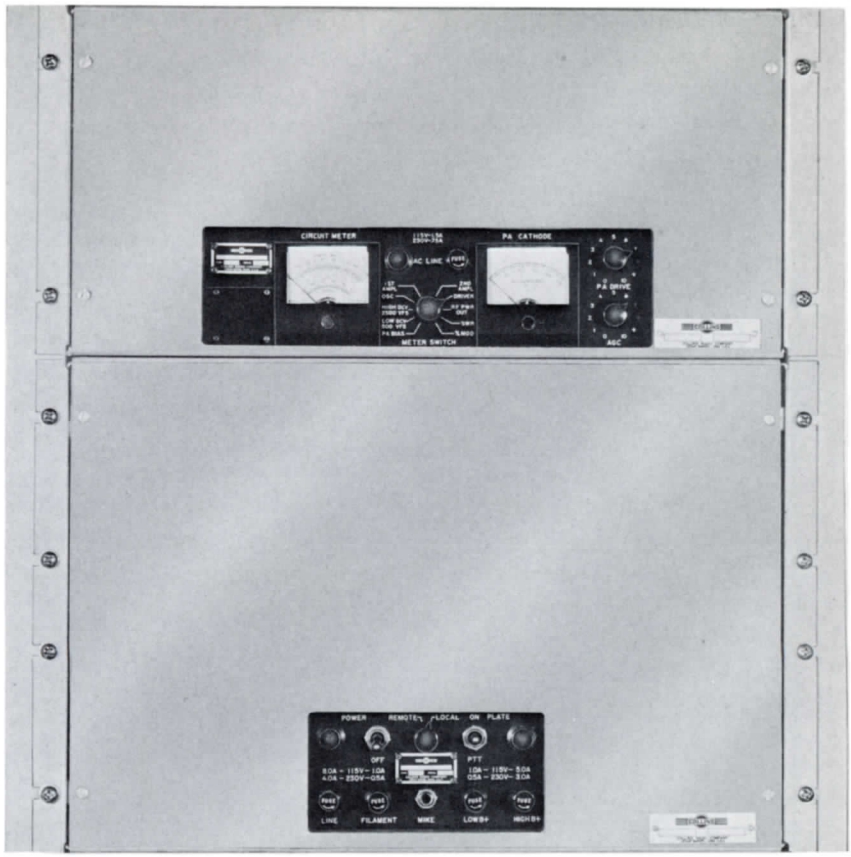
COLLINS

242F-5CL

GROUND-TO-AIR VHF COMMUNICATION TRANSMITTER



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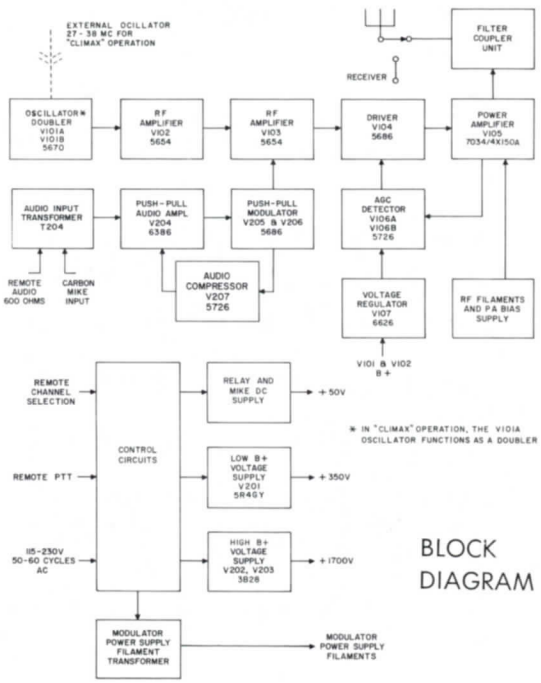
242F-5CL

GROUND-TO-AIR VHF COMMUNICATION TRANSMITTER

Push-Pull Modulator Circuits • Adjustable Power Output • Crystal-Controlled • Excellent Frequency Stability • Adaptable to "Climax" Operation and Multifrequency Service



BLOCK DIAGRAM

THE COLLINS 242F-5CL is a continuous duty transmitter for ground-to-air AM voice communication. Rated conservatively at 50 watts, it operates in the 108-152 mc range and may be adjusted to any output level from 10-50 watts.

Easily modified for multifrequency service on one of four channels within a 500 kc spectrum, the 242F-5CL also is readily adapted to "climax" operation by adding external high stability oscillators to a series of transmitters which will transmit signals with 6 kc spacing. This operation provides aircraft with continuous station-to-station communication without retuning the receiver.

A single channel, crystal-controlled transmitter that may be operated remotely, the 242F-5CL is made up of two units: the RF unit and the modulator power supply unit.

Featuring push-pull audio circuits throughout, the modulator power supply unit contains four supplies which provide all power needs. The high voltage B supply provides plate voltage for the power amplifier, and the low voltage B supply provides voltage for the plates and screens of the low-level tubes and the screen of the PA tube. A 48 v dc supply provides current for a carbon microphone and power for control relays.

A modulation limiter of the compressor type feeds a negative control voltage to the grid of the audio input stage when a predetermined audio level is exceeded and limits the maximum modulation. The modulation limiter has an attack time of approximately 10 milliseconds and holds modulation rise to less than 3 db for a 20 db increase in audio input level. Low level modulation reduces the number of tubes, simplifies circuitry and reduces power requirements of the transmitter.

Voice operation (VOX) of the transmitter is provided by a relay which actuates the low voltage B supply when a ground circuit is completed. The high voltage B supply operates continuously.

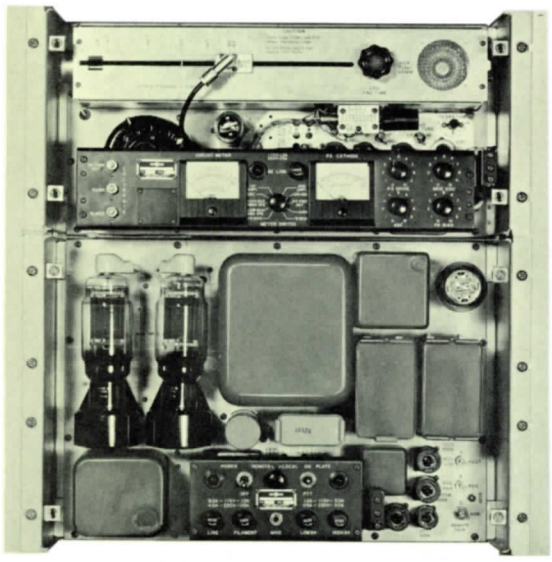
The RF output remains constant over a wide range of variations due to line voltage fluctuations, tube and component aging, etc. Linear power amplification maintains low spurious output and minimizes intermodulation interference produced by operation of several transmitters with antenna systems in close proximity. The linear operation of the power amplifier reduces this type of interference 15-20 db without requiring expensive filter cavities. An overtone oscillator operates in the 54-76 mc range and effectively reduces crystal harmonic spurious output.

Power output and antenna feed line SWR are measured by the reflectometer, which also can remotely monitor SWR, power output and per cent modulation. Complete metering of power output, antenna line SWR, low voltage B, high voltage B, PA bias, per cent modulation and grid voltages (except PA grid) is provided on a tuning meter. A separate meter monitors the cathode current of the PA tube.

A high capacity blower extends tube life by supplying sufficient air to keep the PA tube seals below $+90°$ C at room temperature and sea level. The cooling system keeps tube seals well below the manufacturer's limit of $+175°$ C.

The chassis of the RF and modulator power supply units are designed for mounting in a standard, 19-inch rack with three operational mounting styles available: flush (242F-5CLF), recessed (242F-5CLR), and hinged (242F-5CLH). The hinged mounting permits a 90° swing-out for ease in servicing. Plug-in components are accessible from the front of the unit.

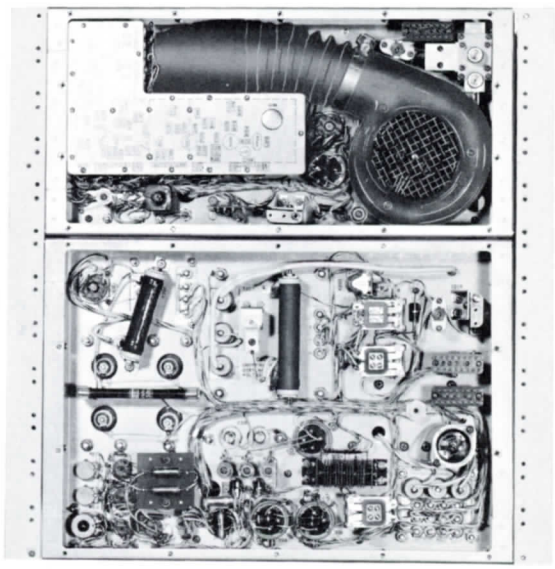
Controls and switches on the front panels promote ease of operation. Tubes and controls which seldom require adjustment are accessible by removing the front dust covers.



Front View

RF UNIT

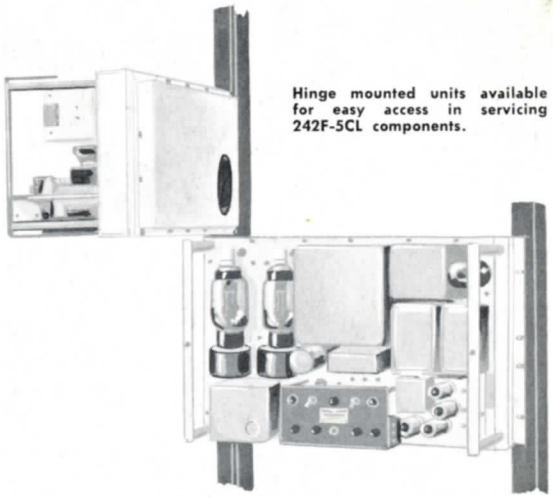
MODULATOR POWER SUPPLY UNIT



Rear View

OPERATION

The oscillator-doubler, V101, uses an overtone circuit with the crystal at one-half the carrier frequency. V101 is wired as a doubler-doubler when the transmitter is used for "climax" operation. V102 and V103 are conventional class C amplifiers. V103 is plate and screen modulated. V104 is a driver tube which is coupled to the power amplifier, V105 (7034/4X150A), both of which operate in class AB_1. V106 is a detector that rectifies a sample of the PA RF voltage and feeds a negative voltage to the grid of V104 to automatically maintain a constant carrier level. A voltage regulator, V107, provides a stable delay voltage for the AGC circuit and a regulated voltage for V101 and V102. The modulator is a two stage amplifier consisting of a push-pull input amplifier, V204, and a push-pull modulator, V205 and V206. V207 rectifies the modulator output and feeds back a dc control voltage to V204 whenever a predetermined level is exceeded. The use of push-pull amplification in the input permits the extremely fast attack time for the compressor action.



Hinge mounted units available for easy access in servicing 242F-5CL components.

ARINC-preferred, reliable tubes are used where applicable. All tubes are operated conservatively and are shielded by Collins heat dissipating tube shields.

SPECIFICATIONS

FREQUENCY RANGE: 108-152 mc.

CHANNELS: The 242F-5CL is a single channel transmitter with the desired output frequency crystal-controlled. Operation on one to four channels within a 500 kc spectrum is available as an optional feature.

FREQUENCY STABILITY: Over-all stability with standard CR-23/U crystals is ±0.005%. Modified CR-23/U crystals will produce 0.002% over-all stability in the 0° to +60° C range.

HARMONICS AND SPURIOUS: All spurious signals, except the second harmonic, are over 100 db below the carrier level. The second harmonic is at least 80 db below the carrier level.

POWER OUTPUT: The power output is conservatively rated at 50 watts for continuous duty. The carrier is easily adjusted to any level from 10-50 watts with a front panel control.

OUTPUT IMPEDANCE: 52 ohms is the nominal output impedance but proper loading can be obtained with any load having up to 3:1 VSWR.

CARRIER SHIFT: Less than 10%.

MODULATION: Low level modulation is used. A compressor-type limiter is provided to limit the modulation percentage to any desired value.

AUDIO INPUT: Carbon mike and 600 ohm balanced input provided. 100% modulation possible with −30 dbm into 600 ohm input.

AUDIO FREQUENCY RESPONSE: The audio response is flat within 3 db with respect to 1000 cps from 300-5000 cps.

AUDIO FREQUENCY DISTORTION: The audio frequency distortion is less than 7% at 95% modulation.

NOISE LEVEL: At least 40 db below 90% modulation.

TUBE CLASSIFICATION: ARINC-preferred tubes are used where applicable. The tube complement is:

- 1 7034/4X150A Power Amplifier
- 1 5686 Driver Amplifier
- 2 5654 RF Amplifiers
- 1 5670 Oscillator Doubler
- 1 5726 AGC Detector
- 1 6386 Audio Amplifier
- 2 5686 Modulators
- 1 5726 Compressor Bias Rectifier
- 1 5R4GY Rectifier
- 1 6626 Voltage Regulator
- 2 866A Rectifiers for use over the +15° C to +40° C range. For operation over wider temperature ranges, 3B28 Rectifiers should be specified.

SIZE: RF Unit: 19″ W, 8¾″ H, 7″ D. Modulator Power Supply: 19″ W, 12¼″ H, 7″ D.

WEIGHT: RF Unit: 10 lbs. Modulator Power Supply: 51 lbs.

AMBIENT TEMPERATURE RANGE: −35° C to +60° C.

AMBIENT HUMIDITY RANGE: 0-90%.

ALTITUDE: To 10,000 ft.

POWER SOURCE: The 242F-5CL operates from 115 v or 230 v ac, ±10% 50-60 cps, single phase with a standby requirement of 175 watts and a full load transmitting power requirement of 530 watts with a 90% lagging power factor. Transformer primary windings are connected in parallel for 115 v operation and in series for 230 v operation.

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