

TECHNICAL MANUAL

**ORGANIZATIONAL MAINTENANCE MANUAL:
VOICE COMMUNICATIONS
EQUIPMENT MAINTENANCE**

**GUIDED MISSILE
AIR DEFENSE SYSTEM
AN/TSQ-73**

**HEADQUARTERS, DEPARTMENT OF THE ARMY
6 APRIL 1985**

TECHNICAL MANUAL)
)
 No. 9-1430-655-20-7-5)

HEADQUARTERS
 DEPARTMENT OF THE ARMY
 Washington, D.C., 6 April 1985

**ORGANIZATIONAL MAINTENANCE MANUAL: VOICE COMMUNICATIONS
 EQUIPMENT MAINTENANCE
 GUIDED MISSILE AIR DEFENSE SYSTEM AN/TSQ-73**

REPORTING OF ERRORS

You can help improve this publication. If you find any mistakes, or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in back of this manual direct to: Commander, U.S. Army Missile Command, ATTN: AMSMI-SNPM, Redstone Arsenal, AL 35898-5238. A reply will be furnished to you.

TABLE OF CONTENTS

| Chapter | Page |
|--|-------------|
| LIST OF ILLUSTRATIONS | iii |
| LIST OF TABLES | v |
| 6 VOICE COMMUNICATIONS EXPANDED TROUBLESHOOTING | 6-1 |
| Section I. INTRODUCTION | 6-1 |
| 6-1. Scope..... | 6-1 |
| 6-2. Expanded Troubleshooting Concept | 6-1 |
| 6-3. Troubleshooting Aids..... | 6-1 |
| 6-4. Physical Description..... | 6-1 |
| Section II. OVERALL THEORY | 6-8 |
| 6-5. Overall Functional Description | 6-8 |
| 6-6. Logic Theory Presentation..... | 6-13 |
| 6-7. Circuit Card and Key Signal Lookup Tables..... | 6-13 |
| Section III. VOICE COMMUNICATIONS CENTRAL | 6-74 |
| 6-8. General..... | 6-74 |
| 6-9. Net Communication..... | 6-74 |
| 6-10. Intercom Communications..... | 6-78 |
| 6-11. Local Comm Communication | 6-78 |
| 6-12. Net A and B Communications | 6-78 |
| 6-13. Multiplexing Techniques..... | 6-78 |
| 6-14. Analog Card Descriptions..... | 6-85 |
| 6-15. Operational Control Net Analog Functional Description. | 6-88 |
| 6-16. Command Administration Net Analog Functional Description | 6-95 |
| 6-17. Maintenance Test Net Analog Functional Description | 6-95 |
| 6-18. Net A and Net B Analog Functional Description..... | 6-95 |
| 6-19. Net Ring Detector Circuit Functional Description | 6-96 |
| 6-20. Intercomm Interface Functional Description | 6-96 |
| 6-21. Local Comm Interface Functional Description | 6-96 |
| 6-22. Central-to-Station Functional Description | 6-121 |
| 6-23. Ring Detector Storage Functional Description | 6-121 |

TABLE OF CONTENTS - Continued

| Chapter | Page |
|---|-----------|
| 6-24. Operator Audio Ring and Feedback Functional Description | 6-121 |
| 6-25. Central Input Register Functional Description | 6-121 |
| 6-26. Net Ring No. 1 and Net Ring No. 2 Functional Description..... | 6-139 |
| 6-27. A and B Control Net Function Description..... | 6-139 |
| 6-27.1 Net A and B Receive Functional Description..... | 6-139 |
| 6-28. Net A and B Operator Storage Functional Description | 6-139 |
| 6-29. Subnetter Control Functional Description..... | 6-139 |
| 6-30. Intercomm Net and Ring Functional Description | 6-139 |
| 6-31. Intercomm and Local Comm External Ring Functional Description | 6-139 |
| 6-32. Local Comm Net Storage Functional Description | 6-140 |
| 6-33. Intercomm and Local Comm Audio Receive Functional Description | 6-140 |
| 6-34. 10-Station Net Storage Functional Description..... | 6-140 |
| 6-35. Net Subscriber Storage Functional Description | 6-140 |
| 6-36. Operational Control Net Subscriber Storage Functional Description..... | 6-140 |
| 6-37. Command Administration Net Subscriber Storage Functional Description..... | 6-140 |
| 6-38. Maintenance Test Net Subscriber Storage Functional Description | 6-140 |
| 6-39. Timing Logic Functional Description | 6-175 |
| 6-40. Central-to-Station Multiplex Timing Functional Description | 6-175 |
| 6-41. Front Panel and Fault Isolation Functional Description..... | 6-175 |
| Section IV. VOICE COMMUNICATIONS STATION..... | 6-203 |
| 6-42. General | 6-203 |
| 6-43. Audio Circuits Functional Description..... | 6-203 |
| 6-44. Front Panel Control Logic Functional Description..... | 6-203 |
| 6-45. Multiplexer Control Functional Description..... | 6-204 |
| Section V. EXTERNAL SUBSCRIBER PATCH AND VCS-TO-VCC INTERFACE..... | 6-219 |
| 6-46. VCS-to-VCC Interface | 6-219 |
| 6-47. External Subscriber Patch Interface..... | 6-219 |
| Section VI. POWER DISTRIBUTION..... | 6-220 |
| 6-48. Voice Communications Power Distribution..... | 6-220 |
| Section VII. CABLING AND FRONT PANEL SCHEMATIC DIAGRAMS | 6-221 |
| 6-49. Cabling Diagram..... | 6-221 |
| 6-50. Front Panel Schematics..... | 6-221 |
| Section VIII. GLOSSARY OF TERMS | 6-222 |
| 6-51. General | 6-222 |

LIST OF ILLUSTRATIONS

| Figure | Title | Page |
|--------|---|-------|
| 6-1. | Voice Communications Equipment, Major Units and Assemblies..... | 6-3 |
| 6-2. | Voice Communications Overall Block Diagram..... | 6-8 |
| 6-3. | Voice Corm Station Functional Block Diagram | 6-9 |
| 6-4. | VCC Functional Block Diagram | 6-11 |
| 6-5. | VCC System Interface..... | 6-75 |
| 6-6. | Net Communication..... | 6-77 |
| 6-7. | Intercom Communication | 6-79 |
| 6-8. | Local Comm Communication | 6-80 |
| 6-9. | Sampled Multiplexed Audio..... | 6-80 |
| 6-10. | Time Division Multiplex Switch..... | 6-81 |
| 6-11. | Six Channel TDM Transmit and Receive Switches..... | 6-81 |
| 6-12. | Transmit Circuit Multiplexer..... | 6-82 |
| 6-13. | Receive Circuit Demultiplexer | 6-83 |
| 6-14. | VCC Time Division Multiplexing | 6-84 |
| 6-15. | Audio Time Slots..... | 6-84 |
| 6-16. | Net Ring Detector/Operator Card Block | 6-85 |
| 6-17. | Time Division Switch Card Block..... | 6-86 |
| 6-18. | Battery Subnetter Card Block (1/2) | 6-87 |
| 6-19. | Four-Wire Interface Card (Channel 1) | 6-88 |
| 6-20. | Two-Wire Line Interface Card Block | 6-89 |
| 6-21. | Operational Control Net Analog Block Diagram | 6-91 |
| 6-22. | Operational Control Net Audio Functional Diagram | 6-93 |
| 6-23. | Command Administration Net Analog Block Diagram | 6-97 |
| 6-24. | Command Administration Net Audio Functional Diagram | 6-99 |
| 6-25. | Maintenance Test Net Analog Block Diagram..... | 6-101 |
| 6-26. | Maintenance Test Net Audio Functional Diagram | 6-103 |
| 6-27. | Net A and B Analog Block Diagram | 6-105 |
| 6-28. | Special Net A Audio Functional Diagram | 6-107 |
| 6-29. | Special Net B Audio Functional Diagram | 6-109 |
| 6-30. | Net Ring Detector Circuits Block Diagram | 6-111 |
| 6-31. | Intercomm Interface Block Diagram | 6-113 |
| 6-32. | Intercomm Net Audio Functional Diagram | 6-115 |
| 6-33. | Local Comm Interface Block Diagram | 6-117 |
| 6-34. | Local Comm Audio Functional Diagram | 6-119 |
| 6-35. | Central-to-Station Block Diagram | 6-123 |
| 6-36. | Ring Detector Storage Block Diagram | 6-125 |
| 6-37. | Operator Audio Ring and Feedback Block Diagram..... | 6-127 |
| 6-38. | Central Input Register Block Diagram..... | 6-129 |
| 6-39. | VCS Control Word Format | 6-133 |
| 6-40. | VCS Control Data Input Timing | 6-135 |
| 6-41. | Input Address Process Timing | 6-137 |
| 6-42. | Net Ring No. 1 and Net Ring No. 2 Block Diagram | 6-141 |
| 6-43. | A and B Control Net Block Diagram..... | 6-143 |
| 6-44. | Net A and B Receive Block Diagram | 6-145 |
| 6-45. | Net A and B Operator Storage Block Diagram..... | 6-147 |
| 6-46. | Subnetter Control Block Diagram | 6-149 |
| 6-47. | Intercomm Net and Ring Block Diagram | 6-153 |
| 6-48. | Intercomm and Local Comm External Ring Block Diagram | 6-155 |

LIST OF ILLUSTRATIONS - Continued

| Figure | Title | Page |
|--------|---|-------|
| 6-49. | Local Comm Net Storage Block Diagram | 6-157 |
| 6-50. | Local Comm Net Storage Timing Diagram | 6-159 |
| 6-51. | Intercomm and Local Comm Audio Receive Block Diagram | 6-161 |
| 6-52. | 10-Station Net Storage Block Diagram | 6-163 |
| 6-53. | Net Subscriber Storage Block Diagram..... | 6-165 |
| 6-54. | Operational Control Net Subscriber Storage Block Diagram | 6-169 |
| 6-55. | Command Administration Net Subscriber Storage Block Diagram | 6-171 |
| 6-56. | Maintenance Test Net Subscriber Storage Block Diagram | 6-173 |
| 6-57. | Timing Logic Block Diagram..... | 6-177 |
| 6-58. | 1600 Hz Generation Timing Diagram | 6-181 |
| 6-59. | Audio Time Slot Generation Timing Diagram | 6-183 |
| 6-60. | Transmit Sync Timing Generation Timing Diagram. | 6-185 |
| 6-61. | Operator Time Control Generation Timing Diagram | 6-187 |
| 6-62. | Local Comm Sync Generation Timing Diagram..... | 6-189 |
| 6-63. | Central-to-Station Multiplex Timing Block Diagram..... | 6-191 |
| 6-64. | VCS Frame Generation Timing Diagram | 6-193 |
| 6-65. | VCS Time Slot Generation Timing Diagram | 6-195 |
| 6-66. | VCS Select Timing Diagram..... | 6-197 |
| 6-67. | Front Panel and Fault Isolation Block Diagram | 6-199 |
| 6-68. | VCS Block Diagram..... | 6-205 |
| 6-69. | VCS Audio Circuits Block Diagram | 6-207 |
| 6-70. | Front Panel Control Logic Block Diagram | 6-209 |
| 6-71. | Switch Encoder Timing Diagram | 6-213 |
| 6-72. | Multiplexer Control1Kck Diagram | 6-215 |
| 6-73. | Multiplexer Control Timing Diagram | 6-217 |
| FO-1. | Operational Control Net Analog Logic Diagram | |
| FO-2. | Command Administration Net Analog, Logic Diagram | |
| FO-3. | Maintenance Test Net Analog, Logic Diagram | |
| FO-4. | Net A and B Analog, Logic Diagram | |
| FO-5. | Net Ring Detector Circuits, Logic Diagram..... | |
| FO-6. | Intercomm Interface, Logic Diagram..... | |
| FO-7. | Local Comm Interface, Logic Diagram..... | |
| FO-8. | Central-to-Station, Logic Diagram..... | |
| FO-9. | Ring Detector Storage, Logic Diagram | |
| FO-10. | Operator Audio Ring and Feedback, Logic Diagram | |
| FO-11. | Central Input Register, Logic Diagram | |
| FO-12. | Net Ring No. 1 and No. 2, Logic Diagram | |
| FO-13. | A and B Control Net, Logic Diagram | |
| FO-14. | Net A and B Receive, Logic Diagram | |
| FO-15. | Net A and B Operator Storage, Logic Diagram | |
| FO-16. | Subnetter Control, Logic Diagram..... | |
| FO-17. | Intercomm Net and Ring, Logic Diagram | |
| FO-18. | Intercomm and Local Comm External Ring, Logic Diagram..... | |
| FO-19. | Logic Comm Net Storage, Logic Diagram..... | |
| FO-20. | Intercomm and Local Comm Audio Receive, Logic Diagram | |
| FO-21. | 10-Station Net Storage, Logic Diagram | |
| FO-22. | Net Subscriber Storage Control Circuits, Logic Diagram | |

LIST OF ILLUSTRATIONS - Continued

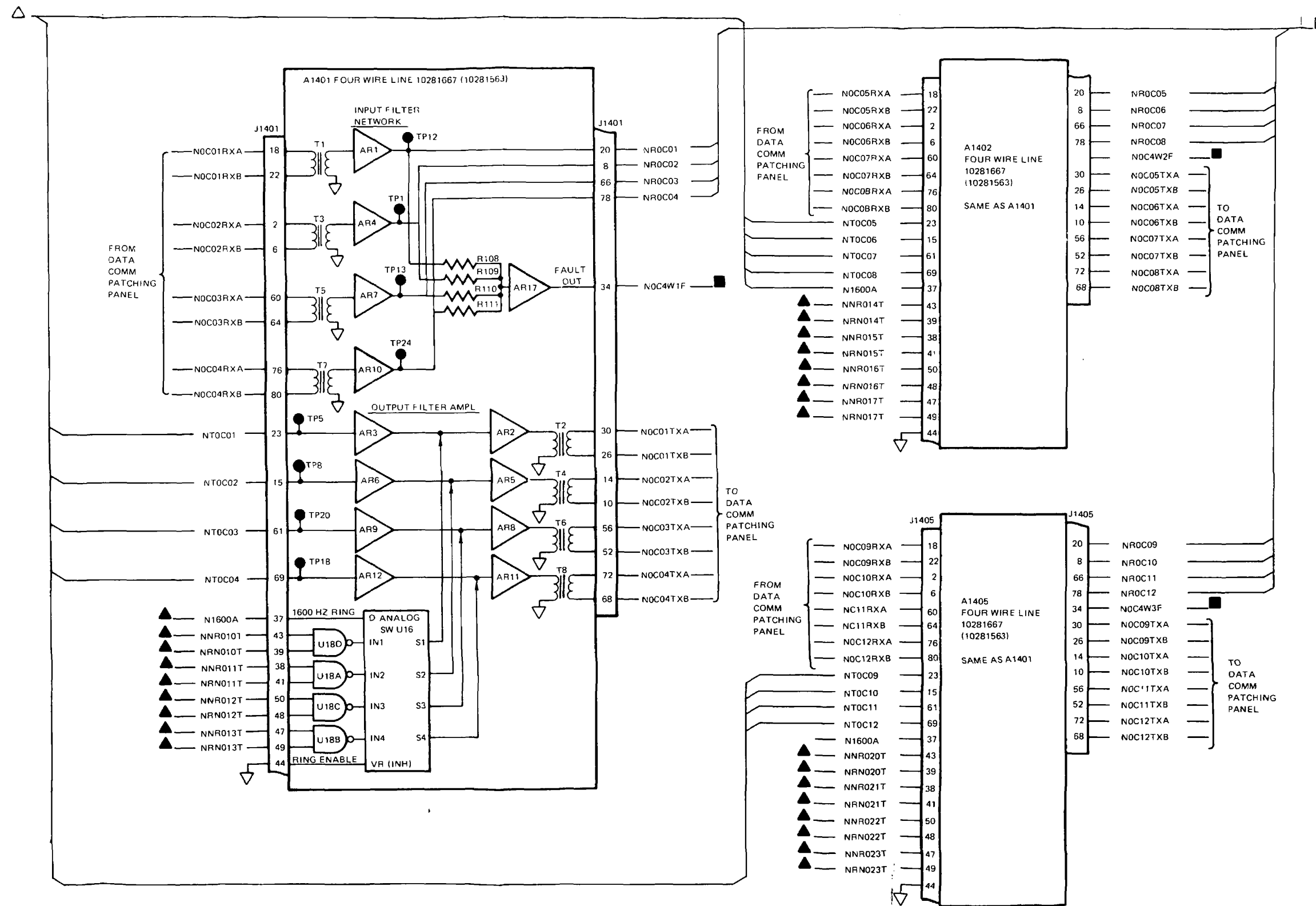
FO-23. Operational Control Net Subscriber Storage, Logic Diagram
 FO-24. Command Administration Net Subscriber Storage, Logic Diagram
 FO-25. Maintenance Test Net Subscriber Storage, Logic Diagram
 FO-26. Voice Comm Central Timing, Logic Diagram
 FO-27. Central-to-Station Multiplex Timing, Logic Diagram
 FO-28. VCC Front Panel and Fault Isolation, Logic Diagram
 FO-29. VCS Audio Circuits, Logic Diagram
 FO-30. VCS Front Panel Control, Logic Diagram
 FO-31. VCS Multiplexer Control, Logic Diagram
 FO-32. VCS-to-VCC Interface Diagram
 FO-33. External Subscriber Patch Interface Diagram
 FO-34. Voice Communications Power Distribution Diagram
 FO-35. VCS Cabling Diagram
 FO-36. VCC Front Panel Schematic Diagram
 FO-37. VCS Front Panel, Schematic Diagram.....

LIST OF TABLES

| Table | Title | Page |
|-------|---|------|
| 6-1. | AN/TSQ-73 Major Equipment Cross-Reference..... | 6-5 |
| 6-2. | VCC Card Location Index..... | 6-14 |
| 6-3. | VCS Card Location Index..... | 6-22 |
| 6-4. | Voice Communications Central Key Signal Lookup..... | 6-23 |

v/(vi blank)

| INPUTS | F/O-SH | OUTPUTS | F/O-SH |
|---------|--------|---------|--------|
| NNR010T | 6-12-2 | NOC4W1F | 6-28-4 |
| NNR011T | 6-12-2 | NOC4W2F | 6-28-4 |
| NNR012T | 6-12-2 | NOC4W3F | 6-28-4 |
| NNR013T | 6-12-2 | | |
| NNR014T | 6-12-2 | | |
| NNR015T | 6-12-2 | | |
| NNR016T | 6-12-2 | | |
| NNR017T | 6-12-2 | | |
| NNR020T | 6-12-2 | | |
| NNR021T | 6-12-2 | | |
| NNR022T | 6-12-2 | | |
| NNR023T | 6-12-2 | | |
| NRN010T | 6-12-3 | | |
| NRN011T | 6-12-3 | | |
| NRN012T | 6-12-3 | | |
| NRN013T | 6-12-3 | | |
| NRN014T | 6-12-3 | | |
| NRN015T | 6-12-3 | | |
| NRN016T | 6-12-3 | | |
| NRN017T | 6-12-3 | | |
| NRN020T | 6-12-3 | | |
| NRN021T | 6-12-3 | | |
| NRN022T | 6-12-3 | | |
| NRN023T | 6-12-3 | | |
| N1600A | 6-28-2 | | |



- NOTES: UNLESS OTHERWISE SPECIFIED
- PARTIAL REFERENCE DESIGNATIONS ARE SHOWN, FOR COMPLETE DESIGNATIONS, PREFIX WITH APPLICABLE UNIT NUMBER AND ASSEMBLY DESIGNATION.
 - ALL CIRCUITS SHOWN ON THIS FIGURE ARE CONTAINED ON CARD CAGE A3A41A2.
 - DEFINITION FOR SYMBOLS SHOWN ARE AS FOLLOWS:
 - INPUT FROM ANOTHER FIGURE
 - INPUT FROM SAME FIGURE
 - OUTPUT TO ANOTHER FIGURE
 - OUTPUT TO BOTH SAME AND ANOTHER FIGURE
 - OUTPUT TO SAME FIGURE
 - REFER TO TABLE 6-2 FOR CIRCUIT CARDS THAT ARE MODULE TEST SET TESTABLE AND CIRCUIT CARD LOCATIONS.
 - REFER TO TABLE 6-4 FOR COMPLETE SIGNAL LOOK UP AND CIRCUIT CARD TEST POINTS.
 - REFER TO VOICE COMMUNICATIONS POWER DISTRIBUTION DIAGRAMS FOR DC POWER AND GROUND CIRCUITS.

FO-1. Operational Control Net Analog, Logic Diagram (Sheet 1 of 4)