



MOTOROLA

QUANTARTM

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



MOTOROLA
intelligence everywhere™

QUANTAR® **Digital–Capable Station**

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6809 Trunking, and IntelliRepeater Systems

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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:

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

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 "R56 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

- TIA/EIA TSB92 "Report On EME Evaluation for RF Cabinet Emissions Under FCC MPE Guidelines," Global Engineering Documents: <http://global.ihs.com/>
- FCC OET Bulletin 65 "Evaluating Compliance with FCC Guidelines for Human Exposure to Radio frequency Electromagnetic Fields": <http://www.fcc.gov/oet/rfsafety/>
- *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

TX Sub–Band Range	VHF 132–154 MHz (R1) 150–174 MHz (R2)	UHF 380–433 MHz (R0) 403–433 MHz (R1) 438–470 MHz (R2) 470–494 MHz (R3) 494–520 MHz (R4)	800 851–870 MHz	900 935–941 MHz
RX Sub–Band Range	VHF 132–154 MHz (R1) 150–174 MHz (R2)	UHF 380–433 MHz (R0) 403–433 MHz (R1) 438–470 MHz (R2) 470–494 MHz (R3) 494–520 MHz (R4)	800 806–825 MHz	900 896–902 MHz
Number of Channels	16			
Channel Spacing	VHF: 30, 25, 12.5 kHz UHF/800: 12.5, 25 kHz 900: 12.5 kHz			
Frequency Generation	Synthesized			
Power Supply Type	Switching			
Power Supply Input Voltage	90–280 V ac			
Power Supply Input Frequency	47–63 Hz			
Battery Revert	12V (25W radios) 24V (100W, 110W, and 125W radios)			
T/R Separation (without duplexer option)	VHF/UHF: Any spacing within same sub-band 800: 45 MHz 900: 39 MHz			
T/R Separation (with duplexer option)	VHF/UHF: ≥ 1.5 MHz 800: 45 MHz 900: 39 MHz			
Temperature Range (ambient)	–30° C to +60° C			

PERFORMANCE SPECIFICATIONS (Cont'd)

Receiver

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

PERFORMANCE SPECIFICATIONS (Cont'd)

Transmitter

Power Output	VHF 6–25W 25–125W	UHF 5–25W 25–110W	800 5–20W 20–100W	900 25–100W
Electronic Bandwidth	Full sub–band			
Intermodulation Attenuation	VHF: 20 dB (single circulator; standard on all PAs) 65 dB (triple circulator – requires triple circulator option) UHF: 50 dB (single circulator; standard on all PAs) 800: 50 dB (single circulator; standard on all PAs) 900: 20 dB (single circulator; standard on all PAs) 70 dB (triple circulator – requires triple circulator option)			
Spurious and Harmonic Emissions Attenuation	90 dB			
Deviation	VHF, UHF, and 800 ±5 kHz (25 kHz) ±2.5 kHz (12.5 kHz)		900 ±2.5 kHz	
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			
FM Hum and Noise (300 to 3000 Hz bandwidth)	45 dB nominal (12.5 kHz) 50 dB nominal (25/30 kHz)			
Frequency Stability	VHF, UHF, 800: 1 ppm		900: 0.1ppm	
RF Output Impedance	50 Ω			
FCC Designation	VHF 25W: ABZ89FC3774 (FCC Rule Parts 22, 74, 80, 90) 125W: ABZ89FC3773 (FCC Rule Parts 22, 74, 80, 90)			
	UHF 25W/R1–2: ABZ89FC4797 (FCC Rule Parts 22, 74, 90) 110W/R0: ABZ89FC4798-A (FCC Rule Part 90) 110W/R1–3: ABZ89FC4798 (FCC Rule Parts 22, 90) 100W/R4: ABZ89FC4798 (FCC Rule Part 74)			
	800 20W: ABZ89FC5775 (FCC Rule Parts 22, 90) 100W: ABZ89FC5776 (FCC Rule Parts 22, 90)			
FCC Designation	900 100W: ABZ89FC5767 (FCC Rule Part 90)			

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

END OF PART 1