

# DESCRIPTION

136-174 MHz "MICOR"

UPRIGHT BASE AND

REPEATER (RT) STATIONS

## 1. ELECTRICAL FEATURES

1.1 The Motorola "Micor" upright base station and repeater (RT) stations are FM two-way radios. Each station is fully solid-state (except for the final amplifier chassis) incorporating integrated circuits. All the advantages of solid-state and integrated circuit technology are utilized:

Reliability -- Components have long life and require less maintenance.

Low current drain -- Little power is consumed except when expending usable power such as receiving audio or transmitting rf signals. High efficiency means less power is consumed during these conditions.

Less heat -- A minimum of filament heating is required, thus the radio operates cooler.

Total regulation -- These stations utilize a single constant voltage (ferro-resonant) transformer to supply all station operating voltages. This feature provides a constant power output level with up to a  $\pm 20\%$  variation of the ac line input voltage.

1.2 All stations require 60 Hz, 120-volt ac power (50 Hz, 120 V/240 volt optional) and operate in the 136-174 MHz frequency range. Models are available for one-, two- or four-frequency operation, and with transmitter power outputs of 250 and 375 watts. In all models, the receiver provides 10 watts of audio at less than 5% distortion into an 8-ohm load.

1.3 Unheated, temperature compensated, plug-in, oscillator modules (channel elements) are used for frequency control. Blowers and their related maintenance problems are eliminated by the use of heat sinks in the transmitter amplifier stages. The transmitters are continuous duty and can operate at full rated power indefinitely.

## 2. MECHANICAL & SERVICING FEATURES

-- Excellent Access - Virtually all components are mounted on circuit boards which are easily removed and replaced without unsoldering leads. The exciter/driver, receiver, remote control unit, high power amplifier, metering chassis, meter panel, and power supply are on individual "shelves".

-- Few Wires - Broken and loose wire connections are greatly reduced as a source of trouble. A single 50-conductor "flat cable" interconnects the exciter/driver, receiver, and remote control unit.

-- Modular Construction - Circuit boards can be removed and replaced in seconds. Spare circuit boards may be carried by a technician and defective boards replaced to quickly return stations to service.

-- Integrated Circuits - Fewer components and more reliable components mean less servicing.

-- Built-in Metering - Meters and selector switches permit monitoring of all important



**MOTOROLA INC.**

ENGINEERING PUBLICATIONS

1301 E. ALGONQUIN ROAD

**Communications Division**

SCHAUMBURG, ILLINOIS 60172

station functions by merely rotating selector switches. A main selector switch determines the chassis to be monitored: RCVR1, RCVR2, EXCITER, or PA; and chassis mounted selector switches determine the specific circuit of the selected chassis to be monitored on the TUNING meter. Separate meters are provided to continuously monitor PA plate voltages and plate current. A slide switch is provided to disable the in-cabinet speaker (mounted on the meter panel). A second slide switch permits INTER-COM or NORMAL operation using a test microphone connected to the meter panel.

#### NOTE

Test microphone is not supplied with the station.

--Alignment - All receiver and exciter/driver alignment is performed from the front of the station. Crystal filters in the receiver i-f section eliminate most i-f alignment adjustments.

### 3. APPLICATIONS

Refer to APPLICATIONS AND CONTROL manual 58P81025E60, which accompanies this manual for applications data.

### 4. "PRIVATE-LINE" OPERATION

This type of station is an improvement in FM two-way radio equipment especially when operating under crowded channel conditions. Several "Private-Line" systems can use the same rf carrier frequency in the same area if each system uses a different "Private-Line" code.

The transmitters are modulated by a continuous code signal in addition to the voice modulation. The receivers accept only correctly code-modulated signals and reject all others.

"Private-Line" coded squelch models also include noise-actuated squelch circuitry. This enables the operator to monitor the channel before transmissions ("PL" disable) and prevent interference with other users of the frequency.

The SQUELCH control has no effect on "PL" squelch sensitivity. In normal operation ("PL" ON), the receiver audio is activated when the on-frequency rf signal is FM modulated with the proper "PL" code to activate the "Private-Line" decoder.

Either one of two types of "Private-Line" coded squelch may be used; tone-coded or binary-coded. In "Private-Line" tone-coded squelch systems, 67-210 Hz tones are transmitted and then detected to unsquelch the audio path in a particular receiver or group of receivers. In "Digital Private-Line" binary-coded squelch systems, a 23-bit binary code word is transmitted continuously and detected to unsquelch the audio path in the receiver(s). Both the tone code and the binary code rate fall below the 300-3000 Hz voice frequency range used in radio communications equipment, therefore, the code signals are not heard by the operator.

### 5. DESCRIPTION OF ITEMS

A block diagram of the station is provided in this section of the instruction manual. The block diagram shows how the items which comprise the transmitter and the receiver are functionally interconnected. Refer to the block diagram while reading the following descriptions.

#### 5.1 TRANSMITTER

The transmitter generates a frequency modulated rf carrier signal of 250 or 375 watts depending upon the model. The transmitter consists of the following items:

--Channel Element - An unheated, temperature-compensated crystal oscillator plug-in module (channel element) provides a stable fundamental rf frequency for the transmitter. One channel element is used for each transmitter frequency. One-, two-, and four-frequency stations are available as standard remote models.

--Exciter - The exciter provides the low power excitation signal for the driver amplifier. An "IDC" (Instantaneous Deviation Control) circuit amplifies and limits audio signals from the microphone (or line) to prevent over deviation. Amplified audio is applied to the channel element to produce direct fm modulation. Multipliers in the exciter multiply the channel element frequency 12 times to generate the carrier frequency signal(s) in the 136-174 MHz band.

--Bandpass Filter - The bandpass filter couples 136-174 MHz signals from the exciter to the driver amplifier and attenuates any harmonics outside this band.

--Driver Amplifier - The driver amplifier provides amplification of the exciter output to provide a level sufficient to drive the high power amplifier. The driver amplifier is completely solid-state and uses Class C amplifiers which are cut-off until signal drive is applied. A controlled amplifier stage regulates the amount of signal drive to prevent over-dissipation in the amplifier stages. The controlled amplifier senses an output from the power control board which regulates the stage gain.

--Harmonic Filter - The low pass harmonic filter passes the 136-174 MHz band carrier signal and attenuates all harmonics from being radiated.

--Power Control Board - The power control board automatically and instantaneously regulates the gain of the driver amplifier board. It maintains a constant output should the source voltage change, and progressively reduces the gain when the chassis temperature increases.

--High Power Amplifier - The high power amplifier increases the output of the driver amplifier to the 250 or 375 watts rated transmitter output power. A tube type, push-pull amplifier is used to produce the high output power.

## 5.2 "MICOR" "SENSITRON" RECEIVER

5.2.1 The receiver accepts rf carrier signals on a specific channel in the 132-174 MHz range and provides voice audio in the 300-3000 Hz range. Refer to the station block diagram for functional operation. The receiver consists of the following items:

--Channel Element - A plug-in crystal oscillator module (channel element) provides stable frequency control for each frequency of operation. One-, two-, and four-frequency stations are available as standard remote models.

--Receiver RF & IF Board - The single-conversion superheterodyne FM receiver includes five rf preselectors (tuned cavities) and two crystal filters for excellent selectivity. Two integrated circuit i-f amplifiers and limiters give high sensitivity. A crystal discriminator demodulates the audio directly from an 11.7 MHz i-f signal. (Some 2-receiver stations may have a "shifted i-f" to 11.8 MHz when required.)

--Audio & Squelch and Audio Power Amplifier Boards - Up to 10 watts of audio

power at less than 5% distortion is provided by this circuit. When no messages are being received, the squelch circuit turns off the audio amplifiers to eliminate annoying noise in the speaker. A squelch tail eliminator circuit prevents the noise burst at the end of a message for strong signals. For weak signals, the circuit is automatically inhibited to prevent loss of portions of messages. The audio power amplifier transistors are mounted on a separate circuit board and aluminum heatsink for good heat dissipation.

5.2.2 With 2-receiver stations, a 2-receiver coupler is used. This unit permits two receivers to operate from the same antenna.

5.2.3 An optional receiver rf preamplifier is also available to improve receiver sensitivity by 6 dB to .25 microvolt. When used with 2-receiver stations, this more than makes up for the half power loss in each "leg" of the 2-receiver coupler.

## 5.3 POWER SUPPLIES

The station uses two solid-state power supplies to provide all the voltages needed for station operation. The power supplies provide regulated outputs with up to a  $\pm 20\%$  variance of ac line input voltage. One power supply provides the high voltages for the vacuum tube high power amplifier and also provides the ac input to the other power supply. The second power supply provides the lower voltages needed for operation of the solid state circuitry and the power amplifier tube filament voltage.

## 5.4 REMOTE CONTROL UNIT

The remote control unit permits remote wireline control of base station and repeater (RT) stations. A complete description of the remote control unit may be found in accompanying APPLICATIONS AND CONTROL manual 68P81025E60.

## 6. ACCESSORIES

In addition to the base or repeater station described in this manual, some additional items are needed to complete the installation as follows:

### 6.1 ANTENNA AND TRANSMISSION LINE

An antenna and transmission line kit is available from Motorola on separate order. The type used should be determined by a qualified

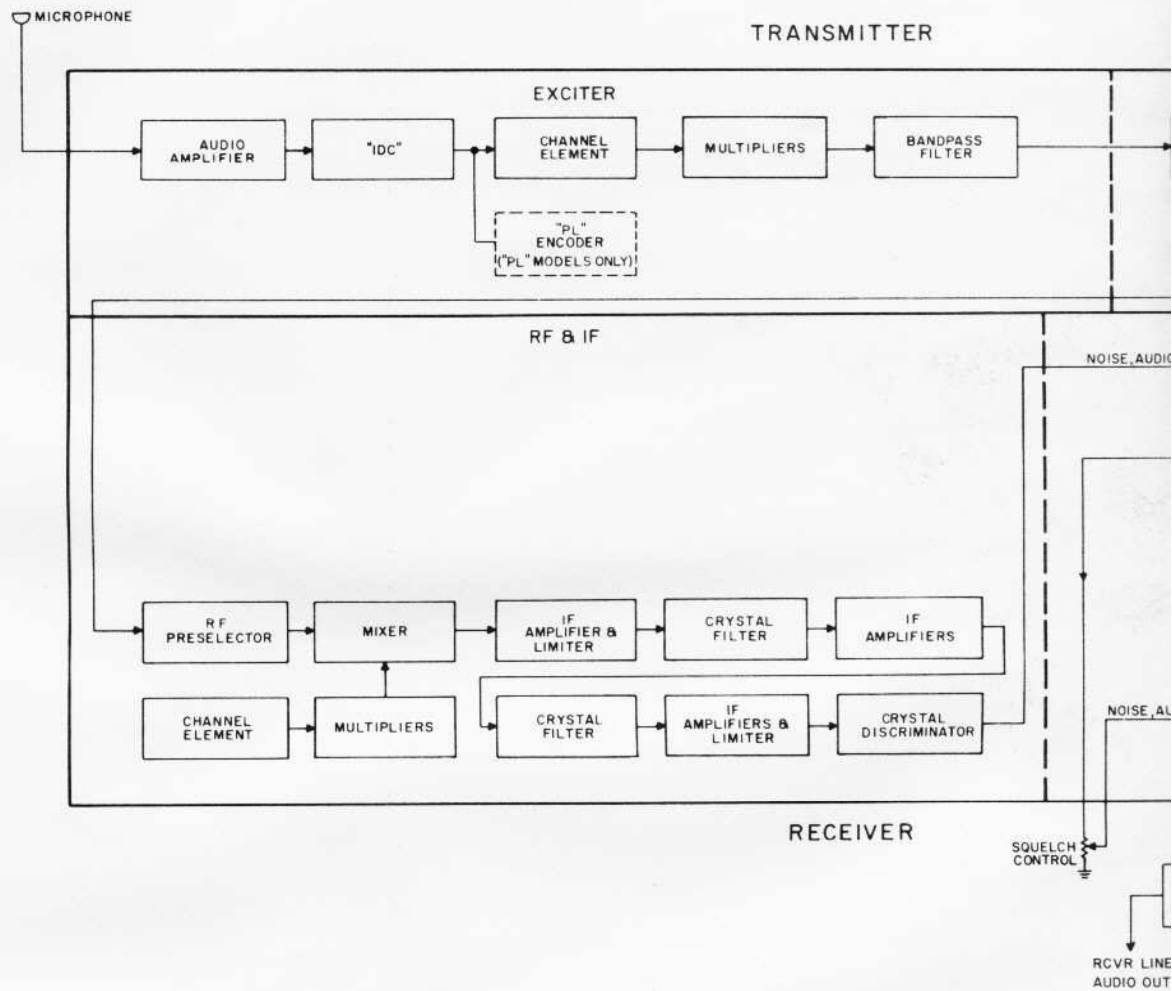
radio communications engineer and will depend upon local operating conditions.

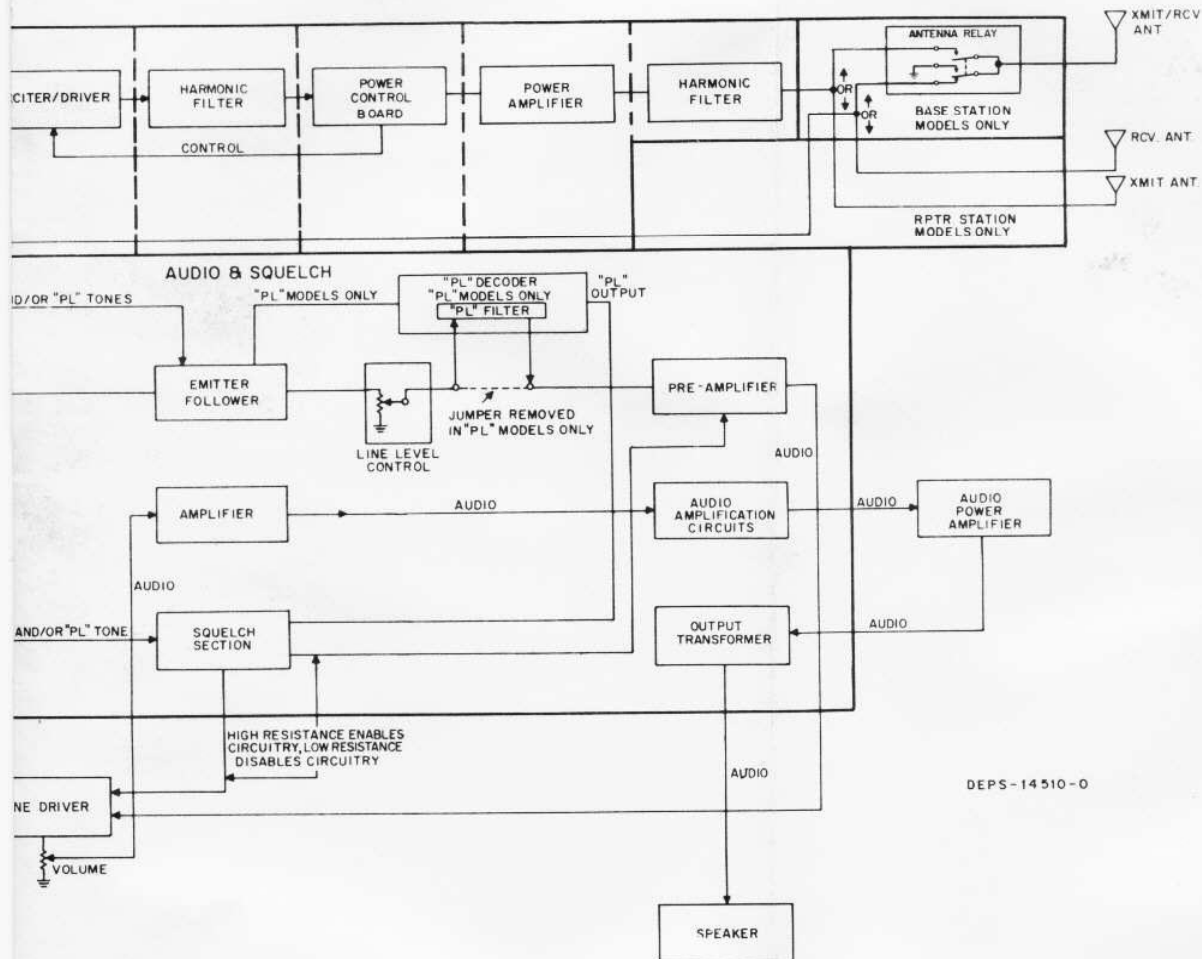
## 6.2 REMOTE CONTROL CONSOLE

A remote control console is required at the control location for this station. It must be compatible with the station; that is, it must supply the audio and control commands of the type that will be accepted by the station.

## 6.3 OPTIONAL ACCESSORIES

Many optional accessories are available as factory installed items in new stations, and as "add-to" items for field installation. Many of those optional accessories are described in this manual. Other accessories may become available after the printing of this manual. Also, other accessories are available which have more special application than those listed herein. See your local Motorola representative for complete details.





Station Block Diagram  
 Motorola No. DEPS-14510-0  
 9/12/75-UP