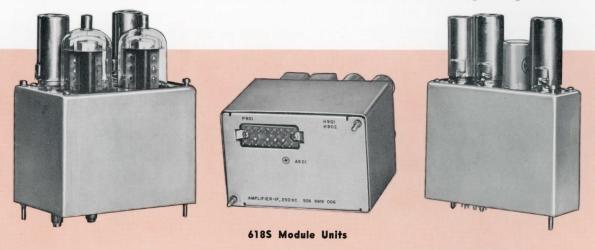
Band	Oscillator	Fixed Injection or Receiver I.F.	Variable I.F.	Multiplier	Output or Input
1	1.75-3.5	.250	2.0-3.75	Not Used	2.0-3.75
2	1.75-3.5	.250	2.0-3.75	1.75-3.5	3.75-7.25
3	1.75-3.5	.250	2.0-3.75	5.25-10.5	7.25-14.25
4	1.75-3.5	.250	2.0-3.75	12.25-24.5	14.25-25.00

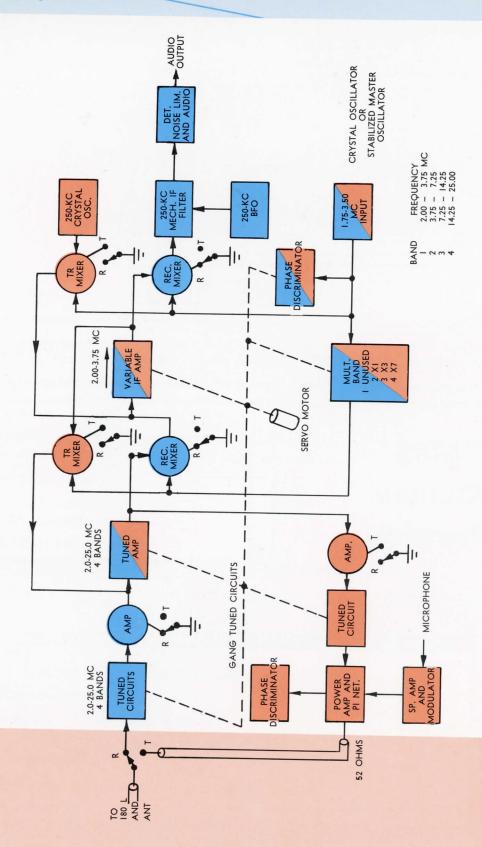
3.50 mc to yield a signal 2.00 to 3.75 mc. This signal is further amplified and filtered in the variable i-f amplifier. It is then injected into the second transmitter-mixer with the desired output of the frequency multiplier. The selected mixer product thus yields an r-f frequency voltage at transmitter output frequency. Voltage amplification occurs in two tuned i-f amplifiers connected in cascade, providing sufficient excitation for the power amplifier. Rated frequency power at a 100 watt level is transformed to 52 ohm impedance by a pi network for conduction to the 180L Automatic Tuning Unit. The operating frequency for both transmission and reception is derived from either a 144 crystal oscillator or a stabilized master oscillator, each of which yields output in the range 1.75 to 3.50 mc. Phase sensitive discriminators through servo systems control the tuning of all r-f amplifiers and the power amplifier. Channel selection is accomplished remotely by selecting the desired crystal of the 144 crystal bank (or by selecting a desired output frequency from the stabilized master oscillator, if S.M.O. is used).

Several advantages are apparent through the use of the particular frequency scheme shown in the block diagram. Of considerable importance is the fact that a single crystal serves for both transmission and reception. A second advantage is the great freedom from spurious signals obtained by the novel double conversion system described. A third advantage is the possibility of other types of transmission through injection of suitable voltages at 250 kc such as narrowband f-m and frequency shift keying. By modification of amplifiers, single sideband transmission would be possible through appropriate injection at 250 kc.

The crystal oscillator unit provides 144 two-pin sockets for installing up to 144 CR18/U crystals. Six socket groups identified by the letters A through F separate the 144 sockets into groups of 24 for convenient selection by letter and number such as A7, B15, E23, etc. This method of channel control results in greatly reducing the number of interconnecting wires while, at the same time, preserving freedom of choice in transmitter output frequencies.



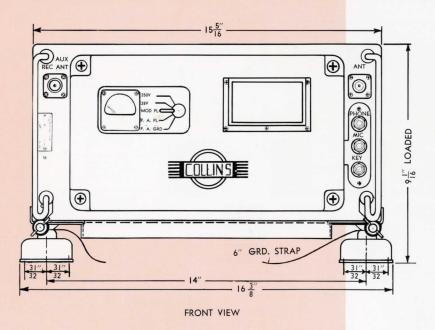
Paris



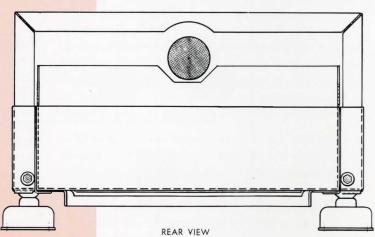
6185 Block Diagram

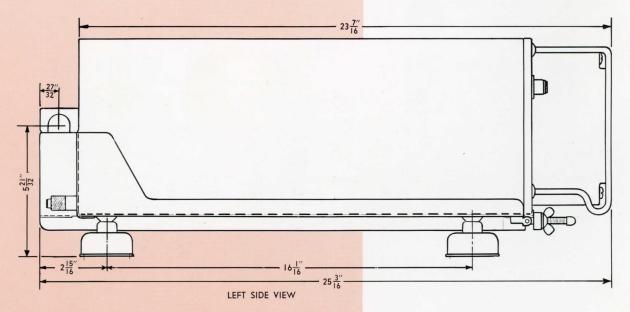
Nice

1



6185 Outline Drawing





Geneva

6185 Specifications

Frequency Range: 2.0 to 25.0 mc inclusive.

Number of Frequency Channels: Up to 144.

Type of Frequency Control: Quartz Crystal, CR-18/U. Only one crystal required for both transmitting and receiving. Cross-band operation possible only by changing frequency selection control.

Frequency Change Method: Autopositioner type remotely controlled switching mechanisms. Automatic resonating of exciter, power amplifier and antenna matching circuits. Frequency selector system in accordance with ARINC Characteristic No. 524.

Size: C1-D case size per RTCA paper, 46-57/EC-14 "Radio Equipment Form Factors" dated April 17, 1947, as amended by Paper 44 - 47/EC - 28, dated September 5, 1947.

Shockmount: Collins Type 350S-1.

Weight: 60 lbs., including shockmount. 51 lbs., excluding shockmount.

Number of Tubes: 34, total.

Input Power Requirements: All voltage obtained via 416W Power Unit.

CHARACTERISTICS OF TRANSMITTER SECTION

R-F Power Output: 100 watts minimum from transmitter.

R-F Output Impedance: 52 ohms.

Types of Emission: A-3 (AM Radiotelephony).

A-1 (CW Telegraphy).

Modulation Capacity: 95%.

Altitude Ranges: Full power operation up to 50,000 ft.

Audio Characteristics:

INPUT: 100 ohm input from standard aircraft carbon microphone, at .25 volts, rms.

SPEECH CLIPPING: 15 db (Adjustable).

Frequency Response: ±2 db from 300 to 3500 cps with rapid attenuation above and below these frequencies.

Rome

618S Specifications

DISTORTION: Less than 5% at 90% modulation.

FREQUENCY STABILITY: Less than $\pm 0.0005\%$ variation in frequency when a given crystal is operated in any socket.

Channeling Time: 8 seconds maximum.

Spurious Radiation: At least 40 db below carrier level. (Additional attenuation provided by associated antenna coupler).

Sidetone: Developed by rectification of carrier for voice operation. Keyed 400 cps audio for monitoring of c-w transmission. Up to 20 mw available directly from sidetone output into 500 ohm load or may be fed through receiver audio stages.

Keying: Break-in operation up to 30 words per minute using a common antenna for transmitting and receiving.

CHARACTERISTICS OF RECEIVER SECTION

Sensitivity: 3 uv maximum for 6 db signal plus noise-to-noise ratio with standard test signal modulated 30% at 1000 cps, or for 10 db signal plus noise-to-noise ratio on c-w reception.

Sensitivity Control: 60 db range of control with a 5000 ohm external control.

AVC: Maximum audio output variation of 3 db for signal from 10 to 100,000 microvolts. No overload below 2-volt signal input.

Selectivity: 6 kc, 6 db down; 15 kc, 60 db down.

I-F and Image Rejection: 80 db minimum.

Audio-Output:

Power: 500 mw into 300 ohm load.

Distortion: 10% maximum.

RESPONSE: ± 3 db 300 to 3500 cycles per second.

Noise Limiting: Series type carrier biased peak noise limiter.

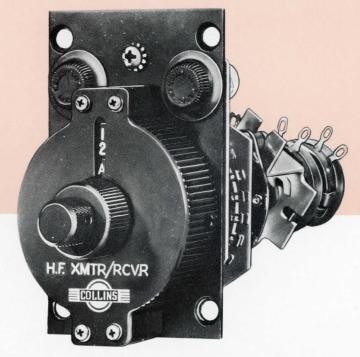
C-W Reception: Remote BFO control possible with ± 2500 cps control range.

Guatemala City

San Salvador

614D-1 Control Unit

1

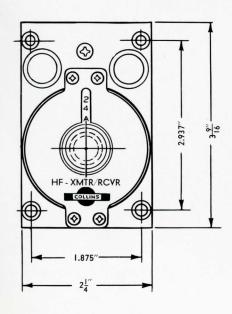


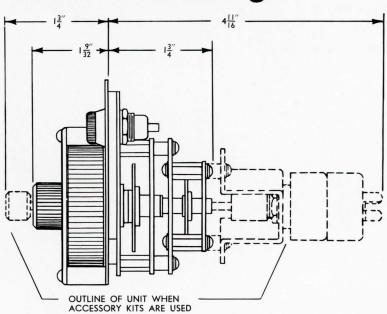
The 614D-1 Control Unit offers the same type coaxial channel selection knobs used in most modern aircraft radio systems today. Frequencies are selected on the basis of channel assignment; that is, A1, A2, ..., A24 through F1, F2, ..., F24 with letters on the outer knob and numerals on the inner knob. These channel assignments correlate with the crystal

mounted positions explained in the crystal oscillator unit. The 614D-1 is expressly designed for use with the 618S and wire-saving circuit techniques are used.

A Volume Control and an On-Off switch are available as accessory kits. The 614D-1 Control Unit is illuminated internally for ease of operation during nighttime flying.

614D-1 Outline Drawing







Three miniature tubes plus the two modulator tubes are included in this "module" for the speech amplifier, clipper, phase inverter and modulator tubes for class AB2 modulation of the final amplifier.

POWER AMPLIFIER

This unit includes the P.A. tubes, the motor driven screw coil, bandswitch, discriminator and other components necessary for the automatic tuning of the final amplifier. Three P.A. tubes are used in a parallel connection.

FIXED I-F UNIT

The fixed i-f unit includes the mechanical filter, i-f amplifiers, 2nd detector, AVC and limiter circuits. Five tubes plus the mechanical filter are used in this circuit.

MODULAR CONSTRUCTION

250 KC CRYSTAL OSCILLATOR UNIT

The 250 kc crystal oscillator for the transmitter, and the remotely controlled beat frequency oscillator are included in this two-tube unit.

AUDIO AMPLIFIER UNIT

This module consists of the receiver audio amplifier. It includes all audio components from the output of the 2nd detector to the audio output transformer, two tubes and one transformer.

TUNER ASSEMBLY

This unit includes all tuned circuits for the receiver front end, the variable i-f, multiplier coils, discriminator coil for automatic tuning and transmitter exciter coils. Also included are bandswitches and necessary relays. This unit contains 11 tubes.

RELAY MODULE

This assembly contains all necessary relays and similar components that can be logically separated from other units. A voltage regulator tube is also located in this unit.

SERVO AMPLIFIER UNIT NO. 1

This unit contains the servo amplifier for automatic tuning of the power amplifier. This unit contains 2 tubes.

144 CRYSTAL, REMOTE SELECTED CRYSTAL OSCILLATOR

This includes the 144 crystal socket and selector assembly and the crystal oscillator. This unit contains one tube.

SERVO AMPLIFIER UNIT NO. 2

This unit is identical with Unit No.

1. It contains the servo amplifier for the automatic tuning of the low level r-f portions of the receiver and transmitter.

PLUG-IN UNITS

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Guaranteed peak performance on ALL frequencies





180L-2 Automatic Antenna Tuning Unit

180L-3 Automatic Antenna Tuning Unit

180L Automatic Tuning Units

The 180L-2 is recommended for use with the 618S.

The Collins 180L-2 or 180L-3 Automatic Tuning Units are used with transmitters operating in the h-f spectrum and require no manual adjustment for initial installation, change in frequency or change of antenna. Thus, instant complete interchangeability is realized. Either the 180L-2 or 180L-3 can readily be used with any transmitter having an output impedance adjustable to 52 ohms and 50-to-150 watts power output.

Complete flexibility of location of these antenna tuning units facilitates mounting in a relatively inaccessible location, thereby shortening the antenna leadin, or utilizing otherwise wasted space, but primarily to permit the greater proportion of the radiating wire to be outside the fusilage.

The 180L-3 Automatic Tuning Unit contains an antenna transfer relay and may be used when separate receiving facilities are to be used with a common antenna. A separate antenna input connector for the 618S receiver is provided on the front panel of the 618S for direct connection to the antenna (through the 180L-3 transfer relay) if desired.

Antenna tuning is constantly monitored as the transmitter operates so that changes in antenna impedance do not result in a mismatch at the transmitter. Changes in antenna impedance from on-the-ground

to in-the-air, with speed, icing and other conditions are all automatically compensated.

SPECIFICATIONS

Power Requirements: (From the 416W Power Supply)

115 volt, 380-420 cycles . . . single-phase . . . 15 watts.

27.5 volt d-c . . . 2.0 amps. 250 volt d-c025 amps.

Size:

Width . . . 10-3/16".

Height . . . 8-15/16".

Depth . . . 13-1/16".

Dimensions are over-all, and include shockmount.

Shockmount: Collins Type 350D-3.

Weight: 20 lbs., including shockmount.

19 lbs., excluding shockmount.

Channel Changing Time: Maximum - 18 seconds.

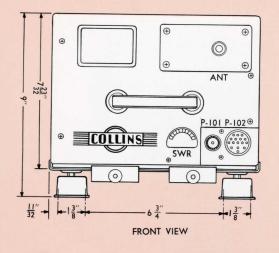
Average - 5 seconds.

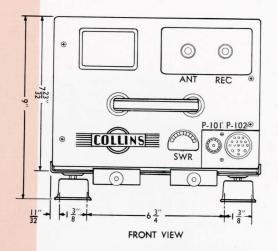
Quantity of Tubes: 3.

Frequency Range: 2.0 - 25.0 mc.

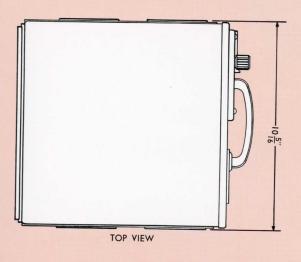
Impedance Matching Limits: All normal transport

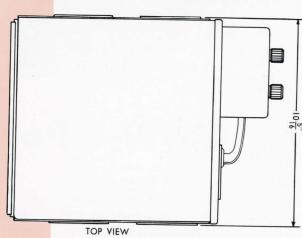
aircraft antennas.

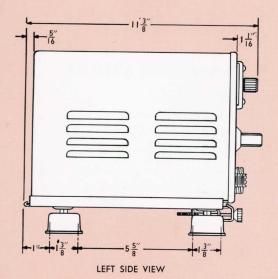


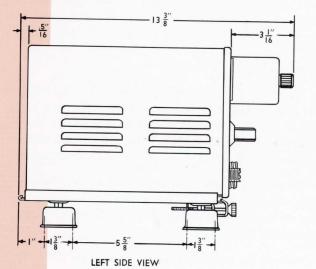


180L-2 and 180L-3 Outline Drawings









Cleveland

Bombay



416W-1 Power Supply

The 416W-1 Power Supply provides all voltages necessary for full power operation of the 618S Transceiver and the 180L Automatic Tuning Unit. This power supply derives its primary power from the 27.5 volt d-c and the 115 volt a-c power mains of the airplane. All components of the power supply are operated conservatively and are able to withstand the full range of climatic conditions called for under Specification RTCA50-52/DO44.

The dynamotor mounted on the 416W-1 provides the high voltage for the modulator and power amplifier and also provides the screen voltage for these stages. This dynamotor operates only on key-down phone position and on c-w position of the transmitter.

In addition to the dynamotor, the 416W-1 utilizes two selenium rectifiers, one to furnish high voltage for the receiver and the other to furnish bias for the modulator tubes.

This power supply conforms to the case size MT-

A1-B as outlined in RTCA Paper 46/57/EC-14. Weight of this unit complete with mounting does not exceed 24 lbs. Without mounting, the weight is 201/2 lbs.

The power plug for this equipment is mounted in the rear and engages a mating plug on the mounting.

SPECIFICATIONS

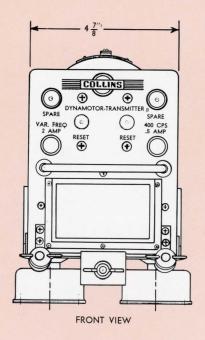
Power Input:

27.5 volt d-c . . . 28 amps.
115 volt, 380-420 cps . . . single-phase . . . 30 watts.
115 volt, 320-1000 cps . . . single-phase . . . 150 watts.

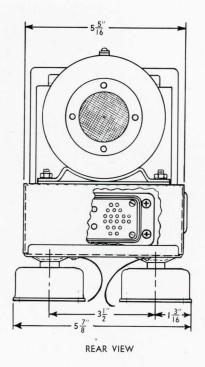
Power Output:

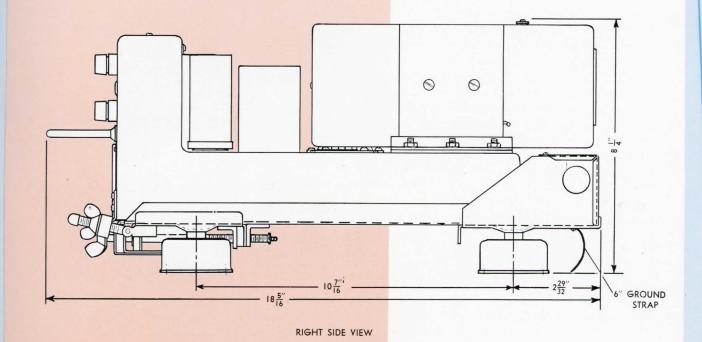
DYNAMOTOR: 600 volts . . . 550 ma 250 volts . . . 150 ma

SELENIUM RECTIFIER: 250 volts . . . 180 ma SELENIUM RECTIFIER: -50 volts . . . 10 ma



416W-1 Outline Drawing





Manila



AIRBORNE

6185 APPLICATIONS



MOBILE



FIXED STATION

Alice Springs

Leigh Creek







Figure 1

AIRBORNE INSTALLATION

Figures 1, 2 and 3 show the three possible complements of the 618S transmitting and receiving equipment for airborne, mobile and fixed station applications. These three figures clearly show the adaptability of the transceiver and antenna tuning unit to the various uses. These three figures also show the changes necessary to adapt the 618S for the services indicated. The chief changes, of course, are in the power supply because the normal power source varies with the type of service. Fixed station use dictates 115/230-volt, 50/60 cycle, power, while for mobile combinations, full operation from a 28 volt d-c system is dictated. For airborne use, both 28 volt d-c supply and a-c supply is available and this fortunately results in the most simple light-weight supply where these features are most urgently required.

In Figure 1, the typical complement of equipment for airborne installation, all elements are shown with the exception of interconnecting cables. The complete frequency control is obtained from the 614D-1 Control Unit which is so designed as to occupy a minimum of panel space in the crowded instrument panel of the aircraft. The power supply, the transceiver and

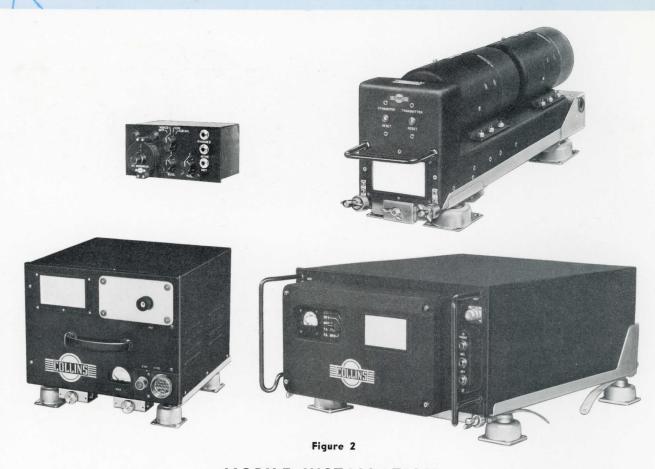
antenna tuning unit are described more completely in connection with the general description given previously.

Figure 2 shows the arrangement of equipment for use in jeeps, trucks and mobile installations. Here the 614D-1 Control Unit is mounted on a small control panel together with the emission selector, BFO adjusting knob and the r-f volume control. Jacks are provided for headphones, a microphone and the telegraph key. Switch contacts and controls are protected from dust and moisture by a formed metal dust cover. The control may be mounted at the transmitter installation point or at any other point convenient to the driver or operator.

The power supply consists of two rotating machines to provide all voltages required by the transceiver. The first dynamotor is identical to that used in the airborne power supply while the second dynamotor provides 400 cycle output for servo tuning systems and the low voltage d-c required for the receiver and exciter stages of the transmitter. The 618S Transceiver is used without modification with the exception

Adelaide

Canberra



MOBILE INSTALLATION

of possible changes in shockmounts to assure optimum isolation for the particular vehicle in which the equipment is mounted. This is also true of the 180L Automatic Tuning Unit where no electrical changes are required. Normally the antenna tuning network is designed to operate into vehicular whip antennas but other fixed antennas can be tuned if necessary. Design charts are available which will define the range of antenna characteristics which can be accommodated by the antenna tuning unit. Only moderate protection from the weather is required for the 618S Transceiver because a relatively tight equipment cabinet is provided. This is also true of the power supply and the 180L Automatic Tuning Unit but for all units some protection from dripping moisture is desirable.

Figure 3 shows the fixed station modification of the 618S Transceiver. The control panel is shown on the left, again repeating the functions available in the mobile installations but more conveniently mounting these on a 19 inch panel. A formed metal dust cover protects the controls and switches from dust and insects. Next in line from left to right is the 50/60 cycle power supply. This unit is necessarily heavier

and larger than power supplies used in the airborne and vehicular installations because a greater conversion efficiency is available than with rotating machines and d-c power supplies. Ordinarily, in fixed station applications, size and weight are not demanding considerations; therefore, size and weight of this power supply are not disadvantages. The power supply shown provides all the operating potentials required by the 618S Transceiver and 180L Automatic Tuning Unit. This includes d-c power for plate circuits as well as 400 cycle voltage for the servo systems. A small amount of 28 volt d-c power is available for relays and control circuits. The 618S Transceiver is used without modification by mounting it in a 19 inch adapter panel and shelf. Ordinary operation would provide for the installation of the control panel, the power supply and the transceiver mounted vertically in a single cabinet or rack corresponding to standard 19 inch relay rack dimensions. Coaxial cable from the transceiver to the antenna tuning unit provides for r-f power transmission to the antenna site. This antenna site must be within 100 feet from the power supply to prevent excessive voltage drop in the inter-

New York



FIXED STATION INSTALLATION

connecting cables. A great deal of freedom is permitted in the antenna structure to be used; however, the exact limits of antenna characteristics which can be suitably tuned by the antenna tuning unit must be determined from design charts.

If desired, control of the equipment can be obtained using the mobile control box. This will allow convenient operation from an operating desk, control tower or other vantage point. The fixed station power supply and control units are ideal for both maintenance tests and instruction purposes. It is quite often inconvenient to provide sufficient 28 volt d-c and 400 cycle a-c for equipment operation in service centers and schools.

A test console is available for complete testing of individual module units from the 618S Transceiver. This test console will allow rapid isolation of faults within sub-units.

These three proposed arrangements of the 618S Transceiver and the 180L Automatic Tuning Unit serve to demonstrate the great versatility of this transmitting and receiving equipment. The advantages to be gained from this universal use is greater utilization of existing equipment, reduction of servicing problems and economies in greater procurement quantities.



