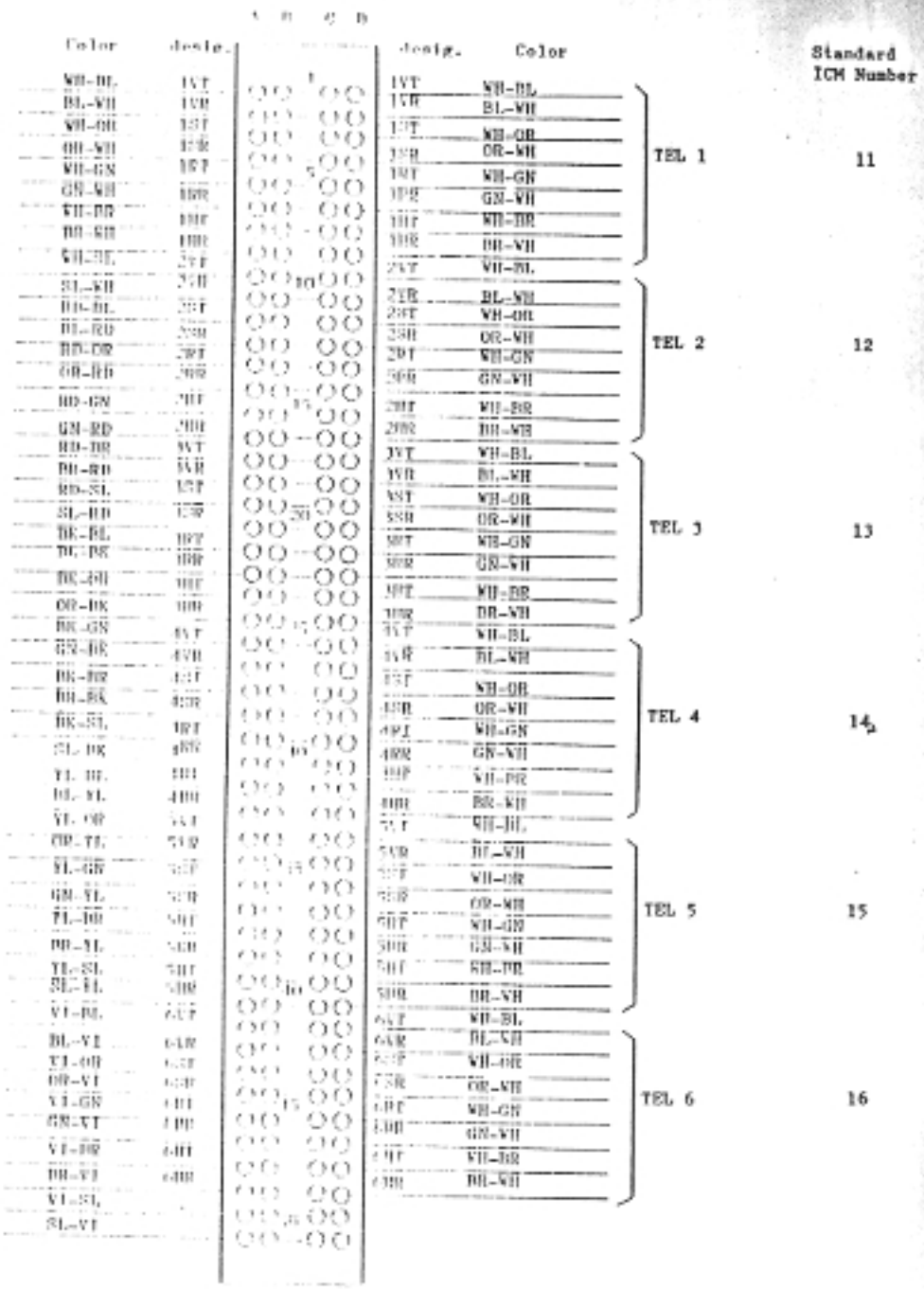
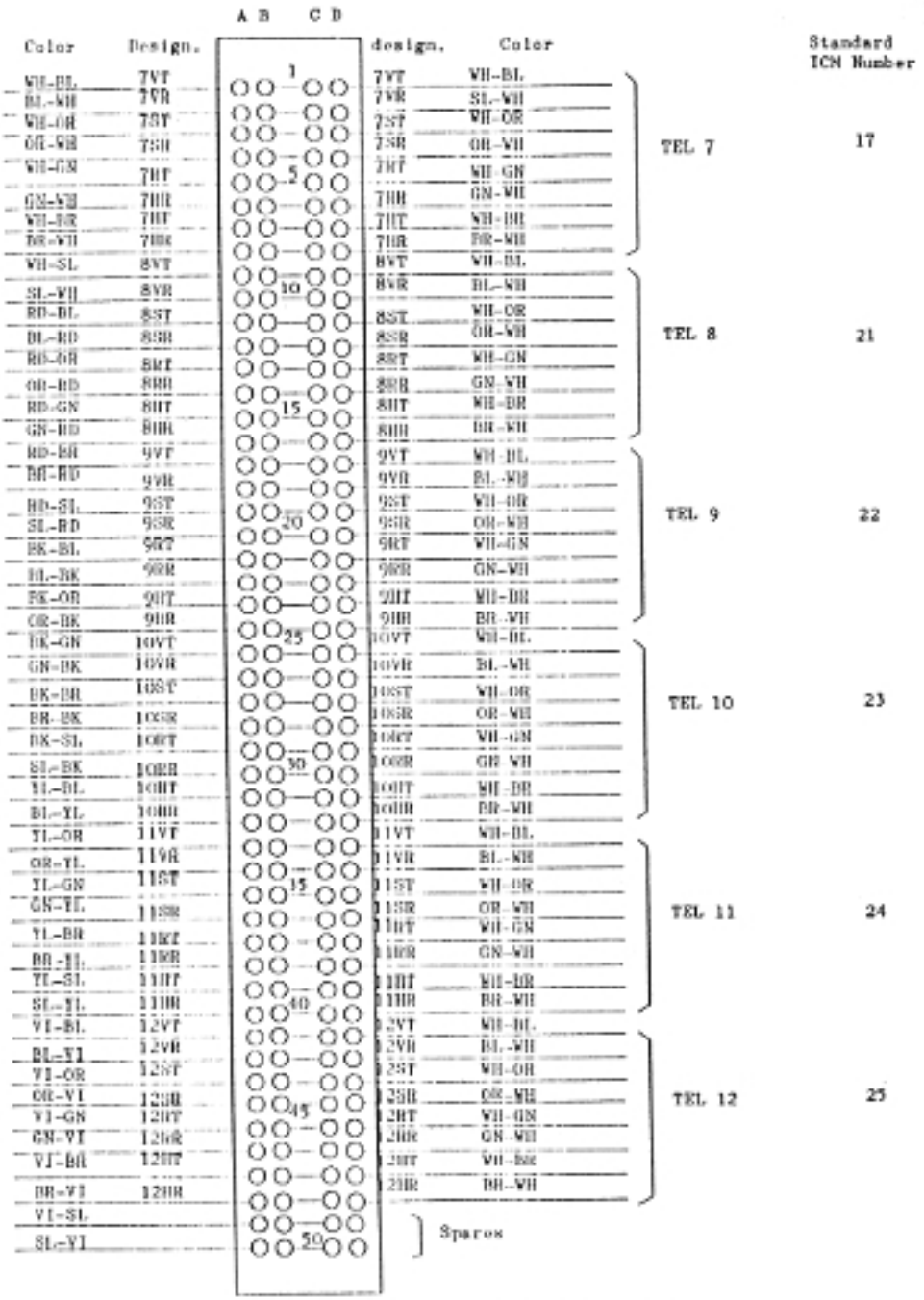


Fig.4-6 Connection of TELS #1 ~ #6



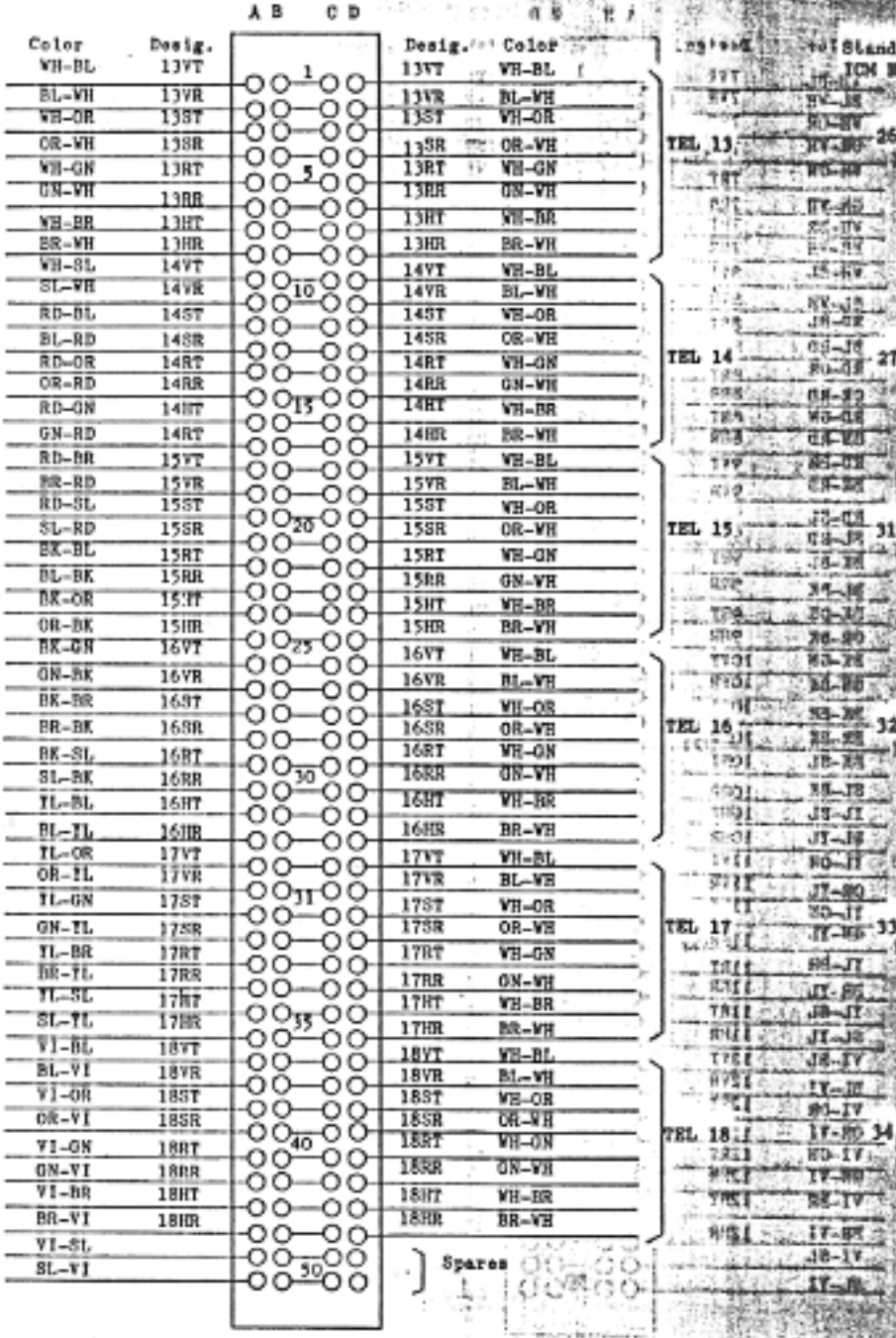
J2 BLOCK OF MDF (66 B4-50 OR 66 M1-50 TYPE)

ROW A FROM J_2 JACK IN KSU

ROW B AND ROW C BRIDGED

ROW D STATION CABLES

Fig.4-7 Connection of TELS #7 - #12



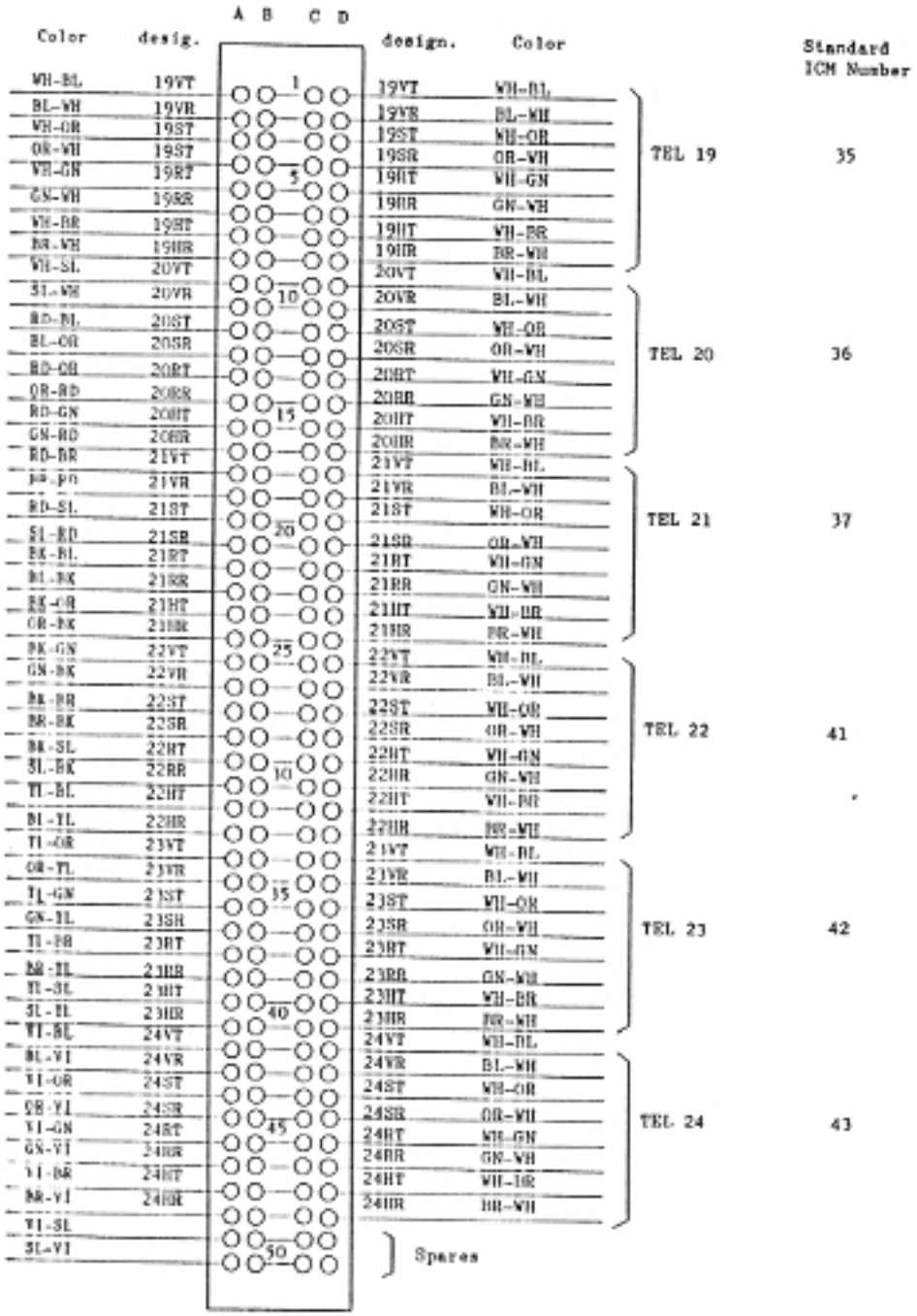
J3 BLOCK OF MDF (66 B4-50 OR 66 M1-50 TYPE)

ROW A FROM J3 JACK IN KSU

ROW B AND ROW C BRIDGED

ROW D STATION CABLES

Fig. 4-8 Connection of TELS #13 ~ #18



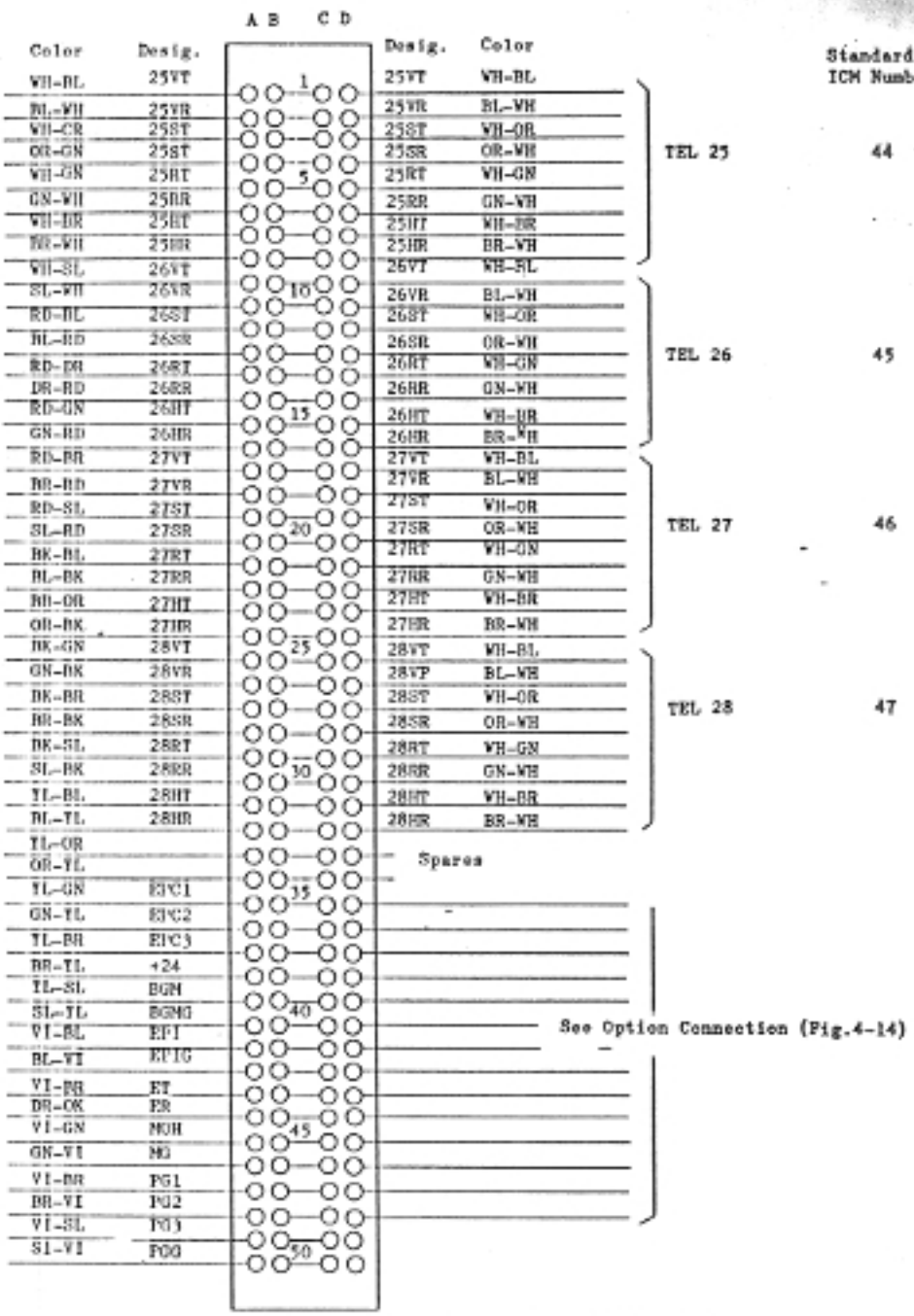
J4 BLOCK OF MDF (66 B4-50 OR 66 M1-50 TYPE)

ROW A FROM J4 JACK IN KSU

ROW B AND ROW C BRIDGED

ROW D STATION CABLES

Fig.4-9 Connection of TELS #19 ~ #24



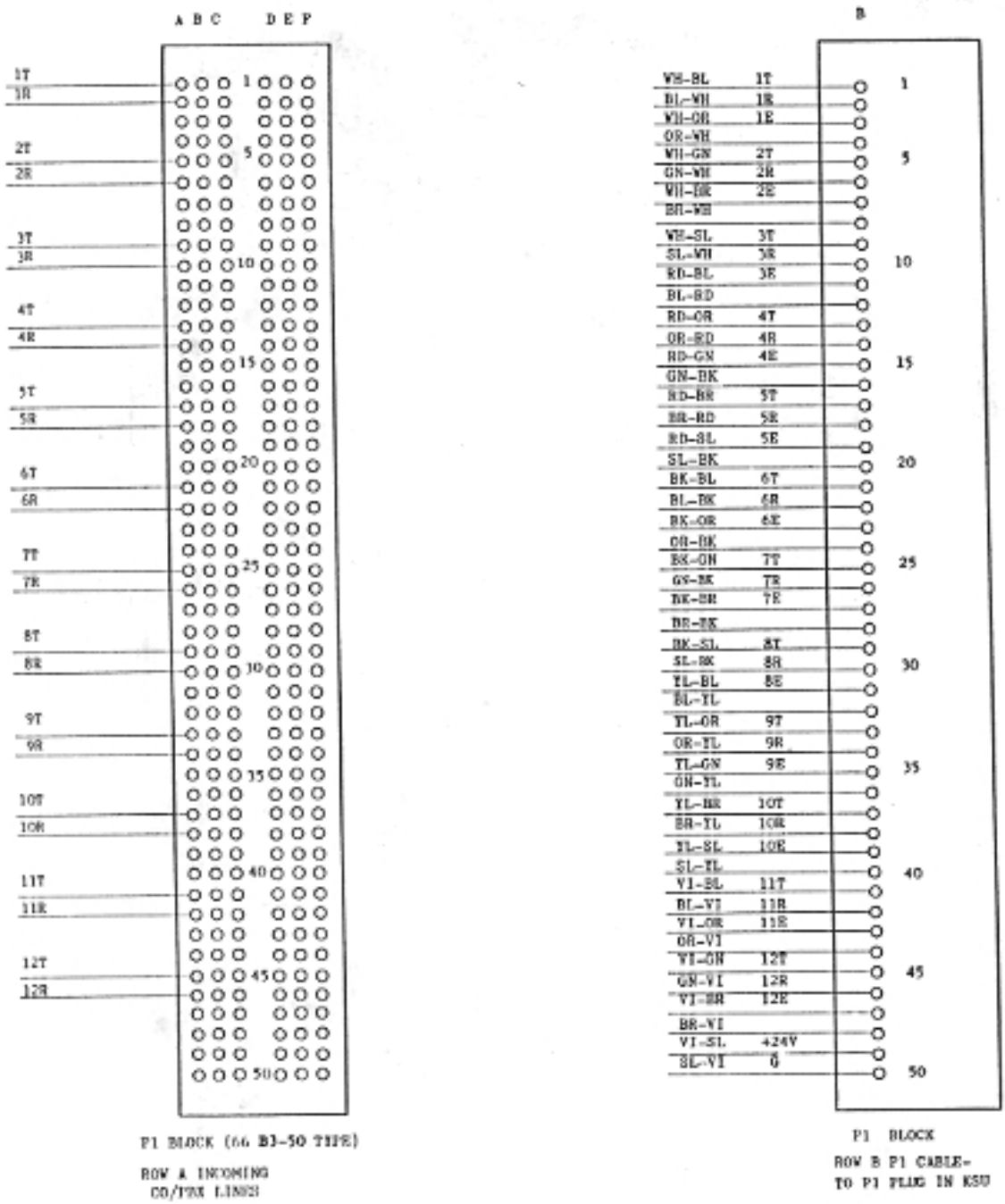
J5 BLOCK OF MDF (66.B4-50 OR 66 M1-50 TYPE)

ROW A FROM J4 JACK IN KSU

ROW B AND ROW C BRIDGED

ROW D STATION CABLES AND OPTION CONNECTIONS

Fig.4-10 Connection of TELS #25 - #28



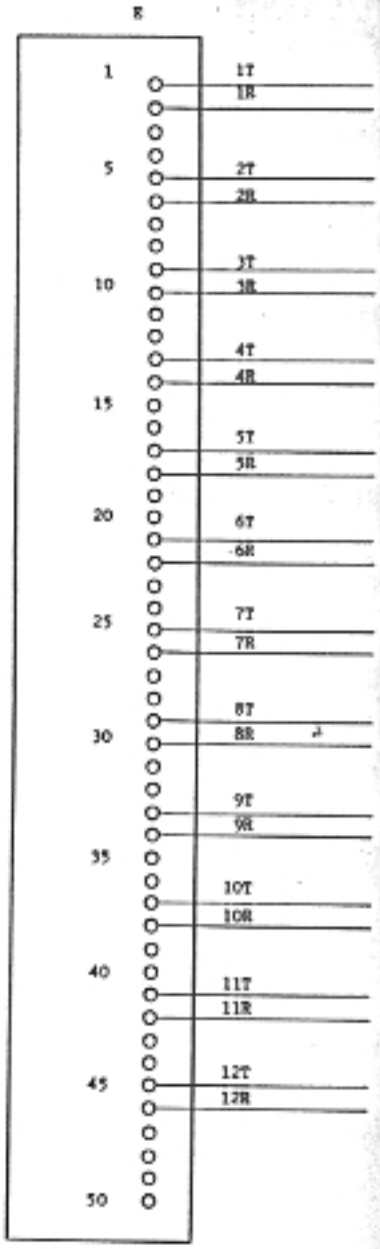
NOTE : IF POWER FAILURE UNIT IS NOT INSTALLED THIS TERMINAL BLOCK CAN BE 66 B4-50 OR 66 M1-50 TYPE (WITH BRIDGING CLIPS)

Fig. 4-12 Termination of Incoming CO/PBX Lines

P1 BLOCK (66 B3-50 TYPE)

ROW C INPUT TO POWER FAILURE UNIT

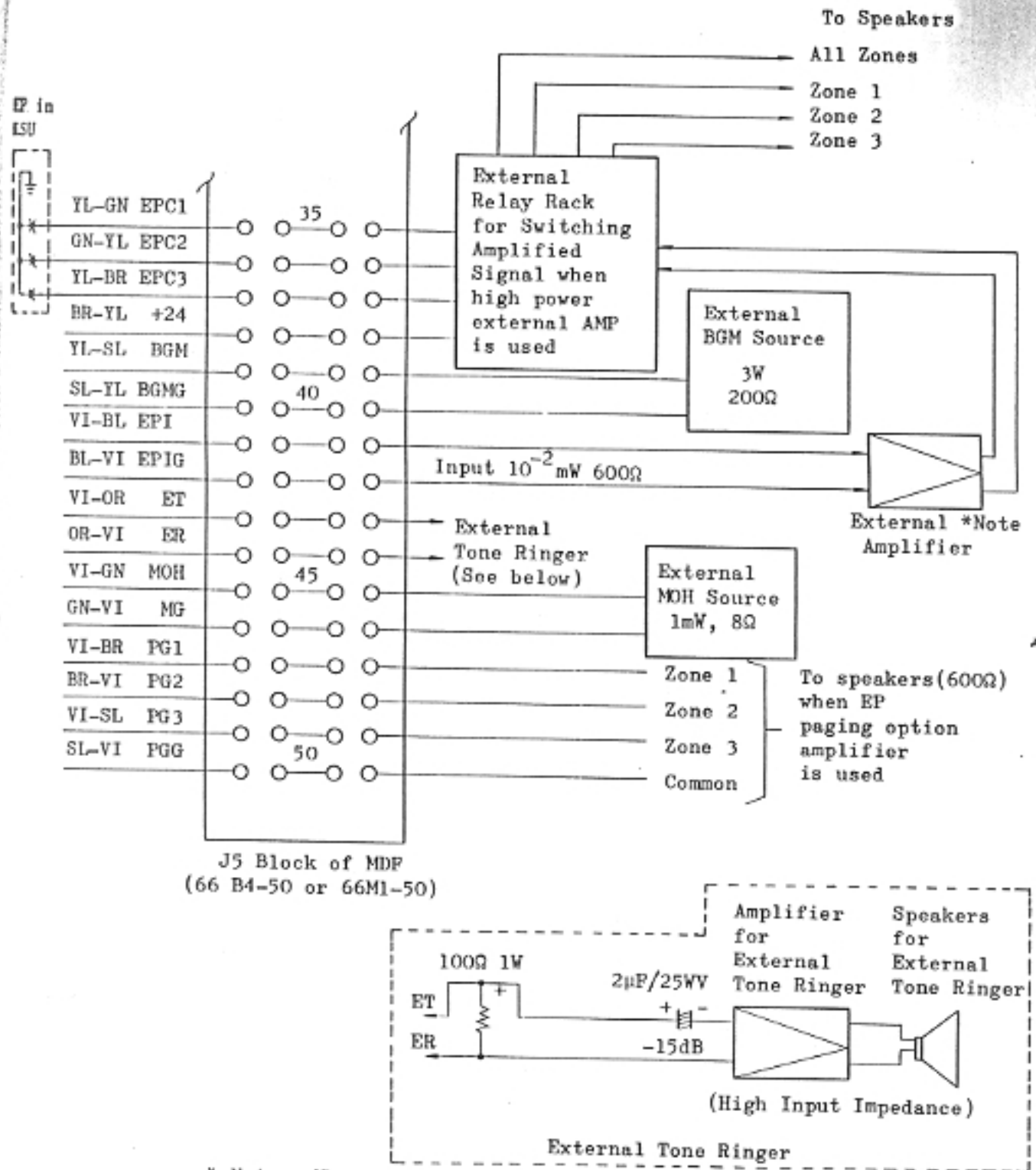
ROW D OUTPUT FROM POWER FAILURE UNIT



P1 BLOCK

ROW E TO SINGLE LINE TELEPHONES

Fig. 4-13 Installation of Power Failure Unit (Option)



* Note: When external high power amplifier is used, remove C1 & C2 on an EP card and insert the EP card.

Fig.4-14 Connection of Options at the MDF (Main Distribution Frame)

TRC	telephones	standard ICM numbers
1	# 1 - # 7	11 ~ 17
2	# 8 - #14	21 ~ 27
3	#15 - #21	31 ~ 37
4	#22 - #28	41 ~ 47

TRCs do not have to be sequentially installed (i.e. TRC2 may be installed without TRC1 being installed - since DSS/BLF stations are telephones #14 and #28 this allows installation of DSS/BLFs even in a small system). A maximum of 4 TRCs may be installed.

8.2 HSW KTU

The HSW KTU is Switch Matrix (Hands Free) Unit. Each HSW has the capacity to provide 2nd switching paths of hands free answer back for 7 stations. When the conntected stations are telephones with hands free answer back (HFAB), the HSW KTU is required.

HSW	Telephones with HFAB	Standard Intercom Numbers
1	# 1 - # 7	11 ~ 17
2	# 8 - #14	21 ~ 27
3	#15 - #21	31 ~ 37
4	#22 ~ #28	41 - 47

The HSW KTUs are not required when hands free answer back telephones are not connected. A maximum of 4 HSW KTUs can be installed.

8.3 LSW KTU

The LSW KTU is the Line Interface and Switch Matrix Unit. Each LSW has the capacity to provide switching paths for 7 stations, and 8 trunks which are CO/PBX lines, intercom or DSS intercom.

Install a matching LSW for every TRC (i.e. if TRC2 is installed, install LSW2 etc.). A maximum of 4 LSWs can be installed.

8.4 HTK KTU

The HTK KTU is the Trunk Unit. Each HTK KTU has the capacity to provide access to 4 lines and/or paths. There are switches on the HTK KTUs which must be positioned correctly for the types of trunks it will offer (CO/PBX, intercom, or DSS/BLF). Due to the configuration of KSU circuitry, however, certain trunks are not flexible, HTK2 trunk #3 and trunk #4 and HTK4 trunk #3 and trunk #4 must be either intercom or DSS/BLF paths. HTK3 trunk #1 and trunk #2 must be CO/PBX trunks.

HTK KTUs do not have to be installed sequentially, HTK3 may be installed without HTK2 installed, etc. but installation of HTK3 or HTK4 requires installation of SW KTUs. Provision has been made so that the first CO/PBX trunk installed in the trunking sequence will appear at all telephones at the first CO/PBX line button etc., the same applies to intercom paths and intercom path buttons. No gaps will exist within the CO/PBX appearances nor within the intercom appearances. The trunking sequence is from HTK1, trunk #1 to HTK4, trunk #4.

a) HTK KTUs come with all trunk assignment switches "OFF" and must be assigned. For switch assignment of HTK KTUs, see the following Fig. 4-17 and Fig. 4-18.

b) Install each assigned HTK KTU to right HTK position in the key service unit.

. A maximum 4 HTK KTUs can be installed in the system.

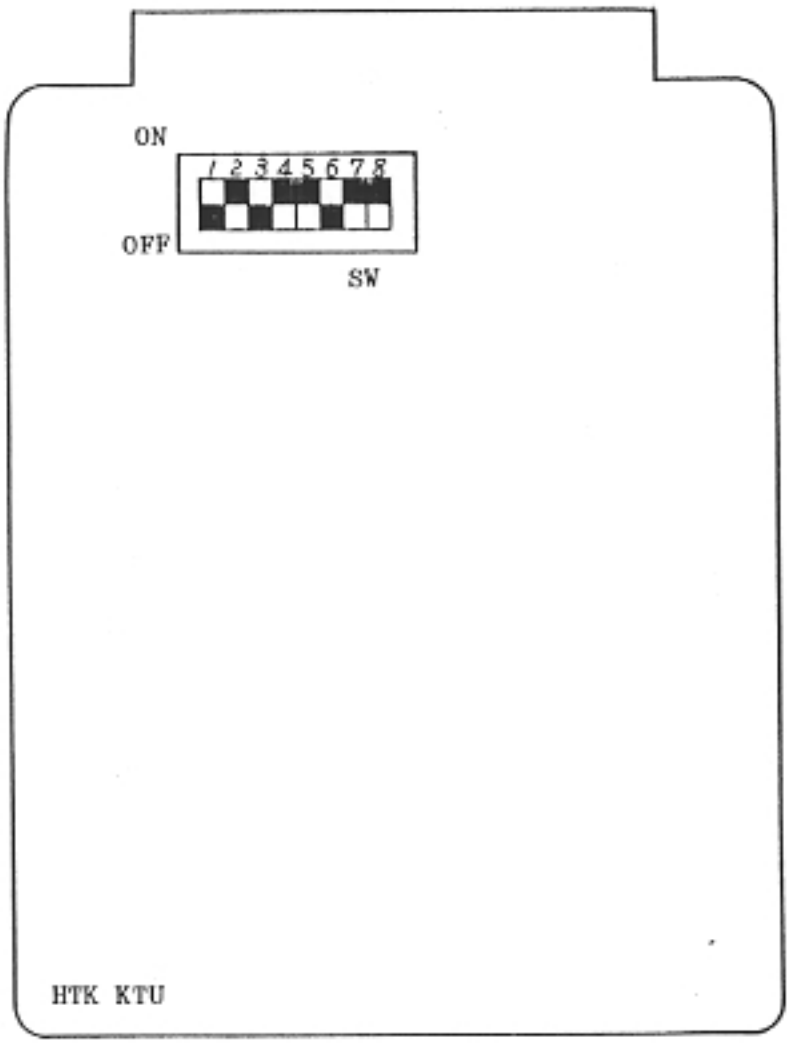
Table 4-3 HTK Configuration

HTK	Trunk	Assignment
1	1	CO/PBX 1
1	2	CO/PBX 2
1	3	CO/PBX 3
1	4	CO/PBX 4
2	1	CO/PBX 5
2	2	CO/PBX 6
2	3	ICM or DSS *
2	4	ICM or DSS *

HTK	Trunk	Assignment
3	1	CO/PBX 7 *
3	2	CO/PBX 8 *
3	3	CO/PBX 9
3	4	CO/PBX 10
4	1	CO/PBX 11
4	2	CO/PBX 12
4	3	ICM or DSS *
4	4	ICM or DSS *

* can not be reassigned.

NOTE: 1. If a HTK trunk has been assigned for intercom (ICM) or DSS/BLF use, do not terminate a CO/PBX line to the corresponding position in the P1 cable connection.
(e.g. If HTK1, trunk 1 has been assigned for ICM use, do not connect an incoming CO/PBX line to CO/PBX 1 position at the incoming CO/PBX line terminal block P1.)



SW	TRUNK NUMBER	
1 2	NO.1	A B
3 4	NO.2	A B
5 6	NO.3	A B
7 8	NO.4	A B

ASSIGN-MENT	A	B
CO/PBX	OFF	ON
ICM	ON	OFF
DSS	ON	ON
	OFF	OFF

Example: Trunk 1 and 2 : CO/PBX
Trunk 3 : ICM
Trunk 4 : DSS

Fig.4-17 Trunk Assignment on HTK KTU

11.3 CO/PBX and Intercom Service Tone

CO/PBX and intercom service tones are controlled by adjusting volume controls on the HTT KTU. Tone level becomes louder when turned counterclockwise. These volumes are adjusted at the manufacture.

CO/PBX Ring Tone:	VR5(CO)
Intercom Dial Tone:	VR1 (DT)
Warning Tone (Split tone):	VR1 (DT)
Intercom Tone Signal:	VR2 (ICM)
Intercom Ring Back Tone:	VR2 (ICM)
Intercom Call Waiting Tone:	VR4 (CWT)
Busy Tone:	VR3 (BT)

Note: 1) Intercom voice signal level is controlled only by the telephone volume.

2) Voice level on internal zone paging and all call is controlled only by the telephone volume.

11.4 Voice Level for External Paging

Voice level on external paging becomes louder by turning the volume VR1 on EP KTU counterclockwise.

11.5 Music On Hold Synthesizer

Music-on-Hold is adjusted as follows when MOH music synthesizer is used.

Note: All volumes on MOH KTU are adjusted at the manufacturer, volumes should not be adjusted except when changing music memory chips.

Tone level:	VR3 (VOL) Louder by turning clockwise
Rhythm tempo:	VR1 (TEMPO) Slower by turning clockwise
Tone pitch:	VR2 (PITCH) Lower by turning clockwise
Tone reverberations:	VR4 (SLOPE) More gradual by turning clockwise