

APPLICANT: MOTOROLA INC.

EQUIPMENT TYPE: ABZ89FC3788

INSTRUCTION MANUALS

An outline of the preliminary VHF 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.

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TUNE-UP PROCEDURE

There is no field tune-up procedure. All adjustments are software controlled and are pre-set at the factory. Certain station operating parameters can be changed via radio service software (RSS) within predetermined limits. Examples include transmitter operating frequencies and power level.



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

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(COVERS
CPN1070/71)**

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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 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 External Power Booster	CA00052

(Continued)

4

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

VHF

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

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 CLN7516A CPN6087A	Add External Power Amplifier Booster High Power Booster PA Deck (VHF R2) Quantar Station w/High Power Booster Hardware 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 CPN1049C CPN1070A CLN7261A CLN7618A CPN6086A TRN7998A 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 Ferrite RFI Suppressor Dual Power Supply Chassis Hardware Front Panel, Dummy Charger Connector AC Adapter Hardware 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 CGN6157A 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 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 (need detailed description of this cable) (need detailed description of this cable)
	X187AA TRN7663A	Domestic Power Cable 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 (no cabinet) 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) CPN1050D 265W Power Supply (AC input; w/ battery charger) CPN1071A 625W Power Supply (AC input; w/ batt chrg); Qty 2 CLN7261A Ferrite RFI Suppressor CLN7619A Dual Power Supply Chassis Hardware CPN6086A Front Panel, Dummy Charger Connector CLN7499A Battery Control Board TKN8786A Battery Temperature Sensor TRN5155A 10' Extension Cable w/connectors and fuse block 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	X676AB Add Triple Circulator (UHF, R1 and R2) TLE9120A Dual Circulator TLN3391A 50 Ohm Load with Heat Sink TLE9140A Low Pass Filter TRN7796A Fan, Peripheral Tray	
Low Pass Filter	X154AA Add Triple Circulator (UHF, R1 and R2) TLE9120A Dual Circulator TLN3391A 50 Ohm Load with Heat Sink TLE9140A 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>	

Need help with the Circulator and Low Pass Filter!!! Gonna talk to Mike V. while he's up here.

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
Exciter Modules	
Exciter Module (VHF Range 2)	TLN3253A
Power Amplifier Modules	
Power Amplifier Module (VHF 25W, R1 & R2)	TLN3255A
High Power Booster PA Deck (VHF 350W, R2)	DLN1108A
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	DLN?????
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)
RX Sub–Band Range	VHF 150–174 MHz (R2)
Number of Channels	16
Channel Spacing	VHF: 30, 25, 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	12 V
T/R Separation (with duplexer option)	VHF: ≥ 1.5 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)
Preselector Bandwidth	VHF/UHF: 4 MHz
Sensitivity (12 dB SINAD)	VHF: 0.25 μ V
Sensitivity (20 dB Quieting)	VHF: 0.35 μ V
Adjacent Channel Rejection	VHF 90 dB (25/30 kHz) 80 dB (23.5 kHz)
Intermodulation Rejection	VHF 85 dB (25/30 kHz) 80 dB (30 kHz)
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 bandwidth)	VHF 50 dB (25/30 kHz) 45 dB (12.5 kHz)
Frequency Stability	1 ppm
RF Input Impedance	50 Ω
FCC Designation (FCC Rule Part 15)	VHF: ABZ89FR3776

PERFORMANCE SPECIFICATIONS (Cont'd)

Transmitter

(Station Level, includes both Power Amplifiers)

Power Output	VHF 175–350 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)
Spurious and Harmonic Emissions Attenuation	90 dB
Deviation	VHF, ±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

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

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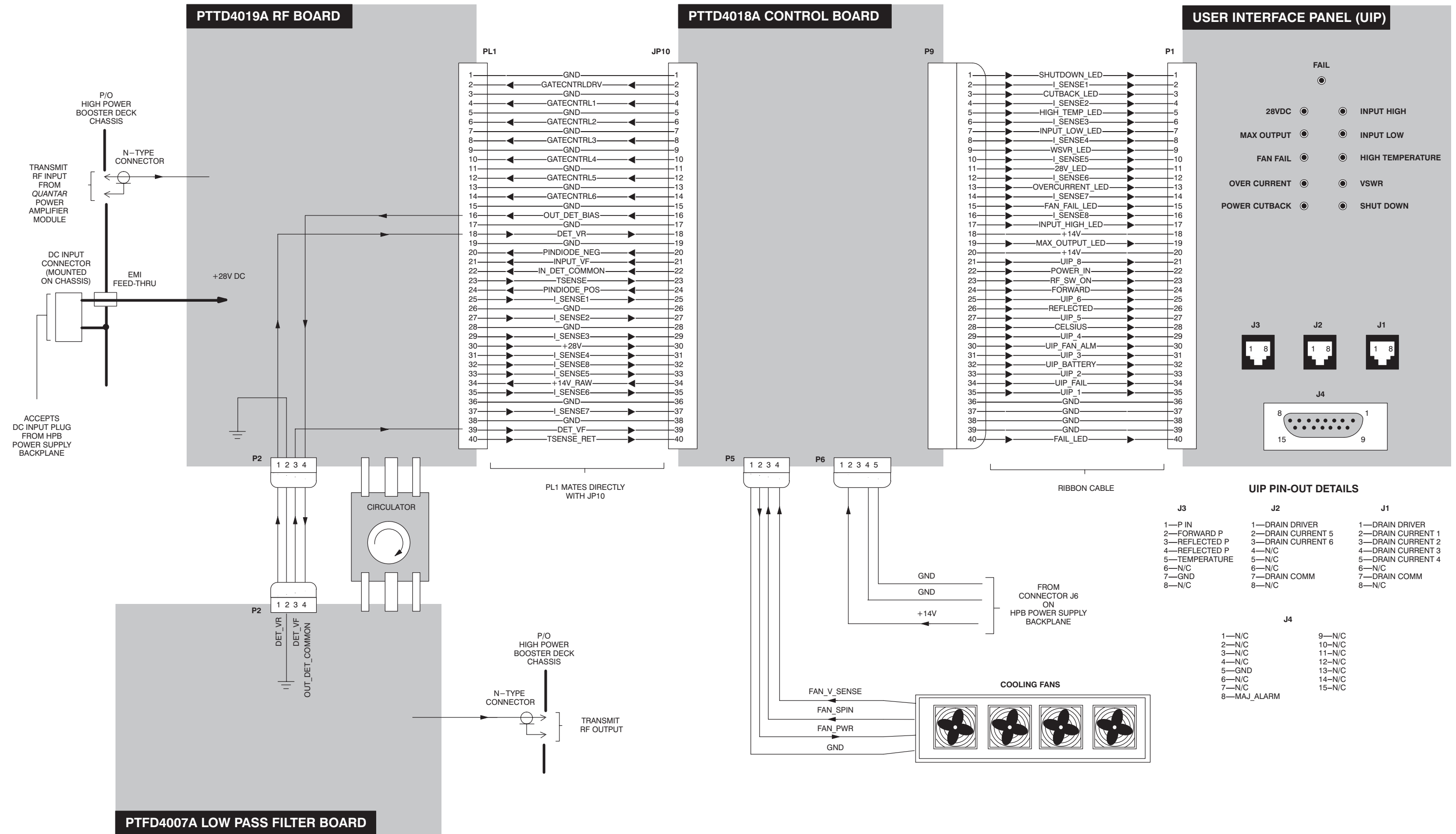


Figure 1. CLD1291A High Power Booster Deck Interconnect Diagram