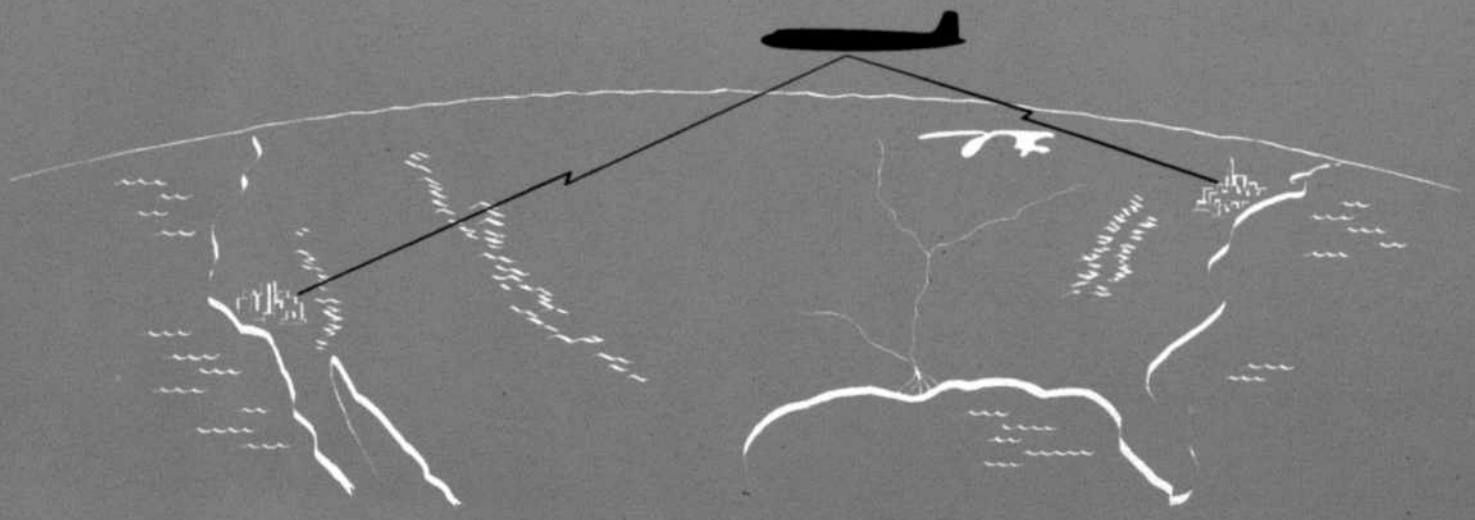
18S-4A

Collins 18S-4A

HF TRANSMITTER-RECEIVER



with COLLINS MECHANICAL FILTER

314S-4 Remote Control Unit

Collins 18S-4A TRANSMITTER/RECEIVER

This brochure describes the new 18S-4A High Frequency Transmitter/Receiver, antenna tuner units 180K-3 and 180L-2, and associated equipment, including the control unit, shockmounts and 180M-1 Test Set. All these units are CAA certificated.

TRANSMITTER/RECEIVER

Newest model in a line that has provided dependable High Frequency service for a widespread aviation clientele since 1947 is the Collins 18S-4A Transmitter/Receiver. This model incorporates the Collins Mechanical Filter for maximum rejection of undesired signals.

The 18S-4A offers up to 20 crystal-controlled frequencies in the 2.0 to 18.5 megacycle range. Output power is rated nominally at 100 watts—fully sufficient for long distance communication.

The new transmitter/receiver with its added selectivity may be used for any of the applications of its predecessors in the 18S line. This includes service on most domestic and international airlines, on business aircraft and on military aircraft.

Among its many features are:

COLLINS MECHANICAL FILTER

Use of the Mechanical Filter in the first IF stage greatly enhances the selectivity of the receiver, since the response of the filter is characterized by a nearly flat top and steep skirts on both sides of the passband. By providing high rejection of adjacent channel interference more dependable reception of weak signals is possible, in effect extending the range of the receiver.

SINGLE CASE

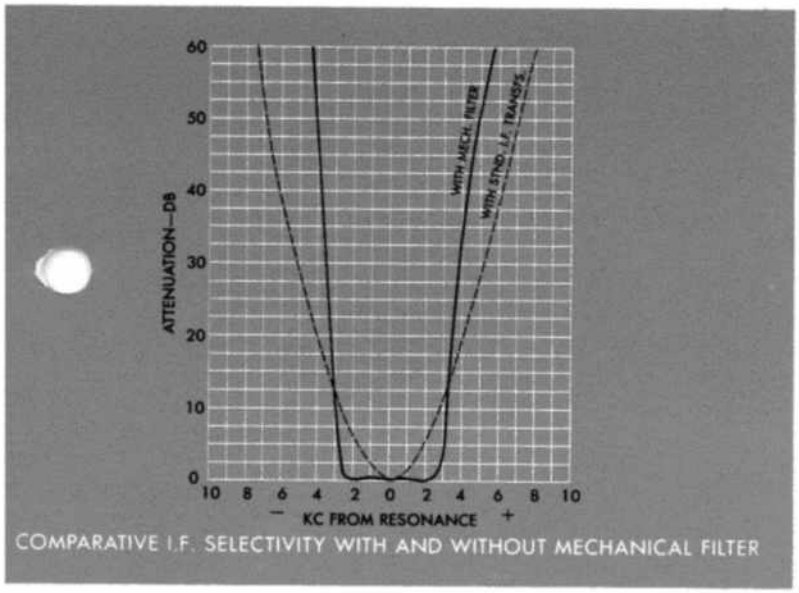
Transmitter, receiver and dynamotor power supply are mounted on a sturdy chassis and all are housed in a single 1½ATR case.

LONG, TROUBLE-FREE OPERATION

High quality fabrication and assembly workmanship and use of service proven components assure reliable service. The dynamotor furnishes the necessary high voltage d-c power and operates only when the transmitter is keyed. This feature means that full utilization is made of the power unit thus assuring maximum service life.

ANTENNA TUNING

To match the impedance of a conventional aircraft antenna 45 or more feet long and the 52-ohm output of the 18S-4A, a separate antenna tuning unit must be used. Two types of units are available. One, the 180K-3, operates on ten pre-set channels with its channel switching mechanism synchronized with that of the 18S-4A. The other, the 180L-2, automatically and independently matches the transmitter/receiver for all frequencies, for all changes in cables or equipment and for changes in the antenna's impedance due to speed, icing or other conditions. Use of a compact antenna loading unit permits its installation in the aircraft near the feed-through. Consequently, a greater proportion of the antenna is kept outside the fuselage and thus transmitter efficiency and receiver sensitivity are improved. In addition, by using a separate unit for antenna tuning, the size and weight of the transmitter/receiver were kept within manageable limits. Finally, an antenna tuner permits accurate tuning of the transmitter/receiver in the shop prior to installation and during overhaul.



COMPARATIVE I.F. SELECTIVITY WITH AND WITHOUT MECHANICAL FILTER

SIMPLIFIED MAINTENANCE

Two multi-contact connectors built into the rear of the shockmount provide all electrical connections except the antenna lead. Thus while the shockmount and wiring become a permanent installation in the aircraft, the 18S-4A can be easily removed from the mount for adjustment, periodic checking or servicing. Within the 18S-4A, the exciter and final amplifier tuning assemblies are constructed to facilitate their removal, saving time in maintenance.

REMOTE CONTROL

Full remote control is provided, including power on-off, type of emission, frequency, transmit or receive (push-to-talk on voice), receiver sensitivity, volume and BFO pitch on CW. All controls are optionally available for mounting on a control panel, or as a 314S-4 control unit which can be located conveniently near the operator.

FREQUENCY SELECTION

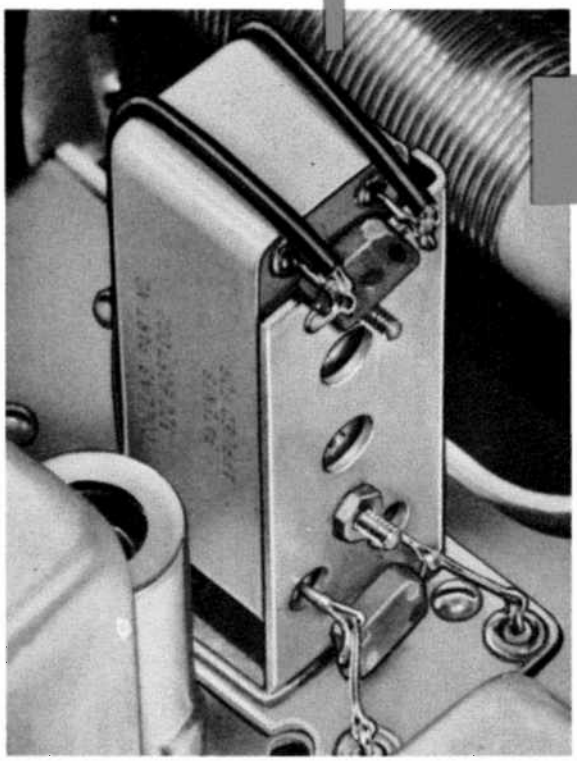
A modified version of the Collins Autopositioner system is used for channel control. Appropriate coil-capacitor-crystal combinations are selected for each frequency. Ten combinations of tuning elements are provided in both the transmitter and receiver for operation on 10 pretuned channels. For most efficient operation, the two frequencies of each channel should be no more than 1% apart.

DESIGN

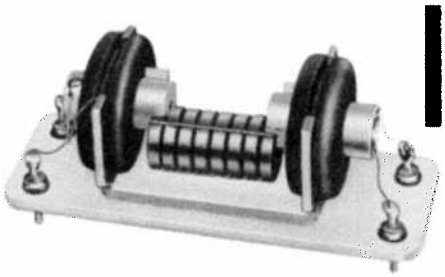
A 12AU6 crystal oscillator followed by three RF stages, one 6AG7 buffer amplifier, a 1625 tuned plate amplifier or doubler and one 813 as the final power amplifier form the transmitter section of the 18S-4A. A pi-section output tank circuit efficiently matches the final stage to the 52 ohm transmission line. The transmitter modulator operates from a standard carbon aircraft microphone. It employs a 6V6 driver amplifier and two 811 tubes in class B push-pull to modulate both plate and screen circuits of the final stage. An audio sidetone circuit provides a monitoring signal for voice communications, and a keyed audio oscillator furnishes an audible note when c-w is used.

The receiver is a single conversion superheterodyne with a crystal-controlled local oscillator. It is designed with automatic noise limiter, delayed automatic volume control and beat frequency oscillator circuits. High sensitivity and selectivity are obtained through the use of a tuned r-f amplifier stage, a mechanically-tuned i-f amplifier stage employing the Collins Mechanical Filter, and three conventionally tuned i-f stages. The sensitivity of the unit is enhanced by the excellent matching of the input to the antenna by the antenna tuning unit.

Filter installed in 18S-4A—Shield removed



F455D-60 MECHANICAL FILTER



Filter exposed showing resonant metal discs

MECHANICAL FILTER

The Collins Mechanical Filter is an electro-mechanical bandpass filter which surpasses, in one small unit, the selectivity of conventional, space-consuming filters. The filter consists of an input transducer, a resonant mechanical section with several resonant metal disks, and an output transducer. An electrical signal is converted into a mechanical vibration at the input transducer by magnetostriction. This mechanical vibration then travels through the resonant mechanical section to the output transducer, where it is converted by magnetostriction back to an electrical signal. Each of the disks in the resonant mechanical section has a mechanically resonant Q exceeding 2,000. Six disks are overcoupled to result in the nearly rectangular selectivity curve. In the 18S-4A the mechanical filter is bracket-mounted inside a standard sized i-f can. Physically, as well as electrically, it appears in the place of the first i-f transformer.

180K-3 ANTENNA TUNING UNIT

Operating in synchronism with the 18S-4A's frequency change mechanism, an Autotune unit in the 180K-3 switches the proper matching elements into the transmission line between the 18S-4A and the antenna. The unit can be wired to provide either pi or L sections for antenna impedance matching. A Power Amplifier plate current meter and Standing Wave Ratio indicator on the front panel give accurate readings of the antenna tuning and transmitter loading. The tuning unit assures there will be maximum transfer of energy between the 52 ohm transmission line and an aircraft antenna 45 feet or more in effective length.

180L-2 AUTOMATIC ANTENNA TUNING UNIT

Collins 180L-2 is an automatic tuning unit which operates by servo-mechanisms and phase discriminators. The 180L-2 requires no manual adjustments for initial installation, change in frequency, or change of antenna. The unit's tuning mechanism is actuated by r-f when a new frequency is selected for the 18S-4A. At that time the transmitter is keyed automatically by the 180L-2 until the circuit balancing is completed. Line-to-antenna match is constantly checked by the 180L-2 as the transmitter operates so that changes in antenna impedance are compensated for automatically.

ASSOCIATED EQUIPMENT

314S-4 REMOTE CONTROL UNIT

This unit is complete, affording remote control of the 18S-4A functions. The 314S-4 is especially suitable for fast or economical installations where a custom-built control panel is not desired. A power connector accompanies the unit and the wiring may enter the top or bottom of the box. This unit is also applicable for use in bench test circuits. A complete line of the individual controls and components for mounting on custom-built panels is alternately available.

350C-5 SHOCKMOUNT

This unit is designed to permit easy insertion or removal of the 18S-4A Transmitter/Receiver. Two multi-contact receptacles incorporated in the rear of the mount engage with connectors mounted in the chassis to provide all electrical connections to the unit except the RF output. The transmitter/receiver is secured on the mount by two compression-ejection levers, which close over the case handles, and by two knurled locking nuts. Shockmount base is provided with grounding straps.

350D-3 SHOCKMOUNT

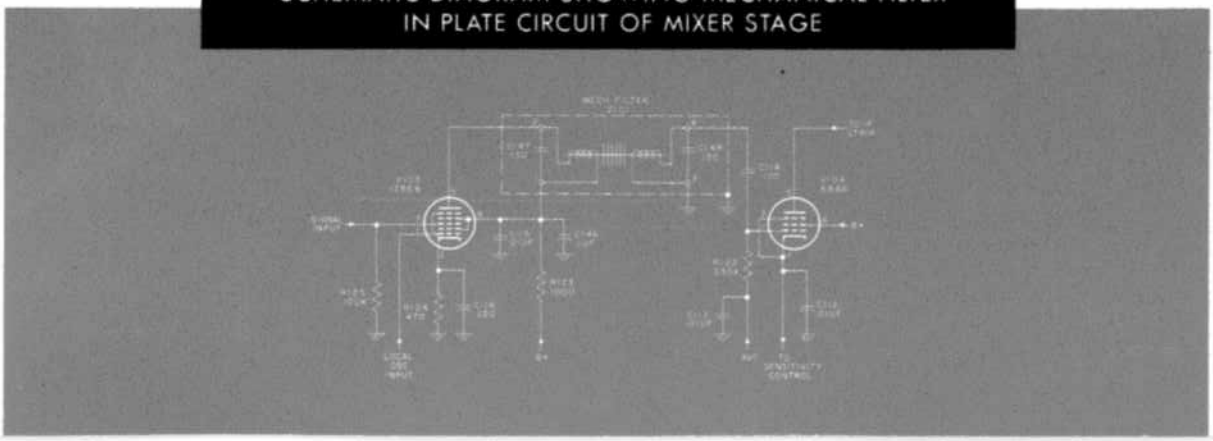
This mount may be used for either the 180K-3 or the 180L-2 Antenna Tuning Units. Knurled fasteners tighten clamps into a flange on front of the Antenna Tuning Unit. The rear of the unit is held in place by mating flanges. No special tools are required for attachment or removal of the antenna tuner. Vibration isolators and grounding straps are provided by the mount.

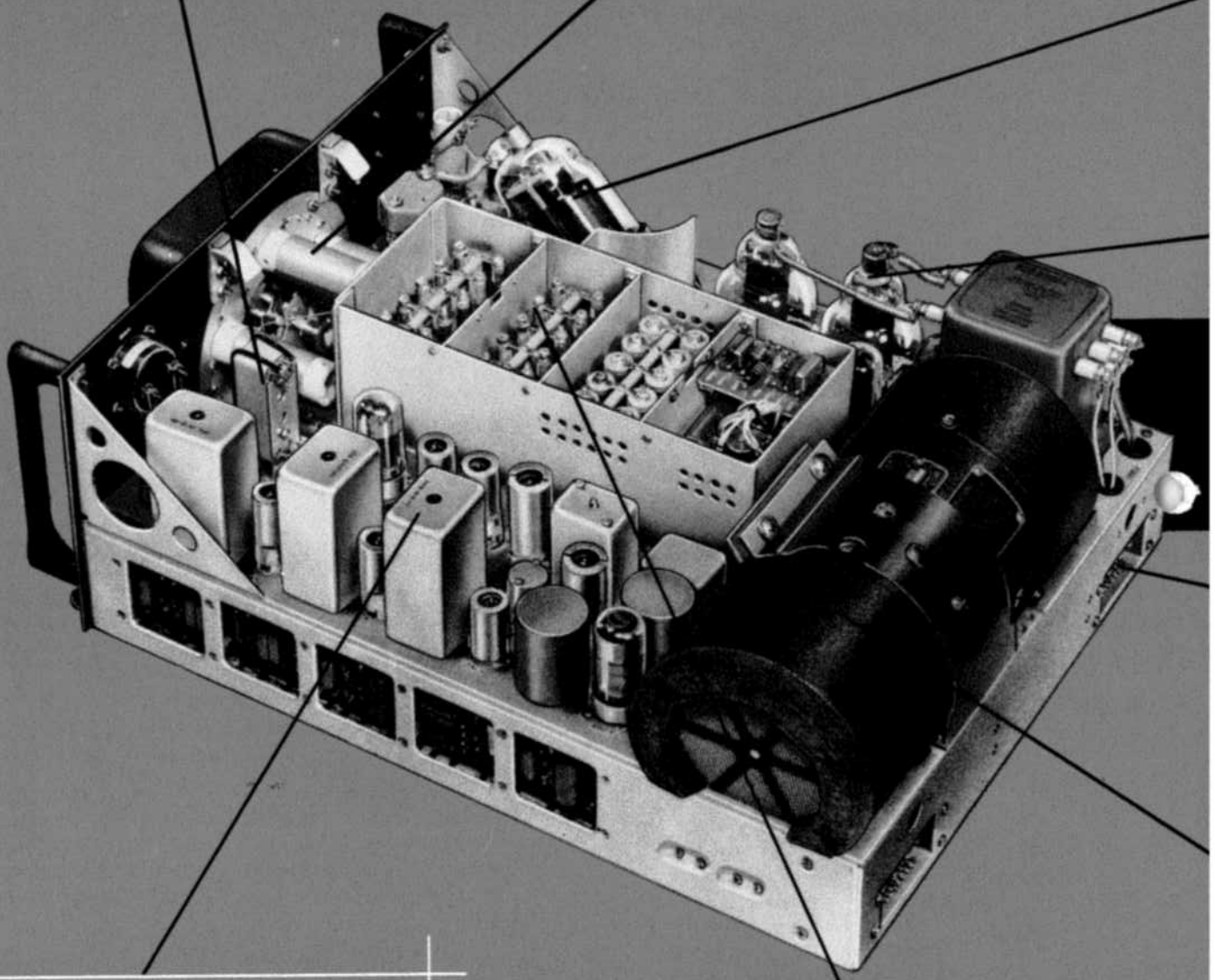
180M-1 ANTENNA TUNING UNIT TEST SET

Collins Type 180M-1 is a single channel matching network which is used to determine circuit elements for the 180K-3 in a minimum period of time. By connecting the 180M-1 between the transmitter and the antenna, various circuit arrangements can be tried and the values of capacitance and inductance can be found for matching the transmission line at each channel frequency. The test set has switches, calibrated dials and meters on the front panel which indicate the values of the elements for proper matching. When the networks and component values have been determined, these circuits can be installed in the 180K-3. Experience has shown that in virtually all cases the antenna tuner can be installed and operated with no further adjustments, with the exception of tuning the variometer, when wired in accordance with the data obtained from the 180M-1.

NOTE: When ordering the 180K-3, it is important to furnish frequency, aircraft type, antenna length information and whether the antenna is grounded or insulated from the fuselage. Transmitter and receiver tuning coils, output network capacitors and 180K-3 wirings vary with frequencies. Details about the antenna are not required when the 180L-2 Automatic Antenna Tuning Unit is employed.

SCHEMATIC DIAGRAM SHOWING MECHANICAL FILTER IN PLATE CIRCUIT OF MIXER STAGE





NEW 455 kc MECHANICAL FILTER

Shown here with cover removed, it replaces the first IF transformer physically and electrically.

POWER AMPLIFIER TUNING ELEMENTS

Mounted behind the front panel cover, the coils and tuning capacitors are readily accessible for frequency changes or servicing.

RECEIVER SECTION

Here, 10 tubes are used for the RF, Mixer, IF, audio and monitoring circuits. Receiver independent of transmitter except for bandswitching.

EXCITER ASSEMBLY COILS

This section includes receiver coils, transmitter exciter coils, band and crystal switches, crystal mounting plate and associated parts.

RF OUTPUT STAGE

One 813 tube serves as the Final Power Amplifier delivering a nominal 100 watts across the band.

PUSH-PULL MODULATOR

Two 811 tubes operating Class B can provide 100% modulation to the RF Carrier.

18S-4A chassis layout

REAR CONNECTORS

Two recessed male connectors join control circuits to the other parts of the system. RF is fed out through the front panel via a coax connector.

DYNAMOTOR POWER SUPPLY

A time proven, highly dependable dynamotor operates only while transmissions are made.

SPECIFICATIONS

FREQUENCY RANGE: 2.0 to 18.5 mc.

TYPE OF FREQUENCY CONTROL: Quartz crystal, 0.01% stability.

FREQUENCY CHANGE METHOD: Autopositioner type remotely controlled switching mechanisms.

NUMBER OF FREQUENCIES: Up to 20. Ten tuned channels each of which can be used for two frequencies; separation of frequencies cannot be greater than 1%.

TRANSMITTER CHARACTERISTICS:

Power Output: 100 watts, nominal, into 52 ohms.
Types of Emission: A-3 (AM Radiotelephony).
A-1 (CW Radiotelegraphy).
Modulation Capability: 100%.
Altitude Range: Full power operation up to 31,000 ft.

RECEIVER CHARACTERISTICS:

Sensitivity: 6 db signal-to-noise with 10 microvolts or less from 2.0 to 18.5 mc.
Selectivity: Bandwidth 6 kc at 6 db attenuation, less than 13 kc at 60 db attenuation.
Noise Limiter: Series type carrier biased peak noise limited.
C.W. Reception: Remote BFO control with at least ±1,500 cycle control range.
Audio Output: 50 mw minimum into 600 ohm circuit.
AVC Characteristics: Audio output constant within 7.0 db from 10 microvolts to 1.0 v r-f input.

TUBE COMPLEMENT:

Transmitter Section:	Receiver Section:
1—12AU6 Crystal oscillator	4—6BA6 R-F and I-F amplifiers
1—6AG7 Amplifier-buffer	1—12BE6 Mixer
1—1625 Amplifier-doubler	1—12AL5 Noise limiter—avc
1—813 Power amplifier	2—12AU7 BFO, audio amplifier-sidetone oscillator
1—6V6 Modulator driver	2—28D7 Local oscillator, audio output amplifier
2—811 Push-pull modulators	

POWER REQUIREMENTS: 28.0 volts d-c. Receiver-transmitter standby, 8.0 amperes; transmit, up to 38.0 amperes.

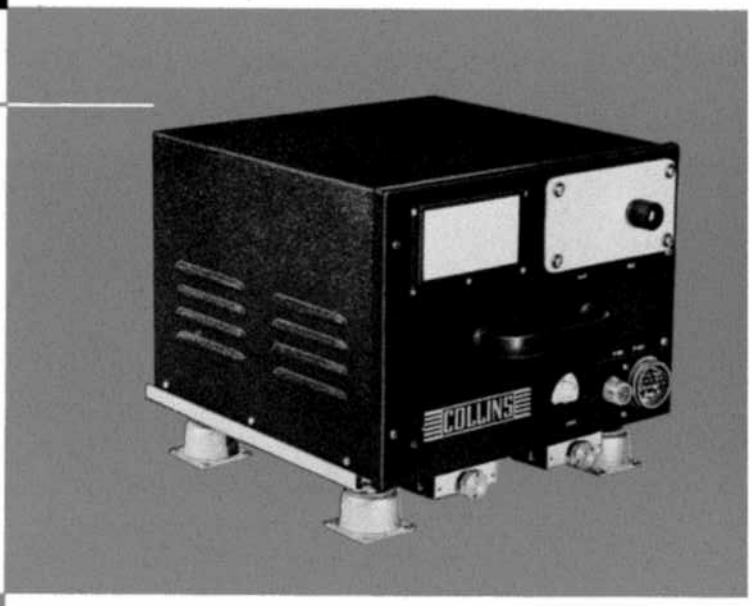
SIZE AND WEIGHT:

	Width	Depth	Height	Weight
Type 18S-4A	15½"	21½"	7¾"	60 lbs.*
Shockmount for 18S-4A				7.5 lbs.

*incl. crystals, coils, etc.

ANTENNA TUNING UNITS

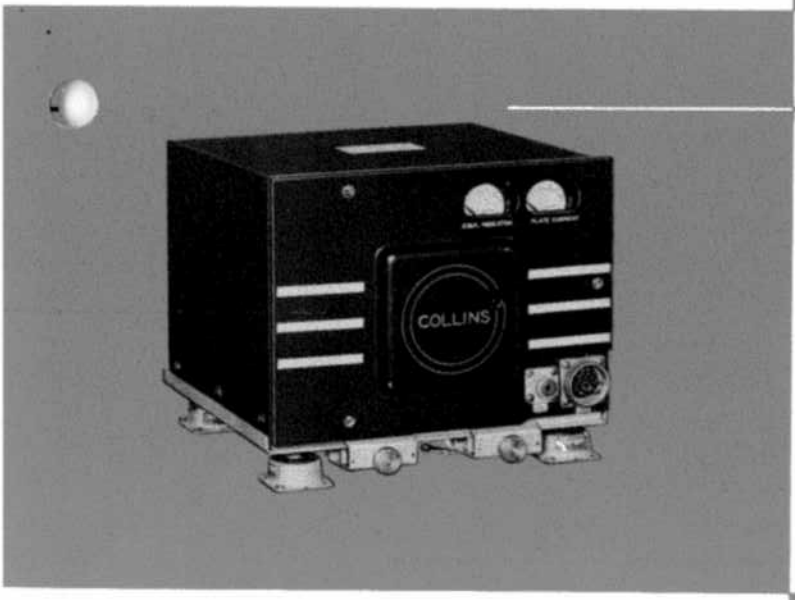
180L-2



Developed for use with HF transmitter/receivers, the 180L-2 automatically matches the transmission line to the antenna. Improved effectiveness of a transmitter is possible since the tuner can be located near the feed-through thus getting maximum power to the radiating wire. The 180L-2 can readily be used with any transmitter having an output impedance adjustable to 52 ohms and 50-to-150 watts power output. Antenna impedance matching capabilities permit use with wide variety of aircraft antennas.

SPECIFICATIONS:

Overall dimensions: 7 23/32" high, 10 5/16" wide, 11 3/8" long
Weight: 19 pounds
Required Shockmount: 350D-3



180K-3

Collins 180K-3 was designed especially to match the 52 ohm output of the 18S-4A to a standard aircraft antenna. This matching system assures optimum performance from the transmitter/receiver. A Collins Type 496B-1 Autotune unit is used to reposition the switches and rearrange the circuit elements remotely and in synchronism with the channel changes in the 18S-4A.

SPECIFICATIONS:

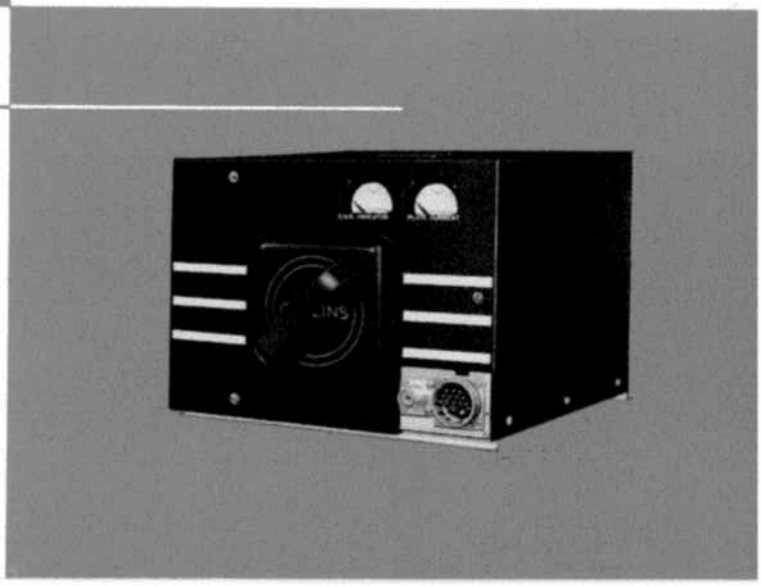
Overall dimensions: 7¾" high, 10¼" wide, 9⅞" long
Weight: 19 pounds
Required Shockmount: 350D-3

180M-1

Collins 180M-1 is a manually adjustable network. It was designed to minimize the time required to determine the circuit elements which must be wired into the 180K-3. Circuits and values of capacitance and inductance can be selected by front panel controls. The unit permits matching aircraft antennas to 52 ohm transmitteer output in the frequency range of 2.7 to 18.5 mc.

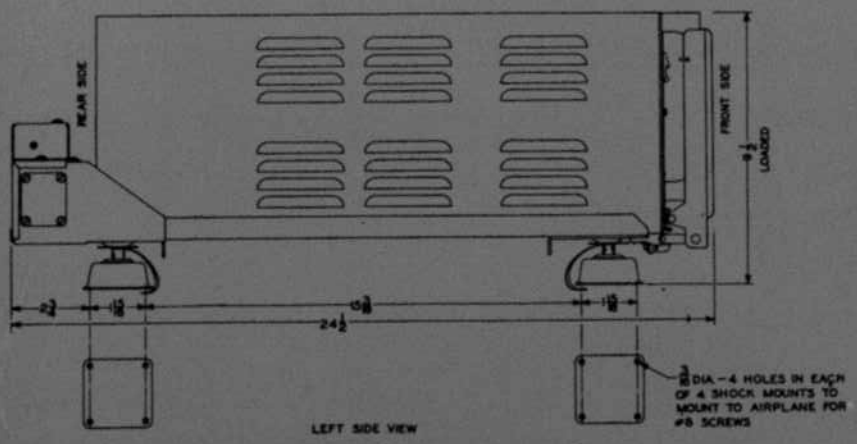
SPECIFICATIONS:

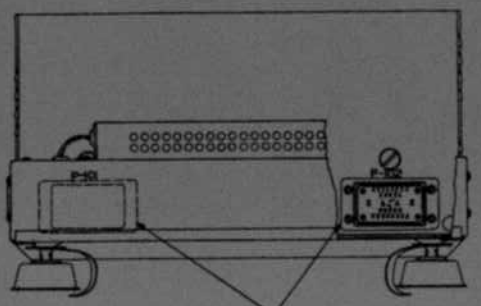
Dimensions: 7¾" high, 10¼" wide, 9⅞" long
Weight: 12 pounds

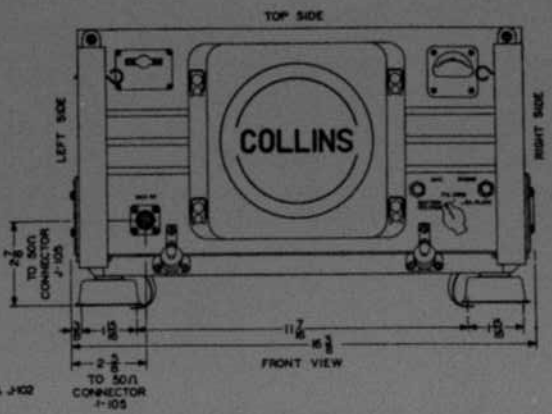


18S-4A TRANSMITTER/RECEIVER

1. CLEARANCE FOR FREE MOVEMENT OF UNIT ON SHOCKMOUNT—1.0 IN. ALL SIDES
2. CLEARANCE FOR FREE CIRCULATION OF AIR FOR VENTILATION—2.0 IN. LEFT AND RIGHT SIDES
3. WEIGHT OF UNIT—60 LBS. (67.5 LBS. INCL. SHOCKMOUNT)
4. POWER REQUIREMENTS: 28.0 VOLTS D.C.
   38.0 AMPS. MAX.
5. CLEARANCE REQ'D FOR INSERTION AND REMOVAL OF 50 Ω R.F. CONNECTOR—6½ INCHES
6. CLEARANCE REQUIRED FOR REMOVAL OF UNIT FROM SHOCKMOUNT—12 INCHES

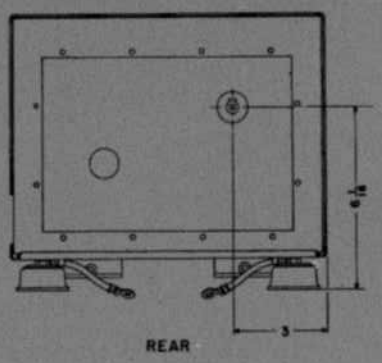


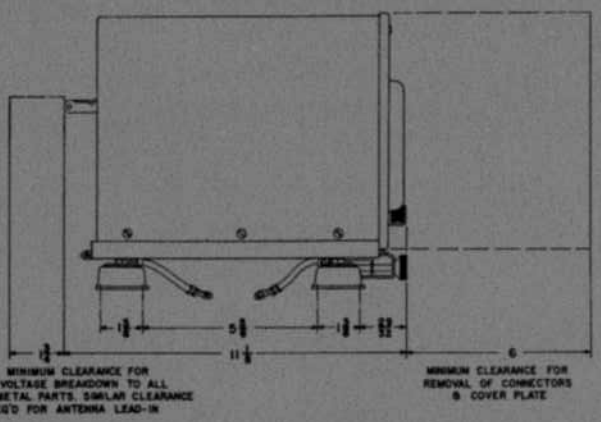


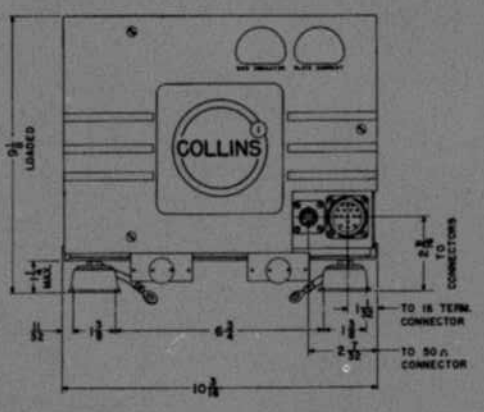


180K-3 ANTENNA TUNER

1. APPROXIMATE WEIGHT—12.8 LBS.
2. 16 MOUNTING HOLES, ⅝₄ DIAMETER—#6 SCREWS
3. ALL DIMENSIONS ARE IN INCHES
4. CLEARANCE OF ½ REQUIRED ON ALL SIDES AND TOP FOR FREE MOVEMENT OF UNIT ON SHOCKMOUNTS
5. SPOTFACE 4 OF 16 MOUNTING HOLES FOR CONTACT WITH GROUNDING STRIPS

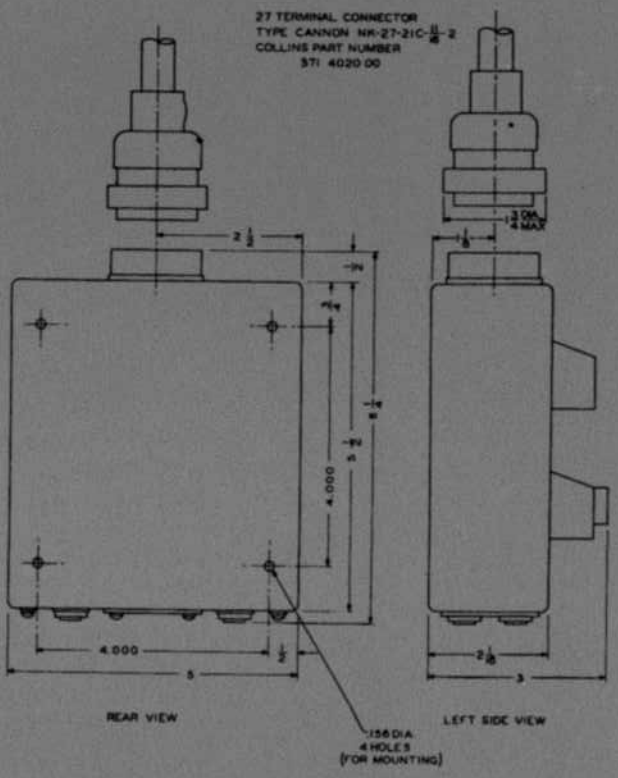






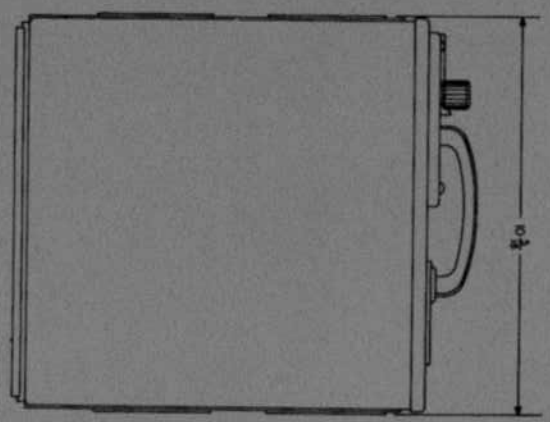
OUTLINE DIMENSIONAL DRAWINGS

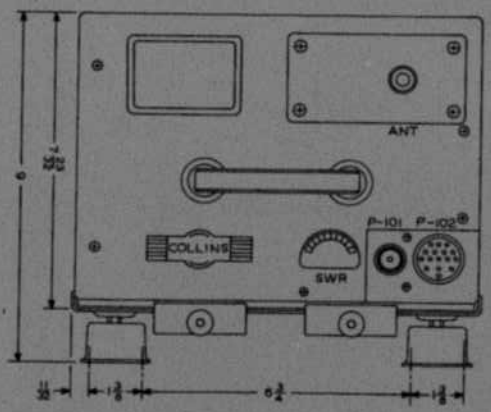
314S-4 REMOTE CONTROL UNIT

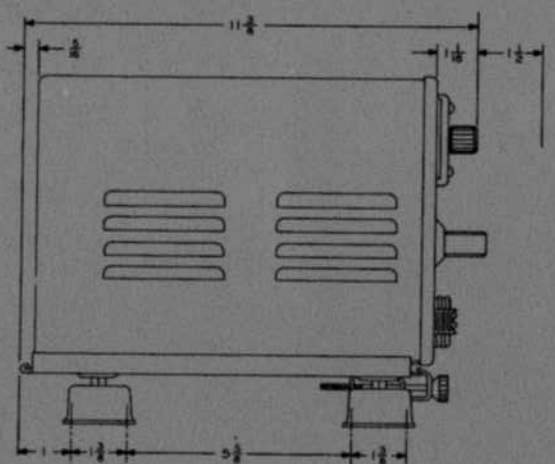


180L-2 ANTENNA TUNER

1. APPROXIMATE WEIGHT 17.4 LBS.
2. 16 MOUNTING HOLES 9/64 DIAMETER— #6 SCREWS
3. ALL DIMENSIONS ARE IN INCHES
4. CLEARANCE OF ½ REQUIRED ON ALL SIDES AND TOP FOR FREE MOVEMENT OF UNIT ON SHOCKMOUNT
5. SPOTFACE 4 OF 16 MOUNTING HOLES FOR CONTACT WITH GROUNDING STRIPS
6. 6 INCH CLEARANCE REQUIRED AT FRONT FOR REMOVAL OF CONNECTOR AND FRONT PANEL







Collins
618S
TRANSCEIVER

This radio transmitting and receiving equipment was especially designed for all commercial aircraft engaged in long-range operations requiring a large number of frequencies. The 618S can be operated on 144 crystal controlled channels at frequencies from 2.0 to 25.0 mc with 100 watt power.

SPECIAL FEATURES OF COLLINS 618S ARE:

1. Large number of channels required for international flight.
2. Automatic tuning.
3. Ease of maintenance because of unitized construction.
4. Collins 180L Antenna Tuning Unit is recommended as in the 18S-4A, to make all antenna matching adjustments.

Communication executives and airline operators have been quick to recognize the importance of this new, fully integrated transceiver.

COLLINS RADIO COMPANY
CEDAR RAPIDS, IOWA

261 Madison Avenue, NEW YORK 16, NEW YORK
1200 18th Street N.W., WASHINGTON, D. C.
1930 Hi-Line Drive, DALLAS 2, TEXAS
2700 W. Olive Avenue, BURBANK, CALIFORNIA
Collins Radio Company of Canada, Ltd.
74 Sparks Street, OTTAWA, ONTARIO

COLLINS