Quantar™
Digital—Capable Station
For Conventional, Securenet, Astro,
6809 Trunking, and IntelliRepeater Systems

VHF — 25W & 125W
UHF — 25W, 100W, & 110W
800 MHz — 20W & 100W
900 MHz — 100W

THIS MANUAL HAS BEEN DISCONTINUED

Instruction Manual 68P81095E05—B /D
## Table of Contents

Model/Option Information ......................................................... xi
Foreword ........................................................................ xxiv
General Safety Information .................................................... xxvi
Performance Specifications ....................................................... xxviii

**DESCRIPTION** ................................................................. 68P81096E56

Introduction ........................................................................ page 1
  Compact Mechanical Design .................................................. page 1
  State-of-the-Art Electrical Design ................................. page 2
  Summary of Operating Features .................................. page 3
  Multiple System Capability ........................................ page 4

Station Components ............................................................. page 6

Functional Theory of Operation ........................................... page 8
  Transmitter Circuity Operation .................................. page 5
  Receiver Circuity Operation ....................................... page 9
  Station Control Circuity Operation ................. page 9
  Wireline Interface Board Operation .................. page 10
  Power Supply Module Operation ....................... page 10

**INSTALLATION** ............................................................... 68P81096E57

Pre-Installation Considerations ........................................ page 2
  Installation Overview .................................................. page 2
  Environmental Conditions at Intended Site ........ page 3
  Equipment Ventilation ............................................... page 3
  AC Input Power Requirements ................................ page 4
  Equipment Mounting Methods ................................ page 4
  Site Grounding and Lightning Protection ................ page 5
  Recommended Tools and Equipment ............... page 6
  Equipment Unpacking and Inspection .......... page 6
  Physical Dimensions and Clearances .............. page 7

Mechanical Installation ........................................................ page 14
  Unpacking the Equipment .................................... page 14
  Mounting Procedures ............................................... page 20
  Stacking Cabinets ...................................................... page 25
  Stacking Modular Racks .......................................... page 26
  Anti-Vibration/EMI Screws ....................................... page 27
Maintenance & Troubleshooting

ROUTINE MAINTENANCE ........................................... 68P81086E39

Introduction ....................................................... page 1
Recommended Test Equipment .................................. page 1

TROUBLESHOOTING ............................................. 68P81096E59

Introduction ....................................................... page 1
Recommended Test Equipment .................................. page 1
Troubleshooting Procedures .................................... page 2
   Troubleshooting Overview ................................ page 2
   Interpreting LED Indicators ................................. page 6
   Interpreting Alarm Alert Tones ............................. page 9
   Verifying Transmitter Circuitry ............................ page 10
   Verifying Receiver Circuitry ............................... page 14

Module Replacement Procedures ......................... page 19
   General Replacement Information ....................... page 19
   Replacing Power Amplifier Module ...................... page 21
   Replacing Exciter Module ................................. page 22
   Replacing Power Supply Module ......................... page 23
   Replacing Station Control Module ...................... page 24
   Replacing Wireline Interface Board .................... page 30
   Replacing Receiver Module and/or Preselector Assembly (VHF and UHF) ................ page 32
   Replacing Receiver Module (800 MHz and 900 MHz) .......... page 33
   Replacing ASTRO modem Card ......................... page 34
   Replacing Backplane Board ............................... page 35
Station Modules

RECEIVER CIRCUITRY

RECEIVER MODULE (VHF RANGES 1 AND 2; INCLUDES PRESELECTOR) .......................... 68P81086E28

Description ................................................................. page 1
General Description ....................................................... page 1
Overview of Circuitry .................................................... page 1

Controls, Indicators, and Inputs/Outputs ............................................. page 2

Functional Theory of Operation .................................................... page 3
Synthesizer and VCO Circuitry ................................................ page 3
Preselector Filter Assembly .................................................. page 4
Receiver Front End Circuitry ................................................ page 4
Custom Receiver IC Circuitry ............................................... page 4
Address Decode and A/D Converter Circuitry ..................................... page 5
Voltage Regulator Circuitry .................................................. page 5

RECEIVER MODULE (UHF) ...................................................... 68P81086E48

Description ................................................................. page 1
General Description ....................................................... page 1
Overview of Circuitry .................................................... page 1

Controls, Indicators, and Inputs/Outputs ............................................. page 2

Functional Theory of Operation .................................................... page 3
Synthesizer and VCO Circuitry ................................................ page 3
Preselector Filter Assembly .................................................. page 4
Receiver Front End Circuitry ................................................ page 4
Custom Receiver IC Circuitry ............................................... page 4
Address Decode and A/D Converter Circuitry ..................................... page 5
Voltage Regulator Circuitry .................................................. page 5

RECEIVER MODULE (800 MHz) .................................................... 68P81086E76

Description ................................................................. page 1
General Description ....................................................... page 1
Overview of Circuitry .................................................... page 1

Controls, Indicators, and Inputs/Outputs ............................................. page 2

Functional Theory of Operation .................................................... page 3
Synthesizer and VCO Circuitry ................................................ page 3
Receiver Front End Circuitry ................................................ page 4
Custom Receiver IC Circuitry ............................................... page 4
Address Decode and A/D Converter Circuitry ..................................... page 5
Voltage Regulator Circuitry .................................................. page 5
RECEIVER MODULE (900 MHz) ...................................................... 68P81091E92

Description ............................................................... page 1
  General Description ..................................................... page 1
  Overview of Circuitry .................................................... page 1

Controls, Indicators, and Inputs/Outputs ............................... page 2

Functional Theory of Operation ......................................... page 3
  Synthesizer and VCO Circuitry ........................................ page 3
  Receiver Front End Circuitry .......................................... page 4
  Custom Receiver IC Circuitry ......................................... page 4
  Address Decode and A/D Converter Circuitry ....................... page 5
  Voltage Regulator Circuitry .......................................... page 5

TRANSMITTER CIRCUITRY

EXCITER BOARD (VHF, UHF, 800/900 MHz) .............................. 68P81086E24

Description ............................................................... page 1
  General Description ..................................................... page 1
  Overview of Circuitry .................................................... page 1

Controls, Indicators, and Inputs/Outputs ............................... page 2

Functional Theory of Operation ......................................... page 3
  Synthesizer and VCO Circuitry ........................................ page 3
  RF Switch Circuitry .................................................... page 4
  Microprocessor Circuitry .............................................. page 4
  TX Power Control Circuitry .......................................... page 5

VHF POWER AMPLIFIER MODULE (25W/125W R1 & R2) .................. 68P81086E23

Description ............................................................... page 1
  General Description ..................................................... page 1
  Overview of Circuitry .................................................... page 1

Controls, Indicators, and Inputs/Outputs ............................... page 2

Functional Theory of Operation ......................................... page 3
  RF Signal Path ......................................................... page 3
  Output Power Control ................................................ page 3
  Sense and Detect Circuitry .......................................... page 4
  Cooling Fans Control Circuitry ...................................... page 6

UHF POWER AMPLIFIER MODULE (R0/110W; R1 & R2/25W; R1-3/110W; R4/100W) 68P81088E44

Description ............................................................... page 1
  General Description ..................................................... page 1
  Overview of Circuitry .................................................... page 1

Controls, Indicators, and Inputs/Outputs ............................... page 2

Functional Theory of Operation ......................................... page 3
  RF Signal Path ......................................................... page 3
  Output Power Control ................................................ page 3
  Sense and Detect Circuitry .......................................... page 4
  Cooling Fans Control Circuitry ...................................... page 6
POWER AMPLIFIER MODULE (20W/100W 800 MHZ; 100W 900 MHZ) 68P81091E91

Description ................................................................. page 1
General Description ....................................................... Page 1
Overview of Circuitry ..................................................... page 1

Controls, Indicators, and Inputs/Outputs ............................ page 2

Functional Theory of Operation ........................................ page 3
RF Signal Path ............................................................... Page 3
Output Power Control .................................................... page 3
Sense and Detect Circuitry ................................................ page 4
Cooling Fans Control Circuitry ........................................... page 6

Station Control Circuitry

STATION CONTROL MODULE (CLN6960/CLN6961) .................. 68P81094E76

Description ................................................................. page 1
General Description ....................................................... Page 1
Overview of Circuitry ..................................................... page 2

Functional Theory of Operation ........................................ page 4
Host Microprocessor/Host ASIC Circuitry .............................. page 4
Non-Volatile Memory ..................................................... page 5
DRAM Memory .............................................................. page 5
External Line Interface Circuitry ....................................... page 6
Digital Signal Processor (DSP) and DSP ASIC Circuitry ......... page 7
Station Reference Circuitry .............................................. page 8
HDLC Bus Control Circuitry ............................................. page 8
Audio Interface Circuitry ................................................. page 9
Input/Output Ports ....................................................... page 10
6809/MRTI Interface Circuitry .......................................... page 10
Front Panel LEDs and Switches ......................................... page 11
Supply Voltages Circuitry .............................................. page 11

STATION CONTROL MODULE (CLN1614) .............................. 68P81096E87

Description ................................................................. page 1
General Description ....................................................... Page 1
Overview of Circuitry ..................................................... page 2

Controls, Indicators, and Inputs/Outputs ............................ page 4

Functional Theory of Operation (CLN7060A Control Board) ....... page 6
Host Microprocessor/Host ASIC Circuitry .............................. page 6
Non-Volatile Memory ..................................................... page 7
DRAM Memory .............................................................. page 7
External Line Interface Circuitry ....................................... page 8
Digital Signal Processor (DSP) and DSP ASIC Circuitry ......... page 9
Station Reference Circuitry .............................................. page 10
HDLC Bus Control Circuitry ............................................. page 10
Audio Interface Circuitry ................................................. page 11
Input/Output Ports ....................................................... page 12
6809/MRTI Interface Circuitry .......................................... page 12
Wireline Circuitry

WIREFLINE INTERFACE BOARD (4-WIRE) .................................................. 68P81094E77

Description ............................................. page 1
General Description .................................. page 1
Overview of Circuitry ................................. page 1
Controls, Indicators, and Inputs/Outputs ..... page 2
Functional Theory of Operation .................. page 3
Functional Overview .............................. page 3
Description of Audio/Data Signal Paths ......... page 7

WIREFLINE INTERFACE MODULE (8-WIRE) ........................................... 68P81094E78

Description ............................................. page 1
General Description .................................. page 1
Overview of Circuitry ................................. page 1
Controls, Indicators, and Inputs/Outputs ..... page 2
Functional Theory of Operation .................. page 3
Functional Overview .............................. page 3
Description of Audio/Data Signal Paths ......... page 7
Station Backplane

STATION BACKPLANE BOARD

Description ................................................................. page 1
Location of Backplane Connectors .................................. page 2
Backplane Connectors Information ................................... page 3

Station Power Supply Modules

265W POWER SUPPLY MODULE (AC INPUT) .......................... 68P81096E09

Description ................................................................. page 1
General Description ....................................................... page 1
Power Supply Module Simplified Block Diagram ...................... page 2
Overview of Circuitry ..................................................... page 3

Performance Specifications .............................................. page 6

Controls, Indicators, and Inputs/Outputs ............................... page 7

Functional Theory of Operation (AC-to-DC Converter Board) ... page 8
Input Conditioning Circuitry ............................................. page 8
Startup Delay Circuitry .................................................. page 8
Boost/Power Factor Correction Circuitry ............................... page 9
Battery Revert Trigger Circuitry ........................................ page 9
VCC Supply Circuitry .................................................... page 9
LED Status Indicators ................................................... page 10

Functional Theory of Operation (DC-to-DC Converter Board) ... page 11
+14V Main Supply Circuitry ............................................. page 11
+5V Supply Circuitry ..................................................... page 12
Battery Charger Control Circuitry ...................................... page 12
Reference Voltage Circuitry ............................................. page 12
Diagnostics Circuitry ..................................................... page 13
Address Decode Circuitry ............................................... page 13
Startup/Shutdown Control Circuitry .................................... page 14

Functional Theory of Operation (Battery Charger/Revert Board) ... page 15
Charger Supply Circuitry ................................................ page 15
Pulse Width Modulator Circuitry ........................................ page 16
Battery Revert Circuitry ................................................ page 16
Current Mode Controller Circuitry ...................................... page 16
SPI Bus Interface Circuitry ............................................. page 17
Shutdown Circuitry ....................................................... page 17
Local Supplies Circuitry ............................................... page 17
625W POWER SUPPLY MODULE (ac input) ........................................ 68P81095E88

Description ................................................................. page 1
Performance Specifications .............................................. page 6
Controls, Indicators, and Inputs/Outputs ............................... page 7

Functional Theory of Operation (AC-to-DC Converter Board) ................ page 8
Input Conditioning Circuitry ............................................ page 8
Startup Delay Circuitry ................................................... page 8
Boost/Power Factor Correction Circuitry ............................... page 9
Battery Revert Trigger Circuitry ........................................ page 9
VCC Supply Circuitry ..................................................... page 9
LED Status Indicators .................................................... page 10

Functional Theory of Operation (DC-to-DC Convertor Board) ............ page 11
+28V Main Supply Circuitry ............................................. page 11
+14V Supply Circuitry .................................................... page 12
+5V Supply Circuitry ..................................................... page 12
Battery Charger Control Circuitry ..................................... page 13
Reference Voltage Circuitry ............................................. page 13
Diagnostics Circuitry ..................................................... page 13
Address Decode Circuitry ............................................... page 14
Startup/Shutdown Control Circuitry .................................... page 14

Functional Theory of Operation (Battery Charger/Revert Board) ........... page 15
Charger Supply Circuitry ................................................ page 15
Pulse Width Modulator Circuitry ...................................... page 16
Battery Revert Circuitry ................................................ page 16
Current Mode Controller Circuitry .................................... page 16
SPI Bus Interfaco Circuitry ............................................. page 17
Shutdown Circuitry ....................................................... page 17
Local Supplies Circuitry ............................................... page 17

210W POWER SUPPLY MODULE (12/24 AND 48/60 V DC INPUT) ........ 68P81085E12

Description ................................................................. page 1
General Description .................................................... page 1
Overview of Circuitry ................................................ page 2
Performance Specifications ............................................. page 3
Controls, Indicators, and Inputs/Outputs ................................ page 4

Functional Theory of Operation ........................................ page 5
Input Conditioning Circuitry ............................................ page 5
Startup Inverter Circuitry .............................................. page 6
Main Inverter Circuitry ................................................. page 6
+5V Inverter Circuitry ................................................ page 7
Diagnostics Circuitry ..................................................... page 8
Address Decode Circuitry .............................................. page 8
600W POWER SUPPLY MODULE (24 V DC INPUT) ........................................... 68P81090E44

Description ............................................................................................... page 1
Performance Specifications ....................................................................... page 3
Controls, Indicators, and Inputs/Outputs ................................................ page 4

Functional Theory of Operation ............................................................... page 5
  Input Conditioning Circuitry ................................................................. page 5
  Startup Inverter Circuitry ................................................................. page 6
  Main Inverter Circuitry ................................................................. page 6
  14.2 V Inverter Circuitry ................................................................. page 7
  +5 V Inverter Circuitry ................................................................. page 7
  Diagnostics Circuitry ................................................................ page 8
  Address Decode Circuitry ............................................................. page 8

600W POWER SUPPLY MODULE (48/60 V DC INPUT) ..................... 68P81096E84

Description ............................................................................................... page 1
  General Description ................................................................ page 1
  Power Supply Module Simplified Block Diagram ....................... page 2
  Overview of Circuitry ................................................................ page 3

Performance Specifications ....................................................................... page 4
Controls, Indicators, and Inputs/Outputs ................................................ page 5

Functional Theory of Operation (DC Input Board) ........................................ page 6
  Input Conditioning Circuitry ................................................................. page 6
  Inverter Circuitry A and B ................................................................. page 7
  Output Filter Circuitry ................................................................. page 7

Functional Theory of Operation (DC Output Board) ............................... page 8
  Inverters A/B Control Circuitry ................................................................. page 8
  +14.2 V Supply Circuitry ................................................................. page 9
  +5V Supply Circuitry ................................................................. page 9
  Reference Voltage Circuitry ................................................................. page 9
  Diagnostics Circuitry ................................................................ page 10
  Address Decode Circuitry ............................................................. page 10
  Startup/Shutdown Control Circuitry ................................................... page 11

Ancillary Equipment

ANTENNA RELAY (OPTION X371AA) ......................................................... 68P81086E22

Description ............................................................................................... page 1
Input and Output Connections ............................................................... page 2
Option Complement ........................................................................ page 3
Performance Specifications ....................................................................... page 3
Mounting Locations ........................................................................ page 4
Functional Theory of Operation ............................................................... page 5
TRIPLE CIRCULATOR OPTIONS

VHF TRIPLE CIRCULATOR OPTION (OPTIONS X676AA-AC) ........................................... 68P81086E34

- Description ........................................................................................................ page 1
- Options Complement ......................................................................................... page 2
- Performance Specifications. .............................................................................. page 3
- Inputs/Outputs. .................................................................................................. page 4
- Functional Theory of Operation. ................................................................. page 5

UHF TRIPLE CIRCULATOR OPTION (OPTIONS X676AN AND X676AP) ....................... 68P81083E54

- Description ........................................................................................................ page 1
- Option Complement ......................................................................................... page 2
- Performance Specifications. .............................................................................. page 3
- Inputs/Outputs. .................................................................................................. page 4
- Functional Theory of Operation. ................................................................. page 5

800/900 MHz TRIPLE CIRCULATOR OPTION (OPTIONS X676AR AND X676AQ) ............ 68P81090E86

- Description ........................................................................................................ page 1
- Option Complement ......................................................................................... page 2
- Performance Specifications. .............................................................................. page 2
- Inputs/Outputs. .................................................................................................. page 3
- Functional Theory of Operation. ................................................................. page 4

DUPLEXER OPTIONS

VHF DUPLEXERS (OPTIONS X182AA, AB, AJ) .............................................................. 68P81086E71

- Description ........................................................................................................ page 1
- Adjustments and Inputs/Outputs ..................................................................... page 2
- Performance Specifications. .............................................................................. page 3
- Typical Mounting Configuration ............................................................... page 3
- Field Tuning Procedure .................................................................................. page 6

UHF DUPLEXER (OPTIONS X182AC THROUGH X182AF) ............................................. 68P81087E94

- Description ........................................................................................................ page 1
- Inputs/Outputs. .................................................................................................. page 2
- Performance Specifications. .............................................................................. page 3
- Typical Mounting Configuration ............................................................... page 4
Field Tuning Procedure .......................................................... page 6
  Field Tuning Overview ......................................................... page 6
  Required Test Equipment ....................................................... page 6
  Setting Up for Tuning Duplexer ............................................... page 7
  Duplexer Tuning Procedure ................................................... page 8

800/900 MHz DUPLEXERS (OPTIONS X182AG AND X182AH) .................. 68P81091E93
  Description ........................................................................ page 1
  Inputs/Outputs ..................................................................... page 2
  Performance Specifications ..................................................... page 3
  Typical Mounting Configuration ............................................. page 3

MODEM OPTION

ASTRO MODEM CARD (OPTION X437AA) ........................................... 68P81086E38
  Description ........................................................................ page 1

PERIPHERAL TRAY OPTION

PERIPHERAL TRAY (OPTION X696AA). ........................................... 68P81086E37
  Description ........................................................................ page 1
  Options Complement .............................................................. page 2
  Peripheral Tray Contents and Inputs/Outputs ............................... page 3

UHSO OPTION

ULTRA HIGH STABILITY OSCILLATOR (UHSO; OPTION X873AA) ........ 68P81088E08
  Description ........................................................................ page 1
  Inputs/Outputs ..................................................................... page 2
  Functional Theory of Operation ............................................ page 3

SYSTEM APPLICATIONS

RA/RT CONFIGURATION (TRC CONTROL) ........................................ 68P81090E98
  Overview ........................................................................ page 1

  Electrical Connections (RF Link) ............................................. page 2
    Console to Station 1 Wiring Connections ................................. page 2
    Station 2 to Station 3 Wiring Connections ............................... page 3

  Electrical Connections (Microwave Link) ................................ page 4
    Console to Microwave Station 1 Wiring Connections ................ page 4
    Microwave Station 2 to Station 3 Wiring Connections ............... Page 5

  RSS Programming ................................................................. page 6

  TX Wireline Alignment ......................................................... page 7
    Station 1 TX Wireline Alignment .......................................... page 7
INPUT/OUTPUT SPECIFICATIONS FOR EXTERNAL CONTROLLERS .......................... 68P81096E86
  Overview ........................................................................................................ page 1
  Electrical Connections ..................................................................................... page 2
  Electrical Characteristics ................................................................................. page 3
  Editing Wildcard Tables .................................................................................. page 8

SERIAL INTERFACE SPECIFICATIONS............................................................. 68P81131E57
  Overview ........................................................................................................ page 1
  Making Serial Connection to Station ............................................................... page 1
  Entering “RSS Mode” ..................................................................................... page 3
  Supported Commands. .................................................................................... page 4
  Important Things to Know. .............................................................................. page 12
FOREWORD

Product Maintenance Philosophy
Due to the high percentage of surface-mount components and multi-layer circuit boards, the maintenance philosophy for this product is one of Field Replaceable Unit (FRU) substitution. The station is comprised of self-contained modules (FRUs) which, when determined to be faulty, may be quickly and easily replaced with a known good module to bring the equipment back to normal operation. The faulty module must then be shipped to the Motorola System Support Center for further troubleshooting and repair to the component level.

Scope of Manual
This manual is intended for use by experienced technicians familiar with similar types of equipment. In keeping with the maintenance philosophy of Field Replaceable Units (FRU), this manual contains functional information sufficient to give service personnel an operational understanding of all FRU modules, allowing faulty FRU modules to be identified and replaced with known good FRU replacements.

The information in this manual is current as of the printing date. Changes which occur after the printing date are incorporated by Instruction Manual Revisions (SMR). These SMRs are added to the manuals as the engineering changes are incorporated into the equipment.
## Service and Replacement Modules

For complete information on ordering FRU replacement modules, or instructions on how to return faulty modules for repair, contact the System Support Center:

**Motorola System Support Center**  
2214 Galvin Drive  
Elgin, IL 60123  
1-800-221-7144  
Int'l 1-847-576-7300  
FAX 1-847-576-2172

The following FRU replacement modules are available:

<table>
<thead>
<tr>
<th>Module Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Receiver Module (VHF Range 1)</td>
<td>TLN3250</td>
</tr>
<tr>
<td>Receiver Module (VHF Range 2)</td>
<td>TLN3251</td>
</tr>
<tr>
<td>Receiver Module (UHF Range 0)</td>
<td>DLN1215</td>
</tr>
<tr>
<td>Receiver Module (UHF Range 1)</td>
<td>TLN3313</td>
</tr>
<tr>
<td>Receiver Module (UHF Range 2)</td>
<td>TLN3314</td>
</tr>
<tr>
<td>Receiver Module (UHF Range 3)</td>
<td>TLN3373</td>
</tr>
<tr>
<td>Receiver Module (UHF Range 4)</td>
<td>TLN3374</td>
</tr>
<tr>
<td>Receiver Module (800 MHz)</td>
<td>TLN3315</td>
</tr>
<tr>
<td>Receiver Module (900 MHz)</td>
<td>TLN3316</td>
</tr>
<tr>
<td>Exciter Module (VHF Range 1)</td>
<td>TLN3252</td>
</tr>
<tr>
<td>Exciter Module (VHF Range 2)</td>
<td>TLN3253</td>
</tr>
<tr>
<td>Exciter Module (UHF Range 0)</td>
<td>DLN1214</td>
</tr>
<tr>
<td>Exciter Module (UHF Range 1)</td>
<td>TLN3305</td>
</tr>
<tr>
<td>Exciter Module (UHF Range 2)</td>
<td>TLN3306</td>
</tr>
<tr>
<td>Exciter Module (UHF Range 3)</td>
<td>TLN3375</td>
</tr>
<tr>
<td>Exciter Module (UHF Range 4)</td>
<td>TLN3376</td>
</tr>
<tr>
<td>Exciter Module (800 MHz)</td>
<td>TLN3307</td>
</tr>
<tr>
<td>Exciter Module (900 MHz)</td>
<td>TLN3308</td>
</tr>
<tr>
<td>Power Amplifier Module (VHF 25W, R1 &amp; R2)</td>
<td>TLN3255</td>
</tr>
<tr>
<td>Power Amplifier Module (VHF 125W, R1)</td>
<td>TLN3379</td>
</tr>
<tr>
<td>Power Amplifier Module (VHF 125W, R2)</td>
<td>TLN3254</td>
</tr>
<tr>
<td>Power Amplifier Module (UHF Range 0; 110W)</td>
<td>DLN1216</td>
</tr>
<tr>
<td>Power Amplifier Module (UHF Range 1; 25W)</td>
<td>TLN3443</td>
</tr>
<tr>
<td>Power Amplifier Module (UHF Range 2; 110W)</td>
<td>TLN3446</td>
</tr>
<tr>
<td>Power Amplifier Module (UHF Range 4; 100W)</td>
<td>TLN3450</td>
</tr>
<tr>
<td>Power Amplifier Module (800 MHz 20W)</td>
<td>TLN3441</td>
</tr>
<tr>
<td>Power Amplifier Module (800 MHz 100W)</td>
<td>TLN3442</td>
</tr>
<tr>
<td>Power Amplifier Module (900 MHz 100W)</td>
<td>TLN3299</td>
</tr>
<tr>
<td>Station Control Module (Conventional/6809)</td>
<td>CLN1293</td>
</tr>
<tr>
<td>Station Control Module (Conventional/6809 EPIC III)</td>
<td>CLN1621</td>
</tr>
<tr>
<td>Station Control Module (EPIC IV)</td>
<td>CLN7692</td>
</tr>
<tr>
<td>Station Control Module (IntelliRepeater)</td>
<td>CLN1294</td>
</tr>
<tr>
<td>4-Wire Wireline Interface Module</td>
<td>CLN1295</td>
</tr>
<tr>
<td>8-Wire Wireline Interface Module</td>
<td>CLN1296</td>
</tr>
<tr>
<td>Power Supply Module (625W AC)</td>
<td>TLN3259</td>
</tr>
<tr>
<td>Power Supply Module (625W AC w/charger)</td>
<td>TLN3260</td>
</tr>
<tr>
<td>Power Supply Module (265W AC)</td>
<td>TLN3261</td>
</tr>
<tr>
<td>Power Supply Module (265W AC w/charger)</td>
<td>TLN3262</td>
</tr>
<tr>
<td>Power Supply Module (210W 12/24 V DC)</td>
<td>TLN3264</td>
</tr>
<tr>
<td>Power Supply Module (210W 48/60 V DC)</td>
<td>TLN3378</td>
</tr>
<tr>
<td>Power Supply Module (600W 24 V DC)</td>
<td>TLN3263</td>
</tr>
<tr>
<td>Power Supply Module (600W 48/60 V DC)</td>
<td>TLN3377</td>
</tr>
<tr>
<td>ASTRO Modem Card</td>
<td>TLN3265</td>
</tr>
</tbody>
</table>
GENERAL SAFETY INFORMATION

The following general safety precautions must be observed during all phases of operation, service, and repair of the equipment described in this manual. The safety precautions listed below represent warnings of certain dangers of which we are aware. You should follow these warnings and all other safety precautions necessary for the safe operation of the equipment in your operating environment.

General Safety Precautions

- Read and follow all warning notices and instructions marked on the product or included in this manual before installing, servicing or operating the equipment. Retain these safety instructions for future reference. Also, all applicable safety procedures, such as Occupational, Safety, and Health Administration (OSHA) requirements, National Electrical Code (NEC) requirements, local code requirements, safe working practices, and good judgement must be used by personnel.
- Refer to appropriate section of the product service manual for additional pertinent safety information.
- Because of danger of introducing additional hazards, do not install substitute parts or perform any unauthorized modifications of equipment.
- Identify maintenance actions that require two people to perform the repair. Two people are required when:
  - A repair has the risk of injury that would require one person to perform first aid or call for emergency support. An example would be work around high voltage sources. A second person may be required to remove power and call for emergency aid if an accident occurs to the first person. Note Use the National Institute of Occupational Safety and Health (NIOSH) lifting equation to determine whether a one or two person lift is required when a system component must be removed and replaced in its rack.
- If troubleshooting the equipment while power is applied, be aware of the live circuits.
- DO NOT operate the transmitter of any radio unless all RF connectors are secure and all connectors are properly terminated.
- All equipment must be properly grounded in accordance with Motorola Standards and Guideline for Communications Sites 68P81089E50 (sometimes referred to as “RF Manual”) and specified installation instructions for safe operation.
- Slots and openings in the cabinet are provided for ventilation. To ensure reliable operation of the product and to protect it from overheating, these slots and openings must not be blocked or covered.
- Only a qualified technician familiar with similar electronic equipment should service equipment.
- Some equipment components can become extremely hot during operation. Turn off all power to the equipment and wait until sufficiently cool before touching.
- Never store combustible materials in or near equipment racks. The combination of combustible material, heat, and electrical energy increases the risk of a fire safety hazard.

Human Exposure Compliance

This equipment is designed to generate and radiate radio frequency (RF) energy by means of an external antenna. When terminated into a non-radiating RF load, the base station equipment is certified to comply with Federal Communications Commission (FCC) regulations pertaining to human
exposure to RF radiation in accordance with the FCC Rules Part 1 section 1.1310 as published in title 47 code of federal regulations and procedures established in TIA/EIA TSB92, Report On EME Evaluation for RF Cabinet Emissions Under FCC MPE Guidelines. Compliance to FCC regulations of the final installation should be assessed and take into account site specific characteristics such as type and location of antennas, as well as site accessibility of occupational personnel (controlled environment) and the general public (uncontrolled environment). This equipment should only be installed and maintained by trained technicians. Licensees of the FCC using this equipment are responsible for insuring that its installation and operation comply with FCC regulations Part 1 section 1.1310 as published in title 47 code of federal regulations.

Whether a given installation meets FCC limits for human exposure to radio frequency radiation may depend not only on this equipment but also on whether the "environments" being assessed are being affected by radio frequency fields from other equipment, the effects of which may add to the level of exposure. Accordingly, the overall exposure may be affected by radio frequency generating facilities that exist at the time the licensee's equipment is being installed or even by equipment installed later. Therefore, the effects of any such facilities must be considered in site selection and in determining whether a particular installation meets the FCC requirements.

FCC OET Bulletin 65 provides materials to assist in making determinations if a given facility is compliant with the human exposure to RF radiation limits. Determining the compliance of transmitter sites of various complexities may be accomplished by means of computational methods. For more complex sites direct measurement of the power density may be more expedient. Additional information on the topic of electromagnetic exposure is contained in the Motorola Standards and Guideline for Communications Sites publication. Persons responsible for installation of this equipment are urged to consult the listed reference material to assist in determining whether a given installation complies with the applicable limits.
In general the following guidelines should be observed when working in or around radio transmitter sites:

- All personnel should have electromagnetic energy awareness training
- All personnel entering the site must be authorized ~ Obey all posted signs
- Assume all antennas are active
- Before working on antennas, notify owners and disable appropriate transmitters
- Maintain minimum 3 feet clearance from all antennas ~ Do not stop in front of antennas
- Use personal RF monitors while working near antennas
- Never operate transmitters without shields during normal operation ~ Do not operate base station antennas in equipment rooms

For installations outside of the U.S., consult with the applicable governing body and standards for RF energy human exposure requirements and take the necessary steps for compliance with local regulations.

References

- Motorola Standards and Guideline for Communications Sites, Motorola manual 68P81089E50
- IEEE Recommended Practice for the Measure of Potentially Hazardous Electromagnetic Fields – RF and Microwave, IEEE Std C95.3–1991, Publication Sales, 445 Hoes Lane, P.O. Box 1331, Piscataway, NJ 08855-1331
- IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz, IEEE C95.1–1991, Publication Sales, 445 Hoes Lane, P.O. Box 1331, Piscataway, NJ 08855-1331
# PERFORMANCE SPECIFICATIONS

## General

<table>
<thead>
<tr>
<th>TX Sub-Band Range</th>
<th>VHF</th>
<th>UHF</th>
<th>800</th>
<th>900</th>
</tr>
</thead>
<tbody>
<tr>
<td>132–154 MHz (R1)</td>
<td>380–433 MHz (R0)</td>
<td>851–870 MHz</td>
<td>935–941 MHz</td>
<td></td>
</tr>
<tr>
<td>150–174 MHz (R2)</td>
<td>403–433 MHz (R1)</td>
<td>438–470 MHz (R2)</td>
<td>470–494 MHz (R3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>494–520 MHz (R4)</td>
<td>806–825 MHz</td>
<td>896–902 MHz</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>RX Sub-Band Range</th>
<th>VHF</th>
<th>UHF</th>
<th>800</th>
<th>900</th>
</tr>
</thead>
<tbody>
<tr>
<td>132–154 MHz (R1)</td>
<td>380–433 MHz (R0)</td>
<td>851–870 MHz</td>
<td>935–941 MHz</td>
<td></td>
</tr>
<tr>
<td>150–174 MHz (R2)</td>
<td>403–433 MHz (R1)</td>
<td>438–470 MHz (R2)</td>
<td>470–494 MHz (R3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>494–520 MHz (R4)</td>
<td>806–825 MHz</td>
<td>896–902 MHz</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Number of Channels</th>
<th>16</th>
</tr>
</thead>
<tbody>
<tr>
<td>Channel Spacing</td>
<td>VHF: 30, 25, 12.5 kHz  UHF/800: 12.5, 25 kHz  900: 12.5 kHz</td>
</tr>
<tr>
<td>Frequency Generation</td>
<td>Synthesized</td>
</tr>
<tr>
<td>Power Supply Type</td>
<td>Switching</td>
</tr>
<tr>
<td>Power Supply Input Voltage</td>
<td>90–280 V ac</td>
</tr>
<tr>
<td>Power Supply Input Frequency</td>
<td>47–63 Hz</td>
</tr>
<tr>
<td>Battery Revert</td>
<td>12V (25W radios) 24V (100W, 110W, and 125W radios)</td>
</tr>
<tr>
<td>T/R Separation (without duplexer option)</td>
<td>VHF/UHF: Any spacing within same sub-band 800: 45 MHz 900: 39 MHz</td>
</tr>
<tr>
<td>T/R Separation (with duplexer option)</td>
<td>VHF/UHF: ≥ 1.5 MHz 800: 45 MHz 900: 39 MHz</td>
</tr>
<tr>
<td>Temperature Range (ambient)</td>
<td>−30°C to +60°C</td>
</tr>
</tbody>
</table>
## PERFORMANCE SPECIFICATIONS (Cont’d)

### Receiver

<table>
<thead>
<tr>
<th>I–F Frequencies</th>
<th>VHF 21.45 MHz (1st)</th>
<th>UHF 73.35 MHz (1st)</th>
<th>800 73.35 MHz (1st)</th>
<th>900 73.35 MHz (1st)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>450 kHz (2nd)</td>
<td>450 kHz (2nd)</td>
<td>450 kHz (2nd)</td>
<td>450 kHz (2nd)</td>
</tr>
<tr>
<td>Preselector Bandwidth</td>
<td>VHF/UHF: 4 MHz</td>
<td><strong>800</strong>: 19 MHz</td>
<td><strong>900</strong>: 6 MHz</td>
<td></td>
</tr>
<tr>
<td>Sensitivity (12 dB SINAD)</td>
<td>VHF: 0.25 µV</td>
<td>UHF: 0.35 µV</td>
<td><strong>800/900</strong>: 0.30 µV</td>
<td></td>
</tr>
<tr>
<td>Sensitivity (20 dB Quietging)</td>
<td>VHF: 0.35 µV</td>
<td>UHF: 0.5 µV</td>
<td><strong>800/900</strong>: 0.42 µV</td>
<td></td>
</tr>
<tr>
<td>Adjacent Channel Rejection</td>
<td>VHF 90 dB (25/30 kHz)</td>
<td>UHF 75 dB (12.5 kHz)</td>
<td>800 70 dB (12.5 kHz)</td>
<td>900 70 dB</td>
</tr>
<tr>
<td></td>
<td>80 dB (23.5 kHz)</td>
<td>85 dB (25 kHz)</td>
<td>80 dB (25 kHz)</td>
<td></td>
</tr>
<tr>
<td>Intermodulation Rejection</td>
<td>VHF 85 dB (25/30 kHz)</td>
<td>UHF 85 dB</td>
<td>800 85 dB</td>
<td>900 70 dB</td>
</tr>
<tr>
<td></td>
<td>80 dB (30 kHz)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spurious and Image Rejection</td>
<td>100 dB</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wireline Output</td>
<td>–20 dBm to 0 dBm @ 60% Rated System Deviation, 1 kHz</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Audio Response (Analog Mode)</td>
<td>+1, –3 dB from 6 dB per octave de–emphasis; 300–3000 Hz referenced to 1000 Hz at line input</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Audio Distortion</td>
<td>Less than 3% @ 1000 Hz</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FM Hum and Noise (300 to 3000 kHz bandwidth)</td>
<td>VHF 50 dB (25/30 kHz)</td>
<td>UHF 45 dB (12.5 kHz)</td>
<td>800 45 dB (12.5 kHz)</td>
<td>900 45 dB</td>
</tr>
<tr>
<td></td>
<td>45 dB (12.5 kHz)</td>
<td>50 dB (25 kHz)</td>
<td>50 dB (25 kHz)</td>
<td></td>
</tr>
<tr>
<td>Frequency Stability</td>
<td>VHF/ UHF/ 800: 1 ppm</td>
<td><strong>900</strong>: 0.1 ppm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RF Input Impedance</td>
<td>50 Ω</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FCC Designation (FCC Rule Part 15)</td>
<td>VHF: ABZ89FR3776</td>
<td>UHF: ABZ89FR4796</td>
<td><strong>800</strong>: ABZ89FR5757</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>900</strong>: ABZ89FR5768</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
PERFORMANCE SPECIFICATIONS (Cont’d)

**Transmitter**

<table>
<thead>
<tr>
<th>Power Output</th>
<th>VHF</th>
<th>UHF</th>
<th>800</th>
<th>900</th>
</tr>
</thead>
<tbody>
<tr>
<td>25–125W</td>
<td>25–110W</td>
<td>20–100W</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Electronic Bandwidth | Full sub-band |

<table>
<thead>
<tr>
<th>Intermodulation Attenuation</th>
<th>VHF: 20 dB (single circulator; standard on all PAs) 65 dB (triple circulator – requires triple circulator option)</th>
<th>UHF: 50 dB (single circulator; standard on all PAs)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>800: 50 dB (single circulator; standard on all PAs)</td>
<td>900: 20 dB (single circulator; standard on all PAs)</td>
</tr>
<tr>
<td></td>
<td>70 dB (triple circulator – requires triple circulator option)</td>
<td></td>
</tr>
</tbody>
</table>

| Spurious and Harmonic Emissions Attenuation | 90 dB |

<table>
<thead>
<tr>
<th>Deviation</th>
<th>VHF, UHF, and 800</th>
</tr>
</thead>
<tbody>
<tr>
<td>±5 kHz (25 kHz)</td>
<td>±2.5 kHz (12.5 kHz)</td>
</tr>
<tr>
<td>±2.5 kHz (12.5 kHz)</td>
<td></td>
</tr>
</tbody>
</table>

| Audio Sensitivity          | −35 dBm to 0 dBm (variable) |

| Audio Response (Analog Mode) | +1, −3 dB from 6 dB per octave pre−emphasis; 300−3000 Hz referenced to 1000 Hz at line input |

| Audio Distortion           | Less than 2% @ 1000 Hz @ 60% rated system deviation |

<table>
<thead>
<tr>
<th>FM Hum and Noise (300 to 3000 Hz bandwidth)</th>
<th>45 dB nominal (12.5 kHz)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>50 dB nominal (25/30 kHz)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Frequency Stability</th>
<th>VHF, UHF, 800: 1 ppm</th>
<th>900: 0.1 ppm</th>
</tr>
</thead>
</table>

| RF Output Impedance | 50 Ω |

<table>
<thead>
<tr>
<th>FCC Designation</th>
<th>VHF 25W: ABZ89FC3774 (FCC Rule Parts 22, 74, 80, 90)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>125W: ABZ89FC3773 (FCC Rule Parts 22, 74, 80, 90)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>UHF 25W/R1−2: ABZ89FC4797 (FCC Rule Parts 22, 74, 90)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>110W/R0: ABZ89FC4798-A (FCC Rule Part 90)</td>
</tr>
<tr>
<td></td>
<td>110W/R1−3: ABZ89FC4798 (FCC Rule Parts 22, 90)</td>
</tr>
<tr>
<td></td>
<td>100W/R4: ABZ89FC4798 (FCC Rule Part 74)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>800 20W: ABZ89FC5775 (FCC Rule Parts 22, 90)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>100W: ABZ89FC5776 (FCC Rule Parts 22, 90)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FCC Designation</th>
<th>900</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>100W: ABZ89FC5767 (FCC Rule Part 90)</td>
</tr>
</tbody>
</table>

*Measurement Methods per TIA/EIA−603
Specifications subject to change without notice

END OF PART 1

(Page xxii is blank)