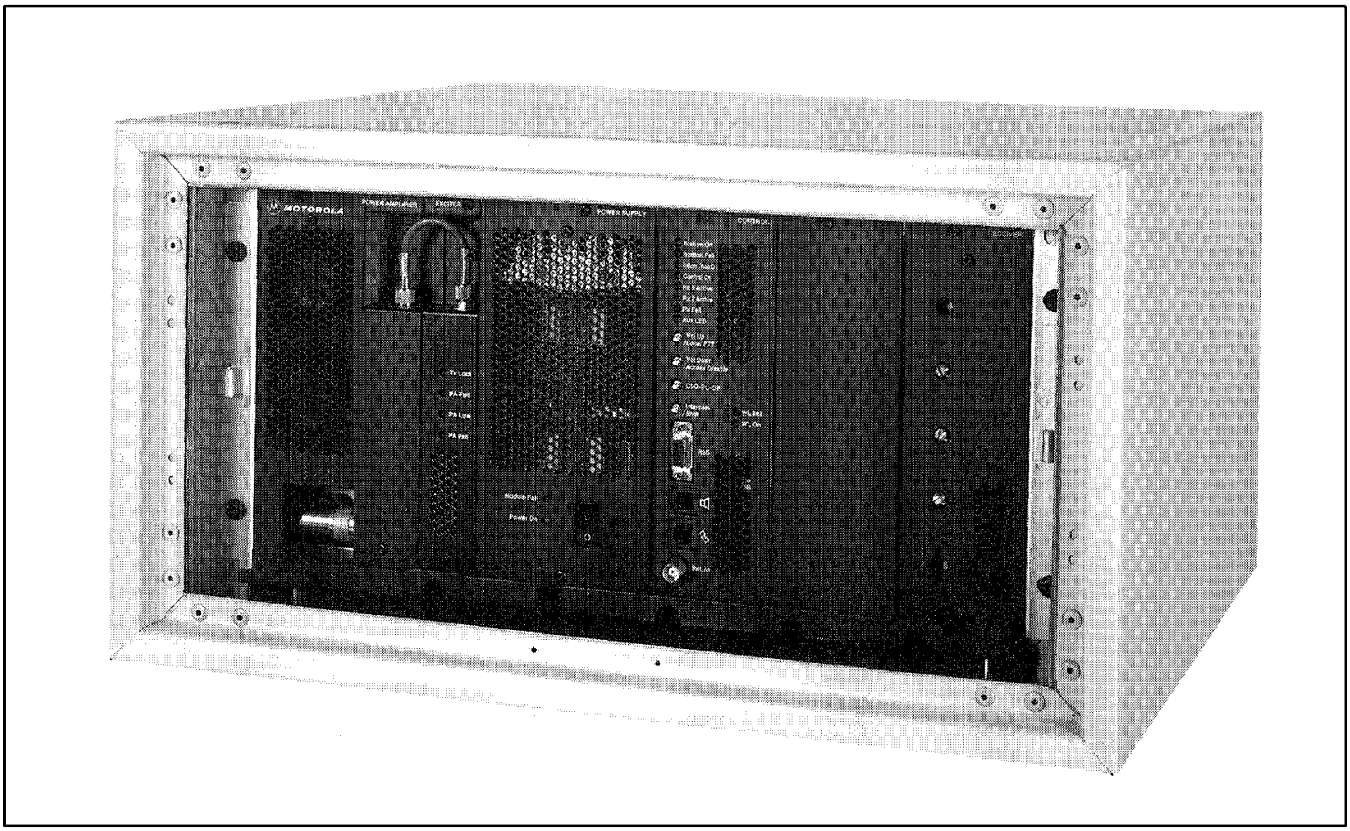

Figure 1. *Quantar* Station in 12" Cabinet (UHF Shown)

1 INTRODUCTION

The Motorola *Quantar* Station (available in VHF, UHF, 800 MHz and 900 MHz) provides conventional analog, *ASTRO*, *ASTRO CAI*, 6809 Trunking, and *IntelliRepeater* capabilities in a compact, software-controlled design. The station architecture and microprocessor-controlled Station Control Module allow for fast and reliable expansion and upgrading. FLASH memory in the Station Control Module allows software downloads to be performed locally (using serial or Ethernet port) or remotely via modem.

Compact Mechanical Design

The entire *Quantar* station is housed in a 5 rack-unit-high card cage weighing only 55 lbs. A single cage may be mounted in a 12" cabinet (shown in Figure 1) or multiple cages may be mounted in standard telephone-style equipment racks or various sizes of Motorola cabinets.

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State–of–the–Art Electrical Design

Transmitter Circuitry

The station transmitter circuitry is designed for continuous duty operation and may be operated at full–rated power. Output power is continually monitored by an internal calibrated wattmeter. The wattmeter output feeds a power control loop which continually adjusts and maintains the desired output power. All adjustments are electronic, including deviation and output power.

Receiver Circuitry

The station receive circuitry features multiple bandwidth capability (12.5, 25, or 30 kHz, depending on band), as well as *ASTRO* digital operation. Injection signals for the 1st and 2nd mixers are generated by frequency synthesizer circuitry electronically controlled by the Station Control Module. All receive signals (analog, *ASTRO,* and *ASTRO CAI*) are detected and digitized before being sent to the Station Control Module, providing improved audio quality consistency throughout the coverage area.

Station Control Module

The *Quantar* Station Control Module is microprocessor–based and features extensive use of ASIC and digital signal processing technology. The module serves as the main controller for the station, providing signal processing and operational control for the station modules.

Wireline Circuitry

The station wireline circuitry provides a wide variety of telephone interfaces, including analog, *ASTRO*, *ASTRO CAI*, Tone Remote Control, DC Remote Control, and WildCard I/O connections. Telephone line connections are easily made to the wireline circuitry via connectors on the rear of the station.

Switching Power Supply

The *Quantar* station features a switching–type power supply which accepts a wide range of ac inputs (90–280 V ac, 47–63 Hz) and generates the necessary dc operating voltages for the station modules. The power supply continually monitors and adjusts the output voltages, and requires no external adjustments or calibration.

Summary of Operating Features

Standard Features

The following are a few of the standard *Quantar* features:

- Compact, single cage design
- Extensive Self-Test Diagnostics and Alarm Reporting
- FRU maintenance philosophy (reduces down time)
- Easily programmed via Radio Service Software
- Local or Remote Software downloading to FLASH memory
- Expansion and upgrades performed by module replacement and/or software upgrade
- Highly reliable and accurate continuous duty transmitter circuitry
- Operates as *IntelliRepeater* trunking station
- Compatible (with appropriate options) with analog, *ASTRO* and *ASTRO CAI* digital signaling
- Versatile and reliable switching–type power supply
- Wide operating temperature range: –30° C to +60° C (–22° F to +140° F)

Optional Hardware Features

The following are a few of the *Quantar* station optional hardware features:

- **Battery Revert** — charges co-located storage batteries and automatically reverts to battery backup operation in the event of ac power failure
- **Triple Circulator Option** — provides additional isolation and intermodulation protection for rf-congested transmitter sites
- **Duplexer Option** — allows a single antenna to serve for both transmitter and receiver circuitry in repeater applications
- **Antenna Relay Option** — allows a single antenna to be switched between transmitter and receiver circuitry for base station applications
- **UHSO Option** — ultra–high stability oscillator provides improved station frequency accuracy required for some system types
- ***ASTRO* Modem** — allows connection (for *ASTRO* digital signaling) to a console through a Digital Interface Unit (DIU) in an *ASTRO* system
- **Station Access Module (SAM)** — allows station to decode MDC Repeater Access (e.g., Select5, DTMF, etc.)
- **Wide Space Receiver** — provides 8 MHz receiver bandwidth for VHF and UHF stations

Multiple System Capability

In addition to conventional capabilities, the *Quantar* station can be programmed to operate in 6809 Trunking and *IntelliRepeater* Trunking systems.

6809 Trunking

When programmed for 6809 Trunking capability, the station can operate in a *SMARTNET* trunking system under control of a 6809 Trunking Controller.

IntelliRepeater *Trunking*

When programmed for *IntelliRepeater* capability, the *Quantar* station can operate in Motorola's most advanced wide-area trunking systems — *SMARTZONE*. The station can operate both as a remote voice channel and, if necessary, perform all call processing and channel assignment tasks normally requiring a trunking controller.

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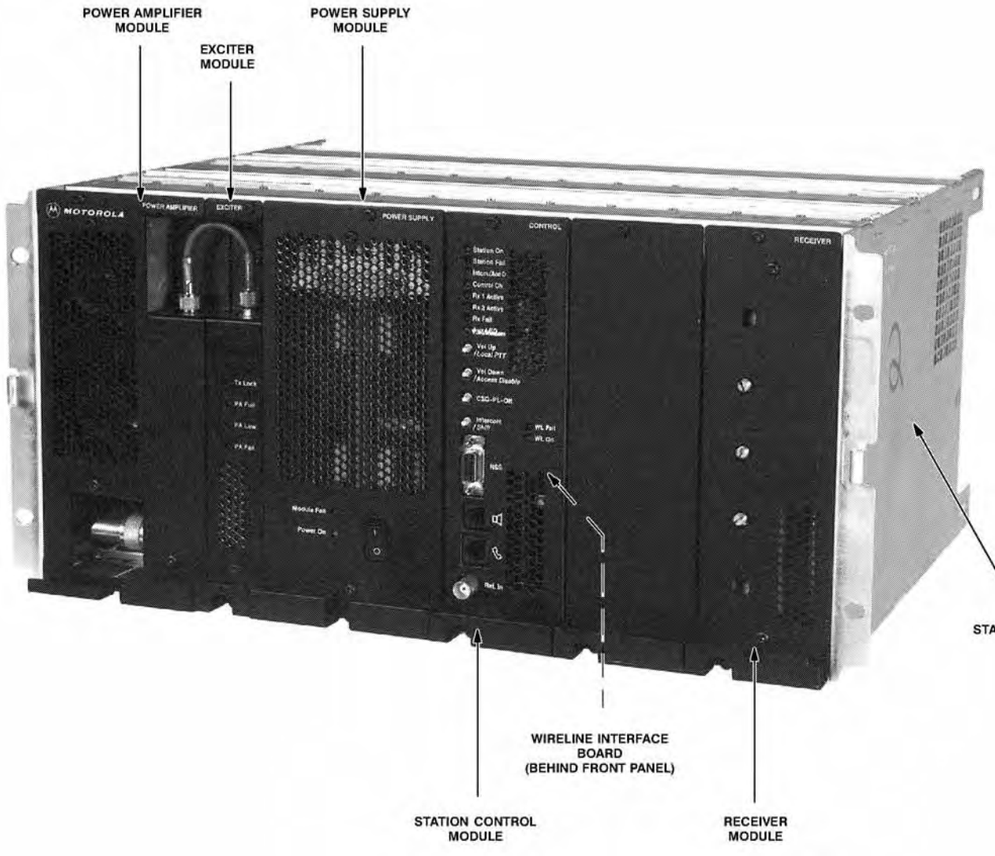
2 STATION COMPONENTS

Figure 2 shows the *Quantar* station modules and components (UHF shown).

FRONT VIEW



REAR VIEW

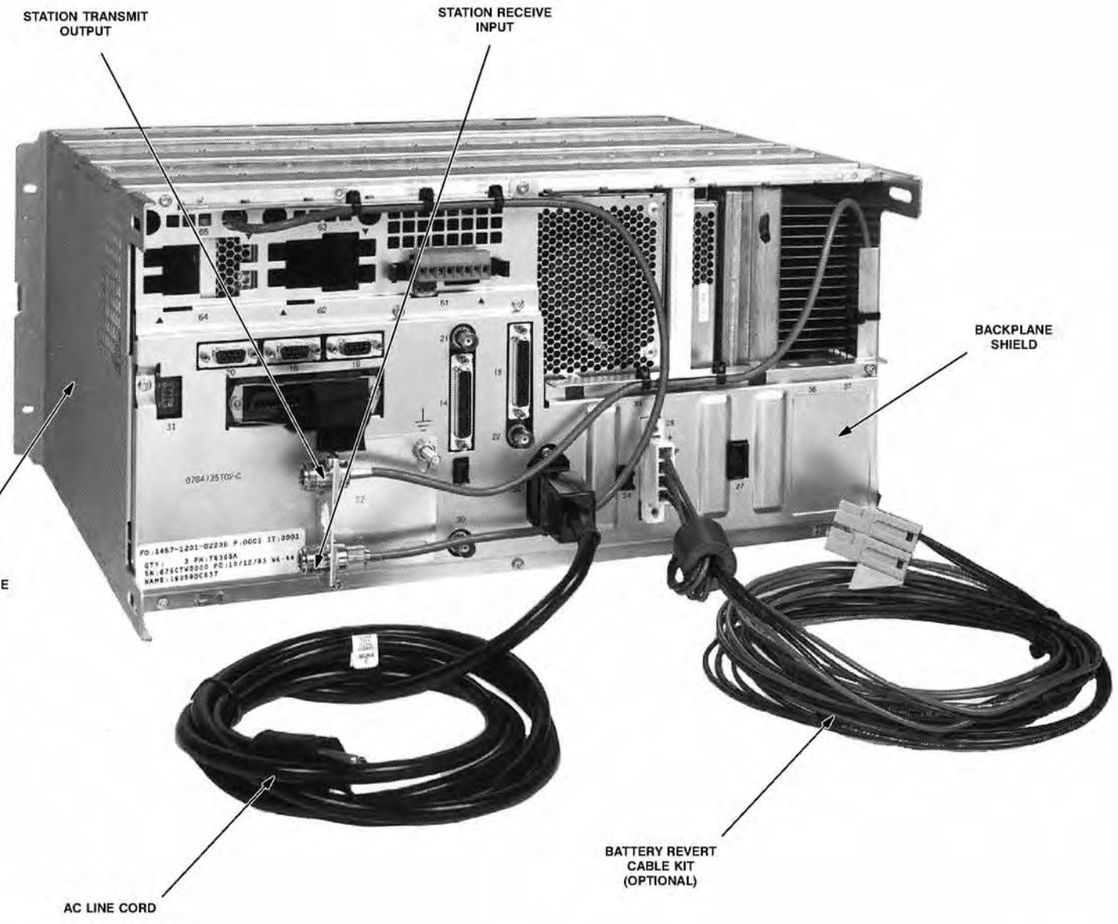


Figure 2. *Quantar* Station Components (Front and Rear Views; UHF Shown)

3 FUNCTIONAL THEORY OF OPERATION

The following functional theory of operation provides an overview of the station circuitry. For a more thorough functional description of a particular module, refer to the functional sections located behind the tab **STATION MODULES**. Refer to the block diagram in Figure 3 for the following functional theory of operation.

Transmitter Circuitry Operation

Introduction

The Transmitter Circuitry is comprised of the Exciter Module and the Power Amplifier (PA) Module. These modules combine to produce the modulated, amplified rf signal which is transmitted via the site transmit antenna.

Exciter Module Operation

The Exciter Module is a microprocessor-controlled module which generates a modulated rf signal at the desired transmit frequency and sends this signal to the PA for amplification. The circuitry operates as follows.

The synthesizer/VCO accepts frequency programming data from the Station Control Module (via the SPI bus) and generates an rf carrier signal at the specified frequency. The modulation audio signal (from the SCM) modulates the carrier, resulting in a modulated rf signal at approximately +13 dBm which is fed to the PA.

The TX Power Control Circuitry accepts an output power detect voltage from the PA and compares this signal to a reference voltage representing the desired output power. Based on the comparison, a power control voltage is generated to control the output power from the PA. This feedback and control loop continually monitors the output power and adjusts the control voltage to maintain the proper output power from the PA.

Power Amplifier Module Operation

The modulated rf signal from the Exciter Module is input to the Intermediate Power Amplifier (IPA) in the PA. After amplification to approximately 0–10 W (depending on power control voltage from Exciter Module), the signal is fed to a Driver or a Final module (depending on station's maximum output power). The gain of the IPA stage is controlled by the power control voltage from the Exciter Module.

The modulated rf signal is amplified by the Driver and/or Final and is output to the site transmit antenna via a circulator and a harmonic filter/coupler. The coupler consists of a calibrated wattmeter which feeds a dc voltage proportional to the output power to the TX Power Control Circuitry in the Exciter Module to serve as the feedback signal in the power control loop.

Receiver Circuitry Operation

Introduction

The Receiver Circuitry accepts receive rf signals from the site receive antenna, performs filtering and dual conversion, and outputs a digitized receive signal to the Station Control Module.

Receiver Module Operation

The receive signal is input from the site receive antenna to a multi-pole preselector filter which provides highly selective bandpass filtering. The filtered signal is then amplified and fed to the rf input of the 1st mixer, which mixes the signal with an injection signal generated by the synthesizer/VCO, resulting in a 21.45 MHz (VHF) or a 73.35 MHz (UHF, 800, 900) 1st i–f (intermediate frequency) signal. (The injection signal frequency is determined by frequency programming data from the Station Control Module via the SPI bus.)

The 21.45 MHz or 73.35 MHz 1st i–f signal is filtered and input to a custom receiver IC. This component contains circuitry for 2nd injection and mixing, amplification, and A/D (analog to digital) conversion, resulting in a digitized receive signal. This signal is fed as differential data to the Station Control Module.

Station Control Module Operation

Introduction

The Station Control Module (SCM) is the microprocessor–based controller for the station. Major components include an MC68360 microprocessor, a 56002 Digital Signal Processor (DSP), and two ASIC devices (host and DSP). The SCM operates as follows.

Station Control Module Operation

The Host Microprocessor (μP) serves as the controller for the SCM, operating from the station software stored in FLASH memory. This software determines the system capabilities of the station (analog, *ASTRO*, etc.) The Host μP communicates with the station modules and the SCM circuitry via address and data buses, an HDLC bus, and a SPI bus. External communications ports include a serial port SCM front panel and backplane) and an Ethernet port (backplane).

The DSP and DSP ASIC perform the necessary digital processing for the station audio and data signals. The DSP circuitry interfaces with the Receiver Module (receive audio), the Exciter Module (modulation signal), the Wireline Interface Board (wireline audio), and external audio devices (microphone, handset, external speaker, and station local speaker).

The 2.1 MHz Reference Oscillator generates the reference signal used by the Receiver and Exciter Modules.

Wireline Interface Board Operation

Introduction

The Wireline Interface Board (WIB) serves as the interface between the customer telephone lines and the station. In general, the WIB processes and routes all wireline audio signals between the station and the landline equipment (such as consoles, modems, etc.). Landline-to-station and station-to-landline audio signals are connected to the WIB via copper pairs at the rear of the station.

Wireline Interface Board Operation

Note: *The WIB is offered in 4–wire and 8–wire models. The WIB shown in the block diagram is a simplified 4–wire model. Refer to the functional sections located behind tab WIRELINE CIRCUITRY for details on both models.*

The WIB contains a microprocessor, two FLASH memory ICs (which contain the WIB operating software downloaded by the SCM), and an ASIC device to process and route the various audio signals. Analog and *ASTRO* signals are processed as follows.

- Analog signals are converted to digital signals and routed to the SCM via the TDM (time division multiplex) bus.
- *ASTRO* and *ASTRO CAI* data signals are processed by an *ASTRO* modem card (daughter board plugged into the WIB) and sent to/from the SCM via the HDLC bus. (The station operates in *transparent* mode only, and **does not** perform encryption or decryption of the *ASTRO* or *ASTRO CAI* signal.)

The WIB also contains the I/O circuitry used with the WildCard Option. Refer to the *Quantar/Quantro* RSS User's Guide (68P81085E35) for more information on the WildCard Option.

Power Supply Module Operation

The Power Supply Module is a switching–type power supply which accepts an ac input (90–280 V ac, 47–63 Hz) and generates the necessary dc operating voltages for the station modules. Stations rated at 20/25 W output power are equipped with Power Supply Modules which generate +5 and +14.2 V dc. Stations rated at 100/110/125 W output power are equipped with Power Supply Modules which generate +5, +14.2 V, and +28 V dc.

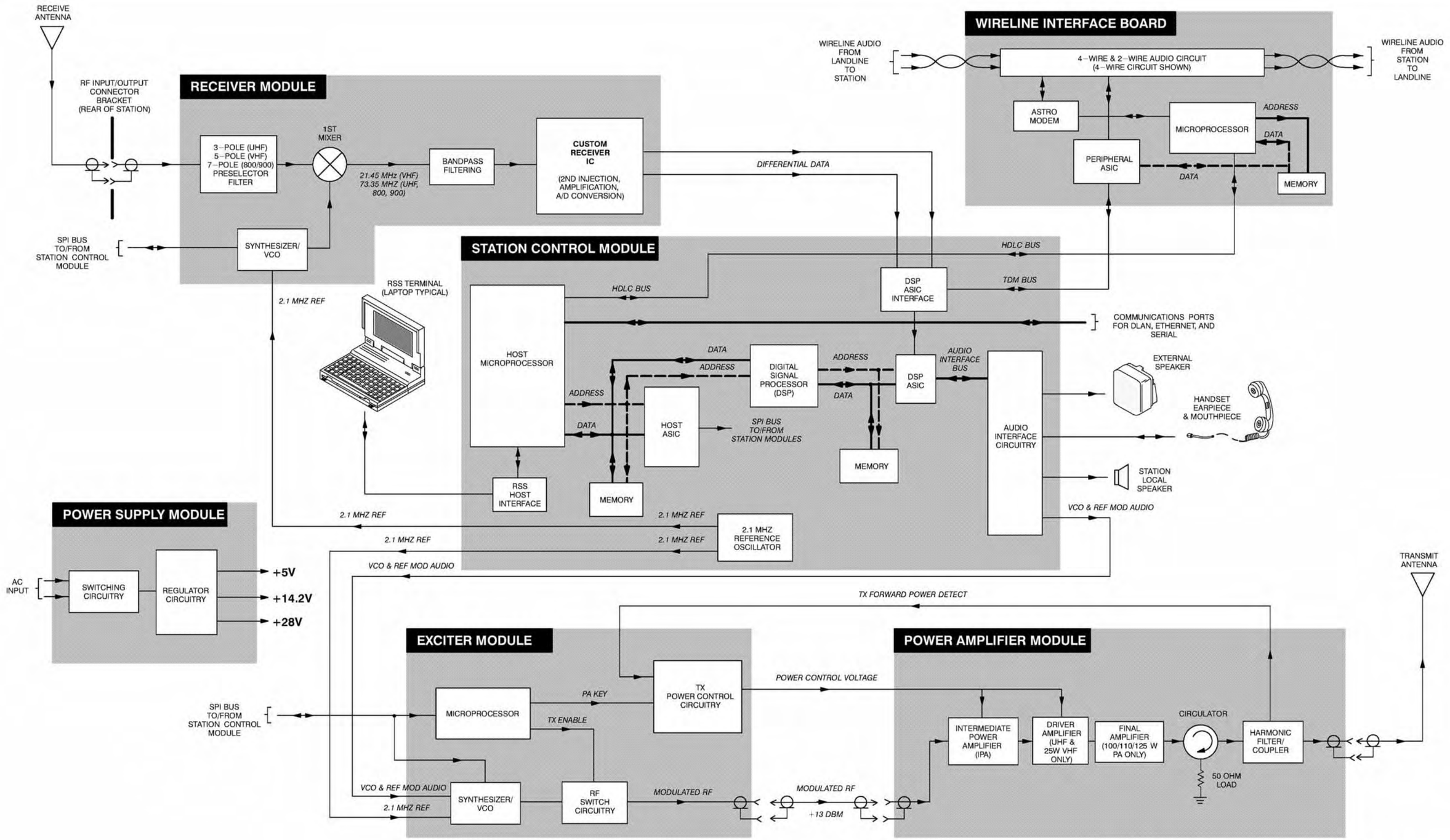


Figure 3. *Quantar* Station Functional Block Diagram

END OF PART 2