

COLLINS RADIO COMPANY 1959 GENERAL CATALOG

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1959 GENERAL CATALOG

Radio Company



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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
Automatic Direction Finder System	19
Magnetic Compass System	20
DMET	20
Airborne Antennas	21
SELCAL System	22
ATC Transponder	22
Audio Amplifiers	23
Inverter, Converter	23
Remote Control Units	24
Test Equipment	25
Shockmounts	28
Smoke Tunnel	29
Ground VOR System	30

AMATEUR EQUIPMENT

Transmitter	32
Receiver	32
Linear Amplifier	32, 33
Accessories	33

BROADCAST EQUIPMENT

Transmitters	35
Transmitter Accessories	36, 37
Speech Equipment	38, 39, 40, 41
Custom Control Desks	41
TV-STL Microwave	42
Weather Radar	42

HF-VHF GROUND SYSTEMS

HF SSB Power Amplifiers	44
HF SSB Exciters	46
HF SSB Receivers	47
HF SSB Transceivers	48
Frequency Standard	49
HF AM Transmitters, Receivers	50
VHF AM Transmitters, Receivers	52
Accessory Equipment	53
Log Periodic Antennas	55
Spectrum Analyzer	55
Remote Control Equipment	56

TRANSORIZON SYSTEMS

1,000 mc System	58
2,000 mc System	60
UHF Transportable Systems	61

MICROWAVE SYSTEMS

RF Systems	63
Voice Carrier Multiplex	64
Carrier Telegraph System	65
Microwave Test Equipment	66
Parabolic Antenna	66

KINEPLEX® SYSTEMS

Kineplex Data Systems	68, 69, 70
-----------------------------	------------

PRECISION COMPONENTS

Autotunes®	72
Autopositioner®	72
Oscillators	73
Mechanical Filters	74, 75
Filter Adapters	76
Tube Shields	76

INDEX	77, 78, 79
-------------	------------

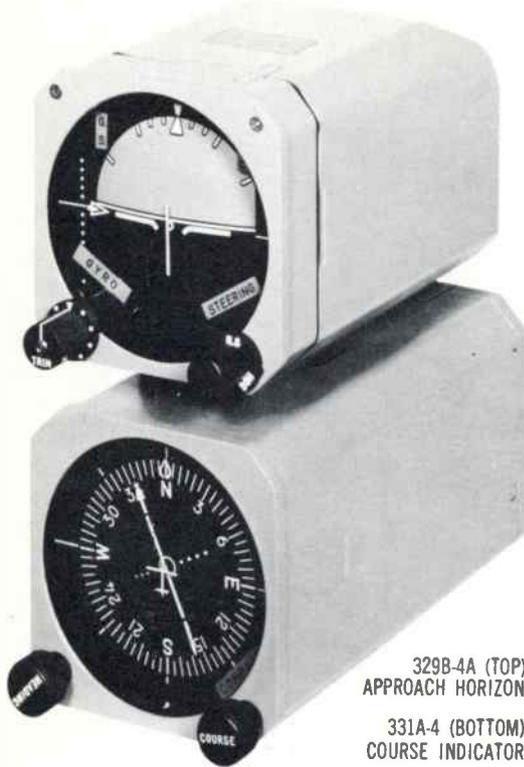


Pan American World Airways, Inc.

COLLINS aviation equipment

INTEGRATED FLIGHT SYSTEMS

FD-105 INSTRUMENTATION



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

FD-104 INSTRUMENTATION



329B-2 (TOP)
APPROACH HORIZON
331A-2C (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 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 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 COURSE INDICATORS — Standard 3 in. instrument showing pictorial plan view of the navigation situation. Matte white markings. 5° azimuth markings.

331A-4 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.

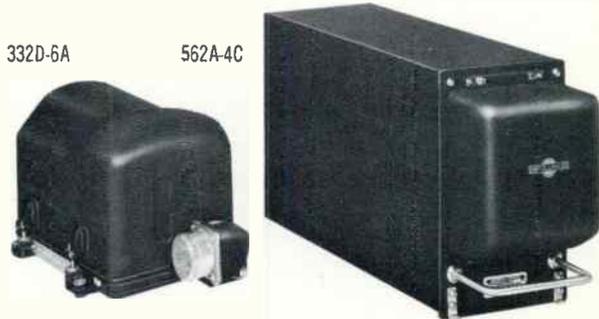
562A-5 STEERING COMPUTER — Provides steering information to the steering pointer on the Approach Horizon. Data concerning localizer deviation, heading error and bank angle is used to compute horizontal guidance signal and feed the steering pointer. ¼ ATR short case.

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



562A-5 562A-7 344C-1



332D-6A 562A-4C

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 servos — 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	Type	W		H	D	Type	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	3¼	3¼	9	4.0	331A-4	4	4	6¾	4.6	331A-2CW	3¼	3¼	9	4.0			
Gyro Monitor	327B-1W	1¼	1½	2¾	.5	.....	.....	.....	.....	.....	327B-1W	1¼	1½	2¾	.5
Vertical Gyro	332D-6A	5½	5½	9¾	6.5	332D-8	9½	6¾	5½	7.5	332D-6A	5½	5½	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 compensation; preselected heading; integrated flight instrumentation and flight director services; optional automatic glideslope capture, yaw damping and mach hold. *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			49.0
Computer Amplifier	562C-1A	½ ATR			29.0	562C-2	½ ATR Short			21.25					
Pedestal Controller	614E-2	4½	5½	4½	2.75	614E-2	4½	5½	4½	2.75	614E-2	4½	5½	4½	2.75
Switching Unit	614E-3	5¾	3¾	6	3.25	614E-3	5¾	3¾	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	8¾	4.0
Primary Servo (3 required)	334C-2	7	5¾	10¾	(total) 40.5	334C-4	3¾	3¾	6¼	(total) 12.75	334C-3	7½	4¾	8½	(total) 10.0
Servo Mount (3 required)	334B-	Included above			(total) 9.0	351B-4	3¾	3¾	3	(total) 6.75	351B-3	Included above			(total) 30.0
Trim Tab Servo	334D-1	4	4	9½	6.5	334D-1	4	3¾	9½	5.5	344D-2-33	4	3¾	9½	6.5
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	3¼	4¾	0.4	121A-2	17	3¼	4¾	0.4
Vertical Reference	332D-8 332D-6A*	9¾	5¾	5¾	6.0	332D-6A	9¾	5¾	5¾	6.5	332D-9	8¾	8	13¾	17.0
Gyro Monitor	327B-1W (not req. with FD-105)	1¼	1½	2¾	.4	327B-1W	1¼	1½	2¾	.4	.....	.....	.....	.....	.....
(Optional) Airspeed Compensator	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	590B-1	6¼	4¾	5¼	4.0
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	4.0
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

*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. 331C-3 output torque is limited by a precision torque limiting clutch located in the gear train ahead of the electrical engage clutch. 331C-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



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.

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.*

17L-4,-6 51R-3 VHF
COMMUNICATION SYSTEM

17L-7 51X-2 VHF
COMMUNICATION SYSTEM



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			
Transmitter	17L-4, -6	½ ATR long			360	29.0	51R-3	Power Supply	427B-1, -2	5½ 5½ 14			.....	6.5	17L-8A and 51X-3
Transmitter	17L-7	¾ ATR short			680	14.0	51X-2		
Transmitter	17L-8	3	3	8½	90	2.25	51X-3	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.



452A-1



309A-2



180R-6

	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	25¾	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	25¼	24.0	18Z-3, -4	.....
Lightning Arrestor — Relay Assembly With Antenna Tuners	452A-1 & 180R-4	7½	16½	25¼	37.0	18Z-3, -4	.....
Transceiver	618T-2, -3	1	ATR		47.0	618T-2	350S-3
Control	714E-1	5¾	5¼	2¾	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)			Wt. (lbs.)	System Combination	Shock-mount
		W	H	D			
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	10¼	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.



180L-2



180L-3

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.



180K-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.

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	5¾	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-1



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 ± 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 omnibeam 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 weighing only 6.3 lbs.

	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 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

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 SYSTEMS



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*: 56.5 lbs.

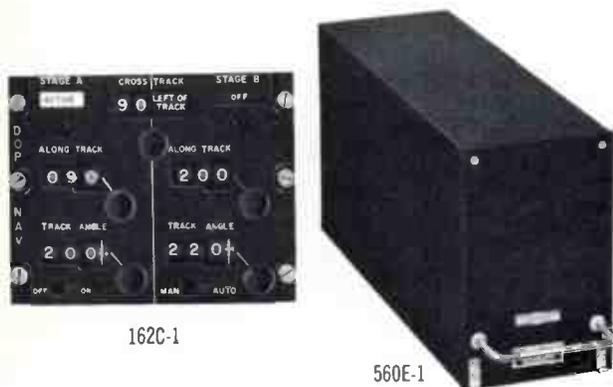
DN-101 DOPPLER RADAR NAVIGATION SYSTEM — An FMCW system is utilized in the DN-101 to overcome transmitter-receiver leakage and system vibration effects. Frequency coherency in the system assists in providing sufficient sensitivity margin for system operation under all conditions of flight and of system 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 6 tubes and 55 transistors. Automatic acquisition trackers eliminate the requirement for slewing. Tracking discriminators are automatically recalibrated every 14 minutes. *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 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 "across-track" data to the integrally lighted dual stage 162C-1 Control. 162C-1 readout limits are 999 nautical miles "along-track" and 99 nautical miles "across-track." *Power Requirements*: 115 v, 400 cps, normal — 120 watts, start — 180 watts. No dc required.



	Type	Dimensions (inches)			Weight (lbs.)
		W	H	D	
Transmitter/Receiver	621C-1	3/8 ATR short			11.5
Computer Tracker	562F-1	1/2 ATR			25.0
Antenna	137Y-1	21 dia. 17			17.0
Indicator	338B-1	3" standard			2.5
Control	714G-1	5 3/4	1 7/8	2	0.5
Computer	560E-1	1/2 ATR short			18.0
Control Panel	162C-1	5 3/4	4 1/2	5	5.0
Dual Antenna	137Y-2	21 dia. 17			20.0

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

*3490-1 Shockmount



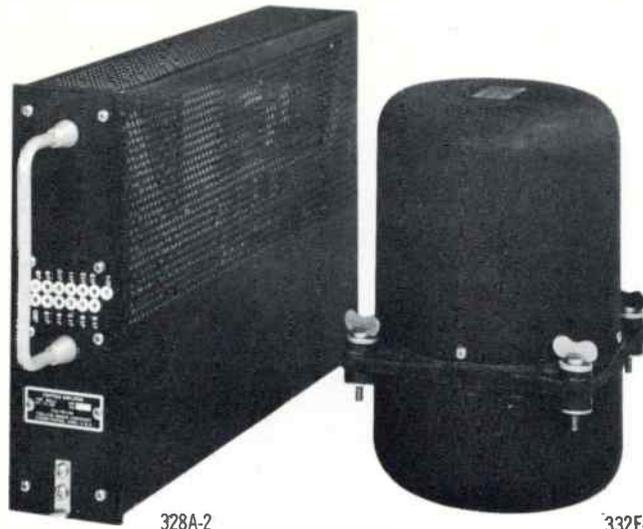
51Y-3

137A-2

MAGNETIC COMPASS SYSTEM



323A-1



328A-2

332E-2

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° 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° freedom in the turn axis. Erection is provided by curved mercury switches and torque motor. *Erection Rate:* 4 to 8° 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 $\frac{3}{8}$	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 $\frac{3}{8}$	1 $\frac{1}{2}$	Panel mount

DMET



860E-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[®] 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 — Digital mileage readout of DMET output on integrally lighted instrument requiring $1\frac{3}{8}$ " x $3\frac{1}{4}$ " panel space.

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.

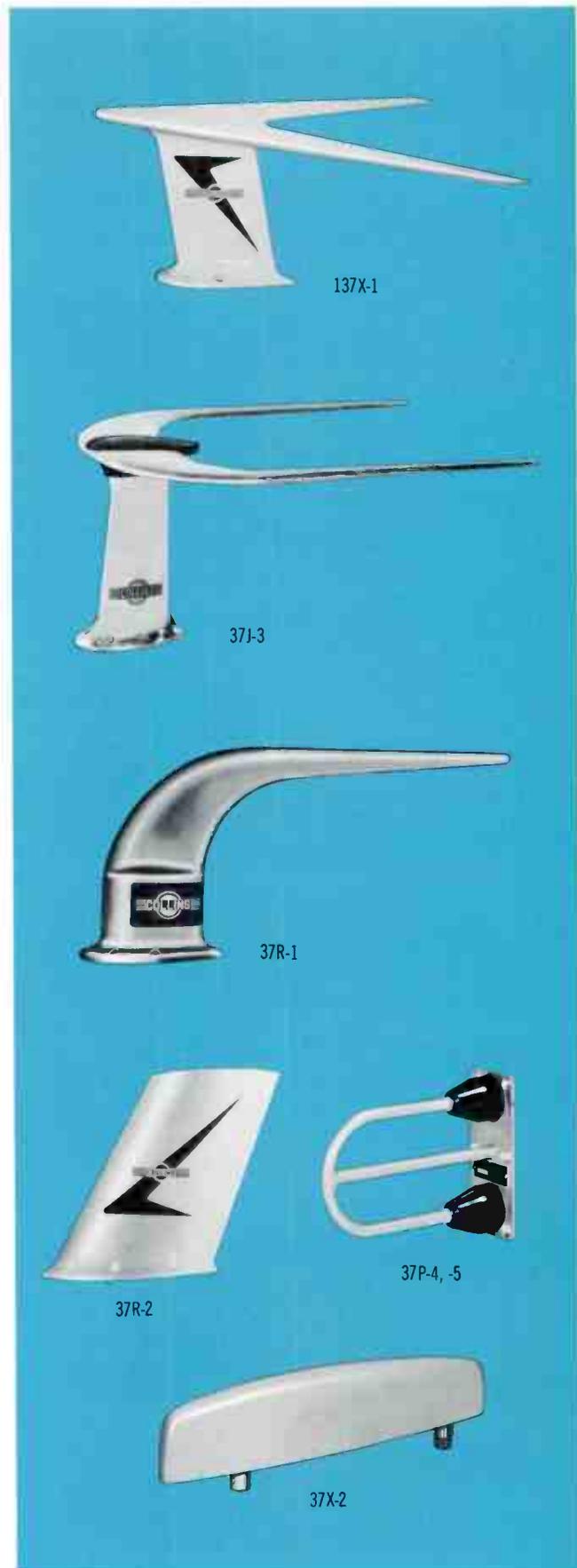
37R-2 VHF COMMUNICATION ANTENNA — A vertically-polarized communication antenna for receiving and transmitting with a maximum input capability of 125 watts. A voltage SWR of 2:1 or less is obtained over the frequency range of 116 to 152 mc. The nominal input impedance is 52 ohms. On new installations, a mounting pattern longer than the present 5⅝" pattern is recommended. For direct replacement of the 37R-1, an adaptor 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	12⅜	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	2⅜	11⅞	1.0	3.5 oz.*	75 mc
37P-4	2	6	4½	0.7	negligible	329-336 mc
37P-5	2	5⅓	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



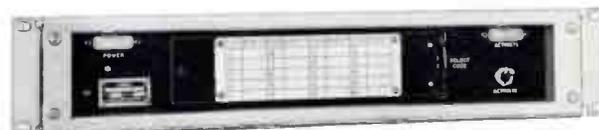
288A-1



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.

AUDIO AMPLIFIERS



346A-1

346D-1

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. $\frac{1}{4}$ 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. Operates to 45,000 feet at -40° to $+70^{\circ}$ C. Multiple impedance output is also provided. Convection cooled. Integral dc power supply. Requires approximately 25 watts of 27.5 v dc for normal voice service; none on standby. Weighs 9.6 lbs. $\frac{1}{4}$ ATR short. *Frequency Response:* 100 to 7,000 cps with less than 3 db variation, 5 db to 10,000 cps. *Distortion:* 7% maximum at 40 watts of output, 5% at lower levels. *Tone Control:* Treble Cut (ground and flight) — 0, 5, 10, 15 db at 7500 cps; Bass Boost — 0, 5, 10 at 100 cps (music only); Bass Cut (voice only) — 0, 5, 10, 15 db at 100 cps. *Output Impedance:* 25, 50, 125, 200, 350 or 500 ohms unbalanced. *Sidetone Output:* 600 mw at rated output (adjustable). *Shockmount:* 390D-9.

INVERTER



488A-1

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:* $6\frac{3}{4}$ " W, $9\frac{3}{4}$ " L, $5\frac{5}{8}$ " H. Requires 4 to 25 amps of 27.5 v dc depending on load. Fourteen transistors are used.

CONVERTER



516G-1

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:* $9\frac{1}{8}$ " D, $3\frac{3}{4}$ " W, $5\frac{1}{8}$ " H. Approved under FAA TSO. Convection provides adequate cooling.

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

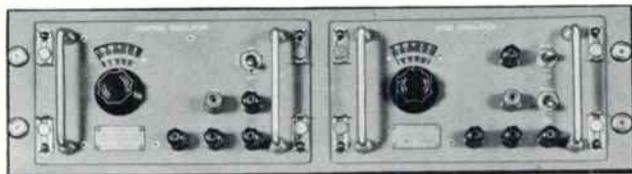


614D-1,
-2, -3

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.



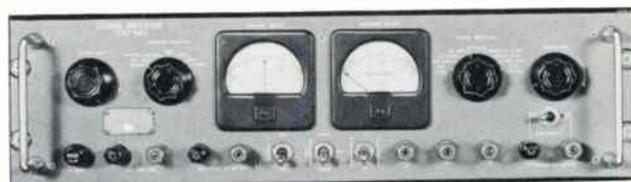
477M-1 INSTRUMENT AMPLIFIER TEST SET — Simulates signals identical to those in the 344C-1 Instrument Amplifier input circuits under actual flight conditions. Separate meters measure line currents, servo amplifier output and flag currents. Rack mounting.



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.



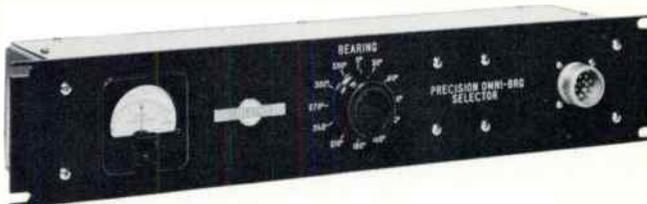
477P-1 APPROACH HORIZON TEST SET — Evaluates operational characteristics on the 329B-4 series of Approach Horizons. With the 477K-1, it provides all dc signal levels and three-wire synchro inputs normally employed in the FD-105. Rack mounting.



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 $\frac{7}{8}$ " 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 or 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.*

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 ¾ 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 ¾ 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

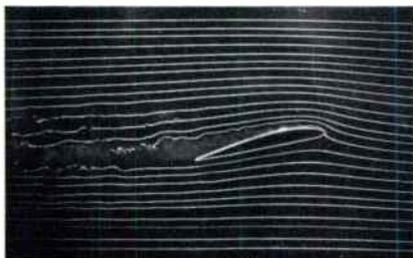
mounted smoke strut in the nozzle of the tunnel. The smoke is produced by a smoke generator and fed directly to the strut where it is released through several small protruding tubes.

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.

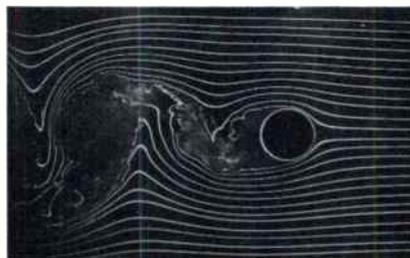
Airflow velocity is controlled by a sliding valve. Chamber is lighted by eight 75 watt bulbs. Still photography and high speed motion pictures may be used for further smoke tunnel studies. *Power Source:* 110 v ac, 15 amps. *Air Speed:* Zero to 35 fps. *Test Models Include:* Flat plate, cylinder with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



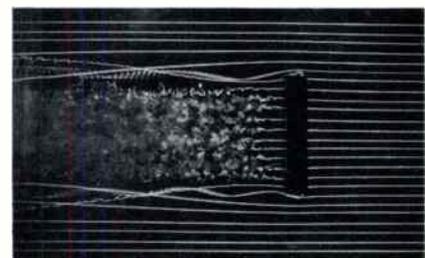
The 960A-1 in operation. Presentation is large enough for viewing by an entire classroom. Photography may be accomplished without special lens, but strobe lights or gas filled bulbs should be inserted in the test chamber to prevent glass flare.



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



Airflow around a cylinder with Kármán 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.

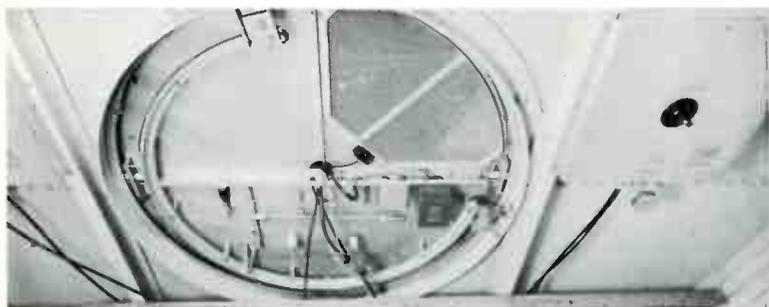
The complete basic VOR installation consists of a VHF transmitter and precision modulation system together with an antenna system designed for efficient radio frequency radiation with a specific pattern. All equipment except the antenna, monitor antenna, and remote control unit is housed in a special 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 to 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, or 516E-2, 28 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 13 200 kc segments in the 3.5 to 29.7 mc range, corresponding to those covered by the 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 AB₁ 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 need not be changed unless antennas with impedances other than 50 ohms are used. The 32S-1 employs the 516F-2 Power Supply for ac operation. With an adapter cable, the 516E-1 or 516E-2 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.

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 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.

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-1 Transceiver.

312B-4 SPEAKER CONSOLE — Integrates the 75S-1, 32S-1, 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.

516F-2 AC POWER SUPPLY — Used with the 32S-1, supplying all voltages for it. 115 v, 50-60 cps. (The 516F-1 Power Supply for the KWM-1 Mobile Transceiver may also be used for the 32S-1 with the addition of an adapter cable.)

516E DC POWER SUPPLIES — The 516E-1 operates from 12 v dc. Provides all operating voltages for the 32S-1 and 75S-1 for mobile or portable operation. Transistorized for maximum efficiency and minimum maintenance. The 516E-2 is a similar power supply for 28 v dc operation.

136 SERIES NOISE BLANKERS — Very effective in eliminating broadband random noise of the type caused by ignition systems and power line leakage. It utilizes an RF noise amplifier tuned to 42.5 mc in conjunction with a bridge type blanker circuit to remove the IF signal during noise pulses. Blanking time is determined by the strength of the noise pulse. Three models are available: the 136A-1 for use with the 75S-1, 136B-1 for the KWM-1 and the 136C-1 for the 75A-4.

351E MOUNTING PLATES — May be used to secure the S/Line 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. Equipment may be easily unclamped for removal without the use of tools. The unit is removed by pulling forward and lifting.

Unit	H	Size (inches) W	D	Weight (lbs.)
75S-1	6 $\frac{7}{8}$	14 $\frac{1}{2}$	11 $\frac{5}{8}$	20
32S-1	6 $\frac{7}{8}$	14 $\frac{1}{2}$	11 $\frac{5}{8}$	16
30S-1	30 $\frac{5}{8}$	17	16 $\frac{3}{4}$	160
312B-4	7 $\frac{3}{4}$	10	12 $\frac{1}{4}$	8 $\frac{1}{2}$
312B-3	7 $\frac{3}{4}$	10	8	4
516F-2	7 $\frac{3}{4}$	10	12	28
516E-1	5 $\frac{3}{4}$	11 $\frac{5}{8}$	7 $\frac{3}{4}$	12 $\frac{1}{2}$



AMATEUR ACCESSORIES



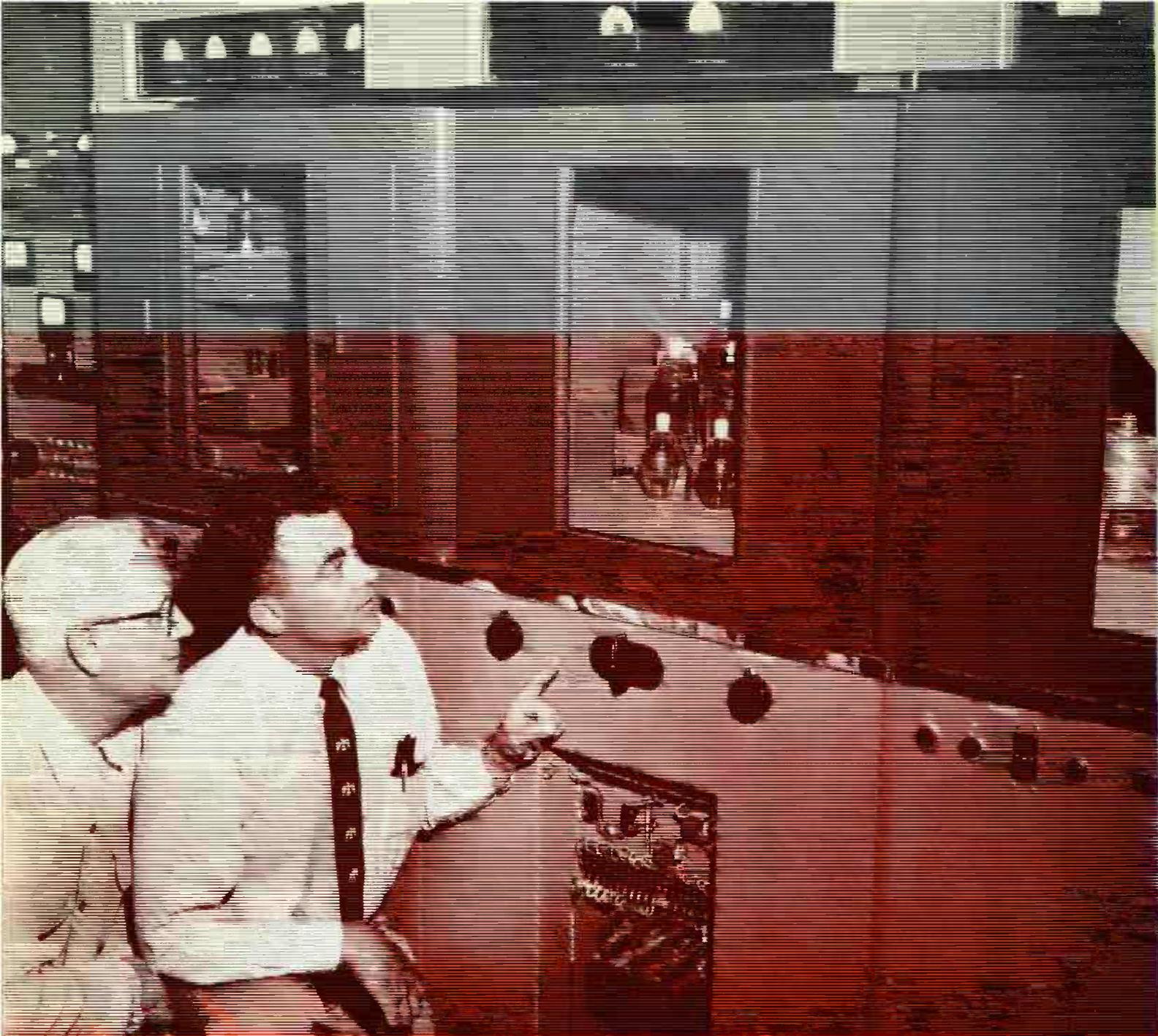
189A-2



307E-1

307E-1 GEAR REDUCTION TUNING KNOB — Provides new ease and accuracy in tuning SSB signals. Operating on a 4 to 1 ratio, it has no detectable backlash. Simple installation on KWS-1 and all 75A models.

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-1 and the back of the 189A-2.



Radio Station KTAT, 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 ± 5 cps (typical ± 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	31¾	Included above	.....
21E	105¼	28	76	2,700	5,500/1,100 (5,500/550**)
Plate Xformer	20½	10¾	25¾	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	Weight	On 3 1/2" Line B	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 0.5 to 8 mc range. *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:* 0.5-2 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.



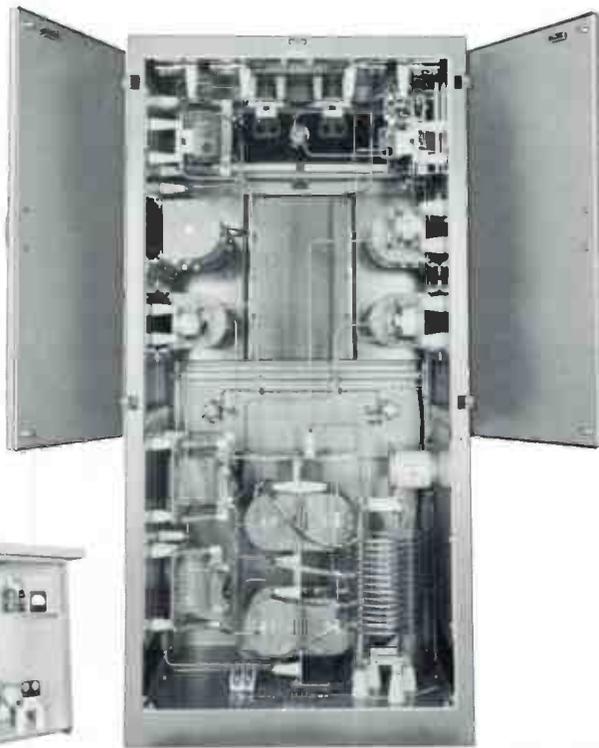
172G-1, -2 DUMMY LOADS — This air-cooled unit provides a load to dissipate transmitter output for off-the-air testing. Consisting of 8 ferrule type, non-inductive resistors, with insulated end brackets and clips, it may be mounted on the transmitter or adjacent wall. The 172G-1 has an impedance of 52 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 EQUIPMENT

Collins speech input consoles employ modular construction to offer AM, FM and TV broadcasters maximum flexibility. Starting with a minimum of modular subunits, the broadcaster may add or relocate subunits as required.

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. For ease of operation, controls are color coded, and write-in strips are provided. The console will accommodate up to seven preamplifiers plus booster amplifiers, program amplifiers, a monitor amplifier and a cueing amplifier (subunits discussed below). 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 $\pm 10\%$, 1 phase, 50/60 cps.

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 $\pm 10\%$, 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 Impe-*

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

409X-1 POWER SUPPLY — Supplies power for 212E-1 and 212F-1 and subunits. *Output Voltages:* Up to 250 ma at 300 v dc adjustable. 6.0 amps at 6.3 v ac. 12 v dc. *Primary Power:* 115/230 v $\pm 10\%$, 1 phase, 50/60 cps, 225 watts max.

409Y-1 POWER SUPPLY — May be used as a second power supply when maximum facilities of 212E-1 are utilized. *Output Voltages:* Up to 100 ma at 300 v dc, adjustable. 3 amps at 6.3 v ac. *Primary Power:* 115/230 v, 1 phase, 50/60 cps, 85 watts max.

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.

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



499G-1



356A-1



356B-1



212E-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	41 1/8	22 1/2	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	10 3/4	100
Preamplifier Subunit	356A-1	± 1 db, 50-15,000 cps	0.5% max.	2 1/8	9 1/2	4 5/8	2 1/4
Program/Monitor Amplifier Subunit	356B-1	± 1 db, 50-15,000 cps	0.5% max. at +30 dbm 3% max. at 8 watts (+39 dbm)	2 7/8	9 1/2	5 3/4	6
Relay Subunit	274K-1	.....	.....	2 1/2	9	5 1/2	2 1/2
Power Supply Subunit	409X-1	.....	.....	8	9 1/2	6	25
Power Supply Subunit	409Y-1	.....	.....	5 1/2	9 1/2	5 1/8	10 3/4
Limiting Amplifier Subunit	356E-1	± 1 db, 50-50,000 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	5 1/8	5
Rack Mounting Shelf	499G-1	.....	.....	19	14	8 3/8	11

212F-1



274K-1

409X-1

409Y-1

356E-1

SPEECH EQUIPMENT

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:* ± 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 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:* ± 1 db 70-15,000 cps. *Distortion:* Less than 1%. *Noise:* 80 db below +12 dbm output. *Gain:* 85 db. *Power Output:* +12 dbm. *Size:* 2¼" W, ¾" D, 3⅝" H.



'Micromote'

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 50 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

SPEECH EQUIPMENT



26U-1

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:* ± 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.

151K-1 TERMINAL BOARD — Used in the base of rack mounting cabinets, this board contains 96 telephone type solder terminals for audio connections and 60 heavy duty threaded stud type terminals for power connections. *Weight:* 2 lbs. 14 oz.



151K-1



151K-5



62E-1

151K-5 TERMINAL BOARD — Provides 100 telephone type terminals, 25 in a row, 4 rows deep, on a bakelite board. *Size:* 8" W, 3 $\frac{1}{2}$ " H (mounting centers 7 $\frac{1}{2}$ " x 2 $\frac{1}{2}$ "). *Weight:* 1 lb.

151K-6 TERMINAL BOARD — Similar to the 151K-1, but provides 144 telephone type terminals and 60 heavy duty terminals. *Weight:* 3 lbs.

62E-1 VU PANEL — The 62E-1 accurately monitors audio levels in broadcasting, recording and sound systems. It has a standard, easily read 4" VU meter with type A scale. Over-swing is slight and pointer action deliberate and positive. Designed to operate from a 600 ohm line, the 62E-1 will also accommodate other impedances with the use of a calibration chart. *Inputs:* 4. *Input Impedance:* 7,500 ohms constant except on 1 mw calibration position. *Primary Power (Meter Illumination):* 6.3 v ac or dc, 0.3 amp. *Size:* 19" W, 5 $\frac{1}{4}$ " H. *Weight:* 9 lbs.

BLANK PANELS — Standard panels are available in several heights, constructed of 3/16" aluminum, drilled to mount in 19" racks and finished in metallic gray. Others on special order.

CUSTOM CONTROL DESKS



Typical Collins Control Desk

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.

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:* ± 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 — ± 0.2 db 60 cps-3 mc; $\pm .5$ db to 4.2 mc; ± 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:* ± 0.5 db 50 cps-13 kc; ± 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° rotation at 15 rpm. In normal TV installation, may be tilted 15° above and 10° below horizontal reference plane, with full 25° 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 ± 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	20¼	70*	650

*With shockmounts 71%".

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 49) 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 imparted 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 49.). *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.

310U SERIES EXCITERS — The 310U is a fixed-tuned, crystal-controlled exciter with a 0.4 watt RF output in the 2-30 mc range for driving a linear power amplifier. The 310U provides from one to ten selectable channels using a common power supply and multiple exciter modules. The exciter is normally equipped for upper sideband, but accessory modules are available for lower sideband, independent sideband, AM, CW and TTY. Conversion circuits include a crystal filter to provide desired spurious rejection with a minimum of tubes and coils. A netting oscillator supplies a test signal for tuning the exciter, setting amplifier levels and checking frequency of an associated receiver. Conventional tubes are used in RF circuits and transistors are employed in audio applications. Plug-in modules permit a wide variation of equipment configurations to meet individual needs and enable easy modification for future requirements. *Frequency Stability:* 1 part in 10^6 (20° to 35°C), 2 parts in 10^6 (0° to 55°C). *Primary Power:* 115/230 v, 1 phase 50/60 cps.



310U



310F-1



310F-6

	Type	RF Output (ohms)	Audio Termination (ohms)	Dimensions (inches)			Wt. (lbs.)
				W	D	H	
Exciter	310F-1	52	150	19	7*	63	255**
Receiver-Exciter	310F-6	52	600 or speaker	20	20	84	205**
Exciter	310F-6E	52	600	20	20	84	205**
Exciter	310U-1	52	600	19	7*	17½	60

*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 49), 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 49), 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.

50T SERIES RECEIVERS — The 50T provides reception on fixed-tuned, crystal-controlled frequencies in the 2-30 mc range. Up to ten selectable channels can be provided, with a common power supply and multiple receiver modules. The receiver is equipped for upper sideband reception, but modules are available for lower sideband, independent sideband, AM, TTY or CW. The 50T employs an RF bandpass crystal filter allowing single conversion to a 500 kc IF with a minimum number of inductors and other components. A Collins Mechanical Filter is used for sideband selection. Exact correlation of receiver and transmitter frequencies is provided by a netting filter. *Frequency Stability:* 1 part in 10^6 (20°C to 35°C), 2 parts in 10^6 (0°C to 55°C). *Power Output:* 0 dbm with 5 uv signal, line amplifier; 2 watts, 3 ohm speaker. *Primary Power:* 115/230 v, 50/60 cps.

51S-1 RECEIVER — Offers continuous coverage of the 0.2 to 30 mc range with excellent dial accuracy, stability and operational simplicity. Facilitates reception of upper or lower sideband, AM, CW or FSK signals. A product detector has been incorporated for separate SSB detection. Multiple conversion, superheterodyne circuits are used with crystal injection oscillators for the first conversion and a permeability tuned oscillator for the second. Receiver includes fast acting, dual time constant AVC circuits and Q-multiplier. Optional external stabilized master oscillator unit which will correct minor frequency errors of injection oscillators and VFO at 1 kc points throughout the range of the receiver is available for applications requiring extreme frequency stability. *Frequency Stability:* Without SMO after 20 minutes warm-up and calibration, the RF will not vary more than ± 50 parts per 10^6 from 0° to 50°C. *Visual Dial Accuracy:* 200 cps all bands. *Primary Power:* 115/230 v, 1 phase, 50/60 cps, 100 watts.



Receiver Type	RF Input Impedance (ohms)	Audio Output Impedance (ohms)	Dimensions (inches)			Weight (lbs.)
			W	D	H	
50E-1	52	150	19	7*	63	225**
50E-6	52	dual 600	20	20	84**	205**
50T	52	600 or speaker	19	7*	24½	65
51S-1	125	4, 500 or 600 low level	19	11½	7	30

*Forward protection.
**Mounted in 84" rack.

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 49) 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:* ± 1 part in 10^6 or ± 5 parts in 10^5 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.



KWT-6



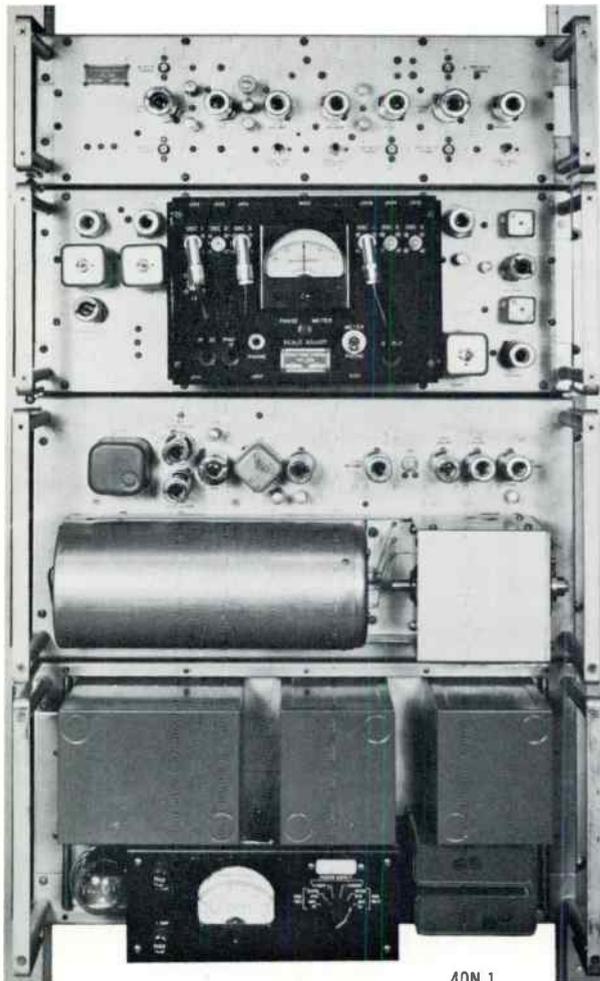
32RS-1C

Transceiver Type	Power Output PEP (kw)	Dimensions (inches)			Weight (lbs.)
		W	D	H	
KWT-6	500	20	20	84*	320*
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.

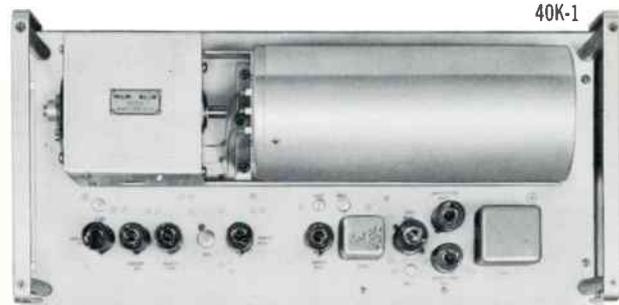
FREQUENCY STANDARD

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.



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, 8U-1 Frequency Divider and 54M-1 Frequency Comparator. The 40N-1 may also be utilized as a secondary frequency standard.



40K-1

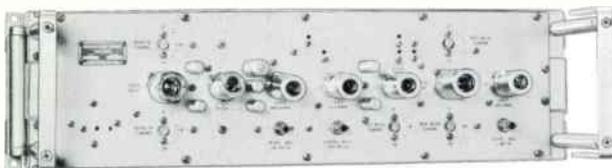
8U-1 FREQUENCY DIVIDER — Outputs of 1 mc, 100 kc and 10 kc may be obtained from a 1 mc signal source by the use of this unit. Regenerative dividing circuits are employed to provide the optimum in frequency and phase stability. All three output voltage levels may be adjusted individually. The outputs 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 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.



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.

8U-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 10^8 per day

	Type	Dimensions (inches)			Weight (lbs.)
		W	D	H	
High Stability Oscillator	40K-1	19	7	8¾	15
Power Supply	426A-1	19	7	8¾	45
Frequency Divider	8U-1	19	7	57/32	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 56). 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.

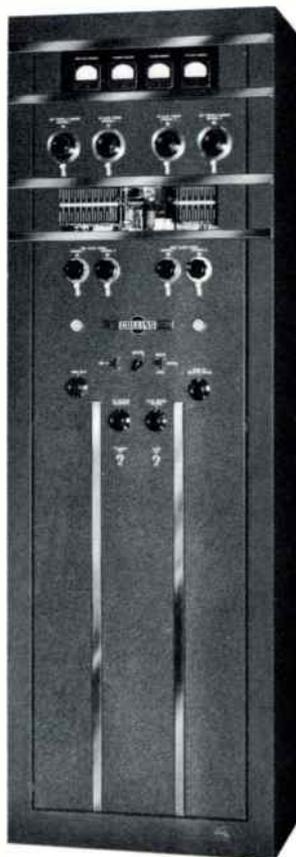
Primary Power: 230 v to 208 v, 3 phase, 60 cps with 50 cps modification available.

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 56). *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.

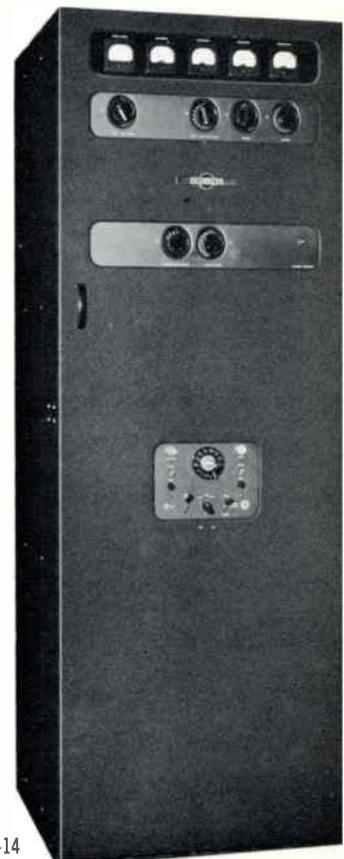
16F-14 400/250 WATT TRANSMITTER — Employs Autotune® for selection of any of 10 frequencies, 2 to 20 mc. Power Output is 400 watts CW, 250 watts AM or MCW; remote control, with 177G-10 (page 56). *Output Impedance:* Unbalanced antennas or concentric transmission lines 50-1200 ohms pure resistance, 70-850 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 at 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 or VOR service 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. Envelope feedback contributes to a low audio distortion level and maintains excellent modulation stability for VOR operations. 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. Resistance coupling is used throughout the modulator. Excellent high frequency response suits the transmitter for VOR and other special applications. 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 811 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.

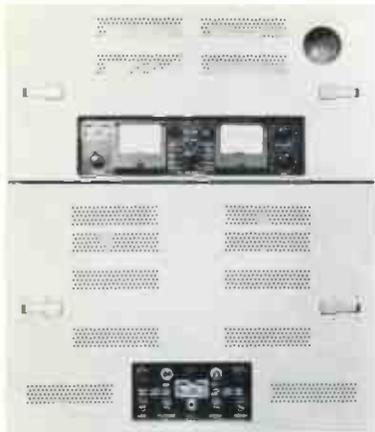
51M-8 RECEIVER — This single-channel, preset, crystal-controlled receiver is ideal for continuous, unattended reception of AM signals in the 108 to 152 mc range. A double conversion superheterodyne circuit is utilized with an advanced automatic noise limiter, which provides maximum suppression of the 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 or RC-101 (page 56). 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:* ± 3 db, 1000 cps reference, 300 to 3750 cps; ± 4 db, up to 10 kc. *Primary Power:* 115/230 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

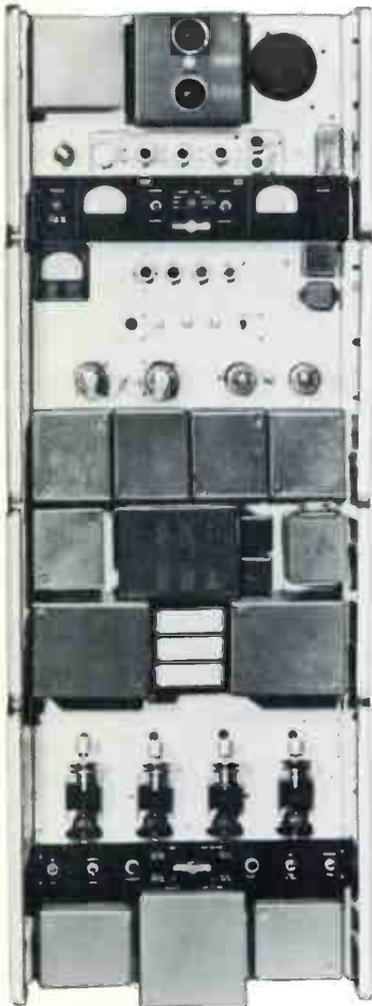
ACCESSORY EQUIPMENT



242F-5CL



51M-8



242F-2

271B-3 SPEAKER

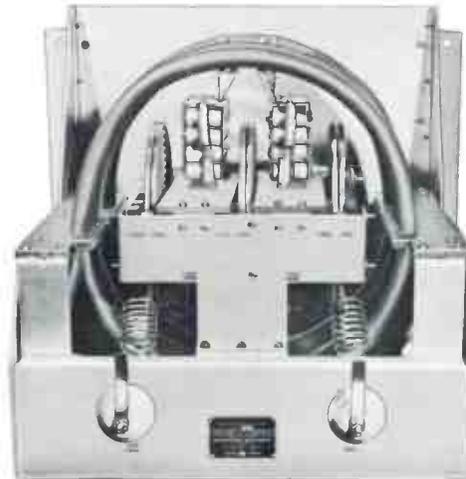


271B SPEAKERS — The 271B-3 is a dual speaker panel; the 271B-4, a single speaker panel. Each speaker has a 600-ohm-to-voice-coil-impedance matching transformer and a terminal board. *Size:* 19" W, 4" D and 7" H. 271B-3—6.3 lbs. 271B-4—4 lbs.

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, 22¾" D and 20¾" H. *Weight:* 75 lbs.

ACCESSORY EQUIPMENT

(continued from page 53)



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.

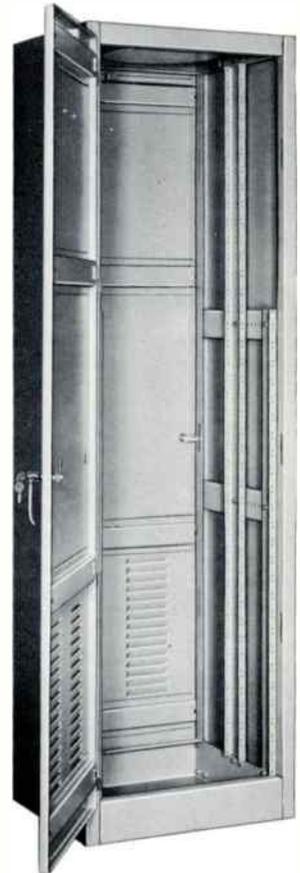
619J-4 EQUIPMENT RACKS — Utilize 6" wide aluminum channels. Tapped for standard 19" rack mounting equipments. *Size:* 18" D, 20 $\frac{1}{2}$ " W, 86 $\frac{1}{8}$ " H. *Weight:* 80 lbs.

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).

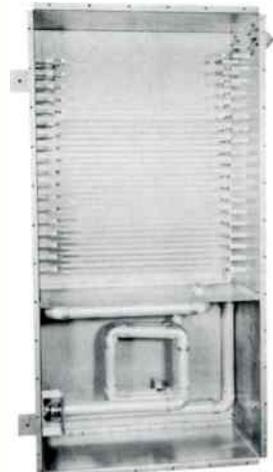
512F-1 COAXITRAN — An impedance changing transformer with a 50 ohm unbalanced input and 200 balanced output. Power rating up to 50 kw with SWR of less than 1.5:1 at most frequencies. *Frequency Range:* 4-30 mc. *Size:* 24" W, 16" D, 37" H. *Weight:* 90 lbs.

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



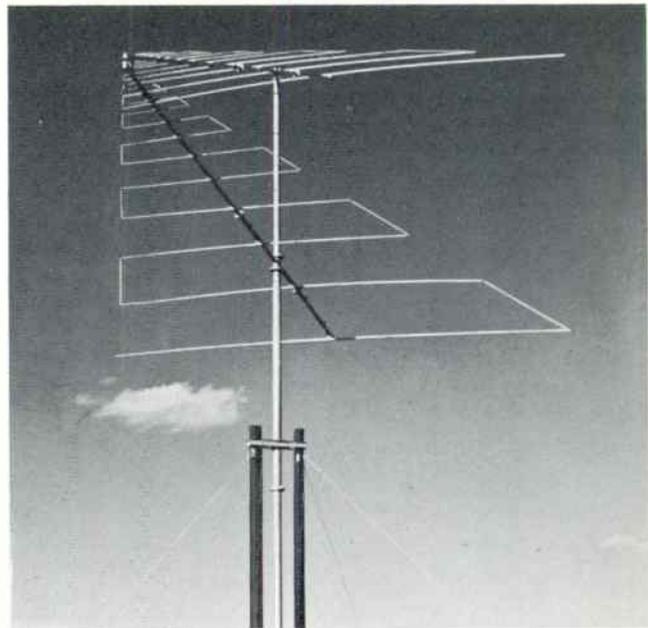
512D-1

LOG PERIODIC ANTENNAS

The 237A Unidirectional HF Antennas are extremely broad-band 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, with side lobes more than 16 db down.

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.



237A

Antenna	Frequency	Longest Element	Boom Length
237A-1	6.5 - 60 mc	70.0'	52.5'
237A-2	11.1 - 60 mc	46.8'	41.0'
237A-3	19.0 - 60 mc	28.1'	24.5'

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 ±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 ±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

RC-101 REMOTE CONTROL SYSTEM — This system controls all functions of two VHF transmitters and two VHF receivers at each of up to twelve remote sites. Sites are connected to each other and to a central operating position by a four-wire, two-way standard long distance telephone circuit. One pair handles outgoing transmitter modulation and control information, while the other pair returns the receiver audio. Push-to-talk control is available.

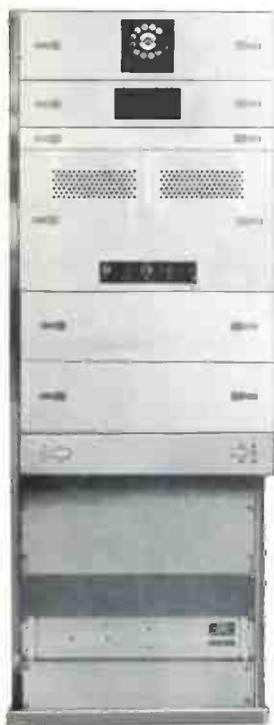
Audio signaling is used, employing a 2500 cps carrier which is frequency modulated by either a 90 or 150 cps subtone. At the remote site, the detected pulses operate a stepping switch to accomplish the desired switching of power, audio and antenna circuitry. A pulse of the 90 cps subtone is used to lock the transmitter in keyed status, a pulse of 150 cps to unlock it. The control carrier thus can time-share the out-going telephone circuit with the transmitter audio. *Control Circuits:* Telephone Line Level Variation — ± 20 db if nominal level does not go below -15 dbm. S/N — $+10$ db minimum except noise in 2000-3000 cps range must not exceed 30 dbm below control carrier level. *Transmitter Modulation:* Distortion — Not more than 5% (not including telephone line). Input — -15 dbm minimum as normally installed. Output — With -15 dbm input, $+6$ dbm output at 1000 cps. *Over-All Size:* Approximately 19" W, 12" D, 37½" H (remote

station), 10½" H (control site). *Primary Power:* 115/230 v, 1 phase. 50/60 cps, 200 watts (remote station), 90 watts (control site). *Weight:* 87 lbs. (remote station), 35 lbs. (control site).

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, 9½" D and 10½" 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:* 17¼" W, 7½" 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:* 21½" W, 11" D and 10⅞" H. *Primary Power:* 115 v, 50/60 cps, 35 watts. *Weight:* 31 lbs.



RC-101



278G-1 (Used at RC-101 Control Site)



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:* ± 336 kc. *Frequency Response:* ± 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	34	78	8700 (total)	Air Inflatable Antenna tower mounted	537J-1, -2, -3	71 cu. ft.**			600
		32	20½	78							
		50	25	72							
Power Amplifier	240E-2	75 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	68¾*	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

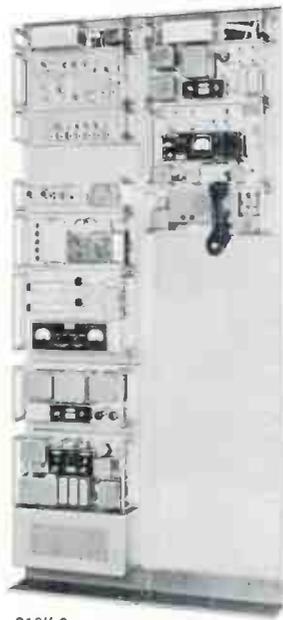
*Excluding rack. **Storage volume.



240D-1



651C-1



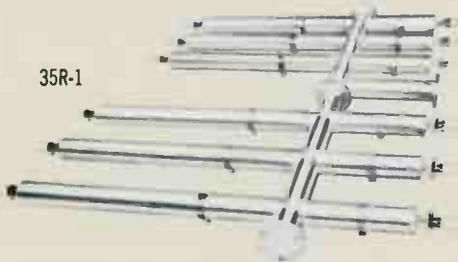
310K-2



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.*

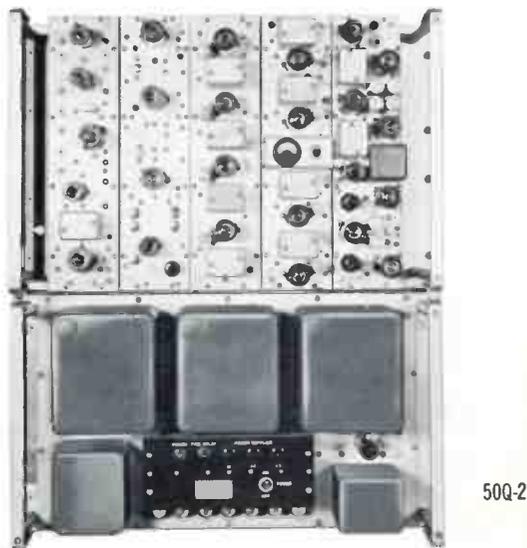
50Q-2 FM RECEIVER — A crystal controlled, double conversion FM receiver for operation in the 1700 to 2400 mc frequency range. The 50Q-2 uses a Collins developed technique called Automatic Bandwidth Control for significantly reducing the threshold signal level while maintaining the advantages of a conventional 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-2 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 310T2-A 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.

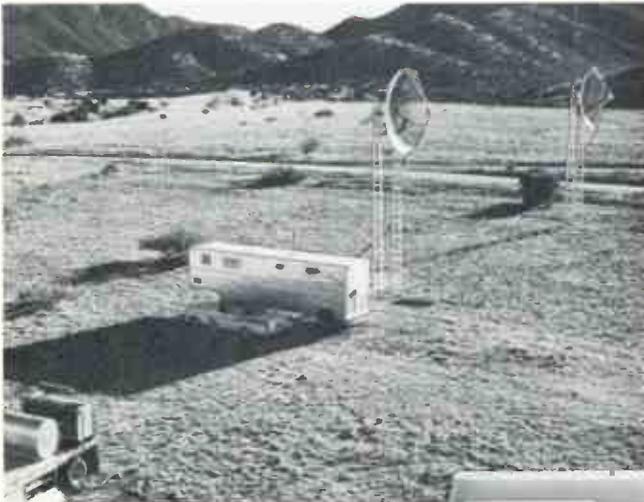
Calibrated directional couplers are included on both RF input and output lines. Frequency of operation may be easily changed by returning the four cavities for maximum power output. *Driving Power: 100 mw max. Freq. Stability: .001% when driven by 310T-2A Exciter. Beam Efficiency: 30% min. Cooling: Forced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

	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

*Excluding rack.

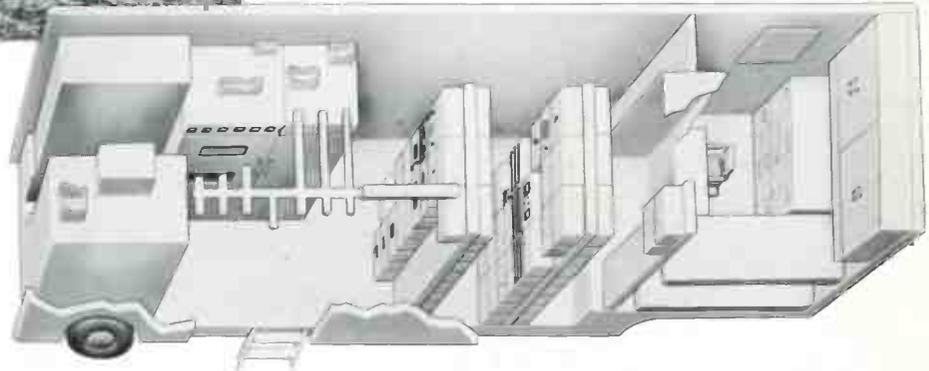


TRANSPORTABLE SYSTEMS



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, Diplexers 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 ± 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

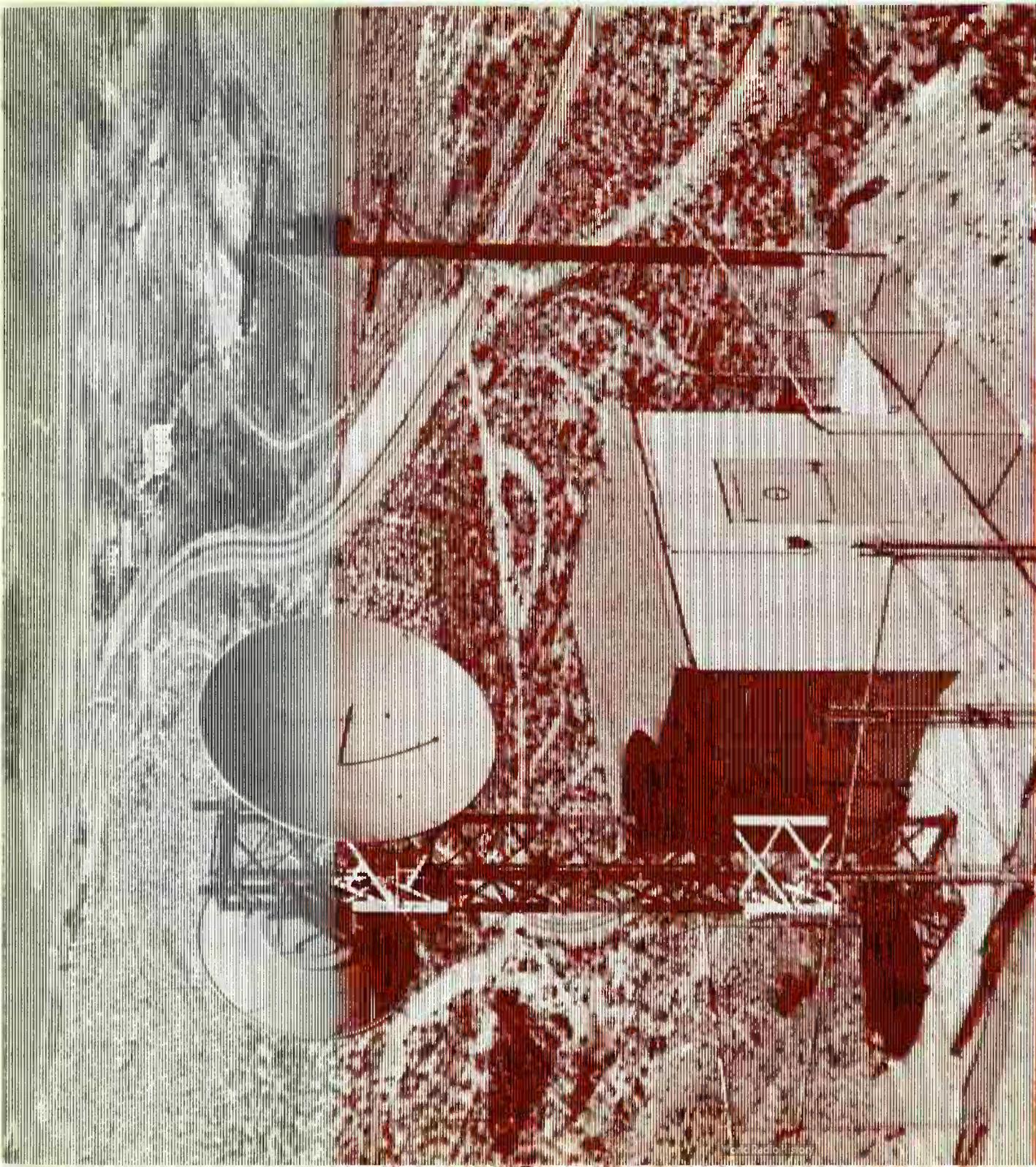


AIR TRANSPORTABLE AST-101 — This complete 1 kw Transhorizon terminal consists of two shelters that can be transported by cargo aircraft or truck. Air inflatable parabolic antennas can be stored in the shelters during transit. One shelter contains the 310K-3 Exciter, 50G UHF Receivers, and Diplexers. Multiplex equipment not normally supplied, but available on special order. The second shelter houses a repackaged 240E-2 Power Amplifier. *Size:* Each shelter — 82½" W, 103" L and 83⅞" H. *Primary Power:* 230 v, single phase, 60 cps, grounded neutral; load balance within 5 amps on either leg; 9,236 watts maximum (less heaters). *Weight:* Rec.-Ex. — 3100 lbs.; PA — 3320 lbs.

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, 83⅞" H. *Weight:* 4,000 lbs.



AST-101



collins microwave systems

RF SYSTEMS

Collins toll-quality radio relay systems provide a reliable, high channel capacity, economical mode of transmission for the common carriers, industry, TV and government. Operation is on one of four bands in the 5925 to 8500 mc frequency range, with transmission and reception of composite signals in a 200 cps to 2000 kc baseband. Five types of systems provide the optimum degree of circuit reliability for the user's requirements consistent with economic considerations.

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.

COLD STANDBY SYSTEMS — A duplicate group of RF and power supply units is included for maximum protection against communication outages from equipment failure. Maintenance may also be performed on the station at any time without interruption of service. Sensing devices detect failure of klystron power output and initiate switchover to energize the standby equipment and, after the proper warm-up period, apply the klystron beam voltage. Solenoid-operated capacitive detuning stubs are used to switch from main to standby equipment. Switchover to full operation on the alternate equipment requires about one minute. An optional sensing system uses a 100-cycle signal applied to the receiver, regulator and modulator of the associated transmitter. The signal is filtered out at the modulator and fed to a sensing detector, which initiates switchover action when the signal is absent.

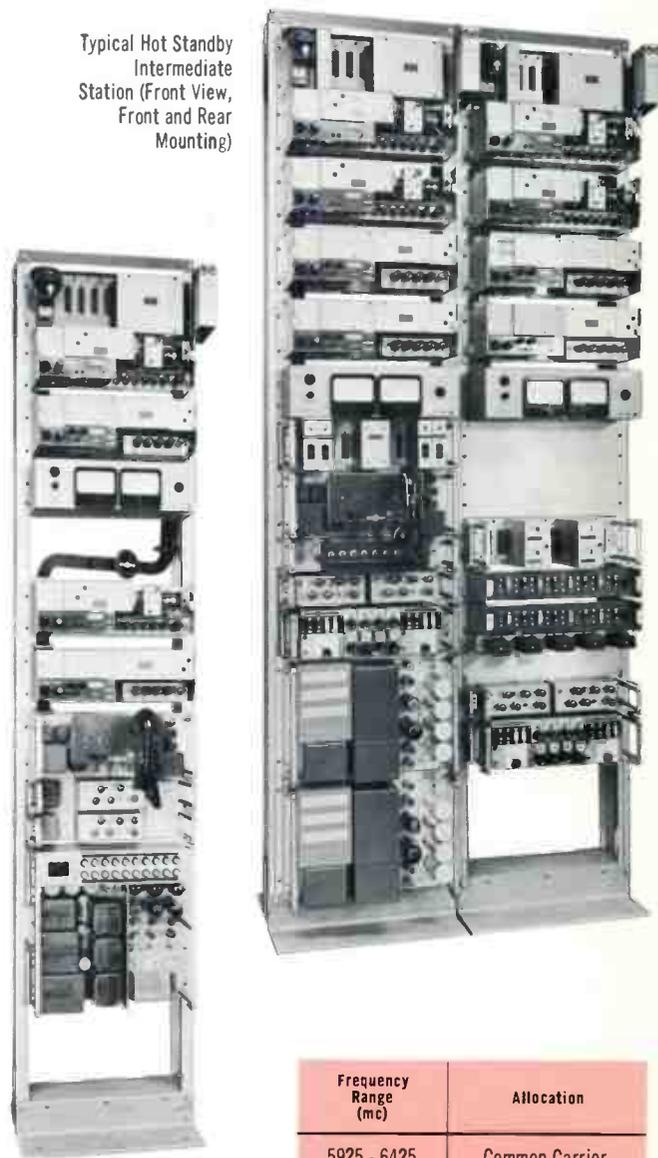
HOT STANDBY SYSTEMS — Both main and auxiliary units are constantly energized and fully operating, permitting rapid switchover in the event of circuit failure. The transfer is effected by the same capacitive detuners employed in the cold standby system.

DIVERSITY SYSTEMS — Maximum reliability is achieved by space or frequency 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 operating from a specified power source. Additional coupling and accessory equipment may be needed in some 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	Television Relay
7125 - 7650	Government

VOICE CARRIER MULTIPLEX

Upper or lower single sideband suppressed carrier techniques are employed to combine a large number of individual voice channels into 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 also included. Terminating units connect channel equipment with incoming and outgoing telephone or other communication circuits, with 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 with a carrier injection frequency which places the channel in the proper position in the base group. The carrier is one of 12 injection frequencies at 4 kc intervals. Each SSB channel thus occupies a 4 kc space in the base group, which in this case is 60-108 kc.

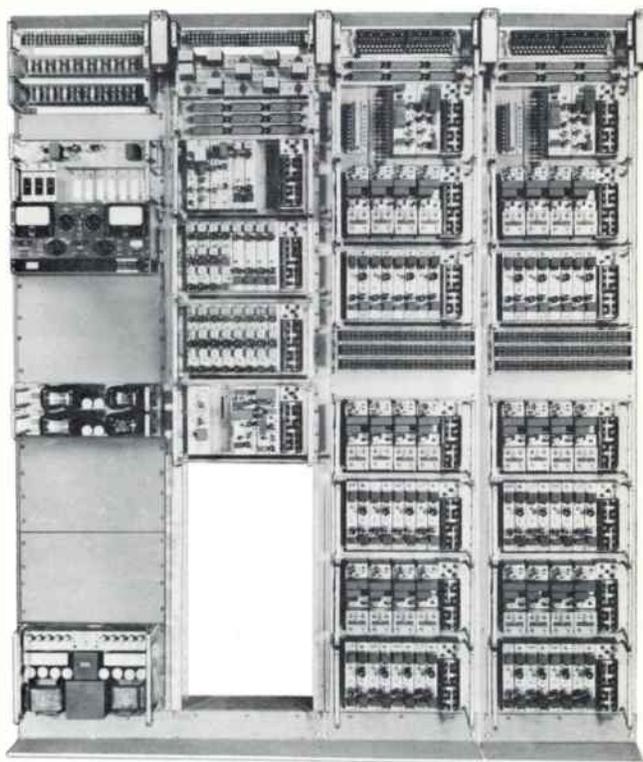
Five base groups are modulated with 5 carrier injection frequencies — 420 kc, 468 kc, 516 kc, 564 kc and 612 kc. The resulting supergroup occupies 312 to 552 kc and consists of 60 voice communication channels.

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.

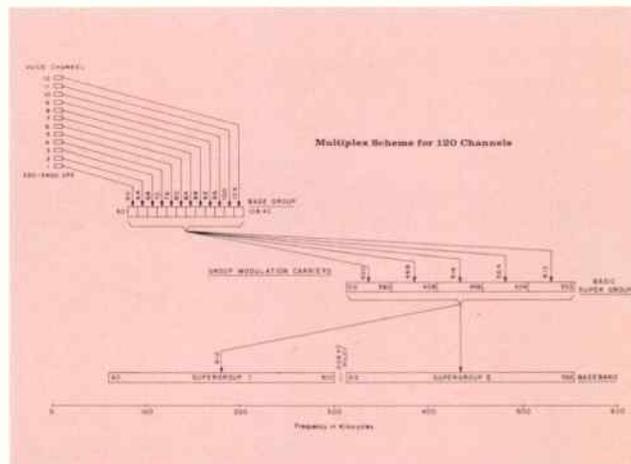
A 48-channel system would require only those modules enabling it to utilize base groups 1, 2, 3 and 4, and supergroup II. A 240-channel system is achieved by adding two more supergroups to the 120-channel system. One of these (312-552 kc) is combined with an 1116 kc carrier injection frequency, translating 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. In receive operation, the identical frequency translation scheme is employed in reverse.

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 240 full duplex voice channels can be provided. *AF Response:* ± 2 db, 350-3450 cps, without signaling. ± 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



CARRIER TELEGRAPH SYSTEM

TE-302 provides up to 18 or 26 FSK channels for teleprinter (with a TWX function), telemeter or other binary data transmission applications.

Information from the dc telegraph channels is transmitted by carrier tones separated by 170 cps in the audio range. Eighteen duplex channels can be accommodated on a 4-wire voice circuit or 9 duplex channels on a 2-wire circuit. Another 8 channels may be added optionally above the voice band with frequencies up to 5050 cps. Besides mark and space, a third condition of "no carrier" may be used for supervisory control or fault alarm.

Transmit and receive units for each channel are individual plug-in modules with etched wiring boards for maximum reliability. The module is further subdivided with a submodule containing the bandpass filter and tuned elements. This submodule may be easily removed and replaced for rapid change in channel frequency assignments. Modules are plugged into mounting panels fitting standard 19 inch relay racks. Electron tubes and relays have been eliminated by the use of transistorized circuits. A fully wired, 18 channel terminal, including all common equipment and power supplies, may be accommodated on a 7' rack with front and back mounting. Other configurations are available for 8'8", 9' or 11'6" racks with mounting on front or both sides. The modular concept makes possible initial installation containing fewer than the maximum number of channels, with new channel modules added as communication requirements increase.

The TE-302 may be connected for full duplex or half duplex operation, with capability of back-to-back operation and an option of 62.5 ma or 20 ma loop current. A switch enables selection of either the high frequency or the low frequency for a mark, and the receive unit may be strapped to operate in a steady mark or space condition in the absence of a received signal. If desired for TWX operation, a strap may be installed in the transmit unit so a remote switch can control on-off function. The TE-302 System and options are fully compatible with standard telegraph equipment, such as the Western Electric 43A. *Frequency Allocation:* 26 channels, center frequencies from 425 to 5050 cps. *Transmission Rate:* 60, 75 or 100 wpm. *Maximum Transmit Level:* +6 dbm per channel. *Minimum Receive Level:* -45 dbm per channel. *Bias Distortion:* 5% maximum over any 10 db range between +6 dbm to -45 dbm input signal. *Frequency Stability:* ± 2 cps over environmental range for channels to 3315 cps. For higher frequencies, 5% maximum change. *Line Impedance:* 600 ohms balanced. *Environmental Conditions:* 0°C to +60°C ambient; humidity to 90%. *Telegraph Options:* Full duplex neutral, half duplex neutral and back-to-back operation. *Power Source:* Commercial ac power or office battery 21-30 v dc, 130 v bias battery, and loop telegraph supply +130 v or -130 v. *Power Consumption (per channel):* 27 v at 60 ma, 130 v at 23 ma, plus loop current. *Weight:* Approx. 500 lbs.



TE-302 (Front)



TE-302 (Back)

Channel Number	East to West		West to East	
	Send	Receive	Send	Receive
1	425	3315	3315	425
2	595	3145	3145	595
3	765	2975	2975	765
4	935	2805	2805	935
5	1105	2635	2635	1105
6	1275	2465	2465	1275
7	1445	2295	2295	1445
8	1615	2125	2125	1615
9	1785	1955	1955	1785

TEST EQUIPMENT

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 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:* ±5%. **SELECTIVE VOLTMETER** — *Frequency Range:* 4 to 750 kc in 6 bands. *Frequency Accuracy:* 2% ±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.



478G-2

476J-1



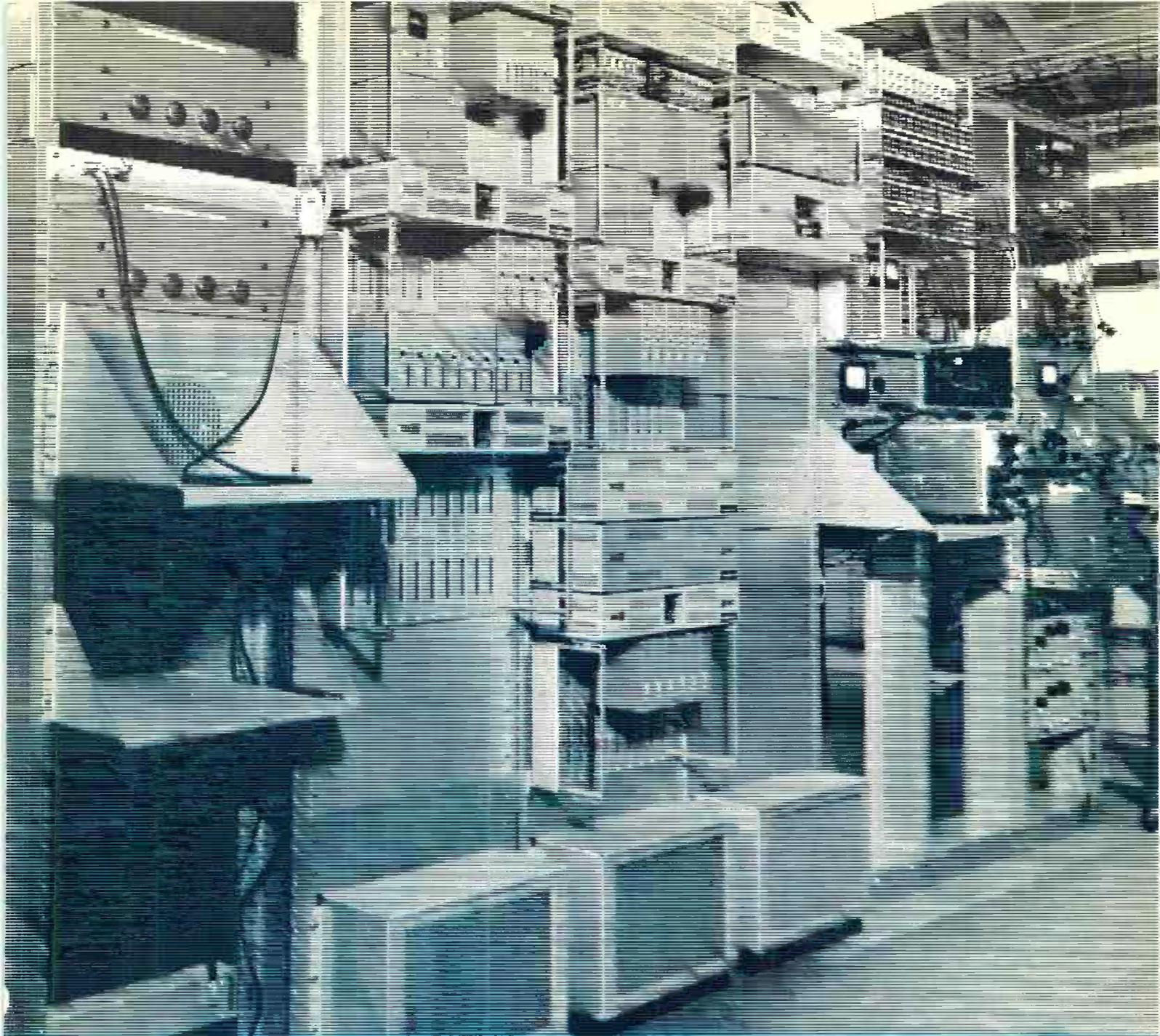
PARABOLIC ANTENNAS



537E-1

537E OFFSET FEED ANTENNA — The complete antenna system consists of a parabolic antenna normally mounted at the base of the microwave tower or on the roof of the microwave station, together with a tower mounted reflector. The reflector at the top of the tower eliminates long waveguide runs and electrical maintenance of tower mounted components. However, antennas may be mounted either horizontally or vertically as required. An offset waveguide feedhorn makes critical installation adjustments unnecessary. De-iced antenna contains four 115 or 230 volt heating elements with wattage chosen for the normal low temperatures expected in a particular location. Thermostats energize the heaters at approximately 40°F. Antenna is available with or without de-icer. *Wind Loading:* 100 mph. *VSWR:* Less than 1.15:1. *Weight:* 250 lbs. *De-Icing:* Optional. Center Feed paraboloidal antennas are also available in two sizes, with or without de-icer.

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**[®]
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 ± 0.6 cps. TE-206 arranged to furnish a 300 ± 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 ± 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:** ± 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°C to 43°C (60°F to 110°F). Humidity - 0 to 90% without condensation.

768G-1 KINECARD CONVERTER — The completely transistorized 768G-1 Kinecard 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 Kinecard 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 Kinecard 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°C to 43°C (60°F to 110°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	86 $\frac{1}{8}$	400	40	75 bits per second per channel 3,000 bits per second total
Kineplex Data System with Teletypewriter Converters	TE-202	41	20	86 $\frac{1}{8}$	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

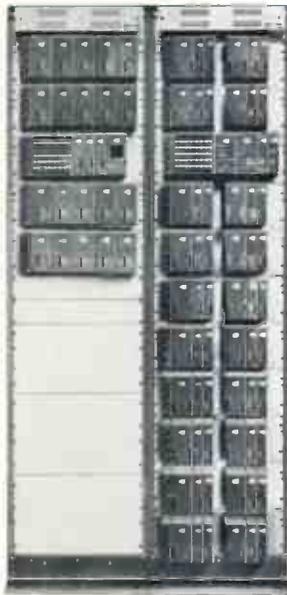
the TE-206 Data System, and it operates in the half-duplex mode. The data may be recorded on the tape in either of two standard, expanded Univac formats. The tape handler operates at either of two tape speeds to provide optimum transmission efficiency for each of the standard data formats. Errors in 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 \pm 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 \pm 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:** $\frac{1}{2}$ " by $1\frac{1}{2}$ 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 \pm 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 $\frac{1}{2}$ " 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 — $\frac{3}{4}$ " minimum. No flux transitions are to occur during the gap period. Character Density — 200 \pm 0% — 30% characters per inch. File Length — May be any number of 120 character records. **File Gap** — $\frac{3}{4}$ " 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:** $\frac{1}{2}$ " by $1\frac{1}{2}$ 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 \pm 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

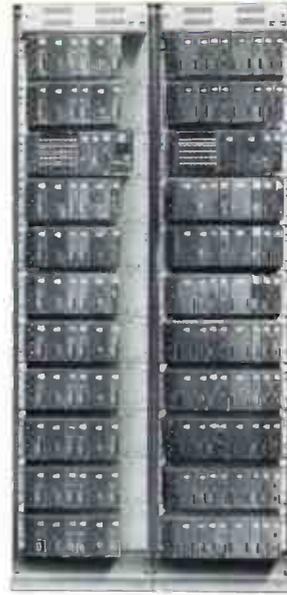


Front

TE-202 Data Communication System

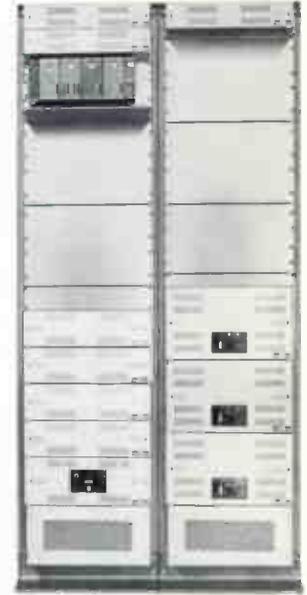


Back



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.

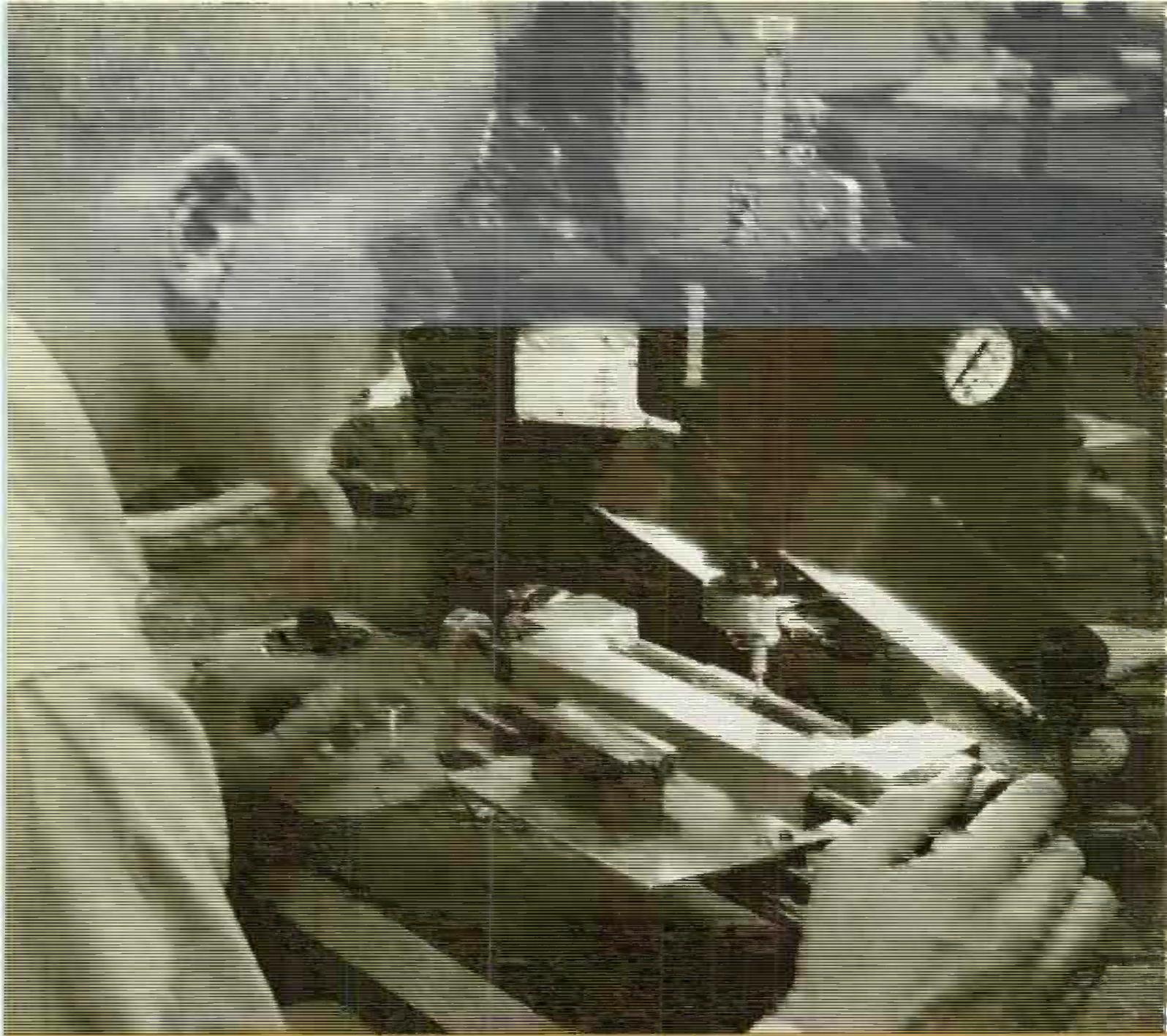
The basic communication channel on radio and wire line facilities has a nominal bandwidth of 3 kc. The TE-202 has been designed to maximize the utilization of this basic channel. The system is comprised of channeling equipment which may be added in multiples of two channels to a maximum of forty channels. 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, $0-45^{\circ}\text{C}$ 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[®]

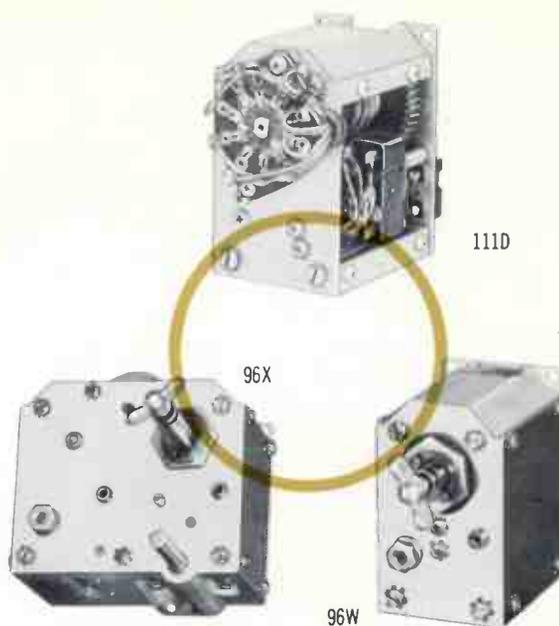
Collins Autotune Systems accurately and automatically reposition shafts to any of several predetermined settings. Autotunes may be controlled directly or remotely with only electrical connections between control point and Autotune. They are easily repositioned manually to any new setting.



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 — 4 3/8D, 2 7/8H	3 1/16W, 4 1/8 — 4 3/8D, 2 7/8H	1 5/16W, 3D, 2 7/8H
Weight (lbs.)	3	3	1½	2¼	¾

*Viewed from front.

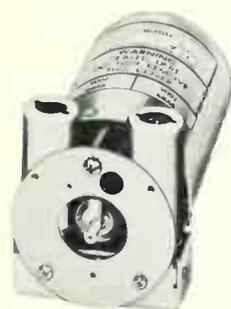
AUTOPOSITIONER[®]



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 1/16" 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

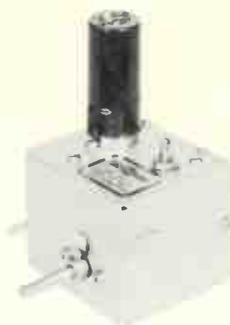


70H-3



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 ²⁷ / ₃₂ dia. x 6 ⁵ / ₁₆	3½W, 7 ¹⁷ / ₃₂ D, 4 ⁷ / ₃₂ H	2 ³³ / ₆₄ W, 2 ¹⁵ / ₆₄ D, 3 ³¹ / ₃₂ 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 in a nickel-plated brass case, 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

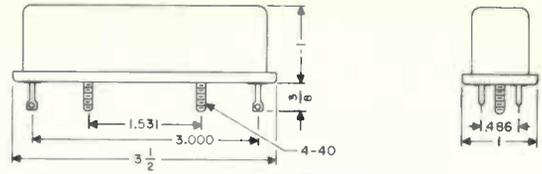
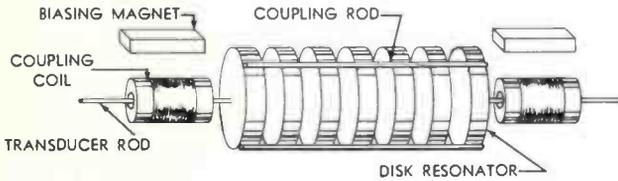
Transmission Loss: Generally insertion losses are on the order of 10 to 12 db, although certain filters have losses as low as 6 db. In applications with series resonant input and parallel resonant output, actual voltage gains are obtained.

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

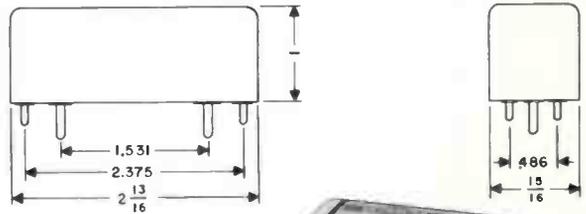
Environmental Characteristics: Most designs employ temperature compensation, and the nominal bandwidth of a given filter is essentially unaffected by a wide variation in ambient temperature. Humidity has no effect.

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

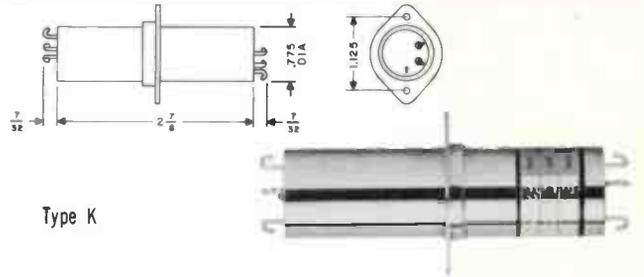
FUNCTIONAL DIAGRAM OF A TYPICAL MECHANICAL FILTER



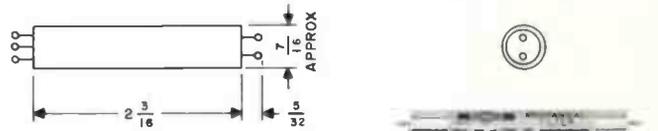
Type C



Type E



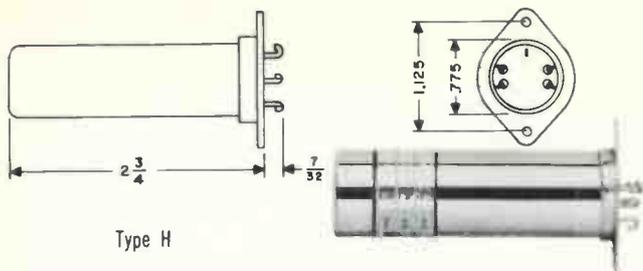
Type K



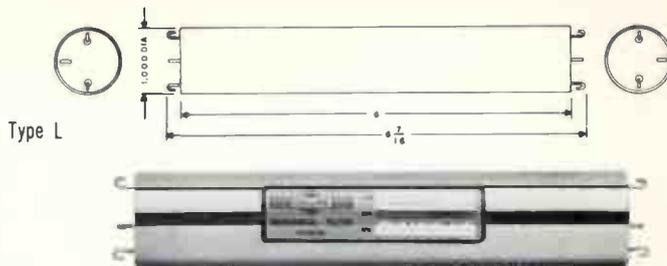
Type Y



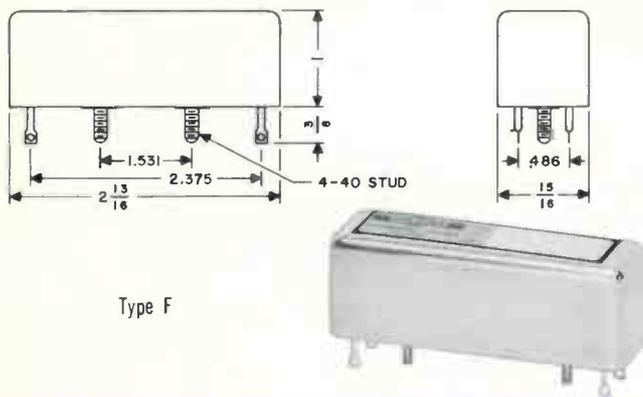
Filter Type	Center Frequency	6 db Bandwidth	60 db Bandwidth	Case Style	Filter Type	Center Frequency	6 db Bandwidth	60 db Bandwidth	Case Style
F250A-20	250 kc	2.0 kc	4.3 kc	C	F455*-120	455 kc	12.0 kc	23.0 kc	*
F250Z-3	250 kc	2.7 kc	5.5 kc	W	F455*-160	455 kc	16.0 kc	27.5 kc	*
F250A-67	250 kc	6.7 kc	14.0 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	*					



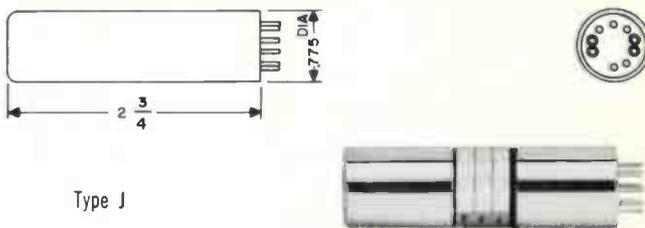
Type H



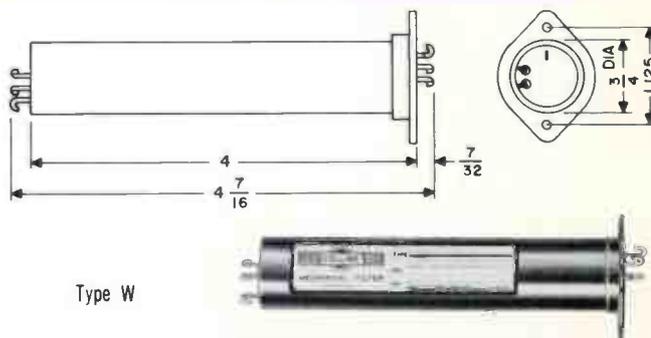
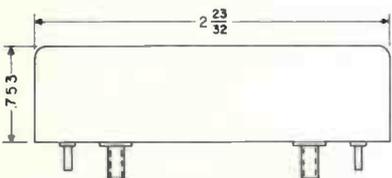
Type L



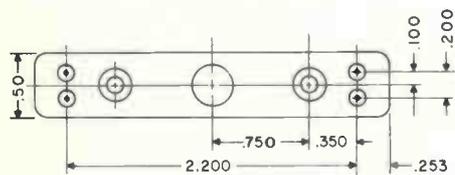
Type F



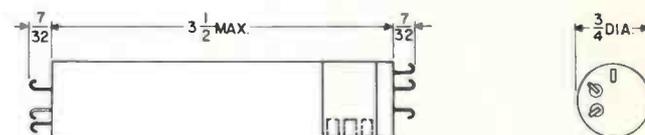
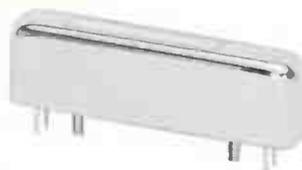
Type J



Type W



Special Case Designed to User's Requirements



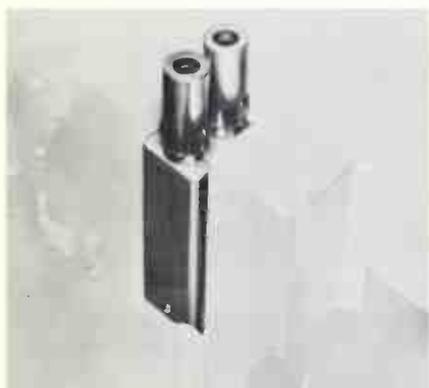
Type for F300 Series



CASE STYLES

SSB Filter Type	Carrier Frequency	Sideband	Case Style	SSB Filter Type	Carrier Frequency	Sideband	Case Style
F60Z-4	60 kc	Upper	L	F100Z-4	100 kc	Upper	L
F64Z-4	64 kc	Upper	L	F104Z-4	104 kc	Upper	L
F68Z-4	68 kc	Upper	L	F250Z-4	250 kc	Upper	C
F72Z-4	72 kc	Upper	L	F250Z-5	250 kc	Lower	C
F76Z-4	76 kc	Upper	L	F300Z-4	300 kc	Upper	3/4" dia., 3 1/2" L
F80Z-4	80 kc	Upper	L	F300Z-5	300 kc	Lower	3/4" dia., 3 1/2" L
F84Z-4	84 kc	Upper	L	F455Z-1	455 kc	Upper	H
F88Z-4	88 kc	Upper	L	F455Z-2	455 kc	Lower	H
F92Z-4	92 kc	Upper	L	F455Z-4	455 kc	Upper	Y (7/16" dia., 2 1/2" L)
F96Z-4	96 kc	Upper	L	F455Z-5	455 kc	Lower	Y (7/16" dia., 2 1/2" L)

FILTER ADAPTERS



353A for Hammarlund SP400, National HRO-60



353B for Hammarlund SP-600-JX

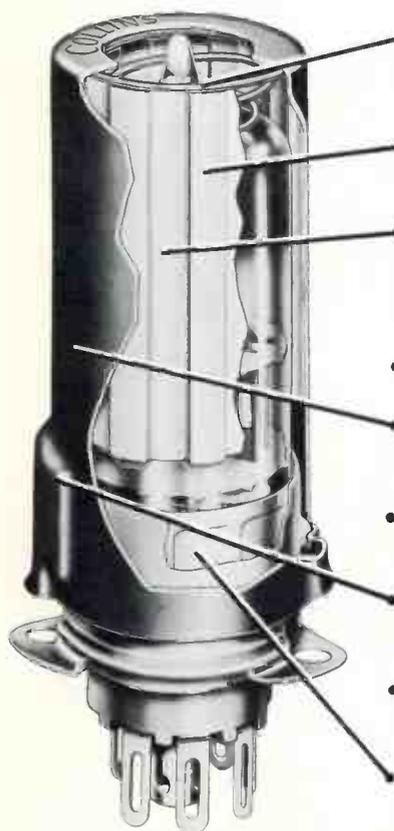


353D for National HRO-50, HRO-50T1

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	2¼	7 pin large
66J-4	TS-103U01	1½	9 pin short
66J-5	TS-103U02	1 5/16	9 pin medium
66J-6	TS-103U03	2¾	9 pin large

INDEX

COMPLETE LISTING BY PRODUCT TYPE NUMBERS

AVIATION EQUIPMENT

17L-4, -6 VHF Communication Transmitters	10, 11, 24	314S-4 Remote Control Unit	24	349D-3A Shockmount	17, 28
17L-7 VHF Communication Transmitter	10, 11, 24	314U-8 Remote Control Unit	24	349D-4 Shockmount	8
17L-8, -8A VHF Communication Transmitters	10, 11	314U-10 Remote Control Unit	24	349D-5 Shockmount	8
18S-4A HF Transmitter-Receiver	14, 24	316A Line Simulator	19	349E-3 Shockmount	13, 28
18Z-3, -4 HF SSB Communication Systems	12, 13	323A-1 Flux Detector	20	349F-4 Shockmount	13, 28
37J-3 VOR/LOC Navigation Antenna	21	327A-2 Marker Light Indicator	17	349F-5 Shockmount	13, 28
37P-4, -5 Glideslope Antennas	21	327B-1 Gyro Monitor	7, 9	349G-3 Shockmount	13
37R-1, -2 VHF Communication Antennas	21	327C-1 Slave Indicator	20	349H-2 Shockmount	22, 28
37X-2 Marker Beacon Antenna	21	327D-1 Trim Indicator	9	349H-3 Shockmount	10, 28
49T-3 Adapter	13	328A-2 Magnetic Compass Amplifier	20	349H-4 Shockmount	10, 17, 28
51R-3 VHF Comm/Nav Receiver	10, 11, 24	329B-2 Approach Horizon	6, 7, 9	349H-5 Shockmount	17, 28
51R-4 VHF Comm/Nav Receiver	16, 17, 24	329B-2A Approach Horizon	9	349H-6 Shockmount	28
51V-3 Glideslope Receiver	16, 17, 24	329B-4 Approach Horizon	8, 9	349J-1 Shockmount	8, 28
51X-2 VHF Comm/Nav Receiver	10, 11, 16, 17, 24	329B-4A Approach Horizon	6, 7	349N-1 Shockmount	13, 28
51X-3 VHF Comm/Nav Receiver	10, 11, 16, 17, 24	331A-2C Course Indicator	6, 7, 9	349P-1 Shockmount	8
51Y-3 ADF Receiver	19	331A-3C Course Indicator	7	350C-5 Shockmount	14, 28
51Z-2 Marker Beacon Receiver	16, 17	331A-4 Course Indicator	6, 7, 9	350D-3 Shockmount	14, 28
121A-1 Mechanical Disconnect	9	331E-2 ADF Indicator	17	350E-3A Shockmount	11, 28
121A-2 Emergency Disconnect	9	331H-1 Course Selector Indicator	17	350E-3C Shockmount	10, 28
137A-2 ADF Antenna	19	332C-1 Radio Magnetic Indicator	17	350E-3D Shockmount	22, 28
137X-1 VHF Comm/Nav Antenna	21	332D-6A Vertical Gyro	7, 8, 9	350F-3 Shockmount	10, 28
137Y-1, -2 Doppler Antennas	18	332D-8 Vertical Gyro	7	350G-3 Shockmount	28
162C-1 Doppler Navigation Computer Control	18	332D-9 Vertical Reference	8, 9	350L-2 Shockmount	28
179J-1, -2, -3 ADF Sense Antenna Couplers	19	332E-2 Directional Gyro	20	350M-1A Shockmount	28
180K-3 Antenna Tuning Unit	14	333B-1, -3 Servo Amplifiers	11	350M-2 Shockmount	7, 28
180L-2 Automatic Tuning Unit	14	334C-2, -3, -4 Primary Servos	8, 9	350S-3 Shockmount	13, 14, 28
180L-3 Automatic Tuning Unit	14	334D-1, -2 Trim Tab Servos	9	350T-1 Shockmount	14, 28
180M-1 Antenna Tuning Unit Test Set	27	336A-2 Omni-Bearing Selector	17	350T-3 Shockmount	28
180R-6 Antenna Coupler	12, 13	336A-3 Omni-Bearing Selector	17	350V-1 Shockmount	28
278H-1 Control Panel	22	337A-2 Omni-Bearing Indicator	11, 17	350X-1 Shockmount	20
288A-1 Tone Generator	22	338B-1 Doppler Indicator	18	351A-1 Accessory Frame	11
309A-1, -2 Antenna Coupler Control	12, 13	339D-1 Distance Indicator	20	374A-1 Receiver/Transmitter	15
		344A-1 Instrumentation Unit	16, 17	390D-1 Shockmount	23, 28
		344B-1 Instrumentation Unit	16, 17	390D-2 Shockmount	17, 28
		344C-1 Instrument Amplifier	7, 9	390D-3 Shockmount	17, 28
		344D-1 Omni Converter	16, 17	390D-4 Shockmount	20, 28
		345A-2 Sensing Unit	7	390D-5 Shockmount	28
		345A-3, -4 Sensing Units	8, 9	390D-6 Shockmount	28
		346A-1 Interphone & Isolation Amplifier	23	390D-7 Shockmount	7, 28
		346D-1 Passenger Address Amplifier	23	390D-8 Shockmount	17, 28
		349A-4 Shockmount	15, 28	390D-9 Shockmount	23, 28
		349B-2 Shockmount	15, 28	390E-1 Shockmount	17, 28
		349D-1 Shockmount	19, 28	390E-2 Shockmount	10, 28
				390F-1 Shockmount	28

237A-1, -2, -3 Log Periodic Antennas	55
242F-2 200 Watt Transmitter	52
242F-5CL 50 Watt Transmitter	52
270G-3 Cabinet Speaker	54
271B-3, -4 Speakers	53
302E-2 Directional Wattmeter	48
310F-1 Exciter	46
310F-6 Receiver-Exciter	46
310U Series Exciters	46
432D-2 2.5/2 kw Transmitter	50
478R-1 Spectrum Analyzer	55
512B-2 HF Impedance Conversion Unit	53
512D-1 HF Impedance Conversion Unit	54
512F-1 Coaxtran	54
512G-1 Exponential Line Kit	54
619F Cabinets	54
619J-4 Rack	54
Dipole-Balun Antenna	48
KWT-6 500 Watt Transceiver	48
Rack Terminal Panel	53
RC-101 Remote Control System	56
Receiver Cabinet	54

TRANSHORIZON SYSTEMS

35Q-1 Coaxial Bandpass Filter	58
35R-1 Coaxial Branching Filter	58
50Q-2 FM Receiver	60
137Q-1, -2, -3 Antennas	58

240D-1, -2 10 kw Power Amplifier	58
240E-2 1 kw Power Amplifier	58
240F-2 1 kw Power Amplifier	60
310K-2, -3 Exciter-Modulators	58
310T-2A FM Exciter	60
537J-1, -2, -3 Air Inflatable Antennas	58
651C Series Receivers	58
AST-101 Air Transportable System	61
AST-102 Air Transportable System	61
TST-101, -201 Ground Transportable Systems	61

MICROWAVE SYSTEMS

476J-1 Wideband and Selective Voltmeter	66
478G-2 Test Panel	66
537E-1 Offset Feed Antenna	66
Cold Standby Systems	63
Diversity Systems	63
Hot Standby Systems	63
Non-Standby Systems	63
Q Line Systems	63
TE-302 Carrier Telegraph System	65
Voice Carrier Multiplex	64

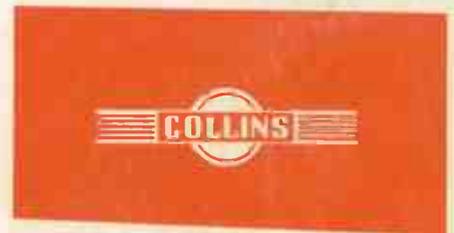
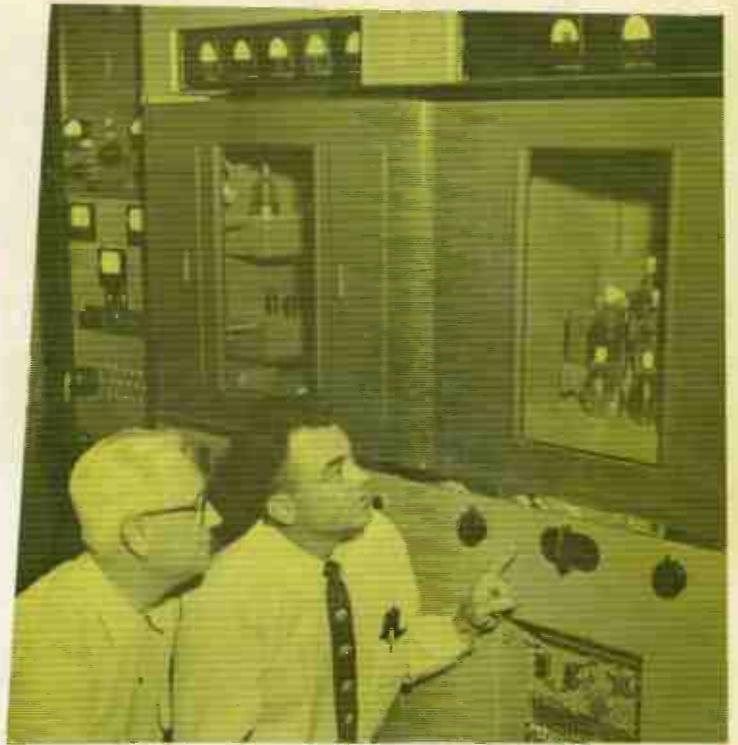
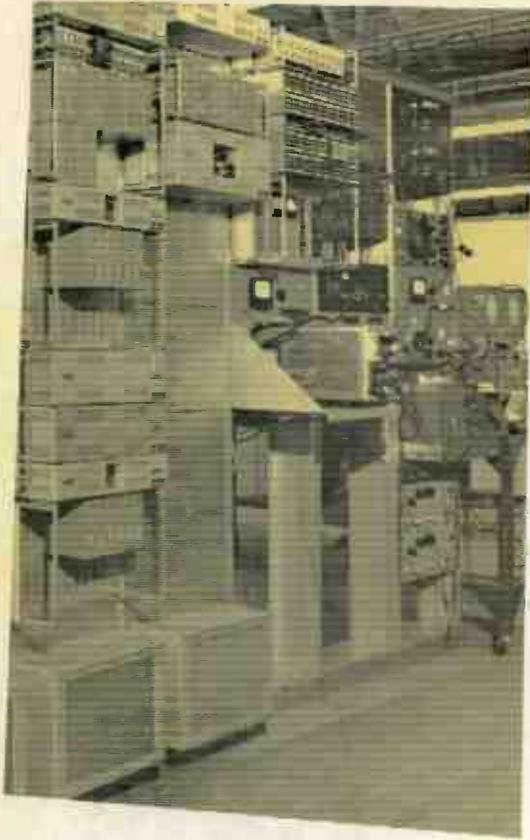
KINEPLEX® SYSTEMS

768G-1 Kinocard Converter	68
768H-1 Kinetape Converter	68
768H-2 Kinetape Converter	69
TE-202 Data Communication System	70

TE-202 Data Communication System (with teletypewriter converters)	70
TE-206 Data Communication System	68

PRECISION COMPONENTS

66J Series Tube Shields	76
70E-1 Oscillator	73
70E-15 Oscillator	73
70H-3 Oscillator	73
70H-12 Oscillator	73
70K-1 Oscillator	73
96W Autotune®	72
96X Autotune	72
111D Autotune Control	72
353A, B, D Series Mechanical Filter Adapters	76
381E-1 Autopositioner®	72
496A, C Autotunes	72
496B Autotune	72
F60-104Z Series SSB Mechanical Filters	75
F250A, Z Series Mechanical Filters	74
F250Z Series SSB Mechanical Filters	75
F300X-68 Mechanical Filter	74
F300Z Series SSB Mechanical Filters	75
F455E, F, H, J, K, Y Series Mechanical Filters	74
F455Z Series SSB Mechanical Filters	75
F500B, F Series Mechanical Filters	74



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