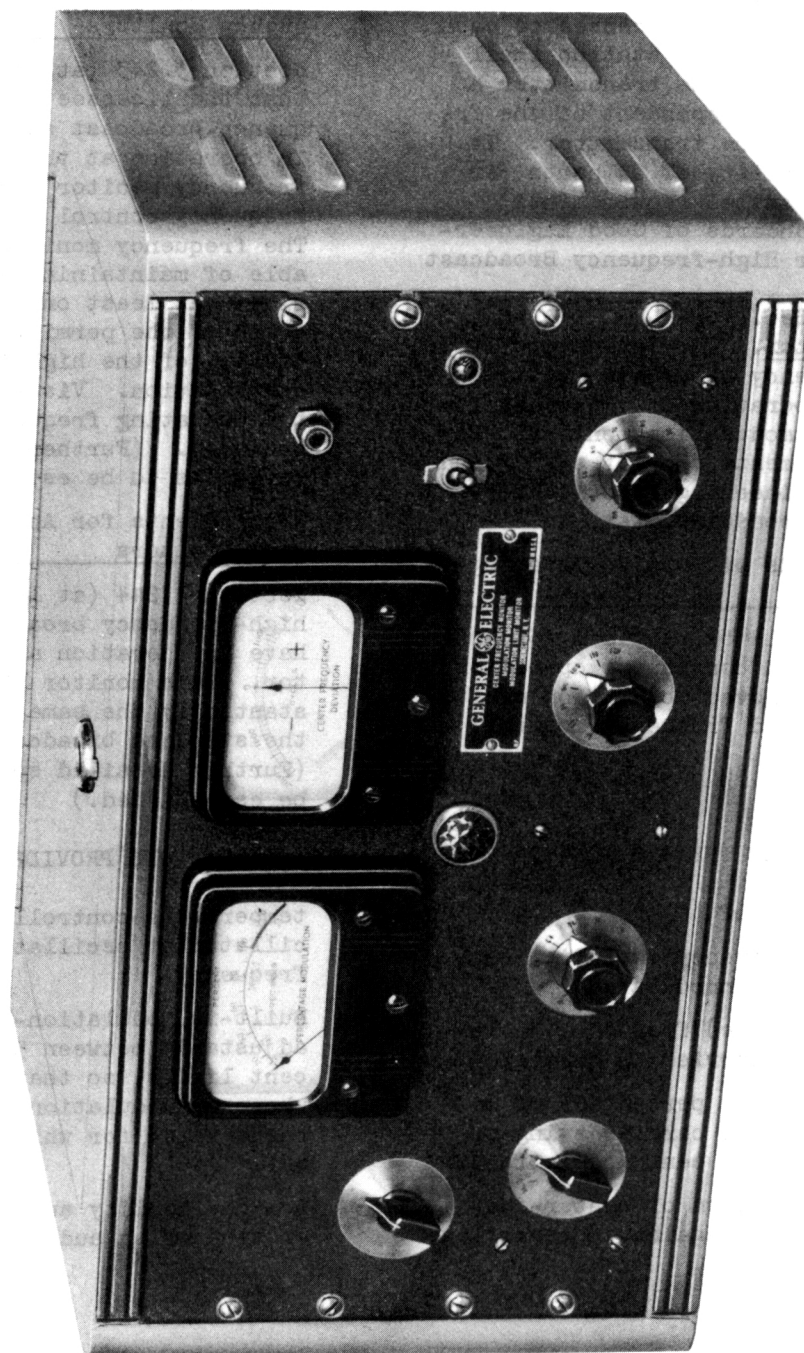




FM STATION MONITOR

GENERAL ELECTRIC FM STATION MONITOR



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FCC REQUIREMENTS REGARDING MONITORS FOR FM BROADCAST STATIONS

Sec. 3.243

Frequency Monitor. The licensee of each high-frequency broadcast station shall have in operation at the transmitter a frequency monitor independent of the frequency control of the transmitter. It shall have a stability of 20 parts per million. For detailed requirements thereof see "Standards of Good Engineering Practice for High-frequency Broadcast Stations."

Sec. 3.244

Modulation Monitor. The licensee of each high-frequency broadcast station shall have in operation at the transmitter an approved modulation monitor. For detailed requirements thereof see "Standards of Good Engineering Practice for High-frequency Broadcast Stations."

From FCC Standards of Good Engineering Practice

7. Means should be provided for connection and continuous operation of the approved modulation monitor and approved frequency monitor.

9. Requirements for Approval of Frequency Monitors

Section 3.243 (at left) requires that the licensee of each high-frequency broadcast station shall have in operation at the transmitter a frequency monitor independent of the frequency control of the transmitter. The frequency monitor shall be capable of maintaining an accuracy within at least one-half (1000 cycles) of the permitted frequency deviation of the high-frequency broadcast station. Visual indication of the operating frequency shall be provided. (Further detailed specifications to be established.)

10. Requirements for Approval of Modulation Monitors

Section 3.244 (at left) requires all high-frequency broadcast stations to have in operation a modulation monitor. This monitor should have substantially the same performance as the standard broadcast monitor. (Further detailed specifications to be established.)

WHAT THE G-E MONITOR FOR FM BROADCAST STATIONS PROVIDES

1. Direct reading of
 - a. Center-frequency deviation when carrier is unmodulated
 - b. Mean (average) frequency deviation when carrier is modulated
2. Direct reading of percentage of modulation (based on carrier swing of $\angle 75$ kc at 100 per cent modulation)
3. Instant calibration of center-frequency indicator against a precision

temperature-controlled crystal oscillator at oscillator fundamental frequency.

4. Built-in modulation-limit flasher, adjustable between 50 and 120 per cent limits, so that lamp flashes whenever modulation percentage exceeds value for which control is set.
5. A high-fidelity audio output for operation of an audio-quality monitor.

GENERAL ELECTRIC FM STATION MONITOR

HOW IT IS BUILT

Mechanical Construction

Front Panel: Nickel-silver with gray enamel finish and etched characters.

Cabinet: Steel, finished in gray wrinkle lacquer; hinged cover with flush-mounted spring latch.

Chassis: Parts mounted on sturdy steel chassis and panel assembly, removable as a unit from the front of the cabinet, and held in place by machine screws accessible from the front of the panel.

Dimensions: Height 10 1/2 in.; width, 21 in.; depth, 13 1/2 in. Chassis assembly can be mounted in standard 19-inch relay rack..

Weight: About 60 lb

Accessibility: All tubes and crystal units easily reached through the top of the cabinet. Removing chassis assembly from cabinet allows complete access to all parts and wiring.

Controls: All controls for the normal operation and adjustment of the monitor are brought out on front panel. These include:

- a. Off-on switch
- b. Switch to permit reading of modulation percentage in either positive or negative direction
- c. Calibrate-local-remote switch to permit instant direct calibration of the center-frequency indicator against a precision crystal frequency and to permit remote operation of the instruments, the flasher and flasher control at a console.
- d. Zero-adjustment for center-frequency deviation indicator.
- e. Push-button switch for determining if the signal level in moni-

toring circuits is approximately correct.

- f. Control for signal level in monitoring circuits.
- g. Control for setting operating point of modulation-limit flasher at any modulation percentage in the range from 50 to 120 per cent.
- h. Other adjustments (screwdriver type) for initial "line-up," are located on the chassis. Instruction book furnishes complete details.

Crystals:

Two crystals are supplied with each monitor:

- a. A precision calibration crystal
- b. A crystal employed during the actual monitoring operation

To change the frequency of the monitors, only (b) need be changed and a few simple tuning adjustments made. Each crystal is mounted in a G-E Type G-31 Thermocell which provides a high degree of temperature control. The G-31 is essentially the same as the G-30 (see GEA-3363A) except that the crystal is clamped between the electrodes. The crystals are in the range of 3000 to 5300 kilocycles. As mentioned, the calibration crystal is used at its fundamental frequency; thus any error introduced by the crystal is not multiplied due to any frequency multiplication process when calibrating the frequency deviation instrument. The temperature coefficient of both crystals is better than one part per million per degree C. The thermostat holds the crystal temperature stable within one degree C.

GENERAL ELECTRIC FM STATION MONITOR

SPECIAL ADVANTAGES AND FEATURES

This is the first monitor commercially available that has been especially designed for FM broadcast stations. It combines the functions of frequency-monitor, percentage modulation monitor, and modulation limit monitor, each function being required by the FCC, and in addition provides an audio-frequency channel for high-fidelity audio monitoring.

Measures the center frequency with or without modulation.

Uses new G-31 crystal units

Special precision crystal for calibrating frequency-deviation indicator

Provision for remote console operation of percentage modulation and cen-

ter-frequency instruments and over-modulation flasher and flasher control.

Instant calibration

Built-in "limiter" action to eliminate amplitude-modulation effects

Built-in voltage-regulated power supply

Design co-ordinated with G-E transmitter line; input matched to pickup loop provided in all G-E FM transmitters

Can be used with any FM transmitter

Moderate input single requirements

TECHNICAL SPECIFICATIONS

Power Supply: 115 volts, 60 cycle, single phase, a-c

Tube Complement: 6A5G, 5U4G, 6SJ7, VR-90, 6N7, 6SA7, 6AG7, 6H6, 6AC7, 6F8G, 2051, 6J5

Radio-frequency Range: 42 to 50 mc

Frequency Stability: It is recognized that during day to day operation, it is possible for a small amount of frequency drift to exist in the monitoring circuits. For this reason, a precision crystal frequency standard of high accuracy has been incorporated in the monitor, and the calibration method has been made so simple that the operator can instantly check and adjust the monitor by panel controls. The accuracy of the calibration of the monitor in terms of the station operating frequency is better than 0.0002 per cent (or $\frac{1}{100}$ cycles at 50 mc). The over-all stability of the monitor is within 0.001 per cent.

Audio Output Impedance: 600 ohms

Audio Output Level: Approx 0.3 volts rms into a 600-ohm load. Standard de-emphasis is employed.

Audio Frequency Response: 30 to 15,000 CPS within $\frac{1}{2}$ db

Installation: The monitor is shipped from the factory completely adjusted to purchaser's frequency. Minor adjustments, easily made, may be necessary in case of rough handling during shipping. Only input, output (a-f) and power need be connected.

Operation: The complete calibration operation of the center-frequency deviation indicator is as follows:

1. Turn on power and allow time for warm-up
2. Switch to "calibrate"
3. Push button to check signal level
 - a. Adjust level if necessary
4. Adjust frequency monitor, if necessary, to "zero" cycles deviation
5. Switch to "run" position
 - a. Push button, and adjust level again if necessary

GENERAL ELECTRIC FM STATION MONITOR

TECHNICAL SPECIFICATIONS (CONT'D)

(Most of these adjustments will be found unnecessary in actual operation.) The two instruments on the panel will then indicate percentage of modulation and center-frequency deviation.

FCC Approval: Monitor was discussed informally with FCC engineers on January 28, 1941 and approval is anticipated after submission of test data.

Tube Replacement: In practice it may be found that changing certain of the tubes will necessitate minor adjustments. These are covered in the instruction book.

Changing Frequency: Because of the incorporation of a separate calibrating crystal in this monitor, it is possible to change frequency in the field by replacing one crystal and making a few simple tuning adjustments. It is not necessary to realign the entire unit. The essential monitoring circuits have been precisely aligned during factory tests. In ordering the new crystal, it is necessary only to specify the new frequency of the transmitter with which the monitor is to be used.

Standard Equipment: Monitor; one set of tubes; two crystals; instruction

FCC Applications: In filing FCC applications specifying the use of this monitor, questions 18(g) and 19(f) of FCC Form 319 (revised December, 1940) should be answered as follows:

"General Electric FM Station
Monitor, Cat. No. 6933906."

FCC Approval No. 2431-2441

GENERAL ELECTRIC FM STATION MONITOR

Factory—Schenectady

Device	Root Cat. No.†	Net Price*	Weight in Lb Approx	Dimensions in Inches		
				Height	Width	Depth
FM Station Monitor	6933906	\$860	60	10 1/2	21	13 1/2

* Price is f.o.b. factory.

† Modifications of this equipment are indicated by suffixes to the "Root Cat. No." These modifications will not appreciably alter the technical specifications or performance of the monitor.

Shipment: Approximately June 15, 1941, first units.

Ordering instructions: Give operating frequency of purchaser's transmitter with which monitor is to be used.

Standard equipment: Monitor; one set of tubes; two crystals; instruction book.

For description of this apparatus, see Section 6914, beginning page 101.

Prices Subject to Change without Notice

New information.