REGISTER NO. 5222

JUL 78

OMEGA II

BT-1530/2250 KEY TELEPHONE SYSTEM

INTRODUCTION

Property of
Tel Plus Comm.
5030 N. First
Fresno, CA 93710
(209) 222-6662

This Technical Manual provides the Distributor/Installer with the procedures for Installing/Maintaining the BT1530/2250 Key Telephone Systems.

The Technical Manual is recommended reading prior to the installation of the first system to familiarize the Distributor/Installer with the basic operation of the BT1530/2250 Key Telephone System.

The T.M. is divided into four (4) Categories:

I GENERAL INFORMATION
II INSTALLATION
III MAINTENANCE
IV ILLUSTRATIONS/SCHEMATIC DIAGRAMS

The first Category provides an Equipment Listing, feature highlights, and operational guide. The second Category consists of installation instructions for both Standard and Optional Equipment. The fourth Category provides illustrations, schematics, and parts lists of the various assemblies that make up the OMEGA II BT1530/2250 Key Telephone Systems.

Each Category includes its own Table of Contents. The APPENDIX includes electronic component description and specifications. Provided also is a familiarization with the Circuit Description symbols and wire wrap techniques.

Each T.M. is registered. The Register No. appears at the top right hand corner of this page. A record is maintained by SHIMCOM of each T.M. holder so that a suitable number of revisions/ supplements are issued to each T.M. holder.

The original REGISTRATION blank on the following page must be filled out and returned to IWATSU Customer Service in order to receive any revisions/supplements. Copies of the Registration will not be accepted. Only <u>one</u> of each revisions/supplements will be issued for each T.M. on hand.

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OMEGA PHONE II

BT-1530/2250 KEY TELEPHONE SYSTEM

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OMEGAPHONE II

BT-1530/2250 KEY TELEPHONE SYSTEM

I. GENERAL

OMEGA PHONE II

BT-1530/2250 KEY TELEPHONE SYSTEM

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1.02 This Section will be revised on issuance of a new or revised Section for the Category as described in the Table of Contents.

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OMEGA PHONE II

BT-1530/2250 KEY TELEPHONE SYSTEM

GENERAL DESCRIPTION

1.00 INTRODUCTION

1.01 The Omega-Phone II Key Telephone System is a new multiple line key telephone system featuring from thirteen (13) up to twenty (20) CO line capacity and thirty-two to fifty-eight extensions. The Omega-Phone II Key Telephone instrument is a compact, low profile, modern styled telephone. Made from white re-inforced ABS plastic, the instrument features a rugged housing and hook switch assembly to thwart breakage. Two models are offered: a BT1530-sixteen (16) button telephone set, and a BT2250 twenty-four (24) button telephone set. Both instruments can utilize fifty (50) pair telephone cable and can be interconnected.

1.02 Each instrument features Light Emitting Diode (LED) line lamp indicators, large rectangular line keys with integral dust cap and label, multiple function buttons, and a built-in station directory tray. Standard W.E. 500 type components are utilized for handset components allowing for easy replacement. Provision is made in the telephone for addition of any accessory equipment such as an operator's headset, hands-free telephone, memory dialer, etc. Optional color faceplates are available for color co-ordination with any interior decor. The telephone is adaptable for wall mounting by the addition of an optional wall mount adapter.

1.03 The Omega-Phone II Key Service Unit (KSU) is a one piece wall or floor mounted cabinet featuring a removable power supply and individual circuit card mounting for circuit functions. The KSU also features an inner door assembly for ease of servicing and installation of optional assemblies.

1.04 The basic KSU unit is prewired for the model BT1530 telephone capacity. Expansion of both CO Lines and Intercom extensions are easily accomplished in the same cabinet. All CO and Intercom line cards feature LED line status indicators showing the operational status of the individual line circuits. All circuit cards are keyed to prevent improper insertion of the individual circuit card. All volume controls are plainly marked and are adjustable from the front panel. The common circuit cards provide all necessary circuit for visual and audible control signals as well as dial intercom. The system is modified for pushbutton dialing by adding two (2) circuit cards into prewired card files.

1.05 Amphenol connectors are provided for connection to the house cables while a FCC standard connector is utilized for connection to the CO Lines or Interface devices. Audio connectors are utilized for connection to a Background Music (BGM) source and Public Address (PA) Amplifier input. Provision is made for hookup of external mechanical ringers to operate during a local power failure. Wire wrap terminals are used throughout the KSU.

1.06 The basic BT1530 power supply is incorporated into the KSU cabinet with external viewing of the indicator lamp and fuse holders. An auxilary lamp power supply is available for full system capacity operation.

2.00 EQUIPMENT LISTING

2.01 BT1530/2250 Station Equipment is listed in Table A.

2.02 Optional Station associated equipment is listed in Table B.

2.03 BT1530/2250 Switching Equipment is listed in Table C.

2.04 Optional KSU associated equipment is listed in Table D.

2.05 Optional System Components are listed in Table E.

3.00 FEATURES

3.01 In addition to the standard Key Telephone features, the Omega Phone II provides the following features as standard:

a. Rotary or Omega-Tone Dial
b. Individual Line button designation
c. Light Emitting Diode (LED) Line Illumination
d. Automatic Line Key Restoration
e. Tone Ring or Voice Calling Intercom signalling w/individual volume control
f. Secretary Transfer/Don't Disturb Function Key
g. Alternate Point Answering Intercom
h. "Hot Line" Extension All Call channel with PA connection
i. Standard W.E. 500 type Components
j. Capacity for thirteen (13) or twenty (20) CO Lines
k. Prewired instruments for two (2) Intercom Lines, expandable up to four (4) Intercom Lines
l. Prewired for connection to a Busy Lamp Field (BLF) or Direct Station Selection (DSS) Unit
m. Provision for Headset Jack
n. PA connection with individual Volume Control for paging/BGM
o. Thirty-two (32) Extension capacity provided as standard, expandable up to fifty-eight (58) Extensions
p. Dial Access to Special Features
q. Built-in slide Extension Directory Tray
r. Dial Restriction on CO Lines
s. Group Calling on Intercom Lines
t. Night Service-CO Audible ringing transfer
u. Private conversation on CO lines
v. BGM through station speaker with Off-Hook Cutoff.
w. "Meet Me" conference circuit

TABLE A

BT1530/2250 STATION EQUIPMENT

MODEL NO.	ORDER NUMBER	DESCRIPTION
BT1530(P) BT1530(P)C	013 Note 1 023	Rotary Dial 16 Button Desk Key Telephone equipped with Station Priv. Unit
BT1530T(P) BT1530T(P)C	014 Note 1 024	Omega-Tone Dial 16 Button Desk Key Telephone equipped with Station Priv. Unit
BT2250(P) BT2250(P)C	015 Note 1 025	Rotary Dial 24 Button Desk Key Telephone equipped with Station Priv. Unit
BT2250T(P) BT2250T(P)C	016 Note 1 026	Omega-Tone Dial 24 Button Desk Key Telephone equipped with Station Priv. Unit

TABLE B

OPTIONAL STATION ASSOCIATED EQUIPMENT

MODEL NO.	ORDER NUMBER	DESCRIPTION
OTD-1	125	OMEGA-TONE DIAL (ROTARY CONVERSION)
PRV	131	CO LINE PRIVACY UNIT (REPLACEMENT)
WOM-1	143	WALL MOUNT ADAPTER (CONVERSION)
HFS-1	113	EXTENSION HANDSFREE TALKBACK ADAPTER
TRR	139	EXTENSION TOLL RESTRICTOR-ROTARY DIAL
ORD	124	ROTARY DIAL (REPLACEMENT)
TRT	140	EXTENSION TOLL RESTRICTOR-DTMF
LST	136	LOUD SPEAKER TELEPHONE UNIT
HJB	116	HEADSET JACK ASSEMBLY
AHC	100	AUXILARY HOOKSWITCH CONTACT
CPR1530	150	BT1530 COLOR PANEL-ROTARY DIAL
CPT1530	150 Note 2	BT1530T COLOR PANEL-OMEGA-TONE DIAL
CPR2250	150	BT2250 COLOR PANEL-ROTARY DIAL
CPT2250	150	BT2250T COLOR PANEL-OMEGA-TONE DIAL
NPC	423	NON-PRIVACY CONNECTOR
SPA-S	135	LOUD SPEAKER TELEPHONE ADAPTER
OTD-S	128	LOUD SPEAKER TELEPHONE TONE DIAL
OTD-OP	127	OUTPULSE DIAL
OTD-OM	126	OUTPULSE DIAL W/MEMORY

Note 1. SUFFIX C INDICATES COCOA BROWN COLOR HOUSING
2. WOODGRAIN FACEPLATES - ORDER NUMBER 155

TABLE C

BT1530/2250 SWITCHING EQUIPMENT (KSU)

MODEL NO.	ORDER NUMBER	DESCRIPTION
BT1530 KSU	002	Rotary Dial Key Service Unit, equipped with 32 Extension Dial Intercom, Common Control circuits, PA Connection, and PSA-1530 Power Supply; prewired for up to Thirteen (13) CO Lines and Four (4) Intercom Lines, Omega-Tone Receiver and Music-on-Hold.
BT2250 KSU (DISCONTINUED)		Rotary Dial Key Service Unit, equipped with 32 Extension Dial Intercom, Common Control circuits, PA Connection, and PSA-1530 Power Supply; prewired for up to Twenty (20) CO LInes, Four Intercom Lines, 58 Extensions, Omega-Tone Receiver, and Music-on-Hold.

TABLE D

OPTIONAL KSU ASSOCIATED EQUIPMENT

MODEL NO.	ORDER NUMBER	DESCRIPTION
UCOL	141	UNIVERSAL CO LINE CARD
COL-1	106	STANDARD CO LINE CARD
ICL-1	119	INTERCOM LINE CARD
MOH	121	MUSIC-ON-HOLD CARD
RCD-1	132	OMEGA-TONE DECODER CARD
RCV-1	133	OMEGA-TONE RECEIVER CARD
HFK-1	112	HANDSFREE TALKBACK AMPLIFIER CARD
EEX-1	111	EXTENSION EXPANSION CARD AND
STL	137	AUTO RINGDOWN CIRCUIT CARD
PCC-1	130	INDIV. CO LINE EXP. CONN.
KTB	120	CO LINE EXPANSION TERMINAL
MTL	123	OFF-PREMISE EXTENSION CARD
PSA-1530-1	007	SYSTEM POWER SUPPLY (REPLACEMENT)
PSB-1530-1	008	AUXILARY LAMP POWER SUPPLY
CCE-L	102	CIRCUIT CARD EXTENDER - LARGE
CCE-S	103	CIRCUIT CARD EXTENDER - SMALL
IAP	118	KSU COMMON CIRCUIT CARD
DCR	107	KSU COMMON CIRCUIT CARD
SEC	134	KSU COMMON CIRCUIT CARD
TNS	138	KSU COMMON CIRCUIT CARD

TABLE E

OPTIONAL SYSTEM COMPONENTS

MODEL NO.	ORDER NUMBER	DESCRIPTION
DSS-1	108	DIRECT STATION SELECTION CONTROL
DSS-K1	109	KSU CIRCUIT CARD
BLF-B	101	FORTY-EIGHT (48) STATION LAMP FIELD
UEX-B	142	UNIVERSAL EXTENSION ADAPTER
ZPA-B-1	145	THREE ZONE PAGE ADAPTER

NOTES

1. A letter suffix on the BT1530/2250 Color Panel indicates color of panel.

*WG	WOODGRAIN
*BE	BEIGE
GR	GREEN
*BR	BROWN
*GL	GOLD
BL	BLUE
RD	RED

2. IAI reserves the right to make changes without notice.

3. Asterisk (*) indicates only faceplates available on DSS-1.

3.02 The following features are offered as optional:

a. Direct Station Selection (DSS) Call Announcing
b. Dedicated Attendant Intercom Line
c. Busy Lamp Field
d. Universal CO Line card
e. Individual Station Toll Restriction-Rotary or Omega-Tone Dial
f. Handsfree Talkback on Intercom/DSS calls.
g. Music-on-Hold
h. Station Outpulse Dial Unit
i. Expansion up to twenty (20) CO Lines
j. Expansion up to fifty-eight (58) Extensions
k. Full Feature Intercom Extension Adapter
l. Zone Paging Adapter (PA)
m. Multi-Trunk Conferencing
n. Off-Premise Capability
o. Night Transfer-CO Line signalling
p. Interchangeable Color Face Plates
q. Auxilary Lamp Power Supply
r. Loudspeaker Telephone Adapter

4.00 DESCRIPTION OF FEATURES

4.01 Station Operation

a. CO Line calls-Any station can originate and receive calls on the CO Line Key functions. Incoming calls are indicated by a 15 IPM (3 sec off, 1 sec on) audible signal and a corresponding line lamp flashing at 60 IPM (50% on-50% off). Each CO Line can be placed on "HOLD", the corresponding line lamp then flashes at 120 IPM (50% on-50% off). Any other station can release the "Holding" condition by pressing the corresponding line key. A steady line lamp indicates that the line is busy.

b. Intercom Line calls-Each station can originate and receive Intercom Line calls. Two (2) Intercom Lines are standard and can be expanded up to four (4). Each Intercom Line requires an individual line key. Line lamps indicate the status of the Intercom Lines, a flashing line lamp indicates that another extension is dialing an Intercom call while a steady lamp indicates that the Intercom Line is busy. Ringback and busy condition tones indicating the status of the called extension are provided for the calling extension. The incoming extension calling audible tone signal is discernable from the incoming CO audible tone to avoid confusion. Individual Station Paging is available by dialing a third digit after the extension number.

4.02 Explanation of Features-Standard

a. Private Conversation on CO Lines-A CO Line privacy unit (PRV) is provided standard in each BT1530/2250 Key Telephone. This allows the first extension that enters a CO Line to exclude all other extensions from that line. An extension CONF (Exclusion Release) Key is provided to allow additional extensions into the conversation. If required, any extension can be arranged for automatic entry into a busy CO Line (Executive Priority).

b. Rotary or OMEGA Tone Dial-Each telephone can be equipped for rotary or push-button dialing. Each dial can be substituted at any time. The OMEGA Tone Dial features a 12 button pad assembly, meeting all MF tone signalling criteria required.

c. The BT1530 telephone is wired for thirteen (13) CO and two (2) Intercom lines. The BT2250 is wired for twenty (20) CO and two (2) Intercom lines. Both telephones can be expanded to utilize up to four (4) Intercom Lines and are wired with 50 pair telephone cable.

d. Light Emitting Diodes (LED) are utilized for line lamp indicators. The LED provides low current requirements and long life, eliminating lamp burnout problems and resulting service calls.

e. Individual Line Button Designation-Each CO/Intercom Line Key is provided with its own designation label. All pressure sensitive labels are provided on a single sheet for ease in typing the individual line key designations.

f. Automatic Line Key Restoration-Each line key restores to its rest position upon placing the handset on hook. This eliminates inadvertantly taking a CO Line call off of "Hold" and interference with exixting calls.

g. Wall or Desk Capability-Each telephone can be wall or desk mounted. No modification of any internal mechanisms is required for wall mounting. An optional wall mounting kit is offered, consisting of a wall mounting plate and hanger cup assembly.

h. When dialing another extension on the Intercom, either Voice Paging (individual station) or Tone Ringing can be used to signal the called extension. By arranging straps in the KSU, either Individual Station Paging or Tone Ringing can be operated by dialing two digits, with the remaining function operated by dialing the third digit.

This allows for end-user preference of which method should operate first. A volume control is provided on each telephone to control the voice/tone level of the station speaker. Each telephone comes equipped with switch-hook cutoff of the station speaker on internal calls. A strapping option is included to allow for Intercom signalling when the extension is off-hook and busy on a CO Line call.

i. Secretary Transfer/Don't Disturb-Each station is equipped with a "Transfer" switch which allows the incoming Intercom extension signal to be switched to a pre-determined extension. This feature can also be used as a "blocking" switch preventing any other extension from signalling (Voice or Tone Calling).

j. Alternate Point Answering (APA)-Each station is equipped with an APA feature whereby the extension can answer an Intercom call of another station. The CONF Key is pressed to silence the station ringing (or Voice calling) and free the Intercom Line for voice conversation.

k. "Hot Line" All Call with PA Connection-An "All Call" function key is provided standard. To make an "All Call" to all extensions in the system, the PAGE Key is pressed and the voice message is recited into the handset. Simultaneously, the "page message" will be heard at all extensions in the system as well as through a PA system (if the system is so equipped). It is not necessary to be on a CO or Intercom Line to utilize the "All Call", as a separate channel is provided for this feature. When engaged on a conversation on a CO or Intercom Line, the PAGE Key can be used for conference initiation or call transfer. All other parties on the CO or Intercom Line do not hear the "page message". The CO or Intercom Line is automatically "held" while the Page Key is pressed

l. Standard W.E. 500 type components-Each telephone instrument uses standard 500 type voice components. This allows for easy replacement of handset, coil cord, etc., as well as addition of options such as hard of hearing handset, long coil cords, etc.

m. Prewired for BLF and DSS-Each extension is prewired for hookup to a Busy Lamp Field (BLF) or Direct Station Selection (DSS) with its integral Busy Lamp Field.

n. Provision for Headset Jack-Each extension is equipped for mounting an optional Headset Jack assembly. Cutout indications are provided on the telephone housing for jack installation. Terminals are provided for headset jack wiring.

o. PA Connection provision is made for system connection to a Public Address system. A separate input with an individual volume control is provided for a music source (BGM). A separate volume control is provided for controlling the PA voice input. The PA connection is operated when the PAGE Key is pressed. Spare relay contacts are provided for controlling special functions during the "page" interval. No amplification is provided for external PA/BGM speakers, a separate PA amplifier must be used.

p. Thirty-two (32) Extension Capacity - The basic system control unit provides capacity for 32 dial intercom extensions.

q. Dial Access to Special Features - Special Features such as group calling (Pre-Set Conferencing) or Zone Paging can be accessed through the dial intercom circuit.

r. Built in slide Directory Tray - Each station contains a built in slide Directory Tray where extension numbers are listed. The Directory labels are pressure sensitive and are supplied on a backing suitable for Typewriter operation.

s. Group Calling (Pre-Set Conference) - Any extension number can be arranged to simultaneously ring a pre-determined group of extensions.

t. Dial Restriction on CO Lines-Any extension can be arranged to prevent dialing of calls on CO Lines on an individual CO Line basis.

u. Night Service - CO audible ring transfer - Provision is made for transfer of the CO Line audible ringing signal to pre-determined extension(s) or all extensions in the system for Night Service, peak periods, breaks or alternate answering points.

v. "Meet Me" Conference - When the PAGE Key is pressed while on an ICM Line, the ICM dial register is automatically released allowing the calling extension immediate access to the PA/All Call system. The calling extension can then call the desired party to the ICM Line.

w. Station BGM - Backgroung music can be played through individual or all stations in the system. When the station handset is taken off-hook, the BGM is automatically cut-off.

4.03 Explanation of Features-Optional.... It is recommended that each feature be thoroughly reviewed for correct system operation. Some optional features cannot be supplied simultaneously with other optional features. The feature installation section should be consulted for any particular problem that will be encountered with the addition of a specific optional feature in the system.

a. Direct Station Selection - An optional Direct Station Selection (DSS) unit is available for the Attendant (Line Answering) position. Momentary push-button keys are provided to direct signal (by tone or voice) individual or groups of extensions in the system. "Automatic Hold Release" of the associate telephone extension CO Line Key is provided allowing one step operation of the DSS function. A busy Lamp Field (BLF) is provided on the DSS unit to show switch-hook status of the extension in the system. LED indicators are utilized for the BLF functions. The DSS call has call priority if both an ICM call and a DSS call occur simultaneously at an extension.

b. Dedicated Attendant Line - A dedicated line can be provided for the Attendant for two way handset communication with the called extension(s). This allows the Attendant to talk with any extension without using the Dial Intercom Lines. This frees the dial ICM Lines for internal traffic and permits the Attendant to transfer calls without being delayed by busy ICM Lines. The Attendant (ATTD) Line uses a spare CO Line pick-up key at each extension. This still allows expansion of the Dial ICM Lines to four (4). When the Attendant utilizes the ATTD Line, the ATTD Line lamp flashes at the extensions indicating a call. When the answering extension presses the ATTD Line Key, the line lamp goes steady. The conversation between the Attendant and the called extension is private, additional extensions being added by pressing the extension CONF Key. The ATTD Line can be used with the PAGE Key on the associated Attendant station as a "Meet Me" Line.

c. Universal CO Line Card-A Universal CO Line Card (UCOL) is available, whereby the line card can be used for any type of VCA or direct wire hookup. The UCOL line card interfaces directly with BELL STC. STP, CD9, or C2A Voice Connection Arrangements. No additonal equipment is required.

d. Busy Lamp Field-A busy Lamp Field (BLF) is available, similar in style to the standard station. Long life LED lamps are utilized for extension indicators. Thirty-two (32) and forty-eight (48) line units are available. No additional power supply or auxilary equipment is required.

e. Individual Station Toll Restriction- An extension toll restrictor for rotary or tone (separate models) are offered.

f. Handsfree Talkback on Intercom- Individual or call extensions can be modified to operate with "Handsfree" (HF) reply on either ICM Line or DSS calls. A HF Microphone Unit is installed in each station that will operate Handsfree and one common circuit card is added to the KSU. When one extension calls another equipped with HF, a warning tone is heard both at the called and calling extension indicating a HF call. The called party can now talk to the calling extension without using the station handset. A "time out" circuit is provided limiting the conversation to approximately forty (40) seconds. After the "time out", the ICM Dial Register releases and the HF circuit disconnects. The called party must use the handset and press the ICM Line Key to talk to the calling extension.

g. Handsfree Talkback on DSS - When the extensions are equipped for HF Talkback, the Attendant can call a HF extension with the extension answering HF. No "time out" circuit is provided on DSS-HF calls. If the HF circuit is busy on an Extension to Extension ICM call, the Extension to Extension call, after a warning tone reverts to one way voice calling during the DSS call duration. If the DSS calls a non-HF extension, any HF circuit call in progress on the ICM Register is undisturbed. When the DSS calls a HF extension, both the Attendant and the called extension receive a tone burst indicating a HF call in progress.

h. Station Outpulse Dial Unit-The Station Outpulse Dial Unit provides push-button dialing in rotary dial Central Offices.

i. Extension Expansion - The basic 1530 KSU cabinet can be expanded to fifty-eight (58) extensions by addition of the EEX expansion circuit card and harness assembly. Wire wrap terminals are used exclusively for installion of all KSU wiring options. An auxilary Power Supply Model PSB-1530 must be added to meet the additional lamp battery requirements.

j. CO Line Expansion - The basic 1530 KSU cabinet is expandable up to twenty (20) CO Lines individually or up to a maximum of seven (7). A wiring harness is provided for wire wrap connection of the printed circuit board connectors.

k. Full Feature Intercom Extension Adapter - The Extension Adapter provides full Intercom features inculding two (2) dial Intercom Lines, Paging, Alternate Point Answering, and Buzzer when used in conjunction with a standard wall or desk 500 type telephone.

l. Zone Page Adapter - The Zone Page Adapter provides for up to three (3) zones of paging in a PA system. The unit is accessed through the dial intercom circuit and features "Time-Out" to prevent register tie up. The DSS unit also has access to Zone Paging through individual DSS Keys.

m. Multi-Trunk Conferencing - This feature allows for talking to more than one CO Line at the same time. The CO Line Key switches in the individual extension can be strapped so that more than one CO Line can be connected simultaneously to the station voice circuit. No amplification is provided and the conversation voice level is limited by local telephone line conditions as well as distance of the outside CO line parties.

n. Off-Premise Circuits - Two (2) Tie Line circuits are offered. The model STL can be used as an Automatic (or Manual) Ringdown circuit between the system and a single line station or KTS off premise.

The Model MTL provides full ICM features to a Dial Intercom OPX. The OPX can access any of two ICM Lines and dial local extensions. DSS signalling and Call Splitting, OPX BLF indication, DSS CO Line Add-on, Night Service , and OPX Dial Access to CO Line (2) are all provided as standard.

o. Night Transfer - The Attendant station can be modified such that the "Transfer" switch is used to switch the incoming CO ringing signal to a designated group of stations or all stations in the system for "Night Operation."

p. Auxilary Lamp Power Supply - An auxilary lamp power supply (PSB-1530) is available to supply power for the additional line lamps when the system extension capacity exceeds thirty-two (32).

q. Interchangable Color Face Plate - A variety of different color face plate is available for end-user color preference.

r. Loudspeaker Adapter - An adapter is offered to convert the telephone station for "handsfree" calls both on CO and ICM Lines. A "handsfree" unit such as the Northern Telecom "Companion II" or the Precision Components PC-4A can be used.

s. Additional Hookswitch Assembly - An additional hookswitch assembly can be added to the telephone station for controlling special features.

OMEGAPHONE II

BT-1530/2250 KEY TELEPHONE SYSTEM

SYSTEM OPERATION

1.00 RECEIVING AN OUTSIDE CO LINE CALL

1.01 When an outside CO Line call is received at the telephone it

3.03 If the Attendant desires direct communication with the local party, the Attendant can select an available Intercom Line, dial the extension number of the local party, and use either individual voice station paging or tone ringing to signal the extension. When the extension answers, the message can be relayed.

3.04 As an optional alternative, the Attendant may be equipped with a Direct Station Selection (DSS) Unit. With the DSS Unit, the Attendant can direct signal any extension in the system without utilizing the Intercom Lines. The DSS Unit is equipped with a Busy Lamp Field (BLF) which shows the switch-hook status of the extension. Along with the DSS, the Attendant can use a dedicated voice line for voice communication with the particular extension.

4.00 MAKING AN OUTSIDE CO LINE CALL

4.01 The extension that wishes to make an outside CO Line call first selects an available CO Line. The line lamp indicates the status of the line. When the lamp is steady or flashing, that particular line is busy.

4.02 The handset is lifted off-hook and the line key of the available outside line is pressed. The line lamp now glows steady, and dial tone is heard in the handset. The telephone number of the distant party can now be dialed in its entirety.

4.03 When the dialing is completed, the standard telephone signals for distant station ringing or busy will be heard in the handset. When the conversation is concluded, the line lamp will estinguish when the handset is placed on-hook and the line key will restore to its rest (up) position.

5.00 DIALING ANOTHER EXTENSION ON THE INTERCOM

5.01 When an extension wishes to make an Intercom call, an Intercom line that is not busy is selected. Upon taking the handset off-hook and pressing the Intercom Line Key, the line lamp will flash at a slow rate (30 IPM). Dial tone (450hz) is then heard in the handset. Any other extension can now be dialed and voice/tone calling used to signal the individual extension.

5.02 Upon completion of dialing the extension number, the calling party will hear ringback tone (15 IPM) if the called extension is not busy or busy tone (450hz at 120 IPM) if the called extension is busy.

5.03 Tone signalling is standard for two digit dialing with individual voice paging accessed by dialing the third digit "1". Strapping options are available in the KSU to reverse the order if individual station paging is desired first and tone ringing controlled by dialing any digit after the extension number.

5.04 At the called extension, the Intercom signalling tone (450hz at 60 IPM) is heard through the station speaker. The called party then checks which Intercom Line the call is on by noting the flashing line lamp, and presses the particular line key. Upon lifting the handset off-hook at the called extension, the tone ringing stops, the ringback tone is disconnected, the line lamp glows steady and conversation can take place.

5.05 The calling party, if he chooses, can initially voice page the called extension by dialing "1" after the extension number. If the called extension was busy, however, the voice page would not operate and busy tone would be heard in the calling party handset.

5.06 If the called extension was initially busy (off-hook) when the extension was first dialed, busy tone will be heard by the calling party. However, the calling party can wait a maximum of 20-40 seconds for the called party to go on-hook and then automatically start to receive tone ringing, with busy tone changing to ringback tone at the calling party.

5.07 If the called party does not answer or the calling party waiting exceeds the 20-40 seconds the Dial Intercom register disconnected and becomes available for use by another extension. The calling party must then hang-up and re-dial the extension number. The "time-out" feature is provided so that no extension can tie up the Intercom dial register for an extended period of time, preventing other extensions from dialing a call.

5.08 If the called party was not at the telephone, the call could be answered at another extension in the system by depressing the Intercom Key Line, taking the handset off-hook, and then pressing the CONF Key. Upon pressing the CONF Key, the tone ringing (or voice calling) is disconnected, the ringback tones become disconnected, and conversation can take place between the calling party and the answering party. This feature is commonly referred to as Alternate Point Answering (APA).

6.00 UTILIZING THE PAGE KEY

6.01 The PAGE Key provides an All Call to each extension in the system as well as a voice connection to a PA system if the telephone system is so equipped. The PAGE Key can be used for one way message between the calling party and any extension in the system as well as used for trying to locate a particular party in the system. Because the page message is heard at all extensions and through the PA system, the desired party can be called to a particular CO or Intercom line.

6.02 The caller takes the handset off-hook, presses an available Intercom Line, then press the PAGE Key, recites the message in the handset, and releases the PAGE Key. The called party can now go to any extension in the system and answer the page call by picking up a phone on the Intercom Line that the caller is waiting.

6.03 If no reply is required or a "Call-back" message is given, no line key has to be selected. The handset is taken off-hook the PAGE Key pressed, and the message recited into the headset.

6.04 If an extension is engaged in a conversation on a CO or Intercom Line, and wishes a third party to join, the extension user presses the PAGE Key and calls the third party on the line. While the PAGE Key is pressed, the CO or Intercom Line remains connected, the party on the CO or Intercom Line will not hear the page message.

6.05 If an extension wishes to call another extension and sees that the dial Intercom is busy (some other extension is in the process of making a dial Intercom call) as determined by noticing the flashing line lamp on another Intercom Line, the PAGE circuit can still be utilized. The caller first presses an unused Intercom Line Key, then lifts the handset off-hook. The line lamp will glow steady and no dial tone will be heard. The PAGE Key can now be pressed, the called party contacted, and conversation takes place on the Intercom Line.

7.00 ATTENDANT OPERATION OF THE OPTIONAL DIRECT STATION SELECTION (DSS) UNIT

7.01 Upon answering a CO Line call and determining call requirements, the Attendant views the BLF indicator of the desired extension on the DSS unit. This will tell the Attendant if the extension is busy on another call. If the extension is busy, the Attendant can inform the calling (distant) party or transfer the call to another extension. Also, the Attendant can still inform the original extension requested of the waiting call in a more precise manner so as not to disturb the call already in progress.

7.02 When the Attendant calls the local extension on the DSS, the CO Line call automatically goes on "Hold" and the pick-up Key restored when the Extension Key is pressed on the DSS unit. The ATTD Line Lamp starts flashing at a slow rate (60 IPM). Either voice paging or tone ringing can be utilized for DSS Signalling by presetting to the particular mode of operation desired. While the Key is pressed, the Attendant's voice (or tone) is heard at the called extension. The extension, upon hearibg the "page" message, can either answer the call that is waiting or press the Attendant Line. which lamp is flashing at a slow rate (60 IPM). When the extension becomes steady. If the called extension was busy on another line, the line could be placed on "Hold" before switching to the Attendatn Line.

7.03 If the DSS call and the Intercom call from another extension in the system occur simultaneously at the extension, the DSS call has priority. After the Attendant informs the extension of the nature of the waiting call, either the extension or the Attendant can re-enter the CO Line and talk to the waiting party. When the Attendant goes on-hook or switches to another CO Line, the DSS disconnects.

7.04 The PAGE Key at the Attendant station can be utilized with the ATTD Line. Upon pressing the station PAGE Key, the CO Line call automatically goes on "Hold" and the pick-up Key restored. The ATTD Line lamp starts to flash at a slow rate. The page message is then recited and the PAGE Key released. When the called party picks up a phone at any extenison in the system and presses the ATTD Line pick-up key, the line lamp goes steady and conversation can take place.

7.05 If the DSS call an extension equipped with HF talkback, the extension can reply HF to the DSS calls. The Attendant holds the DSS Station Key pressed during the conversation. No "time-out" period is included in HF DSS calls. If the called extension wishes, it can switch to private handset conversation by taking the handset off-hook and pressing the ATTD Line Key. The Attendant then releases the DSS Station Key.

8.00 OPERATION OF EXTENSION EQUIPPED WITH CO LINE PRIVACY

8.01 If all extensions in the system are equipped with the optional "Privacy Unit", once an extension has entered into a free CO Line, the line becomes private to that extension.

8.02 If the extension desires to have another extension enter the line, the CO Line is placed on "Hold", the extension then informs the add-on party by dialing or paging the desired party, informing the line to enter. The extension again presses the CO Line Key, taking the line off "Hold", then presses the CONF Key which causes the line lamp to flash at 120 IPM. When the add-on party enters the line, the line lamp becomes steady, the CO Line now becomes private to the two (2) extensions.

8.03 If a third extension is to be added, both previous extensions must press and hold their CONF Key until the third party enters the conversation.

9.00 INTERCOM OPERATION WITH THE OPTIONAL HANDSFREE TALKBACK

9.01 If an extension is equipped with the optional "Handsfree Talkback Unit", an Intercom caller to that particular extension has the ability of two way voice communication without the called extension using the handset.

9.02 When the "Handsfree" extension is dialed and individual station paging utilized, a momentary warning tone will be transmitted to the "Handsfree" extension, signalling that an incoming Intercom call is in progress. The caller can now talk to the called extension, the called extension answering "Handsfree". The call can only last the duration of the "Time-out" (20-40 second maximum) because the Intercom dial register connection is maintained for the duration of the call. When "Time-out" function is exceeded, the register frees itself and the call becomes disconnected.

9.03 If the "Handsfree" station wishes to talk to the called party longer than the 20-40 second period, the called extension picks up the handset and presses the flashing Intercom Line Key (the line lamp remained flashing during the talkback period), the register disconnects, the line lamp glows steady and the conversation renews.

9.04 If a HF extension to extension call on the ICM Register is taking place and the DSS then initiatea a call to any HF equipped extension, the extension to extension call on the ICM Register after receiving a warning tone reverts to one way voice calling. When the DSS HF call releases, the HF connection resumes between extensions as long as the "time out" period is not exceeded. If the DSS make a call to a non-HF extension, any HF call taking

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BT-1530/2250 KEY TELEPHONE SYSTEM

II. INSTALLATION

OMEGAPHONE II

BT-1530/2250 KEY TELEPHONE SYSTEM
TABLE OF CONTENTS

1.00 INTRODUCTION

1.01 This Section is a Table of Contents for each Category of the Technical Manual.

1.02 This Section will be revised on issuance of a new or revised Section for the Category as described in the Table of Contents.

2.00 TABLE OF CONTENTS

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BT-1530/2250 KEY TELEPHONE SYSTEM

GENERAL INFORMATION

1.00 SPECIFICATIONS

1.01 Electrical Characteristics

a.	Telephone Voice Network:	Equiv. to U.S. 500 type
b.	Rotary/Tone Dial:	Meets all TELCO specifications
c.	Power Supply:	117VAC ± 10%, 50-60hz, Input; 24VDC, 5VDC Output
d.	CO Line Sensitivity:	20hz ringing, 65VRMS through 3 Kohm operation
e.	Max Loop Resistance KSU-Key Telephone:	40 ohms
f.	Operating Temperature:	-10° to 50° C

1.02 Mechanical Characteristics

a. STATION EQUIPMENT: BT1530/2250 TELEPHONES

- Dimensions: 10¼ in. X 10 in. X 4 in. (LxWxH)
- Weight: 6 Lbs.
- Shipping Weight: 7 Lbs

b. CENTRAL EQUIPMENT: BT1530KSU (EXPANDABLE)

- Dimensions: 9¼ in. X 21 in. X 31 in. (LxWxH)
- Weight: 64 Lbs.
- Shipping Weight: 77.2 Lbs.

c. POWER SUPPLY: PSA-1530

- Dimensions: 7½ in. X 9 in. X 12¼ in. (LxWxH)
- Weight: 34 Lbs
- Shipping Weight: 36 Lbs.

d. POWER SUPPLY: PSB-1530:

- Dimensions: 6½ in. x 8¼ in. x 6½ in (LxWxH)
- Weight: 19 Lbs
- Shipping Weight: 20.4 Lbs.

2.00 AUDIBLE/VISUAL INDICATIONS

2.01 CO Line Audible/Visual Supervisory Signals are shown in Table A.

TABLE A

CO Line Audible/Visual Supervisory Signals

FUNCTION	LAMP	AUDIBLE SIGNAL
CO Incoming	60 IPM	450hz (modulated) at 15 IPM
Answering	Steady	NONE
Hold	120 IPM	NONE

2.02 Intercom Line Audible/Visual Supervisory Signals are shown in Table B.

TABLE B

Intercom Line Audible/Visual Supervisory Signals

FUNCTION	LAMP	AUDIBLE SIGNAL
Intercom Calling	30 IPM	450hz Dial Tone
Busy Tone	30 IPM	450hz interrupted at 30 IPM
Ringback	30 IPM	450hz (modulated) at 15 IPM
Handsfree Warning	30 IPM	450hz. 1-2 sec.
Answering	Steady	NONE

3.00 Extension Numbering Plan

a. Standard BT1530 KSU: 11-18, 21-28, 31-38, 41-48
b. BT2250 KSU: 11-18, 21-28, 31-38, 41-48, 51-58, 61-68, 71-78, 81-82
c. BT1530 KSU Equipped with optional Extension Expansion Circuit (EEX): Same as BT2250 KSU

4.00 POWER SUPPLY SPECIFICATIONS

4.01 Power Supply PSA-1530-1 Electrical Characteristics shown in Table C.

TABLE C

PSA-1530-1 ELECTRICAL CHARACTERISTICS

FUNCTION	VOLTAGE
Input	117 VAC + 10% 50/60hz
Output	+L (LAMP) 24 VDC ± 6V @ 6A, Filtered +R (RELAY) 24 VDC ± 6V @ 3A, Filtered +P (TALK) 24 VDC ± 6V @ 2.5A, Filtered +I (IC) 5VDC ± 0.25v @1.2A, Regulated

4.02 Power Supply Fusing for PSA-1530-1 is shown in Table D.

TABLE D

PSA-1530-1 FUSES

FUNCTION	FUSE	DESIGNATION
117 AC Line	5 AMP 3AG SLO BLO	F1
Lamp Battery (+L)	2 AMP 3 AG x4	F2,F3,F4,F5
Relay Battery (+R)	3A 3AG	F6
Talk Battery (+P)	3A 3 AG	F7
IC Battery (+I)	1.5A 3AG (FAST BLOW)	F8
Regulator Circuit	2A 3AG SLO BLO	F9

NOTE F9 is located PSA cabinet. Remove top of PSA for service.

4.03 Power Supply PSB-1530-1 (Expansion) Electrical Characteristics are shown in Table E.

TABLE E

PSB-1530-1 ELECTRICAL CHARACTERISTICS

FUNCTION	VOLTAGE
Input	117 VAC + 10%, 50/60HZ
Output	+L (LAMP) 24 VDC + 6V @ 6A, Filtered

4.04 Power Supply Fusing for PSB-1530 is shown in Table F

TABLE F

PSB-1530-1 FUSES

FUNCTION	FUSE	DESIGNATION
117 AC Line	3 AMP (SLOBLO)3AG	F1
Lamp Vattery(+L)	2 AMP 3AG x4	F2,F3,F4,F5

5.00 PREPARATIONS

5.01 Prior to installation of the system, preparations should be made to insure a smooth installation process.

5.02 The layout of the system should be inspected. A survey of the site should be made to determine:the best location for central equipment; particular hazards or obstructions that could be encountered in installation; location of distribution boxes; cable runs; etc.

5.03 A layout drawing of the site should be used with markings indicating: location of the KSU; cable distribution boxes; cable runs; and station equipment location. The layout information should also include extension number designations as well as any special features that apply to the individual extensions i.e. Busy Lamp Field, Call Diverters, etc.

5.04 An extension Program Sheet should be prepared for the installer to program the individual extensions to the exact requirement. Specific information should be noted for each extension including CO Line capability and special features or wiring.

5.05 An equipment list should be prepared. This list includes all central and station equipment; cable; accessory equipment and special tools/equipment required for the installation process.

5.06 Cross-Connect charts should be prepared for the Main Distributor Frame (MDF) as well as for any other distribution boxes in the system. This allows the Installer to program the individual extension cables in minimum amount of time.

5.07 All station, central, and accessory equipment should be checked for shipping damage. All equipment should be tested for proper operation prior to installation on the job site.

5.08 Extension cables, distribution frame cables and any other wiring should be tagged for immediate identification.

6.00 CABLING REQUIREMENTS

6.01 Both the BT1530 and BT2250 Key Telephones can utilize 50 pair cable for connection to the MDF and/or Distribution Terminal boxes. No 24 AWG guage wire can be used, the cable normally being the standard U.S. telephone type, utilizing a connector and the standard wire color code.

READ

6.02 The "modified cartwheel" or "star" type of cable distribution is recommended on site. In this method, Extensions are connected to the KSU by either direct home run cables or through Distribution Terminal boxes located through the system. Extension cables should not be "looped" as this has a tendency to result in cross talk and noise

on the system. In cases where Extensions are bridged, adequate spare conductors in the connecting cable should be insured in case of any selective wiring requirement for each extension.

READ

6.03 When Distribution Terminals are utilized, it may be necessary to provide spare conductors in a separate cable (or binder) for connecting the selective wiring functions of each Extension (connected to the Distribution Terminal) to the MDF. Both the BT1530 and BT2250 Telephones have up to five selective wiring functions that are determined by the individual Extension features programmed.

READ

a. The BT2250 Key Telephone contains one (1) spare conductors in the Extension connecting cable. When the BT2250 is connected to a Distribution Terminal, 75 pair cable must be used to connect the Distribution Terminal Box to the MDF due to the buildup of selective wire functions at each Distribution Terminal.

READ

b. The BT1530 Key Telephone contains twenty-nine (29) spare conductors in the Extension connecting cable when 50 pair telephone cable is used. When a group of BT1530 Key Telephone is connected to a Distribution Terminal, these spares can be assigned to the selective wires so that 50 pair cable may be used to connect the Distribution Terminal to the MDF. However, when more than seven BT1530 Key Telephones or one or more BT2250 Key Telephones (along with the BT1530) are terminated in the same distribution box, an additional 25 pair cable is required for connecting the Distribution Terminal to the MDF. This allows all unused Line Key and optional functions to be installed so that they will be available for future expansion.

6.04 In instances where a limited number of CO Lines (Maximum of eight) and no further expansion is required, 25 pair cable can be utilized to connect the BT1530 to the MDF or Distribution Terminal box.

READ

6.05 Certain optional system assemblies such as the DSS unit or Busy Lamp Field require separate connecting cables to the MDF. Refer to the installation instructions of the individual assembly to determine the cable requirements.

6.06 Figure 1 illustrates a typical "modified cartwheel" distribution system. Shown are typical cable requirements for each feature as well as cable requirements for Distribution Terminals.

a. EXT No. 1 illustrates cable requirements when the BT1530/2250 Telephone is connected by a home run to the MDF.

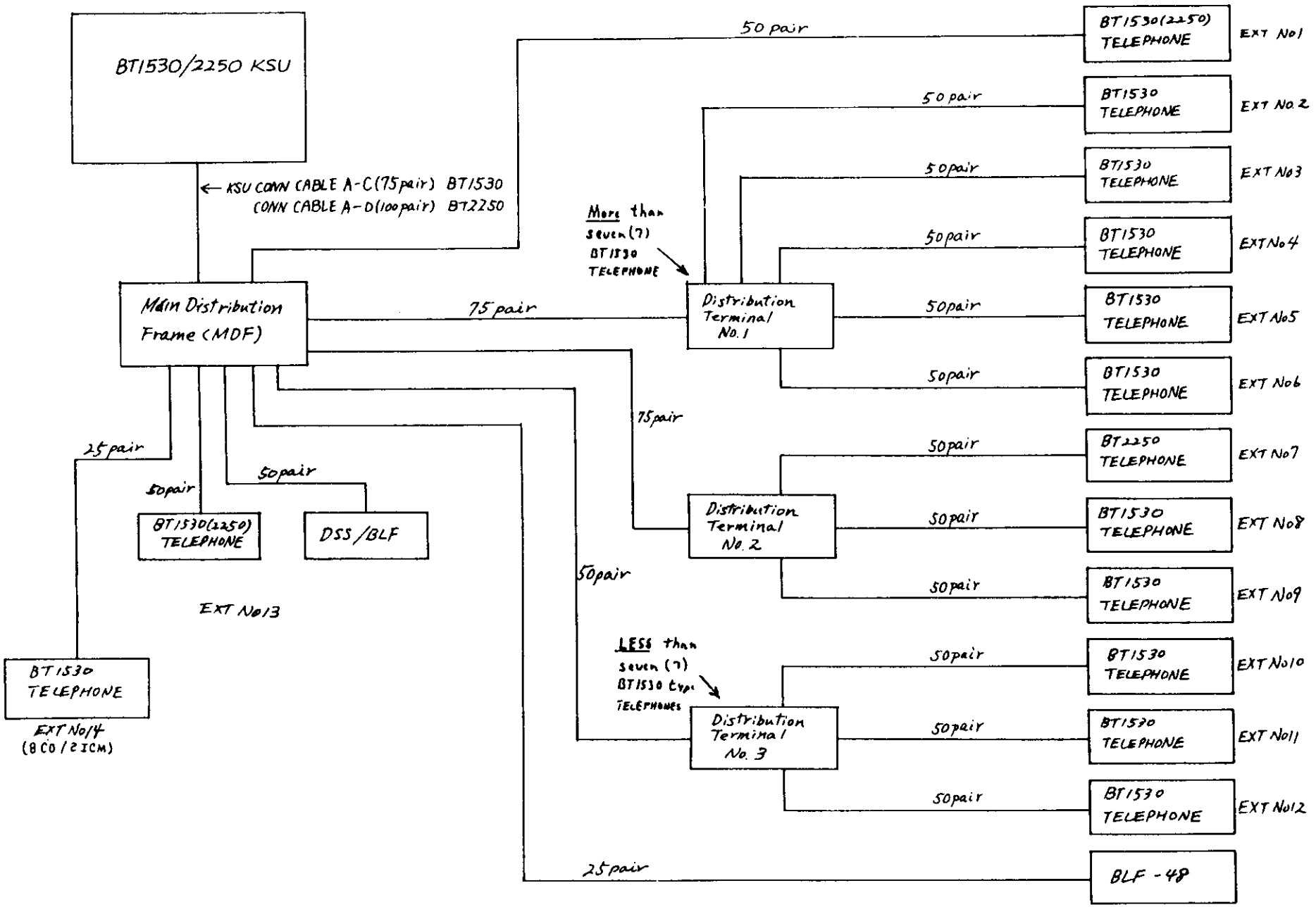


Figure 1 Typical Modified "Cartwheal" Cable Distribution System

b. Distribution Terminal No. 1 illustrates the requirement for a 75 pair connecting cable to the MDF when more than seven BT1530 telephones are connected or future expansion is anticipated.

c. Distribution Terminal No. 2 illustrates the requirement for a 75 pair cable when BT2250 Telephones are connected to a Distribution Terminal.

d. Distribution Terminal No. 3 illustrates the use of 50 pair cable for connection of a Distribution Terminal to the MDF when a limited number of BT1530 Telephones are connected and no future expansion is anticipated. Associated with Extension No. 12 is a Busy Lamp Field (BLF-48) that requires a 25 pair cable. This cable can be a separate home run to the MDF or can be included in the Distribution Terminal No. 3 connecting cable if 75 pairs are utilized.

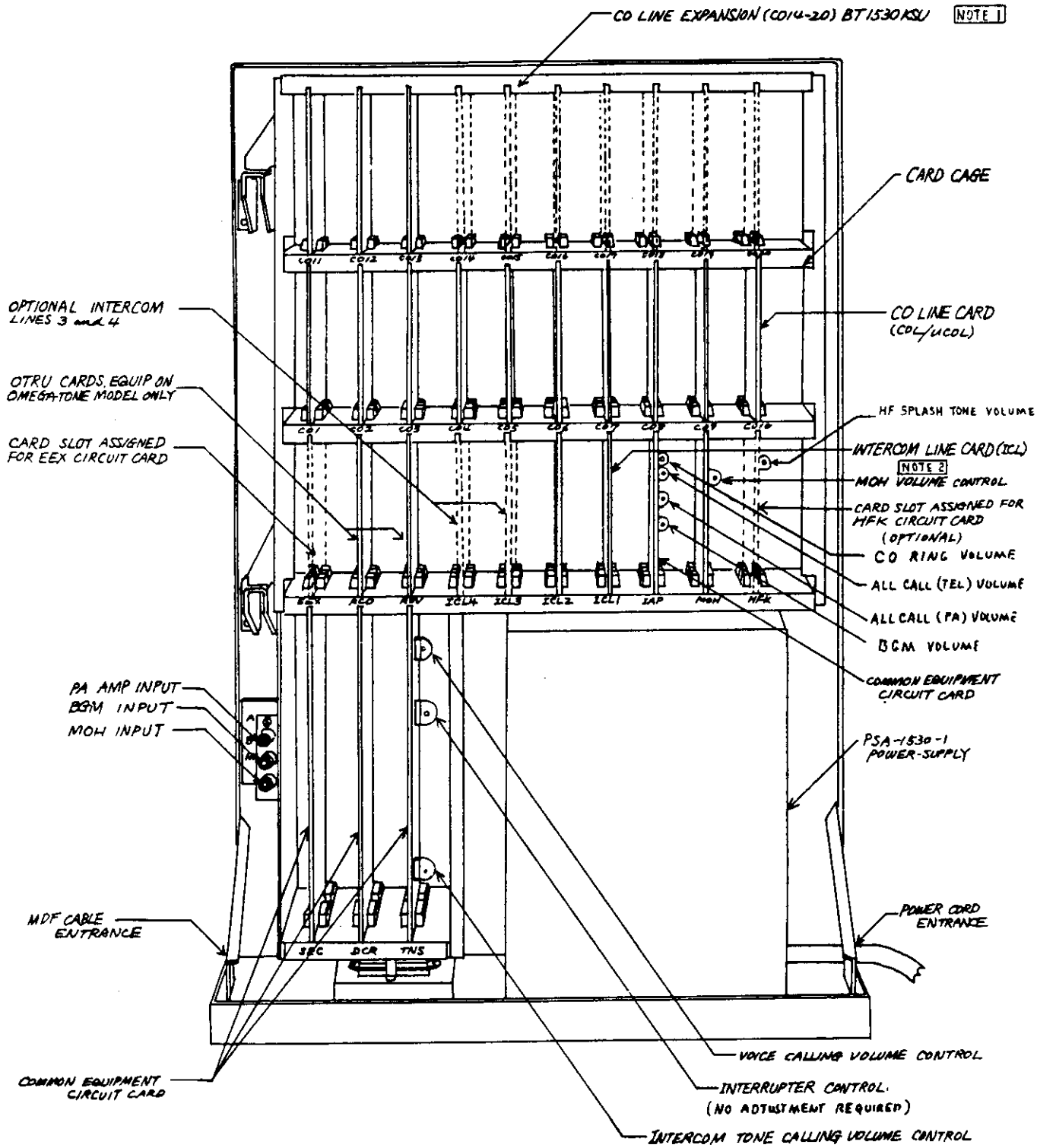
e. Extension No. 13 illustrates a home run connecting cable for both the Extension and associated DSS unit. Both require 50 pair cables. If the DSS unit is associated with an Extension connected to a Distribution Terminal, a separate 50 pair home run is required between the DSS and the MDF.

f. Extension No. 14 illustrates the connection of a BT1530 Telephone with 25 pair cable when a limited number of CO Lines (eight maximum) is required and no future expansion is anticipated.

7.00 KSU CONSTRUCTION

7.01 Figure 2 shows a front view of the BT1530 KSU with its circuit card, PSA-1530 Power Supply, and Terminal(s) placement. The Installer should become familiar with the items described in Figure 2 as they are referred to throughout the Technical Manual.

7.02 Figure 3 shows a view of the BT1530 KSU with the card cage open. The various Terminals and Connectors, as noted, are referred to throughout the Technical Manual.



NOTES

1. BT-2250 KSU is equipped with prewired CO14-CO20 card slots.
2. Equip for number of Intercom Lines required.

Figure 2 BT 1530 KSU Front View

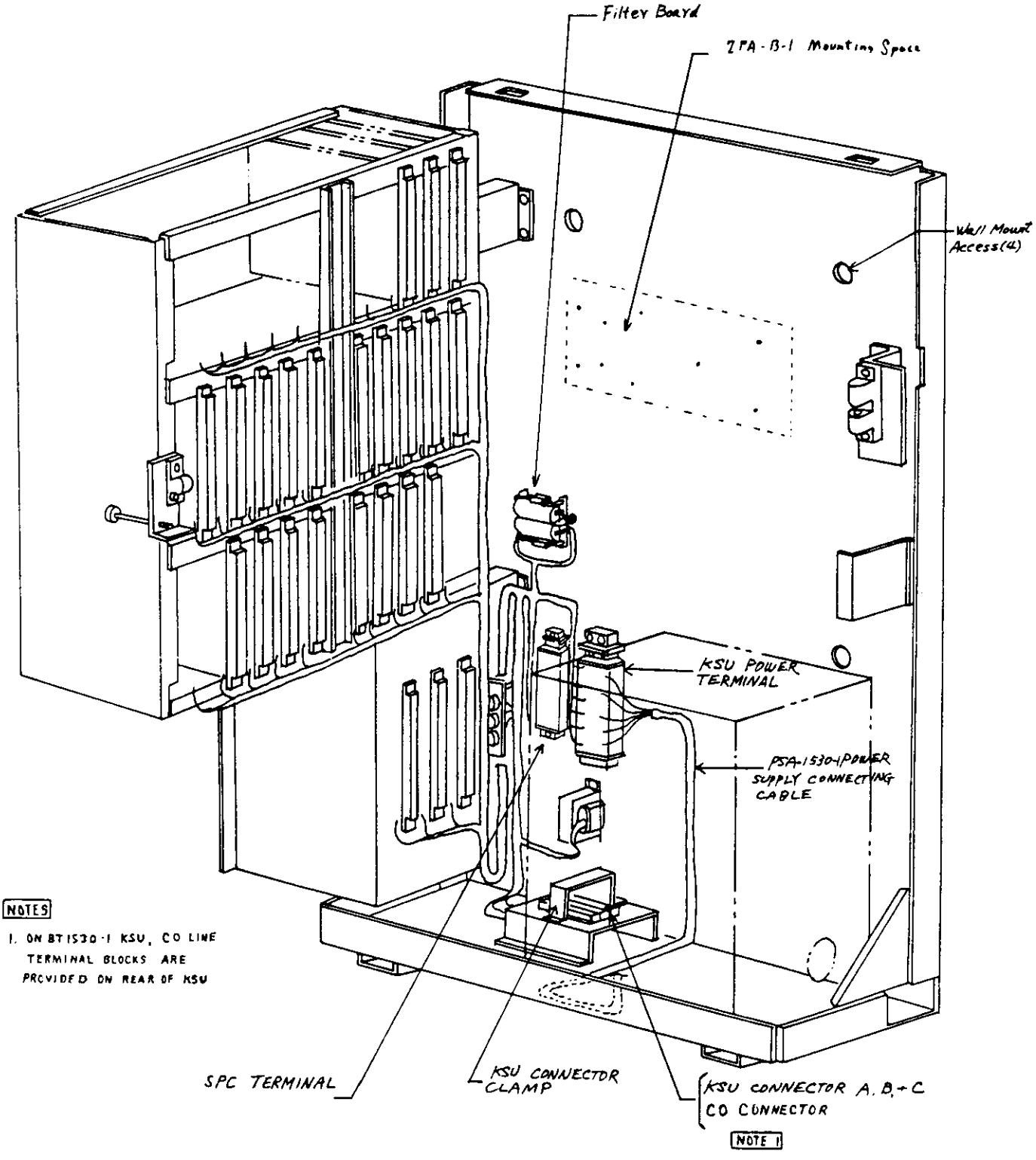


Figure 3 BT 1530 KSU Back Panel View

OMEGAPHONE II

BT-1530/2250 KEY TELEPHONE SYSTEM

KSU INSTALLATION

1.00 LOCATING THE KSU

1.01 The KSU should be installed in an accessible place with room for associated equipment, terminal blocks and Voice Connection Arrangements (VCA). The area should be dry and exhibit a relatively low, constant temperature. The area should be relatively dust and vibration free, and ventilated. The area should be accessible only to those requiring entrance.

1.02 The area should contain a suitable number of electrical outlets for commercial power. A separately fused AC power line should be utilized for all telephone associated equipment.

1.03 The KSU and associated equipment should be wall mounted on a suitable backboard. Key hole slots are provided on the rear panel of the KSU for wall mounting.

1.04 The KSU can be floor mounted as long as it is mounted on a stand, preventing possible damage from water or mechanical equipment.

2.00 POWER SUPPLY INSTALLATION

2.01 The PSA-1530 Power Supply is provided as a separate assembly and must be installed in the KSU cabinet. Tapped screw holes are provided on the base of the KSU cabinet to hold the power supply in place.

2.02 A GROUND post is provided on the power supply. The Ground Strap from the BT1530 KSU should be connected to the GROUND terminal on the PSA-1530.

READ DO NOT ATTEMPT TO EARTH GROUND ANY INDIVIDUAL POWER SUPPLY VOLTAGE(S).

2.03 A wiring harness is provided to connect the power supply to its associated terminals on the KSU. A Power Terminal Strip is provided on the rear panel of the KSU cabinet. Figure 1 shows the connection of the PSA-1530 Power Supply to the KSU Power Terminal.

READ

2.04 DO NOT MAKE ANY CONNECTIONS TO THE KSU POWER TERMINAL WITH THE POWER SUPPLY TURNED ON. KEEP THE POWER SUPPLY UNPLUGGED WHILE MAKING CONNECTIONS. CHECK THE POWER SWITCH TO MAKE SURE IT IS IN THE "OFF" POSITION BEFORE PLUGGING POWER CORD INTO THE AC OUTLET.

2.05 Care should be exercised such that no loose objects, wire pieces, etc., fall into the ventilated area of the power supply. As the power supply gets hot during operation, no objects should be left on top of the power supply.

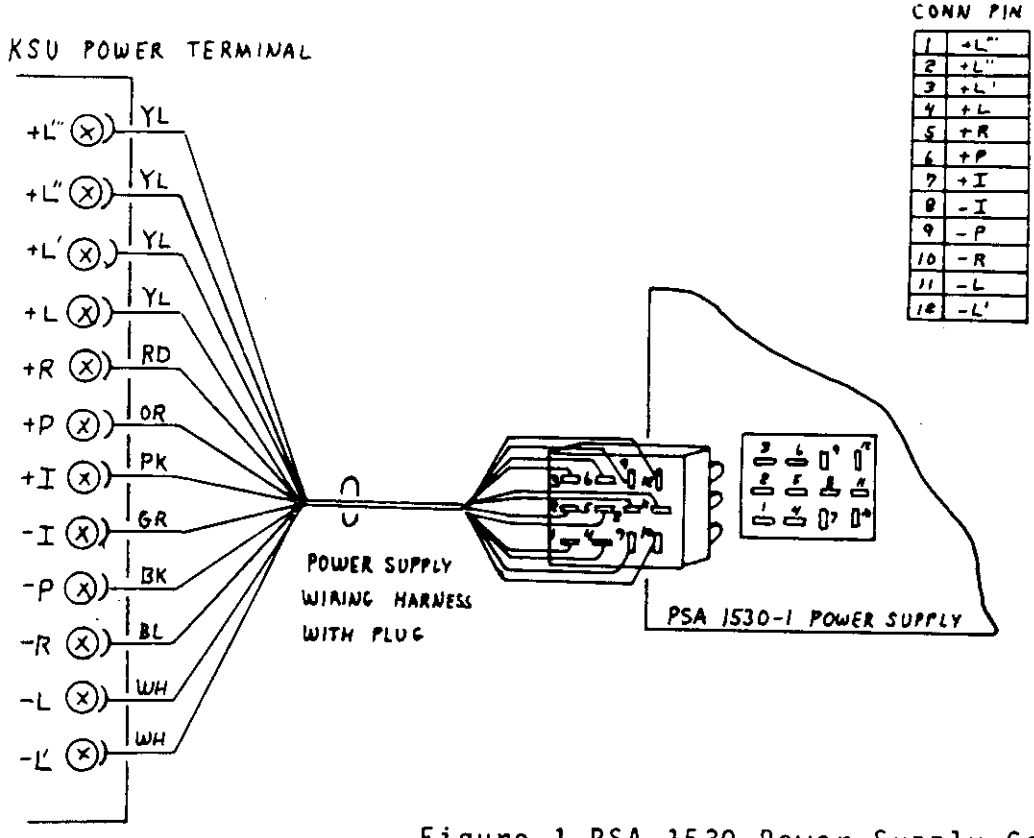


Figure 1 PSA-1530 Power Supply Connection

3.00 GROUNDING

3.01 A GROUND post is provided on the KSU cabinet for an Earth ground connection. A cold water pipe or electrical ground rod should be used to establish an Earth ground. If both are unavailable, a heavy copper conductor No. 14 AWG or better should be used to connect to the nearest Earth ground point.

3.02 The third conductor of the commercial power cord should not be used to establish the Earth ground. Also, electrical conduit should not be used to establish an Earth ground.

3.03 The GROUND post on the PSA-1530 Power Supply is installer connected to the GROUND post on the KSU cabinet with the jumper strap provided

3.04 No Earth ground should be derived from associated TELCO equipment or terminations. It is acceptable to utilize same Earth ground point.

4.00 KSU CONNECTOR CABLES

4.01 Seventy-five pair plug-ended cable is required to connect the standard BT1530 KSU to the MDF. Amphenol connectors for cables A, B and C (1st, 2nd, 3rd binders) are provided on the KSU. Individual male-ended amphenols and No 24 AWG wire may be utilized.

4.02 A connector clamp is provided on the KSU to hold the individual Amphenol connectors securely in place.

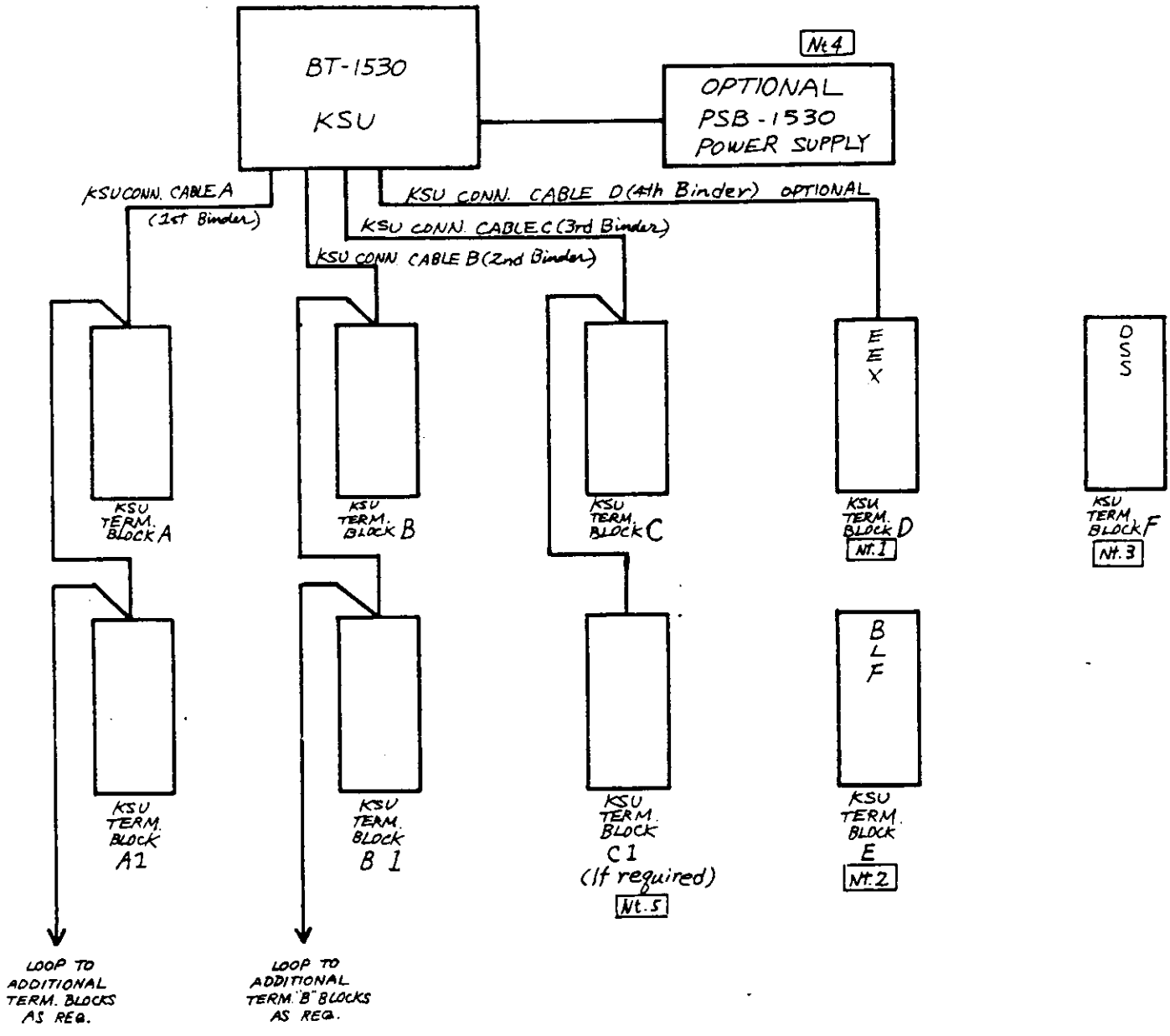
4.03 An additional Amphenol connector (KSU CONN D) is required when the KSU is equipped with the Extension Expansion Card (EEX). An additional 25 pair connecting cable is required. KSU TERMINAL BLOCK D terminates the KSU CONN Cable D. Consult Section 2004, 7.06 for connection of KSU CONN D wiring harness.

4.04 Each KSU CONNECTOR cable (or binder) is terminated to a 66 type terminal block, typically a Siemons 66B4-25 or equivalent. Required loop connections are made to associated blocks to conserve terminals for attachment to branch (or extension) cables. Two individual conductors should not be terminated on the same 66 block terminal clip. Figure 2 illustrates a typical MDF Terminal Block Arrangement.

4.05 Table A illustrates KSU CONN CABLE A,B, and C conductor and terminal designations.

READ IT SHOULD BE NOTED THAT CABLE (BINDERS) A & B, ALTHOUGH SIMILAR IN SOME RESPECTS, DIFFER FROM THE STATION EQUIPMENT TAIL (DROP) CABLE. A STATION TAIL CABLE SHOULD NOT BE PLUGGED DIRECTLY INTO THE KSU AMPHENOL CONNECTORS WITHOUT AN ADAPTER ARRANGEMENT.

4.06 Terminal designations used for each CO Line Function are:



NOTES

Nt.1. Standard on BT2250 KSU. Optional on BT1530 KSU when equipped with EEX.

Nt.2. Required when BLF-B or DSS-1 is equipped. Refer to Section 2007; 2.00-3.00 for terminal assignment.

Nt.3. Required when DSS-1 is equipped. Refer to Section 2007; 3.00 for terminal assignment.

Nt.4. Required when system extension capacity exceeds thirty-two (32).

Nt.5 Required if ICM 3 / ICM 4 is equipped.

Figure 2 Typical MDF Terminal Block Arrangement

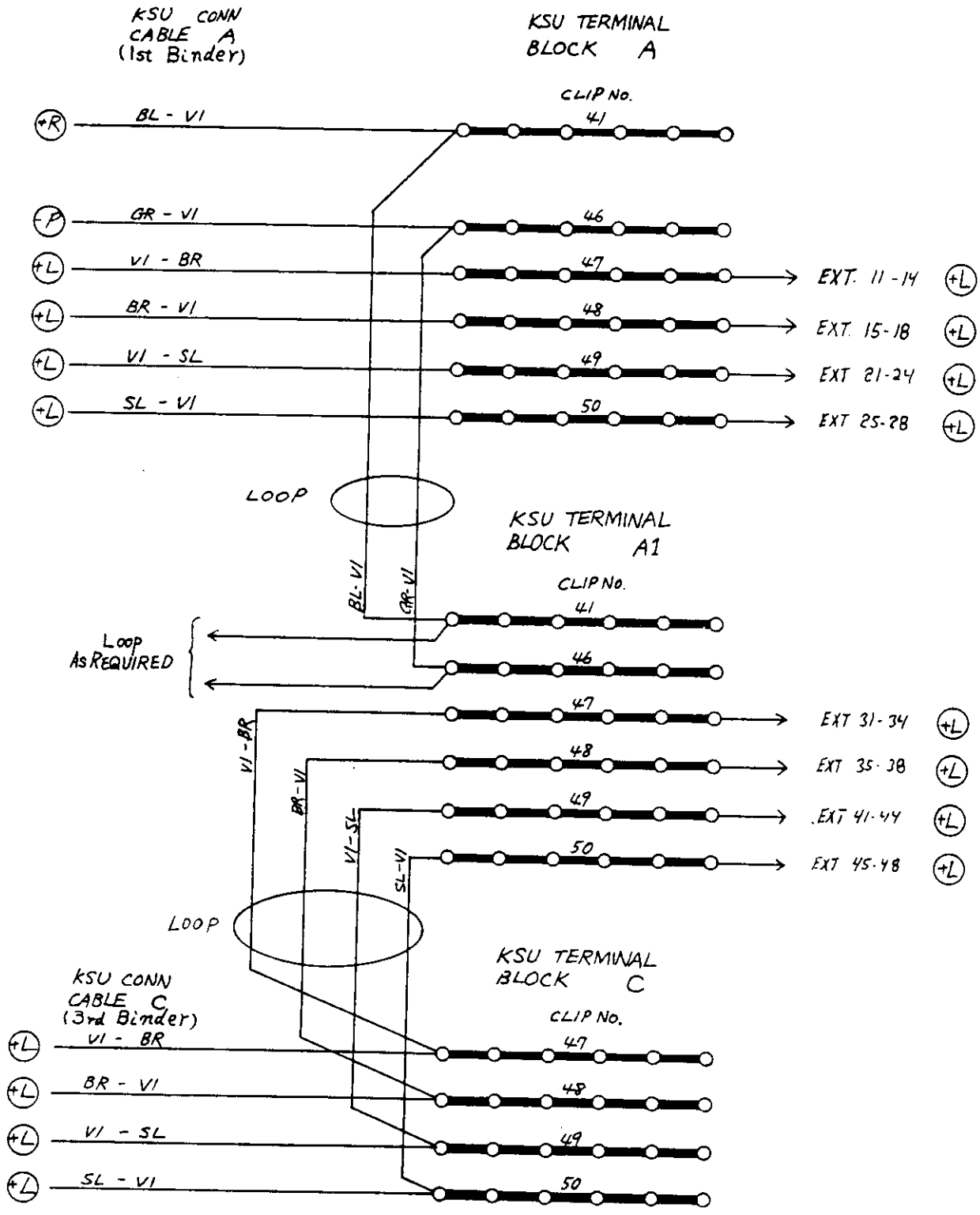


Figure 3 Lamp/Relay Battery Distribution at the MDF

4.15 KSU TERMINAL BLOCK F is assigned for termination of the optional Direct Station Selection (DSS) Unit. Refer to Installation-Optional System Equipment for instruction on connection of DSS Unit.

4.16 Optional Intercom Lines No. 3 and 4 appear on KSU TERMINAL BLOCK C. If they are being equipped, loop connections to KSU TERMINAL BLOCK C1 is required to insure adequate terminal clips for all extension (branch) cables. CO Lines 12 and 13 for the standard BT1530 KSU or CO Lines 19 and 20 of the CO Line Extension for the BT2250 Telephone should be left connected at KSU TERMINAL BLOCK B (B1) as they can be used to provide private lines, special features, etc.

5.00 EXTENSION INTERCOM DIAL CODE NUMBER ASSIGNMENT

5.01 KSU TERMINAL BLOCK C provides "Z" connections for the standard BT1530 KSU Intercom extension capacity. Refer to Table A, KSU CONNECTOR C for specific Intercom dial codes and terminal assignments.

5.02 Individual "Z" leads of extension (branch) cables are cross connected to the KSU "Z" leads on KSU TERMINAL BLOCK C for assignment of Intercom dial codes.

READ

5.03 If the system is equipped with both HF Talkback and DSS Call Announcing, refer to Section 2007 for details regarding assignment of dial codes for HF extensions.

6.00 INCOMING CO AUDIBLE RING DISTRIBUTION

6.01 Provision is made on the standard BT1530 KSU for Common CO Audible Indication (Day Connection), Night Service or Audible Signal Transfer, or installer programming of the Individual CO Line Incoming Audible signal for selected extensions in the system.

6.02 All connections are made to the individual extension "B" lead for enabling CO Line audible at the extension. Figure 4 shows typical connections of the extension "B" lead for various configurations.

6.03 A volume control marked "INCOMING" is provided on the IAP circuit card for control of Incoming CO Audible Signal tone levels.

6.04 Provision is made for "All Call" at each extension to receive CO Incoming Ringudible. If both occur simultaneously, CO ring indication has priority and the "All Call" signal is preempted.

6.05 Common Incoming COudible Signal (Day Connection)

a. When a Common Incoming CO Audible signal for all CO Lines is required, the "BO" lead (KSU TERMINAL BLOCK C) is connected to the extension(s) "B" lead that is to receive Incoming CO Line ring indication.

b. Figure 4 shows extensions No. 11 and 12 wired to receive the Common Audible CO Incoming ring signal.

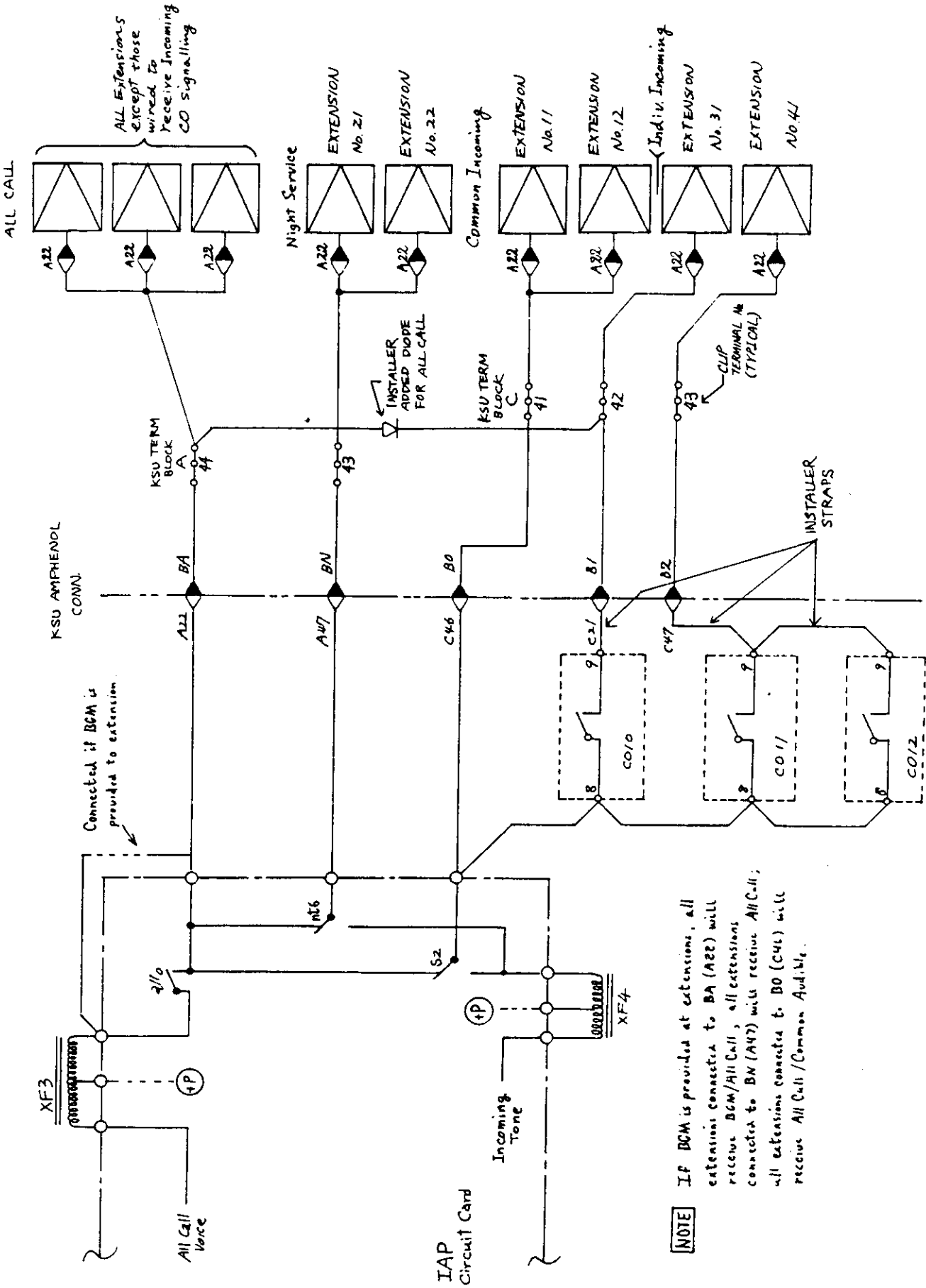


Figure 4 All Call/Incoming CO Connection

6.06 Common Incoming Audible Signal (Night Connection)

a. When a common audible signal for all CO Lines is required for Night Service (or peak hours, breaks, etc.), the "B" lead of extensions that are to receive the CO ringing indication during Night Service is connected to the "BN" lead at KSU TERMINAL BLOCK A.

b. All extensions equipped for Night Service will receive All Call as standard during regular service. During the transfer condition, All Call will be preempted during the CO ringing interval if both occur simultaneously.

c. Figure 4 shows extension No. 21 and 22 connected for Night Service operation.

d. Refer to Section 2005; 8.04 for arranging the Extension TRANS (TRANSFER) Key to make Night Service operational.

e. The Night Transfer Control Extension(s) TRS lead (EXTENSION CONN A46) is connected to TR on KSU TERMINAL BLOCK A to operate the Night Transfer.

6.07 Individual (Group) CO Incoming Audible Signal

a. Five (5) Individual CO Incoming Audible signal indications are available on the standard BT1530 KSU. Up to fourteen (14) Individual Audible signals are available when the KSU is equipped with the optional KSU CONNECTOR D.

b. Each Individual CO Line Audible is installer programmed to meet individual (or group) Incoming CO Audible Signaling requirements by connection of the Individual CO Line Signal "B" lead (B1-B5 on the BT1530 KSU) to the individual CO Line(s) assigned. Connections are made at the individual CO Line card PCC connectors wire wrap TERMINAL No. 9 to the selected B1-B5 function lead(s) (KSU TERMINAL BLOCK C). CO Lines are grouped together by looping the card connector TERMINAL No. 9 of each CO Line that is to form a group and then connecting to an available B1-B5 lead of KSU CONNECTOR CABLE C (BT1530 KSU) or B6-B15 lead on KSU CONNECTOR CABLE D (when equipped).

c. The Individual Siganl leads B1-B5 of KSU CONN CABLE C are located bundled on the hinged side of the card cage. The wire straps are of sufficient length for connection to the individual CO Line card connectors. TABLE B lists the conductor colors for the Individual CO Signal control leads of the standard BT1530 KSU and optional equipped KSU CONN D.

TABLE B

INDIVIDUAL CO INCOMING AUDIBLE KSU HARNESS WIRE COLOR

FUNCTION	WIRE COLOR	LOCATION
B1	BR-WH	CONN C21
B2	OR-WH	C47
B3	SL-WH	C22
B4	GR-WH	C48
B5	RD-WH	C23
B6 (OPTIONAL)	BL-WH	CONN D39
B7 (OPTIONAL)	RD-WH	D14
B8 (OPTIONAL)	OR-WH	D40
B9 (OPTIONAL)	BK-WH	D15
B10 (OPTIONAL)	GR-WH	D41
B11 (OPTIONAL)	PK-WH	D16
B12 (OPTIONAL)	BR-WH	D42
B13 (OPTIONAL)	YL-WH	D17
B14 (OPTIONAL)	SL-WH	D43

d. When Individual CO Line Incoming ringing is utilized. the Common Audible signal control lead "B0" can still be used. However, both the Common CO Line Audible and Individual CO Line Audible will operate when an incoming call is received on the CO Line wired for individual signalling. If this condition cannot be tolerated, one of the five Individual Audible control leads must be installer wired as a Common Audible function, omitting all CO Lines programmed to ring individually or in selected groups.

e. Figure 4 illustrates Extension No. 31 programmed to receive Individual CO Line Incoming Audible from CO Line 10, while Extension No. 41 is wired to receive Individual CO Line Audible from CO Lines 12 and 13.

e. Strapping Option SB3 on the TNS circuit card is used when the optional KSU Handsfree Amplifier (HFK) circuit is equipped. Refer to SECTION 2004, Installation of Optional KSU Assemblies for instructions on arranging SB3.

8.02 Intercom Time Out

a. During an Intercom call, a "Time-Out" function limits the Voice or Tone signalling duration to a maximum of 20 or 40 seconds. Connect SHORTING BAR on DCR card for desired time limit.

b. The "Time-Out" can be disabled by cutting a wire strap at DCR circuit card PC connector TERMINAL 27a.

8.03 Group Calling (Pre-Set Conference)

a. A pre-determined group of extensions can be dialed on the Intercom circuit utilizing a two digit dial code. Tone or Voice calling can be used to signal the group of extensions.

b. The number of extensions to be called simultaneously should not exceed five (5). There is no limit to the number of individual groups in a system other than the availability of individual dial codes for each group.

c. No special circuit cards or KSU modification are required for programming extensions for group calling. All programming is accomplished on KSU TERMINAL BLOCK C (and D if system is so equipped) by strapping "Z" leads through Diodes to the specific group calling two digit access code "Z" lead.

d. Figure 6 illustrates a typical group calling arrangement. Polarity of the Diodes must be observed. Diodes equivalent to a 1N4002 may be utilized for strapping the "Z" leads.

READ

e. IF AN EXTENSION ARRANGED FOR GROUP CALLING DIALS THE EXTENSION NUMBER ASSIGNED TO THE SAME GROUP, THE INTERCOM REGISTER RELEASES AFTER COMPLETION OF DIALING THE "GROUP CALL" NUMBER. THIS IS DUE TO THE OFF HOOK INDICATION OF THE CALLING EXTENSION DETECTED BY THE REGISTER. TO PREVENT THIS OCCURENCE, SPECIAL WIRING IS REQUIRED. CONSULT THE IAI ENGINEERING DEPARTMENT FOR APPLICATION ASSISTANCE.

8.05 BGM through Extension Speakers

a. BGM can be provided to any individual extension, group of extensions or an entire system on an installer option basis. A BGM source with a high impedance (low level) output is connected to the BGM input on the KSU. This input serves both as the input for the BGM through the extension speakers as well as the local PA system (if equipped). The BGM Volume Control on the IAP circuit card serves as the master control for both functions.

b. When BGM is installed in a system with individual extension speakers to be connected, Installer straps are required on the IAP circuit card connector as shown on Figure 8.

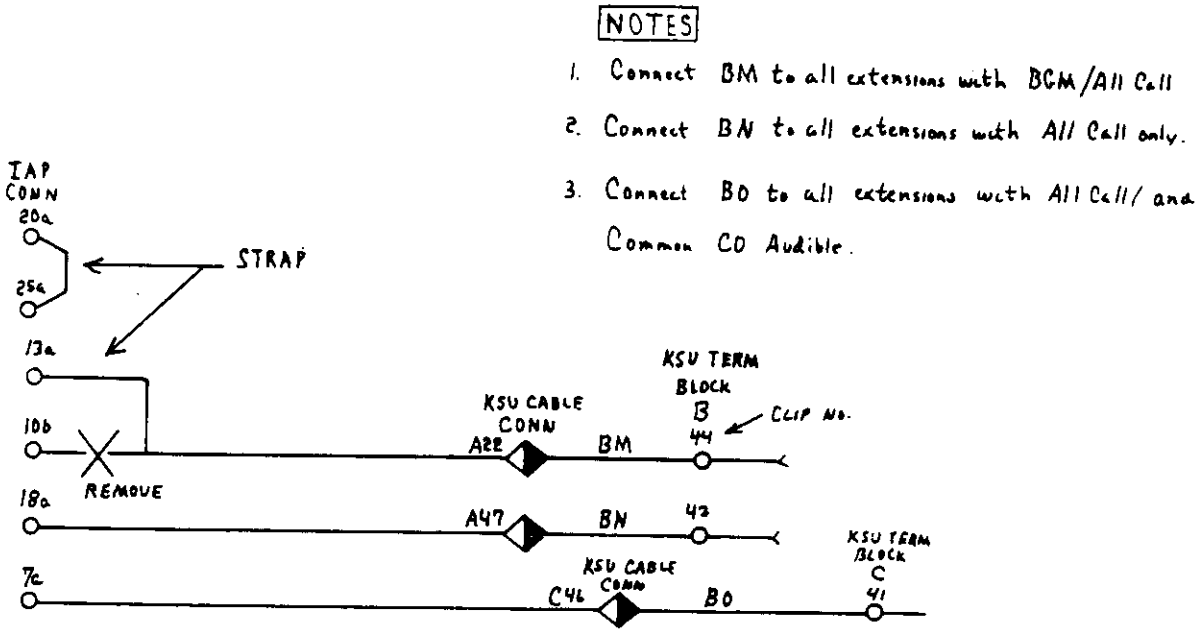


FIGURE 8 IAP Card Connector Strap Requirements for BGM.

READ c. All extensions that will be programmed to receive BGM/All Call must have its "B" lead A22 connected to the BM (formerly BA) of the KSU CONN TERM BLOCK A (A22). All extensions that will receive All Call only are connected in multiple to BN (A47) of KSU TERM BLOCK A.

TABLE A

BT 1530-3 CO LINE RIBBON CONNECTOR WIRING			
CO LINE #	CO CONN PIN NO.	CO CONN WIRE COLOR	KSU HARNESS COLOR
1T	26	WH/BL	OR
1R	1	BL/WH	OR/WH
2T	27	WH/OR	GR
2R	2	OR/WH	GR/WH
3T	28	WH/GR	BR
3R	3	GR/WH	BR/WH
4T	29	WH/BR	RD
4R	4	BR/WH	RD/WH
5T	30	WH/SL	BL
5R	5	SL/WH	BL/WH
6T	31	RD/BL	OR
6R	6	BL/RD	OR/WH
7T	32	RD/OR	GR
7R	7	OR/RD	GR/WH
8T	33	RD/GR	BR
8R	8	GR/RD	BR/WH
9T	34	RD/BR	RD
9R	9	BR/RD	RD/WH
10T	35	RD/SL	BL
10R	10	SL/RD	BL/WH
11T	36	BK/BL	OR
11R	11	BL/BK	OR/WH
12T	37	BK/OR	GR
12R	12	OR/BK	GR/WH
13T	38	BK/GR	BR
13R	13	GR/BK	BR/WH
14T	39	BK/BR	RD
14R	14	BR/BK	RD/WH
15T	40	BK/SL	BL
15R	15	SL/BK	BL/WH
16T	41	YL/BL	OR
16R	16	BL/YL	OR/WH
17T	42	YL/OR	GR
17R	17	OR/YL	GR/WH
18T	43	YL/GR	BR
18R	18	GR/YL	BR/WH
19T	44	YL/BR	RD
19R	19	BR/YL	RD/WH
20T	45	YL/SL	BL
20R	20	SL/YL	BL/WH

c. Connection to the local network CO lines are accomplished by use of the TELCO (USOC Code) type RJ2IX connecting arrangement. This consists of a female 25 pair ribbon (amphenol) connector which provides for up to 25 CO line circuits. This connector will be installed within twenty-five (25) feet of the KSU. The RJ2IX connector should be connected by a cable directly to the KSU to eliminate any possible harm to the network.

- When utilizing the BT 1530-1 KSU, the connecting cable between the network interface connector (RJ2IX) is punched down on the KSU CO TERM BLOCKS A-C.

- When utilizing the BT 1530-3 KSU, the connecting cable between the RJ2IX and KSU is plugged in the ribbon connector (amphenol) labeled CO on the KSU.

READ Until the BT 1530 KSU is FCC registered, the connecting cable between the KSU and the network interface (RJ2IX) can be supplied and made up by the local distributor. After the system is registered, the cable becomes a part of the registered equipment and is either supplied or specified as to type by the manufacturer.

d. When using the TELCO RJ2IX, the arrangement of the CO Lines (line number, type of service, etc.) must be specified at time of request for service. Rearrangement of the lines can be accomplished on the MDF (EXTENSION) side of the KSU.

READ The above procedures are to be followed in accordance with the rules/regulations concerning DIRECT CONNECTION outlined in ENG BULLETIN 78-013.

e. When utilizing the COL/UCOL type line card, the polarity of the line circuit must be such that the TIP side of the line is negative in respect to the RING side of the line. This polarity is opposite to that supplied on the TELCO network interface in that the TIP side of the line is normally GROUND (+) and the RING is BATTERY (-) potential. To determine whether the polarity is correct, a BT 1530/2250 telephone or VOM can be used.

- If a VOM is used, the DC volt scale grater than 50 volts must be used. The POS lead of the meter is connected to the TIP side and NEG lead connected to the RING side of the CO Line on the MDF (EXTENSION) side of the KSU. If the meter reads reverse polarity, transpose Tip/Ring connections on the KSU Conn cable for the respective CO line.

- If a telephone (rotary or tone) is used, attempt to break CO dial tone. If dial tone remains after dialing a digit, reverse the Tip/Ring connections on the KSU CONN CABLE at the MDF for the respective CO line.

READ When DIRECT CONNECTION is used on certain types of CO exchanges that reverse battery before completion of dialing (e.g. a toll call on some step by step exchanges, a polarity guard must be installed between the KSU and CO line appearance of the extensions. The polarity guard is also required when TRUNK CONFERENCING (Ref SECTION 2005, Para. 9.04) is utilized with CO exchanges that reverse battery after completion of dialing and retain battery on incoming calls. FIGURE 3 illustrates connection of the line polarity guard.

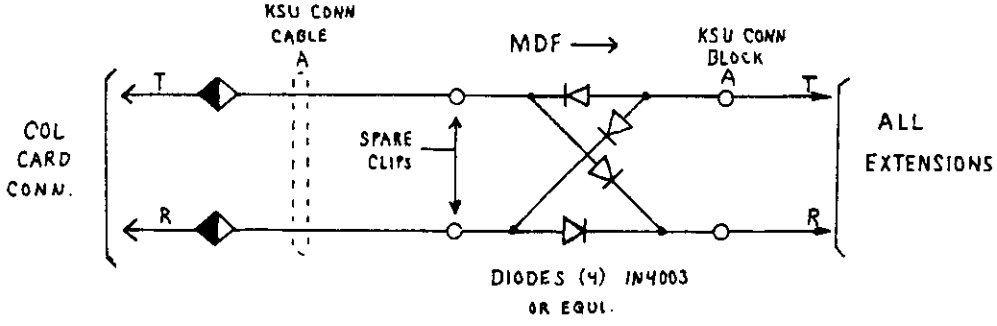


Figure 3 CO Line Polarity Guard

2.03 DIRECT CONNECTION to CO lines utilizing the COL-2 line card.

READ The following information applies to FCC Registered equipment only. The COL-2 line card must be installed in accordance with FCC requirements governing equipment that incorporates "protective circuitry" (Ref. ENG BULLETIN 78-013). An ENG BULLETIN will be issued when the COL-2 is available and authorized for DIRECT CONNECTION by the FCC.

a. The COL-2 line card is a new line card developed for OMEGA II KTS incorporating "protective circuitry" as defined by FCC rules/regulations concerning DIRECT CONNECTION. The COL-2 line card provides transformer isolation between the network interface and OMEGA II KTS. Local system battery is used for talk supply on the extension voice circuit. Direct ringing is used for CO incoming signalling, no 20-30 hz ringing is available on the equipment side of the isolation transformer. CO incoming signalling by means of loud ringing bells or similar devices will be covered under an APPLICATION BULLETIN.

READ

b. The COL-2 cannot be installed in the FCC Registered BT 1530-3 KSU until two (2) installer straps are made on each CO Line card connector.

- The installer must remove one connection on pin 13 and pin 15 on the CO line card connector that is a part of KSU CONN CABLE A (and/or B) wire harness and strap the wire to pin 18 and pin 17 (respectfully) of the connector.

- Table B indicates the wire color coding for each CO line card connector that must be installer strapped.

c. Connection to the TELCO network interface is made through a cable assembly that is registered as a part of the OMEGA II system. This connectorized cable is used with the TELCO type (USOC CODE) RJ21X standard connector. No terminal blocks can be used between the RJ21X unless they are registered with the FCC as part of the system. Since rearrangement of the CO lines can be accomplished on the MDF (station) side of the KSU, no cross-connect blocks will be initially registered as part of the OMEGA KTS. Any subsequent registration will be announced by an ENG BULLETIN.

d. Figure 4 illustrates the CO line circuit when the COL-2 is DIRECT CONNECTED.

e. In event of power failure, the BT 1530/2250 extensions cannot initiate or receive CO Line calls unless telephone instruments are provided on the TELCO side of the isolation transformer in the COL-2. The telephone instruments for use during power failure can either be TELCO or customer provided. If customer provided instruments are used, the telephones should be FCC registered and connected to the CO by modular jacks or any other standard means of connection.

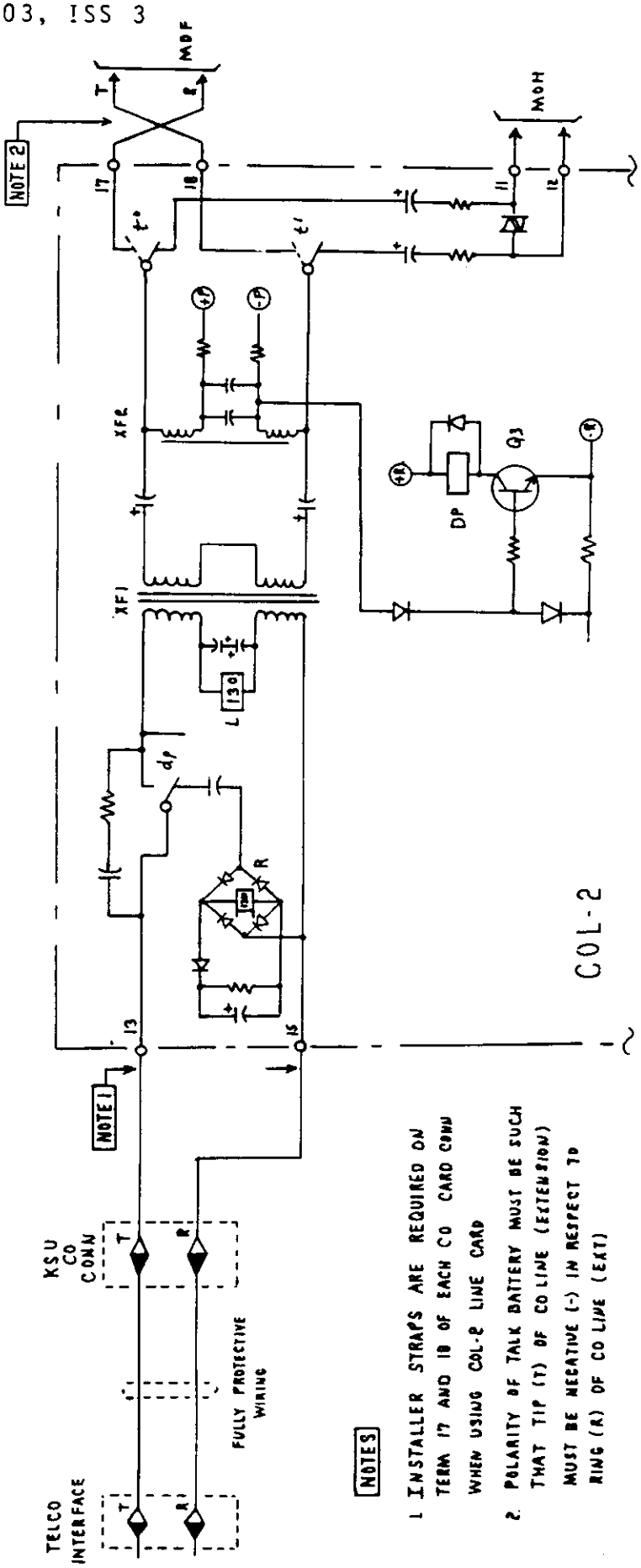


Figure 4 COL-2 CO Line Circuit

3.02 Connection to the TELCO type STC Voice Connection Arrangement

a. The COL or UCOL CO line card can be used for connection to the TELCO type STC VCA. Three (3) conductors are required for each STC used. A connector (Cinch type DA-51225-1 or equi.) must be provided for use with some types of STC VCA.

b. Both the COL and UCOL CO Line card must be strapped to correspond to the STC signalling requirements. FIGURE 6 illustrates the correct strap position for each type card. To prevent possible damage to the card, it is recommended that the strap options of each card be inspected before it is placed in service.

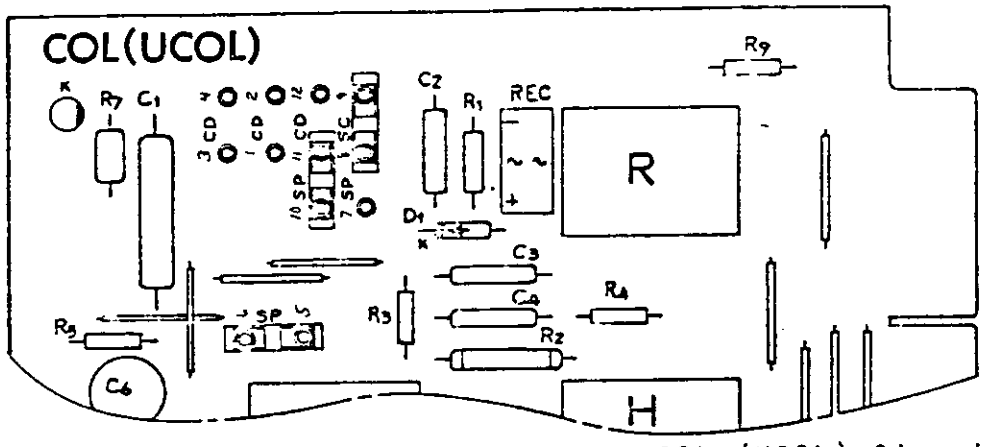


Figure 6 Strapping Option on COL (UCOL) Circuit Card for STC Connection

c. Connection of the STC type VCA to the BT 1530 KSU:

- When using the BT 1530-1 KSU, the installer cross connects the CT,CR, and RUI terminal of each VCA to the respective terminals for the CO Line appearance on the KSU CO LINE TERMINAL BLOCK A-C on the rear of the KSU.

- When using the BT 1530-3 KSU, the installer connects the CT/CR terminals of each VCA through an amphenol ended cable to the respective CO Line on the KSU in accordance with TABLE A. In addition, the installer must strap between RUI of the VCA to Pin 10 of the respective CO Line card connector.

d. FIGURE 7 illustrates the CO Line circuit when using the STC type VCA.

READ When using the BT 1530-1 KSU and the UCOL line card for CD-9/C2A type VCA, the installer must remove a strap between pin number 10 to pin number 21 on each CO Line card connector.

- When utilizing the BT 1530-3 KSU, the installer connects the CT/CR of each VCA to the KSU amphenol connector in accordance with TABLE A. In addition, the installer must strap the connections indicated in FIGURE 9 for each VCA to the pin numbers indicated on the respective CO Line card connector.

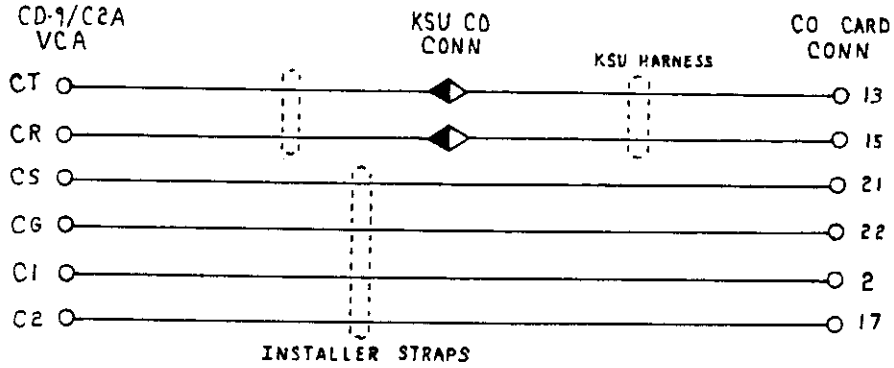
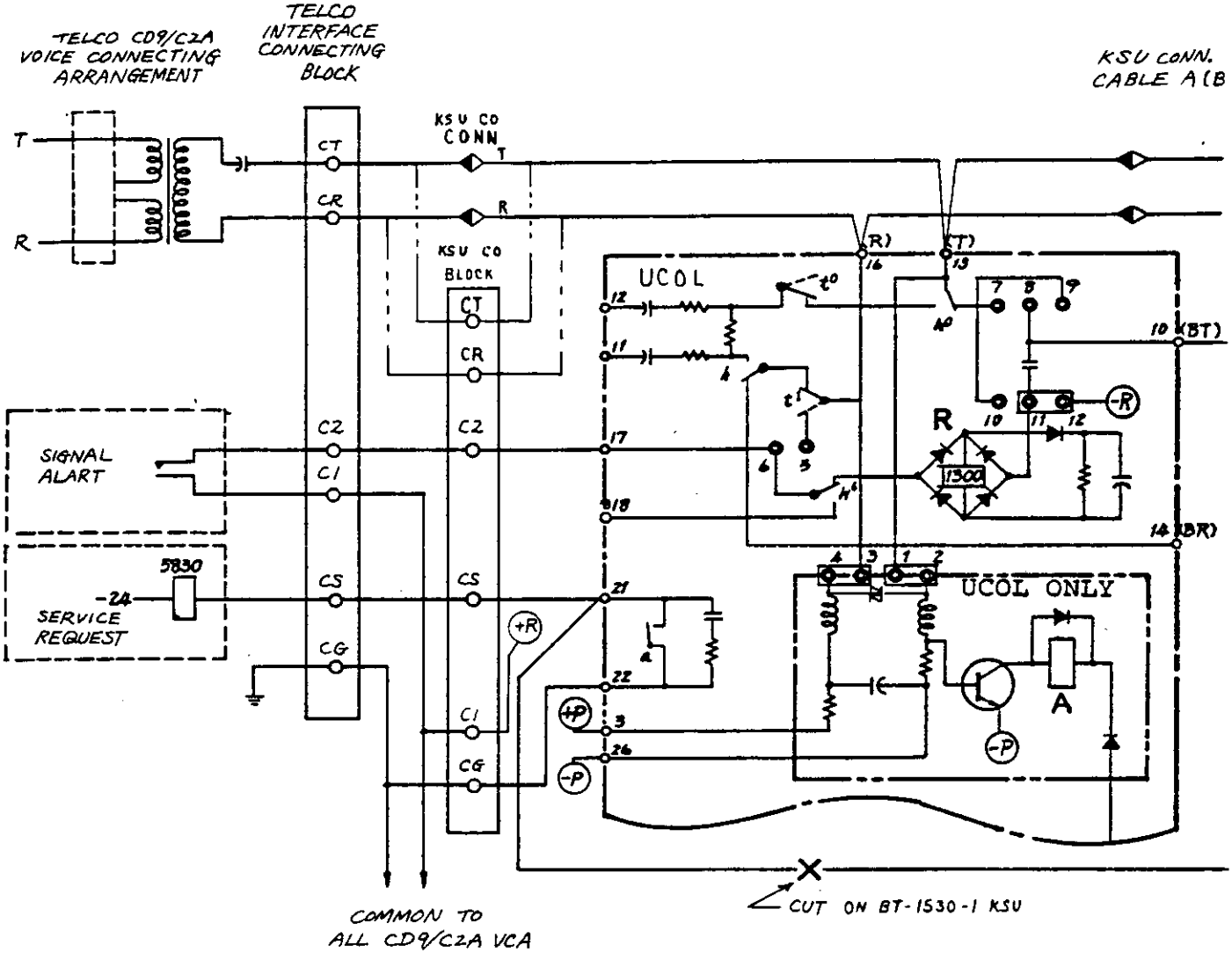


Figure 9 Installer Straps for CD-9/C2A Operation

d. FIGURE 10 illustrates the CO Line circuit when using the C2A/CD-9 type VCA



NOTE ON BT1530-3 KSU, STRAPS ARE REQUIRED BETWEEN C2, C1, CS, + CG OF VCA TO RESPECTIVE PIN NUMBERS SHOWN ON UCOL CARD CONNECTOR.

Figure 10 CO Line Circuit - CD-9/C2-A Connection

OMEGA PHONE II

BT-1530/2250 KEY TELEPHONE SYSTEM

INSTALLATION OF OPTIONAL KSU ASSEMBLIES

1.00 INTRODUCTION

1.01 This section covers installations of optional KSU assemblies. Reference should be made to Section 2006-Installation of Optional Station Equipment-when corresponding equipment must be installed in the associated extensions for operation of the optional features.

2.00 INSTALLATION OF OMEGA-TONE RECEIVER (OTRU)

2.01 The Omega-Tone Receiver Unit consists of two individual circuit cards, the Tone Detector circuit card (RCV) and the Tone Decoder circuit card (RCD).

2.02 Prewired card files on the KSU are supplied as standard. No modifications of the KSU wiring is required for addition of the OTRU to the system.

2.03 Each OTRU is factory supplied, pre-tuned to detect the standard MF tone signals. Care should be taken to prevent damage to the circuit cards during handling and installation. The cards should be inserted into the KSU card files only when the power switch is in the OFF position to prevent possible damage to the circuits.

READ

2.04 Because of the precise adjustment requirements for MF tone signalling discrimination, it is suggested that in case of difficulty, the OTRU circuit cards be returned to the supplier for maintenance. Spare circuit cards should be carried in inventory for servicing of defective equipment.

3.00 INSTALLATION OF INTERCOM LINES THREE (3) AND FOUR (4)

3.01 Intercom Lines Three (3) and Four (4) can be added to the standard BT1530 KSU by insertion of the standard Intercom Line Card (ICL) into the prewired card files on the KSU. No modification of existing KSU wiring is required when expanding the number of Intercom Lines.

3.02 Intercom Lines Three (3) and Four (4) P1, P2, P3, and P4 connections appear on KSU TERMINAL BLOCK C. Extension (branch) cables must be cross connected to KSU TERMINAL BLOCK C for operation.

3.03 Extension Telephone line keys must be modified for operation on the third and fourth Intercom Lines. Refer to Section 2005-Installation of Station Equipment-for required station modifications.

READ

3.04 Extension (branch) cable connections to ICM 3 and ICM 4 at KSU TERMINAL BLOCK C are different for the BT1530 and 2250 telephone. Consult Table A and B, Section 2005 for wiring color codes for each type of telephone.

4.00 INSTALLATION OF THE MUSIC-ON-HOLD (MOH) CIRCUIT CARD

4.01 The Music-on-Hold (MOH) circuit card provides background music/program source to the holding party on the CO Lines. Any standard FM tuner/tape deck high impedance output can be connected to the MOH input.

READ

4.02 When the Music-on-Hold (MOH) circuit card is added to a standard BT1530 KSU, a wiring harness strap across the MOH PC connector TERMINALS 15-16 must be cut in order for the MOH to operate. Any BT1530 KSU placed in service without the MOH unit installation should be wired with the strap across TERMINALS 15-16 in order to prevent cross talk during the "Hold" interval.

4.03 A high/low impedance strapping option is provided on the MOH circuit card. The high impedance input is 10 Kohm while the low impedance input is 600 ohm. Input sensitivity is - 10db.

4.04 A Volume Control is provided on the front of the MOH circuit card to adjust the MOH level. Maximum level on the individual CO Lines is - 8dbm average for a 3 second period measured at the CT-CR terminal of each CO Line when VCA's are used. In practice, the MOH level should be such to insure no crosstalk between lines.

4.05 Standard "Phono" jack audio connectors are provided for connection of the MOH input to the Music Source. A standard "Phono" plug such as the Switchcraft type 3502 can be used.

4.06 If the same Music Source is used for BGM through the PA system, the MOH input can be bridged to the Music Source (BGM) Input. Care should be taken to insure that the source impedance are the same (both high impedance) for the MOH and Music Source Input.

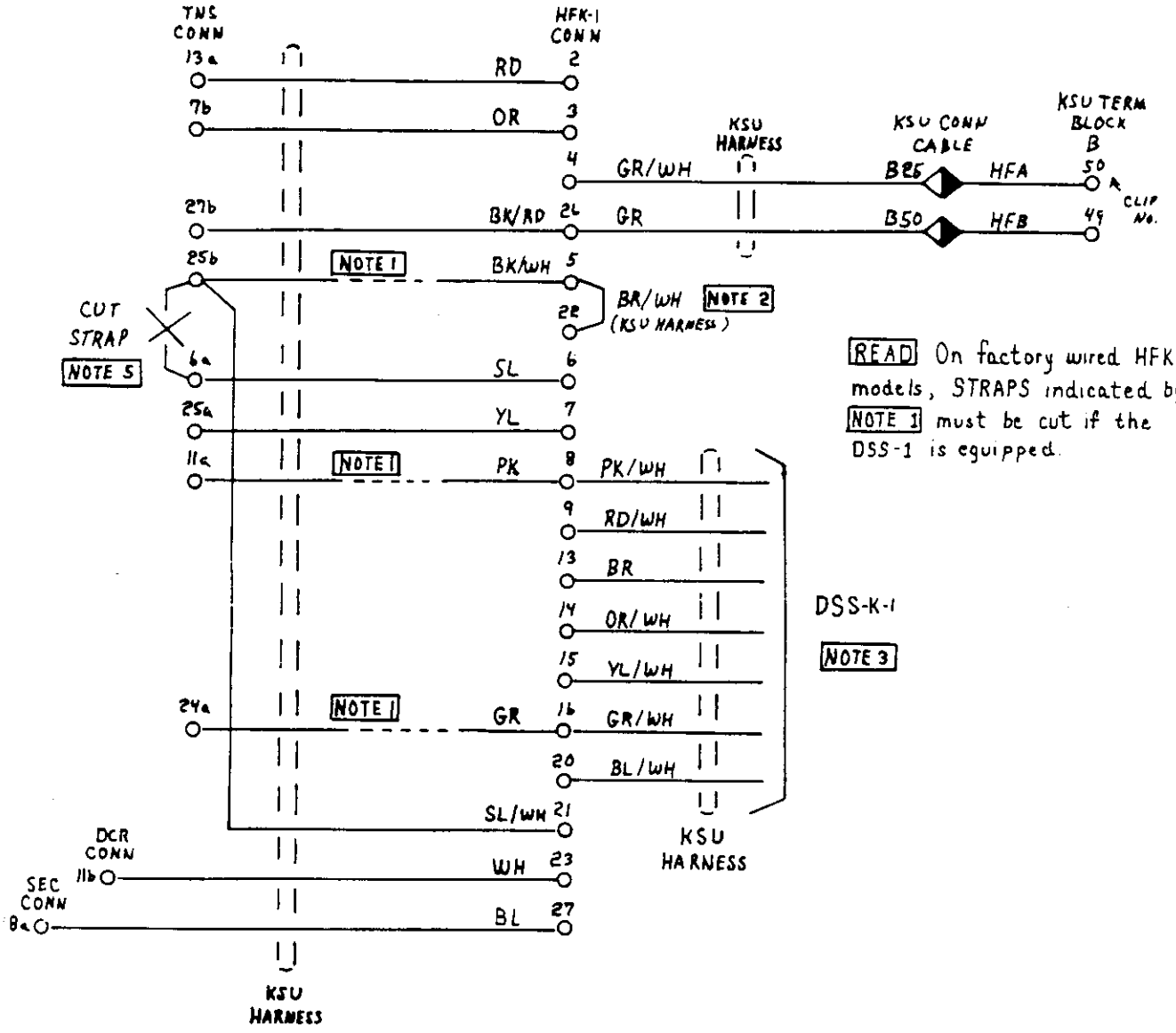
4.07 Spare contacts are provided on the MOH control relay for control of Music Source start/stop. The SPC Terminal on the rear panel of the KSU is provided for connection of the Music Source Control leads. The AC Line Voltage for the Music source should not be switched on/off by these contacts, as high voltage circuits could cause system noise and misoperation. Refer to Section 4002; BT1530 KSU Wiring Diagram for location of the MOH relay contacts on the SPC TERMINAL BLOCK.

5.00 INSTALLATION OF KSU HANDSFREE AMPLIFIER UNIT (HFK-1)

5.01 The KSU Handsfree Amplifier Circuit Card (HFK-1) is required when any Extension in the system will be equipped for "Handsfree Talkback" on Intercom/DSS calls. Once the HFK-1 circuit card has been added to the KSU, any number of Extensions can be equipped for "Handsfree".

5.02 Refer to Section 2006-Installation of Optional Station Equipment- for modification requirements on station equipment for operation with the "handsfree" (HF) feature.

5.03 Initial production models of the KSU Handsfree Talkback Amplifier circuit card HFK (Series 0) had no provision for handsfree talkback on DSS calls. The HFK-1 (Series 1) provides this feature. Since addition of the DSS call HF Talkback capability



READ On factory wired HFK models, STRAPS indicated by NOTE 1 must be cut if the DSS-1 is equipped.

NOTES

1. Required only when DSS Subsystem is NOT equipped
2. Required only when DSS Subsystem is equipped.
3. Required only when DSS Subsystem is equipped.
4. TNS SEC and DCR card connector is prewired.

READ 5. Strap on TNS connector MUST be cut any time HFK-1 is equipped.

FIGURE 1 HFK-1 CIRCUIT CARD INSTALLATION

NOTE On all production models of the BT1530 KSU after SEPT 77, the HFK-1 card connector will be factory wired. When HF Talkback is equipped, the Installer will be required only to insert the HFK-1 card and remove/connect certain straps depending upon system requirements. An Engineering Bulletin will be issued when such a change is implemented.

5.05 The HFK-1 amplifier circuit is factory adjusted for voice switching control functions. No adjustment is required when the HFK-1 is installed in a system. In case of difficulty,it is recommended that the HFK-1 circuit card be returned to the supplier for corrective measures.

READ

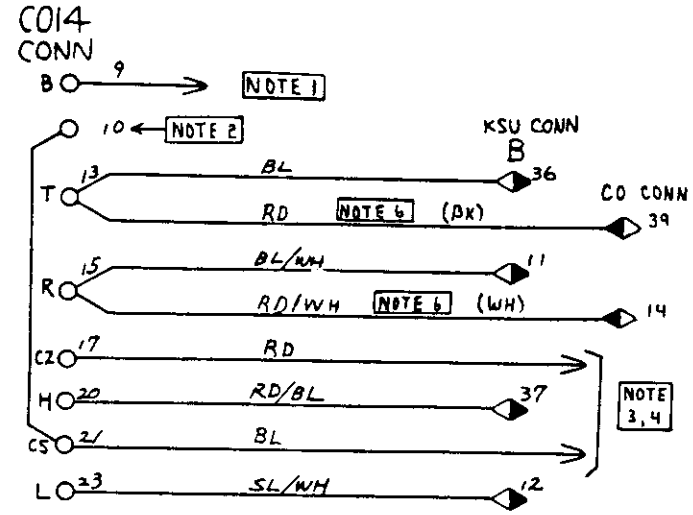
5.06 On any KSU previously modified for HF, the strap between TERMINAL 6a and 25b on the TNS circuit card must be reconnected if the HFK-1 circuit card is pulled from the KSU card file. Also, if the HFK-1 circuit card is returned for repair and no spare HFK-1 card is available, the strap should be installed teill the HFK-1 card is returned to service.

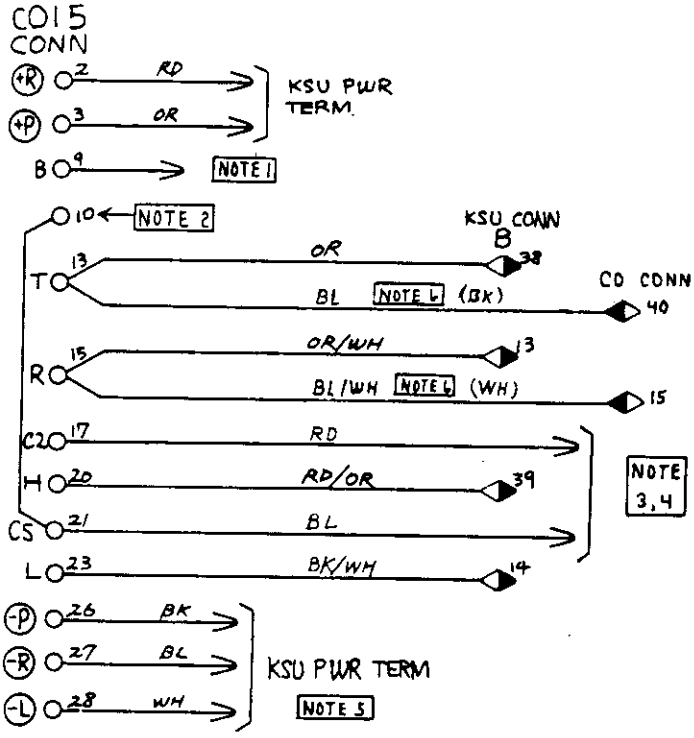
5.07 Tone Calling at HF equipped extensions

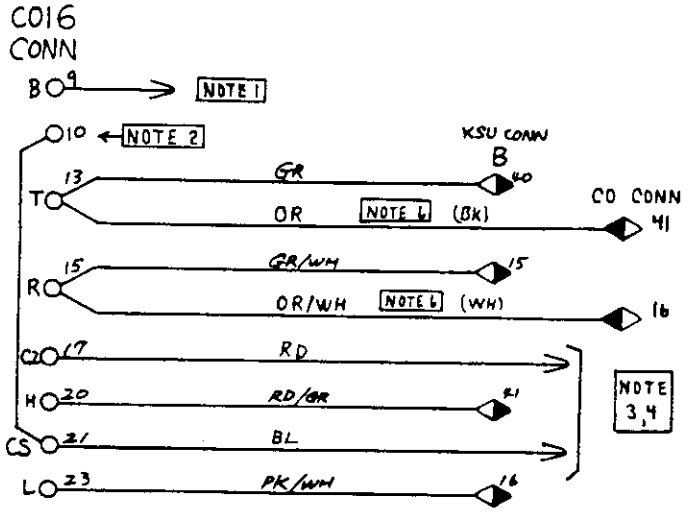
a. Provision is made for Tone Calling on the dial ICM Line(s) to HF equipped extensions. SHORTING BAR SB3 on the TNS circuit card must be arranged in accordance with the digit access set on the ICM register for Tone Calling. If Tone Calling is to be two (2) digit dial access, SB3 must be placed in the Tone (T) positions (this is the factory wired position). If Voice (HF) Calling is to be two (2) digit, SHORTING BAR SB3 as well as SB1 and SB2 on the TNS circuit card must be placed in the Voice (V) position.

b. At both HF and Non-HF equipped extensions, a warning tone is heard at the called extension when the HF Talkback (or Voice Calling) mode is accessed by the calling extension.

5.08 When HF Talkback is added to a system with DSS, precautions must be undertaken when assigning ICM dial codes - Refer to Section 2007; Para 3.10; Page 13 for details.







COLOR CHART			
BL	BLUE	SL	SLATE
WH	WHITE	OR	ORANGE
BK	BLACK	PK	PINK
RD	RED	GR	GREEN
YL	YELLOW	BR	BROWN

NOTES

1. Individual CO Incoming Audible, Strap to B1-B15 as per Section 2002: 6.00 if required.
2. Strap on all CO LINE CONN added when equipped for STC type Voice Connection Arrangement.
3. Refer to Figure 4, Connection of KSU CO Line Terminal Block D and E KTB Wiring Harness(BT 1530-1 KSU only).
4. All connecting wire for KSU COL 14-20 to KSU CO TERM BLOCK D and E are Provided on PCC harness assembly.
5. Connect Battey Lead of KSU Wire Harness only to CO Line Card Slot indicated.
6. On BT 1530-1 KSU, strap wire color indicated in parenthesis to CO Line TERMINAL BLOCK D (KTB).

Figure 3a

CO Line 14-16 Selective Wire Connections to KSU Wire Harness

6.04 Individual CO Incoming Audible Control leads (B1-B5) are connected to CO Line 14-20 as described in Section 2002; 6.07b. If no Individual CO Incoming Audible is required, all expanded CO Lines (14-20) are automatically connected to operate theommon CO Incoming Audible Control (BO).

6.05 Refer to Section 4002; BT2250 KSU Wiring Diagram for complete wiring diagram of CO Lines 14-20.

6.06 Refer to Section 2002; Basic KSU Installation; Table A for terminations on KSU CONN B and TERM BLOCK B for CO Lines 14-20.

READ

6.07 POWER SUPPLY PSB-1530 is not required when the BT1530 KSU is expanded to twenty (20) CO Lines when the extension capacity remains at thirty-two (32).

7.00 INSTALLATION OF THE EXTENSION EXPANSION (EEX-I) ASSEMBLY IN THE BT1530 KSU

7.01 The BT1530 KSU can be expanded to increase the number of extensions to a maximum of fifty-eight (58) by the addition of the EEX Extension Expansion Assembly. The EEX assembly consists of one EEX circuit card; one circuit card connector w/hardware; and KSU CABLE CONN D wire harness w/Amphenol connector. Wire wraps are used to establish connections.

7.02 Installation of the EEX-I

a. Mount the EEX circuit card connector in the card file marked EEX with the hardware provided.

b. Connections to the existing KSU wiring harness is required. Figure 5 illustrates cross connections required between the existing KSU wiring harness and the EEX card connector.

c. KSU CONN D Wire Harness must be installed alongside the existing KSU wire harness. Figure 6 illustrates the KSU CONN D wiring harness construction while Figure 6a illustrates the routing of the KSU CONN D wire harness along the existing wire harness of the KSU

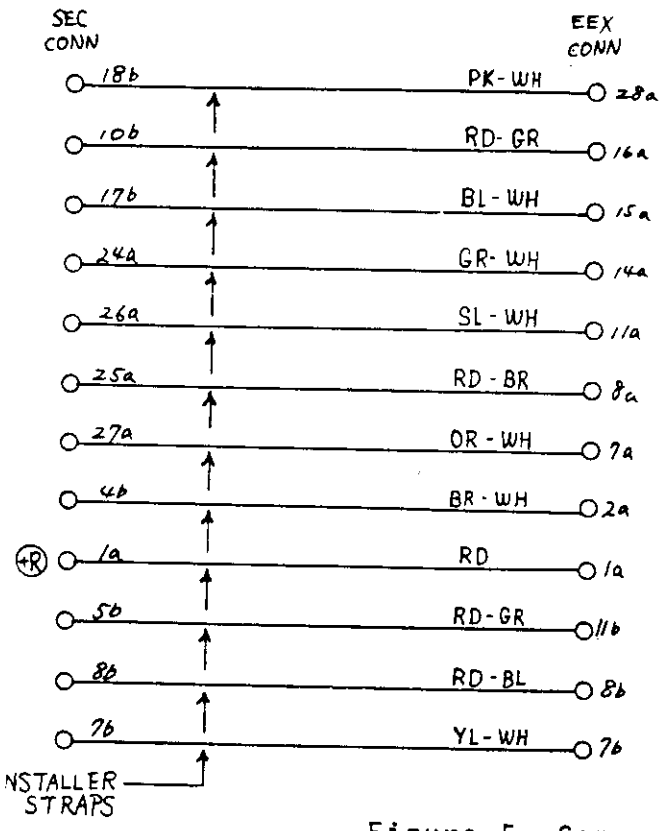


Figure 5 Connection of the EEX Card Connector to the Existing KSU Wire Harness

d. Care must be taken when installing the KSU CONN D wire harness to prevent damage to the harness when the KSU card cage is closed. Cable ties should be used to hold the new harness securely in place against the existing harness. KSU CONN D Amphenol connector should be mounted securely in place on the KSU Amphenol mounting bracket.

e. Connections on the KSU CONN D wire harness to the EEX-1 circuit card connector are shown in Figure 7. KSU CONN D Wiring Diagram is illustrated in Figure 8.

f. Mount, with the hardware provided, the EEX-1 POWER TERMINAL on the KSU back cabinet at the tapped holes located just above the KSU GROUND POST.

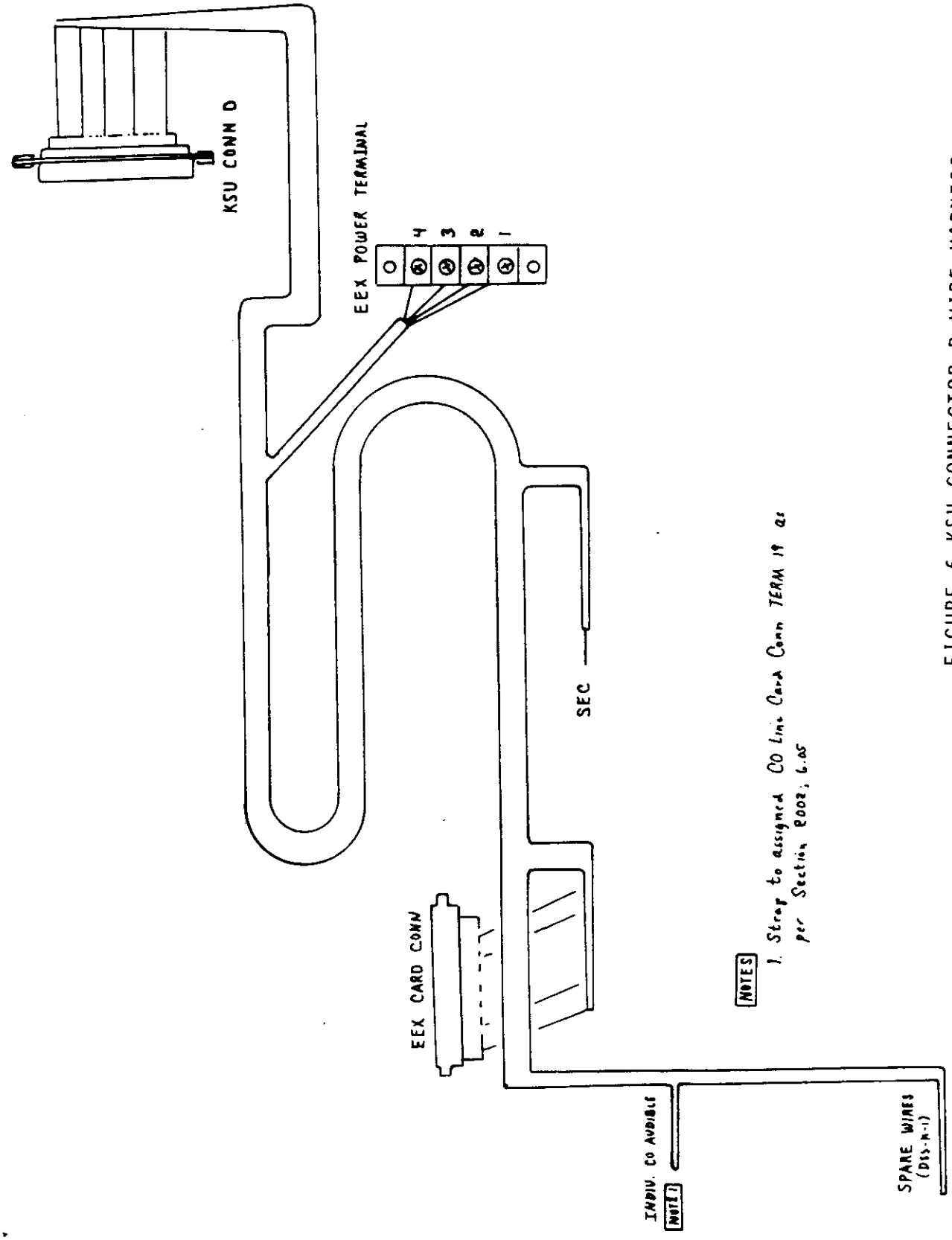


FIGURE 6 KSU CONNECTOR D WIRE HARNESS

B6-B15

EEX CONNECTOR D WIRING HARNESS				
FUNCTION	CONN PIN NO.	HARNESS CABLE COLOR	KSU TERMINAL CONNECTION	NOTE
EXTENSION Z51-Z82	26	BL / WH	EEX 9a	
	1	RD / WH	EEX 10a	
	27	OR / WH	EEX 12a	
	2	BK / WH	EEX 13a	
	28	GR / WH	EEX 5b	
	3	PK / WH	EEX 6b	
	29	BR / WH	EEX 10b	
	4	YL / WH	EEX 13b	
	30	SL / WH	EEX 4b	
	5	RD / BL	EEX 4a	
	31	RD / OR	EEX 3a	
	6	RD / BR	EEX 2b	
	32	RD / GR	EEX 1b	
	7	RD / SL	EEX 5a	
	33	BL / WH	EEX 6a	
	8	RD / WH	EEX 3b	
	34	OR / WH	EEX 24a	
	9	BK / WH	EEX 15b	
	35	GR / WH	EEX 25a	
	10	PK / WH	EEX 9b	
	36	BR / WH	EEX 27a	
	11	YL / WH	EEX 14b	
	37	SL / WH	EEX 26a	
	12	RD / BL	EEX 23a	
	38	BK / RD	EEX 19a	
	13	YL / RD	EEX 22a	
B6	39	BL / WH	INDIV CO INCOMING	Nt. 1
B7	14	RD / WH		
B8	40	OR / WH		
B9	15	BK / WH		
B10	41	GR / WH		
B11	16	PK / WH		
B12	42	BR / WH		
B13	17	YL / WH		
B14	43	SL / WH		
B15	18	RD / BL		
SPARE	44	BL / WH	SPARE	Nt. 3
	19	OR		
	45	BL		
	20	RD / WH		
	46	OR / WH		
	21	BK / WH		
LAMP BATTERY (+L)	47	YL	EEX PWR TERMINAL	Nt. 2
	22	YL		
	48	YL		
	23	YL		
	49	YL		
	24	YL		
	50	YL		
	25	YL		

COLOR CHART	
BL	BLUE
RD	RED
OR	ORANGE
BK	BLACK
GR	GREEN
PK	PINK
BR	BROWN
YL	YELLOW
SL	SLATE
WH	WHITE

Nt 1 Connect to CO Line PCC Connector Terminal 9 at each CO Line assigned for Individual Incoming Signal Control.

Nt. 2 Connect to SPC Power Terminal (+L) Lamp Battery for operation with the PSB-1530 Power Supply.

Nt 3 These leads may be assigned to DSS-K-1 Functions. Refer to Section 2007, 3.00

Figure 7 KSU CONNECTOR D Wire Harness

7.04 Table B shows KSU CONN D color code and terminal assignment at the MDF. A fourth (4th) twenty-five (25) pair cable (or binder) is required to connect the KSU CONN D to the MDF. KSU CONN D terminates at KSU TERM BLOCK D on the MDF.

7.05 KSU CONN D wiring harness provides ten (10) additional Individual Incoming CO Audible Control leads (B6-B15) as well as six (6) additional spare KSU lead-ins for optional functions. The Individual Incoming CO Audible Control leads (B6-B15) are connected to the CO Lines as described in Section 2002; 6.00 are left bundled for future use. The spare lead-in wires on KSU CONN D should be bundled for future use.

7.06 Individual "Z" leads of the expanded extensions are cross connected to KSU TERM BLOCK D for assignment of dial codes in accordance with the dial codes listed in Table B.

READ

7.07 The Auxilary Power Supply PSB-1530-1 is required when the EEX-1 circuit card is equipped on the system KSU and the number of operating extensions exceed thirty-two (32). Any dial code numbers derived from the EEX circuit card used for special features such as Zone Paging (ZPA-B) or group calling do not necessitate use of the PSB-1530-1 Power Supply Thirty-two (32) is the limit of extension telephones that can operate primarily on the PSA-1530-1 Power Supply.

READ

7.08 When KSU CONN D is equipped, special consideration must be given to proper current distribution for Lamp Battery (+L) for the group of expanded extensions. Refer to Para. 8.02 for connection of the expansion extension Lamp Battery (+L) leads on KSU TERM D when the PSB-1530-1 is equipped.

8.00 INSTALLATION OF THE PSB-1530-1 POWER SUPPLY TO THE BT1530/ 2250 KSU.

8.01 The auxilary KSU Power Supply PSB-1530-1 provides additional Lamp Battery when the BT1530 (or BT2250) KSU is equipped with the EEX circuit card and system capacity exceeds thirty-two (32) extensions.

8.02 Figure 9 illustrates the connection of the PSB-1530-1 the BT1530/2250 KSU and Lamp Battery (+L) current distribution for all extensions.

READ

a. Care should be taken to insure that the PSB-1530-1 Lamp Battery is not connected in multiple with the Lamp Battery of the PSA-1530-1 Power Supply.

b. KSU CONN A and B provide a total of eight (8) Lamp Battery (+L) feeds while KSU CONN D provides an additional eight (8) Lamp Battery (+L) feeds.

c. Each Lamp Battery (+L) feed should be connected to not more than four (4) individual Extension (+L) leads. If branch cable terminates in a Distribution box, care should be taken to insure that the branch cable (+L) feed is not connected to more than four (4) extensions (+L) leads at the Distribution Terminal.

d. The following extension Lamp Battery (+L) connection assignments are recommended (as depicted in Figure 10).

- Extensions 11-18 and 21-28 are connected to KSU TERM BLOCK A.
- Extensions 31-38 and 41-48 are connected to KSU TERM BLOCK C (A1).

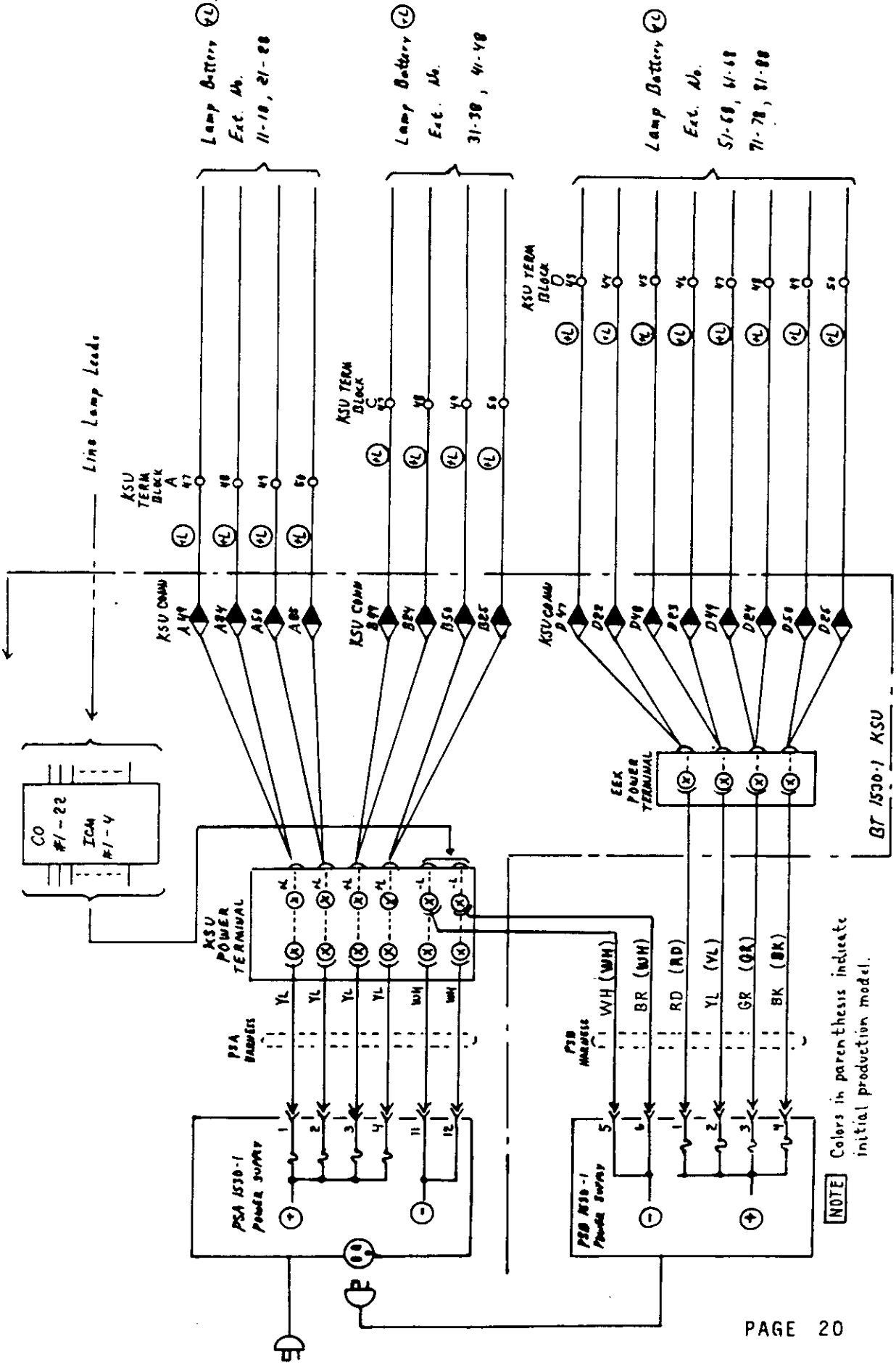


FIGURE 9 POWER SUPPLY PSB-1530-1 CONNECTION TO THE KSU AND EEX POWER TERMINAL

OMEGAPHONE II

BT-1530/2250 KEY TELEPHONE SYSTEM

KEY TELEPHONE INSTALLATION

1.00 GENERAL

1.01 The BT1530 and BT2250 Key Telephones provide thirteen (13) and twenty (20) CO Lines as well as two (2) Intercom Lines. Each telephone can be expanded to operate on up to four (4) Intercom Lines at the expense of two (2) CO Lines. Both telephone instruments provide the same standard and optional features, differing only in CO Line capacity. Each telephone can be installer programmed to meet individual system requirements.

1.02 Intercom tone or voice calling through the local station speaker is provided standard. A Volume Control, located on the base of the telephone, sets the extension voice/tone levels. A small electrical screw driver is required for adjustment.

1.03 When installed, the telephone instruments should not be placed in direct sunlight as the line lamp indicators may be difficult to visualize. Also, because of the various solid state circuits utlized within the instrument, the telephones should not be placed above any radiator or other heat source.

2.00 EXTENSION (BRANCH) CABLE CONNECTION TO THE MDF

2.01 Tables A and B list the BT1530/2250 Key Telephone lead designation and conductor assignment.

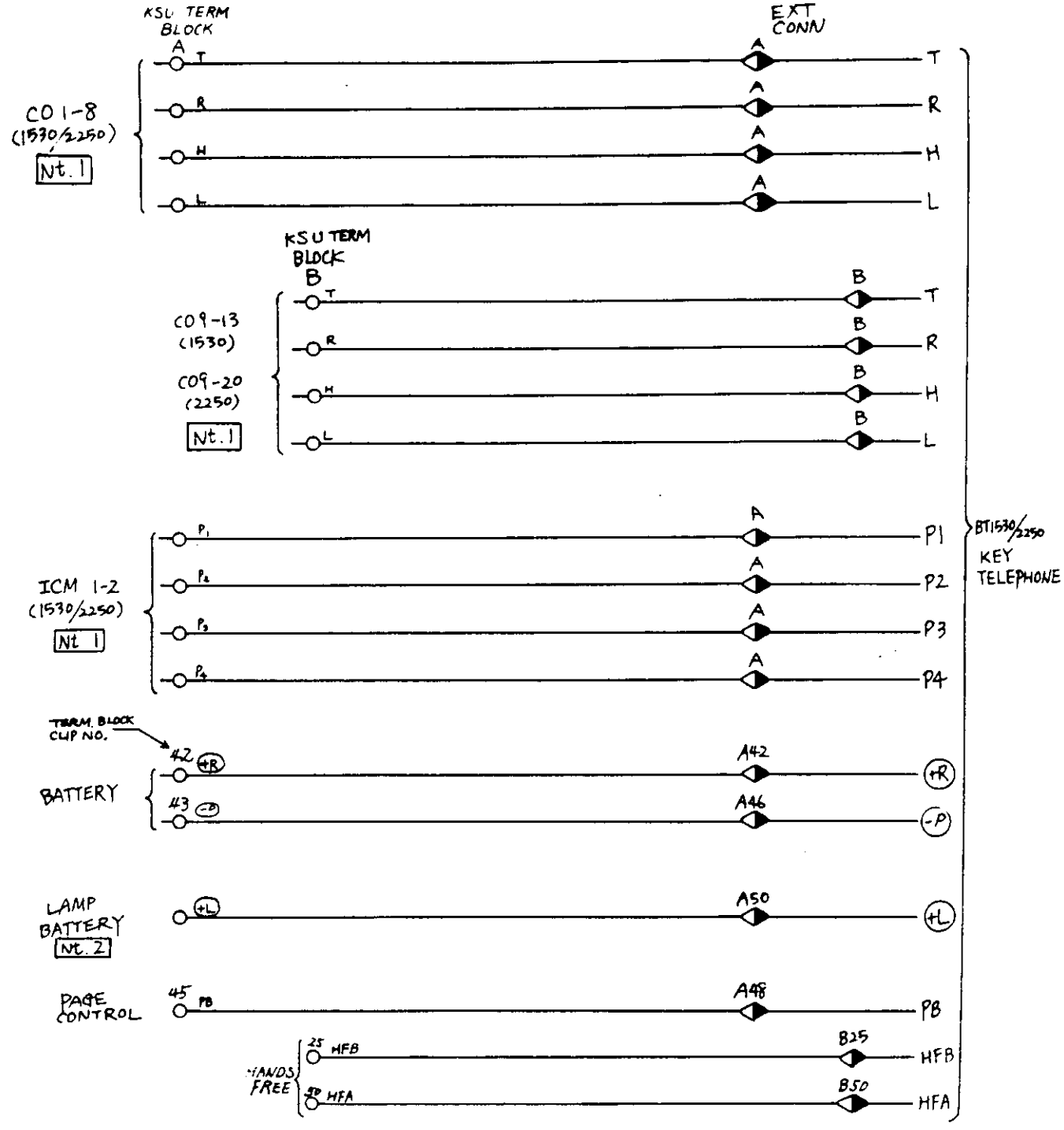
2.02 Table C lists the BT1530/2250 extension functions that are connected in multiple with their corresponding terminal at the MDF.

2.03 Table D lists the individual extension functions that require selective wiring or dedicated connection at the MDF. The selective connections required are determined by the features programmed for the individual extension.

2.04 Wiring Plans/Cable Requirements.

a. WIRING PLAN A: An individual BT1530/2250 Key Telephone can be connected to the MDF by a single fifty (50) pair telephone cable in instances when no additional telephones

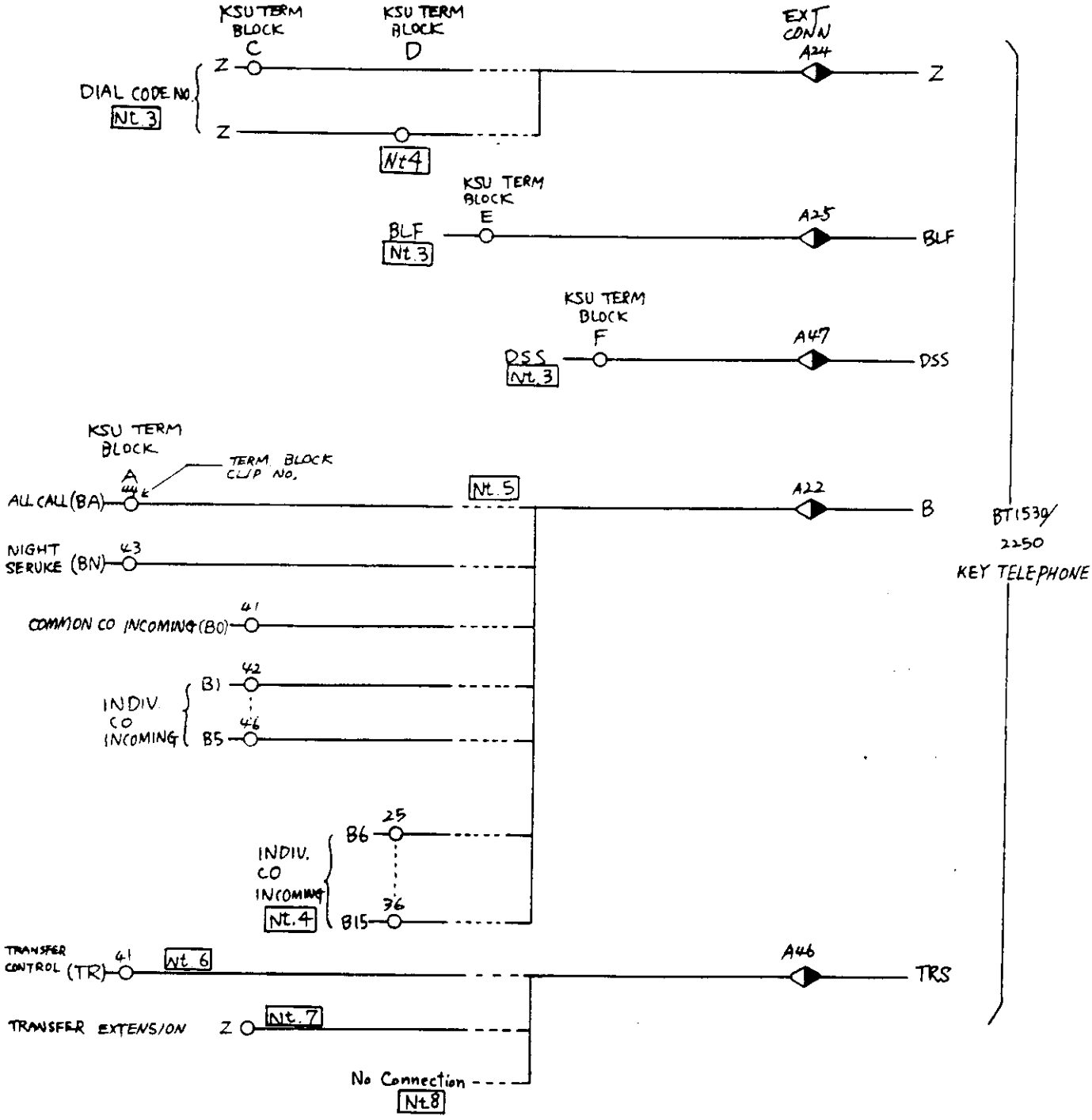
CONNECTOR A						CONNECTOR B					
FUNCTION	LEAD DESIG.	TAIL CABLE COLOR	CONN PIN NO.	HOUSE CABLE COLOR	NOTE	FUNCTION	LEAD DESIG.	TAIL CABLE COLOR	CONN PIN NO.	HOUSE CABLE COLOR	NOTE
COL 1	1T	BL	26	WH - BL		COL 9	9T	WH - BL	26	WH - BL	
	1R	OR	1	BL - WH			9R	WH - BK	1	BL - WH	
	1H	GR	27	WH - OR			9H	WH - YL	27	WH - OR	
	1L	BR	2	OR - WH			9L	WH - GR	2	OR - WH	
COL 2	2T	BL	28	WH - GR			10T	AZ - WH	28	WH - GR	
	2R	RD	3	GR - WH							



NOTES

1. Connections are determined by Pick up Key Terminal assignment per line.
2. Connect to (+L) Battery on KSU TERM BLOCK A, C, or D as described in Section 2002, 4.11.

Figure 1a Extension Multiple Connections at the MDF



NOTES

3. Terminal Assignment is determined by Dial Code No assigned to Extension.
4. Standard on BT2250 KSU, optional on BT1530 KSU.
5. Terminal Assignment is determined by function assigned to Extension. "B" lead.
6. Connect when Extension is wired to operate as Night Service Control.
7. Connect to Transfered Extension "Z" lead. Terminal Assignment is determined by Dial Code No assigned to Transfered Extension.
8. Do not terminate in multiple with other extension TRS lead. Insulate and bundle for future use.

Figure 1b Extension Selective Connections at the MDF

READ

b. WIRING PLAN B: When a Distribution Terminal Block is required, a fifty (50) pair cable can be used to connect the Distribution Terminal to the MDF if no PT2250 Key

CTOR B (2nd Binder)				CONNECTOR C (3rd Binder)					
CONN PIN NO.	CABLE COLOR	DISTR. TERM. CLIP NO.	Note	FUNCTION	LEAD DESIG.	CONN PIN NO.	CABLE COLOR	DISTR. TERM CLIP NO.	Note
26	WH - BL	1		DIAL CODE ASSIG.	Z-E1	26	WH - BL	1	#1
1	BL - WH	2			Z-E2	1	BL - WH	2	
27	WH - OR	3			Z-E3	27	WH - OR	3	
2	OR - WH	4			Z-E4	2	OR - WH	4	
28	WH - GR	5			Z-E5	28	WH - GR	5	
3	GR - WH	6			Z-E6	3	GR - WH	6	
29	WH - BR	7			Z-E7	29	WH - BR	7	
4	BR - WH	8			Z-E8	4	BR - WH	8	
30	WH - SL	9			Z-E9	30	WH - SL	9	
5	SL - WH	10			Z-E10	5	SL - WH	10	
31	RD - BL	11			Z-E11	31	RD - BL	11	
6	BL - RD	12			Z-E12	6	BL - RD	12	
32	RD - OR	13			Z-E13	32	RD - OR	13	
7	OR - RD	14			Z-E14	7	OR - RD	14	
33	RD - GR	15		BLF CONTROL	BLF-E1	33	RD - GR	15	#3
8	GR - RD	16			BLF-E2	8	GR - RD	16	
34	RD - BR	17			BLF-E3	34	RD - BR	17	
9	BR - RD	18			BLF-E4	9	BR - RD	18	
35	RD - SL	19			BLF-E5	35	RD - SL	19	
10	SL - RD	20			BLF-E6	10	SL - RD	20	
36	BK - BL	21			BLF-E7	36	BK - BL	21	
11	BL - BK	22			BLF-E8	11	BL - BK	22	
37	BK - OR	23			BLF-E9	37	BK - OR	23	
12	OR - BK	24			BLF-E10	12	OR - BK	24	
38	BK - GR	25			BLF-E11	38	BK - GR	25	
13	GR - BK	26			BLF-E12	13	GR - BK	26	
39	BK - BR	27			BLF-E13	39	BK - BR	27	
14	GR - BK	28			BLF-E14	14	BR - BK	28	
40	BK - SL	29		DSS CONTROL	DSS-E1	40	BK - SL	29	#4
15	SL - BK	30			DSS-E2	15	SL - BK	30	
41	YL - BL	31			DSS-E3	41	YL - BL	31	
16	BL - YL	32			DSS-E4	16	BL - YL	32	
42	YL - OR	33	Nt. 1		DSS-E5	42	YL - OR	33	
17	OR - YL	34			DSS-E6	17	OR - YL	34	
43	YL - GR	35			DSS-E7	43	YL - GR	35	
18	GR - YL	36			DSS-E8	18	GR - YL	36	
44	YL - BR	37			DSS-E9	44	YL - BR	37	
19	BR - YL	38			DSS-E10	19	BR - YL	38	
45	YL - SL	39			DSS-E11	45	YL - SL	39	
20	SL - YL	40			DSS-E12	20	SL - YL	40	
46	VI - BL	41			DSS-E13	46	VI - BL	41	
21	BL - VI	42			DSS-E14	21	BL - VI	42	
47	VI - OR	43		COMMON	B0	47	VI - OR	43	#5
22	OR - VI	44		INDIV. INCOMING	B1	22	OR - VI	44	
48	VI - GR	45			B2	48	VI - GR	45	
23	GR - VI	46			B3	23	GR - VI	46	
49	VI - BR	47			B4	49	VI - BR	47	
24	BR - VI	48			B5	24	BR - VI	48	
50	VI - SL	49		SPARE		50	VI - SL	49	
25	SL - VI	50				25	SL - VI	50	

ion Terminal Block Wiring Plan C

COLOR CHART	
WH	WHITE
BL	BLUE
OR	ORANGE
GR	GREEN
BR	BROWN
SL	SLATE
RD	RED
BK	BLACK
YL	YELLOW
VI	VIOLET

Notes 1. Equipped on BT-2250 KSU or BT-1530W/CO Line Expansion.

2. Connect to assigned Intercom Dial Code(2) at KSU TERM BLOCK C (or D if equipped).

3. Connect to assigned BLF terminal on KSU TERM BLOCK E at the MDF. Terminal on KSU TERM BLOCK E is determined by Dial Code assigned to corresponding extension.

4. Connect to assigned DSS terminal on KSU TERMINAL BLOCK F at the MDF. Terminal on KSU TERMINAL BLOCK F is determined by Dial Code assigned to corresponding extension.

5. Connect to Incoming CO Audible Control on KSU TERM BLOCK C at the MDF.

6. Δ indicates spare conductor that should not be utilized for any function.

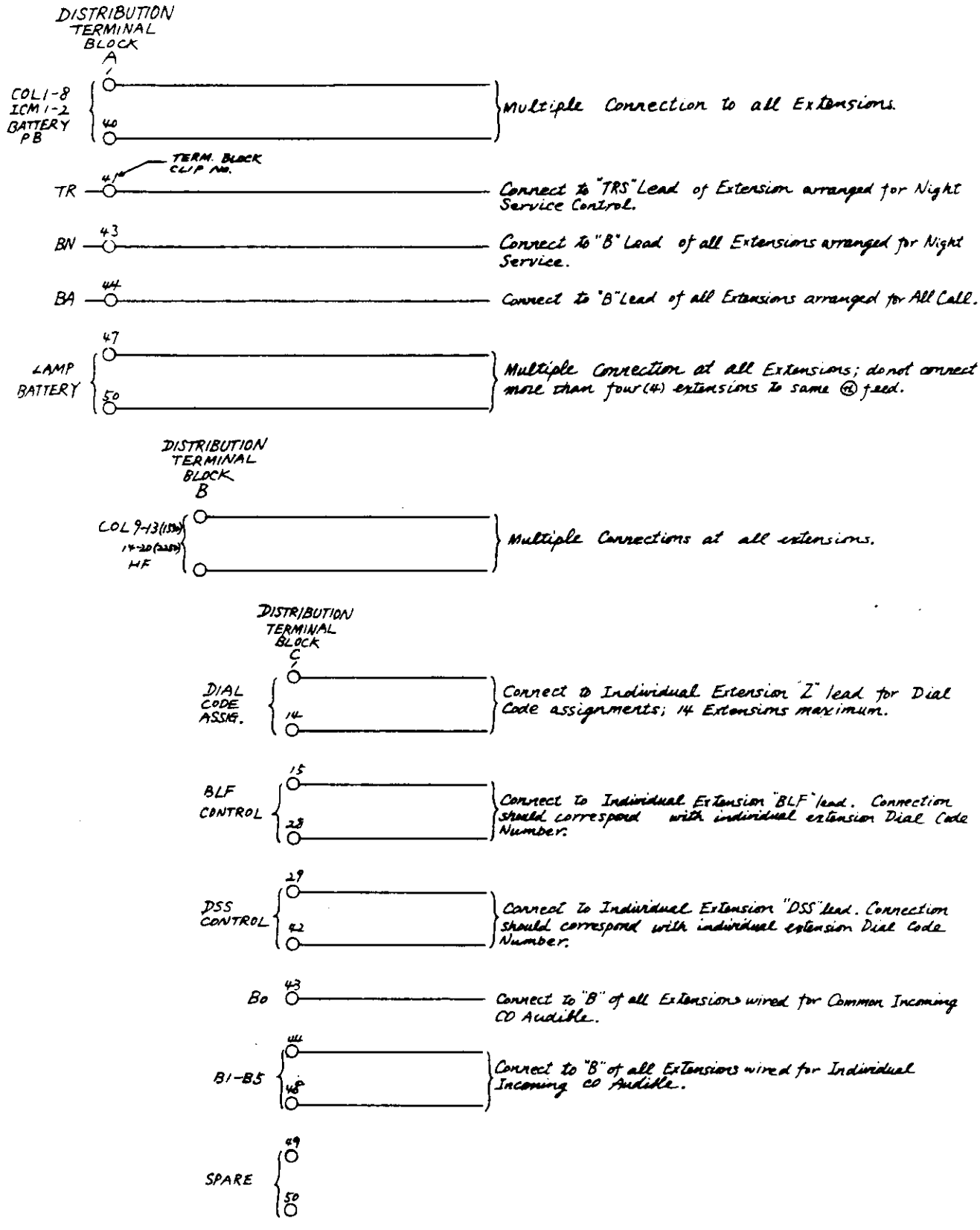


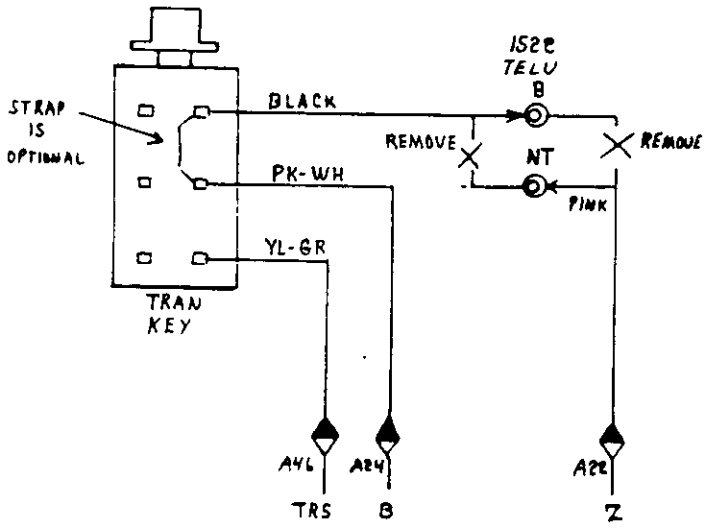
Figure 3b Connection of Extension Cable to Distribution Terminal, Wiring Plan C

8.04 Using the Extension TRAN Key to Operate the Night Service Feature (system without DSS).

a. The TRAN Key at any extension arranged for Incoming CO Audible can be wired to operate the Night Service. The TRAN Key is pressed and remains operated.

b. To operate the Night Service Feature, the following action is accomplished at the controlling extension:

- At the controlling extension circuit card, swap the connection at TERM "NT" and "B". Push-on type terminals are used.
- At the MDF, swap the "Z" lead (A24) and "B" lead (A22) connections on KSU TERM BLOCK C of the station cable that will control the Night service.
- Figure 5 illustrates the circuit at the extension(s).



1. Swap connections at TERM "NT" and "B" on extension circuit card
2. CONN A24 changes to "B" lead and CONN A22 changes to "Z" lead.
3. Swap extension A24 and A22 on MDF
4. Isolate extension TRS (A46) and connect to TR on KSU TERM BLOCK A.

FIGURE 5

MODIFICATION OF EXTENSION TRAN KEY FOR NIGHT SERVICE CONTROL

c. The controlling extension "TRS" lead (A46) is isolated from all other extension "TRS" lead and is connected to "TR" on KSU TERM BLOCK A on the MDF.

d. Any number of extensions can be wired to operate the Night Service. However, on such a case, all extensions' TRAN Key must be restored before Day Service can resume.

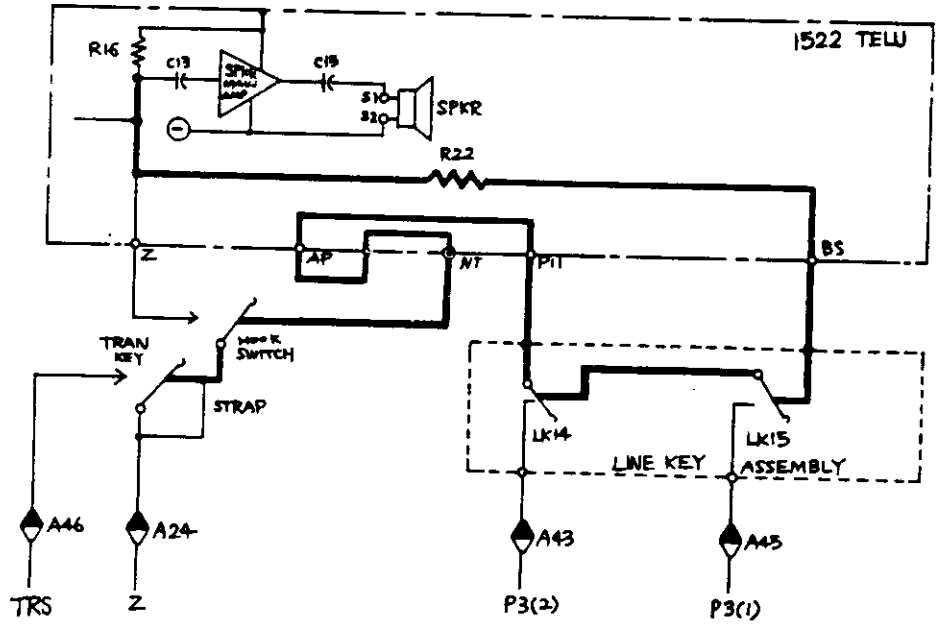
e. The TRAN Key of an extension CANNOT be wired for Night Service and ICM Transfer simultaneously since both functions use the extension "TRS" lead.

d. Intercom Three (ICM 3) and Four (ICM 4) are connected to the MDF at KSU TERMINAL BLOCK C. CO Lines 12 and 13 (1530) or 19 and 20 (2250) should be left connected at KSU TERMINAL BLOCK B as they may be used for special service such as private lines to individual extensions.

9.02 Hookswitch Bypass (Signalling a Busy Extension)

a. Each extension can be installer wired to receive incoming Intercom Line call indication when off-hook on a CO Line call. When off-hook on another Intercom Line, busy tone will be returned to the caller.

b. To bypass the extension hookswitch, Yellow wire on TERM BSA in the extension is connected to the station circuit card Terminal "BS". Figure 8 shows the revised wiring arrangement for Hookswitch Bypass. Note that the Extension "Z" function is routed through the Intercom Line Keys (LK14-15) and returns to the Extension Amp input.



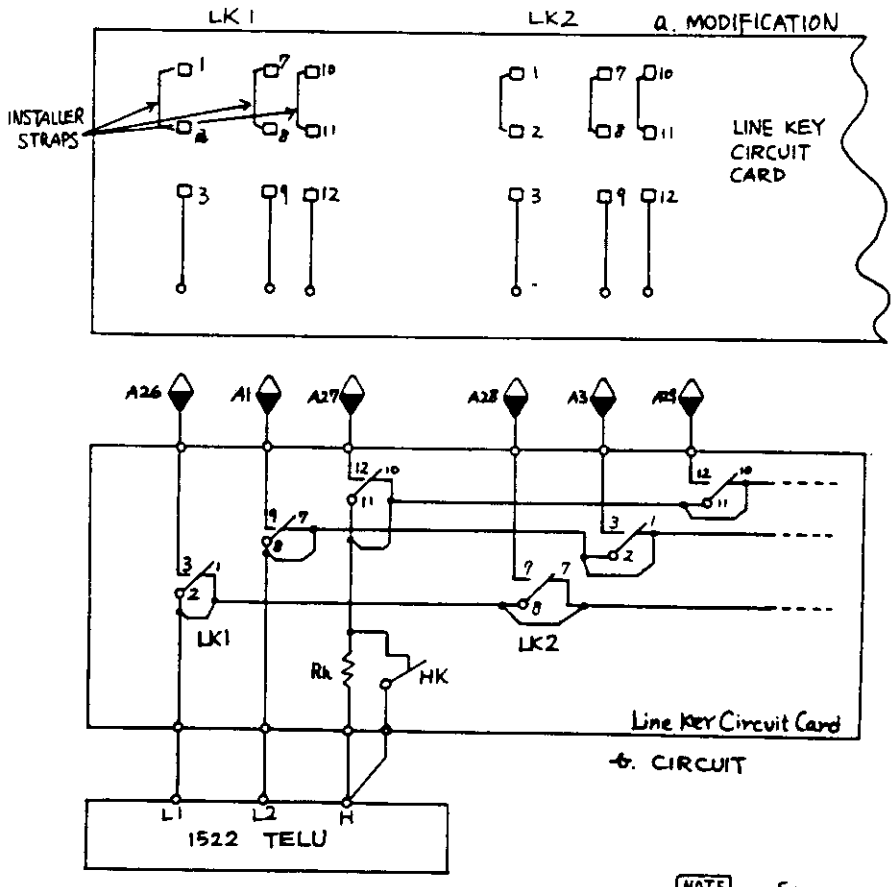
Note : Bypass circuit shown by heavy line.

Figure 8

Hookswitch Bypass Circuit

c. When the extension is called, the Tone (or Voice) calling will be heard through the extension speaker at a lower level so as not to disturb the conversation taking place.

9.03 Dial Restriction CO Lines



NOTE Strap only those Line Keys which are to be "Conferenced". Do not strap any Intercom (ICM) Line Keys or Line Key Thirteen (LK13) on the BT-1530 Telephone or Line Key Twenty (LK20) on the BT-2250 Telephone.

Figure 9 CO Line Conferencing Line Key Modification and Circuit

only if no other function is operated or if interference with another function can be tolerated.

c. Figure 10 illustrates the wiring modification for converting the TRAN Key for Mic cutoff.

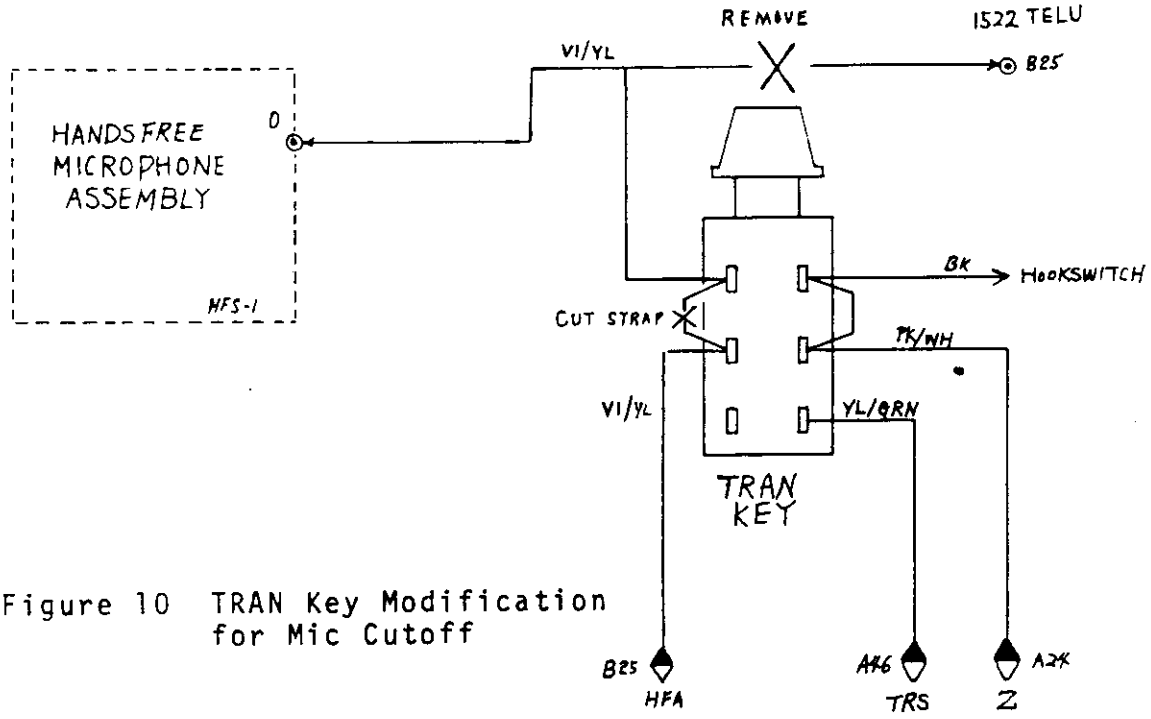


Figure 10 TRAN Key Modification for Mic Cutoff

d. Refer to Section 2006, 5.00 INSTALLATION OF HFS for familiarization with the HFS circuit operation.

9.06 Hookswitch Cutoff of the All Call/CO incoming Audible when Off-Hook

a. The All Call/CO Incoming Audible is factory wired to cut-off when the handset is taken off-hook. This eliminates the extension being called by the All Call or BGM on the station speaker while talking on a CO or ICM Line

b. At any extension that receives the Common CO Incoming Audible the hookswitch cutoff should be eliminated by removing the SHORT BAR strap at TERM J on the extension circuit card.

READ c. At any extension wired for private line service or Individual CO Incoming Audible, the cutoff may or may not be disabled depending upon user preference.

3.01 Any rotary dial model BT1530/2250 Key Telephone can be modified for push-button dialing by addition of the Omega-Tone Dial (OTD' Push-on connectors are provided for ease of installation. The OTD dial is installed in the same manner for extensions with or without the CO Line Privacy Unit (PRV).

3.02 Procedures for Installation of the OTD into a rotary dial telephone

a. After removing the telephone housing and accessing the extension 1522 TELU circuit card, remove the six (6) yellow wires from TERMINALS D1, D2, D3, D4, P4, 12 and the shorting bar at P2-P3 on the extension circuit card.

b. Remove the Rotary Dial and Mounting Plate assembly from the Dial Support Bracket by straightening the tabs that hold the Mounting Plate and lifting the dial out of place.

c. Install the Omega-Tone Dial on the Dial Support Bracket from the front by loosening the OTD mounting screw and inserting the OTD dial into the Support Bracket Keyway. Tighten the OTD mounting screws to hold the OTD securely in place.

d. Table A lists the OTD wire connections to the 1522 TELU circuit card.

TABLE A

OMEGA-TONE DIAL (OTD) CONNECTIONS TO 1522 TELU CIRCUIT CARD

Terminals on 1522 TELU	OTD Wire Color	OTD Terminals
P1	Yellow	P1
P2	Yellow w/Dotted Black	P2
P3	Yellow	P3
P4	Yellow w/Black Stripe	P4
12	Yellow	12
D1-D2	Strap w/Shorting Bar	

e. Figure 2 illustrates the circuit diagram of the OTD dial in BT1530/2250 Telephone network.

4.00 INSTALLATION OF WALL MOUNT ADAPTER (WOM)

4.01 Both the BT1530 and BT2250 Key Telephones can be modified for wall mounting by addition of the Wall Mounting Adapter (WOM). No change in the telephone hookswitch mechanism is required.

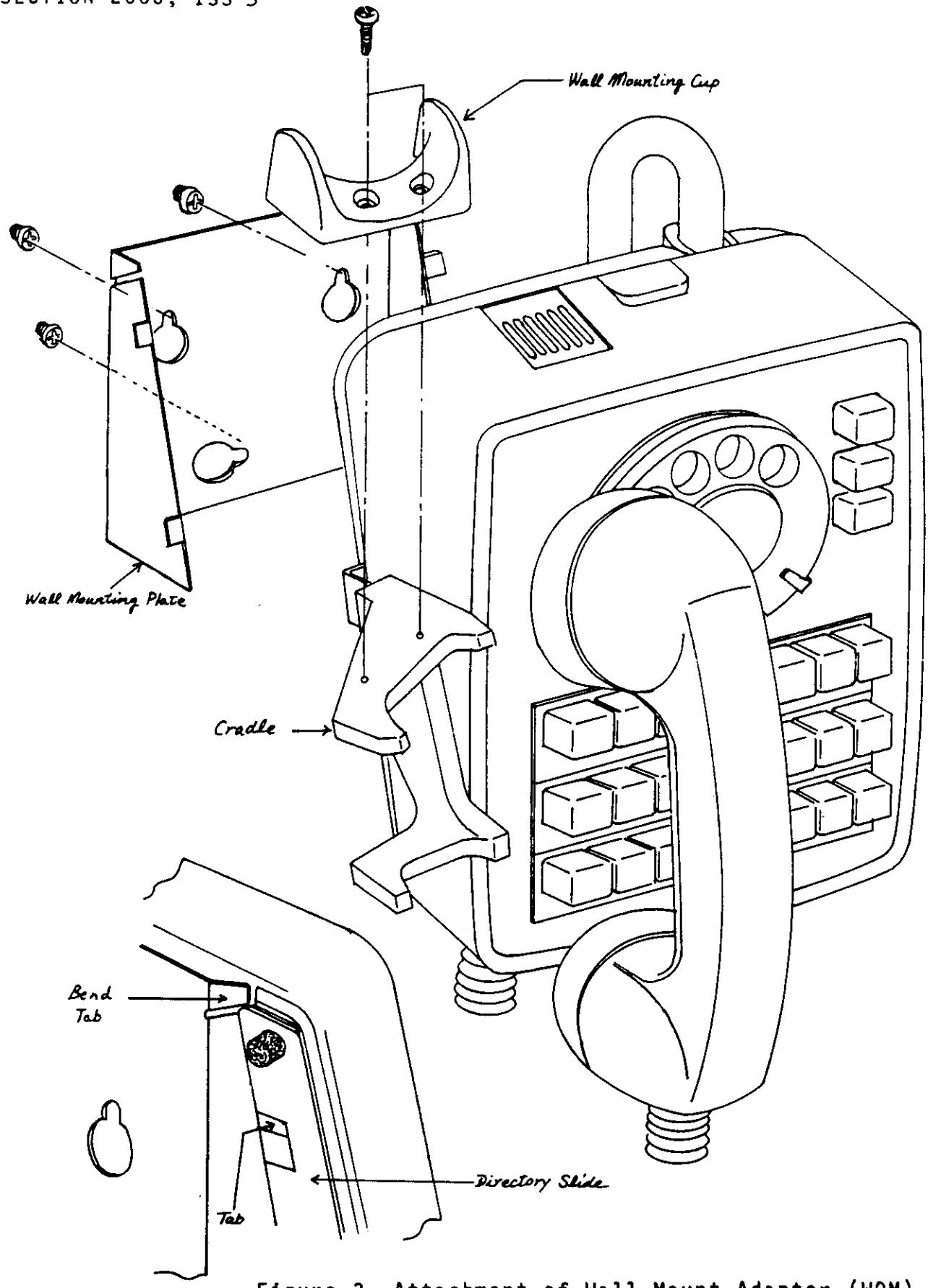


Figure 3 Attachment of Wall Mount Adapter (WOM) to BT 1530/2250 Telephone

CO Line "H" lead control through the extension hookswitch as well as proper operation of the extension Privacy Unit (PRV) if so equipped.

6.04 Installing the HJB in the BT1530/2250 extension.

a. Figure 1 illustrates the location of the HJB mounting posts on the base of the BT1530/2250 telephone. Attach the HJB bracket to the mounting posts with the screws provided.

b. On the BT1530/2250 Telephone housing, cutout indications are provided for the HJB Access holes. Remove the cutouts with a drill bit or round file.

c. Figure 5 illustrates the extension wiring modifications for Headset connection to the BT1530/2250 Voice Network.

7.00 INSTALLATION OF THE SPA-S LOUDSPEAKER TELEPHONE ADAPTER

7.01 The SPA-S provides a terminal strip for cross-connection of the BT1530/2250 Key Telephone network/control functions to various loudspeaker telephone adapters. Tone dial model telephones require replacement of the standard OTD-1 dial with the model OTD-S dial.

a. Figure 6 illustrates mounting of the spare Hookswitch Contact assembly in the telephone. Care should be taken to insure proper operation of the spare hookswitch contact.

b. Figure 7 illustrates mounting the SPA-S in the telephone.

c. Figure 8 illustrates connection of the SPA-S to the Northern Telecom COMPANION II handsfree telephone adapter.

d. Figure 9 illustrates connection of the SPA-S to the Precision Components 4A type handsfree telephone adapter.

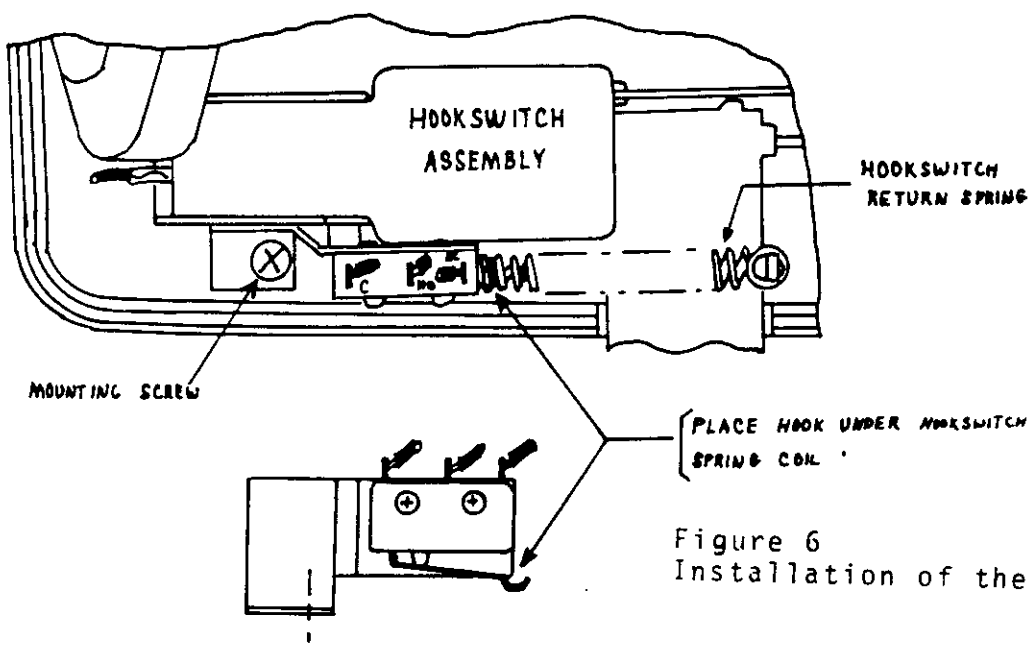
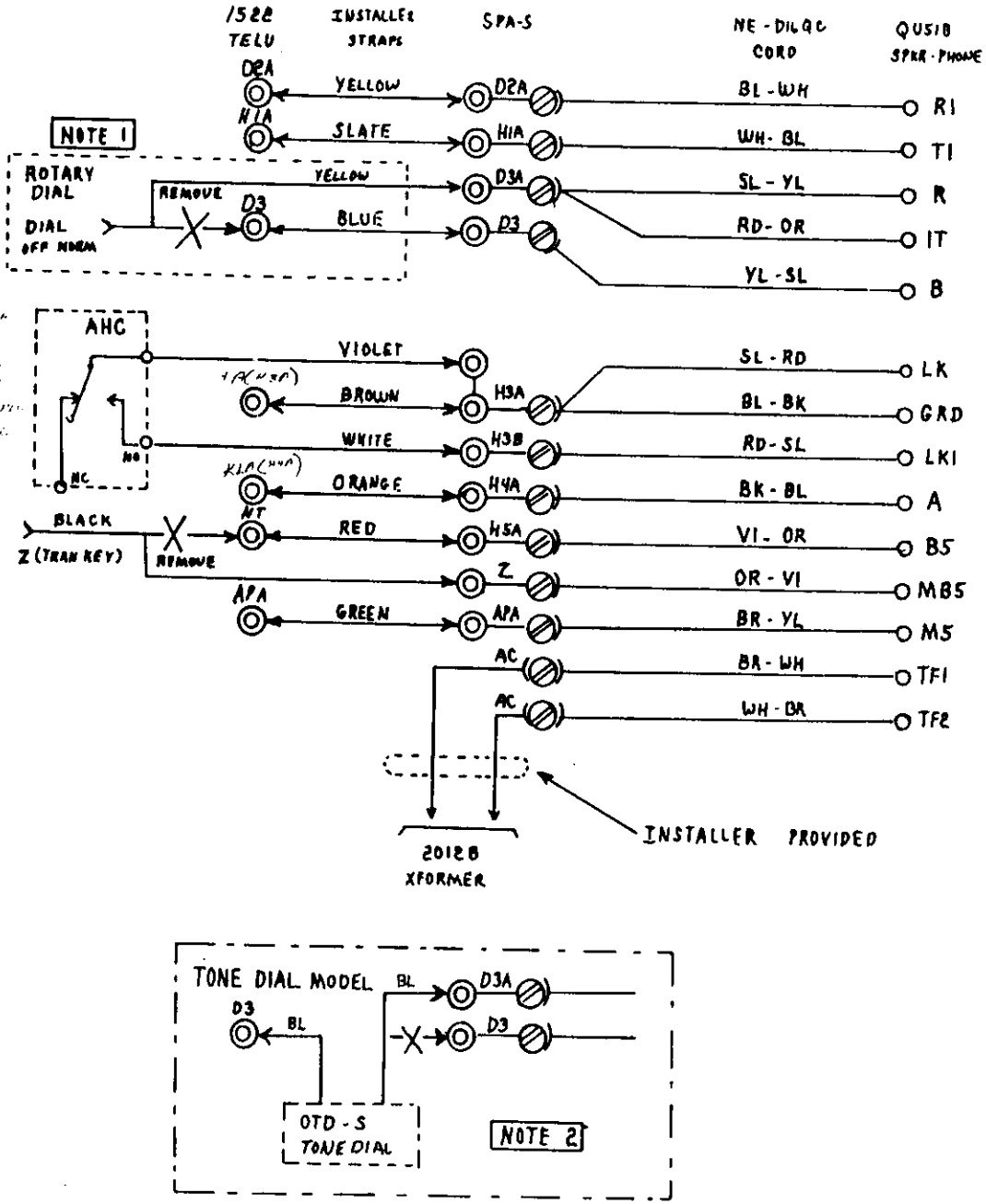


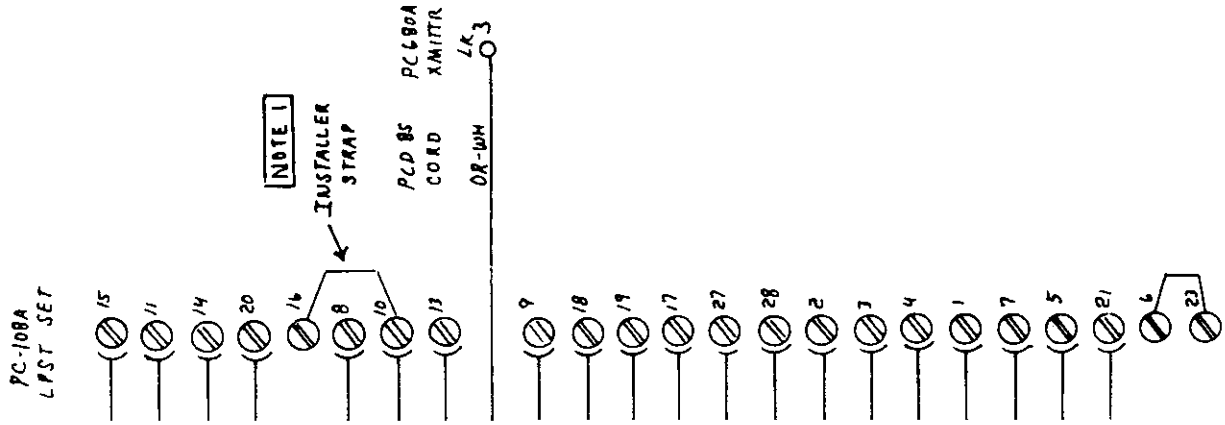
Figure 6
Installation of the AHC



NOTES

1. ON ROTARY DIAL MODELS, REMOVE YELLOW WIRE FROM D3 AND CONNECT TO D3A OF SPA-S.
2. ON TONE DIAL MODELS, CONNECT BLUE LEADS OF OTD-S DIAL TO D3 OF STATION AND D3A OF SPA-S
3. REMOVE BLACK WIRE FROM NT AND CONNECT TO Z OF SPA-S
4. INSULATE AND STORE CONDUCTORS OF DIL QC CORD NOT BEING UTILIZED

Figure 8 Connection of the SPA-S to the COMPANION II.


PC-108A
LAST SET
15
11
14
20
NOTE 1
INSTALLER
STRAP
16
8
10
PCD 85
CORD
13
PC690A
XMITR
LK3
OR-WH
9
18
19
17
27
28
2
3
4
1
7
5
21
6
22

8.00 Installation of the OTD-OP Outpulse Dial

8.01 The OTD-OP Outpulse Dial provides push-button dialing on rotary dial CO Line services. The OTD-OP is system battery powered, no effect is felt on voice transmission at the telephone extension equipped for outpulse. The OTD-OP can be installed in either a rotary or tone dial equipped station, a tone dial faceplate required when coverting rotary dial models. When outpulse dialing is utilized in place of tone dialing, no OTRU DTMF Tone Receiver is required for the KSU.

8.02 Installing the OTD-OP in the BT 1530/2250 Key Telephone

a. Preparation for installing the OTD-OP in a rotary dial model telephone.

- After removing the telephone faceplate and housing, remove the six (6) YELLOW and SLATE wires of the rotary dial from TERMINALS D1, D2, D3, D4, P4 and 12 on the station circuit card.

- Remove the rotary dial and dial mounting plate from the dial support bracket by straightening the two (2) metal tabs that hold the dial mounting plate in place and lifting out the dial assembly.

b. Preparation for installing the OTD-OP in a tone dial model telephone

- After removing the telephone faceplate and housing, remove the five (5) YELLOW wires on TERMINAL P1, P2, P3, P4 and 12 on the station circuit card.

- Remove the tone dial by loosening the two (2) screws that hold the dial to the dial support bracket and lifting the tone dial out of place.

- Remove the SHORTING BAR across TERMINAL D1-D2 and connect across TERMINALS P2-P3

c. Installing the OTD-OP in the telephone

- Table B lists the OTD-OP wire connections to the station circuit card

TABLE B

OTD-OP DIAL CONNECTIONS TO K22 TELU CARD		
TERM (1533 TELU)	OTD-OP WIRE COLOR	OTD-OP TERMINAL
D1	Yel w/Blk	D1
D2	Yel	D2
D4	Slate w/Rd	D4
P4	Slate	P4
12	Slate w/Dotted Rd	P4
H4A (LKA)	Red	⊕
⊖	Black	⊖

- Mounting screws (2) are supplied with the OTD-OP. After starting the mounting screws, place the OTD-OP into the dial support bracket from the front by inserting the screws into the keyway on the support bracket. Tighten the two screws to hold dial firmly in place and attach housing and faceplate

- Verify operation of the dial by calling designated check numbers

d. Utilizing the OTD-OP Telephone Loudspeaker Adapter (SPA-S)

- Provision is made for using the OTD-OP with telephone loudspeaker adapters such as the Companion II or PC-4A. The OTD-OP can be used to dial calls while in the loudspeaker mode. The dial pulse noise will be shunted during dialing.

- To utilize the OTD-OP, connect TERMINAL SP on the OTD-OP to TERMINAL D3A on the SPA-S Loudspeaker Adapter.

OMEGAPHONE II

BT-1530/2250 KEY TELEPHONE SYSTEM

INSTALLATION OF OPTIONAL SYSTEM ASSEMBLIES

1.00 GENERAL

1.01 This section describes installation of the optional BT1530/2250 Key Telephone System assemblies (apparatus) that provide supplementary features.

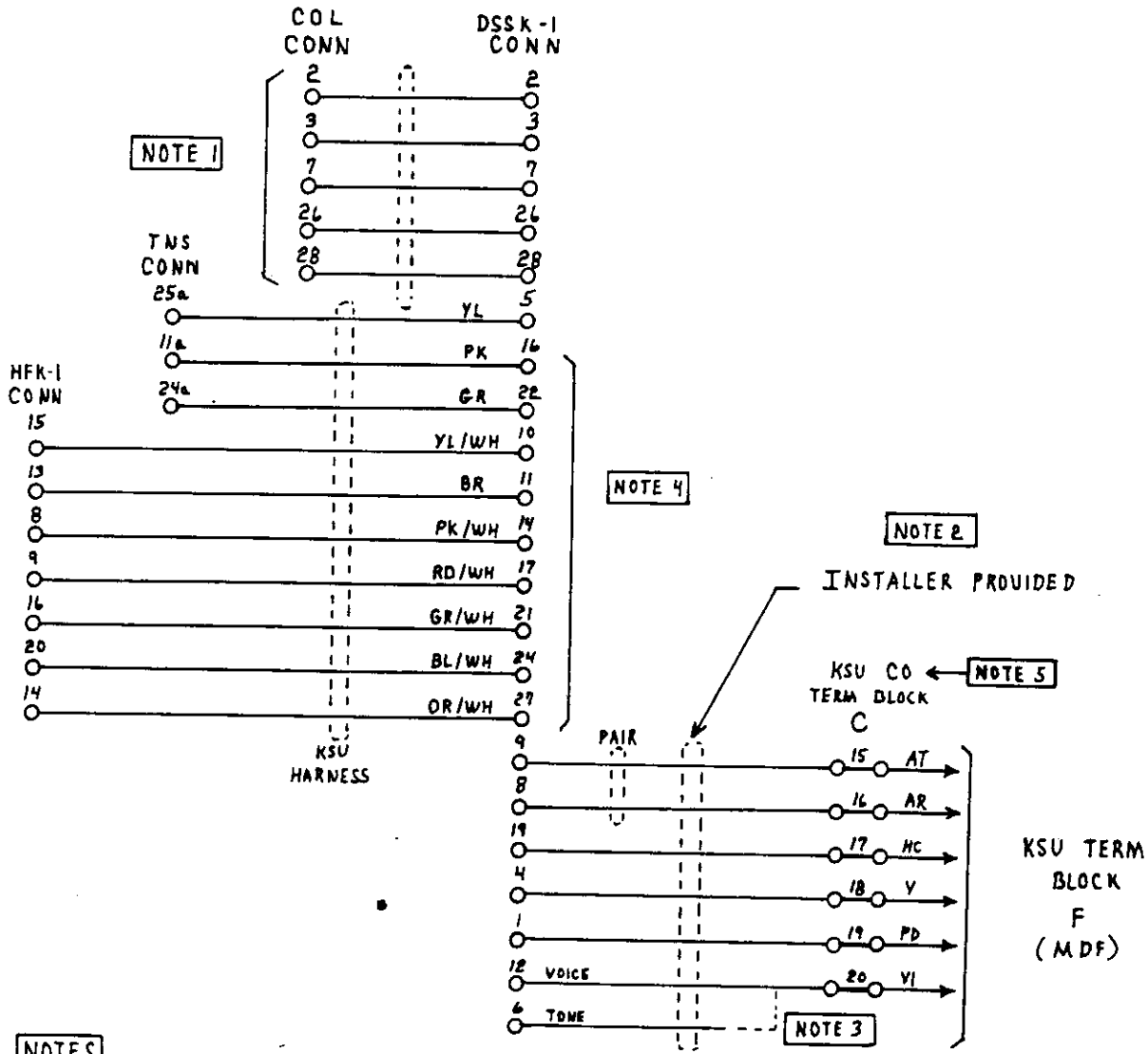
BUSY LAMP FIELD (BLF) CONNECTOR A						
FUNCTION	LEAD DESIG.	TAIL CABLE COLOR	CONN PIN NO.	HOUSE CABLE COLOR	CLIP NO.	NOTE
	BLF 11	BL	26	WH - BL	1	
	12	OR	1	BL - WH	2	
	13	GR	27	WH - OR	3	
	14	BR	2	OR - WH	4	
	15	SL	28	WH - GR	5	
	16	RD	3	GR - WH	6	
	17	BK	29	WH - BR	7	
	18	YL	4	BR - WH	8	
	21	PK	30	WH - SL	9	
	22	VI	5	SL - WH	10	
	23	WH	31	RD - BL	11	
	24	AZ	6	BL - RD	12	
	25	BL - WH	32	RD - OR	13	
EXTENSION	26	BL - BK	7	OR - RD	14	
	27	BL - YL	33	RD - GR	15	
BLF	28	BL - GR	8	GR - RD	16	
	31	OR - WH	34	RD - BR	17	
LEAD	32	OR - BK	9	BR - RD	18	
	33	OR - YL	35	RD - SL	19	
	34	OR - GR	10	SL - RD	20	
	35	GR - WH	36	BK - BL	21	
	36	GR - BK	11	BL - BK	22	
	37	GR - YL	37	BK - OR	23	
	38	GR - RD	12	OR - BK	24	
	41	BR - WH	38	BK - GR	25	
	42	BR - BK	13	GR - BK	26	
	43	BR - YL	39	BK - BR	27	
	44	BR - GR	14	BR - BK	28	
	45	SL - WH	40	BK - SL	29	
	46	SL - BK	15	SL - BK	30	
	47	SL - YL	41	YL - BL	31	
	48	SL - GR	16	BL - YL	32	
	51	RD - WH	42	YL - OR	33	
	52	RD - BK	17	OR - YL	34	
	53	RD - YL	43	YL - GR	35	
	54	RD - GR	18	GR - YL	36	
	55	BK - WH	44	YL - BR	37	
	56	BK - OR	19	BR - YL	38	
	57	BK - YL	45	YL - SL	39	
	58	BK - PK	20	SL - YL	40	
	61	YL - WH	46	VI - BL	41	
	62	YL - BK	21	BL - VI	42	
	63	YL - RD	47	VI - OR	43	
	64	YL - GR	22	OR - VI	44	
	65	PK - WH	48	VI - GR	45	
	66	PK - BK	23	GR - VI	46	
	67	PK - YL	49	VI - BR	47	
	68	PK - GR	24	BR - VI	48	
RELAY	-R	VI - WH	50	VI - SL	49	NOTE 1
BATTERY	-R	VI - BK	25	SL - VI	50	

COLOR CHART			
BL	BLUE	BK	BLACK
OR	ORANGE	YL	YELLOW
GR	GREEN	PK	PINK
BR	BROWN	VI	VIOLET
SL	SLATE	WH	WHITE
RD	RED	AZ	AZURE

NOTE

1. Do not connect to ⊖ Lamp Battery.

TABLE A BLF-B CONNECTOR CABLE
Terminal Designation and Assignment



NOTES

1. INSTALLER STRAPS REQUIRED WHEN CO14 - CO20 CARD FILE UTILIZED FOR MOUNTING DSS-K CARD CONNECTOR IN KSU.
2. SPARE WIRES OF KSU CONN D CABLE ASSEMBLY CAN BE USED FOR THESE FUNCTIONS; REFER TO FIGURE 2A.
3. CONNECT TO VI OF DSS-T CONTROL STATION IN PLACE OF DSS-K CONN PIN 12 WHEN TONE CALLING ONLY IS USED.
4. THESE CONNECTIONS ARE NOT REQUIRED IF HANDSFREE TALKBACK IS NOT EQUIPPED.
5. CO TERM BLOCK PROVIDED ON BT1530-1 KSU ONLY

FIGURE 2 DSS-K-1 CROSS CONNECTIONS IN KSU

The DSS/BLF lead of the ATTENDANT (DSS) telephone is not required. However, the BLF lead of the ATTND telephone must be connected to TERM HB of the DSS.

READ b. The ATTND ICM Line appearance on the MDF is located at the CO Line appearance on KSU TERM BLOCK B in which the DSS-K-1 card is mounted. To connect the extensions to the ATTND ICM Line, the line pickup key on the extension to be assigned to the ATTND ICM Line (usually next to the last ICM appearance on the extension) is cross-connected to the line appearance on the MDF assigned to the DSS-K-1. The Tip (T), Ring (R), Hold (H), and Lamp (L) of the extension pickup key is cross-connected to the respective terminal. No connections are required for the pickup key on the ATTND telephone.

NOTE The ATTND ICM Line appearance at the extensions is optional. If no handset, to handset voice communications to the ATTND is required, the ATTND Line appearance on KSU TERM BLOCK B should not be cross-connected to the extension.

c. To call a group of extensions with a single DSS Station Key, the extension DSS leads must be connected through DIODES to the DSS Station Key as shown in Figure 5. A maximum of five (5) extensions can be connected in one group.

d. To direct access the ZPA-B Zone Page Adapter, the DSS Signal Key is connected to the ZPA-B wire harness as illustrated in Figure 9 of SECTION 2007. In addition, the ATTND AT and AR functions must be cross-connected to the ZPA-B per NOTE 2 on Figure 9.

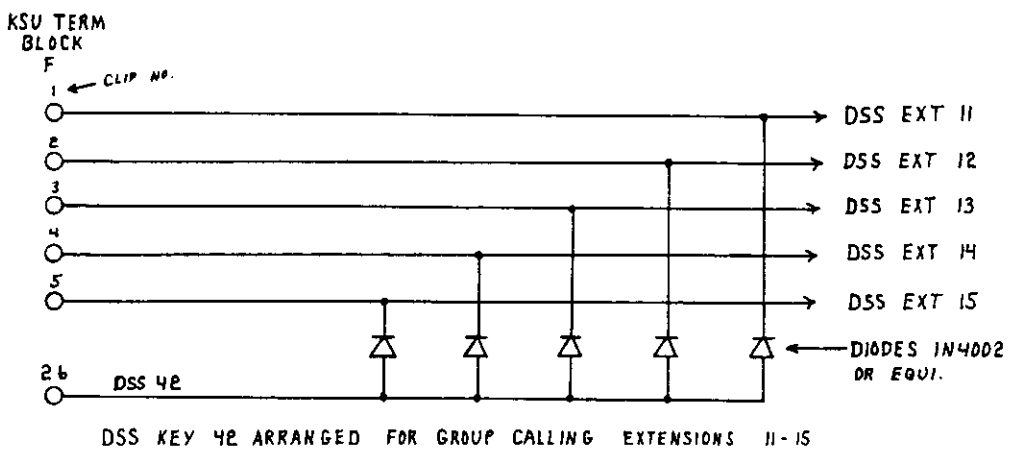


Figure 5 DSS Group Calling

4.03 A Volume Control is provided on the ZPA-B to control the Zone Page input level to the PA Amplifier.

READ

4.04 Zone Paging is accessed from any extension by dialing the Two Digit Intercom dial code number assigned to the specific zone. A Shorting Bar (SB) option is provided on the ZPA circuit card to provide two digit dial access to the ZPA regardless of the Tone/ Voice Calling priority set on the KSU. Table C indicates the Shorting Bar (SB) connection for the particular setting of Tone/Voice Calling dial access.

TABLE C

ZPA-B SHORTING BAR (SB) ARRANGEMENT

Terminal	Mode of Operation
1-2	Tone Calling Two Digit Access
1-3	Voice Calling Two Digit Access

4.05 Connecting the ZPA to the KSU

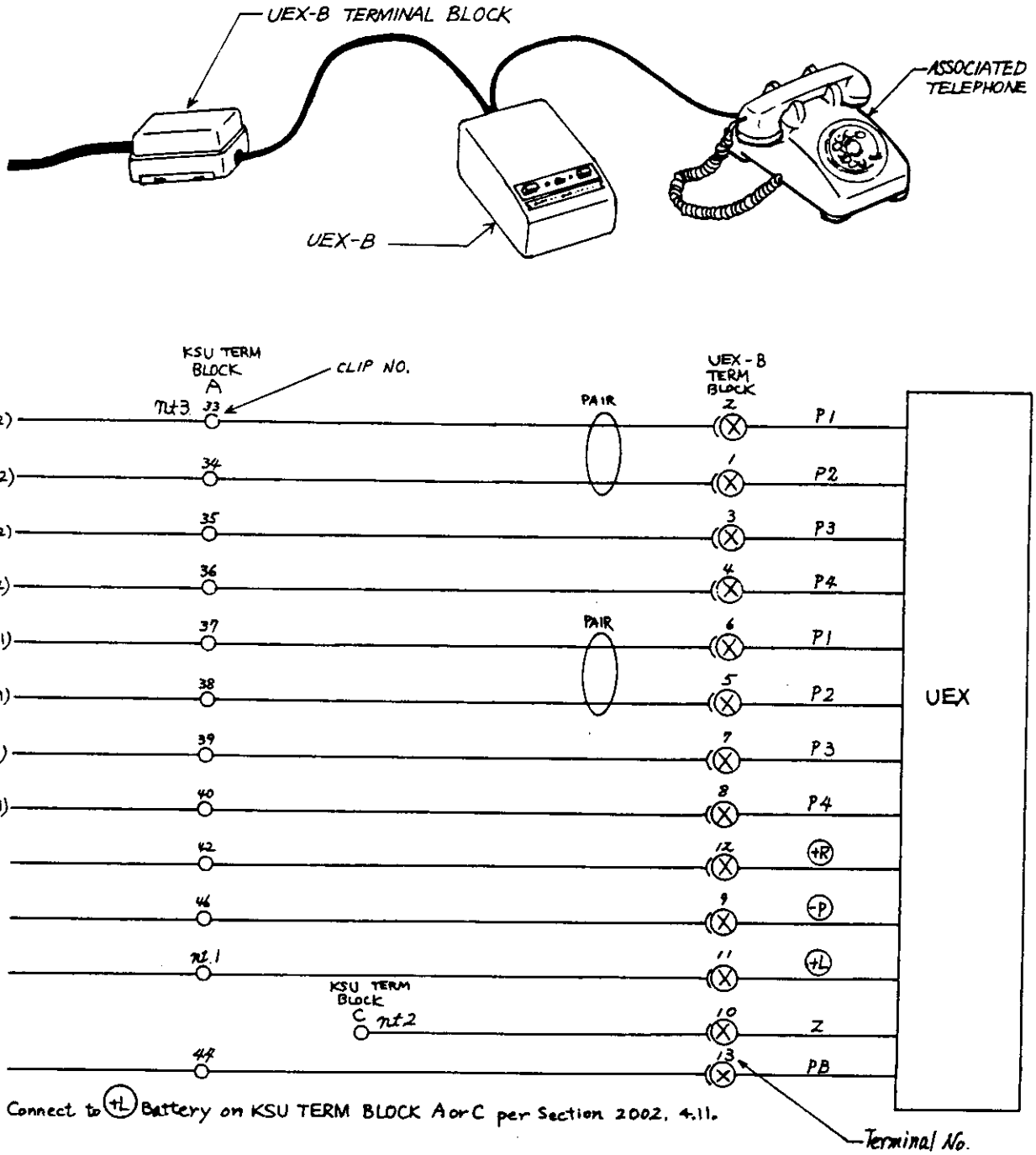
a. Figure 8 illustrates the ZPA-B-1 CONNECTOR CABLE ASSEMBLY

b. Figure 9 illustrates the ZPA-B-1 CONNECTOR CABLE connections when the DSS unit is equipped.

4.06 If the Busy Lamp Field (BLF) indication is required at the DSS when the Zone Page Adapter is busy, DIODES (IN4002 or equi.) are connected to each Intercom Dial Code "Z" lead assigned to the individual zones as illustrated in Figure 10.

READ

4.07 The PA Amplifier Output (Constant Voltage or Constant Impedance Output) is connected to the PAGE AMP OUTPUT screw terminals on the ZPA-B. The individual zone speaker cables (3) are connected to the associated Zone Spkr. screw terminals. It is recommended that when Zone Paging is equipped, the Constant Voltage (25 or 70 volt) method for speaker distribution is utilized to prevent varying page volume levels between zones due to unequal speaker line impedances.



Nt. 1. Connect to (+L) Battery on KSU TERM BLOCK A or C per Section 2002, 4.11.

Nt. 2. Connect to assigned dial code (2) number on KSU TERM BLOCK C if Intercom Signalling is equipped.

Nt. 3. Connect UEX-B Terminal Block pin No. 1-8 to KSU TERM BLOCK B if ICM 3-4 is used for UEX-B Extension

Figure 11 UEX-B Connection to KSU TERM Blocks on the MDF

6.00 INSTALLATION OF THE OPX ADAPTER (MTL)

6.01 The Model MTL Off-Premise Extension (OPX) adapter provides a two wire interface to a TELCO provided private line circuit connected to either single line station equipment or a Key Telephone System. When a single line station is required, the station equipment must be customer owned. When a Key Telephone System (KTS) is connected, the KTS can either be Customer Owned (COE) or TELCO supplied, and a spare line circuit and pickup (P.U.) Key is required.

Check local TELCO tariffs to ascertain if Illumination and CO Audible are provided on a TELCO provided KTS when connected as an OPX to a COE provided KTS.

6.02 The MTL provides the following features:

a. Dial access from the OPX to any extension in the KTS on either of two (2) ICM Lines.....The OPX, upon going off hook and hearing a dial tone, can dial any extension number in the system, including another OPX (if so equipped). Voice Announcing or Tone Ringing can be used by the OPX to call any extension in the system while only machine ringing can be used to call another OPX. The MTL automatically selects a free ICM Line to connect the OPX to the KSU ICM Dial Register. At the called extension, the ICM call operates in a normal manner, the ICM register timing out after 20-40 seconds if the call goes unanswered.

b. Dial access from any extension to the OPX on any of two (2) ICM Lines.....To call the OPX, an extension selects a free ICM Line (predetermined for OPX operation) and dials the extension number assigned to the OPX. At the OPX, 15 IPM ringing is heard. The OPX, upon going off-hook, is connected to the calling extension. If the OPX is busy, standard busy-back tone is heard by the calling extension.

c. Busy Tone provided to the OPX when the ICM Lines and/or ICM Dial Register is busy.....When either the ICM Lines or the ICM Dial Register is busy, the OPX hears Busy Tone upon going off-hook. The OPX can wait off-hook and immediately be connected to the first available ICM Line.

d. Tone-Rotary Dial Off-premise Instruments.....Either rotary dial or DTMF dial (if the KTS is so equipped) station(s) can be used at the OPX.

e. Direct Access to the OPX from the DSS.....The DSS (ATTND) can direct signal the OPX by pressing a DSS EXT. Key assigned to the OPX. The DSS (ATTND) can then talk with the OPX on the ATTND ICM Line Circuit.

f. BLF Indication of the OPX Status.....The OPX, when off-hook, provides a BLF control signal to indicate off-hook status.

g. CO Line Add-On to the OPX.....The MTL provides the capability for the OPX to be connected to either of two (2) predetermined CO lines. Additional CO line capacity can be achieved through

- One spare CO Line card file for each MTL installed in the BT 1530 KSU. A card connector/wire harness if provided with each MTL. Installer straps are required to connect the dedicated ICM Lines as well as control functions to the MTL. Aprox. installation time: 1½ hrs. first MTL, 1 hr. each additional.

- One 24/48v Battery depending upon loop limits. A standard 1A2 KTS 24v power supply "A" Battery can be used. Installation time: ½ hr.

- A 20-30 hz. 105v Ring Supply (Can be the 30 hz. ring supply on standard 1A2 Power Supply). Estimated installation time: ½ hr.

- CO Line Add-on requires one (1) additional hour installation time each OPX. For expansion beyond the two (2) CO Line wired on the MTL, one external 4PDT 24 VDC Relay is required for each CO with one (1) hr. estimated installation time for each CO.

b. Mounting the MTL card connector in the BT 1530 KSU

- Each MTL assembly is provided a fifty-six (56) pin card connector and mounting hardware. The card connector is installer mounted in a spare CO Line card file of the top tier of the KSU. When mounting the connector, insure that the card connector is mounted such that the pin numbers read from top to bottom (1 to 28).

- The CO Line card file chosen should allow for possible CO Line expansion or MTL appearance expansion. The first choice for installation should be CO Line slot #19 (assuming that CO #20 is being utilized for the DSS-K circuit card). Any additional MTL circuit to be equipped should be installed adjacent to the first MTL appearance

c. MTL Harness installation/strapping requirement

CAUTION All connections of the MTL harness to the KSU common control function must be made with the SYSTEM BATTERY turned OFF!

- Figure 14 illustrates the mounting and routing of the MTL connector and cable harness. Cable ties should be used to hold the cable harness securely in place.

- Figure 15 illustrates the harness connections required on the MTL card connector and KSU control functions. Care should be taken to insure proper terminations.

READ

1. Not all connections illustrated in Figure 15 are required. If the DSS or CO Line Add-on functions are not utilized, the connections illustrated for these functions can be disregarded.

READ

2. The MTL wire harness is formed assuming that the DSS-K card is mounted in CO Line slot #14 and the two CO Line Add-on circuits are using CO Line slots #12 and 13. The harness connections illustrated for these functions may be disregarded and individual installer straps provided for these connections if different CO Line slots are being utilized for these functions.

READ

3. If more than one (1) MTL circuit card is equipped, the MTL wire harness for only the first MTL appearance is required. Common connections between MTL card connectors can be connected in multiple for the terminals indicated.

d. Assignment of the MTL to station/DSS codes

READ

- Connect the ICM dial code assigned to the OPX by strapping MTL CONN pin 24A (BK-WH if wire harness is used) to the respective pin assignment on the SEC or EEX (if so equipped) card connector. Figure 16 illustrates dial code/pin assignments on the SEC/EEX circuit card connector.

READ

- Connect MTL CONN Pin 1A to the DSS-T Signal Lead corresponding to the ICM dial code selected to call the OPX. Connect MTL CONN Pin 3A to the BLF Lead of the DSS signal Key selected to call the OPX.

e. Connection of the CO Line Add-on circuits

- Figure 17 illustrates the connections required for the CO Line Add-on circuits. Two CO Line circuits are prewired with each MTL.

READ

- To allow the OPX direct access to the CO Lines, the following straps are required.

  1. Strap MTL CONN Pin 3A to MTL CONN Pin 15A

  2. Assign each CO Line Add-on circuit to an un-used ICM dial code by strapping MTL CONN Pin 23B (YL-WH of harness) and MTL CONN Pin 22B (PK-WH of harness) to the assigned dial code on the SEC or EEX (if equipped) circuit card for CO Line Add-on #1 and #2 (respectively).

READ

- To allow the ATTND to control the CO Line Add-on, the following straps are required:

  1. Strap MTL CONN Pin 23B (CO #1) and CONN Pin 22B (CO #2) to individual DSS signal keys.

3. Make Busy both ICM Lines on the system and verify presence of Busy Tone when the OPX goes off-hook.

4. CO Line Add-on Operation is verified by dialing the ICM codes wired for add-on or operation of the add-on by the DSS.

5. DSS Operation of the OPX is verified by pressing the OPX Signal Key to cause ringing at the OPX. Going off-hook with the test set should connect the OPX to the ATTND ICM Line.

OMEGA PHONE II

BT-1530/2250 KEY TELEPHONE SYSTEM

III. MAINTENANCE

OMEGAPHONE II

BT-1530/2250 KEY TELEPHONE SYSTEM

TABLE OF CONTENTS

1.00 INTRODUCTION

1.01 This Section is a Table of Contents for each Category of the Technical Manual.

1.02 This Section will be revised on issuance of a new or revised Section for the Category as described in the Table of Contents.

2.00 TABLE OF CONTENTS

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OMEGA PHONE II

BT-1530/2250 KEY TELEPHONE SYSTEM

CIRCUIT DESCRIPTION STANDARD FEATURES

1.00 INTRODUCTION

1.01 This section describes the circuit operation of the various standard operational features of the BT1530/2250 Key Telephone System. Some individual features, although classified as standard are, in essence, installer options and are described in Section 3002 with other optional features. Consult the Table of Contents for listing of the features described in this section.

1.02 Reference should be made to the Condensed System Drawings No. 1 and 2, Section 4001 for circuit diagrams of the features described.

1.03 Reference should be made to APPENDIX II for explanation of the symbols used in the circuit description sequence drawings.

1.04 Reference should be made to APPENDIX III for familiarization of the digital electronic circuits used in the Omega-Phone II Common Control circuits.

2.00 CO LINE OPERATION

2.01 Power On

a. RELAY T operates on all CO Line cards through the following circuit:

COL — (+R) - h_4 - D3 - T_{1-2} COL (UCOL) (500) - (-R)

b. Power is supplied to all Interrupters and Tone sources.

2.02 Incoming CO Line Call-Direct Connection (Bridged Ringing)

a. When the Central Office (CO) 20hz ringing signal appears at the Tip/Ring terminals of the KSU CO LINE TERMINAL COL, RELAY R of the COL (UCOL) operates as follows:

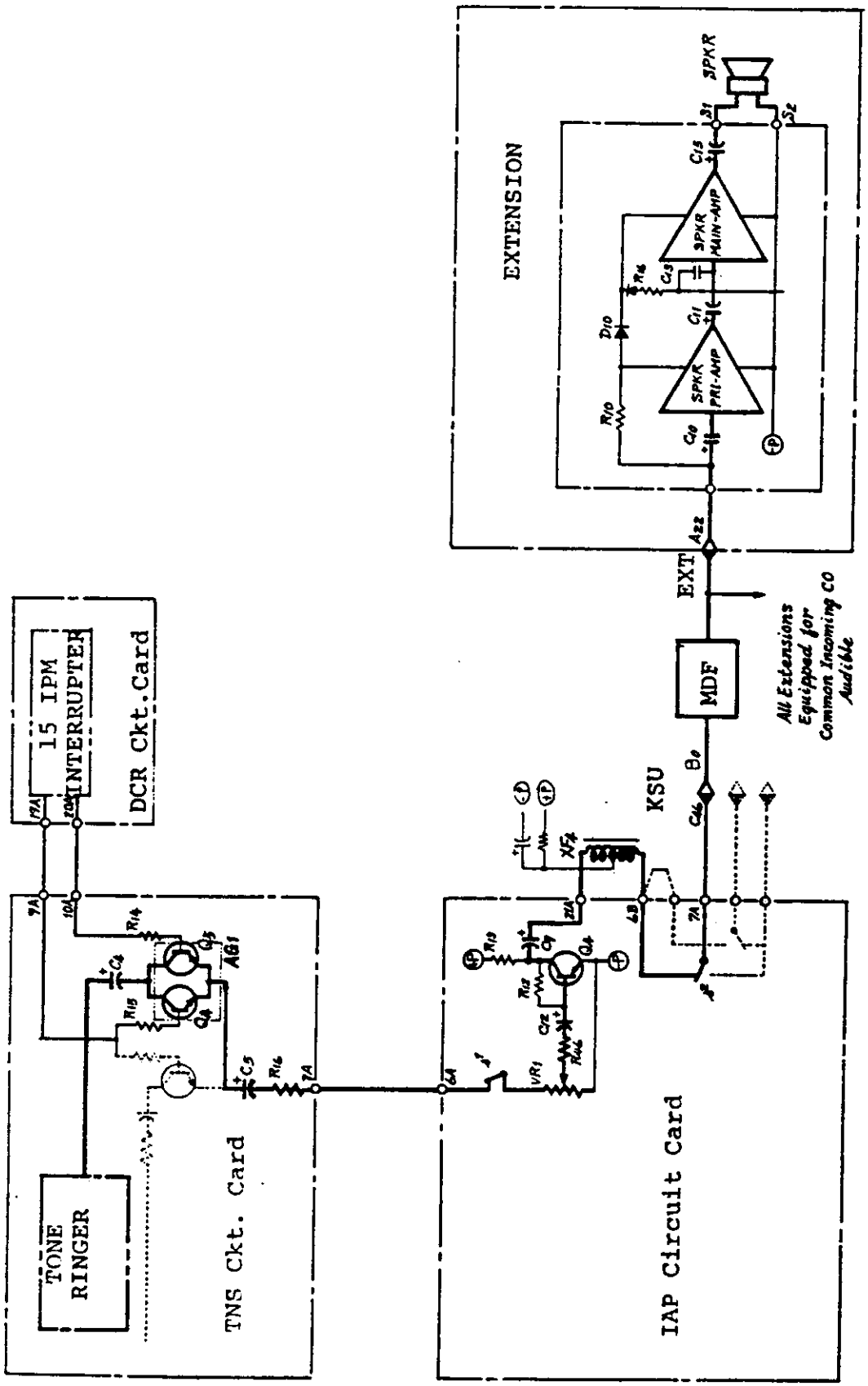


Figure 1 CO Incoming Tone Circuit

COL

b. DIODE D2 becomes reversed biased because of reduced (+R) battery on the H lead. RELAY T is released due to reverse phasing of T secondary winding 4-3 by the following circuit:

COL (UCOL)
(+R)-D4-T_{4-3}(1000)-T_{1-2}(500)- (-R)

c. Upon release of the HOLD Key (HK) at the extension, all battery is taken off the HOLD (H) Lead since the Line Key (LK) restores to its rest position. RELAY H remains operated through the following circuit:

COL (UCOL)
(+R)-h_4-t_3-H_{3-4}(600)- (-R)

COL

d. The line lamp starts to flash at the HOLD rate (120 IPM) operated by supplying [120 IPM] (+L) to TRANSISTOR Q1 by the following circuit:

DCR — IAP — COL (UCOL)
[120 IPM]-T11B - T24-R14-Q5-R16-R17-Q6-T24b - T16-t_4-LED-R7-Q1- (-L)

e. A DC holding bridge (R2) is placed across the TIP-RING of the CO Line by relay contacts t_1-h_1 and t_0-h_0 on the COL (UCOL) circuit card.

2.05 Reanswering

COL

a. When the call is reanswered, (+R) battery is placed on the HOLD (H) lead by the circuit described in 2.02a. DIODE D2 becomes forward biased causing RELAY T to operate due to (+R) battery across RELAY H winding 1-2.

2.06 Completion of Call

COL

a. When the handset goes on-hook, the Line Key (LK) restores. (+R) battery is disconnected from the "H" lead and the H releases. RELAY T remains operated due to its slow release during the RELAY H release interval and remains operated due to the circuit described in para. 2.01a.

2.07 Dialing a CO Line Call

a. When an extension goes off-hook on a free CO Line, the Line Key (LK) connects the extension voice network to the TIP-RING, dial tone is returned by the CO, and the call then dialed.

b. RELAY H on the COL (UCOL) card operates as described in Para. 2.02a, providing a steady line lamp and disconnecting the ringing detector circuit on the COL (UCOL) Line card.

3.00 CO Line Calls Utilizing Voice Connection Arrangements (VCA)

3.01 CO Line Call-STC Operation

a. When the CO 20hz ringing on the TELCO CO Line operates the Ringing Generator in the STC, RELAY R on the COL (UCOL) Line card is operated through the following circuit:

STC KSU COL (UCOL)
RU1 - CS - T21-T10-C1-11-REC-R_{1-2}(1300)-REC-h_4-6-5-t_1-T15-

COL KSU STC
R - CR

b. Operation of all other incoming circuits is the same as previously described. When the extension goes off-hook on the CO Line, the STC detects the DC path across the TIP-RING, disconnects the Ringing Generator, and supplies Talk Battery for conversation.

3.02 CO Line Call- CD-9/C2A Operation (UCOL only)

a. When the CO 20hz ringing on the TELCO CO Line is detected by the CD-9/C2A VCA, the CD-9/C2A provides a contact closure for incoming ring indication. RELAY R on the UCOL is operated by the following circuit:

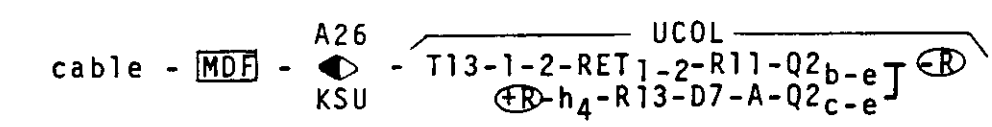
KSU CD9-C2A KSU UCOL
(+R) - C1 - C2 - C2 - T17-6-h_4-REC-R_{1-2}(1300)-REC-11-12- (-R)

b. When the extension goes off-hook on the CO Line, the UCOL detects the DC path across the Tip-Ring, causing RELAY A to operate. RELAY A provides a contact closure across CS-CG of the CD-9/C2A, disconnecting the ringing. RELAY A operates through the following circuit:

UCOL
UCOL A 1 A 1
(+P)-R9-RET_{4-3}-4-3-T15 - ◀▶ - MDF - cable - ◀▶ -
KSU EXT

EXTENSION A26
$LK1_{8-9}$-L2-4-3-HS_1-HS_2-NETWORK-2-1-L1-$LK1_{2-3}$ - ◀▶ -
1522 TELU EXT

con't



UCOL

c. RELAY H operates as previously described in Para. 2.02a. During dialing of an outgoing call, RELAY A detects dial pulses, repeating the dial pulses across the CD-9/C2A CS-CG terminals.

d. All other circuit functions are as previously described.

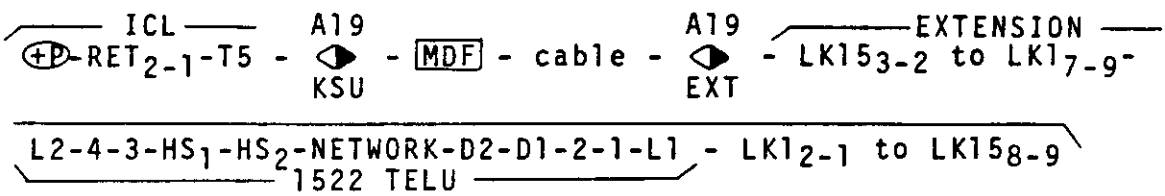
3.03 CO Line Call-STP Operation

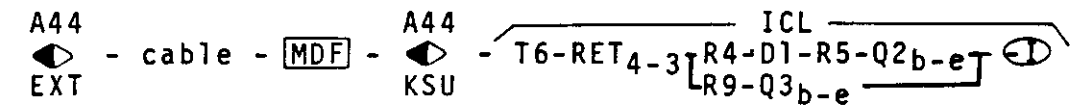
a. Operation of the circuit utilizing the STP VCA is the exact operation as previously described for Direct Connection of CO Lines except that all CO Ringing and Talk Battery functions are provided by the VCA.

4.00 INTERCOM CALLS

4.01 Seizing the Register (Register not busy) Note 1

a. When the Intercom Line Key is pressed and the handset removed, Q2 and Q3 on the ICL card detects an extension off-hook condition through the following circuit:





ICL

b. Both TRANSISTOR Q2 (ST) and Q3 (DPD) outputs go LOW. NOR Gate G1, arranged as an Inverter (INV), connects $\overline{ST}$ with delay to NOR Gate G2. Because of the delay of the $\overline{ST}$ input from G1 and $\overline{ST}$ input at NOR Gate G2, a HIGH pulse output is connected to NAND Gate G3 input. All other inputs to NAND Gate G3 are HIGH when the Register is idle.

c. NAND Gate G3 is connected to NAND Gate G4 and G5 which operates as a SET-RESET Flip Flop (RSFF). NAND Gate G5 input is controlled by NOR Gate G6 output which goes HIGH when both ST is low and NAND Gate G12 is LOW. Both ANS (ANSWER) and TO (TIME OUT) are HIGH when the Register is idle.

Note 1 Refer to Para 6.00 for connection of the extension voice network to the Intercom Line on PRV equipped models.

d. Because the Register is idle, REG is LOW. $\overline{REG}$ is then HIGH (Inverted by NAND Gate G11 on each ICL circuit card). When the HIGH Pulse arrives from NOR Gate G2, causing NAND Gate G3 to go LOW, the RSFF (Gates G4 and G5) are allowed to change output states. NAND Gate G4 output becomes HIGH while G5 output goes LOW. NAND Gate G3 output returns to HIGH after the pulse.

ICL

e. When the RSFF changes state, the Intercom Line has now seized the Register and audible/visual control signals are activated.

f. The Intercom Line Lamp starts flashing at 30 IPM, controlled by NAND Gate G8 and G9. Since $\overline{ST}$ is HIGH and NAND Gate G4 output is now HIGH, NAND Gate G8 output is controlled by the 30 IPM Interrupter output. NAND Gate G10 output is HIGH since the RSFF G5 output is LOW. Since NAND Gate G10 enables NAND Gate G9, G9 output varies directly with the 30 IPM Interrupter output, causing the Darlington connected TRANSISTOR Q5 and Q6 to turn the line lamp on-off at 30 IPM.

DCR

g. RSFF G5 LOW output causes NAND Gate G1 on the DCR circuit card to change state, REG goes HIGH. When REG goes HIGH all other Intercom Lines are locked out by NAND Gate G11 on each ICL circuit card by preventing the RSFF on each ICL to change state when the Intercom Line is seized.

ICL

h. Dial Tone is connected to the calling extension by turning ON TRANSISTOR Q1 by the RSFF G4 HIGH output on the ICL circuit card, connecting TRANSFORMER XF1 on the TNS circuit card to the Intercom Voice path through the following circuit:

ICL — TNS

(+1)-R3-RET-6-5-Q1$_{c-e}$-T8 - T5A-XF1$_{3-4}$-D4- (-1)
C2

DCR

i. When REG goes HIGH, NAND Gate G3 on the DCR circuit card goes LOW (DC1 is HIGH) causing NAND Gate G4 to go HIGH. NAND Gate G4 and G19 control the Dial Tone/Busy Tone to the calling extension by operating (turning ON) ANALOG GATE AG2 on the TNS circuit card.

TNS

j. Dial Tone is connected to TRANSFORMER XF1 on the TNS circuit card by the following circuit:

TNS

$\boxed{\text{450hz OSC}}$-C8-AG2-C9-bt$_4$-T21B-T11A-XF1- (-P)

DCR

k. During the Register idle period, all Digit Counter and Supervise Flip Flops (FF) have been RESET ($\overline{Q}$ is HIGH) by the 3840 IPM Interrupter through NOR Gate G2. When REG goes HIGH, the RESET function is disabled by NOR Gate G2 going LOW. Also, G2 starts the 36-40 second timer for the Time Out (TO) function.

4.02 DIALING THE INTERCOM CALL (ROTARY DIAL)

a. When the RSFF G4 output goes HIGH on Register Seizure, NAND Gate G7 on the ICL circuit card is enabled. Dial Pulse Detector (DPD) TRANSISTOR Q3 output can now pass through NAND Gate G7.

ICL

b. When the extension dials the first digit of the called extension, ST remains LOW during the dial break period because of the slow discharge of CAPACITOR C3 through R5 causing TRANSISTOR Q2 to remain ON. The Dial Pulse Detector (DPD) TRANSISTOR Q3 will turn ON-OFF corresponding to the Dial Pulse train.

c. DP1 on the ICL circuit card will go LOW for each dial pulse break causing NAND Gate G5 output to go HIGH. G5 output (DP) is connected to the 1st and 2nd Digit Dial Pulse Counter through NOR Gates G6, G7, and G8 as well as the Digit Supervision Control Monostable Flip Flop MM1 on the DCR circuit card.

DCR

d. NAND Gates G9 and G10 control which digit counter the Dial Pulses (DP) will enter. Because all Digit Supervision Flip Flop (FF1 and FF2) have been RESET ($\overline{Q}$ is HIGH) because the Register was idle, NAND Gate G9 output is LOW, enabling NOR Gate G7, while NAND Gate G10 output is HIGH, disabling NOR Gate G8.

e. Upon the first HIGH dial pulse (DP), Flip Flop FF3 of the 1st Digit Counter changes state ($\overline{Q}$ goes LOW) and at the same time Monostable Flip Flop MM1 goes LOW. Monostable Flip Flop MM1, because of the C2, R18 time constant, remains LOW longer than the Dial Pulse (DP) HIGH interval and will retrigger on the next Dial Pulse (DP).

DCR

f. Monostable Flip Flop MM2 (utilized during MF tone dialing) output is HIGH. When MM1 output goes LOW, NAND Gate G11 will go HIGH causing NOR Gate G12 to go LOW. When G12 goes LOW, NOR Gate G13 will go HIGH since Digit Control Three (DC3) is LOW until the third (3rd) digit is dialed. NOR Gate G13 will remain HIGH during the entire 1st digit Dial Pulse (DP) train.

g. First (1st) Digit Counter Flip Flop FF3, FF4 and FF5 are connected as a binary counter. NOR Gate Transistor-Relay Driver G15, G16 and G17 output is held LOW by the Second (2nd) Digit Supervise Flip Flop FF2. In this manner, the extension relay tree on the SEC circuit card is operated only on the completion of the 2nd Digit Pulse.

h. Table A lists the First (1st) Digit Counter output for each 1st digit number that can be dialed.

TABLE A

FIRST DIGIT COUNTER OUTPUT

No. Dialed	FF3	FF4	FF5
RESET	HIGH	HIGH	HIGH
1	LOW	HIGH	HIGH
2	HIGH	LOW	HIGH
3	LOW	LOW	HIGH
4	HIGH	HIGH	LOW
5	LOW	HIGH	LOW
6	HIGH	LOW	LOW
7	LOW	LOW	LOW
8	HIGH	HIGH	HIGH
9	NOT VALID		
0 (Oper)	NOT VALID		

DCR

i. Upon completion of the First (1st) Digit Dial Pulse, MM1 will return to the HIGH level during the dial pulse interdigit time (600 ms.min.) causing NAND Gate G11 to go LOW, NOR Gate G12 to go HIGH, and NOR Gate G13 to go LOW.

j. When NOR Gate G13 goes LOW, First Digit Supervision FLIP FLOP FF1 will change state (Q goes HIGH, $\overline{Q}$ goes LOW). When FF1 Q output goes HIGH, NAND Gate G9 becomes disabled and causes NOR Gate G7 to become disabled (hold LOW), allowing no more Dial Pulses (DP) to enter the First Digit Counter. NAND Gate G10 output goes LOW enabling NOR Gate G8, allowing 2nd Digit Dial Pulse (DP) to enter the Second Digit Counter.

k. When FF1 changed state, Digit Control One (DC1) NOR Gate G18 goes LOW. DC1 going LOW cause NAND Gate G3 to go HIGH and subsequently NAND Gate G4 to go LOW. This cuts off dial tone at the calling extension by causing ANALOG GATE AG2 on the TNS circuit card to turn OFF.

l. When the first Dial Pulse (DP) of the 2nd Digit number is received, Monostable Flip Flop MM1 once again goes LOW,

held LOW (by the C2, R18 time constant) longer than the dial pulse break interval and retriggers on the next Dial Pulse (DP). MM1 will remain LOW during the entire Second Digit Pulse train.

m. When MM1 goes LOW, NAND Gate G11 will go HIGH, NOR Gate G12 goes LOW and NOR Gate G13 will go HIGH. NOR Gate G13 output will remain HIGH as long as MM1 remains LOW.

n. At the same time, Dial Pulses (DP) pass through NOR Gate G8 causing the Second Digit Counter Flip Flops FF6, FF7 and FF8 to advance on each Dial Pulse (DP) received. NOR Gates G20, G21, and G22 are controlled by Second Digit Supervision Flip Flop FF2, each output being held HIGH so that the extension relay tree on the SEC circuit card is not operated until the Second Digit Pulses are completed. Table B lists the output of the Second Digit Counter for each 2nd digit number that is dialed.

TABLE B

SECOND (2nd) DIGIT COUNTER OUTPUT

No. Dialed	FF6	FF7	FF8
RESET	HIGH	HIGH	HIGH
1	LOW	HIGH	HIGH
2	HIGH	LOW	HIGH
3	LOW	LOW	HIGH
4	HIGH	HIGH	LOW
5	LOW	HIGH	LOW
6	HIGH	LOW	LOW
7	LOW	LOW	LOW
8	HIGH	HIGH	HIGH
9	NOT VALID		
0 (Oper)	NOT VALID		

DCR

o. When the Second (2nd) Digit Dial Pulse train is completed, MM1 will return to the HIGH state, causing NAND Gate G11 to go LOW, NOR Gate G12 to go HIGH and NOR Gate G13 to go LOW. NOR Gate G13 going LOW causes FLIP FLOP FF1 to change state (Q goes LOW, $\overline{Q}$ goes HIGH). FF1 Q going LOW causes FLIP FLOP FF2 to change state (Q goes HIGH, $\overline{Q}$ goes LOW).

p. When FF2 $\overline{Q}$ output goes LOW, NAND Gate G10 output goes HIGH causing NOR Gate G8 to be held LOW, preventing any additional Dial Pulses from entering the Second Digit Counter.

q. If a Third Digit is dialed (for Voice/Tone Calling option), MM1 will again go LOW causing Gate G11, G12 and G13 to

change state (G13 going HIGH). When MM1 returns to HIGH (after completion of the dial pulse), NOR Gate G13 goes LOW. This causes FF1 to change state (Q goes HIGH, $\overline{Q}$ goes LOW).

DCR

r. When FF1 $\overline{Q}$ goes LOW, both inputs to NOR Gate G18 are LOW, causing its output Digit Control Three (DC3) to go HIGH. HIGH on DC3 disables NOR Gate G13, holding its output LOW, preventing anymore change in the Digit Supervise FLIP FLOP FF1 and FF2.

4.03 DIALING THE INTERCOM CALL (OMEGA-TONE DIAL)

TNS

a. When Dial Tone is connected to the calling extension through TRANSFORMER XF1 on the TNS circuit card (ref 3.01h) one winding of XF1 is connected to the OMEGA-TONE Discriminator Circuit Card (RCV) input.

RCV

b. The RCV circuit card contains the tone detection and discrimator circuits for the standard MF tone signalling frequencies. The OMEGA-TONE Decoder Circuit Card (RCD) provides the interface and coded outputs to the First and Second Digit Counters on the DCR circuit card. Figure 2 illustrates the OMEGA-TONE Receiver functional diagram.

c. Since the OMEGA-TONE Discriminator Circuit Card (RCV) circuit operation is highly technical and beyond the scope of this section, all references should be made to the RCV circuit card output connections L1-L3 and H1-H3 which connects to the RCD circuit card. All the RCV Discriminator outputs are normally LOW, except when a MF dial tone is detected and two of the six outputs corresponding to the number dialed go HIGH. Table C lists the particular output for each digit number that can be dialed.

TABLE C

OMEGA TONE CIRCUIT CARD RCV OUTPUT

No. Dialed	L1	L2	L3	H1	H2	H3
1	X			X		
2	X				X	X
3	X					
4		X		X		
5		X			X	
6		X				X
7			X	X		
8			X		X	
9	NOT VALID					
0 (Oper)	NOT VALID					

X- HIGH OUTPUT

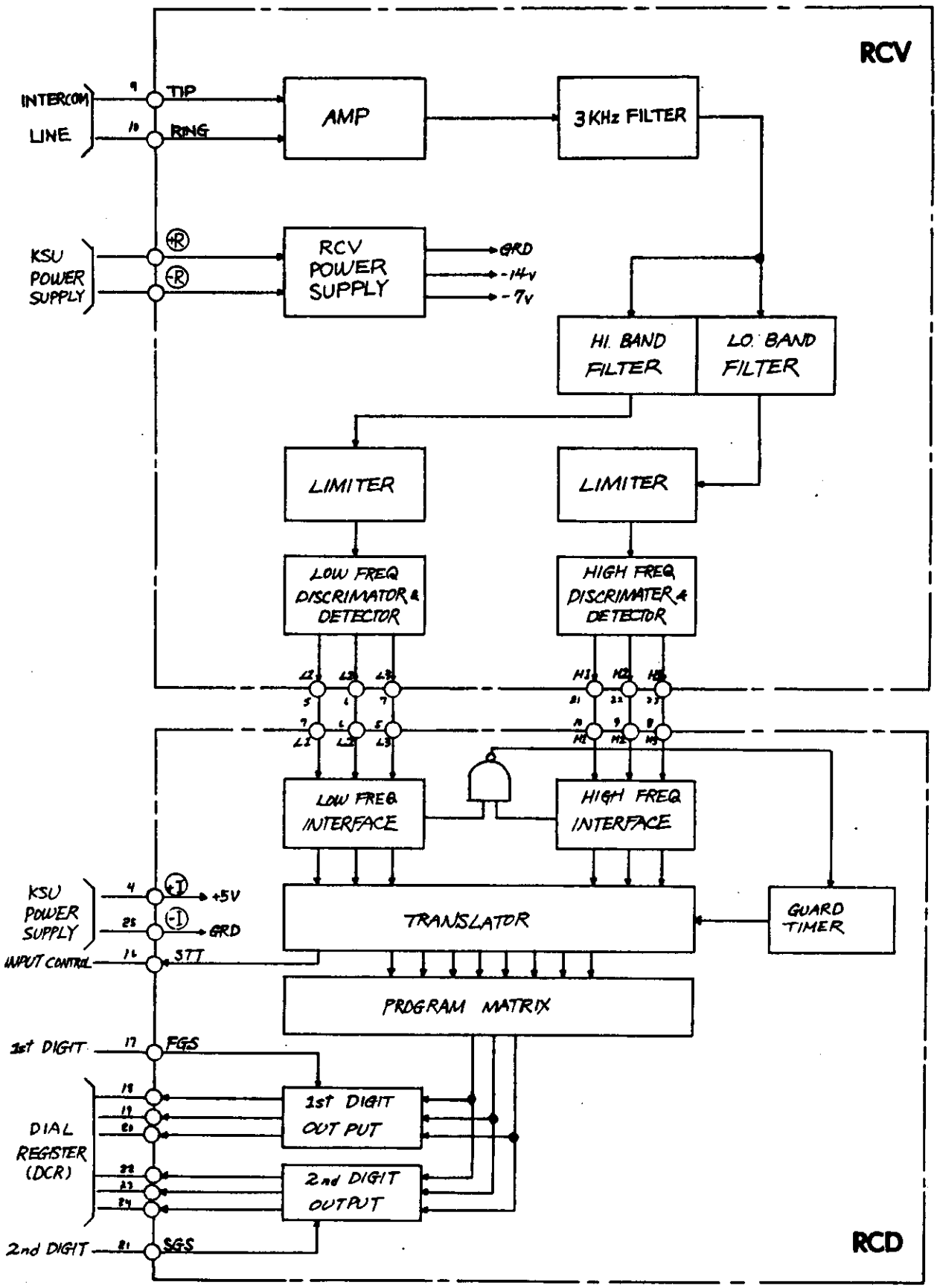


Figure 2 Omega-Tone Receiver (OTRU) Unit

d. When the caller presses a digit Key on the OMEGA-TONE Dial, the RCV circuit card two-of-six output is interfaced to the RCD circuit card logic by TRANSISTOR Q1-Q6. A HIGH Input on the L1-L3, H1-H3 Inputs causes the respective TRANSISTOR to turn ON, providing a LOW Input to the INVERTER Gates G1-G6.

e. The INVERTER Gates G1-G6 output are translated to the "decimal equivalent" of the number dialed by NAND Gates G7 -G14. The NAND Gate output corresponding to the "decimal" number dialed goes LOW.

f. When one of the eight NAND Gates (G7-G14) goes LOW, NAND Gate G18 output goes HIGH. This operates the Output Timer so that when a valid MF tone signal is detected, only one 10 msec. pulse is supplied to the register counter circuit on the DCR circuit card each time a digit button is pressed at the calling extension.

g. NAND Gates G15, G16 and G17 convert the decimal equivalent number into Binary form, to parallel load the First or Second Digit Counter FLIP FLOP (FF) on the DCR circuit card. The outputs of NAND Gates G15, G16 and G17 are LOW except when a valid MF tone is detected. Table D lists the NAND Gate G15-G17 outputs for each number that can be dialed.

CD

TABLE D

NAND GATES G15-G17 OUTPUT CHARACTERISTICS

No. Dialed	G15	G16	G17
RESET	LOW	LOW	LOW
1	HIGH	LOW	LOW
2	LOW	HIGH	LOW
3	HIGH	HIGH	LOW
4	LOW	LOW	HIGH
5	HIGH	LOW	HIGH
6	LOW	HIGH	HIGH
7	HIGH	HIGH	HIGH
8	LOW	LOW	HIGH
9	NOT VALID		LOW
0 (Oper)	NOT VALID		

h. The outputs of NAND Gate G15-17 are connected in parallel to the First and Second Digit Counter Driver Output. The First and Second Digit Output sections are controlled separately, FGS from the DCR circuit card controlling the First Digit and SGS from DCR circuit card controlling the Second Digit Output.

RCD

i. Because FGS is LOW and SGS is HIGH during the First (1st) Digit, the First Digit Output is enabled and Second Digit Output is disabled. The Output Timer provides a 10 msec. HIGH pulse at the output of NAND Gate G29. This causes the respective First Digit Output NAND gates to go LOW for 10 msec., parallel loading the First Digit Counter on the DCR circuit card.

DCR

j. At the same time, NAND Gate G21 on the RCD circuit card provides a LOW 10 msec. pulse on the STT control line to the Digit Supervise Monostable MM2 and NAND Gate G14 on the DCR circuit card. MM2 switches LOW, held low by the R17-C1 time constant, causing NAND Gate G11 to go HIGH, NOR Gate G12 to go LOW, and NOR Gate G13 to go HIGH.

k. When MM2 returns HIGH, NOR Gate G13 goes LOW causing Digit Supervise Flip Flop FF1 to change state (Q goes HIGH, $\overline{Q}$ goes LOW). This, in turn causes NAND Gate G9 (FGS) to go HIGH and NAND Gate G10 (SGS) to go LOW.

l. When FF1 Q goes HIGH, NOR Gate G18 (DC1) goes LOW. DC1 going LOW causes NAND Gate G3 to go HIGH and subsequently NAND Gate G4 to go LOW. This cuts off dial tone at the calling extension because G4 and G19 control ANALOG GATE AG2 on the TNS circuit card.

m. When the Second Digit MF tone signal is detected by the RCV circuit card, a two-of-six HIGH output is provided on the L1-L3, H1-H3 terminals. The respective TRANSISTORS Q1-Q6 are turned ON, providing LOW output to the respective INVERTER Gates G1-G6. The HIGH outputs of the corresponding INVERTER Gates G1-G6 (two-of-six) is translated into the "decimal" equivalent by NAND Gates G7-G14. A LOW output on one of Gates G7-G14 causes NAND Gate G18 to go HIGH preparing the Output Timer for a 10 msec. pulse. NAND Gates G15-G17 convert the "decimal" output from G7-G14 into "Binary" form and load the Second Digit Counter Output.

RCD

n. Since SGS is LOW after the First Digit is completed, the Second Digit Output is enabled by NAND Gate G20. The Output Timer provides a 10 msec. HIGH pulse at the output of NAND Gate G29. This causes the particular output(s) of the Second Digit Output NAND Gates corresponding to the number dialed to go LOW for 10 msec., parallel loading the Second Digit Counter on the DCR circuit card.

o. At the same time, NAND Gate G21 provides a LOW 10 msec. pulse on the STT control line to the Digit Supervise Monostable FLIP FLOP MM2 and NAND Gate G14 on the DCR circuit card.

p. MM2 switches LOW, held LOW by the R17-C1 time constant, causing NAND Gate G11 to go HIGH, NOR Gate G12 to go LOW, and NOR Gate G13 to go HIGH.

q. When MM2 output returns HIGH, NOR Gate G13 goes LOW causing FLIP FLOP FF1 to change state (Q goes LOW, $\overline{Q}$ goes HIGH). FF1 Q output going LOW causes FLIP FLOP FF2 to change state (Q goes HIGH, $\overline{Q}$ goes LOW).

DCR

r. When FF2 Q output goes HIGH, NAND Gate G10 (SGS) goes HIGH, disabling the Second Digit Output on the RCD circuit card. The First and Second Digit Outputs on the RCD circuit card are both disabled, preventing any change in the Counters on the DCR circuit card.

s. If a Third Digit MF tone signal is detected by the RCV circuit card, the two-of-six HIGH output is sent to the RCD circuit card. The RCD circuit card decodes the number dialed, a LOW output appearing on the corresponding TRANSLATER NAND Gate G7-G14.

RCD

t. Because both FGS and SGS are HIGH, the First and Second Digit outputs are disabled, no digit information is passed to the Counters on the DCR circuit card.

u. The Output Timer NAND Gate G18 goes HIGH, causing a 10 msec. LOW pulse to appear on the STT control lead.

v. The 10 msec. LOW pulse on the STC control lead causes Monostable FLIP FLOP MM2 to go LOW, causing G11 to go HIGH, G12 to go LOW, and G13 to go HIGH. When MM2 returns to HIGH, NOR Gate G13 goes LOW causing FLIP FLOP FF1 to change state (Q goes HIGH, $\overline{Q}$ goes LOW).

CR

w. When $\overline{Q}$ of FF1 goes LOW, NOR Gate G18 goes HIGH because both inputs ($\overline{Q}$ of FF2 is LOW) are LOW. NOR Gate G18 (DC3) HIGH output holds NOR Gate G13 output LOW, preventing any other change in the Digit Supervise FLIP FLOPS FF1 and FF2.

.04 Connecting the Called Extension (Extension Not Busy)

a. When Digit Control Two (DC2) goes HIGH on completion of the Second Digit, the First and Second Digit Counter NOR Gates G15-G17, G20-G22 are enabled. The outputs of the First and Second Digit Counters cause their respective NOR Gates to go HIGH

CR

b. A HIGH output on the NOR Gates G15-G17, G20-G22 cause their respective TRANSISTOR RELAY DRIVER Q1-Q6 on the SEC circuit card to turn ON, causing the RELAYS to

C/
X

operate. Table C lists the Relay operation on the SEC and optional EEX circuit card for each counter output.

TABLE C

RELAY OPERATION ON SEC-EEX CIRCUIT CARD

SEC/EEX

First Digit Counter	Second Digit Counter	SEC Card	EEX Card
FF3		A	
FF4		B	
FF5		C	
	FF6	1A,1B	1C
	FF7	2A	2B
	FF8	4A,4B	4C,4D

c. When the SEC relays (and EEX relays if so equipped) operate, a circuit path is made through the relay tree to the called extension "Z" lead. The Extension Detector circuit is operated through the following circuit: (Extension No. 15 is dialed E.G.)

EXTENSION: (-P) - MAIN-AMP - R16-Z-HS_5-HS_6-TK_{1-2} (1522 TELU) - A24 EXT - cable - MDF -

C28 KSU - SEC: $T15_b$-$1b_5$-b_2-$4a_0$-$2a_4$-a_1-c_4-b_5-TK_b - TNS: $T24a$-bt_2-R38-$Q13_{b-e}$-R45-(+P)

TNS

d. When the called extension is not busy (on-hook), Q13 on the TNS circuit card conducts because of (-P) battery from the extension amplifier circuit. TRANSISTOR Q14 is enabled because DC2 on the DCR circuit card is HIGH, reverse biasing DIODE D9. RESISTOR R41 forward biases Q14 causing Q14 to turn ON. RELAY BT operates through the following circuit:

TNS: (-R) -$Q14_{c-e}$-BT (470)-$Q13_{c-e}$- (+P)

Once RELAY BT has operated, it remains energized through a holding path by contact closure bt_1.

e. Relay contacts bt_3 connects the extension relay tree to the Tone/Voice Signal TRANSFORMER XF2. Besides audio coupling the tone/voice signals, TRANSFORMER XF2 supplies (+P) battery to the called extension, turning the extension amplifier circuit ON. Figure 3 illustrates the circuit through which the called extension is supplied calling tone/voice and Battery through XF2.

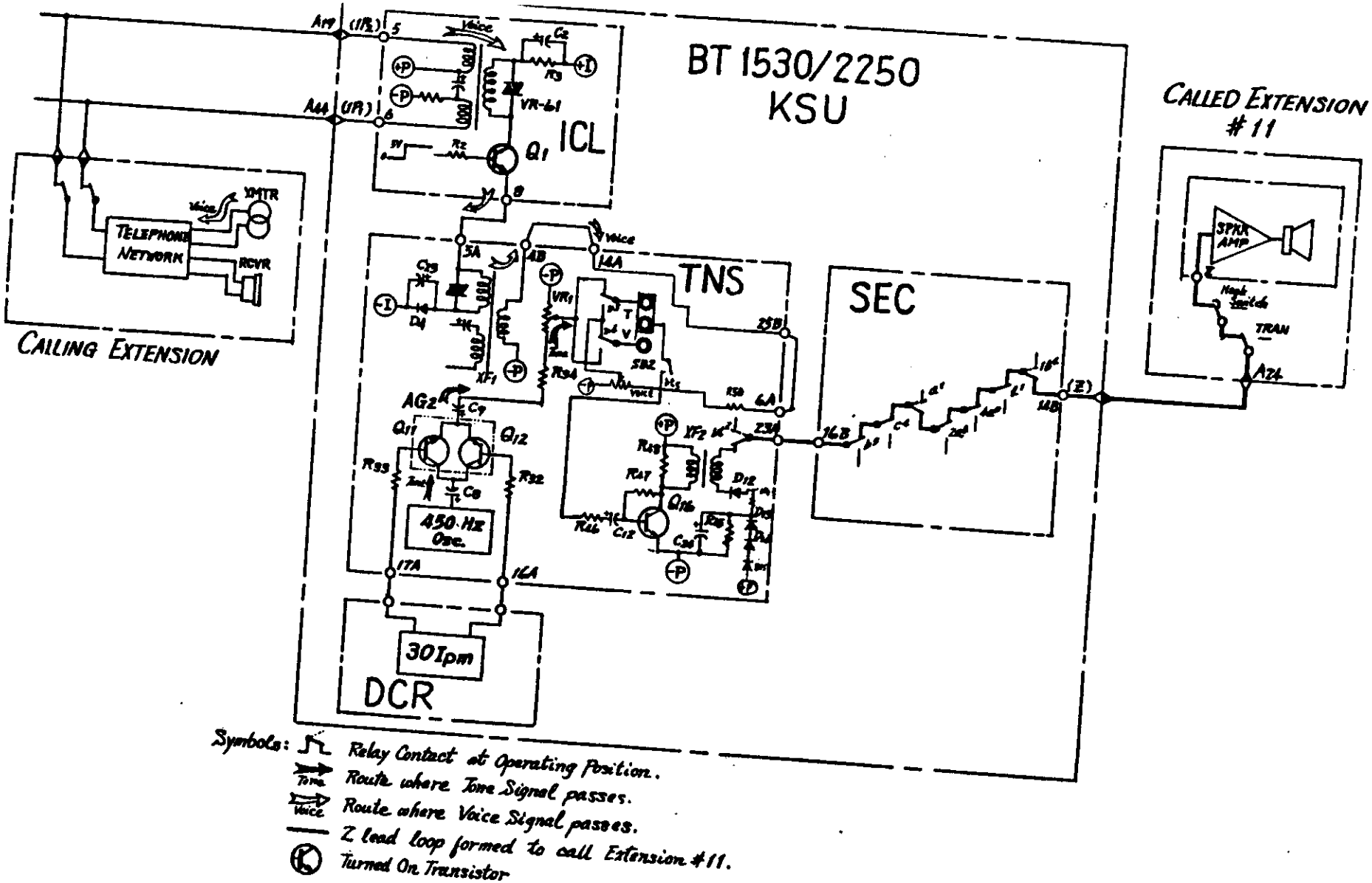


Figure 3 Intercom Tone/Voice Signalling and Control Circuit

DCR

f. When the DC2 on the DCR circuit card goes HIGH on completion of the Second Digit, NAND Gate G24 is enabled. When RELAY BT on the TNS circuit card operates, bt_0 provides a LOW on the BT lead control. A LOW on BT causes NAND Gate G28 to be held HIGH, disabling the Gate. Also, NAND Gate 26 (connected as an INVERTER) goes HIGH enabling NAND Gate G27. The remaining input to NAND Gate G27 is connected to the 30 IPM Interrupter through NAND Gate G28 (connected as an INVERTER). The output of NAND Gate G27 is controlled by the 30 IPM Interrupter, providing an Inverted Interrupter input to NAND Gate G29.

g. NAND Gate G24 output is controlled by the 30 IPM Interrupter. Because REG is LOW (Register is seized), NAND Gate G3 output is HIGH. This enables NAND Gate G24 to pass the 30 IPM Interrupter signal. NAND Gate G4 (plus the Inverted output at NAND Gate G34) control the turn on of the ANALOG GATE AG2 on the TNS circuit card, turning AG2 ON for one (1) second, OFF for one (1) second. AG2 controls the output of the 450hz Osc. which provides Dial Tone, Busy Tone to the calling extension and Ringing Tone to the called extension.

4.05 Operation with Tone Calling Arranged for Two (2) Digit Access

a. When DC2 on the DCR circuit card goes HIGH, 30 IPM Ringing Tone is sent to the called extension through TRANSFORMER XF2 by the following circuit:

TNS

450hz OSC-C8-AG2-C9-R34-VR1-v SB2 (TONE POSITION)-bt_5-

-R46-C12-$Q16_{b-e}$ ⊕P-$XF2_{1-2}$-C26-$Q16_{c-e}$ ⊖P

DCR

b. At the calling extension, Ringback Tone (modulated 450hz at 15 IPM) is heard. The Ringback tone is controlled by the 15 IPM Interrupter Output NAND Gates G30 and G31 on the DCR circuit card.

TNS

c. The 15 IPM Interrupter controls ANALOG GATE AG1 and TRANSISTOR Q17 on the TNS circuit card allowing the tone to pass through the gate for one (1) second, off for three (3) seconds. Ringback Tone is connected to the calling extension through TRANSFORMER XF1 by the following circuit:

TNS

TN Ringer-C4-AG1-Q17e-c-C11-R39-v_2-SB1 (TONE POSITION)-bt_4-

T23b-T11a-C10-$XF1_{1-2}$- ⊖P

d. The calling extension hears the Ringback tone through the same circuit that provided Dial Tone to the calling extension. (REF Para. 4.01h)

e. If the calling extension dials a Third Digit (Rotary or Tone) Digit Control Three (DC3) on the DCR circuit card goes HIGH (REF Para. 4.02r-s, 4.03s-w). This causes RELAY V on the TNS circuit card to operate since DIODE D11 is no longer forward biased and TRANSISTOR Q15 ON.

f. Relay contact v_2 disconnects the Ringback Tone from the calling extension. A "voice" path is now open from TRANSFORMER XF1 to the Intercom Line voice path using the circuit described in Para. 4.10h. Voice paging from the calling extension is connected to the called extension through TRANSFORMER XF2 by the following circuit:

TNS

TNS

(-P) - $XF1_{6-5}$-T4b - T14a - T25b - T6a - VR3 - V5-SB2(TONE)-bt_s-R46

C12 - $Q16_{b-e}$ (-P)

+P - $XF2_{1-2}$C26 $Q16_{c-e}$

g. The "Voice" signal is connected to the called extension through TRANSFORMER XF2 by the same circuit path that the "Tone" signal was connected (REF Para. 4.04e).

4.06 Operation with Voice Calling Arranged for Two (2) Digit Access

a. Upon completion of dialing the Second Digit, "Voice" paging to the called extension is accessed through TRANSFORMER XF1 by the following circuit:

TNS

(-P) -$XF1_{6-5}$-T4b-T14a- -SB2 (VOICE POSITION)-bt_5-T25b-T6a-

-R46-C12...$Q16_{b-e}$ (-P)

(+P)-$XF2_{1-2}$-C26-$Q16_{c-e}$

b. "Voice" from the Intercom Line circuit is connected to TRANSFORMER XF1 through the same circuit path that Dial Tone was accessed (REF Para. 4.01h).

c. If the calling extension dials a Third Digit (Rotary or Tone), Digit Control Three (DC3) on the DCR circuit card goes HIGH (REF Para. 4.02r-s; 4.03s-w). This causes RELAY V on the TNS circuit card to operate since DIODE D11 is no longer forward biased and holding TRANSISTOR Q15 OFF.

TNS

d. Fifteen (15) IPM Interrupter Ringback Tone (modulated 450 hz) is connected to the calling extension through TRANSFORMER XF1 by the following circuit:

TNS

TN Ringer-C4-AG1-C11-R37-v_2-SB1 (VOICE POSITION)-bt_4-T11a-C10-$XF1_{1-2}$-(-P)

TNS

e. Because ANALOG GATE AG2 is turned ON (REF Para. 4.04g), Ringing tone interrupted at 30 IPM is sent to the called extension through TRANSFORMER XF2 by the following circuit:

TNS

450hz OSC-C8-AG2-C9-R34-VR1-v_4-SB2 (VOICE POSITION)-bt_5-R46-C12-$Q16_{b-e}$-(-P)

(+P)-$XF2_{1-2}$-C26-$Q16_{c-e}$

4.07 Answering the Intercom Call

a. When the called extension presses the Intercom Line Key and takes the handset off-hook, the Intercom Line Card (ICL) detects the off-hook (answer) condition through the following circuit: (Calling Ext. No.15 on ICM1 e.g.)

TNS — SEC

(+P) - D14-D13-D12-$XF2_{4-3}$-bt_3-T23a - T16b- -$2a_4$-$4a_6$-b_2-$1b_5$-T15b - C28 KSU - MDF - cable - A24 EXT - EXTENSION: TK_{2-1}-HS_6-HS_7-AP-P11-$LK14_{11-10}$-$LK15_{11-12}$ - A45 EXT - cable - MDF - A45 KSU - ICL: T9-R12-$Q4_{b-c}$-(-I)

b. Plus P (+P) battery on the Intercom Line P3 lead causes TRANSISTOR Q4 (ANS) to turn ON. This provides a LOW input to NAND Gate G12. ANS going LOW causes G12 to go HIGH, which in turn causes NOR Gate G6 to go LOW (ST is LOW).

ICL

c. When NOR Gate G6 goes LOW, the SET-RESET FLIP FLOP (RSFF) composed of NAND Gates G4 and G5 can change state since the input to G4 is HIGH (Ref Para. 4.10d) and the input to G5 has changed from HIGH to LOW.

d. When the output of RSFF NAND Gate G5 goes HIGH, NAND Gate G10 goes LOW (ST is HIGH). Because of G10 is LOW, NAND

Gate G7 goes HIGH causing TRANSISTOR Q5 and Q6 to turn ON steady, which in turn causes the Intercom Line Indicator Lamp to burn steady.

ICL

e. The LOW output on NAND Gate G4 disables NAND Gate G7, preventing any additional dial pulses from entering the Register. Also, TRANSISTOR Q1 is turned OFF, disconnecting the voice/tone path from the Register.

f. When the NAND Gate G5 on the ICL circuit card goes HIGH, NAND Gate G1 (REG) on the DCR circuit card goes LOW. REG going LOW disables NAND Gate G3, preventing any more tone signals from passing through ANALOG GATE AG2 on the TNS circuit card.

g. REG going LOW enables NOR Gate G2, allowing it output to go HIGH at approx. a 3840 IPM rate. When NOR Gate G2, is HIGH, both NOR Gate G32 and G33 (connected as INVERTERS) go LOW. This causes the First and Second Digit Counters

DCR

FLIP FLOPS FF3-FF8 as well as the Digit Supervise FLIP FLOPS FF1-FF2 to RESET ($\overline{Q}$ output goes HIGH).

h. With NOR Gate G2 going HIGH, the 36-40 TIME OUT (TO) counter is continually RESET.

i. When the First and Second Digit Counter (FLIP FLOP FF3-FF8) are RESET, NOR Gates G15-17, G20-22 go LOW causing RELAYS on the SEC (and EEX if equipped) card to release, disconnecting the called extension "Z" lead from the register.

j. When the Digit Supervise FLIP FLOP FF1-FF2 are RESET, DC1 goes HIGH while DC2 and DC3 go LOW on the DCR circuit card.

k. RELAY BT on the TNS circuit card is released when DC2 goes LOW, causing TRANSISTOR Q14 to turn OFF. RELAY V is re-

TNS

leased because DC3 going LOW causes TRANSISTOR Q15 to turn OFF.

4.08 Connecting the Called Extension (Extension Busy)

a. When DC2 on the DCR circuit card goes HIGH after the end of the Second Digit, the relay tree on the SEC (and EEX if equipped) circuit card operate, connecting the called extension "Z" lead to the Extension Detector circuit as described in Para. 4.04c.

b. If the called extension is Busy (off-hook), no (-R) battery is available to turn TRANSISTOR Q13 ON, pre-

TNS

venting operation of RELAY BT on the TNS circuit card. Because RELAY BT does not operate, the called extension "Z" lead is not connected to the Tone/Voice signal source, TRANSFORMER XF2, but remains connected to the "detector" circuit.

c. Because DC2 is HIGH on the DCR circuit card, NAND Gate G24 is enabled. Because BT remain HIGH, NAND Gate G25 is enabled, passing the 120 IPM Interrupter signal. Also, BT being HIGH causes NAND Gate G26 (connected as an INVERTER) to go LOW, disabling NAND Gate G27 by causing it to go HIGH.

DCR

d. Because G27 is HIGH, NAND Gate G29 is enabled, passing the 120 IPM Interrupter signal through to NAND Gate G24. Because G24 was enabled by DC2 going HIGH, G24 passes the 120 IPM Interrupter to NAND Gate G4.

e. NAND Gate G4 is enabled because DC1 is LOW after the First Digit causing NAND Gate G3 to go HIGH. NAND Gate G4 passes the 120 IPM Interrupter signal. Both NAND Gate G4 and G34 control the ANALOG Gate AG2 on the TNS circuit card, turning the AG2 on-off at a 120 IPM rate.

f. Busy Tone is sent to the calling extension through TRANSFORMER XF1 by the following circuit:

TNS

450hz OSC-C8-AG2-C9-R35-bt_4-$T2 3_D$-T11a-C10-$XF1_{1-2}$- (-P)

g. The Intercom Line Voice path is connected to TRANSFORMER XF1 through winding 3-4.

h. If the called extension returns on-hook, the extension "detector" circuit is supplied (-P) battery by the called extension amplifier unit by the circuit described in Paragraph 4.04c. RELAY BT on the TNS circuit card operates, causing Voice/Tone Signals to be supplied to the called extension as outlined in Paras. 4.04, 4.05 and 4.06.

TNS

i. When RELAY BT operates, BT goes LOW, disabling NAND Gate G28 on the DCR circuit card, disconnecting the AG2 driver circuit from the 120 IPM Interrupter, allowing AG2 to be controlled by Voice/Tone calling function.

4.09 Alternate Point Answering (APA)

a. If the called party is not at the called extension, the call can be answered at any other extension by using the CONF (APA) Key.

b. When the Intercom Line Key is pressed and the handset taken off-hook at the answering extension, the CONF Key is pressed. This releases the KSU Intercom Register by placing (+R) battery on the Intercom P3 lead and operating the ANS detector through the following circuit:

EXTENSION

(+R)-HS_3-HS_4-9-8-D14-H-RH-$LK1_{11-10}$...$LK13_{11-10}$-P-PA-CK_{1-3}-AP-

P1-P2-$LK14_{11-10}$-$LK15_{11-12}$ - A45 EXT - cable - MDF - A45 KSU -

ICL

T9-R12-$Q4_{b-e}$- (-I)

NOTE: The EXTENSION circuit does not take into account the PRV unit

ICL

c. Plus R ((+R)) battery on the P3 leads cause TRANSISTOR Q4 (ANS) on the ICL circuit card to turn ON. This provides a LOW input to NAND Gate G12. ANS going LOW caused the Register to release and Intercom Line clearing as described on Para. 4.07b-1.

4.10 Time Out Function

a. When REG on the DCR circuit card goes HIGH, NOR Gate G72 goes LOW. LOW on the output of G72 enables the 36-40 sec. Time Out (TO) circuit.

DCR

b. The called extension must answer the call before the 36-40 sec. period. Also, if the called extension is busy (off-hook) the calling extension can wait only the duration of the time-out period before the Register is RESET.

c. The Time Out (TO) FLIP FLOPS FF9-FF12 is controlled by the 15 IPM Interrupter. When both inputs to NAND Gate G34 are HIGH, G34 output goes LOW.

ICL

d. When NAND Gate G34 goes LOW after 36-40 seconds, NAND Gate G12 on the ICL goes HIGH. This causes NOR Gate G6 to go LOW. When NOR Gate G6 goes LOW, the RSFF changes state and the Register RESETS as described in Para. 4.07c-k.

4.11 Completion of Call

a. When both parties go on-hook, the DC path across P1-P2 of the Intercom Line is opened. Plus P ((+P)) battery is no longer connected through R4, D1, and R5 to the base of TRANSISTOR Q2 (ST) on the ICL circuit card. This causes CAPACITOR C3 to discharge, through R5, R6 and $Q2_{b-e}$. The discharges hold ST LOW till Q2 is no longer forward biased and turns OFF.

ICL

b. When Q2 turns OFF, ST goes HIGH. ST going HIGH causes

ICL

INV Gate G1 to go LOW. G1 going LOW causes NAND Gate G10 to go HIGH. G10 going HIGH causes NAND Gate G9 to go LOW (NAND Gate G8 is HIGH). G9 going LOW turns OFF TRANSISTOR Q5 and Q6, extinguishing the Line Lamp.

4.12 Abandoning the Call

a. If the calling extension abandons the call before the called party answers, the DC path across P1-P2 of the Intercom Line is opened. TRANSISTOR Q2 in the ICL Line card turns OFF as described in Para. 4.11a.

b. When Q2 turns OFF, ST goes HIGH. ST going HIGH causes NOR Gate G6 to go LOW (G12 is LOW since both ANS and TO are HIGH). When G6 goes LOW, the RSFF composed of NAND Gate G4 and G5 can change state since the input to G4 is HIGH (REG is HIGH causing G11 to go LOW and G3 to go HIGH).

ICL

c. The RSFF changes state, NAND Gate G5 is HIGH and G4 is LOW. The Registor is then released by the circuit operation described in Para. 4.07d-k.

d. The Intercom Line Lamp extinguishes by the circuit described in Para. 4.11b.

5.00 USING THE PAGE (ALL CALL) KEY

5.01 Making an All Call to the Extensions

a. Pressing the PAGE Key at the calling Extension operates RELAY ALL on the IAP circuit card through the following circuit:

EXTENSION: (+R)-HS$_4$-PK$_{3-2}$-T$_1$- T -T2-Pk$_{5-6}$ - A48 EXT - cable - MDF - A48 KSU - IAP: T19b-T15a-ALL(470)-R6-(-R)

b. When RELAY ALL operates, voice from the calling extension is coupled through TRANSFORMER XF1 on the IAP circuit card, connected by relay contact all$_1$ to TRANSISTOR Q3. Q3 amplifies the voice and couples the voice through CAPACITOR C7 to the All Call TRANSFORMER XF3.

IAP

c. TRANSFORMER XF3 supplies both plus (+) battery and voice to the All Call output control lead "BA". Battery and voice are connected to those extensions wired for All Call as shown in Figure 4.

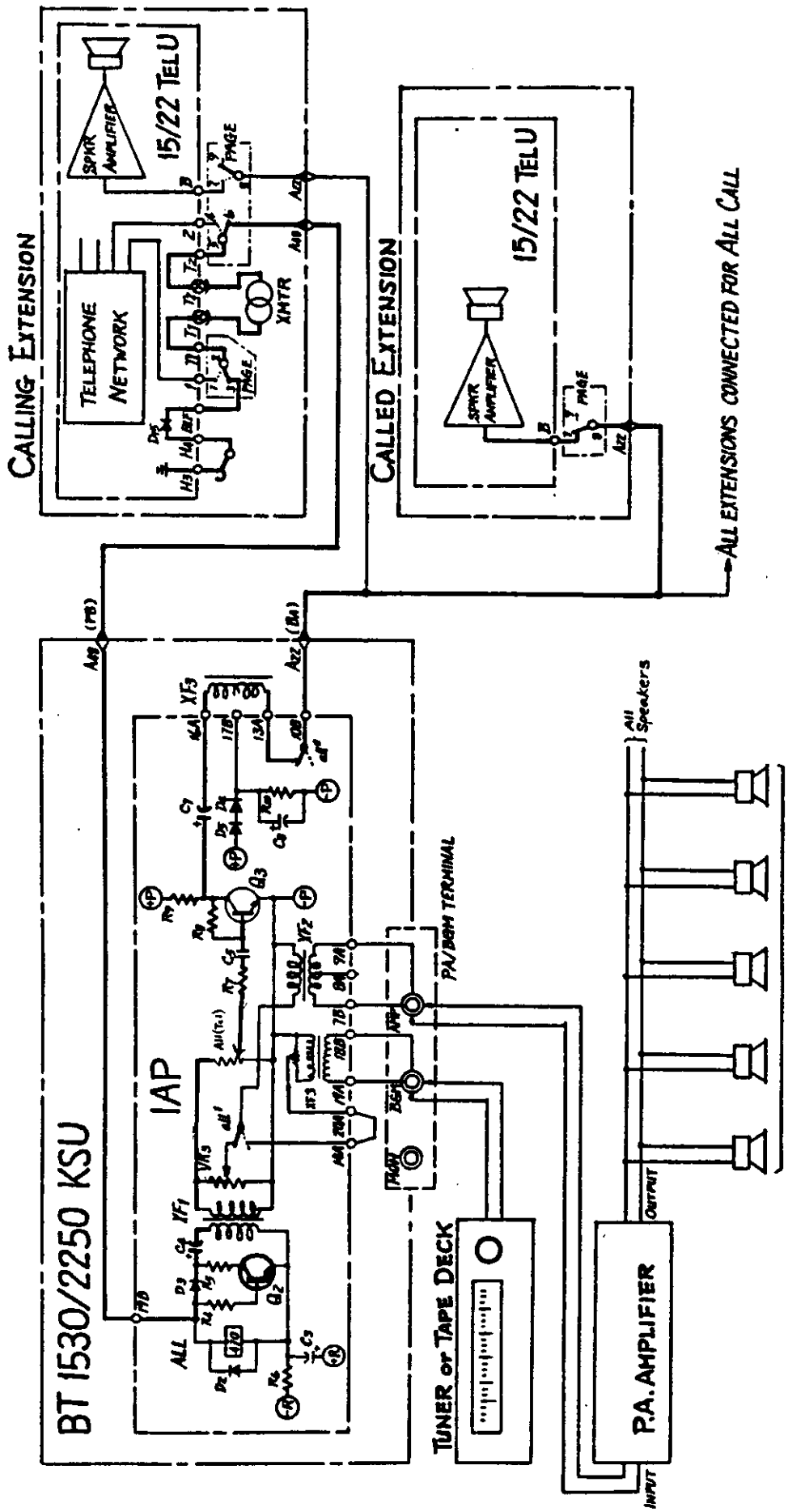


Figure 4 All Call Voice/Control Circuit

IAP

d. Those extensions arranged for Night Service receive All Call on the Night Service lead "BN" (A47) through relay contact nt_0 on the IAP circuit card.

e. Extension arranged for Individual CO Line Audible receive the All Call through the external installer provided DIODES that are forward biased by (+P) battery through TRANSFORMER XF3. When a CO Line Incoming Ring occurs, the individual DIODE becomes reversed biased due to greater (+P) battery potential through TRANSFORMER XF4 than through XF3 due to the series voltage drop of DIODES D and D5

f. At the calling extension, PAGE Key contacts PK_{7-9} disconnect the B control lead (A22) to prevent "feedback" from occurring.

5.02 PA Connection

IAP

a. The Background Music Source (BGM) input is connected through its own VOLUME CONTROL (VR2) and relay contact all, to the PA Amp. Input TRANSFORMER XF2. When RELAY ALL operates (through the circuit described in Para. 5.01a), XF2 is disconnected from the BGM source and connected to the page input.

b. At the same time the calling extension page is heard through the All Call, the voice page is heard through the external PA system.

c. Figure 4 illustrates the PA Connection operating circuit.

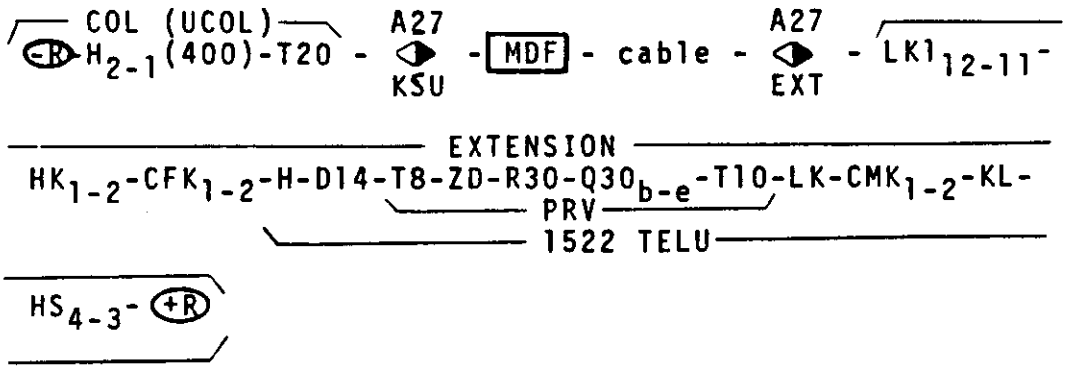
6.00 PRIVACY UNIT OPERATION

6.01 Operation of the Privacy Unit (PRV) on a Free CO Line.

a. When any handset is taken off-hook, (+R) battery is supplied to the PRV unit through Hookswitch contact HS_{3-4} Because no (-R) battery is available through the Line Key (LK), TRANSISTOR Q30 is OFF, holding TRANSISTOR Q31 OFF.

b. Because Q31 is OFF, TRANSISTOR Q32 is turned ON due to current flow through RESISTOR R34, R35 and R36. When Q32 turns ON, RELAY K operates, disconnecting the voice network from the Extension Line Key assembly.

c. When a CO Line Key (e.g. CO 1) is pressed, (-R) battery through RELAY H on the COL (UCOL) turns TRANSISTOR Q30 on through the following circuit:



PRV

d. When TRANSISTOR Q30 turns ON, Q31 turns ON. When Q31 turns ON, forward bias is supplied to Q30 through RESISTOR R33 to hold Q30 ON. Also, current now flows through DIODE D31 and Q31$_{c-e}$ causing a low voltage drop to appear across RESISTOR R35 and R36. TRANSISTOR Q32 then turns OFF, releasing RELAY K. The Extension's Voice Network is now connected across the CO Line TIP-RING.

COL

e. When TRANSISTOR Q30 turns ON, DIODE D30 is forwarded biased causing ⊕R battery to appear at RELAY H coil on the COL (UCOL) circuit card. RELAY H now operates.

f. ⊕R battery less the series voltage drop of DIODE D14 and D30 holds RELAY H operated

6.02 Exclusion of Other Extensions on a Busy CO Line

a. When another extension equipped with a PRV unit presses the CO Line Key of the busy CO Line, TRANSISTOR Q30 of the second extension PRV unit remains OFF due to ⊕R battery on the "H" lead. RELAY K on the PRV of EXT. No. 2 remains operated, keeping the extension voice network disconnected from the CO Line TIP-RING.

b. COMMON Key Sw contacts CMK$_{1-2}$ prevent defeating the local extension PRV unit when a CO Line is busy by causing TRANSISTOR Q30 to turn OFF (subsequently causing Q32 to turn ON and operating RELAY K) when switching from CO Line to CO Line.

6.03 Privacy Release Operation

a. When EXT No. 1 wishes to let another Extension (No. 2) enter the conversation, the CONF Key is pressed at EXT No. 1. This causes a minus (-) potential to appear on the "H" lead due to the voltage divider set up by the insertion of RESISTOR RH in series with the ⊕R battery in the "H" lead circuit.

COL

b. TRANSISTOR Q30 of the PRV unit at EXT No. 1 still remains turned ON due to R33, allowing (+R) battery to still remain on the "H" lead, sufficient to hold RELAY H on the COL (UCOL) operated. However, due to the lower positive (+) potential appearing across RELAY H coil, DIODE D2 on the COL (UCOL) card becomes reversed biased and RELAY T releases due to the reverse phasing of its winding through the circuit described in Section 3001: 2.04b. The line lamp starts to flash at a fast rate (120 IPM) controlled by the circuit as described in Section 3001 2.04d.

PRV EXT 1

c. TRANSISTOR Q30 remaining ON hold TRANSISTOR Q31 ON and Q32 OFF, keeping the PRV Privacy RELAY K not operated.

PRV EXT 2

d. Sufficient (-R) battery is now available on the "H" lead to cause TRANSISTOR Q30 on EXT No. 2 PRV unit to turn ON. This in turn causes Q31 to turn ON, providing forward bias through RESISTOR R33 to hold Q30 ON. Q31 turning ON causes the voltage drop across RESISTOR R35 and R36 to go LOW turn TRANSISTOR Q32 OFF and prevents operation of RELAY K.

e. When Q30 on the PRV unit at EXT No. 2 turns ON, the voltage divider on the "H" lead is bypassed by Q30 providing direct (+R) battery less the voltage drop of Q30, D30 and D14 on the "H" lead.

COL

f. Direct (+R) battery on the "H" lead causes DIODE D2 on the COL (UCOL) circuit card to become forward biased, causing RELAY T to operate and the line lamp to return to steady.

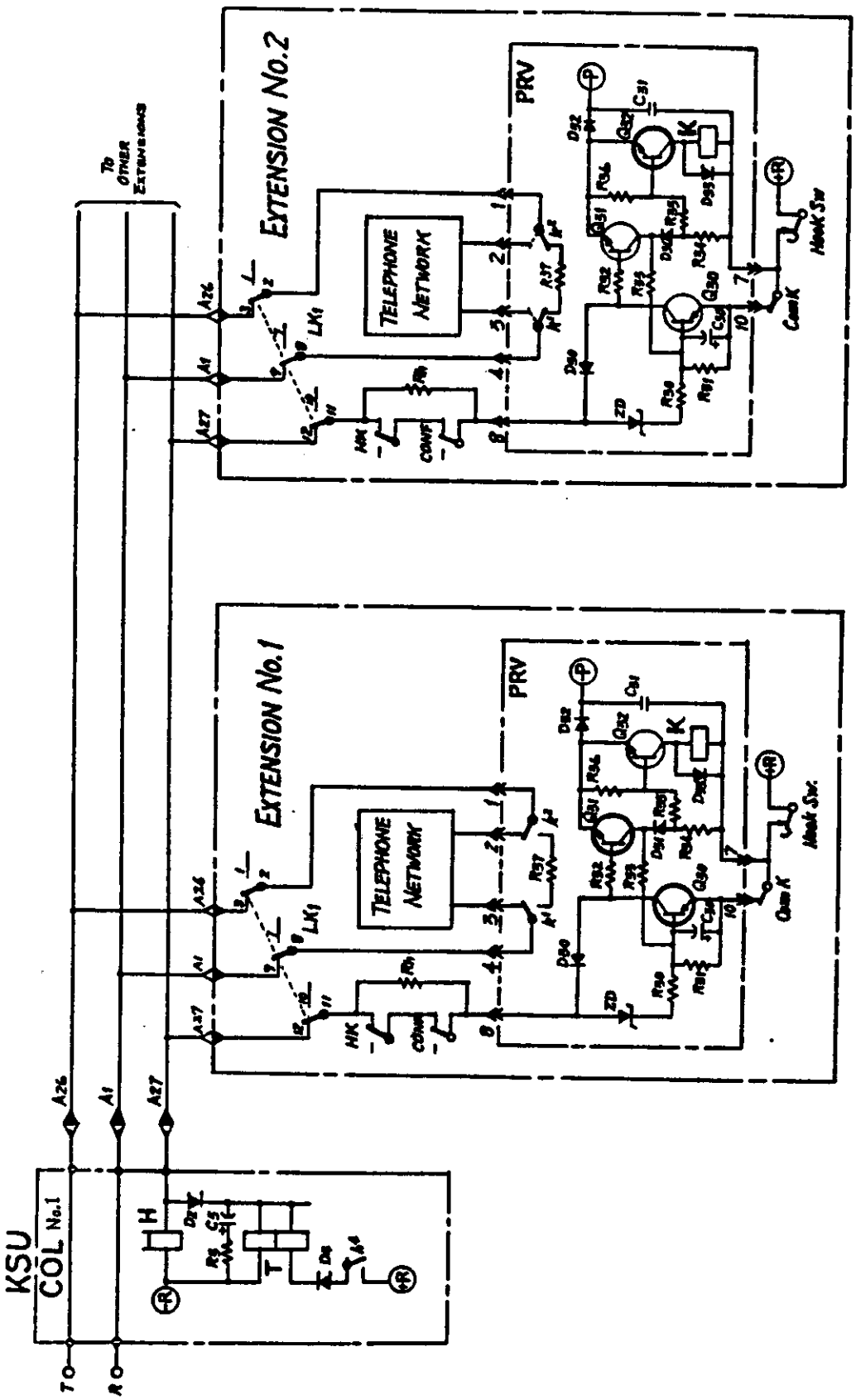
g. The CONF Key is released at EXT No. 1 and both Extension Voice Network are connected across the TIP-RING of the CO Line. If a third extension is to enter the line, both EXT No. 1 and EXT No. 2 pressing their respective CONF Key cause the voltage divider to appear on the "H" lead. Enough minus (-) voltage appears on the "H" lead allowing TRANSISTOR Q30 of the PRV unit on EXT No. 3 to turn ON.

h. Figure 3 illustrates the Privacy Unit operating circuit with Extension No. 1 and No. 2 connected to CO Line No. 1.

6.04 Defeating the Privacy Unit on the Intercom Line

a. When the handset is taken off-hook, RELAY K on the PRV unit operates as described in Para. 6.01a-b. When the Intercom Line Key is pressed, (-P) battery from RESISTOR R21 turns TRANSISTOR Q30 ON through the circuit as shown in Figure 4.

b. Q30 turning ON prevents the Privacy RELAY K from operating as described in Para. 6.01d.



Symbols: 'K' Relay Contacts at Operating Position in Ext. #2.
Turned On Transistor.

Figure 3 CO Line Privacy Unit (PRV) Circuit

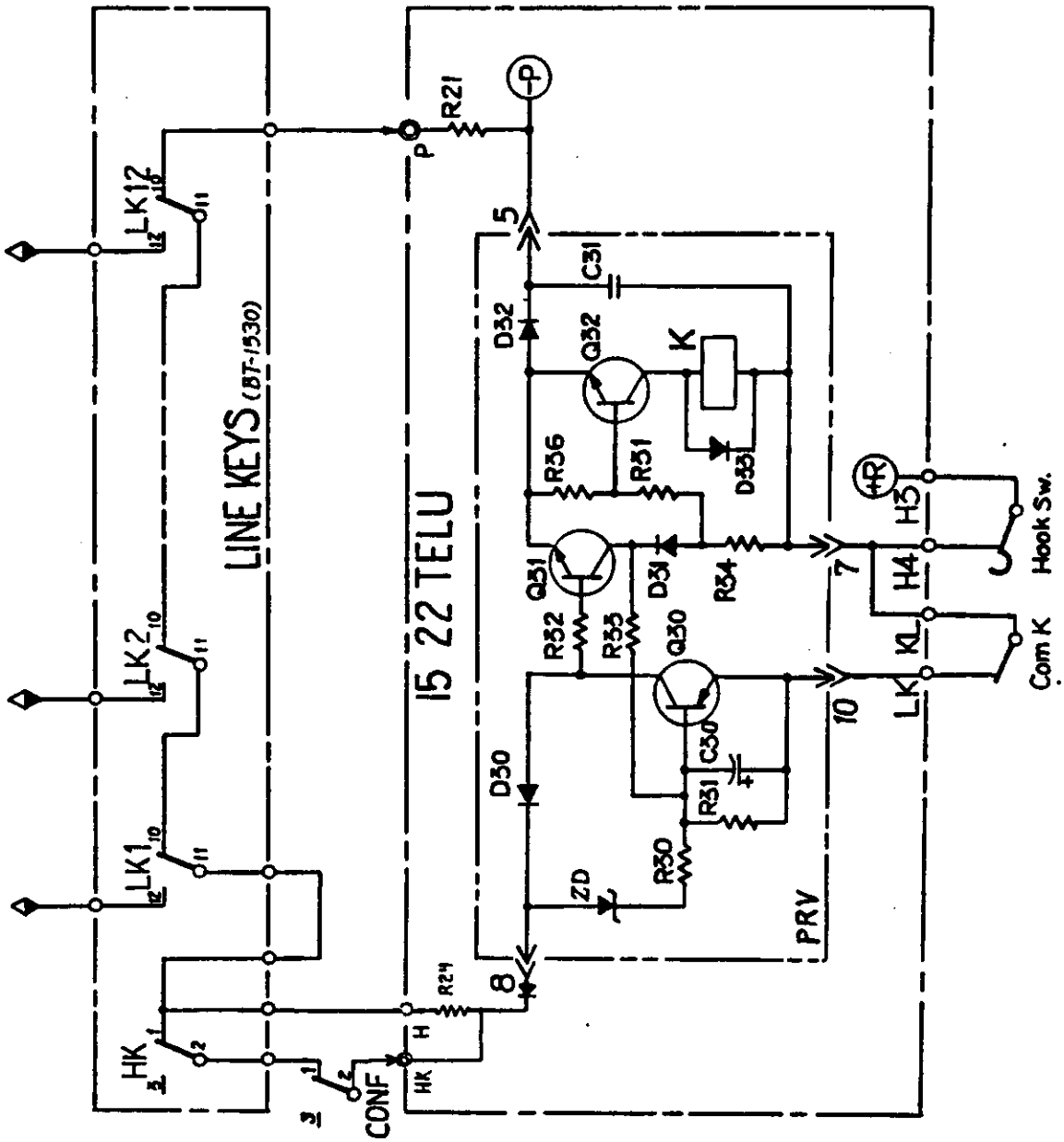


Figure 4 Privacy Unit (PRV) Operation on Intercom Lines

OMEGA PHONE II

BT-1530/2250 KEY TELEPHONE SYSTEM

CIRCUIT DESCRIPTION OPTIONAL FEATURES

1.00 INTRODUCTION

1.01 This section describes the circuit operation of various optional or Installer programmed features of the BT 1530/2250 Key System. Refer to the Table of Contents for a listing of the individual features described.

1.02 Refer to Condensed System Dwg. No. 1 and 2, Section 4000 for wiring diagrams of the features described.

1.03 Condensed circuit diagrams are provided in this section for clarity in some instances. Refer to Section 4000 for complete schematic diagrams of the feature(s) described.

2.00 HANDSFREE TALKBACK OPERATION

2.01 Accessing the KSU Handsfree Circuit Card (HFK-1) control/voice amplifier circuit.

a. When a HFS-1 equipped extension is called on the ICM and Voice Calling is accessed, the HFK-1 circuit card is operated through the following circuit:

TNS: (+R)-T3b-T13a-v_1-SB3 (Tone) -bt_3 -T24a-T16-HF (470)- (-R) :HFK

NOTE If the called extension is Busy, the HFK-1 circuit card is not operated because of relay contact bt_3 on the TNS circuit card is not operated.

b. +R battery on TERM T16 of the HFK-1 circuit card causes RELAY AM to operate momentarily due to CAPACITOR C22 charging current causing TRANSISTOR Q19 to turn ON. When C stops charging, Q19 turns OFF. This causes RELAY AM to operate for only 1-2 seconds.

c. Assuming the Shorting Bars on the TNS circuit card are in the Tone Call two digit access mode, the Calling Extension is sent a momentary warning tone through TRANSFORMER XF2 on the TNS circuit card by the following circuit:

TNS — HFK — TNS

450hz -T25a - T7-R58-C28-Q22-VR4-am,-C18-T8-T11a-C10-XF2

d. The 450 hz warning tone is connected to the Called Extension through TRANSFORMER XF2 on the TNS and the HFK-1 amplifier as shown in Figure 1

e. At the Called Extension, +P Battery from TRANSFORMER XF1 on the TNS circuit card causes the extension amplifier to turn ON. At the same time, +P Battery turns on the extension HF microphone

2.02 Operation of the HF Voice Circuit

a. The output of the Called Extension Mic Amplifier is connected through the HFK-1 circuit card to the Calling Extension by the circuit illustrated in Figure 2.

b. The Hybrid circuit on the HFK-1 circuit card connects the Bi-directional Transmit/Receiver Amplifiers of the HFK-1 to the ICM Voice path. Figure 2 illustrates the function diagram of the HFK-1 circuit card since the electronic operation of the HF circuit is beyond the scope of this discussion.

2.03 Disconnect of the HF Voice Circuit

a. During the HF Talkback interval, the ICM Dial Register remains operated. The Time Out Function is energized, limiting the time duration of the HF Talkback call.

b. If either the Calling Extension goes ON-HOOK, the Called extension goes OFF-HOOK on the ICM line, or the ICM Register releases due to operation of the Time Out Function, +P Battery disconnects from the Extension Z line. RELAY BT on the TNS circuit card release also causes RELAY HF release on the HFK-1 circuit card.

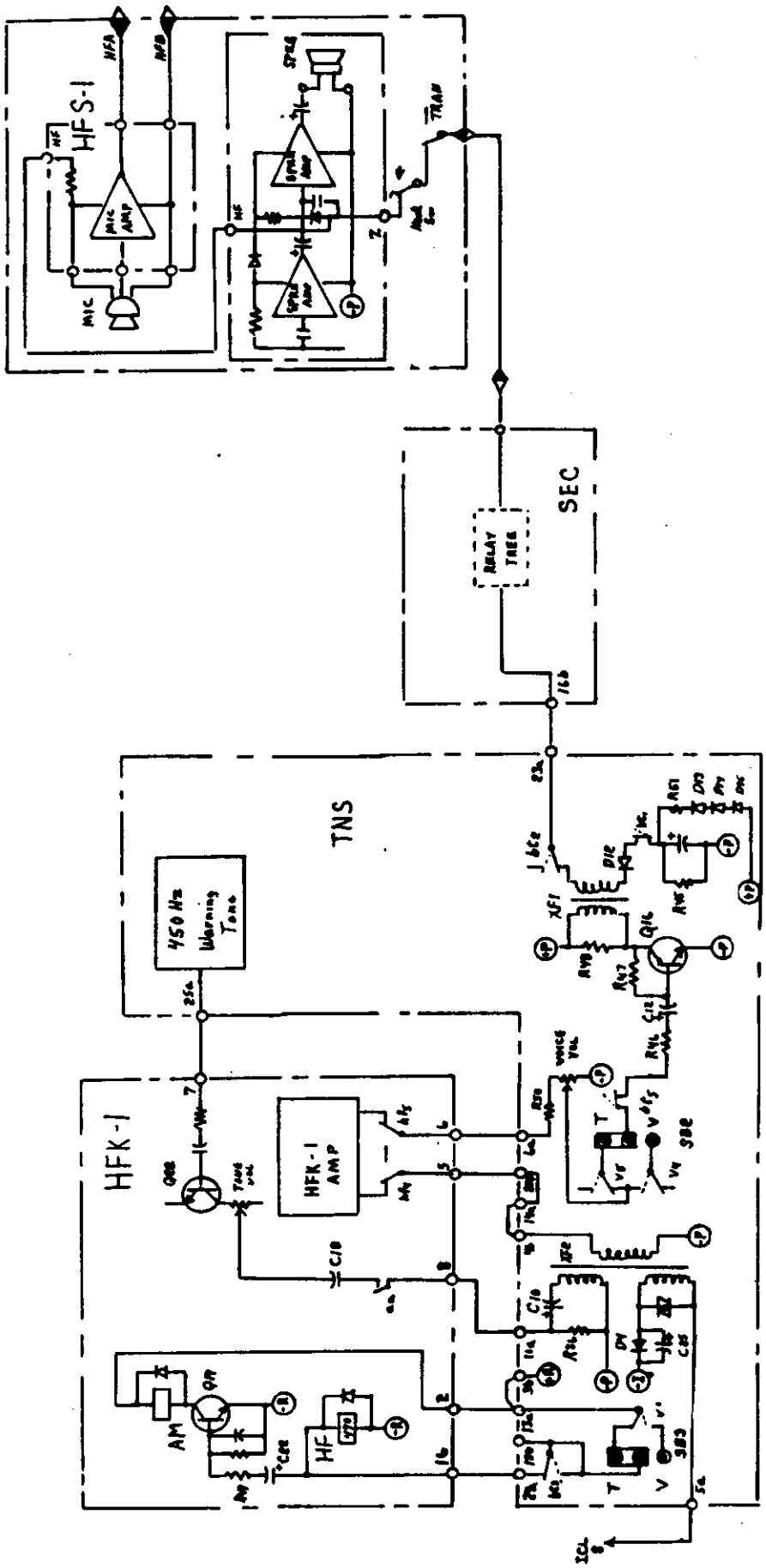


FIGURE 1 HF Voice and Tone Control Circuits

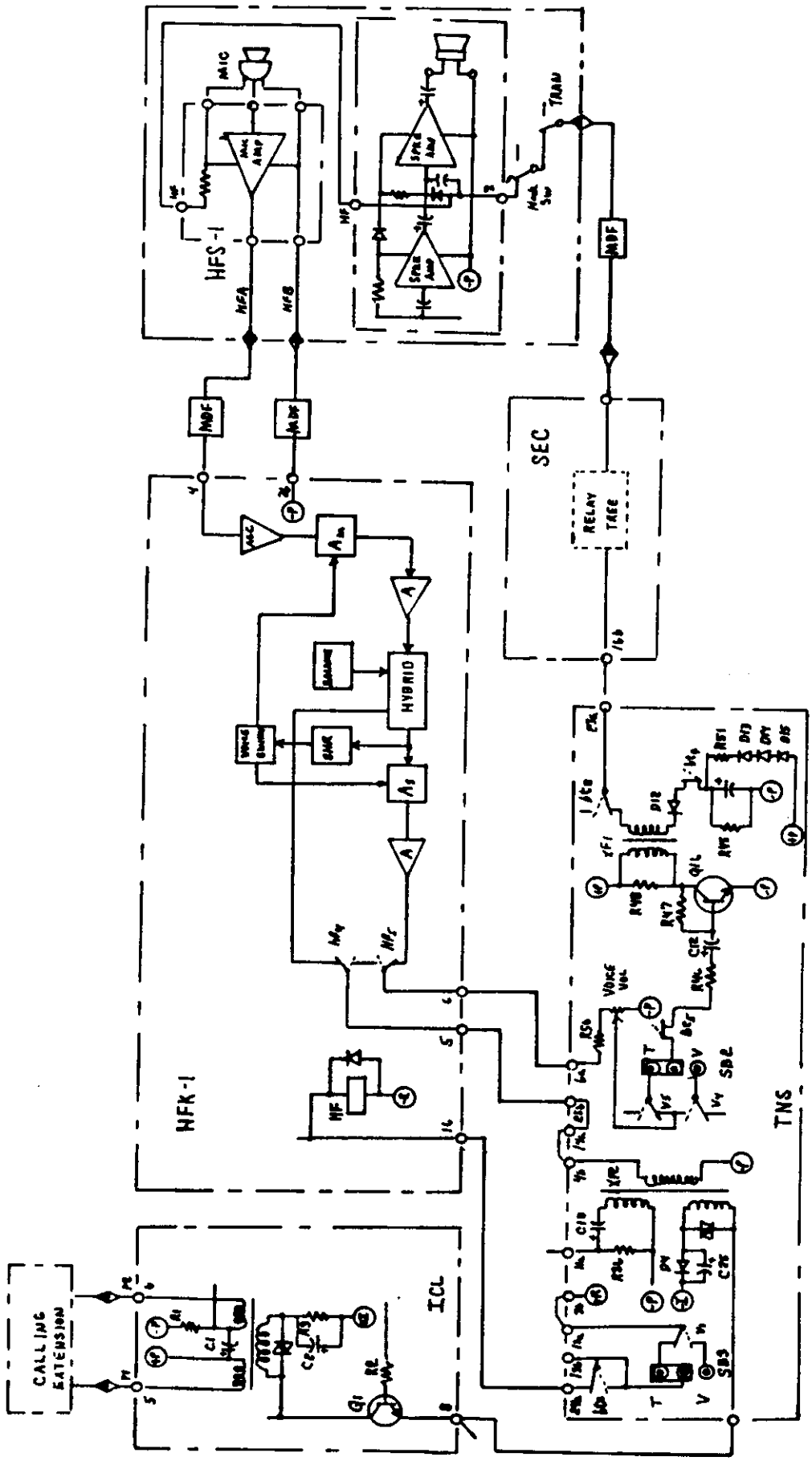


Figure 2 Voice Connection Between Calling and Answering Extension when HF is Operated.

3.00 MUSIC-ON-HOLD OPERATION

3.01 When the HOLD Key (HK) is pressed at the extension, RELAY T on the COL (UCOL) circuit card releases while RELAY H remains operated through the circuit described in Section 3001, 3.04.

3.02 When the RELAY T releases, RELAY HA on the MOH circuit card is operated through the following circuit:

$$\overbrace{\text{(+R)-}h_4\text{-}t_5\text{-D5-T19}}^{\text{COL (UCOL)}} - \overbrace{\text{T10-HA(470)- (-R)}}^{\text{MOH}}$$

3.03 RELAY HA can be used to control the START/STOP operation of the MOH source through contacts ha_1 and ha_2.

3.04 At the same time, the MOH input is connected to the MOH amplifier through TRANSFORMER XF1. The MOH Output TRANSFORMER XF2 isolates the MOH battery from the CO Lines and connects the MOH audio through relay contacts h_0-t_0 and h_1-t_1 on the COL (UCOL) card to the held party on the CO line.

4.00 OPERATION OF THE NIGHT SERVICE

4.01 Figure 5 illustrates the operation of RELAY NT on the IAP circuit card during Night Service.

4.02 The Night Service control Extension TRAN Key must be modified in accordance with Section 2005; 8.04 for operation of this feature.

4.03 Circuit Operation

a. (+P) battery from TRANSFORMER XF1 on the Common Incoming CO Audible Control (BO) is switches through the control extenstion TRAN Key to the TR function on KSU TERMINAL BLOCK A. +P battery on TR causes RELAY NT on the IAP circuit card to operate.

b. When RELAY NT operates, relay contact nt_0 switches the Night Service Control lead (BN) to the output of TRANSFORMER XF1, causing all extensions connected to "BN" to ring.

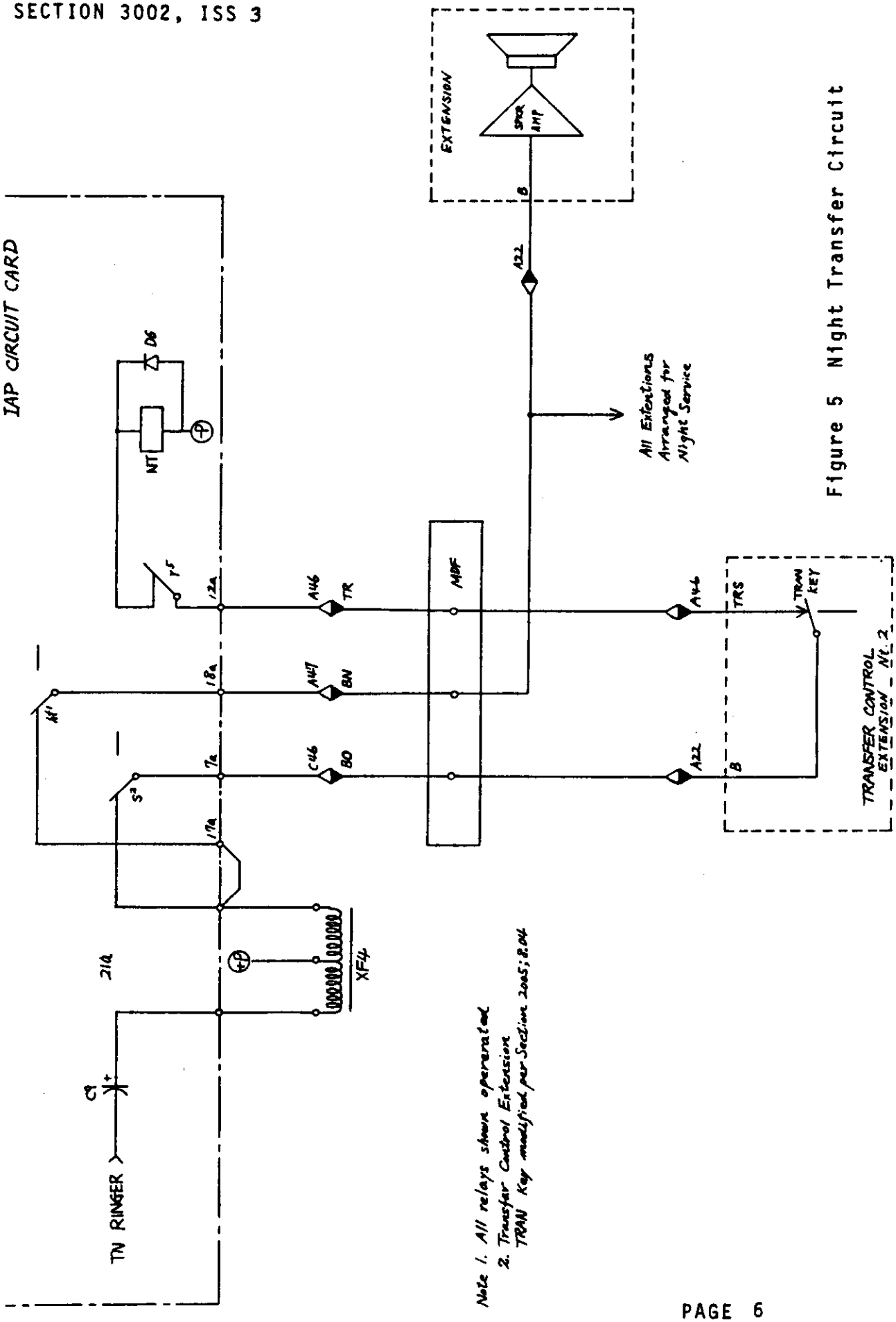


Figure 5 Night Transfer Circuit

Note 1. All relays shown operated
2. Transfer Control Extension TRAN Key modified per Section 2005; 8.04

OMEGA PHONE II

BT-1530/2250 KEY TELEPHONE SYSTEM

CIRCUIT DESCRIPTION OPTIONAL SYSTEM FEATURES

1.00 INTRODUCTION

1.01 This section describes the circuit operation of optional BT1530/2250 Key Telephone System assemblies that provide supplementary features. Refer to the Table of Contents for a listing of the individual features described.

1.02 Refer to the APPENDIX II for explanation of the symbols used in the circuit description sequence drawings.

1.03 Condensed circuit diagrams of the individual features are provided in some instances for clarity purposes. Refer to Section 4001, Condensed System Drawing No. 1 and 2 and individual assembly drawings for complete diagrams of the features described.

2.00 DIRECT STATION SELECTION (DSS) CIRCUIT OPERATION

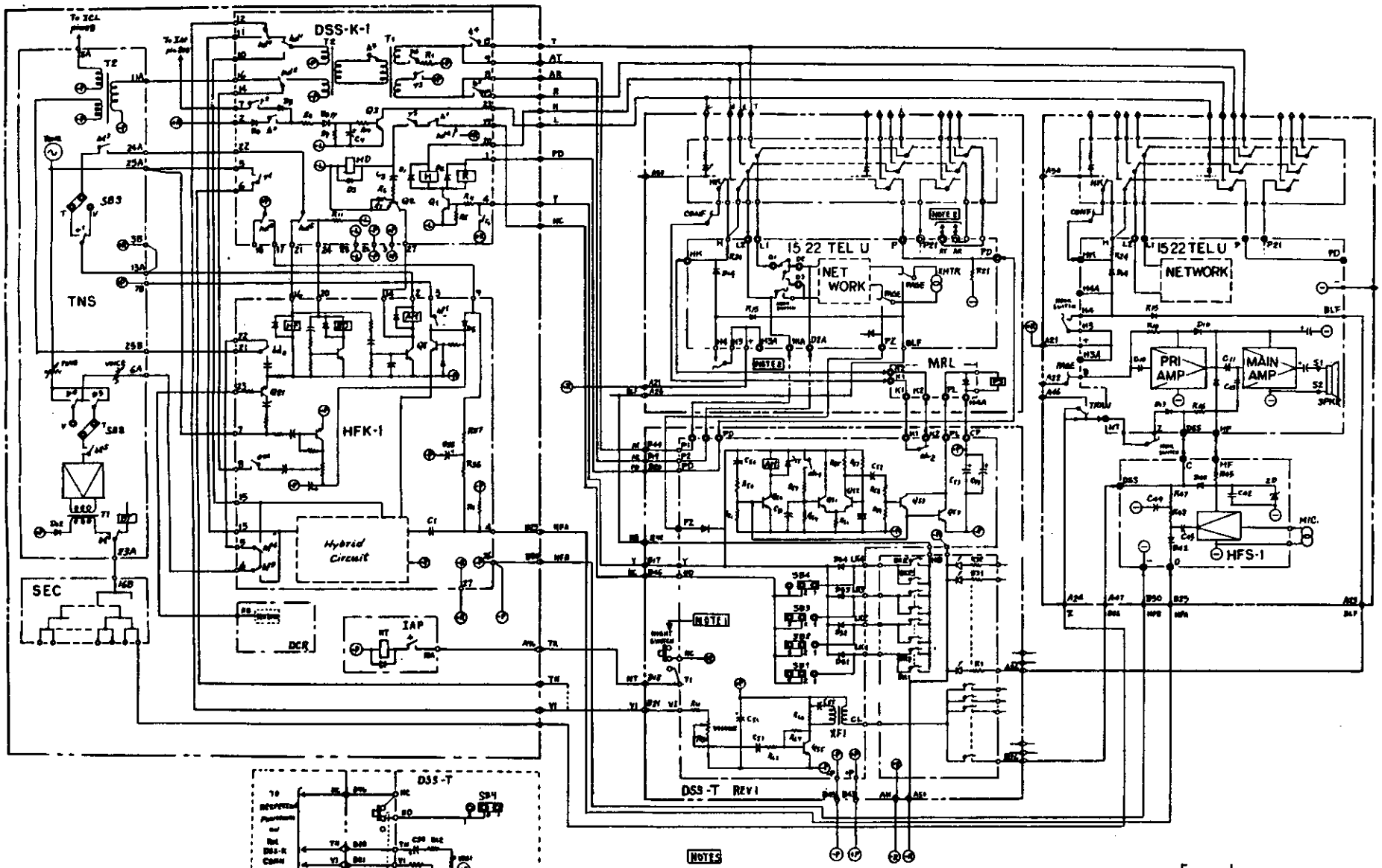
2.01 Figure 1 illustrates the DSS subsystem operating circuit. Refer to Section 4004 for complete diagrams of the DSS Control Station and DSS-K Line card circuit.

2.02 Connection of the Attendant Voice circuit to the DSS circuit.

a. After the Attendant answers a CO Line call and presses a DSS station key, (+R) voltage on the HB lead of the DSS unit derived from the Attendant station BLF lead is connected to TERM Y of the DSS unit. (+R) voltage on Y causes RELAY AH on the DSS unit to operate momentarily. Relay contact ah_2 causes the CO line appearing at the Attendant station to go on HOLD due to placing RESISTOR R24 in series with the HOLD (H) lead.

b. Relay contact ah_1 also causes the SOLENOID on the MRL circuit card to operate restoring the CO line key on the Attendant station to the normal (up) position.

c. When the Attendant Line Keys are all restored, plus voltage appears on PD of the Attendant telephone from the station privacy unit. This allows RELAY R on the DSS-K circuit card to operate due to both the (+R) voltage appearing on the Y lead turning on TRANSISTOR Q1 of the DSS-K and plus voltage on RELAY R coil from PD.



TONE - VOICE SWITCH MODELS

NOTES

1. INITIAL PRODUCTION MODEL OF THE DSS-T CONTROL STATION ARE WIRED FOR A "TONE-VOICE" SELECTOR SWITCH RATHER THAN THE CURRENT MODEL "NIGHT" SWITCH. SEE CUTOUT DRAWING AT LEFT FOR TONE-VOICE SWITCH MODELS.
2. BT 1630/2250-1 USE TERM DIA/DSA WHILE BT 1630/2250-2 USE TERM AT/AR FOR DSI AT/AR CONNECTION.

Figure 1

HF/DSS SUBSYSTEM

d. When RELAY R operates, the DSS Tip/Ring (AT/AR) is connected to the DSS Talk Battery on the DSS-K by relay contacts r_3 and r_4. TRANSFORMER XF1 connects the DSS Voice through relay contact h_5 to the DSS/HF Voice circuit.

e. When RELAY R operates, relay contact r_2 connects the 60 IPM Interrupter to TRANSISTOR Q3 on the DSS-K circuit card, in turn causing the Attendant Line Lamp to flash at 60 IPM at all extensions.

f. Relay contact r_1 connects the Tone Source on the TNS circuit card to the TN lead of the DSS unit if Tone Calling is used instead of Voice Calling. The Tone/Voice circuit on the DSS unit is wired such that either Tone or Voice is used. When in the Tone Call mode, the DSS unit will have no effect on the ICM Register.

2.03 Operation of the DSS Voice/Control Circuits.

a. Calling a HF equipped extension by the DSS unit

- When RELAY R on the DSS-K operates, relay contact r_5 connects TERM HC (Pin 19 of the DSS-K) to RELAY HD. When the SHORTING BAR(SB1) on the DSS unit is arranged for HF extension calling, Plus Voltage is connected to TERM HC (B46) when the DSS station Key is pressed.

- Plus Voltage on HC causes RELAY HD on the DSS-K to operate as well as RELAY AM on the HFK-1 card to operate due to TRANSISTOR Q2 turning ON momentarily. RELAY AM momentary operation causes the HF warning tone to be heard at both the DSS and the called extension.

- The Attendant Voice (P1/P2) is connect to TERM VI of the DSS unit by the following circuit:

DSS-K — HFK-1

XF1 - XF2 - hd, - TIO - T15 - HYBRID - T13 -

DSS-K

T11 - hdo - T12 - VI (KSU TERM BLOCK F)

- Relay contact hd_3 supplies (+P) battery for the HFK-1 Hybrid/Amplifier circuit through TRANSISTOR Q5 on the HFK-1 circuit card.

- Relay contact hd_5 releases RELAY HF on the HFK-1 if an ICM call was taking place when the DSS unit seized the HF circuit. Relay BD operates momentarily connecting busy tone to the calling extension on the ICM Register indicating that the HF circuit has been seized by the DSS. The ICM call then reverts to one way Voice Calling due to RELAY HF on the DSS-K release.

b. Calling a Non-HF extension by the DSS unit.

- When RELAY R on the DSS-K card operates, relay contact r_5 connects TERM HC (Pin 19 of the DSS-K) to RELAY HD. When the DSS station key is pressed, RELAY HD on the DSS-K does not operate because no plus voltage appears on HC due to the SHORTING BAR placed in the Non-HF position.

- The Attendant Voice (P1/P2) is connected to TERM VI of the DSS unit by the following circuit:

DSS-K

$XF1\text{-}h_5$ - XF_2 - hd_1 - hd_0 - T12 - VI

Since RELAY HD on the DSS-K does not operate, no effect is made on any ICM call using the HF circuit if both DSS calling and a ICM call occur simultaneously. The callers voice on the HF ICM call is connected to the Voice pre-amplifer on the TNS circuit card by the following circuit:

ICL — TNS — HFK-1

T8 - T5a - XF2 - T25b - T21 - bd_0 - T22 - T5 - hfy

TNS

Hybrid - hf_5 T6 - T6A - Voice PRE-AMP

c. Voice on the TERM VI is connected through a volume control and pre-amplifier on the DSS unit through TRANSFORMER XF1 to the DSS station key. When the DSS station key is pressed, both voice and ⊕ battery are supplied the called extension amplifier (and HF microphone unit if equipped).

- If the extension called is equipped for HF Talkback, the DSS control voltage on the DSS lead is higher than the ICM call DC voltage on the Extension Z lead, thereby cutting off DIODE D13 and allowing the DSS voice to be heard only. DC power is also supplied to the extension HF unit. RESISTOR R47 and R48 connect the higher DC voltage to TERM HFA thereby cutting off any other extension HF unit by reverse biasing DIODE D42 of the other HF unit. The voice reply from the called extension is connected by the HFA/HFB leads to the Hybrid/Amplifier unit on the HFK-1 circuit card.

- If an extension is equipped with no HF unit, the DSS Voice/Control voltage is connected directly to TERM DSS on the station amplifier unit. Any ICM Voice/Tone calling taking place at the extension is then cut off due to reverse biasing DIODE D13 on the station circuit card.

d. Answering the DSS call on the Attendant Line

- When the called extension goes OFF-HOOK on the Attendant ICM line, (+R) battery on the HOLD (H) lead causes RELAY H on the DSS-K to operate. Relay contacts h_1 cause RELAY HD to release, disconnecting the DSS Voice circuit from the HF circuit. Relay contact h_5 disconnects the Attendant Line voice from Transformer XF2.

- Although RELAY R on the DSS-K remains operated, the Attendant Line Lamp goes steady due to relay contact h_0 place steady (+R) voltage on the base of TRANSISTOR Q3 of the DSS-K.

- Relay contact h_2 and h_4 connect the Attendant Line circuit battery to the called extension allowing voice conversation to take place.

e. Releasing the DSS Connection

When the Attendant presses any line key or goes ON-HOOK, RELAY R of the DSS-K releases disconnecting DSS talk battery and releasing RELAY H.

2.04 Attendant Line Operation in Conjunction with the Attendant PAGE Key

a. When a CO has been answered and the Attendant PAGE key pressed to call a party to the Attendant ICM line, (+R) voltage on PZ of the ext. is connected to Y of the DSS unit.

b. Plus voltage on Y causes both RELAY AH on the DSS unit to operate as well as RELAY R on the DSS-K card to operate when plus voltage appears on PD.

c. The circuit then operates as previously described.

2.05 Operation of the DSS Busy Lamp Field

a. Operation of the DSS Busy Lamp Field is the same as illustrated in Figure 1, Section 2007-Installation of Optional System Assemblies.

3.00 ZONE PAGE ADAPTER (ZPA-B-1) OPERATION

3.01 Figure 2 illustrates the ZPA-B operating circuit. Refer to Section 4004 for detailed schematic of the ZPA-B.

3.02 Extension Dial Access to Zone Paging (Voice Calling Arranged for Two Digit Access on the KSU)

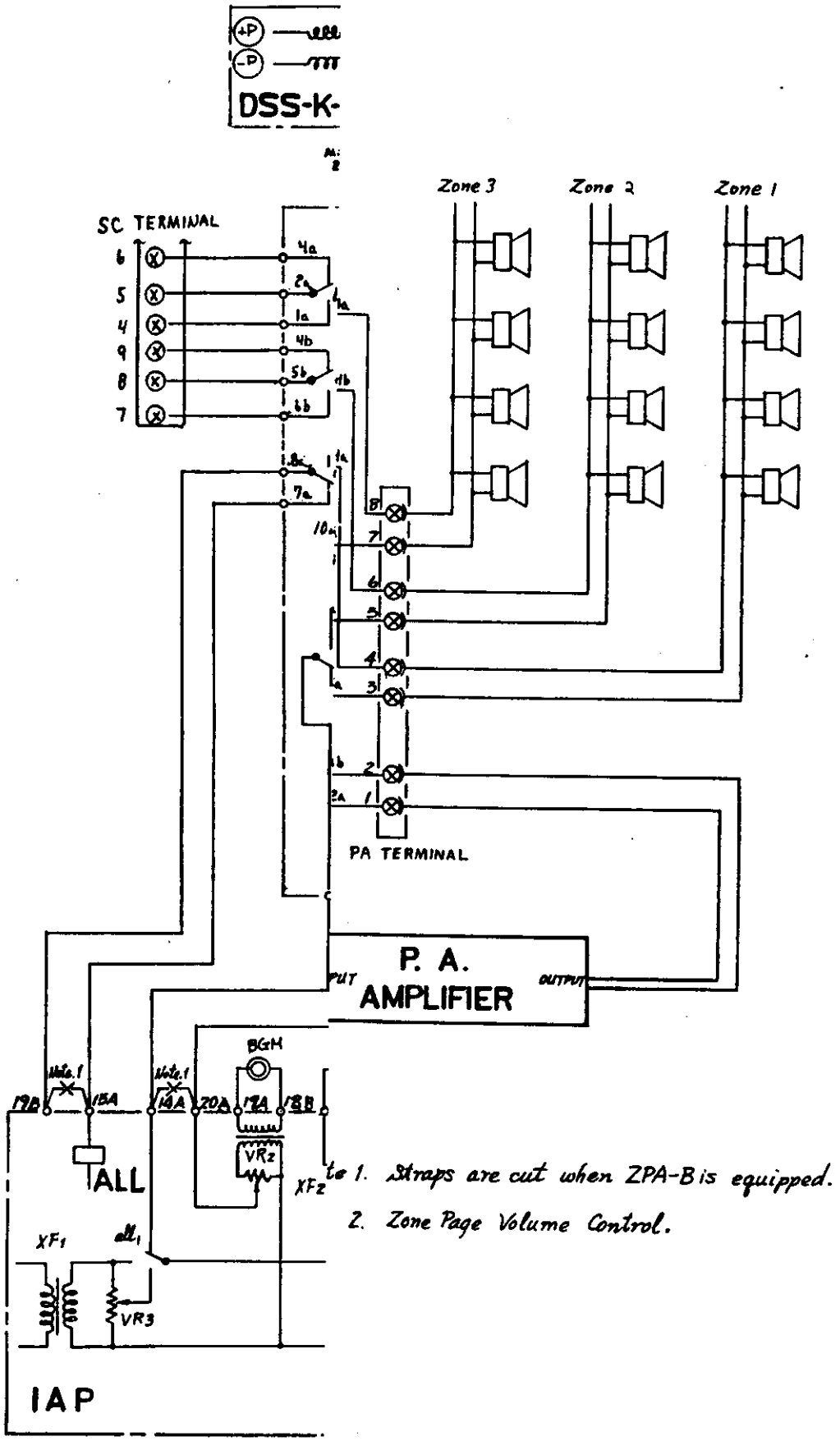
a. When an extension dials the two digit dial code (e.g. No. 41) assigned for an individual zone page, the Intercom Register operates as described in Section 3001; 3.00-3.03.

b. Upon completion of the second digit of the two digit dial code, the Relay tree on the SEC (and EEX if so equipped) circuit card operates, connecting the "Z" (41) lead to the Detector circuit on the TNS circuit card as described in Section 3001; 3.04a-c.

c. If the ZPA-B is not busy (not engaged in a call from the DSS or REG #2), (-R) Battery through both RELAY 1Z and A (in series with D14, D15) on the ZPA-B cause TRANSISTOR Q13 on the TNS circuit card to turn ON. RELAY BT then operates as described in Section 3001; 3.04d.

d. Once RELAY BT has operated, relay contact bt, connects the "Z" lead (Z41) to (+P) Battery through TRANSFORMER XF2 and DIODE D12, D13, and D14 on the TNS circuit card.

e. (+P) Battery on the "Z" lead (Z41) causes RELAY A and 1Z on the ZPA-B to operate.



1. Straps are cut when ZPA-B is equipped.
2. Zone Page Volume Control.

OMEGAPHONE II

BT-1530/2250 KEY TELEPHONE SYSTEM

MAINTENANCE/REPAIR POLICIES

1.00 INTRODUCTION

1.01 This section covers maintenance and repair procedures as well as the Service Policy of IWATSU regarding the BT1530/2250 Key Telephone Systems.

1.02 Although the most stringent quality control measures have been maintained by the manufacturer, a component may subsequently fail during system operation. The electrical characteristics of the BT1530/2250 Key Systems, as described in Section 3001-03, may not be extensive enough for on-site repair of a defective assembly by local maintenance personnel. Replacement of a card/assembly may be required for return to normal operation. Guidelines for the repair/return of defective material to IWATSU are provided for varying types of situations.

1.03 All repairs/replacements as well as returned goods are subject to the IWATSU Warranty Policy as listed in Table A.

2.00 RECOMMENDED SPARE PARTS

2.01 Because the BT1530/2250 Key Telephone Systems utilize the latest electronic components/circuit techniques, replacement of individual circuit card assemblies may be required for return to normal service. It is the responsibility of the distributor to maintain a spare parts inventory of BT1530/2250 assemblies to provide a minimum time delay in system malfunction.

2.02 Table B lists the recommended parts inventory. Additional quantities of the individual assemblies should be ordered as the number of installed systems increases or as the customer maintenance program warrants.

TABLE A

WARRANTY POLICY

All the equipment, components and parts to be furnished (hereafter "Equipment"), by IWATSU AMERICA INC. (hereafter IWATSU) carry the warranty described in the official manual and Service Bulletin(s), WHICH IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, and for no other implicit representation except title.

IWATSU will, at its option, either repair or replace defective Equipment returned to it by the original PURCHASER (transportation charges prepaid) within a period of one (1) year from the date of shipment to the original PURCHASER, provided such returns are made in accordance with the prescribed procedures set forth in the official manual and Service Bulletin(s) and such inspection discloses to the satisfaction of IWATSU that the said defects are as claimed by the PURCHASER.

In addition to the foregoing statement of the warranty, Equipment to be furnished from U.S. manufacturers will bear the warranty of those manufacturer.

This warranty does not include labor and other services with respect to the installed equipment. IWATSU will separately bill the Purchaser on a time and expense basis for all on-site services provided by IWATSU which may be required to determine the existence of or to verify and defects in material or workmanship, and to repair or replace any defective items. IWATSU shall not be obligated to repair or replace any Equipment which has been repaired by others, abused or improperly installed, altered or used with equipment other than the Equipment and material described in the official manual and Service Bulletin(s), and IWATSU will not be obligated to repair or replace Equipment otherwise misused or damaged in any manner.

NOTE:

The warranty stated above is in lieu of all other obligations or liabilities on the part of IWATSU , and IWATSU neither assumes nor authorizes any other person to assume for it any other liability. The Purchaser expressly waives any right, claim or cause of action that might otherwise arise out of the purchase and use of the Equipment and services related thereto. In no event shall IWATSU be liable for special, indirect, or consequential damages of any nature (including, without limitation, any loss or damage resulting from the interruption or failure in the operation of the Equipment) with respect to any Equipment sold and delivered, or any service rendered hereunder.

TABLE B

RECOMMENDED SPARE PARTS: BT1530/2250 KEY TELEPHONE SYSTEM

ITEM	MODEL	DESCRIPTION	QUAN.	NOTE
1.	IAP	Incoming, All Call, PA Circuit Card	1	1
2.	TNS	Interruptor, Tone Function Generator, Detector Circuit Card	1	1
3.	DCR	Intercom Dial Register Circuit Card	1	1
4.	SEC	Extension Relay Circuit Card	1	1
5.	COL	CO Line Card (Standard)	4	2
6.	UCOL	Universal CO Line Circuit Card	4	2
7.	ICL	Intercom Line Circuit Card	2	3
8.	MOH	Music-on-Hold Circuit Card	1	4
9.	RCV	Omega-Tone Receiver Circuit Card	1	5
10.	RCD	Omega-Tone Decoder Circuit Card	1	5
11.	HFK	Handsfree Talkback Circuit Card	1	4
12.	EEX	Extension Expansion Circuit Card	1	4
13.	PSA-1530	Standard BT1530 KSU Power Supply	1	
14.	PSB-1530	Expansion BT1530/2250 KSU Power Supply	1	4
15.	HFS	Handsfree Talkback (Mic.) Circuit Card	2	4
16.	OTD	Omega-Tone Dial (Replacement)	2	5
17.	BT1530(P)	Rotary Dial BT1530 Key Telephone with Privacy	2	6
18.	BT1530T(P)	Omega-Tone Dial BT1530 Key Telephone w/PRV	2	6
19.	BT2250(P)	Rotary Dial BT2250 Key Telephone w/PRV	2	6
20.	BT2250T(P)	Omega-Tone Dial BT2250 Key Telephone w/PRV	2	6

Notes:

1. Common cards on BT1530/2250 KSU
2. Either COL or UCOL circuit cards should be stocked depending on card utilization. Quantity of cards to be stocked depend on the number of systems being serviced.
3. Quantity of circuit cards to be stocked depend upon the number of systems to be serviced.
4. Optional assemblies-stock only as required.
5. Required only when Omega-Tone models are provided. These cards require qualified technicians and precision test equipment for service maintenance.
6. Stock of telephone(s) depends on the number of systems serviced.

3.00 SERVICE PROCEDURES

3.01 NORMAL SERVICE

a. NORMAL SERVICE is classified as any condition which requires replacement of the defective unit(s) in the system.

b. The defective assembly should be immediately returned to IWATSU for repair/replacement. The following procedure is to be adhered to:

- Call or write IWATSU Customer Service and request a Return Authorization Form (illustrated in Figure 1).
- Information related to the quantity, description, and disposition of the equipment to be returned to IWATSU must be indicated at the time of the Return Authorization request.
- On receipt of the Return Authorization Form, follow the instructions on the form and return the equipment (with copy of form) to IWATSU The Return Authorization number(s) must appear on all cartons and shipping documents. IWATSU will accept all such returns freight prepaid only.
- To expedite handling, it is recommended that the IWATSU Return Authorization Number be clearly notated on each item being returned.

c. On receipt by IWATSU the assembly will be repaired (or replaced at IWATSU'S option) and returned promptly to the Sender.

d. Table A, BT1530/2250 Key Telephone System Warranty, indicated IWATSU liabilities under warranty conditions.

e. Defective equipment returned, under warranty conditions, will be repaired (or replaced) by IWATSU Warranty shall be null and void under the following conditions:

- Equipment that has been repaired by other than IWATSU or Equipment that has been abused, neglected, improperly installed or returned to IWATSU without proper authorization.
- Equipment received by IWATSU in a damaged condition, for whatever reason, remains the liability of the owner.
- Equipment altered or used with third party equipment other than that recommended in the Technical Manual (TM).

IWATSU AMERICA INC.

120 West Commercial Avenue, Moonachie, N. J. 07074

R.A.Number

All correspondence should be refered to this number

RETURN AUTHORIZATION

ISSUED	SEND TO

Authorized by	Date	Customer P.O.	S.O.Number

Item	Authorized Quan.	Description	Reason Number	Quan. Shipped

Reason for return

Place in reason column for each item listed

1 Credit less handling charge.
2 Repair and Return(P.O.Number attached)
3 Replacement(Defective or wrong material shipped)
4 Warranty repair
5 Other(Explain)_____

INSTRUCTION: The above is an Authorization by Iwatsu to return only the listed items. All items returned are subject to Iwatsu inspection, Iwatsu shall reserve the right to repair, at its option, any part that is defective provided that inspection of the same items contain the defects as claimed by the Purchaser.

All returns must be shipped freight prepaid. All returns must be properly packaged to prevent damage during transit. Items damaged during transit will void any warranty still in effect.

All items not in warranty and returned must include Customer P.O.Number and P.O.Authorization Signature.

All cartons must be marked with the Return Authorization Number. A copy of this Authorization must be included as a Packing Slip.

Customer P.O.	Customer Signature	Date

Figure 1 Return Authorization Form

- Any equipment whose Warranty markings are destroyed or altered.

f. Return Authorizations are valid for up to thirty (30) days after date of issue. Equipment returned for repair will be limited to that on the specific Return Authorization. Any additional equipment must be supported by another IWATSU authorization, including thereto additions to the original Return Authorization. In all such cases, IWATSU will acknowledge receipt of and assume responsibility for only such equipment as listed on the original Return Authorization. Any other equipment returned to IWATSU remains the property of the Buyer, and is subject to handling charges on return to the Buyer.

g. Any equipment returned for repair/replacement during the Warranty period which, when found, performs satisfactorily, will be subject to handling charges.

h. Equipment not within the Warranty period is subject to parts, labor and freight charges as applicable.

3.02 EMERGENCY SERVICE

a. Any system failure which requires IWATSU support is defined as EMERGENCY SERVICE.

b. Procedures to follow for EMERGENCY SERVICE:

- During regular business hours (Eastern Time), advise IWATSU Customer Service for Engineering assistance.

- Outside of regular business hours, call IWATSU and leave your telephone number and best time(s) for returning call. Otherwise, a return call will be made the following day.

- The Service Engineer will attempt to trouble shoot the problem via phone. To insure minimum down time, the local maintenance personnel must be familiar with the system operation as outlined in Section 3001-03 and have attempted corrective action before calling for assistance.

- Should replacement parts be deemed necessary, the Service Engineer will expedite shipment by fastest transport. Every effort will be made for prompt delivery.

READ In most cases, an adequate inventory of components reduces system down-time and minimizes the necessity for EMERGENCY SERVICE.

- Upon receipt of the replacement(s), return the defective unit(s) with the Return Authorization to IWATSU as outlined in Para. 3.01b.

c. All items in Warranty returned to IWATSU after emergency replacement are subject to the provisions of the Warranty Policy (Table A) and that of Para. 2.01d-f.

READ d. If, within thirty (30) days after EMERGENCY SERVICE, the defective parts are not received by IWATSU., then the replacements will be billed as new parts with no credit authorization for the rejected part(s) in question.

e. All equipment, in or out of Warranty, returned to IWATSU shall be subject to IWATSU inspection prior to credit authorization. Equipment not deemed suitable for re-stock and/or resale due to abuse, poor installation, damage, etc., will be cause for credit refusal by IWATSU. Notice of such rejection will be forwarded to the Sender requesting disposition, i.e., repair or return. On Sender's approval, such equipment will be repaired or replaced and subject to parts, labor and handling charges.

3.03 ENGINEERING CHANGES-MANDATORY

a. Changes to the BT1530/2250 required for Quality Assurance by the manufacturer are classified as MANDATORY.

b. MANDATORY changes are supplied on a no-charge basis. Appropriate equipment/components that are required will be supplied to each distributor. IWATSU shall, in no manner, be liable for any charges, direct or indirect, in the implementation of the MANDATORY ENGINEERING CHANGES.

c. When the MANDATORY ENGINEERING CHANGE consists of an individual assembly replacement, a Return Authorization Form will be supplied with the assembly. The old assembly as well as the Return Authorization must be returned within thirty (30) days after issuance of the replacement or the replacement shall be billed as a new unit to the original purchaser and no credit shall be issued for the replacement assembly.

d. In all cases, the returned original assembly shall be subject to the same terms and conditions as outlined in Para. 3.02e.

e. It shall be the responsibility of the Distributor to insure total implementation of the MANDATORY ENGINEERING CHANGE in all applicable equipment. Formal release and issuance of the replacement components shall constitute the limit of IWATSU liability.

f. The Service Bulletins, as issued, should be retained in the Technical Manual. Applicable revisions (when required), should be noted in the Technical Manual. The number of Service Bulletins that are issued to an individual Distributor is determined by the number of Technical Manuals on hand at each Distributor level.

g. In all cases, IWATSU reserves the right to make changes in the equipment without prior notice.

3.04 ENGINEERING CHANGES-OPTIONAL

a. OPTIONAL ENGINEERING CHANGES are defined as those changes recommended for product improvement or expansion. Also, as production is maintained, various refinements may become applicable.

b. OPTIONAL ENGINEERING CHANGES will be published in the Service Bulletins. Implementation of such changes is at the Distributor's discretion. Where applicable, modification kits as specified in the Service Bulletin can be ordered from IWATSU

4.00 ENGINEERING ASSISTANCE

4.01 When required, IWATSU will provide Engineering Assistance in cases where local maintenance personnel cannot correct system operation. IWATSU reserves the right to bill the Distributor/Installer for time and expenses in all cases where Engineering Assistance is required, even when the equipment requiring assistance is within the stated Warranty period. When equipment is out of the Warranty period, charge for repair, replacement of defective equipment as well as any Engineering Assistance is applicable.

4.02 Service Bulletins as well as Application Bulletins will be issued to all Distributors. All Bulletins should be filed with the Technical Manual to insure current information on accessories.

4.03 Application Bulletins are issued upon information furnished to IWATSU by support manufacturers. In cases where third party equipment is utilized, the information is only intended to serve as a guide for the particular application. IWATSU shall not be liable in any manner for information not correct, changes that occur, or problems that result due to any misinformation concerning the application of third party equipment.

f. (+P) Battery through RELAY A coil causes TRANSISTOR Q1 on the ZPA-B to turn ON. When Q1 turns ON, (-R) Battery through Q1 and relay contact a_4 causes TRANSISTOR Q15 on the TNS circuit card to remain OFF, preventing RELAY V from operating if a third digit is dialed.

g. The voice circuit from the Intercom Line to TRANSFORMER XF1 on the TNS circuit card is the same as previously described in Section 3001; 3.01h. TRANSFORMER XF1 is connected to Volume Control VR1 on the ZPA-B when RELAY A operates through relay contact a_1 and a_2. Relay contact a_1 breaks the Music Input from the PA Amp Input. Volume Control VR1 controls the voice level that feeds the PA Amp Input through relay contact all1 on the IAP circuit card.

h. RELAY 1Z operation connects the output of the PA Amplifier to the individual zone speaker lines.

i. Because the Intercom Dial Register is not reset (No (+P) Battery on the Intercom Line P3 lead), the line lamp remains flashing and the Time Out (TO) function allows the Zone Page call to last a maximum of 36-40 seconds. The ZPA-B connection is released upon operation of the Time Out (TO) function as well as when the CONF Key is pressed at the calling extension as described in Section 3001; 3.09b-c.

3.03 All Call Priority

a. When an extension activates the All Call while another extension is connected to the ZPA-B, the individual zone relay is momentarily released during the All Call due to (-R) Battery interrupted by relay contact all_5 on the IAP circuit card. The PA Amplifier is automatically connected to the three zones during the All Call interval. RELAY A on the ZPA-B remains operated. Relay contact all_1 connects the all call voice on the PB lead to the PA Amp Input.

b. Relay contact all_5 places (-R) Battery through the ZPA-B on TRANSISTOR Q14 on the TNS circuit card, causing Q14 to turn OFF, releasing RELAY BT. Busy Tone (450hz interrupted at 120 IPM) is then heard at the extension connected to the ZPA-B during the All Call interval.

c. When the All Call releases, RELAY ALL on the IAP circuit card releases. The individual zone relay (1Z-3Z) on the ZPA-B then re-operates, connecting the calling extension to the ZPA-B.

3.04 DSS Operation of the Zone Page Adapter.

a. When the DSS Key for the individual zone page area is pressed, (+P) Battery through the DSS Key and Diode D24 (Zone 1 e.g.) operates RELAY 1Z on the ZPA-B. (+P) Battery from the DSS also operates RELAY DS on the ZPA-B.

b. The Attendant Line Talk circuit is connected to the input of the PA Amplifier through relay contact ds_0 and ds_1.

c. Relay contact ds_5 disconnects the All Call circuit so that no All Call can disrupt the DSS Zone Call.

d. Relay contact ds_4 disconnects (-R) Battery from the 1Z-3Z RELAY holding circuit, releasing any Zone relay if the ZPA-B was connected to an extension when the DSS call occurs. (-R) Battery through relay contact ds_4 also turns OFF TRANSISTOR Q14 on the TNS circuit card, causing RELAY BT to release. When BT releases, busy tone is connected to the calling extension during the DSS Zone Call interval.

e. When the Zone Page DSS Key is released on the DSS Control Unit, RELAY DS and 1Z (e.g.) release on the ZPA-B. The calling extension connection is reestablished to the ZPA-B.

4.00 OPERATION OF THE UNIVERSAL EXTENSION ADAPTER

4.01 figure 3 illustrates a standard 500 type telephone connected to the UEX-B Adapter.

4.02 Operation of the Intercom Voice Circuit

a. The Intercom Voice circuit (P1-P2) is connected through the Intercom Line Switch on the UEX-B to the Voice Network of the associated telephone instrument.

b. The associated telephone handset microphone is wired through the PAGE Key on the UEX-B for operation of the All Call.

4.03 Receiving an Intercom Call

a. When a call is made to a UEX-B Extension, (+P) on the "Z" lead causes the extension buzzer to sound continuously.

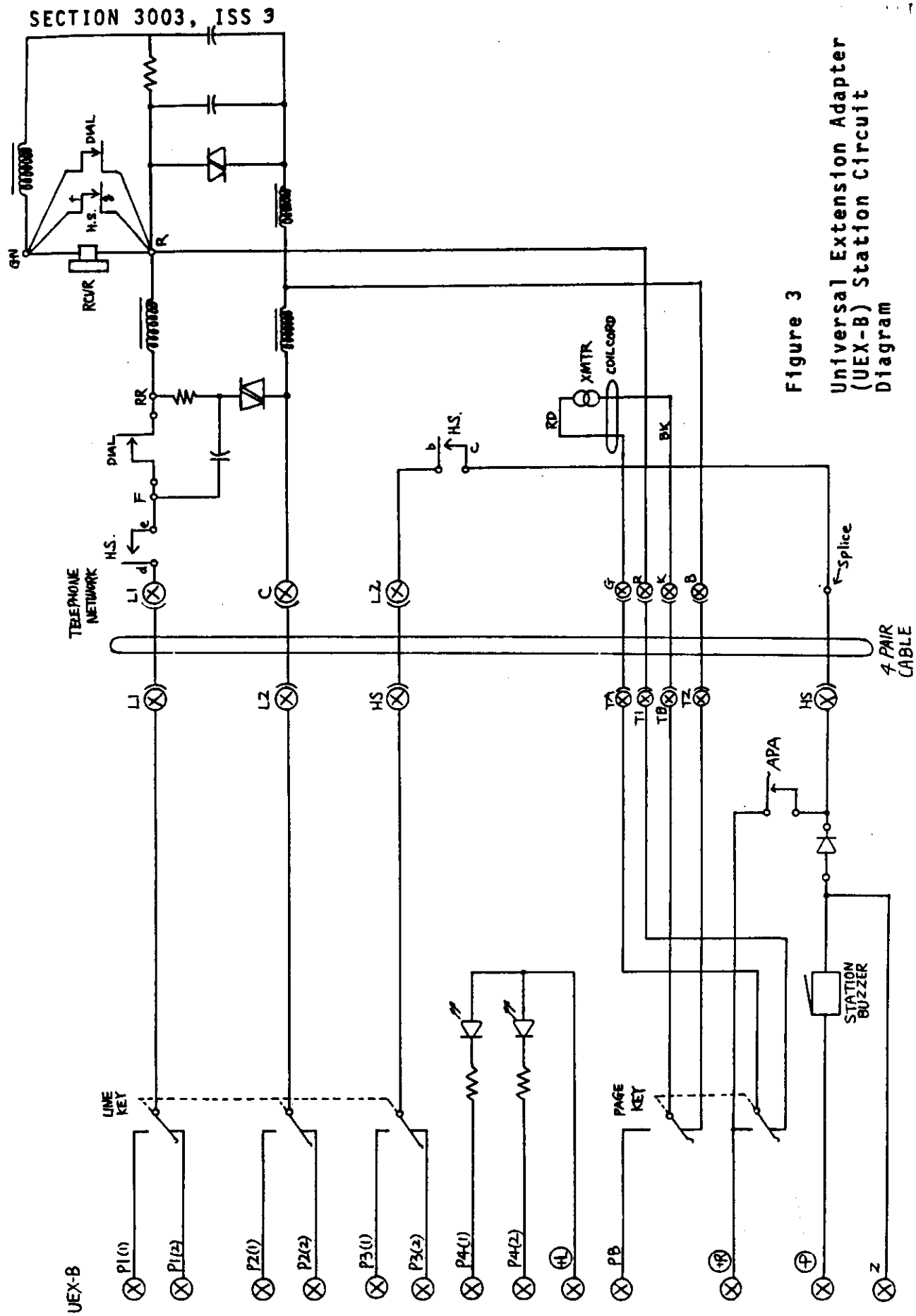


Figure 3

Universal Extension Adapter (UEX-B) Station Circuit Diagram

b. When the call is answered by the extension going off-hook on the Intercom Line that the call is on, (+P) Battery from the "Z" lead is connected through HS -HS of the extension telephone and the Intercom Line Select switch on the UEX-B to the P3 lead of the Intercom. This silences the ringing by causing the Intercom Register to reset as described in Section 3001; 4.07 b-k.

4.04 Operating the APA (CONF) Key

a. When the CONF Key is pressed, the Intercom Register is reset due to (+P) Battery placed on the Intercom P3 lead as previously described in Section 3001, 4.09 c.

5.00 TRAINING

5.01 IWATSU shall conduct training sessions at locations to be announced. In all cases, responsibility for all costs incurred, namely expenses, training aids, etc., shall be the responsibility of the Distributor.

OMEGAPHONE II

BT-1530/2250 KEY TELEPHONE SYSTEM

IV. ILLUSTRATIONS/SCHEMATIC DIAGRAMS

OMEGA PHONE II

BT-1530/2250 KEY TELEPHONE SYSTEM

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OMEGA PHONE II

BT-1530/2250 KEY TELEPHONE SYSTEM

CONDENSED SYSTEM DRAWINGS

1.00 INTRODUCTION

1.01 This section provides condensed system diagrams of the BT1530/2250 Key Telephone System for convience in understanding and troubleshooting circuit operation.

1.02 Refer to Section 4002--004 for complete illustrations, circuit diagrams, and components lists for the assemblies described.

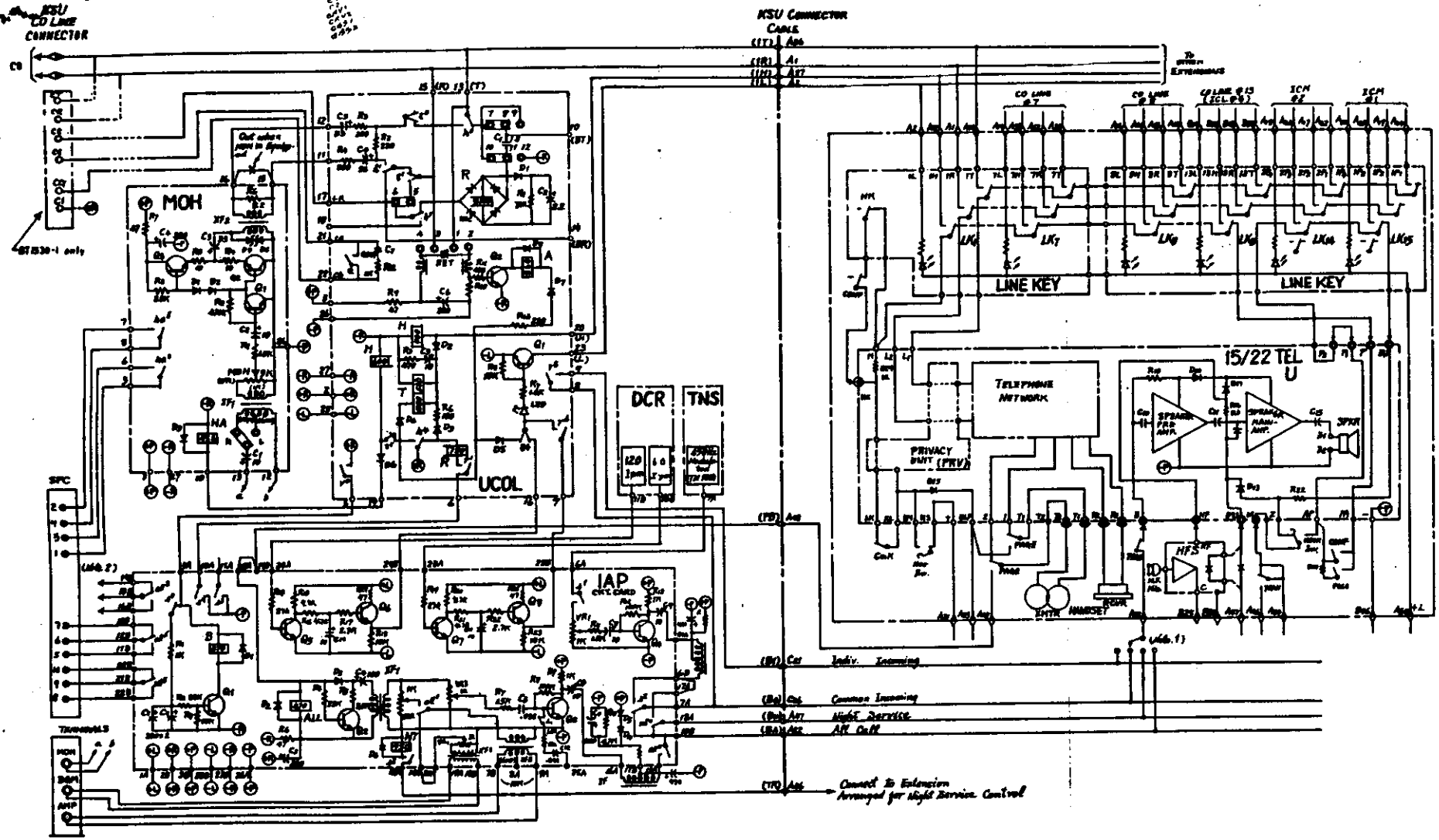
2.00 CONDENSED SYSTEM DIAGRAM

2.01 Figure 1 illustrates the BT1530/2250 Key Telephone System operating circuit.

a. Figure 1a shows the CO Line associated circuits as well as the All Call.

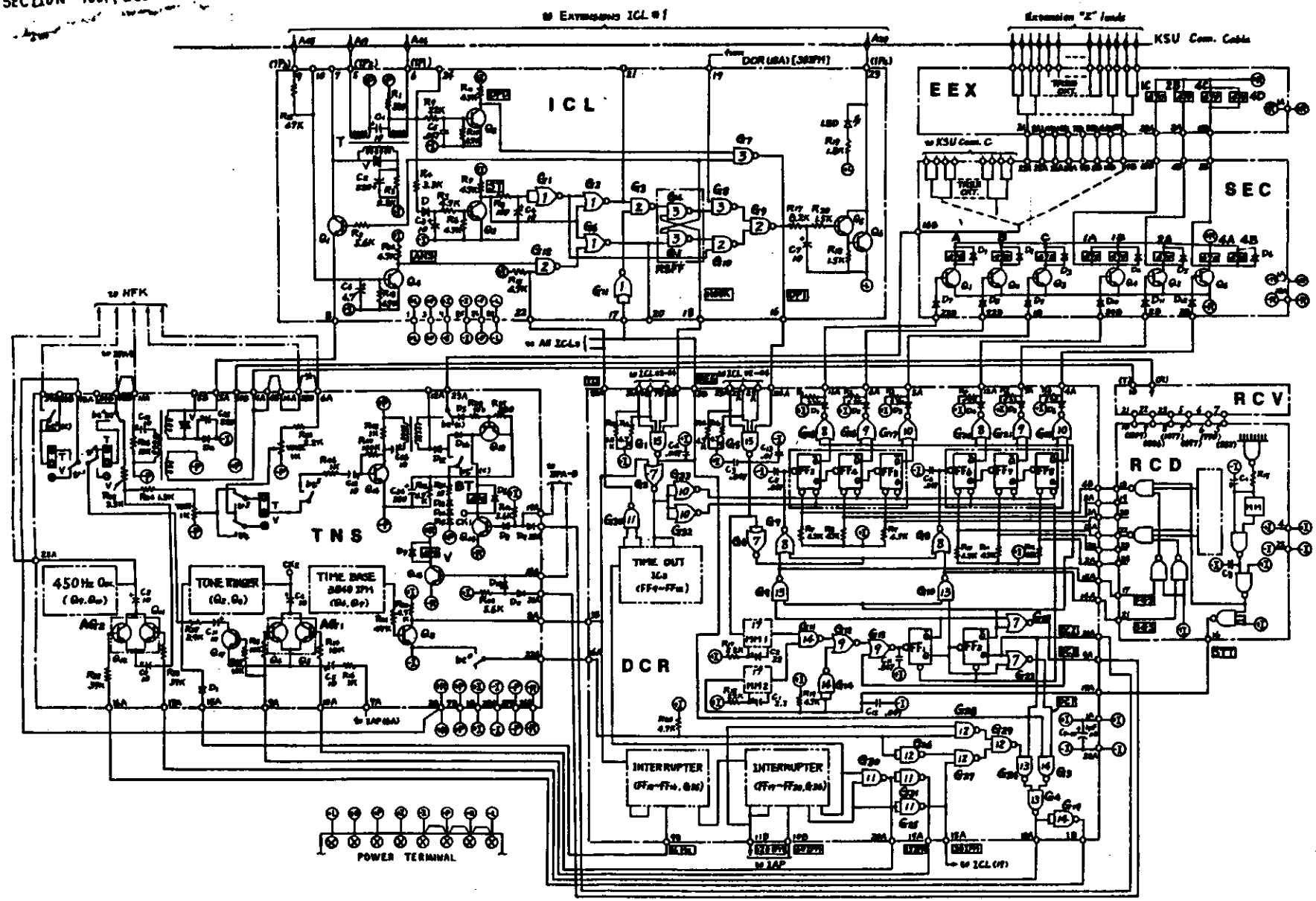
b. Figure 1b shows the Dial Intercom, Power Supply and Handsfree Talkback circuits.

2.02 Figure 2 shows the Omega-Tone Receiver/Decoder operation with the Intercom Dial Register.



Note 1. "B" lead of Extension is connected to assigned function.
2. Used on Zone Page Adaptor ZPA-B.

Figure 1a Condensed System Drawing


ICL
EEX
SEC
RCV
RCD
TNS
DCR
KSU Com. Cable
TIME OUT
INTERRUPTER
INTERRUPTER
TONE RINGER
TIME BASE
POWER TERMINAL

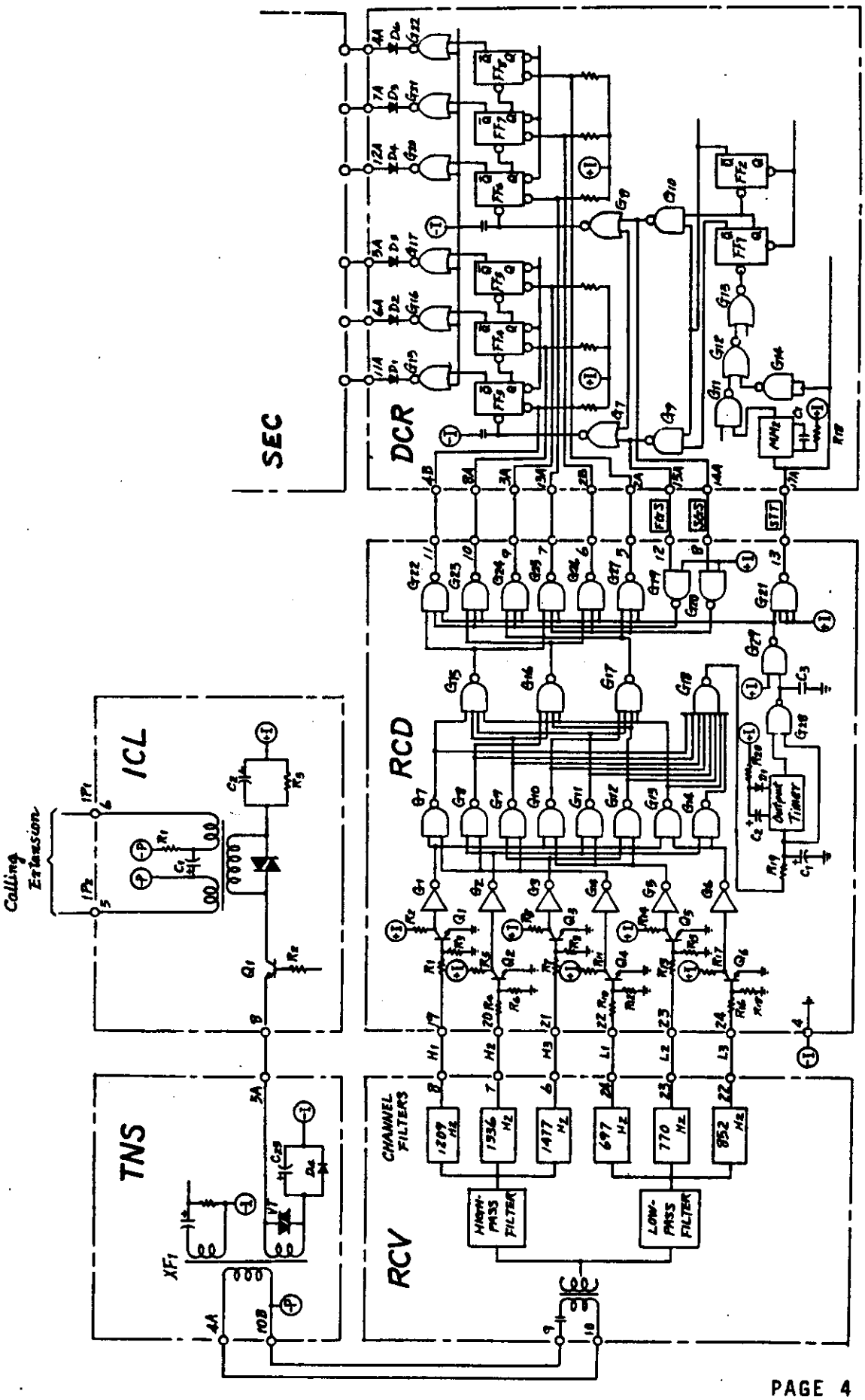


Figure 2 Omega-Tone Receiver Operating Circuit

OMEGA PHONE II

BT-1530/2250 KEY TELEPHONE SYSTEM

KSU COMPONENT/ASSMBLY DRAWINGS

1.00 INTRODUCTION

1.01 This section provides illustrations, circuit diagrams, wiring diagrams, and parts list of the BT 1530/2250 KSU components and optional assemblies.

2.00 BT 1530/2250 KSU WIRING DIAGRAMS

2.01 Figure 1 illustrates the BT 1530 KSU wiring plan.

2.02 Figure 2 illustrates the BT 2250 KSU wiring plan for CO Lines No. Fourteen (14) to Twenty (20).

2.03 Figure 3 illustrates the BT 2250 KSU wiring plan for the EEX Expansion card connector and KSU CONNECTOR CABLE D.

3.00 KSU COMPONENTS/ASSEMBLIES

3.01 The Standard and Optional BT 1530/2250 KSU components/assemblies illustrations are provided in the figure indicated.

a. Standard Components/Assemblies

- COL.....Figure 4
- UCOL.....Figure 5
- ICL.....Figure 6
- IAP.....Figure 7
- TNS.....Figure 8
- SEC.....Figure 9
- DCR.....Figure 10

b. Optional Components/Assemblies

- RCV.....Figure 11
- RCD.....Figure 12
- MOH.....Figure 13
- EEX.....Figure 14
- HFK.....Figure 15
- PCC.....Figure 16
- KTB.....Figure 17

4.00 POWER SUPPLIES

4.01 The PSA-1530 Power Supply is illustrated in Figure 18.

4.02 The optional PSB-1530 Power Supply is illustrated in Figure 19.

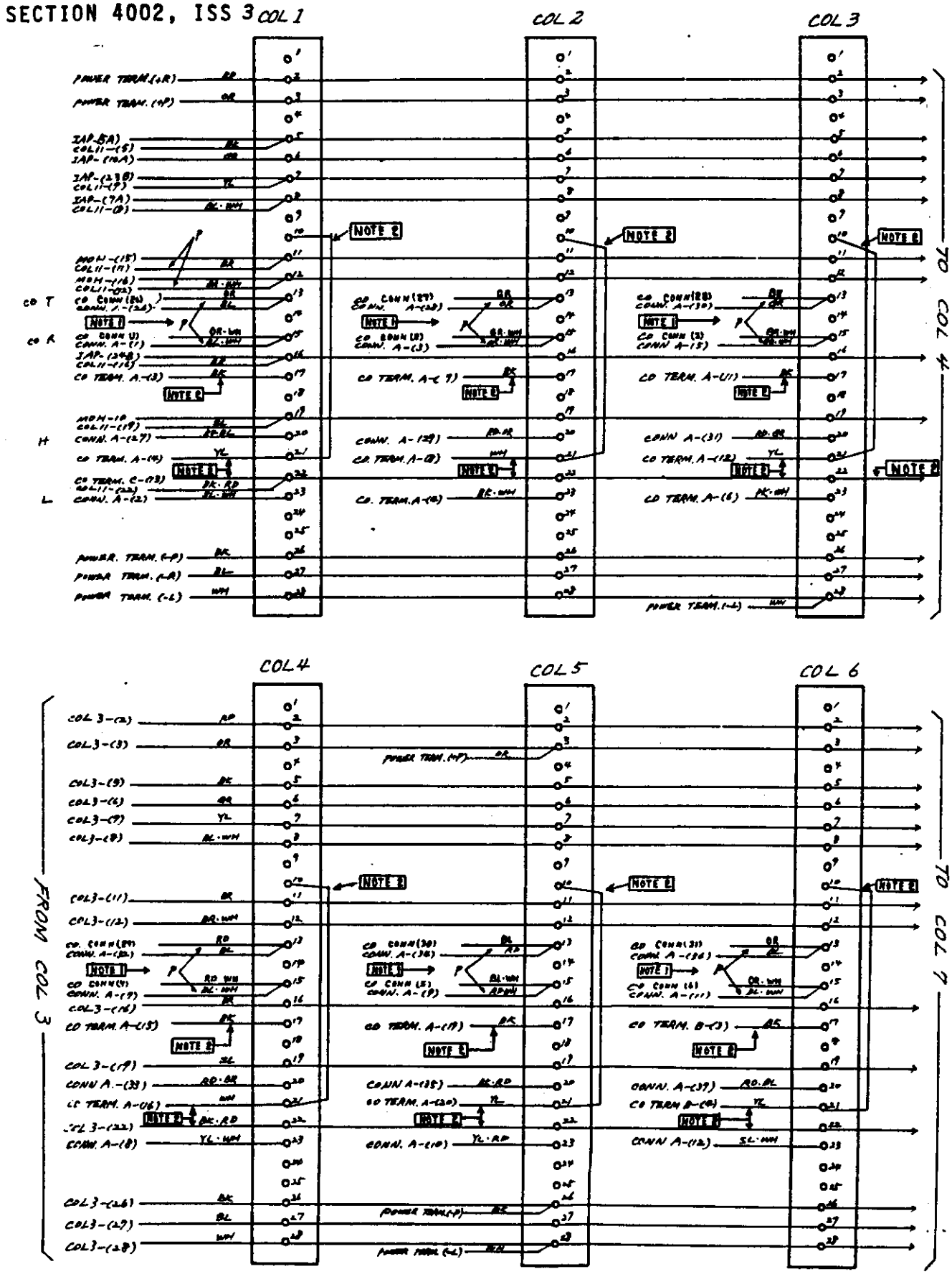
READ The following NOTES refer to FIGURE 1 and FIGURE 2 of this section.

NOTE

1. On Model BT 1530-1 KSU, the wiring indicated for TERM 13 and 15 for KSU CONNECTOR CABLE A (CO 1-10) and CABLE B (CO 11-20) is m to the KSU CO TERMINAL BLOCKS. The Model BT 1530-3 KSU provides an "amphenol" type connector in place of the KSU CO TERMINAL BLOCKS and is wired in accordance with the color coding indicated.

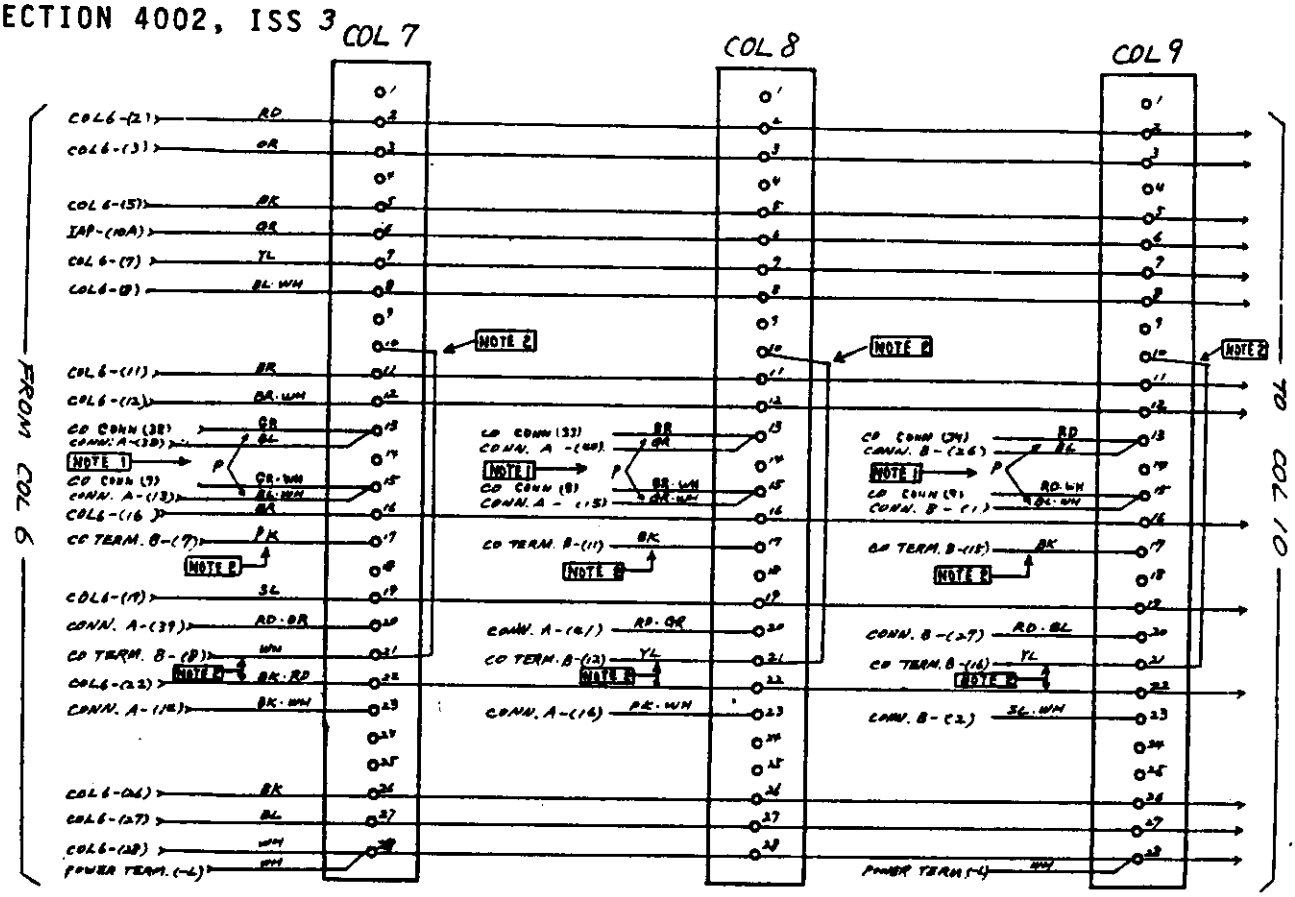
2. Connections indicated by NOTE 2 are provided only on the Model BT 1530-1 KSU.

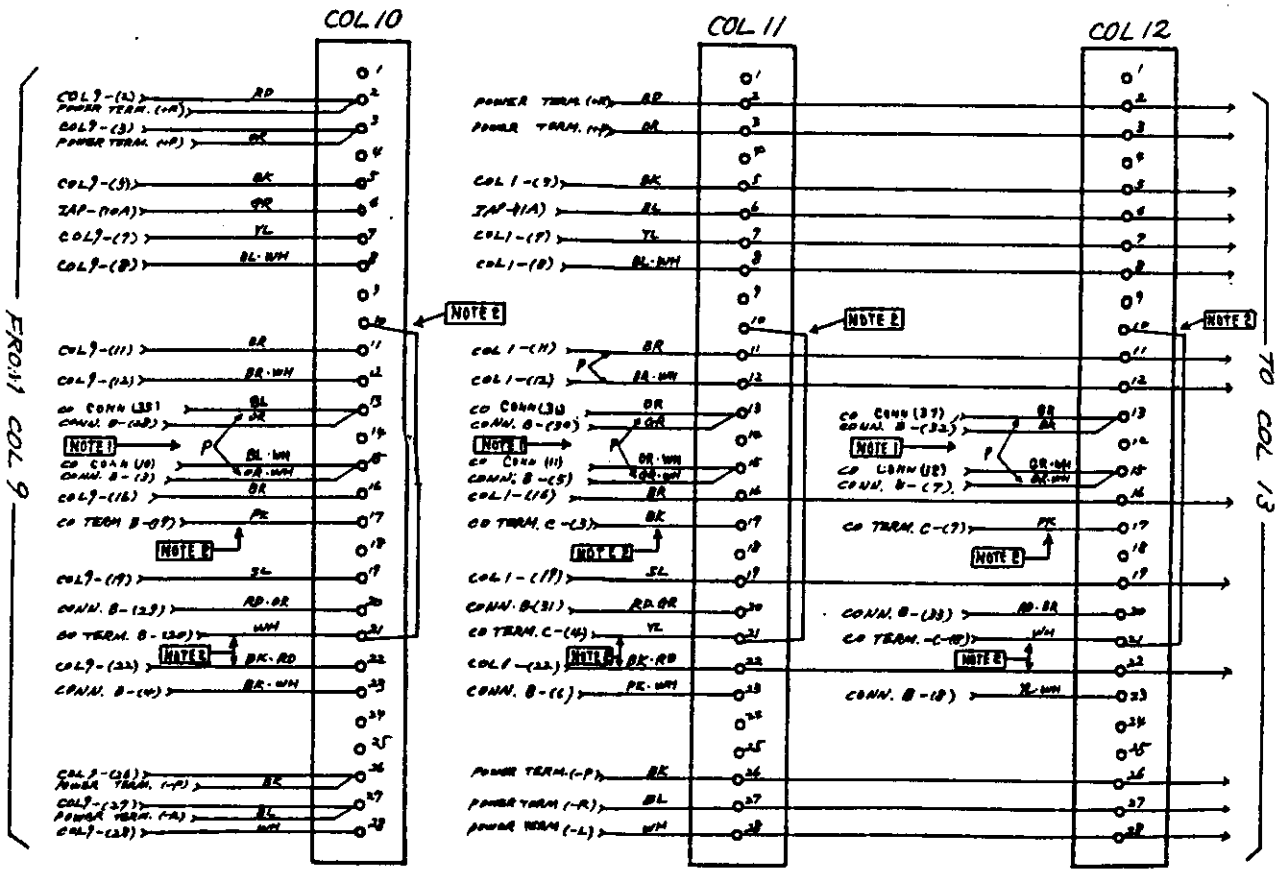
SECTION 4002, ISS 3



Note. P indicates wire pair

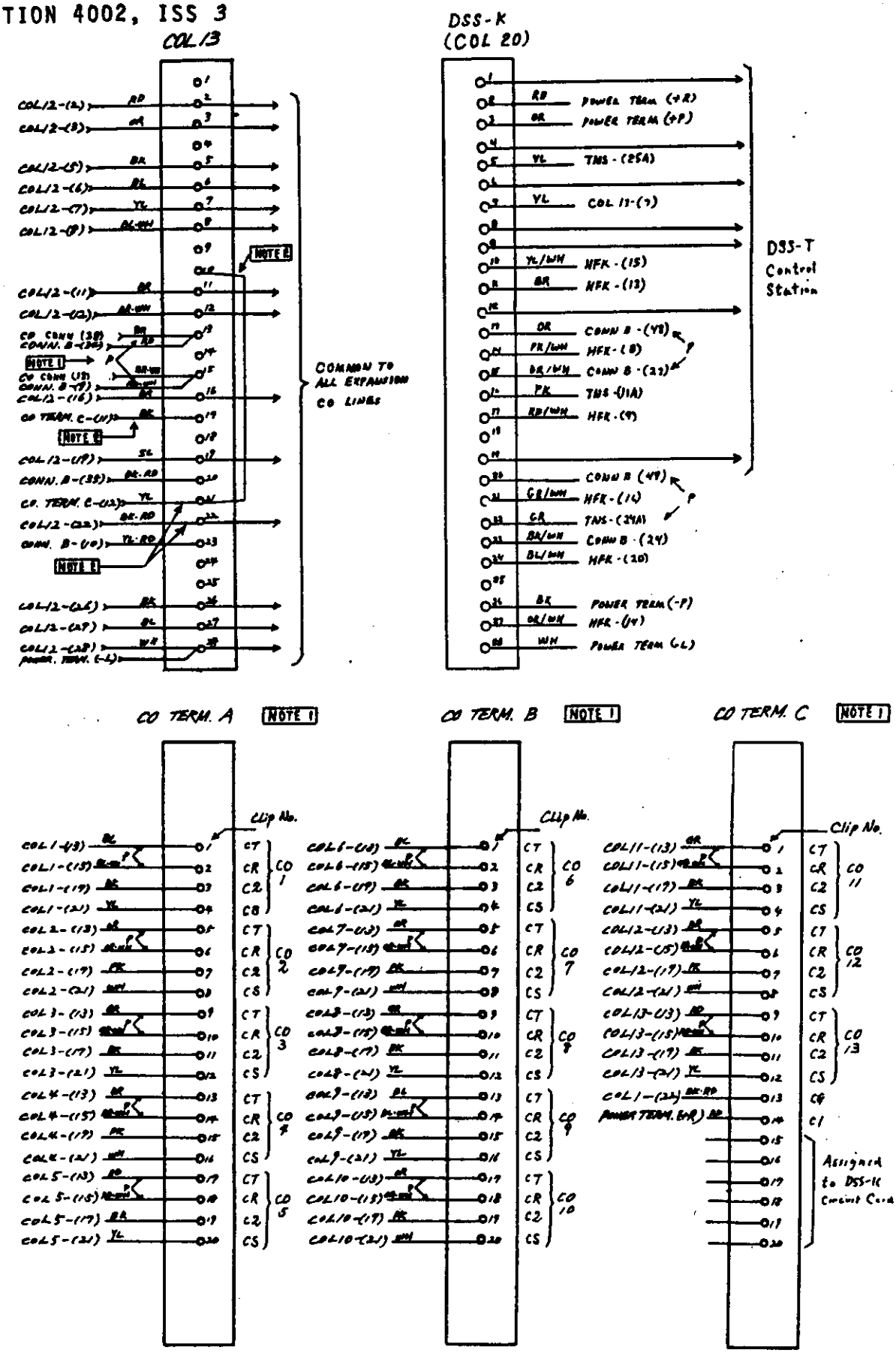
Figure 1a BT 1530 KSU Wiring Diagram PAGE 3





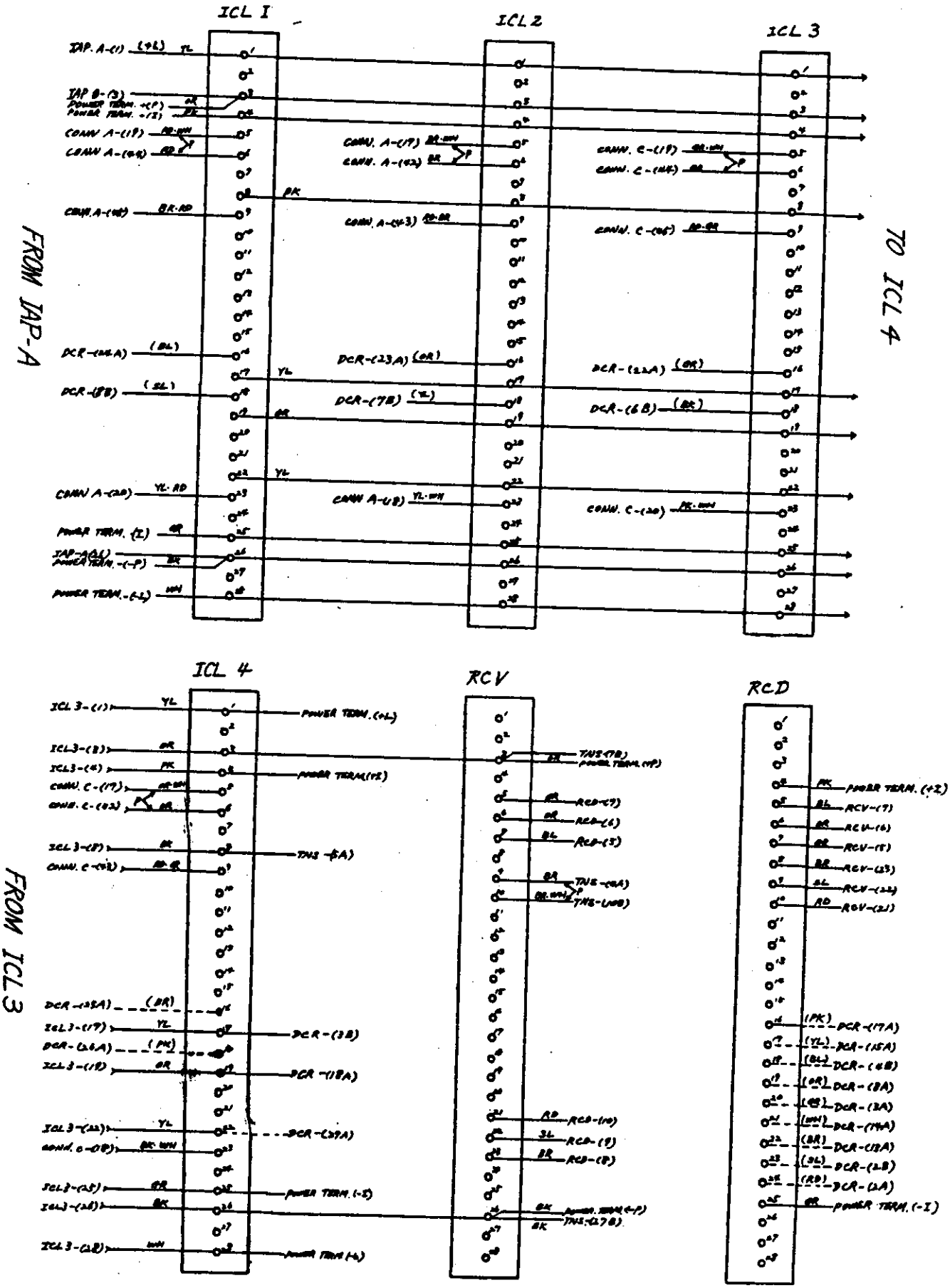
Note: P< indicates wire pair

Figure 1b BT 1530 KSU Wiring Diagram



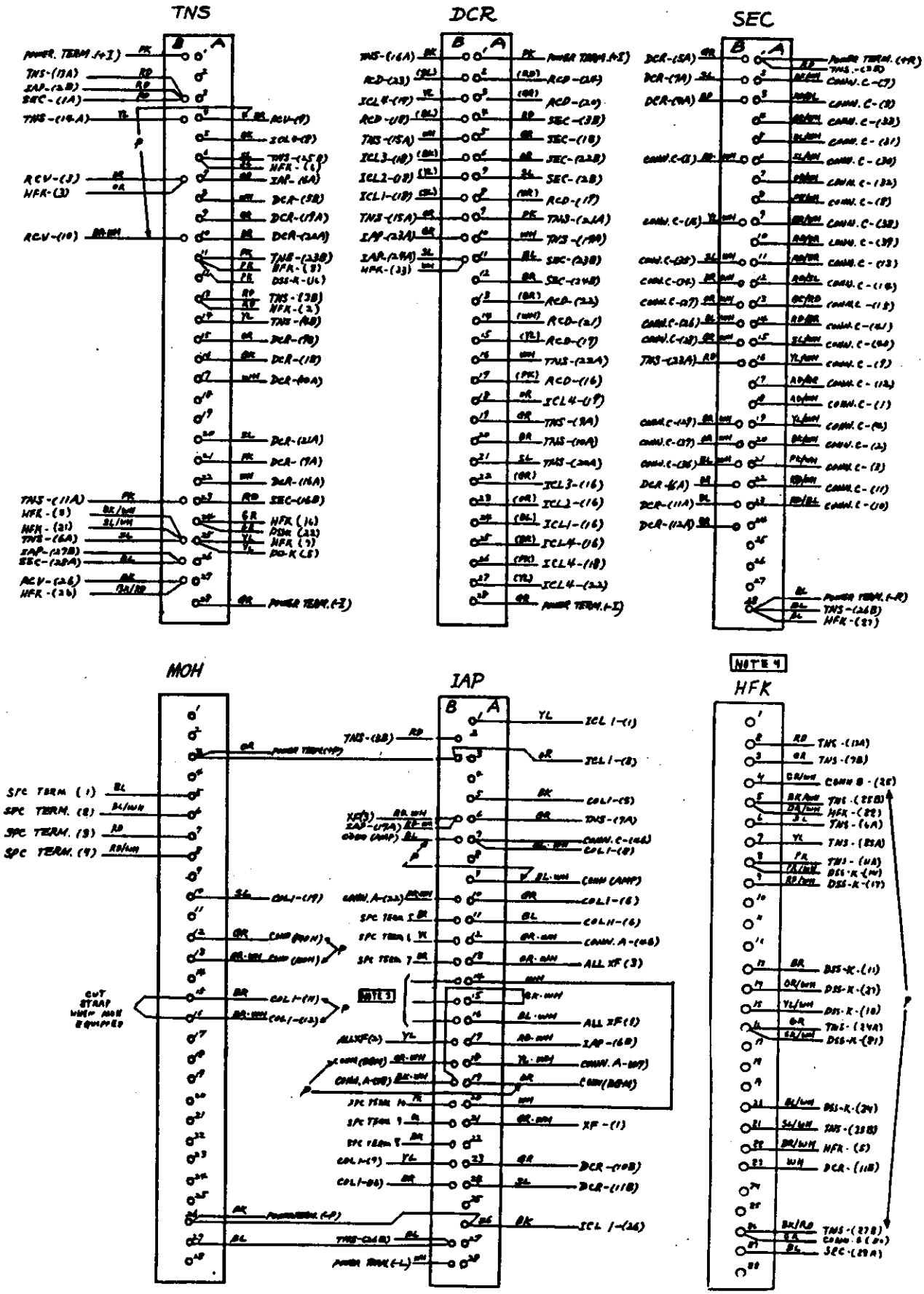
Note:
P indicates wire pair

Figure 1c BT 1530 KSU Wiring Diagram



Note: P< indicates wire pair

Figure 1d BT 1530 KSU Wiring Diagram



Note: P< indicates wire pair

Figure 1e BT 1530 KSU Wiring Diagram

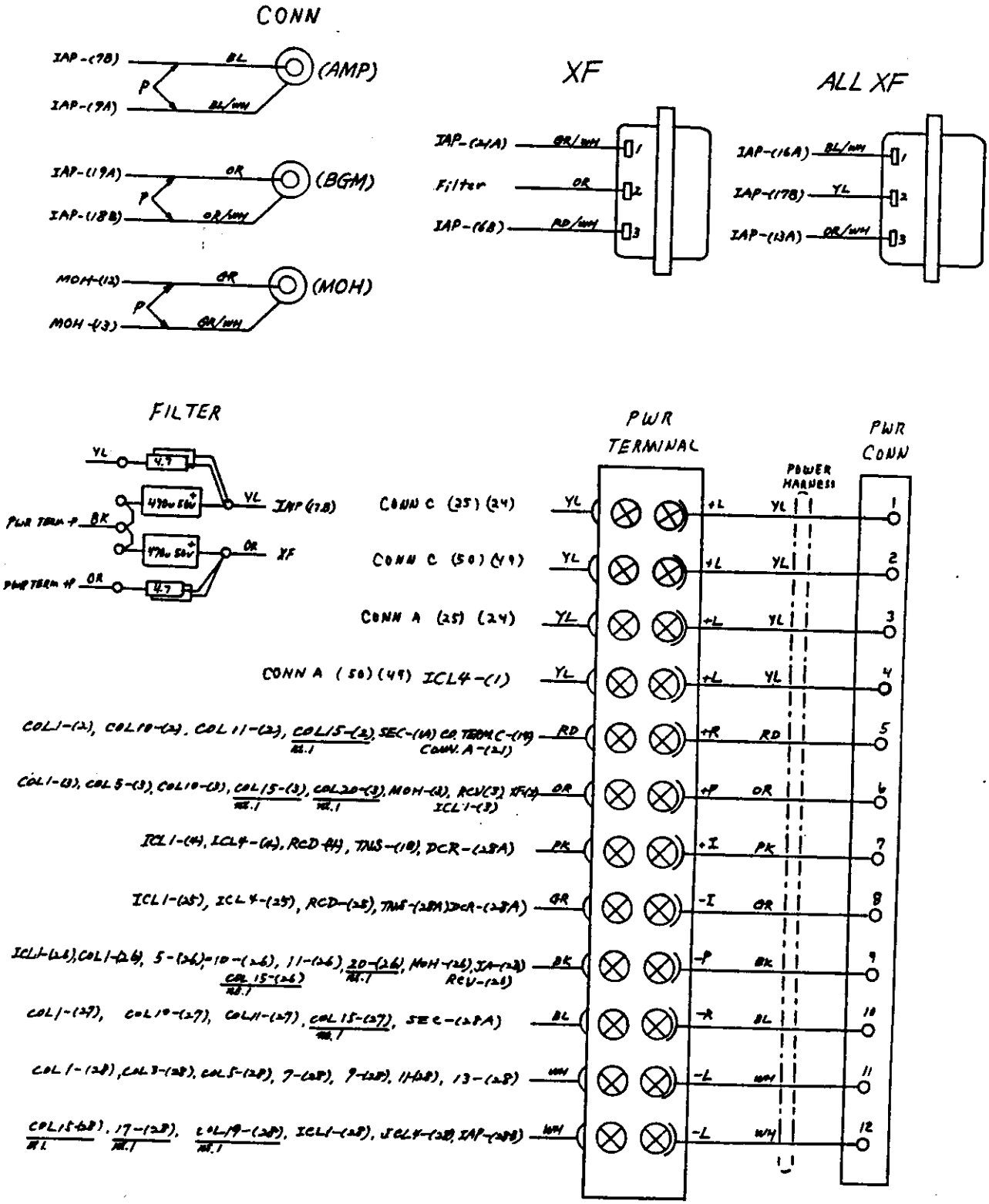
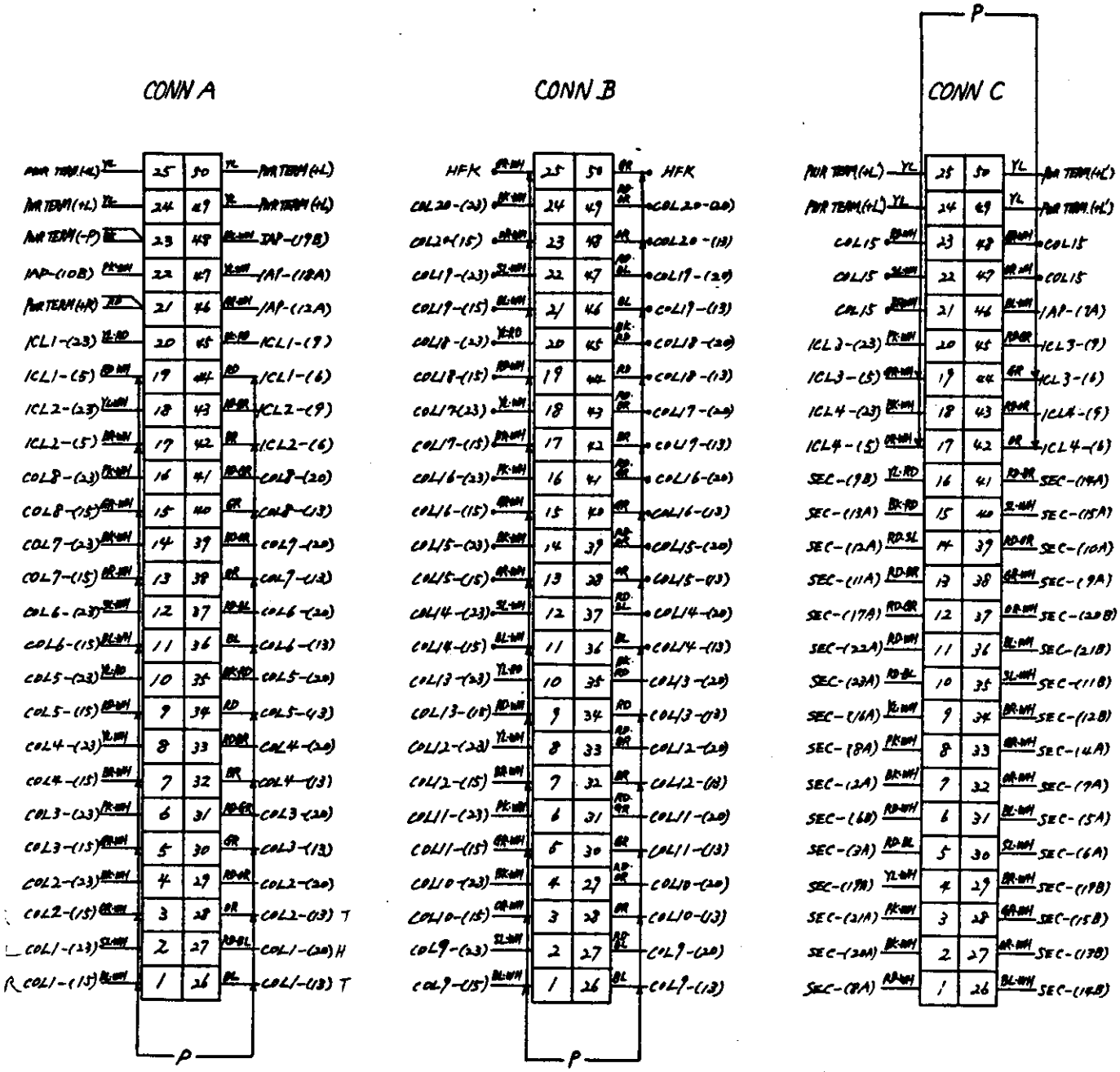


Figure 1f BT 1530 KSU Wiring Diagram



P indicates wire pair

Figure 1a BT 1530 KSU Wiring Diagram

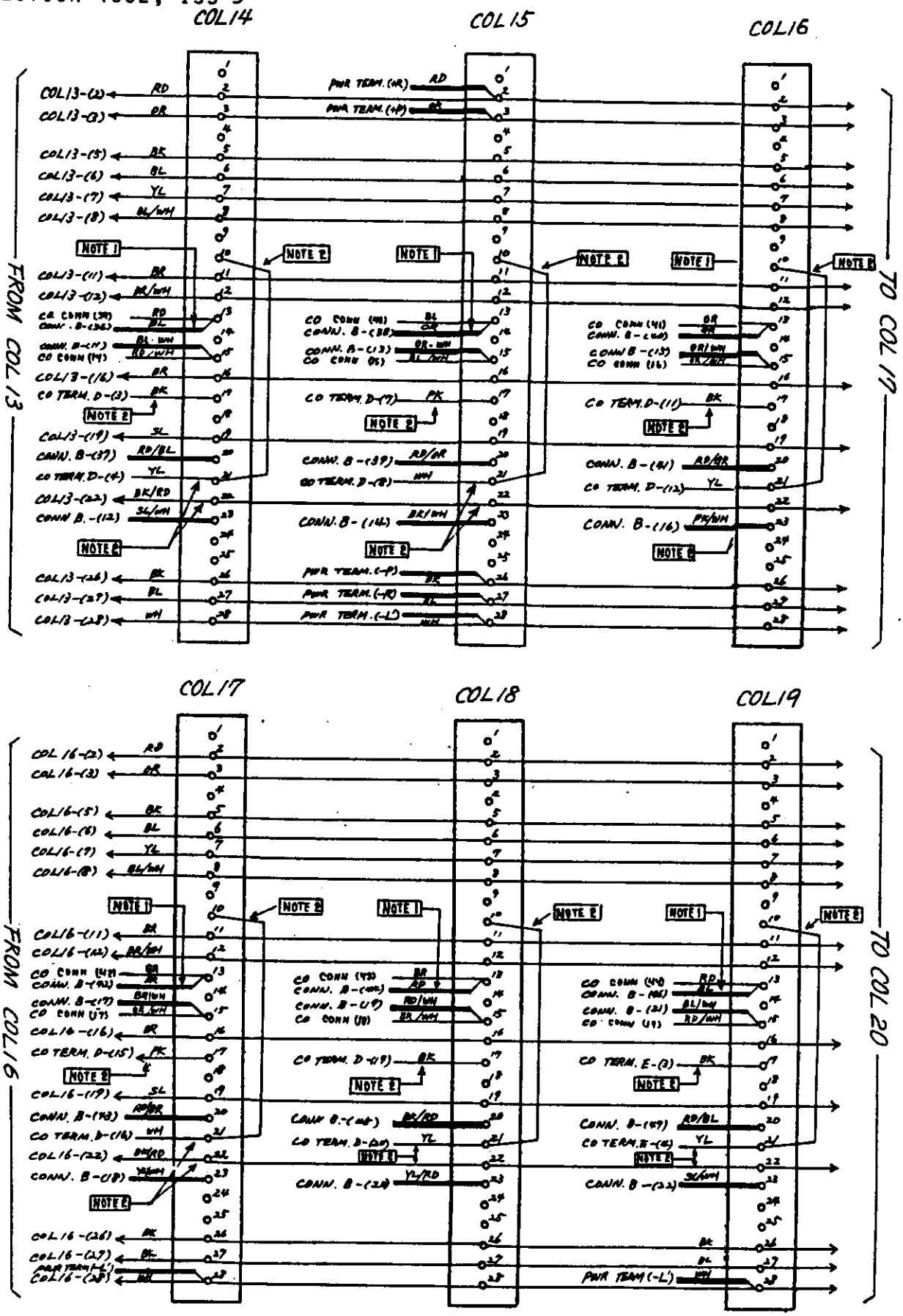


Figure 2a BT 2250 KSU COL 14-20 Wiring Diagram (Expanded BT 1530 KSU)

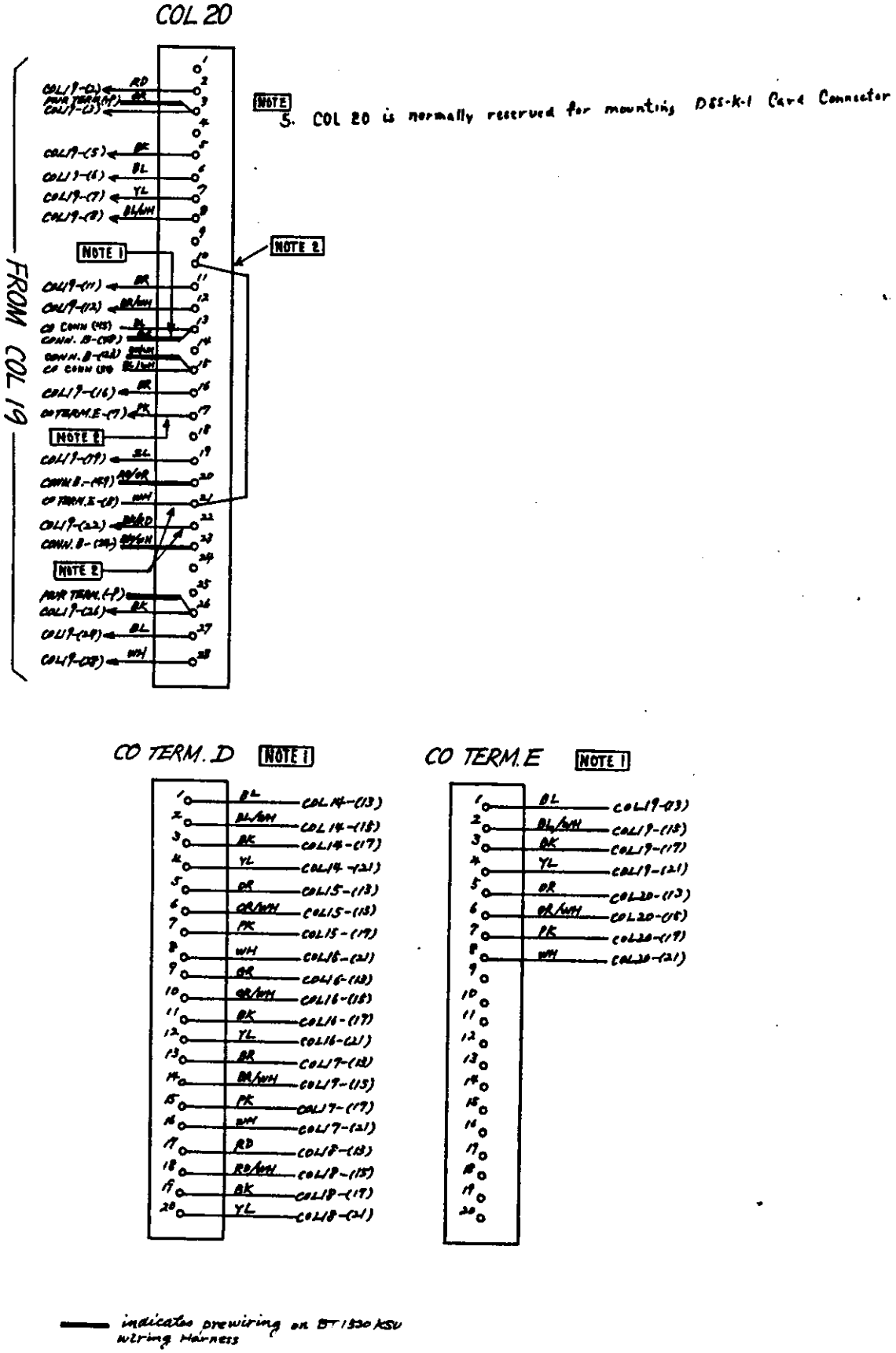
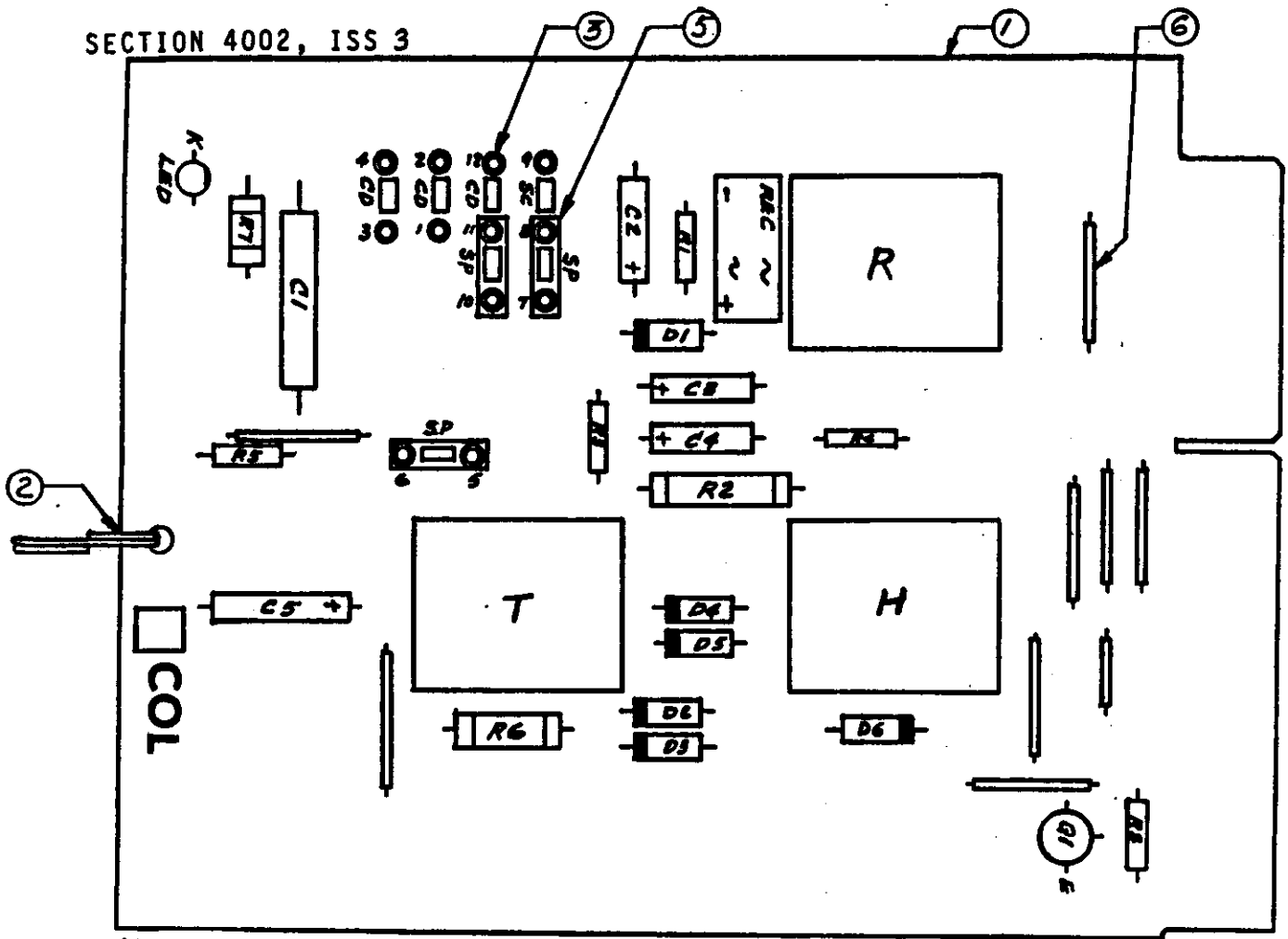


Figure 2b BT 2250 KSU COL 14-20 Wiring Diagram (Expanded BT 1530 KSU)



PARTS LIST					
ITEM NO.	PART NO.	SYM.NO.	DESCRIPTION		QTY
1.	TE-101392		P.C.B. COL		1
2.	TP-122823		PULL RING		1
3.	P-114510		TERMINAL N-60		12
4.			SCREW 2.6X4S		3
5.	P-118035		SHORTING BAR		3
6.	P-118169-9		JUMPER WIRE		9
		C1	CAPACITOR:	1.8mf +100-10% 50V	1
		C2		2.2mf " "	1
		C3,4		3.3mf " 160V	2
		C5		10mf " 50V	1
	P-122539	D1-6	DIODE:	SIR40Z	6
		Q1	TRANSISTOR:	2SD78	1
	P-120286	REC	SIRB40Z		1
		LED	LED:	SLP-24B	1
		R8	RESISTOR:	10K ½W ±10%	1
		R2		220 2W ±5%	1
		R3,4		220 ½W ±10%	2
		R5		470 " "	1
		R6		180 1W ±5%	1
		R7		1.8K ½W "	1
	RL-3799	H	RELAY:	M-173	1
	"	R		M-172	1
	"	T		M-174	1
		R1	RESISTOR	39K ¼W ±10%	1

Figure 4a COL Line Card Components and Illustration

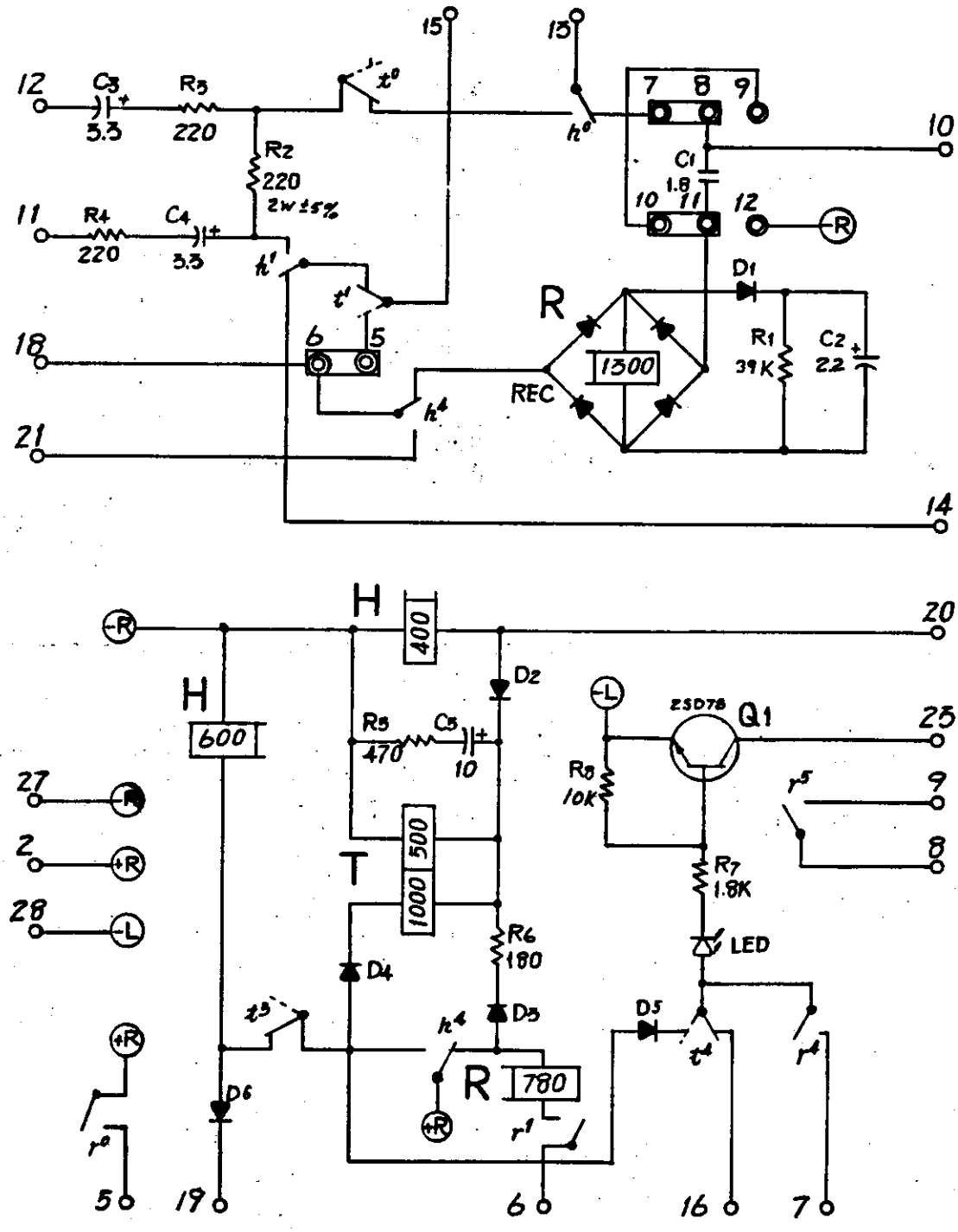


Figure 4b COL Line Card Schematic

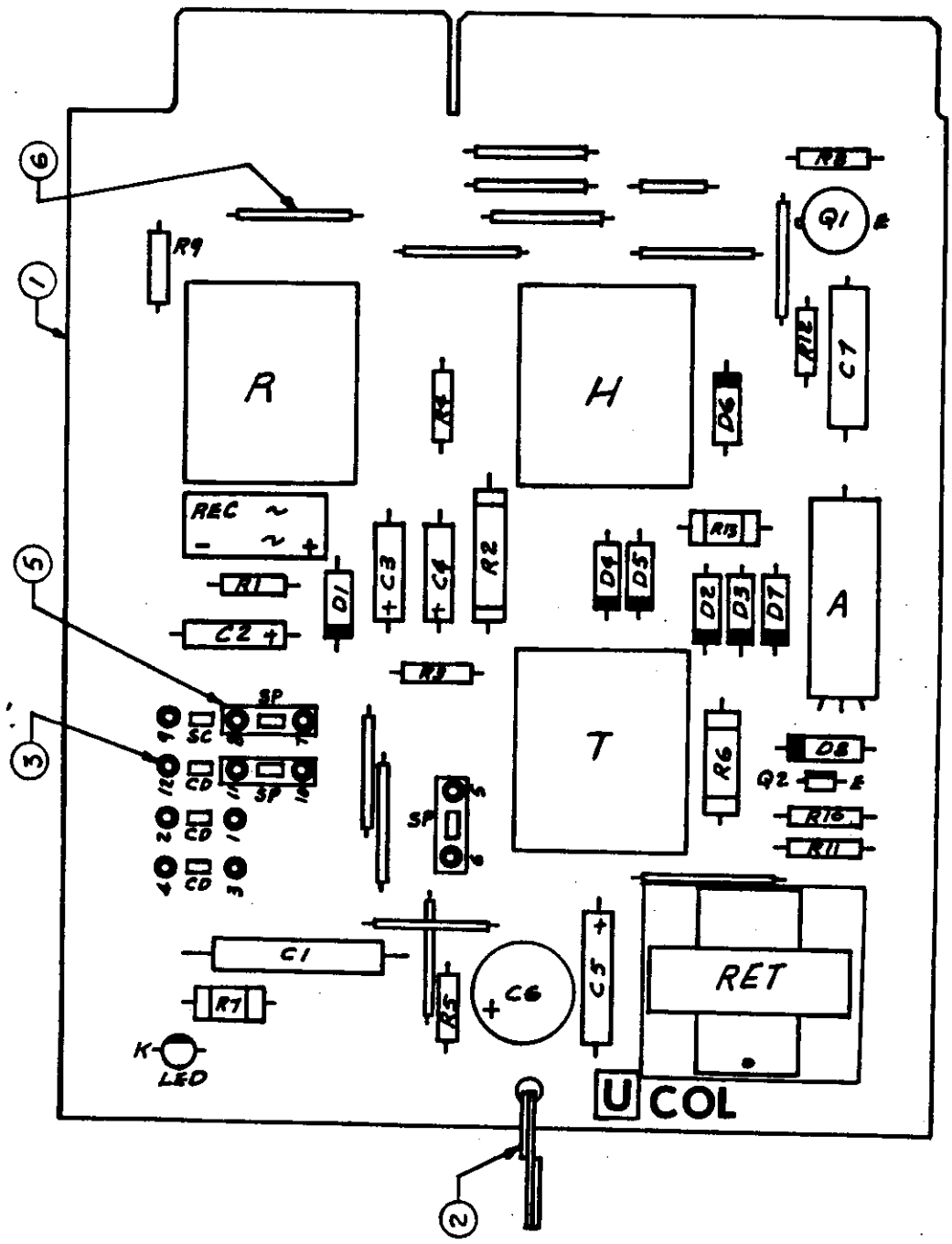


Figure 5a UCOL Line Card Illustration

PARTS LIST					
ITEM NO.	PART NO.	SYM.NO.	DESCRIPTION		QTY
1.	TE-101392		P.C.B. UCOL		1
2.	TP-122823		PULL RING		1
3.	P-114510		TERMINAL N-60		12
4.			SCREW 2.6x4S		3
5.	P-118035		SHORTING BAR		3
6.	P-118169-9		JUMPER WIRE		13
		C1	CAPACITOR:	1.8mf +100-10% 50V	1
		C2		2.2mf " "	1
		C3,4		3.3mf " 160V	2
		C5		10mf " 50V	1
		C6		220mf " "	1
		C7		.047mf " 180V	1
	P-122539	D1-8	DIODE:	SIR40Z	8
		Q1	TRANSISTOR:	2SD78	1
		Q2		2SC1213A	1
	P-120286	REC	RECTIFIER:	SIR840Z	1
		R8	RESISTOR:	10K ¼W ±10%	1
		R2		220 2W ±5%	1
		R3,4		220 ¼W ±10%	2
		R5,11		470 " "	2
		R6		180 1W ±5%	1
		R7		1.8K ¼W "	1
		R9		47 " ±10%	1
		R10		22 ¼W ±5%	1
		R12		1K " ±10%	1
		R13		220 ¼W ±5%	1
		LED	LED:	SLP-24B	1
	TP-123066	RET	RETARD COIL:		1
	RL-3799	H	RELAY:	M-173	1
	"	R		M-172	1
	"	T		M-174	1
		A	REED RELAY	SRF-12B	1
		RI	RESISTOR	39K ¼W ± 10%	1
		VRI	VARISTOR		1

Figure 5b UCOL Line Card Components

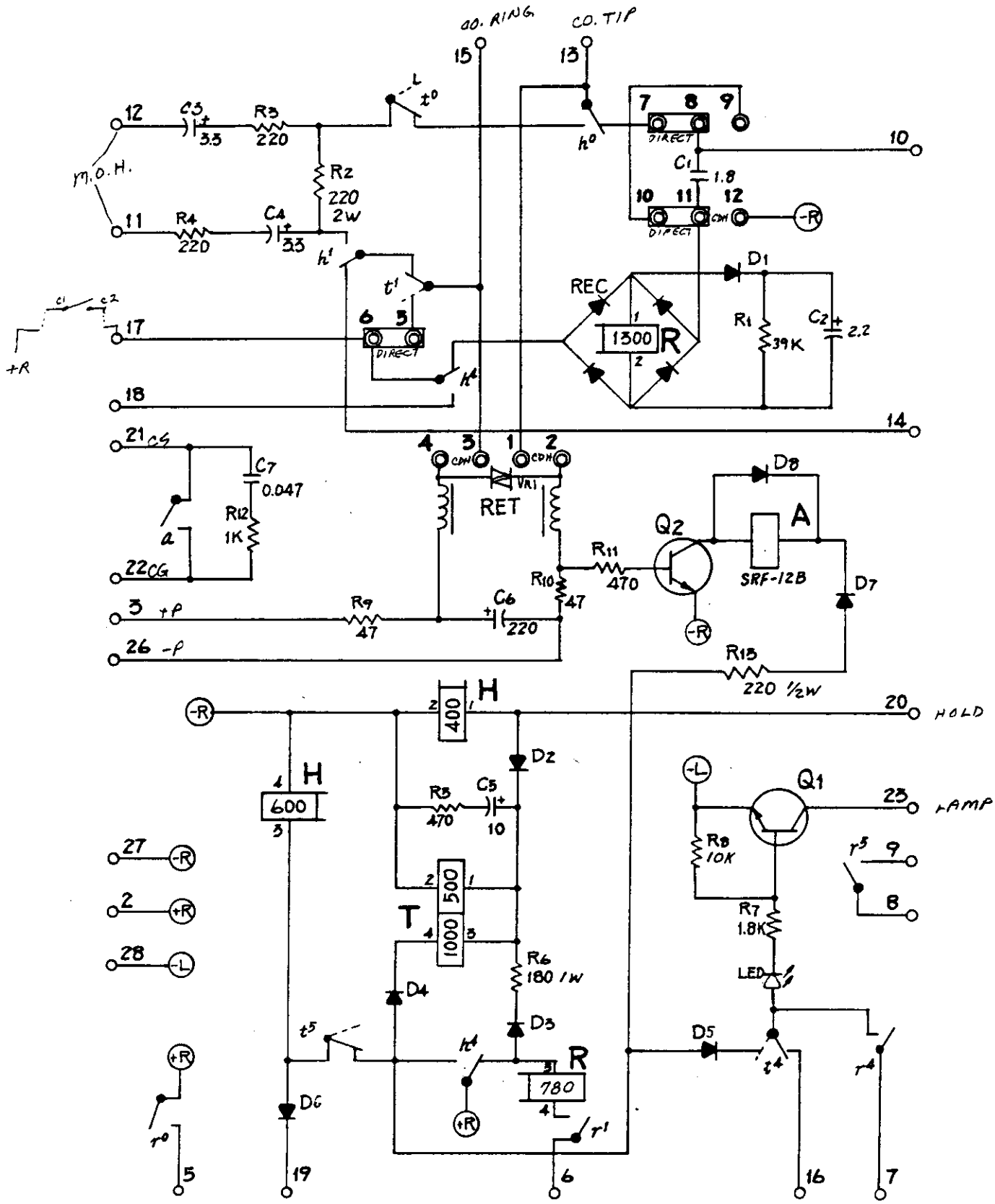


Figure 5c UCOL Line Card Schematic

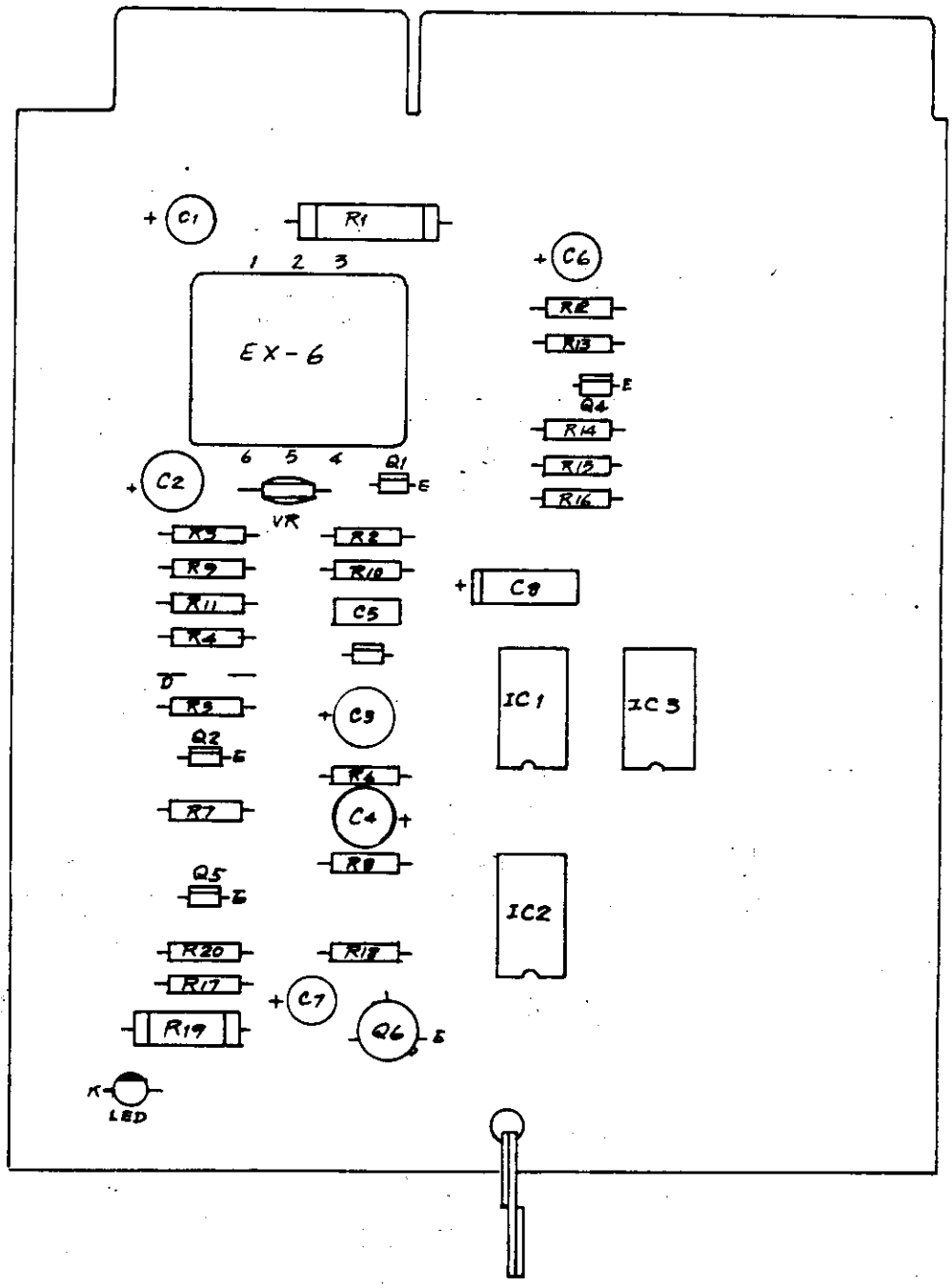


Figure 6a ICL Intercom Line Card Illustration

PARTS LIST				
ITEM NO.	PART NO.	SYM. NO.	DESCRIPTION	QTY
1.	TE-101393		P.C.B. ICL	1
2.	TP-122823		PULL RING	1
		C1,3,4	CAPACITOR: 10mf +100-10% 50V	3
		C2	220mf " "	1
		C5	.047mf " 180V	1
		C6,7	4.7mf " 50V	2
		C8	(NOISE LIMITER) 1mf +100 -10% 16V	1
		D1	DIODE: 1S2076A	1
		Q1-5	TRANSISTOR: 2SC1213A	5
		Q6	2SD78	1
		VR	VARISTOR: VR-60	1
		IC1	INTEGRATED CIRCUT: HD2511P	1
		IC2,3	HD2503P	2
		LED	LED: SLP-24B	1
		XF1 (T1)	TRANSFOMER: EX-6	1
		R1	RESISTOR: 330 2W ±10%	1
		R2	5.6K ¼W ±5%	1
		R3	2.2K " "	1
		R4	3.3K " "	1
		R13-16, 5-7,10,11	4.7K " "	9
		R8	100 " "	1
		R9	22K " "	1
		R12	47K " "	1
		R17	8.2K " "	1
		R18,20	1.5K " "	2
		R19	1.8K ½W ±10%	1

Figure 6b ICL Intercom Line Card Components

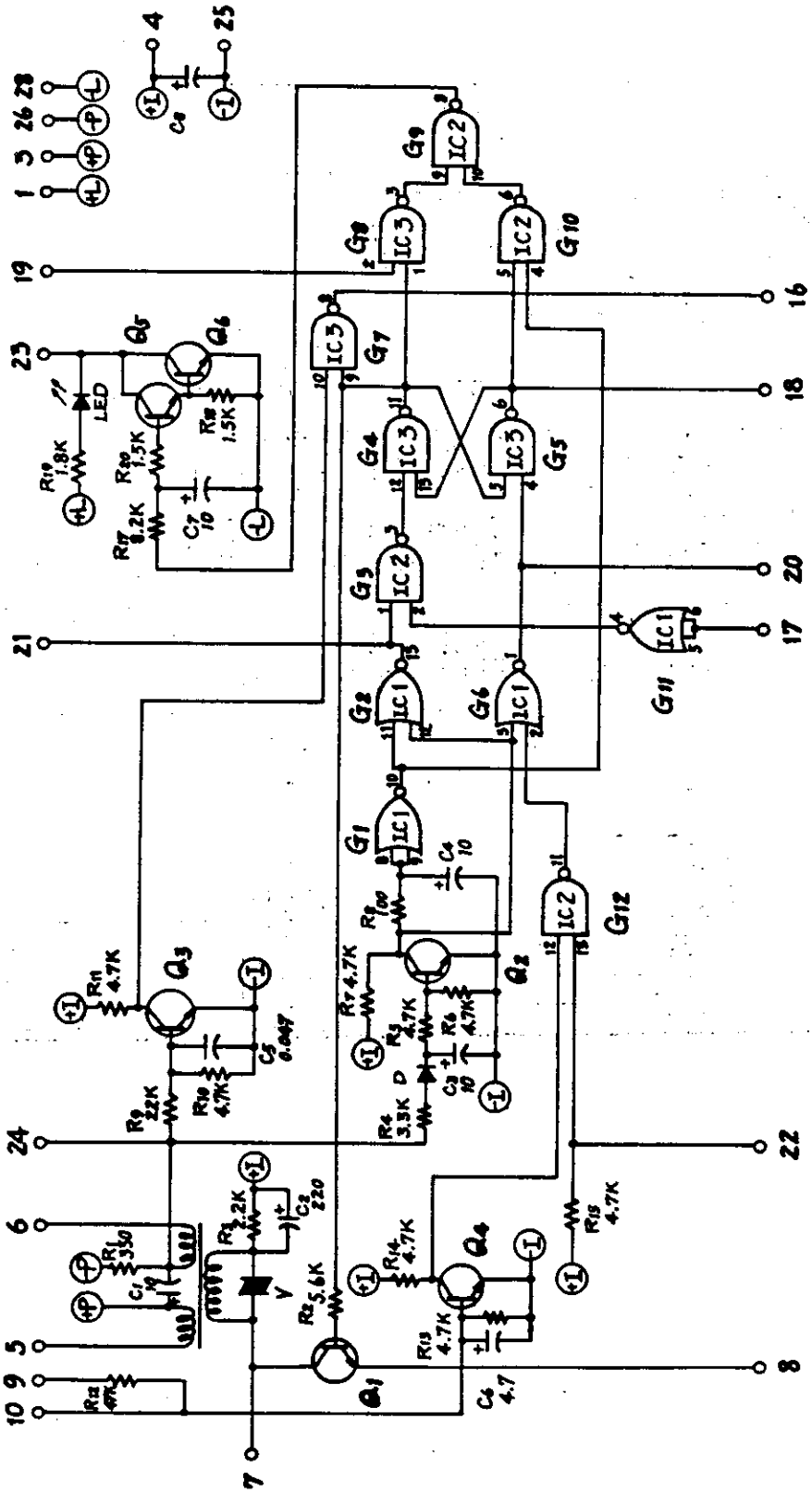


Figure 6c ICL-1 Intercom Line Card Schematic

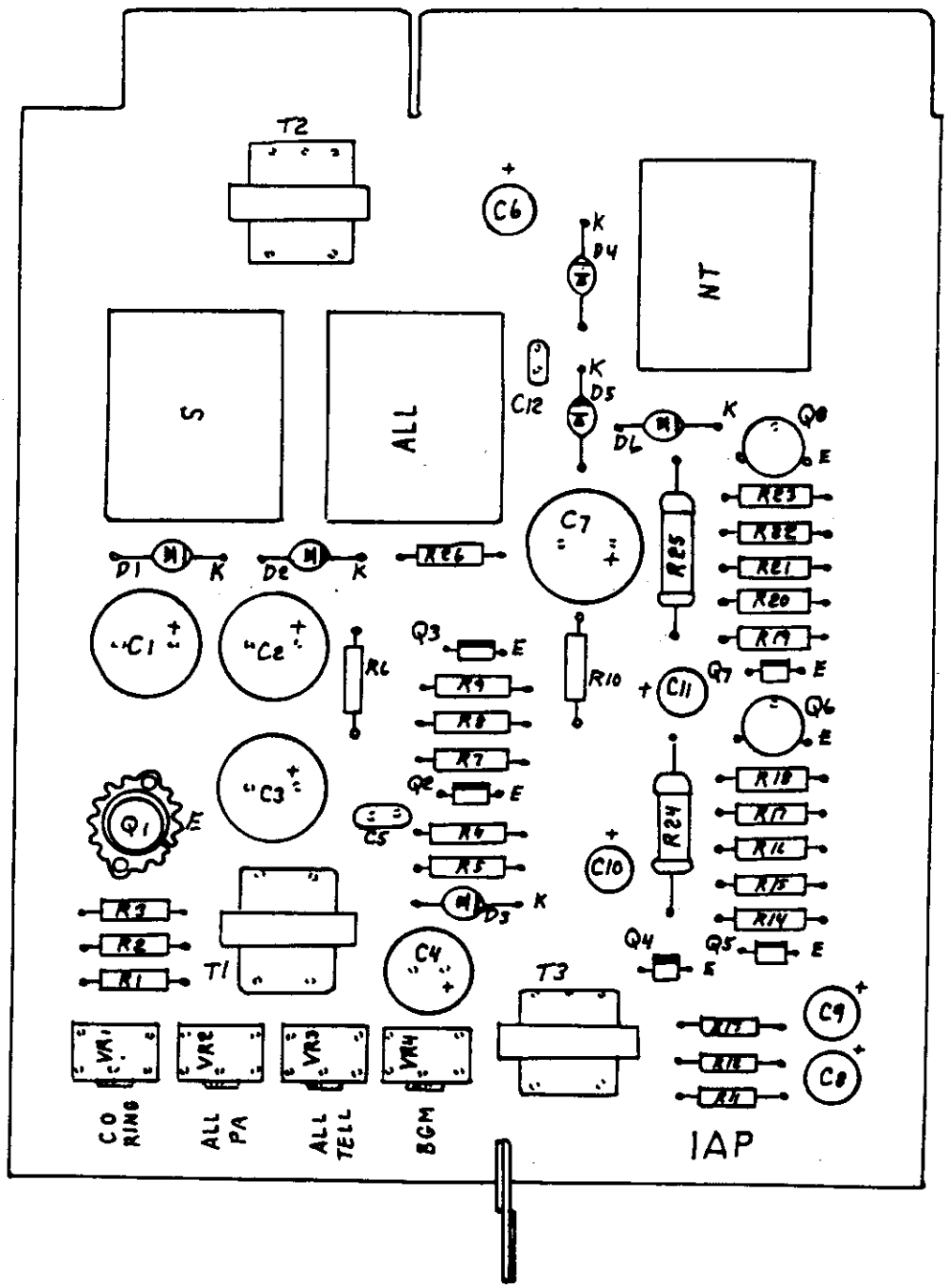


Figure 7a IAP Circuit Card Illustration

PARTS LIST					
ITEM NO.	PART NO.	STM. NO.	DESCRIPTION		QTY
1.	TE-101394		P.C.B. IAP		1
2.	TP-122823		PULL RING		1
3.			SCREW 2.6X4S		3
4.	P-121700		HEATSINK NZ5C		1
		C1,2	CAPACITOR:	330mf+100-10 50V	2
		C3,7		220mf " "	2
		C4		100mf " "	1
		C5,C12		.033mf " 180V	2
		C6,8,9,10 11,12		10mf " 50V	6
		D1-6	DIODE:	6E SILICON	6
		Q1	TRANSISTOR:	2SC1008	1
		Q2-5,7		2SC1213A	5
		Q6,8		2SD78	2
		XF1 (T1)	TRANSFORMER:	EX-4	1
		XF2 (T2)		EX-2	1
		XF3 (T3)		EX-	1
		VR1,2,3	POTENTIOMETER:	1K	3
		VR4		10K	1
		R1,9,13	RESISTOR:	1K ¼W ±5%	3
		R2		33K " "	1
		R3,18,23		10K " "	3
		R4		22K " "	1
		R5		3.3K ½W 10%	1
		R6		470 " "	1
		R7,11,26		1.5K ¼W ±5%	2
		R8,12		100K " "	2
		R10		4.7K " "	1
		R14,19		27K " "	2
		R15,16, 20,21		4.7K " "	4
		R17,22		2.7K " "	2
		R24,25		47 2W 10%	2
	RL-3829	NT	RELAY:	M-101	1
	"	ALL		M-107	1
	"	S		M-111	1

Figure 7b IAP Circuit Card Components

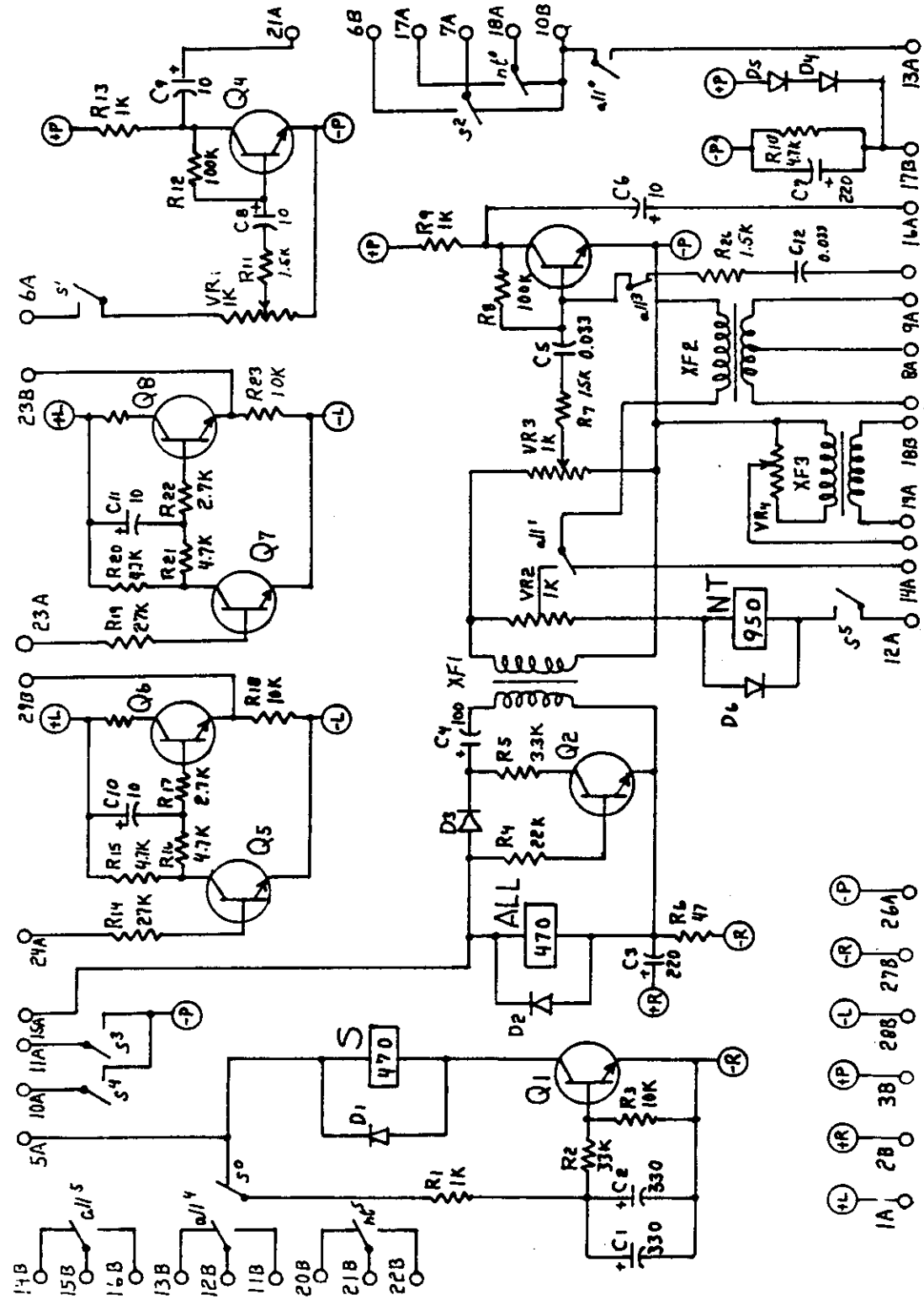


Figure 7c IAP-1 Circuit Card Schematic

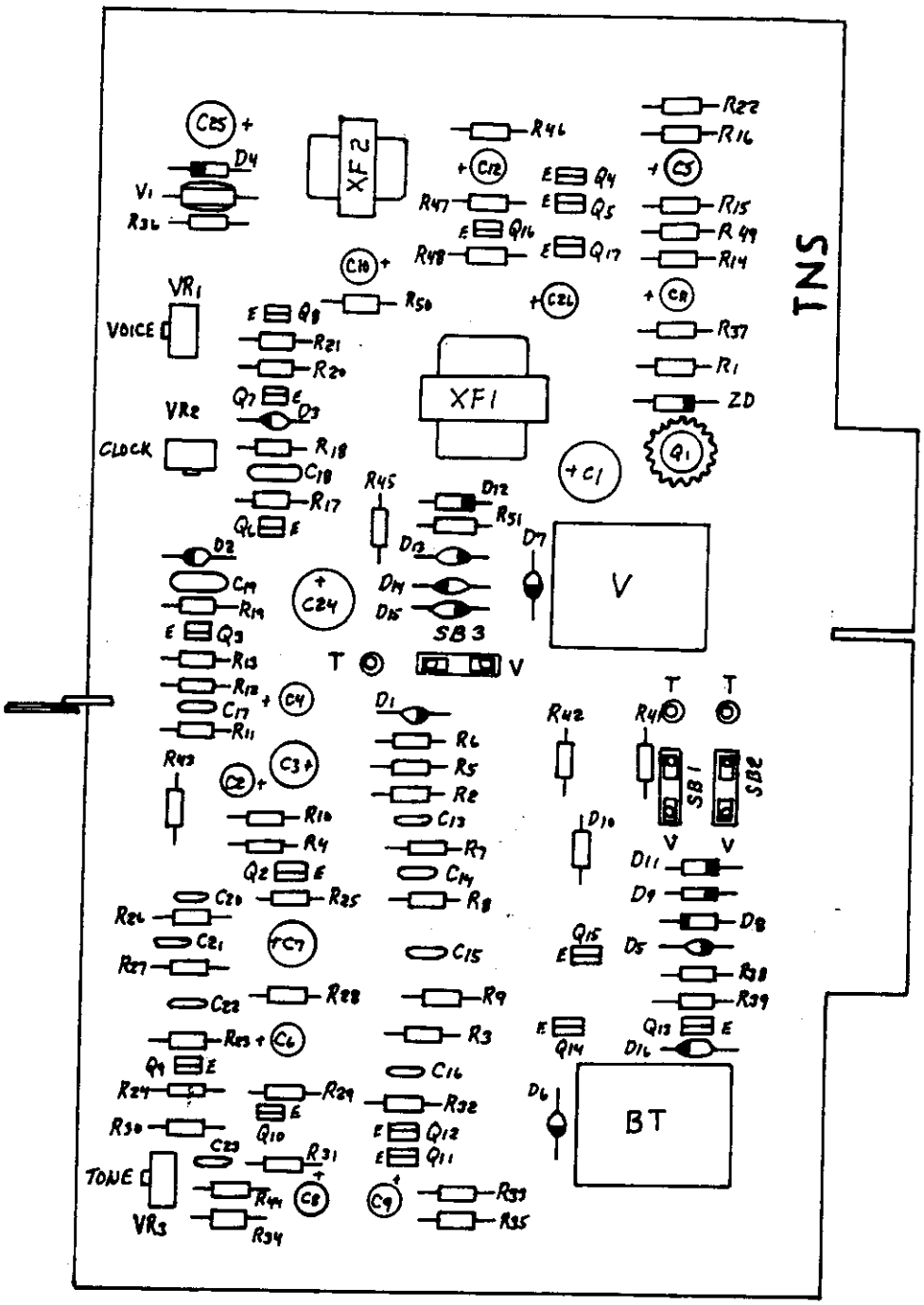


Figure 8a TNS Circuit Card Illustration

PARTS LIST

ITEM NO.	PART NO.	SYM. NO.	DESCRIPTION		QTY
1.	TE-101391		P.C.B. TNS		1
2.	TP-122823		PULL RING		1
3.	P-114510		TERMINAL N-60		9
4.	P-118035		SHORTING BAR		3
5.			SCREW 2.6X4S		2
6.			JUMPER		1
		C1,	CAPACITOR	100mf +100-10%50V	1
		C2,4-6,8-12, 26		10mf " "	11
		C3,7		33mf " "	2
		C13-16,21,22		.015mf + 10% 180V	6
		C24		220mf +100-1-%5-V	1
		C17,20		1000pf +25%	2
		C18,19		.22mf " 180V	2
		C23		.01mf " "	1
		C25		220mf +100-10%10V	1
		D1-3,5-7,12-16	DIODE	6E SILICON	10
		D4,8-11		1S2076A	5
		ZD		RD-16AM	1
		Q1	TRANSISTOR	2SD78	1
		Q2-4,6-11 14-17		2SC1213A	12
		Q5,12,13		2SA673A	3
		XF1 (T1)	TRANSFORMER	EX-1	1
		XF2 (T2)		EX-7	1
	K-104096	V1	VARISTOR	VR-60	1
	TP-123114-1	VR1,3	POTENTIOMETER	1K	2
	TR-123114-4	VR2		20K	1
		R1,34	RESISTOR	1.5K ¼W +5%	2
		R2,3,11,12, 23,47		100K " "	6
		R4,14,15,17 20,24,36,49		10K " "	8
		R5		6.8K " "	1
		R6-9,27		15K " "	5
		R10,18		2.7K " "	2
		R35		3.3K " "	1
		R16,43,44,46,48		1K " "	5
		R37		3.9K " "	1
		R18,19,32,33		39K " "	4
		R21,29,13		47K " "	3
		R22,45		4.7K " "	2
		R25,26		8.2K " "	2
		R30,31		22K " "	2
		R38		100 " "	1
		R39		330 " "	1
		R41,42		5.6K " "	2
		R50		2.2K " "	1
		R51		10K ¼W 10%	1
	RL-3829	V	RELAY	M-107	1
	P-119714-2	BT		M-112	1

Figure 8b TNS Circuit Card Components

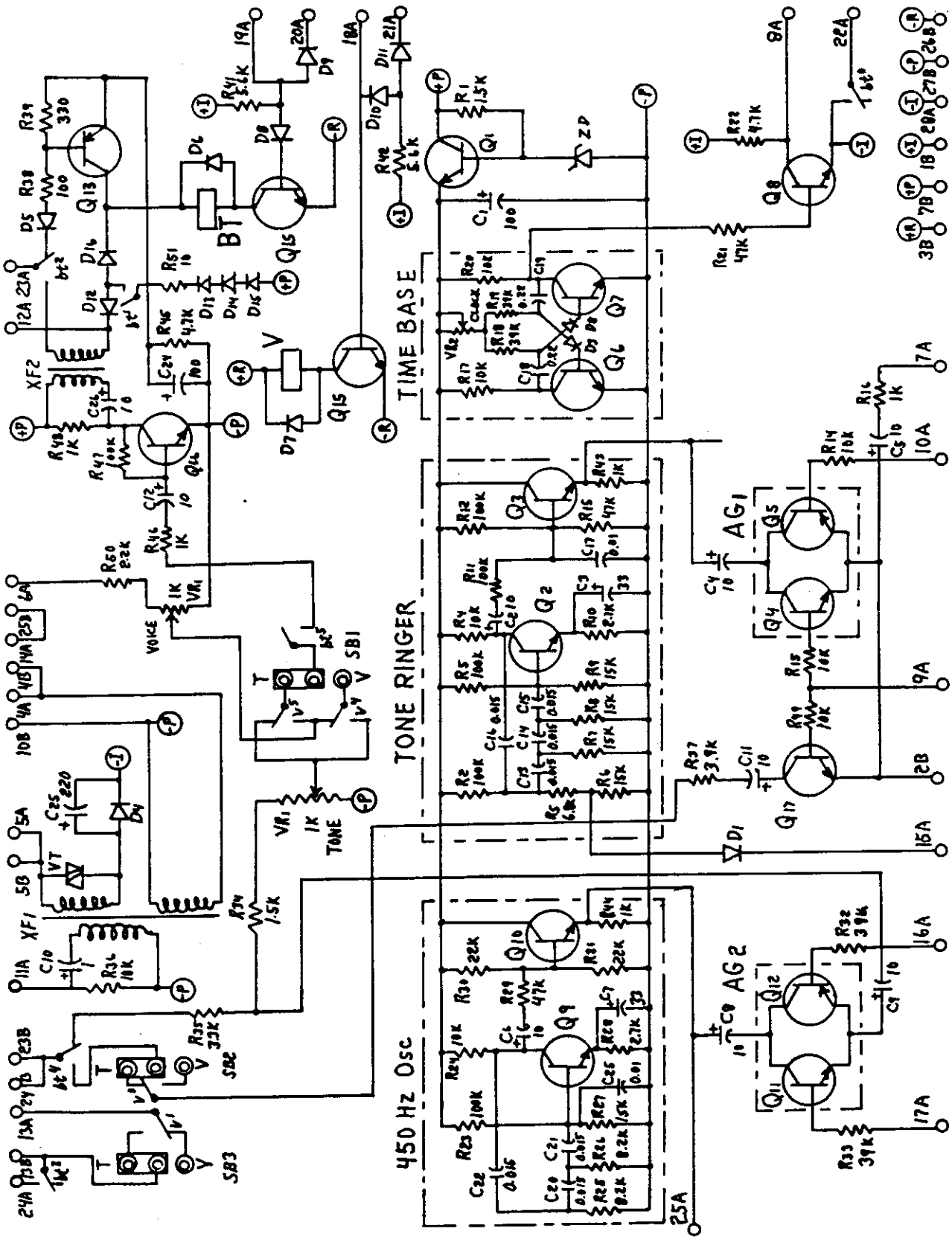
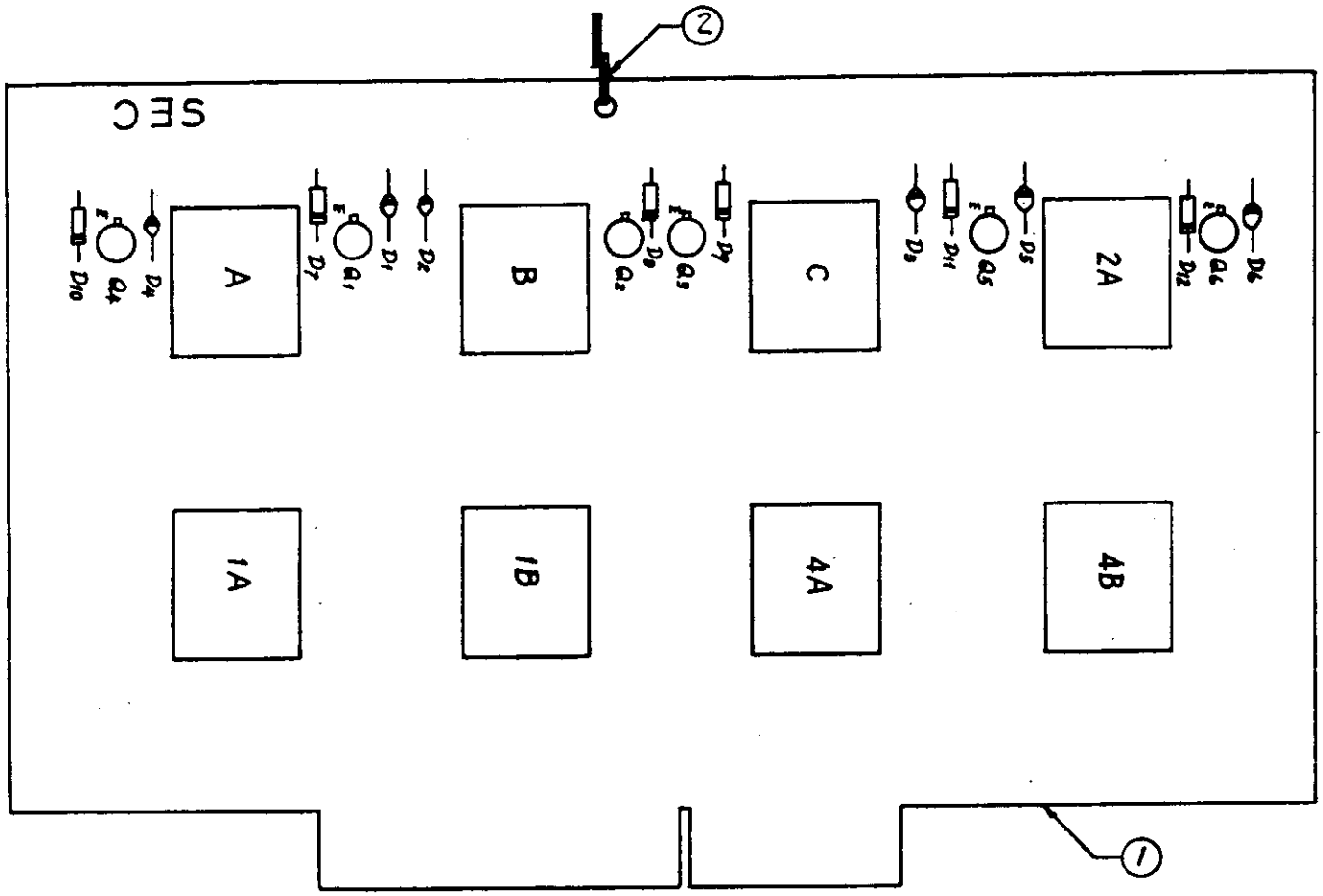


Figure 8c TNS Circuit Card Schematic



PARTS LIST					
ITEM NO.	PART NO.	SYM. NO.	DESCRIPTION		QTY
1.			P.C.B. SEC		1
2.	TP-122823		PULL RING		1
3.			SCREW 2.6X4S		8
	P-119165	D1-6	DIODE:	6E SILICON	6
		D7-12		1S2076A	6
		Q1-6	TRANSISTOR:	2SC1008	6
	RL-3829	A,B,1A, 1B,2A,4A	RELAY:	M-108	6
		C,4B		M-107	2

Figure 9a SEC Circuit Card Illustration and Components

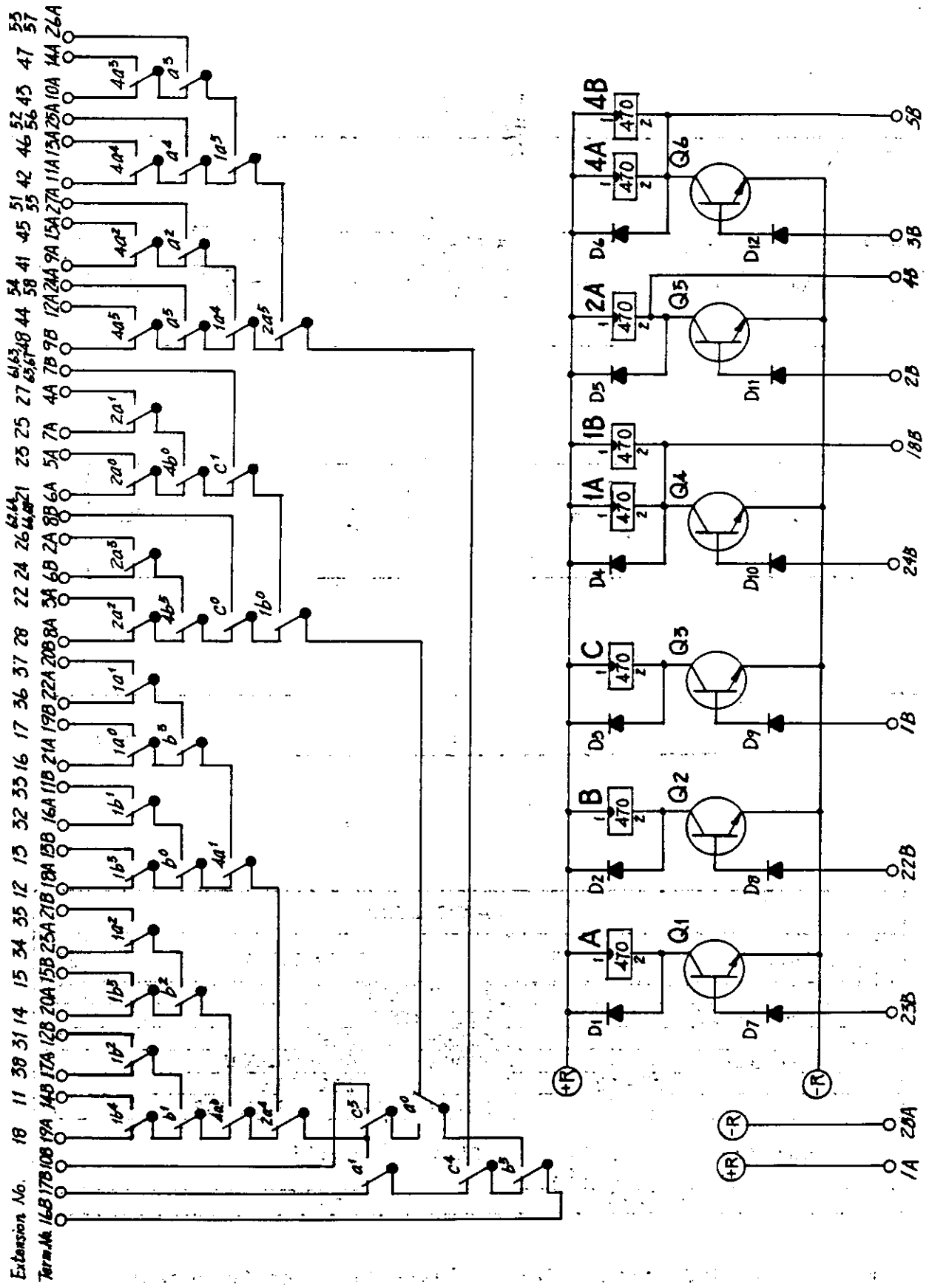
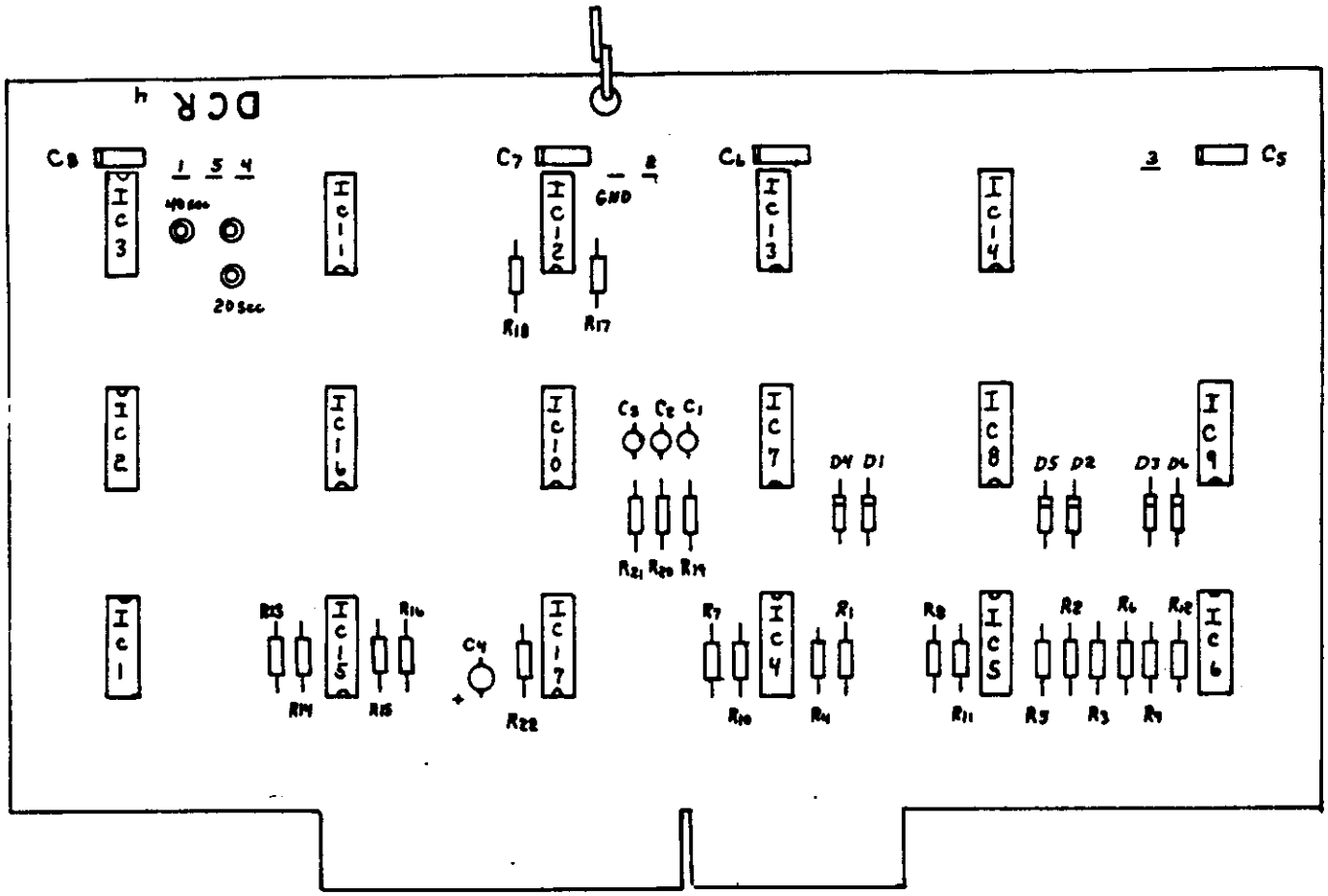


Figure 9b SEC Circuit Card Schematic



PARTS LIST					
ITEM NO.	PART NO.	SYM. NO.	DESCRIPTION		QTY
1.	TE-101388		P.C.B. DCR		
2.	TP-122823		PULL RING		
		C1-C3	CAPACITOR	4.7mf 10V	3
		C4		22mf 10V	1
		C5-C8		1.0mf 16V	4
			DIODE 1S.2076A		6
		IC1-IC3	INTEGRATED CIRCUIT	HD7493AP	3
		IC4-IC6		HD7476P	3
		IC7-IC9		HD7402P	3
		IC10		HD7414P	1
		IC11-14		HD7400P	4
		R7-R18	RESISTOR	560 ¼W 5%	12
		R19-R21		220 ¼W 5%	3
		R1-R6		2.2 ¼W 5%	6
		R22		27K ¼W 5%	1

Figure 10a DCR Circuit Card Illustration and Components

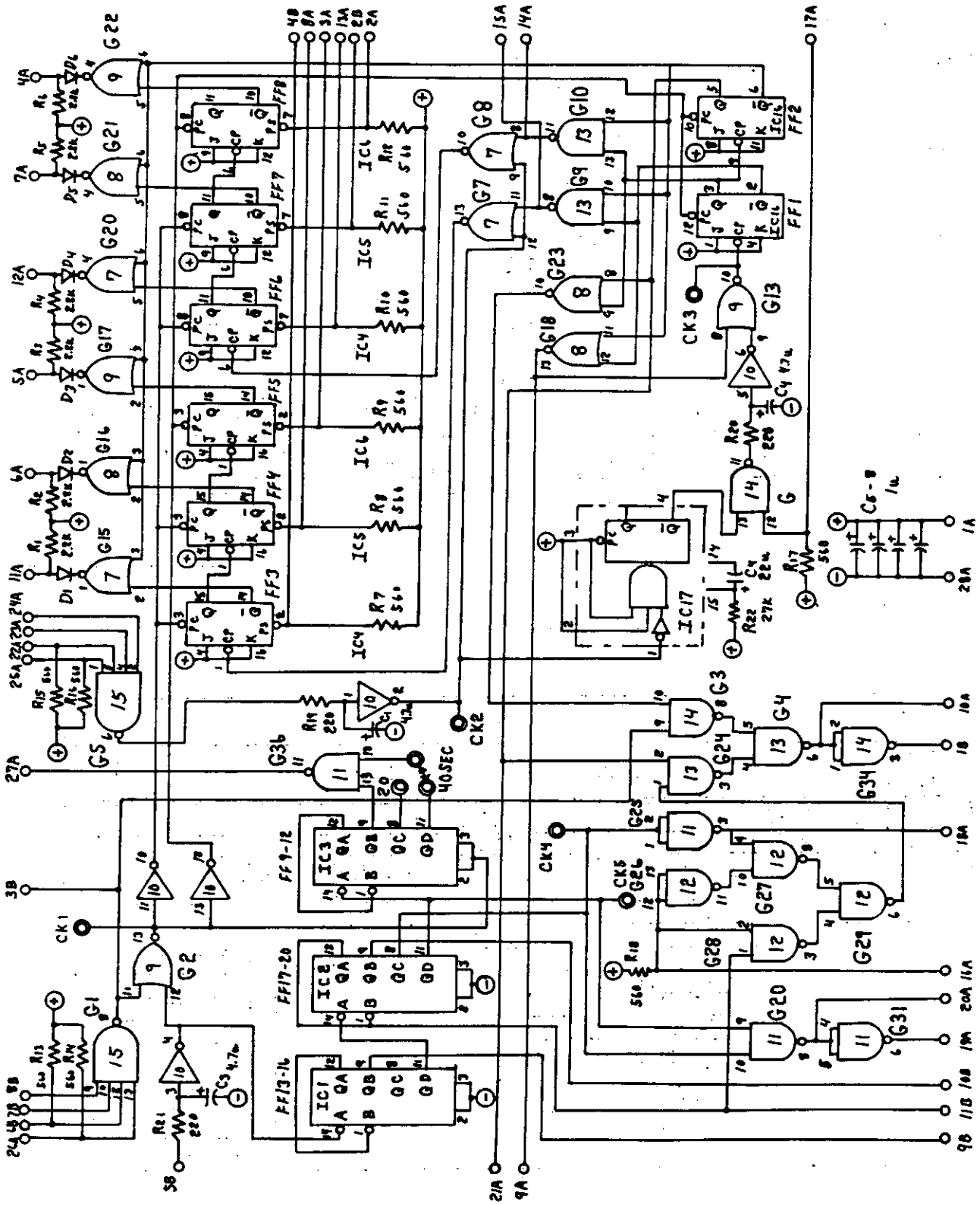


Figure 10b DCR REV 4 Circuit Card Schematic

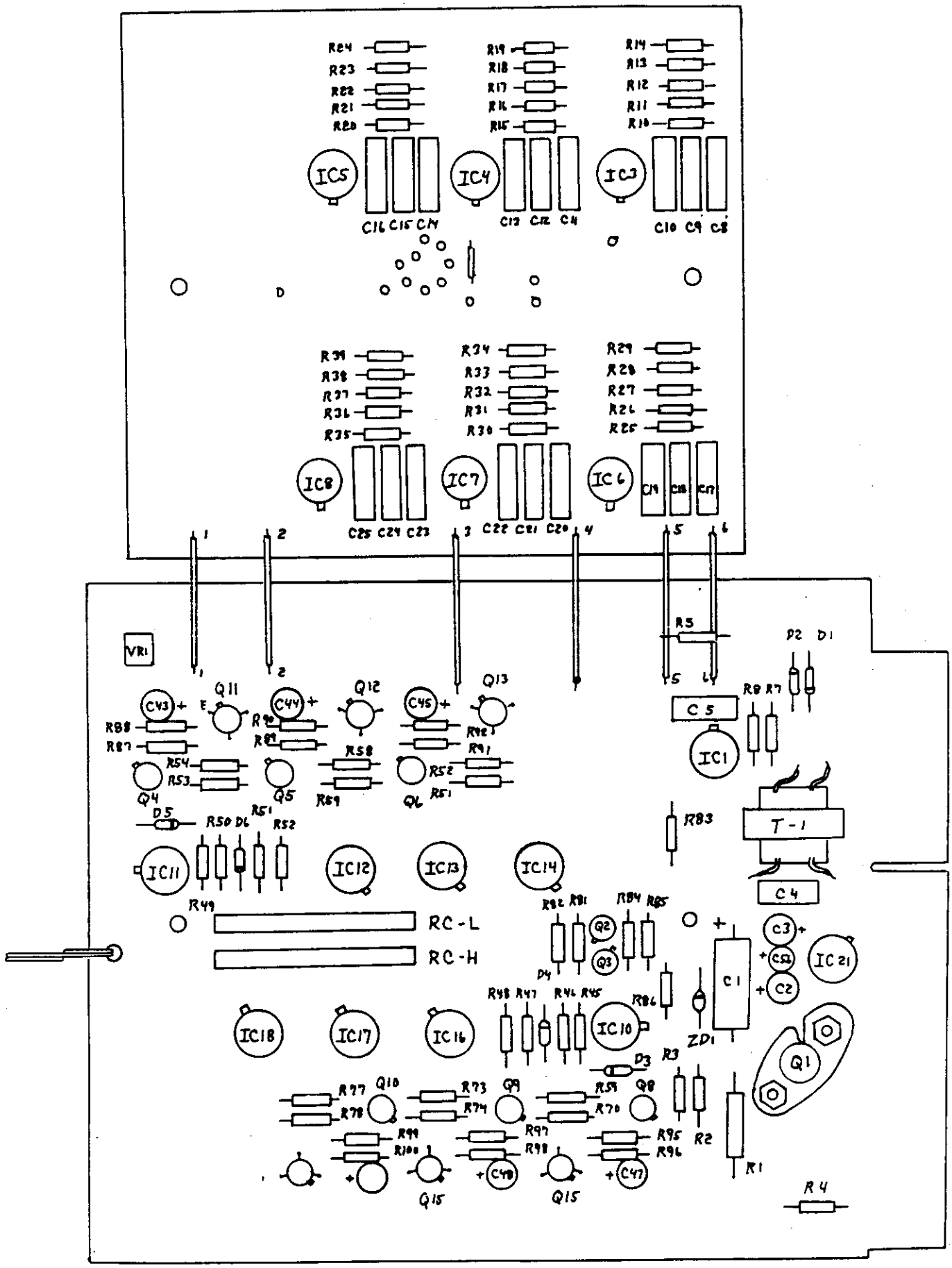


Figure 11a RCV-1 OTRU Receiver Line Card Illustration

PARTS LIST PAGE 1 OF 2

ITEM NO.	PART NO.	SYM. NO.	DESCRIPTION		QTY
1.	TG-104954		P.C.B. RCV-1		1
2.	TG-104955		" " 2		1
3.	TP-122823		PULL RING		1
		C1	CAPACITOR	33 mf +100-10% 25V	1
		C2,3		10 mf " 180V	2
		C4,5		.1 mf " "	2
		C8,9,11,12, 14,15,17,18 20,21,23,24		4700pf ±0.25%	12
		C10,13,16, 19,22,25		9400pf. "	6
		C43-45,47-49		2.2mf " 50V	6
		C56		3.3mf " 50V	1
		RC-L	HYBRID		1
		RC-H			1
		D1-6	DIODE	1S953	6
		ZD1		ZENER AWO1-15V	1
		Q1	TRANSISTOR	2SB505	1
		Q2-6,8-10		2SC943	8
		Q11-13,15-17		2SA603	6
		XF1 (T1)	TRANSFORMER ST-28		1
		VR1	POTENTIOMETER 5K		1
		IC1,3-8,10-14 16-18,21	INTERGRATED CIRCUIT	HA17741M	16
		R1	RESISTOR	560 1W +5%	1
		R2,3,14,19, 24,29,34,39		2.7K ¼W ±1%	8
		R4		15 " +5%	1
		R5		4.7K " "	1
		R6		51K " "	1
		R7		470K " "	1
		R10,11		28K " "	2
		R12		12.8K " +1%	1
		R13,18,23, 28,33,38		330 " "	6
		R15,16		25.3K " "	2
		R17		11.5K " "	1
		R20,21		22.9K " "	2
		R22		10.2K " "	1
		R25,26		48.6K " "	2
		R27		23.1K " "	1
		R30,31		44K " "	2
		R32		20.8K " "	1
		R35,36		39.7K " "	2
		R37		18.5K " "	1
		R45,49		3.57K " "	2
		R46,50		8.45K " "	2
		R47,51		100 " "	2
		R48,52		27 " "	2

Figure 11b RCV-1 OTRU Receiver Component List

PARTS LIST							
ITEM NO.	PART NO.	SYM NO.	DESCRIPTION				QTY
		R53,57,61 69,73,77	RESISTOR	56K	¼W	±5%	6
		R54,58,62,70 74,78		54K	"	"	12
		R56,60,64,72 76,80		27K	"	"	6
		R81,84		3.9K	"	"	2
		R82,85		750	"	"	2
		R83,86,87,89, 91,95,97,99		1K	"	"	8
		R88,90,92,96, 98,100		10K	"	"	6

Figure 11b OTRU Receiver Card Component List (Cont'd)

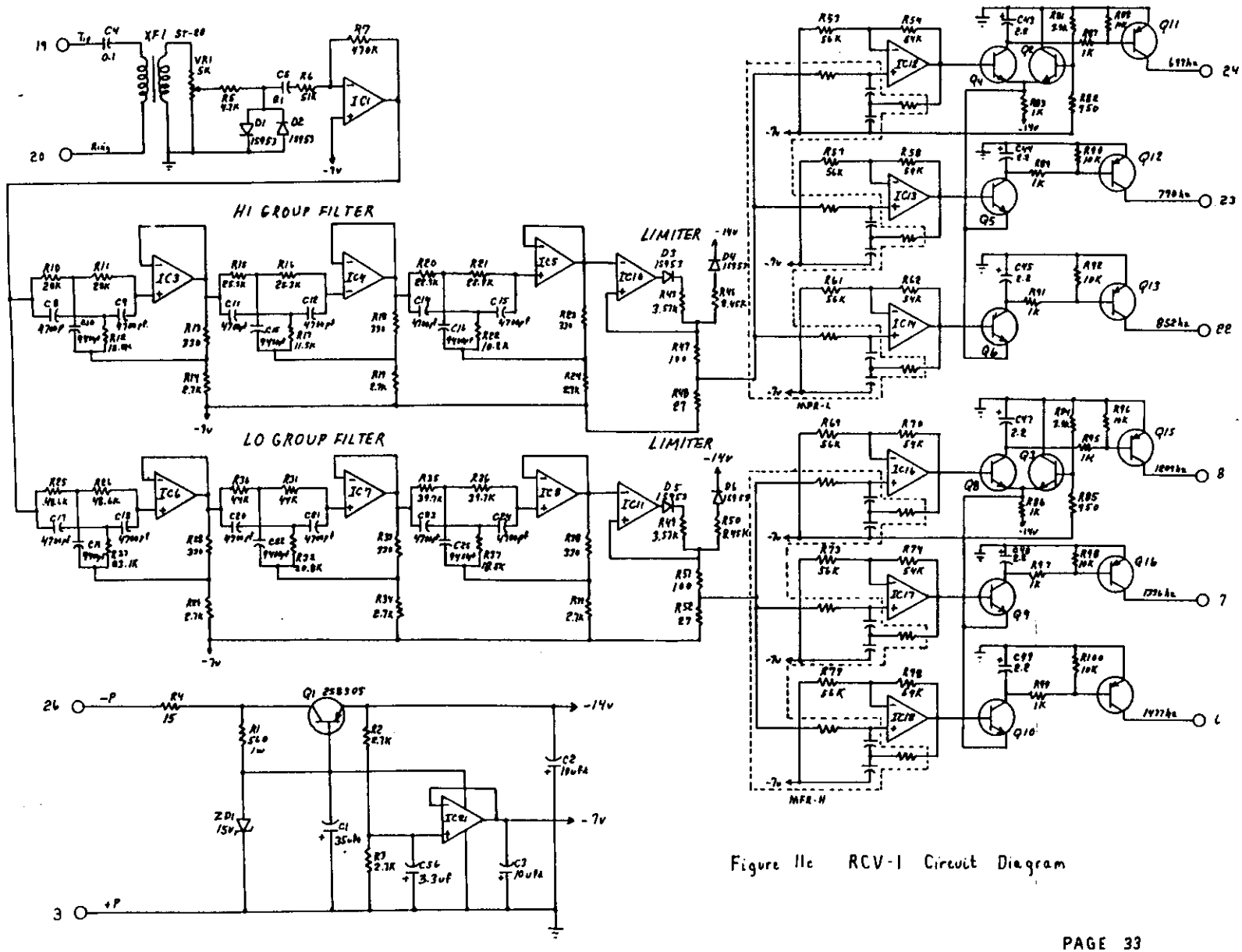
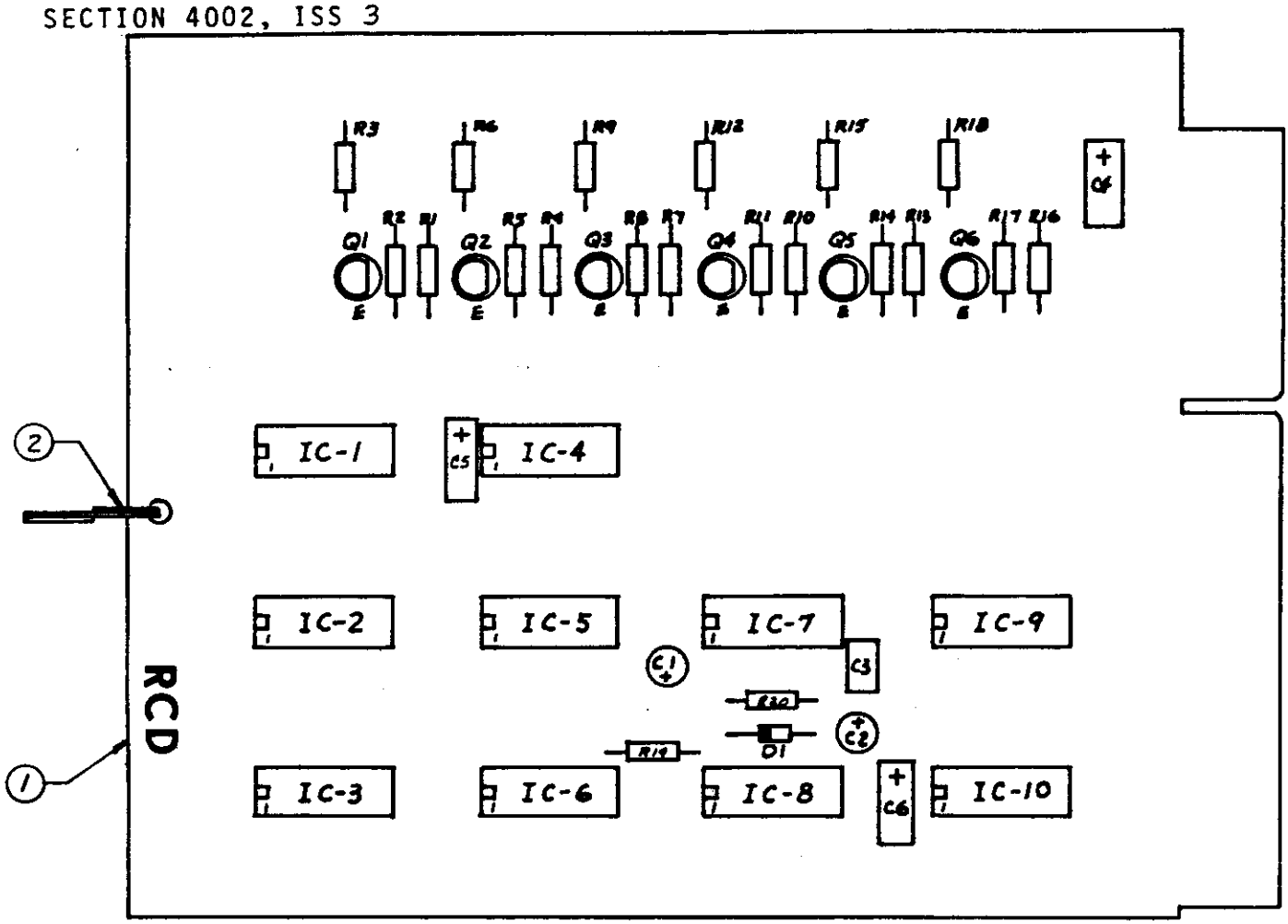


Figure IIc RCV-1 Circuit Diagram



PARTS LIST					
ITEM NO.	PART NO.	SYM. NO.	DESCRIPTION		QTY
1.	TE-101399		P.C.B. RCD		1
2.	TP-122823		PULL RING		1
		C1	CAPACITOR:	10 mf +100-10%50V	1
		C2		4.7mf " "	1
		C3		.033mf " 180V	1
		C4,5,6	(noise limiter)	1mf " 16V	3
	P-119497	D1	DIODE:	1S953	1
		Q1-6	TRANSISTOR:	2SC372-Y	6
		IC1	INTEGRATED CIRCUT:	HD7404P	1
		IC2,3,7		HD7400P	3
		IC4,5		HD7420P	2
		IC6		HD7430P	1
		IC8		SN74122N	1
		IC9,10		HD7410P	2
		R1,4,7, 10,13,16	RESISTOR:	56K ¼W ±5%	6
		R2,3,5,6, 8,9,11,12, 14,15,17,18		4.7K " "	12
		R19		220 " "	1
		R20		27K " "	1

Figure 12a RCD Circuit Card Illustration and Components

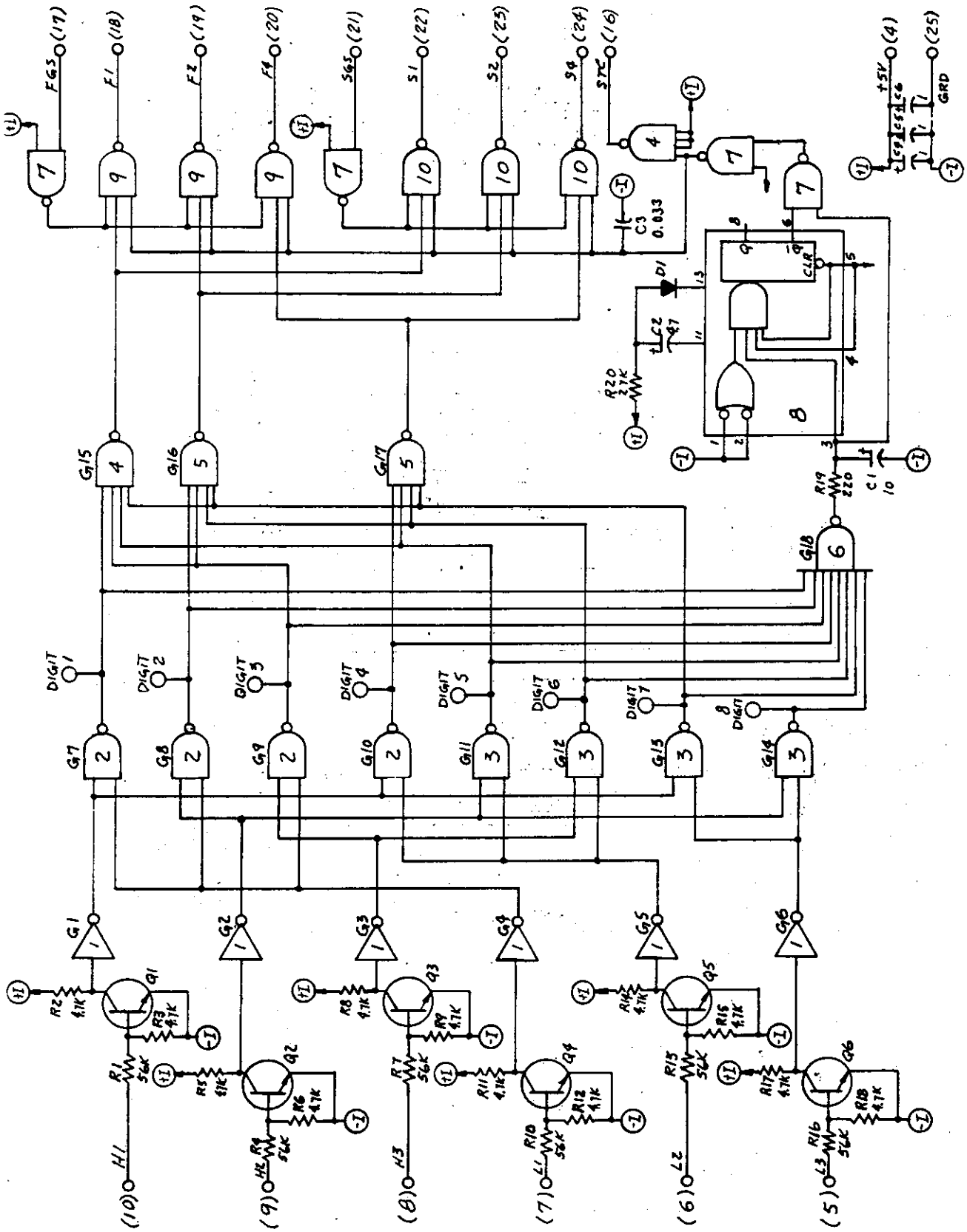
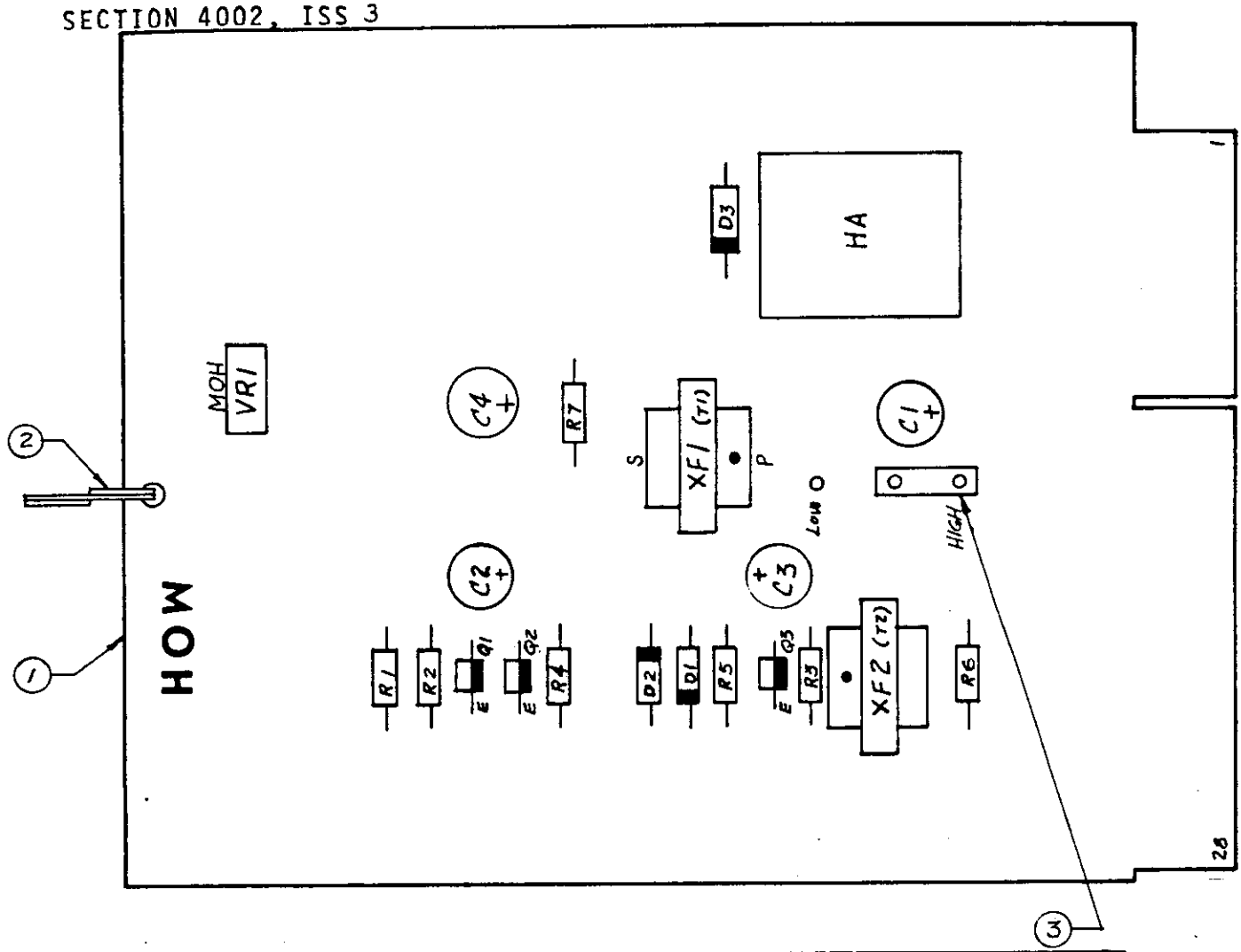


Figure 12b RCD Circuit Card Schematic



PARTS LIST					
ITEM NO.	PART NO.	SYM. NO.	DESCRIPTION		QTY
1.			P.C.B. MOH		1
2.	TP-122823		PULL RING		1
3.			SHOTING BAR		1
		C1,2	CAPACITOR:	10mf +100-10%50V	2
		C3		33mf " "	1
		C4		330mf " "	1
		D1,2	DIODE:	1S2076A	2
		D3		6F SILICON	1
		Q1,3	TRANSISTOR:	2SC1213A	2
		Q2		2SA673A	1
		XF1 (T1)	TRANSFORMER:	EX-2	1
		XF2 (T2)		EX-3	1
		VR1 (MOH)	POTENTIOMETER:	3K	1
		R1	RESISTOR:	1.5k ½W 5%	1
		R2		470k " "	1
		R3		3.3K " "	1
		R4,5		10K " "	2
		R6		8.2 " "	1
		R7		47 " "	1
		HA	RELAY:	M-101	1

Figure 13a MOH Circuit Card Illustration and Components

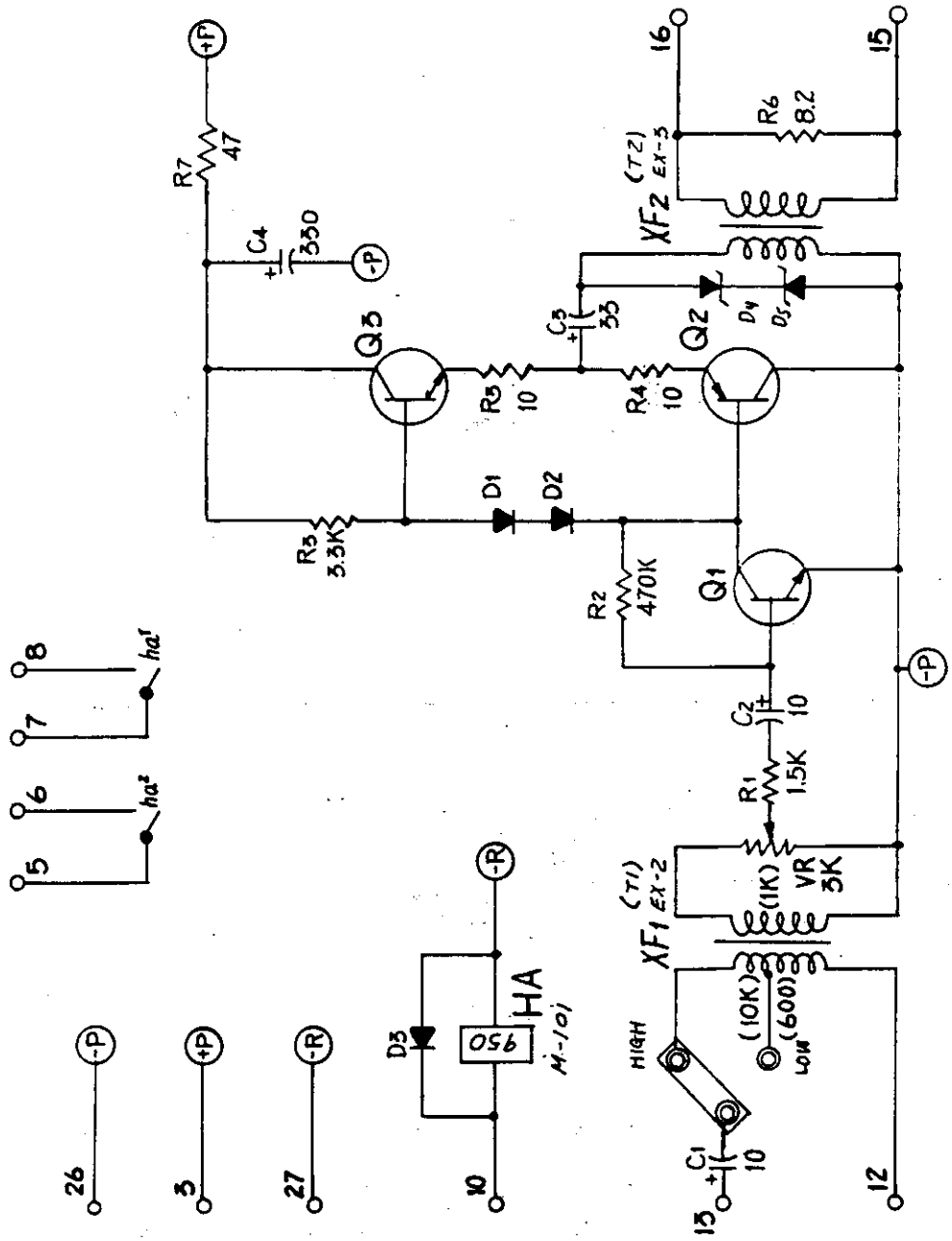


Figure 13b MOH Circuit Card Schematic

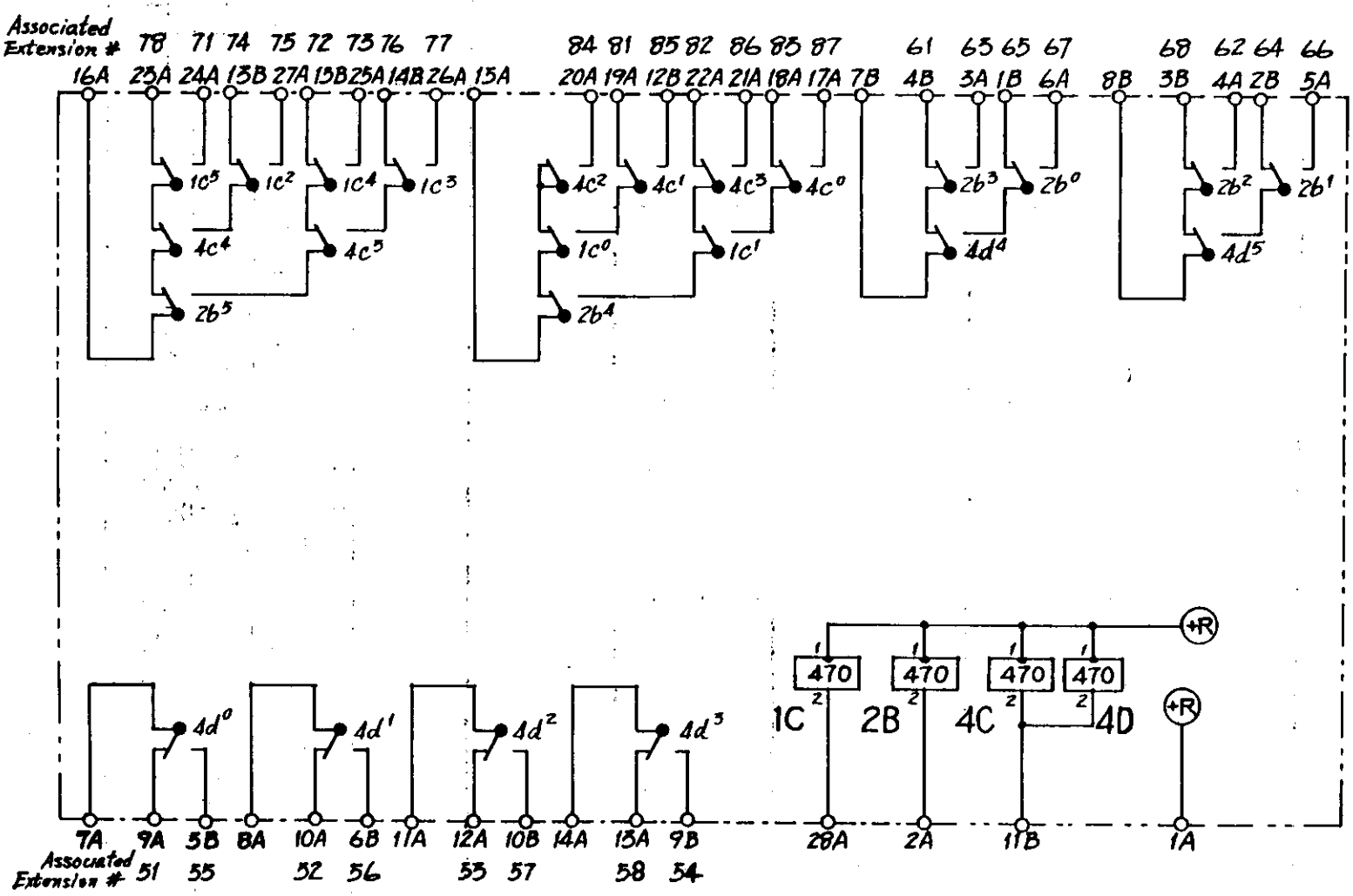
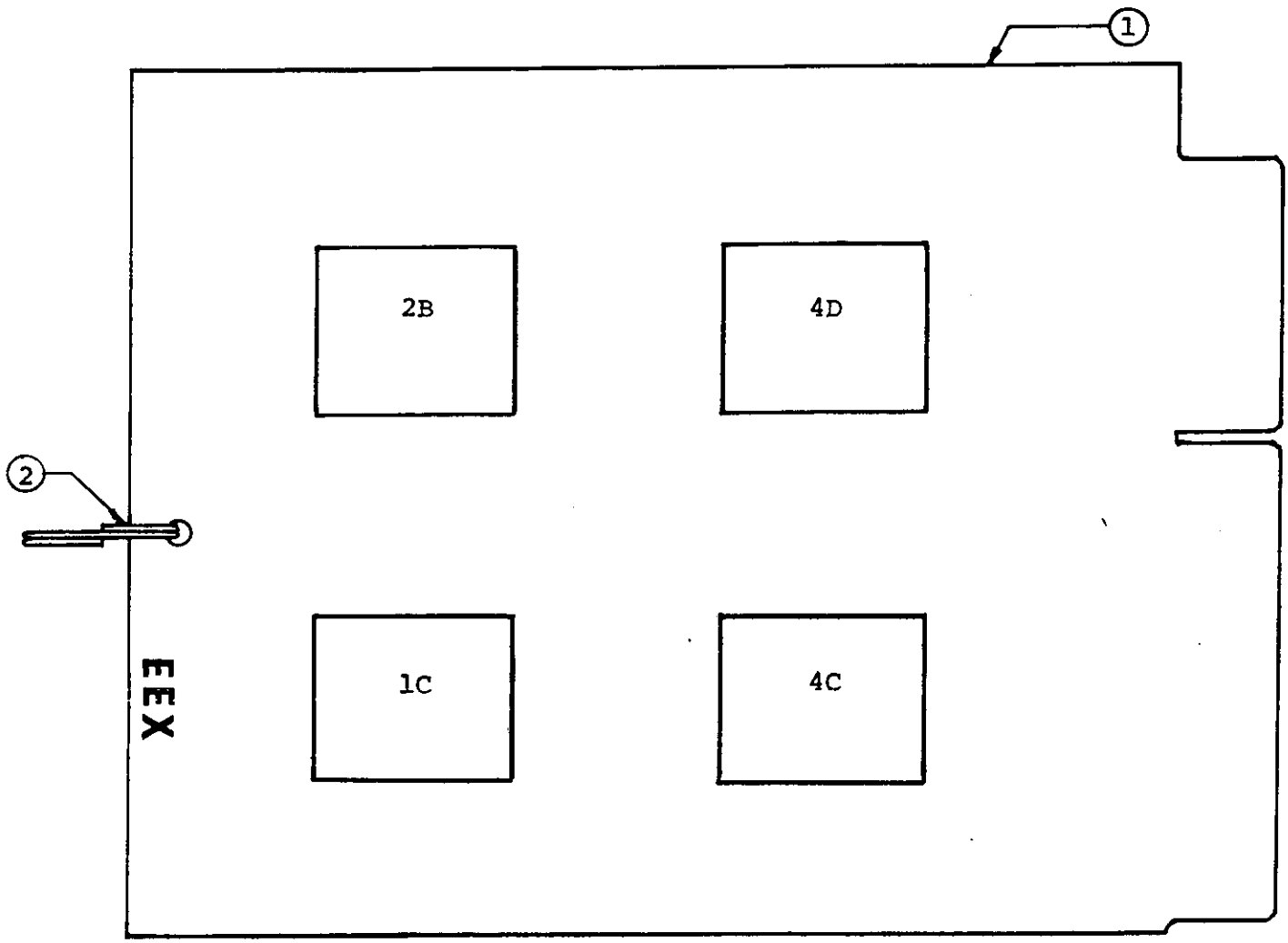
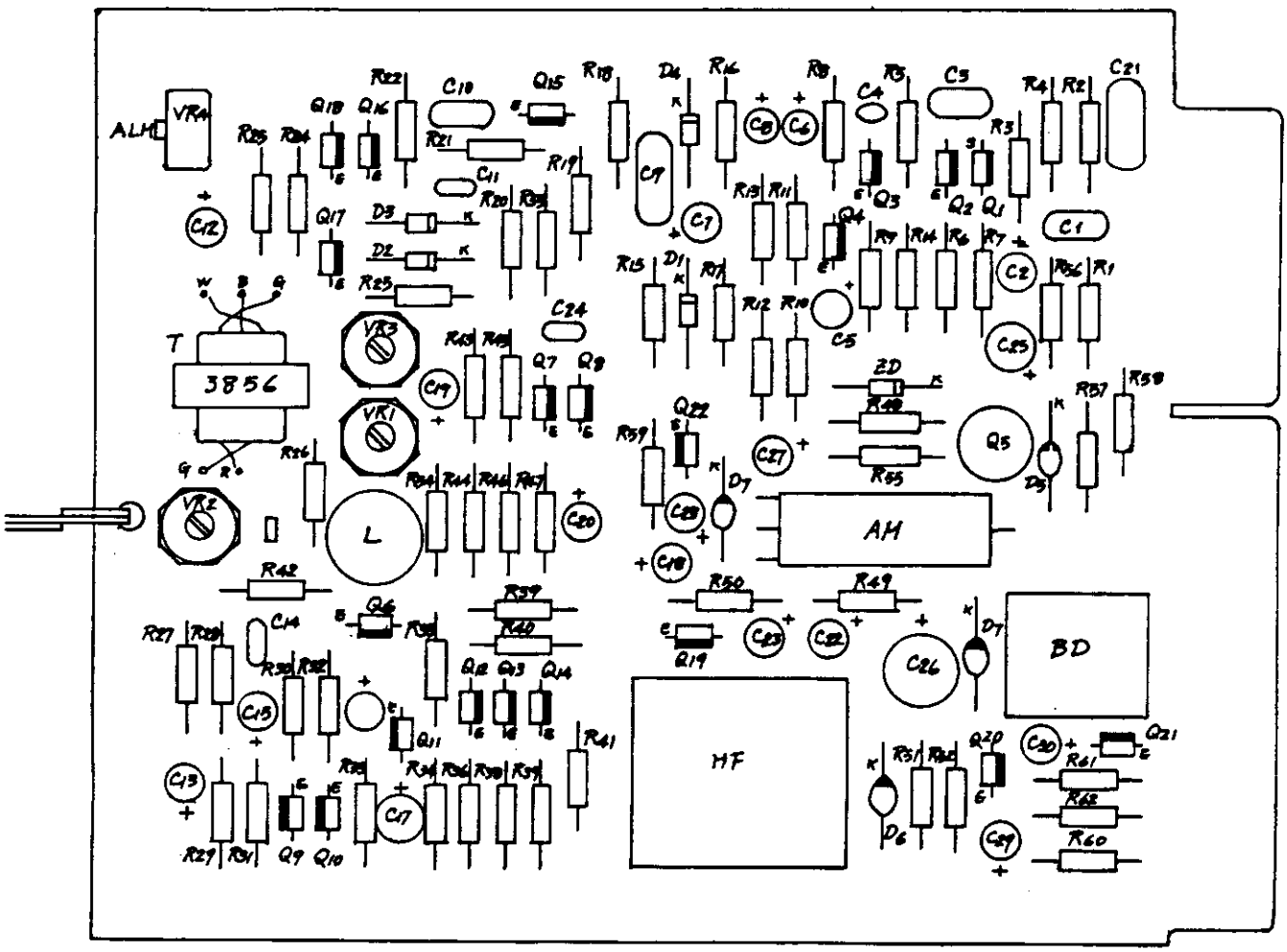


Figure 14b EEX Circuit Card Schematic



PARTS LIST					
ITEM NO.	PART NO.	SYM.NO.	DESCRIPTION		QTY
1.			P.C.B. EEX		1
2.	TP-122823		PULL RING		1
3.			SCREW 2.6X4S		4
	RL-3829	1C,2B, 4C,4D	RELAY:	M-108	4

Figure 14a EEX Circuit Card Illustration and Components



PARTS LIST					
ITEM NO.	PART NO.	SYM NO.	DESCRIPTION		QTY.
1.			P.C.B. HFK		1
2.			PULL RING		1
3.			SCREW 2.6 x 4S		1
4.			PUSH ON TERMINAL		1
5.		Q1	TRANSISTOR:	2SK40	1
		Q2-4,6,7, 9,15,16		2SC458	8
		Q5		2SC1008	1
		Q8,11,12 17, 19-22		2SC1213A	8

Figure 15a HFK-1 Circuit Card Illustration and Components

:K-1 COMPONENT LIST

PARTS LIST PAGE 2 OF 3

ITEM NO.	PART NO.	SYM NO.	DESCRIPTION		QTY.
		Q10,13,14 18		2SA673A	4
7.		ZD	DIODE	RD134M	1
		D1-4		1S2076A	4
		D5-8		6E SILICON	4
8.		C1,3,10	CAPACITOR	.047mf=10% 180v	3
		C2,6,8,15,23		10mf = 100-10% 16v	5
		C4		470pf " 180v	1
		C5,7,12,13		1mf " 50v	4
		C9,21		0.1mf + 10% 180v	2
		C11		1000pf + 25%	1
		C14,24		.033mf + 10% 180v	2
		C16,18-20, 27-30		3.3mf +100-10% 50v	8
		C17		22mf " 25v	1
		C22		10mf " 50v	1
		C25		33mf +100-10% 25v	1
		C26		33mf " 50v	1
9.		VR1	POTENTIOMETER	1K	1
		VR2		10K	1
		VR3		50K	1
		VR4		1K	1
10.		R1,50,52,62	RESISTOR	5.1K ¼W+5%	4
		R2,4,28 34,43,59		5 1K " "	6
		R3		30K " "	1
		R5,41		120K " "	2
		R6		300 " "	1
		R7		150K " "	1
		R8,13,21 44,58		15K " "	5
		R9,11,36		2.7K " "	3
		R10,48,53		2K " "	3
		R12		120 " "	1
		R14,15,20		100K " "	3
		R16,46,47		1K " "	3
		R17,18		7.5K " "	2
11.		R19,30,31	RESISTOR	6.2K ¼W 15%	3
		R22,54		510 " "	2
		R23,57,60		3.3K " "	3
		R24,25		5.1K ½W "	2
		R26,55		620 ¼W "	2
		R27		2.4K " "	1
		R29,61		24K " "	2
		R32		910 " "	1
		R33		8.2K " "	1
		R35		36K " "	1

PARTS LIST					PAGE 3 OF 3
ITEM NO.	PART NO.	SYM NO.	DESCRIPTION		QTY.
		R37		3.6K ¼W 15%	1
		R38,39		1.8K " "	2
		R40		27K " "	1
		R42		10K " "	1
		R45		3K " "	1
		R49,51		43K " "	2
		R56		220 " "	1
12.		BD	RELAY:	TECK-TT24	1
		HF		M-107	1
13.		AM	REED RELAY:	SRF-12B	1
14.		T	TRANSFORMER:	400Hz Matching Trans	1
15.		L	CHOKE COIL:	SL1316-563	1

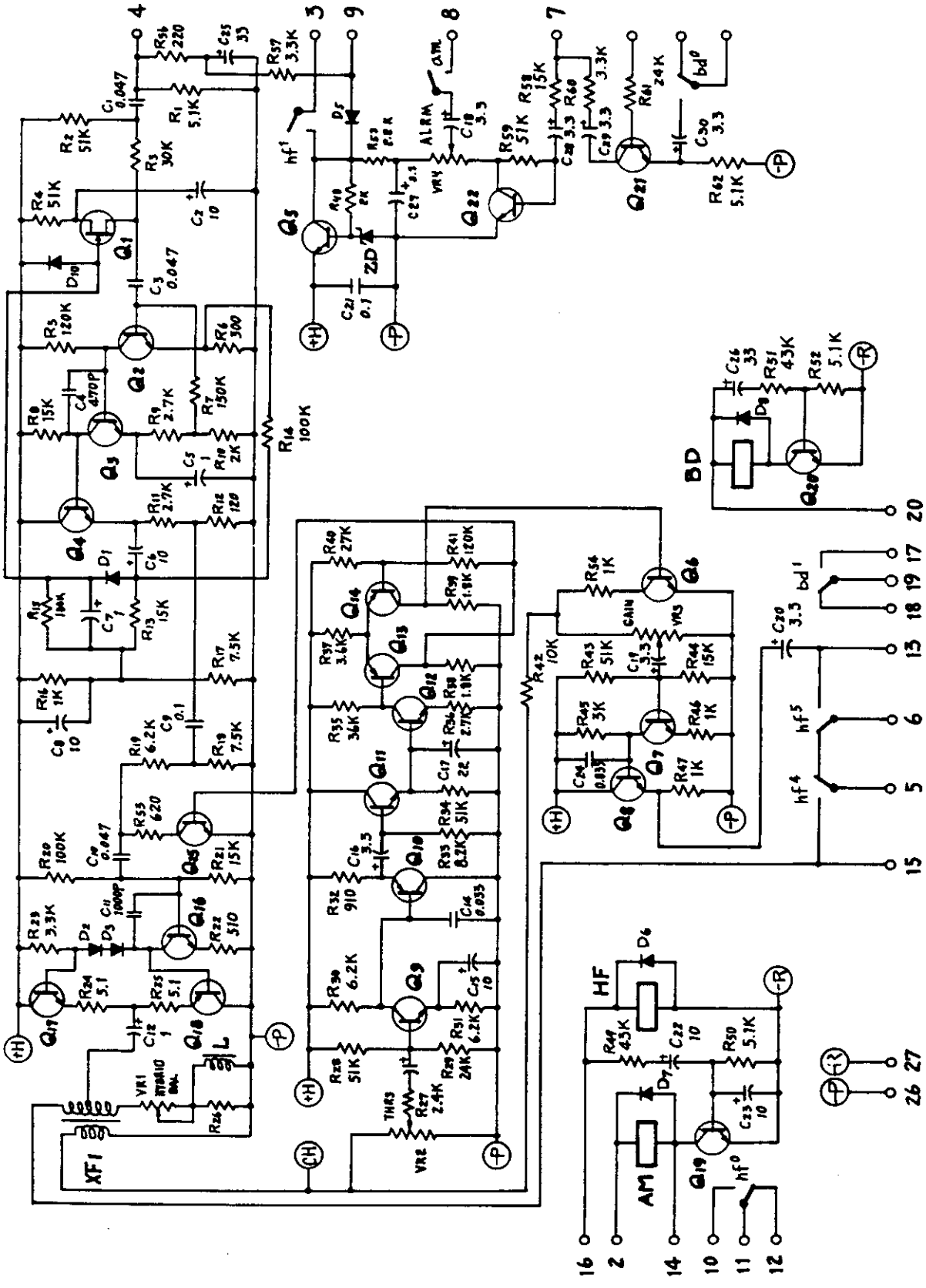
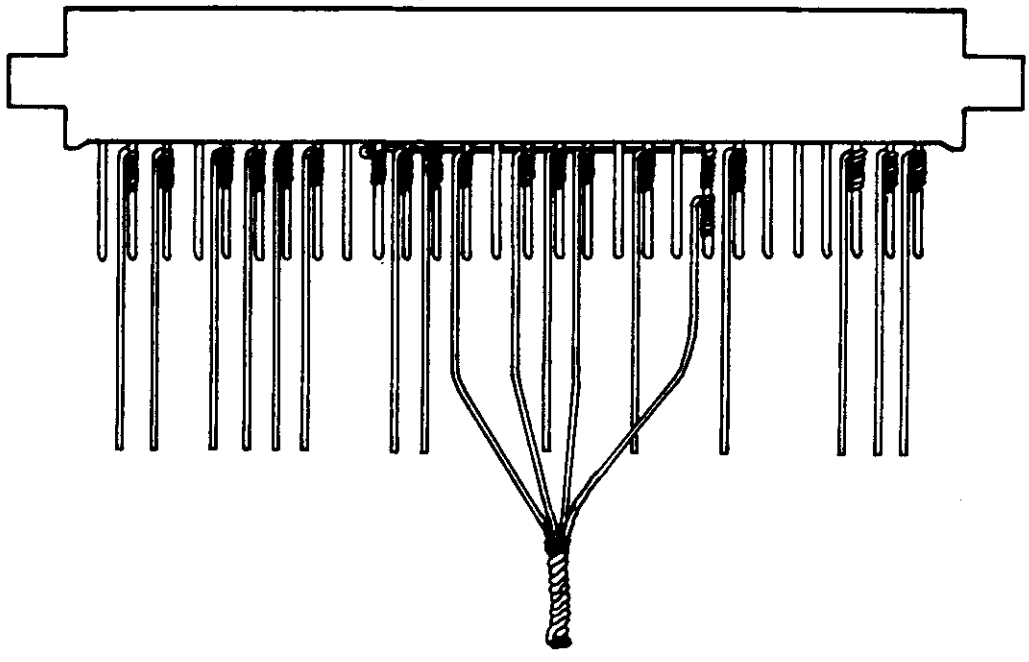


Figure 15c HFK-1 Circuit Card Schematic



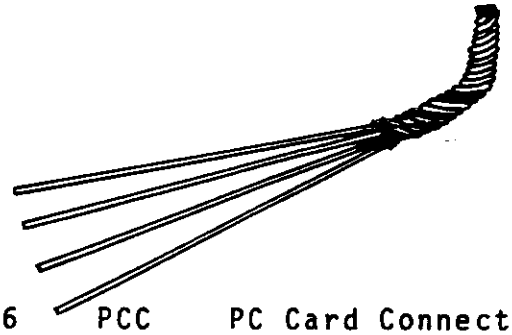


Figure 16 PCC PC Card Connector Illustration

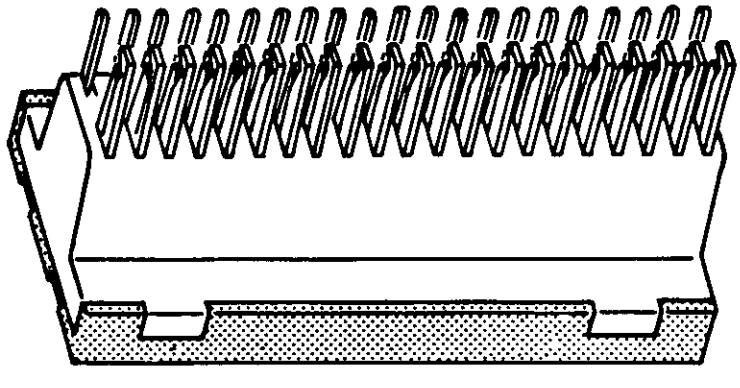
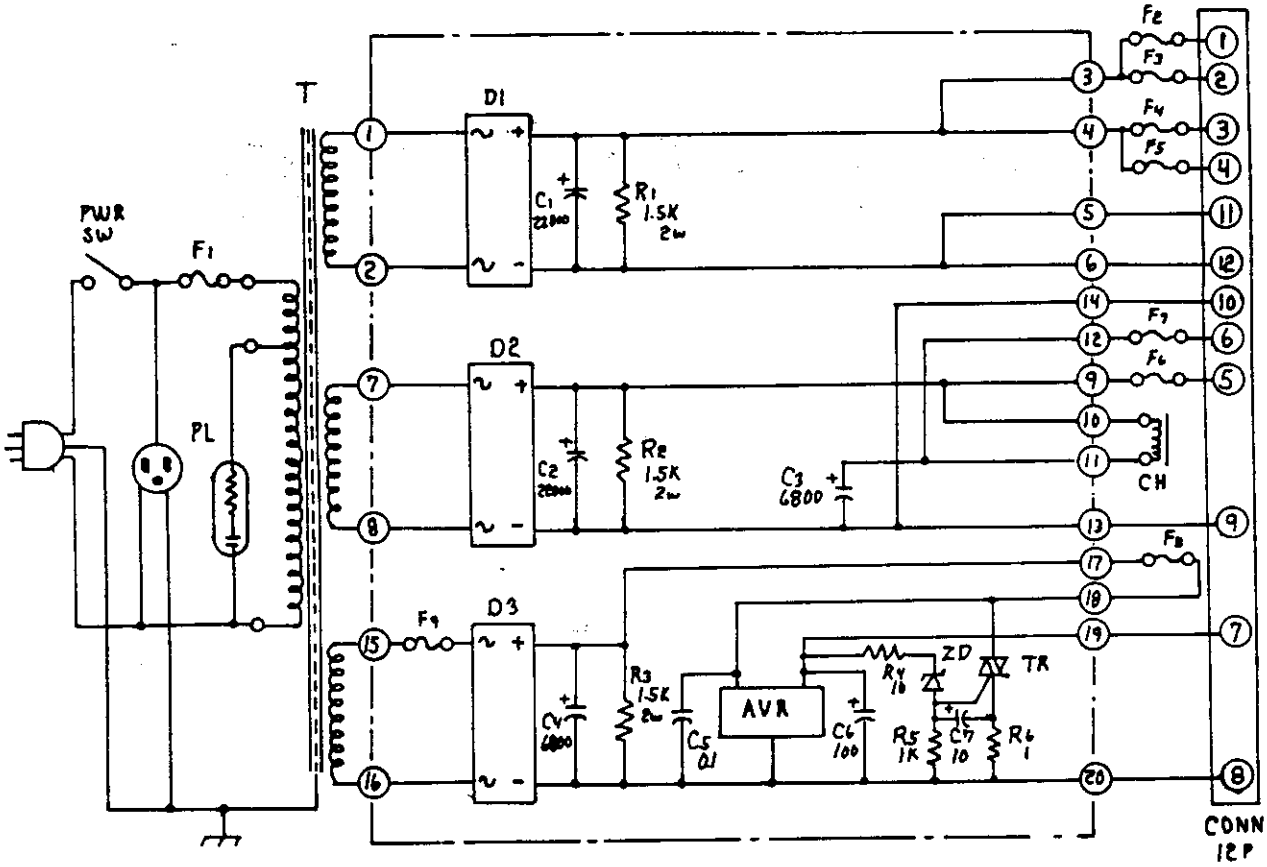
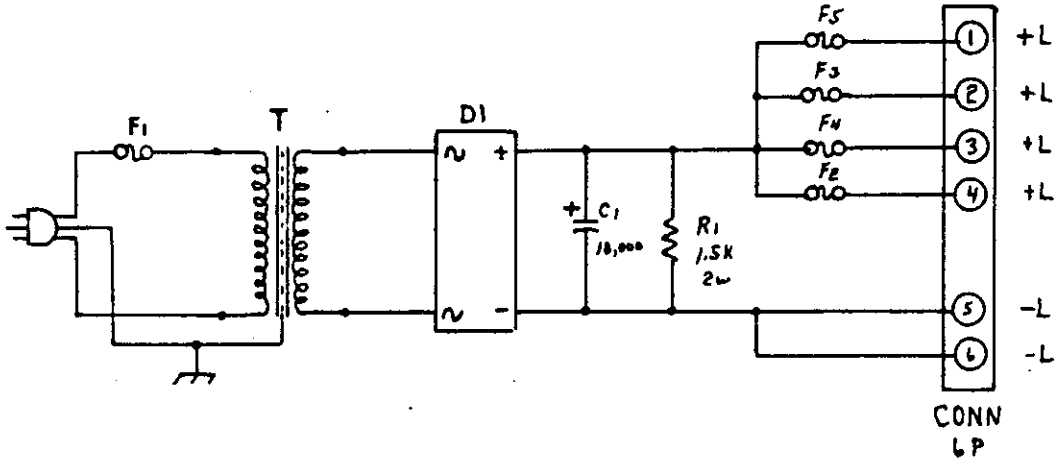


Figure 17 KTB KSU Terminal Block Illustration



PARTS LIST					
ITEM NO.	PART NO.	SYM. NO.	DESCRIPTION		QTY
1.			POWER SUPPLY (A)		1
2.	450-AB12F	CONN.	CONNECTOR 12 PIN		1
3.			AC OUTLET		1
			POWER CORD/PLUG		1
	CH-1530	CH	CHOKE 40mh 2.5A		1
	MP-017	NL	NEON LAMP		1
		SW	POWER SWITCH		1
		F1	FUSE	5ASB-3AG	1
		F2,F3,F4,F5		2A - 3AG	4
		F6,F7		3A-3AG	2
		F8		1.5A-3AG	1
		F9		3ASB-3AG	1
	KBH2502	D1,D2,D3	BRIDGE RECTIFIER (G.I.)		3
	LM340T-5	AVR	IC REGULATOR (NS)		1
	RD6.2EB	ZD	ZENER DIODE		1
	SC146	TR	TRIAC (GI)		1
	T-1530	T	POWER TRANSFORMER		1
		C1,C2	CAPACITOR	22000mfd 35V	2
		C3,C4		6800mfd 35V	2
		C5		0.1mfd 100V	1
		C6		100mfd 25V	1
		C7		10mfd 25V	1
		R1,R2,R3	RESISTOR	1.5K 2W	3
		R4		10 2W	1
		R5		1K ½W	1
		R6		1 10W	1

Figure 18 PSA-1530 Power Supply Schematic and Components.
Figure 18 PSA-1530 Power Supply Schematic and Components.



PARTS LIST				
ITEM NO.	PART NO.	SYM NO.	DESCRIPTION	QTY.
1.			POWER SUPPLY (B)	1
2.	450-AB6F	CONN	CONNECTOR 6 PIN	1
3.			POWER CORD/PLUG	1
4.		F1	FUSE 3ASB-3AG	1
5.		F2,F3,F4,F5	2ASB-3AG	4
6.	KBH 2502	D1	BRIDGE RECTIFIER	1
7.		C1	CAPACITOR 10000uf 35v	1
8.		R1	RESISTOR 1.5K 2W	1
9.	T-1530EX	T	POWER TRANSFORMER	1

Figure 19 PSB-1530 Power Supply Schematic and Components

OMEGAPHONE II

BT-1530/2250 KEY TELEPHONE SYSTEM

STATION EQUIPMENT/OPTIONS DRAWINGS

1.00 INTRODUCTION

1.01 This section provides illustrations, circuit diagrams, wiring diagrams, and parts list of the BT 1530/2250 Key Telephone System Station Equipment.

2.00 STATION EQUIPMENT

2.01 BT 1530 Key Telephone

a. Figure 1 illustrates the BT 1530 Key Telephone components.

b. The schematic of the BT 1530 Key Telephone is shown in Figure 2.

c. The wiring plan of the BT 1530 Key Telephone is shown in Figure 3.

2.02 BT 2250 Key Telephone

a. Figure 4 illustrates the BT 2250 Key Telephone components.

b. The schematic of the BT 2250 Key Telephone is shown in Figure 5.

c. The wiring plan of the BT 2250 Key Telephone is shown in Figure 6.

3.00 BT 1530/2250 KEY TELEPHONE OPTIONAL ASSEMBLIES

3.01 The optional BT 1530/2250 Key Telephone assemblies are illustrated in the following indicated figures:

- PRV.....Figure 7
- OTD.....Figure 8
- HFS.....Figure 9
- HJB.....Figure 10
- SPA-S .....Figure 11
- OTD-OP.....Figure 12

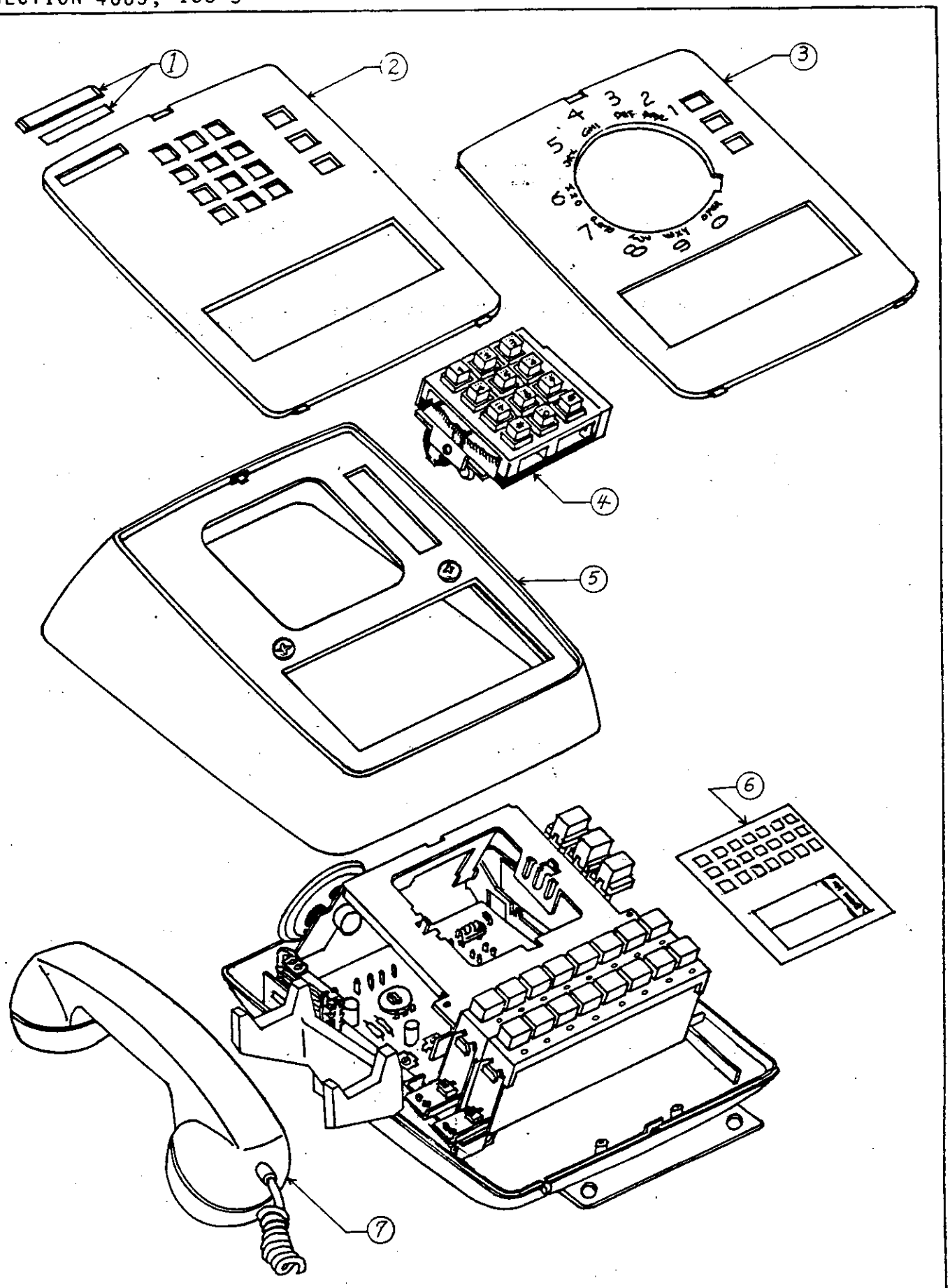


Figure 1a BT 1530 Station Assembly (A)

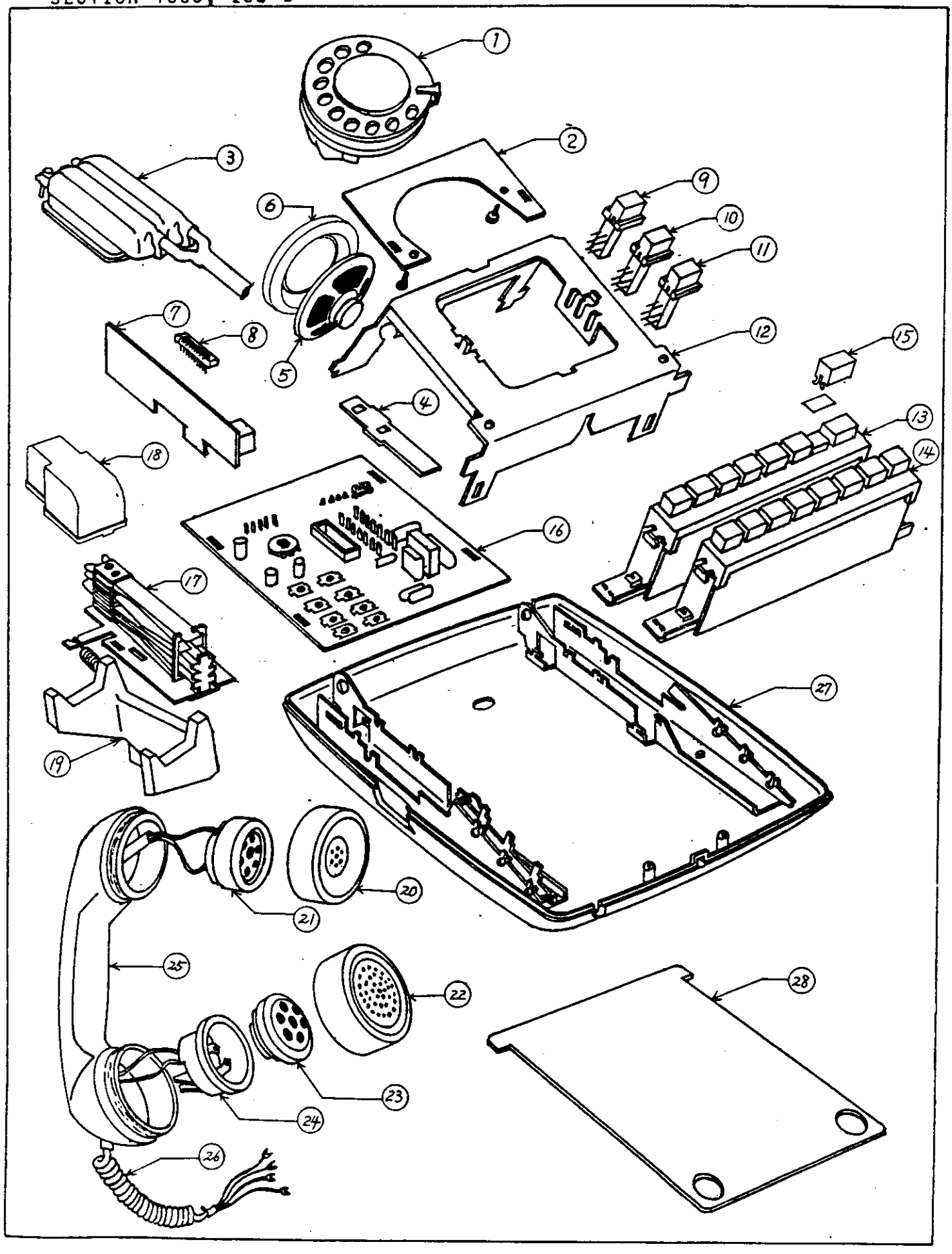


Figure 1b BT 1530 Station Assembly (B)

FIGURE 1a BT-1530 ASSEMBLY (A)		
ITEM NO.	PART NO.	DESCRIPTION
1.		NUMBER PLATE
2.		COLOR PANEL (TONE) CPT-1530
3.		COLOR PANEL (ROTARY) CPR-1530
4.		OMEGA-TONE DIAL (OTD)
5.		HOUSING
6.		DESIGNATION LABEL
7.		HANDSET ASSEMBLY

FIGURE 1b BT-1530 ASSEMBLY (B)		
ITEM NO.	PART NO.	DESCRIPTION
1.		ROTARY DIAL
2.		DIAL MOUNTING BRACKET
3.		CONNECTER CABLE
4.		CONNECTER CABLE CLAMP
5.		SPEAKER
6.		SPEAKER CUP
7.		PRIVACY UNIT (PRV) (-1 only)
8.		NON-PRIVACY CONNECTOR (NPC) (-1 only)
9.		TRAN KEY
10.		PAGE KEY
11.		CONF KEY
12.		DIAL SUPPORT BRACKET
13.		KEY ASSEMBLY A-1530
14.		KEY ASSEMBLY B-1530
15.		KEY CAP
16.		1522-TELU CIRCUIT CARD
17.		CRADLE SWITCH ASSEMBLY
18.		CRADLE SWITCH COVER
19		CRADLE ASSEMBLY
20.		RECEIVER CAP
21.		RECEIVER UNIT
22.		TRANSMITTER CAP
23.		TRANSMITTER UNIT
24.		TRANSMITTER CUP
25.		HANDLE
26.		COIL CORD
27.		BASE ASSEMBLY
28.		DIRECTORY TRAY

Figure 1c BT 1530 Station Components

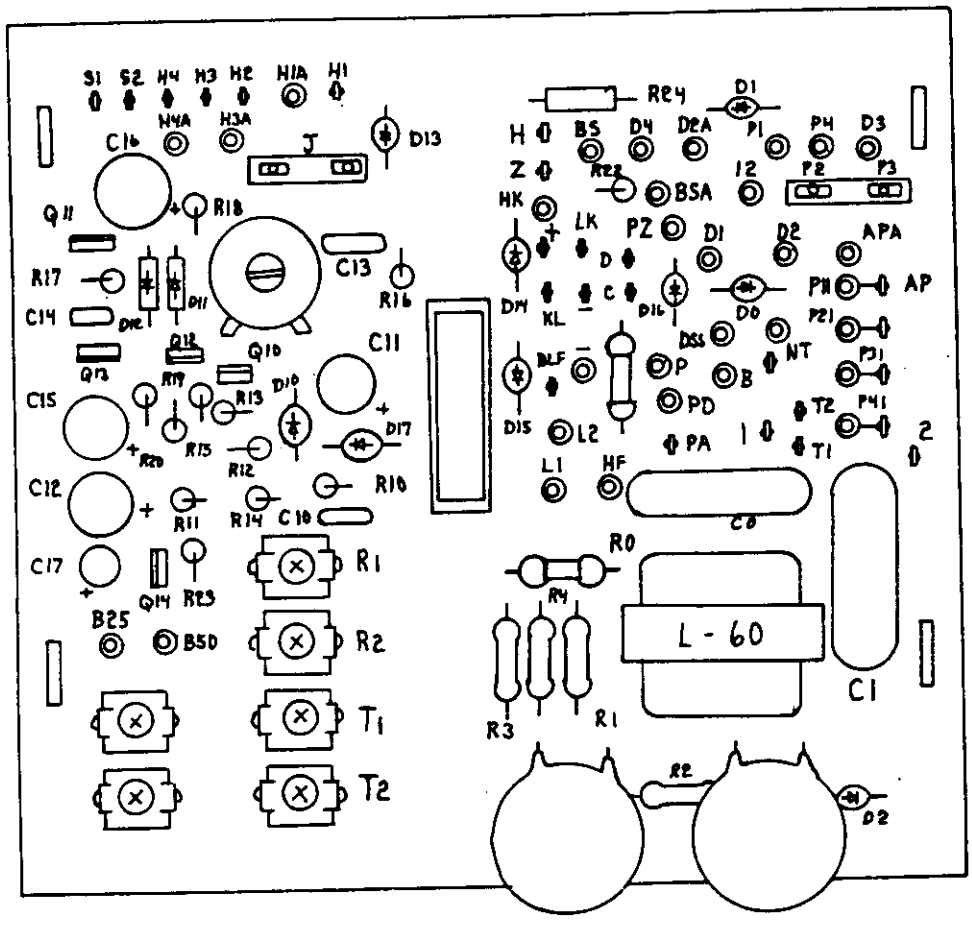
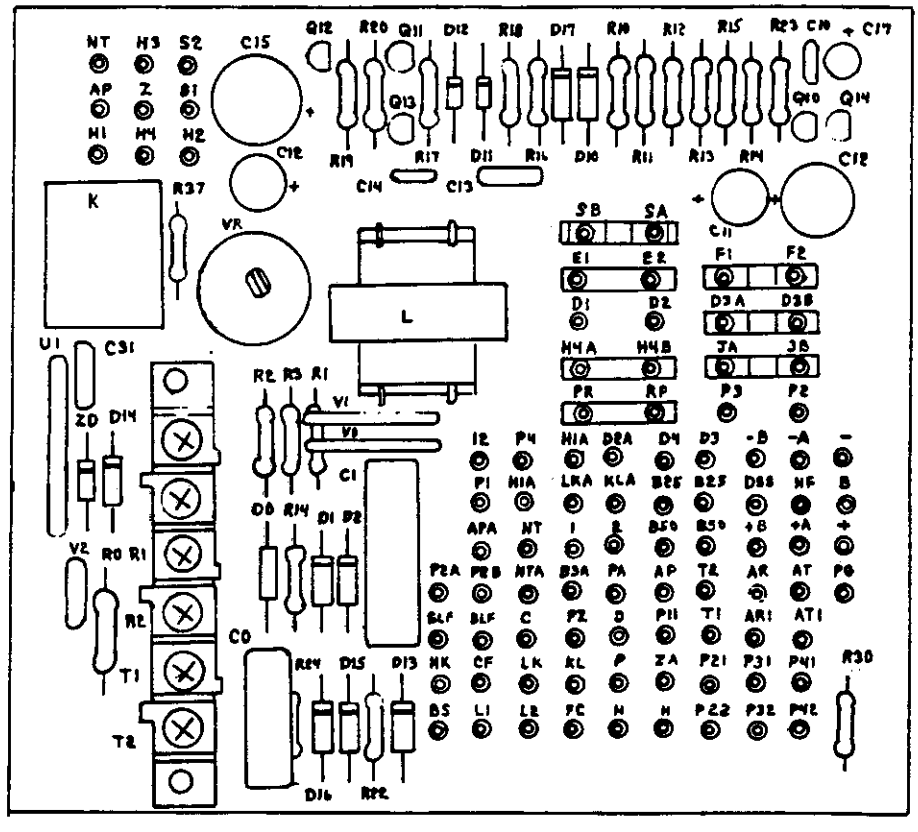
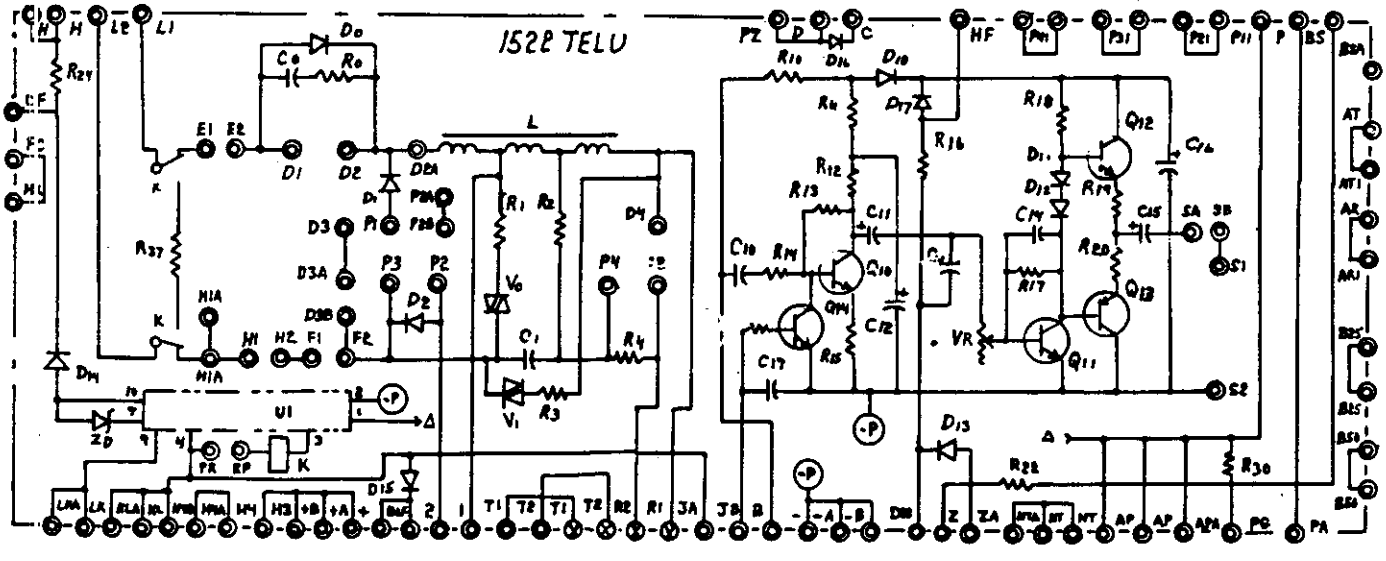


Figure 1b-1 BT 1530/2250 Station Circuit Card (1522 TELU) Illustration and Schematic



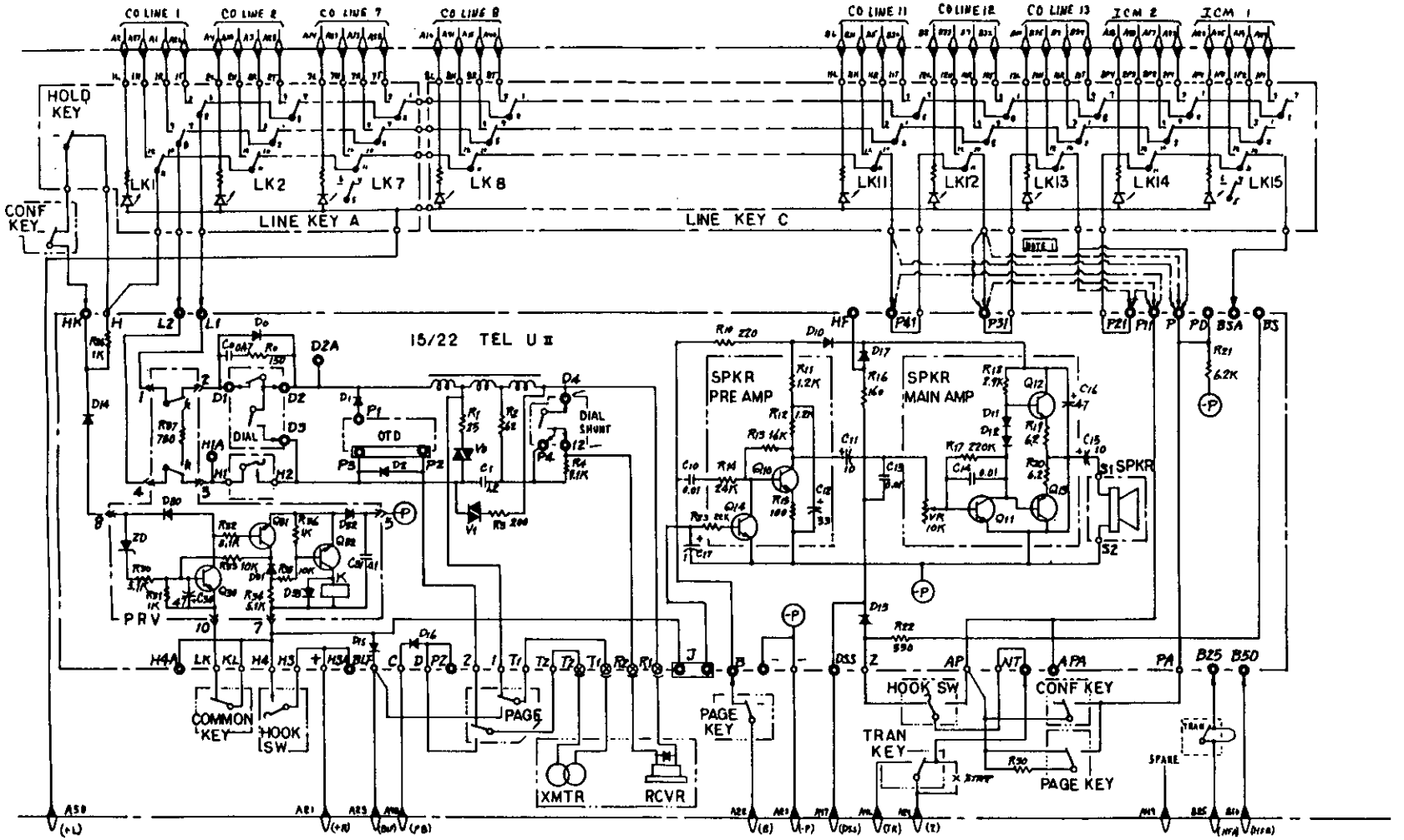


Fioure 1b-2 BT 1530/2250-2 Station Circuit Card

PARTS LIST					
ITEM NO.	PART NO.	SYM NO.	DESCRIPTION		QTY
1.	TG-104930		P.C.B. BT-15-22		1
2.	P-114510		TERMINAL-SOLDER	(-1)	21
3.	HP-043		PUSHON TERMINAL N-80		91
4.	P-118035		SHORTING BAR		8
5.	TP-122939		TERMINAL M-3	(-1)	6
6.			SCREW TERMINAL	(-2)	1
7.		U1	HYBRID	(-2)	1
8.		C0	CAPACITOR .47mf+100-10%180V		1
		C1	1.2mf " "		1
		C10,14,31	.01mf " "		2
		C11,15	10mf " 50V		2
		C12	33mf " "		1
		C13	.1mf " 180V		1
		C16	40mf " 50V		1
		C17	1mf " "		1
9.		XF1 (L)	TRANSFORMER L-60		1
10.		D0-2,10,13-17	DIODE 6E SILICON		8
		ZD	RD11A	(-2)	1
		D11,12	1S2075K		2
11.		Q10-12,14	TRANSISTOR 2SC458		4
		Q13	2SA539L		1
12.	TP-122976	V0	VARISTOR V308		1
13.	TP-122977	V1	108DZ0C		1
14.	TP-122978	VR	POTENTIOMETER 10K		1
15.		R0	RESISTOR 150 ½W ±5%		1
		R1	25 ¼W "		1
		R2	62 " "		1
		R3	200 " "		1
		R4	9.1K " "		1
		R10	220 " "		1
		R11,12	1.2K " "		2
		R13	16K " "		1
		R14	24K " "		1
		R15	100 " "		1
		R16	160 " "		1
		R17	220K " "		1
		R18	2.4K " "		1
		R19,20	6.2 " "		2
		R21	6.2K " "		1
		R22	330 " "		1
		R23	22K ½W "		1
		R24	1K 1W "		1
		R30	1K ½W "		1
16.	TP-122980		CONNECTOR U-SA1001	(-1)	1

Figure 1b-3 BT 1530/2250 Station Circuit Card (1522 TELU) Components

NOTE (-1) indicates BT1530/2250-1 only
(-2) indicates BT1530/2250-2 only



NOTES

1. —— shows factory wired connection for 2 ICM Lines
- - - shows required wire change for 3 ICM Lines
—·— shows required wire change for 4 ICM Lines

Figure 2 BT1530(f)-1 Key Telephone

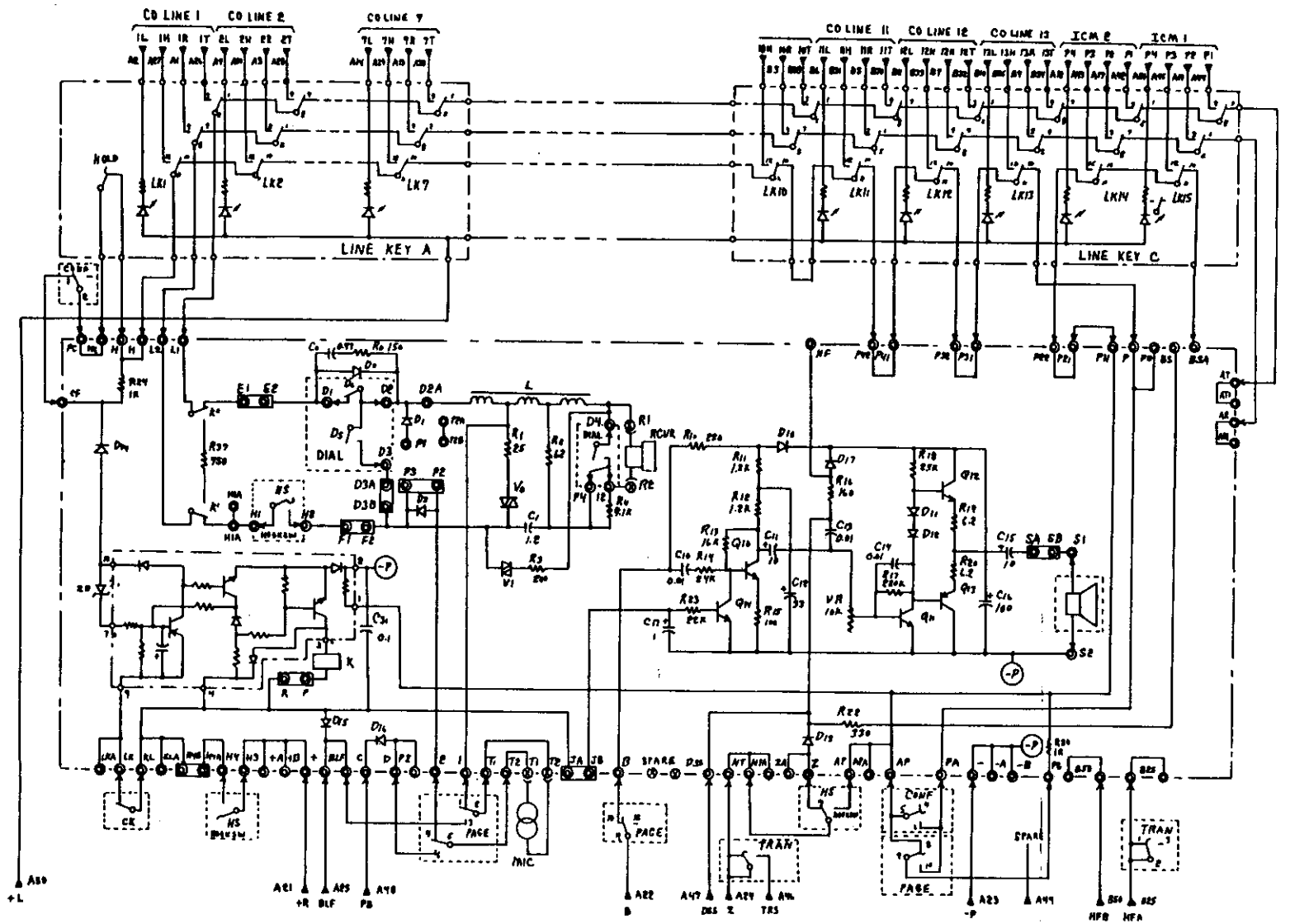


Figure 2-1
BT 1530(P)-2 Key Telephone

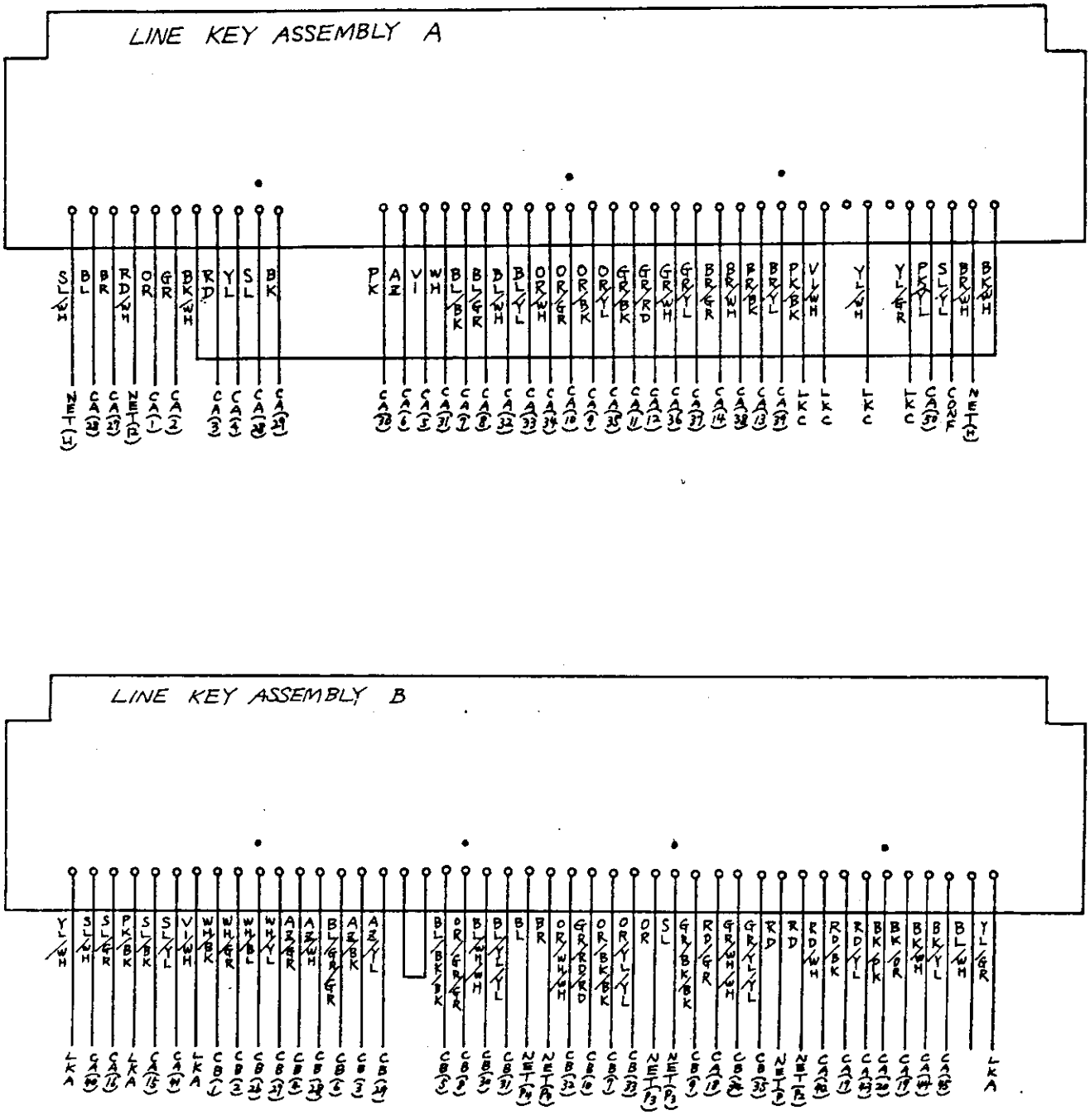


Figure 3a BT 1530 Key Telephone Wiring Diagram

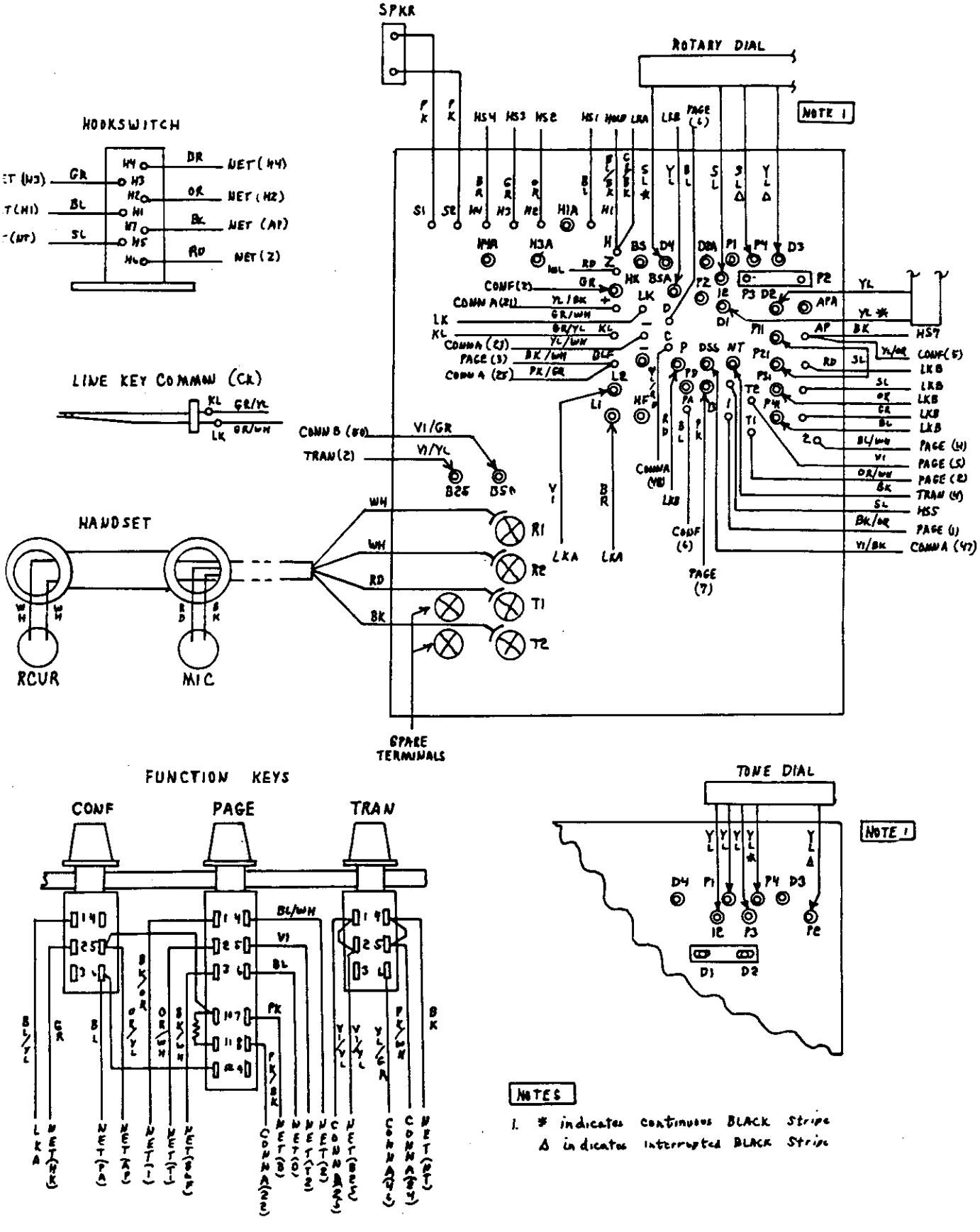


Figure 3b BT 1530 Key Telephone Wiring Diagram (-1 only)

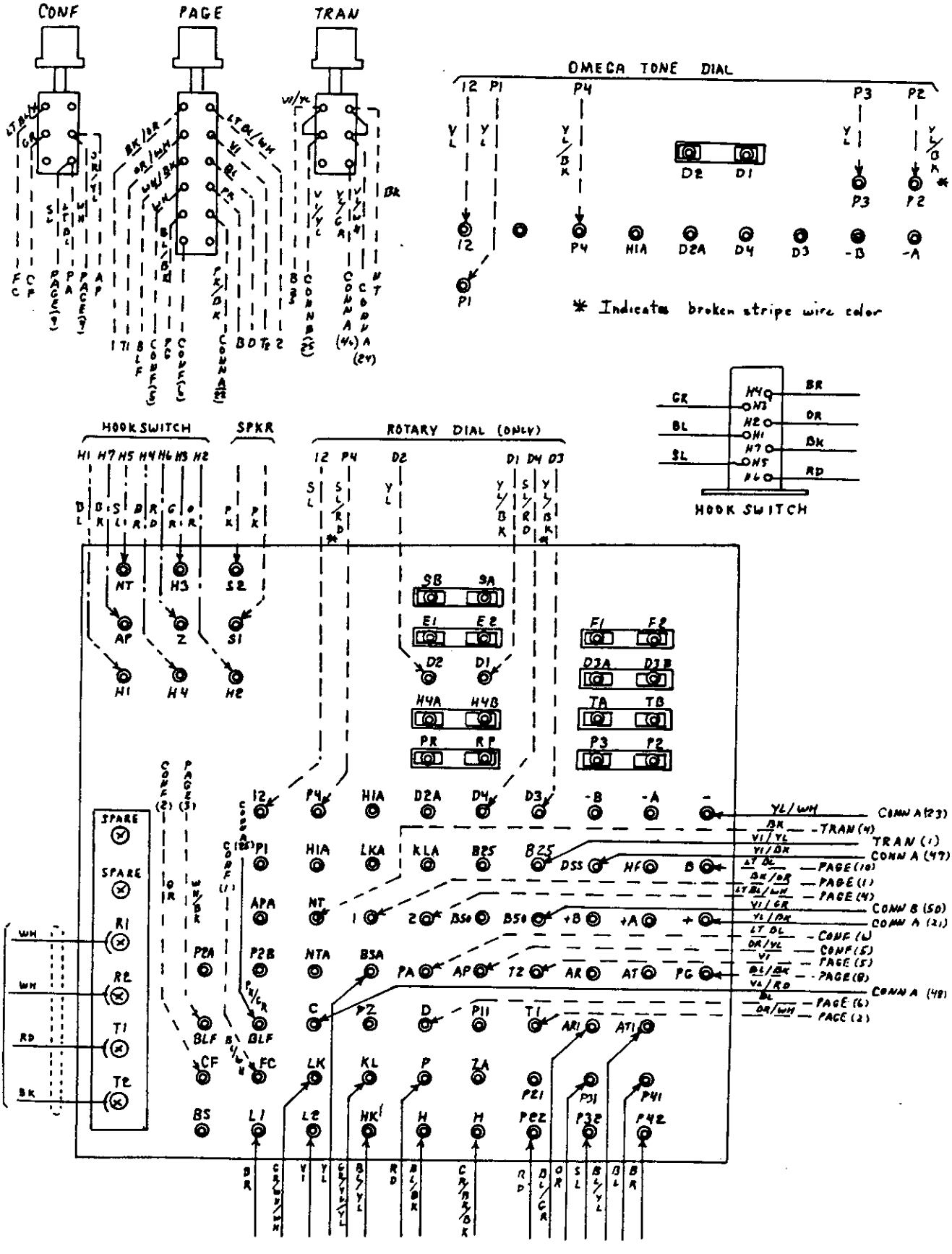
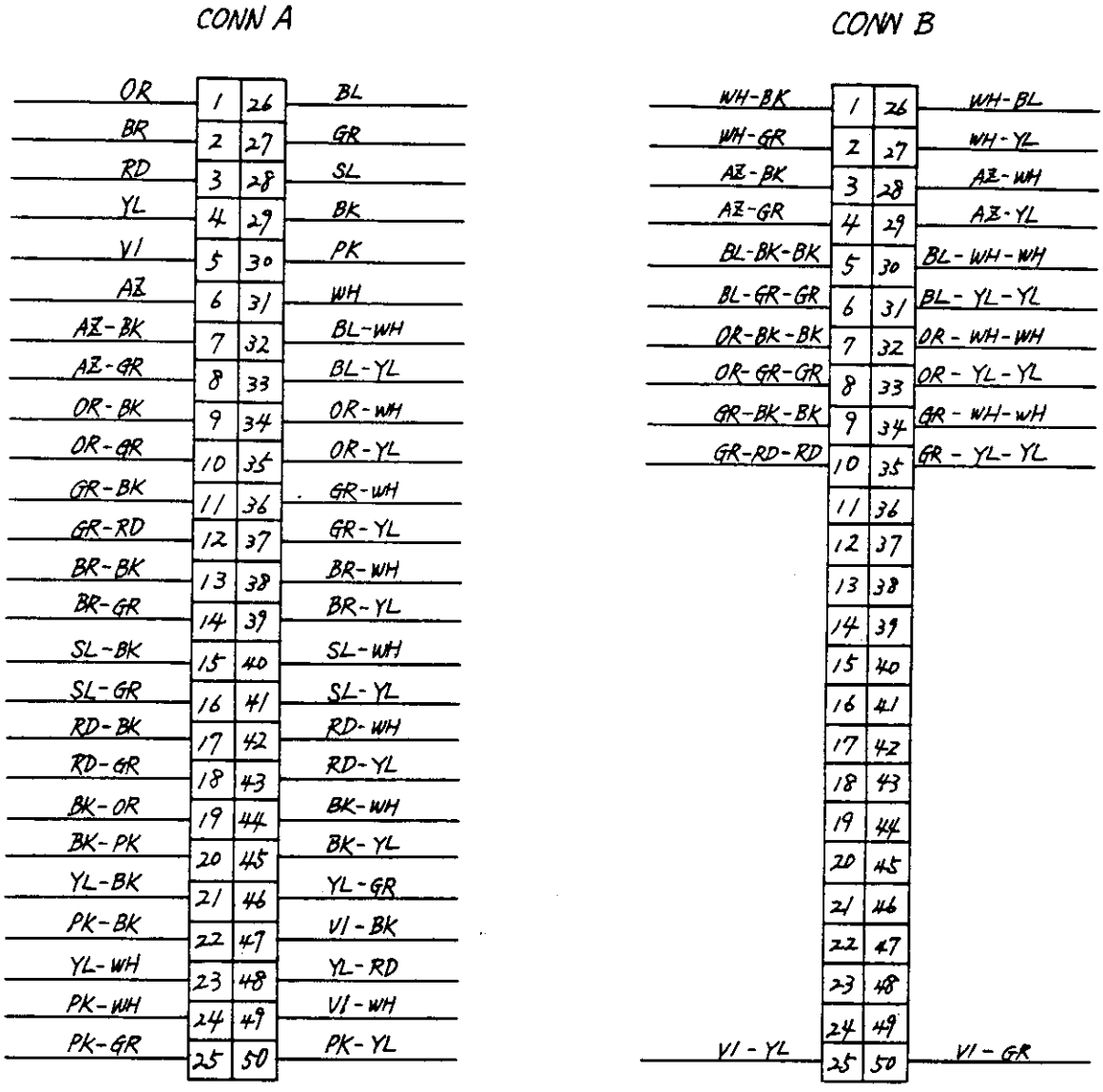


Figure 3b-1

BT 1530/2250 (-2) KEY TELEPHONE WIRING DIAGRAM



TAIL CABLE CONNECTORS

Figure 3c BT 1530 Key Telephone Wiring Diagram

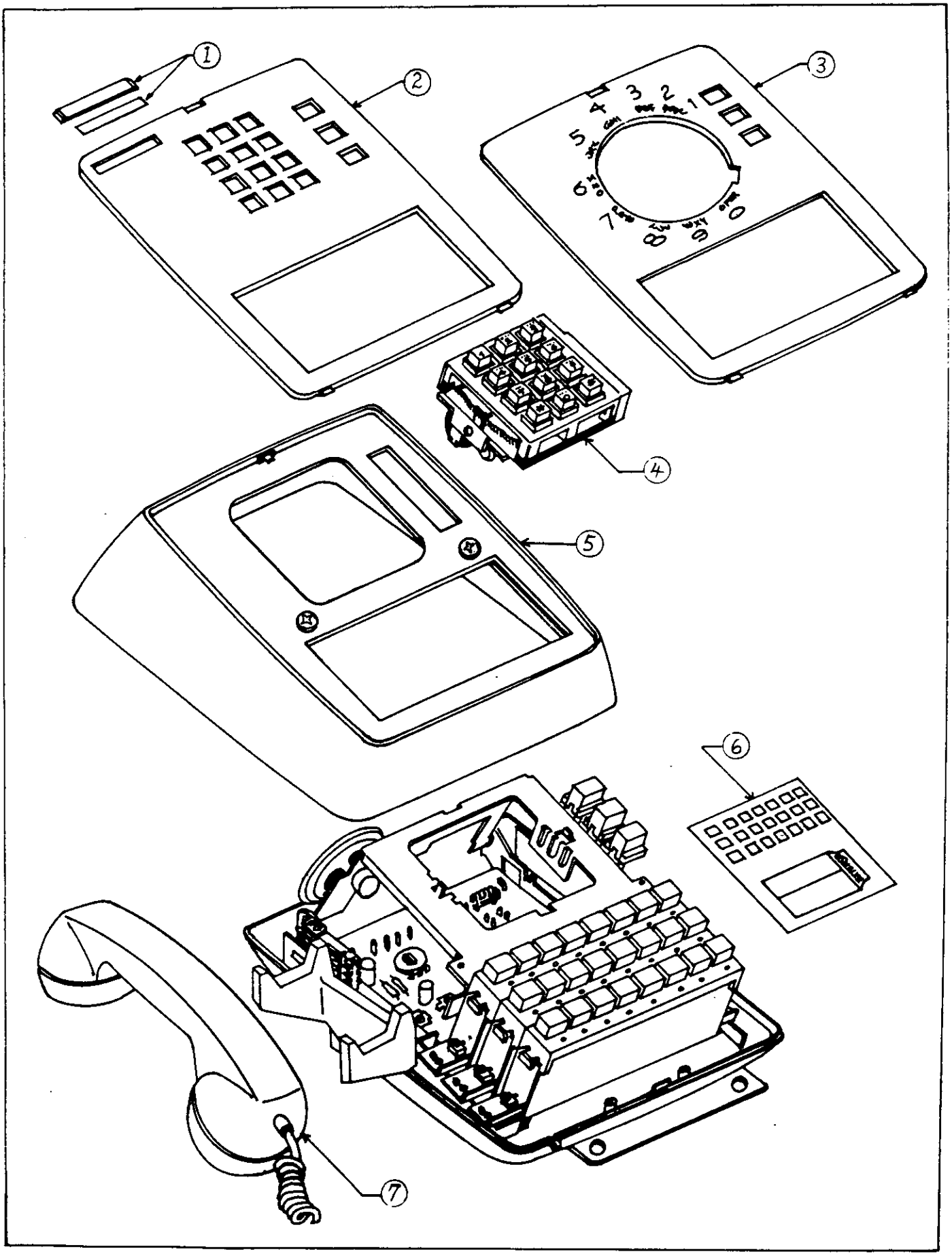


Figure 4a BT-2250 Station Assembly (A)

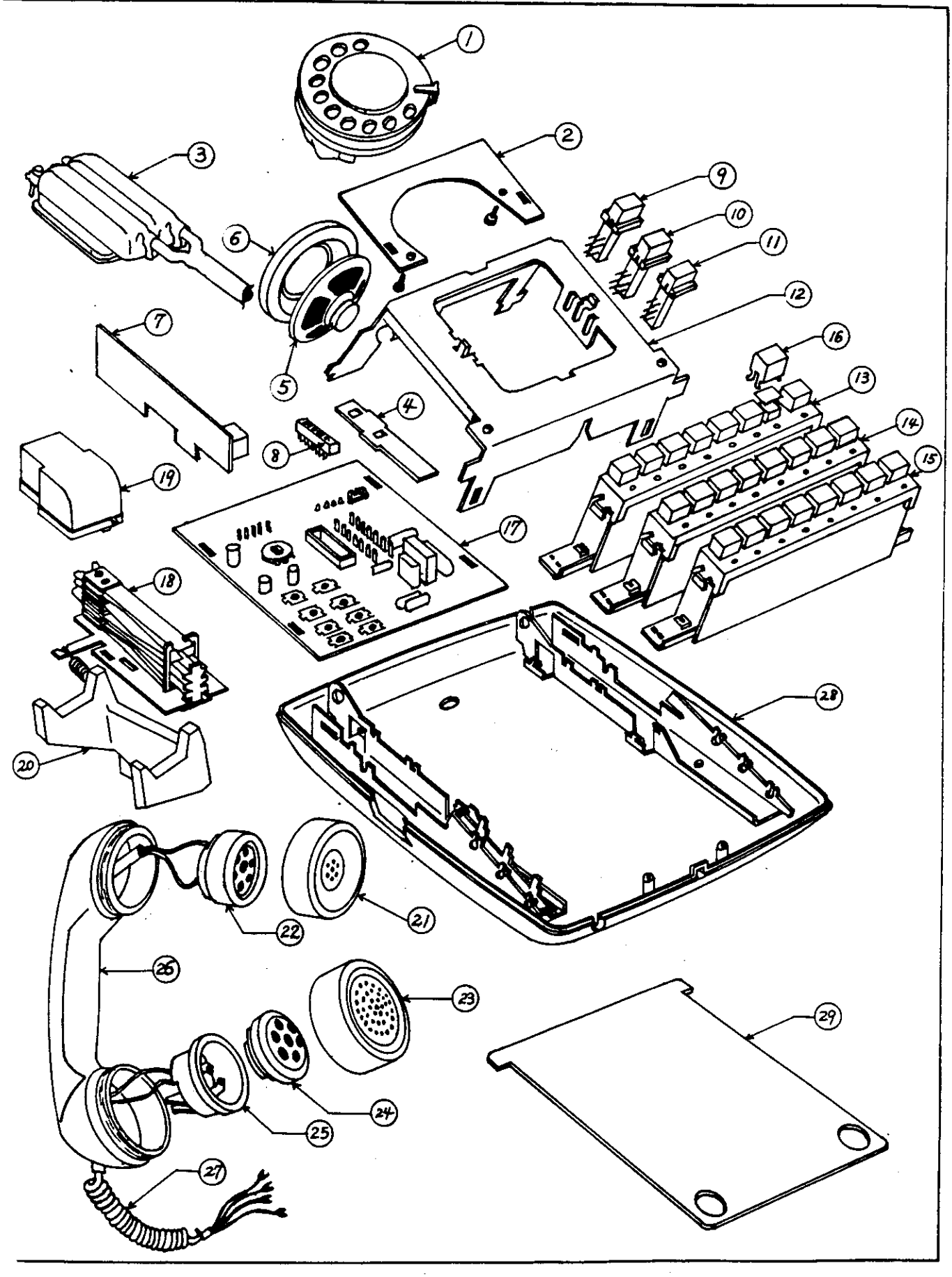
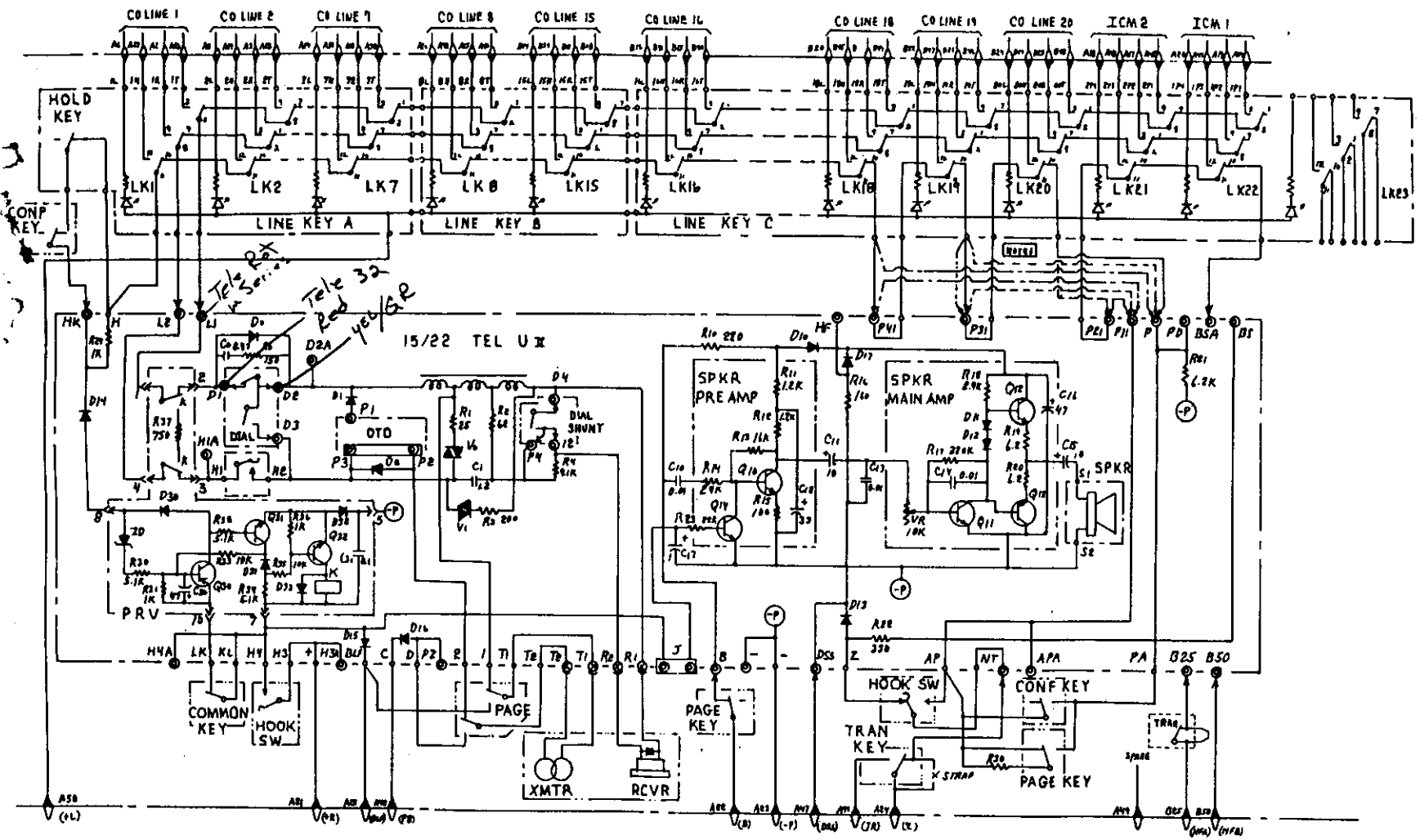


Figure 4b BT-2250 Station Assembly (B)

FIGURE 4a BT-2250 ASSEMBLY (A)		
ITEM NO.	PART NO.	DESCRIPTION
1.		NUMBER PLATE
2.		COLOR PANEL (TONE) CPT-2250
3.		COLOR PANEL (ROTARY) CPR-2250
4.		OMEGA-TONE DIAL (OTD)
5.		HOUSING
6.		DESIGNATION LABEL
7.		HANDSET ASSEMBLY

FIGURE 4b BT-2250 ASSEMBLY (B)		
ITEM NO.	PART NO.	DESCRIPTION
1.		ROTARY DIAL
2.		DIAL MOUNTING BRACKET
3.		CONNECTOR CABLE
4.		CONNECTOR CABLE CLAMP
5.		SPEAKER
6.		SPEAKER CUP
7.		PRIVACY UNIT (PRV) (-1 only)
8.		NON-PRIVACY CONNECTOR (NPC) (-1 only)
9.		TRAN KEY
10.		PAGE KEY
11.		CONF KEY
12.		DIAL SUPPORT BRACKET
13.		KEY ASSEMBLY A-2250
14.		KEY ASSEMBLY B-2250
15.		KEY ASSEMBLY C-2250
16.		KEY CAP
17.		1522-TELU CIRCUIT CARD
18.		CRADLE SWITCH ASSEMBLY
19.		CRADLE SWITCH COVER
20.		CRADLE ASSEMBLY
21.		RECEIVER CAP
22.		RECEIVER UNIT
23.		TRANSMITTER CAP
24.		TRANSMITTER
25.		TRANSMITTER CUP
26.		HANDLE
27.		COIL CORD
28.		BASE ASSEMBLY
29.		DIRECTORY TRAY

Figure 4c BT-2250 Station Components



NOTES

1 —— shows factory wired connection for 2 ICM Lines
- - - shows required wire change for 3 ICM Lines
—·— shows required wire change for 4 ICM Lines

Figure 5 BT 2250(P)-1 Key Telephone

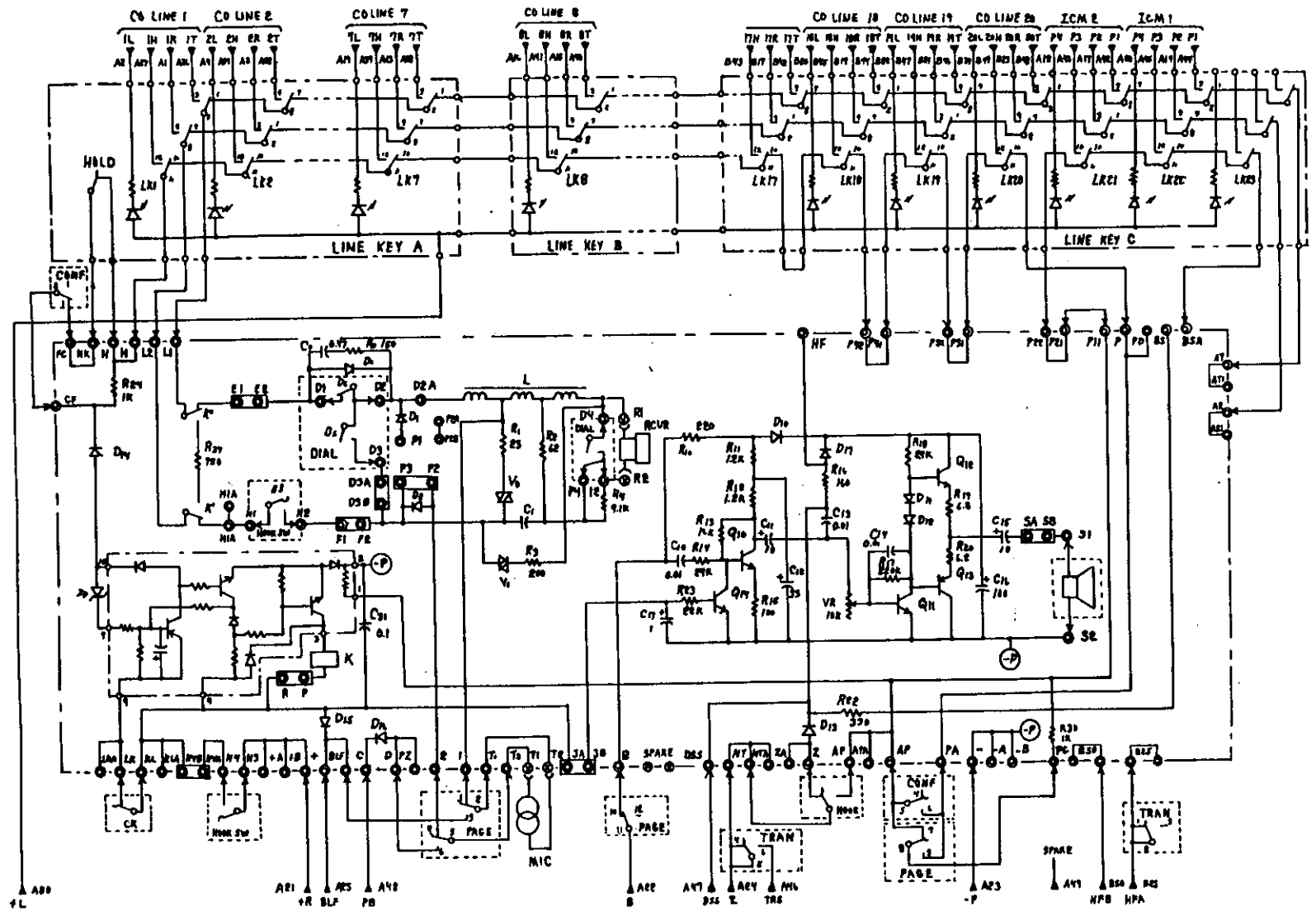


Figure 2-1
BT 2250(P)-2 Key Telephone

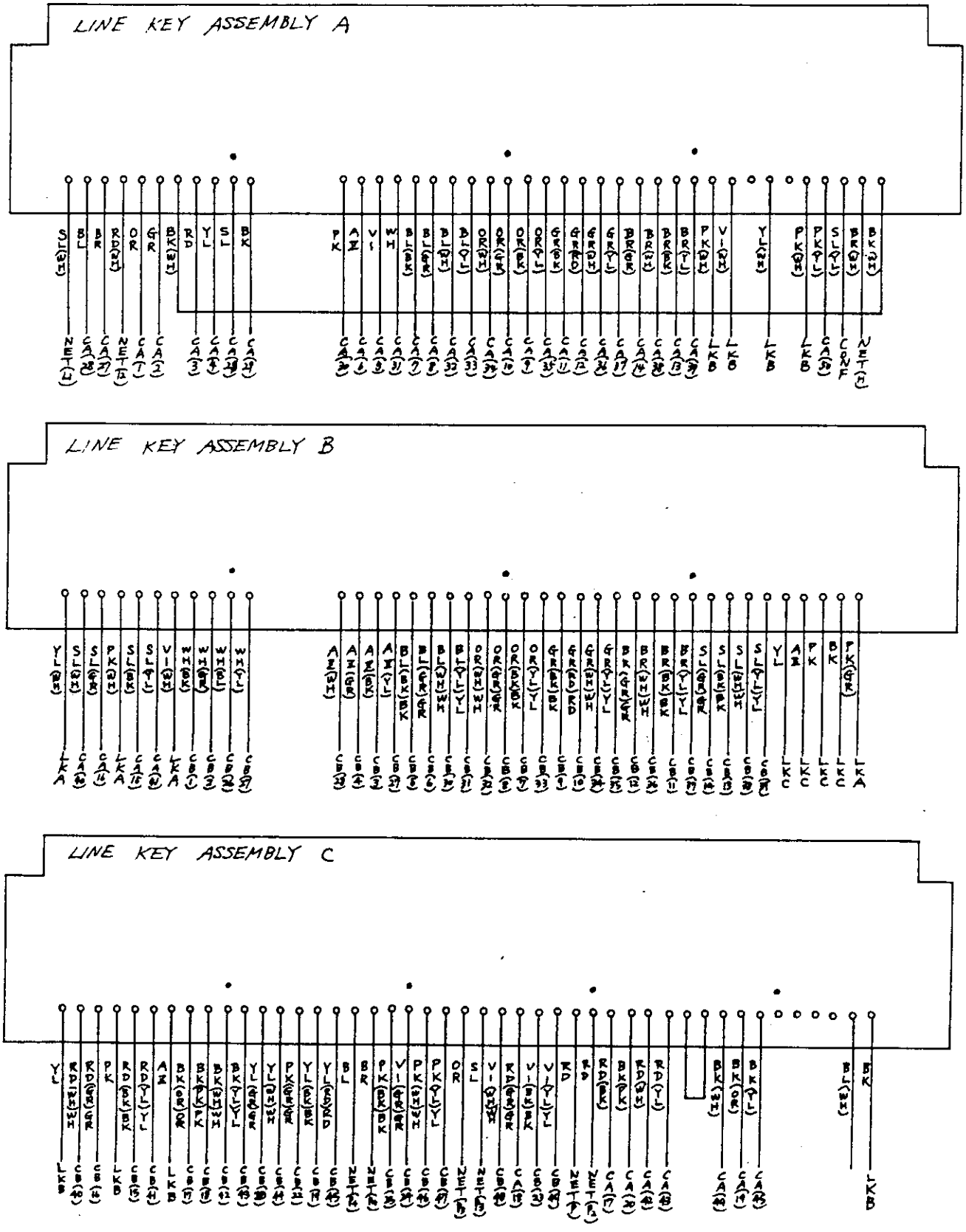
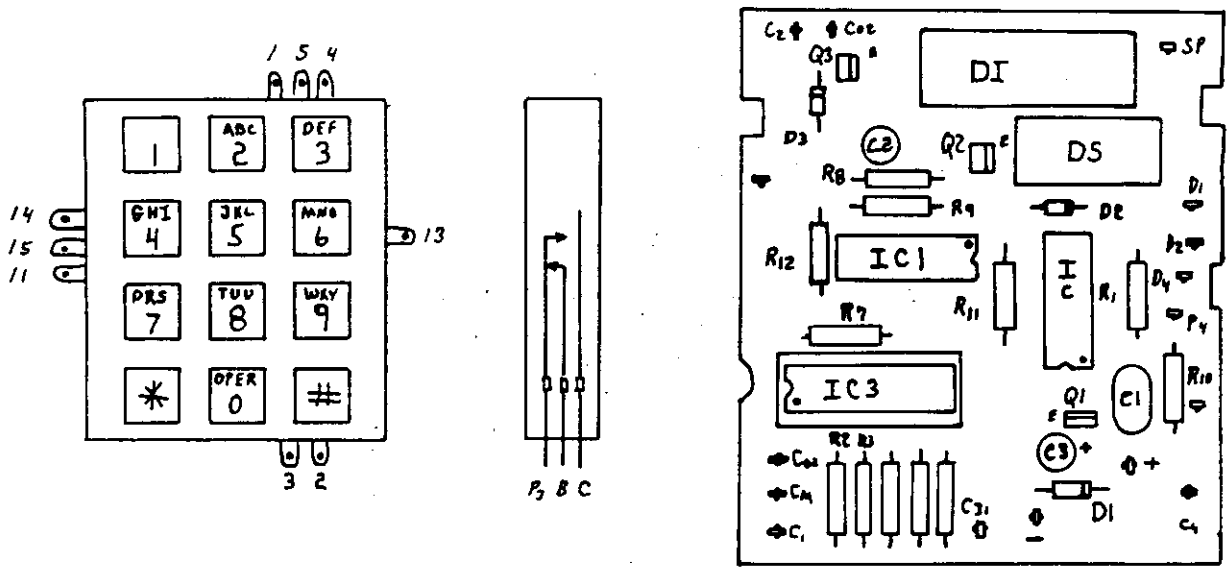
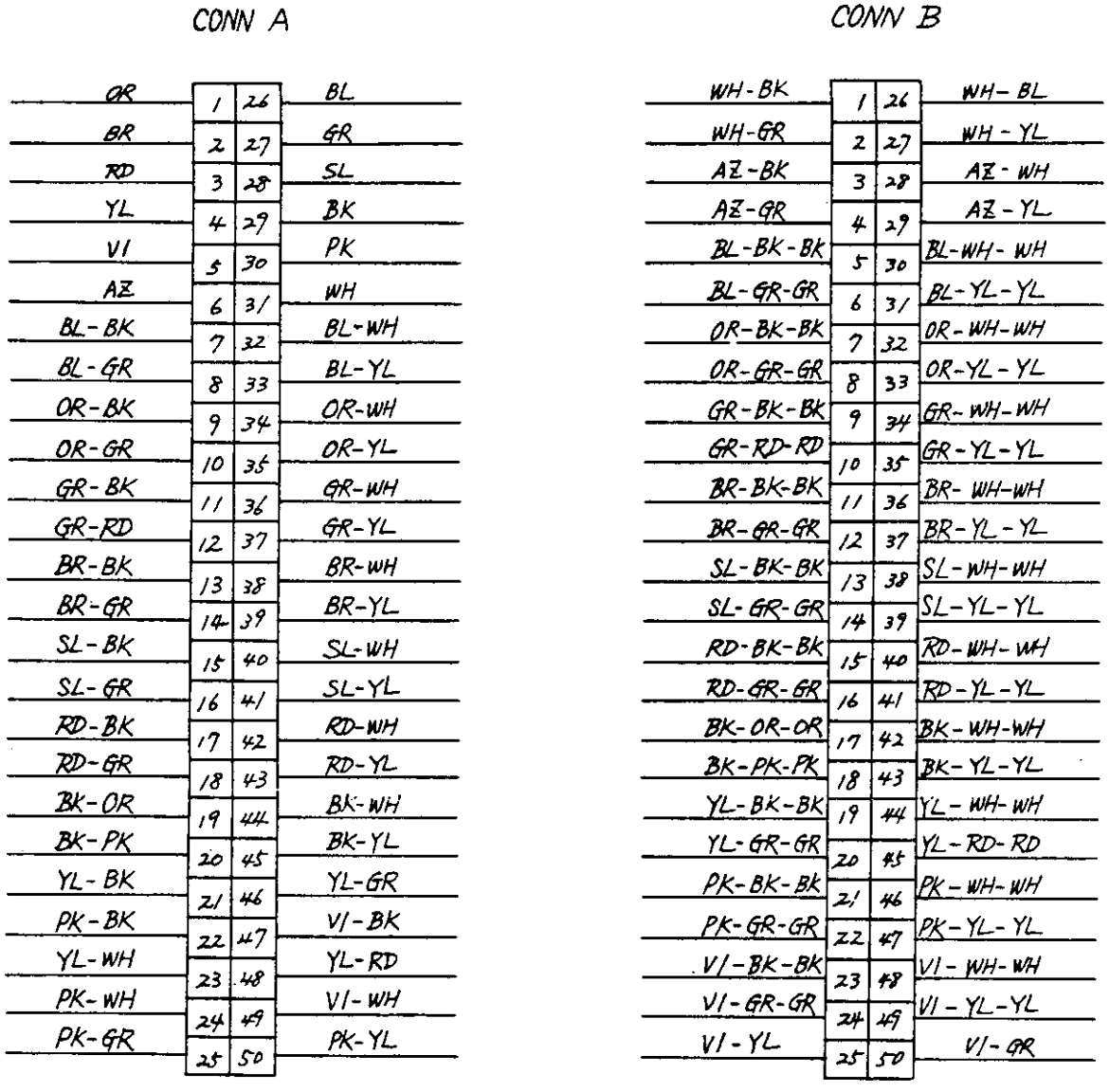


Figure 6a BT 2250 Key Telephone Wiring Diagram



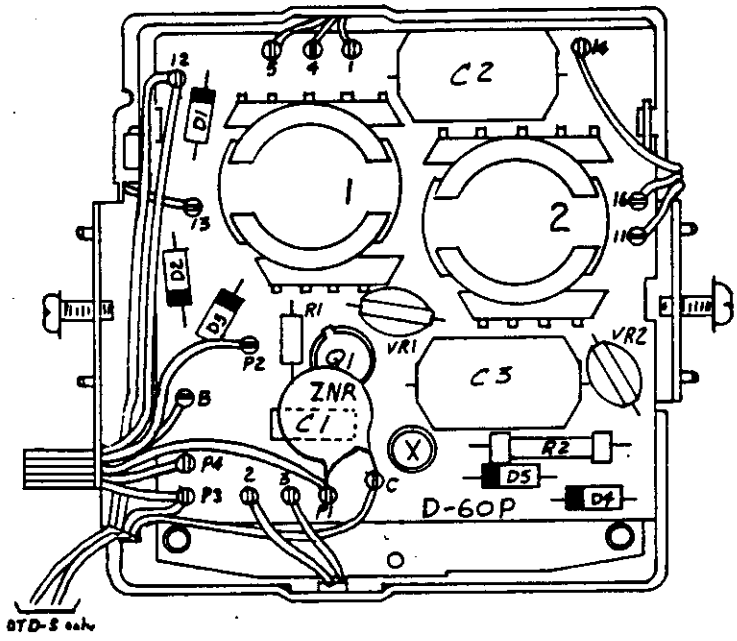
PARTS LIST					
ITEM NO.	PART NO.	SYMBOL NO.	DESCRIPTION		QTY
1	TG-105634		PCB OTD-OP		1
2	TP-124549	IC1	Integrated Circuit	AY-5-9100P	1
	TP-124550-1	IC2		MSM 4011	1
	TP-124550-2	IC3		MSM 4013	1
3		Q1	Transistor	2SD414	1
		Q2		2SC458	1
		Q3		2SA673	1
4		D1	Diode	RD15E	1
		D2-D3		1S2076A	2
5		R1	Resistor	510K ¼W	1
		R2-R7		100K ¼W	6
		R8		11.5K ¼W	1
		R9		24K ¼W	1
		R10		2K ¼W	1
		R11-R12		30K ¼W	2
6		C1	Capacitor	0.1 ufd 50v	1
		C2		1000 pfd 450v	1
		C3		1 ufd 50v	1
7	TP-124552	DS	Relay	RZ-24	1
	TP-124551	DI		SRF-3C	1
8	TG-104935-G3	SW1	Switch	D-60PS	1

Figure 12a Omega Outpulse Dial Model OTD-OP Illustration/Components



TAIL CABLE CONNECTORS

Figure 6c BT 2250 Key Telephone Wiring Diagram



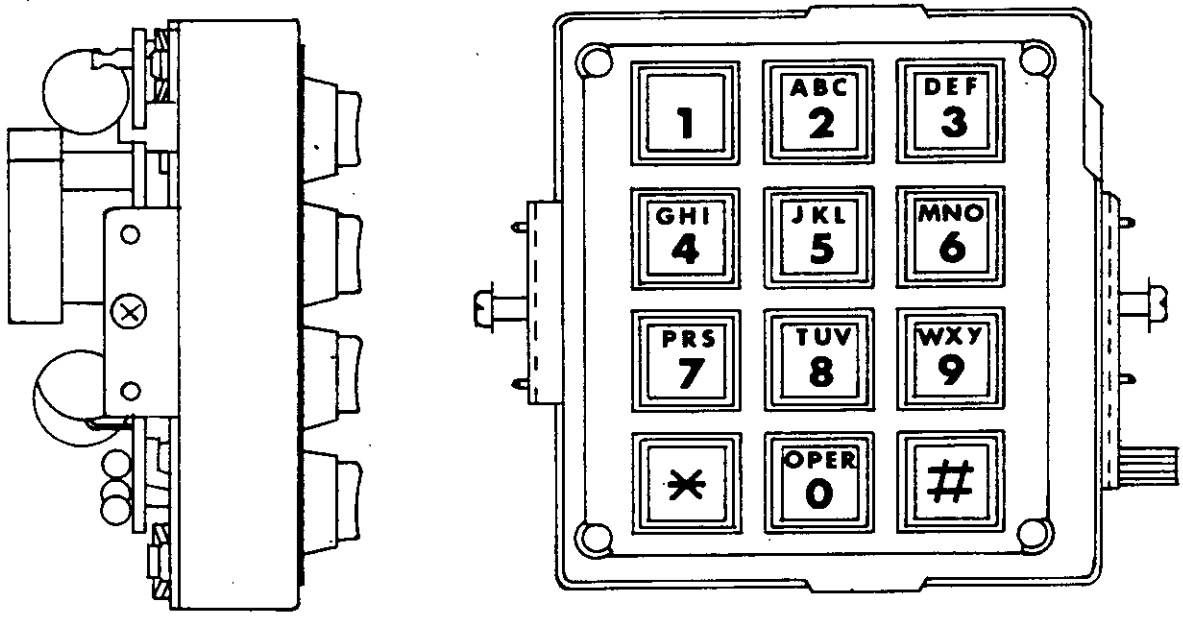


Figure 8a Omega Tone Dial OTD (OTD-S) Illustration

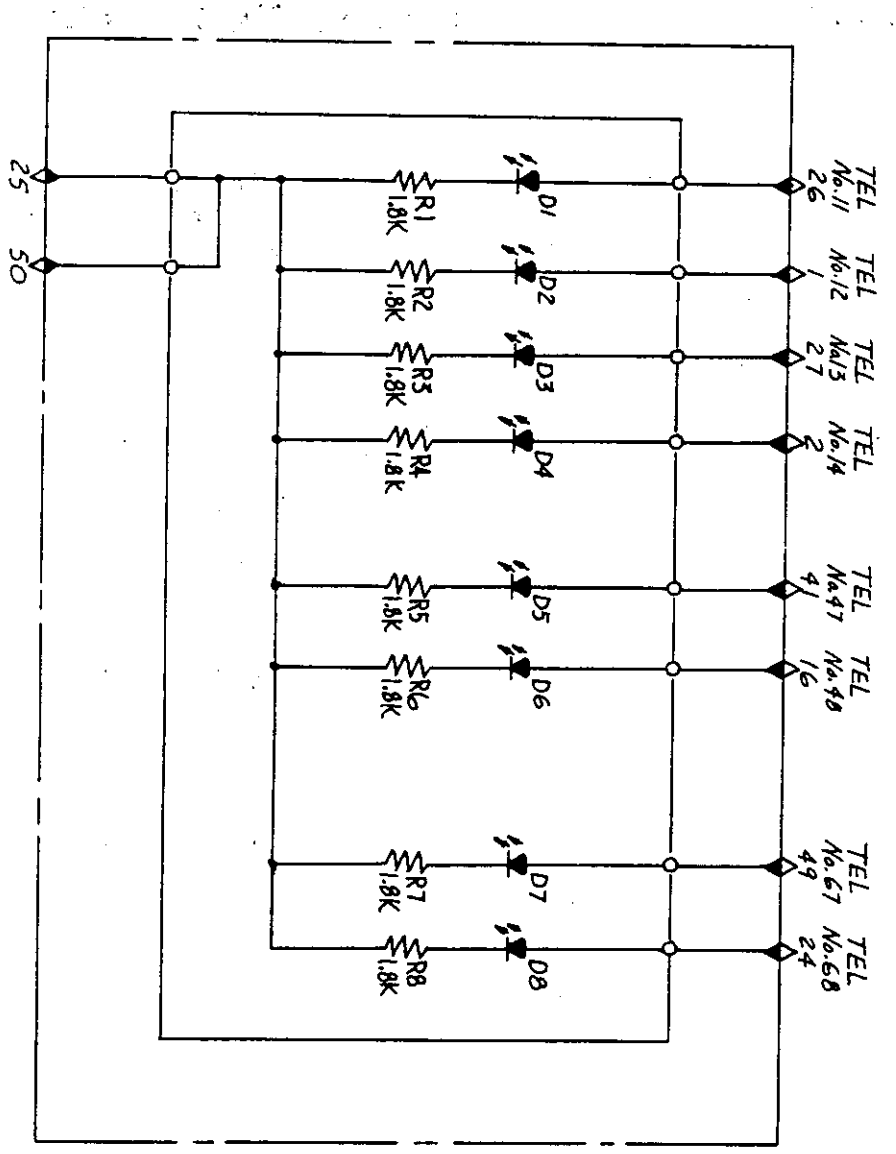
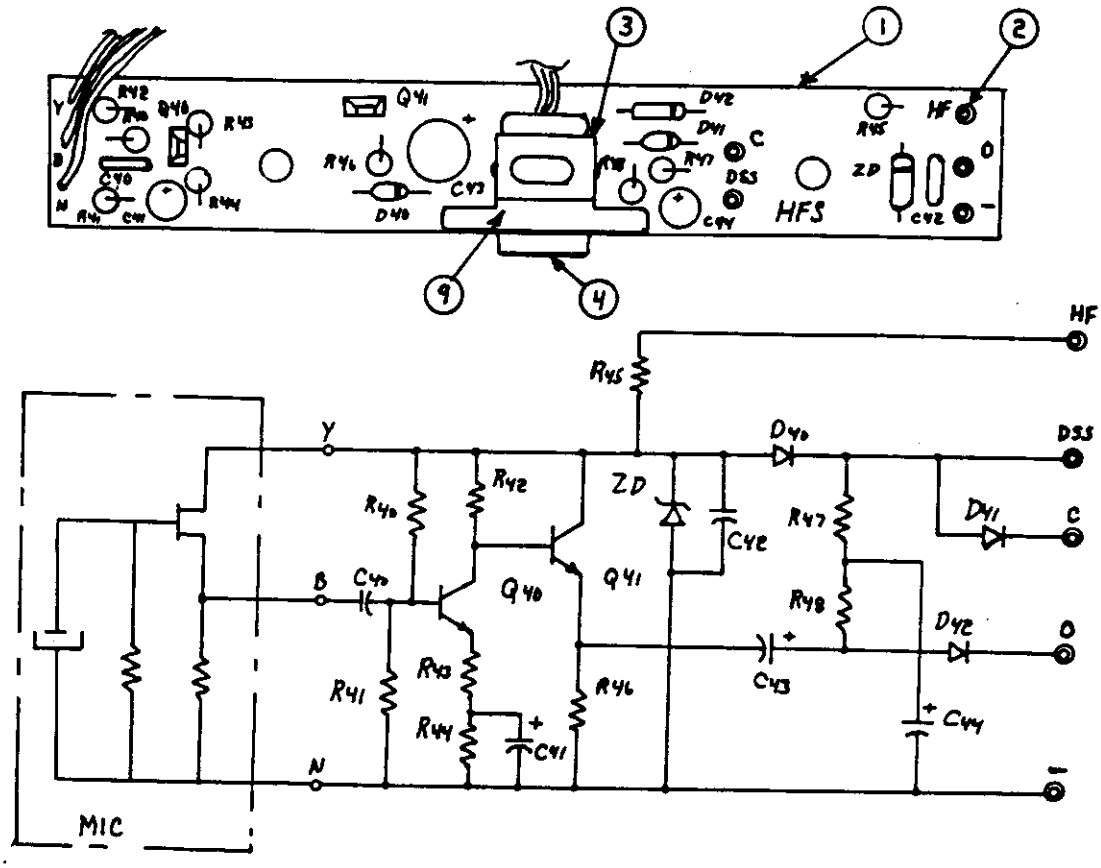
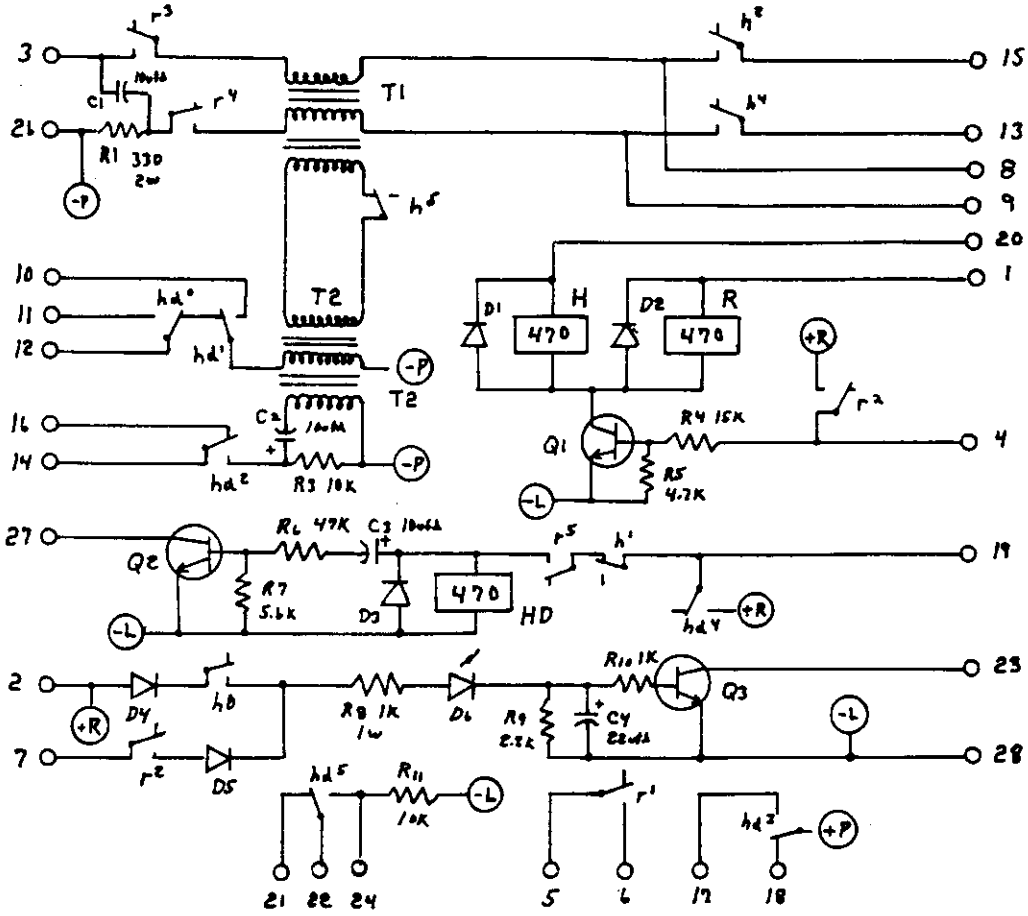


Figure 1a BLF-48 Schematic



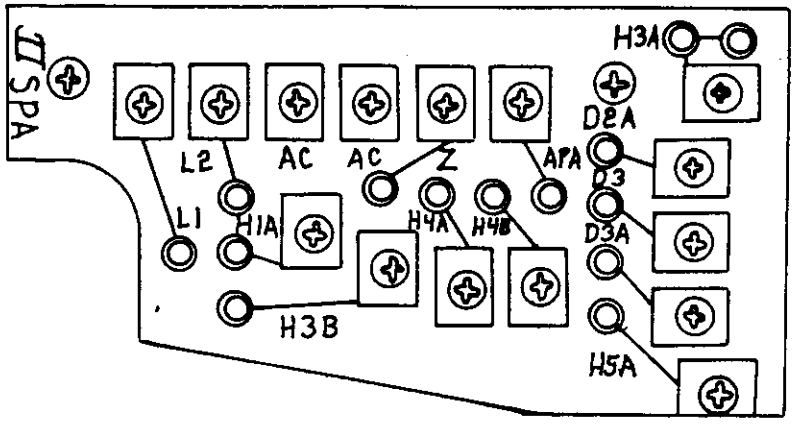
PARTS LIST					
ITEM NO.	PART NO.	SYM NO.	DESCRPIPTION		QTY
1	TK-107754		PCB HFS		1
2	TP-124028		N-60 TERMINAL		1
3			MICROPHONE HOLDER		1
4			MICROPHONE TOP		1
5		C40	CAPACITOR	0.033 ufd 50v	1
		C41		1 ufd 50v	1
		C42		0.1 ufd 50v	1
		C43		33 ufd 25v	1
		C44		4.7 ufd 50v	1
6		R40	RESISTOR	100K ¼W	1
		R41		51K ¼W	1
		R42		10K ¼W	1
		R43		470 ¼W	1
		R44		8.2K ¼W	1
		R45		1.5K ¼W	1
		R46		4.3K ¼W	1
		R47, R48		2.2K ¼W	2
7		D40, 41	DIODE	6E	2
		D42		152076A	1
		ZD		ZENER RD9AL	1
8		Q40,41	TRANSISTOR 2SC458		2
9	TP-123103	MIC	MICROPHONE EMB		1

Figure 9 Handsfree Micorphone Assembly HFS-1

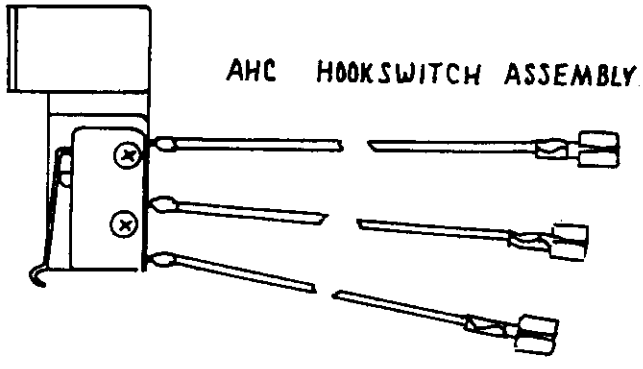


PARTS LIST					
ITEM NO.	PART NO.	SYM NO.	DESCRIPTION		QTY
1.	TE-101411		P.C.B. DSS-K-1		1
2.			SCREW 2.6 x 4S		3
3.	TP-112823		PULL RING		1
4.	P-119714-3	HD,H,R	RELAY	M-108	3
5.	TP-123065	T2	TRANSOFMER	EX-7	1
	TP-123064	T1		EX-6	1
6.		R10	RESISTOR	1K ¼W 5%	1
		R9		2.2K " "	1
		R7		5.6K " "	1
		R6		47K " "	1
		R5		4.7K " "	1
		R4		15K " "	1
		R3, R11		10K " "	2
		R8		1K 1W 10%	1
		R1		330 2W 10%	1
7.	TP-123110-11	C4	CAPACITOR	22 uf 35v	1
	P-119158-10	C1,C2,C3		10 uf 35v	3
8.	P-119165	D1-D5	DIODE	6E	5
	TP-12304-1	D6		SLP-24B	1
9.	P-122054	Q1, Q3	TRANSISTOR	2SD78	2
	TP-122848	Q2		2SC1213	1

Figure 2a DSS-K-1 Circuit Diagram/ Parts List



SPA-S TERMINAL BOARD



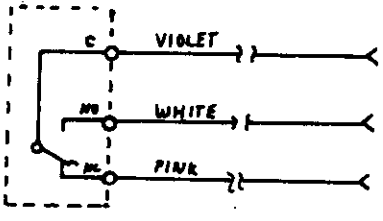
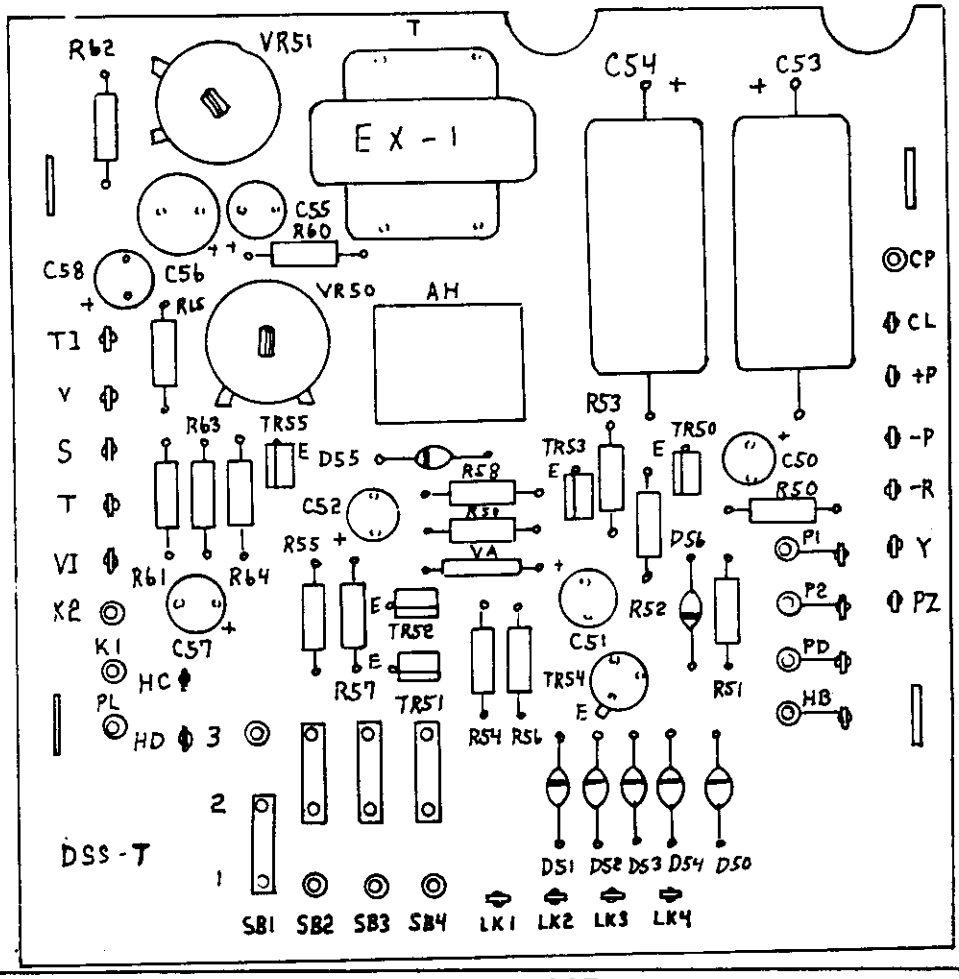


Figure 11 SPA-S Assembly



DSS-T PARTS LIST					
ITEM NO.	PART NO.	SYM NO.	DESCRIPTION		QTY
1.	TG-105005		DSS-T PCB		1
2.	P-114510		N-60 TERMINAL		20
3.	HP-043		SOLDER TERMINAL		21
4.	P-118035	SB1-4	SHORTING BAR		4
5.		R50,54,55, 57,59	RESISTOR	10K ¼W 5%	5
		R51,R58		4.7K " "	2
		R52		6.8K " "	1
		R53		22K " "	1
		R56,61,62		470 " "	3
		R60		1K " "	1
		R63		1.5K " "	1
		R64		100K " "	1
		R65		390 " "	1
6.	TP-123805	R50,R51	POTENTIOMETER	1K	2
7.		C50,52	CAPACITOR	4.7 ufd. 50v	2
		C51,55,57,58		10 ufd 50v	4
		C53,54		330 ufd 50v	2
		56		47 ufd 50v	1
8.		D50-56	DIODE	6E	7
9.		Q50-53,55	TRANSISTOR	2SC1213A	5
		Q54		2SD78	1
10.	K-104097	VA	VARISTOR	VR61	1
11.	P-121252	AH	RELAY	TECK-TT24	1
12.		XF1	TRANSFORMER	EX-1	1

Figure 2d DSS-T Illustration/Parts List

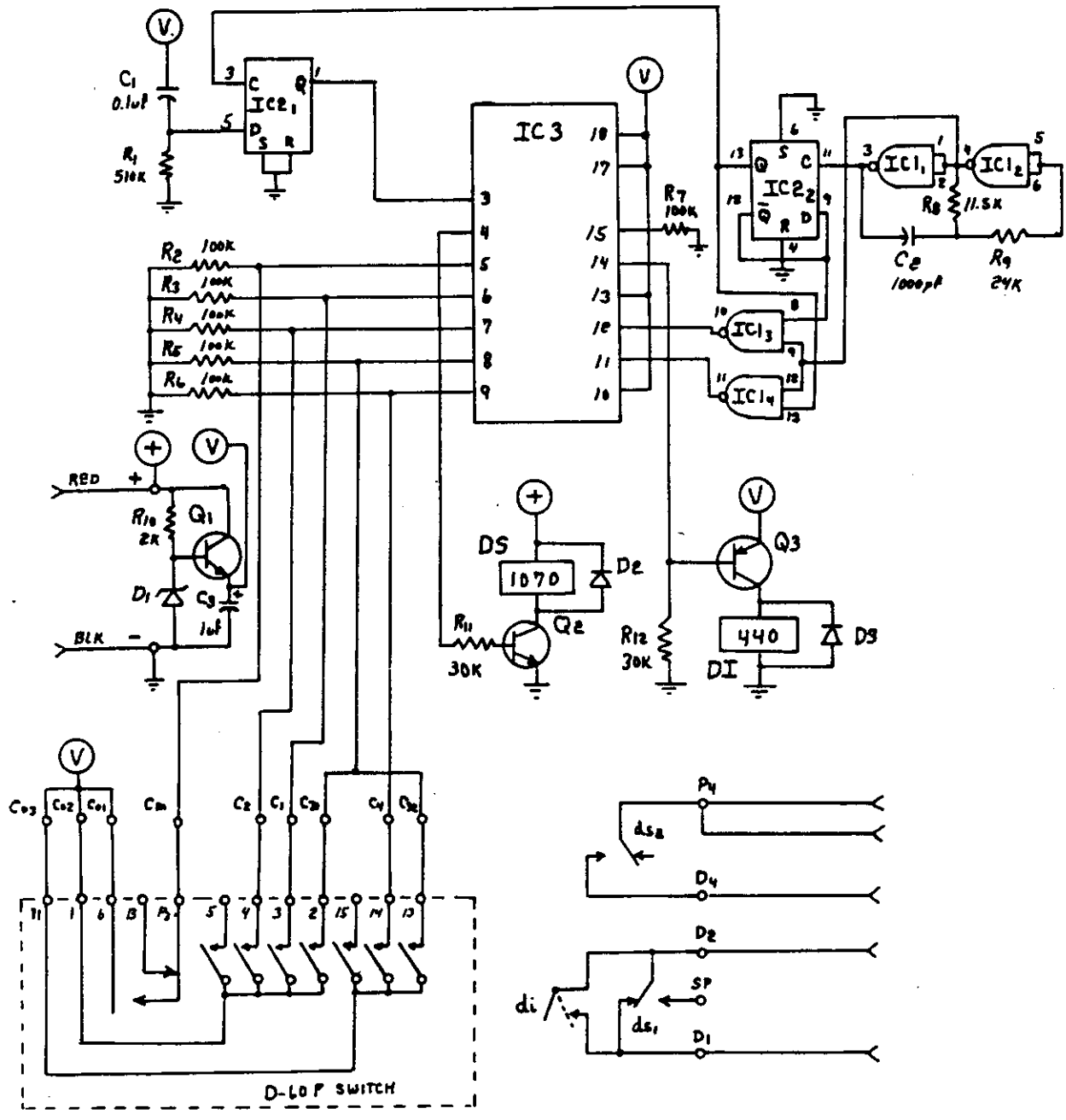


Figure 12b Omega Outpulse Dial Model OTD-OP Schematic

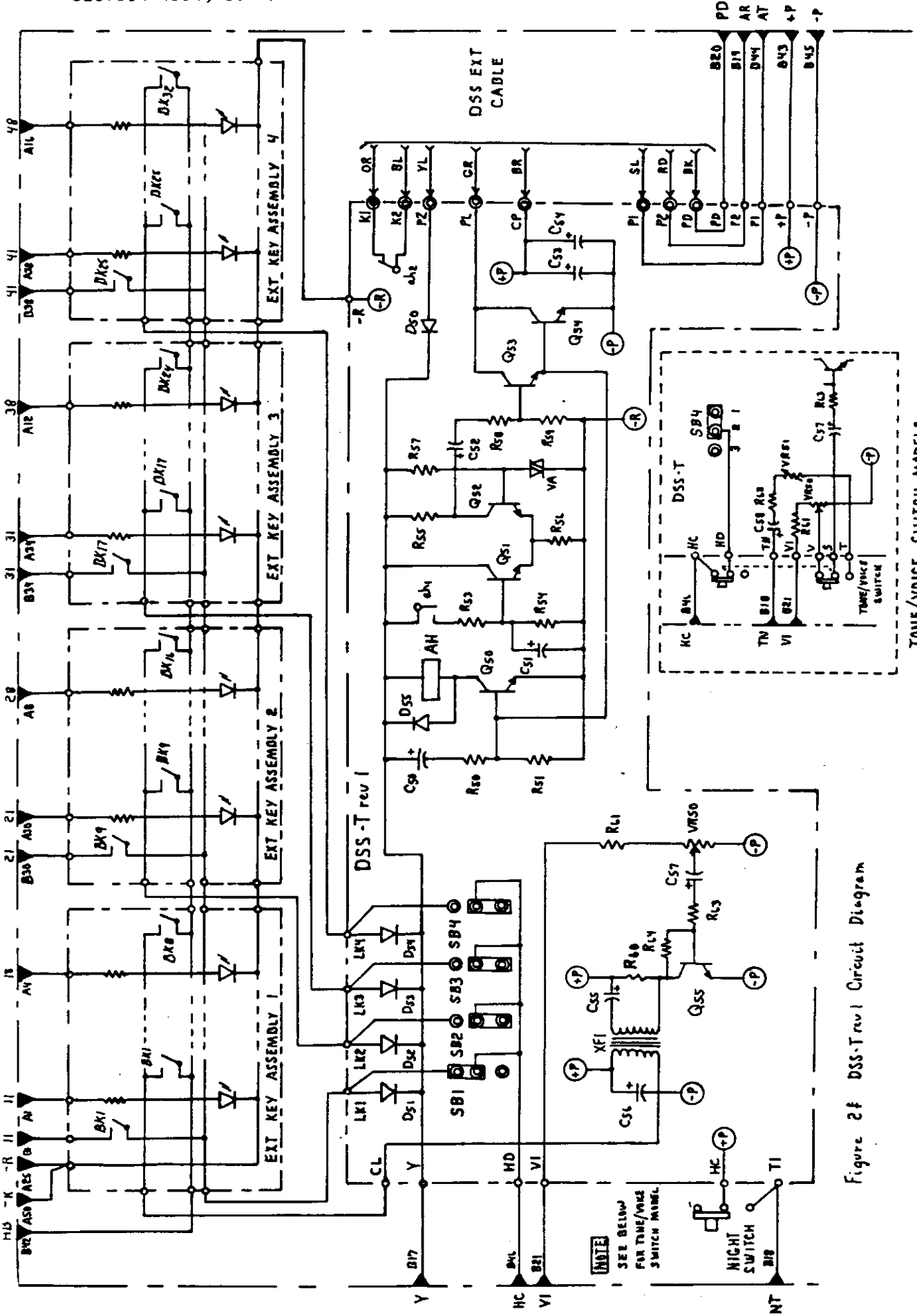


Figure 2f DSS-T rev 1 Circuit Diagram

OMEGA PHONE II

BT-1530/2250 KEY TELEPHONE SYSTEM

OPTIONAL SYSTEM EQUIPMENT DRAWINGS

1.00 INTRODUCTION

1.01 This section provides complete illustrations, circuit diagrams, wiring diagrams and parts lists of the BT1530/2250 Key Telephone Optional System Components.

2.00 OPTIONAL SYSTEM EQUIPMENT

2.01 Busy Lamp Field

a. The Busy Lamp Field (BLF- B) is illustrated in Figure 1.

2.02 Direct Station Selection Unit

a. The DSS- 1 is illustrated in Figure 2.

2.03 Universal Extension Adapter

a. The Universal Extension Adapter (UEX-B) is illustrated in Figure 3.

2.04 Zone Page Adapter

a. The Zone Page Adapter (ZPA-B-1) is illustrated in Figure 4.

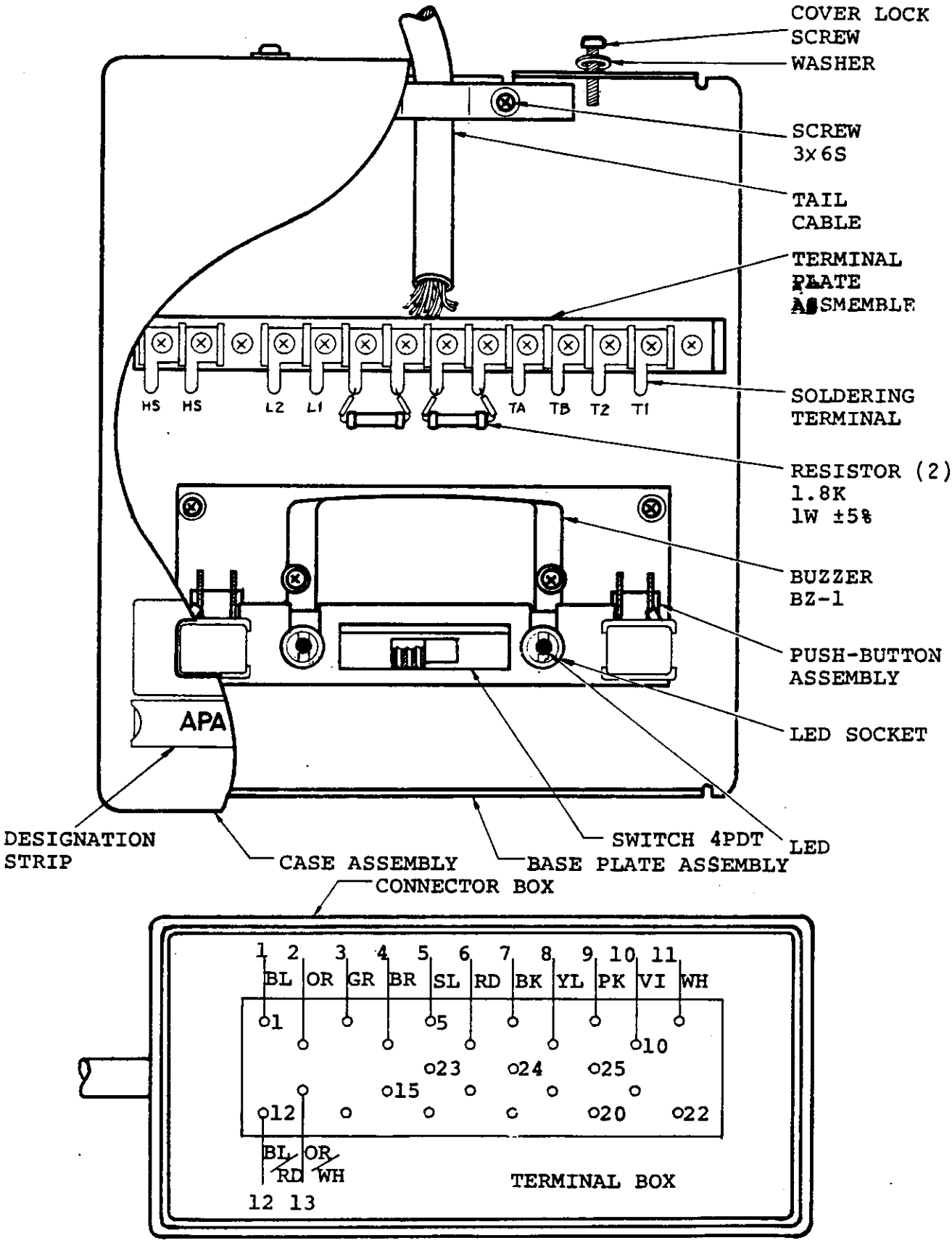
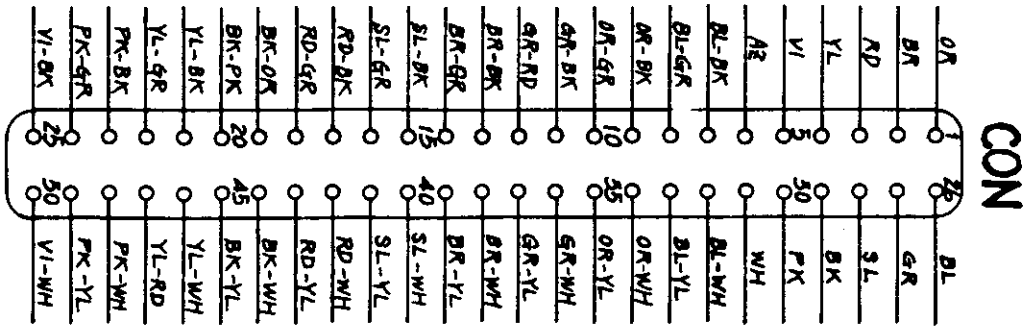


Figure 4a UEX Components



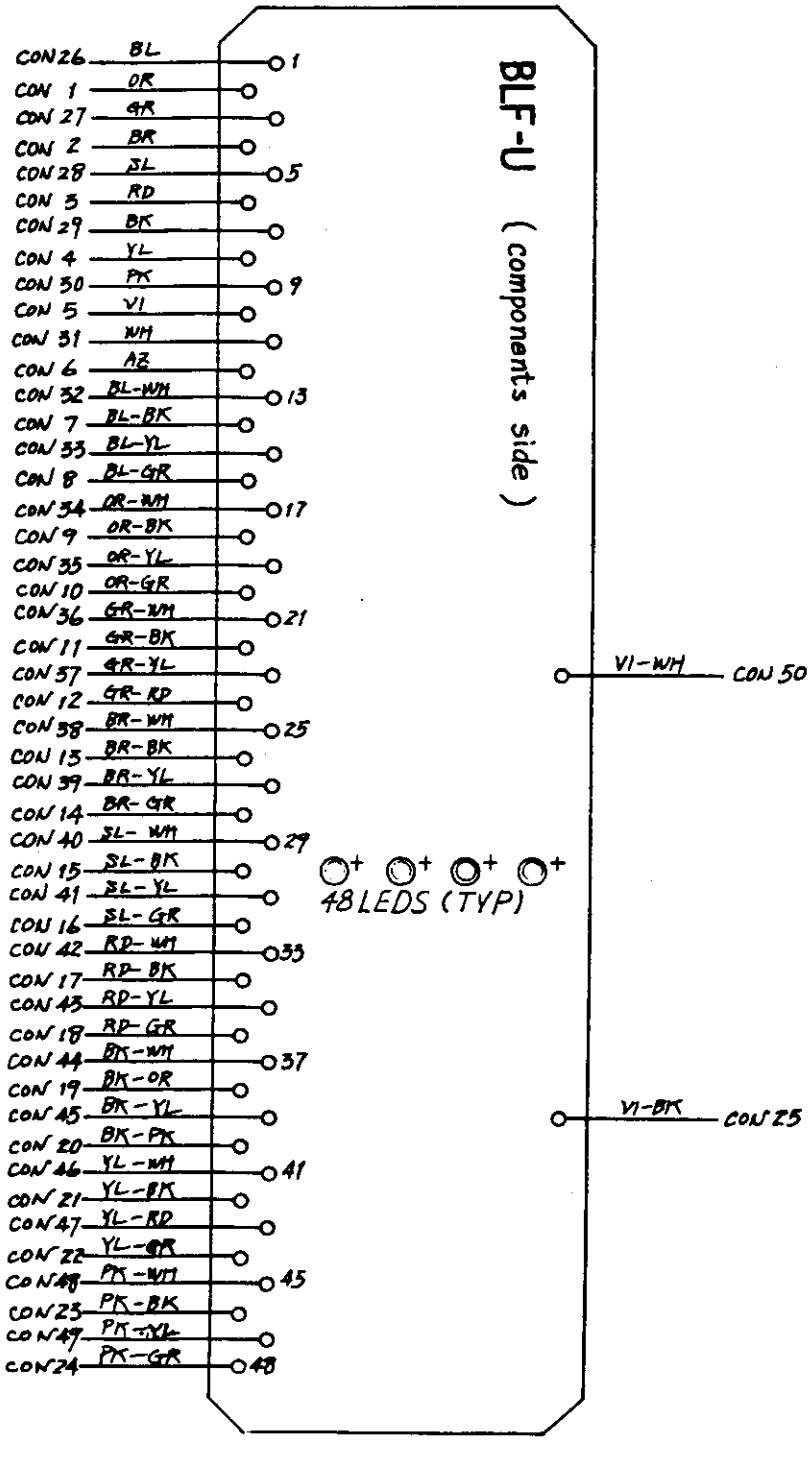
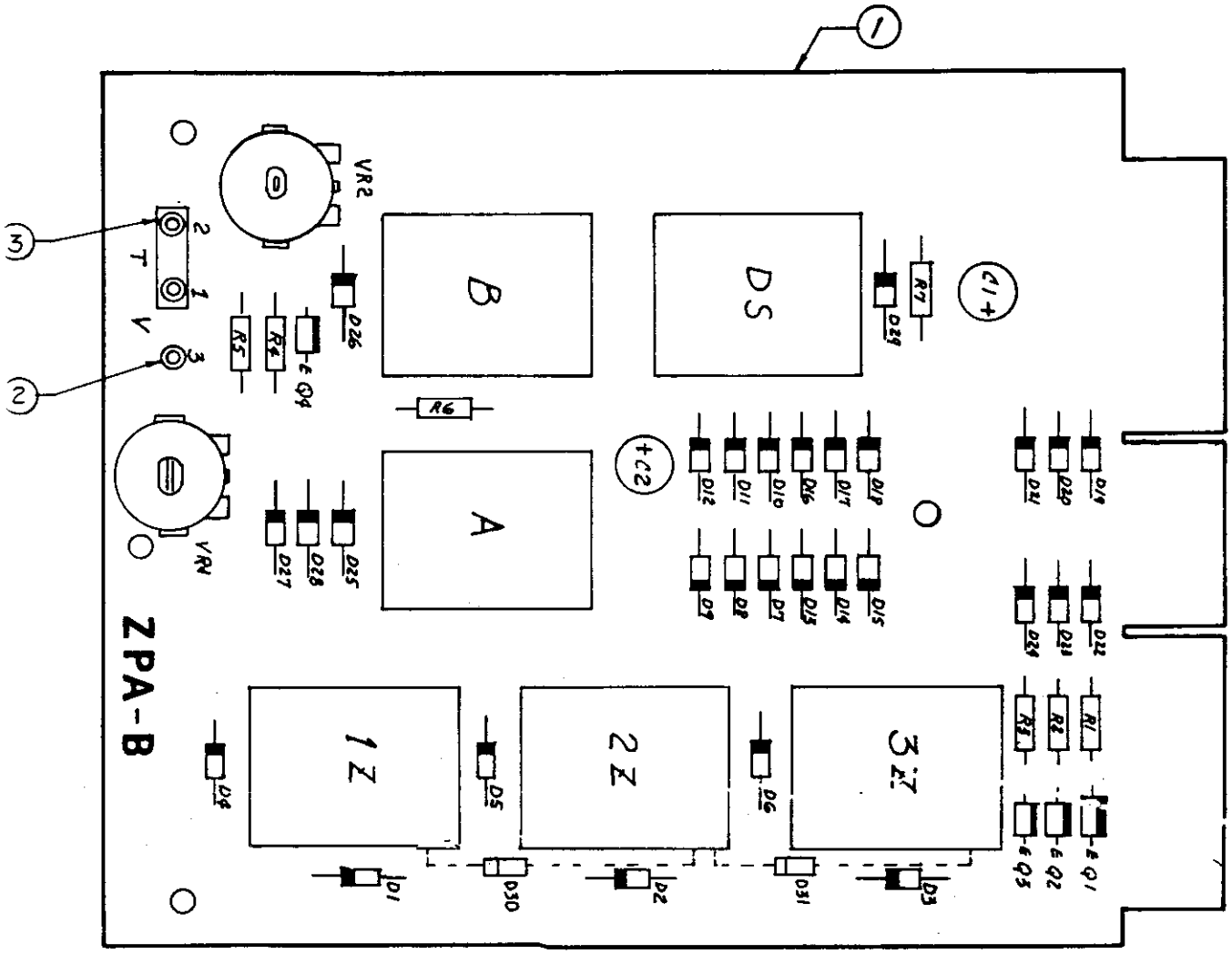


Figure 1b BLF-48 Wiring Diagram



PARTS LIST					
ITEM NO.	PART NO.	SYM. NO.	DESCRIPTION		QTY
1.	TE-101397		P.C.B. ZPA-B		1
2.	P-114510		TERMINAL N-60		3
3.	P-118035		SHORTING BAR		1
4.			SCREW 2.6X4S		5
		C1,2	CAPACITOR:	10mf +100-10% 50V	2
		D1-31	DIODE:	6E SILICON	31
		Q1-4	TRANSISTOR:	2SC1213A	4
		VR1·VR-2	POTENTIOMETER:	3K	2
		R1-3	RESISTOR:	4.7K ¼W ± 5%	3
		R4,5		470 " ±10%	2
		R6		1K " ± 5%	1
		R7		2.7K " "	1
		1Z-3Z	RELAY:	M-111	3
		A,B,DS		M-108	3

Figure 4a ZPA-B Circuit Card

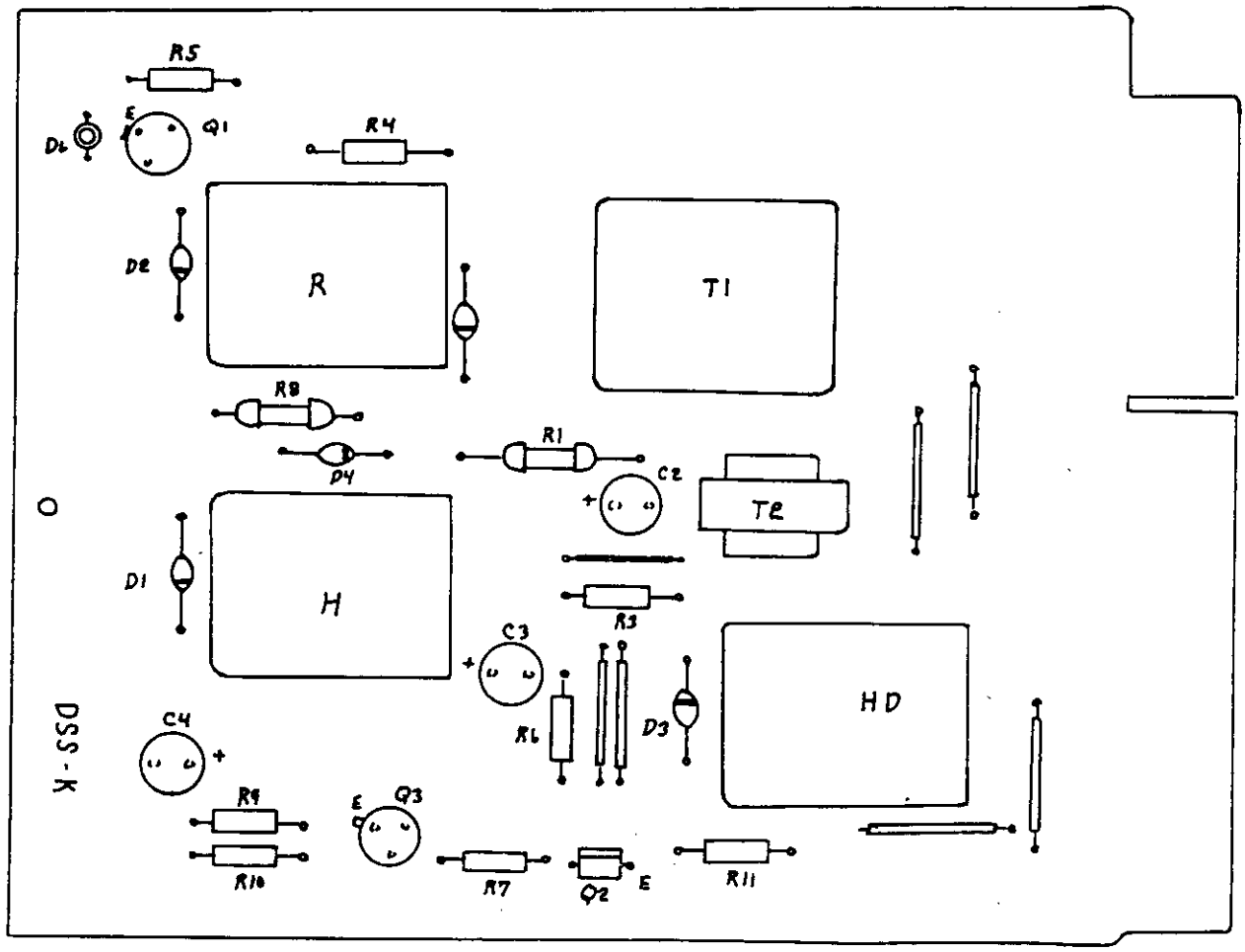


Figure 2b DSS-K-1 Circuit Card Illustration

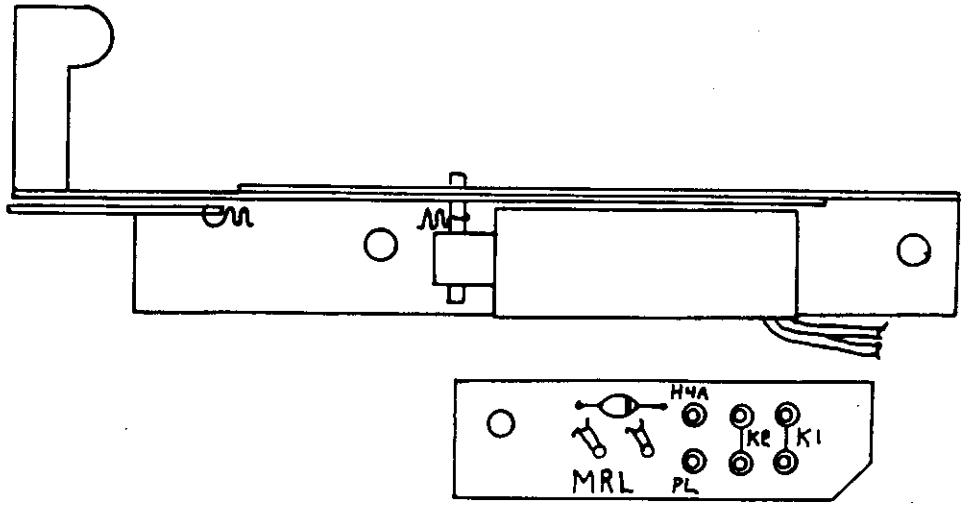


Figure 2c MRL Illustration

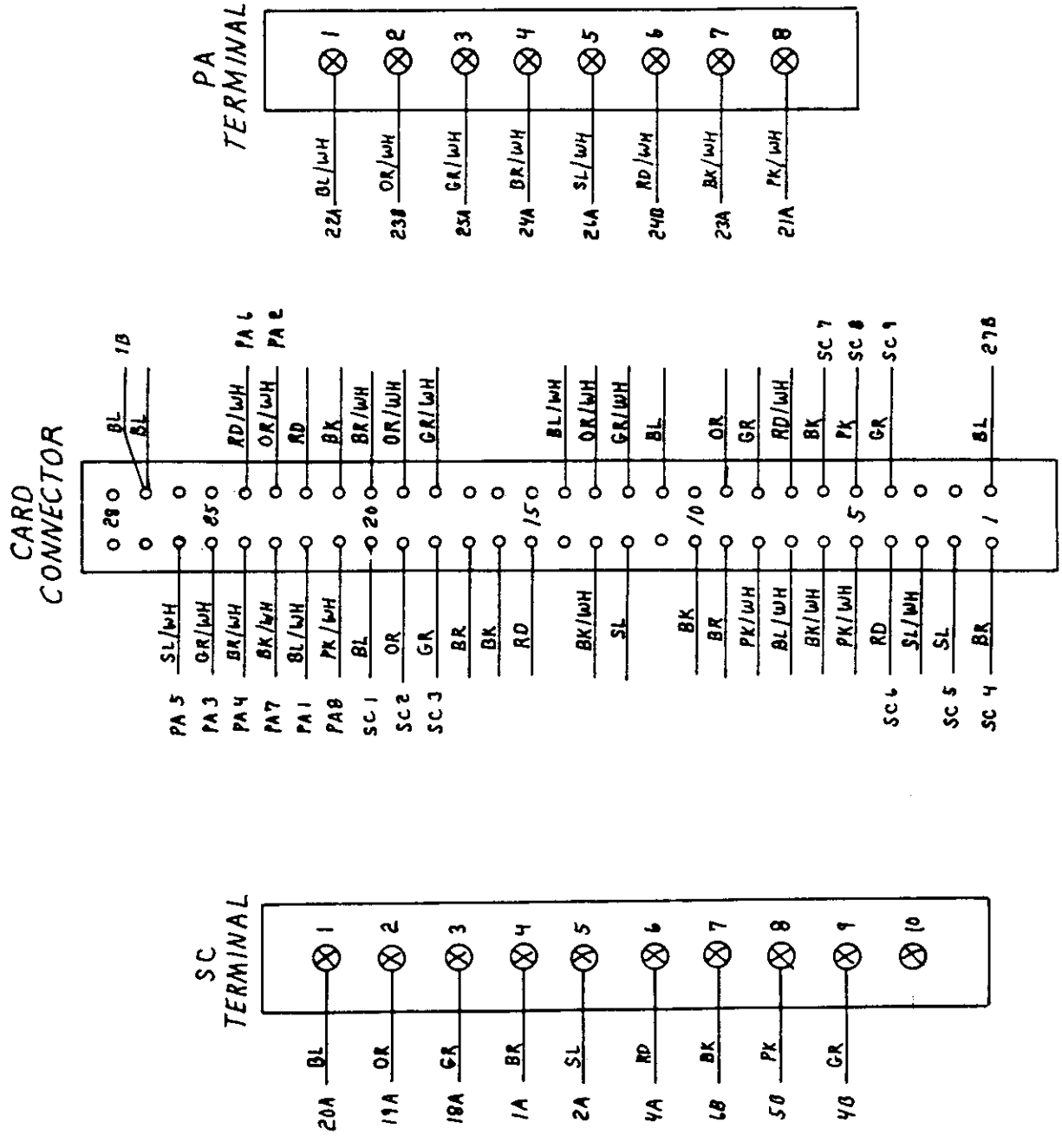


Figure 4c ZPA-B1 Wiring Diagram

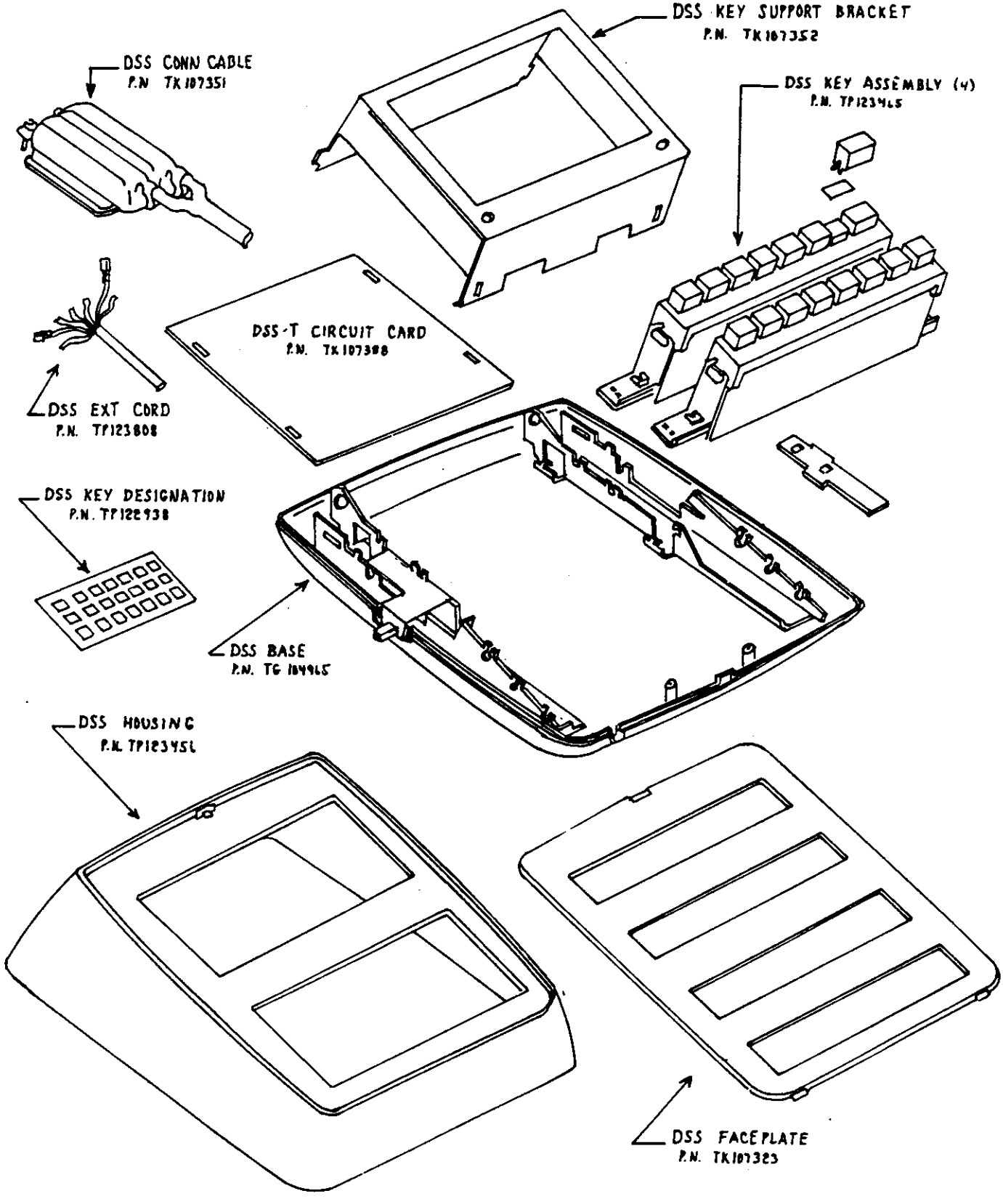
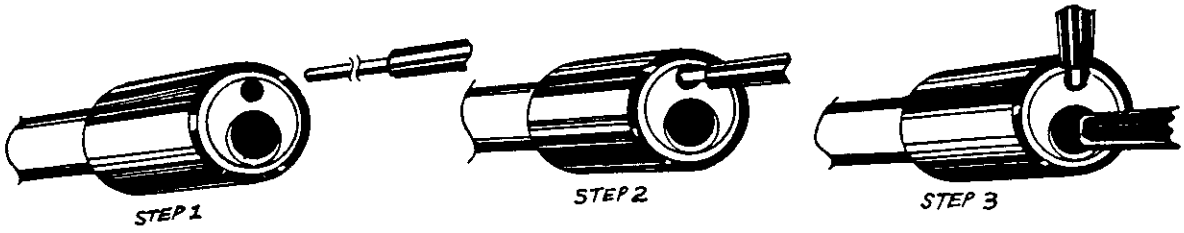


Figure 2e DSS-T Station Assembly

3. At least five to six turns are required for each connection. Three individual wire wrap connections can be established at each post.



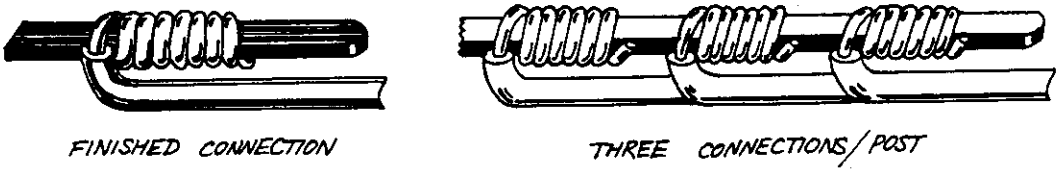


Figure 1 Wire Wrap Techniques

4. Care should be taken to insure proper wire wrap connections. Situations such as overwraps and openwraps as shown in Figure 2 should be avoided.

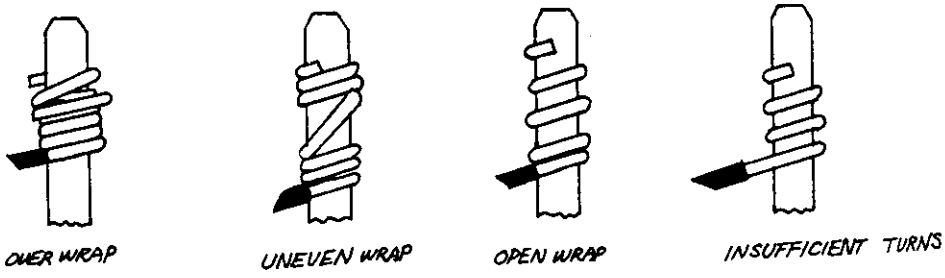


Figure 2 Wire Wrap Errors

EXPLANATION OF SYMBOLS

A. CIRCUIT DESCRIPTION SEQUENCE SYMBOLS

1. RELAYS

a. S(470) : RELAY S; Coil, 470 Ohm DC Resistance.
b. H_{1-2}(400): RELAY H Primary Coil (Coil Term No. 1-2), 400 Ohm DC Resistance.
c. H_{3-4}(600): RELAY H Secondary Coil (Coil Term No. 3-4), 600 Ohm DC Resistance.

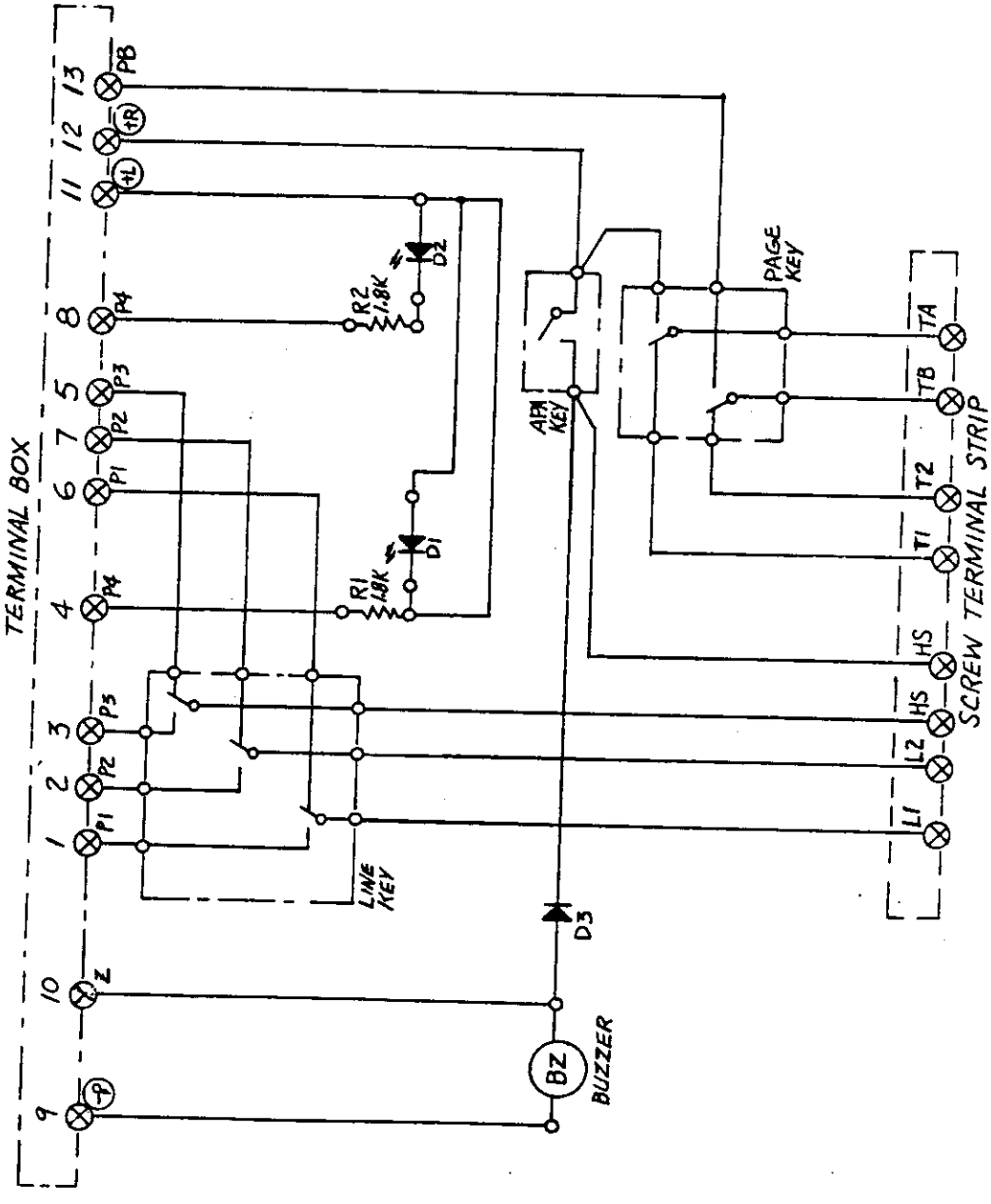
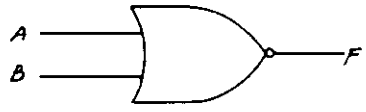


Figure 4b UEX Schematic

APPENDIX

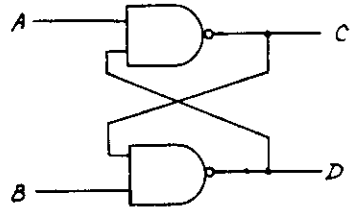
c. NOR GATE



TRUTH TABLE

INPUT		OUTPUT
A	B	F
H	H	L
H	L	L
L	H	L
L	L	H

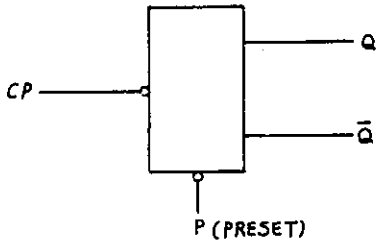
d. SET-RESET FLIP FLOP



TRUTH TABLE

INPUT		OUTPUT	
A	B	C	D
H	L	H	L
L	H	L	H
H	H	NO CHANGE	
L	L	NOT ALLOWED	

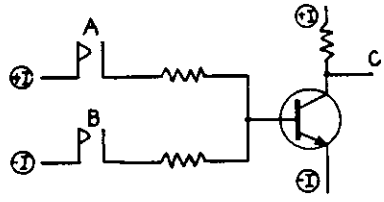
e. J & K FLIP FLOP NOTE: J & K INPUT NOT SHOWN FOR CLARITY



TRUTH TABLE

CP	P	Q	$\bar{Q}$
	L	L	H
H → L	H	H	L
L → H	H	NO CHANGE	
L → H	H	L	H

f. TRANSISTOR



TRUTH TABLE

A	B	C
OPEN	OPEN	HIGH
CLOSED	OPEN	LOW
CLOSED	CLOSED	HIGH
OPEN	CLOSED	HIGH

III CHARACTERISTICS OF COMPONENTS

A. RELAYS

1. Relay, M-Type

a. Relay Table - Table A
b. Outline and Pin Arrangement - Figure 3

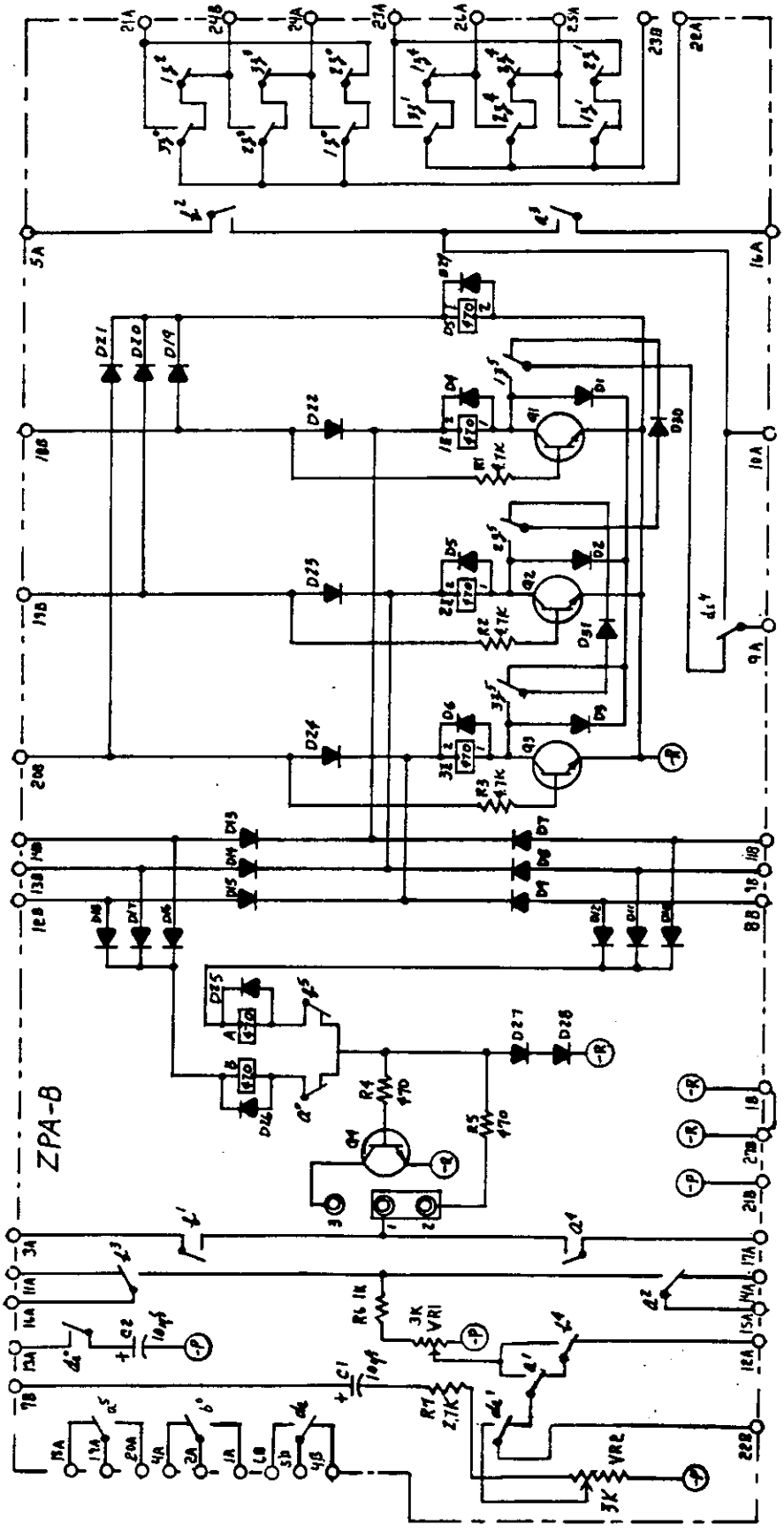
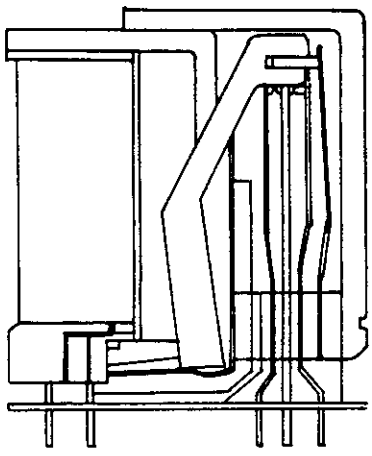
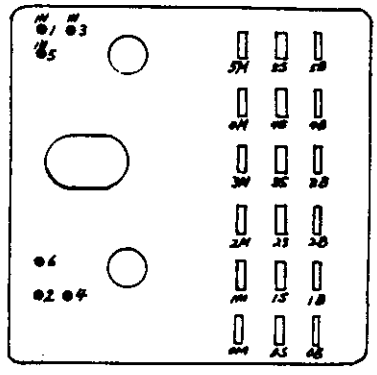


Figure 4b ZPA-B Schematic Diagram

(Figure 3)





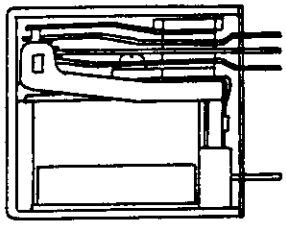
2. RELAY, MINIATURE CRADLE TYPE

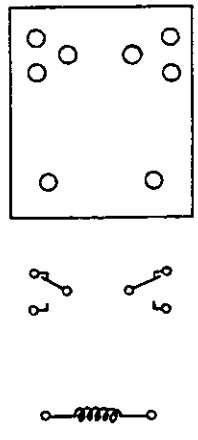
a. Electrical Characteristics

1. Coil

Resistance: 1500 (±10%) Ohms
Current: 9.2 ma
Voltage: 24 VDC

2. Outline and Pin Arrangement: Figure 4





3. RELAY - REED type (SRG-12)

a. Electrical Characteristics

1. Coil

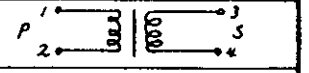
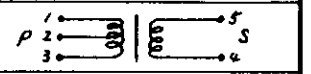
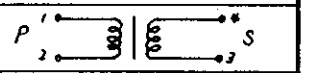
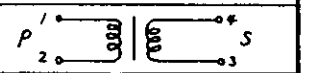
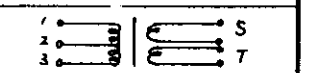
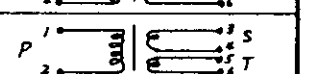
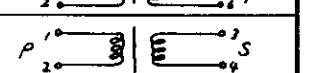
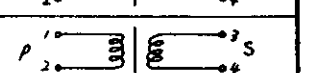
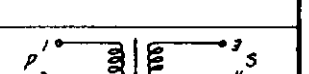
Resistance: 1450 (±10%) Ohms
Current: 8.5 ma
Power: 1.0 watts

OMEGAPHONE II

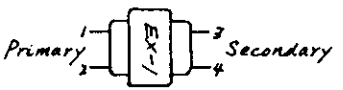
BT-1530/2250 KEY TELEPHONE SYSTEM

APPENDIX

TABLE D TRANSFORMER ELECTRICAL CHARACTERISTICS

Type No.	Impedance			D.C. Resistance			D.C. Current			Loss (dB)	Bottom View
	P	S	Other	P	S	Other	P	S	Other		
EX-1	1kΩ	32			20Ω			160mA		1.5	
EX-2	10K	1K	(1-2) 600							1.5	
EX-3	300									1.5	
EX-4	50	1K								1.8	
EX-5	5K		(1-2) 1K	(2-3) 2Ω			(2-3) 800mA			1.5	
EX-6	(P) 300	(S) 300	(T) 50	250Ω	250Ω	200Ω				2.3	
EX-7	(P) 600	(S) 50	(T) 600		20Ω		30	10mA		1.5	
ST-23	600	8								1.5	
ST-28	500	200					10	30mA		2.0	
IST-3											
SP-4											
LETTARD COIL	0.3H	0.3H		150Ω	150Ω		50mA	50mA			

Notes. 1. The value which showed as A.C. Value (Impedance & Loss) is measured at 1000 Hertz.
2. The head side of the letter or letters which is printed on the core cover is secondery or third side.



OMEGAPHONE II

BT-1530/2250 KEY TELEPHONE SYSTEM

APPENDIX

I WIRE WRAP TECHNIQUES

A. The BT1530/2250 KSU utilizes "wire wrap" connections on all printed circuit card connectors. Some options require the Installer to wire wrap the optional feature(s) circuit card connector to establish circuit connection with existing KSU functions. The following are the requirements:

1. A suitable "wire wrap" tool must be used to make the connection. Several types of tools are available: Air powered, pneumatic, battery or hand operated. The battery or hand operated variety are suitable for use on the BT1530/2250 KSU.

2. The correct tool based upon the size of the wire wrap post on the card connector and guage wire used is required. The card connector uses a .025 X .025 inch post and No. 24 or 26 AWG solid wire.

3. Manual tools such as the OK Manual Wire Wrap tool P.N. HW-2444 or combination Wire Wrap/Un-Wrap tool P.N. HW-UW2444 can be used to establish the wire wrap connection. Tools may be ordered from:

OK Machine and Tool Corp.
3455 Conner Street
Bronx, New York 10475

Tel. No. 212-994-6600

B. Procedures to follow in making "wire wrap" connections.

1. Strip the wire approximately 1 1/2 inches. Insert the bare wire into the bit of the wire wrap tool as illustrated in Figure 1a.

2. Insert the wire wrap tool over the wire wrap post and slowly twist until the wire end is totally wrapped around the connector wire wrap post as shown in Figure 1.

TABLE B TRANSISTOR CHARACTERISTICS

Device No.	Type (Nt.1)	Maximum Ratings						Electrical Characteristics				Package Type	Substitute
		P_C watts	T_j °C	IC amps	V_{CBO}	V_{CEO}	V_{EBO}	H_{fe}	I_{CBO} μA	V_{CE}	f_t mhz		
2SA 539L	PNP, Si, EP	0.25	125	-0.2	-60	-45	-5	80	-0.1	-45	200	No.1	RCA SK 3114
2SA 603	PNP, Si, EP	0.3	150	-0.2	-60	-45	-8	150	-0.5	-45	220	No.4	RCA SK 3118
2SA 673	PNP, Si, EP	0.4	125	-0.5	-35	-35	-4	150	-0.5	-35	50	No.3	RCA SK 3114
2SA 708	PNP, Si, E	0.8	150	-0.7	-80	-60	-8	150	-0.1	-60	50	No.4	RCA SK 3203
2SB 505	PNP, Si, EP	15	175	-2	-80	-60	-10	80	-1	-60		No.5	
2SC 372Y	NPN, Si, EP	0.2	125	0.1	30		4		1		150	No.2	RCA SK 3044
2SC 458L	NPN, Si, EP	0.2	125	0.1	30	30	5	140 (100-500)	0.1	30	230	No.3	RCA SK 3124
2SC 943	NPN, Si, EP	0.3	150	0.2	60		8	150	0.5		220	No.4	RCA SK 3128
2SC1008	NPN, Si, E	0.8	150	0.7	80	60	8	160	0.1	60	50	No.4	
2SC1213A	NPN, Si, EP	0.4	125	0.5	35		4	180	0.5		50	No.3	RCA SK 3128
2SD 78A	NPN, Si, E	1	175	2	100	60	12	80	1	60		No.4	RCA SK 3024
2SC31													RCA SK 3024
2SK 40													RCA SK 3118

Notes 1. E; Epitaxial Transister
EP; Epitaxial Planar Transister
Si; Silicon Transister

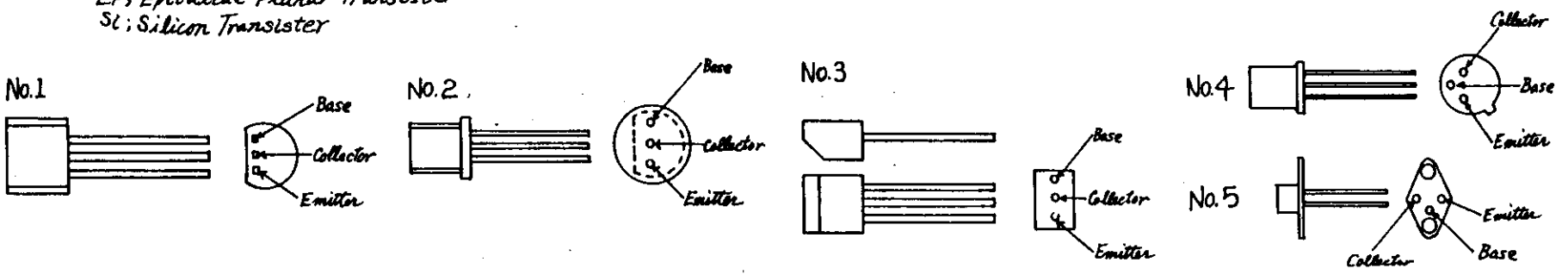


Figure 6 TRANSISTOR OUTLINE AND PIN ARRANGEMENT

APPENDIX

2. LINE KEY AND SWITCHES

a. $LK1_{8-9}$: LINE KEY No. 1, contact No. 8-9

b. HK_{1-2} : HOLD KEY, contact No. 1-2

c. HS1 : Hook-switch contact No. 1

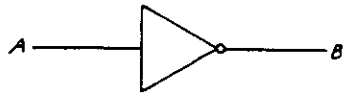
3. OTHER

a. $Q1_{b-e}$....TRANSISTOR No. 1, base to emitter junction
b. $Q2_{b-c}$....TRANSISTOR No. 2, base to collector junction
c. C1.....CAPACITOR No. 1
d. R1.....RESISTOR No. 1
e. T6a.....TERMINAL No. 6a on card connector
f. A46.....AMPHENOL CONNECTOR TERM A46

g. 120 IPM..INTERRUPTER, 120 Impulses per Minute
h. VR1.....VARIABLE RESISTOR No. 1
i. XF3.....TRANSFORMER No. 3
j. 450hz....TONE SOURCE, 450hz tone
k. Cable....Cable connection between KSU and Extension
l. MDF.....MAIN DISTRIBUTION FRAME
m. (+R).....BATTERY, PLUS RELAY

4. INTEGRATED CIRCUITS (IC)

a. INVERTERS

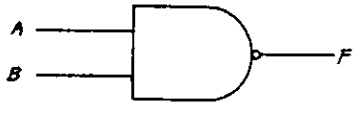


TRUTH TABLE

INPUT	OUTPUT
A	B ($\overline{A}$)
HIGH	LOW
LOW	HIGH

NOTE: $\overline{A}$ Indicates Inverted State

b. NAND GATE

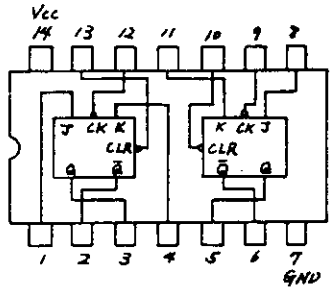


TRUTH TABLE

INPUT		OUTPUT
A	B	F
H	H	L
H	L	H
L	H	H
L	L	H

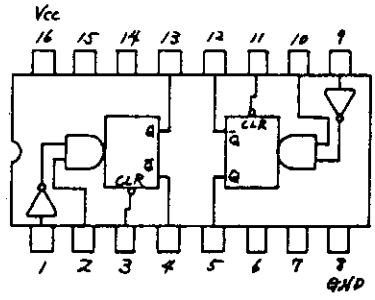
Note: H - HIGH STATE ≅ 5VDC
L - LOW STATE ≅ 0VDC

f. HD2530P DUAL J & K MASTER-SLAVE FLIP FLOP



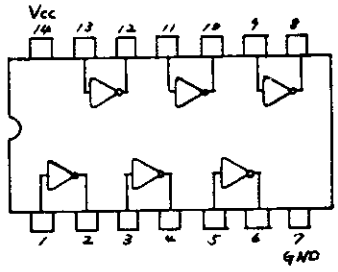
REPLACEMENT: SN74107

g. HD2561P DUAL RETRIGGERABLE
Monostable Multivibrator



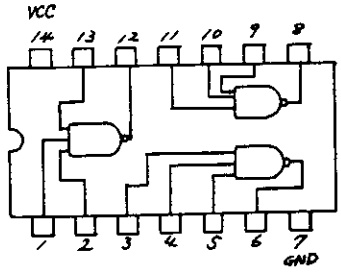
REPLACEMENT: SN74123

h. HD2522P HEX INVERTER



REPLACEMENT: SN7404

i. HD2507P TRIPLE 3-INPUT NAND GATE



REPLACEMENT: SN7410

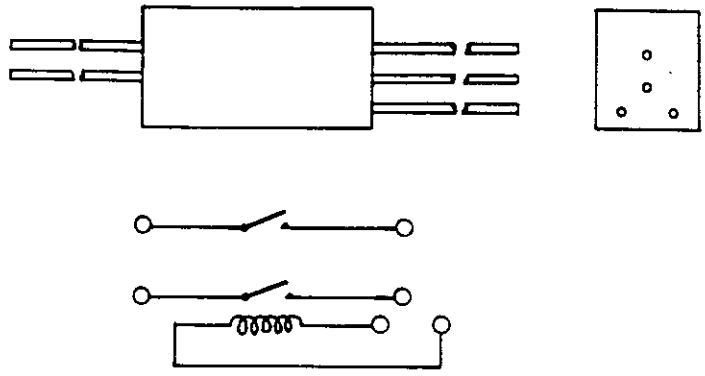
TABLE A RELAY TABLE

RELAY Type No.	Coils				Min. Op. Current (mA)	Min Hold Current (mA)	Contacts (Note)						
	Coil No.	Diameter (mm)	Turns	Resistance (ohms)			Pile-Up	0	1	2	3	4	5
M-101	P	0.09	9000	950	13.5		2PDT	BM					BM
	—												
M-107	P	0.09	6500	470	—		4PDT	BM	BM			BM	BM
	—												
M-108	P	0.09	6500	470	28.2		6PDT	BM	BM	BM	BM	BM	BM
	—												
M-111	P	0.09	6500	470	29.2		6PDT	MbB	MaB	MaB	MaB	MaB	MbB
	—												
M-112	P	0.09	6500	470	29.2		6PDT	MaB	MbB	MbB	MbB	MbB	MaB
	—												
M-172	P	0.08	10300	1300	12.5		4PST	M	M			M	M
	S	0.08	2400	780		19.0							
M-173	P	0.10	5450	400	30.0	11.0	4PDT	MaB	MaB			MaB	MaB
	S	0.08	3550	600									
M-174	P	0.09	5800	500	21.5		4PDT	BM	BM			BM	BM
	S	0.08	5800	1000									

Note MaB : Make after Break
MbB : Make before Break

2. Contact Rating: 200 ma. (max)

b. Outline and Pin Arrangement - Figure 5



B. SEMICONDUCTORS

1. TRANSISTORS

a. Electrical Characteristics: Table B
b. Outline and Pin Arrangement: Figure 6

2. Diodes

a. Electrical Characteristics: Table C
b. Outline and Pin Arrangement: Figure 7

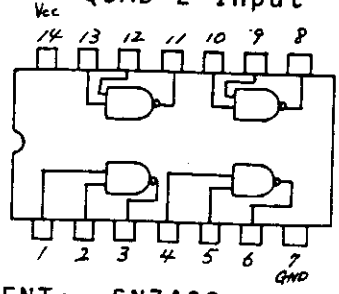
C. TRANSFORMERS

1. Electrical Characteristics: Table D

D. INTEGRATED CIRCUITS (IC)

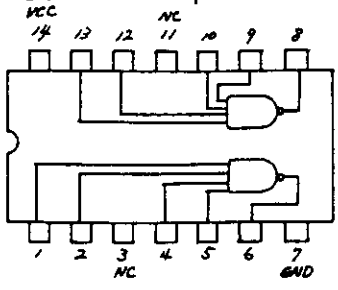
1. DIGITAL INTEGRATED CIRCUITS (IC)

a. HD2503P QUAD 2-Input NAND GATE



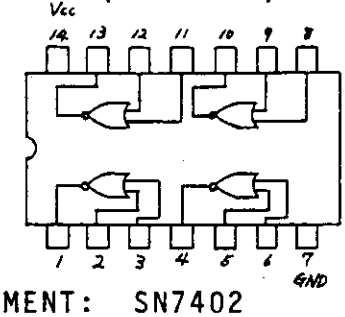
REPLACEMENT: SN7400

b. HD2504P DUAL 4-Input NAND GATE



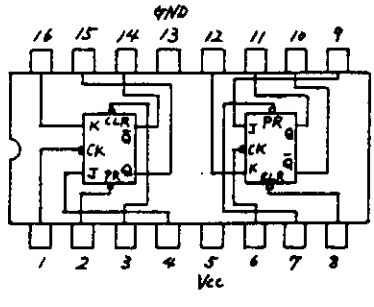
REPLACEMENT: SN7420

c. HD2511P QUAD 2-Input NOR GATE



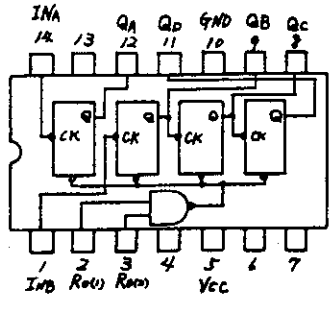
REPLACEMENT: SN7402

d. HD2516P DUAL J & K MASTER-SLAVE FLIP FLOP



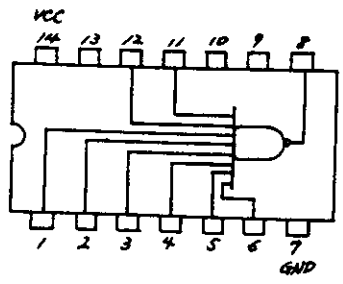
REPLACEMENT: SN74H106

e. HD2520P 4-BIT BINARY COUNTER

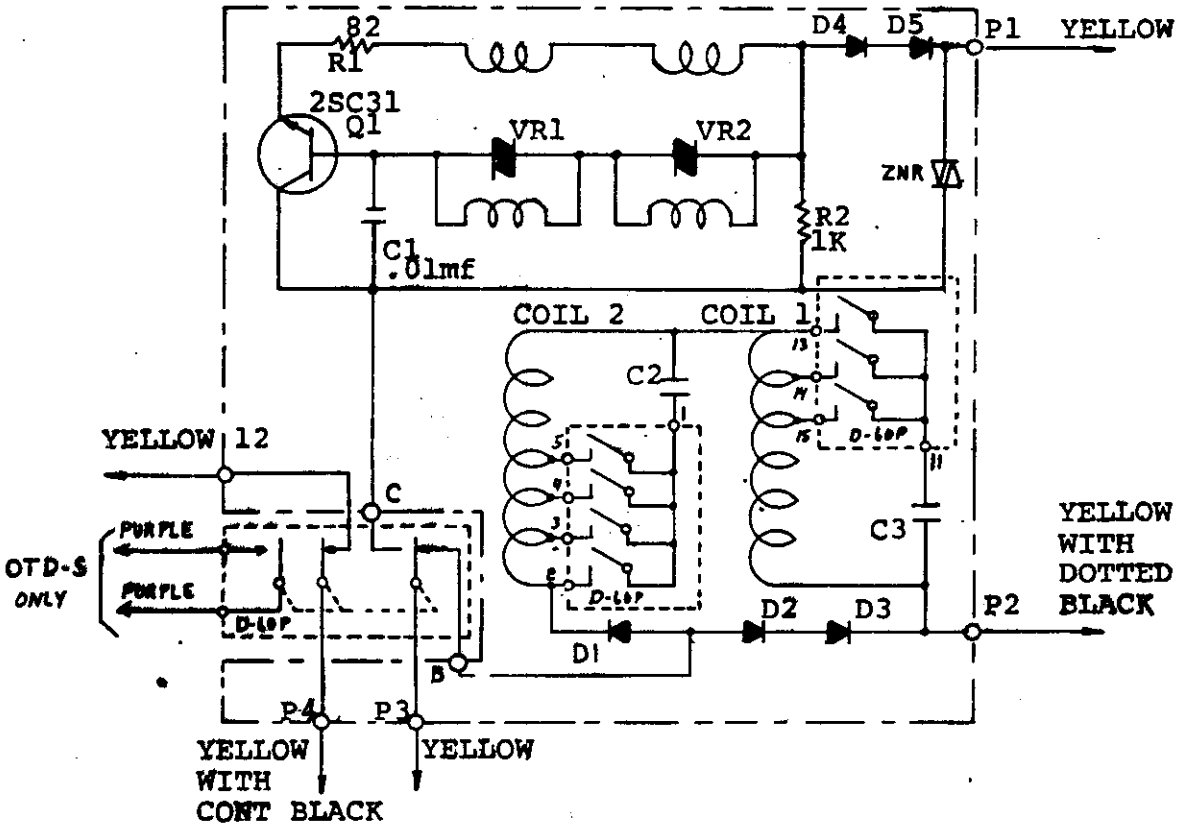


REPLACEMENT: SN7493

j. HD2508P 8-INPUT NAND GATE



REPLACEMENT: SN7430



PARTS LIST				
ITEM NO.	PART NO.	SYM. NO.	DESCRIPTION	QTY
1.			P.C.B. D-60P	1
		C1	CAPACITOR: .01mf +100-10%180V	1
		C2,3	NEC 3002HJ	2
		D1-5	DIODE: SD-60P	5
		Q1	TRANSISTOR: 2SC31	1
		VR1,2	VARISTOR: VR-60	2
		CO1	COIL:	1
		CO2		1
		R1	RESISTOR: 82 ¼W ±5%	1
		R2	1K 2W "	1
		ZNR		1

Figure 8b Omega Tone Dial OTD (OTD-S) Schematic And Components