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Official Radio Communications Sponsor for the 1984 Olympic Games

"MSF 5000" BASE STATION AND REPEATER

Maximum Station Flexibility


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Leadership from Motorola

For more than 50 years, Motorola has been noted for its ability to apply state-of-the-art technology to FM two-way radio. For the 1980's and beyond, Motorola continues the tradition of leadership with the microprocessor based MSF 5000, a new generation of UHF base stations and repeaters, offering:

- **Maximum system flexibility**
- **Superior electrical performance**
- **Quality and reliability**
- **Improved serviceability**

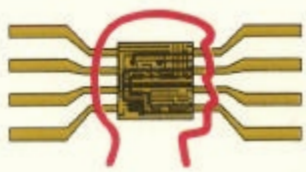
The MSF 5000's superior design allows for built-in duplex filtering and circulators for both base stations and repeaters. There is no degradation of receiver specifications or increase in station size with these built-in peripherals; an industry first.

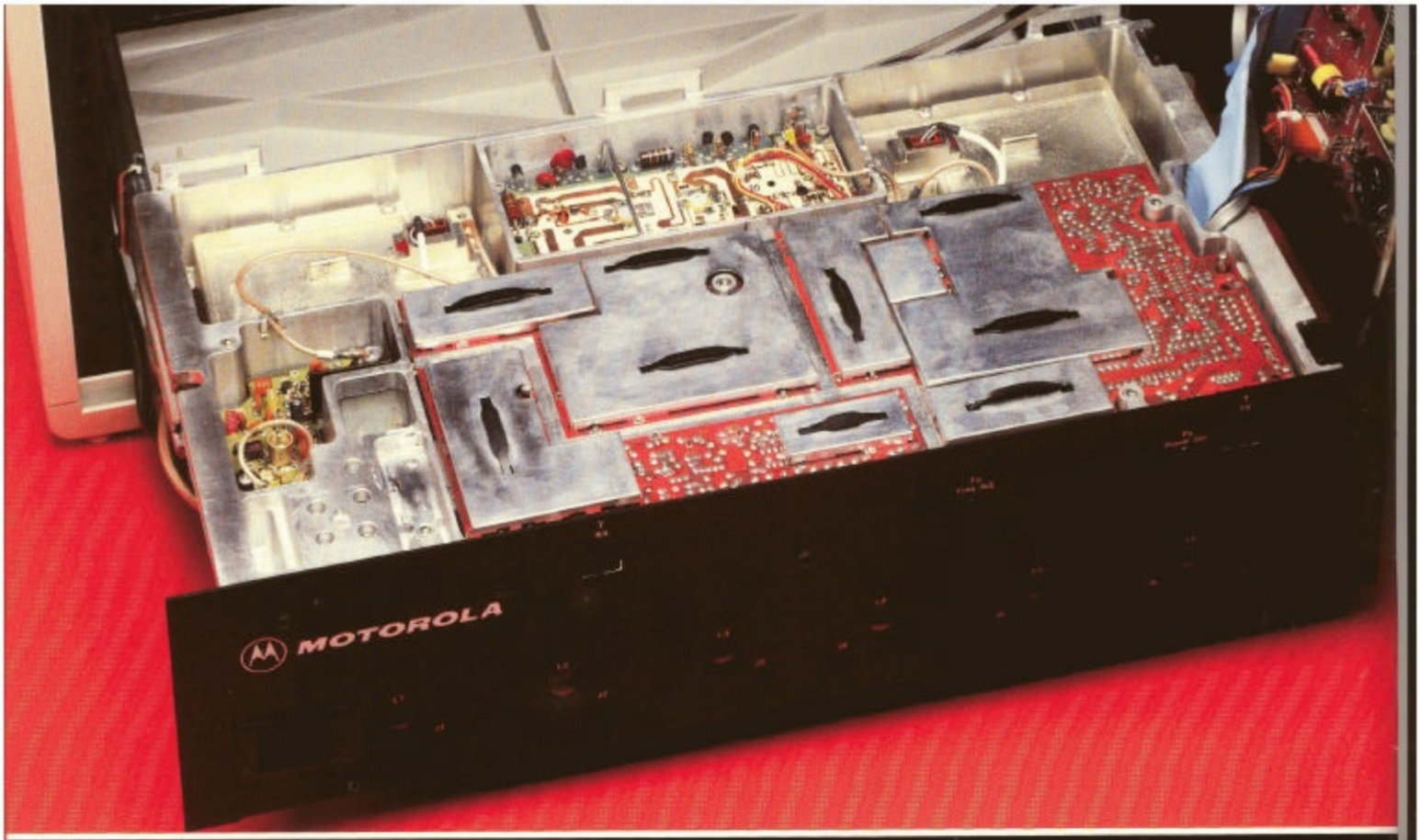
Representing the ultimate in system flexibility, the MSF 5000 base station and repeater meets your needs at the time of installation. Through the use of an EPROM (Erasable Programmable Read Only Memory) code plug, the "personality" of the station comes alive, with station characteristics such as the transmit and receive frequencies, PL/DPL coded squelch, auto station ID and the control configuration. If your needs change or grow, the personality of the station can be changed in the field within hours.

The station was designed to last longer with significant improvements made in both quality and reliability. To help increase the lifetime of station components, a new power amplifier was developed to improve heat dissipation. To further ensure a 'cooler' station, side louvers are a part of Motorola's new convection cooling system.

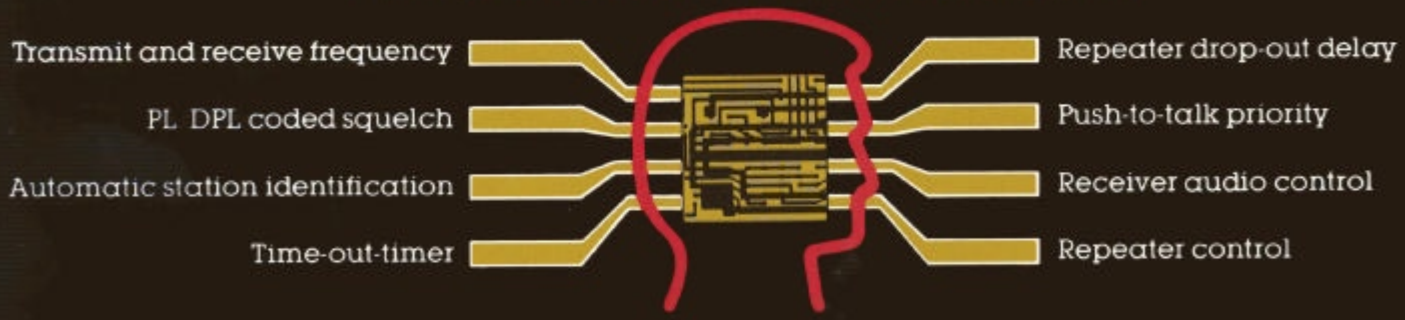
With the advent of remote diagnostic capability a station problem can be diagnosed before going to the site. At the site, this "service friendly" station further isolates the problem with built-in LEDs on the front panel of the station. This means less down time and lower service costs.

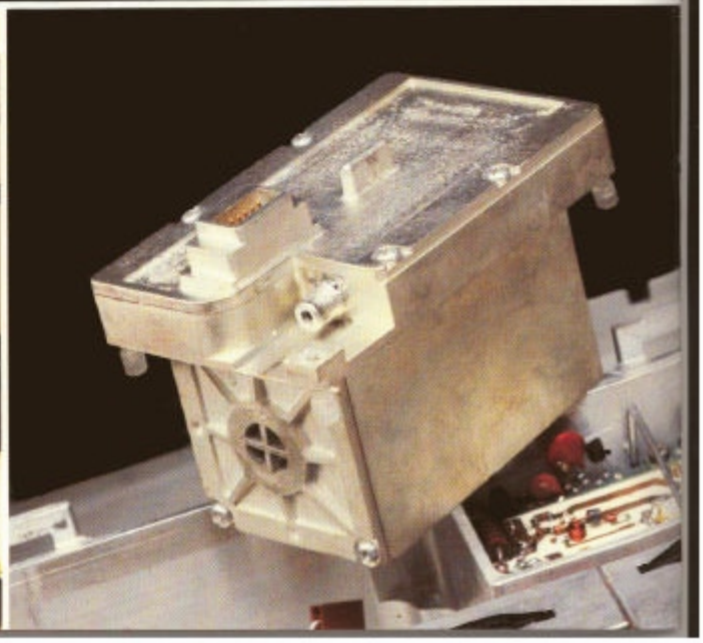
All these features and more add up to the MSF 5000 base station and repeater, unique to the industry and a prudent investment for the future.





Microprocessor controlled communication channel





Microprocessor based control for Maximum System Flexibility

Communication channel

Added systems capability is provided by the microprocessor which 'CONTROLS' all major radio functions on A PER CHANNEL BASIS. This includes:

- Transmit and receive frequency
- PL/DPL coded squelch
- Automatic station identification
- Time-out-timer
- Repeater drop-out delay
- Push-to-talk priority
- Receiver audio control
- Repeater control

Any or all of the above functions can be varied on a per channel basis. Each channel now becomes a communication channel with its own unique programming. Through the use of an EPROM the personality of each communication channel comes alive enabling the station to perform these standard functions. Should your communications needs change or grow, the functions for each specified channel can be reprogrammed in the field, on the existing EPROM, using Motorola R-1801 Digital Analyzer/Controller. System flexibility is greatly increased while system cost is decreased.

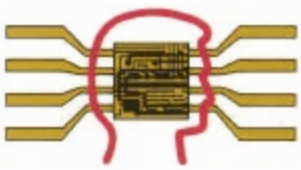
Direct carrier synthesized

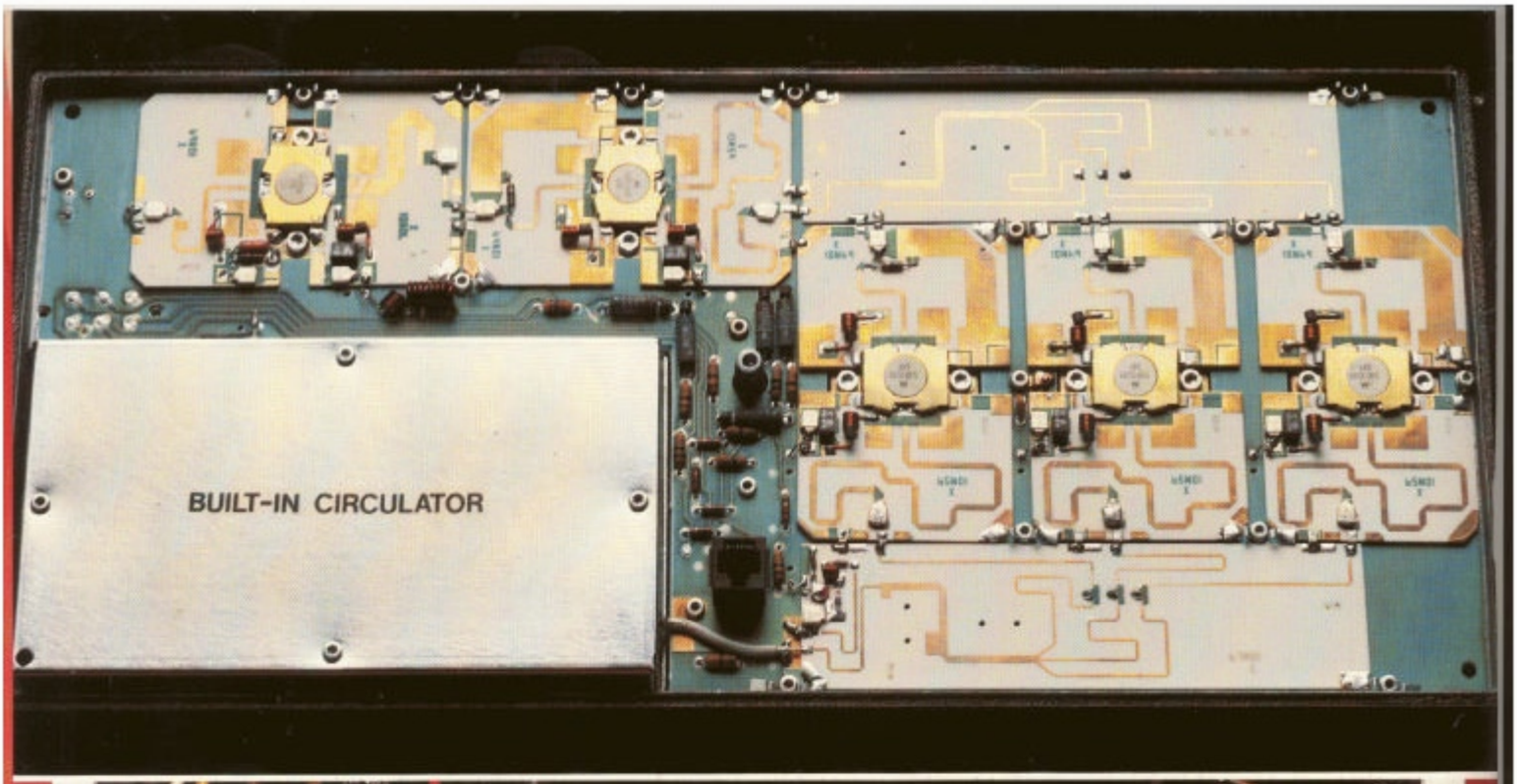
Motorola's front running microprocessor control system manages the high performance transmit and receive synthesizers. The heart of these synthesizers are the Voltage Controlled Oscillators (VCO's). Designed on Motorola's Computer Aided Design equipment, the VCO allows direct synthesis of the 450 MHz carrier and therefore assures the cleanest possible signal.

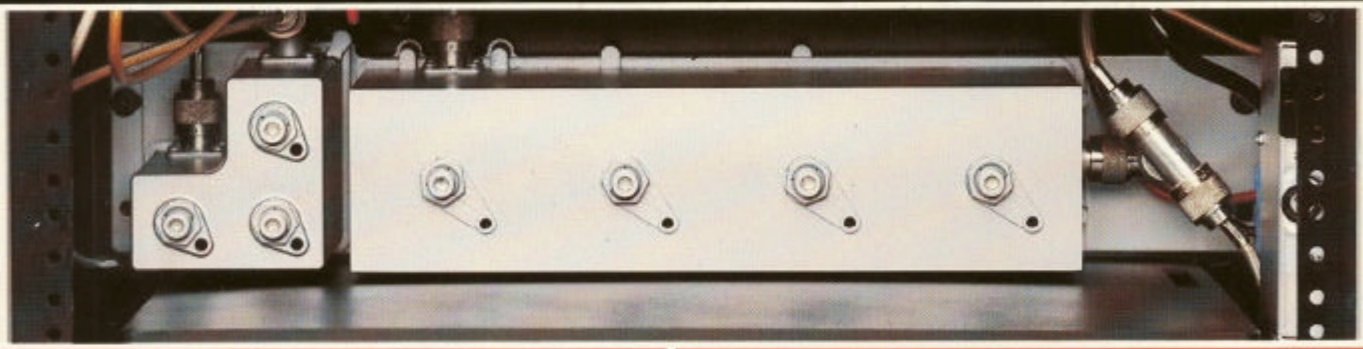
Overall, the VCO design provides for significant improvements in performance specifications for transmitter side band noise and receiver desensitization, at all channels, even the adjacent channel. Furthermore, Motorola's unique VCO design provides the following additional improvements:

- Transmit and receive tuning range of 40 MHz with no sub bands
- Transmit operating bandwidth of 6.1 MHz
- Receive operating bandwidth of 2.0 MHz

No retuning or realignment is necessary within the specified operational bandwidth. Also, the separate transmit and receive synthesizers provide fast key ups for data applications. In addition, the synthesizers are controlled by one reference oscillator for maximum system flexibility.




BUILT-IN CIRCULATOR

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Advanced design providing superior electrical performance and reliability

Power amplifier—Designed to improve component lifetime

Heat is the major enemy of component life. To combat this, the advanced power amplifier features a unique thermal design of the hybrid power block modules and the heat sink, providing dramatic improvements in reliability. Additionally, the modular hybrid design requires no tuning, and features improved serviceability with fewer connections and only two unique power block modules.

Duplex filtering and circulators—Designed to improve system performance

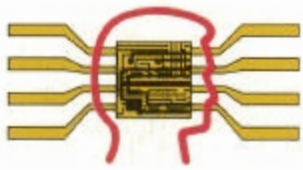
New standards in radio performance are provided by the state-of-the-art duplex filters and circulators. Designed to be built-in and factory pretuned, they eliminate the need for large and costly external peripherals that can degrade system performance. The single stage circulator ships standard with the station while the duplex filtering and two additional circulators can be added optionally. AND for the first time ever, there is no degradation of receiver specifications with these built-in peripherals. Whether on a congested site or a remote location this station will meet your needs!

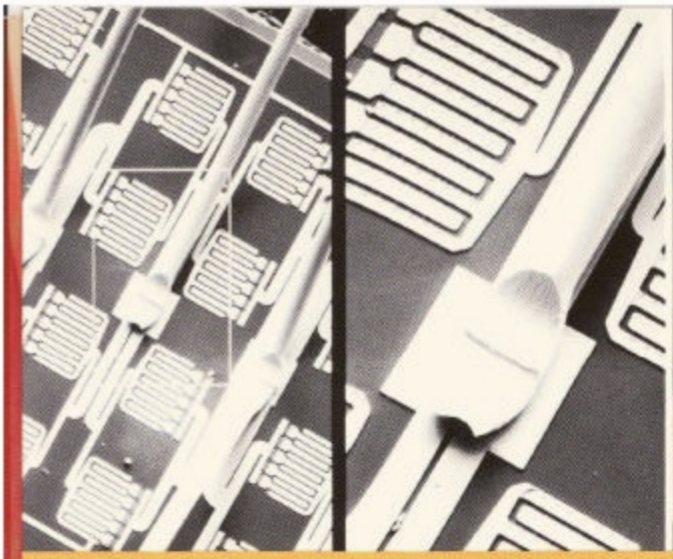
Convection cooling—Designed to improve total station reliability

To further ensure a 'cool' running station, air is drawn in through front louvers and heat generated by the station escapes through side louvers with Motorola's new convection cooling system. This creative new cooling system provides the same cooling effect to units stacked above as well as below. This innovative design feature ensures the highest degree of reliability and long term performance for the MSF 5000.

Power supply—Engineered for optimum reliability

The Motorola reliability story continues with the 13.8 VDC ferro-resonant supply which features fewer components (there are only eight [8] major electrical components) and no hand solder connections. It is tolerant to line voltage variations and provides improved transient protection against line surges and lightning. Later conversion to battery charging can be accomplished with the SIMPLE field addition of a battery charger and emergency revert board. Designed with your safety in mind, the MSF 5000 power supply meets the safety requirements of the Canadian Standards Association.





Magnification of a component on Motorola's Scanning Electron Microscope

SEM equipment is used during Motorola's stringent component qualification process

High speed, computer controlled auto insertion of printed circuit boards

Computerized board testing of the RF circuit board

Computerized environmental test program

Final system testing to ensure operational performance

Designed and manufactured for quality and reliability

Design phase

During the design phase, Motorola development engineers utilized rigorous Accelerated Life Testing (ALT) to simulate years of field stress including temperature, humidity, line voltage, duty cycle and transient EXTREMES. Potential field problems were IDENTIFIED AND CORRECTED prior to initial production runs.

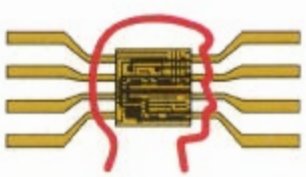
As an added quality measure, suppliers are required to burn-in all the integrated circuits for Motorola production radios. Additionally, component qualification is performed on parts purchased by Motorola using such sophisticated equipment as a Scanning Electron Microscope, a thermal micro-imager, and an X-ray analysis.

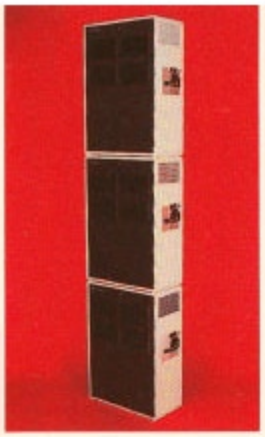
Production phase

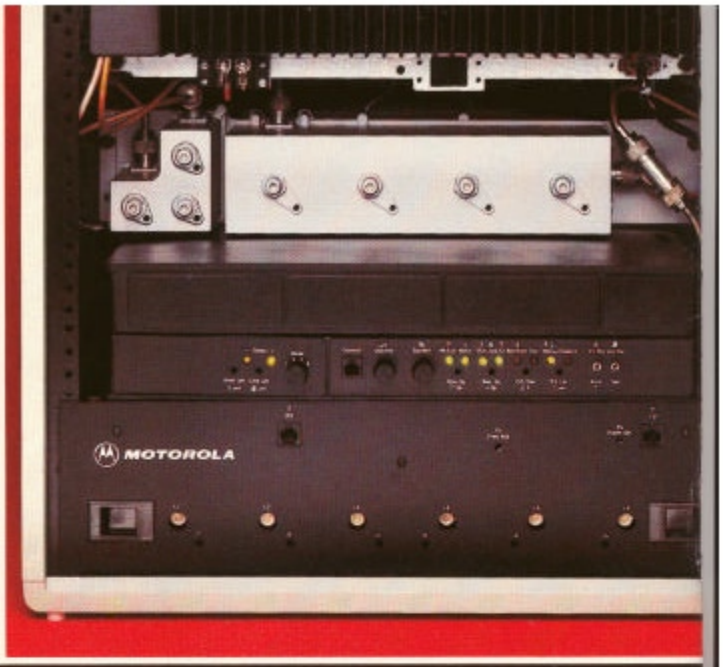
New and advanced testing and assembly techniques are used to ensure the highest quality and reliability levels possible. Motorola's printed circuit boards are inserted using high speed, computer-controlled automatic insertion equipment. After automatic computer programmed insertion, the tolerance, value, and polarity of components on each board is computer checked. In addition, the duplex filtering is automatically factory pretuned with Motorola's auto-tune system. With this system the filters are tuned faster and more accurately which means you will have a more optimally adjusted radio.

Automatic testing

Following final assembly and tuning, the base stations are placed in environmental chambers, where they are temperature cycled and tested at -30° C to +60° C for eight hours. Before the station is shipped, it undergoes a final System Test where operational performance is again verified. Customer satisfaction is our objective, and this battery of tests and new manufacturing processes vividly demonstrate Motorola's commitment to quality and reliability.



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Serviceability—Introducing new, remote diagnostic capability

Easier installation

Ease of installation and servicing were key design factors for the MSF 5000. The front access feature allows station installation against a wall or back to back. (A lateral distance of only six inches must be maintained between stations for cooling and external cabling.) In addition, stations can be stacked three high. These features translate to increased utilization of site space and reduced site costs. Finally ALL terminations (including the internationally accepted AC interconnection) are made on the convenient side mounted junction box, reducing installation costs by eliminating cabinet knockouts and drilling.

Unique mechanical design

The MSF 5000's innovative mechanical design provides for easy access to the major components of the radio including the power amplifier, power supply, RF tray, and control tray. Servicing and adjustments are now made QUICKLY and EASILY; this will reduce down time and related costs.

Self testing

The station automatically performs a 'Self Test' on the microprocessor and the major circuit elements associated with it when the station is powered up or when the test switch is activated on the control panel. The 'test' LED (light emitting diode) will flash in a predetermined sequence to indicate that a particular condition exists.

Built-in diagnostic indicators

A new level of up-front diagnostic capability is provided with additional LEDs on the control panel. These LEDs provide a visual indication of the following station conditions:

- PA activated
- PA delivering full power
- Control signal to key the transmitter
- Transmit synthesizer locked
- Receiver synthesizer locked
- Station in the service mode
- Battery revert

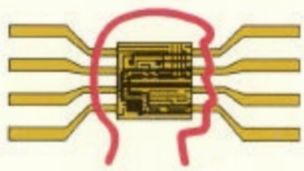
Additionally, the DC and tone remote control boards contain front panel LEDs which indicate signalling current or tone activity respectively.

Remote diagnostics

To further assist in keeping the cost of service down, Motorola has developed new, remote diagnostic aids. The first, 'Alarm Reporting' is capable of sensing four internal alarm conditions including:

- PA failure or power reduction
- Synthesizer unlocked
- Battery revert operation, and
- Battery over voltage condition

The station reports these conditions to the dispatcher over the wireline and/or on-the-air via a predetermined number of alert tones. The second, an optional wild card allows up to four external alarms to be sensed at the site (door open, water on the floor, etc.) and sent over the wireline and/or on-the-air. The third, 'Phone Line Integrity Test' is available with tone remote control models. Now, one service person can measure phone line loss by depressing a button at the console. The station will respond by applying a fixed level tone which is sent back to the remote console. Unnecessary site trips are virtually eliminated.



Motorola's new, interactive diagnostic metering panel— The ultimate service tool

Diagnostic metering panel

Motorola is proud to announce an interactive Diagnostic Metering Panel (DMP). It is divided into three main sections: audio amplifier/speaker, analog meter for radio test and alignment, and a status display for control signals. Local monitoring of the receiver audio and intercom are provided by an integral five watt audio amplifier and loudspeaker.

The analog meter can be connected to either the receiver, the transmitter power control loop, or the transmitter power amplifier, by means of a standard telephone type modular connector. When metering the PA, now for the first time ever, the average current of EACH individual output transistor can be measured. With the addition of external voltage probes the analog meter can also serve as a general purpose DC voltmeter.

The status display provides an array of LEDs for simultaneously monitoring all sixty-four logical control signals within the station. After selecting the particular channel required, the service person can manually activate any one of the logic signals to simulate desired conditions for test purposes. The Diagnostic Metering Panel is another quality product from Motorola, the leader in FM two-way radio.

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Support Services

Wherever Motorola sells, our product is backed by service. In the U.S., we have 900 authorized or company-owned centers. In addition, our products are serviced throughout the world by a wide network of company or authorized independent distributor service organizations.

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Communications and Electronics Inc.

A Subsidiary of Motorola, Inc.
1301 East Algonquin Rd., Schaumburg, Illinois 60196
(312) 397-1000

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