

APPLICANT: MOTOROLA INC.

EQUIPMENT TYPE: ABZ89FC5797

INSTRUCTION MANUALS

An outline of the preliminary 800 MHz high power booster radio system manual is included in this package (in draft form). Final manuals will be sent to the commission and/or telecommunication certification body (TCB) as soon as they become available. All of the descriptions and schematics in this filing are up to date and will be included in the instruction and/or service manuals.



MOTOROLA

Commercial Government and
Industrial Solutions Sector

QUANTAR™

Digital-Capable Station with High Power Booster

For Conventional and ASTRO Systems

VHF Range 2
350 W Continuous Duty
800 MHz
150 W Continuous Duty

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MODEL AND OPTION SELECTION PROCEDURE (INCLUDES MODEL/OPTION COMPLEMENTS)

The following equipment ordering scenario is used by the sales representative to equip a *Quantar* Station with High Power Booster with the proper hardware and firmware for specific system types and customer-defined options and features. The scenario is described here to explain the process and to show the structure and contents of the various options and models.

1

The sales model is T5365A (as translated from C99ED/001C).

NOTE: *The Sales Model includes only a TRN7795A Base Station Nameplate. Equipping the station with the proper modules is accomplished by ordering additional options, as described in the following steps.*

2

A System Family Option must be selected as follows:

System Type	Family Option	VHF
Conventional Analog	X597	✓
Conventional <i>ASTRO</i> VSELP	X599	✓
Conventional <i>ASTRO</i> CAI	X806	✓

3

The External Power Booster Option must be ordered as follows:

External Power Booster	Option
Add 350W VHF External Power Booster	CA00052
Add 350W 800 MHz External Power Booster	CA00116

(Continued)

4

The Station Frequency/Power Option must be ordered as follows:

VHF		800 MHz	
Frequency Range	Output Power	Frequency Range	Output Power
VHF High Band Range 2 (150–174 MHz)	25W	800 MHz	20W
	Option X330AA		Option X250AA

5

A cabinet or open rack option must be ordered as follows:

Option	Description
Cabinets X308AG X180AG X36AF	46" Cabinet 60" Cabinet 70" Outdoor Cabinet
Standard Open Racks X832AF X882AF X810AH	7' Standard Open Rack 7½' Standard Open Rack 8' Standard Open Rack
Modular Racks X741AH X742AG X743AG	30" Modular Rack 45" Modular Rack 52" Modular Rack

6

If no other options are selected, Motorola's Order Processing appends the appropriate standard options (based on power and frequency band) to complete the station equipment list. The table on the next page shows the completed equipment lists for the available options. If additional options are desired, they must be added to the initial order form. Step 7 lists the available options and the impact each has on the standard equipment configuration.

(Continued)

VHF

Quantar Station with High Power Booster (VHF Range 2; 350W Transmitter) (X308 46" Cabinet Selected in Step 5)

Source	Option/ Kit	Description
Option from Initial Sales Order	X597AA	Conventional System Family Option
	CA00052AB CLD1291A CPN6087A	Add External Power Amplifier Booster High Power Booster PA Deck (VHF R2) High Power Booster Dual Power Supply Chassis
	X330AA TLD3110B TKN8699A TRN7480A TRN7708A CHN6100A	VHF High Band Ranges 1 & 2; 25W Transmitter 25 W Power Amplifier Module (VHF R1 & R2) PA-to-Exciter RF Cable Station Interconnect Board (Backplane) PA Module Front Panel Anti-Vibration/EFI Screws (2)
	X308AG THN6691A CLN7516A TTN5040B	46" Cabinet 46" Cabinet Hardware Grommet Kit
Options/Kits Internally Added by Motorola Order Processing	X131AB CLD1280A CHN6100A	Exciter Module (VHF High-Band Range 2) Exciter Module (Board and Hardware) Anti-Vibration/EFI Screws (2)
	X333AB CLD1260A CLN7334A TRN7799A CHN6100A	Receiver Module (VHF High-Band Range 2) Receiver Module (Board, Preselector, Hardware) Receiver Module Front Panel VHF/UHF Tuning Kit Anti-Vibration/EFI Screws (2)
	X43AV CPN1049F CPN1070B CLN7618A CPN6086A CLN7261A CHN6100A	Booster Dual Power Supply Option (w/o Batt Chrgr) 265W Power Supply (AC input; w/o battery charger) 625W Power Supply (AC input; w/o batt chrg); Qty 2 Dual Power Supply Chassis Hardware Front Panel, Dummy Charger Connector AC Line Cord Ferrite RFI Suppressor (Qty 3) Anti-Vibration/EFI Screws (2)
	X621AY CLN1614A TRN7476A TKN8751A	Station Control Module (SCM); Standard EPIC III Station Control Module SCM Internal Speaker Internal Speaker Cable
	X222AB TGN6157A CHN6100A	Front Panel (Station Control Module) Station Control Module Front Panel Anti-Vibration/EFI Screws (2)
	X216AA CLN6955A TKN8731A CLN6816A	Wireline Interface Module (WIM) (4-wire) Wireline Interface Board (4-Wire) WIM Cable RFI Suppressor
	C831AA TRN7479A	Card Cage Card Cage Assembly (12")
	X142AA TRN7494A	Duplex Interface Assembly Duplex Interface (includes ant. connector bracket)
	X249DD TKN8753A TKN9151A CKN6456A	RF Cabling (High Power Booster) Receiver mini-UHF to N-type coax cable Internal PA-to-HPB Deck coax cable HPB PA Deck-to-Junction Bracket (TX Out) coax cable
	X187AA TRN7663A	Domestic Power Cable (Qty 3) AC Line Cord
	X163AD TRN7696A CHN6100A	Blank Panels Dual Slot Wide Blank Panel Anti-Vibration/EFI Screws (2)
	X842AB CLN6885A	Ethernet Termination Kit Ethernet Termination Hardware
	X362AD TBN6626A	Packing Packing for 46" Cabinet
	X436BA 68P80801D55	Instruction Manual Quantar Station with Hi-Pwr Booster Functional Manual

(Continued)

800 MHz

Quantar Station with High Power Booster (800 MHz; 150W Transmitter) (X308 46" Cabinet Selected in Step 5)

Source	Option/ Kit	Description
Option from Initial Sales Order	X597AA	Conventional System Family Option
	CA00052AB CLD1291A CPN6087A	Add External Power Amplifier Booster High Power Booster PA Deck (VHF R2) High Power Booster Dual Power Supply Chassis
	X330AA TLD3110B TKN8699A TRN7480A TRN7708A CHN6100A	VHF High Band Ranges 1 & 2: 25W Transmitter 25 W Power Amplifier Module (VHF R1 & R2) PA-to-Exciter RF Cable Station Interconnect Board (Backplane) PA Module Front Panel Anti-Vibration/EFI Screws (2)
	X308AG THN6691A CLN7516A TTN5040B	46" Cabinet 46" Cabinet Hardware Grommet Kit
Option from Initial Sales Order	X131AB CLD1280A CHN6100A	Exciter Module (VHF High-Band Range 2) Exciter Module (Board and Hardware) Anti-Vibration/EFI Screws (2)
	X333AB CLD1260A CLN7334A TRN7799A CHN6100A	Receiver Module (VHF High-Band Range 2) Receiver Module (Board, Preselector, Hardware) Receiver Module Front Panel VHF/UHF Tuning Kit Anti-Vibration/EFI Screws (2)
	X43AV CPN1049F CPN1070B CLN7516A	Booster Dual Power Supply Option (w/o Batt Chgr) 265W Power Supply (AC input; w/o battery charger) 625W Power Supply (AC input; w/o batt chrg); Qty 2
Option from Initial Sales Order		STILL NEEDS WORK... KITS BEING SETUP
	X222AB TGN6157A CHN6100A	Front Panel (Station Control Module) Station Control Module Front Panel Anti-Vibration/EFI Screws (2)
	X216AA CLN6955A TKN8731A CLN6816A	Wireline Interface Module (WIM) (4-wire) Wireline Interface Board (4-Wire) WIM Cable RFI Suppressor
	C831AA TRN7479A	Card Cage Card Cage Assembly (12")
	X142AA TRN7494A	Duplex Interface Assembly Duplex Interface (includes ant. connector bracket)
	X249DD TKN8753A TKN9151A CKN6456A	RF Cabling (High Power Booster) Receiver mini-UHF to N-type coax cable Internal PA-to-HPB Deck coax cable HPB PA Deck-to-Junction Bracket (TX Out) coax cable
	X187AA TRN7663A	Domestic Power Cable (Qty 3) AC Line Cord
	X163AD TRN7696A CHN6100A	Blank Panels Dual Slot Wide Blank Panel Anti-Vibration/EFI Screws (2)
	X842AB CLN6885A	Ethernet Termination Kit Ethernet Termination Hardware
	X362AD TBN6626A	Packing Packing for 46" Cabinet
	X436BA 68P80801D55	Instruction Manual Quantar Station with Hi-Pwr Booster Functional Manual

(Continued)

The following lists available options that may be selected in addition to the standard model and options (described in Steps 1 thru 6).

AVAILABLE HARDWARE OPTIONS FOR QUANTAR STATION with HIGH POWER BOOSTER

Option Category	Option and Complement
Power Supply	AC Input Supplies X30BM Booster Dual Power Supply Option (with Batt Chgr) CPN1050G 265W Power Supply (AC input; w/ battery charger) CPN1071B 625W Power Supply (AC input; w/ batt chrg); Qty 2 CLN7261A AC Line Cord Ferrite RFI Suppressor (Qty 3) CLN7619A Dual Power Supply Chassis Hardware CLN7499A Battery Control Board TKN8786A Battery Temperature Sensor Cable (Qty 2) TKN8732A Battery Charger Cable Kit (Station Power Supply) CKN6719A Battery Charger Cable Kit (HPB Power Supplies; Qty 2) TRN5155A 10' Extension Cable w/connectors and fuse block (Qty 3) CLN7419A Station Internal Power Supply Front Panel w/Screws CHN6100A Anti-Vibration/EFI Screws (2)
Wireline Interface Module	X84AA Omit Standard Wireline Interface Module (WIM) X144AA Add 8-Wire Wireline Interface Module (WIM) CLN6956A 8-Wire Wireline Interface Board (WIB) TKN8731A WIM Cable Kit CLN6816A RFI Suppressor
Antenna Relay	X371AA Add Antenna Relay TRN7664A Antenna Relay, Cables, and Mounting Hardware
Modem	X437AA Add ASTRO Modem TRN7668A ASTRO Modem Card
Circulator	X676AA Add Triple Circulator (VHF, 132–146 MHz) TYD4001A Dual Circulator TLN3391A 50 Ohm Load with Heat Sink TYD4010A Low Pass Filter TRN7796A Fan, Peripheral Tray X676AB Add Triple Circulator (VHF, 144–160 MHz) TYD4002A Dual Circulator TLN3391A 50 Ohm Load with Heat Sink TYD4010A Low Pass Filter TRN7796A Fan, Peripheral Tray X676AC Add Triple Circulator (VHF, 158–174 MHz) TYD4003A Dual Circulator TLN3391A 50 Ohm Load with Heat Sink TYD4010A Low Pass Filter TRN7796A Fan, Peripheral Tray X676AQ Add Triple Circulator (800 MHz) TLF7320A Dual Circulator TLN3391A 50 Ohm Load with Heat Sink TLF7340A Low Pass Filter TRN7796A Fan, Peripheral Tray
UHSO	X873AA Add Internal Ultra High Stability Oscillator CLN7012A BNC Terminator CHN6100A Anti-Vibration/EFI Screws (2) CLN1477A UHSO Module TTN5070C UHSO Board TTN5071A UHSO Housing and Front Panel TTN5072A UHSO 5 PPB Ovenized Element
Peripheral Tray	X696AA Add Peripheral Tray TRN7751A Quantar Peripheral Shelf
Miscellaneous	HSN1000 External Speaker TRN7738A External Speaker Hardware (bracket and cable) HMN1001A Microphone <i>Note that the external speaker and microphone are not options and must be ordered as line items on the STIC–1 order form.</i>

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

*Motorola System Support Center
1311 E. Algonquin Road
Schaumburg, IL 60196*

*1-800-221-7144
Int'l 1-847-576-7300
FAX 1-847-576-2172*

For complete information on ordering FRU replacement modules, or instructions on how to return faulty modules for repair, contact the System Support Center (see sidebar).

The following FRU replacement modules are available:

Receiver Modules

Receiver Module (VHF Range 2) TLN3251A
Receiver Module (800 MHz) TLN3315A

Exciter Modules

Exciter Module (VHF Range 2) TLN3253A
Exciter Module (800 MHz) TLN3307A

Power Amplifier Modules

Power Amplifier Module (VHF 25W, R1 & R2) TLN3255A
Power Amplifier Module (800 MHz; 20W) TLN3441A
High Power Booster PA Deck (VHF 350W, R2) DLN1108A
High Power Booster PA Deck (800 MHz, 150W) DLNxxxxx

Station Control Modules

Station Control Module (Conventional/6809 EPIC III) CLN1621A

Wireline Interface Modules

4-Wire Wireline Interface Module CLN1295A
8-Wire Wireline Interface Module CLN1296A

Power Supply Modules

Power Supply Module (265W AC w/o Charger) TLN3261A
Power Supply Module (265W AC w/Charger) TLN3262A
Power Supply Module (600W AC w/o Charger; HPB) DLN1109A
Power Supply Module (600W AC w/Charger; HPB) . DLN1110A

Miscellaneous

High Power Booster PA Deck Front Panel/Fans DLN1156A
Battery Control Board DLN1111A
ASTRO Modem Card TLN3265A

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 “R56” 68P81089E50 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.

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 Radiofrequency 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 150–174 MHz (R2)	800 MHz 851–870 MHz
RX Sub–Band Range	VHF 150–174 MHz (R2)	800 MHz 806–825 MHz
Number of Channels	16	
Channel Spacing	VHF: 30, 25, 12.5 kHz 800 MHz: 12.5 kHz, 25 kHz	
Frequency Generation	Synthesized	
Power Supply Type	Switching	
Power Supply Input Voltage	90–264 V ac	
Power Supply Input Frequency	47–63 Hz	
Battery Revert	12 V	
T/R Separation (with duplexer option)	VHF: ≥ 1.5 MHz 800 MHz: ≥ 45 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)	800 73.35 MHz (1st) 450 kHz (2nd)
Preselector Bandwidth	VHF: 4 MHz	800: 19 MHz
Sensitivity (12 dB SINAD)	VHF: 0.25 μ V	800: 0.30 μ V
Sensitivity (20 dB Quieting)	VHF: 0.35 μ V	800: 0.42 μ V
Adjacent Channel Rejection	VHF 90 dB (25/30 kHz) 80 dB (23.5 kHz)	800 70 dB (12.5 kHz) 80 db (25 kHz)
Intermodulation Rejection	VHF 85 dB (25/30 kHz) 80 dB (30 kHz)	800 85 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)	800 45 dB (12.5 kHz) 50 dB (25 kHz)
Frequency Stability	1 ppm	
RF Input Impedance	50 Ω	
FCC Designation (FCC Rule Part 15)	VHF: ABZ89FR3776	800: ABZ89FR5757

PERFORMANCE SPECIFICATIONS (Cont'd)

Transmitter

(Station Level, includes both Power Amplifiers)

Power Output	VHF 100–350 W	800 5–150 W
Electronic Bandwidth	Full sub–band	
Intermodulation Attenuation	VHF: 20 dB (single circulator; standard on all PAs) 65 dB (triple circulator – requires triple circulator option) 800: 50 dB (single circulator; standard on all PAs)	
Spurious and Harmonic Emissions Attenuation	90 dB	
Deviation	±5 kHz (25 kHz) ±2.5 kHz (12.5 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	1 ppm	
RF Output Impedance	50 Ω	
FCC Designation (FCC Rule Parts 22, 74, 80, 90)	VHF 25W Internal PA: ABZ89FC3774 350W High Power PA Deck: ABZ89FC3788 800 20W Internal PA: ABZ89FC5775 150W High Power PA Deck: A B Z 8 9 F C 5 7 9 7	

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

