TECHNICAL MANUAL
No. 11-5805-652-14

HEADQUARTERS
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Operator's, Organizational, Direct Support and General Support Maintenance Manual

CENTRAL OFFICE TELEPHONE, ELECTRONIC AN/FTC-37(V)1 AND AN/FTC-37(V)2 (TE-400 EPABX)

IDENTIFYING TECHNICAL PUBLICATION SHEET

I. IDENTIFICATION DATA

PURPOSE: This technical publication i's issued for the purpose of identifying an authorized commercial manual for Army use and for providing supplemental technical information hereto.

MANUFACTURER: ITT Telecommunications
2107 Swift Drive
Oak Brook, Illinois 60521

Equipment:	*Supplied under Contract No.:*
Electronic Telephone Central Office AN/FTC-37(V)2	DAAB07-71-c-007 DAAB07-72-C-0116
Electronic Telephone Central Office AN/FTC-37(V)1	DAAB07-72-C-0103

TITLE: ITT Telecommunications Electronic Private Automatic Branch Exchange Installation Maintenance Manual

II. SUPPLEMENTAL DATA

1. LIST OF AFFECTED PAGES IN BASIC MANUAL.

Section No.	*Page No.*
I	1-1
II	2-1, 2-2, 2-3, 2-4
III	3-1, 3-2, 3-6, 3-9
IV	4-1, 4-31
V	5-1, 5-2, 5-5, 5-10, 5-11, 5-12
XII	12-7, 12-9, 12-10
XIII	13-1. 13-2

a. SUPPLEMENTARY INFORMATION. The information contained in the above identified commercial manual is supplemented as follows:

a. Introduction/Scope
b. Pre-Installation
c. Cabinet Familiarization
d. Power-off Connection and Tests
e. Power-On Adjustment
f. General Operational Description
p. Trouble Detection and Repair
h. Console Operation

PART A

INTRODUCTION

Section I. GENERAL

1-1. Scope

a. This manual contains procedures for operating, installing and making Elec- ionic Telephone Central Office AN/FTC-37(V)1 **(100-line Electronic Private Au**tomatic Branch **Exchange (EPABX) system)** and AN/FTC **37(V)2 (200-line EPABX system). These procedures include operation, i**nstallation, and **maintenance instructions for the K–500 Series Key Service Units (KSUs) a**nd for the NE-3 **speakerphone system, used** with AN/FTC-**37(V)1 and AN/FTC–37(V) 2. T**his manual also **contains operating procedures for Control Monitor C–9263/FTC (Attendant's Console), used with AN/FTC–37(V)1, an**d Control Monitor **C–8958/FTC, the attendant's** console used with **AN/FTC–37(V)2.**

b. **For a listing of applicable publications referred to in this manual, refer to appendix A, References.**

c. Refer to appendix B for the Maintenance Allocation Chart (MAC).

d. For identification of the component parts comprising the equipments covered in this manual, refer to TM 11-5805-652-24P, Repair Parts and Special Tools List (RPSTL).

1-2. Indexes of Publications

a. ***DA Pam*** 310-4. Refer to the latest issue of DA Pam 310-4 to determine whether there are new editions, changes, *or* additional publications pertaining to the equipment.

b. DA Pam *310-7.* Refer to DA Pam 310-7 to determine whether there are modification work orders (MWOs) pertaining to the equipment.

1-3. Forms and Records

a. Reports *of Maintenance and Unsatisfactory* ***Equipment.*** Maintenance forms, records, and reports which are to be used by maintenance personnel at all maintenance levels are listed in and prescribed by TM 38-750.

b. Report *of* ***Packaging*** and ***Handling De***ficiencies. Fill out and forward DD Form 6 (Report of Packaging and Handling Deficiencies) as prescribed in AR 700-58/NAVSUP PUB 378/ AFR 71-4/MCO P4030.29, and DSAR 4145.8.

C. Discrepancy in Shipment Report (DIS-REP) (SF 361). Fill out and forward Discrepancy in Shipment Report (DISREP) (SF 361). as prescribed in AR 55-38/NAVSUPINST 4610.33/AFM 75-18/MCO P4610.19A, and DSAR 4500.15.

1-4. Reporting of Errors

Report of errors, omissions, and recommendations for improving this publication by the individual user is encouraged. Reports should be submitted on DA Form 2028, Recommended Changes to Publications and Blank Forms, and forwarded direct to Commander, US Army Electronics Command, ATTN: AMSEL-MA-CW, Fort Monmouth, NJ 07703.

Section II. DESCRIPTION AND DATA

1-5. Purpose and Use

Refer to supplement section I, page l-l, paragraph 1.0. Refer also to the two pages preceding page l-l. Thes pages, unnumbered, are titled "Identifying Technical Publication Sheet" and "Introduction," **and are located in part** *ONE* **of** this manual (as indicated in the table of contents).

1-6. Description

Refer to supplement section I, page l-l, paragraph 2.0 (part ONE).

1-7. Difference **Between Models**

Refer to supplement section I, page l-l, paragraph 2.0 (part ONE). Refer also to paragraph 1-3 below.

1-8. Items Comprising an Operable Equipment

Refer to supplement section I, page 1-2, table l-l, (part ONE), for a description of major equipments comprising the AN/FTC-37(V)1 and the AN/FTC-37(V)2. The AN/FTC-37(V)1 and the AN/FTC-37(V)2 and the major equipments comprising them are further described below. The used-on codes employed for identifying and sociating these equipments are defined as follows:

A-AN/FTC-37(V)1
B-AN/FTC-37(V)2
C-OA-8721/FTC37(V)
D-OA-8658/FTC-37(V)
E-OA-8659/FTC-37(V)
F-OP-83/FTC-37(V)
G-OP-71/FTC-37(V)

FSN	Qty (ea)	Nomenclature	Mfr's Part No	Used-On Code						
				A	B	C	D	E	F	G
5805-155-8029	1	Central Office, Telephone, Electronic AN/FTC-37(V)1	6287302							
5805-134-8419	1	Central Office, Telephone, Electronic AN/FTC-37(V)2	6287266							
5805-001-4071	1	Line Circuit and Matrix Switching Group OA-8721/ FTC-37(V)	130203-101 (modified)	x						
5805-134-8412	1	Line Circuit and Matrix Switching Group OA-8658/ FTC-37(V)	130097-1		x					
5805-136-9014	1	Line Circuit and Matrix Switching Group OA-8659/ FTC-37(V)	130097-1		x					
5805-155-8030	1	Power Supply Group OP-83/ FTC-37(V)	6287294	x						
5805-134-8415	1	Power Supply Group OP-71/ FTC-37(V)	6287263		x					
5805-155-8041	1	Control Monitor C-9263/FTC	316199(2)122	x						
5805-134-8414	1	Control Monitor C-8958/FTC	316199(2)122		x					
5830-139-1054	1	Power Supply Assembly	616300(1)122	x	x				x	x
5830-139-1055	1	Power Supply Assembly	616300(2)122	x	x				x	x
5830-139-1056	1	Power Supply Assembly	316300(3)122	x	x				x	x
5830-162-4449	1	Power Supply Assembly	316300(4)122	x	x				x	x
5830-138-4832	10	Line Circuit Assembly	316040(1)122			x	x	x		
5830-159-5969	10	Line Circuit Assembly	316040(2)122			x	x	x		
5830-138-4829	2	Originate Control and Group Generator Assembly	616029(1)122			x	x			
5805-147-5596	2	Originate Control and Group Generator Assembly	316029(2)122					x		
5895-005-2463	3	Register Assembly	316302(1)122			x	x	x		
5805-160-8948	1	Group Hunt Assembly	316045(1)122			x	x			
5805-160-8948	3	Group Hunt Assembly	316045(1)122					x		
5839-138-4831	2	System Alloter Assembly	316039(1)122			x	x			
5805-150-1754	2	System Allotter Assembly	316039(3)122					x		
5805-168-4928	12	Junctor Assembly	316024(1)122			x	x	x		
5830-138-4836	1	Override Attendant Assembly	316062(3)122			x	x			
5830-150-1747	1	Override Attendant Assembly	316062(4)122					x		
None Assigned	1	Miscellaneous Panel Assembly	130046-5 (modified)			x				
None Assigned	1	Miscellaneous Panel Assembly	130046-1 (modified)				x			
Non Assigned	1	Miscellaneous Panel Assembly	130046-2 (modified)					x		
5830-138-4834	1	Class of Service Assembly	316043(2)122			x	x	x		
5830-153-9422	1	Class of Service Assembly	316043(3)122							
5805-148-0674	2	Primary-Secondary Matrix Assembly	316065(16)122			x	x	x		
None Assigned	1	Tertiary-Quarternary Matrix Assembly	316041(11)122			x				
5805-148-0673	1	Tertiary-Quarternary Matrix Assembly	316041(12)122				x			

FSN	Qty (ea)	Nomenclature	Mfr's Part No	Used-On Code						
				A	B	C	D	E	F	G
5805-148-0673	1	**Tertiary-Quarternary Matrix Assembly**	316049(12)122							
5830-139-1058	1	5V Supply and Alarms, Assembly	316301(1)122			x	x	x	x	
5830-139-1040	1	Main Alarm Voltage Check Assembly	316069(2)122			x	x		x	
5830-139-1041	1	voltage check Supply Assembly	316070(2)122			x	x		x	
5830-138-4838	1	System Main Alarm Assembly	316068(2)122			x	x			
5830-138-4830	2	Tone Supply Assembly	316037(1)122			x	x			
5830-138-4835	1	Public Address Assembly	316047(1)122			x	x			
5895-009-1113	1	Conference Assembly	316077(1)122			x	x			
None Assigned	1	Attendant% Control Assembly	316035(2)122			x	x			
5805-147-5595	1	Attendant% Trunk and Allotter Assembly	316073(2)122			x	x			
5830-150-1748	1	Attendant's Trunk Assembly	316099(2)122			x	x			
None Assigned	6	City Trunks Assembly	316075(4)122			x				
None Assigned	1	Trunk Allotter Assembly	316034(2)122			x				
None Assigned	1	Unassinged Night Answering Assembly	316036(6)122			x				
None Assigned	1	Assigned Night Answering Assembly	316042(1)122			x				
None Assigned	1	Series Voltage Regulator Assembly	316141(3)122			x				
None Assigned	1	Miscellaneous Panel Assembly	6287303			x				
None Assigned	1	Miscellaneous Panel Assembly	6287264				x			
5805-169-5017	1	Power Supply Assembly	316300(6)122					x	x	
5805-169-5018	1	Power Supply Assembly	316300(6)122					x	x	
5805-162-4444	1	Power Supply Assembly	316300(7)122					x	x	
5805-460-8820	1	Power Supply Assembly	361300(8)122					x	x	

PART ONE

SUPPLEMENT

EPABX INSTALLATION **AND** MAINTENANCE DATA

I N T R O D U C T I O N

PURPOSE OF SUPPLEMENT.

This supplement extends coverage of the ITT Telecommunications TE-400 EPABX Installation and Maintenance commercial manual. The purpose of the supplementary material provided IS twofold. First, it supplies additional material needed to expand the basic commercial manual. Secondly, it provides material to cover the No-Break Power modifications that have been incorporated into Electronic Telephone Central **Office** AN/FTC-37(V)2 (200-line **EPABX sys**tern) and Electronic Telephone Central Office AN/ FTC-37(V)1 (100-line EPABX system).

This supplement consists *of two parts: Part 1, Sup*plement EPABX Installation and Maintenance Data, contains both additional data to supplement the basic manual and data covering the No-Break Power Modification; Part 2, Console Operation, contains additional data on console operation. Refer to Repair Parts and Special Tools List for component Parts Identification information.

USE OF SUPPLEMENT.

The 200-line **EPABX** system is similar to the 100-line EPABX system. This supplement covers both systems. Certain paragraphs in this supplement are applicable to the 200-line and/or 100-line EPABX systems. The paragraph text is prefixed with system identification (200-line) 200-line EPABX system or (100-line) 100-line EPABX system as applicable. The **designation** assigned for a numbered paragraph will also apply to all sub-paragraphs unless otherwise indicated. The absence of the prefix designates that the paragraph is applicable to both 200-line and 100-line EPABX systems.

The contents of this supplement should be examined by all **users of EPABX** equipment to familiarize themselves with the supplemental data provided and also to ascertain what material in the basic manual has been augmented. The following sections in the basic manual have been supplemented:

Section I	scope
Section II	Pre-Installation
Section III	Cabinet Familiarization
Section IV	Power-Off Connection and Test
Section V	Power-On Adjustment
Section XII	General Operational Description
Section XIII	Trouble Detection and Repair

Supplement

Section I

CONTENTS

Tables

Supplement

Section I

SCOPE

1.0 GENERAL

The installation and maintenance information provided herein supplements the installation and maintenance data provided in the basic EPABX commercial manual. In addition, material is provided to cover the No-Break Power modification. Table 1-1 lists the components of the EPABX, the official nomenclature, common name and manufacturer's part number.

2.0 EQUIPMENT DESCRIPTION

The components that make up the various configuration of EPABX are listed in table l-l. The differences between for example, a *100*-line EPABX and a 200-line EPABX is basically in the No-Break Power system. Differences within the functional areas of the EPABX can be found within the appropriate EPABX configuration satellite drawings and in the basic commercial manual. Thedifferences between the 200-line and 100-line EPABX No-Break Power system is discussed below:

(200 Line) The 200-line EPABX system with No-Break Power modification consists of three cabinets. Cabinet No. 1 is a basic unit with minor changes resulting from the No-Break Power modification. The changes involve the modification of the Miscellaneous Panel Assembly and the addition of an audible alarm to signify when a system main alarm occurs. Cabinet No. 2 is a basic unit with minor changes also made to the Miscellaneous Panel Assembly. Cabinet No. 3 contains the No-Break Power supplies. The No-Break Power modification, as described in this supplement, is not the same option described in the basic manual; that is, battery standby power is not provided. The No-Break Power modification consists of the addition of a third cabinet housing a duplicate set of power supplies as provided in cabinets 1 and 2. The standby power supplies are connected through control circuitry to the power bus bars as are the primary power supplies. If a primary power supply fails, control circuitry will automatically remove the defective supply from the bus bar and the standby power supply will assume the full load with no break in service.

(100 Line) The 100-line EPABX system with No-Break Power modification is similar in design to the 200-line EPABX system except that the 100-line EPABX No-Break power supply cabinet contains one set of power supplies. The power supplies used in both cabinets are identical to the ones used in the 200-line EPABX system. The 100-line EPABX functions are all located in the Line Circuit and Matrix Switching Group OA-8721/FTC-37(V) (Cabinet 1). The changes made to this cabinet are the same as those &scribed for the 200-line EPABX. If a primary power supply in cabinet 1 fails, control circuitry will automatically *remove* the defective supply from the bus bar and the standby power supply in the No-Break cabinet will assume the full load with no break in service.

3.0 TEST EQUIPMENT

Table 1-2 lists the test equipment required for direct support maintenance.

4.0 INSTALLATION DRAWINGS

Installation drawings supplied with the equipment are referenced in this supplement. Consult the Installation Specifications drawing, which is a part of the installation drawing package supplied with your equipment, for a list, by title and number, of all the installation drawings required. A basic complement of the types of drawings normally supplied in this installation drawing package are as follows:

(a) Location and Plant Plan
(b) Equipment Layout and Installation Details
(c) Cable Carrier Layout and Installation Details
(d) Cabling Diagram
(e) Distribution Frame Layout
(f) Wire Run List
(g) Consolidated List of Materials

A specific installation drawing will be referenced by drawing type only. Consult the Installation Specifications &awing list for the drawing number applicable to your facility.

5.0 PACKAGING DATA

The EPABX is packaged in accordance with specification MIL-P-116, Method 11. The equipment cabinets are packaged in individual woo&n shipping crates. Corners and sharp edges of cabinets are covered with cushioning material to protect the vaporproof barrier.

6.0 PREPARATION FOR RESHIPMENT

Repackaging of equipment for shipment or limited storage will normally be performed at a packaging facility or by a repackaging team. Should emergency packaging be required, select the materials from those listed in SB 38-100, Preservation, Packaging, and Packing Materials, Supplies, and Equipment Used by the Army. Package the equipment in accordance with the original packaging, so far as possible, or with the available materials.

Table 1-1. Official Nomenclature to Common Name

Official Nomenclature	Common Name	Mfr. Part No.	Cabinet No.
Central Office, Telephone, **Electronic AN/FTC-37(V)2** consisting of:	**200-Line EPABX**	**6287266**	--
Line Circuit and **Matrix Switching** Group **OA-8658/FTC-37(V)**	**Matrix Switching Group**	**130097-1**	1
Line Circuit and **Matrix Switching Group** OA-8659/FTC-37(V)	**Switching Group**	**130097-1**	2
Power Supply Group OP-71/FTC-**37(V)**	No-Break **Cabinet**	**6287263**	3
Control-Monitor C-8958/FTC	**Console**	**316199(2)122**	**N/A**
Central Office, Telephone, Electronic **AN/FTC-37(V)1 consisting of:**	**100-Line EPABX**	**6287302**	--
Line Circuit **and Matrix Switching Group** OA-8721/FTC-37(V)	**Matrix Switching Group**	**130203-101 (Modified)**	**1**
Power Supply Group OP-83/FTC-37(V)	**No-Break Cabinet**	**6287294**	**2**
Control-Monitor C-9263/FTC	**Console**	**316199(1)122**	**N/A**

Table 1-2. Test Equipment

Test **Equipment**	**Mfr. Part No.**	**Nomenclature or** FSN
Multimeter	**Simpson 260**	**AN/USM-210**
Oscilloscope	**HP120B**	**6625-016-1874**
Card Extender	**130587-1**	
Card Extender	**130587-2**	
Card Extender	**130587-3**	
Card Extender	**130680-1**	
Hand Test Telephone	**Automatic Elec. L-9066-CF**	
Cord and Plug Assy.	**Automatic Elec. D-543142-A**	

Section II

CONTENTS

Section II

PRE-INSTALLATION

1.0 GENERAL

1.1 **AC Input Per No-Break Cabinet**

(200 Line, Cabinet No. 3)
(a) 115VAC, 60 Hz, 30 Amp

(100 Line, Cabinet No. 2)
(b) 220VAC, 50 Hz, 15 Amp

1.2 **AC Power Protection Per No-Break Cabinet**

(200 Line, Cabinet No. 3)
(a) 30 Amp circuit breaker per 115VAC input

(100 Line, Cabinet No. 2)
(b) 15 Amp circuit breaker per 220VAC input

1.3 **External AC Cabling Per Bay**

Refer to **appropriate** Installation **drawing.**

1.4 External DC Power Requirements

Not applicable.

1.5 Grounding

Refer to Section III, **Fig.** 3-1, in basic manual **and** appropriate Installation drawing.

2.0 EQUIPMENT CAPABILITIES AND STANDARD CONFIGURATION

2.1 (200 Line) Power Equipment

The power supply equipment provided consists of a primary and a No-Break back-up secondary arrangement.

2.1.1 Primary **Power Supply (316300)**

The primary power supply equipment consists of four individual power modules mounted vertically at the extreme left side of cabinets 1 and 2 at levels D-G. The power modules in cabinet 1 are cross-connected to modules of similar output in cabinet 2. The power modules in cabinet 1 are the master units while those in cabinet 2 are the slave units. All voltage adjustments are made in the master units. The combined outputs of master and slave modules are applied to common bus bars in cabinets 1 and 2 through two power relays. Refer to System Power and Miscellaneous Frame Circuit (Mod) drawings.

2.1.2 **Ho-Break Power** Supply **(316300)**

The No-Break back-up power **supply equ**ipment consists of eight individual power **modules** mounted in cabinet 3. Four modules(master units) are mounted vertically at the left at levels D-G **while four** modules **(slave units) are mounted vertically at** the **right also at levels D-G. The modules** at the left are cross-connected to the **modules at the right with similar outputs. The combined outputs of master and slave modules are applied to commonbus bars in cabinets 1 and 2 through two power relays located in cabinet 3. Refer to System Power and Miscellaneous Frame Circuit** (Mod) **drawings.**

2.2 (100 Line) Power Equipment

The power supply equipment provided consists of a **primary and a No-Break** back-up **secondary arrangement.**

2.2.1 Primary Power Supply (316300)

The primary power supply equipment is the same as described in paragraph 2.1.1 and is also located in cabinet 1. The difference being that the power supply outputs are cross-connected to modules of similar outputs in the No-Break cabinet. The outputs of cabinet 1 modules are applied to a common bus bar in cabinet 1 through a power relay. Refer to System Power and Miscellaneous Frame Circuit (Mod) **drawings.**

2.2.2 No-Break Power Supply (316300)

The No-Break back-up power supply equipment consists of four individual power modules mounted in the No-Break cabinet (cabinet 2). The four modules are mounted vertically at the left at levels D-G. The outputs of the modules are applied to common bus bars in cabinet 1 through a power relay located in cabinet 2. Refer to System Power and Miscellaneous Frame Circuit (Mod) drawings.

Section III

CONTENTS

FIGURES

Section III

CABINET FAMILIARIZATION

1.0 PRELIMINARY INSTALLATION PROCEDURE

1.1 **Place equipment in the assigned applicable place. Refer to Fig. 3-1 in the basic manual and applicable Equipment Layout and Installation Detail drawings.**

Unpack the equipment and inventory. Use applicable Consolidated List of Materials drawing to check items.

2.0 SYSTEM CABINET DESCRIPTION

2.1 200-Line Cabinets No. l and 2 and 100-Line Cabinet No. 1

The first and second cabinet of the 200-line EPABX system and the first cabinet of the 100-line EPABX system is described in the basic manual.

2.2 No-Break Power Cabinet (Fig. 3-1 and 3-2)

Figure 3-1 illustrates the No-Break **Power configuration for the 200-line EPABX cabinet No. 3. Figure 3-2 illustrates the** No-Break Power configuration **for the 100-line EPABX cabinet No. 2. Only levels C through G of these cabinets are used. Level C is designated Attendant Control Sub-Back.** However, this level contains only three printed circuit boards in the No-Break Power configuration. The DC power supplies are equipped on levels D through G.

3.0 PRINCIPAL ITEMS **LOCATIONS**

3.1 **System** Test Panel

The No-Break Power cabinets are equipped with a modified version **of** the System Test Panel illustrated in **Fig.** 3-8 of the basic manual. The No-Break cabinets have only a voltage check pushbutton (labeled V. C. RESET).

3.2 No-Break Power Cabinet, AC Power Source, DC Power **Supplies** and Blower Locations

Remove rear door and face rear. Refer to No-Break Power Cabinet assembly drawing.

3.2.1 The blower input and filter input are located at the bottom left.

NOTE: Blockage of blower input will remove power from the system.

3.2.2 The **AC** power transformers and their associated capacitors are positioned at the bottom right.

3.2.3 **The AC power cord access entrance is located between the blower input and** AC **power transformer.**

3.3 (200 Line) Miscellaneous Panel Assembly **(Fig. 3-3, 3-4, and 3-5)**

Facing the rear of a cabinet, the miscellaneous panel assembly is on the inside right.

3.3.1 **cabinet 1** Miscellaneous Panel Assembly (Fig. 3-3)

Letters A, B, C etc., have been assigned to individual **items of** the panel assembly. The items are **identified below:**

A - **AC** Circuit Breaker for Cabinets 1 and 2
B - VC Transformer Fuse, 5VDC Supply, Blower Fuses, and 3 VDC Power Relay
C - Spare Fuses
D - Voltage Check Transformer
E - **Power Relay**
F - Ring Generator
G - Ring Generator Suppression Assembly, and Diodes CRA3, **CRA4**
H - PFCT1, PFCT2, Auxiliary Relay, and RL1
J - MC1 through MC5 (5VDC Supply)
K - MB1 (5VDC Supply Rectifier), and Diodes **CR5A,** CR5B
L - Q1, MR1, and MCB (5VDC Supply
M - TE Resistor Assembly and RV1, RV2, SCR1, RV21, RV22
N - TE Resistor Assembly PCB
O - Miscellaneous Panel Assembly, Connector Block

3.3.2 Cabinet 2 Miscellaneous Panel Assembly (Fig. 3-4)

Letters **A,** B, C etc., have been assigned to individual items of the panel assembly. The items are identified below:

A - Not Used
B - VC Transformer Fuse, 5VDC Supply, and Blower Fuses
C - Spare Fuses
D - Voltage Check Transformer
E - Power Relay
F - Ring Generator

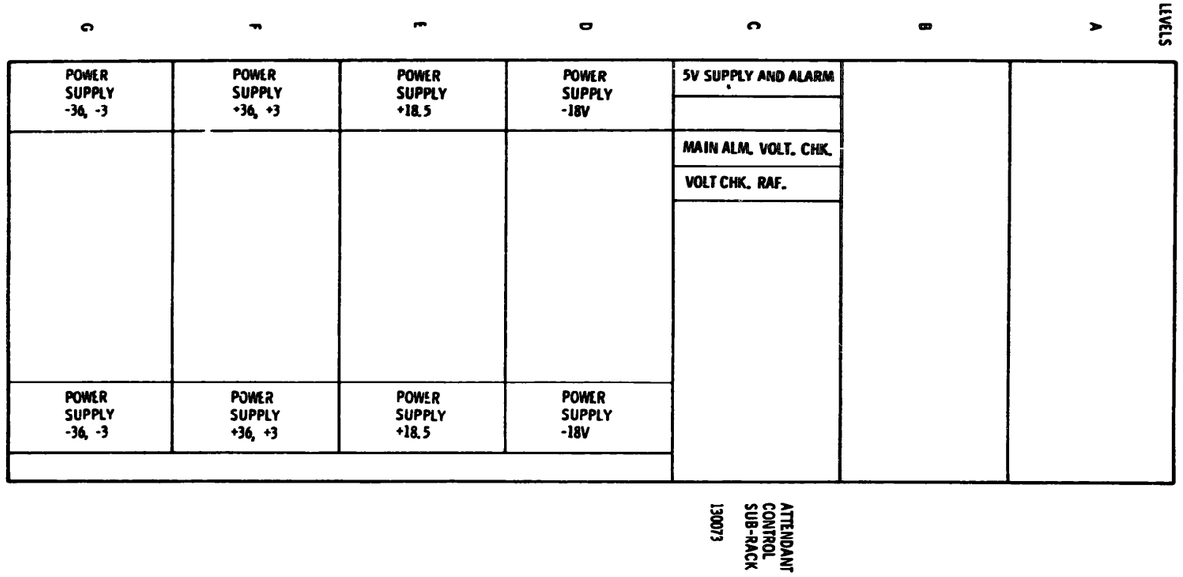

Figure 3-1. 200-Line EPABX No-Break Power Configuration.

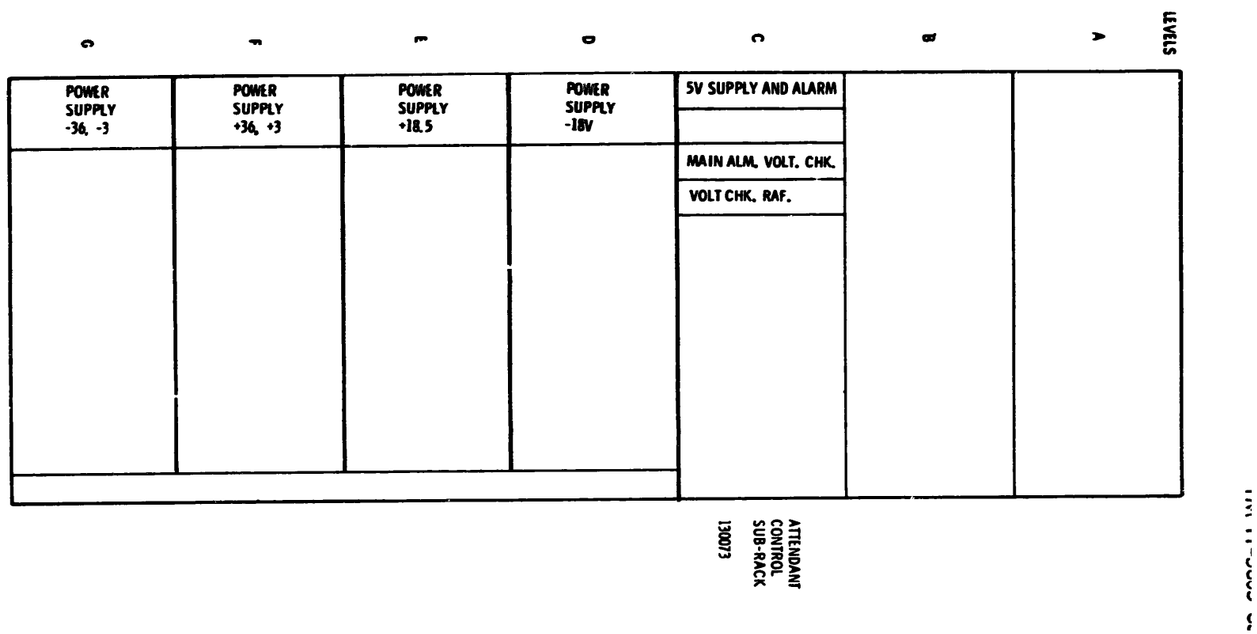

Figure 3-2. 100-Line EPABX No-Break Power Configuration

	0	1	2	3	4	5	6	7	8	9	10	11
00	U0	U1	U2	U3	U4	U5	U6	U7	U8	U9	17R2 R	SR2 R
01	T0	T1	T2	T3	T4	T5	T6	T7	T8	T9	17R2 S	SR2 S
02	H0	H1	H2	H3	H4	H5	H6	H7	H8	H9	RRG2	APS
03	MC1	MC2	MC3	MC4	BO	CD	S1-1	S1-2	S2-1	S2-2		
04	LT1	LR1	LT2	LR2	LT3	LR3	ST1	ST2	ST2	SR2	ST3	SR3
05	TT1	TR1	TT2	TR2	TT3	TR3	CT1	CR1	CT2	CR2	CT3	CR3
06	PR2	PR3	PR4	RV1	RV2	RG	+36 T	+18.5 T	-18 T	-36 T	-3	+3

	0	1	2	3	4	5	6	7	8	9	10	11
07	SCR1	IR1	X1	MC5	+5	+5	+5					
08	U0	U1	U2	U3	U4	U5	U6	U7	U8	U9		
09	T0	T1	T2	T3	T4	T5	T6	T7	T8	T9		
10	H0	H1	H2	H3	H4	H5	H6	H7	H8	H9		
11												
12												
13				VC RST	ALRM	BLWR	+5	+5	+5	+5	-3	+3

Pin Designations for Terminal Block Assemblies

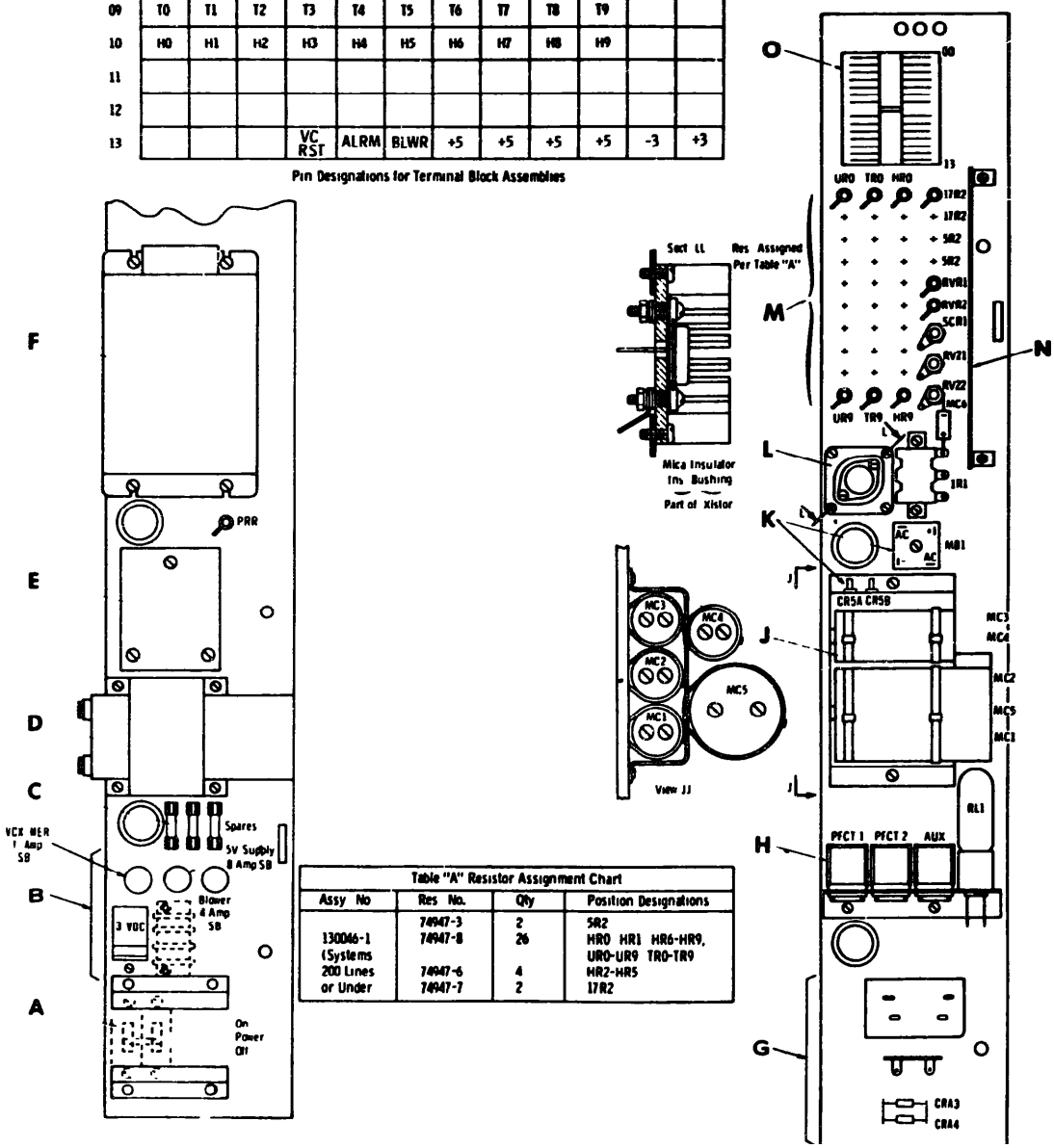

Table "A" Resistor Assignment Chart

Assy No	Res No.	Qty	Position Designations
130046-1 (Systems 200 Lines or Under	74947-3	2	SR2
	74947-8	26	HR0 HR1 HR6-HR9, UR0-UR9 TR0-TR9
	74947-6	4	HR2-HR5
	74947-7	2	17R2

Figure 3-3. 200-Line EPABX, Cabinet 1 Miscellaneous Panel Assembly.

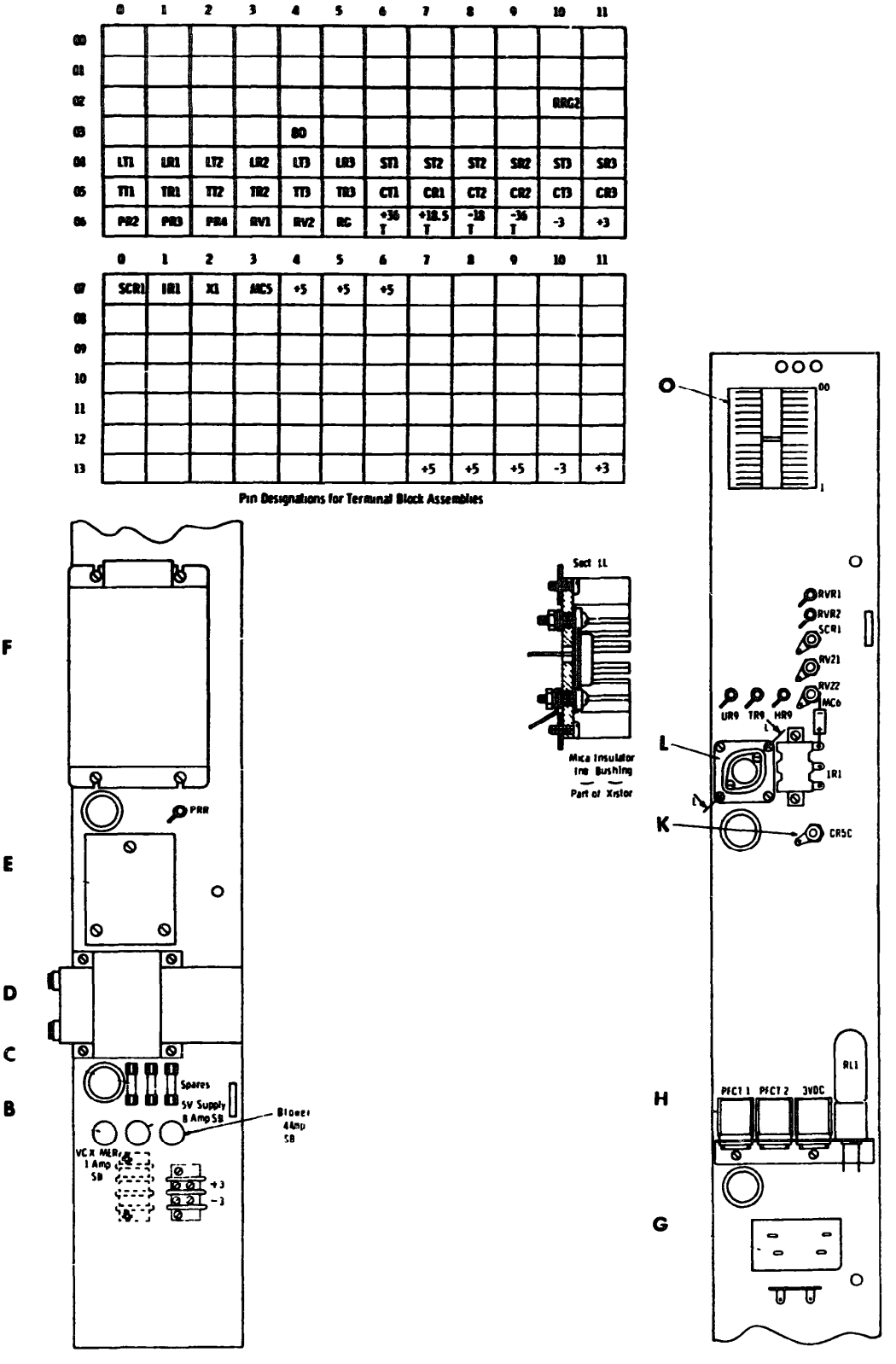

Figure 3-4. 200-Line EPABX, Cabinet 2 Miscellaneous Panel Assembly.

G - Ring Generator Suppression Assembly
H- PFCT1, PFCT2, 3VDC **Power Relay, aid RL1**
J - Not Used
K- Diode CR5C
L Q1, MR1, and MCB (5VDC Supply)
Y- Not Used
N- Not Used
O - Miscellaneous Panel Assembly, Connector Block

3.3.3 cabinet 3 Miscellaneous Panel Assembly (Fig. 3-5)

Letters **A,** B, C, etc., have been assigned to individual items of the panel assembly. The items are identified below:

A - AC Circuit Breaker
B - VC Transformer Fuse, 5VDC Supply, and Blower Fuses
C - *Spare* Fuses
D - Voltage Check Transformer
E - Power Relay
F - Power Relay
G - Diodes CRA1, CRA2
H - Relay No. 2
J - MC1 through MC5 (5VDC Supply
K - MB1 (5VDC Supply Rectifier)
L - Q1, MR1, and MCB (5VDC Supply)
M - MR2, CR5D, CR5E, CR5F, SCR1
N - Q2
O - Miscellaneous Panel Assembly, Connector Block
P - Diode CRB1

3.4 (100 Line) Miscellaneous Panel Assembly (Fig. 3-6 and 3-1)

Facing the rear of a cabinet, the miscellaneous panel assembly is on the inside right.

3.4.1 Cabinet 1 Miscellaneous Panel Assembly (Fig. 3-6)

Letters A, B, C, etc., have been assigned to individual items of the panel assembly. The items are identified below:

A - **AC** Circuit Breaker *for* Cabinet 1
B - VC Transformer Fuse, **5VDC** Supply, Blower Fuses, and 3VDC Power Relay
C - Spare Fuses
D - Voltage Check Transformer
E - Power Relay
F- Ring Generator
G- Diodes CRA3, CRA4
H - PFCT1, PFCT2, Auxillary Relay, and RL1
J - MC1 through MC5 (5VDC Supply
K - MB1 (5VDC Supply Rectifier) and Diodes CR5A, CR5B
L - Q1, MR1, and MCB(5VDC Supply)
M- TE Resistor Assembly and RV1, RV2, SCR1, RV21, RV22
N - TE Resistor Assembly PCB
O - Miscellaneous Panel Assembly, Connector Block

3.4.2 Cabinet 2 Miscellaneous Panel Assembly (Fig. 3-7)

Letters A, B, C, etc., have been assigned to individual items of the panel assembly. The items are **identified below:**

A - **AC** Circuit Breaker
B - VC Transformer Fuse, 5VDC Supply, and Blower Fuses
C- Spare Fuses
D - Voltage Check Transformer
E - Power Relay
F - Diodes CRA1, CRA2
G - Relay No. 2 (AUK)
H - MC1 through MC5 *(5VDC Supply)*
J - MB1 (5VDC Supply Rectifier)
K - Q1, IR1, and MCB(5VDC Supply)
L - CR5D CR5E, SCR1
M - Miscellaneous Panel Assembly, Connector Block
N - Diode CRB1

3.5 No-Break Cabinet Horizontal and Vertical Bus Bars

Refer to basic manual for description of the No-Break Cabinet horizontal and vertical bus bars.

3.6 No-Break Cabinet Printed Circuit Board **Locations**

For location of PCB's on 200-line No-Break cabinet, see Fig. 3-1, on 100-line No-Break cabinet, see Fig. 3-2. **Each** PCB is inserted into the appropriate female connector and each has a distinct plug arrangement that prevents inadvertent insertron of the PCB into an incorrect position.

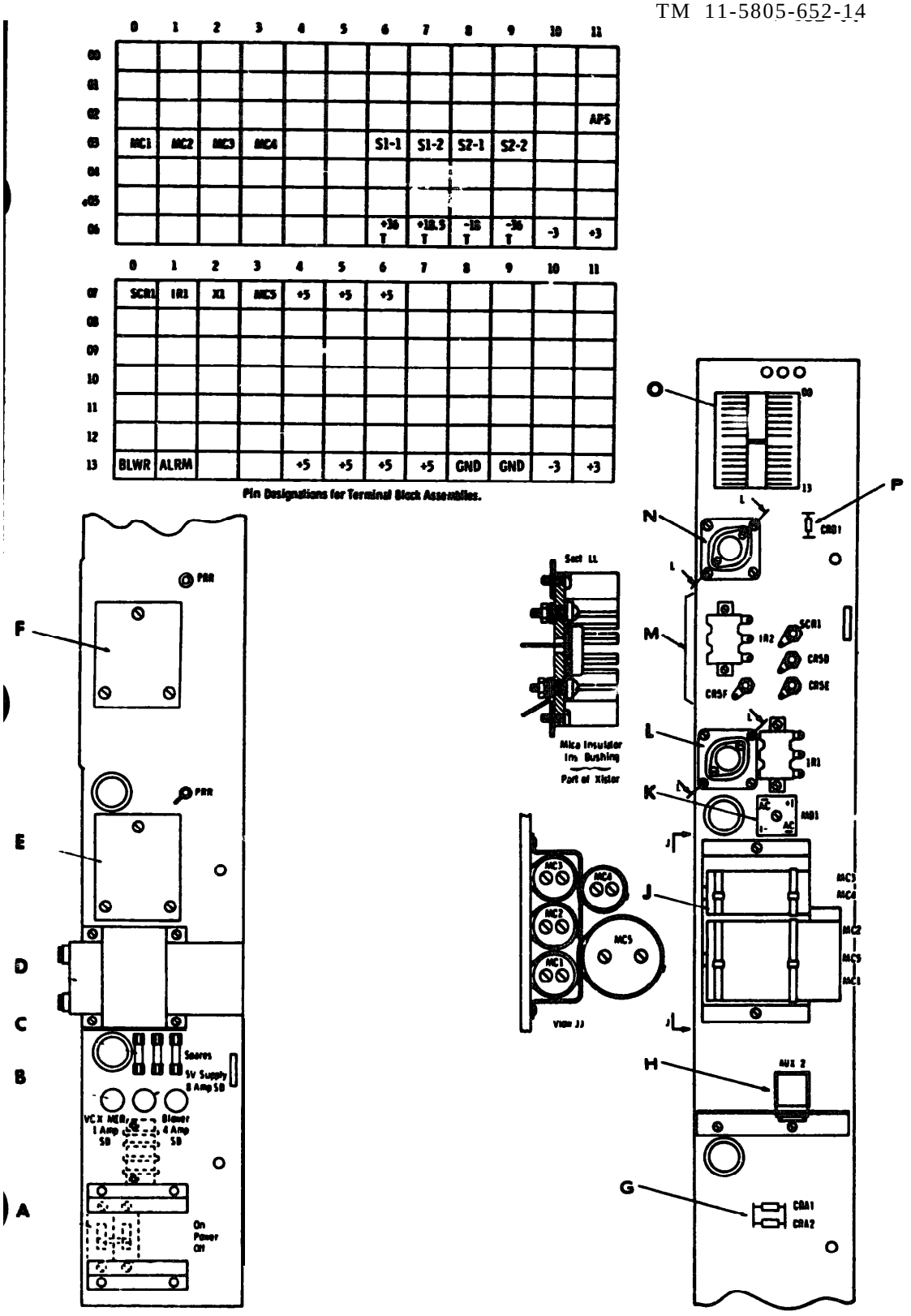

Figure 3-5. ZOO-Line EPABX, No-Break Cabinet Miscellaneous Panel Assembly

	0	1	2	3	4	5	6	7	8	9	10	11
00	U0	U1	U2	U3	U4	U5	U6	U7	U8	U9	17R2 R	SR2 R
01	T0	T1	T2	T3	T4	T5	T6	T7	T8	T9	17R2 S	SR2 S
02	H0	H1	H2	H3	H4	H5	H6	H7	H8	H9	RRG2	APS
03	MC1	MC2	MC3	MC4	BO	CO	S1-1	S1-2	S2-1	S2-2		
04	LT1	LR1	LT2	LR2	LT3	LR3	ST1	ST2	ST2	SR2	ST3	SR3
05	TT1	TR1	TT2	TR2	TT3	TR3	CT1	CR1	CT2	CR2	CT3	CR3
06	PR2	PR3	PR4	RV1	RV2	RG	+36 T	+18.5 T	-18 T	-36 T	-3	+3

	0	1	2	3	4	5	6	7	8	9	10	11
07	SCR1	IR1	X1	MC5	+5	+5	+5					
08	U0	U1	U2	U3	U4	U5	U6	U7	U8	U9		
09	T0	T1	T2	T3	T4	T5	T6	T7	T8	T9		
10	H0	H1	H2	H3	H4	H5	H6	H7	H8	H9		
11												
12												B(C)
13	-36	AOR	ALRM	VC RST	ALRM	-18A					-3	+3

Pin Designations for Terminal Block Assemblies

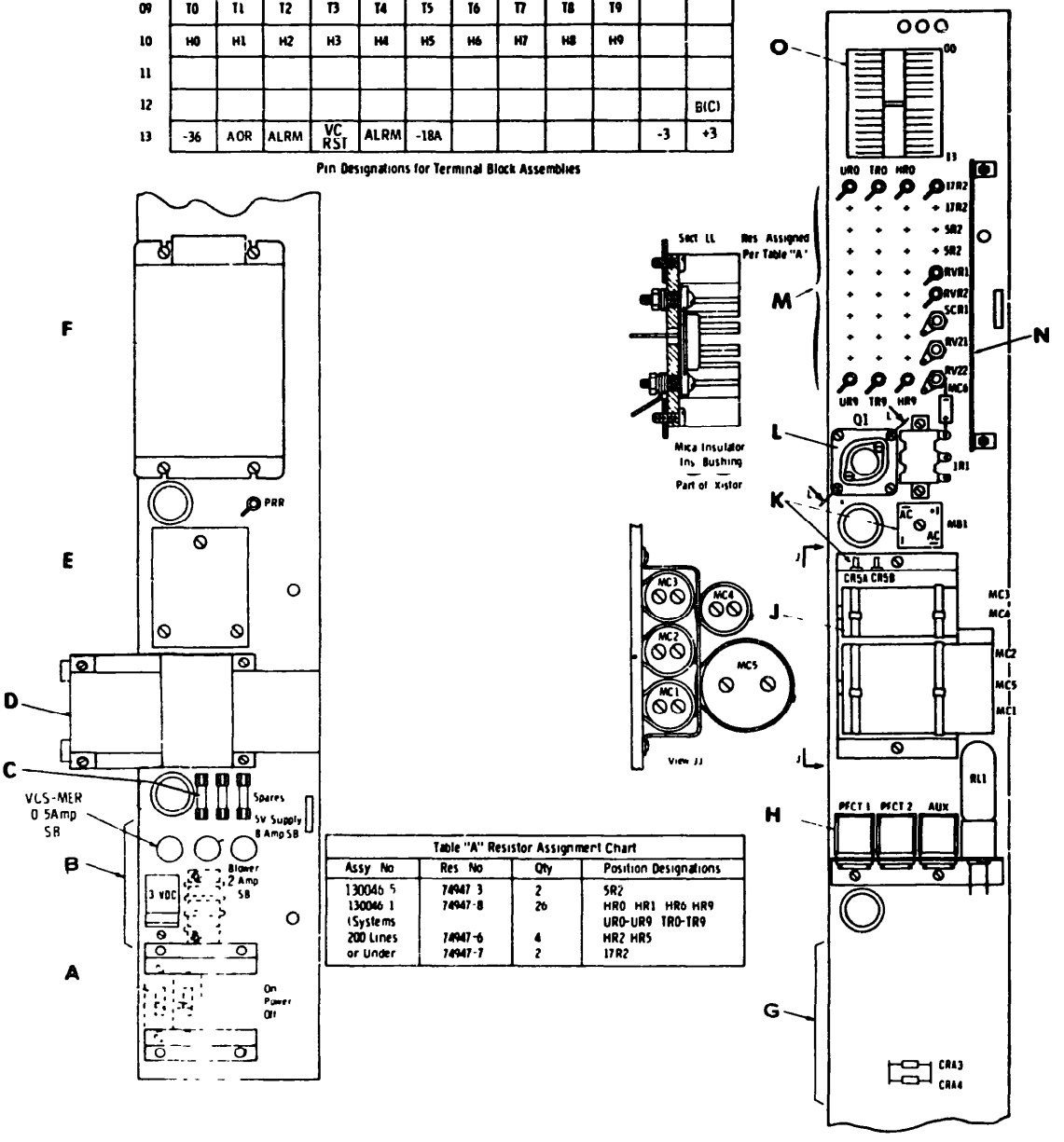

Table "A" Resistor Assignment Chart

Assy No	Res No	Qty	Position Designations
130046 5	74947 3	2	SR2
130046 1 (Systems 200 Lines or Under	74947-8	26	HR0 HR1 HR6 HR9 URO-UR9 TRO-TR9
	74947-6	4	HR2 HR5
	74947-7	2	17R2

Figure 3-6. 100-Line EPABX, Cabinet 1 Miscellaneous Panel Assembly.

	0	1	2	3	4	5	6	7	8	9	10	11
00												ALM LMP
01												
02												APS
03	MC1	MC2	MC3	MC4	BINO*	SPARE	S1-1	S1-2	S2-1	S2-2		
04												
05												
06							+36 T	+18.5 T	-18 T	-36 T	-3	+3

	0	1	2	3	4	5	6	7	8	9	10	11
07	SCR1	IR1	X1	MB5	+5	+5	+5	B(C)				
08												
09												
10												
11												
12	AOR	-36			**	**	**	**				
13	-18A	ALRM	ALRM	VCR					GND	GND		

Pin Designations for Terminal Block Assemblies.

**SPARES TO CABINET 1

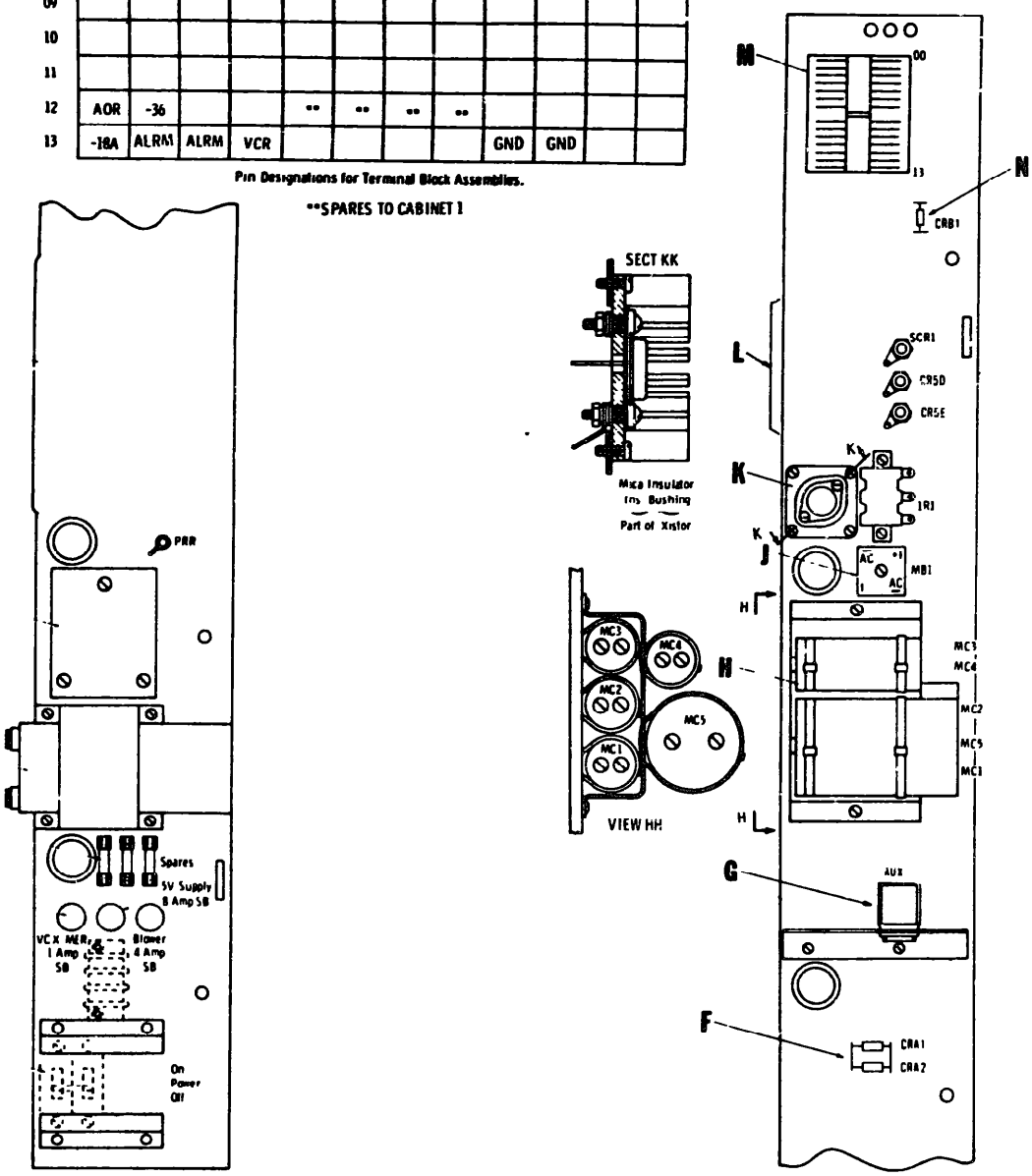

Figure 3-7. 100-Line EPABX, No-Break Cabinet Miscellaneous Panel Assembly.

Supplement

Section IV

CONTENTS

Supplement

Section IV

POWER-OFF CONNECTIONS AND TEST

1.0 GENERAL

Refer to the material in the basic manual and the Installation Drawings listed in Section I of this supplement for equipment interface information.

2.0 POWER/GROUND CONNECTIONS

No internal AC power input and power multiple cable connections are necessary.

These connections have already been accomplished Perform external ground cable connection as described in the applicable Installation Specification drawing.

3.0 POWER-OFF MEASUREMENTS

Perform power-off measurements as described in basic manual.

Supplement

Section V

CONTENTS

Supplement

Section V

POWER-ON ADJUSTMENTS

1.0 GENERAL

Refer to material in basic manual and material in this section to accomplish power adjustments. Figure 5-1, 5-2 and 5-3 referenced throughout this section can he found in the basic manual.

2.0 INITIAL ADJUSTMENTS

2.1 AC Power On

Apply AC power by:

(a) **Connect AC** power cords to AC source.
(b) Position AC circuit breakers in cabinet 1 and No-Break cabinet to ON.

2.2 Blower Operation

Insure that blowers **are in** operation **by** checking each air output (lower front).

2.3 DC Power Supplies Access

Access to the DC power supplies (for adjustment) is achieved by lifting the ventilation **assembly up and swinging assembly to left.**

2.4 **DC Power** Supplies Adjustments

Refer to *Fig.* **5-2 for test point (TP) and adjustment locations. (On the 200-line EPABX system only, the master power supplies in cabinet 1 and No-Break cabinet** are adjustable; slave **power supplies in cabinet 2 are not adjustable. On the 100-line EPABX system, the power supplies in cabinet 1 and the No-Break cabinet are adjustable.) Using a calibrated 20,000 ohm per volt VOM, adjust the cabinet power supplies (-18VDC, +18.5VDC, +36 VDC, and -36VDC power supplies). Repeat the adjustment procedure for the power supplies located in the No-Break cabinet. Any convenient chassis point may be used for VOM ground connectron. Place VOM on appropriate DC scale for accurate reading. Replace DC power supply ventilation assembly to closed position.**

2.5 **+3VDC and -3VDC Adjustment**

Adjust the +3VDC and -3VDC supplies in each **of the cabinets. Refer to Fig. 5-2 for test point (TP) and Adjustment locations.**

2.6 (200 Line) 5VDC Power Supply Adjustment

2.6.1 Refer l & Fig. 3-3 supplement section III. Insert cabinet 1 +5 VDC supply and alarm PCB into its connector. Connect VOM positive lead to **bottom terminal of power** resistor 1R1. Connect VOM negative lead to chassis ground. Adjust 5VDC power supply for +5VDC by adjusting the potentiometer located on the bottom front of the +5VDC supply and alarm PCB.

2.6.2 Refer to Fig. 3-5 of supplement Section III. Insert cabinet 3 +5VDC supply and alarm PCB into its connector. Repeat adjustment procedure outlined **in paragraph 2.6.1.**

2.7 (106 Line) 5VDC Power Supply Adjustment

2.7.1 Refer to Fig. 3-6 of **supplement Section III and repeat the procedure given in paragraph 2.6.1 for cabinet 1.**

2.7.2 **Refer to Fig. 3-7** of **supplement Section III and repeat the procedure given in paragraph 2.6.1 for the 100-line No-Break cabinet.**

2.8 **Power Removal**

2.8.1 **Remove AC power before inserting PCB's by placing AC circuit breakers in cabinet 1 and No-Break cabinet to OFF.**

2.8.2 **Insert the following PCB's in cabinet 1 and No-Break cabinet:**

(a) Voltage check reference 316070( )122
(b) Voltage check main alarm 316069( )122
(c) System main alarm (cabinet 1 only) 316068(2)122

2.9 **Reapplying** AC **Power**

2.9.1 **Return AC power by placing AC circuit breakers in cabinet 1 and No-Break cabinet to ON.**

2.10 **Voltage Check and +5VDC Adjustment**

The power relay (PR) may or may not operate when the AC power is reapplied. The alarm lamps on the

316069 PDB may or may not be "on." Location of **alarm** lamps are shown on Fig. 5-1 and 5-3.

2.10.1 PR relay operates-Lamps on 316069 and Hi-Lo lamps on 316301 are extinguished.

NOTE: If PR does not operate, **proceed to paragraph** 2.10.2

2.10.1.1 Using a calibrated VOM, measure the outputs of the Voltage Check PCB (316670). Each output may be measured from the test point at the front of the PCB. Each TPL identified, All voltages have a ±16% tolerance.

2.10.1.2 Main Alarm Voltage Check - Refer to Fig. 5-2 and 5-3. Place AC circuit breaker in No-Break cabinet to OFF.

NOTE: The power supplies in the No-Break cabinet must be disabled to permit the high and low adjustments of cabinet 1 power supplies.

Hi-Lo Voltage Detection Adjustments

(a) Connect a calibrated DC voltmeter (use appropriate scale) to the test jack **of** the +36 volt power supply.

(b) Adjust the +36 volt power supply for an output of 39.6 volts.

(c) Press the voltage check reset pushbutton while rotating the +36 volt high "potentiometer adjust" (second from bottom of main alarm voltage check PCB) clockwise until the top lamp is extinguished.

(d) Slowly rotate the "potentiometer adjust" counterclockwise until the associated lamp comes "on"

(e) Return the +36 volt power supply output to +36 volts.

(f) Press the voltage check reset pushbutton to extinguish the lamp.

(g) Adjust the +36 volt power supply for an output of 32.4 volts.

(h) Press the voltage check reset pushbutton while rotating the +36 volt low "potentiometer adjust" (top of PCB) **counterclockwise until the associated lamp is extinguished.**

(i) Slowly rotate the "potentiometer adjust" clockwise until the lamp comes "on."

(j) Return the +36 volt power supply output to +36 volts.

(k) Press the voltage check reset pushbutton to extinguish the lamp.

(1) Repeat Steps (a) through (k) using the -36 volt power supply, the -36 volt low potentiometer and lamp (third from top of board), and the -36 volt high potentiometer and lamp (fourth from bottom of board).

(m) Connect the DC voltmeter to the test jack of the +18.5 volt power supply.

(n) Adjust the +18.5 volt power supply for an output of 20.4 volts.

(o) Press the voltage check reset pushbutton while rotating the +18.5 volt high "potentiometer adjust" (first from bottom of board) clockwise until the associated lamp is extinguished.

(p) Slowly rotate the "potentiometer adjust" counterclockwise until the lamp comes 'on."

(q) Return the +18.5 volt power supply output to +18.3 volts.

(r) Press the voltage check- reset pushbutton to extinguish the lamp.

(s) Adjust the +18.5 volt power supply for an output of 16.6 volts.

(t) Press the voltage check reset pushbutton while rotating the +18.5 volt low "potentiometer adjust" (fourth from top of board) counterclockwise until the associated lamp is extinguished.

(u) Slowly rotate the "potentiometer adjust" clockwise until the lamp comes "on."

(v) Return the +18. 5 volt power supply output to +18. 5 volts.

(w) Press the voltage check reset pushbutton to extinguish the lamp.

(x) Repeat steps (m) through (w) using the -18 volt power supply, the -18 volt low potentiometer and lamp (second form top of board), and the -16 volt high potentiometer and lamp (third **from** bottom of board). **All lamps** should not be extinguished and the power relay should remain operated.

2.10.1.3 +5VDC Hi-Lo Adjustments - Refer to paragraph 2.6 for 200-line EPABX system, or paragraph 2-7 for 100-line EPABX system.

Low Voltage Adjustment

(a) **Adjust** +5VDC Supply to +4.2 volts. The PR relay "drops out" and "sets up" an alarm condition causing the +5 volt alarm lamp to turn "'on. "

(b) Readjust voltage to +5 volts.

(c) Depress VC reset button. The PR relay operates and the 5 volt alarm lamp goes "Out."

High Voltage Adjustment

(a) Adjust +5VDC supply to +5.8 volts. The PR relay "drops out" and "sets up" an alarm condition causing the 5 volt alarm lamp to turn "on."

(b) Readjust voltage to +5 volts.

(c) Depress VC reset button. The PR relay operates and the 5 volt alarm lamp goes "Out."

2.10.2 Power relay does not operate - lamps on 316069 and/or 316301 remain "on."

2.10.2.1 Perform the following steps if the alarm lamp(s) on the 316069 PCB remain "on."

(a) Refer to Fig. 5.2 and repeat all steps of paragraphs 2.4, 2.5 and 2.9.

(b) **Refer** to Fig. 5-3 and **repeat** all **steps of paragraphs** 2.10.1.1, 2.10.1.2, and 2.10.1.3

(c) If alarm lamp(s) remain "on" refer to Section XII, paragraph 7.0, and Section XIII, paragraph 2.1 in basic manual.

2.10.2.2 Perform the following steps if alarm lamp(s) of 316301 PCB remain "on."

(3 Perform step 2.10.1.1

(b) Follow procedure outlined in paragraph 2.6 for 200-line EPABX system or paragraph 2.7 for 100-line EPABX system.

(c) Repeat all steps **in** paragraph 2.10.1.3

2.10.2.3 Place **AC** circuit breakers in No-Break cabinet to ON. Place **AC** circuit breakers in cabinet 1 to OFF.

NOTE: The power supplies in cabinet 1 must he disabled to permit the high and low adjustments of No-Break cabinet power supplies.

2.10.2.4 Perform the adjustment procedures outlined in paragraphs 2.10.1.2 through 2.10.2.2 in No-Break cabinet.

2.11 ±3VDC Alarm Adjustments

2.11.1 +3VDC Adjustments

(a) Adjust +3VDC output to 4.0 VDC. Alarm lamp(s) should go "on.'

(b) Adjust +3VDC output to exactly +3.0VDC. Alarm lamps should go "out."

(c) Adjust +3VDC output to +2.0 VDC. Alarm lamp should go "on."

(d) Readjust +3VDC output to exactly +3.0VDC.

2.11.2 -3VDC Adjustments

(a) Adjust -3VDC output to -4.0 VDC. Alarm lamp(s) should go "on.'

(b) Adjust -3VDC output to exactly -3.0VDC. Alarm lamps(s) should go "out."

(c) Adjust -3VDC output to -2.0 VDC. Alarm Lamps should go "on."

(d) Readjust -3VDC output to exactly -3.0VDC.

2.11.3 Repeat all steps of paragraphs 2.11.1 and 2.11.2 for all equipped cabinets.

2.12 AC Power On-Off Test

Place AC circuit breakers in cabinets 1 and No-Break cabinet to OFF position. Wait 1 minute then place circuit breakers to ON position. The PR relay should operate within 3 to 5 seconds and all alarm lamps on 316069 and 316301 PCB's should go "out." Check PR relays in each equipped cabinet to insure they have operated.

Supplement

Section XII

CONTENTS

FIGURES

S u p p l e m e n t

S e c t i o n X I I

G E N E R A L O P E R A T I O N A L D E S C R I P T I O N

1.0 GENERAL

The 200-line EPABX No-Break modification provides an additional cabinet containing **an additional** set of power supplies and control circuitry as housed in cabinets 1 and 2. Paragraphs 2.0 through 2-15 cover this modification. The 100-line **EPABX** No-Break modification is similar in design to the 200-line EPABX. The 100-line No-Break modification is covered in paragraphs 3.0 through 3.15. The 3 volt dc supplies used in both systems are identical in operation. Paragraphs 4.0 through 4.5 cover the dc supply operations.

2.0 (200 Line) DC VOLTAGE GENERATION - **SEE** FIG. 12-2.

2.1 DC voltage generation description for primary and no-break back-up circuits are essentially similar. The AC input is provided to a stepdown transformer located in each cabipet. **A** consistent voltage type transformer is used, thus allowing for large line fluctuations. Each **cabi**net has its own separate rectifier and series regula**ting** (SR) circuits. Cabinets 1 **and 3 have the** above, plus the control circuits. The control output regulates all power supplies by controlling the series regulator circuits. Thus, the outputs of all power supplies of a type in cabinets 1 and 2 and those in **cabinet 3 are** paralleled for multibay operation. Thus, most adjustments are made in cabinets 1 and 3. The ±3VDC supplies in cabinet 2 are adjustable in that cabinet.

2.2 Each power supply (-18, +18.5, +36, -36VDC) has its separate AC **input** from the transformer secondary to its rectifier assembly located within the power supply.

2.3 The ±3VDC supply voltages are derived from the +36, -36VDC power supplies and are adjusted from the front **of** each +36, -36VDC supply.

2.4 The voltage check reference transformer provides AC outputs **to the** 316070 voltage **check** reference circuit that allows the 316070 to supply highly regulated reference voltages of ±18, ±36, ±56 to the 316069 main alarm and voltage check circuit.

2.5 The output **of** the -18, +1835, -36, +36VDC supplies are also supplied to the main alarm and voltage **check circuit.** The voltages are compared, and if **within ±10%, a ground IS provided** to the auxiliary relay via **the auxiliary** relay power signal (APS). With the auxiliary relay operated, a ground is supplied to each power relay (PR) of each cabinet. The PR is operated and dc voltages from power supplies in cabinets 1/2 and 3 are applied to common bus bars in cabinets 1, 2 and 3. Each PR has four C type contact sets. In the idle state, a load is provided. Each contact set is composed of (one each) -18, +18.5, -36, +36VDC.

2.6 In the event of a failure of a power supply in the primary dc power system, the following world occur. The out-of-tolerance condition would be detected by the main alarm voltage **check** circuit. This results in the loss of the **APS** ground signal to the auxiliary relay causing the relay to deenergiae. The now open contacts of the auxiliary relay cause relays PR1 **and** PR2 to deenergize. The &energized state of PR1 and PR2 remove all primary power supplies (-18, +18.5, -36, -3, +36, and +3VDC) from the cabinet bus bars. Service is maintained by the no-break dc power system which is still connected to the bus bars.

2.7 **A** failure of a supply in the **no**break dc power system would result in removal of all its supplies from the bus bars while the primary dc power system maintains operation.

2.8 **As shown in** Fig. 12-1, the APS lead for the primary dc power system is routed through the +5VDC supply and alarm circuit and blower switches in cabinets 1 and 2. The failure of a blower in cabinet 1 or 2 will result in the removal of both primary and no-break **dc** power from the bus bars.

2.9 **A** failure of the blower in cabinet 3 will **cause only** removal of no-break dc power from the bus bars. Primary dc power will not be affected and service will be maintained.

2.10 If a +5VDC power supply and alarm circuit should fail **or** is misadjusted, the APS ground circuit will open. The auxiliary and PR relays will deenergize causing removal of the respective **dc** power system from the bus bars. The other dc power system will, however, continue to maintain EPABX operation.

2.11 The main alarm voltage check circuit has **adjustment** and alarm lamps corresponding to each power supply. The **adjustments are made initially and normally it is not necessary to readjust them.**

2.12 A manual reset pushbutton (V. C. RESET) is provided **in cabinets** 1

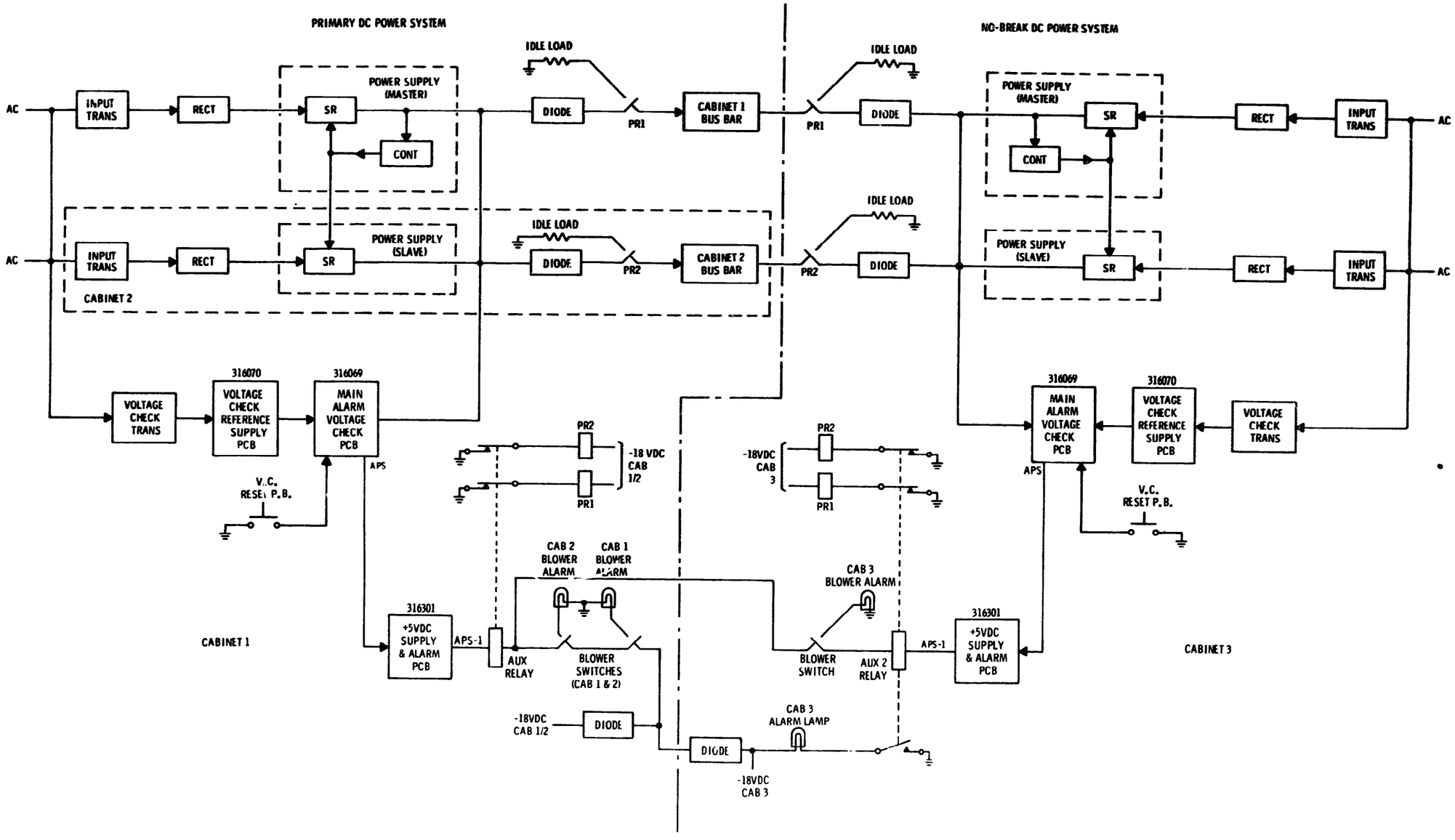

Figure 12-1. Block Diagram of DC Voltage Generation with No-Break Modification (200-Line EPABX System)

and 3 to reset the main alarm voltage check circuit. III the event the voltage deviation was temporary, such as a surge in AC input, the circuit can be reset and normal operation resumed

2.13 The attendant's console contains an ALARM RESET pushbutton which permits the console operator to reset the main alarm voltage check circuit from a remote location.

2.14 A BLOWER ALARM lamp is provided on the top of cabinets 1, 2 and 3. This lamp will signify that blower operation is faulty. The cause could be insufficient air flow due to a dirty filter or blockage, a defective blower vane switch, inoperative blower motor or an open blower fuse. The SYSTEM ALARM lamps on cabinet 1 will also go on when a blower fault occurs. Note that an inoperative blower in cabinet 1 or 2 will remove all power (both primary and no-break) from the bus bars. However. an inoperative blower in cabinet 3 will not interrupt EPABX operation. The SYSTEM ALARM and BLOWER ALARM lamps in cabinet 3 will go on as will the SYSTEM ALARM lamp in cabinet 1.

2.15 An overvoltage or undervoltage condition or permanent breakdown in a -18, +18.5, -36, +36 or +5VDC power supply in the primary dc power system (cabinet 1/2) go on. A similar condition in the no-break dc power system (cabinet 3) will cause the SYSTEM ALARM lamps on cabinets 1 and 3 to go on.

3.0 (100 Line) DC VOLTAGE GENERATION - SEE FIG. 12-2

3.1 DC voltage generation description for primary and no-break back-up circuits are essentially similar. The AC input is provided to a stepdown transformer located in each cabinet. A consistent voltage type transformer is used, thus allowing for large line functions. Each cabinet has its own separate rectifier and series regulating (SR) circuits. Cabinets 1 and 2 have the above, plus the control circuits. The control output regulates all power supplies by controlling the series regulator circuits. Thus, the outputs of the power supplies in cabinets 1 and 2 are paralled for multibay operation. The power supply adjustments are made in cabinets 1 and 2.

3.2 Each power supply (-18, +18.5, +36, -36VDC) has its separate AC input from the transformer secondary to its rectifier assembly located within the power supply.

3.3 The ±3VDC supply voltages are derived from the +36. -36VDC power supplies and are adjusted from the front of each +36, -36VDC supply.

3.4 The voltage check reference transformer provides AC outputs to the 316070 voltage check reference circuit that allows the 316070 to supply highly regulated reference voltages of ±18, ±36, ±56 to the 316069 main alarm and voltage check circuit.

3.5 The output of the -18, +18.5, -36, +36VDC supplies are also supplied to the main alarm and voltage check circuit. The voltages are compared, and if within ±10%, a ground is provided to the auxiliary relay via the auxiliary relay power signal (APS). With the auxiliary relay operated, a ground is supplied to the power relay (PR) of each cabinet. The PR is operated and dc voltages from power supplies in cabinets 1 and 2 are applied to common bus bars in cabinets 1 and 2. Each PR has four C type contact sets. In the idle state a load is provided. Each contact set is composed of (one each) -18, +18.5, -36, +36VBC.

3.6 In the event of a failure of a power supply in the primary dc power system, the following would occur. The out-of-tolerance condition would be detected by the main alarm voltage check circuit. This results in the loss of the APS ground signal to the auxiliary relay causing the relay to deenergize. The now open contacts of the auxiliary relay cause relay PR1 to deenergize. The deenergized state of PR1 removes all primary power supplies (-18, +18.5, -36, -3, +36, and +3VBC) from the cabinet bus bars. Service is maintained by the no-break dc power system which IS still connected to the bus bars.

3.7 A failure of a supply in the no-break dc power system would result in removal of all its supplies from the bus bars while the primary dc power system maintains operation.

3.8 As shown in Fig. 12-1, the APS lead for the primary dc power system is routed through the +5VDC supply and alarm circuit and blower switch in cabinet 1. The failure of a blower in cabinet 1 will result in the removal of both primary and no-break dc power from the bus bars.

3.9 A failure of the blower in cabinet 2 will cause only removal of no-break dc power from the bus bars. Primary dc power will not be affected and service will be maintained.

3.10 If a +5VDC power supply and alarm circuit should fail or is misadjusted, the APS ground circuit will open. The auxiliary and PR relays will deenergize causing removal of the respective dc power system from the bus bars. The other dc power system will, however, continue to maintain EPABX operation,

3.11 The main alarm voltage check circuit has adjustment and alarm lamps corresponding to each power supply. The adjustments are made initially and normally it is not necessary to readjust them.

3-12 A manual reset pushbutton (V. C. RESET) is provided in cabinets 1 and 2 to reset the main alarm voltage check circuit. In the event the voltage deviation was temporary, such as a surge in AC input, the circuit can be reset and normal operation resumed.

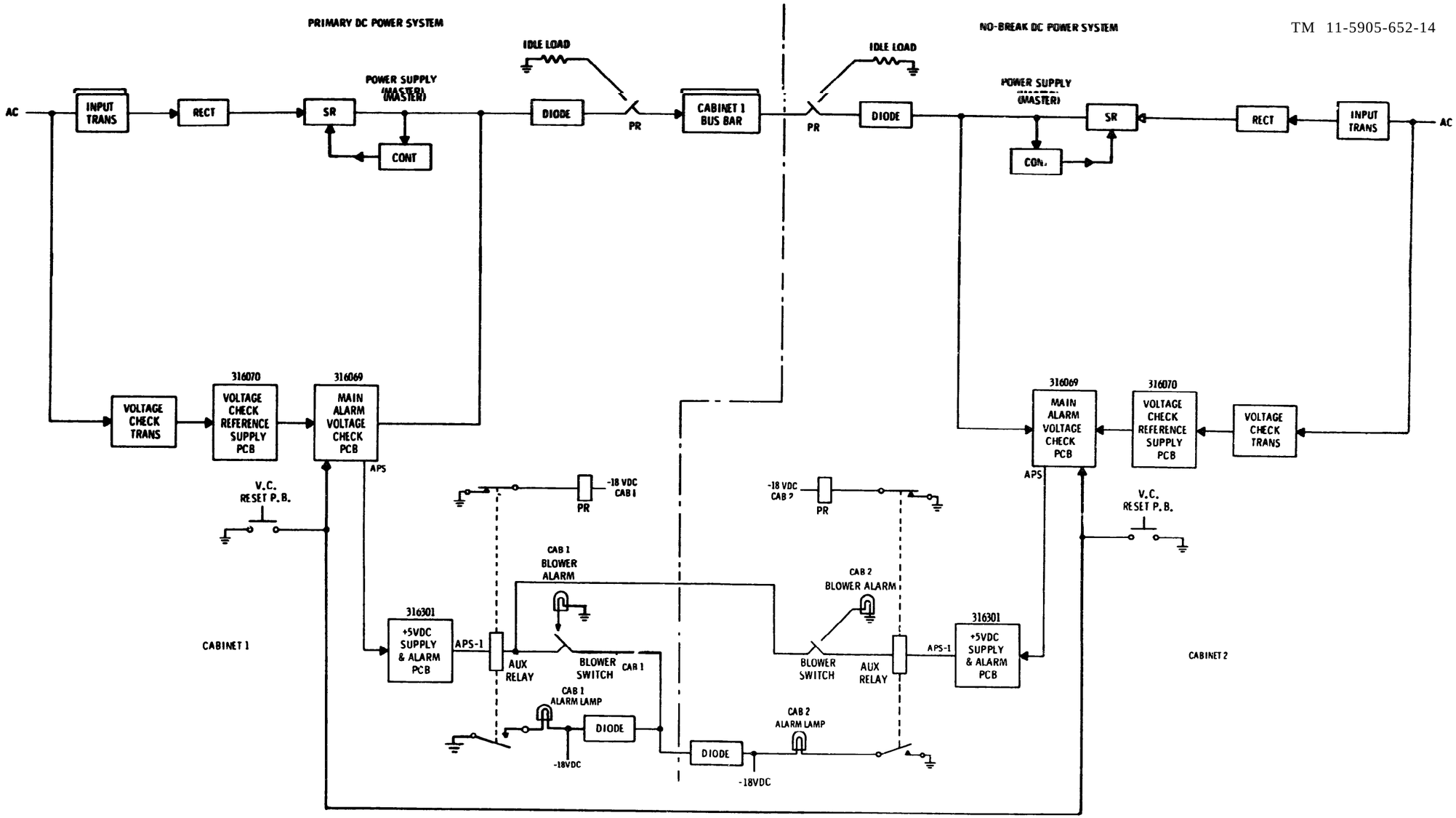

Figure 12-2. Block Diagram of DC Voltage Generation with No-Break Modification (100-Line EPABX System).

3.13. The attendant's console contains an ALARM RESET pushbutton which permits the console operator to reset the main alarm voltage check circuit from a remote location.

3.14 A BLOWER ALARM lamp is provided on the top of cabinets 1 and 2. This lamp will signify that blower operation is faulty. The cause could be insufficient air flow due to a dirty filter or blockage, a defective blower vane switch, inoperative blower motor or an open blower fuse. The SYSTEM ALARM lamps on cabinet 1 will also go on when a blower fault occurs. Note that an inoperative blower in cabinet 1 will remove all power (both primary and no-break) from the bus baas. However, an inoperative blower in cabinet 2 will not interrupt EPABX operation. The SYSTEM ALARM and BLOWER ALARM lamps in cabinet 2 will go on as will the SYSTEM ALARM lamp in cabinet 1.

3-15 An overvoltage or undervoltage condition or permanent breakdown in a -18. +18.5, -36, +36 or +5VDC power supply in the primary dc power system will cause the SYSTEM ALARM lamps on cabinet 1 to go on. A similar condition in the no-break dc power system will cause the SYSTEM ALARM lamps on cabinets 1 and 2 to go an.

4.0 THREE VOLT DC SUPPLIES

4.1 The basic functions of the ±3VDC supplies is to provide clamp voltage to the lines, junctors, and all other circuits capable of originating or terminating a call.

4.2 Failure of the -3VDC supply usually results in an inability to ring a line.

4.3 Failure of the +3VDC supply usually results in an inability to terminate a call.

4.4 In the event that a switchover from the primary dc power system to the no-break power system is necessary, the -3V and +3V bus bar connections are also transferred to the no-break -3V and +3V power supplies.

4.5 The fault of a -3V or +3V power supply does not result in a dc power system switchover. The fault must have occurred in anyone of the -18, +18.5, -36, +36 or +5VDC power supplies. A -3V or +3V power supply fault condition by itself will, however, cause the SYSTEM ALARM lamp(s) to go on. During normal operation, -3V and +3V power supplies in cabinet 1 are on line

Supplement

Section XIII

CONTENTS

Supplement

Section XIII

TROUBLE DETECTION AND REPAIR

1.0 ROUTINE MAINTENANCE

1.1 General

Routine maintenance of a **solid** state switching is greatly simplified in comparison to a mechanical system.

1.2 Periodic Inspection and Maintenance

Visual inspection and **routine maintenance** checks should be made quarterly -- four times per **year.**

1.3 Visual Inspection

(a) Check cleanliness of cabinet assembly location area.

(b) Inspect and clean cabinet blower filters. Follow instructions stamped on filter.

(c) **Check** cables from distribution *frame* to EPABX equipment cabinets for damage and snug fit on cable connectors.

(d) **Check** equipment cabinets for damage.

(e) Vacuum interior of cabinets using non-metallic nozzle.

(f) Check cabinets for disturbance of PCB's.

1.4 Electrical Maintenance

(a) Refer to supplement Section V. Perform all steps of paragraphs **2.4, 2.5** and 2.6 for the 200-line EPABX system **or** paragraph 2.7 for the 100-line EPABX system.

(b) Refer to Section V in basic manual. Perform all steps of paragraphs 3.2, 3.3, 3.4 and 4.0

(cl From **a** TJP dial trunk assess **digits** and observe **trunk** allotter "stepping" through all *four* allott groups.

2.0 TOTAL SYSTEM FAILURE

2.1 *With* the addition of **no-break** power capability, the possibility of total system failure from breakdown of **a** dc power supply is eliminated. However, certain conditions can still cause complete system failure.

2.1.1 No alarms - complete system failure. Refer to Section III, Fig. 3-1 in basic manual and supplement Section III, Fig. 3-1, for 200-line **EPABX** No-Break cabinet or Fig. 3.2 for 100-line EPABX No-Break cabinet.

2.1.2 Check the following for **defects:**

(a) **AC** circuit breakers

(b) **AC** input

(c) Voltage check transformer fuse. Refer to supplement Section III, Fig. 3-2, 3-3 and 3-4 for 200-line EPABX system or Fig. 3-5 and 3-6 for 100-line EPABX system.

(d) Blower motor

(e) Blower vane switch

(f) Blower motor fuse

3.0 PARTIAL **SYSTEM** FAILURE

3.1 A partial system failure involves the removal from the dc voltage bus bars of a dc power system, either primary or no-break. Use the following procedure to locate the source of the malfunction.

3.1.1 Main alarm and voltage check (316069) PCB is alarmed.

(a) Check DC power supplies -18, +18.5, -36, and +36VDC. Refer to supplement Section V, paragraph 2.4. If power supply output voltages are correct, proceed to step(b). If power supply voltages are out of tolerance and will not adjust, proceed to step (e).

(b) Check outputs of 316070 voltage check reference supply. Refer to supplement Section V, paragraph 2.10.1.1, and Fig. 5-1 in basic manual.

(c) If 316070 output voltages are incorrect, replace 316070 PCB and recheck. Main alarm and voltage check 316069 may need adjustment. See paragraphs 2.10.1.2 and 2.10.1.3 of supplement Section V.

(d) If 316070 output voltages are correct, perform all steps of paragraphs 2.10.1.2 and 2.10.1.3 of supplement Section V. If alarm lamps remain on and DC power is not restored (PR relay operated), perform all steps of paragraph 17.0 (power-off measurements) in Section IV of **basic manual. Replace PCB 316069 and repeat all steps of paragraphs 2.10.1.2 and 2.10.1.3 in supplement Section V.**

(e) Remove AC power and replace defective supply.

(f) Make all adjustments on 316069 PCB as described in paragraphs 2.10.1.2 and 2.10.1.3 of supplement Section V.

3.1.2 **PCB 316301 (5VDC Supply and Alarms) Alarm Lamps On.**

Replace PCB 316301 and **follow instructions outlined in paragraphs** 2.6 and 2.10.13 of supplement Section v for 200-line EPABX systems or paragraphs 2.7 and 2.10.13 of supplement Section V *for* 100-line **EPABX system.**

3.1.3 A failure of the ±3VDC power supply will cause **a** major alarm. Test **and/or** adjust 3VDC power supply as **described** in supplement section v, paragraphs 2.4 and 2.5.

PART TWO

SUPPLEMENT: CONSOLE OPERATION

GENERAL

The attendant's console is primarily used to answer listed directory number **calls and extend** them **to** the appropriate station. **The attendant** may **be required to assist in extending outgoing traffic, act as information operator and handle other special services. These services may include extension of restricted stations, setting up conferences paging, and other feature calls. Additionally the attendant monitors the systems alarm conditions**

PACKAGING

The console IS a desk mounted unit housing the indicators and control required to perform the attendant's functions. The top of the console is a slanted surface engineered for both visibility and accessibilty. (See Figure 1) The control cables enter vu slots in the rear and handset jack is equipped on either side. The cabinet contains dual function push-buttons acting as both illuminous indicators and keys. Other apparatus consists of a standard telephone dial, key set, miscellaneous supervisory and control lamps and keys. The basic console IS equipped with twenty-four trunk keys and a one hundred busy tamp field. Should the systems requirements exceed twenty-four trunk appearances the busy lamp field IS omitted allowing the console to house a maximum of forty-two trunk keys One console IS capable of performing all functions required of a forty-two trunk - tour hundred line system: however, should the attendants traffic exceed the ability of one operator, additional positions can be supplied.

1. CONSOLE OPERATION

The following IS presented to aid the Attendant.

11 Incoming Trunk Call (City Trunks)

111 The incoming call flashes the associated trunk button (TB) 120 IPM bright and sounds the console buzzer

112 The Attendant (ATTD) answers by depressing the flashing trunk button. The trunk button changes to steady bright, the buzzer turns "off", and the talk city (TC) lamp comes "on" steady bright

1.1.3 The Attendant determines the station number desired and key punches the number on the console station number pad.

1.1.4 If the station is net busy, it will ring. Upon answer, the TC lamp will go out and the talk extension (TE) lamp will turn "on" steady bright The Attendant announces the call and, if call is accepted, **depresses the release bar. The city trunk party and the station will be connected and the TE lamp will turn "off". The trunk button (TB) will turn "on" dim steady.**

1.1.5 **The Attendant may depress the release bar if the station is not busy and the Attendant does not wish to announce the call. Ring back tone (RBT) will be transmitted to the city party. The TB lamp will flash at a dim 60 IPM. The TC lamp will go "out". Upon answer by the station, the TB lamp will turn "on" dim steady.**

1.1.6 To release from a mis-key, busy, or ringing station prior to depressing the release bar, depress the release extension key and re-key.

1.1.7 If the station IS busy the Attendant may:

a Place the trunk in a hold condition by depressing the hold bar. The trunk busy (TB) lamp will flash a wink signal (.9 seconds on, .1 seconds off).

b Place the call on camp-on-busy (COB).

1.1.8 Camp-On-Busy Operation

a After key punching the desired number and receiving busy tone, depress the COB button.

NOTE Group hunt master numbers may not be camped on unless all associated slave numbers are busy.

b Depress the release bar. The trunk button lamp will flash 120 IPM dim.

c Two station numbers may be placed into COB at the same time. When the second number IS camped on, the COB button will turn

"on" bright steady and no further station numbers will be accepted.

d. The COB circuit will attempt to ring the called number every five seconds.

e. The trunk button lamp will turn dim steady when the camped-on station has answered.

NOTE: If a trunk call has been answered, and then placed in hold, the trunk must be reseized (by depressing the trunk button), and then depressing the release extension button before it can be placed into Camp-On-Busy operation

1.1.9 Attendant Recall

a. The trunk button lamp will flash 120 IPM bright when the EPABX station connected to the city trunk recalls the Attendant.

b. Depress the trunk button. The TB lamp will turn bright steady.

c. The talk city tamp will not turn "on".

d. The Attendant may split the trunk manually by depressing the talk extension or talk city button, or the Attendant may participate in a three-way conversation.

e. If it is desirable to transfer the call, instruct the EPABX station to "hang-up". Depress the talk city button and proceed as though it were an incoming call.

f. If the call has been lost and there is a recall, depress the TC button and proceed as though it were an incoming call

1.2 Incoming Trunk Call (DID with Attendant Access)

1.2.1 The associated trunk button lamp will turn "on" bright steady when the trunk is seized and will flash a dim 60 IPM indicating a call is ringing. The trunk button lamp will turn dim steady indicating an answer.

1.2.2 If the Attendant IS recalled, the call may be treated as an Incoming city trunk call (except: Camp-On-Busy is not accessible.

1.3 Outgoing Call

1.3.1 Any EPABX station may reach an outside party by dialing the Attendant (digit 0) and requesting a trunk. This action defeats the class-of-service (COS) restriction feature when the city number is dialed by the Attendant.

a. The Attendant's trunk button lamp (Op 1 or 2) will flash 120 IPM bright and the console buzzer will sound. The Attendant will answer by depressing the trunk button. The trunk button lamp will turn bright steady.

b. The Attendant may, if desirable, depress an appropriate city trunk button and release from the call by depressing the release bar.

c. The EPABX station will receive city dial tone and may dial the number directly.

d. The Attendant, if time and charges (T and C) are desired, depresses the hold bar instead of the release bar. The trunk button lamp will flash "wink" upon completion of the call, indicating that the call has been completed and that T and C can now be obtained.

e. If desirable, the Attendant may place the statron's call by dialing the number directly, using an appropriate trunk button. Upon answer, the Attendant may release from the call or proceed as in Step (d) above.

f. If requested, the Attendant may book the call and place it at a later time. The Attendant must release the station connected to the Attendant's trunk.

1.3.2 Placing Outgoing Call from Console

a. The Attendant may seize an outgoing trunk by depressing an appropriate trunk button and dialing the desired number.

b If a mis-dial occurs, the city may be released and reseized by depressing the release city (RC) button.

c After the called number has answered, the Attendant may transfer it to an EPABX station in the same manner as an Incoming Call

NOTE The Attendant must not extend a booked call to an EPABX station until the distant party has answered

1.3.3 An outgoing call from a station will turn

the associated trunk button "on" dim steady.

1.4 Attendance Line

1.4.1 The Attendant may originate calls to all EPABX stations and features by:

a. Depressing the attd. line button (MB). The ALB lamp will turn "on" and dial tone wilt he received.

b. Using the rotary dial and dialing the desired number(s).

c. The Attendant must depress release bar to release from call.

1.5 Attendant Override (Busy Verification)

1.5.1 The Attendant Override feature may be employed by:

a Depressing attendant override button (AOB). The AOB lamp will turn "on" bright steady.

b. Key punching the desired station number. (The busy station will receive a burst of dial tone to announce the override).

c. Depressing release bar to release.

1.6 Unassigned Night Answer (UNA)

Upon departure from the console, the Attendant turns the UNA key ON. All incoming calls will be answered through the UNA circuit.

1.7 Assigned Night Answer (ANA)

1.7.1 Same as UNA

1.8 Attendant Controlled Conference

1.8.1 Any extension user can call the Attendant via an attendant trunk to request a conference with a maximum of five other extensions and one trunk party

a. After acknowledging the conference request and obtaining the list of conferees, depress the CONF key. The attendant trunk will go dark and the conference lamp will light bright steady, indicating the conference circuit has been seized and the attendant and the extension have been transferred into the conference circuit.

b. Disconnect from the conference circuit by operating the release button.

c. To call an extension conferee, operate attendant trunk #2 (will light steady) and key punch the desired station number.

d. When the extension answers, advise him of the conference. To add the extension into the conference depress the conference key-

e. Repeat the procedure in Steps (b), (c), and (d) for the other extension Conferees.

f. To add an outgoing trunk to the conference, operate an idle outgoing trunk key and dial the desired number.

g. When the outs& party answers, advise him of the conference; to add the outside party, key punch number assigned as trunk conference assessing number (attendant transferred into conference to announce trunk party) and then the release button to disconnect from the conference (trunk party added to conference when attendant releases).

h. If an incoming trunk party requests a conference, obtain the list of the conferees and place trunk on hold.

i. Repeat the procedure in Steps (b), (c), and (d) for the other extension conferees. At least one station must be in the conference before the trunk party is added.

j. Re-enter the incoming trunk and add the incoming party by key punching the assigned number (see Step (g) above).

k. To release the trunk from the conference, station user in the conference must dial the digit 2 or greater. If the conferee wants to contact the attendant he must go "on hook" and then dial "0". The attendant may then return him to the conference by operating the conference key.

1.9 Alarms

1.9.1 Should a minor alarm occur, the alarm lamp will turn on dim.

1.9.2 Should a major alarm occur, the lamp will turn on bright, and buzzer will sound.

1.9.3 In either case, the Attendant should depress the Alarm Reset Button for approximately five seconds. If the Alarm is extinguished, the fault bas been cleared, and requires no trouble call. If the alarm remains, or returns frequently, a trouble report should be made.

1.10 Off-Normal

The Off-Normal lamp should turn "on" when the first digit is key punched, and turn off when the third digit is key punched.

Trunk Lamp Signals on ITT Console

TRUNK LAMP SIGNALS

CALL CONDITION	TYPE TRUNK	TRUNK LAMP
Incoming CO Trunk	Central Office	Flashes bright 120 IPM. Buzzer operates.
Trunk Answered (by attendant)	All Trunks	Bright Steady
Station Ringing	2-Way Central Office DID	Flashes dim 60 IPM
Request for Transfer	2-Way Central Office DID DOD	Flashes bright 120 IPM
Camp-On Established	2-Way Central Off ice	Flashes dim 120 IPM
Station Answers	2-Way Central Off ice DID	Dim Steady
Trunk on Hold	All Trunks	Dim Wink
30 Second Extended Ringing Attendant Recall	DID	Flashes bright 120 IPM. Buzzer operates.
Extension Dials '0"	Attendant Trunk	Flashes bright 120 IPM. Buzzer operates.

2. MULTI-ATTENDANT OPERATION

2.1 All incoming calls will be split (odd and even) between two consoles.

2.2 All calls may be transferred from one console to the other by turning the transfer key on the console from which the call IS to be transferred.

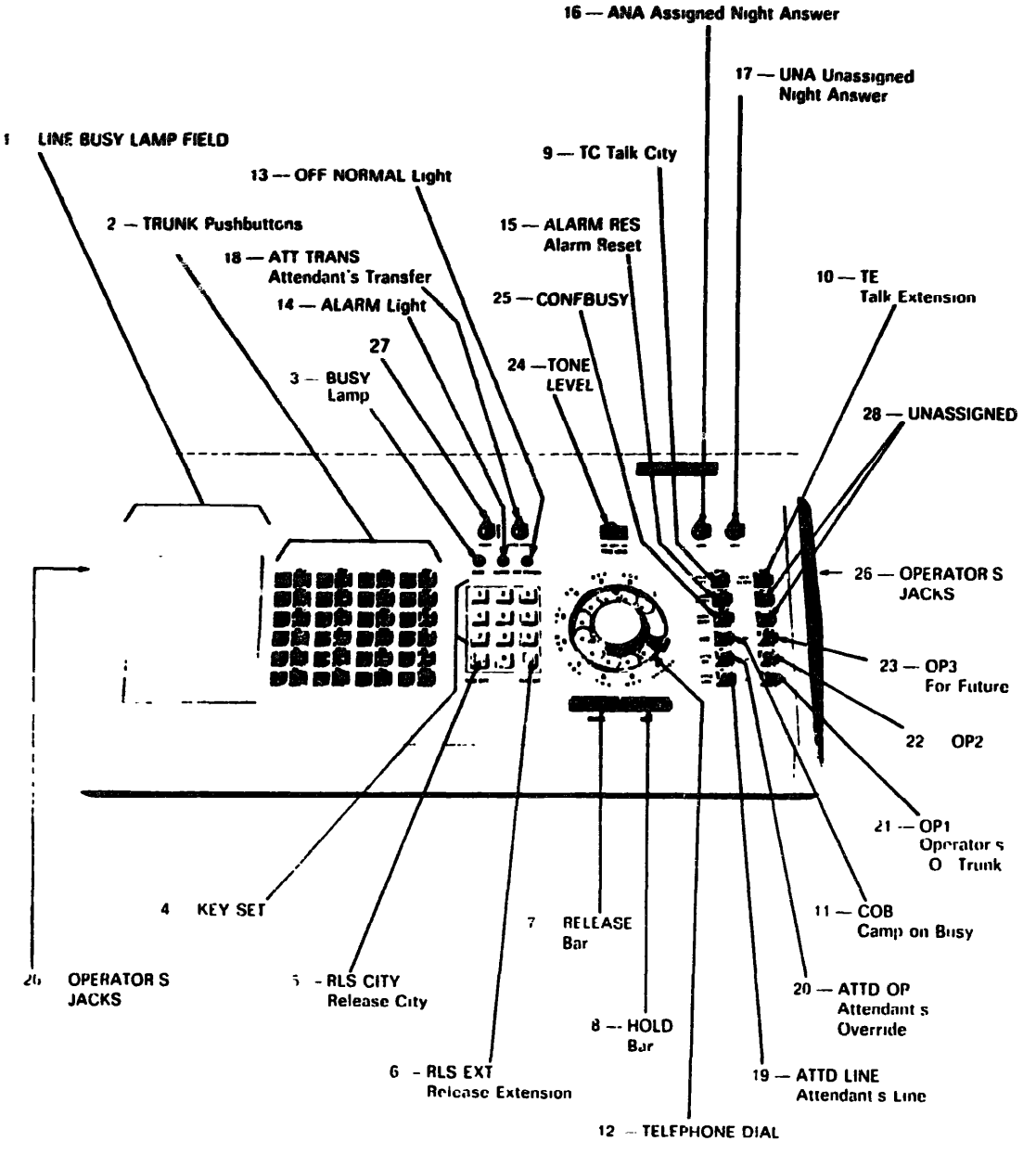

Figure 1. Attendance Console, Location of controls and Indicators

Table 1. Functions and Use of Attendant's Controls

Item	Name	Function
1	LINE BUSY LAMP FIELD 00 through 99	Lamp lights to indicate a busy line. May not be included on certain consoles.
2	TRUNK Pushbuttons with integral lamp (labeled with trunk identifying number)	Used to answer or initiate trunk calls. Pushbutton lamp flashes bright at 120 IPM to indicate incoming call. Lights steady bright to indicate attendant connected to trunk. Flashes dim 120 IPM to indicate line being accessed by Comp On Busy. Lights steady dim to indicate line connected to trunk. Flashes dim 60 IPM to indicate station is ringing.
3	BUSY LAMP	Lights to indicate busy line condition when line accessed through attendant's KEY SET is busy.
4	KEY SET Pushbuttons labeled 1 through 0	Ten pushbutton KEY SET used by attendant to access extensions from City Trunks, Override, or Conference.
5	RLS CITY Release City	Releases City party from trunk without releasing trunk from attendant.
6	RLS EXT Release Extension	Releases Extension from trunk without releasing trunk from attendant.
7	RELEASE	Releases attendant from a trunk or extension or both.
8	HOLD	Used to place a Trunk Call in the Hold condition. Causes Trunk lamp to wink dim.
9	TC Talk City	Used to talk to the city trunk only (extension cannot hear).
10	TE Talk Extension	Used to talk to the extension only (city party cannot hear).
11	COB Camp On Busy	Used when accessing a busy extension. Checks the busy condition of the extension exery six seconds until it becomes idle, then causes it to ring.
12	TELEPHONE DIAL	Used by the attendant when making a Trunk Call or when using the attendant's line to call a feature or extension.
13	OFF NORMAL	Lights to indicate an incomplete number is contained in the attendant's pushbutton digit stores.

Table 1. Function and Use of Attendant's Controls (continued)

Item	Name	Function
14	ALARM	Lights dim to indicate a minor alarm in the switching equipment. Lights bright to indicate a major alarm in the switching equipment.
15	ALM RES Alarm Reset	Used by attendant to reset the alarm indication caused by a temporary malfunction.
16	ANA Assigned Night Answer	Switches trunk answer supervision from the attendant to specific extensions.
17	UNA Unassigned Night Answer	Switches trunk answer supervision to any extension; also prepares an indicating device to be activited when an incoming call is received.
18	ATT TRANS Attendant's Transfer	Switches all attendant's functions to another Attendant's Console.
19	ATTD LINE Attendant's Line	Connects the attendant to a specific line circuit so that the attendant can utilize the switching system as would any other extension.
20	ATTD OR Attendant's Override	Provides a cut through feature for the attendant to override any extension connected to a trunk, Junctor, or Tieline.
21	OP1 Operator's "0" Trunk	Connects attendant to extension accessing the attendant's trunk circuit #1.
22	OP2	Connects attendant to extension accessing the attendant's trunk circuit #2
23	OP3	Future
24	TONE LEVEL	Controls the level of attendant's buzzer Positions are LO-OFF-HI.
25	CONFERENCE BUSY	Utilized for conference
26	OPERATOR'S JACKS	The jacks (one on the left and one on the right of the console) provide for connection of the operator's headset and or handset to Attendant's Console
27	HDST HNST	Provides selection for Headset - Handset operation
28	UNASSIGNED	

PART THREE

BASIC INSTALLATION AND MAINTENANCE DATA

Section I

CONTENTS

Section I

SCOPE

1.0 GENERAL

The purpose of this manual is to provide sufficient Information and instructions for the installation and maintenance of the TE-400 EPABX system by personnel who have only a minimal background in telecommunications installation and electronic circuit techniques.

CAUTION: Failure to adhere strictly to the sequential installation (Sections I through VIII) procedures outlined in this manual may result in major damage to the system componentry.

1.1 Sections I through VIII comprise the Installation portion of this manual.

1.2 Sections IX through XIV are devoted to the maintenance and repair of the TE-400 EPABX.

1.2.1 In the maintenance portion of this manual, repair is limited to:

(a) Replacement of a printed circuit board (PCB).
(b) Location and removal of short circuits.
(c) Replacing wires.
(d) Replacing fuses.
(e) Replacing plug-in lamps.

1.3 The persons involved should be familiar with:

(a) Band tools
(b) *Wire* wrapping
(c) Unwrapping
(d) Splicing
(e) Soldering
(f) Volt-Ohm-Milliammeter (20,000 ohms per volt)

1.4 Although it IS not specifically stated throughout this document, all installation/repair should be performed using "good telephone practices" This is especially important in the wrapping of wire, pulling cables, etc.

1.5 Numerous tables are provided for the installer to complete and maintain These tables are necessary for the installation. For record purposes, these tables should be retained in a secure place

1.6 The fallowing tools should be available:

(a) Insulated screw driver
(b) Wire wrap (24 gauge, 22 gauge, 20 gauge tip)
(c) Unwrapper
(d) Soldering iron (80 watt)
(e) Level
(f) 6" Adjustable wrench
(g) 5" Straight slot
(h) Flats
(i) Wire strippers
(j) Long nose pliers (4')
(k) K-500 Instrument to be connected with test plug (plug supplied).
(l) Eight K-500 instruments to be connected to the MDF vertical terminals for test. (Instruments may be re-used if not damaged.)

1.7 One of the following pieces of test equipment is required. Both are recommended:

(a) Oscilloscope
(b) Audio Frequency Generator

1.7.1 The following test equipment is required:

(a) Volt-Ohm-Milliammeter (20,000 ohms per volt) that IS accurately calibrated.

1.8 Terminology - All terms relating to the manual are explained on first usage. Section XV (EPABX Designations) is also included for reference

2.0 SATELLITE DRAWINGS

2.1 The following drawings are used and supplied in conjunction with this manual:

(a) TE-400 System Assembly Dwg 130097
(b) TE-400 Strapping Dwg 329972
(c) TE-400 Strapping Dwg. 130117
(d) Equipment Specifications
(e) Sub-Rack Dwgs. 130070 through 130080 (130080 supplied only if utilized)
(f) System Block Diagram 316023

Section II

CONTENTS

C O N T E N T S (C o n t ' d)

TABLES

FIGURES

Section II

PRE-INSTALLATION

1.0 General

1.1 AC Input Per Bay

(a) 115VAC, 60 Hz, 30 amps, or
(b) 115VAC, 50 Hz, 30 amps, or
(c) 220VAC, 50 Hz, 15 amps

1.2 AC Power Protection Per Bay

(a) 30 amp circuit breaker per 115VAC input
(b) 15 amp circuit breaker per 220VAC input.

1.3 External AC Cabling Per Bay

(a) Refer to Section III, Fig. 3-1.

1.4 External DC Power Requirements.

Those system equipped with the following features will require an external 48VDC source.

(a) Direct inward dial (DID) trunks or tie lines
(b) Standby power

1.5 Grounding

(a) Earth ground of 1 ohm or less is required. Refer to Section III, Pig. 3-1 for connection.
(b) Multibay bonding is supplied. Refer to Section III, Fig. 3-1.
(c) Refer to Section III, Fig. 3-1 for AC power input grounding.

1.6 System Circuit(s) Protection

(a) Cabinet(s) Blowers. . . . . 4 amp, 2AG, SB fuse
(b) 5VDC Supply . . . . . 8 amp, 2AG, SB fuse
(c) DID Trunk/Tie Line . . . . . 018 amp, 2AG fuse
(d) Voltage Check Reference Supply 1 amp, 2AG fuse
(e) Ring Generator . . . . . 0.5 amp, 2AG fuse
(f) Tone Supply Outputs . . . . . 0.5 amp, 2AG fuse
(g) All Other Circuits . . . . . Electronic voltage check circuit (316069, 316070, and 316301)

1.7 Main Distribution Frame(MDF) Protection

Any circuit(a) terminated on the MBF with external cabling that may be exposed to HIGH VOLTAGE or HIGH AMPERAGE should be protected with heat coils or carbons.

1.8 Ring Generator

(a) 30 Hz, 5 Watt, one per bay (internally mounted), or
(b) 20 Hz, 5 Watt, one per buy for systems utilizing 50 Hz, AC power (externally mounted).

1.9 Dial Pulse Requirements

(a) 8 to 12 ips (impulses per second), normally 10 ips.
(b) 62.5% break (±5% of total period) normal pulsing from subscriber's instrument may be distorted by the line conditions.

1.10 Call Progress Tones

(a) Dial Tone (DT) . . . . . 600 Hz
(b) Busy Tone (BT) . . . . . 600 Hz interrupted
(c) Ring Tone (RT) . . . . . (0.5 sec. off, 0.5 sec. on) 600 Hz modulated by 12 ips (interrupted 1 sec. on, 3 sec. off)
(d) Ring Back Tone (RBT) . . . . . Same as RT

1.11 Line Loop and Instrument Considerations

(a) The recommended instrument(s) to be attached to the line is the ITT K-500 series, or equivalent.

NOTE: Employing other types may result in degradation of the line performance.

(b) The maximum allowable number of bridged ringers per line is two.
(c) The minimum leakage between Tip and Ring (T and R) is 15,000 ohms.
(d) The minimum leakage between T or Rand ground is 15,000 ohms.
(e) All ringers are bridged high impedance ringers.

1.12 Table 2-1 shows the possible instrument combinations that are recommended to equip per line per Station.

NOTE: A line refers to an output from the TE-400 line circuit. A station is a line equipped with instrument(s) connected via T-R cabling to an EPABX line circuit.

Table 2-1. Instrument Combinations

Equipment Combination	A	B	C	D	E	F	G
1	1						X
2	1	1					X
3	1		1-				X
4	2		2			X	
5	2			2			X
6					1		X

1.12.1 Column Explanatory for Table 2-1

A - Standard Instrument with high impedance ringer.

B - Instrument with high impedance bridged ringer and bridged neon lamp. The lamp to have a minimum of 15,000 ohms series resistance.

C - Instrument with bridged neon lamp. Lamp to have a minimum of 15,000 ohms series resistance.

D - Instrument with neon lamp connected to ground. Lamp to have a minimum of 15,000 ohms series resistance.

E - Key System Line Input. The TE-400 is compatible with all key systems in manufacture today.

NOTE: On key systems, all Instruments must be matched top-to-tip and ring-to-ring

F - DC Loop Resistance (DCR) - 600 ohms maximum (Instruments included)

G - DC Loop Resistance (DCR) - 1200 ohms maximum (instruments included)

1.13 Table 2-2 is provided to show representative figures on cabling

1.14 Trunk/Tie tine Summary

1.14.1 Table 2-3 IS presented to provide specific trunk Information.

1.14.2 Column Explanatory for Table 2-3

A - External 48VDC IS required

B - Type of DCR loop resistor required

c - Type of DCR loop resistor required

D - Type of DCR loop resistor required

E - Type of DCR loop resistor required

F - External terminating equipment is required

G - Loop Start - Trunk IS signaled via ring voltage on the R lead The trunk signals via a loop closure

H - Ground Start - Trunk is signaled via a ground on the R lead, and signals via ground on the T lead.

J - Loop - Trunk/tie lines are signaled in and out by loop open/ closure on T and R leads.

K - E&M - Trunks/tie lines are signaled in via the E lead and out via the M lead.

NOTE: All other columns are self-explanatory.

1.15 Attendant Console Description. See Fig. 2-1

1.15.1 Trunk appearances:

(a) 24 with 100 line busy lamp field (BLF)
(b) 42 maximum (BLF not equipped)

1.15.2 Rotary Dial used for:

(a) Calls outside system.
(b) Calls from attendant line to EPABX stations or features.

1.15.3 Key Pad used for:

(a) Incoming trunk calls to EPABX stations
(b) Placing stations and/or trunks into conference.
(c) Attendant override.

Table 2-2. Cabling

Cable	Length (Kılo Feet)	DCR (ohms)	DB Loss at 1000 Hz
#26 NL	12 7	1050	6.88
#26 NL	11 08	920	6 0
#26 NL	5.54	460	3.0
#26 H88	12 4	1050	4.23
#26 H88	8 8	743	3.0
#24 NL	18	935	7.97
#24 NL	13 5	703	6 0
#24 NL	6.75	352	3.0
#24 H88	19.8	1050	4.56
#24 H88	13	690	3 0
#22 NL	18	575	6.12
#22 NL	17 6	563	6 0
#22 NL	8.8	282	3.0
#19 NL	18	288	4 34
#19 H88	58.2	1050	4 66
#19 H88	37.5	675	3.00

Table 2-3. Trunk Information

Group Identity	A	B	C	D	E		F	G	H	J	K	L	M	N	O	P	Q	R	S	T	U	V
								Supv & Sig				Operational Features										
	External 48 VDC	TR 2	MR 5	MR 6	MR 7	Direction	External Terminating Equipment Required	Loop Start	Grd Start	Loop	E & M	Att Access	Transfer	Override	Toll Restrict	Msg. Reg.	UNA	ANA	2nd Dial Tone	Rev. Batt	Intercept	Tandem
CITY TRUNK						INC		X				X	X	X			X	X				
316061 () 122		X				OTG		X				X	X	X	X	X						
CITY TRUNK						INC			X			X	X	X			X	X				
316075 () 122		X				OTG			X			X	X	X	X	X						
DID TRUNK						INC				X		X	X	X						X	X	
316089 () 122	X		X	X	X	OTG				X		X	X	X	X	X						
DID TRUNK						INC				X			X	X						X	X	
316056 () 122	X		X	X	X	OTG				X			X	X	X	X						
TIE TRUNK						INC				X		X		X								
316054 () 122	X		X	X	X	OTG				X		X		X								
TIE TRUNK						INC				X				X					X			
316090 () 122	X		X	X	X	OTG				X				X								
TIE TRUNK						INC				X		X		X					X			
316091 () 122	X		X	X	X	OTG				X		X		X								
TIE TRUNK						INC				X		X	X	X					X			
316092 () 122	X		X	X	X	OTG				X		X	X	X								
TIE TRUNK						INC				X			X	X					X			
316093 () 122	X		X	X	X	OTG				X			X	X								
DID TRUNK						INC	X				X	X	X	X							X	
316094 () 122	X		X	X	X	OTG	X				X	X	X	X	X							
DID TRUNK						INC	X				X		X	X	X						X	
316095 () 122	X		X	X	X	OTG	X				X		X	X								
TIE TRUNK						INC	X				X			X					X			
316096 () 122	X		X	X	X	OTG	X				X			X								
TIE LINE						INC				X				X								X
316060 () 122	X		X	X	X	OTG				X				X								X
TIE LINE						INC	X				X			X								X
316051 () 122	X		X	X	X	OTG	X				X			X								X

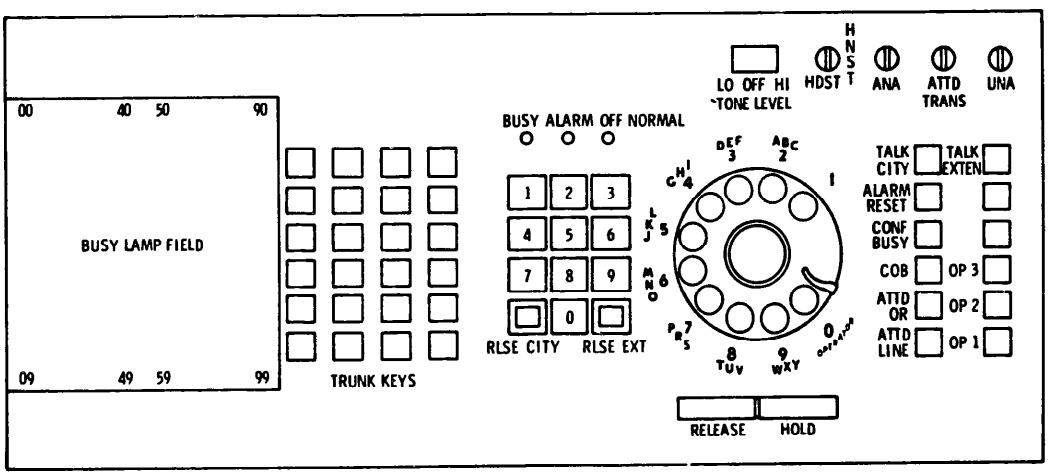

Fig. 2-3. Attendant Console.

1.15.4 **Location from EPABX equipment bay:**

(a) Maximum DCR - 26 ohms

(b) Cable Gauge	Feet
24	500
22	800
19	1625

1.15.5 Dimensions

Width	Depth	Height
24"	12"	5-1/2"

1.16 MDF Locations

(a) Non-Critical

(b) The cable length between the MDF and EPABX TE-400 bay should be taken into consideration when calculating loop DC resistance.

1.17 Floor Space

The EPABX equipment cabinet for a 100-line system requires a cabinet 77.25" high, 37" wide, and 26.5" deep. Multiple 100-line Increments require cabinets **of** the same size.

Lift-off doors are provided at the front and **red** of the cabinet. Space between the front or the rear of the cabinet and other objects should be adequate for easy passage of a person (minimum of two feet). Terminal strapping fields are accessible from the rear of the cabinet. Access to the top of the bay is only required for plugging in the connectors of interconnecting cables.

1.17.1 Floor Loading

The equipment cabinet weight is approximately 700 pounds (including printed circuit boards). Four leveling feet, approximately 1-1/2" in diameter, are placed at the four corners of the base.

2.0 EQUIPMENT CAPABILITIES AND STANDARD CONFIGURATIONS

The TE-400 system is arranged to provided growth from 25 to 100 lines, in increments of five lines, within each cabinet. A maximum of four cabinets, providing a total capacity of 400 lines, may be installed in each TE-400 system. Refer to Dwg. 130097 for configurations and PCB positions Refer to Section III, paragraph 2.0.

2.1 Refer to Section X for functional description of printed circuit boards.

2.2 Attendant Console (316028)

Refer to Section X, paragraph 3.3.

2.3 Power Equipment

The power supply assembly provided with **the system is available in two arrangements, regular standby.**

2.3.1 **Regular Power Supply (316300)**

The regular power supply consists of four individual power modules mounted at the extreme left side of the cabinet at levels D-G. The power supply modules of like voltages will be cross-connected to common bus bars in multicabinet installations. Refer to Fig. 3-1, Section III.

2.3.2 Standby Power Supply

Standby power units may be provides on an optional basis as **a** replacement for the **regular** power modules. The standby power units will:

(a) Provide "no break" power derived from a local battery supply, in the event of failure of the 110V 50-60 cycle commercial power.

(b) Each standby power unit will have the capacity of serving one 100-line EPABX system.

(c) **A** maximum **of** two standby power units will be housed in each standby power cabinet.

(d) The standby power cabinet will have the same height and depth dimensions as the apparatus cabinet.

(e) Each standby power cabinet must be located adjacent to the apparatus cabinet(s) that it is serving. That is, in the case of one standby power cabinet serving two apparatus cabinets, the standby power cabinet must be located between the two apparatus cabinets.

2.4 Power Failure Cut-Through (PFCT)

Provision is made for the extension of central office service direct to preassigned PABX extensions in case of power failure, subject to the following definitions and exceptions.

2.4.1 Power failure is defined as a loss of system DC power.

2.4.2 Capacity

A maximum of three EPABX stations may cut-through to an equivalent number of trunks for each 100-line cabinet.

2.4.3 Loop Start City Trunks

Loop Start City Trunks - In the case where the trunks cut-through to the EPABX stations are loop start city trunks, normal incoming and outgoing service will be provided between the central office and the EPABX stations.

2.4.4 Ground Start City Trunks

In the case where the trunks cut-through to the EPABX stations are ground start city

trunks, the station instruments must be equipped with a ground source under control of a push button. This button must be depressed to obtain a central office dial tone when originating a call. Incoming service will be provided in a normal manner.

2.4.5 DID Trunks (Loop Signaling)

In the case where the trunks cut-through to the EPADX stations are direct inward dial trunks, only outgoing service will be provided.

2.4.6 DID Trunks (E&M Signaling)

The power failure cut -through feature will not function for either incoming or outgoing service if the DID trunks are arranged for E & M signaling.

2.5 Satellite Equipment

The following equipment may be required upon installation. The required equipment will depend on the features incorporated in the system.

2.5.1 A 48VDC Power Supply will be required whenever DID trunks/tie lines are equipped.

2.5.2 Amplifiers, speakers, etc, will be required on those systems equipped with the public address system feature

2.5.3 Audible signaling components (such as horns, bells, etc.) will be required on systems equipped with:

(a) Unassigned Night Answer (UNA) - Audible signaling devices for UNA must be capable of being driven by a 30 Hz signal interrupted at one second on, one second off.

(b) Code Call - Audible signaling devices for use with code call must be capable of following a switch closure of 1 ips

NOTE: These satellite equipments may not be supplied by ITT. See Equipment Specifications for ITT supplied equipment.

2.6 EPABX 1 input and Output Circuits

Table 2-4 shows the Inputs/outputs of various EPABX circuits that are connected to satellite equipment

Table 2-4. EPABX Input and Output Circuits

Circuit	Output
Trunks/Tie Lines (E-M)	E and M Leads - One set per circuit
Trunks/Tie Lines (All)	Tip and Ring - One set for each circuit
Lines	Tip and Ring - One set for each circuit
UNA	URL1, URL2, URL3, URL4
Code Call	CCM1, CCM2, CCM3, CCM4
Public Address	TR1, TR2, TR3, APC1, APC2

2.7 Environmental

2.7.1 Temperature 0° to 100°F

The TE-400 does not require air conditioning. However, the TE-400 must be placed in a ventilated room. The room ventilation and air move. meat must be equivalent to a system cooling fan of cubic feet per minute listed below. The recommended ambient temperature is **100°F.** maximum.

Ambient Temperature	Air Movement
°F.	CFM
70	64
80	76
90	94
100	125

2.7.2 Humidity

Humidity 10 - 90%

2.7.3 Atmosphere

(a) Non-corrosive atmosphere
(b) Non-explosive atmosphere

NOTE: If it is necessary to operate the TE-400 III an environment that exceeds the figures listed in paragraph 2.7, the Director of Engineering must be consulted

3.0 PREINSTALLATION PLANNING

3.1 Equipment Location

The assigned equipment space(s) should be surveyed for:

(a) Size
(b) Environment
(c) Floor loading
(d) Cable(s) access
(e) Location of console
(f) AC power supply outlets and ground

3.2 Equipment Specifications (E-S)

Each system produced IS provided with an Equipment Specifications

3.2.1 Sheet 1 of the E-S will be provided for each cabinet of a system

The cabinet pictoral shows the shelf position of all equipped PCB' s

The numbering plan shows the assigned access digits for each circuit

Table A lists cabinet(s) and associated equipment

Table B lists PC boards associated with the cabinet

General and Shop notes are of interest to the installer(s)

Shop notes are performed by the shop prior to shipments.

3.2.2 theetE-S will be provided for **each system.**

Strapping **Chart** A **refers to equipment** strapping options.

The installer(s) will be required to complete those items marked "Installer. "

Strapping Charts B and C show special strapping. The installer(s) **will be required to complete these** items marked **"Installer."**

Table C lists all ship loose Items.

The installer(s) will complete items listed under "Installation Notes."

3.2.3 Sheet 3 IS supplied when or if any special drawings are required.

3.3 Trunks/lie tines Assignments

Table 2-5 IS provided for **the installer(s) to fill in.**

3.3.1 Table 2-5 Column Explanatory

A - Quantity - The first equipped trunk in cabinet 1 **is designated as trunk 1, and the count IS made in sequence from that point using all equipped trunks and tie lines.**

NOTE: Equipment Specifications details console appearance.

B - Group Identity- ITT circuit number. Refer to Table 2-3 and E-S.

c - Type - Supervisory signaling presented/received to/from central office. Refer to Table 2-3.

D - DCR Loop - The DC resistance of the trunks tip and ring cable between the MDF and CO This information must be obtained from the CO.

E - **Resistors TR2, MR5, MR6, and MR7 are equipped by the install**ler **to adjust the trunks to the correct loop resist**ance.

Refer to Table 2-3 to determine which trunks are equipped with TR2, MR5, MR6, **or MR7.**

Three values of each resistor are supplied.

DCR Loop	**TR2**	MR5	MR6 **and MR7**
0-800 ohms	**1200 ohms**	**1000 ohms**	**390 ohms**
401-800 **ohms**	**820 ohms**	**620 ohms**	**180 ohms**
801-1200 ohms	390 ohms	220 ohms	0 ohms

NOTE: See Equipment Specifications, Ship Loose Material.

F - 48VDC requirement may be determined from **Table 2-3.**

G - E&M terminal equipment required may be determined **from** Table 2-3.

H - Incoming only, outgoing only, or two-way may be determined from the Equipment **Specifications. ALL TE-400** trunks are two-way **trunks but may be engineered** for one-way operation.

J - All TE-400 trunks that have attendant access may have a console appearance. See Table 2-3. However, outgoing only trunks **may** NOT use this feature. See Equipment Specifications.

K - Refer to Equipment Specifications for the appropriate Access Digit(s).

L - Consult with the CO to determine city number assignment.

3.3.2 Table 2-5 Usage

Example: Trunk 1, Bay 1 has a group identity of 316075. The **type is ground start. DCR loop equals 605 ohms, thus TR2 equals 820 ohms. Resistors MR5, MR6, and MR7 are not installed. The 48VDC** or external **terminating equipment** is not required. The trunk is a two-way trunk with **console appearance.** The ac**cess digit is 9 and the assigned city number is 686-7401.**

3.4 Station/Line Assignments

Each EPABX cabinet is wired for 100 **lines, X00 to X99. Four hundred IS the maximum number of** wired **lines.**

The number of lines equipped is in multiples of five **(each line PCB has five line circuits), from 5 to 400.**

The number of stations equipped is determined by the **equipment user's requirements. All lines wired** (100 **in each cabinet) are terminated on the MDF.** A **station refers to the actual user's location and instrument. Thus, station 200 is connected to the MDF, which is connected to line 200 in the equipment cabinet**

Table 2-6 is presented to allow the Installer to determine Line and Feature assignments.

The installer must consult the Equipment Specifications (E-S) and the customer to determine what lines will be equipped for the items listed in Table 2-6. A check should be inserted to indicate assignment

3.4.1 Table 2-6 Column Explanatory

A - EPABX **Line - Refer to Equipment Specifications numbering scheme The first entry should be the lowest (nominally 200) line equipped and proceed sequentially upwards to the highest line number equipped.**

B - Not Assigned - Line circuit equipped but not active.

c - **Tie Line Assignment - Each tie line installed removes one line from service as a station. Consequently, any line appearance assigned for tie line usage cannot be assigned to a station.**

Consult Equipment Specifications to determine the lines installed and the number assigned.

D - Attendant (Attd) Line - This line is assigned to the attendant and may be selected from any line.

E - Trunk Conference Line - This lines as assigned to the trunk accessing conference and can be any lines may assigned as an attendant line or tie line.

F - Station Equipment (See Table 2-1) - Establish thee station equipment **required** or presently installed. From Table 2-1 determine the **number** corresponding to station **equipment** and enter under Station Equipment column.

G - Group Hunt (Rotary Service) - SIX group-hunt circuits **may be** provided in each **hundred** line group (see Equipment Specifications). The first station number in the group is the master number. One master number plus a maximum of four slave stations comprise one group-hunt circuit.

NOTE: **A** slave station can only appear in one hunt group.

Croup **hunting** IS not restricted to **consecutive numbering** but may start with any extension number (master) **and include a maximum** of **any four slave** numbers **within the same hundred** group.

Any station can be **assigned** as a master or slave.

Consult equipment user for **desired master numbers and assigned slaves for each group hunt circuit. Do NOT mix slaves between groups.**

Example: Group Hunt 1 - If 220 IS the master, **enter "M" under** Group **Hunt 1 column corresponding to 220. Identify slaves as "S1," "S2," "S3," and "S4."**

H - Power **Failure Cut-Through** (PFCT) - Three lines may be **assigned per bay for power failure cut-through These lines will be connected directly to a central** office **trunk in the event of a power or complete (loss of DC power for any reason) equipment failure**

Central office trunking - ground start

Type of instrument required - ground button to activate CO

Type of service supplied - normal inward and outward.

Central office trunking - loop start

Type of instrument required - Normal (K-500)

Type **of service supplied - normal inward and outward.**

Central office trunk - DID (loop)

Type of instrument required - Norma! (K-500)

Type Of service supplied - outward only.

Central office trunk - DID **(E&U)**

The PFCT will not function.

Where a mixture of trunks are provided (i.e., ground start and loop start) it is desirable to place the PFCT lines to the type of trunk providing both in and out service.

Determine what systems are to be assigned to PFCT and enter under PACT column.

J - **Assigned** Night Answer **(ANA)** - Each **ANA** PCB has provisions for six stations to he assigned ANA service. One PCB **is normally equipped per station (see Equipment Specifics**

Consult with equipment **user** to determine **stations to be assigned to** ANA.

NOTE: ANA station should not be a group hunt slave station.

K - Single Digit Access (SDA) - Each equipped SDA and PCB has provisions for five stations to be assigned as SDA's. Consult Equipment Specifications to determine if SDA is equipped Consult equipment user to determine stations to be assigned.

L - Executive Override - Consult Equipment Specifications to determine if executive override IS equipped. If equipped, one station may be assigned as executive override. Consult equipment user to establish station

M - Intercept Number - Refer to Equipment Specifications if intercept is equipped.

Consult equipment user to determine line to be intercepted

N - Class of Service Restriction - Each equipped station may be restricted from five features This restriction prevents the station(s) from accessing the specific feature(s) when the access code(s) feature digit is dialed A busy tone IS returned to the restricted station(s) upon dialing a restricted feature digit(s)

This restriction IS accomplished by equipping or not equipping a diode on the class of service (COS) PCB

The option of either equipping or not equipping a diode to restrict a station is established prior to shipment and is detailed in the Equipment Specifications installation notes

Use the information on the E-S **installation notes and consult with the equipment user to determine what stations should be restricted Then enter the type of restriction under the class of service (COS) column**

An "X" under Y column shows that the station **should be restricted** and a diode must be equipped. An "X" **under** the N column shows that station will be restricted if a diode **is** not **equipped.**

Example:

	Access Level	Install Diode to Restrict	Install Diode to Unrestrict
Toll Restriction (316067)			X
City Trunk (316075)	9	X	
City Trunk (316075)	81		X

This shows that the equipment has toll restriction and all stations will be toil restricted unless **a diode** IS equipped. City **trunk** (dial 9) may be **accessed by** all stations unless a **diode** IS equipped. City trunk (dial 81) cannot be accessed unless a diode IS equipped.

A	B	C	D	E	F	G	H	J	K	L	M	N	O	P	Q
Trunk Tie/Line Qty	Group Identity	Type	DCR Loop	TR2	MR5	MR6	MR7	48 VDC Required	E&M Term Equip Req	Inc Only	Out Only	Two Way	Console App.	Access Digit(s)	City Number Assigned
1															
2															
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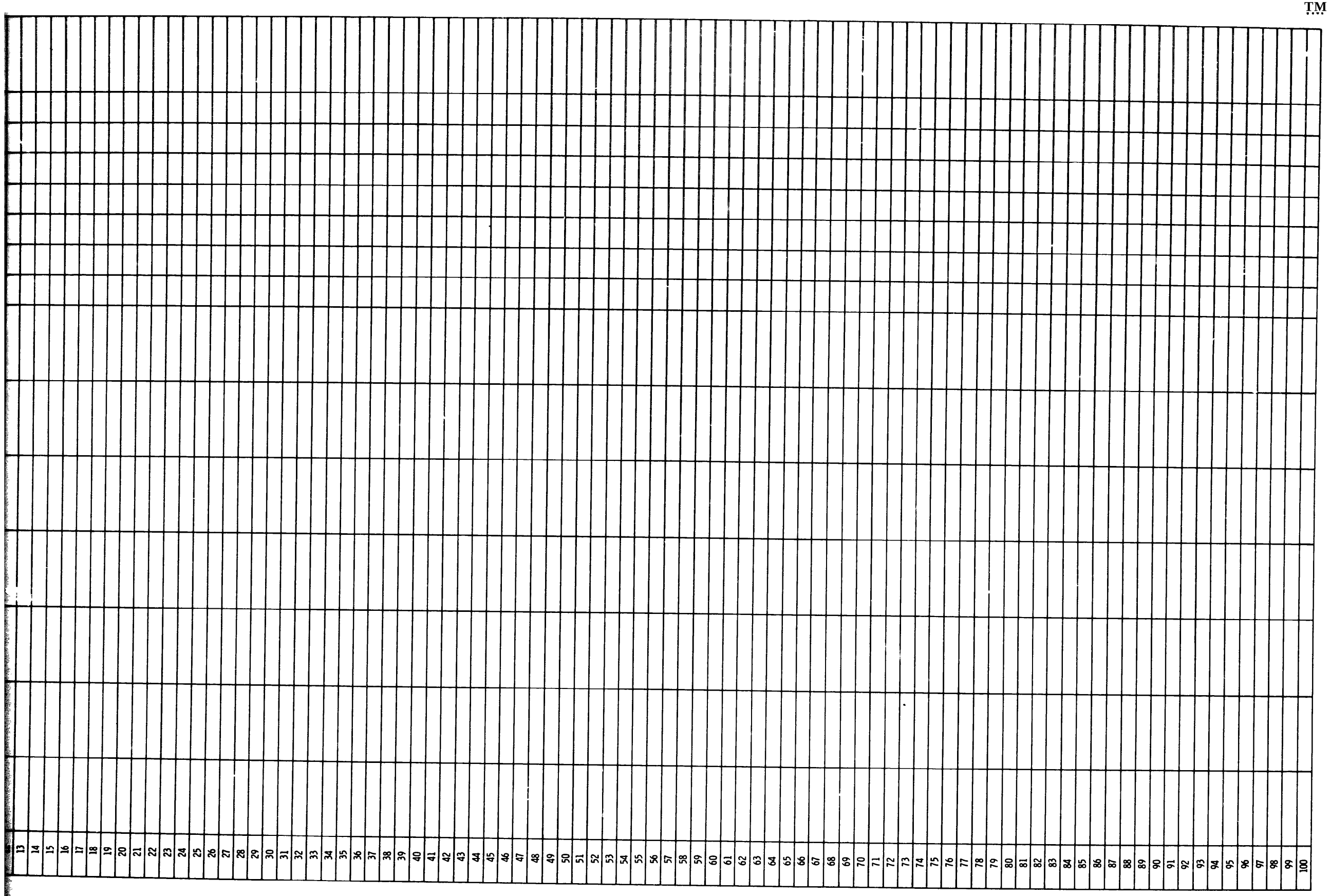
Table 2-5
Trunks/Tie Unit Assignment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A	B	C	D	E	F	G	H	J	K	L	M	N	O	P	Q
Trunk Tie/Line Qty	Group Identity	Type	DCR Loop	TR2	MR5	MR6	MR7	48 VDC Required	E&M Term Equip Req	Inc Only	Out Only	Two Way	Console App.	Access Digit(s)	City Number Assigned
101															
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Table 2-5 (Cont'd)
Trunk/Tie Line Assignments

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A	B	C	D	E	F	G						H	J	K	L	M	N Class of Service Restriction									
EPABX	Not Assigned	Tie Line Assigned	Attd Line	Trk Conf Line	Stations Equip-ment	Group Hunt 1	Group Hunt 2	Group Hunt 3	Group Hunt 4	Group Hunt 5	Group Hunt 6	Power Failure Cut Thru	ANA	Single Digit Access	Exel Over-ride	Intercept No.	1		2		3		4		5	
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Table 2-6.

Line and Feature Assignments

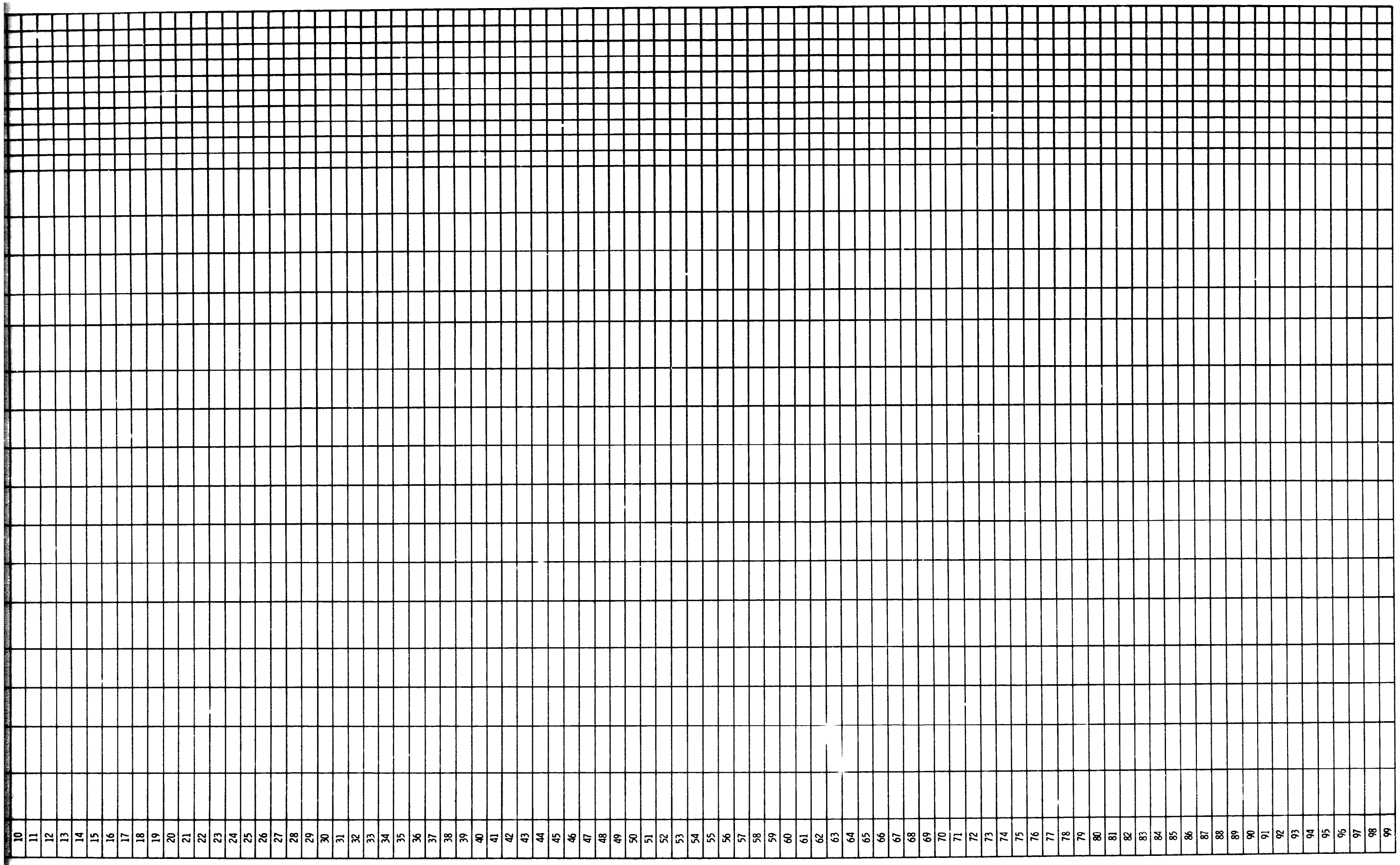
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Table 2-6 (Cont'd)

Line and Features Assignment

A	B	C	D	E	F	G						H	J	K	L	M	N Class of Service Restriction									
EPABX	Not Assigned	Tie Line Assigned	Attd Line	Trk Conf Line	Stations Equip-ment	Group Hunt 1	Group Hunt 2	Group Hunt 3	Group Hunt 4	Group Hunt 5	Group Hunt 6	Power Failure Cut Thru	ANA	Single Digit Access	Exel Over-ride	Intercept No.	1		2		3		4		5	
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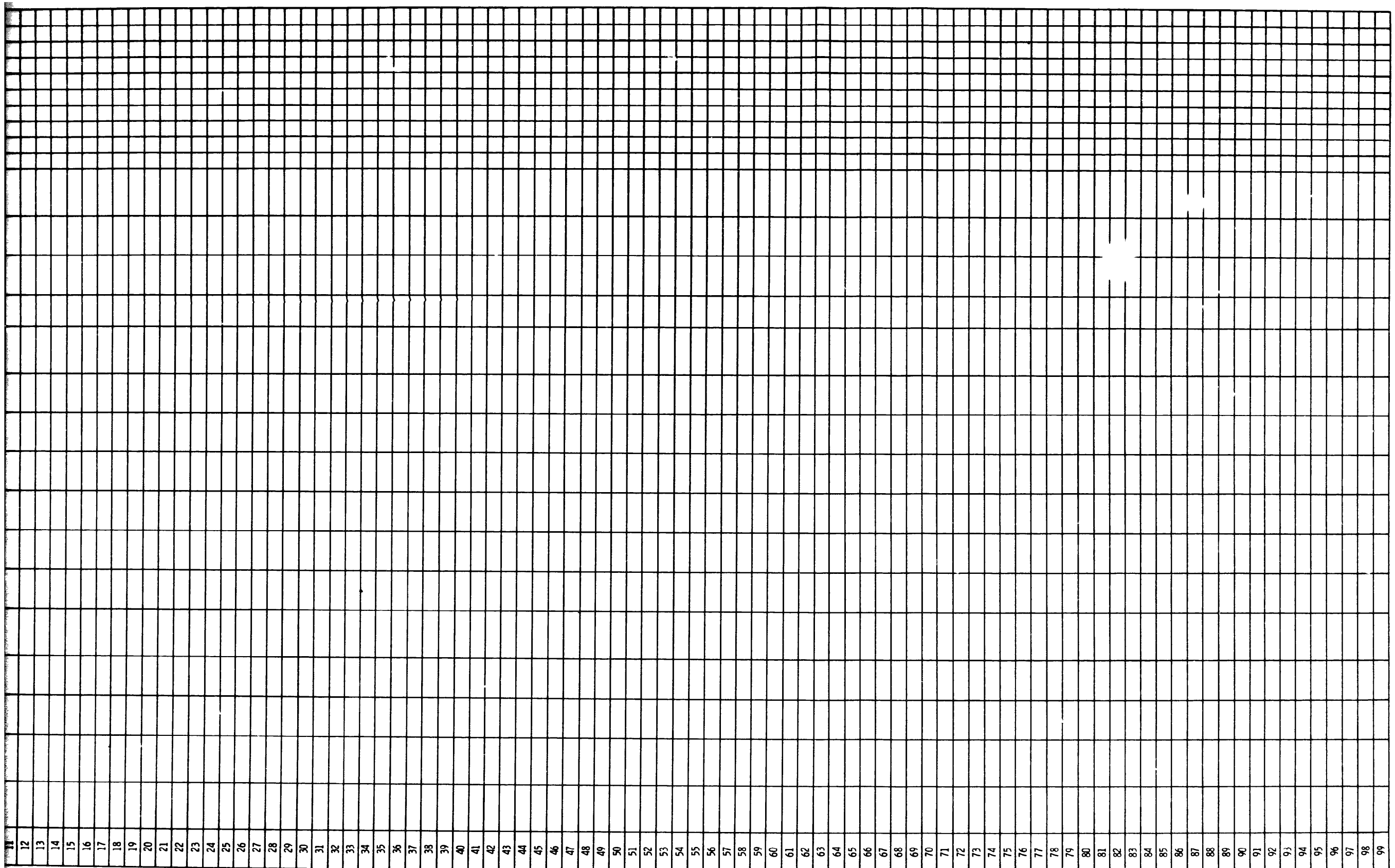
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Table 2-6 (Cont'd)
Line and Feature Assignments

A	B	C	D	E	F	G						H	J	K	L	M	N Class of Service Restriction									
EPABX	Not Assigned	Tie Line Assigned	Attd Line	Trk Conf Line	Stations Equip-ment	Group Hunt 1	Group Hunt 2	Group Hunt 3	Group Hunt 4	Group Hunt 5	Group Hunt 6	Power Failure Cut Thru	ANA	Single Digit Access	Exel Over-ride	Intercept No.	1		2		3		4		5	
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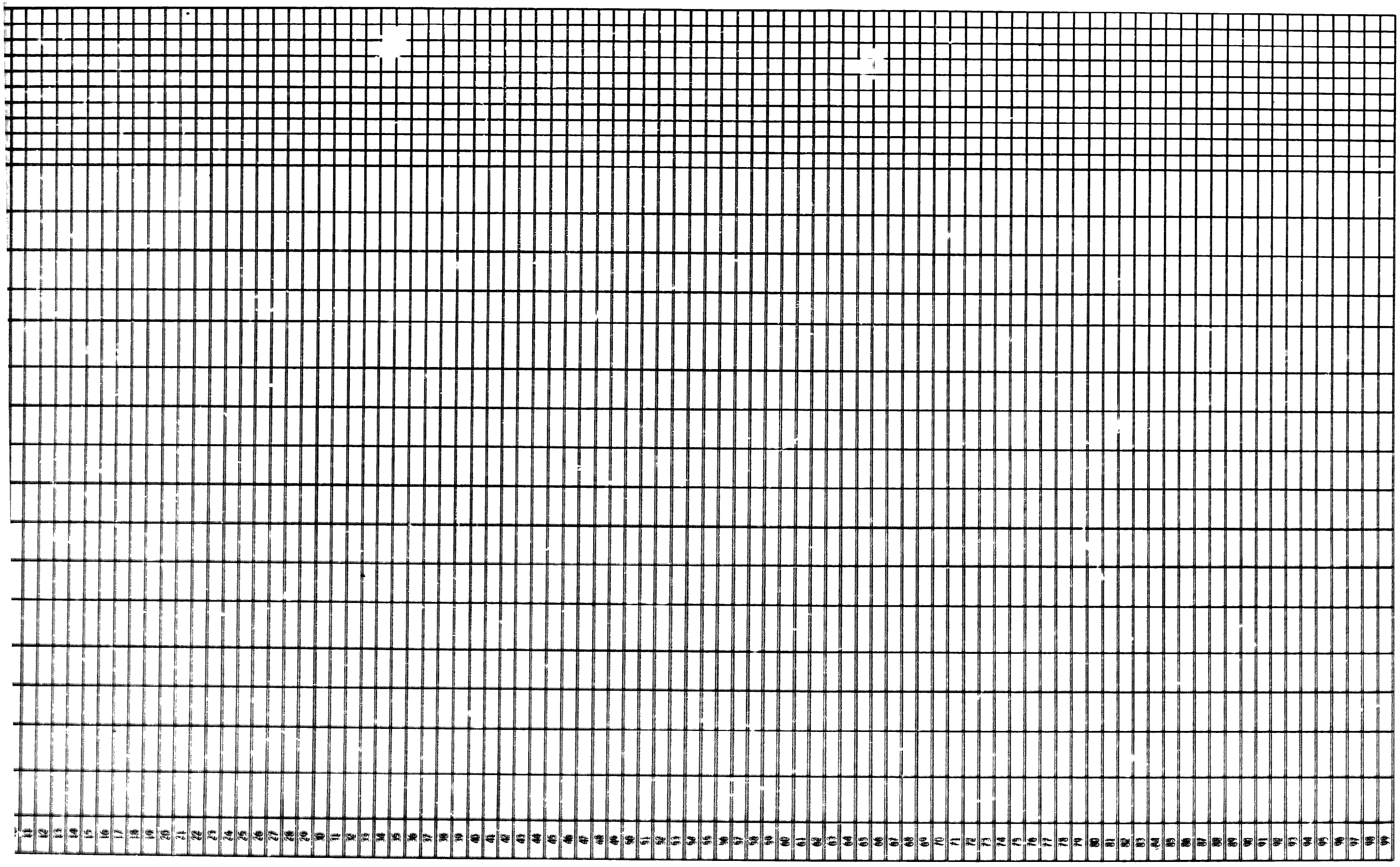

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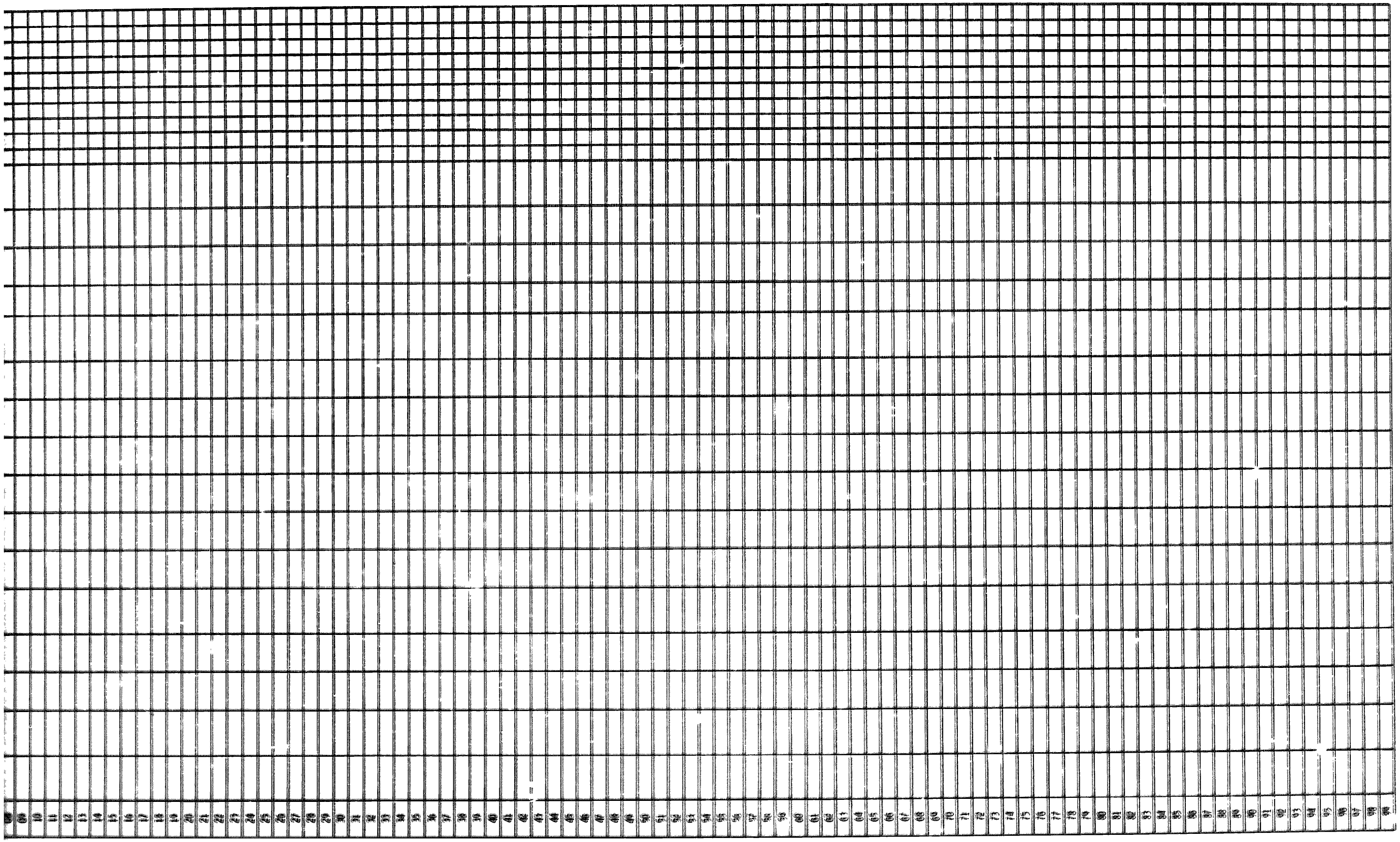
Table 2-6 (Cont'd)
Line and Features Assignments



Section III

CONTENTS

FIGURES

Section I I I

CABINET FAMILIARIZATION

1.0 PRELIMINARY INSTALLATION PROCEDURE

1.1 Place equipment in the assigned place Refer to Fig. 3-1.

Unpack the equipment and Inventory. The Equipment Specifications contain. complete shipping list.

Fig. 3-1 **shows** a typical four-cabinet **system Two,** three, or four single cabinets are connected in a like manner.

Place the supplied rubber feet in place and insure cabinet(s) are level. Observe caution while tripping or **raising** cabinet(s) to install feet. If a multicabinet is being Installed, level and align all cabinets.

Route interbay cabling along top in space provided. Do not connect but place cabling in approximate position.

On a muticabinet system, insure that no cabling is caught between cabinets while aligning and leveling system.

2.0 SYSTEM CABINET(S) DESCRIPTION

2.1 **Remove cabinet(s) front door(s). Face front of equipment and refer to the** appropriate figure(s) of this **section as required.**

2.1.1 **Basic Cabinet Description (Fig. 3-2)**

Each cabinet provides seven levels CA-G) of **mounting space.**

Each level accommodates one sub-rack of printed circuit boards (PCB's). The basic cabinet will always contain levels A and B.

- **(a) Level A contains 20 line positions.**
- **(b) Level B contains the Control Circuitry.**

2.1.2 **First Cabinet Description (Fig. 3-3)**

The first cabinet of any system will contain levels A. B. and C. Level C is designated Attendant Control Sub-Rack. The DC power supplies will be equipped on levels C, D, E, F, and G The PC boards and sub-racks on levels D through G are optional and will be equipped as required.

2.1.3 **Second Cabinet Description (Fig 3-4)**

The second cabinet of any system will contain levels A. B. and C. Level C is designated Multiple Attendant Control Sub-Rack. The DC power supplies will be equipped on levels D through G Levels D-G will be equipped with PCB sub-racks on an as needed basis.

2.1.4 Third and Fourth Cabinet Description (Fig. 3-5)

The third and fourth cabinets of any system will contain levels A, B, and C Level C sub-rack is designated Toll Restrictor Sub-Rack. Levels D-G will contain the DC power supplies. Levels D through G will be equipped with PCB sub-racks on an as needed basis

2.1.5 Optional Sub-Rack Description (Fig. 3-6)

The four optional sub-racks are shown on Fig. 3-6 Any cabinet can contain:

Level	Sub-Rack
D	City Trunk or DID Trunk
E	City Trunk or DID Trunk
F	City Trunks, DID Trunks. or Tie Lines
G	City Trunks, DID **Trunks, or Hotel/Motel** Features (or addi**tional features)**

3.0 PRINCIPAL ITEMS LOCATIONS

3.1 **Junctor Test Panel (Fig. 3-7)**

Facing the front **of the cabinet, the** junctor test panel is located on **the right side of** cabinet(s).

3.2 System Test Panel (Fig. 3-8)

Fig. 3-8 shows the alarm reset button (labeled Reset), voltage check button (labeled VC), regular (Reg), and test phone jack.

3.3 Fuse Panel Assy. (Fig. 3-9)

A fuse panel is located on each shelf of those systems equipped and/or wired with trunks/tie lines requiring external 48VDC. Fig. 3-9 shows the fuse panel.

3.4 **Refer to Equipment Specifications for specific PCB layout and equipped positions.**

3.5 **AC Power Source, DC Power Supplies and Blower Locations**

Remove rear door and face rear. Refer to Dwg 130097 (sheet 2), Section E-E.

3.5.1 **The blower input and filter input are located at the bottom left.**

NOTE: Blockage of blower input will remove power from the system.

3.5.2 **The AC power transformers and their associated capacitors are positioned at the bottom right.**

3.5.3 The AC power cord access entrance is located between the blower input and AC power **transformer.**

3.6 Miscellaneous Panel Assy. (Fig. 3-10)

Refer to Fig. 3-10. Facing the rear of the cabinet, the miscellaneous panel assembly is on the inside right.

Letters A, B, C. etc., have been assigned to individual items of the panel assembly. The items are identified below:

A - AC Circuit Breaker(s). All system AC circuit breakers will be located in cabinet 1.
B - VC Transformer fuse, 5VDC supply, and blower fuses.
C - Spare fuses.
D - Voltage Check Transformer.
E - Power Relay.
F - Ring Generator.
G - Ring Generator Suppression Assembly.
H - PFCT1, PFCT2, Auxiliary Relay, and RL1.
J - MC1 through MC5 (5VDC supply).
K - MB1 (5VDC supply rectifier).
L - Q1, MR1, and MCB (5VDC supply).
M - TE resistor assembly and RV1, RV2, SCR1, RV21, RV22.
N - TE resistor assembly PCB.
O - Miscellaneous Panel Assembly. Connector block.

NOTE: Items A, D, J, M, and N will note be equipped on cabinets 2, 3. or 4 of multicabinet systems.

3.7 Horizontal Bus (Fig. 3-11) and Vertical Bus Bar (Fig. 3-12)

A horizontal DC voltage/ground bus bar is located on each level. The horizontal bar is connected on the right to a vertical bar, which is connected to the DC power relay. Refer to Figs. 3-11 and 3-12.

3.8 Printed Circuit Board Locations

Refer to Dwg. 130097 (sheet 4) The PCB's are assigned positions on each shelf. Each PCB is inserted into the appropriate female connector. Each PCB **has a distinct plug arrangement that** prevents inadvertent **insertion of the PCB into an** incorrect position.

Facing thee rear of **the cabinet, the PCB positions are** counted 1, 2, 3, etc., **from right to left.**

3.9 Strapping Field

The strapping field (SF) is located on the left and is **inside the cabinet. The connectors of** each 12x35 **S.F. point directly to the right.**

Each level is assigned one 12 x 35 S.F.

3.10 Punching Block

The punching block is on the left rear and its connectors point directly outward. Each punching block is equipped with 12 x 7 connectors on an as needed basis. Each level is assigned its own punching block.

Dwg. 130071 shows the level A sub-rack punching block and strapping field. The pin count starts at the upper left as 00.0 and counts downward to 034.0 (lowest left pin). The assigned horizontal count starts from the extreme left vertical count and progresses in numerical sequence to the right (00.0 to 00.11). Thus, GHA 25 is found to be on 025.7. It is 25 from the top and 7 from the left. Likewise, 235 is found on 16.4.

The method of pin count is the same for the punching block and strapping field.

4.0 SUB-RACK DRAWING NUMBERS

Dwg. No.	Sub-Rack	Level	Bay(s))
130071	Lines	A	All
130072	Control	B	All
130073	Attd. Control	C	1
130074	Attd. Multiple	C	2*
130075	Toll Restrictor	C	2 or 3*
130076	City Trunk	*	*
130077	DID	*	*
130078	Tie Line	*	*
130079	Hotel/Motel	*	*
130080	Feature	*	*

*** Refer to appropriate paragraph in Section E for Level and Bay (cabinet) information.**

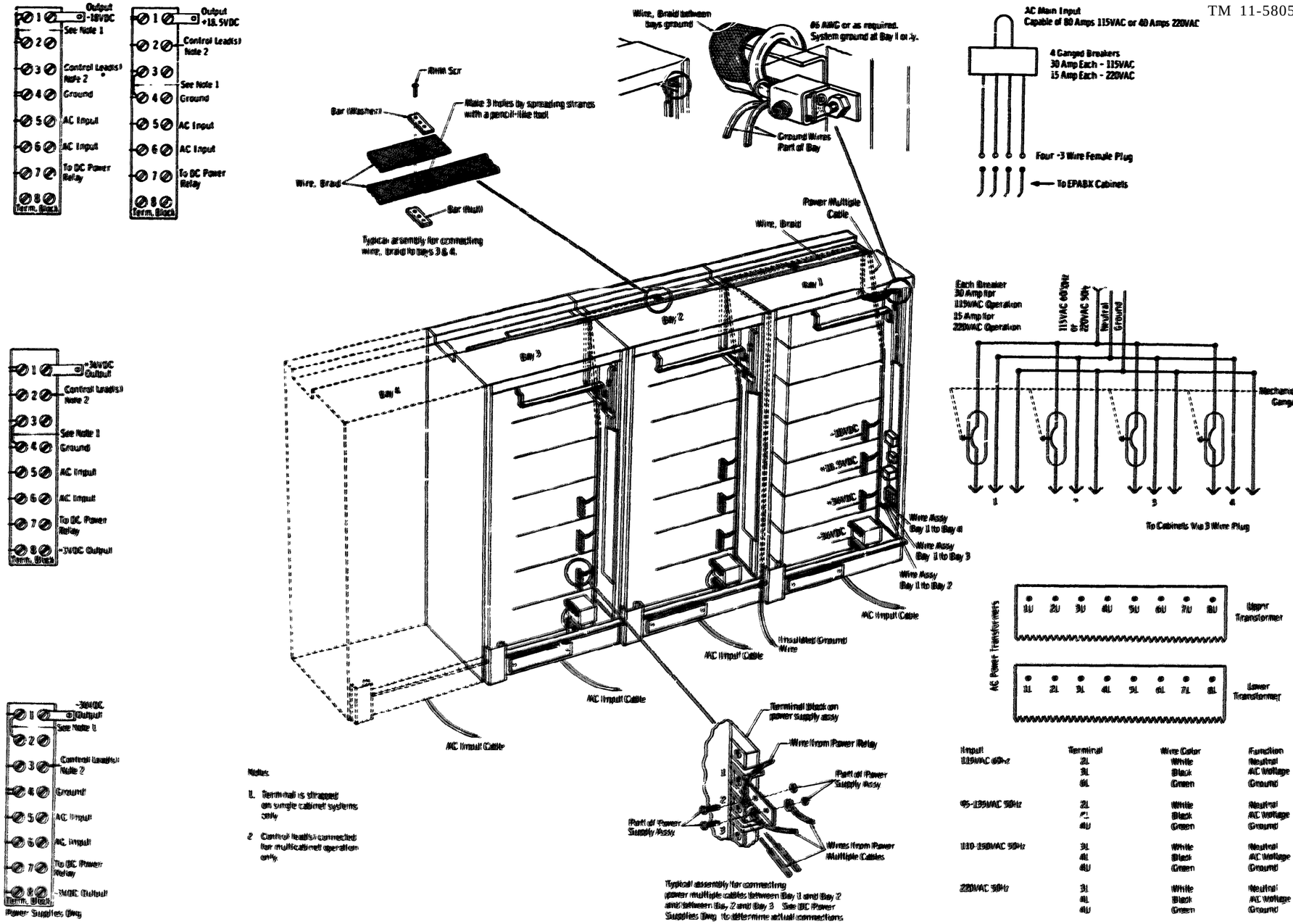


Fig. 3-1 Typical Multicabinet System Layout

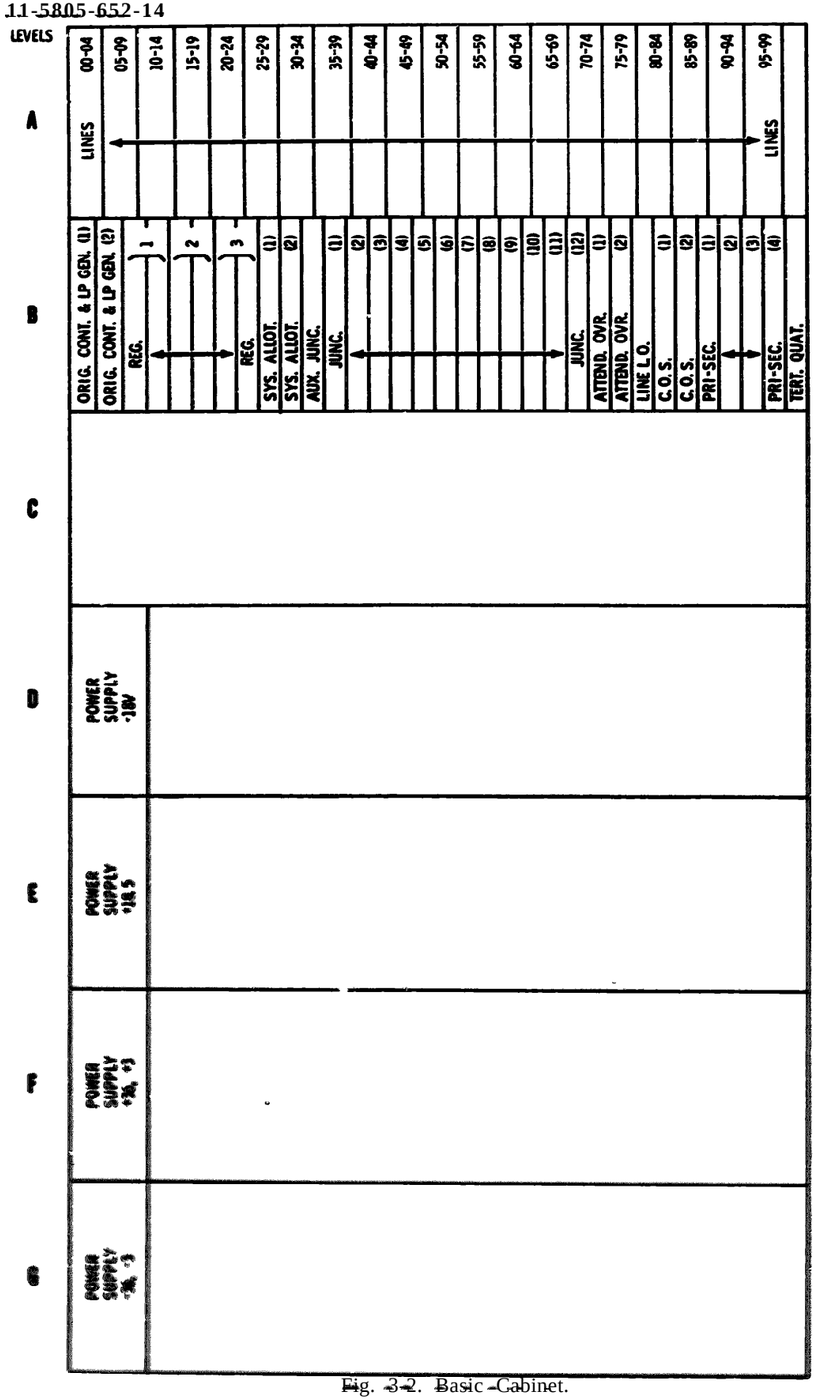


Fig. 3-2. Basic Cabinet.

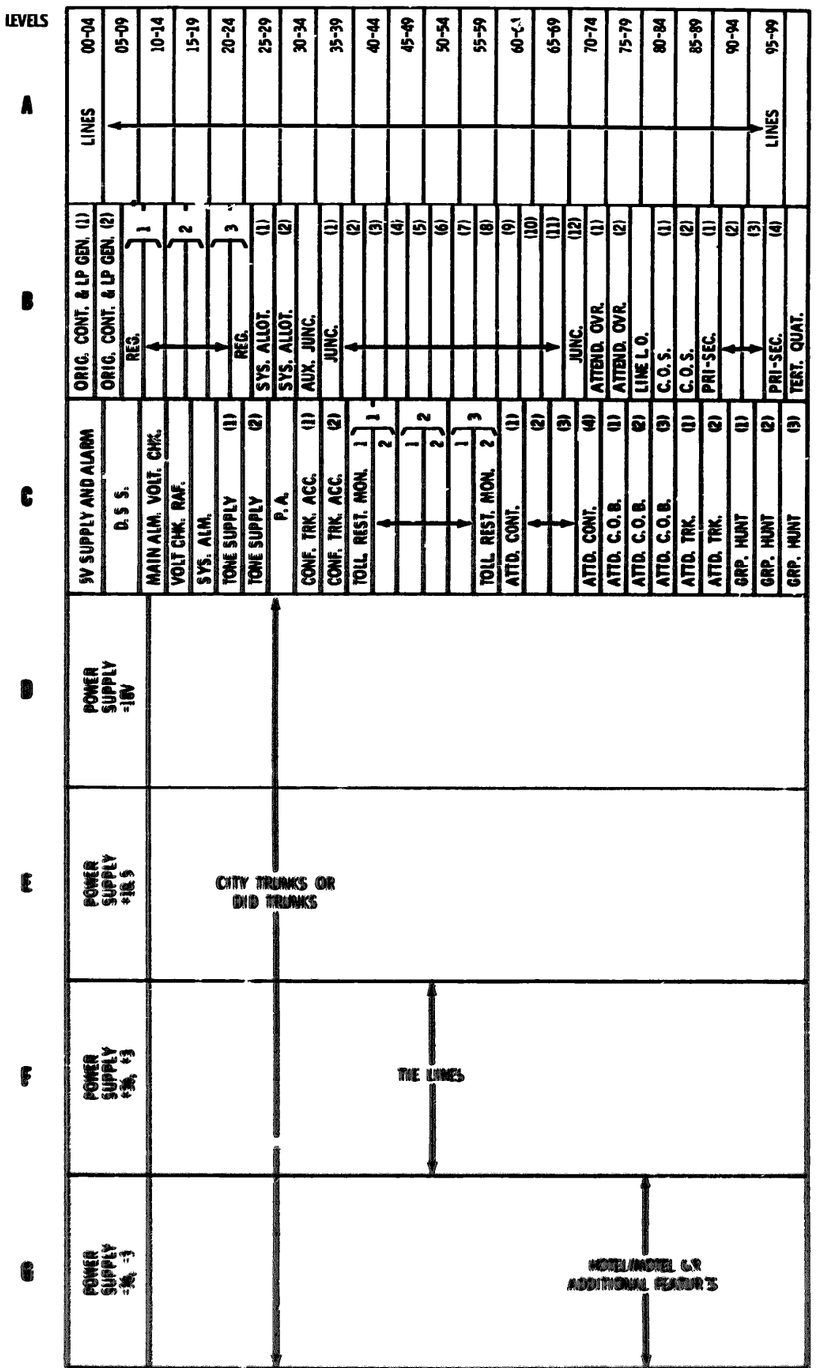


Fig. 3-3. First Cabinet.

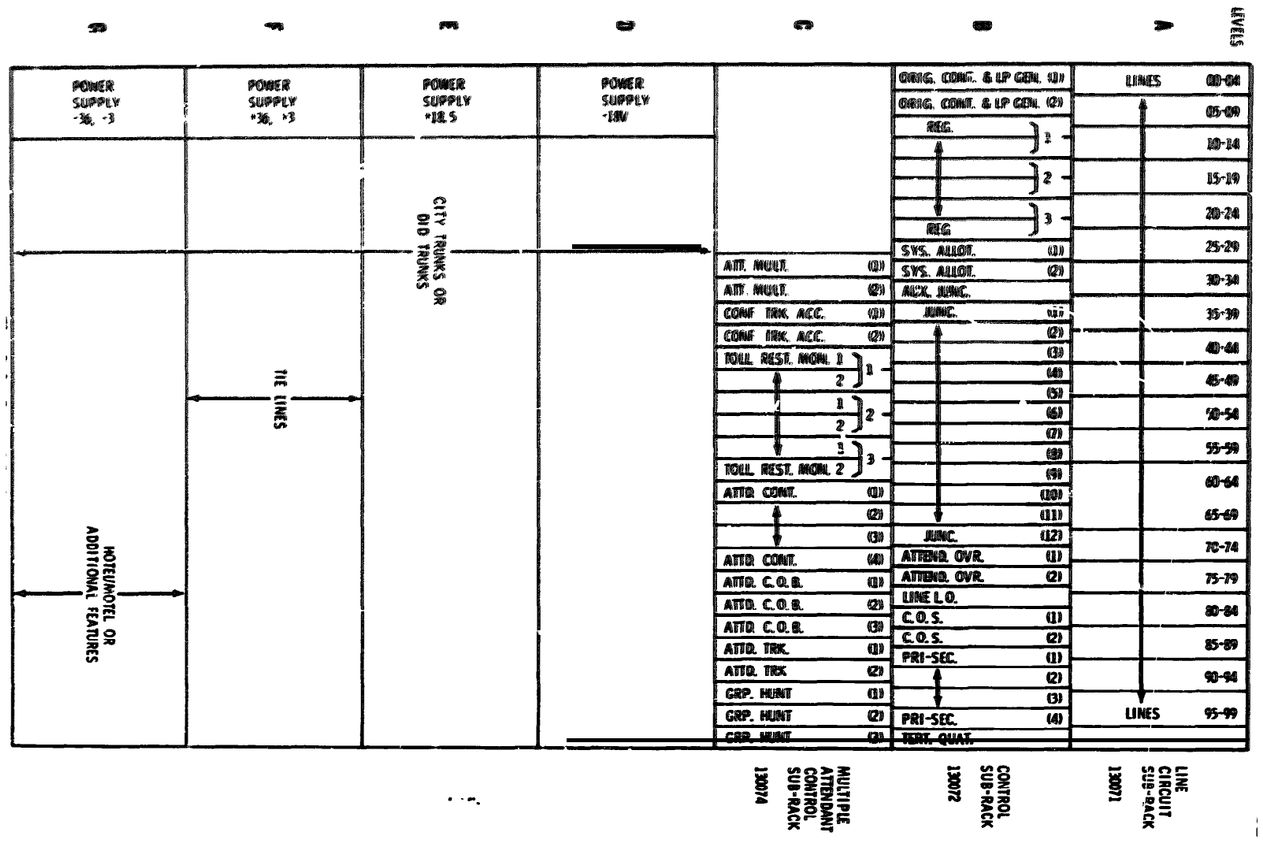


Fig. 3-4 Sound Control

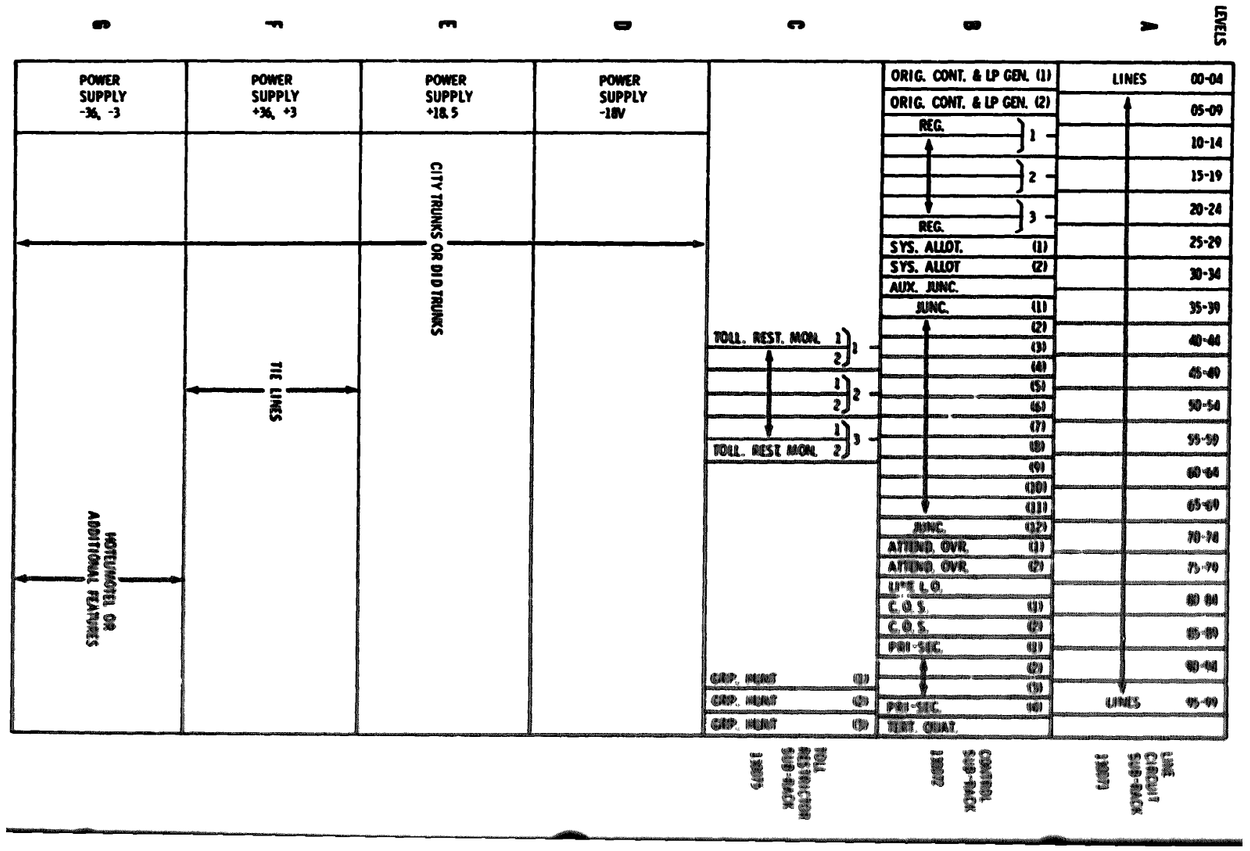


Fig. 3-5 Third and Fourth Cabinet

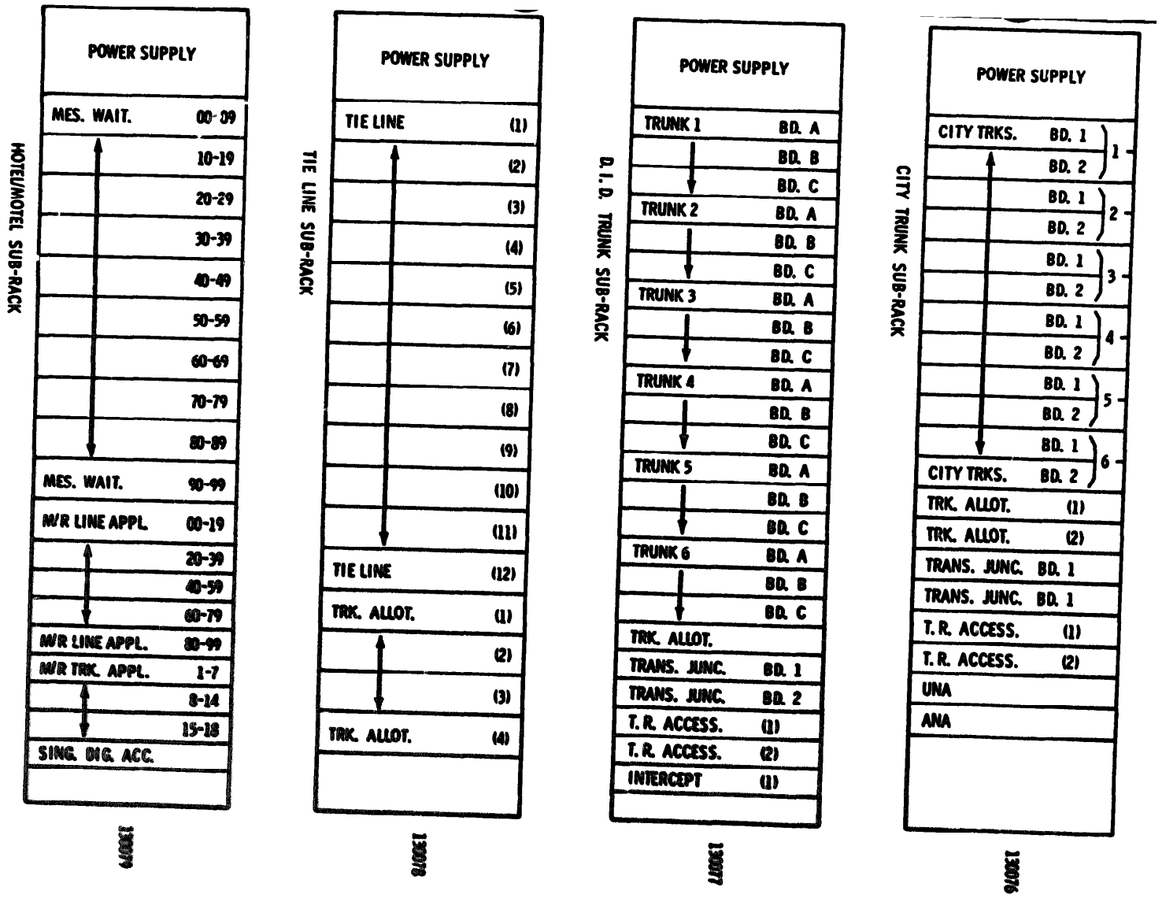


Fig. 3-6. Optional Equipment Sub-Racks

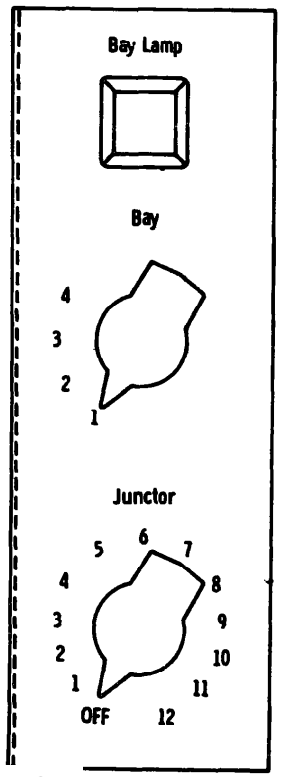


Fig. 3-7 Junctor Test Panel.

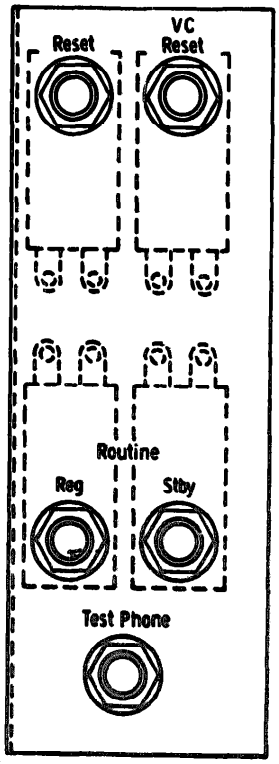


Fig. 3-8. System Test Panel.

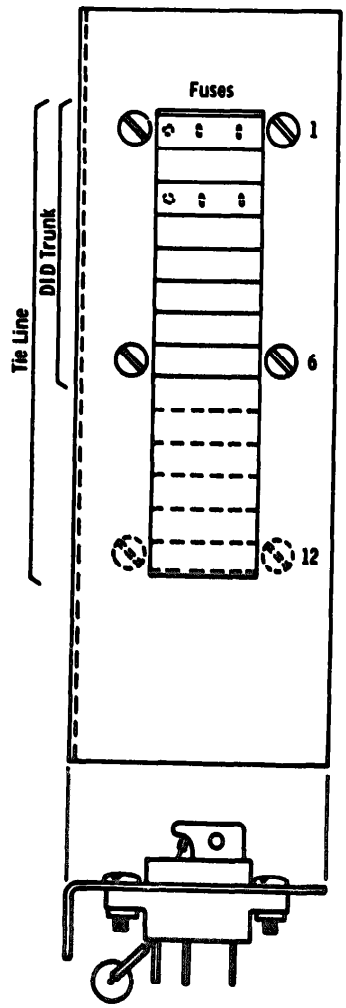


Fig. 3-9. Fuse Panel Assembly

	0	1	2	3	4	5	6	7	8	9	10	11
00	U0	U1	U2	U3	U4	U5	U6	U7	U8	U9	17R2 R	5R2 R
01	T0	T1	T2	T3	T4	T5	T6	T7	T8	T9	17R2 S	5R2 S
02	H0	H1	H2	H3	H4	H5	H6	H7	H8	H9	RRG2	AP5
03	MC1	MC2	MC3	MC4	BO	CD	S1-1	S1-2	S2-1	S2-2		
04	LT1	LR1	LT2	LR2	LT3	LR3	ST1	ST2	ST2	SR2	ST3	SR3
05	TT1	TR1	TT2	TR2	TT3	TR3	CT1	CR1	CT2	CR2	CT3	CR3
06	PR2	PR3	PR4	RV1	RV2	RG	+36 T	+18.5 T	-18 T	-36 T	-3	+3

	0	1	2	3	4	5	6	7	8	9	10	11
07	SCR1	IR1	X1	MC5	+5	+5	+5					
08	U0	U1	U2	U3	U4	U5	U6	U7	U8	U9		
09	T0	T1	T2	T3	T4	T5	T6	T7	T8	T9		
10	H0	H1	H2	H3	H4	H5	H6	H7	H8	H9		
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Pin Designations for Terminal Block Assemblies

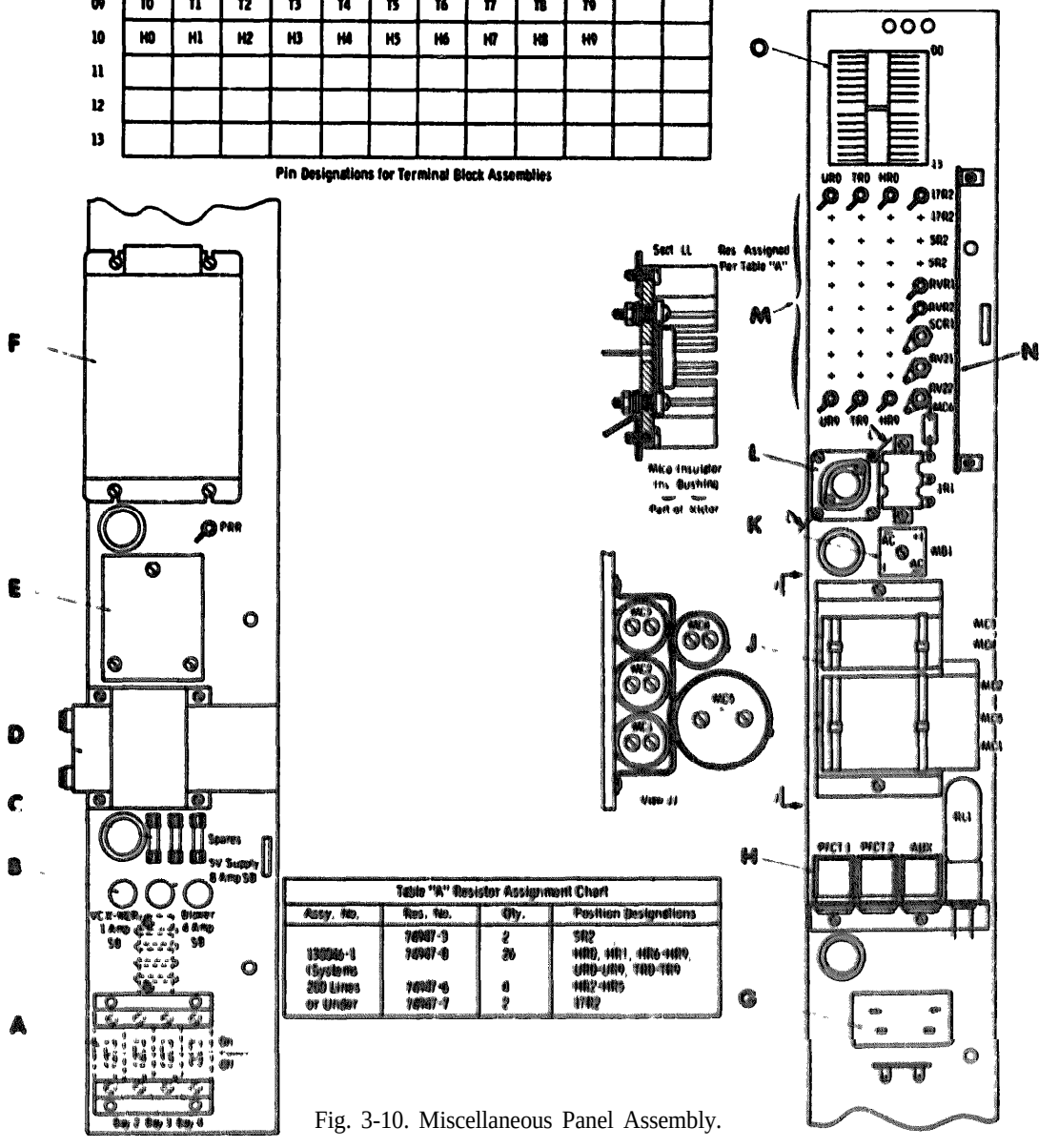


Table "A" Resistor Assignment Chart			
Assy. No.	Res. No.	Qty.	Position Designations
13E946-1 (Systems 200 Lines or Under)	14W47-3	2	5R2
	14W47-8	20	HR0, HR1, HR6-HR9, URO-UR9, TR0-TR9
	14W47-6	6	HR2-HR5
	14W47-7	2	17R2

Fig. 3-10. Miscellaneous Panel Assembly.

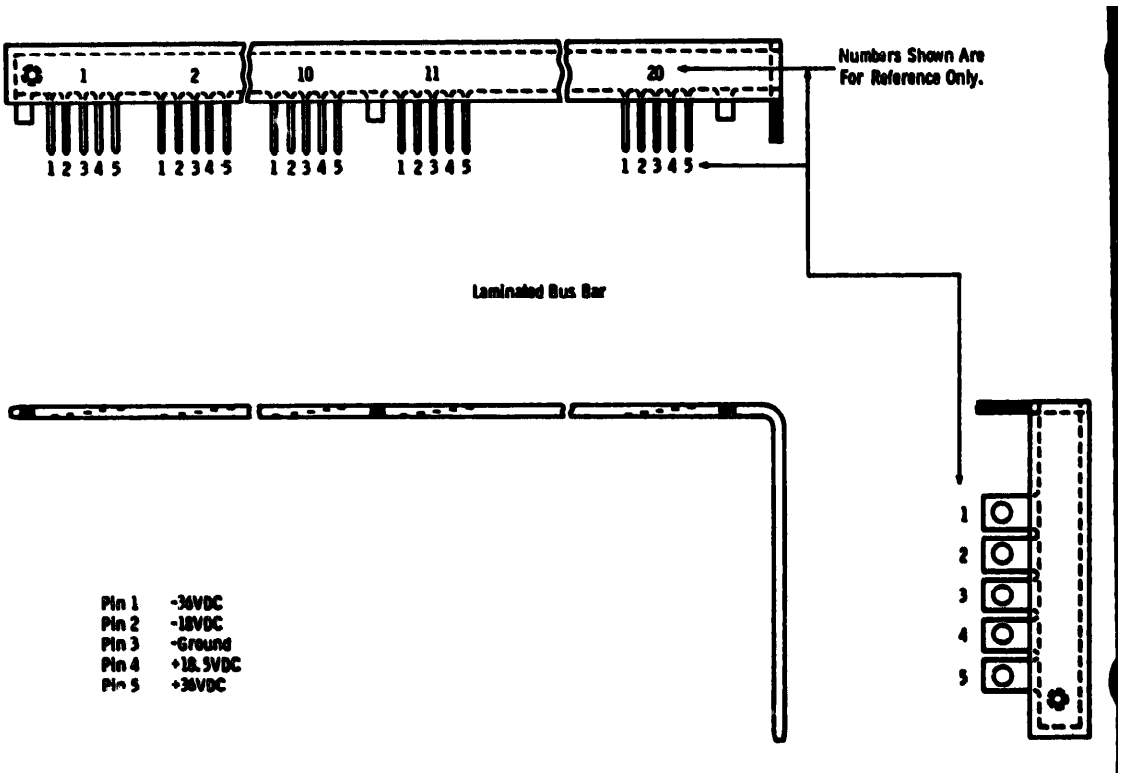


Fig. 3-11. Horizontal Bus Bar.

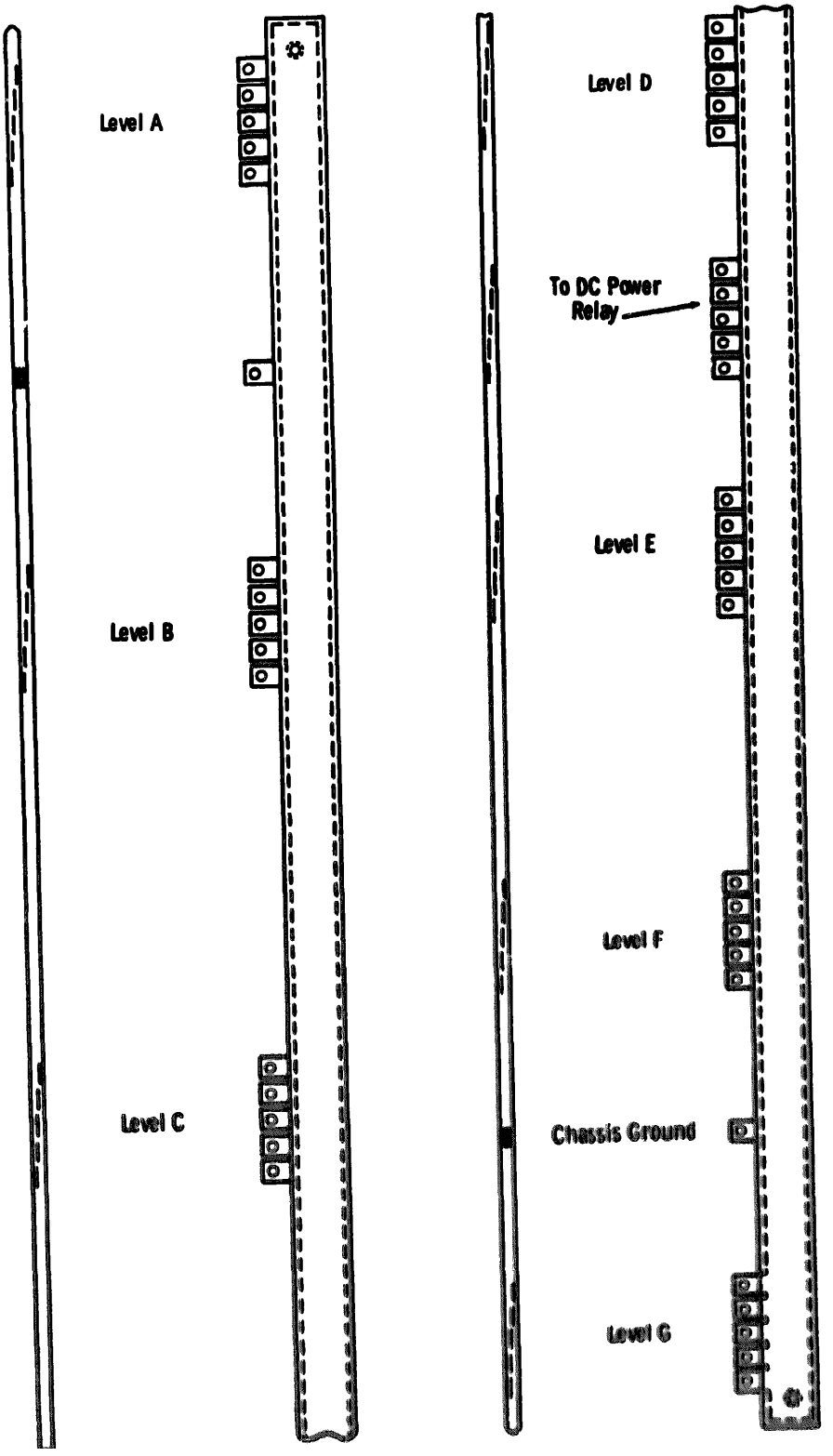


Fig. 3-12. Vertical Bus Bar.

Section IV

CONTENTS

CONTENTS (Cont'd.)

TABLES

FIGURES

Section IV

POWER-OFF CONNECTION AND TESTS

1.0 VISUAL

1.1 Inspect the equipment for:

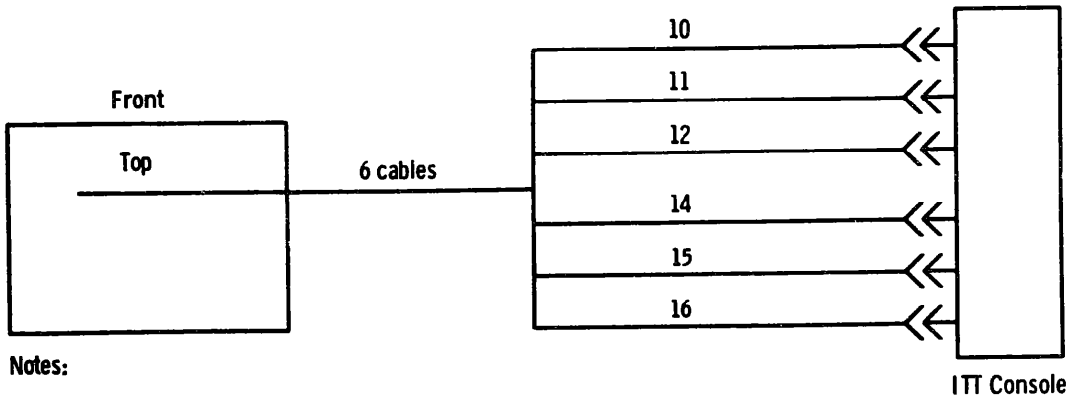
(a) Broken wires
(b) Shorted pins, connectors, and/or wires.
(c) Miscellaneous damage.

2.0 POWER/GROUND CONNECTIONS

2.1 Power Input

(a) Insert AC power cord(s) as shown in Fig. 3-1, Section III
(b) Connect AC power cords as shown in Fig. 3-1, Section III

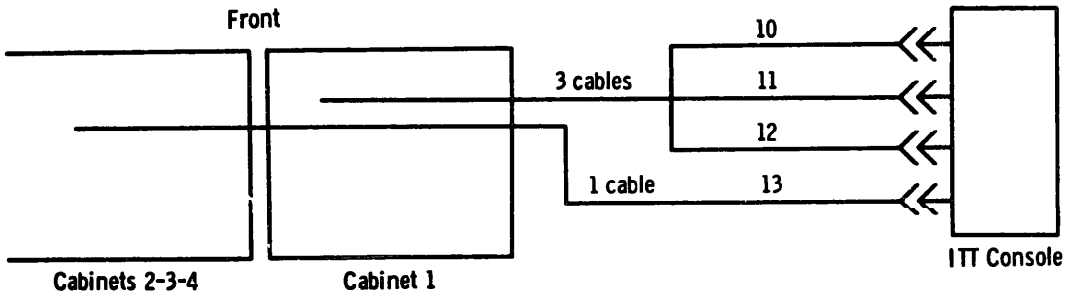
CAUTION: Insure that these connections are correct for the voltage and frequency supplied before applying power to the system



Notes:

1. Reference Table 4-1 for cable(s) number.
2. BLF equipped.
3. 24 trunk appearance (maximum).

ITT Single Console/Single Cabinet



Notes:
1. Reference Table 4-1 for cable(s) number.
2. BLF not equipped in console.
3. 42 trunks (maximum).
4. BLF console is not normally equipped.

ITT Single Console/ Multicabinet
Optional BLF Console

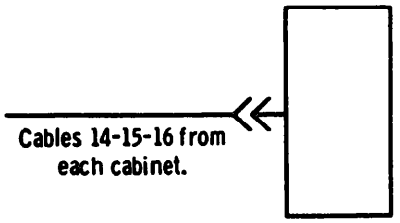


Fig. 4-1. Single Console Positions.

2.2 Ground Cable

Connect ground multiple cable and external each ground cable as shown in Fig. 3-1, Section III. Insure that earth ground cable IS connected to a known earth ground of no more than 1 ohm.

2.3 Power Multiple Cables (Multicabinet Installations)

2.3.1 Connect DC power multiple cables as shown in Fig. 3-1, Section III.

2.3.2 AC Power Multiple

(a) Remove three (3) bolts from me frame miscellaneous assembly on cabinet 1.
(b) Swing hinged panel out to allow access.
(c) Connect AC power multiple cables as shown in Fig. 3-1, Section III
(d) Swing panel to original position, then replace bolts

3.0 CONSOLE(S) CABLES(S) CONNECTIONS

3.1 Single Position Console Wig. 4-1)

3.1.1 Refer to Equipment Specifications, Table A, for equipped cabling. A description of each cable is given in Table 4-1

3.1.2 Each cable will be 25 pair (50 wires), 24 gauge, end terminated in a female amphenol connector

3.1.3 Each connector will be stamped as to identity.

3.1.4 The cables will be pre-routed to the top cable trough. The cables may be routed out of the cabinet to either left or right

3.1.5 On multicabinet systems, equipped with multihundred busy lamp field(s), the busy lamp field (BLF) cables will be marked for cable identification. The Equipment Specification will furnish *necessary* information since this will be special cabling.

3.1.6 Determine the number of cables to be connected to the console. Position the console in the designated operating space Route the required cabling between the equipment and the console.

3.1.7 The prewired console cabling is end connected ted In a female amphenol connector. The cable is 24 gauge, 25 pair. See Fig. 4-2.

3.1.8 The connector of the cabling to be used should be similar to the connector to the equipment male and console female onnecotrs.

3.1.9 Mark both ends of each cable as they are run from the equipment to the console. After cabling is run, connect each end. Insure that connecttons are snug and holding *screws* are tight

3.1.10 Information pertaming to *iron* works and/or *other* supporting devices is not supplied in this manual since installation space will dictate how the external cabling will be supported.

3.2 Muti-Position Console (Fig. 4-3)

3.2.1 Cabling and connections for multi-attendant consoles may be identified as in paragraph 3.1.1 The Equipment Specifications will contain identification information to enable the installer(s) to distinguished between position 1 and position 2 consoles

Table
Connector Cables

Conductor Color	Connector Term No
B-W	1
W-B	26
O-W	2
W-O	27
G-W	3
W-G	28
BN-W	4
W-BN	29
S-W	5
W-S	30
B-R	6
R-B	31
O-R	7
R-O	32
G-R	8
R-G	33
BN-R	9
R-BN	34
S-R	10
R-S	35
B-BK	11
BK-B	36
O-BK	12
BK-O	37
G-BK	13
BK-G	38
BN-BK	14
BK-BN	39
S-BK	15
BK-S	40
B-Y	16
Y-B	41
O-Y	17
Y-O	42
G-Y	18
Y-G	43
BN-Y	19
Y-BN	44
S-Y	20
Y-S	45
B-V	21
V-B	46
O-V	22
V-O	47
G-V	23
V-G	48
BN-V	24
V-BN	49
S-V	25
V-S	50

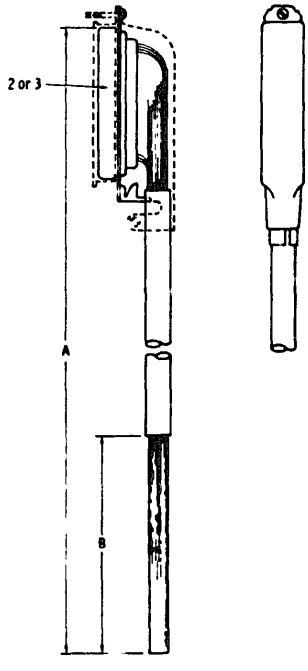


Fig. 4-2. Cable Connector.

Table 4-1
TE-400 Connecting Cable

Cable No.	Use Connecting Chart No.	Description	Purpose
130103-1	130120	Line Tip & Ring Conn. Cable	Used on Bay 1 to connect lines 00-25 to distributing frame.
13010. -1	130121	Line Tip & Ring Conn. Cable	Used on Bay 1 to connect lines 26-49 to distributing frame.
130103-1	130122	Line Tip & Ring Conn. Cable	Used on Bay 1 to connect lines 50-74 to distributing frame.
130103-1	130123	Line Tip & Ring Conn. Cable	Used on Bay 1 to connect lines 75-99 to distributing frame.
130103-7	130120	Line Tip & Ring Conn. Cable	Used on Bay 2 to connect lines 00-24 to distributing frame.
130103-7	130121	Line Tip & Ring Conn. Cable	Used on Bay 2 to connect lines 25-49 to distributing frame.
130103-7	130122	Line Tip & Ring Conn. Cable	Used on Bay 2 to connect lines 50-74 to distributing frame.
130103-7	130123	Line Tip & Ring Conn. Cable	Used on Bay 2 to connect lines 75-99 to distributing frame.
130103-2	130124	Trunk Tip & Ring Conn. Cable	Used on Bay 1 to connect trunks 1-24 to distributing frame.
130103-8	130124	Trunk Tip & Ring Conn. Cable	Used on Bay 2 to connect trunks 1-24 to distributing frame.
130103-3	130125	Power Fail Cut-Thru & Misc. Conn. Cable	Used on Bay 1 to connect power fail lines, public address amplifier, UNA bell & code call bell to distributing frame.
130103-9	130125	Power Fail Cut-Thru & Misc. Conn. Cable	Used on Bay 2 to connect power fail lines to distributing frame.
130103-4	130126	Bell Telephone Console Conn. Cable #1	Used on Bay 1 to connect Bell console 757A.
130103-4	130127	Bell Telephone Console Conn. Cable #2	Used on Bay 1 to connect Bell console 757A.
130103-4	130128	Bell Telephone Console Conn. Cable #3	Used on Bay 1 to connect Bell console 757A.
130103-4	130129	Bell Telephone Console Conn. Cable #4	Used on Bay 1 or Bay 2 to connect Bell console 757A to trunks 13 to 24.
130103-4	130130	Bell Telephone Console Conn. Cable #5	Used on Bay 2 to connect Bell console 757A to trunks 25 to 30.

Table 4-1 (Cont'd)

TE-400. Connecting Cable

Cable No.	Use Connecting Chart No.	Description	Purpose
130103-4	130131	Bell Selector Console Conn. Cable #1	Used on Bay 1 to connect Bell selector console 1A1 or 1A2.
130103-4	130132	Bell Selector Console Conn. Cable #2	Used on Bay 1 to connect Bell selector console 1A1 or 1A2.
130103-4	130133	Bell Selector Console Conn. Cable #3	Used on Bay 1 to connect Bell selector console 1A1 or 1A2.
130103-3	130132	Bell Selector Console Conn. Cable #5	Used on Bay 2 to connect Bell selector console 1A2.
130103-3	130133	Bell Selector Console Conn. Cable #6	Used on Bay 2 to connect Bell selector console 1A2.
130103-9	130134	Bell Selector Console Conn. Cable #4	Used on Bay 2 to connect Bell selector console 1A2.
130103-3	130135	Attendant's Console Conn. Cable #10	Used on Bay 1 for 1st attendant or Bay 2 for 2nd attendant consoles.
130103-1	130136	Attendant's Console Conn. Cable #13	Used on Bay 1 for 1st attendant or Bay 2 for 2nd attendant to connect trunks 26 to 42 to the consoles.
130104-3	130149	Attendant's Multiple Cable	Used on Bay 1 to cable K & TL leads to Bay 2 when two attendants positions equipped.
130104-4	130149	Attendant's Multiple Cable	Used on Bay 2 to cable K & TL leads to Bay 1 when two attendants positions equipped.
130103-6	130153	RS Connector Cable (Male)	Used on Bays 1, 2 & 3 to connect RS terminals when two digit in-dial registers equipped.
130103-5	130153	RS Connector Cable (Female)	Used on Bays 2, 3 & 4 to connect RS terminals when two digit in-dial registers equipped.
130103-3	130154	Attendant's Console Connecting Cable #11	Used on Bay 1 for 1st attendant or Bay 2 for 2nd attendant consoles.
130103-3	130155	Attendant's Console Connecting Cable #12	Used on Bay 1 for 1st attendant or Bay 2 for 2nd attendant consoles.

Table 4-1 (Cont'd)
TE-400 Connecting Cable

Cable No.	Use Connecting Chart No.	Description	Purpose
130103-6	130160	Bay 1 to Bay 2 Common Multiple Connecting Cable #3	Used on Bay 1 to connect to Bay 2.
130103-5	130160	Bay 2 to Bay 1 Common Multiple Connecting Cable #3	Used on Bay 2 to connect to Bay 1.
130163-1	130164	Wire Braid (Ground Strap)	Used on Bay 1 to Bay 2, Bay 2 to Bay 3 & Bay 3 to Bay 4.
130103-2	130189	E&M-A&B Connecting Cable #1	Used on Bay 1 to connect trunks 1-12 to distributing frame.
130103-2	130190	E&M-A&B Connecting Cable #2	Used on Bay 1 to connect trunks 13-24 to distributing frame.
130103-8	130189	E&M-A&B Connecting Cable #1	Used on Bay 2 to connect trunks 1-12 to distributing frame.
130103-8	130190	E&M-A&B Connecting Cable #2	Used on Bay 2 to connect trunks 13-24 to distributing frame.

3.2.2 **Two diode box assemblies (Fig. 4-4) are provided. These boxes are connected in series (one for each console position) with cables 10 and 13.**

3.2.3 Although a busy lamp field is available, a BFL will not normally be **provided** since a system c**an be equipped with** 42 **trunks. Fig. 4-3 shows a typical installation.**

3.2.4 Connect cables with care and insure they match.

3.3 Bell Console (Fig. 4-5)

3.3.1 Cabling identification may be determined as in paragraph 3.1.1

3.3.2 **Fig. 4-5 shows a typical Bell console installation.**

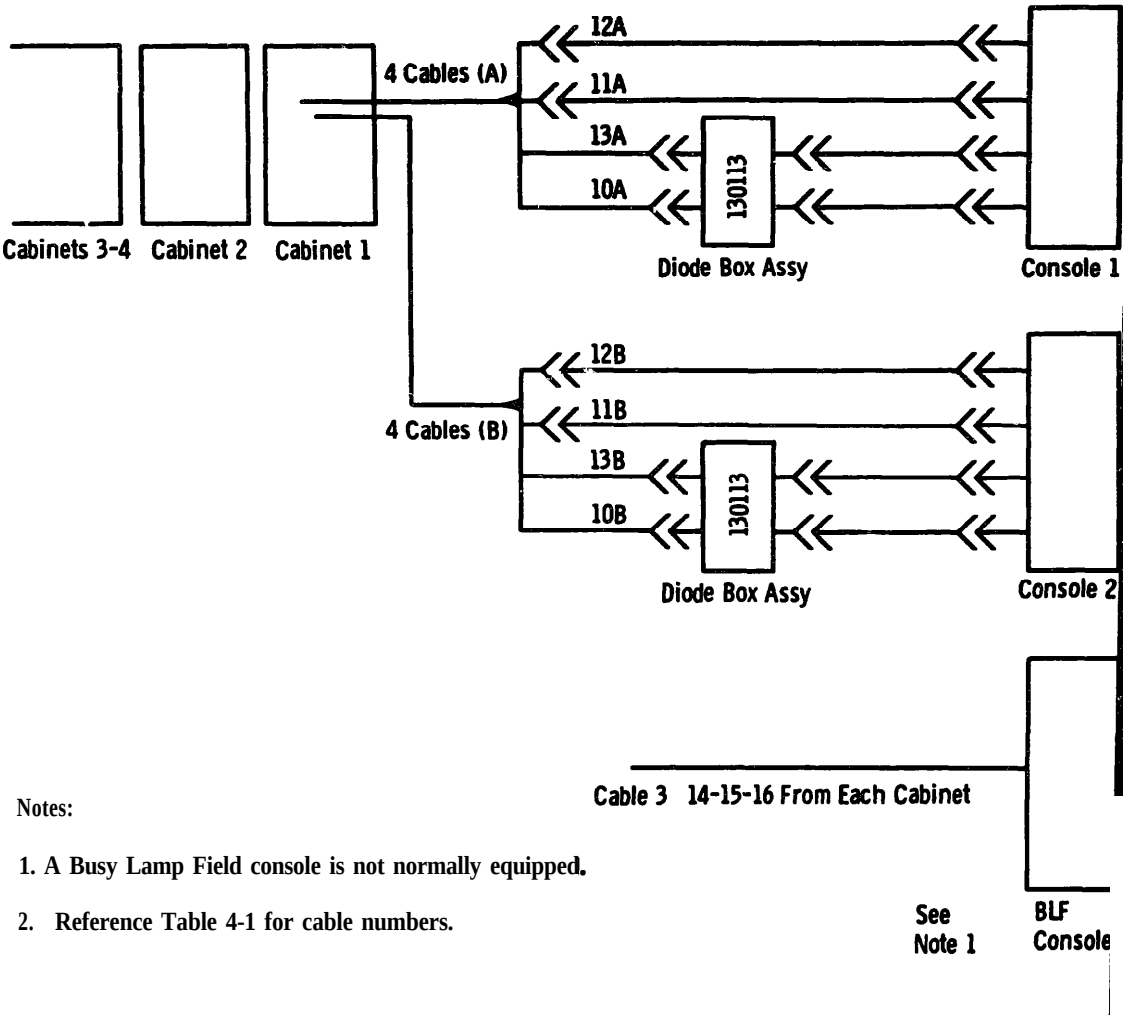
*3.3.3 The following cables will not be re-*quired on *a* single cabinet system:

(a) CON 6
(b) SEL 4
(c) SEK 5
(d) SEL 6

4.0 INTERCABINET CABLES

4.1 All equipped intercabinet cabling will be marked for identification.

4.2 Refer to Equipment Specifications, Table A, for equipped cabling.



Notes:

1. A Busy Lamp Field console is not normally equipped.
2. Reference Table 4-1 for cable numbers.

Fig. 4-3. Typical Multi-Position Console Installation.

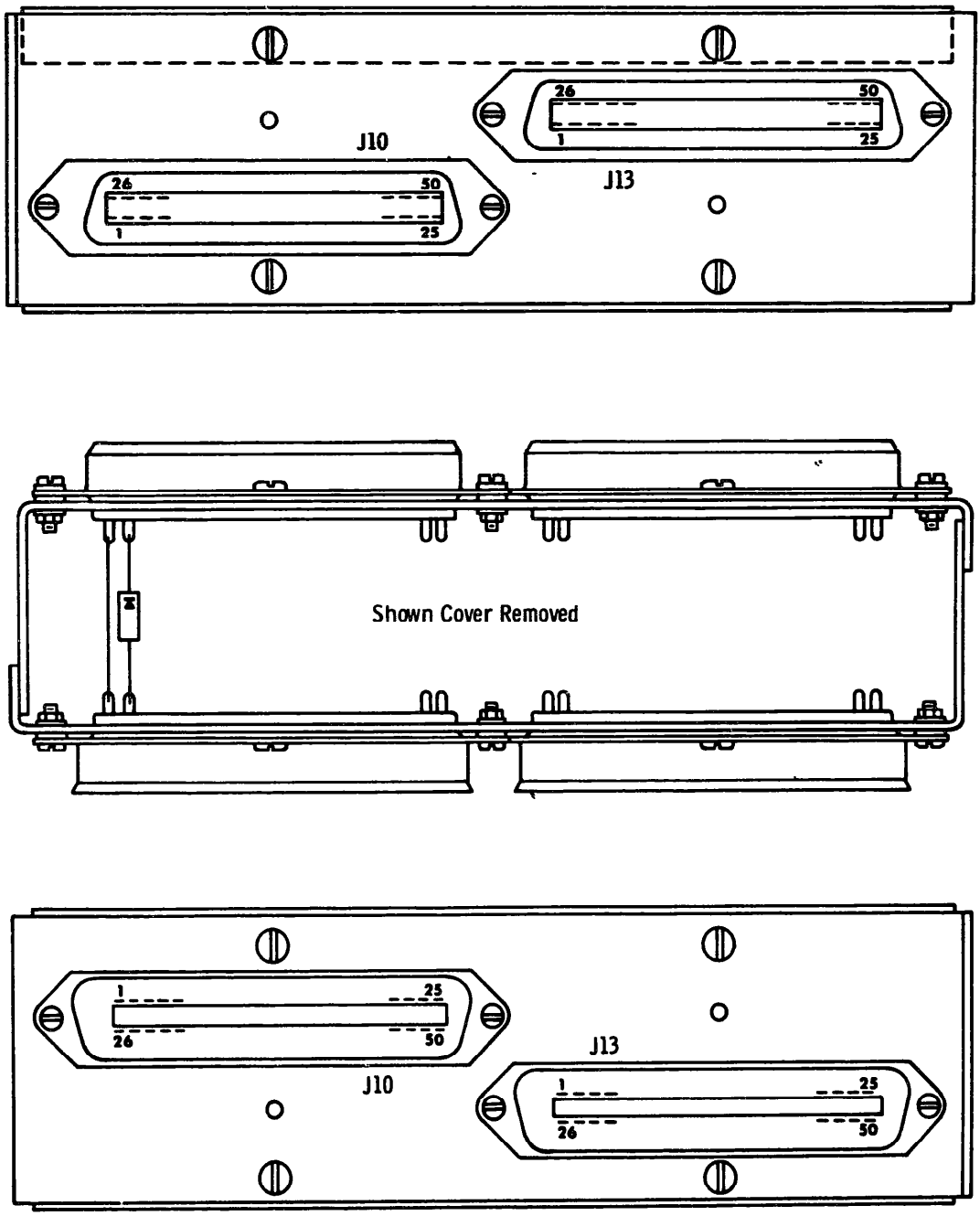


Fig. 4-4. Diode Box Assembly.

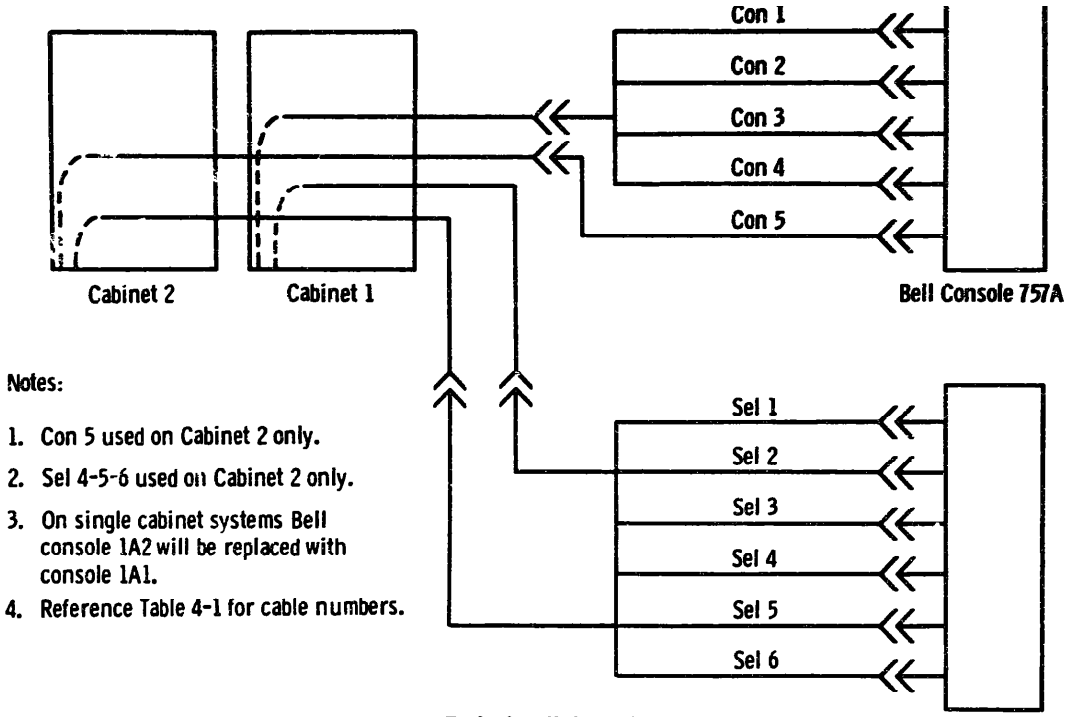


Fig. 4-5. Typical Bell Console Installation.

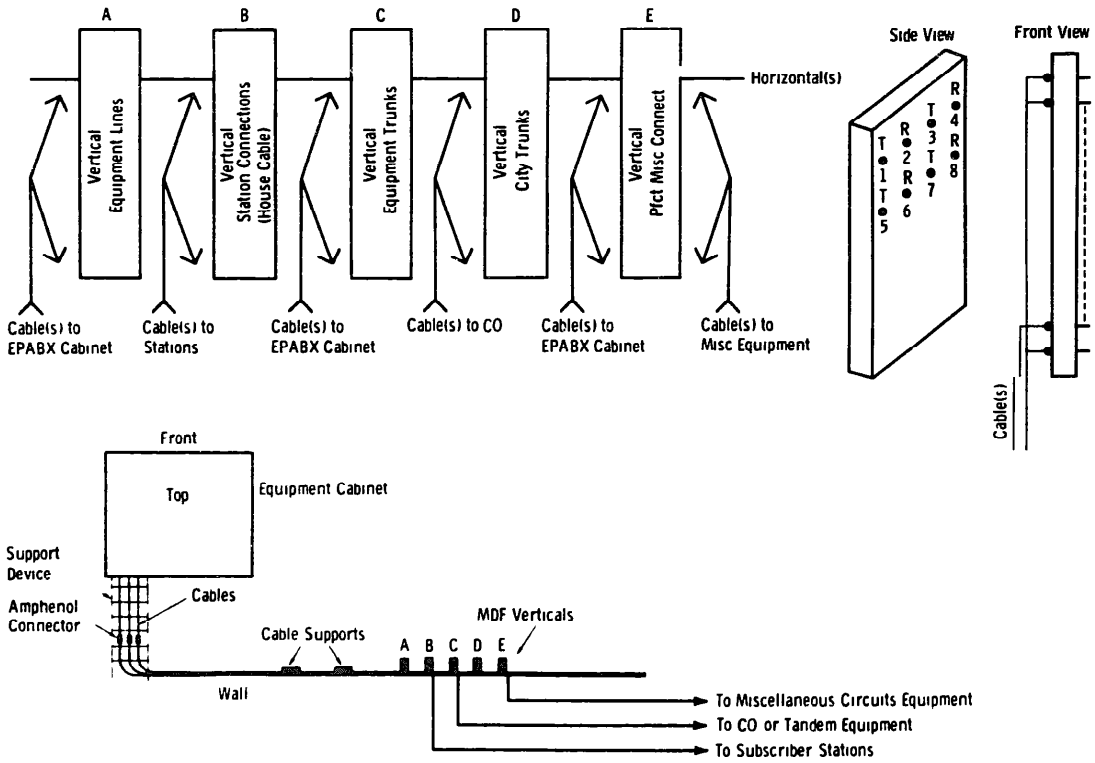


Fig. 4-6. Typical Single Cabinet TE-400 System and MDF Layout.

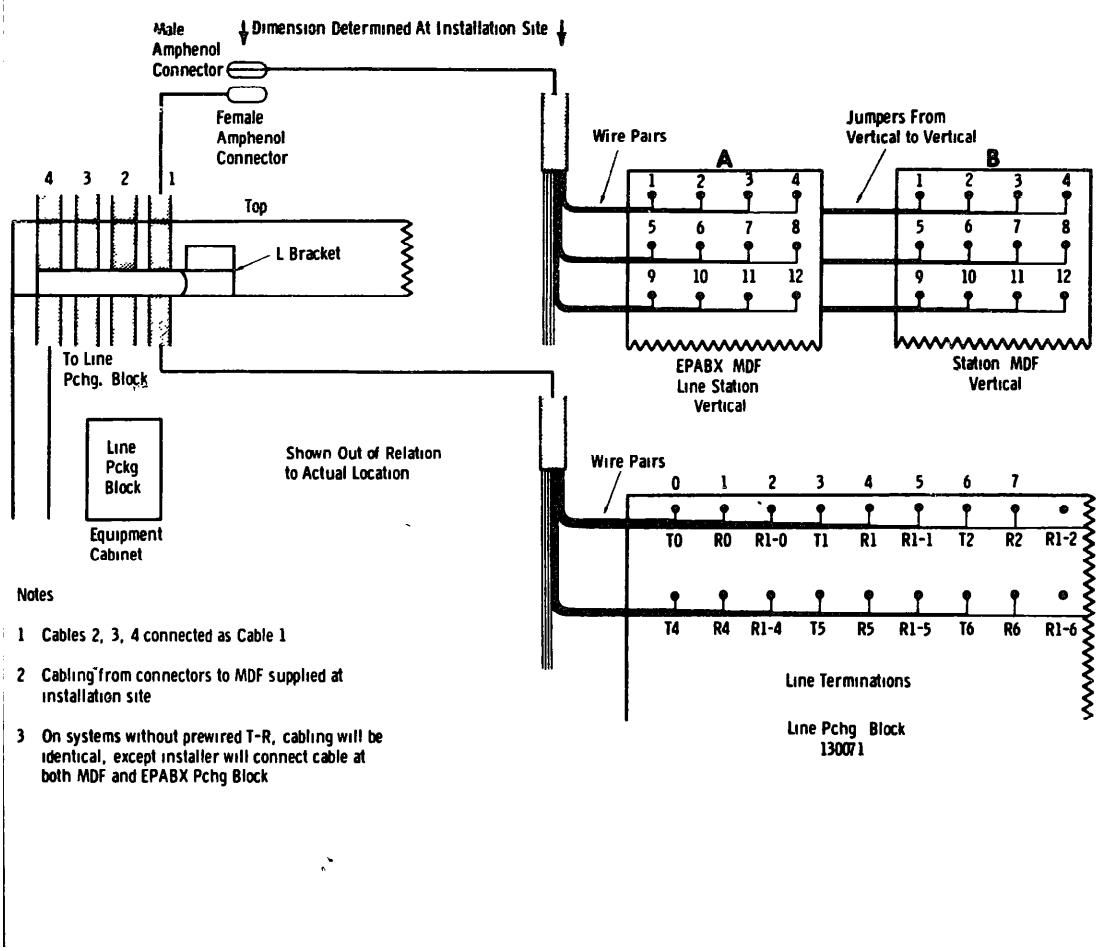


Fig. 4-7. Typical installation Showing Connections Between TE-400 Cabinets and MDF Verticals.

4.3 Connect each cable, like identification to like identification.

4.4 Insure firm fit and that holding screws are tight.

5.0 MAIN DISTRIBUTION FRAME(MDF) LAYOUT AND ASSIGNMENT(TYPICAL)

5.1 The purpose of any MDF is to provide cross connection points between the EPABX equipment and the distribution plant

5.2 Figs. 4-6 and 4-7 are provided to show a typical installation.

5.3 Refer to Fig. 4-6. A top view of a single cabinet TE-400 and MDF layout is shown

5.3.1 Each vertical is equipped with a number of feed-through terminals. A connection can be made on each terminal side with continuity.

5.3.2 Five verticals are shown Each vertical is assigned to:

(a) EPABX lines(s) T-R outputs
(b) Subscriber stations T-R inputs/ outputs.
(c) EPABX trunk/tie lines T-R output.
(d) Central Office or tandem equipment line T-R input/outputs
(e) EPABX miscellaneous circuits outputs and installation miscellaneous devices (i.e., UNA Beils, Public Address Systems).

5.3.3 EPABX outputs may be connected to other equipment(s) by connecting Jumpers between vertical terminals.

5.4 Fig 4-7 shows connections between the cabinet(s) and MDF Verticals

5.4.1 Although connections are only shown for lines T-R, these are typical for trunk/tie lines T-R and PFCT miscellaneous connecting cable

5.5 Vertical Terminal Assignment

5.5.1 To prevent confusion and miswiring, the terminal assignments must be completed and designated before terminations are attempted.

5.6 Tables 4-2 and 4-3 are to be completed by the installer

5.6.1 These tables supply information concernig connections to the MDF

5.7 Table 4-2 Column Explanatory

A - EPABX circuit such as line numbers, trunk/tie line number, or miscellaneous circuits (i.e., UNA, Code Call, E&M Leads, etc.)

B - Cable Number - Identification of cable between TE-400 cabinet and MDF vertical.
C - Vertical - Vertical to which cable terminates.
D - Output - Output of EPABX circuit such as T-R, URLI (UNA), etc.
E - Terminal numbers of vertical.
F - Wire color of cable pair terminated to vertical terminal.
G - Connect to - Vertical and terminal number to connect to for operation. This part of the table should be filled in after Table 4-3 IS completed.

5.8 Table 4-3 Column Explanatory

A - Satellite Equipment - Subscriber station numbers, trunk/tie line numbers, miscellaneous equipment outputs
B - Cable number, vertical, outputs, terminals, wire color - Same as Table 4-2.
C - Location - Physical location of equipment.
D - CO Line Numbers - The number assigned by the CO to an incoming trunk

NOTE: Columns B, C, and D should be filled in when performing "Cut-Over Procedures" in Section VII of thus manual

6.0 PREWIRED LINE(S) TIP-RING CONNECTIONS

6.1 Prewired Cables

6.1.1 Each cabinet(s) will be equipped with four line T-R cables

6.1.2 Identify these cables as described in paragraph 3.1.1

6.1.3 Use Tables 4-4 through 4-7 and Figs. 4-2, 4-6, and 4-7 for reference

6.1.4 Each pair is 25 pair 24 gauge and female ended amphenol connector

6.2 Cable Run

6.2.1 Determine cable length

6.2.2 Insure cables are terminated with male connector(s) that will mate with the associated female amphenol connector(s).

6.2.3 Identify each cable at both ends

6.2.4 Refer to Table 4-2, then butt, strip, and terminate cables to MDF vertical(s)

6.3 Cable Connections

A EPABX Circuit	B Cable Number	C Vertical	D Output	E Terminal Numbers	F Wire Color	G Connect To Terminal Number	G Connect To Vertical Number

A EPABX Circuit	B Cable Number	C Vertical	D Output	E Terminal Numbers	F Wire Color	G Connect To Terminal Number	G Connect To Vertical Number

Table 4-2
Cable Connections to MDF -(EPBAX Circuits)

A EPABX Circuit	B Cable Number	C Vertical	D Output	E Terminal Numbers	F Wire Color	G Connect To Terminal Number	G Connect To Vertical Number

A EPABX Circuit	B Cable Number	C Vertical	D Output	E Terminal Numbers	F Wire Color	G Connect To Terminal Number	G Connect To Vertical Number

Table 4-2 (Cont'd)

Cable Connection to MDF (EPBAX Circuit)

A EPABX Circuit	B Cable Number	C Vertical	D Output	E Terminal Numbers	F Wire Color	G Connect to Terminal Number	G Connect to Vertical Number

Table 4-2 (Cont'd)

Cable Connections to MDF (EPABX Circuit)

A EPABX Circuit	B Cable Number	C Vertical	D Output	E Terminal Numbers	F Wire Color	G Connect To Terminal Number	G Connect To Vertical Number

Table 4-2 (Cont'd)

Cable Connections to MDF (EPABX Circuit)

A EPABX Circuit	B Cable Number	C Vertical	D Output	E Terminal Numbers	F Wire Color	G Connect To Terminal Number	G Connect To Vertical Number

A EPABX Circuit	B Cable Number	C Vertical	D Output	E Terminal Numbers	F Wire Color	G Connect To Terminal Number	G Connect To Vertical Number

Table 4-2 (Cont'd)

Cable Connection to MDF (EPABX Circuit)

A	B						C	D
Satellite Equipment	Cable Number	Vertical	Output	Terminal Numbers	Wire Color		Location	C.O. Lines Number

A	B						C	D
Satellite Equipment	Cable Number	Vertical	Output	Terminal Numbers	Wire Color		Location	C.O. Lines Number

Table 4-3
Cable Connection to MDF -(Satellite Equipment)

A	B						C	D
Satellite Equipment	Cable Number	Vertical	Output	Terminal Numbers	Wire Color		Location	C.O. Lines Number

A	B						C	D
Satellite Equipment	Cable Number	Vertical	Output	Terminal Numbers	Wire Color		Location	C.O. Lines Number

Table 4-3 (Cont'd)

Cable Connection to MDF- (Satellite Equipment

A	B						C	D
Satellite Equipment	Cable Number	Vertical	Output	Terminal Numbers	Wire Color		Location	C.O. Lines Number

A	B						C	D
Satellite Equipment	Cable Number	Vertical	Output	Terminal Numbers	Wire Color		Location	C O Lines Number

Table 4-3 (Cont'd)
Cable Connections to MDF-(Satellite Equipment)

A	B						C	D
Satellite Equipment	Cable Number	Vertical	Output	Terminal Numbers	Wire Color		Location	C.O. Lines Number

A	B						C	D
Satellite Equipment	Cable Number	Vertical	Output	Terminal Numbers	Wire Color		Location	C.O. Lines Number

Table 4-3 (Cont'd)
Cable Connections to MDF-(Satellite Equipment)

A	B						C	D
Satellite Equipment	Cable Number	Vertical	Output	Terminal Numbers	Wire Color		Location	C.O. Lines Number

A	B						C	D
Satellite Equipment	Cable Number	Vertical	Output	Terminal Numbers	Wire Color		Location	C.O. Lines Number

Table 4-3 (Cont'd)

Cable Connections to MDF-(Satellite Equipment)

Table 4-4
Line Tip and Ring **Connecting Cable**

This Chart Used on Cables:
130103-1
130103-7

Stamp
(Connector) "Line T & R 00-24"

Pin	Serve	Color	Desig.	"A" Sub-Rack Pchg.	Pin	Serve	Color	Desig.	"A" Sub-Rack Pchg.
26		W-B	T-00	00.0	1		B-W	R-00	00.1
27		W-O	T-01	00.3	2		O-W	R-01	00.4
28		W-G	T-02	00.6	3		G-W	R-02	00.7
29		W-BN	T-03	00.9	4		BN-W	R-03	00.10
30		W-S	T-04	01.0	5		S-W	R-04	01.1
31		R-B	T-05	01.3	6		B-R	R-05	01.4
32		R-O	T-0	01.6	7		O-R	R-06	01.7
33		R-G	T-07	01.9	8		G-R	R-07	01.10
34		R-BN	T-08	02.0	9		BN-R	R-08	02.1
35		R-S	T-09	02.3	10		S-R	R-09	02.4
36		BK-B	T-10	02.6	11		B-BK	R-10	02.7
37		BK-O	T-11	02.9	12		O-BK	R-11	02.10
38		BK-G	T-12	03.0	13		G-BK	R-12	03.1
39		BK-BN	T-13	03.3	14		BN-BK	R-13	03.4
40		BK-S	T-14	03.6	15		S-BK	R-14	03.7
41		Y-B	T-15	03.9	16		B-Y	R-15	03.10
42		Y-O	T-16	04.0	17		O-Y	R-16	04.1
43		Y-G	T-17	04.3	18		G-Y	R-17	04.4
44		Y-BN	T-18	04.6	19		BN-Y	R-18	04.7
45		Y-S	T-19	04.9	20		S-Y	R-19	04.10
46		V-B	T-20	04.0	21		B-V	R-20	05.1
47		V-O	T-21	05.3	22		O-V	R-21	05.4
48		V-G	T-22	05.6	23		G-V	R-22	05.7
49		V-BN	T-23	05.9	24		BN-V	R-23	05.10
50		V-S	T-24	06.0	25		S-V	R-24	06.1

Table 4-5
line Tip and Connecting Cable

This Chart Used on Cables:
130103-1
130103-7

Stamp
(Connector) "Line T & R 25-49"

Pin	Serve	Color	Desig.	"A" Sub-Rack Pchg.	Pin	Serve	Color	Desig.	"A" Sub-Rack Pchg.
26		W-B	T-25	06.3	1		B-W	R-25	06.4
27		W-O	T-26	06.6	2		O-W	R-26	06.7
28		W-G	T-27	06.9	3		G-W	R-27	06.10
29		W-BN	T-28	07.0	4		BN-W	R-28	07.1
30		W-S	T-29	07.3	5		S-W	R-29	07.4
31		R-B	T-30	07.6	6		B-R	R-30	07.7
32		R-O	T-31	07.9	7		O-R	R-31	07.10
33		R-G	T-32	08.0	8		G-R	R-32	08.1
34		R-BN	T-33	08.3	9		BN-R	R-33	08.4
35		R-S	T-34	08.6	10		S-R	R-34	08.7
36		BK-B	T-35	08.9	11		B-BK	R-35	08.10
37		BK-O	T-36	09.0	12		O-BK	R-36	09.1
38		BK-G	T-37	09.3	13		G-BK	R-37	09.4
39		BK-BN	T-38	09.6	14		BN-BK	R-38	09.7
40		BK-S	T-39	09.9	15		S-BK	R-39	09.10
41		Y-B	T-40	10.0	16		B-Y	R-40	10.1
42		Y-O	T-41	10.3	17		O-Y	R-41	10.4
43		Y-G	T-42	10.6	18		G-Y	R-42	10.7
44		Y-BN	T-43	10.9	19		BN-Y	R-43	10.10
45		Y-S	T-44	11.0	20		S-Y	R-44	11.1
46		V-B	T-45	11.3	21		B-V	R-45	11.4
47		V-O	T-46	11.6	22		O-V	R-46	11.7
48		V-G	T-47	11.9	23		G-V	R-47	11.10
49		V-BN	T-48	12.0	24		BN-V	R-48	12.1
50		V-S	T-49	12.3	25		S-V	R-49	12.4

Table 4-6
Line Tip and Ring Connecting Cable

This Chart Used on Cables:
130103-1
130103-7

Stamp
(Connector) "Line T & R 50-74"

Pin	Serve	Color	Desig.	"A" Sub-Rack Pchg.	Pin	Serve	Color	Desig.	"A" Sub-Rack Pchg.
26		W-B	T-50	12.6	1		B-W	R-50	12.7
27		W-O	T-51	12.9	2		O-W	R-51	12.10
28		W-G	T-52	13.0	3		G-W	R-52	13.1
29		W-BN	T-53	13.3	4		BN-W	R-53	13.4
30		W-S	T-54	13.6	5		S-W	R-54	13.7
31		R-B	T-55	13.9	6		B-R	R-55	13.10
32		R-O	T-56	14.0	7		O-R	R-56	14.1
33		R-G	T-57	14.3	8		G-R	R-57	14.4
34		R-BN	T-58	14.6	9		BN-R	R-58	14.7
35		R-S	T-59	14.9	10		S-R	R-59	14.10
36		BK-B	T-60	15.0	11		B-BK	R-60	15.1
37		BK-O	T-61	15.3	12		O-BK	R-61	15.4
38		BK-G	T-62	15.6	13		G-BK	R-62	15.7
39		BK-BN	T-63	15.9	14		BN-BK	R-63	15.10
40		BK-S	T-64	16.0	15		S-BK	R-64	16.1
41		Y-B	T-65	16.3	16		B-Y	R-65	16.4
42		Y-O	T-66	16.6	17		O-Y	R-66	16.7
43		Y-G	T-67	16.9	18		G-Y	R-67	16.10
44		Y-BN	T-68	17.0	19		BN-Y	R-68	17.1
45		Y-S	T-69	17.3	20		S-Y	R-69	17.4
46		V-B	T-70	17.6	21		B-V	R-70	17.7
47		V-O	T-71	17.9	22		O-V	R-71	17.10
48		V-G	T-72	18.0	23		G-V	R-72	18.1
49		V-BN	T-73	18.3	24		BN-V	R-73	18.4
50		V-S	T-74	18.6	25		S-V	R-74	18.7

Table 4-7
line lip and Ring Connecting Cable

This Chart Used on Cables:
130103-1
130103-7

Stamp
(Connector) "Line T & R 75-99"

Pin	Serve	Color	Desig.	"A" Sub-Rack Pchg.	Pin	Serve	Color	Desig.	"A" Sub-Rack Pchg.
26		W-B	T-75	18.9	1		B-W	R-75	18.10
27		W-O	T-76	19.0	2		O-W	R-76	19.1
28		W-G	T-77	19.3	3		G-W	R-77	19.4
29		W-BN	T-78	19.6	4		BN-W	R-78	19.7
30		W-S	T-79	19.9	5		S-W	R-79	19.10
31		R-B	T-80	20.0	6		B-R	R-80	20.1
32		R-O	T-81	20.3	7		O-R	R-81	20.4
33		R-G	T-82	20.6	8		G-R	R-82	20.7
34		R-BN	T-83	20.9	9		BN-R	R-83	20.10
35		R-S	T-84	21.0	10		S-R	R-84	21.1
36		BK-B	T-85	21.3	11		B-BK	R-85	21.4
37		BK-O	T-86	21.6	12		O-BK	R-86	21.7
38		BK-G	T-87	21.9	13		G-BK	R-87	21.10
39		BK-BN	T-88	22.0	14		BN-BK	R-88	22.1
40		BK-S	T-89	22.3	15		S-BK	R-89	22.4
41		Y-B	T-90	22.6	16		B-Y	R-90	22.7
42		Y-O	T-91	22.9	17		O-Y	R-91	22.10
43		Y-G	T-92	23.0	18		G-Y	R-92	23.1
44		Y-BN	T-93	23.3	19		BN-Y	R-93	23.4
45		Y-S	T-94	23.6	20		S-Y	R-94	23.7
46		V-B	T-95	23.9	21		B-V	R-95	23.10
47		V-O	T-96	24.0	22		O-V	R-96	24.1
48		V-G	T-97	24.3	23		G-V	R-97	24.4
49		V-BN	T-98	24.6	24		BN-V	R-98	24.7
50		V-S	T-99	24.9	25		S-V	R-99	24.10

8.3.1 Connect cables - male to female. Check all connectors for snug fit and that holding screws are tight.

7.0 PREWIRED TRUNKS/TIE LINES TIP-RING CONNECTIONS

7.1 Each cabinet will be equipped with trunk tip-ring connecting cable(s).

7.2 The Table 4-6, Figs. 4-2 and 4-7, for reference.

7.3 Cable Run

(a) Determine cable lengths.
(b) Insure they are terminated with male connector(s) that will mate with the female amphenol connector(s).
(c) Identify each cable at both ends.
(d) Using Table 4-2, butt, strip, and terminate cables to MDF vertical(s)

7.4 Connect cables via connectors - male to female. Check all connectors for snug fit and that all holding screws are tight.

8.0 PREWIRED RED PFCT AND MISCELLANEOUS CONNECTING CABLE AND TRUNK E-M AND A-B LEADS CONNECTIONS

8.1 Prewired PFCT and Miscellaneous Connecting Cable

8.1.1 Each cabinet will be equipped with one cable.

8.1.2 Identify this cable as in paragraph 3.1.1

8.1.3 Use Table 4-9, Figs 4-2 4-6, and 4-7 for reference.

8.1.4 The cable is 25 pair, 24 gauge and has a female ended amphenol connector.

8.1.5 Connect cable as outlined on Steps (a) through (d) of paragraphs 7.3 and 7.4

8.2 Trunk E-M and A-B Leads

8.2.1 Each cabinet will be equipped with one or two cables leach cable provides leads for 12 trunks)

8.2.2 Identify this cable as in paragraph 3.1.1

8.2.3 Use Tables 4-10, 4-11, *Figs* 4-2, 4-6, and 4-7 for reference

8.2.4 Connect cable(s) as outlined in Steps (a) through (d) of paragraphs 7.3 and 7.4.

9.0 INSTALLER WIRED CABLING

9.1 Cable layout, identification. and length should be arrived at by following instructions outlined on paragraphs 6.0, 7.0, and 8.0.

9.2 The Installer will terminate cable(s) at both ends.

9.3 Lines

9.3.1 Refer to Dwg. 130071 and Fig. 4-7.

9.3.2 Dwg. 130071 shows terminal locations for line tip and ring. The punching block for line T-R is located parallel with level A in each cabinet.

9.3.3 Refer to Table 4-2 and terminate cable(s) at both ends.

9.4 Trunks

9.4.1 Refer to Dwgs 13076, 130077, and Fig 4-7.

9.4.2 Dwgs 130076 and 130077 show that both DID and city trunks utilize the same terminal block for T-R.

9.4.3 Refer to Section III of this manual and Equipment Specifications and establish which levels are equipped with trunks. The punching block is parallel with each equipped level.

9.4.4 Using the information supplied by Table 4-2, terminate cable(s) at both ends.

9.5 Tie Lines

9.5.1 mute, identify, and determine cable(s) length as described in paragraphs 6.0, 7.0, and 8.0, then terminate cable at both ends.

9.5.2 Refer to Dwg. 130078 and Fig. 4-7.

9.5.3 Tie lines may be terminated the same as in the trunk' lines except that 12 T-R terminals are provided.

9.6 Miscellaneous Outputs

Refer to Equipment Specifications to determine:

(a) If the following outputs and inputs are required
(b) Location of level equipped with circuit

9.6.1 Unassigned Night Answer (UNA) Outputs

(a) Four outputs are available - URL1, URL2, URL3, and URL4
(b) Provide cabling as required to URL1, URL2, URL3, and URL4.

Table 4-8

Line Tip and Ring Connecting Cable

This Chart Used for Cables:
130103-2
130103-8

Stamp
Connector "TRK T & R"

Pin	Serve	Color	Desig.	Sub-Rack Pchg.	Pin	Serve	Color	Desig.	Sub-Rack Pchg.
26		W-B	T1	D-00.0	1		B-W	R1	D-00.1
27		W-O	T2	D-00.2	2		O-W	R2	D-00.3
28		W-G	T3	D-00.4	3		G-W	R3	D-00.5
29		W-BN	T4	D-00.6	4		BN-W	R4	D-00.7
30		W-S	T5	D-00.8	5		S-W	R5	D-00.9
31		R-B	T6	D-00.10	6		B-R	R6	D-00.11
32		R-O	T7	E-00.0	7		O-R	R7	E-00.1
33		R-G	T8	E-00.2	8		G-R	R8	E-00.3
34		R-BN	T9	E-00.4	9		BN-R	R9	E-00.5
35		R-S	T10	E-00.6	10		S-R	R10	E-00.7
36		BK-B	T11	E-00.8	11		B-BK	R11	E-00.9
37		BK-O	T12	E-00.10	12		O-BK	R12	E-00.11
38		BK-G	T13	F-00.0	13		G-BK	R13	F-00.1
39		BK-BN	T14	F-00.2	14		BN-BK	R14	F-00.3
40		BK-S	T15	F-00.4	15		S-BK	R15	F-00.5
41		Y-B	T16	F-00.6	16		B-Y	R16	R-00.7
42		Y-O	T17	F-00.8	17		O-Y	R17	F-00.9
43		Y-G	T18	F-00.10	18		G-Y	R18	F-00.11
44		Y-BN	T19	G-00.0	19		BN-Y	R19	G-00.1
45		Y-S	T20	G-00.2	20		S-Y	R20	G-00.3
46		V-B	T21	G-00.4	21		B-V	R21	G-00.5
47		V-O	T22	G-00.6	22		O-V	R22	G-00.7
48		V-G	T23	G-00.8	23		G-V	R23	G-00.9
49		V-BN	T24	G-00.10	24		BN-V	R24	G-00.11
50		V-S		SPARE	25		S-V		SPARE

Table 4-9
PFCT and Miscellaneous Connecting Cable

This Chart Used for Cables:
130103-3
130103-9

Stamp
(Connector) "P F & Misc"

Pin	Serve	Color	Desig.	Sub-Rack Pchg.	Pin	Serve	Color	Desig.	Sub-Rack Pchg.
26		W-B	LT1	B-19.0	1		B-W	LR1	B-19.1
27		W-O	LT2	B-19.2	2		O-W	LR2	B-19.3
28		W-G	LT3	B-19.4	3		G-W	LR3	B-19.5
29		W-BN	ST1	B-19.6	4		BN-W	SR1	B-19.7
30		W-S	ST2	B-19.8	5		S-W	SR2	B-19.9
31		R-B	ST3	B-19.10	6		D-R	SR3	B-19.11
32		R-O	TT1	B-20.0	7		O-R	TR1	B-20.1
33		R-G	T12	B-20.2	8		G-R	TR2	B-20.3
34		R-BN	TT3	B-20.4	9		BN-R	TR3	B-20.5
35		R-S	CT1	B-20.6	10		S-R	CR1	B-20.7
36		BK-B	CT2	B-20.8	11		B-BK	CR1	B-20.9
37		BK-O	CT3	B-20.10	12		O-BK	CR3	B-20.11
38		BK-G			13		G-BK		
39		BK-BN			14		BN-BK		
40		BK-S			15		S-BK		
41		Y-B	TR1	C-00.0	16		B-Y	APC1	C-00.3
42		Y-O	TR2	C-00.1	17		O-Y	APC2	C-00.4
43		Y-G	TR3	C-00.2	18		G-Y		
44		Y-BN	URL1	D-06.6	19		BN-Y		
45		Y-S	URL2	D-06.7	20		S-Y		
46		V-B	URL3	D-06.8	21		B-V		
47		V-O	URL4	D-06.9	22		O-V	CCM1	
48		V-G			23		G-V		
49		V-BN			24		BN-V		
50		V-S			25		S-V		

Table 4-10
E&M -A&B Connecting Cable #1

This Chart Used on Cables:
130103-2
130103-8

Stamp
(Connector) "TRK. E&M-A&B1"

Pin		Color	Desig.	Pchg.	Pin		Color	Desig.	Pchg.
26		W-B	E-1	"D" 02.0	1		B-W	M-1	"D" 02.1
27		W-O	E-2	02.2	2		O-W	M-2	02.3
28		W-G	E-3	02.4	3		G-W	M-3	02.5
29		W-BN	E-4	02.6	4		BN-W	M-4	02.7
30		W-S	E-5	02.8	5		S-W	M-5	02.9
31		R-B	E-6	02.10	6		B-R	M-6	02.11
32		R-O	A-1	03.0	7		O-R	B-1	03.1
33		R-G	A-2	03.2	8		G-R	B-2	03.3
34		R-BN	A-3	03.4	9		BN-R	B-3	03.5
35		R-S	A-4	03.6	10		S-R	B-4	03.7
36		BK-B	A-5	03.8	11		B-BK	B-5	03.9
37		BK-O	A-6	03.10	12		O-BK	B-6	03.11
38		BK-G	E-1	"E" 02.0	13		G-BK	M-1	"E" 02.1
39		BK-BN	E-2	02.2	14		BN-BK	M-2	02.3
40		BK-S	E-3	02.4	15		S-BK	M-3	02.5
41		Y-B	E-4	02.6	16		B-Y	M-4	02.7
42		Y-O	E-5	02.8	17		O-Y	M-5	02.9
43		Y-G	E-6	02.10	18		G-Y	M-6	02.11
44		Y-BN	A-1	03.0	19		BN-Y	B-1	03.1
45		Y-S	A-2	03.2	20		S-Y	B-2	03.3
46		V-B	A-3	03.4	21		B-V	B-3	03.5
47		V-O	A-4	03.6	22		O-V	B-4	03.7
48		V-G	A-5	03.8	23		G-V	B-5	03.9
49		V-BN	A-6	03.10	24		BN-V	B-6	03.11
50		V-S	---	-----	25		S-V	---	-----

Table 4-11
E&M- A&B Connecting Cable #2

This Chart Used on Cables:
130103-2
130103-8

Stamp
(Connector) "TRK. E&M- A&B2"

Pin		Color	Desig.	Pchg.	Pin		Color	Desig.	Pchg.
26		W-B	E-1	"F" 02.0	1		B-W	M-1	"F" 02.1
27		W-O	E-2	02.2	2		O-W	M-2	02.3
28		W-G	E-3	02.4	3		G-W	M-3	02.5
29		W-BN	E-4	02.6	4		BN-W	M-4	02.7
30		W-S	E-5	02.8	5		S-W	M-5	02.9
31		R-B	E-6	02.10	6		B-R	M-6	02.11
32		R-O	A-1	03.0	7		O-R	B-1	03.1
33		R-G	A-2	03.2	8		G-R	B-2	03.3
34		R-BN	A-3	03.4	9		BN-R	B-3	03.5
35		R-S	A-4	03.6	10		S-R	B-4	03.7
36		BK-B	A-5	03.8	11		B-BK	B-5	03.9
37		BK-O	A-6	03.10	12		O-BK	B-6	03.11
38		BK-G	E-1	"G" 02.0	13		G-BK	M-1	"G" 02.1
39		BK-BN	E-2	02.2	14		BN-BK	M-2	02.3
40		BK-S	E-3	02.4	15		S-BK	M-3	02.5
41		Y-B	E-4	02.6	16		B-Y	M-4	02.7
42		Y-O	E-5	02.8	17		O-Y	M-5	02.9
43		Y-G	E-6	02.10	18		G-Y	M-6	02.11
44		Y-BN	A-1	03.0	19		BN-Y	B-1	03.1
45		Y-S	A-2	03.2	20		S-Y	B-2	03.3
46		V-B	A-3	03.4	21		B-V	B-3	03.5
47		V-O	A-4	03.6	22		O-V	B-4	03.7
48		V-G	A-5	03.8	23		G-V	B-5	03.9
49		V-BN	A-6	03.10	24		BN-V	B-6	03.11
50		V-S	---	-----	25		S-V	---	-----

(c) Refer to Dwg. 130076 for punching block connection.
(d) Furnish one ground wire for punching block 130071 for each output.

9.6.2 Public Address Outputs

(a) Three outputs are available- TR1-TR3 for 600 ohms impedance
TR1-TR2 for 300 ohms Impedance
APC1-APC2 for switch closure
(b) Refer to Dwg. 130073 punching block for terminal location.
(c) Provide cabling as required.

9.6.3 External 48VDC supply input

(a) Only systems equipped with DID trunk tie lines will require -48VDC
(b) Cable -48VDC and ground as required to each level so equipped

Refer to Dwgs. 130077 and 130078 for punching block terminal locations

9.6.4 On those systems equipped with EM Trunk/Tie Lines the E-M loads will have to be connected to the terminating satellite equipment A maximum DCR loop of 100 ohms is allowed

Refer to Dwgs 130077 and 130078 for punching block terminal locations Cable and connect as required

9.7 Hotel/Motel Connections

9.7.1 Line Cabling - Line cabling will be the same as described in paragraph 6.0 and Steps 9.3.1 through 9.3.3 of paragraph 9.3 except:

(a) All lines utilized for message waiting are connected to the R1 terminal instead of the R terminal on punching block 130071

Example.

X00-TO and R1-0
X00-T1 and R1-1

9.7.2 Trunk Cabling- Trunk cabling will be the same as described in paragraph 7.0

9.7.3 Trunk Loop Adjustment Resistors - Refer to paragraph 15 0 and Dwg 130079

9.7.3.1 Trunks 316061-316075

(a) RBR1 same value as TR2
(b) Equip with RBR1 Instead of MR5

9.7.4 Hotel/Motel Attendant Position

(a) Refer to Dwg. 130079
(b) MW terminals are provided for 100 lines per cabinet MW-0 corresponds to line X00.
(c) PC (Peg Count) terminals are provided for 100 lines per cabinet. Terminal PC-O corresponds to line X00
(d) Cable and connect as required

10.0 PFCT CONNECTIONS WITH PREWIRED RED CABLING

10.1 Assignment - Three PFCT stations may be assigned per cabinet Refer to Section II, paragraph 2.10

10.1.1 Establish the station(s) assigned from Table 2-6 of Section II. Refer to Table 4-2 of this section and determine vertical assignments

10.1.2 Insure that central office (CO) trunks are not E&M trunks E&M trunks cannot be assigned to PFCT

10.1.3 If a mixture of DID loop, loop start, and/or ground start trunks is provided, utilize (if possible) in the following order:

(a) Loop start
(b) Ground start
(c) DID loop

10.1.4 Ground star: trunks will require PFCT station instruments be equipped with a groundbutton

10.1.5 See Table 2-5 of Section II for trunking information and Equipment Specifications for cabinets equipped in

NOTE: The following connection" information IS for initial installation Prewire but do not connect Jumpers if installation has another system in operation

10.2 Refer to Table 4-9 and perform the following steps:

10.2.1 From EPABX Line Vertical, connect the first PFCT Line No T to miscellaneous connect cable vertical terminal LT1 Repeat for R to LR1 If jumper has been connected from line vertical to station vertical, remove T-R Jumpers

10.2.2 From station vertical connect the first PFCT station T to miscellaneous connect cable vertical terminal ST1 Repeat for R to SR1

10.2.3 From the EPABX trunk vertical , connect the first trunk assigned as PFCT T to TT1 of the miscellaneous connect cable vertical Repeat for R to TR1

10.2.4 From the CO trunk vertical connect the first CO trunks T to the miscellaneous connect cable vertical Repeat for R to CR1

10.2.5 Repeat above until all PFCT circuits/ stations are assigned

11.0 UNASSIGNED NIGHT ANSWER PREWIRED CABLING

11.1 **Assignment - Four outputs are available to connect to bells for audible signaling of a trunk call during UNA operation.**

11.1.1 **The four available outputs are:**

(a) URL1
(b) URL2
(c) URL3
(d) URL4

11.1.2 Each output is activated until the call(s) is answered via the UNA circuit.

11.1.3 Connect cable(s) as required to PFCT and miscellaneous connect vertical terminals URL1, URL2, URL3, and URL4 as required.

11.2 Refer to Table 4-9.

A ground common to the system should be provided from the external bell(s) to system ground

12.0 PUBLIC ADDRESS CONNECTION- PREWIREDCABLE

12.1 **The public address** (PA) PCB allows an unrestricted EPABX station to access an external PA system.

12.1.1 The following three outputs are available:

(a) TR2 to TR3 - 300 ohms impedance
(b) TR1 to TR3 - 600 ohms impedance
(c) APC1 to ACP2 - Closed switch when PA is accessed.

12.2 **Connections**

12.2.1 Determine the input impedance of the PA system. Connect cable pair to PFCT and miscellaneous connector vertical terminals TR2-TR3 or TR1-TR3. Connect cable pair to terminals APC1-APC2 if a switch closure is desired.

12.2.2 Refer to Tables 4-2 and 4-9

13.0 OTHER FEATURES STRAPPING

13.1 Refer to Equipment Specifications, Table A, **and** Installation Motes.

13.2 Use Dwg. 130117 to determine straps **required.** Use appropriate **figure** and page number, then strap as required.

14.0 CLASS OF SERVICE ASSIGNMENT/ EQUIPPING

14.1 Refer to Table 2-6 in Section II of this manual.

14.2 **Remove class of service (COS) PCB's from each cabinet.**

14.3 **The lines and inputs to the COS circuit are .dentified as 1, 2, 3, 4, 5.**

14.3.1 The Equipment Specifications **shall** detail the circuits associated **with** each COS point.

Example:
Access Code (Dial 9) Trunk - 1
Access Code (Dial 5) PA - 2
Toll Restrictor - 3

14.4 Table 2-6 of Section II lists the class of serviceforeach station assigned.

14.5 Install diodes as **required to restrict** system stations. Solder diodes to PCB connection terminals.

14.5.1 Perform this step an all cabinets of the system.

14.6 Replace COS PCB's but do not reinaert into female connectors.

15.0 TRUNK/TIE LINES LOOP ADJUSTMENT RESISTOR

15.1 Refer to Equipment Specifications, Table 2-5, and paragraphs 3.3.1-E and 3.3.2 of Section II.

15.2 Table 2-5 provides location and **value** of resistors to be installed.

15.3 Refer **to Dwg. 130077** for DID trunk information.

15.4 Refer to Dwg. 130076 for city trunk information

15.5 Refer to Dwg. 130078 for tie lines information.

15.6 Install apperciate resistors.

16.0 SATELLITE EQUIPMENT CABLING

16.1 **Initial Installations**

(a) Refer to Table 4-3.
(b) Install, designate, and **cable any** terminal appearances required for Satellite Equipment on the MDF verticals

16.2 **Replacement Installations**

16.2.1 See Section VU of this manual.

17.0 POWER-OFF MEASUREMENTS

17.1 Remove all PCB's from their female connectors by pulling the boards outward. Leave **disconnected** PCB's in their respective mounting slots.

17.2 **With VOM on Rx1 scale, measure the resistance of the following DC power supply outputs to ground. Refer to Fig. 3-1 of Section III.**

-18VDC	**5 ohms minimum**
+18.5VDC	**5 ohms minimum**
+36VDC	**15 ohms minimum**
+3VDC	**5 ohms minimum**
-36VDC	**15 ohms minimum**
-3VDC	**5 ohms minimum**

17.3 **Measure DC resistance on each horizontal bus bar:**

Ground to Ground - zero ohms maximum

17.4 **Measure DC resistance on one horizontal bus bar:**

Each voltage pin to ground - infinity (open)
Each voltage pin to all other voltage pins - infinity (open)

CAUTION: **Do** not perform any "Power-On Adjustments" of Section V until performing all s**teps and** meeting all requirements of paragraphs 17.1, 17.2, 17.3, and 17.4.

Section V

CONTENTS

CONTENTS (Cont'd)

FIGURES

Section V

POWER-ON ADJUSTMENTS

1.0 GENERAL

1.1 **The location of all busy/seize, allott,** and alarm lamps IS shown, in Fig. 5-1. The **lamp** color codes are:

Alarm - red
Allott - yellow
Busy/Seize - green

NOTE: Lamps may or may not be **color coded,** depending on **issue of** PCB.

1.2 **The location of all voice originate** (VO) **and voice terminate (VT) potentiometers requiring adjustment is** also **shown in Fig 5-1.**

1.2.1 The **adjustment of all VO and** VT potentiometers **IS accomplished in the following manner:**

(a) Place a 20,000 **ohms per volt VOM on the positive DC scale (3VDC scale is recommended, if available) Connect positive meter lead to appropriate** VO **or VT potentiometer Test Point (TP) Connect negative meter lead to ground (any convenient chassis point may be used).**

(b) Adjust associated VO **or VT potentiometer for** +1VDC

I **NOTE: Circuit under Adjustment must be seized before adjustment is attempted. Walt 60 seconds before adjustment is attempted.**

CAUTION: **Use insulated clips to connect VOM to** VT/VO **Test Point. Do not short VT/VO test point to other PCB components, printed circuit tracks, or ground Damage will result if a short is placed on PCB. Use an insulated screw driver to adjust potentiometers.**

1.3 **The following abbreviations are used in this Section:**

TJP - Test phone equipped with Jack for insertion into test circuit.

TVP - Test phone equipped to **connect to MDF vertical terminals**

1.4 **An Instrument must be connected as a conventional city line so that it may be used for the performance of Section V tests**

2.0 INITIAL ADJUSTMENTS

2.1 **AC Power On**

Apply AC power by:

(a) Connect AC power cords to AC source
(b) Position AC circuit breakers (cabinet 1) to ON

NOTE: All AC circuit breakers for complete system are located in cabinet 1.

2.2 **Blower Operation**

Insure that blowers are operation by **checking each** air **output (lower front).**

2.3 **DC Power Supplies Access**

Access to the DC power supplies (for **adjustment) is achieved by lifting** the ventilation **assembly up and swinging assembly to left.**

2.4 **DC Power Supplies Adjustments**

Refer to Fig. 5-2 for test point (TP) **and adjustment locations**

Using a calibrated 20,000 **ohm per volt** VOM, **adjust the -18VDC, +18 5VDC, +36VDC, +3VDC, -36VDC, and -3VDC supplies in first cabinet** (-18V, +18.5V, **+38V, and -38V are not adjusted in cabinets 2, 3,** or 4)

Any convenient chassis point may be used for VOM ground connection. Place VOM on appropriate DC scale for accurate reading.

2.5 **+3VDC and -3VDC Adjustments (Multicabinet)**

Adjust the +3VDC and -3VDC supplies in cabinets 2, 3, and 4 Replace DC power supplies ventilation assembly to closed position

2.6 **5VDC Power Supply Adjustment**

Refer to Fig. 3-10 of Section III Insert +5VDC supply and alarm PCB into its connector Connect VOM positive lead to bottom terminal of power resistor 1R1. Connect VOM negative lead to chassis ground Adjust 5VDC power supply for +5VDC by adjusting the potentiometer located on the bottom front of the +5VDC supply and alarm PCB.

2.7 **Power Removal**

2.7.1 **Remove AC power before inserting PCB's by placing AC circuit breakers to OFF**

2.7.2 **Insert the following PCB's:**

(a) Voltage check reference 316070( )122
(b) Voltage check main alarm 316069( )122
(c) System main alarm 316068(2)122

2.8 **Reapplying AC Power**

Return AC **power by placing AC** circuit **breakers to ON**

2.9 Voltage Check and +5VDC Adjustments

The power relay (PR) may or may not operate when the AC power is reapplied. The alarm lamps on the 316069 PCB may or may not be "on."

2.9.1 **PR relay ope**rates - Lamps on 316069 and Hi-Lo lamps on 316301 are extinguished.

NOTE: If PR does not operate, proceed to paragraph 2.9.2

2.9.1.1 Using a calibrated VOM, measure the outputs of the Voltage Check PCB (316070). Each **output** may be measured from the test point at the front of the PCB. Each TP is Identified. All voltages have a ±10% tolerance.

2.9.1.2 Main Alarm Voltage Check - Refer to Figs. 5-2 **and 5-3**

Hi-Lo Voltage Detection **Adjustment**

(a) Connect a calibrated DC voltmeter (use-ate scale) to the test Jack of the +36 volt power supply.

(b) **Adjust** the +36 volt power supply for an output of 39.6 volts

(c) Press the voltage check reset push button while rotating the +36 volt high "potentiometer adjust" (second from bottom of main alarm voltage check PCB) **clockwise until** the top lamp **is extinguished.**

(d) Slowly rotate **the "potentiometer adjust" counterclockwise until the associated lamp comes on "**

(e) Return the +36 volt power supply output to +36 volts

(f) Press the voltage check reset push button to extinguish the lamp

(g) Adjust **the +36 volt power supply for an output of 32 4 volts**

(h) Press the voltage **check reset push button while rotating the +36 volt low "potentiometer adjust" (top of PCB) counterclockwise until the associated lamp IS extinguished**

(I) Slowly rotate the "potentiometer adjust" clockwise until the lamp comes "on"

(j) Return the +36 volt power supply output to +36 volts

(k) Press the voltage check reset push button to extinguish the lamp

(l) Repeat Steps (a) through (k) using the -36 volt power supply, the -36 volt low potentiometer and lamp (third from top of board), and the -36 volt high potentiometer and lamp (fourth from bottom of board)

(m) Connect the DC voltmeter to the test jack of the +18 5 volt power supply

(n) Adjust the +18.5 **volt power supply for an output of 20.4 volts**

(o) Press the voltage check reset push button while rotating the +18.5 volt high "potentiometer **adjust" (first from** bottom of board) clockwise unt**il the associated lamp** is ext**ingu**ished.

(p) Slowly rotate the **"potentiometer** adjust' counterc**lockwise until** the lamp comes "on."

(q) Return the +18.5 volt power supply **output to +18.5** volts.

(r) Press the voltage check reset push button to extinguish the lamp.

(s) Adjust the +18.5 volt power supply for an output of 16.6 volts.

(t) Press the voltage check reset push button while rotating the +18.5 volt low "potentiometer **adjust"** (fourth **from** top of board) counterclockwise until the associated lamp is extinguished.

(u) Slowly rotate the "potentiometer adjust" clockwise until the lamp comes "on."

(v) Return the +18 5 volt power supply output to +18.5 volts

(w) Press the voltage check reset **push button to extinguish the lamp**

(x) Repeat Steps (m) through (w) using the -18 volt power supply, **the -18 volt low potentiometer and lamp (second from** ₀**op o**f board), and the -18 volt high potentiometer and lamp (third from **bottom** of board) All lamps should now be extinguished **and the** power relay **should re**main operated

2.9.1.3 **+5VDC Hi-Lo Adjustments - Refer to** paragraph 2 6

Low Voltage Adjustment

(a) Adjust +5VDC supply to +4 2 volts The PR Relay "drops out" and "sets up" an alarm condition causing the +5 volt alarm lamp to turn "on"

(b) Readjust voltage to +5 volts

(c) Depress VC reset button. The PR relay operates and the 5-volt **alarm lamp goes "out"**

High Voltage Adjustment

(a) Adjust +5VDC supply to +5 8 volts The PR relay "drops out" and "sets up" an alarm condition causing the S-volt alarm lamp to turn "on"

(b) Readjust voltage to +5 volts

(c) Depress VC reset button The PR relay operates and the 5-volt alarm lamp goes "out"

2 9 2 Power relay does not operate - lamps on 316069 and/or 3160301 remain "on"

2.9.2.1 **Perform the following steps if the** alarm lamp(s) on the 316069 PCB **remain "on."**

(a) Refer to Fig 5-2 and repeat all steps of paragraphs 2 4, 2.5, and 2.6.

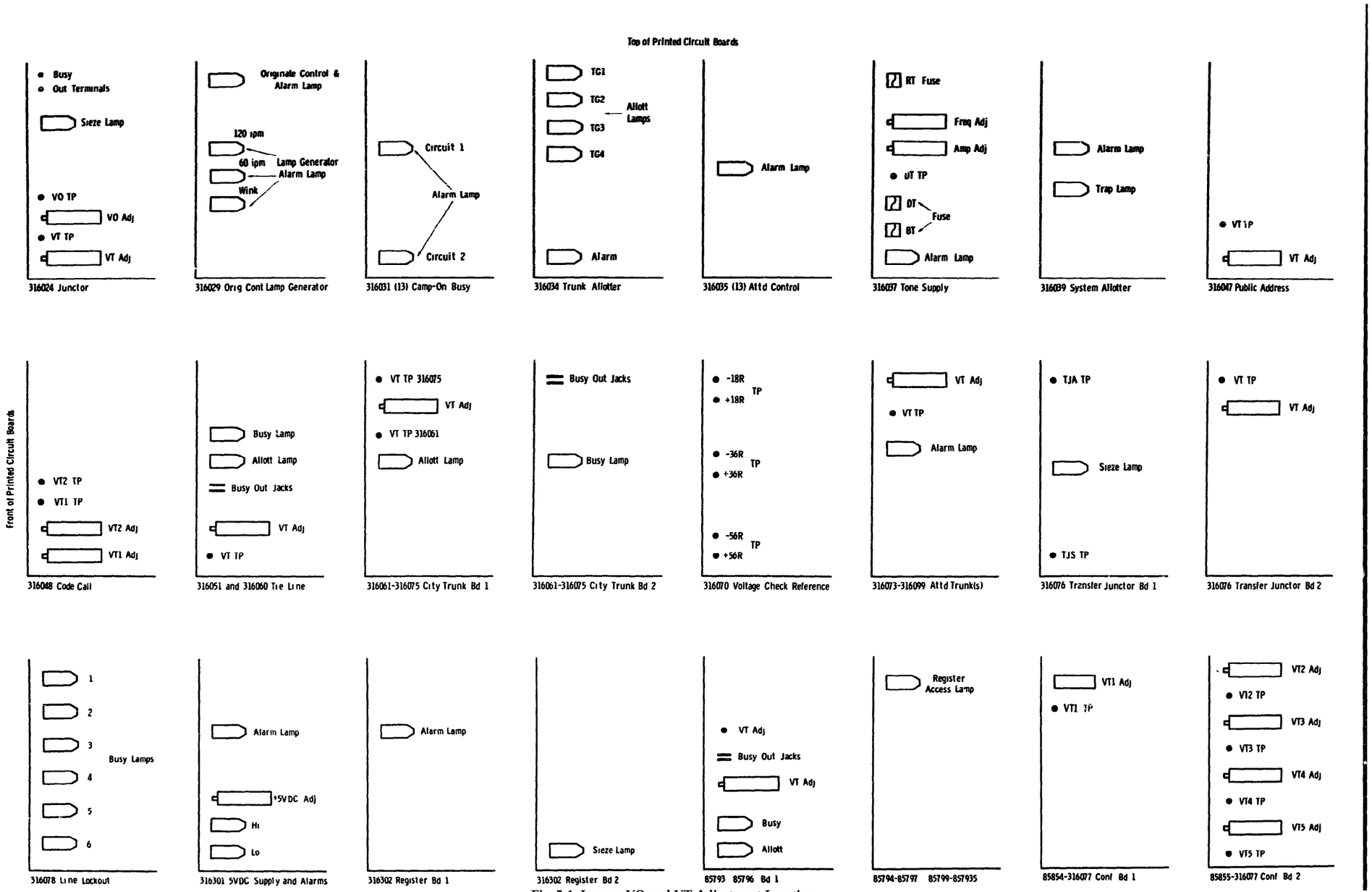


Fig. 5-1. Lamps, VO and VT Adjustment Locations.

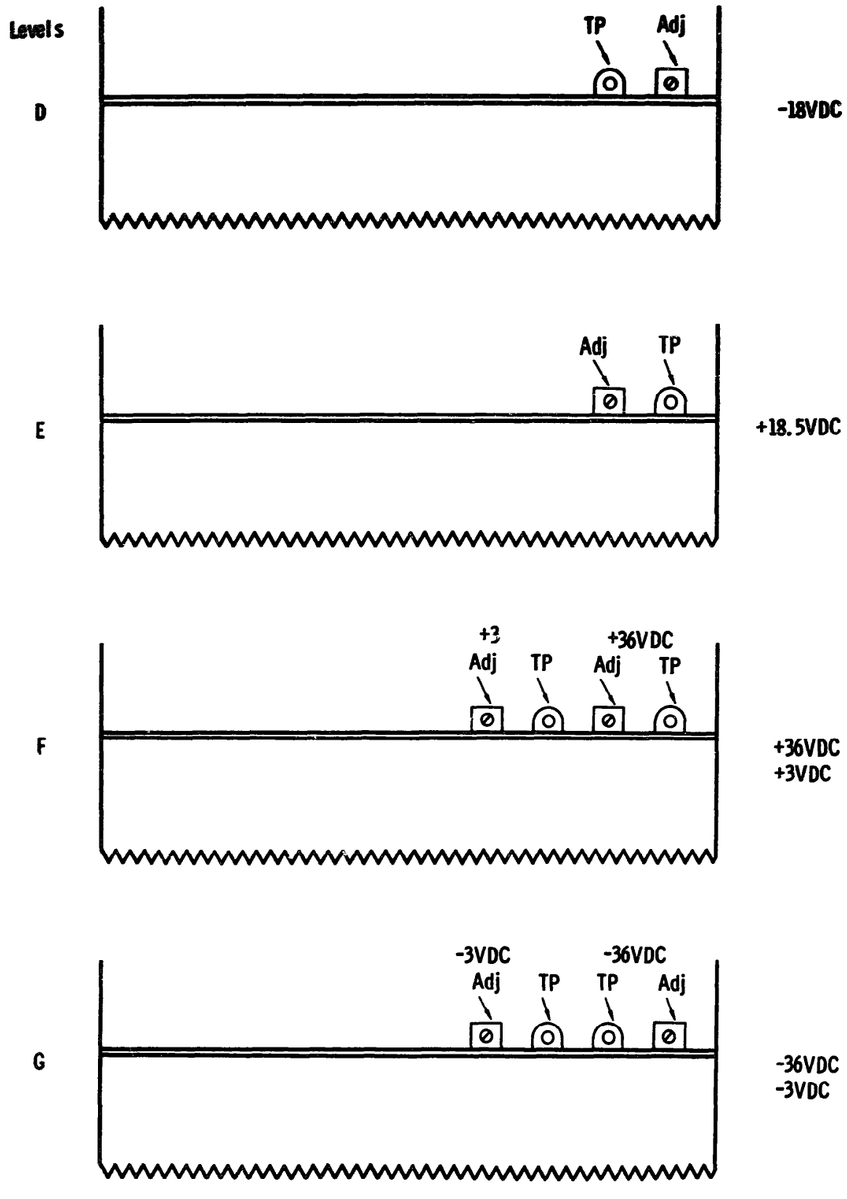


Fig. 5-2. DC Power Supply Adjustment Locations.

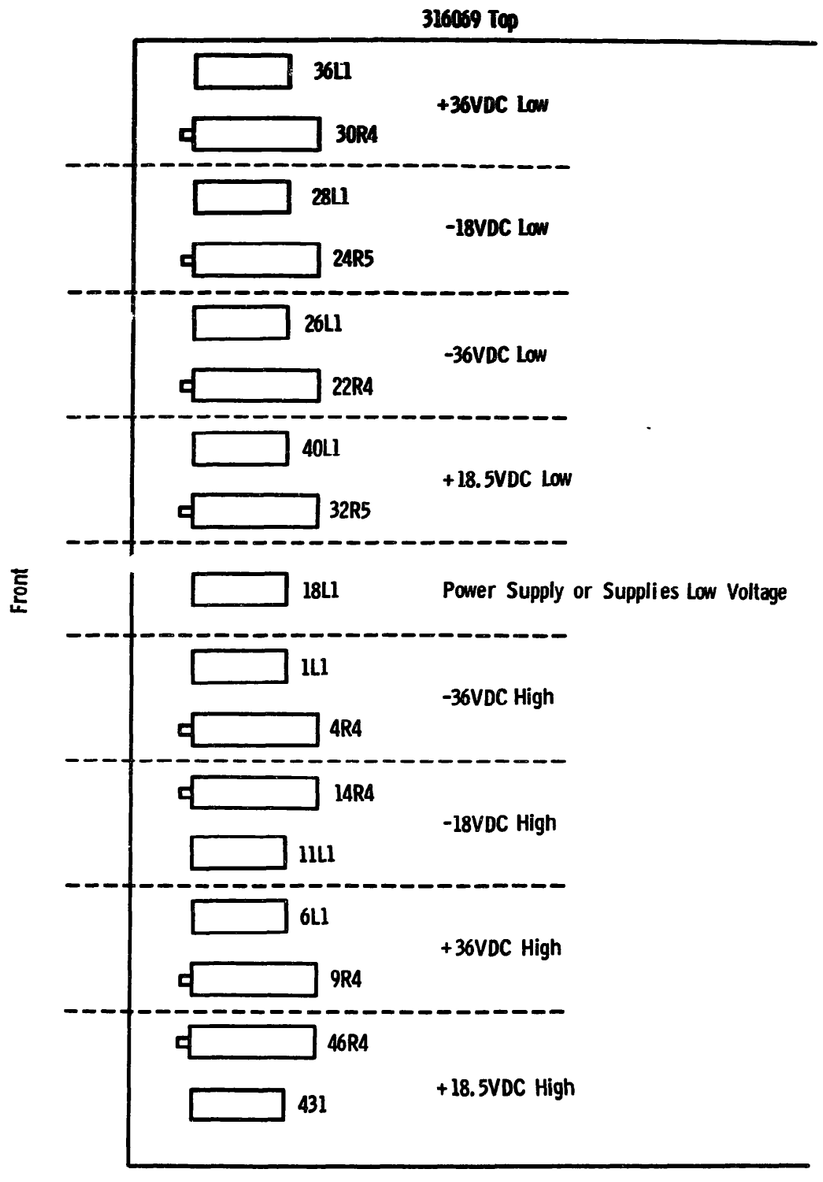


Fig. 5-3. DC Power Supply High-Low Voltage Adjustments.

(b) Refer to Fig. 5-3 and repeat all steps of paragraphs 2.9.1.1, 2.9.1.2, and 2.9.1.3.
(c) If alarm lamp(s) remain "on," refer to Section XII, paragraph 7.0, and Section XIII, paragraph 2.1.

2.9.2.2 Perform the Pollowing steps if alarm lamps(s) of 316301 PCB remain **on.'*

(a) Perform Step 2.9.1.1.
(b) Follow procedure outlined in paragraph 2.6.
(c) Repeat all steps of paragraph 2.9.1.3

2.10 48VDC Alarm

Verify and apply 48VDC input to systems requiring external 48VDC. The 48VDC alarm lamp should go "out" when the external 48VDC source is applied.

2.11 3VDC Alarm Adjustments (See Fig. 5-2)

2.11.1 +3VDC Adjustment

(a) Adjust +3VDC output to 4.0VDC. Alarm lamp(s) should turn 'on."
(b) Adjust +3VDC output to exactly +3.0VDC. Alarm lamps should go -out.*
(c) Adjust +3VDC output to +2.0VDC Alarm lamp should turn "on."
(d) Readjust +3VDC output to exactly +3 0VDC.

2.11.2 **-3VDC Adjustments**

(a) Adjust -3VDC output to 4.0VDC. Alarm tamp(s) should turn "on."
(b) Adjust -3VDC output to exactly -3.0VDC. Alarm lamp(s) should go "out."
(c) Adjust -3VDC output to -2 0VDC. Alarm lamps should turn "on."
(d) Readjust -3VDC output to exactly -3.0VDC.

2.11.3 Repeat all steps of paragraphs 2.11.1 and 2.11.2 for all equipped cabinets.

2.12 AC Power On-Off Test

Place AC circuit breakers to OFF position. Wait one minute then place circuit breakers to ON position. The PR relay should operate within three to five seconds and all alarm lamps on 316069 and 316301 PCB's should go 'out." Check PR relays in each equipped cabinet to insure they have operated.

3.0 COMMON CONTROL CIRCUITS TESTS

3.1 Printed Circuit Board Insertion

3.1.1 Insert the following PCB's:

(a) Tone supply 316037( )122
(b) Originate control and lamp generator 316029( )122
(c) System allotter 31603( )122
(d) No. 1 register 316302 (Board 1 and Board 2)
(e) No. 1 junctor 316024( )122 (all cabinets)
(f) Line PCB 316040- corresponding to assigned attendant's line number.

3.2 Tones Supply Circuit (363037) Adjustment Test

3.2.1 Adjustment Using Oscilloscope

(a) Connect probe to TP on regular tones supply front.
(b) Adjust top potentiometer for 600 Hz (1.66 millisecond).
(c) Adjust bottom potentiometer for 15V peak-to -peak signal.
(d) Repeat the above procedure for standby PCB.

3.2.2 Adjustment Using Test Phones

(a) Insert TJP into test circuit test jack.
(b) Place bay switch to bay 1, junctor switch to junctor 1.
(c) Go off-hook - dial tone should be heard. Junctor 1, bay 1 will be seized.
(d) Connect another test phone to the output of an audio signal generator such as Northeast Electric Company Model 15B Test Set.
(e) Set signal generator to 600 Hx and set output to a desirable level.
(f) Listen to both phones and compare signal levels. Adjust tones supply top potentiometer to obtain Identical signal levels.-
(g) Remove regular tones supply then repeat Steps (a) through (f) above for standby tone supply.
(h) Connect 20,000 ohm per volt VOM to tones supply TP (front and middle of PCB). Adjust bottom potentiometer for 5VAC rms.
(i) Reinsert regular tones supply PCB. Repeat Step (h) for regular tones supply.

3.3 Routine Test

3.3.1 Depress reset button and hold for five seconds to extinguish all alarm lamps.

3.3.2 Depress regular routine key and hold key depressed for 20 to 30 seconds. The routine key is located on the test panel right front.

As key is depressed, bottom allotter alarm lamps (red) will come "on." All four alarm lamps (red) will come "on" within 20 to 30 seconds. Some alarm

lamps on the standby originate control may come "on" at this time. They may be Ignored. The console alarm lamp will turn 'on" briefly and buzzer will sound.

The regular tone supply alarm lamp (red) will come on within 20 to 30 seconds. The standby allotter alarm lamp should go "out" at this time.

D&press the reset button as in Step 3.3.1. All alarms should go 'out."

3.3.3 Depress and hold the standby routine key for 20 to 30 seconds. The alarm lamps (red) on the standby allotter, originate control, and tone supply PCB"s should turn "on."

Depress the reset button as in Step 3.3.1 All alarm lamps should go "out."

3.4 Register(s) (3160302) Test

3.4.1 Insert all PCB's except:

(a) COS PCB's 316043( )122
(b) Transfer juctor 316076( )122
(c) Camp-on-busy 316031( )122
(d) Register 316302( )122
(e) UNA 316036( )122
(f) ANA 316042( )122

NOTE: Register 1 is already inserted Leave in place

3.4.2 Place junctor test switch to OFF Insert TJP into test jack

3.4.3 Connect a TVP to the following EPABX lines T-R on the MDF and dial the line number it is attached to from the TJP.

X00, X01, X11, X12, X22, X33, X44, X55, X66, X77, X88, and X99

X corresponds to the hundreds digit of the line attached to

If a line PCB is not equipped, do not dial that number

Observe the TVP rings but do not establish transmission

3.4.4 Remove register 1 and insert register 2 Repeat all steps of paragraph 3 4 3.

3.4.5 Repeat Steps 3 4 3 and 3 4 4 for all equipped registers

3.4.6 Insert all equipped registers Into the system.

4.0 JUNCTOR (316024) Test

4.1 Function

The junctor teat circuit enables the selection of any equipped junctor for test purposes The bay lamp will turn "on" when a busy junctor is selected.

4.2 Junctor Selection

4.2.1 To select junctor in bay 1:

Bay switch- position 1
Junctor select switch- as desired

4.2.2 To select junctors in bay 2:

Bay switch -position 2
Bay 1 junctor select switch- positron 1
Bay 2 junctor select switch -as desired

4.2.3 To select junctors in bay 3:

Bay switch -position 3
Bays 1 and 2 junctor select switches- position 1
Bay 3 junctor select switch- as desired

4.2.4 To select junctors in bay 4:

Bay switch- position 4
Bays 1, 2, and 3 junctor select switches- positron 1
Bay 4 junctor select switch- as desired

4.3 Junctor Test

4.3.1 Insert TJP into test Jack. Connect TVP to an equipped MDF vertical line T-R then perform the following steps:

(a) Select junctor 1, bay 1 and place TJP "off hook" Dial tone should be received
(b) Dial any TVP number that is connected to the MDF at a line appearance. Junctor seize lamp will go "off' when dialing is completed
(c) Observe ring back tone, audible ring of MDF test phone. Answer MDF test phone and establish conversation
(d) Place VOM on positive DC voltage scale that will allow an accurate reading of +1VDC (3VDC scale, if equipped).
(e) Ground may be derived from any convenient chassis point.
(f) Connect VOM to VO test point of junctor in use Insure that the test point is not shorted to ground or adjacent PCB tracks or components.
(g) Adjust VO potentiometer (top potentiometer on bottom) for +1VDC
(h) Connect VOM to VT test point of junctor in use
(i) Insure that test point is not shorted to ground or adjacent PCB tracks or components.
(J) Adjust VT potentiometer (bottom potentiometer) for +1VDC. Remove VOM from test point.
(k) Re-establish conversation and insure transmission
(l) Place TVP 'on hook." Remain "on hook" for approximately 30 seconds Observe that TVP does NOT re-ring.

(m) The TJP should remain "dead." Go "off hook" with TVP and insure transmission.

(n) From attendant console, depress **attendant** override (busy station verification) button. Attendart override button lamp will come "on." Key punch number (depress DSS button on Bell consoles) of TVP. **Insure both** TVP and TJP receive burst of **dial** tone and that attendant can enter three-way transmission. Release attendant by depressing release bar **(button).**

(0) Place both phones **'on hook." Place TJP "'off hook." Dial** 1 and observe busy tone. Place TJP 'on hook."

(p) Repeat Steps (a) through (o) above for all equipped junctors.

(q) Return **bay switch to position 1.** Return all junctor switches to OFF. Remove TJP **and** TVP.

5.0 LINE CIRCUIT (316040) AND FEATURE(S) CIRCUIT TESTS

5.1 Preliminary

Determine **equipped line appearance Using** two **TVP's, connect to-the lowest and highest MDF line appearances.**

5.1.1 Lowest line appearance is station number from X00 upward.

5.1.2 Highest line appearance IS station number from X99 downward.

5.2 A check of the equippped features is accomplished by dialing the access code of the features from the lowest station number TVP Refer to Equipment Specifications for equipped features and access code(s).

5.2.1 Public Address 316047 Test (if **equipped)**

(a) Dial assess code
(b) Insure burst of ring tone (RT).
(c) Adjust VT Level for +1VDC.

NOTE: The PA **feature will be rechecked during "Cut-Over Procedure" (Section VII)**

5.2.2 Code Call 316048 Test (if equipped)

(a) Dial access code.
(b) Dial three digit code
(c) Insure code is repeated via dial tone bursts.
(d) Dial termination code from TVP **connected to highest line** appearance.
(e) Establish transmission.
(f) Adjust VT1 and VT2 for +1VDC.
(g) Place both TVP's 'on hook"

NOTE: **Code Call will be rechecked during "Cut-**Over Procedure" (Section VII)

5.2.3 Attendant Trunks (U equipped)

Single Console System

(a) The attendant has two trunk circuits:

316073 (Trunk 1)
316099 (Trunk 2)

(b) Dial access code for attendant. A **trunk will be seized. The attendant's** trunk will be seized and the attendant's trunk lamp (located on **console)** will flash at 120 ipm **bright. Answer** call at the console' by depressing the lamp **button that is flashing.** The lamp will turn **"on."**

(c) Establish transmission. Adjust **the** VT of **the trunk seized** for +1VDC

(d) Depress release bar on console. **Place TVP 'on hook."**

(e) Repeat Steps **(b), (c), and (d) above and adjust level** of other **attendant's trunks.**

Multrconsole Systems

(a) Each console has two trunks.
(b) Dial access code (as in Step (b) under Single Console System), answer, and adjust each trunk's VT level for +1VDC.

5.3 Line-to-Line and Line-to-Features

5.3.1 Call fro-m TVP **to TVP, both directions Insure ringing and transmission**

(a) Dial an equipped feature (PA, code call, or attendant trunk) Establish connection and transmission.

5.3.2 Work inwards (toward middle) and repeat Step 5 3 1 for all equipped lines.

Example **(1): 200 to 299**
299 to 200
200 to PA
299 to PA

Example (2): 201 to 298
298 to 201
201 to PA
298 to PA

6.0 FEATURE CIRCUITS TEST

6.1 Test the following features if equipped.

6.1.1 Executive **Override 316052**

(a) **Connect a TVP to the** MDF **line vertical terminal assigned to executive** override.

(b) Connect TVP's to **two** equipped line appearances. Establish **transmission between them.**

(c) From the executive override TVP, dial one of the two TVP's. After receiving busy tone, dial the override access Code.

(d) Both TVP's should receive a burst of dial tone, and three-way transmission should be possible.

(e) Place all three TVP's "on hook." Disconnect from MDF.

6.1.2 Group Hunt 316045

(a) Connect TVP's to MDF line appearances assigned to group hunt circuit No. 1.

(b) Connect a TVP to a non-group hunt MDF line appearance.

(c) Place TVP assigned to group hunt master "off hook."

(d) From non-group hunt TVP, dial group hunt master TVP number TVP Slave 1 should ring.

(e) Answer TVP slave 1 Establish transmission. Place both phones "on hook." Place TVP slave 1 "off hook."

(f) Repeat Step (d). Slave 2 should ring.

(g) Repeat Steps (d), (e), and (f) for all slaves.

(h) Repeat Steps (a) through (g) for all group hunt circuits equipped.

6.1.3 Line Lock-Out

(a) Connect SIX TVP's to MDF line appearances

(b) Place all SIX TVP's "off hook" All six corresponding busy lamps will come "on"

(c) Check all junctors with junctor test switch to establish that they are not busy.

(d) Busy tone should be received from each TVP

(e) Repeat Steps (a) through (d) for each line lock-out PCB equipped

6.1.4 Auxillary Junctor (316079)

(a) Remove all junctors except No. 1.

(b) Insert TJP into test Jack

(c) Connect TVP to any equipped MDF line appearance.

(d) Dial the TVP number from the TJP A busy tone should be received

(e) Dial any equipped feature previously checked Feature should be accessible.

(f) Remove TJP and TVP.

(g) Insert all junctors

6.1.5 Single Digit Access (316086)

(a) Connect TVP's to MDF line appearances assigned as SD.?, lines.

(b) Connect TJP to test jack.

(c) Dial the SDA access code assigned to each line appearance.

(d) Answer each SDA line. Establish transmission.

(e) Remove TJP and TVP's.

NOTE: SDA is normally a hotel/motel feature but may be equipped in other systems.

6.1.6 System Main Alarm 316068

Major Alarm

(a) Depress regular routine key, placing both system allotters in an alarm condition

(b) Console alarm light will come "on" bright and console buzzer will sound alarm

(c) Depress attendant reset key for five seconds. All alarm lamps will go "out" and buzzer will go "off."

Minor Alarm

(a) Depress standby routine key, placing standby allotter into an alarm condition

(b) Console alarm lamp will come "on" dim and buzzer does not sound.

(c) Depress attendant reset key for five seconds All alarm lamps will go "out" and buzzer will go "off."

6.1.7 Hotel/Motel Feature Tests

Message Waiting (316057) Test

(a) Connect a telephone equipped with neon lamp to MDF line tip and ring designated as a message waiting station.

(b) At attendant position, place message waiting switch corresponding to station under test to the operate position.

(c) The lamp on phone will "wink" at approximately 60 ipm.

(d) Place phone "off hook." Wink signal is removed and lamp goes "out." Dial the attendant Establish transmission. Place phone "on hook" and "wink" will return

(e) Place message waiting switch to OFF positton. Wink signal is removed and lamp will go "out."

(f) Repeat Steps (a) through (e) for all message waiting stations

Message Register (316080) Test

(a) Connect a TVP to lowest MDF line appearance equipped with message registration.

(b) Place TVP "off hook." Dial trunk access code corresponding to trunk group equipped with message registration

(c) Observe peg count meter of station under test. Dial city

number and let city phone ring but do not answer. Peg count meter should not count.

(d) Answer city phone. Peg count meter should count. Place both phones "on hook."

(e) Repeat Steps (a) through (d) for all lines equipped with message registration, and all trunks equipped with message registration.

NOTE: One call through each trunk is sufficient.

6.1.8 Traffic Recording Adapter Circuit (316046) Test

Line Circuits

(a) Identify traffic recording equipment assigned to lines. Note that equipment is showing idle.

(b) Connect a TVP to an MDF line appearance corresponding to the first Line connected to the traffic recording adapter circuit.

(c) Place phone 'off hook" for 30 seconds. Note that traffic recording equipment shows busy for 30 seconds. Place phone 'on hook." Equipment shows idle.

(d) Repeat Steps (b) and (c) for all lines connected to the traffic recording equipment.

Junctor

(a) Refer to paragraph 4.0 of this section.

(b) Identify traffic recording equipment assigned to junctors. Note that equipment display indicates idle.

(c) Repeat Steps (a) through (c) of paragraph 4.3.1 in this Section.

(d) Observe peg count meter counts as junctor is seized.

(e) Remain "off hook" for 30 seconds. Note that traffic recording equipment shows busy for 30 seconds. Place phone 'on hook." Equipment shows Idle.

(f) Repeat Steps (a) through (e) above for all junctors connected to traffic recording adapter.

(g) Remove all junctors from female connectors but leave in mounting slots. Note that traffic recording equipment shows all circuits busy.

(h) Insert junctor No. 1 Note "all circuits busy" clears. Insert all junctors.

Registers

(a) Identify traffic recording equipment assigned to registers. Note that equipment display indicates idle.

(b) Remove all register PCB's except register No 1 (two PCB's)

(c) Connect a TVP to an equipped MDF line appearance and go "off hook." Note register seizure (green lamp)

(d) Peg count meter counts and register is seized. Register remains seized for ten seconds. Equipment should indicate "all circuits busy" and duration of seizure.

(e) Repeat Steps (a) through (d) for all equipped registers.

(f) Remove TJP.

NOTE: It is recommended that the following test (Attendant Control Test) be deferred until after the completion of the "Trunk/Tie Line Test," paragraph 9.0 of this Section.

Attendant Control

(a) Identify traffic recording equipment associated with the attendant control.

(b) Connect a TVP to an equipped MDF line appearance. Place TVP "off hook" and dial the attendant's access code. Answer call at console then depress release bar. Peg count meter counts upon release. Place TVP's "on hook" and remove TJP.

Trunks/Tie Lines and Transfer Junctor

(a) Identify traffic recording equipment associated with trunk/tie lines and transfer junctor. Note that all displays are idle.

(b) Using appropriate trunk test procedure, place incoming or outgoing calls.

(c) As each trunk is seized, note that peg meter counts upon trunk seizure and that the duration of seizure is displayed.

(d) During the test, at appropriate point, note that peg meter counts upon seizure and that duration of seizure is displayed.

(e) Meconnect all trunk/tie lines and transfer junctor PCB's. Note that equipment displays all equipment busy. The duration indication will remain idle.

(f) Insert all trunk/tie lines and transfer junctor PCB's.

7.0 TRUNK ALLOTTER (316034) TEST

7.1 Refer to Equipment Specifications for trunk/tie lines equipped, assigned access codes, and trunk allotter location.

7.2 A trunk allotter is associated only with two-way and one-way (out) trunk/tie lines

7.3 Remove all trunk/tie lines, except the first equipped trunk/tie line, associated with the trunk allotter under test

7.4 Note that the trunk tie/line allott lamp (yellow) is "on"

7.5 Observe that one of the four trunk group allott lamps (yellow) on the trunk allotter is "on."

7.6 **Dial the trunk/tie line access code.**

(a) The trunk/tie line busy (green) lamp turns "on."
(b) Trunk allotter trunk group (yellow) lamp turns "off," proceeds to next lamp, and turns "on."

7.7 **Continue dialing the access code. Note that the trunk allotter yellow lamps proceed to come "on" in sequence and that the alarm (red) lamp remains "off."**

7.8 **Repeat Trunk Allotter Test (Steps 7.1 through 7.7) for all equipped trunk allotters.**

8.0 CONSOLE OPERATION

The following is presented to aid the installer(s) in trunk and related circuit tests.

8.1 ITT Console

8.1.1 **Incoming** Trunk call (City Trunks)

8.1.1.1 The incoming call flashes the associated trunk button (120 ipm bright) sad **sounds** the console buzzer.

8.1.1.2 The Attendant (Attd) answers by depressing the flashing trunk button. The trunk button changes to steady bright, the buzzer turns "off," and the talk city (TC) lamp comes "on" steady bright.

8.1.1.3 The Attendant determines the station number desired and key punches the number on the console station number pad.

8.1.1.4 If the station is not busy, it will ring. Upon answer, the TC lamp will go out and the talk entension (TX) lamp will turn "on" steady bright. The Attendant **announces** the call and, if call is accepted, depresses the release bar. The city trunk party and the station will be connected and the TE lamp will turn "off." The trunk button (TB) will turn 'on" dim steady.

8.1.1.5 The Attendant may depress the release bar if the station is not busy and the Attendant does not wish to announce the call. Ring back tone (RBT) will be transmitted to the city party. The TB lamp will flash at a dim 60 ipm. The TC lamp will go "Out." Upon answer by the station, the TB lamp will turn "on" dim steady.

8.1.1.6 To release from a mis-key, busy, or ringing station (prior to depressing the release bar), depress the release extension key and re-key.

8.1.1.7 If the station is busy the Attendant may:

(a) Place the trunk in a hold condition by depressing the hold bar. **The trunk busy** (TB) lamp will flash a wink signal (.9 seconds on, .1 second off).
(b) Place the call on camp-on-busy (COB).

8.1.1.8 **Camp-on-Busy Operation**

(a) After key punching the desired number and receiving busy tone, depress the COB button.

NOTE: Group hunt master numbers may not be camped on unless all associated slave numbers are busy.

(b) Depress the release bar. The trunk button lamp will flash 120 ipm dim.
(c) Two station numbers per circuit may be placed in the COB mode at the same time. When the second number is camped on, the COB button will turn "on" bright steady and no more station numbers will be accepted.
(d) The COB circuit will attempt to ring the called number every five seconds.
(e) The trunk button lamp will turn dim steady when the camped-on station has answered.

8.1.1.9 Attendant Recall

(a) The trunk button lamp will **flash** 120 **ipm bright when the EPABX** station connected to the **city trunk recalls the** Attendant.
(b) Depress the trunk **button. The** TB lamp will turn **bright steady.**
(c) The talk city lamp **will not turn** "on."
(d) The Attendant may spilt the trunk manually by depressing the talk extension or talk city button, or the Attendant may participate in a three-way conversation.
(e) If it is desirable to transfer the call, instruct the EPABX station to "hang up." &press the talk city button and proceed as though it were an incoming call.
(f) If the call had been lost and there is a recall, depress **the** TC button and proceed as though it were an incoming call.

8.1.2 Incoming Trunk Call (DID with Attendant Access)

8.1.2.1 The associated trunk button lamp will turn "on" bright steady when the trunk is seized and will flash a dim 60 ipm indicating a call has been terminated. The trunk button lamp **will turn** dim steady indicating an **answer.**

8.1.2.2 If the Attendant is recalled, the **call** may be treated as an incoming City trunk call except:
camp-on-busy is not accessible.

8.1.3 outgoing Call

8.1.3.1 Any EPABX station may reach an outside party by dialing the Attendant (digit 0) and requesting a city trunk. This action defeats the class-of-service (COS) restriction feature when city number is dialed by the Attendant

(a) The Attendant's trunk button lamp (Op 1 or 2) will flash 120 ipm bright and the console buzzer will sound. The Attendant will answer by depressing the trunk button. The trunk button lamp will turn bright steady.

(b) The Attendant may, if desirable, depress an appropriate city trunk button and release from the call by depressing the release bar.

(c) The EPABX station will receive city dial tone and may dial the number directly.

(d) The Attendant, if time and charges (T and C) are desired, depresses the hold bar instead of the release bar. The trunk button lamp will flash wink upon completion of the call, indicating that the call has been completed and that T and C can now be obtained.

(e) If desirable, the Attendant may place the station's call by dialing the number directly, using an appropriate trunk button. Upon answer, the Attendant may release from the call OF proceed as in Step (d) above.

(f) If requested, the Attendant may book the call and place it at a later time. The Attendant must release the station connected to the Attendant's trunk.

8.1.3.2 Placing Outgoing Call from Console

(a) The Attendant may seize an outgoing trunk by depressing an appropriate trunk button and dialing the desired number

(b) If a mid-dial occurs, the city may be released and reseized by &pressing the release city (RC) button.

(c) After the called number has answered, the Attendant may transfer it to an EPABX station in the same manner as an incoming call.

NOTE: The Attendant must not extend a booked call to an EPABX station until the distant party has answered.

8.1.3.3 An outgoing call from a station will turn the associated trunk button "on" dim steady.

NOTE: The Attendant must not place outgoing calls on hold until the called party has answered.

8.1.4 Attendant Line

8.1.4.1 The Attendant may originate calls to all EPABX stations and features by:

(a) Depressing the attd. line button (ALB). The ALB lamp will turn 'on" and dial tune will received.

(b) Using the rotary dial and dialing the desired number(s).

(c) The Attendant must depress release bar to release from call.

8.1.5 Attendant Override (Busy Verification)

8.1.5.1 The Attendant override feature may be employed by:

(a) Depressing attendant override button (AOB). The AOB lamp will come "on" bright steady.

(b) Key punching the desired station number. The busy station will receive a burst of dial tone to announce the orertide.

(c) Depressing release bar to release.

8.1.6 Unassigned Night Answer (UNA)

Upon departure from the console, the Attendant turns the UNA key ON. All incoming calls will be answered through the UNA circuit.

8.1.7 Assigned Night Answer (ANA)

8.1.7.1 Same as UNA

8.1.8 Attendant Controlled Conference

8.1.8.1 Any extension user can call the Attendant via an attendant trunk to request a conference with a maximum of five other extensions or tie lines (can be mixed) and one trunk party.

(a) After acknowledging the conference request and obtaining the list of conferees, operate the CONF key. The attendant trunk lamp will go dark and the conference lamp will light bright steady, indicating the conference circuit has been seized and the attendant and the extension have been transferred into the conference circuit.

(b) Disconnect from the conference circuit by operating the release button.

(c) To call an extension conferee, operate attendant trunk #2 (will light steady) and key punch the desired station number

(d) When the extension answers, advise him of the conference. To add the extension, operate the conference key.

(e) Repeat the procedure in Steps (b), (c), and (d) for the other extension conferees.

(f) To add an outgoing trunk* to the conference, operate an idle outgoing trunk key and dial the desired number.

(g) When the outside party answers, advise him of the conference; to add the outside party, key punch number assigned as trunk conference accessing number (attendant transferred into conference to announce trunk party) and then the release button to disconnect from the conference (trunk party added to conference when attendant releases).

(h) If an incoming trunk party requests a conference, obtain the list of the conferees and place the trunk on hold.

(i) Repeat the procedure in Steps (b), (c), and (d) for the other extension conferees*

* At least one station must be in the conference before the trunk party is added.

(j) Re-enter the incoming trunk and add the incoming party by key punching the assigned number (see Step (g) above).

(k) To release the trunk from the conference, station user in the conference must dial the digit 2 or greater. If a conferee wants to contact the attendant he must go "on hook" and then dial "0." The attendant may then return him to the conference by operating the conference key.

8.1.9 Trunk Lamp **Signals on ITT Console**

TRUNK LAMP SIGNALS

CALL CONDITION	TYPE TRUNK	TRUNK LAMP
Incoming CO Trunk	2-Way Central Office	**Flashes** bright 120 ipm. Buzzer operates.
Trunk Answered (by attend- - 1	All Trunks	Bright steady.
Station Ringing	2-Way Central Office DID	Flashes dim 60 ipm.
Request for Transfer	%-Way Central Office DID DID	Rashes bright 120 ipm.
Camp-On Established	2-Way Central Office DID	Flashes dim 120 ipm.
Station Answers	2-Way Central Office DID	Dim steady.
Trunk on Hold	All Trunks	Dim Wink.
30 Second Delayed Answer	DID	Flashes bright 120 ipm. **Buzzer** operates.
Extension Dials "0"	Attendant Trunk	Flashes bright 120 ipm. Buzzer operates.

8.2 Bell Console

The operation of the Bell console is similar to the operation of the ITT console.

8.2.1 Substitute the following terms in the text of paragraph 8.0 (Console Operation) when referring to a Bell console

ITT Console	Bell Console
(a) Key punch station number	(a) Depress station DSS number
(b) Release bar	(b) Release button
(c) Hold bar	(c) Hold button
(d) Attendant override	(d) Busy verification

8.2.2 Since the Bell console contains a built-in busy lamp field (BLF), a busy station may be determined by referring to the DSS console.

8.3 Multi-Attendant Operation

8.3.1 All incoming calls will be split (odd and even) between the two consoles

8.3.2 All calls may be transferred from *one* console to the other by turning the transfer key on the console from which the call is to be transferred.

9.0 TRUNK/TIE LINE TEST

9.1 Refer to Equipment Specifications for trunks/tie lines equipped and location.

9.2 Test ail trunks/tie lines by using appropriate test procedure(e) listed in Section VI

9.3 Multi-Console Systems

9.3.1 All trunks having a console appearance will appear at the console on an odd-even basis.

9.3.2 Test each trunk with the consoles split Transfer all trunks to position 1 and retest each trunk. Transfer all **trunks** to **position** 3 and retest each trunk.

10.0 TOLL RESTRICTOR (316067) TEST

10.1 Use the "Toll Restrictor Test" of Section VI as necessary with assoicated trunk test

11.0 ATTENDANCE DIGIT READ-OUT TEST

11.1 **Complete an incoming call from a city number to the Attendant.**

11.2 ~~Connect a TVP to MDF line T-B terminals representing~~ **X00 (lowest equipped** number is usually 200).

Text **Key punch** X00. Insure ring but do not **answer**. Depress release extension **key. Ringing should stop.**

11.4 Repeat above step for X01, X11, X22, X33, X44, X55, X66, X77, X88, and X99. Repeat for each hundred group equipped.

NOTE: Do not test line appearances not equipped With PCB'S.

12.0 CAMP-ON-BUSY (316031) TEST

12.1 Refer to "Camp-On-Busy Test" in Section Vi. Perform test if COB is equipped.

13.0 ATTENDANT LINE TEST

NOTE: Attendant line will be inoperative whenever TJP is inserted.

13.1 Depress attendant line button on console. Attendant line button turns "on" bright steady. System dial tone is returned.

13.2 Using console rotary dial, dial the number of a TVP connected to the MDF line terminals.

13.3 Insure ring back, answer, and establish conversation.

13.4 Release by depressing release bar. Place TVP "on hook."

14.0 TRUNK CONFERENCE ACCESSING (316077) TEST

14.1 Systems Arranged for Station Access

(a) Connect five TVP's to MDF line terminals that are not restricted from the conference access code.

(b) Dial access code from each TVP and establish five-way transmission insure conference busy lamp on console is "on" bright steady.

(c) Adjust each (total of five) VT potentiometer for +1VDC. Use calibrated VOM for measurement

(d) Complete call from city phone via city trunk to attendant. Attendant key punches trunk conference accessing number and depresses release key

(e) Six-way transmission should now be possible

(f) Dial digit 2 from any one of the TVP'S. The trunk should release from the conference

(g) Place one TVP "on hook." Go "off hook" and dial the attendant. Attendant answers, depresses **conference button and** rel**ease** key. The TVP should now **be connected back** in conference.

(h) Place all TVP's "on hook."' Place one TVP 'off hook" and dial the attendant. Attendant places the TVP into conference as in Step (g).

(i) Attendant depresses OP2 and key punches number of and idle TVP. The TVP rings and answers. Attendant places TVP into conference as in Step (g). Repeat for other three TVP's.

(j) Place all TVP's "on hook."

14.2 Systems Arranged for Attendant Controlled Conference

(a) Connect five TVP's to MDF line terminals that are not restricted from the conference access code.

(b) Place all TVP's 'on hook." Go "off hook" with one TVP and dial the attendant. Attendant places the TVP in conference by depressing the conference button and release key.

(c) Attendant &presses OP2 and key punches number of an idle TVP. The TVP rings and answers. The attendant places TVP into conference by depressing conference button and release key.

(d) Repeat Step (c) for the remaining TVP's. Adjust each (total Of five) VT potentiometer for +1VDC. Use calibrated VOM for measurement.

(e) Complete call from city phone via city trunk to attendant. Attendant key punches trunk conference accessing code and depresses release key.

(f) Six-way transmission should now be possible.

(g) Dial the digit 2 from a TVP. The trunk should release from the conference.

15.0 RESTRICTEDSTATION -CLASS OFSERVICE TEST

15.1 Connect a TVP to MDF line appearance of a restricted station. Dial each restricted code of that station. Busy tone should be returned for each restricted digit(s) dialed.

(a) Repeat above procedure for all restricted stations of the system.

16.0 POWER FAILURE CUT-TROUGH TEST

16.1 Connect an appropriate TVP to MDF line vertical terminals of PFCT.

(a) For city trunks:

Ground start - TVP must have ground button.

Loop start - Normal instrument.

(b) For DID trunks:

Loop - Normal instrument.

16.2 Place AC circuit breakers to OFF.

16.3 For PFCT with city trunks:

(a) Place in and out calls between TVP and city place. Insure that TVP rings. (Ground button must be depressed to initiate call **on** ground start trunks.)

16.4 **DID Loop Trunks:**

(a) Place outgoing call to city number.

16.5 **Repeat Steps 16.3 and 16.4 for all PFCT numbers assigned.**

16.6 **Restore AC** power.

Section VI

CONTENTS

FIGURES

Section VI

TEST PROCEDURES

1.0 CITY TRUNK TEST (316061 and 316075)

In the following procedures, TVP refers to a test phone connected to the MDF vertical terminals of an equipped EPABX line. Insert the trunk/tie line under test only. Remove when test is completed.

1.1 Outgoing - With Console Appearance

(a) Connect a ground start or loop start (as appropriate) city line to the MDF tip and ring of the trunk to be tested.

(b) Connect a TVP to an MDF station line appearance that is unrestricted. Dial "0" and have Attendant extend the call to the desired trunk. After the Attendant releases, dial the city number. Answer, then adjust the "VT" potentiometer to +1VDC, then release.

(c) Dial "0" and have the Attendant extend the call to the desired trunk. The Attendant now dials the city number. Answer the city phone. The Attendant now depresses the hold bar on the console. A two-way conversation should be possible between the TVP and the city phone. Place both phones "on hook." The Attendant should receive a wink lamp indication on the assoiated trunk button. The Attendant should now enter the trunk and then push the release bar The trunk should clear in approximately six seconds.

(d) The trunk allott lamp of the desired trunk should light. Dial the trunk access code from the TVP. The allott lamp will go "out" and the busy lamp will come "on." The city dial tone will be heard. Dial the city number and answer Immediately dial zero; the digit will be ineffective. Watt at least ten seconds after dialing. Now dial "0" again and the Attendant's trunk lamp should flash a bright 120 ipm The Attendant now is able to talk to the city and the TVP The Attendant can depress the talk city key and converse with the city and the TVP will be cut off. The Attendant can depress the talk extension key and converse with the TVP and the city will be cut off. The Attendant now releases, and the TVP remains connected to the city

(e) If equipped, insert transfer junctor No 1 PCB Depress reset button to extinguish all alarms.

(f) From the TVP, continue to talk with the city and dial digit "2" Nothing should happen to Interrupt the conversation

(g) Dial digit "1" from the TVP. The city party is cut off and the TVP receives the EPABX dial tone. Depress the TVP hook switch for a period not to exceed ten seconds, and release The city party should now be heard again

(h) Dial digit "1" from the TVP. A dial tone will be heard Dial another "1," and a busy tone will be heard. Dial another "1," and the TVP should now be able to converse with the city again.

(i) Dial digit "1" from the TVP. A dial tone will be heard. Connect a second TVP to the MDF station line. Dial the numbers of the second TVP. When it rings, dial "1." The second TVP should drop out and conversation with the city should again be possible.

(j) Dial "1" from original TVP, then dial number of second TVP. Answer the second TVP. The city party should not be able to hear. Only the TVP's should be able to hear one another. Dial "2' from original TVP. The city and both TVP's should be able to converse. Check and adjust the transfer junctor VT to +1VDC. Place the original TVP "on hook." The second TVP may now converse with the city.

(k) With the second TVP, dial "1." Then dial the number of the original TVP. Answer the original TVP. Dial "2" from second TVP. This brings the city party back tn. Now dial "1" from the second TVP and the original TVP should be cut off. Release the trunk.

(l) Remove transfer junctor No. 1 and insert transfer junctor No. 2 Repeat Steps (f) through (k).

(m) Repeat Steps (f) through (k) for ail transfer junctors accessible by trunk under test

(n) Connect a TVP to the MDF line appearance that is restricted from accessing the trunk Dial trunk access code. A busy tons should be received.

If the system is equipped with toll restrictors and if the trunk under test accesses the toll restrictor, perform the "Toll Restrictor Test" (paragraph 4.0 of this Sectton).

(o) Establish a call as described in Step (d) Do NOT dial "0"

(p) Depress attendant override button on console. The associated lamp will turn "on." Key punch the TVP number. Both the TVP and-city will hear a burst of dial tone. A three-way conversation should be possible. Depress the release bar. The attendant override lamp button will turn "off" Place TVP and city phone "on hook"

1.2 Outgoing - Without Console Appearance

(a) Connect a TVP to MDF station line appearance that is unrestricted Connect a city line to the MDF tip and ring terminals of the trunk under test

(b) The trunk allott lamp (yellow) of the desired trunk will light. Dial the trunk access digit. The trunk allott lamp should go "out," and the busy lamp (green) should turn "on." Dial the city number. Check for ring back tone, answer, and begin transmission.

(c) Dial "0" from TVP. The Attendant's buzzer should not sound.

(d) Place TVP and city phones "on hook." The trunk should clear in approximately six seconds.

(e) Repeat Steps (e) through (p) of paragraph 1.1.

1.3 Incoming (316075 Only)

All incoming city trunks have console appearance.

(a) Place city phone "off hook" and dial number assigned to the EPABX trunk to be seized. The associated trunk lamp button should flash 120 ipm, and the buzzer in the console will be heard.

(b) Depress attendant trunk button. The lamp indication will be bright steady. The Attendant can now converse with city. Depress Attendant release bar. The trunk lamp will be dim steady.

(c) After approximately six seconds, the trunk should indicate recall. The lamp will flash bright at 120 ipm, and the buzzer will sound.

(d) Attendant answers and key punches the TVP number. The TVP rings.

(e) Attendant depresses release extension key and TVP drops out.

(f) Key punch TVP number again. When TVP answers, talk city lamp goes "out" and talk extension lamp lights. The City should not hear the TVP or attendant.

(g) The Attendant then releases and city and TVP can converse.

(h) Place TVP "on hook." The Attendant is recalled in approximately six seconds as in Step (c).

(i) Attendant answers and key punches the TVP station number. Attendant releases by depressing the release bar. Lamp indication is a dim 60 ipm.

(j) If transfer junctor equipped, the TVP station answers and immediately dials "1." A dial tone will be received Place TVP "on hook." Trunk should clear in approximately 16 seconds.

(k) Repeat Steps (a) and (d) above. Place city phone "on hook." The TVP stops ringing, and trunk should clear in approximately six seconds.

(l) Repeat Step (a) above. Place city phone "on hook." The trunk button will go "out" and buzzer turns "off."

(m) Depress trunk button of trunk under test and then the hold bar Place city phone "off hook," and dial the city number associated with the EPABX trunk under test. The city busy tone should be returned.

NOTE: If number dialed is city master rotary number, the bay tone may not be returned.

(n) If camp-on-busy is equipped, place TVP "off hook" Insert camp-on-busy circuit No. 1.

(0) Answer trunk recall and key punch to busy TVP. The busy lamp on console will light and busy tone is returned.

(p) Depress COB button on console. Depress release bar. The trunk lamp indication is dim 120 ipm.

(q) Place TVP "on hook." In seven seconds or less the TVP will ring and trunk indication change to dim 60 ipm. Answer TVP and then place phone "on hook."

(r) Remove COB circuit No. 1 and insert COB circuit No. 2. Depress reset button to extinguish all alarms.

(s) Repeat Steps o) through (r) above.

(t) Place city phone "on book." Turn key on console to UNA position, if equipped.

(u) Initiate a call from the city phone. The relay in UNA will pulse.

(v) Place TVP "off hook" and dial the assigned UNA digit. The trunk lamp will change from a bright 130 ipm to dim steady. Transmission to the city should be possible.

(w) If the system is equipped for MA rather than UNA, insert the ANA printed circuit board.

NOTE: Connect TVP to EPABX station(s) assigned as ANA as required.

(x) Initiate a city call to the EPABX. The extension assigned to this trunk will ring. Answer and establish transmission. Place both phones "on hook."

1.4 Incoming (316061 Only)

(a) Repeat Step (a), paragraph 1.3.

(b) Depress Attendant trunk button. The trunk lamp will be bright steady, and the Attendant can converse with city.

(c) Key punch the TVP number. The TVP will ring.

(d) Repeat Steps (e) through (g), paragraph 1.3.

(e) Place TVP and city phone "on hook."

(f) Repeat Steps (a) and (b) above,

(g) Key punch the TVP number. The TVP will ring.

(h) Repeat Steps (e) through (g), (l), and (k), paragraph 1.3

(l) Answer the TVP. Place both city phone and TVP "on hook."

(j) Repeat Steps (n) through (x), paragraph 1.3.

2.0 TIE LINES TEST (316051 and 316060)

2.1 Connect tip and ring from distant equipment (DE) to tie line tip and ring terminals of MDF. Connect a TVP to equipped MDF line appearance.

2.1.1 From distant equipment, dial access code to seize EPABX tie line.

(a) The tie line busy lamp (green) will come "on." The phone connected to the DE receives a dial tone from the EPABX.

(b) Dial the TVP number. Check for ringing and ring back tones. Answer TVP and establish transmission.

(c) Connect VOM to VT test point. Adjust VT potentiometer for +1VDC.

(d) Depress Attendant override button on console. Key punch the TVP number. The TVP and DE phones should receive a burst of dial tone, and three-way conversation should be established. Depress release bar on console. Attendant is released.

(e) Place both TVP and DE phones "on hook." The tie line becomes idle.

2.1.2 Check to make sure that the tie line (that is inserted and under test) is allotted. Allott lamp (yellow) will come "on."

(a) Dial the access code for the tie line under test. Note that the tie line busy lamp turns "on," and dial tone is received on DE.

(b) Dial DE phone number. Note ring back tone. Answer and establish transmission.

(c) Place DE phone and TVP "on hook " The tie line becomes idle.

3.0 DIRECT INWARD DIAL AND TIE TRUNK TEST PROCEDURE

3.1 Determine which trunk PCB number the EPABX is equipped with Refer to the following information for the correct test procedure:

Trunk	Perform Steps
316089	(a) through (n) of paragraph 3.1.1 and (a) through (o) of paragraph 3.1.3.
316056	(a) through (e) of paragraph 3 1 2, (a) through (c) of paragraph 3 1 5, (1) through (o) of paragraph 3 1 3
316054	(a) through (n) of paragraph 3 1 1 and (a) through (o) of paragraph 3 1 3
316090	(a) through (e) of paragraph 3 1 2, (a) and (b) of paragraph 3 1 6, (n) and (o) of paragraph 3 1 3
316091	(a) through (n) of paragraph 3 1 1, (a) through (d) of paragraph 3 1 4, (n) and (o) of paragraph 3.1 3
316092	(a) through (n) of paragraph 3 1.1, (a) through (d) of paragraph 3 1.4, (n) and (o) of paragraph 3.1.3.
316093	(a) through (e) of paragraph 3.1.2, (a) and (b) of paragraph 3.1.6, (n) and (o) of paragraph 3 1.3
316094	(a) through (n) of paragraph 3.1.1 and (a) through (o) of paragraph 3.1.3.
316095	(a) through (e) of paragraph 3.1.2, (a) through (c) of paragraph 3.1.5, (1) through (o) of paragraph 3.1.3.
316096	(a) through (e) of paragraph 3.1.2, (a) and (b) of paragraph 3.1.6, (n) and (o) of paragraph 3.1.3.

3.1.1 Outgoing - With Console Appearance (Attendant Access)

(a) Connect a city line to the MDF tip and ring terminals of the trunk under test. Connect a TVP to an equipped MDF line tip and ring that IS not restricted from the access code of trunk under test

(b) Dial "0" with the station TVP and have Attendant extend the call to the desired trunk After Attendant releases, dial the city number Answer the city phone and adjust the "VT" potentiometer for +1VDC

(c) Dial "0" with the station TVP and have Attendant extend the call to the desired trunk The Attendant now dials the city number Answer the city phone The Attendant now depresses the hold bar on the console. Conversation with the city should be possible Place both phones 'on hook." The Attendant should receive a wink lamp indication on the associated trunk button The Attendant should now enter the trunk and then depress the release bar The trunk should clear in approximately six seconds

(d) The trunk allott lamp of the desired trunk should light Dial the trunk access digit from the TVP The allott lamp will go "out" and the busy light will light City dial tone will be heard Dial the city number and answer Immediately dial "0" The digit will be ineffective Walt at least ten seconds after dialing Now dial "0" and the Attendant's trunk lamp should flash bright 120 ipm The Attendant now enters and is able to talk to the TVP and the city Depressing the Attendant's talk city key will cut off the TVP Depressing the Attendant's talk extension key cuts the city off and the Attendant converses with the TVP The Attendant releases.

(e) If equipped, insert transfer junctor No 1 printed circuit boards Depress reset button to extinguish all alarms

(f) The TVP now talking to the city party dials a "2" Nothing should happen to interrupt the conversation

(g) From the TVP dial "1" The city party is cut off and the TVP receives a dial tone from the EPABX Depress the TVP hook switch for a period not to exceed ten seconds and release The city party should now be heard again

(h) Dial "1" from the TVP A dial tone should be received Dial another "1" and a busy tone will be heard Dial another "1" and transmission with the city should be possible

(1) Dial "l" from the TVP. A dial tone should be received. Connect a second TVP as in Step (a) above. **Dial second** TVP number. When second TVP rings, dial "1." Thee second TVP drops **out** and the city should be heard again.

(j) Dial "1." Dial the second TVP number. Answer the second TVP. The city party should not be able to hear. Only the TVP's should be able to hear one another. Dial "2." The city and both TVP's should be able to converse. Check and **adapt** the transfer junctor VT potentiometer for +1VDC.

Place the original **TVP** "on hook." The **second** TVP should now be able to **talk to the city.**

(k) Dial "1" from the second TVP, and then the number of the original TVP. Answer the original TVP. Dial "2" from the second TVP and the city is again connected. Now dial "1" from the **second TVP and the original TVP** should be cut **off. Release the trunk.**

(1) Remove transfer **junctor No. 1 and insert transfer junctor No. 2. Repeat Steps (e) through (j) above.**

Repeat Steps (e) through (h) for all transfer junctors accessible by trunk under test.

(m) Connect a TVP to an MDF line appearance **that is restricted from accessing the trunk. Dial the trunk access code. A busy tone should be received.**

(n) If the system is equipped with toll restriction, and if the trunk under test accesses the toll restrictor, perform the **"Toll Restrictor Test," (paragraph 4 0).**

3.1.2 Outgoing - Without Console Appear - ance (Attendant Access)

(a) Connect a **TVP to an MDF line appearance that is unrestricted. Connect a city line to the MDF tip and ring terminal of the trunk under test.**

(b) The trunk allott lamp (yellow) of **the desired trunk will light. Dial the trunk access digit from the TVP. The allott lamp should go "out" and the busy lamp (green) should turn "on." Dial the city number Check for ring back tone. Answer, and establish transmission.**

(c) Dial "0" from TVP. The Attendant's buzzer should not sound.

(d) Place city phone and TVP "on hook." The trunk should clear in approximately six **seconds**

(e) Repeat Steps (e) through (1) of paragraph 3.1.1 if transfer junctor is equipped.

3.1.3 Incoming - With Console Appearance (Attendant Access), Without Second Dial Tone

(a) Connect a TVP to the MDF line appearance corresponding to the city number assigned to:

Access the trunk, and King that line.

(b) Prom the city phone, dial the number assigned. The trunk busy and register access lamps (green) will turn 'on." The register access lamp will go "out" upon completion of dialing. The console trunk lamp button will flash dim 60 ipm.

(c) Check for **ringing** and ring back tones. Place city phone "on hook." Trunk should go idle.

(d) Place TVP "off hook." Repeat Steps (a) and (b) above.

(e) A busy tone will be sent to the city phone. Place city phone and TVP 'on hook." **Trunk** will go idle.

(f) Remove all registers from system.

(g) Repeat Step (a) above. The trunk busy lamp will turn "on." **The register access will remain off. The** EPABX **busy tone will be returned** to the city phone.

(h) Reinsert all registers. Depress reset button to extinguish **alarms. Place city phone 'on hook."**

(i) Repeat Steps (a) and (b) above. Allow TVP to ring for 30 seconds. At the end of 30 seconds (approximately), the **TVP will stop ringing. The Attendant console** trunk **button will flash 120 ipm.**

(j) Answer the TVP. The trunk lamp will turn "on." Key punch **the TVP number and release. The trunk button** will **flash dim 60 ipm**

(k) Answer the TVP. Establish transmission between TVP and city phone Place both phones "on hook."

(1) **If equipped, dial a number assigned to Intercept** from **the city phone.**

(m) Check for ring back tone.

Operator Intercept - The trunk button will flash 120 ipm The Attendant answers and **both parties converse. The call may then** be com**pleted to a station in the normal manner.**

Recorder Intercept - Recorder is started information is transmitted to calling party

(n) Repeat Steps (a) and (b). Answer TVP and establish transmission.

(o) Depressing Attendant override button on console will turn lamp "on" bright steady Key punch the TVP number. The TVP and city party should hear a burst of dial tone. Establish a three-way conversation with Attendant. Depress release bar on console. The Attendant override lamp will go "'out." Place TVP and city phone "on hook"

3.1.4 **Incoming - With Second Dial Tone** and **With Console Appearance (Attendant Access)**

(a) Repeat **Step** (a) **of** paragraph **3.1.3**

(b) From the city phone, dial the number assigned to access the

trunk. The trunk busy and register access lamps (green) will turn "on." **A** dial tone will be returned to the city phone. Dial the TVP number. The register access lamp will turn "off' upon completion of dialing, and the trunk button lamp will flash dim 60 ipm **during** ringing.

(c) Repeat Steps (c) and (d) of paragraph 3.1.3 and Steps (a) and (b) of paragraph 3.1.4.
(d) Repeat **Steps** (e) through (h) of paragraph 3.1.3.
(e) Repeat Step ***(a)*** of paragraph 3.1.3 and Step (d) of paragraph 3.1.4

3.1.5 Incoming - Without Console Appearance (Attendant Access), Without **Second Dial** Tone

(a) Repeat Step (a) of paragraph 3.1.3.
(b) From the city phone, dial the number assigned to th nk. The trunk busy and register access lamp n) will turn **"on."** The register access lamp turn "off" **upon** completion of dialing.
(c) Repeat Steps (c) through (m) of paragraph 3.1.3

3.1.6 Incoming - With Second Dial Tone and Without Console Appearance (Attendant Access)

(a) Repeat Step (a) of paragraph 3.1.3 and Step (b) of paragraph 3 1 4. The trunk button lamp will not flash, as it is not equipped.
(b) Repeat Steps (c), (d), and (e) of paragraph 3.1.4

4.0 TOLL RESTRICTOR TEST

4.1 Toll restriction samples the digits dialed **to the** city, and disconnects those Calls from stations that are restricted from these digits If a station dials a restricted number, a system **busy** tone will be returned to that station

4.2 The toll restrictor contains the following circuits:

1-316067(11)112	Monitor Board One
1-316067(12)122	Monitor **Board** Two with class of service, programable for ten restricted **codes.**
1-316067(16)	Monitor Board Two equipped to add an additional ten programable codes.
1-316067(31)	Access Board, provides access for three **trunks.**
1-316067(15)	Monitor Board Two without class of service.

4.3 For **systems** equipped with one circuit, the following PCB's would be equipped:

1-316067(11)122
1-316067(12)122
1-316067(16)122 (if more than **ten codes** were to be restricted)
1-316067(31)122 **For** each group of three trunks to be accessed.

For additional circuits, the PCB's would remain the same except 316067(12) would be 316067(15).

A maximum of five circuits may be equipped in each system.

4.4 From the Equipment Specifications, determine the toll restrictor PCB **locations.**

4 . 5 **Insert** clip into busy **out** terminals on all 316067(11) toll restrictor PCB's. See Fig. 6-1.

CAUTION: Equipment may be damaged **due to inadvertent shorts.**

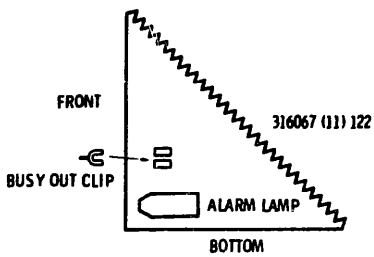


Fig. 6-1. Partial View of Toll Restrictor PCB.

4.6 Connect a TVP **to an MDF** line appearance that is not restricted from accessing the trunk(s) **under test but** is toll restricted.

4.7 Dial **trunk** access **code** from TVP. A system busy tone should be returned.

4.8 Remove **busy** clip from one toll restrictor circuit.

(a) Dial access **code** and seize trunk. The toll restrictor access lamp (green) on 316067(31) associated with the trunk under test will turn "on" The monitor lamp (green) on 316067(12) or 316067(15) of circuit under test will turn "on."

Refer to Equipment Specifications for restricted code(s). Dial the first restricted code. The trunk should release from **the city and the** EPABX system **busy tone should be returned.**

(b) Repeat Step (a) for each restricted **code**
(c) Repeat Steps (a) and (b) for each trunk.

4.9 Reconnect clips to **busy out** terminals of circuit tested In paragraph 4.8. Remove clip from busy out terminals of next circuit to **be tested** Repeat Steps (a), **(b),** and (c) of paragraph 4.8.

4.10 **Repeat Step 4.9** for all equipped toll restrictor circuits.

5.0 CAMP-ON-BUSY TEST PROCEDURE (316031)

5.1 Insert three camp-on-busy PCB's in system. Depress the reset button to extinguish all alarm lamps.

(a) Using two city lines, establish an incoming call on two EPABX city trunks.

(b) Connect a TVP to line 200. Place TVP 'off hook," setting **up** a busy line.

(c) Answer one of the incoming trunk calls and key punch line **200** The busy lamp will come "on" and a busy tone will be heard by the Attendant and city phone.

(d) Depress the COB button. The **trunk** lamp will change from bright steady to dim 120 ipm. Depress Attendant release bar

(e) Answer the other Incoming trunk call. Key punch line 200 The busy lamp will light and a busy tone will be returned.

(f) Depress the COB button. The trunk lamp then indicates dim 120 ipm and COB lamp will light dim steady. This indicates that both camp-on-busy circuits are busy.

(g) Place the TVP "on hook." Line **200 will ring in seven seconds** or less. The COB lamp will be extinguished, and the associated trunk will indicate dim 60 ipm.

(h) Answer TVP on line 200. The trunk lamp will turn "on" dim **steady.**

Place TVP 'on hook." In seven seconds or less, the remaining trunk lamp will change from dim 120 ipm to dim 60 ipm, and TVP on 200 will ring. Answer and go 'on hook." In six seconds both trunks will be indicating recall.

(i) Move the TVP to line 211 and repeat Steps (a) through (h) above.

This procedure should be continued until all of the following numbers have been camped on: 200,211, **212,233,244,255,266,277,288,299.**

If the system is over 100 lines, perform further tests to insure that camp-on is capable of accessing lines beginning with the other hundred digits used.

Section VII

CONTENTS

Section VII

CUT-OVER PROCEDURES

1.0 General

This Section provides certain cut-over procedures. Although each cutover is different, these procedures should be followed as a guide.

2.0 PRE-CUTOVER-INITIAL INSTALLATION

2.1 Customer Training

2.1.1 All station users and Attendants should be properly trained before using the EPABX system.

2.1.2 The service assistant should provide the training. If a service assistant is not available, schedule training at a time convenient to the equipment user.

2.1.3 Refer to the Customer Training Manual.

2.2 Procedure

2.2.1 Refer to Table 4-2, Section IV. Table 4-2 provides the MDF vertical number and the terminal numbers of each EPABX circuit with an output to station and satellite equipment.

2.2.2 Refer to Table 4-3, Section IV.

(a) Enter all information required on Table 4-3.

2.2.3 Using Table 4-3 as a guide, cable and connect station and satellite equipment

2.2.4 Connect jumpers between EPABX circuit outputs (Table 4-2), MDF vertical terminals, and satellite equipment (Table 4-3). Enter these connections on Table 4-2 under "Connect to" column.

2.3 Station Tests

2.3.1 Make a station-to-station call and check that:

(a) Number assigned to station is correct
(b) Station is receiving a dial tone.
(c) Station is receiving a ring back tone.
(d) Transmission is possible.
(e) Audible ring and/or visual signal is present.

2.3.3 Check each station to insure it cannot dial its restricted access codes without receiving a busy tone.

2.3.3 Check each station to insure that it can access those feature circuits not restricted.

2.4 Trunks/Tie Lines Test

2.4.1 Utilizing the appropriate test procedure (Section VI), check each trunk/tie line equipped.

2.5 Code Call - UNA - PA

2.5.1 Make sure satellite equipment is functioning properly. Refer to Section V for test procedures.

2.6 Insure that Directory is correct and distributed

2.7 Place TE-400 equipment into service.

3.0 PRE-CUTOVER (TELECOMMUNICATION SYSTEM IN CURRENT OPERATION)

3.1 Procedure

(a) Repeat Steps 2.1.1, 2.1.2, 2.1.3, 2.2.1, end 2.2.2.
(b) Remove all EPABX PCB's listed under "EPABX Equipment" in Table 4-2, Section IV, from female connectors. Leave PCB's in mounting slots.
(c) Repeat Steps 2.2.3 and 2.2.4.
(d) Remove power from present system in service.
(e) Remove cabling from previous system to MDF.
(f) Insert all PCB's into female connectors on EPABX.
(g) Repeat tests in paragraphs 2.3, 2.4, and 2.5.

4.0 POST-CUTOVER

4.1 Procedure

4.1.1 Observe operation of TE-400 system for a minimum of one day. Make sure that Attendant understands console operation, and that station users are able to utilize equipment.

4.1.2 Refer to Customer Service Manual for operational questions and/or complaints.

4.1.3 Refer to Maintenance portion of manual (Sections IX through XIV) for troubleshooting procedures, (if necessary).

Section VIII

CONTENTS

Section VIII

SYSTEM EXPANSION PROCEDURES-

130097 TE-400 CABINET(S)

1.0 PRELIMINARY

1.1 Read Sections I through VII and re-familiarize yourself with this installation. Particular attention should be paid to Section III (Cabinet Familiarization)

1.2 Refer to Tables 2-3, 2-5, and 2-6 of Section II These tables were filled in upon initial installation, and should be amended to reflect this expansion.

1.3 Follow Section III, 1 1 in general. Do not disturb cabinet inn operation Align and level new cabinet(s) to level of m-use cabinet.

1.4 Perform on the new cabinet only: Section IV, paragraphs 1 0 and 2 0

1.5 Using paragraphs 2 2 and 2.3 of Section IV as a guide, connect new cabinet. (Tag, for identity, cables to m-use cabinet) Do not connect to m-use cabinet

1.6 Consult Equipment Specifications and customer Refer to Section IV, paragraph 5.0, Tables 4-2 and 4-3 Fill in as required for expansion.

1.7 For the new cabinet, do as required, Section IV, paragraphs 6 0, 7 0, 8.0, 9.0, 10.0, 11.0, 12.0, 13 0, 14 0, 15 0, 16 0, and 17 0

NOTE: If lines/trunks, tie lines are to be distributed from m-use cabinet(s) to expansion cabinet(s), reflect these changes on Tables 2-5 and 2-6 of Section II and Table 4-3 of Section IV.

1.8 Familiarize yourself thoroughly with the old and new Equipment Specifications. ITT Dwg. 130117 will be referred to extensively

1.9 At this time the expansion cabinet should be wired for AC input, the multicabinet power cables should be wired, EPABX circuit outputs/inputs (T-R-satellite) to the MDF wired

1.10 Remove all PCB's from new cabinet Leave in position

2.0 REMOVE POWER FROM IN-USE CABINET

2.1 Connect cables as in Section IV, paragraphs 2 2, 2 3, 3 0 (if required), and 4.0

2.2 Refer to and perform all Installation Notes listed on Equipment Specifications

CAUTION; Exercise extreme care to insure correct connections on punching block and strapping field Refer to Section III, paragraphs 3 9, 3.10, and 4.0, for familiarization

2.3 After wiring is complete, repeat all steps of paragraph 17 0, Section IV, on all cabinets

3.0 REPEAT ALL TEST AND ADJUSTMENTS OF SECTION V COMPLETELY. USE SECTION VI AS REQUIRED.

4.0 REPEAT ALL TESTS AND PROCEDURES OUTLINED IN PARAGRAPHS 1.0, 2.0, AND 4.0 OF SECTION VII.

NOTE; It may be assumed that the satellite equipment (instruments, etc) are in place and connected to the MDF to facilitate cutover and minimize down time

5.0 IT IS RECOMMENDEDTHE INSTALLER REMAIN IN CLOSE PROXIMITY WITH THE SYSTEM FOR 72 HOURS AFTER IT IS REPLACED IN SERVICE.

Section IX

CONTENTS

FIGURES

Section IX

DESCRIPTION OF CABINET ASSEMBLIES 320136

1.0 GENERAL

1.1 The second generation cabinets were listed as 320136 assemblies. These assemblies are readily identifiable from the third generation 130097 assemblies by the swing-out door on the 320136.

1.2 Numerous cabling variations exist on the 320136 cabinets. It is imperative that the Equipment Specifications be studied carefully due to the numerous cabling variations

2.0 CABINET ASSEMBLIES 320136

2.1 Front views of two typical cabinets are shown in Figs. 9-1 and 9-2

2.2 ITT Dwg 329972 details all strapping patterns for TE-400 320136 assemblies.

2.2.1 EPABX circuit outputs/inputs are located on the punching field. Job strapping is done on the strapping field. See ITT Dwg. 329972

2.3 Refer to Equipment Specifications for further familiarization with 320136 assemblies.

NOTE: Refer to Section XI for interchangeability of PCB's between different cabinet assemblies.

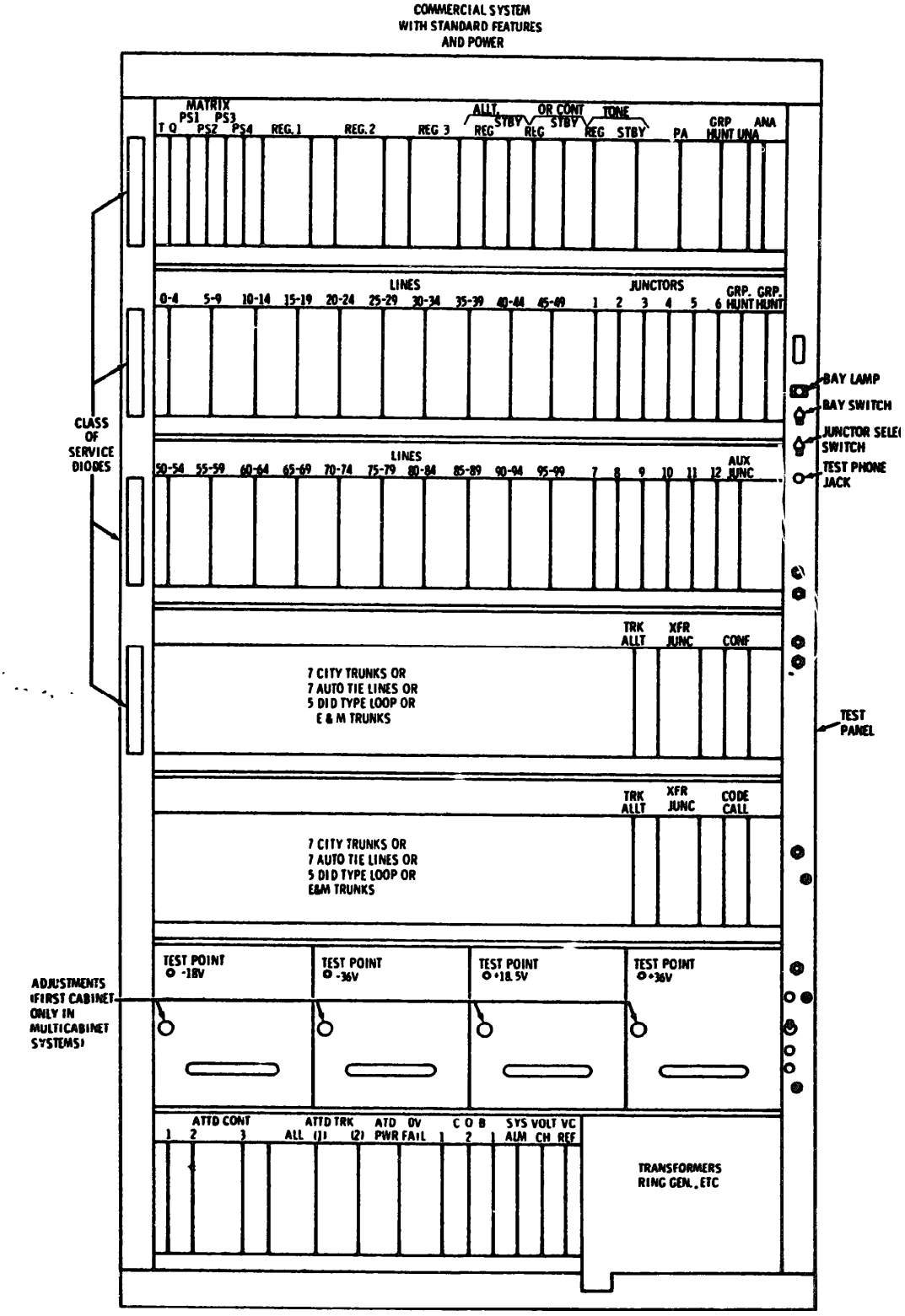


Fig. 9-1. Typical TE-400 320136 Cabinet Assembly

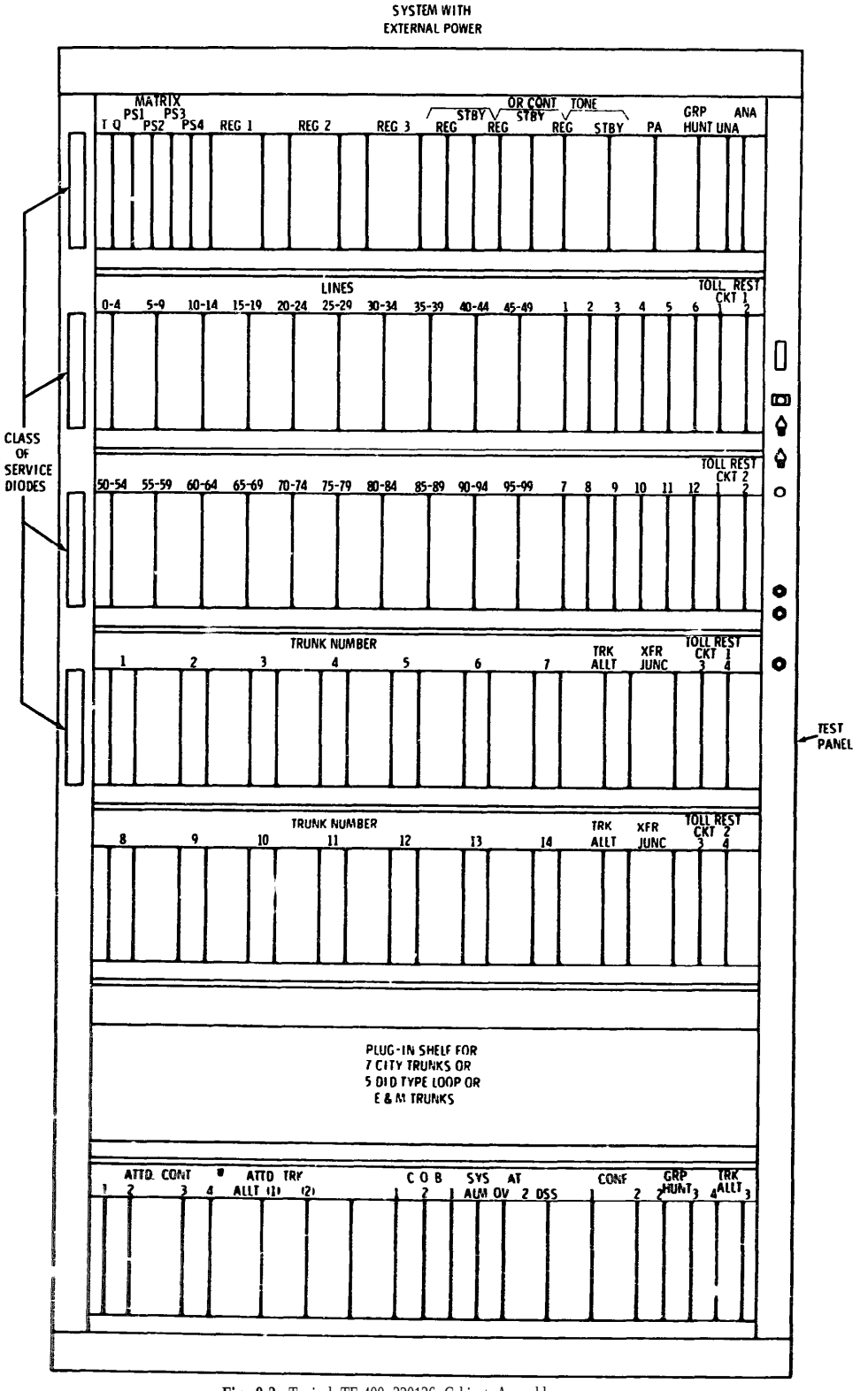


Fig. 9-2. Typical TE-400 320136 Cabinet Assembly

Section X

CONTENTS

CONTENTS (Cont'd.)

TABLES

Section X

PRINTED CIRCUIT BOARD

FUNCTIONAL DESCRIPTION

1.0 GENERAL

1.1 The following number scheme is used on ITT drawings for identification purposes

(a) 31xxxx( )68 - Schematic
(b) 31xxxx( )77 - Narrative
(c) 31xxxx( )122 - Assembly

1.2 An assembly *may* consist of one or more than one PCB.

Example; 316075(4)122 Ground Start City Trunk Assembly
Board 1-316075(11)122
Board 2-316075(15)122

1.3 In addition to the above, the PCB's that an assembly is comprised of may be numbered in such a manner that no direct relationship is recognizable.

Example: 316061(4)122 Loop Start City Trunk
Board 1-85860-1
Board 2-85861-4

1.4 Any PCB of any assembly is composed of two parts - the drill board and the component parts.

Example: 85862 - Drill board for PCB 85860-1 which is part of assembly 316061(4)122

1.5 A higher () number is assigned to an assembly when the assembly is changed or modified. The PCB dash number (85861-4) is advanced also, and the drill board issue number may change.

1.6 The drill board number is etched in the foil.

Example: 85862 - Drill hoard

The issue number will be stamped after the drill toard number.

Example: 85862-2

The 85862-2 is the second drill board issued and replaces issue number 1

1.7 The PCB assembly issue number of any assembly of more than one PCF can change (advance) separately or at the same time The same also applies to drill boards

1.8 Each PCB is stamped with an Issue Number.

Example: PCB 85860-1
ISS. 1R5

1.9 A serial number is also stamped on the PCB to allow activity tracing of the PCB

1.10 The Issue Number bears very little relation to the actual number of different assemblies An Issue Number can change for reasons that have no bearing on circuit operation or function

2.0 INDEX OF ASSEMBLIES

Junctor	316024
Register	316025
Console	316028
Originate Control and Lamp Generator	316029
Camp-On-Busy	316031
Trunk Allotter	316034
Attendant's Control Circuits	316035
Unassigned Night Answer	316036
Tones Supply	316037
System Allotter	316039
Line Circuit	316040
Tertiary Quaternary Matrix	316041
Assigned Night Answer	316042
Class of Service	316043
Group Hunt	316045
Traffic Recording Adapter	316046
Public Address	316047
Code Call	316048
Five Party (Meet Me) Conference	316049
E-M Tie Trunk	316051
Executive Override	316052
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Loop Tie Trunk	316054
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Message Waiting	316057
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Primary-Secondary Matrix	316065
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Conference Trunk Accessing	316077
Line Lockout	316078
Auxiliary Junctor	316079
Message Register Line Applique	316080
Message Register Trunk Applique	316081
Attendant's Multiple Position	316082
Single Digit Line Access	316086
Loop DID Trunk	316089
DID Loop Tie Trunk	316090
DID Loop Tie Trunk	316091
DID Loop Toe Trunk	316092

DID Loop Tie Trunk	316093
E-M Trunk	318094
E-M Tie Trunk	316095
L-M Tie Trunk	316096
Attendant's Trunk No. 2	316099
24VDC Supply	316141
Console Applique	316184
Power Supply	316300
+5VDC Supply and Alarms	316301
Register	316302

3.0 ASSEMBLIES GENERAL DESCRIPTION

3.1 Junctor 316024( )122, ( )68 Dwg., Fig. 1

3.1.1 One PCB is required per circuit. A maximum of twelve may be equipped per 100 line cabinet

3.1.2 The junctor provides supervision and connection of all originating calls. On local calls it provides termination and voice paths. The junctor is released after all successful origination and terminations to feature circuits, and may be reseized immediately. On a failure to terminate, it is held to the originating line to provide busy tone.

3.1.3 One junctor (nominally No. 12) is reserved for the executive line on systems equipped with executive override.

3.1.4 Five outputs (DIW, DIX, DIY, D12, OVJ) are provided for the override circuits.

3.1.5 The seize lamp (green) will turn "on" when a junctor has been seized and is in the process of originating or terminating a call. The lamp will go "out" after the call is terminated or atondoned.

3.2 Registers Assemblies (316025 and 316302)

3.2.1 Two PCB's are required per register circuit. A list of register assemblies (and their associated PCB's) employed by the TE-400 are listed below;

(a) **316025**(1)122 Assy ,( )68 Dwg., Fig. 1, 5
316025(11) - Board 1
316025(12) - Board 2

(b) **316025**(2)122 Assy , ( )68 Dwg., Fig. 1, 3, 5
316025(13) - Board 1
316025(12) - Board 2

(c) **316025**(3)122 Assy,( )68 Dwg., Fig. 1, 3, 5
316025(14) - Board 1
316025(12) - BoaFd 2

(d) **316302(1)122** Assy,( )68 Dwg., Fig. 1
130108-1 - Board 1
130109-1 - Board 2

(e) **316302(2)122 Assy** , ()68 Dwg., Fig. 1, 2
130108-1 - Board 1
130109-1 - Board 2

3.2.2 Digital Store

	Local	Feature	Maximum Lines
316025(1)	3 digit	1 digit	100
316025(2)	2 digit	1 digit	200
316025(3)	3 or 4 digit	1 and/or 2	400
316302(1)	3 or 4 digit	1 and/or 2	*1000
316302(2)**	3 or 4 digit	1 and/or 2	**400

TE-400 has a maximum of 400 lines.
* * 316302(2) has a 2-digit in-dial completion for DID trunks.

3.2.3 Provision is made for insertion of three register circuits (six PCB's) per cabinet.

3.2.3.1 Access - Access to registers is provided via the local junctor circuit for local originating calls, and directly from the dial trunk or tie line on incoming calls. Access is possible to a maximum of five registers from any one junctor, tie line, trunk, or transfer junctor.

3.2.3.2 Dial Tone - Dial tone is extended from the tone supply to the junctor, trunk, or tie line via the register upon seizure. The local junctors are arranged to always extend the dial tone to the originating subscriber. The DID tie trunks are arranged to extend or withhold the dial tone on an optional basis (Section II, Table 2-3). The DID trunks are arranged to always withhold the dial tone.

3.2.4 Typical Numbering Plan, 316302(1)122

Cabinet	Hundreds	Feature Digits
1	2xx	
2	3xx	
3	4xx	
All	---	0 - Operator
All	---	6 - Public Address
All	---	7 - Tie Line
All	---	81 - Features
All	---	9 - City Trunk

3.2.5 A seize lamp (green) will turn "on" when the register is accessed.

3.2.6 Failure of the register will cause a minor alarm to appear on the Attendant's console. The alarm lamp (red) on the register board 2 will also turn "on."

3.3 Consoles(316028)

3.3.1 Two ITT Attendant Consoles are available.

(a) Attendant Console 316028( )122 Assy., ( ) 68 Dwg., Figs. 1 and 2
(b) Attendant Console 316028(2)122 Assy., ( ) 68 Dwg., Figs. 1 and 3

3.3.2 The operation and functions of the consoles are identical with the following exceptions:

(a) 316028(1) employs 24 trunk keys and is equipped with 100-line busy lamp field
(b) 316028(2) employs 42 trunk keys and a busy lamp field is not equipped

3.3.3 The console IS arranged to serve a PABX having up to 42 trunk circuits All functions are performed by push-button operations No circuit operation requires the use of more than a single push button. Lamps and push buttons for each circuit are combined, having the lamp mounted inside a transluscent push-button knob Attendant consoles of 24-trunk capacity are arranged with an integral busy lamp field consisting of 100 line busy lamps However when more than 24 trunks are equipped, additional trunk push buttons are added in place of the busy lamp field and the busy lamp field may be relocated to an adjacent busy lamp field console. This busy lamp console is optional

In addition to one combined push-button lamp for each trunk circuit, the Attendant's turret contains a single 'release" bar to be used for releasing the Attendant from any circuit, a single 'hold' bar used for putting any circuit in a hold condition, a buzzer cut-off button, a ten-key keyset for completing incoming trunk calls, attendant override, or placing a call into conference by key sending, an error button, and a turn key used for night answering services.

In addition to the above mentioned equipment, the console is equipped with a standard instrument dial of the K-500 type. with lucite finger wheel, for completing outgoing city trunk calls, and calls within the EPABX utilizing the Attendant line The console is equipped with jacks at both ends for the optional use of a headset or a handset.

The dimensions of the Attendant console are approximately 24" wide, 12" deep and 5" high The top forms a gently sloping surface on which all buttons, keys, dials, etc., are mounted.

The console is equipped with a flexible cable terminated at one end inside the Attendant console and at the other end with a connector. This cable is arranged to be connected by the type of cable normally used in key systems for the interconnection to the EPABX cabinet.

3.4 Originate Control and Lamp Generator Assemblies (316029)

3.4.1 316029(1)122 Assy., ( ) 68 Dwg . Figs 1 and 2

3.4.1.1 One PCB is required per circuit Two PCB's (regular and standby) are equipped in the first cabinet of all systems

3.4.1.2 The lamp generator (Fig 1) provides lamp supervisory signals of 120 ipm, 30 ipm, and "wink" (0.9 second off, 0.1 second on)

The maximum load is:

42 trunks (with console appearance)
4 attendant trunks
2 attendant control circuits

3.4.1.3 The Originate Control (Fig. 2) provides an originate control pulse (OH) to the lines for origination control.

3.4.2 Originate Control 316029(2) Assy., ( )68 Dwg, Fig. 2

3.4.2.1 One PCB is required per circuit. The 316029(2) IS identical to the 316029(1) except that the lamp generator (Fig. 1) is not equipped

3.4.2.2 The 316029(2) will be equipped, two per bay, in all bays except Bay 1, unless the system requirement exceeds the capacity of the 316029(1)

3.4.2.3 Both the 316029(1) and (2) are equipped as a regular and a standby, and if the regular should fall, transfer to the standby is automatic If either the regular or standby fall, a minor alarm will occur A failure of both will generate a major alarm

3.5 Camp-ON-Busy 316031(2)122 Assy.,() 68 Dwg., Figs. 1 and 2

3.5.1 Three PCB's are required per two circuits

(a) 316031(11)122- Boards 1 and 3
(b) 316031(12)122 - Board 2

3.5.2 One set may be equipped per each attendant control circuit.

3.5.3 The COB furnishes the Attendant with the ability to place an incoming trunk call in ramp-on" to a busy extension The extension will ring within 5 (±2) seconds, once the extension IS idle

3.5.4 Two circuits are provided per assembly The COB lamp button will light (at Attendant's console) when both circuits are busy.

3.5.5 Refer to Section II. Table 2-3. for trunks capable of accessing this feature

3.5.6 Failure of either circuit will result an a minor alarm

3.6 Trunk Allotter Assemblies (316034)

3.6.1 Trunk Allotter 316034(1)122 Assy., ()68 Dwg., Fig 2

3.6.1.1 One PCB is required per circuit

3.6.1.2 One circuit is required for each trunk group that is to be accessed directly by the subscriber

3.6.1.3 Capacity - Each trunk allotter has a capacity of four allott groups with a total of seven trunks in each group for a sum total allotter capacity of 28 trunks. A trunk allotter is required for each access code that represents multiple matrix appearances of individual circuits, i.e., trunks, tie lines, dictation trunks, etc

3.6.1.4 Operation - The trunk allotter assures the sequential selection and seizure of trunks within a trunk group by progressively advancing the trunk selection from one allott group to the next group each time a trunk is seized.

3.6.1.5 Class of Service - The trunk allotter recognizes the presence or absence of a class of service indication from the line circuit as having or not having the privilege of accessing the trunk.

3.6.1.6 Allott Group Busy - In the event that all trunks within the selected allott group are busy, the trunk allotter will allott a trunk at random from all allott groups

3.6.2 Trunk Allotter 316034(2)122 Assy., ( ) 68 Dwg., **Fig** 2

3.6.2.1 The 316034(2) is identical to the 316034(1) except that:

(a) The 316034(2) has outputs for shop wiring to enable the class of service PCB to require or not require a class of service **diode to be** Installed for station restriction.

3.7 Attendant's Control 316035(1)122 Assy., ()68 Dwg., Figs. 3,4,5,6,7, and 8.

3.7.1 One circuit consists of four PCB's:

(a) **316035(11)122 - Board 1**
(b) **316035(12)122 - Board 2**
(c) **316035(13)122 - Board 3**
(d) **316035(14)122 - Board 4**

3.7.2 One circuit is required **per attendant** console.

3.7.3 Failure of the attendant's **control** circuit will provide a minor **alarm**

3.7.4 **Functions**

(a) Enables the attendant console position to access any trunk, local extension, or attendant's trunk.

(b) Enables the attendant to transfer an extension from attendant's trunk to an outgoing trunk or conference.

(c) Provides control of the lamps on the attendant's console to indicate the condition of the trunks and attendant's trunks.

(d) Provides for sounding the buzzer to gain the attendant's attention when needed

(e) Enables the attendant to extend call from a trunk to an extension

3.8 Unassigned Night Answer Assemblies (316036)

3.8.1 Unassigned Night Answer 316036(1)122 Assy , ( ) 68 Dwg , Figs. 1 and 2

3.8.1.1 One PCB is required per circuit. Each can provide UNA service for a maximum of seven city trunks

3.8.2 Unassigned Night Answer 316036(2)122 Assy , ( ) 68 Dwg , Figs 1 and 2.

3.8.2.1 One PCB is required per circuit. Each can provide UNA service for a maximum of 14 city trunks.

3.8.3 Unassigned Night Answer 316036(4) and (5), 122 Assy., ( ) 68 Dwg., Fig. 2

3.8.3.1 The 316036(4) extends the 316036(1) by seven trunks and shares common control equipment with the 316036(1).

3.8.3.2 The 316036(5) extends the 316036(2) by 14 trunks and shares common control with the 316036(2).

3.8.4 Unassigned Night Answer 316036(6)122 Assy., ( ) 68 Dwg., Figs. 1, 2, and 3

3.8.4.1 One PCB is required per circuit. Each circuit can furnish UNA service for six city trunks.

3.8.5 Unassigned Night Answer 316036(7)122 Assy. ( ) 68 Dwg., Fig. 1

3.8.5.1 The 316036(7) is identical to the 316036(6) except it services an additional six trunks and uses common control equipment located on the 316036(7).

3.8.6 Operation

3.8.6.1 The UNA circuits provide output(s) enabling audible/visual signaling (from a satellite device) of the presence of an incoming trunk call when the turret is unattended and the console UNA key is operated in the UNA position.

The call may be answered from any extension by dialing the UNA access digit(s) and, if equipped, the call can be transferred to another extension by dialing the digit 1. The system must be equipped with a transfer junctor 316076 assembly to make it possible to transfer a call from an extension.

3.9 Tone Supply 316037(1) 122 Assy., ( ) 68 Dwg., Figs. 1 and 2

3.9.1 One PCB is required per circuit.

3.9.2 The Tone Supply circuit provides:

(a) 600 Hz dial tone (DT)
(b) **600** Hz 0 5 second on/O 6 second **off busy tone (BT)**
(c) 600 Hz modulated at 12 ips interrupted at a rate of **1.0 second on/3 0 seconds off ring tone (RT)**
(d) **RG1,** 2, 3, and 4 to the ring generator for start/stop of ring generator voltage

3.9.3 **The amplitude** and frequency of the **dial tone are controlled by** potentiometers. **See Fig. 5-1 of Section V**

3.9.4 **Dial tone (DT), ring tone (RT),** and **busy tone (BT) circuits are fused by 0.5 amp, 8AG fuses located** on the front of the PCB

3.9.5 **One regular and one standby circuit are equipped per system. Transfer from regular to standby is automatic in case of failure of the regular. If either regular or standby fails, a minor alarm will result. If both fail, a major alarm will be generated. The alarm lamp (red) located on the PCB will turn "on."**

3.10 System Allotter Assemblies (316039)

3.10.1 System Allotter 316039( )122 AD **( )68** Dwg., Figs. 1 and 2

3.10.1.1 One PCB is rewired per circuit.

3.10.2 System Allotter 316039(2)122 Assy , **( )68 Dwg.. Fig- 2.**

3.10.2.1 One PCB is required per circuit

3.10.2.2 **The 316039(2) is equipped with a 12-stage ring counter. It will normally be equipped in Bay 2 of systems requiring a total regular interval time (RIT) count of 32 or less.**

NOTE: The 316039(2) is available on the 130097 assembly at special engineering only.

3.10.3 **System Allotter 316039(3)122 Assy., ( ) 68 Dwg., Fig. 2**

3.10.3.1 **One PCB is required per circuit.**

3.10.3.2 **The 316039(3) is equipped with a 20-stage ring counter. It will normally be equipped in Bays 2, 3, or 4 in systems requiring a total RIT count of 40, 60, 80, or less.**

3.10.4 **System Allotter 316039(1) Operation**

3.10.4.1 **The allotter supplies an RIT output for each cycle of DT input. The RIT pulses are used for system timing. Each RIT is 1.6 millisecond duration. A regular enable (REN) output enables all circuits requiring an RIT input (SIT-SEN for standby allotter). The 316039(1) provides 20 RIT time slots.**

3.10.4.2 **In addition, the assigned register time slot will be extended to 3.2 milliseconds when terminating to a feature** This extended time slot permits completion of four operations - drop-junctor **(DJ),** trap, termination, and drop-back-to-junctor (DBJ) in the event of a failure to terminate

3.10.4.3 One regular and one standby are equipped in the first cabinet of all systems Transfer from regular to standby, in the case of failure, will be automatic A minor alarm will be generated if either fails **A** major alarm will **be** generated if both fall

3.10.4.4 The alarm lamp (red) located on the front of the PCB will turn "on" in the event of a failure

3.10.4.5 The trap lamp will turn 'on" if the trap circuit becomes permanently marked This is a failure.

3.10.5 System Allotters 316039(2) **and 316039(3)** Operation

3.10.5.1 Both the **316039(2)** and (3) are equipped with regular and **standby**

3.10.5.2 Failure of the 316039(2) or (3) allotters will generate alarms/ transfers **as the 316036(1). See paragraph 3.10.4.**

3.11 Line Circuit 316040(1)122 and 316042(2)122 Assemblies, ()68 Dwg., Figs. 1, 2, and 33.

3.11.1 One PCB IS required for five line carcuits

3.11.2 The 316040(1) mounts inn odd line positions The 31604012) mounts in even positions

3.11.3 The lane circuit provides a trasition from the subscribers balanced loop to the unbalanced (single path) EPABX switching system

3.11.4 The line circuit recognizes supervisory signals (ringing. on-hook, off-hook), and provides a transmission path, busy lamp field (BLF) output. and lamp busy output

3.12 Tertiary Quaternary (TQ) Matrix 316041(6)122 Assy., ( )68 Dwg., Figs. 1,2, and 3.

3.12.1 Tertiary Quaternary **(TQ) Matrix** 316041(6)122 Assy _ ( ) **68** Dwg., Figs, 1,2 and 3

3.12.1.1 The TQ **matrix has 41 quaternary horizontal (QH) outlets Each outlet** as connected to the VT (voice terminate) circuit. **Each QH outlet is connected to the cathode of five quaternary diodes Each QH diode anode is connected to the cathode of five tertiary horizontal (TH) diodes Twenty-five TH inlets are provided to the system strapping field for system grading to the 25 secondary horizontal (SH) outlets from the P-S matrix**

6.12.1.2 Any terminated call will be connected via the VT circuit, QH diode, TH diode, SH diode, and PH diodes.

3.12.1.3 Grading connection is covered in the ITT Dwg. 329972.

3.12.2 Tertiary Quaternary (TQ) Matrix 316041(7) Assy., ( )88 Dwg., Fig. 2

3.12.2.1 One PCB is required per circuit One circuit is equipped per cabinet.

3.12.2.2 Provision is made for the Insertion of one teritary/quaternary PC board. The TQ matrix has 40 quaternary horizontal (QH) outlets. Each QH outlet is connected to a VT (voice terminate) circuit on a one to one basis. Each outlet (QH) is connected to the cathode of five quaternary diodes. Each anode of a QH diode is connected to the cathode of five tertiary horizontal (TH) diodes. Twenty-five TH inlets are provided to the system grading terminal for grading connectings to the 25 SH outlets from the P-S matrix.

3.12.2.3 The TQ matrix IS controlled, in that, upon termination attempt, the associated TH and QH horizontal/vertical cross-connects are applied bias voltage. This decreases fan-out and insures firing of the devices.

3.12.2.4 Any terminated call will be connected via the VT circuit, QH diode, TH diode, SH diode, and PH diode.

3.12.2.5 Failure of the 316041(7) will generate a minor alarm

3.12.2.6 Grading connections are covered in ITT Dwg 130117

3.13 Assigned Night Answer 31 6042(1) Assy., ()68 Dwg., Figs. 1 and 2.

3.13.1 One PCB is required per circuit

3.13.2 One ANA PCB is equipped to allow direct station ringing from a trunk for an incoming call when the console is unattended.

3.13.3 Each PCB can service six trunks.

3.13.4 The maximum number of ANA circuits that can be assigned is equal to the number of junctors equipped.

3.14 Class of Service 316043(2)122 and (3) 122 Assemblies, ( )68 Dwg.

3.14.1 Both assemblies require one PCB for each circuit. Each circuit can accommodate fifty lines.

3.14.2 Restriction of five (maximum) features is accomplished by equipping or not equipping a diode.

3.14.3 On TE-400 320136 assemblies the class of service panel is located on the left front Restriction is accomplished as described in paragraph 3.14.2

3.15 Group Hunt 316054(1)122,( )68 Dwg. Figs. 1 and 2.

3.15.1 One PCB is required for two circuits

3.15.2 Each circuit has one master line (directory number) assignment and four slave line assignments. Hunting is sequential. The fourth slave may be assigned to 25 lines. Hunting will then be sequential over the first three slave lines and random hunting for the 25 lines assigned to the fourth slave.

3.15.3 Three PCB's may be equipped in each bay (130097 assemblies only).

3.15.4 On TE-400 320136 assemblies, the number of equipped 316045(1) PCB's may be determined via the Equipment Specifications

3.16 Traffic Recorder Adapter Assemblies (3160461

3.16.1 Traffic Recorder Adapter 316046(1)122 Assy., ( )68 Dwg., Figs. 2A, B, C, D and E.

3.16.1.1 One PCB is required for each circuit Each circuit can furnish traffic information from three transfer junctors, ten lines, three, registers, and two attendant control circuits.

3.16.2 Traffic Recorder Adapter 316046(2)122, ( )68 Dwg., Figs. C, D, and F.

3.16.2.1 One PCB is required for each circuit Each circuit can provide traffic information from 12 junctors.

3.16.3 Traffic Recorder Adapter 316046(3)122 Assy., Figs. 1, A, C, and E

3.16.3.1 One PCB is required for each circuit. Each circuit can furnish traffic information from 12 trunks.

3.17 Public Address 316047(1)122 Assy., ( )68 Dwg., Fig. 1

3.17.1 One PCB is required for each circuit.

3.17.2 One circuit provides access for non-restricted lines to an external public address system.

3.17.3 The output impedance is 300 or 600 ohms. An additional output (dry contact closure) is furnished for control of external equipment.

3.18 Code Call 316048(1) and 316048(2)122 Assy., ( )68 Dwg., Figs. 1 and 2.

3.18.1 Two PCB's are required for one cir-

3.18.2 **Non-restricted** lines **may access the code call by dialing d feature digit(s). By dialing one of 125 possible three-digit codes, audible signaling will be provided. The party signaled may answer the call by dialing a feature digit(s)**

3.19 **Five Party "Meet Me" Conference 316049 ()122 Assy.,( )168 Dwg., Figs. 1 and 2.**

3.19.1 **Two PCB's are required per circuit.**

3.19.2 **A maximum of five parties may dial the access code(s) and meet for a conference**

3.19.3 **The Attendant does not have** access **to the conference.**

3.20 **E&M Tie Trunk 316051( )122**

3.20.1 Refer to **Table 2-3, Section Il.**

3.20.2 See paragraph 17.0 of Section XII.

3.21 **Executive Override Assemblies (316052)**

3.21.1 **Executive Override** 316052(1)122 **Assy . ( )** 68 Dwg., **Figs.** 1 and 2

3.21.1.1 **One PCB is required per circuit.**

3.21.1.2 **The executive override permits the executive line to override busy extensions by dialing a feature digit(s) after receipt of busy tone. The override is announced by a short burst of dial tone. Three-way conversation is then possible.**

3.21.1.3 **Use of the 316052 requires one junctor (nominally No 12) to be dedicated to executive override.**

3.21.1.4 **The 316052(1) may override:**

(a) **12 junctors, 12 trunks/tie lines**
(b) **10 junctors, 14 trunks/tie lines**

3.21.2 **Executive Override 316052(2)122 Assy . ( ) 68 Dwg., Fig 2**

3.21.2.1 **Executive override 316052(2) employs the control circuit on the 316052(1) and is used to expand the number of junctors and trunks/tie lines that may be overridden by 12-12 or**

3.22 **Power Supply Assemblies (316053 and 316308)**

3.22.1 **The EPABX power supply is divided into four modules; the +18 volt supply, +18.5 volt supply, -36 volt and -3 volt supply, and the +36 volt and -3 volt supply**

3.22.2 **The operation of each supply is identical. They differ in two respects; the amount of current that** each IS rated to supply, and the output voltage and **polarity.**

3.22.3 The AC line voltage is stepped down to the prescribed full-wave bridge input **voltage and** is full-wave rectified. This rectified voltage is then filtered. After filtering, the voltage is fed to a regulator circuit which maintains a constant voltage at the output of the supply to within a **±5% tolerance from 0 to 100%** rated load over the prescribed temperature range.

3.22.4 The supply is resistive **against a short** circuit by means of cur**rent limiting** diodes.

3.22.5 The **AC** line vol**tage is stepped down to** 23-26 volts (rm**s) for the 18-volt potentials and 42-45** volts (rms) **for the 36-volt potentials.**

This secondary voltage is full-wave rectified through a bridge rectifier circuit, and the negative output of the bridge is connected to the collectors of the power transistors.

The -3 volt and +3 volt potentials are derived from the -36 volt and +36 volt modules.

3.22.6 **Table 10-1 lists the Power Supply Assemblies, Outputs, and Locations.**

3.22.7 **In multibay operation, only those supplies in Bay 1 have the control circuitry equipped. This control circuitry (see Section XII, paragraph 7.0) is connected to the supplies in succeeding bays to provide regulation control.**

3.22.8 **In multibay operation for TE-400 assemblies 320136 and 130097, a strap must be removed from the bay 1 supplies. See Section XI**

3.23 **Loop Tie Trunk 316054(1)122 and 316024(4)122 Assemblies — Refer to Table 2-3, Section II.**

3.23.1 **Two PCB's are required for one circuit**

3.23.2 **The 316054(1) has resistors MR5, 6, and 7 mounted on board 2 of the assembly**

3.23.3 **The 316054(4) has resistors mounted on TE-400 assembly (130097) punching field (PF) assembly**

NOTE: See Section XII, paragraph 16.0

3.24 **Loop DID Trunk 316056(1)122 and 316056(4)122 Assemblies — Refer to Table 2-3 of Section II.**

3.24.1 **Three PCB's are required for one circuit**

3.24.2 **The 316056(1) has resistors MR5, 6, and 7 mounted on board 2 of the assembly**

Table 10-1
Power Supply Assemblies- Outputs and Locations

Power Supply Assembly	Output Voltages	Cabinet Assembly	Bay(s)
316053(1)122	-18VDC	320136 (internal)	1
316053(2)122	-36VDC	320136 (internal)	1
316053(3)122	+18.5VDC	320136 (internal)	1
316053(4)122	+36VDC	320136 (internal)	1
316053(5)122	-18VDC	320136 (internal)	2, 3, or 4
316053(6)122	-36VDC	320136 (internal)	2, 3, or 4
316053(7)122	+18.5VDC	320136 (internal)	2, 3, or 4
316053(8)122	+36VDC	320136 (internal)	2, 3, or 4
316053(9)122	-18VDC	85924 (auxiliary cabinet)	1
316053(10)122	-36VDC	85924 (auxiliary cabinet)	1
316053(11)122	+18.5VDC	85924 (auxiliary cabinet)	1
316053(12)122	+36VDC	85924 (auxiliary cabinet)	1
316053(13)122	-18VDC	85924 (auxiliary cabinet)	2, 3, or 4
316053(14)122	-36VDC	85924 (auxiliary cabinet)	2, 3, or 4
316053(15)122	+18.5VDC	85924 (auxiliary cabinet)	2, 3, or 4
316053(16)122	+36VDC	85924 (auxiliary cabinet)	2, 3, or 4
316300(1)122	-18VDC	130097	1
316300(2)122	+18.5VDC	130097	1
316300(3)122	-36, -3VDC	130097	1
316300(4)122	+36, +3VDC	130097	1
316300(5)122	-18VDC	130097	2, 3, or 4
316300(6)122	+18.5VDC	130097	2, 3, or 4
316300(7)122	-36VDC, -3VDC	130097	2, 3, or 4
316300(8)122	+36VDC, +3VDC	130097	2, 3, or 4

3.24.3 The 316056(4) has resistors MR5. 6, and 7 mounted on the TE-400 assembly 130097 PF assembly.

NOTE: See Section XII, paragraph 16.0

3.25 Message Waiting 316057(1)122 and 316057(2)122 Assemblies, ( )68 Dwg., Figs 1 and 2.

3.25.1 One PCB is required for ten circuits

3.25.2 The 316057 supplies a "message waiting" signal to a station. The "message waiting" visual signal is a flashing lamp on the station instrument.

3.25.3 The 316057(2) expands the message waiting capacity by ten lines per equipped PCB

3.26 Loop Tie Line 316060(1)122 and 316060(4)122 Assemblies – Refer to Table 2-3 of Section II.

3.26.1 One PCB is required per circuit

3.26.2 The 316060(1) has resistors MR5, 6, and 7 mounted on the PCB.

3.26.3 The 316060(4) has the resistors mounted externally

NOTE. See Section XII, paragraph 17.0

3.27 Loop Start City Trunk 316061(1)122 and 316061(4)122 Assemblies – Refer to Table 2-3 of Section II

3.27.1 Two PCB's are required for each circuit

3.27.2 The 316061(1) is composed of:

(316060 Board 1
(316061 Board 2 (Resistor 1MΩ mounted on Board 2)

3.27.3 The 316061(4) is composed of:

(316060 - Board 1
(316061 - Board 2

3.27-3.1 (Resistor 1MΩ is mounted externally on cabinet punching field)

NOTE. See Section XII paragraph 17.0

3.28 Attendant Override Assemblies (316062)

3.28.1 Attendant Override 316062(1)122 Assy, ( )68 Dwg Figs 1, 2, and 3

3.28.1.1 One PCB is required per circuit. One circuit is required for override

3.28.1.2 The 316062 is accessed from the Attendant's console via the attendant control and trunk 2 circuits The Attendant must key punch the desired number. A short burst of dial tone will announce the override.

3.28.1.3 Also equipped is the attendant's alarm reset and automatic reset. The automatic alarm reset extinguishes all alarms if AC power or DC power is cycled off/on by supplying a reset pulse to all circuits with an alarm output.

3.28.1.4 The power failure cut-through relay is equipped on this PCB. See Section II,)

3.28.2 Attendant Override 316062(2)122 Assy, ( ) 68 Dwg, Fig. 1

3.28.2.1 The 316062(2) is used to extend the number of circuits that can be overridden by:

(a) 12 junctors and 12 trunks, or
(b) 10 junctors and 14 trunks

3.28.2.2 The 316062(2) is partially equipped utilizing common circuitry on the 316062(1)

3.28.3 The 316062(1) and (2) assemblies may be equipped in cabinets 1 and 2. The 316062(1) will be equipped in cabinet 2 only when the multiple attendant's position is equipped

3.28.4 Attendant Override 316062(3) and (4) Assemblies

3.28.4.1 The 316062(3) is identical to the (1) Assembly and the 316062(4) is identical to the (2) Assembly, except:

(a) Power failure cut-through relay is not equipped
(b) Matrix control test alarm is equipped

NOTE: See Section XI

3.29 Intercept Assemblies (316063)

3.29.1 Intercept 316063(1)122 Assy, ( )68 Dwg Figs 1 and 2

3.29.1.1 One PCB is required per circuit

3.29.1.2 One circuit is required for first five DID trunks to be intercepted

3.29.2 Intercept 316063(2)122 Assy ( )68 Dwg Fig 2

3.29.2.1 The 316063(2) is used in conjunction with the 316063(1) for each additional five trunks to be intercepted

3.29.3 Intercept 316063(4)122 Assy ( )68 Dwg Figs 1, 2, and 3

3.29.3.1 one PCB is required per circuit aid one circuit is required for first six DID trunks to be intercepted.

3.29.4 Intercept 316063(5)122 Assy.,( ) Dwg., Fig. 2

3.29.4.1 The 316063(5) is used with the 316035(4) for each additional six trunks to be intercepted.

3.29.5 The 316063 Intercept circuit permits the routing of DID calls directed to vacant feature codes and unassigned or unequipped telephone numbers, to either a recorded announcement or to the console attendant.

3.30 Primary-Secondary Matrix Assemblies (316065)

3.30.1 The primary-secondary (P-S) matrix assemblies are listed below.

(a) 316065(3)122 Assy., ( ) 68 Dwg., Fig. 1
(b) 316065(5)122 Assy., ( ) 68 Dwg., Fig. 1
(c) 316065(7)122 Assy., ( ) 68 Dwg., Figs. 1 and Y
(d) 316065(8)122 Assy., ( ) 68 Dwg., Figs. 1 and Y

3.30.2 The operation of all P-S matrix assemblies used is identical.

3.30.3 Operation

Each board provides a primary matrix consisting of 25 primary horizontal PH inlets. Each PH inlet (line-up appearances) is connected to the anode of five primary diodes. Each primary diode's cathode is connected to the anode of five secondary horizontal (SH) diodes, for a total of 25 SH outlets.

In a single cabinet with four PCB's, a total of 100 PH inlets and SH outlets is available. These SH outlets are pregraded to provide 15 outlets for local junctor originating points, and 25 for connecting to the tertiary quaternary matrix for terminating connections and system grading.

System grading provides proper cross connections. These PNPN diodes provide transmission paths.

3.31 Toll Restriction Assemblies(316067)

3.31.1 Toll Restriction is made up of the following PCB's:

(a) Monitor Board 1 316067(11)122 Assy., Fig. 1
(b) Monitor Board 2 316067(12)122 Assy., Figs. 1, 2, and 4
(c) Monitor Board 2 316067(13)122 Assy., Figs. 1 and 4
(d) Monitor Board 2 316067(14)122 Assy., Fig. 4
(e) Access Board 1 316067(13)122 Assy.
(f) Access Board 2 316067(14)122 Assy.
(g) Access Board 2 316067(31)122 Assy.

8.31.2 The toll restriction circuit interfaces with the trunk to detect dialed digits. It may be strapped to reject or pass digits.

3.31.3 AN individual station may be restricted from the toll restriction cult.

3.31.4 The (11) and (12) assemblies check class of service and store digits for detection. The (12) assembly may be programmed to pass or reject a maximum of ten 1, 2, or 3 digit codes. Codes may not be mixed.

3.31.5 The (16) assembly extends the maximum codes by ten each.

3.31.6 The (15) assembly is the (11) assembly without the class of service. A (15) assembly would be used in conjunction with an (11) assembly, (i.e., second, third, fourth, or fifth circuits).

3.31.7 The (13) assembly is used to access four trunks.

3.31.8 The (14) assembly is used to access three trunks.

3.31.9 The (31) assembly is used to access three trunks.

3.31.10 The first circuit of a system with nine trunks could be:

316067(11)122
316067(13)122
316067(31)122
316067(31)122
316067(31)122

The second circuit:

316067(11)122
316067(13)122

The third circuit:

316067(11)122
316067(13)122

3.31.11 Operation

As a station accesses the trunk, the (31) assembly will pass the digits to the (11) and (13) assemblies of the circuit accessed. This access is random, in that a four-layer diode on the board will fire and select one of the three idle circuits.

If all circuits are busy, the station will be rejected and busy tone passed to the subscriber.

If the circuits are free and the called number is not restricted, the call will proceed as normal.

If the called number is restricted, busy tone will be passed to the subscriber and the called dropped.

3.32 System Main Alarm Assemblies (316068)

3.32.1 System Main Alarm 316068(1)122 Assy., ( ) 68 Dwg., Figs. 1 and 2

3.32.1.1 One PCB is required per circuit.

3.32.1.2 The system main alarm provides a major or minor alarm indication to the attendant's console and equipment cabinet alarm lamps on receipt of logic inputs from the system.

3.32.1.3 A ground is supplied to the PFCT resistor (located on TE bus, 320126 assemblies without external power cabinet), when a major alarm is encountered.

3.32.2 System Main Alarm 316068(2)122 Assy., ( ) 68 Dwg., Figs. 1, 2, and 4

3.32.2.1 Refer to paragraphs 3.32.1.1 and 3.32.1.2.

3.32.2.2 The 316068(2) does not provide an output to PFCT.

3.32.2.3 Fig. 4 of ( ) 68 Dwg. applies if 316068(1) is required.

3.32.2.4 The 316068(2) provides four outputs to external circuits:

(a) two to console
(b) two to the cabinet alarm lamps

3.32.2.5 The 316068(2) provides a minor alarm in the event of a failure of the +5VDC or 48VDC supplies.

NOTE: An option is available to convert the +5VDC alarm from a minor to major alarm.

3.33 Main Alarm Voltage Check Assemblies(316069)

3.33.1 Main Alarm Voltage Check 316069(1) 122 Assy., ( ) 68 Dwg., Fig. 1

3.33.1.1 One PCB is required for each circuit and one circuit is required per system.

3.33.1.2 The 316069 compares the DC outputs of the power supplies and the 316070 voltage check card and,

(a) provides a ground output on the ADS lead if the supplies do not vary greater than ±5%.
(b) removes the ground from the ADS lead if the variation exceeds ±5%. This results in removal of DC power from the system by dropping the power relay (PR).

3.33.2 Main Alarm Voltage Check 316069(2) 122 Assy., ( ) 68 Dwg., Fig. 1

3.33.2.1 Refer to paragraph 3.33.1.2.

3.33.2.2 The 316069(2) is used on the 130097 cabinet assemblies only.

3.34 Voltage Check Reference Supply Assemblies(316070)

3.34.1 Voltage Check Reference Supply 316070(1)122 Assy., ( ) 68 Dwg., Figs. 1, 2, and 3

3.34.1.1 One PCB is required per circuit. One circuit is required per system.

3.34.1.2 The 316070 provides -18, +18.5, -36, +36, -56, +56 VDC to the 316069 main alarm voltage check circuit for comparison with the system power supplies outputs. A reset output is also applied to the 316069 when the comparison of these voltages are within ±10%.

3.34.2 Voltage Check Reference Supply 316070(2)122 Assy., ( ) 68 Dwg., Figs. 1 and 2

3.34.2.1 Operation of the 316070(2) is the same as the operation of the 316070(1) except DC output (Fig. 3) is deleted.

3.35 Attendant's Trunk and Allotter 316079(1)122 Assy., ( )68 Dwg., Figs. 1 and 2.

3.35.1 One circuit per PCB. One PCB per attendant control

3.35.2 The trunk allotter allows rotation of attendant trunk calls between trunks 1 and 2.

3.35.3 The attendant's trunk allows an extension to dial the attendant. The attendant may service the trunk call by:

(a) Supplying information.
(b) Transferring the extension to an idle city trunk.
(c) Requesting the extension to hang up and dial an outside number for the extension.
(d) Transfer the extension into a conference (if equipped).

3.35.4 Failure of the trunk will cause a minor alarm.

3.36 Attendant's Trunk No.2, 316074(1)122 Assy., ( )68 Dwg., Fig. 1.

3.34.1 The 316074 will function the same as the 316079 assembly except it cannot provide access to the conference circuit. See paragraph 3.54

3.37 Ground Start City Trunk Assemblies (316075)

3.37.1 Ground Start City Trunk 316075(1)122 Assy

3.37.1.1 The 316075(1)132 assembly consists Of:

(a) 316075(11)123 - Board 1
(b) 316075(12)122 - Board 2

3.37.2 **Ground Start City Trunk 316075(4)122 Assy,**

3.37.2.1 The 316075(4) consists Of:

(a) 316075(11)122 - Board 1
(b) 316075(14)122 - Board **2**

3.37.3 The 316075(1) has TR2 mounted internally on the 316075(12) assembly.

3.37.4 The 316075(4) has TR2 removed from 316075(14) assembly and TR2 mounts on the punching field.

NOTE: See Section XII, paragraphs 15.0 and 16.0

3.38 Transfer Junctor 316076(1)122 Assy., ()68 Dwg., Fig. 1.

3.38.1 **Two PCB's are required for each circurt.**

(a) 316076(11)122 - Board 1
(b) 316076(12)122 - Board 2

3.38-2 One circuit may be equipped for each **trunk sub-rack. See Table 2-3 of Section II to determine** what trunks may access the transfer junctor.

NOTE: See Section XII, paragraphs 15.0 and 16.0

3.38.3 Operation

Any city or **DID** trunk call, whether incoming or outgoing, may be transferred from one extension or may be held while the PABX extension calls **another** extension for consultation. For this operation, the party on the **PABX** extension dials digit one. This causes the trunk circuit **to be** placed **in a hold condition and connects the extension to** a **register circuit** The extension party receives dial tone and places a call to another **extension in a** normal manner. After **talking** to **the other** extension, either party may be connected to the trunk, depending upon which extension goes "on **hook." Prior to either party going 'on hook" to effect transfer, the** dialing of a digit 2 by the origi **nal PABX extension** will connect the city party, for **ming a three-party** conference.

3.39 Conference Trunk Accessing 316077(1)122 Assy., ()68 Dwg., Figs. 1 and 2.

3.39.1 Two PCB's are required per circuit.

(a) 858854-1- Board 1
(b) 858855-1- Board 2

3.39.2 **Strapping option permits:**

(a) Any unrestricted station to inter the conference by dialing the access **code** and/or the attendant to place the station **into the conference.**

(b) Only the attendant to place a station into the conference.

3.39.3 **The conference circuit may be provided by inserting the two associated PC boards.**

3.39.3.1 The basic conference circuit (316049) permits a maximum of five local stations to dial the assigned access code on a prearranged basis, thus establishing a "meet-me" type of conference. This circuit may be modified to provide access to the conference from the primary (line) side of the matrix, thus **permitting the addition of a conferee located in a distant office (316077).**

3.39.3.2 Attendant access to the 316077 confer' **ence circuit is accomplished via a conference key located on the console.**

3.40 line Lockout 316078(1)122 Assy., ()68 Dwg., Fig. 1.

3.40.1 One PCB is required for SIX circuits.

3.40.2 A **station permanently "off hook" for** any reason will be seized by a lockout **circuit when the register times-out and an associated permanent** signal lamp IS caused to light. Busy tone will be passed **to the station. The station will release from lockout when the "on hook" condition is receive*.**

3.41 Auxiliary Junctor 316079(1)122 Assy.. ()68 Dwg., Figs. 1 and 2.

3.41.1 One PCB is required per circuit.

3.41.2 The auxiliary junctor reserves one junctor for feature calls. If N of N + 1 junctors **are busy, then any attempt to call local-to-local** will result in busy tone.

3.42 Message Register Line Applique 316080(1)122 Assy., ()68 Dwg., Fig. 1.

3.42.1 One **PCB** is required for **20 circuits.**

3.42.2 This circuit in conjunction with the trunk applique circuit provides a 'peg **count" output whenever a city call** is completed from **a station. See paragraph 3.43.**

3.43 **Message Register Trunk Applique Assemblies(316081)**

3.43.1 **The 316081 in conjunction with** the **line applique circuit (316080)** provides **a "peg count" output whenever a city call is** completed.

3.43.2 The 316081(1), (2), (3), and (5) assemblies provide service for seven trunks each.

3.43.3 The 316081(4) assembly provides service for five trunks

3.44 Attendant Multiple Position Assemblies

3.44.1 Attendant multiple position board one 316082(11)122 assy., ( )68 Dwg., Fig. 1

3.44.2 Attendant multiple position board two 316082(12)122 assy., ( )68 Dwg., Fig. 1

3.44.3 Diode Box 130113-1 Assembly

3.44.4 Two PCB's and two diode box assemblies are required for one circuit.

3.44.5 The 316082 provides multiple console operation. Each trunk will be split between console 1 and console 2 on an odd-even basis. One attendant may gain full control by operating the attendant transfer key on the other console

3.44.6 On TE-400 320136 cabinet assemblies, the diode box assembly is replaced with a 316082(13)122 assembly mounted on the terminate bus.

3.45 Single Digit Access 316086(1)122 Assy. ()68 Fig., Fig. 1

3.45.1 One PCB IS required for six circuits.

3.45.2 The 316086 permits single digit access to six individual lines.

3.46 loop DID Trunk Assemblies

3.46.1 Refer to Table 2-3 of Section If

3.46.2 Three PCB's are required *per* circuit

3.46.3 Loop DID Trunk 316089(1), (2), and (3) assemblies are composed of:

(a) 85793 - Board 1
(b) 85794-1. -2, -3 - Board 2
(c) 85795 - Board 3

3.46.4 Loop DID Trunk 316089(4) IS *composed of:*

(a) 85793 - Board 1
(b) 85794-4 - Board 2
(c) 85795 - Board 3

3.46.5 Loop DID trunk 316089(1), (2), and (3) assemblies have MR5, 6, and 7 mounted internally on the 85794-1, -2, -3, Board 2.

3.46.6 The 316089(4) has resistors MR5, 6, and 7 located externally on the punching field.

NOTE: See Section X10, paragraph 16.0.

3.47 DID Loop Tie Trunk Assemblies (316090)

3.47.1 Refer to Table 2-3 of Section II

3.47.2 Two PCB's are required for each circuit.

3.47.3 DID loop tie trunk 316090(1), (2), and (3) are composed of:

(a) 85796 - Board 1
(b) 85797-1, -2, -3 - Board 2

3.47.4 DID Loop Tie Trunk 316090(4) is composed of:

(a) 85796 - Board 1
(b) 85797 -4 - Board 2

3.47.5 Resistors MR5, 6, and 7 are located on the punching field

3.47.6 See Section XII, paragraph 16.0

3.48 DID Loop Tie Trunk 316091(1)122 Assy.

3.48.1 Two PCB's are required for each circuit.

(a) - Board 1
(b) - Board 2

3.48.2 The Board 2 has MR5, 6, and 7 mounted externally on the punching held.

3.48.3 Refer to Table 2-3 of Section II.

3.49 DID Loop Trunk 316092(1)122 Assy.

3.49.1 Refer to Table 2-3, Section II

3.49.2 Two PCB's are required for each *circuit.*

(a) - Board 1
(b) - Board 2

3.49.3 The board 2 has MR5, 6, and 7 mounted externally on the punching field.

3.50 DID Loop Tie Trunk 316093(1)122 Assy.

3.50.1 Refer to Table 2-3, Section II.

3.50.2 Two PCB's are required for each circuit

(a) - Board 1
(b) - Board 2

3.50.3 Resistors **MR5, 6, and** 7 are **equipped** on Board 2.

NOTE: See Section XII, paragraph 16.0.

3.51 Two-Way DID E&M Trunk 316094(1) Assy.

3.51.1 **Three PCB's are required for each circuit.**

(a) 85793 - Board 1
(b) 85935-1 - Board 2
(c) 85795 - Board 3

3.52 Two-Way E&M Tie Trunk 316095(1)122 Assy.

3.52.1 See Table 2-3, Section II.

3.52.2 Two PCB's are required for each circuit.

(a) - Board 1
(b) - Board 2

3.52.3 The Board 2 **has** MR5, 6, and **7 mounted externally on the punching** field.

3.53 Two-Way E&M Loop Tie Trunk (316096)

3.53.1 Refer to Section II, Table 2-3

3.53.2 Two PCB's are required **for each** circuit.

(a) Board 1
(b) Board 2

3.53.3 The Board 2 has MR5, 6, and 7 mounted externally on the punching field.

3.54 Attendant Trunk No. 2, 316099(1)122 Assy., ()68 Dwg., Fig. 1.

3.54.1 One PCB IS required per circuit. One circuit for each attendant control.

3.54.2 The 316099 provides all services of **the 316073 assembly (see paragraph 3.35) except allotting.**

3.54.3 It further provides:

(a) Access to the attendant's line.
(b) Access to the attendant's override.
(c) By seizing OP2, the attendant may key a station into a conference (if equipped), or extend the call to a trunk.

3.54.4 Failure of trunk No. 2 will generate a minor alarm.

3.55 The 24 VDC Supply 316141(1)122 Assy. ()68 Dwg., Fig. 1.

3.55.1 One PCB is required for two circuits.

3.55.2 The 316141 provides two +24VDC **outputs for operation of external equipment. The +24 is derived from the +36VDC system supply.**

3.56 Console Applique 316184(1)122 Assy., ()68 Dwg., Fig. 1.

3.56.1 **One PCB is required per circuit.**

3.26.2 One circuit is required for systems utilized by Bell companies. The console applique provides Interface between the attendant control circuits and consoles similar to Bell 757A, and associated direct station selection consoles:

3.57 Five-Volt Supply and Alarms 316301(1)122 Assy., ()68 Dwg., Figs. 1, 2, and 3.

3.57.1 One PCB is required per circuit. One circuit is required for each system

3.57.2 The five volt supply provides +5VDC **for the integrated circuitry. In addition, alarm circuitry IS provided for ±3VDC, -46VDC supplies.**

Section XI

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Section XI

PRINTED CIRCUIT BOARD INTERCHANGEABILITY

1.0 'GENERAL

1.1 Table 11-1 shows the Interchangeability of printed circuit boards between the 320136 cabinet assemblies and the 130097 third generation cabinets

1.2 An 'X" under columns A, B or C of Table 11-1 indicates the following:

A - Used in 320136 Cabinet assemblies only
B - Used in both 320136 and 130097 Cabinet assemblies
C - Used in 130097 Cabinet assemblies only

1.3 Both Drill Board **Issue numbers and Assembly Issue** numbers are listed

1.4 The Drill Board Assembly Issue numbers art? the lowest **issue** numbers **used** Unless otherwise noted, all higher issue numbers may **be used**

1.5 Many boards are listed that have never **been used This must be taken into** consideration when using this table to determine which spare parts to **stock.**

1.6 Paragraph 2.0 defines the notes listed **in the Notes column**

Table 11-1

Interchangeability of Printed Circuits

Description	Drill Board Issue	Assembly Issue	A	B	C	Notes
316024	3	16	X			
316024	3	17		X		
316025	all	all	X			
316029 (1)	4	10R3		X		
316029 (2)	5	13		X		
316031 (11)	2	9R1		X		
316031 (12)	2	9R1	X			1
316031 (12)	3	10	X			
316031 (12)	4	12	X			
316031 (13)	2	9R1		X		
316031 (13)	3	10		X		
316031 (13)	3	12		X		
316034 (1)	4	15	X			
316034 (1)	6	17	X			
316034 (2)	1	20			X	
316035 (11)	2	17R7		X		
316035 (11)	3	24		X		
316035 (11)	4	26		X		
316035 (12)	4	17R7		X		2
316035 (12)	5	19		X		
316035 (12)	6	26		X		
316035 (13)	4	17R7		X		
316035 (13)	5	24		X		
316035 (13)	6	26		X		
316035 (14)	1	17R7		X		
316035 (14)	1	24		X		
316035 (15)	4	17R12			X	
316036 (1)	3	12R3	X			
316036 (1)	4	15	X			

Table 11-1 **(Cont'd)**

Interchangeability of Printed Circuits

Description	Drill Board Issue	Assembly Issue	A	B	C	Notes
316036 (2)	3	12R3	X			
316036 (2)	3	15	X			
316036 (3)	3	12R3	X			
316036 (3)	4	15	X			
316036 (4)	3	12R3	X			
316036 (4)	4	15	X			
316036 (5)	3	12R3	X			
316036 (5)	4	15	X			
316036 (6)	1	16			X	
316036 (7)	1	16			X	
316036 (8)	all	all			X	
316037 (1)	6	11R3		X		
316037 (1)	7	15		X		
316037 (1)	8	17		X		
316039 (1)	5	18R2		X		
316039 (1)	6	23		X		
316039 (2)	5	18R2		X		3
316039 (2)	6	23		X		3
316039 (3)	5	18R2		X		
316039 (3)	6	23		X		
316040 (1)	1	12R1		X		
316040 (1)	2	16		X		
316040 (2)	1	12R1		X		
316040 (2)	3	16		X		
316041 (1)	2	4R1	X			4
316041 (1)	2	5	X			4
316041 (2)	2	4R1	X			4
316041 (2)	2	5	X			4
316041 (3)	2	4R1	X			4
316041 (3)	2	5	X			4
316041 (4)	2	4R1	X			4
316041 (4)	2	5	X			4
316041 (5)	2	4R1	X			4
316041 (5)	2	5	X			4
316041 (6)	2	4R1	X			4
316041 (6)	2	5	X			
316041 (7)	1	5R1			X	
316041 (7)	2	6			X	
316042	4	5R1		X		
316042	5	6		X		
316042	6	8		X		
316043 (3)	1	6			X	
316045	4	10R1		X		
316045	6	13		X		
316047	3	14R1	X			
316047	3	14R2		X		
316047	4	16		X		
316048 (11)	1	10R1	X			
316048 (11)	2	14	X			
316048 (12)	1	10R1		X		

Table 11-1 (Cont'd)

Interchangeability of Printed Circuits

Description	Drill Board Issue	Assembly Issue	A	B	C	Notes
316048 (12)	2	14		X		
316048 (13)	1	10R4			X	
316048 (13)	3	15			X	
316049 (11)	1	15R1	X			
316049 (11)	2	18	X			
316049 (12)	2	15R1	X			
316049 (12)	3	18	X			
316051	1	3		X		
316051	2	4		X		
316052	2	7R3		X		
316052	3	10		X		
316053 (1)			X			5, 6
316053 (2)			X			5, 6
316053 (3)			X			5, 6
316053 (4)			X			5, 6
316053 (5)			X			6, 7
316053 (6)			X			6, 7
316053 (7)			X			6, 7
316053 (8)			X			6, 7
316053 (9)			X			7, 8
316053 (10)			X			7, 8
316053 (11)			X			7, 8
316053 (12)			X			7, 8
316053 (13)			X			8, 9
316053 (14)			X			8, 9
316053 (15)			X			8, 9
316053 (16)			X			8, 9
316057	2	11R1		X		
316057	2	3		X		
316060 (1)	1	1R1	X			
316060 (2)	1	1R1	X			
316060 (3)	1	1R1	X			
316060 (1)	1	1R2	X			
316060 (2)	1	1R2	X			
316060 (3)	1	1R2	X			
316060 (1)	1	3	X			
316060 (2)	1	3	X			
316060 (3)	1	3	X			
316060 (1)	2	4	X			
316060 (2)	2	4	X			
316060 (3)	2	4	X			
316060 (4)	1	3R1			X	
316060 (4)	2	4			X	
316061 (85860)	2	1	X			
316061 (85860)	2	1R2		X		
316061 (85860)	2	3		X		
316061 (85861)	2	1	X			
316061 (85861-4)	2	1R3			X	
316061 (85861-4)	4	4			X	
316062 (1)	4	11	X			

Table 11-1 (Cont'd)

Interchangeability of Printed Circuits

Description	Drill Board Issue	Assembly Issue	A	B	C	Notes
316062 (1)	6	11R6			X	
316062 (1)	7	17			X	
316062 (1)	8	18			X	
316062 (2)	6	11	X			
316062 (2)	6	11R6			X	
316062 (2)	7	19			X	
316062 (2)	8	18			X	
316062 (3)	all	all			X	
316064 (4)	all	all			X	
316063 (1)	1	1	X			
316063 (1)	2	6	X			
316063 (3)	3	7	X			
316063 (4)	1	7			X	
316063 (5)	1	7			X	
316063 (6)	1	7			X	
316065 (1)	1	7	X			
316065 (2)	1	7	X			
316065 (3)	1	7	X			
316065 (4)	1	7	X			
316065 (5)	1	7	X			
316065 (6)	1	7	X			
316065 (7)	1	9		X		
316065 (8)	1	9		X		
316067 (11)	1	4R1		X		
316067 (11)	1	9		X		
316067 (12)	1	4R1		X		
316067 (12)	1	9		X		
316067 (15)	1	4R1		X		
316067 (15)	1	9		X		
316067 (16)	1	4R1		X		
316067 (16)	1	9		X		
316067 (13)	1	4R1	X			
316067 (13)	3	9	X			
316067 (14)	1	4R1	X			
316067 (14)	3	9	X			
316067 (31)	1	10			X	
316068	2	12R1	X			
316068	3	13	X			
316068	4	14	X			
316068 (2)	2	12R2			X	
316068 (2)	4	14			X	
316069 (1)	2	13	X			
316069 (2)	2	14			X	
316070 (1)	2	5R1	X			
316070 (1)	4	8	X			
316070 (2)	2	6R1			X	
316070 (2)	4	10			X	
316073	2	9R1	X			
316073 (1)	3	10	X			
316073	2	9R5		X		

Table 11-1 (Cont'd)

Interchangeability of Printed Circuits

Description	Drill Board Issue	Assembly Issue	A	B	C	Notes
316073 (1)	3	14		X		
316074	1	9R1	X			
316074	2	10	X			
316075 (11)	3	9R1	X			9
316075 (11)	4	13	X			9
316075 (11)	3	9R7		X		9
316075 (11)	4	16		X		9
316075 (12)	6	9R1	X			9, 10
316075 (12)	9	15	X			9, 10
316075 (15)	7	9R8			X	9, 10
316075 (15)	9	20			X	9, 10
316076 (11)	1	9R1		X		
316076 (11)	1	11		X		
316076 (12)	2	9R1	X			
316076 (12)	2	9R2		X		
316076 (12)	3	11		X		
316076 (12)	4	12		X		
316077 (86854-1)	1	1R1	X			
316077 (86854-1)	1	1R2		X		
316077 (85854-1)	2	3		X		
316077 (85855-1)	1	1R1	X			
316077 (85855-1)	2	1R2		X		
316077 (85855-1)	3	2		X		
316078	1	1R1	X			
316078	2	2	X			
316078	1	1R4		X		
316078	2	5		X		
316079 (1)	1	1R2		X		
316079 (1)	1	3		X		
316079 (1)	2	4		X		
316080	1	1R1		X		
316080	1	3		X		
316081	1	1R1	X			
316081	2	2	X			
316081 (3)	1	1R2			X	
316081 (3)	2	5			X	
316081 (4)	1	1R2			X	
316081 (4)	2	5			X	
316082 (11)	1	1R1		X		
316082 (11)	2	2		X		
316082 (12)	1	1R1		X		
316082 (12)	2	2		X		
316082 (13)	2	1R1	X			
316082 (13)	3	2	X			
316086	1	1R1		X		
316086	1	2		X		
316089 (85793)	2	1R1	X			
316089 (85793)	3	4	X			
316089 (85793)	2	1R4		X		
316089 (85793)	3	5		X		

Table 11-1 (Cont'd)

Interchangeability of Printed Circuits

Description	Drill Board Issue	Assembly Issue	A	B	C	Notes
316089 (85794-1)	2	2R1	X			
(85794-2)	2	2R1	X			
(85794-3)	2	2R1	X			
(85794-1)	4	7	X			
(85794-2)	4	7	X			
(85794-3)	4	7	X			
316089 (85794-4)	2	2R5			X	
316089 (85794-4)	4	9			X	
316089 (85795)	1	2R1		X		
316089 (85795)	1	5		X		
316090 (85796)	2	2R1	X			
316090 (85796)	2	2R3		X		
316090 (85796)	3	5		X		
316090 (85797-1)	3	2R1	X			
(85797-2)	3	2R1	X			
(85797-3)	3	2R1	X			
316090 (85797-1)	4	4	X			
(85797-2)	4	4	X			
(85797-3)	4	4	X			
316090 (85797-4)	2	2R3			X	
316090 (85797-4)	4	6			X	
316094 (85793)	2	1R1	X			
316094 (85793)	2	1R4		X		
316094 (85793)	3	4		X		
316094 (85935-1)	3	1R1		X		
316094 (85935-1)	3	1R1		X		
316094 (85935-1)	4	2		X		
316094 (85935-1)	4	2		X		
316094 (85795)	1	2R1		X		
316094 (85795)	1	5		X		
316096 (85796)	2	2R1	X			
316096 (85796)	2	2R3		X		
316096 (85796)	3	5		X		
316096 (85799)	3	5R1		X		
316096 (85799)	4	8				
-						
-						
316099	3	1R1	X			
316099	7	1R7		X		
316099	8	7		X		
316141	1	1		X		
316184	1	1R1	X			
316184	3	1R4			X	
316184	4	5			X	
316300 (1)	all	all			X	11
316300 (2)	all	all			X	11
316300 (3)	all	all			X	11
316300 (4)	all	all			X	11
316300 (5)	all	all			X	12
316300 (6)	all	all			X	12
316300 (7)	all	all			X	12

Table 11-1 (Cont'd)

Interchangeability of Printed Circuits

Description	Drill Board Issue	Assembly Issue	A	B	C	Notes
316300 (8)	all	all			X	12
316301	1	1			X	
316302 (1)	1	1			X	
316302 (2)	1	1			X	
316046	1	1		X		

2.0 Table 11-1 Notes

NOTES

1. The 316031(12) is equipped with one COB circuit. It is not provided with the 130097 TE-400 assembly
2. The 316035(12) issue 17R7 and below must have track from relay AL2-2 cut to operate with 316099(1)122 attendant trunk No. 2. This track must not be cut for operation with the 316074(1) 122 attendant trunk No 2
3. The 316039(2) allotter will be provided on TE-400 assemblies 130097 as special engineering only
4. These assemblies are listed for reference only They were never equipped.
5. These assemblies of the 316053, when utilized for multicabinet operation, are used in cabinet 1 only A strap between H-G must be removed for multicabinet operation and the strap replaced for single cabinet. Refer to Fig. 11-1.
6. These assemblies of the 316053 are always utilized for cabinets 2, 3, or 4 of multicabinet systems. Strap between H-G must be removed. (Note 5.) Refer to Fig. 11-1 (PCB will be partially equipped.)
7. See Note 6. These supplies will be located in the auxiliary power cabinet, and are used for cabinet 1 supplies only Refer to Fig. 11-1.
8. See Notes 6 and 7. These supplies will be located in auxiliary power cabinet, utilized for cabinets 2. 3, or 4 only. Refer to Fig 11-1
9. No issue lower than 9R6 may be utilized in systems equipped with a 31607(14) having a "piggyback" assembly.
10. Equip strap "A-A" for local connectors which put battery on the tip ("T" lead) as soon as they are ring tripped. Equip strap "B-B" at all other times Refer to Fig. 11-2.
11. These assemblies are utilized on TE-400 assembly 130097. Remove straps as shown in Section III, Fig. 1, for multicabinet operation. These assemblies used on cabinet 1 only.
12. See Note 11. These assemblies used on cabinets 2, 3, or 4 only

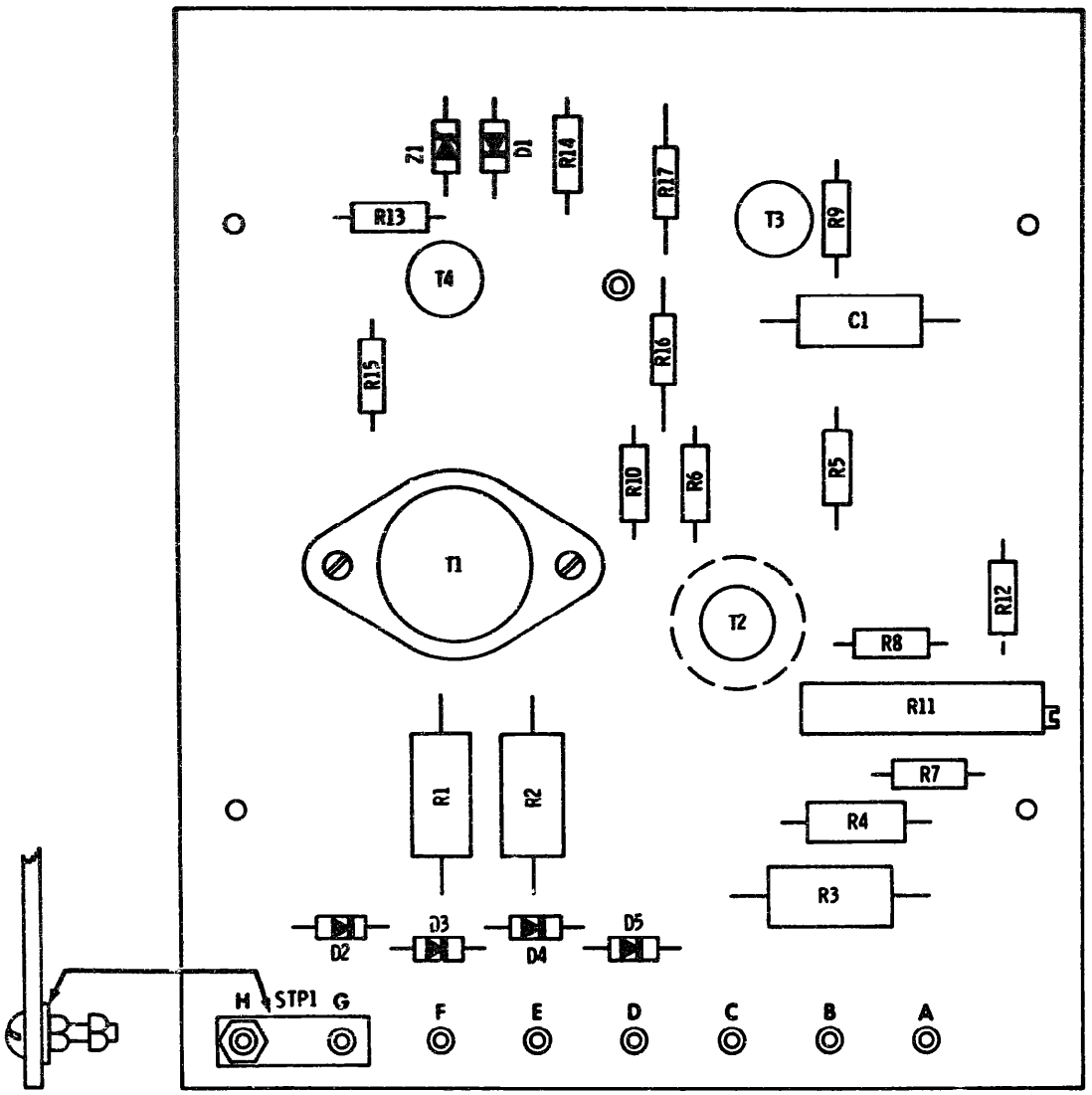

Fig. 11-1 Power Supply 316053 PCB

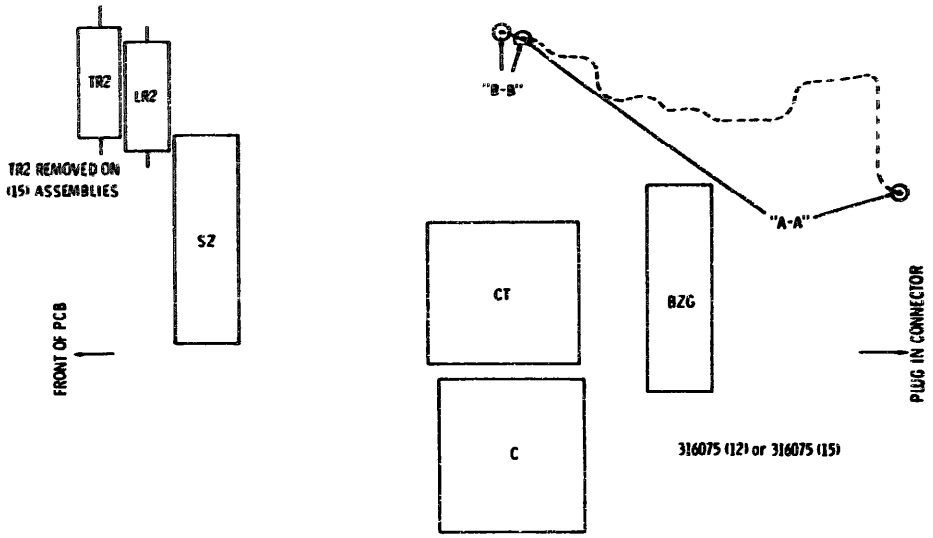

Fig. 11-2 Partial View of Ground Start City Trunk 316075 Assy.

Section XII

CONTENTS

TABLES

FIGURES

C O N T E N T S (C o n t ' d)

Section XII

GENERAL OPERATIONAL DESCRIPTION

1.0 GENERAL

The operation of the TE-400 EPABX can be more readily understood if ITT Dwg. 316023 is referred to while studying this Section. It is suggested that Section X be read carefully, referring to figures supplied and the 316023 EPABX Block Diagram.

2.0 TIME CONTROL MARK GENERATOR

2.1 **The tone supply provides a 600 Hz dial tone (DT) to the system allotter.** Refer to Fig. 12-1.

2.2 The allotter **generates a 1.6 millisecond** pulse fo**r each cycle of the 600 Hz** input. This pulse is called **a regular interval time** (RIT) or standby interval time (SIT).

(a) A 20- or 12-**stage ring counter** produces the **RIT pulses. A** single cabinet system is normally **equipped with a** 20-stage ring counter.

(b) The ring counter will provide 20 sequential counts, and then repeat itself; thus RIT1 will occur and recur every 32 milliseconds.

(c) Each RIT (1 **through 20) occurs** for a discrete (1.8 millisecond) time period, and then recurs every 32 milliseconds.

(d) An RIT pulse is **assigned (one to** each circuit) to the following:

RIT 1	Register 1
RIT 2	**Attendant** Control
RIT 3	Camp-On-Busy No. 1
RIT 4	**Register 2**
RIT 5	**Junctor** 1
RIT 6	Camp-On-Busy No. 2
RIT 7	Junctor 2
RIT 8	Register 3
RIT 9	Junctor 3
RIT 10	Transfer **Junctor No.** 1
RIT 11	**Junctor 4**
RIT 12	Transfer Junctor No. 2
RIT 13	**Junctor 5**
RIT 14	**Junctor 6**
RIT 15	**Junctor 7**
RIT 18	**Junctor 8**
RIT 17	**Junctor 9**
RIT 18	**Junctor 10**
RIT 19	**Junctor 11**
RIT 20	**Junctor 12**

(e) With the above assignment. register 1 will mark-for 1 6 millisecond and remark every 32 milliseconds The same is true for all other circuits

(f) Each circuit, having an assigned time slot, cannot switch except during that time slot Only one circuit may switch at any given time

(g) Under normal operation, the regular allotter will provide a **regular enable (REN) output to the circuits requiring an RIT pulse. If the regular allotter fails, the REN will be removed and the standby allotter will provide a standby enable (SEN) output to the circuits, and switching from RIT's to SIT's occurs. A minor alarm will be provided on the console.**

2.3 The junctor will receive its RIT and REN input from the allotter.

(a) The junctor will also receive five register free (RF) inputs from its five accessible registers (three per cabinet).

(b) With an RF, RIT, and REM input, the junctor will mark its **voice originate (VO) lead from ground** to -18VDC **for 1.6 millisceond,** or **one RIT pulse.**

(c) As the VO marks, the junctor will provide a signal **originate mark (SOM**) pulse to the originate control (316029).

2.4 **The originate control will compare the time period of the SOM input with the** cycle of DT that produced the RIT_SOM; **and, if correct,** will provide an originate horizontal (OH) **pulse** to the lines circuits (318040).

(a) **In an idle system, each junctor will be marking in sequence** providing an SOM pulse in **sequence** to the originate control. The originate **control** then provides an OH pulse in **sequence to tie lines.**

2.5 For mulitcabinet systems, the allotter RIT count may be expanded by 12 or 20, depending on the needed time slots. The allotter will **continue to count sequentially. The total time** between a specific RIT may be determined **by** multiplying 1.66 by **the number of ring-counter stages For example:**

Lines	RIT Count	Time (milliseconds)
100	20	33
200	40	66
300	60	99
400	80	132

2.6 For correct origination, a QH pulse must-sent on the line The **origination is random in that the junctor will be seized that is marked at the time the "off hook" condition of the station instrument is recognized**

2.7 If a station, in a system with traffic, attempts origination during a time slot that is assigned to a busy junctor, the line must wait until the time slot from a free junctor occurs

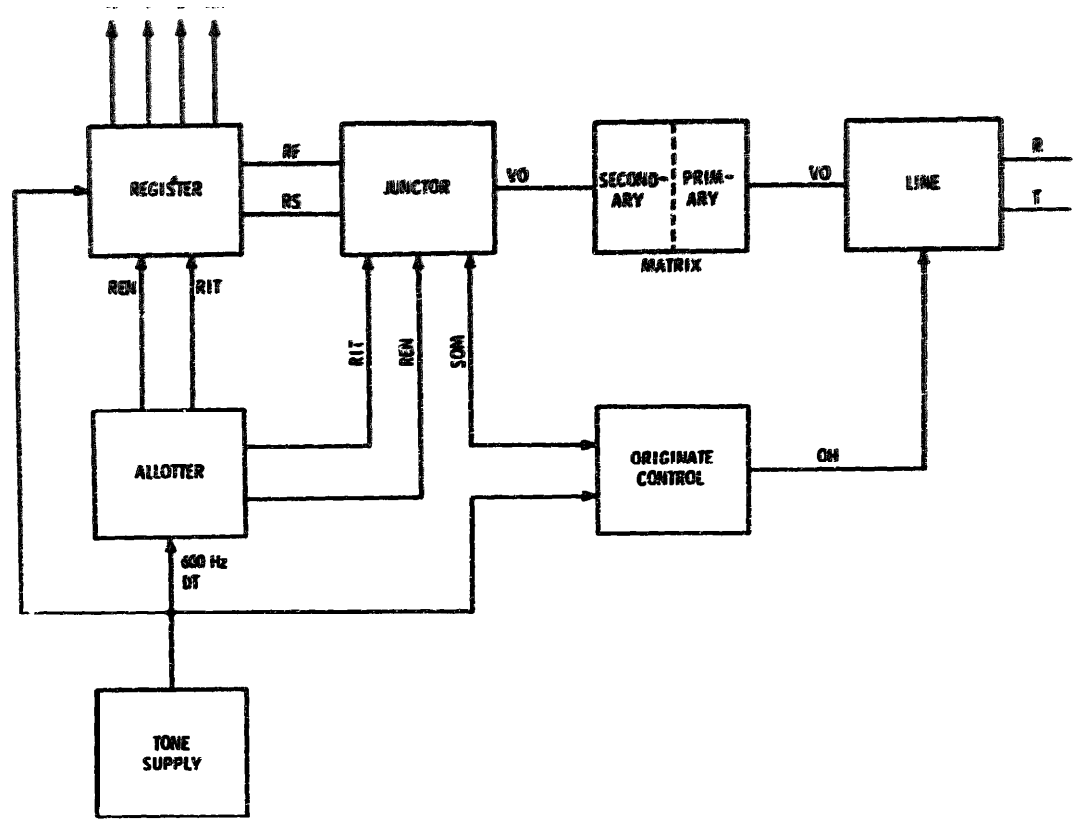

Fig. 12-1. Block diagram of Time Control Mark Generator.

3.0 ORIGINATION

3.1 To originate a call the subscriber goes 'off hook." The line VO will pulse towards +18VDC.

3.2 In each 100 liner, the lines are divided **into** four **group of 25** lines each. Each group is connected to the primary matrix on **a** one-line to one-input basis. gee Fig. 12-2.

(a) Each input has access to the anode of five primary diodes. Each diode is connected to one group of five secondary diodes. The outlets of the secondary matrix are 25 secondary horizontal (SH) leads.

(b) Four primary-secondary matrices (316065) are equipped per 100 lines. These outlets are graded to present 25 outlets to the tertiary matrix for terminating paths, and 15 to the junctor VO's for origination.

(c) The 15 junctor outputs are graded so that in a 100-line, 12-junctor system each may access one out **of** ten junstors.

3.3 As the lines VO **mark** toward +18VDC (Fig. 12-1), the junctors VO mark toward +18VDC. The associated diodes **fire and** connect the line VO to the junctor VO. After the diodes have fired, a low impedance path exists. The junctor/line **combination provides holding current for** the matrix. **The junctor seize lamp will be "on." A** junctor may **access one of five registers. The register** seize lamp (green) will be **"on."**

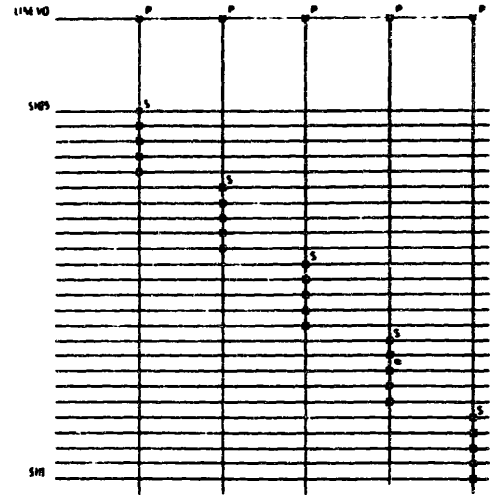

Fig. 12-2. Call Originations from One Line **Group (25 Lines).**

3.4 **A dial tone is provided to the registers from the tone supply. On seizure, the DT is passed via the register seize lead (RS) to the junctor, the primary-secondary (P-S) matrix, and to the line. See Fig. 12-1.**

(a) Dial pulses are passed via the line VO, P-S matrix, junctor, and to the register stores.

(b) The register will store the digits. Upon completion of the dialing, the register will send (mark) out its stored digits on the terminate bus during the register's next assigned time slot (RIT pulse). A terminate pulse will be sent via the register seize (RS) lead to the junctor. The register and junctor seize lamps will go "out." The duration of the register mark for a local call is 1.6 millisecond (RIT).

4.0 TERMINATION (STATION-TO-STATION)

4.1 **Upon receipt of the terminate pulse, the junctor will mark its voice terminate** (VT) lead **to -18VDC. Refer to Fig. 12-3.**

(a) The hundreds (H), tens (T), and units (U) output of the register is graded to the lines via the terminate bus. The 1.6 millisecond mark from the register will cause the addressed lines VO to rise toward +18VDC.

(b) Each junctor VT is tied to the tertiary-quaternary (T-Q) matrix on a quaternary horizontal (QH). There are 40 QH outlets available for connection to all circuits that have a VT connection. Each VT output occupies one QH outlet. Thus, 12 junctors will have 12 QH outlets assigned.

NOTE: (T-Q) matrix 316041(6) used on most 320136 TE-400 cabinet assemblies has 41 QH inlets.

(c) The 40 QH outlets are graded in the (T-Q) matrix **for 25** tertiary **horizontal** (TH) inlets. These inlets are **graded and connec**ted to the 25 SH outlets from the P-S matirx.

(d) With the he VO at +18VDC and the junctor VT at -18VDC, the primary, secondary. tertiary, and quaternary diodes will fire.

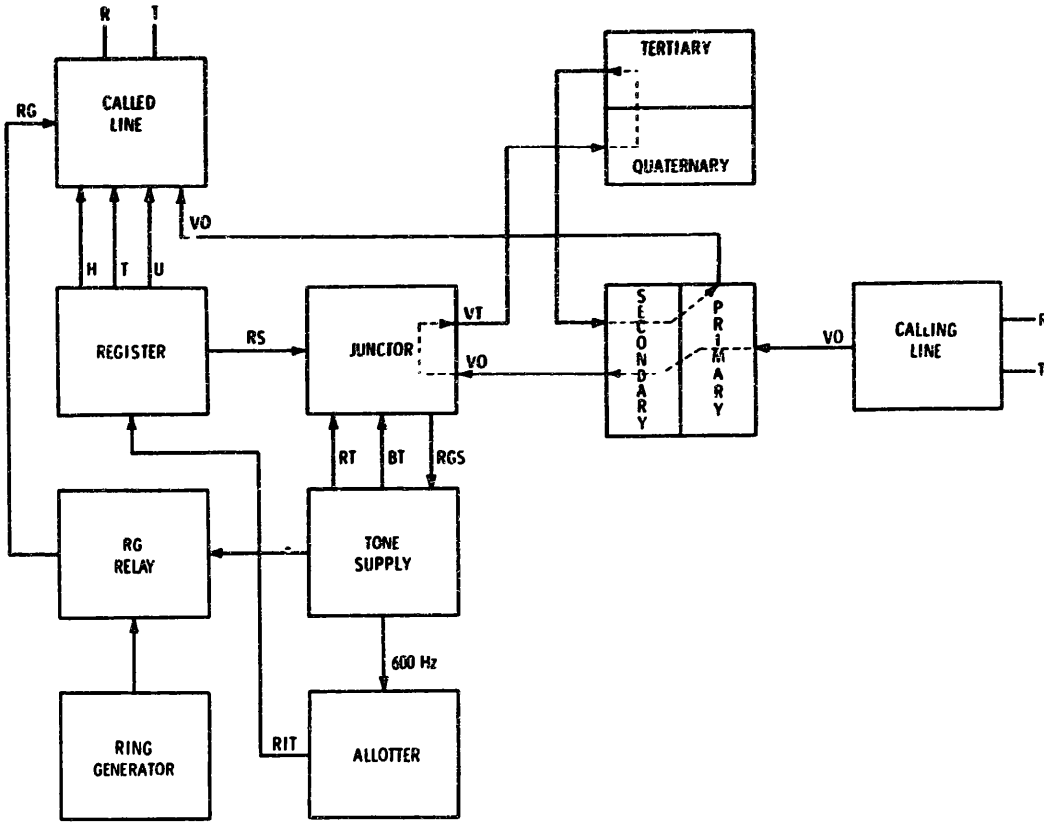

Fig. 12-3. Block Diagram Shaving Station-to-Station Termination.

4.2 The junctor will recognize this as termination The ring tone (RT) will be gated-out to the line terminated in the junctor VT. At the same time, a ring generator start (RGS) output is sent to the interrupter on the tone supply The ring back tone (RBT) is provided to the originating line.

(a) The terminated line will integrate the RT and close its ring up (RU) relay.

(b) The RGS input to the tone supply will start the interrupter The interrupter will provide a one-second "on," three-second "off" ground to the ring generator control. The ring generator will pulse "on-off" to provide ring generator current to the RG input of the called line.

(c) The ring generator (RG) will pass through the closed contacts of relay RU, via the ring lead, to the station istrument of the called line

4.3 Upon answer, the line circuit will detect answer of the call and open the RU relay. The junctor will also detect the answer. and will remove the outputs (1) RGS. (2) RBT, and (3) RT and turn cm the speech gates Transmission may take place.

(a) If the codes do not fire (refer to Step (d) of paragraph 4.1), due to any reason, the junctor will detect this and pass a busy tone (BT) to the originating line. The busy tone is supplied by the tones supply.

(b) It should be noted that termination occurs during; the RIT time slot (1.6 millisecond) that marked the register.

4.4 As described previously, and shown in Fig. 12-3, a line IS normally addressed by marking the R's, T's, and U's leads from the register via the TE bus

(a) This grading IS shown in Fig 12-4 It should be noted that if an Attendant Control (316035) and Console (316028) are equipped, the output from the attendant control digit stores are essentially parallel with the register digit outputs.

(b) In either case, a ground pulse IS supplied to the H, T, and U input of the lane circuit

(c) The circuit within the line IS a three-input AND gate

NOTE: An AND gate requires three simultaneous inputs to perform its assigned function(s)

(d) The H's 2, T's 5, and U's 4 outputs are used to mark the digits 2-5-4

(e) To mark the digits 2-6-7, the 2 is again marked Due to no input to the T's 6 and U's 7, the line 2-6-7 will not be addressed

(f) Grading IS such that no line circuit(s) will have the same three inputs

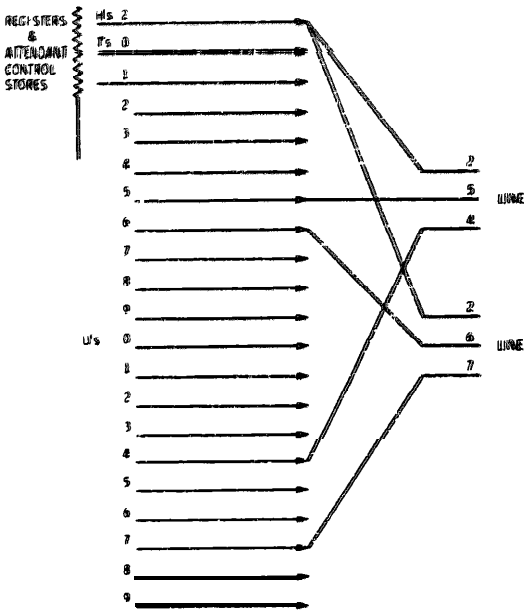

Fig. 12-4 Grading Block Diagram.

4.5 The line circuit also has a group hunt access (GHA) output. This GHA lead may be opened to address the line Opening the GHA lead will cause the lines VC to pulse towards +18VDC. If a junctor (or feature) VT is being marked (paragraphs 4.1, 4.2, and 4.3) termination may occur.

4.6 Each line circuit's GHA lead is connected to the punching field (refer to Dwg 130071 or 329972). If it IS not used for a feature application (SHA, GHA, or ANA), it is connected to ground

5.0 TERMINATION (FEATURE CALL)- SEE FIG. 12-5

5.1 If the dialed number is a feature call (trunk/tie lines, attendant, code call, public address, conference), the register detects this and will mark the required hundreds and/or tens digit plus a feature mark (FM). This will be time (1).

5.2 The addressed feature will provide a feature mark allott (FMA) pulse to the allotter The allotter will then expand the RIT to 3 32 milliseconds It will also provide a drop junctor (DJ) pulse to the junctor

(a) The junctor will drop the originating line by removing the holding current (Ih) from the matrix This occurs at time (1)

5.3 The allotter will mark the Crap circuit, and the dropped line will re-fire to the trap and be held This IS time (2).

(a) The addressed feature will check the lines class of service If the line IS acceptable, the feature will provide a drop

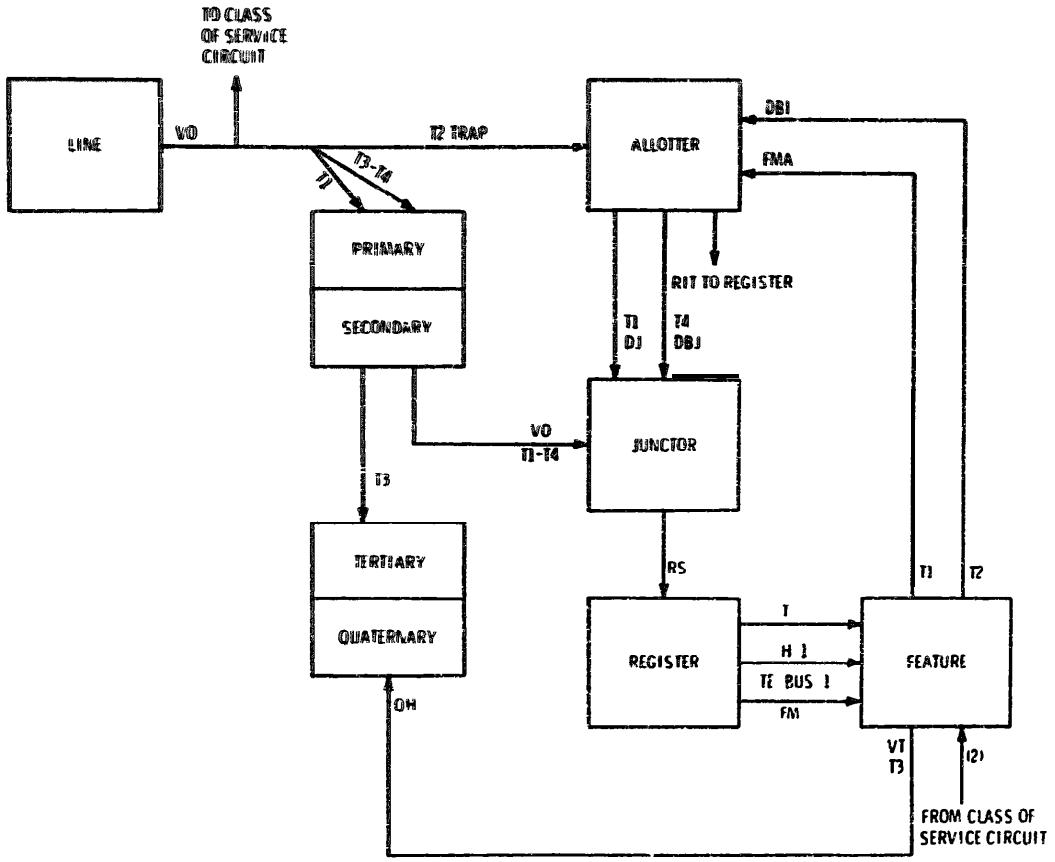

Fig. 12-5. Block **Diagram of Feature Call Termination.**

back inhibit (DBI) pulse to **the** allotter. The DBI pulse will prevent **a** drop-back-to-junctor (DBJ) from being originated within the allotter. This occurs during time (2)

5.4 The trap **circuit will drop the line, and** the line VO will mark positive. The feature VO will then **mark** to -18VDC. and the P-S and T-Q matrix diodes **will** fire, and **termination will occur** This **takes** place during time (3).

5.5 If the addressed feature **does not provide** a DBI pulse, the allotter will **generate** a DBJ pulse The DBJ pulse will be sent to the **junctor dropping** the line from the trap circuit. The line VO will **re-fire through the P-S matrix to the re-marked junctor VO This takes place** during time **(4)**

(a) The junctor will recognize this and **send a busy tone to the line**

6.0 PNPN MATRIX - SEE FIG. 12-8

6.1 Each primary **matrix PCB has 25 outlets for connection to 25 line VO terminals**

(a) **Each primary outlet is connected to five primary diodes Each primary diode IS connected to five secondary diodes Each secondary diode becomes a secondary horizontal (SH) outlet Each primary-second** PCB **has 25 SH outlets** (Refer to **Fig** 12-8)

(b) The **SH outlets** (100) of **four P-S matrices are graded to provide 15 outlets for assignment to the junctor VO's, and 25 for assignments to the tertiary matrix inlets**

6.2 **The SH grading for the junctors IS shown in Fig. 12-9 In a 12-junctor system, VO's 13, 14, and 15 are folded back to VO's 8, 9, and 10**

(a) A maximum of 12 junctors may be equipped per cabinet Dwgs 130117 and 329972 detail the strapping

6.3 **Each cabinet has one tertiary quaternary** (T-Q) **matrix (316041).**

NOTE: See Table 11-1 of Section XI

(a) Each quaternary matrix has 40 quaternary horizontal (QH) inlets Each QH inlet is assigned on a one-to-one basis to the feature VT's

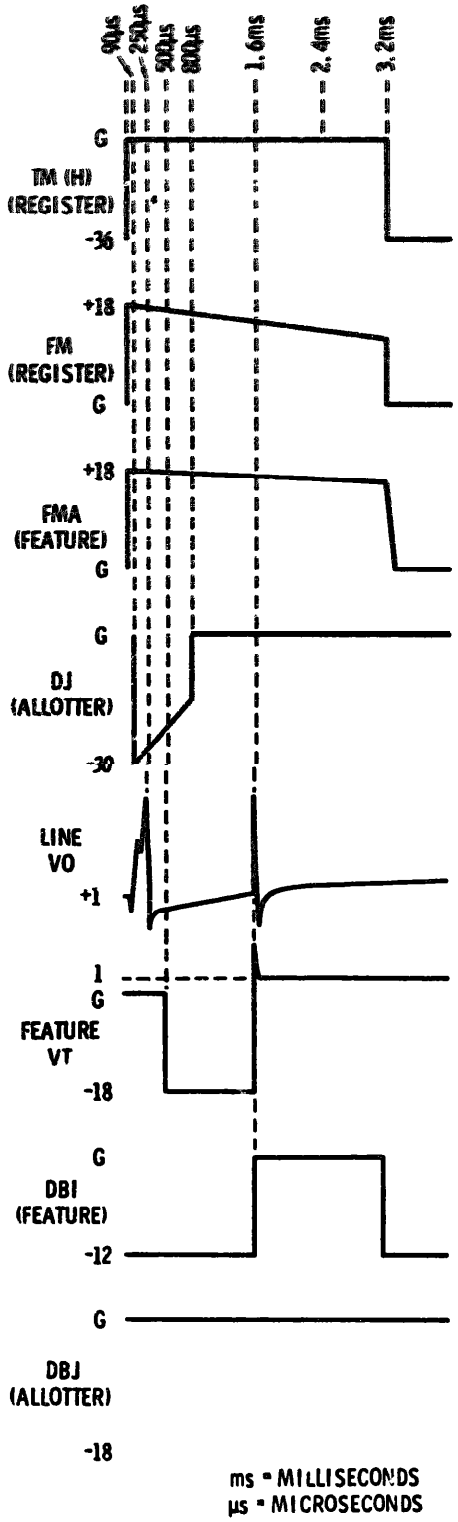

Fig. 12-6. Oscillograph Showing Feature Call Control Marks.

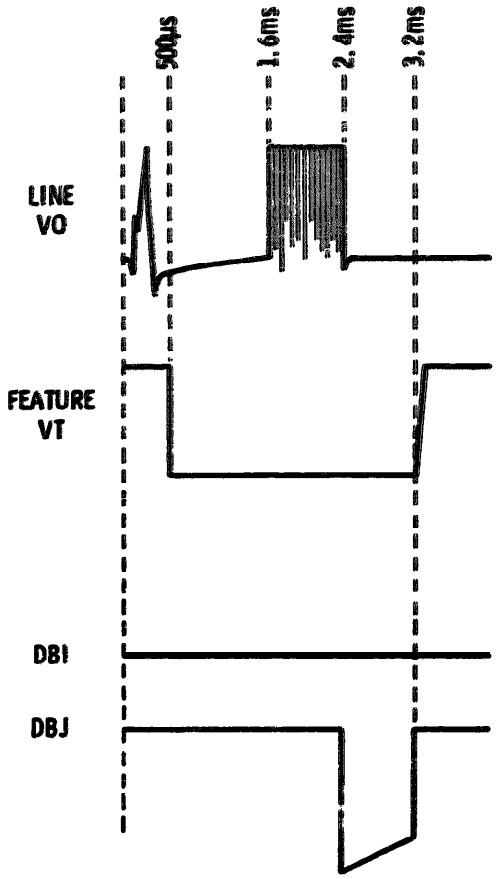

Fig. 12-7. Osciliograph Showing Failure of a Feature Call.

(b) For a 100-line cabinet, the following circuits VT's require **a** QH outlet assignment:

Circuit	QH Required	Total Possible Equipped	
Junctor	1 each	12	12
Transfer Junctor	1 each	4	4
Trunks	1 each	24	18
Tie Lines	1 each	0	12
Attendant Trunks	1 each	2	2
Code Call	2 each	1	1
Public Address	1 each	1	1
Conference	5 each	1	1
Line Lockout	6 each	1	1
Total		46	52

6.4 Although it is possible to specify a single cabinet with 46 or 52 circuits requiring QH outlets, this cannot be done due to the limitation of 40 QH Inlets each T-Q.

(a) The tertiary horizontal (TH) outlets are made available **for**

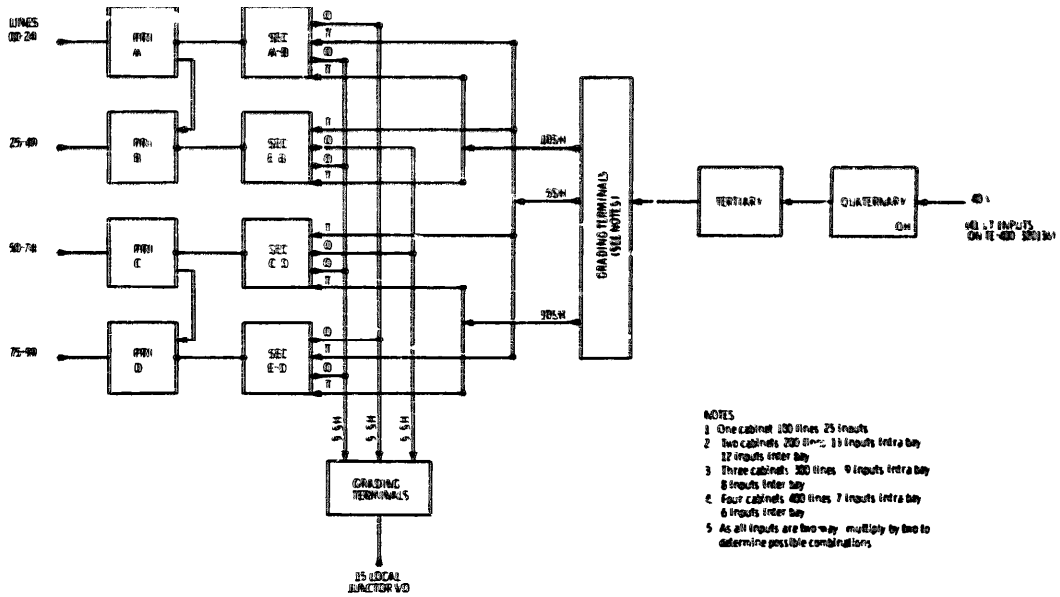

Fig. **12-8. PNPN Matrix Block Diagram.**

grading to the secondary horizontal (SH) outlets.

(b) Strapping information for single and multicabinet systems is provided in Dwgs. 130117 and 329972.

7.0 DC VOLTAGE GENERATION - SEE FIG. 12-10

7.1 The AC input is provided to a step-down transformer located in each cabinet.

Each bay has its own separate rectifier and series regulating (SR) circuits. Bay 1 has the above, plus the control circuits. The control output regulates all power supplies **by** controlling **the** series **regulator** circuits. Thus, the **outputs** of all power supplies of a type (i.e., -18) are paralleled for multibay operation, **and** controlled from **bay** 1. Thus, all **adjustments** (except ±3VDC) are made on bay 1.

7.2 Each **power** supply (-18, +18.5, +36, -36 VDC) has its separate AC input from the transformer secondary to its separate rectifier assembly.

7.3 On TE-400 assemblies 320136, the rectifier assemblies are located on he rear of the cabinet or in the external power cabinet.

7.4 On TE-400 assemblies 130097, the rectifier assemblies are located within the power supply assemblies.

7.5 On TE-400 assemblies 320136 with Internal power, the ±3VDC is derived from the +18 5, -18VDC supplies anti is fused and adjusted from She front of each cabinet.

7.6 On TE-400 assemblies 320136 with external power, the ±3VDC supply is derived as in paragraph 7.5 **but** fuse and **adjustment** location i in She rear of each power cabinet (85924).

7.7 On TE-400 assemblies 130097, the ±3VDC supplies are derived from the +36, -36VDC supply and ate adjusted from the front of each +36, -36VDC supply (Section V, Fig. 5-2).

7.8 The voltage check reference transformer (paragraph '7.1) provides AC outputs to the 316070 voltage check reference circuit that allows the 316010 to supply ±18, ±36, ±56 to the 316089 main alarm and voltage check circuit.

7.9 The outputs of the +18.5, -18, +36, -36 VDC supplies are also supplied to the 316069. The 316069 compares these outputs, and (if within ±10%) provides a ground to the auxiliary relay via the auxiliary relay power signal (APS). With the auxiliary relay operated, a ground is supplied to each *power* relay of each bay. The PR is operated and power is supplied to the system voltage bus **bars.** Each PR has four "C" type contact sets. In the IDLE state (320136 assemblies with external power cabinet 85924 and 130097 cabinet assemblies only), an IDLE load IS provided.

Each contact set is composed of (one each) -18, +18 5, -36, +36 VDC

7.10 If a short is placed upon the DC bus **bars,** the power supply output will fall 10% below its rated output. The 316069 will **detect** this and remove power from the system by removing ground from the APS lead, ultimately removing ground from all PR relays and de-energizing same.

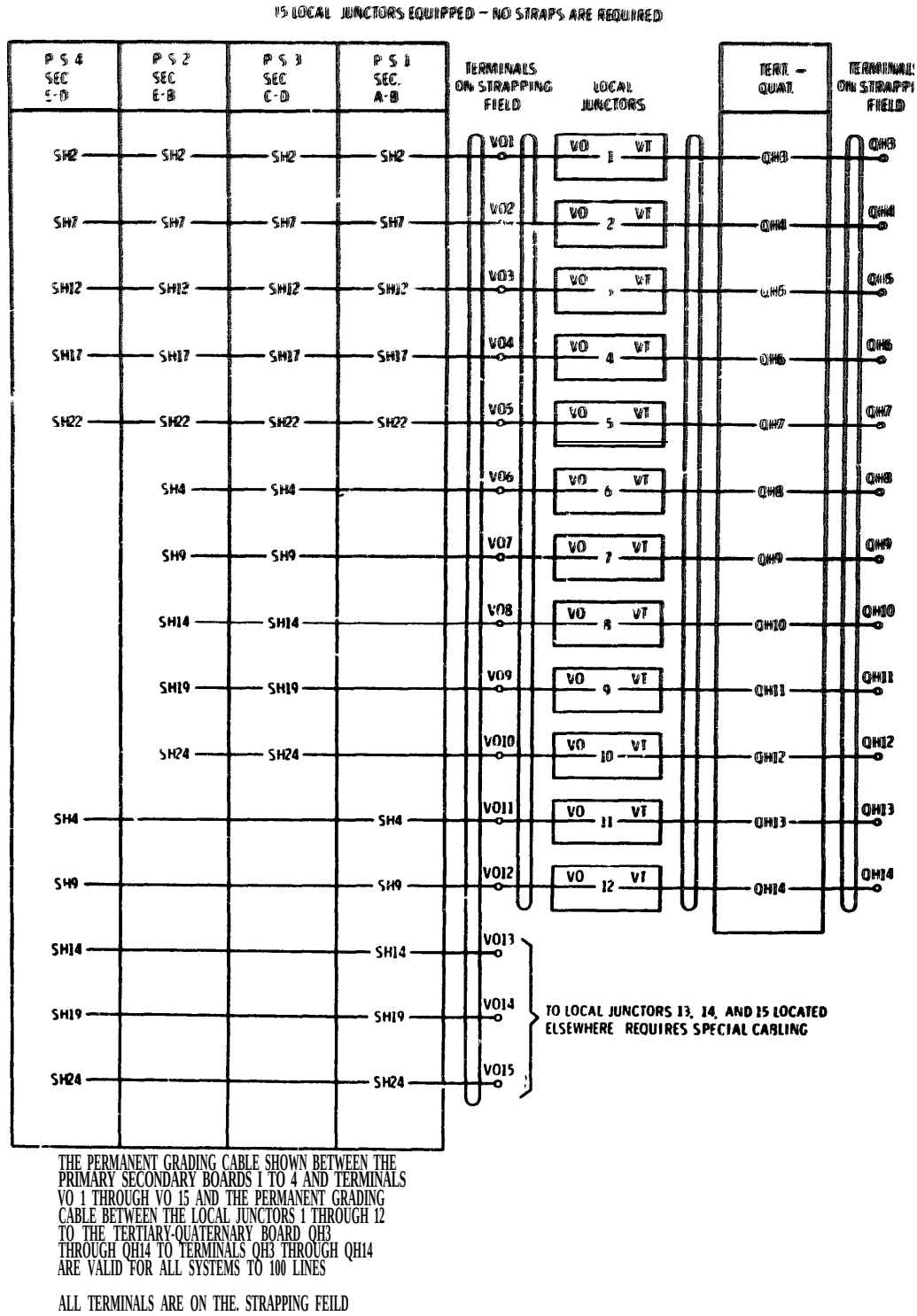

Fig. 12-9 Originating Permanent Grading Cable and Terminal Strapping - 100 Lines.

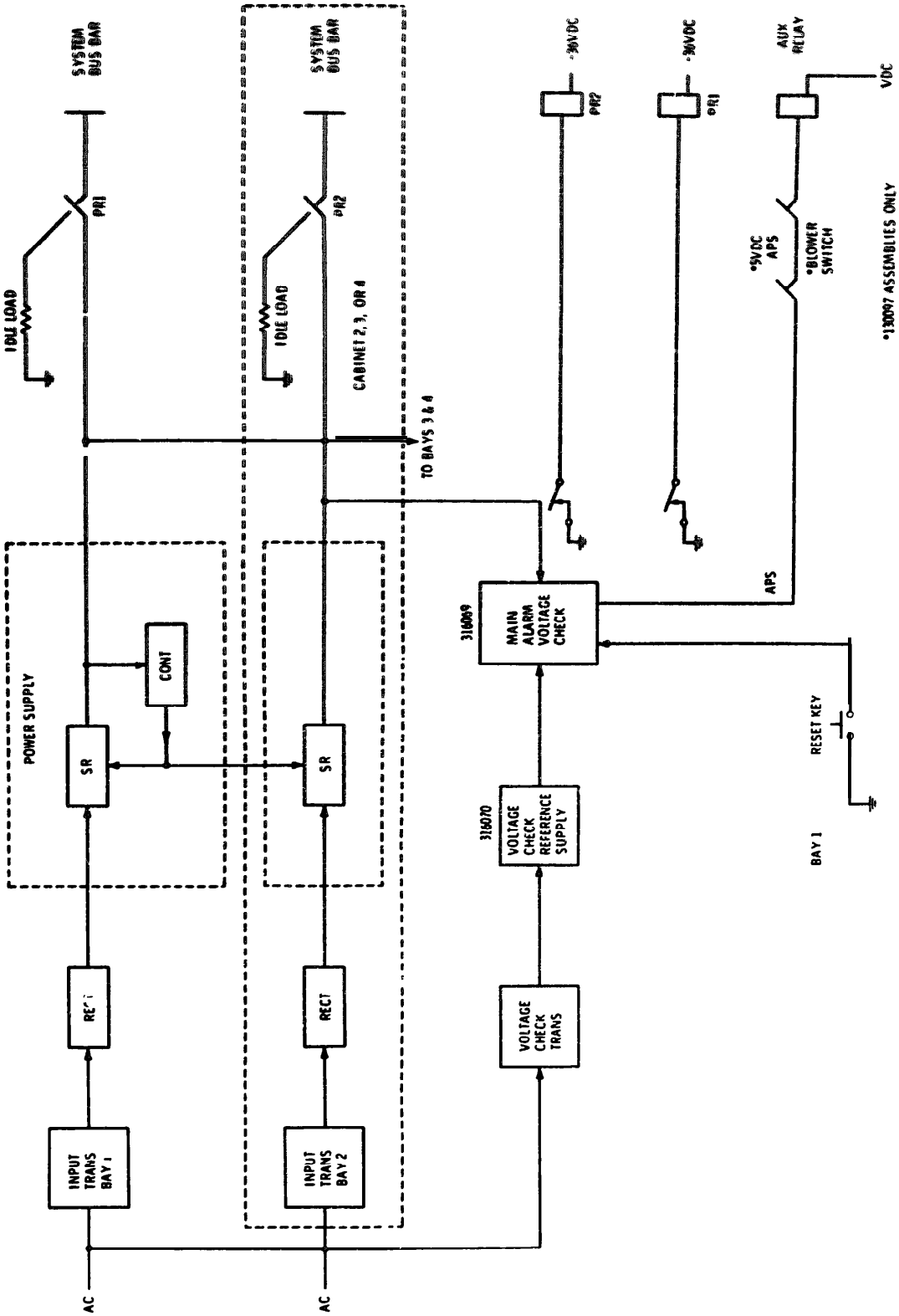

Fig. 12-10 Block Diagram of DC Voltage Generation.

7.11 If the AC input goes beyond limits, the output of the 316070 will vary. Variance greater than ±10% will be detected by the 316069 and power removed as described above. The AC input to the 316070 is fused.

7.12 The APS lead is multiplied through the blower switch and the 5VDC supply on 130097 assemblies only. The DC power is automatically removed when:

(a) blower fails, or
(b) 5VDC power supply fails or is misadjusted.

7.13 The 316069 has adjustments and alarm lamps (paragraph 2.9 and Figs. 5-1 and 5-3 of Section V) corresponding to each power supply. The adjustments are made initially and it may or may not be necessary to readjust them.

7.14 A manual reset is provided.

7.15 A constant voltage transformer is used for the AC input, thus allowing for large line fluctuations.

7.16 Applying an external ground to the APS lead when the PR relay is de- l energized (as in paragraphs 7.10, 7.11, or 7.12) may result in serious damage to the system.

7.17 As noted in Section XI, the power supplies are not interchangeable. A -18VDC (for example) supply for bay 1 has control circuitry and may be Identified by the adjustment potentiometer. For bay 2 the potentiometer and control circuit will not he equipped.

7.18 On the 130097 assemblies, a 5VDC source is equipped. See Section X, paragraph 3.57 for description.

8.0 THREE-VOLT DC SUPPLIES

8.1 The basic functions of the ±3VDC supplies is to provide clamp voltage to the lines, junctors, and all other circuits capable of originating or terminating a call.

8.2 failure of the -3VDC supply usually results in an inability to ring a line.

8.3 Failure of the +3VDC supply usually results in an inability to terminate a call.

NOTE: Termination to any feature circuit is (generally) as described in paragraph 5.0. Certain features do not utilize the VT or seizure as described in paragraph 5.0

9.0 ATTENDANT OVERRIDE

9.1 Each junctor, trunk, or tie line has the following outputs: DIW, DIX, DIY, DIZ. These outputs are connected via a grading pattern to the 316062 attendant override.

9.2 Each junctor, trunk, or tie line has an override voice originate (OVO) or override voice terminate (OVT) lead connected to the 316062.

9.3 When the attendant override button is depressed on the Attendant's console, the console's a T-R is connected to the override circuit, via the OPT lead

9.4 The attendant then key punches the desired station number on the console key pad. This causes the terminate bus to be marked and the line circuit addressed. This provides a positive pulse via the line VO, P-S matrix, junctor VO (or trunk/tie-line VT) to the 316062 via the DIW, DIX, DIY, and/or DIZ leads.

The 316062 will decode the input and cause the OPT lead to be connected to the console T-R.

9.5 A one-second burst of dial tone will be provided to warn the parties of the incoming call.

9.6 If the desired station is not busy, BT will be returned to the Attendant.

10.0 GROUP HUNT - SEE FIG. 12-11

10.1 Each group hunt PCR contains two group hunt circuits. Fig. 12-11 shows only inputs/outputs for one circuit only.

(a) A master group bunt line is assigned. The H's, T's, and U's leads are connected to thee group hunt circuit.
(b) In an idle state, ground is provided to each slave line via the GHA lead. Refer to paragraphs 4.5 and 4.6.
(c) If the master line is addressed, the group hunt circuit is addressed. The following outputs are provided:
(1) GHCR and GHCS to the system allotter to inhibit the trap circuit.
(2) RTA to the system allotter to expand the RIT pulse to 3.32 milliseconds.
(d) The RIT expansion causes the H's, T's, and U's mark to remain for 3.32 milliseconds. If the master line is not busy, it will mark positive on its VO and termination will occur. Refer to paragraphs 4.1, 4.2, and 4.3.

10.2 If termination does not occur, the group hunt will sequentially open each GHA lead (1-2-3-4). If the first slave line is free, it will be marked and will terminate (refer to paragraphs 4.5 and 4 6). If the first slave line is busy, the second slave line may respond.

10.3 If all slave lines are busy, termination will not occur. At the end of 3.32 milliseconds, the junctor or trunk/tie line will detect that termination has not occurred and will provide a busy tone to the originating line.

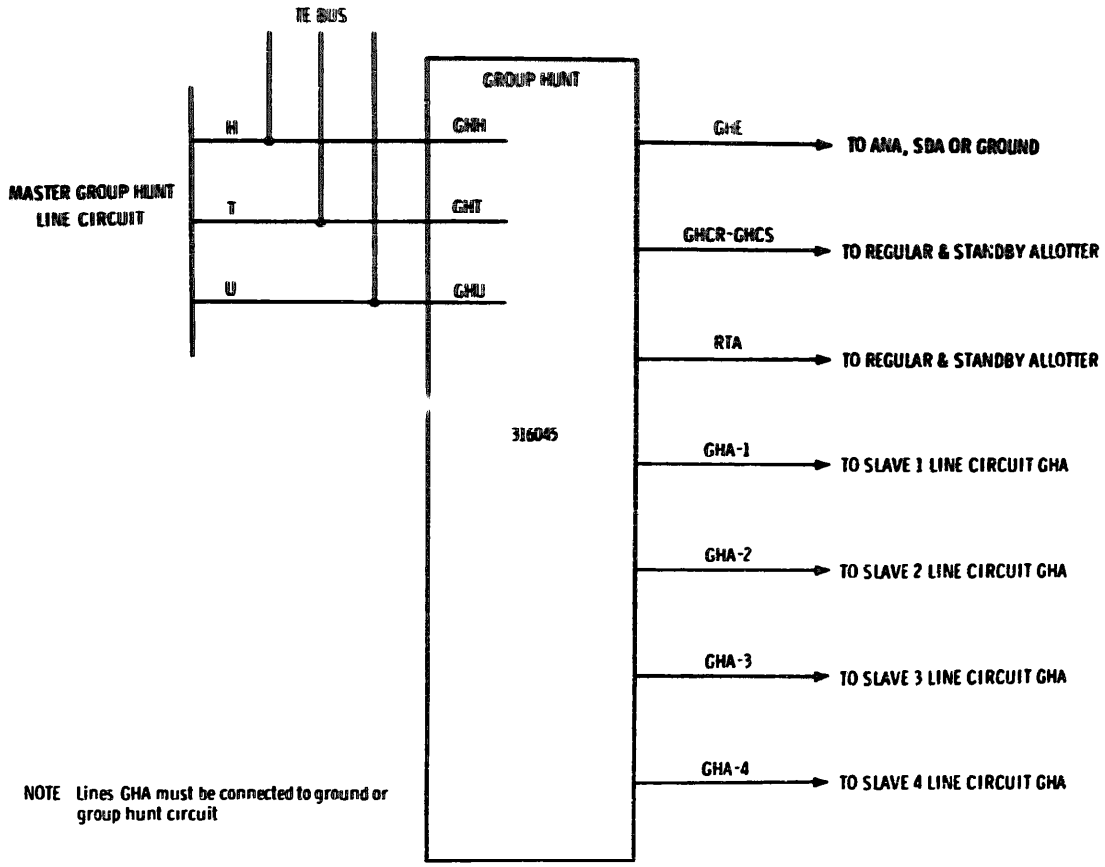

Fig. 12-11 Group Hunt Circuit Block Diagram.

10.4 The fourth slave GHA may be connected to a maximum of 25 line GHA's If it IS marked, all 25 lines will attempt to terminate. One will succeed This will be entirely at random.

10.5 The GHE (group hunt extend) lead will be tied to ground unless it is utilized by the single digit access (SDA) or assigned night answer (ANA) circuits.

Accessing the SDA or ANA circuit (connected to GH via GHE) will then result in addressing the master line as in paragraphs 10.1 through 10 4.

11.0 SINGLE DIGITACCESS (316086)

1 1 . 1 Six lines may be connected to the SDA circuit. These lines may then be addressed by dialing the assigned single digit.

11.2 The call is processed as in paragraphs 3 1, 3.2, 3 3, 3 4. 4 1, 4 2, and 4.3 with the following exception

11.3 The register recognizes the single digit and addresses the SDA circuit with an Ii's and feature mark. This opens the SDA line's GHA lead (as in group hunt), and allows termination to occur as described in paragraphs 3 1, 3 2, 3.3, 3 4, 4 1, 4 2, and 4 3

12.0 AUXILIARY JUNCTOR APPLIQUE CIRCUIT (316079)

12.1 Each junctor's (maximum 12) JB (junctor busy) output IS connected to the 316079. Each 316079 has three AJB (all junctor busy) outputs (one per register)

As long as N out of N+1 junctors are free, the AJB lead will remain at -18VDC

If N+1 become busy, then all JB inputs are at -18 (a free junctor yields a ground on its JB lead) and the AJB output goes to ground.

12.2 If an attempt is made to dial a local subscriber number through the N+1 junctor. busy tone will be returned

12 3 Feature calls will be processed normally

13.0 EXECUTIVEOVERRIDE (EOR)

13.1 The EOR circuit provides the capability of reaching a busy line. The subscriber, who has access to this circuit, will be able to access a busy line via the junctor/trunk/tie line with which the busy line is associated.

13.2 The EOR circuit is permanently associated with the line which is capable of overriding a busy line. A junctor is also assigned to this line, such that this line can only seize this particular junctor which is made not accessible to any other line. This line dials for the desired number in the normal manner. If the desired line is busy, the subscriber with the EOR (Executive Override) feature could dial digit two to access the desired busy line via a set of relay contacts to the junctor associated with the desired busy line.

13.3 As the subscriber with the EOR (executive override) feature goes off hook, the EOR line seizes the EOR applique circuit and EOR junctor. (The common OH input to the line circuits is removed from the executive's line circuit and EOH from the executive applique circuit is connected to the OH terminal of the executive's line circuit. The SOM output of the EOR junctor is isolated from the common SOM terminal of the junctors. With the above arrangement, the EOR line circuit can only seize the EOR junctor.) And, the EOR junctor seizes a register via the R-J matrix in the normal manner. When all the dialed information is stored in the register, termination is ready to take place. The register extends a pulse to the termination side of the junctor. In this case, this pulse is also extended to the EOR applique circuit via terminal MC. During this time slot, the desired line circuit will also be marked by the terminating bus. If the line circuit is busy, this pulse is extended to its junctor and this pulse from the line circuit to the junctor will enable a gate in the EOR junctor adapter circuit. The output of this gate is fed back to the EOR applique circuit via four diodes to operate a set of flip-flops identifying the junctor in which the desired line circuit is located. If the EOR party desires to override, he dials two. This will enable the relays, and a path via the relay contact will be established from the EOR line circuit to the junctor after a burst of warning tone is sent to both parties.

14.0 TRUNK-TIE LINE SEIZURE

14.1 Any trunk or tie line that is accessible by dialing a feature digit(s) must be equipped with a trunk allotter (316034). See Fig. 12-12.

(a) Termination to a trunk feature was described in paragraph 5.0.

(b) Each trunk allotter can allott a maximum of 28 trunks/tie lines. These 28 trunks/tie lines are divided into four trunk groups (TG) for a maximum assignment of seven trunks to each TG.

(c) A trunk/tie line must be allotted before it can be seized directly by a subscriber.

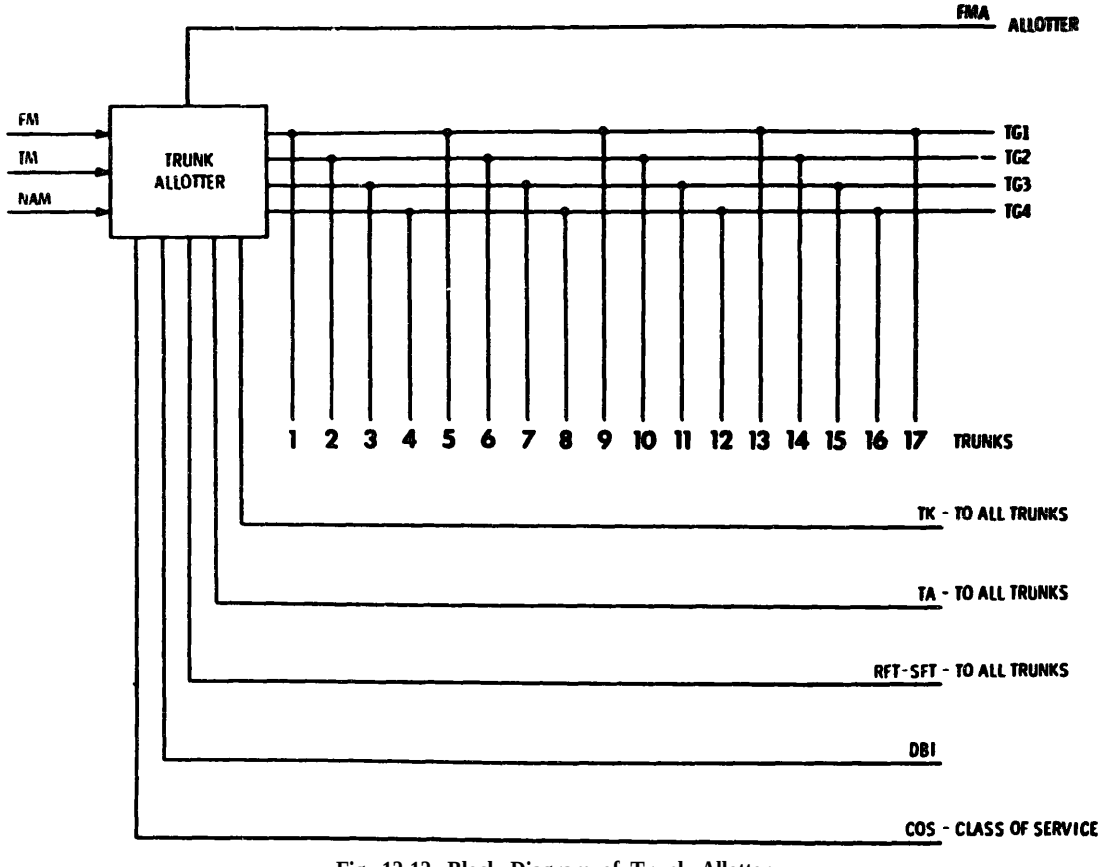

Fig. 12-12. Block Diagram of Trunk Allotter.

(d) The trunks/tie lines are assigned sequentially as shown in Table 12-1.

Table 12-1

Typical Trunk Group Assignment

TG	Trunks
1	1, 5, 9, 13, 17
2	2, 6, 10, 14
3	3, 7, 11, 15
4	4, 8, 12, 16

(e) As the trunk allotter is addressed, it will step sequentially through its four TG's.

14.2 The Allotting of the trunks in each group is described in the following paragraphs:

(a) When power is applied to the cabinet, one of the four leads of the TG will mark negative. This negative pulse will be present on the TG lead of the assigned trunks.

(b) Of the assigned trunks, one will be allotted. This is due to the firing of a four-layer diode on the individual trunk bard.

(c) When tie trunk allotter is addressed via a feature digit(s) (FD) and feature **mark,** RFT and SFT will mark all trunks. The trunk previously allotted will accept this input and mark its VT.

(d) At the same time, the trunk allotter will step to its next TG and mark it negative. The trunk allott lead (TA) of all assigned trunks will mark positive, and a trunk will be allotted.

(e) As the trunk allotter is addressed, the lines class of service is checked. If acceptable, a DBI pulse IS sent to the allotter from the trunk allotter. At the same time, an FMA input IS provided to the system allotter to double the RIT pulse.

14.3 Each TG will always have a first allott, second allott, third allott, etc., trunk. The second will allott if the first is busy, etc.

(a) It IS Important to understand that the first allott, second, etc, may not be in sequence. This is due to the use of four-layer diodes within the trunk. For example: In TG1, trunk 17 could be the first allott, trunk 5 the second, **etc.**

(b) If all trunks within a trunk group are busy, a pulse on the trunk allott overflow (TK) lead will cause any free trunk to allott

14.4 The trunk allotter assembly 316034(2) may be strapped so that a **diode must** be provided to restrict a line **or** a diode is not equipped to provide restriction. This option is not available on TE-400 320136 assemblies

14.5 A NAM input is provided from the unassigned night answer circuit to reallott the trunks for each unassigned night answer call. The NAM pulse will be accompanied by an FM pulse.

14.6 After the originating subscriber seizes the trunk, the central office (CO) trunk will be seized. The central office dial tone will be returned to the subscriber's extension.

15.0 TWO-WAY CITY TRUNKS

15.1 This circuit provides a means of establishing calls between an EPABX extension and the central office. Incoming calls may go through the attendant, or directly from an extension to the central office.

15.2 Functions:

(a) Marks the trunk busy when it is seized by an extension or the city so that the trunk cannot be allotted.
(b) Passes dial pulses to the city.
(c) Provides toll restriction.
(d) Provides trunk hold on incoming calls.
(e) Provides trunk hold on outgoing calls for time and charges information.
(f) Provides a means of transferring the trunk **to** another EPABX extension on either incoming **or** outgoing calls.
(g) Provides for consultation calls, or transferring either incoming or outgoing calls.
(h) Provides unassigned night answer service.
(I) Provides assigned night answer service.
(j) Provides camp-on-busy access.
(k) Provides operator recall on outgoing or incoming calls.
(l) Provides attendant's access with visual and audible indication.
(m) Provides trunk splitting.
(n) Provides a means of releasing if the city abandons the call at any time.
(o) Provides a six-second delay after **the extension goes "on** hook" before the trunk can be allotted.
(p) Provides message registration.
(q) Provides attendant override.
(r) Provides attendant recall on an incoming call if the extension should lose the call for any reason

15.3 The following terms will be used in describing the operation of the two-way **city trunks:**

BZG - Busy Guard Relay
BZ - Buzzer Lead
CT - Cut-Through Relay
L - Dial Relay
SZ - Seize Relay
RU - Ring-Up Relay

T	-	Tip
R	-	Ring
VT	-	Voice Terminate
TSS	-	Trunk Splitting Lead
REX	-	Release Extension
COA	-	Camp On Access
COE	-	Camp On Enable
TH	-	Trunk Hold
LU	-	Lock Up
TJA	-	Transfer Junctor Access
TJR	-	Transfer Junctor Release
TUN	-	Trunk Unassigned Night Answer
ORI	-	Operator Recall Inhibit
SAT	-	Saturate
TL	-	Trunk Lamp
RFT	-	Feature Terminate
SFT	-	Feature Terminate
TG	-	Trunk Group
TA	-	Trunk Allott
OVT	-	Override Voice Terminals

15.4 The following paragraphs describe the general operation of two-way city dial trunks for both loop and ground start operation.

15.5 City originates call to EPABX.

(a) The city placer ground on the tip of the EPABX trunk.

(b) The BZG relay operate@.

(c) -18 volts is extended to lead BZ-1 to cause the attendant's buzzer to sound.

(d) The trunk is marked busy to prevent it being allotted end seized by an EPABX extension.

(e) The Attendant's trunk lamp button flashes bright at 120 ipm.

NOTE: 15.5 (a) and (b) for 316075 trunk only.

15.6 Attendant answers the incoming call.

(a) The Attendant depresses the flashing trunk button.

(b) The trunk is held in a busy state to prevent it from being allotted and seized by an EPABX extension.

(c) The Attendant trunk lamp button changes from bright flashing at 120 ipm to bright steady. The console's talk city lamp cornea on.

(d) The COB circuit is accessed (if a COB is idle).

(e) The Attendant may now converse with the city party via the TC lead, XR2-2 relay contacts, and T1.

15.7 The Attendant terminates a city call to an EPABX extension.

(a) The Attendant keys-in the desired EPABX extension via the Attendant key sender. These digits are stored by both the Attendant's and the COB storage circuits. When all the digits have been stored, the Attendant's control circuit during its allott period marks the desired extension and extends a negative pulse to the trunk via the PU lead.

(b) The trunks VT lead is marked negative.

(c) If termination is complete, the extension and the trunk will be connected together via the four-layer diode matrix and ring tone will be sent to the line.

(d) The ring back tone is sent to the city party and the trunk is held in a busy state.

(e) The Attendant may now release from the trunk if it is desirable, or may remain connected to the trunk to announce the call.

(f) If the Attendant releases from the trunk, the trunk lamp button will change from bright steady to dim 60 ipm to indicate a ringing condition.

Text EPABX extension answers.

(a) The trunk senses the answer condition.

(b) The Attendant's trunk lamp button changes from dim 60 ipm to dim steady if the Attendant has released from the trunk; otherwise, the Attendant's trunk will remain bright steady.

(c) The trunk is held in a busy state. The ring tone and ring back tone are turned off.

(d) If the Attendant remained connected to the trunk, a negative signal is sent to the Attendant's control via the TSS lead to operate the automatic trunk splitting circuits. The automatic trunk splitting circuit will hold the trunk speech gate off via the SAT lead. The Attendant may converse with the EPABX extension via t&e TE lead without the city party overhearing the conversation. The trunk speech gate will turn on when the Attendant releases from the trunk, allowing the EPABX extension to converse directly with the city party. If the Attendant released from the trunk while the trunk was in the ringing condition, the trunk speech gate will turn on as soon as the EPABX extension answers.

With the EPABX extension having answered the call, the trunk digit stores are enabled, making operator recall and transfer junctor features available to the extension as soon as the incoming trunk call is answered.

15.9 Release Extension

If the extension keyed by the Attendant does not answer, the Attendant depresses the REX button on the turret. This places a timed negative pulse of approximately one-half second duration on the REX lead, causing the trunks VT lock-up path to be interrupted. This allows the trunk to release the unanswered extension by removing matrix holding current.

NOTE: The only time an extension can be released using the REX button is while the extension is in a ringing or busy condition.

15.10 The COB terminates the city call to an EPABX extension.

(a) If the extension to which the Attendant wishes to terminate

the trunk is busy, the Attendant may place the trunk in a camp-on-busy (COB) condition by depressing the COB button on the Attendant turret.

(b) When the Attendant enters a trunk to service an incoming call, a negative pulse is sent to the COB circuit via lead COA. This causes the COB circuit to mark lead COB 1 or COB 2 positive, seizing the associated circuit.

(c) If the call is completed in the normal manner, the COB circuit will be released.

(d) If the extension is busy and the Attendant operates the COB button, the COB circuit is set via the COE-1 lead. The Attendant's trunk lamp button changes from bright steady to dim 120 ipm.

(e) The L relay remains operated, holding the loop to the city closed. Thus, the trunk, in effect, is in a hold condition under control of the COB. The COB circuit will mark the COB-1 or COB-2 leads positive, causing an attempt to mark the trunks VT lead. However, as long as the Attendant is in the trunk, the signal is inhibited.

(f) The Attendant may now release from the trunk. Every five seconds, the COB circuit will cause the trunk's VT lead to be marked negative. At the same time, the COB attempts to mark the extension.

(g) When the extension becomes idle and both the trunk and extension are marked, they will be fired together via the four-layer diode matrix. The trunk's sensing stages will detect this and:

(1) Send a ring tone to the extension.
(2) Cause the COB to be released.

The Attendant's trunk lamp button will change from dim 120 ipm to dim 60 ipm, indicating the ringing condition.

The call will now proceed as a normal call.

(h) If the Attendant should key in the wrong number or desire to change the number, the COB circuit must be released to clear the COB storage circuits. The Attendant operates the REX button which sends a timed (one-half second) negative pulse to the trunk via the REX lead. When the REX pulses negative, the COB is reset.

(i) If the city party should abandon the call while the trunk is under control of the COB circuit:

(1) The trunk will release because the loop has been opened.
(2) The COB is reset, thus releasing the COB circuit.
(3) The hold condition is removed.
(4) When the six-second timer times out, the trunk will return to an idle condition.

(j) If the Attendant should re-enter the trunk while it is under control of the COB circuit, the COB enable flip-flop will be reset via the LU lead. The Attendant's trunk lamp button will change from dim 120 ipm to bright steady. If another extension is desired, the REX button should be operated in order to clear the COB storage circuits.

If the city party wishes to hold the extension for a longer period, the Attendant must re-operate the COB button before releasing from the trunk.

15.11 Operator Recall

(a) If it is desired, the EPABX extension may recall the Attendant by dialing the digit 3 or above.

(b) The operator recall is set.

(c) A negative voltage is sent to the BZ lead to sound the Attendant's buzzer.

(d) The Attendant's trunk lamp button for that trunk switches from dim steady to bright 120 ipm.

(e) As the Attendant enters the trunk, the BZ lead returns to ground, disabling the Attendant's buzzer.

(f) The trunk is now under control of the Attendant who can talk with both the extension and city party.

(g) The Attendant's lamp button for that trunk switches from bright 120 ipm to bright steady.

NOTE: Since there is an extension in the trunk, COB is not accessed when the Attendant enters the trunk.

(h) The Attendant may now transfer the call to another extension or release from the trunk, placing the trunk beck under control of the extension. If transfer is desired, the party requesting the transfer must go "on hook" after contacting the attendant.

15.12 Trunk Hold

(a) Any time after the Attendant enters a trunk, the trunk may be placed in a trunk-hold condition by depressing the trunk-hold button at the Attendant's turret.

(b) Depressing the trunk-hold button places a ground on the TH lead. The L relay is held operated, and the loop to the city is held.

(c) Each time the Attendant enters a trunk and the trunk is in a hold condition, the trunk is reset via the LU lead.

(d) The main functions of the hold condition are:

(1) To hold an incoming call while the Attendant is busy with something else.
(2) To obtain time and charges from the central office operation.

(e) The trunk lamp button will only give an indication of a trunk hold condition when the attendant has released from the trunk and there is no EPABX extension in the trunk. The lamp indication is a dim wink.

15.13 Transfer Junctor Access

(a) When desirable, the EPABX extension connected to the trunk may initiate a consultation call after answering an incoming trunk call, or ten seconds after the last digit was dialed on an outgoing trunk call by dialing the digit one. This causes the transfer to be accessed.

(b) The digit one is detected, causing one of the four-layer diodes connected to TJA 1 or 2 to fire (if a transfer junctor is available). When one of the diodes has fired, the circuit is held marked.

(c) The speech gate circuits are turned OR.

(d) If a transfer junctor has been seized, the dial tone will be passed to the trunk VT lead via one of the marked four-layer diodes.

(e) The transfer junctor and system register. The trunks VT lead is now held marked by two circuits:

(1) The normal hold path which is under control of the extension connected to the trunk.

(2) The transfer junctor.

(f) The city trunk speech gate IS turned 'off l *

15.14 Extension dials into transfer junctor.

(a) The extension connected to the trunk may now dial the number of the desired EPABX extension. Dial pulses are passed to the transfer junctor via the TJA lead.

(b) If the extension should dial the wrong digit, the extension may cancel the call by momentarily going "on hook," releasing the transfer junctor During the time the extension is 'on kook," the trunk is held marked by the transfer junctor for approximately ten seconds When the extension goes "off hook," again the transfer junctor will be released, making it necessary to dial digit one again to reseize the transfer junctor

NOTE: Do not use this feature after the last digit has been dialed.

(c) When dialing is completed, the transfer junctor will send a pulse via the TJA lead to the trunk which sets the transfer terminate flip-flop This removes the hold condition placed on the trunk by the transfer junctor when the transfer junctor was accessed The trunk's VT lead is now under control of the extension connected to the trunk

(d) The digit stores in the trunk are now enabled.

(e) If the called extension is busy, the transfer junctor will send a busy tone to the trunk.

(f) To release the transfer junctor it is necessary to dial the digit one.

(g) If the called extension is idle, the transfer junctor will send a ring back tone to the trunk.

(h) If the called extension is not answered, it is necessary to dial the digit one to release the transfer junctor.

15.15 Extension in transfer junctor answers.

(a) When the extension in the transfer junctor answers, the called and calling parties may converse without the city party hearing the conversation.

(b) The city party may be included in the conversation by the extension in the trunk dialing the digit two.

(c) The digits are stored in the digit stores of the trunk. The transfer junctor conference circuit will be set, and turns the city speech gate on. The city party is now included in the conversation.

15.16 Transfer Junctor Release

(a) The extension connected to the trunk may release the transfer junctor at any time after termination by dialing the digit one.

15.17 Transfer

(a) During a consultation call, it may be desirable to transfer the extension connected to the transfer junctor to the trunk (placing this extension in control of the trunk). The extension connected to the trunk goes 'on hook." This signal is sent to the transfer junctor via the TJA lead. The extension IS released from the trunk.

(b) After approximately a one-second delay and during the transfer junctor's allott period, the transfer junctor releases the extension connected to the transfer junctor and extends a pulse to the trunk to mark the trunk's VT lead.

(c) If the attempt to transfer is not successful, the extension will be reconnected to the transfer junctor. During the next allott period, the transfer junctor will be released as described previously Since there is no extension connected to the trunk's VT lead, the trunk will clear to an idle condition. If the original call was an incoming call, the trunk will be reseized by the city.

(d) If the attempt to transfer is successful, the extension will be connected to the trunk, placing the trunk under control of the transferred extension During the next transfer junctor allott period, the transfer junctor will be released as described previously.

NOTE: Do not attempt to transfer until after the extension connected to the transfer junctor *answers.*

15.18 **Unassigned Night Answer (UNA)**

(a) If for any reason the Attendant's turret is left unattended, the unassigned night answer (UNA) may be turned on (at the Attendant's turret), giving any EPABX extension the capability of servicing an incoming trunk call.

(b) When the trunk is seized by an incoming call, the BZG relay is operated, and a negative signal is sent to the UNA circuit via the RU lead which actuates an audible or visual alarm, indicating an incoming trunk call.

(c) Any extension may answer the trunk call by dialing the UNA feature digit. The UNA circuit will mark the trunk's VT lead via the TUN lead. The extension and the trunk will be connected together through the four-layer diode matrix. The trunk is now under control of the extension.

(d) Operating the UNA key places a ground on the ORI lead. Thus, with the trunk is **the UNA condition, the operator** recall feature is inhibited.

15.19 Assigned **Night Answer (ANA)**

(a) If for any reason the attendant turret is left unattended, the assigned night answer (ANA) may be turned on (at the attendant's turret). **A** preass**igned extension now has** the capability of servicing the incoming trunk call.

(b) When the trunk is seized by an incoming call, a **negative signal** is sent to the ANA circuit via the RU lead. The ANA circuit will mark the trunk's VT lead during its allotter period via the PUA lead. At the same time. the preassigned extension is marked, causing the extension and trunk to fire together via the matrix. This is detected by allowing a ring signal to be sent to the extension and a ring back signal to the city party. The VT lead IS now held marked. When the **ANA** circuit was turned on, a negative signal was extended to the trunk via the ANF lead.

(c) When the extension answers, the VT lead moves to +l volt. The trunk **is** now under control of the extension.

(d) If the city abandons the call **before the** ANA **extension** answers and the extension is in a ringing condition, the **extension will be released**

(e) Operating the ANA key places a ground on the ORI lead. Thus, with the trunk in the ANA condition, the operator recall **feature is inhibited.**

15.20 Trunk Allotted (See Paragraph 14.0)

(a) Only a trunk that has been **allotted may be** seized by an extension **attempting to make a call to the city Refer to Fig. 12-12**

(b) For a trunk to be allotted, either lead TC or TK must be negative and lead TA positive, This **will allow the** trunk **to be allotted. The trunk is now under control of the trunk allotter for outgoing calls**

15.21 **Extension originates call to city.**

(a) When an extension with the proper class of service dials the trunk feature digit, the trunk allotter places ground on leads RFT-SFT. This marks the VT lead of the allotted trunk. The Extension which dialed the feature digit will now be connected to the trunk via the matrix, placing the trunk under control of that extension.

(b) The trunk is now marked and the trunk busy lamp is turned **"on."** The tr**unk lamp bu**tton turns "on" dim steady.

(c) The ten-second timer is primed.

(d) The L relay is operated.

(e) When the L relay is operated, ground is placed on the trunk's R lead.

(f) The city equipment responds by placing ground on the trunk's T lead operating the BZG relay.

(g) The CT relay now operates, closing the loop to the city which operates the SZ relay and C relay

(h) When the C relay is operated, the speech gate to the city is turned on and the ten-second **timer is now enabled and starts to time** out. With the loop to the city closed **and the speech gate on, the EPABK extension** will hear a dial tone from the city.

(I) The EPABX extension may now dial the city number.

(j) The C relay releases at the start of **each digit and re-**operates 300 milliseconds after the last dial pulse **of** each **digit. This shorts out the T1 transformer during dialing and resets the ten-second timer; therefore, the inter-digit time is always ten seconds.**

(l) **When the ten-second timer times out, the L relay is held** operated, preventing **any more dial pulses to be** passed **to the** city. **Also, the trunks digit stores are enabled, making operator recall and transfer junctor features** available **the extension.**

15.22 Attendant originates call to city

(a) The Attendant may originate a call to the city by depressing the trunk button of any idle trunk

(b) **Ground IS extended to the trunk via the K lead to operate the KR relays which are then held operated by a ground** on **the LU lead**

(c) The L relay operates via ground on the S lead.

(d) Ground is extended to the city on the R lead, and the city returns ground on the T lead, operating the BZG relay With the BZG relay operated, the CT relay will operate, closing the loop to the city which operates the SZ **relay and the C relay**

(e) Dial pulses are passed to the city via the S lead and L1 relay contacts

NOTE 1: **The Attendant cannot access the trunk's digit stores; therefore, the transfer junctor is not available to the Attendant**

NOTE 2: The Attendant does not enable the ten-second timer.

15.23 Release City (RC)

(a) If the Attendant should dial the wrong digit when dialing a city number, the city may be released and reseized by depressing the RC button.

(b) Ground is removed from the S lead, allowing the L relay to release. Thus, the loop to the city is open, allowing the city equipment to release.

(c) When the RC button is released, the city will be reseized as described above.

15.24 Attendant Transfer of an Extension to a Trunk

(a) The Attendant may transfer an EPABX extension from the attendant's feature circuit to a trunk by depressing a trunk lamp button of an idle trunk.

(b) The operation of the trunk is the same as in paragraph 15.21 with the exception that during the attendant's feature allott period, the trunk's PU lead is marked negative causing the trunk's VT lead to be marked via the PU lead. This connects the extension that was in the attendant's feature to the trunk. Thus, an extension that is restricted from making a trunk call is now connected to a trunk.

(c) The Attendant may dial the city number for the extension and release the extension from the trunk, or the Attendant may release from the trunk and allow the extension to dial the city number. However, as long as the Attendant is connected to the trunk, the L relay is under control of the Attendant, and the extension cannot signal the city. The extension is inhibited from operating the L relay.

(d) When the extension entered the trunk, the ten-second timer was enabled. Thus, the first digit must be dialed within ten seconds.

NOTE: The Attendant should not place the trunk in a hold condition until the city answers.

15.25 Toll Restriction

(a) When the class of service for an extension can make only limited city calls, the toll restriction circuits will monitor the information dialed to the city.

(b) When a trunk is allotted, ground is extended to the toll restrictor via the TRA lead. If a toll restiction circuit IS not available, the trunk is inhibited from being marked via the TRA lead when a restricted extension dials the trunk feature digit.

(c) When the trunk IS seized by a restricted extension, the toll restriction circuit IS seized via the TRF lead.

(d) As the extension dials into the city, the first three digits are passed to the toll restriction circuit via the TRH lead If the first three digits are an unrestricted code, the call will proceed normally. If, however, the code is restricted, the toll restriction circuit will inhibit the L relay from operating via the TRG lead and extend a busy tone to the trunk's VT lead via the TRJ lead.

15.26 Attendant Override

(a) If the Attendant wishes to converse with a busy EPABX extension, the Attendant may initiate an attendant override. If the busy extension is connected to a trunk, the level of the VT lead will move from +1V to approximately +4V, causing the DIW, DIX, DIZ, and DIY leads to be marked.

(b) The override circuit recognizes these signals and connects the Attendant to the OVT lead of the proper trunk, thus allowing the Attendant to converse with the EPABX extension.

15.27 Reverse Battery Supervision Detection (City Answer Detection)

(a) Some types of CDO, during a heavy traffic period, will be seized and connected through to the EPABX; however, there may be a period of waiting for a CDO register to become available. This watting period may be longer than the time-out period of the ten-second timer. In this case, the extension would hear a dial tone from the city when the register became available but would not be able to dial the city number due-to the timer having timed out, locking the L relay operated. This option provides a resistor, diode, relay combination to detect the answer supervision sent from the central office.

(b) The ten-second timer circuit is inhibited until the CDO party answers. This operates the RB detection relay and the timer starts to time out. The inhibit network on the timer also changes its time-out period to approximately 500 milliseconds. After the timer times out, the circuit operation IS as described.

NOTE: All the components necessary for this option are mounted externally to the standard trunk printed circuit boards.

15.28 Optional CT Relay Control

(a) When the local connector in the central office is of the type (the same as or similar to the Bell System's No. SD 31656 local connector) that places battery on the tip ("T" lead) of the city trunk and when the local connector is i e g tripped by the city trunk, strapping option "A" must be equipped as described in Note 8 on Dwg. 316075( )66.

(b) This option allows the CT relay control flip-flop to be set approximately 16 milliseconds after the L relay is operated as opposed to the normal operation.

(c) This change in timing is required to insure the CT relay control flip-flop is s before the BZG relay is released by the battery applied to the tip ("T" lead) by the local connector.

15.29 **Loop Trunk Comparison**

(a) **Operation of the loop start trunk is similar to operation of the ground start city trunk.**

(b) **A ring up (RU) relay is provided on the loop start trunk instead of a busy guard relay.**

(c) **If a city party abandons a call while the loop start trunk is in the ringing condition, and the Attendant has released, the trunk will release if the city trunk has first party release. If the city trunk has last party release, the Attendant must re-enter the trunk to effect release.**

This is not true on the **ground start trunk. It will re**lease in either case.

(d) **If an incoming call, with a ground start trunk, should be** lost (for any reason) **after it has been terminated to an EPABX station, the operator will be recalled in** approximately 15 seconds.

This does not apply to the **loop start trunk. The call** will be lost in this case.

16.0 TWO-WAY DID LOOP TIE TRUNK (LOOP SIGNALING) AND E&M TIE TRUNK (E&M SIGNALING) OPERATION

16.1 General

Refer to paragraph 2.0, Section X, for trunk assembly numbers

16.1.1 The following descriptions of DID trunk circuit operation **were written** basically concerning the loop signaling type **trunks;** however, **there** IS no difference in the operation of the trunk **circuit when** using E&M signaling types.

16.1.2 **Purpose** of Circuit - **The** DID **trunk circuit provides** a means of establishing a **call between an** EPABX **extension and the central office (CO) Outgoing calls may go through the attendant or directly from an EPABX** extension to the **CO. Incoming calls can go directly to an EPABX extension if the outside party dials the extension number after dialing the city number assigned to the EPABX**

16.2 City Originates to EPABX

16.2.1 **The city places a resistive loop on the tip and ring (T and R) of the trunk which operates the INC relay.**

16.2.2 **The trunk IS marked busy to prevent it from being allotted and seized by an** EPABX **extension**

16.2.3 **The attendant's trunk lamp button turns "on" dim steady** via **the TL lead, indicating the trunk is busy.**

16.2.4 **The trunk is now held busy to prevent the trunk from being allotted**

16.2.5 **Accessing a Register for an Incoming Call**

(a) **If a register is idle it is accessed via the RS leads.**

(b) **The fact that a register has been accessed by the trunk is detected.**

(c) **Dial pulses sent from the city are detected and passed to the register via the RS lead to the register**

(d) If a register had not been accessed by the time the first **dial pulse** is received from the city, a register may not **be** seized should one become idle.

(e) If the register was not accessed **the busy** tone gates are enabled, thus allowing busy tone to be sent to the city party.

(f) Second Dial Tone (optional) (See Table 2-3, Section II).

When register access is detected, the second dial tone flip-flop IS set. The C relay is operated, removing the resistive shorts from across T1; idle period termination IS removed, **and** the dial tone gates are enabled sending dial tone to the city.

16.2.6 **Register Termination of the Call to an** EPABX **Extension**

(a) **When the register has received** all **the digits from the** city, the register sends a terminate pulse approximately 1 6 millisecond **duration to the trunk via the RS lead. This IS detected and causes the trunk's VT lead to be** marked negative. At the same time, **the** register will **cause the desired line circuit to mark positive on its VO lead. If the extension is idle, the extension and the trunk will be fired together via the four-**layer diode matrix. **This causes the trunk's VT lead to ascend to approximately +1V then descend to ap-**proximately -5V.

(b) **The inhibit on the ring signal is removed**

(c) **The VT level detectors detect that an extension has been fired to the trunk and causes ring signal to be sent to the** EPABX extension **via the trunk's VT lead, T-Q, and P-S matrix.**

(d) **The busy tone gates are inhibited**

(e) **Ring back tone is sent to the city**

(f) **The trunk's VT lead is held marked.**

(g) **The attendant's trunk lamp button will flash dim 60 ipm, indicating an extension is being rung**

(h) **The reset condition is removed from the reverse battery (RB) relay control flip-flop**

(i) **If the desired extension is busy, the terminate pulse will be sent to the trunk, causing the trunk's VT lead to be marked. However, the extension will not be fired to the trunk; thus, the VT level will go to approximately -18V for the duration of the terminate pulse. At the end of the terminate pulse, the register terminate flip-flop is set This** removes **idle period termination, operates the C relay, and enables the busy tone gates, allowing busy tone to be sent to the city.**

16.2.7 **EPABX Extension Answers**

(a) When the extension answers, the VT lead potential rises from approximately -5V to +1V. The +1V level is set by potentiometer 3R4.

(b) The VT level detectors sense the answer condition.

(c) Ring signal and ring back tones are turned off.

(d) The attendant's trunk lamp button changes from dim 60 ipm to dim steady via the TL lead

(e) The trunk's VT lead is held marked

(f) The trunk is held in a busy state

(g) The reverse battery (RB) relay control flip-flop is set (operating the reverse battery supervision relay).

NOTE: The L relay will operate at this time; however. it will have no effect on the circuit as the OTG relay is not operated.

(h) When the RB relay operates:

(1) The C relay IS held operated and under control of the RB relay

(2) The trunk's digit stores are enabled, making operator recall and transfer junctor features available to the EPABX extension if the trunk circuit is so equipped

(i) The speech gate to the city IS turned on''

(j) Idle period termination IS held off

16.3 Transfer Junctor Access (Optional) - See Table 2-3, and Paragraph 15 13

16.4 Extension Dials Into Transfer Junctor - See Paragraph 15 14.

16.5 Extension in the Transfer Junctor Answers - See Paragraph 15.15.

16.6 Transfer Junctor Release - See Paragraph 15.16

16.7 Transfer

(a) During a consultation call. it may be desieable to transfer the extension connected to the transfer Junctor to the trunk (placing this extension in control of the trunk) The extension connected to the trunk goes "on hook' This signal IS sent to the transfer junctor via the marked four-layer diode and the extension is released from the trunk

(b) After approximately a one-second delay and during the transfer junctor's allott period, the transfer junctor:

(1) Releases the extension connected to the transfer junctor.

(2) Extends a pulse to the trunk to mark the trunk's VT lead via the marked four-layer diode

(c) If the attempt to transfer is successful, the extension will be connected to the trunk, placing the trunk under control of the transferred extension During the next transfer junctor allott period, the transfer junctor will be released as has been described

(d) If the attempt to transfer is not successful, the extension will be reconnected to the transfer junctor and during the next allotter period the transfer junctor will be released as has been described.

The trunk will then take one of the following actions:

(1) If an EPABX extension initiated the call, the trunk will clear down to an idle condition and the call will be lost

(2) If the city initiated the call, the trunk will provide a -18VDC voltage to the BZ lead to sound the attendant's audible alarm. The attendant's trunk lamp button switches from dim steady to bright 120 ipm via the TL lead. indicating a request for service by that trunk. When the attendant enters the trunk, the trunk IS reset. the operator recall is reset. the trunk is now under control of the attendant and may be serviced as described later.

(3) If the city party hangs up before the timer times out, the trunk will be reset, the timer will not time out, and the trunk will clear down to an idle condition.

NOTE 1: Do not attempt to transfer until after the extension connected to the transfer junctor answers

NOTE 2: If the trunk circuit is not equipped with an attendant access circuit and an attempt to transfer IS not successful, the trunk will clear down to an idle condition when the transfer junctor IS released and the call IS lost

16.8 Operator Access (Optional) - See Table 2-3, Section I I

16.8.1 **Dial Zero Operator Recall**

(a) If it is desired, the EPABX extension may recall the attendant by dialing the digit 3 or greater, after answering an incoming call or ten seconds after the last digit was dialed on an outgoing call

(b) The dial pulses are detected and passed to the digit stores

(c) At the start of the first dial pulse, the reset condition IS removed from the digit stores, allowing the digits to be passed to the digit stores As the third pulse comes in to the stores, it IS detected and inhibited so that no more pulses are sent to the stores

(d) A negative voltage is sent to the BZ lead to sound the attendant's audible alarm

(e) The attendant's trunk lamp button switches from dim steady to bright 120 ipm via the TL lead, indicating a request for service by that trunk.

16.8.2 Extended Ringing

16.8.2.1 When an incoming call has been terminated to an extension and the extension is ringing, the ring signal gates were enabled, removing the negative voltage necessary to hold the timer circuit recovered; thus, as soon as the EPABX extension starts ringing, the timer starts timing for 30 seconds If the timer times out before the extension answers, the operator will be recalled.

This disables the ring signal gates after a short delay, which allows the timer to recover, cuts off ring signal to the extension, ring back to the city party, and drops the matrix connection to the extension. With the operator recalled:

(a) -18V is extended to the BZ lead to cause the attendant's buzzer to sound

(b) The attendant's trunk lamp button changes from dim 60 ipm to bright 120 ipm via the TL lead, indicating a request for service by that trunk. The attendant may now service the call as described later

NOTE: After the operator IS recalled and the ringing gates are disabled. the city party will not hear ringback tone The city party's phone is quiet until the attendant enters the trunk.

16.8.3 Attendant answers a request for service

16.9 Operator Recall

16.9.1 There are three operator recall conditions

(a) Dial zero operator recall This IS when an extension connected to the trunk dials the digit three or greater as has been explained in paragraph 16.8.1

(b) Recall for extended ringing as explained in paragraph 16 8 2

(c) Recall for a lost transfer call as explained in Step (d) of paragraph 16 7

16.10 Recall Circuit Operation

(2) The attendant depresses the flashing trunk button, causing the trunk's KR relay to operate by placing a ground on the K lead The KR relays are then held operated by a ground on the LU lead

(b) The L relay IS held operated via the S lead

(c) The operator recall IS reset by a ground through KR1-2 relay contacts

(d) The negative voltage is removed from the BZ lead.

(e) The attendant's trunk lamp button switches from bright 120 ipm to bright steady via the KR1-2 relay contacts and the TL lead.

16.11 If the request for service is a dial zero operator recall, the attendant may now talk with both the extension and the city party, or either separately, by depressing the talk city (TC) button or the talk extension (TE) button The trunk is under control of the attendant; the attendant may now transfer the call to another extension (when the first extension hangs up) or release from the trunk, placing the trunk back under control of the extension. If the attendant is to extend the call to another extension, the extension connected to thee trunk must hang up The "on hook" condition is' sensed by the VT lead level detectors; the extension is released from the trunk by removing the holding current from the four-layer diode matrix. This puts the attendant incomplete control of the trunk

(a) The attendant may now extend the call to an extension by punching the extension's number into the key sender 'These digits are stored by the attendant's storage circuits When all the digits have been stored, the attendant's control circuit during its allott period, will mark, the described extension and extend a negative pulse to the trunk via the PU lead

(b) The trunk's VT lead is marked negative -18V via the PU lead

(c) If the desired extension is idle, the extension and the trunk will be connected together via the four-layer diode matrix This causes the trunk's VT lead potential to increase to approximately +1V, then decrease to approximately -5V

(d) The VT level detectors cause ring tone to be sent to the EPABX extension via the trunk's VT lead, T-Q, P-S matrix

(e) Ring back tone is sent to the city party

(f) The trunk IS held in a busy state

(g) The trunk's VT lead is held marked

(h) The attendant may now release from the trunk if it is desirable since the trunk is now under control of the ringing gates If the attendant does release from the trunk, the trunk lamp button will change from bright steady to dim 60 ipm via the TL lead

(i) When the extension answers, the VT lead moves from approximately -5V to +1V The +1V level is set by potentiometer 3R4

(j) The VT level detector senses the answer condition

(k) The attendant's trunk lamp button changes from dim 60 ipm to dim steady if the attendant has released from the trunk, otherwise, the attendant's trunk lamp will remain bright steady

(l) The trunk's VT lead is held married

(m) Ring signal and ring back are turned "off."

(n) A negative signal is sent to the attendant's control via the TSS lead to operate the automatic trunk splitting circuits if the attendant is still in the trunk. The automatic trunk splitting circuit will hold the trunk speech gate "off" via the SAT lead. The attendant may converse with the EPABX extension via the TE lead without the city party overhearing the conversation. The trunk speech gate will turn "on" when the attendant releases from the trunk, allowing the EPABX extension to converse directly with the city party. If the attendant released from the trunk while the trunk was in the ringing condition, the trunk speech gate will turn "on" as soon as the EPABX extension answers.

16.12 If the request for service is a recall for extended ringing, the circuit operation is the same as described in paragraph 16.10. The attendant may now converse with the city party via the TC lead and T-R leads.

The attendant may extend the call to an extension in the same manner as in the previous paragraph (16.11).

16.13 If the request for service is recall for lost transfer, the circuit operation is similar to Steps (a) through (e) of paragraph 16.11. The only difference is that when the attendant enters the trunk, there is no EPABX extension connected to the trunk and the attendant will be in a "talk city" mode.

16.14 Attendant originates call to city.

16.14.1 The attendant may originate a call to the city by depressing any of the idle trunk's trunk lamp buttons.

(a) Ground is extended to the trunk via the K lead to operate the KR relays which are then held operated by a ground on the LU lead.

(b) The L-relay operates via ground on the S lead.

(c) Idle period termination IS removed via the SAT lead.

(d) The OTG relay is operated This extends a resistive loop to the city to seize the city equipment. Dial tone will now be sent from the city to the attendant via T1 and the TC lead

(e) Dial pulses may now be passed to the city via the S lead, KR1-3 relay contact, and L-1 relay contacts, which opens and closes the loop to the city.

(f) The trunk IS marked busy

(g) The attendant's trunk lamp button turns on bright steady via the KR1-2 relay contacts.

16.15 Release City (RC) - See Paragraph 15.23

16.16 Attendant Transfer and Extension to a Trunk

16.16.1 The attendant may transfer an EPABX extension from the attendant's trunk circuit to a trunk by depressing an idle trunk's lamp button.

16.16.2 The operation of the trunk is the same as in paragraphs 16 10 through 16.13, with the exception that during the attendant's feature allott period the trunk's PU lead is marked negative, causing the VT lead of the trunk to be marked via the PU lead, KR1-6. At the same time, the extension is released from the trunk circuit; thus, the extension is transferred to the trunk. In this manner, a restricted extension may be connected to a trunk.

16.16.3 The attendant may dial the city number for the extension and release from the trunk, or release from the trunk and allow the extension to dial the city number.

NOTE 1: When the extension entered the trunk the ten-second timer was enabled; thus, the first digit must be dialed within ten seconds. Otherwise, the L-relay will be held operated, preventing any signaling to the city.

NOTE 2: The attendant should not place the trunk in a trunk hold condition until the city party answers.

16.16.4 As long as the attendant is in the trunk, the trunk's lamp button will be bright steady; when the attendant releases from the trunk with an extension connected to the trunk VT lead, the trunk lamp button will switch to dim steady.

16.17 Trunk Hold

16.17.1 Any time after the attendant enters a trunk, the trunk may be placed in a trunk hold condition by depressing the trunk hold button

16 17 2 The trunk hold will;

(a) Hold an incoming call while the attendant IS busy with something else.

(b) Hold the connection to the city so the attendant may get time and charges information firm the central office operator on outgoing calls.

16.17.3 The trunk hold button places ground on the TH lead which sets the trunk hold flip-flop via the KR2 3 relay contacts.

(a) The L-relay IS held operated for an outgoing call

(b) Each time the attendant re-enters the trunk it IS necessary to depress the TH button again if the trunk is to be put back into trunk hold

(c) The trunk lamp button will only give an indication of a trunk hold condition when the attendant has released from the

trunk and when there is no EPABX extension connected to the trunk. The lamp indication is a wink

16.18 **Trunk Allotted**

16.18.1 Only a trunk that has been allotted may be seized by an extension attempting to make a city call.

16.18.2 See paragraphs 14.0 and 15.20.

16.19 Extension originates call to city.

16.19.1 See paragraph 15.21.

16.20 **Toll Restriction (Optional) — See Table 2-3, and Paragraph 15.25.**

16.21 **Attendant Override** - see Paragraph 15.26

16.22 **Intercept (Optional)**

16.22.1 **Recorded Message Option**

(a) If the city party originates a call to the EPABX trunk and dials a feature number or an unequipped extension number, the intercept circuit will recognize that the call cannot be completed and send a recorded message to the city party.

(b) During the register terminate period, a pulse is sent to the intercept circuit via the ITP lead.

(c) If the call cannot be completed, the intercept circuit sends signals back on the BTI and ITC leads to hold off busy tone.

(d) A recorded message is sent to the city party from the intercept circuit via the OVT lead and T1.

(e) *When* the city party hangs up, a release signal is sent to the intercept circuit via lead ITR.

16.22.2 **Attendant Access Option**

(a) If the city party originates a call to the EPABX trunk and dials a feature number or an unequipped extension number, the intercept circuit will recognize that the call cannot be completed.

(b) During the register terminate period, a pulse is sent to the Intercept circuit via the ITP lead.

(c) If the call cannot be completed, the Intercept circuit sends a ground back to the trunk on the ITC lead to set the operator recall

(d) Ring back tone is sent to the city from the intercept circuit via the OVT lead and T1.

(e) When the attendant enters the trunk to answer the request for service, a release signal is sent to the intercept circuit via the ICR lead

If the call is abandoned before the attendant answers, a release signal is Bent to the Intercept circuit via the ITC lead

16.23 **Busy Out**

16.23.1 The trunk circuit may be busied out by placing a strap across the busy out terminals. This places a negative voltage:

(a) To turn on the attendant's trunk lamp button dim steady indicating the trunk is busy.

(b) To operate the L-relay, the C-relay, and the OTG relay, which closes the loop to the city, thus preventing an incoming call.

(c) To prevent the VT lead from being marked by the trunk allotter, thus preventing an outgoing call.

16.24 **Reverse Battery Supervision (City Answer Detection) — (Optional) — (Loop Trunks Only) — See Paragraph 15.27.**

16.25 Miscellaneous

16.25.1 Operator Recall Inhibits

(a) When DID trunks are used in a system equipped with other types of trunks that have the night answer features, it is necessary to inhibit all the operator recall features in the trunk circuits. When the ABA or UNA key is operated, a ground is placed on the ORI lead. This inhibits dial zero operator recall, recall for extended ringing, and recall for lost transfer.

16.25.2 **Reset** When the System Power is Turned "On"

(a) When the system power is turned on and the system has been reset, the trunk should be in an idle condition.

If the trunk hold should be set when tie power is turned on, the trunk could be held busy and l he attendant would have to enter the trunk to clear the condition. it is also possible to fire the trunk to an "off hook" extension when the power is turned "on." This condition looks normal to the trunk circuit and cannot be reset except by placing the phone "on hook."

If the central office were extending a loop at the time the power was turned "on," the condition looks normal and the trunk cannot be reset except by removing the loop.

When the power is turned "on" and there is no loop from the city and the trunk has not fired to an "off hook" extension, a pulse is extended to the transfer junctor access circuit via RK1, to insure the trunk is not connected to the transfer junctor, which could prevent the reset of the trunk

16.26 E&M Option (See Table 2-3)

The operation of the trunk circuit adapted for E&M signaling is the same as that for loop signaling with similar features except that instead of being seized by a loop the E&M trunk is

seized by a ground on the E lead. The city is seized by placing battery on the M lead via the L relay contact. For E&M operation the trunk must be used with an E&M signaling circuit. This circuit will be mounted external to the equipment cabinet.

16.27 Two Digit - In Dial Completion

In situations that require multiple assignment of the CO hundreds digit, the 316302(2) register is utilized within the EPABX.

This allows hundreds identification of the umber being dialed by trunk seizure, requiring only the tens and units digits to be pulsed from the city. Thus, a trunk in cabinet 1, upon seizure, automatically assumes that the station being addressed is located within that cabinet (hundreds group).

In practice this IS accomplished via recognition Of the RS lead seizure, and by assignment of the RS-RF leads, the called station is determined.

As this is a accomplished by shop wiring, changing Of trunk/station relationships may only be accomplished after careful study of Dwg 130117.

17.0 TWO-WAY TIE II NE 316060()68 AND 316051(68) - LOOP SIGNALING AND E&M SIGNALING

17.1 Purpose of Circuit

17.1.1 This circuit provides a **means of** establishing calls between extensions **in two different PABX telephone systems. Incoming calls may,** by waiting for dial tone and then dialing **the desired extension** number, be connected to that extension or **(if** the line had the **proper class of service) dial a feature digit ma access any** of the **features provided in the second EPABX system.** Outgoing calls may be initiated by an extension (with the proper class of service) by dialing the tie line **access digit. waiting for the second dial tone, and then dialing the desired extension or feature number** in the **far end EPABX.**

17.1.2 **Circuit** Functions

(a) Provides loop or E&M signaling.
(b) **Provides** attendant or executive **override**
(c) Marks the circuit **busy when** seized by an incoming or **out**going call so that the circuit cannot be allotted
(d) Provides direct, access to feature circuits (when equipped **with the proper** class of service) or extensions in the terminating EPABX

17.2 Functional Description

17.2.1 The originating PABX places a resistive loop on the tip and ring of the tie line.

17.2.2 This seizes the tie line, allows it to mark its VO lead towards +18VDC, seizing a free junctor and register (see paragraph 3 0 - Origination)

17.2.3 **Dial tone will be returned to the originating PABX party, who may now dial the required access digits to accomplish operation.**

17.2.4 **The line will require one PNPN P-S matrix PH inlet, thus requiring one line per equipped tie line, reducing the total system by one line per equipped tie line.**

17.2.5 **Seizure allotting of the tie line was described in general in paragraph 14.0.**

17.2.6 Extension **originates to an outgoing tie** line call.

(a) **When an extension with the** proper class of service **cials the tie line feature digit, the trunk allotter places ground on the RFT, SFT. and RCS leads which allow the trunk's VT lead to be marked negative for approximately 1.6 millisecond. The extension which dialed the feature digit now be connected to the trunk via the matrix and the VT lead, placing the trunk under control of that extension.**
(b) **When the** matrix is fir**ed and held, the level of the VT lead increases from -18V** to approximately **+1V.**
(c) **The trunk's VT lead is now** held **marked.**
(d) **The trunk is marked busy. Ground is extended to the MET lead.**
(e) **Approximately two milliseconds** after **the matrix firing is de**tected, the **OTG** relay **IS operated.**
(f) **When the OTG relay operates:**

(1) The L-relay is operated.
(2) **A ground is extended to lead OTG-M to operate the out**going peg-count circuit.
(3) **A resistive loop is extended to** seize the far **end** PABX.
(4) The **secondary of T1 is connected to the speech path** so that tones may be passed to **the EPABX extension.**
(g) Approximately 180 milliseconds after the matrix IS fired and held, the C-relay IS operated. **This:**

(1) Removes the inhibit, allowing the speech **gate to be turned "on."**
(2) Removes the resistive shorts **from Its primary of** T1, allowing dial tone to **be heard by the EPABX sub**scriber via T1 **and** the VT lead.

(h) The EPABX extension **may now** dial the desired far end PABX extension **number** The dial pulses are detected and sent out via the L-1 relay contacts
(i) The C-relay releases at the start of each digit and re-operates **180** milliseconds after the last dial pulse **of** each digit This shorts out T1 during dialing to improve the signaling to the far end **PABX** The speech gate IS turned "off" The speech gate is then

held "off" by C-1 relay contacts during each series of dial pulses.

17.2.7 **Attendant or Executive Override - see paragraph 15.26**

17.2.8 **Busy out**

The tie line may be busied out by placing a strap across the busy out terminals.

17.2.9 The maximum input signal level the tie line will accept before distortion occurs is zero DBM.

17.2.10 **Optional Tie Line Circuits**

(a) **Loop Trunk Signaling - The loop tie line described in paragraphs 17.1.1 through 17.2.9 is the basic tie line circuit.**

(b) **E&M Signaling (Optional) - The operation of the tie line circuit adapted for E&M signaling is the same as that for loop signaling except that instead of being seized by a loop, the E&M tie line is seized by a ground on the E lead. Another PABX is seized by placing battery on the M lead via the L-relay. For E&M operation, the tie line must be used with an E&M signaling circuit. This circuit will be mounted externally to the equipment cabinet. Circuit description for Two-Way Tie Line 316051 ( ) 68 (E&M Signaling) is shown in Dwg. 316060 ( ) 77.**

18.0 CONSOLE OPERATION

18.1 Refer to paragraph 3.3 of Section X for basic console fun&tons. Refer to Section V, paragraph 8, for console operation.

Section XIII

CONTENTS

Section XIII

TROUBLE DETECTION AND REPAIR

1.0 ROUTINE MAINTENANCE

1.1 General

Routine maintenance of a solid state switching system is greatly simplified in comparison to a mechanical system.

1.2 Periodic Inspection and Maintenance

Visual inspection and routine maintenance checks should be made quarterly--four times per year.

1.3 Visual Inspection

(a) Cleanliness of cabinet assembly location area.
(b) check cables from MDF to system equipment for damage and snug fit on cable connectors.
(c) Check equipment cabinets for damage.
(d) Indication of water seepage or leakage
(e) Equipment cabinets for disturbance of PCB's.

1.4 Electrical Maintenance

(a) Refer to Section V - Perform all steps of paragraphs 2.4, 2.5, and 2.6.
(b) Refer to Section V - Perform all steps of paragraphs 3.2, 3.3, 3.4, and 4.0.
(c) From a TJP, dial trunk access digits and observe trunk allotter "stepping" through all four allott groups.

NOTE: IF, WREN TROUBLESHOOTING, A PCB IS REPLACED AND DOES NOT CORRECT THE TROUBLE, RE-INSERT THE ORIGINAL PCB BEFORE PEPCEDURING FURTHER

1.5 The troubleshooting procedures in this Section are performed in conjunction with the associated tables of Section XIV.

1.6 The TE-400 is under warranty for one year. An attempt to replace components upon a PCB may void the warranty upon that PCB if it is damaged beyond repair during the attempt

1.7 The troubleshooting procedures in this Section are offered as an aid to the installer/repairman. Careful study of this manual, the equipment, and the Equipment Specifications should provide the necessary knowledge. If problems are encountered beyond your ability, contact:

Customer Service
ITT Telecommunication
2107 Swift Drive
Oak Brook, Illinois 60521

Telephone: (312) 654-3600

Telex:

2.0 TOTAL SYSTEM FAILURE

2.1 No alarms - complete system failure - refer to Section III, Fig. 3-1, for systems using 130097 cabinet assemblies.

2.1.1 Check the following for defects:

(a) AC circuit breakers
(b) AC input
(c) Voltage check transformer fuse - refer to Section III, Fig. 3-10, for 130097 cabinet assemblies.
(d) Blower(s) (130097 cabinet assemblies only)

2.2 Main alarm and voltage check (316069) PCB is alarmed.

(a) Check DC power supplies -18, +18.5, -36, and +36VDC. Refer to Section V, paragraph 2.4. If power supply output voltages are correct, proceed to Step (b). If power supply voltages are out of tolerance and will not adjust, proceed to Step (e) or (f).
(b) Check outputs of 316070 voltage check reference supply. See Section V, paragraph 2.9.1.1, and Fig 6-1.
(c) If 316070 output voltages are incorrect, replace 316070 PCB and recheck. Main alarm and voltage check 316069 may need adjustment. See paragraphs 2.9.1.2 and 2.9.1.3 of Section V.
(d). If 316070 output voltages are correct, perform all steps of paragraphs 2.9.1.2 and 2.9.1.3 of Section V. If alarm lamps remain 'on" and DC power is not restored (PR relay Operated), perform all steps of paragraph 17.0 (power-off measurements) in Section IV. Replace PCB 316069 and repeat all steps of paragraphs 2.9.1.2 and 2.9.1.3 in Section V.
(e) On single cabinet systems, remove AC power and replace defective supply. See Step (g) below.

NOTE: Refer to paragraph 3.22 of Section X and paragraph 7.0 of Section XII.

(f) On multicabinet systems, use the following procedure to locate the defective supply.

(1) Remove AC input power. Remove 316069 main alarm and voltage check. Disconnect DC power output cable and control lead at last equipped bay. Insure that cables are not shorted.

(2) Restore AC power. Check for faulty supply as in Step (a) above. If DC supply voltages (paragraph 2.4, Section V) are now within tolerance, the disconnected bay is at fault. Perform the following step if DC supply voltages are still incorrect.

(3) Repeat Steps (1) and (2) above until supplies in cabinets 4, 3, and 2 have been eliminated. If power supply at still checks bad, trouble is in cabinet 1 supply.

(4) Replace defective supply and do step (g).

(g) Make all adjustments on 316069 PCB as in paragraphs 2.9.1.2 and 2.9.1.3 of Section V.

2.3 PCB 316301 (5VDC Supply and Alarms) Alarm Lamps "On" - (130097 Cabinet Assemblies Duly)

(a) Replace PCB 316301 and follow instructions outlined in paragraphs 2.6 and 2.9.1.3 of Section V.

2.4 Stations do not ring. RBT normal. No alarms.

(a) Check fuse at ring generator. Replace, if necessary.

(b) On 320138 assemblies, dial TVP from another TVP. Insure RBT received Observe RL3 on 316037 (tones) pulsing Replace, if required.

Observe ring generator extension relay pulsing. If 316037 RL3 pulses, and extension relay does not, check input to replay. Repair as required. Replace as required.

2.5 No dial tone at all stations - major alarm

(a) Check both (regular and standby) allotters 316039 ( ) for an alarm condition. Replace as required.

(b) Check both (regular and standby) tone supplies for an alarm condition. Replace as required.

(c) Inspect all registers (316025 or 316302) for an alarm condition. Replace as required.

2.6 No dial tone at all stations - minor alarms

(a) Check 316037 tone supply If in an alarm condition, remove and check for dial tone at TVP If dial tone returns, replace PCB

(b) Check 316039 allotter If in an alarm condition, remove and check for dial tone at TJP. Replace as necessary.

(c) Check all registers (316025 and 316302) for an alarm condition. Replace as required.

2.7 No busy tone (BT) and/or ring back tone (RBT) at all stations - major alarm

(a) Repeat Step (b) of paragraph 2.4.

2.8 Wrong numbers - all stations (station-to-station or station-to-feature)

(a) Perform all steps of paragraphs 3.4.1 through 3.4.6 of Section V.

2.9 Wrong numbers - all stations (incoming DID trunk calls)

(a) Perform all steps of paragraphs 3.4.1 through 3.4.6 of Section V.

(b) Insure correct digit outpulsing from central office equipment.

3.0 MAJOR ALARMS

3.1 A major alarm will occur if both of the following PCB's fail. The console alarm lamp will glow a bright red and the console buzzer will sound continuously when this happens.

Common Control Circuits

Regular Allotter	316039( )122
Standby Allotter	316639( )122
Regular Tone Supply	316037( )122
Standby Tone Supply	316637( )122
Regular Originate Control	316029( )122
Standby Originate Control	316029( )122

3.2 As noted in Section XII, failure of any regular common control circuit will result in automatic transfer from the defective regular PCB to the standby. The possibility of this not occurring was covered in paragraph 2.5.

3.3 On TE-400 assemblies 320136 with the PFCT relay mounted upon the 316062, a major alarm will place those stations assigned to PFCT into the PFCT mode and they will be connected directly to the central office equipment.

3.4 Replace all card(s) causing a major alarm.

3.5 On some 130097 TE-400 cabinet assemblies a failure of the ±3VDC supply may cause a major alarm. Consult Equipment Specifications The alarm lamp on the 316301 PCB will be "on" Test/adjust 3VDC as in Section V, paragraphs 2.4 and 2.5

4.0 MINOR ALARMS

4.1 General

A minor alarm will be generated at times when there are no system defects. Depress the reset key when a minor alarm is indicated If

the alarm lamp goes "out" and does not come back "on," it may be assumed that the system is operating normally.

4.2 The locations of the alarm lamps are shown in Fig. 5-1. Section V. The alarm lamps are color coded on some 130097 cabinet assemblies. Refer to paragraph 1.1, Section V.

4.3 If a PCB indicates a minor alarm, replace same with PCB. If the minor alarm condition remains, further troubleshooting will be necessary.

4.4 Failure of the following PCB's will generate minor alarms.

316025 ( ) 122	Register
316029 ( ) 122	Originate Control and Lamp Generator
316031 ( ) 122	Camp-On-Busy
316034 ( ) 122	Trunk Allotter
316035 ( ) 122	Attendant Control
316037 ( ) 122	Tones Supply
316039 ( ) 122	Allotter
316041(7)122	T-Q Matrix
316067 ( ) 122	Toll Restrictor
316073 ( ) 122	Attendant Trunk 1
316074 ( ) 122	Attendant Trunk 2
316099(1)122	Attendant Trunk 2
316302(1)122	Register

4.5 Failure of the fuse that protects the external 48VDC will cause a fuse alarm on some systems.

4.6 On systems with auxiliary power cabinets, failure of the blower will cause a minor alarm.

4.7 On 130097 cabinet assemblies. failure of the ±3VDC or external 48VDC will generate a minor alarm.

4.8 Originate Control and Lamp Generator (316029) Trouble

(a) Indication- Originate control and lamp generator 'drifts" into an alarm condition Depressing reset key cures trouble temporarily but alarm condition returns.

(b) Remedy - Retest junctors (Section V, paragraph 4 0). Seize each junctor a minimum of five times. When alarm appears, replace junctor under test.

5.0 STATION TROUBLES

5.1 General

5.1.1 Always check ±3VDC supplies whenever a station complaint IS received.

(a) Check ±3VDC fuses on TE-400 systems using 320136 assemblies

(b) Check ±3VDC at TP output on all 130097 assemblies

(c) The 5VDC supply and alarm 316301 PCB includes a 3VDC alarm lamp on TE-400 systems using the 130097 cabinet assemblies.

5.1.2 In the following repair procedures, disconnecting the station under test at the MDF terminal and connecting a TVP is referred to as "Connect TVP."

5.2 No dial tone -no origination -no termination.

(a) Connect TVP.

(b) TVP receives dial tone. Dial TVP from TJP (refer to Section V). Trouble is indicated in station wiring or instrument. Locate and repair.

(c) Connect TVP. If no dial tone is received, replace station line card. Retest from TVP. Re-connect station T-R at MDF. Retest from station.

5.3 Dial tone normal - origination normal - station will not ring.

Calling party hears chopped RBT The RU relay (on line PCB) chatters when station is called (ring trip).

(a) Connect TVP.

(b) Call TVP from TJP. TVP rings. Trouble is indicated in station wiring or instrument.

NOTE: Probable short to ground on "R" lead or "T" lead.

(c) TVP does not ring. Replace station line card, then re-connect station T-R to MDF. Retest from station.

5.4 No origination - termination normal

(a) Connect TVP.

(b) Call TVP from TJP. If TVP rings, check and repair station wiring or station instrument.

(c) TVP does not ring. Replace line PCB. Retest. Re-connect station wiring. Retest.

5.5 Origination normal - no termination - BT returned to caller.

(a) Replace associated 316045 group hunt PCB if station is a group hunt slave. Retest.

(b) If trouble is not corrected, connect TVP and retest. If trouble is no longer indicated, check station wiring and instrument.

(c) If trouble remains, replace line PCB and retest. Connect station wiring at MDF and retest

5.6 Wrong numbers received when dialing from one station

5.6.1 Connect TVP Follow procedure described in paragraph 3 4, Section V,

but dial from TVP connected to trouble line to TVP's referred to in paragraph 3.4, Section V. Also, dial equipped feature(s) digit(s).

(a) If wrong numbers are no longer received when dialing from the TVP connected to the trouble line, check station wiring for: high impedance leakage, more than two ringers across line, and dial pulses from station instrument for 62.5 ±5% break. Repair as needed. Reconnect to MDF. Retest from station.

(b) If wrong number trouble recurs, retest as in Step (a). If wrong numbers are still received, replace line card and retest. If trouble as still not corrected. repeat all procedures outlined in paragraph 3.4, Section V.

5.7 Station user complains of occasional peiods when dial tone es not available immediately but is available after station has been "off hook.. for a few moments.

(a) This may be normal. Explain to station user that a register must be available for station to receive dial tone and that during heavy traffic periods a short watt may be necessary to receive dial tone.

(b) Follow instructions outlined in paragraph 4.0, Section V.

5.8 Station user complains of occasional periods when dial tone IS not received. "Raspy" noise (matrix blocking) IS evident "off hook." Dial tone available after short wait.

(a) Explain to station user that a junctor must be available to receive dial tone If one IS not available due to usage, a short waiting period will prevail.

(b) Follow instructions of paragraph 4.0. Section V.

5.9 Station cannot complete feature call. Busy tone IS returned when feature call is attempted Station can complete local-to-local calls with no wrong numbers received

(a) Insure that station is not restricted. If station IS restricted, inform station user that this is normal.

(b) if station is not restricted, replace line card and retest If trouble remains, swap regular and standby allotters If trouble IS corrected, replace standby allotter If trouble is not corrected, perform junctor test (paragraph 4 0, Section V).

5.10 Various stations complain of being "dead" when 'off hook" and remaining that way. Trouble IS intermittent

(a) Using junctor test switch and TJP, seize each junctor 15 times each Note that when only one register IS seized that dial tone IS returned on each seizure When two registers are seized, dial tone will not be returned Replace each junctor that seized two registers

(b) Refer to paragraph 4 0, Section V

5.11 Various stations complain of "no ring - no answer."

(a) Follow instructions outlined in paragraphs 3.3 and 4.0, Section V.

5.12 Various stations complain of BT being returned after dialing one or two digits.

(a) Follow instructions outlined in paragraphs 3.3 and 4.0, Section V.

5.13 Various stations complain of weak DT, BT, RBT, and transmission.

(a) Follow instructions outlined in paragraph 4.0, Section V.

5.14 Various stations complain of receiving BT when dialing feature digit(s).

(a) Perform registers test (paragraph 3.4, Section V). Also dial feature digit(s) from TVP when performing registers test.

5.15 Various stations complain of failure to reach attendant.

(a) From TVP dial through attendant trunk No. 1 and then No. 2. Check VT level. Adjust or replace as required.

5.16 Station receives DT after dialing local station and when station answers a drop-back-to-dial tone is encountered.

(a) If stations are equipped with key equipment, insure that all stations have tip and ring connected to the same corresponding sides of the key.

(b) Follow instructions outlined in paragraph 4.0, Section V.

5.17 Attendant tine - No Dial Tone

(a) Place junctor test switch to OFF. Remove TJP if connected

(b) Refer to paragraph 2.1 of this Section.

5.18 Transmission is noisy and/or weak (local calls only).

(a) Perform junctor test (paragraph 4 0, Section V) Replace defective junctor.

6.0 CONSOLE TROUBLES

6.1 Wrong numbers received when keyed or DSS

(a) Replace 316054(14) and connect TVP to station MDF terminals

as follows: X00, X01, X11, X22, X33, X44, X55, X66, X77, X88, and X99.

NOTE: Do not connect to an MDF terminal number corresponding to an unequipped line.

(b) Seize trunk by depressing trunk button and key punch TVP line number. Repeat for each station number listed above.

(c) If trouble is not corrected, replace 316035(14) with original and replace 316035(12) and repeat Steps (a) and (b) above.

(d) If trouble is not corrected, replace 316035(12) with original. Replace 316035(13) and repeat Steps (a) and (b) above.

(e) If trouble is not corrected, inspect key pad switch contacts for correct adjustment (i.e., good follow-through, make, and no bounce). Repair or replace as necessary.

6.2 Wrong numbers or BT returned when attendant attempts override.

(a) Repeat all steps of paragraph 6.1.
(b) Replace 316062 and retest.

6.3 Attendant cannot access attendant override.

(a) Replace 316062. Retest if trouble remains.
(b) Disconnect all junctors, trunks, and tie line PCB's. Leave disconnected PCB's in their respective mounting slots.
(c) Plug in one of the above PCB's at a time. Complete a call through each and attempt override from console. Replace each PCB that cannot be overridden.

6.4 Camp-on-busy circuit terminates to wrong numbers.

(a) Replace 316031(11) PCB No. 1 and retest.
(b) If trouble is not corrected, replace 316031(11) PCB No. 3 and retest.
(c) If trouble is still not corrected, replace 316031(13) PCB and retest If trouble remains, perform steps of paragraph 6.1.

6.5 Camp-on-busy circuit cannot be accessed

(a) Perform all steps of paragraph 6.4
(b) Disconnect all trunks accessible (Table 2-3, Section II) by COB, except one Perform all steps of COB test procedure (paragraph 5 0, Section VI) with the following exceptions:
(1) Call through one trunk.
(2) Use only one station number.
(c) Repeat for each trunk. Replace those that will not allow COB to be accessed.

6.6 Attendant Cannot access any incoming trunk call.

(a) Replace the PCB's of the 316035(2) assembly, one at a time. Retest after each PCB replacement.

6.7 Attendant cannot answer a specific incoming trunk call.

(a) Replace trunk PCB's associated with failing trunk button.

6.8 Attendant cannot answer incoming call on OP1.

(a) Replace 316073.

6.9 Attendant cannot answer incoming call on OP2.

(a) Replace 316074 or 316099 (as equipped).

6.10 Attendant cannot place a trunk call on hold.

(a) Replace associated trunk PCB and retest.

6.11 Attendant cannot place any trunk on hold.

(a) Replace 316035(11). Retest.
(b) If trouble remains, replace 316035(12) and retest
(c) If trouble still is not corrected, replace 316035(13) and retest.

6.12 Incoming trunk call does not split when answered by attendant (one trunk only) - no talk city and/or no talk extension.

(a) Replace defective associated trunk assemblies.

6.13 Incoming trunk calls (all) do not split when answered by attendant (no talk city - no talk extension).

(a) Replace 316035(11) and retest.
(b) If trouble does not clear, replace 316035(12) and retest.
(c) If trouble does not clear, replace 316035(13) and retest.

6.14 Attendant cannot release from a trunk.

(a) Replace 316035(11) and retest
(b) If trouble remains, replace 316035(13).

6.15 **Lamps on attendant console show erratic operation.**

(a) Replace regular originate control 316029(1).

6.16 Attendant cannot transfer a call from OP1 to any city trunk.

(a) Replace 316073 **and** retest.
(b) if trouble is it corrected, replace 316035(11) **and** retest.
(c) If trouble remains, replace 316035(12) and retest.
(d) If trouble is **not** corrected, **replace 316035(13).**

6.17 Attendant cannot transfer a **call from OP2 to any city trunk.**

(a) Replace (as equipped) 316074 or 316099 and retest.
(d) **Perform Steps** (b), (c), **and** (d) **of paragraph 6.16.**

6.18 Attendant cannot extend incoming trunk call into conference (conference assembly 316077 only).

(a) Replace line PCB corresponding to conference trunk accessing number. Retest.
(b) If trouble remains, replace 316077 conference assembly. Retest.
(c) if trouble remains, replace 316009 attendant trunk No 2. Retest.

6.19 Attendant cannot extend a station into **conference (conference assembly 316077 only)**

(a) Insure that station is not restricted **from conference.**
(b) Perform Steps **(b) and (c) of paragraph 6.18.**

6.20 Console trunk button flashes 120 ipm bright and buzzer sounds approximately two times.

(a) Station has disconnected **from** call **before central** office equipment **has** This is normal if EPABX "clears down" before COE.

6.21 Console trunk button flashes 120 ipm bright and buzzer sounds Upon answer, party-in trunk announces intention of outdialing to the city

(a) Insure that party attempting call **has** not waited longer than ten seconds after dialing trunk access digit(s) This is normal if ten seconds have elapsed.

NOTE: Also insure that central office equipment is not **slow** in providing dial tone.

(b) If party attempting call has not waited longer than ten seconds before dialing trunk access digit(s), replace board A of erratic trunk circuit. Retest.

7.0

7.1 **Trunk allotter will not "step" (allott) and one trunk/tie line always remains allotted.**

(a) Replace board A of **trunk/tie line that is allotted. Retest.**

7.2 Trunk allotter ski**ps one or more trunk groups as it 'steps" (allotts). Allott lamp &es not turn "on."**

(a) Replace trunk allotter **PCB and retest.**

7.3 No trunk in trunk allott group will **allott.**

(a) Remove all trunks PCB's assigned to that group.
(b) Replace one trunk assembly at a time and dial trunk access digit(s), **observing that** one trunk in each group **allotts. Replace board A of** trunk assembly from **allott group in difficulty that causes** return of trouble.

7.4 **Station cannot** access transfer junctor **(trunk calls only).**

(a) Insure that stations attempting to use trunks with transfer junctor **access are not restricted.**
(b) Repeat trunk test for equipped **trunks. See Section Vi.**

7.5 Station can access transfer junctor but falls to transfer, or ES unable to include or exclude city party from the conversation.

(a) Repeat Steps (a) and (b) of paragraph 7.4.

7.6 Station user can direct distance **dial from** station that IS toll restricted.

(a) Perform toll restrictor test (paragraph 4.0, Section Vi).

7.7 ANA station does not ring when con**sole ANA** key **operated in** ANA **position** and incoming trunk call IS present

(a) Replace ANA 316042 PCB and retest **If trouble IS not corrected,** replace associated trunk assembly Retest.

7.8 UNA bell does not ring Console UNA key operated in UNA position and incoming trunk call IS present

(a) Replace UNA 316036 PCB and retest if trouble remains, replace associated trunk assembly and retest.

7.9 UNA call cannot be answered.

	(a) Perform Step (a) of paragraph 7.8.	alarms when UNA call is answered.
7.10	Regular and/or standby allotter	(a) Replace associated line PCB of answering station.

Section XIV

CONTENTS

TABLES

Section XIV

TROUBLE DETECTION TABLES

1.0 GENERAL

1.1 The tables in this Section are furnished so they may be used as a ready reference for the following types of trouble:

(a) Total system failure.
(b) Major alarms.
(c) Minor alarms.
(d) Station troubles.
(e) Console troubles
(f) Miscellaneous trouble.

1.2 Section XIV should be referred to as noted

Table 14-1
Total System Failure

FAULT: TOTAL SYSTEM FAILURE - Refer to Section XIII, paragraph 2.0.

INDICATION	CHECK	REPLACE/REPAIR
No alarms - complete failure.	AC input. AC circuit breakers Voltage Check Transformer Fuse. Blowers (and Switch)* * 130997 Assembly Only	As required.
316069 Main Alarm and Voltage Check PCB is alarmed	DC supplies. 316070 ( ) 122 PCB 316069 ( ) 122 PCB Refer to Section XIII, paragraph 2.2	As required.
316301 5VDC Supply PCB is alarmed Valid on 130097 Assembly only	316301 PCB Refer to Section XIII, paragraph 2 3	As required
Stations do not ring. RBT normal No alarms	Ring Generator Fuse Refer to Section XIII, paragraph 2 4	As required
No dial tone - all stations - major alarms	316039, 316037, 316025, 316302 PCB's. Refer to Section XIII, paragraph 2 5	As required
No dial tone - all stations - minor alarms	Refer to Section XIII, paragraph 2 5	As required
No BT and/or no RBT - all stations - major alarms	Tones Supply 316037 PCB Refer to Section XIII, paragraph 2 4, Step (b)	As required
Wrong numbers - all stations complain - (Station-to-Station or Station-to-Feature)	Registers Refer to Section V, paragraph 3 4	As required
Wrong numbers - all stations complain - (Incoming DID trunk calls)	Registers Refer to Section V, paragraph 3 4 and Section XIII, paragraph 2 9	As required.
Attendant cannot answer incoming trunk call	Console dial for off-normal switch closed	As required

Table 14-2
Major Alarms

FAULT: MAJOR ALARMS - Refer to Section XIII, paragraph 3.0.

INDICATION	CHECK	REPLACE//RETURN
Console Alarm Lamp on "bright." Console buzzer "on."	All cabinet PCB's for alarms. Refer to Fig. 5- ; and Section XIII, paragraph 3.0.	PCB's as required.
PFCT stations connected directly to Central Office equipment.	As above.	As above.

Table 14-3
Minor Alarms

FAULT: MINOR ALARMS - Refer to Section XIII, paragraph 4.0.

INDICATION	CHECK	REPLACE
Console alarm lamp on Dim	All cabinet PCB's for alarms Refer to Fig. 5-1, Section V.	PCB's as required.
Fuse alarm (32d136 cabinets only).	48VDC fuses on DID-E&M Trunks/ Tie Lines	As required.
Blower alarm (320136 cabinets only).	Blower in Auxiliary Power Cabinet.	As required.
Originate Control and ' amp Generator 316029 "drifts" into alarm condition. Can be re-set, but trouble returns	Refer to Section V, paragraph 4.0.	As required.

Table 14-4
Station Troubles

FAULT: STATION TROUBLES - Refer to Section XIII, paragraph 5 0

INDICATION	CHECK	REPLACE
No DT No origination No termination.	Instrument. House Cables. Line PCB Refer to Section XIII, paragraph 5 2	As required.
DT normal Origination normal Station will not ring (Ring Trip)	Instrument House Cable. Line PCB Refer to Section XIII, paragraph 5 3	As required.
No origination. Termination normal	Instrument House Cable Line PCB. Refer to Section XIII, paragraph 5 4	As required.
Origination normal No termination	Group Hunt PCB Line PCB. Refer to Section XIII, paragraph 5 5	As required.

Table 14-4 (Cont'd)

INDICATION	CHECK	REPLACE
Wrong numbers.	Instrument (Total no ringers). House Cable. Line PCB. Register PCB. Refer to Section XIII, paragraph 5.6.	As required.
Occasionally no DT.	Check traffic. Junctors. Refer to Section XIII, paragraph 5.7.	As required.
Occasional periods of no dial tone. Matrix blocking is heard in receiver.	Traffic. Junctors. Refer to Section XIII, paragraph 5.8.	As required.
Unable to complete feature call	Restriction. Line PCB. Allotter. Refer to Section XIII, paragraph 5.9.	As required.
Intermittent periods of no DT. Clears when hook switch is bounced.	Junctor. Register. Refer to Section XIII, paragraph 5.10.	As required.
Intermittent no ring - no answer	Junctor. Register. Refer to Section XIII, paragraph 5.11.	As required.
Intermittent BT after dialing one or two digits.	Junctor. Register. Refer to Section XIII, paragraph 5.12.	As required.
Intermittent weak DT, BT, RT, transmission.	Junctor. Refer to Section XIII, paragraph 5.13.	As required.
BT on dialing feature digits.	Registers Refer to Section XIII, paragraph 5.14.	As required
Failure to connect through to attendant.	Attendant trunks. Refer to Section XIII, paragraph 5.15.	As required.
Station drops back to dial tone after dialing local station, when local station answers (drop back to dial tone).	Junctor. Refer to Section XIII, paragraph 5.16	As required.
Attendant Line - no DT.	Junctor test switch to off position. Remove TJP. Refer to Section XIII, paragraph 5.17	As required.
Transmission is noisy or weak (local calls only)	Junctor Refer to Section XIII, paragraph 5 18.	As required.
Transmission is noisy or weak (trunk/tie lines).	Trunk/tie lines. Refer to Section V, paragraph 9 0	As required

Table 14-5
Console Troubles

FAULT: CONSOLE TROUBLES - Refer to Section XIII, paragraph 6.0.

INDICATION	CHECK	REPLACE
Wrong numbers when attendant keys (DSS) station.	Attendant control PCB's. 316035(12). 316035(14). 316035(13). Key Pad. Refer to Section XIII, paragraph 6.1.	316035(12). 316035(14). 316035(13). Key Pad. As required.
Wrong numbers, or BT returned attendant attempts override. Caution: BT will be returned if station is not busy.	As above, or 316062. Refer to Section XIII, Step (b) of paragraph 6.2.	As above, or 316062.
Attendant cannot access attendant override.	316062. Refer to Section XIII, paragraph 6.3.	As required.
Camp on busy circuit terminates to wrong numbers.	316031(11). 316031(13). Refer to Section XIII, paragraph 6.4.	As required.
Camp on busy circuit cannot be accessed.	316031(2). Trunks. Refer to Section XIII, paragraph 6.5.	As required.
Attendant cannot answer any incoming trunk.	316035(1). Refer to Section XIII, paragraph 6.6.	As required from 316035(1) assembly.
Attendant cannot answer a specific incoming trunk call.	Trunk Assembly. Refer to Section XIII, paragraph 6.7.	Trunk Assembly.
Attendant cannot answer incoming call on OP1.	316073. Refer to Section XIII, paragraph 6.8.	316073.
Attendant cannot answer incoming call on OP2.	316074 or 316099. Refer to Section XIII, paragraph 6.9.	316074, 316099. As equipped.
Attendant cannot place a trunk call on hold	Associated trunk assembly. Refer to Section XIII, paragraph 6.10.	Associated trunk assembly.
Attendant cannot place any trunk call on hold.	316035(11). 316035(12). 316035(13). Refer to Section XIII, paragraph 6.11.	As required.
Incoming trunk call does not split when answered by attendant (one trunk only) - no TC, no TE.	Associated trunk assembly. Refer to Section XIII, paragraph 6 12	Associated trunk assembly.
Incoming trunk calls (all) do not split (no TC, no TE) when	316035(11). 316035(12). 316035(13). Refer to Section XIII, paragraph 6.13.	As required.
Attendant cannot release from a trunk.	316035(11) 316035(13). Refer to Section XIII, paragraph 6 14.	As required.
Lamps on attendant's console show erratic operation.	316029. Refer to Section XIII, paragraph 6 15.	316029

Table 14-5 (Cont'd)

INDICATION	CHECK	REPLACE
Attendant cannot transfer a call from OP1 to any city trunk.	316073. 316035(11). 316035(12). 316035(13). Refer to Section XIII, paragraph 6.16.	As required.
Attendant cannot transfer a call from OP2 to any city trunk.	316074. 316099. Refer to Section XIII, paragraph 6.17.	As required.
Attendant cannot extend an incoming trunk call into conference (conference assembly 316077 only).	316040. 316077 assembly. 316099. Refer to Section XIII, paragraph 6.18.	As required.
Attendant cannot extend a station into conference (conference assembly 316077 only).	Station not restricted from conference. 316077 conference assembly. 316099 attendant trunk No. 2. Refer to Section XIII, paragraph 6.19.	As required.
Console trunk button flashes 120 ipm bright, buzzer sounds approximately two times.	Refer to Section XIII, paragraph 6.20.	
Console trunk button flashes 120 ipm, buzzer sounds. Upon answer, party in trunk announces intention of outdialing to the city.	Trunk assembly. Refer to Section XIII, paragraph 6.21.	As required.

Table 14-6
Miscellaneous Troubles

FAULT: MISCELLANEOUS TROUBLES - Refer to Section XIII, paragraph 7.0.

INDICATION	CHECK	REPLACE/REPAIR
Trunk allotter will not step (allott). One trunk/tie line always remains allotted.	Refer to Section XIII, paragraph 7.1.	Board A of trunk assembly, as required.
Trunk allotter skips one or more trunk groups	Trunk allotter. Refer to Section XIII, paragraph 7.2	Trunk allotter
No trunk in trunk allott group will allott.	Refer to Section XIII, paragraph 7.3.	As required.
Station cannot access transfer junctor.	Refer to Section XIII, paragraph 7.4.	As required.
Station can access transfer junctor, but fails to transfer, and/or is unable to include/exclude city party	Refer to Section XIII, paragraph 7.5	As required.
User can direct distance dial from station that is toll restricted.	Refer to Section XIII, paragraph 7.6	As required.
ANA station does not ring on incoming trunk call.	Refer to Section XIII, paragraph 7.7.	As required.

Table 14-6 (Cont'd)

INDICATION	CHECK	REPLACE
UNA bell does not ring on incoming trunk call.	316036 UNA PCB. Refer to Section XIII, paragraph 7.8.	As required.
UNA call cannot be answered.	Refer to Section XIII, paragraph 7.9.	As required.
Regular and/or Standby allotter alarms when UNA call is answered.	Refer to Section XIII, paragraph 7.10.	As required.

Section XV

GLOSSARY OF TERMS

ABR1 ABR2	Attendant's busy tone return.
AC-AL1 AC-AL2	Attendant's control alarm outputs to system main alarm.
AF-AL1 AF-AL2	Attendant's feature alarm outputs to system main alarm.
ALE	Attendant's line enable.
ALK	Attendant's line key.
ALL	Attendant's line lamp.
ALO-1 ALO-2	Inputs to attendant's control from the systems allotters.
ANA	Assigned night answer.
ANF	From ANA circuit to all associated trunks. ANA circuit extends -18 volts on ANF when ANA key in attendant's console is operatea.
ANK	From attendant's console to ANA circuit. Ground extended from ANA lead of attendant's console via ANA key to ANK lead of ANA circuit.
ANM	Pulses in synchronism with the allotter pulse of its associated junctor
APS	Auxiliary power relay signal from voltage check circuit. Controls application of power to the system busses
AR	Attendant release
ARS	Attendant's reset. From attendant's reset key to attendant's override circuit
ASU AST ASH	Attendant's stores units, tens, and hundreds Enables the digit stores in sequence.
ATE-1 ATE-2	Extends ground via attendant's trunk key to operate attendant's AL relay in attendant's control circuit.
ATK-1 ATK-2	Attendant's trunk key
ATL-1 ATL-2	Attendant's trunk lamp
ATR	Attendant release
BL	Busy lamp
BLF	Busy lamp field.
BT	Busy tone (600 Hz Interrupted at 60 ipm)
BUZ	-18 volts sent on BUZ lead to attendant's console to operate the buzzer.
BZ	From trunks to attendant's control. At -18 volts to cause attendant's control to gate out 120 ipm to buzzer in console.
BZG	Busy guard relay.
CBA1 CBA2 CBA3 CBA4	Camp-on-busy alarm outputs to system main alarm.
CBL	Conference busy lamp
CC	Code call.
CCM1 CCM2	From code call circuit to bell or other signal unit
CDO	Central district office.
CF	Conference.
CFF	Call forwarding feature.
CO	Central office
COB	camp-on-busy
COM-1 COM-2	Supplies -18 volts from contacts of attendant's ALF relays in attendant's trunk circuits to control allotting of attendant's trunk circuits
COS	Class of service May be used in conjunction with feature symbols, TA-COS, PA-COS, etc.
CT	Cut-through relay
DBF1 DBF2	Drop back to feature control lead used on attendant's trunk circuits to return extension to attendant's trunk during failure of extension to city trunk
DBI	Drop back inhibit.
DIA DIB DIC DID DIE	Inputs on override circuits from trunks and junctors Assigned on a coded basis for override access of particular trunk or junctor.
DIW DIX DIY DIZ	Outputs from trunk and junctors to override inputs DIA, DIB, DIC, DID, DIE
DJ	Drop junctor
DJB	Drop back to junctor

DKP	Supplies -18 volts through attendant's digit buttons to the digit stores for digit storage.
DT	Dial tone (600 Hz continuous tone - 15 volts P/P at supply).
EIT	Extension in trunk. Ground if no extension in trunk and -18 volts with extension in trunk.
EMA	Extends +3 pulse from override circuits to all local junctors and trunks to enable override.
EOH	Executive override originate control.
EOS	Executive override.
EOT	Executive override.
ERA ERB ERC ERD ERF	Code lead inputs on executive override circuit from DIX. DIW, DIY, and DIZ outputs of junctors and trunks.
ESP	Executive override.
EV	Multiples toll restrictor code detectors together.
EGC	Attendant's feature speech gate control.
FGE-1 FGE-2	Attendant's feature speech gate control.
MA	Positive mark from feature to allotter when a feature IS accessed. Allotter then extends the terminate pulse and sends a DJ mark to the junctor
FMI	Feature mark one.
FMII	Feature mark two.
GHA	Group hunt access (group hunt circuit accesses slave lines by pulsing the line circuit terminate gate over the GHA lead).
GHCR	Group hunt extends -18 volts on this lead to inhibit the trap circuit in the regular system allotter
GHCS	Group hunt trap inhibit lead to standby system allotter
GHU GHT GHH	Units, tens, and hundreds leads of group hunt master numbers
H	Hundreds (hundreds digit or mark)
HDST	Head set
HLD	Trunk hold leads in attendant's control. Depressing hold bar extends ground on HLD1 and -18 volts on HLD2
HNST	Hand set.
IBC	Inter-board connection.
K	From trunks to trunk buttons on console. Operator seizes trunk by placing ground via KL lead on K lead to operate KR relays in trunk. LU lead maintains ground to keep KR relays operated.
KL	Ground extended from KL through trunk button to K lead on trunk to operate RK relays.
KR	Attendant's trunk access relay.
LB	Connection from line circuit to message registers.
LGA1 LGA2	Lamp generator originate control alarm indication to system main alarm.
LGO-1	Lamp generator output (120 ipm)
LGO-2	Lamp generator output (60 ipm).
LGO3	Lamp generator output (wink).
LU	Lock up
MA1 MA2	Alarm outputs from system allotter to system main alarm.
MC	Extends ground from the executive junctor to the executive override circuit when the register terminate pulse appears.
MJIG	Alarm inputs to system main alarm.
MJIN	Alarm inputs to system main alarm.
OH	Originate control pulse to line circuits.
ON	Off normal (indicates attendant's stores are not set in the idle condition).
OPT	Operators transmission path for override.
ORI	Operator recall inhibit Inhibits operator recall during UNA or ANA operation Also used to inhibit recall or UNA operation when DID trunks are used and prevents ringing time out on DID trunks.
ORU	Extends -18 volts from attendant's control via the UNA key to the UNA circuit to start the multivibrator
ORT	Operator's ring lead from attendant's control to console.
OTT	Operator's tip lead from attendant's control to console.

OVO	**Override voice originate.**
OVT	**Override voice terminate.**
PA	**Public address.**
PCHG	**Punching.**
PFCT	**Power failure cut-through.**
PH	**Primary horizontal (inputs to primary matrix from line circuit VO).**
PS	**Primary second (matrix).**
PU	**Pulse up. From attendant's control to trunk to mark the trunk VT negative for termination.**
PUA	Pulse up lead for ANA to trunks to mark trunk VT negative from termination.
Q1, 2 **R1, 2** **S1, 2** **T1, 2**	Strapping points on ring counter in systems allotters to extend **ring** counter in size to accommodate larger systems.
QH	Quarternary horizontals **(quaternary** outlets to trunk and feature VT terminals).
R	Ring.
RC	Release city.
RCK	Release city key.
RE	Release extension.
REN	Regular enable.
REX	Release extendon.
RF	Register free.
RG	Ring generator (30 Hz sub-cycle, applier ring current to lines).
RGS	Ring generator start (applies ground to interrupter circuit on tone supply to start ringing).
RIT	Outputs from the regular system allotter to all circuits requiring an allotter pulse or mark.
RK	Reset key.
ROI and ROF	Used as chain leads on UNA circuit. ROI of preceding circuit **is** connected to ROF of succeeding circuit.
RRK	Regular routine key.
RS	Register seize.
RSC **RFT** **SFT**	**Ground is extended on these leads from the trunk allotter to the trunk to mark the VT negative when an extension with the proper class of service dials the trunk feature digit.**
RT	**Ring tone (600 Hz interrupted at 12 ips switched on for one (1) second and off for three (3) seconds.**
RTA	From attendant's console to allotter. **Extends** -18 volt signal to allotter to **lengthen** the allotter pulse.
RTA	Group hunt circuit extends a negative pulse to the system allotter on RTA lead to extend allotter pulse.
RU	From trunks to ANA or UNA circuit. Extends -18 volts when an incoming call seizes a trunk.
S	Signal lead. Attendant's did pulses are sent to the trunk via the S lead.
SAT	Saturate. When at ground trunk speech gate is off.
SBC1 SBC2	Alarm outputs from tone supplies to system main alarm.
SEN	Standby enable.
SF	Strapping field.
SG1 SG2	Speech gate leads. Used to extend attendant's speech leads throughout all attendant's override circuits.
SH	Secondary horizontals (secondary outlets to junctor VT terminals for origination and to tertiary matrix horizontale for termination cross connects.
SIT	Outputs from the standby system allotter.
SOM	Stop out mark.
SRK	Standby routine key.
SZ	Seize relay.
T	Tens (tens digit or mark).
T	Tip.
T1 R1 TT1 TR1 TS1 RS1	Tip and ring connections for power failure cut-through of selected lines to trunks.
TA	Trunk allotter.
TA	Trunk allott extends +18 volts to trunks for allotting during -18 volt mark from TG or TK at +2 volts when allotted.

TB	Trunk allotter to all trunks.
TCK	Talk city key.
TCL	Talk city lamp.
TDP	Dial pulse lead. Trunk extends dial pulses from extension to transfer junctor over TDP.
TE	Terminate bus.
TEK	Talk extension key.
TEL	Talk extension lamp.
TEO	From attendant's control to city trunks. Supplies -18 volts from attendant's TE relay to city trunk speech control. Used by attendant for talk extension mode.
TF	Toll restrictor monitor circuit free indication extended to access circuit.
TFA	From toll restrictor to trunk allotter.
TG	Trunk group (trunk allotter groups (4) within a group of trunks) - pre-selects or allotts a trunk for seizure outgoing from EPABX.
TH	Tertiary Horizontals.
TH	Trunk hold. Ground sent from attendant's control to trunk via TH lead to put trunk in hold.
TJ	Transfer junctor
TJA	Transfer junctor access.
TJH	Transfer junctor hold. Extends ground from transfer junctor to trunk to hold trunk during short hang up (ten-second hold).
TJR	Transfer junctor release
TK	From trunk allotter to all trunks in that group. Applies random allott to all trunks to pre-allott a trunk if a trunk was not allotted when the TG was applied.
TL	Trunk lamp (from trunks to console lamps).
TM	Tens mark (terminate mark - may be from hundreds or tens counter of registers, depending on type of registers and size of system). May be designated as H on some features. This IS the digit mark input for accessing a feature in conjunction with FM1 or FMII mark
TMA	Register alarm output to system main alarm.
TQ	Tertiary quaternary (matrix).
TRA	Switches negative when trunk is seized. Remains at ground when a trunk is allotted.
TRAP	Connection from all line circuits to system allotters. Trap is fired when a line accesses a feature.
TRB	From toll restrictor message register. Also inhibits trunk from being marked if a toll restriction circuit is not available.
TRC	From monitor to access circuit. Pulses negative when calling party is restricted.
TRE	Class of service signal from monitor to access circuit.
TRF	Toll restrictor free indication to trunk. Restriction circuit is seized via the TRF lead.
TRG	Toll restrictor extends ground to trunk to prevent further outdialing when restricted.
TRH	As the extension dials, the first three digits are passed to the toll restriction circuit via the TRH.
TRJ	Extends busy tone from toll restrictor to trunk.
TRK	Multiples toll restrictor code detectors together.
TRS	Toll restrictor free indication to trunk. Remains at +18 volts when a monitor circuit is free.
TSS	Trunk splitting. From trunk to attendant's control to extend -18 volts from trunk to TE relay in attendant's control.
TST,MAT	Test matrix.
TUN	Extends ground from UNA circuit to trunk, causing trunk VT to mark to -18 volts.
U	Units (units digit or mark).
UNA	Unassigned night answer
URL1 URL2 URL3 URL4	Outputs from UNA and CC circuits to bell (URL1 and URL2 to UNA, URL3 and URL4 to CC)
V	Matrix verticals (PS verticals and TQ verticals).
VO	Voice originate
VT	Voice Terminate.

EPABX SYSTEM DESCRIPTION

I. Line to Line Call
Allotter
Tone Supply
Junctor
Register
Originate Control
Line
Matrix
Terminate Buss

II. Group Hunting Call
Group Hunt

III. Feature Call-PA
Public Address
Class of Service

IV. Line to Trunk Call-Dictation Trunk
Trunk Allotter
Dictation Trunk

V. Line to Trunk Call - City Trunk
City Trunk

VI. Feature Call -Attendant
Attendants Feature **Allotter**
Attendants Feature
Attendants Control
city Trunk

VII. Attendants Line Call
Attendants Line

VIII. Incoming Trunk Call
City Trunk
Attendants Control
Camp on Busy
Assigned Night Answer
Unassigned Night Answer

IX, Executive Line Call
Executive Junctor
Executive Override Applique

X. Feature Call - Conference
Conference

XI. Feature Call - Code Call
Code Call

XII. Attendants Override Call
Attendants Override

CHAPTER 1

K-501 SERIES KEY SERVICE UNITS

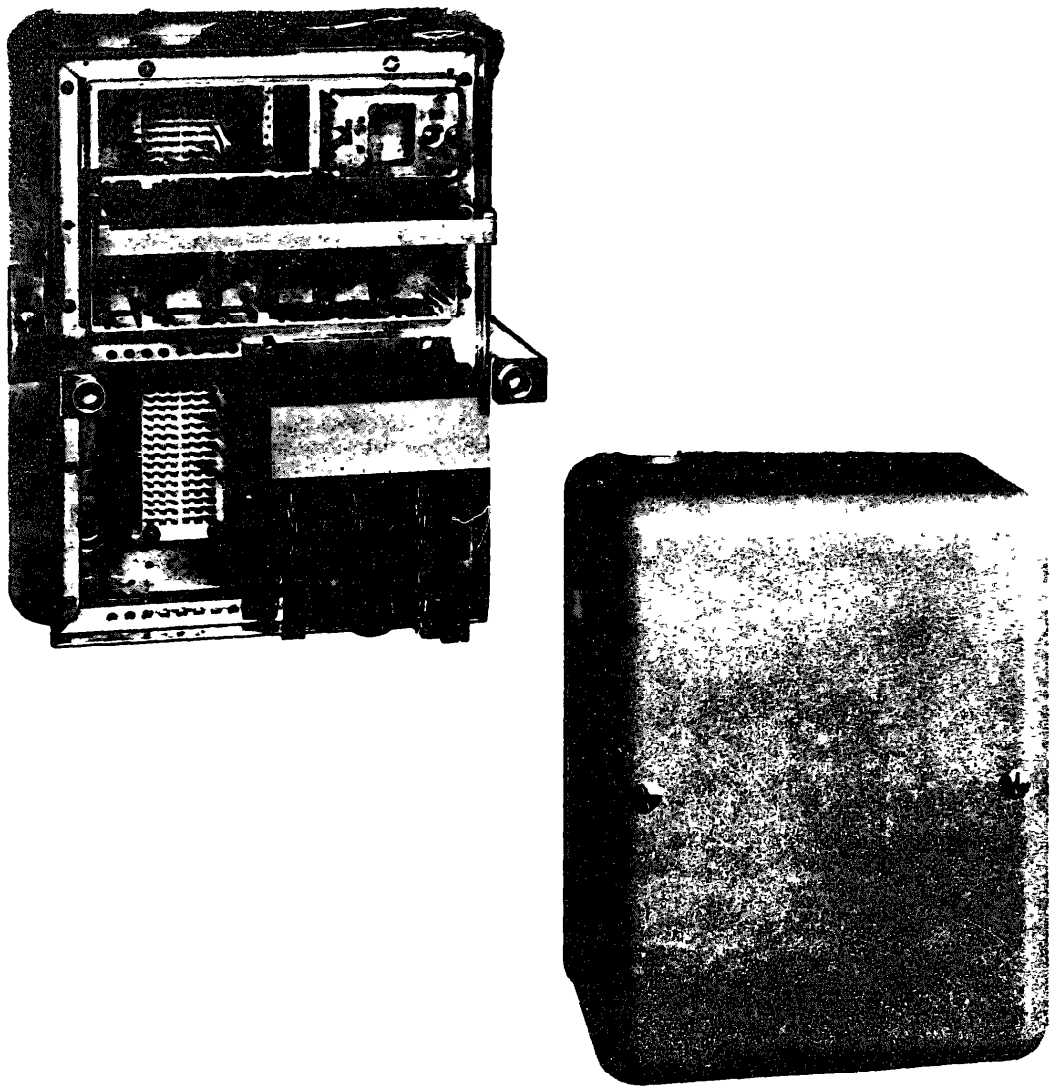

Figure 1-1

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Table 1-1.

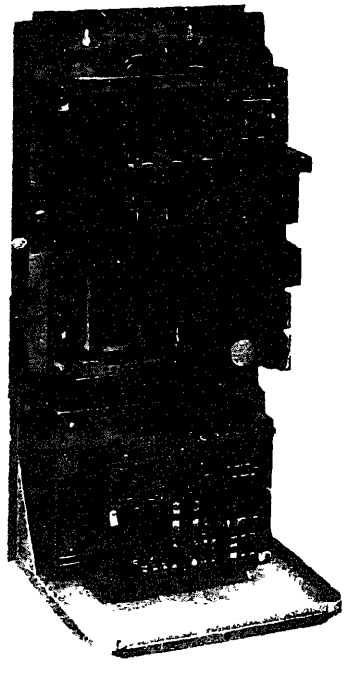
ORDERING INFORMATION

Power Supply	Intercom				
	NONE	ROTARY DIAL		PUSHBUTTON DIAL	
		9 DIAL CODES	18 DIAL CODES	10 DIAL CODES	19 DIAL CODES
6-Line Capacity Key Service Units, Wall Cabinet					
NONE	50100-000-963	50109-000-963	50118-000-963	50110-000-963	50119-000-963
6-Line Capacity Key Service Units, Floorstand Cabinet					
NONE	50100-00F-963	50109-00F-963	50118-00F-963	50110-00F-963	50119-00F-963
180125-001*	50100-0FP-963	50109-0FP-963	50118-0FP-963	50110-0FP-963	50119-0FP-963
180125-002**	50100-FPG-963	50109-FPG-963	50118-FPG-963	50110-FPG-963	50119-FPG-963

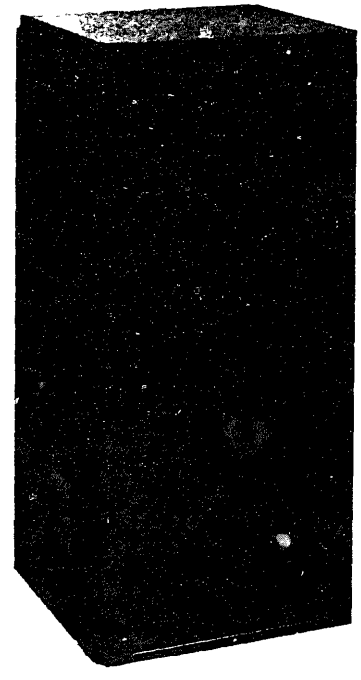
Key Telephone Units (KTU's)

Code	Description
K-400-00D	KTU. CO/PBX Line Card. One required per CO or PBX Line.
K-401-00A	KTU. Manual Intercom Card. One required per manual intercom circuit.
K-207-0C1	KTU, Rotary Dial Selective Intercom Circuit; 9 Dial Codes.
K-216-0A1	KTU, Transfer Circuit. Used with K-207-0C1 to add 9 Dial Codes.
K-347-00C	KTU, Pushbutton Dial Selective Intercom Circuit; 10 Dial Codes.
K-316-00A	KTU, Transfer Circuit. Used with K-347-00C to add 9 Dial Codes.

*Does not include ringing generator. (For buzzer signaling.)
**Includes ringing generator. (For buzzer or ringer signaling.)



FLOORSTAND UNIT WITH POWER SUPPLY. (COVER REMOVED)



FLOORSTAND AND COVER

Figure 1-1 --Continued.

SECTION 1. GENERAL DESCRIPTION

1. INTRODUCTION

The K1A2 Key Telephone System consists of a basic prewired mounting package designated a Key Service Unit, and is provided to receive and associate "plug-in" units in verying combinations to meet subscribers requirements. **The "plug-in" units, designated Key Telephone Units, are new station switching circuits which employ miniature relays and solid state components such as transistors, varistors,** diodes., etc., assembled on printed circuit "plug-in" **cards.**

The system is designed to provide means for signaling a subscriber station associated with a Central Office (CO) or Private Branch Exchange (PBK), for holding that line and for indicating by means **of visual signals whenever the line is being called, held or is busy. It also provides for originating and holding outgoing calls. On an optional basis, it provides a common talking-manual signaling intercomminicating system** and/or **a common talking-dial selective signaling intercommunicating** system.

2. FEATURES

The following features are provided:

a. Flashing visual signals on incoming calls.

b. Common audible signals for incoming calls. (Optional.)

c. Station audible signals for incoming calls, non-bridged ringers. **(Optional.)**

d. Steady visual signals while a station associated with the key telephone system makes a lie busy.

e. Holding calls on a line, while another line is used.

f. **Winking** or **steady visual signal to indicate** a **held line.**

g. **Removal of the hold on a line when a station associated with the key telephone system seizes the line** or **when the line is momentartly opened at the CO** or **PBX.**

h. Operation of the CO or PBX line under local power failure conditions.

i. Release of visual and audible signals (timeout) in approximately 15 or 30 seconds, on a per-line basis, if the call is unanswered and abandoned.

3. SYSTEMS COMPONENTS

Each key telephone system consists essentially of a K501 Key Service Unit with or without a **dial intercommunicating circuit, and with an elextromechanical interrupter. To which is added on the subscriber's premises, a printed circuit type "plug-in" line card on the basis of 1 per CO or PBX line and (if required) 1 - printed circuit type "plug-in" manual intercommunicating card, on the basis of 1** per **circuit.**

The Key Service Units are available with floorstand cabinet with or without Power Supply. Power Supplies are of **two types; one with and one without ringing sub-cycle. Approximate dimensions of power supplies are 4%" D x 7" H x 8¼" W.**

Dimensions of the Floor Stand and cover **are: 13" wide, 11¼" deep and 27¾" high.**

4. DESCRIPTION OF KEY TELEPHONE SYSTEM COMPONENTS

a. The K501 KSU consists of: a die-cast backboard upon which are mounted, 2 "quick connect'* connecting blocks, cable clamps and hooks for station cables; a mounting frame hinged and locked to the backboard, and upon which is mounted a card mounting assembly including 6 printed circuit connectors and an electro-mechanical interrupter. The interrupter is common to the entire system and provides *for* lamp flashing, lamp winking and interrupted ringing.

The backboard is arranged so that the hinge and locking bracket may be transposed to permit the gate opening from right to left instead of left to right as factory assembled.

The KSU is completely pre-wired between the connecting blocks, interrupter and all connectors for "plug-in" cards. It is designed for wall mounting and is providedwith a light grey fiberglass overall **cover. The approximate dimensions are: 16-1/2 in. Ii x 13-1/2 in. W x 10-1/2 in. D.**

b. The K400 KTU is the CO or PBX Line Circuit and consists of a printed circuit board upon which is assembled miniature relays, thermistors, varistors, diodes, capacitors and resistors to provide the necessary switching **circuitry. It also provides easily accessible terminals to change optional features by the installer on the subscribers premises. The assembly is approximately 5-1/4 in. L x 3-1/2 in. W x 1-1/4 in. D.**

c. The K401A KTU is the Manual Intercommunicating Line Circuit and consists of a printed circuit board upon which is assembled a battery feed inductor, current limiting resistors and a busy lamp relay. The assembly is approximately 5-1/4 in. L x 3-1/2 in. W x 1-1/4 in. D. (See figure 1-3).

d. The K207C1 KTU provides for a 9-station common talking, dial selective intercommunicating circuit. It is a modular type unit designed to mount within the K501 KSU, and consists of a two-bank selector and wire spring relays and other components, all of which are mounted on a metal panel and wired to a terminal panel having screw type terminals for external connections. The approximate size is 6-15/16 in. H x 5-7/32 in. W x 6-1/2 in. D.

e. The K216A1 KTU is used in conjunction with a K207C1 KTU to expand rotary-dial selective intercom from 9 to 18 stations. Approximate size is 7"H x 3"W x 6-1/2"D.

f. The K347C KTU provides for a 10-station common talking, pushbutton dial selective intercom circuit. It is a modular type unit designed to mount within the K501 KSU and consists of a panel and 5 plug-in cards. The approximate size is 7"H x 9-1/4"W x 8-1/2"D.

g. The K316A plugs into the K347C KTU to expand pushbutton-dial intercom from 10 to 19 stations.

5. OPERATING INSTRUCTIONS

5.1 General

Operation of the Key Telephone System is extremely simple. The push buttons on the station telephones (See Fig. 1-4) serve to switch the talking circuit to any one line. Visual signals indicate incoming calls . . . illuminated buttons insure rapid identification of calls and busy lines, and prevent interruptions of calls in progress.

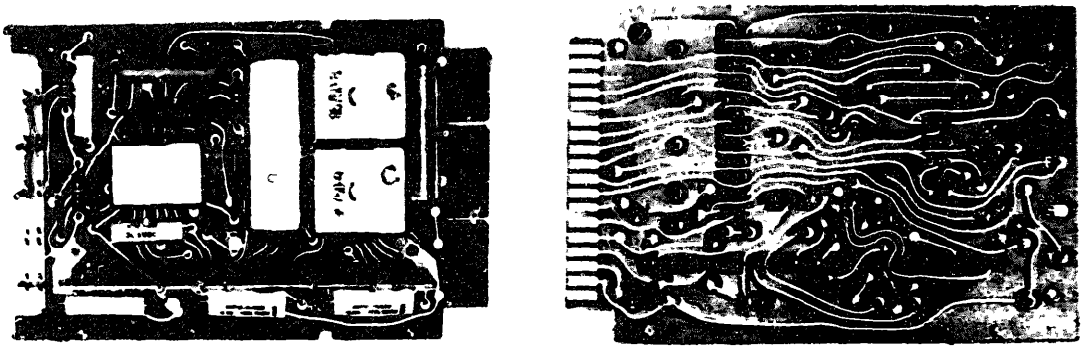


Figure 1-2.
K400(D)962 Key Telephone Unit

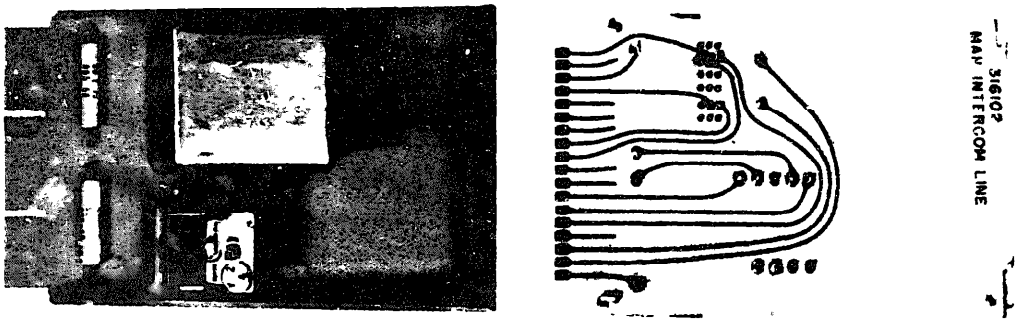


Figure 1-3
K401(A)962 Key Telephone Unit

5.2 Central Office or PBX Lines

Incoming Call

Incoming calls on Central Office or PBX lines are audibly indicated by the station ringer or by a buzzer. The Key Telephone Sets equipped with signal lamps also provide a visual signal indicating which line has an incoming call waiting to be answered by illuminating (flashing lamps) the button of the associated line at all stations at which the line appears.

An incoming call is answered by pressing the line pick-up button associated with the audible and/or visual signals received and picking up the telephone handset.

Outgoing Call

An outgoing call is originated by selecting an idle line, pressing the associated line pick-up button and picking up the telephone handset.

Holding

When it is desfired to hold an incoming call for the purpose of obtaining information over another line, transferring an incoming calf, etc., the hold button is depressed. This causes a holding bridge to be placed across the line and keeps the lamp associated with the line being held lighted or winking so that other stations will know the line is in use. When the subscriber (or the station to which the call has been transferred) desires to pick up the line again the line pick-up button associated with that line is depressed and the hold condition is automatically released permitting the subscriber (or the person to whom the call was transferred) to converse on the line.

When the wink feature is provided, a visual hold signal in conjunction with the holding feature enables a subscriber to distinguish between a line in a normal busy condition or a line with an incoming call. This "wink" signal feature uses the same signal lamp used for line and busy signals, but has a long "on" period and a short "off" period giving the impression of a wink when the line is in a held condition

Operation With Local Power Failure

Should a local power failure occur, ail lines except the Central Office or PBX lines become inoperative. With Central Office or PBX Lines it is possible during a power failure to make an outgoing call since selection of a line and removal of the station handset permits the subscriber to originate a call regardless of the availability of local power to the Key Telephone System If, during a local power failure, the local ringing supply remains operative, the common audible signals, if provided, will operate during an incoming call but will follow the incoming ringing on the line rather that locking in as would be the case when power is available to the relays of the system. During a complete local power failure it is possible. on Central Office and PBX Lines, to receive incoming signals only if ringers are bridged across the lines to operate on incoming ringing current.

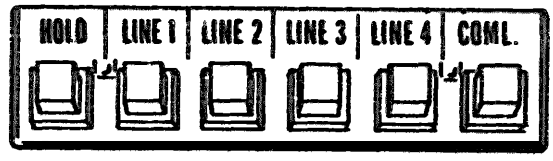


Figure 1-4.
Push Button Panel of Key Telephone Set

Disconnection

Upon completion of the conversation, returning the handset to the cradle will extinguish the signal lamp and restore the line to the idle (non-busy) condition.

5.3 Intercommunication Line

Incoming Call

An incoming call is answered by pressing the line pick-up button associatedwith the audible and/or visual signals received and picking up the telephone handset.

Outgoing Call - Manual Selection of Stations

An outgoing call is originated by lifting the telephone handset, pressing the line pick-up button associated with the intercom line, and operating the signaling button associated with the intercom line.

Outgoing Call - Dial Selection of Stations

An outgoing call is originated by lifting the telephone handset and depressing the line pick-up button associated with the intercom line. The desired station may then be selected by dialing the required digit or digits. For a nine station line, a single digit from "2" to "0" IS used for station identification. At the completion of dialing the buzzer or bell assigned to the called station only will ring for a period of from one to three seconds indicating to the called station that a call is to be answered. If the called station fails to answer the calling station can repeat the audible signal by redialing without hanging up.

SECTION 2. INSTALLATION

1. GENERAL

The instructions contained in this section are furnished to aid and assist the installer in the installation of K1A2 Key Telephone Systems.

In preparing for the installation of a K1A2 KTS, the installer should thoroughly read the literature contained in Section 1, so that he will be familiar with the equipment and features of the system.

2. **MOUNTING**

The K501 Key Service Unit is designed **for** wall mounting and **should be firmly** mounted to a wall at **convenient** height from the floor and in such a position as to allow the equipment gate to swing out to the right to facilitate wiring, **inspection** and maintenance.

The connecting blocks are furnished with **aluminum** pressure sensitive tapes, preprinted **with terminal designations. The tape is one continuous strip** and should be cut at the slots on the **fanning** strips with the sharp edge of the R714B tool (used for terminating the station cable to the connecting block **terminals**) before the wires are terminated **on the** blocks.

Figure 2-1 shows the layout of the connecting **blocks and figure 2-3 shows the termination of cable on the blocks.**

The location of the apparatus cabinet should be determined primarily with the following considerations in mind:

a. **A centralized location to minimize cable *runs* to telephone stations.**

b. **Accessibility for inspection and maintenance.**

C. **Proximity to telephone stations to eliminate possible conversation distractions.**

d. **Compatibility with the decor of the premises.**

e. **Accessibility of a power outlet for the power supply.**

3. WIRING

3.1 General

The K501 Key Service Unit is a factory interwired unit. Connections between station apparatus and the Key Service Unit are made on connecting blocks with quick connect terminals.

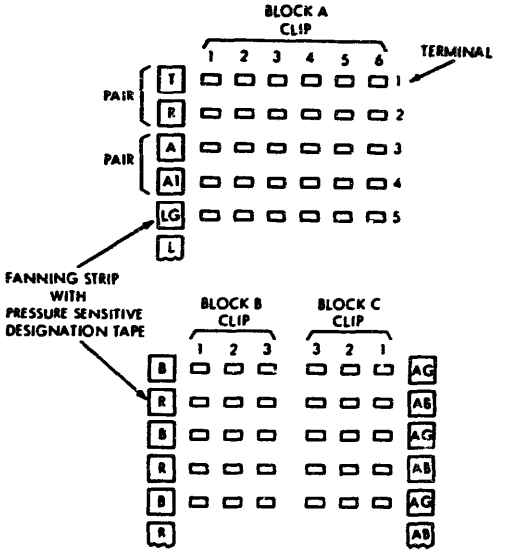


Figure 2-1. Layout of Connecting Blocks

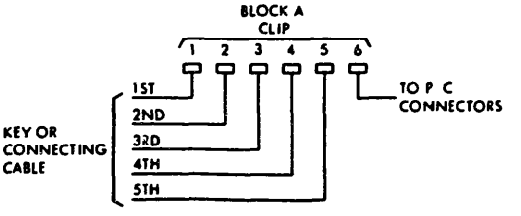


Figure 2-2. Termination of Cables on Connection Blocks

3.2 Connecting Blocks

Connections between station apparatus and the connection blocks are shown in Table 2-3 for the K501 Key Service Unit.

Connect an external power source as shown in the tables when power is not provided as part of the package.

The connecting blocks are designed for use with unskinned plastic insulated wire. Insulated conductors are terminated on the clip by insertion into the clip opening, placing the R714B tool over **the clip (with the cutoff blade up) and pushing firmly toward the terminal block. This action forces the wire to** a

fixed position in the clip and at the same time cuts the wire insulation. The force of the blade against the base of the connecting blocks cuts-off the unused end of wire. For wires that are not to be cut off, the "bit" of the R714B tool is reversed so that the cut-off blade is not used.

4. EQUIPPING

4.1 Installation of CO or PBX Line Circuits

K400 KTU's on the basis of one KTU per line **required, are plugged** Into the printed circuit connectors, usually **fr**om left to right. The KTU is oriented in a vertical position with the printed circuitry to the left, inserted in the guides on the mounting frame and firmly inserted into the connector. After all units areinserted the screwsfor the retaining **bar are** tightened to prevent any KTU's from **falling out of** the card mounting assembly.

4.2 CO or PBK Line Circuit Options

Z - Short Time-out. (Used with automatic ringing co or PBK).

W - Interrupted Station Audible Signaling

T - Steady Station Audible Signaling

V - Auxiliary Common Audible Signal Circuit

Y - Winking Hold Lamp

X - Steady Hold Lamp

Each K400 is factory wired for options Z, W and Y. If other options are required by the subscriber, the installer should re-wire the option terminals on the printed circuit board to meet specific requirements. (See Figure 2-3).

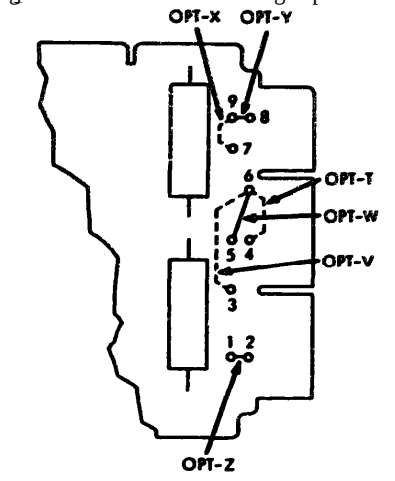
4.3 Installation of Manual Intercommunicating Circuit

The K401A KTU is plugged into the selected printed circuit connector in the same manner as the K400 **KTU.** Strapping of battery feed wires for the K401A KTU is required (See Table 2-3). For suggested wiring for station audible signals see Fig. 2-4.

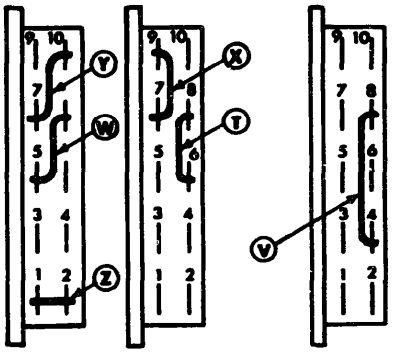
4.4 Station Apparatus

A connection chart is provided to facilitate connection of the K564 and K565 **Key** Telephone Sets to the Connecting Blocks of the **K501** KSU. (See Table 2-6).

Figure 2-3. K400 KTU Wiring Options



K400B KTU



K400(D) KTU

5. POWER SUPPLY

Before the power supply is connected to the K-501 KSU, the power cord should be connected to a **wall service** outlet and the DC voltage to Talking (A) and Relay (B) Battery outputs measured with a DC Voltmeter.' If the voltage obtained is higher than 26 V. DC compensation should be made by moving the tap on the primary of the power supply to a higher value of AC Voltage. Most power supplies are normally tapped at 111, 117 and 123 V. AC.

SPECIAL NOTE:

Since the K400 CO or PBK Line Circuit is designed for grounded ringdown only, it is necessary that the "B" Battery Ground of the Power Supply be connected to **a** good earth ground. This connection is to be made to terminal 45(BG) on Connecting Block "C" of the K501 KSU.

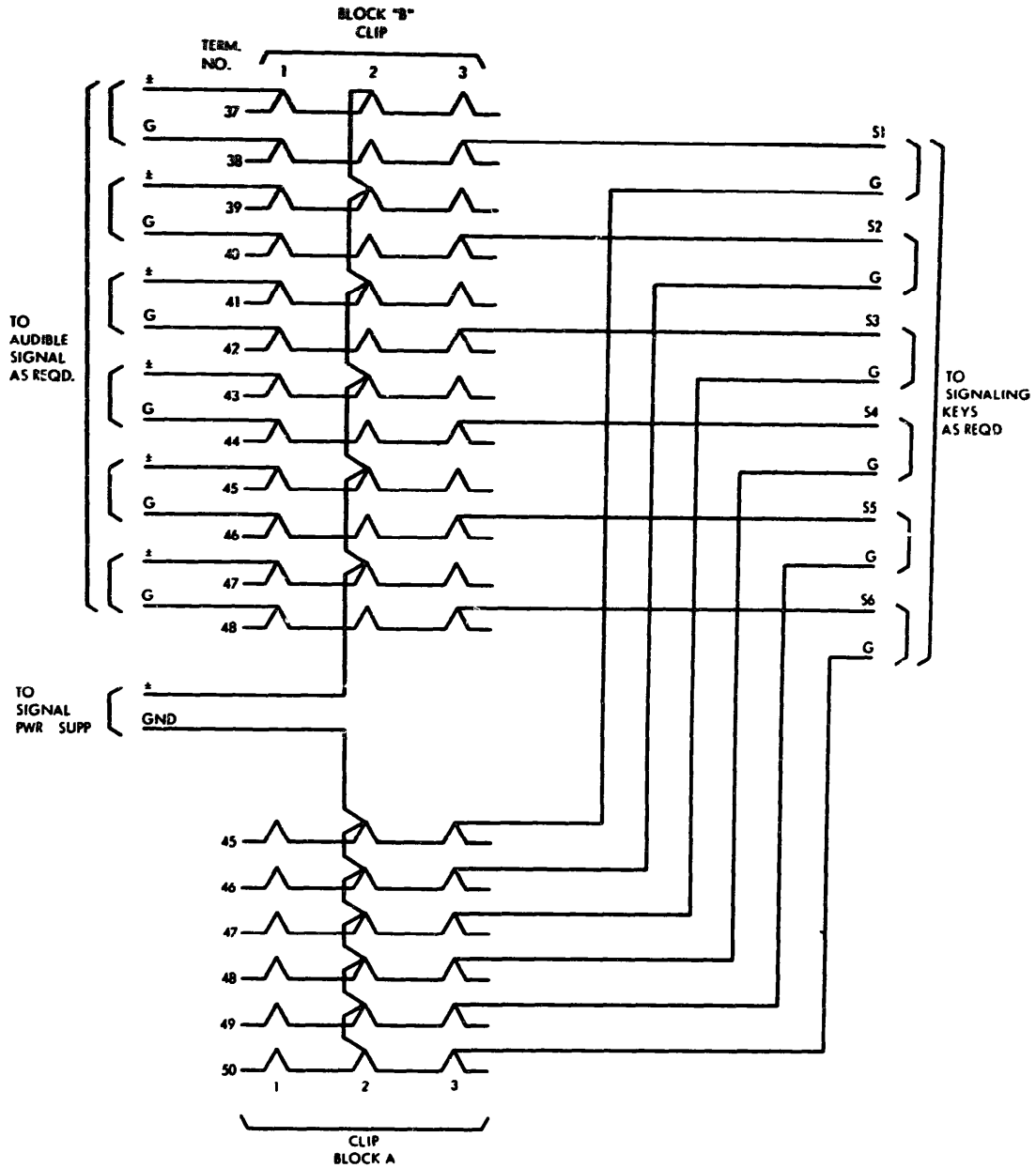


Figure 2-4. Manual Intercom Station Signaling

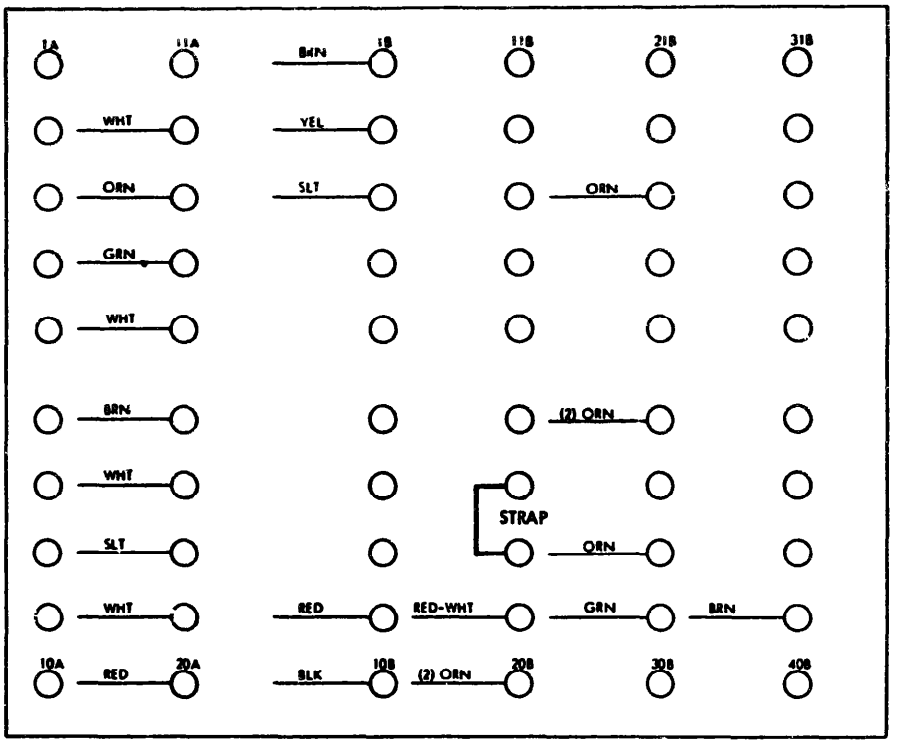


TABLE 2-1. Terminal Connections for Adding K207C1 KTU

TABLE 2-2. Terminal Connections for Adding K347C KTU

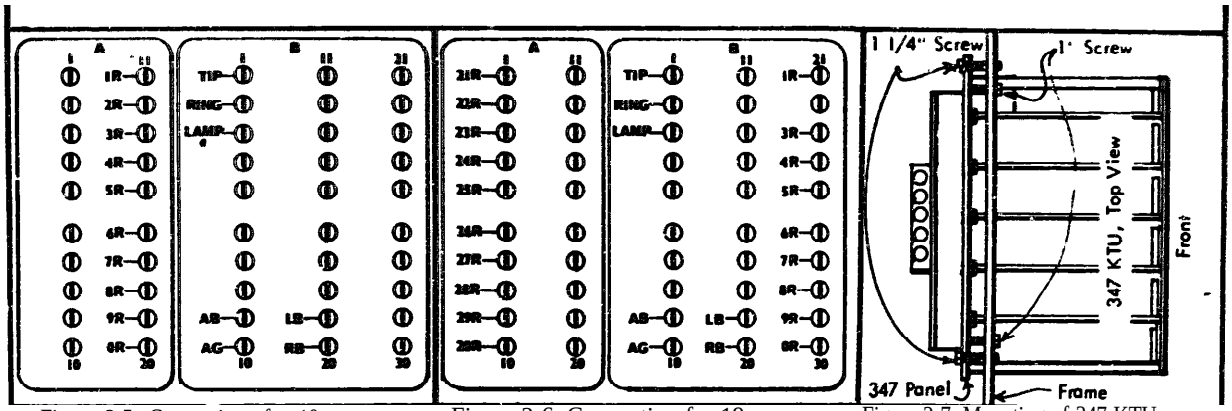


Figure 2-5. Connections for 10 TEL-TOUCH stations

Figure 2-6. Connection for 19 TEL-TOUCH stations

Figure 2-7. Mounting of 347 KTU using screws for spacers

6. INSTALLATION

6.1 MOUNTING

If mounting the unit in a wall cabinet, install it behind the mounting frame using the four I 1/4" machine screws and spacers provided. If mounting in a floorstand cabinet, use the 3/8" machine screws provided and mount the unit behind the frame. In the 501 KSU type will cabinet, it may be necessary to move the connecting blocks to the higher Position. In the 511 KSU type wall cabinet, remove the acoustic podding from inside the cover to allow clearance for the 347 KTU. Certain 511 KSU type cabinets will not permit use of the fiber spacers provided because of interference with the "T" section of the center mounting frame. In such case, use the 1" machine screws provided. Install the four 1" screws from the front of the frame approximately 6" apart so each corner of the 347 panel will rest against the ends of the screws. Install the 1 1/4" screws from the rear. (See figure 2-7)

6.2 CONNECTING

CAUTION: When connecting, be sure that "A Battery" and "A Ground" leads are terminated on terminals 9B and 10B respectively. Otherwise damage to the printed cards may result.

(a) For pure TEL-TOUCH System. (Figures 2-5 and 2-6)

1. On terminal block B of the K 501 Key Service Unit:
   - Strop from 17 to 37:
   -Connect one end of a 4-foot wire, (any color), to terminal 3B, spudger into main cable arm and bring out in long sub-arm in group of conductors for termination on the K 347.
   - For 10 stations, terminate the 4-foot wire on terminal 11A of the K 347; for 19 stations, terminate the wire on terminal 1A.

2. Terminate other conductors as shown in figure 2-5 for 10 stations of figure 2-6 for 19 stations.

3. Plug "A-W', "Al", "A2", "A3", and "A4" cards, with printed circuit side to the left, into designated connectors For 19 stations, also plug in the "A5" cord and install the "A3 Auxiliary" card on the "A3" card.

(b) For mixed TEL-TOUCH and Rotary Dial Stations (Table 1)

1. Install the 207 C in the normal manner for rotary dial intercom. For 18 stations, install the 216 A in the normal manner also.

2. Mount the 347 B near the 207 C and strop between the two units OS shown in table 1. For 18 stations strop between the 347 B and the 207 C and the 216 A OS shown in table 1. Note diodes

3. Plug "Al", "A2", "A3" and "A4" cards into their designate connectors. For 18 stations, install the "A3 Auxiliary" card on the "A3" cord.

4. Connect T and R leads of rotary dial phones to 1B and 2B respectively on the 207C. Connect T and R leads of push-button dial phones to 1B and 2B respectively on the 347 B.

TABLE 1. CONNECTING K-347B to K-207C and K-216A

K-207 C	K-347 B	K-216 A
11A	11A	
12A	12A	
13A	13A	
14A	14A	
15A	15A	
16A	16A	
17A	17A	
18A	18A	
19A	19A	
20A	20A	
1B	4B	
2B	2B	
"A Bat"	9B	
"A Ground"	10B	
"Sig Bat"	20B	
	6B 16B	33
		32

Diodes (1N2070 or any diode rated 750 ma, 600 v peak reverse voltage)

NOTE: If shorter signal is desired, remove strap from terminals C3 and C5 on A3 Cord.

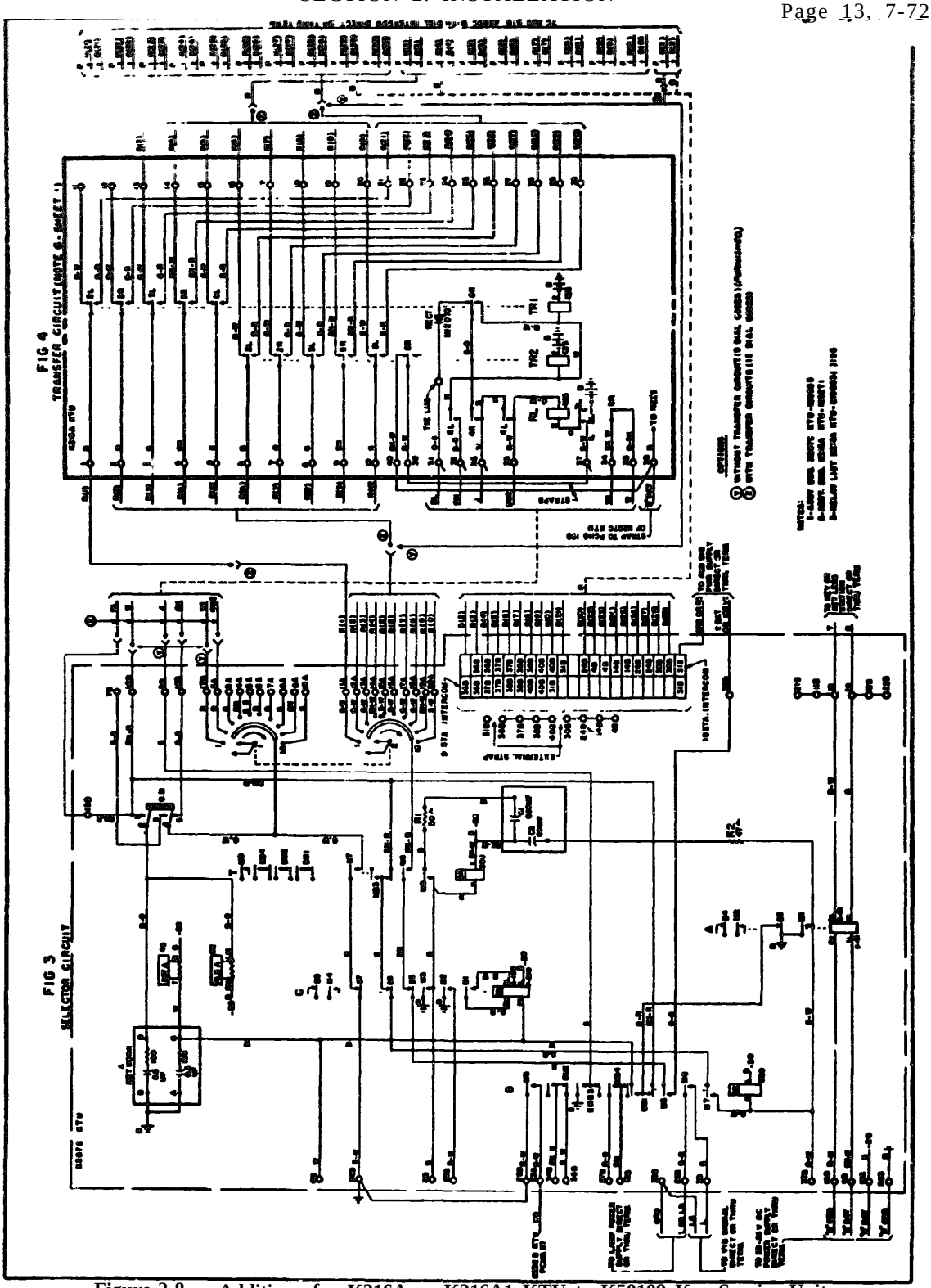


Figure 2-8 Addition of a K216A or K216A1 KTU to K50109 Key Service Unit

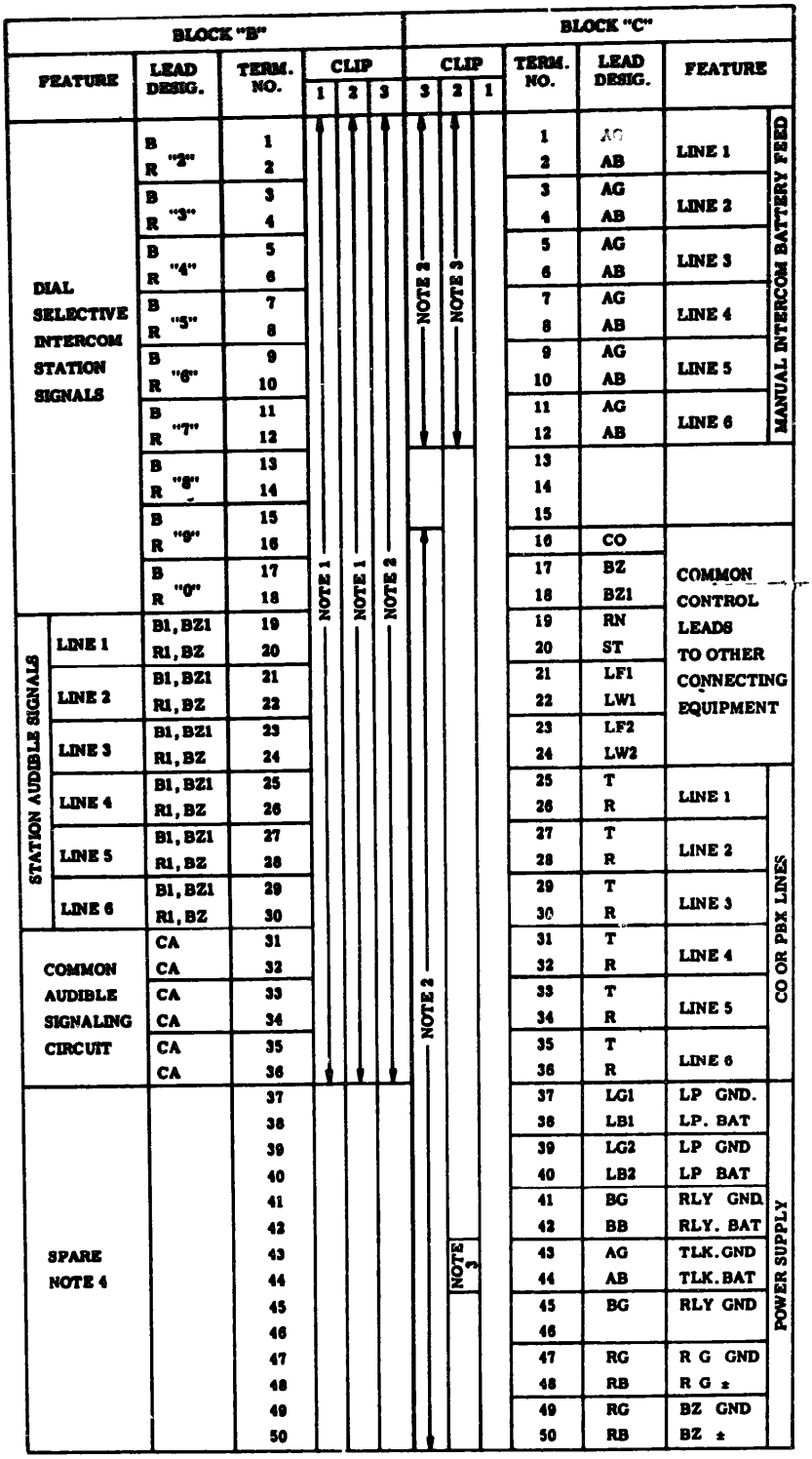
Table 2-3.

CONNECTIONS BETWEEN STATION APPARATUS AND CONNECTING BLOCKS

BLOCK "A"								
FEATURE	LEAD DESIG.	TERM. NO.	CLIP 1	CLIP 2	CLIP 3	CLIP 4	CLIP 5	CLIP 6
LINE 1	T	1	NOTE 1	NOTE 1	NOTE 1	NOTE 1	NOTE 1	NOTE 2
	R	2						
	A	3						
	A1	4						
	LG	5						
	L	6						
LINE 2	T	7						
	R	8						
	A	9						
	A1	10						
	LG	11						
	L	12						
LINE 3	T	13						
	R	14						
	A	15						
	A1	16						
	LG	17						
	L	18						
LINE 4	T	19						
	R	20						
	A	21						
	A1	22						
	LG	23						
	L	24						
LINE 5	T	25						
	R	26						
	A	27						
	A1	28						
	LG	29						
	L	30						
LINE 6	T	31						
	R	32						
	A	33						
	A1	34						
	LG	35						
	L	36						
DIAL SELECTIVE INTERCOM LINE	T	37						
	R	38						
	T	39						
	R	40						
	LG	41						
	L	42						
	LG	43						
	L	44						
SPARE NOTE 4	B	45						
	R	46						
	B	47						
	R	48						
	B	49						
	R	50						

NOTES:

1. **Terminate connector or running cables from left to right on clips as required.**
2. **Shop wiring from apparatus is terminated on this clip.**
3. **When K401A KTU, manual intercom is required, associated BAT. A and GND. A leads are to be strapped to terms. 44 and 43 of Block C.**
4. **These spare terms. may be used for manual signaling. (See Fig. 2-4).**


BLOCK "B"
BLOCK "C"
FEATURE
LEAD DESIG.
TERM. NO.
CLIP
1 2 3
3 2 1
DIAL SELECTIVE INTERCOM STATION SIGNALS
B R "2"
B R "3"
B R "4"
B R "5"
B R "6"
B R "7"
B R "8"
B R "9"
B R "0"
STATION AUDIBLE SIGNALS
LINE 1
LINE 2
LINE 3
LINE 4
LINE 5
LINE 6
B1, BZ1 R1, BZ
COMMON AUDIBLE SIGNALING CIRCUIT
CA
SPARE NOTE 4
NOTE 1
NOTE 2
NOTE 3
AG
AB
CO
BZ
BZ1
RN
ST
LF1
LW1
LF2
LW2
T
R
LG1
LB1
LG2
LB2
BG
BB
RG
RB
LINE 1
LINE 2
LINE 3
LINE 4
LINE 5
LINE 6
MANUAL INTERCOM BATTERY FEED
COMMON CONTROL LEADS TO OTHER CONNECTING EQUIPMENT
CO OR PBX LINES
LP GND.
LP. BAT
LP GND
LP BAT
RLY GND.
RLY. BAT
TLK. GND
TLK. BAT
RLY GND
R G GND
R G ±
BZ GND
BZ ±
POWER SUPPLY

SECTION 2. INSTALLATION

NOTES:

1. ONLY CLIPS 1, 2, 3, 4 AND 5 OF BLOCK "A" AND CLIPS 2 AND 3 OF BLOCK B ARE USEABLE IN TERMINATION OF STATION CONN OR EXTERNAL CONN. BLOCK CABLES
2. COMMON AUDIBLE SIGNAL TERMINATION FOR SIX CO OR PBX LINES, STRAP DESIRED TERMINALS TOGETHER AND CONNECT SLT-YEL CABLE CONDUCTOR TO THE STRAPPED GROUP AND YEL-SLT CABLE CONDUCTOR TO A VACANT B1 TERMINAL
3. DEPENDING UPON WHERE THE K401(A)962 KTU MANUAL INTERCOM CARD IS INSERTED, IT IS NECESSARY TO STRAP THE CORRESPONDING AG AND AB CLIPS TO CLIPS 43 AND 44 RESP,.
4. TO USE BUZZERS FOR INTERCOM SIGNALS AND RINGERS FOR CO LINES, CHANGE STRAPPING AS FOLLOWS:
   A. REMOVE BRN STRAP FROM 48 AND 50 ON BLOCK "C".
   B. CONNECT RING BATTERY TO TERMINAL 48 ON BLOCK "C".
   C REMOVE BRN LEAD FROM TERMINAL 39B OF K207 C KTU
   D CONNECT A WIRE FROM TERMINAL 50 OF BLOCK "C" TO TERMINAL 39B OF K207 C KTU
   E CONNECT 18 V ± FROM POWER SUPPLY TO TERMINAL 50 OF BLOCK "C"
5. TO USE RINGERS FOR INTERCOM SIGNALS AND BUZZERS FOR CO LINES, CONNECT 105V ± TO TERMINAL 50 AND 18V ± TO TERMINAL 48 ON BLOCK "C"
6. IF DIAL INTERCOM (K207 C OR K347 C KTU) IS INCLUDED IN THE PACKAGE, THE CONDUCTORS NORMALLY USED FOR LINE 5 MUST BE CONNECTED FOR DIAL INTERCOM AS SHOWN
7. IF RINGERS ARE USED FOR AUDIBLE SIGNALS, CONNECT YEL-SLT TO B, OR B1, TERMINAL, AND SLT-YEL TO R, OR R1 TERMINAL IF BUZZERS ARE USED FOR AUDIBLE SIGNALS, CONNECT YEL-BLU TO B OR B1 TERMINAL, AND BLU-YEL TO R OR R1 TERMINAL-FOR THE K564 AND K565 IF THE K231, OR K232 TELEPHONE IS USED, THE ORN-YEL AND YEL-ORN CONDUCTORS ARE USED FOR BUZZER CONNECTIONS
8. THESE CONDUCTORS ARE USED FOR ACCESS TO DIAL INTERCOM "WITH ALL PICKUP BUTTONS RELEASED"
9. CONNECT DIAL INTERCOM STATION AUDIBLE SIGNALING LEADS PER ASSIGNED DIGITS

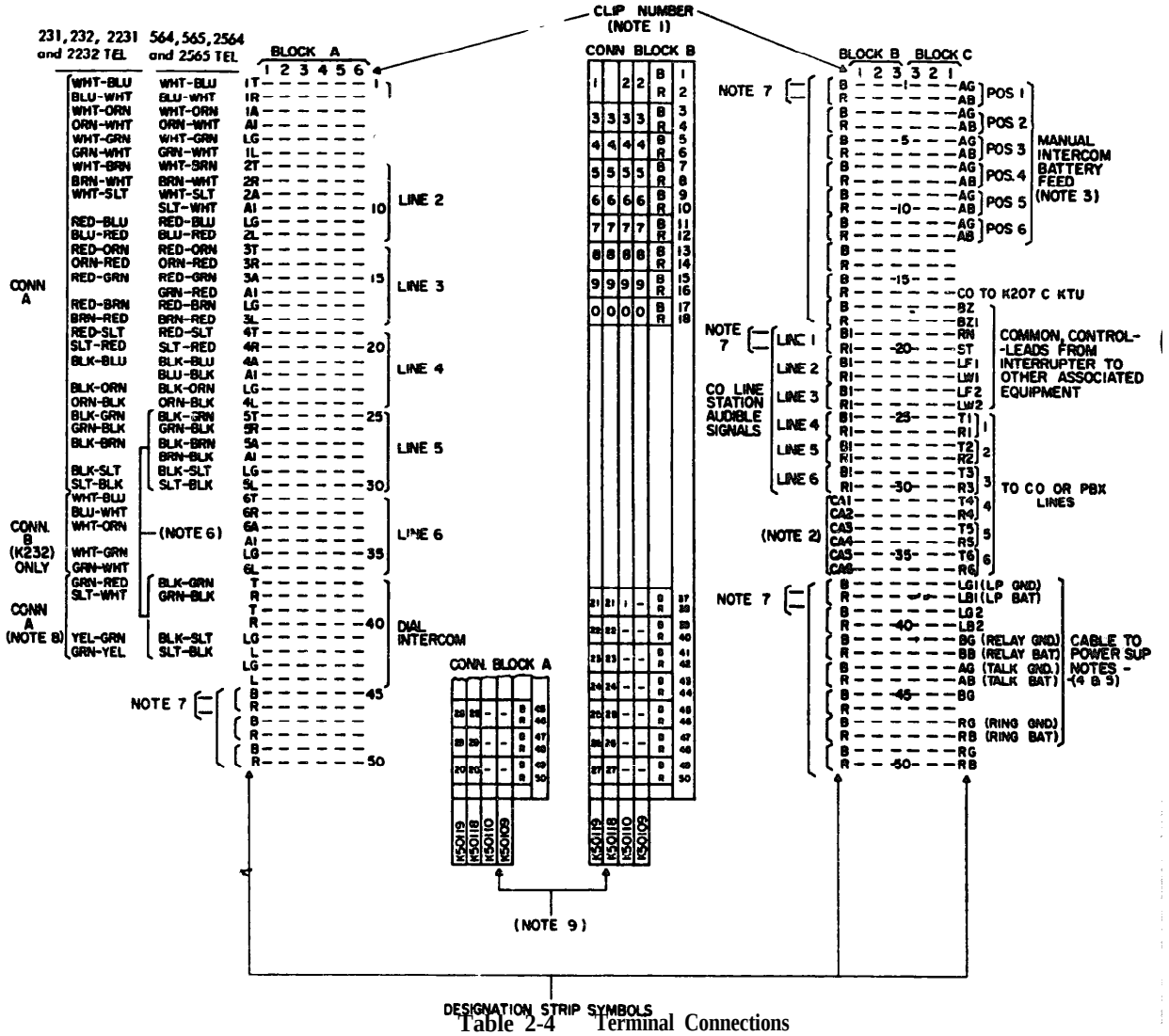
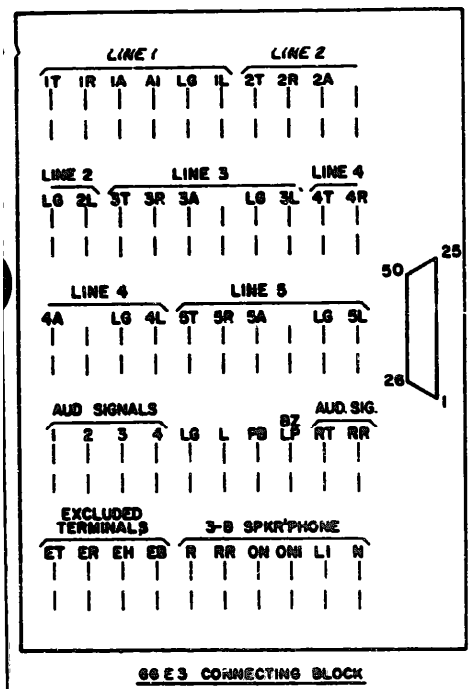


Table 2-4 Terminal Connections

NOTES.

1- THIS FEATURE APPLICABLE TO BOTH K565( )40M AND K565( )42M TELEPHONES
2- THIS FEATURE APPLICABLE TO K565( )42M TELEPHONE ONLY
3- THESE FEATURES ARE NOT APPLICABLE TO K564( )40M TELEPHONE.
4- THESE FEATURES APPLICABLE TO K231( )50M TELEPHONE



66E3 CONNECTING BLOCK

CIRCUIT	CLIP NUMBER	CIRCUIT DESIGNATION	CABLE CONDUCTOR COLOR	K501 K S U. W/O COML TERM NO	K501 K S.U W/ COML TERM NO.
LINE 1	1	1T	WHT – BLU	1	1
	2	1R	BLU – WHT	2	2
	3	1A	WHT – ORN	3	3
	4	1I	ORN – WHT	4	4
	5	LG	WHT – GRN	5	5
	6	1L	GRN – WHT	6	6
LINE 2	7	2T	WHT – BRN	7	7
	8	2R	BRN – WHT	8	8
	9	2A	WHT – SLT	9	9
	10	–	–	–	–
	11	LG	RED – BLU	11	11
	12	2L	BLU – RED	12	12
LINE 3	13	3T	RED – ORN	13	13
	14	3R	ORN – RED	14	14
	15	3A	RED – GRN	15	15
	16	–	–	–	–
	17	LG	RED – BRN	17	17
	18	3L	BRN – RED	18	18
LINE 4	19	4T	RED – SLT	19	19
	20	4R	SLT – RED	20	20
	21	4A	BLK – BLU	21	21
	22	–	–	–	–
	23	LG	BLK – ORN	23	23
	24	4L	ORN – BLK	24	24
LINE 5	25	5T	BLK – GRN	25	37 OR 39
	26	5R	GRN – BLK	26	38 OR 40
	27	5A	BLK – BRN	27	–
	28	–	–	–	–
	29	LG	BLK – SLT	29	41 OR 43
	30	5L	SLT – BLK	30	42 OR 44
(3) (4) AUX SIGNALS	31	5	BLU – YEL	BLOCK B	BLOCK B
	32	6	YEL – BLU		
	33	3	ORN – YEL		
	34	4	YEL – ORN		
HOLD LAMP	35	–	GRN – YEL	AUX CIR.	AUX CIR
	36	–	YEL – GRN		
P B SIG.	37	SG	BRN – YEL	GND TO AUX APPAR.	
BZ LAMP	38	L2	YEL – BRN	TO BZ LAMP FIELD	
RINGER	39	RT	YEL – SLT	CONN. BLK B	CONN. BLK B
	40	RR	SLT – YEL		
(1) (3) EXCLUSION K565 ONLY	41	ET	VIO – BLU	(1) TO SUCCEEDING EXCLUDED PHONES	(1) TO SUCCEEDING EXCLUDED PHONES
	42	ER	BLU – VIO		
	43	EH	VIO – ORN		
	44	EB	ORN – VIO		
(2)(3)(4) R	45	RI	GRN – VIO	CABLE THRU 148B OR 149B ADAPTER TO 55 BW CONT UNIT	
RR	46	TI	VIO – GRN		
3B ON	47	P3	BRN – VIO		
SPKRPH ONI	48	P4	VIO – BRN		
LI	49	LK	SLT – VIO		
N	50	AG	VIO – SLT		

Table 2-5 **Cable Termination for 66E3 Connecting Block**

Table 2-6. Connection Chart, K564. K565. K2564, K2565 Telephone Sets

CKT. FEAT.		TERMINAL IN SET	MOUNTING CORDS (a)			CONNECTING BLOCK TERMINAL NUMBER		CONNECTING CABLE	
			50-Cond.	42-Cond.	34-Cond.				
LINE	LEAD DESIG.		K-565/39 /42 phones	K-565/30 /40 phones	K-564/30 /40 phones	SCREW TYPE	AMPHENOL	50-Cond. (a)	40-Cond. (h)
1	R	1R	BLU-WHT	BLU-WHT	BLU-WHT	1-1	1	BLU-WHT	BLU
	T	1T	WHT-BLU	WHT-BLU	WHT-BLU	1-2	26	WHT-BLU	WHT
	A1	1B	ORN-WHT	ORN-WHT	ORN-WHT	1-4	2	ORN-WHT	ORN
	A	1H	WHT-ORN	WHT-ORN	WHT-ORN	1-5	27	WHT-ORN	WHT
LAMP	L	1L	GRN-WHT	GRN-WHT	GRN-WHT	4-1	3	GRN-WHT	GRN
	LG	1LG	WHT-GRN	WHT-GRN	WHT-GRN	4-2	28	WHT-GRN	WHT
2	R	2R	BRN-WHT	BRN-WHT	BRN-WHT	1-6	4	BRN-WHT	BRN
	T	2T	WHT-BRN	WHT-BRN	WHT-BRN	1-7	29	WHT-BRN	WHT
	---	---	SLT-WHT(b)	SLT-WHT(b)	SLT-WHT(b)	1-9	5	SLT-WHT	BRN
	A	2H	WHT-SLT	WHT-SLT	WHT-SLT	1-10	30	WHT-SLT	SL
LAMP	L	2L	BLU-RED	BLU-RED	BLU-RED	4-4	6	BLU-RED	WHT
	LG	2LG	RED-BLU	---	---	---	31	RED-BLU	---
3	R	3R	ORN-RED	ORN-RED	ORN-RED	1-3	7	ORN-RED	BLU
	T	3T	RED-ORN	RED-ORN	RED-ORN	1-8	32	RED-ORN	RED
	---	---	GRN-RED(b)	GRN-RED(b)	GRN-RED(b)	2-1	8	GRN-RED	YEL
	A	3H	RED-GRN	RED-GRN	RED-GRN	2-2	33	RED-GRN	ORN
LAMP	L	3L	BRN-RED	BRN-RED	BRN-RED	4-6	9	BRN-RED	RED
	LG	3LG	RED-BRN	---	---	---	34	RED-BRN	---
4	R	4R	SLT-RED	SLT-RED	SLT-RED	2-4	10	SLT-RED	GRN
	T	4T	RED-SLT	RED-SLT	RED-SLT	2-5	35	RED-SLT	RED
	---	---	BLU-BLK(b)	BLU-BLK(b)	BLU-BLK(b)	2-6	11	BLU-BLK	SLT
	A	4H	BLK-BLU	BLK-BLU	BLK-BLU	2-7	36	BLK-BLU	BRN
LAMP	L	4L	ORN-BLK	ORN-BLK	ORN-BLK	4-9	12	ORN-BLK	RED
	LG	4LG	BLK-ORN	---	---	---	37	---	---
5	R	5R	GRN-BLK	GRN-BLK	GRN-BLK	2-9	13	GRN-BLK	SLT
	T	5T	BLK-GRN	BLK-GRN	BLK-GRN	2-10	38	BLK-GRN	RED
	---	---	BRN-BLK(b)	BRN-BLK(b)	BRN-BLK(b)	2-3	14	BRN-BLK	YEL
	A	5H	BLK-BRN	BLK-BRN	BLK-BRN	2-8	39	BLK-BRN	BLU
LAMP	L	5L	SLT-BLK	SLT-BLK	SLT-BLK	4-3	15	SLT-BLK	BLK
	LG	5LG	BLK-SLT	---	---	---	40	BLK-SLT	---
AUX SIGS (d)		1	BLU-YEL	BLU-YEL	---	---	16	BLU-YEL	---
		2	YEL-BLU	YEL-BLU	---	---	41	YEL-BLU	---
		3	ORN-YEL	---	ORN-YEL(b)	---	17	ORN-YEL	---
		4	YEL-ORN	---	YEL-ORN(b)	---	42	YEL-ORN	---
HOLD LAMP		HL	GRN-YEL	---	GRN-YEL(b)	---	18	GRN-YEL	---
		HLG	YEL-GRN	---	YEL-GRN(b)	---	43	YEL-GRN	---
PB SIG		SG	BRN-YEL	BRN-YEL	BRN-YEL	3-1	19	BRN-YEL	ORN
BZ LP		L2(c)	YEL-BRN	YEL-BRN	YEL-BRN	3-2	44	YEL-BRN	BLK
R-R1		RR	SLT-YEL	SLT-YEL	SLT-YEL	3-4	20	SLT-YEL	GRN
B-B1		RT	YEL-SLT	YEL-SLT	YEL-SLT	3-5	45	YEL-SLT	BLK
EXCLUDED CIRCUIT	R	ER	BLU-VIO(e)	BLU-VIO(e)	---	3-6	21	BLU-VIO	BRN
	T	ET	VIO-BLU(e)	VIO-BLU(e)	---	3-7	46	VIO-BLU	BLK
	A1	EB	ORN-VIO(e)	ORN-VIO(e)	---	3-9	22	ORN-VIO	SLT
	A	EH	VIO-ORN(e)	VIO-ORN(e)	---	3-10	47	VIO-ORN	BLK
SPEAKER PHONE	R1	R	GRN-VIO(e)	GRN-VIO(e)	---	3-3	23	GRN-VIO	BLU
	T1	RR(c)	VIO-GRN(e)	VIO-GRN(e)	---	3-8	48	VIO-GRN	YEL
	P3	ON	BRN-VIO(e)	BRN-VIO(e)	---	4-8	24	BRN-VIO	ORN
	P4	ON1	VIO-BRN(e)	VIO-BRN(e)	---	4-10	49	VIO-BRN	YEL
	LK	L1(c)	SLT-VIO(e)	SLT-VIO(e)	---	3-5	25	SLT-VIO	GRN
	AG	N	VIO-SLT(e)	VIO-SLT(e)	---	4-7	50	VIO-SLT	YEL

pair

pair

NOTES:

a. Colors are designated, body first stripe second.

b. Spare conductors, tape and store in telephone.

c. Terminal on telephone network.

d. Auxiliary term strip in telephone.

e Exclusion and speakerphone leads not associated with these features, must be disconnected, taped and stored in telephone set when two or more sets are connected in multiple through bridging adaptors.

f Terminals 28, 31, 34, 37 and 40 are strapped on the mounting cord connector.

g. These terminals are not used except when the telephone is modified to install an exclusion switch.

h. If Superior Cable Co. No. 25 x 24 ICRS "Ring Stripe" Cable is used, colors designated become a two color combination, i.e. BLU-WHT, WHT-BLU, ORN-WHT, WHT-ORN etc. The first color is the body and the second the "ring stripe".

Table 2-7. Connection Chart, K830, K831, K854, K2830, K2831, and K2854 Telephone Set

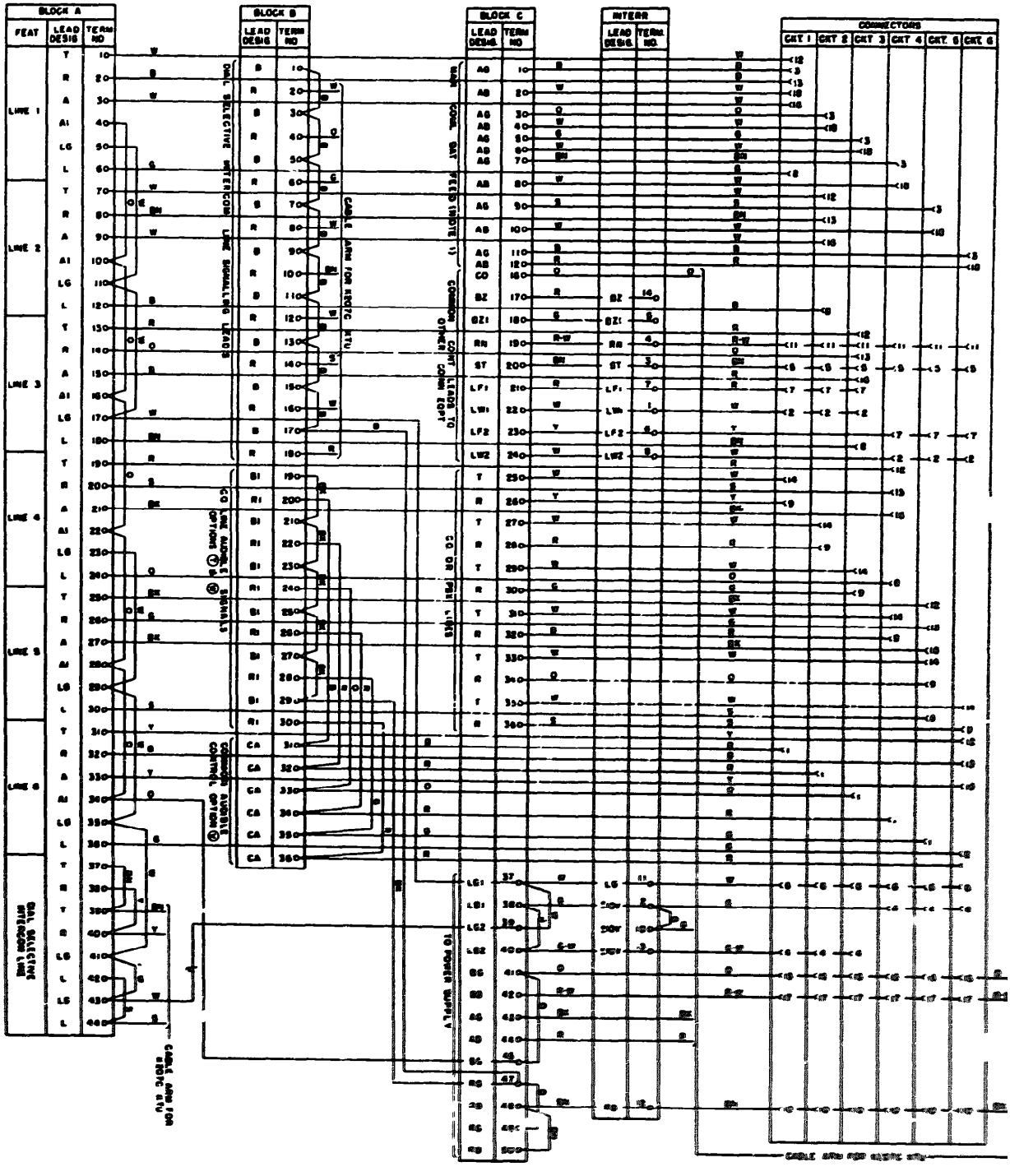
LINES 1 THROUGH 9			
Tel Set Term	Lead Color	Lead Desig	Conn or Plug Term
Line 1 (Blue) Plug	BL-W	R	1
	W-BL	T	26
	W-O	A	27
	G-W	L	3
	W-G	LG	28
Line 2 (Orange) Plug	BR-W	R	4
	W-BR	T	29
	W-S	A or S	30
	BL-R	L	6
	R-BL	LG	31
Line 3 (Green) Plug	O-R	R	7
	R-O	T	32
	R-G	A or S	33
	BR-R	L	9
	R-BR	LG	34
Line 4 (Ivory) Plug	S-R	R	10
	R-S	T	35
	BK-BL	A or S	36
	O-BK	L	12
	BK-O	LG	37
Line 5 (Slate) Plug	G-BK	R	13
	BK-G	T	38
	BK-BR	A or S	39
	S-BK	L	15
	BK-S	LG	40
Line 6 (White) Plug	BL-Y	R	16
	Y-BL	T	41
	BR-BK	A or S	14
	G-Y	L	18
	Y-G	LG	43
Line 7 (Red) Plug	BR Y	R	19
	Y-BR	T	44
	BL-BK	A or S	11
	BL-V	L	21
	V-BL	LG	46
Line 8 (Black) Plug 1 4	O-V	R	22
	V-O	T	47
	G-R	A or S	8
	BR-V	L, R4, or IT	24
	V-BR	LG, P3 or IR	49
Line 9 (Yellow) Plug 2 5	S-V	R	25
	V-S	T	50
	S-W	A or S	5
	G-V	L or R1	23
	V-G	LG or T1	48
10	O-W	A1	2
6	O-Y	SG, LK or Spare	17
15	Y-O	BL, AG or Spare	42
A	S-Y	R or R1	20
G	Y-S	B or B1	45

LINES 10 THROUGH 19			
Tel Set Term	Lead Color	Lead Desig	Conn or Plug Term
Line 10 (Blue) Plug	BL-W	R	1
	W-BL	T	26
	W-O	A	27
	G-W	L	3
	W-O	LG	28
Line 11 (Orange) Plug	BR-W	R	4
	W-BR	T	29
	W-S	A or S	30
	BL-R	L	6
	R-BL	LG	31
Line 12 (Green) Plug	O-R	R	7
	R-O	T	32
	R-G	A or S	33
	BR-R	L	9
	R-BR	LG	34
Line 13 (Ivory) Plug	S-R	R	10
	R-S	T	35
	BK-BL	A or S	36
	O-BK	L	12
	BK-O	LG	37
Line 14 (Slate) Plug	G-BK	R	13
	BK-G	T	38
	BK-BR	A or S	39
	S-BK	L	15
	BK-S	LG	40
Line 15 (White) Plug	BL-Y	R	16
	Y-BL	T	41
	BR-BK	A or S	14
	G-Y	L	18
	Y-G	LG	43
Line 16 (Red) Plug	BR-Y	R	19
	Y-BR	T	44
	BL-BK	A or S	11
	BL-V	L	21
	V-BL	LG	46
Line 17 (Black) Plug	O-V	R	22
	V-O	T	47
	G-R	A or S	8
	BR-V	L	24
	V-BR	LG	49
Line 18 (Yellow) Plug	S-V	R	25
	V-S	T	50
	S-W	A or S	5
	G-V	L	23
	V-G	LG	48
Line 19 (Violet) Plug	S-Y	R	20
	Y-S	T	45
	O-W	A or S	2
	O-Y	L	17
	Y-O	LG	42

Note. Lead colors, lead designations, and plug/connector terminals are consistent through internal cords, mounting cord and connecting cable.

SECTION 3. CIRCUIT DIAGRAMS

Figure 3-1 K501 Key Service Unit Wiring Diagram



NOTES:

1. When a K401A KTU Manual Intercom IS used, Associated BAT. A and GND A leads are to be strapped to terminals 44 and 43 on Block c

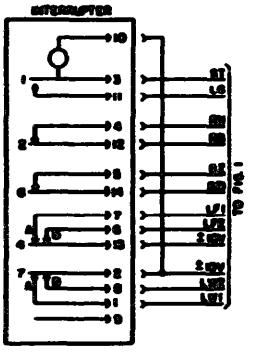


Figure 3-2. Interrupter Diagram

Figure 3-3. K207C1 KTU Diagram

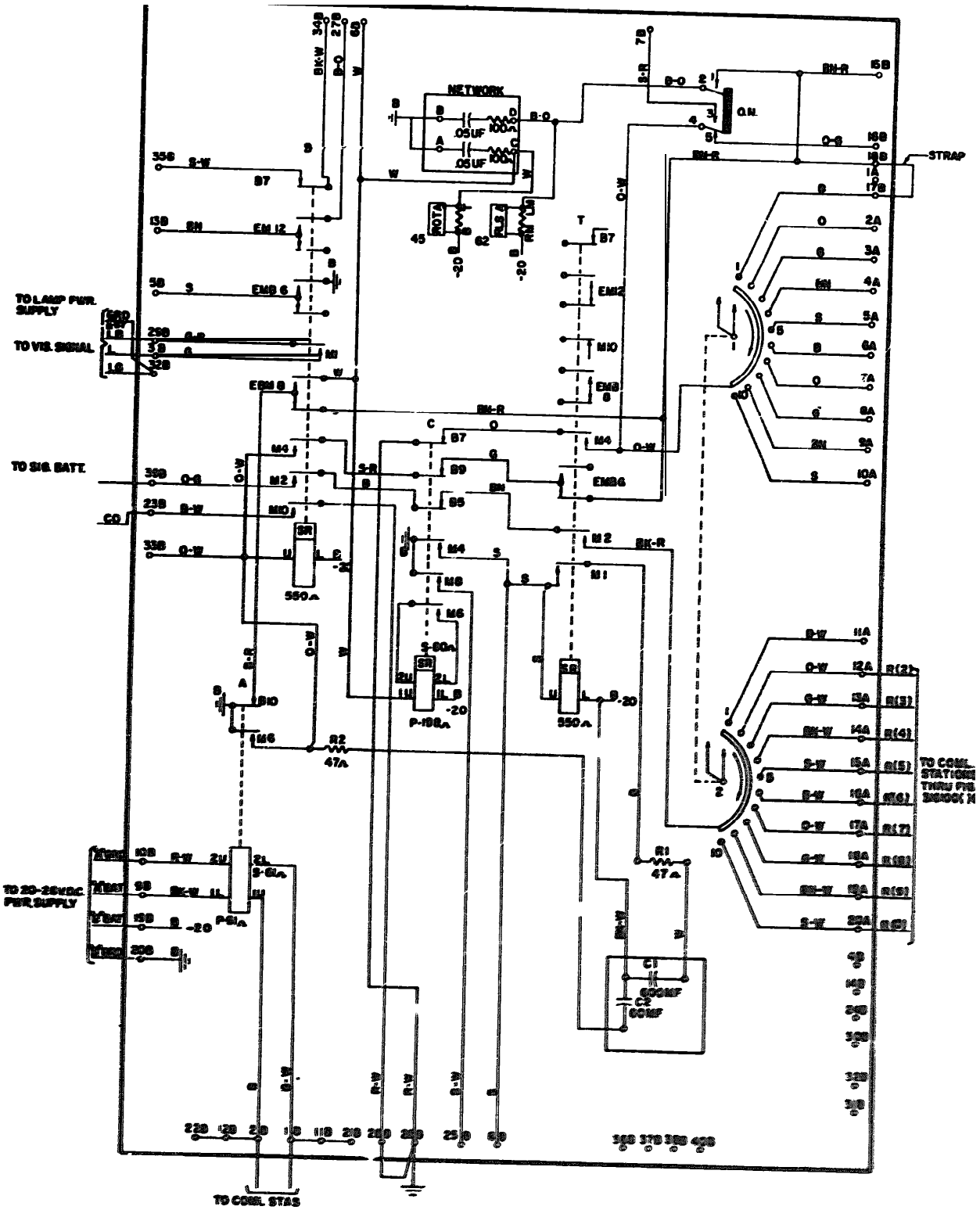
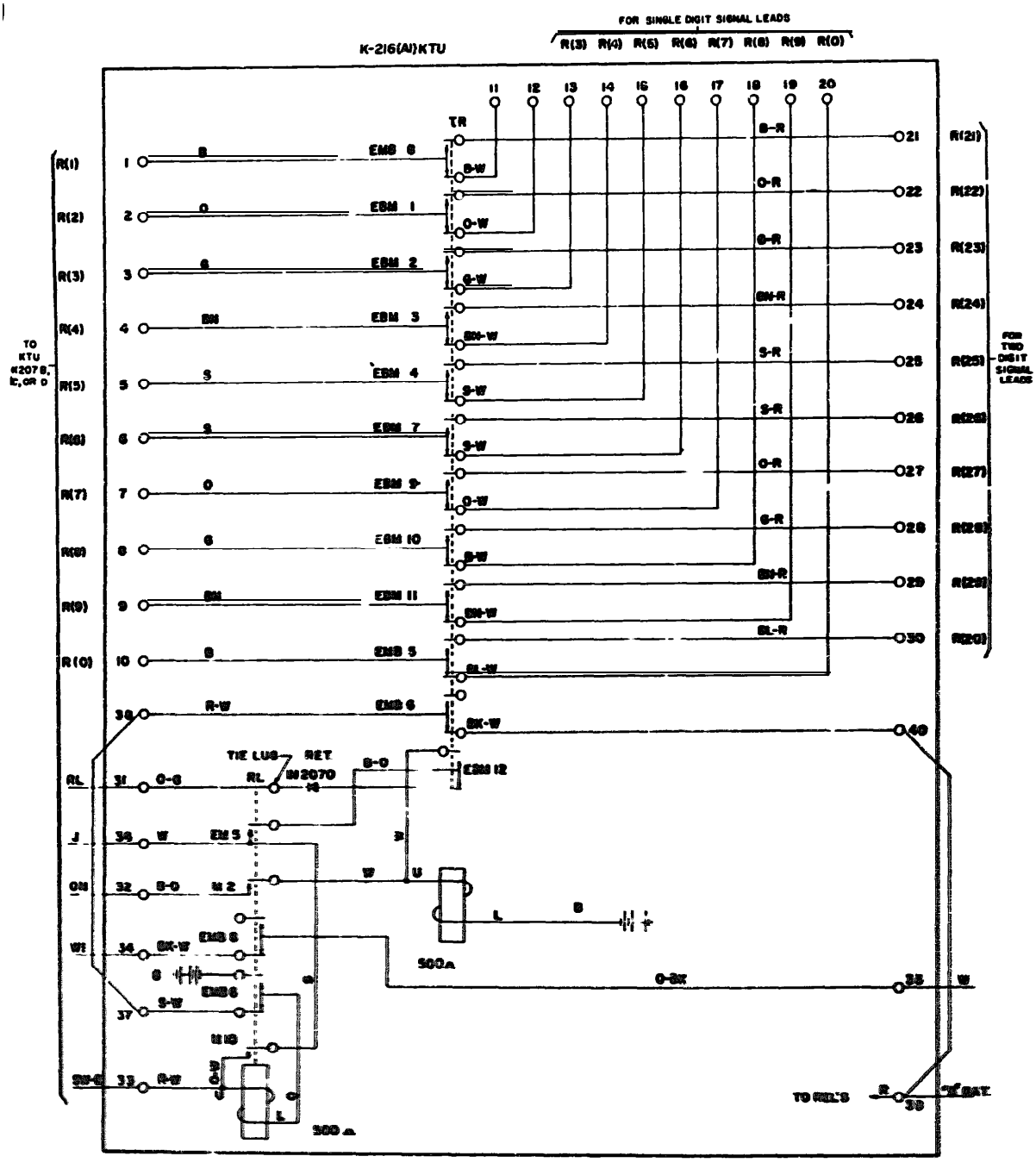
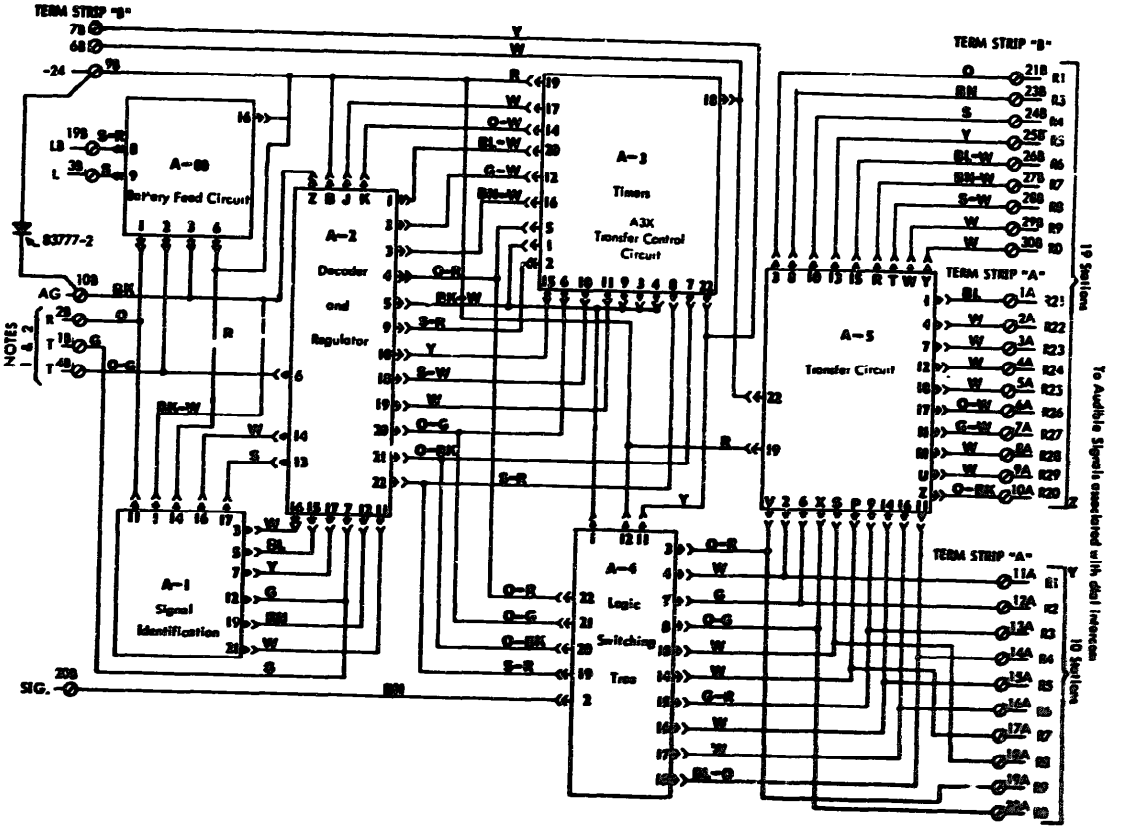


Figure 3-4. K316A1 KTU Diagram





NOTES

1. **When using the K-347 B KTU, connect 1B(T) and 2B(R) on K-207C KTU to 4B(T) and 2B(R) respectively on the K-347 B KTU. Connect rotary dial phones to the K207 C and pushbutton dial phones to the K-347 B.**

2. **Y - without transfer circuit (10 dial codes)**
   Z - with transfer circuit (19 dial codes)

Figure 3-5. K347C KTU Diagram

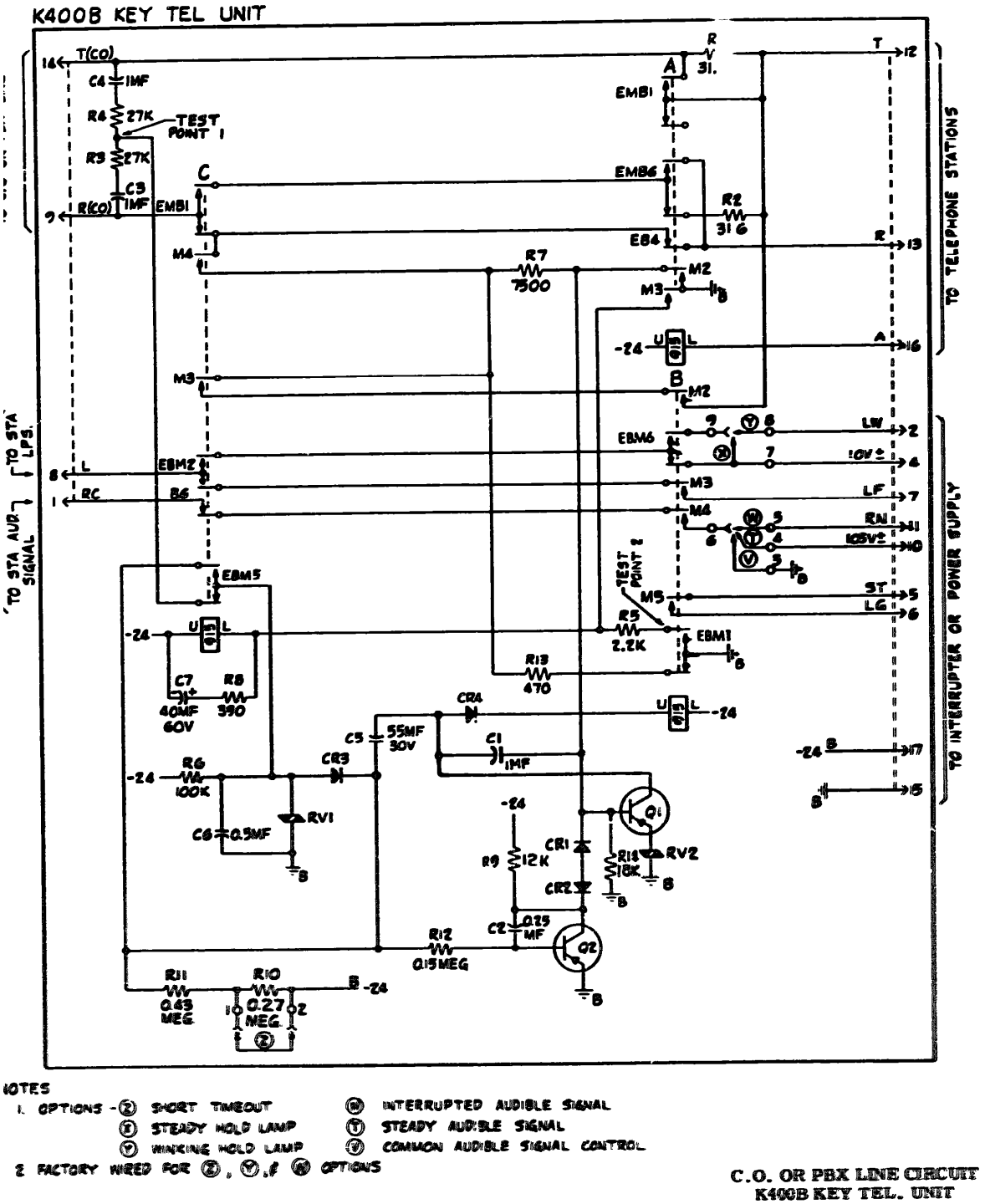
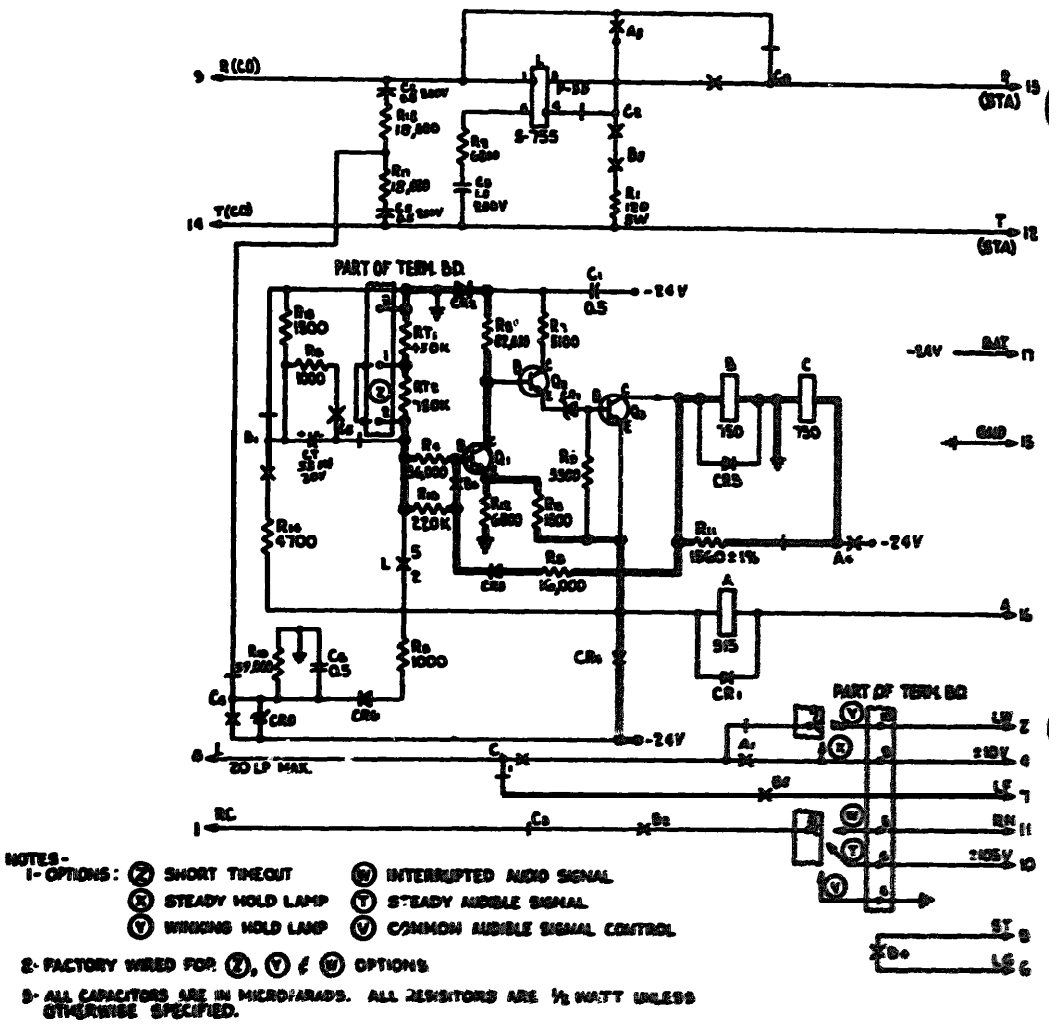


Figure 3-6. K400B KTU Diagram

K400(D) KTU, Idle Circuit Condition;



NOTES-
1- OPTIONS: (Z) SHORT TIMEOUT (W) INTERRUPTED AUDIO SIGNAL
(X) STEADY HOLD LAMP (Y) STEADY AUDIBLE SIGNAL
(V) WINKING HOLD LAMP (V) COMMON AUDIBLE SIGNAL CONTROL

2- FACTORY WIRED FOR (Z), (Y) & (W) OPTIONS

3- ALL CAPACITORS ARE IN MICROFARADS. ALL RESISTORS ARE ½ WATT UNLESS OTHERWISE SPECIFIED.

TECHNICAL NOTE

An incompatibility problem may occur between 1A2 KTS equipped with 400D KTU's and certain CO's or PBX's. A lost call can result, in some cases, when the switching system reswitches an established connection while the key telephone station is on hold. If the reswitching sequence opens the loop for an interval greater than that required to release the 400D KTU hold circuit, a disconnection will occur.

The release time of the 400D KTU can be extended to bridge the open intervals generated by these reswitching sequences by applying the appropriate one of two options following. (See figure 2.)

Option ZC, delay hold release for electronic switching, consists of adding a 5 MF capacitor across terminals 2 and 3 of the 400D KTU option block.

Option ZD, delay hold release for offices other than electronic consists of adding a 1 MF capacitor across terminals 2 and 3 of the block.

When the existing Z option is provided with ZC or ZD option, the strap between terminals 1 and 2 of the option block should be removed and replaced with one of the capacitor pigtail leads.

Figure 3-7. K400D KTU Diagram

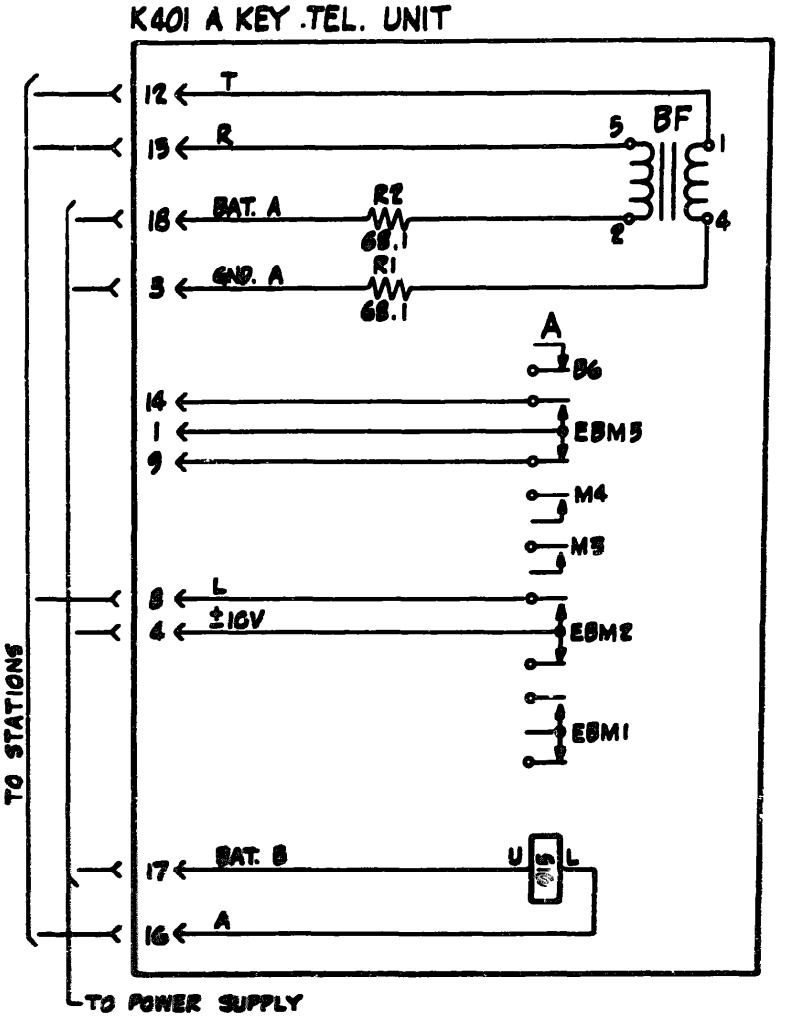


Figure 3-8. K401A KTU Diagram

1 GENERAL

The Key Telephone Units utilized as modular components of the K501 Key Service Unit (KSU) have been designed to provide a high grade of service to the subscriber, thus reducing maintenance effort to a minimum. It is the purpose of this section to provide maintenance personnel with information and aids that are useful in the upkeep of the Key Service Units to a state of the highest performance efficiency.

1.1 Periodic Preventive Maintenance

The frequency of this type of maintenance is determined by the local operating company and is influenced by the environmental conditions surrounding the location of the switching apparatus for the Key Service Units on the subscriber's premises.

Essential factors involved in preventive maintenance are:

a. A visual inspection to determine that wiring is properly dressed and that terminal screws have not become loosened, and that conductors terminated on connecting blocks have not become broken.

b. Inspection of power supply fuses.

C. The removal of any accumulated dust or dirt that might affect component operation. This probability is very slight since all of the KTU's are protected by an overall apparatus cabinet cover. The use of a small portable vacuum cleaner should prove usefull in the removal of dust.

d. Lubrication- The only moving part requiring lubrication is the selector in the K207C KTU which requires the application of a few drops of high grade light machine or clock oil applied on the top of the arm assembly immediately underneath the retaining collar. The frequency of this operation should be such that it occurs at least every six months.

e. Cleaning - If an inspection of the selector reveals that some tarnishing or collection of dirt on the segment contacts of the selector has occurred, cleaning with an approved liquid contact cleaner such as John B. Moore, Solvent M-3 (Frigisol), applied with a brush or cloth is recommended.

1.2 "On the Site" Trouble Shooting and Repairs

Systematic and regular preventive maintenance schedules should substantially reduce this type of maintenance to the following phases:

a. A visual inspection to determine possible sources of trouble such as broken wires. loose connections and burned out fuses. In many cases thoroughness in this endeavor will greatly expedite the restoration of normal service to the subscriber.

b. A system checkout and analysis as outlined in Section 2, may pinpoint the localization of trouble.

C. A closer analysis of the Key Telephone Unit may be performed with the aid of a Volt-Ohmmeter or other visual or audible trouble shooting device, once the trouble has been localized to a particular KTU.

d. If tests reveal that some part or component on the K400B or K401A KTU is defective, the entire printed circuit card should be replaced by one that is in good condition and the defective card returned to the shop.

Normally, complete *relay* replacements are not made in field repairs since it has been determined that it is more economical to change out the KTU having the defective relay. However, if a 4000 type relay coil on the K227A KTU is found to be defective, a replacement coil may be installed "on the job". The armature gap may require slight readjustment; therefore, the gag should be checked (see par 4.0) and the necessary *readjustment made.*

If, in the course of the investigation, defective parts such as capacitors, resistors, rectifiers (diodes) etc. are found, they may redly be replaced on the K207C or K227A KTU's by removing the terminal panel assembly on the rear of the KTU, permitting access to the faulty component.

1.3 Shop Maintenance

Shop Maintenance is that phase of the maintenance and service program that is related to the major repairs and servicing of KTU's that are not normally performed in the field. Involved here is the replacement and adjustment of complete relays, selectors etc. on the K207C and K227A KTU's only. In order to promote efficient shop maintenance, an adequate supply of replacement KTU's should be on hand to prevent interruption of subscriber's services. In addition, spare parts may be required to be available on a determined quantity level. See Table 4.2 for list of replacement parts.

It is recommended that defective K400 and K401A KTU's be returned to ITT Telecom for repair and return in any case where the operating company does not have skilled personnel trained in printed circuit repair techniques and the necessary "desoldering" devices required for replacement of components. In the event such skills and devices are accessible,

replacement parts are listed elsewhere in this section for this purpose. It should be noted that there are no adjustments required for the miniature relays on the printed circuit cards and the plastic covers for these relays should not be removed

2. MAINTENANCE AIDS

In order to provide thorough and efficient maintenance of the KSU's, the serviceman should have a thorough and workable knowledge of all the circuits involved in the three arrangements and the optional features of the system. This data is included in the manual and is located as follows:

Functional Schematics, Sect. 3
Circuit Schematics, Sect 3

3 RELAY MAINTENANCE

Proper relay maintenance is essential to continued good performance of the switching circuits utilized in the K207 & K227A Key telephone units of the **K501** KSU. This maintenance can be divided into three important phases, namely:

1. Periodical Inspection
2. Cleaning
3. Adjustment or Replacement

Each phase is briefly discussed to provide useful information in the performance of these ***services.***

3.1 Periodic Inspection

Properly protected relays generally need little inspection, either visual or by means of gauges, as it is believed that regular routine tests will disclose abnormal relay troubles. However, it is known that dirt and dust are the natural enemies of proper and continued relay performance. Therefore, in such environmental conditions, periodic inspections may **be warranted.**

3.2 Cleaning

If, due to relay failure or as a result of a periodic inspection, a relay is found to be dirty, it should be properly cleaned. Superficial dust or dirt should be removed by means of a suitable soft brush and collected by means of a linen cloth or a small portable vacuum cleaner. Adjacent relays or other apparatus should be adequately protected.

The contacts should be cleaned with a "camel hair" brush and then slightly burnished with a small piece of "bond" paper. Care should be taken to not bend, distort or damage the springs. No cleaning agent is required for relays.

3.3 Adjustment or Replacement

Wire Spring Relays, due to their unique construcion, normally require no adjustment in the field Since each group of contact springs are factory pretensioned and will normally retain these characteristics throughout its lifetime, no attempt should be made to apply readjustment to these items.

Should a spring, or set of springs, become damaged or distorted, the entire relay should be replaced and the defective relay returned to the factory through ITT Telecom Regional Offices. In the event that a contact spring has been crossed with another through misuse *or* mishandling of the relay with the cover removed, it may be replaced by the use of an orange stick Insert the orange stick under the contact spring and move the spring away from the stationary spring allowing the spring to fall into its proper position in plastic spring comb. Note: In replacing a make spring, it may be necessary to temporatialy remove the fixing spring from the contact cover. When misplaced springs are restored to their proper position, the fixing spring should be reinstalled and followed by the cover.

TABLE 4-1
REPLACEMENT PARTS LIST

UNIT NUMBER	COMPONENT	PART NUMBER	REMARKS
K501 K5U	Cable Block	86425	Used in pairs
	Connecting Block	95634	Block "A"
	Connecting Block	95743	Block "B" & "C"
	Cable Hook	86423	
	Receptacle	95827	Gate Lock
	Designation Strip	95647-3	
	Connector	95744	Printed Circuit Cards
	Connector	95745	Interrupter
	Card Retainer	86419	
	Interrupter	95742	
	Cover	86434	
	THM Screw	69817	Conn. Block Mtg.
	RHM Screw	58713	95744 Conn. Mtg.
	RHM Screw	56233	Cable Hook Mtg.
	Hex Nut	66435	95744 Conn. Mtg.
	RHM Screw	54855	95745 Conn. Mtg.
	RHM Screw	68959	Cable Block Mtg.
	Stud	79593	Cover Locking
	Retaining Ring	79680	Cover Stud
	RHM Screw	86855	Card Retainer

CHANGE PER ORDER T-35400 DTD 5-20-68

ASSEMBLY AND TEST OF

K501 KEY SERVICE: UNIT

1. **SCOPE**

1.1 This specification covers the assembly, wiring and test for all K501 Key Service Units.

2. APPLICABLE DOCUMENTS

2.1 The following ITT Kellogg specifications standards, drawings, and publications form a part of this specification:

Specifications

GM Spec. 716 Inspection & Tests for Key Telephone Units
GM Spec. 317 Inspection & Tests for Key Telephone Units

Drawings

190647	K501 Key Service Unit, Assembly
316100( )68	K501 Key Service Unit, Schematic
316100( )77	K501 Key Service Unit, Circuit Description
316000( )113	K501 Key Service Unit, Terminal Connections

3. REQUIREMENTS

3.1 General

3.1.1 Key Service Units when assembled and wired strictly in conformance with their respective drawings shall be capable of meeting the requirements of this specification. The inspection and testing of a completely assembled and wired key service unit shall assure a commercial product consistent with good workmanship, appearance and operation. Any deviation is subject to engineering department approval.

3.2 Assembly

3.2.1 The K207C Key Telephone Unit (when required) shall be assemblies to the mounting frame and located in position as shown on the key service unit assembly drawing. The drawing shows the rear (or terminal) side of the key telephone unit.

3.2.2 The key service unit cable shall be installed as show on the KSU assembly drawing. Each arm of the cable to be terminated on the K207C KTU (if required) shall be fed through its respective fanning strips from below. If the K207C KTU is not required the cable arms shall be grouped and taped to the lower part **of** the mounting frame, Cable arms that are to be terminated on the KSU connecting blocks may be temporarily taped to the cable hooks located at the top of the backboard.

3.3 Wiring

3.3.1 Connecting Blocks - The connecting blocks are designed for **use** with unskinned plastic insulated wire. Insulated conductors are terminated on the clips by insertion into the clip opening, placing the R714B tool over the clip (with the cutoff blade up) and pushing firmly toward the terminal block. This action forces the wire to a fixed position **in** the clip and at the **same** time cuts **the** wire insulation, The force of the blade against the base of the connecting block cuts off the unused end of **the** wire. Conductors shall be terminated on the connecting block in accordance with drawing 316100( )113.

Caution

For wires that are not to be cut off **(going** elsewhere) the "bit" of the R714B tool shall be reversed or another tool may be used, with the blade installed inside **the tool** handle.

3.3.2 Printed Circuit Connectors - Conductors in each arm of the cable that are to **be** terminated on the interrupter and line circuit connectors, are of predetermined length *and* shall not be appreciably shortened. Approximately 5/16 inch insulation shall be stripped from the end of the conductor. The stripped end shall than be inserted into the terminal eyelet, bent back upon itself, crimped and then soldered per QQ: 236. Where two or more conductors are to **be** terminated on a specific terminal, soldering shall be done after all conductors arc installed as above. Conductors shall be terminated on **the** P.C. Connectors in accordance with the KSC **Terminal** Connection drawing 316100( )113.

3.3.3 K207C Key Telephone Unit (when required) - Conductors in each arm of the cable are of g-determined lengths and shall not be appreciably shortened. Approximately 1/2 inch insulation shall be stripped from the end of each conductor and the stripped portion then inserted under the head of the terminal screw. Care shall be exercised that the wire falls within the terminal cup to preclude cutting of the wire when the screw is tightened. Conductors shall be terminated on the K207C KTU in accordance with the KSU Terminal Connection drawing 316100( ) 113.

3.3.4 Cable and Wire Dressing - After the cable has been terminated on the connecting blocks, printed circuit connectors and the K207C KTU (if required) the cable shall be hand dressed neatly so as to preclude damage to the cable when the gate of the KSU is closed, Individual conductors terminated on the connecting blocks shall be depressed downward in a "U" shape while those terminated on the printed circuit connectors and the K207C KTU (if required) shall be dressed upward in a "U" shape.

3.4 Testing - Each key service unit shall be completely tested to determine that it is properly wired and that all features will function in a normal and proper manner.

3.4.1 Test Equipment - Since the Key Telephone Units that might be associated with the K501 KSU are tested separately an operational test using telephones is not necessary.

Each KSU shall be tested in a manner so as to assure that continuity, between all points of the KSU as designated on the schematic drawing 316100( )68, is in evidence.

Test equipment to be used shall be at the discrimination of the manufacturing test equipment department.

3.4.2 Testing Unterminated Wiring - If the KSU to be tested does not utilize the K207C KTU, certain leads in the cable form are unterminated. Each KSU shall be visually *inspected* to determine that the proper color conductors for cable arm L, M, N, P & Q are terminated on the corresponding proper terminals on the connecting blocks, interrupter connector and printed circuit connector for circuit 6. (See Dwg. 316100( )68).

4. QUALITY ASSURANCE PROVISIONS

4.1 Tests shall be performed in accordance with **procedures** outlined in 3.4 testing.

4.2 Each **Key** Service Unit assembled and wired shall be 100% **tested.**

5. PREPARATION FOR DELIVERY

5.1 There are **no** preparation for delivery **provisions** applicable to this specification.

6. NOTES

SHEET RECORD

CHANGES	APP
ISSUE: 1	
35798 3-17-69 ISSUE 4 VOIDED & REDRAWN. ADDED CODES 50110, 50118 & 50119. LWG	
ISSUE: 5	
T-35935 ISS 5 VOIDED & REDRAWN. LGC 5-24-71	
ISSUE: 6	
T-37328 ADDED KSP-347 TO -3, -5, -8, -10, -13, -15, -18, -20, -23, -25, -28, -30, -33, -35, -38, -40 LGC 10-4-71	
ISSUE: 7	
T-38507 181742 WAS 316100( ) 120. 181736 WAS 316100( ) 60. 31741 WAS 316100( ) 113 ADDED 181716 & 180773. RR 5-1-72	
ISSUE: 8	

ISSUED SHEETS				
2, 3	2, 2	2, 1	2	TABLE "A"
		3, 1	3	Assembly
4, 3	4, 2	4, 1	4	Stocklist

NOTES:

1. ASSEMBLY, WIRE AND TEST PER GM 717.
2. FOR TERMINAL CONNECTIONS, REFER TO DWG. 181742
3. FOR SCHEMATIC DIAGRAMS, REFER TO DWG. 181736 [illegible].
4. DIMENSIONS ARE SHOWN FOR ENGINEERING REFERENCE AND IDENTIFICATION PURPOSES ONLY.

ASY. OR STKL.	DESCRIPTION	CIRCUIT DRAWING NO.	CIRCUIT FIG.	REMARKS
190647-101-602 050100(000)963	Consists of Apparatus Mounting with Cover, Interrupter and Internal Coble. Arranged for: 6 CO or PBX Line Circuits or Manual Intercom Circuits. Wired, but not equipped for Rotary or Tel-Touch Dial Selective Intercom.	181736		Wire per 181742
190647-102-602 050109(000)963	Same as -101 except equipped for 9-station Rotary Dial Intercom	181736		Wire per 181742
190647-103-602 050110(000)963	Same as -101 except equipped for 10-station Tel-Touch Intercom	181736		Wire per 181742
190647-104-601 050118(000)963	Same as -101 except equipped for 18-station Rotary Dial Intercom	181736		Wire per 181742
190647-105-602 050119-000-963	Same as -101 except equipped for 19-station Tel-Touch Dial Intercom			
190647-106-602 050100(00)963 DOF	Consists of Apparatus Mounting with Interrupter and Internal Cable mounted on a floorstand with cover. Arranged for: 6 CO or PBX Line Circuits or Manual Intercom Circuits Wired, but not equipped for Rotary or Tel-Touch Dial Selective Intercom.	181736		Wire per 181742
190647-7 050109(F)963	Same as -106 except equipped for 9-station Rotary Dial Intercom	181736		Wire per 181742
190647-8 050110(F)963	Same as -106 except equipped for 10-station Tel-Touch Dial Intercom	181736		Wire per 181742
190647-9 050118(F)963	Same as -106 except equipped for 18-station Rotary Dial Intercom	181736		Wire per 181742
190647-10 050119(F)963	Same as -106 except equipped for 19-station Tel-Touch Dial Intercom	181736		Wire per 181742

T A B L E " A "

Asy. or STKL.	DESCRIPTION	Circuit Drawing No.	Fig.	REMARKS
190647-11 50100(FP)963	Consists of Apparatus Mounting with Interrupter and Internal Cable, mounted on a floorstand with cover. Equipped with Power Supply for Buzzer only audible signals. Arranged for: 6 CO or PBX Line Circuits or Manual Intercom Circuits. Wired but not equipped for Rotary or Tel-Touch Dial Selective Intercom	181736		Wire per 181742
190647-12 50109(FP)963	Same as -11 except equipped for 9-station Rotary Dial Intercom	181736		Wire per 181742
190647-13 50110(FP)963	Same as -11 except equipped for 10-station Tel-Touch Dial Intercom	181736		Wire per 181742
190647-14 50118(FP)963	Same as -11 except equipped for 18-station Rotary Dial Intercom	181736		Wire per 181742
190647-15 50119(FP)963	Same as -11 except equipped for 19-station Tel-Touch Dial Intercom	181736		Wire per 181742
190647-16 50100(FPG) 963	Consists of Apparatus Mounting with Interrupter and Internal Cable, mounted on a floorstand with cover. Equipped with Power Supply for Buzzer or Ringer audible signals. Arranged for: 6 CO or PBX Line Circuits or Manual Intercom Circuits Wired but not equipped for Rotary or Tel-Touch Dial Selective Intercom	181736		Wire per 181742
190647-17 50109(FPG)963	Same as -16 except equipped for 9-station Rotary Dial Intercom	181736		Wire per 181742
190647-18 50110(FPG)963	Same as -16 except equipped for 10-station Tel-Touch Dial Intercom	181736		Wire per 181742
190647-19 50118(FPG)963	Same as -16 except equipped for 18-station Rotary Dial Intercom	181736		Wire per 181742

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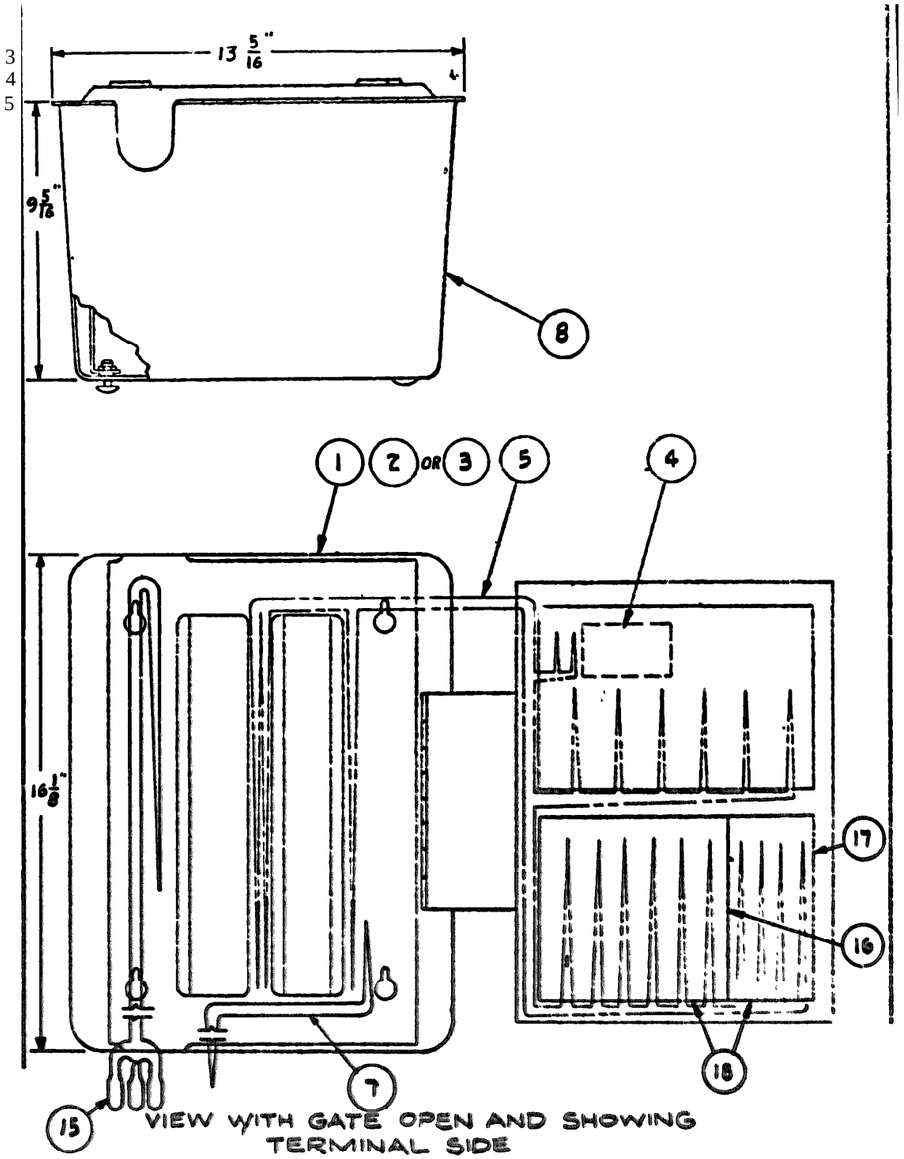
TABLE "A"

ASY. OR STKL.	DESCRIPTION	CIRCUIT DRAWING NO.	CIRCUIT FIG.	REMARKS
190647-20 50119(FPG)963	Same as -16 except equipped for 19-station Tel-Touch Dial Intercom	181736		Wire per 181742
190647-21 50100(FP)964	Same as -11 except equipped with "CAC" Power Supply	181736		Wire per 181742
190647-22 50109(FP)964	Same as -21 except equipped for 9-station Rotary Dial Intercom	181736		Wire per 181742
190647-23 50110(FP)964	Same as -21 except equipped for 10-station Tel-Touch Dial Intercom	181736		Wire per 181742
190647-24 50118(FP)964	Same as -21 except equipped for 18-station Rotary Dial Intercom	181736		Wire per 181742
190647-25 50119(FP)964	Same as -21 except equipped for 19-station Rotary Dial Intercom	181736		Wire per 181742
190647-26 50100(FPG)964	Same as -16 except equipped with "CAC" Power Supply	181736		Wire per 181742
190647-27 50109(FPG)964	Same as -26 except equipped for 9-station Rotary Dial Intercom	181736		Wire per 181742
190647-28 50110(FPG)964	Same as -26 except equipped for 10-station Tel-Touch Dial Intercom	181736		Wire per 181742
190647-29 50118(FPG)964	Same as -26 except equipped for 18-station Rotary Dial Intercom	181736		Wire per 181742
190647-30 50119(FPG)964	Same as -26 except equipped for 19-station Tel-Touch Dial Intercom	181736		Wire per 181742
190647-31 50200(FP)963	Consists of Apparatus Mounting with Interrupter, Internal Cable and Connector Cable, mounted on a floorstand for Buzzer only audible signals. Arranged for: 6 CO or PBX Line Circuits or Manual Intercom Circuits Wired, but not equipped for Rotary or Tel-Touch Dial Selective Intercom	181736		Wire per 181742

ISSUE 1:

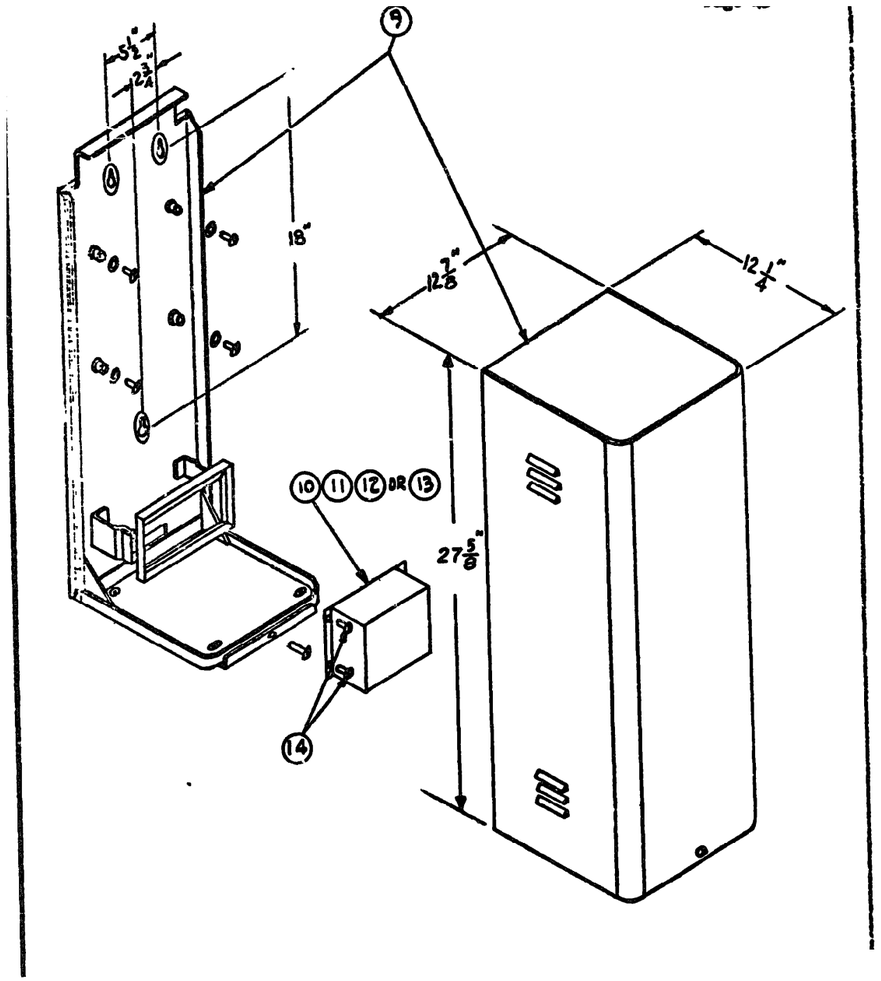
F-504 TABLE "A" ISSUE 6:

ASY. OR STKL.	DESCRIPTION	CIRCUIT DRAWING NO.	CIRCUIT FIG.	REMARKS
190647-32 50209(FP)963	Same as -31 except equipped for 9-station Rotary Dial Intercom	181736		Wire per 181742
190647-33 50210(FP)963	Same as -31 except equipped for 10-station Tel-Touch Dial Intercom	181736		Wire per 181742
190647-34 50218(FP)963	Same as -31 except equipped for 18-station Rotary Dial Intercom	181736		Wire per 181742
190647-35 50219(FP)963	Same as -31 except equipped for 19-station Tel-Touch Dial Intercom	181736		Wire per 181742
190647-36 50200(FPG)963	Consists of Apparatus Mounting with Interrupter, Internal Cable and Connector Cable, mounted on a floorstand with cover. Equipped with Power Supply for Buzzer or Ringer audible signals. Arranged for: 6 CO or PBX Line Circuits or Manual Intercom Circuits Wired, but not equipped for Rotary or Tel-Touch Dial Selective Intercom	181736		Wire per 181742
190647-37 50209(FPG)963	Same as -36 except equipped for 9-station Rotary Dial Intercom	181736		Wire per 181742
190647-38 50210(FPG)963	Same as -36 except equipped for 10-station Tel-Touch Dial Intercom	181736		Wire per 181742
190647-39 50218(FPG)963	Same as -36 except equipped for 18-station Rotary Dial Intercom	181736		Wire per 181742
190647-40 50219(FPG)963	Same as -36 except equipped for 19-station Tel-Touch Dial Intercom	181736		Wire per 181742



VIEW WITH GATE OPEN AND SHOWING TERMINAL SIDE

ISSUE 1
ISSUE 2
ISSUE 3
ISSUE 4
ISSUE 5



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STOCKLIST							ASSEMBLIES & QUANTITIES												
ITEM	PART NO. BASE	SUB	FGC	DESCRIPTION			101 50100( )963	102 50109( )963	103 50110( )963	104 50118( )963	105 50119( )963	106 50100(F)963	107 50109(F)963	108 50110(F)963	109 50118(F)963	110 50119(F)963	111 50100(FP)963	112 50109(FP)963	113 50110(FP)963
1	86449	1		Apparatus Mounting			1	1	1	1	1								
2	86449	2		Apparatus Mounting								1	1	1	1	1	1	1	1
3	86449	3		Apparatus Mounting															
4	95742	1		Interrupter			1	1	1	1	1	1	1	1	1	1	1	1	1
5	181741	101		Cable Assy.			1	1	1	1	1	1	1	1	1	1	1	1	1
6	181741	102		Cable Assy.						1	1				1	1			
7	87671	1		Cable (Power Supply)													1	1	1
8	86434	1		Cover			1	1	1	1	1								
9	96099	1		Floorstand & Cover								1	1	1	1	1	1	1	1
10	96101	1		Power Supply															
11	96101	2		Power Supply															
12	180125	1		Power Supply														1	1
13	180125	2		Power Supply															
14	79400	2		RHM Screw													4	4	4
15	75006		601	Connector Cable															
16	K207	C1	962	Key Telephone Unit				1		1			1		1			1	
17	K216	A1	962	Key Telephone Unit						1					1				
18	K347	C	962	Key Telephone Unit					1		1			1		1			1
19	K316	A	962	Key Telephone Unit							1					1			
20	180514	1		Instruction Sheet			1	1	1	1	1	1	1	1	1	1	1	1	1
21	181741	103		Cable Assy.						1					1				
22	181716	101		Wood Block								1	1	1	1	1	1	1	1
23	181716	102		Wood Block								1	1	1	1	1	1	1	1
24	181716	103		Wood Block								1	1	1	1	1	1	1	1
25	180773			Wood Screw								1	1	1	1	1	1	1	1
26	KSP-347			Key System Practice					1		1			1		1			1

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STOCKLIST					ASSEMBLIES & QUANTITIES													
ITEM	PART NO. BASE	PART NO. SUB	PART NO. FGC	DESCRIPTION	114 50118(FP)963	115 50119(FP)963	116 50100(FPC)963	117 50109(FPC)963	118 50110(FPC)963	119 50118(FPC)963	120 50119(FPC)963	121 50100(FP)964	122 50109(FP)964	123 50110(FP)964	124 50118(FP)964	125 50119(FP)964	126 50100(FPC)964
1	86449	1		Apparatus Mounting	1	1	1	1	1	1	1	1	1	1	1	1	1
2	86449	2		Apparatus Mounting													
3	86449	3		Apparatus Mounting													
4	95742	1		Interrupter	1	1	1	1	1	1	1	1	1	1	1	1	1
5	181741	101		Cable Assy.	1	1	1	1	1	1	1	1	1	1	1	1	1
6	181741	102		Cable Assy.	1	1				1	1				1	1	
7	87671	1		Cable (Power Supply)	1	1	1	1	1	1	1	1	1	1	1	1	1
8	86434	1		Cover													
9	96099	1		Floorstand & Cover	1	1	1	1	1	1	1	1	1	1	1	1	1
10	96101	1		Power Supply			—					1	1	1	1	1	
11	96101	2		Power Supply													1
12	180125	1		Power Supply	1	1											
13	180125	2		Power Supply			1	1	1	1	1						
14	79400	2		RHM Screw	4	4	4	4	4	4	4	4	4	4	4	4	4
15	75006		601	Connector Cable											1		
16	K207	C1	962	Key Telephone Unit	1			1		1			1		1		
17	K216	A1	962	Key Telephone Unit	1					1						1	
18	K347	C	962	Key Telephone Unit		1			1		1			1		1	
19	K316	A	962	Key Telephone Unit		1					1					1	
20	180514	1		Instruction Sheet	1	1	1	1	1	1	1	1	1	1	1	1	1
21	181741	103		Cable Assy.	1	1	1	1	1	1	1	1	1	1	1	1	1
22	181716	101		Wood Block	1	1	1	1	1	1	1	1	1	1	1	1	1
23	181716	102		Wood Block	1	1	1	1	1	1	1	1	1	1	1	1	1
24	181716	103		Wood Block	1	1	1	1	1	1	1	1	1	1	1	1	1
25	180773			Wood Screw		1			1		1			1		1	
26	ESP-347			Key System Practice													

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STOCKLIST							ASSEMBLIES & QUANTITIES												
ITEM	PART NO. BASE	SUB	FGC	DESCRIPTION			127 50109(FPC)964	128 50110(FPC)964	129 50118(FPC)964	130 50119(FPC)964	131 50200(FP)963	132 50209(FP)963	133 50210(FP)963	134 50218(FP)963	135 50219(FP)963	136 50200(FPC)963	137 50209(FPC)963	138 50210(FPC)963	139 50218(FPC)963
1	86449	1		Apparatus Mounting		+													
2	86449	2		Apparatus Mounting			1	1	1	1									
3	86449	3		Apparatus Mounting							1	1	1	1	1	1	1	1	1
4	95742	1		Interrupter			1	1	1	1	1	1	1	1	1	1	1	1	1
5	181741	101		Cable Assy.			1	1	1	1	1	1	1	1	1	1	1	1	1
6	181741	102		Cable Assy.					1	1				1	1				
7	87671	1		Cable (Power Supply)			1	1	1	1	1	1	1	1	1	1	1	1	1
8	86434	1		Cover															
9	96099	1		Floorstand & Cover			1	1	1	1	1	1	1	1	1	1	1	1	1
10	96101	1		Power Supply															
11	96101	2		Power Supply			1	1	1	1									
12	180125	1		Power Supply							1	1	1	1	1				
13	180125	2		Power Supply												1	1	1	1
14	79400	2		RHM Screw			4	4	4	4	4	4	4	4	4	4	4	4	4
15	75006		601	Connector Cable							1	1	1	1	1	1	1	1	1
16	K207	C1	962	Key Telephone Unit			1		1			1		1			1		1
17	K216	A1	962	Key Telephone Unit					1					1					1
18	K347	C	962	Key Telephone Unit				1		1			1		1			1	
19	K316	A	962	Key Telephone Unit						1					1				
20	180514	1		Instruction Sheet			1	1	1	1	1	1	1	1	1	1	1	1	1
21	181741	103		Cable Assy.			1	1	1	1	1	1	1	1	1	1	1	1	1
22	181716	101		Wood Block			1	1	1	1	1	1	1	1	1	1	1	1	1
23	181716	102		Wood Block			1	1	1	1	1	1	1	1	1	1	1	1	1
24	181716	103		Wood Block			1	1	1	1	1	1	1	1	1	1	1	1	1
25	180773			Wood Screw			1	1	1	1	1	1	1	1	1	1	1	1	1
26	KSP-347			Key System Practice				1		1			1		1				1

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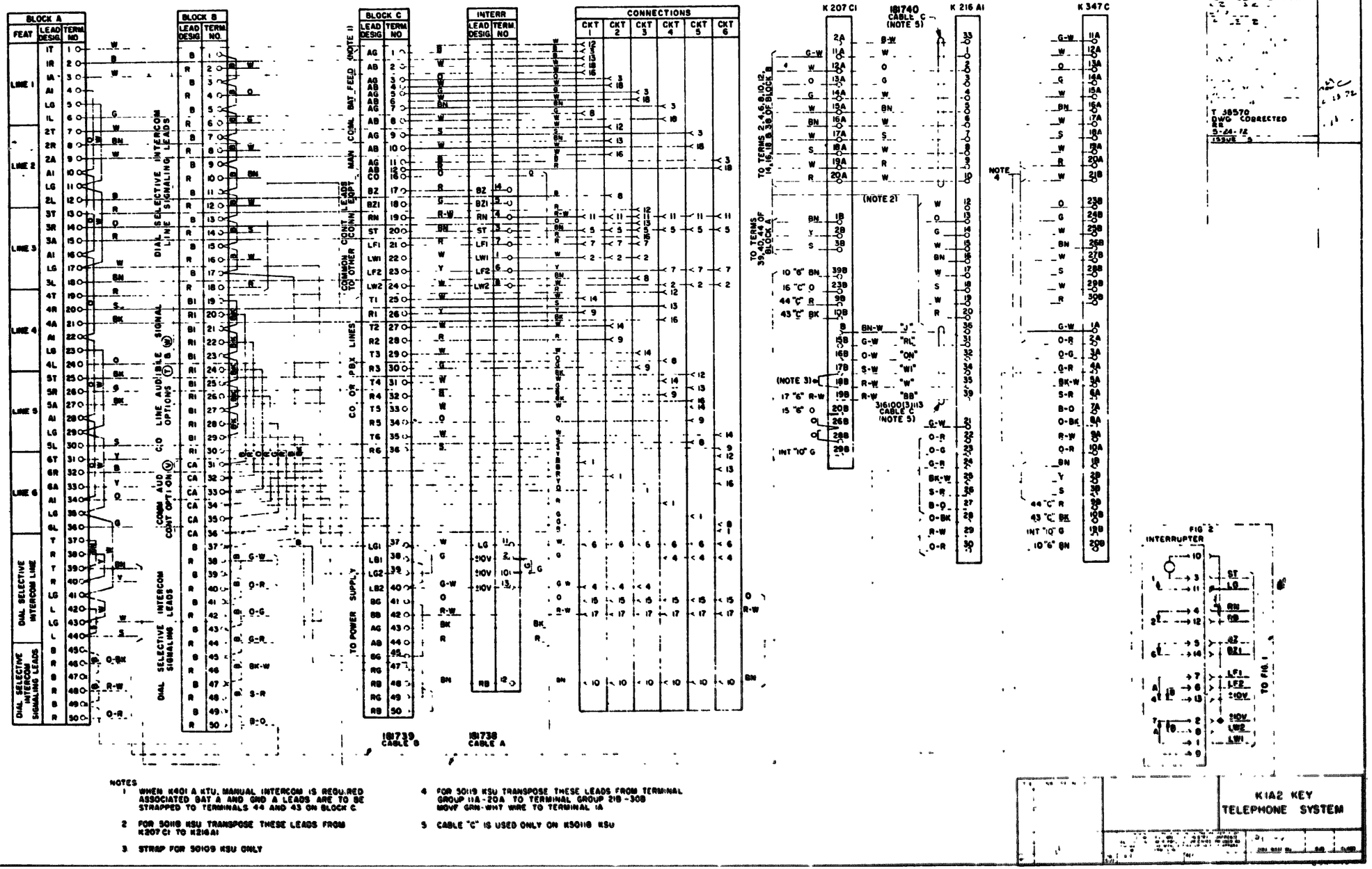
ITEM	PART NO. BASE	PART NO. SUB	PART NO. FGC	DESCRIPTION			ASSEMBLIES & QUANTITIES 140 50219(FPG)963
1	86449	1		Apparatus Mounting			
2	86449	2		Apparatus Mounting			
3	86449	3		Apparatus Mounting			1
4	95742	1		Interrupter			1
5	181741	101		Cable Assy.			1
6	181741	102		Cable Assy.			1
7	87671	1		Cable (Power Supply)			1
8	86434	1		Cover			
9	96099	1		Floorstand & Cover			1
10	96101	1		Power Supply			
11	96101	2		Power Supply			
12	180125	1		Power Supply			
13	180125	2		Power Supply			1
14	79400	2		RHM Screw			4
15	75006		601	Connector Cable			1
16	K207	C1	962	Key Telephone Unit			
17	K216	A1	962	Key Telephone Unit			
18	K347	C	962	Key Telephone Unit			1
19	K316	A	962	Key Telephone Unit			1
20	180514	1		Instruction Sheet			1
21	181741	103		Cable Assembly			1
22	181716	101		Wood Block			1
23	181716	102		Wood Block			1
24	181716	103		Wood Block			1
25	180773			Wood Screw			1
2(	KSP-347			Key System Practice			1

FIG 1
K501 KEY SERVICE UNIT



NOTES

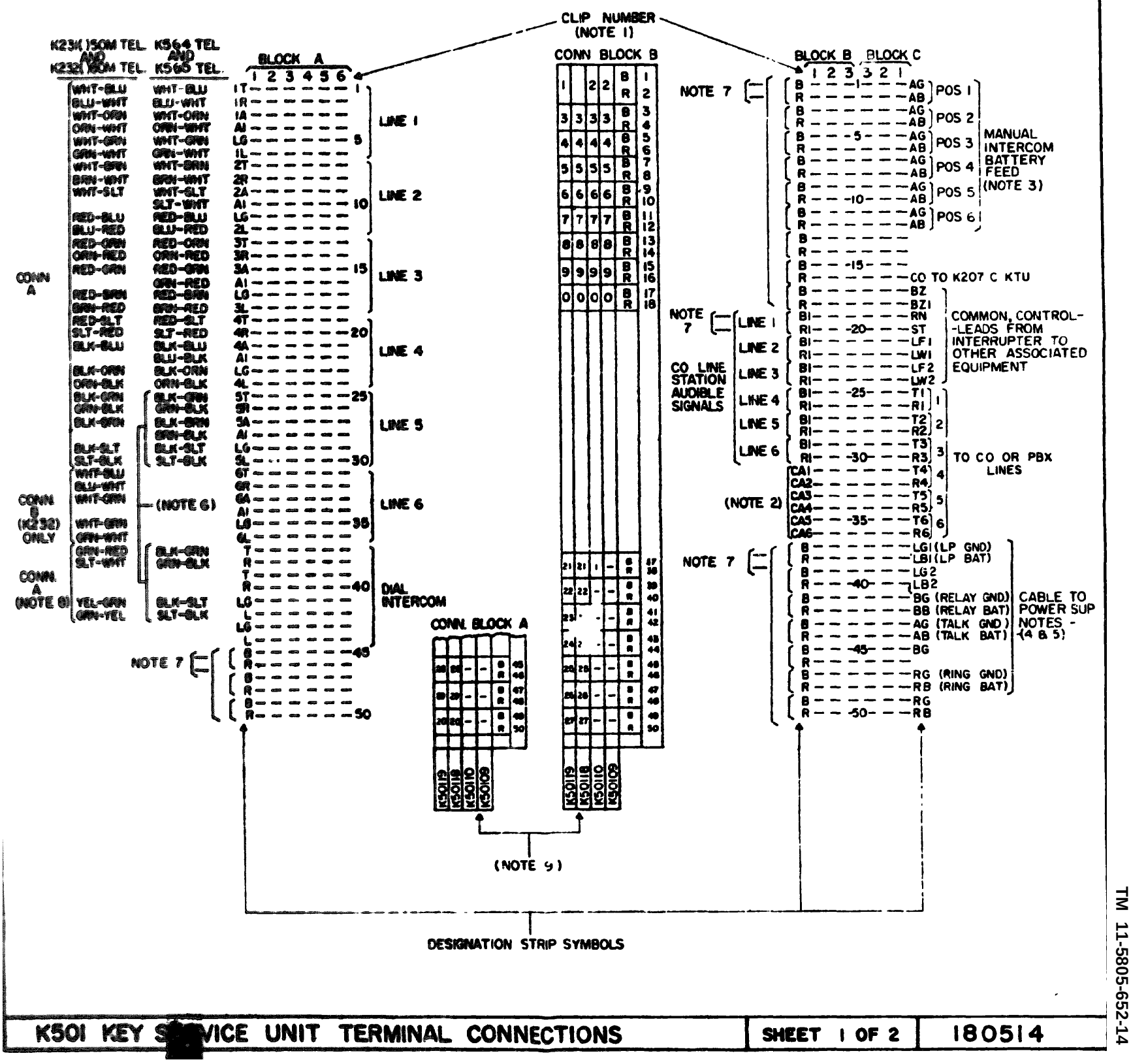
1. WHEN K401 A KTU, MANUAL INTERCOM IS REQUIRED ASSOCIATED BAT A AND GND A LEADS ARE TO BE STRAPPED TO TERMINALS 44 AND 43 ON BLOCK C
2. FOR 50H8 KSU TRANSPOSE THESE LEADS FROM K207 CI TO K216 AI
3. STRAP FOR 50H3 KSU ONLY
4. FOR 50H9 KSU TRANSPOSE THESE LEADS FROM TERMINAL GROUP 11A-20A TO TERMINAL GROUP 21B-30B MOVE GRN-WHT WIRE TO TERMINAL 1A
5. CABLE "C" IS USED ONLY ON K50H8 KSU

K1A2 KEY TELEPHONE SYSTEM

REVISIONS	
ISSUE 1	APPROVED
T 38570 DWG CORRECTED ER 5-24-72 ISSUE 2	

NOTES:

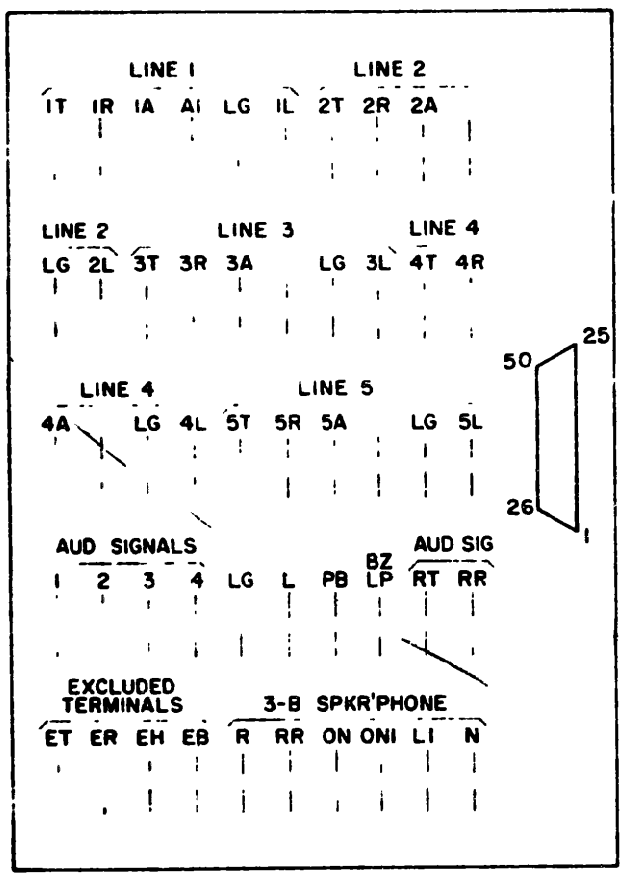
1. ONLY CLIPS 1, 2, 3, 4 AND 5 OF BLOCK "A" AND CLIPS 2 AND 3 OF BLOCK B ARE USEABLE IN TERMINATION OF STATION CONN OR EXTERNAL CONN. BLOCK CABLES.
2. COMMON AUDIBLE SIGNAL TERMINATION FOR SIX CO OR PBX LINES, STRAP DESIRED TERMINALS TOGETHER AND CONNECT SLT-YEL CABLE CONDUCTOR TO THE STRAPPED GROUP AND YEL-SLT CABLE CONDUCTOR TO A VACANT B1 TERMINAL.
3. DEPENDING UPON WHERE THE K40(A)962 KTU MANUAL INTERCOM CARD IS INSERTED, IT IS NECESSARY TO STRAP THE CORRESPONDING AG AND AB CLIPS TO CLIPS 43 AND 44 RESP.
4. TO USE BUZZERS FOR INTERCOM SIGNALS AND RINGERS FOR CO LINES, CHANGE STRAPPING AS FOLLOWS:
   A. REMOVE BRN STRAP FROM 48 AND 50 ON BLOCK "C".
   B. CONNECT RING BATTERY TO TERMINAL 48 ON BLOCK "C".
   C. REMOVE BRN LEAD FROM TERMINAL 398 OF K207 C KTU
   D. CONNECT A WIRE FROM TERMINAL 50 OF BLOCK "C" TO TERMINAL 398 OF K207 C KTU
   E. CONNECT 18 V.± FROM POWER SUPPLY TO TERMINAL 50 OF BLOCK "C"
5. TO USE RINGERS FOR INTERCOM SIGNALS AND BUZZERS FOR CO LINES, CONNECT 105V± TO TERMINAL 50 AND 18V± TO TERMINAL 48 ON BLOCK "C"
6. IF DIAL INTERCOM (K207 C, OR K347 C KTU) IS INCLUDED IN THE PACKAGE, THE CONDUCTORS NORMALLY USED FOR LINE 5 MUST BE CONNECTED FOR DIAL INTERCOM AS SHOWN.
7. IF RINGERS ARE USED FOR AUDIBLE SIGNALS, CONNECT YEL-SLT TO B, OR B1. TERMINAL, AND SLT-YEL TO R, OR R1 TERMINAL IF BUZZERS ARE USED FOR AUDIBLE SIGNALS, CONNECT YEL-BLU TO B OR B1 TERMINAL, AND BLU-YEL TO R OR R1 TERMINAL.-FOR THE K564 AND K565 IF THE K231, OR K232 TELEPHONE IS USED, THE ORN-YEL AND YEL-ORN CONDUCTORS ARE USED FOR BUZZER CONNECTIONS.
8. THESE CONDUCTORS ARE USED FOR ACCESS TO DIAL INTERCOM "WITH ALL PICKUP BUTTONS RELEASED".
9. CONNECT DIAL INTERCOM STATION AUDIBLE SIGNALING LEADS PER ASSIGNED DIGITS.



K501 KEY SERVICE UNIT TERMINAL CONNECTIONS | SHEET 1 OF 2 | 180514

NOTES

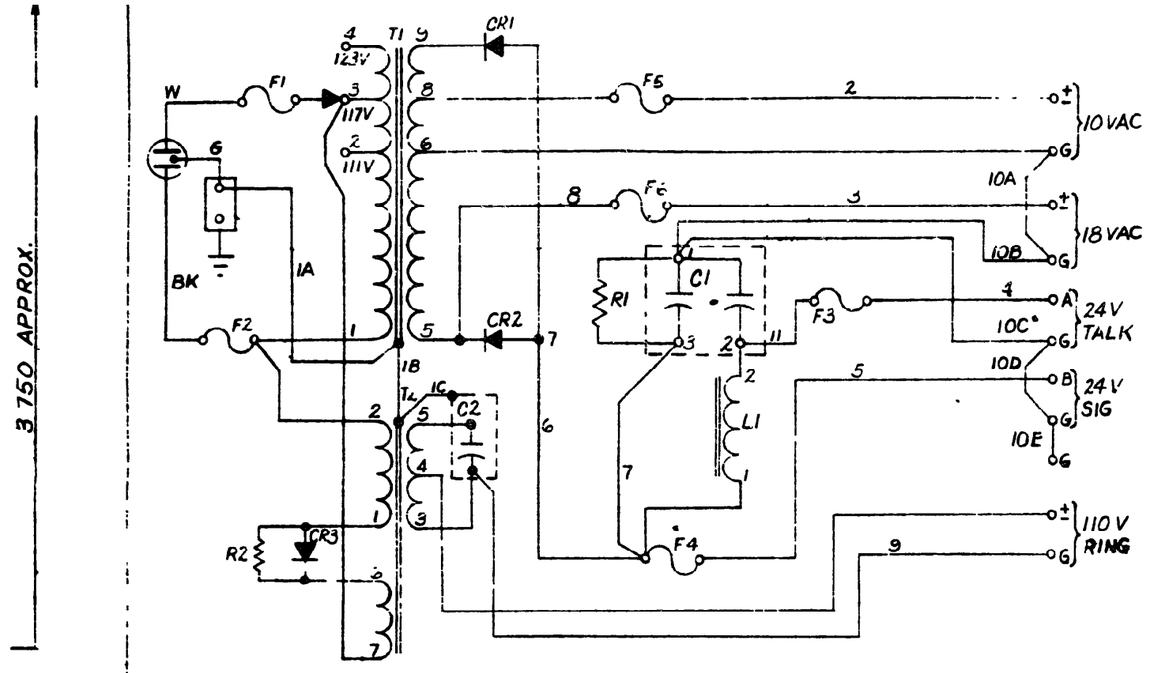
1- THIS FEATURE APPLICABLE TO BOTH K565( )40M AND K565( )42M TELEPHONES
2- THIS FEATURE APPLICABLE TO K565( )42M TELEPHONE ONLY
3- THESE FEATURES ARE NOT APPLICABLE TO K564( )40M TELEPHONE
4- THESE FEATURES APPLICABLE TO K231( )50M TELEPHONE



66E3 CONNECTING BLOCK

CIRCUIT	CLIP NUMBER	CIRCUIT DESIGNATION	CABLE CONDUCTOR COLOR	K501 KS'I W/O COML TERM NO	K501 KSU W/ COML TERM NO
LINE 1	1	1T	WHT – BLU	1	1
	2	1R	BLU – WHT	2	2
	3	1A	WHT – ORN	3	3
	4	1I	ORN – WHT	4	4
	5	LG	WHT – GRN	5	5
	6	1L	GRN – WHT	6	6
LINE 2	7	2T	WHT – BRN	7	7
	8	2R	BRN – WHT	8	8
	9	2A	WHT – SLT	9	9
	10	–	–	–	–
	11	LG	RED – BLU	11	11
	12	2L	BLU – RED	12	12
LINE 3	13	3T	RED – ORN	13	13
	14	3R	ORN – RED	14	14
	15	3A	RED – GRN	15	15
	16	–	–	–	–
	17	LG	RED – BRN	17	17
	18	3L	BRN – RED	18	18
	19	4T	RED – SLT	19	19
	20	4R	SLT – RED	20	20
LINE 4	21	4A	BLK – BLU	21	21
	22	–	–	–	–
	23	LG	BLK – ORN	23	23
	24	4L	ORN – BLK	24	24
LINE 5	25	5T	BLK – GRN	25	37 OR 39
	26	5R	GRN – BLK	26	38 OR 40
	27	5A	BLK – BRN	27	–
	28	–	–	–	–
	29	LG	BLK – SLT	29	41 OR 43
	30	5L	SLT – BLK	30	42 OR 44
(3) (4) AUX SIGNALS	31	5	BLU – YEL	BLOCK B	BLOCK B
	32	6	YEL – BLU		
	33	3	ORN – YEL		
	34	4	YEL – ORN		
HOLD LAMP	35	–	GRN – YEL	AUX CIR	AUX CIR
	36	–	YEL – GRN		
PB SIG	37	SG	BRN – YEL	GND TO AUX APPAR	
BZ LAMP	38	L2	YEL – BRN	TO BZ LAMP FIELD	
RINGER	39	RT	YEL – SLT	CONN BLK B	CONN BLK B
	40	RR	SLT – YEL		
(1) (3) EXCLUSION K565 ONLY	41	ET	VIO – BLU	(1) TO SUCCEEDING EXCLUDED PHONES	(1) TO SUCCEEDING EXCLUDED PHONES
	42	ER	BLU – VIO		
	43	EH	VIO – ORN		
	44	EB	ORN – VIO		
(2)(3)(4) 3B SPKRPH. R	45	RI	GRN – VIO	CABLE THRU 148B OR 149B ADAPTER TO 55 BW CONT UNIT	
RR	46	TI	VIO – GRN		
ON	47	P3	BRN – VIO		
ONI	48	P4	VIO – BRN		
LI	49	LK	SLT – VIO		
N	50	AG	VIO – SLT		

CABLE TERMINATION FOR 66E3 CONNECTING BLOCK | SHEET 2 OF 2 | 180514



NOTES:
1. ALL CHASSIS GND. WIRES ARE 1.
2. ALL OUTPUT GND. WIRES ARE 10.
3. ALL WIRING IS 20 AWG.
4. DIAGRAM IS FOR MODEL EAK-1, FOR MODEL EBK-1 REMOVE T2, R2, CR3 & C2 (110 V RING CIRCUIT).

SYM	REF. NO.	DESCRIPTION
C1	116172	2000/2000 MFD 30 VDC CAP.
C2	115915	1.0 MFD 660 VAC CAP.
CR1	132391	DIODE
CR2	132891	DIODE
CR3	132891	DIODE
F1&2	152255	FUSE, 2 AMP
F3&4	152256	FUSE, 2 AMP
F5	152274	FUSE, 5 AMP
L1	8245-001	FILTER, CHOKE
T1	8244-001	TRANSFORMER
T2	8243-001	TRANSFORMER
R1	X01679	750 OHM 2 WATT RES.
R2	X01126	9.1 K OHM ½ WATT RES.

REF. NO. 191183

6.500 APPROX.

NOTES
1 REDUCE ABOVE TO APPROX DIMENSIONS.
2 LETTERING TO BE BLOCK
3 LABEL TO HAVE ADHESIVE BACKING.

TOLERANCES UNLESS NOTED	
FRACTION	±
DECIMAL	±
ANGLE	±
SUPERSEDES	

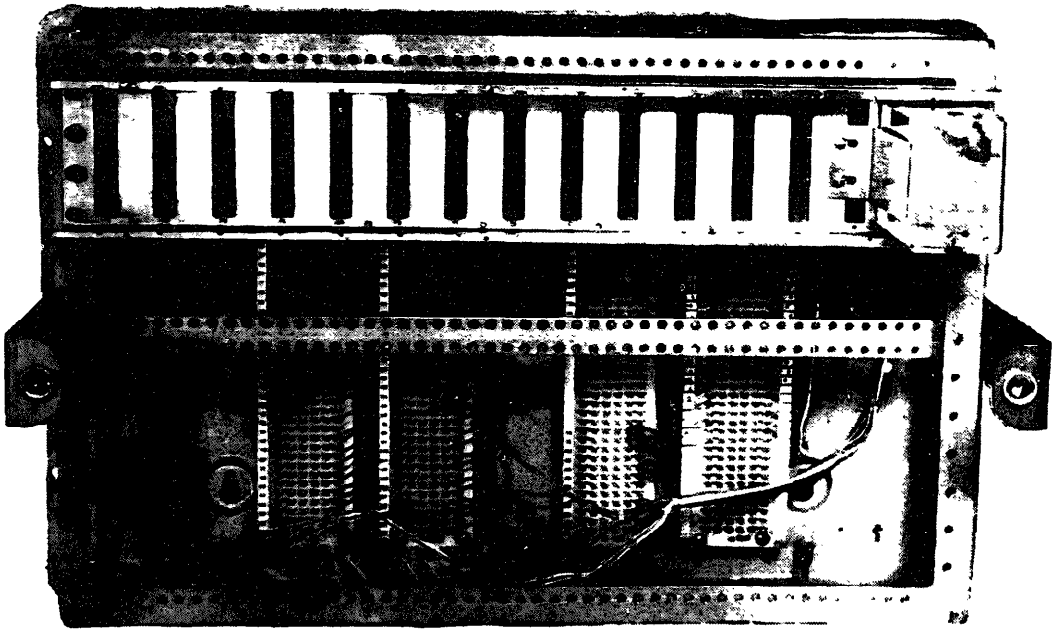
WIRING LABEL
EAK-1 & EBK-1

DESIGN RS | DWN RS 12-11-69 | CK'D

C 191183-9

CHAPTER 2

K-512 SERIES KEY SERVICE UNITS



Overall Dimensions with Cover, Approximately 17" High, 26" Wide and 10" Deep

Figure 1. Basic K512 Key Service Unit, Cover Removed
includes:

K584B or K584C KTU, 13-Line Panel.

190478, Interrupter.

180180, Equipment Cabinet with Cover.

Connecting Blocks.

Internal Wiring.

K-512 SERIES KEY SERVICE UNITS

1.0 IDENTIFICATION

The K-512 series of Key Service Units are 13-line capacity, factory packaged and pre-wired K1A2 systems Each unit consists of on apparatus mounting to accept 13 plug-in KTU's, an electro-mechanical interrupter, connecting blocks, internal wiring and a fiberglass cover. Ten different packages are offered as follows:

(1) K51200-00-963 KSU, Basic unit, wired for but not equipped with rotary or T-T dial selective intercom.

(2) K51200-0PG-963 KSU Same as item (1) except includes 180715-001 power supply assembly.

(3) K51209-00-963 KSU, Same as Item (1) except equipped with K-207C1 rotary dial intercom selector (9 dial codes.)

(4) K51209-OPG-963 KSU Same as item (I) except equipped with K-207C1 rotary dial intercom selector and 180715-001 power supply. (9 dial codes)

(5) K51210-00-963 KSU. Same item (1) except equipped with K-347C T-T dial intercom selector. (10 dial codes.)

(6) K51210-OPG-963 KSU. Same as item (2) except equipped with K-347C T-T dial intercom selector and 180715-001 power supply (10 dial codes.)

(7) K51218-000-963 KSU. Same as item (1) except equipped with K-207C1 rotary dial intercom selector and K-216A1 intercom transfer circuit. (18 dial codes,)

(8) K51218-OPG-963 KSU. Some as item (1) except equipped with K-207C1 rotary dial intercom selector, K-216A1 intercom transfer circuit and 180715-001 power supply. (18 dial codes.)

(9) K51219-000-963 KSU. Some as item (I) except equipped with K-347C T-T dial intercom selector and K-316A intercom transfer circuit.. (19 T-T dial codes.)

(10) K51219-OPG-963 KSU Same as item (1) except equipped with K-347C T-T dial intercom selector, K-316A intercom transfer circuit, and 180715-001 power supply. (19 T-T dial codes.)

Approximate overall dimensions of the K512 KSU's are 17" high X 26" wide X 10" deep

2.0 APPLICATION

The K512 series Key Service Units are used to provide Key Telephone Systems, with or without dial intercommunication, in applications where more than six CO or PBX lines are required Each K512 KSU utilizes a K584 type panel which has thirteen 18-pin connectors for installation of K400, K400D or K401A Key Telephone Units. Each K400B or K400D KTU is a printed circuit cord and provides the necessary facilities for pickup and hold on one CO or PBX line. Each K401A KTU provides o manual intercom circuit.

Handle plug-in KTUs carefully to avoid damage to printed wiring and delicate components.

3.0 INSTALLATION

The K512 series Key Service Units are wall mounted Incoming CO or PBX lines and Station or Distribution Cables are terminated on Connecting Blacks A, Band C as illustrated an Drawing 180532-101-120, per notes I, 2 and 3 thereon A ten conductor cable having 22 AWG wire and one pair of 18 AWG wire (for 10 VAC connections) is recommended far power and is terminated on Block C. The K400 or K401 type KTUs are installed in the appropriate connectors OS required.
Dial Intercom Leads, (T and R) and (L and LG) are terminated on Block D and Audible Signal leads (B and R) ore terminated on Block E. Intercom signaling digits are assigned depending upon the type K512 KSU being installed.

A rotary dial-selective intercom circuit for 9 or 18 dialing codes may be added to the K51200 KSU by installing o K-207C1 KTU for 9 stations; or by installing a K-207Cl KTU and a K-216A1 KTU for 18 stations. A T-T dial-selective intercom circuit for 10 or 19 dialing codes may be added to the K51200 KSU by installing a K-347C KTU for 10 stations, or by installing a K-347C plus a K-316A KTU for 19 stations.

The connecting blocks in the KSU provide only five station connection points far each CO or PBX line coming into the system. In the likely event that more that five stations are to be connected to o line, a secondary distribution point must be provided or some stations must be connected in multiple.

CAUTIONS

(I) Minimum size power supply recommended is Lorain RT3B or equivalent.

(2) A maximum of 200 lamps (51A) can be supplied from the system.

(3) A maximum of 50 lamps (51A) can be supplied from any one of the four interrupter contacts. The four interrupter contacts supply four line groups: 1-3, 4-6, 7-9, and 10-13.

(4) A maximum of 20 lamps (51A) can be supplied from any one line.

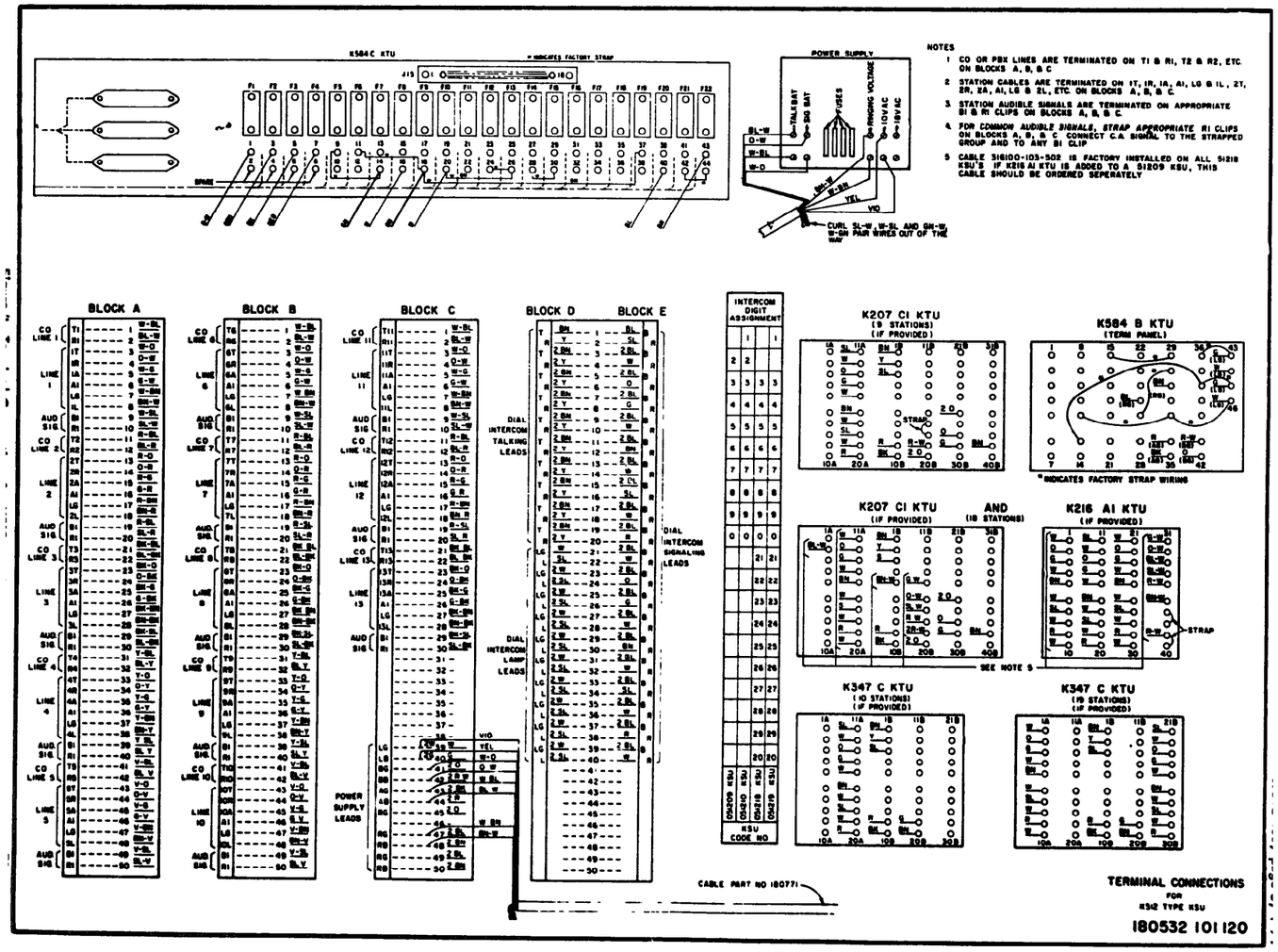


Figure 2. Terminal Connection for K512 type KSU

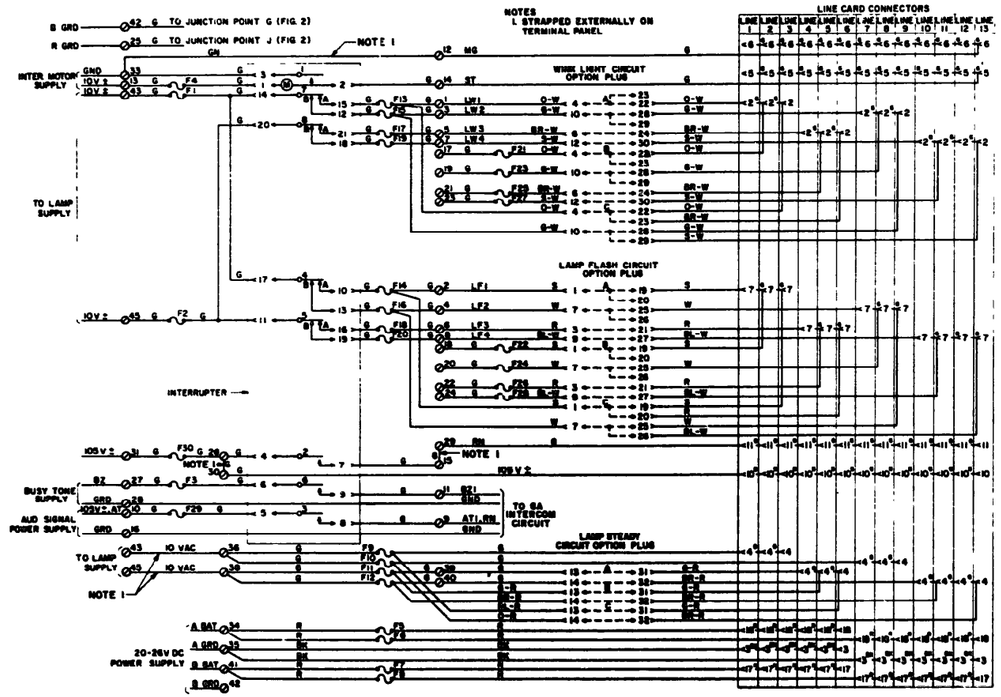


Figure 3. K584B Power Connections and Fuse Designation.

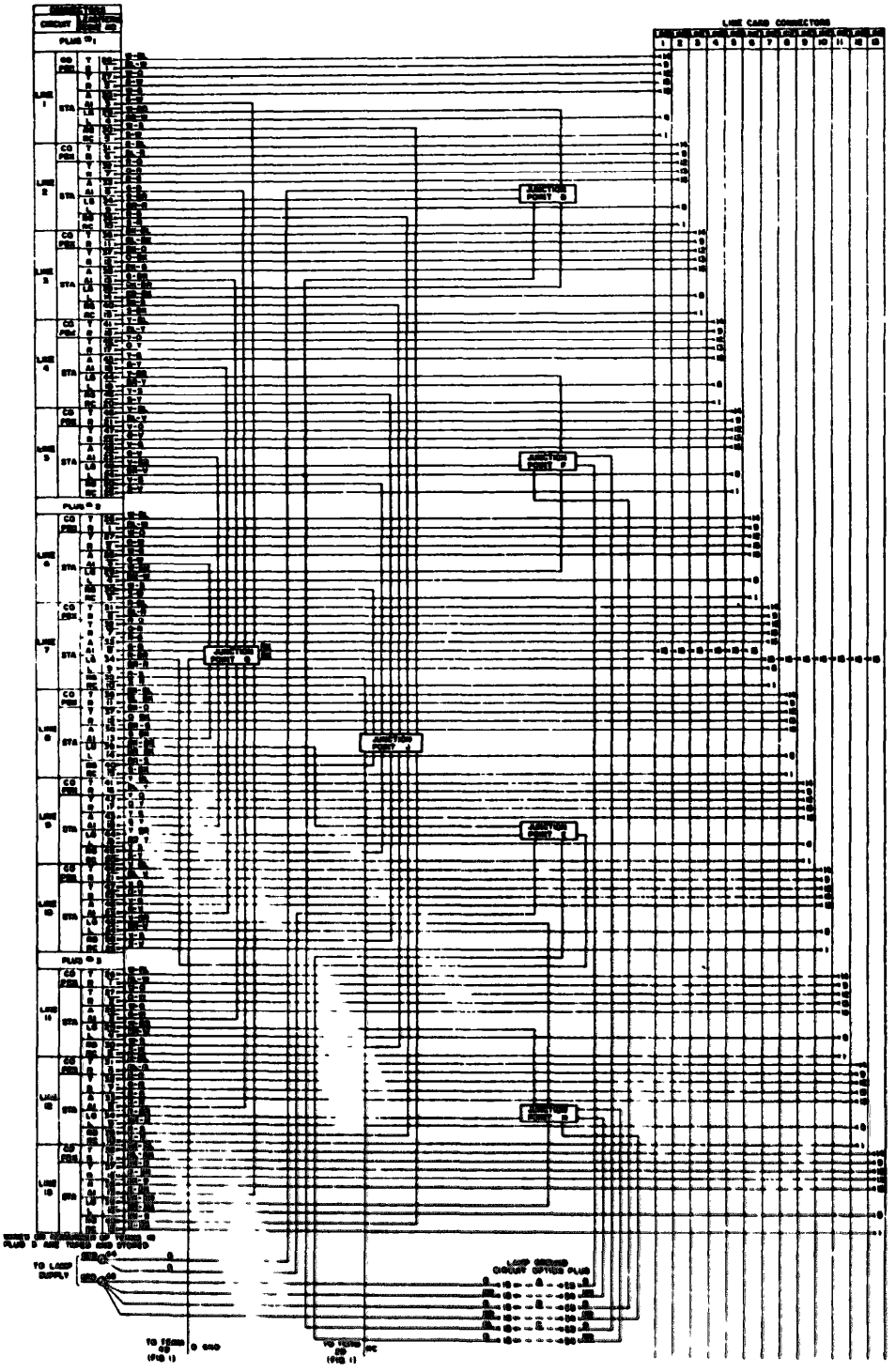


Figure 4. K584B Internal Wiring

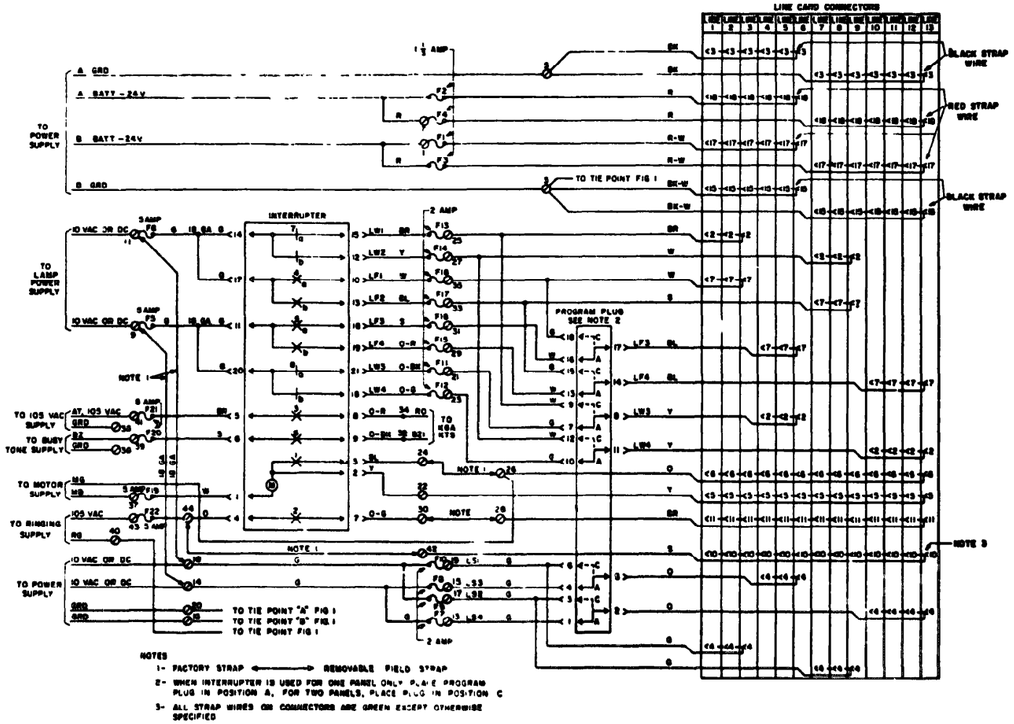


Figure 5. K584C Power Connection and Fuse Designation

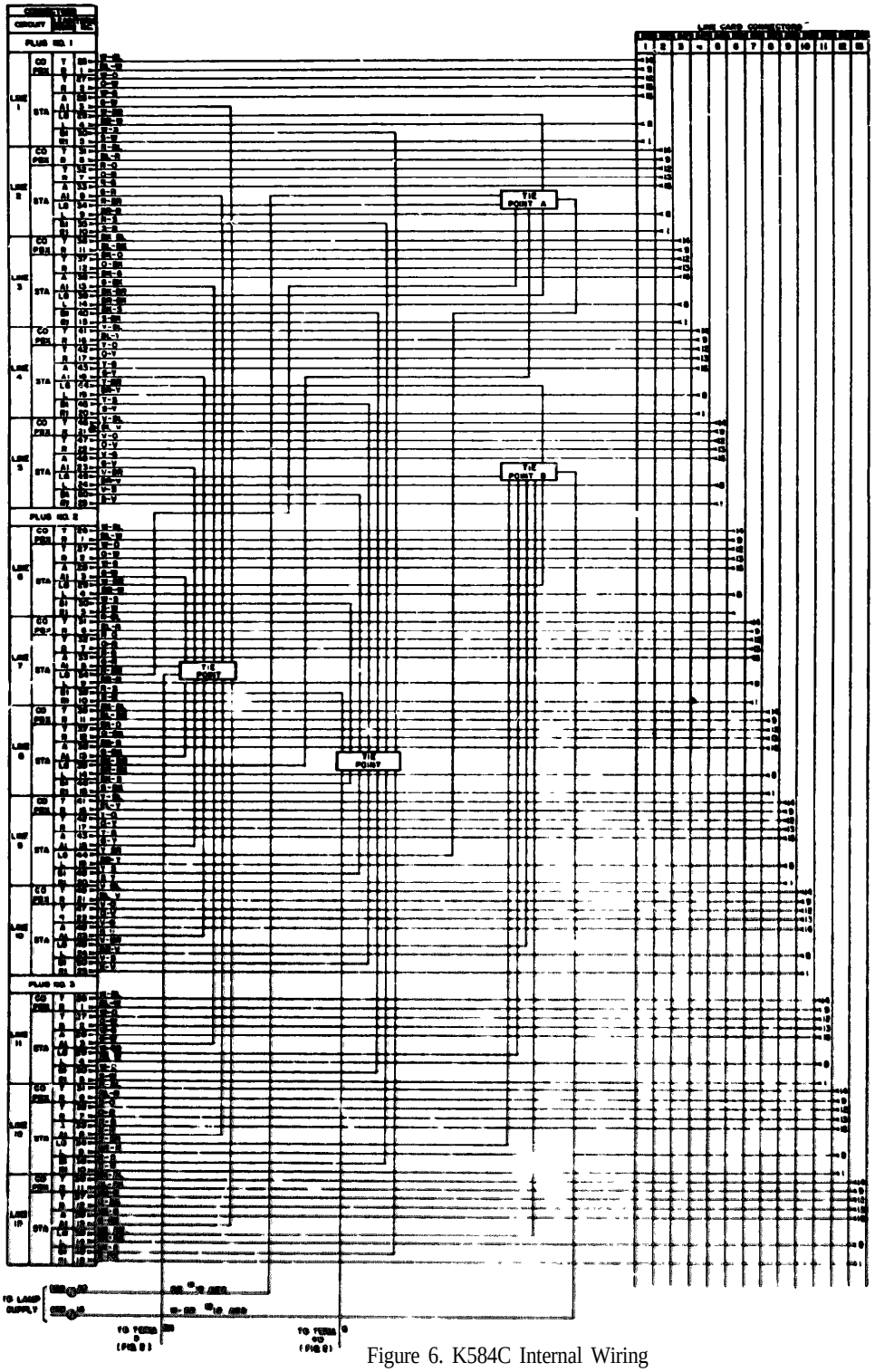


Figure 6. K584C Internal Wiring

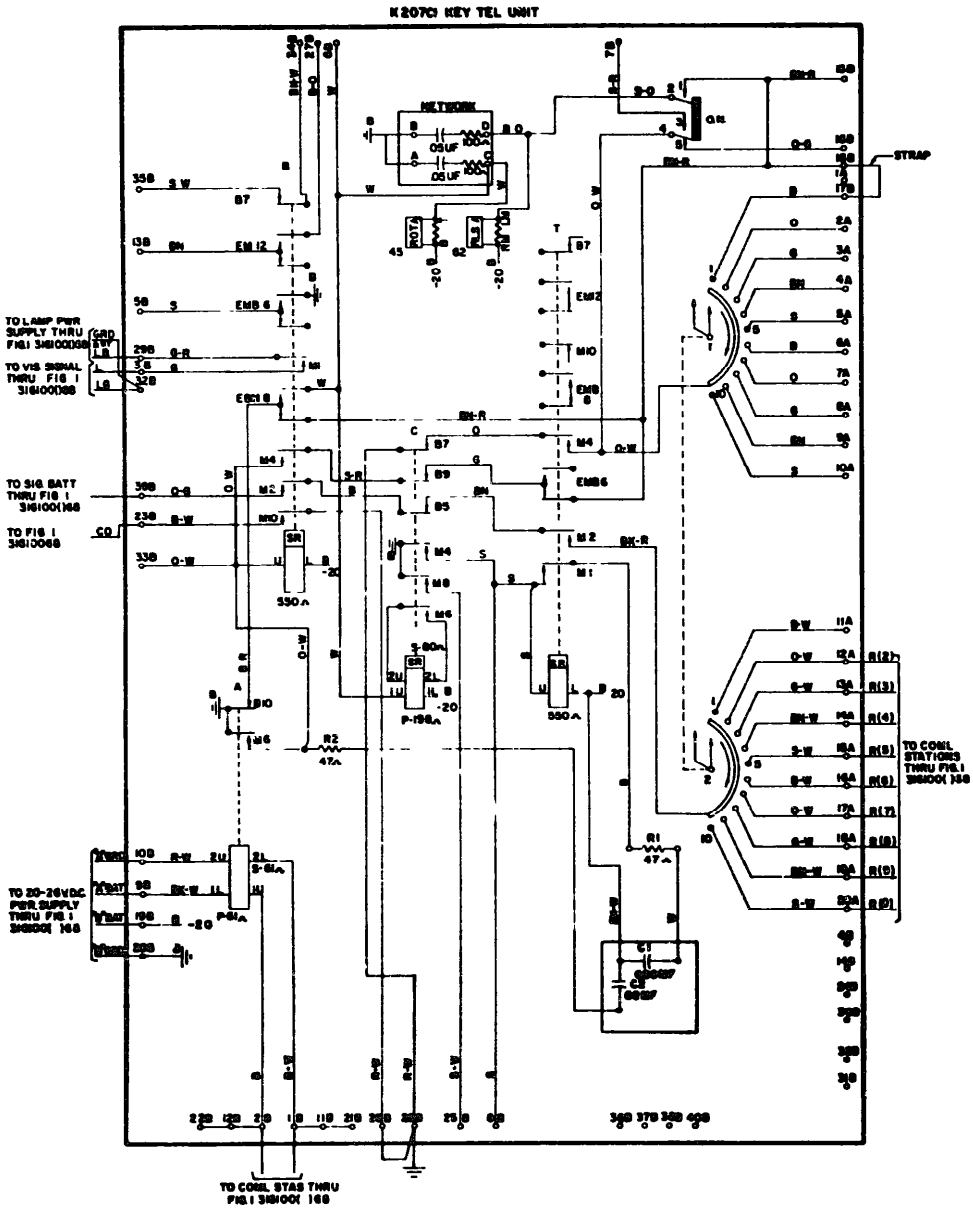


Figure 7. Schematic, K207C1 KTU

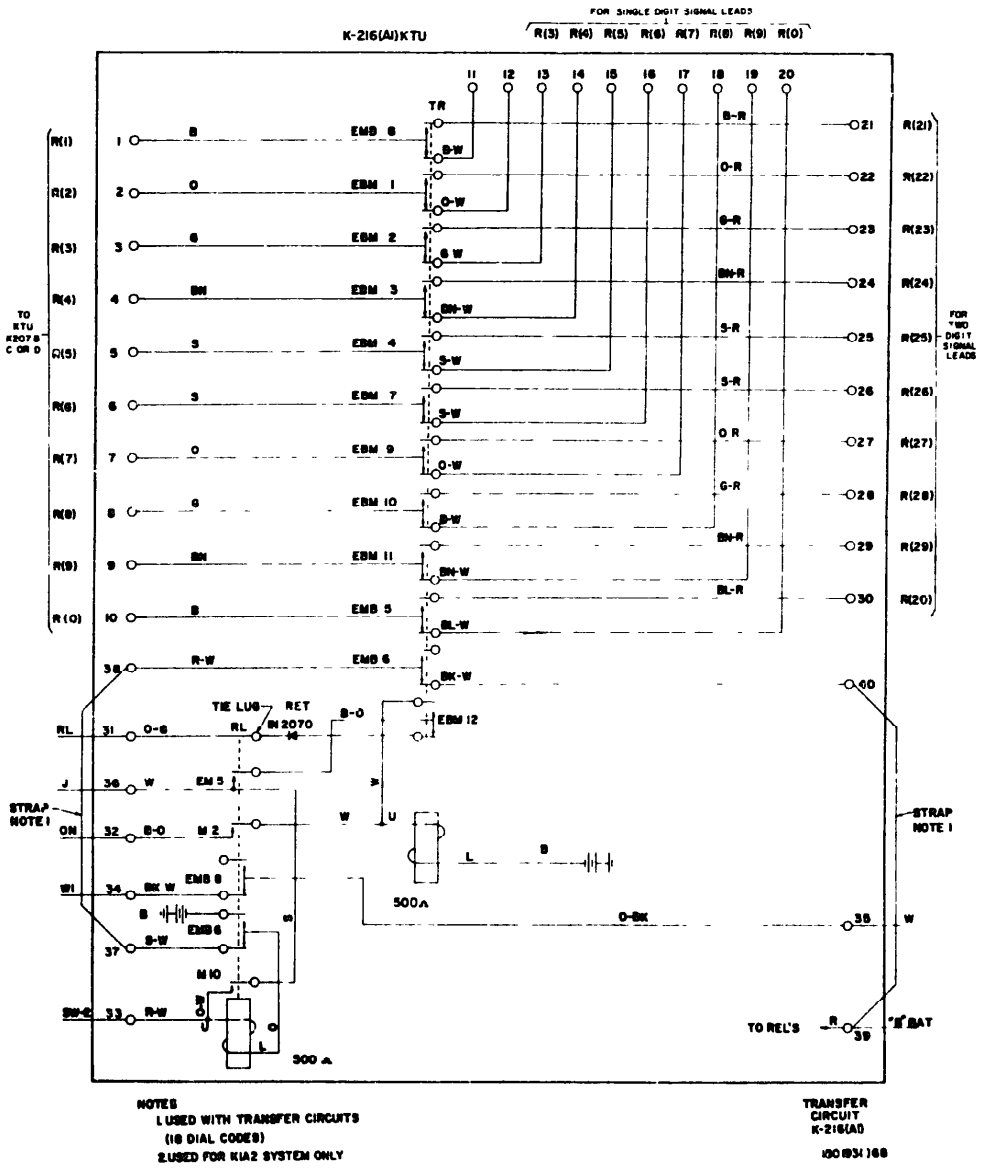
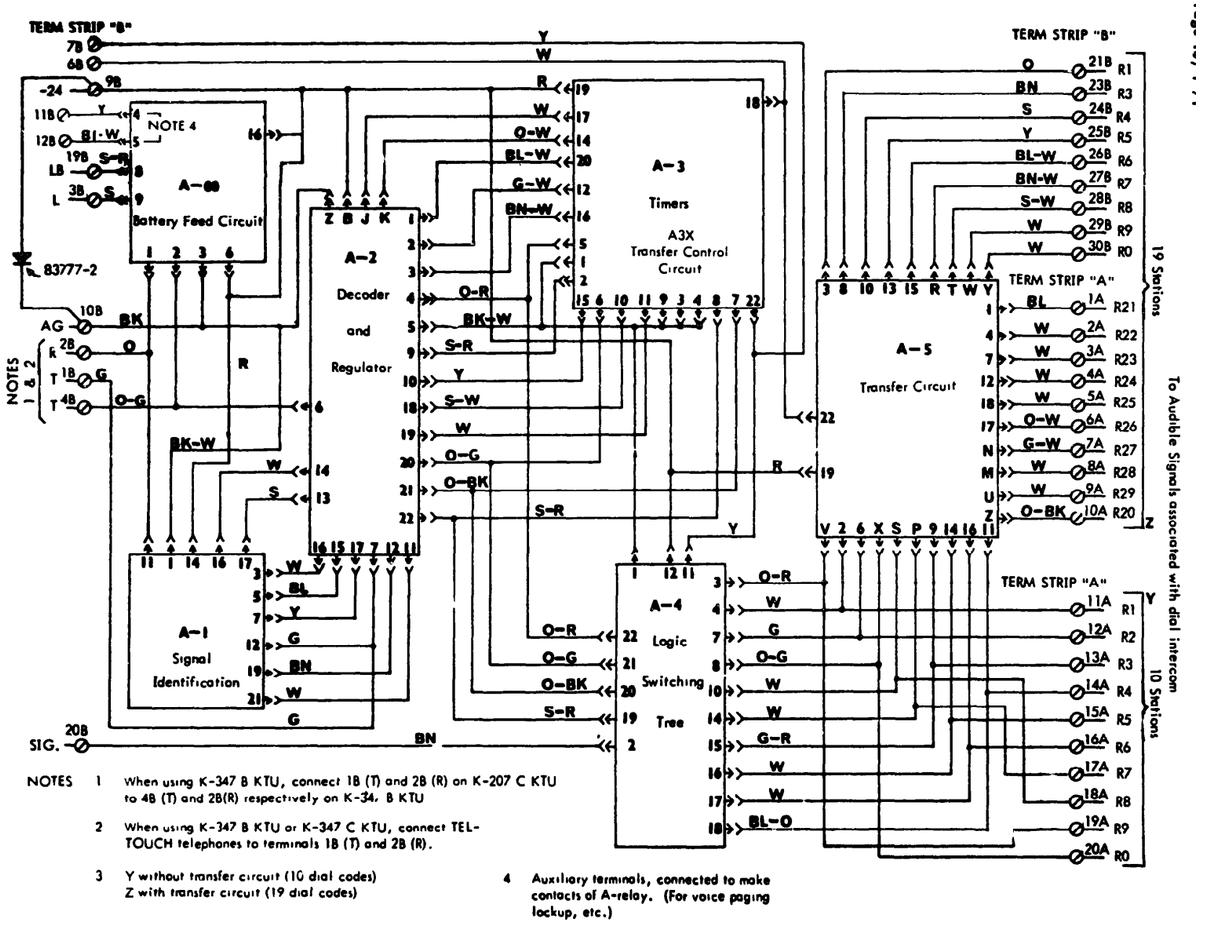


Figure 8. Schematic, K216A1 KTU



NOTES
1 When using K-347 B KTU, connect 1B (T) and 2B (R) on K-207 C KTU to 4B (T) and 2B(R) respectively on K-34. B KTU

2 When using K-347 B KTU or K-347 C KTU, connect TEL-TOUCH telephones to terminals 1B (T) and 2B (R).

3 Y without transfer circuit (10 dial codes)
Z with transfer circuit (19 dial codes)

4 Auxiliary terminals, connected to make contacts of A-relay. (For voice paging lockup, etc.)

Figure 9. Block Diagram, K347C KTU

5.0 MAINTENANCE

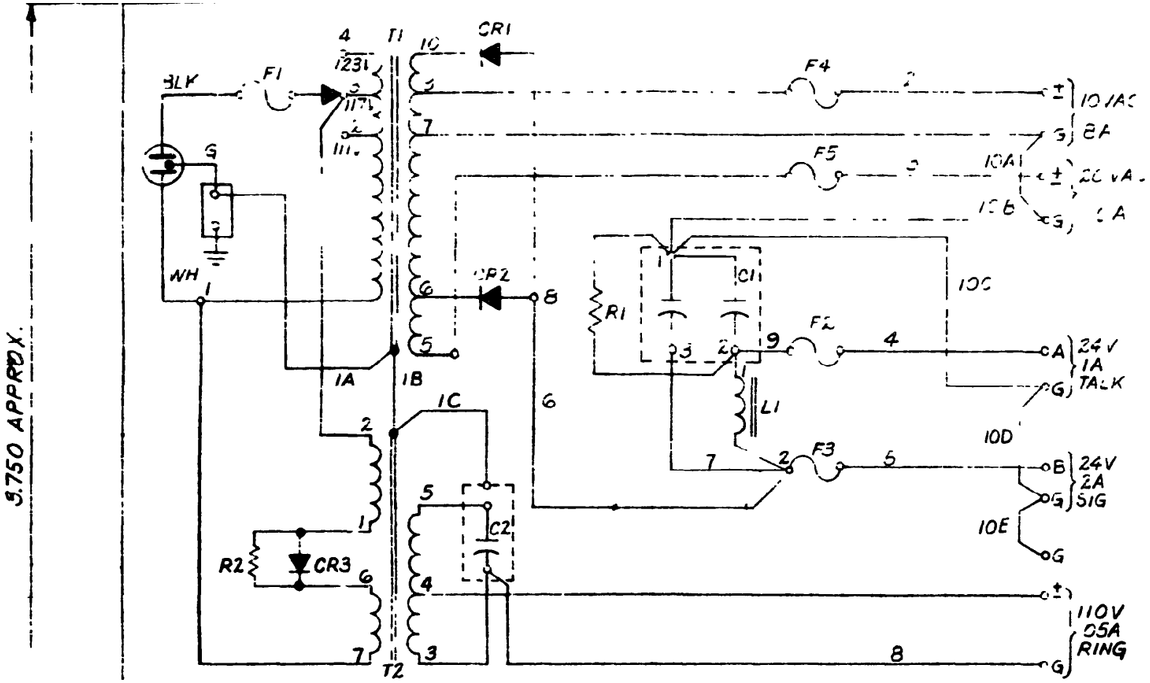
Maintenance of the K512 type KSU is primarily limited to o check for broken wiring at the connecting blocks on the backboard and at the KTU terminals.

A further check should be made to determine the status of fuses on the external power supply and the fuse panel of the K584 KTU. In each case, the current rating of the fuse is stomped on the panel OS well OS on the fuse.

Full use of the KTU schematics listed in Section 4.0 should be utilized for trouble shooting these units. Field repair of printed circuit cords used in the K584 and K347C Key Telephone Units is not recommended, defective cords should be returned to the factory for repair or replacement

6.0 REPLACEMENT PARTS

KSU OR KTU	PART NUMBER	DESCRIPTION
K512 KSU	079601-101	Cover Assembly
	190478-101	Interrupter
	180532-101	Cable Assembly
	095634-101	Connecting Block (A, B, &C)
	095743-101	Connecting Block (D & E)
	095647-108	Designation Strip (Block A, B & C)
	095647-109	Designation Strip (Block D&E)
K584B KTU K584C KTU	095744-101	P.C. Card Connector
	190477-101	Connector (Interrupter)
	180051-101	Fuse, 1,'2 A
	180051-102	Fuse, 1-1/3 A
	180051-103	Fuse, 2A
	108851-104	Fuse, 5A
	190473-104	Connector Cable)
	190473-107	Connector (584B Program Plug)
	180049-101	Plug, Program (K584B)
	180586-101	Plug, Program (K584C)
K207 C KTU	079677-103	Selector
	096055-101	Network
	180175-110	Relay (A)
	180175-105	Relay (B & T)
	180175-106	Relay (C)
	079700-106	Capacitor
K216 A KTU	180175-103	Relay (RL)
	180175-112	Relay (TRI)
	083777-102	Diode (CRI)
K347 C KTU	180296-101	P.C. Card Connector
	1980299-101	"A00" P.C. Card
	180252-101	"A1" P.C. Card
	180253-101	"A2" P.C. Card
	180254-101	"A3" P.C. Card
	180256-101	"A4" P.C. Card
K316 A KTU	180255-101	"A-3X" P.C. Card
	180275-101	"A-5" P.C. Card



NOTES:
1. MAXIMUM COMBINED D C OUTPUT TALK AND SIGNAL - 2 AMPERES.
2. ALL CHASSIS GROUND WIRES ARE #1.
3. ALL OUTPUT GROUND WIRES ARE #10.

SYM.	REF. NO.	DESCRIPTION
C1	116197	3500/3500 MFD 30 VDC CAP
C2	115915	1.0 MFD 660 VAC CAP.
CR1,2	133917	DIODE
CR3	132891	DIODE
F1	152328	FUSE, 5 AMP
F2,5	152256	FUSE, 2 AMP.
F3	152274	FUSE, 5 AMP.
F4	152275	FUSE, 10 AMP.
L1	8245-001	FILTER, CHOKE
T1	8269-001	TRANSFORMER
T2	8243-001	TRANSFORMER
R1	X01679	750 OHM 2 WATT RES.
R2	X01126	9.1K OHM ½ WATT RES

REF. NO 191299

NOTES:
1-REDUCE ABOVE TO APPROX. DIMENSIONS
2-LETTERING TO BE BLOCK
3-LABEL TO HAVE ADHESIVE BACKING

TOLERANCES UNLESS NOTED	
FRACTION	±
DECIMAL	±
ANGLE	±
SUPERSEDES:	

WIRING LABEL
EAK-4

DESIGN R.E. DWN R.E.
CK'D 6-3-70
C 191299

3 2

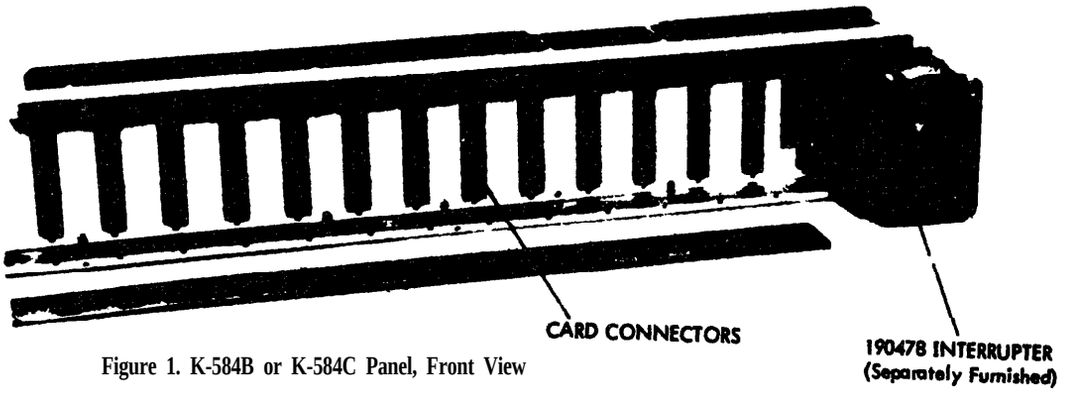


Figure 1. K-584B or K-584C Panel, Front View

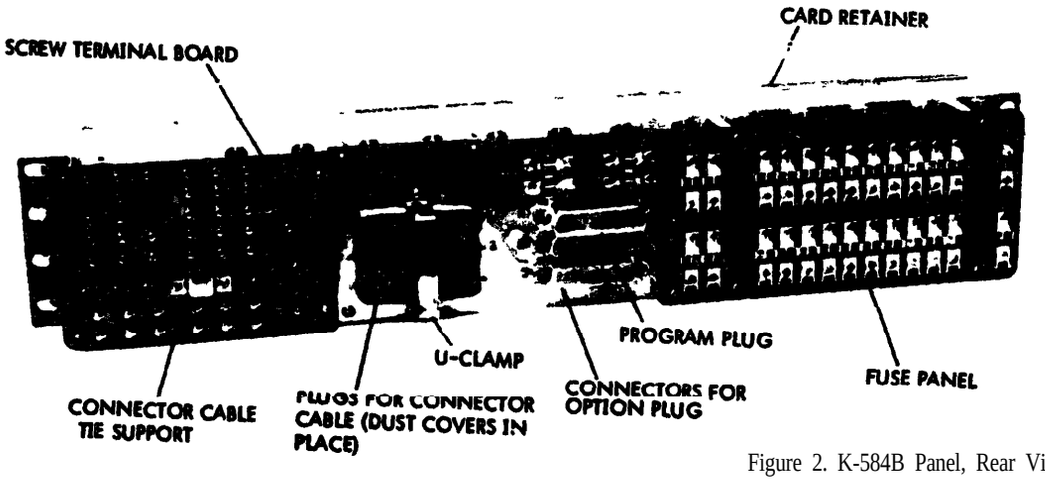


Figure 2. K-584B Panel, Rear View

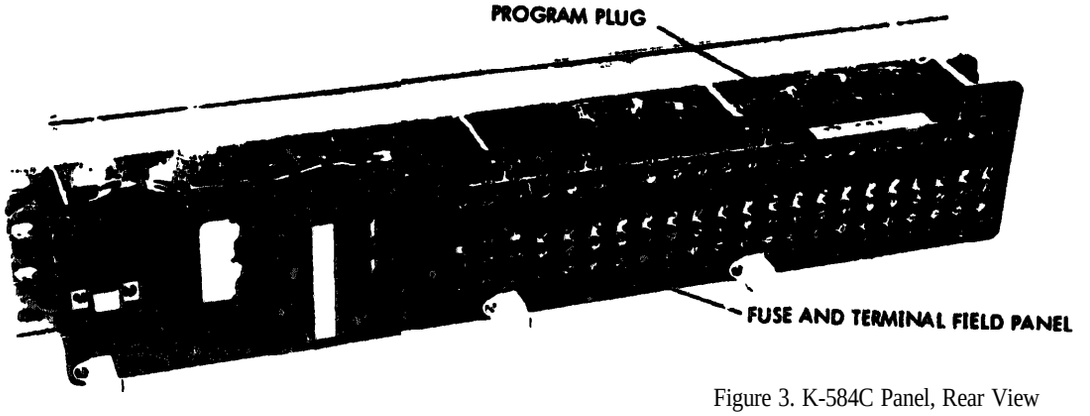


Figure 3. K-584C Panel, Rear View

K-584B and K-584C 13-CELL CARD MOUNTING PANEL IDENTIFICATION AND INSTALLATION

1.0 IDENTIFICATION

1.1 PURPOSE OF EQUIPMENT

The K-584 type panels are designed for use at loge centralized installations of K-1A2 Key Telephone System arrangements Each panel will accept thirteen K-400 type or K-401A plug-in KTU's and one 190478 interrupter. Approximate dimensions ore 23" W X 4" H X 4 1/2" D. The panels mount on any frame structure designed for 23" mounting plates.

The K-584C supersedes the K-584B, (discontinued June 1970)

1.2 DESCRIPTION

All line and station wiring is factory wired from the connectors to three SO-contact quick-connect plugs numbered 1, 2 and 3. Power supply wiring, interpanel strapping and miscellaneous circuits ore field connected to the screw terminal field.

Lamp fusing is divided into lamp flash (LF), lamp wink (LW) and lamp steady (LS). For lamp functions, the panels ore divided into three groups of three lines each and one group of four lines. No more than 50 lamps con be supplied from any group, or the capacity of the interrupter contacts will be exceeded. Fusing and terminal assignments of the K-584C panel differs extensively from the K-584B panel. *(See Table 1)

Optional programs allow rearrangement of lamp distribution and fusing within or external to the panel. These options ore selected as follows.

K-5848 - Three 34-contact connecton lettered A, B and C serve as receptacles for the single program option plug provided

K-584C- One 18-contact connector serves OS o receptacle for the combined Program A/Program C plug.

PROGRAM "A"

When the K-584B panel Is used alone, the program plug is placed in receptacle A. When the K-584C panel Is used alone, the program plug is inserted so that "Program A" may be mod from the plug top. Under this arrangement, fusing for on average of 17 lamps per line circuit is provided not to exceed 50 lamps per interrupter contact.

PROGRAM "B" (Not provided on K-584C)

With the program plug in receptacle B of the K-584B panel and the 10-volt ac input to the Interrupter changed to ground, the entire output of the interrupter is used to synchronously drive auxiliary (slave) relay equipment. All lamp flash and lamp wink functions, including those of the master panel, are served from auxiliary relay contacts.

PROGRAM "C"

With the program plug in receptacle C in the K-584B panel, or Inserted so "Program C" may be read from the plug top in the K-584C panel, half the output of the interrupter, (LF1, LF2, LW1, and LW2, leads), Is used to power on average of eight lamps per line within the panel. The remaining interrupter lads, (LF3, LF4, LW3, and LW4) may be used to power up to 100 lamps, In succeeding panels not equipped with on Interrupter.

CAUTION

REMOVE POWER CORD FROM OUTLET BEFORE CHANGING PROGRAMS TO PRECLUDE POSSIBILITY OF BLOWING FUSES.

3.0 INSTALLATION

3.1 MOUNTING

The K-584B and K-584C panels ore arranged to mount on 22-3/8 inch mounting centers such as provided by the following.

(a) Any standard commercial 23 inch rock.

(b) 79600 apparatus mounting. (Will accomodate three K-584 panels if center horizontal bar is removed.)

(c) 180180 apparatus cabinet. (Will accomodate three K-584 panels if center horizontal bar is removed.)

(d) 96053-1 floor type apparatus cabinet (Ambox) Will accomodate a maximum of six K-584 panels.

(e) 96053-2 floor type apparatus cabinet (Ambox). Will accomodate o maximum of ten K-584 panels.

3.2 CONNECTIONS

(a) LINE AND STATION CONNECTIONS

Only three station or key cables can be connected directly to a 584-type panel, so o master distribution point is normally required. Connections from the panels to the distribution point can be made by one 75-pair cable terminated at one end with three SO-contact connectors or by three 25-pair cable each terminated at one end by o SO-contact connector. Recommended cables ore:

(1) 75006( )601, 6-feet long, 75 pair, three connectors
(2) 25025( )601, 25-feet long, 25 pair, one connector
(3) 25050()601, 50-feet long, 25 pair, one connector.
(4) 25100()601, 100-feet long, 25 pair, one connector

The connector cable(s) must be brought in from the left rear of the K-584B and C panels for connection to plugs 1, 2 and 3.

(b) POWER CONNECTIONS

Power connections for the K-584B and C panels are made to the screw terminal field Be sure each fuse in the panel is the correct rating specified for the circuit and that lamp limitations of the interrupter ore not exceeded.

The K-584B and C panels may be intermixed in key system arrangements (See figure 4.)

TABLE 1. FUSE DISTRIBUTION OF K-584B and K-584C Panels

	584B						584C			
	PROGRAM A		PROGRAM B		PROGRAM C		PROGRAM A		PROGRAM C	
GROUP	FUSE	CONN SERVED	FUSE	CONN SERVED	FUSE	CONN SERVED	FUSE	CONN SERVED	FUSE	CONN SERVED
LF1	14	1-3	22	1-3	14	1-6	18	1-3	18	1-6
LF2	16	7-9	24	7-9	16	7-13	17	7-9	17	7-13
LF3	18	4-6	26	4-6	18		16	4-6	16	
LF4	20	10-13	28	10-13	20		15	10-13	15	
LW1	13	1-3	21	1-3	13	1-6	13	1-3	13	1-6
LW2	15	7-9	23	7-9	15	7-13	14	7-9	14	7-13
LW3	17	4-6	25	4-6	17		11	4-6	11	
LW4	19	10-13	27	10-13	19		12	10-13	12	
LS1	9	1-3	9	1-3	9	1-6	10	1-3	10	1-6
LS2	10	7-9	10	7-9	10	7-13	8	7-9	8	7-13
LS3	11	4-6	11	4-6	11		9	4-6	9	
LS4	12	10-13	12	10-13	12		7	10-13	7	

KSP584-00B
KSP584-00C
Page 4, 8-70

TABLE II FUSE ASSIGNMENT

	584B		584C	
FUSE	CAPACITY	CIRCUIT	CAPACITY	CIRCUIT
1	5A	10V ac or dc LW1, LW2 LF1, LF2	1-1/3 A	A Bat.
2	5A	10V ac or dc LW3, LW4 LF3, LF4	1-1/3 A	B Bat.
3	1/2A	Busy Tone	1-1/3 A	B Bat.
4	1/2A	Interrupter Motor Supply (ac or dc)	1-1/3 A	A Bat.
5	1-1/3 A	A Bat	5A	10V ac or dc Lamp Wink 3 & 4 Lamp Flash 3 & 4
6	1-1/3 A	A Bat.	5A	10V ac or dc LW1, LW2 LF1, LF2
7	1-1/3 A	B Bat	2A	10V ac or dc LS4
8	1-1/3 A	B Bat.	2A	LS2
9	2A	10V ac or dc LS1		LS3
10		LS2		LS1
11		LS3		LW3
12		LS4		LW4
13		LW1		LW1
14		LF1		LW2
15		LW2		LF4
16		LF2		LF3
17		LW3		LF2
18		LF3	2A	10V ac or dc LF1
19		LW4	1/2A 1/2A	Interrupter Motor Supply (ac or dc)
20		LF4	1/2A	Busy Tone
21		LW1	1/2A	AT 105V ac (6A)
22		LF1	1/2A	105V ac (RN)
23		LW2		
24		LF2		
25		LW3		
26		LF3		
27		LW4		
28	2A	10V ac or dc LF4		
29	1/2A	AT, 105V ac (6A)		
30	1/2A	105V ac (RN)		

TABLE III. LAMP DISTRIBUTION

CAPACITY	USED ALONE PROGRAM A	AS FIRST PANEL E/W INTERRUPTER PROGRAM B (584B ONLY)	AS FIRST PANEL E/W INTERRUPTER PROGRAM C	AS SECOND PANEL WITHOUT INTERRUPTER PROGRAM C
LAMPS	200	200*	100	100
AVERAGE LAMPS PER LINE	17	17*	8	8

* Entire output of interrupter used to drive auxiliary relays. Lamp flash and lamp wink functions are served from an external source.

TABLE IV. LINE AND STATION CONNECTIONS TO K-584B or C PANEL

CIRCUIT		LEAD DESIG	BLOCK A 66-TYPE CONNECTING BLOCK TERMINAL	CLIP	COLOR BL-W BINDER	TERMINAL ON K 584 KTU TERMINAL	CONNECTOR
LINE 1	CO PBX	T	1	4	W-BL	26	1
		R	2		BL-W	1	
	STA	T	3		W-O	27	2
		R	4		O-W	2	
		A	5		W-G	28	
		A1	6		G-W	3	
		LG	7		W-BR	29	
		L	8		BR-W	4	
		RG	9		W-S	30	
		RC	10		S-W	5	
LINE 2	CO PBX	T	11		R-BL	31	
		R	12		BL-R	6	
	STA	T	13		R-O	32	
		R	14		O-R	7	
		A	15		R-G	33	
		A1	16		G-R	8	
		LG	17		R-BR	34	
		L	18		BR-R	9	
		RG	19		R-S	35	
		RC	20		S-R	10	
LINE 3	CO PBX	T	21		BK-BL	36	
		R	22		BL-BK	11	
	STA	T	23		BK-O	37	
		R	24		O-BK	12	
		A	25		BK-G	38	
		A1	26		G-BK	13	
		LG	27		BK-BR	39	
		L	28		BR-BK	14	
		RG	29		BK-S	40	
		RC	30		S-BK	15	
LINE 4	CO PBX	T	31		Y-BL	41	
		R	32		BL-Y	16	
	STA	T	33		Y-O	42	
		R	34		O-Y	17	
		A	35		Y-G	43	
		A1	36		G-Y	18	
		LG	37		Y-BR	44	
		L	38		BR-Y	19	
		RG	39		Y-S	45	
		RC	40		S-Y	20	
LINE 5	CO PBX	T	41		V-BL	46	
		R	42		BL-V	21	
	STA	T	43		V-O	47	
		R	44		O-V	22	
		A	45		V-G	48	
		A1	46		G-V	23	
		LG	47		V-BR	49	
		L	48		BR-V	24	
		RG	49		V-S	50	
		RC	50		S-V	25	

CIRCUIT		LEAD DESIG	BLOCK B 66-TYPE CONNECTING BLOCK TERMINAL	CLIP	COLOR O-W BINDER	TERMINAL ON K 584 KTU TERMINAL	CONNECTOR
LINE 6	CO PBX	T	1	6	W-BL	26	2
		R	2		BL-W	1	
	STA	T	3		W-O	27	
		R	4		O-W	2	
		A	5		W-G	28	
		A1	6		G-W	3	
		LG	7		W-BR	29	
		L	8		BR-W	4	
		RG	9		W-S	30	
		RC	10		S-W	5	
LINE 7	CO PBX	T	11		R-BL	31	
		R	12		BL-R	6	
	STA	T	13		R-O	32	
		R	14		O-R	7	
		A	15		R-G	33	
		A1	16		G-R	8	
		LG	17		R-BR	34	
		L	18		BR-R	9	
		RG	19		R-S	35	
		RC	20		S-R	10	
LINE 8	CO PBX	T	21		BK-BL	36	
		R	22		BL-BK	11	
	STA	T	23		BK-O	37	
		R	24		O-BK	12	
		A	25		BK-G	38	
		A1	26		G-BK	13	
		LG	27		BK-BR	39	
		L	28		BR-BK	14	
		RG	29		BK-S	40	
		RC	30		S-BK	15	
LINE 9	CO PBX	T	31		V-BL	41	
		R	32		BL-V	16	
	STA	T	33		V-O	42	
		R	34		O-V	17	
		A	35		V-G	43	
		A1	36		G-V	18	
		LG	37		V-BR	44	
		L	38		BR-V	19	
		RG	39		V-S	45	
		RC	40		S-V	20	
LINE 10	CO PBX	T	41		Y-BL	46	
		R	42		BL-Y	21	
	STA	T	43		Y-O	47	
		R	44		O-Y	22	
		A	45		Y-G	48	
		A1	46		G-Y	23	
		LG	47		Y-BR	49	
		L	48		BR-Y	24	
		RG	49		Y-S	50	
		RC	50		S-Y	25	

CIRCUIT		LEAD DESIG	BLOCK C 66-TYPE CONNECTING BLOCK TERMINAL	CLIP	COLOR G-W BINDER	TERMINAL ON K 584 KTU TERMINAL	CONNECTOR
LINE 11	CO PBX	T	1	6	W-BL	26	3
		R	2		BL-W	1	
	STA	T	3		W-O	27	
		R	4		O-W	2	
		A	5		W-G	28	
		A1	6		G-W	3	
		LG	7		W-BR	29	
		L	8		BR-W	4	
		RG	9		W-S	30	
		RC	10		S-W	5	
LINE 12	CO PBX	T	11		R-BL	31	
		R	12		BL-R	6	
	STA	T	13		R-O	32	
		R	14		O-R	7	
		A	15		R-G	33	
		A1	16		G-R	8	
		LG	17		R-BR	34	
		L	18		BR-R	9	
		RG	19		R-S	35	
		RC	20		S-R	10	
LINE 13	CO PBX	T	21		BK-BL	36	
		R	22		BL-BK	11	
	STA	T	23		BK-O	37	
		R	24		O-BK	12	
		A	25		BK-G	38	
		A1	26		G-BK	13	
		LG	27		BK-BR	39	
		L	28		BR-BK	14	
		RG	29		BK-S	40	
		R	30		S-BK	15	
(READ-ENDED AND STORED BEHIND KTU) K-584B ONLY			31		Y-BL	41	
			32		BL-Y	16	
			33		Y-O	42	
			34		O-Y	17	
			35		Y-G	43	
			36		G-Y	18	
			37		Y-BR	44	
			38		BR-Y	19	
			39		Y-S	45	
			40		S-Y	20	
			41		V-BL	46	
			42		BL-V	21	
			43		V-O	47	
			44		O-V	22	
			45		V-G	48	
			46		G-V	23	
			47		V-BR	49	
			48		BR-V	24	
			49		V-S	50	
			50		S-V	25	

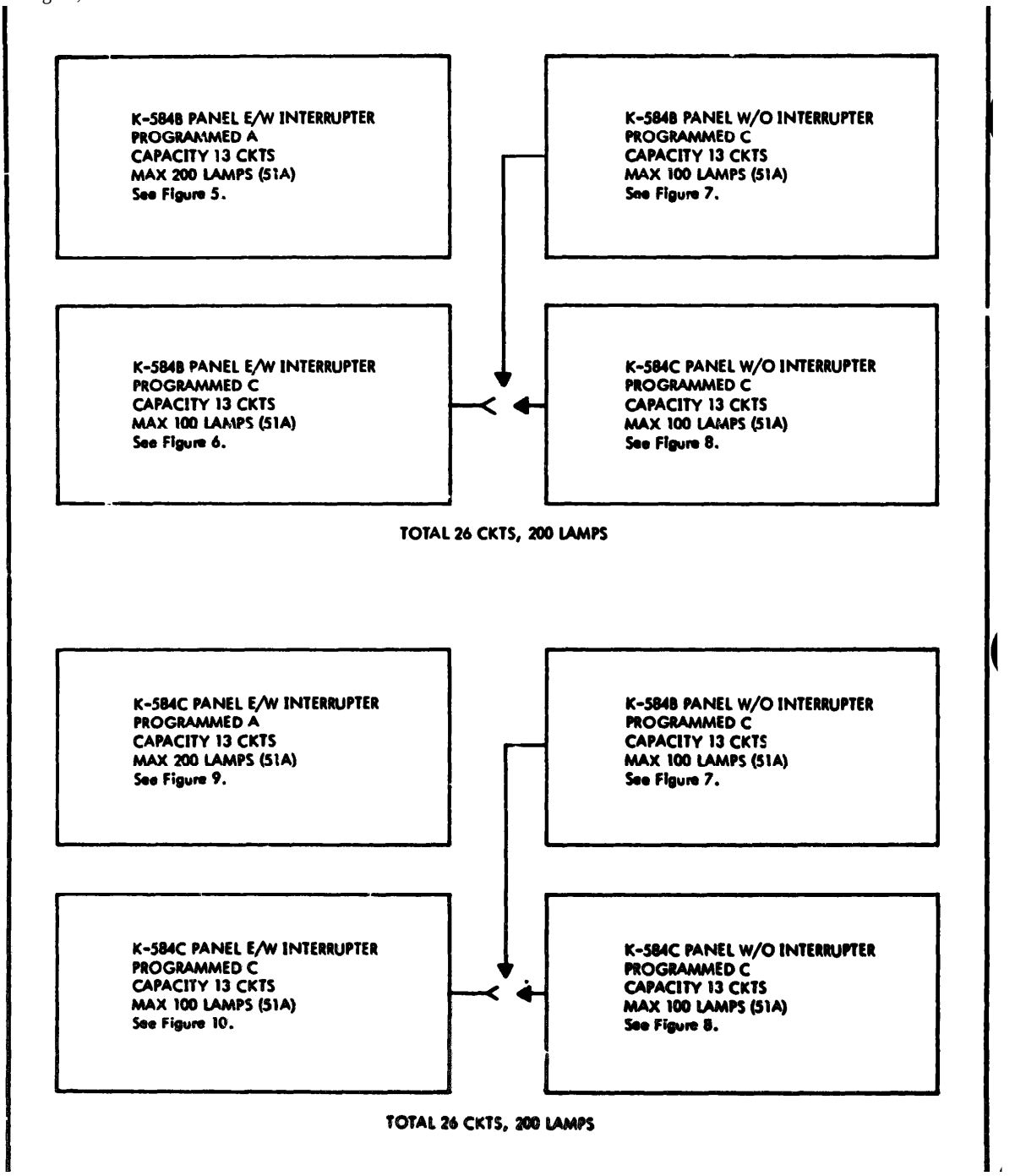


Figure 4. Block diagram showing system arrangements.

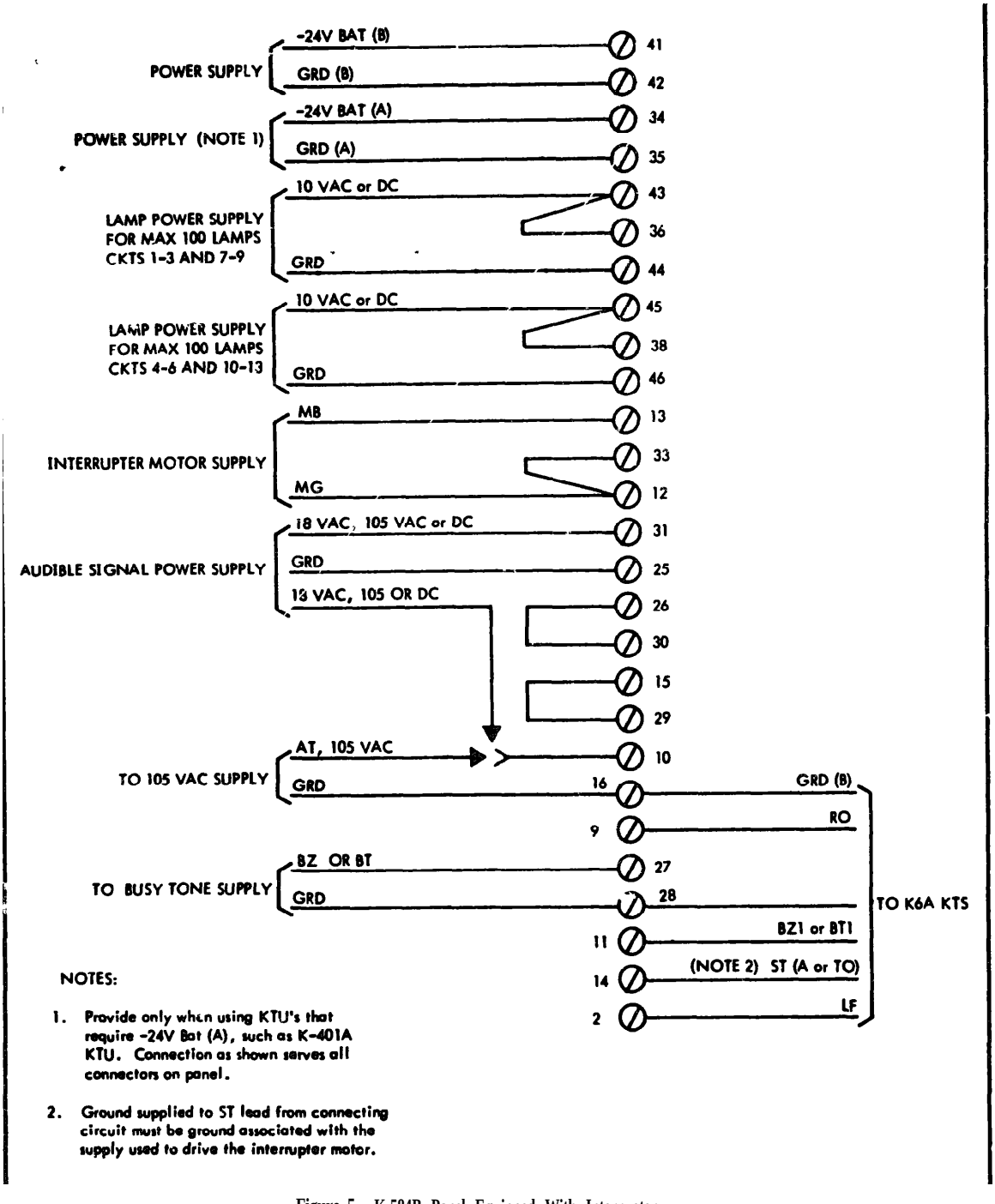


Figure 5. K-584B Panel Equipped With Interrupter (Panel not used to control other panels)
PROGRAM PLUG IN RECEPTACLE A

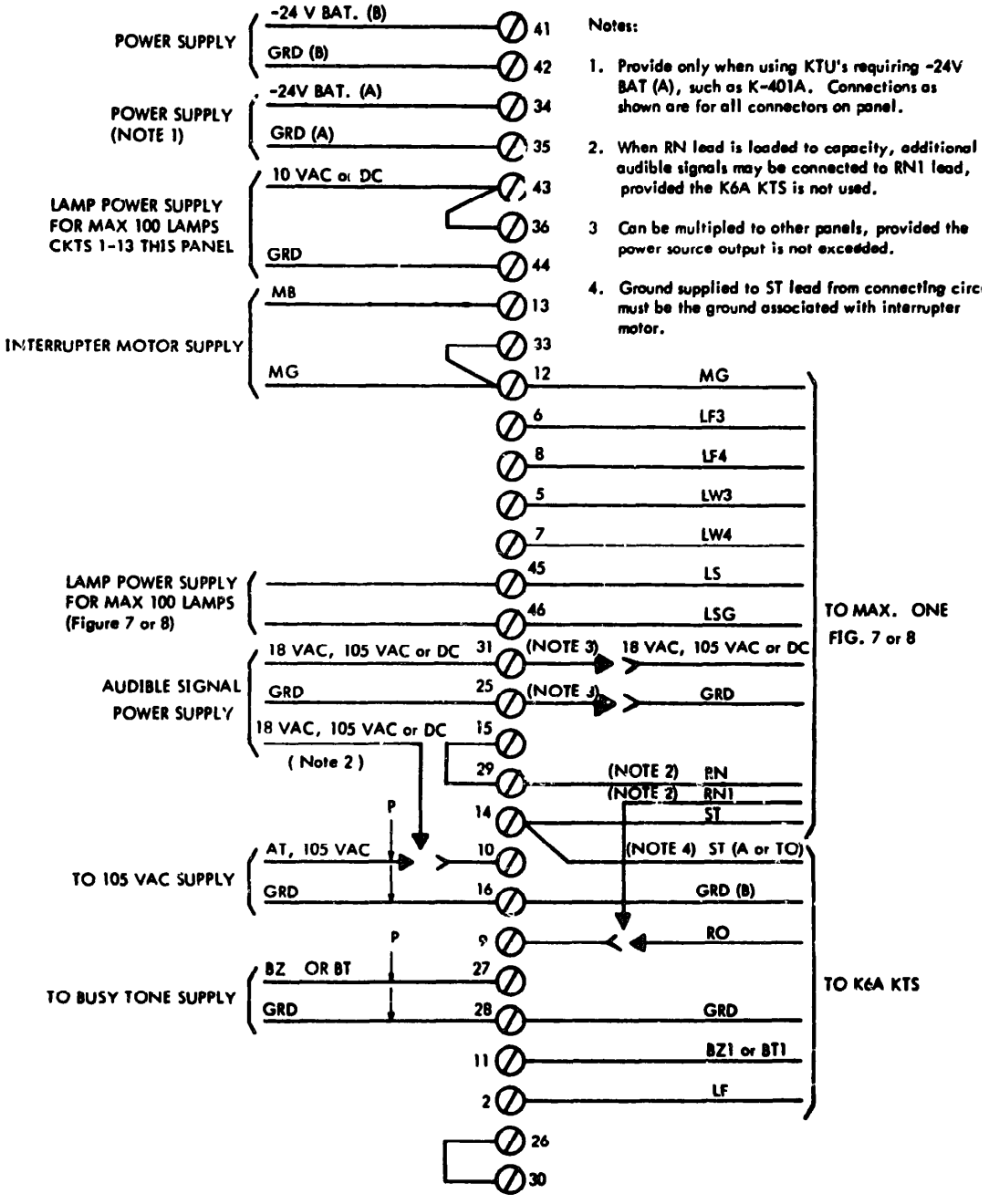
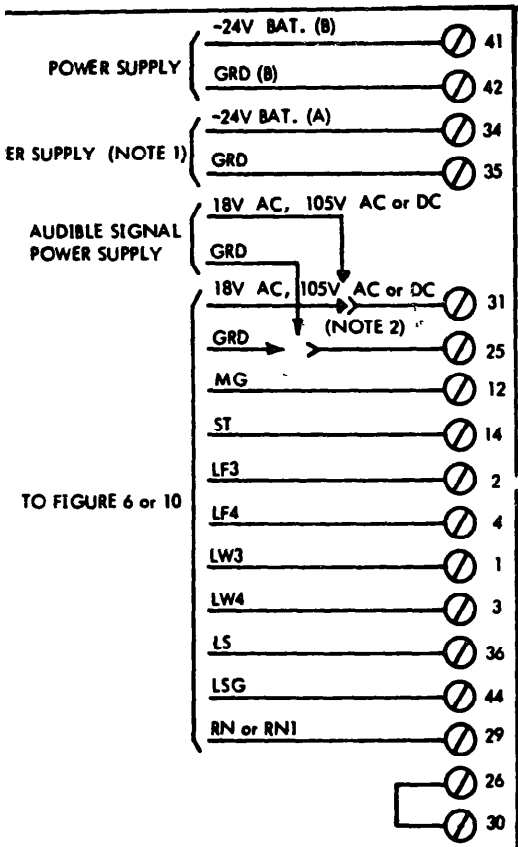


Figure 6. K-584B Panel Equipped With interrupter (Panel used to control one other panel)

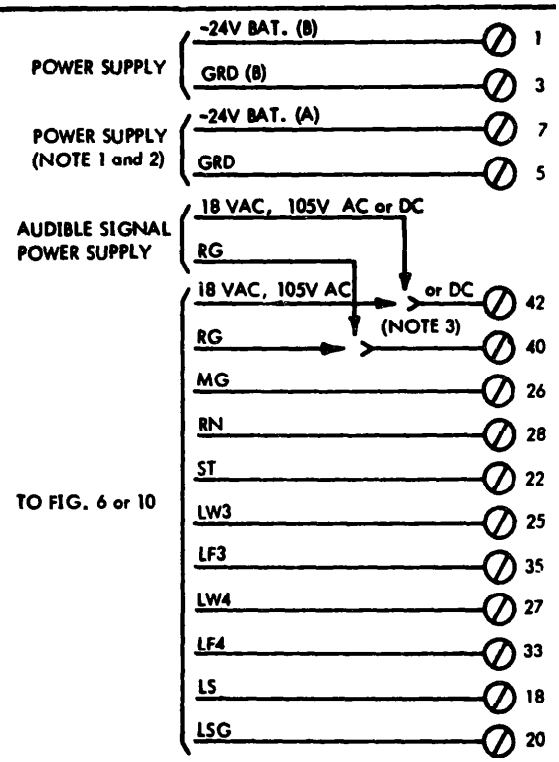
PROGRAM PLUG IN RECEPTACLE C



NOTES:

1. Provide only when using KTU's that require -24V BAT.(A), such as the K-401A KTU. Connection as shown serves all connectors on panel.
2. If leads from preceding panel are loaded to capacity, provide separate audible signal power to this panel.

Figure 7. K-584B Panel Not Equipped With Interrupter (Panel controlled by another panel)
PROGRAM PLUG IN RECEPTACLE C



NOTES:

1. Provide only when using KTU's that require -24V BAT. (A), such as the K-401A KTU.
2. When more than one supply is used to provide -24 VDC and 10 VAC power, power supply ground terminals are bonded together.
3. If leads from preceding panel are loaded to capacity, provide separate audible signal power to this panel.

Figure 8. K-584C Panel Not Equipped With Interrupter (Panel controlled by another panel)
PROGRAM C

KSP584-00B
KSP584-00C
Page 10, 8-70

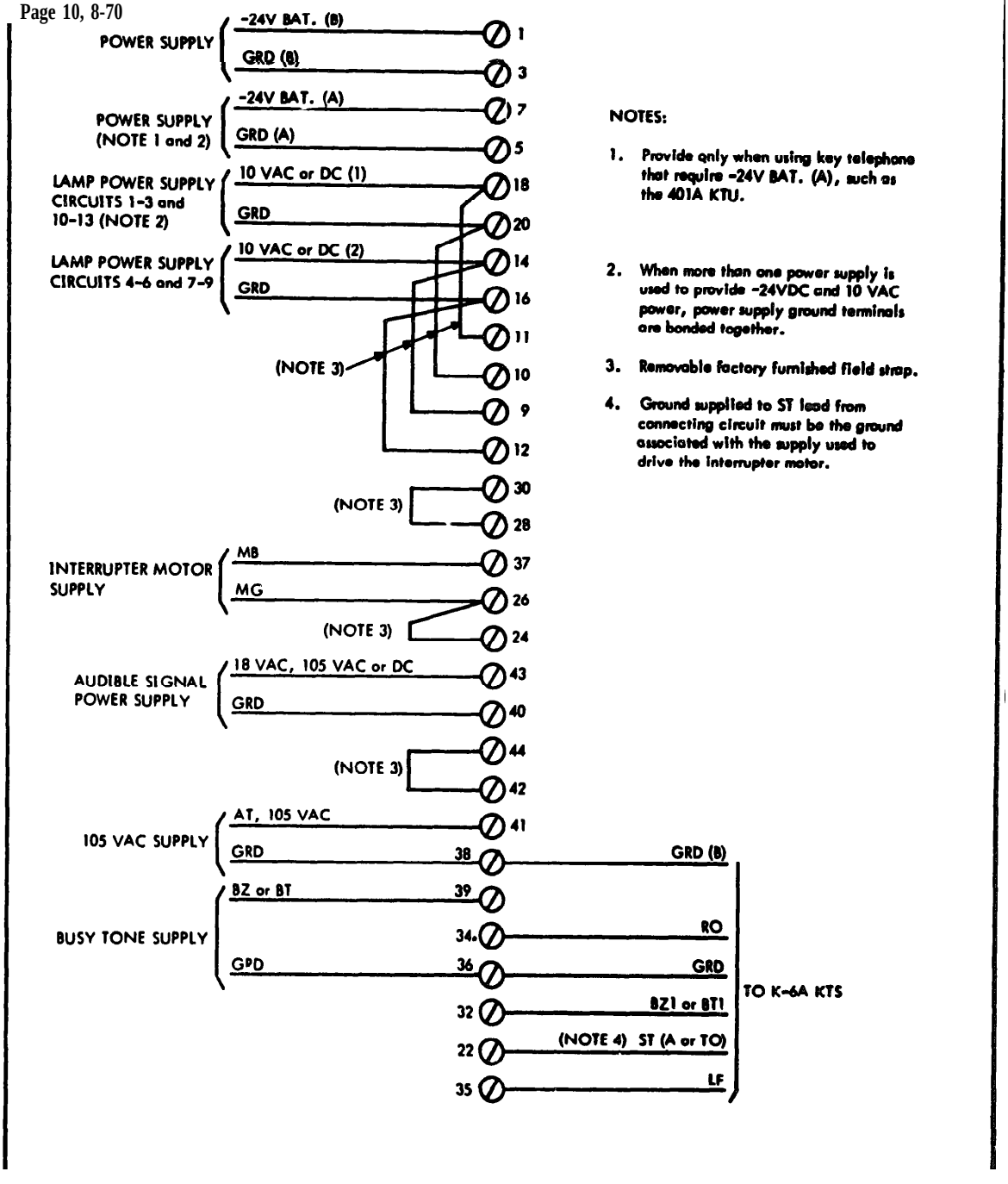
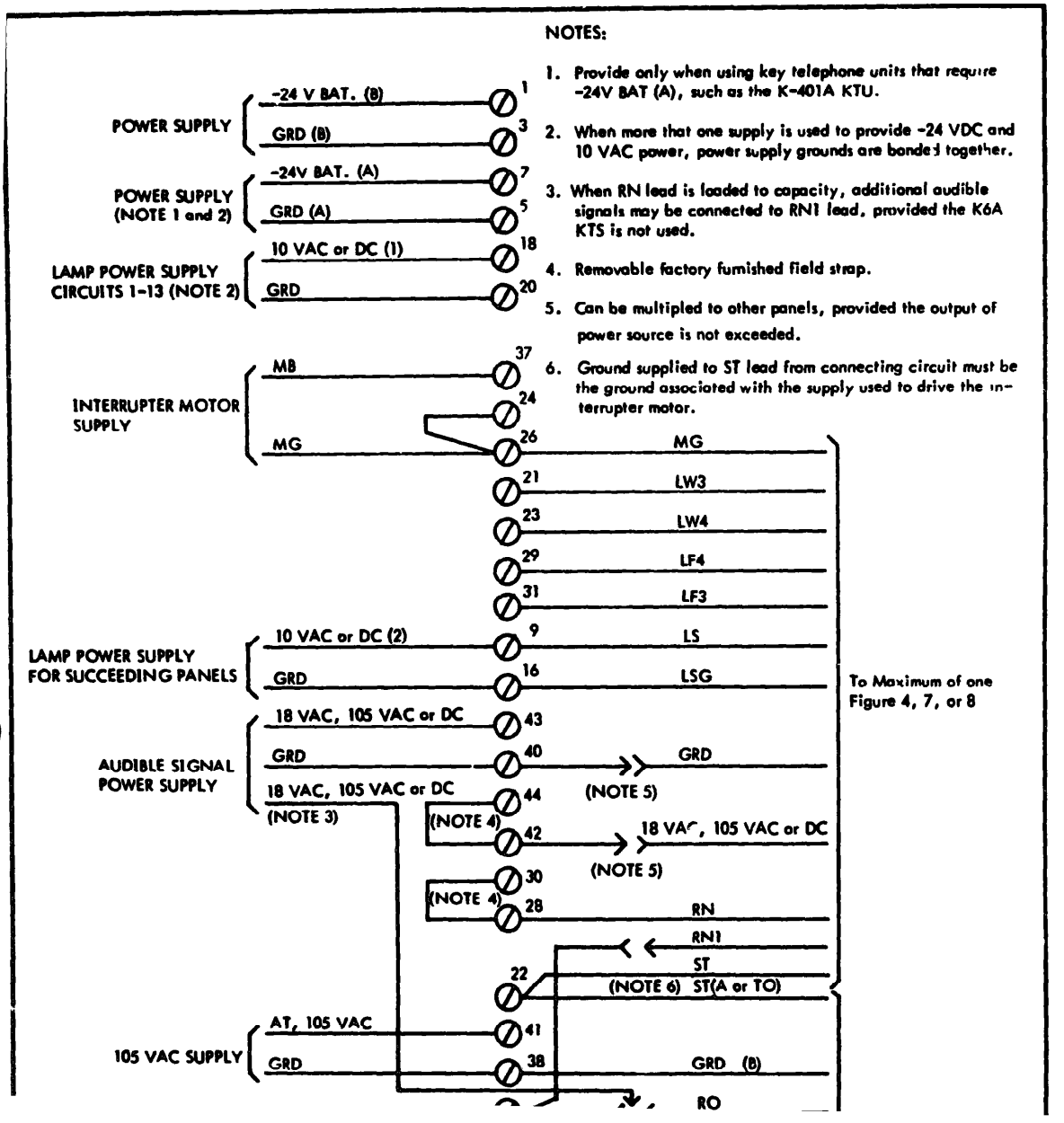


Figure 9. K-584C Panel Equipped With Interrupter
(Panel not used to control other panels)


NOTES:
1. Provide only when using key telephone units that require -24V BAT (A), such as the K-401A KTU.
2. When more that one supply is used to provide -24 VDC and 10 VAC power, power supply grounds are bonded together.
3. When RN lead is loaded to capacity, additional audible signals may be connected to RN1 lead, provided the K6A KTS is not used.
4. Removable factory furnished field strap.
5. Can be multipled to other panels, provided the output of power source is not exceeded.
6. Ground supplied to ST lead from connecting circuit must be the ground associated with the supply used to drive the interrupter motor.
POWER SUPPLY
-24 V BAT. (B)
1
GRD (B)
3
POWER SUPPLY (NOTE 1 and 2)
-24V BAT. (A)
7
GRD (A)
5
LAMP POWER SUPPLY CIRCUITS 1-13 (NOTE 2)
10 VAC or DC (1)
18
GRD
20
INTERRUPTER MOTOR SUPPLY
MB
37
24
MG
26
MG
21
LW3
23
LW4
29
LF4
31
LF3
LAMP POWER SUPPLY FOR SUCCEEDING PANELS
10 VAC or DC (2)
9
LS
GRD
16
LSG
To Maximum of one Figure 4, 7, or 8
AUDIBLE SIGNAL POWER SUPPLY
18 VAC, 105 VAC or DC
43
GRD
40
GRD
(NOTE 5)
18 VAC, 105 VAC or DC
(NOTE 3)
44
(NOTE 4)
42
18 VAC, 105 VAC or DC
(NOTE 5)
30
(NOTE 4)
28
RN
RN1
ST
22
(NOTE 6) ST(A or TO)
105 VAC SUPPLY
AT, 105 VAC
41
GRD
38
GRD (B)
RO

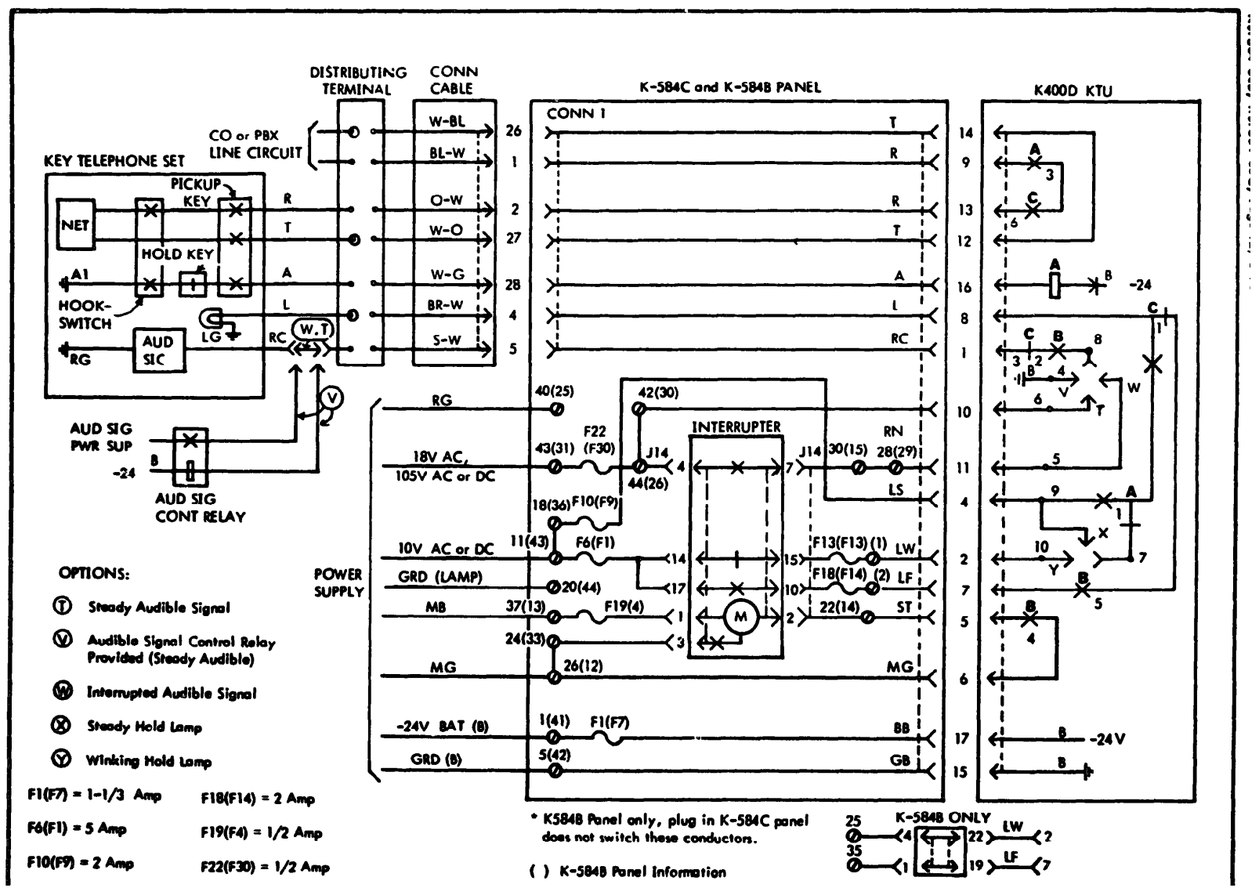


Figure 11. Typical Functional Layout of K-584C or B (Showing Line Circuit 1 Only)

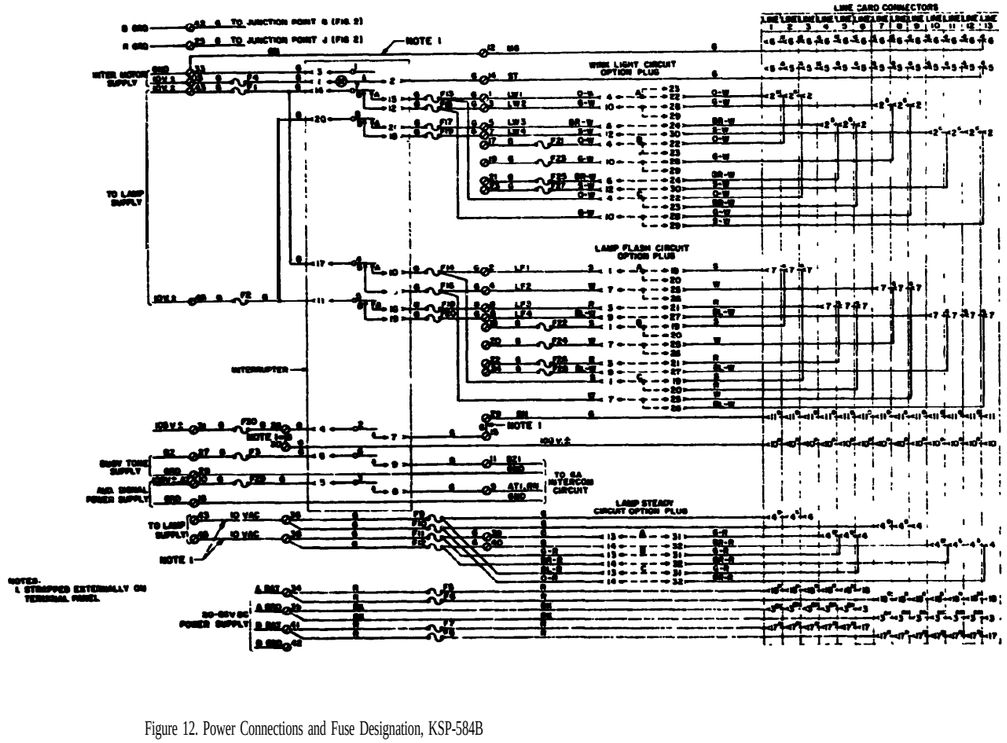


Figure 12. Power Connections and Fuse Designation, KSP-584B

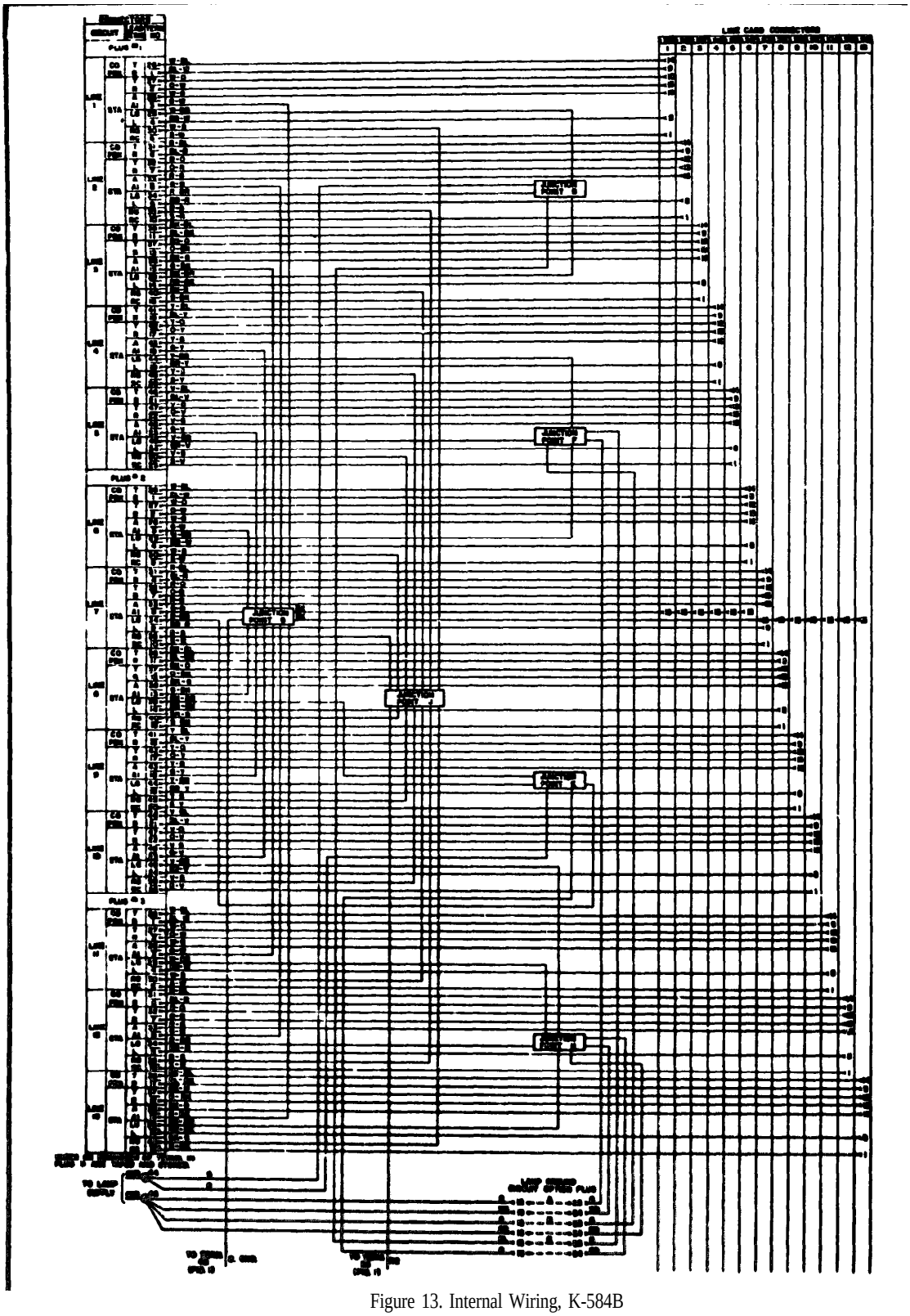


Figure 13. Internal Wiring, K-584B

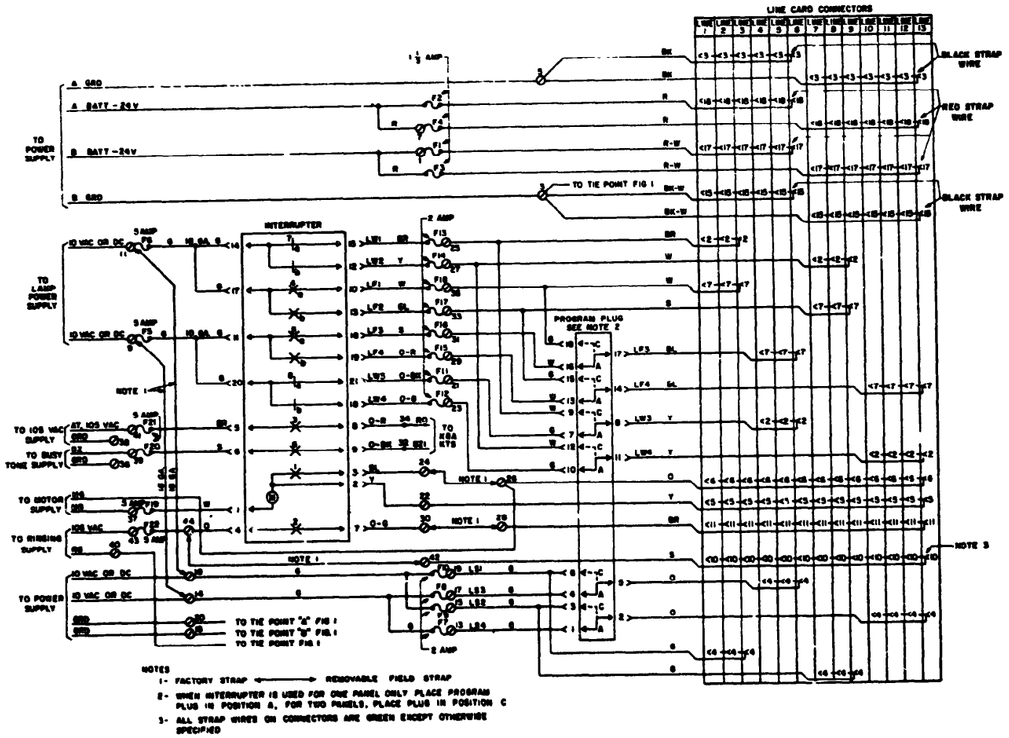


Figure 14. Power Connections and Fuel Designations.

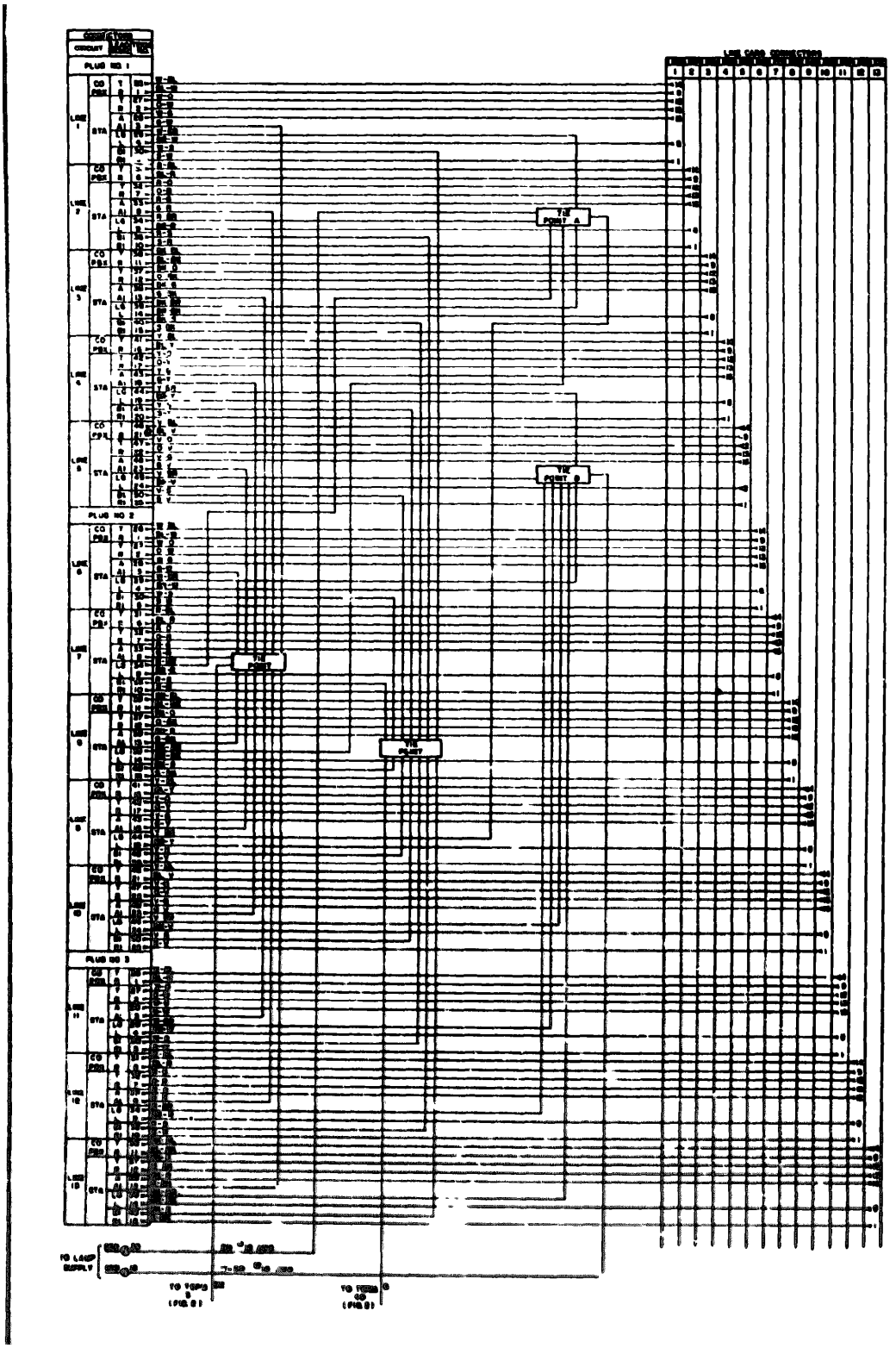


Figure 15. Internal Wiring, K-584C

4.0 MAINTENANCE OF K-584 TYPE PANELS

Maintenance should be limited to tracing of wriring trouble, fuse replacement, and replacement of improperly operating KTU's

5.0 REPLACEMENT PARTS

ITEM	PART NO.
Fuse, 1/2 ampere	180051-001
Fun, 1- 1/2 ampere	180051-002
Fun, 2 ampere	180051-003
Fun, 5 ampere	180051-004
Interrupter	190478-001
Plug, program (584B)	180049-001
Plug, program (584C)	180586-001
Socket, interrupter	190477-001

CHAPTER 4

K400(D)962 KEY TELEPHONE UNIT (KTU), CENTRAL OFFICE OR PBX LINE CIRCUIT FOR K-1A2 KEY TELEPHONE SYSTEM

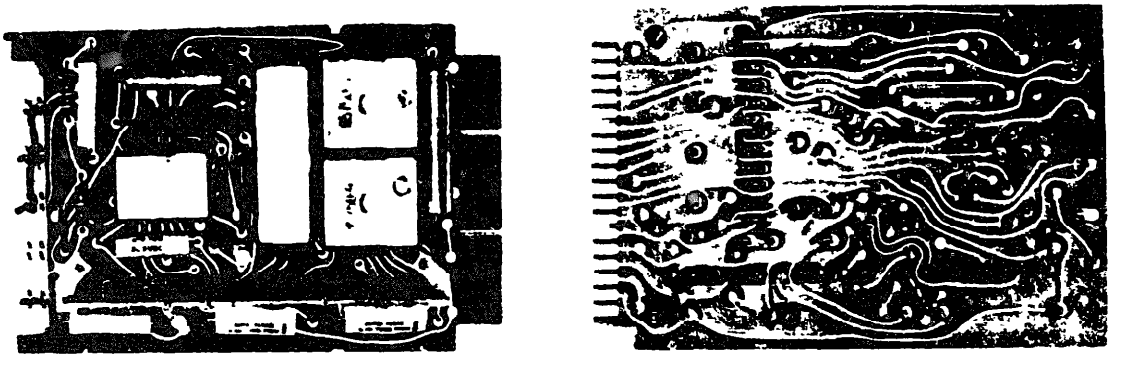


Figure 1, K-400D Key Telephone Unit; Component Side (left) and Printed Circuit Side.

1. GENERAL

The K400(D)962 KTU is o new and improved plug-in CO or PBX line circuit. It is mechanically and electrically interchangeable with K400B type unit in the K501 and K512 series KSUs. Operationally the K400D KTU sore fully compatible with K400B KTUs in any K1A2 system installation.

Unlike the K400B KTU, the K400D provides means on the option block/handle for field addition of a pigtailed resistor to reduce the short time-out "Z" option interval to a shorter period, depending upon thee value of resistor added. Table I provides resistance required for decreasing short time-out interval.

Circuitwise the K400D KTU performs more satisfactorily in all types of field operating circumstances than does the K400B. For example, it is the only unit recommended for use behind certain type PBX's. The K-400D KTU has been designed to overcome, circumvent, and be unaffected by limiting operating conditions.

The switching of elements in the 'hold" and "ring-up" bridges is such that no switchook flash distortion will adversely affect (or be misinterpreted by) connecting switch trains.

"Ring-up" and "hold" functions are accomplished by the use of o split winding "dry-reed" relay. The ringing detector, a combined grounded-metallic circuit is not normally subject to false ring of longitudinally induced foreign potentials. Ringing bridge impedance is approximately equal to one high impedance ringer. A maximum of three ringers may be connected in combination across the line ahead of or behind the K400D KTU. A non A-lead type station, dialing ahead of the line circuit, could ring up the circuit falsely if longitudinal voltages were present, however, this will not occur unless such voltages are above 35 volts rms. The K400D KTU is normally impervious to induced foreign potentials on the CO line, transversely up to approximately 24 volts rms or longitudinally up to approximately 90 volts rms

2. INSTALLATION

2.1 PLUGGING IN

K400D KTUs are installed one KTU per line required. The units plug into the connectors provided in the key service unit with the printed circuit side of the card to the left. Be sure the KTU is plugged in firmly. After all units are inserted, tighten the retaining bar screws to prevent the units from falling out of the cord mounting assembly.

2.2 CIRCUIT OPTIONS

Options provided on the K-400D KTU ore as follows:

Z - Short Time-Out. (Used with automatic ringing CO or PBX.)
W- Interrupted Station Audible Signaling
T - Steady Station Audible Signaling
V - Auxiliary Common Audible Signal Circuit
Y - Winking Hold Lamp
X - Steady Hold Lamp

Each K400D is factory wired for options Z, Wand Y. If other options are required by the subscriber, the installer must re-wire the option terminals on the printed circuit board as required. (Figure 2.)

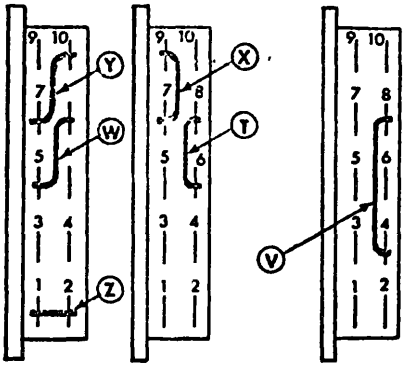
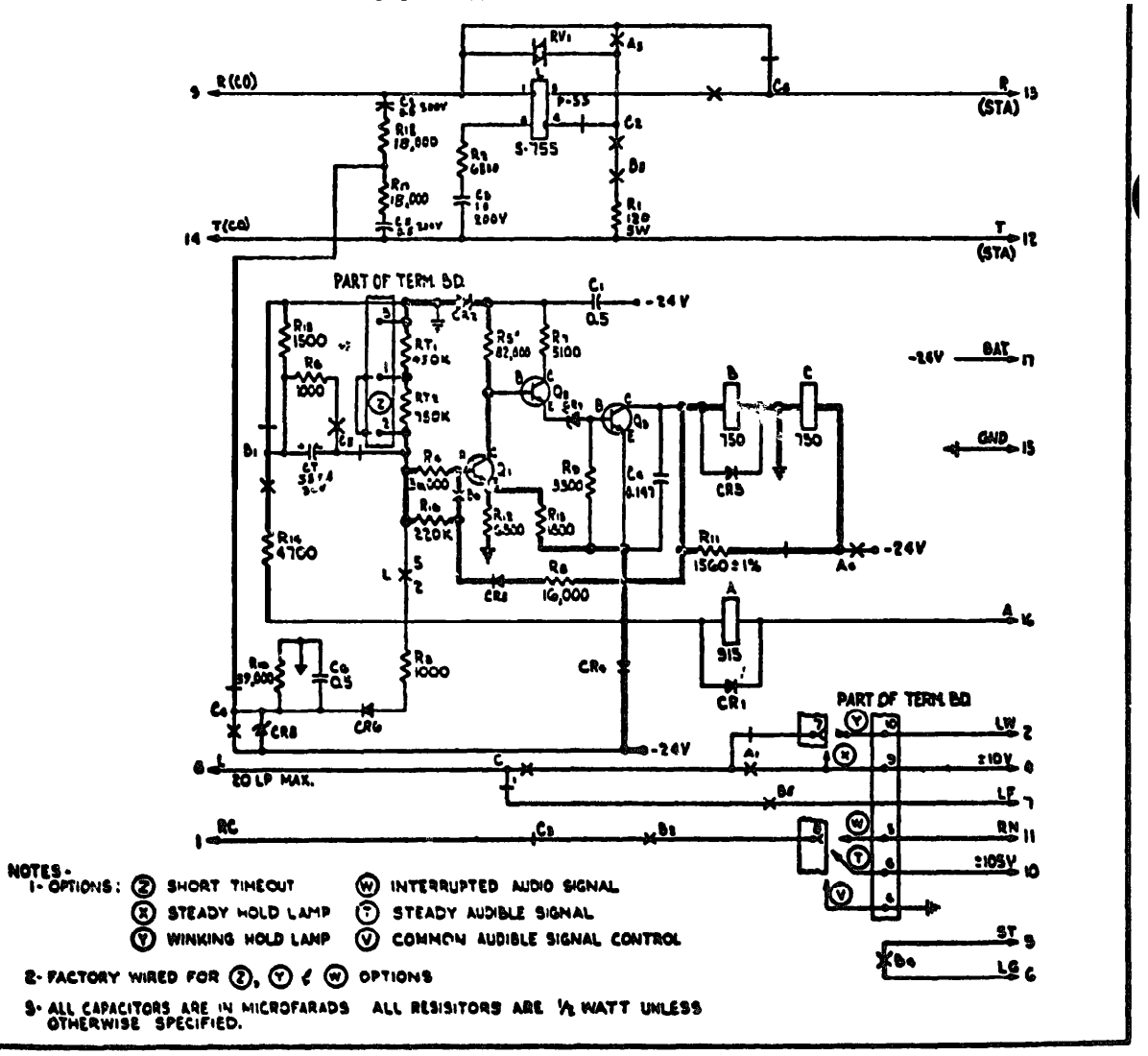


Figure 2. K400(D) KTU, Circuit Options

Figure 3. K400(D) KTU, Idle Circuit Condition; Paragraph 3.1 (a)



3. OPERATION

3.1 INCOMING SIGNAL

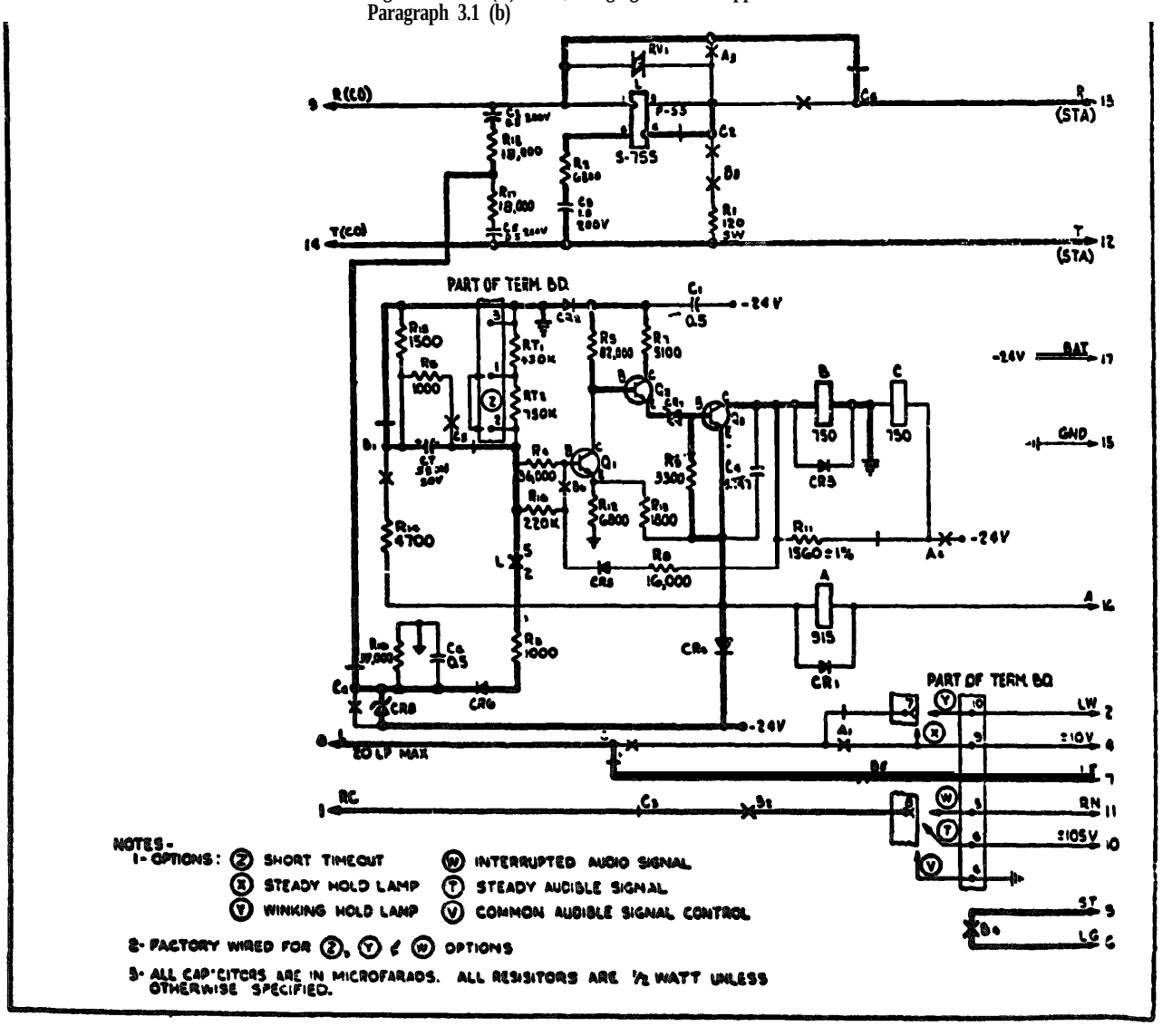
(a) Idle Circuit Condition (Figure 3.)

In the idle circuit condition all relays ore in the unoperated state and transistors Q2 and Q3 are off. Transistor Q1 is held on by current to its base through the resistor network formed by resistors RT1, RT2, R16, R8, R11 and the B and C relay coils

(b) Ringing Current Applied (Figure 4.)

Ringing voltage is usually applied across the line with the tip (T) side grounded. Ringing current then flows through the series connected primary and secondary windings of relay L, resistor R2 and capacitor C3, causing relay L to operate on each half-cycle of ringing current. Ringing current also flows through capacitor C2 and resistor R18 to the cathode of zener diode CR8. The negative (-) side of capacitor CT is normally maintained at about -16 volts de. Negative (-) half-cycles of ringing causes CR8 to conduct in the forward direction so that the cathode of diode CR6 is at approximately -24.4 volts dc. CR6 is thus forward biased and capacitor CT charges through resistor R3 toward o negative (-) 24 volt dc potential.

Figure 4. K400(D) KTU, Ringing Current Applied
Paragraph 3.1 (b)



3. OPERATION

continued

On positive half-cycles of ringing current, zener diode CR8 breaks down and conducts so that the cathode of diode CR6 is at about 0 volts potential. The negative (-) end of capacitor CT is somewhere between -16 and -18 volts, so diode CR6 is reversed biased and capacitor CT does not charge. However, capacitor CT does have a dial discharge path through resistors RT1 and RT2 combined with resistors R16, R11 and the windings of relays Band C. The charge lost by capacitor CT during this interval is much less than that gained during the negative (-) half-cycle. After approximately 0.5 second, a sufficent number of cycles of ringing current will have charged capacitor CT to about -18 volts, the base voltage of transistor Q1, which causes Q1 to "turn-off". Because of the symmetry of the detector circuit, its operation will be the some when ringing voltage is applied across the line with the ring (R) side grounded. In this case, ringing current flows to the cathode of zener diode CR8 through capacitor C5 and resistor R17.

When transistor Q1 **turn.-off", its collector voltage rises and transistor O2 "turns on'; zener diode CR7 breaks down and causes transistorr Q3 to also "turn-on" to operate relay B. Relay C does not operate at this time since resistor R11 limits the current through its winding to less than its operate value. Relay B, operated, connects ground to the ST lead: the L lead to the LF lead and interrupted (option W) or steady (option TT ringing current or ground (option V) to the RC lead for audible signal control. Transistor Q1 remains off and transistors Q2 and Q3 on until either the call is answered or "timed-out".

An unimpeded path for ringers in telephone sets is provided when bridged *ringing* for o particular line is required.

3.2 TIME-OUT OF RING UP CIRCUIT (Figure 5.)

(a) When Z Option is Not Provided

At the instant transistor Q1 "turns-off" the voltage at the (-) end of capacitor CT is about -18 volts, When the B relay operates, the voltage divider formed by resistors R14 and R15 is switched into the circuit and the voltage at the (+) end of CT drops from 0 volts to about -6 volts. Consequently, the (-) end of capacitor CT drops from -18 to about -24 volts. On subsequent half-cycles of ringing, diode CR6 will be reverse biased as before. Operation of relay B caused the anode of diode CR5 to be connected back to -24 volts through resistor R 8, transistor Q3 and diode CR4. The cathode of diode CR5 is connected to the base of transistor Ql, which is at about -24 volts so diode CR5 does not conduct. The discharge path for capacitor CT is thus only through resistors RT1 and RT2 to ground. On negative half cycles of ringing, diode CR6 will conduct slightly to restore the charge lost by capacitor CT during the previous positive half-cycle. In this way, the change on capacitor CT which determines the duration of the time-out remains constant once the circuit has operated regardless of the duration of the ringing cycle.

When the first cycle of ringing has ceased, the (-) end of capacitor CT begins to charge toward ground through resistors RT1 and RT2. Transistor Q1 remains off until the voltage at the (-) end of capacitor CT reaches -18 volts at which time transistor Q1 "turns-on" and its collector voltage drops. This causes transistor Q2, zener diode CR7 and transistor Q3 to "turn-off" and relay B is released to restore the circuit to normal or idle condition. The time required for relay B to release after the lost cycle of ringing is approximately 30 seconds.

(b) When Z option is provided

This arrangement functions in a manner similar to that described in 3.2 (a) with the exception that resistor RT2 is short circuited, thereby, lowering the resistance through which the capacitor CT discharger. This results in o shorter time out period. On incoming calls where one cycle of ringing is received the the out is approximately 11 seconds. Subsequent cycles of ringing received before relay B releases resists the time out circuit to approximately 10 seconds. Any incoming call, for example, which is signaled by machine ringing will time out in approximately 10 seconds after the call is abandoned by the calling party.

(c) Provisions For Reduced Time Out

In cases where o shorter time out than that obtained with the Z option is required, this can be obtained by shunting he RT1 resistor with on appropriate resistor. The time out desired as a fraction of the original time out, TO, can be obtained by using the appropriate resistor, selected from the table following

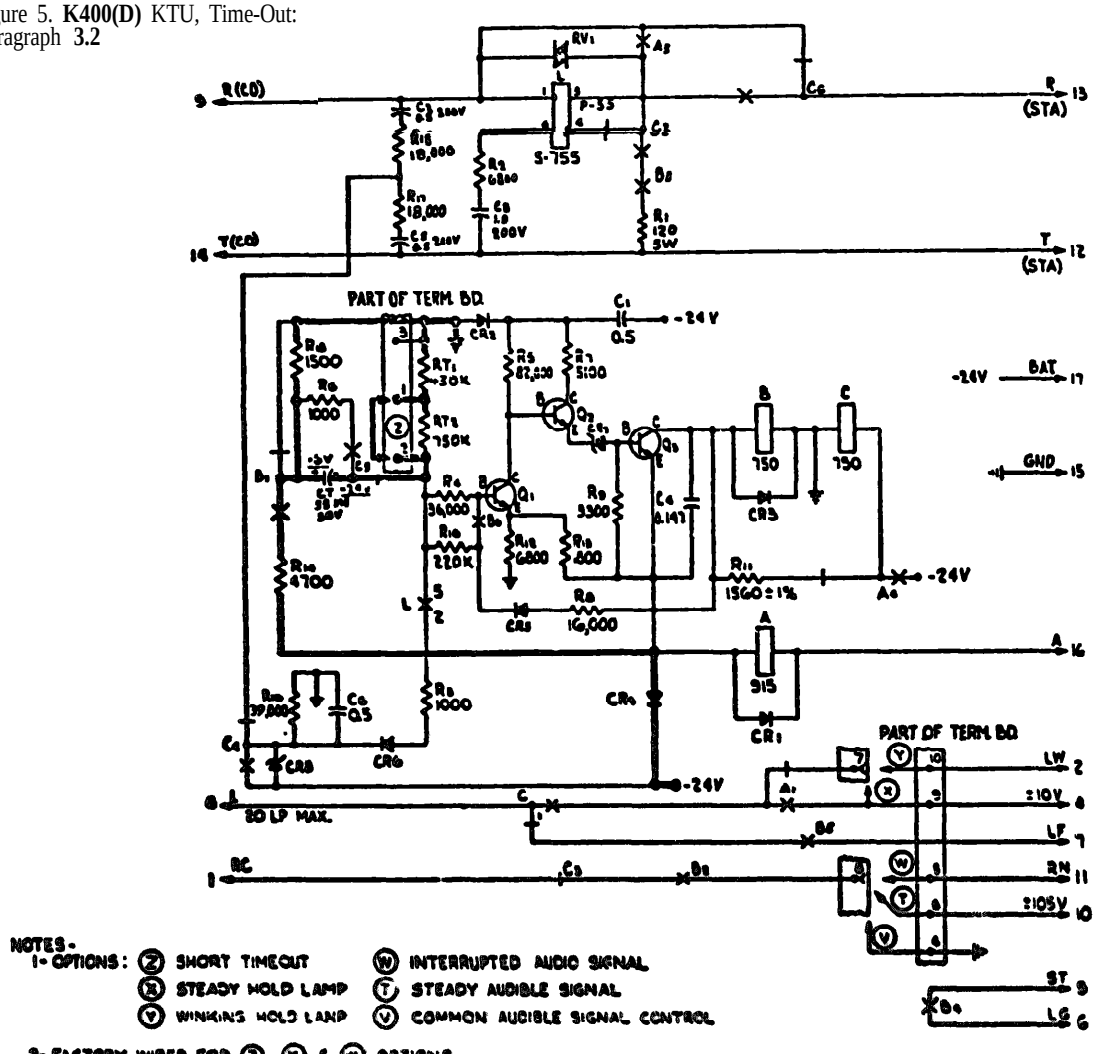
NOTE: Where the operation of machine ringing is one second, the time out shall not be reduced below 50 per cent of the original time out.

TABLE 1. RESISTANCE REQUIRED FOR VARIOUS TIME-OUT INTERVAL:

TIME OUT DESIRED	RESISTANCE (Megohms)
3/4 of original time-out	1.2
2/3 of original time-out	0.75
1/2 of original time-out	0.39
1/3 of original time-out	0.20
1/4 of original time-out	0.13

NOTE: If duration of machine ringing is one second, the time-out shall not be reduced below 1/2 of original time-out.

Figure 5. **K400(D)** KTU, Time-Out: Paragraph **3.2**



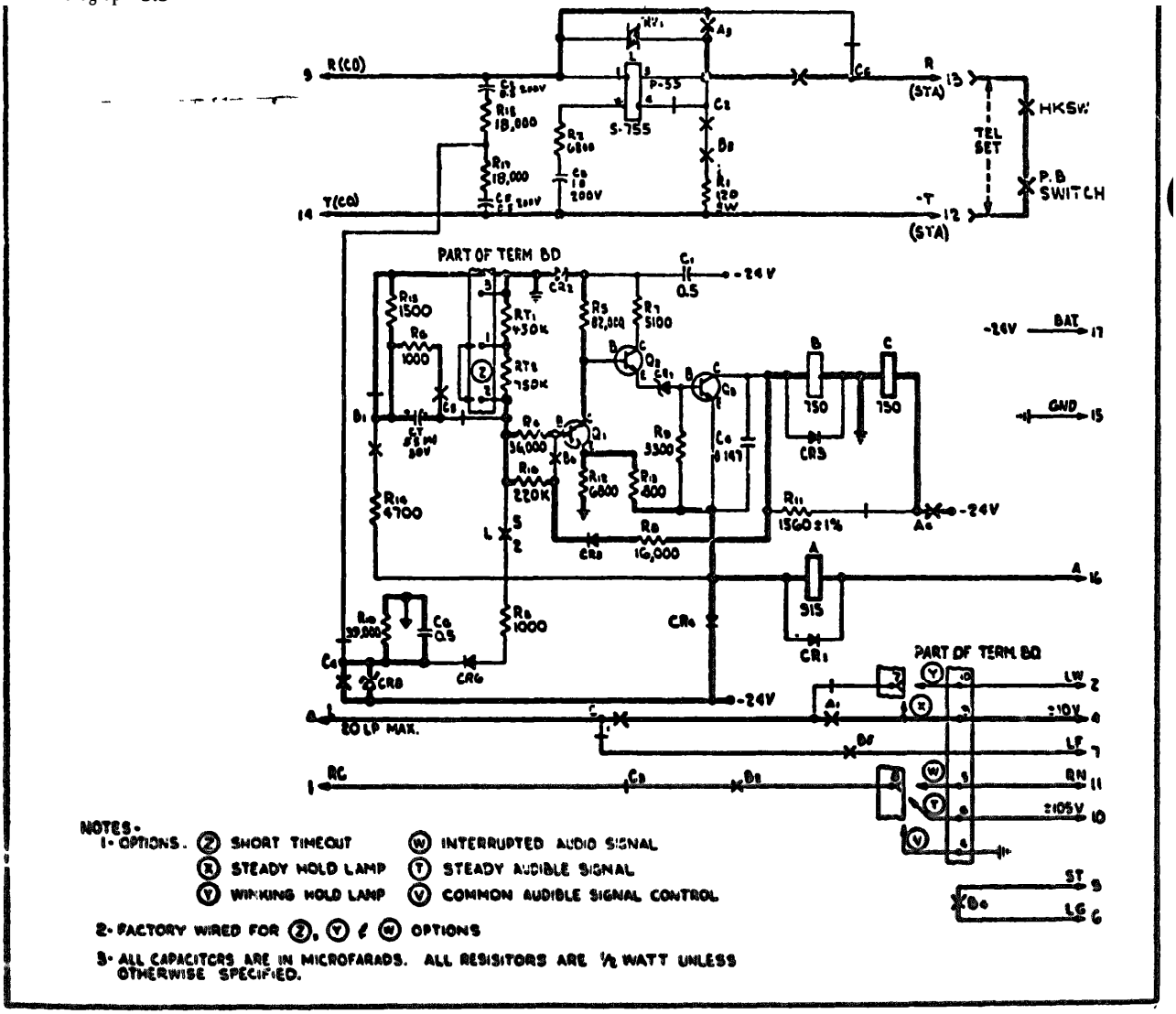
3.3 ANSWERING AN INCOMING CALL (Figure 6.)

An incoming call is answered by operating the pickup key associated with the line being rung and going off hook. The station is then connectcd across the line through the hookswitch and key contacts, and ringing is tripped at the Central Office or PBX. Ground is also connected through the hookswitch and key contact to the A lead, operating relay A which shunts terminals 1 and 3 of relay 1 preventing it from operating on line current and connects -24 volts to the winding of relay C, causing it to operate. Relay C operated disconnects the (-) end of capacitor CT from the base circuit of transistor Q1 and connects resistor R6 across capacitor CT causing it to discharge. Transistor Q1 "turns-on" releasing relay B. Relay C operated, also removes the center tap of the ring up bridge from the rest of the circuit and shorts zencr diode CR8 thereby preventing the induction of noise into the talking path; it also disconnects the secondary of relay L and eliminates the shunting effect on the line of the secondary winding in series with resistor R2 and capacitor C3. Relays A and C operated establish the talking path to the telephone, connect the lamp "L" lead to +10 volts and open the RC lead to discontinue local audible signaling.

3.4 OUTGOING CALL

The procedure for making an outgoing call is the same OS that for answering an incoming call except that transistors Q2 and Q3 are normally off and *relay* B is released.

Figure 6. K400(D) KTU, Answering an Incoming Call; Paragraph 3.3

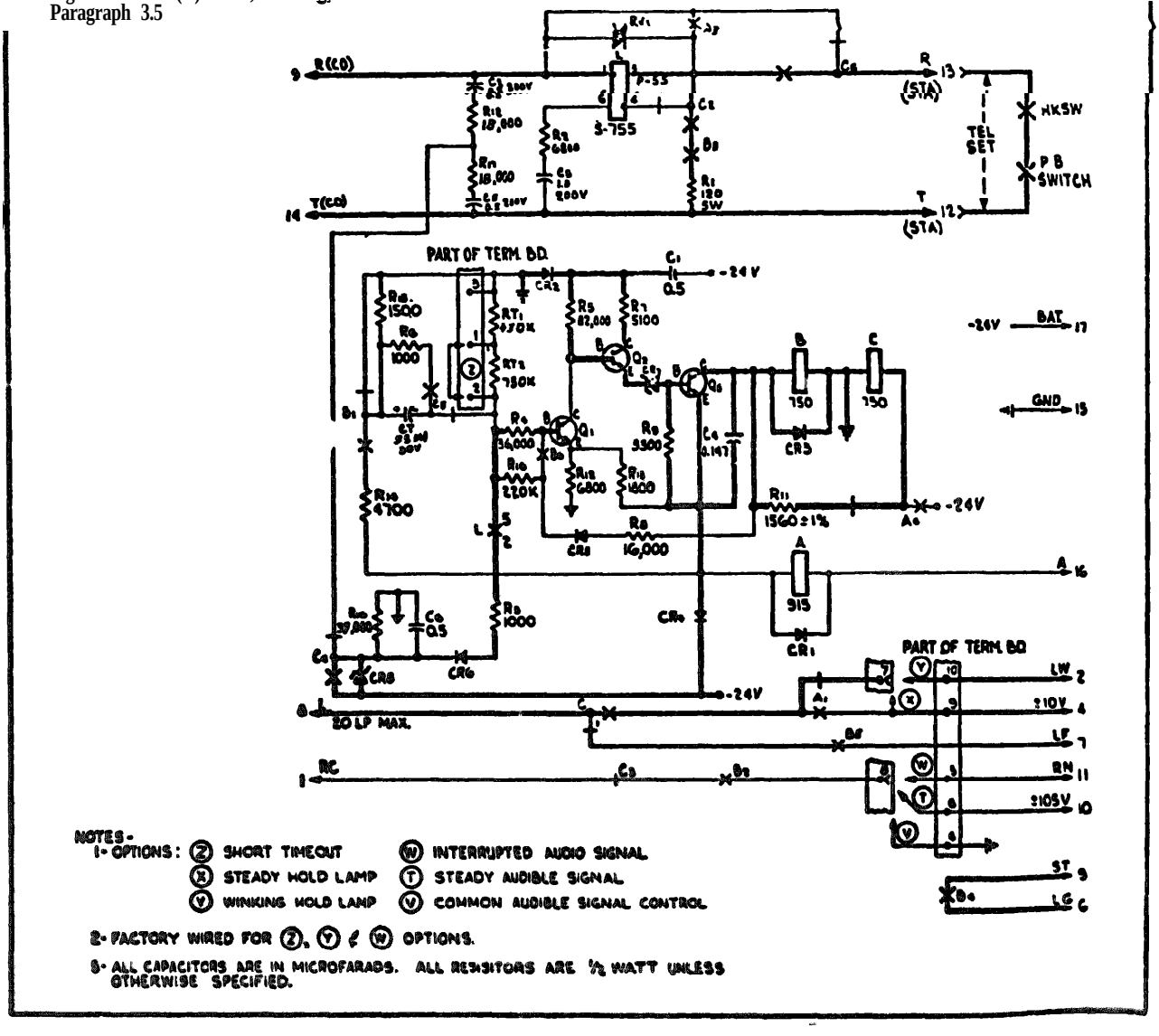


3.5 HOLDING (Figure 7)

(a) Placing o Line On Hold

A busy line can be placed on hold by operating the bold key on the telephone set. When the hold key is depressed, ground is disconnected from the "A" Id allowing relay A to release. The A relay contacts shunting the relay L primary open and since the station T and R leads have not yet been disconnected from the line, relay L operates on line current. Operation of relay L causes the base of transistor Q1 to be connected through resistor R4, R3, diode CR6 and the operated relay C contacts to -24 volts. The voltage at terminal 2 of the L relay drops to nearly -24 volts causing transistor Q1 to turn off and transistors Q2 and Q3 thereby turn on. Transistor Q3 will have turned on about 2 milliseconds after relay A releases and a hold path is thereby provided for relay C through resistor R11, transistor Q3 and diode CR4 to -24 volts. Finally relay B operates through transistor Q3. Relays B and C operated connects the hold resistor R1 in series with the primary of relay L across the CO line, connects the LG lead to the ST lead to start the interrupter, connects the L lead to the LW lead (Y option) or lo +10 V (X option). When the hold key is released the telephone push button is released disconnecting the telephone from the line. line current through the L relay and resistor R1 maintains the CO line on hold until released.

Figure 7. K400(D) KTU, Holding; Paragraph 3.5



(b) Release of the Holding Bridge by o Station

Any station of the key telephone system that sizes the line by operating the associated pickup key and going "off-hook" will cause the A relay to operate and shunt the primary of relay L which thereby releases. Transistor Q1 then "turns-on" and transistors Q2 and Q3 "turn-off" releasing relay B. Relay C is held operated by relay A. The circuit is thus restored to the busy state.

(c) Release of the Holding Bridge from the Central Office or PBX

In the event o held party "abandons", the line circuit may be released from the connecting switching equipment by providing a momentary interruption of the line circuit. This causes the L relay to release. Transistor Q1 thereby "turns-on", restoring the circuit to the idle state.

(d) Release of the Holding Bridge from the Central Office or PBX, Battery Reversal

If the voltage across the line is reversed when the line is in the hold condition, the line circuit hold will be released. Reversal of the line current causes the L relay to release and then reoperate. When the L relay releases, transistor Q1 "turns-on" and transistors G2 and Q3 "turn-of" and relays B and C release.

3.6 DISCONNECTION

When all stations go on hook, the A lead is disconnected from ground causing relay A to release. Release of relay A opens the holding path relay C, which, in turn releases. In this way, the circuit is restored to the idle state.

3.7 OPERATION WITH LOCAL POWER FAILURE

During periods when the local dc supply is Inoperative it is possible to originate outgoing calls. When the station goes off hook, connection to the line is metallic. The primary and secondary of the L relay are connected in series with resistor R2 and capacitor C3 but this has o negligible effect on the talking circuits. If ringers are bridged across the line in the telephone set, incoming calls ore signaled in the usual way although visual and common audible signals an inoperative.

TECHNICAL NOTE

An incompatibility problem may occur between 1A2 KTS equipped with 400D KTU's and certain CO's or PBX's. A lost call can result, in some cases, when the switching system reswitches an established connection while the key telephone station is on hold. If the reswitching sequence opens the loop for an interval greater than that required to release the 400D KTU hold circuit, a disconnection will occur.

The release time of the 400D KTU can be extended to bridge the open intervals generated by these reswitching sequences by applying the appropriate one of two options following. (See figure 2.)

Option ZC, delay hold release far electronic switch-!*, consists of adding o 5 MF capacitor across terminals 2 and 3 of the 400D KTU option block.

Option ZD, delay hold release for officer other than electronic consists of adding a 1 MF capacitor across terminals 2 and 3 of the block.

When the existing 2 option is provided with ZC or ZD option, the strap between terminals 1 and 2 of the option black should be removed and replaced with one of the capacitor pigtail leads.

CHAPTER 5

CORINTHIAN MULTI-KEY TELEPHONES ROTARY DIAL (K2230 SERIES) MULTI-KEY TELEPHONE

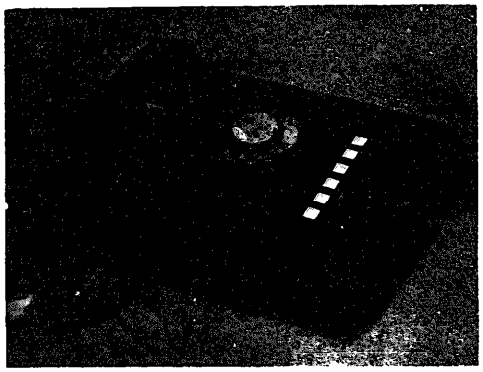


Figure 1A. K-234 CORINTHIAN Telephone

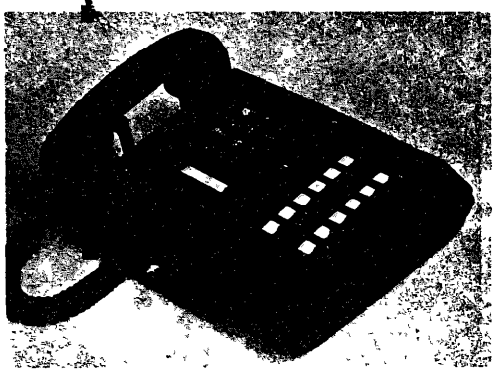


Figure 1B. K-2235 CORINTHIAN Telephone

CORINTHIAN* MULTI-KEY TELEPHONES,

ROTARY DIAL (K-230 SERIES) AND

PUSHBUTTON DIAL (K-2230 SERIES).

1. GENERAL INFORMATION

These telephones are used in conjunction with o key telephone system to provide access to o maximum of eleven lines which may be central office trunks, PBX, private, and intercom lines. The lower left hand (red) button is used to place o hold on one or more outside lines.

Ordering information is given in Table 1.

Replaceable parts are listed in Table II.

2. INSTALLATION

Mounting cords are terminated with quick-connect plugs. Installation consists basically of plugging the mounting cord into appropriately pm-wired connecting boxes of the key telephone system. Special instructions (if required) and a wiring diagram are Packed with each telephone.

2.1 HANDSFREE (SPEAKERPHONE) APPLICATIONS

All Corinthians of current manufacture are equipped to operate with handsfree (speakerphone) equipment. Corinthians with new codes, (K-234, 235, 236, 2234, 2235, 2236), hove speakerphone leads connected within the telephone. If used without speakerphone, disconnect, insulate and store following leads:

SLATE-VIOLET wire, (pin 16, receptacle E) from L1 on network
VIOLET-SLATE wire, (pin 17, receptacle E) from G on network
VIOLET-GREEN wire, (pin 18, receptacle E) from RR on network
GREEN-VIOLET wire, (mounting cord) from terminal #6 on terminal board.

Corinthians with old codes, (K231, 232, 233, 2231, 2232, 2233) are shipped with speakerphone lea a disconnected,

2.2. ALL-BUTTONS-UP INTERCOM

All-buttons-up intercom is available on all Corinthian telephoner except K-233 and K-2233. If expansion kit 180113 is added to there units, the all-buttons-up intercom is automatically added.

TABLE 1. ORDERING INFORMATION (See also Table III)

Series	Code	Description
A	K-231**( )42M	TELEPHONE, Multi-key; Rotary Dial, 5-line capacity, 50-conductor cord with plug.
B	K-234**( )42M*	
A	K-232**( )42M	TELEPHONE, Multi-key; Rotary Dial; 11-line capacity; 80-conductor cord with plug.
B	K-235**( )42M*	
A	K-233**( )42M	TELEPHONE, Multi-key; Rotary Dial; 5-line capacity; 80-conductor cord with plug.
B	K-236**( )42M*	
A	K-2232**( )42M	TELEPHONE, Multi-Key; Pushbutton Dial; 5-line capacity; 50-conductor cord with plug.
B	K-2234**( )42M*	
A	K-2232**( )42M	TELEPHONE, Multi-key· Pushbutton Dial; 5-line capacity; 80-conductor cord with plug.
B	K-2235**( )42M*	
A	K-2233**( )42M	TELEPHONE, Multi-key, Pushbutton Dial, 5-line capacity, 80-conductor cord with plug.
B	K-2236**( )42M*	
	** SUBSTITUTE COLOR CODE AS FOLLOWS: 00-Black, 05-Green; 13-Light Beige; 15-White	
	* Recommended units.	

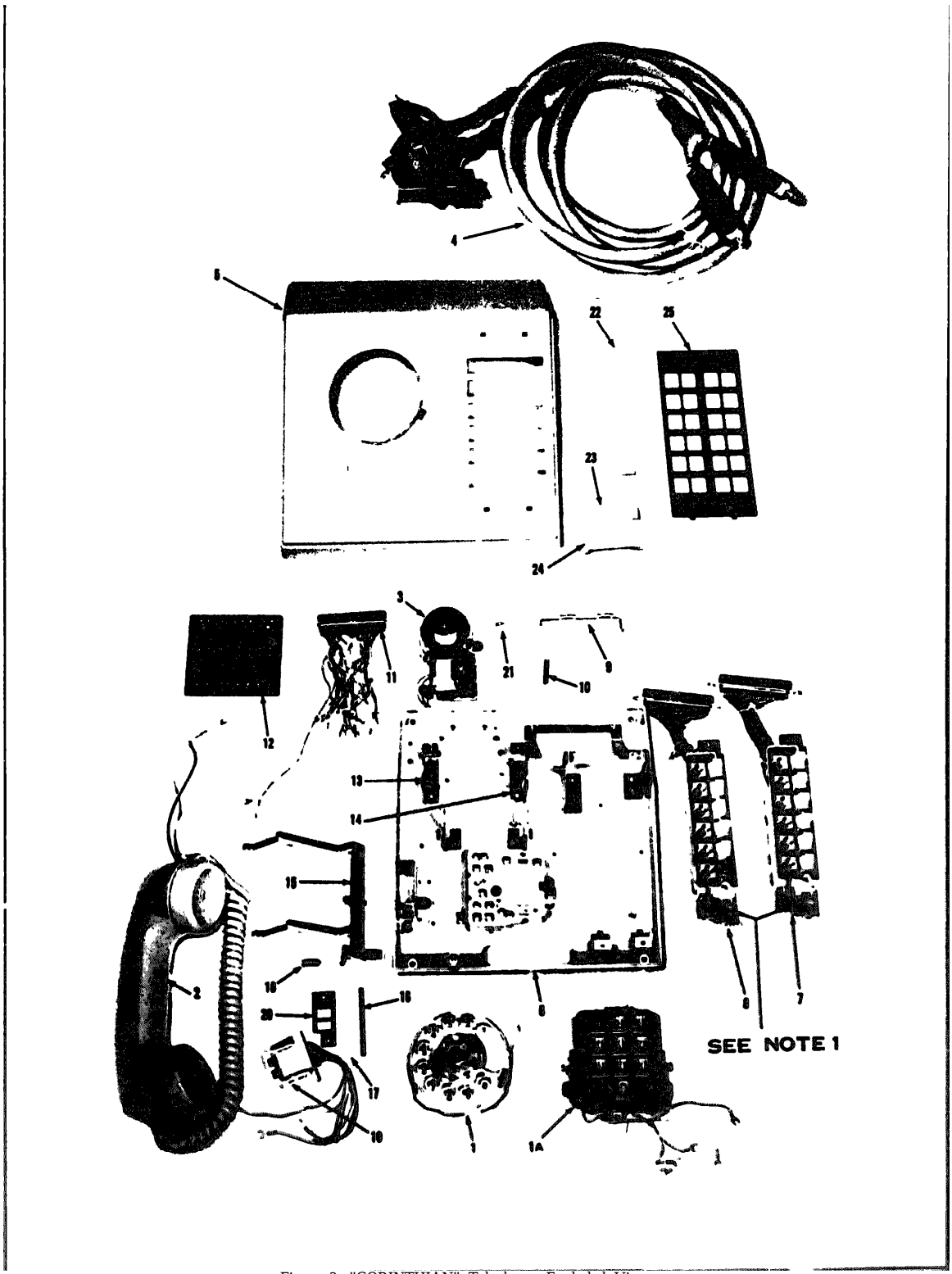


Figure 2. "CORINTHIAN" Telephone, Exploded View

TABLE II. REPLACEABLE PARTS LIST, "CORINTHIAN" MULTI-KEY TELEPHONES

FIGURE NO	INDEX NO.	PART NUMBER	NAME, Description (Indented items are included in the part under which they are indented)	QUANTITY USED ON: 231	232	233	234	235	236	2231	2232	2233	2234	2235	2236
2	1	3800(G)450	DIAL, Rotary	1	1	1	1	1	1	-	-	-	-	-	-
	1A	3600(G)450	DIAL, Pushbutton	-	-	-	-	-	-	1	1	1	1	1	1
	2	65**(C2)410	HANDSET	1	1	1	1	1	1	1	1	1	1	1	1
	3	148E(BA)470	RINGER	1	1	1	1	1	1	1	1	1	1	1	1
	4	869**(15)650	MOUNTING CORD ASSEMBLY, 80-CONDUCTOR	-	1	1	-	-	-	-	1	1	-	-	-
	4	870**(15)650	MOUNTING CORD ASSEMBLY, 50-CONDUCTOR	1	-	-	-	-	-	1	-	-	-	-	-
	4	874**(15)650	MOUNTING CORD ASSEMBLY, 80-CONDUCTOR	-	-	-	-	1	1	-	-	-	-	1	1
	4	875**(15)650	MOUNTING CORD ASSEMBLY, 50-CONDUCTOR	-	-	-	1	-	-	-	-	-	1	-	-
	5	88527-**	HOUSING, for Rotary Dial	1	1	1	1	1	1	-	-	-	-	-	-
		180167-**	FACEPLATE (Not Shown)	1	1	1	1	1	1	-	-	-	-	-	-
	5	180143-**	HOUSING, for Pushbutton Dial	-	-	-	-	-	-	1	1	1	1	1	1
		88126-2	SCREW, Housing	4	4	4	4	4	4	4	4	4	4	4	4
	6	88528-##	BASE ASSEMBLY, Rotary Dial	1	1	1	1	1	1	-	-	-	-	-	-
	6	88528-**	BASE ASSEMBLY, Pushbutton Dial	-	-	-	-	-	-	1	1	1	1	1	1
		88105-1	BRACKET, Cradle Hook	1	1	1	1	1	1	1	1	1	1	1	1
		95944-2	RIVET	11	11	11	11	11	11	11	11	11	11	11	11
		88532-1	BRACKET, Rotary Dial (LH)	1	1	1	1	1	1	-	-	-	-	-	-
		88532-2	BRACKET, Rotary Dial (RH)	1	1	1	1	1	1	-	-	-	-	-	-
		88531-1	BRACKET, Pushbutton Dial	-	-	-	-	-	-	2	2	2	2	2	2
		88535-1	BRACKET, for Key Connectors	1	1	1	1	1	1	1	1	1	1	1	1
		88533-1	BRACKET, Key (RH Rear)	1	1	1	1	1	1	1	1	1	1	1	1
		88545-1	BRACKET, Key (LH Rear)	1	1	1	1	1	1	1	1	1	1	1	1
		180117-1	BAR, Tie	1	1	1	1	1	1	1	1	1	1	1	1
		180118-1	BRACKET, Key (Front)	1	1	1	1	1	1	1	1	1	1	1	1
		88180-1	NETWORK	1	1	1	1	1	1	1	1	1	1	1	1
		180221-1	SCREW	2	2	2	2	2	2	2	2	2	2	2	2
		66435-1	NUT	2	2	2	2	2	2	2	2	2	2	2	2
		87483-1	FOOT	5	5	5	5	5	5	5	5	5	5	5	5
		95943-2	RIVET, (Foot)	5	5	5	5	5	5	5	5	5	5	5	5
	7	598(X)740	KEY AND CONNECTOR ASSEMBLY	-	1		-	1		-	1	1	-	1	1
		75576-4	SCREW, (Key to Brackets)	-	2	2	-	2	2	-	2	2	-	2	2
		67042-3	SCREW, (Connector to Bracket)	-	2	2	-	2	2	-	2	2	-	2	2
	8	599(X)740	KEY AND CONNECTOR ASSEMBLY	1	1	1	1	1	1	1	1	1	1	1	1
		75576-4	SCREW, (Key to Brackets)	2	2	2	2	2	2	2	2	2	2	2	2
		67042-3	SCREW, (Connector to Bracket)	2	2	2	2	2	2	2	2	2	2	2	2
	9	180562-1	PIVOT BAR ASSEMBLY (Adjustable)	-	1	-	-	1	-	-	1	-	-	1	-
	10	190329-1	SPRING Pivot Bar	-	1	-	-	1	-	-	1	-	-	1	-
		190354-1	SCREW, Shoulder (Pivot Bar)	-	1	-	-	1	-	-	1	-	-	1	-
	11	88546-1	CONNECTOR AND WIRE ASSEMBLY	1	1	1	1	1	1	1	1	1	1	1	1
		67042-3	SCREW, Connector Mounting	2	2	2	2	2	2	2	2	2	2	2	2
	12	88540-1	TERMINAL BOARD ASSEMBLY	1	1	1	1	1	1	1	1	1	1	1	1
		75576-4	SCREW	2	2	2	2	2	2	2	2	2	2	2	2
	13	88536-1	BRACKET, Terminal Board (LH)	1	1	1	1	1	1	1	1	1	1	1	1
	14	88536-2	BRACKET, Terminal Board (RH)	1	1	1	1	1	1	1	1	1	1	1	1
		75576-4	SCREW, (Bracket to Base)	2	2	2	2	2	2	2	2	2	2	2	2
	15	88240-1	CRADLE HOOK ASSEMBLY	1	1	1	1	1	1	1	1	1	1	1	1
	16	88109-1	PIN, Cradle Hook	1	1	1	1	1	1	1	1	1	1	1	1
	17	73538-8	RING, Retaining	2	2	2	2	2	2	2	2	2	2	2	2
	18	75307-4	SPRING, Cradle Hook Return (75307-3 will work)	1	1	1	1	1	1	1	1	1	1	1	1
	19	88114-2	SPRING NEST ASSEMBLY	1	1	1	1	1	1	1	1	1	1	1	1
	20	88543-1	SPACER, Spring Nest	1	1	1	1	1	1	1	1	1	1	1	1
		88127-2	SCREW	2	2	2	2	2	2	2	2	2	2	2	2
	21	78825-5	HANGER, Cable	1	1	1	1	1	1	1	1	1	1	1	1
		54336-5	WASHER	1	1	1	1	1	1	1	1	1	1	1	1
		88127-2	SCREW	1	1	1	1	1	1	1	1	1	1	1	1
	22	88270-2	CARD, Number (For Key Strips)	1	2	1	1	2	1	1	2	1	1	2	1
	23	87513-1	CARD, Number	-	-	-	-	-	-	1	1	1	1	1	1
	23	75415-1	CARD, Number	1	1	1	1	1	1	-	-	-	-	-	-
	24	87514-1	RETAINER, Number Card	-	-	-	-	-	-	1	1	1	1	1	1
	25	180114-1	ESCUTCHEON ASSEMBLY	-	1	-	-	1	-	-	1	-	-	1	-
	25	180114-2	ESCUTCHEON ASSEMBLY	1	-	1	1	-	1	1	-	1	1	-	1
		95857-1	TIE, Wire	2	2	2	2	2	2	2	2	2	2	2	2

** COLOR: 00-Black; 05-Green; 13-Light Beige; 15-White

COLOR: 21-Black; 25-Green; 33-Light Beige; 35-White

3. EXPANSION FROM 5-LINE TO II-LINE CAPACITY.

The K-233, K-236, K-2233 and K-2236 5-line Corinthians may be expanded to 11-line capacity by adding kit number 180113 which Includes the additional key assembly. The K-231 and K-2231 S-line Corinthians may be exploded to 11-line capacity by adding kit number 180113 and replacing the 50-conductor mounting card with type B69 80-conductor mounting card. (See item 4, table II).

The K-234, and K-2234 S-line Corinthians may be expanded to II-line capacity by adding kit number 180113 and replacing the SO-conductor mounting cord with type 874 80-cond mounting cord. (See item 4, table II.)

4. EXPLANATION OF CODE SERIES IN TABLE 1.

Series A codes of Table I are early code numbers whereas series B codes ore latter codes.' The two series are identical except far the following differences in wiring:

(1) HANDSFREE CONNECTIONS

The latter series of Corinthians (B) have all leads associated with speakerphone (handsfree) operation connected, whereas in the early series, these leads are not connected. (See paragraph 2.1.)

(2) ALL-BUTTONS-UP INTERCOM CONNECTIONS

The early (A) series utilizes pins number 5, B, and II an line plug "A" far "all-buttons+ intercom whereas the latter (B) series uses pins number 16, 41, and 47 of line plug "A" far 6-button sets and pins number 20, U and 45 of line plug "B" far 12-button sets.

The latter series is mare universally applicable and is recommended far new installations. Far additions to present installations now using early series Corinthians and using all--buttons-up intercom, use early series Corinthians. The A and B series are compatible with each other if the all-buttons-up intercom feature is not used and the associated leads ore disconnected at the telephone connecting boxes.

5. DISASSEMBLY AND REASSEMBLY

5.1 HOUSING GROUP (Figure 2)

a. REMOVAL AND DISASSEMBLY OF HOUSING GROUP.

(1) Loosen the four cabinet lock screws and lift Housing off.

(2) To remove Escutcheon Assembly (25). press the four friction latch fingers of the Escutcheon up through up through the holes in the housing. (To remove Escutcheon Assembly with housing in place, pry outward at the upper edge.)

(3) To remove the Number Card (23) and Retainer (24), use a straightened paper clip or similar device. Insert it in the notch at the right end of the Retainer, and pry the Retainer and Number Card out.

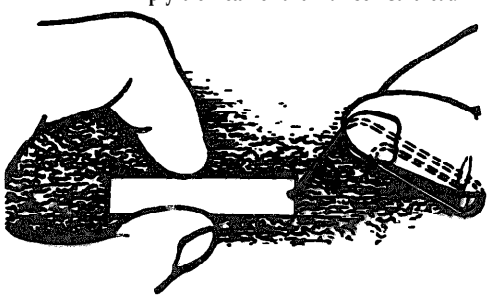


Figure 3. Removal of Number Card and Retainer

b. ASSEMBLY AND INSTALLATION OF HOUSING GROUP

(1) To install the Number Card (23), place the Card in the recess of the Housing. Grasp the Retainer (24) near its center and insert one end in place in the Housing. Bend the opposite end down with the other hand, and release the center hold. (See figure 4)

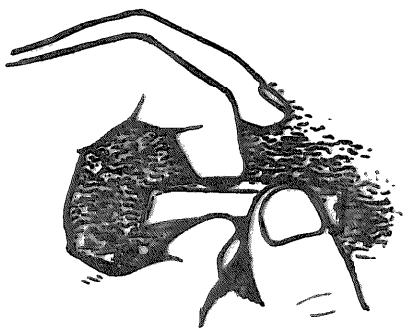
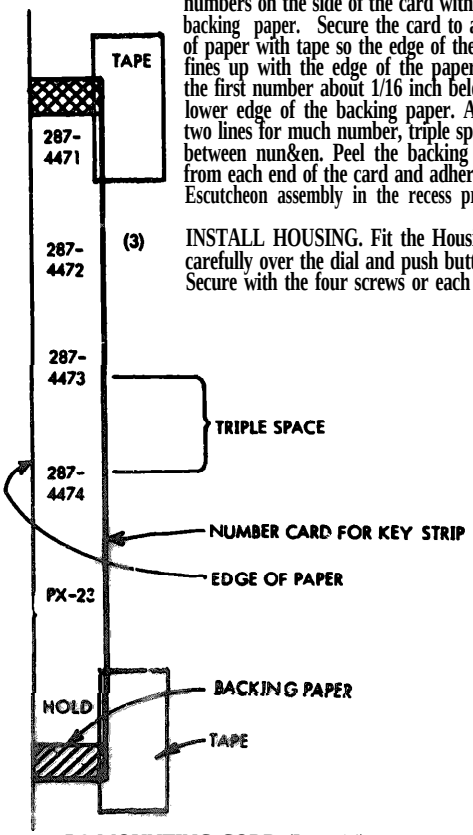


Figure 4. Installation of Number Card and Retainer

(2) NUMBER CARDS FOR KEY STRIP. Type numbers on the side of the card with the backing paper. Secure the card to a sheet of paper with tape so the edge of the card fines up with the edge of the paper. Type the first number about 1/16 inch below the lower edge of the backing paper. Allowing two lines for much number, triple space between nun&en. Peel the backing paper from each end of the card and adhere to the Escutcheon assembly in the recess provided.

(3) INSTALL HOUSING. Fit the Housing carefully over the dial and push buttons. Secure with the four screws or each comer.



5.2 MOUNTING CORD (Item 14)

a. REMOVAL OF MOUNTING CORD

(1) Remove the screw and washer that secure the Cable Hanger (21) to the Base.

(2) Unplug the Mounting Cord Plugs from the connectors in the phone.

(3) Remove the Wire Ties as necessary and remove the Mounting Cord and the Cable Hanger.

b. INSTALLATION OF MOUNTING CORD

(1) Plug the "C" plug of the Mounting Cord to the 599 Key Connector. (Lower Connector on 23< and 1232.)

(2) Plug the "D" plug to the 598 Key Connector.

(3) Plug the "E" plug to the Terminal Board Connector.

(4) Secure the Mounting Cord to the Base with the Cable Hanger, Washer and Screw.

(5) Install the Wire Ties to prevent wires from interfering with other components.

5.3 KEY ASSEMBLY

a. LAMP REPLACEMENT (Housing Removed). Pull off the brass frame. Use long nose pliers and pull out the foam rubber pocked behind the contacts. Replace lamp and repack the foam rubber. Install the brass frame.

b. REMOVAL OF KEY AND CONNECTOR ASSEMBLY

(1) Remove the two screws that secure the connector to its bracket.

(2) Remove the two screws that secure the Key Assembly to its brackets.

NOTE: The lower connector (232 and 1232 phones) is wired to the 599 Key Assembly.

c. INSTALLATION OF KEY AND CONNECTOR ASSEMBLY

(1) Place the Key Assembly and its Connector loosely in places on their respective brackets. Install the four mounting screws and tighten.

NOTE: When replacing a key assembly on a 12-button "CORINTHIAN", remove and discard the Latch Bar Return Spring and Retaining Pin - indicated by "See Note 1" on figure 2.

5.4 PIVOT BAR GROUP (Items 9 and 10)

a. REMOVAL OF PIVOT BAR (Item 9)

(1) Use round now pliers and remove Spring (10)

(2) Remove the Shoulder Screw that secures the Pivot Bar (9) to the outer Key Mounting Bracket. Slip the Pivot Bar dawn and inward until it clean the stud of the inner Key Bracket.

b. INSTALLATION OF PIVOT **BAR (Item 9)**

(1) Place the inner end of the Pivot Bar over the stud of the inner Key Bracket. Engage the slots of the Pivot Bar with the notches in the Latch Bars of the Key Assemblies.

(2) Install the Shoulder Screw through the hole in the outer Key Bracket and thread it into the Pivot Bar.

(3) Attach spring (9).

(4) Test operation of the push buttons to see that both key assemblies function as one unit.

5.5 DIAL (Items 1 and 1A)

a. REMOVAL OF DIAL

(1) Loosen the dial mounting screws and lift dial from bracket.

(2) Disconnect leads and remove dial.

b. INSTALLATION OF DIAL

(1) Refer to the appropriate circuit label and connect dial lad, as indicated.

(2) Place Dial in the brackets so the small holes in the dial flanges sat over the punched bosses of the mounting bracket. Tighten the mounting screws.

5.6 **TERMINAL BOARD AND CONNECTOR GROUP (Items 11, 12, 13, 14)**

NOTE: If this group is being removed temporarily, do not disconnect leads between the connector (11) and the terminal board (12), but remove both components as a unit.

a. REMOVAL OF TERMINAL AND CONNECTOR GROUP

(1) Refer to the **appropriate circuit label and** disconnect leads to **Network, Hookswitch,** and Dbl.

(2) Remove the two screws that attach the Connector and the two screws that attach the Terminal Board.

b. **INSTALLATION OF TERMINAL BOARD AND CONNECTOR GROUP**

(1) Install the Terminal Board and the Connector and secure with two screws each.

(2) Refer to the appropriate circuit label and connect leads.

5.7 RINGER (Item 3)

a. REMOVAL OF RINGER

(1) Disconnect **red** lead from "K" **terminal on Network.**

(2) Disconnect black lead from "4" **terminal** on Terminal Board.

(3) Pull slate and slatea-red leads loose from base. (Taped down)

(4) If Dial and Terminal Board have not been removed, loosen them from their mounting brackets and move them as necessary to gain access to the Ringer Mounting Screws.

b. INSTALLATION OF RINGER

(1) Secure Ringer to Base with the two mounting screws.

(2) Tape the slate and state-red leads to the base. (Be sure their terminals are taped or otherwise insulated.)

(3) **Connect black** lard **to "4" terminal on Terminal Board.**

(4) Connect red lead to "K" terminal on Network.

(5) **Install Dial and Terminal Board.**

5.8 HANDSET **ASSEMBLY** (Item 2)

a. **REMOVAL OF HANDSE**T. (Housing Removed) **Disconnect the leads and** pull the cord hook off **the finger in the base.**

b. **INSTALLATION OF HANDSET. Refer** to the **aparopriate circuit label and connect thl** handset **leads. Secure the cord to the baseby s**lipping the **cord hook over the finger in the base.**

5.9 **CRADLE HOOK AND SWITCH GROUP (Items 15 thru 20)**

a. REMOVAL OF CRADLE HOOK AND SWITCH GROUP

(1) Use round nose pliers and remove Spring (18).

(2) Remove one Retaining Ring (17) and remove Pin (16).

(3) Work the Cradle Hook (15) up and out from the Spring Nest Assembly (19).

(4) Disconnect the Spring Nest leads.

(5) Remove the two screws that secure them to the Bose, and remove the Spring Nest Assembly (19) and Spacer (20). If necessary, remove the Spacer from the leads.

b. INSTALLATION OF CRADLE **HOOK AND SWITCH GROUP**

(1) Insert Spring Nest leads through rectangular holes in Spacer (19). (Refer to figure 2).

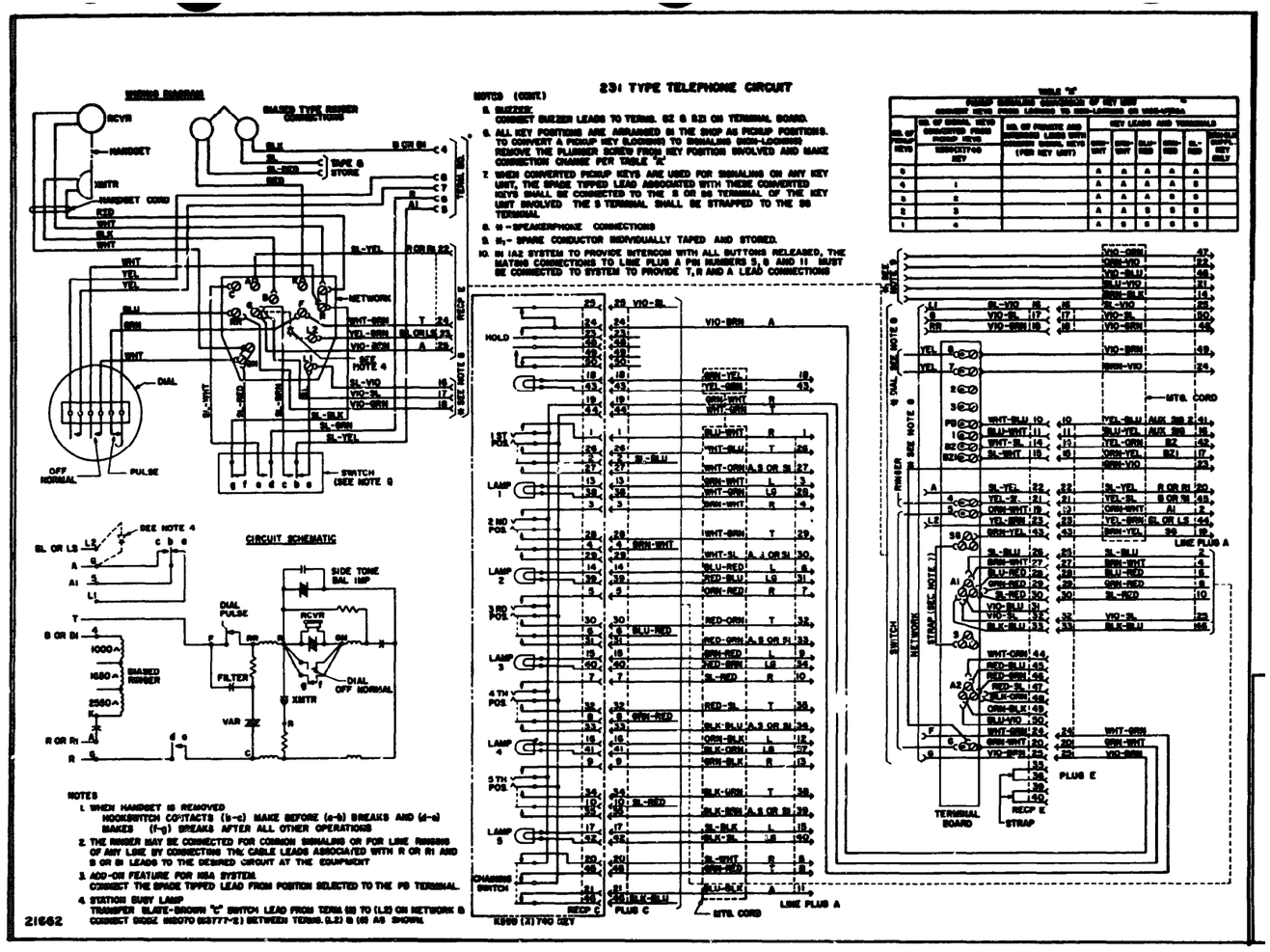
(2) **Position the Spacer and Spring Nest over** their mounting holes in the base. (Pull leads toward center of Base.) Secure with the two screws.

(3) Refer to the appropriate circuit label and connect Spring Nest leads.

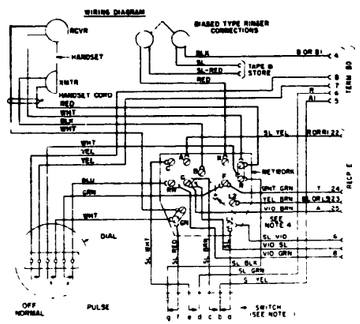
(4) Position the Cradle Hook (15) so its mounting holes line up with hales in the Bracket. Actuating arm of the Cradle Hook must engage the mating arm of the *ring Nest Assembly. Install Pin (16) and Retaining Ring (17).

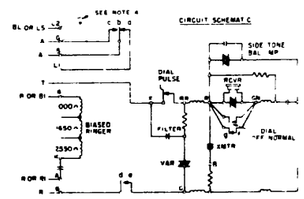
(5) UK round nose pliers and install Spring (18).

231 TYPE TELEPHONE CIRCUIT



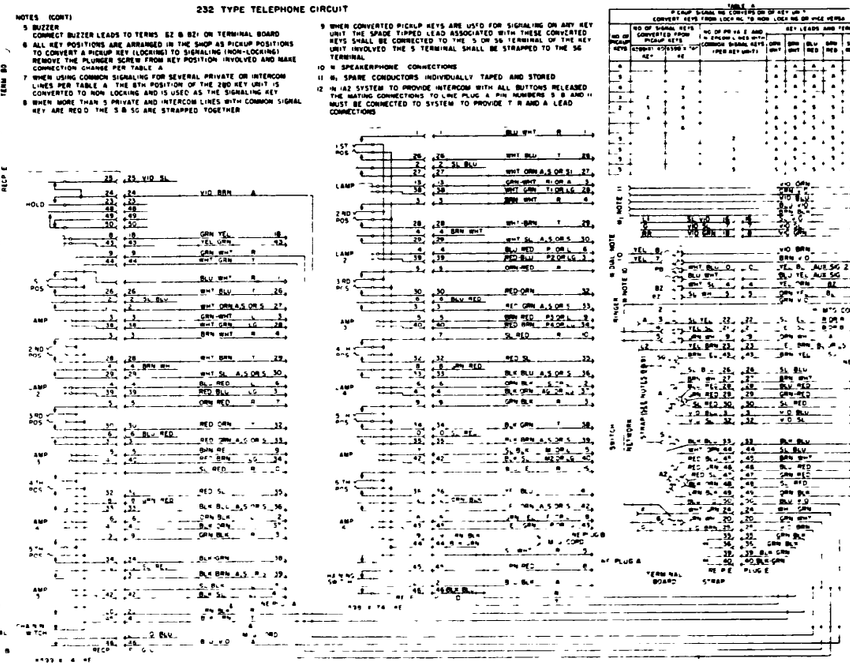
232 TYPE TELEPHONE CIRCUIT



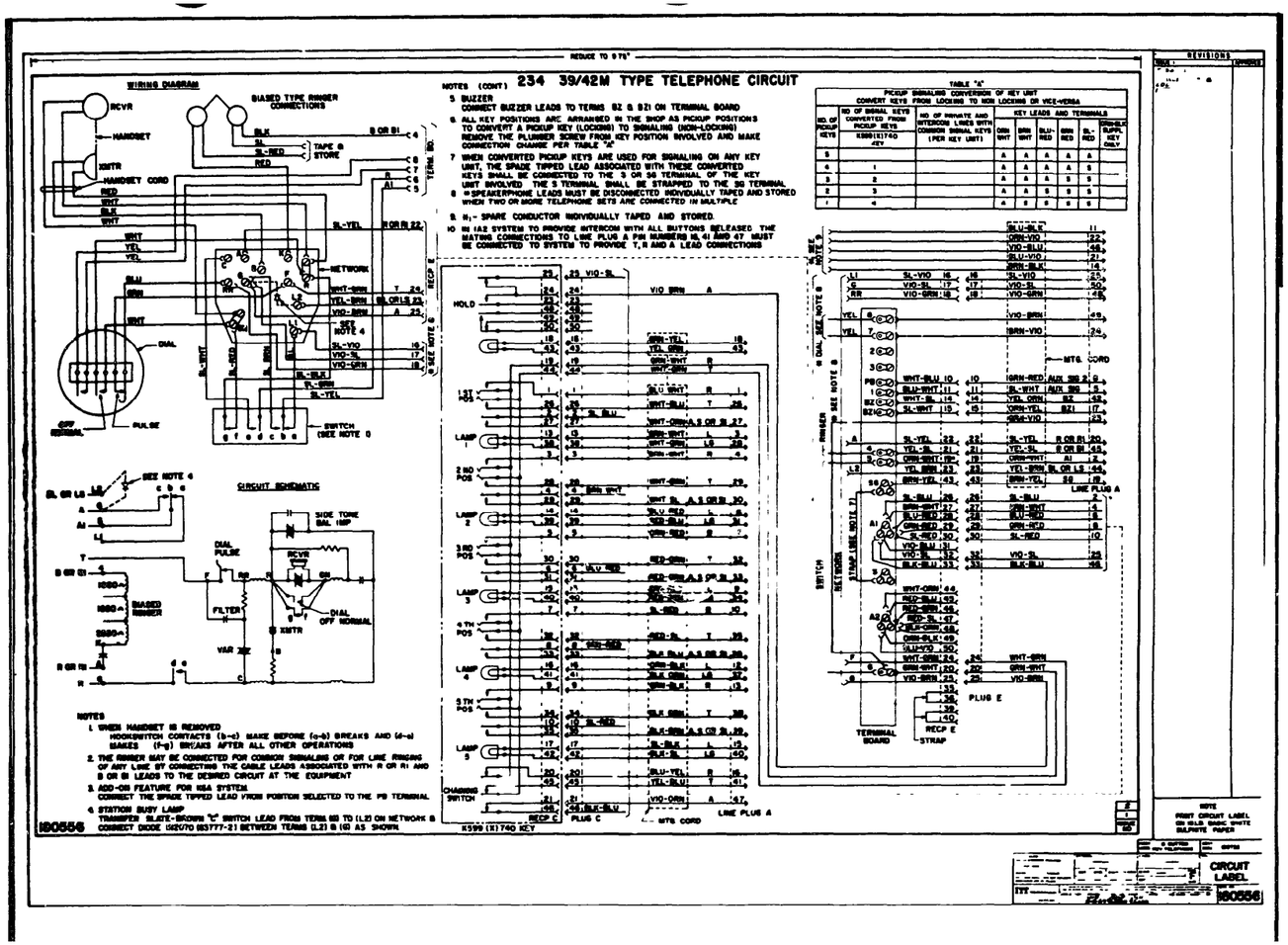


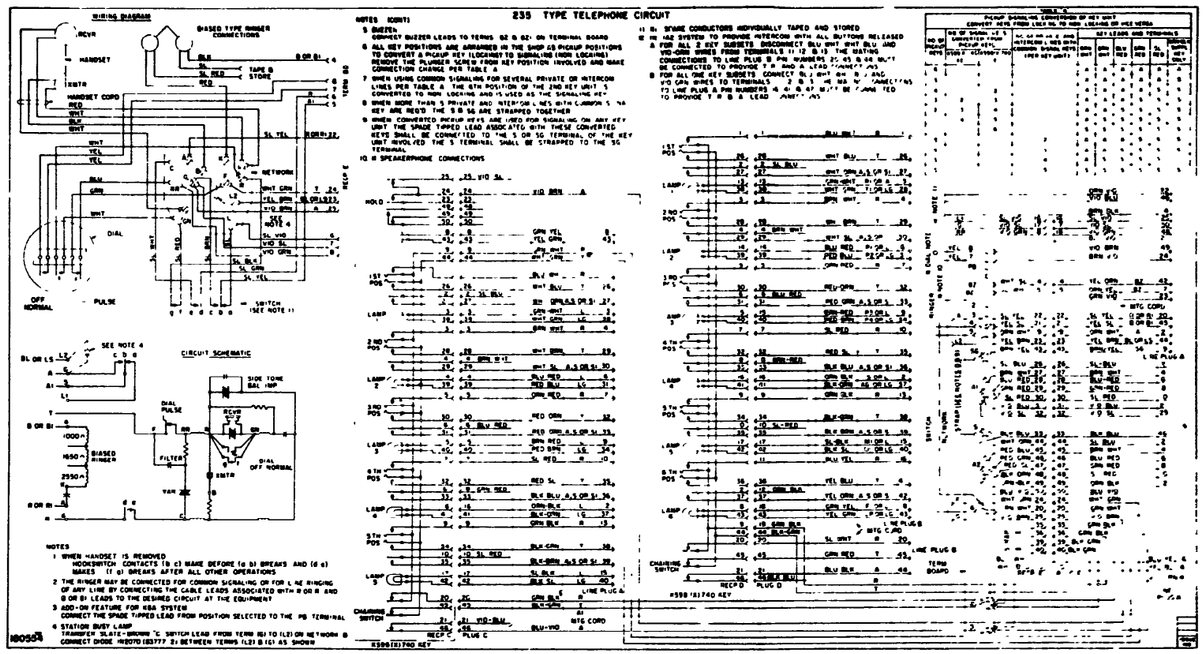
NOTES
1 WHEN HANDSET IS REMOVED
HOOKSWITCH CONTACTS (b c) MAKE BEFORE (a d) BREAKS AND (c e) MAKES (f g) BREAKS AFTER ALL OTHER OPERATIONS
2 THE A WIRE MAY BE CONNECTED FOR COMMON SIGNALING OF AN L INE BY CONNECTING THE CURR E LEAD ASSOCIATED WITH THE RINGING AND BUSY LAMPS TO THE DESIRED PCL AT THE EQUIPMENT
3 ADD N FEATURE FOR KBA SYSTEM CONNECT THE TRADE T PREC LEAU FROM PIN ON SIDE E ED TO THE PR TERMINAL
4 STAY PIN BUSY LAMP TRANSFER STATE BROWN WIRE T LEAD FROM TERMINAL TO ON NETWORK B CONNECTOR CODE 420 C 83777 21 BETWEEN TERMINALS 7 B 51 AS SHOWN

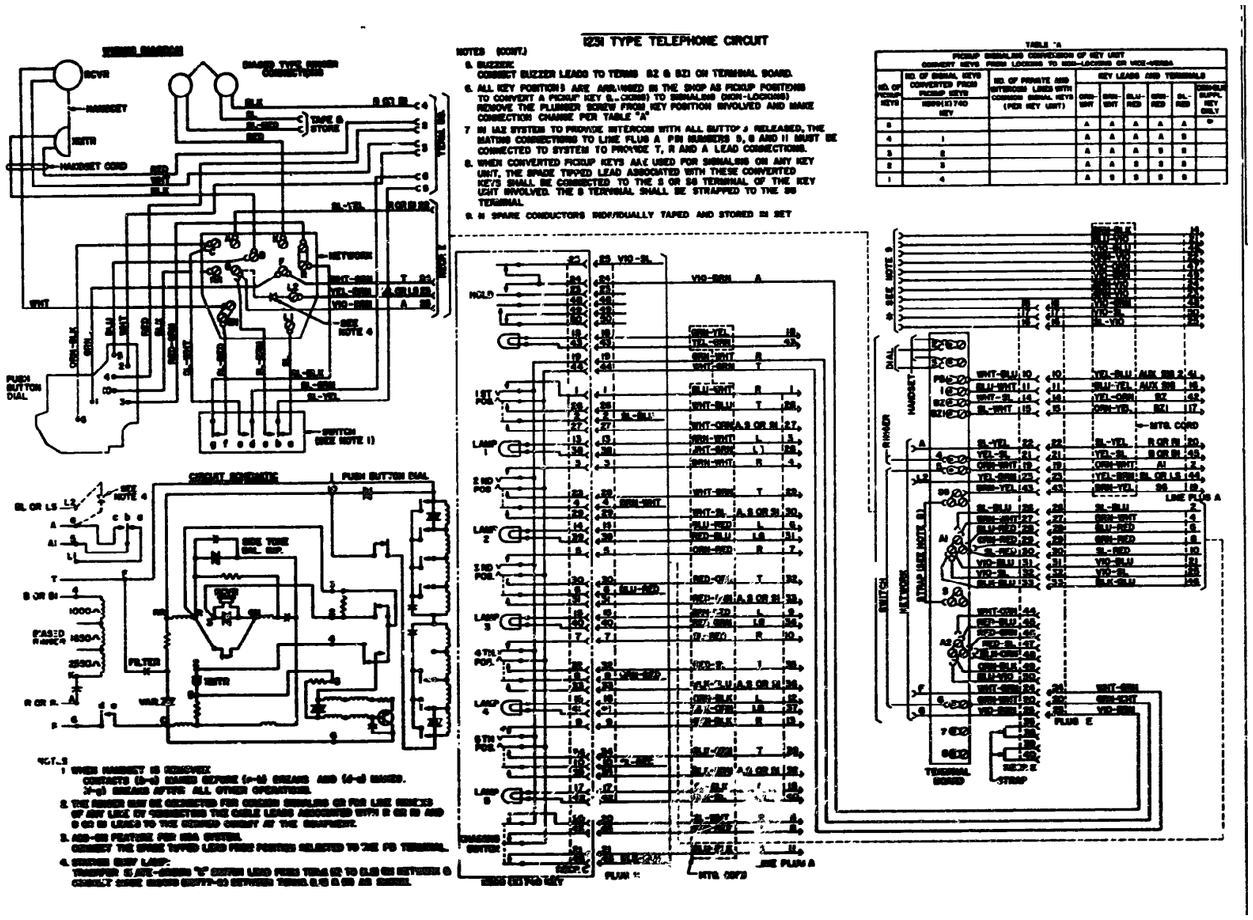
NOTES (CONT)
5 BUZZER
CONNECT BUZZER LEADS TO TERMS BZ & BZ1 ON TERMINAL BOARD
6 ALL KEY POSITIONS ARE ARRANGED IN THE SHOP AS PICKUP POSITIONS TO CONVERT A PICKUP KEY (LOCKING) TO SIGNALING (NON-LOCKING) REMOVE THE PLUNGER SCREW FROM KEY POSITION INVOLVED AND MAKE CONNECTION CHANGE PER TABLE A
7 WHEN USING COMMON SIGNALING FOR SEVERAL PRIVATE OR INTERCOM LINES PER TABLE A THE 6TH POSITION OF THE 280 KEY UNIT IS CONVERTED TO NON LOCKING AND IS USED AS THE SIGNALING KEY
8 WHEN MORE THAN 3 PRIVATE AND INTERCOM LINES WITH COMMON SIGNAL KEY ARE REQ D THE S & SG ARE STRAPPED TOGETHER
9 WHEN CONVERTED PICKUP KEYS ARE USED FOR SIGNALING OR ANY KEY UNIT THE SPADE TIPPED LEAD ASSOCIATED WITH THESE CONVERTED KEYS SHALL BE CONNECTED TO THE S OR SG TERMINAL OF THE KEY UNIT INVOLVED THE S TERMINAL SHALL BE STRAPPED TO THE SG TERMINAL
10 N SPEAKERPHONE CONNECTIONS
11 B1 SPARE CONDUCTORS INDIVIDUALLY TAPED AND STORED
12 IN A2 SYSTEM TO PROVIDE INTERCOM WITH ALL BUTTONS RELEASED THE MATING CONNECTIONS TO LINE PLUG A PIN NUMBERS 9 & 8 AND 11 MUST BE CONNECTED TO SYSTEM TO PROVIDE T R AND A LEAD CONNECTIONS



234 39/42M TYPE TELEPHONE CIRCUIT




235 TYPE TELEPHONE CIRCUIT
WIRING DIAGRAM
BIASED TYPE RINGER CONNECTIONS
CIRCUIT SCHEMATIC
NOTES
1 WHEN HANDSET IS REMOVED HOOKSWITCH CONTACTS (b c) MAKE BEFORE (a b) BREAKS AND (d a) MAKES (f g) BREAKS AFTER ALL OTHER OPERATIONS
2 THE RINGER MAY BE CONNECTED FOR COMMON SIGNALING OR FOR LINE RINGING OF ANY LINE BY CONNECTING THE CABLE LEADS ASSOCIATED WITH R OR R AND B OR B1 LEADS TO THE DESIRED CIRCUIT AT THE EQUIPMENT
3 ADD-ON FEATURE FOR KSA SYSTEM CONNECT THE SPARE TIPPED LEAD FROM POSITION SELECTED TO THE PB TERMINAL
4 STATION BUSY LAMP TRANSFER SLATE-BROWN "C" SWITCH LEAD FROM TERM (5) TO (L2) ON NETWORK B CONNECT DIODE 1N3070 (83777 2) BETWEEN TERMS (L2) B (G) AS SHOWN
NOTES (CONT)
5 BUZZER: ODDITY BUZZER LEADS TO TERMS G2 & G2' ON TERMINAL BOARD
6 ALL KEY POSITIONS ARE ARRANGED IN THE SHOP AS PICKUP POSITIONS TO CONVERT A PICKUP KEY (LOCKING) TO SIGNALING (NON LOCKING) REMOVE THE PLUNGER SCREW FROM KEY POSITION INVOLVED AND MAKE CONNECTION CHANGE PER TABLE A
7 WHEN USING COMMON SIGNALING FOR SEVERAL PRIVATE OR INTERCOM LINES PER TABLE A THE 6TH POSITION OF THE 2ND KEY UNIT IS CONVERTED TO NON LOCKING AND IS USED AS THE SIGNALING KEY
8 WHEN MORE THAN 5 PRIVATE AND INTERCOM LINES WITH COMMON S ARE REQD THE S & SG ARE STRAPPED TOGETHER
9 WHEN CONVERTED PICKUP KEYS ARE USED FOR SIGNALING ON ANY KEY UNIT THE SPARE TIPPED LEAD ASSOCIATED WITH THESE CONVERTED KEYS SHALL BE CONNECTED TO THE S OR SG TERMINAL OF THE KEY UNIT INVOLVED THE S TERMINAL SHALL BE STRAPPED TO THE SG TERMINAL
10 ® SPEAKERPHONE CONNECTIONS
11 SIX SPARE CONDUCTORS INDIVIDUALLY TAPED AND STORED
12 FOR KSA SYSTEM TO PROVIDE INTERCOM WITH ALL BUTTONS RELEASED
A FOR ALL 2 KEY SUNSETS DISCONNECT BLU WHT WHT BLU AND YIO-GRN WIRES FROM TERMINALS 11 12 & 13 THE DATUNG CONNECTIONS TO LINE PLUG B PIN NUMBERS 25 45 & 46 MUST BE CONNECTED TO PROVIDE T R AND A LEAD TRANSMITTING
B FOR ALL ONE KEY SUNSETS CONNECT BLU WHT WHT BLU AND YIO GRN WIRES TO TERMINALS 2 & 1 HE 500 W CONNECTING TO LINE PLUG B PIN NUMBERS 4 41 & 67 MUST BE TURNED TO PROVIDE T R & A LEAD TRANSMITTING
TABLE A
PICKUP SIGNALING CONVERSION OF KEY UNIT
CONVERT KEYS FROM LOCK NO TO NON LOCKING OR VICE VERSA
KEY LEADS AND TERMINALS
KEY UNIT
PICKUP KEY
SIGNALING KEY
NON LOCKING SIGNALING KEYS
TERMINAL BOARD
LINE PLUG B
LINE PLUG A
RECP C
PLUG C
RECP D
PLUG D
MTG CORD
MTG CORD
TERM BOARD
#598(II)740 KEY
#598(II)740 KEY
#80954



Diagram, 1231 Multi-Key Telephone (5-Line TEL-TOUCH "CORINTHIANS"

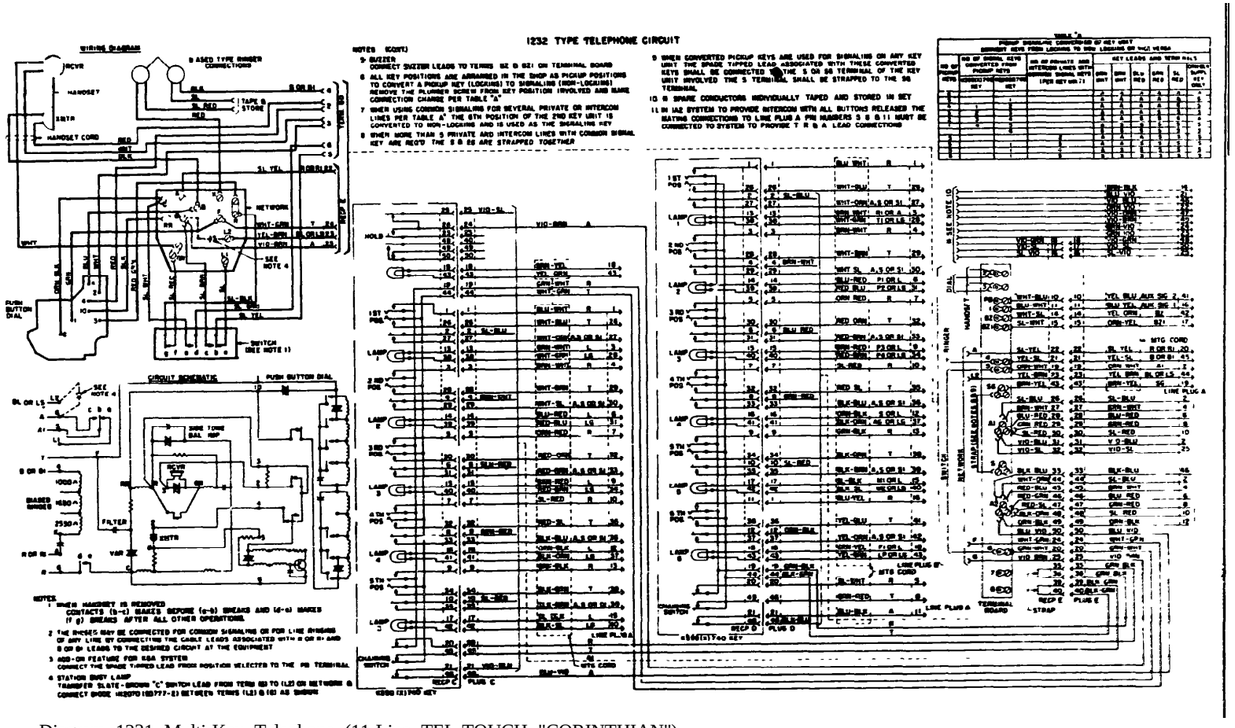


Diagram 1231 Multi-Key Telephone (11-Line TEL-TOUCH "CORINTHIAN")

223I TYPE TELEPHONE CIRCUIT

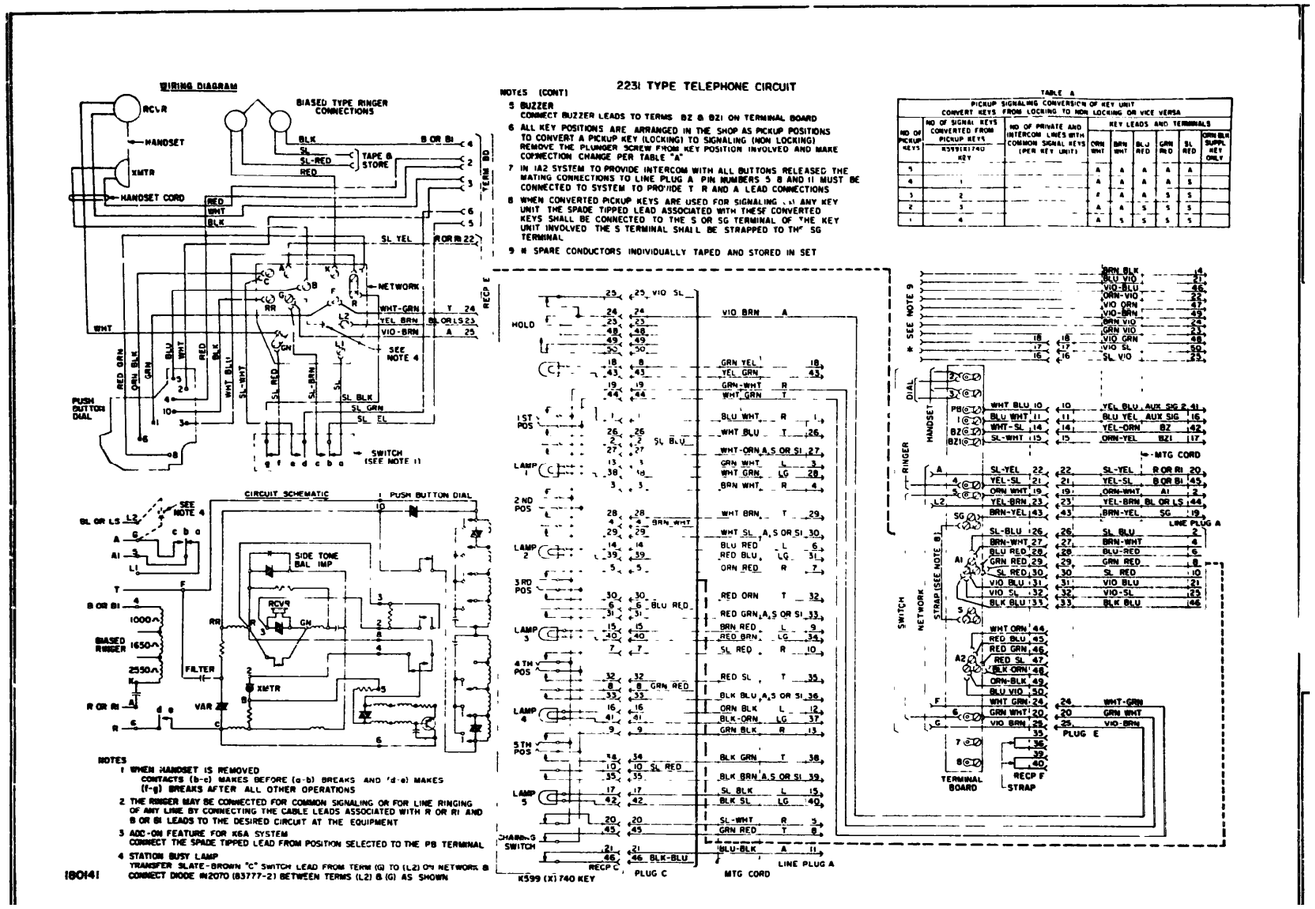
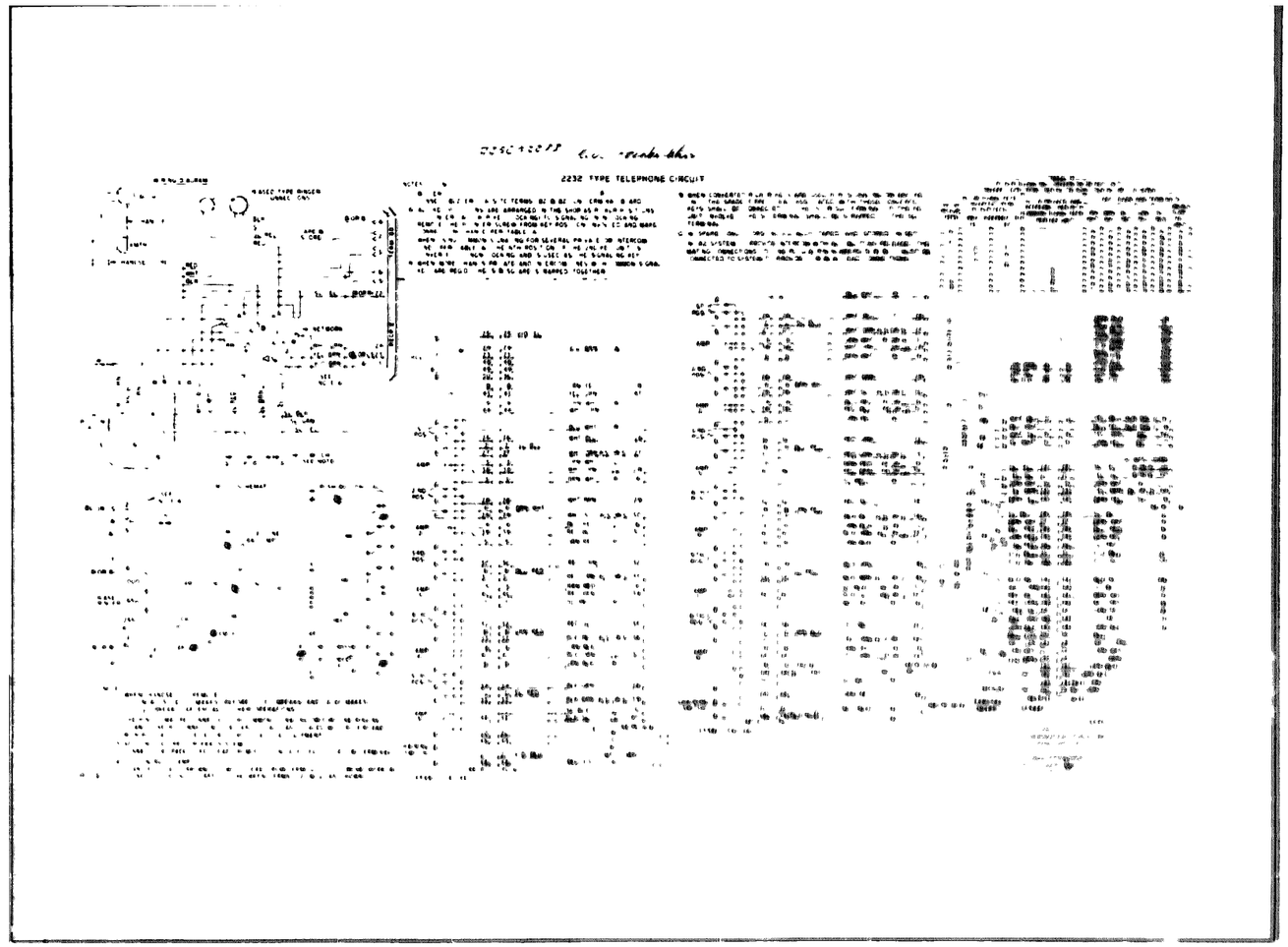
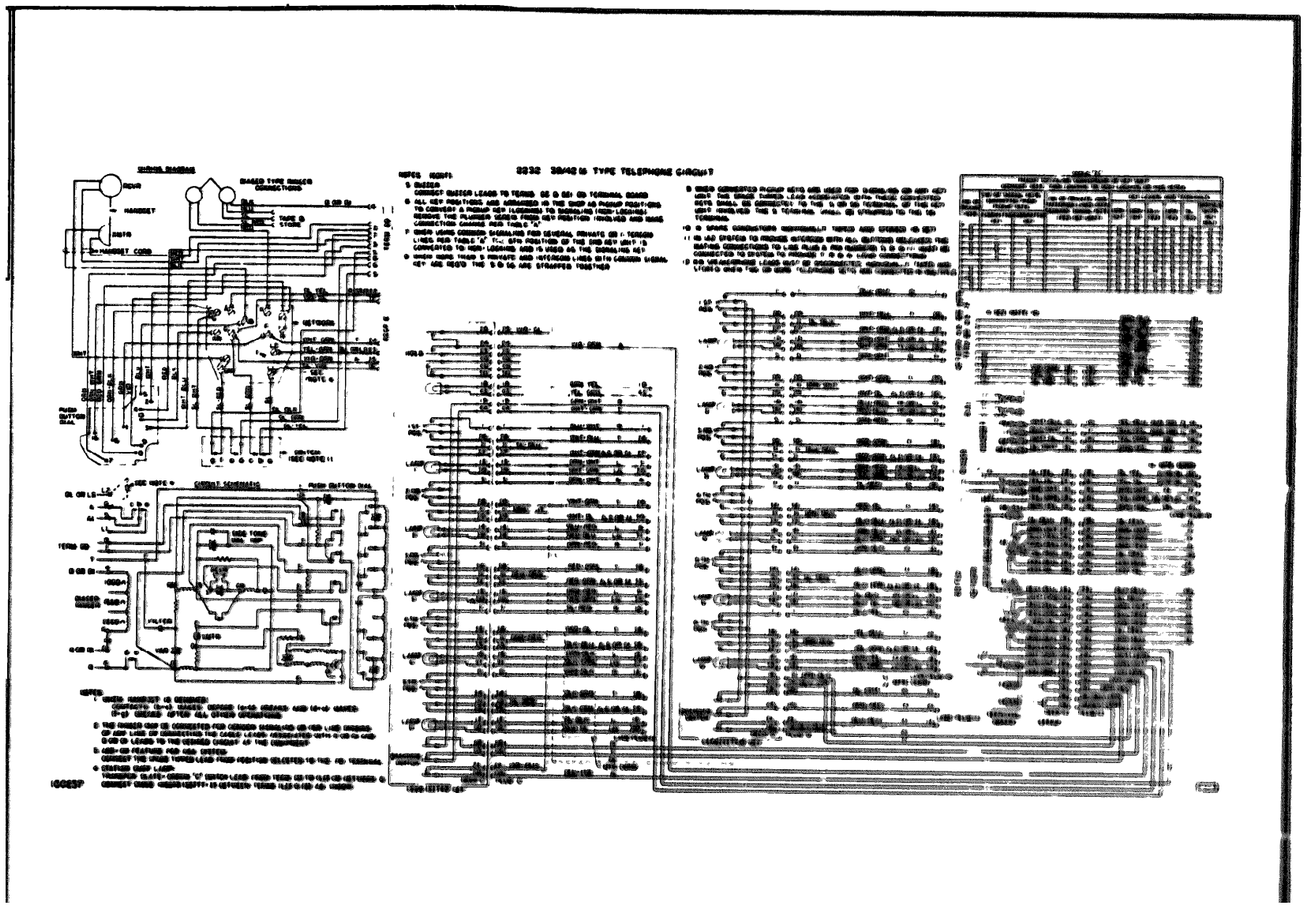
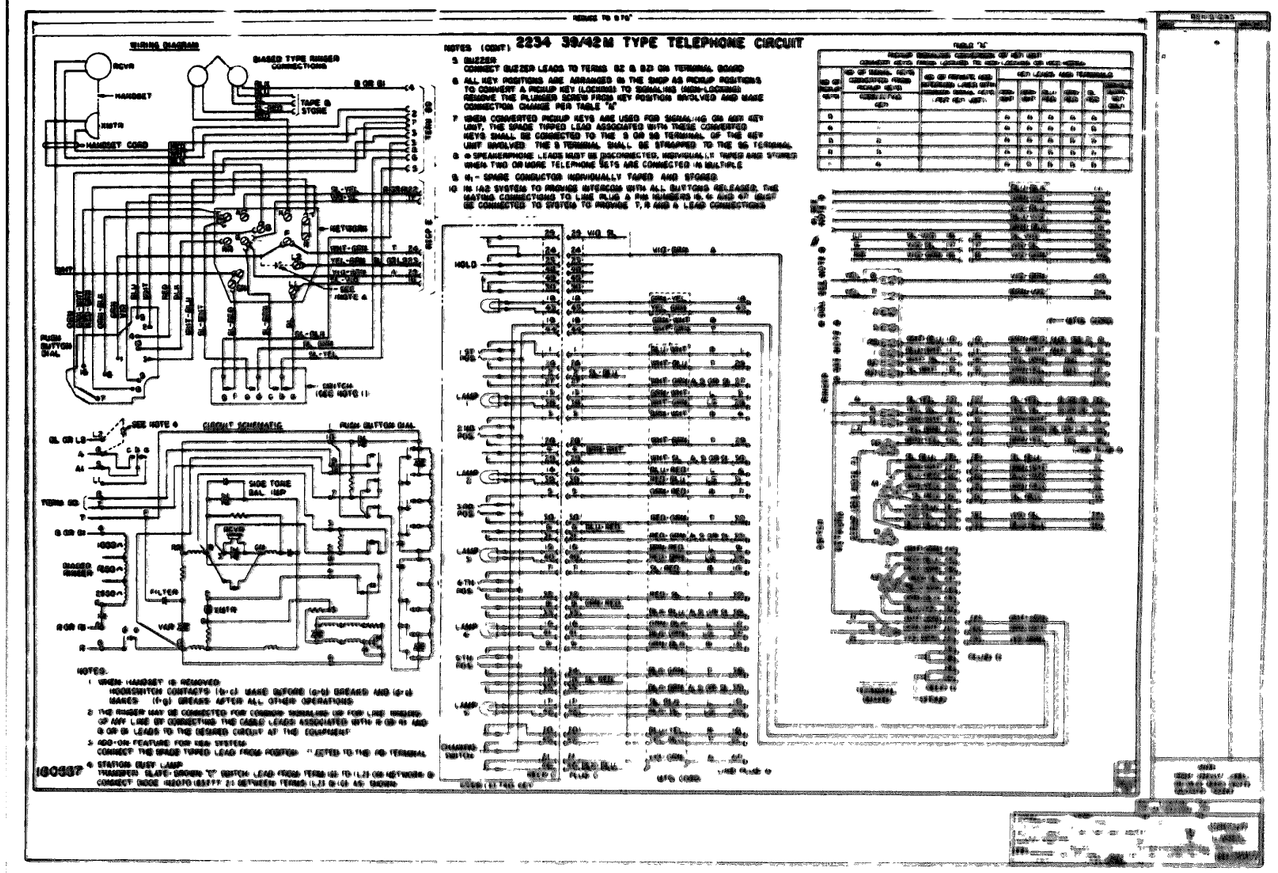


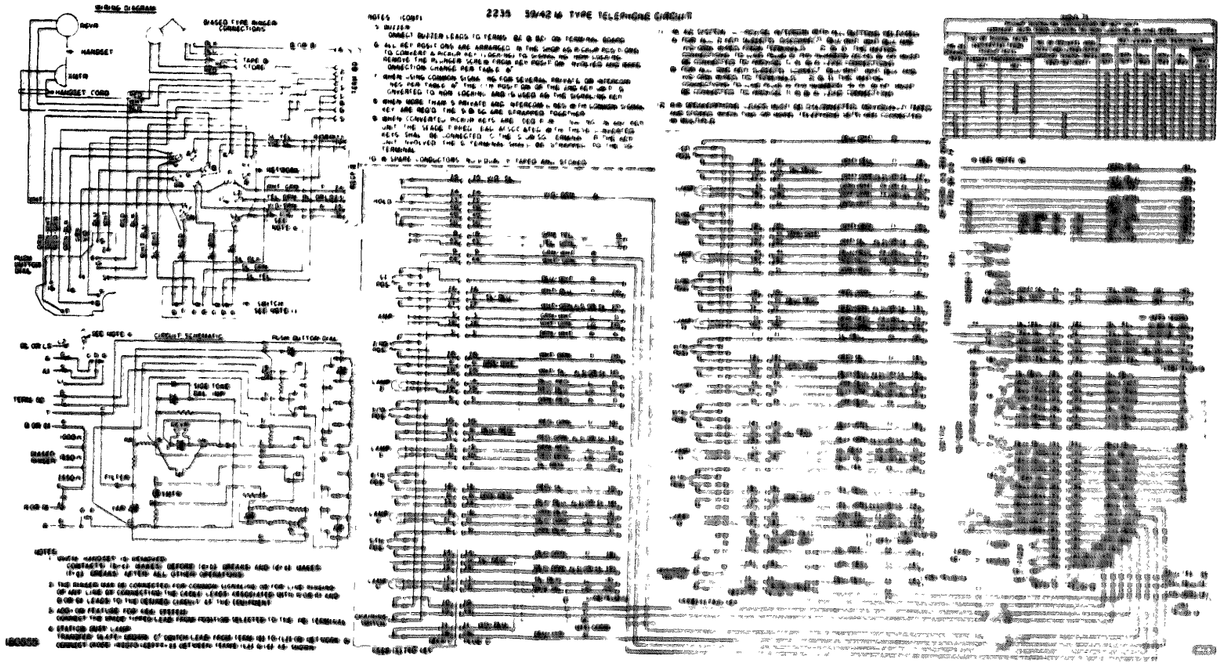
TABLE A
PICKUP SIGNALING CONVERSION OF KEY UNIT
CONVERT KEYS FROM LOCKING TO NON LOCKING OR VICE VERSA

NO OF PICKUP KEYS	NO OF SIGNAL KEYS CONVERTED FROM PICKUP KEYS K599X(X)740 KEY	NO OF PRIVATE AND INTERCOM LINES WITH COMMON SIGNAL KEYS (PER KEY UNIT)	KEY LEADS AND TERMINALS				
			ORN WHT	BRN WHT	BLU RED	GRN RED	SL RED	ORN BLK SUPPL KEY ONLY
1			A	A	A	A		
4	1		A	A	A	S		
3	2		A	A	S	S		
2	3		A	S	S	S		
1	4		S	S	S	S		


2232 TYPE TELEPHONE CIRCUIT




2234 39/42M TYPE TELEPHONE CIRCUIT
WIRING DIAGRAM
CIRCUIT SCHEMATIC
NOTES (CONT)
NOTES:
160337



VOICE SWITCHING CIRCUIT

2.06 Voice switching is the automatic transfer from receiving to transmitting condition. This circuit is controlled by speech from the speakerphone user. The level of speech necessary to cause switching is predetermined.

2.07 If possible, place audible signals away from the transmitter unit where there will be no interference with the voice switching feature. It may be necessary to lower the volume of the audible signal or install audible signal using the cutoff feature of the NE-55 type control unit. Use the leads to common signal control and common ringer or buzzer circuit for this cutoff feature.

LOUDSPEAKER ADJUSTMENT

2.08 An alternate loudspeaker connection is provided in each NE-55 type control unit to compensate for a strongly reverberant room condition.

2.09 This condition may cause voice switching while receiving calls. The effect of voice switching causes portions of the incoming speech to be chopped off.

2.10 To compensate for this condition, move the loudspeaker lead from terminal 33 to terminal 24 on the NE-55A control unit. Move lead from terminal 29 to terminal 30 on the NE-55QB unit. This places a resistor in series with one loudspeaker lead.

TEST CALL

2.11 When all connections have been made

(a) Place a call to test desk.

(b) Adjust the loudspeaker volume to a moderately loud listening level by turning the volume control on the transmitter clockwise. Position volume control halfway between lowest and highest level.

(c) Have the test center repeat the question, "In what suburb does Joe live?" several times.

(d) If choppiness is detected in the sentence, particularly in the first b in suburb and the t in what, change one loudspeaker lead according to 2.10.

(e) Repeat this test at a high listening level by turning the volume control to the extreme clockwise position.

(f) When there is no choppiness, the room adjustment is satisfactory.

3. MAINTENANCE

3.01 Table A provides maintenance procedures for troubles which may be encountered.

3.02 After working on equipment, test the complete system as specified in 2.11.

RADIO INTERFERENCE

3.03 Where radio interference is experienced in the telephone set only, a suppressor may be installed. See procedure on radio signal suppression in telephone sets.

3.04 Where radio interference is experienced with an NE-6A?.N transmitter, solder an MS-13811, .1 capacitor from terminal B to terminal D of the printed wiring board or ground the transmitter unit case.

PART FIVE

SPEAKERPHONE SYSTEMS (USFI WITH AN/FDC-37(A)1 AN/FTC-37(V)2)

CHAPTER 1

SPEAKERPHONE SYSTEMS-NE-3 TYPE

INSTALLATION AND MAINTENANCE

1. GENERAL

1.01 For connection information between speakerphone components and telephone sets, refer to appropriate procedures.

2. INSTALLATION

2.01 Avoid installing apparatus with plastic covers or parts (control units, transmitters, etc) in locations where the temperature in the immediate vicinity exceeds 140 degrees F.

NE-55 TYPE CONTROL UNIT

2.02 Locate the control unit no more than 100 feet from the other components. Mount the control unit on an insulated surface (wooden backboard, etc).

2.03 A standard 120-volt ac receptacle is required for the operation of the NE-2013 transformer. This receptacle must be on a circuit that is not controlled by a switch. Power outlet is furnished and maintained by the customer.

2.04 The length of wire between the transformer and the control unit should not exceed 100 feet of standard cordage wire.

TRANSMITTER AND LOUDSPEAKER

2.05 Place transmitter and loudspeaker within convenient reach of customer and with 3 feet minimum spacing. Fig 1 shows a typical installation.

NOTE: There should be no obstruction between customer, transmitter, and loudspeaker.

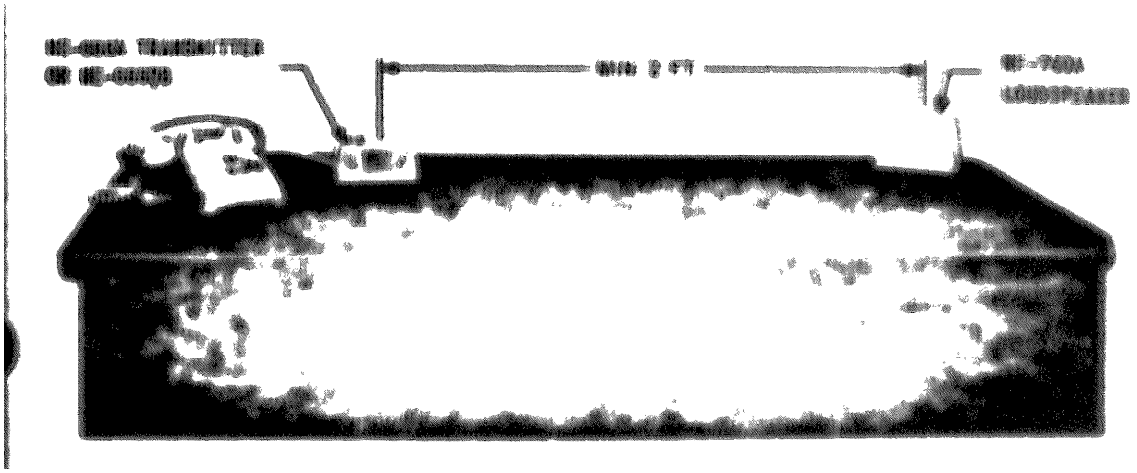


Figure 1- NE-3 Type Speakerphone System Installation

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VOICE SWITCHING CIRCUIT

2.06 Voice switching is **the** automatic transfer from receiving to transmitting condition. This circuit **is** controlled by speech from the speakerphone user. The level of speech necessary to cause switching is predetermined.

2.07 If possible, place audible signals away from the transmitter unit where there will **be no** interference with **the** voice switching feature. It may be necessary to lower the volume of **the audible** signal or install audible signal using the cutoff feature of the NE-55 type control unit. Use the leads to **common** signal control and common ringer or buzzer circuit for this cutoff feature.

LOUDSPEAKER ADJUSTMENT

2.08 An alternate loudspeaker **connection** is provided in each NE-55 type control unit to compensate for a strongly reverberant **room** condition.

2.09 This condition may cause voice switching while receiving calls. The effect of voice switching causes portions of the incoming speech to be chopped off.

2.10 To compensate for this condition, **move** the loudspeaker lead from terminal 33 to terminal 24 on the NE-55A control unit. **Move lead** from terminal 29 to terminal 30 on the NE-55QB unit. This places a resistor in series with **one** loudspeaker lead.

TEST CALL

2.11 When all connections have been made:

(a) **Place a call to test desk.**

(b) Adjust **the** loudspeaker volume to a moderately loud listening level by turning **the** volume control on the transmitter clockwise. Position volume control halfway between lowest and highest. level.

(c) Have the test center repeat the question, "In what **suburb does** Joe live?" several times.

(d) If choppiness is detected in the sentence, particularly in **the** first **b** in suburb and the t in what, change **one** loudspeaker lead according to 2.10.

(e) Repeat this test at a high listening level by turning the volume control to the extreme clockwise position,

(f) When there is no choppiness, the **room adjustment** is satisfactory.

3. MAINTENANCE

3.01 Table A provides maintenance procedures for troubles which may be encountered.

3.02 After working on equipment, test the complete system as specified in 2.11.

RADIO INTERFERENCE

3.03 Where radio interference is experienced in the telephone set only, **a** suppressor may be installed. See procedure on radio signal suppression in telephone sets.

3.04 Where radio interference is experienced with an NE-667AN transmitter, solder an NS-13814, L7 capacitor from terminal B to terminal D of the printed wiring board or ground the transmitter unit case.

TABLE A
TROUBLES AND PROBABLE CAUSES

Trouble Indication	Probable Cause	Check
On key does not light	No power or open wiring	Power supply outlet with a neon lamp voltage tester or equivalent or check LK lead
Lamp does not light but set works	Light burnt out	Lamp in transmitter
Lamp lights but does not stay lit when ON button is released	Loose connection in local wiring	Contacts 10M of K1 relay or OFF key contacts in transmitter
Amplification seems deficient in receiver or transmitter circuit or both	Faulty control unit	Replace control unit
Set transmits but does not receive	Loose or open wiring to loudspeaker	*SP1* and *SP2* leads Loudspeaker
Set receives but does not transmit	Local wiring open Defective transmitter	*M* lead Transmitter
No variation in volume when control is rotated	Open wiring Defective volume control Defective control unit	*P1* lead Check volume control Replace control unit
Dial heard over loudspeaker	Dial Wiring	For proper dial *P3* and *P4* leads

3.05 Where radio interference is experienced with an NE-666A or NE-666QB transmitter, place an NS-13814, L7 capacitor across the terminals of the NE-AC1 or NE-AB2 transmitter unit.

4. GENERAL

Purpose Of Circuit

4.01 This circuit provides distant talking and loudspeaker receiving, as well as circuitry for connection to special telephone sets to provide for a combination of regular and distant talking telephone circuits, together with facilities for switching between two types of telephone circuits. The speakerphone control unit is a voice-switched, fully transistorized station set designed to give transmit and receive volume performance comparable to that obtained from an NE-500 type telephone set on typical loop. Special single-line telephone sets are provided as part of this circuit, but the equipment may also be, used with special key telephone sets of connecting circuits to provide for use with line and signaling circuits of key telephone system NE-1A, -1A1 or -6A.

5. CIRCUIT DESCRIPTION

ORIGINATING OR ANSWERING A CALL

Handset Operation

5.01 To originate or answer a call, the handset is lifted from its mounting, thus

operating he switchhook assembly in the telephone set. The operated switchhook assembly supplies ground to the A lead to operate the A relay of the line circuit, if connected to key telephone system W-1AI or to the R lead to operate the station busy lamp circuit, if provided. The switchhook assembly also completes the talking circuit from the tip and ring of the line through the telephone set equipment and, in sequence, removes the short circuit from the receiver circuit.

Speakerphone Operation

5.02 To originate or answer a call, the non-locking ON key, Fig. 2, is depressed. This places a ground on the S lead to operate the K1 relay in the control unit. The K1 relay locks up through contact K1N, the OFF key and the break contacts of the unoperated switchhook assembly. The handset must be on the mounting to complete the holding circuit of the K1 relay when the speakerphone is used. The K1 relay operated (A) connects the balance cord of the T1 and T2 leads, through the transmit of the telephone set and, with hybrid, through the operated pickup key to the tip circuit and (B) removes ground over the T1 lead, the lead, back contacts of the switchhook assembly, and K1N of the K1 relay to the A lead to the line circuit, if connected to key telephone system W-1AI. It also connects a ground to the R lead to the station busy lamp circuit, if provided, and cuts off the ringers. The lamp on the transmitter unit lights to indicate that the speakerphone is in the talking condition.

Dialing with handset removed from mounting

5.03 The dial on the telephone set is operated in the usual manner when the handset is lifted from the mounting. The off-normal contacts connected to the D1 and D2 leads short circuit the receiver during rotary dialing. The (AT) and (AR) leads are connected for DIGITAL use. At the completion of dialing, the handset circuit is restored to the talking condition.

Dialing with the Speakerphone Energized

5.04 After the ON key in Fig. 2 has been operated and the signal lamp lighted, the dial is operated in the usual manner, except that the handset is not lifted from its mounting. The off-normal contacts connected to the D1 and D2 leads short circuit the input to the receiver amplifier in the control unit. When a DIGITAL dial is used, the tones associated with each digit, are heard. The other pair of off-normal contacts perform no useful function at this time. At the completion of dialing, the rotary dial short circuit is removed and the speakerphone circuit is restored to the talking condition.

Shifting from Handset to Speakerphone Operation

5.05 To change to the speakerphone circuit when talking with the handset, the ON key of Fig. 2 is operated. Operation of the ON key operates the K1 relay of Fig. 3 only when the handset is on the mounting. For this reason it is necessary to hold the ON key depressed until the handset is replaced. When the handset is replaced, a locking circuit for the K1 relay is completed through the back contacts of the switchhook assembly. The operated K1 relay operates the speakerphone circuit.

Shifting from Speakerphone to Handset Operation

5.06 To change to the handset when talking on the speakerphone, it is only necessary to lift the handset from its mounting. This operates the switchhook assembly and opens the locking path of the K1 relay, which releases

The release of the K1 relay opens the **tip and ring at the** speakerphone control unit, extinguighes the signal lamp in Fig. 2, and re**stores** the speakerphone control unit to the **idle condition.** The operated **switchlock as**sembly connects the talking circuit of the **handset as described in 4.01.**

Terminating a Conversation When Using the Speakerphone

5.07 Operation of the OFF key in Fig. 2 breaks the lockup circuit of the K1 **relay** which releases **and** restores the speaker**phone** circuit to the idle condition.

6. DESCRIPTION OF TRANSISTORIZED CONTROL UN IT

6.01 The control unit is designed to work with connecting pairs up to 100 feet **in** length from the other units which connect **to it.** The NE-666 type transmitter contains **a microphone, a volume control** potentiometer, and **the ON-OFF control buttons. It also contains a 3-stage amplifier so that the transmitter output will override noise** interference which may **be picked** up in long connecting cords and cable **pairs. The NE-630 series telephone sets incorporate an NE-667AN transmitter which plugs into the last** module. **The loudspeaker has a relatively high impedance voice** coil **to reduce the losses caused by the resistance of the cords and cable pairs.**

CIRCUIT OPERATION (SEE FIGS 4 AND 8)

6.02 **The control unit consists of five plug-in amplifiers which utilize transistors in the common emitter configuration. Various types of negative feedback are applied to stabilize ac gains against transistor parameter variations and to control both the input and output impedances. DC bias circuits are included for stabilizing operating currents and voltages.**

6.03 The microphone amplifier, AM, consists of three stages designed to work between a 300-ohm transmitter unit and a 4,000-ohm transformer **load impedance. A shunt feedback connection is used on the output in order to make the output impedance low. This reduces noise interference on long cord and cable pairs between the transmitter and the subscriber** set **and also reduces the power supply hum being passed to the control vario-losser.** A **shunt feedback connection is used on the input for the convenience of hawing one side of the microphone terminals grounded. Me** resulting **low input impedance is built up by means** of a **300-ohm resistor to match the nominal microphone impedance and to equalize its response characteristic.**

6.04 **The receive amplifier, AR, also has three stages and was designed to work between a 5,000-ohm transformer secondary and a 27-ohm loudspeaker load. To provide a power output of 100 milliwatts without requiring a heat sink, an NE-16A diffused silicon NPN transistor is used for the output in place of the NE-12 type used in the other amplifier stages. Shunt feedback produces a low output impedance so that the low frequency loudspeaker reasonance will be dampened. Series feedback is applied to the input to increase the input impedance so that a shunt resistor on the transformer secondary can effectively control the impedance on the primary side which terminates the receive vario-losser.**

6.05 **The transmit amplifier, AT, consists of two stages designed to work from a 5,000-ohm transformer secondary to a hybrid coil winding which presents a 1,000-ohm load impedance and has a 5,000-ohm resistor shunted**

across it. Series feedback on the output raises the output impedance to such a high value that the 5,000-ohm resistor effectively terminates the hybrid coil winding. The input also employs series feedback so that a 5,000-ohm resistor across the secondary of the input transformer effectively terminates it for the transmit vario-looser.

6.06 The switchguard amplifier, AG, has one transistor employing emitter degeneration, causing both input and output impedance to be high. Since the input is bridged across the loudspeaker, the source impedance is very much smaller than the input impedance of the amplifier and the gain is nearly independent of transistor parameters. The load impedance is the primary of a 2,000- to 10,000-ohm output transformer which connects to a full wave rectifier and the load of the time constant circuit plus the control vario-losser. Since this is essentially a bridging amplifier, the power gain can be taken as the ratio of power into its 2,000-ohm load impedance versus the power into the 2?-ohm loudspeaker impedance, which is 10 dB.

6.07 The transmit control and noise threshold amplifiers, AC and AN, are similar in configuration and consists of two stages, each with shunt feedback on the outputs and series feedback on the inputs. The high input impedance of the control amplifier, shunted by the base biasing resistors of the first stage, provides a stable load impedance for the control vario-losser. In the noise threshold amplifier, the high input impedance is desirable in order to minimize the bridging effect on the output of AM.

7. VARIO-LOSSERS

7.01 The transmit vario-losser, TVL, is a single, balanced, series type. Together with its input pad, it has an insertion loss of 500 ohms impedance and 69 dB when no control current is flowing. This drops to 33 dB at currents of 1 ma or higher. The pad keeps the speech levels low enough so that nonlinearity up to the overload point of AM is held to 1 dB or less for all values of dc control current.

7.02 The receive vario-losser, RVL, is a 2-stage balanced shunt type. At zero control current its insertion loss, including its input pad, between 10,000-ohm impedances is 21 dB. At 1 ma and above, its loss increases to 63 dB. The pad keeps non-linearity within 1 dB up to the over-load point of AR for all values of control current.

7.03 The control vario-losser, CVL, is essentially a voltage divider having one variable resistor. The voltage insertion loss between the output of AM and the input of AC is 11 dB with no direct current coming from the switchguard rectifier. At maximum current of 1.5 ma, the insertion loss is 54 dB.

8. POWER RELAY

8.01 An NE-2012B plug-in transformer or a CT. 20-228 Multi-Tap transformer supplies 18 volts ac at full load to the control unit. The low-voltage alternating current supplied to the subscriber set is rectified by a full wave germanium diode bridge and filtered with a pi-shaped LC network. The inductance of the filter is provided by the 16-ohm winding of the power control K1 relay. A typical power line voltage of 117 volts nets a dc output of 15 volts at 100 ma. Of this current, 35 ma is used to light the 10-volt OA lamp through a voltage-dropping resistor and 65 ma is supplied to the electronic circuits.

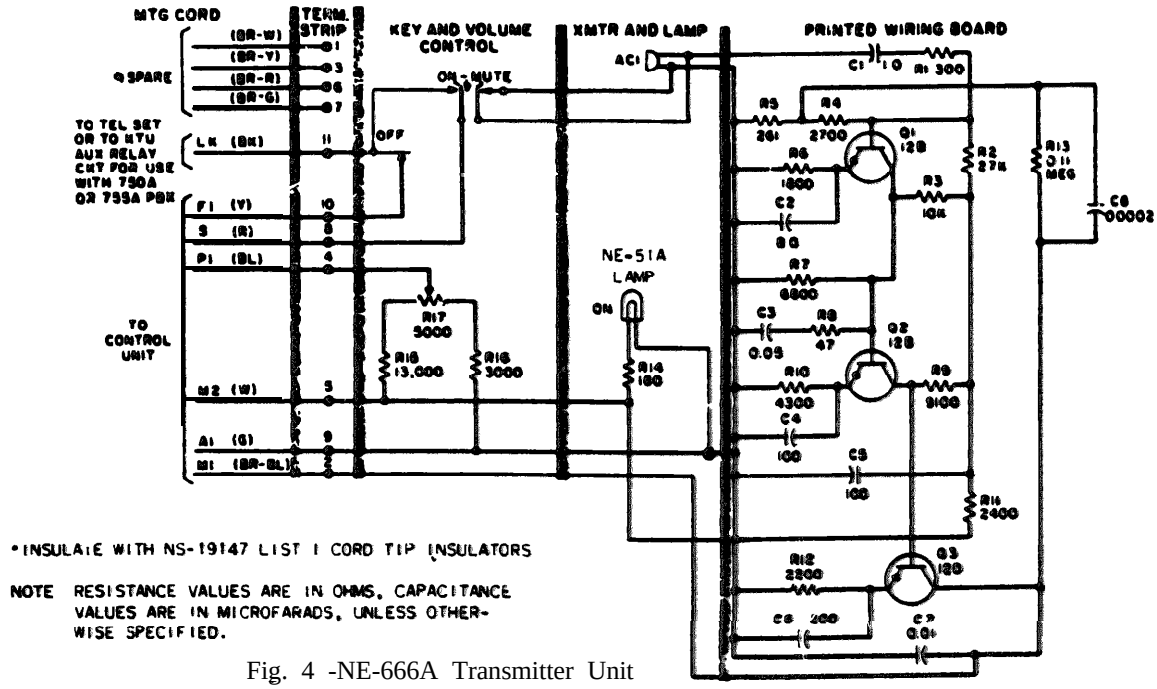


Fig. 4 -NE-666A Transmitter Unit

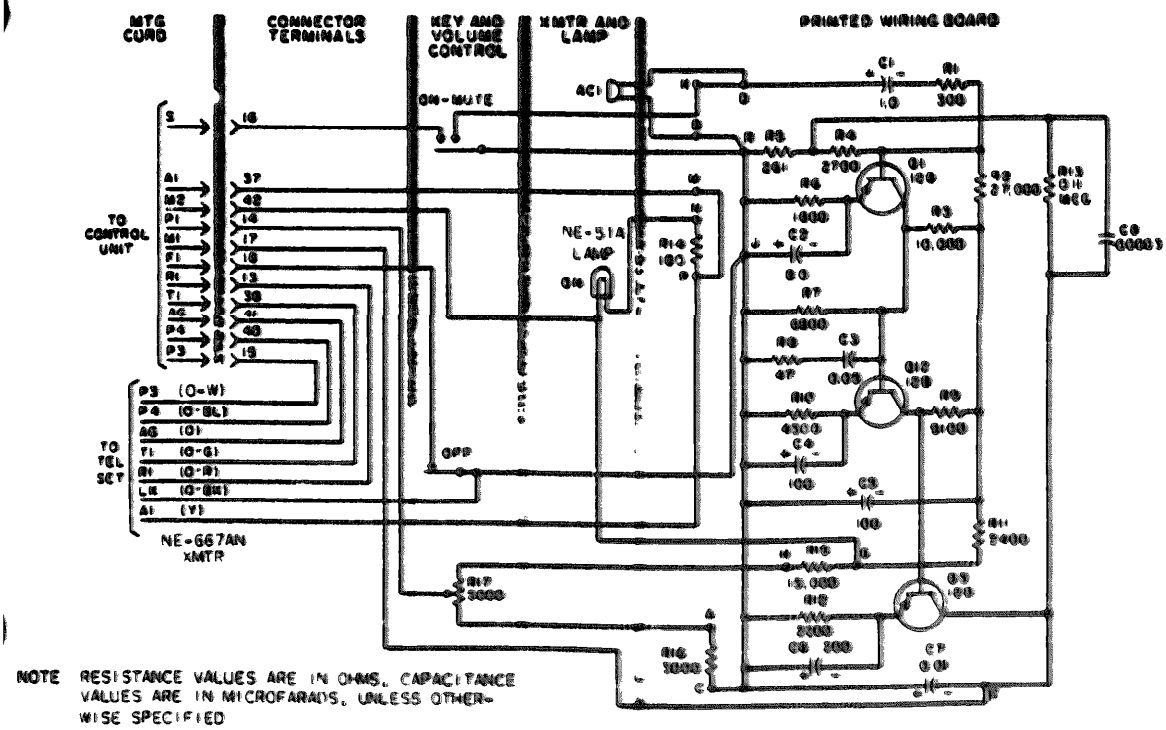


Fig. 5 -NE-667AN Transmitter Unit

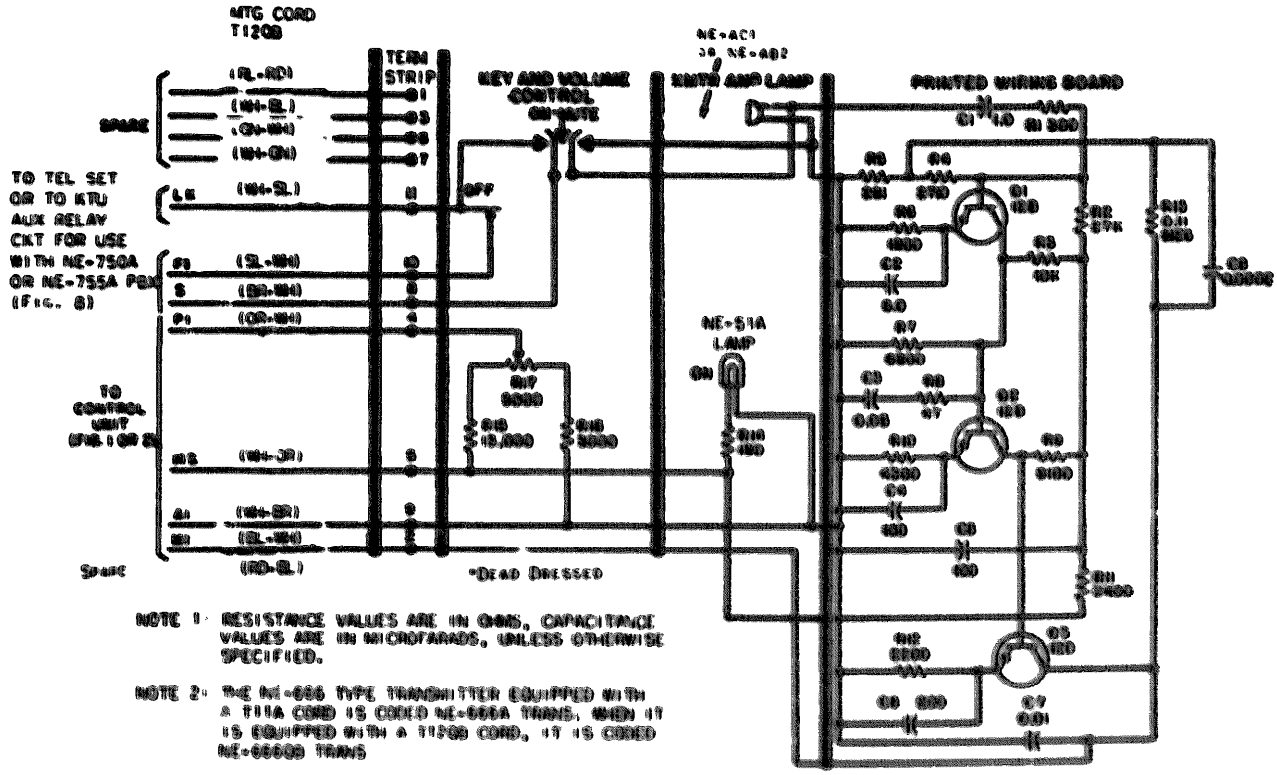
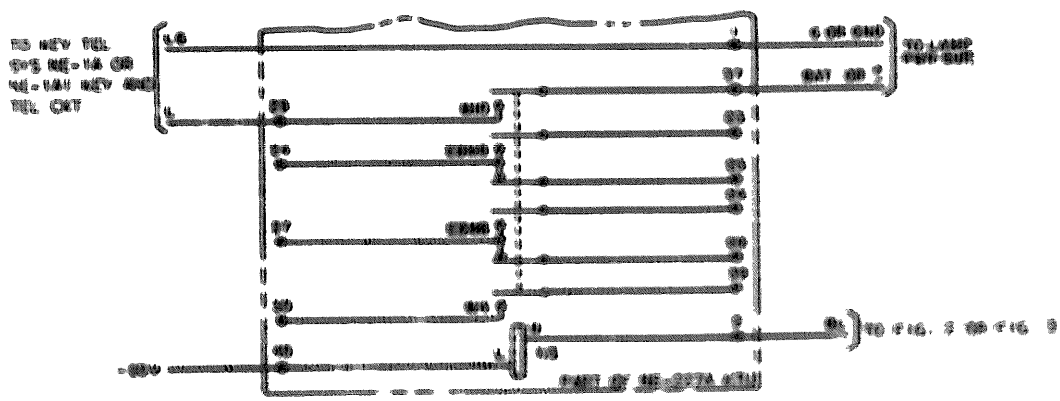


Fig. 6 NE-668QO Transmitter



Fig, 7- Station Busy Lamp Control Circuit

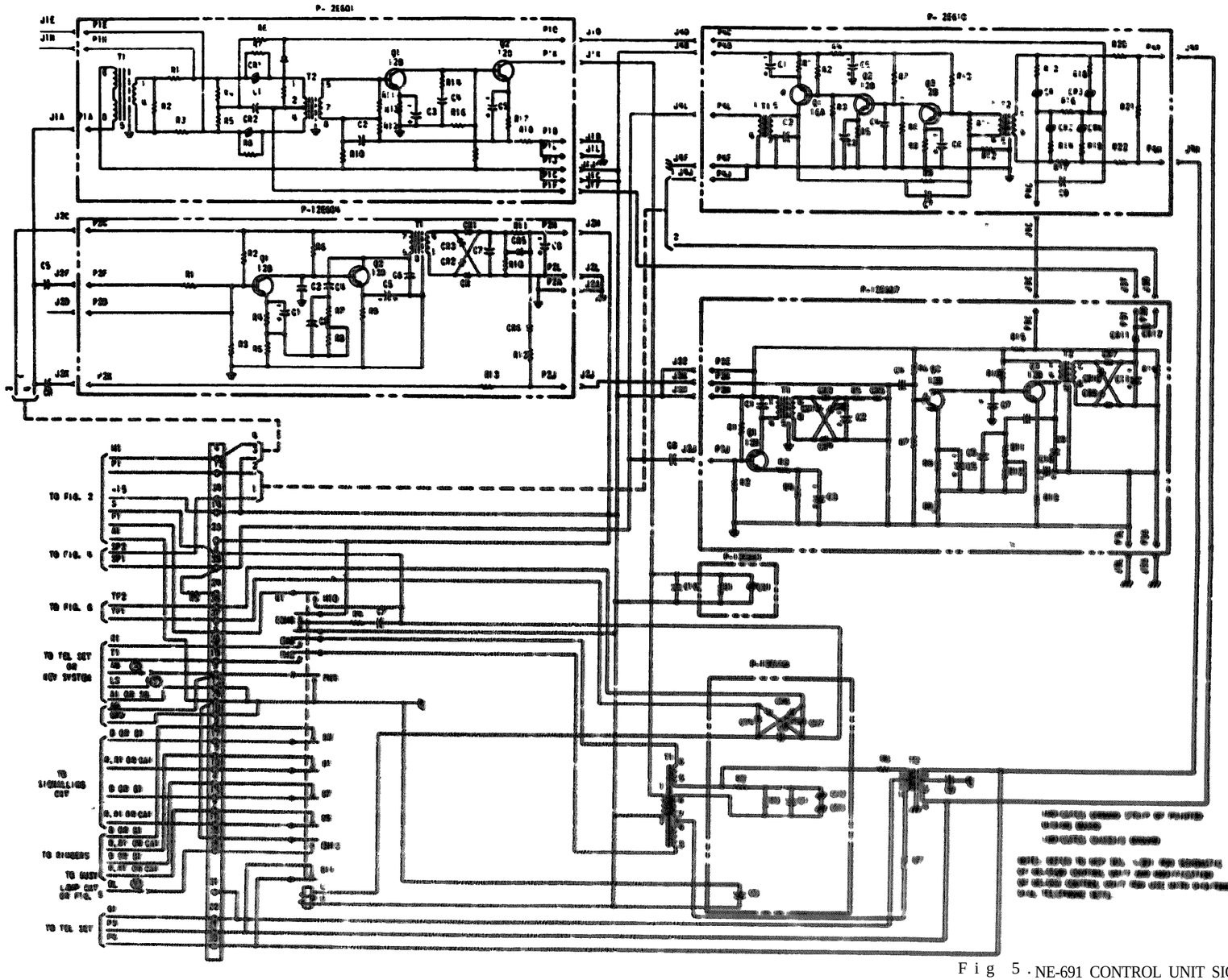


Fig 5. NE-691 CONTROL UNIT SIGNATURE

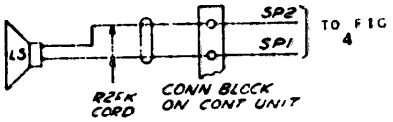


Figure 5-Loudspeaker

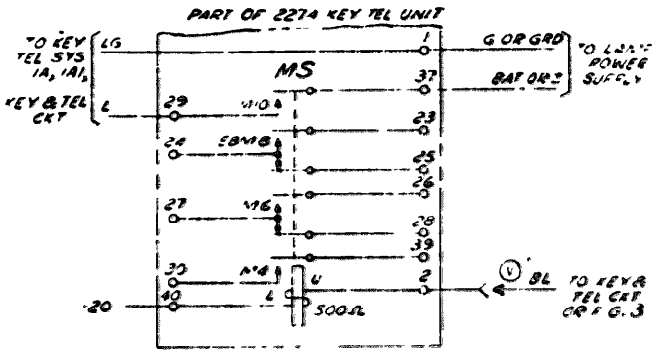


Figure 6- Station Busy Lamp Control CKT

All code numbers are prefixed by NE-.

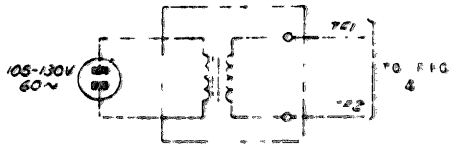


Figure 7- Plug-in Power Transform NE-20120

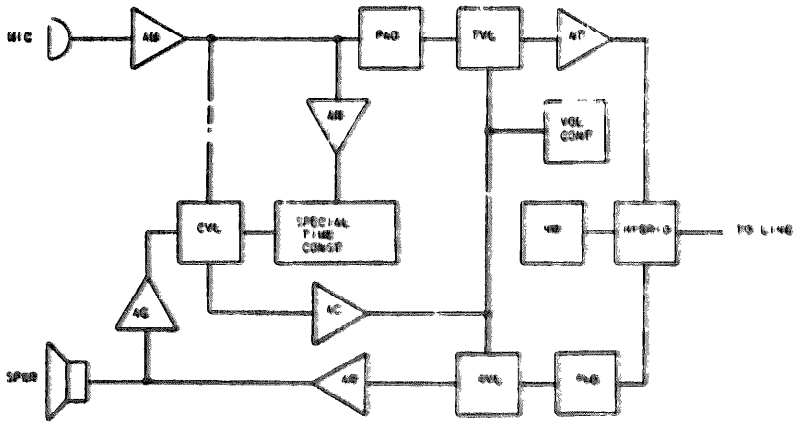


Figure 8- Clock Diagram of Control Unit

CHAPTER 2

NE-3 TYPE SPEAKERPHONE SYSTEM

CONTROL UNITS

AND TRANSMITTER UNITS

CONNECTIONS

1. GENERAL

1.01 This procedure shows connections between components in the W-3 type speakerphone system.

1.02 For connections to the various telephone sets see the other WP's on the 30230 series

1.03 For information on the W-3 type speakerphone system used in conjunction with the Business Interphone System, see WP's on the 20070 series.

2. REASON FOR REISSUE: To correct Fig. 1.

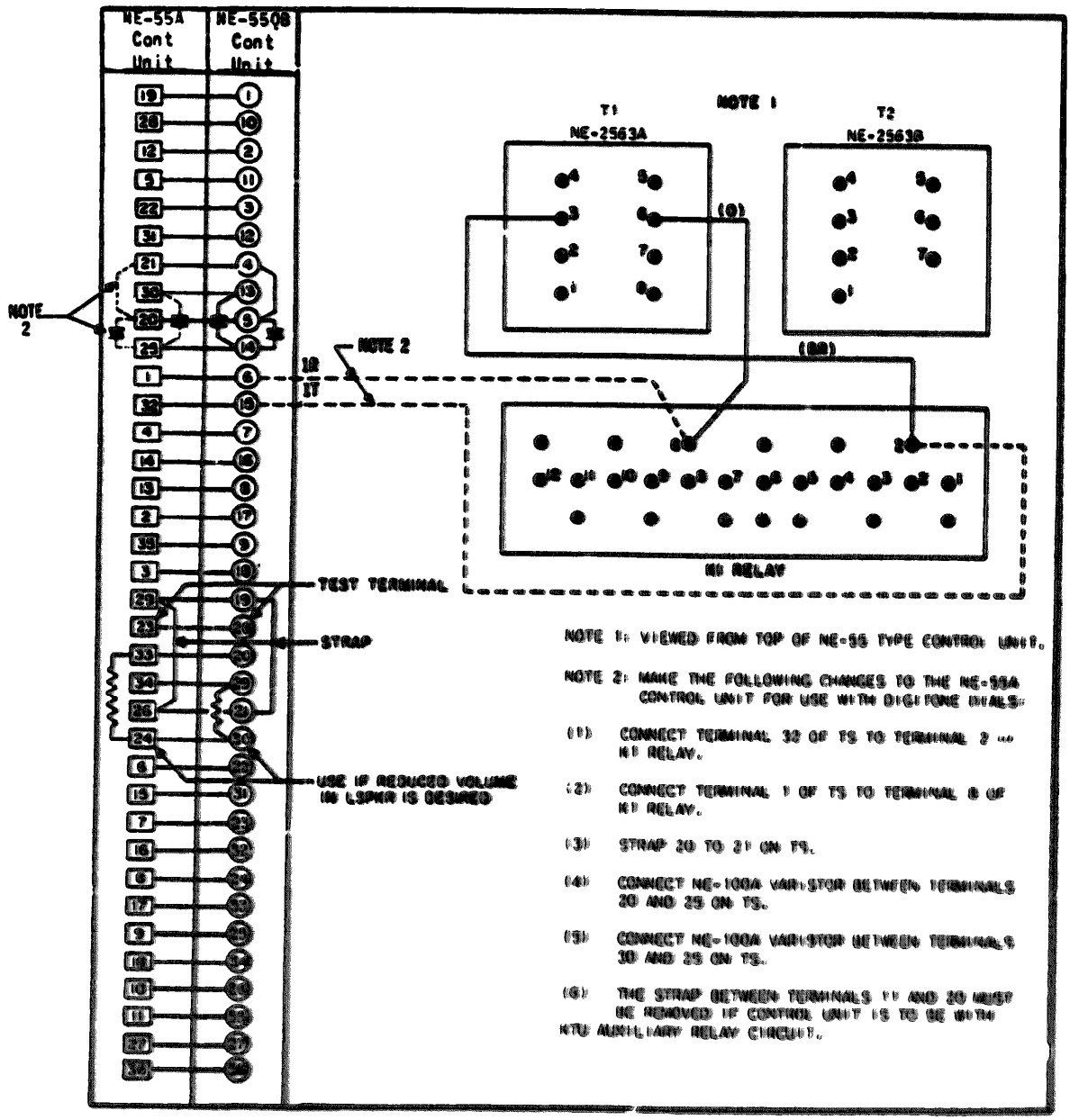


Fig. 1- Modifications of NE-55A Control Unit for Use with DIGI TONE Dial Telephone Set.

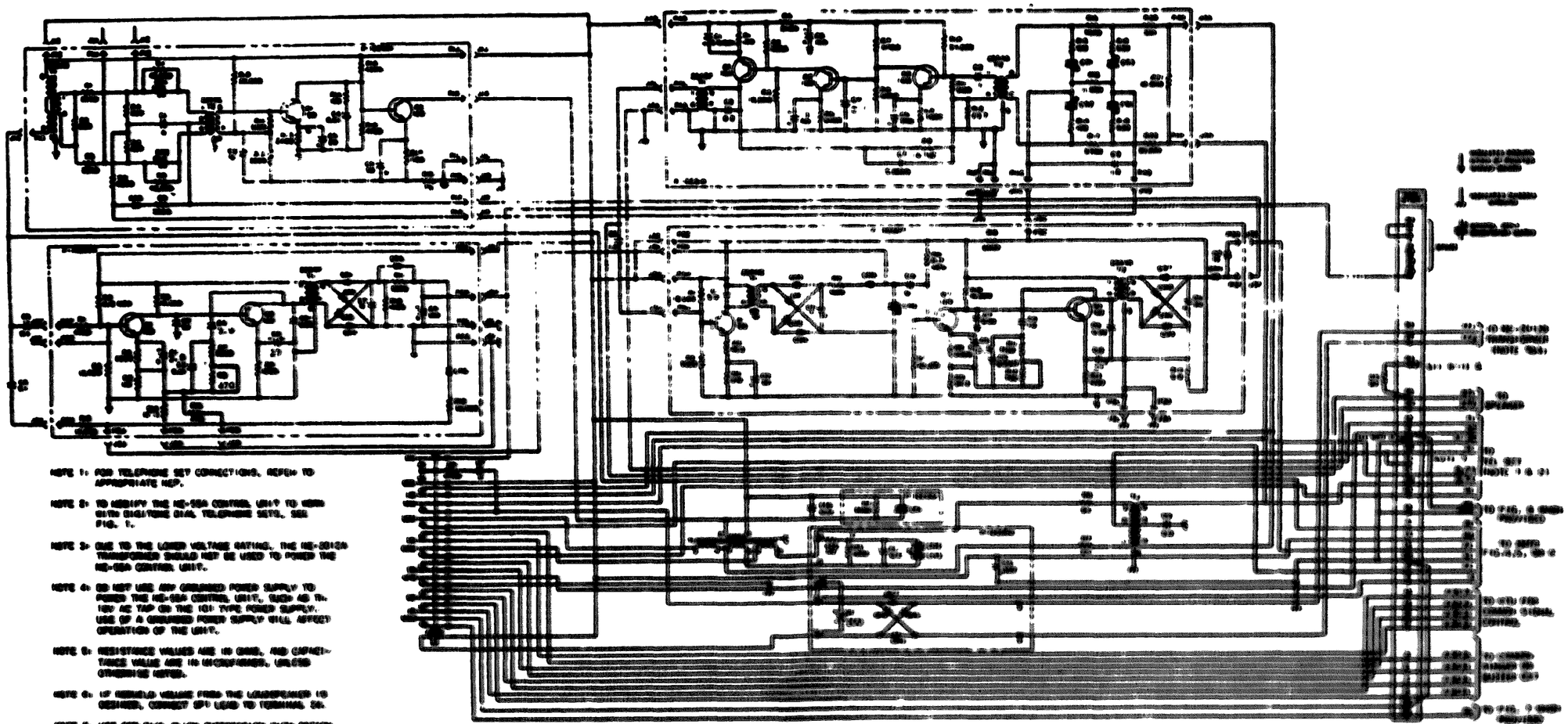
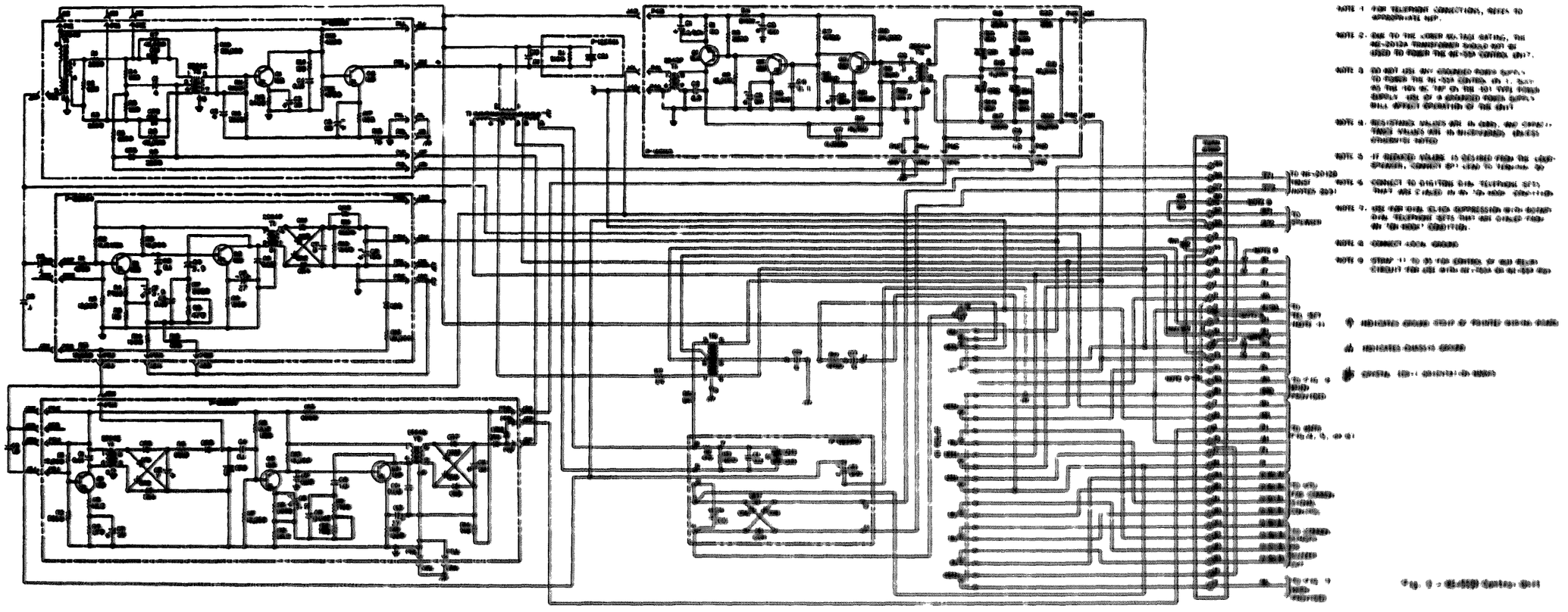
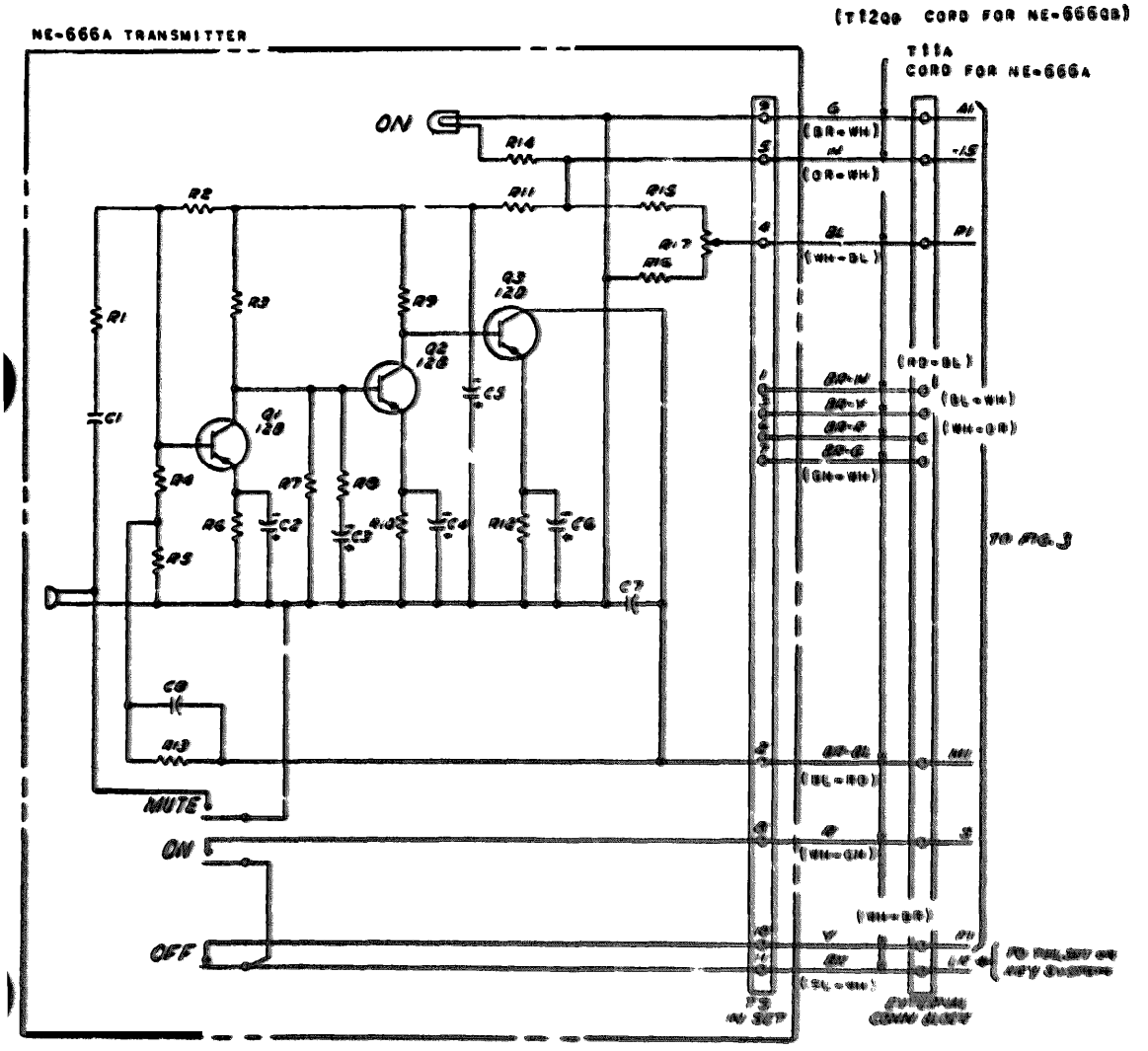


Fig. 2- NE584 Control Unit



8.02 The plug-in transformer. the rectifier, and the filter are connected at all times to the ac power. Closing the ON button in the transmitter completes the dc power supply circuit between the relay winding and the second filter capacitor in parallel with the load. The circuit locks up through the relay make contact, the OFF button break contact of the transmitter, and a switch-hook assembly break contact in the telephone act.

9. REASON FOR REISSUE: To add information on NE-3B speakerphone system: To correct code numbers.



The Color Codes in Brackets are for the T12QB Cord in Brackets

Figure 2- Key and Transmitter Circuit

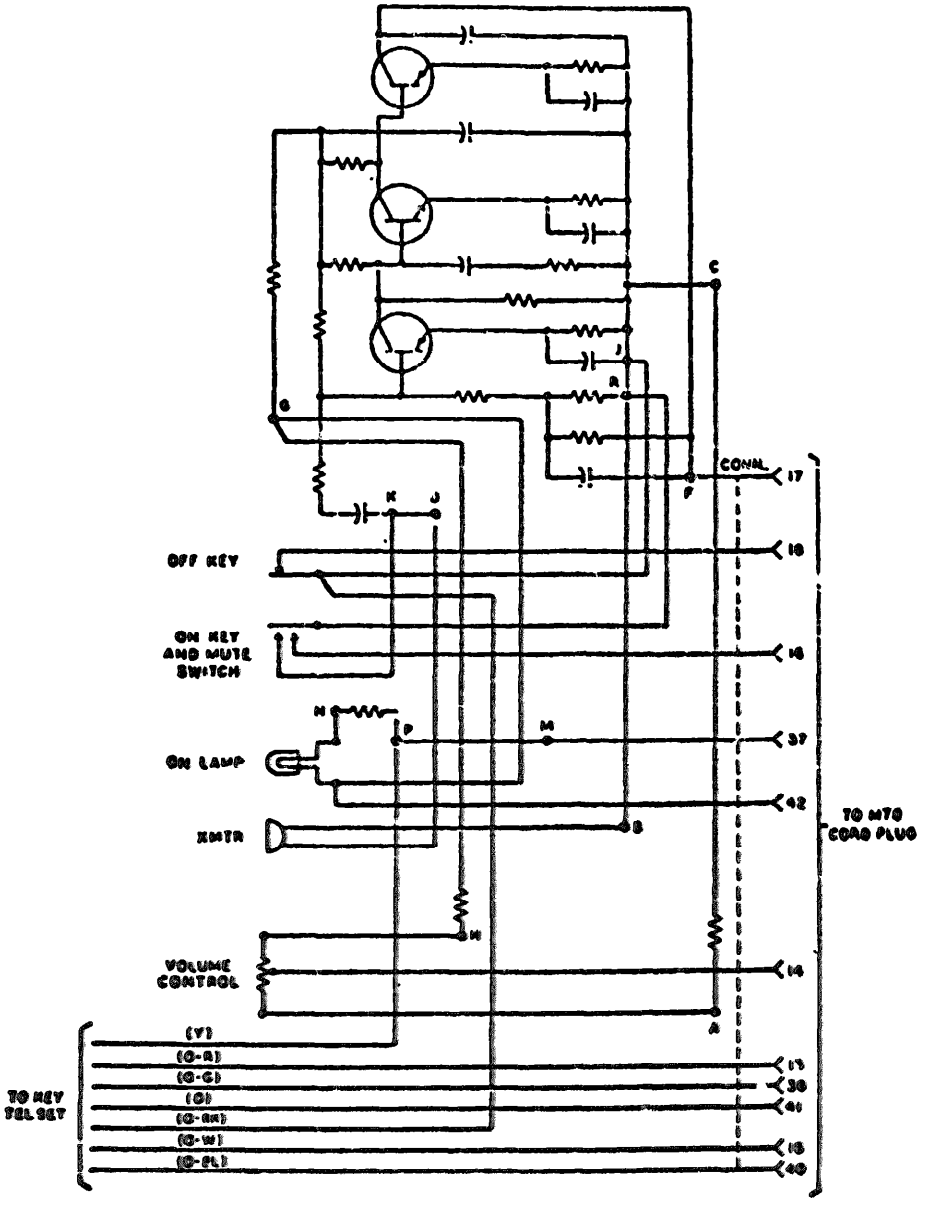


Figure 3- NE-567AN Transmitter Unit

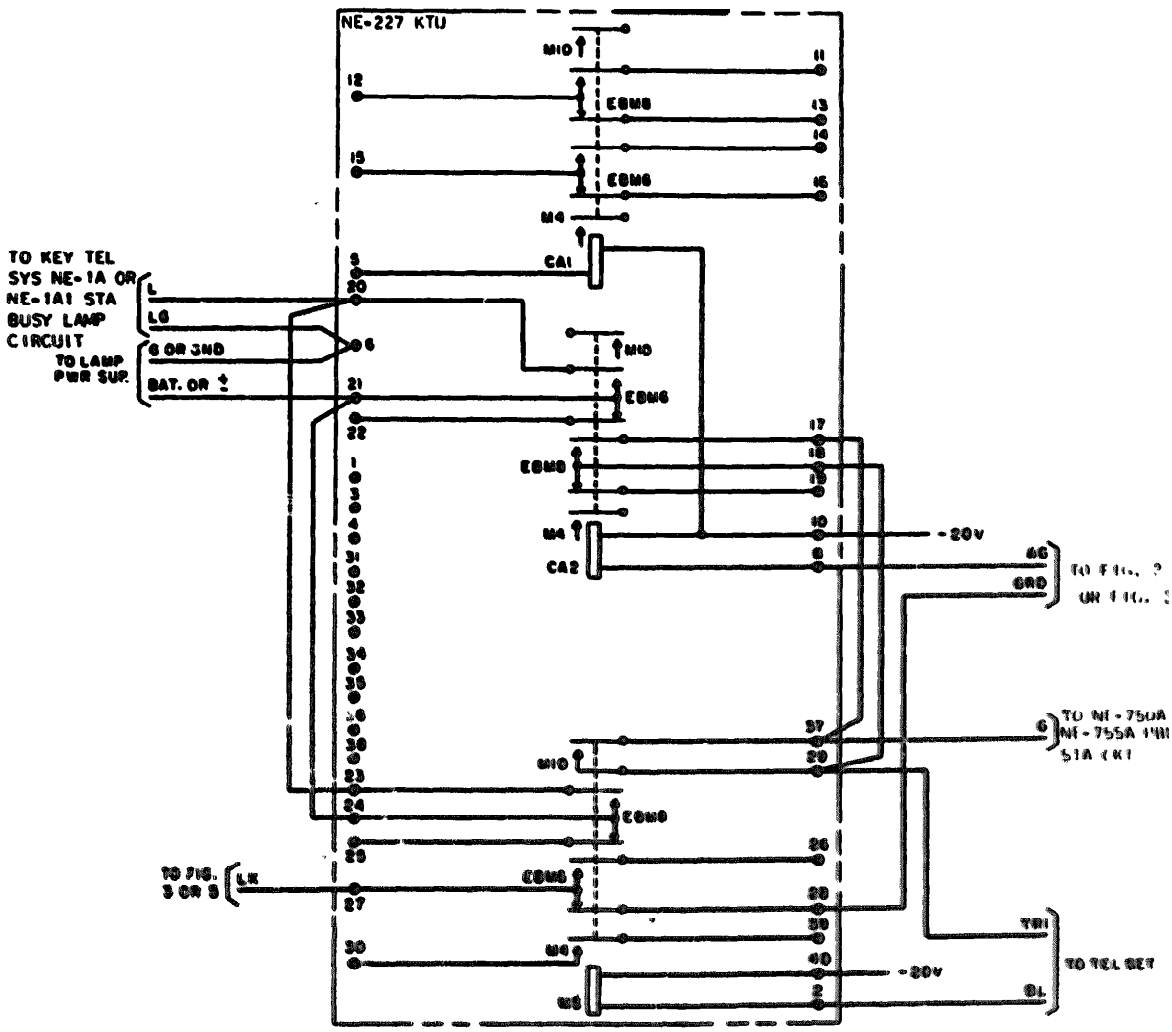
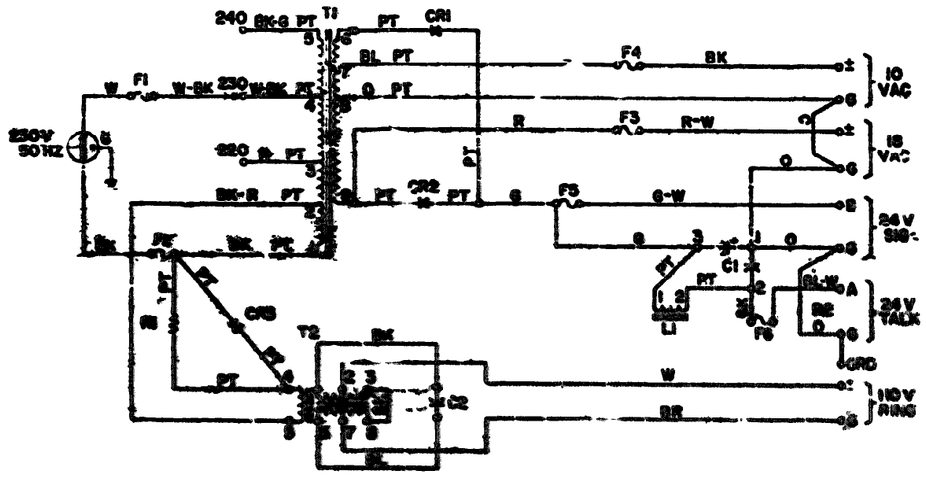


Fig. 8- Auxiliary Relay Circuit for Use With NE-758A or NE-755A PBX

FOR CURRENT ISSUE OF LABEL SEE DWG LIBRARY

RT3J50 POWER SUPPLY



MANUFACTURING NOTES:

1. ALL WIRES SHALL BE 20GA STRANDED UNLESS OTHERWISE SPECIFIED.
2. PT - LEADS FURNISHED WITH COMPONENTS OR SUB-ASSEMBLIES

ENGINEERING NOTES:

S1. AS TERMINAL TO TERMINAL CONNECTIONS, WIRE SIZES AND COLORS, AND PART NUMBERS ARE SHOWN ON THIS SCHEMATIC, THERE IS NO SEPARATE WIRING DIAGRAM DRAWING.

S2. CHASSIS, C2 CASE, T1 AND T2 CORES ARE ELECTRICALLY CONNECTED TO INPUT GROUND PIN.

DESIG.	PART NO.	APPARATUS
C1	2734-187	2000/2000 uF 30 VDC CAP
C2	2714-537	1.0 uF 460 VAC CAP
CR1	2812-321	DIODE
CR2	2812-321	DIODE
F1	2484-225	1 AMP FUSE
F2	2484-225	1 AMP FUSE
F3	2483-664	2 AMP FUSE
F4	2483-668	.5 AMP FUSE
F5	2483-664	2 AMP FUSE
F6	2483-664	2 AMP FUSE
L1	4423-024	FILTER CHOKE
R1	2815-279	4700 OHM 1/2 WATT RES
T1	4447-614	TRANSFORMER
T2	4537-009	TRANSACTOR
CR3	2812-310	DIODE

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SD-5742-008 LABEL PT NO. 31[illegible]38

REPLACE TO [illegible]

CIRCUIT LABEL FOR RT3J50 POWER SUPPLY

SD-5742-008

APPENDIX A

REFERENCES

Following is a list of references applicable to the AN/FTC-37(V)1 and the AN/FTC-37(V)2.

AR 55-38	REPORTING OF Transportation Discrepancies in Shipments.
AR 380-5	Department of the Amy Information Security Program.
AR 700-58	**Reporting of Packaging and Handling Deficiencies.**
DA PAM 310-4	**Index of Technical Manuals, Technical Bulletins,** Supply Manuals **(Types 7, 8, and 9), Supply Bulletins, and Lubrication Orders.**
DA Pam 310-7	**US Army Equipment Index of Modification Work Orders.**
MIL-P-116	**Preservation, Packaging, Methods of.**
SB 38-100	**Preservation, Packaging, Packing, and Marking Materiels, Supplies, and Equipment Used by the Army.**
TB SIG 291	**Safety Measures To Be Observed When Installing and Using Whip Antennas, Field Type Masts, Towers, Antennas, and Metal Poles That Are Used with Communication, Radar, and Direction Finder Equipment.**
TM 11-5805-652-24P	**Organizational, Direct Support and General Support Maintenance Repair Parts and Special Tools Lists (Including Depot Maintenance Repair Parts and Special Tools) for Central Office, Telephone, Electronic AN/FTC-37(V)1 (FSN 5805-155-8029), AN/FTC-37(V)2 (FSN 5805-134-8419), and Associated Equipment.**
TM 38-750	**The Army Maintenance Management System (TAMMS).**
TM 740-90-1	**Administrative Storage of Equipment.**

APPENDIX B
MAINTENANCE ALLOCATION

Section I. INTRODUCTION

B-1. General

This appendix provides a summary of the maintenance operations covered in the equipment literature. It authorizes categories of maintenance for specific maintenance functions on repairable items and components and the tools and equipment required to perform each function. This appendix may be used as an aid in planning maintenance operations.

B-2. Maintenance Functions

Maintenance functions will be limited to and defined as follows:

a. Inspect. **To determine the serviceability of an item by comparing its physical, mechanical, and/or electrical characteristics with established standards through examination.**

b. Test. **To verify serviceability and to detect incipient failure by measuring the mechanical or electrical characteristics of an item and comparing those characteristics with prescribed standards.**

c. Service. **Operations required periodically to keep an item in proper operating condition, i.e., to clean, preserve, drain, paint, or to replenish fuel/lubricants/hydraulic fluids or compressed air supplies.**

d. Adjust. **Maintain within prescribed limits by bringing into proper or exact position, or by setting the operating characteristics to the specified parameters.**

e. Align. **To adjust specified variable elements of an item to about optimum or desired performance.**

f. Calibrate. **To determine and cause corrections to be made or to be adjusted on instruments or test measuring and diagnostic equipment used in precision measurement. Consists of the comparison of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.**

g. Install. **The act of emplacing, seating, or fixing into position an item, part, module (component or assembly) in a manner to allow the proper functioning of the equipment/system.**

h. Replace. **The act of substituting a serviceable like-type part, subassembly, module (component or assembly) in a manner to allow the proper functioning of an equipment/system.**

i. Repair. **The application of maintenance services (inspect, test, service, adjust, align, calibrate, replace) or other maintenance actions (welding, grinding, riveting, straightening, facing, remachining, or resurfacing) to restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module/component/assembly, end item or system.**

j. Overhaul. **That maintenance effort (service/action) necessary to restore an item to a completely serviceable/operational condition as prescribed by maintenance standards (e.g., DMWR) in pertinent technical manuals. Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like-new condition.**

k. Rebuild. **Consists of those services/actions necessary for the restoration of unserviceable equipment to a like-new condition in accordance with original manufacturing standards. Rebuild is the highest degree of materiel maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (hours, miles, etc.) considered in classifying Army equipment/components.**

l. Symbols. **The uppercase letter placed in the appropriate column indicates the lowest level at which that particular maintenance function is to be performed.**

B-3. Explanation of Format

a. Group Number. **Column 1 lists group numbers, the purpose of which is to match components, assemblies, subassemblies and modules with the next higher assembly.**

b. Functional ***Group.*** Column 2 lists the next higher assembly group and the item names of components, assemblies, subassemblies and modules within the group for which maintenance is authorized.

c. Maintenance Functions. Column 3 lists the twelve maintenance functions defined in B-2 above. Each maintenance function required for an item is specified by the symbol among those listed in d below which indicates the level responsible for the required maintenance. Under this symbol is listed an appropriate work measurement time value determined as indicated in e below.

d. Use of Symbols. The following symbols are used to prescribe work function responsibility:

C-Operator/Crew
O-Organization
F-Direct Support
H—General Support
D—Depot

e. Work Measurement Time. **The active repair time required to perform the maintenance function is included directly below the symbol identifying the category of maintenance. The skill levels used to obtain the measurement times approximate those found in typical TOE units. Active repair time is the average aggregate time required to restore an item (subassembly, assembly, component, module, end item or system) to a serviceable condition under typical field operating conditions. This time includes** preparation time, fault isolation/diagnostic time, and QA/QC time in addition to the time required to perform specific maintenance functions identified for the tasks authorized in the maintenance allocation chart. This time is expressed in man-hours and carried to one decimal place (tenths of hours).

f. Tools ***and*** Test Equipment. This column is used to specify, by code, those tools and test equipment required to perform the designated function.

g. Remarks. Self-explanatory.

B-4. Explanation of Format of Table 1, Tool and Test Equipment Requirements

The columns in Table I, Tool and Test Equipment Requirements, are as follows:

a. Tools and Equipment. **The numbers in this column coincide with the numbers used in the tools and equipment column of the applicable tool for the maintenance function.**

b. Maintenance Category. **The codes in this column indicate the maintenance category normally allocated the facility.**

c. Nomenclature. **This column lists tools, test, and maintenance equipment required to perform the maintenance functions.**

d. Federal Stock Number. **This column lists the Federal stock number of the specific tool or test equipment.**

e. Tool Number. **Not used.**

SECTION II. MAINTENANCE ALLOCATION CHART

(1) GROUP NUMBER	(2) FUNCTIONAL GROUP COMPONENT ASSEMBLY NOMENCLATURE	(3) MAINTENANCE FUNCTIONS											(4) TOOLS AND EQUIPMENT	(5) REMARKS
		INSPECT	TEST	SERVICE	ADJUST	ALIGN	CALIBRATE	INSTALL	REPLACE	REPAIR	OVERHAUL	REBUILD		
A	AN/FGC-37(V)1 AND AN/FGC-37(V)2	O 1.5	H 2.0	O 0.5	H 1.0					H 5.5			1 2 thru 15 1 2 thru 11 2 thru 15	Replace fuses, lamps
A1	LINE CRT AND MATRIX SWITCHING GROUP OA-8721/FTC-37(V), OA-8658/FTC-37(V)	O 1 0	H 1.5	O 0.3	H 0.8					H 4.1			1 2 thru 15 1 2 thru 11 2 thru 15	Replace fuses, lamps
A1a	CIRCUIT CARD ASSEMBLIES		H 0.5					H 0.1	H 0.1	H 1.0			2 thru 8, 11 2 2 2,3,4,11	
A1b	PRI-SEC MATRIX ASSEMBLIES		H 0.5					H 0.1	H 0.1	H 1.0			2 thru 8, 11 2 2 2,3,4,11	
A1c	TERTIARY-QUARTERNARY MATRIX ASSEMBLIES		H 0.5					H 0.1	H 0.1				2 thru 8, 11 2 2	

SECTION II. MAINTENANCE. ALLOCATION CHART

(1) GROUP NUMBER	(2) FUNCTIONAL GROUP COMPONENT ASSEMBLY NOMENCLATURE	(3) MAINTENANCE FUNCTIONS											(4) TOOLS AND EQUIPMENT	(5) REMARKS
		INSPECT	TEST	SERVICE	ADJUST	ALIGN	CALIBRATE	INSTALL	REPLACE	REPAIR	OVERHAUL	REBUILD		
A1d	FUSE PANEL ASSEMBLY		H 0.2					H 0.1	H 0.1	H 1.0 H 0.4			2,3,4,11 2,3 2 2 2,3	
A1e	MODULE SUB-ASSEMBLY		H 0.5					H 0.5	H 0.7	H 1.3			2,3,4 2 2 2,3,4	
A1f	POWER SUPPLY ASSEMBLIES		H 0.5					H 0.7	H 1.0	H 2.0			2,3,4 2 2 2,3,4	
A1g	REGISTER ASSEMBLIES		H 0.5					H 0.1	H 0.1	H 1.0			2 thru 6, 11 2 2 2 thru 6, 11	
A1j	MISC. PANEL ASSEMBLIES		H 0.5	O 0.2				H 0.3					2,3,4 1 2	Replaceable fuses

SECTION II. MAINTENANCE ALLOCATION CHART

(1) GROUP NUMBER	(2) FUNCTIONAL GROUP COMPONENT ASSEMBLY NOMENCLATURE	(3) MAINTENANCE FUNCTIONS											(4) TOOLS AND EQUIPMENT	(5) REMARKS
		INSPECT	TEST	SERVICE	ADJUST	ALIGN	CALIBRATE	INSTALL	REPLACE	REPAIR	OVERHAUL	REBUILD		
									H 0.5				2	
										H 1.2			2,3,4	
A1i	SUB-RACK ASSEMBLIES	H 0.3											1	
								H 0.5					2	
									H 0.7				2	
										H 1.3			2,3,4	
A1j	CABINET ASSEMBLIES	O 0.3											1	
				O 0.3									1	
										H 0.5			1	
A2	LINE CKT AND SWITCHING GROUP OA-8659/FTC-37(V)	O 1.0											1	
			H 1.5										2 thru 15	
				O 0.3									1	Replace fuses, lamps
					H 0.8								2 thru 11	
										H 4.1			2 thru 15	
A2a	CIRCUIT CARD ASSEMBLIES		H 0.5										2 thru 8, 11	
								H 0.1					2	
									H 0.1				2	
										H 1.0			2 thru 8, 11	
A2b	POWER SUPPLY ASSEMBLIES		H 0.5										2,3,4	
								H 0.3					2	

SECTION II. MAINTENANCE ALLOCATION CHART

(1) GROUP NUMBER	(2) FUNCTIONAL GROUP COMPONENT ASSEMBLY NOMENCLATURE	(3) MAINTENANCE FUNCTIONS											(4) TOOLS AND EQUIPMENT	(5) REMARKS
		INSPECT	TEST	SERVICE	ADJUST	ALIGN	CALIBRATE	INSTALL	REPLACE	REPAIR	OVERHAUL	REBUILD		
									H 0.5				2	
										H 1.2			2,3,4	
A2c	MISC PANEL ASSEMBLY		H 0.5										2,3,4	
				O 0.2									1	Replace fuses, lamps
								H 0.3					2	
									H 0.5				2	
										H 1.2			2,3 4	
A2d	SUB-RACK ASSEMBLIES	H 0.3											1	
								H 0.5					2	
									H 0.7				2	
										H 1.3			?,3,4	
A3	POWER SUPPLY GROUP OP-83/FTC-37(V)	O 0.5											1	
			H 0.5										2 thru 8	
				O 0.3									1	Replace fuses, lamp
					H 0.3								2 thru 8	
										H 1.8			2 thru 8	
A3a	MISC PANEL ASSEMBLY		H 0.5										2,3,4	
				O 0.2									1	Replace fuses
								H 0.3					2	
									H 0.5				2	
										H 1.2			2,3,4	

SECTION II. MAINTENANCE ALLOCATION CHART

(1) GROUP NUMBER	(2) FUNCTIONAL GROUP COMPONENT ASSEMBLY NOMENCLATURE	(3) MAINTENANCE FUNCTIONS											(4) TOOLS AND EQUIPMENT	(5) REMARKS
		INSPECT	TEST	SERVICE	ADJUST	ALIGN	CALIBRATE	INSTALL	REPLACE	REPAIR	OVERHAUL	REBUILD		
A 4	POWER SUPPLY GROUP OP-71/FTC-37(V)	O 0.5											1	
			H 0.5										2 thru 8	
				O 0.3									1	Replace fuses, lamps
					H 0.3								2 thru 8	
										H 1.8			2 thru 8	
A4a	MISC PANEL ASSEMBLY		H 0.5										2,3,4	
				O 0.2									1	Replace fuse, lamps
								H 0.3					2	
									H 0.5				2	
										H 1.2			2,3,4	
A5	CONTROL-MONITOR C-9263/FTC	O 0.3											1	
			H 0.5										2,3,4,9,11	
				O 0.2									1	Replace lamps/caps
									H 1.5				2	
										H 1.5			2,3,4,9,11	
A5a	KEY ASSEMBLIES			O 0.2									1	Replace lamps
								H 0.3					2	
									H 0.5				2	
										H 1.0			2,3,4,11	
A5b	CIRCUIT CARD ASSEMBLY		H 0.5										2 thru 8, 11	
								H 0.1					2	

SECTION II. MAINTENANCE ALLOCATION CHART

(1) GROUP NUMBER	(2) FUNCTIONAL GROUP COMPONENT ASSEMBLY NOMENCLATURE	(3) MAINTENANCE FUNCTIONS											(4) TOOLS AND EQUIPMENT	(5) REMARKS
		INSPECT	TEST	SERVICE	ADJUST	ALIGN	CALIBRATE	INSTALL	REPLACE	REPAIR	OVERHAUL	REBUILD		
A5c	PANEL ASSEMBLY		H 0.3					H 0.4	H 0.1 H 0.4	H 1.0 H 0.8			2 2 thru c, .: 2,3 2 2 2,3	
A6	CONTROL MONITOR C-8958/FTC	O 0.3	H 0.5	O 0.>									1 2,3,4,9,11 1	Replace lamps/caps
A6a	CIRCUIT CARD ASSEMBLIES		H 0.5					H 0.1	H 1.5 H 0.1	H 1.5 H 1.0			2 2,3,4,9,11 2 thru 8, 11 2 2 2 thru 8, 11	
B	ASSOCIATED EQUIPT													
B1	CONTROL UNIT ASSEMBLY	O 0.3	H 0.8							H 1.5			1 2 thru 11 2 thru 8	
B1a	CIRCUIT CARD ASSEMBLIES		H 0.5										2 thru 8, 11	

SECTION II. MAINTENANCE ALLOCATION CHART

(1) GROUP NUMBER	(2) FUNCTIONAL GROUP COMPONENT ASSEMBLY NOMENCLATURE	(3) MAINTENANCE FUNCTIONS											(4) TOOLS AND EQUIPMENT	(5) REMARKS
		INSPECT	TEST	SERVICE	ADJUST	ALIGN	CALIBRATE	INSTALL	REPLACE	REPAIR	OVERHAUL	REBUILD		
								H 0.1					2	
									H 0.1				2	
										H 1.0			2 thru 8, 11	
B 2	TRANSMITTER		H 0.3										2,3,4,11	
										H 0.6			2,3,4,11	
B2a	CIRCUIT CARD ASSEMBLY		H 0.5										2,3,4,11	
								H 0.3					2	
									H 0.5				2	
										H 1.3			2,3,4,11	
B3	KEY SERVICE UNITS		H 0.5										2,3,12 thru 15	
										H 0.8			2,3	
B3a	POWER SUPPLY		H 0.3										2,3,4	
				O 0.3									1	Replace fuses
								H 0.3					2	
									N 0.5				2	
										H 1.0			2,3,4	
B3b	KEY TELEPHONE UNITS		H 0.5										2 thru 8, 11	
								H 0.1					2	
									N 0.1				2	
										N 1.0			2 thru 8, 11	

SECTION II. MAINTENANCE ALLOCATION CHART

(1) GROUP NUMBER	(2) FUNCTIONAL GROUP COMPONENT ASSEMBLY NOMENCLATURE	(3) MAINTENANCE FUNCTIONS											(4) TOOLS AND EQUIPMENT	(5) REMARKS
		INSPECT	TEST	SERVICE	ADJUST	ALIGN	CALIBRATE	INSTALL	REPLACE	REPAIR	OVERHAUL	REBUILD		
B4	LOUDSPEAKER	O 0.3	H 0.3										1 2,3,11	
B5	TRANSFORMER, POWER (STEP-DOWN)		H 0.3					H 0.1	H 0.1				2,3	
B6	TELEPHONE SET, 11 KEY		H 0.3							H 0.5			2,3,4,11 2,3,4,11	

TABLE I. TOOL AND TEST EQUIPMENT REQUIREMENTS

TOOLS AND EQUIPMENT	MAINTENANCE CATEGORY	NOMENCLATURE	FEDERAL STOCK NUMBER	TOOL NUMBER
1	O	TOOL KIT, ELECTRONIC EQUIPMENT TK-101/G	5180-064-5178	
2	H	TOOL KIT, ELECTRONIC EQUIPMENT TK-105/G	5180-610-8177	
3	H,D	MULTIMETER AN/USM-210	6625-019-0815	
4	H,D	OSCILLOSCOPE HP-120B	6625-860-2400	
5	H,D	CARD EXTENDER, ITT NO. 130587-1		
6	H,D	CARD EXTENDER, ITT NO. 130587-2		
7	H,D	CARD EXTENDER, ITT NO. 130587-3		
8	H,D	CARD EXTENDER, ITT NO. 130680-1		
9	H,D	HAND TEST TELEPHONE, AUTOMATIC ELEC. L-9066-CF		
10	H,D	CORD AND PLUG ASSY, AUTOMATIC ELEC D-543142-A		
11	H,D	AUDIO FREQUENCY GENERATOR TS-421C	6625-669-0228	
12	H	WIRE WRAP TOOL, GARDNER-DENVER P/N 14H-1C	5120-978-3493	
13	H	BIT, GARDNER-DENVER P/N 500131	5120-919-3478	
14	H	SLEEVE, GARDNER-DENVER P/N 18840	5130-987-7057	
15	H	WIRE UNWRAP TOOL, GARDNER DENVER P/N A-31478	5120-897-7518	

By Order of the Secretary of the Army:

FRED C. WEYAND
General, ***United States Army***
Acting Chief of Staff

Official:

VERNE L. BOWERS
Major General, United States Army
The Adjutant General

Distribution:

Active *Army*
CNGB (1)
TSG (1)
USAMB (2)
USAARENBD (10)
USASA (1)
TRADOC (2)
AMC (1)
MICOM (1)
TECOM (2)
ABADCOM (2)
ARADCOM Rgn (1)
OS Maj Comd (2)
USACC (2)
HISA (Ft Monmouth) (18)
Armies (1)
USASESS (5)
Svc College (1)
NG: None
USAR: None
For explanation of abbreviations used, see AR 310-50.

Fort Huachuca (5)
WSMR (1)
Fort Carson (5)
USAERDAA (1)
USAERDAW (1)
Army Dep (1) except
LBAD (10)
SAAD (15)
TOAD (14)
ATAD (10)
USA Dep (1)
Sig Sec USA Dep (2)
Sig Dep (2)
Sig FLDMS (1)
Ft Richardson (ECOM Ofc) (1)
Units org under fol TOE:
29-134 (1)
29-136 (1)

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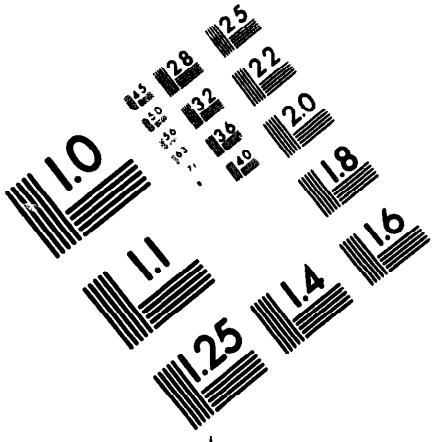
END

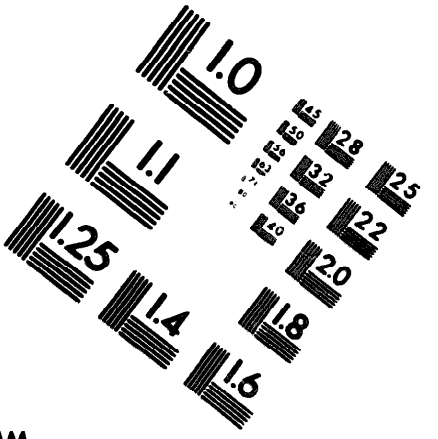
DATE

11-10-82

DEPARTMENT OF THE ARMY

MICROFORM
TEST TARGET





150 MM

10 mm e= 81 mm

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abcdefghijklmnopqrstuvwxyz$¢£ %# ½ ¼ ¾ —=+×&@*

15 mm (e= 1.09 mm)

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abcdefghijklmnopqrstuvwxyz$¢£/%# ½ ¼ ¾ —=+×&@*

20 mm (e= 1.37 mm)

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2.5 mm (e= 1.77 mm)

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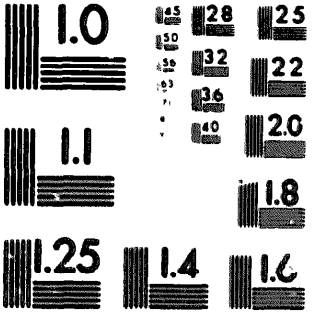

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2.5 mm (e= 1.77 mm)

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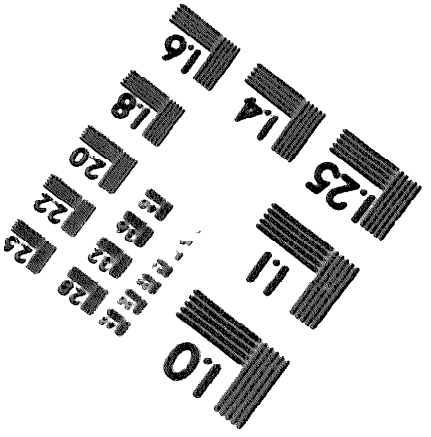

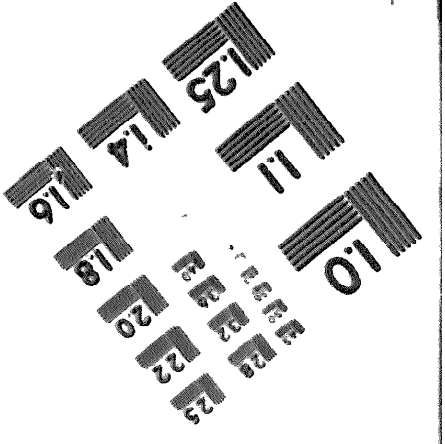

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