

HF COMMUNICATION EQUIPMENT 1964-65



HF COMMUNICATION EQUIPMENT CATALOG

1964-1965

Collins Radio Company, with more than 30 years of experience in research, development and manufacture of equipment and systems for use in the HF spectrum, has contributed many distinctive improvements in HF communication equipment design. These include automatic tuning systems, stable frequency sources, Mechanical Filters, linear power amplifiers, antenna coupling methods, highly efficient broadband antennas and single sideband systems for a wide range of applications. The use of rigid, uncompromising standards of excellence, beginning in the laboratory and continuing through every production step, assures the customer of dependable, high performance equipment of proven quality.

As a result of a continuing development program, Collins offers a complete line of single sideband equipment to meet virtually all HF communication requirements. The equipment and systems are equally applicable to surface, transportable, airborne or marine communication for both civilian and government needs. Collins' single sideband systems aid in spectrum conservation and greatly improve the quality and flexibility of high frequency communication.

Currently in use throughout the world, in such applications as Strategic Air Command networks, Naval Tactical Data System, NATO's defense line in the North Atlantic and Arctic regions, satellite tracking systems and commercial airlines, Collins HF systems are providing consistently high performance and outstanding reliability.



CONTENTS

Typical Systems <i>page 2</i>	
Receivers <i>page 17</i>	
Transmitting Equipment <i>page 24</i>	
Transceivers <i>page 38</i>	
Communication Systems <i>page 59</i>	
Universal Radio Group Equipment <i>page 81</i>	
Antennas <i>page 92</i>	
Antenna Couplers and Accessories <i>page 100</i>	
Data and Teletypewriter Equipment <i>page 116</i>	
Test Equipment <i>page 129</i>	
Amateur Radio Equipment <i>page 133</i>	
Tables, Charts and Graphs <i>page 142</i>	
Cross Reference of Military Nomenclatures <i>page 153</i>	
Index by Type Number <i>page 156</i>	
Index by Function <i>page 158</i>	
Glossary <i>page 160</i>	

For fast location of equipment, flip the pages until you reach the section where the black marker in the right margin is opposite the appropriate diamond above.

Typical HF Communication Systems

EXCITER

POWER
AMPLIFIER

TERMINATION
EQUIPMENT

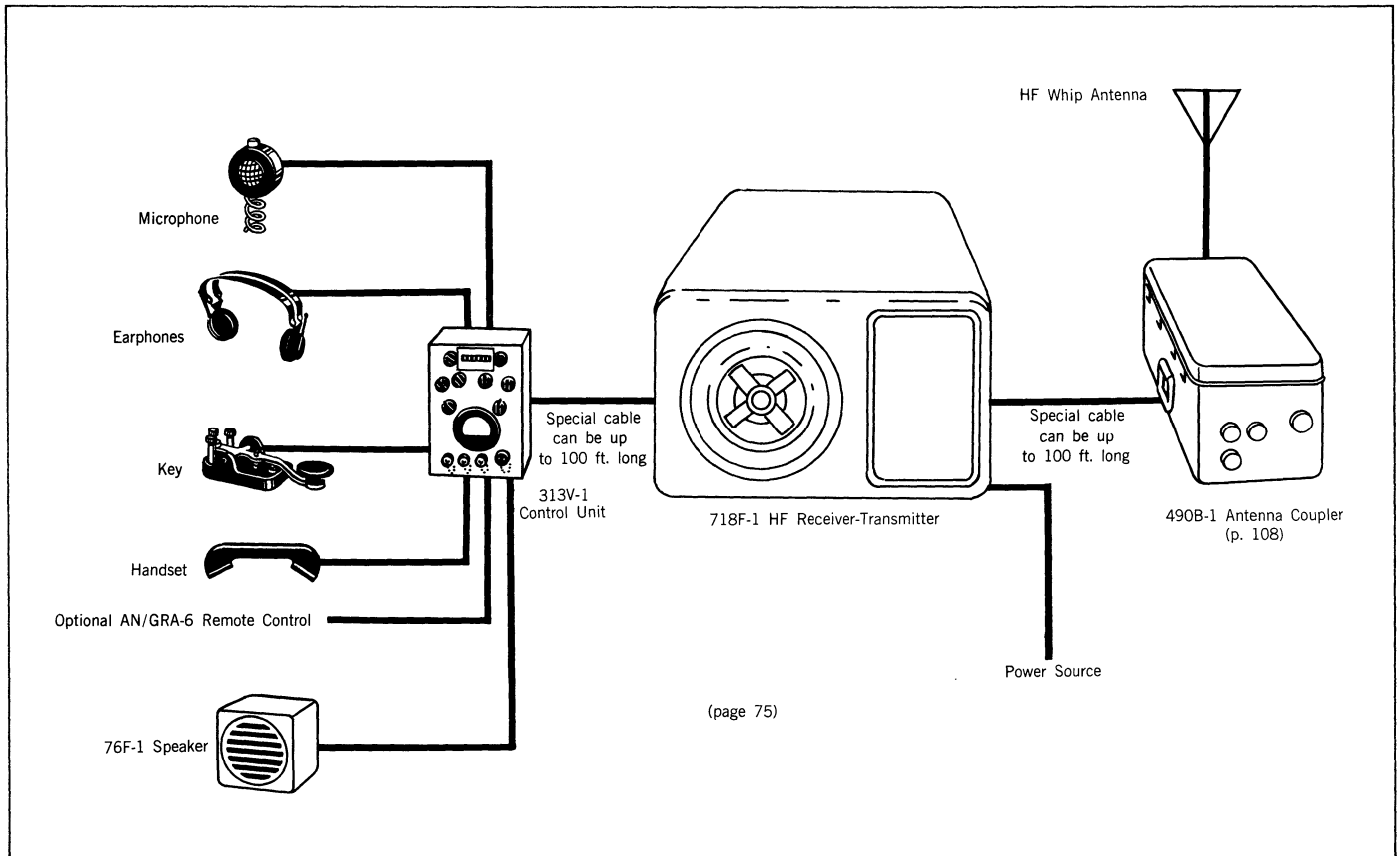
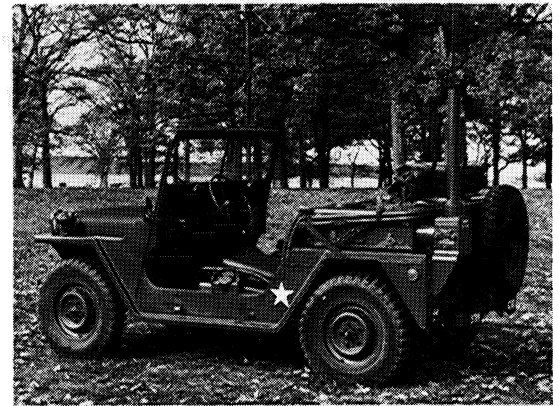
RECEIVER

Mobile HF Communication Systems



VC-102 HF Communication System

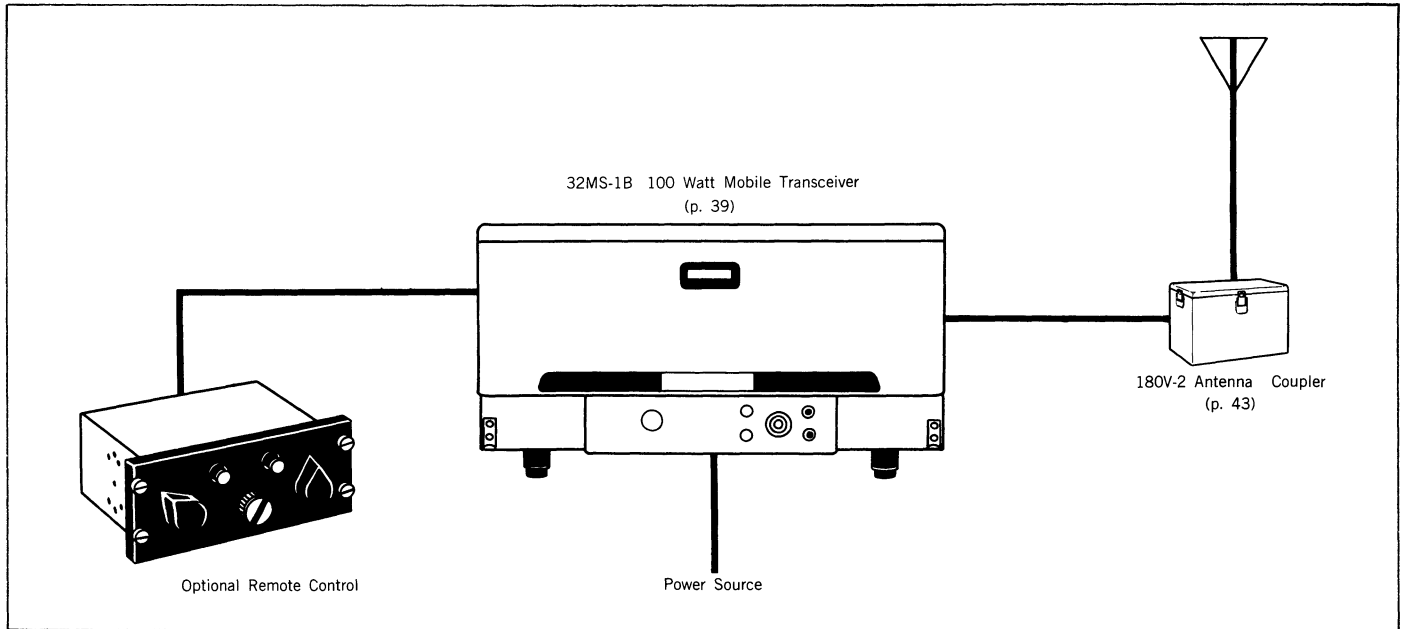
The VC-102 is a multipurpose communication system to meet varied tactical requirements. Automatic tuning insures on-frequency operation. The drip-proof transceiver case is watertight when nonoperating; the antenna coupler is watertight when operating, making the system suitable for a wide environmental range. Output power is 400 watts PEP or 100 watts in AM operation. A choice of 28,000 automatically tuned channels is provided over the 2.0-29.999 mc frequency range. Multiple unit construction allows easy installation in Jeeps, trucks, tanks, transportable shelters, as well as small boats or landing craft.



32MS-1B 100 Watt Mobile Transceiver

The 32MS-1B is a compact 100 watt PEP SSB transceiver with a choice of single sideband or compatible AM on any of four preset frequencies in the 1.6-15.0 mc range. Plug-in

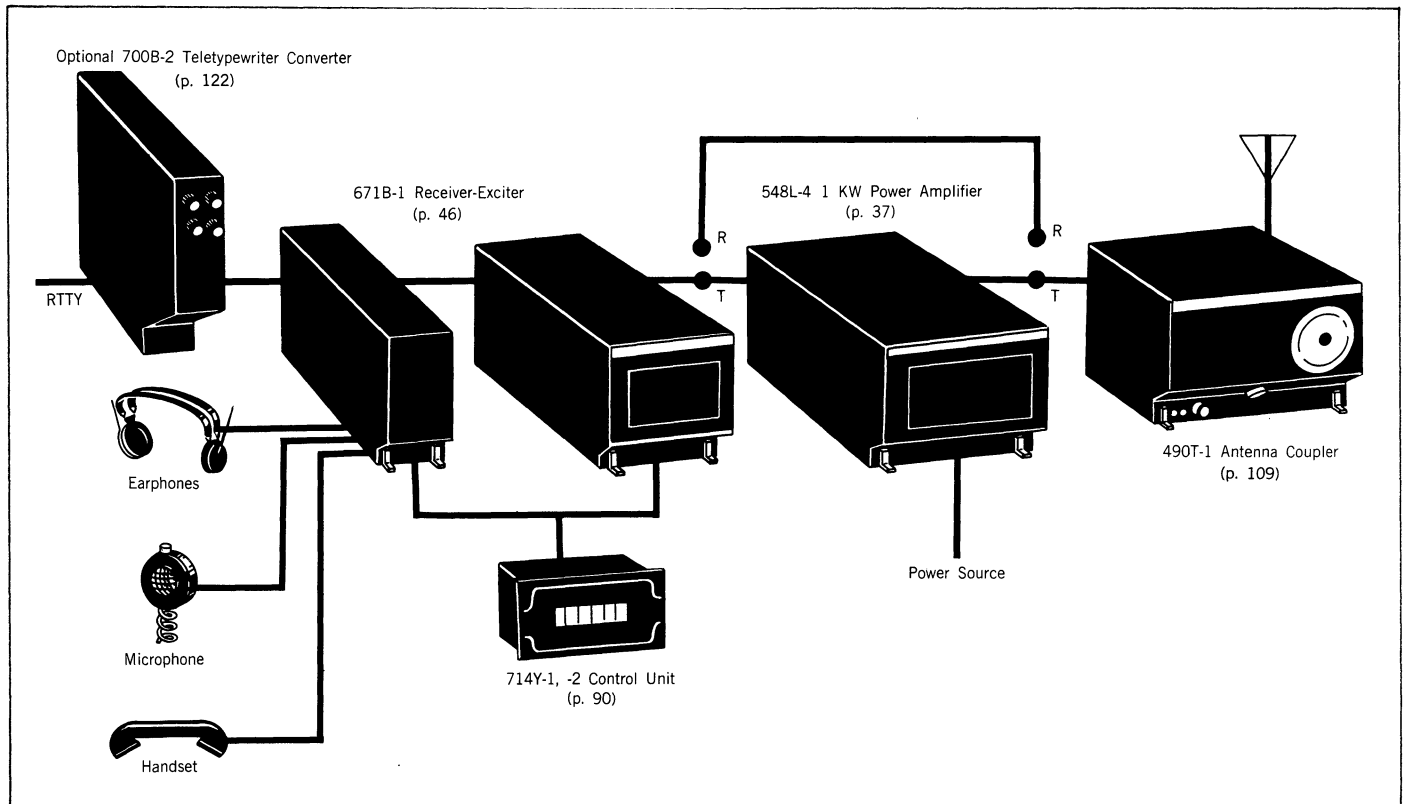
power supplies permit operation from either 12 v dc, 28 v dc or 115 v or 230 v, 50-400 cps sources. Three optional control unit styles will meet most installation requirements.



Universal Radio Group

The Collins Universal Radio Group equipment provides a mobile HF system of extreme installation flexibility. Specific system components can be selected to meet individual needs. Equipment can be chosen for a receiver, transmitter or trans-

ceiver to operate on either 28,000 or 280,000 automatically tuned channels in the 2.0-29.9999 mc frequency range. Mode choice includes USB, LSB, ISB, AM, optional FSK. Primary power can be 27.5 v dc or 120 v or 208 v, 400 cps, 3 phase.



VC-104 Vehicular HF-UHF Communication System

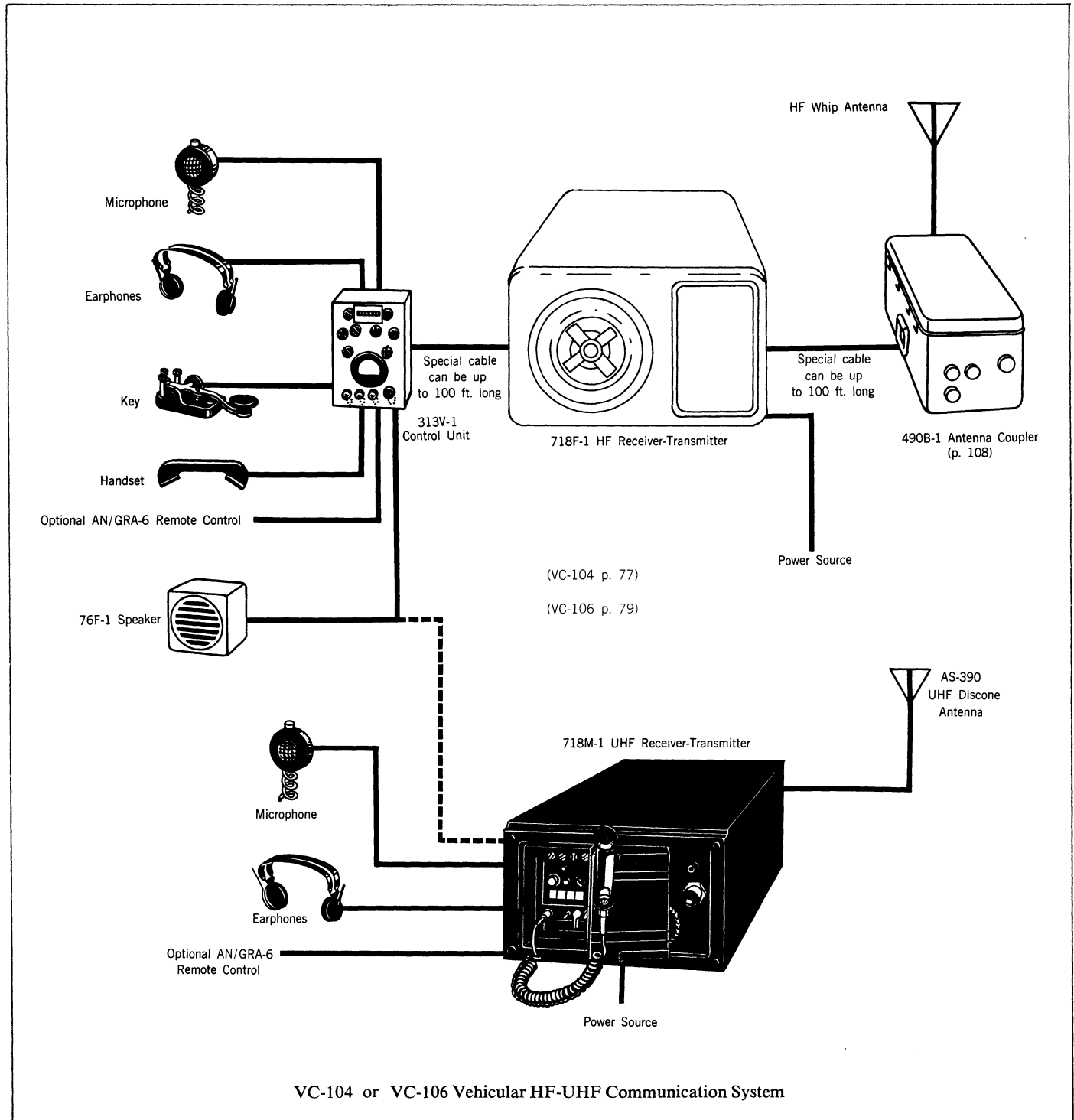
The VC-104 HF-UHF System is normally installed in a standard M38A 4 x 4 ¼-ton military vehicle. It provides 400 watts PEP or 100 watts in AM, CW and FSK on 28,000 au-

tomatically tuned channels in the 2.0-29.999 mc range. In UHF, output power is 20 watts in AM on any of 1750 100 kc increments in the 225.0-399.9 mc frequency range.

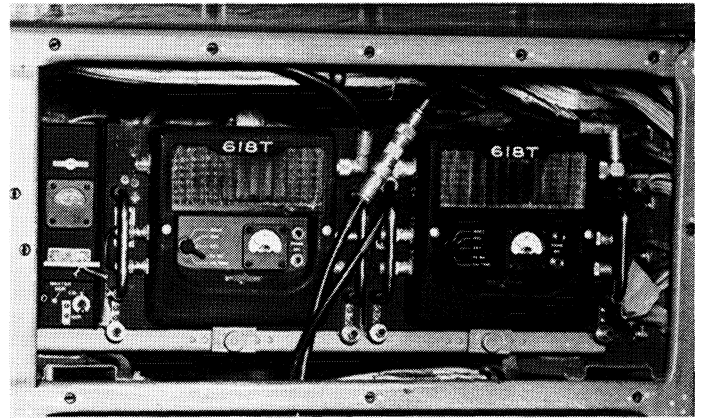
VC-106 Vehicular HF-UHF Communication System

The VC-106 HF-UHF System is designed for installation in a 4 x 4 ¼-ton M151 military vehicle. It provides 400 watts PEP or 100 watts in AM, CW or FSK on 28,000 automati-

cally tuned channels in the 2.0-29.999 mc range. In UHF operation, it has 20 watts AM power output on any of 1750 100 kc channel increments in the 225.0-399.9 mc range.



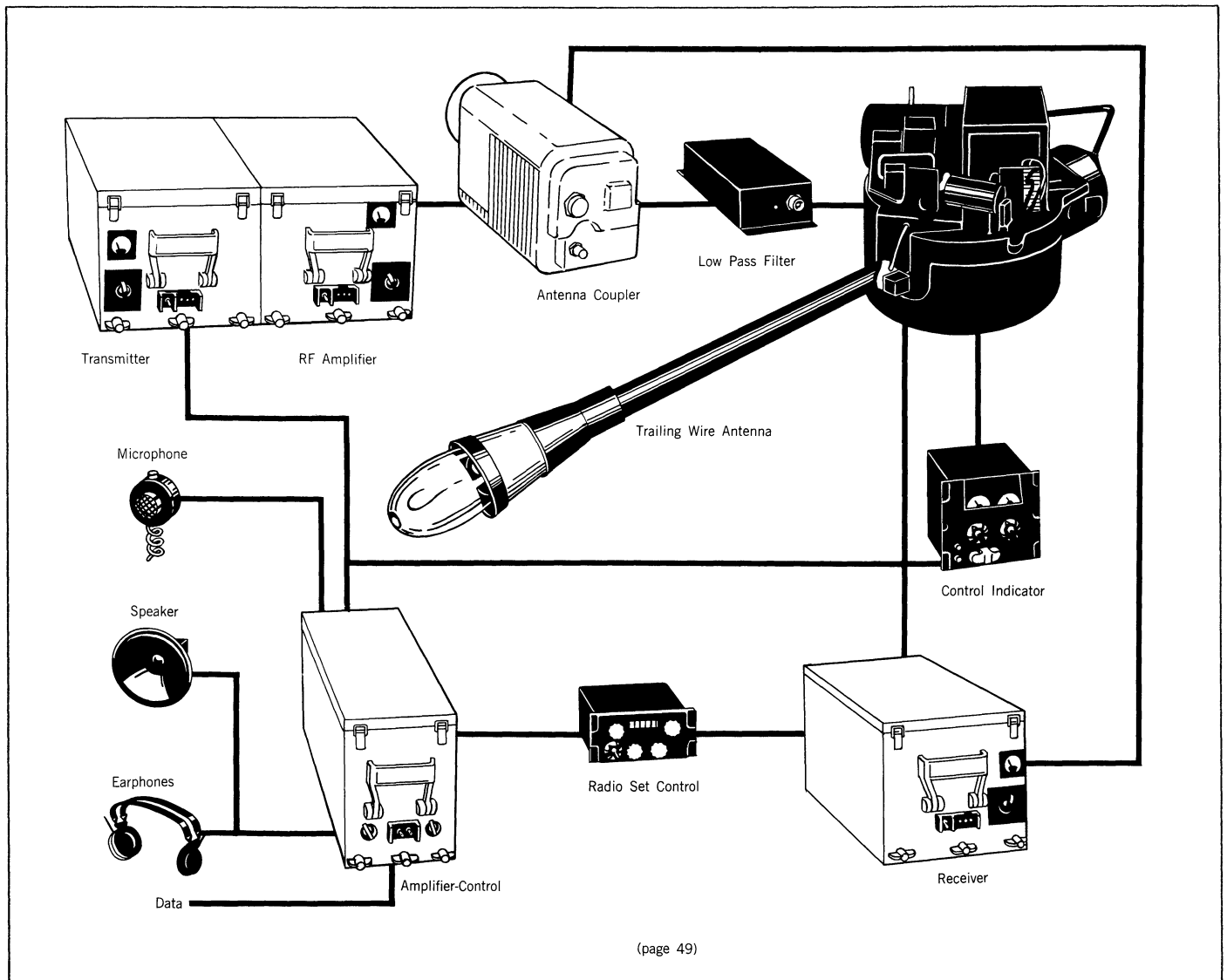
Airborne Systems



AN/ARC-80 Airborne HF Communication System

The AN/ARC-80 is an airborne single sideband system especially suited for data handling, as well as voice or CW communication. It offers a choice of LSB, USB or ISB modes on channels spaced 1 kc throughout the 2.0-29.999 mc range.

Transmit power is 900 watts PEP. An efficient trailing wire antenna for speeds up to 300 knots is adjusted automatically to the correct frequency. Frequency variation can be manually adjusted to zero with a received standard signal.

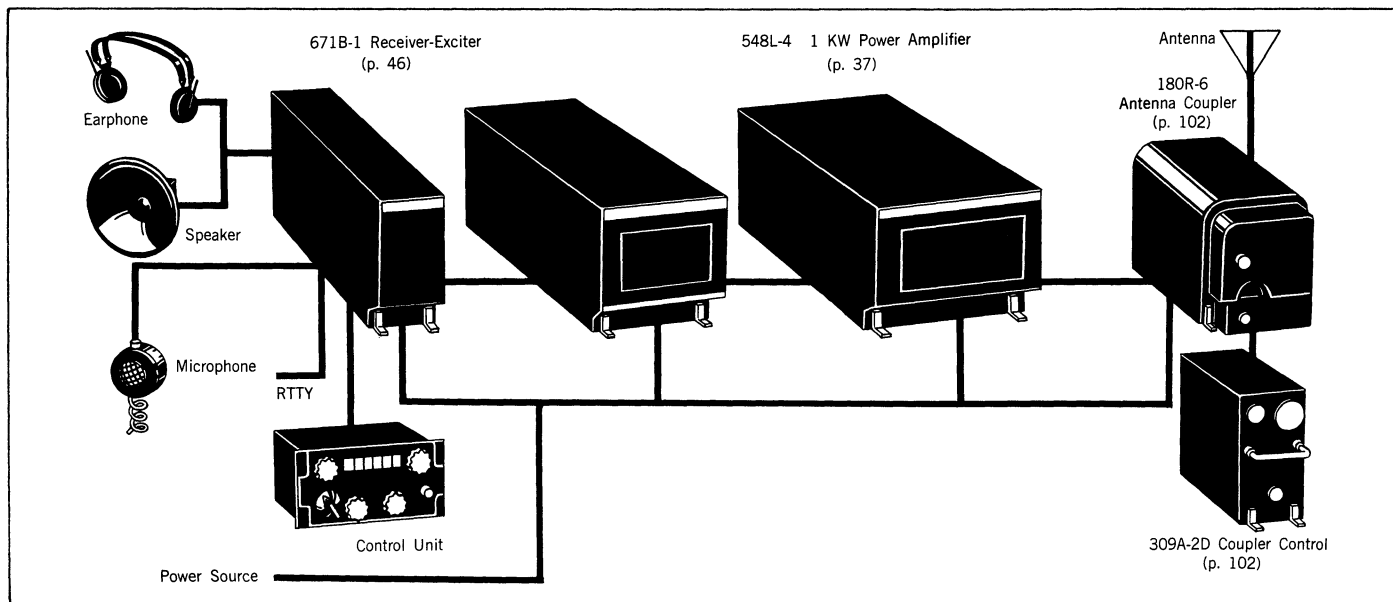


(page 49)

Universal Radio Group

The Collins Universal Radio Group offers a choice of operating modes and installation flexibility for airborne applications in the 2.0-29.9999 mc frequency range. A choice of either 1.0 kc or 0.1 kc channel increments is available. Modes of operation, implemented by plug-in circuit cards, include USB, LSB with 3 kc or 6 kc bandwidths, or AM. Power out-

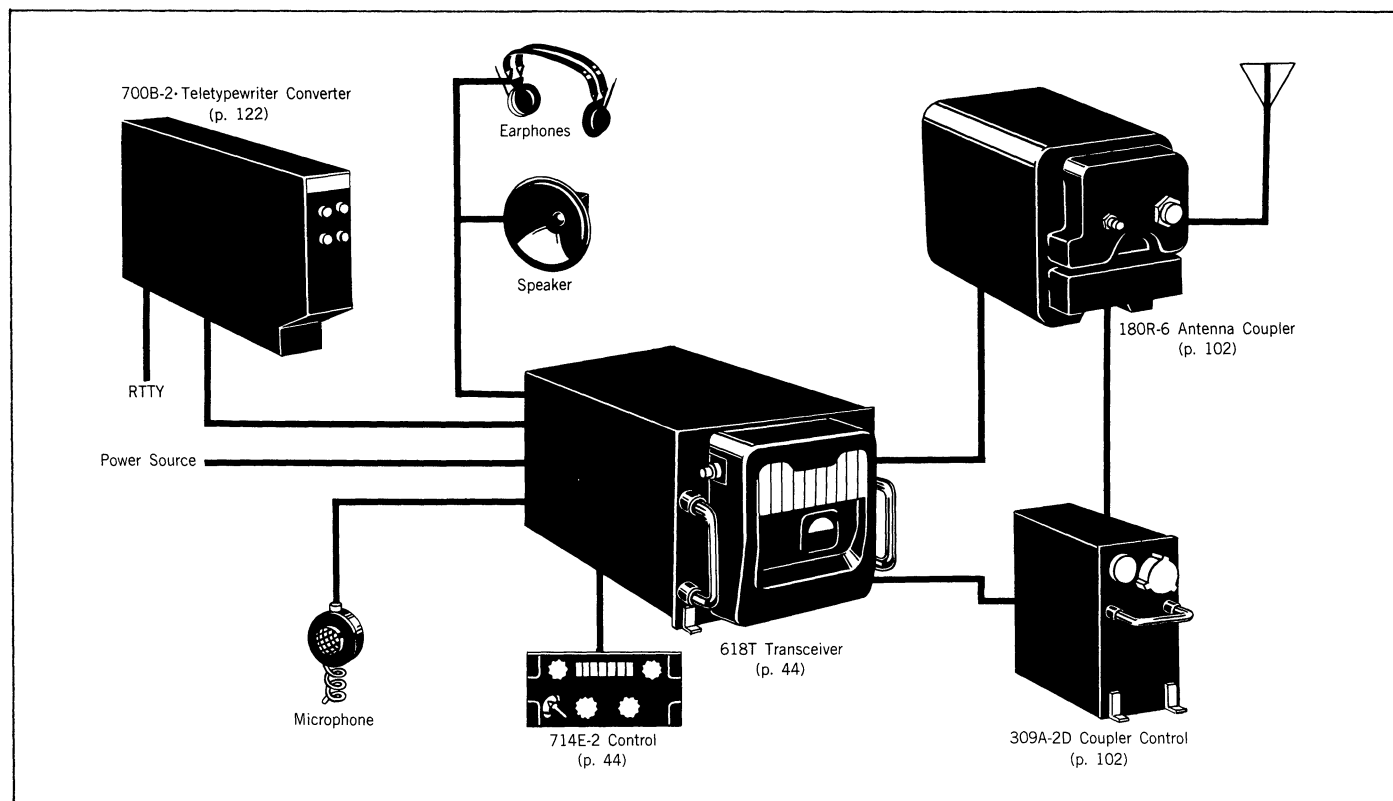
put is 1 kw PEP. Individual units are housed in ATR, ARINC Specification 404 cases. System control mounts in standard aircraft console. Primary power source can be 27.5 v dc; or 120 v or 208 v, 400 cps, 3 phase. Receive-only or transmit-only systems can be selected, as well as the transceiver shown below.



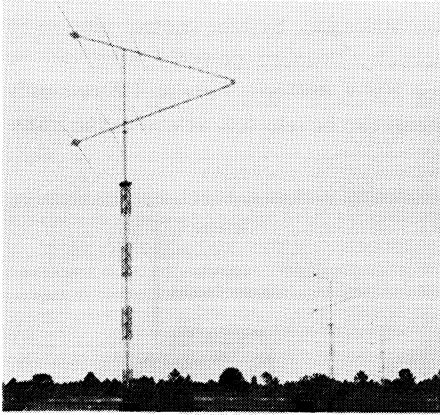
618T Transceiver

The versatile 618T provides 1 kc channel increments throughout the 2.0-29.999 mc range with 400 watts PEP out-

put on single sideband or 100 watts on AM, CW or FSK. A teletypewriter can be used with an optional converter.



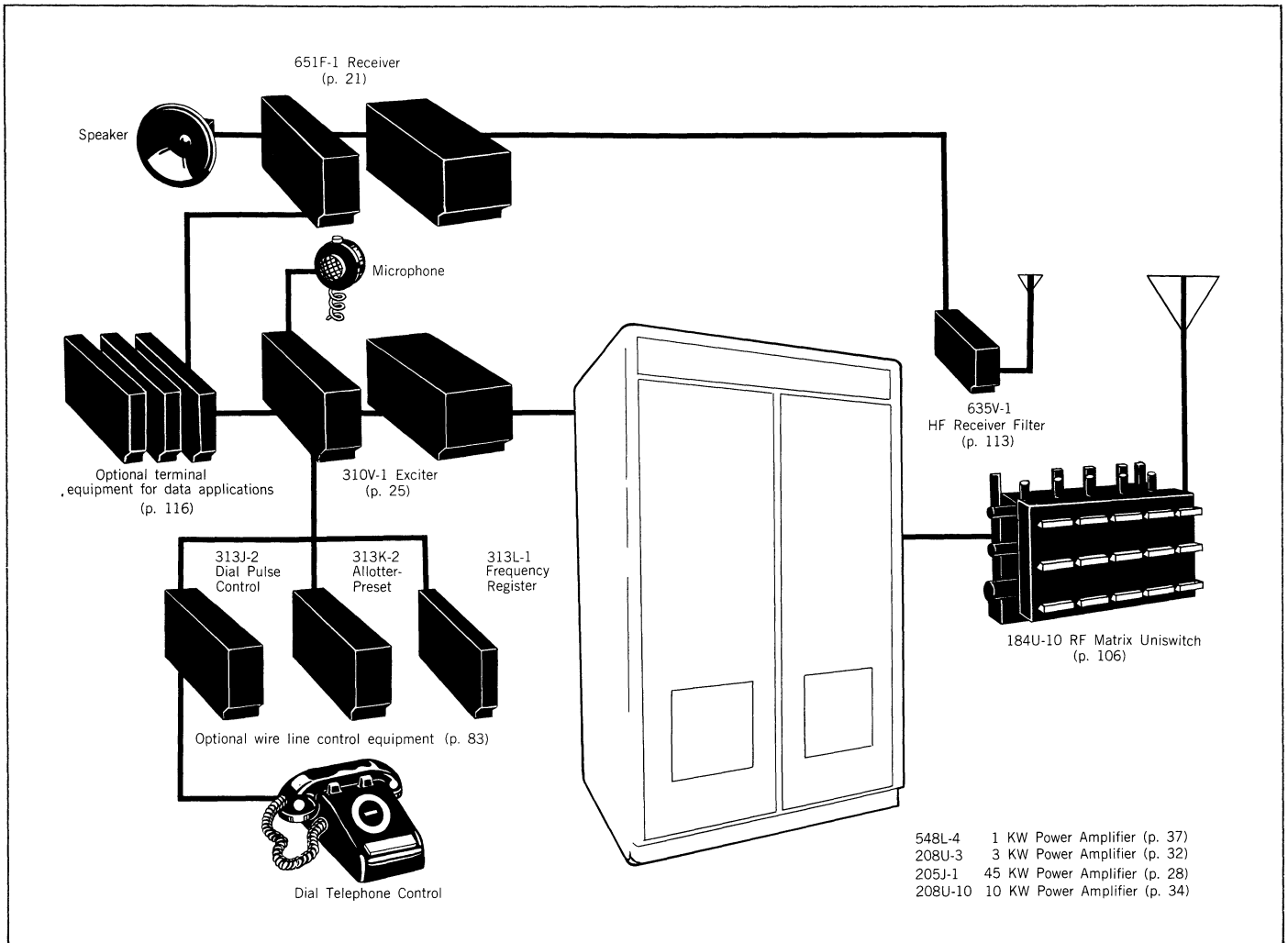
Fixed Station HF Communication Systems



Universal Radio Group

A wide choice of modular components can be selected to meet all HF communication requirements from single channel transceivers to complex data handling terminals which can be remotely controlled over ordinary telephone lines. Equipment can be chosen for a receiver, transmitter or transceiver operation with up to four multiplexed communication channels on a single channel frequency assignment. RF fre-

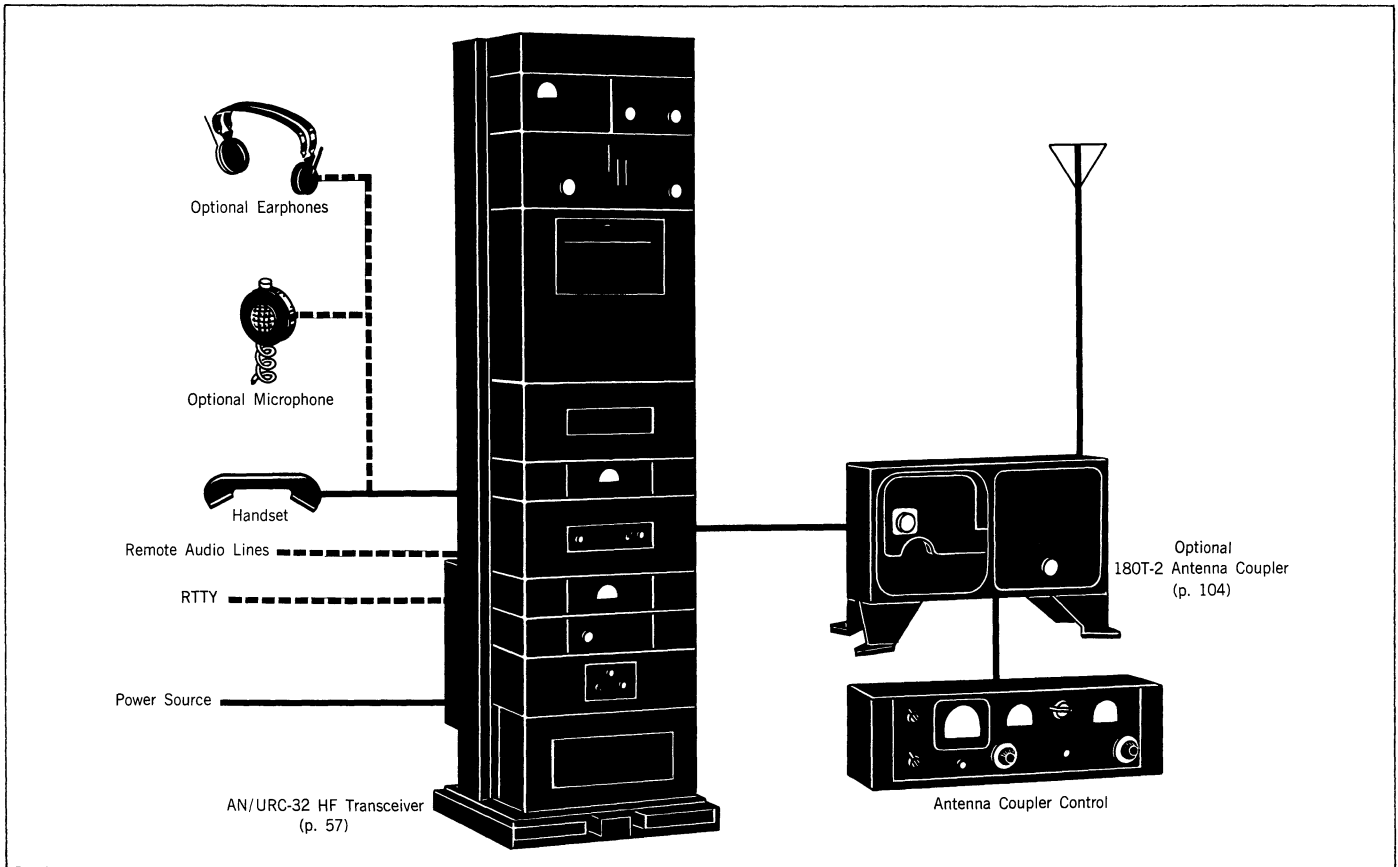
quencies can be selected in either 1.0 kc or 0.1 kc increments throughout the 2.0-29.9999 mc range. A choice of 1 kw, 3 kw, 10 kw or 45 kw power amplifiers, together with a variety of antennas to meet specific circuit path requirements, insures highly reliable communication. Accessories include antenna switching matrices, Kinesig® data modems, remote control equipment and selective calling systems.



AN/URC-32 Transceiver

The AN/URC-32 provides simplex operation in USB, LSB, both sidebands independently, AM, RTTY or CW modes over the 2-30 mc frequency range. It is manually tuned in 1 kc channel increments. Transmit power output is 500 watts

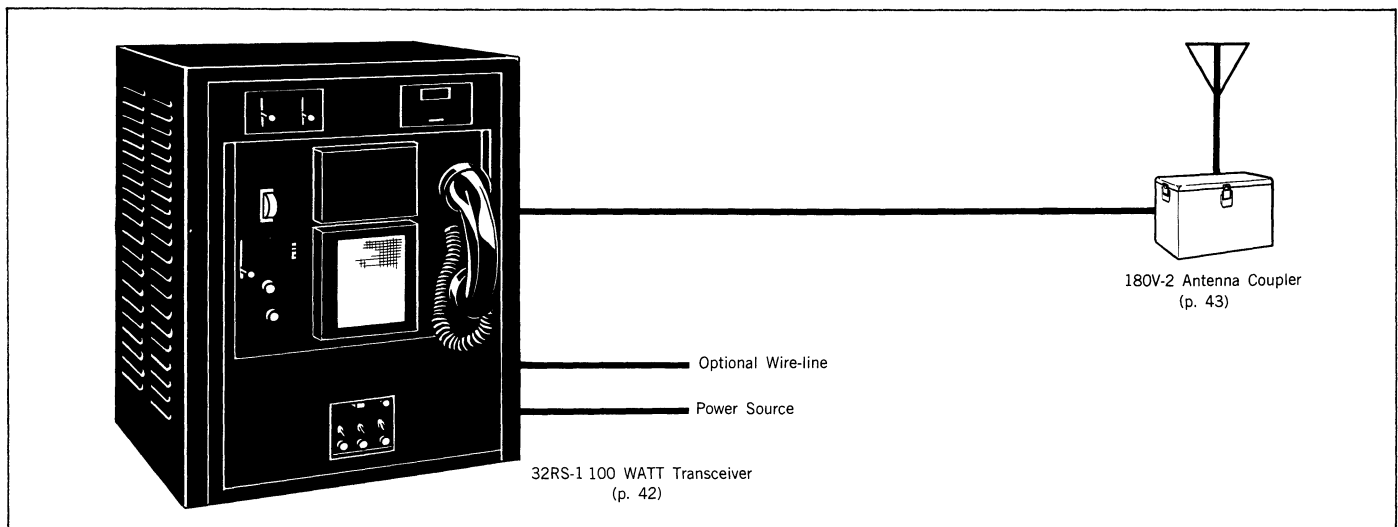
PEP in sideband or 125 watts carrier in compatible AM. It includes an integral, high stability frequency standard. The AN/URC-32 employs a standard 19" rack configuration which can be shockmounted in transportable installations.



32RS-1 100 Watt Transceiver

The 32RS-1 Transceiver has an output of 100 watts PEP on any of four preset channels in the 1.6-15.0 mc frequency range. It features VOX control and can be operated by non-technical personnel. Installation is very simple requiring only

an antenna and power source. An optional phone patch allows termination over wirelines. Other accessories include a directional wattmeter and an antenna coupler for either high or low impedance antennas.

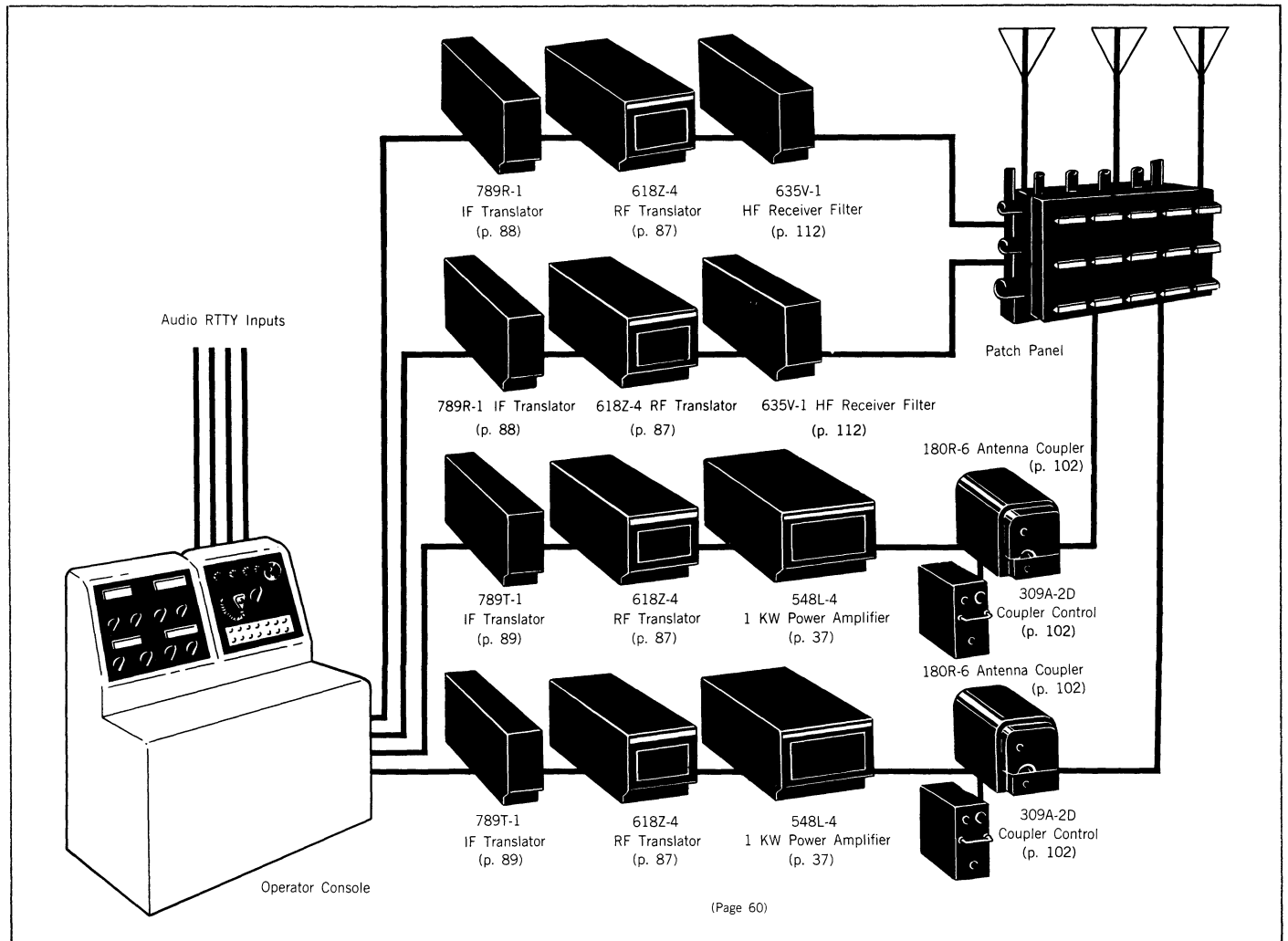


Transportable HF Communication Systems

ANNA-1 Air Transportable HF Communication System

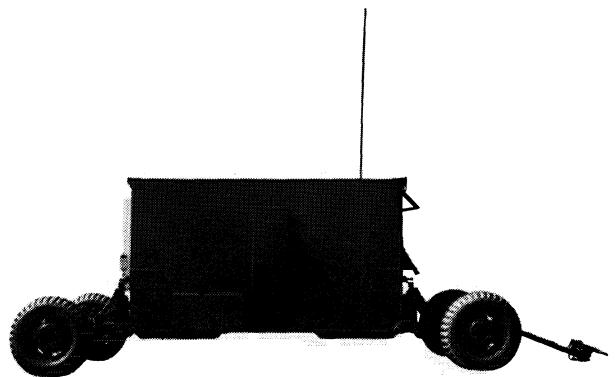
The ANNA-1 is a complete air transportable HF communication terminal, including a maintenance facility, housed in two S-141A/G style shelters. It provides either simplex or full duplex operation on two independent radio circuits, which are automatically tuned in 0.1 kc channel increments

throughout the 2.0-29.9999 mc frequency range. Choice of modes includes USB, LSB, ISB or AM. Voice frequency telegraph facilities may be employed. Basic system units are of the highly reliable Universal Radio Group type. Power is supplied by a 30 kw diesel generator.



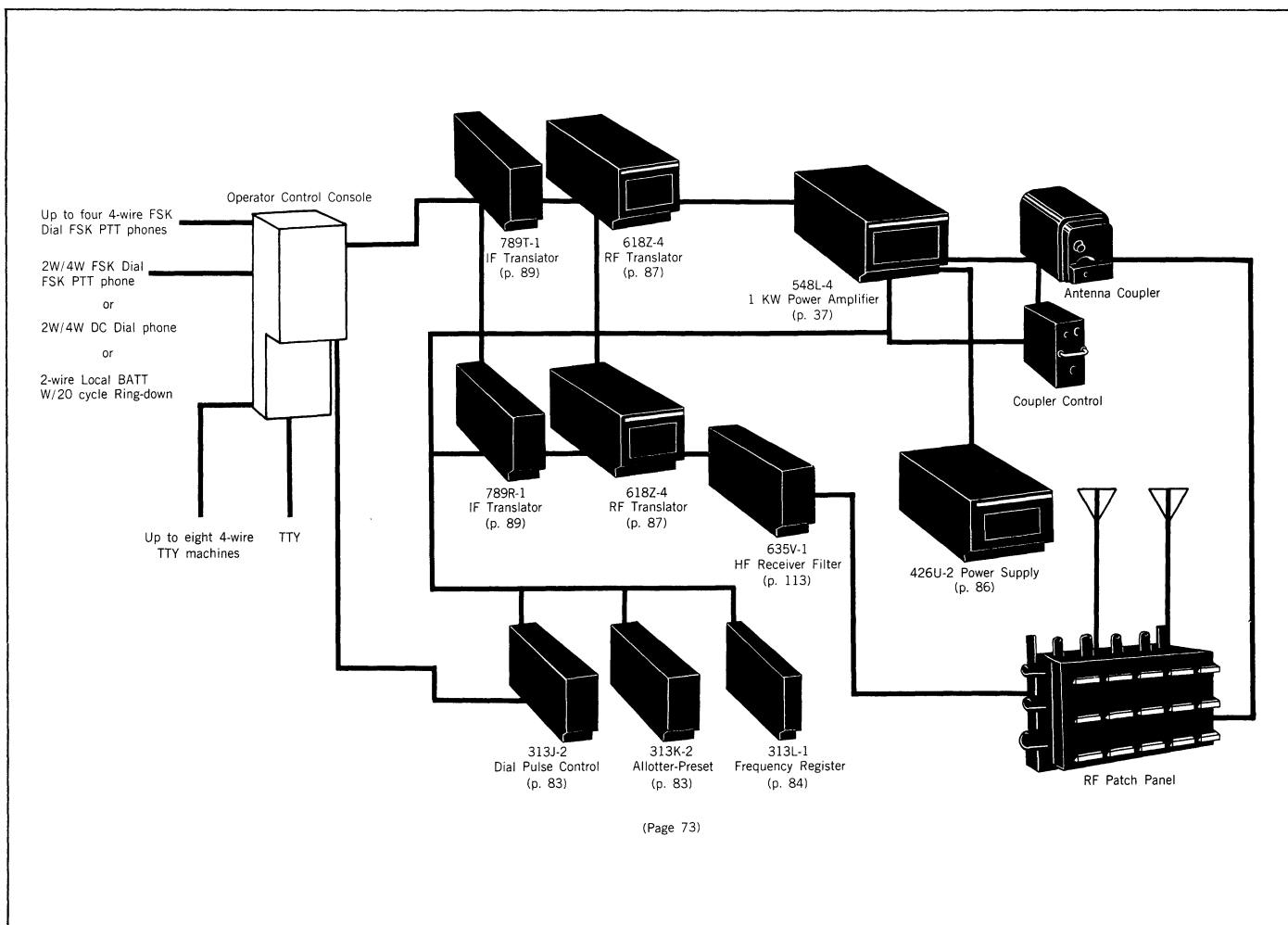
AN/TSC-38 Transportable HF Communication Central

The AN/TSC-38 is a transportable HF terminal housed in two mobile units. One S-141 shelter houses all radio equipment, and the second unit carries generators, antennas and ancillary equipment. It offers two simultaneous communication circuits with a 10 kw power output level which will handle 16 TTY and 3 voice channels, together with a 1 kw circuit for two TTY and three voice channels. The system can be automatically tuned to a new operating frequency in a maximum interval of 30 seconds. The 2.0-29.9999 mc frequency range is covered in 280,000 channel increments. Primary power is supplied by two 45 kw, 400 cps generator sets. Twelve 2- or 4-wire external subscriber circuits can also be accommodated. AN/TSC-38 radio system can be controlled from a remote location.

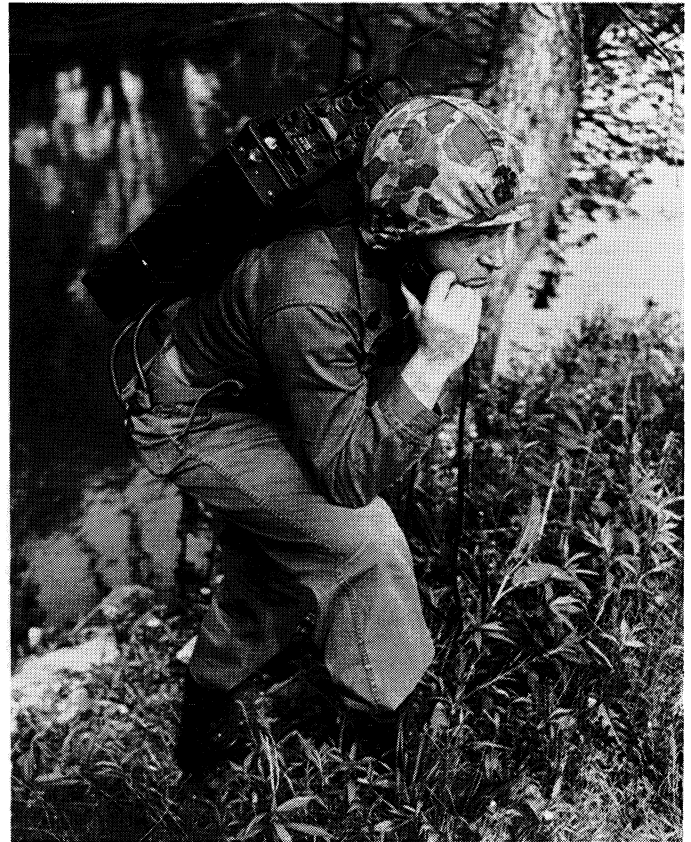


TCS-110-1 HF Communication Terminal

The TCS-110-1, easily transported by fixed-wing aircraft, helicopter or truck, is a full duplex HF terminal with cryptographic and limited message center capabilities. It is automatically tuned in 0.1 kc tuning increments over the 2.0-29.9999 mc frequency range. Transmit power output is 1 kw PEP average in SSB, CW, RTTY and compatible AM operational modes. It is housed in an S-144/G size shelter and operates from an external 120 v, 1 phase, or 208 v, 3 phase, 50-60 cps or 400 cps power source. Optional remote control facility by means of FSK dial pulses over a 2-wire or 4-wire telephone line. Five 2- or 4-wire external telephone lines or eight 4-wire, 60 ma neutral TTY lines can be accommodated. When used in duplex operation the receiver can be operated with only 10% frequency separation from the transmitter. The transmitter antenna is mounted on top of the shelter to minimize transmission line length, which reduces undesired radiation and loss. The receiving antenna is located at ground level a short distance from the communication terminal.

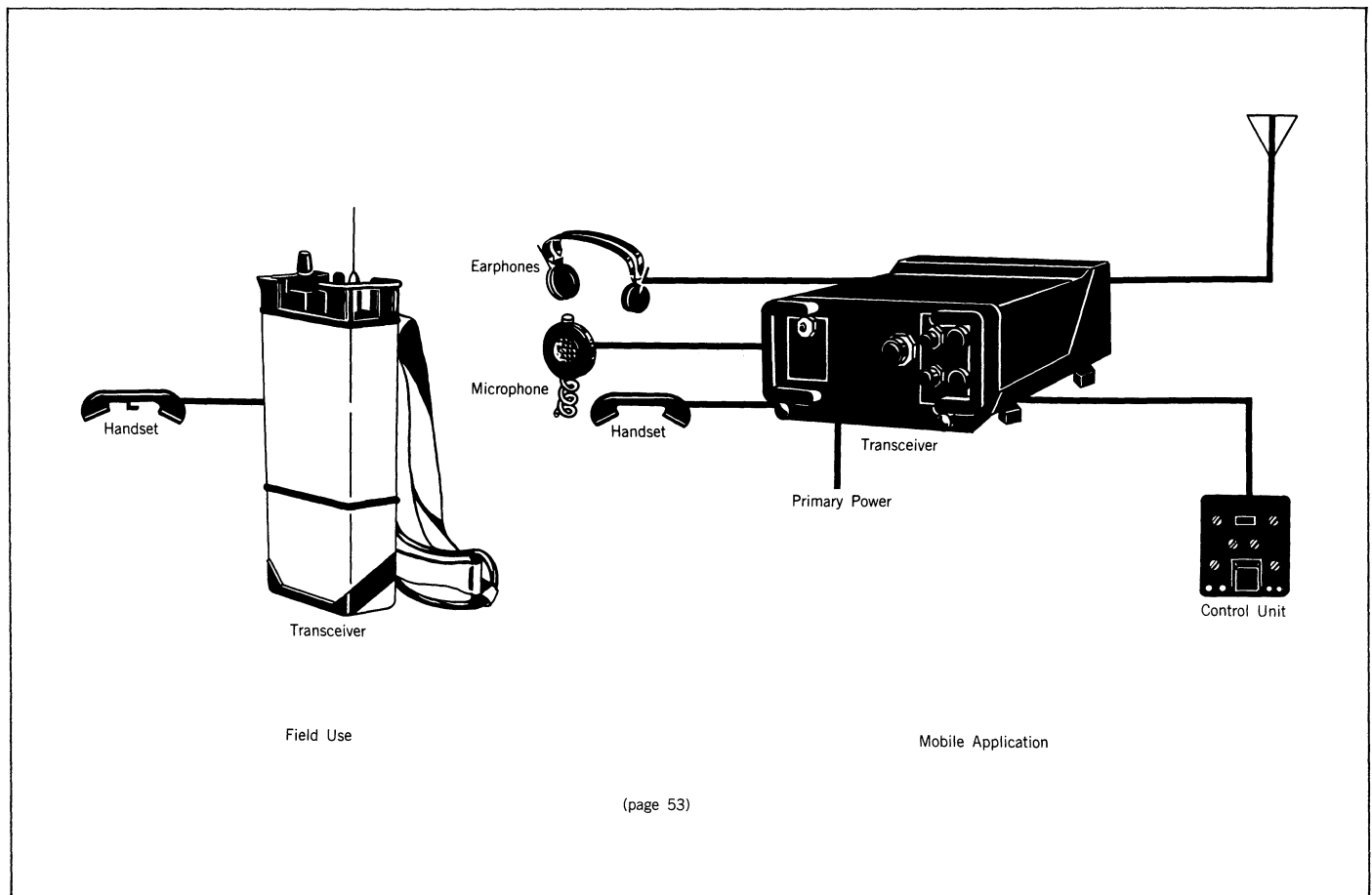


HF Pack Sets



AN/PRC-38 SSB-FM Man Pack Transceiver

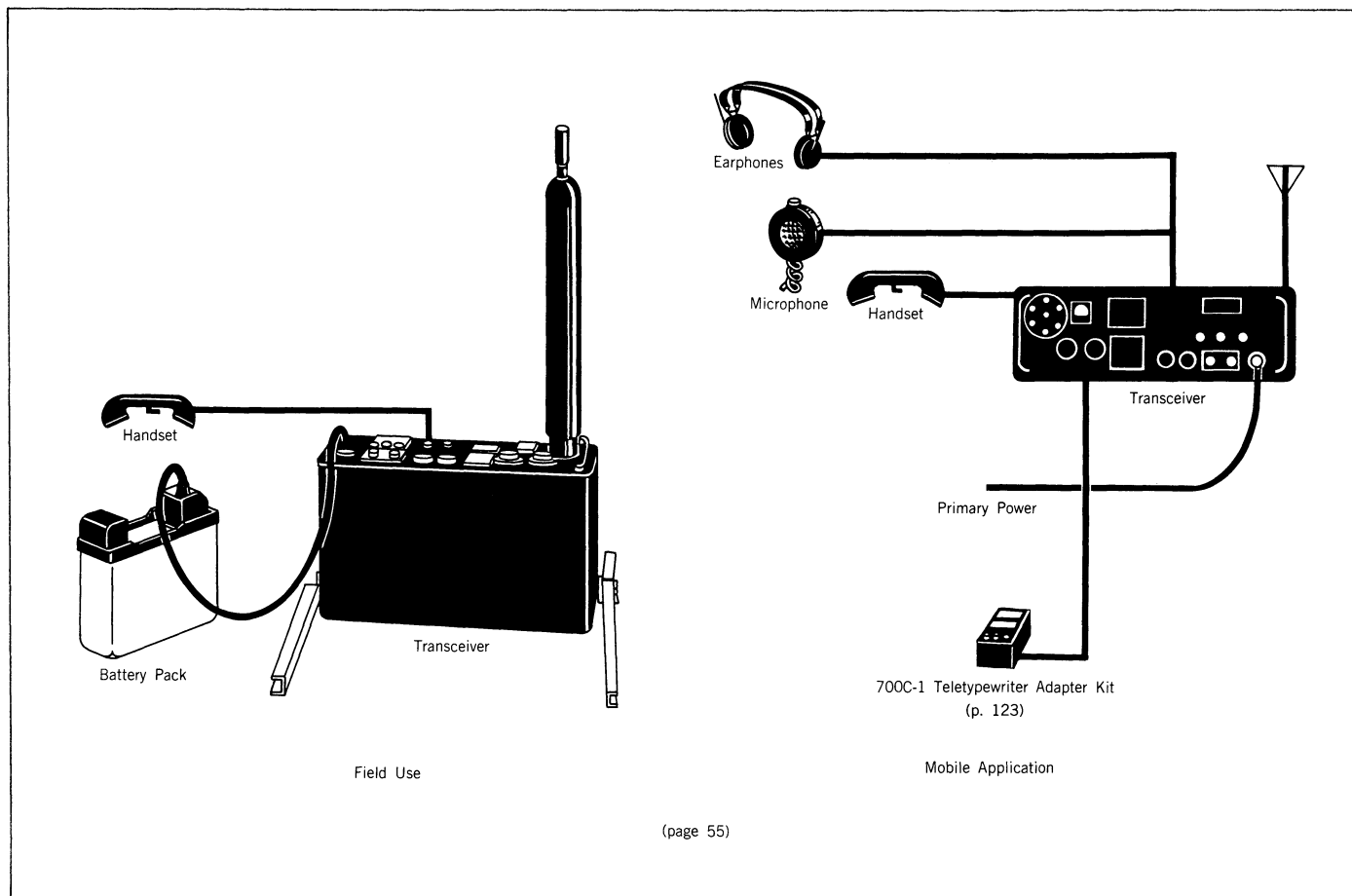
The AN/PRC-38 Transceiver, with 40 watts PEP output in SSB or 20 watts on FM over the 20.0-69.99 mc frequency range, is suitable for man pack, vehicular, aircraft, ship-board, or semifixed station applications. It fulfills a distinct need for compatible short range communication. In mobile installations, it will operate directly from the vehicle battery.





AN/PRC-47 Man Pack HF Transceiver

The AN/PRC-47 is a two-man pack transportable HF transceiver providing 100 watts PEP output on any one of the 10,000 channels in the 2.0-11.999 mc frequency range. Mode choice includes USB-voice, CW or optional FSK RTTY. A watertight case is available for storage or transit. Accessories are available for mobile or semifixed installations.



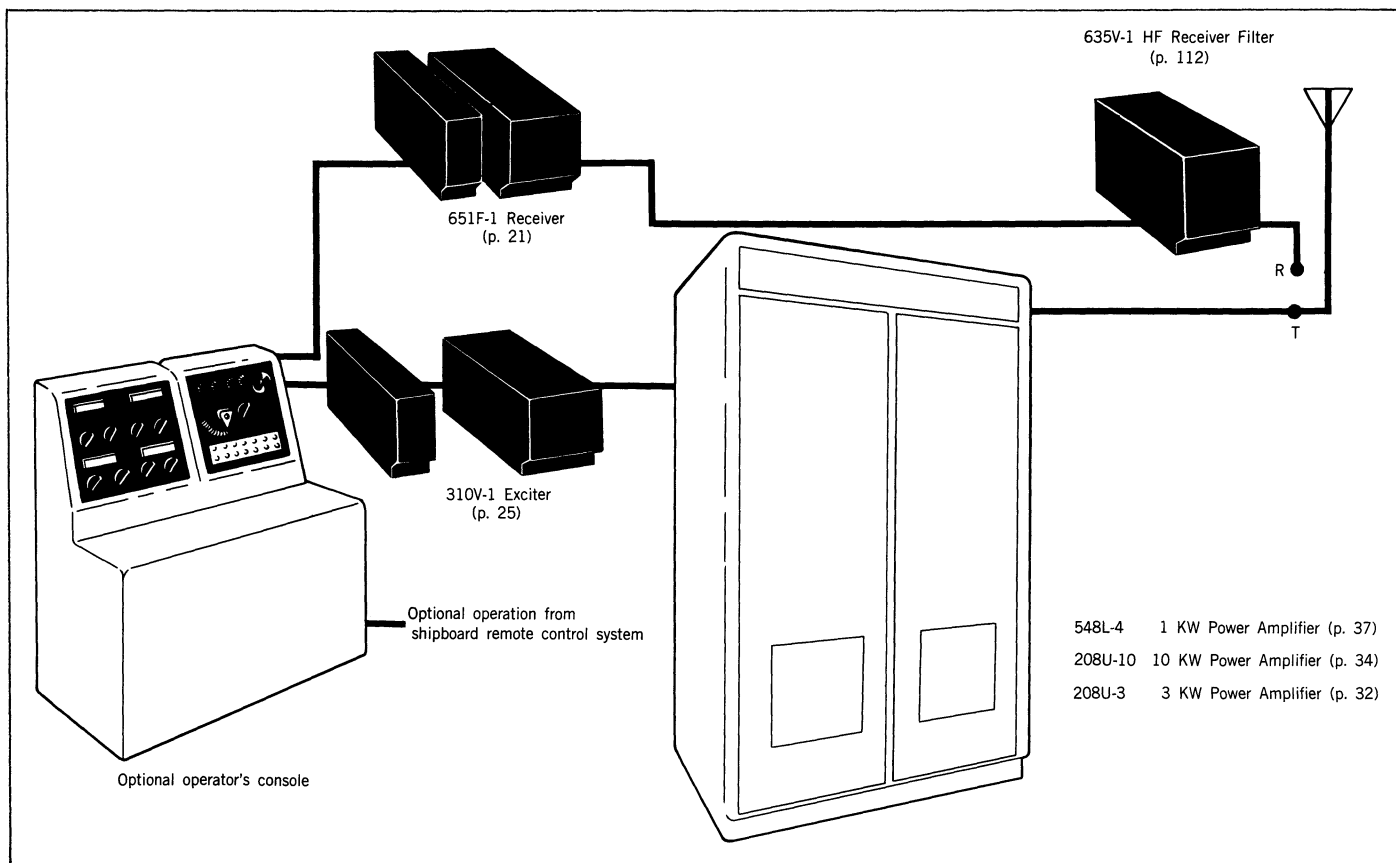
Shipboard HF Communication Systems



Universal Radio Group

The Collins Universal Radio Group offers an HF communication system to meet specific operating requirements, together with flexibility of installation by the selection of modular components. Equipment can be chosen for receive, transmit or transceive operation with up to four multiplexed

audio channels on a single frequency assignment, in the 2.0-29.9999 mc range. RF channel increments may be spaced either 1.0 kc or 0.1 kc. A choice of 1 kw, 3 kw or 10 kw power amplifiers is available. Accessories include switchboards, antenna switching matrices, racks and RTTY converters.

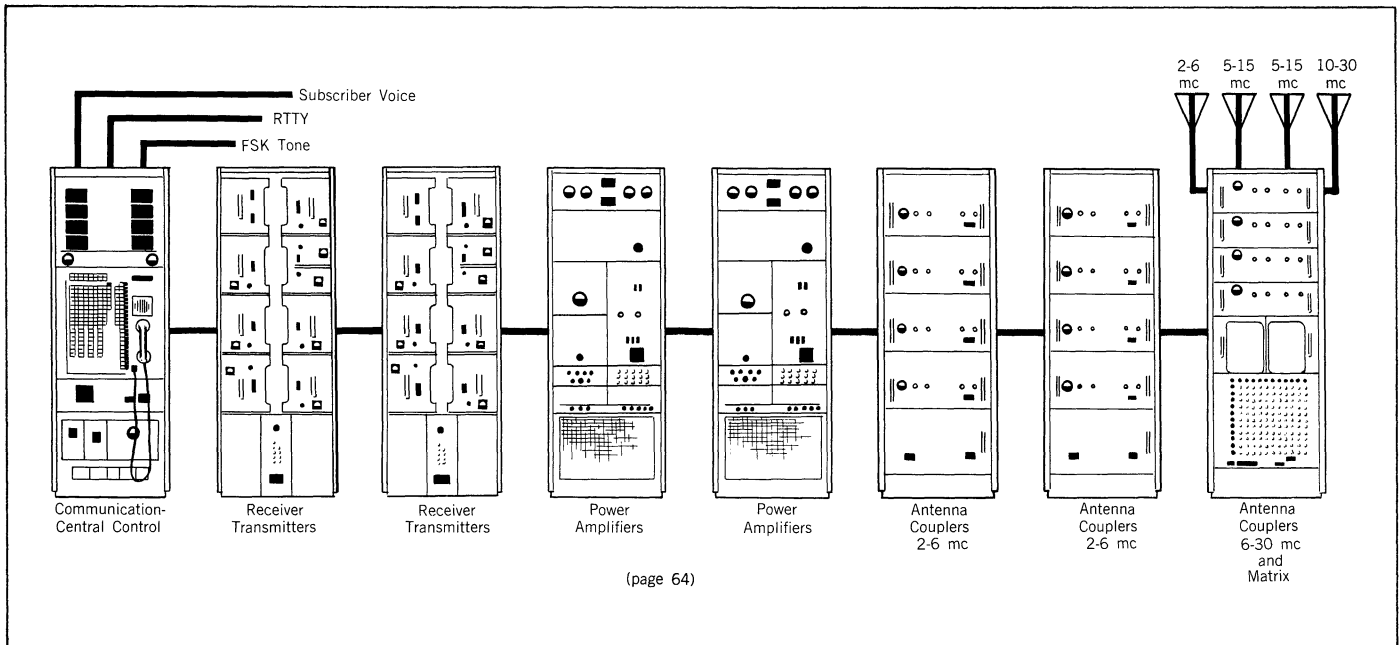




AN/SRC-16 Shipboard HF Communication System

The AN/SRC-16 provides long range, high capacity communication in the 2-30 mc frequency range. Modes of operation include data, SSB, AM, FSK and CW, any of which can be used on four independent transmit and receive channels. The system includes two 5 kw power amplifiers which

can be switched into any two channels in lieu of the normally used 500 watt amplifiers. Tuning is completely automatic in 1 kc channel increments. An independent frequency standard maintains the system stability at one part in 10^8 per 30 days. Integral test facilities simplify system maintenance.



AN/SRC-23 Shipboard HF Communication System

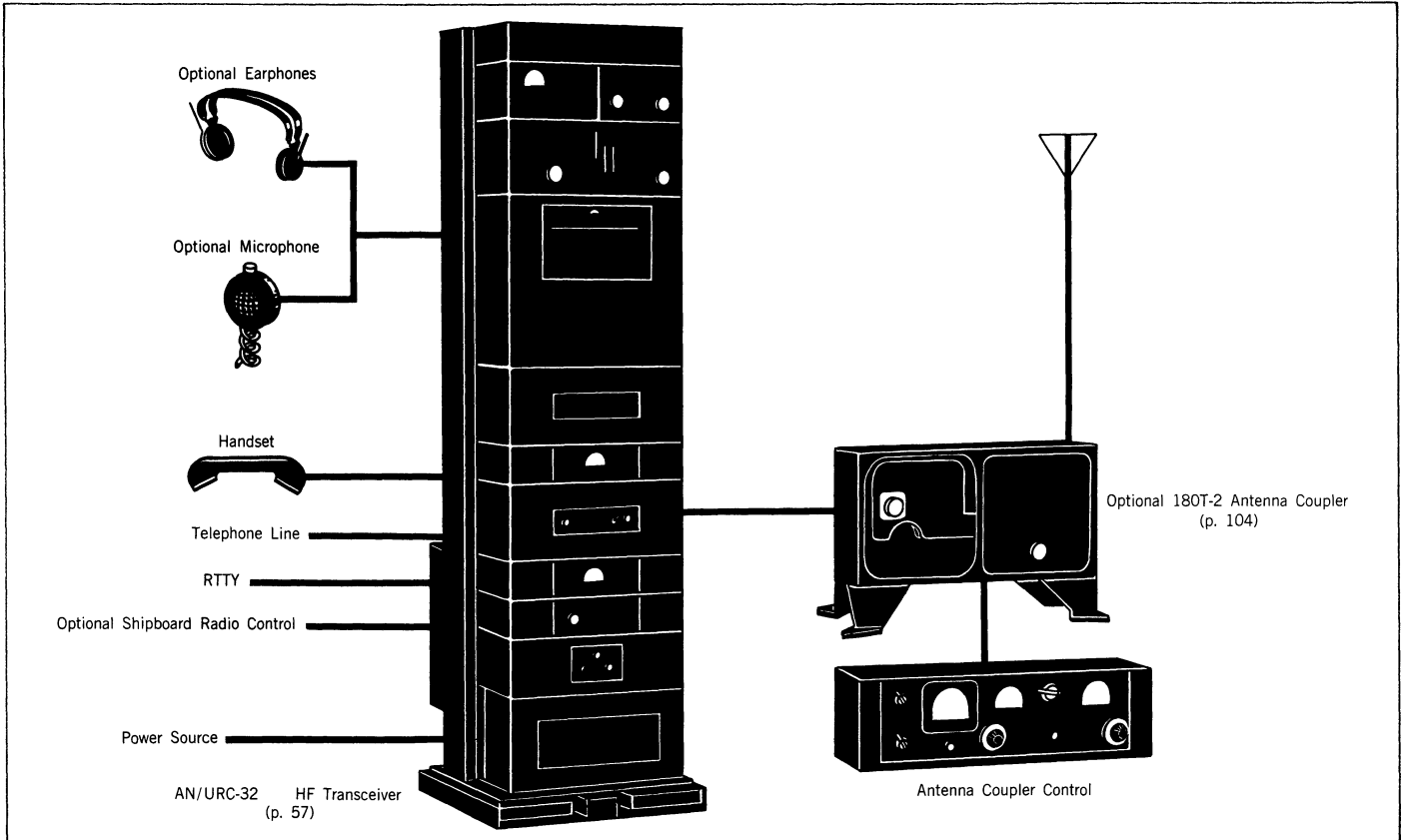
The AN/SRC-23 is a single channel facility which uses the same basic subunits as the AN/SRC-16 system. It provides reliable communication on any of 28,000 automatically tuned channels in the 2-30 mc range. Output power is 500

watts PEP or 500 watts average. Modes of operation include data, either SSB or AM and voice, FSK or CW. The AN/SRC-23 meets all complex data transmission and reception requirements.

AN/URC-32 HF Transceiver

The AN/URC-32 is well suited to shipboard installation by use of an optional integral rack shockmount. It provides simplex operation in USB, LSB, both sidebands independently, AM, RTTY or CW modes over the 2-30 mc frequency range in 1 kc channel increments. An illuminated, digital dial which

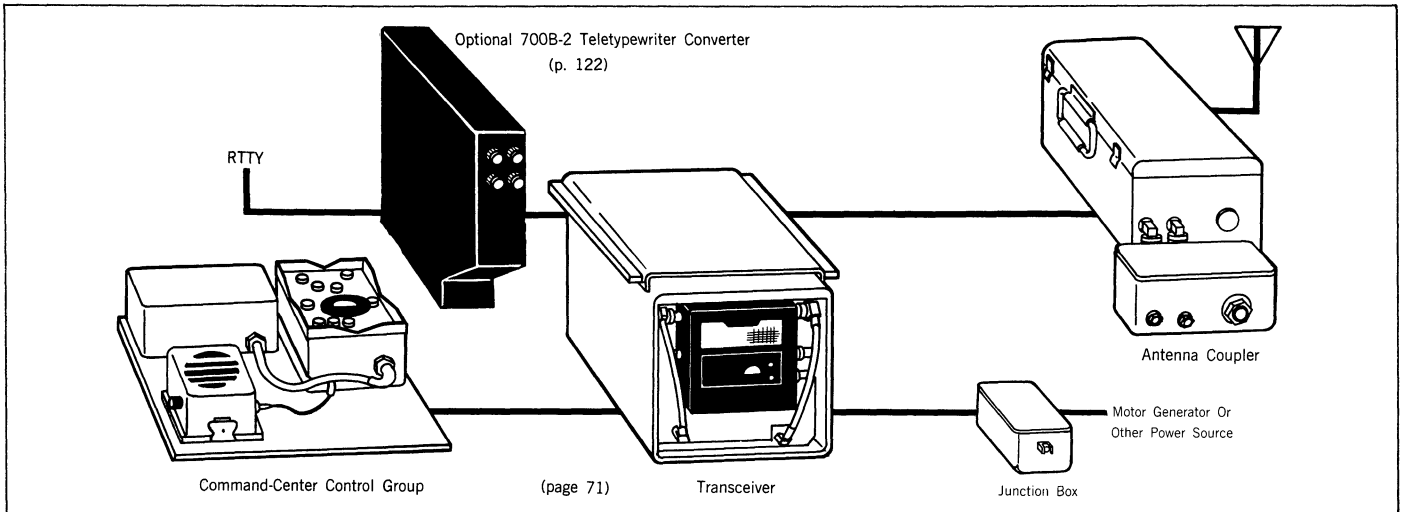
directly indicates operating frequency greatly simplifies tuning. Transmit power output is 500 watts PEP in sideband, or 125 watts carrier in compatible AM. An integral transistorized standard insures excellent frequency stability. A comparator permits frequency checks with an external standard.



HF-105, -106, -107, -108, -109 Shipboard HF Systems

These multiple purpose shipboard systems feature ease of installation, operation and maintenance with optimum tactical communication range for small boats, landing craft or ships. Transmit power is 400 watts in sideband operation or 100 watts in AM, CW or optional FSK, on any of 28,000

channels in the 2.0-29.999 mc frequency range. Automatic tuning is initiated by a separate control unit which indicates channel frequency directly and can be located in the command center. Complete operation of the system requires no technical background.



Receivers

RECEIVER

51S-1 Communication Receiver

R-1122 / GR (51S-1), R-1156 / GR (51S-1F)



51S-1F

Features

Ruggedness
Operational Simplicity
Tuning Accuracy
Sensitivity
Selectivity
Stability

Applications

SSB
AM
CW
RTTY
Facsimile
Laboratory Measurement

The 51S-1 is a professional single sideband communication receiver providing continuous coverage from 2-30 megacycles. A high degree of sensitivity, selectivity, stability and tuning accuracy insures superior performance in SSB, CW, FSK and AM modes of operation.

The versatile 51S-1 Receiver is installed in a wide variety of military and commercial applications throughout the world.

Examples of typical installations are:

1. Fixed station communication and monitoring
2. Airborne communication and monitoring
3. Mobile communication (vehicular)
4. Shipboard communication and monitoring
5. Laboratory measurements

There are two configurations of the 51S-1 — one for cabinet mounting and the other for conventional 19" rack mounting. The rugged, compact, lightweight construction makes it possible for the receiver to be easily transported in a lightweight carrying case.

Different versions of the receiver are available for operation

from either ac or dc power sources. The ac version will operate from 50-400 cycle power. The dc version operates from 26.5 v dc.



51S-1 in cabinet

Optional filters are available to suit a variety of bandwidth requirements. Separate Mechanical Filters for each sideband eliminate the necessity for oscillator shifting.

Highly selective Q multiplier rejection tuning enhances operation in the presence of interfering signals. Since no crystal filter is required, the problem of filter ringing is eliminated.

Nominal frequency drift after warm-up is less than 100 cps per week at normal room temperatures. The 51S-1 can be used in unattended RTTY operation.

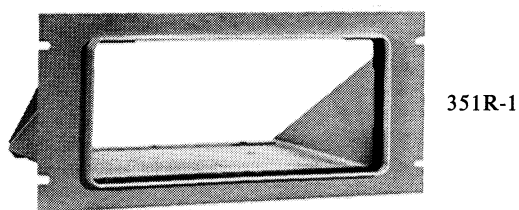
The 2-30 mc range is covered in 1 mc bands. The tuning dial mechanism has been designed with minimum reflected torque for smooth, effortless, finger-touch tuning. The counter-type dial indicates frequency directly. Linear dial calibration provides 7.8 ft. of bandspread for each megacycle

of coverage. Band change time is five seconds average and dial tuning from end to end requires only ten seconds average. The AGC system uses fast attack and slow release time constants for optimum SSB operation.

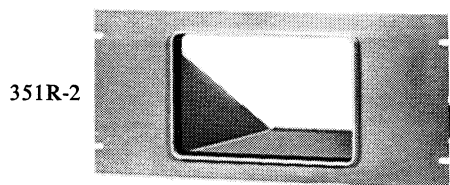
In addition to its normal communication functions, the 51S-1 provides coverage from 200 kc to 2 mc. While this coverage is not considered suitable for communication purposes, it is most useful in laboratory measurements. It is especially suited for investigation of SSB balanced modulator outputs, low IF exciter and receiver frequencies and low frequency mixer schemes.

The 51S-1, mounted in a desk top cabinet, operates from 115 v or 230 v, 50-400 cps power source. The 51S-1A is identical except it is supplied for 26 v dc operation. The 51S-1F, for mounting in a standard 19" RETMA rack, operates from a 115 v or 230 v, 50-400 cps power source, and the 51S-1AF from 26 v dc.

Accessories



351R-1



351R-2

351R-1 and 351R-2 RACK MOUNTS

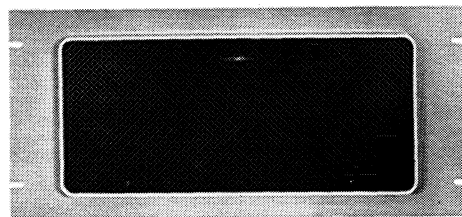
The 351R-1 can be used to mount a desk top style 51S-1 in a standard 19" (48.26 cm) rack. The 351R-2 will accommodate a 312B-3 speaker. Each is 8 $\frac{3}{4}$ " (22.23 cm) high and front panels have slotted mounting holes.



312B-3 CABINET SPEAKER

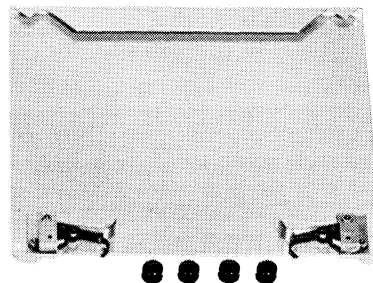
The 312B-3 is housed in an attractively styled cabinet which matches the 51S-1 Receiver. It contains a 5" x 7" speaker and is complete with connecting cable.

Impedance: 4 ohms. *Size:* 10" W, 7 $\frac{3}{4}$ " H, 8" D (25.4 cm W, 19.69 cm H, 20.32 cm D). *Weight:* 4 lbs. (1.81 kg).

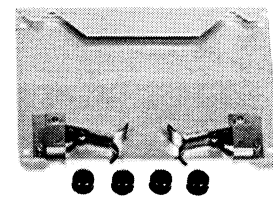


312C-1,-2,-3 PANEL MOUNTED SPEAKERS

For rack mounted receiver assemblies. Single, dual or triple speaker groupings. Panel size is 19" W, 8 $\frac{3}{4}$ " H (48.26 cm W, 22.23 cm H).



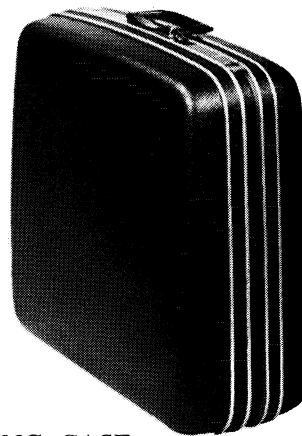
351E-4



351E-3

351E MOUNTING PLATES

The 351E can be used to secure the 51S-1 or 312B-3 equipments to bench or table in shipboard, airborne or vehicular installations. The 351E-3 will mount the 312B-3 Speaker. The 351E-4 has two snap-in clamps for secure installation of the 51S-1. The equipment can be easily unclamped for removal without the use of tools. The unit is removed by pulling forward and lifting.



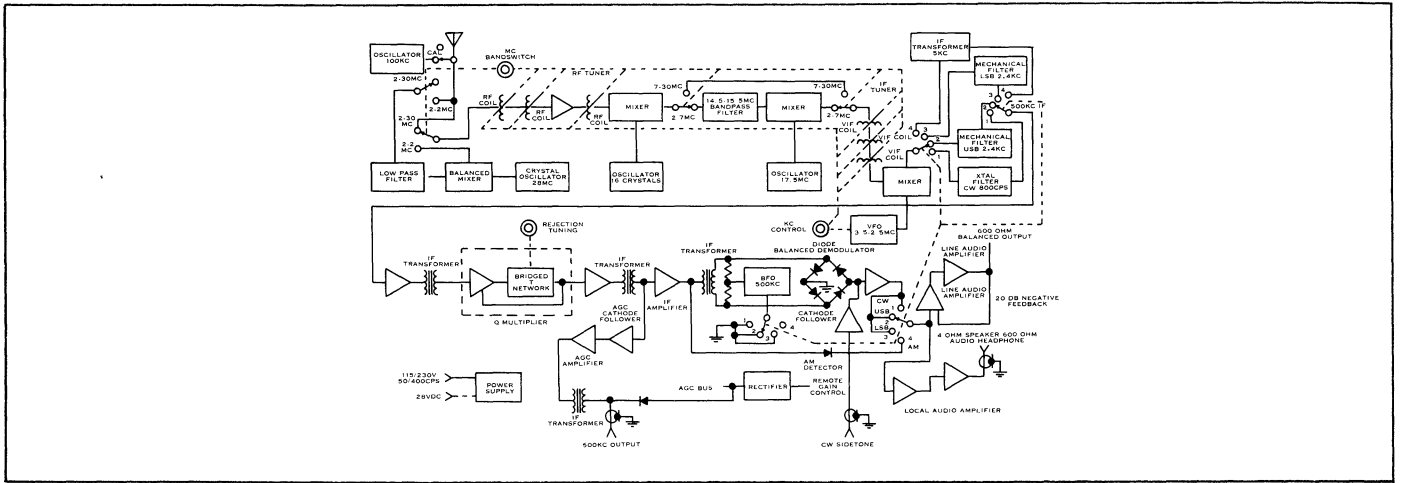
CC-2 CARRYING CASE

The CC-2 is designed to hold the components of a portable Collins SSB or CW station. The 51S-1 can be transported in the case. The CC-2 is adapted from the Samsonite Silhouette and includes a shock-resistant molded interior for the equipment. The CC-2 weighs 9.5 lbs. (4.31 kg) empty.

HS-1 HEADSET

The model HS-1 is a 600 ohm headset complete with plug and rubber-cushioned earphones. The color is light gray.

Functional Circuits



Specifications

FREQUENCY RANGE: 2-30 mc continuous coverage; additional coverage from 0.2-2.0 mc for laboratory measurements. (Specifications do not apply below 2 mc.)

MODES OF OPERATION: USB, LSB, AM or CW (all bands).

CALIBRATION: 1 kc per dial division. Direct reading in megacycles and kilocycles (all bands).

TUNING: Frequency range, divided into linear 1 mc bands.

FREQUENCY STABILITY: After 90 minute warm-up, frequency stability will be nominally within 100 cps per week at normal room temperature.

SENSITIVITY: SSB and CW — 0.6 uv for not less than 10 db $S+N/N$ (2-30 mc). AM — 3 uv for not less than 10 db $S+N/N$ (2-30 mc).

SELECTIVITY: SSB — 300-3050 cps when using 2.75 kc Mechanical Filter; 300-2700 cps when using optional 2.4 kc Mechanical Filter (at 3 db points). CW — 800 cps or 300 cps, depending on filter used. AM — 5 kc using normal IF transformers or 6 kc with optional Mechanical Filter.

AGC TIME CONSTANTS: Rise time — 0.8 millisecond. Decay time — 0.1 second.

AGC CHARACTERISTICS: Audio output variation less than 6 db for RF inputs from 5-50,000 uv. Not more than 3 db change in audio output with RF signals from 50,000 uv to 1 v.

RF INPUT: 50 ohms unbalanced.

CROSS-MODULATION: Inputs for 10 db cross-modulation (2.30 mc).

Desired Signal (uv)	Interfering Signal uv Level and % of Frequency Removed		
	(1%)	(2%)	(4%)
5	25,000	100,000	300,000
50	50,000	150,000	800,000
500	100,000	300,000	1 v

SPURIOUS RESPONSE: Not less than 80 db (2-30 mc). Image rejection not less than 50 db (2-25 mc). Not less than 40 db (25-30 mc) measured at midband.

INPUT-OUTPUT METER: Input calibrated in decibels above AGC threshold. Output level calibrated for either 0 dbm or +10 dbm.

IF OUTPUT: 500 kc; 50 millivolts at 50 ohms.

AUDIO OUTPUT: 4 ohms and 600 ohms unbalanced 1.0 watt, distortion less than 10%. Separate 600 ohm balanced output for connection to telephone line, distortion less than 1.2% at 0 dbm.

FREQUENCY RESPONSE: SSB — Within 3.5 db, 300-3050 cps, line output; within 3.5 db, 350-3050 cps, local output (with optional 2.4 kc Mechanical Filter within 3.5 db, 300-2700 cps). AM — Within 6 db, 100-2500 cps, line output; within 6 db, 200-2500 cps, local output.

AMBIENT TEMPERATURE RANGE: 0°-50° C.

AMBIENT HUMIDITY: Up to 90%.

POWER REQUIREMENTS: 125 watts, 115 v ± 10%, or 230 v ± 10%, 50-60 cps; 400 cps operation with reduced hum specification at full audio output. For 26.5 v ± 10% operation, the internal ac supply unit is replaced by an optional dc unit.

REJECTION NOTCH: Not less than 40 db.

BFO: Supplied by 500 kc crystal.

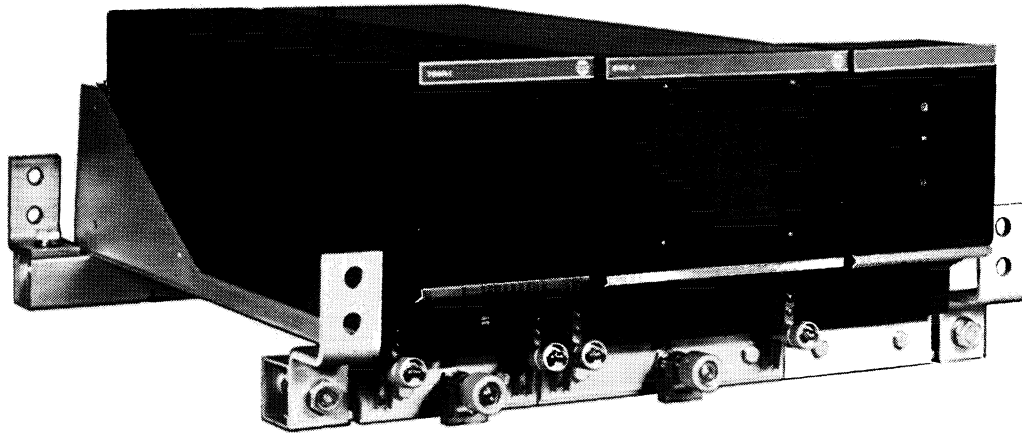
SIZE AND WEIGHT:

	Size			Weight (approx.)
	W	H	D	
Rack mounted	19"	8 ³ / ₄ "	13 1/64"	26 lbs.
	48.26 cm	22.23 cm	33.06 cm	11.8 kg
Cabinet mounted	14 ³ / ₄ "	6 9/16"	13 1/64"	26 lbs.
	37.47 cm	16.67 cm	33.06 cm	11.8 kg

Related Equipment

Antennas, p. 92-99

651F-1 universal radio group Receiver



Features

Automatic Tuning
Compact Packaging
Telephone Compatibility
Installation Flexibility
Remote Operation

Applications

Fixed Station
Transportable
Shipboard
Mobile

The 651F-1 is a shelf mounted receiver covering the 2.0-29.999 mc frequency range in 28,000 1.0 kc channel increments or 2.0-29.9999 mc in 280,000 0.1 kc increments. Modes of reception include a choice of upper sideband, lower sideband, independent sideband (separate channels on each sideband), four channel multiplex, conventional AM or compatible AM with AFC. Bandwidths of 3 kc or 6 kc are optional. The 651F-1 is part of the Collins Universal Radio Group of building block equipments, which can be selected to meet a wide range of communication requirements.

SYSTEM APPLICATION

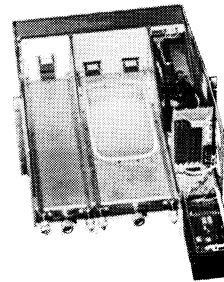
The 651F-1 URG Receiver is suitable for continuous operation in fixed station, transportable, mobile or shipboard communication systems. A simplified automatic tuning system permits control from a local shelf or console mounted unit or a dial pulse remote arrangement over telephone lines. The channel frequency can be phase locked to the internal 100 kc standard or to an external standard. Automatic frequency control can be employed to allow compatibility with unstable signals.

RECEIVER CONSTRUCTION

The 651F-1 consists of an IF translator, an RF translator, and distribution frame on a rack mounting shelf with an integral cooling air plenum. It is compatible with either Unistrut racking or cabinet enclosures. The IF translator employs card cage construction to permit a choice of operational capability for the initial installation and to facilitate modification as communication needs change. The RF translator contains the RF tuner and frequency stabilizing circuits.

EASE OF MAINTENANCE

Transistors and semiconductors are used wherever applicable to minimize weight, size and power consumption. Each individual card or module contains a complete circuit division facilitating maintenance procedures.



Wiring easily accessible

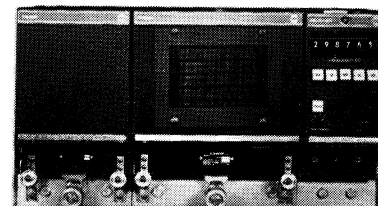
BASIC CONFIGURATION

The 651F-1 Receiver is normally supplied for 3 kc USB channels, 1 kc tuning increments, internal frequency standard and operation from a 27.5 v dc power source. It includes a 499L-1 22" wide mounting shelf with cooling air plenum for attachment to rack cooling systems. A wiring distribution frame and circuit breaker are also included.

OPTIONAL CONFIGURATIONS

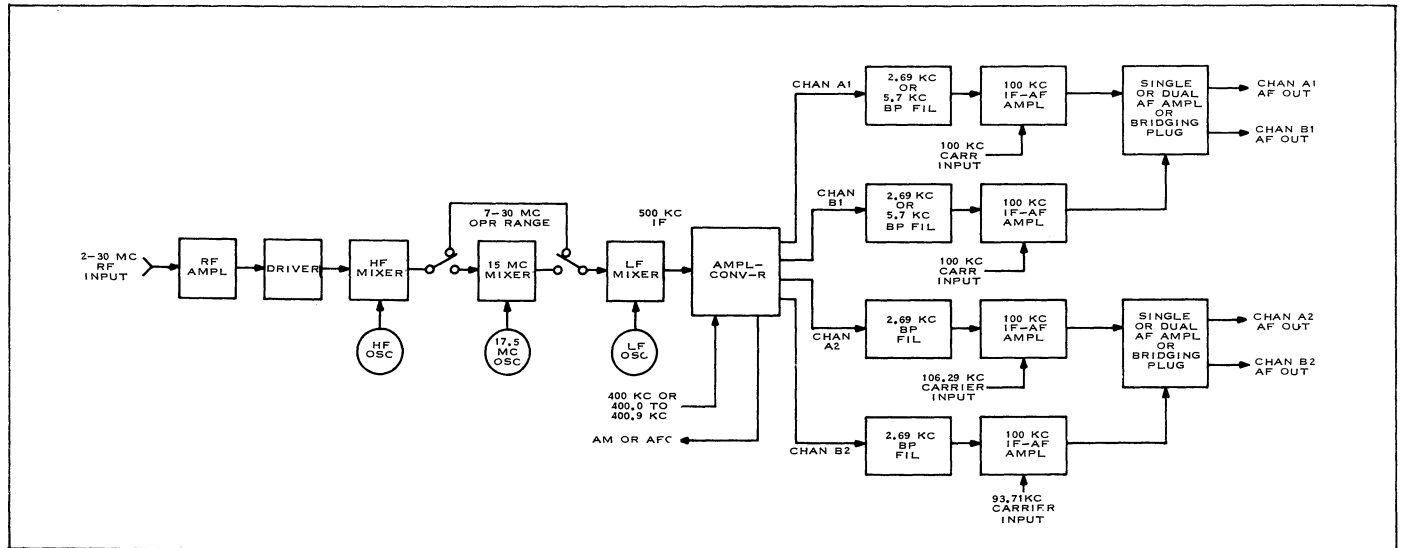
Mode Options The following choices are available to meet specific operating requirements: LSB, 3 kc bandwidth; LSB, 6 kc bandwidth; USB, 6 kc bandwidth; AM; or four channel multiplex.

Tenth KC Channel Increment Option The number of RF channels can be increased to 280,000 for more effective spectrum utilization.



651F-1 on 19" shelf

Functional Circuits



Automatic Frequency Control Option The AFC option can be implemented to permit the frequency of the 651F-1 to be phase locked to the pilot carrier of an incoming signal. It is used when the 651F-1 is operated in a communication network with unstable transmitting equipment. This option is only available when the 0.1 kc channel increment option is employed.

Line Amplifier Options Plug-in audio line amplifiers can be used if a higher channel output level is needed. Both single and dual amplifier card modules are available. Audio levels can be adjusted individually.

External Frequency Standard Option This option offers greater frequency stability for data communication applications.

Memory Matrix Option The memory matrix is necessary only in systems sharing frequency control equipments. The 0.1 kc digit information is retained in the absence of continuous frequency information until a new frequency is selected. It is intended primarily for installations using the 313 series of wire line control equipments.

Power Supply Option An internal power supply offers operation from a 115 v or 230 v, 45-450 cps power source in lieu of the normal 27.5 v dc.

Mounting Shelf Options (1) A 499L-1 shelf as normally supplied, except designed for a 19" rack and including an integral blower. (2) A 499L-1 shelf as in option 1, except an AM control unit is included. (3) A 499L-1 shelf as in option 1, except a control for AFC operation is included. (4) A 499L-1 22" wide shelf as normally supplied, with a control unit for AM operation. (5) A 499L-1 22" wide shelf as normally supplied, with a control unit for AFC operation.

Specifications

FREQUENCY RANGE: 2.0-29.999 mc or 2.0-29.9999 mc with 1.0 kc or 0.1 kc channel increments.

TYPES OF RECEPTION: SSB — USB (nominal 3 kc, 6 kc), LSB (nominal 3 kc, 6 kc), ISB (nominal 3 kc, 6 kc), four nomi-

nal 3 kc channel multiplex. AM — conventional or compatible AM when implemented with AFC.

TUNING TIME: 8 seconds after completion of desired channel frequency selection.

SENSITIVITY: SSB — not less than 10 db $S+N/N$ ratio for a single tone input signal of 0.5 uv below AGC threshold. AM — not less than 10 db $S+N/N$ ratio for a 30% modulation carrier of 2 uv below AGC threshold.

SELECTIVITY: Determined by individual bandpass filter electrical characteristics.

Filter	1 DB Maximum Ripple From	60 DB Attenuation Points
A-1 (nominal 3 kc)	100.35-103.04 kc	NLT 99.925 kc NMT 103.30 kc
A-2 (nominal 3 kc)	103.25-105.94 kc	NLT 102.99 kc NMT 106.31 kc
B-1 (nominal 3 kc)	96.96-99.65 kc	NLT 96.70 kc NMT 100.075 kc
B-2 (nominal 3 kc)	94.06-96.75 kc	NLT 93.69 kc NMT 97.01 kc
A-1 (nominal 6 kc)	100.30-106.00 kc	NLT 99.70 kc NMT 107.00 kc
B-1 (nominal 6 kc)	94.00-99.70 kc	NLT 93.00 kc NMT 100.30 kc
AM (nominal 6 kc)	97.15-102.85 kc	96.55 kc minimum 103.45 kc maximum
Carrier (nominal 250 cps)	99.875-100.125 kc at 3 db roll-off points	NLT 99.50 kc NMT 100.50 kc

Maximum ripple in the filter passband — 1.0 db from +15° C to +65° C, 1.5 db from -30° C to +15° C and 3.0 db from -40° C to -30° C.

PILOT CARRIER AGC: Threshold — 2 uv nominal, equivalent to full level carrier reception; 0.2 uv nominal 20 db suppression. Audio Rise—Not more than 3 db increase in audio output for increase in RF input from 2 uv to 100 mv; not more than 3 db increase in audio output referenced to 2 uv input level when input is increased to 1 v. Time Constants — Rise

time 0.1 second; decay time 1 second. Enabling Method — A ground on the enable line. Level Control — Choice of three levels. Two preset levels are available by individual enabling commands; one preset continuously adjustable and one preset adjustable in 3 db steps for a total of 30 db. Pilot carrier amplifier is enabled automatically whenever one of the pilot carrier presets is enabled. A third external control can be used to continuously vary level from a remote position. (Remote line operation is not terminated when one of the preset levels is desired.)

AFC OPERATION: Carrier Sensitivity — AFC operation is possible on pilot carrier signals in the range of 0.5 uv to 0.1 v. Carrier Selectivity and Acquisition — Control is possible on pilot carrier signals in the frequency range of ± 100 cps from dial frequency. Acquisition covers a ± 50 cps frequency range and is attained in less than 10 seconds (1 second typical). Manual acquisition provided for a ± 1000 cps frequency range.

Tracking Rate — Automatic frequency control will remain locked on carrier frequencies which vary up to 10 cps/second (30 cps/second typical).

Selectivity Range — Automatic frequency control is possible on pilot carrier signals in the frequency range of ± 1000 cps from dial frequency.

Hold Time — Frequency is maintained within ± 10 cps for a minimum of one minute after loss of input signal.

Locking Error — Lock is maintained within less than ± 1 cps of the received carrier frequency.

Carrier Loss Alarm — Carrier loss is indicated by a ground-on-line command for operation of an external alarm when the suppressed carrier fades to a level less than necessary for automatic frequency control.

Frequency Deviation Meter — External connections for a 0-100 ua meter provide indication of the frequency deviation corrected by the AFC. The external meter should have two ranges, 0-1000 cps and 0-100 cps, selected by external shunts.

FREQUENCY CONTROL: All injection sources except channel A-2 and B-2 multiplex carriers are phase locked to the internal frequency standard (or to the external standard, if used).

FREQUENCY STABILITY: Internal Standard — 1 part in 10^8 per day due to aging; rms stability factor does not exceed 1 part in 10^8 in any 10 minute period. Multiplex channels A-1 and B-1 determined by reference sources; A-2 and B-2 have an additional deviation of ± 2 cps.

HUM AND NOISE: SSB — At least 50 db below rated output.

AM — At least 40 db down. With F1A noise weighting, at least 60 db below rated output.

SPURIOUS RESPONSE: At least 60 db below response to normal inband signals.

HARMONIC DISTORTION: SSB — Not more than 1% (2000 uv CW input, 1500 cps audio output). AM — Not more than 5% (2000 uv, 30% modulation at 1000 cps).

INTERMODULATION DISTORTION: All intermodulation products at audio output are not less than 40 db down from one of two equal test signals applied to input terminals at 100 uv level and at +10 dbm audio output level.

QUIETING: For each 10 db increase of input signal, the signal-to-noise ratio will increase 10 ± 1 db up to 30 db above AGC threshold. Ultimate quieting at +50 db above AGC threshold, at least 50 db.

INTERNAL SPURIOUS: Except for three LFO crossover frequencies, which are not more than 3.0 uv equivalent; not more than 0.5 uv equivalent at any other frequency.

IMAGE REJECTION: At least 60 db except 55 db at 200 kc above or below dial frequency.

IF REJECTION: At least 90 db.

AUTOMATIC GAIN CONTROL: Threshold — SSB, 1 uv nominal; AM, 2 uv nominal. Audio Rise — SSB, not more than 4 db increase in audio output when the RF input is increased from threshold to 1 v; AM, not more than 6 db increase in audio output when the RF input is increased from threshold to 100 mv. Time Constants — All times are referred to within 3 db of equilibrium levels; SSB Voice, rise time 8 milliseconds, decay time 0.15 second; SSB Data, rise time 0.2 second, decay time 0.15 second; AM, rise and decay time 0.2 second. Control Method — Isolated individual channel control up to a nominal 60 uv RF input signal with strongest signal channel controlling common AGC stages above 60 uv signal.

RF INPUT: 0.5 uv to 1.0 v into nominal 50 ohms. AGC threshold 1.0 uv nominal (2.0 uv on AM).

AF OUTPUT: -10 dbm nominal and can be internally amplified to +10 dbm nominal into 600 ohms for single tone input above AGC threshold.

POWER REQUIREMENTS: 24.0-30.25 v dc (27.5 v nominal) negative ground with no more than 1 v peak-to-peak, 200 watts maximum. Can be implemented for ac power, 115 v or 230 v, 45-450 cps.

SIZE: 22 5/16" W, 8 3/4" H, 24 1/2" D (56.67 cm W, 22.23 cm H, 62.23 cm D), including shelf.

WEIGHT: 62 lbs. (28.12 kg), minimum implementation; 80 lbs. (36.29 kg), maximum implementation, including shelf.

Basic Units

789R-1 IF Translator, p. 88-90

618Z-4 RF Translator, p. 87

Related Equipment

313 Series Controls, p. 83-85

Racks and Cabinets, p. 91

Antennas, p. 92-99

635R-1 Bandpass Filter, p. 110, 111

635T-2 Bandpass Filter, p. 111, 112

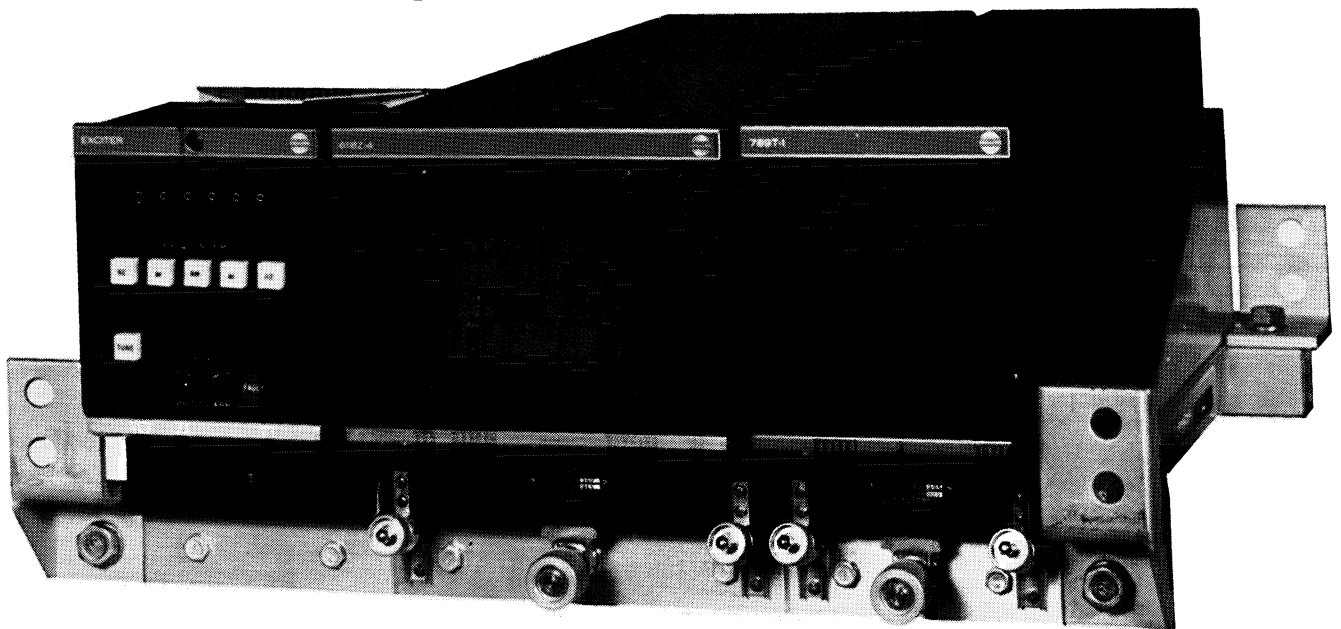
635V-1 Bandpass Filter, p. 112

Transmitting Equipment

EXCITER

POWER
AMPLIFIER

310V-1 universal radio group Exciter



Features

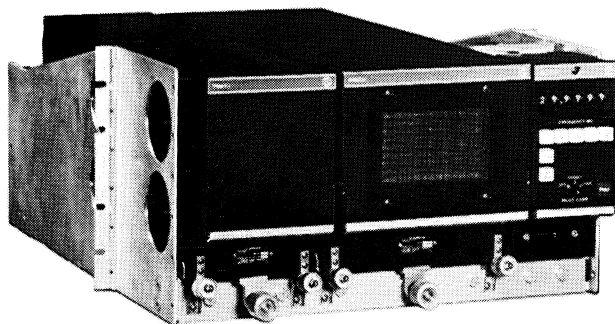
*Automatic Tuning
Compact Packaging
Telephone Compatibility
Installation Flexibility
Remote Operation*

Applications

*Fixed Station
Transportable
Shipboard
Mobile*

The 310V-1 is a shelf mounted HF exciter which, together with an automatically tuned power amplifier of the desired level, provides an extremely versatile HF transmitter. It offers a choice of 0.1 kc or 1.0 kc channel increments over the 2.0-29.9999 mc frequency range.

Modes of operation include upper sideband, lower sideband, independent sideband (separate channels on each sideband), or compatible AM with a choice of 3 kc or 6 kc bandwidths. Four 3 kc SSB multiplex channels may be optionally used. Power output is 0.4 watt PEP for continuous duty operation. The 310V-1 is part of the Collins Universal Radio Group of building block equipments, which can be selected to meet a wide range of communication requirements.



310V-1 on 19" shelf

SYSTEM APPLICATION

The 310V-1 is ideally suited for fixed station, transportable, shipboard or mobile applications. A simplified automatic tuning system permits control from a local shelf or console mounted unit or by a dial pulse remote arrangement over telephone lines. Audio terminations are compatible with telephone industry standards.

EXCITER CONFIGURATION

The 310V-1 consists of an IF translator, an RF translator, and distribution frame on a rack mounting shelf with an integral cooling air plenum. It is compatible with either Uni-strut racking or cabinet enclosures. The IF translator employs card cage construction to permit a choice of operational capability for the initial installation and to facilitate modification as communication needs change. The RF translator contains the RF tuner and frequency stabilizing circuits.

FOUR CHANNEL MULTIPLEX

As many as four 3 kc bandwidth audio inputs can be multiplexed in the IF translator. The level of each individual channel is automatically adjusted according to the number in use. ALC of the multiplex signal is provided by a bias from the final stage of the associated power amplifier.

EASE OF MAINTENANCE

Transistors and semiconductors are used wherever applicable to reduce size, minimize power consumption and increase reliability. Each individual card or module contains a complete circuit division, facilitating routine or corrective maintenance procedures.

BASIC CONFIGURATIONS

The 310V-1 Exciter is normally supplied for 3 kc USB channels, 1 kc tuning increments, operation from an internal fre-

quency standard and a 27.5 v dc power source. It includes a 499L-2 22" wide mounting shelf with a cooling air plenum for attachment to rack cooling systems. A wiring distribution frame and circuit breaker are also included.

OPTIONAL CONFIGURATIONS

Mode Options The following choices are available to meet specific operating requirements: LSB, 3 kc bandwidth; LSB, 6 kc bandwidth; USB, 6 kc bandwidth; 4-channel multiplex; and AM modes.

Tenth KC Channel Increment Option The number of RF channels can be increased to 280,000 for more effective spectrum utilization.

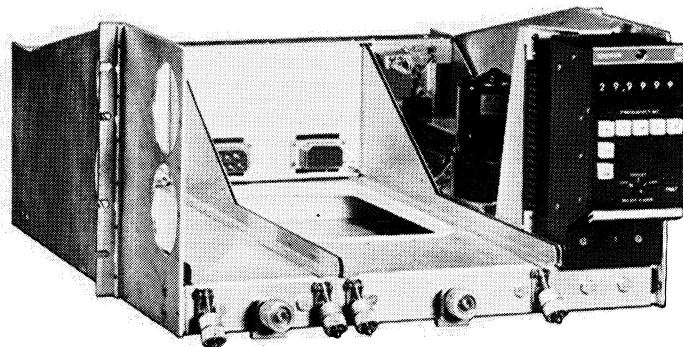
Line Amplifier Options Plug-in audio line amplifiers can be used if the audio input level is below the required level. Both single channel and dual channel amplifier card modules are available. Individual level adjustments are provided.

External Frequency Standard Option This option offers greater frequency stability for data communication application.

Memory Matrix Option The memory matrix is necessary only in systems sharing frequency control information between equipments. In installations which share frequency control equipment, the 0.1 kc digit information is retained in the absence of continuous frequency information until a new fre-

quency is selected. It is intended primarily for installations using the 313 series of wire line control equipments.

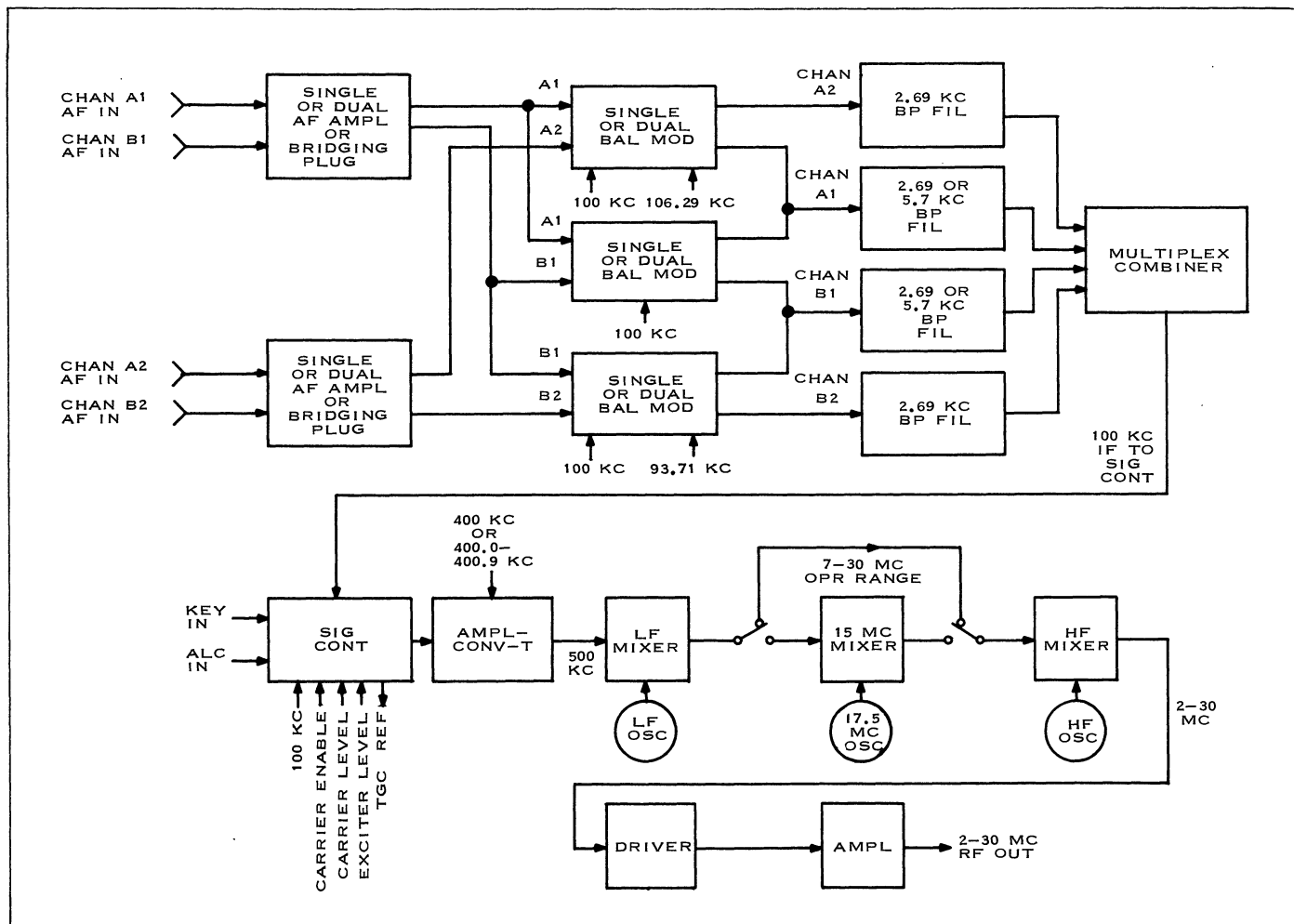
Power Supply Options An internal power supply offers operation from a 115 v or 230 v, 45-450 cps power source in lieu of the normal 27.5 v dc.



Easily removed subunits

Mounting Shelf Options (1) A 499L-2 shelf as normally supplied, except designed for a 19" rack and including an integral blower. (2) A 499L-2 shelf as in option 1, except with an exciter control unit. (3) A 499L-2 shelf as normally supplied, except with an exciter control unit.

Functional Circuits



Specifications

FREQUENCY RANGE: 2.0-29.999 mc or 2.0-29.9999 mc with 1.0 kc or 0.1 kc channel increments.

TRANSMISSION MODES: SSB — USB, LSB, ISB (3 kc or 6 kc nominal bandwidths), or four nominal 3 kc channels multiplexed. AM — Compatible.

TUNING TIME: Not more than 8 seconds after selection of frequency.

SELECTIVITY: Determined by individual bandpass filter electrical characteristics.

Filter	1 DB Maximum Ripple From	60 DB Attenuation Points
A-1 (nominal 3 kc)	100.35-103.04 kc	NLT 99.925 kc NMT 103.30 kc
A-2 (nominal 3 kc)	103.25-105.94 kc	NLT 102.99 kc NMT 106.31 kc
B-1 (nominal 3 kc)	96.96-99.65 kc	NLT 96.70 kc NMT 100.075 kc
B-2 (nominal 3 kc)	94.06-96.75 kc	NLT 93.69 kc NMT 97.01 kc
A-1 (nominal 6 kc)	100.30-106.00 kc	NLT 99.70 kc NMT 107.00 kc
B-1 (nominal 6 kc)	94.00-99.70 kc	NLT 93.00 kc NMT 100.30 kc

Maximum ripple in the filter passband — 1.0 db from +15°C to +65° C; 1.5 db from -30°C to +15° C; 3.0 db from -40° to -30° C.

FREQUENCY CONTROL: All injection sources except A-2 and B-2 carrier injection are phase locked to a 100 kc standard.

STABILITY: Internal standard — 1 part in 10⁸ per day due to aging; rms stability factor does not exceed 1 part in 10⁸ in any 10-minute period. Multiplex channels A-1 and B-1 determined by reference source; channels A-2 and B-2 can have an additional deviation of ±2 cps.

RF OUTPUT: 0.4 watt PEP minimum into nominal 50 ohms.

OUTPUT DISTORTION: Third and higher order distortion products are suppressed at least 40 db below 0.4 watt PEP, measured by the standard two-tone test technique.

HARMONIC EMISSION: At least 50 db below nominal peak envelope voltage levels.

INTERMODULATION DISTORTION: Not less than 40 db down.

ADJACENT CHANNEL CROSS-TALK: Not less than 45 db down.

HUM: Not less than 50 db below one tone of a two-tone 0.4 watt PEP test signal.

SPURIOUS EMISSION: 40 db below nominal PEV.

TRANSMIT GAIN CONTROL: In response to dc levels of 4 v or more derived from the output of the IF translator and the output of the RF translator or power amplifier, an infinite memory automatic gain control will maintain the dc levels proportional within +1 db.

AUTOMATIC CHANNEL LOADING: Single or any combination of channel inputs maintained at nominal input level will be controlled automatically to permit minimal excursions above nominal PEV level or operation into the ALC region.

AUDIO INPUT LEVEL: A -6 dbm, single tone input will produce maximum RF output with the exciter gain control full on and no ALC/TGC input. Specified distortion characteristics will be maintained with a two-tone input each having -6 dbm level with ALC voltage applied to maintain output level at 0.2 watt PEP. When implemented with the line amplifiers, tones at -26 dbm will meet the same specified output requirements.

AUTOMATIC LOAD CONTROL: Input voltage in the range 0 v to -10 v will cause the exciter output to be reduced at least 20 db. Minimum distortion requirements are met with up to 10 db reduction in gain. Application of ALC control will not affect carrier output in the AM or reduced carrier modes and will not affect the TGC.

POWER REQUIREMENTS: 24.0-30.25 v dc negative grounded with no more than 0.5 v peak ripple, 170 watts nominal. Can be implemented for 115 v, 45-450 cps.

SIZE: 22 5/16" W, 8 3/4" H, 24 1/2" D (56.67 cm W, 22.23 cm H, 62.23 cm D), including shelf.

WEIGHT: 62 lbs. (28.12 kg) minimum implementation; 80 lbs. (36.29 kg) maximum, including shelf.

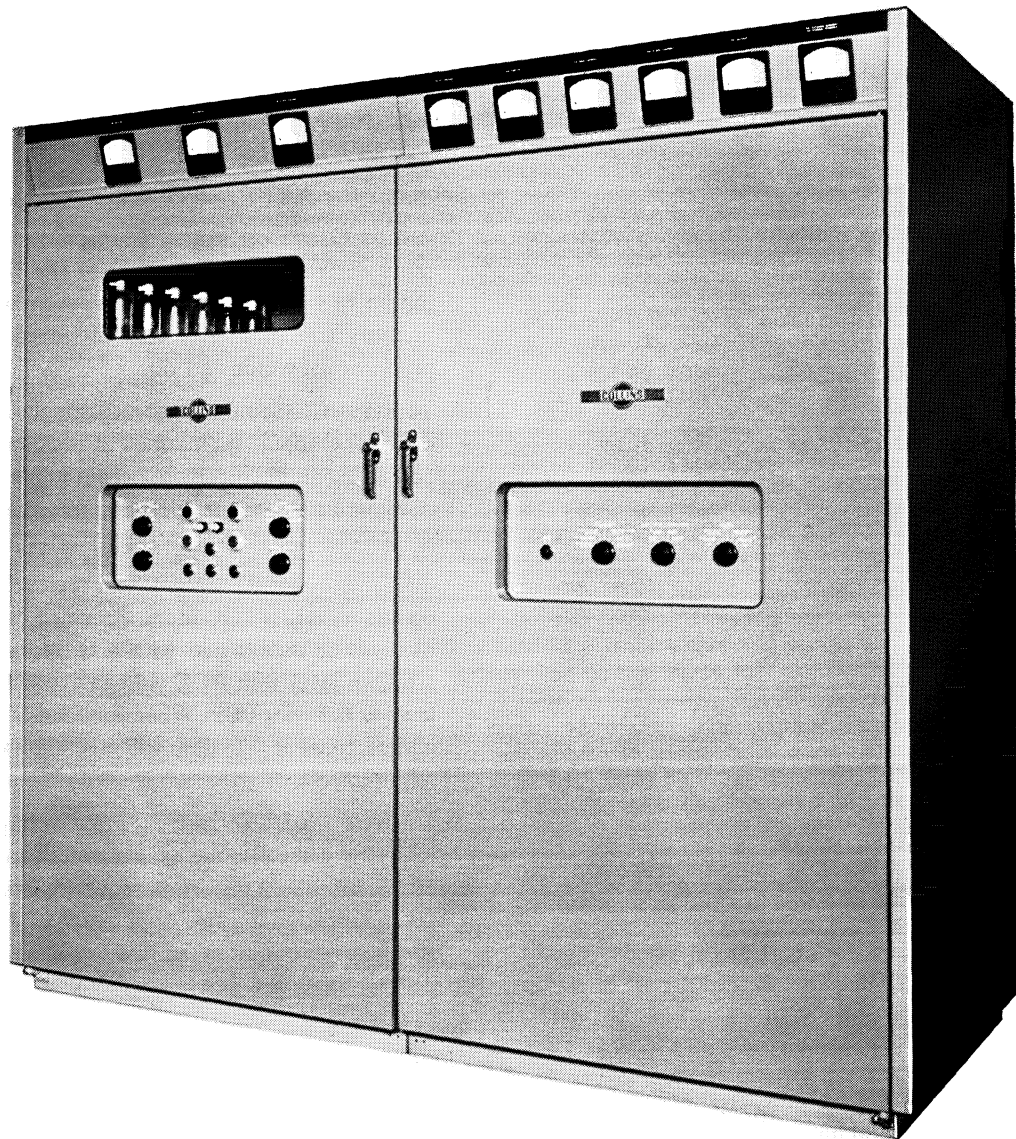
Basic Units

789T-1 IF Translator, p. 88-90
618Z-4 RF Translator, p. 87

Related Equipment

Power Amplifiers, p. 28-37
426U-2 Power Supply, p. 86
313 Series Controls, p. 83-85
Racks and Cabinets, p. 91
Antennas, p. 92-99
635W-1 Harmonic Filter, p. 113
184U-10 RF Matrix Uniswitch, p. 106, 107

205J-1 45 KW HF Power Amplifier OA-1448/GRT



Features

Servo Tuning
Simplified Controls
Power Selection
Functional Enclosure
Conservative Ratings

Applications

Fixed Station
Long Path

The 205J-1 is an automatically tuned linear power amplifier with 45 kw PEP output over the 2-30 mc frequency range. A power reduction circuit allows the level to be quickly reduced to 12 kw.

Low distortion amplifiers permit transmission of multiplex

signals without mutual interference between subchannels.

The 205J-1, with an external HF exciter and antenna system, provides a complete transmitter for fixed station use. The input level required is only 0.2 watt at the operating frequency. It is especially suited for long range point-to-point or ground-to-air single sideband communication applications. It can be arranged for local or remote control in either attended or unattended operation.

Dependability, long life and savings in size and weight are achieved by modern tubes and components, together with proven single sideband circuitry. The 205J-1 is easily serviced and maintained. All important circuits are metered. Components and wiring are accessible through full length electrically interlocked cabinet doors.

AUTOMATICALLY TUNED

RF and prepositioning information for the tuned circuits of the power amplifier is supplied by an external exciter. Prepositioning information can also be obtained from an internal control panel. Phase discriminator servo systems within the equipment automatically complete the tuning and loading of the three amplifier stages. A pi-L network is used for output coupling. A directional coupler measures the forward and reflected power in the output transmission line.

LOW DISTORTION

Reduced distortion and improved linearity are achieved by the use of approximately 10 db of negative over-all RF feedback in the power amplifier.

AUTOMATIC GAIN CONTROL

Transmitter gain control circuitry permits adjustment of the signal level to operate the power amplifier near its maximum power capability without the possibility of it being overdriven on peaks. Rectified voltage derived from the signal peaks is used to control circuitry in the associated exciter, reducing the excitation level on signal peaks.

AUTOMATIC PLATE DISSIPATION CONTROL

Automatic plate dissipation control circuits allow the power amplifier to operate at full input during the tuning cycle and remove the requirements of high/low power switching with its accompanying problems.

CONSERVATIVELY RATED SUPPLIES

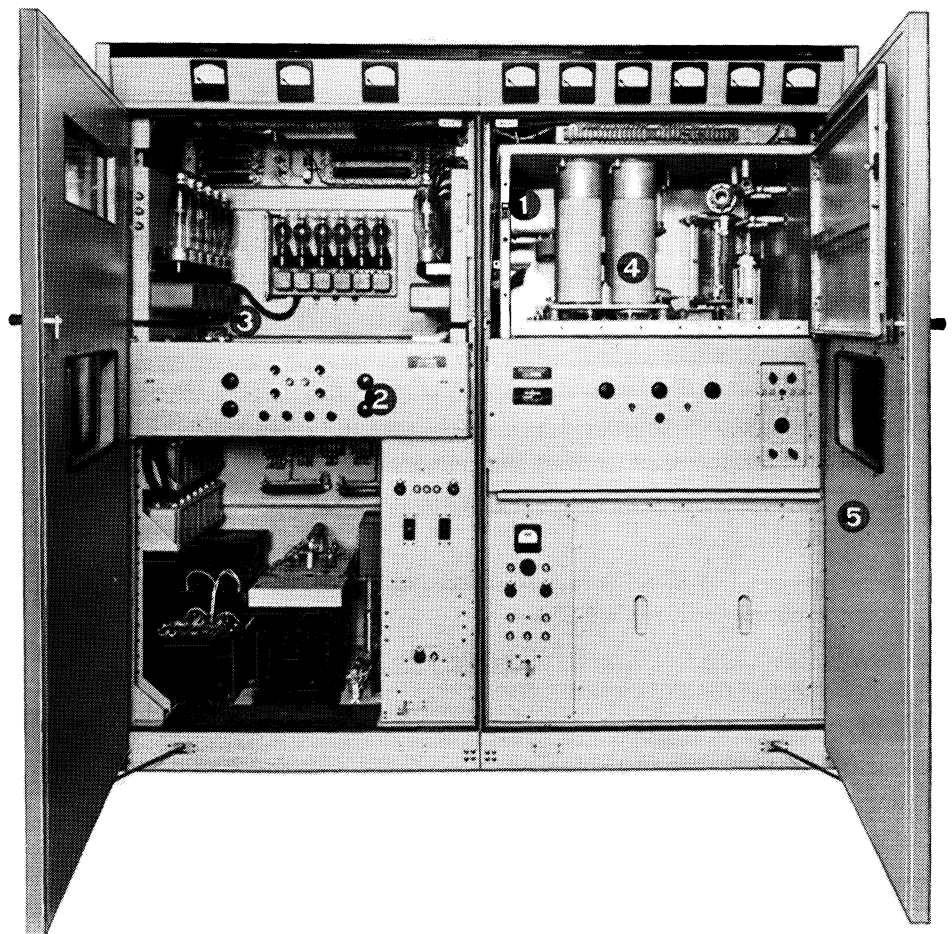
Efficient three-phase, full-wave rectifier circuits are used in both plate and screen supplies. The screens of the tubes in the output stage are connected directly to ground to give maximum effectiveness to the screen grid shielding. The PA cathodes are operated 700 v below ground, making the total final amplifier plate supply voltage 7,500 v.

The negative side of the PA plate supply is grounded through the primary of a thyatron trigger transformer. In the event of a high voltage arc to ground, the initial surge of current in the negative return fires a thyatron. This action effectively shorts the high voltage supply to ground.

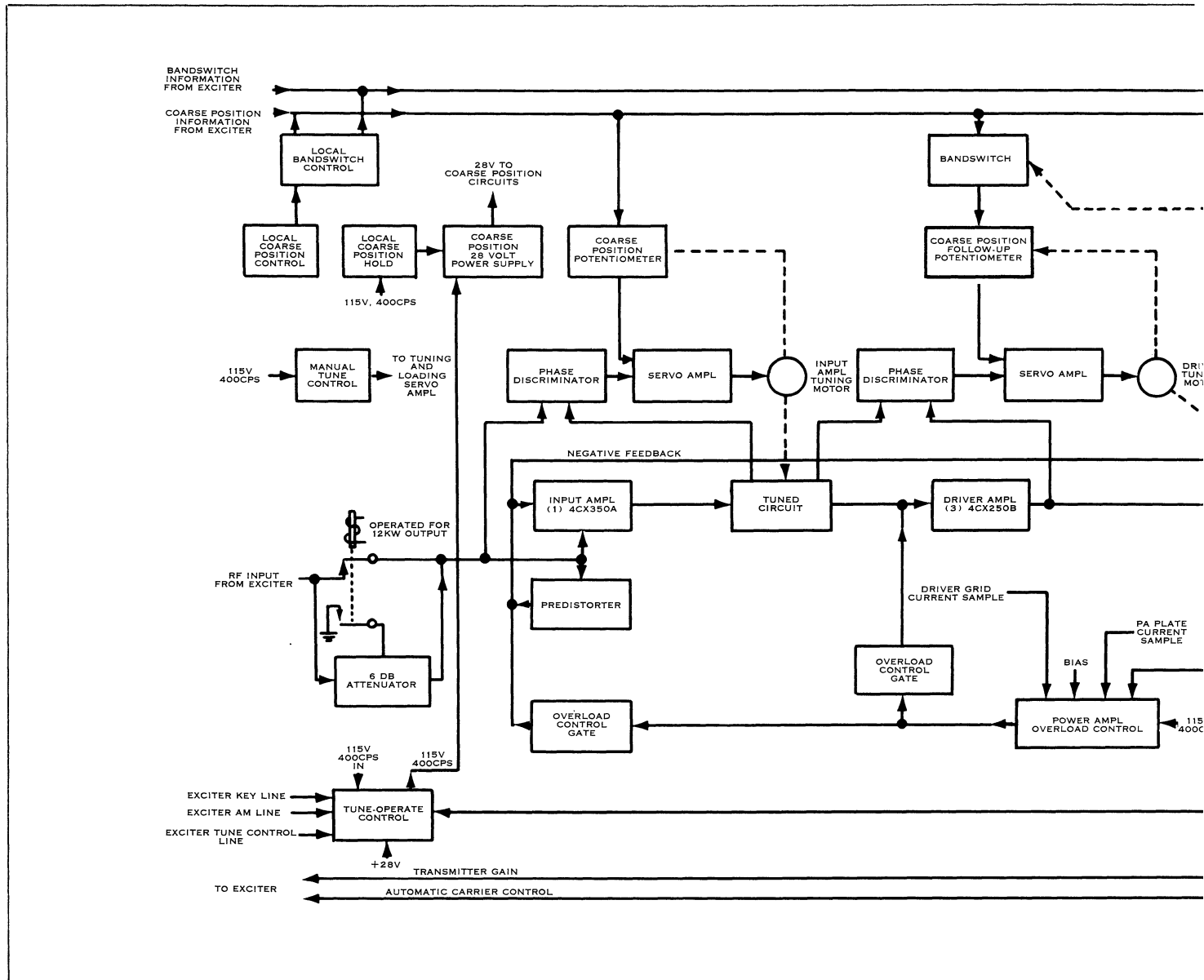
The low voltage plate and screen supply also use a three-phase, full-wave rectifier. Mercury vapor rectifier tubes are temperature-controlled allowing operation of the power amplifier at low ambient temperatures.

Design Highlights

1. Separate shielded compartments for each RF stage.
2. Simplified operating controls are located on recessed panels.
3. Conservatively rated power supplies have excellent dynamic regulation.
4. Ceramic tetrode tubes provide high gain with few amplifier stages.
5. All components and wiring are accessible through full length doors.



Functional Circuits



Specifications

FREQUENCY RANGE: 2-30 mc, automatically tuned.

OUTPUT IMPEDANCE: 50 ohms, 2:1 maximum VSWR. Flange connection for standard EIA 3 $\frac{1}{8}$ " 50 ohm transmission line.

INPUT IMPEDANCE: 50 ohms unbalanced, termination for type UG-89B/U connector.

POWER OUTPUT: 45 kw PEP; may be reduced to 12 kw PEP. Average output capability is 22.5 kw.

EMISSION: Any type not exceeding bandwidth or power capability. Superior for SSB service.

INPUT INFORMATION REQUIRED: 0.2 watt nominal at operating frequency, together with bandswitch and coarse positioning information for automatic operation. Semi-automatic operation only requires RF drive signal.

RF BANDWIDTH: Not less than 16 kc bandwidth between -1 db points.

DISTORTION: Third and higher odd-order distortion at least 35 db below either of two equal tones required to drive the power amplifier to 45 kw PEP.

HARMONIC OUTPUT: Second harmonic at least 50 db down. Higher harmonics at least 60 db down.

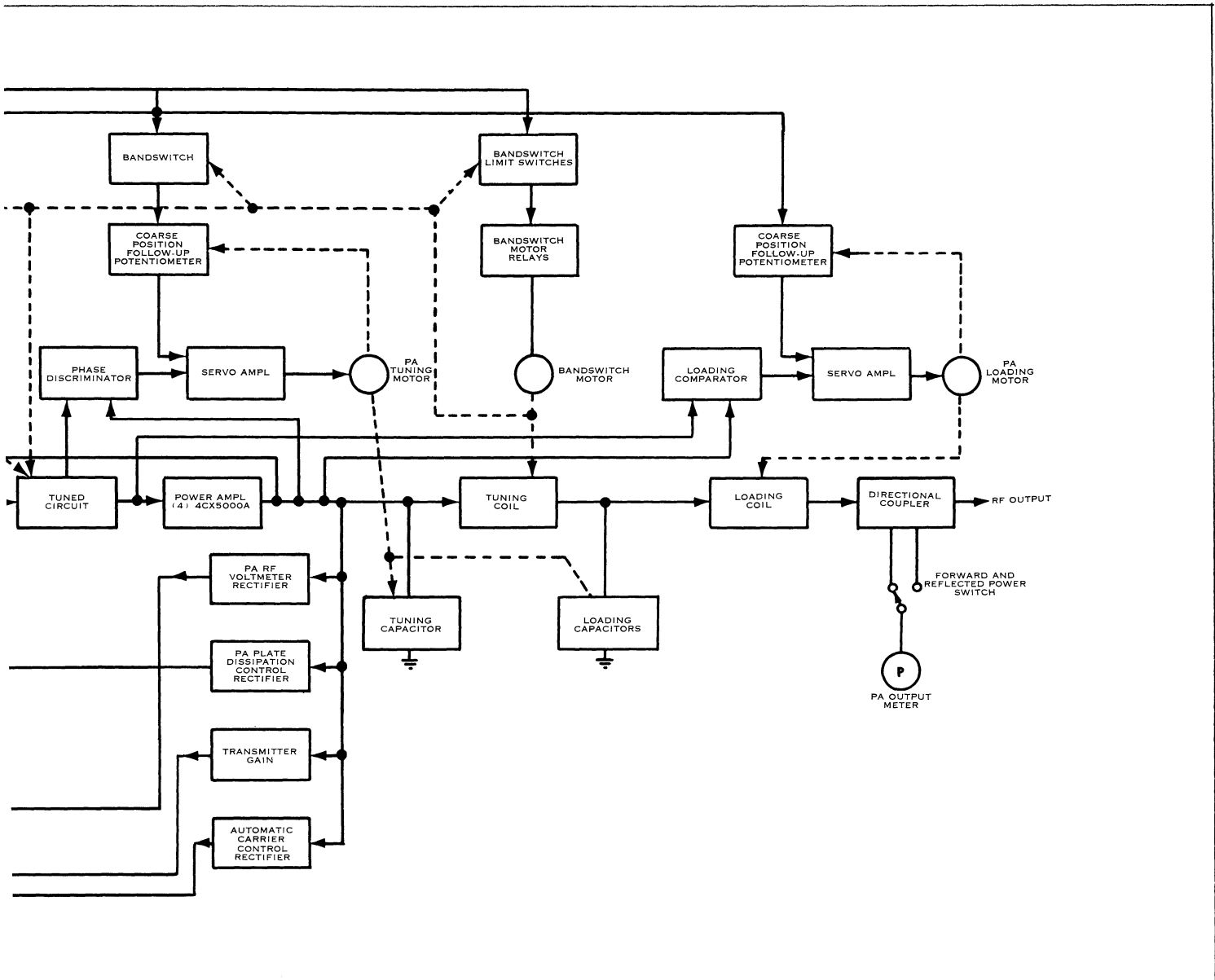
NOISE LEVEL: At least 50 db below either of two equal tones required to drive the power amplifier to 45 kw PEP output.

COOLING REQUIRED: Approximately 2000 cfm of air at a pressure of 0.4" water column, supplied by internally located centrifugal fan.

PRIMARY POWER: 195-255 v or 350-410 v, 3 phase, either 50 or 60 cps units can be supplied, 67 kva nominal, 0.95 pf for 45 kw PEP output, 2-tone test signal.

AMBIENT TEMPERATURE: -29° C to +52° C.

DUTY CYCLE: Continuous.



SIZE AND WEIGHT:

	W	Size H	D	Weight
205J-1 Power amplifier with power supply (over-all)	88¾" 212.73 cm	78" 198.12 cm	35½" 90.17 cm	3137 lbs. 1422.94 kg
Plate transformer	18¾" 46.67 cm	32¾" 83.19 cm	33¾" 84.77 cm	1040 lbs. 471.74 kg
Circuit breaker	16¼" 41.28 cm	26¾" 67.95 cm	17½" 43.50 cm	146 lbs. 66.23 kg
Power supply control	17" 43.18 cm	26¾" 67.95 cm	9¼" 23.50 cm	71 lbs. 32.21 kg
Centrifugal fan	30¾" 76.52 cm	32½" 81.60 cm	21¼" 53.98 cm	183 lbs. 83.01 kg

Related Equipment

- 310V-1 Exciter,* p. 25-27
- 651F-1 Receiver, p. 21-23
- Antennas, p. 92-99
- 478R-1 Spectrum Analyzer, p. 130, 131
- 476D-1 Distortion Analyzer-Monitor, p. 130
- *205J-1 requires special modification

208U-3 3 KW HF Power Amplifier

Features

Automatic Tuning
Low Intermodulation
Distortion
Low Spurious
Voltage-Regulated Supplies
Remote Operation

Applications

Fixed Station
Transportable
Shipboard

The 208U-3 is an automatically tuned linear power amplifier with 3 kw PEP output over the 2-30 mc frequency range. When used with an external exciter, such as the Collins 310V-1, and an antenna, it provides a complete HF transmitting system. Input power required is only 0.2 watt at the operating frequency.

Emission capability includes single sideband, CW or FSK signals. Several types of antennas can be accommodated. The 208U-3 operates from a 200-250 v, 47-420 cps, 3 phase primary power source.

Control functions are actuated by low voltage, direct current circuits. Dial-pulse control equipment is optionally available for remote operation over ordinary wire lines.

APPLICATION VERSATILITY

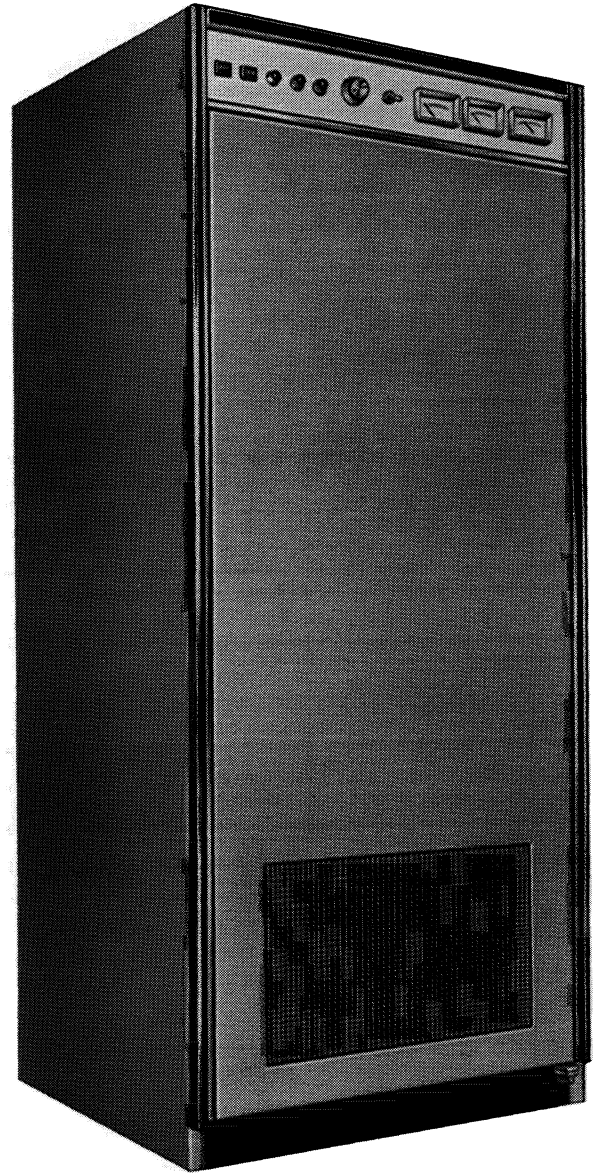
The 208U-3 is part of the Collins Universal Radio Group equipment and is ideally suited for fixed station, transportable or shipboard applications.

It is mounted in a rugged Unistrut frame to which doors, trim panels and meter-control panel may be added as required for custom configurations. Cabinet trim panels are available to completely enclose the power amplifier, to enclose the front, top and back or to enclose the front only, depending on installation requirements.

Installation is simplified since the RF and power supply units can be separated to permit passage through restricted space and then be reassembled.

CIRCUIT FEATURES

A rapid, highly accurate automatic antenna tuning system requires only the RF signal from the associated exciter for frequency information. Shielded ceramic tetrode tubes contribute to excellent circuit stability and provide high gain with a minimum number of stages and tuned circuits. Fast operating, automatic tuning insures optimum linearity and peak

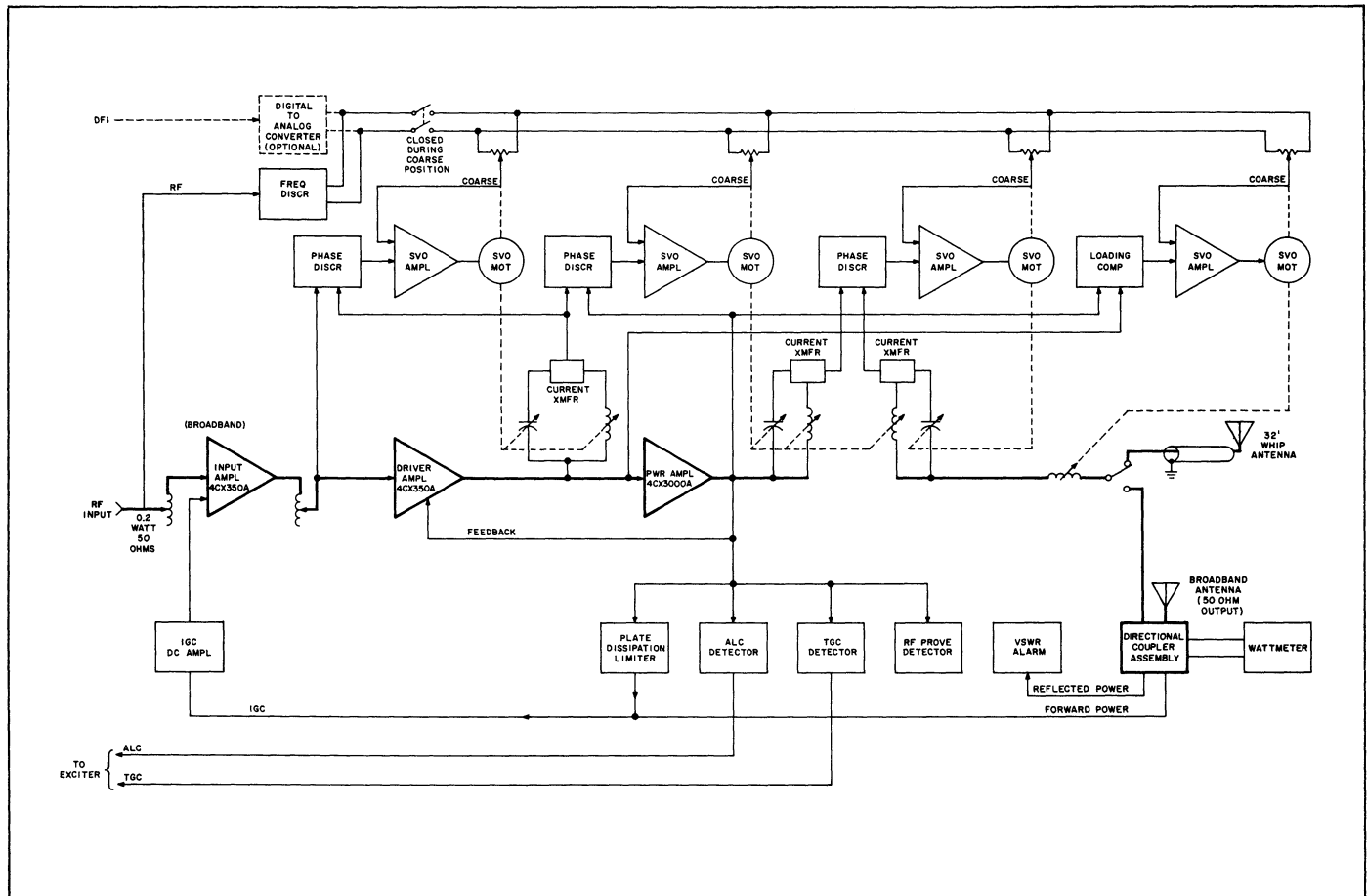


power output at all frequencies. An efficient antenna network matches a wide range of antenna impedances.

Power supplies have automatic line voltage regulation. Long life silicon rectifiers with transient suppression are used in all power supply circuits.

Reliability is assured by the use of solid state components in all applicable circuits. All significant voltage, current and RF power levels are monitored by three meters. Voltage samples are readily available for external logging and optional fault alarm equipment.

Functional Circuits



Specifications

FREQUENCY RANGE: 2-30 mc.

POWER OUTPUT: 3 kw PEP or average.

DRIVE POWER: 0.2 watt PEP.

INPUT IMPEDANCE: 50 ohms.

OUTPUT IMPEDANCE: 50 ohms. Will accommodate up to 3:1 SWR. Will match at 32 ft. whip with accessory items.

OUTPUT INTERMODULATION DISTORTION: Third and higher order products at least 40 db below either of two equal test tones which drive the power amplifier to rated output.

OUTPUT HARMONIC CONTENT: All harmonic output is not less than 80 db below the fundamental power output measured on a 50 ohm load at any level up to rated power output.

TUNING TIME: Maximum, 10 seconds; nominal, 5 seconds.

Tune failure information is provided if equipment should fail to tune within 15 seconds.

POWER SOURCE: 200-250 v, line to line, 3 phase, 47-420 cps.

A primary power regulator automatically maintains the input voltage at 225 v.

POWER CONSUMPTION: Single tone CW at rated power, 7.5 kva. Two-tone at rated power, 4.3 kva. Power factor not less than 0.9.

AMBIENT HUMIDITY: 0%-95%.

ALTITUDE: 0-10,000 ft. operating; 0-50,000 ft. nonoperating.

VIBRATION: 5-15 cps 0.03" double amplitude; 16-55 cps 0.02" double amplitude or 1 g, whichever is less.

SHOCK: Each individual unit (RF and power supply subunits), when mounted in a suitable test frame, shall be capable of accepting 3 blows each direction in each of three planes for a total of 18 blows and each impact shall be 15 g maximum, 11 milliseconds in duration.

SIZE: 31 9/16" W, 69" H, 22 3/8" D (80.17 cm W, 175.26 cm H, 56.83 cm D).

WEIGHT: Approx. 750 lbs. (340.2 kg).

Related Equipment

310V-1 Exciter, p. 25-27

313 Series Controls, p. 83-85

Antennas, p. 92-99

476D-1 Distortion Analyzer-Monitor, p. 130

478R-1 Spectrum Analyzer, p. 130, 131

184U-10 RF Matrix Uniswitch, p. 106, 107

651F-1 Receiver, p. 21-23

208U-10 10 KW Power Amplifier

Features	Applications
<i>Automatic Tuning</i>	<i>Fixed Station</i>
<i>Integral Shielding</i>	<i>Transportable</i>
<i>Efficient Cooling</i>	<i>Shipboard</i>
<i>Unattended Operation</i>	
<i>Front Accessibility</i>	
<i>Application Groups</i>	

The 208U-10 is an automatically tuned, 10 kw HF linear power amplifier which covers the 2-30 mc frequency range. It will linearly amplify SSB, AM, CW, FSK or any other type of signal within the specified bandwidth and power capabilities. Tuning is normally completed within 10 seconds and never exceeds 25 seconds. The 208U-10 will tune into a 50 ohm broadband antenna without an antenna coupler. Drive power required from an associated exciter is only 0.2 watt PEP. The 208U-10 is part of the Collins Universal Radio Group equipment which can be selected to meet a wide range of communication requirements.

The 208U-10 is equally well suited for fixed station, transportable or shipboard installations. Heavy components are mounted on a solid aluminum base-casting to give superior structural characteristics under shock and vibration conditions. The AN/TSC-38 HF Communication System is a typical transportable application of the 208U-10 Power Amplifier. Optional cabinet styles, cooling and input power requirements permit its use in a wide range of applications without degradation of performance.

AUTOMATIC TUNING

A rapid, highly accurate automatic tuning system requires only the RF signal from the associated exciter for frequency information. Reliability is increased by the use of solid state servo amplifiers.

CERAMIC TETRODE TUBES

Compact, well shielded ceramic tetrode tubes provide high gain with a minimum number of stages and contribute to excellent circuit stability.

DC REMOTE CIRCUITS

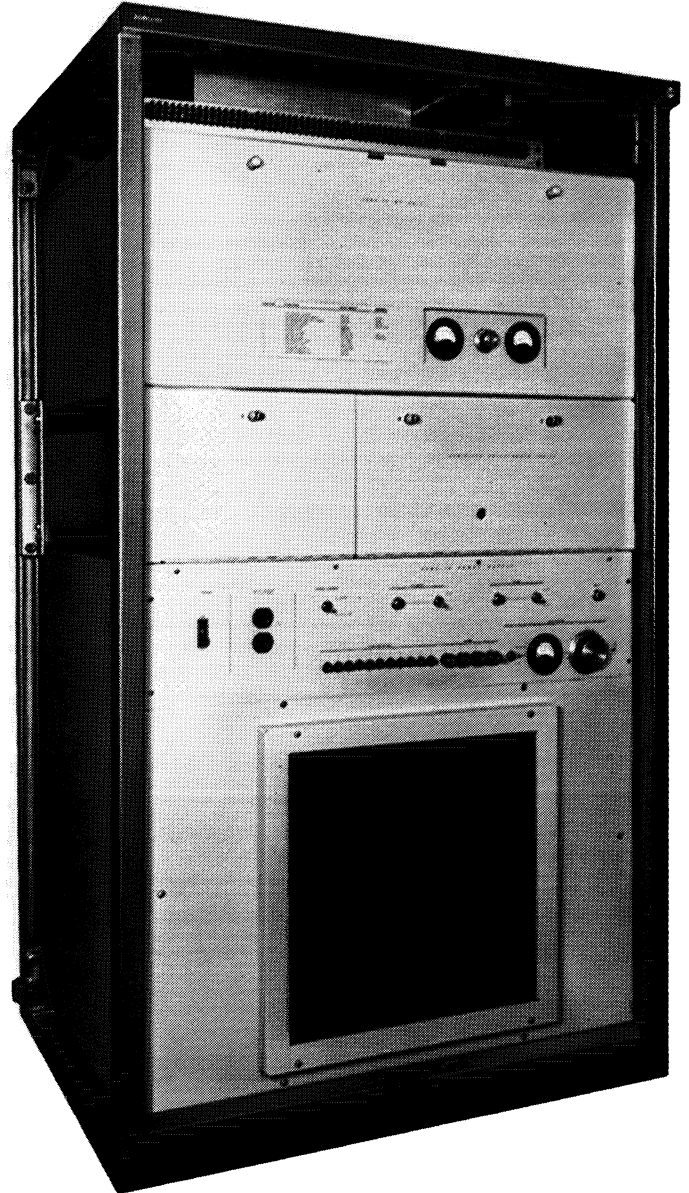
Function control circuits employ low voltage direct current and can be used with telephone type termination facilities for unattended remote operation.

INTEGRAL SHIELDING

Very low conducted and radiated interference levels have been achieved by the use of integral shielded compartments and adequate filtering for each RF stage.

EXTENDED RELIABILITY

Simplified circuitry with a minimum number of stages and



tuned circuits increases reliability. Solid state components are used wherever applicable to insure reliability. Long life silicon rectifiers, together with efficient transient suppression circuits, are employed in power supplies. All components are rated for continuous operation at the highest specified temperatures. A high capacity blower insures adequate cooling even in high altitude environments.

CUSTOM CONFIGURATIONS

The 208U-10 is mounted in a rugged Unistrut frame with removable exterior panels to facilitate use in custom configurations and to simplify installation in transportable shelters or in shipboard radio rooms. In shipboard applications the final

RF amplifier can be separated from the power supply to facilitate handling through a restricted passage, and it can then be quickly reassembled.

APPLICATION GROUPS

The following application groups are available: trim panels for single or multiple installation, modified location of cooling-air inlet and exhaust, a choice of primary power sources, automatic filament voltage regulation, primary power line filters and automatic RF voltage control.

Trim Options The exterior cabinet panels and meter panel snap or bolt on and can be installed initially or added later to provide integrated styling with other related equipments. Trim panels are not supplied with the basic power amplifier; instead, optional application groups are selected to meet individual customer requirements.

Cabinet trim is available to completely enclose the power amplifier, to enclose the front, top and back, or to enclose the front only. Partial enclosure of the front, top and back is for the middle units of a multiple power amplifier installation. The front trim group is for transportable hut or van installations where the top, back and sides of the power amplifier are adjacent to other equipment, walls or ceiling.

Each of the trim groups is available with either a meter-control panel or a styled blank panel to complete the front enclosure. The meter-control panel is for applications that require local operational adjustments and power-level control, while the blank panel is used in remotely controlled installations.

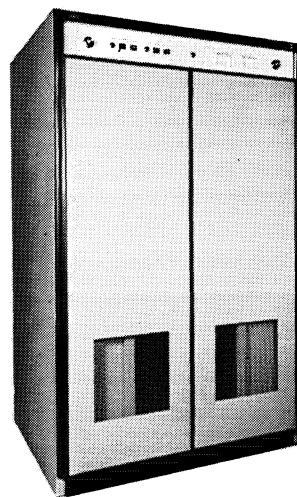
Cooling Air Options The 208U-10, as supplied, has a front air inlet with filter and a top air outlet. A rear air intake application group with external filtering is available for installations where the ambient room air cannot be used for cooling. In transportable installations with low ceilings, an application group allows air to be exhausted from the top-rear without extension of the power amplifier height.

Power Source Options The 208U-10 is normally supplied to operate from a 195-255 v, 47-63 cps, 3 phase power source. Application groups are available for operation from either a 195-255 v, 400 cps, 3 phase power source, or a 380 v or 440 v, 50-60 cps, 3 phase, 4-wire wye power source.

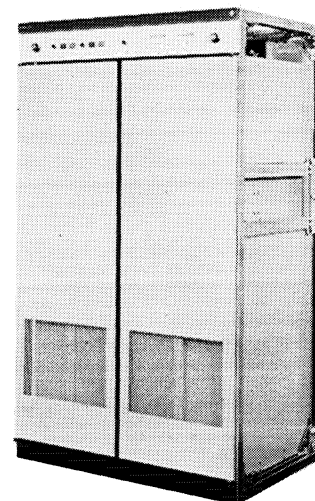
Filament-Voltage Regulator Option An automatic filament-voltage regulator application group will maintain the filament voltages within $\pm 1\%$ for line voltage changes of $\pm 10\%$.

AGC Option An automatic gain control application group can be added for operation with exciters which do not have external gain control provisions.

Interference Suppression Option The 208U-10 meets all ordinary conducted RF interference requirements over the 90 kc to 30 mc range but in some applications additional attenuation may be desired. An application group of three power-line filters for 195-255 v, 50-60 cps or 400 cps power-line sources will provide a minimum additional attenuation of 45 db from 150-500 kc and 65 db from 500 kc to over 100 mc.

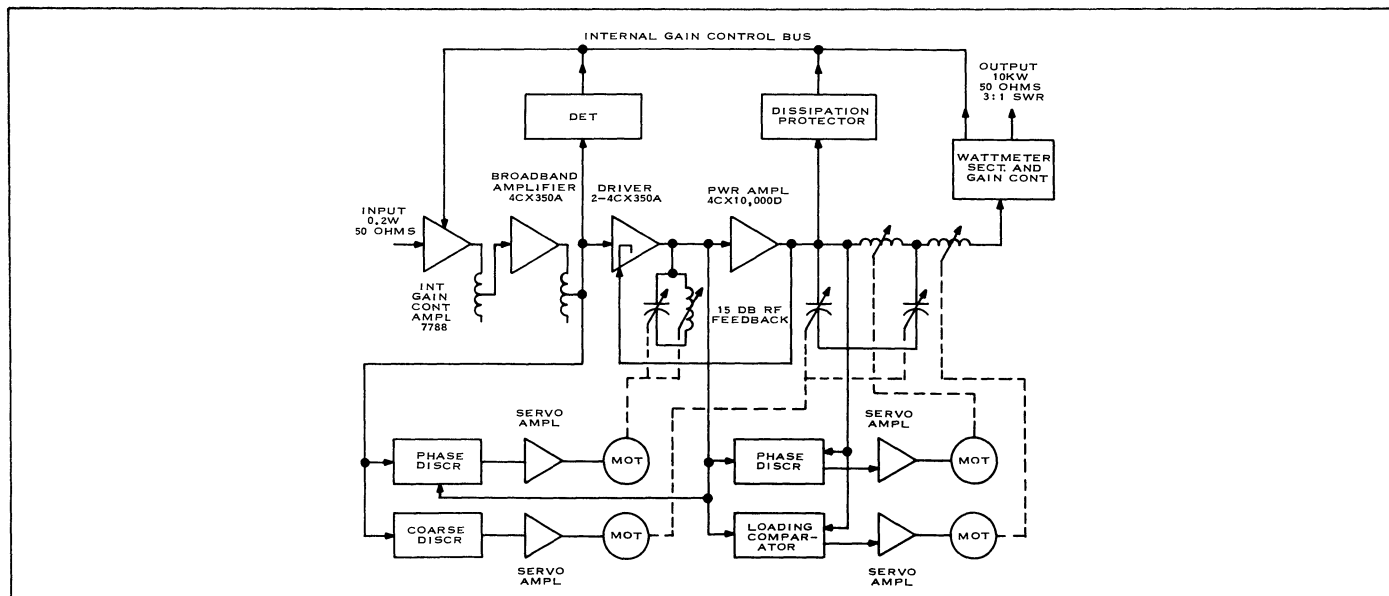


Complete Trim Group



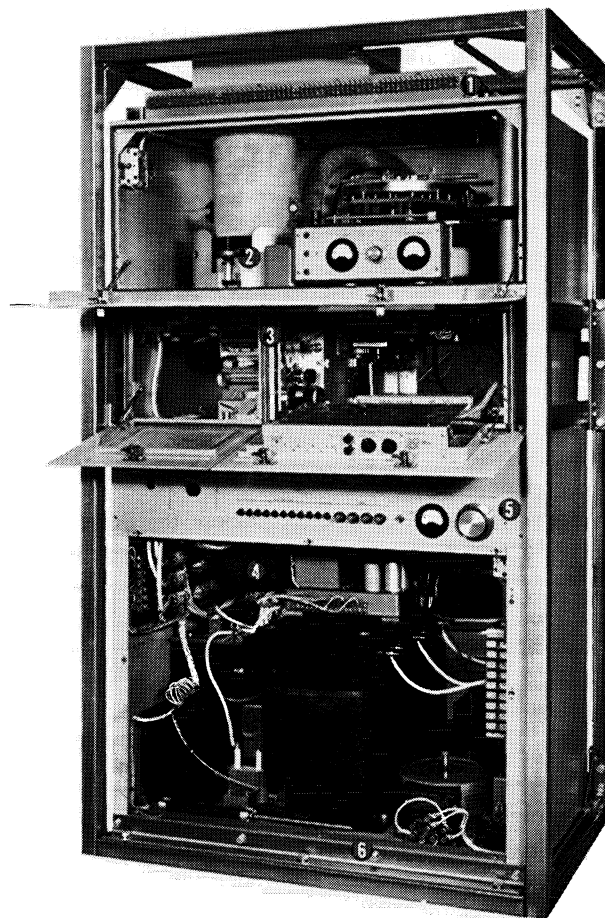
Front and Top Trim Only

Functional Circuits



Design Highlights

1. Centralized System Connections
2. Ceramic Tetrode Tubes
3. Excellent RF Shielding
4. High Capacity Blower
5. Simplified Controls
6. Aluminum Base Casting



Specifications

FREQUENCY RANGE: 2-30 mc.

POWER OUTPUT: 10 kw PEP or average.

DRIVE POWER: 0.2 watt PEP.

INPUT IMPEDANCE: 50 ohms.

OUTPUT IMPEDANCE: 50 ohms, with up to 3:1 SWR (2.5-30.0 mc); 2:1 SWR (2.0-2.5 mc).

INTERMODULATION DISTORTION: All odd order distortion products at least 35 db below one of two equal tones which drive the power amplifier to 10 kw PEP.

HARMONIC CONTENT: Second harmonic at least 55 db down. Higher order harmonics at least 60 db down.

TUNING TIME: Less than 25 seconds.

POWER CONSUMPTION: Single tone CW at rated power — 22 kva; two-tone test—20 kva. Power factor not less than 0.9.

POWER SOURCE: 195-255 v with 2% regulation, 47-63 cps, 3

phase. Taps provided for line voltage compensation. Available for operation from 380 v or 440 v, 50-60 cps, 4-wire wye connection, or 200-250 v, 380-420 cps, 3 phase power sources on special order.

AMBIENT HUMIDITY: 0%-95%.

ALTITUDE: 0-10,000 ft. operating; 0-50,000 ft. nonoperating.

VIBRATION: 5-15 cps 0.03" durable amplitude. 16-55 cps 0.02" double amplitude or 1 g whichever is less.

SHOCK: Each individual unit, when mounted in suitable test frame, shall be capable of accepting 3 blows each direction in each of 3 planes for a total of 18 shocks, and each impact in the vertical plane shall be 30 g, 11 milliseconds in duration, and each impact in the horizontal plane shall be 15 g, 11 milliseconds in duration.

SIZE: Without trim — 39¾" W, 69" H, 27¼" D (1.01 meters W, 1.75 meters H, 0.69 meter D).

WEIGHT: Approx. 1650 lbs. (748.44 kg).

Related Equipment

310V-1 Exciter, p. 25-27

635W-1 Harmonic Filter, p. 113

313 Series Controls, p. 83-85

Antennas, p. 92-99

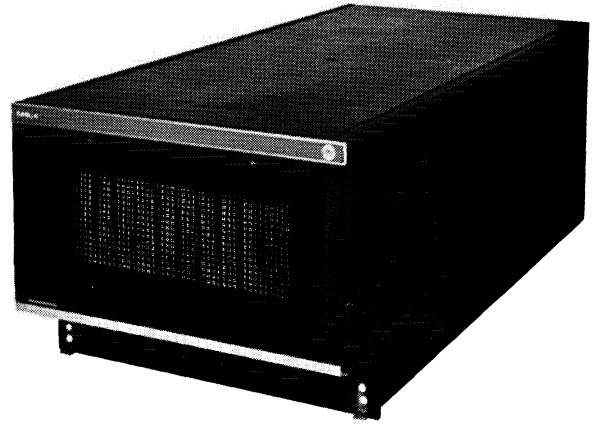
476D-1 Distortion Analyzer-Monitor, p. 130

478R-1 Spectrum Analyzer, p. 130, 131

184U-10 RF Matrix Uniswitch, p. 106, 107

651F-1 Receiver, p. 21-23

548L-4.1 KW HF Power Amplifier



Features

Automatic Tuning
 Low Spurious
 Compact Packaging
 Maximum Accessibility

Applications

Fixed Station
 Mobile
 Transportable
 Airborne
 Shipboard

The 548L-4 is a compact power amplifier with a 1 kw PEP or average output in the 2.0-29.9999 mc range.

It features automatic tuning, using tuning information in 0.1 kc increments. Tuning time is 2-3 seconds nominal, 10 seconds maximum.

Required drive is 0.2 watt PEP maximum on the channel frequency. Over-all gain is within 3 db over the operating range and within 1 db for a signal bandwidth of not less than ± 7 kc of the center frequency. When used with an exciter, such as the Collins 310V-1, and an antenna, it provides a complete HF transmitter. The 548L-4 is part of the Collins Universal Radio Group of building block equipments, which can be selected to meet a wide range of communication system requirements.

ADVANCED CIRCUITRY

The RF circuits consist of a two-stage amplifier with over-all inverse feedback. Two 7551 tubes are used to drive four parallel 4CX350F's. The output passes through a directional wattmeter circuit for transmission line VSWR indication.

FLEXIBLE INSTALLATION

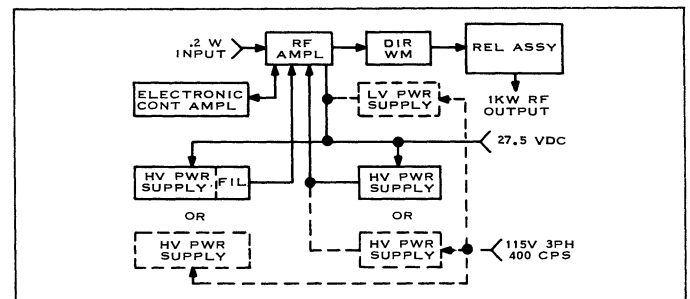
The 548L-4 is housed in an ARINC 404 1 ATR size case which can be easily mounted in a Unistrut or other type rack

for flexibility in configuration. Forced air cooling permits it to be used over a wide range of ambient temperatures.

The 548L-4 Power Amplifier is equally applicable to fixed station, shipboard, airborne and surface or air transportable systems. It can be used in continuous duty applications with either attended or unattended operation through local, remote or telephone dial control. All frequency control functions are accomplished by grounds on wires using a two-out-of-five frequency code.

The 548L-4 is available with either an ac or dc power supply and with or without a transmit-receive relay.

Functional Circuits



Specifications

FREQUENCY RANGE: 2.0-29.9999 mc.

TUNING: Automatic, continuous coverage.

TYPES OF SIGNALS: Any, within bandwidth capability.

RF INPUT: 0.2 watt PEP maximum for rated PEP output.

TUNING TIME: Not more than 10 seconds maximum.

OUTPUT DISTORTION: Third and higher order distortion down at least 35 db from either tone in a standard two-tone test.

HARMONIC EMISSION: Suppressed at least 35 db below PEP output level.

OUTPUT IMPEDANCE: 50 ohms unbalanced.

OUTPUT LEVEL: 1000 watts ± 2 db PEP or average with rated input level.

COOLING REQUIREMENTS: Forced air with 460 lbs. per hour at 1" water pressure minimum.

POWER REQUIREMENTS: 22.0-30.25 v dc (27.5 v nominal) negative grounded with no more than 0.5 v ripple, 450 watts standby and 3000 watts maximum keyed; also available for operation with 120 v or 208 v power source, 400 cps, 3 phase.

SIZE: 10 $\frac{1}{8}$ " W, 7 $\frac{5}{8}$ " H, 19 9/16" D (25.72 cm W, 19.37 cm H, 49.69 cm D).

WEIGHT: 52 lbs. (23.6 kg).

Related Equipment

310V-1 Exciter, p.25-27

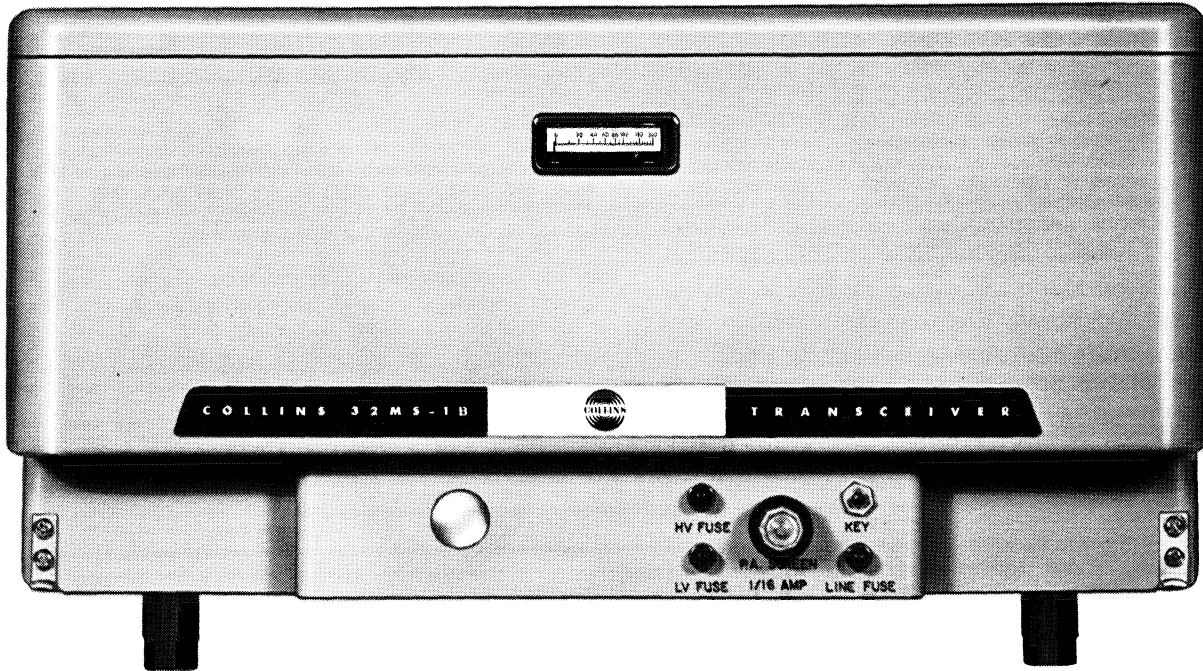
Antennas, p. 92-99

426U-2 Power Supply, p. 86

Transceivers

TRANSCIVER

32MS-1B 100 Watt Mobile Transceiver



Features

*Four Pretuned Channels
Stable Signals
Simplified Controls
Power Source Options*

Applications

*Petroleum
Lumbering
Maritime Service
Highway Construction
Civil Defense
Aircraft
Vehicle Fleet*

The 32MS-1B Mobile Transceiver, with an output power of 100 watts PEP, provides SSB voice communication on four channels which can be preset to any frequency in the 1.6-15.0 mc range. All functions, including pushbutton channel selection, are controlled from a small remote unit. The 32MS-1B is especially suited for use in private autos, trucks, military vehicles, aircraft and marine installations.

SIMPLIFIED OPERATION

Proven SSB circuitry with a minimum number of controls facilitates use by nontechnical personnel. Each channel frequency employs separate sets of inductors to insure optimum selectivity.

Speech clipping is used on both positive and negative peaks to provide increased effective modulation. RF feedback is used

in the RF amplifier section to maintain high linearity.

EASILY MAINTAINED

All tubes and controls for initial adjustments and tuning are reached by removing the top and bottom cover. Tune-up requires no external test equipment. The technician is not directly exposed to any high voltage circuits while maintaining the equipment.

High stability frequency generation circuits, common to the transmitter and receiver sections, simplify over-all circuitry and operation, and insure transmission and reception of signals on identical frequencies, with no manual adjustment.

OPTIONAL POWER SUPPLY

Plug-in supplies permit operation from 12 v dc, 28 v dc or 115 v or 230 v, 50-400 cps, single phase sources, and facilitate use of the 32MS-1B in land or maritime mobile, fixed station or airborne applications.

ADEQUATE COOLING

The 32MS-1B is housed in a welded aluminum case. Cooling is by convection. When transmitting, a blower forces air directly on the PA tubes and effects general air circulation throughout the cabinet.

Additional forced air can be employed in accordance with ARINC standards for installations where normal ambient air circulation is restricted.

RAPID INSTALLATION

The transceiver, together with control unit, antenna tuner and associated antenna, is easily installed. A separate antenna tuner is not required if the Collins 437P-1 Mobile Antenna is used. Plugs or cable connectors are employed for all wiring between system components.

Accessories

437P-1 MOBILE ANTENNA

The 437P-1 is a tunable, vertical whip antenna for vehicular use. It can be preset for operation on four communication channels in the 1.6-15.0 mc frequency range. The prepositioned taps are automatically selected as the transmit channel is selected. Power handling capability is 100 watts PEP.

The antenna consists of an eight foot stainless steel whip mounted on a tubular base loading coil assembly. Tuning and matching are preset by means of adjustable taps for each channel. A motor driven Autopositioner® included in the assembly operates a switch upon completion of a ground circuit. The antenna can be mounted with a standard universal mount located on the bumper or rear deck of the vehicle. Weight is 6 lbs. (2.72 kg).



48A-1SW DESK SET CONTROL

The 48A-1SW Desk Set provides pushbutton control of all 32MS-1B operating functions, including channel selection and mode choice. It includes a transistor monitor amplifier with separate volume level control. Push-to-talk control of the transmit function is provided by a switch in the handset.



48B-2SW MOBILE CONTROL

The 48B-2SW Control for mobile installations allows pushbutton selection of the desired operating channel and mode of operation. An adjustable mounting bracket permits the control unit to be positioned for maximum ease of use. An integral transistor amplifier and speaker can be used for receiver monitoring.





313W-1 REMOTE CONTROL

The 313W-1 Remote Control functions include channel selection, audio level control and mode selection together with an on-off control. Primarily intended for use where audio output and input amplifiers are available as in aircraft installations. The unit has jacks on the rear for direct use of microphone and headset.

Specifications

PRIMARY POWER: Power supplies available for operation from either 115 v or 230 v, 50-400 cps, 28 v dc or 12 v dc.

POWER REQUIREMENTS: At 117 v ac — nominal transmitting test tone, 3 amps; transmitting average speech, 2.4 amps; receive, 1.2 amps. At 14 v dc — transmitting test tone, 22.5 amps nominal; transmitting average speech, 17 amps; receive, 7 amps. At 28 v dc—transmitting test tone, 11.5 amps; nominal; transmitting average speech, 9 amps; receive, 3.8 amps.

ENVIRONMENTAL CONDITIONS: Ambient temperature range (operating) — from -20° to $+55^{\circ}$ C. Altitude — 30,000 ft. (9,144 meters). Humidity—0% -95%. Vibration—mounted on 390L-1A Shockmount and vibrated according to MIL-E-5400-E Curves 1 and 3, Fig. 5, up to 250 cps; i.e., suitable for aircraft use.

MODE: Single sideband or AM with reinserted carrier.

STABILITY: ± 1 part per million.

TRANSMIT POWER OUTPUT: SSB — 100 watts PEP with two-tone input, using the ac power supply, or 80 watts PEP with two-tone input, using dc power supplies. Compatible AM with single tone input — either 50 watts average using ac power supply, or 40 watts average using dc power supply.

TRANSMIT OUTPUT IMPEDANCE: 52 ohms with SWR of less than 2.5:1.

HARMONIC AND OTHER SPURIOUS RADIATION: Second harmonic — at least 45 db below rated PEP. Carrier — at least 50 db below rated PEP static. Unwanted sideband — at least 60 db below rated PEP. Two-tone distortion products — at least 27 db below rated PEP. All other spurious radiation — at least 50 db down from rated PEP.

TRANSMIT AUDIO INPUT: Telephone handset at control box or balanced 600 ohm input with 0 dbm input level.

SPEECH CLIPPING LEVEL: -3 dbm on AM; $+8$ dbm on SSB.

AUDIO FREQUENCY RESPONSE: Transmitter, over-all, ± 3 db, 400-2700 cps measured across 52 ohm resistive load.

NOISE LEVEL: More than 40 db below rated power output.

AUTOMATIC LOAD CONTROL: Capable of maintaining at least 6 db compression.

RECEIVER BANDWIDTH: SSB — 3 kc, determined by Mechanical Filter. AM — 6 kc, nominal.

RECEIVER SENSITIVITY: Less than 1 uv input signal for 10 db signal-to-noise ratio in SSB service; less than 3 uv signal, modulated 30% with 1000 cps tone for 10 db signal-to-noise ratio in AM service.

AGC CHARACTERISTICS: Output audio change is less than 6 db for input variation from 10-100,000 uv.

RECEIVER IMAGE REJECTION: 1.6-12.0 mc, more than 50 db; 12-15 mc, more than 40 db.

RECEIVER AUDIO OUTPUT POWER: SSB—0 dbm output for 1 uv input; or AM — 0 dbm output for 3 uv, 30% modulation, 1000 cps.

RECEIVER AUDIO DISTORTION: Less than 10% harmonic distortion at audio output.

RECEIVER AUDIO FIDELITY: Over-all ± 3 db, 400-2700 cps for SSB; ± 3 db, 300-3000 cps for AM.

SIZE: 15 $\frac{3}{8}$ " W, 7 $\frac{1}{2}$ " H, 21 $\frac{5}{8}$ " D (39.05 cm W, 19.05 cm H, 54.93 cm D).

WEIGHT: With ac supply, 48 $\frac{3}{4}$ lbs. (22.11 kg); with 28 v dc supply, 36 $\frac{3}{4}$ lbs. (16.67 kg); with 12 v dc supply, 36 $\frac{1}{2}$ lbs. (16.56 kg).

Related Equipment

180V-2 Antenna Coupler, p. 43

32RS-1 100 Watt Transceiver

Features

Four Pretuned Channels
Stable Signals
Simplified Controls
Voice Operation (VOX)

Applications

Petroleum
Lumbering
Maritime Service
Highway Construction
Civil Defense
Mining
Widespread Business

The 32RS-1 is a compact SSB voice transmitter-receiver for fixed base industrial use. It has 100 watt PEP output on any of four pretuned channels in the 1.6-15.0 mc frequency range. Seven basic operating controls permit operation by nontechnical personnel. A front panel meter indicates transmitter output and incoming signal strength.

CIRCUIT FEATURES

Each communication channel employs separate sets of inductors to insure optimum frequency selectivity. RF feedback maintains high RF amplifier linearity. Automatic load control circuitry provides a high level of "talking power" by compensating for changes in voice levels. High stability frequency generation circuits, common to both transmitter and receiver, achieve circuit simplification and eliminate the need for frequency trimming adjustments.

VOICE OPERATE CONTROL

An integral voice operated relay (VOX) automatically switches the unit from receive function to transmit whenever the operator speaks into the handset. If desired, VOX can be over-riden by depressing a push-to-talk button in the handset or by grounding the key terminal.

The VOX control facilitates operation with ordinary telephone extensions or through a telephone switchboard. An accessory "hybrid" termination unit is available for convenient connection of the 32RS-1 Transceiver to existing 2-wire telephone circuits.

EASY TUNE-UP

The panel meter can be employed for transmitter tuning functions and a self-contained audio oscillator permits rapid



set up of new operating channels. All adjustments are continuous and the technician is protected from high voltage.

SIMPLE INSTALLATION

The 32RS-1, together with associated antenna and optional antenna tuner, is interconnected by plug-in cables. An accessory panel, located at the top of the transceiver, will accommodate the 152J-1 Phone Patch or 302E-2 Directional Wattmeter, as well as other switches and controls.

Accessories

302E-2 DIRECTIONAL WATTMETER

The 302E-2 can be mounted directly in the 32RS-1 accessory panel. It can be easily removed for use at the antenna site. A direct reading 0-200 watt scale indicates either forward or reflected power.

Size: 5" W, 3" H, 5¼" D (12.7 cm W, 7.62 cm H, 13.34 cm D). Weight: 3 lbs. (1.36 kg).

152J-1 PHONE PATCH

The 152J-1 uses a resistance hybrid circuit to match a 600 ohm telephone line to the unbalanced transmit and receive audio terminations. It effectively isolates receiver and transmitter functions.

When the phone patch is in operation, the 32RS-1 handset is left on its cradle and the station telephone is used. The line

level is monitored using the station phone. A position is provided to "disconnect" the 32RS-1 when only telephone usage is desired.

The station operator has complete supervisory control by means of a switch which allows either transmit, receive or VOX operation.

Size: 5" W, 3" H, 6 $\frac{5}{8}$ " D (12.7 cm W, 7.62 cm H, 16.83 cm D). *Weight:* 3 lbs. (1.36 kg).

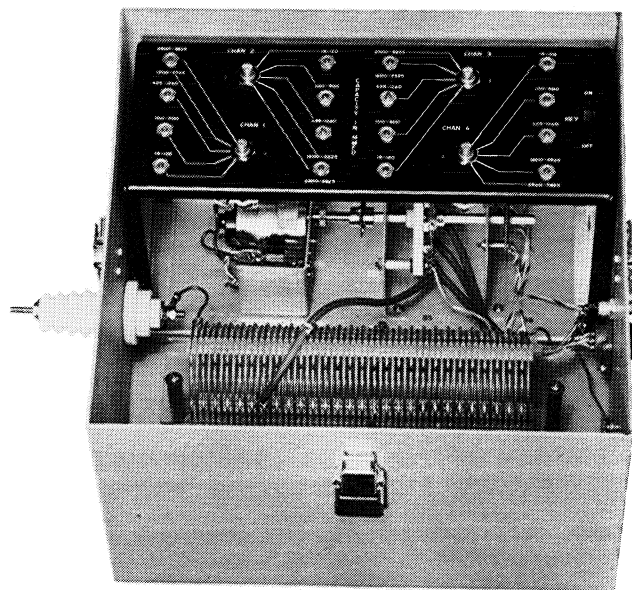
180V-2 ANTENNA COUPLER

The 180V-2 will load single wire or whip antennas longer than 50 ft. over the 1.6-15.0 mc range or longer than 30 ft. over the 2.5-15.0 mc range. The circuit design is a modified reversible "L" type matching network, which allows the use of either low or high impedance antennas.

The 302E-2 Directional Wattmeter can be used directly at the coupler site to facilitate adjustment for minimum reflected power. A remote key-switch allows operation of the transmitter during tuning.

The 180V-2 is weatherproof, permitting installation at the base of the antenna for maximum RF radiation efficiency.

Size: 12" W, 7 $\frac{1}{2}$ " H, 12" D (30.48 cm W, 19.05 cm H, 30.48 cm D). *Weight:* 15 lbs. (6.80 kg).



180V-2 Antenna Coupler

Specifications

GENERAL CHARACTERISTICS

FREQUENCY RANGE: 1.6-15.0 mc.

CHANNEL SELECTION: 4 crystal-controlled channels chosen by channel selector switch.

FREQUENCY STABILITY: 1 part in 10⁶ (0.0001%).

AMBIENT TEMPERATURE RANGE: -15° C to +55° C.

AMBIENT HUMIDITY RANGE: 0%-90%.

POWER SOURCE: 115 v or 230 v, 50-60 cps, single phase.

POWER REQUIREMENTS: 175 watts, receive only; 230 watts, standby; 350 watts for full power transmit (average speech) and 450 watts for full power transmit (2-tone test).

SIZE: 22" W, 24 $\frac{1}{2}$ " H, 14 $\frac{3}{4}$ " D (55.88 cm W, 62.23 cm H, 37.47 cm D).

WEIGHT: 97 lbs. (44 kg).

TRANSMITTING CHARACTERISTICS

POWER OUTPUT: 100 watts PEP.

OPERATING MODES: Either upper sideband or lower sideband voice operation can be specified (USB is standard); RTTY by means of optional FSK keyer-converter.

OUTPUT IMPEDANCE: 52 ohms, capable of tuning a VSWR of 2.5:1.

HARMONIC AND OTHER SPURIOUS SUPPRESSION: Carrier — at least 50 db below peak output. Unwanted sideband — at

least 50 db below peak output. Second harmonic — at least 45 db below peak output into 52 ohm load. Spurious radiation — 1.6-9.0 mc, down 60 db; 9-12 mc, down 45 db; 12-15 mc, transmit image down 40 db.

AUDIO INPUT: Telephone handset with provision for external 4-wire telephone connection, or with accessory hybrid, 2-wire telephone connection.

OVER-ALL RESPONSE: ± 3 db, 350-3000 cps.

AUDIO FREQUENCY DISTORTION: Less than 6% with 100 watt PEP output.

AUTOMATIC LOAD CONTROL: Capable of at least 6 db compression level.

RECEIVING CHARACTERISTICS

SELECTIVITY: 3 kc nominal, determined by the Mechanical Filter.

SENSITIVITY: Less than 1 uv for 10 db signal-to-noise ratio.

IMAGE REJECTION: -50 db, 1.6-12.0 mc; -40 db, 12-13 mc; -30 db, 13-15 mc.

AUDIO OUTPUT POWER: 2 watts maximum, undistorted. More than 50 mw output for a 1 uv input signal, 1.6-12.0 mc. More than 25 mw output for a 1 uv signal 12-15 mc.

OVER-ALL RESPONSE: ± 3 db, 350-3000 cps.

RECEIVER DISTORTION: Less than 10% harmonic distortion and -30 db intermodulation distortion at 0.5 watt audio output level.

618T HF Transceiver *including HF-101, HF-102, HF-103, AN/ARC-94 and AN/ARC-102 Systems*



Features	Applications
<i>Automatic Tuning</i>	<i>Airborne</i>
<i>Frequency Accuracy</i>	<i>Transportable</i>
<i>SELCAL Monitoring</i>	<i>Mobile</i>
<i>Teletypewriter Capability</i>	<i>Shipboard</i>
<i>Modular Construction</i>	<i>Fixed Station</i>

The 618T is a compact HF single sideband transceiver for voice, CW, data or compatible AM communication in the 2.0-29.999 mc frequency range. It is automatically tuned in 28,000 1 kc channel increments by means of an operator's control unit.

The operating frequency is indicated directly in a digital-type presentation. Nominal transmit power is 400 watts PEP in SSB or 100 watts in compatible AM.

APPLICATIONS

A choice of optional accessory antenna tuners permits its use in a wide range of aircraft with peak performance at all frequencies. A retrofit adapter is available to facilitate installation in an airframe which has been wired for a Collins 618S HF AM system.

The 618T, while primarily designed as an airborne transceiver, is ideally suited for transportable, mobile, shipboard and semifixed station applications. Simplified automatic tuning permits it to be operated by nontechnical personnel. Instant on-frequency operation is assured by a temperature-compensated frequency standard with a stability of 0.8 part per million per month.

Mission performance under a wide range of environments has been greatly enhanced by an extensive reliability testing program. It is housed in a 1 ATR case and weighs only 52 lbs., simplifying installation requirements.

DATA TRANSMISSION

For voice transmission, a very minute frequency error can be allowed. Accurate reproduction of the transmitted frequency components for data and signaling systems is either unnecessary for 100 word per minute teletypewriters or can be accommodated by accessory units. This concept results in

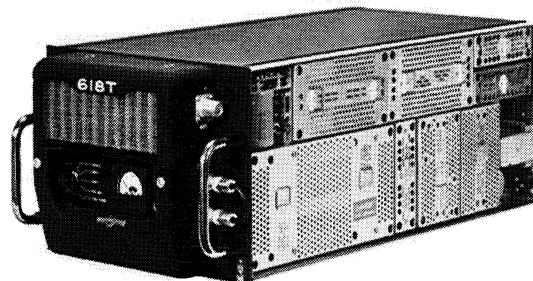
simplicity for the voice transceiver and adds automatic frequency control complexity only when required by high speed data systems.

SELECTIVE CALLING

The use of a selective calling (SELCAL) system on AM is facilitated by a special audio output, which allows signals to be monitored regardless of the mode selection switch setting.

COOLING OPTIONS

Filtered air from a front panel blower is distributed to all portions of the transceiver requiring forced air cooling. The air is metered by vents of the proper size in the main chassis. An exhaust port is provided for use with central cooling systems in accordance with ARINC Specification 404, if desired.

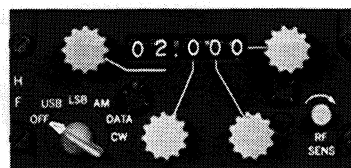


EASY MAINTENANCE

Low maintenance costs are achieved by the use of plug-in modular assemblies. Transistor circuitry employed wherever applicable results in a high degree of reliability, together with minimum weight and power consumption.

TRANSCEIVER SYSTEMS

The 618T Transceiver is available in the following system configurations for airborne applications:
 HF-101 — 618T-1 Transceiver and 714E-2 Control with ex-



714E-3 Control Unit



516H-1 Power Supply
(optional)

ternal 516H-1 Power Supply for operation from 27.5 v dc, 51 amp and 115 v, 1 phase, 400 cps, 2 amp power source.

HF-102 — 618T-2 Transceiver and 714E-2 Control with self-contained power supply for operation from 27.5 v dc, 4 amp and 208 v, 3 phase, 400 cps, 800 watt source.

HF-103 — 618T-3 Transceiver and 714E-2 Control with self-contained power supply for operation from a 27.5 v dc, 35 amp, and 115 v, 1 phase, 400 cps, 1 amp source.

AN/ARC-94 — 618T-2 Transceiver and 714E-2 Control with self-contained power supply for operation from a 27.5 v dc, 4 amp, and 208 v, 3 phase, 400 cps, 800 watt source.

AN/ARC-102 — 618T-3 Transceiver and 714E-2 Control with self-contained power supply for operation from a 27.5 v dc, 35 amp, and 115 v, 1 phase, 400 cps, 1 amp source.

Specifications

FREQUENCY RANGE: 2.0-29.999 mc.

NUMBER OF CHANNELS: 28,000.

TYPE OF FREQUENCY CONTROL: Crystal oscillator.

METHOD OF FREQUENCY CHANGE: Autopositioner®-type, remotely controlled switching mechanisms. Automatic resonating power amplifier and antenna matching circuits.

POWER SOURCE:

618T-1 and 516H-1 — 27.5 v dc and 115 v, 400 cps, single phase.

618T-2 — 27.5 v dc and 115 v, 400 cps, 3 phase.

618T-3 — 27.5 v dc and 115 v, 400 cps, single phase.

Note: 618T-2 is 208 v (208 v line to line), 3 phase, wye connected with grounded neutral.

POWER REQUIREMENTS: Receive — 180 watts. Transmit SSB — 800 watts. Transmit AM — 1050 watts.

FREQUENCY STABILITY: 0.8 part per million per month.

NOMINAL CHANNEL CHANGE TIME: 618T — 8 seconds; 30 seconds including antenna tuner.

AMBIENT TEMPERATURE RANGE: -40° C to + 55° C with 30 minute operation at +70° C.

AMBIENT HUMIDITY RANGE: Up to 95% relative humidity at 50° for 48 hours.

ALTITUDE RANGE: Pressure equivalent of 30,000 feet.

TRANSMITTING CHARACTERISTICS

RF POWER OUTPUT: SSB — 400 watts PEP; AM — 100 watt carrier.

RF OUTPUT IMPEDANCE: 52 ohms.

VSWR: Transmitter shall provide specified power output into 52 ohm load with SWR not to exceed 1.3:1.

AUDIO INPUT IMPEDANCE: 100 ohms unbalanced; 600 ohms balanced.

AUDIO FREQUENCY RESPONSE: 5 db peak-to-valley ratio from 300-3000 cps.

DISTORTION: SSB — Third order products down at least 30 db. AM — Less than 20% at 85% modulation.

RECEIVING CHARACTERISTICS

SENSITIVITY: SSB — 1 uv for a 10 db S+N/N ratio. AM — 3 uv modulated 30% at 1,000 cps for a 6 db S+N/N ratio.

SELECTIVITY: SSB — 2.85 kc, 6 db down; 6.0 kc, 60 db down. AM — 5.5 kc, 6 db down; 14.0 kc, 60 db down.

AGC CHARACTERISTICS: Maximum variation of audio output is 6 db for signals from 10-100,000 uv. No overload below 1 v signal input.

IF REJECTION: 80 db minimum.

AUDIO OUTPUT POWER: 100 mw into a 300 ohm load.

AUDIO DISTORTION: Less than 10%.

AUDIO FREQUENCY RESPONSE: 5 db peak-to-valley ratio from 300-3,000 cps.

SIZE AND WEIGHT:

	Size			Weight
	W	H	D	
618T-1 transceiver	10 $\frac{1}{8}$ " 25.7 cm	7 $\frac{5}{8}$ " 19.4 cm	22 $\frac{3}{16}$ " 56.4 cm	50.0 lbs. 22.68 kg
618T-2 transceiver	10 $\frac{1}{8}$ " 25.7 cm	7 $\frac{5}{8}$ " 19.4 cm	22 $\frac{3}{16}$ " 56.4 cm	52.0 lbs. 23.59 kg
618T-3 transceiver	10 $\frac{1}{8}$ " 25.7 cm	7 $\frac{5}{8}$ " 19.4 cm	22 $\frac{3}{16}$ " 56.4 cm	50.0 lbs. 22.68 kg
714E control*	5 $\frac{3}{4}$ " 14.6 cm	2 $\frac{5}{8}$ " 6.67 cm	4 $\frac{3}{8}$ " 11.1 cm	2.0 lbs. 0.91 kg

*Add $\frac{3}{4}$ " (1.9 cm) to length of 714E-2, and $\frac{1}{2}$ " (1.27 cm) to length of 714E-3 for connector.

Related Equipment

180L-3A Antenna Coupler, p. 101

180R-4/309A-1 Antenna Coupler and Control, p. 101, 102

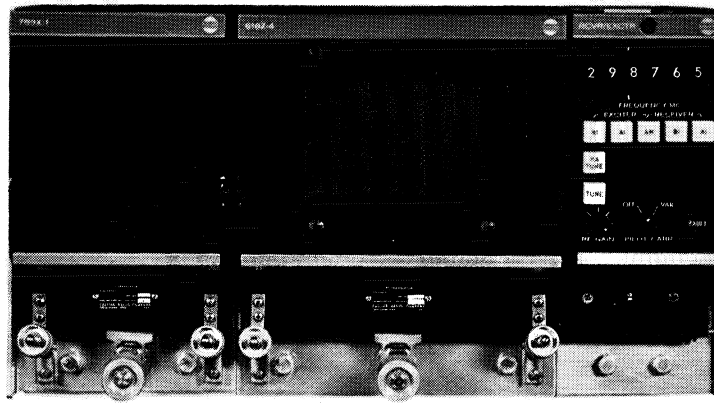
180R-6/309A-2D Antenna Coupler and Control, p. 102, 103

180R-12/309A-9 Antenna Coupler and Control, p. 103, 104

618T Test Equipment, p. 131, 132

488A-2 Inverter, p. 108

671B-1 universal radio group Receiver-Exciter



Features

*Automatic Tuning
Installation Flexibility
Compact Packaging
Telephone Compatibility
Remote Operation*

Applications

*Fixed Station
Transportable
Shipboard
Mobile*

The 671B-1 is a shelf mounted receiver-exciter, covering the 2.0-29.9999 mc frequency range in either 28,000 1.0 kc or 280,000 0.1 kc channel increments. It is part of the Collins Universal Radio Group of building block equipments which can be selected to meet a wide range of communication requirements. A complete HF transceiver consists of a 671B-1 and an automatically tuned linear amplifier of the desired power level. Mode choice includes upper sideband, lower sideband, or independent sideband with nominal 3 kc or 6 kc bandwidths. Compatible AM is available with 3 kc or 6 kc bandwidth in transmit and 3 kc in receive.

SYSTEM APPLICATION

The URG receiver-exciter is suitable for continuous operation in fixed station, transportable or shipboard applications. Either local or remote telephone-dial control systems can be used. Audio terminations are compatible with telephone industry standards, allowing control of all necessary functions over ordinary wire lines.

HIGH STABILITY

An internal frequency standard offers stability of one part in 10^8 per day; however, an optional external standard is available for applications which require extreme accuracy.

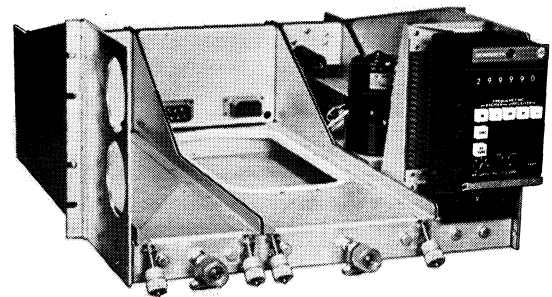
CONTROLS

A simplified control system uses ground-on-line command in a two-out-of-five coding system for frequency selection.

EASE OF MAINTENANCE

Transistor and semiconductor circuitry is used wherever applicable to reduce size, minimize power consumption and increase reliability. Unit construction and circuit modules per-

mit maximum accessibility for routine maintenance and simplify spare parts logistics in larger communication systems.



Easily removed subunits

MECHANICAL CONFIGURATIONS

The basic receiver-exciter consists of an IF translator unit, RF translator unit and mounting shelf.

The IF translator, containing the IF and audio circuits, employs card cage construction to permit a choice of modes and audio requirements by plug-in circuit cards. This arrangement also facilitates modification as communication needs change. In receive, it converts the 500 kc signal from the RF translator to audio, and functioning as an exciter, it converts the audio input to a 500 kc signal for the RF translator.

The RF translator contains the RF tuner frequency generating circuits, frequency stabilization circuit, voltage regulator and power supply. In receive function, the RF translator accepts the RF signal and converts it to the 500 kc frequency required by the IF translator. As an exciter, it converts the 500 kc signal from the IF translator to the desired RF output frequency. An integral mounting shelf with wiring distribution frame and a cooling air plenum is compatible with both Unistrut racking and attractive cabinet enclosures. A modified shelf is also available for use in standard 19" racks.

BASIC CONFIGURATION

The 671B-1 is normally supplied with an internal frequency standard, upper sideband 3 kc bandwidth and 1 kc RF channel increments for operation from a 27.5 v dc power source. Also included is the 499L-3 Mounting Shelf with cooling air plenum, distribution frame and circuit breaker.

OPTIONAL CONFIGURATIONS

Mode Options The following choices are available to meet other specific operating requirements: LSB, 3 kc bandwidth; LSB, 6 kc bandwidth; USB, 6 kc bandwidth; and AM.

Tenth KC Channel Increment Option The number of RF channels can be increased to 280,000, allowing more effective utilization of the RF spectrum allocation.

Line Amplifier Options Plug-in audio line amplifiers can be used on the incoming line in transmit and the audio output in receive if higher levels are needed. Single input or output line amplifiers for one channel systems, as well as dual amplifiers for systems using channels on both USB and LSB, are available.

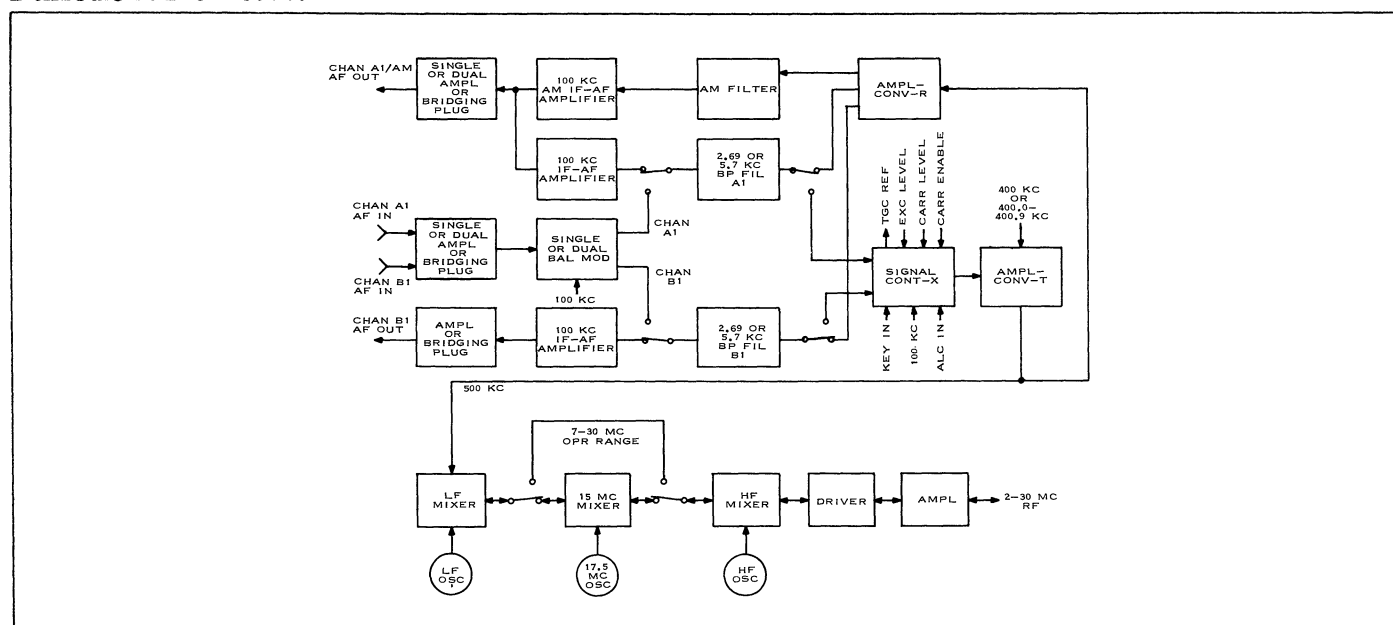
External Frequency Standard Option This option offers extremely high frequency stability when a standard such as the Collins 40N-1 is used.

Memory Matrix Option The memory matrix is necessary only in systems using 0.1 kc tuning option which share frequency control information between equipments. The 0.1 kc digit information is retained in the absence of continuous information after tuning is completed until a new frequency is selected. It is primarily intended for installations using the 313 series of wire line control equipments.

Power Supply Option An internal power supply enables operation from 115 v or 230 v, 45-450 cps power sources in lieu of the standard 27.5 v dc.

Mounting Shelf Options A 499L-3 22" (55.25 cm) wide shelf with distribution frame and local control unit and cooling air plenum for central rack cooling; 499L-3 19" (48.34 cm) wide shelf with distribution frame and blower in lieu of plenum; or a 499L-3 19" (48.26 cm) wide shelf with distribution frame, blower and control unit.

Functional Circuits



Specifications

FREQUENCY RANGE: 2.0-29.999 mc or 2.0-29.9999 mc with 1.0 kc or 0.1 kc channel increments.

TYPES OF EMISSION: SSB — USB, LSB, ISB (3 kc or 6 kc nominal bandwidths) or conventional AM in receive and compatible AM in transmit.

TUNING TIME: Not more than 8 seconds after selection of channel frequency.

STABILITY: Internal standard — 1 part in 10^8 per day due to aging; rms stability factor does not exceed 1 part in 10^8 in any 10 minute period.

FREQUENCY CONTROL: All injection sources are phase locked to an internal standard (or external standard, if used).

POWER REQUIREMENTS: 24.0-30.25 v dc negative ground with no more than 0.5 v peak ripple; 170 watts nominal. Can be implemented for 115 v or 230 v, 45-450 cps.

SELECTIVITY:

Filter	± 1 DB Maximum Ripple From	60 DB Attenuation Points
A-1 (nominal 3 kc)	100.35-103.04 kc	NLT 99.925 kc NMT 103.30 kc
B-1 (nominal 3 kc)	96.96-99.65 kc	NLT 96.70 kc NMT 100.075 kc
A-1 (nominal 6 kc)	100.30-106.00 kc	NLT 99.70 kc NMT 107.00 kc
B-1 (nominal 6 kc)	94.00-99.70 kc	NLT 93.00 kc NMT 100.30 kc
AM (nominal 6 kc)	97.15-102.85 kc	NLT 96.55 kc NMT 103.45 kc

Filter passband response — 1.0 db from $+15^\circ\text{C}$ to $+65^\circ\text{C}$; 1.5 db from -30°C to $+15^\circ\text{C}$; 3.0 db from -40°C to -30°C .

RECEIVING CHARACTERISTICS

RF INPUT: 0.5 uv to 1 v.

AF OUTPUT: Nominal -10 dbm; can be amplified internally to +10 dbm nominal into 600 ohms for single tone input above AGC threshold.

SENSITIVITY: SSB — Not less than 10 db S+N/N ratio for a standard test signal of 0.5 uv, single tone signal-on to signal-off. AM — Not less than 10 db S+N/N ratio for a standard 30% modulated test signal of 2 uv, modulation-on to modulation-off.

SPURIOUS RESPONSE: Not less than 60 db below response to inband signals.

INTERMODULATION DISTORTION: All intermodulation products at audio output are not less than 40 db down from one of two equal test signals applied to input terminals at 1000 uv level and at +10 dbm audio output level.

AUDIO OUTPUT: Nominal -10 dbm and can be amplified internally to +10 dbm with a single tone RF input above AGC threshold. Optional +10 dbm line amplifiers when implemented in IF translator.

HUM AND NOISE: For each 10 db increase of input signal the S+N/N ratio increases 10 ± 1 db up to not less than 50 db below rated SSB output and not less than 40 db below rated AM output; with F1A noise filter weighting on SSB, not less than 60 db below rated output.

HARMONIC DISTORTION: Not more than 1% (2000 uv CW input, 1500 cps audio output).

AGC THRESHOLD: SSB — 1 uv nominal. AM — 2 uv nominal.

AGC AUDIO RISE: SSB — not more than 4 db increase in audio output when the RF input is increased from threshold to 1 v. AM — not more than 6 db increase in audio output when the RF input is increased from threshold to 200 mv.

AGC TIME CONSTANTS: All times are referred to within 3 db of equilibrium levels. SSB — rise time 8 milliseconds; decay time 0.15 second.

TRANSMITTING CHARACTERISTICS

RF OUTPUT: 0.4 watt PEP minimum.

AF INPUT: Test tone level — 26 dbm, nominal on 600 ohms each channel; -6 dbm nominal on 600 ohms when not implemented with line amplifiers. Voice -34 VU nominal each channel; -14 VU when not implemented with line amplifiers.

CARRIER SUPPRESSION: Electrically controlled (both stepped and continuous) from 0-30 db, below PEV as measured by standard two-tone test; carrier leak suppression not less than 55 db in SSB.

HARMONIC EMISSION: At least 50 db below PEV level.

TRANSMIT GAIN CONTROL: In response to dc levels of 4 v or more derived from the output of the IF translator and the output of the RF translator or power amplifier, an infinite memory AGC will maintain the dc levels proportional within ± 1 db by bias control of the RF translator gain.

HUM: Not less than 50 db below one tone of a two-tone 0.4 watt PEP test signal.

AUTOMATIC LOAD CONTROL: Input voltage in the range 0 to -10 v will cause the exciter output to be reduced at least 20 db. Minimum distortion requirements are met with up to 10 db reduction in gain. Application of ALC will not affect carrier output in the AM or reduced carrier modes and will not affect the TGC.

SPURIOUS EMISSIONS: 40 db below nominal PEV.

AUDIO INPUT: A -6 dbm, single tone input will produce maximum RF output with the exciter gain control full on and no ALC/TGC input. Specified distortion characteristics are maintained with a two-tone input each having -6 dbm level with ALC voltage applied to maintain output level at 0.2 watt PEP. With the addition of line amplifiers, tones at -26 dbm will meet the same output requirements.

SIZE:

	<i>W</i>	<i>H</i>	<i>D</i>
Cabinet shelf	21 $\frac{3}{4}$ " 55.25 cm	9 $\frac{1}{2}$ " 24.13 cm	23 $\frac{1}{2}$ " 59.69 cm
Standard 19" shelf	19 1/32" 48.34 cm	9 7/16" 23.97 cm	25 9/16" 64.93 cm

WEIGHT: 72 lbs. (32.66 kg) minimum implementation; 95 lbs. (43.09 kg) maximum implementation, including shelf.

Basic Units

789X-1 IF Translator, p. 88-90

618Z-4 RF Translator, p. 87

Related Equipment

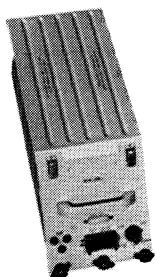
Power Amplifiers, p. 28-37

313 Series Controls, p. 83-85

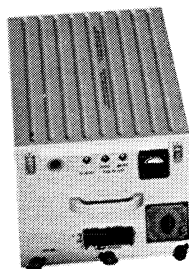
Racks and Cabinets, p. 91

AN/ARC-80 Airborne HF Communication System

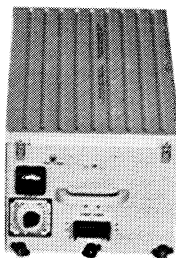
Amplifier Control



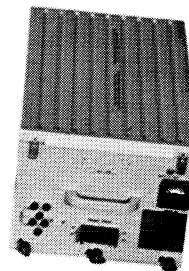
RF Amplifier



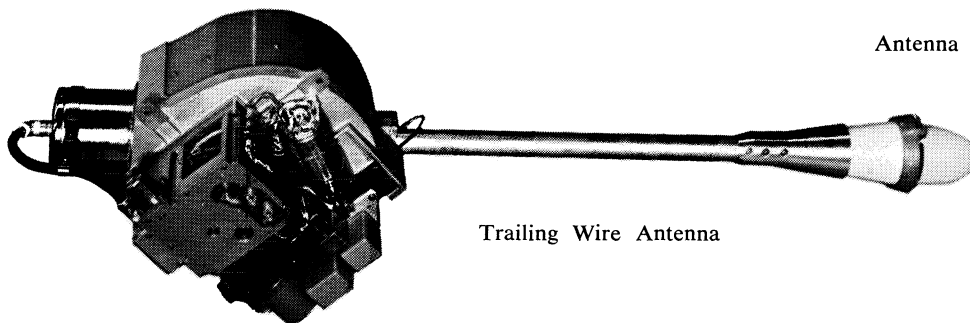
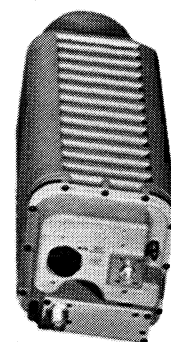
Transmitter



Receiver



Antenna Coupler

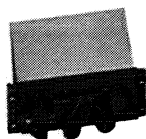


Trailing Wire Antenna

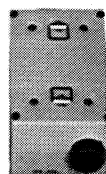
Control Indicator



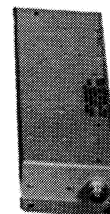
Pilot Control



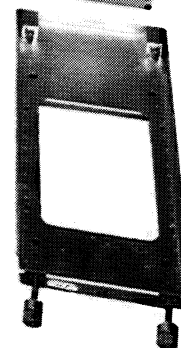
RF Filter



LP Filter



Coupler Mount



Features

*Automatic Tuning
Data Capability
Frequency Calibration
Simplified Maintenance
Reduced Weight*

Applications

Airborne

The AN/ARC-80 HF Airborne Communication System is especially suited for data handling. It consists of a transmitter, RF amplifier, receiver, antenna coupler with shock-mount, trailing wire antenna, amplifier control unit, and line and harmonic filters. Mode and frequency selectors are on the radio set control unit, while PA plate power and trailing wire antenna controls are located on the control indicator unit. The system provides 1 kc channel increments over the 2.0-29.999 mc frequency range with 900 watts PEP output under normal conditions.

Data communication can be used in upper sideband, lower sideband or independent sideband, and voice in upper sideband mode. Other modes available with a minor change in

the amplifier-control unit include CW, AM, FSK/teletypewriter and voice on lower sideband.

Frequency variations can be adjusted to zero with a received standard signal by means of a front panel control.

TRAILING WIRE ANTENNA AND ANTENNA COUPLER

A trailing wire antenna is automatically positioned to the required length for the frequency selected. It can be operated at aircraft speeds up to 300 knots. The associated antenna coupler requires no cooling in environments up to 55° C.

Forward and reflected output power is monitored by a meter located on the control-indicator unit. Indicator lights denote antenna wire torque limits.

Interlocks prevent transmission at full power during tuning cycle. The normal 30 second tuning sequence is indicated by a flashing lamp that remains lighted when tuning operation is completed.

SIMPLIFIED INSTALLATION

Mounting plenums are available for the transmitter, RF am-

plifier, receiver group and the amplifier-control and any associated equipment. The mountings provide shock and vibration isolation together with distribution of cooling air to the equipment. Cable ducts are included for installation of interconnecting wiring. These mounts are normally not supplied with the AN/ARC-80 system but are available for custom requirements.

MODULAR CONSTRUCTION

The units employ modular construction to simplify maintenance and to facilitate upgrading of the equipment as dic-

tated by future technical advances. Self-test and fault isolation features permit monitoring of in-flight performance and rapid determination of a malfunctioning unit or module.

CIRCUIT PROTECTION

Protective features include devices to guard against cooling air loss, excessively high or low voltages, an open or short in the RF amplifier output circuits, unretracted trailing wire antennas as landing gear is lowered or landing hook is down, and snagged antenna or loss of drogue. The antenna protective devices are optional.

Specifications

FREQUENCY RANGE: 2.0-29.999 mc.

NUMBER OF CHANNELS: 28,000.

MODES: LSB, USB, ISB, data and voice.

POWER REQUIREMENTS: 208 v, 380-420 cps, 3 phase, wye connected. Standby — 609 va. Receive — 667 va continuous, 1069 va tune. Transmit — 2520 va continuous, 2626 va tune. 25-29 v dc. Tune only — 15 amps. Antenna-jettison only — 28 amps. Panel illumination — 5.0 v at 3 amps.

AMBIENT TEMPERATURE RANGE: Data mode — -12° C to $+55^{\circ}$ C. Voice mode — -28° C to $+55^{\circ}$ C.

SERVICE CONDITIONS: MIL-E-5400.

ALTITUDE: 15,000 ft., operating; 50,000 ft., nonoperating.

TRANSMITTING CHARACTERISTICS

RF POWER OUTPUT: 900 watts PEP standard conditions; 800 watts, minimum power.

FREQUENCY STABILITY: 5 parts in 10^8 per 7 hr. period.

AUDIO INPUT: 3.0 PEV, 600 ohms.

VOICE INPUT: 0.25 v, carbon microphone.

INTERMODULATION DISTORTION: 36 db below PEP.

SPURIOUS OUTPUT: 0.15-2.0 mc, $+5$ dbm; 2-40 mc, $+17$ dbm; 40-60 mc, -10 dbm; 60-100 mc, -5 dbm; 100-225 mc, $+5$ dbm; 225-450 mc, -50 dbm; 450-1000 mc, -23 dbm.

RECEIVING CHARACTERISTICS

SENSITIVITY: 2 uv for 10 db S+N/N.

INTERMODULATION DISTORTION: 46 db below PEV.

FRONT END REJECTION: 80 db or greater.

AUDIO OUTPUT: 3 PEV, 600 ohms.

VOICE OUTPUT: 12 PEV, 600 ohms.

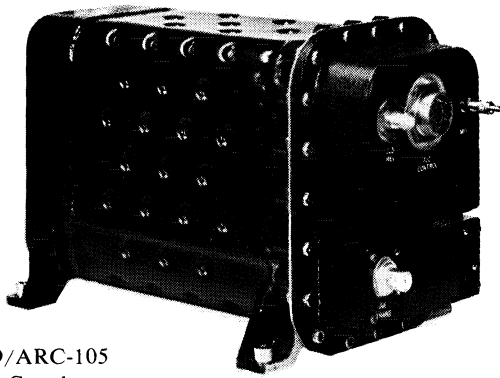
DYNAMIC RANGE: 100 db.

FREQUENCY STABILITY: 5 parts in 10^8 per 7 hr. period.

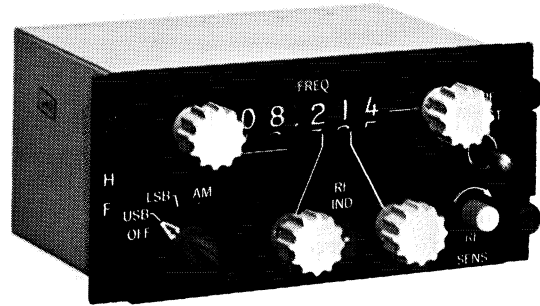
SIZE AND WEIGHT:

Unit	Size			Weight
	W	H	D	
AM-3536/ URC RF amplifier	10 $\frac{7}{8}$ " 27.62 cm	8 43/64" 22.03 cm	20 25/64" 51.79 cm	51 lbs. 23.14 kg
R-1153/ URC receiver	10 $\frac{7}{8}$ " 27.62 cm	8 43/64" 22.03 cm	20 25/64" 51.79 cm	40 $\frac{1}{2}$ lbs. 18.38 kg
AM-3535 amplifier- control	6 $\frac{3}{8}$ " 16.19 cm	8 43/64" 22.03 cm	20 25/64" 51.79 cm	24 lbs. 10.89 kg
AS-1331 trailing wire antenna	14" 35.56 cm	11" 27.94 cm	50" 127.0 cm	38 lbs. 17.24 kg
CU-1094 antenna coupler	7 $\frac{1}{8}$ " 18.10 cm	8 11/32" 21.20 cm	21 $\frac{1}{2}$ " 54.61 cm	27 $\frac{1}{2}$ lbs. 12.47 kg
T-899/ URC transmitter	10 $\frac{7}{8}$ " 27.62 cm	8 43/64" 22.03 cm	20 25/64" 51.79 cm	41 lbs. 18.60 kg
C-4368 control unit	5 $\frac{3}{4}$ " 14.61 cm	2 $\frac{5}{8}$ " 6.67 cm	4 13/16" 12.22 cm	2 $\frac{1}{4}$ lbs. 1.02 kg
ID-1066 control- indicator	5 $\frac{3}{4}$ " 14.61 cm	5 $\frac{1}{4}$ " 13.34 cm	5 3/16" 13.18 cm	3 lbs. 1.36 kg
F-775 RF interference filter	4 $\frac{1}{2}$ " 11.43 cm	3 $\frac{1}{4}$ " 8.26 cm	6 $\frac{1}{4}$ " 15.88 cm	2 lbs. 0.91 kg
F-776 low-pass filter	10 3/16" 25.88 cm	2" 5.08 cm	4" 10.16 cm	4 lbs. 1.81 kg
MT-290 mounting, antenna coupler	7 $\frac{1}{8}$ " 18.10 cm	2" 5.08 cm	17" 43.18 cm	1 $\frac{3}{4}$ lbs. 0.79 kg

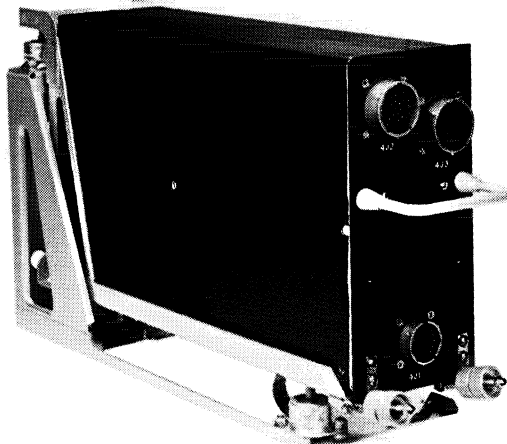
AN/ARC-105 Airborne HF Communication System



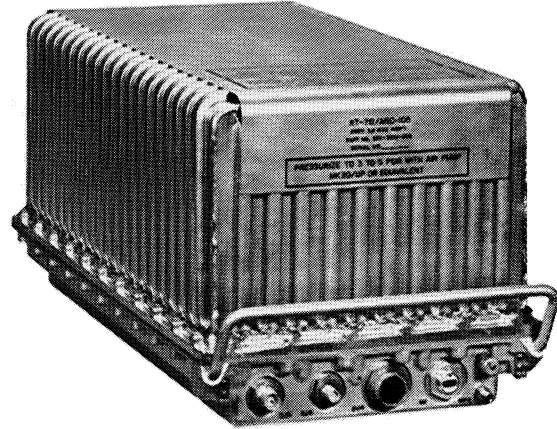
CU-1239/ARC-105
Antenna Coupler



C-4958/ARC-105 Control



C-4959/ARC-105 Antenna Coupler Control



RT-712/ARC-105 Transceiver

Features

Simplicity of Operation
Automatic Tuning
Frequency Stability
System Design
Increased Reliability
Ease of Maintenance

Applications

Airborne

The AN/ARC-105 is a pressurized HF SSB voice communication system covering the 2.0-29.999 mc frequency range in 28,000 1 kc channel increments. It was specifically designed for use in tactical jet aircraft, such as the McDonnell RF4C. The AN/ARC-105 provides the pilot the capability to operate either upper sideband, lower sideband, or AM. The transmitter power output is 400 watts PEP in sideband or 100 watts in AM. Operating frequency is selected directly by the pilot with his control unit, which displays the selected frequency as a digital readout. The RF characteristics of the flush-type shunt antenna are automatically matched at the selected operating frequency by an antenna coupler.

SYSTEM COMPONENTS

The AN/ARC-105 system consists of an HF receiver-transmitter, antenna coupler, antenna coupler control unit, pilot's control unit and associated mountings and RF transmission line accessories.

The RT-712/ARC-105 Receiver-Transmitter Unit features plug-in modules for all major circuits. It is housed in a pressurized case. The C-4958/ARC-105 Control Unit permits frequency and mode selection. It also includes a receiver RF gain control and push-to-test indicator. The CU-1239 Antenna Coupler matches the RF characteristics to the shunt antenna, and the antenna tuning logic and servo control circuitry is contained in the C-4959/ARC-105 Control Unit. This arrangement allows the coupler to be installed directly at the feed point of the antenna.

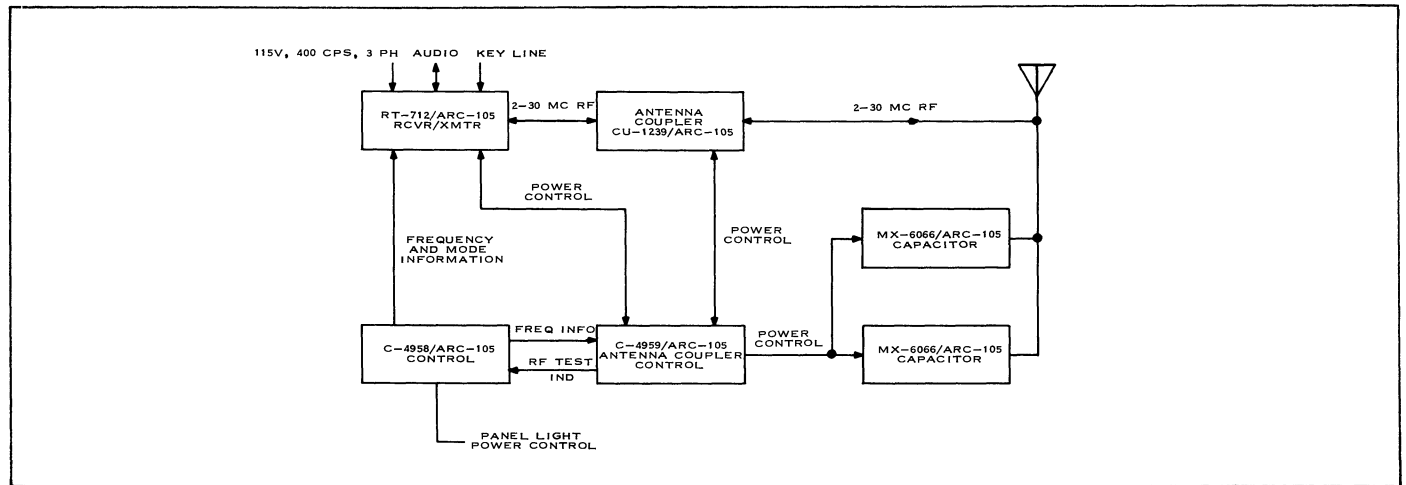
OPERATIONAL CHECK

An RF test switch located on the pilot's control box permits a simple check of over-all system operation and provides a means of isolating a malfunction to a particular unit. A side-tone circuit in the receiver-transmitter provides an audible check of over-all system operation in transmit.

HIGH RELIABILITY

Modular construction and transistor circuitry wherever applicable provide a high degree of reliability, together with minimum weight and power consumption. A temperature-compensated frequency standard using no oven assures frequency stability at 0.8 part per million per month. Mission performance under a wide range of environments has been greatly enhanced by an extensive reliability testing program of the AN/ARC-105 and related HF transceivers.

Functional Circuits



Specifications

FREQUENCY RANGE: 2.0-29.999 mc.

NUMBER OF CHANNELS: 28,000.

MODES: Upper sideband, lower sideband, AM.

POWER REQUIREMENTS: 115 v (line to neutral), 400 cps, 3 phase, 4-wire, 1039 watts maximum.

FREQUENCY STABILITY: 0.8 part per million per month.

TUNING TIME: 25 seconds maximum.

TRANSMITTING CHARACTERISTICS

DUTY CYCLE: 5 minutes transmit, 5 minutes receive.

RF POWER OUTPUT: SSB — 400 watts PEP;
AM — 100 watts.

RF OUTPUT IMPEDANCE: 52 ohms unbalanced.

VSWR: 1.3:1 maximum.

AUDIO INPUT IMPEDANCE: 100 ohms unbalanced;
600 ohms balanced.

AUDIO FREQUENCY RESPONSE: ± 5 db, 300-3000 cps.

DISTORTION: Third order products -30 db. Second harmonic emission -35 db. Carrier suppression -40 db. Opposite sideband suppression -30 db.

NOISE: -40 db minimum.

RECEIVING CHARACTERISTICS

SENSITIVITY: SSB — 1 uv for a 10 db S+N/N ratio. AM — 3 uv modulated 30% at 1000 cps for a 6 db S+N/N ratio.

SELECTIVITY: SSB — not more than 6 db down at 300 cps and 3000 cps; not less than 15 db down at 0 and 3500 cps; not less than 60 db down at -1350 cps and $+4650$ cps. AM — 6 kc, 6 db down; 14 kc, 60 db down.

AGC CHARACTERISTICS: Maximum variation of audio output is 6 db for signals from 10-100,000 uv. No overload with signals to 0.5 v. Attack time, 50 milliseconds maximum. Release time, 800 milliseconds maximum.

IF REJECTION: 80 db minimum.

AUDIO OUTPUT POWER: 50 mw with 5 uv RF input.

AUDIO OUTPUT IMPEDANCE: 300 ohms unbalanced.

AUDIO DISTORTION: 10% maximum with 80% modulation at 1000 cps.

AUDIO FREQUENCY RESPONSE: ± 5 db from 300-3000 cps.

SIZE AND WEIGHT:

	Size			Weight
	W	H	D	
RT-712/ ARC-105 transceiver	11.44" 29.06 cm	10.25" 26.04 cm	22.77" 57.84 cm	66.0 lbs. 29.94 kg
MT-3094/ ARC-105 mounting	12.19" 30.96 cm	5.23" 13.28 cm	24.98" 63.45 cm	6.0 lbs. 2.72kg
C-4958/ ARC-105 control	5.75" 14.61 cm	2.63" 6.68 cm	4.88" 12.4 cm	1.8 lbs. 0.82 kg
C-4959/ ARC-105 antenna coupler control	3.69" 9.37 cm	7.72" 19.61 cm	14.47" 36.75 cm	10.4 lbs. 4.72 kg
MT-3095/ ARC-105 mounting	4.59" 11.66 cm	8.81" 22.38 cm	16.2" 41.15 cm	1.4 lbs. 0.64 kg
CU-1239/ ARC-105 antenna coupler	8.5" 21.59 cm	8.5" 21.59 cm	14.41" 36.6 cm	17.4 lbs. 7.89 kg
CG-2755/ ARC-105 RF transmission line	5.88" 14.94 cm	5.88" 14.94 cm	24.03" 61.04 cm	2.0 lbs. 0.91 kg
MX-6066/ ARC-105 vacuum capacitor	4.13" 10.49 cm	7.5" 19.05 cm	5.88" 14.94 cm	15.0 lbs. 6.8 kg
MX-6067/ ARC-105 feed line capacitor	1.88" 4.78 cm	2.75" 6.99 cm	16.25" 41.28 cm	0.5 lbs. 0.23 kg
MX-6068/ ARC-105 interconnect capacitor	2.33" 5.92 cm	0.5" 1.27 cm	11.02" 27.99 cm	0.2 lbs. 0.09 kg

AN/PRC-38 40 Watt SSB-FM Man Pack Transceiver



Features

Multimode Communication
Simplified Operation
Spectrum Utilization
HF/VHF/SSB or FM
Compatibility
Easily Maintained

Applications

Man Pack
Vehicular
Aircraft
Shipboard
Semifixed

The AN/PRC-38 is a man pack transceiver with 40 watts PEP output and a choice of single sideband or FM modes in the 20.0-69.99 mc frequency range. Suitable in man pack, vehicular, aircraft, shipboard or semifixed station applications, it fulfills a distinct need for compatible SSB or FM short range military communication. The number of available channels is increased tenfold using 7.5 kc SSB channels, spaced 10 kc, compared with conventional FM.

COMMUNICATION COMPATIBILITY

Compatibility with currently used FM modes, as well as SSB, permits routine communication with activities using the following equipment: AN/ARC-44, AN/ARC-54, AN/ARC-58, AN/ARC-94, AN/GRC-3, AN/GRC-5, AN/GRC-7, AN/MRC-36, AN/MRC-37, AN/MRC-38, AN/MRC-83, AN/MRC-87, AN/MRC-94, AN/MRC-95, AN/PRC-8, AN/PRC-9, AN/PRC-10, AN/PRC-25, AN/TRC-91, AN/TSC-15, AN/TSC-38, AN/URC-20, AN/URC-21, AN/URC-32, AN/VRC-12 and other military communication equipment.

SIMPLIFIED OPERATION

A straightforward, digital-type tuning system, with a dial that indicates frequency directly, reduces the possibility of operator error. A unique frequency synthesis system gener-

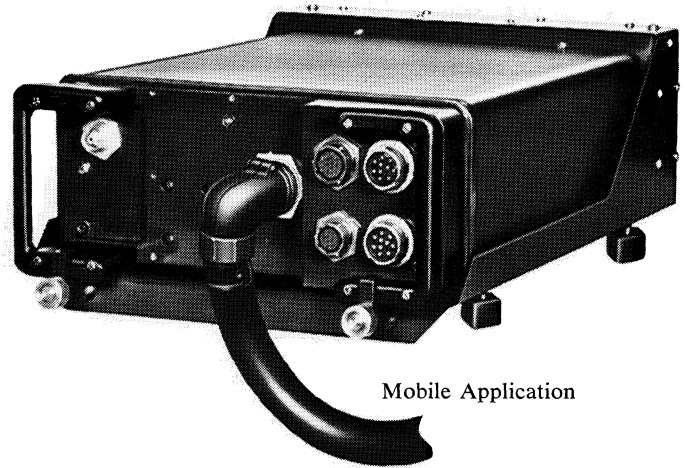
ates the high stability injection signals required for SSB operation, with excellent accuracy over a wide range of temperature and humidity conditions. Reference frequencies are maintained within one-half cycle per megacycle by a temperature-sensitive network, with no crystal oven.

REDUCED POWER REQUIREMENTS

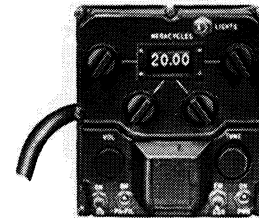
Low power consumption results in lower operating temperature and extended component life. Transistor circuits are used wherever applicable. IF and low level RF circuits common to both transmit and receive functions effect maximum power economy. Magnetic latching relays are used for emission switching to conserve power.

The AN/PRC-38 uses the same battery, type BB-451/U, as the AN/PRC-41 UHF Transceiver and the AN/PRC-47 HF Transceiver. It can be operated directly from the vehicle battery in mobile applications.

For pack set use the AN/PRC-38 is carried in a rucksack frame. An optional shockmount is available for mobile applications. Test points are available to allow rapid isolation of any malfunctioning subassembly. Operation can be restored immediately by replacement of the easily removable subassemblies.



Mobile Application



Control Unit

Specifications

- FREQUENCY RANGE: 20.0-69.99 mc.
- NUMBER OF CHANNELS: 5000 available.
- FREQUENCY STABILITY: ±0.5 part per million.
- POWER SOURCE: 22-28 v dc; 24 v dc nominal.
- POWER CONSUMPTION: Transmit — not more than 260 watts.
Receive — not more than 23 watts.
- DUTY CYCLE: 9 minutes receive; 1 minute transmit.
- ANTENNA REQUIREMENTS: Automatic coupler will match a 5 ft. whip antenna, 50 ohms, or any antenna impedance falling within a 5:1 VSWR.
- AMBIENT TEMPERATURE RANGE: -40° C to +60° C.
- AMBIENT HUMIDITY RANGE: 0% -100%.
- ALTITUDE RANGE: Sea level to 10,000 ft. (3048 meters).
- TRANSMITTING CHARACTERISTICS
- MODULATION: FM or SSB.
- TRANSMIT POWER OUTPUT: 40 watts PEP on SSB; 20 watts average on FM.
- TRANSMIT FM DEVIATION: ±15 kc nominal.

RECEIVING CHARACTERISTICS

- RECEIVE SENSITIVITY: On SSB, an S+N/N ratio of at least 10 db with a 0.5 uv RF input to antenna. On FM, an S+N/N ratio of at least 10 db with 0.5 uv RF input, ±8 kc deviation to antenna.
- RECEIVER AUDIO OUTPUT: 300 mw maximum capability, 300 ohm output impedance.
- ACCESSORY AUDIO EQUIPMENT: The AN/PRC-38 works with H-33E/PT or equivalent and with H-138/PT or equivalent.

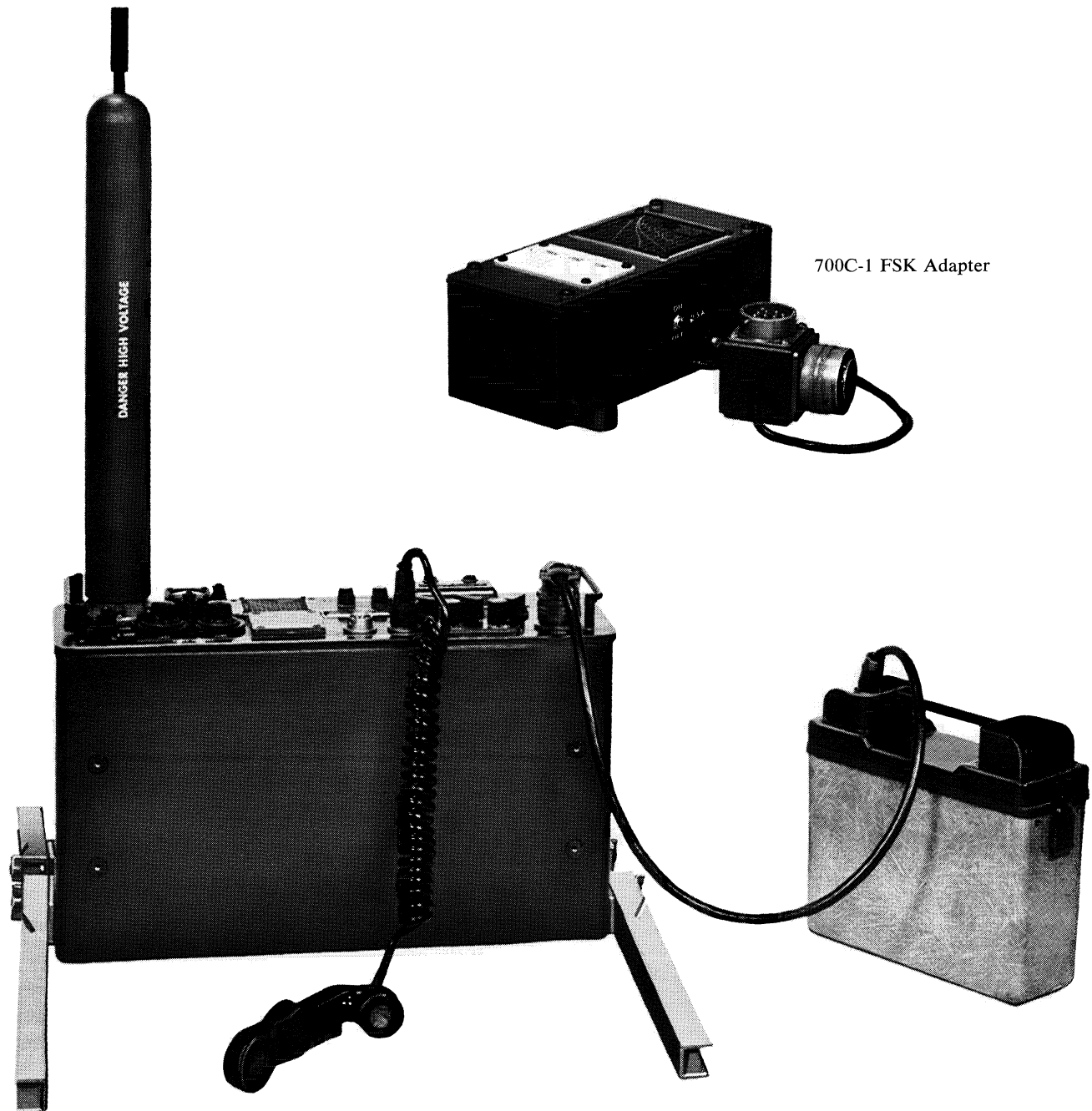
SIZE:

	<i>W</i>	<i>H</i>	<i>D</i>
AN/PRC-38 without battery	11¾" / 29.85 cm	15" / 38.1 cm	4⅝" / 11.7 cm
AN/PRC-38 with battery	11¾" / 29.85 cm	22½ cm / 57.15 cm	4⅝" / 11.7 cm

WEIGHT:

AN/PRC-38 only	28 lbs.	12.7 kg
Battery, BB-451/U	16 lbs.	7.26 kg

AN/PRC-47 100 Watt Man Pack HF Transceiver



700C-1 FSK Adapter

Features

- Simplified Tuning*
- No Oven Warm-up*
- Speech Processing*
- Submersible Case*

Applications

- Man Pack*
- Semifixed*
- Mobile*

The AN/PRC-47 is a two-man team pack transceiver for CW or SSB voice communication in the 2.0-11.999 mc fre-

quency range. It features simplified digital tuning in 10,000 channel increments with the operating frequency indicated directly on an illuminated dial. Transmit power output level is 100 watts PEP. An optional external 199Q-1 cooling blower can be used for continuous duty operation. An external 700C-1 FSK adapter permits teletypewriter communication and also provides forced air cooling for the receiver-transmitter unit. The AN/PRC-47 can be operated from either a 24 v military pack set battery, a 24 v vehicle battery or a 115 v, single phase, 400 cps source.

APPLICATION CONFIGURATIONS

The AN/PRC-47 can be used for forward echelon combat control, guiding air supply or paratroop drops, long range reconnaissance missions, front line administration or tactical networks. It can be mounted on a Jeep for rear echelon or front line employment.

Two rucksack frames facilitate man pack use: one is used to carry the transceiver; the other, the battery supply, antenna and accessories. The AN/PRC-47 is also ideally suited to the vibration environments of vehicular operation and can be installed quickly by the use of optional mounting clamps. Power can be obtained from the vehicle battery-generator system, and it can use either the antenna supplied or a mobile whip. The transceiver is operationally compatible with the AN/MRC-83, AN/MRC-87, AN/MRC-94, AN/MRC-95, AN/TRC-69, AN/TRC-75, AN/TRC-91, AN/TSC-15, AN/TSC-38 and other similar single sideband equipment.

The AN/PRC-47 can be set up for operation by a two-man team in a few minutes. In operation, a leg attaches to each of the four corners of the case to give stability. Wire radials are unwound and connected to the transceiver case to form a ground plane for the antenna. A 15-foot sectional whip an-

tenna, which fastens directly to an insulator on the transceiver front panel, completes the installation. For storage or vehicular transport, a watertight case accommodates the entire system.

CIRCUITRY

The AN/PRC-47 uses a stabilized master oscillator with no oven. This reduces power drain and requires no warm-up. Balanced modulators and Mechanical Filters for sideband separation in transmit give excellent carrier suppression and negligible interchannel cross-talk.

Tuning and loading of the power amplifier are facilitated by a visual power output indicator. An audio channel circuit can be used for a sidetone signal. The AN/PRC-47 Transceiver uses a standard military H-33G/PT handset.

MODULAR CONSTRUCTION

Major circuits are arranged in six modules — RF oscillator, signal data-translator, amplifier-modulator, oscillator control, audio amplifier and power supply. Mechanical connections, where required, permit easy module removal. Test points for all significant circuit voltages are located on the top of each module to facilitate rapid trouble isolation.

Specifications

FREQUENCY RANGE: 2.0-11.999 mc.

FREQUENCY STABILITY: ± 25 cps.

NUMBER OF CHANNELS: 10,000 1 kc channels.

MODES: USB — Voice, MCW or FSK.

IMPEDANCES: Receiver RF input 50 ohms. Transmitter output network capable of matching a 15-foot whip antenna or a 50 ohm resistive load. Receiver audio output 300 ohms.

EXTERNAL POWER SOURCE: 24 v dc or 115 v, 400 cps nominal. Negative ground battery is interchangeable with the one used in the AN/PRC-38 or AN/PRC-41 Radio Set.

INPUT POWER: Transmit, less than 320 watts; receive, less than 18 watts.

SIZE:

	<i>W</i>	<i>H</i>	<i>D</i>
Transceiver	23 $\frac{3}{8}$ " 58.74 cm	13 11/16" 34.77 cm	6 15/16" 17.62 cm
Battery case	4" 10.16 cm	9 $\frac{7}{8}$ " 25.08 cm	11 9/16" 29.37 cm

WEIGHT: Transceiver — Approx. 41 lbs. (18.6 kg). Battery and case — 17 lbs. (7.71 kg).

TRANSMITTING CHARACTERISTICS

POWER OUTPUT: Choice of 100 watt or 20 watt PEP levels.

AUDIO FIDELITY: ± 6 db from 300-3000 cps, relative to 1700 cps.

DISTORTION: Third order intermodulation products 30 db down from either of two equal test tones at 100 watts PEP using voice modulation.

CARRIER SUPPRESSION: 40 db down.

SPURIOUS OUTPUT: At least 50 db down from desired output.

RECEIVING CHARACTERISTICS

SENSITIVITY: 2 uv for 10 db signal-plus-noise-to-noise ratio; 50 mw minimum audio output.

SELECTIVITY: At -6 db — 300-3000 cps above channel frequency (with response at 1700 cps above channel frequency as reference). At -60 db — 1000 cps below channel frequency to 4600 cps above channel frequency.

AVC CHARACTERISTICS: Less than 10 db audio output variation for input signals from 5-100,000 uv.

AUDIO OUTPUT: 500 milliwatts, 1000 uv input.

AUDIO DISTORTION: Less than 15%.

Related Equipment

700C-1 FSK Adapter, p. 123

AN/URC-32 HF Transceiver

Features

28,000 Channels
Digital Tuning
Excellent Stability
Optional Shockmounts
Complete Accessibility

Applications

Shipboard Communication
Fixed Station

The AN/URC-32, a rack mounted single sideband transceiver, provides simplex operation in the 2-30 mc frequency range with 500 watts PEP output. Continuous coverage is provided in 1 kc increments with channel frequency indicated directly on an illuminated counter-type dial. Frequency coverage in 0.1 kc steps is optionally available. A choice of modes includes upper sideband, lower sideband, independent sideband (separate channels on each sideband), AM, RTTY or CW.

SYSTEM APPLICATIONS

The AN/URC-32 is well suited for shipboard, fixed or transportable communication systems. Shockmounts which provide excellent isolation for shipboard installation are available for the equipment rack.

HIGH FREQUENCY STABILITY

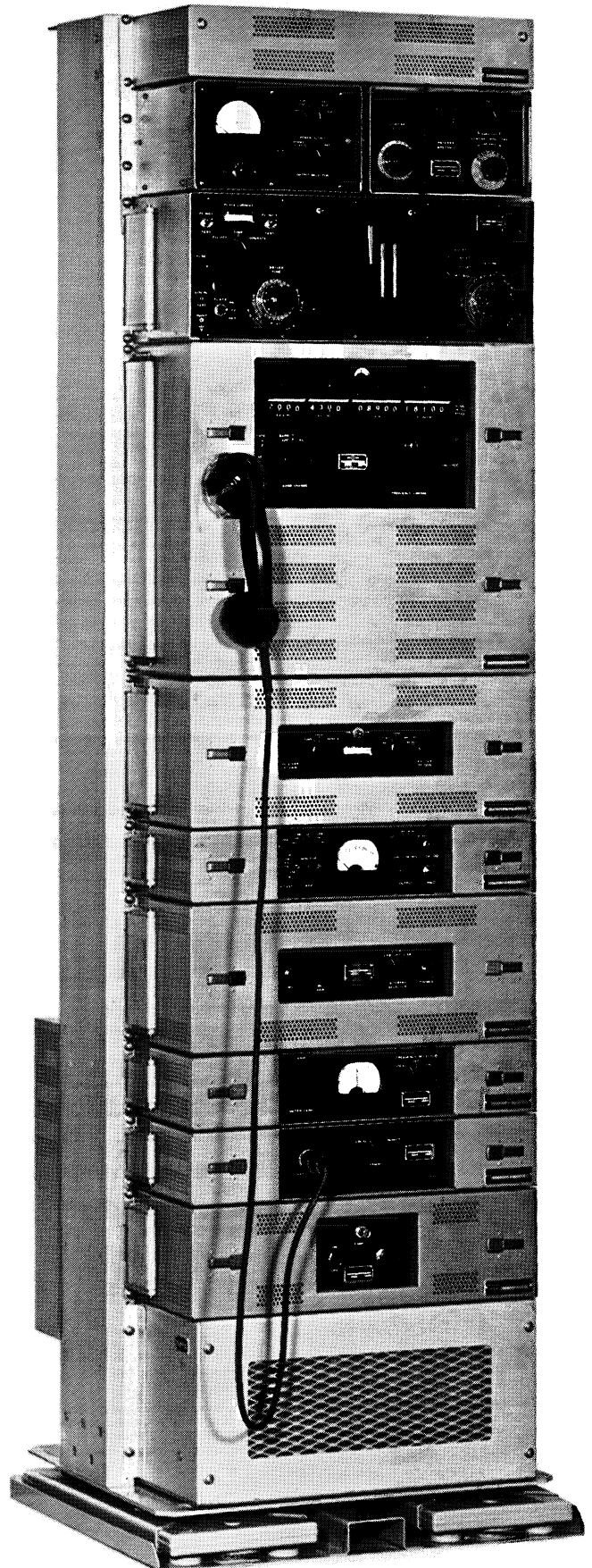
On-frequency channel selection, without searching or fine tuning, is assured by an integral transistorized frequency standard with a stability of one part in 10^6 per month. An external Collins 40N-1 Frequency Standard can be used in installations requiring stabilities of one part in 10^8 per day. Manual tuning of the transmitter places the receive circuits in proper adjustment when reception on the same frequency is desired.

MAXIMUM ACCESSIBILITY

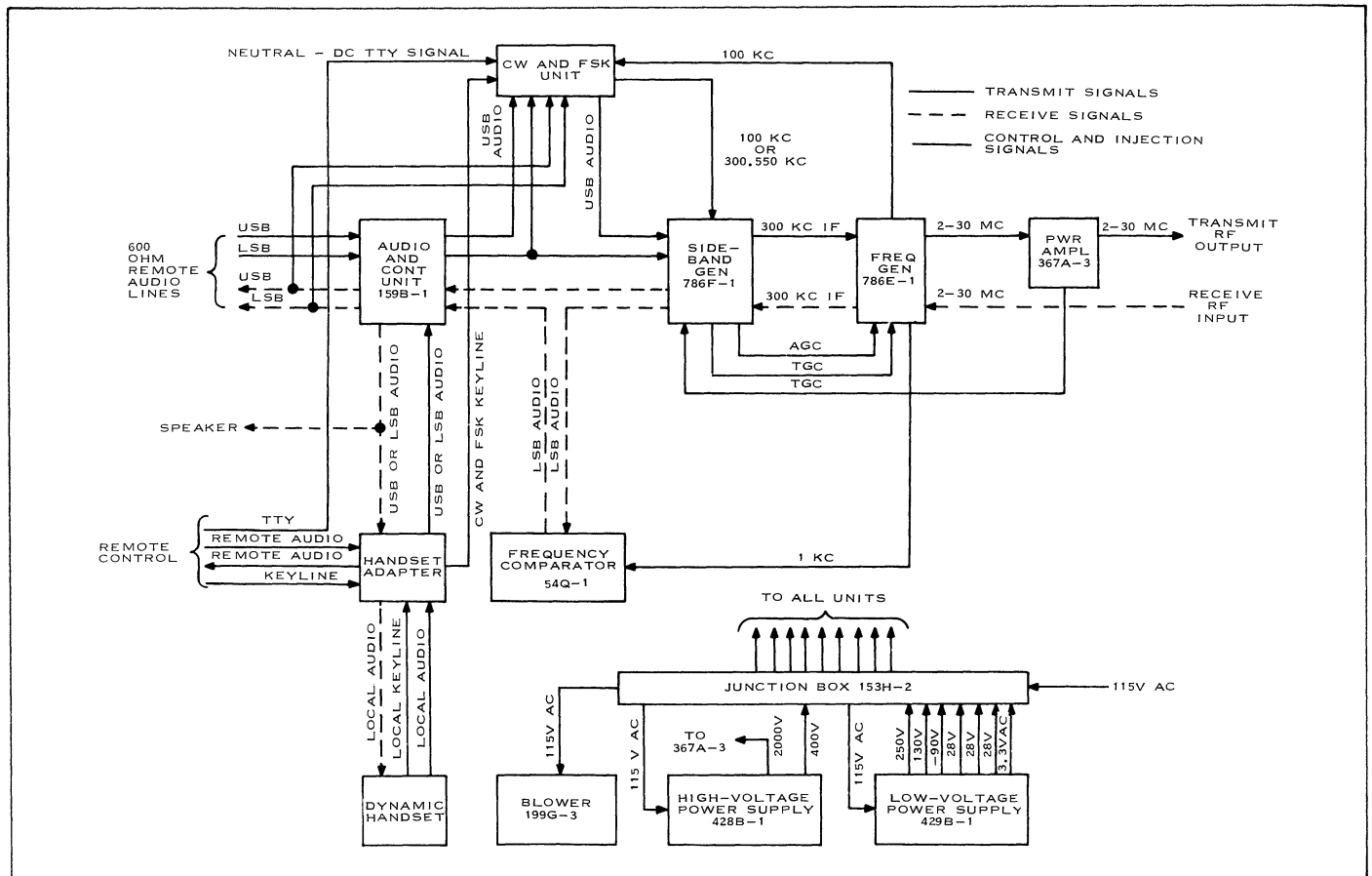
Circuitry is divided into logical groups on individual chassis which feature quick disconnect devices. Each chassis is mounted on the rack with swing-out type hinges providing complete access to all components and wiring. Many of the units have plug-in modules or subunits to further facilitate inspection and maintenance.

MODERN CIRCUITRY

Receiver and exciter circuits employ double conversion above 3.7 mc. Balanced modulators and Mechanical Filters provide excellent carrier suppression and negligible inter-channel cross-talk. The power amplifier is a two-stage, four-band unit with excellent linearity. Included is a frequency comparator that can be used to check the received signal with an external standard if desired.



Functional Circuits



Specifications

FREQUENCY COVERAGE: 2-30 mc in 1 kc steps manually tuned; variable 1 kc BFO on CW; 0.1 kc steps available with optional module.

FREQUENCY STABILITY: 1 part in 10^6 for one month, or 1 part in 10^8 per day with external 40N-1 standard.

MODES OF OPERATION: USB; LSB; ISB; AM; CW as 1.0 kc or 1.5 kc audio tone on USB; teletypewriter using ± 425 cps shift FSK on USB.

POWER SOURCE: 115 v or 230 v, single phase, 50-60 cps; 1500 watts maximum, transmit; 420 watts, receive (with PA in transmit standby).

RF TERMINATION: 52 ohms. Type N coaxial fitting.

ANTENNA REQUIRED: Shipboard whip antenna with 180T-2 antenna coupler.

SIZE: 21 7/8" W, 73" H, 20 7/8" D (55.56 cm W, 185.42 cm H, 53.02 cm D), including rack.

WEIGHT: Approx. 350 lbs. (158.9 kg), including rack.

TRANSMITTING CHARACTERISTICS

POWER OUTPUT: SSB — 500 watts PEP; compatible AM — 125 watts carrier.

AUDIO INPUT: Dynamic handset, two 600 ohm balanced lines at -38 to $+8$ dbm, or audio input from shipboard remote radiophone unit.

SSB DISTORTION: At full PEP, third order distortion products 35 db below either of two equal test tones.

SPURIOUS SIGNALS: Undesired sideband, at least 40 db below rated PEP level.

AUDIO RESPONSE: 4 db, 350-3,000 cps; down 60 db at 4,000 cps. Distortion less than 5%.

KEYING RATE: 100 wpm, FSK; 35 wpm, CW.

NOISE: More than 40 db below either of two equal tones when transmitter is driven to full output.

RECEIVING CHARACTERISTICS

SENSITIVITY: 1 uv for 10 db signal-to-noise-plus-noise ratio in SSB operation; 2 uv for 10 db signal-to-noise-plus-noise ratio in AM operation.

SELECTIVITY: 3 kc bandwidth, SSB; 6 kc bandwidth, AM.

AUDIO OUTPUT: Loudspeaker at 2 watts, headphones, handset, two 600 ohm lines at -34 to $+14$ dbm. Can also be used with a shipboard remote radiotelephone unit.

Related Equipment

180T-2 Antenna Coupler, p. 104, 105

Communication Systems

EXCITER

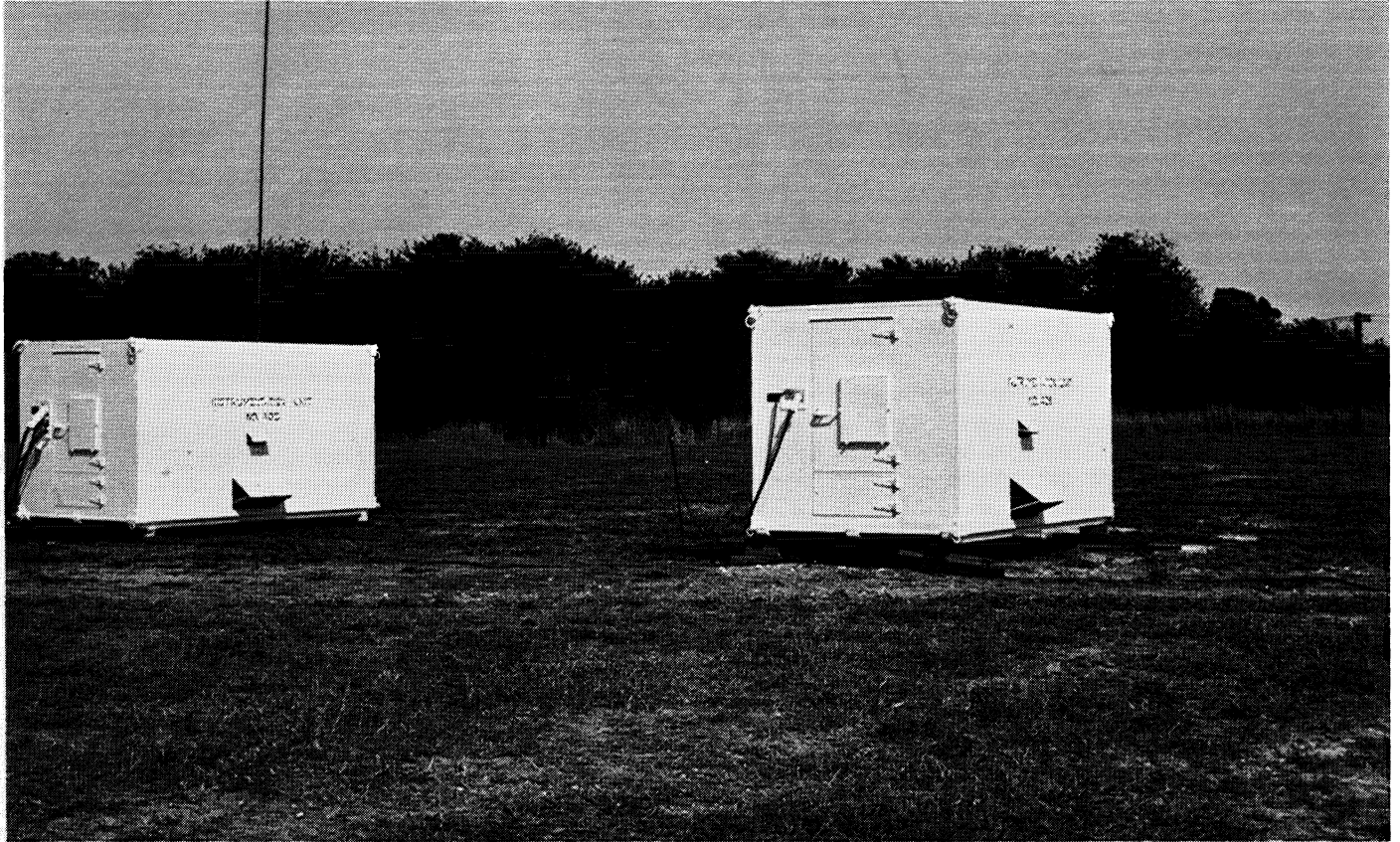
POWER
AMPLIFIER

ANTENNA
COUPLER

TERMINATION
EQUIPMENT

RECEIVER

ANNA-1 Air Transportable HF Communication System



Features

High Mobility
Lightweight
Self-contained
One-Man Operation
Two Independent Systems

Applications

Air Transportable

The ANNA-1 HF Communication System provides either simplex or full duplex operation on two independent radio circuits, which are automatically tuned in 0.1 kc channel increments throughout the 2.0-29.9999 mc frequency range. Transmit power output is 1 kw PEP or average. Choice of modes includes upper sideband, lower sideband, independent sidebands or AM, together with voice frequency telegraph facilities.

An RF patch panel permits a choice of antennas for either system. The selection includes a semidirectional, horizontally-polarized log-periodic for short to medium range, point-to-point communication and a vertically-polarized, omnidirectional monopole with low angle radiation for ship-to-shore and ground-to-air communication. A 32 ft. whip can be installed on the shelter to provide an operational radio circuit within minutes after the equipment is moved on site. Receiver bandpass filters allow transmit-receive frequency separation as low as 10%.

REMOTE AREA OPERATION

Lightweight shelters used in the system can be easily transported by cargo aircraft, as well as railroad, ship or rubber-tired vehicles.

Each terminal contains all necessary equipment, including antennas, primary power generator and maintenance facilities, to quickly establish voice and teletypewriter communication for support of government or commercial operations in remote geographical locations. Air conditioning and heating maintain shelter temperatures at reasonable levels for efficient operation.

Separate operator consoles for radio and audio facility control functions are located directly behind the TTY machines to enable one operator to have complete station control.

SYSTEM CONFIGURATION

The terminal is housed in three major subsystems — a communication shelter, an electronic maintenance shelter and a power generator. The communication shelter houses the operator console and all facilities for two integral, full duplex, HF SSB radio terminals including RTTY message capabilities. The electronic maintenance shelter provides storage space and work area for adjustment and repair of subsystems at remotely located sites.

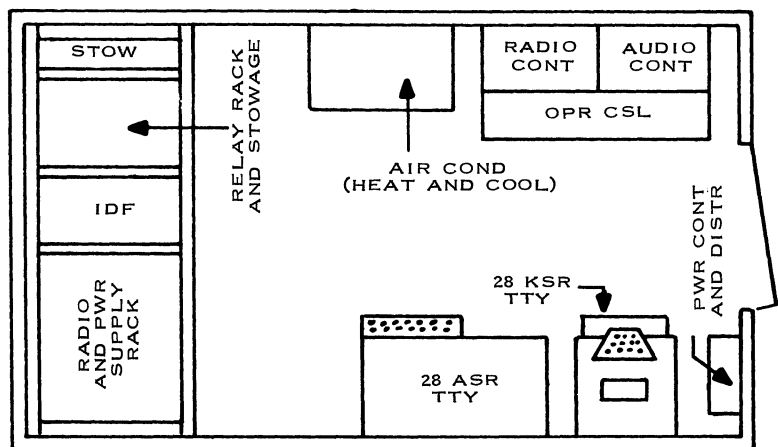
The modified military type S-141A/G shelters have 3" protective skid rails, square inside corners, and are equipped with

roof access steps. Separate air conditioning and heating units are included in each shelter. The system is capable of withstanding low level shock and vibration encountered by railroad, cargo aircraft, ship and rubber-tired vehicles employed in transport. A type III military transporter can be used for transport over highways and unimproved terrain. Power for the terminal is supplied by a 30 kw diesel generator. Its output is 120 v or 208 v, 60 cps, 3 phase, 4-wire with 5% voltage and frequency regulation. A fuel tank with suf-

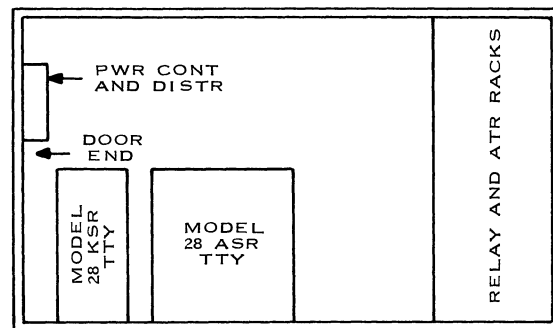
ficient capacity for eight hours of operation is supplied.

SIMPLIFIED MAINTENANCE

Modular electronic equipment, together with circuit card techniques, is used where applicable to facilitate maintenance and spare parts logistics. All interunit wiring terminates at a distribution frame, providing flexibility in interconnection of components and readily accessible test points.



Communication Shelter Floor Plan



Communication Shelter Left Wall Layout

Specifications

GENERAL

- FREQUENCY RANGE: 2.0-29.9999 mc.
- TUNING INCREMENTS: 0.1 kc steps.
- FREQUENCY STABILITY: 1 part in 10⁸ per day.
- TUNING: Completely automatic.
- CONTROL: Local operator.
- POWER OUTPUT: 1 kw PEP or average.
- MODE OF OPERATION: Duplex or simplex (patch selectable).
- RECEIVE FREQUENCY SEPARATION: 10% from transmitter frequency.
- CHANNELIZATION: Two independent 3 kc channels.
- TRANSMISSION MODES: USB and AM, normal operation. LSB and ISB, simple patching.
- AUDIO TERMINATIONS: 0 db level, 600 ohms.
- CHANNELIZATION: Channel A — 1 db P/P ripple, +350 to +3040 cps; -60 db points, -75 and +3300 cps. Channel B — 1 db P/P ripple, -350 to -3040 cps; -60 db points, +75 and -3300 cps.

- TTY FACILITIES: Includes frequency shift keyers and converters, dc loop control and TTY patching panel.
- ANTENNAS: Type 437C-3A, vertically-polarized omnidirectional. Type 637E-1, horizontally-polarized log-periodic, and a 32 ft. whip antenna.
- PRIMARY POWER: 208 v, 60 cps, 3 phase, wye connected. Peak power requirement is approximately 22 kw. Diesel driven generator normally furnished as part of system.

	W	Size H	D	Weight
*Main-tenance shelter	81" 205.74 cm	83" 210.82 cm	142" 360.68 cm	3895 lbs. 1766.77 kg
*Commu-nication shelter	81" 205.74 cm	83" 210.82 cm	142" 360.68 cm	5295 lbs. 2401.81 kg
Diesel generator	60" 152.4 cm	78" 198.12 cm	96" 241.3 cm	3925 lbs. 1780.38 kg
437C-3A tower skid	54" 137.16 cm	60" 152.4 cm	126" 320.04 cm	1670 lbs. 757.51 kg

*With antenna stowed.

Basic Units

- 714Y-2 Frequency Control, p. 90
- 789R-1 IF Translator, p. 88-90
- 789T-1 IF Translator, p. 88-90
- 618Z-4 RF Translator, p. 87
- 635T-2 Receiver Bandpass Filter, p. 111, 112
- 548L-4 1 KW Power Amplifier, p. 37
- 180R-6/309A-2E Antenna Coupler and Control, p. 102, 103

AN/MRC-95 Vehicular HF Communication System



Features	Applications
<i>Automatic Tuning</i>	<i>Mobile</i>
<i>Simplified Operation</i>	<i>Airlift Capability</i>
<i>Modular Construction</i>	
<i>Remote Operation</i>	
<i>Application Versatility</i>	

The AN/MRC-95 is an automatically tuned HF communication system installed in a 4 x 4 ¼-ton M151 military vehicle. Frequency range is 2.0-29.999 mc in 1 kc increments with a transmit power output of 400 watts PEP in either upper sideband or lower sideband and 100 watts in AM with re-inserted carrier, CW or frequency shift keying. The AN/

MRC-95 provides optimum tactical communication whether moving or in fixed locations. Automatic tuning permits operation by nontechnical personnel. A temperature compensated standard assures instant on-frequency operation.

EQUIPMENT CONFIGURATIONS

The basic transceiver is the proven Collins 618T-3, housed with associated power supply and frequency shift keyer in a compact aluminum case, which is drip-proof during operation and watertight in the transport condition. The local-remote control, antenna coupler, load coil, and auxiliary speaker are of watertight construction. Rugged packaging ideally suits the AN/MRC-95 communication system for airlift and airdrop operations.

The rugged Fiberglas antenna employs four sections for mo-

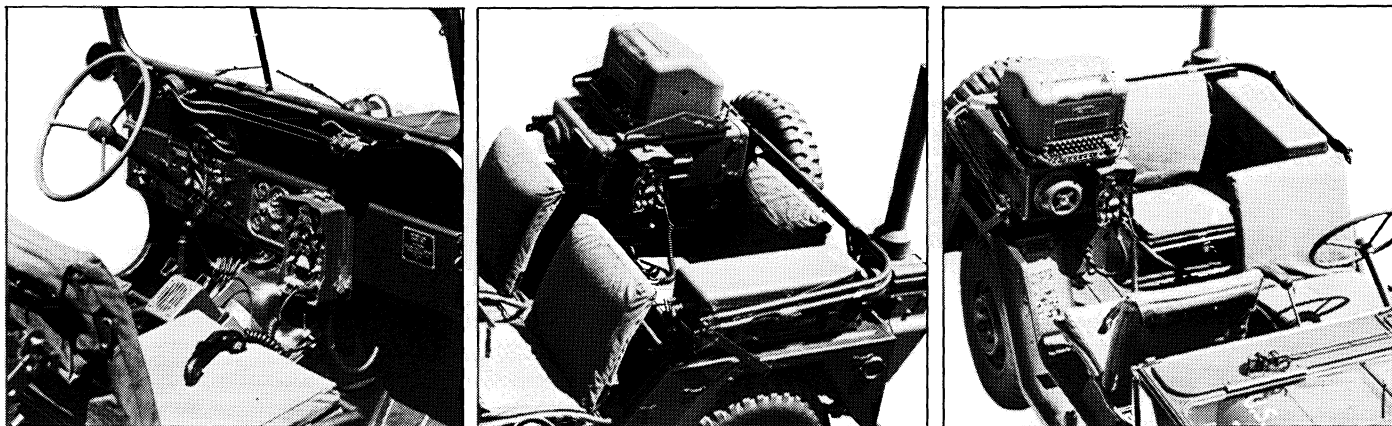
bile operation and eight sections for stationary use. A connector located on the side of the load coil also permits the use of a dipole antenna.

A choice of three control box positions in the vehicles allows the control box to be used from the rear seat, front of transceiver case or instrument panel. The control box can be used with an appropriate interconnecting cable at distances up to 100 ft. from vehicle.

Phone patch extends system versatility for use with wire circuits. Remote control over long distances can be achieved by the use of the AN/GRA-6 or similar type equipment.

MOBILE POWER SYSTEM

The electrical generating system will supply more than 200% of the capacity required for the communication system, making it independent of the vehicle battery. An emergency switch permits operation from the vehicle battery. Sufficient excess power is available for operation of an auxiliary UHF or VHF communication system. A voltmeter/tachometer assures correct engine speeds and generating capacity under all conditions. System protective devices include an oil pressure interlock with manual override.



Flexibility of control unit location permits installation on the vehicle instrument panel or on the transceiver.

Specifications

FREQUENCY RANGE: 2.0-29.999 mc.

POWER OUTPUT: SSB — 400 watts PEP; AM — 100 watts; CW, FSK — 100 watts.

NUMBER OF CHANNELS: 28,000 spaced 1 kc.

FREQUENCY SELECTION: 4 knobs with digital indicators.

TUNING METHOD: Automatic, servo controlled, including antenna coupler.

CHANNEL CHANGE TIME: 15 seconds nominal.

OPERATING MODES: USB, LSB, AM, CW and FSK.

FREQUENCY STABILITY: 0.8 part in 10⁶ per month.

SEMIREMOTE CAPABILITY: Complete control of radio by remote control box up to 100 ft. with appropriate cable.

REMOTE CAPABILITY: Control over 2-wire line with AN/GRA-6 or equivalent. (Push-to-talk and audio functions.)

TELEPRINTER OPERATION: 850 cps shift. 400 cps primary power for teleprinter available at transceiver case.

ANTENNA REQUIRED: 16 ft. or 32 ft. whip, or 45-90 ft. wire.

AUDIO CHARACTERISTICS: Input — 100 ohm carbon microphone. Output — 300 ohms.

PHONE PATCH REQUIREMENTS: 600 ohm phone line, operator controlled, not voice operated.

MICROPHONE: Differential carbon, Electro-Voice 205KK or equivalent.

KEY: Standard military types.

HANDSET: Military type H33F/PT or equivalent.

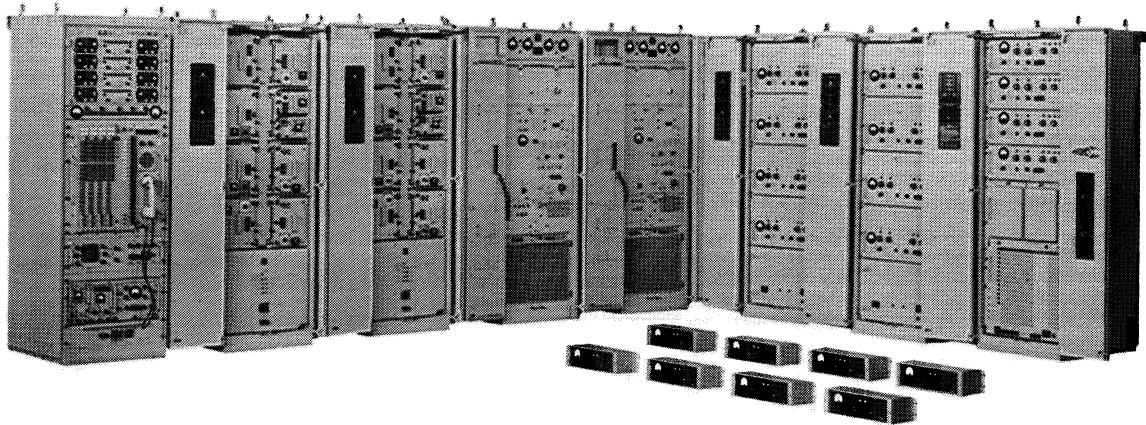
INPUT POWER: 27.5 v dc, 53 amps peak during tuning; 31 amps SSB voice transmit, 14 amps receive.

SIZE AND WEIGHT:

	Size			Weight
	W	H	D	
Transceiver case	19½" 49.53 cm	12¾" 32.39 cm	30" 76.2 cm	140 lbs. 63.53 kg
Coupler case	9" 22.86 cm	9" 22.86 cm	27" 68.58 cm	50 lbs. 22.68 kg
Control box	6" 15.24 cm	9" 22.86 cm	3.5" 8.89 cm	7.5 lbs. 3.4 kg
Speaker	7½" 19.05 cm	7" 17.78 cm	4¾" 12.07 cm	3.5 lbs. 1.59 kg
Load Coil	9" 22.86 cm	9" 22.86 cm	7¾" 18.73 cm	22 lbs. 9.98 kg

GFE EQUIPMENT: M151 vehicle and 100 amp generating system. H33F/PT Handset; TT4 Teletypewriter.

AN/SRC-16 Shipboard HF Communication System



Features

Automatic Tuning
Simultaneous Channels
Mode Choice
Data Transmission
Simplified Maintenance

Applications

Shipboard
Fixed Station

The AN/SRC-16 is a high capacity, long range HF communication system which provides four independent transmit and four independent receive channels. The system includes two 5 kw linear amplifiers which can be switched into any two transmit channels in lieu of the 500 watt amplifiers normally used.

Frequency coverage is in 1 kc tuning increments over the 2.0-29.999 mc range. Operating mode choice includes AM, CW, MCW, FSK, SSB, ISB and data communication on each channel. The channel frequency of each transmitter and receiver is phase locked to a primary frequency standard assuring high signal stability.

CIRCUIT FEATURES

Linear power amplifiers, high performance filters and low distortion circuitry meet all complex data transmission and reception performance requirements. Compatible AM is transmitted using the upper sideband and a reinserted carrier. Pi network output circuitry assures efficient antenna loading. The converter for FSK-CW mode reception includes an oscilloscope to monitor test tones and to facilitate BFO adjustment on FSK reception.

RF LEVEL CONTROL

A variable attenuator, using transistor circuitry, provides automatic control of radiated or received power levels. The RF signal between the transmitter and RF amplifier can be attenuated up to 120 db. Normally, it is automatically controlled by direct current pulses. It can be switched to the receiver input to manually attenuate the RF signal level.

ANTENNA SWITCHING

The AN/SRC-16 employs 12 automatic antenna couplers

with terminations for three or more antennas. In a typical installation, eight couplers are associated with the 2-6 mc antenna, two couplers with the 5-15 mc antenna and two with the 10-30 mc antenna. Other arrangements are optionally available to meet individual system requirements. An RF switching matrix located in the HF coupler cabinet connects individual channel equipment to the proper antenna couplers. The couplers permit duplex operation on all channels by isolating transmit and receive circuitry, as well as maintaining the correct antenna impedance match. External equipments, such as the AN/URC-32, AN/WRT-2, AN/SRT-14 and AN/SRT-15, can also be connected to the antenna matrix through auxiliary input jacks.

INPUT PATCHING

A communication patching switchboard permits connecting remote input audio lines to any of the radio channels. Interlocked pushbutton selectors prevent improper operation, and visual or aural signals indicate equipment status. Voice compression and noise squelching facilitate voice communications. Redundant power supplies prevent central control failure in the event of a single power supply malfunction.

SYSTEM TEST FACILITIES

An integral multipurpose test set simplifies system maintenance tests. A two-tone signal can be applied to either transmitted sideband for distortion measurements and check of performance quality. A sidetone containing the signal is sampled at the T/R relay, coupled to the receiver input, demodulated and passed to a distortion measuring circuit which analyzes the hum level at 400 cps and 800 cps, third order distortion products and the second harmonic of the F1 tone. Frequency lock is tested by transmitting one of two tones on both LSB and USB in a closed loop throughout the system.

UNITIZED CONSTRUCTION

The entire system is housed in eight separate equipment cabinets. Maintenance and installation are simplified through the use of modular construction. Individual units are mounted on slide cabinet drawers and all electrical connections are made through mating connectors wherever possible. Addi-

tionally, the system can be easily expanded as traffic increases by adding units and cabinets.

Completely automatic tuning allows the control cabinet to be located up to 900 feet from the other seven cabinets of the installation. It contains facilities for switching of remote input stations, system fault alarm, digital frequency selection, standby-operate control, manual variable RF level attenuation, audio level metering, RF output metering, signal monitoring, with controls and indicators for all modes.

Specifications

NUMBER OF CHANNELS: 4 transmit and receive channels, each capable of independent, simultaneous operation.

FREQUENCY RANGE: 2.0-29.999 mc in 1 kc increments.

FREQUENCY STABILITY: 1 part in 10^8 per 30 days (with internal frequency standard).

MODE OF OPERATION: Radio frequency simplex or duplex.

TYPE OF SIGNALS: Single sideband, reduced carrier; two independent sidebands, reduced carrier; composite transmission; CW telegraphy; frequency shift telegraphy; single sideband with carrier in transmit function; double sideband with carrier in receive function.

WEIGHT AND VOLUME:

	<i>Est. Wt. Crated</i>	<i>Est. Wt. Uncrated</i>	<i>Est. Vol. Crated</i>
Cabinet 1	1255 lbs. 569.27 kg	855 lbs. 387.83 kg	35 cu. ft. 0.99 cu. meter
Cabinets 2 & 3, each	1540 lbs. 698.54 kg	995 lbs. 451.33 kg	35 cu. ft. 0.99 cu. meter
Cabinets 4 & 5, each	1610 lbs. 730.3 kg	1110 lbs. 503.5 kg	35 cu. ft. 0.99 cu. meter
Cabinet 7	1720 lbs. 780.19 kg	1320 lbs. 598.75 kg	35 cu. ft. 0.99 cu. meter
Cabinets 6 & 8, each	1610 lbs. 730.3 kg	1056 lbs. 479.0 kg	35 cu. ft. 0.99 cu. meter
Antenna coupler control	20 lbs. 9.07 kg	12 lbs. 5.44 kg	1.2 cu. ft. 0.034 cu. meter

DECK SPACE REQUIRED: 38 sq. ft. (3.53 sq. meters).

COOLING WATER REQUIRED: 49.6 gpm at 35° C maximum.

POWER SOURCE: 440 v, 400 cycle, 3 phase, delta connected — 27.4 kw at 0.9 pf; 115 v, 400 cycles, 3 phase, delta connected — 11 kw.

ANTENNAS REQUIRED: 3 broadband, nominal 50 ohm impedance; VSWR no greater than 4:1.

AUDIO INPUT: 600 ohms balanced.

AUDIO OUTPUT: 600 ohms balanced.

TRANSMITTER CHARACTERISTICS

POWER OUTPUT: Low power — 500 watts PEP with two or

COOLING

Each cabinet is water cooled by a closed-cycle cooling system. The inlet of the centrifugal blower is attached to a water cooled heat exchanger and supplies air to a plenum located at the rear or center of the cabinet. This plenum supplies cooling air to all the units in the cabinet through openings in the rear or bottom of the units. When a unit is withdrawn from the cabinet, the plenum opening is closed by a sliding valve.

more tones; average power output of 250 watts continuous. High power (2.0-5.999 mc only with CU-1169/SRC-16 antenna coupler) — 5.0 kw PEP with two or more tones; average power output of 2.5 kw continuous.

OUTPUT IMPEDANCE: For antennas having frequency ranges from 2.0-5.999 mc, 6.0-14.999 mc and 10.0-29.999 mc.

CARRIER SUPPRESSION: 45 db below PEP output.

HARMONIC SUPPRESSION: 50 db below PEP output.

SPURIOUS SUPPRESSION: 50 db below PEP output.

DISTORTION: 35 db below PEP at rated power (third order distortion as measured by two-tone test).

OPPOSITE SIDEBAND REJECTION: 50 db below the level of a single tone.

PHASE STABILITY: Not more than 2.38° of phase shift in a 22 millisecond period.

BANDWIDTH: 300-3050 cps for each sideband (1½ db points).

INPUT LINES: Ten 600 ohm balanced lines; 0-60 ma teleprinter loop; key and microphone.

RECEIVER CHARACTERISTICS

PHASE STABILITY: Not more than 2.38° of phase shift in a 22 millisecond period.

BANDWIDTH: 300-3050 cps for each sideband (1½ db points).

NOISE FIGURE: 17 db or better.

DISTORTION: Any intermodulation product or distortion 35 db or more below either tone from a two-tone test signal.

IF AND IMAGE REJECTION: —80 db or more below 25 mc; —65 db or more above 25 mc.

AGC CHARACTERISTICS: Will maintain output level within +3 db for inputs of 10 uv rms to 1 v rms. Approximately 6-12 millisecond attack time and normal decay time of 0.5-1.0 second. AGC delayed on command.

OUTPUT LINES: 18 600 ohm balanced lines; speaker and handset.

SENSITIVITY: Better than 1 uv for a 10 db S+N/N ratio.

FREQUENCY STANDARD CHARACTERISTICS

OUTPUT FREQUENCY: 100 kc and 1 mc.

OUTPUT VOLTAGE: 1 v.

STABILITY: Aging rate — less than 1 part in 10⁸ per 30 days.
Temperature variation — less than ±4 parts in 10¹¹ per degree C (0.000004 cps at 100 kc).

RESET ACCURACY: Better than ±5 parts in 10¹¹.

FREQUENCY CHANGE WITH SHOCK: Less than 1 part in 10⁸.

HARMONIC DISTORTION: 40 db below rated output.

SPURIOUS OUTPUTS: 60 db below rated output.

ANTENNA COUPLER CHARACTERISTICS

FREQUENCY RANGE: CU-1169/SRC-16 — 2.0-5.999 mc. CU-1170/SRC-16 — 6.0-29.999 mc.

INPUT IMPEDANCE: 50 ohms nominal.

ANTENNA VSWR (tuning range): 4:1 (50 ohms) maximum.

RF INPUT POWER: CU-1169/SRC-16 — 6000 watts PEP, 3000 watts average continuous, maximum. CU-1170/SRC-16 — 1200 watts PEP, 600 watts average continuous, maximum. Both units require 100 watts average forward power for automatic antenna tuning and constant surveillance.

EFFICIENCY: 60% minimum.

ISOLATION, INPUT TO OUTPUT: 45 db minimum with channel frequencies separated 15% or more.

ISOLATION BETWEEN INPUTS: 45 db minimum with channel frequencies separated 15% or more.

PRIMARY INPUT VOLTAGE: 115 v ±10%, 400 cps, 3 phase, delta or wye.

PRIMARY INPUT POWER: 100 watts maximum.

TYPE OF SERVICE: Continuous, unattended, remote.

AN/SRC-23 Shipboard HF Communication System

The AN/SRC-23 is a single channel communication system using components of the AN/SRC-16 system. It offers exceptionally high frequency stability for long range surface-to-surface and surface-to-air communication in data, AM, FSK,

CW and SSB modes. Tuning is completely automatic on 28,000 channels in the 2.0-29.999 mc range. Detailed information on a system to specific requirements is available upon request.

Available only on a production contract.

AN/TRC-115 Transportable HF Communication System

Features

*Automatic Tuning
Single Shelter
One-Man Operation*

Applications

*Transportable
Communication Center*

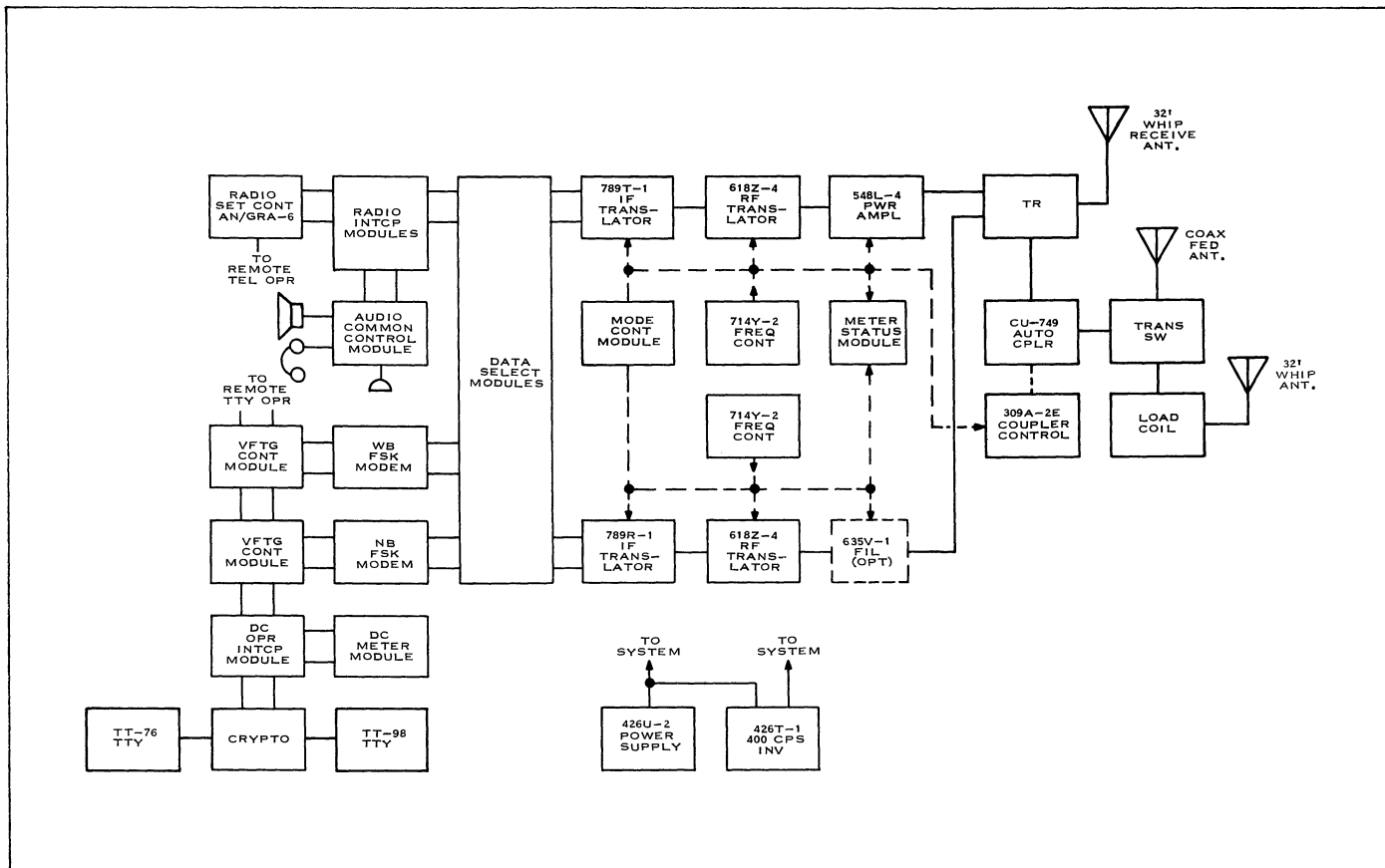
The AN/TRC-115 employs one 1 kw transmitter using single sideband techniques and one receiver with one voice channel and one teletypewriter channel capable of being transmitted and received simultaneously. The systems cover the 2.0-29.9999 mc frequency range in 280,000 channel increments with direct reading frequency control and fully automatic tuning, including the antenna circuits. Function switches permit selection of AM, upper sideband, or lower or independent sideband modes for either simplex or duplex operation. All equipment necessary to place the system in full operation is housed in one compact shelter that is transportable by fixed-wing aircraft, helicopter or truck. The AN/TRC-115 consists of components of the Collins Universal Radio Group in an S-144()/G shelter. It can be set up and operated by one man.

In duplex operation, two RF channel frequencies are required. Both an 85 cycle shift and an 850 cycle shift teletypewriter keyer-converter unit are included to provide the AN/TRC-115 with teletypewriter transmission capabilities.



The AN/TRC-115 contains the necessary units to control, switch and operate remote telephone line, remote teletypewriter, and the local operator's equipment. The unit consists of a communication control console, one radio receiver, one radio transmitter, two radio set controls, one antenna coupler and coupler control, and a telegraph terminal group.

Functional Circuits



Specifications

SHELTER: S-144()/G.

TRANSMITTER POWER: 1 kw PEP or average.

FREQUENCY RANGE: 2.0-29.9999 mc in 0.1 kc steps.

MODES OF OPERATION: USB (3 kc), LSB (3 kc), ISB (each sideband 3 kc), and compatible AM.

INFORMATION TYPES: Voice and/or voice frequency TTY.

MODE OF OPERATION: Full or half duplex.

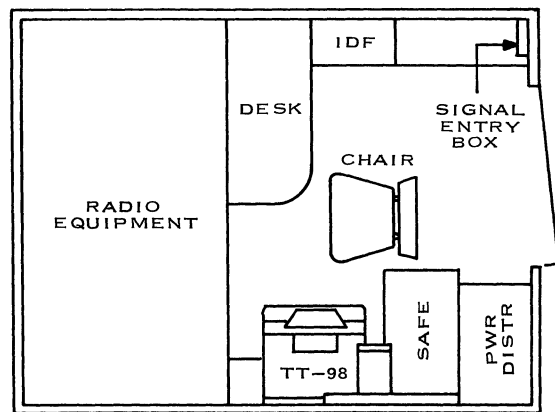
CARRIER SUPPRESSION: Normal SSB operation is for carrier to be fully suppressed (-50 db); optional reduced carrier operation with three levels of suppression.

AFC: Optional.

IMAGE REJECTION: Below 20 mc, at least 80 db; above 20 mc, at least 60 db.

FREQUENCY STABILITY: One part in 10⁸ per day.

RMS STABILITY FACTOR: Does not exceed one part in 10⁸ in any 10-minute period.



AN/TRC-115 Floor Plan

TRANSMITTER DISTORTION PRODUCTS: Third and higher order distortion suppressed at least 40 db; harmonic emission suppressed at least 35 db, referenced with PEP level.

ANTENNAS: Transmit — 32 ft. whip, shelter mounted. Duplex Receive — 32 ft. whip, field mounted. A dipole or any 50 ohm impedance antenna can also be used.

Basic Units

789R-1 IF Translator, p. 88-90

789T-1 IF Translator, p. 88-90

618Z-4 RF Translator, p. 87

548L-4 1 KW Power Amplifier, p. 37

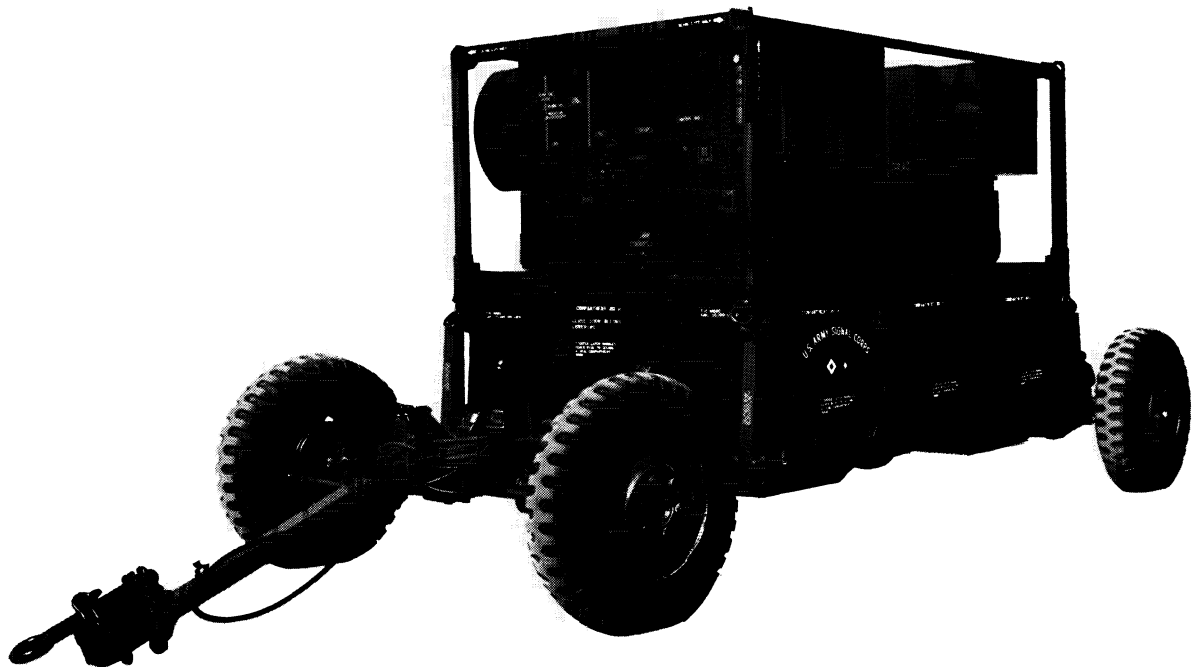
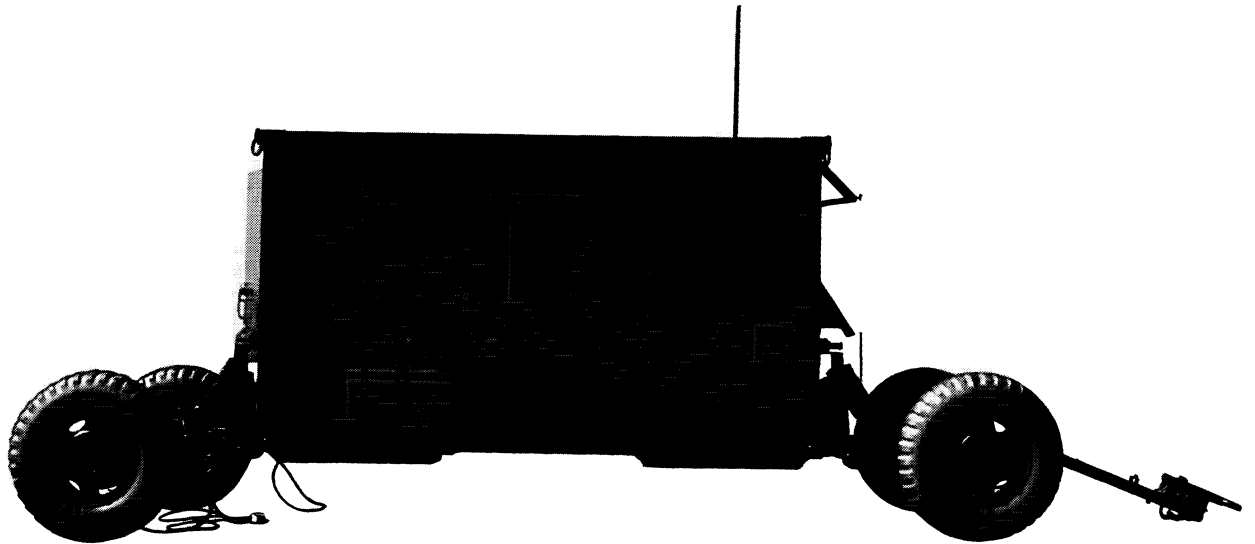
635V-1 Bandpass Filter, p. 112

714Y-2 Frequency Control, p. 90

700B-2 Teletypewriter Converter, p. 122, 123

426U-2 Power Supply, p. 86

AN/TSC-38 Transportable HF Communication Central



Features

*Automatic Tuning
Remote Operation
Rapid Set Up*

Applications

*Highway Towing
Aircraft Transport*

The AN/TSC-38 is a transportable HF station with radio channels covering the 2.0-29.9999 mc frequency range in 0.1 kc channel increments. Digital tuning simplifies operation and assures optimum equipment performance. The systems can be completely tuned to a new operating frequency in a

maximum of 30 seconds facilitating tactical communication. The primary HF radio system is full duplex with a 10 kw PEP or average transmitter and two space diversity receivers to handle four independent sideband circuits in a nominal 12 kc bandwidth. A secondary full duplex system includes a 1 kw PEP or average transmitter and a receiver with four independent sidebands.

Either system is capable of reception at frequencies within 10% of the transmitter operating frequencies. System can be operated in a completely suppressed carrier SSB mode, or AFC and carrier re-insertion at three preset levels can be used if desired. A 20-line automatic switchboard is included in the system. Manually initiated ringdown signaling is available on the radio circuits.

MINIMUM SET UP TIME

The self-contained HF facility is housed in two mobile units which can be transported by single C-130B, C-133, C-124, or two C-119 aircraft; or towed by a prime mover over highways, unimproved roads or cross country terrain. The equipment is operational only minutes after arrival on site.

The AN/TSC-38 operates from either a 120 v or 208 v, 50-60 cps or 400 cps, 3 phase, wye connected power source with no manual switching. The equipment will tolerate line voltage and frequency with up to $\pm 10\%$ variation.

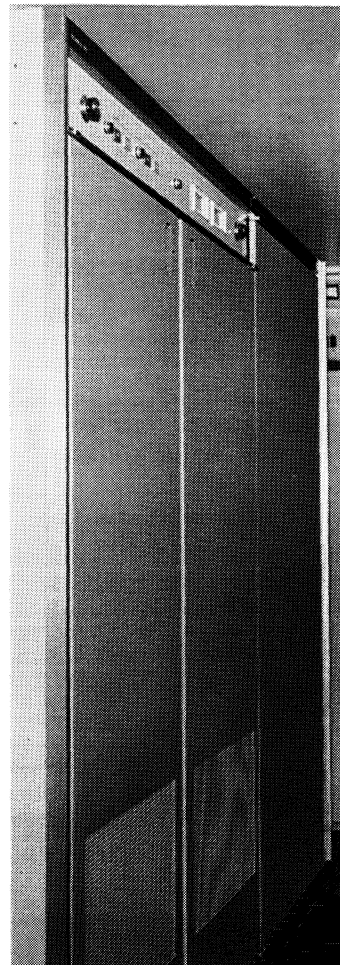
Power for the complete system is provided by a primary and a backup 65 kw, 400 cps turbine generator set. Batteries furnish power for immediate touch-down and emergency operation of the secondary radio system and its associated terminal equipment.

REMOTE OPERATION

The following radio system functions can be controlled from a remote location — primary power control, sideband selection, frequency changing, ten preset conditions, operational mode and push-to-talk operation, carrier reinsertion and AFC selection.

EQUIPMENT CONFIGURATION

The system is a completely transportable configuration consisting of two mobile units: an air conditioned S-141 shelter and undercarriage which houses all electronic equipment; and an undercarriage and pallet with installed primary power engine generator and compartments for transportation of antennas, outside plant equipment and spare parts.

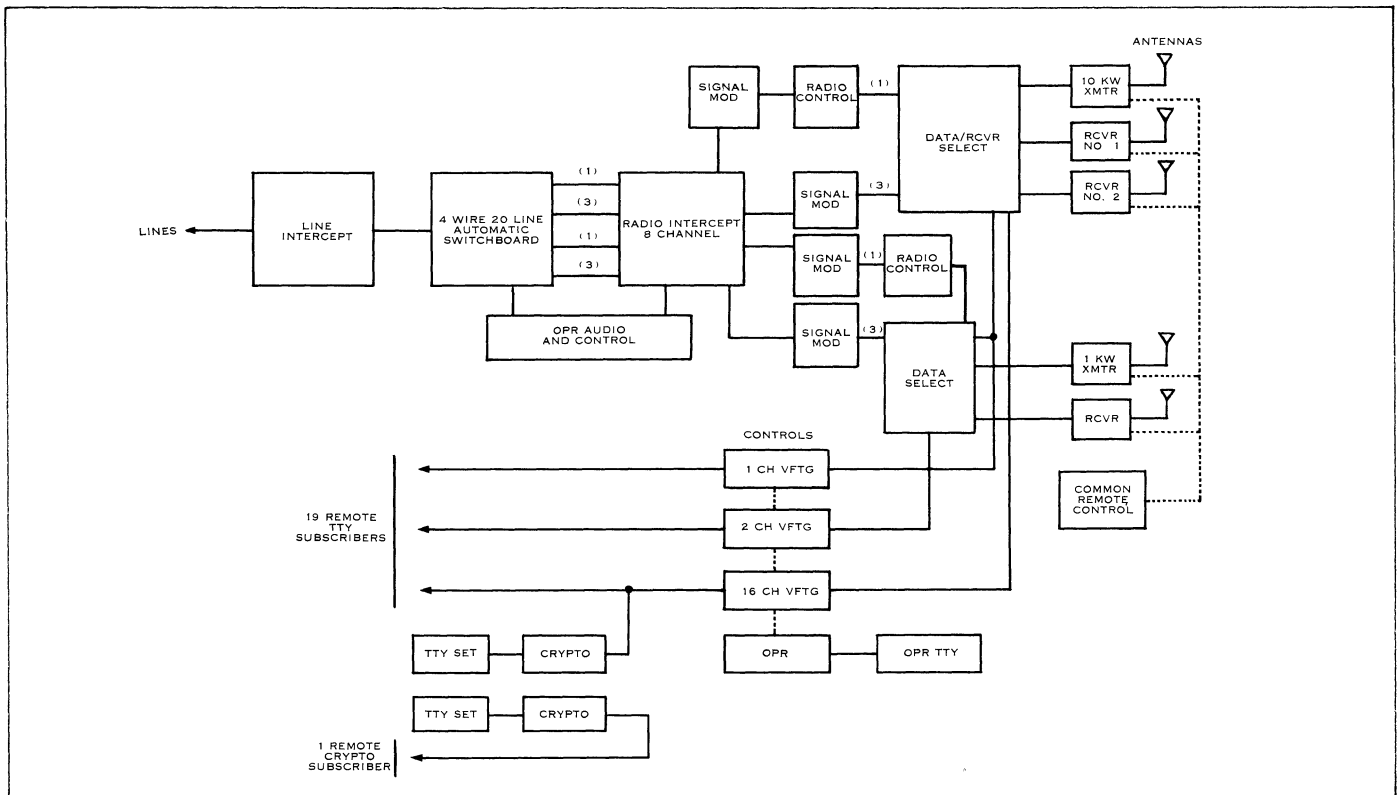


10 KW Power Amplifier



All equipment easily accessible

Functional Circuits



Specifications

FREQUENCY RANGE: 2.0-29.9999 mc.

TUNING INCREMENTS: 0.1 kc steps.

FREQUENCY STABILITY: 1 part in 10^8 per day.

TUNING: Completely automatic.

CONTROL: Local switch select, FSK dial-pulse select, and remote FSK dial-pulse select over a 2- or 4-wire telephone line.

EXTERNAL SUBSCRIBERS: Twelve 2- or 4-wire (switch selectable).

- (1) 2- or 4-wire FSK dial, FSK push-to-talk (3 maximum).
- (2) 2- or 4-wire dc dial common battery; maximum loop resistance, 500 ohms (12 maximum).
- (3) 2- or 4-wire common battery manual; maximum loop resistance, 500 ohms (12 maximum).
- (4) 2- or 4-wire local battery ringdown subscribers (6 maximum).
- (5) 2- or 4-wire switchboard trunks (12 maximum).

TELEPHONE SWITCHING: Switchboard; 4-wire, dc dial, 20-line, 10-link, single-register 28 v dc loop operation. Attendant; single DSA (Dial Service Assistance) position.

VOICE FREQUENCY TELEGRAPHY GROUP (PRIMARY)

CHANNELS: Sixteen 4-wire, full duplex circuits.

CHANNEL FREQUENCY: 425-2975 cps.

FREQUENCY SHIFT: ± 42.5 cps.

MODE OF OPERATION: Normal space diversity, switch-selectable to 8-channel space/frequency diversity on an individual channel basis.

VOICE FREQUENCY TELEGRAPHY GROUP (SECONDARY)

CHANNELS: Two 4-wire circuits.

CHANNEL FREQUENCY: Any two between 425 and 2975 cps.

FREQUENCY SHIFT: ± 42.5 cps.

MODE OF OPERATION: Normal nondiversity, switch-selectable to 1-channel frequency diversity.

VOICE FREQUENCY TELEGRAPHY GROUP (WIDEBAND)

CHANNEL: One 4-wire full duplex nondiversity.

CHANNEL FREQUENCY: 2000 cps channel center frequency ± 425 cps shift.

CRYPTOGRAPHY

Space and cabling are provided for two full duplex on-line terminals.

LOCAL TELETYPEWRITER

Two page-printer/keyboards; one typing reperforator, one transmitter distributor equipment, and one combination reperforator/keyboard/transmit distributor.

EXTERNAL SUBSCRIBERS

Twenty 4-wire lines; 20 or 60 ma neutral or 30 ma polar.

PRIMARY RADIO-FULL DUPLEX

TRANSMITTER POWER OUTPUT: 10 kw PEP/average.

RECEIVERS: Two (space diversity).

MODE OF OPERATION: Switch selection; full duplex or simplex.

FREQUENCY SEPARATION: 10% from transmitted frequency.

CHANNELIZATION: Four independent 3 kc channels in a 12 kc assignment.

ANTENNA REQUIREMENTS: 1 each 10 kw transmit antenna displaying 50 ohms with a VSWR of less than 3:1 from 2.5-30.0 mc and 2:1 from 2.0-2.5 mc. 2 each, receive antennas for space diversity reception.

SECONDARY RADIO-FULL DUPLEX

TRANSMIT POWER OUTPUT: 1 kw PEP/average.

CHANNELIZATION: One receiver with four 3 kc ISB channels.

MODE OF OPERATION: Switch selection; full duplex or simplex.

ANTENNA REQUIREMENTS: 1 transmit and 1 receive antenna displaying 50 ohms with 3:1 VSWR or 32 ft. whip.

ANTENNAS SUPPLIED: Two 32 ft. whip antennas (within shelter). Two receive sloping vee antennas (1 kw). One 10 kw transmit sloping vee antenna.

Basic Units

Power Amplifiers, p. 34-37

789R-1 IF Translator, p. 88-90

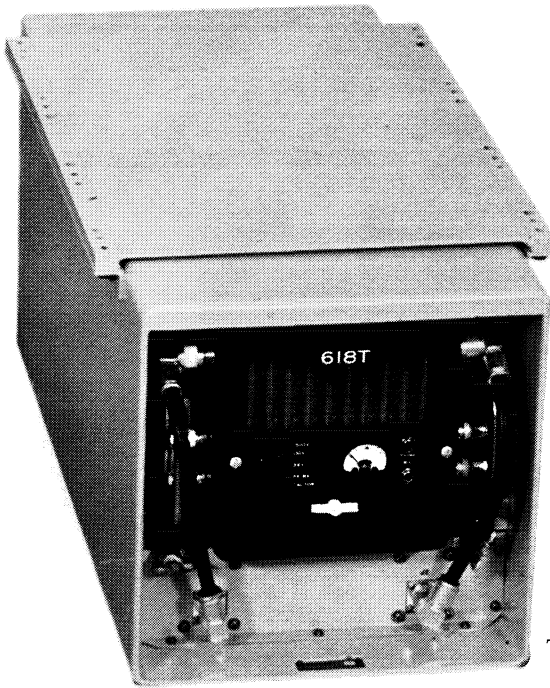
789T-1 IF Translator, p. 88-90

618Z-4 RF Translator, p. 87

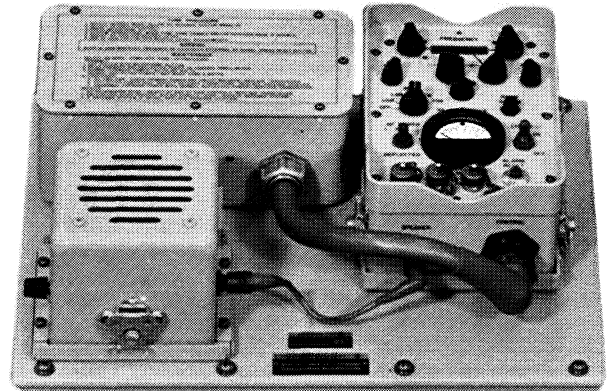
635V-1 Harmonic Filter, p. 112

426U-2 Power Supply, p. 86

HF-105, -106, -107, -108, -109 HF Shipboard Systems



Transceiver Case



Command Center Control Group

Features

*Automatic Tuning
Command-Center Operation
Optional Power Sources
Easy Installation
Simplified Maintenance*

Applications

*Small Boat
Landing Craft
Shipboard*

The Collins HF-105, HF-106, HF-107, HF-108 and HF-109 are multiple purpose, single sideband radio systems which operate from different primary power sources to meet a variety of application requirements.

The systems are automatically tuned and cover the 2.0-29.999 mc frequency range in 28,000 channel increments. Transmit power output is 400 watts in either upper or lower sideband and 100 watts in AM with reinserted carrier, CW or optional FSK.

The systems offer optimum tactical communication range for small boats, landing craft and ships.

COMMAND-CENTER OPERATION

The ship's commanding officer is offered a new concept in rapid communication, since the desired channel frequency can be selected directly from a control unit in the command center in much the same manner as an aircraft radio is operated. Tuning is completely automatic. Channel change time is less than 30 seconds nominal. Complete operation of the equipment requires no technical background.

RAPID INSTALLATION

The systems can be quickly installed by ship's personnel using only common skills, such as welding and cable wiring. A routine installation requires only about 16 hours.

Equipment packaging in four basic units — transceiver, command control group, antenna coupler group and power supply group — makes installation adaptable to various types of ships. The five HF communication systems are identical except for primary input power requirements.

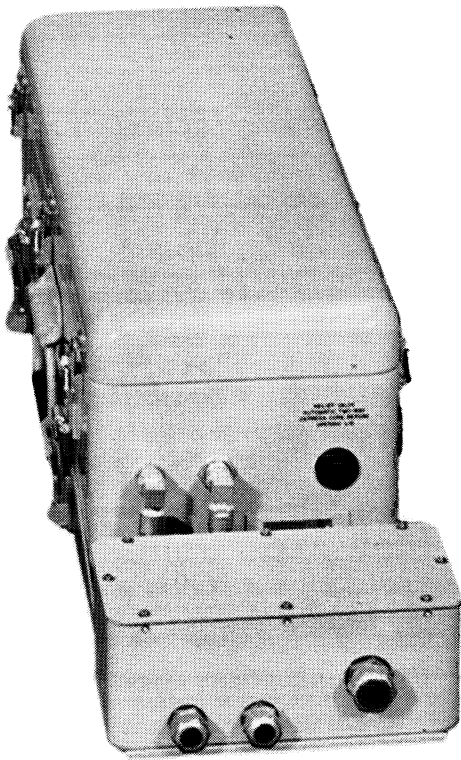
The basic transceiver is the proven 618T housed in a type 1, drip-proof, wrap-around case. Capability of remotely located control unit and antenna coupler facilitates optimum installation.

The watertight control group may be located up to 350 ft. from the transceiver. In addition to all operating controls, it includes an RF wattmeter to monitor over-all functioning of the system during operation.

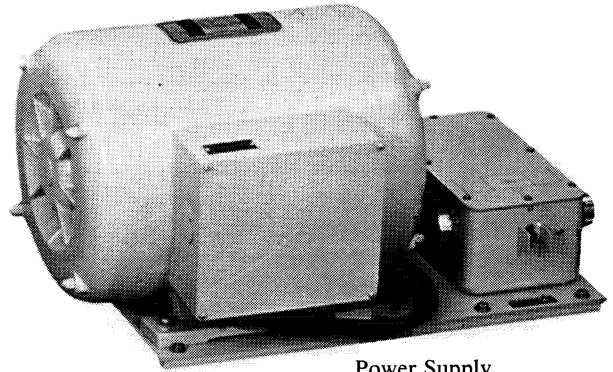
Flexibility in antenna location is made possible by a separate antenna coupler which can be located up to 100 ft. from the transceiver case.

EASE OF MAINTENANCE

The location of an equipment malfunction can be quickly isolated by ship's personnel using a simplified procedure which is outlined on a permanently attached plate located near the control unit. Corrective maintenance is initiated by substitution of one of the three easily replaced major system units. This feature makes it especially suitable for small ships which have limited space and equipment for trouble shooting.



Antenna Coupler



Power Supply

Specifications

FREQUENCY RANGE: 2.0-29.999 mc.

NUMBER OF FREQUENCY CHANNELS: 28,000 spaced 1 kc.

FREQUENCY SELECTION: 4 control knobs with indicators.

CHANNEL CHANGE TIME: Less than 15 seconds nominal, including antenna coupler.

OPERATING MODES: USB, LSB, AM, CW and optional FSK.

FREQUENCY STABILITY: 0.8 part in 10⁶ per month.

WARM-UP TIME: 30 seconds.

TELETYPEWRITER OPERATION: 850 cps shift with optionally available 700B-2 Teletypewriter Converter.

ANTENNA REQUIRED: 16 ft. or 32 ft. whip, or 45-90 ft. wire.

AUDIO CHARACTERISTICS: Input — 100 ohms carbon microphone. Output — 300 ohms.

MICROPHONE: Standard military differential carbon type.

KEY: Standard military types.

INPUT SOURCE:

System	Power Source
HF-105	27.5 v dc.
HF-106	220 v or 120 v, 50 or 60 cps, 1 phase.
HF-107	440 v or 220 v, 60 cps, 3 phase.
HF-108	208 v, 400 cps, 3 phase, 4-wire.
HF-109	440 v, 220 v or 120 v, 400 cps, 3 phase.

SIZE AND WEIGHT:

	Size			Weight
	W	H	D	
Transceiver and mount	12" 30.48 cm	12" 30.48 cm	25½" 64.77 cm	102 lbs. 46.27 kg
Antenna coupler and mount	9½" 24.13 cm	10" 25.4 cm	36½" 92.71 cm	70 lbs. 31.75 kg
Control group	18½" 46.99 cm	14" 35.56 cm	5" 12.7 cm	26 lbs. 11.79 kg

Power supply group

Differs with type of system.

Basic Units

618T Transceiver, p. 44, 45

490B-1 Automatic Antenna Coupler, p. 108

Related Equipment

700B-2 Teletypewriter Converter, p. 122, 123

TCS-110-1 Transportable HF Communication Terminal



Features

*Automatic Tuning
Single Shelter
One-Man Operation*

Applications

*Transportable
Communication Center*

TCS-110-1 is a compact, lightweight HF terminal housed in a single S-144/G size shelter. It includes all facilities to control, switch and operate five remote telephone and teletypewriter lines together with the local operator's audio and teletypewriter circuits.

The basic HF radio equipment, Collins' Universal Radio Group, provides four independent 3 kc wide multiplexed channels in a 12 kc frequency allocation. It is automatically tuned throughout the 2.0-29.9999 mc frequency range in 0.1 kc channel increments. Choice of operating modes includes 4 channel multiplex (A-1, A-2, B-1, B-2) in independent sideband, upper sideband, lower sideband, CW, teletypewriter and compatible AM.

In duplex operation, the receiver can be operated with only 10% frequency separation from the transmitter. The transmit antenna is mounted on top of the shelter to minimize transmission line length, which reduces undesired radiation and loss. The receiving antenna is located at ground level a short distance from the terminal.

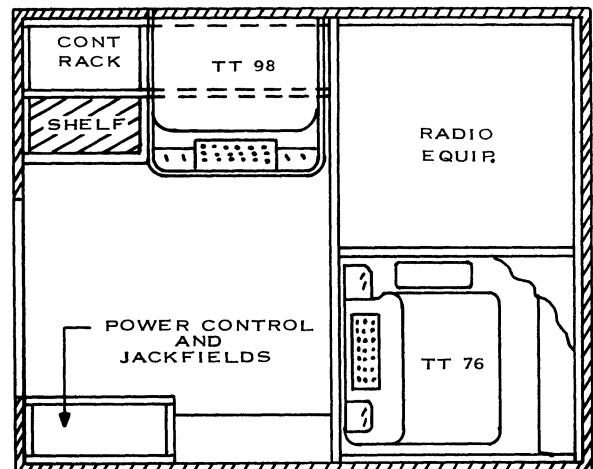
In addition to local control, the system can be operated by FSK dial pulses over a conventional 2- or 4-wire telephone line. Terminal equipment for cryptographic units enables compatibility with existing systems.

RAPID SET UP

All equipment required to place the communication terminal in service is housed in the shelter. It can be transported by fixed-wing aircraft, helicopter or truck, and set up for operation by one man.

EQUIPMENT CONFIGURATION

The interior of the shelter is arranged to make maximum use of available space, while providing for easy maintenance and complete removal or replacement of individual equipment, if the need arises. The power control center provides immediate access to the lighting and equipment power switch



TCS-110-1 Floor Plan

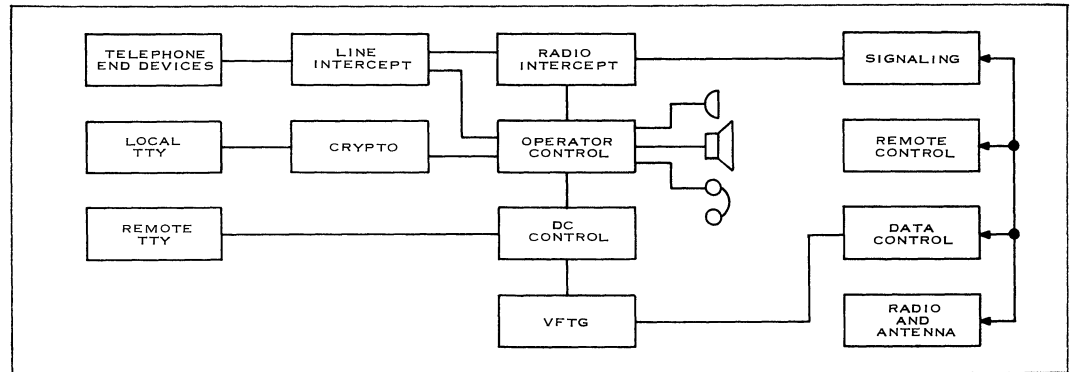
from the shelter entrance and the normal operating position. The operating console has function controls carefully grouped to facilitate operation with minimum effort. All status displays are located at eye level. The equipment is arranged to preclude blind spots and sharp protrusions to insure maximum efficiency and personnel safety.

ADVERSE ENVIRONMENTS

The equipment shelter is designed to operate over a wide

range of environmental conditions, including temperatures of -40°C to $+50^{\circ}\text{C}$ (-52°C to $+54.4^{\circ}\text{C}$ nonoperating), 100% relative humidity at 35°C and 10,000 ft. pressure (50,000 ft. nonoperating). It will operate satisfactorily under sand, dust, salt and fungus environments as normally encountered in desert, seacoast and tropical areas. Shock and vibration, as encountered during aircraft transport, railroad humping, 18-inch drops and Munson road tests, can be tolerated by the TCS-110-1 system.

Functional Circuits



Specifications

GENERAL

FREQUENCY RANGE: 2.0-29.9999 mc; 0.1 kc steps.

FREQUENCY STABILITY: 1 part in 10^8 per day.

TUNING: Automatic.

CONTROL: Local switch select, FSK dial-pulse select, and remote FSK dial-pulse select over a 2- or 4-wire telephone line.

EXTERNAL SUBSCRIBERS: Five 2- or 4-wire.

- (1) 2- or 4-wire FSK dial FSK PTT (4 maximum).
- (2) 2- or 4-wire dc dial common battery; maximum loop resistance, 500 ohms (1 maximum).
- (3) 2- or 4-wire common battery manual; maximum loop resistance, 500 ohms (1 maximum).
- (4) 2- or 4-wire local battery-type ringdown subscribers (1 maximum).
- (5) 2- or 4-wire switchboard trunks (4 maximum).

TELEPHONE SWITCHING: Switchboard; 4-wire.

DUPLEX RADIO

POWER OUTPUT: 1 kw PEP/average.

RECEIVERS: One.

MODE OF OPERATION: Switch selection; full duplex or simplex.

FREQUENCY SEPARATION: 10% from transmitted frequency.

CHANNELIZATION: Four independent 3 kc channels in a 12 kc frequency assignment.

ANTENNAS: Two 32 ft. Fiberglas whips.

VOICE FREQUENCY TELEGRAPH PRIMARY

CHANNELS: Eight 4-wire, full duplex circuits.

CHANNEL FREQUENCY: 425-2975 cps.

FREQUENCY SHIFT: ± 42.5 cps.

MODE OF OPERATION: Normal 8 channel nondiversity, switch-selectable to four channel frequency diversity on an individual channel basis.

CRYPTOGRAPHY

Space and cabling are provided within the shelter for one full duplex on-line terminal.

LOCAL TELETYPEWRITER

TWO PAGE PRINTER/KEYBOARD: One TT-76/FG keyboard, typing reperforator, transmitter distributor, and one TT-98/FG page printer/keyboard.

EXTERNAL SUBSCRIBERS

Eight 4-wire lines; 60 ma neutral.

POWER SOURCE: 120 v ac, single phase; or 208 v, 3 phase, 50-60 cps or 400 cps.

SIZE: S-144/G Shelter — 62" W, 66" H, 78" D (157.48 cm W, 167.64 cm H, 198.12 cm D), maximum.

Basic Units

789R-1 IF Translator, p. 88-90

789T-1 IF Translator, p. 88-90

618Z-4 RF Translator, p. 87

548L-4 1 KW Power Amplifier, p. 37

426U-2 Power Supply, p. 86

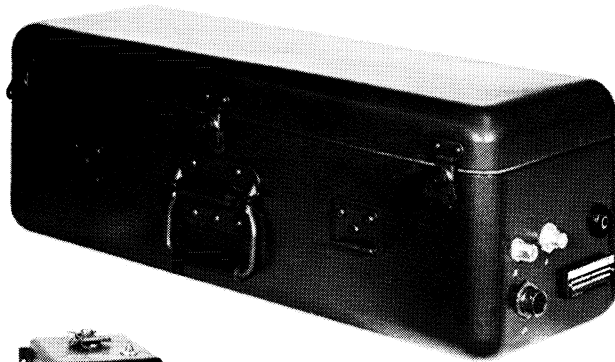
635T-2 Receiver Bandpass Filter, p. 111, 112

313 Series Control, p. 83-85

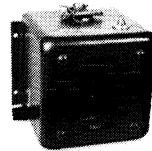
VC-102 HF Communication System



Transceiver



Antenna Coupler



Speaker



Control Box

Features

Automatic Tuning
Remote Operation
Phone Patch
Teletypewriter Capability
Modular Construction

Applications

Mobile
Transportable
Shipboard
Fixed Station

The VC-102, a multiple purpose single sideband radio system, provides optimum tactical area communication whether used in mobile or fixed installations. The 2.0-29.999 mc frequency range is covered in 28,000 1 kc increments. Transmit power output is 400 watts PEP in either upper sideband or lower sideband and 100 watts in AM with reinserted carrier, CW or FSK. Automatic tuning permits operation by unskilled personnel and assures on-frequency operation.

SYSTEM APPLICATION

The VC-102, using modular construction, is ideally suited for vehicular, transportable, shipboard and fixed HF station installations.

All operating controls are located on a compact local-remote unit, which can be used with an appropriate cable at distances up to 100 ft. from the transceiver case. Remote control over long distances can be achieved by the use of the AN/GRA-6 or similar type equipment.

A telephone patch circuit extends system versatility for use with wire line circuits. This function is under direct supervision of the operator.

Teletypewriter A nonsynchronous FSK unit is supplied for teletypewriter speeds up to 100 words per minute. The frequency shift keyer uses solid state components, built-in loop supply and an electronic keyer. It is housed in the main equipment case.

Antenna Choice The rugged Fiberglas antenna employs four sections for mobile operation and eight sections for stationary

use. A separate antenna coupler allows the antenna to be located up to 100 ft. from the transceiver case.

BASIC EQUIPMENT

The basic transceiver is the proven Collins 618T-3, housed with a power supply and optional 700B-2 FSK unit in a compact aluminum case which is drip-proof during operation and watertight in transport. The local-remote control, antenna coupler, auxiliary speaker and auxiliary load coil are of watertight construction.

Modular construction, together with plug-in major assemblies, reduces maintenance and parts problems. The extensive use of transistor circuits provides increased reliability and reduction of power consumption and weight.

Accessories

INSTALLATION KITS

Installation kits are available for the M38A-1 and M151 military vehicles which include all mounting brackets and interconnecting cables for the transceiver and antenna coupler cases and remote-local control box, together with the whip antenna assembly. Mounting bases are supplied with quick disconnect receptacles to facilitate removal of the equipment cases for inspection or maintenance.

The Fiberglas antenna consists of four sections for a 16 ft. whip and four extension sections for 32 ft. heights. It is complete with canvas stowage bag.

FIXED STATION ANTENNA

A Fiberglas antenna kit for shipboard or fixed station installation includes a feed-through type base section for bulkhead mounting and one or more extension sections.

76F-1 SPEAKER/AMPLIFIER

The optional speaker unit, similar to LS-166, is mounted in a watertight case with a self-contained transistor audio am-

plifier. A gain control is provided on the side of the enclosure.

690D-1 LOAD COIL

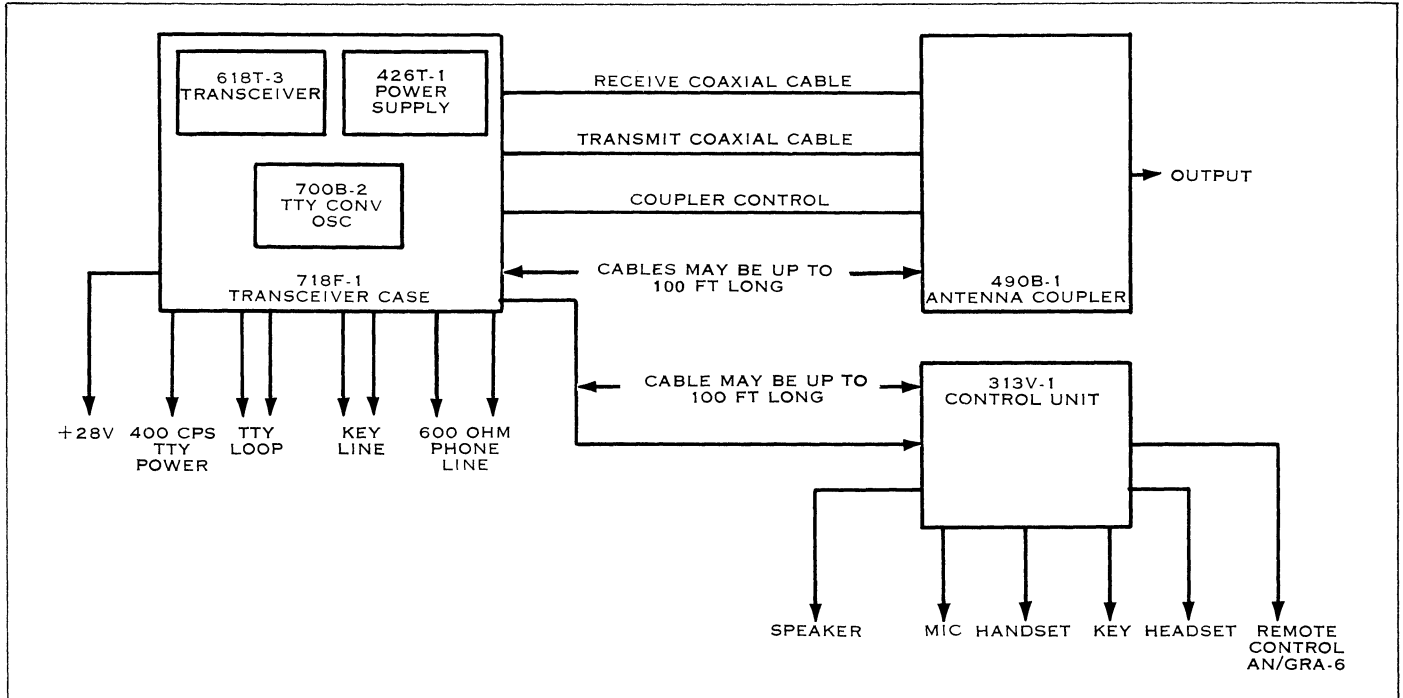
The optional load coil unit is used to electrically lengthen a 16 ft. whip antenna in the 2-30 mc range. It is mounted in a watertight case which also provides the antenna mount. A

coax fitting UG-680/U type N is provided on the side of the case for connecting a dipole antenna.

CABLES

Optional cables 100 ft. long are available for the control and antenna coupler.

Functional Circuits



Specifications

- FREQUENCY RANGE:** 2.0-29,999 mc.
- NUMBER OF FREQUENCY CHANNELS:** 28,000 spaced 1 kc.
- FREQUENCY SELECTION:** 4 knobs with digital indicators.
- TUNING METHOD:** Automatic, servo-controlled, including antenna coupler.
- CHANNEL CHANGE TIME:** 15 seconds nominal, including antenna coupler.
- OPERATING MODES:** USB, LSB, AM, CW and FSK.
- FREQUENCY STABILITY:** 0.8 part in 10⁶ per month.
- SEMIREMOTE CAPABILITY:** Complete control with appropriate cable up to 100 ft.
- REMOTE CAPABILITY:** Control over 2-wire line with AN/ GRA-6 or equivalent. (Push-to-talk and audio control only, 2 miles.)
- ANTENNA REQUIRED:** 16 ft. or 32 ft. whip, or 45-90 ft. wire.
- PHONE PATCH REQUIREMENTS:** 600 ohm phone line operator controlled, not voice operated.

- MICROPHONE:** Differential carbon, Electro-Voice 205KK or equivalent.
- KEY:** Standard military type.
- HANDSET:** Military type H33F/PT or equivalent.
- POWER INPUT:** 27.5 v dc, 53 amps peak during tuning; 37 amps nominal SSB voice transmit; 14 amps receive.
- GFE EQUIPMENT:** AN/GRA-6 remote control, if used.

SIZE AND WEIGHT:

	<i>W</i>	<i>Size H</i>	<i>D</i>	<i>Weight</i>
Transceiver case	19½" 49.5 cm	12¾" 32.4 cm	30" 76.2 cm	140 lbs. 63.5 kg
Coupler case	9 5/16" 23.65 cm	9" 22.8 cm	27" 68.6 cm	50 lbs. 22.7 kg
Control box	6" 15.2 cm	9" 22.8 cm	3.5" 8.9 cm	7.5 lbs. 3.4 kg
Speaker	7½" 19.0 cm	7" 17.8 cm	4¾" 12.1 cm	3.5 lbs. 1.6 kg

Basic Unit

618T-3 Transceiver, p. 44, 45

Related Equipment

700B-2 Teletypewriter Converter, p. 122, 123

VC-104 Vehicular HF-UHF Communication System



Features

Automatic Tuning
HF-UHF Communication
Phone Patch
Remote Operation
Modular Construction

Applications

Mobile
Airlift Capability

The VC-104, installed in a 4 x 4 ¼-ton M38A-1 military vehicle, provides optimum tactical mobile communication in the 2.0-29.999 mc and 225.0-399.9 mc frequency ranges.

In the HF range, 1 kc channel increments are provided with 400 watts PEP level output in either upper sideband, or lower sideband and 100 watt output level in AM with reinserted carrier, CW or FSK.

The UHF range is covered in 100 kc increments with 20 watts AM output power.

Automatic digital tuning reduces required operator proficiency and precludes the possibility of equipment damage because of operator error. A separate UHF single frequency receiver is included to monitor the guard channel.

EQUIPMENT CONFIGURATION

The basic communication equipment, a Collins VC-102 system for HF SSB, compatible AM, CW and FSK, and a Collins 718M-1, which includes an AN/ARC-52X for UHF voice, are housed in compact aluminum cases. The cases are drip-proof during operation and watertight in the transport condition. The M38A-1 vehicle is equipped with a standard military 100 amp, 27.5 v electrical system.

The primary power system includes a voltmeter/tachometer to assure correct engine speeds and generating capacity under all conditions. Both the HF and UHF systems can be operated while the vehicle is in motion.

Carrying racks are included for transporting AN/PRC-25, AN/PRC-41 and AN/PRC-47 pack sets. The VC-104 is well-suited for airlift and airdrop operations because of small size, reduced weight and ruggedness.

A phone patch circuit extends system versatility for use with wire line facilities. This function is under direct supervision of the operator.

CONTROLS

All HF operating function controls are located on a compact local-remote unit which can be quickly detached from the transceiver case. The VC-104 can be used with an appropriate cable at distances up to 100 ft. from the vehicle. Remote control over greater distances can be accomplished by the use of the AN/GRA-6 or similar equipment.

In addition to manual selection of the 1750 channels, 19 of the most commonly used UHF frequencies can be preset, allowing rapid channel selection. The AN/GRA-6 will also control the 718M-1 UHF Transceiver.



Controls are centrally located. The HF control unit may be quickly detached for semi-remote operation.

OPTIONAL FSK

One hundred word per minute FSK capability can be added to the HF system by the use of a Collins 700B-2 Teletypewriter Converter.

ANTENNA CHOICE

Remote location of the HF antenna is made possible by a separate antenna coupler which can be positioned up to 100 ft. from the vehicle. A connector located on the HF whip mounting base permits the use of a dipole antenna. A discone UHF antenna mounts directly on the vehicle.

Specifications

HF SYSTEM CHARACTERISTICS

POWER OUTPUT: SSB — 400 watts PEP; AM — 100 watts; CW, FSK — 100 watts.

FREQUENCY RANGE: 2.0-29.999 mc; 1 kc channel increments.

FREQUENCY STABILITY: 0.8 part in 10^6 per month.

ANTENNA: Whip, adjustable in sections 16-32 ft. Long wire, 45-90 ft., or dipole antenna can be used.

PHONE PATCH: 600 ohm line.

POWER INPUT: 27.5 v dc; 53 amps peak during tuning; 37 amps nominal SSB voice transmit; 14 amps receive.

WEIGHT: 200 lbs. (90.72 kg).

UHF SYSTEM CHARACTERISTICS

POWER OUTPUT: 20 watts.

FREQUENCY RANGE: 225.0-399.9 mc; 100 kc increments.

FREQUENCY STABILITY: ± 10 kc.

PRESET CHANNELS: 19, including guard channel.

ANTENNA: AS-390 with 4 each 4 ft. mast sections.

POWER INPUT: 27.5 v dc; 16 amps tuning; 14 amps transmit; 9 amps receive.

WEIGHT: 125 lbs. (56.70 kg).

GFE EQUIPMENT: M38A-1 vehicle and 100 amp generating system. AN/GRA-6 remote control, if used.

Basic Unit

VC-102 HF Communication System, p. 75, 76

Related Equipment

700B-2 Teletypewriter Converter, p. 122, 123