

# 1960 GENERAL CATALOG

**Collins**

**Radio Company**



EFFECTIVE APRIL, 1960

**DIVISIONS :** COLLINS RADIO COMPANY, CEDAR RAPIDS DIVISION, Cedar Rapids, Iowa

COLLINS RADIO COMPANY, WESTERN DIVISION, 2700 West Olive Avenue, Burbank, California

COLLINS RADIO COMPANY, TEXAS DIVISION, 1200 North Alma Road, Richardson, Texas

COLLINS RADIO COMPANY, INTERNATIONAL DIVISION, P.O. Box 1891, Dallas 21, Texas    CENTRAL SALES DIVISION, P.O. Box 1891, Dallas 21, Texas

**SUBSIDIARIES :** ALPHA CORPORATION, 820 East Arapaho Road, Richardson, Texas

COLLINS RADIO COMPANY OF CANADA, Ltd., 11 Bermondsey Road, Toronto, Ontario, Canada

COLLINS RADIO COMPANY OF ENGLAND, Ltd., 242 London Road, Staines, Middlesex, England

COLLINS RADIO COMPANY, GmbH, Flughafen Rhein/Main, Frankfurt aM, Germany

COLLINS RADIO INTERNATIONAL, C.A., Caracas, Venezuela

COMMUNICATION ACCESSORIES COMPANY, Lee's Summit, Missouri

# CONTENTS

## GENERAL LISTING BY PRODUCT AREAS

### AVIATION EQUIPMENT

Integrated Flight Systems .....	6
Automatic Pilot .....	8
VHF Communication Systems .....	10
HF SSB Communication Systems .....	12
HF Communication Systems .....	14
Weather Radar System .....	15
VHF Navigation Systems .....	16
Navigation Instruments .....	17
Doppler Navigation System .....	18
Audio Amplifiers .....	19
Inverter, Converter .....	19
Magnetic Compass System .....	20
DMET .....	20
Airborne Antennas .....	21
SELCAL System .....	22
ATC Transponder .....	22
Automatic Direction Finder System .....	23
Remote Control Units .....	24
Test Equipment .....	25
Shockmounts .....	30
Smoke Tunnel .....	31
Ground VOR System .....	32

### AMATEUR EQUIPMENT

Transmitter .....	34
Receiver .....	34
Linear Amplifier .....	35
Mobile Transceiver .....	35
Accessories .....	36

### BROADCAST EQUIPMENT

Transmitters .....	39
Transmitter Accessories .....	40
Speech Input Consoles .....	42
Remote Amplifiers .....	44
Turntables .....	44
Announcer .....	45
Limiters, Equalizers .....	45
Custom Control Desks .....	45
Automatic Tape Control .....	46
Loudspeakers .....	46
Radio Station Trailer .....	47
Microphones .....	47
TV-STL Microwave .....	48
Weather Radar .....	48

### HF-VHF GROUND SYSTEMS

HF SSB Power Amplifiers .....	50
HF SSB Exciters .....	52
HF SSB Receivers .....	53
HF SSB Transceivers .....	54
Frequency Standard .....	55
HF AM Transmitters, Receivers .....	56
VHF AM Transmitters, Receivers .....	58
Accessory Equipment .....	59
Log Periodic Antennas .....	61
Spectrum Analyzer .....	62
Remote Control Equipment .....	62

### TRANSHORIZON SYSTEMS

1,000 mc System .....	64
2,000 mc System .....	66
UHF Transportable Systems .....	67

### MICROWAVE SYSTEMS

RF Systems .....	69
Voice Carrier Multiplex .....	70
Microwave Test Equipment .....	71
Parabolic Antennas .....	72

### KINEPLEX® SYSTEMS

Kineplex Data Systems .....	74
-----------------------------	----

### PRECISION COMPONENTS

Autotunes® .....	78
Autopositioner® .....	78
Oscillators .....	79
Mechanical Filters .....	80
Filter Adapters .....	82
Tube Shields .....	82
Transformers, Filters, Magnetic Amplifiers .....	83
Toroids .....	84

### RESEARCH CAPABILITIES .....

### ALPHA CORPORATION .....

### ORGANIZATION .....

### INDEX .....

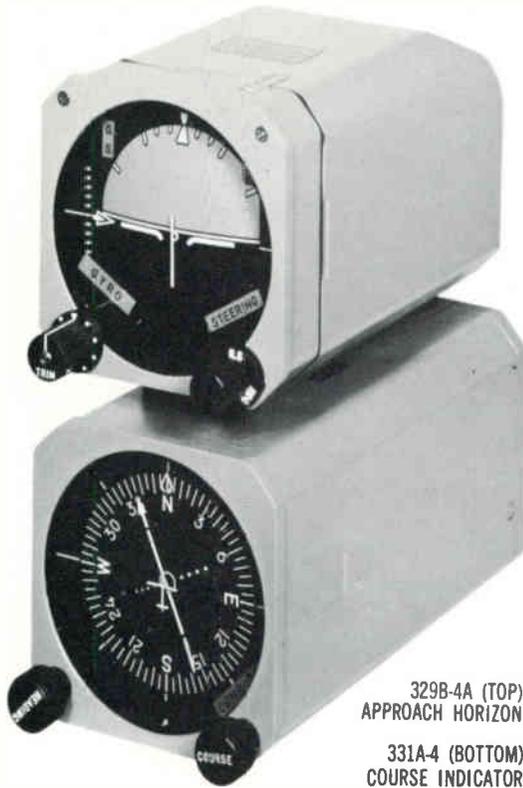


Par American World Airways, Inc.

# COLLINS aviation equipment

# INTEGRATED FLIGHT SYSTEMS

## FD-105 INSTRUMENTATION



329B-4A (TOP)  
APPROACH HORIZON  
331A-4 (BOTTOM)  
COURSE INDICATOR

## FD-107 INSTRUMENTATION



329B-2W (TOP)  
APPROACH HORIZON  
331A-2CW (BOTTOM)  
COURSE INDICATOR

Collins Integrated Flight Systems present basic attitude, navigation situation and steering information to the pilot on two easily interpreted, space-saving instruments. The systems, variations of which are available for all aircraft from light single engine to jet airliner, are used to control the aircraft attitude under instrument conditions, fly selected headings and VOR radials, and to make ILS approaches. Steering pointer indications enable the pilot to smoothly acquire and hold selected headings or localizer tracks. ILS crosswind correction is automatically presented by the steering pointer.

Aircraft attitude, glideslope position and steering directions appear on a "forward view" instrument, the Approach Horizon. The second instrument, the Course Indicator, displays the "plan view" or navigational picture of the flight. Included in this display are aircraft heading, selected heading, heading deviation, deviation from course, selected track crab angle and direction of travel along a selected omni radial. Once the navigational problem is set up on the Course Indicator, the pilot receives flight director steering information and can make good his desired flight path by keeping the steering pointer centered.

The Integrated Flight System — Automatic Pilot combination utilizes a single computer and common function, heading and track selector controls to provide simultaneous monitoring of the flight attitude and navigational situation as well as indication of the attitude and navigational corrections being

made by the Automatic Pilot. Approach Horizons have no mode selector switch when combined with Automatic Pilots.

**FD-105** — Basic attitude information, navigation situation and flight director steering are presented on two 4" instruments. The FD-105 accepts signals from standard central data sources which also feed other systems. The Approach Horizon of the FD-105 has a two-color horizon background which further simulates the pilot's forward view of the flight.

Five large failure warning flags included in the integral wedge lighted instruments virtually eliminate the possibility of the pilot overlooking the failure of a central data source or some phase of the FD-105 system. Reliable magnetic amplifiers and transistors are used throughout; no vacuum tubes are required. All markings are matte white. Red or white lighting. *Power Requirements:* 115 v ac, 400 cps — start, 71 va; run, 58 va. A test set for the FD-105 is shown on page 25. *Approx. Weight:* 34 lbs.

**FD-104** — The presentation is made on two standard 3" instruments designed for rear mounting. Accepts signals, excluding attitude, from standard central data sources as prescribed by ARINC. Instruments have matte white markings. *Power Requirements:* 115 v ac, 400 cps, single phase — start, 100 va; run, 50 va. 28 v dc — start, 30 watts; run, 10 watts. A test set for the FD-104 is shown on page 25. *Approx. Weight:* 35 lbs.

**FD-107** — A lightweight flight director using FD-104 instruments along with a 562A-7 Steering Computer. Complete computer-amplifier is housed in a short ¼ ATR case. Accepts signals from standard central data sources prescribed by ARINC. *Power Requirements:* 115 v ac, 400 cps — start, 75 va; run, 50 va. 27.5 v dc — start, 30 watts; run, 22 watts. *Approx. Weight:* 22.55 lbs.

**329B-2 SERIES APPROACH HORIZONS** — 3 in. forward view pitch and roll instrument with glideslope reference and computed steering pointer indications. Glideslope and localizer warning flags indicate radio signal failure.

**329B-4 SERIES APPROACH HORIZONS** — Larger 4 in. forward view pitch and roll instrument with two-color horizon background, internal wedge lighting. Large, red warning flags indicate unreliable steering, gyro, glideslope or localizer signals. Red or white lighting. Pitch indications to 85° above and below the horizon; roll indications cover the complete 360° range of indication.

**331A-2 SERIES COURSE INDICATORS** — Standard 3 in. instrument showing pictorial plan view of the navigation situation. Matte white markings. 5° azimuth markings.

**331A-4 SERIES COURSE INDICATORS** — Larger 4 in. plan view navigation situation instrument. Integral wedge red or white lighting. Warning flag indicates loss of compass signal. All markings are matte white. The 331A-4A includes a glideslope pointer on the left side and glideslope and localizer warning flags. The 331A-3C, a 3" version with integral lighting, is available in a clamp mounted model.

**327B-1W GYRO MONITOR** — Indicates the operating condition of the vertical gyro. Matte white markings.

**562A-5 STEERING COMPUTER** — Provides steering information to the steering pointer on the Approach Horizon. Data concerning localizer deviation, heading error and bank angle is used to compute horizontal guidance signal and feed the steering pointer. ¼ ATR short case.

**562A-4C STEERING COMPUTER** — Provides steering information identical to 562A-5 in a ½ ATR short case.

**562A-7 STEERING COMPUTER** — Extremely lightweight version providing steering information identical to the 562A-5 plus signal monitoring and excitation of the Vertical Gyro and a self-contained bank erection-cutout circuit which is adequate



for standard flight operation, eliminating the need for the 345A-2 Sensing Unit. Utilized with the FD-107.

**344C-1 INSTRUMENT AMPLIFIER** — Normally consists of 3 servo amplifiers — one each for the bank, pitch and compass serves — and two flag-alarm circuits controlling warning flags indicating servo channel failure.

**345A-2 SENSING UNIT** — Consists of a yaw rate gyro which, through relays, interrupts power to the vertical gyro during turns to prevent gyro precession.

**332D-6A VERTICAL GYRO** — A non-tumbling vertical reference which supplies signals in proportion to the roll and pitch of the aircraft. The bank pickoff is active for ±100°, while the bank freedom is ±360°. Pitch pickoff is active ±52° with a freedom of ±85°.

**332D-8 VERTICAL GYRO** — Non-tumbling vertical reference providing pitch and bank information to the FD-105. Standard synchro pickoffs are used which permit use with other systems requiring 2 or 3 wire ac. Bank is 360°, pitch freedom ±85°.

	FD-104					FD-105					FD-107				
	Type	Dimensions (inches)			Weight (lbs.)	Type	Dimensions (inches)			Weight (lbs.)	Type	Dimensions (inches)			Weight (lbs.)
		W	H	D			W	H	D			W	H	D	
Approach Horizon	329B-2W	3½	3½	6½	2.3	329B-4A	4	4	6¾	4.2	329B-2	3½	3½	6½	2.3
Course Indicator	331A-2CW	3¾	3¾	9	4.0	331A-4	4	4	6¾	4.6	331A-2CW	3¾	3¾	9	4.0
Gyro Monitor	327B-1W	1¼	1½	2¾	.5						327B-1W	1¼	1½	2¾	.5
Vertical Gyro	332D-6A	5¾	5¾	9¾	6.5	332D-8	9½	6¾	5¾	7.5	332D-6A	5¾	5¾	9¾	6.5
Steering Computer	562A-4C	½ ATR Short			15.4	562A-5	¼ ATR Short			8.3	562A-7	¼ ATR Short			8.3
Sensing Unit	345A-2	4½	5½	16¾	3.3	345A-2	4½	5½	16¾	3.3					
Instrument Amplifier						344C-1	¼ ATR Short			7.3					
Shockmount	350M-2	½ ATR Short			3.7	390F-5	Dual ¼ ATR Short			2.3	390D-7	¼ ATR Short			1.3

# AUTOMATIC PILOT SYSTEMS

Collins Automatic Pilot Systems, designed for all aircraft from executive twin to jet airliner, precisely control aircraft flight attitude in any mode of operation. Transient-free engagement and smooth "fade-in, fade-out" changes in control functions allow smooth flight characteristics during mode selection. All incorporate modular construction, magnetic amplifiers and transistors — no tubes are used.

As a Flight Director-Automatic Pilot combination, the Collins Integrated Flight Systems provide a continuous and complete attitude and navigational situation monitor.

**AP-103 AUTOMATIC PILOT SYSTEM** — The newest version of Collins Automatic Pilots, the AP-103 is designed to automatically control all high performance commercial and executive aircraft including airline and executive jets. The AP-103/FD-105 combination provides automatic flight on Doppler track, localizer or VOR beams with crosswind correction; smooth flight across VOR stations; automatic control of altitude, heading, rate of turn and pitch attitude; automatic ILS approach with crosswind correction; manual ILS approaches with flight director steering; air speed compensations; preselected heading; integrated flight instrumentation and flight director services; optional automatic glideslope capture, yaw damping. *Approx. Weight:* AP-103/FD-105 — 131.65 lbs. (includes vertical reference).

**AP-102 AUTOMATIC PILOT SYSTEM** — The AP-102 is a lightweight system providing automatic pilot services in the airliner range from four engine reciprocating and turboprop airliners down through executive twin aircraft. Combined with the flight director, the AP-102 flies the aircraft automatically in response to heading signals during cross country and localizer-glideslope signals (including crosswind correction) during approach, in addition to other standard automatic flight control features. System combines with the FD-107. *Approx. Weight:* AP-102/FD-107 — 81 lbs.

**AP-101E AUTOMATIC PILOT SYSTEM** — The AP-101E provides automatic pilot services in the same range as the AP-102. Operation is similar to the AP-102. The system combines with the FD-104 or FD-105. *Approx. Weight:* AP-101E/FD-104 — 145 lbs. AP-101E/FD-105 — 156 lbs.

**614E-2 FLIGHT CONTROLLER** — All control functions including pitch control, four position mode selection, engage and bank control are provided in an edge lighted, pedestal mounted unit.

**562A-6 STEERING COMPUTER** — The 562A-6 supplies steering information to the Approach Horizon, lateral guidance signals to the 562C-1A, allows transient free guidance over VOR stations and provides automatic crosswind correction in NAV and approach modes. *Shockmount:* 349J-1.

**562C-1A, -2 COMPUTER AMPLIFIER** — Servo amplification, vertical guidance computation, trim coordination, transducer excitation and relay service are provided by the 562C-1A for the AP-101E System.



614E-2



562C-3/332D-9

562C-2/562A-7/332D-6A



562A-6/562C-1A/332D-6A

The 562C-2 (AP-102) includes servo amplification for all three control axes, main power transformer and isolated voltage supplies. *Shockmounts:* 562C-1A — 349J-1. 562C-2 — 349D-4.

**562C-3 COMPUTER AMPLIFIER** — Includes above services plus necessary switching and fading functions for the AP-103 System; flight director steering computer circuitry; horizontal guidance to the steering pointer of the 329B-4 Approach Horizon and provisions for optional yaw stabilization. *Shockmount:* 562C-3 — 349D-5.

**614E-3 SWITCHING UNIT** — Fading, switching and other control circuits are provided for AP-101E, -102. *Shockmount:* 349J-1 or 349P-1.

**590A-2 ALTITUDE CONTROLLER** — A controller signal is generated by the 590A-2 to level off and maintain flight at a constant pressure altitude.

**345A-3, -4 SENSING UNIT** — Yaw, roll and pitch rate gyros and a relay box are contained in the 345A-3. The 345A-4 for AP-103 contains two rate gyros sensing pitch and roll.

**334C-2 PRIMARY SERVOS** — Composed of two parts, a drive unit and a control unit, the Primary Servos position control surfaces when the automatic pilot is in control. Either capstan or lever arm configuration. Two counter rotating hysteresis clutches driven by a continuously rotating dc motor apply power through an adjustable torque limiting clutch to the cap-

	AP-101E/FD-105, FD-104				AP-102/FD-107				AP-103/FD-105						
	Type	Dimensions (inches) W H D			Weight (lbs.)	Type	Dimensions (inches) W H D			Weight (lbs.)	Type	Dimensions (inches) W H D			Weight (lbs.)
Steering Computer	562A-6	½ ATR Short			17.5	562A-7	¼ ATR Short			8.2	562C-3	¾ ATR			41.0
Computer Amplifier	562C-1A	½ ATR			29.0	562C-2	½ ATR Short			21.25					
Pedestal Controller	614E-2	4½	5%	4½	2.75	614E-2	4½	5%	4½	2.75	614E-2	4½	5%	4½	2.7
Switching Unit	614E-3	5%	3%	6	3.25	614E-3	5%	3%	6	3.25	.....	.....	.....	.....	.....
Altitude Controller	590A-2	5¾	5	6¾	2.25	590A-2	5¾	5	6¾	2.25	590A-2	5¾	5	6¾	2.25
Sensing Unit	345A-3	4½	3	15	7.6	345A-3	4½	3	15	7.6	345A-4	5	5¼	8%	2.0
Primary Servo (3 required)	334C-2	7	5¾	10¾	(total) 40.5	334C-4	3¾	3¾	6¾	(total) 12.75	334C-3	7½	4¾	8½	(total) 25.5
Servo Mount (3 required)	334B-	Included above			(total) 9.0	351B-4	3¾	3¾	3	(total) 6.75	351B-3	Included above			(total) 7.5
Trim Tab Servo	334D-1	4	4	9½	6.5	334D-1	4	3¾	9½	5.5	344D-2-33	4	3¾	9½	6.0
Trim Indicator	327D-1W	4	2	1¾	0.5	327D-1W	4	2	1¾	0.5	327D-1	4	2	1¾	0.5
Disconnect	121A-1	3½	8½	7%	1.3	121A-2	17%	3¾	4¾	0.4	121A-2	17%	3¾	4¾	0.4
Vertical Reference	332D-8 332D-6A*	9¾	5%	5%	6.0	332D-6A	9¾	5%	5%	6.5	332D-9	8¾	8	13¾	16.8
Gyro Monitor	327B-1W (not req. with FD-105)	1¼	15%	2¾	.4	327B-1W	1¼	15%	2¾	.4	.....	.....	.....	.....	.....
(Optional) Airspeed Compensator	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	590B-1	6¼	4¾	5¼	2.9
Approach Horizon	329B-4 329B-2AW*	4 3½	4 3½	6¾ 6½	4.0 2.3	329B-2AW	3½	3½	6½	2.3	329B-4	4	4	6¾	4.2
Course Indicator	331A-4 331A-2CW*	4 3¾	4 3¾	7¾ 9	4.6 4.0	331A-2CW	3¾	3¾	9	4.0	331A-4	4	4	7¾	4.6
Instrument Amplifier	344C-2 (not req. with FD-104)	¼ ATR Short				.....	.....	.....	.....	.....	344C-1	¼ ATR Short			5.0
						.....	.....	.....	.....	.....	390D-6	Shockmount			1.3

\*For AP-101E/FD-104 combination

stan. The electrical engage clutch in connection with the disconnect switches and the torque limiting clutch provide a positive safety feature. Three Primary Servos are required.

**334C-3, -4 PRIMARY SERVOS** — Controlled voltage split-field series dc servomotors actuate the 334C-3 and -4 Primary Servos. 334C-3 output torque is limited by a precision torque limiting clutch located in the gear train ahead of the electrical engage clutch. 334C-4 output is electrically limited.

**334D-1 TRIM TAB SERVO** — Direct drive servo. Magnetic clutch electrically engaged.

**334D-2-33 TRIM TAB SERVO** — Direct drive servo. Additional clutch provides override without disconnect.

**121A-1 MECHANICAL DISCONNECT** — Independent manual disengagement and an emergency device for disconnecting AP-101 trim tab and primary servos.

**121A-2 EMERGENCY DISCONNECT** — Positive knife switch interlocked with the electrical engage circuitry of the AP-102, -103 primary servos.

**332D-6A VERTICAL GYRO** — 332D-6A provides the prime vertical reference for AP-101E, -102 operation. Bank signals

are available between ±100° with bank freedom of 360° and pitch signals between ±52° with freedom of pitch between ±85°. Automatically caged when turned off.

**332D-9 VERTICAL REFERENCE** — This self-contained central data source supplies basic attitude information to the AP-103 and attitude instruments. Additional outputs for radar and other equipment. A warning signal capable of operating a warning flag, light or relay, a yaw rate gyro, power and isolation circuitry is included. Gyro has 360° freedom of roll and ±82° pitch range.

**327B-1W GYRO MONITOR** — Safe application of power to gyro motor rotor and torque erection motors is indicated.

**327D-1W TRIM INDICATOR** — Trim indication is provided in all three axes.

**590B-1 AIRSPEED COMPENSATOR** — (Optional) Performs parameter scheduling when gains must be varied as a function of airspeed.

**IFS COMPONENTS** — Components common to the Flight Directors and Automatic Pilots are described on the preceding pages. Chart above indicates required equipment.

# VHF COMMUNICATION SYSTEMS

## 17L-8A/51X-3 VHF COMMUNICATION SYSTEM

## 618F-1 VHF COMMUNICATION SYSTEM



**618F-1 VHF COMMUNICATION SYSTEM** — The 618F-1 is a panel mounted, crystal-controlled transceiver providing 360 channel communication service with 50 kc spacing between channels in the 118.0-135.95 mc frequency range. It provides for single-channel-simplex (SCS) and double-channel-simplex (DCS) with direct frequency presentation. Only 9 $\frac{3}{4}$ " is required behind the panel, including space for rear connectors. Minimum transmitter output is six watts.

A complete communication package is formed with the 427D-1 Power Supply which can be located anywhere in the aircraft. The highly reliable transistorized power supply operates off either a 27.5 or 13.75 v dc source. Opposite rewiring of the power supply connections on a master panel converts the system to either voltage. A squelch sensitivity control permits fine adjustment to tune out no signal noise. The complete system weighs only 12.7 lbs.

**427D-1 POWER SUPPLY** — Designed for the 618F-1, the power supply is transistorized to reduce weight and heat. Operates off either 27.5 v dc or 13.75 v dc power source. Bridge type transistorized oscillator drives high voltage supply. In addition to the power supply circuits, the 427D-1 includes the Fixed IF Amplifier and Modulator-Audio Amplifier. Shockmounted.

**17L-7/51X-2 VHF COMMUNICATION SYSTEM** — Maintaining the "Airline Standard of Quality" of their predecessors, the 17L-7 and 51X-2 combine extended frequency coverage and reliability with reduced size and weight. In addition to wide use by the military, international, domestic and local service airlines, the system is popular for business aircraft fleets. Both designed for ARINC cooling. *System Weight Including 390E-2 Dual Shockmount: 27 lbs.*

**17L-8A/51X-3 VHF COMMUNICATION SYSTEM** — A light-weight airborne communication system for private and executive aircraft. Built to airline standards, the panel mounted receiver and transmitter are less than 9" long and incorporate digital tuning, crystal control and low power requirements. The system weighs 10.75 lbs., including power supply, and will mount in any single engine or heavier aircraft without weight penalty. No additional shockmounting required.

**17L-4, -6/51R-3 VHF COMMUNICATION SYSTEM** — Long in use by airlines and military aircraft throughout the world. *System Weight: Approx. 65 lbs. Shockmount: 350F-3.*

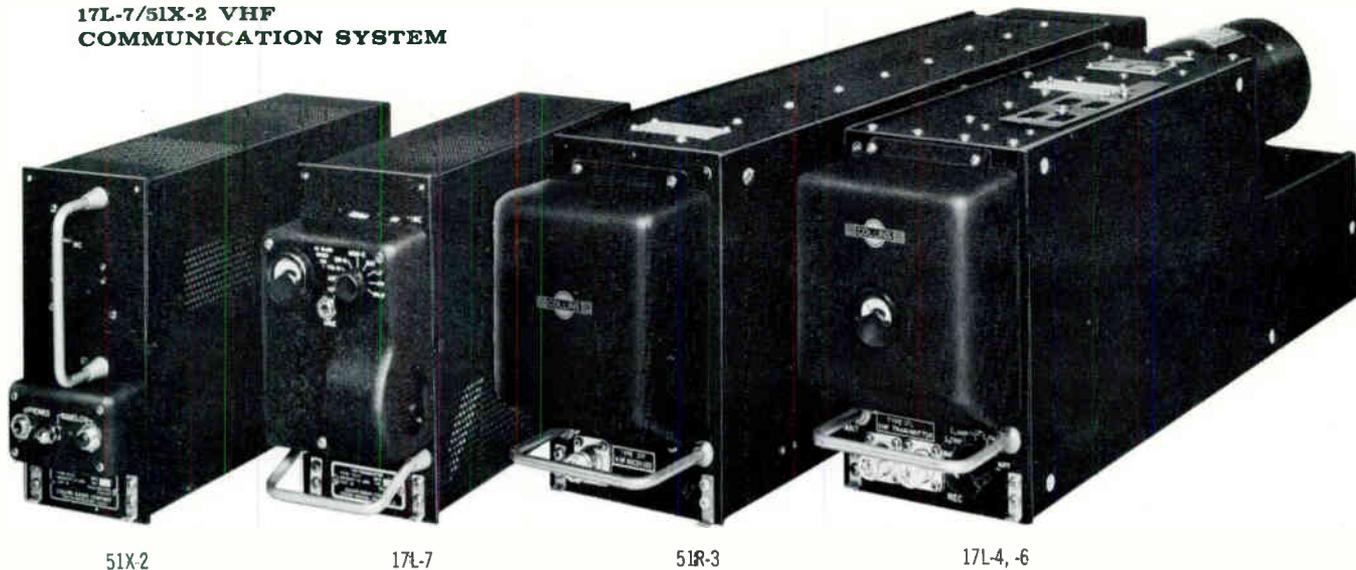
**17L-7 VHF COMMUNICATION TRANSMITTER** — The 17L-7 provides 680 crystal-controlled channels with 50 kc spacing between 118.0 and 151.95 mc. Only six tubes and five transistors are utilized, with four additional transistors in the dc power supply. Remote control frequency selection permits operation in SCS, DCS or DCD. Power output is 25 watts. DC or ac power supplies integral. Operates without pressurization to 30,000 feet. *Shockmount: 349H-3.*

**51X-2 VHF COMMUNICATION/NAVIGATION RECEIVER** — The 51X-2 provides reception on 880 crystal-controlled channels between 108.0 and 151.95 with 50 kc spacing. This includes all VHF communication, VOR and localizer frequencies. With the VOR/LOC instrumentation unit, complete navigation reception is provided. DC or ac power supplies are integral. Features are modularized construction, extended frequency coverage, reduced size and weight, increased reliability and transistorized dc power supply. *Shockmount: 349H-4.*

**17L-8A VHF COMMUNICATION TRANSMITTER** — The 17L-8A is a crystal-controlled 90 channel transmitter with frequency coverage from 118.0 to 126.9 mc in 100 kc increments. Power output is 3 watts. It is primarily intended to provide, along with the 51X-3, increased communication potential for twin and single engine 'light' aircraft. It is constructed in a standard 3" instrument case to be mounted on the instrument panel of any aircraft. The 17L-8A may be used with either 13.5 or 27.5 v systems. The 17L-8 is a 27.5 v model.

**51X-3 VHF COMMUNICATION/NAVIGATION RECEIVER** — Built in the same type case as the 17L-8A, the 51X-3 provides 190 crystal-controlled channels between 108.0 and 126.9 with 100 kc spacing. Combined with the 344A-1, it provides complete navigation and communication service combines with the 344D-1 Omni Converter to provide localizer or omni course deviation and ambiguity indication in a completely panel mounted system. Mounts on any aircraft panel.

17L-7/51X-2 VHF  
COMMUNICATION SYSTEM



**427B-1, -2 POWER SUPPLY** — Provides transistorized power supply and modulator. IF strip and audio amplifier for the 51X-3/17L-8A combination. 427B-1 is for 27.5 v systems, 427B-2 for 13.5 v. 427A-1 Power Supply — Modulator/Power Supply for 17L-8A alone, 27.5 v dc only.

**17L-4, -6 VHF COMMUNICATION TRANSMITTER** — 25 watts transmitter output with 360 crystal-controlled channels spaced 50 kc between 118.0 and 135.95 mc. The 17L-6 is identical to the 17L-4 with the addition of an audio clipper which reduces overmodulation and distortion. *Shockmount:* 350E-3C.

**51R-3 VHF COMMUNICATION/NAVIGATION RECEIVER** — A 280 channel crystal-controlled receiver with 100 kc spacing between 108.0 and 135.9 mc. Receives all VOR/LOC and communication frequencies and with the accessory frame and accessories provides full instrumentation facilities. *Shockmount:* 350E-3A. External power supply required.

**351A-1 ACCESSORY FRAME** — Provides mounting surfaces for 51R-3 accessories — two 337A Omni-Bearing Indicators, three 333B Servo Amplifiers and two 416N-1, N-5 or N-6 Power Supplies. This arrangement complements two 51R-3 Receivers. *Shockmount:* 350E-3A.

**333B-1, -3 SERVO AMPLIFIER** — Required to drive each Radio Magnetic Indicator card from a gyro-stabilized compass. The 333B-1 is for mounting on the 351A-1 Accessory Frame; the 333B-3 includes a base for separate mounting.

**416Z-1 POWER SUPPLY** — For the 17L-4, -6, a transformer-rectifier type for use where both 27.5 v dc and 115 v, 300-1,000 cps sources are available. Replaces dynamotor normally supplied with 17L-4, -6. Especially needed where dc main supply is limited.

**416N-1 POWER SUPPLY** — For the 51R-3, a conventional dynamotor supply for 27.5 v dc. Plugs into 351A-1 Accessory Frame or separate mounting base.

**416N-5 POWER SUPPLY** — For the 51R-3, a conventional ac supply for use with 115 v, 300-1,000 cps source. Plugs into 351A-1 or separate mounting base.

**416N-6 POWER SUPPLY** — For the 51R-3, a new transistorized supply for 27.5 v dc. Reduces weight of present 51R-3 installations and requires less maintenance. B+ voltage is supplied from 26.5 v dc by a transistorized oscillator-rectifier circuit. Interchanges with the 416N-1 with no wiring changes.

	Type	Dimensions (Inches)			Channels	Weight (lbs.)	System Combination	Type	Dimensions (Inches)			Channels	Weight (lbs.)	System Combination	
		W	H	D					W	H	D				
Transceiver	618F-1	5¾	3¾	9¾	360	5.4	.....	DC Power Supply	427B-1, -2	5½	5½	14	.....	6.5	L-8A, X-3
Transmitter	17L-4, 6	½ ATR long			360	29.0	51R-3	DC Power Supply	427D-1	5¾	5½	14¾	.....	7.3	618F-1
Transmitter	17L-7	¾ ATR short			680	14.0	51X-2	Accessory Frame	351A-1	½ ATR			.....	7.3	51R-3
Transmitter	17L-8A	3	3	8½	90	2.25	51X-3	Servo Amplifier	333B-1, -3	6¼	5½	7½	.....	2 or 2.4	351A-1
Receiver (Comm/Nav)	51R-3	½ ATR long			280	29.5	17L-4, -6	DC Power Supply	416Z-1	.....			.....	6.6	17L-4, -6
Receiver	51X-2	¾ ATR short			880	10.5	17L-7	AC Power Supply	416N-5	.....			.....	8.2	51R-3
Receiver	51X-3	3	3	8½	190	2.75	17L-8, -8A	DC Power Supply	416N-6	.....			.....	4.8	51R-3

# HF/SSB COMMUNICATION SYSTEMS



618T-2

## 18Z-3,-4 ONE KW SYSTEM



548D-3

618C-3

614Q-3

High frequency single sideband communication systems relieve spectrum congestion while greatly improving the quality of high frequency communication. Output power in AM is divided between the carrier and two sidebands while SSB radiated energy is concentrated in one sideband resulting in a four to one power advantage for a given output rating. SSB is essentially immune to selective fading. Collins Mechanical Filters eliminate the unwanted sideband and suppress the carrier. RF negative feedback techniques provide power amplification linearity to avoid distortion products. Frequency mixing schemes result in a comparatively simple transmitter-receiver combination with a low spurious product. Automatic servo tuning insures precision in tuning, simplifies operation and facilitates multichannel design.

**18Z-3, -4 1 KW SYSTEM** — Fully automatic, 28,000 channel SSB airborne communication is provided in the 2 to 30 mc range in consecutive 1 kc steps by the 18Z. Power output is 1 kw PEP. The system includes a 618C-3 Receiver-Exciter unit, a 548D-3 or -4 Power Amplifier and one or more 614Q-3 Remote Control units.

The 18Z-3 is the unpressurized version and it employs an auxiliary fan for cooling; the 18Z-4 uses a pressurized power amplifier unit, with an air-to-air heat exchanger requiring external cooling air.

The equipment is extremely simple to operate, with the desired frequency set directly on a counter-type dial. Any of four

operational modes may be selected: upper sideband, lower sideband; twin sideband (both sidebands, suppressed carrier), and AM (upper sideband with reinserted carrier).

Either "Voice operate" or push-to-talk actuation of the transmitter may be used. A stabilized master oscillator is referenced to a compact frequency standard with stability of better than one part in  $10^6$  per month. The 1 kw power amplifier provides excellent linear operation as a result of optimum operating levels and use of RF feedback.

Several accessory antenna couplers and tuners are available in both pressurized and unpressurized versions.

**Impedances:** Receiver RF input and transmitter RF output — 52 ohms. Receiver audio output and transmitter audio input — 150 ohms. **Primary Power:** 115 v (line-to-neutral), 3 phase, 380-420 cps, 1200 watts (SSB transmit).

**614Q-3 REMOTE CONTROL** — Frequency selection for the 18Z is accomplished by four manual setting knobs on the front panel. These knobs control selection of megacycle, tenths of megacycle, tens of kilocycle, and units of kilocycle. Frequency selection automatically initiates operation of a servo bridge follow-up system to tune the radio. Other front panel controls on the back lighted panel are: Upper, Lower, AM or Twin Sideband mode selection, a Sensitivity Control and an ON-OFF switch. Several control boxes may be used in one system.

**180R-6 ANTENNA COUPLER** — In conjunction with the 309A-2, automatically loads and tunes fixed wire antennas.

Cooling air is supplied by an internal blower. The 180R-6 contains antenna loading and phasing elements and driving motors for resonating the antenna and matching the impedance of a wire antenna to the 52 ohm output impedance of the power amplifier. The automatically-tuned impedance matching network will operate over the full 2 to 30 mc range.

Also included are tuning and loading elements, a portion of the switching circuits, servo motors, antenna transfer relay and lightning arrestor assembly. Operates without pressurization to 20,000 feet. Pressurized version available.

**309A-2 ANTENNA COUPLER CONTROL** — Includes relay and switching control to assist the 180R-6 in loading and tuning a fixed wire antenna. The 309A-2 can provide multicouplers for coupling the antenna to either an auxiliary HF receiver or an auxiliary Loran receiver. Operates without pressurization to 75,000 feet.

**AT-101/AT-102 ANTENNA TUNERS** — Automatically couples Collins airborne HF communication equipment with tail cap antennas. AT-101 is for single transmitter-receiver; AT-101A will accommodate one auxiliary receiver. AT-102 is for dual installations and one or two auxiliary receivers. AT-101/AT-102 include pressurized the 452A-1 Lightning Arrestor and Relay Assembly and one or two 180R-4 Couplers plus one or two 309A-1 Coupler Accessory Units.

**618T-2, -3 400 WATT TRANSCEIVER** — The 618T provides HF SSB communication on 28,000 channels with 1 kc spacing in the 2 to 30 mc range with 400 watts PEP. Compatible AM transmission is available with 100 watts carrier. The

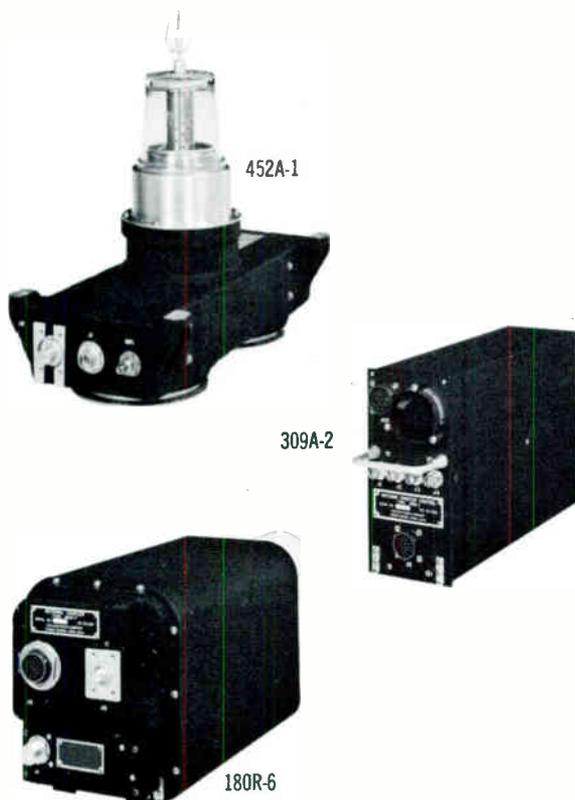
618T-2 contains an internal 115 v, 3 phase, 400 cps power supply. The 618T-3 has a self-contained dc power supply.

Frequency stability is one part per million plus 2.5 cps error per month. Two tubes in parallel provide the 400 watts PEP. The injection sources of the 618T are phase locked to an internal frequency standard to provide excellent stability. Frequency control is accomplished with a stabilized master oscillator and stabilized crystal oscillators.

Remotely controlled Autopositioners® provide for frequency selection in the transceiver. Power amplifier and antenna matching circuits are automatically tuned. A blower on the front panel distributes filtered cool air to the main chassis. The 49T-3 Retrofit Adapter used with 350S Shockmount facilitates installation of the 618T in an airframe cabled for a 618S HF System.

*No. of Tubes: 14. No. of Transistors: 62. Transmitting RF Output Impedance: 52 ohms. Transmitter Distortion: Less than 5%. Receiver Sensitivity: 3 uv max. for 6 db signal-plus-noise-to-noise ratio with standard test signal modulated 30% at 1,000 cps or for 10 db signal-plus-noise-to-noise ratio on SSB. Selectivity: AM—5.5 kc, 6 db down; 14 kc, 60 db down; SSB—2.85 kc, 6 db down; 6 kc, 60 db down. Audio Output: Power—500 mw into 300 ohm load. Distortion—less than 10%. Response—±3 db, 300 to 3,500 cps.*

**714E-1 REMOTE CONTROL UNIT** — Contains all controls necessary for frequency selection of any one of the 28,000 channels of the 618T. Provides direct readout of frequency and for selection of lower sideband, upper sideband or AM operation. The 714E-1 Remote Control may be mounted in the flight station. The unit is back lighted.



	Type	Dimensions (inches)			Weight (lbs.)	System	Shock-mounts
		W	D	H			
Receiver Exciter	618C-3	1	ATR		59.5	18Z-3, -4	349E-3
Power Amplifier (non-pressurized)	548D-3	1	ATR		53.0	18Z-3	349F-4
Power Amplifier (pressurized)	548D-4	1	ATR		72.0	18Z-4	349F-5
Control	614Q-3	5¼	7¾	5¾	4.6	18Z-3, -4	Console
Antenna Coupler	180R-6	7	25½	9½	24.6	18Z-3, -4	349G-3
Coupler Accessory	309A-1	¾	ATR Short		12.5	18Z-3, -4	349N-1
Coupler Control	309A-2	¾	ATR Short		15.0	18Z-3, -4	349N-1
Lightning Arrestor—Relay Assembly With Antenna Tuner	452A-1 & 180R-4	7½	16½	25¾	24.0	18Z-3, -4	.....
Lightning Arrestor—Relay Assembly With Antenna Tuners	452A-1 & 180R-4	7½	16½	25¾	37.0	18Z-3, -4	.....
Transceiver	618T-2, -3	1	ATR		47.0	618T-2	350S-3
Control	714E-1	5¾	5¾	2½	1.5	618T-2	Console

# HF COMMUNICATION SYSTEMS

**618S-1, -4 HF TRANSCEIVERS** — With up to 144 crystal-controlled channels in the 2 to 25 mc range, the 618S-1 provides 100 watt voice or CW output for long range HF communication. The 618S-1 employs modular construction, Mechanical Filters and automatic tuning. The 618S-4 includes a module which has squelch and Selcal output circuitry. Requires 28 amps at 27.5 v dc and 180 watts at 115 v ac, 400 cps. Remote tuning through the use of Autopositioner and servo control. Full operation to 50,000 feet. *Frequency Stability:* 0.007%. *Channeling Time:* 8 sec. max. excluding tuning unit. *Spurious Radiation:* 45 db below desired frequency, second harmonic 35 db below desired frequency. *Sensitivity:* 5 uv max. for 6 db signal-plus-noise-to-noise ratio with 30% modulated signal. *Selectivity:* 5.5 kc min. 6 db down, 14 kc max. 60 db down.



618S-1

**18S-4A HF TRANSMITTER-RECEIVER** — A self-contained transmitter, receiver and power supply, the 18S-4A provides up to 20 crystal-controlled channels in the 2 to 18.5 mc range with 100 watt output on voice or CW. The receiver uses a Mechanical Filter in the IF stage for sharp selectivity.



18S-4A

Ten channels are normally provided, but 20 channels may be made available by using two crystals in each channel with no more than 1% spacing. Channels are selected in the transmitter-receiver by a Collins Autopositioner.

Automatic tuning is provided with 180L-2. Transmitter uses three tubes. The receiver section has ten tubes and includes an automatic noise limiter, delayed AVC and BFO. *Power Requirement:* 38 amps, 27.5 v dc.

**180L-3 AUTOMATIC TUNING UNIT** — For the 618S, requires no manual adjustment for initial installation, change in frequency or antenna. Contains antenna transfer relay for use when separate receiving facilities are desired with a common antenna. An SWR indicator is included on the front panel. Tunes long wire antennas 40 to 100 ft. long to appear as 52 ohms resistive. Two discriminators feeding servo systems automatically phase and load the antenna after a signal is received from the transmitter. The 180L-3A contains an internal relay for grounding an adjacent antenna.

	Type	Dimensions (inches) W H D	Wt. (lbs.)	System Combination	Shock-mount
Transceiver	618S-1, -4	1½ ATR long	51	.....	350S-3
Transmitter-Receiver	18S-4A	1½ ATR long	53	.....	350C-5
Automatic Tuner	180L-3	10¾ 7¾ 13¾	20	618S	350D-3
Automatic Tuner	180L-2	10¾ 7¾ 11¾	19	618S/18S-4A	350D-3
Antenna Tuner	180K-3	10¾ 7¾ 10¾	12	18S-4A	350D-3
Power Supply	416W-1, -3	4¾ 6¾ 18¾	22	618S	350T-1

**416W-1 POWER SUPPLY** — A dynamotor and ac power supply for the 618S. Requires 27.5 v dc at 30 amps on transmit, 6 amps standby; 30 watts, 115 v, 380-420 cps; 150 watts, 115 v, 300-1000 cps.

**416W-3 POWER SUPPLY**—Provides same voltages as 416W-1 from 3 phase, 115 v, 400 cps source.

**180L-2 AUTOMATIC TUNING UNIT** — For the 618S and 18S-4A. Provides the same functions as the 180L-3 without the antenna changeover feature. Phasing and loading is automatically accomplished.



180L-2



180L-3

**180K-3 ANTENNA TUNING UNIT** — Matches the output of the 18S-4A to standard aircraft long wire antennas. Uses 10 preset channels which are selected as the 18S-4A channels. The Collins Autotune® system is used to position the tuning elements. The 18S-4A provides all power for the 180K-3.



180K-3

# WEATHER RADAR SYSTEM



561G-1



493A-2

The WP-101 Airborne Weather Radar System provides the pilot with a continuous map of precipitation conditions in the sky area within a radius of 150 miles and approximately 240° around the nose of the aircraft. Ranges are 20, 50 and 150 miles. An optional bright tube indicator enables viewing in direct sunlight. Ground mapping, a secondary function, shows the location of cities, lakes, rivers, mountains and shorelines, and it also allows identification of dangerous terrain obstacles. The presentation of weather conditions in terms of range and azimuth relative to aircraft heading enables the pilot to avoid storms or turbulent areas by detours of five miles or less.

Short, high power pulses of RF energy in the C-band 5400 mc range are generated in the transmitter and radiated from the antenna. Between these transmitter pulses, reflections from objects within system range are received and translated by the receiver into video responses appearing as bright spots or lighted areas on the cathode ray indicator tube. Storm areas return echoes according to their precipitation density.

**776C-1, -2 SYNCHRONIZER**—Contains power supplies, servo amplifiers and basic timing circuitry. Blower cooled. 776C-2 supplies signals for a two-indicator system.

**374A-1 RECEIVER/TRANSMITTER** — Contains all RF and IF circuitry. Blower cooled. Operates on 5400 mc ±40 mc.

**561G-1, -2 COCKPIT CONTROL** — Provides control of radar. Presentation and range control is on indicator.

**493A-1 INDICATOR** — Provides target range and azimuth on conventional yellow face cathode ray tube. Brightness and range controls on indicator. Centered or offset sweeps are available. Straight or offset hoods for daytime use.

**493A-2 INDICATOR** — Provides offset range and azimuth of targets on a bright storage cathode ray tube with sufficient brightness for use in direct sunlight without hood. Images are stored for almost the duration of one revolution of antenna. Variable color filter adjusts display from green through near white to deep red.

**537F-1 ANTENNA** — 21" parabolic dish with 7½° beam-width. Rotates continuously through 360° at 15 rpm. Stabilized horizon ±35°.

**537F-3 ANTENNA** — 30" antenna with approx. 5½° beam-width. Stabilized 30° up and 35° down. Operation identical to 537F-1.



776C-1

374A-1



537F-1

	Type	Dimensions (inches)			Weight (lbs.)	Shockmount
		W	H	D		
R-T Unit	374A-1	1	ATR		54.0	349A-4
Indicator	493A-1	5"	scope		11.0	Panel mount
	493A-2	5"	scope		17.3	Panel mount
Antenna	537F-1	20"	dish		25.7	.....
	537F-3	30"	dish		30.7	.....
Control	561G-1,-2	5¼	3¾	3	1.4	.....
Synchronizer	776C-1	1	ATR		34.5	349B-2
	776C-2	1	ATR		38.0	349B-2

# VHF NAVIGATION SYSTEMS



VOR-101



344D-1/427B-1, -2/51X-3

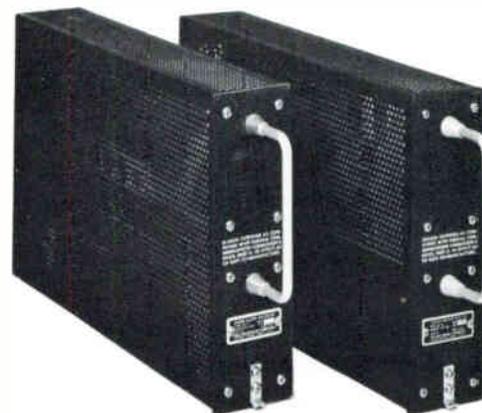
51X-3/427B-1, -2  
344A-I



51R-4



VOR-102



51V-3

51Z-2

Collins Navigation Systems provide optional variation in case size, weight and degree of instrumentation. Reliability, accuracy, ease of maintenance and modular construction characterize these five system combinations designed to fit any VHF navigation need from airliner down through single engine aircraft. Units record azimuth runout error of less than  $\pm 0.5$  when tested with a precision track selector.

**51R-4 NAVIGATION RECEIVER** — Complete navigation receiver service in a  $\frac{1}{2}$  ATR case. 880 channels with 50 kc spacing between 108.0 and 151.95 mc are provided. OBI and the necessary servo amplifier for RMI instrumentation are included internally. Utilizing the identical modules included in the VOR-101, the 51R-4 takes less frontal space in a radio

rack and utilizes a single power supply. The 51R-4, VOR-101 and VOR-102 provide visual localizer course presentation and simultaneous voice reception from 108.10 through 111.90 mc; visual omnichannel presentation and simultaneous voice reception from 108.00 through 117.95 mc; and VHF reception for voice communication from 118.00 through 151.95 mc. *51R-4 Weight: 23 lbs.*

**VOR-101 NAVIGATION SYSTEM** — The 51X-2 VHF Receiver is combined with the 344B-1 VOR/LOC Instrumentation Unit to provide the same services as the 51R-4. Consists of two short  $\frac{3}{8}$  ATR cases. Utilizing the modules included in the 51R-4, this combination has the advantage of individual replacement, shorter depth in the rack. Units may be

mounted in different locations or in a single dual shockmount. *System Weight:* 24.5 lbs.

**VOR-102 NAVIGATION SYSTEM** — The 51X-2 VHF Receiver is combined with the 344A-1 VOR/LOC Instrumentation Unit for course selection, cross pointer and flag services for instruments such as the ID-48 and 336A-2, -3 or 331H-1. Utilized where RMI service is not desired. Other functions are identical to 51R-4. *System Weight:* 19.5 lbs.

**LIGHTWEIGHT DELUXE NAVIGATION SYSTEM** — The 51X-3 panel mounted VHF Receiver is combined with the 344A-1 VOR/LOC Instrumentation Unit for same services as the VOR-102. 51X-3 provides 190 crystal-controlled channels with 100 kc spacing between 108.0 and 126.9 mc. Contains necessary switching for simultaneous glideslope and localizer tuning. Front panel channel selection, audio and squelch controls. 427B-1, -2 Power Supply containing audio amplifier and power supply is required. *System Weight:* 18.75 lbs.

**LIGHTWEIGHT STANDARD NAVIGATION SYSTEM** — 344D-1 Omni Converter Indicator is combined with the 51X-3 VHF Receiver for left-right VOR and LOC indication, reciprocal bearing, to-from information and VOR course selection. 427B-1, -2 Power Supply is required to complete system for single engine aircraft. *System Weight:* 13.90 lbs.

**51Z-2 MARKER BEACON RECEIVER** — Provides pilot with sharp visual and aural indications of passage over a 75 mc marker beacon. Transistor switches driven from filter outputs turn on lamps. Both one and three lamp versions available. Remotely controlled HI-LO preset sensitivity for more positive indications during instrument approach. Twilight and "no station" hiss are eliminated by a SQUELCH circuit. AC or dc power supplies integral. Three-light version weighs 4.9 lbs., one-light, 3.8 lbs.

**51V-3 GLIDESLOPE RECEIVER** — Motor driven crystal switch for frequency selection of 20 channels between 329.3 and 335.0 mc. A 10 channel version is available. Flag alarm circuit included. Low power requirements, modular construction for simplified maintenance, ARINC cooling design, advanced component application and integral ac or dc power supplies are incorporated in a ¼ ATR short case.

	System	Control	Size W H D	Wt. (lbs.)	Shock- mount
Receiver	51X-2	VOR-101 or VOR-102	314U-8, -10 614U-3, -7	¾ ATR short 10.0	349H-4 390E-1
Instrumentation Unit	344B-1	VOR-101	.....	¾ ATR short 13.0	349H-5 390E-1
Instrumentation Unit	344A-1	51X-3 or VOR-102	.....	¼ ATR short 9.0	390D-8
Receiver	51X-3	344A-1 and 427B-1, -2	Direct	3" 3" 8½"	2.75 Panel mount
Receiver	51R-3	.....	614F-2, -3 314U-8, -10	½ ATR long 29.5	350E-3A
Receiver Instrumentation Unit	51R-4	.....	314U-8, -10 614U-3, -7	½ ATR 23.0	349D-3A
Marker Receiver	51Z-2	.....	Fixed Tuned	¼ ATR short 4.9	390D-2 390F-2
Glideslope Receiver	51V-3	.....	314U-8, -10 614U-3, -7	¼ ATR short 6.4	390D-3 390F-2
Omni Converter	344D-1	51X-3 427B-1, -2	51X-3	3" 3" 8½"	2.4 Panel mount
Power Supply	427B-1, -2	.....	.....	5½" 5½" 14"	6.5 Mount included

**51R-3 VHF NAVIGATION RECEIVER** — Provides 280 crystal-controlled channels with 100 kc spacing between 108.0-135.9 mc. With accessories in 351A-1 Accessory Frame provides localizer, RMI, crosspointer, OBI, To-From and flag alarm. See page 11 for additional data.

## NAVIGATION INSTRUMENTS



**331H-1 COURSE SELECTOR INDICATOR** — Provides VOR and ILS cross-pointer service, to-from, flag and digital course selector indication. Standard 3" case. *Weight:* 4.0 lbs.

**ID-48 DEVIATION INDICATOR** — Provides VOR and ILS displacement data. Flag service. Standard 3" case. *Weight:* 1.9 lbs.

**337A-2 OMNI-BEARING INDICATOR** — Presents true bearing to VOR station and drives RMI pointers. Panel mounted or mounts in 51R-3 accessory frame. Standard 3" case. *Weight:* 2.5 lbs.

**336A-2 OMNI-BEARING SELECTOR** — Enables selection of desired track and provides to-from information. Operates with any unit requiring single 30 cps rotor resolver. Matte white or orange markings. Standard 3" case. *Weight:* 2 lbs.

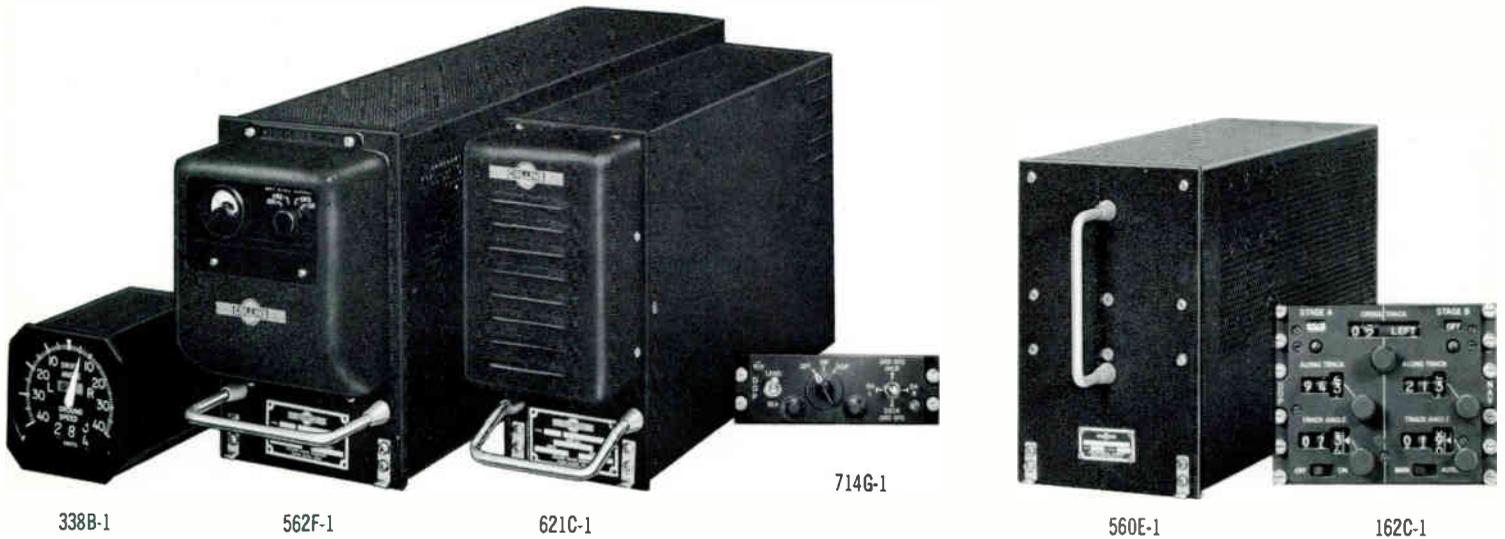
**336A-3 OMNI-BEARING SELECTOR** — Performs same function as 336A-2 and is for use with either new or old VOR instrumentation units such as 51R-3, 51R-4, 344B-1 and 344A-1. Standard 3" case. Matte white or orange markings. *Weight:* 2 lbs.

**332C-1 RADIO MAGNETIC INDICATOR** — Provides heading, omni and ADF bearing. Inputs for VOR and ADF. Standard 3" case. Matte white or orange markings. *Weight:* 2 lbs.

**331E-2 ADF INDICATOR** — Presents VOR and ADF bearing. Variation set knob sets card. *Weight:* 1.5 lbs.

**327A-2 MARKER LIGHT INDICATOR** — Contains three press-to-test lights and Hi-Low sensitivity switch. Standard 3" case. Available in kit form as 327A-1. *Weight:* .63 lb.

# DOPPLER NAVIGATION SYSTEM



The DN-101 Doppler Radar Navigation System is a high accuracy, dead reckoning system of navigation achieved by measuring the Doppler shift of three beams of X-band energy directed to the earth's surface. Designed specifically for airline service, the DN-101 permits full dual system operation from a single antenna through less than four square feet of radome area. Ground speed and drift angle are determined to approximately 1 percent and 1/2 degree. The NC-103 Navigation Computer System presents "along-track" distance and "across-track" deviation information on a control panel and provides outputs for display on horizontal situation or plan view indicators. DN-101 *Weight*: 57.9 lbs.

**DN-101 DOPPLER RADAR NAVIGATION SYSTEM** — An FMCW system is utilized in the DN-101 to overcome transmitter-receiver leakage and system vibration effects. Frequency coherency in the system assists in providing sufficient sensitivity margin for system operation under all conditions of flight and of system degradation due to accumulated flight time. Single sideband techniques are employed using the third sideband of the FMCW wave. Operates effectively to zero altitude. System design is such that the energy in the third sideband can be optimized so that nearly all of the energy of the 2 watt transmitter is contained in the upper and lower third FM sidebands. The DN-101 is immune to

interference from high power search radar.

The panel mounted 338B-1 Indicator provides a continuous indication of drift angle and ground speed.

The Janus technique, applied after tracking, is used to cancel aircraft pitch and roll errors. Microwave energy is applied to three beams on a time shared basis. The feedhorn system of the lens antenna has the proper illumination taper for desired side lobe suppression and is able to feed two Doppler systems simultaneously through one lens. The metal of the horn and the lens is common to the two systems. High gain conical beams established by the lens type antenna provide high system gain and low sea state bias errors. The DN-101 contains only 11 tubes and 44 transistors. Automatic acquisition trackers eliminate the requirement for slewing. Tracking discriminators are automatically recalibrated every 14 minutes.

The DN-101 consists of a 621C-1 Transmitter-Receiver, 562F-1 Computer-Tracker, 137Y-1 Antenna, 338B-1 Indicator and 714G-1 Control Unit. All units are identical in a dual installation except that a 137Y-2 Antenna is used to serve both systems. Maximum reliability is achieved with a completely passive antenna which has no moving parts. Complete ramp and maintenance shop test equipment is available, and the system can be fully checked without expensive flight testing. Operation at zero altitude permits passive feed horn system measurement of all functions. *Power Consumption*: 250 watts ac, 12 watts dc.



**NC-103 DOPPLER NAVIGATION COMPUTER SYSTEM** —

Ground speed and drift angle from the DN-101 is processed in the computer along with compass inputs and pilot-selected ground track data and presented on a readout control panel. Provisions are made to supply output data to auxiliary panel display indicators as well as autopilot control signals.

The NC-103 is composed of two units — the panel mounted 162C-1 Control Panel and the 560E-1 Computer — which may be coupled with an Integrated Flight System and an automatic pilot for completely automatic flight from take-off to destination.

The coordinates of the aircraft flight plan are set into the 162C-1 Control Panel. This panel contains the selection, switching, display and interlock functions of the system. The

control is divided into two stages, A and B, which are alternately active during the flight.

The CROSS TRACK display is centered at the top of the control and always indicates the distance to the right or left of the desired track of the active stage. Each stage has an ALONG TRACK and TRACK ANGLE display. The ALONG TRACK indicator shows the distance remaining to destination while TRACK ANGLE is the course selected for that leg of a flight.

Contacts are provided in the 162C-1 for a 10 mile warning indication. This allows a warning light to be lit when the ALONG TRACK distance reaches 10 in either stage. The circuitry for the 10-mile warning is already in the 162C-1.

The 560E-1 Computer is an analog computer which accepts selected track, ground speed and drift angle information. This information is integrated to provide ALONG TRACK and CROSS

TRACK information to the integrally lighted 162C-1 Control. The necessary integrators, synchros, amplifiers and other mechanisms are housed in the computer's 1/2 ATR short case.

The computer's modularized subassemblies provide the advantages of fast removal and replacement of units, environmental isolation and system flexibility. Power requirements are reduced, system reliability is increased and considerable reduction in size and weight is accomplished by using transistors throughout the system. The NC-103 computing and control functions are divided between the 560E-1 and 162C-1 in such a way as to insure maximum system accuracy with a minimum of weight.

Readout limits on the 162C-2 are 999 n.m. ALONG TRACK and 99 n.m. CROSS TRACK. *Power Requirements:* 115 v, 400 cps, 75 watts maximum. No dc required.

## AUDIO AMPLIFIERS



### 346A-1 INTERPHONE AND ISOLATION AMPLIFIER —

Provides a complete audio system with a flexibility to meet the needs of most aircraft. It uses three different plug-in transistorized modules on the chassis-frame (which will accommodate six) to provide interphone, isolation and speaker amplifier functions. Combinations may be made up from the 356C-1 Isolation and Interphone Module, 356D-1 Amplifier Module (2 watt), 356F-1 Speaker Amplifier (10 watt) Module. Power drain of each 356C-1 is .08 amp at 27.5 v dc; of 356D-1 is .015 to .165 amp; of 356F-1 is .035 to .650 amp at 27.5 v dc. Weighs 7 lbs. or less. 1/4 ATR short. *Shockmount:* 390D-1.

### 346D-1 PASSENGER ADDRESS AMPLIFIER —

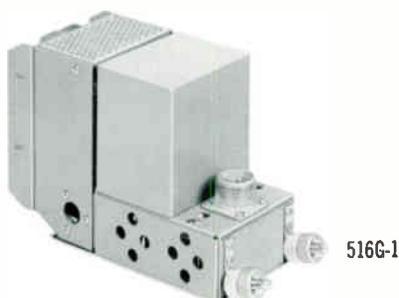
A completely transistorized high fidelity amplifier with less than 7% distortion at 40 watts of sine wave output. It provides inputs for pilot, stewardess and a tape reproducer. A multi-position tone control is provided for Treble Cut, Bass Boost and Bass Cut. Requires approximately 25 watts of 27.5 v dc for normal voice service; none on standby. Weighs 9.6 lbs. 1/4 ATR short. *Frequency Response:* 100 to 7,000 cps with less than 3 db variation, 5 db to 10,000 cps. *Output Impedance:* 25, 50, 125, 200, 350 or 500 ohms unbalanced. *Sidetone Output:* 600 mw at rated output. *Shockmount:* 390D-9.

## INVERTER



The 488A-1 is lightweight, transistorized inverter with no primary rotating parts. At 55°C, supplies 250 va of 115 v, 400 cps power from a 27.5 v dc supply. Contains self protecting circuitry for line transients. Will supply 170 va continuously at 70°C. Frequency maintained within 5%. 60% efficient. Requires no preventative maintenance. Has sufficient reserve capacity to insure blowing the fuse in the event of a short in the unit when the inverter is already under full load. *Weight:* 9.25 lbs. *Size:* 6 3/4" W, 9 3/4" L, 5 5/8" H. Requires 4 to 25 amps of 27.5 v dc depending on load. Fourteen transistors are used.

## CONVERTER

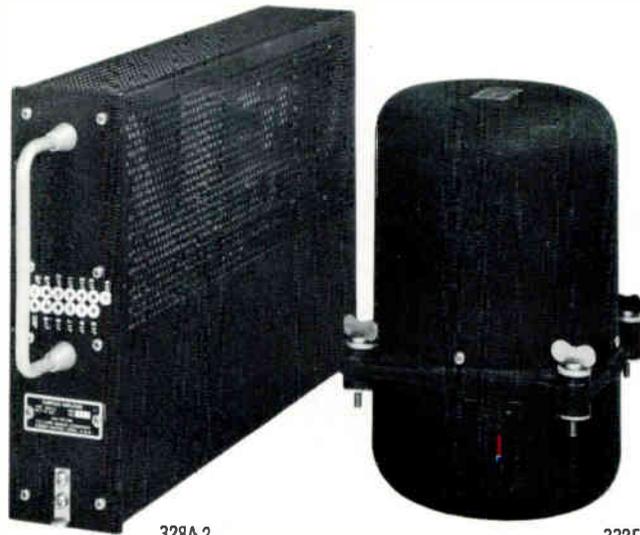


A lightweight transistorized power converter, the 516G-1 allows aircraft with 12 volt systems to be fitted with 27.5 volt equipment. Provides 10 amps continuous and 15 amps intermittent. Absence of moving parts insures long periods between overhauls. Preventative maintenance is unnecessary. Drain is proportional to load and is zero at no load. Overall efficiency 80% or greater. Operates to 30,000 feet. Noise filters incorporated. Four power transistors are used with two high current silicon rectifiers. *Weight:* 7 pounds. *Size:* 9 1/2" D, 3 3/4" W, 5 7/8" H. Approved under FAA TSO. Convection provides adequate cooling.

# MAGNETIC COMPASS SYSTEM



323A-1



328A-2

332E-1

The MC-102 is a lightweight, gyro-stabilized airborne magnetic compass. The system provides  $\pm 1.0^\circ$  of accuracy. Initial automatic slaving at  $360^\circ$  per minute rapidly synchronizes the DG with the earth's magnetic field. After synchronization, the system changes to normal slaving speed of 2 to 3 degrees per minute. *Power Requirements:* 115 v, 400 cps, start — 88 va, run — 65 va; 27.5 v dc, start — 24 watts, run — 5 watts.

**328A-2 COMPASS AMPLIFIER** — Includes three high power synchro transmitters with the optional addition of a fourth. Provides adequate power sources to drive an automatic pilot, flight director, Doppler and other flight and navigation systems. Has module test points on the front of the  $\frac{1}{4}$  ATR short case.

**332E-2 DIRECTIONAL GYRO** — Automatic fast slave or manual slave gyro with controlled tumbling in the pitch-and-roll axis and  $360^\circ$  freedom in the turn axis. Erection is provided by curved mercury switches and torque motor. *Erection Rate:* 4 to  $8^\circ$  per minute near level.

**323A-1 FLUX DETECTOR** — Senses direction of the earth's

magnetic field. Compensator is available where hard iron deviation is of undesirable magnitude.

**327C-1 SLAVE INDICATOR** — Monitors synchronization of the DG and Flux Detector. Indicates direction of correction during manual slaving; automatic slave and power monitor during automatic operation. Slave switch controls automatic slaving or manual slaving in either direction.

	Type	Weight (lbs.)	Dimensions (inches)			Shockmount
			W	H	D	
Flux Detector	323A-1	1.3	3 $\frac{1}{8}$	4 $\frac{3}{4}$	4 $\frac{3}{4}$	.....
Compass Amplifier	328A-2	7.5	$\frac{1}{4}$ ATR short			390D-4
Directional Gyro	332E-2	5.5	4 $\frac{1}{2}$	4 $\frac{7}{8}$	4 $\frac{7}{8}$	350X-1
Slave indicator	327C-1	0.3	1 $\frac{1}{4}$ Inst.			Panel mount
Slave Switch	.....	0.2	2 $\frac{1}{8}$	1 $\frac{1}{8}$	1 $\frac{1}{2}$	Panel mount

## DMET



860E-1



339D-1

Collins 860E-1 Distance Measuring Equipment, TACAN, provides precise distance information for aircraft up to 200 nautical miles from an associated ground beacon. The power amplifier provides 1 kw minimum peak pulse power.

Autopositioner<sup>®</sup> tuning selects one of 126 channels, 1 mc wide in the 1025 through 1150 mc range for transmitting distance interrogation pulses. It tunes the receiver from 962 through 1024 mc or 1151 through 1213 mc. Interrogation pulses are transmitted with random timing so that the system will only lock on pulses replying to its own interrogation. Will lock on and track up to 1800 knots. *Frequency Control:* Direct crystal. *Altitude:* 30,000 feet. *Weight:* 35 lbs. *Transmitter Frequency Stability:* 0.007%. *Receiver Sensitivity:* -90 dbm. *Accuracy:* .17 mile or .2% of the distance measured. *Search Time:* 22 sec., maximum.

**339D-1 DISTANCE INDICATOR** — Integrally lighted, requiring 1 $\frac{3}{8}$ " x 3 $\frac{1}{4}$ " panel space. Presents a digital mileage readout of DMET. Can be used with Doppler Radar Navigation Systems. When used with DMET, distance of the aircraft from fixed radio beacon is presented. With Doppler systems, it gives direct readings of distance to go along track. Weight 1.1 lb.

# ANTENNAS

**37R-1 VHF COMMUNICATION ANTENNA** — A vertically-polarized communication antenna for both transmitting and receiving. Frequency range is 118.0-136.0 mc with a standing wave ratio of 2:1 or less. Impedance is 52 ohms into unbalanced line. FAA certificated.

**37J-3 VOR NAVIGATION ANTENNA** — Horizontally-polarized antenna for receiving VOR and localizer signals. Frequency range is 108-122 mc with a standing wave ratio of 5:1 or less. Impedance is 52 ohms into unbalanced line. It will withstand more than 150 lbs. sideward pressure. FAA certificated. *Base Plate: 7¼" L, 3¾" W.*

**137X-1 COMMUNICATION-NAVIGATION ANTENNA** — Provides a combined antenna with essentially the same electrical characteristics as the 37J-3 and 37R-1. Designed to withstand the forces encountered at Mach .9 at sea level in an attitude of 5° pitch and 5° yaw. Passes salt spray tests. With adaptor plate, mounts same holes as 37J and R. Standard mounting plate recommended for new installations. FAA certificated. Also passes Mil. Spec.

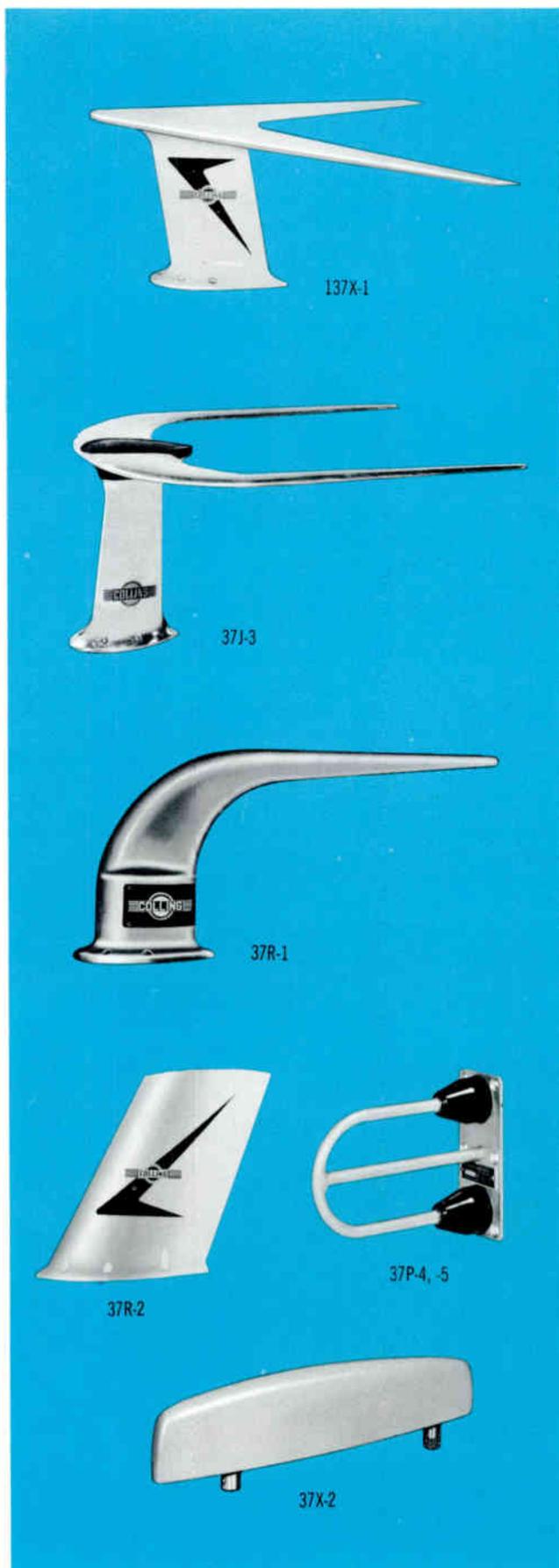
**37R-2 VHF COMMUNICATION ANTENNA** — A vertically-polarized communication antenna for receiving and transmitting with a maximum input capability of 125 watts. A voltage SWR of 2:1 or less is obtained over the frequency range of 116 to 152 mc. The nominal input impedance is 52 ohms. On new installations, a mounting pattern longer than the present 5⅝" pattern is recommended. For direct replacement of the 37R-1, an adapter plate is available. FAA certificated.

**37X-2 MARKER BEACON ANTENNA** — A horizontally-polarized antenna for receiving the 75 mc marker beacon signal. The standing wave ratio is 3:1 or less through operating temperature range: -40°C to +70°C. Impedance is 52 ohms into unbalanced line. FAA certificated.

**37P-4, -5 GLIDESLOPE ANTENNA** — A horizontally-polarized antenna for receiving glideslope signals. It has a standing wave ratio of 3:1 or less from 329 to 335 mc at room temperature. Impedance is 52 ohms into unbalanced line. Constructed of aluminum. FAA certificated. Passes water submersion tests at an altitude of 70,000 feet and salt spray test. The 37P-5 has two inputs for dual glideslope receiver installation. Passes Mil. Specs. *Baseplate: 4½" L, 2" W.*

Type	Dimensions (inches)			Weight (lbs.)	Drag 250 mph	Frequency Range
	W	H	D			
37J-3	17¼	12	27	4.0	2.6	108-122 mc
37R-1	3¾	10½	21⅞	3.5	1.0	118-136 mc
37R-2	3¾	12¾	11½	2.0	0.5 1.3*	116-152 mc
137X-1	10⅞	24¼	25⅞	4.7	2.7 15.3**	118-136 mc Comm. 108-127 mc Nav.
37X-2	1⅞	2⅞	11⅞	1.0	3.5 oz.*	75 mc
37P-4	2	6	4½	0.7	negligible	329-336 mc
37P-5	2	5½	4½	0.7	negligible	329-336 mc

\*at 400 mph    \*\*at 600 mph



# SELCAL SYSTEM

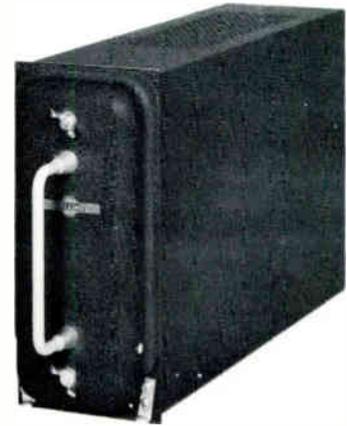
Selcal provides for calling of a single flight on two separate frequencies or single flight and group calling on a single frequency. Ground units provide for control of the calling transmitter. Tones are designated A to M (I omitted) and flights may be assigned a combination of four letters.

**456C-1 AIRBORNE SELCAL** — Twelve resonant reed relay assemblies in each of two channels are contained in a  $\frac{3}{8}$  ATR short case. Eight switches on the front panel select the code assigned for the two channels. A cover protects against accidental change of position. Operates without pressurization to 30,000 feet. *Weight:* 10.25 lbs. *Power Requirements:* 115 v, 300-1000 cps, 15 va; 27.5 v dc, .65 amp; external B+ supply possible. *Shockmount:* 349H-2.

**288A-1 TONE GENERATOR** — Used in conjunction with a communication transmitter as part of a ground-to-air selective calling system. The Tone Generator is mounted in a fixed station rack and used to modulate a transmitter with the tones selected by the tone generator control units. The 12 tone oscillators of the 288A-1 may be used in any of the sequences listed in ARINC 531. Occupies  $8\frac{1}{4}$ " vertical rack space.

**614J-1, K-1 CONTROL UNIT** — Rack mounted pushbutton control for selection of codes and keying of transmitter. The 614K-1 is console mounted.

**278H-1 CONTROL PANEL** — Provides for 20 preset code sequences. A memory drum accessible from the front is set to any desired code. Rack mounted.



456C-1



288A-1



614K-1

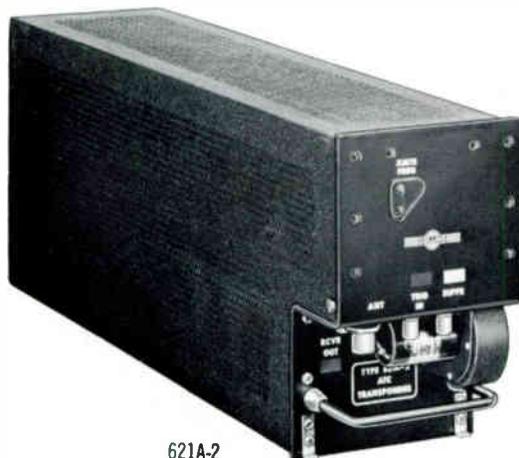


614J-1



278H-1

# ATC TRANSPONDER



621A-2

The 621A-2 Transponder, operating in conjunction with ATC ground radar, provides a signal which reinforces radar replies, permitting a positive identification of aircraft despite rain clouds, ground clutter or operation near the maximum range of the radar. A pair of time spaced pulses transmitted on 1030 mc to the 621A-2 Transponder in the aircraft causes a reply to be transmitted on a frequency of 1090 mc. Four different modes of interrogation are accommodated. Choice of 64 different coded replies, which may be selected by the pilot using a control unit. A special identification pulse may be transmitted immediately following the code reply. Housed in  $\frac{1}{2}$  ATR case weighing 26 lbs. *Frequency Control:* Transmitter — Stabilized cavity oscillator. Receiver — Crystal controlled. *Power Requirements:* 115 v, 300-1000 cps, 150 va. *Modes of Interrogation:* 8, 17 or a choice of 19, 21, 23 or 25 usec. spacing. *Shockmount:* 350E-D3.

# ADF SYSTEM



614L-2



614L-1

The DF-202 Automatic Direction Finder System consists of a single conversion superhetrodyne receiver housed in a long 1/2 ATR case with 2 precision remote tuning controls, a flush or semiflush mounted, sealed loop antenna and an antenna coupler. Features include RF input circuitry to match the high capacitance sense antennas, Mechanical Filters for sharp selectivity, couplers and line simulators to further match the receiver to the varied sense antenna systems, use of silicon diodes, dry disk rectifiers and transistors to reduce tube count, modular construction, many test points to facilitate maintenance and no mechanical connection between tuning head and receiver.

**51Y-3 RECEIVER** — The 51Y-3 has a frequency range of 90 to 1800 kc in four bands. Bandswitching is performed remotely and automatically by the 100's knob on the control. Only eleven vacuum tubes of four types are used. A front mounted blower is available for extremely high environmental temperatures. All cases are compatible with ARINC cooling. The 51Y-3 operates with a 3,000 mmf sense antenna input.

**137A-2 ANTENNA**—The 137A-2 is a hermetically sealed

flush or semiflush mounted antenna which is electrically and physically interchangeable with conventional ADF loops. The rotating loop on the 137A-2 Antenna may be removed for servicing without disturbing the corrector settings. Ferrite correctors provide for quadrantal error correction.

**614L REMOTE CONTROLS** — Allow remote frequency selection by use of a high precision, self-balancing bridge network to provide a digital frequency presentation.

When the tuning knobs are moved, an error signal is coupled to the receiver, amplified and used to tune the RF section of the receiver. The 614L-4 is similar to the 614L-1, but has provision for ATC Transponder controls; 614L-5 same as 614L-2 with the addition of special connectors and mounting bracket; the 614L-6 is identical to the 614L-2 but has step-stops on the left-right switch. The 614L-1B has ADF receiver transfer switching.

**179J-1, -2** — Transforms flush sense antenna impedance to the proper value to match the 51Y-3. The 179J-3 couples 51Y-3 to standard 270 mmf antenna system. The 316A simulates coaxial line. The 179J and 316A are designed for specific system parameters.

	Type	Dimensions (inches)			Weight (lbs.)
		W	H	D	
Control	614L-1, -1B, -4	4 1/2	6 1/2	4 1/4	2.6
Control	614L-2, -6	5 3/4	4 1/2	4 1/4	2.6
Control	614L-5	5 3/4	4 1/2	5 5/8	2.8
Receiver	51Y-3*	1/2 ATR			20.3
Antenna	137A-2	9 5/8	16 1/8	4 1/4	8.4
Antenna Coupler	179J-1, -2	4 1/2	4 1/2	3	1.4
Antenna Coupler	179J-3	2	1 1/8	1 3/4	0.5
Line Simulator	316A	4	2	1 1/4	0.3

\*349D-1 Shockmount



51Y-3

137A-2

# REMOTE CONTROL UNITS



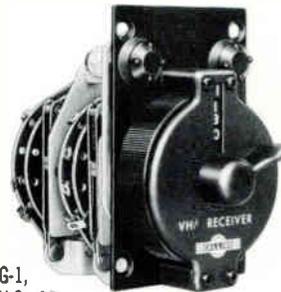
614U-1, -2, -3, -4



614U-7



314S-4



614G-1,  
314U-8, -10



614X-1



614C-2



614F-1,  
-2, -3

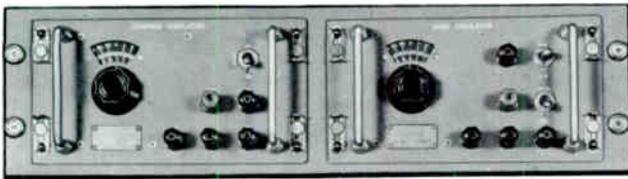


614D-1,  
-2, -3

Type	Remote Control for —	Range (50 kc Steps)	Mounting	Type	Remote Control for —	Range (50 kc Steps)	Mounting
614U-1, -2	51X-2, 17L-7 combination	118.0 - 151.95 mc	Console	614D-1	618S	144 Channels assigned	Panel
614U-3, -4	51X-2 or 51R-4, 51V-3, 344B-1 or 344A-1 combination	108.0 - 151.95 mc 329.3 - 335 mc	Console	614D-2	618S	Band selection 144 frequencies	Panel
614U-7	51R-4 or 51X-2, 51V-3, 860E-1 and 344B-1 or 344A-1	108.0 - 151.95 mc 329.3 - 335 mc 126 DMET channels	Panel	614D-3	618S, contains switching contacts to prevent tune-up radiation**	Band selection 144 frequencies	Panel
614F-1	51X-1, 17L-4, -6 or 51X-2, 17L-7 combinations	118.0 - 135.95 mc	Panel	614G-1	51X-1	118.0 - 135.95 mc	Panel
614F-2	51R-3, 17L-4, -6 combination	108.0 - 135.9 mc*	Panel	314U-8	51V-2, -3; 51R-3, -4; VOR 101, 102; DME	108.0 - 135.95 mc 329.3 - 335.0 mc	Panel
614F-3	Simplex control of 17L-4, -6, 51R-3 and 51V-2, -3 combinations	108.0 - 135.9 mc* 329.3 - 335.0 mc	Panel	314U-10	51V-2, -3; 51R-3, -4; VOR 101, 102; DME	108.0 - 135.95 mc 329.3 - 335.0 mc	Panel
614X-1	51X-1A, 17L-4, -6 or 51X-2, 17L-7 combinations	118.0 - 135.95 mc	Panel	614C-2	618S, provides increased function control	Based on channel assignment	Console
314S-4	18S-4A	20 channels	Operators Console	*100 kc steps. **Switching provided to connect 180L shunt capacitance on specific channels to minimize 180L tuning time.			

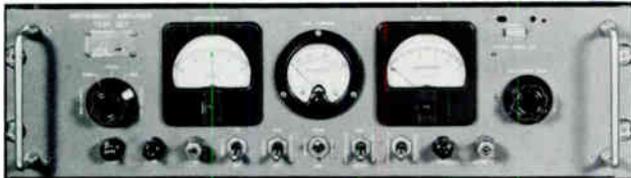
# AVIATION TEST EQUIPMENT

**FD-105 IFS TEST EQUIPMENT** — Completely tests all important circuit parameters of the individual components of the FD-105 System. Units may be used individually or rack mounted. *Size:* (approx.): 19" W, 3½" D, 23" H.



**477K-1 GYRO SIMULATOR** — Simulates ARINC sources. Supplies pitch and bank signals for test and adjustment of the 329B-4 series. Easily removed from rack to simulate gyro signals in the aircraft.

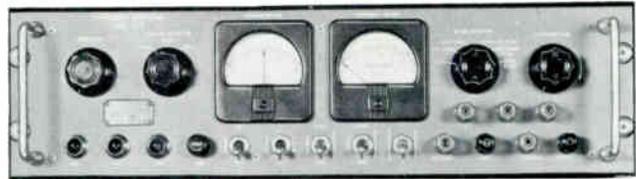
**477L-1 COMPASS SIMULATOR** — Simulates ARINC sources. Generates heading signals of a gyro stabilized magnetic compass. Operation of compass warning flag may be checked. May be removed from rack for simulating compass signals in the aircraft.



**477M-1 INSTRUMENT AMPLIFIER TEST SET** — Simulates signals identical to those in the 344C-1 Instrument Amplifier input circuits under actual flight conditions. Separate meters measure line currents, servo amplifier output and flag currents. Rack mounting.



**477N-1 STEERING COMPUTER TEST SET** — Simulates selected heading, bank and course datum signals normally supplied to the 562A-5 Steering Computer. All important circuit functions may be tested and adjustments implemented. Complete test takes 15 min. Rack mounting.



**477P-1 APPROACH HORIZON TEST SET** — Evaluates operational characteristics on the 329B-4 series of Approach Horizons. With the 477K-1, it provides all dc signal levels and three-wire synchro inputs normally employed in the FD-105. Rack mounting.



**477Q-1 COURSE INDICATOR TEST SET** — Used with 477L-1 to functionally test all operational characteristics of the 331A series Course Indicator. Rack mounting.



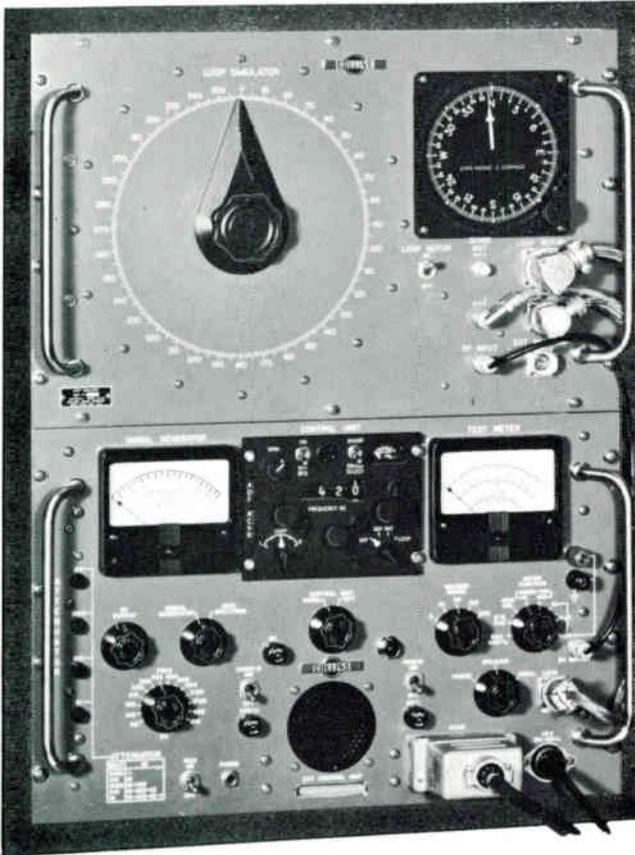
**478C-2 FD-104 IFS TEST SET** — Provides accurate simulated aircraft heading signals, lateral and vertical displacement signals, attitude signals, and rate of change of these signals as necessary for bench testing and calibrating the Collins 562A Steering Computers and components of the FD-104 IFS. Provides .001 to 10 cps signals for testing meter responses and servo mechanisms. No vacuum tubes are used. *Power Requirements:* 230 watts max. *Size:* 10½" H, 19" W, 12" D.



**479V-2 PRECISION OMNI-BEARING SELECTOR** — Used for a test panel for checking the 344A-1, 51R-3 and earlier navigation receivers. 30° steps selected by a tap switch with a maximum runout error of ±.05°. Tests the receiver without introducing omni-bearing selector errors. *Weight:* 5 lbs. *Size:* 3½" H, 19" W, 4" D.

AVIATION TEST EQUIPMENT

(Continued from page 25)



**477U-1, 477V-1 ADF TEST SET** — Provides complete test and simulator signals for the DF-201 ADF. The 477U-1 ADF Loop Simulator generates a calibrated RF field and excites a contained loop antenna. Receiver bearing indications are displayed on the front panel. The 477V-1 tests antenna, loop, ADF aural and ADF bearing sensitivity, dial calibration, bearing speed, AVC and gain control characteristics, and makes test point measurements on individual modules. *Mounting:* Rack or carrying case.



**479S-3 VOR AUDIO SIGNAL GENERATOR** — Used for precision testing and calibration of VOR receivers. It provides all output signals required for VOR, tone localizer and

glideslope audio circuit investigations, and for modulating a suitable RF signal generator. The unit derives all signals from electromechanical generators operated from shafts driven by synchronous motors. Size: 10½" H, 19" W, 14" D.



**479T-2 ALL CHANNEL VOR-ILS SIGNAL GENERATOR** — A portable test set for ramp testing of navigation and ILS receivers. May be used inside or outside the plane for an over-all check on the installation from receiving antenna to indicating instruments. Complete coverage of all channels from 108.0 through 135.9 and 329.3 through 335.0 mc. RF level can be varied from 4 to 200,000 microvolts. Signals include: VOR, LOC, glideslope, 1000 cps audio tone. Size: 19" W, 18" H, 10½" D.



**479U-1 THREE CHANNEL VOR-ILS SIGNAL GENERATOR** — A portable test set for ramp checking VOR/LOC

and glideslope receivers and associated components installed in the aircraft from antenna to instruments. One channel each provided for VOR, localizer and glideslope. Test antenna and cords included. *Size: 13 $\frac{3}{8}$ " L, 7 $\frac{5}{8}$ " W, 13" D.*



**478A-1 ZIFOR (Zero Indicator for Omni-range)** — Used for precisely ascertaining the proper zero, or North, setting on audio signal generators used in VOR testing and to set the zero on the Collins 479S series of test equipment and their equivalents. May also be used to check for phase shift through the RF signal generator. Used with the 479S-3. *Size: 13 $\frac{1}{2}$ " H, 13 $\frac{1}{2}$ " W, 7 $\frac{1}{2}$ " D.*



**180M-1 ANTENNA TUNING UNIT TEST SET** — A manually adjustable network used to minimize the time required to determine the circuit elements which must be wired into the 180K-3. Circuits and values of capacitance and inductance selected by front panel controls. *Size: 7 $\frac{3}{4}$ " H, 10 $\frac{1}{4}$ " W, 9 $\frac{7}{8}$ " L.*



**479X-2 INSTRUMENT ZEROING PANEL** — Provides precision facilities for indexing VOR resolver type instruments. By means of a precision network. Gives uniform results with 51X-1A, 51R-3, 51X-2, 51X-3 and 51R-4 Collins Navigation Receivers. OBS and OBI instruments can be indexed within  $\pm 1^\circ$ . Rack mounting.

Designed to permit Omni-Resolver Zeroing procedures to be carried out in accordance with RTCA standards. Does not require a phase standard. Zeroed to standards recognized by RTCA SC-61. *Size: 3 $\frac{1}{2}$ " H, 19" W, 4" D.*



**479V-3 PRECISION OMNI-BEARING SELECTOR** — Transformer operation provides a design center track selector for the 344B-1, 51R-4, 344A-1, 51R-3, 51R-2 and 51R-1 VHF instrumentation units.

Thirty cycle or 400 cycle operation is selected by a panel switch. 30° steps selected by a tap switch with maximum runout error of  $\pm .03^\circ$ . *Weight: 7.5 lbs. Size: 19" W, 3 $\frac{1}{2}$ " H, 6" D.*



**478H-1 618S TEST SET** — The 478H-1 and associated 413F-1 Power Supply provide complete self-contained facilities for testing modular subassemblies of the 618S. Also provides a convenient test station for detailed circuit checks. The lower portion of the test set panel carries all operating controls required to simulate functions of the complete 618S Transceiver. *Weight: 35 lbs. Size: 19 $\frac{3}{4}$ " H, 17 $\frac{1}{2}$ " W, 8" D.*

**413F-1** — Provides all operating voltages. 413F-1 requires 6 amps of 115 v, 1 phase, 60 cps. *Weight: 30 lbs. Size: 9" H, 17 $\frac{1}{2}$ " W, 7" D.*

## AVIATION TEST EQUIPMENT

(Continued from page 27)



**476F-1 DOPPLER TRACKER SIGNAL SIMULATOR** — Provides complete facilities for testing the 562F-1 Computer-Tracker of DN-101 system. Tests sensitivity and accuracy of the system and makes component tests of IF stage gain, discriminator alignment, discriminator tracking, servo stage gain, local oscillator accuracy, calibration oscillator accuracy and timer operation. Designed for standard rack mounting in permanent installations but has a carrying case available for portable applications. Complete testing of the 562F-1 requires 115/230 v, 50-60 cps; 115 v, 400 cps, and 28 v. *Dimensions:* 17 $\frac{3}{8}$ " W, 11 $\frac{1}{4}$ " H, 14-1/6" D. (Front panel 19" W.)

**476G-1 DOPPLER MICROWAVE SIMULATOR** — A rack mounted unit for testing and alignment of the 621C-1 Transmitter-Receiver and the 137Y-1 and 137Y-2 Antennas of the DN-101 system. In addition to switching and receiver sensitivity antenna tests, the 476G-1 tests 621C-1 IF amplifier gain, klystron output power, transmitter frequency, modulation index, power supply regulation and power supply ripple. *Dimensions:* 17 $\frac{3}{8}$ " W, 12 $\frac{5}{8}$ " H, 14 $\frac{3}{8}$ " D. (Front panel 19" W.)

**476H-1 DOPPLER SYSTEM SIMULATOR** — Allows operation of the DN-101 system to be checked on the ground without costly test flights. The 476H-1 is positioned under the aircraft for rapid evaluation of system sensitivity, ground speed and drift angle errors. This test set is portable and is contained in a carrying case. It provides the interconnecting cables and signal simulation necessary to test for proper operation of the NC-103 Navigation Computer System. Testing may be accomplished in an aircraft installation or on a bench. When used in conjunction with a stopwatch, this test set may be used to make system accuracy measurements. Case size is approximately 6" x 6" x 10" and total weight will be approximately 6 lbs. *Power Required:* 115 v, 400 cps, approximately 2 watts.

**172H-1 COMPOSITE DUMMY TAILCAP ANTENNA** — Simulates a typical tailcap antenna for testing AT-101 and AT-102 Antenna Couplers. Will take 1 kw PEP load for five minute period, two minute duty cycle, 500 watts PEP continuous. *Dimensions:* 9 $\frac{1}{2}$ " W, 10 $\frac{1}{2}$ " H, 16" D.

**476X-1 ATC TRANSPONDER RAMP TEST SET** — A portable unit designed to meet flight line requirements for the testing of transponders. Set is designed to permit one man to check all functions of the transponder from the cockpit. Built



172H-1



476X-1

in self-test feature with flag type indicators and automatic programming circuitry which gives positive go/no-go information. The unit is contained in a rugged, weather proof case for operation under all flight line conditions. Semiconductors are

employed to provide increased reliability, low battery drain and reduce warm up time. *Power Source:* Internal battery with built-in trickle charger which operates from 115 or 220 v  $\pm$ , 50-421 cps. *Antenna:* Built-in, vertically polarized (provisions for direct connection also provided). *Weight:* 29 $\frac{1}{2}$  lbs. *Dimensions:* 12 $\frac{5}{8}$ " H, 9 $\frac{1}{2}$ " W, 13 $\frac{1}{2}$ " D.

**578M-1** — This test set provides the interconnections, power and signal simulation necessary to perform all maintenance on the 162C-1 Control Panel. All components are mounted on or behind a standard rack panel approximately 7" x 19". In addition, an A.C. vacuum tube voltmeter is required — Hewlett Packard Model 400D or equivalent. *Power Required:* 115 v, 400 cps, approximately 15 watts in addition to the power required by the 162C-1 Control Panel.

**578N-1** — This test set provides the interconnections, power and signal simulation necessary to perform all maintenance on the 560E-1 Computer. Provision is made for testing the complete computer or for testing the individual modules. All components are mounted on or behind a standard rack panel approximately 12 $\frac{1}{2}$ " x 19". Additional equipment required — Hewlett Packard Model 400D or equivalent. *Power Required:* 115 v, 60 cps, approximately 70 watts, in addition to the 115 v, 400 cps, power required by the computer.

**578P-1** — This test set provides the power and interconnections necessary to perform all maintenance on the two computer modules in the 562F-1 Computer Tracker, which is a part of the DN-101 Doppler Radar Navigation System. All components in the test set are mounted on or behind a standard 7" x 19" rack panel. *Power Required:* 115 v, 400 cps, negligible amount in addition to that required by the two modules.



**578X-1 TRANSPONDER TEST SET** — Used with a Boonton 235-A Navigation Aid Test Set, provides a complete test facility for the bench testing of ATC Transponders designed in accordance with ARINC characteristic 532B. A minimum of controls are employed to test the transponder under a wide variety of interrogation conditions. The 578X-1 provides interrogation pulse signals to modulate a UHF signal generator in the 235-A. Stable, reliable operation results from the use of crystal controlled oscillators, regulated power supplies, derated electrical components and conventional circuitry. *Power Requirements:* 115-230 v ac, 50-420 cps. *Size:* 19" W, 10 $\frac{1}{2}$ " H, 10" D.

**477Y-1 VOR TEST AMPLIFIER** — Reduces the amount of test equipment required to bench test Instrumentation Units 344A-1, 344B-1 and 344D-1 by accurately simulating the output signals of Collins Navigation and Communication Receiver 51X-2 or 51X-3. The 477Y-1 mounts in a standard 19" relay rack and requires only 1 $\frac{3}{4}$ " panel space. All test connections and controls are located on the front panel. *Weight:*  $\frac{3}{4}$  lbs. *Size:* 1 $\frac{3}{4}$ " H, 19" W, 5 $\frac{1}{4}$ " D.

**AP-103 TEST EQUIPMENT** — Tests all important circuits and functions of the AP-103 Automatic Pilot. Design of the test units permits individual use or in a standard 19" wide rack mounting. The rear panels of all test units are enclosed by a dust cover.

**578C-1 COMPUTER AMPLIFIER ADAPTER** — Used with the 477N-1 Steering Computer Test Set, a 477L-1 Compass Simulator, 614E-2 Pedestal Controller, a 334C-3 Primary Servo, a wide range ac VTVM and a high sensitivity VOM or equivalent, provides circuitry necessary to completely test the 562C-3 Computer Amplifier. *Size:* 19" x 16" x 6". *Weight:* 25 lbs. *Power Requirements:* 28 v dc, 4 amp; 115 v, 400 cps, 2 amp.

**578E-1 VERTICAL REFERENCE TEST SET** — In conjunction with a Scorsby Table, rate of turntable, leveling platform and wide range ac VTVM or equivalent, will test the 3329-D Vertical Reference. *Size:* 19" x 12 $\frac{1}{2}$ " x 6". *Weight:* 15 lbs. *Power Requirements:* 115 v, 400 cps, 135 watts maximum.

**578F-1 PRIMARY SERVO TEST SET** — Provides for the complete electrical testing of the 334C-3 Primary Servo. *Size:* 19" x 7" x 5". *Weight:* 7 lbs. *Power Requirements:* 115 v, 400 cps, 350 va maximum, 27.5 v dc, 20 watts maximum.

**578G-1 AIR SPEED COMPENSATOR TEST SET** — Provides circuitry for the complete electrical testing of the 590B-1 Air Speed Compensator. *Size:* 19" x 5 $\frac{1}{4}$ " x 4". *Weight:* 4 lbs. *Power Requirements:* 115 v, 400 cps, 15 amp; 28 v dc, 0.25 amps.

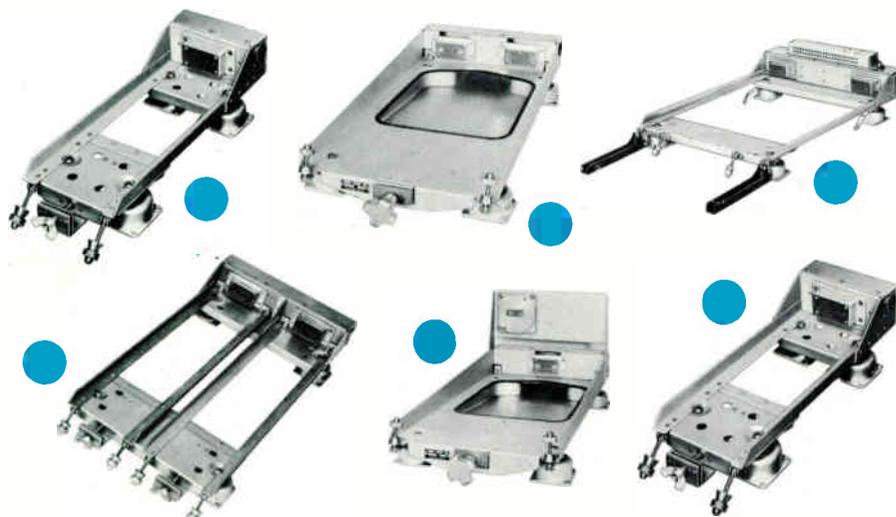
# SHOCKMOUNTS



1. 350S-3 for 618S. Weight: 9 lbs.
2. Short ¼ ATR shockmount. 390D-1 for 346A-1, B-1. 390D-2 for 51Z-2. 390D-3 for 51V-3. 390D-4 for 328A-2. 390D-5 for 562A-5. 390D-6 for 344C-1. 390D-7 for 562A-7. 390D-8 for 344A-1. 390D-9 for 346D-1. Weight: 1.3 lbs.
3. 350D-3 for 180K, 180L. Weight: 1.25 lbs.
4. Short ⅜ ATR shockmount. 349H-2 for 456C-1. 349H-3 for 17L-7. 349H-4 for 51X-2. 349H-5 for 344B-1. 349H-6 for 621C-2. 349N-1 for 309A-1, 309A-2. Weight: 1.5 lbs.
5. ½ ATR shockmount. 349D-1 for 51Y-1, -3. 349D-3A for 51R-4. 350E-3A for 51R-3 or 351A-1. 350E-3C for 17L-4, -6. 350E-3D for 621A-2. 350V-1 for 562C-1A. Weight: 2.2 lbs.
6. Dual short ⅜ ATR shockmount. 390E-1 for 51X-2 and 344B-1. 390E-2 for 51X-2 and 17L-7. Weight: 2.5 lbs.



7. 1 ATR shockmount. 349E-3 for 618C-3. 349F-4 for 548D-3. Weight: 5 lbs.
8. 1 ATR shockmount. 349F-5 for 548D-4. 390J-1 for 618T-2. Weight: 5 lbs.
9. Dual short ¼ ATR shockmount. 390F-1 for dual 51V-3. 390F-2 for 51V-3 and 51Z-2. 390F-3 for 346A-1 and 51V-3. 390F-4 for 346A-1 and 51Z-2. 390F-5 for 562A-5 and 344C-1 or 562A-7 and 344C-1. 390F-6 for 346A-1 and 346D-1. Weight: 2.25 lbs.
10. 349J-1 for 562A-6, 562C-1A, 614E-3 and F type Magnetic Amplifier. Weight: 7 lbs.



11. Short ½ ATR shockmount. 350M-1A for 562A-3A, -3B. 350M-2 for 562A-4, -4A, -4B, -4C or A-6. 390K-1 for 560E-1. 350L-2 for 51V-2. Weight: 3.7 lbs.
12. 349B-2 for 776C-1, -2. Weight: 4 lbs. (Available without air chamber.)
13. 350C-5 for 18S-4A. Weight: 7.5 lbs.
14. Dual ½ ATR shockmount. 350F-3 for 17L-6 and 51R-3. 350G-3 for 51R-3 and 351A-1. Weight: 4.6 lbs.
15. 349A-4 for 374A-1. Weight: 4.5 lbs. (Available without air chamber.)
16. 350T-1 for 416W-1, W-3. Weight: 3.5 lbs. 350T-3 same as above for shockmounted shelves.

# SMOKE TUNNEL

The 960A-1 Smoke Tunnel provides facilities for visual investigations of airflow phenomena occurring in the study of aerodynamics.

Fine smoke filaments pass over easily inserted test models, demonstrating airstream behavior around the structure. Models may be controlled during tests to vary the attack angle or the position of one or two control surfaces.

The tunnel is of the suction type, with a centrifugal blower mounted at the end of its operational system. Air is drawn into the bellmouth and passed through three fine-mesh wire screens to reduce turbulence as it enters the silencing chamber. The flow is then accelerated into the test section through a two dimensional nozzle with a large contraction ratio.

Smoke is introduced into the flow through a vertically

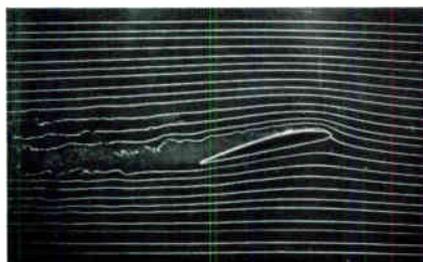
mounted smoke strut in the nozzle of the tunnel. The smoke is produced by a smoke generator and fed directly to the strut where it is released through several small protruding tubes.

As the air and smoke filaments are drawn through the test chamber, the flow patterns that are formed may be observed against black velvet background.

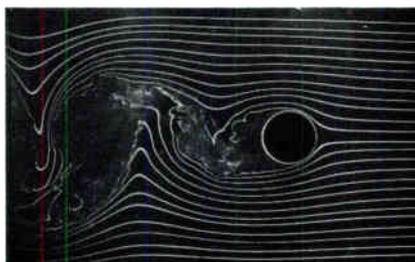
Airflow velocity is controlled by a sliding valve. Chamber is lighted by eight 75 watt bulbs. Still photography and high speed motion pictures may be used for further smoke tunnel studies. *Power Source:* 110 v ac, 15 amps. *Air Speed:* Zero to 35 fps. *Test Models Include:* Flat plate, cylinder with flat plate airfoil and movable flap, symmetrical airfoil, three-dimensional wing and wing tip. *Observation Area Size:* 36" W, 24" H, 2.5" D.



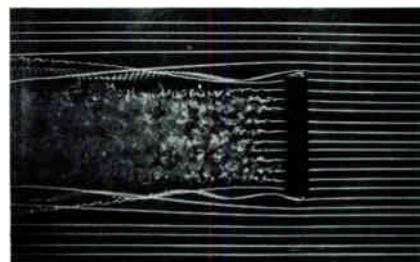
The 960A-1 in operation. Presentation is large enough for viewing by an entire classroom. Photography may be accomplished without special lens, but strobe lights or gas filled bulbs should be inserted in the test chamber to prevent glass flare.



Symmetrical section with angle of attack. Controls allow demonstration of attack angle transition from zero angle to vertical.



Airflow around a cylinder with KARMAN street vortices in the wake. High speed lighting is necessary for stop motion photography.



Three dimensional flow pattern on a straight wing. The formation of the wing tip vortices is demonstrated with this wing model.

# VOR GROUND SYSTEMS

Collins VOR Systems provide complete station installations with two power sizes and single or dual transmitters. Systems comply with requirements of Annex 10 ICAO Aeronautical Telecommunication Standards. A rugged mechanical antenna design eliminates fluctuations and failures of electronic types of generators. The high inherent stability is dependent upon mechanical symmetry which is carefully controlled during the production process and does not change with time or humidity conditions. A monitor of fail-safe design provides a continuous check of the amplitude and character of the transmitted signals. If the monitored functions deviate beyond predetermined limits, the monitor transmits an alarm to the control

point and removes the transmitter from the air. The monitor is self-testing.

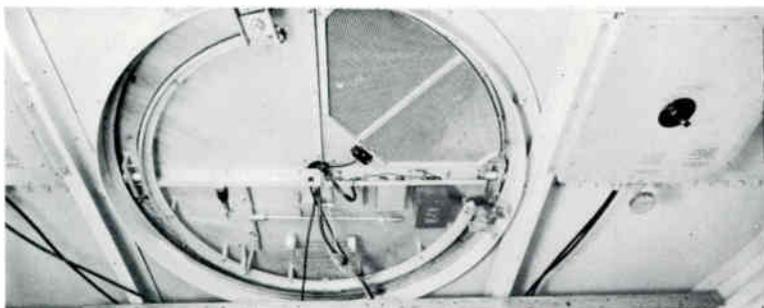
The complete basic VOR installation consists of a VHF transmitter and precision modulation system together with an antenna system designed for efficient radio frequency radiation with a specific pattern. All equipment except the antenna, monitor antenna, and remote control unit is housed in a special prefabricated enclosure, the roof of which serves as a ground plane for the antenna. Facilities are included to measure the transmitted bearing accuracy in eight directions, without the use of an external phase standard.

**OR-102** — The basic VOR system includes a prefabricated steel shelter with VOR antenna and counterpoise, a 50 watt 242F-5 VHF Transmitter, modulation eliminator, local control unit, keyer oscillator, relay power supply, VOR monitor and monitor antenna, equipment rack and cable assembly, house wiring kit and a sound powered handset.

**OR-202** — This 50 watt system is the same as the OR-102, but it provides dual transmitters and automatic switchover in the event of equipment failure.

**OR-302** — This system differs from the basic OR-102 in that it has a 200 watt 242F-2 Transmitter.

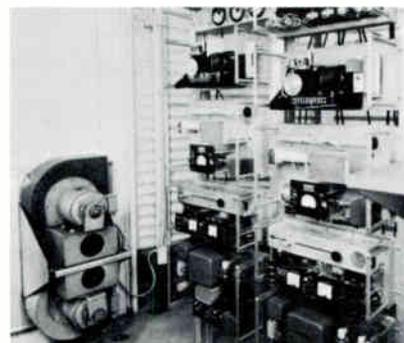
**OR-402** — A dual 200 watt transmitter and automatic switchover system is the only difference between this system and the OR-302.

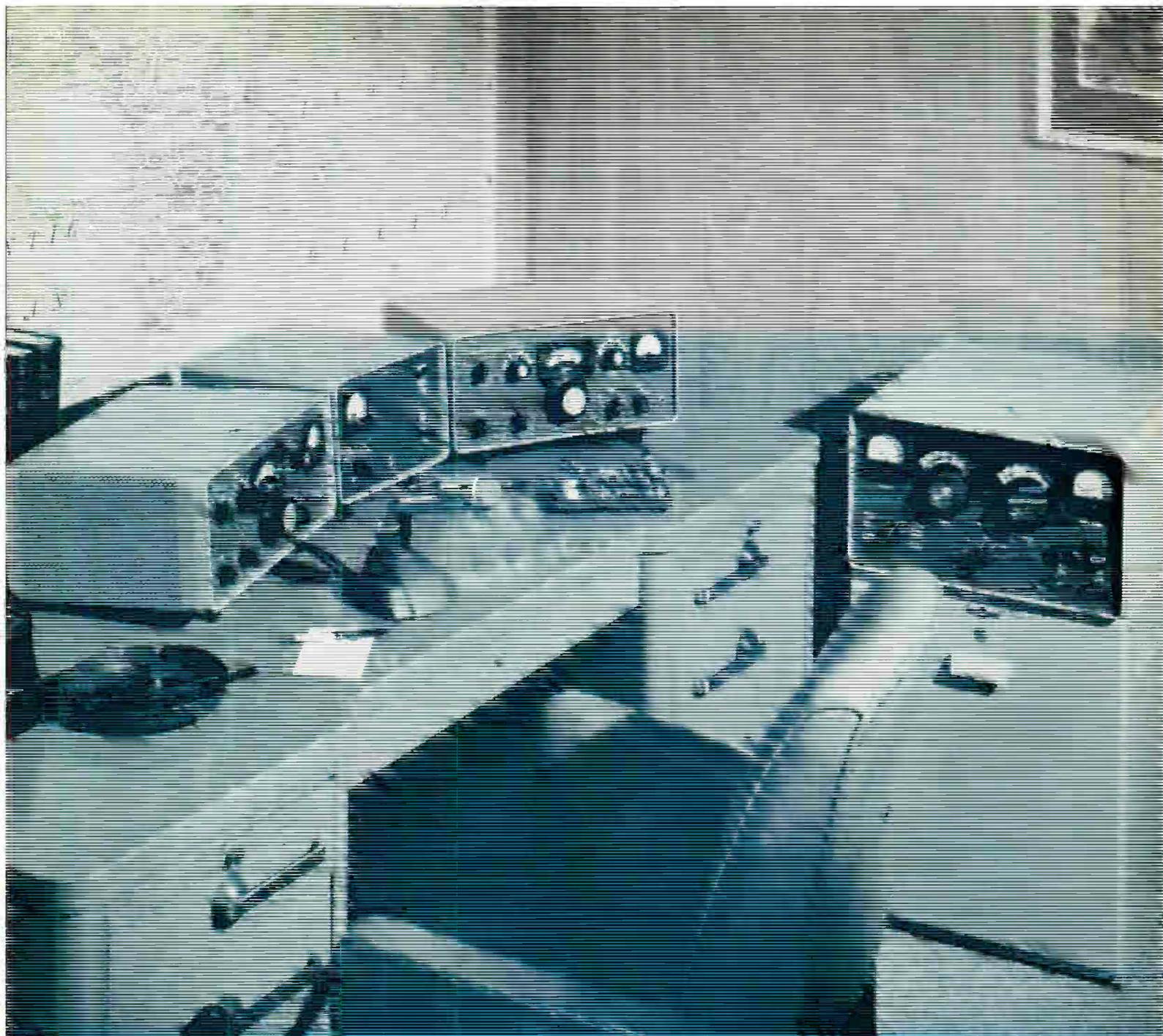


**Above.** Convenient access to antenna interior is through screened hatch. The eight point bearing check may be made without leaving the house by turning the outer shell with crank supplied.

**Right.** The OR-202 installation with covers removed from each unit. Ventilation blower is shown at left. Note passageway space available.

**Far right.** View through antenna house door showing equipment with covers installed.





# COLLINS amateur equipment

# S/LINE AMATEUR SYSTEM

75S-1



32S-1



30S-1

**75S-1 RECEIVER** — Provides SSB, CW and AM reception on all amateur bands between 3.5 and 29.7 mc. It is normally supplied with crystal sockets, band switch positions and crystals for 3.4-3.6, 3.6-3.8, 3.8-4.0; 7.0-7.2, 7.2-7.4; 14.0-14.2, 14.2-14.4; 21.0-21.2, 21.2-21.4 and 21.4-21.6 mc. Facilities are also included for three 200 kc bands between 28 and 29.7 mc, with one crystal supplied for the 28.5 and 28.7 band. A crystal is also provided for reception of frequency and time data from WWV or WWVH. Reception of other bands in the receiver frequency range may be accomplished by crystal substitution. Features include double conversion circuit with crystal controlled HF oscillator, good cross modulation characteristics, product detector for SSB and excellent AVC characteristic for SSB reception with full RF gain. Three degrees of selectivity include 2.1 or optional 0.5 kc with Mechanical Filters, or 4.5 kc conventional IF transformers for AM. Silicon diode rectifiers are used in a self-contained power supply. The 75S-1 may be used to control the 32S-1 Transmitter frequency for transceiver operation. Provision is made for the use of an external 516E-1, 12 v Power Supply for mobile operation. *Frequency Stability:* After warmup, drift will not exceed 100

cps. *Dial accuracy* 1 kc. *CW Sensitivity:* 1 uv for 10 db S/N ratio. *Spurious Response:* IF rejection more than 70 db. Image rejection more than 60 db. Cross-over down more than 50 db.

**32S-1 TRANSMITTER** — With a PEP input of 175 watts on SSB and 160 watts on CW, the 32S-1 covers thirteen 200 kc segments in the 3.5-29.7 mc range, corresponding to those covered by the 75S-1 Receiver. Transmitting on upper or lower sideband, the 32S-1 features Mechanical Filter type sideband generation, stable permeability-tuned VFO, and crystal-controlled high frequency oscillator. The final amplifier consists of two 6146's operating in class AB<sub>1</sub> with approximately 10 db of RF feedback to decrease distortion. Automatic Load Control is utilized to provide a higher average output without distortion. A loading control, concentric with the tuning control, is factory set for 50 ohm antennas and may be varied for antennas with impedances other than 50 ohms. The 32S-1 employs the 516F-2 Power Supply for ac operation. With an adapter cable, the 516E-1 DC Power Supply may be used. *Power Output:* 100 watts into a 50 ohm

load. *Frequency Stability:* Over-all stability with temperature, humidity, pressure and voltage variation — 100 cps. Calibration accuracy 1 kc. *Harmonic and Other Spurious Radiation:* Carrier suppression — 50 db, unwanted sideband — 50 db, second harmonic — 50 db, third order distortion — 30 db.

The 75S-2 and 32S-2 differ from the basic S/Line transmitter and receiver in that an additional crystal board has been added. A front panel control on the 32S-2 and 75S-2 permits switching in the added crystal board providing coverage on 14 additional 200 kc bands.

**30S-1 LINEAR AMPLIFIER** — Completely self-contained in a floor mounting cabinet. It employs a single Eimac 4CX1000A ceramic seal tetrode as a linear amplifier. The 30S-1 is capable of full legal input on SSB as specified by the FCC and 1 kw input on CW. Any exciter with 70 to 100 watt output into a 50 ohm line will drive the 30S-1 without the need for attenuator pads. The output of the amplifier is a pi network with a variable loading control. Correct tuning and loading are indicated by a meter with its zero at 20% of full scale. The loading control is simply adjusted for zero meter reading, while the PA tuning control is operated in the usual manner to obtain minimum plate current. The 30S-1/32S-1 or 30S-1/KWM-2 combination may be operated at three power levels with a panel control. HIGH VOLTAGE OFF automatically switches the exciter to the antenna. In the SSB position, the average indicated input is 1 kw. In CW the input is 1 kw.

A special type metering circuit is used which indicates when the 30S-1 is properly loaded — even at low power. At any power level, any deviation of the loading indicator from zero provides immediate warning of malfunction. Uses RF feedback and includes ALC circuit for connection to 32S-1. Power supply is in the lower portion and fulfills high voltage and bias requirements. Step starting and full overload relay protection are included.

Unit	Size (inches)			Weight (lbs.)
	H	W	D	
KWM-2	7¾	14¾	13¾	18¾
75S-1	6¾	14½	11¾	20
32S-1	6¾	14½	11¾	16
30S-1	30¾	17	16¾	160
312B-5	7¾	10	12¾	8½
312B-4	7¾	10	12¾	8½
312B-3	7¾	10	8	4
516F-2	7¾	10	12	28
516E-1	5¾	11¾	7¾	12½

## KWM-2 MOBILE TRANSCEIVER



KWM-2

The KWM-2 Transceiver is easily moved between mobile and fixed station installations. For mobile use the transceiver slides into the mount, and the power, antenna, antenna selector and car radio speaker plugs connect automatically. These same four connectors are used in a fixed station installation.

The transceiver provides high frequency stability on fourteen 200 kc bands from 3.4-30.0 mc, with 150 watts PEP input on SSB or 160 watts on CW. Filter type SSB generation, a permeability-tuned variable frequency oscillator, crystal-controlled double conversion, VOX and anti-trip circuits, and exclusive ALC and RF inverse feedback are features of the KWM-2. The Collins Mechanical Filter, RF amplifier, all tuned circuits, and several tubes perform the dual role of transmitting and receiving. CW break-in and monitoring sidetone circuits are built-in.

Crystal sockets, crystals and bandswitch positions are provided for 200 kc bands, with the standard amateur configuration equipped as follows: 3.4-3.6, 3.6-3.8, 3.8-4.0; 7.0-7.2, 7.2-7.4; 14.0-14.2, 14.2-14.4, 14.8-15.0; 21.0-21.2, 21.2-21.4, 21.4-21.6; 28.5-28.7. Crystal sockets and bandswitch positions are provided for two additional 200 kc bands between 28 mc and 30 mc.

Fixed station units that may be added for greater KWM-2 versatility are the 30S-1 Linear Amplifier, 312B-5 PTO Console and the 516F-2 AC Power Supply.

The KWM-2A is similar to the KWM-2 except that the KWM-2A is equipped with a switch on the front panel which allows selection between the standard crystal board and an additional crystal board providing 14 crystal positions.

# AMATEUR ACCESSORIES



312B-3



312B-5



516F-2



312B-4



516E-1



302C-3

**312B-3 SPEAKER** — Contains a 5 x 7 inch speaker and connecting cable. Attractively styled to match the 75S-1 Receiver and 32S-1 Transmitter or KWM-2 Transceiver.

**312B-4 SPEAKER CONSOLE** — Integrates the 75S-1, 32S-1 and 30S-1 and accessories into an operating system. It also integrates the KWM-2 and the 30S-1 and accessories into an operating system. It contains a speaker, an RF directional wattmeter with 200 and 2000 watt scales and a hybrid type phone patch for interconnection of the telephone line to transmitter and receiver.

**312B-5 SPEAKER CONSOLE and EXTERNAL PTO** — Is designed for use with the KWM-2 in fixed station operation. It provides separate receive and transmit control, phone patching facilities and a directional wattmeter. The permeability-tuned oscillator allows reception anywhere in the selected 200 kc band while the transmitter frequency is controlled by the PTO in the KWM-2. This function may be reversed or the 312B-5 PTO may be used to control the transceiver frequency.

**399C-1 PTO SPEAKER** — Contains speaker and external PTO for separate receive and transmit control of the KWM-2. It provides the same frequency control as described in the 312B-5.

**516E-1 DC POWER SUPPLY** — The 516E-1 operates from 12 v dc. Provides all operating voltages for the KWM-2 for mobile operation. It may be modified for S/Line operation. Transistorized for maximum efficiency and minimum maintenance.

**516F-2 AC POWER SUPPLY** — Used with the 32S-1 and KWM-2, supplying all voltages for them. 115 v, 50-60 cps.

**302C-3 DIRECTIONAL WATTMETER** — Measures forward and reflected power on 200 and 2000 watt scales. Coupler unit mounts separate from indicator-control box.

**B312-1 DIRECTIONAL COUPLER** — Coupler unit from the 302C-3 and is adaptable for amateurs who want to utilize an optional meter and switch for a customized fixed installation or for use in a mobile installation.

**189A-2 PHONE PATCH** — Provides the necessary apparatus for phone patch operation. It utilizes hybrid circuitry to insure no interaction between the receiver and the telephone for proper VOX operation. Output and input impedances are 600 ohms. Operates equally well on AM or voice operated single sideband. Only two connections to phone line are necessary. Terminal connections are provided on the 32S-1 and 75S-1, KWS-1 and 75A-4, KWM-2 and the back of the 189A-2.

**180S-1 ANTENNA TUNER** — 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 180S-1 is particularly useful for tuning trailing wire antennas on large aircraft.

**351E MOUNTING PLATES** — May 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-1 Receiver or 32S-1 Transmitter; the 351E-2 will mount either the 516F-2 Power Supply or the 312B-4 Station Control, and the 351E-3 will accommodate the 312B-3 Speaker. The 351E-4 has two snap-in clamps for secure installation of KWM-2. Equipment may be easily un-



B312-1



189A-2



MM-2



MM-1



SM-2



SM-1

clamped for removal without the use of tools. The unit is removed by pulling forward and lifting.

**351D-2 MOBILE MOUNT** — Provides secure mounting for the KWM-2 in most automobiles. Cantilever arms fold out of the way when the KWM-2 is removed.

**COLLINS MM-1 MOBILE MICROPHONE** — A pressure operated dynamic microphone designed to fit in 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 Coiled Kord is 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.

**COLLINS MM-2 MICROPHONE** — A high impedance reluctance microphone-single earphone combination which may 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 permits the driver to operate his car with both hands while carrying out radio voice communication. Although it weighs only 3½ ounces, 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 and is cushion mounted in a thermoplastic housing.

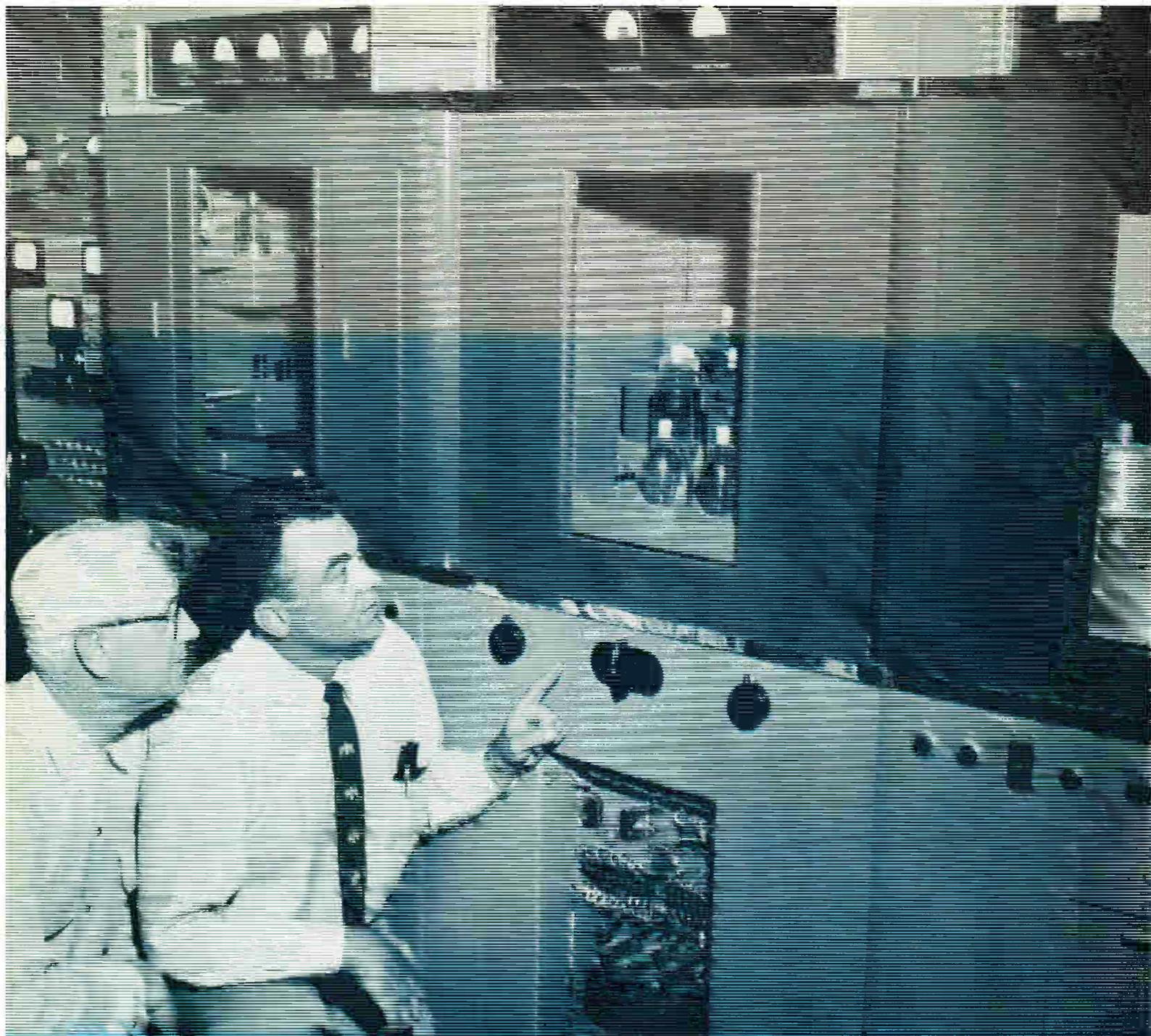
For optimum reception of signals, an adjustable tone arm in the MM-2 pipes sound directly into the operator's right

ear, but does not cover the ear as conventional earphones do. The tiny earplug is equipped with tips of foam plastic and smooth plastic which are interchangeable. The tip does not insert into the ear channel, but does focus the sound into the outer ear. The MM-2 is supplied with a single, five foot connecting cord.

**THE COLLINS MM-3 MICROPHONE** — A high impedance boom mike which has the same characteristics as the MM-2 except that there is no earphone built into the headset of the MM-3.

**THE COLLINS SM-1 DESK TOP MICROPHONE** — A high impedance, non-metallic dynamic mike with a frequency response from 100-10,000 cycles per second. It has an output level of -58 db. Finished in brushed satin chrome, this compact microphone is equipped with a rubber shock stand and a five foot length of Coiled Kord. Like the SM-2, it may be adjusted for various operating positions.

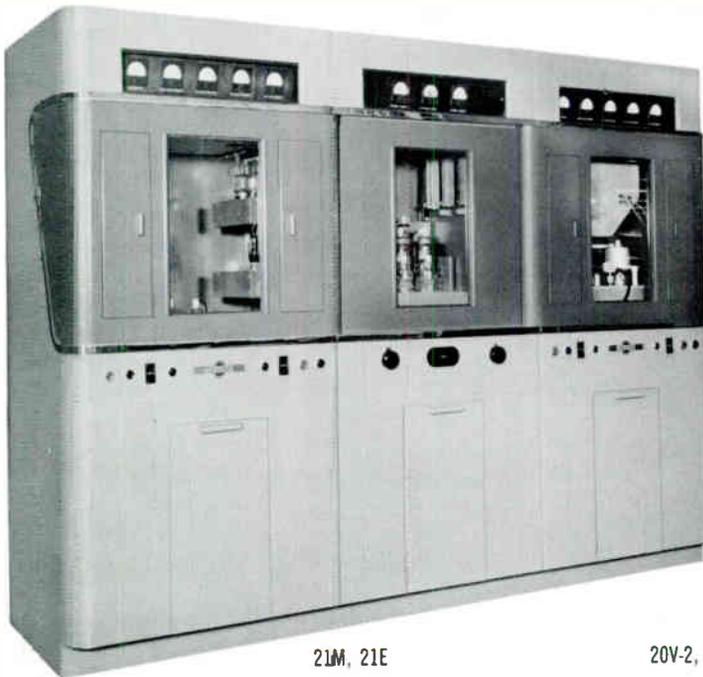
**COLLINS SM-2 MICROPHONE** — A slender, gray and chrome dynamic desk top microphone which blends perfectly with the Collins S/Line. Excellent for ham transmission, this omnidirectional microphone may also be used for high fidelity recording because of its wide frequency response range of 50-13,000 cycles per second. The SM-2 has an output level of -60 db and comes with a five foot length of Coiled Kord. Vibrations in the operating desk or from objects dropped on the desk are not transmitted over the air because of the rubber shock stand of the SM-2. The non-metallic diaphragm of the SM-2 Microphone provides a smooth, uniform response in transmitting. A swivel permits a 60° swing in adjusting the microphone to the position most comfortable for the individual operator.



Radio Station KTKT, Tucson

# COLLINS broadcast equipment

# BROADCAST TRANSMITTERS



21M, 21E



20V-2, 550A-1, 300J-2

Reliable, high fidelity performance in the standard and HF broadcast bands is the result of the straightforward design and modern components in the Collins line of broadcast transmitters. All transmitters may be equipped for remote control. Power increase packages enable fast changeover of 21E 5 kw to 21M 10 kw, 550A-1 500 watt to 20V-2 1 kw, 300J-2 250 watt to 550A-1 500 watt or 20V-2 1 kw.

**21M 10 KW TRANSMITTER** — Offers selectable power output of 10,600 or 5,500 (1,100 on order) watts. Highly stable vacuum crystals eliminate crystal ovens. Pi-L output network. *Frequency Range:* 540-1600 kc standard; up to 10 mc available. *Primary Power:* 208/230 v, 3 phase, 60 cps (50 on order), 32.8 kw (at 10 kw output, 100% mod.), 91.5% PF.\*

**21E 5 KW TRANSMITTER** — Selectable power output of 5,500 or 1,100 (550 on order) watts with same features and coverage as 21M. *Primary Power:* 208/230 v, 3 phase, 60 cps (50 on order), 18.5 kw (5 kw output, 100% mod.), 90% PF.\*

**20V-2 1 KW TRANSMITTER** — Output power of 1,100 or 550 (275 on order) watts may be selected. 20V-2 uses only 7 tube types, no crystal ovens. *Frequency Range:* 540-1600 kc standard; up to 15 mc available. *Primary Power:* 208/230 v, 1 phase, 50/60 cps, 4,150 watts (at 1,100 watts output, 100% modulation), 90% PF.\*

**550A-1 500 WATT TRANSMITTER** — Either 550 or 275 (125 on order) watts output power may be selected. Stable oscillator, pi-L output network. *Frequency Range:* 540-1600 kc standard; up to 15 mc available. *Primary Power:* 208/230 v, 1 phase, 50/60 cps, 2840 watts (at 550 watts output, 100% modulation), 83% PF.\*

**300J-2 250 WATT TRANSMITTER** — Selectable power outputs of 275 or 110 watts. Only 7 tube types, no crystal ovens.

*Frequency Range:* 540-1600 kc standard; up to 15 mc available. *Primary Power:* 208/230 v, 1 phase, 50/60 cps, 1,400 watts (at 275 watts output, 100% modulation), 90% PF.\*

**\*COMMON SPECIFICATIONS (21E/M, 20V-2, 550A-1, 300J-2)** — *Frequency Stability:* Better than  $\pm 5$  cps (typical  $\pm 2$  cps). *Audio Frequency Response:* Within  $\pm 1\frac{1}{2}$  db 30-12,000 cps (typical  $\pm 1\frac{1}{2}$  db 30-15,000). *Audio Frequency Distortion:* Less than 3% 50-10,000 cps for 95% modulation, including all harmonics up to 16 kc (typical less than 3% 30-15,000). *Residual Noise Level:* 60 db or more below 100% modulation. *Carrier Shift:* Less than 3% 0-100% modulation (typical less than 2%). *RF Output Impedance:* 50-240 ohms standard; 600 ohms balanced on order. *Audio Input Impedance:* 150/600 ohms.

Transmitter Type	Dimensions (inches)			Weight (lbs.)	Power Output (watts)
	W	D	H		
21M	105¼	28	76	3,000	10,600/5,500 (10,600/1,100**)
Plate Xformer	24½	12½	31¼	Included above	.....
21E	105¼	28	76	2,700	5,500/1,100 (5,500/550**)
Plate Xformer	20½	10¼	25¼	Included above	.....
20V-2	38	27	76	1,150	1,100/550 (1,100/275**)
550A-1	38	27	76	1,050	550/275 (550/125**)
300J-2	38	27	76	900	275/110

\*\*On special order.

# TRANSMITTER ACCESSORIES

**37M FM ANTENNAS** — Light, compact structure reduces tower requirements, windloading and erection problems. The 37M consists of radiating rings supported on a connecting inter-ring transmission line. Any number of rings, odd or even, may be employed for desired gain. High tuning stability maintains VSWR at better than 1.1 to 1. May be mounted on top or side of tower. *Power Rating:* Arrays up to 20 kw. *Termination:* 51.5 ohm flange.



**SIDE MOUNTING\***

Antenna Type	No. of Rings	Power Gain	Field Gain	A (feet)	On 1 1/2" Line B	Line Weight	On 3 1/8" Line B	Line Weight
37M-1	1	.9	.95	2-6 ±	24	23	32	46
37M-2	2	2.0	1.41	12-6 ±	68	55	100	100
37M-3	3	3.0	1.73	22-6 ±	114	86	170	175
37M-4	4	4.1	2.02	32-6 ±	160	119	240	240
37M-5	5	5.2	2.28	42-6 ±	206	152	310	305
37M-6	6	6.3	2.51	52-6 ±	252	185	380	370
37M-7	7	7.3	2.70	62-6 ±	298	218	450	435
37M-8*	8	8.4	2.90	72-6 ±	344	251	520	500

\*Top mounting antennas or antennas with more than eight rings quoted upon request.  
A = over-all length B = windloading



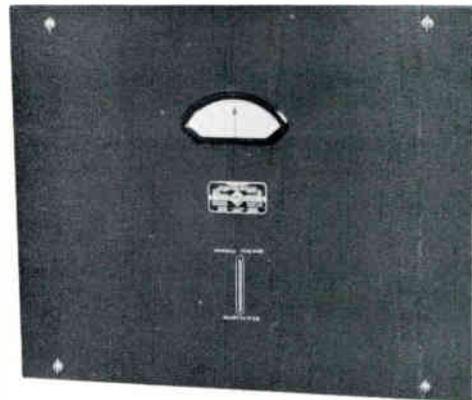
**TOWER LIGHTING FILTER CHOKES** — Solenoid wound chokes with high impedance in broadcast band. Wound with #10 wire, available 2 or 3 wire. *Power Rating:* 120 v, 1 phase, 2,000 watts.



**ANTENNA CURRENT TRANSFORMER** — Used with remote thermocouple and meter for remote monitoring of antenna current. For currents up to 25 amps.



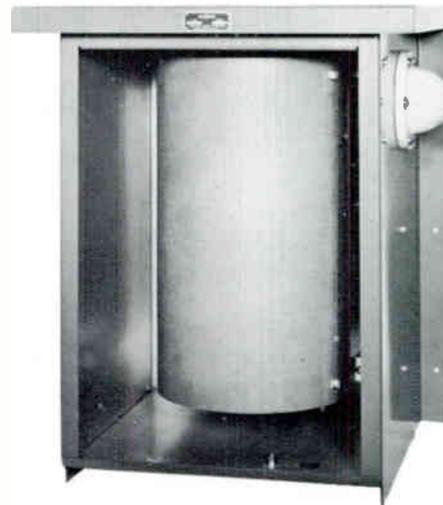
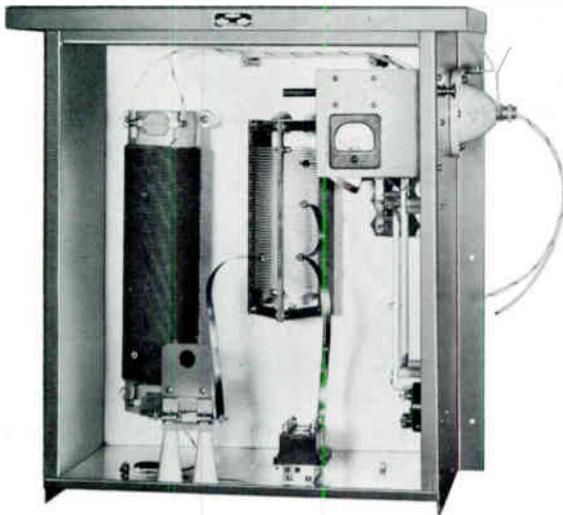
**1931-B AM MODULATION MONITOR** — Measures percentage modulation on positive or negative peaks, indicates over-modulation, monitors program level and measures transmitter audio frequency response and carrier shift when modulation is applied. Operates in either 0.5 to 8 mc range or 3 to 60 mc range, depending on input coil used. *Primary Power:* 105-125 v, 50/60 cps, 50 watts. *Size:* 19" W, 10" D, 8 3/4" H. *Weight:* 32 lbs.



**1181-B FREQUENCY DEVIATION MONITOR** — Gives direct indications of magnitude and direction of frequency deviation of AM transmitter. Positive indication is provided for failure of either transmitter carrier or monitor crystal oscillator. *Frequency Range:* 0.5-1.6 mc (specify crystal frequency). *Deviation Range:* ±30 cps. *Primary Power:* 105-125 or 210-250 v, 50/60 cps, 125 watts. *Size:* 19" W, 13" D, 15 3/4" H. *Weight:* 51 lbs.

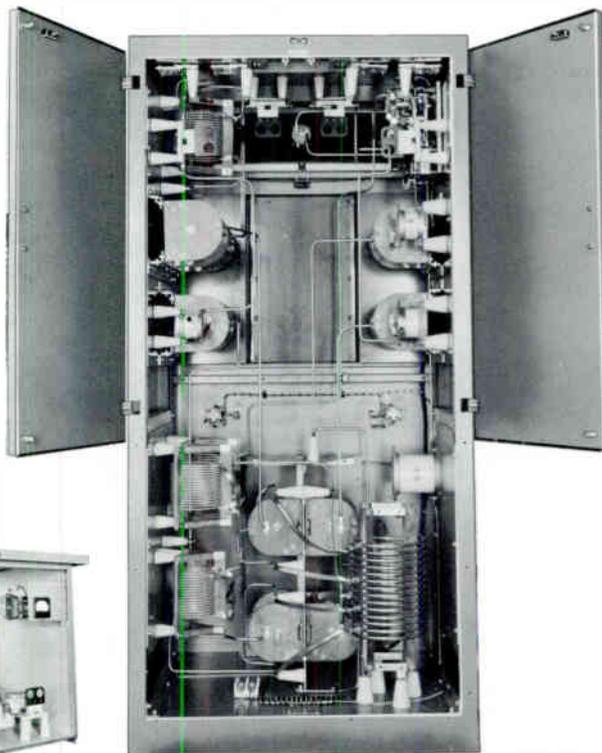


**172G-1, -2 DUMMY LOADS** — This air-cooled unit provides a load to dissipate transmitter output for off-the-air testing. Consisting of 8 ferrule type, non-inductive resistors, with insulated end brackets and clips, it may be mounted on the transmitter or adjacent wall. The 172G-1 has an impedance of 52 ohms; the 172G-2, 73 ohms. *Power Rating:* Up to 1 kw. *Size:* Approx. 6" W, 12 1/2" D, 9" H. *Weight:* 5 lbs.



**42E-7, -8 ANTENNA COUPLING UNITS** — Use a low pass T network to match a series fed vertical radiator to an unbalanced transmission line. The 42E-7 (pictured) is used up to 1 kw; the 42E-8, 5 or 10 kw. Includes antenna current meter and line current meter jack and will house tower lighting filter choke and antenna current transformer. *Size:* 42E-7 — 29" W, 18" D, 28" H. 42E-8 — 36" W, 22" D, 28" H. *Weight:* 42E-7 — 64 lbs. 42E-8 — 124 lbs.

**144A-1 ISOLATION COIL** — Coil provides isolation for the sampling line in directional arrays, presenting a high impedance for the line across the base insulator. Unit consists of a phenolic coil form which will accommodate 37 turns of RG8/U or similar solid dielectric sampling line. May be mounted on wall of tuning shack or in 49U-1 Housing (pictured). *Inductance:* Approx. 180 microhenrys. *Size:* 10" dia., 18" L. *Weight:* 6 lbs.



Rear View, 5 kw Phasor Cabinet

Antenna Tuner



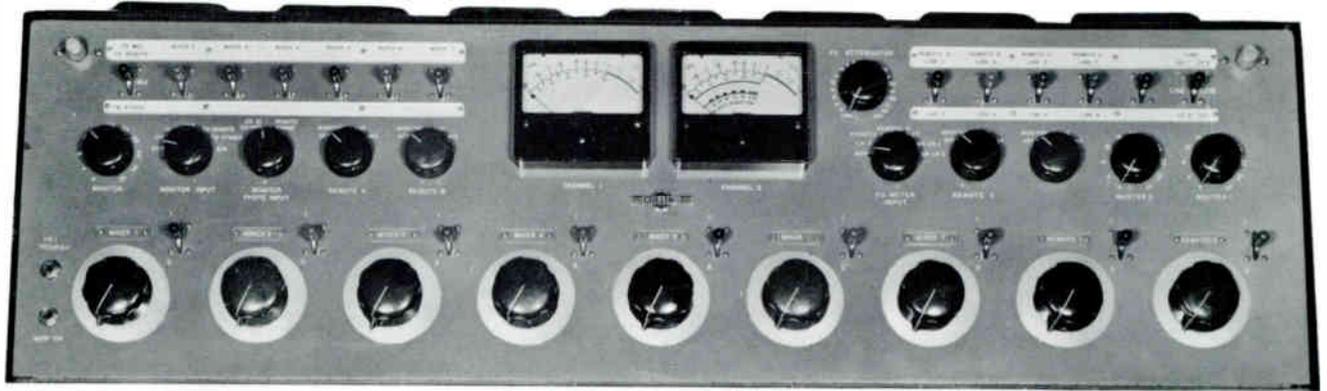
**81M PHASORS** — Custom designed Collins phasing equipment for directional antennas features easily adjusted networks, high stability, maintenance ease, safety and economy. Power dividing circuits and T phase shift networks utilize heavy edge-wound copper ribbon inductors and ceramic cased mica capacitors. Amplitude and phase adjustment controls are recessed counter dials with accurate resetability.



**564A-1 PHASE SAMPLING LOOP** — For accurate sampling of currents in directional arrays. Two loops of wire, connected in series or parallel, inside a copper tubing shield which eliminates electrostatic coupling. Connects with air or solid dielectric line. *Size:* Approx. 30" W, 7'6" H. *Weight:* 50 lbs.

**564A-2 PHASE SAMPLING LOOP** — An unshielded loop of galvanized iron pipe. *Size:* Approx. 42" W, 7'2" H. *Weight:* 35 lbs.

# SPEECH INPUT CONSOLES



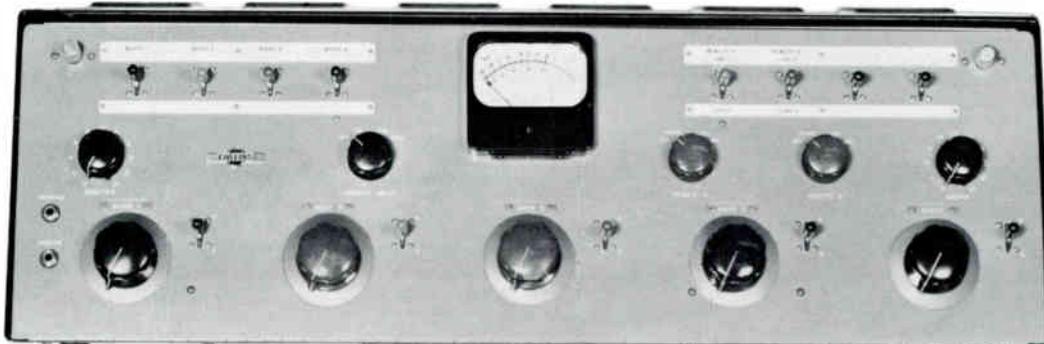
**212E-1 SPEECH INPUT CONSOLE** — This dual channel unit offers high fidelity program control in audio systems, with two output lines and mixing of up to 9 of 22 possible inputs simultaneously. Monitoring is provided for program, audition and remote lines, as well as controls for speakers and warning lights. There are also provisions for measuring external audio levels and for an external input to the monitor amplifier. Excellent frequency response and low noise and distortion are maintained from 50 to 15,000 cps. The console will accommodate up to seven preamplifiers plus booster amplifiers, program amplifiers, a monitor amplifier and a cueing amplifier

(subunits discussed later). Where maximum console capabilities are employed, 499G-1 Rack Mounting Shelf provides additional space for mounting amplifiers, power supplies and relay units. *Input Impedance:* Low Level — 30/150/250/600 ohms (balanced or unbalanced). *Remote Lines* — 150/600 ohms. *Output Impedance:* Line — 150/600 ohms. *Monitor* — 600 ohms. (Shipped 600 ohm output and remote line, 150 ohm low level input.) *Gain:* Low level to program line at least 100 db. Remote line to program line 54 db. *Noise:* No greater than -118 dbm at low level input. *Primary Power:* 115/230 v ±10%, 1 phase, 50/60 cps.



**212G-1 SPEECH INPUT CONSOLE** — A wide range of audio mixing requirements can be met with this single channel console. Incorporating new features and many design and control functions of the 212E-1 and 212F-1, the 212G-1 is a self-contained unit that can be expanded by adding plug-in modules to mix 9 of 13 inputs. The 212G-1 monitors program, audition or net/remote lines and controls speakers and warning lights. Six cueing type attenuators, cue amplifier and internal cue circuit free monitor circuits from cue service. Two spare lever-switches and spare wiring terminals are pro-

vided for custom wiring. *Input Impedance:* Low Level — 30/150/250/600 ohms (balanced or unbalanced). *Net/Remote Lines* — 50/150/250/600 ohms. *Medium Level* — 600 ohms (unbalanced). *Output Impedance:* Line — 150/600 ohms. *Monitor* — 600 ohms. (Shipped wired for 150 ohm low level, 600 ohm net/remote and 600 ohm line.) *Gain:* Low level to program line 100 db. Remote line to program line 53 db. Medium level to program line 62 db. *Noise:* At least 68 db below +18 dbm output with -50 dbm low level input. *Primary Power:* 115 v or 230 v ±10%, 1 phase, 50-60 cps.



212F-1

	Type	Frequency Response	Distortion	Size (inches)			Weight (lbs.)
				W	D	H	
Speech Input Console	212E-1	± 1.5 db, 50-15,000 cps at program line	Less than 1% at +18 dbm at program line Less than 3% at 8 watts out of monitor amplifier	41½	22½	11	135
Speech Input Console	212F-1	± 1.5 db, 50-15,000 cps at program line	Less than 1% at +18 dbm at program line Less than 3% at 8 watts out of monitor amplifier	35	22	10¼	100
Speech Input Console	212G-1	± 1.5 db, 50-15,000 cps at program line	Less than 1% at +18 dbm at program line Less than 3% at 8 watts out of monitor amplifier	41½	21½	8¾	75
Preamplifier	356A-1	± 1 db, 50-15,000 cps	0.5% max.	2½	9½	4½	2¼
Program/Monitor Amplifier	356B-1	± 1 db, 50-15,000 cps	0.5% max. at +30 dbm 3% max. at 8 watts (+39 dbm)	2½	9½	5¾	6
Relay	274K-1	.....	.....	2½	9	5½	2½
Relay	274K-2	.....	.....	2½	9	5½	2½
Power Supply	409X-2	.....	.....	8	9½	6	25
Limiting Amplifier	356E-1	± 1 db, 50-15,000 cps	1.5% max., 50-15,000 cps, no compression 2% max., 50-15,000 cps, up to 30 db reduction, threshold at +20 dbm output	3	9	5½	5
Cue Amplifier	356Q-1	± 1.5 db, 300-10,000 cps	.....	2½	9½	4½	2¼
Mounting Shelf	499G-1	.....	.....	19	14	8¾	11

**212F-1 SPEECH INPUT CONSOLE** — Simultaneous broadcasting and auditioning from any combination of three of eight possible inputs is provided by this single channel console, with capability of mixing five of 12 inputs by adding two preamplifiers. The 212F-1 also enables monitoring of program, audition or remote lines and control of speakers and warning lights. High fidelity performance is offered with low noise and distortion and excellent frequency response from 50 to 15,000 cps. All subunits (see below) can be mounted in the console. *Input Impedance:* Low Level — 30/150/250/600 ohms (balanced or unbalanced). Remote Lines — 150/600 ohms. *Output Impedance:* Line — 150/600 ohms. Monitor — 150/600 ohms. (Shipped 600 ohm program and remote lines, 150 ohm low level input.) *Gain:* Low level to program line at least 100 db. Remote line to program line 50 db. *Noise:* No greater than -118 dbm at low level input. *Primary Power:* 115/230 v ±10%, 1 phase, 50/60 cps.

## SUBUNITS

**356A-1 PREAMPLIFIER**—Operating from a low level microphone or similar source, this high fidelity, two stage unit can drive a program amplifier or audition facilities. *Input Impedance:* 30/150/250/600 ohms. *Output Impedance:* 150/600 ohms balanced or unbalanced. *Input Level:* -60 db nom. *Output Level:* +18 dbm max. *Gain:* 40 db. *Noise:* No greater than -118 dbm at input. *Power Requirements:* 6.3 v ac or dc at 0.3 amps. 250 v dc at 6.5 ma or 300 v dc at 7.5 ma.

**356B-1 PROGRAM/MONITOR AMPLIFIER** — High fidelity makes 356B-1 excellent for program and monitor amplifier use. Three stage amplifier with push-pull output, high or low gain. *Input Impedance:* 150/600 ohms. *Output Impedance:* 150/600 ohms. *Input Level:* -32 dbm. *Output Level:* +30 dbm to 8 watts (+39 dbm). *Gain:* 56 or 68 db, selectable by switch. *Noise:* -116 dbm at input. *Power Requirements:* 6.3 v ac at 1.2 amps. 63 ma at 250 v dc at 1 watt output. 75 ma at 300 v dc at 1 watt output. 88 ma at 300 v dc at 8 watts output.

**274K-1 RELAY UNIT** — Contains four relays to control studio speakers and warning lights. *Power Requirements:* 12 v dc, 560 ma supplied by 409X-2. Warning light power supplied by studio wiring.

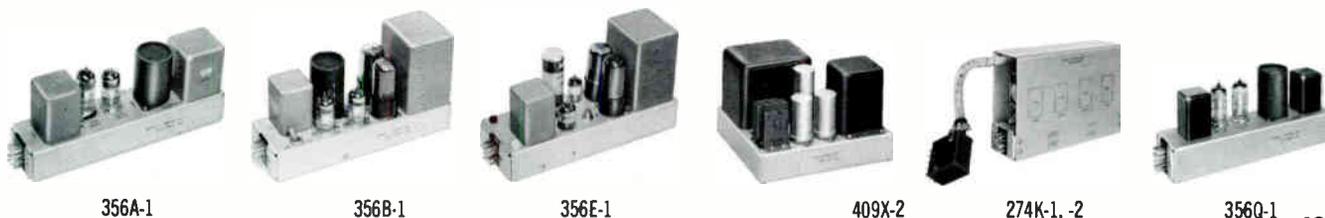
**274K-2 RELAY UNIT** — For use with the 212G-1 only. The unit is similar to the 274K-1 in all specifications except that relays are unenergized in standby.

**409X-2 POWER SUPPLY** — Silicon rectifiers in the high voltage circuit eliminate heat problems associated with vacuum tube rectifiers. *Output Voltages:* Up to 250 ma at 300 v dc adjustable. 6.0 amps at 6.3 v ac. 1.0 amp at 12 v dc. *Primary Power:* 115 v or 230 v ±10%, 1 phase, 50-60 cps.

**356E-1 LIMITING AMPLIFIER** — This optional subunit acts as automatic average level or average limiting amplifier. Ideal for unattended operation, it may also be used to control level differences between two or more sources or serve as program line compressor or amplifier. *Input Impedance:* 150/600 ohms. *Output Impedance:* 150/600 ohms. *Gain:* 54 db. *Compression Ratio:* Adjustable 1.6/1 to 5/1, 3/1 optimum, over 30 db range at input. *Attack Time:* 11 msec, dual operation. 62 msec, average operation. *Release Time:* 0.9 sec for 63% recovery, dual operation. 5.2 sec for 63% recovery, average operation. *Noise:* -50 dbm or less (threshold set at ±20 dbm). *Power Requirements:* 6.3 v ac at 1.55 amps. +300 v dc at 77 ma.

**356Q-1 CUE AMPLIFIER** — A two stage amplifier for amplifying signals from the cueing line. *Gain:* 55 db. *Range:* 300-10,000 cps. *Input Level:* -30 dbm nominal. *Output Level:* +20 dbm (100 mw) nominal. *Input Impedance:* 600 ohms nominal. *Output Impedance:* 4 ohms. *Primary Power:* 6.3 v ac or dc at 0.3 amps. 300 v dc at 7.5 ma.

**499G-1 RACK MOUNTING SHELF** — Offers a flexible facility for rack mounting of various speech equipments and amplifier, relay and power supply subunits for fully expanded facilities of 212E-1.



356A-1

356B-1

356E-1

409X-2

274K-1, -2

356Q-1

## REMOTE AMPLIFIERS

**212Z-1 REMOTE AMPLIFIER** — Weighing a total of 22 pounds including batteries and carrying case, the 212Z-1 offers full functions for remote broadcasts. This transistorized remote amplifier mixes inputs from up to four microphones, with program line and communication line outputs as well as an auxiliary output for PA feed. The unit operates from 115 v ac or self-contained batteries, with automatic changeover on failure and restoration of ac. Battery life is approximately 75 hours. The 212Z-1 provides a maximum gain of 90 db. It employs step faders rather than composition type faders. Incorporated in the unit is a 400 cps tone oscillator to assist in setting up line level. A low, sloping panel with convenient controls and plastic write-in strips simplifies operation. All terminals and jacks except line and program monitors are located at the rear of the unit. Two 212Z-1's may be connected together and operated simultaneously, controlled by one master gain knob. *Input Impedance:* 25-600 ohms. *Output Impedance:* 600 ohms (150 available). *Frequency Response:*  $\pm 1.5$  db 50-15,000 cps. *Distortion:* Less than 1.5% at +5 dbm. *Noise:* 55 db below normal output level (-115 dbm equivalent input noise figure). *Power Output:* Normal — +11 dbm. Emergency — +16 dbm. *Primary Power:* 115/230 v (115 supplied), 50/60 cps, or self-contained batteries (not supplied). *Size:* 15½" W, 14½" D, 6½" H.



212Z-1

**'MICROMOTE' REMOTE AMPLIFIER** — Though only slightly larger than a pack of cigarettes, this high performing remote is excellent for one-man, one-mike situations. The "Micromote" is completely transistorized, weighing only 10 oz. including ear plug headphone and mike connector. Constructed of sturdy chrome finished steel, the "Micromote" contains 6 transistors and 4 mercury batteries with average life of over 200 hours. It includes a Collins M-20 Microphone, a gain control and built-in test light which will operate as long as 12 hours' battery life remains. *Input Impedance:* 50-250 ohms. *Output Impedance:* 600 ohms. *Frequency Response:*  $\pm 2$  db 70-15,000 cps. *Distortion:* Less than 2%. *Noise:* Relative noise at input is -120 dbm on low impedance input. *Gain:* 85 db. *Power Output:* +12 dbm. *Size:* 2¼" W, ¾" D, 3⅝" H.



'Micromote'

## TURNTABLES

**TT-400, -200 TURNTABLES** — Four models include: TT-400 — 16", four pole motor; TT-400S — 16", synchronous motor; TT-200 — 12", four pole; TT-200S — 12", synchronous. All offer the utmost simplicity with only three moving parts in the drive mechanism. Units are constructed of heavy cast aluminum with blue-gray wrinkle finish, and the turntables are non-magnetic. A gear speed shift offers selection of 33, 45 and 78 rpm, with neutral between slots. An indentation in the turntable eliminates the need for a spindle adapter for 7" 45 rpm records. Wow and rumble are greatly reduced by a double-ball thrust bearing. *Noise:* Better than 40 db below normal program level. *Speed Regulation:* Better than 0.25% over-all. *Size:* TT-400 — 2" above table, 6" below table, over-all base 19⅝" square. TT-200 — 1½" above table, 4¼" below, base 14½" x 15½". *Weight:* TT-400 — 53 lbs. TT-200 — 22 lbs.



TT-400, -200

## COLLINS ANNOUNCER

This transistorized portable unit is designed for hi-fidelity remote broadcasting. Small enough to fit into the rear seat of a car for easy transporting, the unit is ideal for use at grand openings, "disc jockey hops" and other events. Self-storing legs detach and fit into the blue-gray, unbreakable Fiberglas cabinet. Unit includes transistorized remote amplifier, two Collins TT-200 12" turntables, two low level microphone inputs, one high level nemo input, one PA feed jack, one output line jack and one headphone monitor jack. Turntable pre-amplifiers feature a feedback design which lowers noise and distortion. *Microphone Channel Impedance:* 50/600 ohms balanced. *Amplifier Output Impedance:* 600 ohms balanced. *Frequency Response:*  $\pm 1.5$  db, 50-15,000 cps on microphone channel. *Output Level:* +6 VU at 2% or less distortion, 50-15,000 cps. *Primary Power:* 115 v, 60 cps. *Size:* 44" W, 16 $\frac{1}{2}$ " H, 10" D. *Standing Height — 31". Weight:* 68 lbs.



## LIMITER, EQUALIZER



**26U-1 LIMITING AMPLIFIER** — The 26U-1 provides control of the amplitude of audio frequency peaks in AM or FM broadcasting as well as in recording and quality PA systems. Distortion and noise in the unit are very low. Controls are provided for adjustment of input and output levels, with an illuminated 4" VU meter and variable attenuator enabling a visual indication of input and output levels and amount of

compression in db. The meter will also measure external audio levels and gain reduction when used with the 356E-1 Limiting Amplifier. *Frequency Response:*  $\pm 1.5$  db 50-15,000 cps. *Distortion:* Harmonic 1.5% max. at 25 db compression. *Input Impedance:* 600 ohms unbalanced. *Output Impedance:* 600 ohms balanced or unbalanced. *Input Level:* -20 to +20 dbm. *Compression Ratio:* 12/1 first 10 db above verge of compression. *Attack Time:* Adjustable 0.5-3.0 msec. *Release Time:* Adjustable 2.2-5.2 sec. *Output Noise:* -60 dbm. *Primary Power:* 120/130 v, 50/60 cps. *Size:* 19" W, 9" D, 10 $\frac{1}{2}$ " H.

**TURNTABLE EQUALIZING PREAMPLIFIER** — Both amplification and equalization are provided by the Turntable Equalizing Preamplifier. The power supply is self-contained and the amplifier completely transistorized. The unit provides a choice of four playback response curves. It is free of hum and non-susceptible to strong RF fields. *Input Impedance:* 250-600 ohms. *Output Impedance:* 250 ohms balanced. *Gain:* 45 db. *Relative Noise:* -115 dbm at the input. *Equalization Switch Positions:* Flat, intermediate, RIAA and roll-off.

## CUSTOM CONTROL DESKS

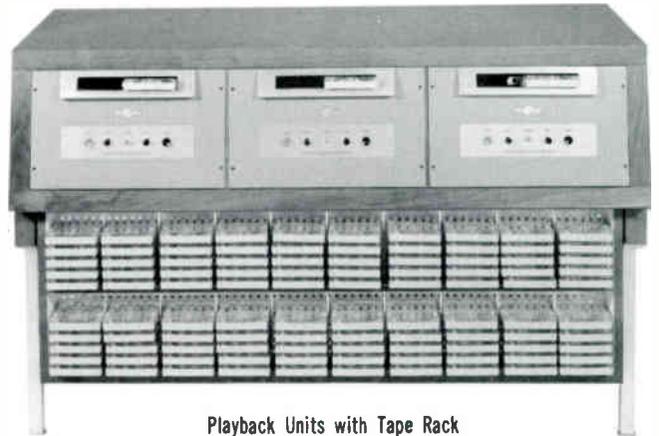


Custom Control Desk with  
212G-1 Console, TT-400 Turntables

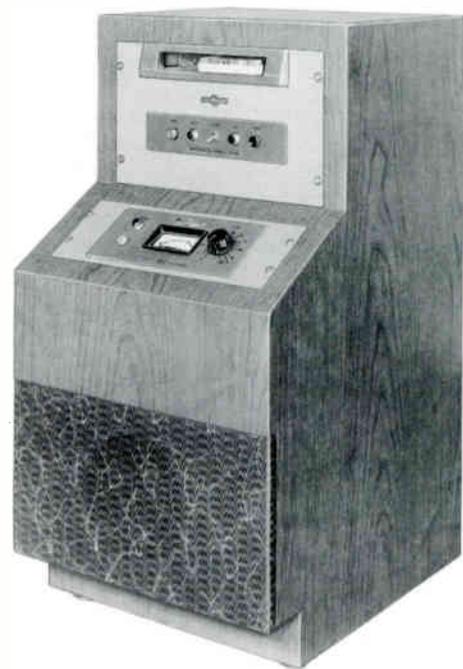
Attractiveness is combined with operational efficiency and economy in Collins control desks, custom designed to each broadcaster's requirements. These desks are sturdily constructed of wood and covered with any of a wide range of patterns of long lasting Formica. Among the features that may be incorporated without sacrificing attractiveness are adjustable feet, built-in record compartments, hidden console cables and provisions for rack mounting. Collins will provide free estimates upon submission of the physical layout of the studio and an outline of functions desired for inclusion in the desk.

# AUTOMATIC TAPE CONTROL

Completely automatic programming in audio systems is achieved with the Collins Automatic Tape Control. By using endless tape cartridges, programming segments up to 31 minutes in length may be played without threading, cueing or rewinding the tapes. A tone burst on the tape automatically recues and stops the tape. Remote control circuitry is provided and tone bursts from one tape may be used to trigger tapes inserted in companion units. Tapes may be stopped at any point for insertion of spot announcements. There are no tape storage problems or chance of accidental erasure, spillage or breakage. Plug-in preamplifiers, cue controls and relays are provided for convenient maintenance. Playback and recording amplifier units are available for standard, 19" rack mounting or 15" mounting for cabinets. *Frequency Response:* +2 db from 80-12,000 cps, +4 db from 60-14,000 cps, at 7.5 inch/second tape speed. *Distortion:* 2% at zero VU record level. *Signal-to-Noise:* 55 db or better. *Input and Output Impedance:* 600 ohms. *Gain:* 60 db. *Start and Stop Time:* Less than 0.1 second. *Primary Power:* 115 v, 60 cps, (50 cps on special order). *Size:* Playback — 8¾" H, 15" or 19" W, 12½" D. Record Amplifier — 5¼" H, 15" or 19" W, 7" D. *Weight:* Playback — 30 lbs. Record Amplifier — 8½ lbs.



Playback Units with Tape Rack



Record/Playback Unit

# HIGH-FIDELITY LOUDSPEAKERS

Collins loudspeakers are designed to produce the finest high-fidelity sound possible. They operate effectively both as full-range speakers and as woofers in multiway systems. When used at full-range, they provide optimum sound reproduction at minimum cost. All leads are color coded. *Power Handling Capacity:* Program — 20 watts. Peak — 40 watts. *Critical Damping Factor:* 15. *Impedance:* 8 ohms. *Voice Coil Diameter:* 2". *Total Flux:* 70,700 maxwells.

**CS-12 LOUDSPEAKER:** *Frequency Response:* 30-13,000 cps. *NIA Sensitivity Rating:* 43 db. *Free Space Cone Resonance:* 40 cps. *Mechanical Crossover:* 1800 cps. *Baffle Opening:* 11". *Mounting:* Four ¼" holes in 11½" circle. *Size:* 12¼" diameter, 3½" over-all depth. *Power Source (for 100 db level):* 12 watts.

**CS-8 LOUDSPEAKER:** *Frequency Response:* 50-13,000 cps. *NIA Sensitivity Rating:* 42 db. *Free Space Cone Resonance:* 56 cps. *Mechanical Crossover:* 2000 cps. *Baffle Opening:* 7⅛". *Mounting:* Four ¼" holes in 7⅝" circle. *Size:* 8⅜" diameter, 3½" over-all depth. *Power Source (for 100 db level):* 15 watts.

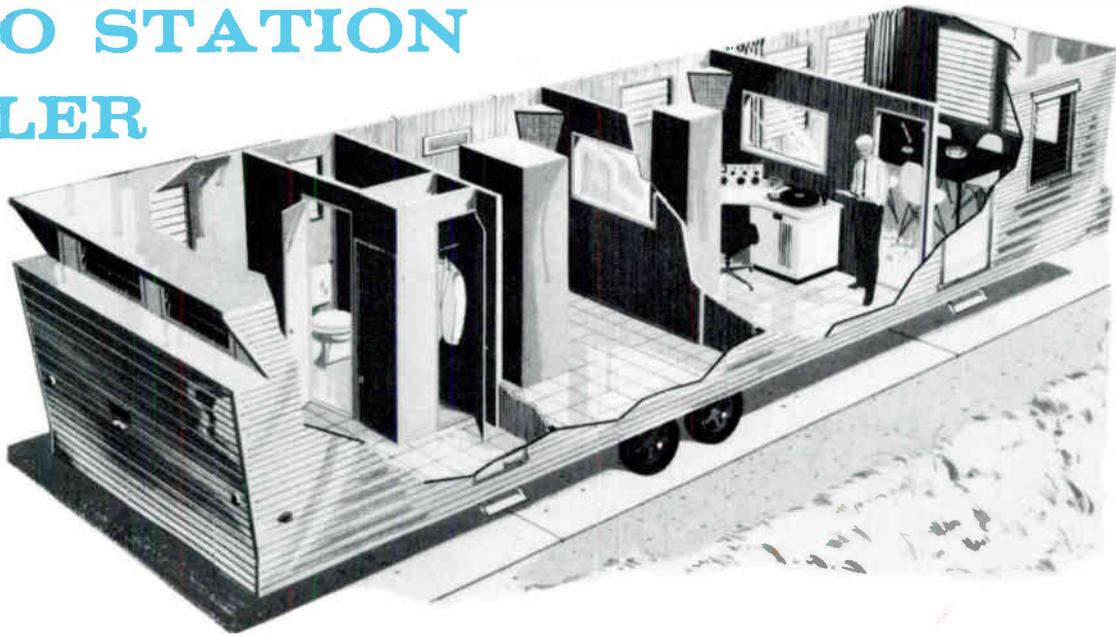


CS-8



CS-12

# RADIO STATION TRAILER



Designed as a complete radio station or mobile studio, the Collins Radio Station Trailer provides all the facilities of a permanent-type studio. All broadcast and office functions may be carried on in the four large rooms of the trailer. Large observation windows connect the studio, control room and transmitter room. Adjoining the large office is an enclosed closet and the rest room, heating and air conditioning facil-

ities. Steel, aluminum and wood paneling are used in the construction to provide rugged service for many years. Each Radio Station Trailer is custom-built to the wishes of the broadcaster and may be outfitted with a complete complement of Collins broadcast equipment. The trailer is 40 feet long and is available in either 8- or 10-foot widths. It allows a new station to go on the air rapidly after the CP is granted.

## MICROPHONES



Collins dynamic, lightweight microphones are specifically designed for radio and television broadcasting, high-fidelity recording and fine quality public address systems. These microphones feature the "Dynaflex" non-metallic diaphragm, which gives smooth response over a wide frequency range and withstands temperature extremes, shocks and humidity. They are essentially non-directional microphones, and are finished in a non-reflecting blue-gray.

**M-20 MICROPHONE** — This small and rugged lavalier microphone frees hands in a one-man speaking situation such as weather shows and demonstrations. It is small enough to be hidden behind a necktie or lapel. Supplied with lavalier

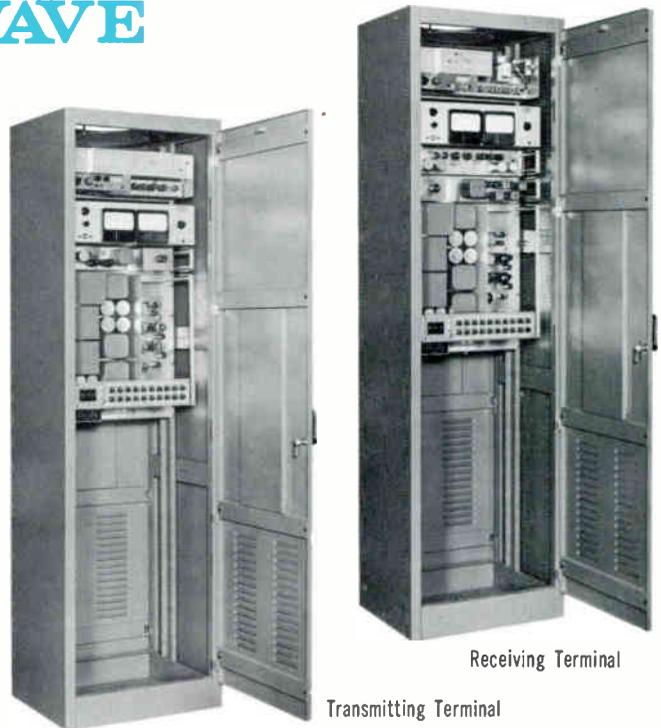
clip and 25 ft. of 3-conductor celanese braided cable. *Impedance:* 50 ohms or 200 ohms, selectable. *Frequency Response:* 60-18,000 cps. *Output Level:* -57 db, with reference to 1 mw/10 dynes/cm<sup>2</sup>. *Size:* 1" diameter, 4" long. *Weight:* 3½ oz.

**M-40 MICROPHONE** — Ideal for panel discussions, dinner meetings and interviews. Equipped with desk stand and 20 ft. of 3-conductor plastic jacketed cable. *Impedance:* 50 ohms or 200 ohms, selectable. *Frequency Response:* 40-20,000 cps. *Output Level:* -59 db, with reference to 1 mw/10 dynes/cm<sup>2</sup>. *Size:* 1-3/16" diameter, 95/8" long. *Weight:* 11 oz.

**M-60 REMOTE MICROPHONE-AMPLIFIER** — This completely self-contained unit combines a one channel remote amplifier and a high quality microphone. The amplifier has six plug-in transistors which are powered by a 5.4 v mercury cell having a 100 hour life expectancy. Includes ear-plug headphone, which turns on amplifier. *Amplifier Output:* +12 dbm at 2% or less distortion. *Frequency Response:* +1.5 db, 60-15,000 cps. *Relative Noise at Amplifier Input:* -119 dbm. *Size:* 1" diameter, 115/8" long. *Weight:* 12 oz.

# TV-STL MICROWAVE

Collins TV Studio-to-Transmitter Link Systems transmit NTSC color or monochrome and high fidelity audio in the 6875-7125 mc band. Systems are also available in the 5925-6425 mc, 6575-6875 mc and 7125-7600 mc bands. Servicing is simplified by easily accessible controls, numerous test points, plug-in subunits and complete metering. Standby units or additional channels may be added to the same rack, with transmitters or receivers stacked on a common waveguide. Parabolic antenna may be mounted as much as 75 feet from RF unit, enabling a complete indoor installation. Equipment features long life reflex klystron, fixed tuned IF amplifier, high fidelity FM modulator. *Power Output:* 100 mw min. *Carrier Deviation:*  $\pm 3$  mc nom. *Receiver Sensitivity:*  $-118$  dbw. *Receiver Noise Figure:* 14 db or less. *Receiver Bandwidth:* 14 mc to 3 db points. *Video Frequency Response:* Video Only —  $\pm 0.2$  db 60 cps-3 mc;  $\pm .5$  db to 4.2 mc;  $\pm 2$  db to 6 mc. With Sound Channel —  $\pm .5$  db to 4.2 mc (sound notch at 6.5 mc). *Video Emphasis Characteristic:* 12 db symmetrical about 400 kc. *Audio Frequency Response:*  $\pm 0.5$  db 50 cps-13 kc;  $\pm 2$  db 20 cps-15 kc. *Audio Distortion:* Less than 1%. *Audio Sub-carrier Emphasis:* 75 usec (standard FM curve). *Primary Power:* 115 v, 1 phase, 50/60 cps.



# WEATHER RADAR

TV weathercasters can add new realism to their programs by showing actual weather conditions live with Collins Weather Radar. Operation in the C band assures high storm penetration. Local map slides superimposed on the radar indicator enable viewers to pinpoint the locations of storms. Cells of high precipitation and turbulence within these storms may be further defined by using the radar's "contour" circuitry. Full coverage of the area is provided, with selectable ranges of 20, 50 and 150 nautical miles. *Primary Power:* 115 v  $\pm 5\%$ , 380-420 cps, 665 va (1 indicator), 790 va (2 indicators) (alternator available). 28 v dc, 1 amp max. (relay).



537F-3 with Radome

**537F-3 ANTENNA** — Mounted on roof. 30" parabolic dish with  $5\frac{1}{2}^\circ$  beamwidth.  $360^\circ$  rotation at 15 rpm. In normal TV installation, may be tilted  $15^\circ$  above and  $10^\circ$  below horizontal reference plane, with full  $25^\circ$  above available by adjustment. *Size:*  $31\frac{1}{2}$ " W,  $31\frac{1}{2}$ " D,  $36\frac{3}{8}$ " H. *Weight:* 30.7 lbs.

**493A-1 INDICATOR** — A Plan Position Indicator with 5" tube. *Size:*  $6\frac{1}{4}$ " W,  $12\frac{1}{2}$ " D,  $6\frac{1}{4}$ " H. *Weight:* 11.8 lbs.

**561G-2 CONTROL** — Central control for system. *Size:*  $5\frac{3}{4}$ " W, 3" D,  $3\frac{3}{8}$ " H. *Weight:* 1.4 lbs.

**374A-1 RECEIVER-TRANSMITTER** — Includes all RF and IF circuits. *Frequency:* 5400 mc  $\pm 30$  mc. *Power Output:* 75 kw peak, min. *Size:*  $10\frac{1}{8}$ " W,  $22\frac{1}{8}$ " D,  $7\frac{5}{8}$ " H. *Weight:* 54 lbs.

**776C-1, -2 SYNCHRONIZERS** — 776C-1 used in 1 indicator systems; 776C-2 in 2 indicator systems. *Size:*  $10\frac{1}{8}$ " W,  $22\frac{1}{8}$ " D,  $7\frac{5}{8}$ " H. *Weight:* 776C-1 — 34.9 lbs. 776C-2 — 38.4 lbs.



374A-1



776C-1



561G-2



493A-1



# COLLINS hf-vhf ground systems

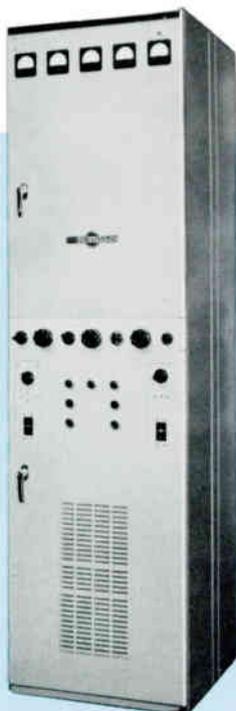
# HF SSB POWER AMPLIFIERS



205J-1

**205J-1 45 KW POWER AMPLIFIER** — An automatically tuned linear power amplifier capable of 45 kw PEP output over the 2 to 30 mc frequency range. Low distortion amplifiers allow transmission of multiplex signals without mutual interference between subchannels. Local or remote control for either attended or unattended operation may be employed. RF and pre-positioning information for the tuned circuits is supplied by an external exciter, such as the Collins 310F-1. Servo devices within the equipment automatically complete the tuning and loading of the three amplifier stages. A pi-L network is used for antenna coupling. Over-all negative feedback provides extremely linear operation. A distortion canceling circuit also contributes to the high degree of linearity. Mercury vapor rectifier tubes are in a temperature-controlled chamber for operation at low temperatures. Power output may be reduced to 12 kw. *RF Bandwidth:* Not less than 16 kc between -1 db points. *Distortion:* 3rd and higher odd order distortion products are at least 35 db below either of two equal tones required to drive the power amplifier to 45 kw PEP output when used with a Collins 310F-1 Exciter. *Harmonic Output:* 2nd harmonic at least 50 db down. All harmonics above 50 mc at least 60 db down. Added filtering can be used at the output transmission line if required. *Noise:* Noise output is at least 50 db below either of two equal tones required to drive the power amplifier to 45 kw PEP output. *Ambient:* -29 to +50°C.

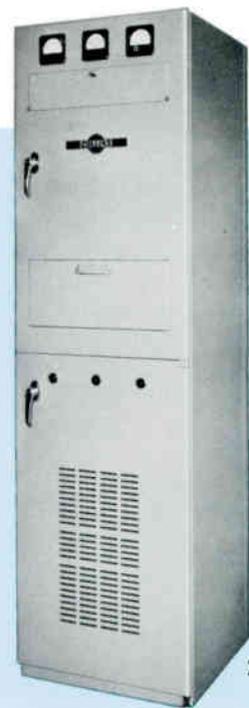
**204C-1 10 KW POWER AMPLIFIER** — A manually tuned linear power amplifier capable of 10 kw output over the 4



204C-1



204F-1



204H-1

to 25 mc frequency range. A nominal 0.1 watt drive signal at the desired output frequency is supplied by an external source. May be used in continuous duty applications with either attended or unattended operation. Local or remote control may be employed. Phase detectors which provide an accurate resonance indication facilitate tuning. A 4CX5000A ceramic-seal tetrode is used as the output amplifier. Accurate neutralization is maintained over the entire frequency range by a broadband capacitance bridge circuit. A pi-L output network provides very high harmonic attenuation in the final amplifier. Power amplifier tuning and loading controls have very low inter-action. *Drive Power:* 0.1 watt nominal. *RF Bandwidth:* Not less than 16 kc between -1 db points. *Distortion:* 3rd and higher odd order distortion products are at least 38 db below either of two equal tones required to drive the power amplifier to 10 kw output.

**204F-1 2.5 KW POWER AMPLIFIER** — The 204F-1 has an output of 2.5 kw PEP or CW on either of two preset channels in the 2 to 30 mc frequency range. Either channel may be tuned to any frequency in the range. RF circuits consist of a three stage linear amplifier with over-all feedback. The use of pretuned circuits permits instantaneous channel switching. A broadband capacitance bridge maintains neutralization over the entire frequency range without adjustment. Single 52 ohm input and output connectors with relay switching for each RF channel is normally supplied, however, individual connectors and separate ALC voltage terminations for each channel may be provided on special order. Connections for power and external control facilities may be made either through top or base of cabinet. Complete front accessibility to all

components and wiring permits installation against the wall. *Drive Power:* 0.1 watt nominal. *RF Bandwidth:* Not less than 16 kc between -1 db points. *Distortion:* 3rd and higher odd order distortion products average 35 db below either of two equal tones required to drive the power amplifier to 2.5 kw PEP.

**204H-1 2.5 KW POWER AMPLIFIER** — An automatically-tuned linear power amplifier with 2.5 kw PEP or continuous average power output in the 2 to 30 mc range, when driven by a suitable exciter, such as the Collins 310F-1. Automatic tuning operation is controlled by prepositioning information and the input frequency. Frequency and phase discriminators, in conjunction with closed-loop servo systems, operate the bandswitch and tuning elements. All controls are located on the front panel and provide manual override of servo functions. The primary power and tuning sequence can be locally or remotely controlled. RF circuits consist of a three stage linear amplifier with over-all feedback, the final stage utilizing a pair of 4CX1000A ceramic-seal tetrodes. The operating point is carefully controlled to provide high efficiency and low intermodulation distortion. A broadband capacitance bridge circuit maintains accurate neutralization over the entire frequency range. Service connections can be made either from the top or through the cabinet base. Mounting feet, which fit within the cabinet base, are available for applications requiring shock isolation. The isolators do not appreciably increase cabinet height. *Drive Power:* 0.1 watt nominal. *RF Bandwidth:* Not less than 16 kc between -1 db points. *Distortion:* 3rd and higher odd order distortion products average 35 db below either of two equal tones required to drive the power amplifier to 2.5 kw PEP.

Power Amplifier Type	Power Output PEP (kw)	Primary Power	Input Impedance (ohms)	Output Impedance (ohms)	Dimensions (inches)			Weight (lbs.)
					W	D	H	
205J-1	45	195-225 v or 350-410 v 50-60 cps, 30, 67 kva	52	52	83¾	35½	78	2950
Plate Transformer					18¾	33¾	32¾	975
Circuit Breaker					16¼	17¾	26¾	153
Step-start Control					17	9¾	27¾	73
Optional Flushing Blower								
204C-1	10	200-250 v (230 v nom) 50-60 cps, 30, 20 kva	52	52	24	26	86	1000
204F-1	2.5	200-250 v (230 v nom) 50 or 60 cps, 10, 6 kva	52	52	20	20	70*	575
204H-1	2.5	200-250 v (230 v nom) 50 or 60 cps, 10, 6 kva	52	52	20	20¾	70*	650

\*With shockmounts 71¾".

# HF SSB EXCITERS

**310F-1 EXCITER** — Servo tuned, this exciter provides a 0.2 watt RF output signal in the 2 to 29.999 mc frequency range to drive a linear power amplifier in single sideband transmission. It may be used for voice operation on upper sideband, lower sideband, twin sideband (independent upper and lower sidebands with suppressed carrier), or one sideband and reinserted carrier for AM compatibility. CW and TTY operation may be accommodated with accessory equipment. A total of 28,000 frequencies in 1 kc steps throughout the range can be selected on a direct reading, counter type dial. The exciter employs a stabilized master oscillator slaved to a highly stable frequency standard. A plug-in, transistorized standard yields a stability of one part in  $10^6$  per month; or an optional external 40N-1 Standard (consisting of 40K-1, 8U-1 and 426A-1, see page 55) provides a stability of one part in  $10^8$  per day. *SSB Distortion:* Third order and higher intermodulation distortion more than 35 db below either tone of standard two-tone signal at rated output. *Primary Power:* 115 v, 1 phase, 60 cps, 625 watts.

**310F-6 RECEIVER-EXCITER** — The 310F-6, manually tuned with 1 kc steps in four bands over the 2 to 30 mc range, provides 0.2 watt excitation as well as reception on a simplex basis. Transceiver techniques are employed in the double conversion circuits used to translate the sideband signal generated at 300 kc to the desired radio frequency or, conversely, to convert the received signal to a 300 kc IF for detection. The 310F-6E Exciter has identical performance characteristics except that receiver functions are not included. The 0.2 watt RF output of the exciter may be used to drive manually tuned linear power amplifiers. Voice controlled (VOX) or push-to-talk exciter actuation is provided. Operation is possible on upper or lower sideband; twin, independent sideband; AM, or, with accessory equipment, CW and TTY. Frequency is selected on a direct reading, digital dial. Stability of one part in  $10^6$  per month is impaired by a plug-in, transistorized standard: stability of one part in  $10^8$  per day, by an external 40N-1 Standard (40K-1, 8U-1 and 426A-1, page 55). *Receiver Selectivity:* Determined by Mechanical Filters. Normally 3 kc bandwidth; 0.8 kc or 6 kc available on special order. *Primary Power:* 115/230 v, 1 phase, 50/60 cps, 280 watts.



310F-1



310F-6

HF SSB EXCITERS						HF SSB RECEIVERS								
Function	Type	RF Output (ohms)	Audio Termination (ohms)	Dimensions (inches)			Weight (lbs.)	Receiver Type	RF Input (ohms)	Audio Output (ohms)	Dimensions (inches)			Weight (lbs.)
				W	D	H					W	D	H	
Exciter	310F-1	52	150	19	7*	63	255**	50E-1	52	150	19	7*	63	225**
Receiver-Exciter	310F-6	52	600 or speaker	19	20	84	205**	50E-6	52	dual 600	19	20	84	205**
Exciter	310F-6E	52	600	19	20	84	205**							

\*Forward projection.      \*\*Mounted in 84" rack.

# HF SSB RECEIVERS

**50E-1 RECEIVER** — This servo tuned SSB equipment may be employed for reception on any frequency in 1 kc steps in the 2 to 29.999 mc range. Operation is possible on either sideband, both sidebands independently, AM, or, with accessory equipment, CW or TTY. A plug-in, transistorized frequency standard results in stability of one part in  $10^6$  per month; an external 40N-1 Standard (40K-1, 8U-1 and 426A-1, page 55), one part in  $10^8$  per day. A diversity configuration, 50E-1D, is available with common utilization of the stabilized master oscillator. *Selectivity:* Determined by Mechanical Filters. Normally 3 kc bandwidth per sideband for SSB; others on special order. *Primary Power:* 115 v, 1 phase, 60 cps, 625 watts.

**50E-6 RECEIVER** — The 50E-6 is manually tuned in 1 kc increments over the 2 to 30 mc range in four bands. Reception may be had on upper or lower sideband, twin sideband, AM, or, with accessories, CW and TTY. A fast attack, slow release AGC is used for SSB reception. The received signal level is indicated on a meter. A manually tuned stabilized master oscillator is slaved to a plug-in frequency standard, providing stability of one part in  $10^6$  per month, or to an external 40N-1 Standard (40K-1, 8U-1, 426A-1, page 55), for one part in  $10^8$  per day. A 50E-6D configuration is also available for applications requiring diversity reception. *Primary Power:* 115/230 v, 1 phase, 50/60 cps, 250 watts.



50E-1



50E-6

# HF SSB TRANSCEIVERS

**32MS-1 MOBILE TRANSCEIVER** — The 32MS-1 has an output power of 100 watts on any of four pretuned channels in the 1.6-15.0 mc frequency range. It offers all the advantages of SSB operation for mobile communication, and is especially suited for use in private autos, trucks, jeeps and marine installations. The transceiver is housed in a dust and salt spray proof cabinet, which is shockmounted and comparable to a standard  $1\frac{1}{4}$  ATR aircraft equipment enclosure. A control box which may be located up to 50 feet from the 32MS-1 and a wide range antenna matching network are included in the accessories. Choice of power supply unit permits operation from a 12 v, 24 v or 115 v, 60 cps source.



32MS-1

32MS-1  
Control

# HF SSB TRANSCEIVERS

**KWT-6 500 WATT TRANSCEIVER (TYPE 5)** — Offers simplex transmission and reception in the 2 to 30 mc range with 500 watts PEP. Continuous coverage of the frequency range in 1 kc steps is provided, with manual tuning. Operational modes include upper sideband; lower sideband; independent sideband; AM, or with accessory equipment, TTY or CW. An integral transistorized frequency standard provides stability of one part in  $10^6$  per month; an external 40N-1 Frequency Standard (40K-1, 8U-1, 426A-1, page 55) may be used for stability of one part in  $10^8$  per day. Receiver and exciter circuits employ double conversion. Balanced modulators and Mechanical Filters for sideband separation provide excellent carrier suppression and negligible interchannel crosstalk. The power amplifier is a two stage, four band unit with excellent linearity. Several configurations are available. Standard telephone levels and impedances are provided. *Audio Output:* +14 dbm into two 600-ohm lines. 1 watt into speaker. Standard headphone output. *Primary Power:* 115/230 v, 1 phase, 50/60 cps, 1400 watts with 500 watts continuous output.

**32RS-1 100 WATT TRANSCEIVER** — This self-contained SSB station has an output of 100 watts PEP on any of four pretuned channels in the 1.6 to 15 mc range. Simplified panel controls and good frequency stability facilitate operation by non-technical personnel. Channels are instantly changed by a selector switch. Operation is on the upper sideband. Either VOX or push-to-talk actuation of the transmitter may be employed. Transmitter automatic load control circuitry maintains a high level of transmitted "talking power." The transceiver requires a CR-27/U crystal for each channel frequency. Coil kits may be obtained for the frequency ranges required. The 32RS-1C is cabinet-mounted; 32RS-1H (hinged) and 32RS-1F (flush) are rack-mounted. *Frequency Stability:*  $\pm 1$  part in  $10^6$  or  $\pm 5$  parts in  $10^6$  depending on oven. *RF Output and RF Input Impedance:* 52 ohms. Capable of tuning VSWR of 2.5:1. *Primary Power:* 115/230 v, 1 phase, 50/60 cps, 350 watts (transmit).

**DIPOLE BALUN ANTENNA KIT** — For use with the 32RS-1 in installations employing a single frequency or separate antennas for multi-channel operation. Complete installation instructions and all materials for antenna construction with the exception of the towers, support wires and coaxial feedline are included.

**152J-1 PHONE PATCH** — Makes use of a resistance hybrid circuit to match the 600 ohm telephone line to the unbalanced transmit and receive audio inputs. The station operator has complete supervisory control and may select either transmit, receive or VOX operation. Mounts in 32RS-1C accessory panel. *Size:* 5" W,  $6\frac{7}{8}$ " D, 5" H. *Weight:* 3 lbs.

**180V-1 ANTENNA COUPLER** — Will properly load a 30 foot whip or longer antenna. It is weatherproof, permitting installation at the antenna base. *Size:* 12" W, 12" D,  $7\frac{1}{2}$ " H. *Weight:* 15 lbs.

**302E-2 DIRECTIONAL WATTMETER** — Measures forward or reverse power. Full scale indication is 200 watts. Mounts in 32RS-1C accessory panel. *Size:* 5" W,  $5\frac{1}{4}$ " D, 3" H. *Weight:* 3 lbs.



32RS-1C



KWT-6

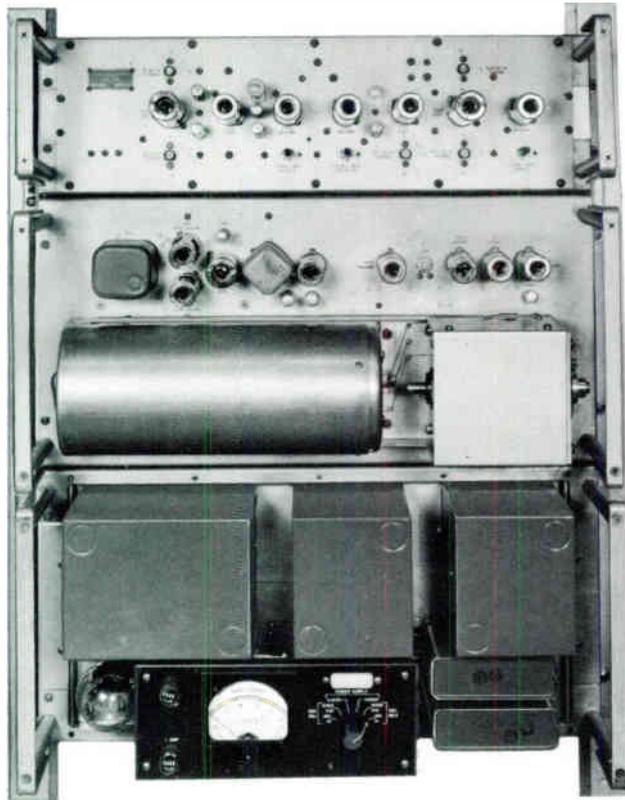
Transceiver Type	Power Output PEP (watts)	Dimensions (inches)			Weight (lbs.)
		W	D	H	
KWT-6	500	20	20	84*	320*
32MS-1 RT	100	16 $\frac{3}{8}$	24 $\frac{1}{8}$	9 $\frac{1}{8}$	38**
32RS-1C	100	22	14 $\frac{3}{4}$	24 $\frac{1}{2}$	97
32RS-1H	100	19	7	19 $\frac{1}{4}$	55
32RS-1F	100	19	7	19 $\frac{1}{4}$	55

\*Includes rack.

\*\*Excludes control unit and power supply.

# FREQUENCY STANDARD

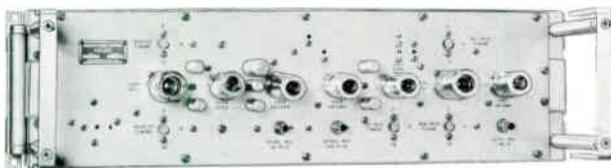
at 10 kc. *Output Impedances:* Approximately 500 ohms. *Input Signal Requirement:* 1 to 10 v rms at 1 mc. *Power Source:* 300 v dc, 60 ma; 6.3 v ac or dc, 2.1 amps; may be supplied from Collins 426A-1 Power Supply.



40N-1

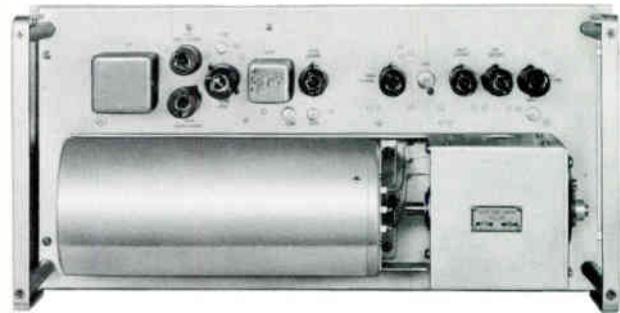
**40N-1 FREQUENCY STANDARD** — May be used in applications requiring extreme stability of mixing injection frequencies in both transmitting and receiving equipment. It consists of the 40K-1 High Stability Oscillator and associated 426A-1 Power Supply, and 8U-1 Frequency Divider. The 40N-2 Frequency Standard includes a 54M-1 Frequency Comparator to permit evaluation of the 1 mc outputs of three 40K-1 High Stability Oscillators. Either configuration may also be utilized as a secondary frequency standard.

8U-1



**8U-1 FREQUENCY DIVIDER** — Outputs of 1 mc, 100 kc and 10 kc may be obtained from a 1 mc signal source by the use of this unit. Regenerative dividing circuits are employed to provide the optimum in frequency and phase stability. All three output voltage levels may be adjusted individually. The outputs may be used with low impedance loads. *Output Voltages:* 0.2 v rms at 1 mc; 0.5 v rms at 100 kc and 0.5 v rms

40K-1



**40K-1 HIGH STABILITY OSCILLATOR** — Ideally suited as a secondary frequency standard or a base frequency generator in frequency synthesizers or stabilized master oscillators. Output frequency is stable to within one part in  $18^8$  per day or better under normal operating conditions. The frequency control element is a 1 mc resonator, with a Q of over one million, sealed in an evacuated glass envelope. *Output Frequency:* 1 mc. *Output Voltage:* 2 v rms in 5000 ohms. *Frequency Stability:* Within one part in  $10^8$  for a 24 hour period. *Short Term Stability:* Less than one part in  $10^{10}$ . *Power:* Furnished by associated Collins 426A-1 Power Supply.

54M-1



**54M-1 FREQUENCY COMPARATOR** — The 54M-1 samples frequencies of any two of three 1 mc signals or compares the tenth harmonic of the 100 kc signal with any one of three 1 mc signals. It may be used to compare the output of three Collins 40K-1 High Stability Oscillators. The frequency difference between two compared channels is indicated on a front panel meter. Aural monitoring is also provided. *RF Input Voltage:* 1 mc input; between 1.3 and 10 v rms into a 40 uufd capacitive load; 100 kc input, 0 to 5 v rms. *Power Requirements:* 250 to 300 v dc, 20 ma; 150 v dc, regulated; 6.3 v, 50-60 cps, 1.5 amp. May be supplied from Collins 426A-1 Power Supply.

	Type	Dimensions (inches)			Weight (lbs.)
		W	D	H	
High Stability Oscillator	40K-1	19	7	8 $\frac{3}{4}$	15
Power Supply	426A-1	19	7	8 $\frac{3}{4}$	45
Frequency Divider	8U-1	19	7	5 $\frac{7}{32}$	6
Frequency Comparator	54M-1	19	7	7	3

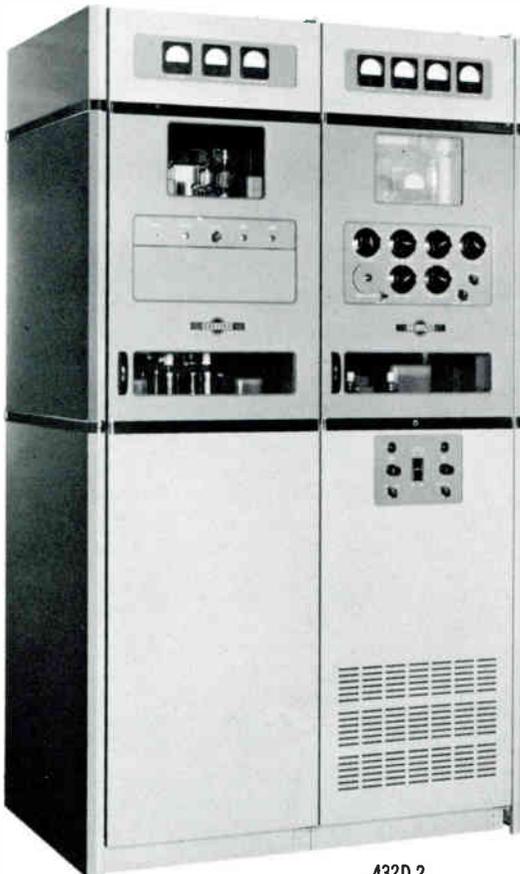
# HF TRANSMITTERS, RECEIVERS

**432D-2 2.5/2 KW TRANSMITTER** — Covers the 2 to 30 mc frequency range with 10 crystal-controlled channels rapidly and automatically tuned by Autotune® system. The 432D-2 has a power output of 2 kw AM and 2.5 kw CW and FSK. FSK may be employed on up to three of the channels by installation of 709E-1 Frequency Shift Oscillator accessory units in the transmitters. One of the 10 channels may likewise be derived from an external signal source, such as a stabilized master oscillator. Remote control of all transmitter functions is available with the 177M-1 (page 62). Channels are easily preset by Autotune® tuning controls on the front panel of the transmitter. Improved performance is achieved by modern components, such as vacuum variable tank capacitor and beam power tetrode. *Power Output:* 2-20 mc, 2500 watts CW-FSK, 2000 watts AM; 20-24 mc, 2250 watts CW-FSK, 1750 watts AM; 24-30 mc, 2000 watts CW-FSK, 1500 watts AM. *Frequency Stability:* AM and CW — Better than 0.002% (depending on crystal). FSK — 0.0005%. *Output Impedance:* 50-70 ohms with maximum SWR of 2 to 1. Connector provided for RG-17/U coaxial cable.

*Primary Power:* 230 v to 208 v, 3 phase, 60 cps with 50 cps modification available.

**30K-5 300/250 WATT TRANSMITTER** — Instantaneous frequency change to either of two pretuned; crystal-controlled frequencies in the 2 to 30 mc range is featured in the 30K-5, which may be controlled remotely by the 177L-2 (page 62). *Power Output:* 2-15 mc — 300 watts, CW; 250 watts, AM. 15-24 mc — 250 watts, CW; 200 watts, AM. 24-30 mc — 200 watts, CW; 125 watts, AM. *Output Impedance:* Matches wide range of antenna impedances. *Primary Power:* 115/230 v, 1 phase 50/60 cps, 1350 watts maximum.

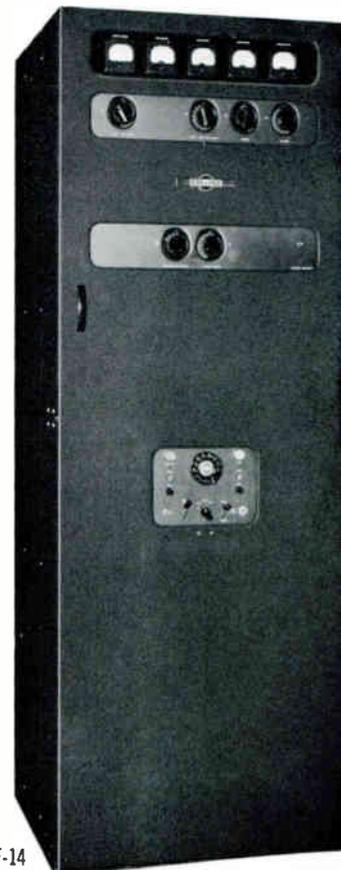
**16F-14 400/250 WATT TRANSMITTER** — Employs Autotune® for selection of any of 10 frequencies, 2 to 20 mc. Power Output is 400 watts CW, 250 watts AM or MCW; remote control, with 177G-10 (page 62). *Output Impedance:* Unbalanced antennas or concentric transmission lines 50-1200 ohms pure resistance, 70-850 ohms at 45° phase angle, or 100-600 ohms at 60°, and balanced trans-



432D-2



30K-5



16F-14

mission lines at 300-1200 ohms within 4-20 mc. *Primary Power:* 115/230 v, 1 phase, 50/60 cps, 1600 watts maximum, at 85% PF.

**32RA-10 75/50 WATT TRANSMITTER** — This compact, self-contained transmitter has a nominal power output of 50 watts in AM radiotelephone service and 75 watts in radiotelegraph service. Four preset, crystal-controlled frequencies in the 1.5 to 15 mc range are available for instant selection. Simplified panel controls facilitate operation by non-technical personnel. A single frequency control selects the crystal, pre-tuned tank circuits for the intermediate amplifier and the output circuit. Plug-in crystals, intermediate tank circuits and output circuit coils are employed in the transmitter. In radiotelephone service, a carbon microphone is used to obtain plate modulation. *Output Impedance:* Collins pi network matches a wide range of antenna impedances. *Primary Power:* 115/230 v, 1 phase, 50/60 cps, 435 va maximum.

**51J-4 RECEIVER** — The 51J-4 is a multiple conversion superheterodyne with continuous coverage of the 0.54 to 30.5 mc range. A linear dial scale is accurately calibrated in 1 kc increments. The Collins Mechanical Filter provides nearly ideal selectivity with filters available for 1.4, 3.1

and 6 kc bandwidths. Receives AM, SSB, CW, MCW and FSK. The use of a high frequency first IF together with three tuned circuits in the RF portion of the receiver gives excellent image rejection. Images are attenuated more than 40 db throughout the entire tuning range. Care has been taken to apportion gain throughout, resulting in extremely good cross modulation and strong signal performance. *Frequency Stability:* Dial calibration at room temperature within 300 cps, if nearest 100 kc point is used to adjust fiducial. *Sensitivity:* 2 uv average on all bands for 10 db S/N and 1 watt output into 600 ohms, except band 1 (.54-1.5) which is 7.5 uv. *Primary Power:* 115/230 v, 1 phase, 45/70 cps, 85 watts.

**51N-7 RECEIVER** — The 51N-7 is a crystal-controlled superheterodyne receiver advantageous for continuous, unattended operation on a fixed frequency in the 2 to 24 mc range. It may be used for AM, CW or MCW reception. Excellent image and spurious response rejection is accomplished by the use of five tuned circuits preceding the mixer. Fixed tuned IF stages eliminate the need for alignment of the IF amplifiers. Relatively constant output level is assured by the use of AVC on the RF amplifier as well as the IF amplifiers. The audio output circuit has an impedance of 600 ohms with a 4 ohm tap for a speaker. The secondary winding is split to permit an RF gain control to be superimposed on a telephone line for remote operation. Features include the Mechanical Filter, automatic noise limiter and carrier-operated squelch circuit. S/N is enhanced by a crystal oscillator allowing reception of either upper or lower sideband by proper selection of crystal. Flush, recessed or hinged mounting styles are available. *Frequency Stability:* 0.001%. *Sensitivity:* With RF gain maximum, a 3 uv signal as 30%, 1000 cps modulation will produce not less than 10 db S/N. *Selectivity:* 4 kc  $\pm 10\%$  at 6 db. *Primary Power:* 115/230 v, 1 phase, 50/60 cps, 45 watts.



32RA-10



51N-7



51J-4

	Type	Power Output (watts)	RF Impedance (ohms)	Dimensions (inches)			Weight (lbs.)
				W	D	H	
Transmitter	432D-2	2500/2000	50 or 70	48	33	84	1450
Transmitter	30K-5	300/250	70-2000	22	16½	66½	385
Transmitter	16F-14	400/250	wide range	28	30	80%	1170
Transmitter	32RA-10	75/50	wide range	22	18	12½	129
Receiver	51J-4*	.....	52	19	13	10½	35
Receiver	51N-7	.....	100 bal. or unbal.	19	7	7	18

\*Cabinet optional.

# VHF TRANSMITTERS, RECEIVERS

**242F-5CL 50 WATT TRANSMITTER** — Offers continuous duty AM communication in the 108 to 152 mc frequency range, ideally suited for climax type operation, with output power conservatively rated at 50 watts. Although the 242F-5CL is basically a single-channel transmitter, an option is available providing up to four channels within a 500 kc spectrum. Spurious output is reduced in this transmitter, and linear power amplification minimizes intermodulation interference between transmitters. Compressor type modulation limiter has extremely fast attack time and holds modulation rise to less than 3 db for a 20 db increase in audio input level. Use of low level modulation reduces the number of tubes, simplifies circuitry and lowers transmitter power requirements. Complete metering and commonly used controls are located on the open panels. A reflectometer included with the harmonic filter, provides an accurate measurement of the power output and VSWR. The transmitter employs a minimum number of different tube types, utilizing ARINC types where applicable. Type 4X150A tubes are employed as power amplifiers and type 5686 as modulators. The power supply circuits use 866A rectifiers. The transmitter may be controlled remotely. Any of the three mounting styles may be obtained; flush, extended or hinged-extended. *Power Output:* Conservatively rated at 50 watts. Adjustable to any level from 10-50 watts by potentiometer. *Frequency Stability:*  $\pm 0.005\%$  or  $\pm 0.002\%$ , depending on crystal. An external frequency standard for climax operation has a stability of approximately one part in  $10^6$  over a period of 6 months. *Harmonic Output:* All spurious except second harmonic over 100 db below carrier level; second harmonic at least 80 db below carrier level. *Modulation:* At least 90%, 300 to 3750 or 300 to 10,000 cps depending upon application. *Primary Power:* 115/230 v, 1 phase, 50/60 cps, 530 watts maximum with 90% lagging PF.

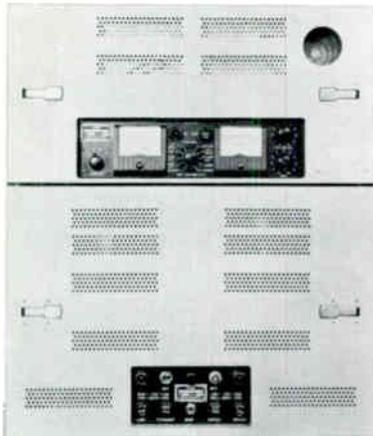
**51M-8 RECEIVER** — This single-channel, preset, crystal-controlled receiver is ideal for continuous, unattended reception of AM signals in the 108 to 152 mc range. A double conversion superheterodyne circuit is utilized with an advanced automatic noise limiter, which provides maximum suppression of the effects of impulse noise of the type associated with ignition systems. A carrier-operated relay-type squelch circuit silences the receiver when no signal is being received. The ratio of signal levels required to open and close the squelch system is less than 1.2 to 1, permitting the squelch to be set open on very weak signals and still close at the end of transmission. The input circuit may be easily modified to provide operation of two or more receivers from a single antenna. The audio output transformer has a split secondary allowing the RF

gain control to be superimposed on telephone lines for remote operation. Printed wire boards and miniaturized components are employed in certain portions of the receiver to provide maximum compactness with improved mechanical and electrical characteristics. Available in flush, recessed and hinged mounting. *Frequency Stability:* 0.002% with premium crystals. *Sensitivity:* Not less than 6 db S/N for 2 uv input modulated 30%. *Selectivity:* Bandwidth at 6 db attenuation not less than 40 kc; bandwidth at 80 db not more than 80 kc. *Primary Power:* 115/230 v, 1 phase, 50/60 cps, 60 watts.

**242F-2 200 WATT TRANSMITTER** — A continuous duty transmitter for ground-to-air or point-to-point communication service in the 108 to 152 mc frequency range. Basically, it is a single channel crystal controlled transmitter, however, a crystal selector switch allows operation on a second channel within 0.3% of the frequency without retuning the transmitter. Spurious outputs are more than 80 db below the carrier level assuring freedom from interference with other services in terminal areas where channel frequencies are closely spaced. Vertical chassis construction allows complete access to all components and greatly simplifies maintenance. Tubes, transformers and controls are accessible from the front. Wiring is accessible from the rear by removal of the protective cover. The equipment may be mounted in either recessed-midrail cabinet or open frame rack. The mechanical design greatly assists in heat dissipation, where multiple installation requires economy of space. All essential circuits are metered to facilitate tuning and maintenance. Remote control functions may be performed up to 50 miles over telephone lines using the 177L-2 (page 62). Additional remote control facilities are available for more complex requirements. *Frequency Stability:*  $\pm .005\%$  or  $\pm .002\%$  depending on crystal. *Harmonic Output:* At least 80 db below carrier level. *Noise Level:* More than 40 db below 100% modulation without clipping. *Audio Input:* 100 ohm carbon or high impedance microphone, with PTT switch, or 600 ohm telephone line. *Audio Frequency Response:*  $\pm 3$  db, 1000 cps reference, 300 to 3750 cps;  $\pm 4$  db, up to 10 kc. *Primary Power:* 155/230 v, 1 phase, 50/60 cps, 1200 watts, 90% PF.

	Type	Power Output (watts)	Dimensions (inches)			Weight (lbs.)
			W	D	H	
Transmitter	242F-5CL	50	19	8	21	60
Receiver	51M-8	....	19	7	7	15
Transmitter	242F-2	200	19	12	52½	121

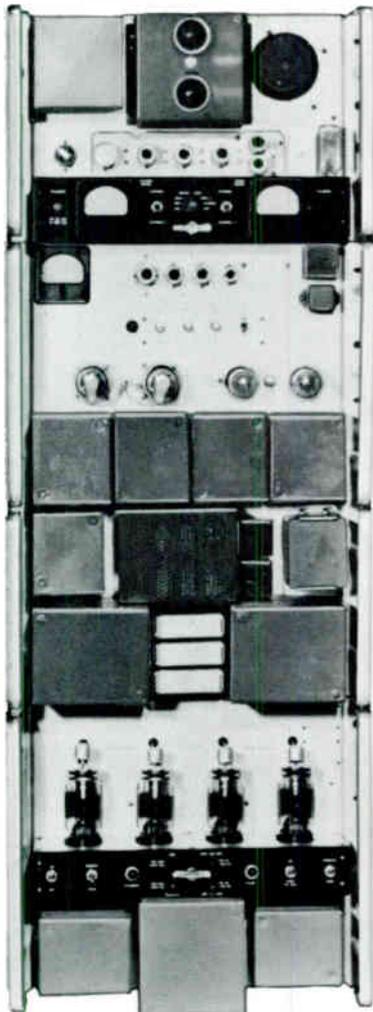
# ACCESSORY EQUIPMENT



242F-5CL



51M-8



242F-2

271B-3 SPEAKER

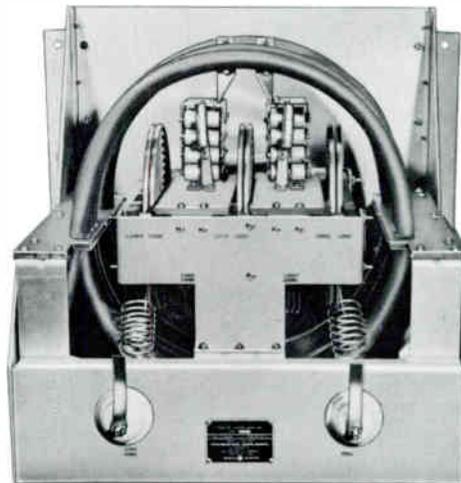


**271B SPEAKERS** — The 271B-3 is a dual speaker panel; the 271B-4, a single speaker panel. Each speaker has a 600-ohm-to-voice-coil-impedance matching transformer and a terminal board. *Size:* 19" W, 4" D and 7" H. 271B-3—6.3 lbs. 271B-4—4 lbs.

RACK TERMINAL PANEL



**RACK TERMINAL PANEL**—Contains 15-amp circuit breaker and rack wiring terminal block. 19" W, 3" D, 7" H. 3½ lbs.



512B-2

**512B-2 HF IMPEDANCE CONVERSION UNIT** — For coupling a transmitter 52 ohm unbalanced RF output with a 300-600 ohm balanced transmission line. 512B-2 may be used with transmitters with powers up to 3 kw AM or 10 kw PEP single sideband and with frequencies between 2 and 30 mc. No tuning or adjusting is necessary because the 512B-2 is broadband. When terminated by a 600 ohm balanced resistive load, coupler will contribute no more than 2:1 SWR from 2-30 mc. *Size:* 23" W, 22⅞" D and 20¾" H. *Weight:* 75 lbs.

## ACCESSORY EQUIPMENT

(continued from page 59)



270G-3

**270G-3 CABINET-SPEAKER** — This unit consists of cabinet and 10" PM speaker, 6-8 ohm impedance voice coil, 8 watts. It is attractively finished to match 51J-4 and 75A-4 Receivers. *Size:* 15" W, 9 $\frac{1}{8}$ " D and 10 $\frac{5}{8}$ " H. *Weight:* 12 $\frac{1}{2}$  lbs.



RECEIVER CABINET

**RECEIVER CABINET** — Houses 19" x 10 $\frac{1}{2}$ " panels, such as 51J-4 and 75A-4 Receivers. St. James gray wrinkle finish, Part No. 505 5959 003. *Size:* 21 $\frac{1}{8}$ " W, 13 $\frac{1}{8}$ " D and 12 $\frac{1}{4}$ " H. *Weight:* 20 lbs.

**619F CABINETS** — Flexible mounting enclosures with choice of door types. Mounting channel may be positioned for flush or recessed mounting or both. *619F-2:* 22" W, 19 $\frac{1}{2}$ " D, 76 $\frac{1}{8}$ " H. *Mounting Space:* 19" W, 18" D, 70 $\frac{1}{8}$ " H. *Weight:* Approximately 150 lbs. *619F-6:* 22" W, 19 $\frac{1}{2}$ " D, 48 $\frac{1}{8}$ " H. *Mounting Space:* 19" W, 18" D, 42 $\frac{1}{8}$ " H. *Weight:* Approximately 100 lbs.

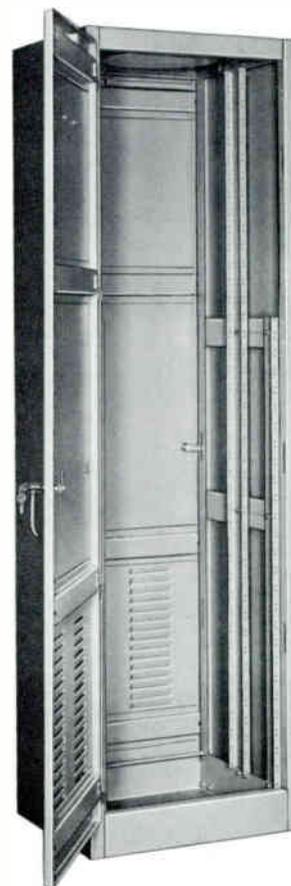
**619J-4 EQUIPMENT RACKS** — Utilize 6" wide aluminum channels. Tapped for standard 19" rack mounting equipments. *Size:* 18" D, 20 $\frac{1}{2}$ " W, 86 $\frac{1}{8}$ " H. *Weight:* 80 lbs.

**512D-1 HF IMPEDANCE CONVERSION UNIT** — This bilateral device converts transmitter output from either 50 to 600 ohms or 600 to 50 ohms, rated up to 50 kw. Unit is broadband over 4 to 30 mc range. *Size:* 37" W, 16" D and 74" H. *Weight:* 200 lbs. Also available in 2-package form (See 512F-1 Coaxitran and 512G-1 Exponential Line Kit descriptions).

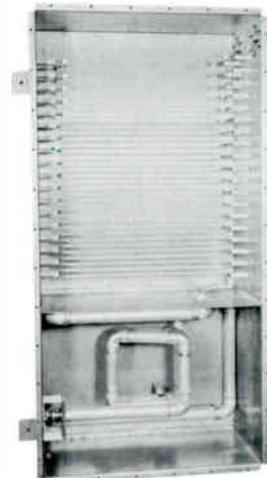
**512F-1 COAXITRAN** — An impedance changing transformer with a 50 ohm unbalanced input and 200 balanced output. Power rating up to 50 kw with SWR of less than 1.5:1 at most frequencies. *Frequency Range:* 4-30 mc. *Size:* 24" W, 16" D, 37" H. *Weight:* 90 lbs.

**512G-1 EXPONENTIAL LINE KIT** — Includes the precut conductors, insulators, spacers and mounting hardware for constructing an 80 foot exponential line with a 200 ohm balanced input and 600 ohm balanced output. *Frequency Range:* 4 to 30 mc.

619F-2



619J-4



512D-1

# LOG PERIODIC ANTENNAS

The 237A Unidirectional HF Antennas are extremely broadband structures for use in high-frequency communication systems. They belong to the Logarithmically Periodic class of antennas for which the radiation patterns and impedance characteristics are essentially independent of frequency.

The 237A-1 covers a frequency range of 6.5 to 60 mc; the 237A-2, 11.1 to 60 mc; and the 237A-3, 19.0 to 60 mc. They provide a horizontally polarized unidirectional beam with a gain of 8 db over an isotropic antenna.

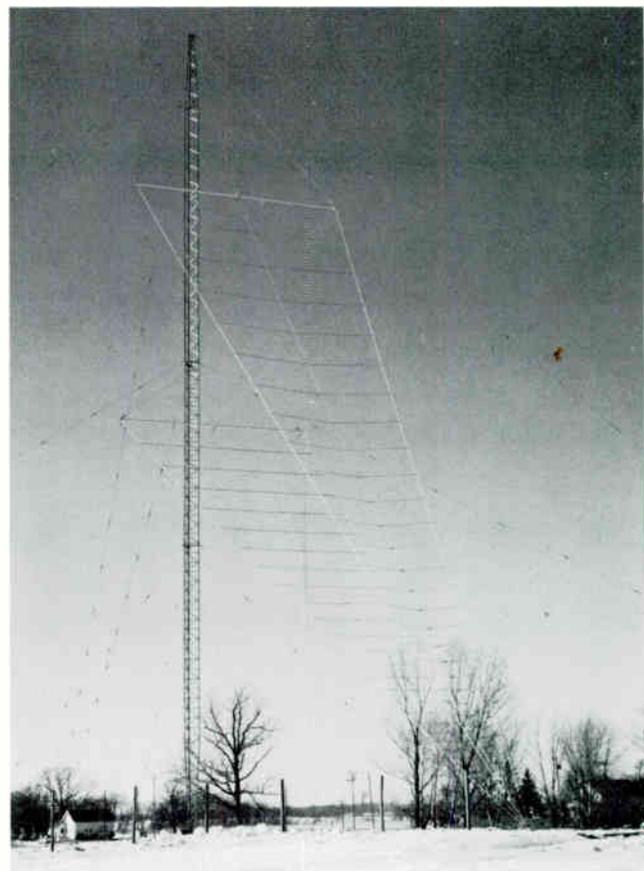
The antennas may be mounted on a rotatable pipe mast for multidirectional applications. The rotator at the base of the mast consists of a power unit and a rotating coaxial joint. The unit is mounted between two poles or towers which aid in erecting the structure without crane or derrick as well as provide a solid permanent support for the structure. *Power Handling Characteristics:* 25 kw, average; 50 kw, peak. *VSWR:* Less than 2:1 at input over the full frequency range. *Free Space Half-Power Beamwidths:* Average value, azimuthal plane — 65°, vertical plane — 90°. *Input:* 52 ohm, 3 1/8" coaxial line. *Wind and Ice Loading:* 80 mph wind with 1/4" radial ice. *Rotation:* 1 rpm motor, reversible, with directional indicator system.

The 237E is also a horizontally polarized log periodic antenna for point-to-point applications between 1320 km and 1850 km. The 237E-1 covers a frequency range of 7.5-60 mc and the 237E-2, 11-60 mc.

The 237N Antenna is a vertically polarized, unidirectional log periodic type with a gain of 4 db over a quarter wave monopole. Azimuth beam width is 150°. VSWR is less than 2:1, over the frequency range. Impedance is 50 ohm unbalanced. The 237N-1 covers a frequency range of 2-30 mc; the 237N-2, 4-30 mc; and the 237N-3, 4-20 mc.



237A



237E

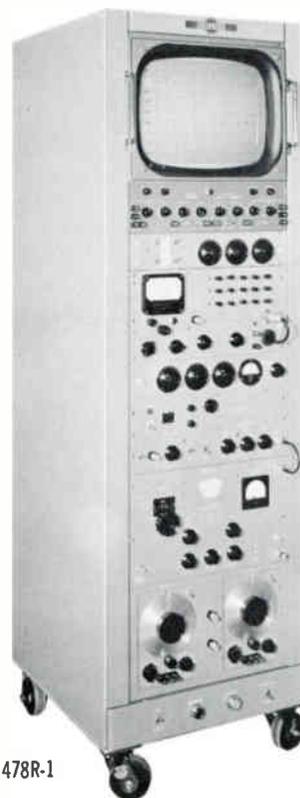
Antennas	Frequency (mc)	Longest Element	Tower Height
237A-1	6.5-60	70'	52.5'
237A-2	11.1-60	46.8'	41'
237A-3	19.0-60	28.1'	24.5'
237E-1	7.5-60	60'	225'
237E-2	11.0-60	41'	180'
237N-1	2.0-30	—	160'
237N-2	4.0-30	—	75'
237N-3	4.0-20	—	75'



237N

# SPECTRUM ANALYZER

**478R-1 SPECTRUM ANALYZER** — The 478R-1 provides rapid and direct visual spectrum plots of amplitude versus frequency, with high resolution and low intermodulation distortion. Applicable to all emission modes. Dynamic range is 70 db or greater, displayed on one scale to an accuracy of  $\pm 1$  db. Signal levels of 20 millivolts rms are used as zero db reference. It may be used to make simultaneous measurements of hum, distortion, noise and other spurious products in a direct plot of db level versus frequency. Permanent data for engineering reports may be provided by using an accessory two-axis recorder. *Input Frequency Range:* 2 to 64 mc and 250 to 300 kc. Other ranges with external injection. *RF Input Voltage Range:* .02 to 3 v rms for 0 db reference level. 70 db dynamic range. RF signals below 6 uv may be detected. *Scanning Bandwidths:* 4, 8 or 16 kc. *Scanning Time:* 2 to 60 sec. Manual scanning may be employed. *Resolution:* 60 cps sidebands can be separated from the carrier frequency throughout the full range. A 4 kc bandwidth and long-persistence tube provide extremely sharp resolution at slow sweep speed. *Calibration Accuracy:* Vertical — Within  $\pm 1$  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. *Primary Power:* 115 v, 60 cps, 1200 va. *Size:* 22" W, 26" D, 69" H. *Weight:* 600 lbs.



478R-1

# REMOTE CONTROL EQUIPMENT

**177G-10 REMOTE CONTROL UNIT** — Complete remote control for the 16F-14 Transmitter. Uses two cable pairs and ground with control loop resistance not exceeding 1000 ohms or line loss not exceeding 25 db. *Size:* 19" W, 9 $\frac{1}{2}$ " D and 10 $\frac{1}{2}$ " H. *Primary Power:* 115 v, 50/60 cps, 25 watts. *Weight:* 30 lbs.

**177L-2 REMOTE CONTROL UNIT** — Used for remote control of 30K-5 and 242F-2 Transmitters. Interconnection requires two telephone line pairs and a ground with single loop

resistance which does not exceed 125 ohms and line loss which does not exceed 25 db. *Size:* 17 $\frac{1}{4}$ " W, 7 $\frac{7}{8}$ " D and 7" H. *Weight:* 12 lbs.

**177M-1 REMOTE CONTROL UNIT** — For remote operation of 432D-2. Requires four telephone lines and ground with audio line loss not more than 25 db, keyline loop resistance not more than 1000 ohms. *Size:* 21 $\frac{1}{8}$ " W, 11" D and 10 $\frac{7}{8}$ " H. *Primary Power:* 115 v, 50/60 cps, 35 watts. *Weight:* 31 lbs.



177M-1



177G-10



177L-2



COLLINS **transhorizon**  
systems

# 1,000 MC SYSTEMS

**240D 10 KW POWER AMPLIFIERS** — The 240D-1 provides a 10 kw FM output in the 755-985 mc frequency range. The 240D-2 provides a 10 kw output power in the 400-550 mc range. The 310K Exciter-Modulator may be used to supply the drive requirements for the 240D-1. *Output Impedance:* 50 ohms. *Drive Power:* 0.1 watts nominal, for 240D-1; 12 watts for 240D-2. *Residual AM:* More than 50 db below carrier. *Harmonic Output:* Following low pass filter, all spurious and harmonic output frequencies are at least 83 db below carrier level. *Primary Power:* 208 v  $\pm 10\%$ , 60 +3 -10 cps, 3 phase, 45 kva.

**240E-2 1 KW POWER AMPLIFIER** — Operates in the 755-985 mc frequency range with output power of 1 kw nominal or 2 kw maximum. Minimum gain is 30 db at a bandwidth of 2 mc. May be driven by 310K Exciter-Modulator. *Output Impedance:* 50 ohms. *Drive Power:* 3 watts nominal. *Residual AM:* More than 50 db below carrier. *Harmonic Output:* Following low pass filter, all spurious output at least 83 db below carrier level. *Primary Power:* 208 v, +3 -10 cps, 3 phase, 4 wire, 8 kw with 2 kw output, 6 kw with 1 kw output.

**651C SERIES RECEIVERS** — Will accommodate up to 24 voice channels with dual diversity reception on any frequency in the 755-985 mc range. Type numbers and channel capacities in this series are: 651C-1, 24 channels; 651C-2, 4; and 651C-3, 12. Two 651C Receivers may be paralleled for quadruple diversity operation. *Noise Figure:* 8 db or better. *Spurious Response:* 60 db down except 1st injection image, which is 45 db. *Input Impedance:* 50 ohms. *Output Impedance:* 600, 270 or 135 ohms. *Primary Power:* 120 v, 60 +3 -10 cps, 975 va.

**310K-2, -3 EXCITER-MODULATORS** — The 310K provides a phase modulated output in the 755 to 985 mc range for driving 240D-1 or 240E-2 Power Amplifiers. The modulator baseband extends from 250 cps to 112 kc. Adjustable power output level is 10 watts nominal into a 50 ohm load. A baseband level panel for use at relay stations is included in the 310K-2. *Frequency Stability:*  $\pm .001\%$ , 0° to 45°C. *Emission:* CW or FM. *Maximum Deviation:*  $\pm 336$  kc. *Frequency Response:*  $\pm 1$  db. *Channel Capacity:* 1 to 24, depending on

multiplex terminal equipment. *Modulation Input Impedance:* 600 or 135 ohms balanced or single ended. *Modulation Input Level:* -20 dbm or less per channel. *Incidental FM:* 75 db below maximum deviation. *Spurious Output:* More than 60 db below the carrier level. *Power Input:* 120 v, 50/60 cps, 600 va.

**537J AIR INFLATABLE ANTENNAS** — A 15 foot parabolic antenna for transportable Transhorizon systems. The 537J-1 is used in the 755 mc to 985 mc range; the 537J-2 in the 1700 mc to 2400 mc range; and 537J-3 in the 350 mc to 600 mc range. Each can be roof mounted or provided with an auxiliary guyed tower which elevates the axis of the antenna to a maximum height of 22½ ft. Track rings allow full 360° azimuth adjustment. A self-contained blower inflates the reflector in 15 minutes and automatically maintains proper pressure. An accessory erection kit is available to facilitate installation. *Power Gain:* Above an isotropic antenna in 350 mc to 600 mc range, 22 db; in 755 mc to 985 mc range, 29 db; and in 1700 mc to 2400 mc range, 36 db. *Horn Power Rating:* One kw continuous. *Wind Loading:* 100 mph.

**137Q ANTENNAS** — Utilize an easily erected 8 section, 15 foot diameter paraboloid reflector. Choice of tower assemblies provides a reflector center height of 34', 26'5", 18'10" or 11'3". An accessory erection kit facilitates installation. 137Q-1 — antenna only; Q-2 antenna and tower; Q-3 antenna and tower with remote azimuth control. *Frequency Range:* 755-985 mc. *Power Gain:* 29 db over isotropic antenna. *Horn Power Rating:* 15 kw (limited by transmission line). *Wind Loading:* 100 mph.

**35R-1 COAXIAL BRANCHING FILTER** — The 35R-1 consists of two 3½" coaxial line rejection notch filters joined by a coaxial T-section for isolation of receiver and transmitter on a common antenna. *Frequency Range:* 755 mc-985 mc. *Power Rating:* 10 kw maximum; 2.5 kw with less than 100 mc receiver-transmitter spacing. *Passband Width:* 7.0 mc or greater. *VSWR:* 1.15 maximum. *Passband Insertion Loss:* 0.2 db maximum. *Performance:* Rejection notch not less than 50 db over 7 mc bandwidth. *Terminations:* 50 ohms.

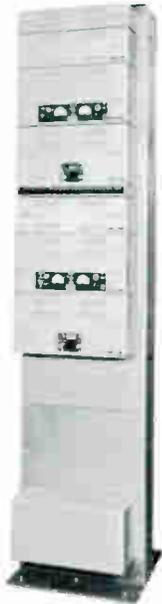
**35Q-1 COAXIAL BANDPASS FILTER** — The four section 35Q-1 will supply additional bandpass filtering between the receiver and branching filter. Connectors for 50 ohm, 1½" rigid coaxial line. An adapter is available for connection to 3½" line. *Frequency Range:* 755-985 mc. *Power Rating:* 250 watts. *Passband:* 7.0 mc or greater. *VSWR:* 1.15 maximum. *Insertion Loss:* 0.2 db maximum. *Performance:* Rejection not less than 50 db at 60 mc removed from pass frequency.

	Type	Dimensions (inches)			Weight lbs.		Type	Dimensions (inches)			Weight lbs.
		W	D	H				W	D	H	
Power Amplifier Rectifier Cabinet Heat Exchanger	240D-1, -2	116 32 50	34 20½	78 78 72	8700 (total)	Air Inflatable Antenna tower mounted	537J-1, -2, -3	71 cu. ft.**			600
Power Amplifier	240E-2	75½	1/16 34	78	2600	15' Antenna	137Q-1	164 cu. ft.**			552
Diversity Receiver	651C-1, -2, -3	20½	18	86¾	425	15' Antenna & Tower	137Q-2	230 cu. ft.**			1332
Exciter-Modulator	310K-2	19	7	80½*	227*	15' Antenna Tower & Control	137Q-3	225 cu. ft.**			1402
Exciter-Modulator	310K-3	19	7	68¼*	202*	Erection Kit					190
Air Inflatable Antenna roof mounted	537J-1, -2, -3	60 cu. ft.**			400	Coaxial Branching Filter	35R-1	65	73	5	160
						Coaxial Bandpass Filter	35Q-1	39½	6½	6	26

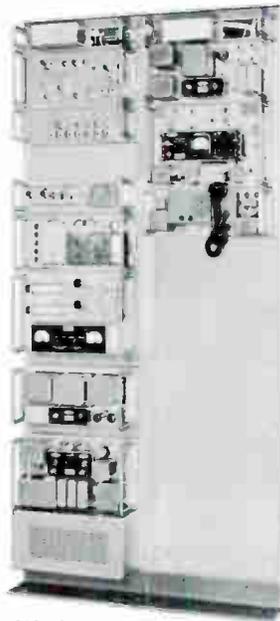
\*Excluding rack. \*\*Storage volume.



240D-1



651C-1



310K-2



240E-2



35Q-1



35R-1



537J-1



137Q-2

# 2,000 MC SYSTEMS

Recent developments resulting from Collins Transhorizon research include a complete line of equipment for the 1700-2400 mc frequency range. This equipment is equally applicable to Transhorizon or line-of-sight communication systems. Unit type construction permits maximum system flexibility. High-density voice carrier operation or high definition TV transmission may be utilized.

**310T-2A FM EXCITER** — Provides a crystal controlled, phase-modulated signal in the 1700-2400 mc frequency range. The minimum 500 milliwatt power output is adjustable over a range that allows optimizing the driving level when a power amplifier is used. The exciter consists of two rack mounted units: T310-1 Modulator-Multiplier having a 70 mc modulated signal output and T310-2 UHF converter-amplifier which heterodynes the 70 mc signal to the 1700-2400 mc band. Up to 132 frequency division multiplexed 4 kc channels plus order wire can be transmitted by the 310T-2A. Integral metering circuits are provided, and units are mounted on articulated hinges giving complete rear accessibility to facilitate maintenance. Each unit is equipped with self-contained power supplies, and provision is made for air cooling all heat dissipating components. *Peak Frequency Deviation: ±672 kc. Incidental FM Noise Level: 19 dba maximum. Intermodulation Distortion Level: 19 dba maximum. Multiplex Frequency Response: ±0.5 db, 4-552 kc. Order Wire Frequency Response: +1.0, -2.0 db, 300 cps to 12 kc. Operating Ambient Temperature: -40° C. to +55°C. Line Voltage: 105-125 v, 47-420 cps, 1 phase, 2 amps.*

**50Q-2 FM RECEIVER** — A crystal controlled, double conversion FM receiver for operation in the 1700 to 2400 mc frequency range. The 50Q-2 uses a Collins developed technique called Automatic Bandwidth Control for significantly reducing the threshold signal level while maintaining the advantages of a conventional FM receiver. IF modules may be selected for operation with up to 132 frequency division multiplexed 4 kc channels. Several receivers may be operated in diversity by simple parallel connection. Integral metering circuits are included. All heat dissipating components are air cooled. *Noise Figure: 8 db. Automatic Bandwidth Control Range: 7 db. Incidental FM Noise Level: 19 dba maximum. Multiplex Frequency Response: ±0.5 db, 4-552 kc. Order Wire Frequency Response: ±1.0 db, 300-3500 cps. Operating Ambient Temperature: -40°C to +55°C. Line Voltage: 105-125 v, 47-420 cps, 1 phase, 4.5 amps.*

**240F-2A POWER AMPLIFIER** — Has a nominal 1 kw CW output over the 1700 to 2400 mc range. A Varian VA-802, four cavity aircooled klystron with permanent magnet focusing, provides a 50 db gain with a bandwidth of 3.0 mc when synchronously tuned and a 40 db gain with a bandwidth of 5.5 mc when stagger tuned for a maximum efficiency. The Collins 310T-2A is normally used to supply excitation requirements. Front panel metering of major functions facilitate adjustment and operation. All operating controls, with the exception of output coupling, are located on a front control panel. Protective circuits remove all klystron voltages in the event of cooling air failure or power supply malfunction. Body and beam current overload protection is also provided. Calibrated directional couplers are included on both RF in-

put and output lines. Frequency of operation may be easily changed by retuning the four cavities for maximum power output. *Driving Power: 100 mw max. Freq. Stability: .001% when driven by 310T-2A Exciter. Beam Efficiency: 30% min. Cooling: Forced air. Temp. Range: -18°C to +45°C. Primary Power: 208 v, ±10%, 400 cps, 4 wire, 5 kva with 1 kw output.*

**240F-2B UHF POWER AMPLIFIER** — Provides an output power level of 1 kw over a continuous tuning range of 1700-2400 mc for fixed station applications. A Varian VA-802, four cavity, forced air cooled, klystron amplifier is employed. This tube provides a minimum power gain of 45 db when synchronously tuned and 35 db when tuned for maximum efficiency. The synchronously tuned condition provides a bandwidth of approximately 2.5 mc. When tuned for maximum efficiency, a bandwidth of approximately 5 mc is obtained. The 240F-2B consists of a meter panel, klystron unit, power supply compartment and cabinet. The meter panel and klystron unit are designed as plug-in units and are readily removable for maintenance or replacement. All input and output connections are made at the top of the cabinet. *UHF Power Input: 500 mw, maximum. Spurious Output: 80 db below carrier level. Primary Line Voltage: 208 v ±10%, 3 phase, 4-wire. Primary Line Frequency: 47 to 63 cps. Primary Power Requirement: 3900 watts, 0.8 pf. Weight: 500 lbs.*

**900B-1 DEVIATION AND LEVEL MONITOR** — Intended for use in making frequency deviation and level adjustments in the AST-102 Tropospheric Communications Terminal. The 900B-1 has switch-selected positions that permit monitoring five frequency deviation adjustments and seven level adjustments. All monitoring paths are provided through switches to a single panel meter which indicates normal operation by a single red line indicator. The 900B-1 mounts in a standard 19-inch relay rack and contains an articulated hinge to facilitate maintenance. *Carrier Input Frequency: 70 mc. Carrier Input Level: 0 dbm into 50 ohms. Test Tone Frequency Range: 300 cps to 30 kc. Test Tone Input Circuit Impedance: Approximately 10,000 ohms. Line Voltage: 120 v ac ±10%, single phase. Line Frequency: 47 to 420 cps. Primary Power Requirements: 55 watts. Weight: 16 lbs.*

**40P-1 FREQUENCY STANDARD** — A self-contained frequency standard, including power supply and frequency dividers, for use on applications requiring a high degree of short term and long term frequency stability. The characteris-

	Type	Dimensions (inches)			Weight (lbs.)
		W	D	H	
FM Exciter	310T-2A	19	7	26¼*	68.5
FM Receiver	50Q-2	19	7	46½*	133.0
Power Amplifier	240F-2A	24	24	52	340
Power Amplifier	240F-2B	24	24	64	500
Dev./Lev Monitor	900B-1	19	7	7*	16
Freq. Standard	40P-1	19	7	5¼*	20
Freq. Synth.	708E-1	19	7	10½*	31

\*Excluding rack.



240F-2B



900B-1



50Q-2



310T-2A



708E-1

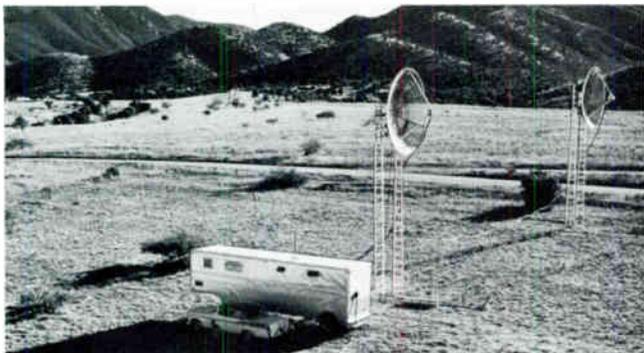


40P-1

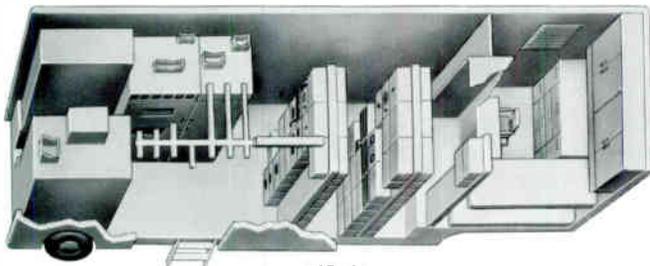
tics of the 40P-1 Frequency Standard are well suited to the requirements of scatter communications equipment for tactical applications. The equipment also is flexible enough so that output frequencies other than those specified can be obtained by replacing plug-in modules. *Output:* 12.5 kc, 125 kc, or 1.25 mc each with 3 outputs of 1 v into 50 ohms. *Line Voltage:* 120 v ac,  $\pm 10\%$ , single phase. *Line Frequency:* 47 to 420 cps. *Primary Power Requirements:* 55 watts. *Weight:* 20 lbs. *Stability:* Long term—1 part/ $10^6/6$  months; Short term—3 parts/ $10^8/2$  microseconds to 5 milliseconds.

**708E-1 FREQUENCY SYNTHESIZER**—Generates 1,000 different output frequencies separated by 12.5 kc in the range from 22.6375 to 35.125 mc. The output signal is generated from three input signals at 12.5 kc, 125 kc and 1.25 kc. These input frequencies are obtained from the 40P-1 Frequency Standard. The output frequency selection controls are calibrated in channels from 000 to 999 and any one of the available output frequencies may be selected without the use of tools or external test equipment. *Output Level:* 50 mw into 50 ohms. *Spurious Output:* -60 db. *Line Voltage:* 120 v ac,  $\pm 10\%$ , single phase. *Line Frequency:* 47 to 420 cps. *Primary Power Requirements:* 120 watts. *Weight:* 31 lbs.

## TRANSPORTABLE SYSTEMS

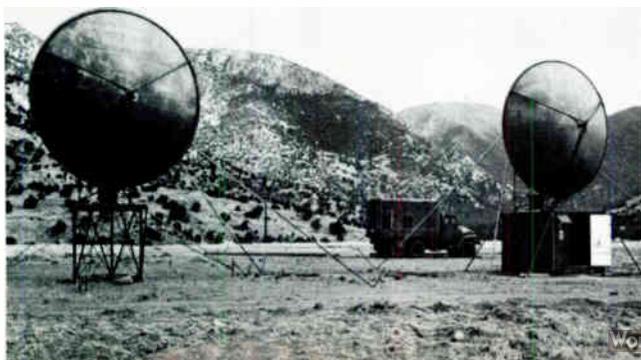


**GROUND TRANSPORTABLE TST-101-201** — The TST-101 Transhorizon Terminal, capable of 1 kw transmission and dual diversity reception in the 755-985 mc range, is transported by two semi-trailers. A flat-bed trailer carries two disassembled antennas, generator and fuel tank. Equipment includes 240E-2 Power Amplifier, 310K-3 Exciter-Modulator, 50G UHF Receivers, Multiplex, 137Q-3 Antennas, Duplexers and HF units. The TST-201 provides 10 kw power output and consists of the van with 240D-1 Power Amplifier replacing the 240E-2. Antenna and power facilities are additional for TST-201. *Size:* Van—8' W, 31' L, 11'3" H. Flat-bed—8' W, 24' L, 12½' H (loaded). *Primary Power:* TST-101—Generator supplied. TST-201—208 v  $\pm 10\%$ , 3 phase, 4 wire, 60 +10 or -3 cps; 62.5 kw max. power. 208 v, single phase, 60 cps, reg. at 1.5 kva. *Loaded Weight:* TST-101—Van, 23,000 lbs.; flat-bed, 17,240 lbs. TST-201—Van, 30,000 lbs.

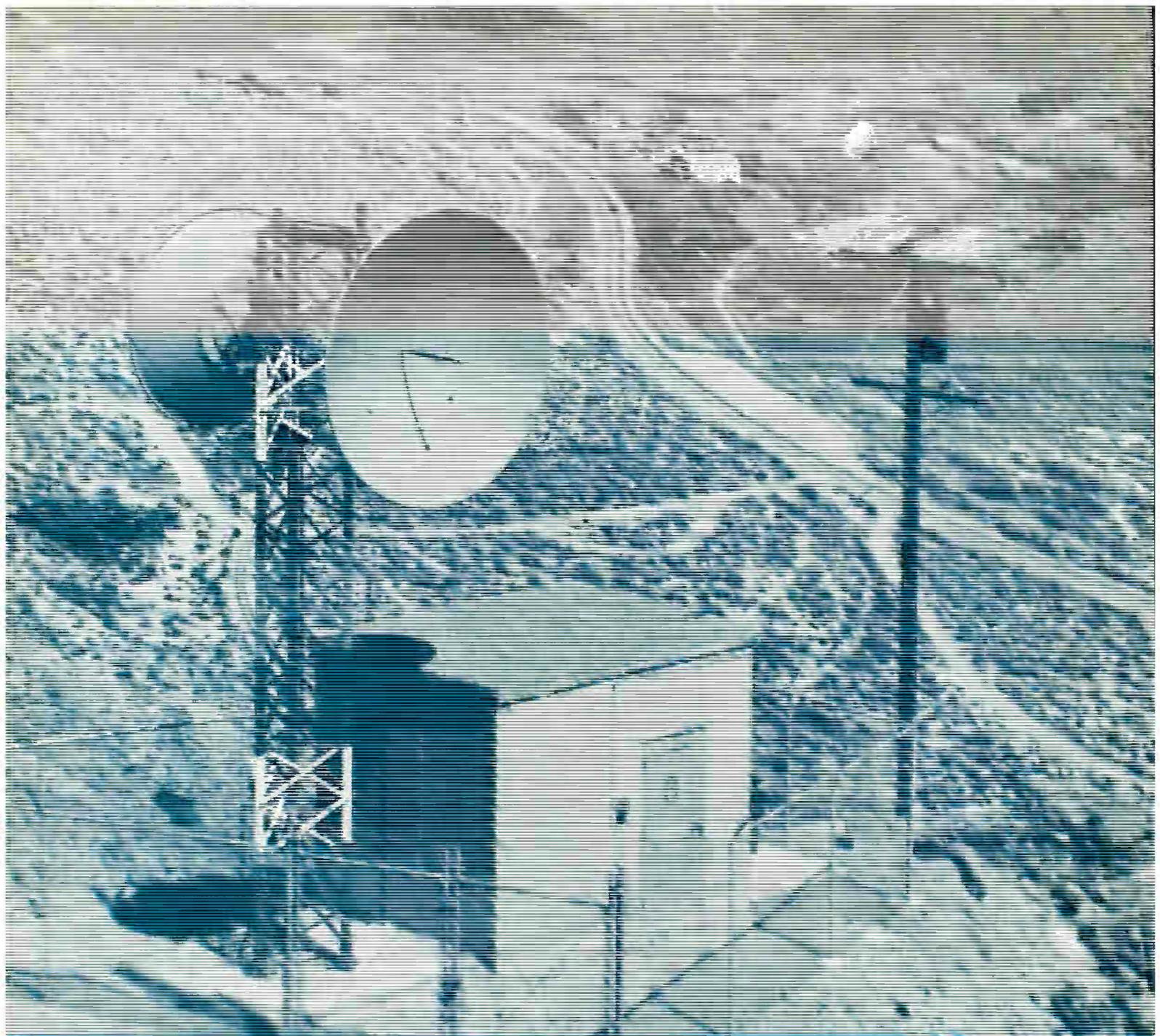


TST-101

**AIR TRANSPORTABLE AST-102** — A versatile 1 kw Transhorizon terminal employing diversity reception in the 1700-2400 mc frequency range. It is completely self-contained in a single light weight shelter that can be transported by cargo aircraft, helicopter or truck. The air inflated parabolic antennas have a 360° rotational range for siting and be stored in the shelter during transit. A bi-polarized feed horn is employed. One antenna is roof mounted and the other is located on a tower, with the receiver RF unit an integral part of each antenna. Equipment contained in the shelter includes a 50Q-2 FM Receiver, which utilizes Automatic Bandwidth Control for improved threshold level, 310T-2A FM Exciter, a 1 kw klystron RF amplifier and provision for AN/TCC-3 or AN/TCC-7 Multiplex. If desired, the exciter output may be connected directly to the antenna for line-of-sight applications. *Size:* 82½" W, 103" L, 83½" H. *Weight:* 4,000 lbs.



AST-102



COLLINS **microwave**  
**systems**

# RF SYSTEMS

Collins toll-quality radio relay systems provide a reliable, economic mode of transmission of multichannel (up to 240) voice signals or wideband TV signals in the common carrier, industrial, and government frequency bands from 5925 to 8500 mc. The high channel capacity message circuit systems have a baseband extending from 200 cps to 2 mc per sec. The wideband TV systems have a baseband extending from 50 cycles to 6 mc. Four types of message circuit systems are available for the optimum degree of circuit reliability consistent with economic considerations. These are listed below. Hot and cold standby options are available for TV systems.

**Q LINE SYSTEM** — The Q Line offers reliable, economical, high density communication with utmost simplicity for systems which will not require future expansion to switchover or standby operation. Units are identical to those employed in standard microwave systems.

**NON-STANDBY SYSTEMS** — A single transmitter and receiver at each terminal station and two each at a repeater station, together with power supplies and associated equipment, comprise this system. If improved circuit reliability is desired at some future time, this configuration may be expanded to include standby or diversity functions.

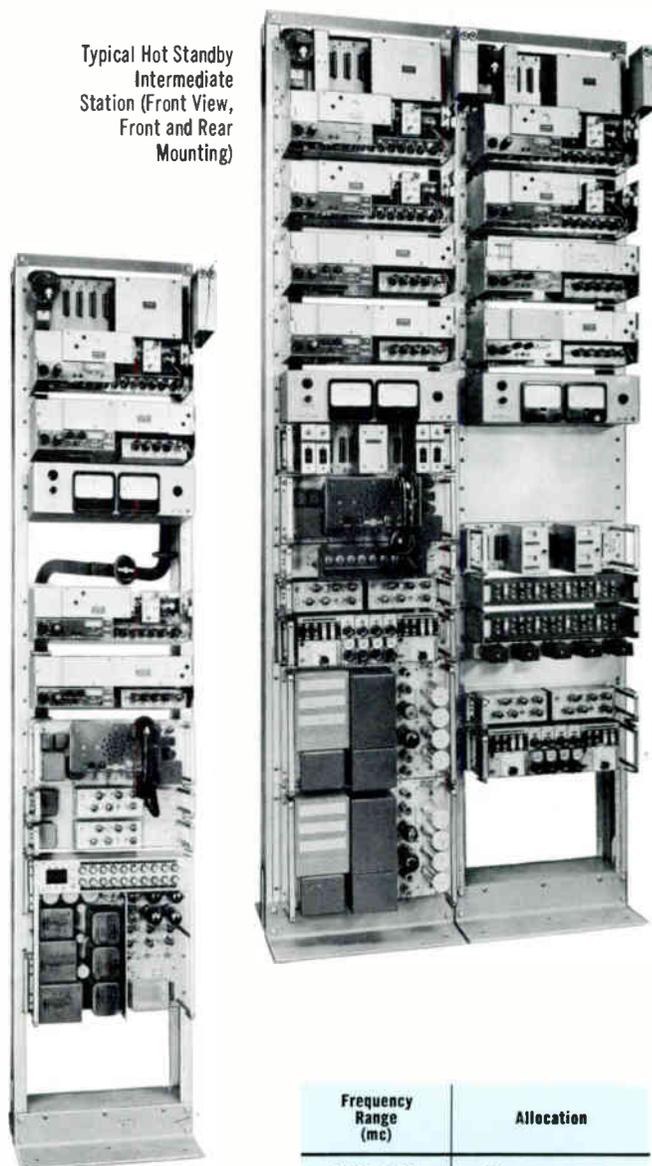
**HOT STANDBY SYSTEMS** — A duplicate group of RF and power supply units is included for protection against communication outages from equipment failure. Both main and auxiliary units are constantly energized and fully operating, permitting rapid switchover in the event of circuit failure. Solenoid-operated capacitive de-tuning stubs are used to switch from main to standby equipment. Switching is initiated by the absence of a 100 cycle tone at the transmitter or receiver sensing detector. The 100 cycle sensing signal is supplied by an oscillator in the transmitter. Maintenance may be performed on the equipment at any time without interruption of service.

**DIVERSITY SYSTEMS** — Maximum reliability is achieved by frequency or space diversity operation in which reception on different frequencies or over two separate signal paths is employed. Without the use of relays, the electronic receiver-output combiner provides a signal-to-noise ratio always equal to or better than that of the best path. With equal signal-to-noise ratio from each receiver, the combined signal-to-noise ratio will be improved 3 db. The combining technique eliminates any delays inherent in a diversity switching method, making the Collins system ideally suited for high speed data handling circuits.

Each equipment configuration is a functionally complete RF system including all transmitting, receiving, power and control equipment necessary for operation from either an ac or dc power source. Additional coupling and accessory equipment is available for special applications.

*Power Output:* 100 mw at the waveguide stack (input to antenna). *Transmitter Frequency Stability:* 0.05% (0.01% with AFC). *Type of Modulation:* FM. *Nominal Deviation:* ±3.0 mc. *Receiver Tangential Threshold Sensitivity:* -118 dbw. *Receiver Noise Figure:* 14 db, including preselector filter. *Receiver Intermediate Frequency:* 60 mc. *IF Bandwidth:* 15 mc at 3 db points. *Receiver Frequency Stability:* 0.05%. *Ambient Temperature Range:* 0° to +140°F. *Maximum Relative Humidity:* 95%. *Maximum Altitude:* 20,000 feet. *Power Source:* 115 v, 50/60 cps or 130 v dc. *Type of Service:* Continuous, unattended operation. *RF Duplexing:* Simultaneous, full duplex, two way communication through a common antenna utilizing waveguide filters and tuned stubs.

Typical Hot Standby Intermediate Station (Front View, Front and Rear Mounting)



Q Line Terminal Station

Frequency Range (mc)	Allocation
5925 - 6425	Common Carrier
6575 - 6875	Operational Fixed
6875 - 7125	Auxiliary Broadcast
7125 - 7650	Government

# VOICE CARRIER MULTIPLEX

Upper or lower single sideband suppressed carrier techniques are employed to combine up to 240 individual voice channels to produce a composite baseband signal using frequency division techniques for simultaneous transmission and reception over the microwave RF systems. All power supplies, frequency generating and synchronization equipment, and control circuits associated with these functions are included. Terminating units connect channel equipment with incoming and outgoing telephone or other communication circuits and provide optional facilities for keying and detecting signaling tones. Channels may be dropped or added at repeaters by bridging onto the baseband.

The system conforms to CCIF standards and is fully compatible with established practices employed in long-haul toll telephone plants.

The incoming audio signal is combined in one of 12 channel modulators, each having a carrier injection frequency which places the channel in the proper position in its associated base group. The carriers are spaced at 4 kc intervals. Each SSB channel thus occupies a 4 kc space in the base group, and the base group occupies the frequency band from 60 to 108 kc.

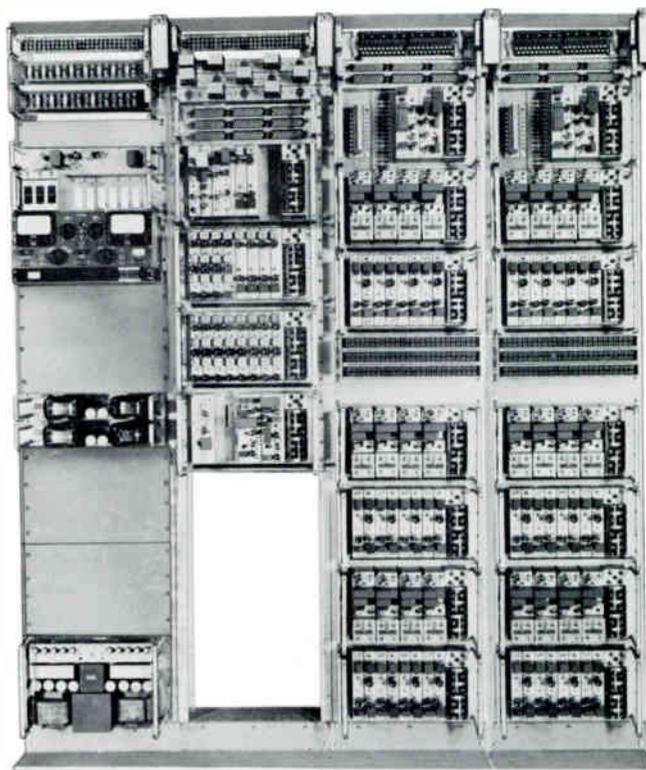
Five base groups are modulated with 5 carrier injection frequencies: 420 kc, 468 kc, 516 kc, 564 kc and 612 kc. The resulting basic supergroup occupies the band from 312 to 552 kc and consists of 60 voice communication channels.

In a 120-channel system, there are normally two such 60-channel supergroups. One supergroup (312-552 kc) is combined with a 612 kc carrier injection frequency in the supergroup SSB modulator, translating the supergroup to the 60-300 kc portion of the baseband and thus obtaining supergroup I. Supergroup II retains its frequency allocation, passing through combining circuits to the 312-552 kc position on the baseband.

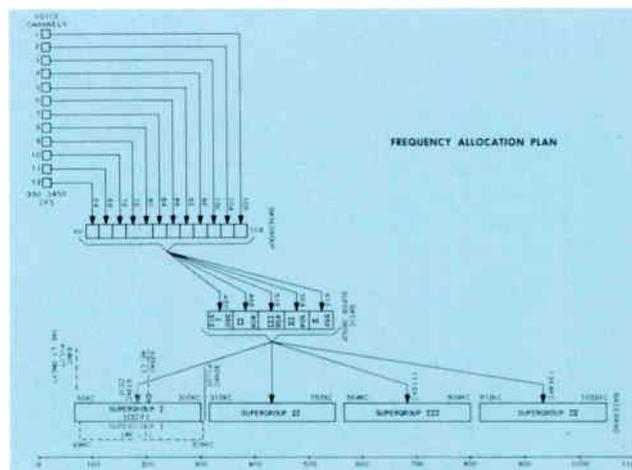
A 48-channel system would require only those modules enabling it to utilize base groups 1, 2, 3 and 4, and supergroup II. A 240-channel system is achieved by adding two more supergroups to the 120-channel system. One of these (312-552 kc) is combined with an 1116 kc carrier injection frequency, translating the supergroup to the 564-804 kc portion of the baseband. Supergroup IV is derived in the same manner except a 1364 kc carrier injection frequency is used, translating the supergroup (312-552 kc) to the 812-1052 kc portion of the baseband. A 480-channel system likewise requires additional supergroups derived in the same manner.

The Collins building block design makes possible a wide variation of station configurations within a system or between systems for varied channel requirements. It facilitates expansion of equipment in the future. These systems utilize 8 foot or 11 foot, 6 inch racks. Articulated hinge mountings are available to mount units or shelves to which rear access may be needed, facilitating mounting on both sides of the racks. *Output Frequency Range:* 60-552 kc for 120 channels and 60-1052 kc for 240 channels (compatible with CCIF and U. S. standards). *Number of Carrier Channels:* From 1 to 480 full duplex voice channels can be provided. *AF Response:*  $\pm 2$  db, 350-3450 cps, without signaling.  $\pm 2$  db, 350-2800 cps, with signaling. *Idle Noise:* Maximum 23 dba on worst channel at 0 dbm level on back-to-back basis (average 17 dba). *Intermodulation:* Maximum 50 db notch-to-no-notch for loading of  $-15$  dbm per channel, between any two stations. *Standby Provisions:* Standby for all carrier units which are common to more than one channel is available. *Signaling:* Each channel

may be equipped for 3400 cps signaling, utilizing E & M or 20-cycle ringdown. *2/W Termination:* Impedance — 600 or 900 ohms  $\pm 10\%$ . Output level — Nominal 0 dbm. Input level — Nominal  $-6$  dbm. *4/W Termination:* Impedance — 600 or 900 ohms  $\pm 10\%$ . Input Level — Nominal 0 dbm. Output level — Nominal 0 dbm. *Frequency Error:* System fully synchronous with zero frequency error throughout. *Power Source:* 115 v, 50-60 cps, 3 kw (120 channels) ac, or 130/24 v dc battery. *Power Consumption:* Approximately 3,000 watts for 120 channel system.



Typical 24-Channel  
Voice Carrier Multiplex



# TEST EQUIPMENT



476A-1



477Z-1, -2

**476A-1 IF TEST SET** — Bench testing of IF amplifiers is greatly simplified by the 476A-1 Test Set. It provides a sweep signal and a detector for IF alignment and trouble shooting, and provides metering for first limiter grid current (2 levels), second limiter grid current, discriminator output voltage, AFC output voltage, and IF amplifier plate current and voltage. *Meter Sensitivity:* 10 ua full-scale. *Physical Dimensions:* 9" W, 7½" D, 7½" H. *Weight:* 5 lbs. *Primary Power:* 115 v ac.

**477Z-1, -2 DEVIATION CALIBRATORS** — With this test equipment, receiver deviation sensitivity measurements, system deviation adjustments, and IF amplifier bench tests are easily accomplished. The calibrators supply a standard deviation frequency modulated test signal, and unmodulated test signals at the IF frequency and at frequencies approximately 2.8 mc on each side of the IF. Test signals are harmonically derived from a crystal controlled pentode oscillator. The modulation signal is a 1000 cps square wave derived from a multivibrator. The 477Z-1 and 477Z-2 are used with 60 mc and 70 mc IF amplifiers respectively. *Output Frequencies:* Unmodulated — (477Z-1) 57.14 mc, 60 mc, 62.86 mc; (477Z-2) 67.2 mc, 70 mc, 72.8 mc. Modulated — FM carrier at intermediate frequency modulated by a square wave for 5.72 mc peak to peak deviation in the 477Z-1, 5.60 mc in the 477Z-2. *Signal Output Level:* HI — -10 dbm, fixed; LO — -40 dbm, fixed. *Output Impedance:* 50 ohms, unbalanced. *Size:* 9" W, 7½" D, 7½" H. *Weight:* 7 lbs. *Primary Power:* 115 v ac, 20 watts.



476B-1

**476B-1 SIGNAL-TO-NOISE TEST SET** — Signal-to-noise and intermodulation distortion measurements over microwave systems can be readily taken with the Collins 476B-1 Signal-to-Noise Test Set. Basically a 455 kc amplifier with low noise and high gain, the unit employs a Collins Mechanical Filter providing excellent selectivity for intermodulation testing. The 3.1 kc bandwidth of the 476B-1 simulates a carrier channel, and the set's output — the selected 455 kc signal or noise — is read by use of an external ac vacuum tube voltmeter. The 476B-1 is useful for simulating a carrier channel for S/N checks between stations with carrier drops. Noise loaded intermodulation tests also may be conducted by using this unit in conjunction with the 476C-1 or 477C-1 Noise Loading Test Sets. A built-in attenuator at the input is adjustable in

one db increments from 0 to 99 db. *Maximum Gain:* Not less than 90 db. *Bandwidth:* 3.1 kc centered at 455 kc. *Notch to No-Notch Resolution:* Not less than 65 db. *Input Impedance:* 200 ohms. *Size:* 18⅝" W, 7½" D, 7¼" H. *Weight:* 14 lbs. *Primary Power:* 115 v, 50/60 cps, 0.3 amps.



476C-1

**476C-1 NOISE LOADING TEST SET** — The 476C-1 is a basic test set for the determination of system intermodulation distortion of frequency division, single sideband carrier equipment. It generates a Gaussian noise test signal and measures the intermodulation noise appearing in a 12 kc notch, or stop band, in the test signal spectrum. The test signal is generated by direct current flowing through a silicon diode in the zener region of conductivity. A pilot notch filter is provided at 308 kc and a noise window notch at 455 kc. A 20 kc high-pass filter may be switched in or out to reduce low frequency noise or prevent interference to fault alarm units or service channel in the system. Low-pass filters may be switched in or out to simulate 120 or 240 channel loading. This unit in conjunction with the 476B-1 Signal-to-Noise Test Set provides a quick and accurate measurement for field noise loading tests. *Output Noise Spectrum:*\* 4-1200 kc, 4-600 kc, 20-1200 kc, 20-600 kc. *Notches:* 75 db, 12 kc notch centered at 455 kc; 30 db notch at 308 kc. *Output Level:* Not less than +6 dbm. *Output Impedance:* 135 ohms. *Size:* 18⅝" W, 7½" D, 7¼" H. *Weight:* 15 lbs. *Primary Power:* 115 v (105-125), 50/60 cps., 0.4 amps.

\*Noise output extends below 4 kc to the limit of the video amplifier response, but is not controlled in production below this frequency.



477C-1

**477C-1 NOISE LOADING TEST SET** — The 477C-1 provides full test facilities for the determination of system intermodulation distortion of frequency division, single sideband carrier equipment. It generates a Gaussian noise test signal and measures the intermodulation noise appearing in one or more of six 12 kc notches, or stop bands, in the test signal spectrum.

The test signal is generated by direct current flowing through a silicon diode in the zener region of conductivity.

This unit is similar to the 476C-1 Test Set but is more functional. Its six notch filters allow selection of six 12 kc stop bands from 52 kc to 556 kc in the test signal frequency spectrum. Six filtered outputs and a flat, non-filtered output allow simulation of several different channel loading conditions. Two high pass filters provide additional means of measuring intermodulation distortion, and may be used to prevent interference to fault alarm units or service channel and for making out-of-band notch-to-no-notch tests.

A 308 kc pilot notch removes the pilot from the system output, and a calibrated attenuator allows accurate control of output level. *Output Noise Spectrum:*\* *Low Passband*—4-100 kc, 4-250 kc, 4-600 kc, 4-1200 kc, 4-1600 kc, 4 kc-2 mc (Flat) (Approx. 4 kc-7 mc). *High Passband*—4 kc-approx. 7 mc, 20 kc-approx. 7 mc. *Output Level:* Not less than +6 dbm. *Output Attenuator:* 0-64 db in 1 db increments. *Output Impedance:* 135 ohms. *Size:* 20 $\frac{3}{8}$ " W, 10" D, 10 $\frac{1}{2}$ " H. *Weight:* 37 $\frac{1}{2}$  lb. *Primary Power:* 115 v (105-125), 50/60 cps, 0.5 amps.

\*Noise output extends below 4 kc to the limit of the video amplifier response, but is not controlled in production below this frequency.



478G-2

**478G-2 TEST PANEL** — Facilities for setting line levels of Collins carrier equipment. Includes a signal source, meters and attenuators. *Test Signaling:* 1000 cps, variable +10 to -28 dbm, 600 ohms. *Meter Ranges:* -20 to +12 dbm, 600 ohm impedance, bridging or balanced. *Meter Response:* Essentially flat to 2 mc for signal levels up to 3 v ac. *Power Requirements:* 130 v dc, 10 ma; 6.3 v, .35 amps, or 24 v. *Size:* 19" W, 7" H. *Weight:* 12 lbs.



476J-1

**476J-1 WIDEBAND AND SELECTIVE VOLTMETER** — Used to measure harmonic distortion, intermodulation products, cross-talk, attenuation and interfering frequencies of telephone carrier equipment. *Wideband Voltmeter*—*Frequency Range:* .2 to 750 kc. *Voltage Range:* 10 to 100 mv, 1 to 10 v. *Accuracy:*  $\pm 5\%$ . *Selective Voltmeter* — *Frequency Range:* 4

to 750 kc in 6 bands. *Frequency Accuracy:* 2%  $\pm 300$  cps. *Voltage Measurement Ranges:* 10 uv to 10 v (-100 to +20 db, .775 v reference, 600 ohms). *Background Noise:* Approximately 1.5 uv (2.5 uv in the range 4-10 kc.) *Balanced Input Impedance:* 75, 150, 600, 2000 ohms, min. return loss 20 db. *Unbalanced Input Impedance:* 75, 150, 600, 20,000 ohms, min. return loss 20 db. *Primary Power:* 110/208 v ac, 42-60 cps, 50 va. *Size:* 18 $\frac{1}{8}$ " W, 10 $\frac{3}{8}$ " D, 12 $\frac{1}{8}$ " H. *Weight:* 44 lbs.

**478J-1 MICROWAVE TEST HORN** — The 478J-1 Microwave Test Horn provides a convenient method for measuring relative field strength in locating the point of maximum illumination on a tower mounted microwave reflector. The test device consists of a pyramidal horn mounted on a 10 foot pole with a pulley mechanism to enable the operator to align the horn for correct polarity in relation to the transmitter signal. A crystal detector is mounted in the horn assembly and connected through coaxial cable to a separate meter to provide indications of field strength. By maneuvering the horn in the region of the reflector with the pole and pulley and locating the area of strongest field strength, an operator in the tower can assist another operator on the ground in directing the antenna to the center of reflection. *Frequency Range:* 5900-8200 mc. *Gain of Horn:* 15 db at 6700 mc. *Meter Range:* 0-50 ua. *Size:* Horn—5" W, 6" D, 10 $\frac{1}{2}$ " H; Meter—4 $\frac{1}{8}$ " W, 3 $\frac{1}{8}$ " D, 5 $\frac{1}{2}$ " H; Pole—10' L, 1" dia. *Weight:* 7.25 lbs.

## PARABOLIC ANTENNAS



537E-1

**537E, G, H OFFSET FEED ANTENNAS** — These offset Parabolic Antennas are horn fed and operate in the 5900 to 7700 mc frequency range. They focus the microwave energy into a highly directive beam to provide high energy gain. They are normally used as illustrated, and may be supplied with several optional mounting arrangements for operation with or without tower mounted passive reflectors. They are available in heated or unheated versions. Thermostats energize the heaters at approximately 40°F. The various type numbers shown above designate various frequency bands between 5900 and 7700 mc. *Wind Loading:* 100 mph. *VSWR:* Less than 1.15:1. *Weight:* 250 lbs. *Optional De-Icing Heater:* 600, 1500, or 2400 watts at 115 volts ac, 600 or 2400 watts at 230 v ac.

Antenna Size	Gain	Beamwidth
5.3' (offset feed)	38.5 db	1.8°
6' (center feed)	39.5 db	1.7°
8' (center feed)	42.0 db	1.4°

(Data at 6700 mc.)



COLLINS **kineplex**<sup>®</sup>  
**systems**

# KINEPLEX® DATA SYSTEMS

**TE-206 DATA COMMUNICATION SYSTEM** — Data transmission rates up to 2400 bits per second can be achieved with the compact, flexible TE-206 Data Communication System. Utilized for conveying digital data at voice frequencies over wire line, cable, carrier or microwave telephone facilities, this equipment is completely transistorized. With applicable conversion equipment, the TE-206 may be employed for transmission of binary record information from teletypewriters, punched cards, computers, magnetic tape, facsimile and other special purpose data equipment.

Data is synchronously encoded into phase shift modulation of four equally spaced tones operating in the frequency region of 21 kc. Each tone is encoded with data from two input channels. A single channel will convey 300 bits per second. Since eight channels are employed, the maximum data rate is 2400 bits per second.

After the tones have been phase shifted in accordance with the incoming data, they are heterodyned to the audio region. The audio frequency spectrum was selected for transmission over the above communication facilities taking into account frequency and delay characteristics of each. Synchronism between the transmitting and receiving terminals is established through the use of a system of amplitude modulation of the composite four audio tones.

At the receiving terminal, the received audio tones are retranslated to the 21 kc region for detection using predicted wave techniques. After detection, the data is regenerated and delivered synchronously to the data conversion equipment.

**Data Input:** Eight parallel channels, each with 300 bits per second synchronous data, 0 volts for "Space" (or "0") and -6 volts for "Mark" (or "1"). Input "Mark" line current 10 ma nominal. Input is single wire to ground. **Output to Wire Line:** (Transmit Terminal) Composite signal including the four channel frequencies. Peak level may be varied from -45 dbm to 0 dbm into a 600 ohm nominal or 1135 ohm nominal line. **Input from Wire Line:** (Receive Terminal) Composite signal including the four channel frequencies. Peak input level -0 dbm to -20 dbm from 600 ohm nominal or 1135 ohm source at 1000 cps. Composite signal is amplitude modulated 3 db down from nominal received with 150 cycle square wave. **Data Output:** Eight parallel data channels, each with 300 bit per second synchronous digital data, 0 volts for "Space" (or "0") and -6 volts for "Mark" (or "1"). "Mark" line current 10 ma nominal. Output may be 2-wire or single wire to ground. **Synchronization:** Obtained from amplitude modulation of the composite audio envelope at the data transition rate of 150 cps. **External Timing:** TE-206 transmitting terminal may be synchronized from external source that provides a synchronizing frequency of  $600 \pm 0.6$  cps. TE-206 arranged to furnish a  $300 \pm 0.3$  cps square wave to external transmitting converter at 0 to -6 volt levels for readout control. TE-206 receiving terminal furnishes a  $300 \pm 0.3$  cps square wave at 0 and -6 volt levels for synchronizing the received data. **Data Rates:** Channel data rate - 300 bits per second. Maximum data rate - 2400 bits per second. **Frequency Control:**  $\pm 10$  cps translation error allowable. **Audio Channel Frequencies:** Channels 1 and 2 - 935 cps. Channels 3 and 4 - 1375 cps. Channels 5 and 6 - 1815 cps. Channels 7 and 8 - 2255 cps. **Power Requirements:**  $115 \pm 10\%$  v, 1 phase, 60 cps, 100 watts. **Environmental Conditions:** Temperature -



768G-1



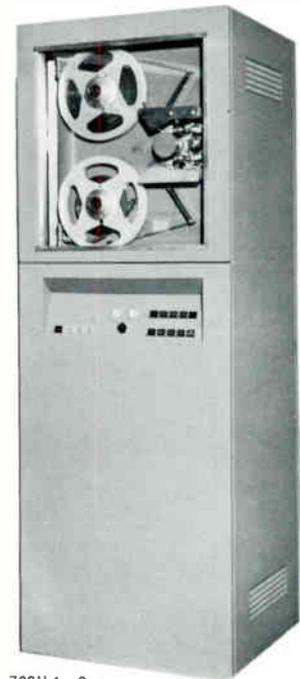
TE-206

$16^{\circ}\text{C}$  to  $43^{\circ}\text{C}$  ( $60^{\circ}\text{F}$  to  $110^{\circ}\text{F}$ ). Humidity - 0 to 90% without condensation.

**768G-1 KINECARD CONVERTER** — The completely transistorized 768G-1 Kinocard Converter is employed for reproduction and transmission of IBM punched card information at a rate of 100 cards per minute. The converter is used in conjunction with an IBM card reader/punch unit and the Collins TE-206 Data System, and is capable of operating in half-duplex or full-duplex modes. The card reader supplies information to the Kinocard Converter, which translates the information and applies it to the eight channels in the TE-206 transmit terminal. Information from the eight channels in the TE-206 receive terminal is stored in the Kinocard Converter until sufficient information is available to supply to the card punch unit. Errors in data assembly and transmission are detected by odd and even parity checks on each card. Erroneous cards are isolated by offset stacking. **Card Speed:** 97 to 100 cpm. **Storage:** Core matrix (576 bits). **Associated Equipment:** TE-206 Data System and IBM 523 Gang Summary Punch. **Operating Modes:** Half-duplex. Full-duplex by addition of an IBM 523. **Checking:** Odd and even parity, 16 bits for each card. **Controls:** Power On-Off. Transmit - Start, Stop, Reset, Test. Receive - Start, Stop, Reset, Test, Card Offset. **Power Requirements:**  $115 \pm 10\%$  v, 1 phase, 60 cps, 300 watts. **Environmental Conditions:** Temperature -  $16^{\circ}\text{C}$  to  $43^{\circ}\text{C}$  ( $60^{\circ}\text{F}$  to  $110^{\circ}\text{F}$ ). Humidity - 0 to 90% without condensation.

**768H-1 KINETAPE CONVERTER** — The completely transistorized 768H-1 is utilized for the reproduction and transmission of magnetic tape information at a maximum rate of 300 eight-bit characters per second. It will accept either 1500 or 2500 foot Remington-Rand Uniservo reels of  $\frac{1}{2}$ " width mylar magnetic tape. This converter is used in conjunction with

	Type	Dimensions (inches)			Weight (lbs.)	Channels	Operational Rate
		W	D	H			
Kineplex Data System	TE-202	41	20	86½	400	40	75 bits per second per channel 3,000 bits per second total
Kineplex Data System with Teletypewriter Converters	TE-202	41	20	86½	700	40	60, 75 or 100 words per minute per channel
Kineplex Data System	TE-206	25	18	58	175	8	300 bits per second per channel 2,400 bits per second total
Kinecard Converter	768G-1	25	20	66	300		100 cards per minute
Kinetape Converter	768H-1	25	20	66	350		300 eight-bit characters per second
Kinetape Converter	768H-2	25	20	66	350		300 seven-bit characters per second



768H-1, -2

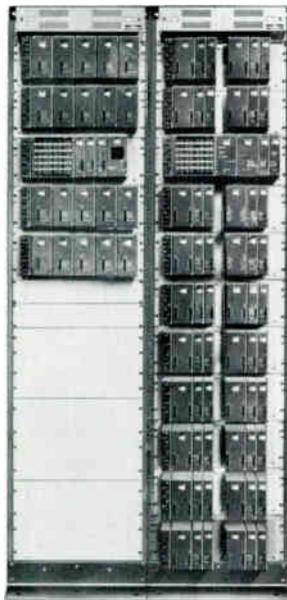
the TE-206 Data System, and it operates in the half-duplex mode. The data may be recorded on the tape in either of two standard, expanded Univac formats. The tape handler operates at either of two tape speeds to provide optimum transmission efficiency for each of the standard data formats. Errors in data assembly or transmission are detected by parity checks, and corrections are made by automatic retransmission of the blockette containing the error.

**Data Format — Type 1:** Blockette Length — 120 characters. Blockette Spacing — 1" minimum. Saturated to zero level state. Character Density — 128 ±5% characters per inch. Block Length — May be any number of 120 character blockettes. Block Spacing — 1" minimum. Saturated to zero level state. **Type 2:** Blockette Length — 120 characters. Blockette Spacing — 0.1" minimum. Saturated to zero level state. Character Density — 128 ±5% characters per inch. Block Length — 6 blockettes. Block Spacing — 1" minimum. Saturated to zero level state. **Tape Speed — Format 1:** 4.6 inches per second. **Format 2:** 2.3 inches per second. **Stop Time:** 3 msec. **Start Time:** 3 msec. **Reverse Time:** 6 msec. **Heads:** Velocity reading and recording, 8 tracks staggered. **Tape Characteristics:** ½" by 1½ mil mylar. Tape is to be pretested for absence of dropouts. **Recording Method:** RZ. **Error Detection and Correction:** Both lateral and longitudinal parity with automatic correction. **Operating Mode:** Half-duplex. **Associated Equipment:** TE-206 Data System. **Controls:** Power On-Off, Override, Retransmission, Reset. Tape forward, Tape Reverse, Stop, Tape Fast Forward, Tape Fast Reverse, Tape Auto. **Power Requirements:** 115 ±10% v, 1 phase, 60 cps, 500 watts. **Environmental Conditions:** Temperature — 16°C to 43°C (60°F to 110°F). Humidity — 0 to 90% without condensation. **Weight:** 350 lbs. total for a half-duplex unit complete with power and cabinet. **Dimensions:** Cabinet — 25" W, 66" H, 20" D.

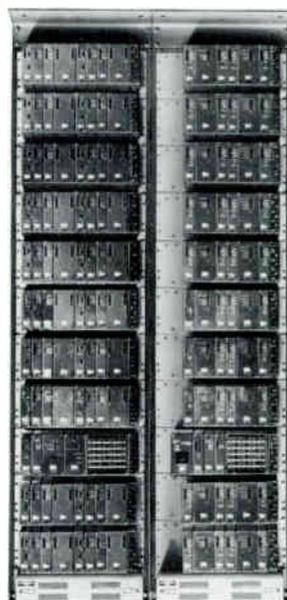
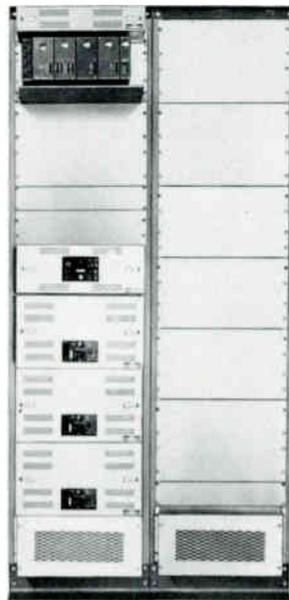
**768H-2 KINETAPE CONVERTER** — The 768H-2 is another transistorized converter for the reproduction and transmission of magnetic tape information at a maximum rate of 300 seven-bit characters per second. It will accept 2400 foot IBM 727 reels of ½" width mylar magnetic tape. The converter is used in conjunction with the TE-206 Data System, and it operates in the half-duplex mode. Data may be recorded on the tape in the standard IBM format. The tape handler operates at a speed to provide optimum transmission efficiency. Errors in data assembly or transmission are detected by parity checks, and corrections are made by automatic retransmission of the record containing the error.

**Data Format:** Record Length — 120 characters plus longitudinal check character. Record Gap — ¾" minimum. No flux transitions are to occur during the gap period. Character Density — 200 +0% —30% characters per inch. File Length — May be any number of 120 character records. **File Gap** — ¾" minimum. No flux transitions are to occur during the gap period. **Tape Speed:** 3" per sec. **Stop Time:** 3 msec. **Start Time:** 3 msec. **Reverse Time:** 6 msec. **Heads:** Velocity reading and recording, 7 tracks in line gap. **Tape Characteristics:** ½" by 1½ mil mylar. Tape is to be pretested for absence of dropouts. **Recording Method:** NRZI. **Error Detection and Correction:** Both lateral and longitudinal parity with automatic correction. **Operating Mode:** Half-duplex. **Associated Equipment:** TE-206 Data System. **Controls:** Power On-Off, Override, Retransmission, Reset. Tape Forward, Tape Reverse, Stop, Tape Fast Forward, Tape Fast Reverse, Tape Auto. **Power Requirements:** 115 ±10% v, 1 phase, 60 cps, 500 watts. **Environmental Conditions:** Temperature — 16°C to 43°C (60°F to 110°F). Humidity — 0 to +90% without condensation. **Weight:** 350 lbs. total for a half-duplex unit complete with power and cabinet. **Dimensions:** Cabinet — 25" W, 66" H, 20" D.

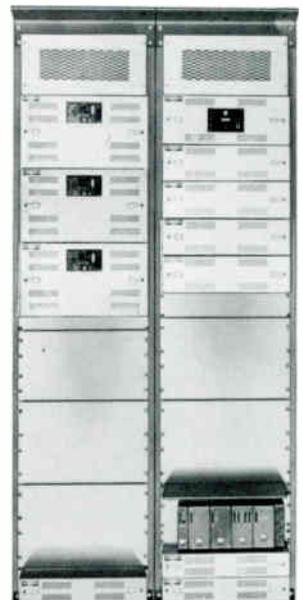
## KINEPLEX® DATA SYSTEMS



Front TE-202 Data Communication System Back



Front TE-202 with Teletypewriter Converters Back



**TE-202 DATA COMMUNICATION SYSTEM**—The completely transistorized TE-202 Data Communication System provides an efficient and flexible high speed, high capacity data link for conveying binary information over radio circuits under adverse conditions, as well as over wire line, cable, carrier or microwave telephone facilities. When employed with appropriate conversion equipment, the data system will accept and transmit binary information for such record media as teletypewriter, punched cards, magnetic tape, facsimile and other special purpose equipment.

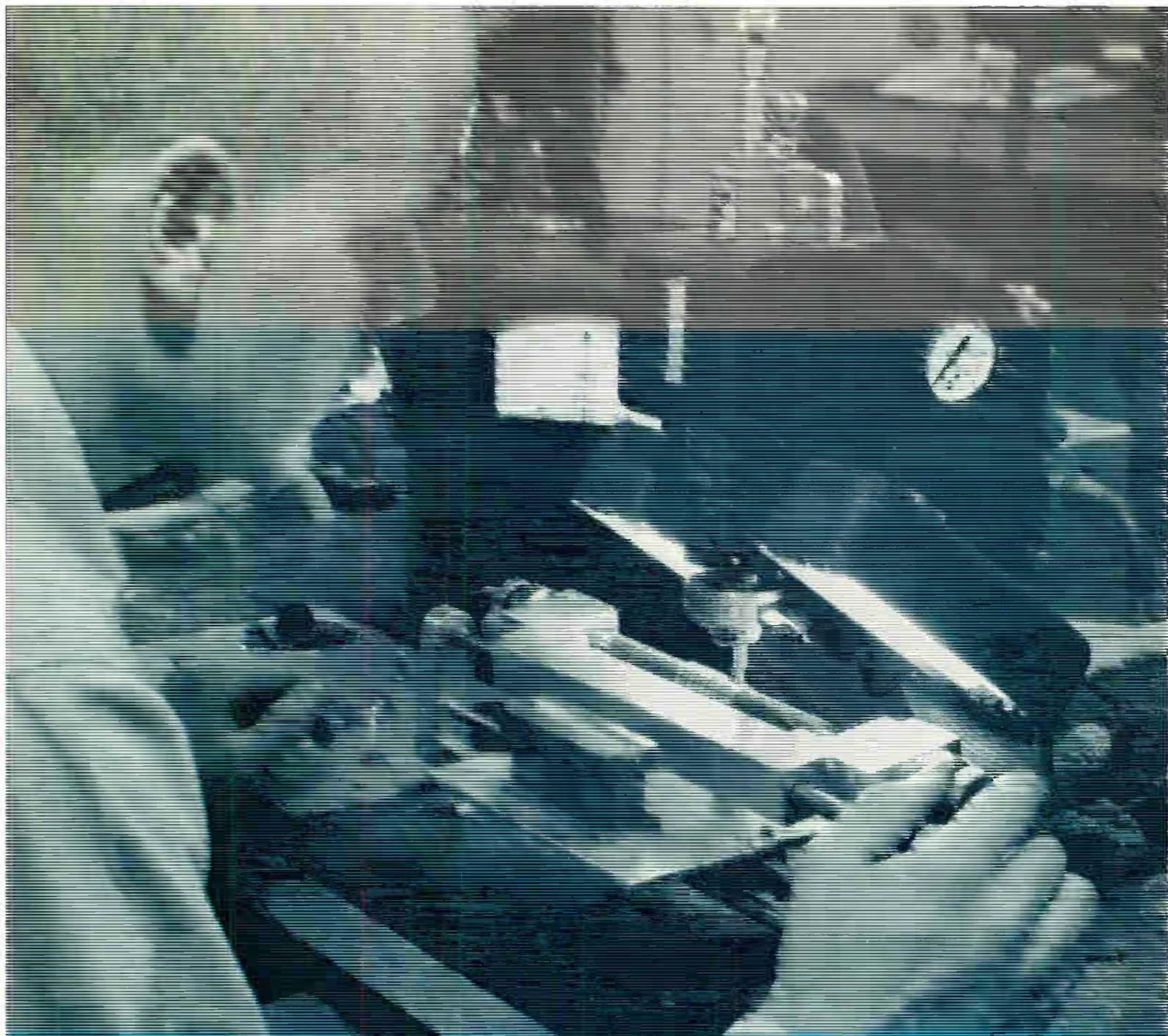
The basic communication channel on radio and wire line facilities has a nominal bandwidth of 3 kc. The TE-202 has been designed to maximize the utilization of this basic channel. The system is comprised of channeling equipment which may be added in multiples of two channels to a maximum of forty channels. A single channel will convey 45, 56 or 75 bits per second, and channels may be connected in series-parallel or parallel-series arrangements to provide for a transmission of data up to a maximum of 3000 bits per second in a 3 kc voice channel.

Forty channels of 60, 75 or 100 word-per-minute start-stop teletypewriter information may be transmitted simultaneously on 20 tones. On teletypewriter service this represents more than twice as many channels on a 3 kc band as compared with present day carrier telegraph systems.

To be efficient, integrated data processing centers incorporating high speed electronic computers will be dependent on the fast transmission of business data to the data processing center from the remote points. The TE-202 provides an efficient and flexible high speed data link for transmitting this information. Magnetic tape input/output storage is ideally suited for these applications; however, punched card, paper tape and other types of storage may be adapted for use with the TE-202. The total data transmission capacity of the TE-202 may be divided between different services as best fits the requirements.

*Transmit Input:* 40 parallel synchronous data signals each operating at maximum of 75 bits per second,  $-23$  v dc for a "mark,"  $-13$  v dc for a "space," unbalanced grounded, 10,000 ohm input circuits. *Transmit Output:* Composite signal of 21 audio tones with a range of 605 cps to 2915 cps at a level of  $-15$  dbm to  $+2$  dbm. *Receive Input:* Composite signal of 21 audio tones with a range from 605 cps to 2915 cps and a level of  $-11$  dbm to  $-45$  dbm. *Receive Output:* 40 parallel synchronous data signals each operating at maximum of 75 bits per second,  $-23$  v dc for a "mark,"  $-13$  v dc for a "space," unbalanced grounded. *Power Input:* Synchronous Data Transmission Equipment—8 amps at  $-27.5$  v dc or 700 watts at 115 v, 1 phase, 60 cps. *Operating Conditions:* Fixed station, 0-45°C ambient, humidity to 95%.

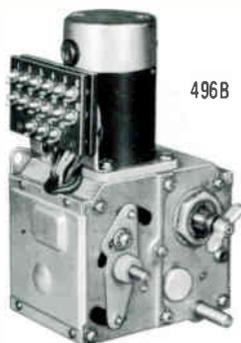
**TE-202 WITH TELETYPEWRITER CONVERTERS**—With Teletypewriter Converters, the TE-202 consists of two racks of synchronous data transmission and converter equipment as required for teletypewriter or data applications. *Transmit Input:* Non-synchronous dc telegraph "start-stop" signals,  $-20$  or  $-60$  ma for a "mark," 0 for a "space." *Transmit Output:* Composite signal of 21 audio tones with a range from 605 cps to 2915 cps at a level of  $-15$  dbm to  $+2$  dbm. *Receive Input:* Composite signal of 21 audio tones with a range from 605 cps to 2915 cps and a level of  $-11$  dbm to  $-45$  dbm. *Receive Output:* Non-synchronous dc telegraph "start-stop" signals, ungrounded, 120 v across 2000 ohms for a "mark," 0 for a "space." *Channels:* 40 channels maximum, 60, 75 or 100 wpm each. *Power Input:* Synchronous Data Transmission Equipment—8 amps at  $-27.5$  v dc or 700 watts at 115 v, 1 phase, 60 cps. Teletypewriter Converter Equipment—3 amps at  $-27.5$  v dc or 250 watts at 115 v, 1 phase, 60 cps. *Total Power Input:* 115 v, 1 phase, 60 cps, 950 watts, or 11 amps at  $-27.5$  v dc.



COLLINS precision  
components

# AUTOTUNES®

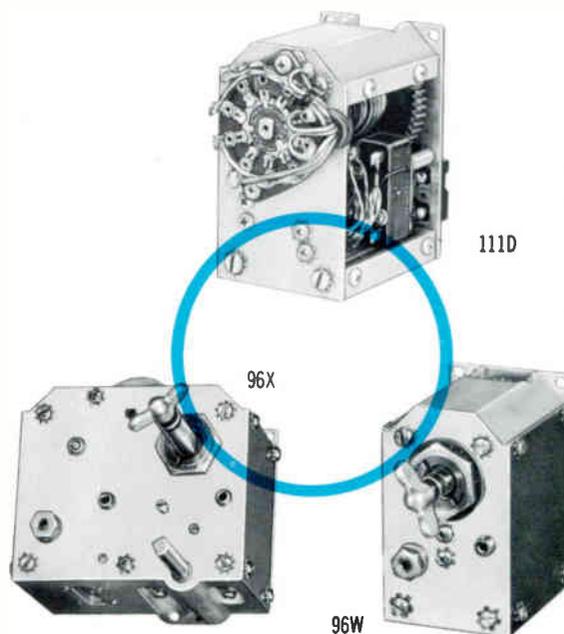
Collins Autotune Systems accurately and automatically reposition shafts to any of several predetermined settings. Autotunes may be controlled directly or remotely with only electrical connections between control point and Autotune. They are easily repositioned manually to any new setting.



496B



496A, C



111D

96X

96W

Autotune Type	496A, C	496B	96W	96X	111D Control
Variable Settings	10 automatic	10 automatic	10 automatic	10 automatic	.....
Usable Output Shaft Rotation	496A — 360° 496C — 330°	360°	1 turn or less (nominal)	10 turns or less	.....
Direction of Rotation	496A — Clockwise* 496C — Reversing	Clockwise*	Reversing	Reversing	.....
Clutch Torque	4 lb.-in. nominal (Up to 6 special)	4 lb.-in. nominal	4 lb.-in. nominal	4 lb.-in. nominal	.....
Normal Operate Time	6 sec.	3 sec.	6 sec.	10 sec.	.....
Reset Accuracy	0.05 angular degrees	0.05 angular degrees	0.05 angular degrees	0.05 angular degrees	.....
Control	Self-contained	Self-contained	111D	111D	Control for 96W, X
Primary Power	115 v, 50/60 cps (capacitive motor)	28 v dc	As required	As required	As required
Size (inches)	3½W, 3¾D, 5 1/16H	3½W, 3¾D, 5 1/16H	1 5/16W, 4 1/16 — 4¾D, 2 7/8H	3 1/16W, 4¾ — 4¾D, 2 7/8H	1 5/16W, 3D, 2 7/8H
Weight (lbs.)	3	3	1½	2¼	¾

\*Viewed from front.

# AUTOPOSITIONER®



The 381E-1 Autopositioner will automatically reset a shaft to any one of 12 evenly spaced positions, utilizing an induction motor driving a rotary shaft with notched stop wheel and relay controlled pawl. Reset accuracy is  $\pm 0.25^\circ$ . The device is actuated by a seeking switch, also driven by the shaft, and a remotely controlled selector switch. *Extent of Rotation:* Continuous. *Direction of Rotation:* Counterclockwise (viewed from shaft end). *Torque:* 6 lb.-in. minimum. *Output Speed:* 60 rpm. *Normal Operate Time:* Approx. 1.2 sec. maximum. *Primary Power:* 115 v, 54-66 cps  $\pm 10\%$ . *Size:* 1 1/8" W, 4 7/8" D, 4 1/8" H. *Weight:* 2 1/4 lbs. *External Requirements:* Motor capacitor, selector and seeking switches.

# OSCILLATORS

Collins permeability tuned, variable frequency oscillators offer exceptional stability and accurate, linear dial calibration. Coils are wound to provide a linear characteristic, and then each oscillator is individually tested to a linear scale. Critical elements are sealed or encapsulated against atmospheric changes and are temperature- and voltage-compensated.



70E-15



70H-3



70H-12



70K-1



70E-1

OSCILLATOR TYPE	70E-1	70E-15	70H-3	70H-12	70K-1
Frequency Range	1.0 — 1.5 mc	2.0 — 3.0 mc	1.5 — 3.0 mc	2.455 — 3.455 mc	3.445 — 3.545 mc
Calibration Linearity	±750 cycles	±750 cycles	±1000 cycles	±500 cycles	±800 cycles
Maximum Frequency Drift 40-120°F	250 cycles	400 cycles	600 cycles	100 cycles oven on	750 cycles
Maximum Drift with ±10% Plate Voltage Change	75 cycles	150 cycles	100 cycles	100 cycles	80 cycles
RF Output	13 — 30 v rms 25 uuf load	1.2 — 2.5 v rms 100 uuf load	5 — 13 v rms no load	2 v rms 1000 ohm load	1.25 — 2.75 v rms 22 uuf load
Electrical Connections	Plug	Solder	Plug	Plug	Solder
Tubes	One 12SJ7	Two 6BA6	Two 5749	One 5749	One 6BA6
Shaft Size (inches)	0.1869 — 0.1873	0.1869 — 0.1872	0.1869 — 0.1872	0.1869 — 0.1872	0.1868 — 0.1871
Rotation for Increased Frequency	Clockwise	Counterclockwise	Counterclockwise	Counterclockwise	Clockwise
Tuning Rate	50 kc/turn	100 kc/turn	150 kc/turn	100 kc/turn	100 kc/turn
Tuning Torque	3 — 4 in.-oz.	10 in.-oz.	10 in.-oz.	10 in.-oz.	6 in.-oz. maximum
Plate Power	250 v @ 7 ma	150 v @ 12 ma	150 v @ 12 ma	180 v @ 10 ma	200 v @ 6 ma
Heater Power	12.6 v @ 150 ma	6.3 v @ 600 ma	12.6 v @ 300 ma	6.3 v @ 300 ma	6.3 v @ 300 ma
Oven Power	None	None	26 v @ 3.0 amp**	26 v @ 2.0 amp*	None
Size (inches)	2¾ sq. x 5	2½ dia. x 5	2 <sup>27</sup> / <sub>32</sub> dia. x 6 <sup>5</sup> / <sub>16</sub>	3½W, 7 <sup>17</sup> / <sub>32</sub> D, 4 <sup>7</sup> / <sub>32</sub> H	2 <sup>33</sup> / <sub>64</sub> W, 2 <sup>15</sup> / <sub>64</sub> D, 3 <sup>1</sup> / <sub>32</sub> H

\*Thermostatically controlled at 167°F.

\*\*Thermostat does not permit oscillator temperature to fall below 33°F.

# MECHANICAL FILTERS

Collins Mechanical Filters are electromechanical bandpass filters with exceptionally steep skirt characteristics and a flat-topped frequency response. Compactly packaged in cases as small as 0.3 cu. in., these low loss devices offer selectivity characteristics surpassing conventional multistage electrical filters. The Collins Mechanical Filter consists of: (1) an input magnetostrictive transducer to terminate the filter and convert electrical oscillations to mechanical oscillations; (2) metal disks which are mechanically resonant; (3) disk coupling rods, and (4) an output transducer performing the same functions as the input transducer in reverse order. Hermetically sealed, the Mechanical Filter is highly stable, requiring no adjustment. Standard Mechanical Filters in production are illustrated on these pages; information can be provided on special designs with a wide variety of characteristics in the 60 to 600 kc range.

### TYPICAL FILTER SPECIFICATIONS

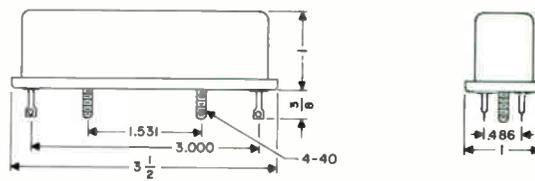
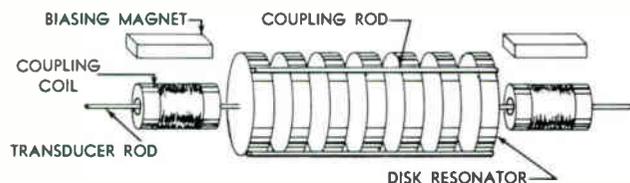
**Transmission Loss:** Generally insertion losses are on the order of 10 to 12 db, although certain filters have losses as low as 6 db. In applications with series resonant input and parallel resonant output, actual voltage gains are obtained.

**Peak-to-Valley Ratio:** Passband response variations of most designs is nominally less than 3 db.

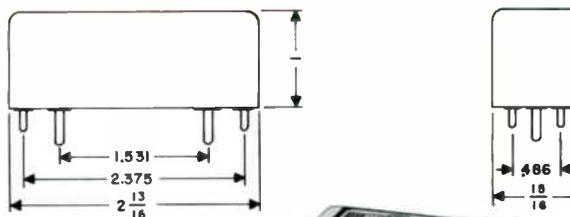
**Environmental Characteristics:** Most designs employ temperature compensation, and the nominal bandwidth of a given filter is essentially unaffected by a wide variation in ambient temperature. Humidity has no effect.

**Terminal Impedance:** Normally the Mechanical Filter is a relatively high impedance device.

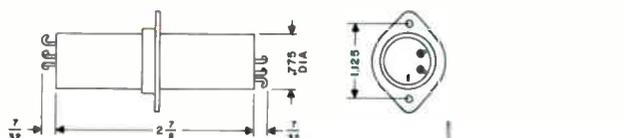
### FUNCTIONAL DIAGRAM OF A TYPICAL MECHANICAL FILTER



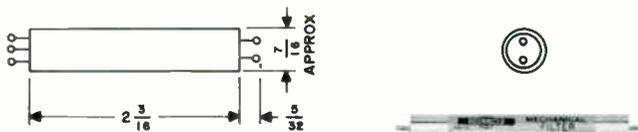
Type C



Type E



Type K

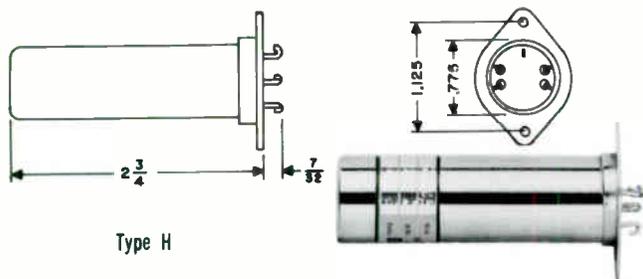


Type Y

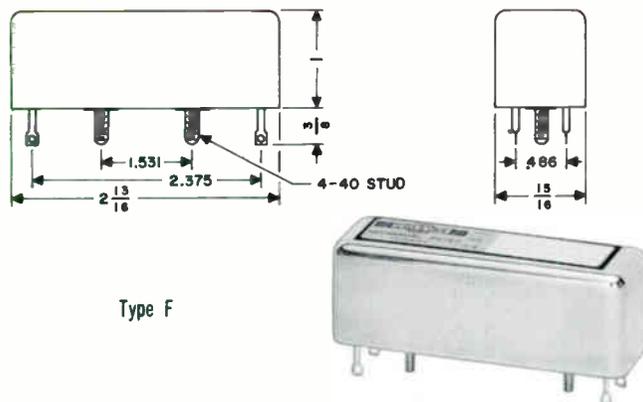


Filter Type	Center Frequency	6 db Bandwidth	60 db Bandwidth	Case Style	Filter Type	Center Frequency	6 db Bandwidth	60 db Bandwidth	Case Style
F250A-20	250 kc	2.0 kc	4.3 kc	C	F455*-120	455 kc	12.0 kc	23.0 kc	*
F250Z-3	250 kc	2.7 kc	5.5 kc	W	F455*-160	455 kc	16.0 kc	27.5 kc	*
F250A-67	250 kc	6.7 kc	14.0 kc	C	F455*-350	455 kc	35.0 kc	62.0 kc	*
F250A-85	250 kc	8.5 kc	18.0 kc	C	F500B-08	500 kc	0.8 kc	3.5 kc	E
F300X-68	300 kc	6.8 kc	13.2 kc	3/4" dia., 3 1/2" L	F500B-14	500 kc	1.4 kc	3.8 kc	E
F455*-05	455 kc	0.5 kc	2.5 kc	*	F500F-14	500 kc	1.4 kc	3.5 kc	F
F455*-15	455 kc	1.5 kc	3.5 kc	*	F500B-31	500 kc	3.1 kc	7.5 kc	E
F455*-21	455 kc	2.1 kc	5.3 kc	*	F500B-60	500 kc	6.0 kc	14.0 kc	E
F455*-31	455 kc	3.1 kc	6.5 kc	*	F500F-60	500 kc	6.0 kc	19.0 kc	F
F455*-40	455 kc	4.0 kc	8.5 kc	*	F500F-94	500 kc	9.4 kc	19.0 kc	F
F455*-60	455 kc	6.0 kc	12.6 kc	*	*Available as F455E, F, H, J or K with case styles of E, F, H, J or K respectively. Case style Y available for all F455 Filters except -05, 15.				
F455*-80	455 kc	8.0 kc	18.5 kc	*					

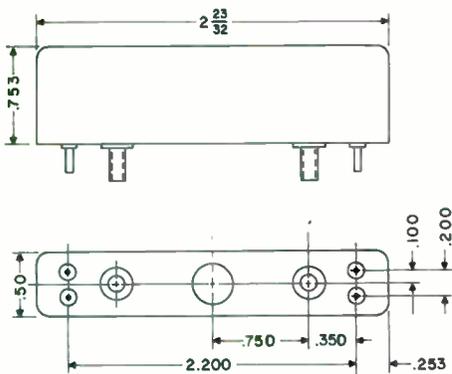
# PRECISION COMPONENTS



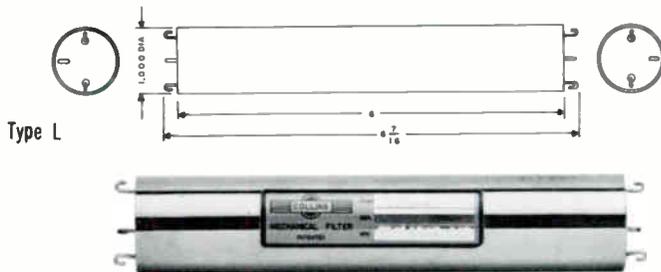
Type H



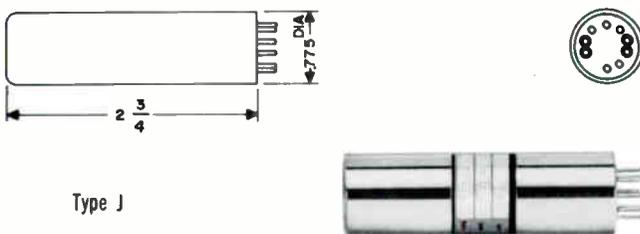
Type F



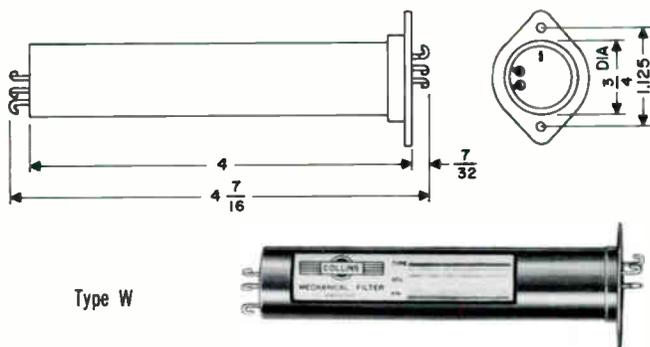
Special Case Designed to User's Requirements



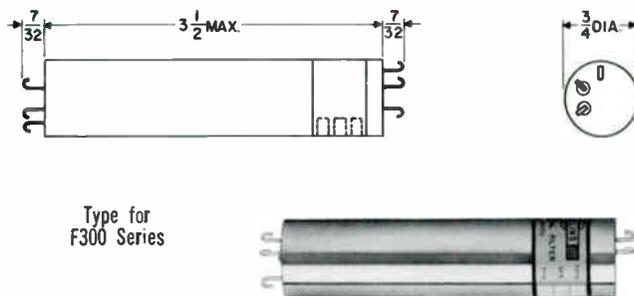
Type L



Type J



Type W

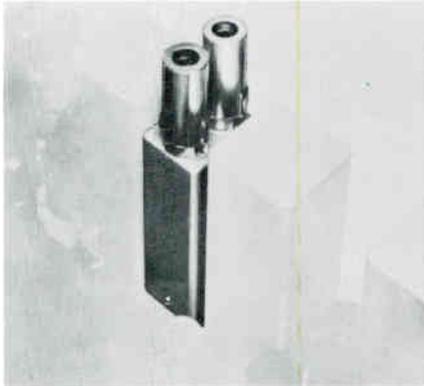


Type for F300 Series

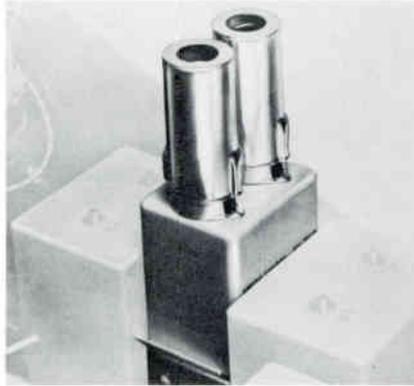
## CASE STYLES

SSB Filter Type	Carrier Frequency	Sideband	Case Style	SSB Filter Type	Carrier Frequency	Sideband	Case Style
F60Z-4	60 kc	Upper	L	F104Z-4	104 kc	Upper	L
F64Z-4	64 kc	Upper	L	F250Z-4	250 kc	Upper	C
F68Z-4	68 kc	Upper	L	F250Z-5	250 kc	Lower	C
F72Z-4	72 kc	Upper	L	F300Z-4	300 kc	Upper	3/4" dia., 3 1/2" L
F76Z-4	76 kc	Upper	L	F300Z-5	300 kc	Lower	3/4" dia., 3 1/2" L
F80Z-4	80 kc	Upper	L	F455Z-1	455 kc	Upper	H
F84Z-4	84 kc	Upper	L	F455Z-2	455 kc	Lower	H
F88Z-4	88 kc	Upper	L	F455Z-4	455 kc	Upper	Y (1/16" dia., 2 1/2" L)
F92Z-4	92 kc	Upper	L	F455Z-5	455 kc	Lower	Y (1/16" dia., 2 1/2" L)
F96Z-4	96 kc	Upper	L	F500Z-4	500 kc	Upper	Y
F100Z-4	100 kc	Upper	L	F500Z-5	500 kc	Lower	Y

# FILTER ADAPTERS



353A for Hammarlund SP400, National HRO-60



353B for Hammarlund SP-600-JX

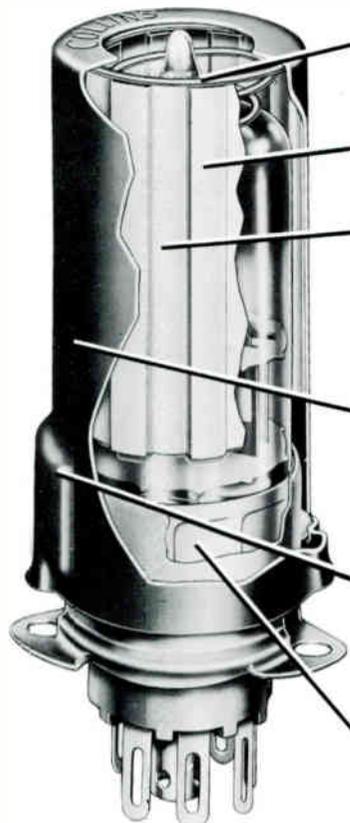


3530 for National HRO-50, HRO-50T1

Available for several Hammarlund and National receivers as well as Collins amateur and communication receivers. About the size of an IF transformer, the adapter includes a Mechanical Filter, 2 IF amplifier tubes with necessary circuits and a connector for plugging the unit into the first or second IF tube socket. Power and signal circuits are supplied through the original socket connections.

Adapter Type	Filter Type	Bandwidth (at -6 db)
353A-, B-, D-05	F455F-05	0.5 kc
353A-, B-, D-15	F455F-15	1.5 kc
353A-, B-, D-31	F455F-31	3.1 kc
353A-, B-, D-60	F455F-60	6.0 kc

# TUBE SHIELDS



- Tube hold-down spring of standard JAN shield is used. Tube cannot work out of socket through long-term vibration.
- Tube is securely held in place laterally against vibration and shock.
- Heat treated beryllium copper corrugated liner and socket insert are highly resilient and will accommodate wide variations in tube diameter.
- Maximum electrostatic shielding is provided.
- Special black finish results in greater heat dissipation.
- Shield assembly is easily inserted and removed from tube.
- Convenient bayonet hold-down feature of the standard JAN shield is retained.
- Corrugated liner is captivated in the shield, will not fall out when shield is removed.
- Base liner of beryllium copper, with tabs punched in for contact, reduces bulb temperature in the most critical tube area.

Collins 66J Heat Reducing Tube Shields can lower bulb hot spot temperature rise above ambient to as low as 55% of former values. Unique feature is that the shield not only gives excellent protection at the middle and top of the tube, but also in the critical base area where electrolysis occurs at the metal-to-glass junction.

Current information indicates that the 66J can reduce tube failures to less than one-half of failures encountered using tubes with shiny JAN shields. Because of the resiliency of the heat treated beryllium copper liner, the 66J accommodates wide variations in tube diameter and protects against shock and vibration. The 66J is interchangeable with the standard JAN shield.

Collins Shield Type Number (Includes shield, corrugated liner & base liner)	Equivalent JAN Shield No.	Height of Shield	Tube Size
66J-1	TS-102U01	1¾	7 pin short
66J-2	TS-102U02	1¾	7 pin medium
66J-3	TS-102U03	2¾	7 pin large
66J-4	TS-103U01	1½	9 pin short
66J-5	TS-103U02	1½ <sup>5</sup> / <sub>16</sub>	9 pin medium
66J-6	TS-103U03	2¾	9 pin large

# CAC INDUCTOR COMPONENTS

Communication Accessories Company, a subsidiary of Collins Radio Company, specializes in the design and manufacture of inductor components and related inductor assemblies. Its basic product line includes toroidal coils, transformers, filters, and magnetic amplifiers. In addition to these products, described in general terms in this catalog, CAC maintains an engineering department equipped to fulfill customer requests for special application of inductor components. Sales representatives, located throughout the United States, are listed on page 90.

**LOW PASS FILTERS** — A wide variety of low pass filters, adhering to MIL-T-27A specifications, have been produced by CAC for special as well as standard applications. One standard series, with cutoff frequencies from 3,000 to 15,000 cps, has a loss of less than 3 db at cutoff and attenuation of more than 45 db at 1.5 times cutoff frequency. A series for etched circuits has loss of less than 1.5 db at 3,500 cps and attenuation of 40 db at 4,500 cps. Another filter, operating from tube plate directly to 600 ohm line, has loss of less than 0.5 db at 3,500 cps and attenuation of 40 db at 5,700 cps.

**BANDPASS FILTERS** — Stable bandpass, bandstop, high pass and low pass filters can be provided for frequencies from subaudio to over 500 kc. These frequency selective components employ high Q toroidal inductors and high quality capacitors. High performance is achieved in these compact units by use of impedance transformations, near unity coupling and other applications of advanced network theory.

**TELEGRAPH FILTERS** — Telegraph tone filters for receive and transmit have been designed with 170 cycle spacing between 425 and 3315 cps. These filters provide continuous duty under extreme service conditions. Use of high quality components and a hermetically sealed case assures a long life and low drift. CAC has also produced telegraph filters with 120 cps, 150 cps, 85 cps and other channel spacing.

**AIRCRAFT NAVIGATION FILTERS** — Typical components for aircraft systems include: *ILS* — 90 and 150 cps filters. *VOR* — 30 cps filters and transformers, 9,960 cps discriminators. *TACAN* — 15, 135 and 4,046 cps bandpass filters; 1,350 cps tuned circuits; pulse differentiating transformers; rate

coupling transformers; special toroidal coils, pulse delay networks. *Marker Beacon* — 400, 1,300 and 3,000 cps tuned circuits, and audio transformers.

**TRANSFORMERS** — A wide variety of hermetically sealed power transformers, laminated transformers and reactors, and special high temperature transformers and reactors are available in standard models or in custom designs. Power transformers, filter reactors, filament transformers and converter transformers, all built to MIL-T-27A, Grade 4, Class S, are designed for the most modern equipment using the latest circuit techniques. Several high temperature transformers and reactors have been specially engineered for withstanding total operating temperatures of 200°C, meeting MIL-T-27A, Grade 4, Class T specifications.

**MAGNETIC AMPLIFIERS** — A variety of magnetic amplifiers include a low level operational amplifier for analog computation in airborne equipment and a series of saturable transformers for two-phase servo motors built to MIL-T-27A, Grade 4, Class R, Life X.

SATURABLE TRANSFORMERS FOR TWO PHASE SERVO MOTORS

Part Number	Output Power (watts)	Output Voltage (volts)	Load Resistance (ohms)	Control Current (ma)	Control Coil Resistance (ohms)	Primary Current (ma)
92-0142-00	2.5	26	250	8	2860	80
92-0143-00	5.0	115	2640	8	3110	130
92-0144-00	10.0	115	1320	8	4200	240

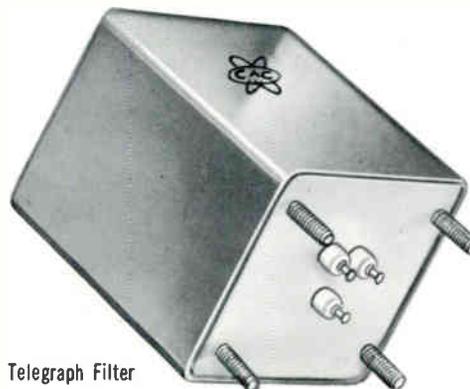
**SPECIAL ASSEMBLIES** — Many types of molded plastic coils have been subminiaturized for modern circuitry. Over 1,000 special printed circuit components are in quantity production, including toroidal and laminated coils and transformers, tuned networks and filters, saturable reactors and magnetic amplifiers.



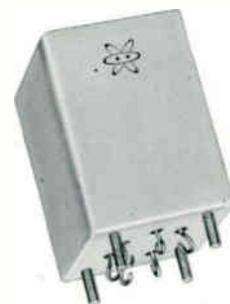
Special Epoxy Cast Assemblies



Power Transformer



Telegraph Filter



Magnetic Amplifier

# CAC TOROIDS

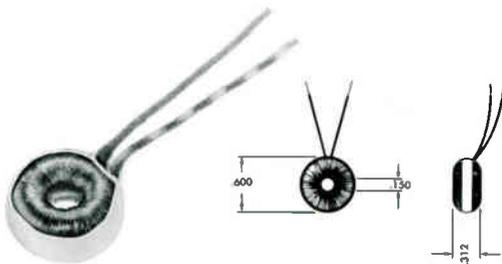
**SUBMINIATURE TOROIDS** — Offered in the open coil and three case styles. Style type QLS (open coil) is a basic inductor component with flex leads. Wax impregnated units are standard with plain or plastic dipped on special order. Style type MPF (molded plastic) utilizes a hi-temp polyester resin molding compound with tinned brass terminals. Style type HSD (hermetically sealed) is the optimum case size for printed circuit applications with mounting tabs. It has a hermetically sealed compression glass header. Available with four leads. Style type HSA (hermetically sealed) uses a space-saving crystal case design with two leads. All the style types are obtainable in core types 050, 051 and 054.

**TOROIDAL COILS** — Manufactured in three styles: open coil type QL, molded plastic type MP, and hermetically sealed type HS. All these toroids are obtainable in core type series 206, 848, 930, 395 and 254. Style type HS is also available in core type series 715. Type QL is a wax impregnated unit with flex leads as the standard unit. Units can be plain or plastic dipped on special order. Type MP is molded in hi-temp polyester resin with the terminals constructed of tinned brass. It has been successfully tested per MIL-T-27A, Grade 5, Class R. Type HS is built per MIL-T-27A, Grade 4, Class Q. Type HS is hermetically sealed with a high permeability case for low hum pickup. Terminals of proven design using teflon assure permanent seal at temperature extremes of -55°C to +85°C. Cores are thermocycled prior to encasement.

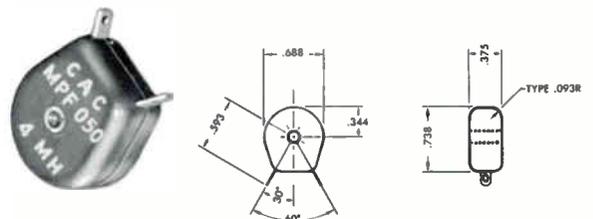
**STANDARD INDUCTANCE VALUES**

Inductance	Core Type	Open Type	Molded Type	Hermetically Sealed Type
5.0 mh to 3.0 hy	050	QLS-050-1 to QLS-050-37	MPF-050-1 to MPF-050-37	HSD-050-1 to HSD-050-37
1.0 mh to 500 mh	051	QLS-051-1 to QLS-051-36	MPF-051-1 to MPF-051-36	HSD-051-1 to HSD-051-36
.05 mh to 10 mh	054	QLS-054-1 to QLS-054-31	MPF-054-1 to MPF-054-31	HSD-054-1 to HSD-054-31
5.0 mh to 3.0 hy	206	QL-206-1 to QL-206-37	MP-206-1 to MP-206-37	HS-206-1 to HS-206-37
2.0 mh to 500 mh	848	QL-848-1 to QL-848-32	MP-848-1 to MP-848-32	HS-848-1 to HS-848-32
5.0 mh to 17.5 hy	930	QL-930-1 to QL-930-47	MP-930-1 to MP-930-47	HS-930-1 to HS-930-47
5.0 mh to 500 mh	395	QL-395-1 to QL-395-27	MP-395-1 to MP-395-27	HS-395-1 to HS-395-27
20 mh to 36 hy	254	QL-254-1 to QL-254-43	MP-254-1 to MP-254-43	HS-254-1 to HS-254-43
20 mh to 60 hy	715			HS-715-1 to HS-715-45

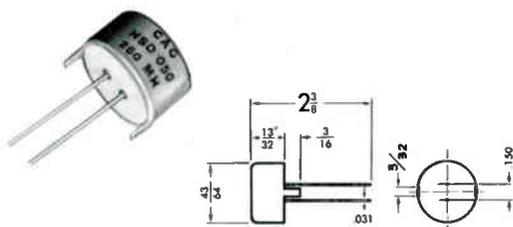
**SUBMINIATURE TOROIDS, Core Types 050, 051, 054**



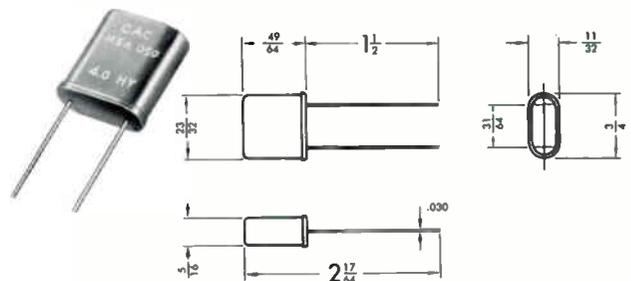
Open Coil Type QLS



Molded Plastic Type MPF



Hermetically Sealed Type HSD

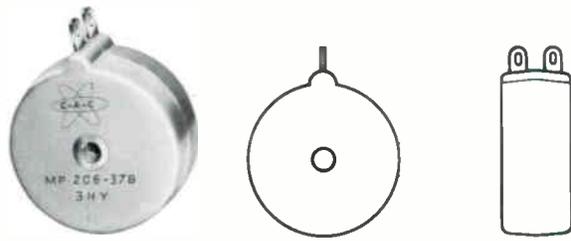


Hermetically Sealed Type HSA

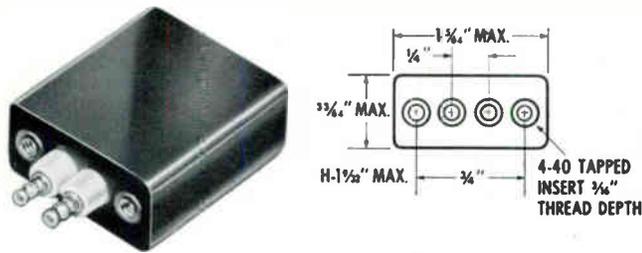
TOROIDAL COILS



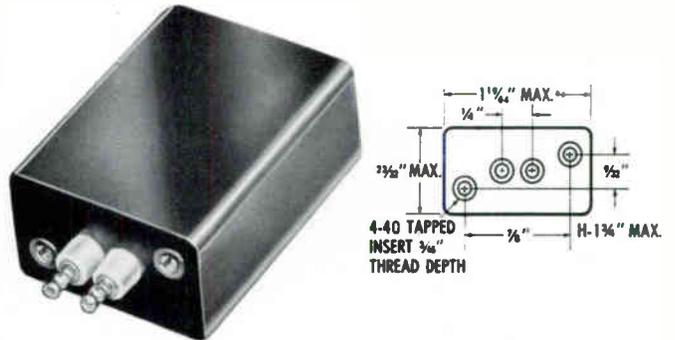
Open Coil Type QL, Core Types 206, 848, 930, 395, 254



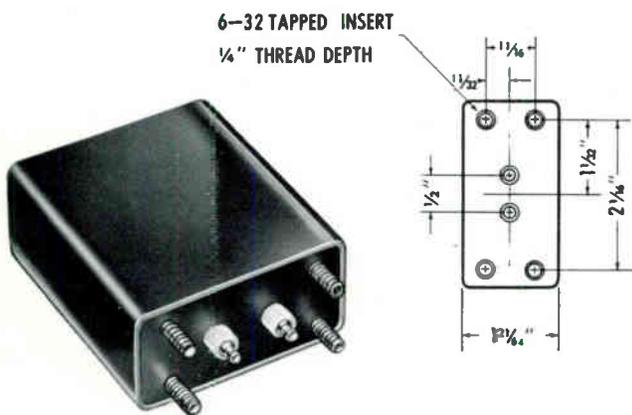
Molded Plastic Type MP, Core Types 206, 848, 930, 395, 254



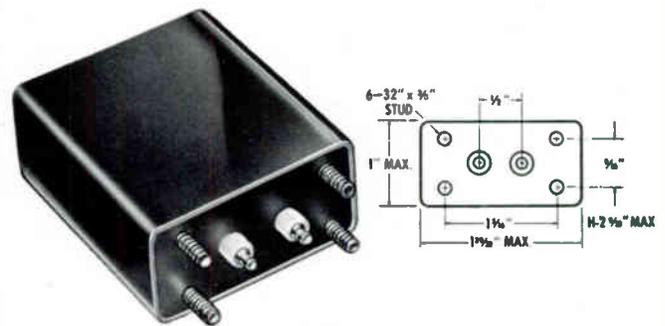
Hermetically Sealed Type HS, Core Types 206, 848



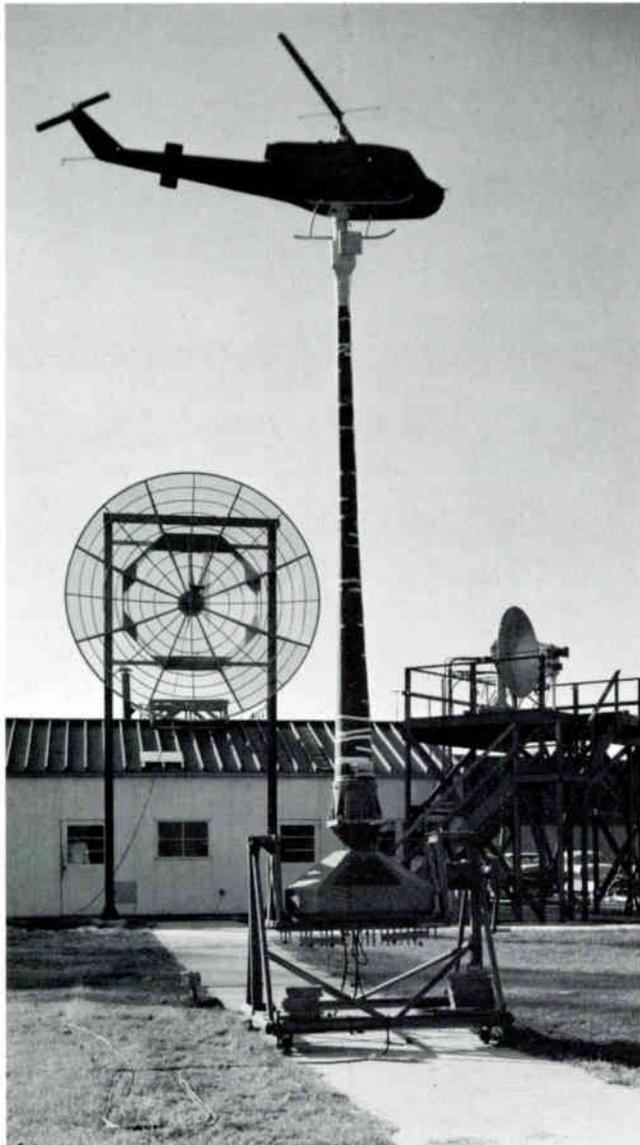
Hermetically Sealed Type HS, Core Types 930, 395



Hermetically Sealed Type HS, Core Type 715



Hermetically Sealed Type HS, Core Type 254



ANTENNA research range at Collins includes special support towers for holding or rotating models about one or two axes for antenna studies.

## RESEARCH IN COMMUNICATION

Collins Radio Company's activities have always been characterized by a determination to extend the state of the art through basic and applied research. The phenomena discovered have been pursued and validated by continuous measurement and test. This work throughout the years has resulted in new scientific techniques which have contributed greatly to the improvement of electronics, especially in the field of communications.

Among the Company's early research programs were the studies of VHF and UHF propagation characteristics, the results of which accelerated in no small measure the practical use of ionospheric and tropospheric scatter communications. More recent research of propagation media has led to the investigation of circuitry such as the parametric amplifier and the tunnel diode as means of improving existing communications systems and evolving new ones.

Celestial navigation research at Collins has led to advancements in electronic, mechanical and inertial techniques applicable to precision navigation systems. The mysteries beyond the earth have been probed by new research instruments at Collins radio astronomy observatory.

Well equipped laboratories staffed by capable scientists are currently absorbed in a major research effort in solid state physics, thermoelectric phenomena, network synthesis, speech processing, modulation theory, information theory, data transmission, ferrite devices, propagation, radiating structures, radio astronomy, mechanics and materials.

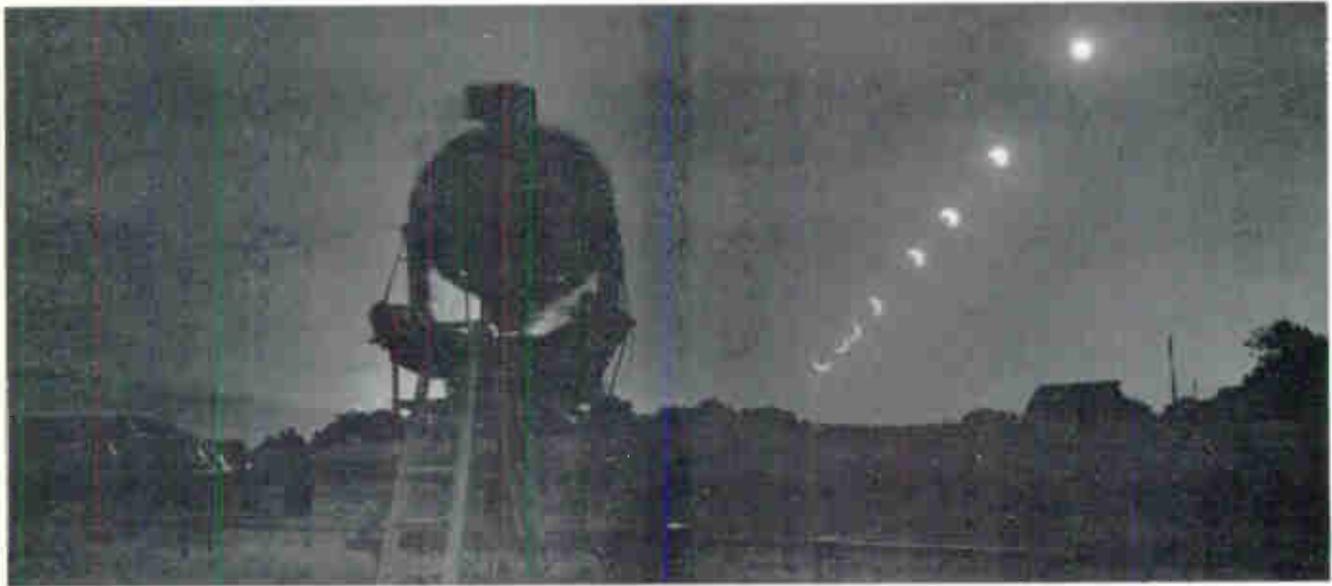
The unique research facilities of Collins are available for investigative assignments of industrial and government groups interested in expanding the frontiers of communication in its broadest concepts.



DIGITAL COMPUTING equipment is employed by analytical groups of Collins' research and development divisions to aid in mathematical calculations.



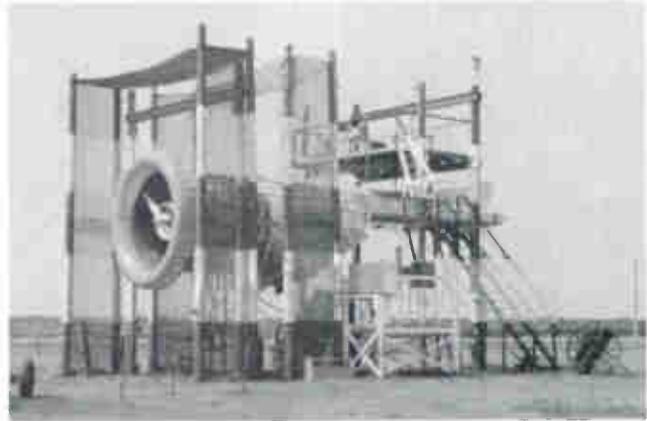
FLIGHT SIMULATOR, using analog computer, enables laboratory duplication of aeronautical conditions for analysis of airborne electronic systems.



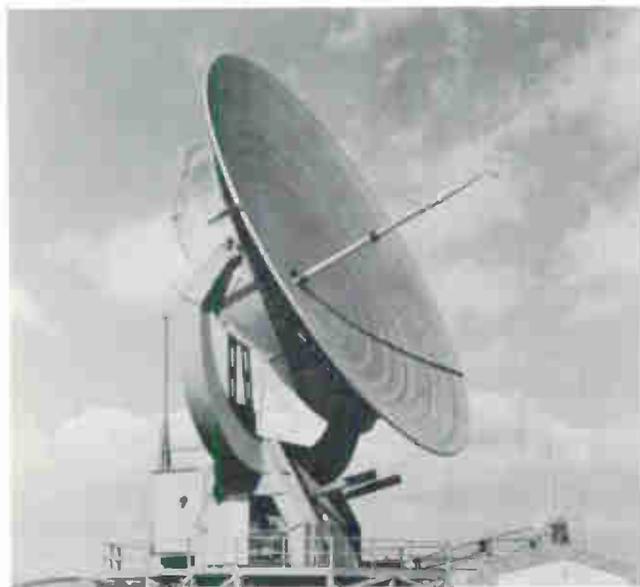
SOLAR ECLIPSE, shown in multiple exposure photograph from Collins Observatory, was studied with 0.87 cm wavelength radio telescope.



MOON RELAY communication dates as far back as 1951 when this antenna was used by Collins for long range contact via the moon on 418 megacycles.



AERODYNE, a wingless aircraft design, was developed to prototype stage in unique application of Collins research and development capabilities.



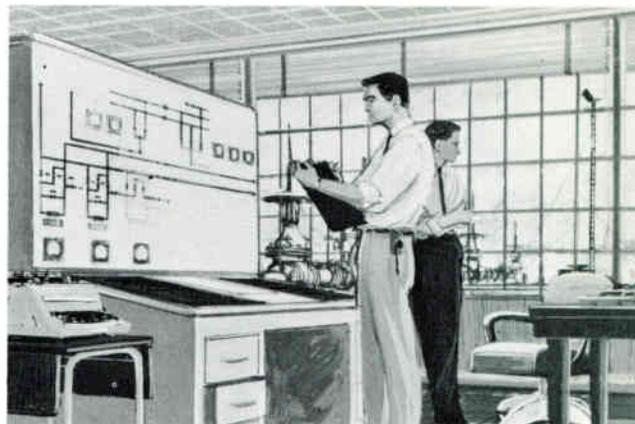
50 FOOT DISH, designed and constructed by Collins for the U. S. Naval Research Laboratory in 1951, was the first of the giant radio telescopes.



PROPAGATION STUDIES, by such means as this transportable terminal, have aided in application of scatter techniques for reliable communication.

## ALPHA CORPORATION

### A NEW CAPABILITY IN MAJOR SYSTEMS MANAGEMENT



Instrumentation, control, and switching systems



Space surveillance systems



Transportable communications systems

As a further extension of activities in the detailed management of technical projects in the U. S. and abroad, Collins Radio Company in April of 1959, formed Alpha Corporation, a wholly-owned subsidiary headquartered in Richardson, Texas. Alpha has assumed responsibility for all systems contracts previously awarded to the Systems Division of Collins.

Military, government, and commercial requirements demand an organization which functions at the systems level, supplying the specialized talent and services needed to integrate the available components, equipment, and techniques into operational systems. The entire Alpha organization is geared to this concept. Alpha is staffed to assume total management responsibility for complete technical projects. This includes not only the electronic equipment but the outside plant, i.e., site preparation, buildings,

roads, towers, antenna arrays, and other supporting structures necessary to provide an operative system.

Alpha depends upon recognized suppliers of subsystems and the parent company's extensive facilities for the original design of subsystems. Alpha personnel devote their time and energies to the dynamic, economic, and logistic interaction of the individual entities which make up the system. Alpha thus is primarily concerned with the production of an operating system of proven feasibility.

Alpha project divisions, each composed of designers, engineers, and constructors, carry out systems work from the preliminary studies through design, development, fabrication, structural construction and installation. Project division personnel will train user personnel and will operate and maintain the system produced until the client desires to take over.



Integrated land, sea, and air communications systems



Data systems



Telecommunications systems

The staff of the former Systems Division of Collins is the nucleus of Alpha Corporation. All of the personnel of the Systems Division, and many from other Collins divisions were transferred to Alpha Corporation upon its formation. This group of over 700 engineers, technicians, and supporting personnel brings to Alpha a most substantial store of experience, know-how, and creative talent.

A basic tenet of the Alpha systems concept is the greatest possible use of the specialized facilities of other companies with control of sub-contractors' work by Alpha project managers. After the system requirements are determined and Alpha personnel plan, analyze and develop overall project concepts, sub-contractors are used to the maximum practicable extent. This approach results in optimum systems design at lowest cost.

## CAPABILITIES BACKED BY EXPERIENCE

Alpha Corporation current prime contracts include:

- HF SSB communications systems for the Strategic Air Command.
- Integrated fleet communications system for the U. S. Navy.
- Deep space and satellite ground-based surveillance systems for the Signal Corps (ARPA) and the Jet Propulsion Laboratory (NASA).
- Telecommunications and command-destroy systems for major missile ranges.
- Construction of primary manufacturing, research, and operating facilities in the U. S. and abroad.
- Construction relating to prime electronics systems contracts.
- Ground and air transportable electronic systems, including high power communications.
- Modification of an aircraft fleet into electronic flying laboratories for the military.
- Tropospheric scatter communication system in the Far East for the U. S. Army.
- Scatter/Microwave communications systems for commercial petroleum companies.
- HF SSB communications system for OCDM.



820 East Arapaho Road • Richardson, Texas

# ORGANIZATION

DIVISIONS, SUBSIDIARIES,  
DEALERS, DISTRIBUTORS  
AND REPRESENTATIVES OF  
COLLINS RADIO COMPANY

## DIVISIONS/Collins Radio Company

CEDAR RAPIDS DIVISION, Cedar Rapids, Iowa • CENTRAL SALES DIVISION, P.O. Box 1891, Dallas 21, Texas • INTERNATIONAL DIVISION, P.O. Box 1891, Dallas 21, Texas • TEXAS DIVISION, 1200 North Alma Road, Richardson, Texas • WESTERN DIVISION, 2700 West Olive Avenue, Burbank, California

## SUBSIDIARIES/Collins Radio Company

ALPHA CORPORATION, 820 East Arapaho Road, Richardson, Texas • COLLINS RADIO COMPANY OF CANADA, Ltd., 11 Bermondsey Road, Toronto, Ontario, Canada • COLLINS RADIO COMPANY OF ENGLAND, Ltd., 242 London Road, Staines, Middlesex, England • COLLINS RADIO COMPANY, GmbH, Flughafen Rhein/Main, Frankfurt aM, Germany • COLLINS RADIO INTERNATIONAL, C.A., Caracas, Venezuela • COMMUNICATION ACCESSORIES COMPANY, Lee's Summit, Missouri

## REGIONAL AND DISTRICT SALES OFFICES/Cedar Rapids Division

### Regional

Central Region, 5200 C Avenue N.E., Cedar Rapids, Iowa  
Southern Region, P.O. Box 1891, Dallas 21, Texas  
Western Region, 1510 West Verdugo Avenue, Burbank, California  
Eastern Region, 261 Madison Avenue, New York 16, New York

### District

2804 Dodson Drive, East Point (Atlanta), Georgia  
939 White Henry Stuart Building, 1318 Fourth Avenue, Seattle, Washington  
205 East Third Avenue, Suite 409, San Mateo, California  
4471 Northwest 36th Street, Miami, Florida

## BROADCAST SALES OFFICES/Cedar Rapids Division

1510 West Verdugo Avenue, Burbank, California  
628 South Rock Hill Road, St. Louis 19, Missouri  
P.O. Box 547, Gatlinburg, Tennessee  
261 Madison Avenue, New York 16, New York  
P.O. Box 1891, Dallas 21, Texas  
205 East Third Avenue, Suite 409, San Mateo, California

939 White Henry Stuart Building, 1318 Fourth Avenue, Seattle, Washington  
P.O. Box 34, Tifton, Georgia  
429 Universal Building, 1825 Connecticut Avenue, Washington, D. C.  
5200 C Avenue N.E., Cedar Rapids, Iowa  
Route 2, Roanoke, Indiana  
P.O. Box 1194, Jackson, Mississippi

## DATA COMMUNICATION SALES OFFICES/Western Division

2700 West Olive Avenue, Burbank, California  
261 Madison Avenue, New York 16, New York

429 Universal Building, 1825 Connecticut Avenue, Washington, D. C.  
5200 C Avenue N.E., Cedar Rapids, Iowa

## MECHANICAL FILTER SALES REPRESENTATIVES/Western Division

Associated Industries, 1752 Rainier Avenue, Seattle 44, Washington  
Gassner & Clark Co., 6644 North Western Avenue, Chicago 45, Illinois  
Charles R. Hile Co., P.O. Box 144, Hillview Road, Paoli, Pennsylvania  
Harold Gray Associates, 46 Tenafly Road, Tenafly, New Jersey  
Westron Sales & Engineering, 7407 Melrose Avenue, Los Angeles 46, California

W. E. Fry & Co., Inc., 406 West 34th Street, Kansas City 11, Missouri  
Wm. R. Lehmann Co., P.O. Box 1224, Orlando, Florida  
Naylor Electric Co., 1718 Erie Boulevard East, Syracuse 3, New York  
R. H. Sturdy Co., 103 Morse Street, Newton 58, Massachusetts

## COMPONENT SALES REPRESENTATIVES/Communication Accessories Co.

Northport Engineering, Inc., 1729 Selby Avenue, St. Paul 4, Minnesota  
Fred A. Pease Company, 4921 East 38th Avenue, Denver 7, Colorado  
Harold Gray Associates, 46 Tenafly Road, Tenafly, New Jersey  
Samuel O. Jewett Company, 13111 Ventura Boulevard, North Hollywood, California  
Samuel O. Jewett Company, 45 West First Avenue, Scottsdale, Arizona  
G. W. Moler Company, P.O. Box 240, Haddonfield, New Jersey

Edward Schmeichel Co., 5968 West Chicago Avenue, Chicago 51, Illinois  
E. B. Schwerin, 4210 Main Street, Kansas City, Missouri  
E. B. Schwerin, 817 Gerald Avenue, St. Louis 21, Missouri  
Testco, Boeing Field, Room 105, Seattle 8, Washington  
Leonard D. Allen Co., Box 32, Salina Station, Syracuse, New York  
Electro Com., 1231 Main Avenue, Cleveland 13, Ohio

## SALES OFFICES / Central Sales Division

P.O. Box 1891, Dallas 21, Texas  
3898 Linden Avenue, Room 201, Dayton, Ohio  
429 Universal Building, 1825 Connecticut Avenue, Washington 9, D. C.  
Paul Revere, Turin Road, Rome, New York  
43 West Front Street, Red Bank, New Jersey

1133 North Farragut Street, Colorado Springs, Colorado  
P.O. Box 1028, Sierra Vista, Arizona  
P.O. Box 686, Plainview, Long Island, New York  
1510 West Verdugo Avenue, Burbank, California

## MICROWAVE SALES OFFICES / Texas Division

1200 North Alma Road, Richardson, Texas  
11 Bermondsey Road, Toronto 16, Ontario, Canada  
261 Madison Avenue, New York 16, New York  
1703 First National Building, Detroit, Michigan  
205 East Third Avenue, Suite 409, San Mateo, California

P.O. Box 1185, Tallahassee, Florida  
P.O. Box 216, Champlin, Minnesota  
1615 California Street, Room 223, Denver 2, Colorado  
6217 Calvin Avenue, Reseda, California

## U. S. AMATEUR EQUIPMENT DISTRIBUTORS / Cedar Rapids Division

Ack Radio Supply Co., Birmingham 3, Alabama  
Alaskan Electronics Supply, Inc., Anchorage, Alaska  
Southwest Electronic Devices, Phoenix, Arizona  
Elliott Electronics, Inc., Tucson, Arizona  
Moory's Wholesale Radio Co., DeWitte, Arkansas  
Lavender Radio Supply Co., Inc., Texarkana, Arkansas  
Valley Electronic Supply Co., Burbank, California  
Amrad Supply, Inc., Burlingame, California  
Henry Radio, Inc., Los Angeles 64, California  
Radio Products Sales, Inc., Los Angeles 15, California  
Elmar Electronics, Oakland 7, California  
Dow Radio, Inc., Pasadena 4, California  
Western Radio & TV Supply Co., San Diego 1, California  
Northern California Amateur Supply,  
San Francisco, California  
Quement Industrial Electronics, San Jose, California  
Eckert Enterprises, Van Nuys, California  
Radio Products Sales Co., Denver 2, Colorado  
Corky's of Hartford, Inc., Hartford, Connecticut  
Radio Shack Corp. of Connecticut,  
New Haven 10, Connecticut  
Huntress Electronics, West Hartford 10, Connecticut  
Willard S. Wilson, Inc., Wilmington 1, Delaware  
Electronic Wholesalers, Inc., Washington 1, D. C.  
Peard Electronic Supply Co., Jacksonville, Florida  
Electronic Supply Co., Miami 32, Florida  
Grice Electronics, Inc., Pensacola, Florida  
Broad Radio, St. Petersburg, Florida  
Kinkade Radio Supply, Inc., Tampa, Florida  
Specialty Distributing Co., Inc., Atlanta 8, Georgia  
Ack Radio Supply Co., Atlanta 13, Georgia  
Kaimuki Radio Company, Honolulu 16, Hawaii  
Newark Electronics Corp., Chicago 6, Illinois  
Allied Radio Corp., Chicago 80, Illinois  
Klaus Radio & Electric Company, Peoria, Illinois  
Graham Electronics Supply, Inc., Indianapolis 4, Indiana  
Radio Distributing Co., Inc., South Bend 15, Indiana

World Radio Laboratories, Inc., Council Bluffs, Iowa  
Radio Trade Supply Co., Des Moines 9, Iowa  
Bob and Jack's, Inc., Des Moines 11, Iowa  
Ken-El's Radio Supply Co., Fort Dodge, Iowa  
The Overton Electric Co., Inc., Topeka, Kansas  
Radio Equipment Company, Lexington, Kentucky  
Radio Parts, Inc., New Orleans 12, Louisiana  
Amateur Radio Center, Baltimore 17, Maryland  
EMCO Electronic Wholesalers, Silver Spring, Maryland  
DeMambro Radio Supply, Inc., Boston 15, Massachusetts  
Radio Shack Corp., Boston 17, Massachusetts  
Douglas Instrument Lab., Boston 19, Massachusetts  
Purchase Radio Supply, Ann Arbor, Michigan  
Communication Service Co., Charlotte, Michigan  
M. N. Duffy & Co., Detroit 26, Michigan  
Warren Radio Company, Kalamazoo, Michigan  
Electronic Center, Inc., Minneapolis 1, Minnesota  
Lew Bonn Company, Minneapolis 3, Minnesota  
Stark Radio Supply Co., St. Paul 3, Minnesota  
Swan Distributing Company, Jackson, Mississippi  
Henry Radio Company, Butler, Missouri  
Burstin-Applebee Co., Kansas City 6, Missouri  
Radiolab, Kansas City 8, Missouri  
Walter Ashe Radio Co., St. Louis 1, Missouri  
Modern Equipment Company, Great Falls, Montana  
Evans Radio, Concord, New Hampshire  
Federated Purchaser, Inc., Mountainside, New Jersey  
Hudson Radio & Television Corp. of New Jersey,  
Newark 2, New Jersey  
Warner Engineering Co., Upper Montclair, New Jersey  
Ft. Orange Radio Distributing Co., Inc.,  
Albany 7, New York  
Adiroack Radio Supply, Amsterdam, New York  
Genesee Radio & Parts Co., Buffalo 16, New York  
Harrison Radio Corporation, New York 7, New York  
Harvey Radio, Inc., New York 18, New York  
Freck Radio & Supply Co., Asheville, North Carolina

Southeastern Radio & Supply Co., Inc.,  
Raleigh, North Carolina  
Dalton-Hege Radio Supply Co., Inc.,  
Winston-Salem, North Carolina  
Steinberg's Inc., Cincinnati 2, Ohio  
Pioneer Electronic Supply Co., Cleveland 15, Ohio  
Universal Service, Columbus 15, Ohio  
Custom Electronics, Inc., Dayton 9, Ohio  
Selectronic Supplies, Inc., Toledo 6, Ohio  
General Electronics, Inc., Oklahoma City, Oklahoma  
Radio, Inc., Tulsa, Oklahoma  
Portland Radio Supply Co., Portland 5, Oregon  
Radio Electric Service Company of Pa., Inc.,  
Philadelphia 6, Pennsylvania  
Cameradio Company, Pittsburgh 22, Pennsylvania  
George D. Barbey Company, Inc., Reading, Pennsylvania  
W. H. Edwards Company, Inc., Providence 3, Rhode Island  
Burghardt Radio Supply, Watertown, South Dakota  
W. & W. Distributing Company, Memphis, Tennessee  
Electra Distributing Company, Nashville 4, Tennessee  
Howard Radio, Abilene, Texas  
Hargis-Austin, Inc., Austin, Texas  
Electronic Equipment & Engineering Co.,  
Corpus Christi, Texas  
Central Electronics, Dallas, Texas  
Crabtree's Wholesale Radio, Dallas, Texas  
C. C. McNicols, El Paso, Texas  
Electronic Equipment Co., Inc., Ft. Worth, Texas  
Busacker Electronic Equipment Company,  
Houston 19, Texas  
Modern Electronics Co., San Antonio, Texas  
Radio & Television Parts Co., San Antonio 2, Texas  
Northwest Electronics Distributors,  
Spokane 3, Washington  
C & G Radio Electronics Co., Tacoma 2, Washington  
Harris Radio Corporation, Fond du Lac, Wisconsin  
Satterfield Electronics, Inc., Madison 5, Wisconsin  
Amateur Electronic Supply, Milwaukee 8, Wisconsin

## U. S. AVIATION EQUIPMENT DISTRIBUTORS / Cedar Rapids Division

Aviation Radio, Inc., Anchorage, Alaska  
Hawkes Aviation, Inc., Phoenix, Arizona  
Sun Valley Air Service, Phoenix, Arizona  
Aviation Service, Inc., Little Rock, Arkansas  
Qualitron, Inc., Burbank, California  
A. Biederman, Inc., Glendale, California  
Bates Aviation, Inc., Hawthorne, California  
The Air-Oasis Company, Long Beach, California  
Airesearch Aviation Service Co., Los Angeles, California  
Bayaire Avionics, Inc., Oakland, California  
Golden Gate Aviation, Inc., Oakland, California  
Clover Field Radio Supply Co., Santa Monica, California

Executive Radio & Aircraft Service, Inc.,  
Santa Monica, California  
Planeservice, Inc., Van Nuys, California  
Norman Larson Company, Van Nuys, California  
Aircraft Radio & Accessories Co., Denver, Colorado  
Usher Aviation Radio Div., New Haven 13, Connecticut  
Atlantic Aviation Corp., Wilmington, Delaware  
Butler Aviation, Washington, D. C.  
Sunny South Aircraft Service, Inc.,  
Ft. Lauderdale, Florida  
Farnell & Company, Lantana, Florida  
American Airmotive Corporation, Miami, Florida  
Big Brothers Aircraft, Inc., Atlanta, Georgia

Southern Airways Company, Atlanta, Georgia  
Bohling Aircraft Corporation, Chicago, Illinois  
Butler Aviation, Chicago, Illinois  
Walston Aviation, Inc., E. Alton, Illinois  
Mid-States Aviation Corp., Northbrook, Illinois  
Skymotive, Inc., Park Ridge, Illinois  
Butler Aviation, Rockford, Illinois  
Capitol Aviation, Springfield, Illinois  
Roscoe Turner Aeronautical Corp., Indianapolis, Indiana  
Elliott Flying Service, Davenport, Iowa  
Des Moines Flying Service, Des Moines, Iowa  
Wilson-Wylie Co., Inc., Kansas City, Kansas

(Continued on page 92)

(Continued from page 91)

United Airplane Sales, Inc., Wichita, Kansas  
Aircraft Radio Laboratory, Louisville, Kentucky  
J. D. Hair, Distributor, Baton Rouge, Louisiana  
Trans-Air Corporation, New Orleans, Louisiana  
Currey Sanders Aircraft Co., Shreveport, Louisiana  
Atlantic Aviation Corp., Boston, Massachusetts  
E. W. Wiggins Airways, Inc., Norwood, Massachusetts  
Anderson Aircraft Radio Co., Detroit, Michigan  
Northern Air Service, Inc., Grand Rapids, Michigan  
Francis Aviation, Lansing, Michigan  
Robbins Aviation Corporation, Pontiac, Michigan  
Minnesota Airmotive, Inc., Minneapolis, Minnesota  
Gopher Aviation, Rochester, Minnesota  
Executive Aircraft Co., Kansas City, Missouri  
Navco Lambert Field, St. Louis, Missouri  
St. Louis Flying Service, Inc., St. Louis, Missouri  
Electronic Consultants Services, Billings, Montana  
Atlantic Aviation Corporation, Teterboro, New Jersey  
Smith-Meeker Engineering Co., Teterboro, New Jersey  
Cutter-Carr Flying Service, Inc., Albuquerque, N. M.

Southwestern Skyway, Santa Fe, New Mexico  
Butler Aviation, Flushing, New York  
DOT Airtronics, Lindenhurst, Long Island, N. Y.  
Airmar Radio Service, Inc.,  
Ronkonkoma, Long Island, N. Y.  
Page Airways, Rochester, New York  
Smith-Meeker Engineering Co., White Plains, New York  
Piedmont Aviation, Inc., Winston-Salem, North Carolina  
Cincinnati Aircraft, Inc., Cincinnati, Ohio  
Ohio Aviation, Vandalia, Ohio  
General Aviation, Inc., Willoughby, Ohio  
Sky Service Company, Bethany, Oklahoma  
Aircraftsmen, Inc., Oklahoma City, Oklahoma  
Spartan Aircraft Company, Tulsa, Oklahoma  
Aero-Air, Inc., Portland, Oregon  
Flightcraft, Inc., Portland, Oregon  
Skyways, Inc., Troutdale, Oregon  
Beckett Aviation Corp., Dravosburg, Pennsylvania  
Reading Aviation Service, Inc., Reading, Pennsylvania

Hawthorne Flying Service, Charleston, South Carolina  
Capitol Air Supply, Inc., Nashville, Tennessee  
Tradewind Airport Corporation, Amarillo, Texas  
Associated Radio Company, Dallas, Texas  
Champs Aviation, Inc., El Paso, Texas  
Continental Radio Company, Inc., Houston, Texas  
Cruse Aviation, Inc., Houston, Texas  
Airnews, Inc., San Antonio, Texas  
Howard Aero, Inc., San Antonio, Texas  
Mathews Electronics, San Antonio, Texas  
Midland Aero Corp., Terminal, Texas  
West Texas Flying Service, Terminal, Texas  
Texas Aviation Corporation, Tyler, Texas  
Tyler Aircraft Radio Co., Tyler, Texas  
Tex Airmen, Inc., Wichita Falls, Texas  
Salt Lake Aircraft Parts, Salt Lake City, Utah  
Aero Industries, Richmond, Virginia  
Sulak Mfg. Co., Seattle, Washington  
Aeromech, Inc., Clarksburg, West Virginia  
Sky Harbor Air Service, Cheyenne, Wyoming

## INTERNATIONAL SALES OFFICES

### International Sales Offices

Case Postale No. 35, Cointrin Airport, Geneva 15,  
Switzerland  
22 Peak Road, Hong Kong, B.B.C.

124 Prospect Hill Road, Canterbury E7, Victoria,  
Australia  
Rua Rodolfo Dantas 91, Apt. 801, Rio de Janeiro, Brazil  
242 London Road, Staines, Middlesex, England

Flughafen Rhein/Main, Frankfurt/Main, Germany  
P.O. Box 1891, Dallas 21, Texas  
11 Bermondsey Road, Toronto 16, Ontario, Canada  
C/o B P 2309, Beirut, Lebanon  
SARL 3 Rue Lord Byron, Paris 8, France

## INTERNATIONAL DEALERS/International Division

### Europe

Leopold Zettel, Zollergasse 35, Wien VII, Austria  
Daniel Delgay, 58a Chaussee de Charleroi,  
Brussels, Belgium  
Tage Olsen A/S, 6D Vesterbrogade, Centrumgaarden,  
Room 133, Copenhagen V, Denmark  
K. L. Nyman, 11 Meritullinkatu, Helsinki, Finland  
Societe Anonyme D'Applications Electroniques,  
62 Rue Mathurins, Paris (8), France  
Atomon, 4 Dragatsaniou Street, Athens, Greece  
G. Helgason and Melsted Ltd., Reykjavik, Iceland  
Telettra (Headquarters), Via Carlo Poma 47, Milan, Italy  
Telettra (Sales Office), Via Paisiello 49, Rome, Italy  
Luftmateriell A/S, Prinsensgt. 2C, Oslo, Norway  
Casa Serras, Rua Augusta, 228, Lisbon, Portugal  
H. & O. Wilmer, Peligros, 2-4, Madrid, Spain  
John C. Lagercrantz, Vartavagen 57, Stockholm, Sweden  
Electravia S.A., Aeroport, Geneva 15, Switzerland  
Telion, Ltd., Albisriederstrasse 232,  
Zurich 47, Switzerland

### Middle East and Africa

Strol (Africa) Lda., Caixa Postal 1358, Luanda, Angola  
Intair-Congo, P.O. Box 7099, Leopoldville, Belgian Congo  
Aerosignals (Pvt.) Ltd., c/o Commercial Air Services  
(Pvt.) Ltd., Box 632, Bulawayo, Southern Rhodesia  
Electrical & Telecommunications Eng., 5, Kasr El-Nil  
Street, Cairo, Egypt  
N. Zand Shirazi, B.O.A.C. Airways Building, Avenue  
Ferdowcy, Teheran, Iran  
The Iraq Scientific Company Ltd., P. O. Box 287,  
Baghdad, Iraq  
Mohammad Saleh Yousuf Behbehani, P. O. Box 341,  
Kuwait, Arabia (Persian Gulf)  
Boulos Freres, B.P. 1656, 32/40, Avenue des Francais,  
Beirut, Lebanon  
Mahomed Ebrahim & Company, Ltd., 500/14 Inverarity  
Road, Sadar, Karachi-3, Pakistan  
W. Gray, P. O. Box 2059, Durban, Union of South Africa

Aerosignals, P. O. Box 957, 46 Marshall Street,  
Johannesburg, Union of South Africa

### Far East

Burma Electronics Ltd., 77 Phayre Street,  
Rangoon, Burma  
Electronic Engineering Company, 9, Ice House Street,  
Hong Kong, B.C.C.  
Hong Kong Aircraft Engineering Co., Hong Kong Airport,  
P. O. Box 5728, Kowloon, Hong Kong, B.C.C.  
Electronics Limited, Connaught Place, New Delhi, India  
Hadi Trading & Industrial Corp., P. O. Box 2437,  
Jakarta, Indonesia  
Kyokuto Boeki Kaisha Ltd., 696 Marunouchi Building,  
Marunouchi, Tokyo, Japan  
Kyokuto Boeki Kaisha Ltd. (Far East Mercantile Co.),  
50 East 42nd Street, New York 17, N. Y.  
Korean Engineering and Manufacturing Co.,  
International P. O. Box 1422, Seoul, Korea  
Industrial Electronics Ltd., P. O. Box 5001,  
Auckland, New Zealand  
Radiowealth, Inc., P. O. Box 3130, Manila, Philippines  
Tech-Lab Ltd., Box 176, Singapore  
Brownell, Lane (Vietnam) Inc., P. O. Box 391,  
Saigon, Vietnam  
Brownell, Lane International Ltd., 50 Broad Street,  
New York 4, New York  
Huntley & Company, P. O. Box 1032, Taipei,  
Taiwan, Formosa  
G. Simon Radio Company, Ltd., 30 Patpong Avenue,  
Suriwong, Bangkok, Thailand

### Central America

Industrias Colombo-Britanicas Ltda., Cra. 24 No. 24-A-40,  
Apartado Aereo 3882, Bogota, Colombia, S. A.  
Telecomunicacion Commercial, Apartado 3923,  
San Jose, Costa Rica  
Electronica Guatemalteca, 6a. Avenida 14-11, Zona 1,  
P. O. Box 514, Guatemala City, Guatemala  
Kenneth H. See, Apartado Postal NO. 67,  
Tegucigalpa, D. C., Honduras

Equipos Electronicos de Mexico, S.A., Calle de Cuba  
No. 16, Apartado Postal 2158, Mexico 1, D.F., Mexico  
Guarantee Radio Supply Company (Broadcast Equipment  
Only), 1314 Iturbide Street, Laredo, Texas  
Servicios Electronicos del Norte, S.A.,  
Tapia y Cuauhtemoc, Apartado, No. 1427,  
Monterrey, N.L., Mexico  
Nicaragua Machinery Company, Apartado 469,  
Managua, Nicaragua  
Tropelco, S.A., Esquina de Calle 45 y via Espana,  
Apartado 827, Panama, Republic of Panama

### South America

Aviacom, Paseo Colon 995 (2E), Buenos Aires, Argentina  
Gundlach S.A., Calle Reyes Ortiz No. 73,  
Cajon de Correo 15, La Paz, Bolivia  
Sabre, Rua 7 de Marco 320-2°, Caixa Postal 5024,  
Rio de Janeiro, Brazil  
Luis M. Desmaras, Plaza Bulnes 59, Casilla 761,  
Santiago, Chile  
Reed and Reed, Casilla 784, Guayaquil, Ecuador  
Reed and Reed, Casilla 576, Quito, Ecuador  
Campos e Hijos S.A., Casilla Postal 117,  
Palma 232/234, Asuncion, Paraguay  
W. E. Van Romondt's Trading Co., Ltd., Waterkant 40-42,  
Postbus 168, Paramaribo, Surinam  
M. Gonzalez del Rio, Casilla de Correo 228,  
Montevideo, Uruguay  
OTACCA, Edif. San Diego, Esq. Maderero,  
Apartado de Correos 3372, Caracas, Venezuela

### Caribbean

Bahamas Airways Limited, P. O. Box 65, Shirley Street,  
Nassau, Bahamas  
Caribbean Electronics, S.A., Edificio Retiro  
Odontologico, Calle L No. 353, Vedado, Habana, Cuba  
Sonorama Importadora, Calle Padre Billini No. 8,  
Apartado 297, Ciudad Trujillo, D.N.,  
Dominican Republic  
Wonards Radio Engineering Ltd., 55½ Church Street,  
Kingston, Jamaica, B.W.I.  
San Juan Electronics, Inc., P. O. Box 5167, Puerta de  
Tierra Sta., Pda 3, San Juan, Puerto Rico

# INDEX

## COMPLETE LISTING BY PRODUCT TYPE NUMBERS

### AVIATION EQUIPMENT

17L-4, -6 VHF Communication Transmitters .....	11	278H-1 Control Panel .....	22	349D-3A Shockmount .....	30
17L-4, -6/51R-3 VHF Communication Systems .....	10	288A-1 Tone Generator .....	22	349F-4 Shockmount .....	30
17L-7 VHF Communication Transmitter .....	10	309A-2 Antenna Coupler Control .....	13	349F-5 Shockmount .....	30
17L-7/51X-2 VHF Communication System .....	10	314S-4 Remote Control Units .....	24	349J-1 Shockmount .....	30
17L-8A VHF Communication Transmitter .....	10	314U-8 Remote Control Units .....	24	349H-2 Shockmount .....	30
17L-8A/51X-3 VHF Communication System .....	10	314U-10 Remote Control Units .....	24	349H-3 Shockmount .....	30
18S-4A HF Transmitter Receiver .....	14	323A-1 Flux Detector .....	20	349H-4 Shockmount .....	30
18Z-3, -4 1 KW Systems .....	12	327A-2 Marker Light Indicator .....	17	349H-5 Shockmount .....	30
37J-3 VOR Navigation Antenna .....	21	327B-1W Gyro Monitor .....	7, 9	349H-6 Shockmount .....	30
37P-4, -5 Glideslope Antenna .....	21	327C-1 Slave Indicator .....	20	349N-1 Shockmount .....	30
37R-1 VHF Communication Antenna .....	21	327D-1 Trim Indicator .....	9	350C-5 Shockmount .....	30
37R-2 VHF Communication Antenna .....	21	327D-1 Trim Indicator .....	9	350D-1 Shockmount .....	30
37X-2 Marker Beacon Antenna .....	21	328A-2 Compass Amplifier .....	20	350E-3A Shockmount .....	30
51R-3 VHF Navigation Receiver .....	17	329B-2 Series Approach Horizons .....	7	350E-3C Shockmount .....	30
51R-3 VHF Communication/Navigation Receiver .....	11	329B-4 Series Approach Horizons .....	7	350E-3D Shockmount .....	30
51R-4 Navigation Receiver .....	16	331A-2 Series Course Indicators .....	7	350F-3 Shockmount .....	30
51V-3 Glideslope Receiver .....	17	331A-4 Series Course Indicators .....	7	350G-3 Shockmount .....	30
51X-2 VHF Communication/Navigation Receiver .....	10	331E-2 ADF Indicator .....	17	350M-1A Shockmount .....	30
51X-3 VHF Communication/Navigation Receiver .....	10	331H-1 Course Selector Indicator .....	17	350M-2 Shockmount .....	30
51Y-3 Receiver .....	23	332C-1 Radio Magnetic Indicator .....	17	350S-3 Shockmount .....	30
51Z-2 Marker Beacon Receiver .....	17	332D-6A Vertical Gyro .....	7	350T-1 Shockmount .....	30
121A-1 Mechanical Disconnect .....	9	332D-8 Vertical Gyro .....	7	350T-3 Shockmount .....	30
121A-2 Emergency Disconnect .....	9	332D-9 Vertical Reference .....	9	350V-1 Shockmount .....	30
137A-2 Antenna .....	23	332E-2 Directional Gyro .....	20	351A-1 Accessory Frame .....	11
137X-1 Communication/Navigation Antenna .....	21	333B-1, -3 Servo Amplifiers .....	11	374A-1 Receiver/Transmitter .....	15
172H-1 Composite Dummy Tailcap Antenna .....	28	334C-2 Primary Servo .....	8	390D-1 Shockmount .....	30
179J-1, -2 Antenna Coupler .....	23	334C-3, -4 Primary Servos .....	9	390D-3 Shockmount .....	30
180K-3 Antenna Tuning Unit .....	14	334D-1 Trim Tab Servo .....	9	390D-4 Shockmount .....	30
180L-2 Automatic Tuning Unit .....	14	334D-1-33 Trim Tab Servo .....	9	390D-5 Shockmount .....	30
180L-3 Automatic Tuning Unit .....	14	336A-2 OMNI-Bearing Selector .....	17	390D-6 Shockmount .....	30
180M-1 Antenna Tuning Unit Test Set .....	27	336A-3 OMNI-Bearing Selector .....	17	390D-7 Shockmount .....	30
180R-6 Antenna Coupler .....	12	337A-2 OMNI-Bearing Indicator .....	17	390D-8 Shockmount .....	30
		339D-1 Distance Indicator .....	20	390D-9 Shockmount .....	30
		344C-1 Instrument Amplifier .....	7	390E-1 Shockmount .....	30
		345A-2 Sensing Unit .....	7	390E-2 Shockmount .....	30
		345A-3, -4 Sensing Units .....	8	390F-1 Shockmount .....	30
		346A-1 Interphone and Isolation Amplifier .....	19	390F-2 Shockmount .....	30
		346D-1 Passenger Address Amplifier .....	19	390F-3 Shockmount .....	30
		349A-4 Shockmount .....	30	390F-4 Shockmount .....	30
		349B-2 Shockmount .....	30	390F-5 Shockmount .....	30
		349D-1 Shockmount .....	30	390F-6 Shockmount .....	30
				390J-1 Shockmount .....	30
				390K-1 Shockmount .....	30
				413F-1 Test Set .....	27

614E-2 Flight Controller	8	578M-1 Test Set	29	32S-1 Transmitter	34
614E-3 Switching Unit	8	578N-1 Test Set	29	75S-1 Receiver	34
416N-1 Power Supply	11	578P-1 Test Set	29	180S-1 Antenna Tuner	36
416N-5 Power Supply	11	578X-1 Transponder Test Set	29	189A-2 Phone Patch	36
416N-6 Power Supply	11	590A-2 Altitude Controller	8	302C-3 Directional Wattmeter	36
416W-1 Power Supply	14	590B-1 Airspeed Compensator	9	312B-3 Speaker	36
416W-3 Power Supply	14	614C-2 Remote Control Unit	24	312B-4 Speaker Console	36
416Z-1 Power Supply	11	614D-1 Remote Control Unit	24	312B-5 Speaker Console and External PTO	36
427B-1, -2 Power Supplies	11	614D-2 Remote Control Unit	24	399C-1 PTO Speaker	36
427D-1 Power Supply	10	614D-3 Remote Control Unit	24	516E-1 DC Power Supply	36
456C-1 Airborne Selcal	22	614F-1 Remote Control Unit	24	516F-2 AC Power Supply	36
476F-1 Doppler Tracker Signal Simulator	28	614F-2 Remote Control Unit	24	351D-2 Mobile Mount	37
476G-1 Doppler Microwave Simulator	28	614F-3 Remote Control Unit	24	351E Mounting Plates	36
476H-1 Doppler System Simulator	28	614G-1 Remote Control Unit	24	B312-1 Directional Coupler	36
476X-1 ATC Transponder Ramp Test Set	28	614J-1, K-1 Control Units	22	MM-1 Mobile Microphone	37
477A-1 Course Indicator Test Set	25	614L Remote Controls	23	MM-2 Microphone	37
477K-1 Gyro Simulator	25	614Q-3 Remote Control	12	MM-3 Microphone	37
477L-1 Compass Simulator	25	614U-1, -2 Remote Control Units	24	SM-1 Desk Top Microphone	37
477M-1 Instrument Amplifier Test Set	25	614U-3 -4, -7 Remote Control Units	24	SM-2 Microphone	37
477N-1 Steering Computer Test Set	25	614X-1 Remote Control Unit	24		
477P-1 Approach Horizon Test Set	25	618F-1 VHF Communication System	10	<b>BROADCAST EQUIPMENT</b>	
477U-1, 477V-1 ADF Test Sets	26	618S-1, -4 HF Transceivers	14	20V-2 1 KW Transmitter	39
477Y-1 VOR Test Amplifier	29	618T-2, -3 400 Watt Transceiver	13	21E 5 KW Transmitter	39
478A-1 ZIFOR	27	621A-2 ATC Transponder	22	21M 10 KW Transmitter	39
478C-2 FD-104 IFS Test Set	25	714E-1 Remote Control Unit	13	26U-1 Limiting Amplifier	45
478H-1 618S Test Set	27	776C-1, -2 Synchronizers	15	37M FM Antennas	40
479S-3 VOR Audio Signal Generator	26	860E-1 DMET	20	42E-7, -8 Antenna Coupling Units	41
479T-2 All Channel VOR-ILS Signal Generator	26	960A-1 Smoke Tunnel	31	81M Phasors	41
479U-1 Three Channel VOR-ILS Signal Generator	26	AP-101E Automatic Pilot System	8	144A-1 Isolation Coil	41
479V-2 Precision OMNI-Bearing Selector	25	AP-102 Automatic Pilot System	8	172G-1, -2 Dummy Loads	40
479V-3 Precision OMNI-Bearing Selector	27	AP-103 Automatic Pilot System	8	212E-1 Speech Input Console	42
479X-2 Instrument Zeroing Panel	27	AP-103 Test Equipment	29	212F-1 Speech Input Console	43
488A-1 Inverter	19	AT-101/AT-102 Antenna Tuners	13	212G-1 Speech Input Console	42
493A-1 Indicator	15	DF-202 ADF System	23	212Z-1 Remote Amplifier	44
493A-2 Indicator	15	DN-101 Doppler Radar Navigation System	18	274K-1 Relay Unit	43
516G-1 Converter	19	FD-104 Integrated Flight System	6	274K-2 Relay Unit	43
537F-1 Antenna	15	FD-105 IFS Test Equipment	25	300J-2 250 Watt Transmitter	39
537F-3 Antenna	15	FD-105 Integrated Flight System	6	356A-1 Preamplifier	43
561G-1, -2 Cockpit Controls	15	FD-107 Integrated Flight System	7	356B-1 Program/Monitor Amplifier	43
562A-4C Steering Computer	7	ID-48 Deviation Indicator	17	356E-1 Limiting Amplifier	43
562A-5 Steering Computer	7	Lightweight Deluxe Navigation System	17	356Q-1 Cue Amplifier	43
562A-6 Steering Computer	8	Lightweight Standard Navigation System	17	374A-1 Receiver-Transmitter	48
562A-7 Steering Computer	7	MC-102 Magnetic Compass System	20	409X-2 Power Supply	43
562C-1A, -2 Computer Amplifiers	8	NC-103 Doppler Navigation Computer System	18	493A-1 Indicator	48
562C-3 Computer Amplifier	8	OR-102 VOR Ground System	32	499G-1 Rack Mounting Shelf	43
578C-1 Computer Amplifier Adapter	29	OR-202 VOR Ground System	32	550A-1 500 Watt Transmitter	39
578E-1 Vertical Reference Test Set	29	OR-302 VOR Ground System	32	537F-3 Antenna	48
578F-1 Primary Servo Test Set	29	OR-402 VOR Ground System	32	561G-2 Control	48
578G-1 Air Speed Compensator Test Set	29	WP-101 Airborne Weather Radar System	15	564A-1 Phase Sampling Loop	41
		VOR-101 Navigation System	16	564A-2 Phase Sampling Loop	41
		VOR-102 Navigation System	17	776C-1, -2 Synchronizers	48
				1181-B Frequency Deviation Monitor	40
		<b>AMATEUR EQUIPMENT</b>		1931-B AM Modulation Monitor	40
		KWM-2 Mobile Transceiver	35	Announcer	45
		30S-1 Linear Amplifier	35	Antenna Current Transformer	40
				Automatic Tape Control	46
				CS-8 Loudspeaker	46
				CS-12 Loudspeaker	46

Custom Control Desks .....	45
High-Fidelity Loudspeakers .....	46
M-20 Microphone .....	47
M-40 Microphone .....	47
M-60 Remote Microphone-Amplifier .....	47
'Micromote' Remote Amplifier .....	44
Radio Station Trailer .....	47
Tower Lighting Filter Chokes .....	40
TT-400, -200 Turntables .....	44
Turntable Equalizing Preamplifier .....	45
TV-STL Microwave .....	48
Weather Radar .....	48

### HF-VHF GROUND SYSTEMS

8U-1 Frequency Divider .....	55
16F-14 400/250 Watt Transmitter .....	56
30K-5 300/250 Watt Transmitter .....	56
32MS-1 Mobile Transceiver .....	53
32RA-10 75/50 Watt Transmitter .....	57
32RS-1 100 Watt Transceiver .....	54
40K-1 High Stability Oscillator .....	55
40N-1 Frequency Standard .....	55
50E-1 Receiver .....	53
50E-6 Receiver .....	53
51J-4 Receiver .....	57
51M-8 Receiver .....	58
51N-7 Receiver .....	57
54M-1 Frequency Comparator .....	55
152J-1 Phone Patch .....	54
177G-10 Remote Control Unit .....	62
177L-2 Remote Control Unit .....	62
177M-1 Remote Control Unit .....	62
180V-1 Antenna Coupler .....	54
204C-1 10 KW Power Amplifier .....	50
204F-1 2.5 KW Power Amplifier .....	51
204H-1 2.5 KW Power Amplifier .....	51
205J-1 45 KW Power Amplifier .....	50
237A Series Log Periodic Antennas .....	61
237E Series Log Periodic Antennas .....	61
237N Series Log Periodic Antennas .....	61
242F-2 200 Watt Transmitter .....	58
242F-5CL 50 Watt Transmitter .....	58
270G-3 Cabinet-Speaker .....	60
271B Speakers .....	59
302E-2 Directional Wattmeter .....	54
310F-1 Exciter .....	52
310F-6 Receiver-Exciter .....	52
432D-2 2.5/2 KW Transmitter .....	56
478R-1 Spectrum Analyzer .....	62

512B-2 HF Impedance Conversion Unit .....	59
512D-1 HF Impedance Conversion Unit .....	60
512F-1 Coaxitran .....	60
512G-1 Exponential Line Kit .....	60
619F Cabinets .....	60
619J-4 Equipment Racks .....	60
Dipole Balun Antenna Kit .....	54
KWT-6 500 Watt Transceiver .....	54
Rack Terminal Panel .....	58
Receiver Cabinet .....	60

### TRANSHORIZON SYSTEMS

35Q-1 Coaxial Bandpass Filter .....	64
35R-1 Coaxial Branching Filter .....	64
40P-1 Frequency Standard .....	66
50Q-2 FM Receiver .....	66
137Q Antennas .....	64
240D 10 KW Power Amplifiers .....	64
240E-2 1 KW Power Amplifier .....	64
240F-2A Power Amplifier .....	66
240F-2B UHF Power Amplifier .....	66
310K-2, -3 Exciter-Modulators .....	64
310T-2A FM Exciter .....	66
537J Air Inflatable Antennas .....	64
651C Series Receivers .....	64
708E-1 Frequency Synthesizer .....	67
900B-1 Deviation and Level Monitor .....	66
AST-102 Air Transportable .....	67
TST-101-201 Ground Transportable .....	67

### MICROWAVE SYSTEMS

476A-1 IF Test Set .....	71
476B-1 Signal-To-Noise Test Set .....	71
476C-1 Noise Loading Test Set .....	71
476J-1 Wideband and Selective Voltmeter .....	72
477C-1 Noise Loading Test Set .....	71
477Z-1, -2 Deviation Calibrators .....	71
478G-2 Test Panel .....	72
478J-1 Microwave Test Horn .....	72
537E, G, H Offset Feed Antennas .....	72
Diversity Systems .....	69
Hot Standby Systems .....	69
Non-Standby Systems .....	69
Q Line System .....	69
Voice Carrier Multiplex .....	70

### KINEPLEX® SYSTEMS

768H-1 Kinetape Converter .....	74
768H-2 Kinetape Converter .....	75
768G-1 Kinecard Converter .....	74
TE-202 Data Communication System .....	76
TE-202 With Teletypewriter Converters .....	76
TE-206 Data Communication System .....	74

### PRECISION COMPONENTS

66J Series Tube Shields .....	82
70E-1 Oscillator .....	79
70E-15 Oscillator .....	79
70H-3 Oscillator .....	79
70H-12 Oscillator .....	79
70K-1 Oscillator .....	79
96W Autotune® .....	78
96X Autotune® .....	78
111D Autotune® Control .....	78
353A, B, D Series Mechanical Filter Adapters .....	82
381E-1 Autopositioner® .....	78
496A, C Autotunes® .....	78
496B Autotune® .....	78
Aircraft Navigation Filters .....	83
Bandpass Filters .....	83
F60-104Z Series SSB Mechanical Filters .....	81
F250A, Z Series Mechanical Filters .....	80
F250Z Series SSB Mechanical Filters .....	81
F300X-68 Mechanical Filter .....	80
F300Z Series SSB Mechanical Filters .....	81
F455E, F, H, J, K, Y Series Mechanical Filters .....	80
F455Z Series SSB Mechanical Filters .....	81
F500B, F Series Mechanical Filters .....	80
F500Z Series SSB Mechanical Filters .....	81
Low Pass Filters .....	83
Magnetic Amplifiers .....	83
Subminiature Toroids .....	84
Telegraph Filters .....	83
Toroidal Coils .....	84
Transformers .....	83



C R E A T I V E   L E A D E R   I N   E L E C T R O N I C S



