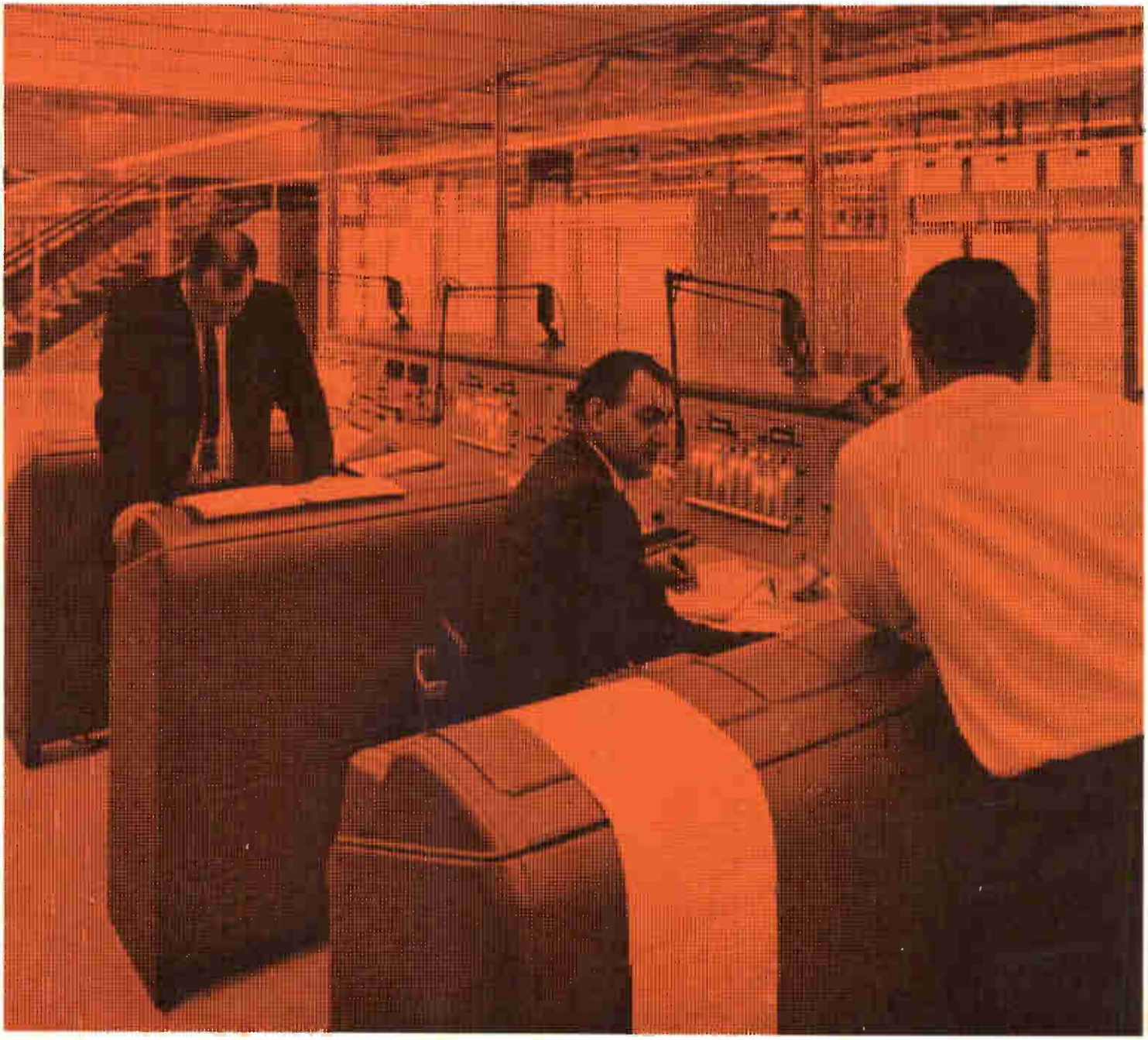
1964

L. J. Wanja

COLLINS

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.

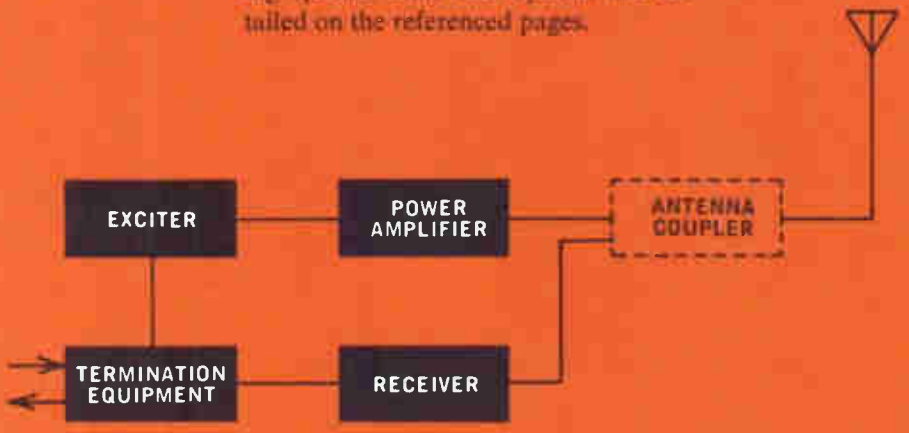
COLLINS

CONTENTS

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

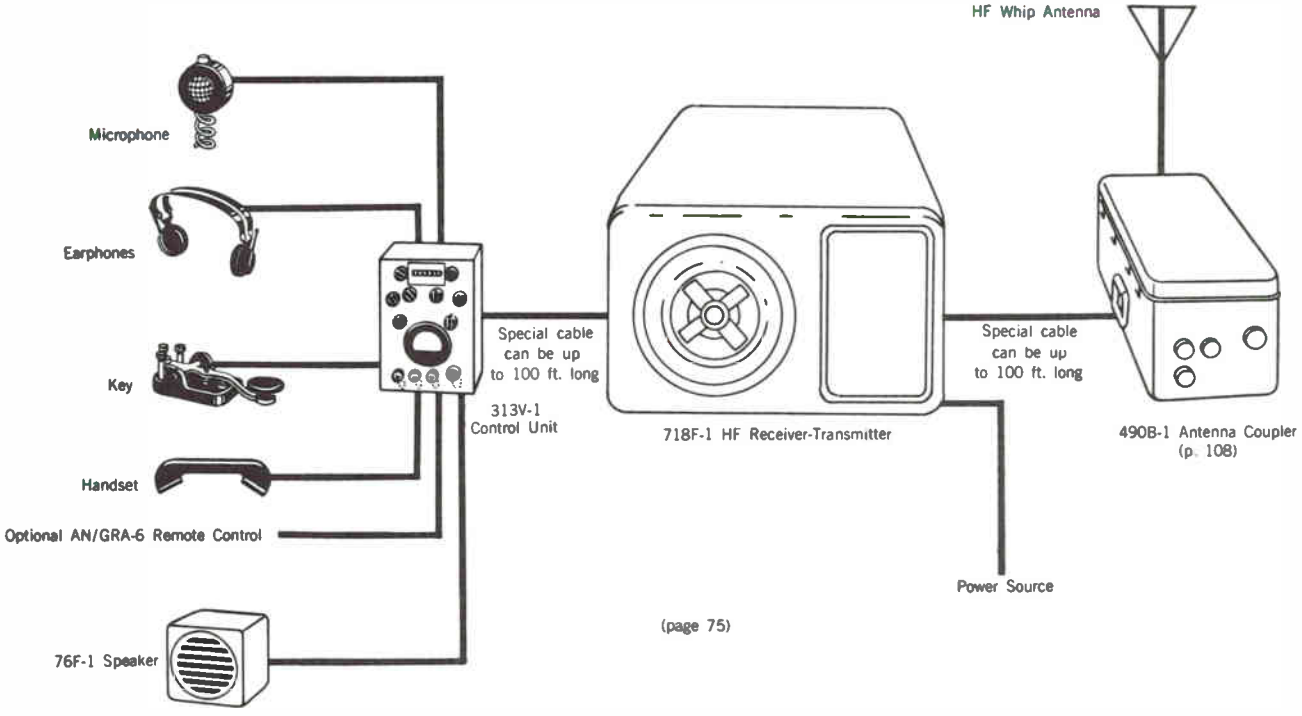
Collins Radio Company, a pioneer in high frequency single sideband equipment development, offers a wide selection of integrated systems, as well as individual receivers, transmitters and transceivers to greatly improve the quality and flexibility of communication. Outlined in this section are typical systems, together with salient features and characteristics, for airborne, fixed point-to-point, shipboard, mobile, transportable and tactical military communication applications. Information regarding specific units and options are detailed on the referenced pages.



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.



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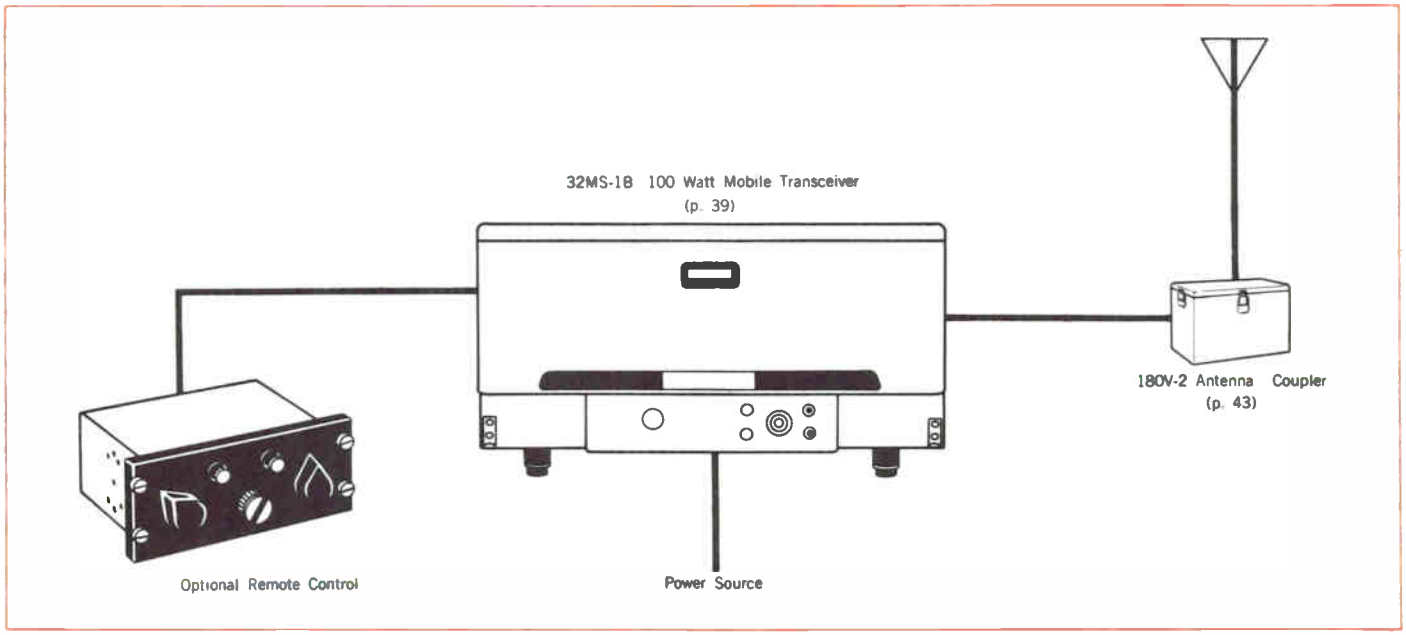
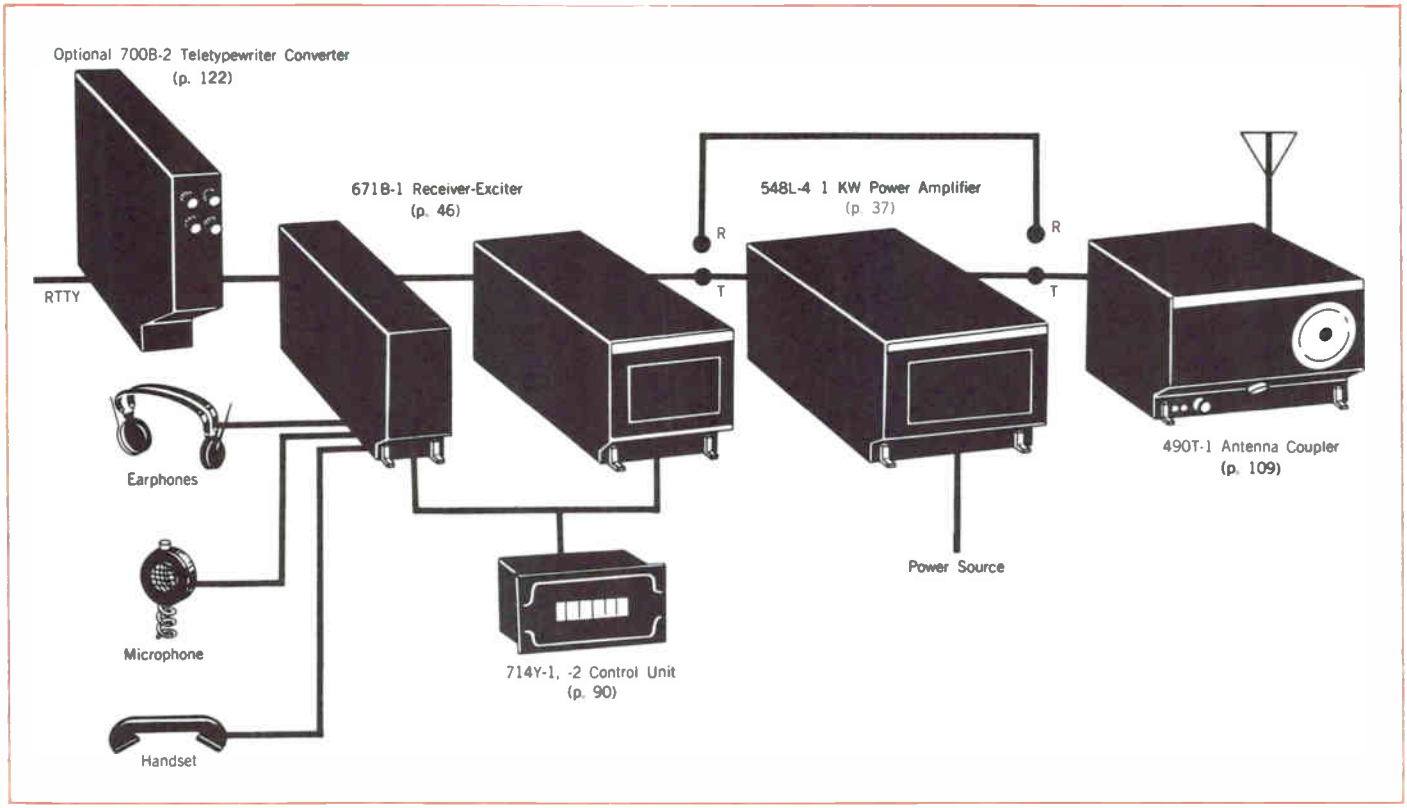
32MS-1B 100 Watt Mobile Transceiver

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 transceiver 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.

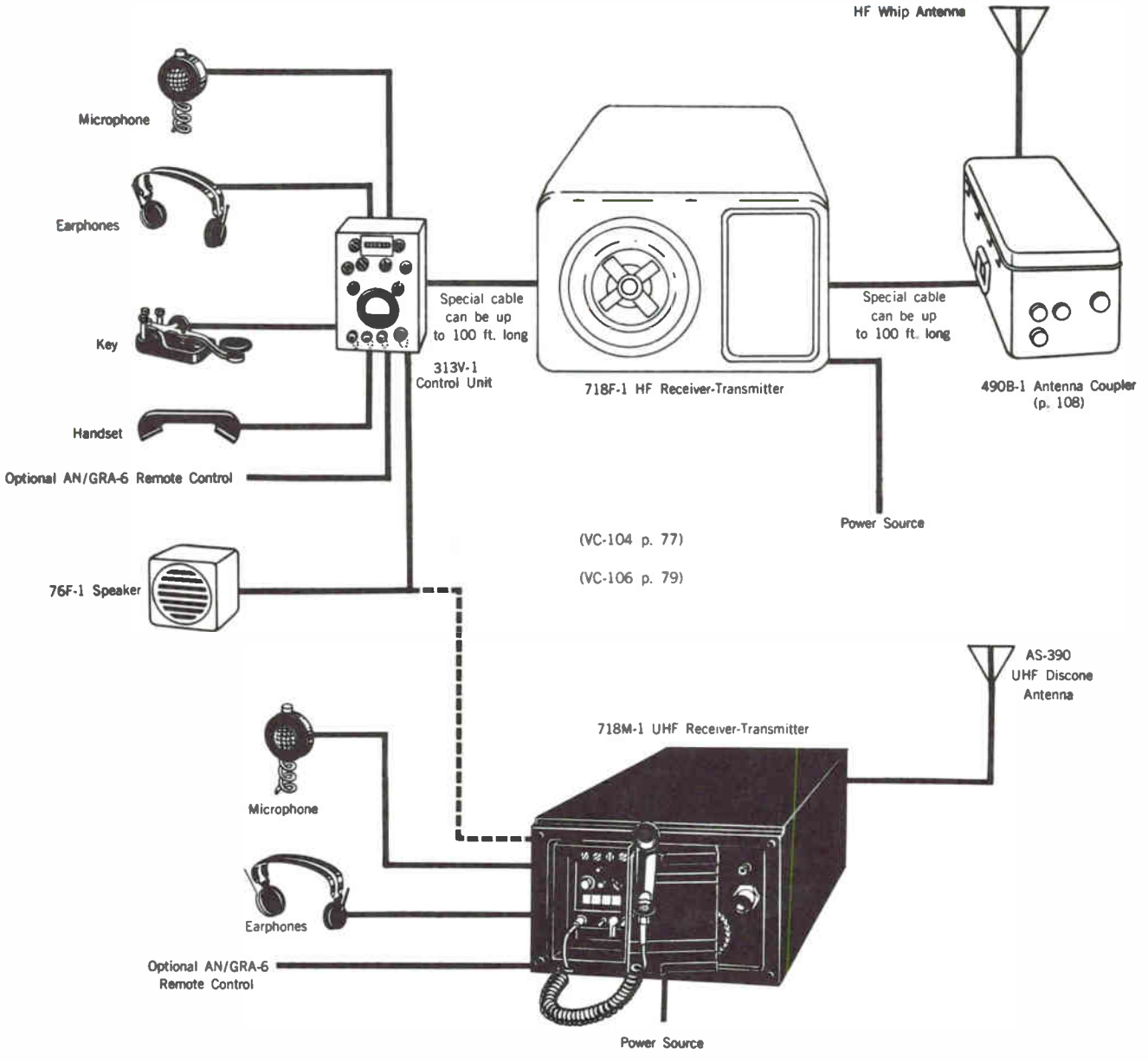


VC-104 Vehicular HF-UHF Communication System

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 automatically 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.

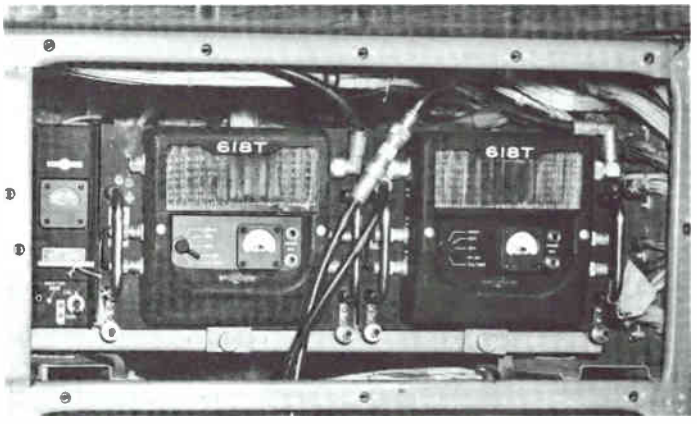
VC-106 Vehicular HF-UHF Communication System

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 automatically 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.



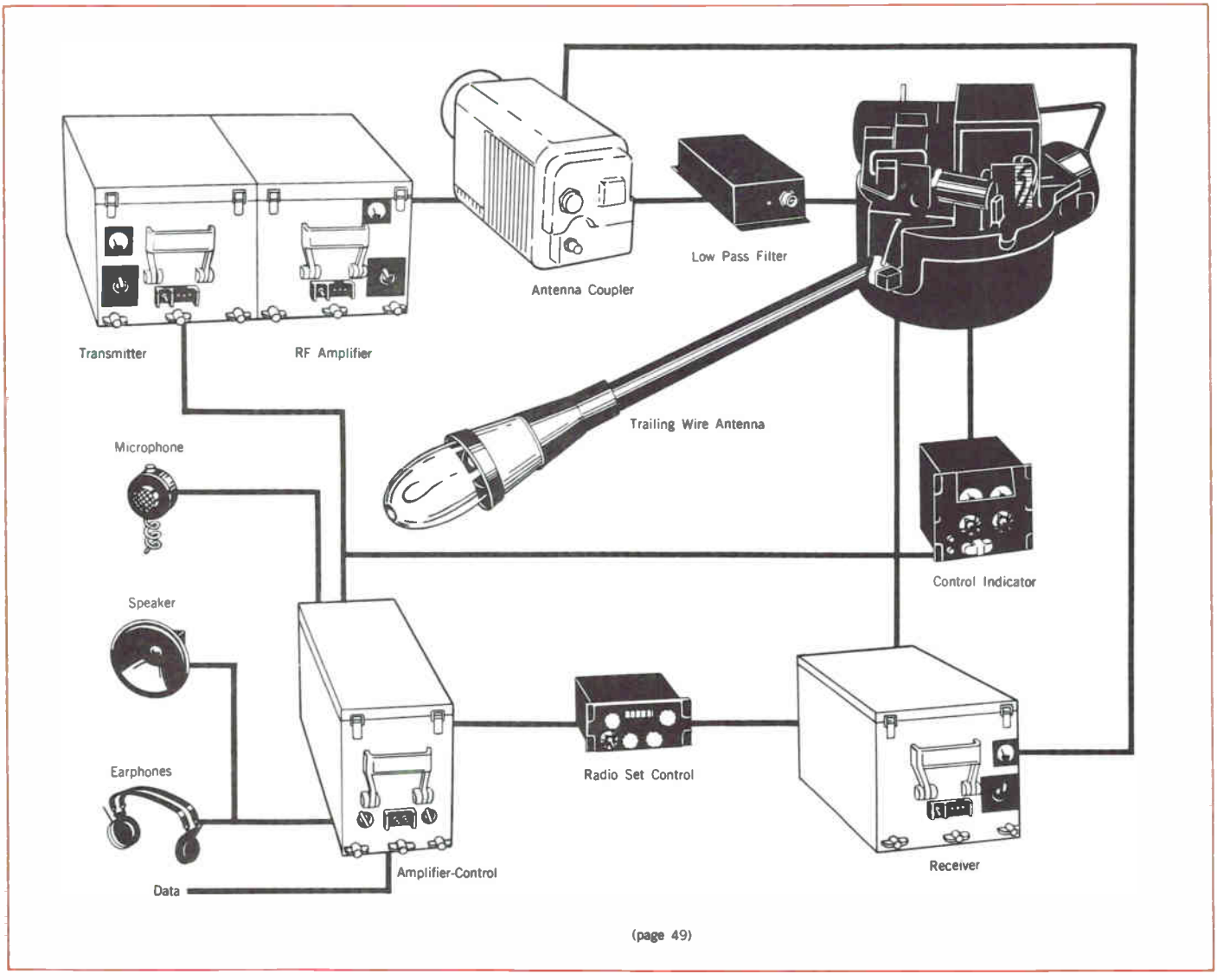
VC-104 or VC-106 Vehicular HF-UHF Communication System

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.



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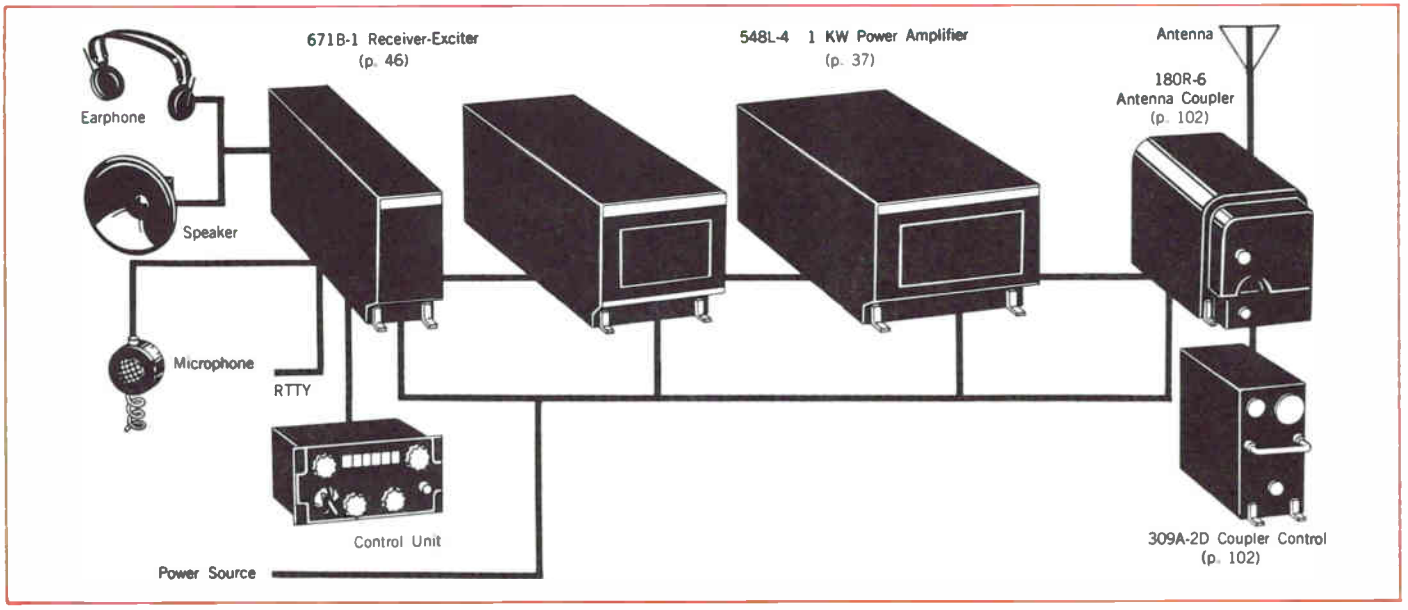
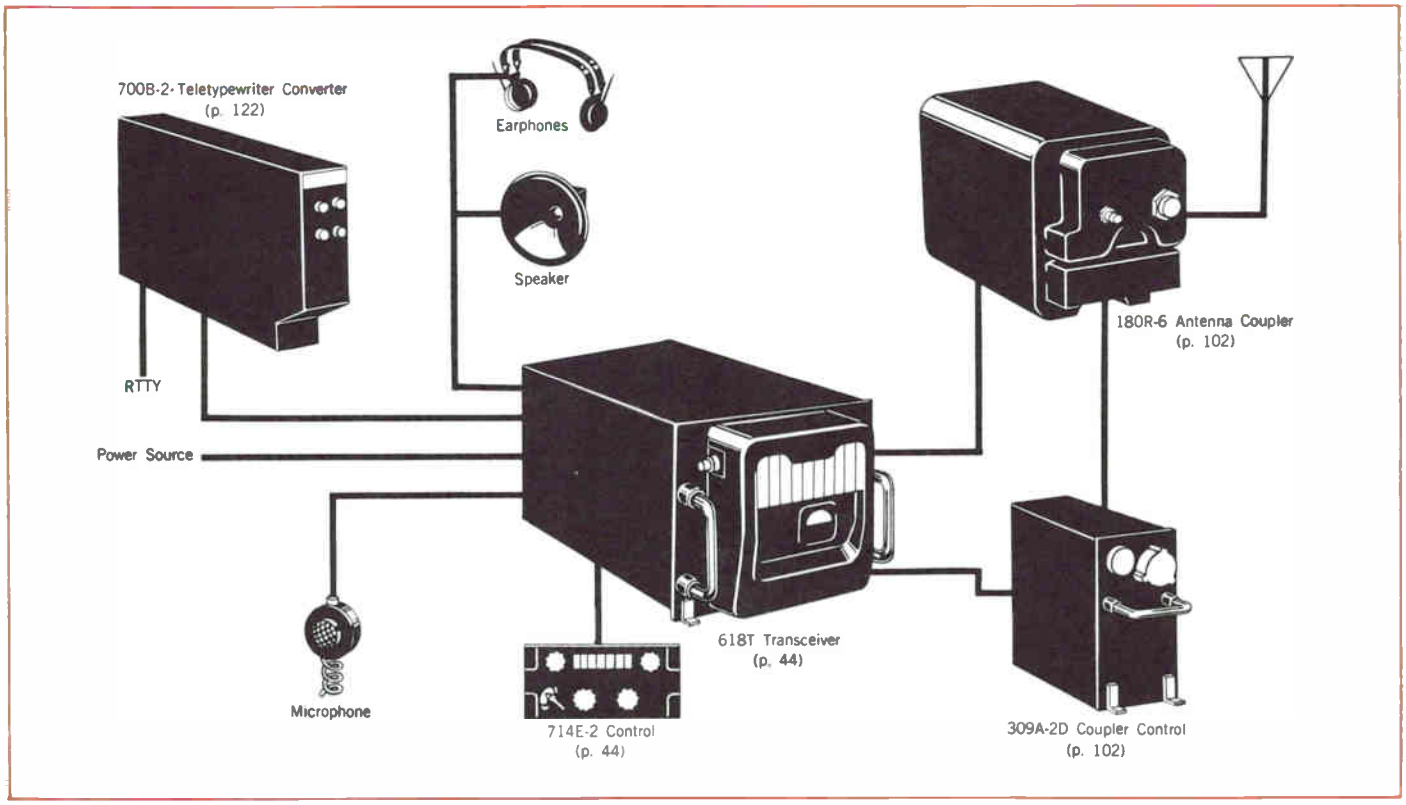
Universal Radio Group

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 output 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.

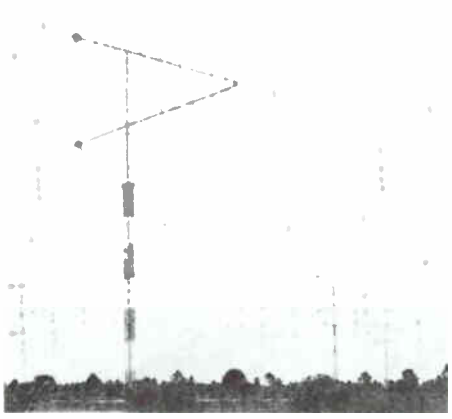


618T Transceiver

The versatile 618T provides 1 kc channel increments throughout the 2.0-29.999 mc range with 400 watts PEP output on single sideband or 100 watts on AM, CW or FSK. A teletypewriter can be used with an optional converter.

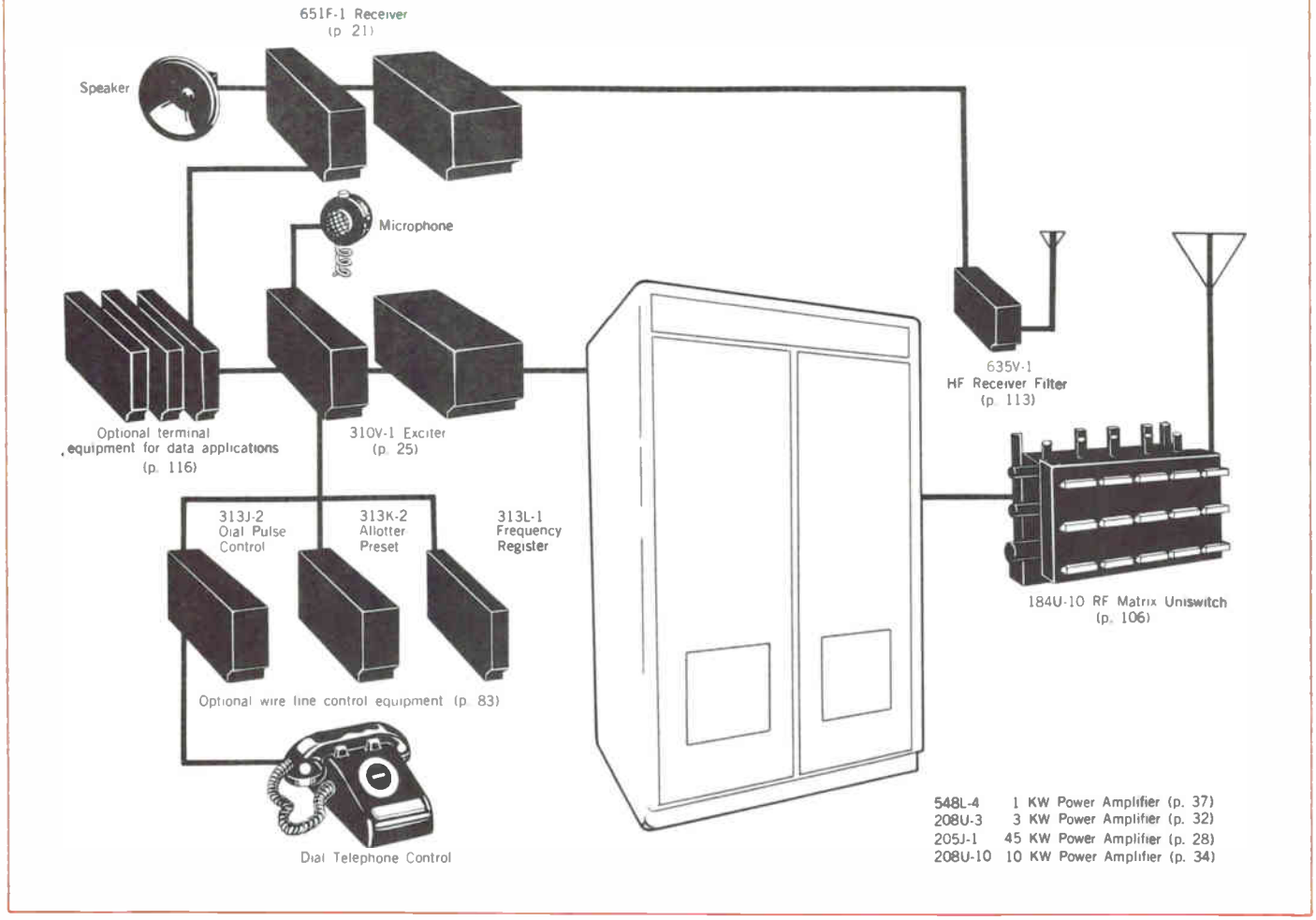


Fixed Station HF Communication Systems



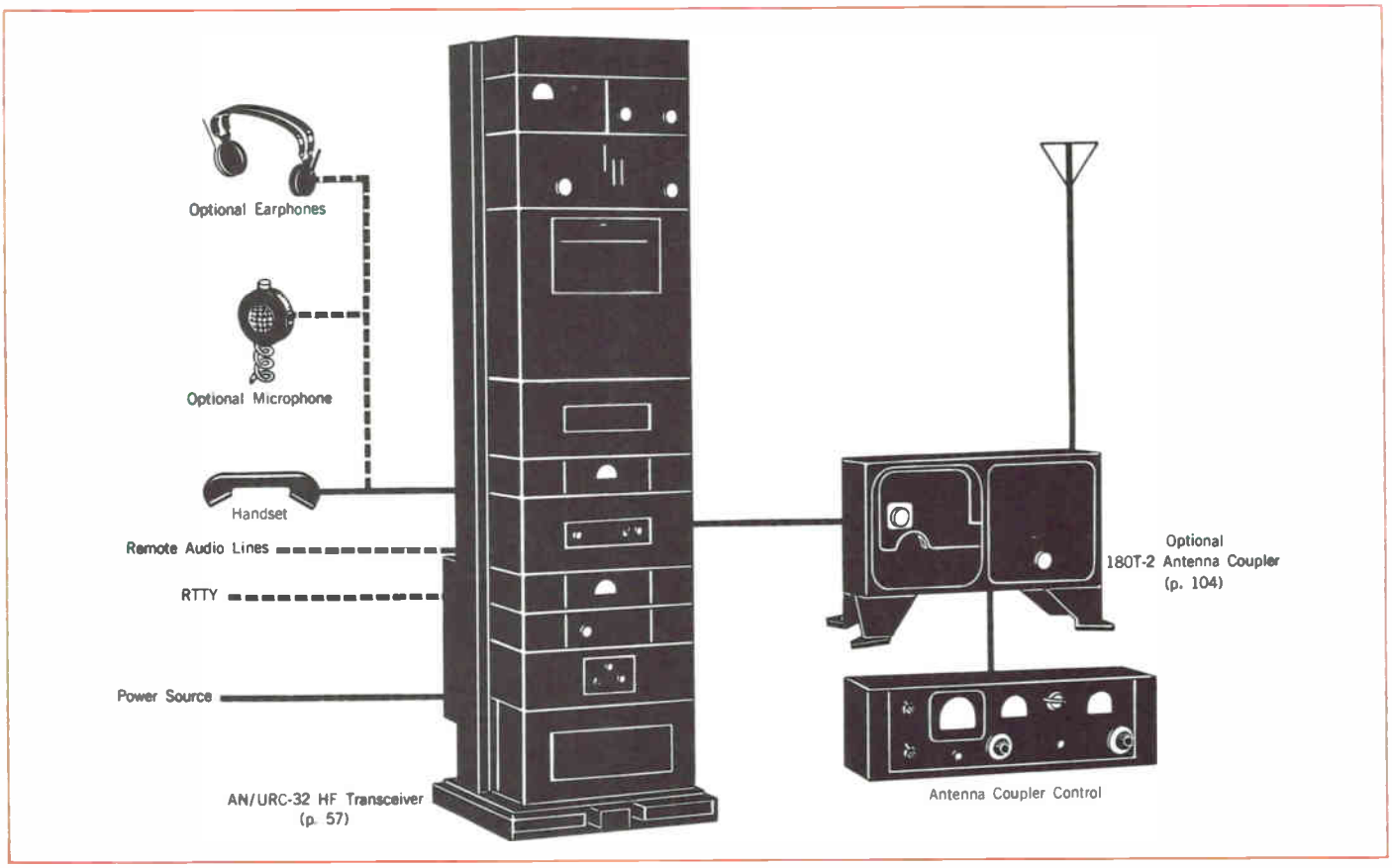
Universal Radio Group

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 frequencies 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.



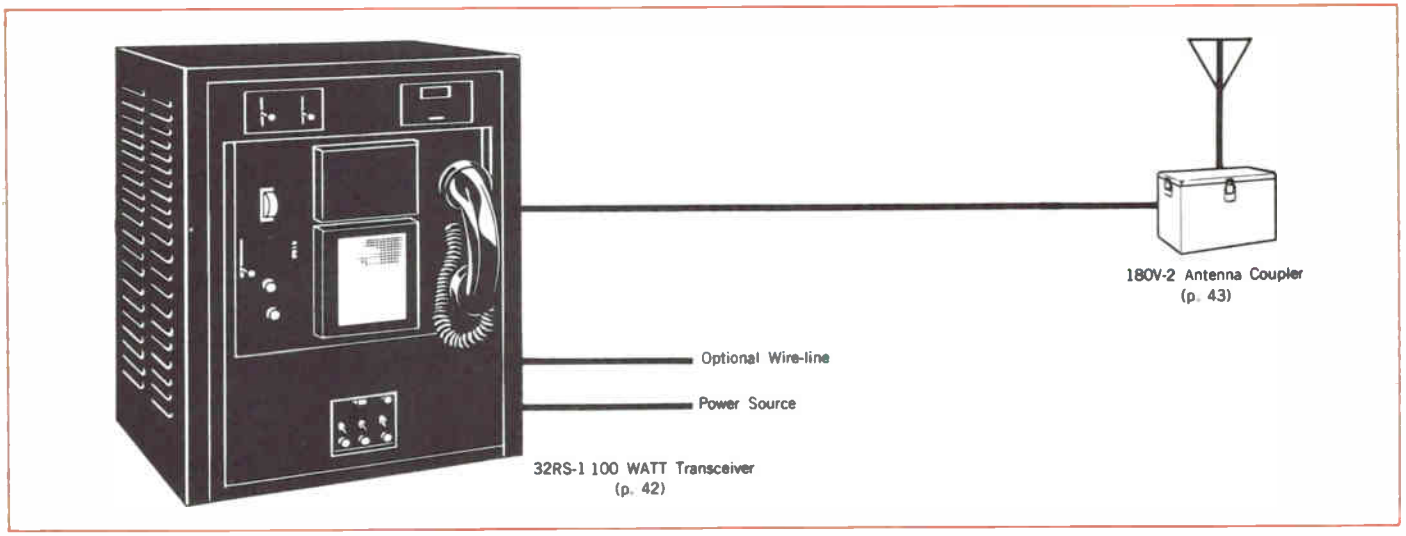
AN/URC-32 Transceiver

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

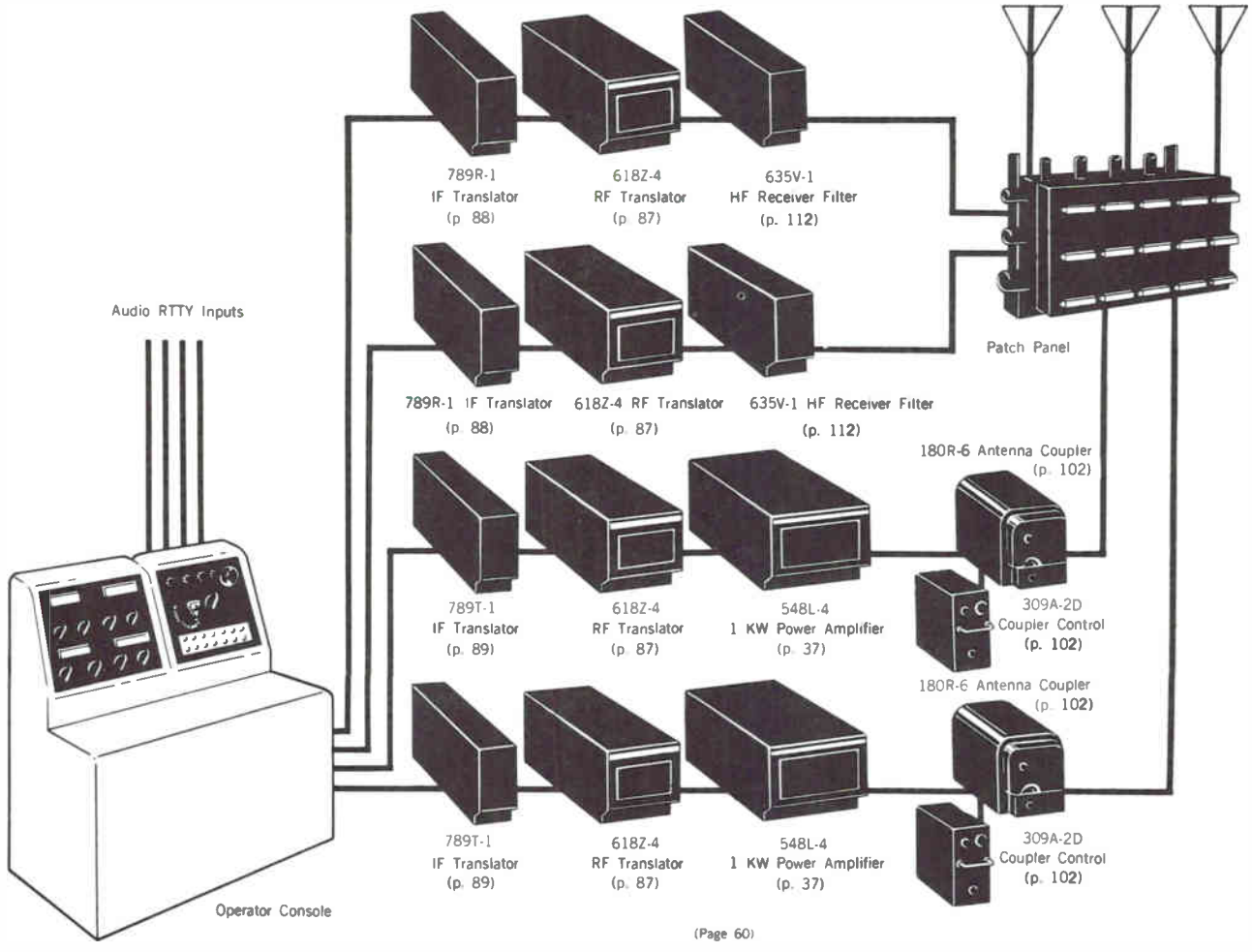
The 32RS-1 Transceiver has an output of 100 watts PEP on any of four preset channels in the 1.6-15.0 mc frequency range. It features VOX control and can be operated by non-technical personnel. Installation is very simple requiring only an antenna and power source. An optional phone patch allows termination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



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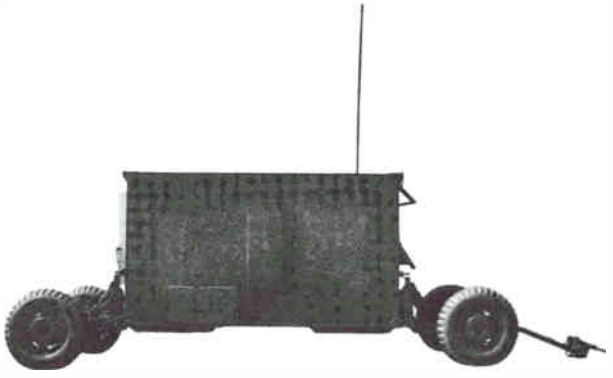
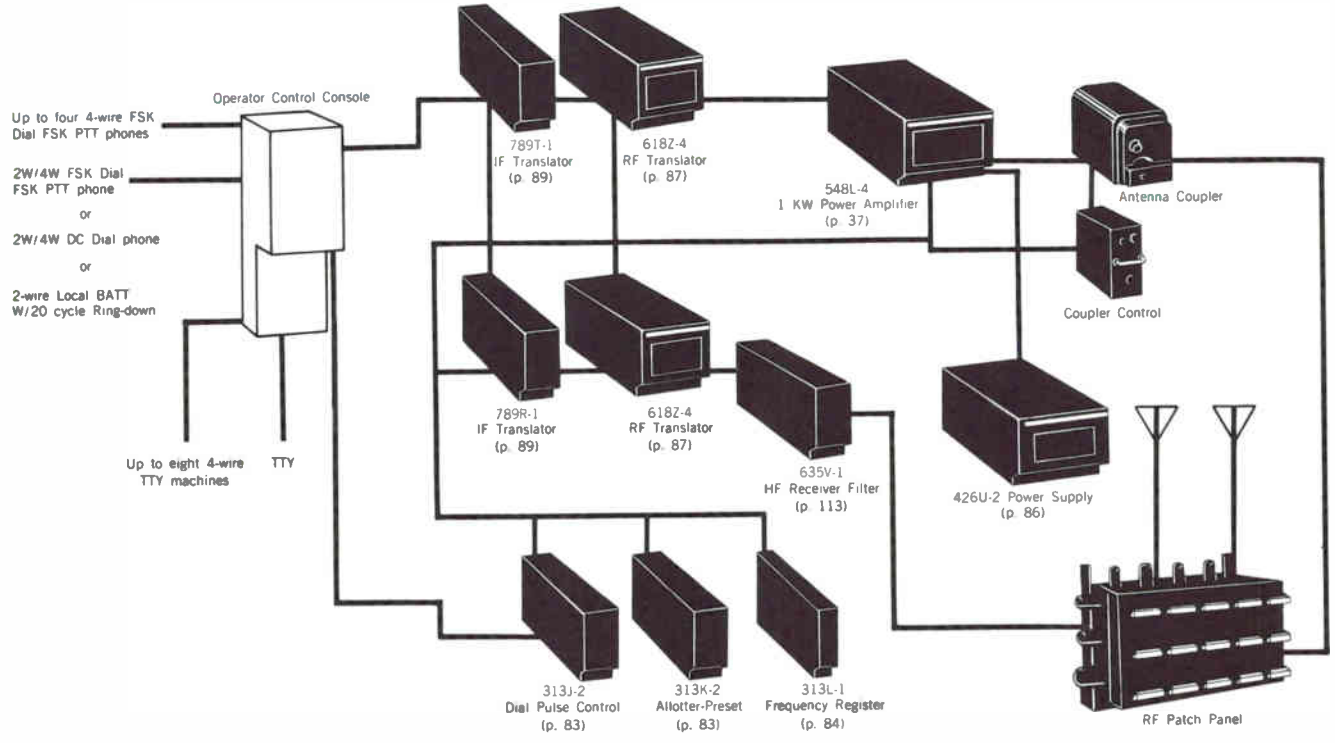
AN/TSC-38 Transportable HF Communication Central

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.



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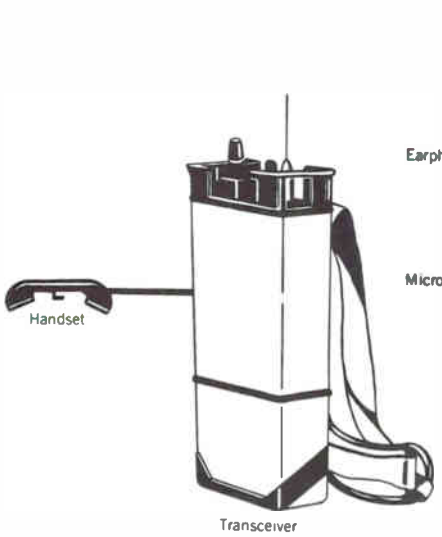
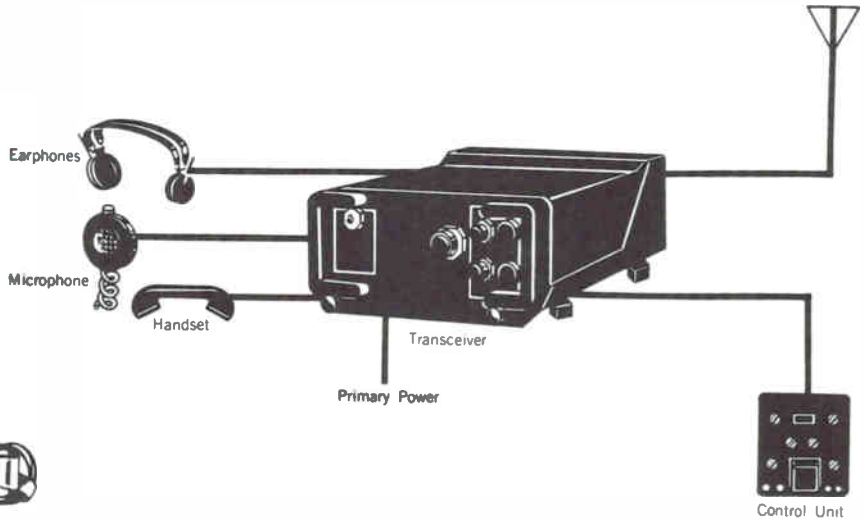
HF Pack Sets

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, shipboard, 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.



Field Use



Mobile Application

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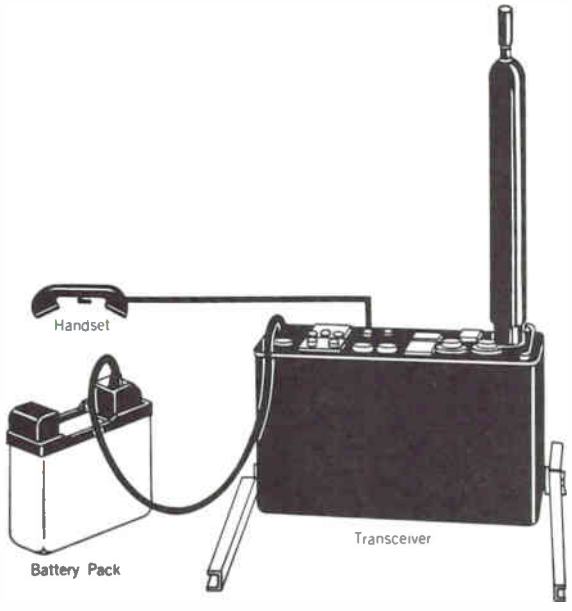
AN/PRC-47 Man Pack HF Transceiver

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.



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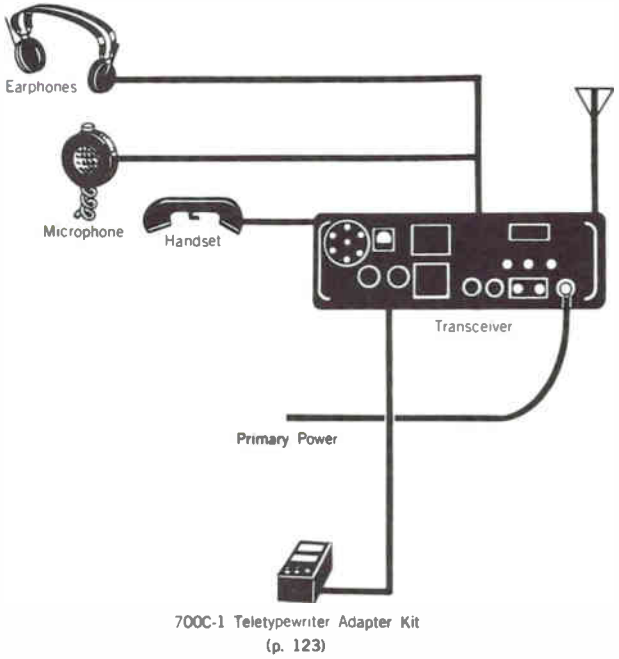

Mobile Application

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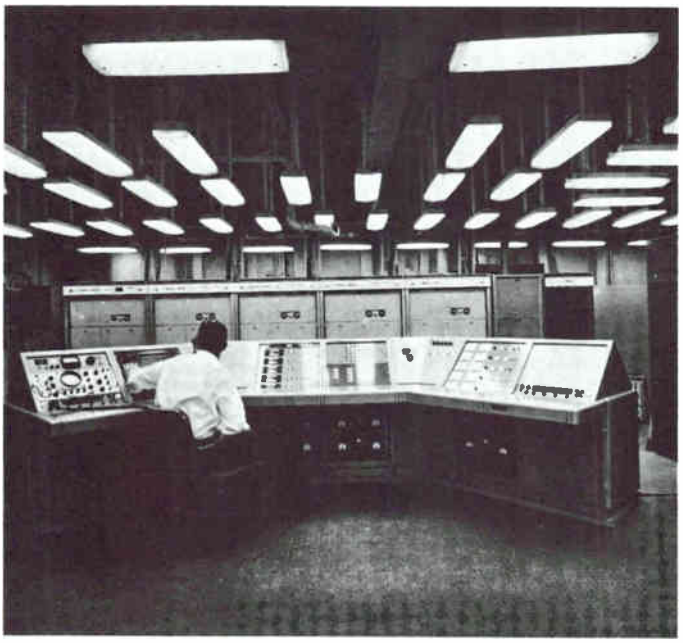
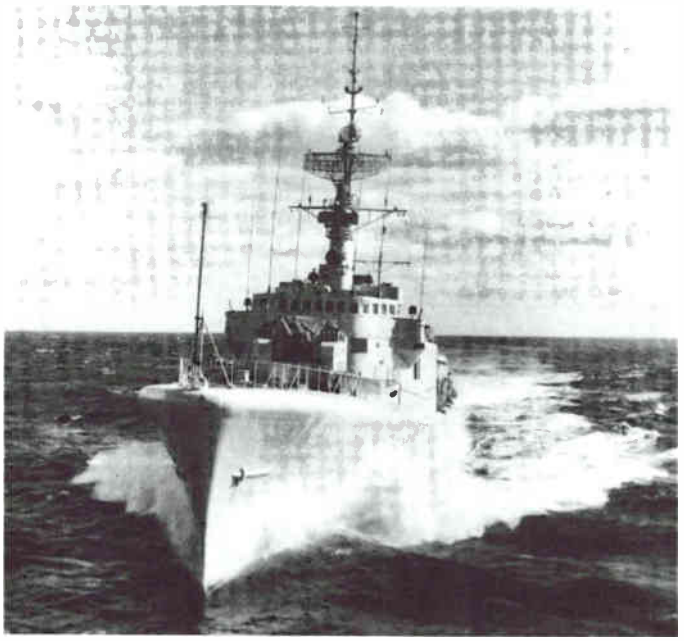
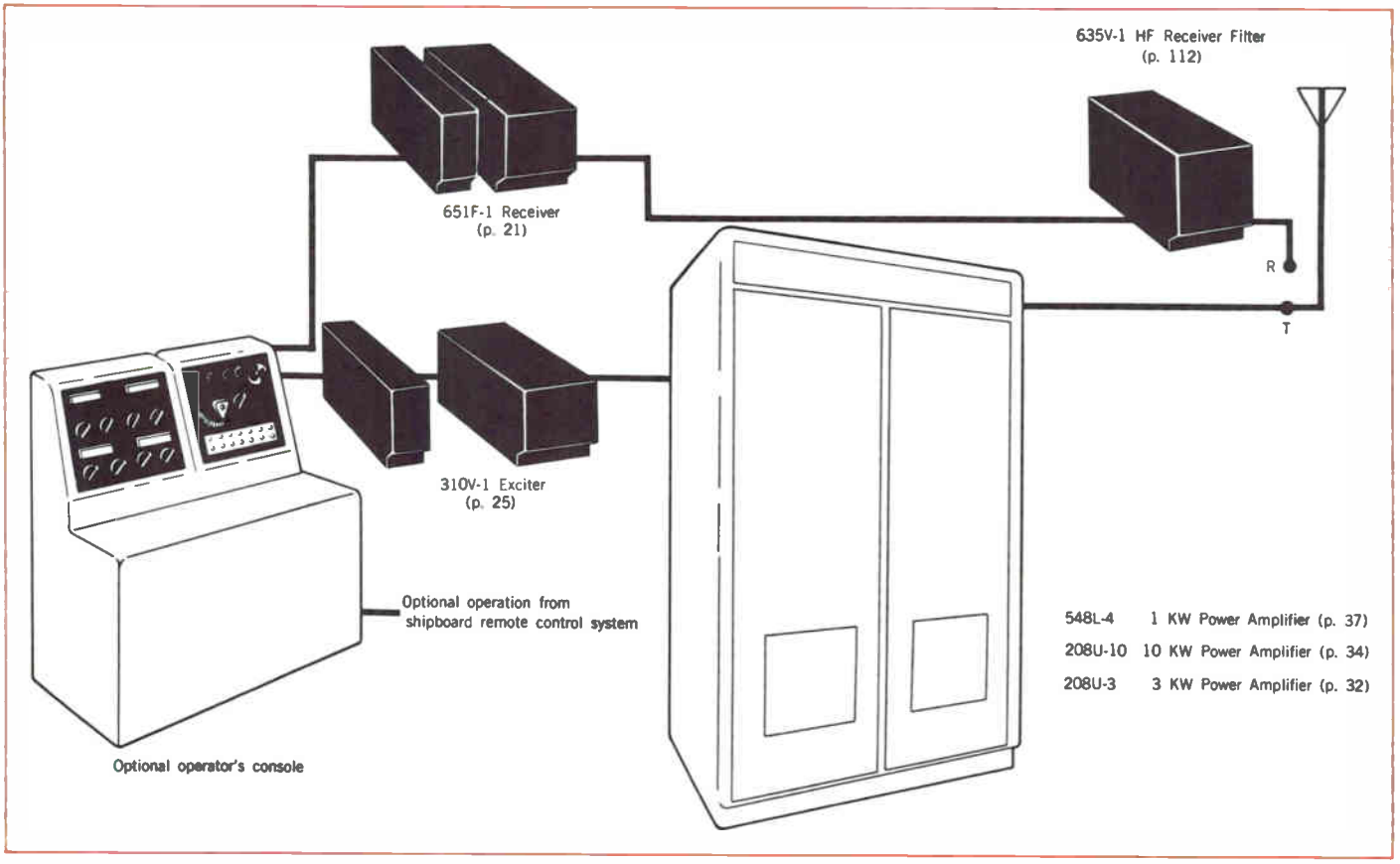
Shipboard HF Communication Systems





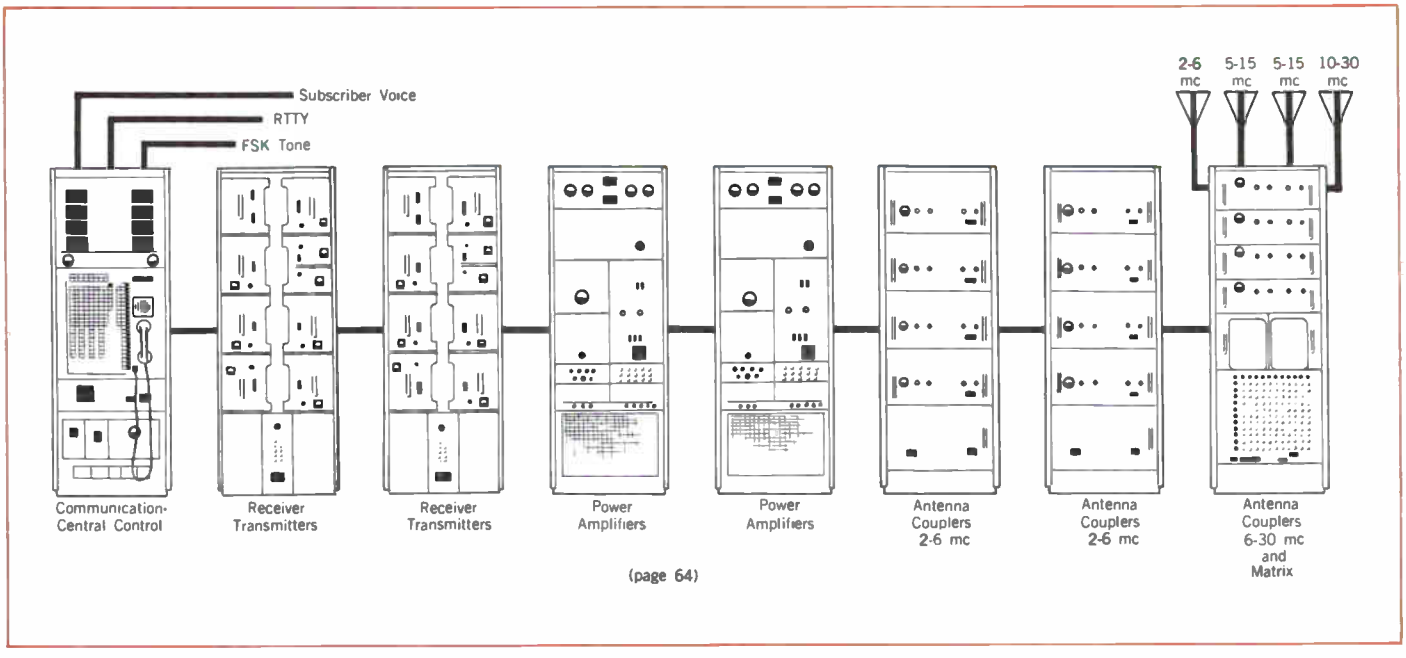
Universal Radio Group

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.



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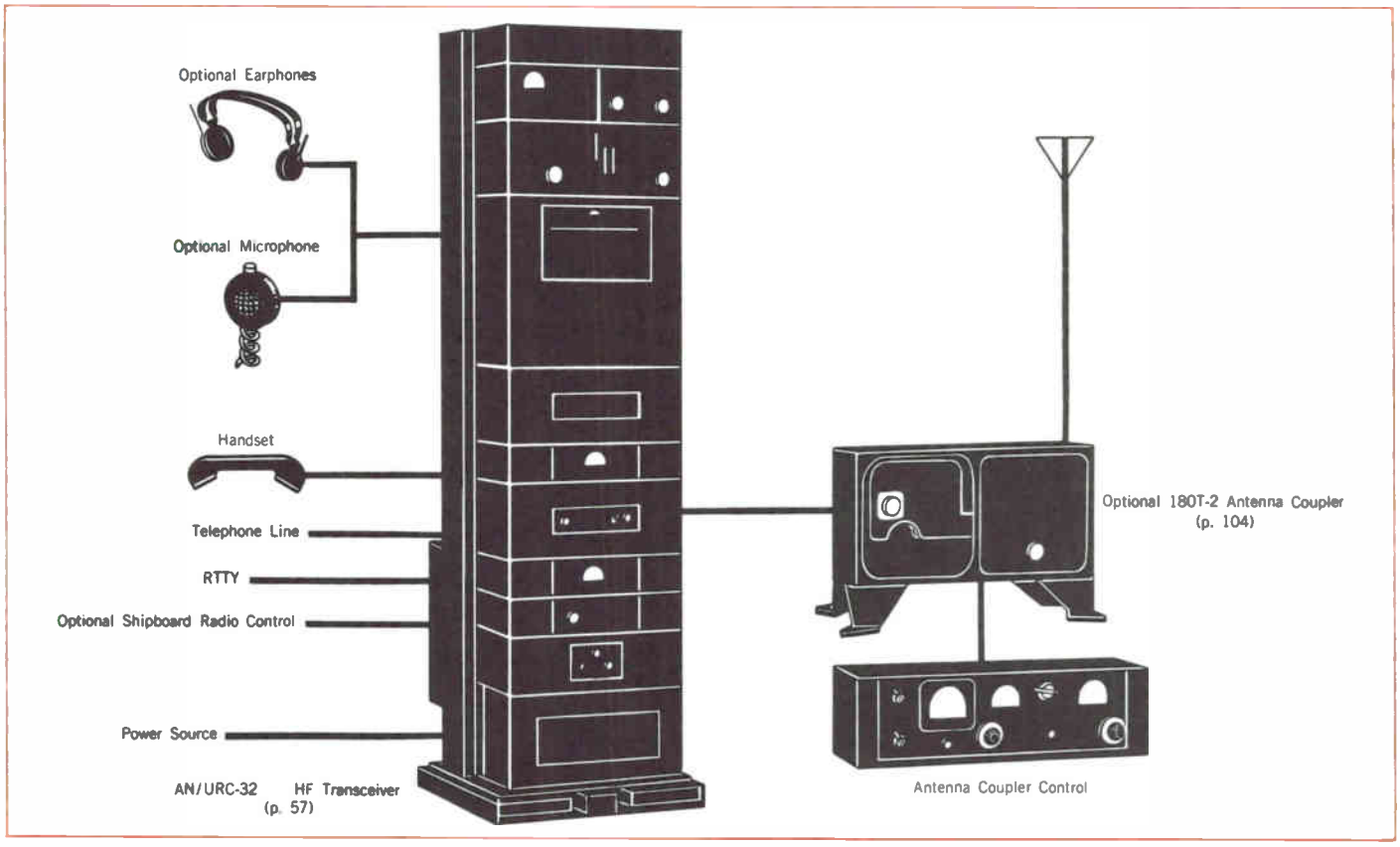
AN/SRC-23 Shipboard HF Communication System

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.

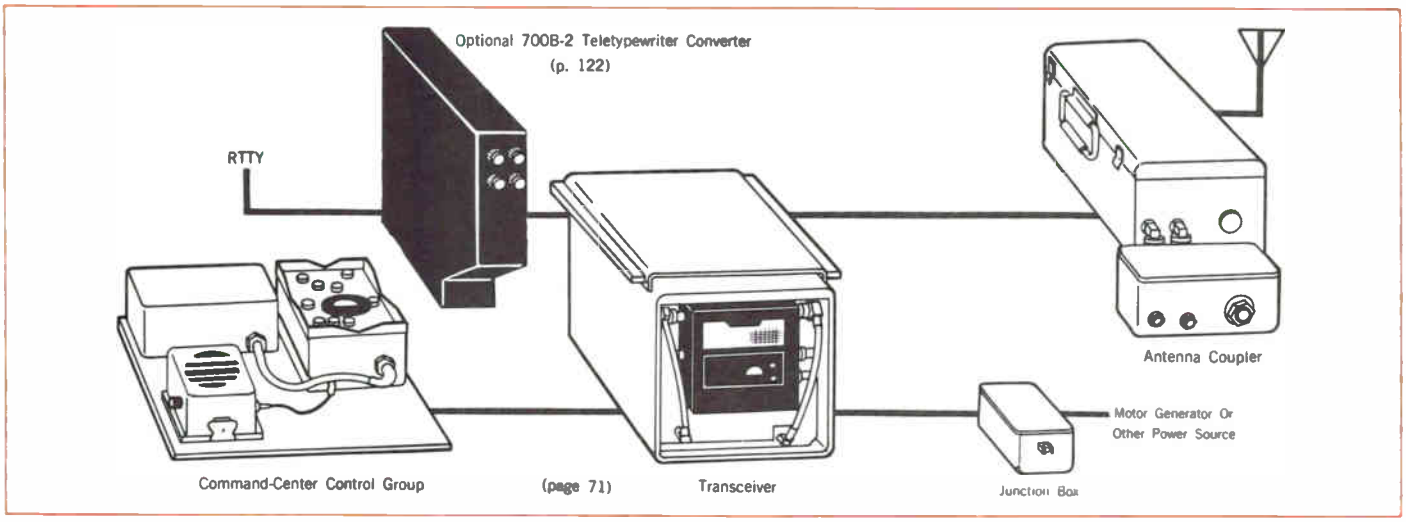
AN/URC-32 HF Transceiver

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.



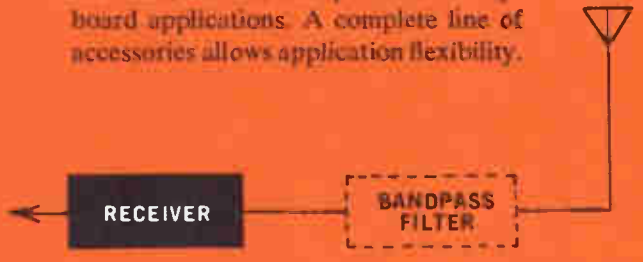
HF-105, -106, -107, -108, -109 Shipboard HF Systems

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

Collins receivers will fulfill most HF single sideband communication requirements. The 51S-1 is a lightweight, general coverage receiver with extreme tuning accuracy. The automatically tuned 651F-1 is part of the Universal Radio Group of building block equipments and can be used in fixed station, airborne, mobile, transportable or shipboard applications. A complete line of accessories allows application flexibility.



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

51S-1F

Features	Applications
Ruggedness	*SSB*
Operational Simplicity	*AM*
Tuning Accuracy	*CW*
Sensitivity	*RTTY*
Selectivity	*Facsimile*
Stability	*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.

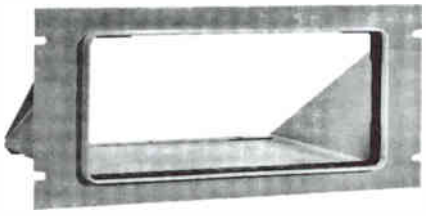
The 2-30 mc range is covered in 1 mc bands. The tuning dial mechanism has been designed with minimum reflected torque for smooth, effortless, finger-touch tuning. The counter-type dial indicates frequency directly. Linear dial calibration provides 7.8 ft. of bandspread for each megacycle

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.

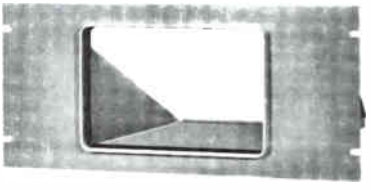
The 51S-1, mounted in a desk top cabinet, operates from 115 v or 230 v, 50-400 cps power source. The 51S-1A is identical except it is supplied for 26 v dc operation. The 51S-1F, for mounting in a standard 19″ RETMA rack, operates from a 115 v or 230 v, 50-400 cps power source, and the 51S-1AF from 26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

Accessories



351R-1

351R-2



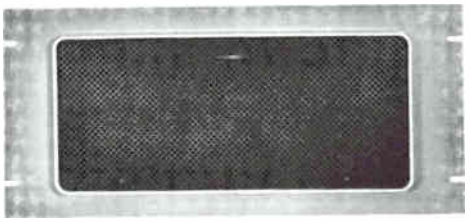
351R-1 and 351R-2 RACK MOUNTS

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 8¾″ (22.23 cm) high and front panels have slotted mounting holes.

312B-3 CABINET SPEAKER

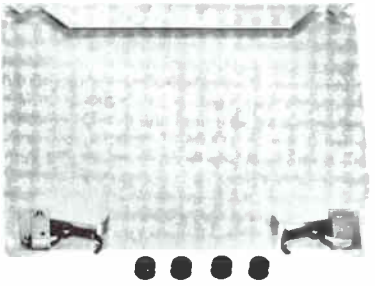
The 312B-3 is housed in an attractively styled cabinet which matches the 51S-1 Receiver. It contains a 5″ x 7″ speaker and is complete with connecting cable.

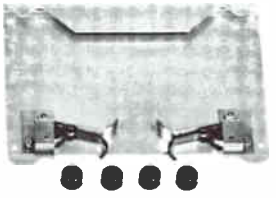
Impedance: 4 ohms. *Size:* 10″ W, 7¾″ H, 8″ D (25.4 cm W, 19.69 cm H, 20.32 cm D). *Weight:* 4 lbs. (1.81 kg).



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

For rack mounted receiver assemblies. Single, dual or triple speaker groupings. Panel size is 19″ W, 8¾″ H (48.26 cm W, 22.23 cm H).

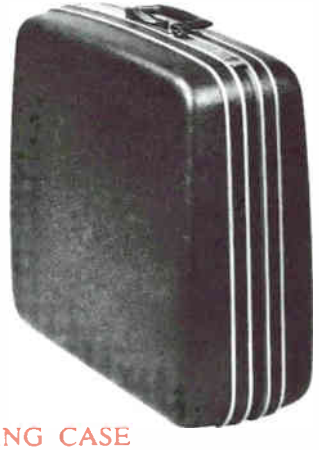




351E-4 351E-3

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.



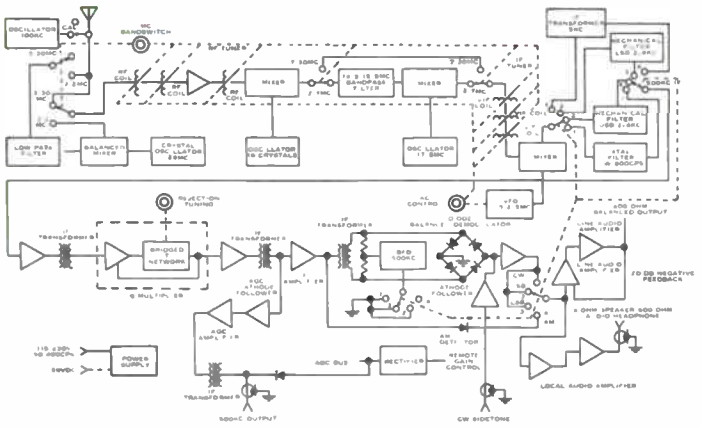
CC-2 CARRYING CASE

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	*Interfering Signal uv Level and % of Frequency Removed*		
(uv)	(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.

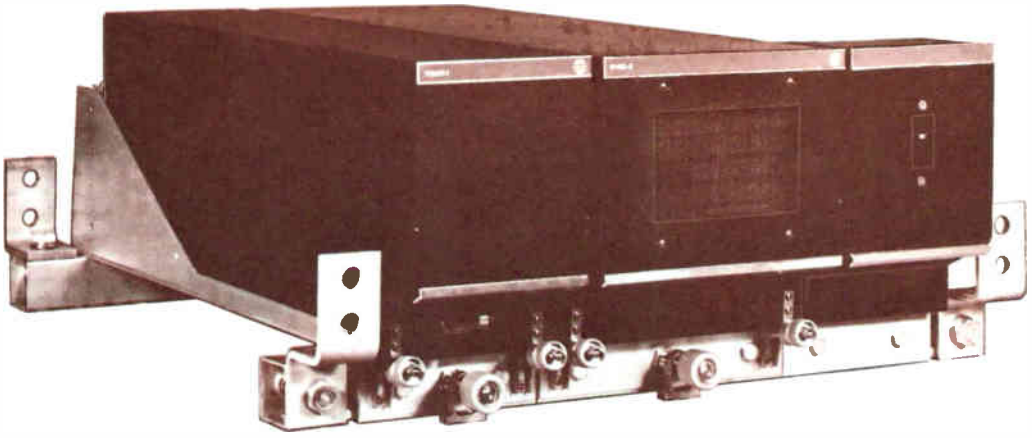
SIZE AND WEIGHT:

	Size			*Weight*
	W	*H*	*D*	(approx.)
Rack mounted	19" 48.26 cm	8¾" 22.23 cm	13 1/64" 33.06 cm	26 lbs. 11.8 kg
Cabinet mounted	14¾" 37.47 cm	6 9/16" 16.67 cm	13 1/64" 33.06 cm	26 lbs. 11.8 kg

Related Equipment

Antennas, p. 92-99

651F-1 universal radio group Receiver



Features	Applications
Automatic Tuning	*Fixed Station*
Compact Packaging	*Transportable*
Telephone Compatibility	*Shipboard*
Installation Flexibility	*Mobile*
Remote Operation	

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

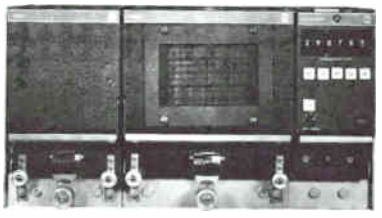
BASIC CONFIGURATION

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

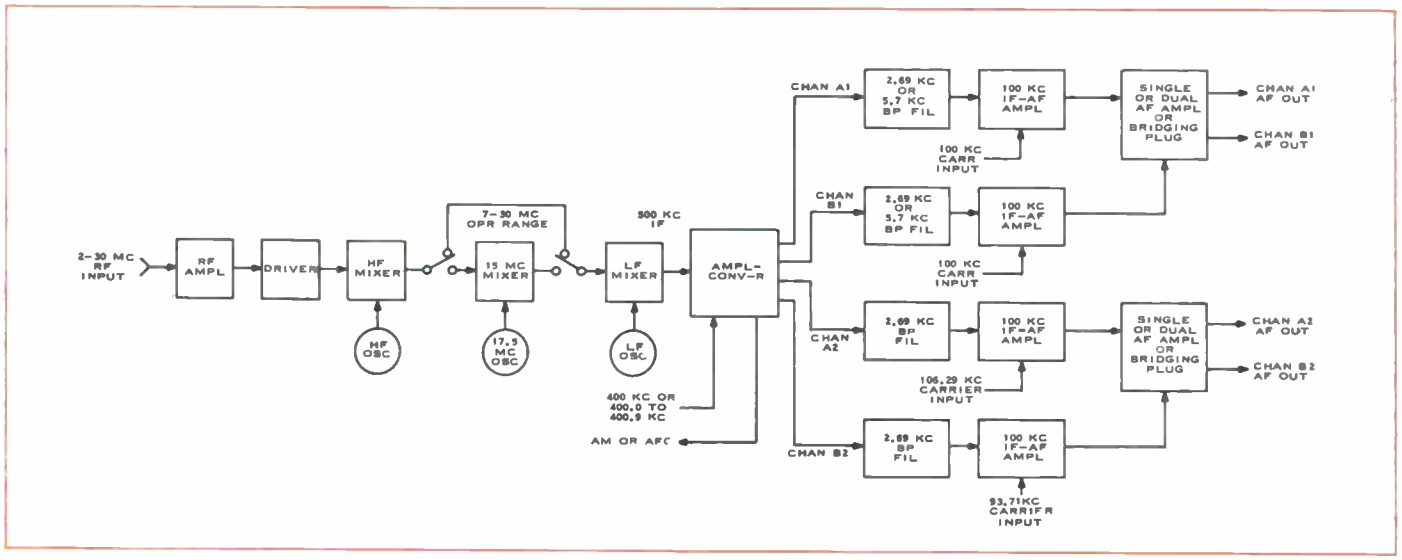
Mode Options The following choices are available to meet specific operating requirements: LSB, 3 kc bandwidth; LSB, 6 kc bandwidth; USB, 6 kc bandwidth; AM; or four channel multiplex.

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 nominal 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, 8¾″ H, 24½″ 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

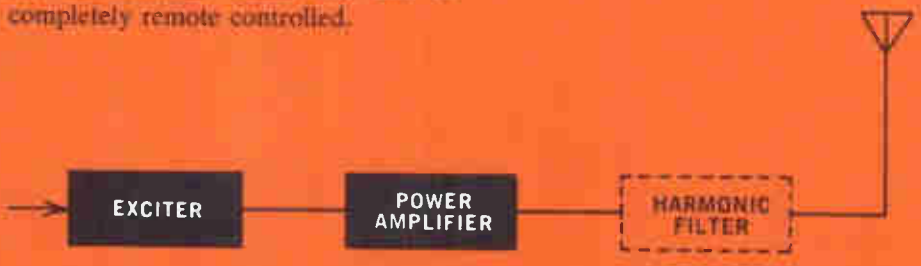
789R-1 IF Translator, p. 88-90
618Z-4 RF Translator, p. 87

Related Equipment

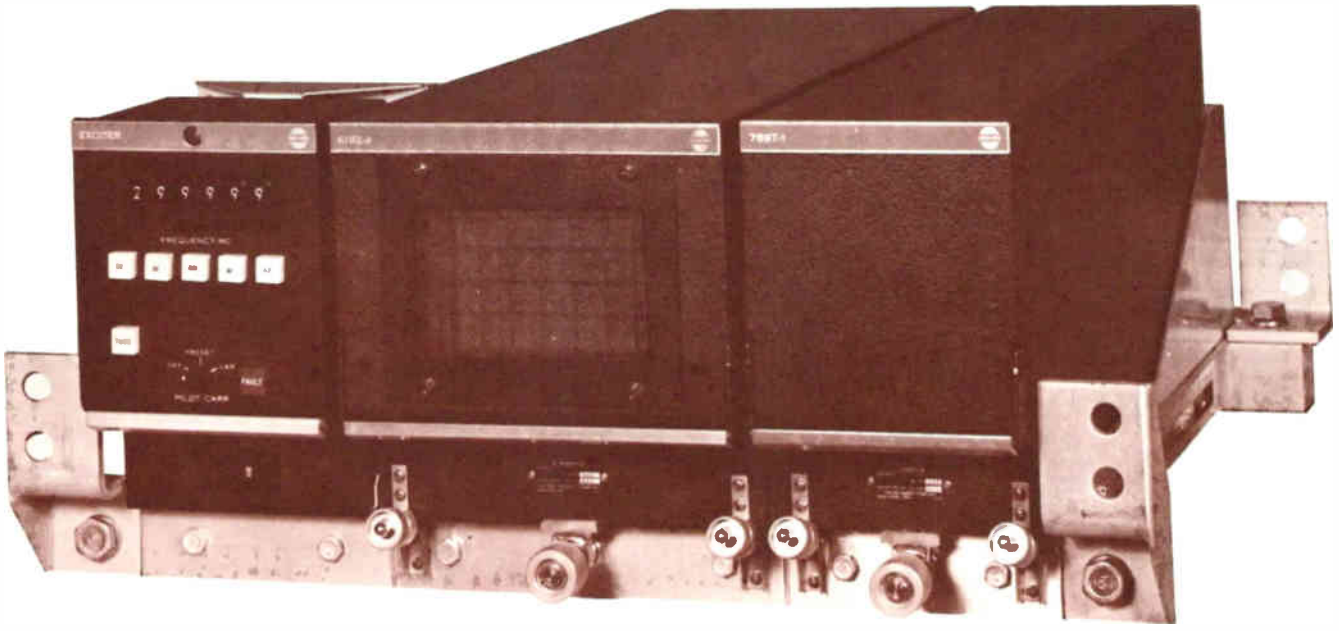
313 Series Controls, p. 83-85
Racks and Cabinets, p. 91
Antennas, p. 92-99
635R-1 Bandpass Filter, p. 110, 111
635T-2 Bandpass Filter, p. 111, 112
635V-1 Bandpass Filter, p. 112

Transmitting Equipment

Collins HF exciters, using efficient mechanically filtered sideband generators, are ideally suited for use in fixed station, airborne, mobile, transportable and shipboard applications. A choice of 1, 3, 10 and 45 kw PEP power amplifiers is available to increase the exciter output to the desired levels. The equipments are automatically tuned and can be completely remote controlled.



310V-1 universal radio group Exciter



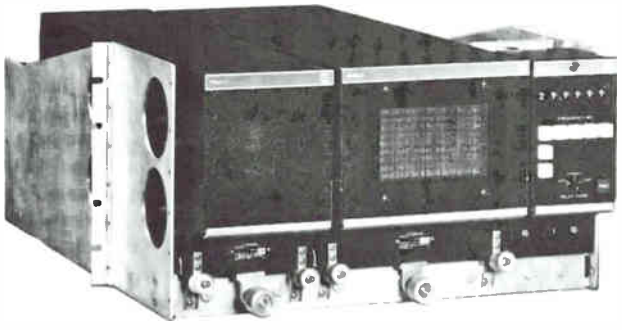
Features

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 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.

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.

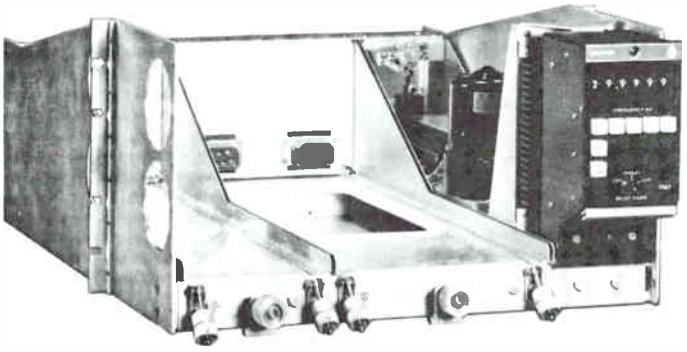
Tenth KC Channel Increment Option The number of RF channels can be increased to 280,000 for more effective spectrum utilization.

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

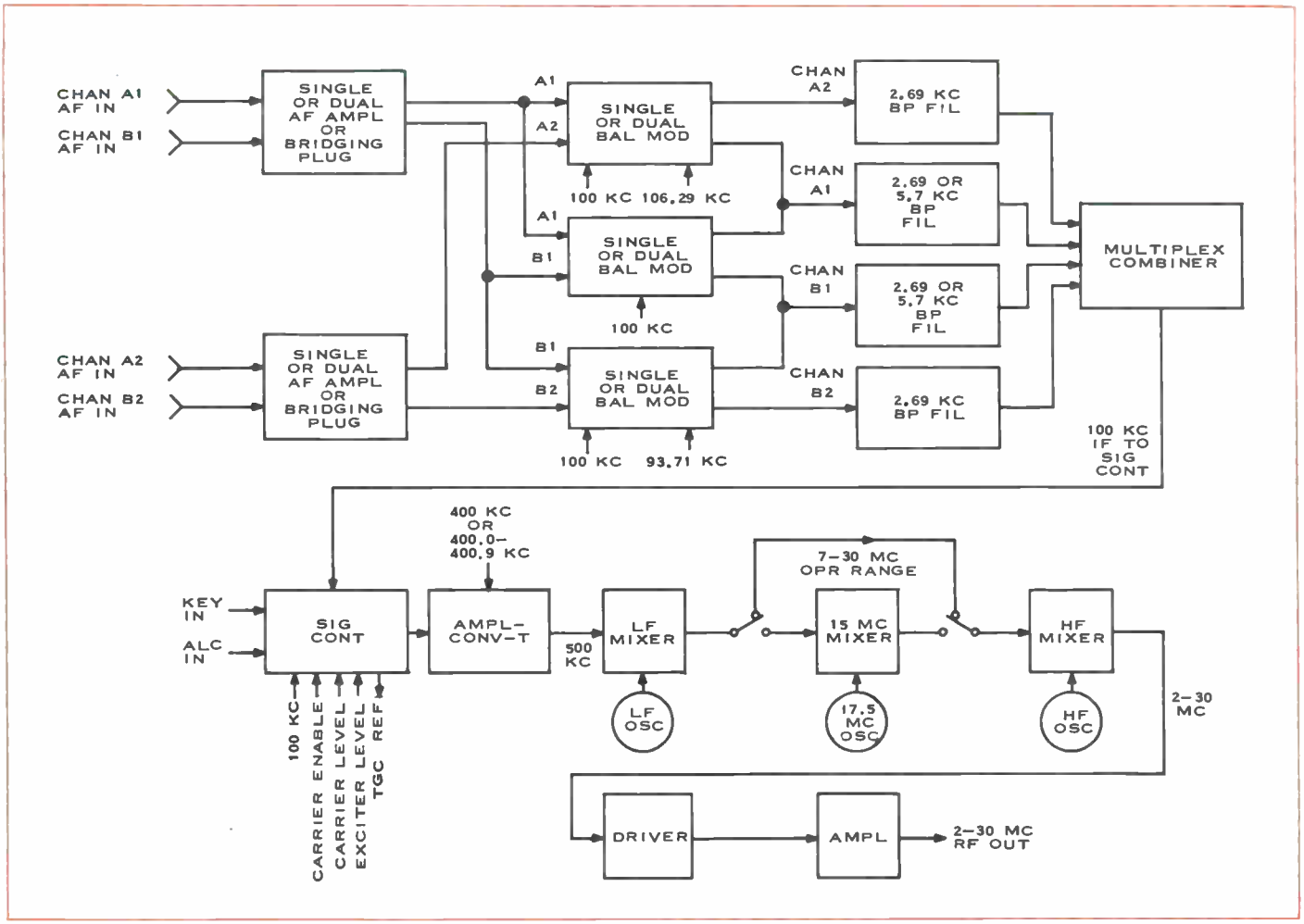
Power Supply Options An internal power supply offers operation from a 115 v or 230 v, 45-450 cps power source in lieu of the normal 27.5 v dc.



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 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 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, 8¾" H, 24½" 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.

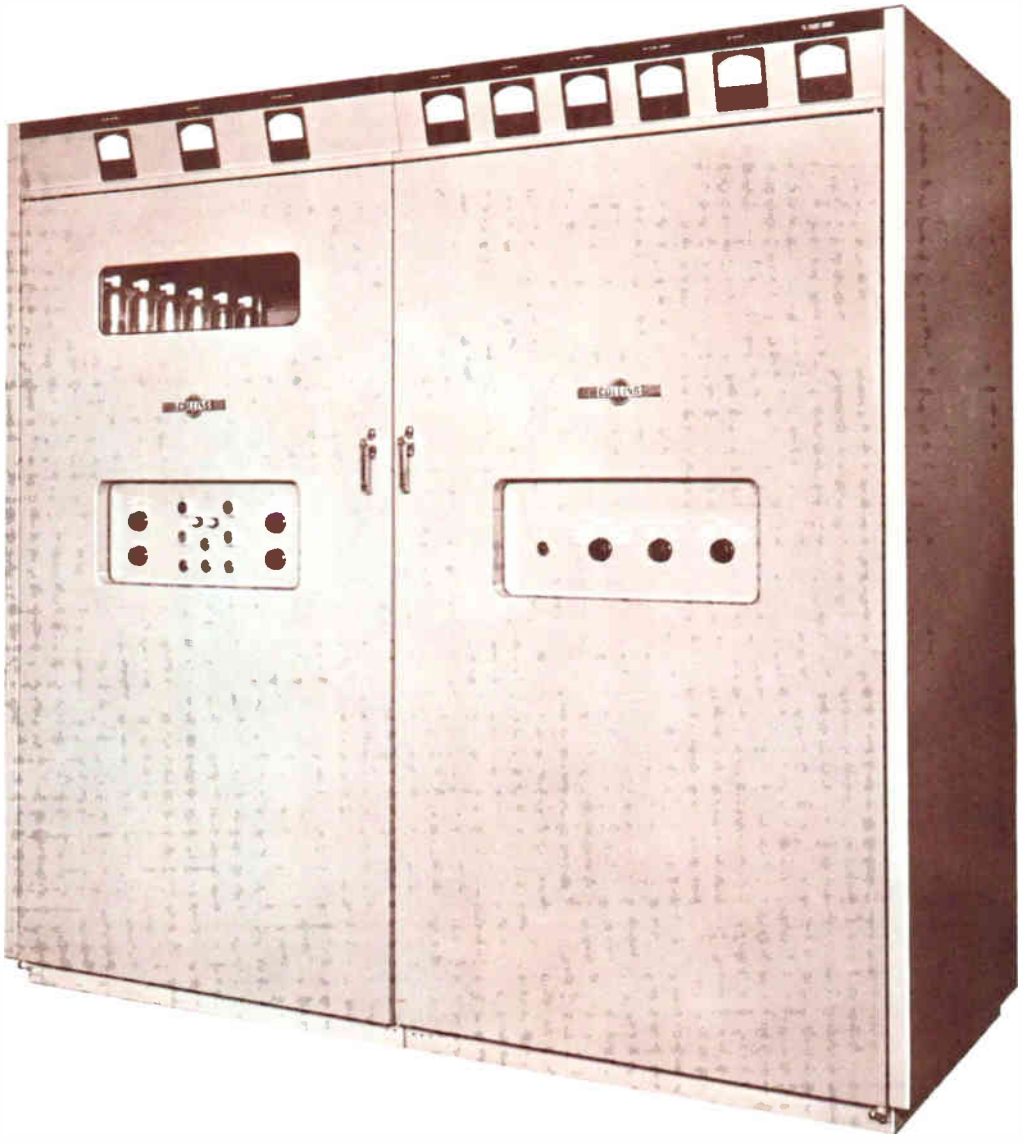
Basic Units

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	Applications
Servo Tuning	*Fixed Station*
Simplified Controls	*Long Path*
Power Selection	
Functional Enclosure	
Conservative Ratings	

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.

 Available only on a production contract.

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

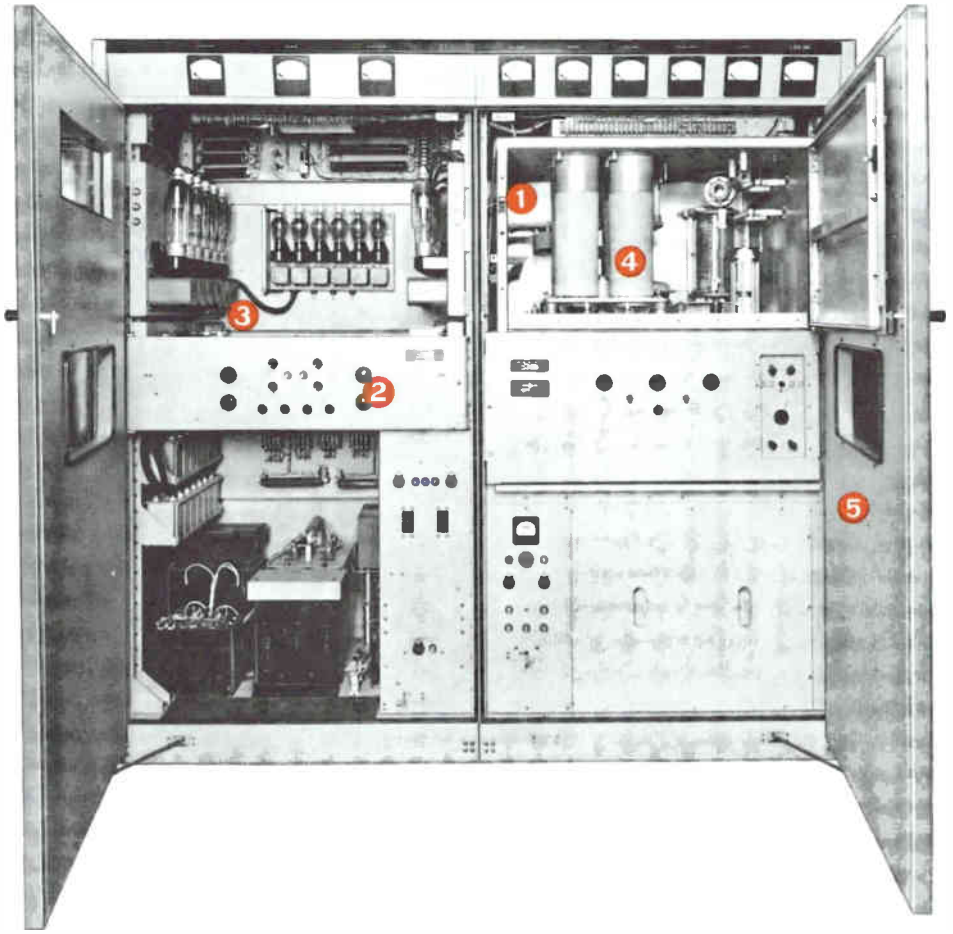
Efficient three-phase, full-wave rectifier circuits are used in both plate and screen supplies. The screens of the tubes in the output stage are connected directly to ground to give maximum effectiveness to the screen grid shielding. The PA cathodes are operated 700 v below ground, making the total final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

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

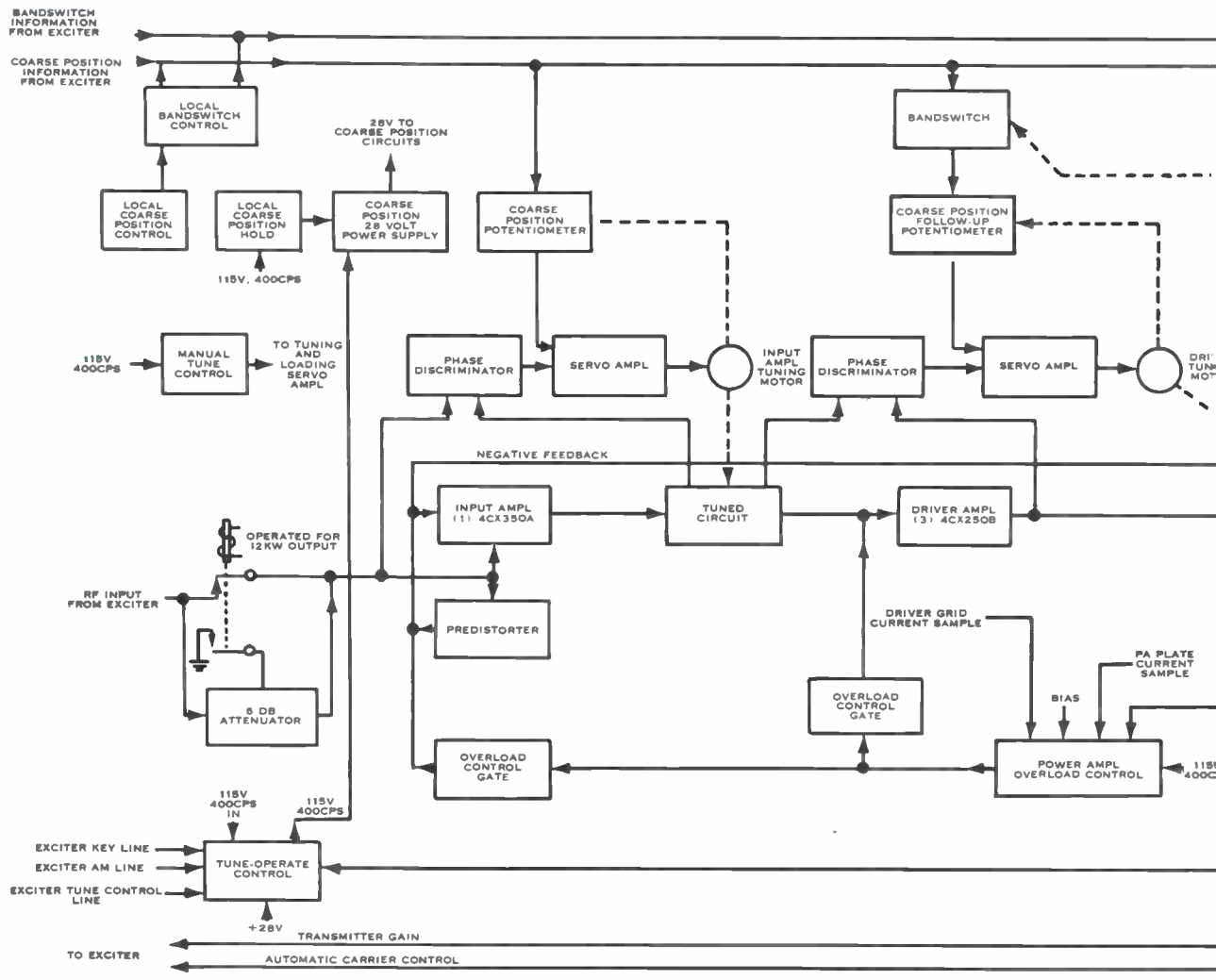
The low voltage plate and screen supply also use a three-phase, full-wave rectifier. Mercury vapor rectifier tubes are temperature-controlled allowing operation of the power amplifier at low ambient temperatures.

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 3⅛" 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.

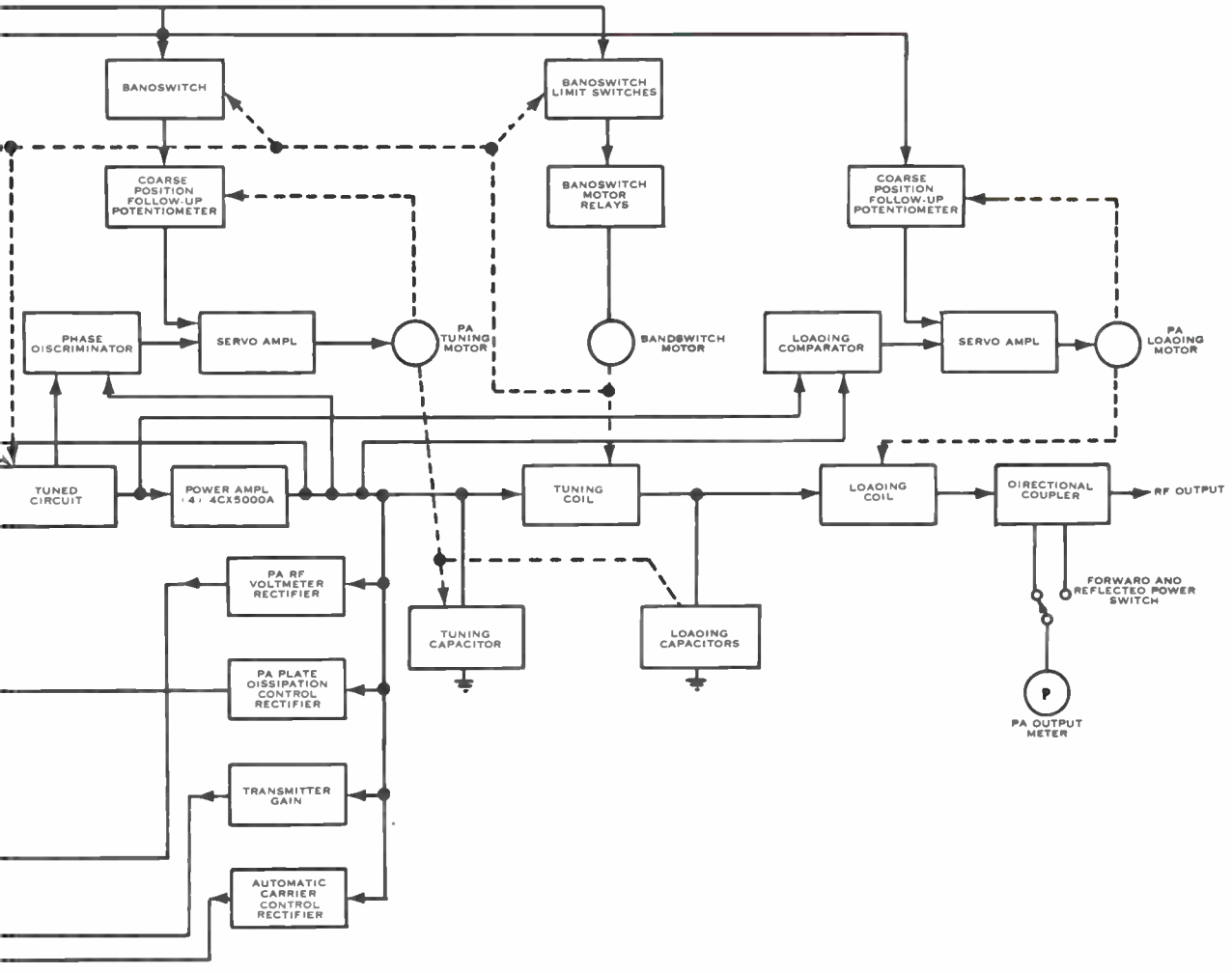
NOISE LEVEL: At least 50 db below either of two equal tones required to drive the power amplifier to 45 kw PEP output.

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:

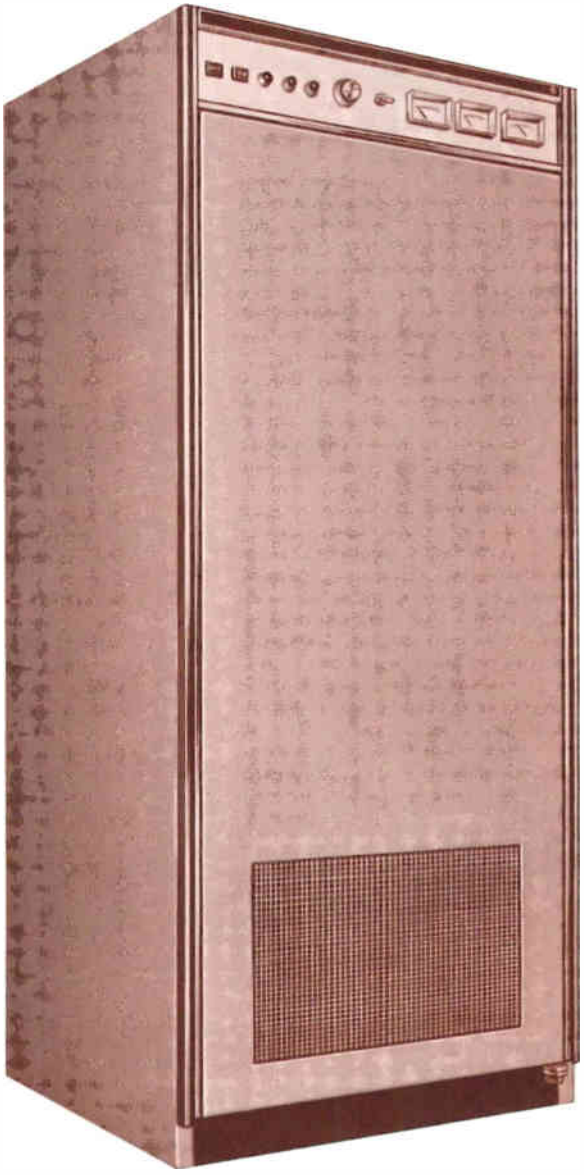
	Size			Weight
	W	H	D	
205J-1 Power amplifier with power supply (over-all)	88¾" 212.73 cm	78" 198.12 cm	35½" 90.17 cm	3137 lbs. 1422.94 kg
Plate transformer	18⅜" 46.67 cm	32¾" 83.19 cm	33⅜" 84.77 cm	1040 lbs. 471.74 kg
Circuit breaker	16¼" 41.28 cm	26¾" 67.95 cm	17⅛" 43.50 cm	146 lbs. 66.23 kg
Power supply control	17" 43.18 cm	26¾" 67.95 cm	9¼" 23.50 cm	71 lbs. 32.21 kg
Centrifugal fan	30⅜" 76.52 cm	32⅛" 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	Applications
Automatic Tuning	*Fixed Station*
Low Intermodulation Distortion	*Transportable*
Low Spurious	*Shipboard*
Voltage-Regulated Supplies	
Remote Operation	



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.

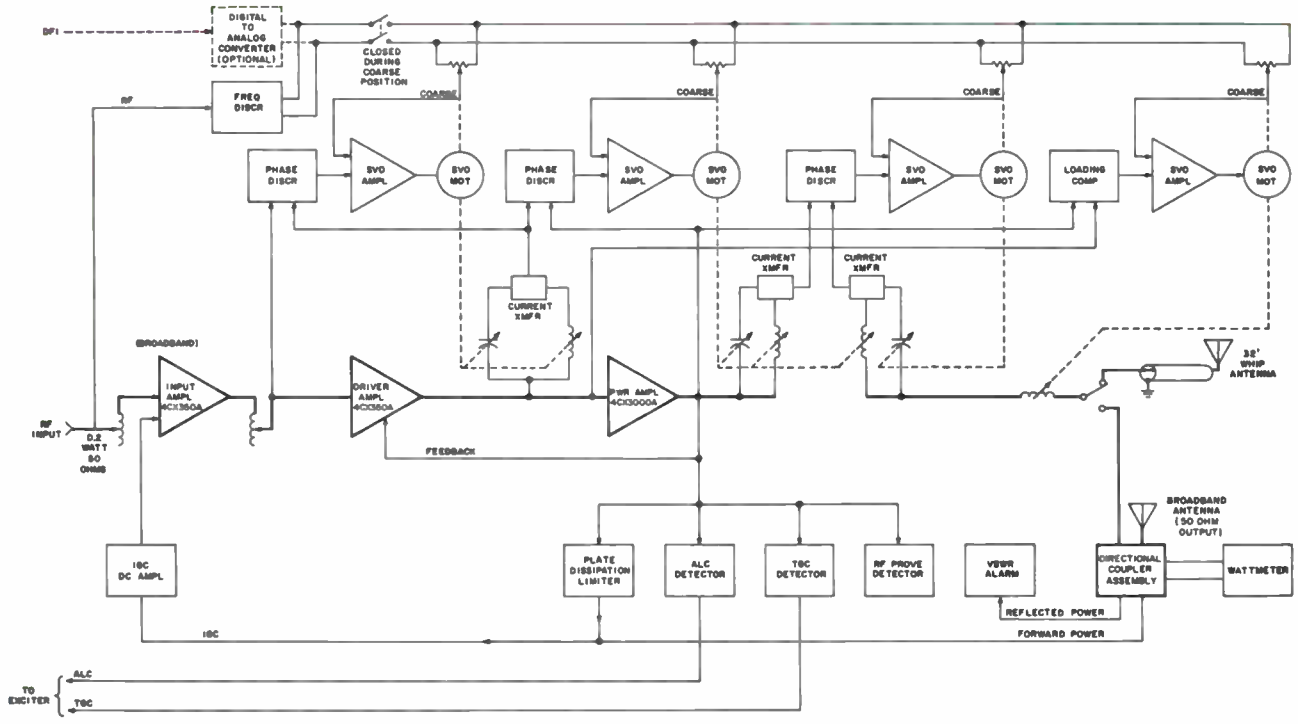
CIRCUIT FEATURES

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, 22⅜" D (80.17 cm W, 175.26 cm H, 56.83 cm D).

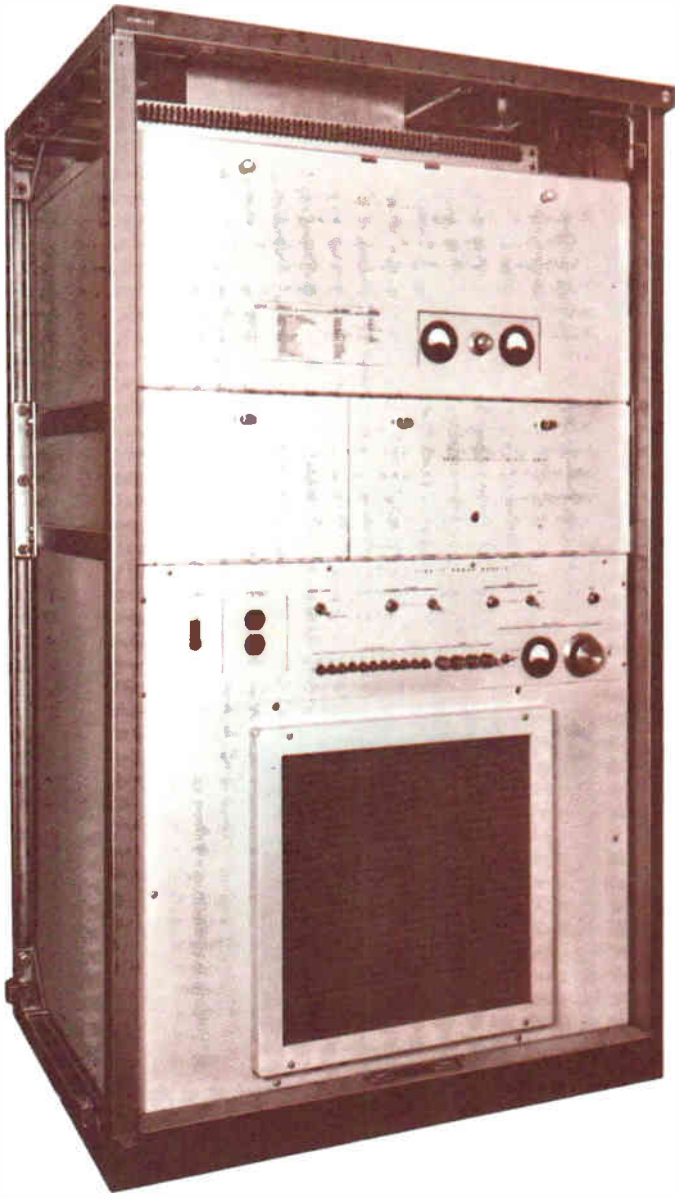
WEIGHT: Approx. 750 lbs. (340.2 kg).

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
Automatic Tuning	*Fixed Station*
Integral Shielding	*Transportable*
Efficient Cooling	*Shipboard*
Unattended Operation	
Front Accessibility	
Application Groups	



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.

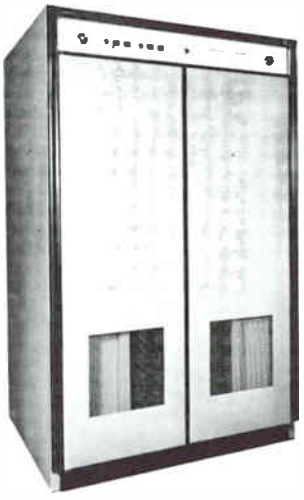
Cooling Air Options The 208U-10, as supplied, has a front air inlet with filter and a top air outlet. A rear air intake application group with external filtering is available for installations where the ambient room air cannot be used for cooling. In transportable installations with low ceilings, an 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.

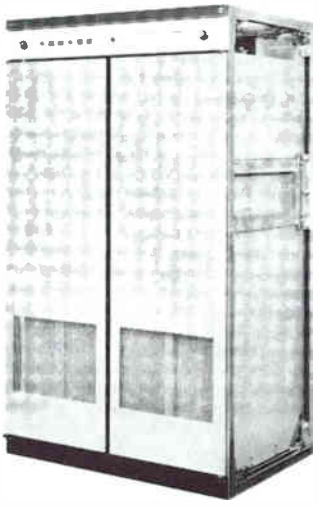
Filament-Voltage Regulator Option An automatic filament-voltage regulator application group will maintain the filament voltages within ±1% for line voltage changes of ±10%.

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.

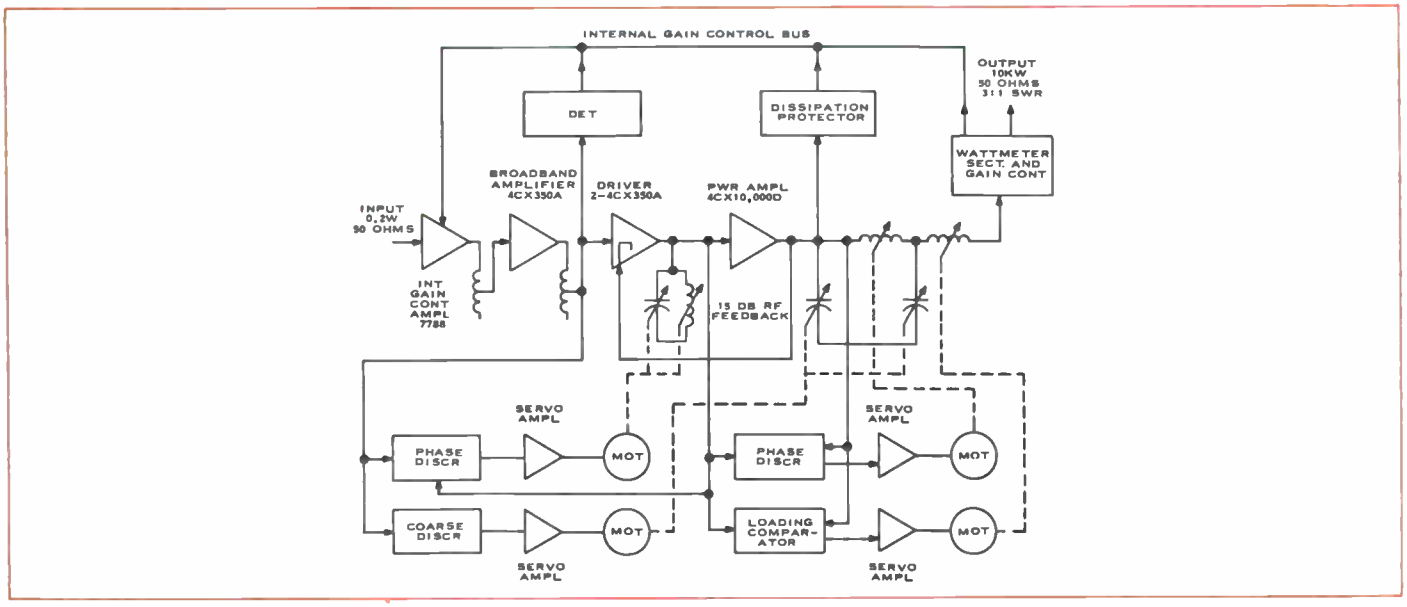


Complete Trim Group



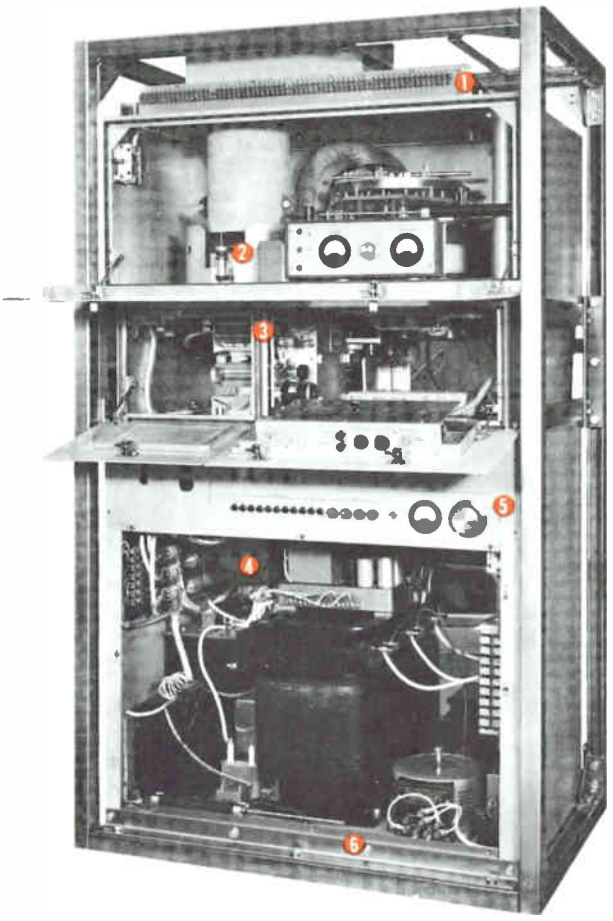
Front and Top Trim Only

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	Applications
Automatic Tuning	*Fixed Station*
Low Spurious	*Mobile*
Compact Packaging	*Transportable*
Maximum Accessibility	*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.

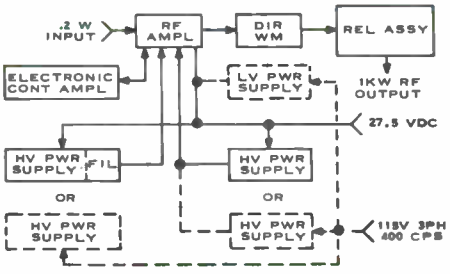
FLEXIBLE INSTALLATION

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: 10⅛" W, 7⅝" H, 19 9/16" D (25.72 cm W, 19.37 cm H, 49.69 cm D).

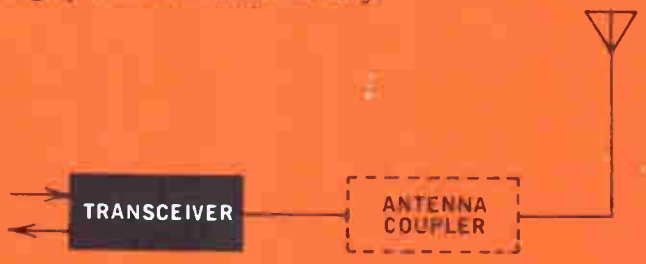
WEIGHT: 52 lbs. (23.6 kg).

Related Equipment

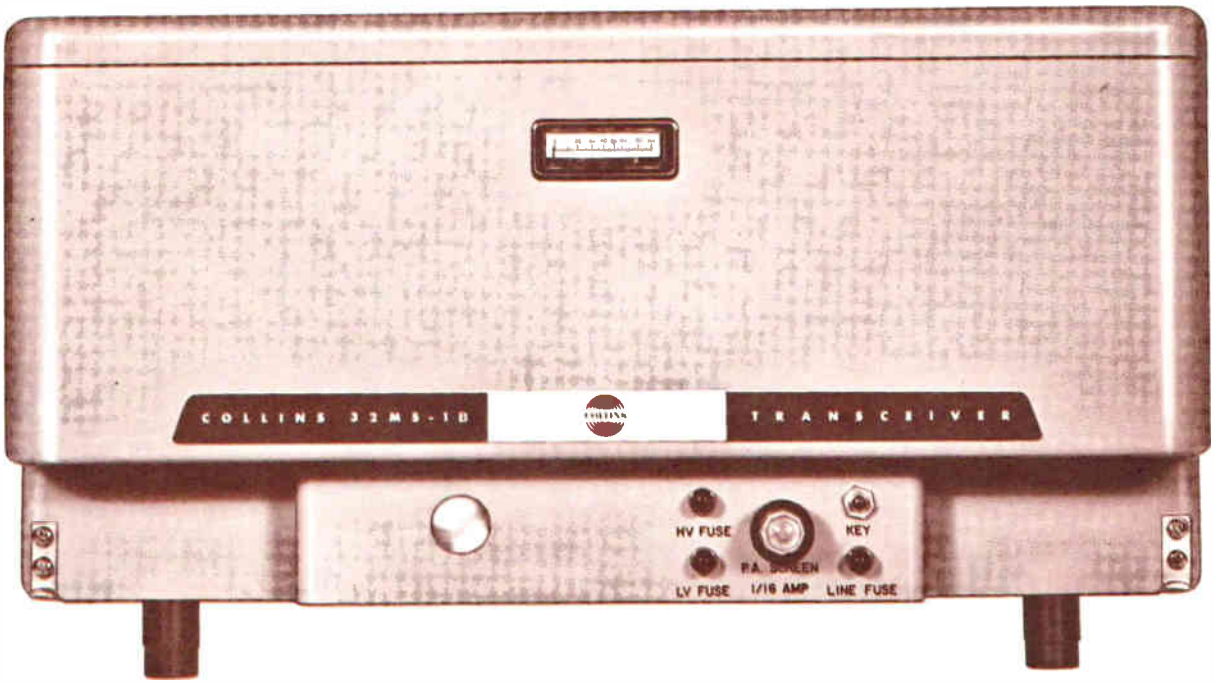
310V-1 Exciter, p.25-27
426U-2 Power Supply, p. 86
Antennas, p. 92-99

Transceivers

A complete line of HF single sideband transceivers for both general purpose requirements and specialized needs is available from Collins. Equipment for airborne, fixed station, mobile, transportable and military field pack applications is included. Each transceiver is especially designed for the intended environment and will provide consistently high performance and reliability.



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° 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.

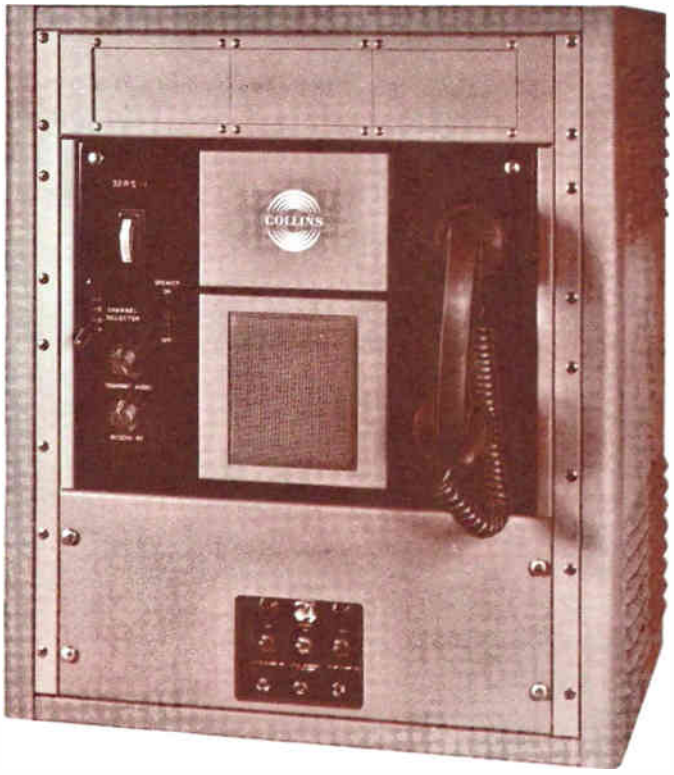
SIZE: 15⅜" W, 7½" H, 21⅝" D (39.05 cm W, 19.05 cm H, 54.93 cm D).

WEIGHT: With ac supply, 48¾ lbs. (22.11 kg); with 28 v dc supply, 36¾ lbs. (16.67 kg); with 12 v dc supply, 36½ lbs. (16.56 kg).

Related Equipment

180V-2 Antenna Coupler, p. 43

32RS-1 100 Watt Transceiver



Features	Applications
Four Pretuned Channels	*Petroleum*
Stable Signals	*Lumbering*
Simplified Controls	*Maritime Service*
Voice Operation (VOX)	*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-ridden 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.

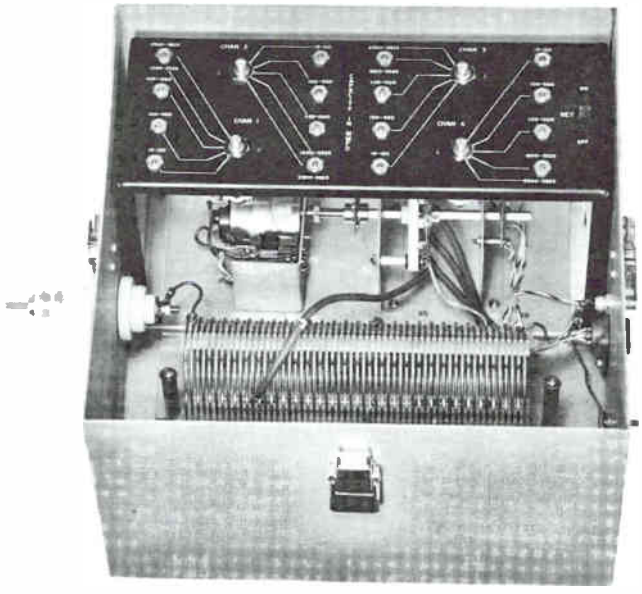
Size: 5" W, 3" H, 6⅝" D (12.7 cm W, 7.62 cm H, 16.83 cm D). *Weight:* 3 lbs. (1.36 kg).

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, 7½" 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 10^6 (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, 24½" H, 14¾" 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
Automatic Tuning	*Airborne*
Frequency Accuracy	*Transportable*
SELCAL Monitoring	*Mobile*
Teletypewriter Capability	*Shipboard*
Modular Construction	*Fixed Station*

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

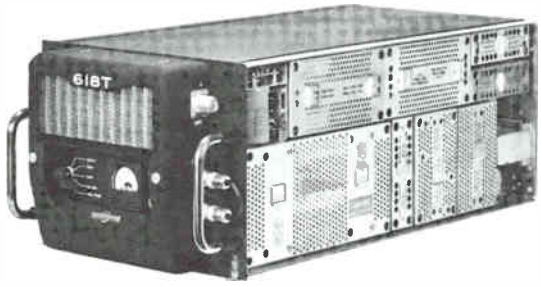
For voice transmission, a very minute frequency error can be allowed. Accurate reproduction of the transmitted frequency components for data and signaling systems is either unnecessary for 100 word per minute teletypewriters or can be accommodated by accessory units. This concept results in simplicity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



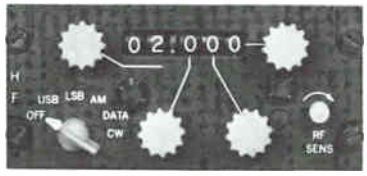
EASY MAINTENANCE

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, 35 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:

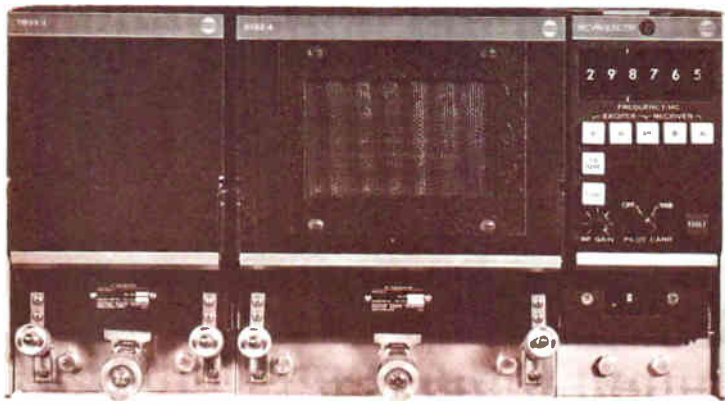
	Size			*Weight*
	W	*H*	*D*	
618T-1 transceiver	10⅛" 25.7 cm	7⅝" 19.4 cm	22 3/16" 56.4 cm	50.0 lbs. 22.68 kg
618T-2 transceiver	10⅛" 25.7 cm	7⅝" 19.4 cm	22 3/16" 56.4 cm	52.0 lbs. 23.59 kg
618T-3 transceiver	10⅛" 25.7 cm	7⅝" 19.4 cm	22 3/16" 56.4 cm	50.0 lbs. 22.68 kg
714E control*	5¾" 14.6 cm	2⅝" 6.67 cm	4⅜" 11.1 cm	2.0 lbs. 0.91 kg

*Add ¾" (1.9 cm) to length of 714E-2, and ½" (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	Applications
Automatic Tuning	*Fixed Station*
Installation Flexibility	*Transportable*
Compact Packaging	*Shipboard*
Telephone Compatibility	*Mobile*
Remote Operation	

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

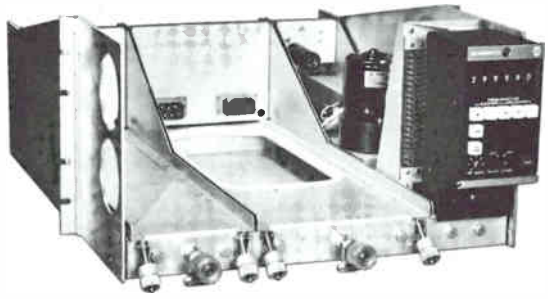
An internal frequency standard offers stability of one part in 10^8 per day; however, an optional external standard is available for applications which require extreme accuracy.

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 permit 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.

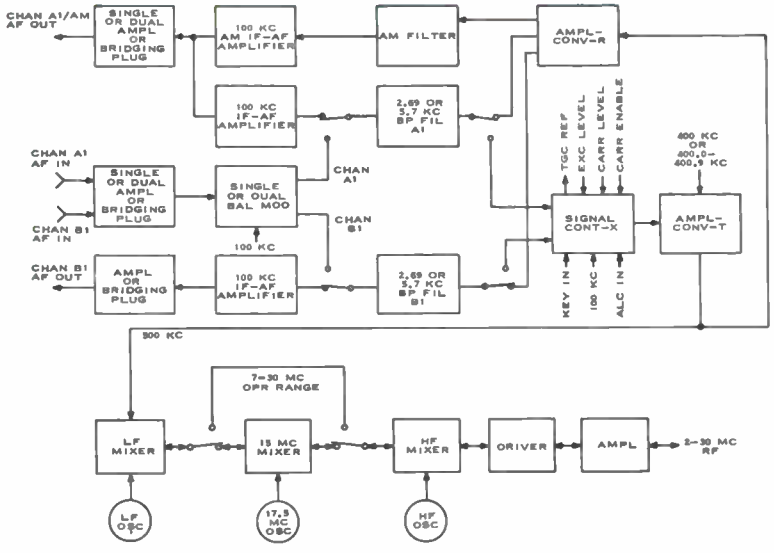
External Frequency Standard Option This option offers extremely high frequency stability when a standard such as the Collins 40N-1 is used.

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° C to +65° C; 1.5 db from −30° C to +15° 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:

	W	*H*	*D*
Cabinet shelf	21¾" 55.25 cm	9½" 24.13 cm	23½" 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.

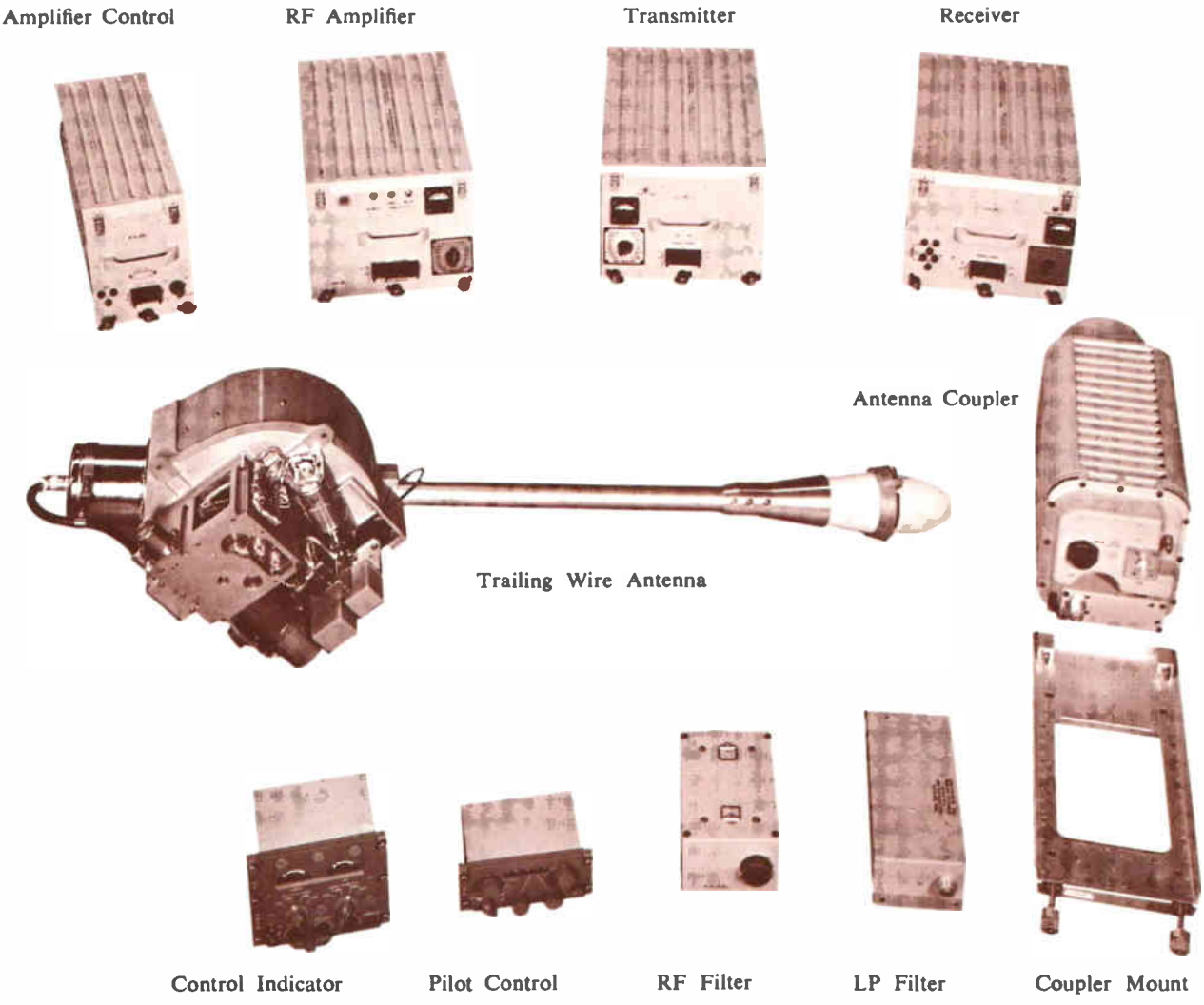
Basic Units

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



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-

Available only on a production contract.

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 dictated 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° C. Voice mode — −28° C to +55° 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.

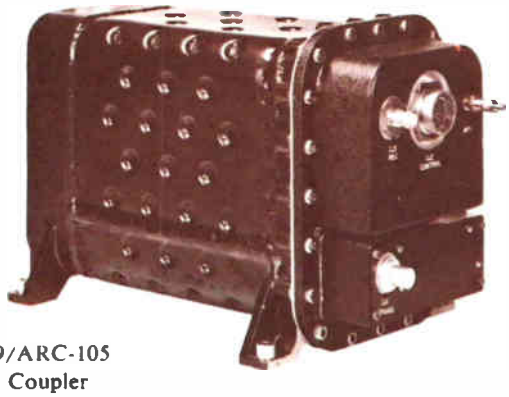
DYNAMIC RANGE: 100 db.

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

SIZE AND WEIGHT:

Unit	*Size* *W*	*H*	*D*	*Weight*
AM-3536/URC RF amplifier	10⅞" 27.62 cm	8 43/64" 22.03 cm	20 25/64" 51.79 cm	51 lbs. 23.14 kg
R-1153/URC receiver	10⅞" 27.62 cm	8 43/64" 22.03 cm	20 25/64" 51.79 cm	40½ lbs. 18.38 kg
AM-3535 amplifier-control	6⅜" 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	7⅛" 18.10 cm	8 11/32" 21.20 cm	21½" 54.61 cm	27½ lbs. 12.47 kg
T-899/URC transmitter	10⅞" 27.62 cm	8 43/64" 22.03 cm	20 25/64" 51.79 cm	41 lbs. 18.60 kg
C-4368 control unit	5¾" 14.61 cm	2⅝" 6.67 cm	4 13/16" 12.22 cm	2¼ lbs. 1.02 kg
ID-1066 control-indicator	5¾" 14.61 cm	5¼" 13.34 cm	5 3/16" 13.18 cm	3 lbs. 1.36 kg
F-775 RF interference filter	4½" 11.43 cm	3¼" 8.26 cm	6¼" 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	7⅛" 18.10 cm	2" 5.08 cm	17" 43.18 cm	1¾ 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	Applications
Simplicity of Operation	*Airborne*
Automatic Tuning	
Frequency Stability	
System Design	
Increased Reliability	
Ease of Maintenance	

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

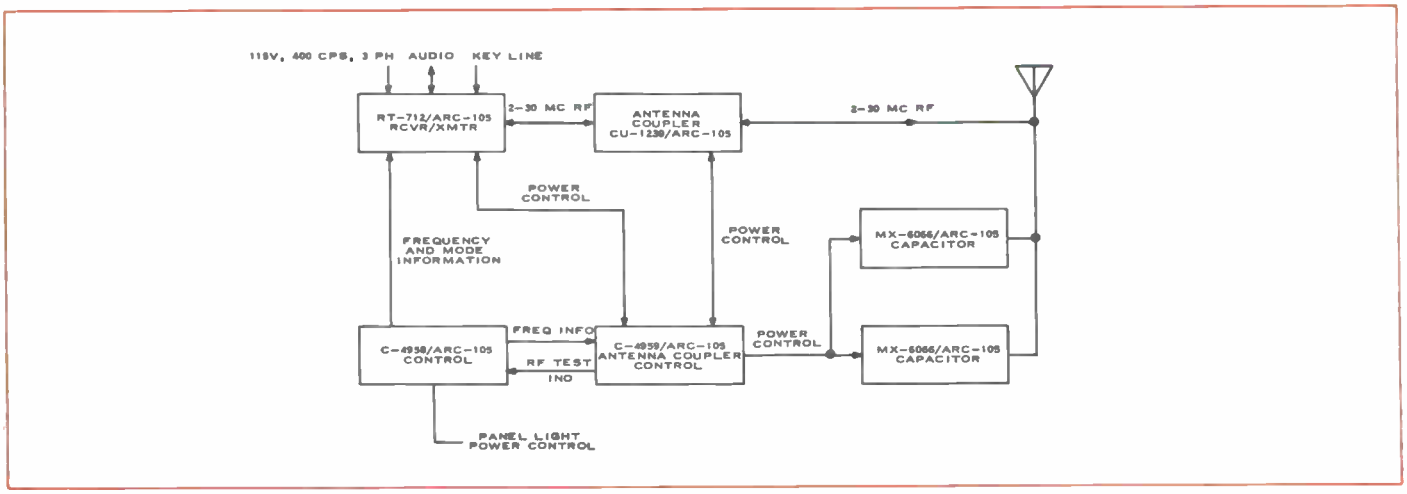
An RF test switch located on the pilot's control box permits a simple check of over-all system operation and provides a means of isolating a malfunction to a particular unit. A sidetone circuit in the receiver-transmitter provides an audible check of over-all system operation in transmit.

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.

Available only on a production contract.

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	Applications
Multimode Communication	*Man Pack*
Simplified Operation	*Vehicular*
Spectrum Utilization	*Aircraft*
HF/VHF/SSB or FM Compatibility	*Shipboard*
Easily Maintained	*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-

Available only on a production contract.

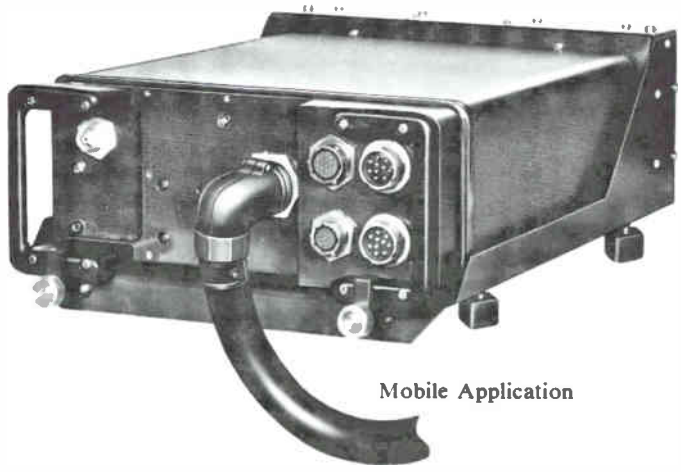
ates the high stability injection signals required for SSB operation, with excellent accuracy over a wide range of temperature and humidity conditions. Reference frequencies are maintained within one-half cycle per megacycle by a temperature-sensitive network, with no crystal oven.

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.

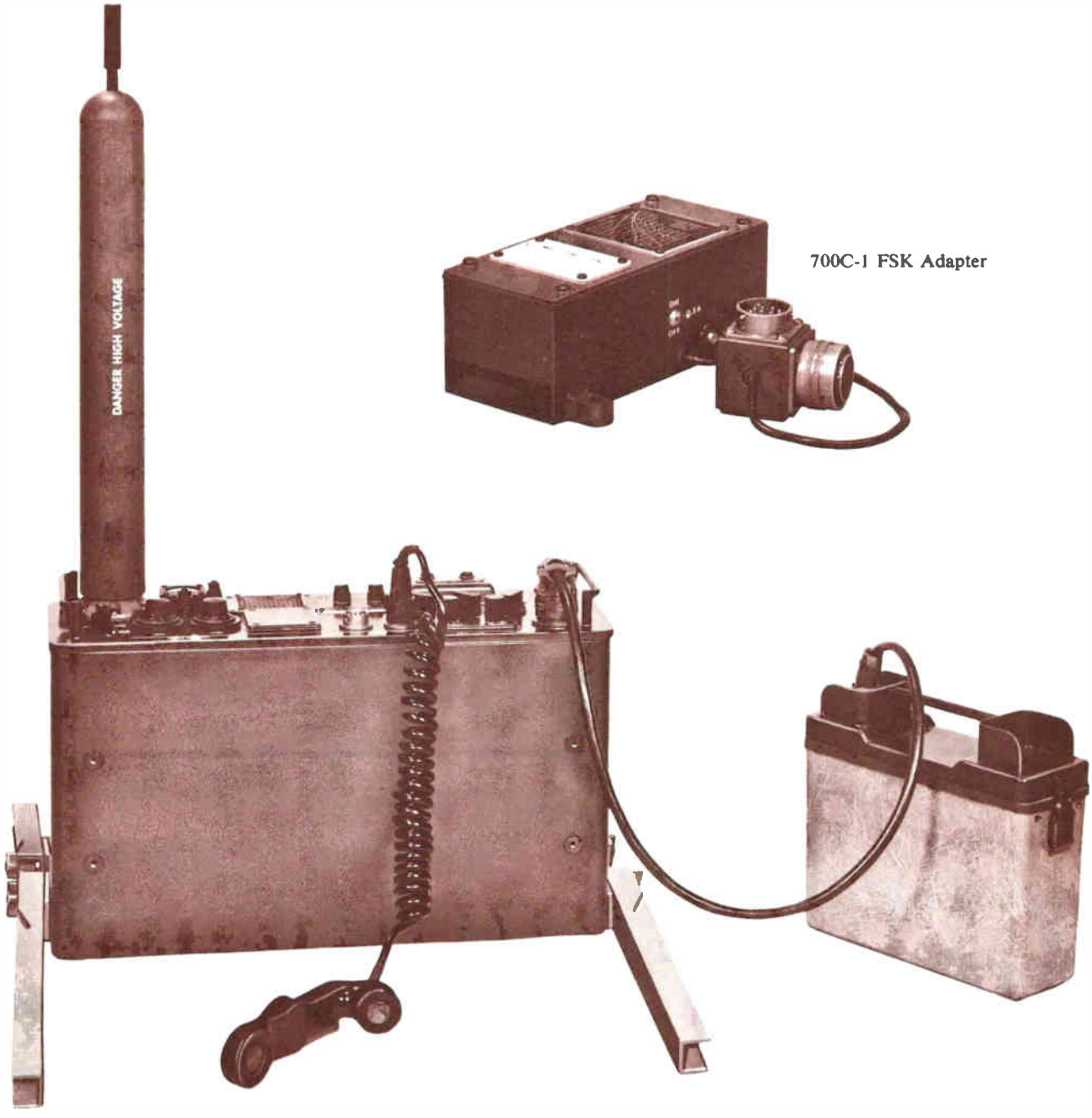
SIZE:

	W	*H*	*D*
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 frequency 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.

Available only on a production contract.

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 antenna, 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:

	W	*H*	*D*
Transceiver	23⅛" 58.74 cm	13 11/16" 34.77 cm	6 15/16" 17.62 cm
Battery case	4" 10.16 cm	9⅞" 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	Applications
28,000 Channels	*Shipboard Communication*
Digital Tuning	*Fixed Station*
Excellent Stability	
Optional Shockmounts	
Complete Accessibility	

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

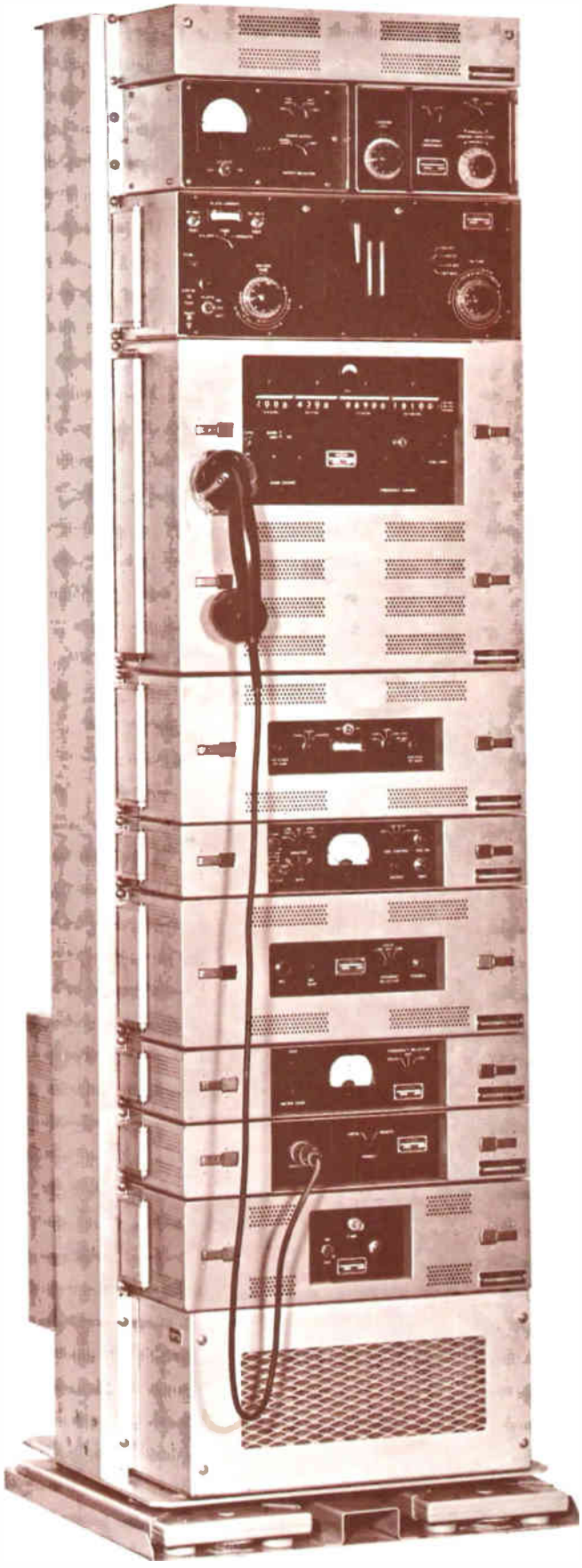
On-frequency channel selection, without searching or fine tuning, is assured by an integral transistorized frequency standard with a stability of one part in 10^6 per month. An external Collins 40N-1 Frequency Standard can be used in installations requiring stabilities of one part in 10^9 per day. Manual 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.

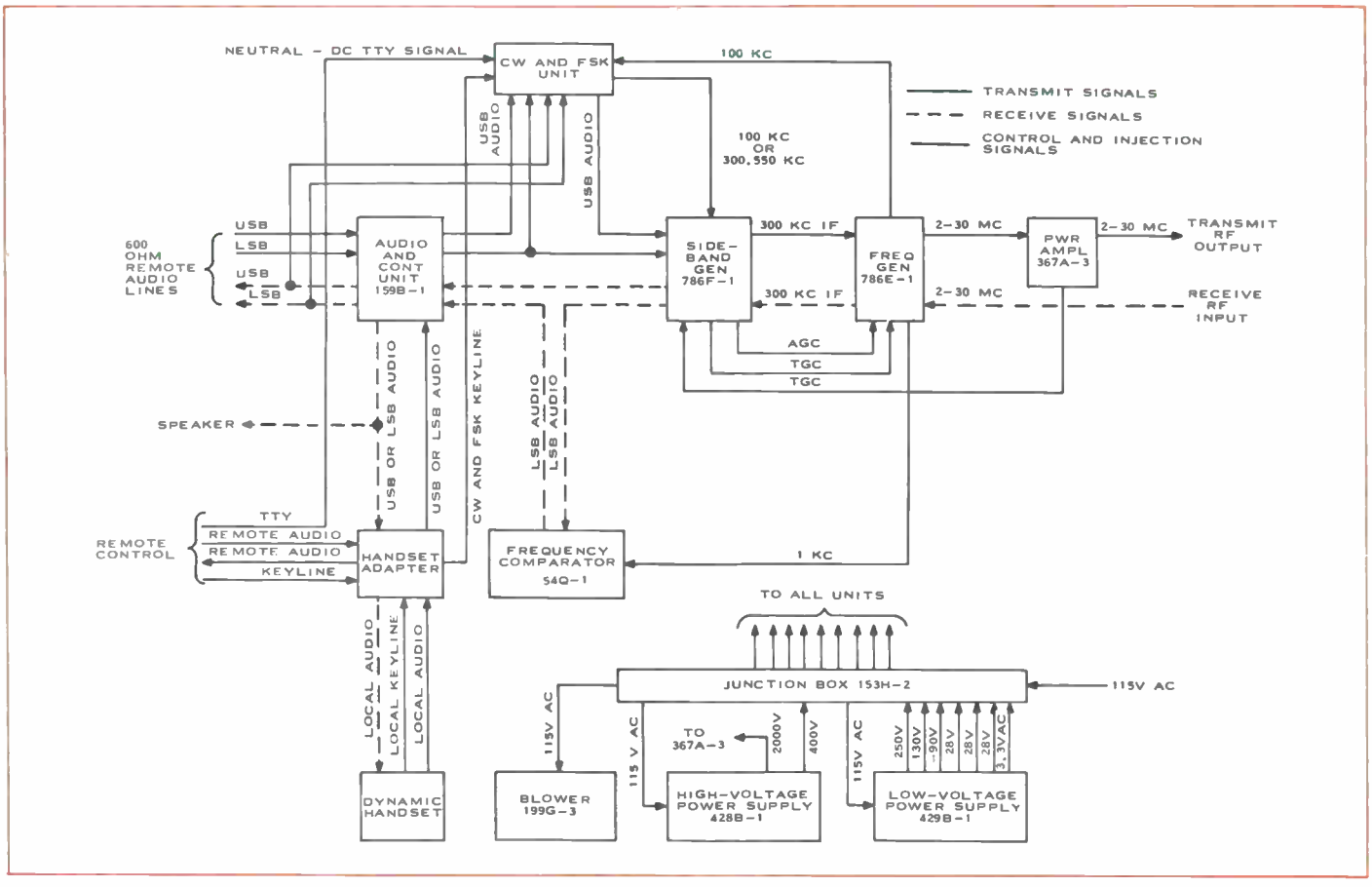
MODERN CIRCUITRY

Receiver and exciter circuits employ double conversion above 3.7 mc. Balanced modulators and Mechanical Filters provide excellent carrier suppression and negligible interchannel 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.



Available only on a production contract.

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 10^9 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.

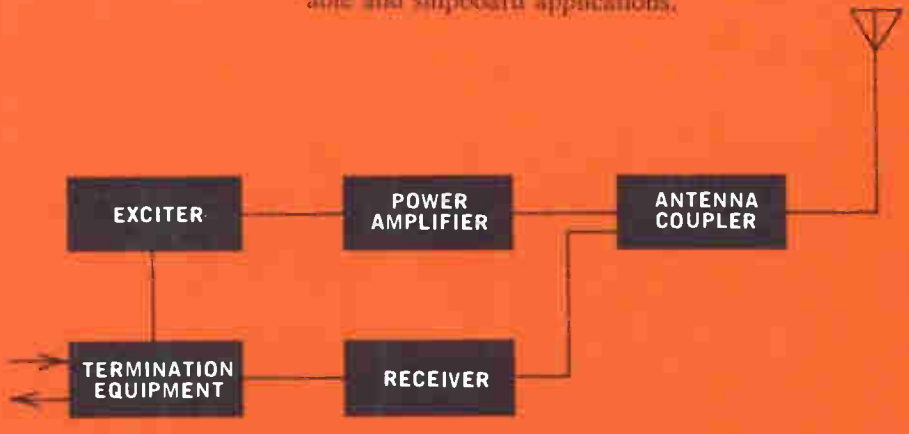
AUDIO OUTPUT: Loudspeaker at 2 watts, headphones, handset, two 600 ohm lines at −34 to +14 dbm. Can also be used with a shipboard remote radiotelephone unit.

Related Equipment

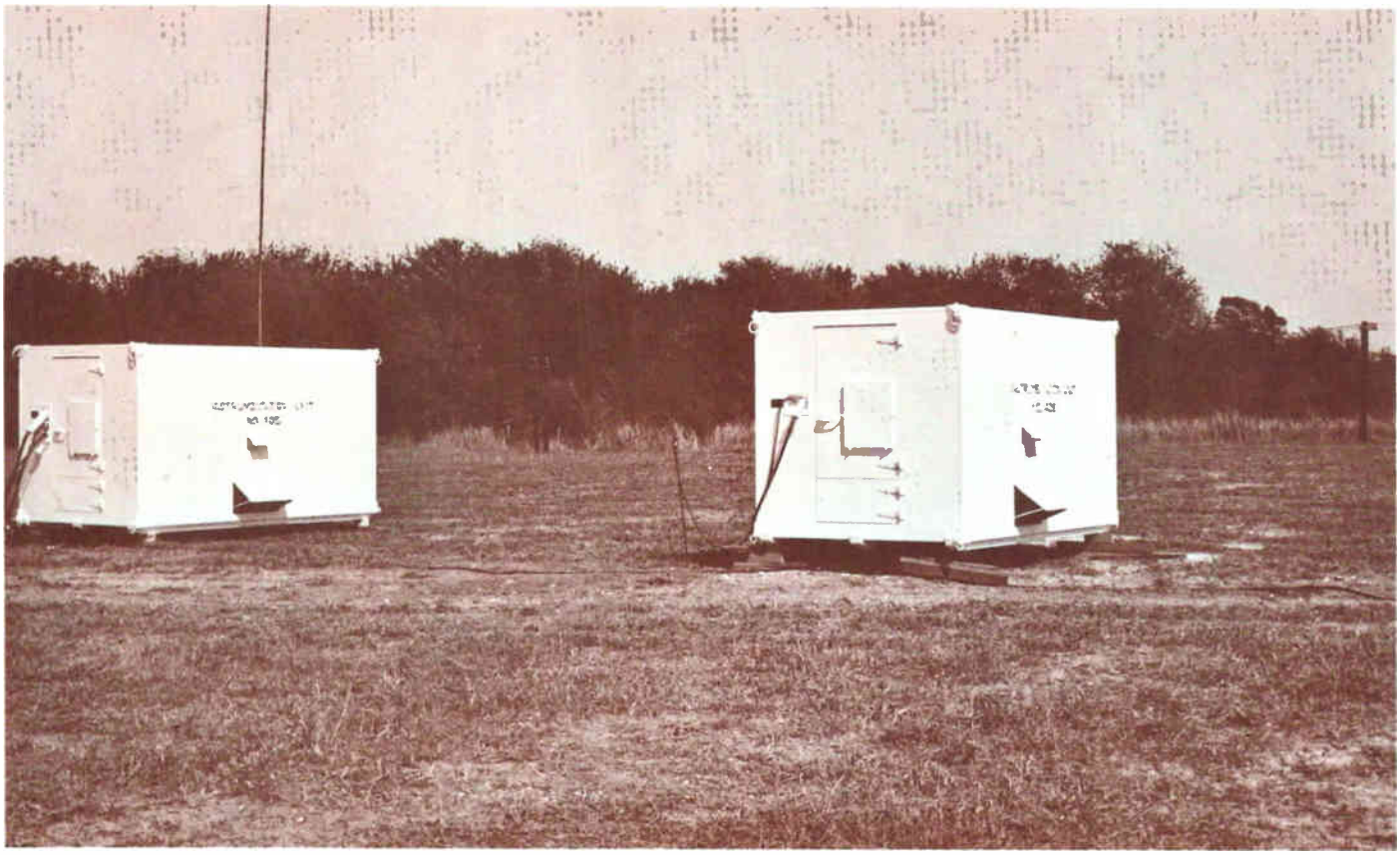
180T-2 Antenna Coupler, p. 104, 105

Communication Systems

Collins HF communication systems represent the latest design concepts in single sideband communication equipment. These concepts have resulted from a continuing SSB development program at Collins which has helped revolutionize communication methods in the HF spectrum in the decades since World War II. Specialized systems are available for both voice and data transmission in airborne, vehicular, transportable and shipboard applications.



ANNA-1 Air Transportable HF Communication System



Features	Applications
High Mobility	*Air Transportable*
Lightweight	
Self-contained	
One-Man Operation	
Two Independent Systems	

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

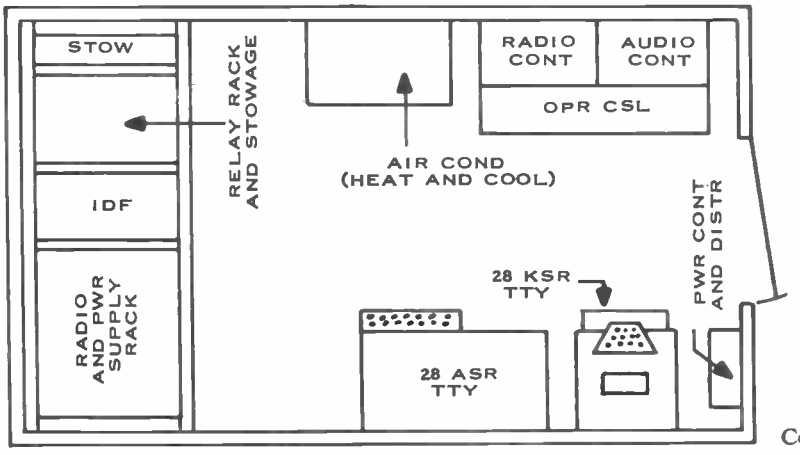
 Available only on a production contract.

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.

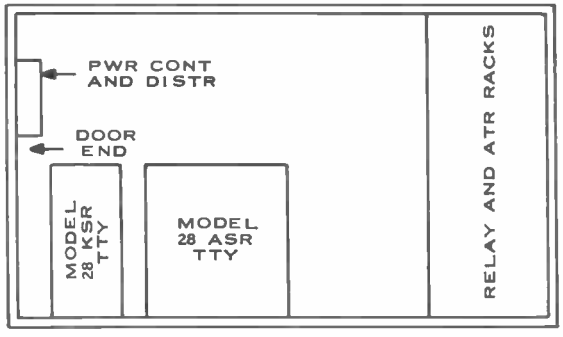
Power for the terminal is supplied by a 30 kw diesel generator. Its output is 120 v or 208 v, 60 cps, 3 phase, 4-wire with 5% voltage and frequency regulation. A fuel tank with sufficient capacity for eight hours of operation is supplied.

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 10^8 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.

	Size			*Weight*
	W	*H*	*D*	
*Maintenance shelter	81" 205.74 cm	83" 210.82 cm	142" 360.68 cm	3895 lbs. 1766.77 kg
*Communication 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

Automatic Tuning
Simplified Operation
Modular Construction
Remote Operation
Application Versatility

Applications

Mobile
Airlift Capability

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 reinserted 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-

 Available only on a production contract.

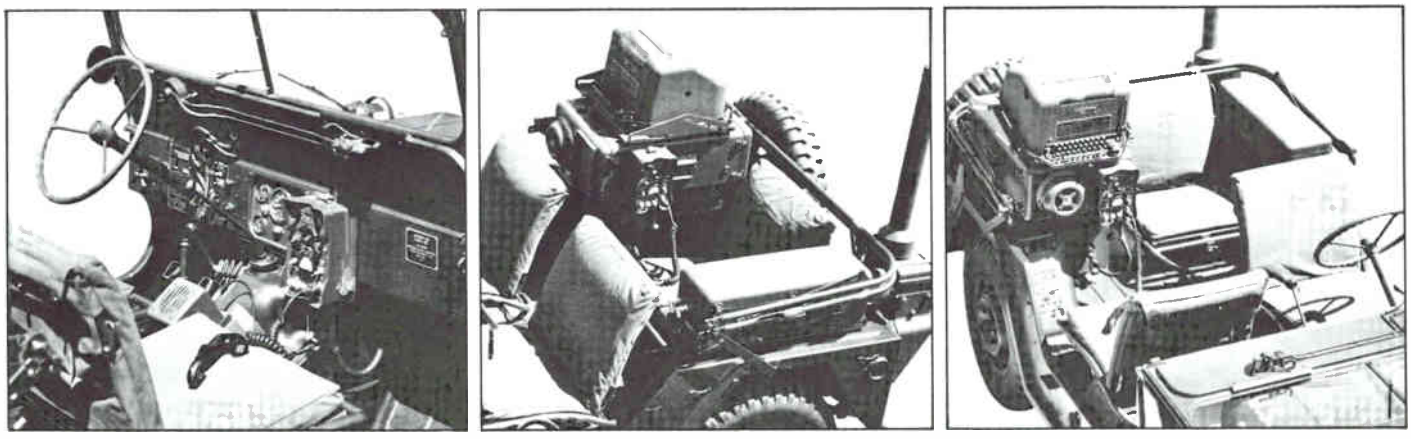
bile operation and eight sections for stationary use. A connector located on the side of the load coil also permits the use of a dipole antenna.

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 10^6 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.

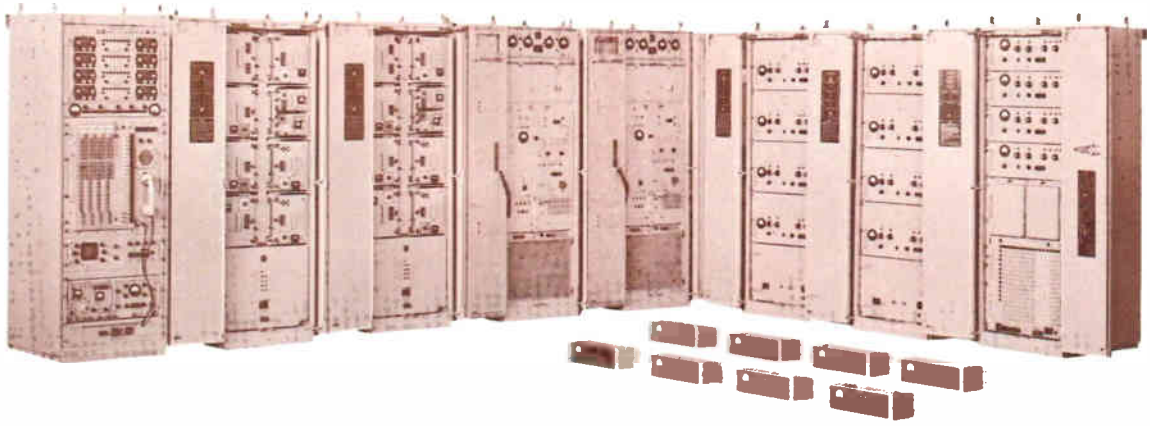
INPUT POWER: 27.5 v dc, 53 amps peak during tuning; 31 amps SSB voice transmit, 14 amps receive.

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	7⅜" 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	Applications
Automatic Tuning	*Shipboard*
Simultaneous Channels	*Fixed Station*
Mode Choice	
Data Transmission	
Simplified Maintenance	

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-

 Available only on a production contract.

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.

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.

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:

	Est. Wt. Crated	*Est. Wt. Uncrated*	*Est. Vol. Crated*
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 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 10^8 per 30 days. Temperature variation — less than ± 4 parts in 10^{11} per degree C (0.000004 cps at 100 kc).

RESET ACCURACY: Better than ± 5 parts in 10^{11}.

FREQUENCY CHANGE WITH SHOCK: Less than 1 part in 10^8.

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 $\pm 10\%$, 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.

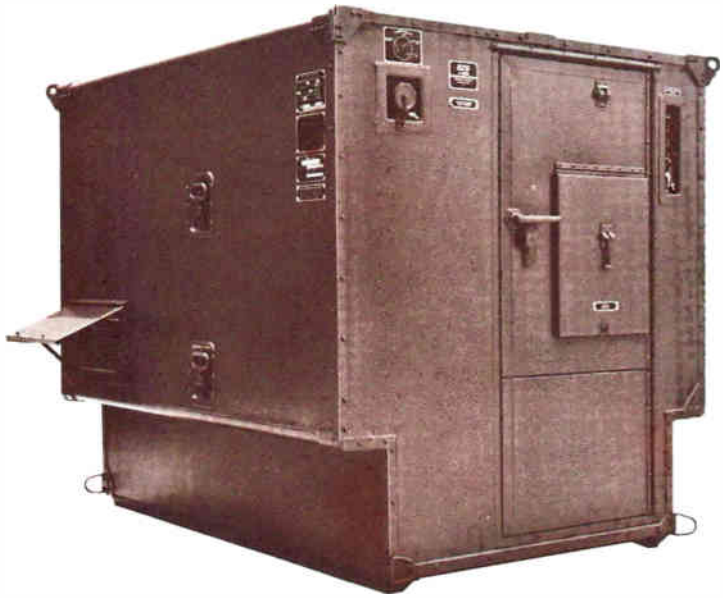
Available only on a production contract.

AN/TRC-115 Transportable HF Communication System

Features	Applications
Automatic Tuning	*Transportable*
Single Shelter	*Communication Center*
One-Man Operation	

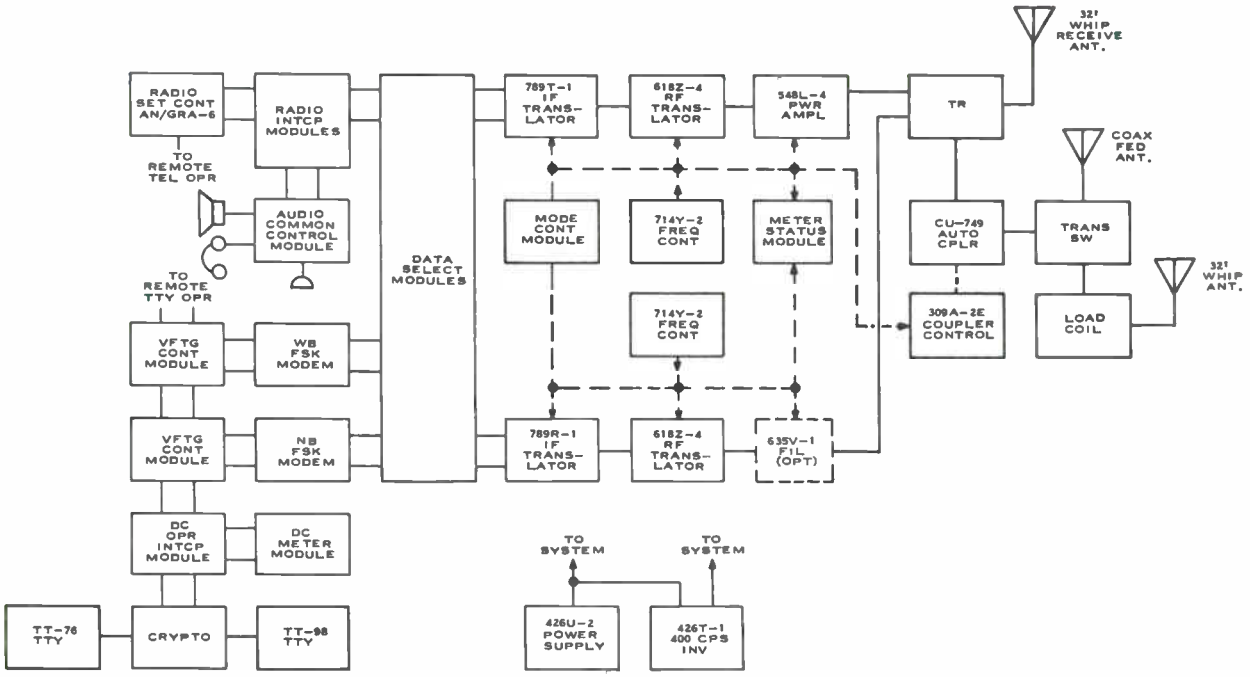
The AN/TRC-115 employs one 1 kw transmitter using single sideband techniques and one receiver with one voice channel and one teletypewriter channel capable of being transmitted and received simultaneously. The systems cover the 2.0-29.9999 mc frequency range in 280,000 channel increments with direct 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.

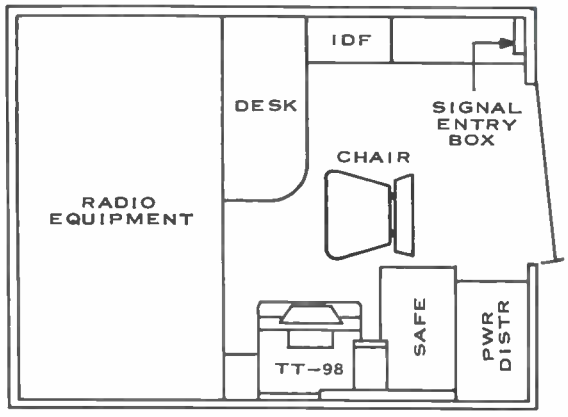
CARRIER SUPPRESSION: Normal SSB operation is for carrier to be fully suppressed (—50 db); optional reduced carrier operation with three levels of suppression.

AFC: Optional.

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

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

RMS STABILITY FACTOR: Does not exceed one part in 10^8 in any 10-minute period.



AN/TRC-115 Floor Plan

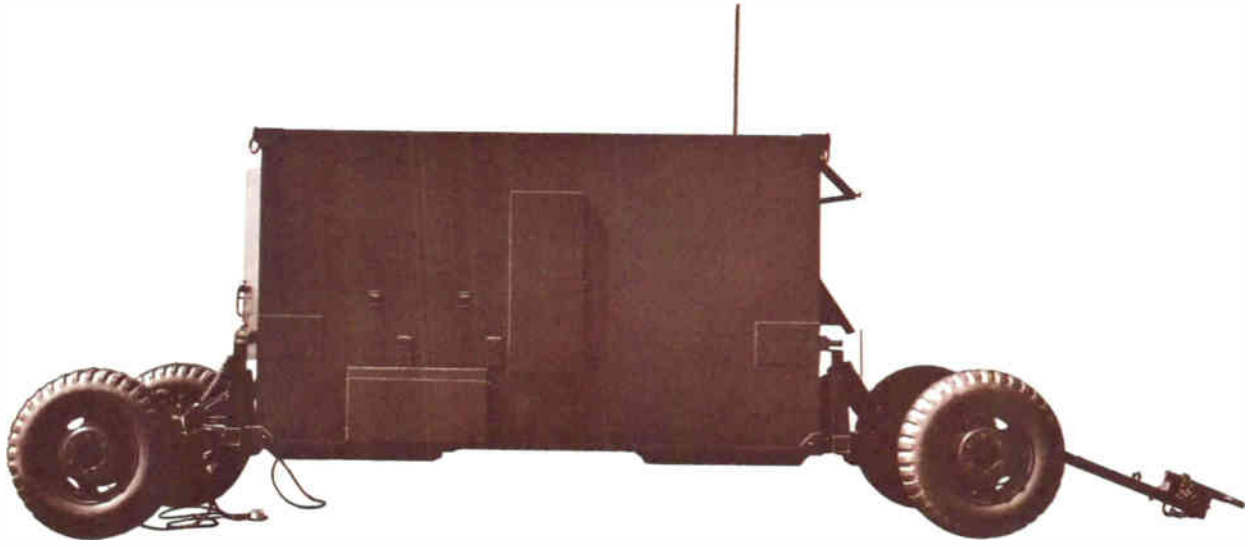
TRANSMITTER DISTORTION PRODUCTS: Third and higher order distortion suppressed at least 40 db; harmonic emission suppressed at least 35 db, referenced with PEP level.

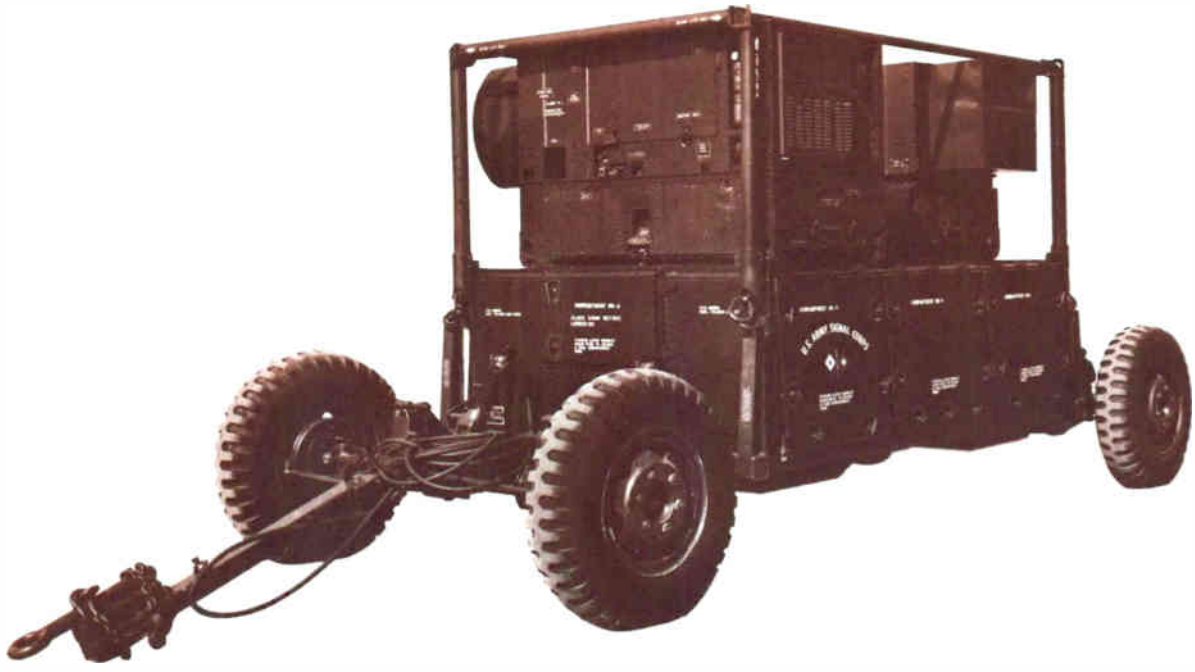
ANTENNAS: Transmit — 32 ft. whip, shelter mounted. Duplex Receive — 32 ft. whip, field mounted. A dipole or any 50 ohm impedance antenna can also be used.

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.

 Available only on a production contract.

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 ±10% variation.

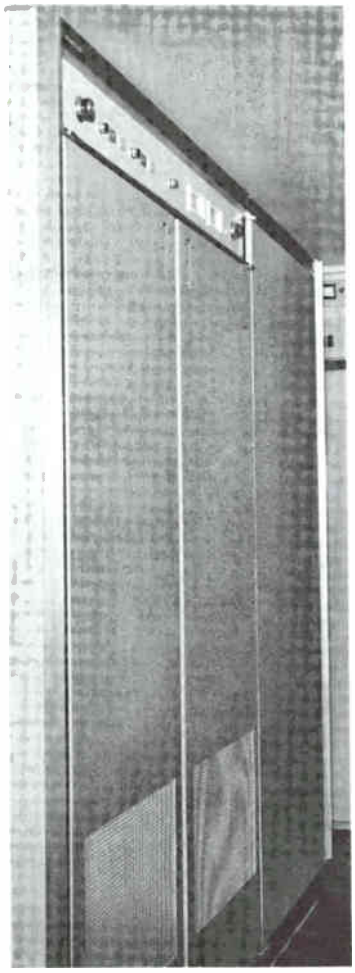
Power for the complete system is provided by a primary and a backup 65 kw, 400 cps turbine generator set. Batteries furnish power for immediate touch-down and emergency operation of the secondary radio system and its associated terminal equipment.

REMOTE OPERATION

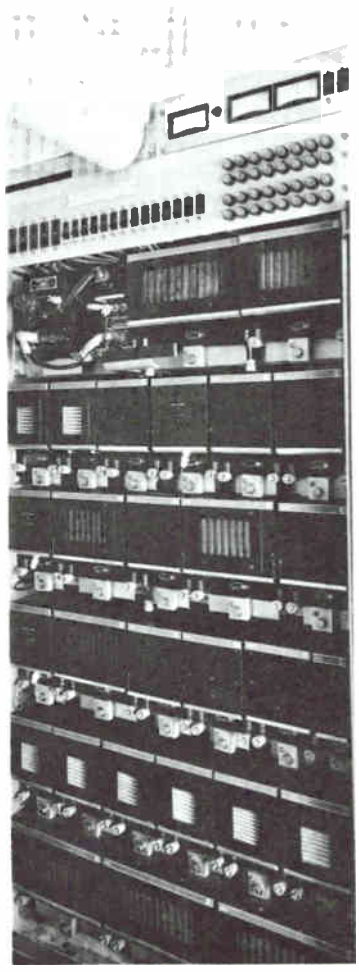
The following radio system functions can be controlled from a remote location — primary power control, sideband selection, frequency changing, ten preset conditions, operational mode and push-to-talk operation, carrier reinsertion and AFC selection.

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.

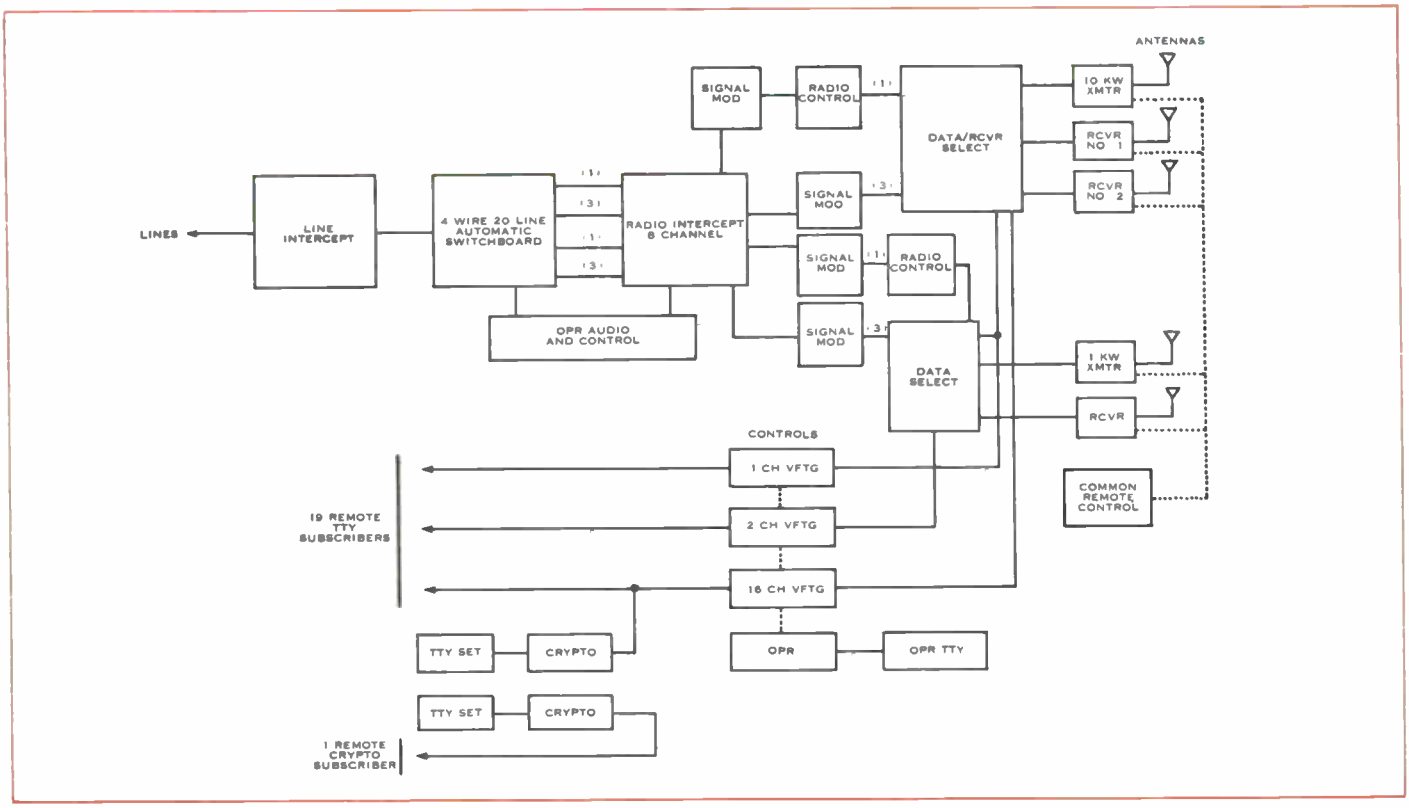


10 KW Power Amplifier



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.

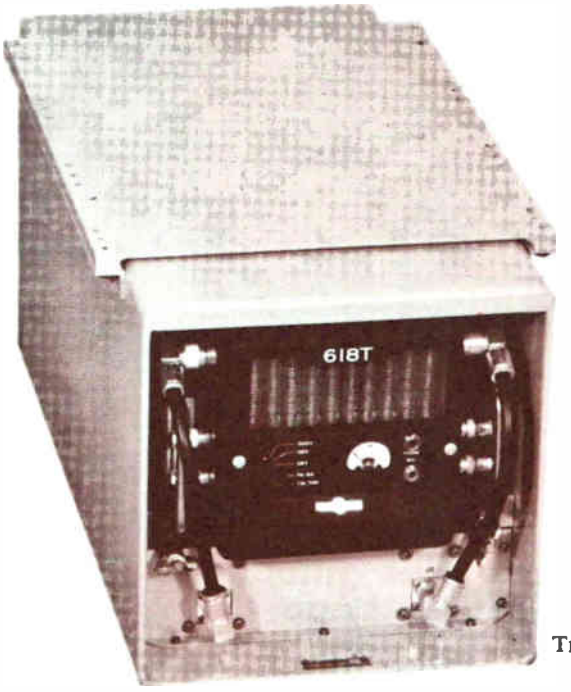
ANTENNA REQUIREMENTS: 1 transmit and 1 receive antenna displaying 50 ohms with 3:1 VSWR or 32 ft. whip.

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

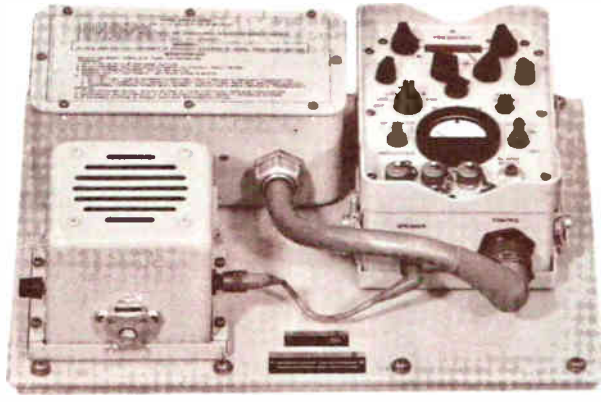
Basic Units

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	Applications
Automatic Tuning	*Small Boat*
Command-Center Operation	*Landing Craft*
Optional Power Sources	*Shipboard*
Easy Installation	
Simplified Maintenance	

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.

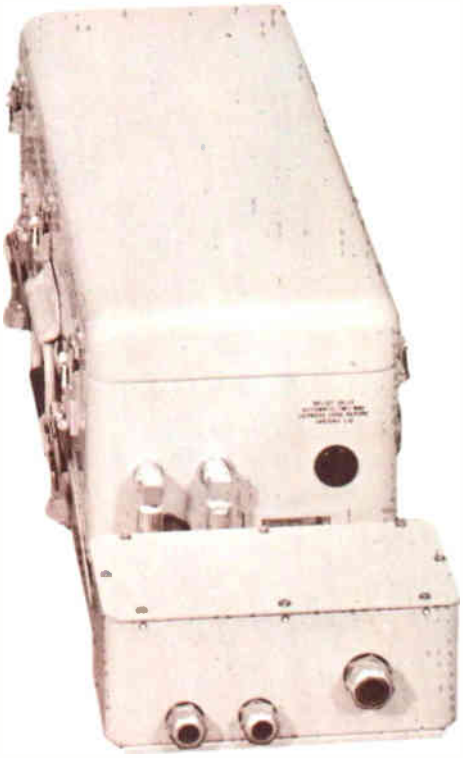
The basic transceiver is the proven 618T housed in a type 1, drip-proof, wrap-around case. Capability of remotely located control unit and antenna coupler facilitates optimum installation.

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.

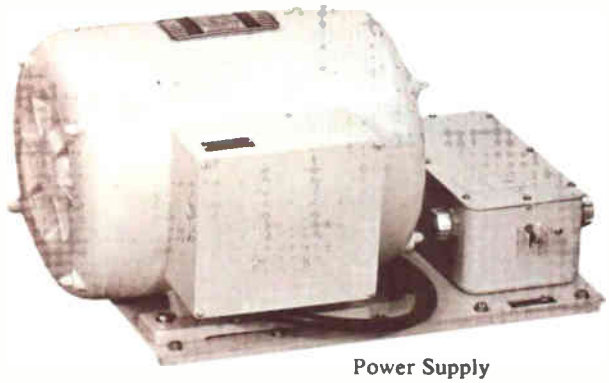
Flexibility in antenna location is made possible by a separate antenna coupler which can be located up to 100 ft. from the transceiver case.

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 10^6 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.		

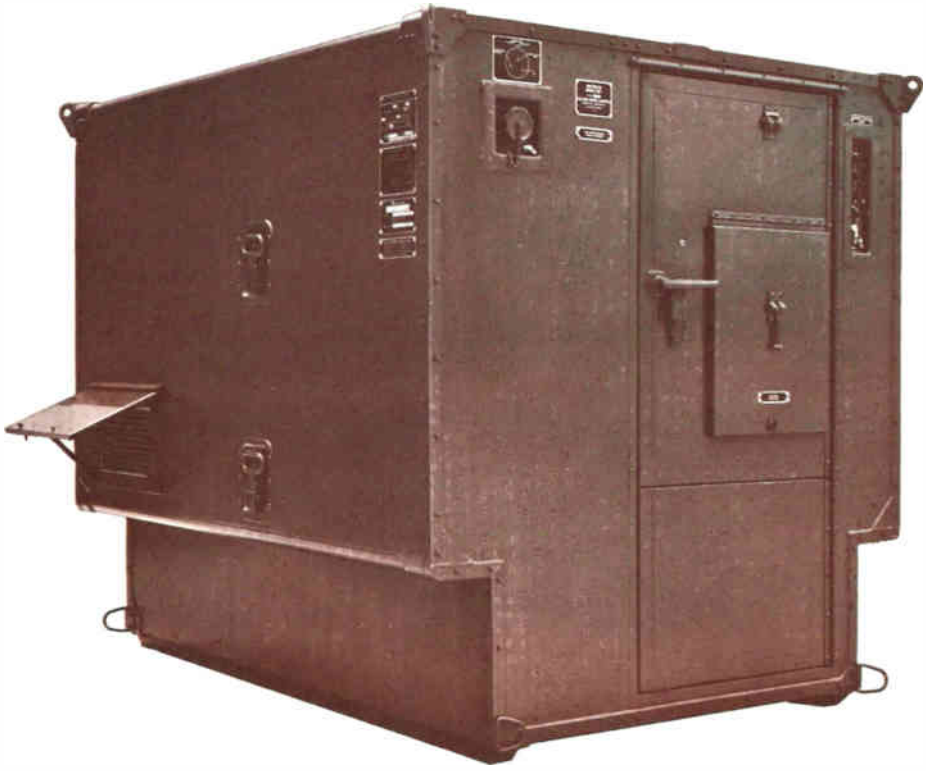
Basic Units

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.

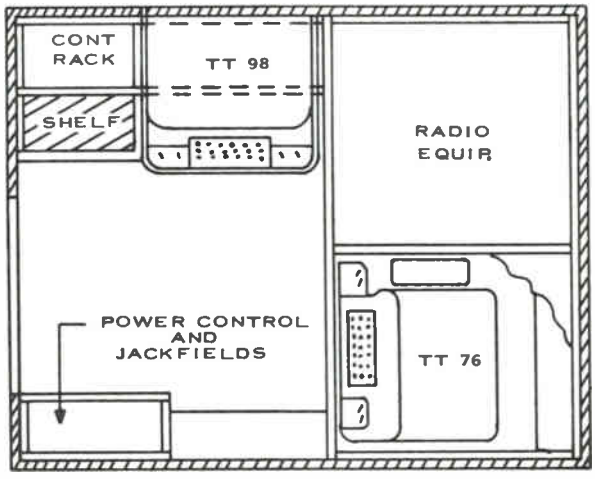
In addition to local control, the system can be operated by FSK dial pulses over a conventional 2- or 4-wire telephone line. Terminal equipment for crytographic units enables compatibility with existing systems.

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

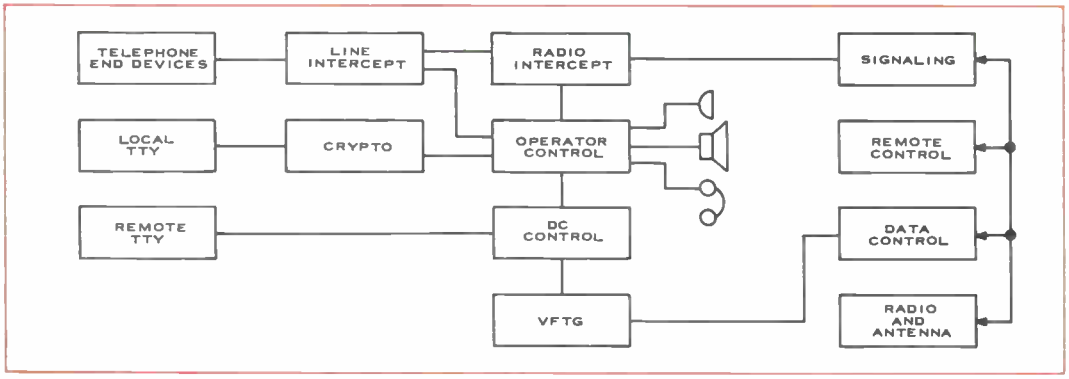
Available only on a production contract.

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° C (−52° C to +54.4° 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.

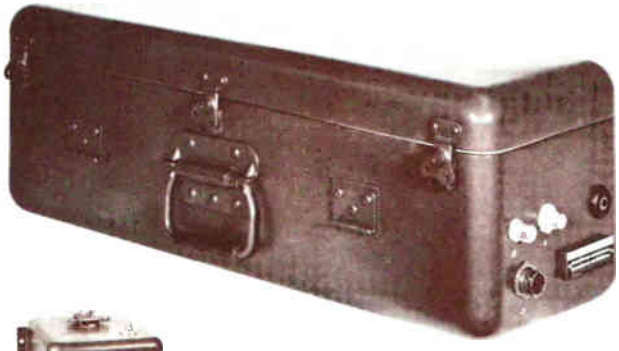
SIZE: S-144/G Shelter — 62″ W, 66″ H, 78″ D (157.48 cm W, 167.64 cm H, 198.12 cm D), maximum.

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	Applications
Automatic Tuning	*Mobile*
Remote Operation	*Transportable*
Phone Patch	*Shipboard*
Teletypewriter Capability	*Fixed Station*
Modular Construction	

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.

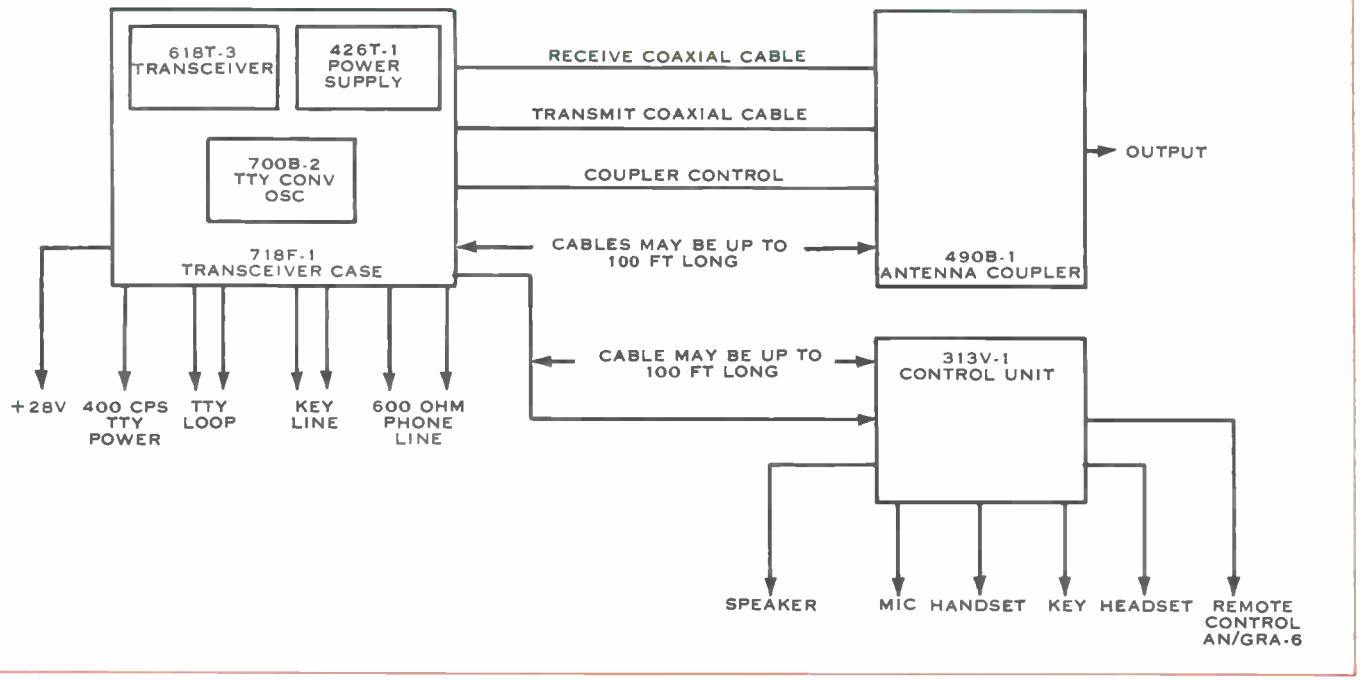
690D-1 LOAD COIL

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 10^6 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:

	Size			*Weight*
	W	*H*	*D*	
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.

Available only on a production contract.

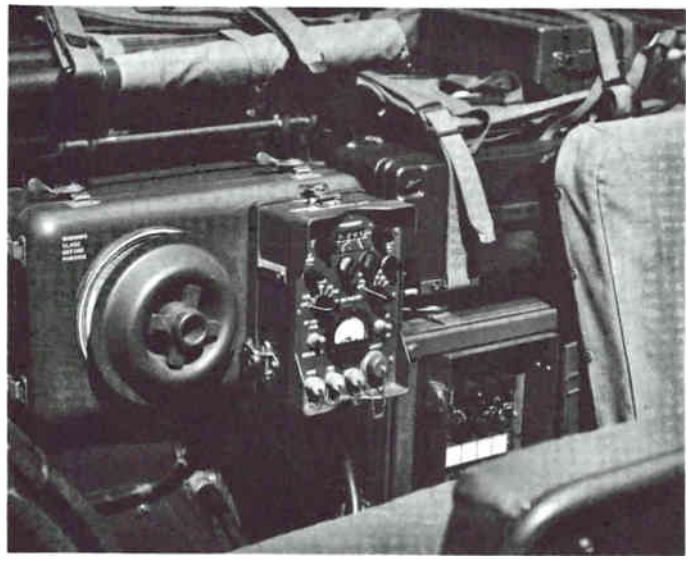
EQUIPMENT CONFIGURATION

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

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.

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

VC-106 Vehicular HF-UHF Communication System

Features	Applications
Automatic Tuning	*Mobile*
HF-UHF Communication	*Airlift Capability*
Phone Patch	
Remote Operation	
Modular Construction	

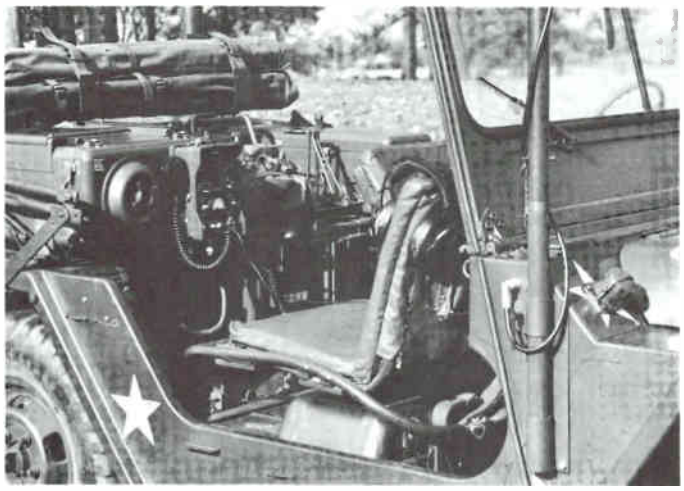
Collins VC-106 is an HF-UHF vehicular communication system installed in a 4 x 4 ¼-ton M151 vehicle. It offers optimum tactical area communication with automatic tuning in the 2.0-29.999 mc and 225.0-399.9 mc frequency ranges, In the HF range, 1 kc channel increments are provided with 400 watts peak envelope power output level in either upper sideband or lower sideband and 100 watt output level in AM with reinserted carrier, CW or frequency shift keying.

The UHF range is covered in 100 kc increments with 20 watts AM output power. In addition to manual selection of the 1750 channels, 19 of the most commonly used UHF frequencies can be preset, allowing rapid channel selection. A separate UHF single frequency receiver is included to monitor the guard channel.

BASIC EQUIPMENT

Both systems can be operated while the vehicle is in motion. The basic equipment includes a Collins VC-102 system for HF SSB, compatible AM, CW and FSK and a Collins 718M-1 which uses an AN/ARC-52X for UHF voice. The systems are housed in waterproof cases which are attached to the vehicle by quick disconnect clamps allowing removal for operation as a fixed station.

Available only on a production contract.



Controls are centrally located.

The M151 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. The size, weight and ruggedness of the VC-106 system ideally suit it to airlift and airdrop operations.

CONTROLS

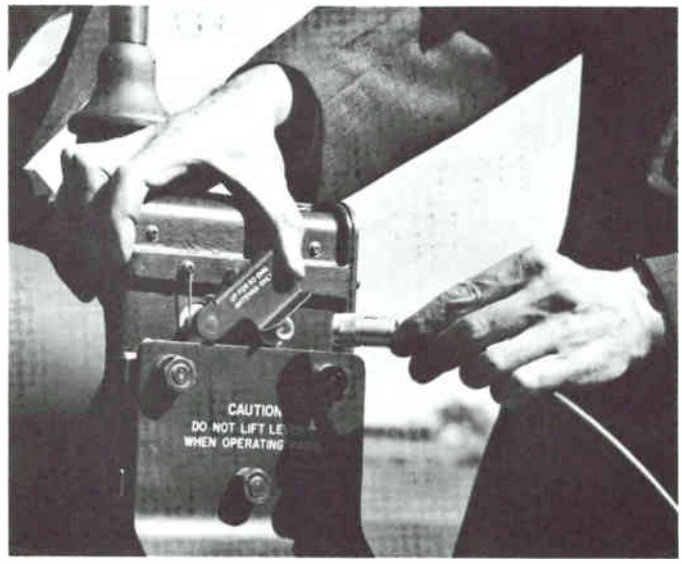
The HF operating controls are located on a compact, local-remote unit, which can be quickly detached from the transceiver case. The unit can be used with an appropriate cable at distances up to 100 ft. from the vehicle. Remote control over greater distances can be accomplished by the use of the AN/GRA-6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

A phone patch circuit extends the versatility of the HF system by permitting connection with wire line telephone facilities. This function is under direct supervision of the operator. UHF radio can also be controlled by the AN/GRA-6.

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

ANTENNA CHOICE

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



Dipole antenna connector automatically disconnects whip.

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 10^8 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. (90.27 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 four each four foot 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: M151 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

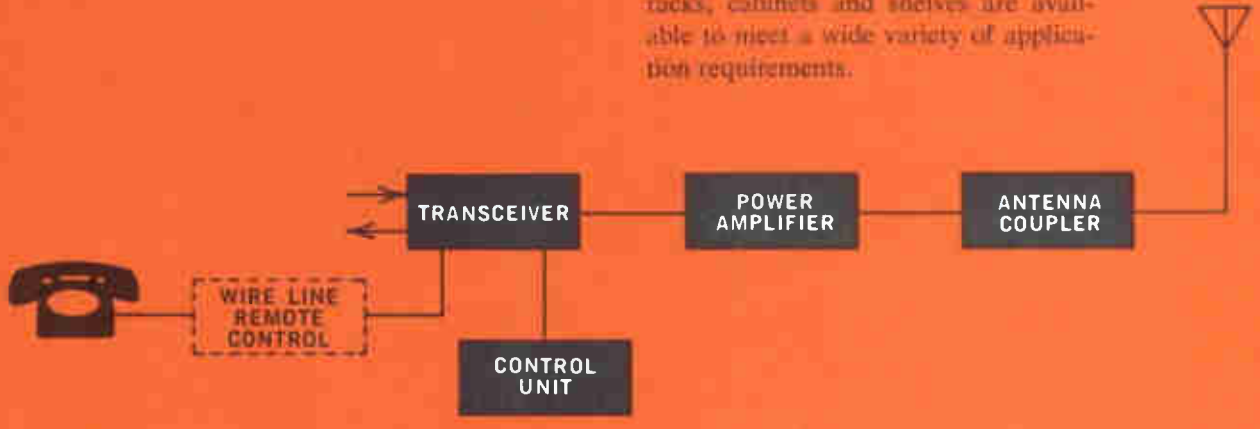
700B-2 Teletypewriter Converter, p. 122, 123

Universal Radio Group

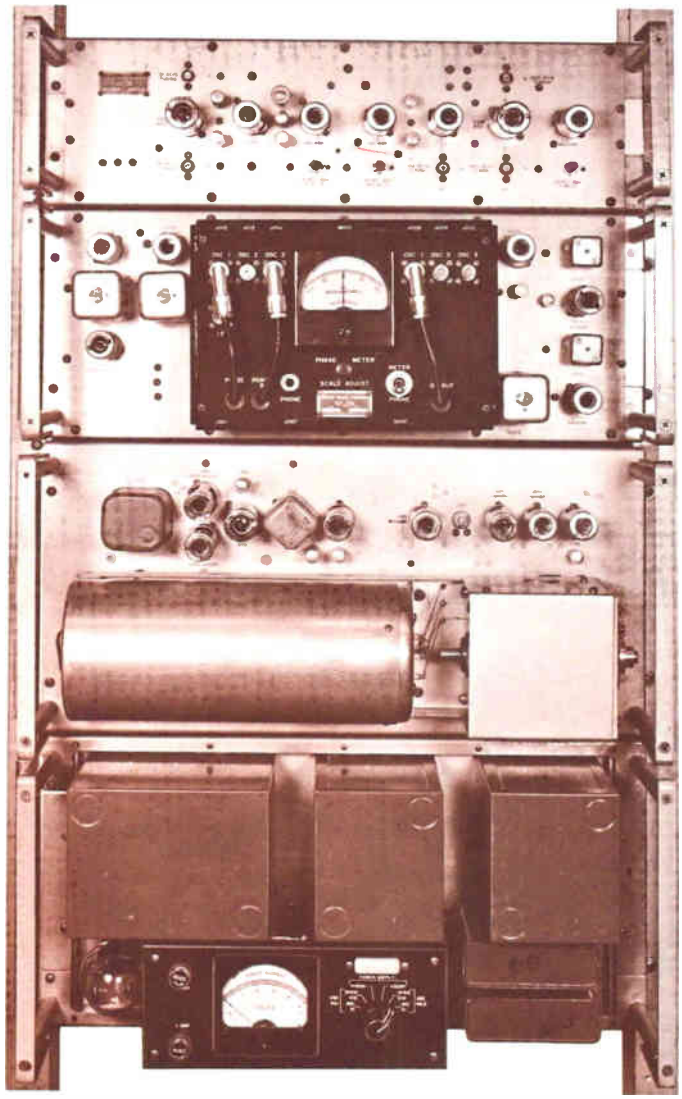
The Collins Universal Radio Group is an advanced line of automatically tuned HF communication equipment based upon a building block concept which gives it a new degree of flexibility, versatility and logistic commonality.

Units can be selected to provide transmitters, receivers or transceivers with local, remote or dial telephone control capabilities. URG equipment is equally well suited for fixed station, transportable, shipboard and airborne applications — and without the extra fabrication costs and long lead time normally involved in tailoring equipment for these installations.

The equipment is of a modular design, with the smaller units housed in ARINC (Aeronautical Radio, Inc.) type enclosures. Shelves of this equipment, as well as the larger power amplifiers, are mounted in rugged Unistrut racks with optional enclosure panels. Attractive racks, cabinets and shelves are available to meet a wide variety of application requirements.



40N-1,-2 Frequency Standards



Features

Frequency Accuracy
Amplitude Stability
Minimum Harmonics
Centralized Metering

Applications

Fixed Station
Shipboard
Data Transmission

The 40N-1,-2 Frequency Standards provide 1 mc, 100 kc and 10 kc outputs with no appreciable harmonics and a stability of one part in 10^{x} per day minimum. They are excellent for supplying reference signals in a wide range of fixed station and shipboard applications.

Both standards are particularly suited for use with HF receivers and exciters, such as Collins' AN/URC-32 and Collins' Universal Radio Group equipment. The 40N-1,-2 are equally suited for use in laboratories or other communication systems as base frequency standards.

The 40N-1 consists of three rack mounted units — a 40K-1 Oscillator, which generates the highly stable 1 mc signal; an 8U-1 Frequency Divider, which supplies simultaneous 1 mc, 100 kc and 10 kc outputs from the basic 1 mc signal; and a 426A-1 Power Supply.

The 40N-2 is a dual frequency standard which includes three 40K-1's, two 8U-1's and a 54M-1 Frequency Comparator, together with associated 426A-1 Power Supplies. The output signals of the 40K-1 Oscillators are compared in the 54M-1, and any two of the three can be selected independently, permitting maximum assurance of frequency accuracy. The difference between any two signals is indicated on a front panel meter or through headphones.

The use of a rugged 1 mc resonator at low power levels, rather than the conventional 100 kc circuit, eliminates normal susceptibility to shock.

Both the 40N-1 and 40N-2 mount in 19″ equipment racks, and all units are of matching mechanical design. All power and coaxial RF cables terminate at the rear of the units. Tubes and adjustments are accessible from the front of each unit by removing the snap-on dust cover.

Specifications

FREQUENCY STABILITY: One part in 10^{8} per day minimum; one part in 10^{9} per day typical.

OUTPUT: 1 mc — 0-2 v rms. 100 kc — 0-5 v rms. 10 kc — 0-5 v rms. 40N-1 — one independent frequency. 40N-2 — best two of three independent frequencies.

OUTPUT IMPEDANCE: 500 ohms nominal. BNC connectors.

POWER REQUIREMENTS: 115 v or 230 v, 50-60 cps.

SIZE AND WEIGHT (excluding rack):

	Size			*Weight*
	W	*H*	*D*	
40N-1	19″ 48.26 cm	22¾″ 57.59 cm	7″ 17.78 cm	66 lbs. 29.94 kg
40N-2	19″ 48.26 cm	79″ 200.66 cm	7″ 17.78 cm	190 lbs. 86.18 kg

313J-2, 313K-2 and 313L-1 Control Equipment

313J-2 Dial Pulse Control

313K-2 Allotter-Preset

313L-1 Frequency Register

313Q-1 Control Unit

Features	Applications
Dial-Pulse Control	*Fixed Station*
Installation Flexibility	*Transportable*
Modular Construction	
Telephone Compatibility	
Complete Remote Operation	

The 313J-2, 313K-2 and 313L-1 Control Units allow complete remote operation of an unattended URG installation over landlines, microwave or a radio link by simple telephone dialing. The control units are part of the Collins Universal Radio Group, a family of integrated building block equipment which permits a selection of units to meet a specific communication requirement. In addition to fixed station application it is suitable for transportable systems, such as the AN/TSC-38.

SIMPLIFIED OPERATION

By dialing the proper predetermined number code groups, the operator can turn on and off the primary power to the equipment, select such functions as operating frequency, mode, receiver gain, transmitter power levels, and can choose an antenna and antenna azimuth if steerable antenna is employed. Other functions are also available as options in the URG equipment.

An automatic switchboard can be used in a radio-telephone exchange system to interconnect with audio circuits originating from either landline or radio to the HF URG facilities. Subscriber control of the system can be effected from any of the connected dial telephones.

PRESET CHANNELS

The most frequently used radio conditions on a particular channel are available by simply lifting the subscriber's handset from its base. The 313K-2 stores preset operating information for ten specified operating conditions which can be applied to any of four radio channels. If the channel is in use, it will not handle a request until termination of processing the previous request.

The normal-preset channel can be obtained from a 714Y, a local manual control unit, or one of the presets in the 313K-2, depending on the interconnection of control equipment. The

normal-preset condition automatically tunes the radio equipment to the preset frequency.

When radio tuning is completed, the user is provided with an audible function-complete signal indicating the system is ready for operation.

BASIC CONTROL UNITS

Remote operation of a URG system is accomplished by the proper combination of three basic radio control units. The 313J-2 Dial Pulse Control decodes incoming telephone dial pulses to select the desired control function and routes dial pulses through the 313K-2 Allotter-Preset to the 313L-1 Frequency Register for frequency information. Azimuth information from the 313J-2 is supplied to the antenna switching matrix. The 313J-2 also provides operating mode information to the HF radio equipment and generates appropriate supervisory signals.

MODULAR CONSTRUCTION

The control equipment is of plug-in modular construction, housed in ARINC ATR-type cases which mount directly on an equipment shelf. Power and control connections are made through self-aligning connectors at the rear of each unit. Units are nonpressurized and dust and explosion proof; no cooling air is required.

313J-2 DIAL PULSE CONTROL UNIT

Operating functions of an individual HF radio channel to be controlled over ordinary telephone lines are housed in the 313J-2. The dial-pulse control unit decodes the serial dial pulses or FSK tone information received over the telephone lines and distributes the control signal directly to the primary radio equipment or to the other control equipments to enable them to perform the functions requested by the operator.

In addition, the dial-pulse control unit generates audible supervisory tone signals, such as continue-dialing, function-complete, busy, tuning-in-progress, and antenna-rotating. These supervisory tones are applied to the telephone circuit to keep the operator informed of the functional status of the equipment.

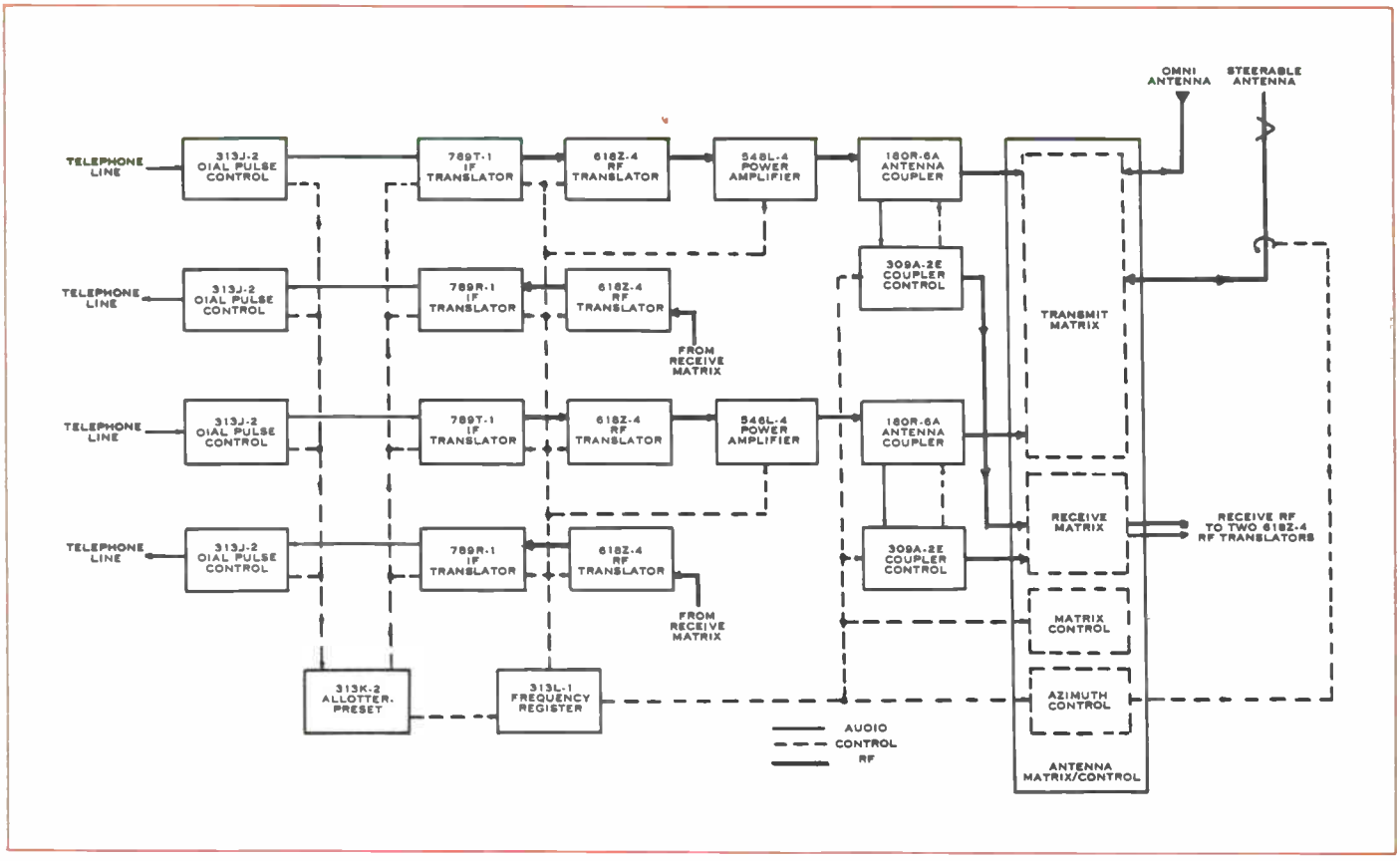
313K-2 ALLOTTER-PRESET

The allotter-preset is used in URG systems which involve more than one group of receive and transmit equipment or which require presets. The allotter circuits control and route signals for the use of time-shared control units, such as the 313L-1 Frequency Register in the communication system, while the preset section provides automatic selection of ten presets controlling mode, frequency and antenna. Preset channels are selected by simply dialing a number. Each unit will accommodate up to four subscribers.

313L-1 FREQUENCY REGISTER

Frequency information in serial dial-pulse form is converted by the 313L-1 to parallel code, using two-out-of-five wires for actuating the associated radio equipment tuning mecha-

Functional Circuits



nisms. The frequency register output circuits are armed by a signal from the 313K-2 Allotter-Preset unit, with subsequent dial pulses representing the frequency information. Frequency requests outside of the 2.0-29.999 mc range will actuate a busy signal. In a typical system, the 313L is available to individual channels on a time-shared or demand basis.

Typical URC System Control Codes

FUNCTION	DIALED CODE ON INPUT TELEPHONE PAIR
Steerable antenna selection	Two digits indicating the desired azimuth in 30° steps, 03, 06, 09, 12, 15, 18, 21, 24, 27, 30, 33, 36.
Omni antenna selection	Digit 4 plus digit 1.
Frequency selection	Digit 5 plus the digits of the desired frequency. In 100 cycle steps, 020,000 to 299,999.
Mode selection:	
Sideband selection	Digit 6 plus digit 1 for USB or digit 2 for LSB.
Twin sideband selection	Digit 6 plus digit 3.
Power ON-OFF	Digit 6 plus digit 0 for off or digit 9 for on.
AM selection	Digit 6 plus digit 4.
RF gain selection	Digit 6 plus digit 5 for low gain or digit 6 for high gain.
Power level selection	Digit 6 plus digit 7 for low power or digit 8 for high power.
Preset selection	Digit 7 plus any digit from 0 to 9 representing the number of the preset desired.
Miscellaneous 1*	Digit 8 plus the digits of the desired frequency. In 100 cycle steps, 020,000 to 299,999.
Miscellaneous 2*	Digit 9 plus any digit from 0 to 9 representing the number of the preset desired.

*Option: For duplex operation, the digit 8 will be used for transmitter frequency selection and the digit 9 for transmitter preset selection.

313Q-1 CONTROL UNIT

The 313Q-1 permits manually switched selection of frequency and mode of transmission, on-off control, and gain control of four different transceivers in a system using the 313J, 313K and 313L remote control equipments. All the supervisory tones present in the automatic system serve the same functions in an installation using the 313Q-1 Control Unit. Selection of any of 280,000 channels with 0.1 kc spacing over the 2.0-29.9999 mc range is indicated by a direct, digital readout of the operating frequency. All frequency selection terminations are diode isolated for 500 ma current to allow paralleling of control units.

The 313Q-1 Control is part of the Collins Universal Radio Group, a family of HF building block equipment which offers a choice of units to meet any communication requirement.

Size: ½ ATR; 5" W, 7 11/16" H, 10 3/32" D (12.7 cm W, 19.53 cm H, 25.64 cm D), *Weight:* 6 lbs. (2.72 kg).

Specifications

POWER REQUIREMENTS (maximum):

313J-2 Dial Pulse Control	27.5 v dc, 5 amps
313K-2 Allotter-Preset	27.5 v dc, 2 amps
313L-1 Frequency Register	27.5 v dc, 2 amps

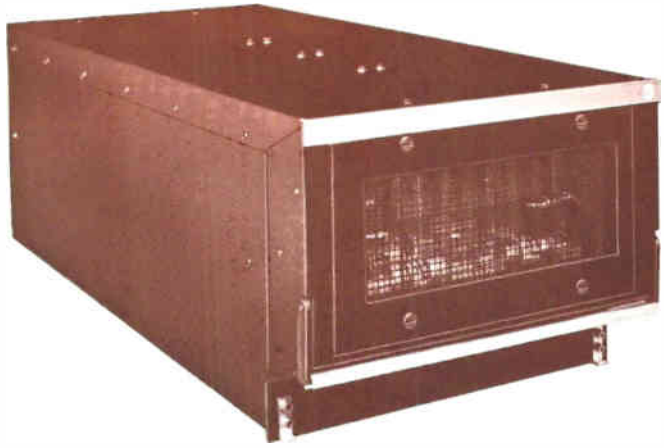
SIZE AND WEIGHT:

	Size			*Weight*
	W	*H*	*D*	
313J-2 dial pulse control	4⅞" 12.38 cm	7⅝" 19.37 cm	19 9/16" 49.69 cm	27½ lbs. 12.47 kg
313K-2 allotter-preset	4⅞" 12.38 cm	7⅝" 19.37 cm	19 9/16" 49.69 cm	19 lbs. 8.62 kg
313L-1 frequency register	2¼" 5.72 cm	7⅝" 19.37 cm	19 9/16" 49.69 cm	14 lbs. 6.35 kg

Related Equipment

Racks and Cabinets, p. 91

426U-2 27.5 V DC Power Supply



Features	Applications
AC or DC Input	*Fixed Station*
Adjustable Output	*Transportable*
Excellent Regulation	*Shipboard*
Parallel Operation	*Mobile*
Solid State	*Airborne*
Circuit Protection	

The 426U-2 is a compact, lightweight power supply which provides 27.5 v, 100 amps nominal dc output from a variety of ac or dc power sources. A variable output current limit control provides maximum current settings between 75 amps and 125 amps. Any number of 426U-2 Power Supplies can be operated in parallel.

APPLICATION

The 426U-2 is part of the Collins Universal Radio Group of HF equipments and is intended for use with the 548L-4 Power Amplifier. It is also well suited for use with other equipments requiring a 27.5 v highly regulated, high current input. The unit can be installed either in a Unistrut equipment rack or an attractive cabinet enclosure.

HIGH RELIABILITY

Solid state components are used throughout for minimum size and maximum reliability. Protective circuits include overload, undervoltage and loss of cooling air, together with fault indicator and remote alarm. The 426U-2 will not be damaged during current overload or short circuit conditions, and normal system operation is quickly restored when the overload is removed.

INSTALLATION

The 426U-2 mounts in an externally cooled, ARINC Specification 404, 1 ATR tray. All power terminations are made through a single rear connector. The washable air filter, test points, over-current control and output voltage control are accessible by removing the front panel insert.

Specifications

INPUT POWER: 90-140 v, line to neutral ac, 45-450 cps, single phase 3-wire, or 3 phase 4-wire; or 90-140 v dc. Overvoltage may be 150 v, line to neutral ac for 90 milliseconds maximum duration. Undervoltage to 0 level without damage to the power supply.

OUTPUT VOLTAGE: 27.5 v dc nominal, 100 amps.

VOLTAGE CONTROL: Continuously variable from 24-29 v dc.

VOLTAGE REGULATION: ±0.5 v from 0-100 amps.

RIPPLE VOLTAGE: Less than 0.25 v rms from 5-100 amps.

LOAD TRANSIENTS: Less than ±1.5 v output variation for a step of 15-90 amps or 90-15 amps.

OVERVOLTAGE: Power supply will shut off if output voltage exceeds 33 v ±2 v for 100 milliseconds.

OVERLOAD PROTECTION: Maximum output current adjustable from 75-125 amps. Overload conditions reduce the output voltage to a level which limits the current to the overload setting. Normal operation is restored upon removal of overload.

EFFICIENCY: 75% minimum at 100 amps output.

TEMPERATURE RANGE: −40° C to +50° C operating; −62° C to +85° C nonoperating.

HUMIDITY: 0%-100%, operating or nonoperating.

ALTITUDE: 0-50,000 ft. operating.

COOLING REQUIREMENTS: 220 lbs. per hour minimum with maximum output over the above temperature range. Requires 150 lbs. per hour at 20°-30° C.

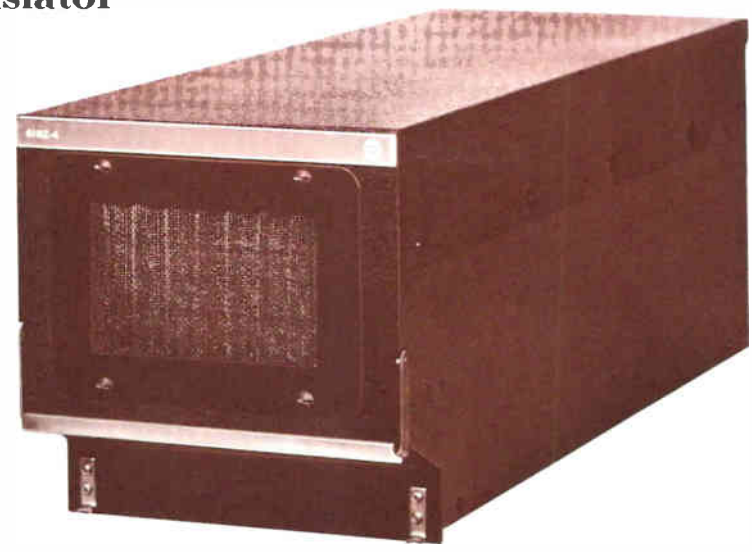
SIZE: 10½" W, 7⅝" H, 19 9/16" D (26.67 cm W, 19.37 cm H, 49.69 cm D).

WEIGHT: 83.5 lbs. (37.88 kg).

Related Equipment

Racks and Cabinets, p. 91
548L-4 1 KW Power Amplifier, p. 37

618Z-4 RF Translator



Features	Applications
Automatic Tuning	*HF Receiver*
Installation Flexibility	*HF Exciter*
Modular Construction	*HF Transceiver*
Remote Operation	

The 618Z-4 RF Translator is the building block in Collins' Universal Radio Group containing the stages which perform the conversions between the intermediate frequencies and the desired operating frequencies in the HF range.

In transmission, the 618Z-4 translates the 500 kc signal from a 789 series IF translator to the desired channel frequency in the 2.0-29.9999 mc range; this signal is amplified to a 0.4 watt PEP level for the input signal to a URG power amplifier. In reception, the 618Z-4 converts the incoming RF signal to the 500 kc frequency required by the associated IF translator. Tuning is automatic.

Typical configurations in which the 618Z-4 RF Translator appears include the 310V-1 Exciter, 651F-1 Receiver and 671B-1 Receiver-Exciter.

CIRCUIT FEATURES

All circuitry with the exception of the RF tuner employs transistors. Careful design consideration has been given to reduction of both conducted and radiated interference. Modular construction facilitates maintenance and equipment support programs.

Plug-in power supplies allow operation from either 27.5 v dc or 115 v or 230 v, 45-450 cps sources. The power supplies use solid state components which are protected against both excessive potentials and high negative transients.

Function and frequency selection is accomplished by a small control unit, such as the Collins 714Y, using two-out-of-five wire coding. A memory circuit retains frequency selection information to allow common sharing of dial-pulse control equipment for remote operation.

OPTIONAL FREQUENCY STANDARD

Two choices of frequency control are available. One uses an internal reference standard of one part in 10^8 per day; the other employs a highly stable external standard for data handling, or other applications requiring exceptionally high stability. Translator frequency determining circuits are phase locked to the standard.

Specifications

FREQUENCY RANGE: 2.0-29.9999 mc.

FREQUENCY CONTROL: Phase locked to internal frequency standard; provision for optional use of external 100 kc frequency standard.

FREQUENCY STABILITY: Internal standard — one part in 10^8 per day (aging rate); rms stability factor does not exceed one part in 10^8 in any 10-minute period.

INPUT CIRCUIT: 50 ohms unbalanced.

OUTPUT CIRCUIT: Transmit — 50 ohms unbalanced. Receive — 25 ohms unbalanced.

RF OUTPUT: Exciter — 0.4 watt PEP minimum.

COOLING REQUIREMENTS: Air cooled; requires minimum of 100 lbs. per hour at 0.5" of water pressure. An optional cooling unit is available for mounting with a plenum shelf.

POWER REQUIREMENTS: 22.0-30.25 v dc (27.5 nominal) negative grounded with less than 0.5 v ripple, 170 watts maximum, or 115 v or 230 v, 45-450 cps.

SIZE: 7½" W, 7⅝" H, 19 9/16" D (19.05 cm W, 19.37 cm H, 49.69 cm D).

WEIGHT: 30 lbs. (13.61 kg).

Related Equipment

789R-1 IF Translator, p. 88-90 *789X-1 IF Translator, p. 88-90*
789T-1 IF Translator, p. 88-90 *Racks and Cabinets, p. 91*

789R-1, 789T-1 and 789X-1 IF Translators

Features	Applications
Automatic Tuning	*HF Receiver*
Installation Flexibility	*HF Exciter*
Modular Construction	*HF Transceiver*
Remote Operation	

The 789R-1, 789T-1 or 789X-1 IF Translator is used with a 618Z-4 RF Translator to provide either an HF receiver, transmitter or transceiver. The IF translators are part of the Collins Universal Radio Group, a family of integrated HF building block equipment which offers a choice of units to meet a particular communication requirement.

The signal processing circuits of the conventional receiver, exciter and transceiver have been divided into two separate translator units. The IF translator contains the audio and intermediate frequency circuits and uses plug-in circuit cards to permit selection of specific performance capabilities, while the radio frequency circuits are located in the associated 618Z-4 RF Translator using shielded module construction. Power requirements are also supplied from the RF translator. The Collins 310V-1 Exciter, 651F-1 Receiver and 671B-1 Receiver-Exciter typify IF translator applications.

OUTSTANDING PERFORMANCE

Each of the IF translators can be tuned in 100 cycle increments from 500.0 to 500.9 kc. Frequency selection is remotely controlled by applying two grounds on a two-out-of-five wire control system, binary two-out-of-five code. A frequency selection memory circuit can be added for dial-operated remote systems which share frequency control facilities with other system equipments.

Plug-in crystal lattice filters are used for channel separation. The card cage chassis permits any desired degree of implementation which can be easily altered to meet changing communication requirements without chassis modification or long down-time. Transistor circuits are used throughout and each plug-in card contains a complete circuit division.

789R-1

The 789R-1 translates the IF signal from an associated Collins 618Z-4 RF Translator to audio frequencies in receiver applications. It can be optionally implemented to accommodate up to four 3 kc SSB multiplex channels. Each receive channel can be operated individually with unused channels contributing no noise or residual AGC. Channels are enabled by a ground-on line control. When more than one channel is used, the correct individual channel level is automatically established. Each channel line amplifier provides test level samples for isolation of malfunctioning units by means of dc levels. AFC is also available for installations which require compatible operation with signals of low frequency stability. One of the IF channels can be used for a separate AM channel. Diversity combining can be used on any of the channels if required. Each channel has individual AGC rise time constant selection. Injection frequencies are referenced to the 100 kc oscillator in the 618Z-4 or an optional external standard. In systems using 0.1 kc spacing, the RF oscillator frequency selector is controlled by a memory matrix module which retains frequency selection information in the absence of external control.

BASIC CONFIGURATION

The 789R-1 is normally supplied for upper sideband, 3 kc bandwidth and 1 kc RF channel increments.

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; AM; four channel multiplex.

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.

Tenth KC Channel Increment Option The number of RF channels can be increased to 280,000.

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.

External Frequency Standard Option This option offers greater frequency stability for data communication or other applications. The 789R-1 normally uses the frequency standard in the associated 618Z-4 RF Translator.

789R-1 Specifications

TYPES OF RECEPTION: USB, LSB, 4-channel SSB multiplex, AM or AFC of the sideband channels.

IF INPUT: 5 microvolts to 100 millivolts, 50 ohms.

AF OUTPUT: −10 dbm nominal, 600 ohms (for single tone input above AGC threshold); +10 dbm output optional, depending on module choice.

PRIMARY POWER INPUT: Derived entirely from associated 618Z-4 RF Translator.

SIZE: ½ ATR; 4 7/8" W, 7⅜" H, 19 9/16" D (12.4 cm W, 19.4 cm H, 49.7 cm D).

WEIGHT: 12 lbs. (5.4 kg) minimum implementation; 18 lbs. (8.2 kg) fully implemented.

789T-1

The 789T-1 converts audio inputs to the nominal 500 kc IF signal required by an associated Collins 618Z-4 RF Translator in transmitter applications. It can be optionally implemented to accommodate up to four 3 kc SSB multiplex channels. Channels are enabled by a ground-on line control. When more than one channel is used, the correct individual channel level is automatically established. Each channel provides test level samples for isolation of malfunctioning units by means of dc levels. A pilot carrier is available for installations which require compatible AM operation (AME) or AFC operation.

The transmit gain control and exciter output levels are automatically adjusted. The signal is translated to the nominal 500 kc IF, using injection frequencies stepped in 0.1 kc channel increments when 280,000 channels are used.

BASIC CONFIGURATION

The 789T-1 is normally supplied for upper sideband, 3 kc bandwidth and 1 kc RF channel increments.

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; AM; 4-channel multiplex.

Tenth KC Channel Increment Option The number of RF channels can be increased to 280,000.

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

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

External Standard Option This option offers greater frequency stability for data communication or other applications. The 789T-1 normally uses the frequency standard in the associated 618Z-4 RF Translator.

789T-1 Specifications

EMISSION: USB, LSB, selectable-level carrier plus USB, LSB or both, compatible AM (USB or LSB plus carrier), 4-channel SSB multiplex with outboard channels inverted, CW telegraphy, audio tone data.

AUDIO INPUT: Single test tone −26 dbm nominal; voice −34 VU nominal, 600 ohms, with line amplifiers.

IF OUTPUT: 20 peak millivolts maximum, 50 ohms.

PRIMARY POWER INPUT: Derived entirely from associated 618Z-4 RF Translator.

SIZE: ½ ATR; 4 7/8" W, 7⅜" H, 19 9/16" D (12.4 cm W, 19.4 cm H, 49.7 cm D).

WEIGHT: 11 lbs. (4.99 kg) minimum implementation; 18 lbs. (8.2 kg) fully implemented.

789X-1

The 789X-1 is a bilateral IF translator used in conjunction with a Collins 618Z-4 RF Translator for transceiver applications. Performance characteristics include 100 cycle channel increments with nominal 3 kc or 6 kc bandwidths of two SSB channels or AM. Injection frequencies are referenced to the 100 kc oscillator in the 618Z-4 or an optional external standard. The RF oscillator frequency selector is controlled by a memory matrix module which retains frequency selection information in the absence of external control. In transmit function, the transmit gain control and exciter output levels are automatically adjusted. Pilot carrier is available for installations which require compatible AM operation.

BASIC CONFIGURATION

The 789X-1 is normally supplied for upper sideband, 3 kc

bandwidth and 1 kc RF channel increments, with adjustable pilot carrier reinsertion for compatible AM in transmit.

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.

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 or LSB are available.

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

External Frequency Standard Option This option offers extremely high frequency stability for data communication or other applications. The 789X-1 normally uses the frequency standard located in the associated 618Z-4 RF Translator.

789X-1 Specifications

MODES: USB with suppressed carrier, LSB with suppressed carrier, selectable-level carrier plus USB, LSB or both, compatible AM (USB or LSB plus carrier), CW, audio tone data.

AUDIO INPUT (TRANSMIT): Single test tone —26 dbm nominal; voice —34 VU nominal at 600 ohms, with line amplifiers.

IF OUTPUT (TRANSMIT): 20 peak millivolts maximum, 50 ohm impedance.

IF INPUT (RECEIVE): 5 microvolts to 100 millivolts, 50 ohms.

AUDIO OUTPUT (RECEIVE): —10 to +10 dbm nominal into 600 ohms (for single tone input above AGC threshold), with line amplifiers.

PRIMARY POWER INPUT: Derived from associated 618Z-4.

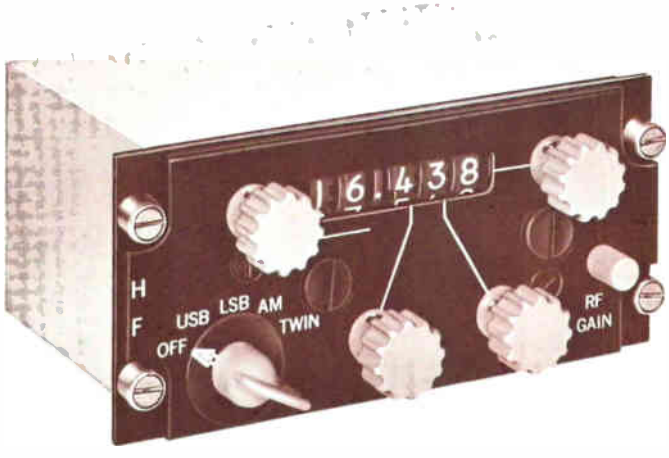
SIZE: ½ ATR; 4 7/8" W, 7⅜" H, 19 9/16" D (12.4 cm W, 19.4 cm H, 49.7 cm D).

WEIGHT: 12 lbs. (5.4 kg) minimum implementation; 25 lbs. (11.3 kg) fully implemented.

Related Equipment

618Z-4 RF Translator, p. 87
714Y-1,-2 Controls, p. 90
Racks and Cabinets, p. 91

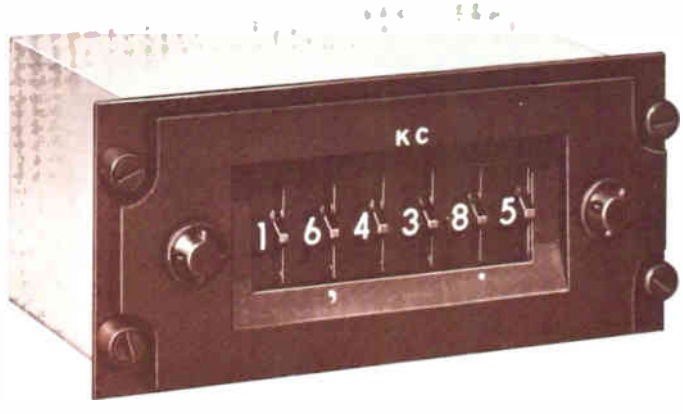
714Y-1 Control Unit



The 714Y-1 is a panel or console mounted control unit which permits selection of frequency, operating mode and RF gain level for a Collins Universal Radio Group receiver, exciter or exciter-receiver installation. Channel frequencies are indicated in a direct reading digital readout and can be selected in 1 kc increments throughout the 2.0-29.999 mc range. All frequency selection terminations are diode isolated to permit paralleling of control units.

Size: 5¾" W, 2⅝" H, 6" D (14.61 cm W, 6.67 cm H, 15.24 cm D). *Weight:* 2 lbs. (0.91 kg).

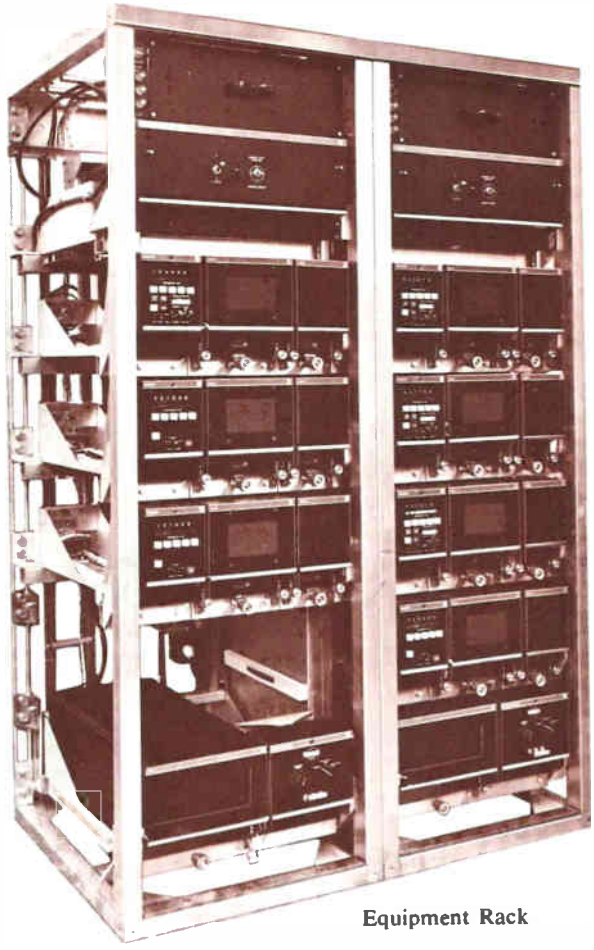
714Y-2 Control Unit



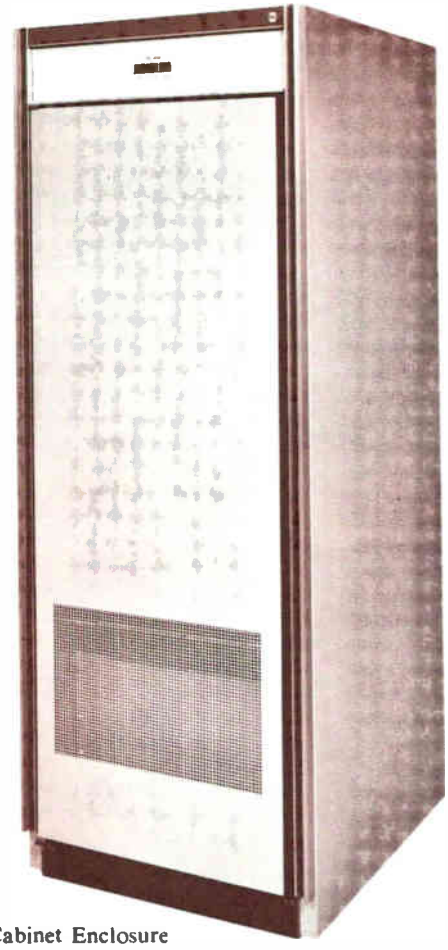
The 714Y-2 is a compact control unit for use with the Collins Universal Radio Group exciters, receivers or exciter-receivers. It allows remote selection of any of 280,000 channels with 0.1 kc spacing over the 2.0-29.9999 mc frequency range. Thumb-index type knobs provide direct digital readout of the operating frequency. All frequency selection terminations are diode isolated for 200 ma current to allow paralleling of control units.

Size: 5¾" W, 2 9/16" H, 6 9/32" D (14.61 cm W, 6.51 cm H, 15.95 cm D). *Weight:* 1 lb. (0.45 kg).

universal radio group Racks and Cabinets



Equipment Rack



Cabinet Enclosure

Features	Applications
Functional Enclosures	*Fixed Station*
ARINC Mounting	*Transportable*
Unified Appearance	*Shipboard*
Flexible Arrangement	*Airborne*

The Universal Radio Group racks and cabinets can be used to house receivers, exciters, receiver-exciters and control equipment in communication systems of varying degrees of complexity for a wide range of applications. The interior rack structure is fabricated of high strength aluminum channels and special hardware which can be easily erected with simple tools. Individual shelves can be located at any desired height. A wide variety of equipment installations can be accommodated by the flexible rack arrangements.

The racks can be enclosed by optional trim panels and flush mounted doors. The exterior finish is light gray enamel, and styling of the cabinet is identical with the Universal Radio Group power amplifier cabinets.

BASIC STRUCTURE

The interior rack consists of four vertical corner posts to which are attached horizontal members supporting the equipment mounting shelves. The most commonly used cabinet is 69″ high over-all; 22″ wide and 27¾″ deep. Other sizes are available for special installations. The rack depth accommodates ARINC Specification 404 long ATR (Air Transport Radio) units. Racks can be used with or without enclosure panels, as required by the type of installation. The racks are designed for solid mounting in all types of service except airborne. The individual shelves can be shockmounted for airborne applications.

COOLING

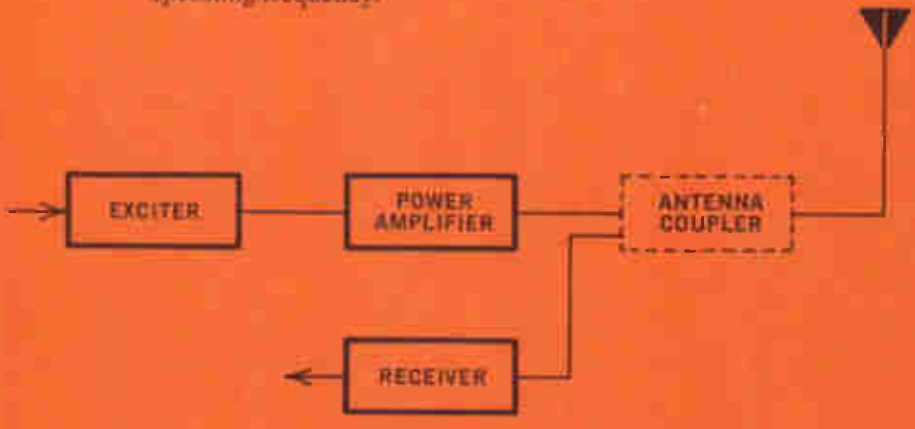
The system cooling air is supplied by a central blower located in the rack. Air distribution between racks in multiple rack installation is handled by external ducting.

WIRING

A distribution frame on each shelf interconnects power and control units within a system. It has high terminal density and is wired according to standard telephone practices. A rack distribution frame is provided at the top of the rack, accessible from the front, for all external wiring to the rack.

Antennas

Ground communication has posed many antenna problems, especially in the HF range where high gain antennas were inherently narrow in bandwidth. Recent development programs at Collins have led to a complete line of logarithmic periodic antennas covering the HF band. The radiation pattern and impedance of these antennas are relatively independent of frequency over wide bandwidths. The antennas shown on the following pages represent a major advance in the field and are especially effective in communication circuits requiring changes in operating frequency.



237B-1 Rotatable-Unidirectional HF Antenna

Features	Applications
Broadband Performance	*Fixed Station*
Unidirectional Operation	*Long Range*
Easily Erected	
Minimum Space	

The Collins 237B-1 is a rotatable-unidirectional HF antenna covering the 6.5-40.0 mc frequency range. The antenna provides a horizontally-polarized unidirectional beam 60° wide with a peak forward gain of 14 db. It is rated up to 50 kw PEP RF levels with less than 2:1 VSWR when terminating a 50 ohm coaxial transmission line. The array is mounted on a 90 ft. (27.4 meter) rotatable center pole supported by two side towers and a guying system. An impedance matching balun is self-contained in the radiating array structure to provide a 50 ohm coaxial input. A 50 ohm transmission line extends down inside the center pole through the rotating joint and elbow, and terminates in a 3⅛" EIA flange below the rotator. The motor supplied with the 143A-1 or 143A-1A Azimuth Control is installed internally in the rotator. The control is mounted on a standard 19" rack.

The high performance characteristics, comparable to a four element Yagi, make the 237B-1 well suited for use in long range military and commercial communication networks.

RUGGED CONSTRUCTION

The 237B-1 array and rotatable center pole are supported by two parallel 80 ft. (24.4 meter) triangular side towers and four guy cables. The motor, its control circuit, the gear reducer and rotary joint are located at ground level for easy maintenance. By opening the top split bearing, the mast and array can be lowered for maintenance. All exposed surfaces are protected by either heavy galvanizing or anodizing. The 237B-1 will withstand winds up to 120 mph (193 kmh).

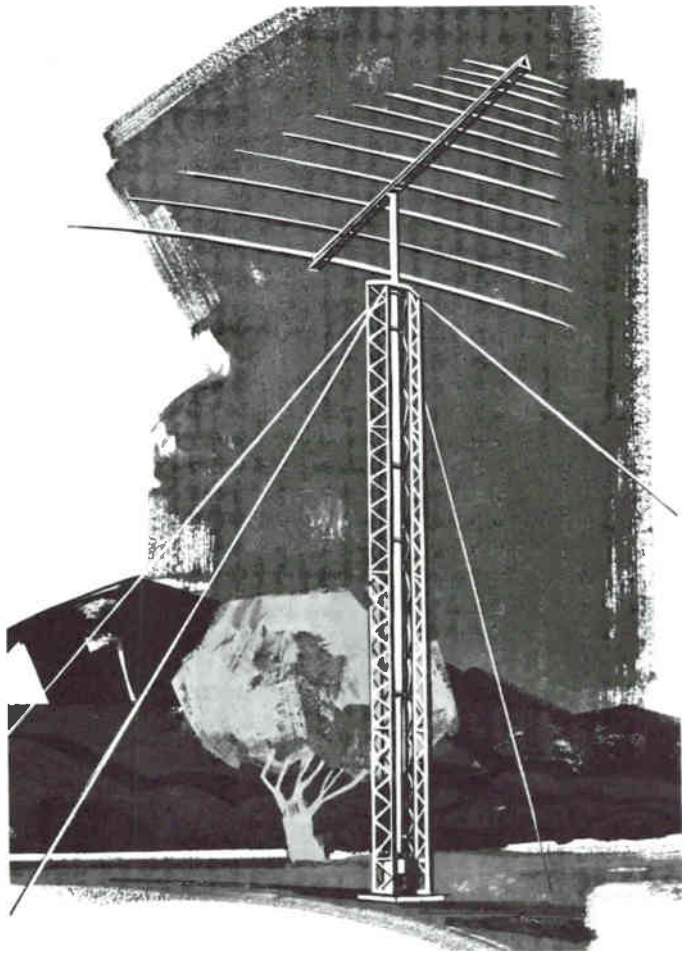
SPACE REQUIREMENTS

In addition to eliminating the requirement for several antennas at a communication facility, the 237B-1 requires a square plot of only 115 ft. (35 meters) per side or 0.31 acre.

Accessories

143A-1,-1A AZIMUTH ROTATION CONTROL

These rotation controls, when used with the 237B-1 antenna, provide remote selection of 30° increments of azimuth. Included with the 143A-1 or 143A-1A are the ½ hp motor and motor control which mount in the rotator. Also included is the control panel for installation at the remote operating position. A 16-conductor control cable is required between the antenna rotator and the remote control panel. Conductor size of #20 AWG can be used for separations up to 2,500 ft. (760 meters). The 143A-1 operates from a 60 cps source and the 143A-1A from 50 cps.



OBSTRUCTION LIGHT KIT

Two 111 watt, 115 v nonflashing beacon lights are provided for on the antenna array. A slip ring assembly mounted at the top bearing allows rotation of the light. A photo-electric switch facilitates operation in unattended installations.

FIELD ERECTION TACKLE KIT

A hand operated winch, winch line, tag lines and associated mounting hardware for lowering the center pole and boom without the use of heavy equipment are included.

Specifications

FREQUENCY RANGE: 6.5-40.0 mc.

POLARIZATION: Horizontal.

IMPEDANCE: 50 ohms.

VSWR: Less than 2:1 with respect to 50 ohms.

POWER HANDLING CAPABILITY: 50 kw peak; 25 kw average.

AZIMUTH BEAMWIDTH: 60° independent of frequency.

VERTICAL BEAMWIDTH: Varies with operating frequency.

PEAK GAIN: 14 db over isotropic; independent of operating frequency.

Specifications *(continued)*

FRONT-TO-BACK RATIO: 18 db average.

INPUT RF CONNECTOR: 3⅛" coaxial flange, coaxial bullet supplied.

OVER-ALL HEIGHT: 105 ft. (32 meters).

BOOM LENGTH: 61 ft. (18.6 meters).

LONGEST ELEMENT: 80 ft. (24.4 meters).

TOTAL WEIGHT: 13,800 lbs. (6,250 kg).

AZIMUTH ROTATION: 360° reversible.

WIND AND ICE LOADING: 120 mph (193 kmh) wind, no ice; 80 mph (129 kmh) wind, ¼" (6.35 mm) radial ice.

INSTALLATION AREA REQUIRED: 0.31 acre (1,225 sq. meters).

PACKAGED FOR SHIPMENT (export): Weight — 14,500 lbs. (6.590 kg): volume — 870 cu. ft. (24.6 cu. meters).

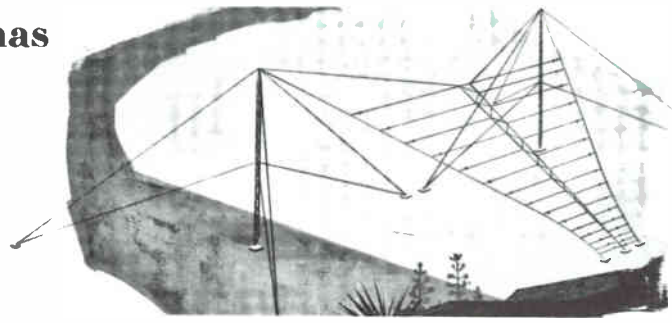
237C-1,-2 Unidirectional HF Antennas

Features

Broadband Performance
Unidirectional Operation
Constant Gain
Frequency Independent
Rugged Construction

Applications

Fixed Station
Short to Medium Range



The Collins 237C-1,-2 are unidirectional, log-periodic antennas for use in the 3-30 mc and 4-30 mc frequency ranges. Horizontal polarization makes them especially suited for reliable point-to-point communication over short to medium path lengths. They provide horizontally-polarized unidirectional beams 70° wide with a forward gain of 11 db. The antennas are power rated at 10 kw with low VSWR when terminating a 50 ohm coaxial line. Vertical radiation pattern is constant over the frequency range.

SIMPLIFIED CONSTRUCTION

The Alumoweld radiating elements are supported by Dacron catenaries from triangular guyed, galvanized steel towers. The vertex of the antenna feed point is secured at ground level to three concrete reinforced anchors. The antennas will withstand environmental conditions of 120 mph (193.08 kmh) winds with no ice or 50 mph (80.45 kmh) winds with one inch of radial ice.

SPACE REQUIREMENTS

Two towers support the 237C-2 array, and three are used with the 237C-1 because of the wider antenna span required for 3 mc operation.

Accessories

OBSTRUCTION LIGHT KIT

Kit consists of dual-lamp, nonflashing beacon with tower mounting hardware. Photocell switch control permits unattended operation. Power source of 115 v ac, 50 or 60 cps, is required at tower base for long life, 111 watt lamps.

GROUND SCREEN KIT

The ground screen is a 16-foot square section of copper mesh and 36 copper wire radials. Ends of the radials attach to the copper mesh and radiate at 10° intervals in a circular pattern. Center of the ground system is located directly under the feedpoint of the antenna.

FERRITE IMPEDANCE TRANSFORMER KIT

Transformers are available for receiving or transmitting with mounting hardware and feed straps to match the 237C-1 and 237C-2 arrays to the 50 ohm transmission line.

SUPPORT TOWER, GUY AND ANCHOR KIT

Disassembled steel towers, all assembly hardware, base shoes, guy strand and fittings, anchor rods and attachment points for the array are included in the kit.

Specifications

FREQUENCY RANGE: 237C-1 — 3-30 mc; 237C-2 — 4-30 mc.

VSWR: 2:1 nominal; 2.5:1 peak.

POLARIZATION: Horizontal.

GAIN: 11.8 db over isotropic.

POWER CAPABILITY: 10 kw peak or average.

INPUT IMPEDANCE: 50 ohms unbalanced.

AZIMUTH BEAMWIDTH: Nominally 70°.

VERTICAL BEAMWIDTH: Upper half-power point nominally 68°; lower half-power point nominally 18°.

WIND AND ICE LOADING: 120 mph (193 kmh) wind, no ice; 80 mph (129 kmh) wind, ¼ inch (6.35 mm) radial ice.

	237C-1	*237C-2*
Height (over-all)	140 ft. 42.67 meters	120 ft. 36.58 meters
Tower spacing required	234 ft. 71.32 meters	207 ft. 63.09 meters
Installation area required	363 x 286 ft. 110.64x87.17 meters	330 x 265 ft. 100.58x80.77 meters

237N-1C,-2C Unidirectional HF Antennas

Features	Applications
Broadband Performance	*Fixed Station*
Rugged Construction	*Long Range*
Unidirectional Operation	*Short Range*

The 237N-1C and 237N-2C log-periodic antennas cover wide frequency ranges of 2-30 mc and 4-30 mc, respectively. The antennas provide a vertically-polarized unidirectional pattern with a gain of 5 db over a resonant quarter wave monopole in the same environment. The antennas are rated at 10 kw PEP and average and provide a VSWR of less than 2:1 with respect to 50 ohms.

The antennas are well suited for directional groundwave communication. The low angle radiation is ideal for long range circuits, particularly if the antenna is installed near the ocean.

RUGGED CONSTRUCTION

The shunt excited radiating elements are suspended between a catenary and the ground screen to provide a grounded structure. The catenary connects between a rear steel tower and short wooden pole.

The antennas will withstand winds up to 120 mph (193.08 kmh) with no ice or 50 mph (80.5 kmh) with 1 inch of radial ice.

Accessories

GALVANIZED STEEL SUPPORT TOWER AND GUY KIT

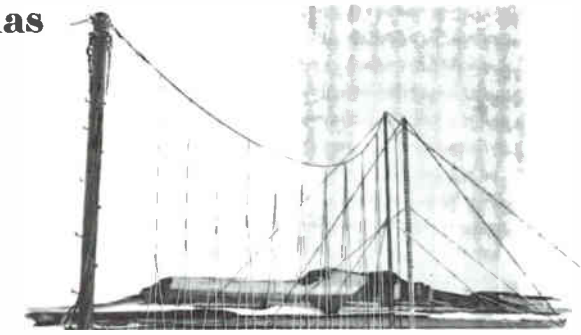
The kit consists of disassembled, triangular, galvanized steel towers, all assembly hardware, base shoes, guy strand and fittings, anchor rods and attachment points for the antenna.

OBSTRUCTION LIGHT KIT

A dual-lamp, nonflashing beacon is supplied with all tower mounting hardware. Photocell switch control permits unattended operation. Power source of 115 v ac, 50 or 60 cps, required at tower base for long-life, 111 watt lamps.

FERRITE TRANSFORMER KIT

Transformers are available for receiving or transmitting.



Mounting hardware and feed straps are supplied. Transformers mount at the short end of the array on pads or posts.

GROUND SCREEN KIT

The ground screen includes copper wire and installation hardware for each antenna.

Specifications

FREQUENCY RANGE: 237N-1C — 2-30 mc.
237N-2C — 4-30 mc.

VSWR: 2:1.

POWER CAPABILITY: 10 kw peak or average.

INPUT IMPEDANCE: 50 ohms unbalanced.

AZIMUTH BEAMWIDTH: 110°.

VERTICAL BEAMWIDTH: Upper half-power point approximately 38°*, lower half-power point 5°*. (*Depends on soil conductivity.)

GAIN: 5 db over resonant ¼ wave monopole test antenna in same environment.

POLARIZATION: Vertical.

SPACE REQUIREMENTS:

	237N-1C	*237N-2C*
Rear tower height	150 ft. 45.72 meters	80 ft. 24.4 meters
Center pole height	80 ft. 24.4 meters	
Forward pole height	20 ft. 6.1 meters	20 ft. 6.1 meters
Ground screen dimensions (over-all)	275 x 609 ft. 83.8 x 185.6 meters	135 x 346 ft. 41.1 x 105.5 meters

(Poles are not furnished with the antennas.)

437C-1A,-2A,-3A Broadband Monopole Antennas

Features	Applications
Broadband Performance	*Fixed Station*
Omnidirectional Radiation	*Short Range*
Rugged Construction	*Long Range*
Prefabricated Components	

The 437C-1A,-2A,-3A Antennas are vertically polarized and each has a 10:1 frequency coverage. Continuous operation over the frequency range is accomplished without switching. All guys are broken with insulators. A static drain coil and spark gap provide lightning protection.

The VSWR is well below 2:1 over 90% of the frequency range with respect to 50 ohms. Peak VSWR of 3:1 can occur at some frequencies.

The 437C antennas, using a galvanized steel pad rather than a concrete footing for the support tower, can be erected in 15 man hours. The galvanized steel tower with high strength Alumoweld radiating wires withstands winds of up to 120 mph (193 kmh).

SPACE REQUIREMENTS

The antennas are similar in mechanical configuration, varying only in size.

Accessories

SUPPORT TOWER KIT

The kit consists of a high strength steel tower with assembly hardware and array attachment points. Basic length of each section is 10 ft. (3.048 meters).

GROUND SCREEN OR COUNTERPOISE KIT

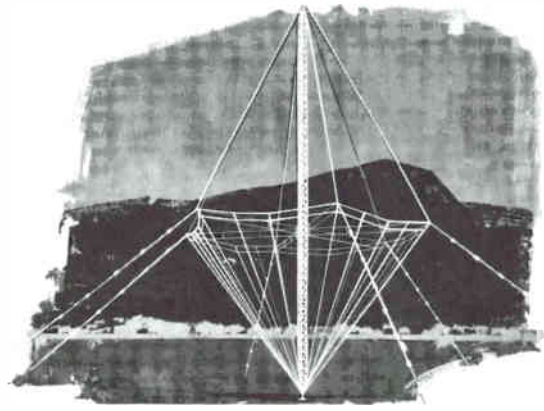
The kit includes soft copper wire for 36 radials supplied in proper lengths with ground stakes and clamps. The ground screen can be trenched, surface mounted or suspended, depending on soil conditions.

FIELD ERECTION KIT

The kit includes an "A" frame, lifting guy, hand winch, and tag lines to erect the antenna without need of crane or winch truck. Hardware common to all three antennas is supplied.

OBSTRUCTION LIGHT KIT

The kit consists of a dual-lamp, nonflashing beacon with photocell control for unattended operation. It includes RF isolation coils for 115 v ac, 50 or 60 cps, power required at tower base for 111 watt, long-life lamps. Kit is common to all three antennas.



Specifications

FREQUENCY RANGE: 437C-1A — 2-20 mc. 437C-2A — 2.5-25.0 mc. 437C-3A — 3-30 mc.

POLARIZATION: Vertical.

AZIMUTH COVERAGE: Omnidirectional.

GAIN: Comparable to ¼ wavelength monopole.

INPUT IMPEDANCE: 50 ohms unbalanced.

VSWR: 2.5:1 nominal; 3:1 peak.

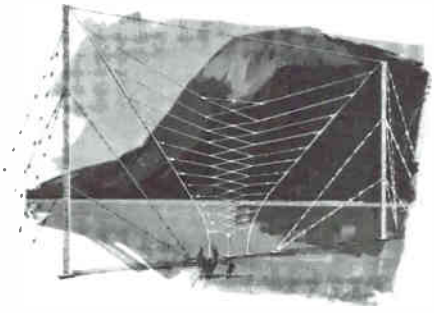
POWER CAPABILITY: 50 kw PEP or average.

WIND AND ICE LOADING: 120 mph (193.08 kmh) with no ice; 50 mph (80.45 kmh) with 1 inch radial ice.

SPACE REQUIREMENTS:

	437C-1A	*437C-2A*	*437C-3A*
Antenna height	108 ft. 32.9 meters	88 ft. 26.8 meters	68 ft. 20.7 meters
Ground screen diameter	240 ft. 73.15 meters	210 ft. 64 meters	160 ft. 48.8 meters

437G-2A Broadband Dipole Antenna



Features	Applications
Broadband Operation	*Fixed Station*
Skywave Propagation	*Short Range*
Horizontal Polarization	*Medium Range*
	Ground-to-Air

The 437G-2A Broadband Dipole Antenna utilizes modified log-periodic principles for HF skywave propagation over short and medium path lengths in the 2.5-30.0 mc frequency range. It overcomes limitations of groundwave communication over short distances by utilizing high angle skywave propagation at the lower frequencies. Maximum radiation in the vertical plane occurs at lower take-off angles as the frequency is increased to accommodate propagation over longer paths. Horizontal polarization minimizes ground losses and does not require a ground screen, simplifying installation.

RUGGED CONSTRUCTION

The antenna is constructed of Copperweld radiating elements suspended in a shoe-lace manner between Dacron catenaries. The array is supported by two galvanized steel towers and will withstand winds up to 120 mph (193.08 kmh).

SPACE REQUIREMENTS

The two 100 ft. (30.5 meter) towers are located 204 ft. (62.2 meters) apart. Installation area necessary is 360 ft. (109.7 meters) by 160 ft. (48.8 meters).

Accessories

OBSTRUCTION LIGHT KIT

The kit consists of a dual-lamp, nonflashing beacon with tower mounting hardware. Photocell switch control permits unattended operation. Requires 115 v ac, 50 or 60 cps, at the tower base to power the 111 watt, long-life lamps.

FERRITE BALUN

A receiving or transmitting ferrite balun to match the 437G-2A array to a 50 ohm coaxial cable is supplied with pole mounting hardware (mounting pole not included).

TOWER AND GUY KIT

This kit includes two 100 ft. (30.48 meter) steel towers with assembly hardware, anchors and array attachment points. Basic length of each galvanized tower section is 10 ft. (3.048 meters). Guys complete with strain insulators are prefabricated in sections.

Specifications

FREQUENCY RANGE: 2.5-30.0 mc.

POLARIZATION: Horizontal.

AZIMUTH BEAMWIDTH: Comparable to ½ wave dipole at the same effective height.

GAIN: Comparable to ½ wave dipole.

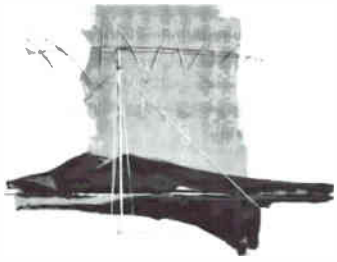
INPUT IMPEDANCE: 50 ohms unbalanced.

VSWR: 2.5:1 nominal; 3:1 maximum.

POWER CAPABILITY: 10 kw average or peak.

WIND AND ICE LOAD: 120 mph (193.08 kms) with no ice; 60 mph (96.54 kms) with 1 inch radial ice.

637B-1A Transportable Rotatable HF Antenna



Features	Applications
Broadband Performance	*Transportable System*
Unidirectional Operation	*Medium Range*
Rapid Installation	*Long Range*
Rotatable	

The 637B-1A is a horizontally-polarized, rotatable log-periodic, unidirectional antenna that provides highly efficient operation over the 6.5-30.0 mc frequency range. It is designed specifically for use with transportable HF communication systems over a wide range of path distances.

A horizontally-polarized, unidirectional beam 65° wide has a peak forward gain of 12 db. The 637B-1A is rated at 10 kw with a low VSWR. A 50 ft. (15.24 meter) mast supports the array. The shunt-fed antenna and mast are at ground potential and require no additional lightning protection.

EASILY ERECTED

Lightweight, high strength materials are used to achieve an antenna that is easily assembled and erected by nonskilled technicians. It can be placed in service by two men in approximately three hours. A versatile power unit is used for driving anchors, raising antenna, and rotating antenna array following erection.

SPACE REQUIREMENTS

Storage volume is only 100 cu. ft. (2.83 cu. meters). Installation area is 90 ft. (27.43 meters) by 135 ft. (41.15 meters).

Specifications

FREQUENCY RANGE: 6.50-30.0 mc.

AZIMUTHAL BEAMWIDTH: 65°.

VERTICAL BEAMWIDTH: Varies with frequency.

VSWR: 2:1 nominal; 2.5:1 peak.

INPUT IMPEDANCE: 50 ohms unbalanced.

FORWARD GAIN: 12 db.

POWER CAPABILITIES: 10 kw PEP or average.

EXTERNAL POWER REQUIREMENTS: 115 v ac, 50-60 cps, single phase, 750 watts.

AZIMUTH ROTATION: ±180°.

WIND LOAD: 60 mph (96.54 kmh), no ice.

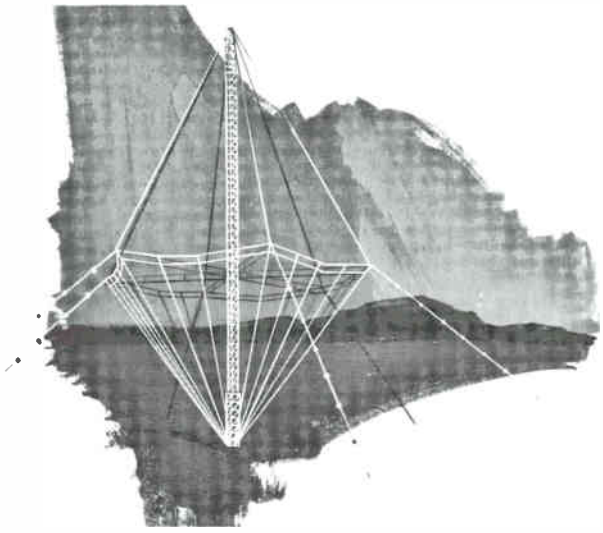
TOTAL WEIGHT: 1200 lbs. (544.32 kg).

STORAGE VOLUME: 100 cu. ft. (2.83 cu. meters).

637C-3 Transportable Broadband HF Antenna

Features	Applications
Broadband Performance	*Transportable System*
Low Angle Radiation	*Short Range*
Rapid Installation	*Long Range*
	Ground-to-Air

The 637C-3 Transportable Broadband HF Antenna is a vertically-polarized monopole antenna, ideally suited for transportable HF communication systems. Low angle radiation patterns provide both short and long range HF communication by groundwave and skywave propagation. The antenna has continuous coverage of the 3-30 mc frequency range



without switching, and handles a VSWR of less than 3:1 and an average power of 10 kw. Standard equipment includes erection kit, ground screen kit, transit frames and cases.

EASILY ERECTED

The 637C-3 consists of a phosphor-bronze wire radiating structure supported by a 70 ft. (21.3 meter) collapsible aluminum tower. A hand winch is supplied with the "A" frame erection kit. The antenna can be assembled and erected from the ground by four men in three hours.

SPACE REQUIREMENTS

Over-all height is 70 ft. (21.3 meters) with a ground screen radius of 80 ft. (24.4 meters). Total weight of the 637C-3 is 450 lbs. (204.1 kg).

Specifications

FREQUENCY RANGE: 3-30 mc.

POLARIZATION: Vertical.

AZIMUTHAL COVERAGE: Omnidirectional.

GAIN: Comparable to ¼ wavelength monopole.

INPUT IMPEDANCE: 50 ohms unbalanced.

VSWR: 2.5:1 nominal; 3:1 peak.

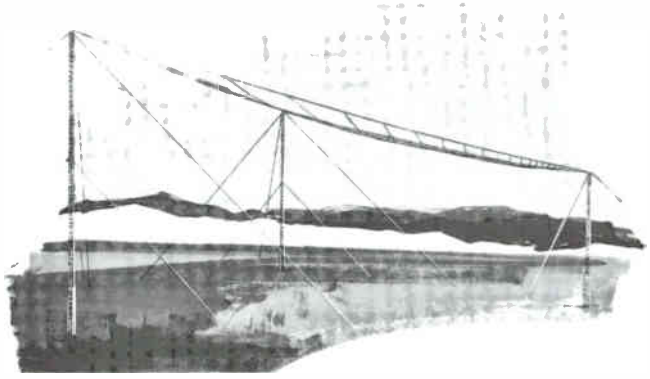
POWER CAPABILITY: 10 kw PEP or average.

WIND LOADING: 60 mph (96.54 kmh) with no ice.

STORAGE SPACE: 26 cu. ft. (0.74 cu. meters).

WEIGHT: 450 lbs. (204.1 kg).

637E-1 Transportable Unidirectional HF Antenna



Features

Broadband Performance
Lightweight Construction

Applications

Transportable System
Short-Medium Range
Long Range

The 637E-1 is a horizontally-polarized, log-periodic antenna for use in transportable communication systems operating in the 3-30 mc frequency range. It provides a horizontally-polarized beam 60° wide with forward gain of 11 db. Power rating is 10 kw.

The antenna is supported by two 70 ft. (21.3 meter) and one 40 ft. (12.19 meter) triangular aluminum, guyed towers which may be knocked down and stored within their base sections. The three storage frames are each 10 ft. (3.05 meters) by 1½ ft. (0.46 meter) by 1½ ft. (0.46 meter). Two transit cases for the antenna array and accessories are 2 ft. (0.61 meter) by 2 ft. (0.61 meter) by 1½ ft. (0.46 meter). Total weight is 850 lbs. (385.56 kg). Equipment supplied includes erection tools and a ferrite transformer.

PREFABRICATED CONSTRUCTION

The antenna uses color coded hardware to facilitate erection. It can be erected in two hours by five men without need for climbing towers. Anchor installation varies depending on local soil conditions.

SPACE REQUIREMENTS

Installation area necessary is a 240 ft. (73.15 meter) by 250 ft. (76.2 meter) plot. Weight is 850 lbs. (385.56 kg). Storage volume is 60 cu. ft. (1.6999 cu. meters).

Specifications

FREQUENCY RANGE: 3-30 mc.

AZIMUTHAL BEAMWIDTH: 60°.

VERTICAL PATTERN: Varies with frequency.

FORWARD GAIN: 11 db over isotropic.

VSWR: 2:1 nominal; 2.5:1 peak.

INPUT IMPEDANCE: 50 ohms unbalanced.

POWER CAPABILITY: 10 kw peak or average.

WIND LOAD: 70 mph (112.63 kmh) with no ice.

STORAGE VOLUME: 60 cu. ft. (1.699 cu. meters).

WEIGHT: 850 lbs. (385.56 kg).

Comparison of Collins HF Antennas

TYPE NUMBER	DESCRIPTION	FREQUENCY RANGE (mc)	APPLICATION	GAIN** (db)	PEAK ENV. POWER (kw)	POLARIZATION	AZIMUTH BEAMWIDTH	VERTICAL BEAMWIDTH (half power points) UPPER	VERTICAL BEAMWIDTH (half power points) LOWER	CONSTRUCTION
237B-1	rotatable LP	6.5-40.0	medium-long range, unidirectional	14	50	horizontal	60°	***	***	planar log periodic
237C-1	fixed wire LP	3-30	short-medium range, unidirectional	11.8	10	horizontal	70°	68°	18°	sloping planar log periodic
237C-2	fixed wire LP	4-30	short-medium range, unidirectional	11.8	10	horizontal	70°	68°	18°	sloping planar log periodic
237N-1C	fixed wire LP	2-30	short-long range unidirectional	5*	10	vertical	110°	approx. 38°	approx. 5°	log periodic
237N-2C	fixed wire LP	4-30	short-long range unidirectional	5*	10	vertical	110°	approx. 38°	approx. 5°	log periodic
437C-1A	broadband monopole	2-20	short-long range omnidirectional	****	50	vertical	360°	.....	.....	two base-to-base wire cones
437C-2A	broadband monopole	2.5-25.0	short-long range omnidirectional	****	50	vertical	360°	.....	.....	two base-to-base wire cones
437C-3A	broadband monopole	3-30	short-long range omnidirectional	****	50	vertical	360°	.....	.....	two base-to-base wire cones
437G-2A	fixed wire LP dipole array	2.5-30.0	short-medium range omnidirectional	*****	10	horizontal	*****	***	***	log periodic
637B-1A	transportable rotatable LP	6.5-30.0	medium-long range unidirectional	12	10	horizontal	65°	***	***	log periodic
637C-3	transportable broadband monopole	3-30	short-long range omnidirectional	****	10	vertical	360°	.....	.....	two base-to-base wire cones
637E-1	transportable fixed wire LP	3-30	short-medium-long range unidirectional	11	10	horizontal	60°	***	***	log periodic

*Gain in db above ¼ wave vertical radiator.
**Compared with isotropic radiator.
***Varies with frequency.
****Comparable to ¼ wave monopole.
*****Comparable to ½ wave dipole.

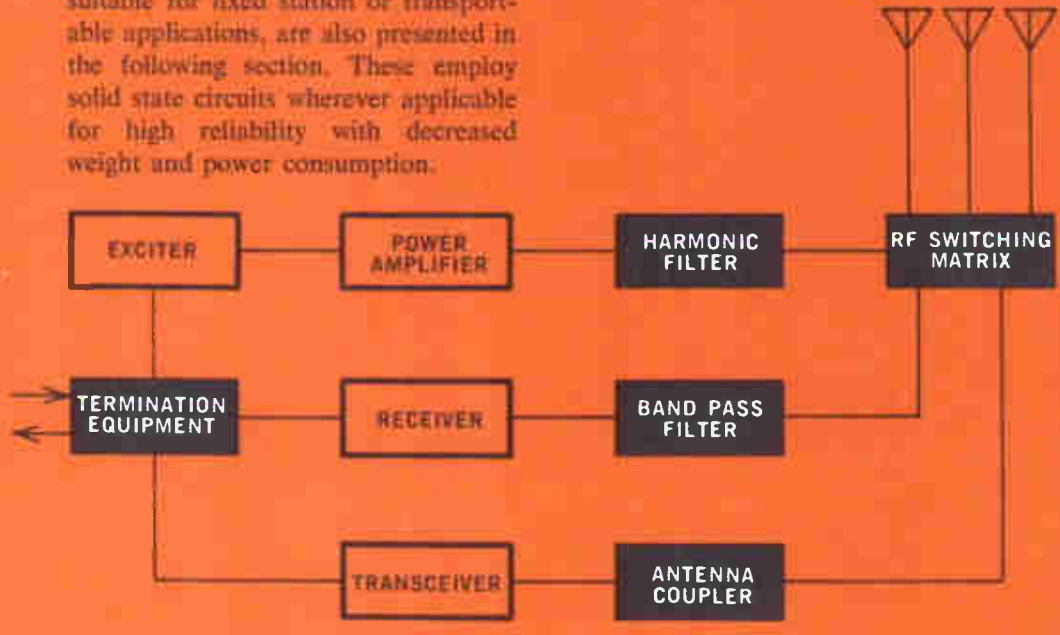
Antenna Couplers and Accessories

Collins offers a complete line of antenna couplers, line flatteners, receiver band-pass filters and RF switching units for use in HF communication systems. The accessory line also includes 400 cps primary power inverters.

The first HF airborne coupler built by Collins appeared in the late 1940's. Since that time approximately 25,000 units have been produced and about 80% of these have been automatic types. Highly efficient couplers are available for airborne, vehicular, transportable, fixed station and marine communication applications.

Receiver filters allow closely spaced receivers and transmitters to function properly with minimum frequency separation. An RF Uniswitch building block for antenna switching enables the assembly of RF matrices which can be remotely controlled.

Automatic dial service switchboards, suitable for fixed station or transportable applications, are also presented in the following section. These employ solid state circuits wherever applicable for high reliability with decreased weight and power consumption.



180L-2, -3, -3A Antenna Couplers

Features	Applications
Automatic Operation	*Airborne HF System*
FAA-TSO Certification	*Wire Antenna*
VSWR Indicator	

The 180L-2,-3,-3A Antenna Couplers automatically resonate a fixed wire or grounded antenna within the frequency range of 2-22 mc. An effective 50 ohm nominal antenna resistance is maintained while compensating for reactance at all operating frequencies. The 180L series can be used with transmitters or transceivers with average power output levels between 50 and 180 watts and up to 500 watts PEP.

180L-3 Antenna Coupler

SYSTEM APPLICATION

Especially suited for use with HF airborne transceivers, such as the Collins 618S and 618T, these couplers will match any fixed wire antenna between 45 and 100 ft. in length, as well as similar grounded end antennas. A front panel VSWR indicator provides an independent check on tuning operation.

RELAY OPTIONS

The 180L-2,-3,-3A Couplers are identical in design with the exception of an antenna transfer relay included in the 180L-3 and 180L-3A and an antenna grounding relay in the 180L-3A. The transfer relay connects the antenna to the receiver when the transmitter is unkeyed. The grounding relay connects the unused antenna to ground in a dual installation.

Specifications

FREQUENCY RANGE: 2-22 mc.

TUNING ACCURACY: Better than 1.3:1 VSWR at most frequencies within the range.

POWER REQUIREMENTS: 27.5 v, 3.5 amps maximum; 115 v, 400 cps, 1 phase, 20 va maximum; 250 v dc, or 400 v dc, 35 ma maximum.

RF POWER INPUT: 500 watts PEP and 50-180 watts average.

INPUT IMPEDANCE: 50 ohms nominal.

RF DUTY CYCLE: 5 minutes on, 5 minutes off for full power.

TUNING TIME: 30 seconds maximum; as low as 5 seconds minimum.

ALTITUDE: 30,000 ft. maximum.

AMBIENT TEMPERATURE: −40° C to +55° C.

SIZE AND WEIGHT:

	Size			*Weight**
	W	*H*	*D*	
180L-2 (without shock-mount)	10⅜" 26.35 cm	7 11/16" 19.53 cm	11⅜" 28.89 cm	20 lbs. 9.07 kg
180L-3,-3A (without shock-mount)	10⅜" 26.35 cm	7 11/16" 19.53 cm	13⅞" 35.24 cm	21 lbs. 9.53 kg
350D-3 mounting	10⅜" 26.35 cm	1½" 3.81 cm	11¾" 29.85 cm	

*Weights include shockmount.

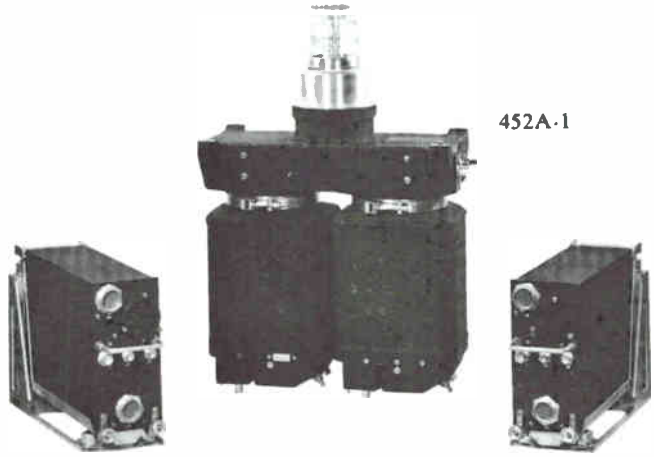
180R-4 Antenna Coupler and 309A-1 Coupler Control Unit

Features	Applications
Automatic Operation	*Airborne HF System*
Low VSWR	*Tail-Cap Antenna*
FAA-TSO Certification	
Lightning Protection	
Explosion Proof	

Together the 180R-4 and the 309A-1 automatically match HF communication transmitters or receivers to an aircraft tail-cap antenna and can be used at power levels of 50-1000 watts PEP, 400 watts average, covering the 2-30 mc frequency range. A remote indicator can be used to show completion of tuning cycle.

ASSOCIATED HF TRANSMITTER-RECEIVERS

Antenna coupler systems are compatible with the following



309A-1 180R-4 180R-4 309A-1

transmit-receive systems: Collins 18Z-3,-4, 18S-4, 618S, 618T, AeroCom Atom-Star-Pack HF systems and military equivalents.

ANTENNA COUPLER CONFIGURATIONS

A type 452A-1 Lightning Arrester is mounted rigidly to the airframe adjacent to the antenna feed point. Either one or two 180R-4 couplers can be clamped to this assembly, permitting a single or dual transmit-receive system to use the antenna. The single coupler and associated control comprise a Collins AT-101 System, and the dual coupler and controls, the AT-102 System. Control circuits are located in the separate 309A-1 Coupler Control Units to simplify system installation and to facilitate maintenance. Two optional type 156G-1 receiver coupler modules plug into the 309A-1, permitting additional receivers to be used for monitoring.

EFFICIENT COOLING

A pressurized case with an internal blower permits operation to 50,000 feet with only 25 cubic inches of make-up air per hour to compensate for minor leaks. The coupler system is explosion-proof and meets Paragraph 4.13.2, Procedure 2 of MIL-E-5272 Specification.

Specifications

FREQUENCY RANGE: 2-30 mc.

TUNING ACCURACY: Within 1.3:1 VSWR for all service conditions at nominal supply voltages.

POWER REQUIREMENTS: 115 v, 380-420 cps, single phase, 2.5 amps maximum.

RF POWER INPUT: 50-1000 watts PEP; 400 watts average maximum.

ANTENNA TERMINAL VOLTAGE: Must not exceed 9000 v peak.

INPUT IMPEDANCE: 50 ohms.

RF DUTY CYCLE: 5 minutes on and 5 minutes off for high power transmitters. Continuous duty operation for 100 watt transmitters.

TUNING TIME: Below 2.5 mc, 10 seconds maximum; above 2.5 mc, 7 seconds maximum.

ALTITUDE: 50,000 feet with 25 cubic inches/hour (409.75 cu. cm/hr.) external make-up air to compensate for minor enclosure leaks.

AMBIENT TEMPERATURE: −55° C to +60° C.

SIZE:	*W*	*H*	*D*
452A-1	7½" 19.05 cm	14 7/32" 36.12 cm	16⅝" 42.23 cm
180R-4	7 7/16" 18.89 cm	11 5/32" 28.34 cm	5 9/16" 14.13 cm
309A-1 and mount, including sway space	4 19/32" 11.67 cm	9 5/16" 23.65 cm	16 21/32" 42.31 cm

WEIGHT:	
AT-101 System (180R-4, 309A-1, 452A-1)	39.35 lbs. 17.85 kg
AT-101A System (AT-101 with an additional 156G-1 plug-in receiver coupler module)	40.35 lbs. 18.3 kg
AT-102 System (two 180R-4's, two 309A-1's and one 452A-1)	68.4 lbs. 31.03 kg

DESIGNATION: Antenna Tuning Systems AT-101, AT-101A and AT-102 meet FAA-TSO-C31a, Category A.

180R-6 Antenna Coupler and 309A-2, -2D Coupler Controls

Features	Applications
Automatic Operation	*Airborne HF System*
Low VSWR	*Wire Antenna*
Installation Flexibility	
Lightning Protection	

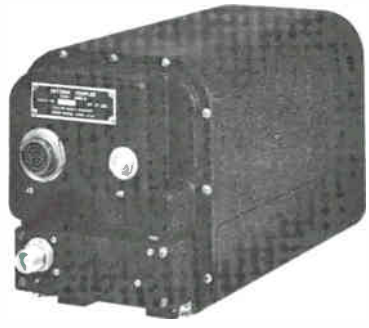
The 180R-6 and the 309A-2,-2D comprise a complete antenna tuning system to automatically resonate 45-100 ft. wire antennas over the 2-30 mc frequency range. It will handle 50-1000 watt PEP, 400 watt average power levels. A transfer relay permits use of a separate transmitter and receiver with a common antenna.

SYSTEM APPLICATION

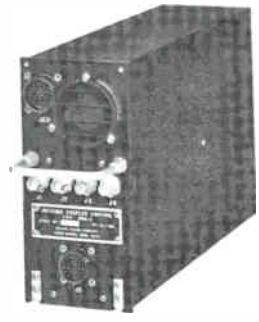
The 180R-6 and 309A-2,-2D Controls are especially suited for operation with the Collins 18Z-3,-4 or 618T HF Transceivers. The 309A-2 Coupler Control is used with the 18Z-3, -4 and the 309A-2D with the 618T.

EASILY INSTALLED

The 180R-6 houses only the loading and phasing components



180R-6 Antenna Coupler



309A-2D Coupler Control

for resonating the antenna and matching the 50 ohm transmission line impedance, while all control circuits are located in the 309A. This arrangement allows the 180R-6 to be located at the antenna feed point for maximum efficiency. The 309A can be placed in the radio rack to facilitate inspection and maintenance. The addition of optional plug-in 156G-1 modules in the coupler control permits the use of up to three additional receivers for monitoring other frequencies. The coupler control uses plug-in subassemblies to simplify inspection and maintenance procedures.

Specifications

FREQUENCY RANGE: 2-30 mc.

TUNING ACCURACY: Within 1.3:1 VSWR for all service conditions at nominal supply voltages.

POWER REQUIREMENTS: 115 v, 380-420 cps, 2 amps, maximum.

RF POWER INPUT: 50-1000 watts PEP; 400 watts average maximum.

INPUT IMPEDANCE: 50 ohms nominal.

RF DUTY CYCLE: Continuous for SSB and AM; 5 minutes on, 5 minutes off, maximum for continuous 400 watt single tone.

TUNING TIME: 30 seconds maximum.

ALTITUDE: 20,000 ft. maximum, nonpressurized model. A pressurized model, 180R-7, may be operated to 75,000 ft.

AMBIENT TEMPERATURE: −55° C to +71° C, operating; −65° C to +85° C, storage.

SIZE AND WEIGHT:

	Size W	Size H	Size D	Weight
180R-6	7" 17.78 cm	9½" 24.13 cm	17 7/32" 43.74 cm	21.5 lbs. 9.75 kg
180R-6 with lightning arrestor	7" 17.78 cm	9½" 24.13 cm	29 19/32" 75.17 cm	24.5 lbs. 11.1 kg
309A-2,-2D	3 11/16" 9.37 cm	7⅝" 19.37 cm	14½" 36.83 cm	12.4 lbs. 5.62 kg
309A-2,-2D with three optional 156G-1 receiver couplers				14 lbs. 6.35 kg

180R-6A Line Flattener and 309A-2E Control

Features

Automatic Operation
Fifty Ohm Coaxial Lines
Low VSWR
Easily Installed

Applications

Fixed Station
Transportable
Shipboard

309A-2E Control

180R-6A Line Flattener

The 180R-6A and 309A-2E comprise an efficient system to automatically match the 50 ohm output of a power amplifier, transmitter or transceiver to an antenna feed line over the 2-30 mc frequency range. It will maintain a 1.3:1 VSWR from terminations with up to 3:1 VSWR at power levels of up to 1 kw PEP, 400 watts average.

SYSTEM APPLICATION

Designed specifically for use with SSB power amplifiers, such as the Collins 548L-4, it is ideally suited for fixed station, transportable or shipboard installations. The loading and phasing components are housed in the 180R-6A, while the control circuits are housed in the 309A-2E. Plug-in subassemblies in the 309A-2E simplify maintenance.

Specifications

FREQUENCY RANGE: 2-30 mc.

VSWR: 1.3:1 VSWR or less.

ANTENNA: 3:1 VSWR maximum.

POWER REQUIREMENTS: 115 v, 380-420 cps, and 27.5 v dc, 2 amps.

RF POWER INPUT: 50-1000 watts PEP; 400 watts average maximum.

INPUT IMPEDANCE: 50 ohms nominal.

RF DUTY CYCLE: Continuous for SSB and AM; 5 minutes on, 5 minutes off, maximum for RTTY (1000 watts average power).

TUNING TIME: 30 seconds maximum.

ALTITUDE: 20,000 ft. maximum.

SIZE AND WEIGHT:

	Size W	Size H	Size D	Weight
180R-6A	7" 17.78 cm	9½" 24.13 cm	17 7/32" 43.74 cm	19.5 lbs. 8.85 kg
309A-2E	3 11/16" 9.37 cm	7⅝" 19.37 cm	14½ 36.83 cm	11.75 lbs. 5.33 kg

180R-12 Antenna Coupler and 309A-9 Coupler Control Unit

Features

Automatic Operation
FAA-TSO Certification
Protective Circuitry

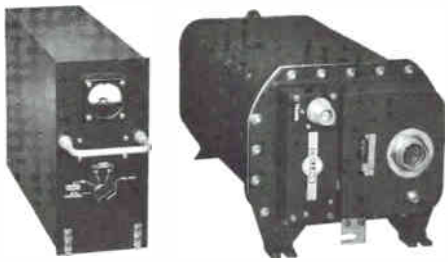
Applications

Boeing 727 Aircraft
Boeing 707 Aircraft
Boeing KC-135 Aircraft

The 180R-12, together with the 309A-9, automatically matches the RF impedance of communication equipment operating in the 2-30 mc frequency range to an aircraft probe-type antenna. The system is automatically tuned in 16 seconds maximum. Typical tuning time is five seconds.

AIRCRAFT APPLICATIONS

The 180R-12 Antenna Coupler, designed for the Boeing 727, can be retrofitted for the 707 or KC-135 aircraft by the addition of airframe cabling and moving a tap on an RF coil. It



309A-9 Coupler Control 180R-12 Antenna Coupler

will operate up to 1200 watt PEP RF power levels and is compatible with Collins' 618S, 618T, AN/ARC-58 or AeroCom (Atom-Star and TR-192 transceivers). With minor modifications of the 309A-9 control, the AT-144 and AN/ARC-21 transceivers can also be accommodated.

DEMAND SURVEILLANCE

During transmission, the input to the coupler is continuously monitored for VSWR; however, the servo loop is activated only during tuning or when the VSWR exceeds preset limits, contributing greatly to increased component life. All coupler components are tested for high reliability and provide in excess of 2000 hours MTBF.

PROTECTIVE DEVICES

High voltage protection is provided by a ball gap that will fire at a voltage lower than that required to cause internal or external arcing. This activates a circuit that will cut off the transmitter power within 50 milliseconds. In the event the protective circuits function because of coupler depressurization, the transmitter can be rechanneled to a new operating frequency, and if excessive voltage does not exist at that frequency, the coupler will tune properly.

In the receiving function, the discriminators are protected against lightning transient damage. Temperature sensors maintain the ambient temperature within correct operational limits. A sensor also removes RF power if internal air temperature exceeds 100° C.

COOLING

A blower in the 180R-12 coupler circulates internal air around the components and through the double-walled, sealed case which acts as a heat exchanger. The coupler is impervious to Skydrol 500 hydraulic fluid.

Specifications

FREQUENCY RANGE: 2-30 mc.

TUNING ACCURACY: 1.3:1 VSWR maximum.

POWER REQUIREMENTS: 115 v, 400 cps, 3 phase, 0.6 amp per phase maximum.

RF POWER INPUT: 1200 watts PEP, 500 watts average power.

ANTENNA TERMINAL VOLTAGE: Will withstand 18,000 v peak at 45,000 feet.

INPUT IMPEDANCE: 50 ohms.

RF DUTY CYCLE: 2-3 mc, 5 minutes on and 5 minutes off; above 3 mc, continuous duty. For installations other than 727, the duty cycle is dependent upon the antenna impedance and environmental temperature.

TUNING TIME: 16 seconds maximum.

ALTITUDE: 45,000 ft. maximum.

SHOCK: MIL-E-5400, Paragraph 3.2.21.6.

AMBIENT TEMPERATURE: 180R-12 — −73° C to +71° C. 309A-9 — −54° to +71° C.

SIZE AND WEIGHT:

	Size			*Weight*
	W	*H*	*D*	
180R-12 antenna coupler	8.31″ 21.11 cm	7.5″ 19.05 cm	18.75″ 47.63 cm	21 lbs. 9.53 kg
309A-9 coupler control	3 11/16″ 9.68 cm	7 25/32″ 19.76 cm	14.5″ 36.83 cm	11 lbs. 4.99 kg

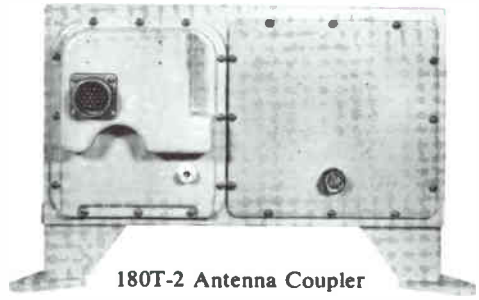
180T-2 Antenna Coupler AN/SRA-22

Features	Applications
Remote Control	*Fixed Station*
Weatherproof Enclosure	*Shipboard*
High Efficiency	*Whip Antenna*

The 180T-2 Antenna Coupler and associated control comprise system to manually tune whip antennas 35 ft. or longer, normally used on ships. The system covers the 2-30 mc frequency range and can be used at power levels of 1000 watts PEP, 500 watts average. The 180T-2 is housed in a watertight enclosure which can be mounted at the base of the antenna.

The separate control unit can be mounted in a 19″ equipment rack, located near the transmitter. A directional wattmeter and function indicators are included in the associated control unit.

Control Unit



180T-2 Antenna Coupler

SYSTEM APPLICATION

The coupler is free of intermodulation distortion, ideally suiting it for single sideband systems, such as the Collins KWT-6 Transceiver. Rugged mechanical design makes it equally applicable to fixed station or shipboard installations.

SIMPLIFIED OPERATION

After the antenna has been tuned to a desired frequency, the coil tap and capacitor dial settings can be recorded on a chart supplied on the remote control unit. These settings can then be used to reset the coupler.

Specifications

FREQUENCY RANGE: 2-30 mc.

TUNING ACCURACY: Within 1.3:1 VSWR for all service conditions at nominal supply voltages.

POWER REQUIREMENTS: 115 v or 230 v, 50-60 cps, 130 watts maximum.

RF POWER INPUT: 1000 watts PEP; 500 watts average.

INPUT IMPEDANCE: 50 ohms.

RF DUTY CYCLE: Continuous.

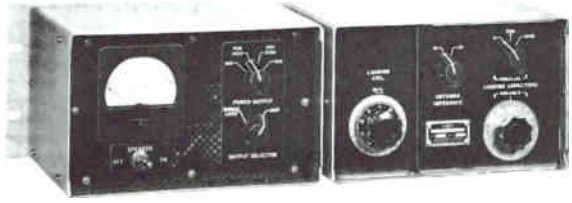
HUMIDITY: Impervious to salt spray.

AMBIENT TEMPERATURE: −28° C to +65° C operating; −50° C to +85° C storage.

SIZE AND WEIGHT:

	Size			*Weight*
	W	*H*	*D*	
Antenna coupler	17¾″ 45.09 cm	11½″ 29.21 cm	19″ 48.26 cm	42 lbs. 19.05 kg
Remote control	19″ 48.26 cm	5¼″ 13.34 cm	6 7/8″ 17.46 cm	17 lbs. 7.71 kg

180U-2, -2A Line Flatteners



180U-2 Line Flattener

Features	Applications
Reversible L Network	*Fixed Station*
Speaker Assembly	*Transportable*
Directional Wattmeter	
VSWR Protection	

The manually tuned 180U-2,-2A Line Flatteners, designed for Collins' KWT-6 equipments, can be used with any HF equipment operating in the 2-30 mc frequency range with 50 ohm RF termination and power level of not more than 500 watts average or 1000 watts PEP. It will reduce antenna transmission line VSWR of 2:1 to 1.1:1 or less.

Loading capacitors are used to adjust the tuning range. An RF wattmeter has two scales, 0-100 watts and 0-1000 watts, which will indicate either forward or reflected power.

A transmit-receive relay includes a set of contacts which can be used in any RF power interlock circuit to protect the power amplifier in the event the antenna is not connected. Type N fittings permit RF connections to be made with standard RG-8/U cable.

REFLECTED POWER PROTECTION

A protective device included on the 180U-2A (CU-737/URC) functions if the reflected SWR power exceeds 30 ±6 watts. An alarm lamp is actuated and the associated transmitter is automatically unkeyed.

Specifications

FREQUENCY RANGE: 2-30 mc.

LINE TUNING CAPABILITY: Reduces 2:1 VSWR to 1.1:1 or less.

POWER REQUIREMENTS: 27.5 v dc, 125 ma for operation of antenna changeover relay.

RF POWER INPUT: 500 watts average; 1000 watts PEP.

RF TERMINATION IMPEDANCE: 50 ohms nominal.

SPEAKER LEVEL: 2 watts maximum.

SIZE: 19″ W, 5¼″ H, 9″ D (48.26 cm W, 13.34 cm H, 22.86 cm D.

WEIGHT: 12¼ lbs. (5.56 kg).

180Y-1 Line Flattener CU-791/URT

Features	Applications
T Network	*Fixed Station*
Bilateral Operation	*Transportable*

The 180Y-1 is a manually operated coupler which matches a 50 ohm transmitter output to a 50 ohm, 1⅝″ rigid coaxial transmission line with a VSWR of up to 3:1. It covers the 2-30 mc frequency range and will handle up to 10 kw PEP or 5 kw average power levels.

The 180Y-1 is a variable, band switched T network configuration, which can be quickly adjusted to give a minimum VSWR when used with a directional wattmeter. The flanges of the rigid coaxial line fasten to opposite sides of the unit to

180Y-1 Line Flattener

permit equipment removal without disturbing the coaxial transmission line.

The coupler is bilateral, allowing either connector to be used as the input or output except for resistances below 25 ohms in the 2.0-2.6 mc frequency band. All controls, together with a tuning chart, are located on the front panel.

Specifications

FREQUENCY RANGE: 2-30 mc.

LINE TUNING CAPABILITY: 3:1 VSWR maximum.

POWER REQUIREMENTS: None.

RF POWER INPUT: Operate — 10 kw PEP; 5 kw average maximum. Tune — 1 kw average maximum.

INPUT IMPEDANCE: 50 ohms.

OUTPUT IMPEDANCE: 50 ohms.

RF DUTY CYCLE: Continuous.

AMBIENT TEMPERATURE: −20° C to +50° C.

AMBIENT HUMIDITY: 0%-95%.

SIZE: 7" W, 11⅝" H, 16 11/16" D (17.78 cm W, 29.53 cm H, 42.39 cm D).

WEIGHT: 23½ lbs. (10.66 kg).

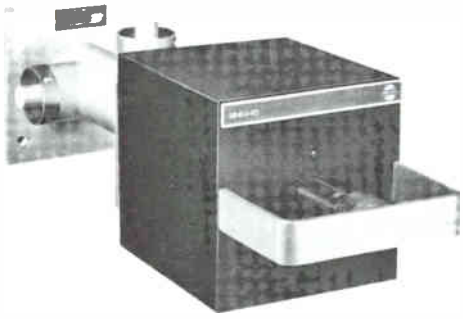
184U-10 RF Matrix Uniswitch

Features

Building Block Flexibility
Improved RF Switching
Mechanical Interlocks
Small Size
Simplified Maintenance
Remotely Controlled

Applications

Antenna Transmitter Matrix
Fixed Station
Shipboard

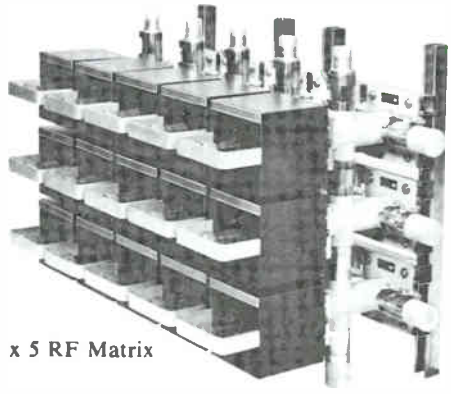


Uniswitch Building Block

The 184U-10 is a single, coaxial crosspoint-switch for building block assembly of an RF matrix to switch any of several transmitters to any of several antennas. The matrix permits either local or remote selection and can be assembled to exactly meet individual requirements. Mechanical and electrical interlocks prevent paralleling or application of power to an open line.

UNISWITCH OPERATION

The 184U-10 Uniswitch employs a simple, single stroke actuating mechanism which moves a dual contact assembly to disconnect both potential RF stubs as the desired crosspoint is established. Long life is assured by the simplicity of the mechanism and controlled contact acceleration.



Typical 3 x 5 RF Matrix

MATRIX ASSEMBLY

Several Uniswitches — one for each crosspoint — are simply bolted on easily constructed Unistrut frame sections to form the desired matrix configuration. The matrix can be modified by adding Uniswitches and frame sections if communication requirements change. Small size permits wall mountings in any position.

SIMPLIFIED MAINTENANCE

Individual Uniswitches can be removed for inspection or maintenance without disturbing other crosspoints. RF lines can be grounded during servicing. Control circuitry is easily accessible while crosspoint is in operation by removal of front cover.

LOW POWER OPERATION

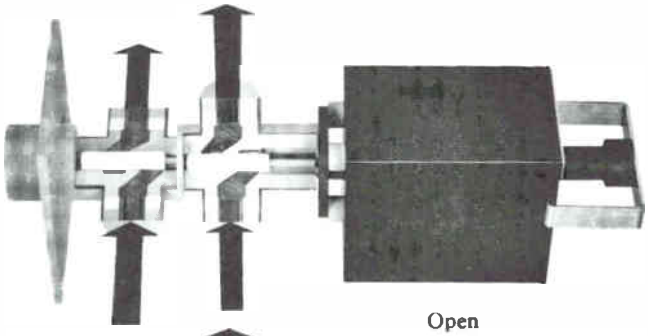
Control wiring is simplified by the low total power requirement of approximately 10 watts, including status display lights and all control relays.

REMOTE CONTROL

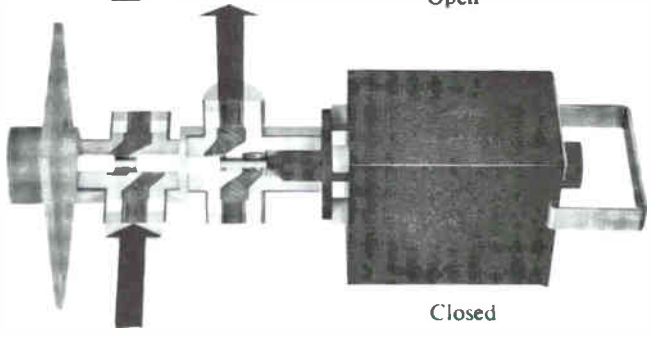
Since RF switching is accomplished by a single relay in each

Uniswitch, wide flexibility in remote control application is possible.

Lighted display pushbuttons, with red and green status lamps, can be conveniently used for remote switching. The red lamp indicates when crosspoint is switching and the green lamp when it is closed. Depressing the button a second time opens the crosspoint and both lamps go out.



Open



Closed

Specifications

RF COAXIAL LINE: 50 ohm EIA, 1⅝", rigid coax.

POWER RATING: 45 kw average with a 1:1 VSWR at 30 mc.

CURRENT RATING: 30 amps rms, 2-30 mc.

VOLTAGE RATING: 2000 v rms, 2-30 mc.

FREQUENCY RANGE: 30 mc maximum.

VSWR: When matrix is terminated in 50 ohm resistive load, the VSWR presented at the input shall not exceed 1.05:1 at 30 mc.

CROSS-TALK: —65 db.

OPERATION: Manual or remote control.

OPERATE TIME: 0.5 second.

REMOTE CONTROL: Single wire ground; other options.

CONTROL POWER: 27.5 v dc at 0.25 amp when switching.

STATUS DISPLAY: SPST.

MANUAL OVERRIDE: Manual operation possible in case of control failure.

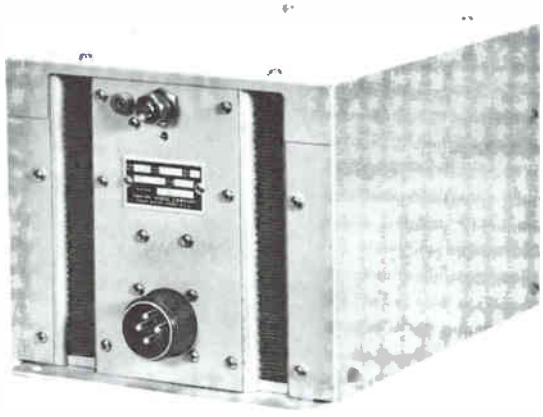
RF FITTINGS: Adapters for all common fittings.

SIZE: 5½" W, 5½" H, 18" D (13.97 cm W, 13.97 cm H, 45.72 cm D).

WEIGHT: Manual — 4½ lbs. (2.04 kg). Remote — 6½ lbs. 2.95 kg).

488A-1 DC to AC Inverter

Features	Applications
Continuous Duty	*Airborne*
No Shockmount	*Fixed Station*
Transient Protection	*Transportable*
Lightweight	*Mobile*



The 488A-1 is a dc to 115 v, 400 cps or 26 v, 400 cps inverter. It facilitates use of equipment requiring a small amount of 400 cps power in applications where only 27.5 v dc is available. Output is 250 va at +55° C, with a frequency accuracy of ±5% and an output regulation of ±10%. Transient protection is provided for up to 65 v peaks. Since the 488A-1 can be mounted directly to the aircraft or vehicle, installation is simplified.

Specifications

POWER SOURCE: 27.5 v dc, 4-25 amps, depending on load. Unit will withstand 65 v transients on supply line.

OUTPUT: Continuous — 250 va, 115 v ac, 400 cps at not more than 55° C; or 170 va, 115 v ac, 400 cps at 55°-70° C; or 140 va, 26 v ac, 400 cps at not more than 55° C. Output voltage regulated to within ±10%. Output frequency within ±5%. Distortion is less than 10%. Efficiency is 60%.

DUTY CYCLE: Continuous.

AMBIENT TEMPERATURE: —40° C to +70° C.

AMBIENT HUMIDITY: Up to 95% at 50° C.

ALTITUDE: Up to 10,000 ft. at 70° C; higher altitudes at reduced temperatures or loads.

SHOCK CONDITIONS: Per RTCA paper 100-54/DO-60, except where angles are called out as 45°, use 90°.

VIBRATIONS: Per RTCA paper 100-54/DO-60.

SIZE: 6¾" W, 5⅝" H, 9¾" D (17.15 cm W, 14.29 cm H, 24.77 cm D).

WEIGHT: 9.25 lbs. (4.2 kg).

488A-2 DC to AC Inverter

Features	Applications
Continuous Duty	*Airborne*
Transient Protection	*Transportable*
Lightweight	*Mobile*
High Efficiency	
Regulated Output	

The 488A-2 is a convection cooled, solid state inverter. In one application, it supplies the 400 cps power requirement of the 618T Transceiver and associated antenna coupler and is mounted directly on the associated 618T Transceiver shockmount. It offers continuous duty operation from a 27.5 v dc source and is actuated by simply grounding an external control lead.

CIRCUIT PROTECTION

The inverter will not be damaged by accidental reversal of input leads and is additionally protected from short circuits or peak loads up to 300 va for periods up to one minute.

Specifications

AMBIENT TEMPERATURE: −40° C to +71° C.

AMBIENT HUMIDITY: Up to 95%.

ALTITUDE: Up to 10,000 ft. at 52° C; higher altitudes at reduced temperatures or loads.

POWER SOURCE: 27.5 v dc ±10%; emergency operation to 20 v dc.

OUTPUT: 115 v, 400 cps, 250 va, single phase, 0.8-1.0 pf.

HARMONIC CONTENT: 10% maximum.

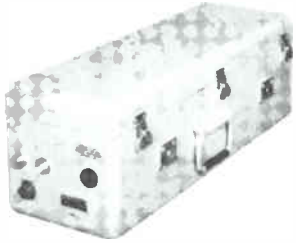
EFFICIENCY: 65% minimum at rated input and load.

REGULATION: ±10% for all variations of input and load.

SIZE: 3″ W, 4½″ H, 10″ D (7.62 cm W, 11.43 cm H, 25.4 cm D).

WEIGHT: 8 lbs. 10 oz. (3.91 kg).

490B-1 Automatic Antenna Coupler



Features	Applications
Waterproof Case	*Fixed Station*
Continuous Duty	*Temporary Installation*
Low VSWR	*Transportable*
Automatic Operation	*Small Ship*
Fully Accessible	*Vehicular*

The 490B-1 automatically resonates long wire, dipole or whip antennas over the 2-30 mc frequency range. It can be employed for continuous duty applications at 500 watts PEP or 200 watts average power levels.

SYSTEM APPLICATION

The 490B-1 is especially applicable to HF communication systems using the Collins 618T or similar HF transceivers. It is contained in a waterproof aluminum case which meets the vehicular or transportable vibration environment.

RELIABLE CIRCUITRY

The antenna is resonated by only two servo driven variable elements, a capacitor and an inductor. The inductive element is tuned by automatically winding silver ribbon from an aluminum drum onto a ceramic cylinder. The unused portion of the coil is completely removed from the circuit by shorting. Temperature limit switches protect the coupler from damage in the event of loss of cooling air. Transistors and diodes are used in all circuits. The 490B-1 consists of five modules and a chassis mounted in a waterproof aluminum case. The easily removable modules simplify maintenance and spare parts programs.

Specifications

FREQUENCY RANGE: 2-30 mc.

FREQUENCY ACCURACY: Within 1.3:1 VSWR for all service conditions at nominal supply voltages.

POWER REQUIREMENTS: 115 v, 400 cps.

RF POWER INPUT: 500 watts PEP; 200 watts average.

INPUT IMPEDANCE: 50 ohms.

RF DUTY CYCLE: Continuous.

TUNING TIME: 35 seconds maximum.

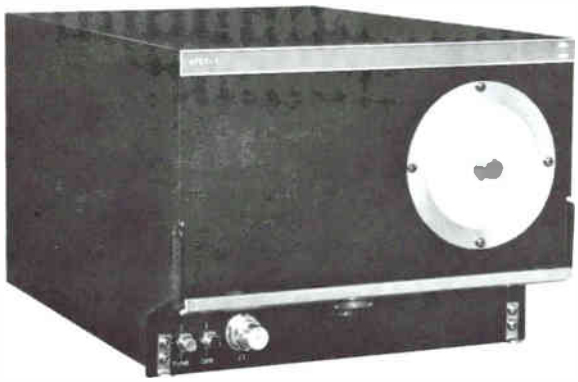
ALTITUDE: 15,000 ft.

AMBIENT TEMPERATURE: −40° C to + 50° C.

SIZE: 9 5/16″ W, 9″ H, 26 13/16″ D (23.65 cm W, 22.86 cm H, 68.10 cm D).

WEIGHT: 50 lbs. (22.68 kg).

490T-1 Antenna Coupler



Features	Applications
Automatic Operation	*Airborne System*
Installation Flexibility	*Wire Antenna*
High Speed Tuning	

The 490T-1 is a general purpose HF automatic antenna coupler for 25 ft. or longer whips and wire antennas in the 2-30 mc frequency range. Shorter antennas can be used with proper loading coils. It can be used at RF power levels up to 650 watts PEP or 200 watts average. Tuning time is 3 seconds maximum, less than 2 seconds average. The high speed tuning capability reduces the over-all rechannel time and keeps radiation at a minimum for radio silence operation. Solid state logic circuits, capable of fast decisions with high speed switched and variable tuning elements, are used to insure reliable high speed tuning.

SYSTEM APPLICATIONS

The 490T-1 is especially suited for use with HF airborne transceivers, such as the Collins 618T. Optional application groups include exchange with either the 180L-2 or 180L-3 Antenna Coupler; shielding of high impedance antenna lead in accordance with MIL-I-6181D and MIL-I-26600; termination for low impedance (50 ohm) coaxial antenna systems. These application groups can be factory installed or added in the field. Front panel indicators aid system fault location.

The 490T-1 is especially suited for use with the 437R-1 HF Helical Antenna. This coupler/antenna system is intended for helicopters and other low flying aircraft where surface communication is of special importance.

RELIABLE OPERATION

The short tuning cycle greatly enhances reliability, since operating elements are energized for only brief periods. The servo system is controlled by a demand surveillance technique which allows the coupler to retune if the antenna impedance changes appreciably, but does not require the servo system to remain in constant operation.

The 490T-1 consists of four RF assemblies, three modules, a chassis, frame, front panel and dust cover. All assemblies are easily removed from the unit, simplifying maintenance and support programs.

Specifications

FREQUENCY RANGE: 2-30 mc, continuous tuning.

TUNING ACCURACY: Within 1.3:1 VSWR.

POWER REQUIREMENTS: 115 v, 400 cps, 1 phase, 130 watts maximum during tuning, 20 watts during operate.

RF POWER INPUT: 650 watts PEP, 200 watts average.

INPUT IMPEDANCE: 50 ohms.

DUTY CYCLE: Continuous.

TUNING TIME: 3 seconds maximum; less than 2 seconds average.

ALTITUDE: 0-30,000 ft. operating.

AMBIENT TEMPERATURE: −55° C to +71° C operating; −62° C to +125° C nonoperating.

VIBRATION: 5-500 cps, 5 g operating; solid mounted.

SHOCK: 30 g, 11 millisecond duration.

SIZE: 10.125″ W, 7.625″ H, 10.625″ D (25.717 cm W, 19.367 cm H, 26.987 cm D).

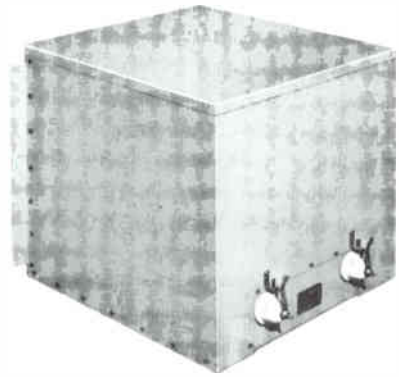
WEIGHT: 18.7 lbs. (8.48 kg.)

512B-2 HF Impedance Conversion Unit

Features	Applications
No Tuning	*Fixed Station*
Lightning Protection	

The 512B-2 is used to connect a transmitter or power amplifier which has a 50 ohm unbalanced output termination to a 300-600 ohm balanced transmission line. Since it is bilateral, the unit can also be used to connect a 300-600 ohm transmission line to a 50 ohm termination.

Power handling capability is 3 kw average or 5 kw PEP, over



the 2-30 mc frequency range. The balun configuration uses broadband circuits, eliminating the need for tuning. When terminated by a resistive load, the 512B-2 will contribute no more than 2:1 SWR.

INSTALLATION

The 512B-2 can be located either inside the transmitter room, on an outside wall, on a pole, or at the transmitter antenna tower. Coaxial cable lengths from the transmitter to the conversion unit are not critical. Lightning protection is provided by static drain chokes and a horn gap located at each output terminal.

Specifications

FREQUENCY RANGE: 2-30 mc.

POWER HANDLING CAPABILITY: 3 kw average or 5 kw PEP.

INPUT RECEPTACLE: Type UG-287/U. Mating connector UG-154/U for RG-17/U cable.

OUTPUT TERMINALS: ¼" — 20 studs on ceramic insulators.

SIZE: 23" W, 20¾" H, 22 7/8" D (58.42 cm W, 52.71 cm H, 58.10 cm D).

WEIGHT: 75 lbs. (34.02 kg).

512D-1 HF Impedance Conversion Unit

Features	Applications
No Tuning	*Fixed Station*
50 KW Rating	
Maintenance Free	
Easily Installed	

The 512D-1 is an impedance conversion unit for use in high power transmitter installations to permit the interconnection of a balanced open-wire transmission line to unbalanced coaxial terminations. It is bilateral in function and can be used to change the impedance of 600 ohm balanced line to 50 ohm unbalanced, or 50 ohm unbalanced to 600 ohm balanced. It will handle power levels up to 50 kw and covers the 4-30 mc frequency range. Broadband circuits preclude the need for any tuning adjustment.

COMPACT CONSTRUCTION

A partitioned enclosure contains (1) a coaxial impedance changing transformer with a 50 ohm unbalanced line to a 200 ohm balanced line, and (2) a folded exponential line, which transforms the 200 ohms to a balanced 600 ohms.

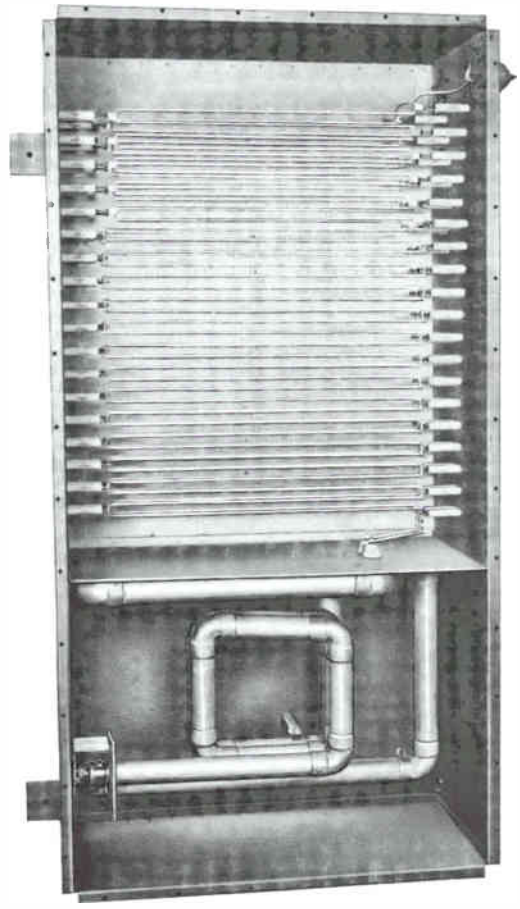
Specifications

FREQUENCY RANGE: 4-30 mc.

POWER HANDLING CAPABILITY: 50 kw.

INPUT IMPEDANCE: Either 50 ohms 3⅛" coax, or 600 ohms open wire.

OUTPUT IMPEDANCE: Either 600 ohms open wire, or 50 ohms 3⅛" coax.



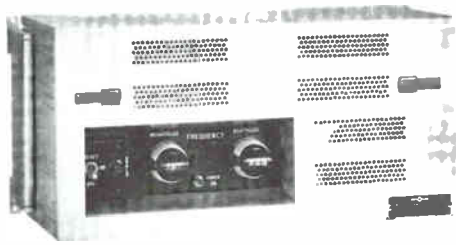
SIZE: 37" W, 74" H, 16" D (93.98 cm W, 187.96 cm H, 40.64 cm D).

WEIGHT: 200 lbs. (90.72 kg).

635R-1 HF Receiver Bandpass Filter

Features	Applications
Duplex Operation	*Fixed Station*
Protective Circuits	*Transportable*
	Shipboard

The 635R-1 is a locally controlled, rack mounted receiver antenna filter for duplex operation with closely spaced transmitting and receiving antennas. Simultaneous transmission at powers up to 1 kw PEP and reception on frequencies displaced 10% or greater is possible, if antenna RF level does not exceed 100 v PEP. It is tuned in 1 kc channel increments



635R-1

throughout the 2.0-29.999 mc frequency range. The 635R-1 has a self-contained power supply for operation from a 115 v or 230 v, 50-60 cps source.

RECEIVER PROTECTION

A protection circuit automatically disconnects the 635R-1 from the antenna if RF levels exceed 100 v peak. Tune interlock circuits allow it to be controlled in common with the associated receiver by any control unit using a two-out-of-five frequency information code.

Specifications

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

TYPES OF SIGNALS: AM, SSB and CW.

INPUT IMPEDANCE: 50 ohms unbalanced.

OUTPUT IMPEDANCE: 50 ohms unbalanced.

SELECTIVITY: The gain shall not deviate more than 1 db from the gain at the dial frequency for all frequencies which are within ±0.3% of dial frequency for the 2.0 mc through 14.999 mc range and within ±45 kc of dial frequency for the 15.0 mc through 29.999 mc range. The attenuation at ±10% of the dial frequency shall be not less than 70 db below the referenced dial frequency gain from 2-8 mc, not less than 65 db from 8-12 mc, not less than 60 db from 12-20 mc, and not less than 50 db from 20.0-29.999 mc.

VOLTAGE GAIN: Not greater than 5.0 db or less than 0.5 db at center frequency.

INTERMODULATION: All harmonic and intermodulation distortion at least 50 db below a 10 millivolt PEV output.

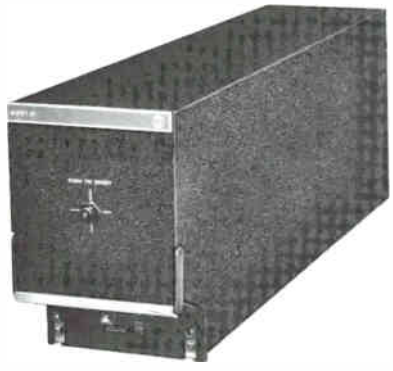
CROSS-MODULATION: At least 10 db below a desired 2 millivolt CW signal when receiving an undesired 91 v peak signal (modulated 30% at 400 cps) at least ±10% displaced from the desired frequency.

POWER REQUIREMENTS: 115 v or 230 v, 50-60 cps, 30 watts maximum.

SIZE: 19″ W, 8¾″ H, 7″ D (48.26 cm W, 22.23 cm H, 17.78 cm D). Mounts in 19″ rack.

WEIGHT: 25 lbs. (11.34 kg).

635T-2 HF Receiver Bandpass Filter



Features	Applications
Automatic Tuning	*Fixed Station*
Unattended Operation	*Transportable*
Protective Circuits	*Shipboard*
	Airborne

The automatically tuned 635T-2 functions as a frequency selecting circuit between the antenna and receiver input. It is remotely tuned in 1 kc channel increments throughout the 2.0-29.999 mc frequency range by an associated 914B-2 Control Unit. The 635T-2 permits duplex operation where transmitting and receiving antennas are closely spaced with frequencies displaced 10% or greater if antenna RF level does not exceed 100 v PEP. Transmitter power can be up to 1 kw PEP. The 635T-2 has a self-contained power supply for operation from a 22-30 v dc source. It is housed in a standard ½ ATR case.

RECEIVER PROTECTION

RF levels exceeding 100 v peak are eliminated by a protection circuit that automatically disconnects the 635T-2 from the antenna. Tune interlock circuits allow it to be controlled in common with the associated receiver by any control unit using a two-out-of-five frequency information code.

914B-2
Control Unit

Specifications

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

FREQUENCY CONTROL: By remote selection on the 914B-2 Control Unit.

TYPES OF SIGNALS: AM, SSB and CW.

INPUT IMPEDANCE: 50 ohms unbalanced.

OUTPUT IMPEDANCE: 50 ohms unbalanced.

SELECTIVITY: The gain shall not deviate more than 1 db from the gain at the dial frequency for all frequencies which are within ±0.3% of dial frequency for the 2.0-14.999 mc range and ±45 kc of dial frequency for the 15.0-29.999 mc range. The attenuation at ±10% of the dial frequency shall be not less than 70 db below the referenced dial frequency gain from

2-8 mc, not less than 65 db from 8-12 mc, not less than 60 db from 12-20 mc and not less than 50 db from 20.0-29.999 mc.

VOLTAGE GAIN: Not greater than 5.0 db or less than 0.5 db at center frequency.

INTERMODULATION: All harmonic and intermodulation distortion at least 50 db below a 10 millivolt PEV output.

CROSS-MODULATION: At least 10 db below a desired 2 millivolt CW signal when receiving an undesired 91 v peak signal (modulated 30% at 400 cps) at least ±10% displaced from the desired frequency.

POWER REQUIREMENTS: 22-30 v dc. Normal operation 30 watts maximum. During tuning, 65 watts maximum.

SIZE: 4 31/32" W, 7 13/16" H, 19 9/16" D (12.62 cm W, 19.84 cm H, 49.69 cm D). ARINC Specification 404, standard ½ ATR.

WEIGHT: 19.2 lbs. (8.71 kg).

635V-1 HF Receiver Bandpass Filter

Features	Applications
Antenna Sharing	*Fixed Station*
Receiver Protection	*Transportable*
Remote Control	*Shipboard*
Distortion Reduction	*Airborne*

The 635V-1 is a tunable, active bandpass filter, covering the 2.0-29.999 mc frequency range. It permits normal HF receiver operation in an interference environment that would greatly degrade reception or even damage the front end of a receiver. Distortion caused by strong RF fields is reduced, and the receiver is protected against damage from high RF voltages both on and off the channel frequency.

COMMON ANTENNAS

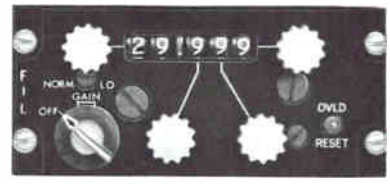
High impedance capacitive input coupling allows connecting more than one 635V-1 to a common antenna, or, under restricted conditions, the 635V-1 can share a common antenna with a power amplifier.

APPLICATIONS

The 635V-1 can be used in fixed station, transportable, shipboard or airborne installations, where transmitter and receiver antennas are closely spaced or duplex operation of transmitter and receiver on a common antenna is desired. It is compatible with Universal Radio Group HF building block equipment. A 6-16 db gain allows the 635V-1 to be located at a distance from the associated receiver. Plug-in power supply modules permit operation from either a 115 v, 400 cps; 115 v or 230 v, 50-60 cps or 27.5 v dc power source.

CONTROL

The 635V-1 can be controlled in common with an associated receiver using a two-out-of-five wire frequency information code, or a separate 914B-3 Control.



914B-3 Control

The 914B-3 has a two position gain control switch which allows a 6-16 db gain, depending upon frequency in the normal position. In the low position, gain is reduced by a nominal 35 db. This position is used to eliminate distortion caused by overdriving with very strong on-frequency signals.

The 635V-1 can also be dial-pulse controlled with Collins 313 series remote control equipment. This arrangement allows frequency selection over a 4-wire line from a remote dial telephone.

Specifications

FREQUENCY RANGE: 2.0-29.999 mc, continuously tuned.

NOISE FIGURE: No more than 10 db at 2 mc, increasing to no more than 17 db at 30 mc with 50 ohm resistive source.

BANDWIDTH: 12 kc minimum to —1 db points.

STRONG RF SIGNAL INPUT: 1000 v rms to 10,000 ft. at frequencies more than 10% removed from nominal operating frequency. Derated linearly with atmospheric pressure above 10,000 ft.; 50,000 ft. maximum.

CROSS-MODULATION: —30 db from desired signal for above strong signal input.

OUTPUT STRONG SIGNAL: Less than 0.5 v to a 50 ohm load for 1000 v input more than 10% removed from signal.

GAIN: Normal position — 6-18 db. Low position — —30 db minimum, —15 db maximum.

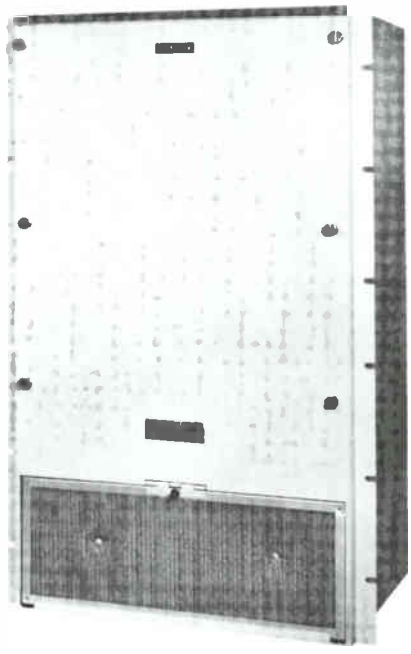
POWER REQUIREMENTS: Dependent upon optional power supply module. 115 v, 400 cps, 1 phase, 85 watts; or 115 v or 230 v, 50-60 cps, 95 watts; or 27.5 v dc, 95 watts.

COOLING AIR: 20 cfm 1" water vacuum to rear port when supplied externally. Can be supplied by optional internal blower.

SIZE: ARINC Specification 404, ½ ATR. 4 31/32" W, 7 13/16" H, 19 9/16" D (12.62 cm W, 19.84 cm H, 49.69 cm D).

WEIGHT: 22 lbs. (9.98 kg).

635W-1 Harmonic Filter



Features	Applications
Automatic Operation	*Fixed Station*
Integral Cooling	*Transportable*
Front Accessibility	*Shipboard*

The 635W-1 is an automatic, continuously tuned, low pass filter designed specifically for operation with Collins 208U-10 Power Amplifier to insure 80 db of harmonic attenuation at the output terminals of the system. The filter is rated for 12 kw average or PEP in the 2-30 mc frequency range. A visual readout of operating frequency is provided.

Ceramic vacuum variable capacitors insure long trouble free operation. A servo sensor insures concurrent tuning of harmonic filter and associated 208U-10 Power Amplifier.

All components are accessible from the front. A safety interlock circuit protects maintenance personnel. Input and output RF connections are made through standard 1⅝" EIA fittings. It is rated for continuous duty operation.

INSTALLATION

A Unistrut cabinet is available as an accessory to house two 635W-1 units. It matches the styling of the 208U-10 Power Amplifier and other Universal Radio Group equipment. Single or multiple wall mounting is also available to meet individual installation requirements.

Specifications

FREQUENCY RANGE: 2-30 mc.

RF POWER INPUT: 12 kw PEP or average, continuous.

INPUT IMPEDANCE: 50 ohms unbalanced; EIA 1⅝" coax.

OUTPUT IMPEDANCE: 50 ohms unbalanced; EIA 1⅝" coax.

VSWR DEGRADATION: From 2.5:1 SWR on the filter output to 3:1 SWR on the filter input.

RF LOSSES: 3% nominal with 50 ohm load.

TUNING TIME: 15 seconds when operating from 60 cps power source, concurrent with power amplifier.

POWER REQUIREMENTS: Normal operation — 115 v, 47-63 cps, 2 watts; 230 v, 47-63 cps, 90 watts; 27.5 v dc, 1.7 watts. During tuning — 115 v, 47-63 cps, 36 watts; 230 v, 47-63 cps, 90 watts; 27.5 v dc, 84 watts.

SIZE: 19" W, 30" H, 15" D (48.26 cm W, 76.2 cm H, 38.1 cm D).

WEIGHT: 105 lbs. (47.63 kg).

SW-1020TA, -1030A Automatic Switchboards

Features	Applications
Termination Flexibility	*Fixed Plant*
Operator Assistance	*Transportable System*
Two-Digit Dialing	
Supervisory Signals	
Through Dialing	

Collins' SW-1020TA and SW-1030A are automatic dial service switchboards providing toll-quality FSK and dc loop dialing with half-duplex radio service capabilities for twenty 4-wire subscribers. The switchboards offer through-dialing on ac or dc lines.

Idle-line hunting (rotary group) can be in any combination by a simple strapping arrangement. Ring/no-ring selection is on a per-line basis. Any line can be used as an inter-office trunk. Immediate direct connection to operator line is completed with minimum strapping.

TRANSPORTABLE APPLICATIONS

The SW-1020TA, when used with Collins' C-8024 signaling dial telephone or other FSK signaling equipment, supplements commercial service and is capable of routing, signaling and completing calls among the 4-wire subscriber units. No auxiliary signaling equipment is required for dc loop dial service. The unit is electrically similar and compatible with Collins' fixed station SW-1030A Switchboard.

The SW-1020TA is contained in an enclosed sliding frame for service and test accessibility. Rugged construction permits transportable applications or use in any environment requiring exceptional shock and vibration tolerances. The SW-1020TA can be operated on an ac/dc dial on per-line basis by making strapping changes on the line panel subassembly.

FIXED PLANT

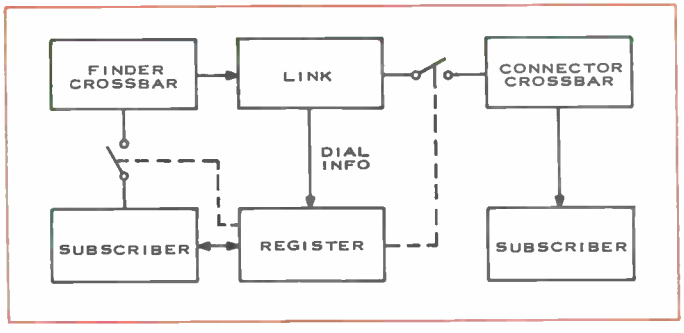
The SW-1030A, for fixed plant installations, has full length front and rear doors to permit complete access to all components and wiring.

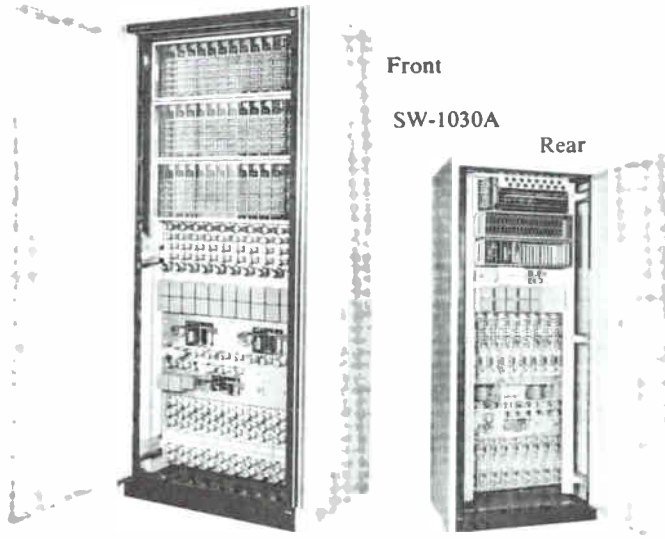
Solid state circuits reduce weight, improve reliabilty and decrease power consumption. The switchboards provide two-party interconnect with optional switchboard attendant facilities. An automatic feature connects subscriber with switchboard attendant when subscriber handset is off-hook 30 seconds without completing call.

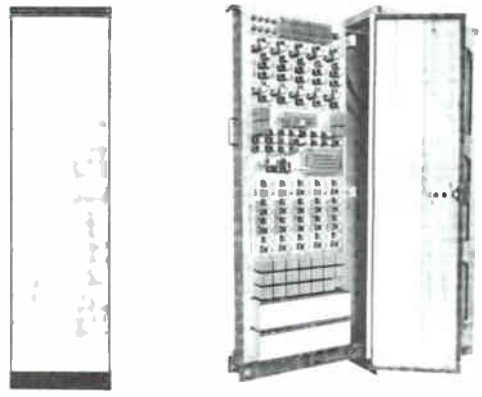
When subscriber goes off-hook, the register determines origin of call and locates an idle link through the finder crossbar. Upon receiving the dialed digits, the register completes call through the connector crossbar. When the calling subscriber's handset is replaced on-hook, the link is released and reverts to idle-link status.

The SW-1030A is designed to operate as an ac switchboard; however, it can be converted to dc operation (all lines) by internal strapping.

Functional Circuits







SW-1020TA

Specifications

LINE CHARACTERISTICS: Loss — 1 db maximum. Level — 0 dbm nominal; 7 dbm maximum. Impedance — 600 ohms, ±10%. Phase angle — not more than 30° from 200 to 10,000 cps. Longitudinal balance — 40 db or more. Noise and cross-talk — 50 db below 0 dbm signal. Frequency response — ±3 db, 300-10,000 cps (after connection is established). Signaling — percent break, 61% nominal; pulse rate, 10 pps nominal.

PULSE GENERATION LIMITS: 58%-67% break, 9.5-10.5 pps.

PULSE DETECTION LIMITS: 50%-70% break, 8-12 pps.

INTERDIGIT TIMING: At least 600 milliseconds.

SIGNALING LEVEL: —26 dbm to —10 dbm, 6 db signaling level margin.

SIGNALING FREQUENCIES: Off-hook — 2847 cps or loop closure. Dial-pulse — 2762 cps or open loop.

SUPERVISION: Dial tone — 600/120 cps, —15 dbm. Busy tone — 600/120 cps at 60 interruptions per minute, —15 dbm. Ringing tone — 1000/20 cps, 0 dbm, or 20 cps, 100 v. Ringback tone level (SW-1020TA only) — —15 dbm.

SW-1020TA POWER REQUIREMENTS: Basic — 28 v dc, +1, —2 v dc, negative ground, 15 amps; less than 100 millivolt ripple. Loop — 28 v dc nominal, 80 milliamps per line maximum. Provision for building out provided on per-line basis.

SW-1030A POWER REQUIREMENTS: Basic — 48 v dc, ±4 v dc, positive ground, 5 amps; less than 100 millivolt ripple. Loop — 48 v dc, ±4 v dc, 80 milliamps per-line maximum.

OPERATING TEMPERATURE: 0° C to +50° C.

RELATIVE HUMIDITY: 95% at 50° C.

ALTITUDE: 10,000 ft. maximum.

SHOCK: SW-1020TA will withstand 30 g when prepared for normal operation.

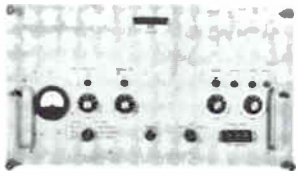
VIBRATION: SW-1020TA — 15-55 cps with total excursion of 0.015″ for a period of 45 minutes along each axis.

SIZE:

	W	*H*	*D*
SW-1020TA	18″ 45.72 cm	69″ 175.26 cm	30″ 76.2 cm
SW-1030A	30″ 76.2 cm	69″ 175.26 cm	24″ 60.96 cm

WEIGHT: 525 lbs. (238.14 kg).

490C-1 Antenna Coupler CU-1169/SRC-16



Features
Automatic Operation
Metered Circuits
Remote Control
Constant Surveillance

Applications
Shipboard
Fixed Station

The 490C-1 (CU-1169/SRC-16) is a rack mounted HF antenna coupler which covers the 2.0-5.999 mc frequency range. It provides proper impedance matching between communication equipment with 50 ohm RF terminations and broadband antennas used for marine and fixed station applications. Receivers and transmitters can be operated with 45 db selectivity at 15% frequency spacing using a common antenna. The coupler is automatically tuned using loading-phasing discriminator information to operate a servo mechanical system. It will match an antenna with up to 4:1 VSWR to a 50 ohm line over the frequency range.

Specifications

FREQUENCY RANGE: 2.0-5.999 mc.

TUNING ACCURACY: 1.3:1 VSWR maximum.

POWER REQUIREMENTS: 115 v, 400 cps, 3 phase, delta connected, 95 watts.

RF POWER INPUT: 6 kw PEP or 3 kw average.

INPUT IMPEDANCE: 50 ohms nominal.

RF DUTY CYCLE: Continuous.

TUNING TIME: 60 seconds maximum.

SIZE: 22 7/8" W, 13½" H, 21¾" D (58.10 cm W, 34.29 cm H, 55.25 cm D).

WEIGHT: 140 lbs. (63.5 kg).

490C-2 Antenna Coupler CU-1170/SRC-16

Features
Automatic Operation
Metered Circuits
Remote Control
Constant Surveillance

Applications
Shipboard
Fixed Station

The 490C-2 (CU-1170/SRC-16) is a rack mounted HF antenna coupler which provides optimum impedance matching between communication equipment with 50 ohm RF terminations and broadband antennas used for marine and fixed station applications in the 6.0-29.999 mc frequency range. Receivers and transmitters can be operated with 45 db selectivity at 15% frequency spacing using a common antenna. The coupler is automatically tuned using loading-phasing discriminator information in conjunction with a servo mechanical system. It will match an antenna with up to a 4:1 VSWR to a 50 ohm line over the frequency range.

Specifications

FREQUENCY RANGE: 6.0-29.999 mc.

TUNING ACCURACY: 1.3:1 VSWR maximum.

POWER REQUIREMENTS: 115 v, 400 cps, 3 phase, delta connected, 90 watts.

RF INPUT POWER: 1.2 kw PEP or 600 watts average.

INPUT IMPEDANCE: 50 ohms nominal.

RF DUTY CYCLE: Continuous.

TUNING TIME: 60 seconds maximum.

SIZE: 21¾" W, 7 13/16" H, 22 7/8" D (55.25 cm W, 19.84 cm H, 58.26 cm D).

WEIGHT: 71 lbs. (32.21 kg).

C-4658/SRC-16 Antenna Coupler Control

Features
Directional Wattmeter
Rack Mounting

Applications
Shipboard
Fixed Station

The C-4658/SRC-16 provides all control functions for either the 490C-1 (CU-1169/SRC-16) or the 490C-2 (CU-1170/SRC-16) antenna couplers. It can be located near the transmitter installation and includes a directional wattmeter in addition to selector switches and status light indicators.

Specifications

POWER REQUIREMENTS: 27.5 v dc, 0.5 amp.

SIZE: 19" W, 5¼" H, 7" D (48.26 cm W, 13.34 cm H, 17.78 cm D). Standard EIA rack mounting.

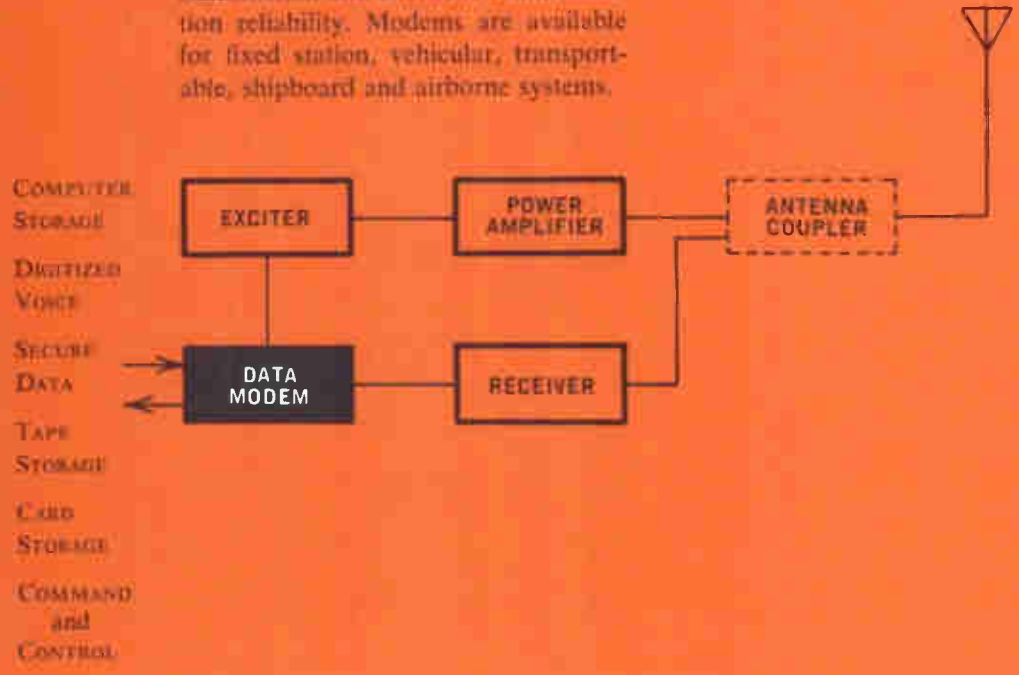
WEIGHT: 12 lbs. (5.44 kg).

Available only on a production contract.

Data and Teletypewriter Equipment

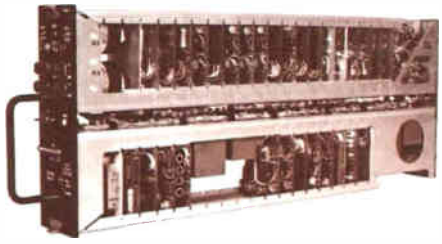
Collins' Kineplex® modems offer high speed data communication for business, scientific, military or industrial information over HF radio circuits. Such systems are currently providing efficient service for military, industrial and government users.

The modems employ Collins' patented Predicted Wave Signaling techniques and kinematic filtering for high speed transmission and excellent communication reliability. Modems are available for fixed station, vehicular, transportable, shipboard and airborne systems.



399R-1 Teletypewriter Adapter

Features	Applications
Half or Full Duplex Operation	*Fixed Station*
Synchronous or Nonsynchronous Input	*Transportable*
HF Compatibility	*Shipboard*



The 399R-1 is a single channel teletypewriter adapter which accepts nonsynchronous binary information from a keyboard, tape reader or storage unit. The information is then converted to synchronous binary data for operation of a modulator-demodulator, such as the Collins TE-204A-2. Strapping allows either a 5 ma or 60 ma teletypewriter loop to be operated at 60 or 100 words per minute. The transmit and receive sections of the teletypewriter adapter can be employed individually in half duplex operation or simultaneously in full duplex operation.

SYNCHRONOUS OPERATION

Speed normalizer circuitry in the 399R-1 synchronizes the data input with timing from an external timing source, such as the Collins 399S-1 or TE-204A-2, so that all bits are of equal time duration and synchronized with the transmit timing used by the modulator.

RECEIVE CIRCUITS

In the receive mode, the loop keyer is driven by binary data from either the TE-204A-2 modem or the 399S-1 adapter (depending on interface parameters and system requirements) and keys a 60 ma or 5 ma loop circuit to operate a teleprinter. The 399R-1 operates from synchronous or nonsynchronous data at 60 or 100 wpm.

TRANSMIT CIRCUITS

In the transmit mode, serial data via a 60 ma loop circuit is accepted from a keyboard, tape reader or storage unit. Nonsynchronous Baudot coded information is converted to synchronous data by the speed normalizer before entering the 399S-1 or TE-204A-2. The data is stored prior to conversion and is read out synchronously with the 399S-1 or TE-204A-2 timing. The time difference in the lengths of nonsynchronous 7.42 Baudot data characters and the synchronous characters is corrected by additional stop bits at the end of a synchronous character as required.

TELETYPE OPERATE CONTROL

The teletype operate control is an automatic keying device which operates from the transition on the incoming data. A space or start bit in the data will cause the teletype operate control circuit to actuate the transmit keyline. A delay circuit prevents a release of the keyline relay for five or six seconds to preclude opening of the line by subsequent data or momentary line interruptions. If the net is already in use, a squelch signal from the TE-204A-2 Modem prevents seizure of the transmit line. Operation of the keyline relay also places the TE-204A-2 in transmit mode. An external ground can be applied to override previous conditions.

SOLID STATE CIRCUITS

The 399R-1 employs solid state circuits with plug-in printed circuit boards and modules.

Specifications

TRANSMIT INPUT: Baudot coded information at 100 wpm or 60 wpm is synchronized with the speed normalizer. High or low mark condition is provided by a strap option.

Option 1 — 60 ma/0 ma input on transmit loop circuit (full duplex operation).

Option 2 — 60 ma/0 ma input on receive loop (half duplex operation; two-wire loop operation).

Option 3 — 0 v dc/-6 v dc data input.

Option 4 — 0 ma/5 ma input on transmit loop circuit, Baudot nonsynchronous (full duplex operation).

Option 5 — 0 ma/5 ma input on transmit loop circuit, Baudot nonsynchronous (half duplex operation).

TRANSMIT OUTPUT:

Option 1 — 0 v dc/-6 v dc synchronous Baudot data.

Option 2 — 0 v dc/-6 v dc nonsynchronous data ouput (derived from loop circuit input).

RECEIVE INPUT: Low-level, Baudot coded dc serial data is converted to high-level serial data to key either a 60 ma or 5 ma loop circuit at 100 wpm. High or low mark condition is provided by a strap option.

RECEIVE OUTPUT: A 60 ma or 5 ma loop circuit drives a teletype printer or punch at 100 wpm.

TIMING: Transmit — externally derived 75 cycle square wave for 100 wpm and 45.45 cycle square wave for 60 wpm operation.

SPEED NORMALIZER: Converts nonsynchronous 60 or 100 wpm Baudot coded to synchronous information.

TRANSMIT LOOP CIRCUIT (strapable options):

Option 1 — mark, 60 ma ±10 ma (adjustable); space, 0 ma

±0.5 ma, 1000 ohms maximum external loop resistance; neutral loop only, internal power only; data rate, 75 bits per second or 45 bits per second.

Option 2 — mark, 10 ma to 1 ma (not adjustable); space, 0 ma to 0.65 ma; 2700 ohm maximum external loop resistance; neutral loop only; internal power only; data rate, 75 bits per second or 45 bits per second.

RECEIVE LOOP CIRCUIT (strapable options):

Option 1 — mark, 60 ma ±10 ma (adjustable); space, 0 ma to ±0.65 ma; 1000 ohm maximum external loop; neutral loop only; internal power only; data rate, 75 bits per second or 45 bits per second.

Option 2 — mark, 5 ma to 1 ma (not adjustable); space, 0 ma to 0.65 ma; 6800 ohm maximum external loop resistance; neutral loop only; internal power only; data rate, 75 bits per second or 45 bits per second.

EXTERNAL TIMING INPUT: 75 cps ±5% symmetrical square wave. Level, 0 v dc ±1 v dc to −6 v dc +1 v dc to −1.5 v dc; rise time, less than 5 usec.

CONTROL INPUT: Manual override or TOX inhibit.

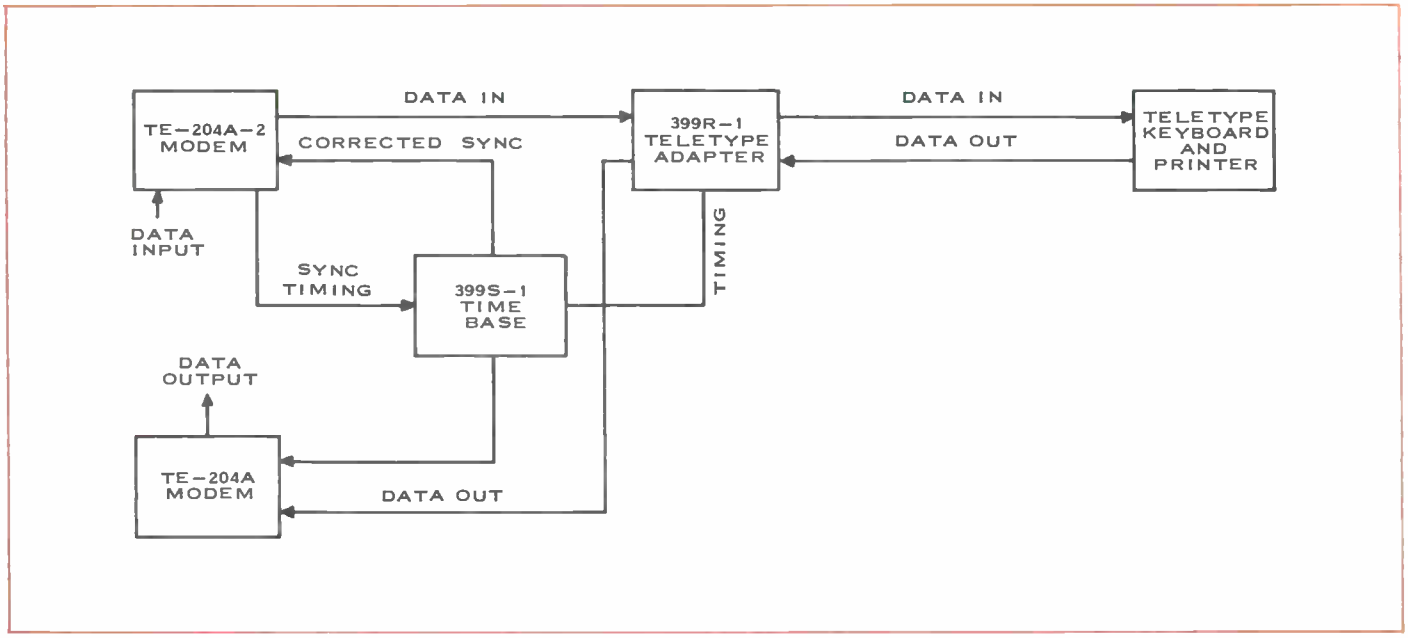
CONTROL OUTPUT: TOX characteristics — response time of 12 milliseconds maximum following application of data and a drop-out of 6 seconds ±3 seconds; TOX override is provided from a 0 v dc source, an external ground circuit of less than 10 ohms, or strap option.

POWER REQUIREMETS: 115 v ac +5% to −10%, 400 cps ±5%, 65 watts maximum.

SIZE: ¼ ATR long, 2¼" W, 7⅝" H, 19 9/16" D (5.72 cm W, 19.37 cm H, 49.69 cm D).

WEIGHT: 13 lbs. (5.90 kg).

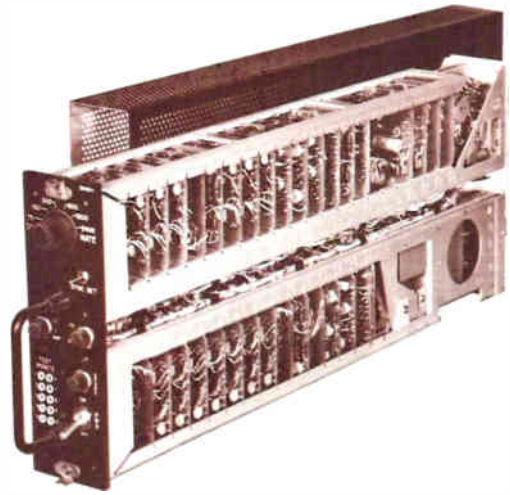
Functional Circuits



399S-1 Time Base

Features	Applications
Accurate Timing	*Fixed Station*
Plug-in Circuit Cards	*Shipboard*
High Reliability	*Transportable*

The 399S-1 is a bit timing signal generator and switching unit. It provides timing pulses for the 399R-1, TE-204A-2 and accessory devices of the Kinesig® system. Receive timing is synchronized with the incoming data. Bit rate selection includes 75, 150, 300, 600, 1200 and 2400 bits per second. Signal switching in the 399S-1 permits signal routing to be directed by externally produced control signals. It also provides voltage and impedance matching for a security encoder/decoder unit, if required.



HIGHLY STABLE CIRCUITS

The time base of the 399S-1 is a highly stable 3 mc oscillator with frequency dividers and a synchronization correction circuit. A regenerative divider reduces the frequency of the master oscillator to 60 kc. Provision for an external 100 kc signal to drive time base is optionally available. For transmit timing pulse output, a digital divider further reduces this 60 kc to the desired bit rate (75, 150, 300, 600, 1200 and 2400 bits per second). The receive timing is achieved from the 60 kc by a similar set of dividers except that it is synchronized with the incoming signal by comparison with sync pulses derived from the incoming tones in the TE-204A-2 modem.

SIMPLIFIED MAINTENANCE

Reliability is greatly enhanced by the use of solid state circuits. Test points for all important circuit parameters are located on the front panel. Removal of the dust cover permits complete access to all plug-in circuit cards. All system connections are completed through plugs at the rear of the unit.

Specifications

TYPE OF SERVICE: Full duplex or half duplex.

NUMBER OF CHANNELS: One.

BIT GATE RATES: 2400, 1200, 600, 300, 150 and 75 bits per second.

CRYSTAL OSCILLATOR FREQUENCY: 3 mc.

POWER REQUIREMENTS: 103.5-120.75 v, 380-420 cps, 30 watts, maximum.

TEMPERATURE RANGE: −20° C to +55° C.

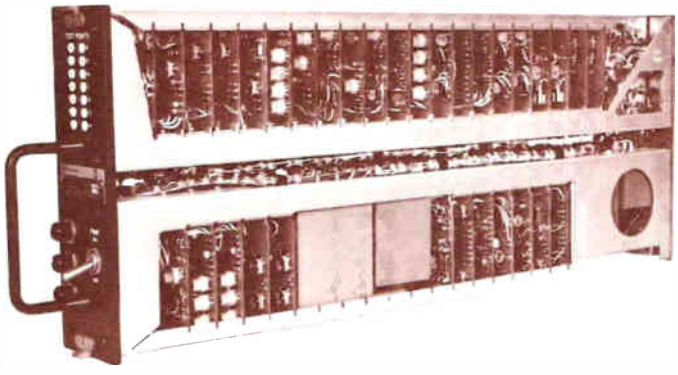
HUMIDITY RANGE: 0%-100%.

SIZE: ¼ ATR long; 2¼" W, 7⅝" H, 19 9/16" D (5.72 cm W, 19.37 cm H, 49.69 cm D).

WEIGHT: 14 lbs. (6.35 kg).

TE-204A-2 Data Modem

Features	Applications
In-band Diversity	*Fixed Station*
Inter-bit Diversity	*Shipboard*
Continuous Synchronization	*Transportable*
Plug-in Circuit Cards	
High Reliability	



The TE-204A-2 is a highly reliable, synchronous data modulator-demodulator for transmission of a single channel of serial binary information at a 75 bit per second rate over HF, VHF or UHF radio circuits.

Both 600 ohm and 150 ohm audio outputs enable the system to be operated with most radio communication equipment. Since this modem operates half duplex, two are required for full duplex operation.

SYNCHRONOUS OPERATION

The modem provides continuous receive-synchronization corrective-information independent of data content of the message being received, including steady mark or space. The TE-204A-2 will operate synchronously with a pulse from the associated 399S-1 Time Base.

HIGH RELIABILITY

The TE-204A-2 uses four tones with both in-band frequency and inter-bit time diversity to minimize the effects of selective fading and interference on RF circuits. Frequency diversity is achieved through a two-tone time sharing system. Each bit (either mark or space) is divided into two equal periods. Predicted Wave Detection provides a significant improvement over nonsynchronous FSK in the presence of noise.

RECEIVE OPERATION

The received audio input frequencies to the TE-204A-2 are 935 or 1375 cps during the first half of a bit and 1815 or 2255 cps during the second half of a bit, depending upon whether a "mark" or "space" was transmitted. The audio signal, heterodyned to the 22 kc region, is applied to two keyed filter detectors, one of which is tuned to the mark frequency and the other to the space frequency. After integration, the filter outputs are algebraically added (+ for mark and − for space) and the resulting information stored as a positive or negative voltage, depending upon whether the mark or space filter has the greater amplitude.

In the second half of the bit, a second heterodyne frequency (880 cps displaced) results in mixer output frequencies being the same as for the first half of the bit, permitting use of a single set of keyed filters. The outputs of the keyed filters during the second half of the bit are detected, sampled and added as before, and the resulting voltage added to the information stored from the first half of the bit. The combined (sampled

and stored) voltage from the two halves of the information bit is sampled, setting the received data output flip-flop.

Receive timing and the transmitted message are synchronized using time diversity effect to drive the keyed filters and gate the local oscillators.

Since the signals are separated in time and frequency, a dual bandpass filter (one to pass the lower pair of tones transmitted during the first half of the bit and the other to pass the higher frequency pair of tones transmitted during the second half of the bit) provides outputs which, when rectified and added, form a square wave. The square wave is then applied to a narrow band circuit tuned to the bit gating rate (75 cycles per second) to provide an output signal to synchronize the receive timing with the input data.

TRANSMIT OPERATION

During transmit operation, the modem accepts incoming synchronous binary data bits and converts them to corresponding audio output tones. These audio tones can be transmitted over any 3 kc communication system. The modem circuit configuration during transmit consists of the tone generators, oscillator-mixer circuit and timing circuit.

SIMPLIFIED MAINTENANCE

Reliability of the TE-204A-2 is greatly enhanced by the use of solid state circuits and plug-in card construction. Test points are located on the front panel. Removal of the dust cover provides access to all circuit cards and wiring.

Specifications

TYPE OF SERVICE: Half duplex.

NUMBER OF CHANNELS: One.

NUMBER OF TONES: Four.

TONE GATING RATE: 75 cps.

TONE FREQUENCIES: Mark 1, 935 cps; Mark 2, 1815 cps; Space 1, 1375 cps; Space 2, 2255 cps.

RESONATOR FREQUENCIES: Mark Data, 21.935 kc; Space Data, 22.375 kc.

TONE DURATION: 6.667 milliseconds.

BIT DURATION: 13.333 milliseconds.

INFORMATION DATA RATE: 75 bits per second.

CRYSTAL OSCILLATOR FREQUENCIES: 21.0 kc and 20.12 kc.

DC INPUT TRANSMIT DATA: Binary ZERO, —6 v dc; Binary ONE, 0 v dc; Input, 5100 ohms, 500 uuf maximum.

TRANSMIT/RECEIVE LEVELS: Transmit Mode, —6 v dc; Receive Mode, 0 v dc.

POWER REQUIREMENTS: 103.5-120.75 v, 380-420 cps; 40 watts maximum.

ENVIRONMENTAL: Temperature Range, —20° C to +55° C; Humidity Range, 0%-100%.

SIZE: ¼ ATR long; 2¼" W, 7⅝" H, 19 9/16" D (5.72 cm W, 19.37 cm H, 49.69 cm D).

WEIGHT: 14 lbs. (6.35 kg).

TE-202 Kineplex® Data Terminals

Features	Applications
Parallel Binary Data	*Fixed Station*
3200 Bit Per Second Rate	
Wireline or Radio Compatibility	
Solid State Circuits	
Modular Construction	

The TE-202 Data Terminals offer highly efficient data communication on high frequency radio circuits. They will handle up to 3200 bits per second of synchronous, parallel binary data over a standard 3 kc voice channel, which also can be derived on wireline or microwave.

Up to 40 channels of data service are provided by the terminals with data rates of 45, 56, 60, 75 or 80 bits per second on each channel. This is ideal for 100 words per minute per channel teletypewriter operation or as a high capacity data link for computers, business machines, telemetry, supervisory control or other applications.

Designed for continuous operation, the terminals require only periodic performance checks after initial start-up to assure normal operation. Rack mounted, the TE-202 features solid state circuitry and modular construction. Modules can be removed or added in multiples of two channels to provide a minimum of four and a maximum of forty channels of data service.

EQUIPMENT CONFIGURATION

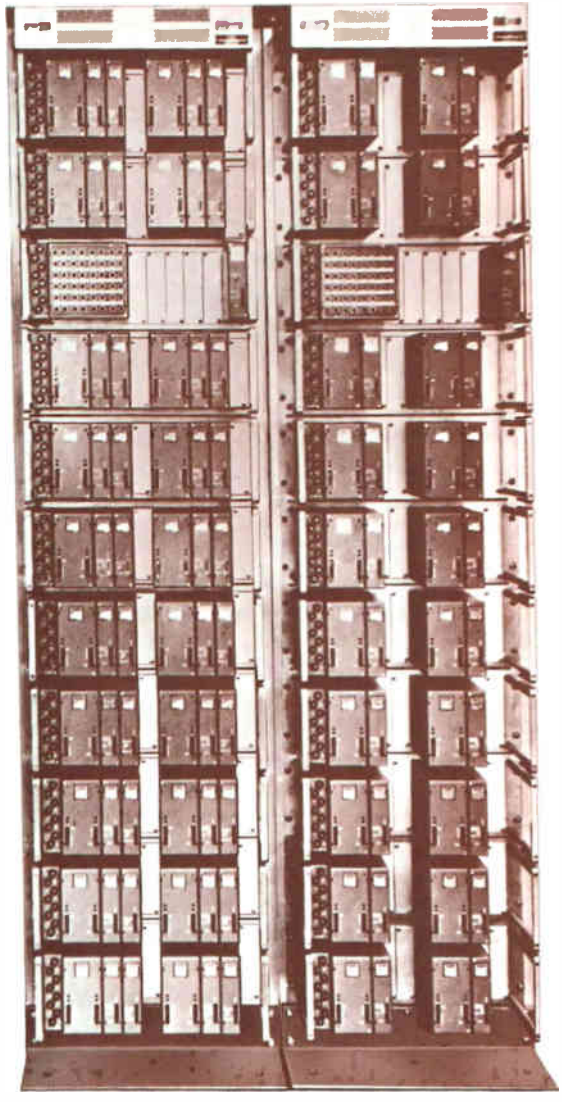
Three TE-202 terminals are offered — the TE-202E-3 Transmit Terminal, the TE-202F-6 Receive Terminal, and the TE-202G-6 Diversity Receive Terminal. A data channel tester, a power control and a patch panel are standard equipment on all terminals.

Each terminal furnishes simplex data service. The transmit terminal, combined with the TE-202F-6 Receive Terminal, provides duplex data service, or combined with the TE-202G-6, furnishes duplex diversity data service.

On long communication links, a duplex terminal can be used as an unattended digital relay station.

TE-202E-3 TRANSMIT TERMINAL

The transmit terminal generates 20 audio tones spaced 110



TE-202G-6 Diversity Receive Terminal

cycles apart in a frequency range of 605 to 2695 cps. A 2915 cps synchronizing tone is also generated. Phase multiplexing combines two incoming data channels onto a single tone, and up to 40 separate data channels can be phase multiplexed onto the 20 tones. Data channels can be grouped together for the transmission of parallel data. A patch panel permits connection of any input line to any one of the data channels.

TE-202F-6 RECEIVE TERMINAL

The TE-202F-6 receives up to 40 channels of parallel data. Audio tones are separated from the received signal by kinematic filtering in both the time and frequency domains. The tones are decoded and converted into binary data. In decoding, two keyed filters are used for each tone. While one is being driven by the signal, the other stores the previously received phase. At the end of the drive period, the detector circuitry converts the phase difference between the two signals into binary information.

TE-202G-6 DIVERSITY RECEIVE TERMINAL

The TE-202G-6 uses diversity to protect against multipath and selective fading encountered in HF radio communication. Two receivers detect, separate, decode and convert audio tones into binary data. The diversity unit reassembles the data through continuous linear combination of the signals for delivery to output data converters.

The operating characteristics of the two diversity receivers are identical to those of the TE-202F-6.

DATA CHANNEL TESTER

The data channel tester provides back-to-back testing or test with a remote terminal over the voice channel for preventive maintenance or fault location. Visual error count indicator lamps quickly isolate marginal or fault conditions by group, channel and state (binary one or zero). Modular construction of the TE-202 permits rapid correction of the indicated marginal or fault condition.

Specifications

TRANSMIT INPUT: 1-40 channels, parallel, synchronous binary data signals, each at 45, 56, 60, 75 or 80 bits per second. Data inputs are voltage levels with respect to ground; −12 v dc ±10% for binary zero (0) and −21 v dc ±10% for binary one (1). Input impedance is 12,000 ohms.

TRANSMIT OUTPUT: Composite signal composed of 20 phase-shifted audio tones and one synchronizing tone. The 20 data tones, spaced 110 cycles apart, range in frequency from 605 cps to 2695 cps. The 2915 cps synchronizing tone is on-off modulated at ½ the transmitted data rate. Output level is −1 dbm maximum in 600 ohms with peaks to +16 dbm.

TIMING: The transmit time base accepts a 100 kc sine wave from a high stability standard and provides timing signals for the transmit terminal and associated equipment. Data timing is a symmetrical square wave, 0 v ±0.5 v to −10 ±0.5 v. with repetition rate equal to data rate.

POWER REQUIREMENTS: 115 v ac ±10%, single phase, 60 cps, 2.5 amps.

TE-202F-6, TE-202G-6 RECEIVE TERMINALS

RECEIVE INPUT: Composite signal composed of 20 phase-shifted audio tones and one synchronizing tone. The 20 data tones, spaced 110 cycles apart, range in frequency from 605 cps to 2695 cps. The 2915 cps synchronizing tone is on-off modulated at one-half received data rate. Nominal input level is −22 dbm. Input impedance is 600 ohms at 1000 cps.

RECEIVE OUTPUT: 1-40 channels, parallel, synchronous binary data signals, each at 45, 56, 60, 75 or 80 bits per second.

Data outputs are voltage levels with respect to ground; −12 v dc ±10% for binary zero (0) and −21 v dc ±10% for binary one (1). Output load impedance is 10,000 ohms.

TIMING: The receive time base accepts a 100 kc sine wave from a high stability standard and provides timing signals for the data receiver and associated equipments. Data timing is a symmetrical square wave, 0 v ±0.5 v to −10 v ±0.5 v. Timing signal for operation and synchronization of external equipment is available at the output data rate.

ASSOCIATED HF RADIO EQUIPMENT

TRANSMITTER CHARACTERISTICS

AUDIO RESPONSE: 2.5 db, 450-3050 cps; 30 db, 4000 cps above carrier; 40 db, 400 cps below carrier.

DIFFERENTIAL DELAY: 0.5 millisecond, 800-3050 cps; 0.9 millisecond, 500-800 cps.

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

FREQUENCY DEVIATION: Not more than 0.5 cps, audio output.

PHASE STABILITY: Not more than 4° per bit-period.

SSB DISTORTION: At full PEP, all distortion products are 35 db below either tone of a two-tone test signal.

SPURIOUS SIGNALS: At least 50 db below rated PEP.

NOISE: 40 db below either tone of a two-tone test signal.

AUDIO INPUT: 600 ohms.

ALC: Adjustable to more than 90% of PEP.

RECEIVER CHARACTERISTICS

AUDIO RESPONSE: 2.5 db, 450-3050 cps; 30 db, 4000 cps above carrier; 40 db, 400 cps below carrier.

DIFFERENTIAL DELAY: 0.5 millisecond, 800-3050 cps; 0.9 millisecond, 500-800 cps.

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

FREQUENCY DEVIATION: Not more than 0.5 cps, audio output.

PHASE STABILITY: Not more than 4° per bit-period.

INTERMODULATION DISTORTION: 3rd order distortion products are 40 db below either tone of a two-tone test signal.

AUDIO DISTORTION: Not more than 1% total.

SPURIOUS SIGNALS: More than 80 db down including images.

AUDIO OUTPUT: 600 ohms, 8 db maximum variation due to AGC control.

AGC: Attack and release time constant of 200 milliseconds.

GAIN STABILITY: Not more than 2 db difference between the audio output levels of the dual diversity receiver.

WIRELINE REQUIREMENTS

FREQUENCY RESPONSE: 3 db, 600-2700 cps; 6 db, 300-3000 cps.

DIFFERENTIAL DELAY: 1.5 milliseconds, 600-2700 cps; 3.0 milliseconds, 500-3000 cps.

CIRCUIT NET LOSS: 20 db.

NET LOSS VARIATION: ±8 db.

LINE IMPEDANCE: 600 ohms at 1000 cps.

FREQUENCY TRANSLATION MAXIMUM: ±1 cps.

BROADBAND NOISE (3 kc nominal bandwidth): 20 db.

SUBSCRIBER STATION PROTECTION: Normal devices.

700B-2 Teletypewriter Converter

Features	Applications
No Adjustments	*Fixed Station*
Solid State	*Shipboard*
Small Size	*Mobile*

The 700B-2 is a compact teletypewriter converter which will change two-tone frequency-shift keyed signals at 1575 cps and 2425 cps to the binary dc levels required to actuate a teletypewriter at speeds to 100 words per minute. It also converts the teletypewriter binary dc output to two-tone audio information that can be used half duplex to modulate a transmitter in the frequency shift keying mode.

A choice of 2-wire 60 ma, 4-wire 60 ma or AN/AGC-1 teletypewriter equipment can be accommodated by simply changing the connection of jumper straps in the unit. Audio output impedances of either 150 or 600 ohms can be selected by jumpers on the rear connector.

The 700B-2 consists of four plug-in modules on an aluminum chassis housed in a short ¼ ATR case. All electrical connections are made through a single connector located at the rear. Test points on each module aid in performing maintenance checks. Reliability is greatly enhanced by the use of solid state components.

Specifications

SIGNAL INPUT-AUDIO

FREQUENCY: Mark, 2425 cps; space, 1575 cps.

SENSITIVITY: 100 mv to 4 v rms input levels at 600 ohms or 1000 ohms.

SIGNAL OUTPUT-AUDIO

FREQUENCY: Mark, 2425 cps; space, 1575 cps.

OUTPUT: 15 milliwatt level at 150 ohms or at 600 ohms.

TELETYPEWRITER: Standard 60 ma 2- or 4-wire loop.

POWER: 115 v ±5%, 400 cps ±5%, 1 phase, 28 watts; 26.5 v dc ±20%, 90 ma nominal.

MOUNTING: ARINC Specification 404.

OPERATING CONDITIONS

AMBIENT TEMPERATURE RANGE: −40° C to +50° C.

AMBIENT HUMIDITY RANGE: 0%-95%.

AMBIENT ALTITUDE: Up to 15,000 ft.

SHOCK CONDITIONS: Will meet Munson road test.

VIBRATION: MIL-STD-167.

SIZE: Standard short ¼ ATR case, 2⅜" W, 7 49/64" H, 15 3/16" D (6.03 cm W, 19.72 cm H, 36.04 cm D).

WEIGHT: 9 lbs. (4.08 kg).

700C-1 Teletypewriter Adapter Kit

Features	Applications
Easily Installed	*Field Use*
Solid State	*Fixed Station*
Small Size	*Mobile*

Used in conjunction with the AN/PRC-47, the 700C-1 Teletypewriter Adapter Kit provides a single channel of half duplex communication using an SSB radio circuit (two-wire operation). Design features include compact construction, solid state components, electronic keyer and integral loop current power supply. A blower and air filter is included to permit continuous duty transmit operation of the AN/PRC-47. In the transmit mode, the binary output of a teletypewriter is converted to two-tone audio signals for modulating the transmitter. In the receive mode, the two-tone FSK signals in the audio range are converted to dc binary levels for operation of a 100 wpm teletypewriter. The filter characteristics will allow RF frequency translation errors or Doppler shift.

The 700C-1 is easily installed on the front panel and requires no wiring changes, adjustments or tuning. A switch and potentiometer are used to select the loop current option and adjust the current to the proper value. The teletypewriter can be located up to one mile from the AN/PRC-47. Terminals are included for connection of a remote push-to-talk switch.

Specifications

SIGNAL INPUT-AUDIO: Frequency — Mark, 2425 cps; space, 1575 cps. Sensitivity — 50 mw into 300 ohms.

SIGNAL INPUT-DC BINARY: DC Binary — 60 ma mark, 0 ma space (option 1); 20 ma mark, 0 ma space (option 2).

SIGNAL OUTPUT-AUDIO: Frequency — Mark, 2425 cps; space, 1575 cps. Output — 0.1 v rms at 50 ohms.

SIGNAL OUTPUT-BINARY: Binary — 60 ma mark, 0 ma space (option 1); 20 ma mark, 0 ma space (option 2).

TELETYPEWRITER EQUIPMENT OPTIONS: (1) Standard 60 ma teletypewriter. (2) AN/AGC-1 teletypewriter. (3) Teleprinter Model 104 "MITE."

POWER: Obtained from AN/PRC-47; 25 watts (includes cooling air blower necessary for continuous duty operation in transmit function).

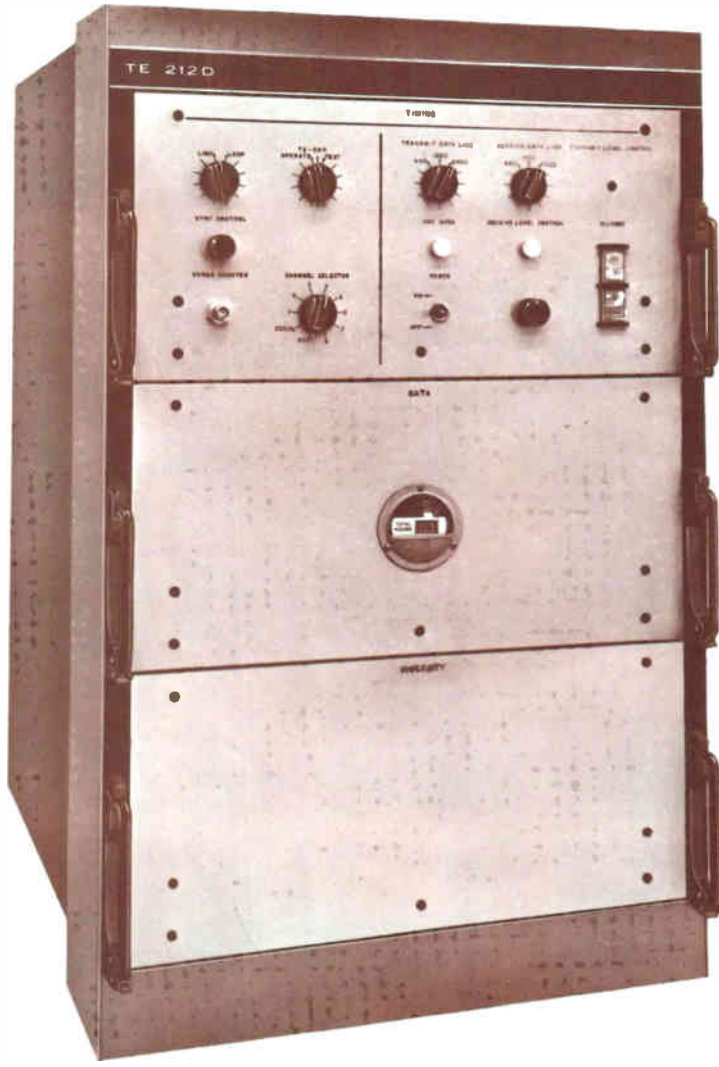
OPERATING CONDITIONS: Ambient Temperature — −40° C to +60° C. Ambient Humidity — 0%-90% relative humidity. Ambient Altitude — Sea level to 12,000 ft. Shock Conditions — 20 g peak. Vibration — 5 g, 10-55 cps. Bias Distortion — 5% maximum.

SIZE: 4¼" W, 3¾" H, 6 7/8" D (10.8 cm W, 9.53 cm H, 17.46 cm D).

WEIGHT: 3 lbs. (1.36 kg).

Available only on a production contract.

TE-212 Digital Data Modem



TE-212D

Features

Full Duplex Transmission
2400 Bit Per Second Rate
Diversity Receive Function
Solid State Circuits

Applications

Fixed Station
Airborne

The TE-212 Digital Data Communication Modem is a solid state, full duplex transmitter and diversity receiver capable of a 2400 bit per second data rate over a 3 kc bandwidth with HF radio equipment.

The TE-212 communicates digital data between aircraft and ground station or between ground stations. It superimposes this data on four audio tones, which are separated by 440 cycles in a frequency range of 935 to 2255 cps.

At the diversity receive terminal, digital data is extracted from the audio tones, using Kineplex® techniques, regenerated and delivered to external equipment in either serial or parallel form.

HIGH RELIABILITY

Phase shift modulation and Collins patented Predicted Wave Detection techniques yield a signal-to-noise ratio four times (6 db) better than frequency modulated systems and make optimum use of narrow bandwidths. Reliability and ease of maintenance are assured by solid state components and drawer-mounted, plug-in modular circuit cards. This packaging technique permits custom, rack or cabinet arrangement.

Diversity operation is provided for additional communication reliability over radio circuits that are subject to selective fading. Diversity operation provides frequency or space di-

versity through continuous, linear combination of the received channels.

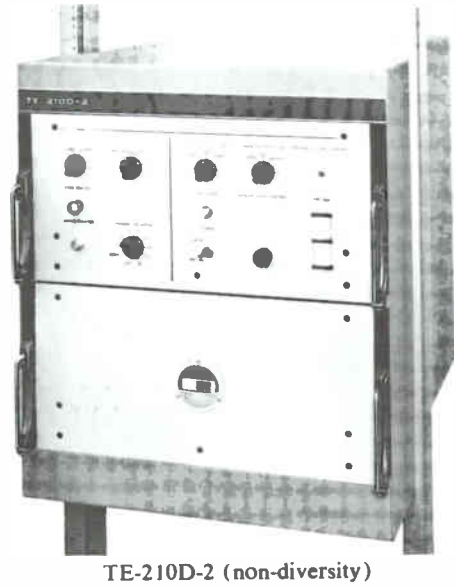
An automatic level control maintains input line level value by automatically correcting for long term line variations. A phase delay compensator network corrects the phase delay inherent in transmission equipment.

FLEXIBLE DATA RATES

The TE-212 is designed for continuous, unattended, automatic, full duplex operation in any of five, dial-selected, data rate modes: 600, 1200 or 2400 bits per second at 3.3. millisecond bit lengths, or 600 or 1200 bits per second at 6.7 millisecond bit lengths. These high speed, flexible data rates plus built-in reliability make the TE-212 Data Communication Modem the solution to rigorous data transmission applications wherever sustained, accurate performance is required.

INTEGRAL TEST FACILITY

The integral test facility compares the received data pattern with the transmitted test pattern and provides visual error indication. Regenerated in the receiver in synchronism with receive timing, the test pattern permits back-to-back testing, or system testing over a voice facility. In the test mode, received serial data on any one of the eight parallel data channels can be monitored.



TE-210D-2 (non-diversity)

ALARMS

Alarms provide relay contact closure for loss of input serial data rate timing, loss of serial input data, loss of serial output data, improper transmit and receive levels.

Specifications

DATA INPUT (DIGITAL)

VOLTAGE LEVEL: Serial — binary zero (0), −1.0 v to +0.25 v; binary one (1), +3.6 v to +6.0 v. Parallel — binary zero (0), −4.0 v to −6.25 v; binary one (1), +1.0 v to −1.0 v.

IMPEDANCE: Serial — 5,000 ohms nominal. Parallel — 10,000 ohms nominal.

DATA OUTPUT (DIGITAL)

VOLTAGE LEVELS: Serial — binary zero (0), −1.0 v to +0.25 v; binary one (1), +3.6 v to +6.0 v. Parallel—binary zero (0), −5.5 v to −6.5 v; binary one (1), +0.25 v to −0.2 v.

IMPEDANCE: 600 ohms maximum output impedance, shunt capacity 300 uuf maximum; 600 ohms load impedance.

AUDIO INPUT/OUTPUT

Composite audio signal consisting of the following frequencies: 600/3 bit per second rate — 1375 cps; 1200/3 bit per second rate — 1375 and 1815 cps; 2400/3 bit per second rate — 935, 1375, 1815 and 2255 cps; 600/6 bit per second rate — 1375 and 1815 cps; 1200/6 bit per second rate — 935, 1375, 1815 and 2255 cps.

IMPEDANCE: 600 ohms ±20% from 900 cps to 2300 cps.

LEVEL: Input — variable, −35 dbm to +5 dbm. Output — variable, −20 dbm to +4 dbm.

EXTERNAL CLOCK INPUT: 100 kc, with frequency stability of 10^6 per day, or greater, 5 v rms minimum, 5000 ohms.

EXTERNAL TIMING: Provided by internal 100 kc crystal oscillator. Data rate timing input — bipolar square wave, 2.9-6.8 v peak-to-peak at 600, 1200 or 2400 cps, 5000 ohms nominal. Data rate timing output — bipolar square waves, 3.6-6.0 v peak-to-peak at 600, 1200 or 2400 cps, 600 ohms maximum. 300 cps and 600 cps input/output — 0 to −6 v, 10,000 ohms input impedance; 600 ohms output impedance.

COOLING: An internal blower and distribution for each enclosure. Panel controlled air paths maintain suitable internal operating temperatures.

POWER REQUIREMENTS: 100-125 v ac rms, 47-63 cps, single phase, 250 watts maximum.

OPERATING MODE: Full duplex, continuous, unattended at 600, 1200 or 2400 bit per second rates.

RELIABILITY: Greater than 2500 hours MTBF (Mean Time Between Failures); less than 15 minutes MTR (Mean Time to Repair). Preventative maintenance less than 5 hours per month for continuous operation.

ENVIRONMENTAL (OPERATING)

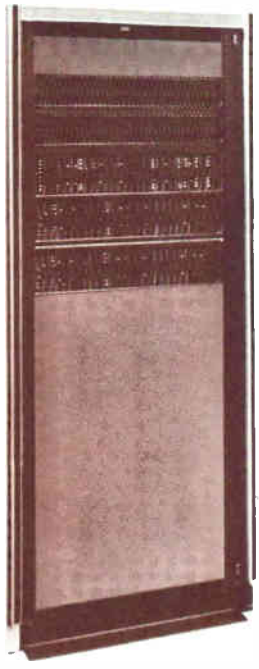
TEMPERATURE: 0° −52° C.

HUMIDITY: 0%-80% relative without condensation.

ALTITUDE: 0-15,000 ft.

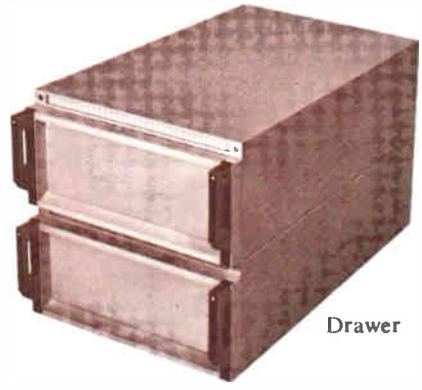
VIBRATION: MIL-T-4807A.

TE-216A-4 Adaptive Kineplex® Data Communication Modem



Cabinet

Airborne



Drawer

Features	Applications
Full Duplex Operation	*Fixed Station*
Binary Data Channels	*Transportable*
Diversity Receiver	*Airborne*
Flexible Data Rates	*Shipboard*

The TE-216A-4 is a full duplex transmitter and receiver capable of 3600 bit per second maximum data rate over a voice bandwidth channel, such as wireline, cable, carrier, microwave or radio circuits. It can be used to replace the Collins TE-210 Modem.

The modem will handle digital data between computers, business machines, telemetry equipment, teletypewriter and other sources. It accepts synchronous parallel or serial digital data from external sources, separates the accepted data into two, four or eight channels and superimposes this data on four audio tones, which are separated by 440 cycles in a frequency range of 935 to 2255 cps.

CHOICE OF DATA RATES

The TE-216A-4 is designed for continuous, unattended, full duplex operation. Data rates in increments of 300 bits per second can be transmitted. Data can be in either serial or parallel form.

TRANSMIT FUNCTION

In the transmit mode, as many as twelve parallel, shifted and amplitude modulated 300 bit per second channels are phase modulated onto four audio tones. Timing is available to external equipment in multiples of 300 cps. External timing in synchronization with the incoming data can be used.

RECEIVE FUNCTION

The receive function accepts the composite audio tone, heterodynes it with an oscillator and passes the signal through a bandpass filter and amplifier. The composite signal is then applied to the input of keyed filters. Two keyed filters are used for each tone. While one is being driven by the signal, the other stores the previously received phase. At the end of the drive period, the phase and amplitude difference between the signals is converted into binary data by the detector.

In the receive mode, the received, phase shifted, amplitude modulated audio tones are demodulated; the digital data detected and reassembled for delivery in serial and parallel form. The receiver supplies data rate timing in multiples of 300 cps to external equipment in synchronization with the output data.

LINE FACILITY REQUIREMENTS

The TE-216A-4 performs satisfactorily over telephone facilities having the characteristics specified under FCC Tariff 237, Schedule 4A, maintained in accordance with standard telephone systems practices.

ASSOCIATED EQUIPMENT

TE-216B-4 DATA TRANSMITTER

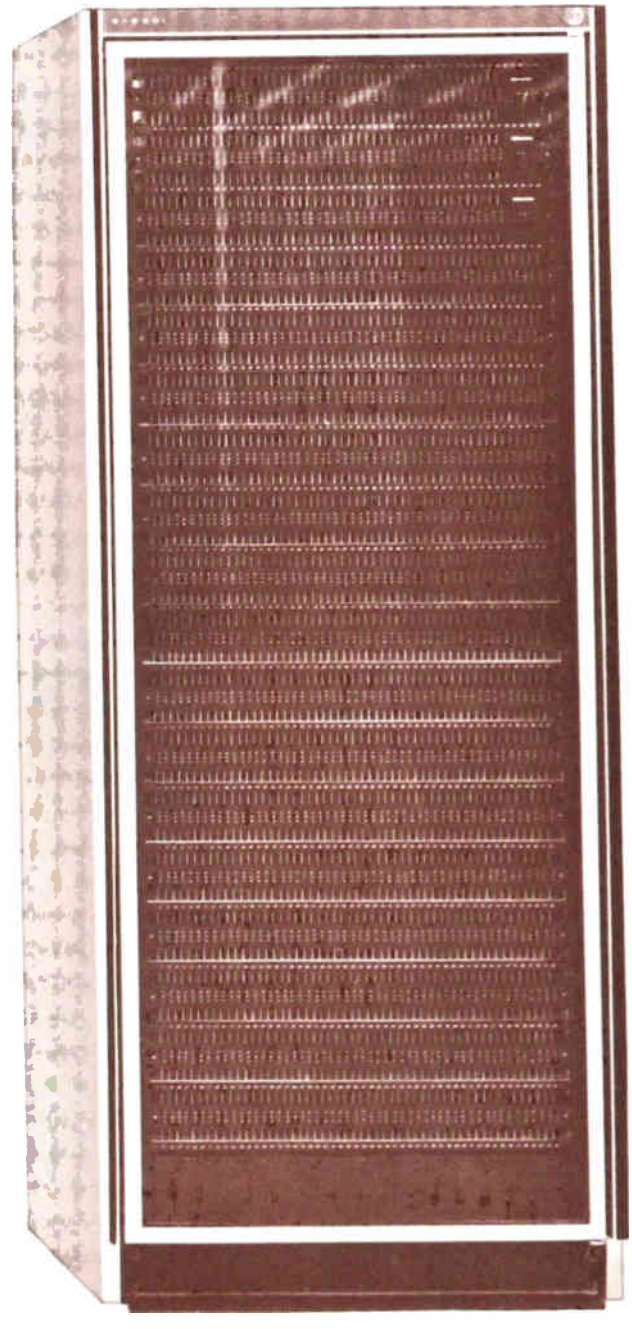
The TE-216B-4 is a high speed digital data transmitter capable of a 3600 bit per second data rate over voice bandwidth channels. Designed for simplex operation, the unit transmits digital data from computers, business machines, telemetry equipment and other digital data sources. The operating parameters are identical to the data rates and transmit functions of the TE-216A-4 Data Communication Modem.

TE-216C-4 DATA RECEIVER

The TE-216C-4 is a high speed digital data receiver capable of detecting the signal transmitted by the Collins TE-216A-4 Data Communication Modem or the Collins TE-216B-4 Data Transmitter. Designed for simplex operation, the TE-216C-4 can receive, detect and regenerate the data transmitted over nominal 3 kc bandwidth channels. The TE-216C-4 delivers the data to external equipment in serial or parallel form. The operating parameters are identical to the receive functions of the Collins TE-216A-4.

TE-216A-20 Adaptive Kineplex® Data Modem

Features	Applications
Full Duplex	*Fixed Station*
Accepts Binary Data	*Shipboard*
Diversity Receiver	*Transportable*
Flexible Data Rates	*Airborne*
Kineplex® Techniques	



The TE-216A-20 is a highly efficient data terminal for use over HF radio circuits. Up to 4500 bits per second of synchronous, parallel binary data can be transmitted over a standard 3 kc voice channel. The equipment can be used also on wireline or microwave circuits.

It offers a wide range of transmission rates in full duplex operation. Up to 60 channels of data service are provided by the terminal with data rates of 75 bits per second on each channel. The TE-216A-20 is ideally suited for 100 word per minute per channel teletypewriter operation or as a high capacity data link for computers, business machines, telemetery, supervisory control or other similar applications. Other bit rates are optionally available. The TE-216A-20 replaces the TE-202.

HIGH RELIABILITY

Designed for continuous operation, the terminal requires only periodic performance checks after initial start-up to assure normal operation. Rack mounted, the Collins TE-216A-20 features solid state circuitry, integrated cooling and power. Transmit and receive circuit cards can be removed or added in multiples of two channels to provide a minimum of two and a maximum of 60 channels of data service.

EQUIPMENT CONFIGURATIONS

Three TE-216A-20 terminal configurations are offered: the TE-216B-20 Transmit Terminal, the TE-216C-20 Receive Terminal, and the TE-216D-20 Diversity Receive Terminal. The TE-216B-20 Transmit Terminal, combined with the TE-216C-20 Receive Terminal, provides duplex data service, or combined with the TE-216D-20, furnishes duplex diversity data service.

On long communication links, a duplex terminal can be used as an unattended digital relay station.

Specifications

TE-216B-20 TRANSMIT TERMINAL

TRANSMIT INPUT: Up to 60 channels, parallel or optionally serial synchronous binary data signals. Data inputs are voltage levels with respect to ground; +3 v dc for binary zero (0) and 0 v dc for binary one (1). Input impedance is 600 ohms. Parallel input is 75 bits per second per channel maxi-

mum; serial, 4500 bits per second with other rates optional in either burst or continuous format.

TRANSMIT OUTPUT: Composite signal composed of 20 phase-shifted and amplitude-modulated audio tones. The 20 data tones, spaced 110 cycles apart, range in frequency from 605 cps to 2585 cps. Output level is −1 dbm maximum into a 600 ohm line with peaks to +10 dbm.

TIMING: The transmit time base operates from either a 100 kc sine wave from a high stability standard or an internal reference frequency and provides timing signals for the transmit terminal and associated equipment. Data timing is available in multiples of 75 cps for either serial or parallel operation.

TE-216C-20 RECEIVE TERMINAL

The receive terminal accepts the composite audio tones, heterodynes them and passes the signal through a bandpass filter and amplifier. The composite signal is then applied to the input of the keyed filters. Two keyed filters are used for each tone. The received, phase shifted amplitude modulated audio tones are demodulated. The digital data after detection is reassembled for delivery in serial or parallel form. The receiver supplies data rate timing for serial or parallel operation to external equipment in synchronization with the ouput data.

TE-216D-20 FULL DUPLEX WITH DIVERSITY

TE-216D-20 terminals can be operated over any voice facility meeting the specifications listed below under transmission facility requirements. TE-216D-20 equipment complies with good telephone engineering practice as to transmitting levels, balance and dielectric strength. Normal subscriber station protection devices are satisfactory in this application.

TRANSMISSION FACILITY REQUIREMENTS

HF RADIO EQUIPMENT

TRANSMITTER CHARACTERISTICS

AUDIO RESPONSE: 2.5 db, 500-2700 cps; −30 db, 4000 cps above carrier; −40 db, 400 cps below carrier.

DIFFERENTIAL DELAY: 1.0 millisecond, 500-2700 cps.

FREQUENCY STABILITY: 1 part in 10^8 per day with synchronization disabled; 1 part in 10^6 per day with continuous synchronization.

SSB DISTORTION: At full PEP, all distortion products are 35 db below either tone of a two-tone test signal.

NOISE: 40 db below either tone of a two-tone test signal.

AUDIO INPUT: 600 ohms.

RECEIVER CHARACTERISTICS

AUDIO RESPONSE: 2.5 db, 500-2700 cps.

DIFFERENTIAL DELAY: 1.0 millisecond, 500-2700 cps.

FREQUENCY STABILITY: 1 part in 10^8 per day (see above).

INTERMODULATION: 3rd order distortion products are 40 db below either tone of a two-tone test signal.

SPURIOUS SIGNALS: Inband −40 db down.

AUDIO OUTPUT: 600 ohms, 8 db maximum variation due to AGC control.

AGC: Attack and release time constant of greater than 200 milliseconds.

WIRELINE REQUIREMENTS

FREQUENCY RESPONSE: 3 db, 500-2700 cps.

DIFFERENTIAL DELAY: 4.0 milliseconds, 500-2700 cps.

CIRCUIT NET LOSS: 30 db.

NET LOSS VARIATION: ±8 db.

LINE IMPEDANCE: 600 ohms at 1000 cps.

BROADBAND NOISE (3 kc nominal bandwidth): 20 db.

Selective Calling System

Features	Applications
Flexible Coding	*Fixed Station*
Ease of Operation	*Path Evaluation*
Synchronous Timing	

The Selective Calling System provides a continuous check of an entire communication network operational status by obtaining an automatic interrogation response from individual stations. It eliminates the need for continuous manual monitoring of receivers at each station in large HF communication systems. The SELCAL can be integrated into fully automatic calling and propagation evaluation systems.

It can also be employed for selective calling of individual stations, manual polling, simultaneous calling of all stations or automatic response to a selective call from another station in the network.

The SELCAL consists of an encoder/decoder and modem which convert digital coding to analog information for radio transmission and which process incoming data to determine message content.

Receive function is activated by a preamble code which distinguishes actual pertinent data from noise or voice transmissions. Time and frequency diversity operation minimize the effects of multipath distortion and selective fading, greatly increasing the reliability on long HF communication paths.

Test Equipment

Collins specialized test equipment includes spectrum analyzers to facilitate rapid and accurate measurement in single sideband systems. Equipment is also available for maintenance and calibration of systems using the 618T Transceiver and module testing of Collins automatic antenna couplers.

Accurate calibration and uniform maintenance procedures assure peak system operating conditions and increased reliability. Precise, standard adjustment of system components facilitates module interchangeability between equipment.

476D-1 Distortion Analyzer-Monitor

Features	Applications
Rapid Measurements	*SSB Installation*
Simplified Operation	*Laboratory*
Two-Tone Tests	
RF Level Indication	

The 476D-1 is a precision, portable test set for single sideband system measurements. Featuring simplicity of operation, it facilitates rapid and accurate measurement of single sideband systems for carrier suppression, opposite sideband suppression and distortion products near the carrier frequency. Complex measurements can be performed by field technicians or production line personnel saving costly engineering time.

An indication of relative RF voltage level permits trimming of tuned circuits operating at levels below that which can be measured by vacuum tube voltmeters. Distortion products can be measured over a 50 db range with an accuracy of approximately 1 db. The monitor function allows aural transmitter checks to be made during normal system operation.

Available only on a production contract.

APPLICATION

The self-contained 476D-1 is ideally suited for use in laboratories or HF single sideband stations. It includes two-tone RF and AF sources for separate measurements of receivers, transmitters, RF or AF amplifiers, modulators or complete systems. The unit is self-checking, and the front panel controls are arranged for simplified operation. RF signal frequencies are indicated on a direct reading dial. The 476D-1 can be mounted in a standard 19″ rack, if desired. Connecting cables, sampling loops or coupling devices are the only accessories required.

Specifications

FREQUENCY RANGE: RF — 1.7-31.7 mc (15 bands). IF — 0.1-1.7 mc. AF — 1500 cps and 2500 cps. Tunable IF — 0.1-1.7 mc.

INPUT SENSITIVITY: RF — 0.03-0.1 v rms. AF — 0.3 v rms.

DYNAMIC RANGE: 50 db below two equal RF or IF tones.

POWER REQUIREMENTS: 115 v, 50-450 cps, 200 watts.

SIZE: 22¼″ W, 18½″ H, 20 7/8″ D (56.52 cm W, 46.99 cm H, 53.02 cm D).

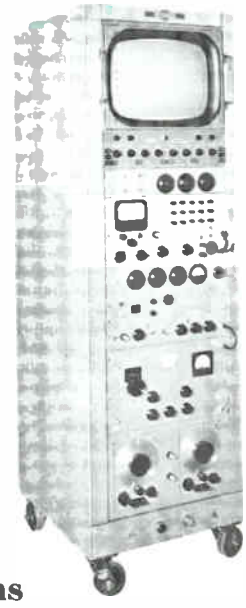
WEIGHT: Approx. 150 lbs. (68 kg).

478R-1 Spectrum Analyzer

Features	Applications
Spectrum Plots	*SSB Station*
Visual Spectrum Presentation	*Laboratory*
Large Oscilloscope	
Waveform Analysis	
Intermodulation Measurements	

The 478R-1 is a versatile, precision test set which accurately displays the output signal spectrum characteristics of RF generators, amplifiers, transmitters, exciters and oscillators on a 17 inch calibrated oscilloscope screen. The dynamic range of the analyzer is at least 70 db, displayed on one scale to an accuracy of ±1 db. It will accept signals from 2 mc to 64 mc and from 250 kc to 300 kc, plotting a spectrum width of 4, 8 or 16 kc without additional coils or test equipment.

Simultaneous measurements of hum, distortion, noise and other spurious products can be used as a direct plot of db level versus frequency. Permanent data for engineering reports can be provided by using a two-axis recorder.



Specifications

INPUT FREQUENCY RANGE: 2-64 mc and 250-300 kc. Other ranges with external injection.

RF INPUT VOLTAGE RANGE: 0.02-5.0 v rms for 0 db reference

level; 70 db dynamic range; RF signals below 6 uv can be detected at some frequencies.

SCANNING BANDWIDTHS: 4, 8 or 16 kc.

SCANNING TIME: 2-60 seconds. Manual scanning of spectrum can be employed.

RESOLUTION: 60 cps sidebands can be separated from the carrier frequency throughout the full range.

CALIBRATION ACCURACY: Vertical — within ±1 db from 0 to —70 db; 10 inches of usable height.

TWO-TONE TEST SIGNAL: Continuously variable audio oscillators provide input signals. Output is 3 v rms for each tone with up to 111 db of attenuation in 0.1 db steps into a 600 ohm external load.

POWER REQUIREMENTS: 115 v, 60 cps, 1200 va (230 v and/or 50 cps on special order).

SIZE: 22″ W, 69″ H, 26″ D (55.88 cm W, 175.26 cm H, 66.04 cm D).

WEIGHT: 600 lbs. (272.16 kg).

618T HF Transceiver Test Sets

Features	Applications
Dynamic Tests	*Shop Maintenance*
Uniform Adjustments	*Field Maintenance*
System Tests	
Rapid Maintenance	

The 678P-1 Test Harness, 678Y-1 Maintenance Kit and 678Z-1 Function Test Set, used with standard communication test equipment, provide a complete test facility for 618T, AN/ARC-94 or AN/ARC-102 Transceivers.

The AN/ARM-73 and MK-773 utilize groupings of these basic test equipments in lightweight, rugged, Fiberglas carrying cases for field and tactical applications. The AN/ARM-73 (678P-2) consists of the 678P-1 and associated cables, while the MK-773 (678Y-3) includes 678Y-1 components, the 678Z-1 and a kit of tools especially suited for maintenance of the 618T Transceivers.

The test sets assure peak operating condition of the communication systems by the use of uniform maintenance procedures. Precise standard adjustment of system components also facilitates modules which interchange between equipments, allowing more effective utilization and rapid over-all system maintenance.

AN/ARM-73 MK-773

678P-1 TEST BENCH HARNESS SET

The 678P-1 Test Bench Harness includes a test panel unit, together with cables and adapters. It is rugged, versatile and simple to use, allowing a rapid test of the complete system. Cable connectors are located on a rear deck away from operational controls. A 714E control unit mounts directly in the front panel. A directional wattmeter measures forward and reflected power. Both resistive and capacitive dummy RF loads are provided.

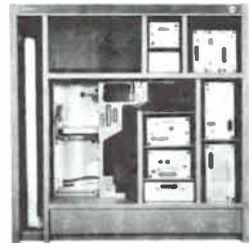
Power Requirements: Determined by transceiver being tested. *Size:* 8½″ W, 9 9/16″ H, 16″ D (21.59 cm W, 24.29 cm H, 40.64 cm D). *Weight:* 25 lbs. (11.34 kg).

678P-1

678Y-1 MAINTENANCE KIT

The 678Y-1 Maintenance Kit consists of nine module extenders, a shipping and storage case, and a complete set of special tools, adapter plugs, cables and detectors to facilitate alignment and adjustment of the 618T Transceiver. The extender plugs into the equipment instead of the module to be tested, and the module then plugs into the extender. It is then located 6″ from the 618T, AN/ARC-94 or AN/ARC-102 chassis, permitting access to all components during operation. All modules except the power amplifier and high voltage supply can be tested. Air flow cooling requirements and the presence of dangerously high voltages preclude the use of extenders for these modules. Each module extender contains test jacks arranged to aid in isolating operational difficulties. The module printed circuit boards can be loosened and exposed for inspection and maintenance.

Size: 23½″ W, 24¼″ H, 11½″ D (59.7 cm W, 61.6 cm H, 29.2 cm D. *Weight:* 48.0 lbs. (21.77 kg).



678Y-1

678Z-1 FUNCTION TEST SET

The 678Z-1 contains a calibrated zener diode voltage source

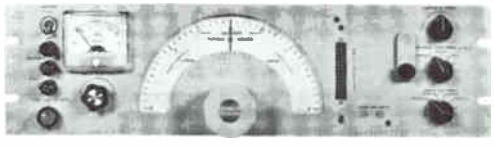
678Z-1

which is used in conjunction with a sensitive bridge detector to provide a method of accurately adjusting the 18 v regulated supply and the reference bias voltages in the VFO and kilocycle stabilizer modules. Provisions are included for VFO capture range checks on the kilocycle stabilizer module and for overriding the transceiver TGC circuits for test purposes. A dummy microphone circuit is also included.
Power Requirements: 115 v, 400 cps, single phase, 0.1 amp. *Size:* 9.375" W, 9.141" H, 5.750" D (23.81 cm W, 23.22 cm H, 14.61 cm D). *Weight:* 5.0 lbs. (2.27 kg).

878L-1, -2, -3 Antenna Coupler Module Test Sets

Features	Applications
Dynamic Test	*Shop Maintenance*
Uniform Adjustments	

The 878L-1 Servo Amplifier Test Set, 878L-2 Relay Control Test Set and 878L-3 Discriminator Tester facilitate maintenance procedures of automatic antenna couplers and associated coupler control units.
The test sets assure peak operating condition of the communication systems for increased reliability by accurate calibration and uniform maintenance procedures. Precise standard adjustment of system components facilitates module interchangeability between equipments, allowing more effective utilization and rapid over-all system maintenance.



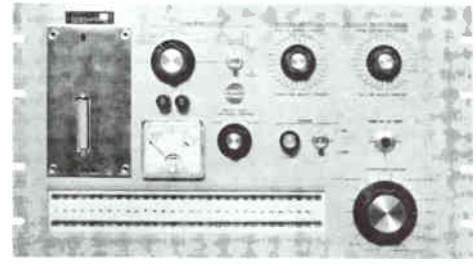
878L-1

878L-1 SERVO AMPLIFIER TEST SET

The 878L-1 develops the operating voltage and error signals required for testing the servo amplifier used in Collins 309A-1, 309A-1A, 309A-2, 309A-2D, 309A-2E, C-1940/ARC-58, C-2848/TRC-75 and unit 4, AN/ARC-80 Antenna Coupler Controls. External test points allow access to servo amplifier outputs for balance and bias adjustments.
Controls are included to select either of three inputs to the servo amplifier and for selection of high and low calibrated signals for adjusting servo amplifier gain. A variable uncalibrated signal is provided for trouble shooting. A socket and holding clamp on the front panel allow direct insertion and retention of the servo amplifier being tested.
Power Requirements: 100-130 v rms, 400 cps ±5%, not more than 3% harmonic distortion. *Size:* 19" W, 5 5/32" H, 18 13/16" D (48.26 cm W, 13.10 cm H, 47.78 cm D). *Weight:* 11½ lbs. (5.22 kg).

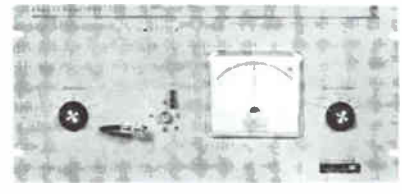
878L-2 RELAY CONTROL TEST SET

The 878L-2 completely tests the relay assemblies used in the following antenna coupler controls: 309A-1, 309A-1A,



878L-2

309A-2, 309A-2D, 309A-2E, 309A-3, C-1940/ARC-58, C-2848/TRC-75 and unit 4, AN/ARC-80. It employs lamp comparisons and voltage indications in a general go-no-go type of test. Resistance selectors are provided for adjusting pull-in and drop-out voltages of the coil and tap servo relays. The unit is completely self-contained and can be mounted in a standard equipment rack. All controls and indicators, as well as the connector for the relay assembly under test, are located on the front panel.
A three-foot extension cable is included to allow easier trouble shooting on the bench, since the module has limited accessibility on the test set.
Power Requirements: 110-125 v, 400 cps, 75 watts. *Size:* 19" W, 10½" H, 8 15/16" D (48.26 cm W, 26.67 cm H, 22.7 cm D). *Weight:* 16.3 lbs. (7.39 kg).



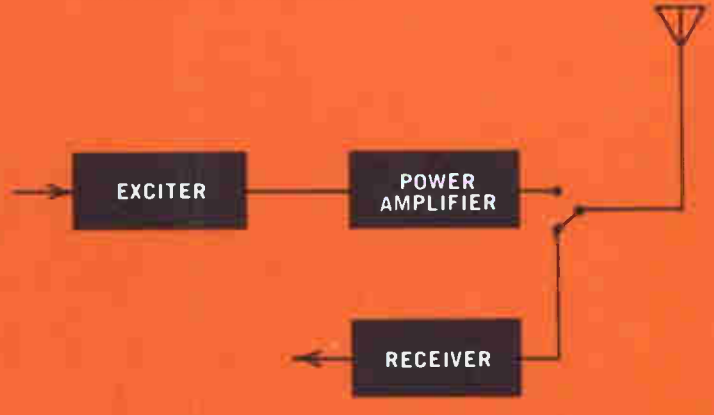
878L-3

878L-3 DISCRIMINATOR TESTER

The 878L-3 can be used to align and perform tracking adjustments on the loading-phasing discriminators used in the Collins 180R-4, -4A, 180R-6, 180R-7, 180R-8 and 180R-10A Antenna Couplers. Operates in conjunction with an external high level RF signal source. Input impedance is 50 ohms. No primary power is required.
Size: 19" W, 8 23/32" H, 10¼" D (48.26 cm W, 22.2 cm H, 26.0 cm D). *Weight:* 12.8 lbs. (5.8 kg).

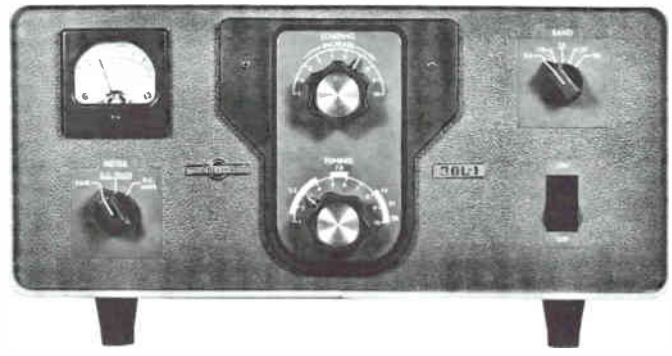
Amateur Radio Equipment

Behind the prestige of Collins amateur equipment is research and development for the world's finest communication systems. The S/Line is a complete station, system-engineered for the advanced amateur. The 32S-3 Transmitter and 75S-3B,-3C Receivers can be operated separately or as a transceiver in which the receiver controls the transmitter frequency. The 30L-1 or 30S-1 Power Amplifier provides high power levels with greatly simplified operation. The KWM-2,-2A Transceivers incorporate time-proven and advanced communication concepts. A complete line of operational accessories facilitates superior single sideband performance in a variety of installations.



30L-1 Linear Amplifier

Features	Applications
Automatic Load Control	*Fixed Station*
RF Inverse Feedback	*Transportable*
Silicon Rectifiers	*Shipboard*
Self-contained Power Supply	*Mobile*
	Airborne



The 30L-1 Linear Amplifier provides 1000 watts PEP input on SSB and CW on all bands. The linear amplifier is designed to be driven by the Collins KWM-1 and KWM-2 Transceivers, as well as the 32S-3 Transmitter. Most other 70-100 watt CW/SSB exciters will also drive the linear.

The 30L-1 has a self-contained power supply with safety interlock circuits for shorting the high voltage to ground if the cover is removed. Automatic antenna switching from exciter to amplifier or receive to transmit and instant warm-up are also features of the 30L-1. The linear amplifier is completely self-contained and designed for table top use. It is easily transported in a CC-2 Carrying Case.

Specifications

FREQUENCY RANGE: 3.4-30.0 mc, covering 80, 40, 20, 15 and 10 meter amateur bands. By retuning input circuit as necessary, the following general coverage bands can be used:

Frequency Band	*Total Coverage*
3.5 mc	3.4-6.0 mc
7.0 mc	6.0-9.5 mc
14.0 mc	9.5-16.0 mc
21.0 mc	16.0-22.0 mc
28.0 mc	22.0-30.0 mc

MODE: SSB or CW.

TYPE OF SERVICE: Attended operation SSB continuous; CW 50% duty cycle.

POWER REQUIREMENTS: 115 v or 230 v, 50-60 cps; CW, key closed, 1200 watts ac; SSB, no modulation, 300 watts ac; SSB, speech modulated, 550 watts ac.

DRIVE POWER: 70-100 watts for full output.

PLATE POWER INPUT: 1000 watts PEP on SSB; 1000 watts on CW on all bands.

POWER OUTPUT: Not less than 500 watts PEP into a 50 ohm load on all bands.

HARMONIC AND OTHER SPURIOUS RADIATION: Second harmonic —40 db; third order distortion —30 db at full power.

NOISE LEVEL: 40 db below one tone carrier.

AMBIENT TEMPERATURE: 0°-50° C.

AMBIENT HUMIDITY RANGE: 0%-90%.

OUTPUT IMPEDANCE: Variable. Normally 50 ohms unbalanced with not more than 2:1 SWR on the amateur bands.

AUDIO COMPRESSION CHARACTERISTICS: ALC operates from the RF input voltage and is factory set for proper input to output voltage ratio.

ALTITUDE: 0-10,000 ft.

PROTECTIVE DEVICES: All removable panels interlocked. Input line fused 8 amps on each side.

SIZE: With feet, 14¾" W, 7¾" H, 13¾" D (37.47 cm W, 19.69 cm H, 34.93 cm D).

WEIGHT: 38 lbs. (17.24 kg).

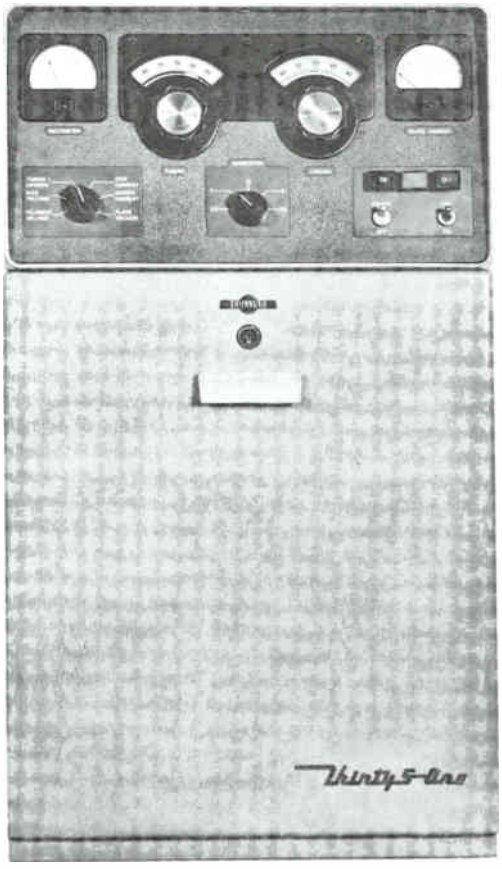
30S-1 Linear Amplifier

Features	Applications
RF Inverse Feedback	*Fixed Station*
Instant Switching	
Quick and Accurate Tuning	
Automatic Load Control	

The 30S-1 is a completely self-contained, linear amplifier. Requiring 70-100 watts input (from 32S-3 or KWM-2), it provides 1 kw PEP output on SSB, CW or RTTY.

An Eimac 4CX1000A is employed as a grounded grid linear amplifier. The 30S-1 can be used on any frequency between 3.4 mc and 30.0 mc. A special comparator circuit allows tune-up at low power.

All operating controls are easily accessible on the front panel, allowing the linear amplifier to be tuned swiftly, surely and easily. Power level can be switched instantly from the 100 watt power level of the associated S/Line transmitter to the full output of the 30S-1 by the push of a button. The 30S-1 can also be tuned to frequencies outside the amateur bands. Automatic load control voltage from the 30S-1 is fed back to the transmitter to assure maximum talking power without



30S-1 Linear Amplifier

overdriving and distortion. Other design features include self-contained power supply, an automatic antenna relay, an efficient and quiet cooling system, and tube and component protective circuitry.

Specifications

FREQUENCY RANGE: 3.4-30.0 mc, including 80, 40, 20, 15 and 10 meter amateur bands.

MODE: SSB, CW or RTTY.

POWER REQUIREMENTS: 115 v or 230 v, 50-60 cps, single phase, 2000 watts maximum.

DRIVE POWER: 70-100 watts for full output.

POWER OUTPUT: 1000 watts.

HARMONIC AND OTHER SPURIOUS RADIATION: Second harmonic —40 db; all others at least 50 db down.

NOISE LEVEL: 40 db below one-tone carrier.

AMBIENT TEMPERATURE: 15°-45° C.

AMBIENT HUMIDITY RANGE: 0%-90%.

OUTPUT IMPEDANCE: 52 ohms with SWR of 2:1 or less.

ALTITUDE: 0-6000 ft.

SIZE: 17" W, 30⅝" H, 18¾" D (43.18 cm W, 77.79 cm H, 47.63 cm D).

WEIGHT: 160 lbs. (72.58 kg).

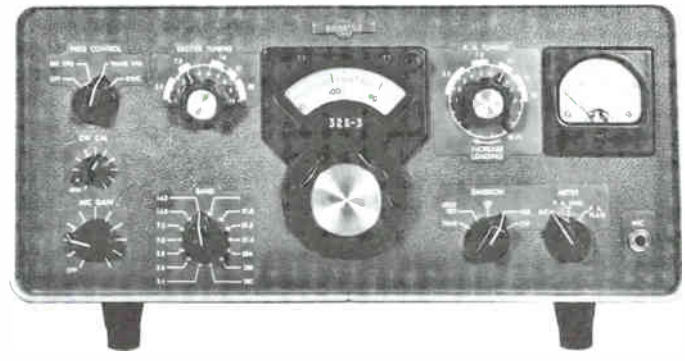
32S-3 Transmitter

Features	Applications
Dual Conversion	*Fixed Station*
Automatic Load Control	*Transportable*
RF Inverse Feedback	*Shipboard*
Mechanical Filter	*Mobile*
	Airborne

The 32S-3 is an SSB or CW transmitter with nominal output of 100 watts from 3.4-30.0 mc (except 5.0-6.5 mc). Choice of thirteen 200 kc bands covers all amateur bands except 10 meters, where one 200 kc band crystal is supplied with provision for two additional crystals. The 32S-3 can be operated on MARS (Military Affiliate Radio Service) frequencies. The transmitter features Mechanical Filter sideband generation, permeability-tuned VFO, crystal-controlled HF oscillator, as well as RF inverse feedback and automatic load control. CW features include grid block keying, spotting control, keying hardness control and sidetone level adjust.

The high degree of frequency stability permits the 32S-3 to be used for RTTY communication.

The 32S-3 can be operated as a transceiver by using oscillator injection voltages supplied by a companion Collins 75S Receiver.



Specifications

FREQUENCY RANGE: 3.4-5.0 mc and 6.5-30.0 mc; with crystals furnished, bands are as follows:

80 meters — 3.4-3.6 mc, 3.6-3.8 mc and 3.8-4.0 mc.

40 meters — 7.0-7.2 mc and 7.2-7.4 mc.

20 meters — 14.0-14.2 mc and 14.2-14.4 mc.

15 meters — 21.0-21.2 mc, 21.2-21.4 mc and 21.4-21.6 mc.

10 meters — 28.5-28.7 mc.

MODE: SSB (either sideband selectable) or CW.

TYPE OF SERVICE: SSB continuous; CW 50% duty cycle.

POWER REQUIREMENTS: 115 v, 50-60 cps using 516F-2 AC Power Supply. Power can be delivered by an external supply which must furnish 800 v dc at 220 ma for PA plates, 275 v dc at 175 ma for PA screens and low voltage B+. Bias voltages adjustable between —60 v and —80 v dc; 6.3 v ac at 7.7 amps or 6.0 v dc at 6.0 amps or 12.0-14.0 v dc at 3.0 amps or 24.0-28.0 v dc at 1.5 amps. CW, key closed, 320 watts ac or 25 amps at 12 v. SSB, no modulation, 230 watts ac, 15 amps at 12 v. SSB, speech, 255 watts ac, 20 amps at 12 v.

PLATE INPUT: 175 watts PEP on SSB; 160 watts on CW.

POWER OUTPUT: 100 watts PEP (nominal) into 50 ohms.

HARMONIC AND OTHER SPURIOUS RADIATION: Carrier suppression —50 db; unwanted sideband —50 db; oscillator feedthrough and/or mixer products —50 db. Second harmonic —40 db. Third order distortion —30 db.

NOISE LEVEL: 40 db below one tone carrier.

AMBIENT TEMPERATURE: 0°-50° C.

AMBIENT HUMIDITY RANGE: 0%-90%.

ALTITUDE: 0-10,000 ft.

PROTECTIVE DEVICES: Primary fuses provided in the companion 516F-2 ac power supply to be used with the equipment.

FREQUENCY STABILITY: Within 100 cps after warm-up.

CALIBRATION ACCURACY: 1 kc.

BACKLASH: Not more than 50 cps.

VISUAL DIAL ACCURACY: 200 cps on all bands.

OUTPUT IMPEDANCE: Variable 50 ohms nominal, capable of matching up to 2:1 SWR.

CW SIDETONE: Provision for monitoring keying in receiver. Sidetone level is adjustable.

KEYING CHARACTERISTICS: Grid block keying is free of chirp and clicks. Modified break-in CW provided. Keyed carrier used for CW keying. Envelope rise and decay time adjustable.

AUDIO INPUT: High impedance microphone or phone patch.

AUDIO FREQUENCY RESPONSE: 300-2400 cps ±6 db.

AUDIO COMPRESSION CHARACTERISTICS: ALC operates on IF and RF amplifier stages with 10 db of compression capability.

RF FEEDBACK: Approximately 10 db of RF feedback around PA and driver for improved PA linearity.

SIZE: Transmitter with feet — 14¾" W, 7¾" H, 11½" D (37.47 cm W, 19.69 cm H, 29.21 cm D).

WEIGHT: 16 lbs. (7.26 kg).

75S-3B, -3C Receivers

Features	Applications
Rejection Tuning	*Fixed Station*
Variable BFO	*Transportable*
Optional Mechanical Filters	*Shipboard*
Zener Regulated Oscillators	*Mobile*
	Airborne

The 75S-3B,-3C provide SSB, CW and AM reception between 3.4 and 30.0 mc (except 5.0-6.5 mc) by selection of the appropriate HF heterodyning crystals. Crystals furnished cover HF amateur bands except the 10 meter band, where one crystal is supplied plus provision for two more.

Features incorporated in the 75S-3B,-3C include dual conversion with a crystal-controlled first heterodyning oscillator; bandpass first IF; stable, permeability-tuned VFO; RF amplifier designed to minimize cross-modulation products; 2.1 kc Mechanical Filter; excellent AGC characteristics; both product and diode detector; rejection notch filter; manual and crystal-controlled BFO, and AGC time constant control. The advanced design of the 75S-3B,-3C includes the use of silicon diodes in lieu of conventional high vacuum rectifier; and the choice of two degrees of CW selectivity with optional plug-in filters (also optional Mechanical Filters for AM). Provision for obtaining power from a dc power supply is also made.

The 75S-3C is an extended frequency version of the 75S-3B which includes an additional crystal board located beneath the chassis. In this board is placed the standard complement of amateur band crystals normally received with the equipment. The upper board can be used for up to 14 additional crystals. This permits ease of operating for MARS (Military Affiliate Radio Service) and other military and commercial applications. A front panel switch allows switching between the two crystal boards.

A conventional RTTY converter and printer can be used with the receiver. Fine tuning for this mode is provided by the variable BFO adjustment.

The 75S-3B,-3C are compatible with Collins 32S-3 Transmitter and 312B-4 Station Control to make a completely in-

tegrated amateur radio station. They are capable of supplying oscillator injection voltages to the companion 32S-3 Transmitter. No auxiliary coupling units or wiring changes are necessary. The two units are patched together with six cables. A switch on the panel of the 32S-3 allows the choice of either transceive or separate VFO operation.

The 75S-3B,-3C can also be conveniently used with other transmitters including Collins' KWS-1, as well as with the KWM-1 or KWM-2 Transceivers. Muting is also provided by the 32S-3 and KWM-2,-2A.

Specifications

FREQUENCY RANGE: 3.4-5.0 mc and 6.5-30.0 mc; with crystals furnished, bands are as follows:

80 meters — 3.4-3.6 mc, 3.6-3.8 mc and 3.8-4.0 mc.
40 meters — 7.0-7.2 mc and 7.2-7.4 mc.
20 meters — 14.0-14.2 mc and 14.2-14.4 mc.
WWV — 14.8-15.0 mc.
15 meters — 21.0-21.2 mc, 21.2-21.4 mc and 21.4-21.6 mc.
10 meters — 28.5-28.7 mc.

MODE: Selectable SSB, CW or AM.

POWER REQUIREMENTS: 115 v, 50-60 cps; approximately 85 watts. Power can be provided by an external supply which delivers 185 v dc at 125 ma and —62 v dc at 5 ma. Filament power can be ac or dc as follows: 6-7 v at 5.5 amps, 12-14 v at 2.75 amps, or 24-28 v at 1.4 amps.

HARMONIC AND OTHER SPURIOUS RESPONSE: Image rejection better than 50 db. Internal spurious signals below 1 uv equivalent antenna input.

AUDIO NOISE LEVEL: Not less than 40 db below 1 watt.

AMBIENT TEMPERATURE: 0°-50° C.

AMBIENT HUMIDITY RANGE: 0%-90%.

ALTITUDE: 0-10,000 ft.

CALIBRATOR: 100 kc crystal.

FREQUENCY STABILITY: Within 100 cps after warm-up.

CALIBRATION ACCURACY: 1 kc.

BACKLASH: Not more than 50 cps.

VISUAL DIAL ACCURACY: 200 cps on all bands.

SENSITIVITY: 0.5 uv for 10 db signal-plus-to-noise-to-noise ratio in SSB mode.

SELECTIVITY: SSB — 2.1 kc at 6 db down; 4.2 kc at 60 db down. AM — 5 kc at 6 db down; 25 kc at 60 db down.

OPTIONAL FILTERS: 200 cps, 500 cps, 800 cps, 1.5 kc for CW and RTTY. 3.1 kc, 4.0 kc and 6.0 kc for AM.

Q MULTIPLIER: Rejection notch depth 50 db nominal, 40 db minimum.

VARIABLE BFO: Tunes 452-458 kc.

AUTOMATIC GAIN CONTROL: AGC threshold — 1.5-3.0 uv; 1.5 uv nominal. Selectable AGC time constant, Fast, Slow and Off. Attack time is 0.8 milliseconds in both Fast and Slow. Fast release time is 300 milliseconds. Slow release time is 600 milliseconds.

AUDIO OUTPUT LEVEL: 1.0 watt at AGC threshold. 3.0 watts maximum.

ANTENNA INPUT: 50 ohms.

AUDIO OUTPUT CIRCUITS: 500 ohms ±20% and 4 ohms ±20%. Panel jack is on divider off of 500 ohm winding.

AUDIO DISTORTION: Not more than 10% at 1 watt.

MUTING: By opening an external ground on mute terminal.

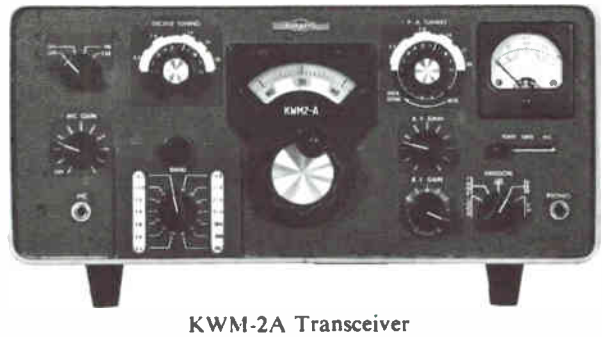
SIZE: Receiver with feet — 14¾" W, 7¾" H, 12½" D (37.47 cm W, 19.69 cm H, 31.75 cm D).

WEIGHT: 20 lbs. (9.07 kg).

KWM-2, -2A 175 Watt Transceivers

Features	Applications
Automatic Load Control	*Fixed Station*
Inverse RF Feedback	*Transportable*
Permeability-Tuned Oscillator	*Shipboard*
Easy-to-Read Dial	*Mobile*
	Airborne

The KWM-2 and KWM-2A are compact HF single sideband transceivers. The equipments have been used in rugged field and air operations with combat units of United States and allied military forces. The KWM-2 provides fourteen 200 kc bands between 3.4 mc and 30.0 mc. The KWM-2A has a second crystal board for selecting frequencies outside the amateur bands. These additional 14 crystals provide ease of operation for MARS (Military Affiliate Radio Service) and other military and commercial applications. A front panel switch permits switching between the two crystal boards. The plate power input of the KWM-2,-2A is 175 watts PEP



KWM-2A Transceiver

on single sideband or 160 watts nominal on CW. Nominal power output is 100 watts. Automatic load control (ALC) maintains the signal level at rated PEP, resulting in an increase in average talk power. Inverse RF feedback improves linearity, reducing distortion products and signal splatter.

Other features include filter-type SSB generation, a permeability-tuned variable frequency oscillator, crystal-controlled double conversion and VOX/ANTI VOX circuits. Collins Mechanical Filter, RF amplifier, all tuned circuits and several tubes function in both transmit and receive.

Specifications

FREQUENCY RANGE: 3.4-5.0 mc and 6.5-30.0 mc; with crystals furnished, bands are as follows:

80 meters — 3.4-3.6 mc, 3.6-3.8 mc and 3.8-4.0 mc.
40 meters — 7.0-7.2 mc and 7.2-7.4 mc.
20 meters — 14.0-14.2 mc and 14.2-14.4 mc.
WWV — 14.8-15.0 mc.
15 meters — 21.0-21.2 mc, 21.2-21.4 mc and 21.4-21.6 mc.
10 meters — 28.5-28.7 mc.

MODE: SSB (either sideband selectable) or CW.

TYPE OF SERVICE: SSB continuous; CW 50% duty cycle.

FREQUENCY STABILITY: Within 100 cps after warm-up.

CALIBRATION ACCURACY: 1 kc.

BACKLASH: Not more than 50 cps.

VISUAL DIAL ACCURACY: 200 cps on all bands.

POWER REQUIREMENTS: With companion 516F-2 or PM-2 AC Power Supply, 115 v, 50-60 cps, or 400 cps with minor changes; power consumption approximately 235 watts in receive function and approximately 475 watts in transmit. In mobile operation, 800 v dc required at approximately 175 ma; low voltage 275 v at 230 ma; a bias supply adjustable between —50 v and —80 v; and 6 v, 12 v or 24 v dc at 11.0, 5.5 or 2.75 amps respectively.

SIZE: With feet, 14¾" W. 7¾" H, 14" D (37.47 cm W, 19.69 cm H, 35.56 cm D).

WEIGHT: 18 lbs. 3 oz. (8.25 kg).

TRANSMITTING CHARACTERISTICS

PLATE INPUT: 175 watts PEP on SSB; 160 watts on CW.

POWER OUTPUT: 100 watts PEP (nominal) into 50 ohms.

HARMONIC AND OTHER SPURIOUS RADIATION: Carrier suppression —50 db; unwanted sideband —50 db; oscillator feedthrough and/or mixer products —50 db; second harmonic —40 db; third order distortion —30 db.

NOISE LEVEL: 40 db below single tone carrier.

ALTITUDE: 0-10,000 ft.

OUTPUT IMPEDANCE: Variable, 50 ohms nominal, capable of matching up to 2:1 SWR.

KEYING CHARACTERISTICS: Keying is free of chirps and clicks. Break-in CW and sidetone provided.

AUDIO INPUT: High impedance microphone or phone patch.

AUDIO FREQUENCY RESPONSE: 300-2400 cps ±6 db.

AUDIO COMPRESSION CHARACTERISTICS: ALC operates on IF and RF amplifier stages and is capable of 10 db compression.

RF FEEDBACK: Approximately 10 db of RF feedback around PA and driver for improved linearity.

RECEIVING CHARACTERISTICS

RECEIVER SENSITIVITY: 0.5 uv for 10 db signal-to-noise ratio in amateur bands.

RECEIVER SELECTIVITY: 2.1 kc bandwidth at 6 db down; 4.2 kc bandwidth at 60 db down.

RECEIVER SPURIOUS RESPONSE: Image rejection 50 db nominal. Internal spurious below 1 uv equivalent antenna input.

RECEIVER OUTPUT LEVEL: 1.0 watt maximum.

AUTOMATIC GAIN CONTROL: The audio output level does not change more than 20 db as the input signal is changed from 5 uv to 1 v. Fast attack and slow release provide excellent AVC action on voice and CW.

Amateur Equipment Accessories

136B-2 NOISE BLANKER

The 136B-2 is designed for use with the KWM-2 under mobile operating conditions. This noise blanker provides effective reduction of impulse-type noise. It differs from simple audio clipping circuits or series-type limiters by silencing ahead of the selective sideband filters. All necessary hardware and instructions are furnished for simple installation in the KWM-2. The 136B-2 requires a 40 mc antenna which can be used as a whip for the car radio. *Weight:* 1¼ lbs. (0.567 kg).

180S-1 ANTENNA TUNER

The 180S-1 is basically a 1 kw pi network for matching various antenna impedances to a 50 ohm coaxial transmission line in the range of 3-30 mc. In most cases it is used as an L network, but when the L network cannot match the desired antenna, the complete pi circuit is used. The variable vacuum capacitor employed in the output circuit may be connected either in series or shunt with the antenna. The 180S-1 is useful for tuning trailing wire antennas on large aircraft.

302C-3 DIRECTIONAL WATTMETER

The 302C-3 is valuable for checking the antenna system. It measures forward and reflected RF power. Two scales are provided: 0-200 watts and 0-2000 watts accommodating both high and low power transmitters. The 302C-3 is contained in two units: the coupler for connecting into a 50 ohm transmission line and the meter panel which is styled to match the S/Line.

312B-3 SPEAKER

The 312B-3 contains a 5″ x 7″ (12.7 cm x 17.78 cm) speaker and connecting cable and is styled to match the S/Line and KWM-2. *Size:* 10″ W, 7¾″ H, 8″ D (25.4 cm W, 19.69 cm H, 20.32 cm D). *Weight:* 4 lbs. (1.81 kg).

312B-4 SPEAKER CONSOLE

The 312B-4 integrates the 75S-3, 32S-3, 30S-1 and accessories into an operating system. The KWM-2 and 30S-1 can also be integrated into an operating system by the 312B-4. A speaker, RF directional wattmeter with 200 and 2000 watt scales, and a phone patch are included in the console. *Size:* 10″ W, 7¾″ H, 12¼″ D (25.4 cm W, 19.69 cm H, 31.12 cm D). *Weight:* 8½ lbs. (3.86 kg).

312B-5 VFO CONSOLE

Designed for use with the KWM-2 in fixed station operation, the 312B-5 provides limited separation of receive and transmit frequencies, phone patching facilities and a directional wattmeter. It includes a 5″ x 7″ permanent magnetic speaker. The PTO control selector can be set as follows: (1) Receive KWM-2, Transmit 312B-5; (2) Transceive KWM-2; (3) Transceive 312B-5. Other control functions are Voice Operated, Receive Only, Transmit Only, Phone Patch On-Off, and Station Mute. Cables are furnished for connections to the KWM-2. *Size:* 10″ W, 7¾″ H, 12¼″ D (25.4 cm W, 19.69 cm H, 31.12 cm D). *Weight:* 8½ lbs. (3.86 kg).

351D-2 MOBILE MOUNT

The 351D-2 provides secure mounting for the KWM-2 in most automobiles. Cantilever arms fold out of the way when the KWM-2 is removed. The connector at the right end is the power plug; the connector at the left end can be used for control of antennas having band switching circuitry. Cables 20 feet in length are attached to each plug.

351E MOUNTING PLATES

The 351E can be used to secure the S/Line or KWM-2 equipments to bench or table in shipboard, airborne or vehicular installations. The 351E-1 will accommodate either the 75S-3B,-3C Receiver or the 32S-3 Transmitter; the 351E-2 will mount either the 516F-2 Power Supply or the 312B-4 Station Control; the 351E-3 will mount the 312B-3 Speaker. The 351E-4 has two snap-in clamps for secure installation of the KWM-2. The equipment can be easily unclamped for removal without the use of tools. The unit is removed by pulling forward and lifting from the mounting plates.

351R RACK MOUNTING ADAPTERS

The 351R-1 is a matching gray rack panel for mounting the 75S-3B,-3C, 32S-3, KWM-2, 30L-1, 62S-1 or 51S-1. The 351R-2 Rack Adapter is a panel for mounting the S/Line and KWM-2 accessories. The 516F-2, 312B-4 and 312B-5 can be mounted in the 351R-2. Both adapters are 8¾″ H and 13 13/16″ D (22.23 cm H and 33.5 cm D) behind the front panel. A supporting shelf holds the unit securely. Mounting hardware is furnished with each rack mount.

440E-1 CABLE KIT

The 440E-1 is similar to the cable which is supplied with the Collins 351D-2 Mobile Mount. This cable can be used to connect the KWM-2 with the MP-1 or 516E-2 Power Supply when the mobile mount is not used.

440F-1 CABLE

The 440F-1 Cable is five feet in length and can be used to connect either the S/Line or the KWM-2 to the 516F-2 Power Supply, allowing the 30S-1 to be placed a greater distance from other units of the S/Line and permitting greater flexibility of fixed station installations.

516F-2 AC POWER SUPPLY

The 516F-2 can be used with the 32S-3 and KWM-2, supplying all voltages for them; 115 v. 50-60 cps, 400 cps with minor change. *Size:* 10″ W, 7¾″ H. 12″ D (25.4 cm W, 19.69 cm H, 30.48 cm D). *Weight:* 28 lbs. (12.7 kg).

CC-2 CARRYING CASE

The CC-2 is designed to hold the components of a portable Collins SSB or CW station. The KWM-2 plus the PM-2 Power Supply, the KWM-2 alone, the 30L-1 or the 51S-1 can be transported in the case. The CC-2 is adapted from the Samsonite Silhouette and includes a shock-resistant interior for the equipment. *Weight:* 9.5 lbs. (4.31 kg) empty.

CC-3 CARRYING CASE

The CC-3 is a specially built case for accessory components of a portable Collins SSB or CW station. The CC-3 has the same styling features as the CC-2. A molded interior allows the CC-3 to accommodate a 312B-5 (or 312B-4) Station Control Console, a 516E-2 (or MP-1) Power Supply, a TD-1 Dipole Antenna, as well as a supply of spare tubes and fuses. *Weight:* 10 lbs. (4.54 kg) empty.

CP-1 CRYSTAL PACKET

The CP-1 contains a set of crystal grippers and all the crystals for operation of the S/Line receiver, S/Line transmitter or the KWM-2,-2A throughout the complete operating range. The crystals not supplied are those for the range of 5.0 to 6.6 mc and those which are already provided with the equipment. The packet is of a waterproof plastic material containing a pouch for each crystal and one for the grippers. Each pouch is marked with appropriate band information and crystal frequency. The complete packet can be fastened into the CC-2 Carrying Case.

DL-1 DUMMY LOAD

The DL-1 is a 100 watt resistive load which can be used for various tuning functions without putting the transmitter on the air. The DL-1 can be switched in and out of the circuit by a front panel switch or can be remotely controlled by the addition of another switch in the operating position. This unit reduces tune-up and testing QRM and requires no additional connecting or disconnecting of wires prior to operation. *Weight:* 2 lbs. (1.3 kg).

MM-1 MOBILE MICROPHONE

The Collins MM-1 is a pressure-operated dynamic microphone designed to fit your hand comfortably. This mike is engineered for maximum voice response, and its die cast case is finished in brushed satin chrome. With its mounting button on the front, the MM-1 slips easily into a dashboard bracket supplied with the mike. When the MM-1 is removed from the dashboard bracket, the microphone is in position for instant transmission. A five-foot length of Koiled Kord with mike plug supplied with the 22 ounce microphone. The MM-1 has a frequency response from 200-10,000 cycles per second and has an output level of —48 db.

MM-2 MICROPHONE

The Collins MM-2 includes a high impedance reluctance microphone and single earphone which can be used in either a fixed station installation or with a mobile unit. The MM-2 has a frequency response from 100-7,000 cycles per second and an output level of —50 db. In mobile use, the ear-piece and microphone unit permit the driver to operate his car with both hands while carrying out radio voice communication. Although it weighs only 3½ ounces (0.099 kg), the Collins MM-2 is built to withstand the strenuous demands of daily mobile operation. Its microphone boom has a 360° adjustment making it possible to angle the mike to the best pickup position. The MM-2 Microphone has a magnetic stray field shield to exclude unwanted noises. For optimum reception of signals, an adjustable tone arm in the MM-2 pipes sound directly into the operator's right or left ear, but does not cover the ear as conventional earphones do. The MM-2 comes equipped with both mike and phone plugs.

MP-1 MOBILE POWER SUPPLY

The MP-1 converts a 12 volt automobile, aircraft or boat battery to the voltages required for the KWM-1, KWM-2 or KWM-2A. The MP-1 includes a high voltage supply for the transmitter PA, bias, and a low voltage supply for the amplifier. *Size:* 5¾" W, 3¾" H, 11" D (14.61 cm W, 9.53 cm H, 27.94 cm D). *Weight:* 7½ lbs. (3.4 kg).

PM-2 PORTABLE POWER SUPPLY

The PM-2 is a lightweight, limited duty cycle power supply providing voltages needed for the KWM-2. The PM-2 quickly slides into place and connects to the rear of the KWM-2, ready to operate in minutes from either 115 v ac or 220 v ac at 50-400 cps as a complete portable SSB or CW station. Both transceiver and power supply can be packed in the lightweight CC-2 Carrying Case for portability. A small auxiliary speaker is included in the PM-2 for emergency use. *Size:* 14¾" W, 7¾" H, 4" D (37.47 cm W, 19.69 cm H, 10.16 cm D). *Weight:* 13.5 lbs. (6.12 kg).

SM-1 DESK TOP MICROPHONE

Collins SM-1 is a high impedance, nonmetallic dynamic mike with a frequency response from 100-3500 cycles per second. It has an output level of —53 db. Finished in brushed satin chrome, this compact microphone is equipped with a rubber isolated stand and a five-foot length of Koiled Kord.

SM-2 MICROPHONE

Collins SM-2 is a slender, gray and chrome desk top unit which blends perfectly with Collins' other station equipment. The SM-2 is omnidirectional and provides excellent transmission for the amateur operator. The frequency response of the SM-2, 200-3,000 cycles, matches that of the S/Line and KWM-2. The SM-2 has an output level of —53 db and is equipped with a five-foot length of Koiled Kord and plug. It is mounted on a rubber isolated stand. A swivel permits a 60° swing for position adjustment.

TD-1 DIPOLE ANTENNA

The TD-1 is designed for use when portability and operation on different frequencies are primary considerations. The molded plastic housing holds two steel tapes calibrated in meters, decimeters and centimeters. These tapes can be extended to the required length for a given frequency and locked in place. A permanent frequency-to-meters conversion chart is attached to the antenna housing. Each end of the tape is attached to a length of nylon line which acts as an insulator and a means for securing the antenna to structures of suitable height and positioning. A directional wattmeter should be used for initial tune-up to insure the proper frequency setting.

Index, Glossary, Reference Information

The following pages include an index by Collins type number, an index by equipment function and a cross index of applicable military nomenclature. Included also are tables, charts and graphs showing useful basic reference information.

Finding Power and Voltage/Current when Decibels are known

Voltage Ratio	Power Ratio	−db+	Voltage Ratio	Power Ratio
1.0000	1.0000	0	1.000	1.000
.9886	.9772	.1	1.012	1.023
.9772	.9550	.2	1.023	1.047
.9661	.9333	.3	1.035	1.072
.9550	.9120	.4	1.047	1.096
.9441	.8913	.5	1.059	1.122
.9333	.8710	.6	1.072	1.148
.9226	.8511	.7	1.084	1.175
.9120	.8318	.8	1.096	1.202
.9016	.8128	.9	1.109	1.230
.8913	.7943	1.0	1.122	1.259
.8810	.7762	1.1	1.135	1.288
.8710	.7586	1.2	1.148	1.318
.8610	.7413	1.3	1.161	1.349
.8511	.7244	1.4	1.175	1.380
.8414	.7079	1.5	1.189	1.413
.8318	.6918	1.6	1.202	1.445
.8222	.6761	1.7	1.216	1.479
.8128	.6607	1.8	1.230	1.514
.8035	.6457	1.9	1.245	1.549
.7943	.6310	2.0	1.259	1.585
.7852	.6166	2.1	1.274	1.622
.7762	.6026	2.2	1.288	1.660
.7674	.5888	2.3	1.303	1.698
.7586	.5754	2.4	1.318	1.738
.7499	.5623	2.5	1.334	1.778
.7413	.5495	2.6	1.349	1.820
.7328	.5370	2.7	1.365	1.862
.7244	.5248	2.8	1.380	1.905
.7161	.5129	2.9	1.396	1.950
.7079	.5012	3.0	1.413	1.995
.6998	.4898	3.1	1.429	2.042
.6918	.4786	3.2	1.445	2.089
.6839	.4677	3.3	1.462	2.138
.6761	.4571	3.4	1.479	2.188
.6683	.4467	3.5	1.496	2.239
.6607	.4365	3.6	1.514	2.291
.6531	.4266	3.7	1.531	2.344
.6457	.4169	3.8	1.549	2.399
.6383	.4074	3.9	1.567	2.455
.6310	.3981	4.0	1.585	2.512
.6237	.3890	4.1	1.603	2.570
.6166	.3802	4.2	1.622	2.630
.6095	.3715	4.3	1.641	2.692
.6026	.3631	4.4	1.660	2.754
.5957	.3548	4.5	1.679	2.818
.5888	.3467	4.6	1.698	2.884
.5821	.3388	4.7	1.718	2.951
.5754	.3311	4.8	1.738	3.020
.5689	.3236	4.9	1.758	3.090

Voltage Ratio	Power Ratio	−db+	Voltage Ratio	Power Ratio
.5623	.3162	5.0	1.778	3.162
.5559	.3090	5.1	1.799	3.236
.5495	.3020	5.2	1.820	3.311
.5433	.2951	5.3	1.841	3.388
.5370	.2884	5.4	1.862	3.467
.5309	.2818	5.5	1.884	3.548
.5248	.2754	5.6	1.905	3.631
.5188	.2692	5.7	1.928	3.715
.5129	.2630	5.8	1.950	3.802
.5070	.2570	5.9	1.972	3.890
.5012	.2512	6.0	1.995	3.981
.4955	.2455	6.1	2.018	4.074
.4898	.2399	6.2	2.042	4.169
.4842	.2344	6.3	2.065	4.266
.4786	.2291	6.4	2.089	4.365
.4732	.2239	6.5	2.113	4.467
.4677	.2188	6.6	2.138	4.571
.4624	.2138	6.7	2.163	4.677
.4571	.2089	6.8	2.188	4.786
.4519	.2042	6.9	2.213	4.898
.4467	.1995	7.0	2.239	5.012
.4416	.1950	7.1	2.265	5.129
.4365	.1905	7.2	2.291	5.248
.4315	.1862	7.3	2.317	5.370
.4266	.1820	7.4	2.344	5.495
.4217	.1778	7.5	2.371	5.623
.4169	.1738	7.6	2.399	5.754
.4121	.1698	7.7	2.427	5.888
.4074	.1660	7.8	2.455	6.026
.4027	.1622	7.9	2.483	6.166
.3981	.1585	8.0	2.512	6.310
.3936	.1549	8.1	2.541	6.457
.3890	.1514	8.2	2.570	6.607
.3846	.1479	8.3	2.600	6.761
.3802	.1445	8.4	2.630	6.918
.3758	.1413	8.5	2.661	7.079
.3715	.1380	8.6	2.692	7.244
.3673	.1349	8.7	2.723	7.413
.3631	.1318	8.8	2.754	7.586
.3589	.1288	8.9	2.786	7.762
.3548	.1259	9.0	2.818	7.943
.3508	.1230	9.1	2.851	8.128
.3467	.1202	9.2	2.884	8.318
.3428	.1175	9.3	2.917	8.511
.3388	.1148	9.4	2.951	8.710
.3350	.1122	9.5	2.985	8.913
.3311	.1096	9.6	3.020	9.120
.3273	.1072	9.7	3.055	9.333
.3236	.1047	9.8	3.090	9.550
.3199	.1023	9.9	3.126	9.772

Finding Power and Voltage/Current when Decibels are known

Voltage Ratio	Power Ratio	−db+	Voltage Ratio	Power Ratio
.3612	.1000	10.0	3.162	10.000
.3126	.09772	10.1	3.199	10.23
.3090	.09550	10.2	3.236	10.47
.3055	.09333	10.3	3.273	10.72
.3020	.09120	10.4	3.311	10.96
.2985	.08913	10.5	3.350	11.22
.2951	.08710	10.6	3.388	11.48
.2917	.08511	10.7	3.428	11.75
.2884	.08318	10.8	3.467	12.02
.2851	.08128	10.9	3.508	12.30
.2818	.07943	11.0	3.548	12.59
.2786	.07762	11.1	3.589	12.88
.2754	.07586	11.2	3.631	13.18
.2723	.07413	11.3	3.673	13.49
.2692	.07244	11.4	3.715	13.80
.2661	.07079	11.5	3.758	14.13
.2630	.06918	11.6	3.802	14.45
.2600	.06761	11.7	3.846	14.79
.2570	.06607	11.8	3.890	15.14
.2541	.06457	11.9	3.936	15.49
.2512	.06310	12.0	3.981	15.85
.2483	.06166	12.1	4.027	16.22
.2455	.06026	12.2	4.074	16.60
.2427	.05888	12.3	4.121	16.98
.2399	.05754	12.4	4.169	17.38
.2371	.05623	12.5	4.217	17.78
.2344	.05495	12.6	4.266	18.20
.2317	.05370	12.7	4.315	18.62
.2291	.05248	12.8	4.365	19.05
.2265	.05129	12.9	4.416	19.50
.2239	.05012	13.0	4.467	19.95
.2213	.04898	13.1	4.519	20.42
.2188	.04786	13.2	4.571	20.89
.2163	.04677	13.3	4.624	21.38
.2138	.04571	13.4	4.677	21.88
.2113	.04467	13.5	4.732	22.39
.2089	.04365	13.6	4.786	22.91
.2065	.04266	13.7	4.842	23.44
.2042	.04169	13.8	4.898	23.99
.2018	.04074	13.9	4.955	24.55
.1995	.03981	14.0	5.012	25.12
.1972	.03890	14.1	5.070	25.70
.1950	.03802	14.2	5.129	26.30
.1928	.03715	14.3	5.188	26.92
.1905	.03631	14.4	5.248	27.54
.1884	.03548	14.5	5.309	28.18
.1862	.03467	14.6	5.370	28.84
.1841	.03388	14.7	5.433	29.51
.1820	.03311	14.8	5.495	30.20
.1799	.03236	14.9	5.559	30.90
.1778	.03162	15.0	5.623	31.62
.1758	.03090	15.1	5.689	32.36
.1738	.03020	15.2	5.754	33.11
.1718	.02951	15.3	5.821	33.88
.1698	.02884	15.4	5.888	34.67
.1679	.02818	15.5	5.957	35.48
.1660	.02754	15.6	6.026	36.31
.1641	.02692	15.7	6.095	37.15
.1622	.02630	15.8	6.166	38.02
.1603	.02570	15.9	6.237	38.90
.1585	.02512	16.0	6.310	39.81
.1567	.02455	16.1	6.383	40.74
.1549	.02399	16.2	6.457	41.69
.1531	.02344	16.3	6.531	42.66
.1514	.02291	16.4	6.607	43.65
.1496	.02239	16.5	6.683	44.67
.1479	.02188	16.6	6.761	45.71
.1462	.02138	16.7	6.839	46.77
.1445	.02089	16.8	6.918	47.86
.1429	.02042	16.9	6.998	48.98
.1413	.01995	17.0	7.079	50.12
.1396	.01950	17.1	7.161	51.29
.1380	.01905	17.2	7.244	52.48
.1365	.01862	17.3	7.328	53.70
.1349	.01820	17.4	7.413	54.95
.1334	.01778	17.5	7.499	56.23
.1318	.01738	17.6	7.586	57.54
.1303	.01698	17.7	7.674	58.88
.1288	.01660	17.8	7.762	60.26
.1274	.01622	17.9	7.852	61.66
.1259	.01585	18.0	7.943	63.10
.1245	.01549	18.1	8.035	64.57
.1230	.01514	18.2	8.128	66.07
.1216	.01479	18.3	8.222	67.61
.1202	.01445	18.4	8.318	69.18
.1189	.01413	18.5	8.414	70.79
.1175	.01380	18.6	8.511	72.44
.1161	.01349	18.7	8.610	74.13
.1148	.01318	18.8	8.710	75.86
.1135	.01288	18.9	8.811	77.62
.1122	.01259	19.0	8.913	79.43
.1109	.01230	19.1	9.016	81.28
.1096	.01202	19.2	9.120	83.18
.1084	.01175	19.3	9.226	85.11
.1072	.01148	19.4	9.333	87.10
.1059	.01122	19.5	9.441	89.13
.1047	.01096	19.6	9.550	91.20
.1035	.01072	19.7	9.661	93.33
.1023	.01047	19.8	9.772	95.50
.1012	.01023	19.9	9.886	97.72
.1000	.01000	20.0	10.000	100.00

Finding Decibels when Voltage/Current Ratio is known

Voltage Ratio	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
1.0	.000	.086	.172	.257	.341	.424	.506	.588	.668	.749
1.1	.828	.906	.984	1.062	1.138	1.214	1.289	1.364	1.438	1.511
1.2	1.584	1.656	1.727	1.798	1.868	1.938	2.007	2.076	2.144	2.212
1.3	2.279	2.345	2.411	2.477	2.542	2.607	2.671	2.734	2.798	2.860
1.4	2.923	2.984	3.046	3.107	3.167	3.227	3.287	3.346	3.405	3.464
1.5	3.522	3.580	3.637	3.694	3.750	3.807	3.862	3.918	3.973	4.028
1.6	4.082	4.137	4.190	4.244	4.297	4.350	4.402	4.454	4.506	4.558
1.7	4.609	4.660	4.711	4.761	4.811	4.861	4.910	4.959	5.008	5.057
1.8	5.105	5.154	5.201	5.249	5.296	5.343	5.390	5.437	5.483	5.529
1.9	5.575	5.621	5.666	5.711	5.756	5.801	5.845	5.889	5.933	5.977
2.0	6.021	6.064	6.107	6.150	6.193	6.235	6.277	6.319	6.361	6.403
2.1	6.444	6.486	6.527	6.568	6.608	6.649	6.689	6.729	6.769	6.809
2.2	6.848	6.888	6.927	6.966	7.008	7.044	7.082	7.121	7.159	7.197
2.3	7.235	7.272	7.310	7.347	7.384	7.421	7.458	7.495	7.532	7.568
2.4	7.604	7.640	7.676	7.712	7.748	7.783	7.819	7.854	7.889	7.924
2.5	7.959	7.993	8.028	8.062	8.097	8.131	8.165	8.199	8.232	8.266
2.6	8.299	8.333	8.366	8.399	8.432	8.465	8.498	8.530	8.563	8.595
2.7	8.627	8.659	8.691	8.723	8.755	8.787	8.818	8.850	8.881	8.912
2.8	8.943	8.974	9.005	9.036	9.066	9.097	9.127	9.158	9.188	9.218
2.9	9.248	9.278	9.308	9.337	9.367	9.396	9.426	9.455	9.484	9.513
3.0	9.542	9.571	9.600	9.629	9.657	9.686	9.714	9.743	9.771	9.799
3.1	9.827	9.855	9.883	9.911	9.939	9.966	9.994	10.021	10.049	10.076
3.2	10.103	10.130	10.157	10.184	10.211	10.238	10.264	10.291	10.317	10.344
3.3	10.370	10.397	10.423	10.449	10.475	10.501	10.527	10.553	10.578	10.604
3.4	10.630	10.655	10.681	10.706	10.731	10.756	10.782	10.807	10.832	10.857
3.5	10.881	10.906	10.931	10.955	10.980	11.005	11.029	11.053	11.078	11.102
3.6	11.126	11.150	11.174	11.198	11.222	11.246	11.270	11.293	11.317	11.341
3.7	11.364	11.387	11.411	11.434	11.457	11.481	11.504	11.527	11.550	11.573
3.8	11.596	11.618	11.641	11.664	11.687	11.709	11.732	11.754	11.777	11.799
3.9	11.821	11.844	11.866	11.888	11.910	11.932	11.954	11.976	11.998	12.019
4.0	12.041	12.063	12.085	12.106	12.128	12.149	12.171	12.192	12.213	12.234
4.1	12.256	12.277	12.298	12.319	12.340	12.361	12.382	12.403	12.424	12.444
4.2	12.465	12,486	12.506	12.527	12.547	12.568	12.588	12.609	12.629	12.649
4.3	12.669	12.690	12.710	12.730	12.750	12.770	12.790	12.810	12.829	12.849
4.4	12.869	12.889	12.908	12.928	12.948	12.967	12.987	13.006	13.026	13.045
4.5	13.064	13.084	13.103	13.122	13.141	13.160	13.179	13.198	13.217	13.236
4.6	13.255	13.274	13.293	13.312	13.330	13.349	13.368	13.386	13.405	13.423
4.7	13.442	13.460	13.479	13.497	13.516	13.534	13.552	13.570	13.589	13.607
4.8	13.625	13.643	13.661	13.679	13.697	13.715	13.733	13.751	13.768	13.786
4.9	13.804	13.822	13.839	13.857	13.875	13.892	13.910	13.927	13.945	13.962
5.0	13.979	13.997	14.014	14.031	14.049	14.066	14.083	14.100	14.117	14.134
5.1	14.151	14.168	14.185	14.202	14.219	14.236	14.253	14.270	14.287	14.303
5.2	14.320	14.337	14.353	14.370	14.387	14.403	14.420	14.436	14.453	14.469
5.3	14.486	14.502	14.518	14.535	14.551	14.567	14.583	14.599	14.616	14.632
5.4	14.648	14.664	14.680	14.696	14.712	14.728	14.744	14.760	14.776	14.791
5.5	14.807	14.823	14.839	14.855	14.870	14.886	14.902	14.917	14.933	14.948
5.6	14.964	14.979	14.995	15.010	15.026	15.041	15.056	15.072	15.087	15.102
5.7	15.117	15.133	15.148	15.163	15.178	15.193	15.208	15.224	15.239	15.254
5.8	15.269	15.284	15.298	15.313	15.328	15.343	15.358	15.373	15.388	15.402
5.9	15.417	15.432	15.446	15.461	15.476	15.490	15.505	15.519	15.534	15.549
6.0	15.563	15.577	15.592	15.606	15.621	15.635	15.649	15.664	15.678	15.692
6.1	15.707	15.721	15.735	15.749	15.763	15.778	15.792	15.806	15.820	15.834
6.2	15.848	15.862	15.876	15.890	15.904	15.918	15.931	15.945	15.959	15.973
6.3	15.987	16.001	16.014	16.028	16.042	16.055	16.069	16.083	16.096	16.110
6.4	16.124	16.137	16.151	16.164	16.178	16.191	16.205	16.218	16.232	16.245

Finding Decibels when Voltage/Current Ratio is known

Voltage Ratio	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
6.5	16.258	16.272	16.285	16.298	16.312	16.325	16.338	16.351	16.365	16.378
6.6	16.391	16.404	16.417	16.430	16.443	16.456	16.469	16.483	16.496	16.509
6.7	16.521	16.534	16.547	16.560	16.573	16.586	16.599	16.612	16.625	16.637
6.8	16.650	16.663	16.676	16.688	16.701	16.714	16.726	16.739	16.752	16.764
6.9	16.777	16.790	16.802	16.815	16.827	16.840	16.852	16.865	16.877	16.890
7.0	16.902	16.914	16.927	16.939	16.951	16.964	16.976	16.988	17.001	17.013
7.1	17.025	17.037	17.050	17.062	17.074	17.086	17.098	17.110	17.122	17.135
7.2	17.147	17.159	17.171	17.183	17.195	17.207	17.219	17.231	17.243	17.255
7.3	17.266	17.278	17.290	17.302	17.314	17.326	17.338	17.349	17.361	17.373
7.4	17.385	17.396	17.408	17.420	17.431	17.443	17.455	17.466	17.478	17.490
7.5	17.501	17.513	17.524	17.536	17.547	17.559	17.570	17.582	17.593	17.605
7.6	17.616	17.628	17.639	17.650	17.662	17.673	17.685	17.696	17.707	17.719
7.7	17.730	17.741	17.752	17.764	17.775	17.786	17.797	17.808	17.820	17.831
7.8	17.842	17.853	17.864	17.875	17.886	17.897	17.908	17.919	17.931	17.942
7.9	17.953	17.964	17.975	17.985	17.996	18.007	18.018	18.029	18.040	18.051
8.0	18.062	18.073	18.083	18.094	18.105	18.116	18.127	18.137	18.148	18.159
8.1	18.170	18.180	18.191	18.202	18.212	18.223	18.234	18.244	18.255	18.266
8.2	18.276	18.287	18.297	18.308	18.319	18.329	18.340	18.350	18.361	18.371
8.3	18.382	18.392	18.402	18.413	18.423	18.434	18.444	18.455	18.465	18.475
8.4	18.486	18.496	18.506	18.517	18.527	18.537	18.547	18.558	18.568	18.578
8.5	18.588	18.599	18.609	18.619	18.629	18.639	18.649	18.660	18.670	18.680
8.6	18.690	18.700	18.710	18.720	18.730	18.740	18.750	18.760	18.770	18.780
8.7	18.790	18.800	18.810	18.820	18.830	18.840	18.850	18.860	18.870	18.880
8.8	18.890	18.900	18.909	18.919	18.929	18.939	18.949	18.958	18.968	18.978
8.9	18.988	18.998	19.007	19.017	19.027	19.036	19.046	19.056	19.066	19.075
9.0	19.085	19.094	19.104	19.114	19.123	19.133	19.143	19.152	19.162	19.171
9.1	19.181	19.190	19.200	19.209	19.219	19.228	19.238	19.247	19.257	19.226
9.2	19.276	19.285	19.295	19.304	19.313	19.323	19.332	19.342	19.351	19.360
9.3	19.370	19.379	19.388	19.398	19.407	19.416	19.426	19.435	19.444	19.453
9.4	19.463	19.472	19.481	19.490	19.499	19.509	19.518	19.527	19.536	19.545
9.5	19.554	19.564	19.573	19.582	19.591	19.600	19.609	19.618	19.627	19.636
9.6	19.645	19.654	19.664	19.673	19.682	19.691	19.700	19.709	19.718	19.726
9.7	19.735	19.744	19.753	19.762	19.771	19.780	19.789	19.798	19.807	19.816
9.8	19.825	19.833	19.842	19.851	19.860	19.869	19.878	19.886	19.895	19.904
9.9	19.913	19.921	19.930	19.939	19.948	19.956	19.965	19.974	19.983	19.991

Voltage Ratio	0	1	2	3	4	5	6	7	8	9
10	20.000	20.828	21.584	22.279	22.923	23.522	24.082	24.609	25.105	25.575
20	26.021	26.444	26.848	27.235	27.604	27.959	28.299	28.627	28.943	29.248
30	29.542	29.827	30.103	30.370	30.630	30.881	31.126	31.364	31.596	31.821
40	32.041	32.256	32.465	32.669	32.869	33.064	33.255	33.442	33.625	33.804
50	33.979	34.151	34.320	34.486	34.648	34.807	34.964	35.117	35.269	35.417
60	35.563	35.707	35.848	35.987	36.124	36.258	36.391	36.521	36.650	36.777
70	36.902	37.025	37.147	37.266	37.385	37.501	37.616	37.730	37.842	37.953
80	38.062	38.170	38.276	38.382	38.486	38.588	38.690	38.790	38.890	38.988
90	39.085	39.181	39.276	39.370	39.463	39.554	39.645	39.735	39.825	39.913
100	40.000	—	—	—	—	—	—	—	—	—

Decibel Conversion Chart

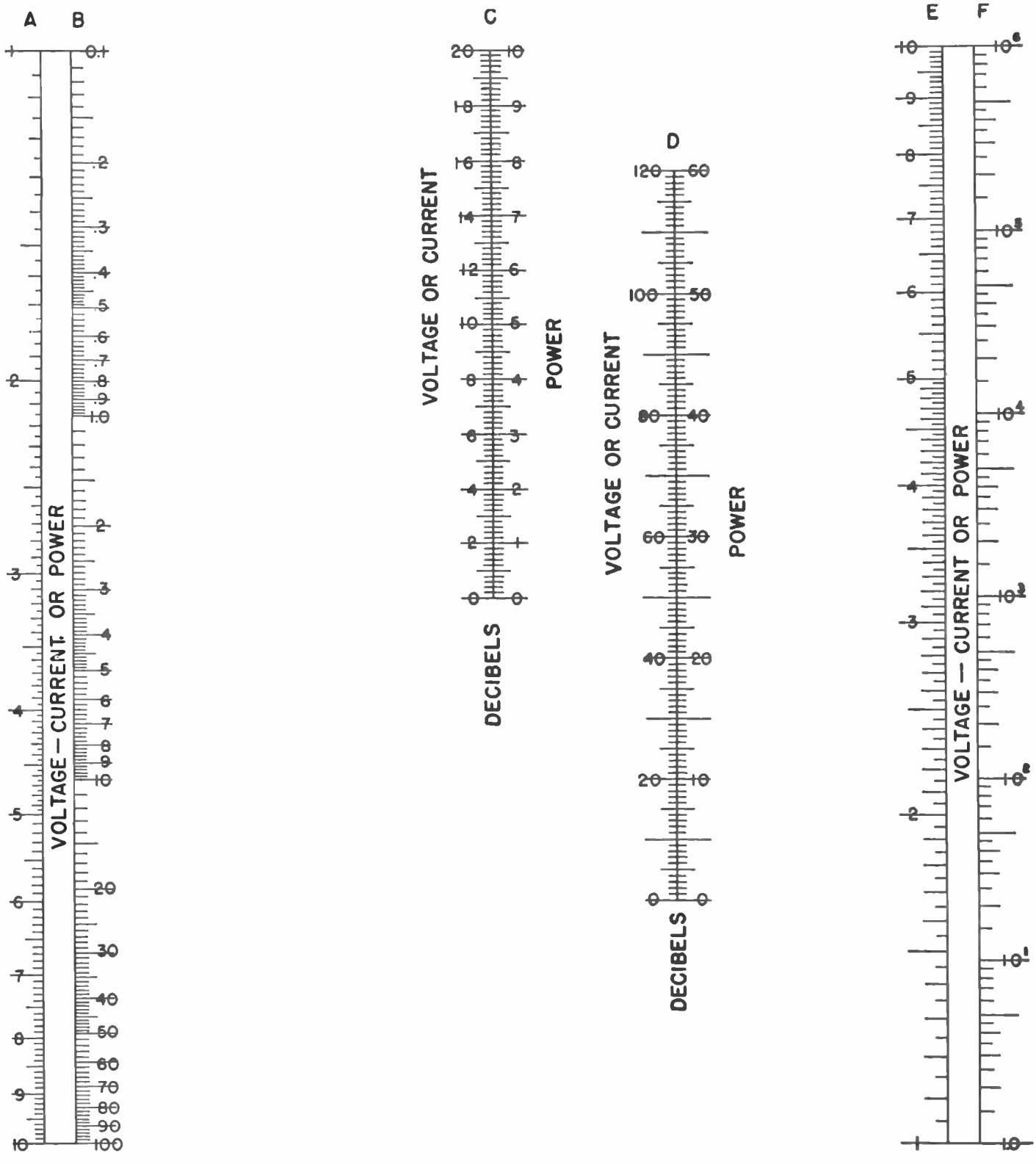


Chart for converting current or power ratios to decibels.

Examples explaining the use of the decibel conversion chart are as follows:

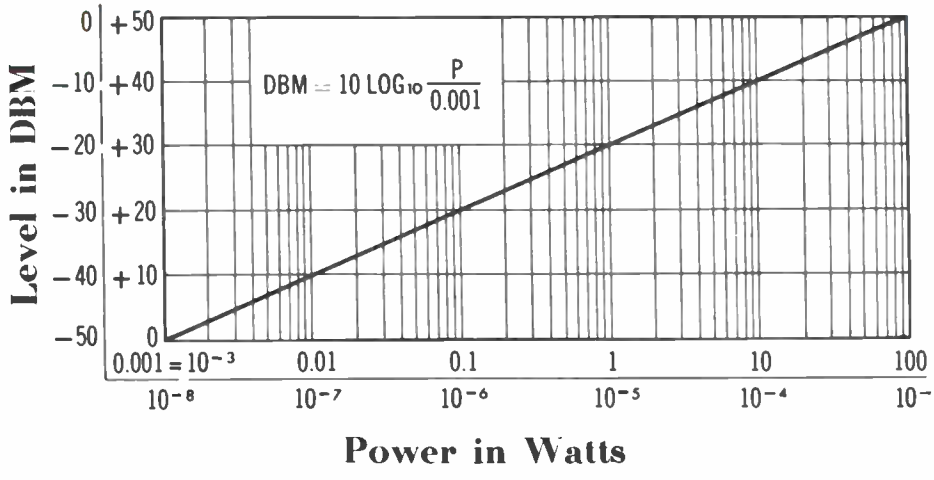
(1) Assume a voltage ratio of 2.4 to 1.2. This voltage ratio in decibels is found by drawing a line from 1.2 on scale A to 2.4 on scale E passing through the decibel voltage scale C at 6 decibels. This can also be found on scales B, D and F; however, the decibel scale D is not expanded as much as the decibel scale C and cannot be read as accurately.

(2) Assume a voltage ratio of 1200 to 1.2. This voltage ratio in decibels is found by drawing a line from 1.2 on scale B to 1200 on scale F passing through the decibel scale D at 60 decibels.

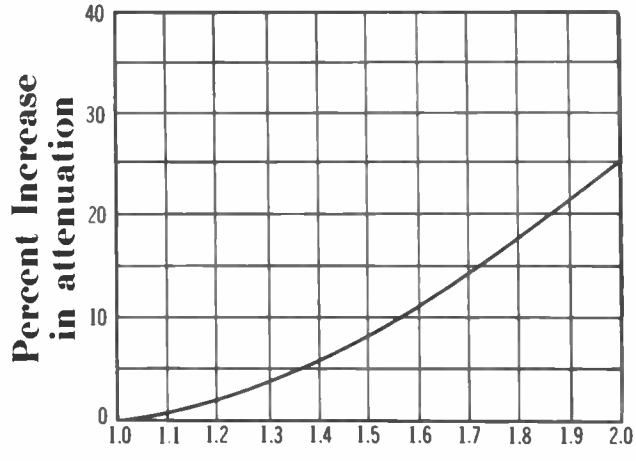
(3) Assume a power ratio of 580 to 320. This power ratio in decibels is found by drawing a line from 3.2 on scale A to 5.8 on scale E (the ratio of 580 to 320 is the same as 5.8 to 3.2) passing through the decibel scale D at 2.6 decibels.

From the above examples it will be noted that the smaller value of any ratio will always be located on scale A or B and the larger value will always be located on the respective scale E or F. Also, the decibels corresponding to ratios of less than 10 to 1 can be found on either set of scales; however, it is preferable to use scales A, C and E as the decibel scale C is expanded and can be read with greater accuracy.

DBM vs. Watts

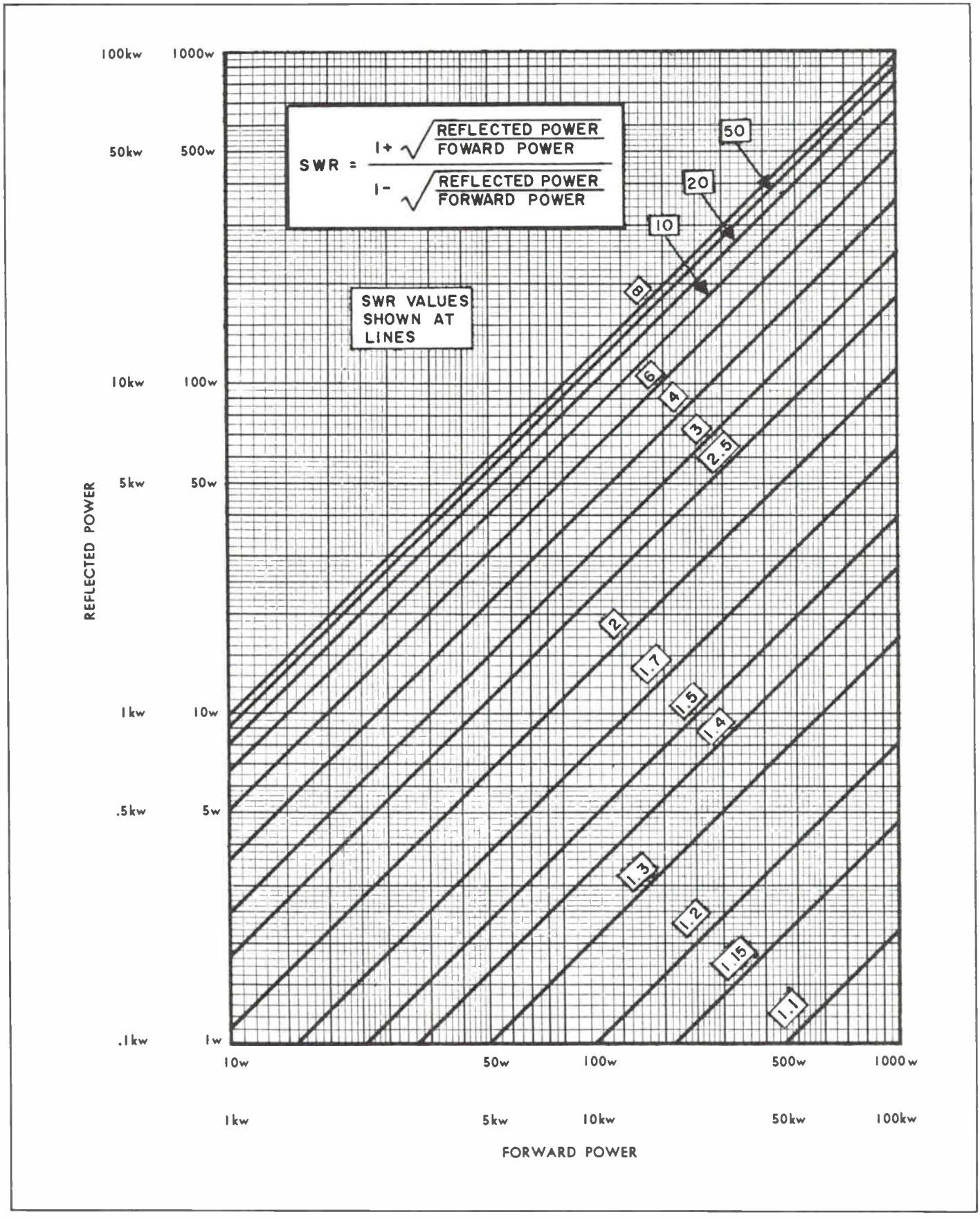


Antennas, Towers and Wave Propagation

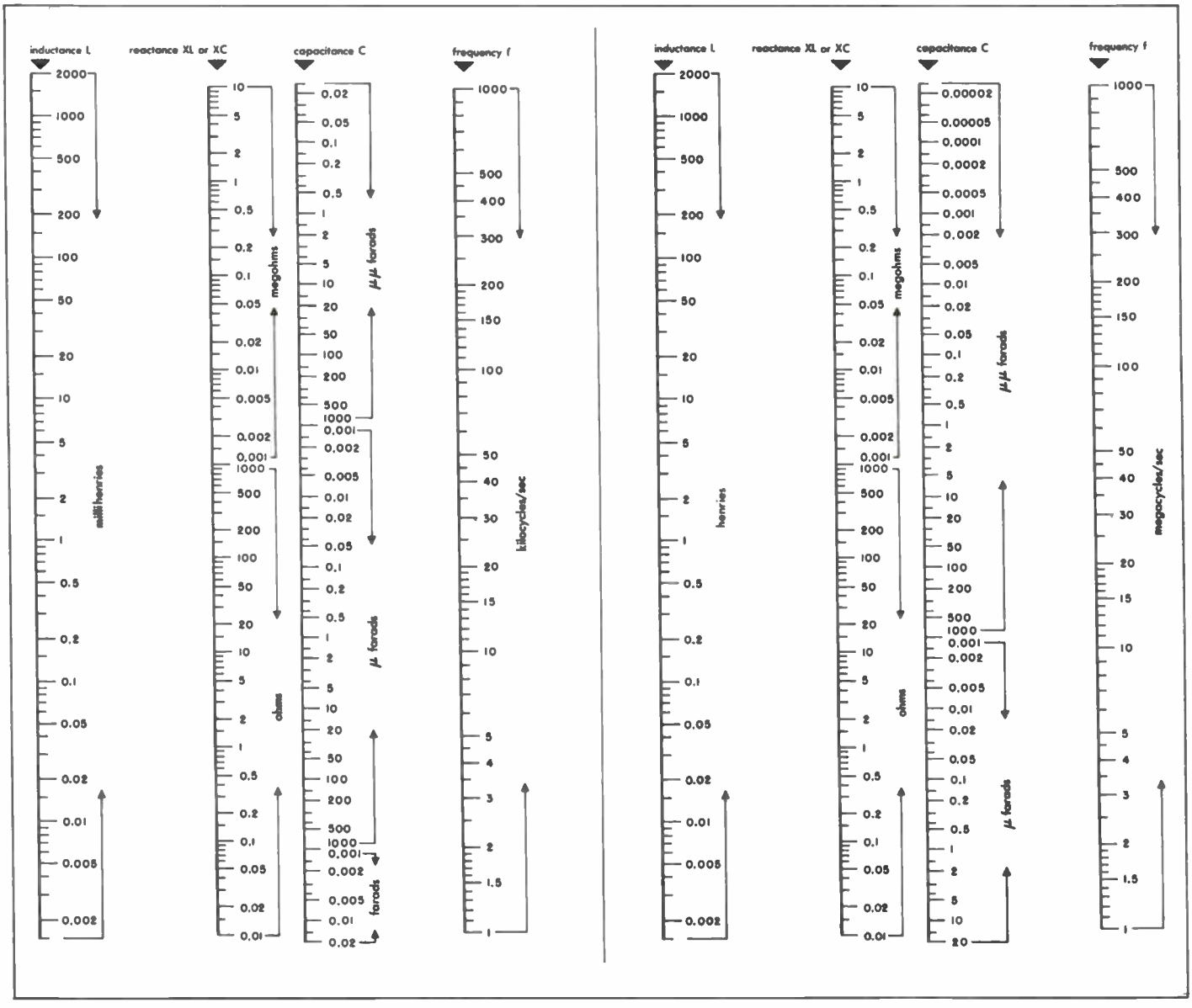


Increase in attenuation in line due to VSWR on line.

Forward vs. Reflected Power



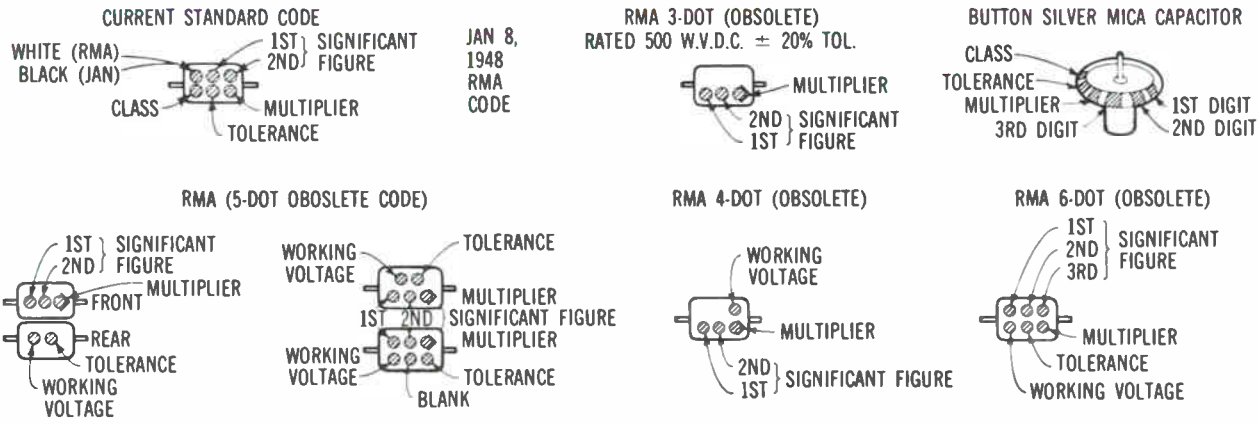
Reactance Chart



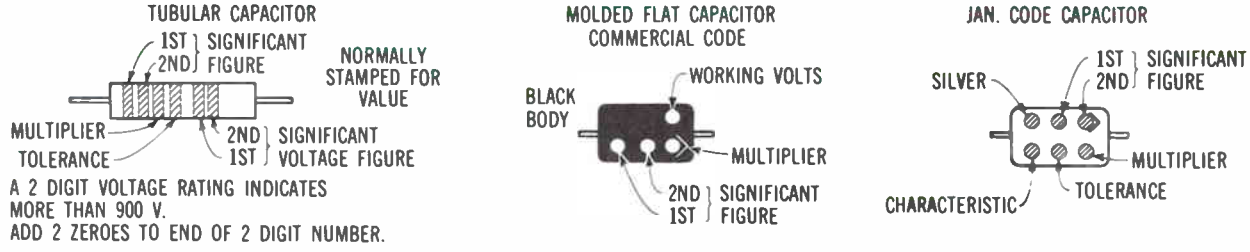
Decimal Equivalents of Fractions

1/32 ..... .03125	9/32 ..... .28125	17/32 ..... .53125	25/32 ..... .78125
1/16 ..... .0625	5/16 ..... .3125	9/16 ..... .5625	13/16 ..... .8125
3/32 ..... .09375	11/32 ..... .34375	19/32 ..... .59375	27/32 ..... .84375
1/8 ..... .125	3/8 ..... .375	5/8 ..... .625	7/8 ..... .875
5/32 ..... .15625	13/32 ..... .40625	21/32 ..... .65625	29/32 ..... .90625
3/16 ..... .1875	7/16 ..... .4375	11/16 ..... .6875	15/16 ..... .9375
7/32 ..... .21875	15/32 ..... .46875	23/32 ..... .71875	31/32 ..... .96875
1/4 ..... .25	1/2 5	3/4 ..... .75	1 ..... 1.0

Standard Color Code – Molded Mica-Type Capacitors

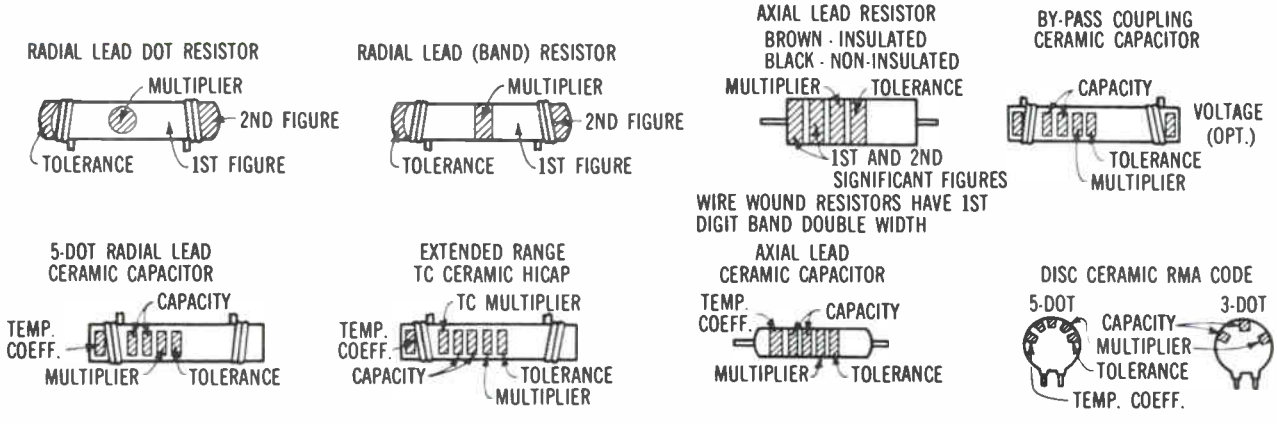


Standard Color Code – Molded Paper-Type Capacitors

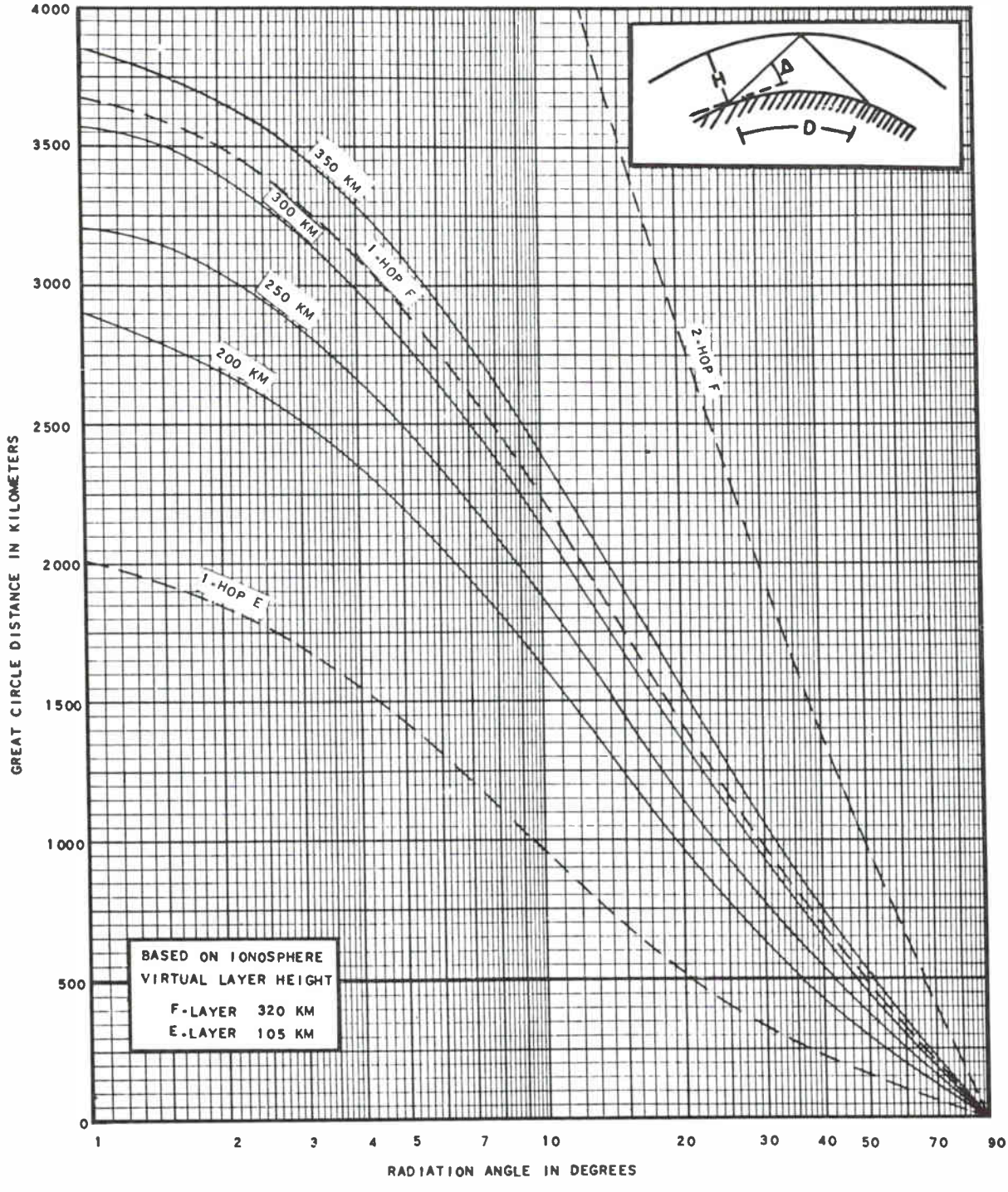


Standard Color Code – Resistors and Capacitors

INSULATED UNINSULATED COLOR	FIRST RING BODY COLOR FIRST FIGURE	SECOND RING END COLOR SECOND FIGURE	THIRD RING DOT COLOR MULTIPLIER
BLACK	0	0	NONE
BROWN	1	1	0
RED	2	2	00
ORANGE	3	3	,000
YELLOW	4	4	0,000
GREEN	5	5	00,000
BLUE	6	6	,000,000
VIOLET	7	7	0,000,000
GRAY	8	8	00,000,000
WHITE	9	9	000,000,000



Radiation Angle Versus Great Circle Distance Curves



Symbols and Prefixes

ac	alternating current
af	audio frequency
AFC	automatic frequency control
A M	amplitude modulation
amp	ampere
ASA	American Standards Association
ASTM	American Society for Testing Materials
AVC	automatic volume control
ave	average
B	susceptance
BCD	binary-coded decimal
C	capacitance
C	Centigrade, degrees Centigrade
cm	centimeter
COD	cash on delivery
cps	cycles per second
cw	continuous wave
D	dissipation factor
db	decibel
dbm	decibel referred to one milliwatt
dc	direct current
E	voltage
EIA	Electronics Industries Association
emf	electromotive force
F	Fahrenheit, degrees Fahrenheit
f	farad
f	frequency
fm	frequency modulation
f.o.b.	free on board
G	conductance
g	gravitation constant
Gc	gigacycles per second
g_m	transconductance
h	henry
h_f	forward current-transfer ratio
h_i	short-circuit input impedance
h_o	open-circuit output admittance
h_r	reverse voltage-transfer ratio
I	current
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
I F	intermediate frequency
in.	inch
IRE	Institute of Radio Engineers
ISO	International Standards Organization
j	$\sqrt{-1}$
k	kilo (10^3)
kg	kilogram
kva	kilovolt ampere
kw	kilowatt
L	inductance
lab	laboratory
lb	pound
LC	inductance-capacitance
lf	low frequency
log	logarithm
m	mass
m	meter; milli (10^{-3})
ma	milliampere
max	maximum
mbar	millibar
Mc	megacycles per second
mh	millihenry
mil	0.001 inch
min	minimum; minute
mm	millimeter
mmho	millimho
mΩ	milliohm
MΩ	megohm
MMΩ	megamegohm
mv	millivolt
mw	milliwatt
n	nano (10^{-9}); any number
nsec	nanosecond
n℧	nanomho
oz	ounce
$_p$	parallel, as L_p
PF	power factor
pf	picofarad
PH	hydrogen in concentration
pp	push-pull; pages
ppm	parts per million
p-to-p	peak-to-peak
prf	pulse repetition frequency
Q	quality factor
R	resistance
®	registered trademark
RC	resistance-capacitance
re	referred to
rf	radio frequency
RH	relative humidity
rms	root-mean-square
rpm	revolutions per minute
$_s$	series, as L_s
sec	second
sync	synchronous, synchronizing
T	period
t	temperature
t	time
uhf	ultra-high frequency
v	velocity
v	volt
va	voltampere
vhf	very high frequency
vlf	very low frequency
vol	volume
vs	versus
w	watt
X	reactance
Y	admittance
Z	impedance
α	short-circuit forward current-transfer ratio (common base)
β	short-circuit forward current-transfer ratio (common emitter)
L	reflection coefficient
Δ	increment
δ	loss angle
θ	phase angle
λ	wavelength
μ	micro- (10^{-6})
μa	microampere
μbar	microbar
μf	microfarad
μh	microhenry
μsec	microsecond
μv	microvolt
Ω	ohm
℧	mho
w	angular velocity ($2\pi f$)

Prefixes

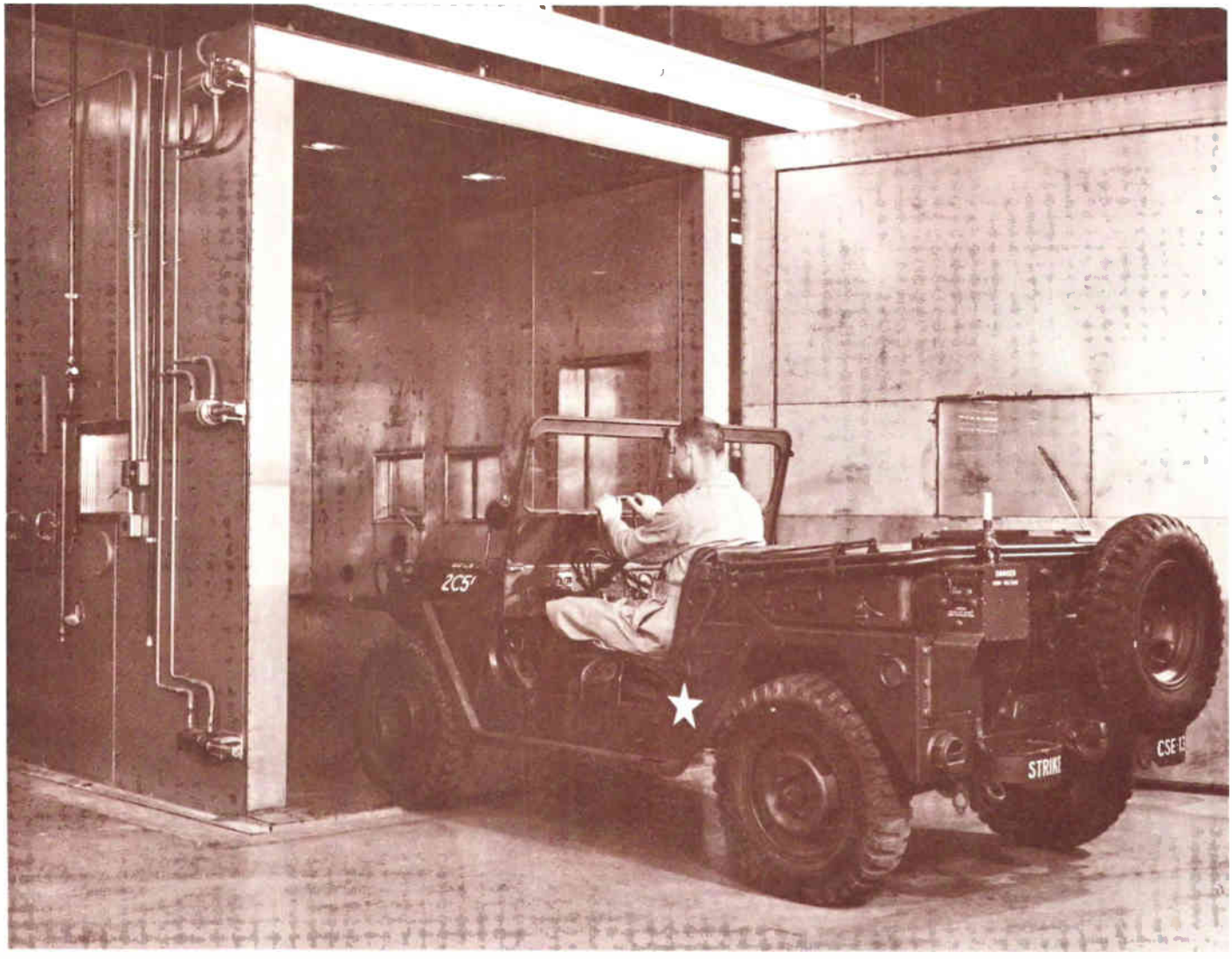
Orders of magnitude from 10^{12} to 10^{-18} are designated by the following prefixes:

Order	*Prefix*	*Symbol*
10^{12}	tera	T
10^{9}	giga	G
10^{6}	mega	M
10^{3}	kilo	k
10^{2}	hecto	h
10	deka	da
10^{-1}	deci	d
10^{-2}	centi	c
10^{-3}	milli	m
10^{-6}	micro	μ
10^{-9}	nano	n
10^{-12}	pico	p
10^{-15}	femto	f
10^{-18}	atto	a

Military Nomenclature Cross Reference

Military Nomenclature	*Equipment*	*Collins Type No.*
AN/ARM-73	Test Harness	678P-2
AN/MRC-95	HF Communication System	VC-102
AN/PRC-38	HF-VHF Transceiver	618K-1
AN/PRC-47	HF Transceiver	618U-1
AN/SRA-22	HF Antenna Coupler	180T-2
AN/URC-32	HF Transceiver	KWT-6-8
C-1940/ARC-58	Coupler Control	309A-2
C-3940/ARC-94	Radio Set Control	714E-3
C-4832/TSW	Coupler Control	309A-2D
C-6116/TSC-15	Frequency Control	714Y-2
C-6118/FRC-93	Speaker Console	312B-4
CU-351/AR	HF Antenna Coupler	180L-3A
CU-523/ARC-58	HF Antenna Coupler	180R-6
CU-737/URC	Line Flattener	180U-2A
CU-791/URT	Line Flattener	180Y-1
CU-991/AR	HF Antenna Coupler	180L-2
CU-1169/SRC-16	HF Antenna Coupler	490C-1
CU-1170/SRC-16	HF Antenna Coupler	490C-2
F-871/U	Bandpass Filter	635R-1
M-127/FRC-93	Microphone	MM-1
MK-773	Maintenance Kit	678Y-3
OA-1373/FRC	Frequency Standard	40N-2
OA-1448/GRT	HF Power Amplifier	205J-1
OA-2008/FRR-53	Frequency Standard	40N-1
PP-3702/ARC-102	Power Inverter Mounting	390J-2
PP-3990/FRC-93	Power Supply	PM-2
R-1122/GR	Receiver	51S-1
R-1156/GR	Receiver	51S-1F
RT-648/ARC-94	HF Transceiver	618T-2
RT-698/ARC-102	HF Transceiver	618T-3
RT-718/FRC-93	HF Transceiver	KWM-2A

Collins Quality and Reliability



Collins Radio Company's reputation for dependable products is a result of the application of rigid, uncompromising standards of excellence. Quality and reliability testing programs are carried out by autonomous organizations whose responsibility crosses boundaries of design, engineering and production.

The quality control programs ensure that Collins equipment and systems perform according to predetermined specifications in the manufacturing test facility, as well as in the intended operational environment. Collins' reliability engineers work with development engineers to assure equipments and systems which will provide long, useful life.

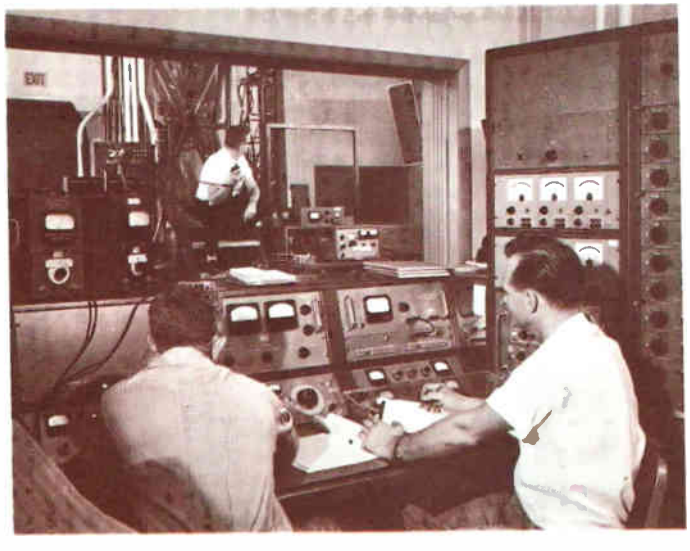
The programs begin with the preparation of specifications for components and subsystems purchased from outside suppliers. When the first engineering model of a new equipment is completed, the unit is subjected to stringent and detailed review by a reliability committee composed of specialists trained to find and correct possible troubles. Following this, a preproduction or pilot line assembly operation provides manufacturing with an opportunity to finalize production assembly techniques and sequences before initiation of the regular production schedule. Selected Collins equipments are also proven in an operational environment in the company's experimental HF radio station located in Cedar Rapids.

In manufacturing, each of the modules and subassemblies is subjected to stringent inspection. Groups of modules are then unitized and again given rigid examination as a subsystem. Maintenance of required specifications is assured by use of either standard test equipment, or as is true in many cases, test equipment developed by Collins to fill a specific requirement. Completed units, composed of modules and subsystems which have already been thoroughly checked, are given highly critical final tests. Here again the finest test devices known are employed. The finished product must meet or exceed exacting specifications, and it must perform satisfactorily in actual operating conditions. The final testing stage involves an operating or reliability run. This is performed under the environmental conditions in which the equipment will be used.

As a further quality audit, equipments are selected from finished

goods stock on a statistical basis and reinspected and retested. Collins also maintains an environmental and reliability test area of approximately 16,000 square feet, equipped to verify the operational effectiveness of any equipment from a single unit, such as a receiver or transceiver, to highly sophisticated electronic systems in almost any environmental extreme. The environmental test laboratories provide tests for sine wave and random noise vibration, shock, explosion, radio interference, rain, salt spray, spin, altitude, and extremes of heat and cold. These facilities include equipment to simulate actual operation in single or combined environments, where applicable, and to measure performance under extreme conditions. All Collins test equipment is periodically checked for accuracy and stability.

Evidence of thorough, painstaking attention to the highest quality and reliability standards is reflected in the thousands of Collins equipments and systems which are providing outstanding performance in varied functions throughout the free world. Product support programs, tailored to the individual customer's specific requirements, are available to assist in maintaining high operational and maintenance standards. These services include field installation and maintenance, customer personnel training, spare parts, equipment repair and modification and updating information. Personnel engaged in support activities maintain close liaison with design engineers, production specialists and quality control personnel to keep abreast of the latest technological developments.



Index by Type Number

Index by Function

*Listed under applicable equipment.

Glossary

AFC Automatic Frequency Control. A circuit that holds a receiver on the frequency of the station it is receiving.

AGC Automatic Gain Control. A device which automatically adjusts the gain of a receiver in accordance with the received signal level.

ALC Automatic Load Control. A circuit which allows a high average level of modulation and optimum transmitter power output within rated limits of distortion.

ARINC Aeronautical Radio, Inc. A corporation whose principal stockholders are the U. S. airlines and whose activities include (1) cognizance of airborne and ground electronics systems in the interest of compatibility, (2) coordination and exchange of technical information, and (3) operation of an extensive communication system devoted to the aeronautical services.

ATR Air Transport Radio. A form factor agreed upon within the airline and electronics industries governing the configuration of avionics equipment. A "one ATR" unit has the following dimensions: width, 10.125″ (25.72 cm); height, 7.625″ (19.37 cm); length, 19.5625″ (49.69 cm).

AVC Automatic Volume Control. A device which maintains the output of a receiver within narrow limits while the signal input amplitude varies over a wide range.

BALANCED MODULATOR A circuit in which the carrier and modulating signals are introduced in such a manner that after modulation takes place the output contains the two sidebands without the carrier.

CARD CAGE A unit to house plug-in circuit cards. Interconnecting wiring is usually included.

CCITT Consultative Committee for International Telephone and Telegraph. The committee has the responsibility of studying technical and operating questions pertaining to wireline transmission and issuing recommendations.

COMPATIBLE AM A method of AM transmission or reception using one sideband and reinserted carrier.

CROSS-MODULATION A type of interference caused by modulation of the carrier of the desired signal by an undesired signal.

DIAL PULSE CONTROL A remote control system for the Universal Radio Group equipment which permits subscriber control of Universal Radio Group equipment from a dial telephone over four-wire circuits.

DIV Diversity. A method of reception using two receivers operating on different frequencies or with spaced antennas to overcome the effects of fading by selecting the strongest of two signals.

EIA Electronic Industries Association.

FREQUENCY SHIFT KEYING A form of frequency modulation in which the modulating wave shifts the output frequency between predetermined values.

IF TRANSLATOR A unit of the Universal Radio Group equipment which contains audio and IF circuits. It is used with an RF translator in receiver or exciter applications.

INTERMODULATION DISTORTION Loss of fidelity resulting from the generation of frequencies that are the sum and difference of those contained in the applied waveform.

LOGARITHMICALLY PERIODIC ANTENNA An antenna which is characterized by input impedance and radiation patterns that are uniform over a wide range.

MECHANICAL FILTER A magnetostrictive device with extremely sharp selectivity characteristics.

MTBF Mean Time Between Failures. Usually expressed in hours of operation and used to evaluate equipment reliability.

MODEM Modulator and Demodulator. A bilateral unit which processes data information for communication over radio channels.

MODULE A group of related components, usually comprising a circuit division, arranged on a common mounting.

MULTIPLEX The simultaneous use of two or more channels on a single circuit.

PEP Peak Envelope Power.

PEV Peak Envelope Volts.

PILOT CARRIER A technique in which a small amount of carrier power is transmitted with the sideband. This type of operation allows compatibility with older equipment.

POWER AMPLIFIER An amplifier to raise the exciter output signal to the desired RF level in a communication system.

PRODUCT DETECTOR A detector circuit characterized by minimum intermodulation products and requiring small local carrier voltage. It is ideal for single sideband applications.

Q MULTIPLIER A filter which has sharp peak response or a deep rejection notch at a particular frequency.

RF FEEDBACK CIRCUIT An inverse feedback arrangement used in RF amplifiers to reduce harmonic distortion and improve fidelity.

RF SWITCHING MATRIX A device to rapidly interconnect a number of power amplifiers and antennas, as required in a communication system.

RF TRANSLATOR A unit of the Universal Radio Group equipment which contains RF circuitry. It is used with an IF translator in receiver or exciter applications.

RTTY Radio Teletypewriter. Teletypewriter communication over radio circuits.

SELCAL Selective Calling. A method of alerting a desired receiving facility by means of a coded discrete signal.

SSB Single Sideband. A method of radio transmission wherein the intelligence is contained in only one sideband. Results in conservation of spectrum, more effective "talking power."

TGC Transmitter Gain Control. A circuit to maintain the over-all transmitter gain within relatively narrow limits.

TSO Technical Standard Order. A U. S. Federal Aviation Agency regulation detailing minimum performance and quality control standards for equipment used on specified civil aircraft.

TWO-OUT-OF-FIVE WIRE SWITCHING A method using only five wires to provide ten switching combinations.

VOX Voice Operated Relay. A circuit which automatically switches a transceiver from receive function to transmit function whenever the operator speaks into microphone.

VU Volume Unit. A term used to express the magnitude of a complex electrical wave, such as that corresponding to speech or music.

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