

# ROLM<sup>®</sup>

## CBX II 8000

### System Service Manual Volume II

#### January 1983

Change Package 2 – July 1983  
Change Package 3 – September 1983  
Change Package 4 – December 1983  
Change Package 5 – March 1984  
Change Package 6 – August 1984  
Change Package 7 – April 1985

**ROLM**  
an IBM company

4900 Old Ironsides Drive  
Santa Clara, CA 95054  
(408) 986-1000  
TWX: 9103387350 ROLM SNTA B  
TELEX: 278156 ROLM UR

#### NOTICE

This document contains proprietary information and may not be reproduced in any form without the express written consent of ROLM Corporation.

## List of Effective Pages

| Page No.            | Change No.* | Page No.        | Change No.* | Page No.          | Change No.* |
|---------------------|-------------|-----------------|-------------|-------------------|-------------|
| Title Page – xxviii | 7           | 10-56           | 0           | 12-22             | 0           |
| 8-1                 | 0           | 10-57           | 7           | 12-23 – 12-24     | 5           |
| 8-2                 | 5           | 10-58 – 10-59   | 0           | 12-25 – 12-27     | 4           |
| 8-3 – 8-12          | 0           | 10-60 – 10-60b  | 2           | 12-28             | 0           |
| 8-13 – 8-16b        | 2           | 10-61           | 0           | 12-28a            | 5           |
| 8-17 – 8-26         | 0           | 10-62           | 2           | 12-29 – 12-33     | 0           |
| 8-26a – 8-26h       | 4           | 10-63 – 10-64   | 0           | 12-34             | 4           |
| 8-27                | 0           | 10-65           | 2           | 12-35             | 0           |
| 8-28 – 8-33         | 5           | 10-66 – 10-68   | 0           | 12-36             | 4           |
| 8-34 – 8-39         | 0           | 10-69 – 10-72   | 2           | 12-37 – 12-38     | 2           |
| 8-40 – 8-40b        | 2           | 10-73 – 10-75   | 6           | 12-39             | 6           |
| 8-41                | 0           | 10-76 – 10-78   | 5           | 12-40             | 0           |
| 8-42                | 5           | 10-79           | 2           | 12-41 – 12-44     | 3           |
| 8-43                | 2           | 10-80           | 7           | 12-45 – 12-46     | 0           |
| 8-44 – 8-48         | 0           | 10-80a          | 2           | 12-47             | 7           |
| 8-49                | 2           | 10-81           | 2           | 12-48 – 12-49     | 0           |
| 8-50 – 8-51         | 4           | 10-82           | 0           | 12-50 – 12-51     | 4           |
| 9-1                 | 3           | 10-82a          | 7           | 12-52             | 7           |
| 9-2 – 9-19          | 0           | 10-83 – 10-84   | 0           | 12-53             | 4           |
| 10-1 – 10-7         | 0           | 10-85 – 10-86b  | 2           | 12-54             | 0           |
| 10-8                | 6           | 10-87           | 0           | 12-55             | 4           |
| 10-8a – 10-8b       | 2           | 10-88 – 10-89   | 2           | 12-56 – 12-66     | 0           |
| 10-9                | 0           | 11-1 – 11-2     | 0           | 12-67 – 12-69     | 6           |
| 10-10               | 6           | 11-3 – 11-4     | 2           | 12-70             | 3           |
| 10-11 – 10-12       | 2           | 11-5 – 11-27    | 0           | 12-71 – 12-103    | 0           |
| 10-13 – 10-14       | 0           | 12-1 – 12-2     | 4           | 12-104            | 7           |
| 10-15               | 2           | 12-2a – 12-2f   | 2           | 12-105            | 0           |
| 10-16               | 0           | 12-3 – 12-6f    | 4           | 12-106            | 2           |
| 10-17 – 10-18       | 2           | 12-7            | 4           | 12-107            | 0           |
| 10-19 – 10-26       | 0           | 12-8            | 0           | 12-108 – 12-109   | 2           |
| 10-27 – 10-28       | 6           | 12-8a           | 4           | 12-110            | 5           |
| 10-29               | 4           | 12-9            | 6           | 12-110a – 12-110d | 2           |
| 10-30 – 10-33       | 0           | 12-10           | 2           | i – xiv           | 7           |
| 10-34               | 2           | 12-10a – 12-10b | 4           | 13-1 – 13-6       | 0           |
| 10-35 – 10-37       | 0           | 12-11 – 12-13   | 0           | 13-7              | 1           |
| 10-38 – 10-40b      | 2           | 12-14 – 12-14a  | 4           | 13-8 – 13-13      | 0           |
| 10-41 – 10-46       | 0           | 12-15 – 12-16   | 0           | 13-14             | 5           |
| 10-47               | 4           | 12-17 – 12-18   | 2           | 13-15 – 13-16     | 2           |
| 10-48 – 10-52       | 0           | 12-19 – 12-20   | 0           | 13-17             | 0           |
| 10-53 – 10-55       | 2           | 12-21           | 2           | 13-18 – 13-18b    | 3           |

Dates of issue for original and changed pages are:

Original January 1983  
CHANGE 1 March 1983  
CHANGE 2 July 1983  
CHANGE 3 September 1983  
CHANGE 4 December 1983  
CHANGE 5 March 1984  
CHANGE 6 August 1984  
CHANGE 7 April 1985

\*Zero in this column indicates an original page.  
The portion of the text affected by the changes is indicated by a vertical line in the outer margin of the page.

## List of Effective Pages (Continued)

| Page No.        | Change No.* | Page No.           | Change No.* | Page No.          | Change No.* |
|-----------------|-------------|--------------------|-------------|-------------------|-------------|
| 13-19           | 0           | 13-75 - 13-76b     | 2           | 13-174a - 13-174b | 2           |
| 13-20 - 13-20b  | 3           | 13-77 - 13-78      | 0           | 13-175 - 13-177   | 0           |
| 13-21           | 5           | 13-79 - 13-82      | 2           | 13-178            | 4           |
| 13-22           | 0           | 13-82a - 13-82b    | 1           | 13-179 - 13-180   | 0           |
| 13-23           | 2           | 13-83              | 0           | 13-181 - 13-182   | 4           |
| 13-24           | 7           | 13-84              | 2           | 13-183            | 0           |
| 13-25           | 0           | 13-85              | 0           | 13-184 - 184c     | 4           |
| 13-26 - 13-26a  | 7           | 13-86 - 13-87      | 2           | 13-185 - 13-186b  | 4           |
| 13-27           | 4           | 13-88 - 13-92      | 0           | 13-187 - 13-188a  | 4           |
| 13-28 - 13-29   | 0           | 13-93 - 13-95      | 7           | 13-189 - 13-190b  | 4           |
| 13-30           | 7           | 13-96 - 13-97      | 2           | 13-190c           | 7           |
| 13-30a          | 4           | 13-98 - 13-98x     | 7           | 13-190d - 13-190j | 4           |
| 13-31 - 13-32   | 1           | 13-99 - 13-100b    | 4           | 13-191 - 13-193   | 0           |
| 13-32a - 13-32b | 4           | 13-101             | 0           | 13-194 - 13-194a  | 4           |
| 13-33           | 4           | 13-102 - 13-102b   | 2           | 13-195 - 13-196a  | 4           |
| 13-34           | 7           | 13-102c - 13-102d  | 7           | 13-197            | 2           |
| 13-35           | 0           | 13-102e - 13-102ad | 2           | 13-198 - 13-203   | 0           |
| 13-36 - 13-36b  | 4           | 13-103 - 13-104    | 7           | 13-204            | 2           |
| 13-37           | 4           | 13-105 - 13-106    | 0           | 13-205 - 13-206   | 0           |
| 13-38 - 13-38a  | 7           | 13-107 - 13-108b   | 2           | 13-207 - 13-208   | 2           |
| 13-39           | 4           | 13-109             | 0           | 13-209            | 0           |
| 13-40 - 13-43   | 0           | 13-110             | 4           | 13-210 - 13-211   | 2           |
| 13-44           | 4           | 13-111             | 2           | 13-212 - 13-214   | 0           |
| 13-44a -        | 6           | 13-112             | 4           | 13-215            | 2           |
| 13-44b          | 4           | 13-113             | 0           | 13-216 - 13-219   | 0           |
| 13-44c - 13-44e | 7           | 13-114             | 2           | 13-220 - 13-221   | 2           |
| 13-45 - 13-46a  | 4           | 13-115 - 13-116    | 1           | 13-222            | 0           |
| 13-47 - 13-48a  | 7           | 13-117 - 13-118    | 2           | 13-223            | 2           |
| 13-49           | 4           | 13-119             | 4           | 13-224 - 13-228   | 0           |
| 13-50           | 0           | 13-120             | 0           | 13-229 - 13-230o  | 7           |
| 13-51           | 7           | 13-121 - 13-122    | 4           | 13-231            | 0           |
| 13-52           | 1           | 13-122a - 13-122b  | 6           | 13-232            | 5           |
| 13-52a - 13-52b | 2           | 13-123 - 13-125    | 0           | 13-233            | 0           |
| 13-53           | 5           | 13-126 - 13-132e   | 6           | 13-234 - 13-235   | 2           |
| 13-54           | 2           | 13-133 - 13-134    | 2           | 13-236 - 13-237   | 0           |
| 13-55           | 0           | 13-135 - 13-138    | 0           | 13-238            | 2           |
| 13-56 - 13-57   | 6           | 13-139 - 13-140b   | 2           | 13-239 - 13-241   | 0           |
| 13-58           | 2           | 13-141 - 13-143    | 0           | 13-242 - 13-243   | 2           |
| 13-59           | 6           | 13-144             | 2           | 13-244            | 0           |
| 13-60           | 2           | 13-145 - 13-150    | 0           | 13-245            | 2           |
| 13-60a          | 1           | 13-151             | 6           | 13-246 - 13-251   | 0           |
| 13-60b          | 2           | 13-152 - 13-153    | 0           | 13-252            | 2           |
| 13-60c - 13-50d | 1           | 13-154             | 6           | 13-253            | 4           |
| 13-61           | 2           | 13-155 - 13-158    | 0           | 12-254 - 13-254b  | 2           |
| 13-62           | 0           | 13-159 - 13-160    | 2           | 13-255 - 13-258   | 0           |
| 13-63           | 2           | 13-161 - 13-168a   | 7           | 13-259 - 13-303   | 7           |
| 13-64 - 13-65   | 7           | 13-168b            | 2           | A-1 - A-23        | 2           |
| 13-66 - 13-67   | 2           | 13-169             | 2           | B-1 - B-33        | 2           |
| 13-68           | 0           | 13-170 - 13-171    | 0           | I-1 - I-2         | 0           |
| 13-69 - 13-72b  | 2           | 13-172 - 13-174    | 4           | I-3 - I-42        | 7           |
| 13-73 - 13-74   | 0           |                    |             |                   |             |





## CONTENTS

| Title                                                                        | Page  |
|------------------------------------------------------------------------------|-------|
| CHAPTER 1. INTRODUCTION                                                      |       |
| 1.1 INTRODUCTION . . . . .                                                   | 1-1   |
| 1.2 READER COMMENT FORM . . . . .                                            | 1-2   |
| 1.3 CHANGE PACKAGES . . . . .                                                | 1-2   |
| 1.4 RELATED DOCUMENTS . . . . .                                              | 1-2   |
| 1.5 SAFETY . . . . .                                                         | 1-3   |
| 1.6 SYSTEM OVERVIEW . . . . .                                                | 1-3   |
| 1.7 EQUIPMENT CABINET STRUCTURE AND CONFIGURATION . . . . .                  | 1-3   |
| 1.7.1 8000 Computer Groups . . . . .                                         | 1-7   |
| 1.7.1A 7000 Computer Groups . . . . .                                        | 1-8c  |
| 1.7.2 Critical Electronics and Telephony Groups . . . . .                    | 1-11  |
| 1.7.3 Power Supply and Power Distribution System . . . . .                   | 1-19  |
| 1.7.4 SAP . . . . .                                                          | 1-22  |
| 1.7.5 Cabinet Ventilation Equipment . . . . .                                | 1-22  |
| 1.8 PERIPHERAL EQUIPMENT . . . . .                                           | 1-25  |
| 1.8.1 ATC . . . . .                                                          | 1-25  |
| 1.8.2 Integral Floppy Disk System . . . . .                                  | 1-25  |
| 1.8.3 Magnetic Tape System . . . . .                                         | 1-28  |
| 1.8.4 Magnetic Cartridge System . . . . .                                    | 1-28  |
| 1.8.5 Station Equipment . . . . .                                            | 1-30  |
| 1.8.6 Service Equipment . . . . .                                            | 1-32  |
| 1.8.7 Plant Wiring Equipment . . . . .                                       | 1-34  |
| 1.9 SPECIFICATIONS . . . . .                                                 | 1-34  |
| 1.10 SYSTEM FEATURES AND OPTIONS . . . . .                                   | 1-37  |
| 1.10.1 Class of Service . . . . .                                            | 1-37  |
| 1.10.2 Direct Inward System Access<br>(Release 6 and Above Option) . . . . . | 1-38  |
| 1.10.3 DISA II (Release 5 and Above) . . . . .                               | 1-38  |
| 1.10.4 Night Service . . . . .                                               | 1-38  |
| 1.10.5 System Forwarding (Option) . . . . .                                  | 1-38  |
| 1.10.6 Hunt Groups . . . . .                                                 | 1-38a |
| 1.10.7 Distribution Groups . . . . .                                         | 1-38a |
| 1.10.8 Communication Line Service . . . . .                                  | 1-39  |
| 1.10.9 Secretarial Intercept . . . . .                                       | 1-39  |
| 1.10.10 Automatic Call Intercept . . . . .                                   | 1-39  |
| 1.10.11 Recorded Announcement Intercept . . . . .                            | 1-39  |
| 1.10.12 Intercom Blocking (Option) . . . . .                                 | 1-39  |
| 1.10.13 Music On Hold and Camp On . . . . .                                  | 1-40  |
| 1.10.14 Control Station (Option) . . . . .                                   | 1-40  |
| 1.10.15 Dictation . . . . .                                                  | 1-40  |
| 1.10.16 Voice Paging . . . . .                                               | 1-40  |
| 1.10.17 Voice Band Modem Capability . . . . .                                | 1-40  |
| 1.10.18 Off-Premise Extensions (OPX) . . . . .                               | 1-40  |
| 1.10.19 Traffic and Feature Use . . . . .                                    | 1-41  |
| 1.10.20 Expanded Traffic Information (Option) . . . . .                      | 1-41  |
| 1.10.21 Additional Serial Interfaces . . . . .                               | 1-41  |

|         |                                            |      |
|---------|--------------------------------------------|------|
| 1.10.22 | Automatic Program Load (Release 6)         | 1-41 |
| 1.10.23 | Toll Restriction                           | 1-41 |
| 1.10.24 | Route Optimization                         | 1-41 |
| 1.10.25 | Call Queuing (Option)                      | 1-42 |
| 1.10.26 | Call Detail Recording/Analysis (Option)    | 1-42 |
| 1.10.27 | Automatic Call Distribution (Option)       | 1-42 |
| 1.10.28 | Electronic Telephone (Option)              | 1-42 |
| 1.10.29 | 4STAR Switching System (Option)            | 1-43 |
| 1.10.30 | Remote Polling                             | 1-43 |
| 1.10.31 | ROLM Electronic Message System (REMS)      | 1-43 |
| 1.10.32 | Centralized Attendant Service              | 1-44 |
| 1.10.33 | CBX Management Reporter                    | 1-44 |
| 1.10.34 | Message Waiting                            | 1-44 |
| 1.10.35 | Code Call                                  | 1-45 |
| 1.10.36 | Password                                   | 1-45 |
| 1.10.37 | PhoneMail Message System                   | 1-45 |
| 1.10.38 | AFACTS                                     | 1-46 |
| 1.10.39 | Unchecked and Checked Forced Account Codes | 1-46 |
| 1.10.40 | Off-System and On-System Forwarding        | 1-47 |

## CHAPTER 2. SYSTEM INSTALLATION AND CHECK-OUT

|        |                                                    |       |
|--------|----------------------------------------------------|-------|
| 2.1    | INTRODUCTION                                       | 2-1   |
| 2.2    | SITE PREPARATION                                   | 2-1   |
| 2.2.1  | Safety                                             | 2-7   |
| 2.2.2  | Site Coordinator                                   | 2-9   |
| 2.2.3  | Customer-Provided Equipment                        | 2-9   |
| 2.2.4  | Floors and Ceilings                                | 2-10  |
| 2.2.5  | Space and Weight Requirements                      | 2-11  |
| 2.2.6  | 208-VAC Power Requirements                         | 2-11  |
| 2.2.7  | DC Power Requirements                              | 2-16  |
| 2.2.8  | External Grounding Requirements                    | 2-22c |
| 2.2.8A | Internal Cabinet Grounding                         | 2-41  |
| 2.2.9  | Air Conditioning Requirements                      | 2-42e |
| 2.2.10 | FCC Emission Requirements                          | 2-49  |
| 2.3    | RECEIVING THE SYSTEM                               | 2-51  |
| 2.3.1  | Unpacking and Inspection Procedures                | 2-51  |
| 2.3.2  | Reshipment Procedures                              | 2-53  |
| 2.4    | CABINET INSTALLATION                               | 2-55  |
| 2.4.1  | Cabinet Placement                                  | 2-55  |
| 2.4.2  | Hardware Configuration Checks                      | 2-55  |
| 2.4.3  | Multi-Cabinet Interconnections                     | 2-57  |
| 2.5    | MDF CROSS-CONNECTS                                 | 2-69  |
| 2.5.1  | Single-Line Interface Groups                       | 2-77  |
| 2.5.1A | ROLMphone Telephone Interface Group                | 2-80a |
| 2.5.2  | ETI/KTI Group Cross-Connects                       | 2-83  |
| 2.5.3  | ATC                                                | 2-90  |
| 2.5.4  | Direct Trunk Interface Group Cross-Connects        | 2-96  |
| 2.5.5  | Universal Tie Trunk Interface Group Cross-Connects | 2-101 |
| 2.5.6  | DID Trunk Interface Group Cross-Connects           | 2-107 |
| 2.5.7  | CBX Bypass Group Cross-Connects                    | 2-111 |
| 2.5.8  | Peripheral Equipment Cross-Connects                | 2-119 |

|        |                                                                                     |        |
|--------|-------------------------------------------------------------------------------------|--------|
| 2.6    | PERIPHERAL EQUIPMENT INSTALLATION . . . . .                                         | 2-119  |
| 2.6.1  | ATC . . . . .                                                                       | 2-119  |
| 2.6.2  | KTA and Key Telephone . . . . .                                                     | 2-126  |
| 2.6.3  | ETS Telephone . . . . .                                                             | 2-129  |
| 2.6.4  | Flashphone . . . . .                                                                | 2-130  |
| 2.6.5  | DELETED . . . . .                                                                   | 2-130  |
| 2.6.6  | Single-Sided Integral Floppy Disk System . . . . .                                  | 2-133  |
| 2.6.6A | Double-Sided Integral Floppy Disk Drive Assemblies . . . . .                        | 2-144a |
| 2.6.7  | Stand-Alone Floppy Disk . . . . .                                                   | 2-145  |
| 2.6.8  | EPI-COM 300 Cartridge System . . . . .                                              | 2-146  |
| 2.6.9  | Kennedy 9-Channel Magnetic Tape System . . . . .                                    | 2-147  |
| 2.7    | SYSTEM UPGRADES AND EXPANSIONS . . . . .                                            | 2-150  |
| 2.7.1  | Adding Software Features . . . . .                                                  | 2-150  |
| 2.7.2  | Adding Hardware to Support Increased Software . . . . .                             | 2-150  |
| 2.7.3  | Adding Critical Electronics Redundancy . . . . .                                    | 2-151  |
| 2.7.4  | Expanding a Wired-for-Redundancy Cabinet . . . . .                                  | 2-151  |
| 2.7.5  | Expanding Memory . . . . .                                                          | 2-154  |
| 2.7.6  | Adding a Cabinet . . . . .                                                          | 2-156  |
| 2.7.7  | Upgrading a 7000 Computer to an 8000 Computer . . . . .                             | 2-158  |
| 2.7.7A | Adding a Quad Serial I/O PCA . . . . .                                              | 2-158p |
| 2.7.7B | Adding MWL Single-Line Interface Groups . . . . .                                   | 2-158u |
| 2.7.7C | Upgrading to Use ROLMphone Telephones . . . . .                                     | 2-158v |
| 2.8    | 8000 COMPUTER CONTROLS AND INDICATORS . . . . .                                     | 2-158y |
| 2.8A   | 7000 COMPUTER CONTROLS AND INDICATORS . . . . .                                     | 2-159  |
| 2.8B   | 7000/8000 COMPUTER CONTROLS AND INDICATORS . . . . .                                | 2-191  |
| 2.8C   | ATC CONTROLS AND INDICATORS . . . . .                                               | 2-224i |
| 2.8D   | ROLMPHONE 400 TELEPHONE CONTROLS AND INDICATORS . . . . .                           | 2-224s |
| 2.9    | 7000 COMPUTER POWER-UP AND POWER-DOWN PROCEDURES . . . . .                          | 2-225  |
| 2.9.1  | 208-VAC System . . . . .                                                            | 2-225  |
| 2.9.2  | DC System . . . . .                                                                 | 2-229  |
| 2.9.3  | Power-Up with APL . . . . .                                                         | 2-233  |
| 2.9.4  | Power-Down Procedures . . . . .                                                     | 2-233  |
| 2.9.5  | 8000 Computer Power-Up and Power-Down Procedures . . . . .                          | 2-234  |
| 2.9A   | 8000 COMPUTER LOADING PROCEDURES . . . . .                                          | 2-234  |
| 2.9A.1 | Loading the System Operating System (IPC Diskettes) . . . . .                       | 2-234a |
| 2.9A.2 | Loading with One IPC Diskette . . . . .                                             | 2-234b |
| 2.10   | 7000 COMPUTER LOADING PROCEDURES . . . . .                                          | 2-234a |
| 2.10.1 | Service Teleprinter Setup . . . . .                                                 | 2-234b |
| 2.10.2 | DCU Setup . . . . .                                                                 | 2-237  |
| 2.10.3 | Loading the 7000 Computer Operating System with<br>Model 85000A CPU 1 PCA . . . . . | 2-240  |
| 2.10.4 | Loading the Operating System with<br>Model 85370 CPU 1 APL PCA . . . . .            | 2-251  |
| 2.10.5 | Dumping from an EPI STR-LINK II to a<br>Techtran PXL 1000 . . . . .                 | 2-268  |
| 2.10.6 | Loading a Move and Change Cassette . . . . .                                        | 2-269  |
| 2.11   | SYSTEM CHECK-OUT PROCEDURES . . . . .                                               | 2-271  |
| 2.11.1 | 4-Wire Test Port PCA . . . . .                                                      | 2-271  |
| 2.11.2 | ATC Check . . . . .                                                                 | 2-280  |
| 2.11.3 | Direct Trunk Balancing . . . . .                                                    | 2-280  |
| 2.11.4 | Trunk Interface Test . . . . .                                                      | 2-292  |

|        |                                             |       |
|--------|---------------------------------------------|-------|
| 2.11.5 | Single-Line Station Test . . . . .          | 2-292 |
| 2.11.6 | ETS Station Test . . . . .                  | 2-292 |
| 2.11.7 | Key Telephone Station Test . . . . .        | 2-292 |
| 2.11.8 | Floppy Disk Check-out . . . . .             | 2-292 |
| 2.11.9 | ROLMphone 400 Telephone Check-Out . . . . . | 2-293 |
| 2.12   | SYSTEM SELF-TEST PROCEDURES . . . . .       | 2-294 |
| 2.12.1 | Self-Test Description . . . . .             | 2-294 |
| 2.12.2 | On-Line Diagnostic/Error Table . . . . .    | 2-299 |
| 2.12.3 | Audit Table . . . . .                       | 2-311 |
| 2.12.4 | Correction Table . . . . .                  | 2-315 |
| 2.12.5 | Traffic Table . . . . .                     | 2-315 |
| 2.12.6 | Bad Trunk Table . . . . .                   | 2-321 |

### CHAPTER 3. SYSTEM MAINTENANCE

|        |                                                                            |       |
|--------|----------------------------------------------------------------------------|-------|
| 3.1    | INTRODUCTION . . . . .                                                     | 3-1   |
| 3.2    | SPECIAL TOOLS AND EQUIPMENT . . . . .                                      | 3-1   |
| 3.3    | PREVENTIVE MAINTENANCE . . . . .                                           | 3-1   |
| 3.3.1  | Checking the Ventilation System . . . . .                                  | 3-1   |
| 3.3.2  | Load Testing the Memory Back-Up Batteries . . . . .                        | 3-2   |
| 3.3.3  | Listing the Maintenance Tables (Self-Test) . . . . .                       | 3-2a  |
| 3.3.4  | Checking Power Supply and Upper-Shelf Voltages . . . . .                   | 3-4   |
| 3.3.5  | Cleaning the Floppy Disk Heads . . . . .                                   | 3-4   |
| 3.3.6  | Cleaning the DCU Heads . . . . .                                           | 3-4   |
| 3.3.7  | Power and Grounding System Inspection . . . . .                            | 3-5   |
| 3.4    | SYSTEM TROUBLESHOOTING . . . . .                                           | 3-13  |
| 3.4.1  | Station/Trunk . . . . .                                                    | 3-13  |
| 3.4.2  | Service Teleprinter . . . . .                                              | 3-18  |
| 3.4.3  | DCU . . . . .                                                              | 3-22  |
| 3.4.4  | Floppy Disk System . . . . .                                               | 3-26  |
| 3.4.5  | Power and Grounding Troubleshooting . . . . .                              | 3-32  |
| 3.4.6  | Plenum Assembly . . . . .                                                  | 3-32c |
| 3.5A   | 8000 COMPUTER DIAGNOSTICS . . . . .                                        | 3-32d |
| 3.5A.1 | Model 87691D Diagnostic Diskette . . . . .                                 | 3-32g |
| 3.5A.2 | 8000 Computer Memory Diagnostic Errors . . . . .                           | 3-32s |
| 3.5A.3 | Model 87693A Diagnostic Cassette . . . . .                                 | 3-32i |
| 3.6    | 7000 COMPUTER DIAGNOSTICS . . . . .                                        | 3-33  |
| 3.6.1  | Model 87620 Diagnostic Cassette . . . . .                                  | 3-35  |
| 3.6.2  | Model 87690 Diagnostic Cassette . . . . .                                  | 3-38  |
| 3.6.3  | Model 87690A Diagnostic Cassette . . . . .                                 | 3-40  |
| 3.6.4  | Model 87690B Diagnostic Cassette . . . . .                                 | 3-44  |
| 3.6.5  | Model 87690C Diagnostic Cassette . . . . .                                 | 3-46  |
| 3.6.6  | Model 87693 Diagnostic Cassette . . . . .                                  | 3-49  |
| 3.6.7  | Model 87490A Magnetic Tape Diagnostic Cassette . . . . .                   | 3-50  |
| 3.6.8  | Model 87691 Diagnostic Diskette . . . . .                                  | 3-55  |
| 3.6.9  | Model 87691C Diagnostic Diskette . . . . .                                 | 3-58  |
| 3.6.10 | Model 89050 Floppy Disk On-Line Diagnostic . . . . .                       | 3-58  |
| 3.7    | REMOVAL AND REPLACEMENT . . . . .                                          | 3-61  |
| 3.7.1  | PCAs . . . . .                                                             | 3-61  |
| 3.7.2  | Model 87870 Single-Sided Integral Floppy Disk<br>Drives Assembly . . . . . | 3-63  |
| 3.7.3  | Model 88981 Double-Sided Integral Floppy Disk<br>Drive Assembly . . . . .  | 3-66a |
| 3.7.4  | Plenum Assembly . . . . .                                                  | 3-66a |

|                                           |                                                                                          |       |
|-------------------------------------------|------------------------------------------------------------------------------------------|-------|
| 3.7.5                                     | 208-VAC Main Power Supply . . . . .                                                      | 3-66g |
| 3.7.6                                     | DC Main Power Supply . . . . .                                                           | 3-66h |
| 3.8                                       | PARTS LIST . . . . .                                                                     | 3-67  |
| 3.9                                       | WIRING DIAGRAMS . . . . .                                                                | 3-71  |
| CHAPTER 4. COMPUTER COMMON CONTROL GROUP  |                                                                                          |       |
| 4.1                                       | INTRODUCTION . . . . .                                                                   | 4-1   |
| 4.2                                       | FUNCTIONAL DESCRIPTION . . . . .                                                         | 4-1   |
| 4.2.1                                     | Redundant 8000 Computer Common Control Group . . . . .                                   | 4-1   |
| 4.2.1A                                    | Nonredundant 8000 Computer Common Control Group . . . . .                                | 4-2c  |
| 4.2.1B                                    | Nonredundant 7000 Computer Common Control Group . . . . .                                | 4-2c  |
| 4.2.2                                     | Redundant 7000 Computer Common Control . . . . .                                         | 4-7   |
| 4.2A                                      | 8000 COMPUTER MAINTENANCE . . . . .                                                      | 4-15  |
| 4.2A.1                                    | Removing and Replacing the Common Control Motherboard . . . . .                          | 4-15  |
| 4.2A.2                                    | Removing and Replacing the Memory Motherboard . . . . .                                  | 4-16  |
| 4.2A.3                                    | Removing and Replacing the Memory PCAs, Memory<br>Controller PCA, and CPU PCAs . . . . . | 4-16a |
| 4.3                                       | 7000 COMPUTER MAINTENANCE . . . . .                                                      | 4-16a |
| 4.3.1                                     | Removing and Replacing the Common Control Motherboard . . . . .                          | 4-16a |
| 4.3.2                                     | Removing and Replacing the Memory Motherboard . . . . .                                  | 4-16b |
| 4.3.3                                     | Removing and Replacing the Memory and Memory<br>Controller PCAs . . . . .                | 4-17  |
| 4.3.4                                     | Removing and Replacing the CPU 2, 3, and 4 PCAs . . . . .                                | 4-18  |
| CHAPTER 5. TDM NETWORK CONTROL GROUP      |                                                                                          |       |
| 5.1                                       | INTRODUCTION . . . . .                                                                   | 5-1   |
| 5.2                                       | FUNCTIONAL DESCRIPTION . . . . .                                                         | 5-1   |
| 5.2.1                                     | TDM Motherboards . . . . .                                                               | 5-1   |
| 5.2.2                                     | Intershelf Buses . . . . .                                                               | 5-3   |
| 5.2.3                                     | TDM Network Control 1 and 2 PCAs . . . . .                                               | 5-4   |
| 5.2.4                                     | TCC . . . . .                                                                            | 5-8   |
| 5.2.5                                     | NPC . . . . .                                                                            | 5-8   |
| 5.2.6                                     | Real-Time Clock PCA . . . . .                                                            | 5-9   |
| 5.2.7                                     | Expander PCA . . . . .                                                                   | 5-9   |
| 5.2A                                      | 8000 COMPUTER MAINTENANCE . . . . .                                                      | 5-10a |
| 5.2A.1                                    | 8000 Computer Troubleshooting . . . . .                                                  | 5-10a |
| 5.2A.2                                    | 8000 Computer Removal and Replacement . . . . .                                          | 5-10a |
| 5.3                                       | 7000 COMPUTER MAINTENANCE . . . . .                                                      | 5-10b |
| 5.3.1                                     | 7000 Computer Troubleshooting . . . . .                                                  | 5-13  |
| 5.3.2                                     | 7000 Computer Removal and Replacement . . . . .                                          | 5-13  |
| CHAPTER 6. INPUT/OUTPUT DEVICE INTERFACES |                                                                                          |       |
| 6.1                                       | INTRODUCTION . . . . .                                                                   | 6-1   |
| 6.2                                       | FUNCTIONAL DESCRIPTION . . . . .                                                         | 6-1   |
| 6.2.1                                     | 2-Channel Serial I/O PCA . . . . .                                                       | 6-1   |
| 6.2.2                                     | Quad Serial I/O PCA . . . . .                                                            | 6-6   |
| 6.2.3                                     | I/O Bus Switch PCA . . . . .                                                             | 6-8   |
| 6.2.4                                     | Motor Control Paddleboard . . . . .                                                      | 6-10  |

|       |                                     |      |
|-------|-------------------------------------|------|
| 6.2.5 | Floppy Disk Interface PCA . . . . . | 6-10 |
| 6.2.6 | I/O Bus Interface PCA . . . . .     | 6-14 |
| 6.3   | MAINTENANCE . . . . .               | 6-14 |
| 6.3.1 | Troubleshooting . . . . .           | 6-14 |
| 6.3.2 | Removal and Replacement . . . . .   | 6-15 |

## CHAPTER 7. CRITICAL ELECTRONICS

|       |                                               |      |
|-------|-----------------------------------------------|------|
| 7.1   | INTRODUCTION . . . . .                        | 7-1  |
| 7.2   | FUNCTIONAL DESCRIPTION . . . . .              | 7-1  |
| 7.2.1 | Tone Sender PCA . . . . .                     | 7-2  |
| 7.2.2 | DTMF Register PCA . . . . .                   | 7-9  |
| 7.2.3 | Quad DTMF Register PCA . . . . .              | 7-11 |
| 7.2.4 | Rotary Sender PCA . . . . .                   | 7-11 |
| 7.2.5 | Rotary Register PCA . . . . .                 | 7-15 |
| 7.2.6 | Conference Bridge Group . . . . .             | 7-17 |
| 7.2.7 | Bias Generator PCA . . . . .                  | 7-17 |
| 7.3   | MAINTENANCE . . . . .                         | 7-20 |
| 7.3.1 | Troubleshooting . . . . .                     | 7-20 |
| 7.3.2 | Removal and Replacement . . . . .             | 7-20 |
| 7.4   | SIGNAL DETECTION PCA (Release 8004) . . . . . | 7-21 |
| 7.4.1 | SDC Installation . . . . .                    | 7-26 |
| 7.4.2 | Signal Detection PCA Maintenance . . . . .    | 7-26 |

## CHAPTER 8. STATION INTERFACE GROUPS

|       |                                                              |       |
|-------|--------------------------------------------------------------|-------|
| 8.1   | INTRODUCTION . . . . .                                       | 8-1   |
| 8.2   | FUNCTIONAL DESCRIPTION . . . . .                             | 8-1   |
| 8.2.1 | Coder PCA, Decoder PCA, and Interface Motherboards . . . . . | 8-1   |
| 8.2.2 | Standard Single-Line Interface Group . . . . .               | 8-6   |
| 8.2.3 | Long-Loop Single-Line Interface Group . . . . .              | 8-11  |
| 8.2.4 | Single-Line OPX or OPS Interface Group . . . . .             | 8-13  |
| 8.2.5 | KTI Group . . . . .                                          | 8-16  |
| 8.2.6 | ETI Group . . . . .                                          | 8-24  |
| 8.2.7 | Message Waiting Lamp Single-Line Interface Group . . . . .   | 8-26a |
| 8.2.8 | ROLMphone Telephone Interface Group . . . . .                | 8-26a |
| 8.3   | MAINTENANCE . . . . .                                        | 8-27  |
| 8.3.1 | Troubleshooting . . . . .                                    | 8-27  |
| 8.3.2 | Removal and Replacement . . . . .                            | 8-49  |

## CHAPTER 9. ATTENDANT'S CONSOLE INTERFACE GROUP

|       |                                   |     |
|-------|-----------------------------------|-----|
| 9.1   | INTRODUCTION . . . . .            | 9-1 |
| 9.2   | FUNCTIONAL DESCRIPTION . . . . .  | 9-1 |
| 9.3   | MAINTENANCE . . . . .             | 9-4 |
| 9.3.1 | Troubleshooting . . . . .         | 9-4 |
| 9.3.2 | Removal and Replacement . . . . . | 9-4 |

## CHAPTER 10. TRUNK INTERFACE GROUPS

|      |                        |      |
|------|------------------------|------|
| 10.1 | INTRODUCTION . . . . . | 10-1 |
|------|------------------------|------|

|        |                                               |       |
|--------|-----------------------------------------------|-------|
| 10.2   | FUNCTIONAL DESCRIPTION . . . . .              | 10-1  |
| 10.2.1 | Direct Trunk Interface Group . . . . .        | 10-1  |
| 10.2.2 | Universal Tie Trunk Interface Group . . . . . | 10-8  |
| 10.2.3 | DID Trunk Interface Group . . . . .           | 10-15 |
| 10.2.4 | CDH Trunk Interface Group . . . . .           | 10-17 |
| 10.2.5 | CBX Bypass Groups . . . . .                   | 10-25 |
| 10.3   | MAINTENANCE . . . . .                         | 10-33 |
| 10.3.1 | Troubleshooting . . . . .                     | 10-33 |
| 10.3.2 | Removal and Replacement . . . . .             | 10-65 |

## CHAPTER 11. CALL PROCESSING

|        |                                              |       |
|--------|----------------------------------------------|-------|
| 11.1   | INTRODUCTION . . . . .                       | 11-1  |
| 11.2   | CALL PROCESSING OVERVIEW . . . . .           | 11-1  |
| 11.2.1 | Transaction Blocks . . . . .                 | 11-3  |
| 11.2.2 | Queues . . . . .                             | 11-4  |
| 11.2.3 | State . . . . .                              | 11-4  |
| 11.2.4 | Status Table . . . . .                       | 11-4  |
| 11.2.5 | Task . . . . .                               | 11-4  |
| 11.2.6 | Scheduler . . . . .                          | 11-4  |
| 11.3   | INTERNAL STATION TO STATION . . . . .        | 11-5  |
| 11.3.1 | *9 Hold . . . . .                            | 11-5  |
| 11.3.2 | Can't Ring and Busy . . . . .                | 11-5  |
| 11.3.3 | COM Group . . . . .                          | 11-5  |
| 11.3.4 | Ringdown . . . . .                           | 11-5  |
| 11.4   | STATION TO TRUNK . . . . .                   | 11-19 |
| 11.4.1 | Basic Trunk-Accessing Call Process . . . . . | 11-19 |
| 11.4.2 | Release 4 Route Optimization . . . . .       | 11-19 |
| 11.4.3 | Release 5 Route Optimization . . . . .       | 11-22 |
| 11.4.4 | Release 6 Route Optimization . . . . .       | 11-22 |

## CHAPTER 12. POWER SUPPLY AND POWER DISTRIBUTION SYSTEM

|         |                                                    |        |
|---------|----------------------------------------------------|--------|
| 12.1    | INTRODUCTION . . . . .                             | 12-1   |
| 12.2    | FUNCTIONAL DESCRIPTION . . . . .                   | 12-1   |
| 12.2.1  | Power Entry Panel . . . . .                        | 12-1   |
| 12.2.1A | Redesigned Power Entry Box . . . . .               | 12-2   |
| 12.2.1B | DC Power Entry Box . . . . .                       | 12-2   |
| 12.2.2  | 208-VAC Cabinet Input Power Distribution . . . . . | 12-7   |
| 12.2.3  | DC Power Supplies . . . . .                        | 12-7   |
| 12.2.4  | Power Distribution . . . . .                       | 12-15  |
| 12.3    | MAINTENANCE . . . . .                              | 12-66  |
| 12.3.1  | Troubleshooting . . . . .                          | 12-66  |
| 12.3.2  | Removal and Replacement . . . . .                  | 12-103 |

## CHAPTER 13. COMMAND SUMMARY

|        |                                         |       |
|--------|-----------------------------------------|-------|
| 13.1   | INTRODUCTION . . . . .                  | 13-1  |
| 13.1.1 | Equipment Required . . . . .            | 13-1  |
| 13.1.2 | Command Format . . . . .                | 13-1  |
| 13.1.3 | Error Messages . . . . .                | 13-4  |
| 13.1.4 | Preliminary Set-Up Procedures . . . . . | 13-5  |
| 13.1.5 | Disconnection . . . . .                 | 13-10 |

|         |                                                                          |         |
|---------|--------------------------------------------------------------------------|---------|
| 13.2    | MOVES AND CHANGES . . . . .                                              | 13-12   |
| 13.2.1  | Introduction . . . . .                                                   | 13-12   |
| 13.2.2  | Move and Change Load . . . . .                                           | 13-12   |
| 13.2.3  | Single-Line Commands . . . . .                                           | 13-13   |
| 13.2.4  | ETS Set, Key Telephone, and ROLMphone<br>Telephone Commands . . . . .    | 13-36   |
| 13.2.5  | Attendant's Console (ATC) Group Commands . . . . .                       | 13-47   |
| 13.2.6  | Trunk Commands . . . . .                                                 | 13-48a  |
| 13.2.7  | Route Optimization, Toll Restriction, and<br>Digit Translation . . . . . | 13-78   |
| 13.2.7A | Ten-Digit Routing and Call Screening Commands . . . . .                  | 13-98   |
| 13.2.7B | NNXMASSRESTRICT Table Commands . . . . .                                 | 13-98h  |
| 13.2.7C | Equal Access Software Commands . . . . .                                 | 13-98k  |
| 13.2.8  | Automatic Call Distribution (ACD) . . . . .                              | 13-98   |
| 13.2.9  | System Commands . . . . .                                                | 13-102  |
| 13.2.10 | Code Call . . . . .                                                      | 13-131  |
| 13.3    | MAINTENANCE . . . . .                                                    | 13-132d |
| 13.3.1  | LET: List Error Table . . . . .                                          | 13-132d |
| 13.3.2  | CET: Clear Error Table . . . . .                                         | 13-134  |
| 13.3.3  | STD: Set Time and Day . . . . .                                          | 13-135  |
| 13.3.4  | RSK: Revise Security Key . . . . .                                       | 13-136  |
| 13.3.5  | PSL: Post/Standby Load . . . . .                                         | 13-136  |
| 13.3.6  | SIDE: Change Side Number . . . . .                                       | 13-137  |
| 13.3.7  | SWT: Switchover . . . . .                                                | 13-138  |
| 13.3.8  | LAT: List Audit Table . . . . .                                          | 13-138  |
| 13.3.9  | LCT: List Correction Table . . . . .                                     | 13-140a |
| 13.3.10 | LRSE: List Extension Register/Sender Data (Release 6) . . . . .          | 13-142  |
| 13.3.11 | LRS: List Register/Senders (Release 4) . . . . .                         | 13-143  |
| 13.3.12 | RRS: Revise Register/Senders (Release 4) . . . . .                       | 13-144  |
| 13.3.13 | RDT: Run Diagnostic Test . . . . .                                       | 13-145  |
| 13.3.14 | RCHT: Run Channel Test (Release 4) . . . . .                             | 13-146  |
| 13.3.15 | LRBT: List Reported Bad Trunks (Release 6) . . . . .                     | 13-146  |
| 13.3.16 | LERV: List ETI Prom Level (Release 5) . . . . .                          | 13-147  |
| 13.3.17 | CDN: Courtesy Down PCA . . . . .                                         | 13-148  |
| 13.3.18 | DCD: Down PCA . . . . .                                                  | 13-149  |
| 13.3.19 | UCD: Up PCA . . . . .                                                    | 13-149  |
| 13.3.20 | DCC: Down Control PCA . . . . .                                          | 13-150  |
| 13.3.21 | UCC: Up Control PCA . . . . .                                            | 13-150  |
| 13.3.22 | DLCB: Down LCBX Tie (Release 5) . . . . .                                | 13-150  |
| 13.3.23 | ULCB: Up LCBX Tie (Release 5) . . . . .                                  | 13-150  |
| 13.3.24 | LEEI: List ETS Error Information . . . . .                               | 13-151  |
| 13.3.25 | RMWT: Run Message Waiting Test . . . . .                                 | 13-151  |
| 13.3.26 | SMW: Set Message Waiting . . . . .                                       | 13-152  |
| 13.3.27 | LSTR: List Self-Test Results . . . . .                                   | 13-152  |
| 13.3.28 | NRST: NPC Restart . . . . .                                              | 13-152  |
| 13.3.29 | NPC: Network Processor PCA . . . . .                                     | 13-153  |
| 13.3.30 | LSYS: List System Status . . . . .                                       | 13-153  |
| 13.3.31 | LAEX: List Assignment of Extensions . . . . .                            | 13-154  |
| 13.4    | CALL DETAIL RECORDING (CDR) . . . . .                                    | 13-154a |
| 13.4.1  | DCDR: Disable CDR Floppy (Release 5) . . . . .                           | 13-154a |
| 13.4.2  | TFDR: Test Floppy Disk Drive (Release 5) . . . . .                       | 13-155  |
| 13.4.3  | FPRN: Print Floppy Sector (Release 5) . . . . .                          | 13-156  |
| 13.4.4  | WEOF: Write End of File (Release 5) . . . . .                            | 13-156  |
| 13.4.5  | LFRV: List Floppy Revision Level (Release 5) . . . . .                   | 13-156  |
| 13.4.6  | TCDR: Test CDR Magnetic Tape (Release 5) . . . . .                       | 13-157  |
| 13.4.7  | FERR: Floppy Print Aborted Operation Status<br>(Release 6) . . . . .     | 13-158  |



|         |                                                                                  |         |
|---------|----------------------------------------------------------------------------------|---------|
| 13.5    | TRAFFIC                                                                          | 13-158  |
| 13.5.1  | LTT: List Traffic Table                                                          | 13-159  |
| 13.5.2  | LTE: List Traffic Table Entry (Release 5)                                        | 13-169  |
| 13.5.3  | LTTD: List Traffic Table Data (Release 6)                                        | 13-169  |
| 13.5.4  | TRF: List Expanded Traffic Statistics                                            | 13-172  |
| 13.5.5  | TRFR: Autoprint Expanded Traffic Statistics<br>(Release 6 and Above)             | 13-178  |
| 13.5.6  | AGT: List ACD Agent Performance and Status Report<br>(Release 5)                 | 13-179  |
| 13.5.7  | AGTR: Autoprint ACD Agent Performance and Status<br>Report (Release 6 and Above) | 13-181  |
| 13.5.8  | AGNT: List Agent Follow-Me Statistics Report<br>(Release 6)                      | 13-182  |
| 13.5.9  | ACD: List ACD Traffic Reports (Release 5)                                        | 13-184  |
| 13.5.9A | HELP: List ACD Move and Change Commands<br>(Release 8001)                        | 13-190b |
| 13.5.9B | LREP: List ACD Reports (Release 8001)                                            | 13-190c |
| 13.5.9C | LST: List ACD Command Buffer (Release 8001)                                      | 13-190c |
| 13.5.9D | DEL: Delete ACD Command (Release 8001)                                           | 13-190d |
| 13.5.9E | MOD: Modify ACD Command (Release 8001)                                           | 13-190d |
| 13.5.9F | SUS: Suspend ACD Command (Release 8001)                                          | 13-190e |
| 13.5.9G | ACT: Activate ACD Command (Release 8001)                                         | 13-190f |
| 13.5.9H | MACD: Master ACD Command (Release 8001)                                          | 13-190g |
| 13.5.9I | MLST: Master List ACD Command (Release 8001)                                     | 13-190h |
| 13.5.9J | MSUS: Master Suspend ACD Command (Release 8001)                                  | 13-190h |
| 13.5.9K | MACT: Master Activate ACD Command (Release 8001)                                 | 13-190i |
| 13.5.9L | MDEL: Master Delete ACD Command (Release 8001)                                   | 13-190i |
| 13.5.10 | ACDR: Autoprint ACD Traffic Reports (Release 6)                                  | 13-191  |
| 13.5.11 | APKL: Autoprint Kill (Releases 6 and 7)                                          | 13-192  |
| 13.5.12 | LCTR: List CDR Traffic (Release 5)                                               | 13-192  |
| 13.5.13 | PROF: List Daily Profile                                                         | 13-194  |
| 13.5.14 | AGS: List Abbreviated Agent Statistics Report<br>(Release 5)                     | 13-196  |
| 13.5.15 | STSR: Start CMR Traffic Statistics Report<br>(Release 6)                         | 13-197  |
| 13.5.16 | LTSR: List CMR Traffic Statistics Report<br>(Releases 6 and 7)                   | 13-198  |
| 13.5.17 | RTIT: Revise CMR Traffic Interval Time<br>(Releases 6 and 7)                     | 13-199  |
| 13.5.18 | LTC: List CMR Traffic Configuration<br>(Releases 6 and 7)                        | 13-200  |
| 13.5.19 | RTC: Revise Traffic Configuration (Releases 6 and 7)                             | 13-200  |
| 13.6    | MESSAGE REGISTRATION                                                             | 13-201  |
| 13.6.1  | LCM: List and Clear Message Total<br>(Release 4 and Above)                       | 13-201  |
| 13.6.2  | LMR: List Message Rate (Release 4 and Above)                                     | 13-202  |
| 13.6.3  | RMR: Revise Message Rate (Release 4 and Above)                                   | 13-202  |
| 13.6.4  | LMT: List Message Total (Release 4 and Above)                                    | 13-203  |
| 13.6.5  | RMT: Revise Message Total (Release 4 and Above)                                  | 13-203  |
| 13.7    | CBX MANAGEMENT REPORTER (CMR)                                                    | 13-204  |
| 13.7.1  | LNNX: List NNX Table (Release 6 and Above)                                       | 13-204  |
| 13.7.2  | RNNX: Revise NNX Table (Release 6 and Above)                                     | 13-205  |
| 13.7.3  | LMNX: List Maximum NNX Count (Release 6 and Above)                               | 13-205  |
| 13.7.4  | LCNX: List NNX Table Count (Release 6 and Above)                                 | 13-205  |
| 13.7.5  | RCNX: Revise NNX Table Count (Release 6 and Above)                               | 13-206  |
| 13.7.6  | LNPA: List NPA Table (Release 6 and Above)                                       | 13-206  |
| 13.7.7  | RNPA: Revise NPA Table (Release 6 and Above)                                     | 13-207  |
| 13.7.8  | LRAT: List Rate Group Table (Release 6 and Above)                                | 13-207  |
| 13.7.9  | RRAT: Revise Rate Group Table (Release 6 and Above)                              | 13-208  |

|                                                                                                    |        |
|----------------------------------------------------------------------------------------------------|--------|
| 13.7.10 LMRG: List Maximum Rate Group Count<br>(Release 6 and Above)                               | 13-208 |
| 13.7.11 LCRG: List Rate Group Count (Release 6 and Above)                                          | 13-209 |
| 13.7.12 RCRG: Revise Rate Group Count (Release 6 and Above)                                        | 13-209 |
| 13.7.13 LHOL: List All Holidays (Release 6 and Above)                                              | 13-209 |
| 13.7.14 SHOL: Designate Holidays (Release 6 and Above)                                             | 13-210 |
| 13.7.15 DHOL: Delete Holiday (Release 6 and Above)                                                 | 13-210 |
| 13.7.16 LFRT: List Flat Rate Table (Release 6 and Above)                                           | 13-210 |
| 13.7.17 RFRT: Revise Flat Rate Table (Release 6 and Above)                                         | 13-211 |
| 13.7.18 LINR: List International Rate (Release 6 and Above)                                        | 13-211 |
| 13.7.19 RINR: Revise International Rate (Release 6 and Above)                                      | 13-211 |
| 13.7.20 RDVN: Revise Division Name (Release 6 and Above)                                           | 13-212 |
| 13.7.21 DDVN: Delete Division (Release 6 and Above)                                                | 13-212 |
| 13.7.22 LDVN: List Department Names (Release 6 and Above)                                          | 13-213 |
| 13.7.23 RDPN: Revise Department Name (Release 6 and Above)                                         | 13-213 |
| 13.7.24 RNUM: Revise Department Number (Release 6 and Above)                                       | 13-213 |
| 13.7.25 RDN: Assign Department Name (Release 6 and Above)                                          | 13-214 |
| 13.7.26 DDPN: Delete Department (Release 6 and Above)                                              | 13-214 |
| 13.7.27 LED: List Extensions Within Departments<br>(Release 6 and Above)                           | 13-214 |
| 13.7.28 LTN: List Telephone Numbers (Release 6 and Above)                                          | 13-215 |
| 13.7.29 LTTN: List Traffic Telephone Number<br>(Release 6 and Above)                               | 13-215 |
| 13.7.30 RTTN: Revise Traffic Telephone Number<br>(Release 6 and Above)                             | 13-216 |
| 13.7.31 NSEN: New Extension Accumulating Summary Data<br>(Release 6 and Above)                     | 13-216 |
| 13.7.32 RSEN: Revise Extension Accumulating Summary Data<br>(Release 6 and Above)                  | 13-216 |
| 13.7.33 RDAC: Change Telephones Subject to Call<br>Accumulation (Release 6 and Above)              | 13-    |
| 13.7.34 RNAC: Change Telephones Not Subject to Call<br>Accumulation (Release 6 and Above)          | 13-217 |
| 13.7.35 SFPT: Set Future Print Time (Release 6 and Above)                                          | 13-217 |
| 13.7.36 LPCT: List Cost Printout Adjustment Factor<br>(Release 6 and Above)                        | 13-218 |
| 13.7.37 RPCT: Revise Cost Printout Adjustment Factor<br>(Release 6 and Above)                      | 13-218 |
| 13.7.38 LECD: List Extension Call Details<br>(Release 6 and Above)                                 | 13-218 |
| 13.7.39 NECD: New Extension Subject to CMR<br>(Release 6 and Above)                                | 13-219 |
| 13.7.40 RECD: Exchange Extensions Subject to CMR<br>(Release 6 and Above)                          | 13-219 |
| 13.7.41 LACR: List Account Code Report (Release 6 and Above)                                       | 13-219 |
| 13.7.42 CACT: Clear Account Code Tables (Release 6 and Above)                                      | 13-221 |
| 13.7.43 LCS: List Corporate Summary (Release 6 and Above)                                          | 13-221 |
| 13.7.44 LDVS: List Division Summary (Release 6 and Above)                                          | 13-222 |
| 13.7.45 LDDS: List Summary Reports For All Extensions<br>Within a Department (Release 6 and Above) | 13-223 |
| 13.7.46 LNES: List Extensions Not in Summary Report<br>(Release 6 and Above)                       | 13-223 |
| 13.7.47 LCSN: List Calls to Specific Numbers<br>(Release 6 and Above)                              | 13-224 |
| 13.7.48 LEPX: List Exceptional Call Parameters<br>(Release 6 and Above)                            | 13-225 |
| 13.7.49 REP: Revise Exceptional Call Parameters<br>(Release 6 and Above)                           | 13-225 |
| 13.7.50 LECR: List Exceptional Calls (Release 6 and Above)                                         | 13-225 |
| 13.7.51 LDEX: List Department Subject to Exceptional<br>Call Recording (Release 6 and Above)       | 13-226 |

|          |                                                                                      |         |
|----------|--------------------------------------------------------------------------------------|---------|
| 13.7.52  | CDEX: Add Department to Exceptional Call Recording List (Release 6 and Above)        | 13-227  |
| 13.7.53  | RDEX: Revise Departments Subject to Exceptional Call Recording (Release 6 and Above) | 13-227  |
| 13.7.54  | SSAC: Set System for Area Code CMR (Release 6 and Above)                             | 13-228  |
| 13.7.55  | LBC: List CDR Block Count (Release 4 and Above)                                      | 13-228  |
| 13.7.56  | SBC: Set CDR Block Count (Release 5 and Above)                                       | 13-228  |
| 13.7.57  | LPLT: List Remaining CDR Capacity (Release 6 and Above)                              | 130228  |
| 13.7.58  | LEXD: List CMR Status of Extension Number (Release 6 and Above)                      | 13-229  |
| 13.7.59  | MAC Commands for Call Management Reporter II (Release 8004)                          | 13-229  |
| 13.7A    | CAS II MAC COMMANDS                                                                  | 13-230a |
| 13.7A.1  | LCP: List Center Parameters                                                          | 13-230b |
| 13.7A.2  | MCP: Modify Center Parameters                                                        | 13-230c |
| 13.7A.3  | LBN: List Branch Name                                                                | 13-230d |
| 13.7A.4  | MBN: Modify Branch Name                                                              | 13-230d |
| 13.7A.5  | LDN: List Department Names                                                           | 13-230e |
| 13.7A.6  | MDN: Modify Department Names                                                         | 13-230f |
| 13.7A.7  | MDX: Modify Department Extension                                                     | 13-230g |
| 13.7A.8  | LBP: List Branch Parameters                                                          | 13-230h |
| 13.7A.9  | MBP: Modify Branch Parameters                                                        | 13-230k |
| 13.7A.10 | CBR: Branch Report Printout                                                          | 13-230k |
| 13.7B    | MODIFIED CAS II MAC COMMANDS                                                         | 13-230l |
| 13.7B.1  | RTK: Revise Trunk Attributes                                                         | 13-230l |
| 13.7B.2  | LTK: List Trunk Attributes                                                           | 13-230l |
| 13.7B.3  | MTF: Modify Tie Flag                                                                 | 13-230m |
| 13.7B.4  | LTT: List Traffic Table                                                              | 13-230m |
| 13.7B.5  | LTE: List Traffic Table Entry                                                        | 13-230m |
| 13.8     | CONFIGURATION MANUAL GUIDE                                                           | 13-229  |
| 13.8.1   | Introduction                                                                         | 13-229  |
| 13.8.2   | Input Listing                                                                        | 13-229  |
| 13.8.3   | Equipment Cabinet(s) Hardware Listing                                                | 13-230  |
| 13.8.4   | Register/Sender Map                                                                  | 13-234  |
| 13.8.5   | Conference Bridge Pairs                                                              | 13-235  |
| 13.8.6   | Tone Sender                                                                          | 13-235  |
| 13.8.7   | Bias Generator                                                                       | 13-235  |
| 13.8.8   | Extension Number Line Assignment and Characteristics Table                           | 12-235  |
| 13.8.9   | Software Group Control Table                                                         | 13-239  |
| 13.8.10  | Trunk Assignment and Characteristics Table                                           | 13-240  |
| 13.8.11  | Trunk/Display Group Information Table                                                | 13-243  |
| 13.8.12  | Trunk Access Table                                                                   | 13-244  |
| 13.8.13  | Class of Service Specification Table                                                 | 13-245  |
| 13.8.14  | ETS Feature Configuration Table                                                      | 13-246  |
| 13.8.15  | ETS Information Table                                                                | 13-247  |
| 13.8.16  | Voice Call Table                                                                     | 13-248  |
| 13.8.17  | Inter-Extension Blocking Table                                                       | 13-248  |
| 13.8.18  | ACD Extension Silent Monitor Table                                                   | 13-248  |
| 13.8.19  | First Digit Table                                                                    | 13-249  |
| 13.8.20  | Message Registration Table                                                           | 13-250  |
| 13.8.21  | Access Codes Table                                                                   | 13-250  |
| 13.8.22  | System Speed Call Table                                                              | 13-251  |
| 13.8.23  | Authorization/Account Codes Table                                                    | 13-251  |
| 13.8.24  | Digit Translation Table                                                              | 13-252  |
| 13.8.25  | Special Digits Table                                                                 | 13-252  |

|          |                                                                   |         |
|----------|-------------------------------------------------------------------|---------|
| 13.8.26  | Trunk Restriction Table . . . . .                                 | 13-252  |
| 13.8.27  | Routeselect Table . . . . .                                       | 13-252  |
| 13.8.28  | Area Routeselect Table . . . . .                                  | 13-253  |
| 13.8.29  | Route Group Table . . . . .                                       | 13-253  |
| 13.8.30  | ATC Group Table . . . . .                                         | 13-254  |
| 13.8.31  | CDR Exclusion Table . . . . .                                     | 13-254  |
| 13.8.32  | CDR Option Parameter Table . . . . .                              | 13-254  |
| 13.8.33  | System Parameters Table . . . . .                                 | 13-256  |
| 13.8.34  | Automatic Call Distribution Parameters Table . . . . .            | 13-257  |
| 13.8.35  | Miscellaneous Data Table . . . . .                                | 13-257  |
| 13.8.36  | Optional Feature Libraries Table . . . . .                        | 13-257  |
| 13.8A    | VIRTUAL PRIVATE LINES COMMANDS . . . . .                          | 13-259  |
| 13.8A.1  | Introduction to Network Conversion Table . . . . .                | 13-261  |
| 13.8A.2  | Network Conversion Table . . . . .                                | 13-261  |
| 13.8A.3  | Conversion Table Commands . . . . .                               | 13-263  |
| 13.8A.4  | Introduction to VPL Configuration Table . . . . .                 | 13-270  |
| 13.8A.5  | On-Net Configuration Table Commands . . . . .                     | 13-272  |
| 13.8A.6  | VPL Class of Service . . . . .                                    | 13-273  |
| 13.8A.7  | LRT: List VPL Route Attributes . . . . .                          | 13-273  |
| 13.8A.8  | Introduction to the Network Traffic<br>Reports Commands . . . . . | 13-275  |
| 13.8A.9  | Signal Detection MAC Commands . . . . .                           | 13-279  |
| 13.8A.10 | Virtual Private Line Maintenance Commands . . . . .               | 13-281  |
| 13.9     | DIRECT FORMAT . . . . .                                           | 13-259  |
| 13.10    | COMMANDS BY RELEASE . . . . .                                     | 13-271  |
|          | APPENDIX A SYSTEM PARAMETERS . . . . .                            | A-1     |
|          | APPENDIX B GLOSSARY . . . . .                                     | B-1     |
|          | INDEX . . . . .                                                   | Index-1 |

## FIGURES

| Figure | Title                                                                              | Page  |
|--------|------------------------------------------------------------------------------------|-------|
| 1-1.   | Shelves . . . . .                                                                  | 1-5   |
| 1-2.   | Slots . . . . .                                                                    | 1-6   |
| 1-2a.  | Sample Redundant Shelf 3 Configuration (8000 CPU) . . . . .                        | 1-8   |
| 1-2b.  | Sample Nonredundant Shelf 3 Configuration (8000 Computer) . . . . .                | 1-8b  |
| 1-3.   | Nonredundant Computer Groups (Shelf 3) . . . . .                                   | 1-8c  |
| 1-4.   | Redundant Computer Groups (Shelf 3) . . . . .                                      | 1-10  |
| 1-5.   | Redundant Computer Groups (Shelf 3) with TCC and NPC . . . . .                     | 1-10  |
| 1-6.   | Critical Electronics and Telephony Groups (TDM Shelves) . . . . .                  | 1-13  |
| 1-7.   | Interface Group Configurations . . . . .                                           | 1-15  |
| 1-7a.  | 8-Channel MWL Line Interface Group . . . . .                                       | 1-18  |
| 1-8.   | 208-VAC Cabinet Front View . . . . .                                               | 1-20  |
| 1-9.   | 208-VAC Cabinet Rear View . . . . .                                                | 1-21  |
| 1-10.  | DC Cabinet Front View . . . . .                                                    | 1-23  |
| 1-11.  | DC Cabinet Rear View . . . . .                                                     | 1-24  |
| 1-12.  | ATC . . . . .                                                                      | 1-26  |
| 1-13.  | CBX with Disk Drives Installed . . . . .                                           | 1-27  |
| 1-14.  | Magnetic Tape System . . . . .                                                     | 1-28  |
| 1-15.  | Magnetic Cartridge System (EPI-COM 300) . . . . .                                  | 1-30  |
| 1-16.  | Single-Line Telephone Faceplates . . . . .                                         | 1-31  |
| 1-17.  | ETS Telephone . . . . .                                                            | 1-32  |
| 1-17a. | ROLMphone 400 Telephone . . . . .                                                  | 1-32a |
| 1-18.  | Service Teleprinter . . . . .                                                      | 1-33  |
| 1-19.  | DCUs . . . . .                                                                     | 1-33  |
| 2-1.   | Cabinet and Auxiliary Equipment Clearances . . . . .                               | 2-12  |
| 2-2.   | Recommended CBX Equipment Room Layout . . . . .                                    | 2-13  |
| 2-3.   | 208-VAC Primary Power Load Balancing . . . . .                                     | 2-14  |
| 2-4.   | Three-Phase and Single-Phase Primary Power (208-VAC Systems) . . . . .             | 2-14  |
| 2-5.   | Sample DC Power Board . . . . .                                                    | 2-17  |
| 2-6.   | DC Primary Power Wiring Diagram . . . . .                                          | 2-18  |
| 2-6a.  | Calculating Battery Size (100-Ah Battery) . . . . .                                | 2-20  |
| 2-7.   | Typical Battery Racks . . . . .                                                    | 2-21  |
| 2-8.   | Fall of Potential Method . . . . .                                                 | 2-24  |
| 2-9.   | Combined Isolated Ground and Single-Point Ground . . . . .                         | 2-28  |
| 2-10.  | Single-Point-to-Cabinet Grounding (not recommended) . . . . .                      | 2-29  |
| 2-11.  | Isolation Transformer with Isolated Ground and<br>Dedicated Power Feeder . . . . . | 2-29  |
| 2-12.  | Simple Ground Loop . . . . .                                                       | 2-32  |
| 2-13.  | Complex Ground Loops Caused by Neutral-Ground Bond in<br>Panelboard . . . . .      | 2-32  |
| 2-14.  | Teleprinter Ground Loop . . . . .                                                  | 2-33  |
| 2-15.  | Correct CBX/Teleprinter Connection . . . . .                                       | 2-35  |
| 2-16.  | Installation Power and Grounding Site Record . . . . .                             | 2-37  |
| 2-16a. | Power Supply Ground Strap . . . . .                                                | 2-42a |
| 2-16b. | TSG/ASG and DSG Terminations . . . . .                                             | 2-42b |
| 2-16c. | DSG Ground Strap on Common Control Motherboard . . . . .                           | 2-42c |
| 2-16d. | Ground Strap on SAP . . . . .                                                      | 2-42d |
| 2-16e. | Interface Motherboard . . . . .                                                    | 2-50a |
| 2-16f. | Multicabinet System (Rear View) . . . . .                                          | 2-50b |
| 2-16g. | Modified Cabinet Doors . . . . .                                                   | 2-50c |
| 2-17.  | Attaching the Cradle to the ATC . . . . .                                          | 2-54  |
| 2-18.  | Sample from System Configuration Printout . . . . .                                | 2-56  |
| 2-19.  | PCA Identification Markings . . . . .                                              | 2-56  |
| 2-20.  | ISB and Ground Strap Connections . . . . .                                         | 2-58  |
| 2-21.  | MG-ISB and Ground Strap Connections . . . . .                                      | 2-58  |
| 2-22.  | ISB Cable Routing for Computers 1 and 2 . . . . .                                  | 2-59  |
| 2-23.  | MG-ISB Cable Routing for Computers 1 and 2 . . . . .                               | 2-59  |

|        |                                                                                |        |
|--------|--------------------------------------------------------------------------------|--------|
| 2-24.  | Cabinet 2 Bay A to Cabinet 1 ISB Routing . . . . .                             | 2-62   |
| 2-25.  | Cabinet 1 Bay B to Cabinet 2 ISB Interconnection . . . . .                     | 2-62   |
| 2-26.  | ISB Terminator PCAs at Cabinet 2 Bay B . . . . .                               | 2-63   |
| 2-27.  | Cabinet 3 Bay B to Cabinet 3 ISB Routing . . . . .                             | 2-63   |
| 2-28.  | Cabinet 1 to Cabinet 3 ISB Interconnections . . . . .                          | 2-64   |
| 2-29.  | ISB Terminator PCAs at Cabinet 3 Bay A . . . . .                               | 2-65   |
| 2-30.  | MG-ISB TDM Network Control Paddleboards . . . . .                              | 2-67   |
| 2-31.  | MG-ISB Terminator PCAs . . . . .                                               | 2-68   |
| 2-32.  | MDF Frame Layout . . . . .                                                     | 2-71   |
| 2-33.  | Interface Groups . . . . .                                                     | 2-75   |
| 2-34.  | SAP-to-MDF Connections . . . . .                                               | 2-76   |
| 2-35.  | Standard Single-Line Interface Group . . . . .                                 | 2-78   |
| 2-36.  | Single-Line OPX or OPS Interface Group . . . . .                               | 2-79   |
| 2-37.  | Long-Loop Single-Line Interface Groups . . . . .                               | 2-79   |
| 2-37a. | MWL Single-Line Interface Group . . . . .                                      | 2-78a  |
| 2-37b. | Single-Line Installation . . . . .                                             | 2-78b  |
| 2-38.  | Single-Line Interface and ROLMphone Telephone<br>Punch-Down Sequence . . . . . | 2-80   |
| 2-38a. | Sample 16-Channel ROLMphone Telephone Interface (RPI) Group . . . . .          | 2-80b  |
| 2-38b. | Sample 48-Channel ROLMphone Telephone Interface (RPI) Group . . . . .          | 2-80b  |
| 2-39.  | ETI Group . . . . .                                                            | 2-84   |
| 2-40.  | KTI Group . . . . .                                                            | 2-84   |
| 2-40a. | ETS Installation . . . . .                                                     | 2-84a  |
| 2-40b. | Key Telephone Installation . . . . .                                           | 2-84b  |
| 2-41.  | ETI and KTI Punch-Down Sequence . . . . .                                      | 2-85   |
| 2-42.  | Extension Classification Table . . . . .                                       | 2-86   |
| 2-43.  | Direct Trunk Interface Used for ATC . . . . .                                  | 2-91   |
| 2-43a. | ATC Installation . . . . .                                                     | 2-92   |
| 2-44.  | System Configuration Prinout A and B for ATC . . . . .                         | 2-92a  |
| 2-45.  | ATC Configuration A Interface Punch-Down Sequence . . . . .                    | 2-93   |
| 2-46.  | ATC Configuration B Interface Punch-Down Sequence . . . . .                    | 2-94   |
| 2-47.  | Direct Trunk Interface Group . . . . .                                         | 2-97   |
| 2-47a. | Direct Trunk Installation . . . . .                                            | 2-98   |
| 2-48.  | Direct Trunk Interface Punch-Down Sequence . . . . .                           | 2-98a  |
| 2-49.  | Universal Tie Trunk Interface Group . . . . .                                  | 2-102  |
| 2-49a. | Tie Trunk Installation . . . . .                                               | 2-102a |
| 2-50.  | Universal Tie Trunk Interface Punch-Down Sequence . . . . .                    | 2-103  |
| 2-51.  | DID Trunk Interface Group . . . . .                                            | 2-108  |
| 2-51a. | DID Trunk Installation . . . . .                                               | 2-108a |
| 2-52.  | DID Trunk Interface Punch-Down Sequence . . . . .                              | 2-109  |
| 2-53.  | CBX Bypass Group . . . . .                                                     | 2-112  |
| 2-53a. | Direct Trunk Bypass Installation . . . . .                                     | 2-112a |
| 2-54.  | CBX Bypass Punch-Down Sequence . . . . .                                       | 2-113  |
| 2-55.  | CBX Bypass Wiring Diagram . . . . .                                            | 2-117  |
| 2-56.  | ATC Cable Terminations . . . . .                                               | 2-120  |
| 2-57.  | VENTURE I Gain Adjustment . . . . .                                            | 2-123  |
| 2-58.  | Plug Amplifier (Exploded View) . . . . .                                       | 2-124  |
| 2-59.  | Jumper Locations for Starset Amplifiers . . . . .                              | 2-125  |
| 2-60.  | KTA Connections . . . . .                                                      | 2-127  |
| 2-61.  | PC-182A Connecting Block . . . . .                                             | 2-132  |
| 2-62.  | Single-Sided Floppy Disk Drive Basic Assembly (Model 87870) . . . . .          | 2-134  |
| 2-63.  | Motor Control Paddleboard Connectors . . . . .                                 | 2-136  |
| 2-64.  | Motor Control PCA Orientation . . . . .                                        | 2-137  |
| 2-65.  | Termination Power Orientation . . . . .                                        | 2-138  |
| 2-66.  | Integral Floppy Disk Drive for APL . . . . .                                   | 2-139  |
| 2-67.  | Drive Select Jumper Plug Locations . . . . .                                   | 2-141  |
| 2-68.  | Integral Floppy Disk Drive for CDR . . . . .                                   | 2-142  |
| 2-68a. | Double-Sided Disk Drive PCA Jumper Plug Configuration . . . . .                | 2-144b |
| 2-68b. | Double-Sided Disk Drive Orientation . . . . .                                  | 2-144c |
| 2-68c. | Double-Sided Floppy Disk Drive Unit . . . . .                                  | 2-144e |
| 2-69.  | Integral Floppy Disk Drive for APL in Redundant Systems . . . . .              | 2-144  |



|         |                                                                                               |         |
|---------|-----------------------------------------------------------------------------------------------|---------|
| 2-69a.  | Double-Sided Disk Drive PCA Jumper Plug Configuration . . .                                   | 2-144b  |
| 2-69b.  | Double-Sided Disk Drive Orientation . . . . .                                                 | 2-144c  |
| 2-69c.  | Double-Sided Floppy Disk Drive Unit . . . . .                                                 | 2-144e  |
| 2-70.   | Transfer Rate Selector Plug . . . . .                                                         | 2-147   |
| 2-71.   | CDR Unit (Rear View) . . . . .                                                                | 2-149   |
| 2-72.   | Retainer Bar Bracket Modification . . . . .                                                   | 2-153   |
| 2-73.   | Second 2-Channel Serial I/O PCA . . . . .                                                     | 2-155   |
| 2-73a.  | Nonredundant Shelf 3 Motherboard Terminal Blocks<br>(7000 Computer) . . . . .                 | 2-158c  |
| 2-73b.  | Model 77780 and 77781 CPU/Memory Switch Assemblies 1 and 2                                    | 2-158g  |
| 2-73c.  | Redundant Shelf 3 Motherboard Terminal Blocks<br>(8000 Computer) . . . . .                    | 2-158h  |
| 2-73d.  | Model 86460 and 86461 Memory Switch Assembly<br>Terminal Blocks . . . . .                     | 2-158i  |
| 2-73e.  | Model 77780 and 77781 CPU/Memory Switch Assembly<br>Terminal Blocks . . . . .                 | 2-158j  |
| 2-73f.  | CPU/Memory Switch Assembly 2 Installed in 208-VAC Cabinet                                     | 2-158k  |
| 2-73g.  | Switched CPU Voltages Terminal Block (TB11) . . . . .                                         | 2-158n  |
| 2-73h.  | Moving +5V to the CPU/Memory Switch Assembly (TB11) . . .                                     | 2-158n  |
| 2-73i.  | Quad Serial I/O, Paddleboards and 25-Pair Cable . . . .                                       | 2-158t  |
| 2-73j.  | Single-Supply Memory 256K PCA . . . . .                                                       | 2-158z  |
| 2-73k.  | 8000 Memory Controller PCA . . . . .                                                          | 2-158ab |
| 2-73l.  | 8000 B CPU PCA . . . . .                                                                      | 2-158ad |
| 2-73m.  | Quad Serial I/O PCA Controls and Indicators . . . . .                                         | 2-158af |
| 2-73n.  | Model 77780 and 77781 CPU/Memory Switch Assemblies 1 and 2                                    | 2-158ah |
| 2-74.   | 7000 Computer Shelf 3 Controls and Indicators . . . . .                                       | 2-161   |
| 2-75.   | 7000 Computer Shelf 3 with TCC and NPC Controls and<br>Indicators . . . . .                   | 2-163   |
| 2-76.   | CPU 1 APL PCA Controls and Indicators . . . . .                                               | 2-166   |
| 2-77.   | NPC Controls and Indicators . . . . .                                                         | 2-168   |
| 2-78.   | TDM Shelves Controls and Indicators . . . . .                                                 | 2-170   |
| 2-79.   | 208-VAC Cabinet 1 Power Entry Panel Controls and Indicators                                   | 2-172   |
| 2-80.   | 208-VAC Cabinets 2/3 Power Entry Panel Controls<br>and Indicators . . . . .                   | 2-174   |
| 2-81.   | DC Cabinet 1 Power Entry Panel Controls and Indicators . . .                                  | 2-176   |
| 2-82.   | DC Cabinets 2/3 Power Entry Controls and Indicators . . .                                     | 2-178   |
| 2-83.   | 208-VAC Main Power Supply (Model 86940) Controls and<br>Indicators (Sheet 1 of 2) . . . . .   | 2-180   |
| 2-84.   | 208-VAC Main Power Supply (Model 77110) Controls and<br>Indicators . . . . .                  | 2-184   |
| 2-85.   | Memory Power Supply (Model 86950) Controls and Indicators . .                                 | 2-186   |
| 2-86.   | DC Main Power Supply Controls and Indicators . . . . .                                        | 2-188   |
| 2-87.   | DC/AC Inverter Controls and Indicators . . . . .                                              | 2-190   |
| 2-88.   | Memory Switch Assembly Controls and Indicators . . . . .                                      | 2-190b  |
| 2-89.   | 2-Channel Serial I/O PCA Controls and Indicators . . . . .                                    | 2-192   |
| 2-90.   | Quad Serial I/O PCA Controls and Indicators . . . . .                                         | 2-194   |
| 2-91.   | I/O Bus Switch PCA Controls and Indicators . . . . .                                          | 2-196   |
| 2-92.   | Floppy Disk Interface PCA Controls and Indicators . . . . .                                   | 2-198   |
| 2-93.   | Rotated 208-VAC Main Power Supply (Model 77110, Level D)<br>Controls and Indicators . . . . . | 2-200   |
| 2-94.   | Memory Power Supply (Model 77100) Controls and Indicators . .                                 | 2-202   |
| 2-95.   | Rotated DC Main Power Supply (Level D) . . . . .                                              | 2-204   |
| 2-96.   | 208-VAC Cabinet 1 PDP Controls and Indicators . . . . .                                       | 2-206   |
| 2-97.   | DC Cabinet 1 PDP Controls and Indicators . . . . .                                            | 2-212   |
| 2-98.   | 208-VAC/DC Cabinet 2 PDP Controls and Indicators . . . . .                                    | 2-218   |
| 2-99.   | 208-VAC/DC Cabinet 3 PDP Controls and Indicators . . . . .                                    | 2-222   |
| 2-99a.  | 208-VAC Cabinet 1 SAP Controls and Indicators . . . . .                                       | 2-224b  |
| 2-99b.  | DC Cabinet 1 SAP Controls and Indicators . . . . .                                            | 2-224d  |
| 2-100.  | DC Cabinets 2/3 SAP Controls and Indicators . . . . .                                         | 2-224g  |
| 2-100a. | ATC Rear and Side Panel Controls . . . . .                                                    | 2-224j  |
| 2-100b. | ATC Front Panel Controls and Indicators . . . . .                                             | 2-224j  |

|         |                                                                                         |        |
|---------|-----------------------------------------------------------------------------------------|--------|
| 2-100c. | Sample ROLMphone 400 Telephone . . . . .                                                | 2-224t |
| 2-101.  | Shelf 3 Motherboard Terminal Blocks (Redundant System) . . . . .                        | 2-227  |
| 2-102.  | PDP Voltage Test Points (Rear) . . . . .                                                | 2-232  |
| 2-103.  | Umbilical Cable Voltage Test Points . . . . .                                           | 2-233  |
| 2-104.  | Operating System Cassette . . . . .                                                     | 2-238  |
| 2-105.  | Techtran Operating System Cassette . . . . .                                            | 2-240  |
| 2-106.  | Inserting the Diskette . . . . .                                                        | 2-263  |
| 2-107.  | 4-Wire Test Port PCA . . . . .                                                          | 2-273  |
| 2-108.  | 4-Wire Test Port PCA Connected to the MDF . . . . .                                     | 2-275  |
| 2-109.  | Loopback and Silent Test Termination . . . . .                                          | 2-276  |
| 2-110.  | Test Setup for Universal Tie Trunk Interface PCA . . . . .                              | 2-278  |
| 2-110a. | Model 85631 Tie Trunk Interface PCA Transmission Levels . . . . .                       | 2-278a |
| 2-111.  | Test Setup for Standard Single-Line Station Interface PCA . . . . .                     | 2-279  |
| 2-112.  | Test Setup for Direct Trunk Interface PCA . . . . .                                     | 2-279  |
| 2-113.  | Direct Trunk Balance Test Setup . . . . .                                               | 2-282  |
| 2-114.  | Logic PCA . . . . .                                                                     | 2-284  |
| 2-115.  | Channel Amplifier PCA . . . . .                                                         | 2-288  |
| 2-116.  | NBOC Network . . . . .                                                                  | 2-290  |
| 2-117.  | R-C Network . . . . .                                                                   | 2-291  |
| 2-118.  | Sample Error Table Listing . . . . .                                                    | 2-303  |
| 2-119.  | Self-Test Troubleshooting Flow Chart . . . . .                                          | 2-305  |
| 2-120.  | Audit Table Format (Releases 3 and 4) . . . . .                                         | 2-312  |
| 2-121.  | Audit Table Format (Releases 5 and up) . . . . .                                        | 2-314  |
| 2-122.  | Sample Correction Table Listing . . . . .                                               | 2-316  |
| 2-123.  | Sample Traffic Table Listing (Release 6) . . . . .                                      | 2-317  |
| 2-124.  | Sample Bad Trunk Table Listing . . . . .                                                | 2-322  |
| 3-1.    | Air Filters . . . . .                                                                   | 3-2b   |
| 3-1a.   | Plenum Assembly and Disposable Air Filter . . . . .                                     | 3-3    |
| 3-2.    | Power and Ground Site Inspection Form . . . . .                                         | 3-6    |
| 3-3.    | Ground Impedance Measurement . . . . .                                                  | 3-7    |
| 3-4.    | Common-Mode Noise Source . . . . .                                                      | 3-8    |
| 3-5.    | Normal-Mode Noise Source . . . . .                                                      | 3-10   |
| 3-6.    | System Troubleshooting . . . . .                                                        | 3-14   |
| 3-7.    | Strapping Option on Silent 700 Service Teleprinter . . . . .                            | 3-21   |
| 3-7a.   | Removing Screens from the Plenum Assembly . . . . .                                     | 3-32c  |
| 3-8.    | Motor Control Paddleboard Connectors . . . . .                                          | 3-65   |
| 3-9.    | Disk Drive Power and Signal Cable Connections . . . . .                                 | 3-66   |
| 3-9a.   | 208-VAC Cabinet (Rear View) . . . . .                                                   | 3-66j  |
| 3-9b.   | DC Cabinet (Rear View) . . . . .                                                        | 3-66c  |
| 3-9c.   | 208-VAC Cabinet Power Entry Box . . . . .                                               | 3-66d  |
| 3-9d.   | 208-VAC Cabinet Plenum Assembly and Power Entry Panel<br>(Front View) . . . . .         | 3-66e  |
| 3-9e.   | 208-VAC Cabinet Main Power Supply . . . . .                                             | 3-66f  |
| 3-9f.   | DC Main Power Supply . . . . .                                                          | 3-66j  |
| 3-10.   | Wiring Diagram, AC1R (Sheet 1 of 4) . . . . .                                           | 3-73   |
| 3-11.   | Wiring Diagram, AC1R (Sheet 1 of 4) . . . . .                                           | 3-81   |
| 3-12.   | Wiring Diagram, AC3R (Sheet 1 of 3) . . . . .                                           | 3-89   |
| 3-13.   | Wiring Diagram, DC1RN (Sheet 1 of 4) . . . . .                                          | 3-95   |
| 3-14.   | Wiring Diagram, DC2RN (Sheet 1 of 4) . . . . .                                          | 3-103  |
| 3-15.   | Wiring Diagram, DC3RN (Sheet 1 of 3) . . . . .                                          | 3-111  |
| 3-16.   | 208 VAC Cabinet 1 - AC Distribution . . . . .                                           | 3-117  |
| 3-17.   | DC Cabinet 1 - Primary Power Distribution . . . . .                                     | 3-119  |
| 4-1.    | Nonredundant 8000 Computer Common Control Block Diagram . . . . .                       | 4-2e   |
| 4-1a.   | Nonredundant 7000 Computer Common Control Block Diagram . . . . .                       | 4-3    |
| 4-2.    | Redundant Computer Common Control Block Diagram . . . . .                               | 4-9    |
| 4-3.    | 12k Memory PCA Address Plug Location and<br>Jumper Configuration . . . . .              | 4-19   |
| 4-4.    | Model 85320 48k Memory PCA Address Plug Location and<br>Jumper Configuration . . . . .  | 4-20   |
| 4-5.    | Model 85320A 48k Memory PCA Address Plug Location and<br>Jumper Configuration . . . . . | 4-20   |



|        |                                                                                            |       |
|--------|--------------------------------------------------------------------------------------------|-------|
| 4-6.   | Model 85320B 48k Memory PCA Address Plug Location and Jumper Configuration . . . . .       | 4-21  |
| 5-1.   | TDM Network Control PCAs, Expander PCAs, and CPU PCAs . . . . .                            | 5-5   |
| 5-2.   | TDM Network Control Signal Flow . . . . .                                                  | 5-7   |
| 5-3.   | Address Bus Command Word Configuration . . . . .                                           | 5-10  |
| 5-4.   | Expander PCA Block Diagram . . . . .                                                       | 5-11  |
| 5-5.   | Expander PCA Signal Flow . . . . .                                                         | 5-12  |
| 5-6.   | Expander PCA Address Plug Location and Configuration . . . . .                             | 5-15  |
| 5-7.   | ISB Assembly (Rear View of Cabinet 1) . . . . .                                            | 5-17  |
| 5-8.   | ISB Terminator B Assembly . . . . .                                                        | 5-18  |
| 5-9.   | ISB Terminator A Assembly . . . . .                                                        | 5-18  |
| 6-1.   | 2-Channel Serial I/O PCA Block Diagram . . . . .                                           | 6-3   |
| 6-2.   | I/O Bus Switch PCA Block Diagram . . . . .                                                 | 6-8a  |
| 6-3.   | Switched I/O Bus Signal Flow . . . . .                                                     | 6-9   |
| 6-4.   | Floppy Disk System in a Nonredundant CBX . . . . .                                         | 6-11  |
| 6-5.   | Floppy Disk System in a Redundant CBX with APL . . . . .                                   | 6-12  |
| 6-6.   | Motor Control PCA Simplified Schematic Diagram . . . . .                                   | 6-13  |
| 6-7.   | Floppy Disk Interface PCA Block Diagram . . . . .                                          | 6-13  |
| 6-8.   | 2-Channel Serial I/O PCA Device Select Code Strapping Locations . . . . .                  | 6-18  |
| 6-9.   | Quad Serial I/O PCA Controls and Indicators . . . . .                                      | 6-19  |
| 6-10.  | Deleted . . . . .                                                                          | 6-21  |
| 6-11.  | Deleted . . . . .                                                                          | 6-22  |
| 6-12.  | I/O Bus Switch PCA Jumper Plugs . . . . .                                                  | 6-23  |
| 6-13.  | Motor Control Paddleboard Location in Cabinet 1 (Rear View) . . . . .                      | 6-24  |
| 6-14.  | Motor Control Paddleboard Connections . . . . .                                            | 6-25  |
| 7-1.   | Tone Sender PCA Signal Flow . . . . .                                                      | 7-3   |
| 7-2.   | Tone Sender PCA Block Diagram . . . . .                                                    | 7-5   |
| 7-3.   | Tone Sender PCA Connections . . . . .                                                      | 7-7   |
| 7-4.   | DTMF Register PCA Signal Flow . . . . .                                                    | 7-9   |
| 7-5.   | DTMF Register PCA Block Diagram . . . . .                                                  | 7-10  |
| 7-6.   | Quad DTMF Register PCA Signal Flow . . . . .                                               | 7-12  |
| 7-7.   | Quad DTMF Register PCA Block Diagram . . . . .                                             | 7-13  |
| 7-8.   | Rotary Sender PCA Output Signal Flow . . . . .                                             | 7-14  |
| 7-9.   | Rotary Sender PCA Input Signal Flow . . . . .                                              | 7-16  |
| 7-10.  | Conference Bridge Group Block Diagram . . . . .                                            | 7-18  |
| 7-11.  | Conference Bridge Group Signal Flow . . . . .                                              | 7-19  |
| 7-12.  | Signal Detection PCA Group . . . . .                                                       | 7-21  |
| 7-13.  | SDC (Connections During a VPL Call . . . . .                                               | 7-24  |
| 7-14.  | SDC Monitoring Reflections of Line Transmit Signals . . . . .                              | 7-25  |
| 8-1.   | Interface Group Signal Flow . . . . .                                                      | 8-2   |
| 8-2.   | Coder PCA Block Diagram . . . . .                                                          | 8-3   |
| 8-3.   | Decoder PCA Block Diagram . . . . .                                                        | 8-5   |
| 8-4.   | Single-Line Interface Group Signal Flow . . . . .                                          | 8-7   |
| 8-5.   | 8-Channel Line Interface PCA Schematic Diagram (One Channel) . . . . .                     | 8-9   |
| 8-6.   | 4-Channel Line Interface PCA Simplified Schematic Diagram . . . . .                        | 8-12  |
| 8-7.   | OPX Single-Line Interface Group Block Diagram . . . . .                                    | 8-14  |
| 8-8.   | Model 85690 8-Channel OPX or OPS Line Interface PCA Simplified Schematic Diagram . . . . . | 8-15  |
| 8-9.   | KTI Group Block Diagram . . . . .                                                          | 8-17  |
| 8-10.  | KTI PCA/KTA/Key Telephone Interconnections . . . . .                                       | 8-18  |
| 8-11.  | KTI PCA Data Conversion . . . . .                                                          | 8-19  |
| 8-12.  | KTI PCA Simplified Schematic Diagram . . . . .                                             | 8-21  |
| 8-13.  | KTA Block Diagram . . . . .                                                                | 8-23  |
| 8-14.  | ETI PCAs Block Diagram . . . . .                                                           | 8-25  |
| 8-14a. | MWL Interface Motherboard (Rear View) . . . . .                                            | 8-26b |
| 8-14b. | 8-Channel MWL Single-Line Interface PCA . . . . .                                          | 8-26c |
| 8-14c. | ROLMphone 400 Telephone System Diagram . . . . .                                           | 8-26d |
| 8-14d. | RPI 1 PCA Block Diagram . . . . .                                                          | 8-26f |
| 8-14e. | RPI 2 PCA Block Diagram . . . . .                                                          | 8-26h |
| 8-15.  | Sample List Extension (LEX) Listing . . . . .                                              | 8-34  |
| 8-16.  | Sample Extension Status (STE) Listing . . . . .                                            | 8-34  |
| 8-17.  | Sample List Class of Service (LCSF) Listing . . . . .                                      | 8-37  |

|         |                                                                                                             |        |
|---------|-------------------------------------------------------------------------------------------------------------|--------|
| 8-18.   | Sample LKB Listing . . . . .                                                                                | 8-41   |
| 8-19.   | ETI I LED Indicators . . . . .                                                                              | 8-48   |
| 8-20.   | Model 85691 8-Channel OPS Line Interface PCA . . . . .                                                      | 8-51   |
| 9-1.    | ATC Signal Flow . . . . .                                                                                   | 9-2    |
| 9-2.    | ATC Block Diagram . . . . .                                                                                 | 9-3    |
| 9-3.    | ATC Connector Block . . . . .                                                                               | 9-9    |
| 9-4.    | ATC Power Transformer (Model 87070A) . . . . .                                                              | 9-11   |
| 9-5.    | ATC Rear View . . . . .                                                                                     | 9-14   |
| 9-6.    | ATC Top Cover Removal . . . . .                                                                             | 9-14   |
| 9-7.    | ATC Alignment Screws . . . . .                                                                              | 9-15   |
| 9-8.    | ATC Fuses . . . . .                                                                                         | 9-16   |
| 9-9.    | ATC Push Button Lamp . . . . .                                                                              | 9-18   |
| 10-1.   | Direct Trunk Interface Group Block Diagram . . . . .                                                        | 10-2   |
| 10-2.   | Direct Trunk Interface PCA (Model 85570)<br>Simplified Schematic Diagram (One Channel) . . . . .            | 10-5   |
| 10-3.   | Direct Trunk Interface PCA (Model 85570A)<br>Simplified Schematic Diagram (One Channel) . . . . .           | 10-7   |
| 10-4.   | 8-Channel Universal Tie Trunk Interface Group Block Diagram . . . . .                                       | 10-9   |
| 10-5.   | Trunk Controller PCA and Model 85630 8-Channel Universal<br>Tie Trunk Interface PCA (One Channel) . . . . . | 10-10  |
| 10-6.   | 4-Channel Universal Tie Trunk Group Block Diagram . . . . .                                                 | 10-13  |
| 10-7.   | 4-Channel Universal Tie Trunk Interface PCA<br>Schematic Diagram (One Channel) . . . . .                    | 10-14  |
| 10-8.   | DID Trunk Interface Group Block Diagram . . . . .                                                           | 10-16  |
| 10-9.   | Model 85610A DID Trunk Interface PCA Schematic Diagram<br>(One Channel) . . . . .                           | 10-18  |
| 10-10.  | CDH Trunk Interface Group Block Diagram . . . . .                                                           | 10-20  |
| 10-11.  | CDH Trunk Interface PCA (Model 85550A)<br>Simplified Schematic Diagram . . . . .                            | 10-21  |
| 10-12.  | CDH Trunk Interface PCA (Model 85550)<br>Simplified Schematic Diagram . . . . .                             | 10-23  |
| 10-13.  | Direct Trunk Bypass Group Functional Block Diagram . . . . .                                                | 10-27  |
| 10-14.  | Sample Bad Trunk Table (LRBT) Listing . . . . .                                                             | 10-34  |
| 10-15.  | Sample Trunk Classification Table . . . . .                                                                 | 10-35  |
| 10-16.  | Sample Trunk Status (STT) Listings . . . . .                                                                | 10-36  |
| 10-17.  | Sample Trunk Attribute (LTK) Listing . . . . .                                                              | 10-38  |
| 10-18.  | Direct Trunk Test Setup . . . . .                                                                           | 10-43  |
| 10-19.  | Sample Access Code (LAC) Listing . . . . .                                                                  | 10-46  |
| 10-20.  | Sample System Parameters (LSP) 44 and 50 Listings . . . . .                                                 | 10-49  |
| 10-21.  | Sample Digit Translation Group (LDTG) and Digit<br>Translation Table (LDTT) Listings . . . . .              | 10-49  |
| 10-22.  | DID Trunk Test Setup . . . . .                                                                              | 10-52  |
| 10-23.  | Sample Channel Identification (CHID) Dialogue . . . . .                                                     | 10-54  |
| 10-24.  | Sample Extension Classification Table (Tie Trunks) . . . . .                                                | 10-55  |
| 10-25.  | Sample List Extension (LEX) Listing . . . . .                                                               | 10-56  |
| 10-26.  | E&M Type I Signaling Test Setup . . . . .                                                                   | 10-57  |
| 10-27.  | E&M Type II Signaling Test Setup . . . . .                                                                  | 10-58  |
| 10-27a. | Model 85630 Tie Trunk Interface PCA Transmission Levels . . . . .                                           | 10-60a |
| 10-27b. | Model 85631 Tie Trunk Interface PCA Transmission Levels . . . . .                                           | 10-60b |
| 10-28.  | 4-Channel Direct Trunk Interface PCA (Model 85570) . . . . .                                                | 10-67  |
| 10-29.  | Direct Trunk Balance Test Setup . . . . .                                                                   | 10-69  |
| 10-30.  | 4-Wire Test Port PCA . . . . .                                                                              | 10-70  |
| 10-31.  | Logic PCA . . . . .                                                                                         | 10-72  |
| 10-32.  | Channel Amplifier PCA . . . . .                                                                             | 10-76  |
| 10-33.  | NBOC Network . . . . .                                                                                      | 10-78  |
| 10-34.  | R-C Network . . . . .                                                                                       | 10-79  |
| 10-34a. | Model 85612 8-Channel DID Trunk Interface PCA . . . . .                                                     | 10-81  |
| 10-35.  | Universal Tie Trunk Controller PCA Jumper and Switch<br>Locations . . . . .                                 | 10-81  |
| 10-36.  | Universal Tie Trunk Controller PCA Signaling Mode Switches . . . . .                                        | 10-82  |
| 10-36a. | Universal Tie Trunk Controller PCA Switch Settings for<br>CAS Applications . . . . .                        | 10-82a |
| 10-37.  | Configuration Selector PCA . . . . .                                                                        | 10-84  |

|         |                                                             |        |
|---------|-------------------------------------------------------------|--------|
| 10-38.  | Model 85630 8-Channel Universal Tie Trunk Interface PCA     |        |
|         | Switch Locations . . . . .                                  | 10-86  |
| 10-38a. | Model 85631 8-Channel Universal Tie Trunk Interface . . . . | 10-86a |
| 10-39.  | 4-Channel Universal Tie Trunk Interface PCA Jumper          |        |
|         | and IC Locations . . . . .                                  | 10-88  |
| 11-1.   | CBX Call Process . . . . .                                  | 11-2   |
| 11-2.   | Station-to-Station Call Process . . . . .                   | 11-7   |
| 11-3.   | *9 Hold Call Process . . . . .                              | 11-11  |
| 11-4.   | Can't Ring and Busy Call Process . . . . .                  | 11-13  |
| 11-5.   | COM Group Call Process . . . . .                            | 11-15  |
| 11-6.   | Ringdown Call Process . . . . .                             | 11-17  |
| 11-7.   | Basic CBX Station-to-Trunk Call Process . . . . .           | 11-20  |
| 11-8.   | Release 4 Route Optimization Call Process . . . . .         | 11-21  |
| 11-9.   | Release 5 Route Optimization Call Process . . . . .         | 11-24  |
| 11-10.  | Release 6 Route Optimization Call Process . . . . .         | 11-25  |
| 11-11.  | Last Choice Trunk Call Process . . . . .                    | 11-26  |
| 11-12.  | Queuing Call Process . . . . .                              | 11-27  |
| 12-1.   | 208-VAC Cabinet 1 - Front View . . . . .                    | 12-2a  |
| 12-1a.  | 208-VAC Cabinet 1 - Rear View . . . . .                     | 12-2b  |
| 12-1b.  | DC Cabinet 1 - Front View . . . . .                         | 12-2c  |
| 12-1c.  | DC Cabinet 1 - Rear View . . . . .                          | 12-2d  |
| 12-1d.  | 208-VAC Cabinet 1 Input Power Distribution . . . . .        | 12-2e  |
| 12-2.   | DC Cabinet 1 Input Power Distribution . . . . .             | 12-5   |
| 12-2a.  | 208-VAC Cabinet Power Entry Box . . . . .                   | 12-6a  |
| 12-2b.  | 208-VAC Cabinet Power Entry Box Wiring Diagram (Cabinet 1)  | 12-6b  |
| 12-2c.  | DC Cabinet Power Entry Box . . . . .                        | 12-6c  |
| 12-2d.  | DC Power Entry Box Wiring Diagram (Cabinet 1) . . . . .     | 12-6d  |
| 12-2e.  | DC Power Entry Box Input Receptacle . . . . .               | 12-6e  |
| 12-3.   | Cabinet 1 Main Power Supply Schematic Diagram . . . . .     | 12-8   |
| 12-4.   | Memory Power Supply Simplified Schematic Diagram . . . . .  | 12-10  |
| 12-4a.  | 208-VAC Cabinet Memory Back-Up Batteries . . . . .          | 12-10a |
| 12-5.   | Memory and Protected Power Wiring Diagram . . . . .         | 12-11  |
| 12-6.   | DC Main Power Supply Schematic Diagram . . . . .            | 12-13  |
| 12-7.   | Cabinet 1 Power Distribution Wiring Diagram . . . . .       | 12-17  |
| 12-8.   | Cabinet 2 Power Distribution Wiring Diagram . . . . .       | 12-19  |
| 12-9.   | Cabinet 3 Power Distribution Wiring Diagram . . . . .       | 12-20  |
| 12-10.  | Distribution Loss Resistors . . . . .                       | 12-23  |
| 12-11.  | 208-VAC Cabinet 1 +5V Distribution . . . . .                | 12-26  |
| 12-12.  | DC Cabinet 1 +5V Distribution . . . . .                     | 12-27  |
| 12-13.  | Power Distribution to Memory Switch Assembly . . . . .      | 12-28  |
| 12-14.  | DC Cabinet 1 +12V Distribution . . . . .                    | 12-28  |
| 12-14a. | Model 77780 and 77781 CPU/Memory Switch Assembly Terminal   |        |
| Blocks  |                                                             | 12-28a |
| 12-15.  | 208-VAC Cabinet 1 +15V Distribution . . . . .               | 12-30  |
| 12-16.  | 208-VAC Cabinet 1 -15V Distribution . . . . .               | 12-31  |
| 12-17.  | DC Cabinet 1 +15V Distribution . . . . .                    | 12-32  |
| 12-18.  | DC Cabinet 1 -15V Distribution . . . . .                    | 12-33  |
| 12-19.  | 208-VAC Cabinet 1 -48V Distribution . . . . .               | 12-34  |
| 12-20.  | DC Cabinet 1 -48V Distribution . . . . .                    | 12-35  |
| 12-21.  | 208-VAC Cabinet 1 Ring Voltage Distribution . . . . .       | 12-36  |
| 12-22.  | DC Cabinet 1 Ring Voltage Distribution . . . . .            | 12-36  |
| 12-23.  | Shelf 3 Motherboard Terminal Blocks . . . . .               | 12-37  |
| 12-24.  | TDM Motherboard Terminal Blocks . . . . .                   | 12-38  |
| 12-25.  | Cabinet 1 ISB Terminator and Coupler PCAs . . . . .         | 12-41  |
| 12-26.  | Cabinets 2 and 3 ISB Terminator PCAs . . . . .              | 12-43  |
| 12-27.  | DC Power-Fail Circuits . . . . .                            | 12-46  |
| 12-28.  | High Temperature Alarm Circuits . . . . .                   | 12-48  |
| 12-29.  | RESET Switch S3 . . . . .                                   | 12-49  |
| 12-30.  | Fuse Alarm and Software Alarm Circuitry . . . . .           | 12-50  |
| 12-31.  | Ring Detection and Answer Circuit . . . . .                 | 12-51  |
| 12-32.  | SAP Real-Time Clock Signals . . . . .                       | 12-52  |

|         |                                                                                                |         |
|---------|------------------------------------------------------------------------------------------------|---------|
| 12-33.  | 208-VAC Cabinet Power Fail Circuit . . . . .                                                   | 12-54   |
| 12-34.  | DC Cabinet Power Fail Circuit . . . . .                                                        | 12-54   |
| 12-35.  | Bypass Enable and Umbilical Enable Circuits . . . . .                                          | 12-55   |
| 12-36.  | MAIN CIRCUIT BREAKER Tripped (208-VAC/DC CBX) . . . . .                                        | 12-70   |
| 12-37.  | Power Supply INPUT Circuit Breaker Tripped (208-VAC/DC CBX) . . . . .                          | 12-71   |
| 12-38.  | +5V Missing at TEST POINT (208-VAC/DC CBX) . . . . .                                           | 12-72   |
| 12-39.  | ±15, +5 (208-VAC/DC CBX) or +12P (DC CBX) Cannot Be<br>Adjusted to Within Tolerances . . . . . | 12-73   |
| 12-40.  | +24V Missing at TEST POINT (208-VAC CBX) . . . . .                                             | 12-74   |
| 12-41.  | -48V Missing at TDM Shelf(ves) (208-VAC/DC CBX) . . . . .                                      | 12-75   |
| 12-42.  | AC1/AC2 Missing at A3TB2 of Common Control Motherboard<br>(208-VAC/DC CBX) . . . . .           | 12-76   |
| 12-43.  | +10V PRIPWR Signal Missing at A7TB2-1/A10TB2-2<br>(208-VAC/DC CBX) . . . . .                   | 12-77   |
| 12-44.  | AC Power Missing to Blowers/Floppy Disk System (DC CBX) . . . . .                              | 12-78   |
| 12-45.  | POWER SUPPLY LED Lighted on SAP (Redundant DC CBX Only) . . . . .                              | 12-79   |
| 12-46.  | Any Supply Voltage Missing at Load (Shelf) . . . . .                                           | 12-81   |
| 12-47.  | ±15V Missing at TEST POINT (208-VAC CBX) . . . . .                                             | 12-83   |
| 12-48.  | ±15V Missing at TEST POINT (Redundant CBX) . . . . .                                           | 12-85   |
| 12-49.  | -15V Missing at TEST POINT (208-VAC CBX) . . . . .                                             | 12-87   |
| 12-50.  | +24V Missing at TEST POINT (DC CBX) . . . . .                                                  | 12-89   |
| 12-51.  | V1/V2 +5V Missing at TDM Shelf(ves) (208-VAC/DC CBX) . . . . .                                 | 12-91   |
| 12-52.  | -48V Missing at TEST POINT (208-VAC/DC CBX) . . . . .                                          | 12-93   |
| 12-53.  | Ring Voltage Missing at TEST POINT (208-VAC/DC CBX) . . . . .                                  | 12-95   |
| 12-54.  | Ring Voltage Missing at TDM Shelf(ves) (208-VAC/DC CBX) . . . . .                              | 12-97   |
| 12-55.  | +12P Missing at TEST POINT (208-VAC/DC CBX) . . . . .                                          | 12-99   |
| 12-56.  | +5P Missing at TEST POINT (208-VAC/DC CBX) . . . . .                                           | 12-101  |
| 12-57.  | Service Alarm PCA Connectors . . . . .                                                         | 12-104  |
| 12-58.  | Memory Back-Up Batteries (Rear View) . . . . .                                                 | 12-107  |
| 12-58a. | 208-VAC Main Power Supply-Front View Bay A . . . . .                                           | 12-110a |
| 12-58b. | Memory Power Supply (Front View) . . . . .                                                     | 12-110b |
| 12-58c. | DC Main Power Supply (Front View) . . . . .                                                    | 12-110c |
| 12-58d. | DC/AC Inverter . . . . .                                                                       | 12-110d |
| 13-1.   | PortaCom PC8110 Service Teleprinter Controls and Indicators . . . . .                          | 13-6    |
| 13-2.   | Cassette Unit/Teleprinter/System Interconnection (Local) . . . . .                             | 13-7    |
| 13-3.   | PortaCom PC8110 Service Teleprinter Connection (Remote) . . . . .                              | 13-8    |
| 13-4.   | TI 745 Silent 700 Teleprinter Controls and Indicators . . . . .                                | 13-9    |
| 13-5.   | TI 745 Silent 700 Teleprinter Remote Connection . . . . .                                      | 13-11   |
| 13-6.   | Sample COS Feature Assignment . . . . .                                                        | 13-30a  |
| 13-7.   | ETS Feature-Button Numbering Layout . . . . .                                                  | 13-45   |
| 13-8.   | Sample System Speed Number Listing . . . . .                                                   | 13-105  |
| 13-9.   | EPI STR LINK II Controls and Indicators . . . . .                                              | 13-124  |
| 13-10.  | Techtran PXL 1000 Controls and Indicators . . . . .                                            | 13-124  |
| 13-11.  | Example of LRS and RRS Command Dialogue . . . . .                                              | 13-145  |
| 13-12.  | Typical Release 4 Traffic Table Listing . . . . .                                              | 13-160  |
| 13-13.  | Typical Release 5 Traffic Table Printout . . . . .                                             | 13-160  |
| 13-14.  | Typical Release 3 Expanded Traffic Table Listing . . . . .                                     | 13-173  |
| 13-15.  | Call-Waiting Display (Bar Graph) . . . . .                                                     | 13-180  |



## TABLES

| Table | Title                                                                                                                                          | Page  |
|-------|------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| 1-1.  | CBX Documents . . . . .                                                                                                                        | 1-2   |
| 1-2.  | Equipment Cabinet Model Numbers . . . . .                                                                                                      | 1-4   |
| 1-3.  | Physical Specifications . . . . .                                                                                                              | 1-34  |
| 1-4.  | Capacity . . . . .                                                                                                                             | 1-34  |
| 1-5.  | Electrical Specifications . . . . .                                                                                                            | 1-35  |
| 1-6.  | Transmission Losses at 1004 Hz . . . . .                                                                                                       | 1-36  |
| 1-7.  | Environmental Specifications . . . . .                                                                                                         | 1-37  |
| 1-8.  | FCC EMI Radiation Limitations . . . . .                                                                                                        | 1-37  |
| 2-1.  | Space and Weight Work Sheet . . . . .                                                                                                          | 2-2   |
| 2-2.  | DELETED . . . . .                                                                                                                              | 2-3   |
| 2-3.  | DELETED . . . . .                                                                                                                              | 2-4   |
| 2-4.  | DELETED . . . . .                                                                                                                              | 2-5   |
| 2-5.  | Total Site Requirements Work Sheet . . . . .                                                                                                   | 2-5   |
| 2-6.  | Site Preparation Check List . . . . .                                                                                                          | 2-6   |
| 2-7.  | Cable Capacities . . . . .                                                                                                                     | 2-22a |
| 2-8.  | General Power Ratings . . . . .                                                                                                                | 2-22b |
| 2-9.  | Bonded Copper Ground Rods . . . . .                                                                                                            | 2-23  |
| 2-10. | Heavy Duty Ground Rod Clamps . . . . .                                                                                                         | 2-23  |
| 2-11. | Bolt Ground Clamps for Cable to Driven Rod or Pipe . . . . .                                                                                   | 2-24  |
| 2-12. | Cast Bronze Ground Clamps for Armored Ground Wire to<br>Water Pipe . . . . .                                                                   | 2-25  |
| 2-13. | Cast Bronze Ground Clamps for Ground Wire to Water Pipe . . . . .                                                                              | 2-25  |
| 2-14. | Sectional Ground Rods . . . . .                                                                                                                | 2-25  |
| 2-15. | Couplings and Driving Studs . . . . .                                                                                                          | 2-26  |
| 2-16. | Pig Tail Ground Rods . . . . .                                                                                                                 | 2-26  |
| 2-17. | Ground Rod Clamps for Cable to Driven Rod . . . . .                                                                                            | 2-26  |
| 2-18. | Maximum Ground (Green) Wire Length for CBX Feeders . . . . .                                                                                   | 2-31  |
| 2-19. | Circuit Capacity . . . . .                                                                                                                     | 2-33  |
| 2-20. | CBX Equipment Room Branch Circuit Requirements . . . . .                                                                                       | 2-34  |
| 2-21. | Plug and Socket Configurations . . . . .                                                                                                       | 2-34  |
| 2-22. | Power and Ground Test Equipment Kits . . . . .                                                                                                 | 2-38  |
| 2-23. | CBX Feeder and Single Point Ground Evaluation . . . . .                                                                                        | 2-40  |
| 2-24. | CBX Branch Circuit Evaluation . . . . .                                                                                                        | 2-41  |
| 2-25. | Equipment Cabinet Environmental Requirements . . . . .                                                                                         | 2-43  |
| 2-26. | ATC Environmental Requirements . . . . .                                                                                                       | 2-43  |
| 2-27. | Air Conditioning and Power Dissipation Specification<br>208-VAC Cabinet 1 with Nonredundant CPU and 144k Memory* . . . . .                     | 2-45  |
| 2-28. | Air Conditioning and Power Dissipation 208-VAC<br>Cabinet 1 with Redundant CPU and 144k Memory* . . . . .                                      | 2-45  |
| 2-29. | Air Conditioning and Power Dissipation Specifications<br>208-VAC Cabinets 2 and 3* . . . . .                                                   | 2-46  |
| 2-30. | Air Conditioning and Power Dissipation Specifications DC<br>Cabinet 1 with Nonredundant CPU, 144k Memory,<br>and Nonredundant Power* . . . . . | 2-46  |
| 2-31. | Air Conditioning and Power Dissipation Specifications DC<br>Cabinet 1 with Nonredundant CPU, 144k Memory,<br>and Redundant Power* . . . . .    | 2-47  |
| 2-32. | Air Conditioning and Power Dissipation Specifications<br>DC Cabinet 1 with Redundant CPU, 144k Memory,<br>and Nonredundant Power * . . . . .   | 2-47  |
| 2-33. | Air Conditioning and Power Dissipation Specifications<br>DC Cabinet 1 with Redundant CPU, 144k Memory,<br>and Redundant Power* . . . . .       | 2-48  |
| 2-34. | Air Conditioning and Power Dissipation Specifications<br>DC Cabinets 2 and 3 with Nonredundant Power* . . . . .                                | 2-48  |



|        |                                                                                                        |         |
|--------|--------------------------------------------------------------------------------------------------------|---------|
| 2-35.  | Air Conditioning Dissipation Specifications DC Cabinets 2 and 3 with Redundant Power*                  | 2-49    |
| 2-36.  | Air Conditioning and Power Dissipation Specifications Floppy Disk Drives*                              | 2-49    |
| 2-37.  | Shelf 3 PCA Identification Markings                                                                    | 2-57    |
| 2-38.  | MDF Requirements                                                                                       | 2-73    |
| 2-39.  | Cabinet-to-MDF Functions (25-Pair Cable)                                                               | 2-74    |
| 2-40.  | Standard Single-Line, Single-Line OPX, MWL Single-Line, and ROLMphone Telephone Cable-Pair Assignments | 2-81    |
| 2-41.  | Long-Loop Single-Line Telephones Cable-Pair Assignments                                                | 2-82    |
| 2-42.  | ETS and Key Telephones Cable Pair Assignment                                                           | 2-87    |
| 2-43.  | ATC Cable Pair Assignments                                                                             | 2-95    |
| 2-44.  | Direct Trunk Cable Pair Assignments                                                                    | 2-99    |
| 2-45.  | Tie Trunk Cable Pair Assignments                                                                       | 2-104   |
| 2-46.  | DID Trunk Cable Pair Assignments                                                                       | 2-110   |
| 2-47.  | CBX Bypass Cable Pair Assignments                                                                      | 2-114   |
| 2-48.  | Key Telephone Connector Terminations                                                                   | 2-126   |
| 2-49.  | Recommended Telephones                                                                                 | 2-128   |
| 2-50.  | ETS Telephone Cable Lead Terminations                                                                  | 2-130   |
| 2-51.  | Plantronics Installation                                                                               | 2-132   |
| 2-52.  | Magnetic Tape System Connectors                                                                        | 2-148   |
| 2-53.  | Shelf Arrangements                                                                                     | 2-151   |
| 2-54.  | Accessing Memory                                                                                       | 2-154   |
| 2-55.  | Hardware Requirements for MG-ISB Upgrade                                                               | 2-157   |
| 2-55a. | Quad Serial I/O Slot Assignments and Installation Procedures for the 7000 Computer                     | 2-158r  |
| 2-55b. | Quad Serial I/O Slot Assignments and Installation Procedures for the 8000 Computer                     | 2-158r  |
| 2-55c. | Quad Serial I/O 25-Pair Cable Assignments                                                              | 2-158s  |
| 2-55d. | RS-232-C Protocol                                                                                      | 2-158u  |
| 2-55e. | 8000 Computer Controls and Indicators Index                                                            | 2-158y  |
| 2-55f. | Single-Supply Memory 256k PCA Controls and Indicators                                                  | 2-158aa |
| 2-55g. | Memory Controller PCA (Model 86200) Controls and Indicators                                            | 2-158ac |
| 2-55h. | 8000B CPU PCA                                                                                          | 2-158ae |
| 2-55i. | Quad Serial I/O PCA Controls and Indicators                                                            | 2-158ag |
| 2-55j. | CPU/Memory Switch Assemblies 1 and 2                                                                   | 2-158ai |
| 2-56.  | 7000 Computer Controls and Indicators Index                                                            | 2-159   |
| 2-57.  | Memory PCA Controls and Indicators                                                                     | 2-165   |
| 2-58.  | CPU 1 and CPU 1 APL PCAs Controls and Indicators                                                       | 2-167   |
| 2-59.  | NPC Controls and Indicators                                                                            | 2-169   |
| 2-60.  | TDM Shelves Controls and Indicators                                                                    | 2-171   |
| 2-61.  | 208-VAC Cabinet 1 Power Entry Panel                                                                    | 2-173   |
| 2-62.  | 208-VAC Cabinets 2/3 Power Entry Panel                                                                 | 2-175   |
| 2-63.  | DC Cabinet 1 Power Entry Panel                                                                         | 2-177   |
| 2-64.  | DC Cabinets 2/3 Power Entry Panel                                                                      | 2-179   |
| 2-65.  | 208-VAC Main Power Supply (Model 86940) Controls and Indicators                                        | 2-183   |
| 2-66.  | 208-VAC Main Power Supply (Model 77110) Controls and Indicators                                        | 2-185   |
| 2-67.  | Memory Power Supply (Model 86950) Controls and Indicators                                              | 2-187   |
| 2-68.  | DC Main Power Supply Controls and Indicators                                                           | 2-189   |
| 2-69.  | DC/AC Inverter Controls and Indicators                                                                 | 2-190a  |
| 2-70.  | Memory Switch Assembly Controls and Indicators                                                         | 2-190c  |
| 2-71.  | 2-Channel Serial I/O PCA Controls and Indicators                                                       | 2-193   |
| 2-72.  | Quad Serial I/O PCA Controls and Indicators                                                            | 2-195   |
| 2-73.  | I/O Bus Switch PCA Controls and Indicators                                                             | 2-197   |
| 2-74.  | Floppy Disk Interface PCA Controls and Indicators                                                      | 2-199   |
| 2-75.  | 208-VAC Main Power Supply (Model 77110, Level D) Controls and Indicators                               | 2-201   |
| 2-76.  | Memory Power Supply (Model 77100) Controls and Indicators                                              | 2-203   |
| 2-77.  | DC Main Power Supply (Level D) Controls and Indicators                                                 | 2-205   |



|        |                                                                                                 |        |
|--------|-------------------------------------------------------------------------------------------------|--------|
| 2-78.  | PDP Controls and Indicators . . . . .                                                           | 2-207  |
| 2-79.  | DC Cabinet 1 PDP Controls and Indicators . . . . .                                              | 2-213  |
| 2-80.  | 208-VAC/DC Cabinet 2 PDP Controls and Indicators . . . . .                                      | 2-219  |
| 2-81.  | 208-VAC/DC Cabinet 3 PDP Controls and Indicators . . . . .                                      | 2-223  |
| 2-81a. | 208-VAC Cabinet 1 SAP Controls and Indicators . . . . .                                         | 2-224c |
| 2-81b. | DC Cabinet 1 SAP Controls and Indicators . . . . .                                              | 2-224e |
| 2-82.  | DC Cabinets 2/3 SAP Controls and Indicators . . . . .                                           | 2-224h |
| 2-82a. | ATC Controls and Indicators . . . . .                                                           | 2-224k |
| 2-82b. | ROLMphone 400 Telephone Controls and Indicators . . . . .                                       | 2-224u |
| 2-83.  | PDP TEST POINTS Voltages . . . . .                                                              | 2-226  |
| 2-84.  | Shelf 3 Backplane Voltage Test Points . . . . .                                                 | 2-228  |
| 2-85.  | TDM Motherboard Voltage Test Points . . . . .                                                   | 2-229  |
| 2-86.  | DC Main Power Supply Voltages (PDP Rear) . . . . .                                              | 2-231  |
| 2-87.  | Service Teleprinter Operating Commands . . . . .                                                | 2-235  |
| 2-88.  | 4-Wire Test Port PCA Controls and Indicators . . . . .                                          | 2-272  |
| 2-89.  | Direct Trunk Interface PCA (Model 85570A)<br>Jumper Configuration and Switch Settings . . . . . | 2-294  |
| 2-90.  | List of Self-Tests . . . . .                                                                    | 2-294  |
| 2-91.  | List of Error Types . . . . .                                                                   | 2-294a |
| 2-92.  | Type 0006 Error Codes . . . . .                                                                 | 2-295  |
| 2-93.  | Self-Test Command Summary . . . . .                                                             | 2-300  |
| 2-94.  | Command Error Message Summary . . . . .                                                         | 2-301  |
| 2-95.  | Self-Test Troubleshooting Procedures . . . . .                                                  | 2-307  |
| 2-96.  | Audit Table Interpretation (Releases 3 and 4) . . . . .                                         | 2-312  |
| 2-97.  | Audit Table Interpretation (Releases 5 and Up) . . . . .                                        | 2-313  |
| 2-98.  | Traffic Table Pegs for Maintenance Use . . . . .                                                | 2-318  |
| 3-1.   | Power Monitoring Connections . . . . .                                                          | 3-11   |
| 3-2.   | Dranetz 606 and 616 Monitoring Ranges and Capabilities . . . . .                                | 3-12   |
| 3-3.   | Station/Trunk Troubleshooting Command Summary . . . . .                                         | 3-15   |
| 3-4.   | Service Teleprinter Troubleshooting . . . . .                                                   | 3-19   |
| 3-5.   | DCU Troubleshooting . . . . .                                                                   | 3-22   |
| 3-6.   | Minimum Hardware Configurations for CDU Troubleshooting . . . . .                               | 3-25   |
| 3-7.   | Table 3-5 CDR Type 0006 Error Codes . . . . .                                                   | 3-27   |
| 3-8.   | Floppy Disk Program Load Troubleshooting . . . . .                                              | 3-29   |
| 3-9.   | APL Type 0006 Error Codes . . . . .                                                             | 3-30   |
| 3-9a.  | Quad Serial I/O Related Problems . . . . .                                                      | 3-32   |
| 3-10.  | Power Problem Categories, Causes, and Frequency . . . . .                                       | 3-32b  |
| 3-10a. | Baud Rate Switches on Floppy Disk Interface PCA . . . . .                                       | 3-32e  |
| 3-10b. | 2-Channel Serial I/O Indicators . . . . .                                                       | 3-32f  |
| 3-10c. | 8000 Computer Memory Error Types . . . . .                                                      | 3-32g  |
| 3-11.  | Off-Line Diagnostics Model Numbers . . . . .                                                    | 3-34   |
| 3-12.  | Diagnostic Program Fault Classification Chart . . . . .                                         | 3-36   |
| 3-13.  | Determining Memory Size and Faulty Memory PCAs . . . . .                                        | 3-37   |
| 3-14.  | ESW/Address Limit Tables . . . . .                                                              | 3-39   |
| 3-15.  | TDM Control Diagnostics . . . . .                                                               | 3-47   |
| 3-16.  | LED Indicators for Magnetic Tape Test . . . . .                                                 | 3-52   |
| 3-17.  | Magnetic Tape Fault Isolation Table . . . . .                                                   | 3-54   |
| 3-18.  | Baud Rate Switches on Floppy Disk Interface PCA . . . . .                                       | 3-57   |
| 3-19.  | Floppy Disk Error Codes . . . . .                                                               | 3-60   |
| 4-1.   | Nonredundant Memory Configurations . . . . .                                                    | 4-5    |
| 4-2.   | Redundant Memory Configurations . . . . .                                                       | 4-14   |
| 5-1.   | Intrashelf Bus Configuration . . . . .                                                          | 5-2    |
| 6-1.   | 2-Channel Serial I/O PCA P4 Pinouts to SAP (J1) . . . . .                                       | 6-5    |
| 6-2.   | Transfer Rate Selector Plug Configurations . . . . .                                            | 6-6    |
| 6-3.   | Quad Serial I/O Slot Assignments and Installation Procedures . . . . .                          | 6-7    |
| 6-3a.  | Quad Serial I/O Slot Assignments for 8000 Computer . . . . .                                    | 6-7    |
| 6-4.   | Quad Serial I/O Troubleshooting . . . . .                                                       | 6-16   |
| 6-5.   | Quad Serial I/O PCA Switch Settings* . . . . .                                                  | 6-20   |
| 7-1.   | Tone Sender PCA Outputs . . . . .                                                               | 7-8    |
| 8-1.   | Single-Line Station Troubleshooting . . . . .                                                   | 8-28   |
| 8-2.   | Extension Status (STE) Listing Definitions . . . . .                                            | 8-36   |

|         |                                                                                                             |        |
|---------|-------------------------------------------------------------------------------------------------------------|--------|
| 8-3.    | COS Features . . . . .                                                                                      | 8-37   |
| 8-4.    | Key Telephone Troubleshooting . . . . .                                                                     | 8-41   |
| 9-1.    | ATC Troubleshooting Procedures . . . . .                                                                    | 9-5    |
| 10-1.   | 4-Channel Universal Tie Trunk Interface PCA<br>Component Configuration . . . . .                            | 10-12  |
| 10-2.   | Trunk Status Listing Definitions . . . . .                                                                  | 10-37  |
| 10-3.   | Trunk Attribute Numbers . . . . .                                                                           | 10-38  |
| 10-4.   | Direct Trunk Protocol . . . . .                                                                             | 10-41  |
| 10-5.   | Tie Trunk Answer Supervision Readings on VOM (Dial Tone)                                                    | 10-61  |
| 10-6.   | Tie Trunk Answer Supervision Readings on VOM (Off Hook)                                                     | 10-61  |
| 10-7.   | DELETED . . . . .                                                                                           | 10-62  |
| 10-8.   | DELETED . . . . .                                                                                           | 10-62  |
| 10-9.   | Direct Trunk Interface PCA (Model 85570A) Jumper<br>Configuration and Switch Settings . . . . .             | 10-73  |
| 10-10.  | Level 1, 2 Model 85630 8-Channel Universal Tie Trunk<br>Interface PCAs Jumper Configuration . . . . .       | 10-85  |
| 10-11.  | Switch Settings on Level 3 and Higher Model 85630<br>8-Channel Universal Tie Trunk Interface PCAs . . . . . | 10-85  |
| 10-12.  | 4-Channel Universal Tie Trunk Interface PCA . . . . .                                                       | 10-87  |
| 10-13.  | 4-Channel Universal Tie Trunk PCA Circuit Descriptions . . . . .                                            | 10-89  |
| 10-14.  | 4-Channel Universal Tie Trunk PCA Circuit Requirements . . . . .                                            | 10-89  |
| 11-1.   | Traffic Table Pegs . . . . .                                                                                | 11-3   |
| 12-1.   | 208-VAC Main Power Supply Output Ratings . . . . .                                                          | 12-7   |
| 12-2.   | Main Power Supply Voltage Adjustments . . . . .                                                             | 12-9   |
| 12-3.   | 208-VAC Main Power Supply DC Overvoltage Trip Ranges . . . . .                                              | 12-9   |
| 12-4.   | Memory Power Supply Output Ratings . . . . .                                                                | 12-9   |
| 12-5.   | Memory Power Supply DC Overvoltage Trip Ranges . . . . .                                                    | 12-10  |
| 12-6.   | DC Main Power Supply Output Ratings . . . . .                                                               | 12-12  |
| 12-7.   | Shelf 3 Motherboard and Memory Switch Assembly Voltages . . . . .                                           | 12-39  |
| 12-8.   | TDM Motherboard Voltages . . . . .                                                                          | 12-39  |
| 12-9.   | DC Main Power Supply/SAP voltage Inputs . . . . .                                                           | 12-47  |
| 12-10.  | 2-Channel Serial I/O PCA J1 Pinouts . . . . .                                                               | 12-55  |
| 12-11.  | CDR Device J2 (SAP) Pinouts . . . . .                                                                       | 12-58  |
| 12-12.  | Teleprinter/DCU J3 (SAP) Pinouts . . . . .                                                                  | 12-58  |
| 12-13.  | RTC, Reset, and Primary Power J4 (SAP) Pinouts . . . . .                                                    | 12-59  |
| 12-14.  | PDP Signals and Power J5 (SAP) Pinouts . . . . .                                                            | 12-61  |
| 12-15.  | Power Supply 1 Failure Sense J6 (SAP) Pinouts . . . . .                                                     | 12-63  |
| 12-16.  | Power Supply 2 Failure Sense J7 (SAP) Pinouts . . . . .                                                     | 12-64  |
| 12-17.  | Modem Alarm J30 (SAP) Pinouts . . . . .                                                                     | 12-65  |
| 12-18.  | Power Supply Voltage Adjustments . . . . .                                                                  | 12-67  |
| 12-19.  | Power Distribution Fault Symptoms . . . . .                                                                 | 12-68  |
| 13-1.   | Modem Extension Number Conversion Table . . . . .                                                           | 13-19  |
| 13-2.   | STE Extension Status Listing Explanation . . . . .                                                          | 13-22  |
| 13-3.   | Class of Service Features . . . . .                                                                         | 13-27  |
| 13-4.   | ETS Features . . . . .                                                                                      | 13-40  |
| 13-4a.  | ROLMphone Telephone Features . . . . .                                                                      | 13-44a |
| 13-5.   | RTK Operations . . . . .                                                                                    | 13-51  |
| 13-6.   | Trunk Status Listing Entries . . . . .                                                                      | 13-64  |
| 13-7.   | Trunk Display Group Delay Interval (Release 4) . . . . .                                                    | 13-67  |
| 13-8.   | Trunk Display Group Delay Interval (Releases 5 and 6) . . . . .                                             | 13-68  |
| 13-8a.  | LDGF Input Values . . . . .                                                                                 | 13-71  |
| 13-9.   | Trunk Access Values . . . . .                                                                               | 13-73  |
| 13-10.  | Trunk and Feature Access Codes . . . . .                                                                    | 13-79  |
| 13-11.  | Route Attributes . . . . .                                                                                  | 13-92  |
| 13-11a. | Ten-Digit Table Attributes . . . . .                                                                        | 13-92  |
| 13-11b. | LTDA Command Combinations . . . . .                                                                         | 13-98a |
| 13-11c. | NNXMASSRESTRICT Table Attributes . . . . .                                                                  | 13-98d |
| 13-11d. | COMMONCARRIERID Table Attributes . . . . .                                                                  | 13-98h |
| 13-11e. | Values of LRT Attributes 8 and 20 . . . . .                                                                 | 13-98l |

|         |                                                                |          |
|---------|----------------------------------------------------------------|----------|
| 13-12.  | Uses of the ETS Call Waiting Thresholds . . . . .              | 13-101   |
| 13-12a. | Master User Commands . . . . .                                 | 13-102d  |
| 13-12b. | Command Group 1: Maintenance . . . . .                         | 13-102e  |
| 13-12c. | Command Group 2: Moves and Changes . . . . .                   | 13-102o  |
| 13-12d. | Command Group 3: Moves and Changes (List Commands) . . . . .   | 13-102s  |
| 13-12e. | Command Group 4: Traffic . . . . .                             | 13-102u  |
| 13-12f. | Command Group 5: Message Registration . . . . .                | 13-102v  |
| 13-12g. | Command Group 6: ACD . . . . .                                 | 13-102v  |
| 13-12h. | Command Group 8: CMR . . . . .                                 | 13-102w  |
| 13-12i. | Command Group 9: Statistics . . . . .                          | 13-102z  |
| 13-12j. | Command Group 10: Data Switching . . . . .                     | 13-102aa |
| 13-12k. | Command Group 11: REMS . . . . .                               | 13-102ab |
| 13-12l. | Command Group 12: AFACTS . . . . .                             | 13-102ab |
| 13-13.  | First Digit Values . . . . .                                   | 13-103   |
| 13-14.  | System Parameters . . . . .                                    | 13-107   |
| 13-15.  | Floppy dump Error Messages . . . . .                           | 13-129   |
| 13-15a. | FDCN Prompts and Error Messages . . . . .                      | 13-131   |
| 13-15b. | RPLD Prompts and Error Messages . . . . .                      | 13-132   |
| 13-15c. | APL Prompts and Error Messages . . . . .                       | 13-132a  |
| 13-16.  | List of Error Types . . . . .                                  | 13-133   |
| 13-17.  | List of Self-Tests . . . . .                                   | 13-134   |
| 13-18.  | Interpretation of Traffic Table Listing . . . . .              | 13-161   |
| 13-19.  | Selected Traffic Data Table Interpretation . . . . .           | 13-172   |
| 13-20.  | Expanded Traffic Table Listing Explanation . . . . .           | 13-174   |
| 13-21.  | ACD Agent Follow-Me Statistics Report Interpretation . . . . . | 13-183   |
| 13-22.  | Current Status Report Interpretation . . . . .                 | 13-185   |
| 13-23.  | Cumulative Status Report Interpretation . . . . .              | 13-186a  |
| 13-24.  | Trunk Group Report Interpretation . . . . .                    | 13-188   |
| 13-25.  | Agent Performance and Status Report Interpretation . . . . .   | 13-190a  |
| 13-26.  | CDR Traffic Report Interpretation . . . . .                    | 13-193   |
| 13-27.  | Daily Profile Report Interpretation . . . . .                  | 13-195   |
| 13-28.  | Abbreviated Agent Statistics Report Interpretation . . . . .   | 13-197   |
| 13-28a. | LCP Command Attributes . . . . .                               | 13-196   |
| 13-28b. | CAS II Branch Parameter Attributes . . . . .                   | 13-230b  |
| 13-29.  | Extension Number Line Assignment and Characteristics . . . . . | 13-236   |
| 13-30.  | Trunk Assignment and Characteristics . . . . .                 | 13-240   |
| 13-31.  | Description of CDR Option Parameters . . . . .                 | 13-255   |
| 13-31.  | Description of CDR Option Parameters . . . . .                 | 13-282   |
| 13-31a. | Network Conversion Table Attributes . . . . .                  | 13-256   |
| 13-31b. | Dual Frequency Code-Words . . . . .                            | 13-261   |
| 13-31c. | Single Frequency Code Words . . . . .                          | 13-267   |
| 13-31d. | VPL Configuration Table Attributes . . . . .                   | 13-267   |
| 13-31e. | Values of LRT Attribute 7 . . . . .                            | 13-270   |
| 13-31f. | Network Traffic Report Attributes . . . . .                    | 13-274   |
| 13-31g. | MONE and MONT Command Display Listings . . . . .               | 13-275   |
| 13-31h. | Common Tones Recognized by SDC . . . . .                       | 13-285   |
| A-1     | System Parameters . . . . .                                    | A-1      |