1966

CEI

Precision by design . . . in special purpose receiving equipment

WIDE RANGE OF SUPERIOR PRODUCTS

ADVANCED FACILITIES

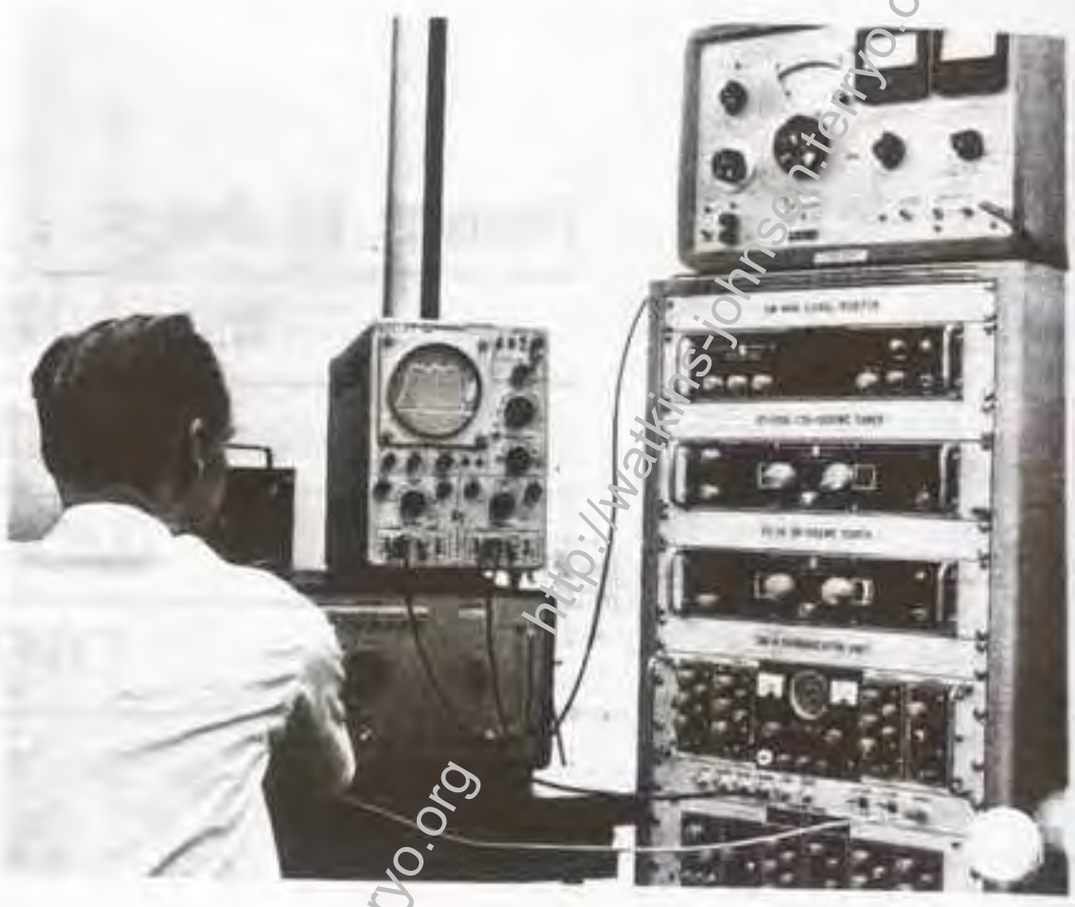
QUICK REACTION CAPABILITY

EXPERIENCED PERSONNEL

CEI produces the nation's most complete selection of advanced special purpose RF receivers and auxiliary receiving equipment. Over 80 different models are available, directed at surveillance, telemetry, direction finding, counter-measures and general communications fields.

This precision product line begins with CEI-designed receivers and receiving systems covering the frequencies from VLF through UHF, including doppler receivers and units with built-in signal monitors. Separate signal monitors, frequency extenders, converters, preamplifiers, multicouplers and other accessories such as audio, video and speaker units are also offered.

All CEI products incorporate latest advances in electronic components and circuit techniques. Solid state devices, printed circuits and modular construction are used whenever consistent with top performance and reliability. The result—compact, lightweight instruments, each of which can be handled easily and requires a minimum of rack space.



Advanced Facilities

CEI is one of the nation's most self sufficient electronics firms. To assure the highest reliability in all its products, the company has adopted a policy of performing in-house all operations possible . . . from design to delivery.

To CEI clients this means that rigid quality control standards can be enforced at every stage of the production operation.

To CEI engineers (who enjoy 11,000 square feet of fully equipped electronic and test laboratories) it means an unusual freedom from the restrictions imposed by dependence on outside sources.

CEI's new 50,000 square foot plant offers complete facilities for precision machining and sheet metal fabrication from artwork to finished boards, metal etching for overlays and nameplates and metal treatment to prevent corrosion. Only electroplating and basic components are purchased outside . . . and these are subjected to strict incoming inspection procedures.

Engineering

The CEI technical staff is comprised of graduate electronic engineers and practical communication equipment technicians, with extensive experience in the design and development of receiving equipment for the telemetry, surveillance and communication fields. The senior electronic engineers and project engineers have specialized in the RF field with particular emphasis in the VHF and UHF frequency ranges.

Among the technical accomplishments of this department were the designs of low noise VHF and UHF receivers employing solid state components and modular construction, UHF tuners requiring extreme stability as well as low noise, the first VHF receiver covering the entire VHF frequency range of 30 to 300 MC, preamplifiers, converters, signal monitors, doppler receivers for such programs as Project Transit, video distribution amplifiers and many other electronic receiving devices for telemetry and communication applications.

Quick Reaction Capability

CEI's wide-ranging communication electronics experience, combined with exhaustive in-house production facilities, has fostered a quick reaction capability equal to the needs of virtually any special application. In most cases, customer requirements can be met with one of CEI's catalog items, which are all available from stock or on early delivery.

For highly unusual applications, CEI will either modify existing products or design and fabricate instruments to match the needs. Utilizing in-house capabilities to the fullest, CEI can meet tight deadlines even on quantity production runs. Of noteworthy importance in such special projects is CEI's provision for secure areas in the new building. These special rooms allow CEI to undertake rigidly classified assignments of any scope and complexity.

Production

In addition to the design and development capabilities, CEI is a production firm with complete in-plant facilities for fabrication and construction of precision electronic equipment.

Machine shop, sheet metal, painting, transformer, printed circuit, assembly and test departments all contribute towards a control of quality and customer delivery assurance. The products designed by the CEI technical staff are all produced by CEI trained production personnel.

CEI

If there is one thing that characterizes CEI it is the fact that not only in top management but throughout the operation in every responsible position there are men with experience, knowledge, and demonstrated ability in electronic engineering and production.

R. E. GRIMM

R. P. MAY

V. M. NOONAN

J. K. GEARING

MANAGEMENT

PRESIDENT

Ralph E. Grimm

A registered professional engineer in the District of Columbia, a member of IEE, SMPTE, and SPSE, Mr. Grimm directs all CEI operations, with particular attention to the technical and engineering phases. He has presented many technical papers before associations and written numerous articles for professional journals. He served in the U. S. Coast Guard as a specialist in Loran development and following the war years was with Air Track Manufacturing Company, Clarke Instrument Corporation, and Nems-Clarke, Inc. Mr. Grimm is widely recognized as an authority in the RF field and has directed the design of ground telemetry, surveillance, and other types of special-purpose receivers widely used throughout the armed services. Ground telemetry equipment designed under his guidance is now considered as standard at virtually every military and satellite base throughout the world. He was formerly an instructor in radio at Capital Radio Engineering Institute, of which he is a graduate.

VICE PRESIDENT IN CHARGE OF SALES

Rudy P. May

Mr. May has had eighteen years' experience in electronic production and sales. After graduation from Virginia Polytechnic Institute, he became a production engineer for Washington Institute of Technology for two years, later transferring to Nems-Clarke Company, where he worked in the same capacity for five years before transferring to sales to eventually become director of all sales activity. He has extensive contacts in the industry, particularly in the field of equipment for surveillance, reconnaissance, telemetry, and communications. He joined CEI in May 1961 to become sales manager and later vice president in charge of sales.

TREASURER

Vincent M. Noonan

Upon completing college, Mr. Noonan obtained certification as a public accountant. He was a partner for many years in a public accounting firm before becoming secretary and treasurer of National Electronic Laboratories, Inc. This firm was a subsidiary of Thiokol Chemical Corporation. Mr. Noonan later became assistant to the treasurer of Thiokol Chemical Corporation, responsible for budgeting, financial forecasting, and special assignments on financial matters.

SECRETARY

John K. Gearing

Mr. Gearing is a member of the Bar of the State of Maryland and the District of Columbia. He is a graduate of the School of Foreign Service, Georgetown University and of Georgetown Law School. Since 1959 he has been a lecturer in the Department of Business Administration at Montgomery Junior College. He has had many years experience in the administration of both Government and commercial contracts. Prior to joining CEI in 1961 Mr. Gearing worked for 5 years at Nems-Clarke.

For Special-Purpose Receiving Equipment

You Can Place Your Trust In CEI

. . . where dedicated, experienced people employ advanced circuitry, finest components and quality construction to produce instruments of unvarying performance and dependability.

Communication Electronics Incorporated
6006 Executive Boulevard
Washington Science Center
Rockville, Maryland

Area Code 301, 933-2800
TWX-710-824-9603

Technical Data

DATA SHEET 131.50

TYPES 301A AND 301A-1 RECEIVERS

TYPE 301A RECEIVER

The CEI types 301A and 301A-1 Receivers are designed for AM and CW reception in the very low frequency range of 3 kc to 30 kc. These frequencies are tuned in three bands: 3-6 kc, 6-14 kc, and 14-30 kc. There are three modes of reception: AM-AGC, AM-MAN and CW. When the receivers are in the AM-AGC mode, the AGC response can be set for either FAST or SLOW by means of a front-panel switch. An internal BFO is activated when the CW mode is selected. The audio output from the receivers is available at a rear-apron terminal strip and at a front-panel PHONES jack. Since direct coupling is employed after the detector, a recorder can be connected to the audio output to record the dc variations in the detector output. An IF output is also provided on the rear apron.

Both receiver types feature an all solid-state design. This provides a unit with high reliability and low power requirements. The units are compact and lightweight requiring only 3.5 inches of vertical rack space and weighing less than 14 pounds. The type 301A is designed to operate from a 115 volt, 50-400 cps primary power source. The type 301A-1 can additionally operate from self-contained, rechargeable batteries.

SPECIFICATIONS

Types of Reception	AM and CW
Frequency Coverage	3-30 kc in three bands: Band I: 3-6 kc Band II: 6-14 kc Band III: 14-30 kc
Input Impedance	75Ω, unbalanced
Intermediate Frequency	45 kc
IF Bandwidth	200 cps
Sensitivity	Approximately 0.1 μv input produces 15 db (s plus n)/n

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Image Rejection	Better than 70 db
Audio Output	Approximately 1 volt rms into a 2K-ohm load (for 50% modulation)
IF Output	Approximately 100 mv into a 50Ω load
Audio Response	10 cps to 100 cps in AGC/Fast position 1 cps to 100 cps in AGC/Slow position 0 cps to 100 cps in AGC/Off position
Dial Accuracy	±1%
Power Input	115 vac, 50-400 cps
Power Consumption	4 watts, approximately
Weight	13.5 lbs, approximately
Over-all Dimensions	19 inches wide x 3.5 inches high x 16.75 inches deep

FOB Rockville, Maryland. Taxes extra where applicable. Price and specifications subject to change without notice.

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Technical Data

DATA SHEET 132.50

TYPE 302 LF RECEIVER

The CEI Type 302 LF Receiver was designed to fill the need for a small sensitive receiver covering the range of 30 to 300 kc. All active elements are solid state, thereby reducing heat and increasing stability. A three position function switch allows the selection of AM-AGC, AM-MAN, and CW reception modes. When the receiver is in the AM-AGC mode, the AGC response can be set to either FAST or SLOW by a front-panel toggle switch. An internal BFO is activated when the function switch is placed in the CW mode.

SPECIFICATIONS

Type of Reception	AM and CW
Frequency Coverage	30-300 kc in three bands Band I: 30-60 kc Band II: 60-140 kc Band III: 140-300 kc
Input Impedance	75 ohm, unbalanced; Type BNC connector
Intermediate Frequency	455 kc
IF Bandwidth	2 kc
IF Rejection	60 db min.
Image Rejection	70 db minimum
Sensitivity	0.4 microvolt input, modulated 50% at a 400 cps rate produces 15 db (s + n)/n
Controls	BFO tuning; AGC-Fast/Slow; RF-IF Gain; Audio Gain; Power-On/Off; main tuning; Range; function-AM-AGC, AM-MAN, CW
Manual Gain Control Range	Greater than 100 db

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Outputs	
Audio	1 volt rms into 2k ohm load
IF	100 mv into 50 ohm load approx.
Audio Response	10 cps to 1000 cps in AGC/fast position 1 cps to 1000 cps in AGC/slow position 0 cps to 1000 cps in AGC/off position.
Meter	Signal Strength
Dial Accuracy	±1%
Power Input	115 volts, 50-400 cps.
Power Consumption	4 watts, approx.
Weight	13.5 lbs
Over-all Size	3.5" h x 19" w x 16.75" d

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9/18/64

Technical Data

DATA SHEET 135.50

TYPE 351 VLF RECEIVER

The CEI Type 351 Receiver is a newly-developed unit which contains features and engineering refinements not normally found in receivers tuning in the VLF range. The 351 Receiver has an unusually wide tuning range, variable IF bandwidths, and high tuning accuracy. It tunes from 1 kc to 600 kc in a single band, thus spanning the ELF band through the VLF and LF bands into the MF band. A front-panel switch allows the selection of a 150 cps, 1 kc, 3 kc, or 6 kc IF bandwidth. The accuracy of the receiver is such that the indicated frequency is within 10 cps of the received frequency throughout the tuning range. To obtain this accuracy, and provide a convenient readout, a digital counter has been included in the design. The Nixie display presents the receiver frequency with no visible flicker.

The low incidental FM of the local oscillator and BFO makes the 351 Receiver suitable for FSK as well as CW and AM reception. This versatile device has been designed using solid-state devices exclusively except for the Nixie tubes. The receiver therefore exhibits high reliability and low power requirements.

SPECIFICATIONS

Frequency Range	1 kc to 600 kc (Lower Band limit 500 cps)
Type of Reception	AM, SSB, CW, MCW, and FSK
Noise Figure	Less than 5 db
Sensitivity (at 50-ohm input impedance and 1-kc IF bandwidth)	CW and FSK, 1 kc to 10 kc: 5 microvolts for 20 db (s plus n) /n CW and FSK, 10 kc to 600 kc: 0.5 microvolt for 20 db (s plus n) /n MCW and AM, 50 kc to 600 kc: 1 microvolt for 10 db (s plus n) /n
Input Impedance	50 ohms or 1000 ohms, selectable by rear-panel switch
Input Attenuator	0 db, -20 db, -40 db, or -60 db, selectable by front-panel switch
Maximum Input Level	1 volt, rms, with input attenuator in -60 db position

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IF Bandwidths	150 cps, 1 kc, 3 kc, or 6 kc selectable by front-panel switch
Image Rejection	70 db, minimum
IF Rejection	60 db, minimum
Dynamic Range	AGC or Manual: 55 db, minimum
BFO	Adjustable ±3 kc by front-panel control
Incidental FM	Less than 10 cps peak deviation
Outputs	Two: front-panel phone jack (2000 ohms nominal); and rear apron audio, 6 milliwatts (600 ohms ungrounded)
Audio Bandwidths	Normal (100 cps to 3 kc) or narrow (825 cps to 1175 cps), selectable by front-panel switch
Power	115/230 vac, 50-400 cps, approximately 25 watts
Size	19-inches wide, 3.5-inches high, and 19.5-inches deep
Weight	20 lbs., approximately

PRICE: $4,000.00

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6/1/65

Technical Data

DATA SHEET 142.50 6/18/65

TYPE 402 RECEIVER

The CEI Type 402 receiver is an extremely compact unit which provides AM and CW reception in the 25 mc to 90 mc frequency range. This receiver is a single-channel crystal-controlled superheterodyne. The frequency range of 25 mc to 90 mc is covered in three standard tuners as follows: 402-1, 25 mc to 40 mc; 402-2, 40 mc to 60 mc; and 402-3, 60 mc to 90 mc. The receivers have been designed so that the user can adjust them to any frequency within their frequency range.

The 402 Receiver features an all solid-state design which provides high reliability and low power requirements. This fact, coupled with the small size, allows up to five of these receivers to be mounted in an equipment frame which is only 5.25-inches high and 19-inches wide. The power consumption of all five receivers combined is only 12.5 watts. The EF-501 through EF-505 Equipment Frames are available to mount from one to five of the 402 series receivers; see data sheet 725.50 for more information on equipment frames.

The 402 Receiver is supplied with an IF bandwidth of 10 kc. A built-in beat frequency oscillator is controlled from the front panel. The BFO frequency is adjustable ±20 kc, also by a front-panel control. The unit also has both automatic and manual gain control capability, selectable by a front-panel switch.

SPECIFICATIONS

Types of Reception	AM and CW
Frequency Range	25 mc to 90 mc in three standard tuners: 402-1, 25-40 mc; 402-2, 40-60 mc; and 402-3, 60-90 mc
Input Impedance	50 Ω, nominal, type BNC connector
Noise Figure	4.5 db, maximum
Image Rejection	60 db, minimum, on 402-2 and 402-3; 50 db, minimum, on 402-1
IF Rejection	60 db, minimum
Oscillator to Antenna Conduction	5 μv
IF Frequency	21.4 mc
IF Bandwidth	10 kc at 3 db points
Sensitivity	0.75 microvolt input, modulated 50%, produces 10 db (s plus n)/n, minimum

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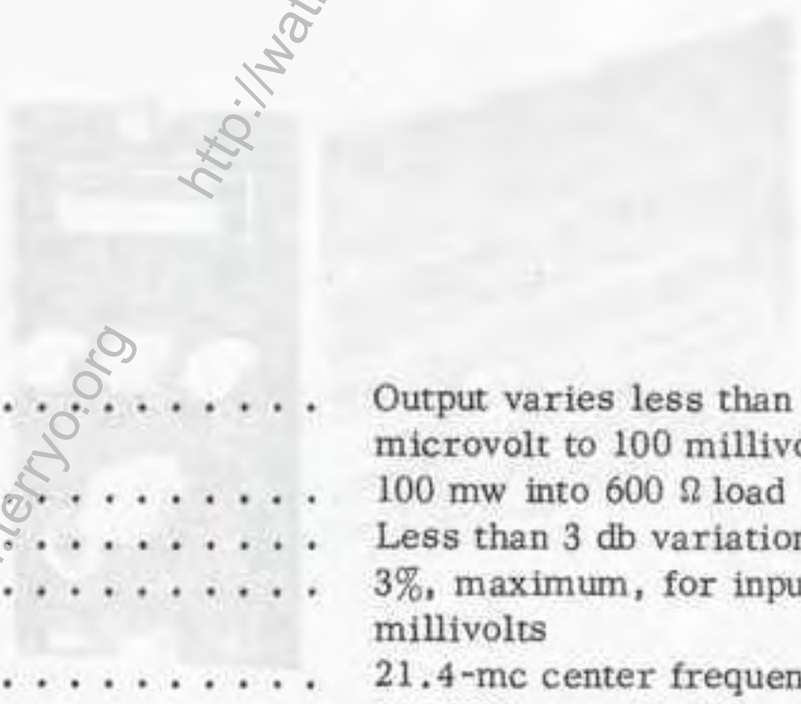

Output Stability with AGC	Output varies less than 6 db for input signal range of 1 microvolt to 100 millivolts
Audio Output	100 mw into 600 Ω load
Audio Response	Less than 3 db variation from 100 cps to 20 kc
Total Distortion	3%, maximum, for input RF range of 10 microvolts to 30 millivolts
BFO	21.4-mc center frequency, continuously variable ±20 kc
Power Input	115/230 vac, 50-400 cps
Power Consumption	2.5 watts, approximately
Over-all Dimensions	3-inches wide, 5-inches high, and 14.1-inches long
Weight	4-1/2 lbs.

PRICE: $995.00

FOB Rockville, Maryland. Taxes extra where applicable. Prices and specifications subject to change without notice.

Technical Data

DATA SHEET 147.50 1/11/66

TYPE 415 AM RECEIVER

The CEI Type 415 Receiver is a completely transistorized, fixed-tuned unit designed for AM reception in the 60 mc to 150 mc frequency range. This range is covered using four standard tuners. A front-panel switch allows the selection of one of four preset channels within the frequency range of the individual receiver. The standard frequency ranges, crystal frequencies, and channel coverage within the range are shown in the table below. The Band A and Band B frequency ranges shown in the table are the standard ranges established at the factory, however, any of the four channels can be readily set on either Band A or Band B by field maintenance personnel.

Special features of the Type 415 Receiver include its small size, light weight, and low power consumption. Up to four of these receivers can be mounted in a 7-inch high by 19-inch wide rack. A 21.4-mc output is provided from the receiver for connection to a CEI signal monitor (the companion unit is the SM-4301) for a visual display of signals in a band around the received signal. The IF bandwidth of the receiver is available at 50 kc or 100 kc; the 50-kc bandwidth is supplied unless the 100-kc bandwidth is specified.

RACK MOUNT AVAILABLE

A specially designed mount is available for the 415 and 416 Receivers and the SM-4301 Signal Monitor. The EF-402 Equipment Frame is shown; see data sheet 725.50 for details on the frame. The SM-4301 Signal Monitor is described in data sheet 322.50.

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SPECIFICATIONS

Frequency Range	60-150 mc in four standard tuners
Number of Channels	Four channels, pre-tuned, crystal controlled.
Type of Reception	AM
Crystal Type	CR-82/U for received frequencies up to 146 mc; CR-82/U correlated (such as Peizo 4202) above 146 mc
Input Impedance	50 ohms, nominal, type BNC connector
Noise Figure	Less than 6.5 db
Image Rejection	Greater than 55 db
IF Rejection	Greater than 65 db
Oscillator Radiation at Antenna Input	10 μv, maximum
IF Frequency	21.4 mc
IF Bandwidth	50 kc unless 100 kc is specified
Sensitivity	50 kc: 1.75 μv input, modulated 50% at 1-kc rate, will produce 10 db (s plus n)/n, minimum 100 kc: 2.5 μv input, modulated 50% at 1-kc rate, will produce 10 db (s plus n)/n, minimum
Audio Output Stability	Amplitude varies less than 3 db for an input signal level change from 1 μv to 10 mv.
Manual Gain Control Range	60 db, minimum
Noise Limiting	In or out, determined by front-panel switch. When in, series noise limiting provided with limiting level automatically adjusted.
Squelch	Adjustable to operate over an input signal range from 1 μv to 50 μv
Audio Output	15 mv across 600-ohm load
Audio Response	Less than 3 db variation from 300 cps to 5 kc
Signal Monitor Output	21.4-mc IF output provided for signal monitor connection
Meter	Signal strength
Power Input	115 volts, 50-400 cps
Power Consumption	3.5 watts
Weight	6.5 lbs.
Size	3.75-inches wide, 6.75-inches high, and 16.5-inches deep

Table of Standard Tuning Ranges*

Receiver Type	Over-all Freq. Range (mc)	Band A Freq. Range (mc)	Band B Freq. Range (mc)	Band/Alignment Frequencies (mc)**			
				Ch1	Ch2	Ch3	Ch4
415-1	60-90	60-75	75-90	A/60	A/75	B/75	B/90
415-2	75-110	75-90	90-110	A/75	A/90	B/90	B/110
415-3	90-130	90-105	105-130	A/90	A/105	B/105	B/130
415-4	110-150	110-125	125-150	A/110	A/125	B/125	B/150

Notes: * - Crystal frequencies determined as follows where f_c is the crystal frequency and f_o is the operating frequency:

415-1: $f_c = f_o + 21.4$ mc

415-2, -3, -4: $f_c = f_o - 21.4$ mc

** - Units are shipped to operate on the bands and alignment frequencies shown in the table unless otherwise specified.

PRICE: $995.00

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Technical Data

DATA SHEET 148.50 1/11/66

TYPE 416 PULSE RECEIVER

The CEI Type 416 Receiver is a crystal-controlled unit providing reception in the 60 mc to 150 mc range for pulse-modulated signals. A front-panel switch allows the selection of one of four preset channels within the frequency range of the individual receiver. The 60 mc to 150 mc frequency range is covered in four standard tuners. The standard frequency ranges, crystal frequencies, and channel coverage within the range are listed in the table below. The Band A and Band B frequency ranges shown in the table are the standard ranges established at the factory; however, any of the four channels can be readily set on either Band A or Band B by field maintenance personnel.

All active elements in the receiver are solid state, resulting in low power requirements and high reliability. The receiver is light weight and small in size. Up to four of these receivers can be mounted in a 7-inch high by 19-inch wide equipment frame. A 21.4-mc output is provided for connection to a signal monitor (SM-4301 is the companion unit) for a visual display of signals in a band around the received signal.

RACK MOUNT AVAILABLE

The 416 Receiver mounts in specially designed frames. In the inset photograph, a receiver and a SM-4301 Signal Monitor are shown in an EF-402 Equipment Frame; see data sheet 725.50 for details on the frame. The SM-4301 Signal Monitor is described in data sheet 322.50.

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SPECIFICATIONS

Frequency Range	60-150 mc in four standard tuners
Number of Channels	Four channels, pre-tuned, crystal controlled
Type of Reception	Pulse
Crystal Type	CR-82/U for received frequencies up to 146 mc; CR-82/U correlated (such as Piezo 4202) above 146 mc.
Input Impedance	50 ohms, nominal, type BNC connector
Noise Figure	6.5 db, maximum
Image Rejection	Greater than 55 db
IF Rejection	Greater than 65 db
Oscillator Radiation at Antenna Input	10 μv maximum
IF Frequency	21.4 mc
IF Bandwidth	2 mc
Tangential Sensitivity	-95 dbm, minimum
Output Stability	Output pulse amplitude varies less than 4 db for an input signal level change of 10 μv to 10 mv.
Pulse Repetition Rate	200 pps, minimum
Manual Gain Control Range	Greater than 60 db
Video Output	Positive pulse out; one volt into a 93-ohm load; type BNC connector.
Signal Monitor Output	21.4-mc IF output provided for signal monitor connection
Meter	Signal strength
Power Input	115 volts, 50-400 cps
Power Consumption	3.5 watts
Weight	6.5 lbs.
Size	4.5-inches wide, 5.0-inches high, and 16.5-inches deep

Table of Standard Tuning Ranges*

Receiver Type	Over-all Freq. Range (mc)	Band A Freq. Range (mc)	Band B Freq. Range (mc)	Band/Alignment Frequencies (mc)**			
				Ch1	Ch2	Ch3	Ch4
416-1	60-90	60-75	75-90	A/60	A/75	B/75	B/90
416-2	75-110	75-90	90-110	A/75	A/90	B/90	B/110
416-3	90-130	90-105	105-130	A/90	A/105	B/105	B/130
416-4	110-150	110-125	125-150	A/110	A/125	B/125	B/150

Notes:

* - Crystal frequencies determined as follows where f_c is the crystal frequency and f_o is the operating frequency: 416-1: $f_c = f_o + 21.4$ mc

416-2, -3, -4: $f_c = f_o - 21.4$ mc

** - Units are shipped to operate on the bands and alignment frequencies shown in the table unless otherwise specified.

PRICE: $995.00

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CEI

Technical Data

DATA
SHEET
151.50
1/11/66

TYPES 501A AND 504A VHF RECEIVERS

TYPE 504A RECEIVER

The CEI Types 501A and 504A Receivers provide AM, FM, and CW reception in the 54 mc to 260 mc frequency range. The units tune this frequency range in a single band. The 501A and the 504A differ only in the fact that the 504A includes a Crystal Marker Oscillator (CMO) which is not included in the 501A. The CMO allows the operator, by means of front panel controls, to accurately adjust dial calibration to the nearest 1-mc or 5-mc mark on the dial. Two IF bandwidths are included, either 300 kc or 10 kc as determined by a front-panel switch setting.

These receivers include both audio and video outputs on the rear apron. The audio output is designed to operate into a 600-ohm load while the video is designed to work into a high-impedance load. The video bandwidth is adjustable from 1 kc to 150 kc by means of a five-position front-panel switch.

Both receivers have been designed using solid-state devices exclusively. The result is high reliability, low power requirements (approximately 1.5 watts), and a compact package which mounts in a standard 19-inch rack with a panel height of only 3.5 inches.

In addition to the transistorized design, the 501A and 504A also feature a tape dial which offers excellent readability and smooth, trouble-free operation. Other features include a power supply which will operate on either 115 vac or 230 vac at line frequencies from 50 cps to 400 cps, a built-in BFO and Squelch, an output to drive a signal monitor, an IF output, and a local oscillator output.

SPECIFICATIONS

Type of Reception	AM, FM, and CW
Frequency Range	54-260 mc
Input Impedance	50 ohms, nominal
Noise Figure	6.5 db, maximum
Oscillator Radiation at Antenna Input	15 microvolts, maximum
Image Rejection	50 db, minimum

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IF Rejection	70 db, minimum
IF Frequency	21.4 mc
IF Bandwidths	300 kc or 10 kc, selectable by front panel switch
Sensitivity, FM (300 kc bandwidth position)	6 microvolt input produces at least 21 db (s plus n)/n with 100 kc deviation and 1 kc modulation
Sensitivity, AM (300 kc bandwidth position)	4 microvolt input produces at least 10 db (s plus n)/n with 50% modulation at 1 kc
Sensitivity, AM (10 kc bandwidth position)	0.75 microvolt input produces 10 db (s plus n)/n with 50% modulation at 1 kc
FM Output Stability	Output varies less than 2 db for inputs above 1.5 microvolt
AM Output Stability	Output varies less than 3 db for an input level change from 4 μv to 10 mv
Video Response	10 cps to 150 kc
Video Bandwidth Control	5 positions: 1, 3, 10, 30, and 150 kc
Video Output Level	Adjustable by front panel control. Capable of 5 volts rms across 10K ohm load
Beat Frequency Oscillator	Crystal controlled at 21.4 mc; operates with 300-kc or 10-kc bandwidths in CW mode
Audio Output	100 mw into 600 ohms
Pre-detection (IF) Output	21.4-mc output provides 100 mv minimum into a 50-ohm load for input levels above AGC threshold
Local Oscillator Output	50 mv, minimum, into 50-ohm load
Signal Monitor Output	21.4-mc center frequency
Crystal Marker Oscillator (Type 504A only)	Outputs: 1.0 mc or 5.0 mc (harmonics to 300 mc) Frequency Stability: ±0.005% from 0°F to 120°F
Size	19-inches wide, 3.5-inches high, and 15.5-inches deep
Weight	15 lbs.
Power Input	115/230 volts, 50-400 cps
Power Consumption	1.5 watts, approximately

PRICE: 501A - $1,600.00
504A - $1,750.00

FOB Rockville, Maryland. Taxes extra where applicable. Price and specifications subject to change without notice.

Technical Data

DATA SHEET 161.50 7/31/64

TYPE 601A VHF RECEIVER

The CEI type 601A Receiver is an AM-CW, double-conversion, single-band superheterodyne which tunes from 54 to 260 mc. Particular features of the receiver include the following: a conventional input and a reference signal input; two simultaneously operating IF sections, one of 100-kc and one of 50-kc bandwidth; two transistorized video amplifiers equipped with individual gain controls and individual outputs; a transistorized audio amplifier equipped with separate gain control, phone jack, and speaker terminals; and a carrier-level-controlled squelch circuit.

By means of the reference signal input, the receiver may be used to note the shift of an incoming carrier with respect to the frequency standard applied. For this reason, the receiver is often employed to observe Doppler effects in the frequency range of 54 to 260 mc. A crystal-controlled BFO is provided for the reception of CW signals when the external reference signal is not used.

Small size, low power consumption, and high performance have been obtained by the use of solid-state devices for those functions for which they are best suited and the use of Nuvistors where high gain, stability, and low noise figure at high frequencies are required.

SPECIFICATIONS

Type of Reception	AM and CW
Frequency Range	54 to 260 mc
Dial Accuracy	±1%
Fine Tuning	Front panel control
Input Impedance	50 ohms, type BNC connector
Noise Figure	6.5 db, maximum
Image Rejection	50 db, minimum
IF Rejection	100 db, minimum
Oscillator Radiation at Antenna Input	40 μv, maximum
Oscillator Frequencies	
1st Local Oscillator	Incoming signal plus 21.4 mc
2nd Local Oscillator	18.9 mc

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Intermediate Frequencies	21.4 mc and 2.5 mc
IF Bandwidths	50 kc and 100 kc
Sensitivity	
50-kc Bandwidth	1.75 μv input, modulated 50% at 1 kc rate, produces 10 db (s plus n)/n, minimum
100-kc Bandwidth	2.5 μv input, modulated 50% at 1 kc rate, produces 10 db (s plus n)/n, minimum
Output Stability	Output varies less than 6 db for an input change of 50 db
Manual Gain Control Range. . . .	100 db, minimum
Video Output Level	5 volts, rms, across a 10K ohm load
Video Amplifier Response	± 2 db from 100 cps to 50 kc
Audio Output Level	100 mw across a 600 ohm load, balanced or unbalanced
Audio Amplifier Response . . .	± 2 db from 100 cps to 30 kc
Signal Monitor Output.	Output at 21.4 mc center frequency provided to operate CEI Signal Monitors
BFO	Crystal-controlled at 2.5 mc, variable ± 20 kc. Operates on both IF bandwidths simultaneously
Reference Input	Input provided at 50-ohm impedance for injection of external reference signals
Meter	Signal Strength
Squelch Sensitivity	0.5 μv or greater at antenna input at maximum gain
Power Input	115 volts, 50-400 cps
Power Consumption	32 watts, approximately
Size	19-inches wide, 3.5-inches high, and 14.5-inches deep
Weight.	12 lbs, approximately

PRICE $1,875.00

FOB Rockville, Maryland. Taxes extra where applicable. Price and specifications subject to change without notice.

Technical Data

DATA SHEET 171.50

TYPES 701A AND 702A UHF RECEIVERS

TYPE 702A RECEIVER

The Types 701A and 702A Receivers were designed to meet the highest possible performance requirements for UHF receivers in critical reconnaissance work. They feature extremely low oscillator radiation, low noise, small size, light weight, and low power consumption.

Both receiver types tune the range of 235 to 1000 mc in two bands, and are identical except that the type 702A has a 50-kc bandwidth IF in addition to the 300-kc bandwidth IF and 2-mc bandwidth IF strips present in the type 701A. In either type receiver, the 2-mc bandwidth IF operates continuously and provides simultaneous AM and FM outputs.

The receivers are designed to handle either amplitude modulated, frequency modulated, or continuous wave signals. A beat frequency oscillator is provided for the reception of CW signals. Both receiver types are equipped with a transistorized carrier operated relay used to control external devices as a function of the received carrier level.

The receivers were designed using both solid state and vacuum (Nuvistor type) devices for compactness, efficiency, and high performance. Both units have a self-contained power supply and are constructed for mounting in a standard 19-inch rack. The panel height is only 3.5-inches.

SPECIFICATIONS

Type of Reception	AM, FM, and CW
Frequency Range	235 to 1000 mc in two bands: Band A, 235-500 mc; Band B, 490-1000 mc
Dial Accuracy	±1%
Fine Tuning	Front panel control provided for vernier tuning
Input Impedance	One input for each band at 50 ohms, type N connectors
Noise Figure	Band A, 10 db, maximum; Band B, 12 db, maximum
Image Rejection	Band A, 65 db, minimum; Band B, 75 db, minimum
I.F. Rejection	Band A, 80 db, minimum; Band B, 90 db, minimum
Oscillator Radiation at Antenna Input	Band A, 8 μv, maximum; Band B, 75 μv, maximum
Local Oscillator Frequencies	
First Local Oscillator	Incoming signal plus 60 mc
Second Local Oscillator	81.4 mc, crystal controlled

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Intermediate Frequencies	60 mc and 21.4 mc
I.F. Bandwidths	
Type 701A Receiver	2 mc and 300 kc, operating simultaneously
Type 702A Receiver	2 mc operating continuously, and either 300 kc or 50 kc, selectable from front panel
Sensitivity	
2-mc Bandwidth	AM: 22 μv, modulated 50% at 1 kc rate, produces at least 10 db (s plus n)/n ratio. FM: 24 μv, modulated at 1 kc rate with 750 kc deviation, produces at least 21 db (s plus n)/n ratio.
300-kc Bandwidth	AM: 8 μv, modulated 50% at 1 kc rate, produces at least 10 db (s plus n)/n ratio. FM: 8 μv, modulated at 1 kc rate with 100 kc deviation, produces at least 21 db (s plus n)/n ratio.
50-kc Bandwidth (Type 702A only)	AM: 3.5 μv, modulated 50% at 1 kc rate, produces at least 10 db (s plus n)/n ratio. FM: 4 μv, modulated at 1 kc rate with 15 kc deviation, produces at least 21 db (s plus n)/n ratio.
Output Stability	
2-mc Bandwidth	AM: Output varies less than 4 db for an input range of 8 μv to 1 mv FM: Output varies less than 4 db for input levels greater than 8 μv
300-kc Bandwidth	AM: Output varies less than 4 db for an input range of 4 μv to 1 mv FM: Output varies less than 2 db for input levels greater than 3 μv
50-kc Bandwidth (Type 702A only)	AM: Output varies less than 4 db for an input range of 4 μv to 1 mv FM: Output varies less than 2 db for input levels greater than 3 μv
Manual Gain Control Range	Greater than 100 db in AM/MAN and CW modes
Video Output	
2-mc Bandwidth	AM: 0.7 volt, rms, across 93 ohms. Amplifier response, less than 3 db variation from 30 cps to 2 mc. FM: 0.7 volt, rms, across 93 ohms. Amplifier response, less than 3 db variation from dc to 2 mc.
300-kc and 50-kc Bandwidths	5 volts, rms, across 10K ohms. Amplifier response, less than 3 db variation from 50 cps to 500 kc
Audio Output	100 mw into 600 ohms. Amplifier response, 100 cps to 40 kc at 3 db points.
FM Deviation Sensitivity	
2-mc Bandwidth	Less than 175-kc deviation produces 0.1 volt, rms
300-kc Bandwidth	50-kc deviation produces 5 volts, rms with max Video Gain
Beat Frequency Oscillator	Crystal-controlled at 21.4 mc; operates with 300-kc or 50-kc bandwidths in CW mode
Signal Monitor Output	21.4 mc center frequency output signal provided for use with CEI Signal Monitors.
Front Panel Controls	Function: FM, AM/AGC, AM/MAN, CW; IF BANDWIDTH (Type 702A only): 300 KC, 50 KC; VIDEO GAIN; POWER: ON-OFF; AUDIO GAIN; Bandswitch; FINE TUNING; IF GAIN; COR SENSITIVITY; COR DELAY: FAST-SLOW; BFO TUNING
Meters	Tuning and Signal Strength
Carrier Operated Relay	
Sensitivity	Less than 1 μv
Range	Adjustable to operate over an input signal level range of 1 μv to greater than 500 μv
Release Time	Slow: 6 seconds, ±20%; Fast: less than 0.5 second
Output	SPDT contacts
Power Input	115/230 volts, 50-400 cps
Power Consumption	63 watts nominal
Weight	21 lbs
Size	3.5-inches high, 19-inches wide, and 15-inches deep

PRICE: Type 701A - $3000.00
Type 702A - $3500.00

FOB Rockville, Maryland. Taxes extra where applicable. Price and specifications subject to change without notice.

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Technical Data

DATA SHEET 175.50 7/29/65

TYPES 770A AND 775 RECEIVERS

TYPE 770A RECEIVER

The Types 770A and 775 Receivers are designed for the reception of AM, FM, CW, and pulse signals in the UHF frequency range of 235 to 1000 mc. Modern components and techniques have been used to obtain maximum performance and retain the advantages of small size and low power consumption. The Type 775 includes a carrier operated relay (COR) circuit not included in the Type 770A.

A feature of these receivers is the unique AGC circuit, which has a charge time sufficiently short to permit operation on pulse widths as narrow as 1 microsecond and a discharge time sufficiently long to operate with pulse repetition rates as low as 50 pps. The loop gain of the AGC circuitry will hold the output pulse amplitude within narrow limits with large RF input level changes.

The pulse handling capability and selectable IF bandwidths make these receivers very versatile instruments.

SPECIFICATIONS

Type of Reception	AM, FM, CW, and Pulse; CW available on 100-kc bandwidth only
Frequency Range	235-1000 mc in two bands: Band A: 235-500 mc; Band B: 490-1000 mc
Signal Inputs	Antenna input for Band A Antenna input for Band B Reference input for marker injection
Signal Outputs	Video output, audio output, signal monitor output, 21.4 mc IF output, local oscillator output
Noise Figure	Band A: 10 db maximum; Band B: 12 db maximum
Image Rejection	Band A: 65 db minimum; Band B: 75 db minimum
IF Rejection	Band A: 80 db minimum; Band B: 90 db minimum
Oscillator Radiation at Input of Receiver	Band A: 8 μv maximum; Band B: 75 μv maximum
Antenna Input Impedance	Band A: 50 Ω, nominal; Band B: 50 Ω, nominal
IF Bandwidth	100 kc, 500 kc, and 4 mc switchable from front panel
IF Frequencies	60 mc; 21.4 mc; 2.5 mc, 100-kc bandwidth only
Gain Control Characteristics	
Pulse AGC, 4-mc Bandwidth	Charge time is sufficiently short to permit pulse widths as narrow as 1 microsecond and as wide as a square wave. Discharge time is sufficiently long to operate with pulse repetition rates as low as 50 pps.

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Gain Control Characteristics (Cont'd)	
Normal AGC	Charge time: 0.3 sec, Discharge time: 0.3 sec
Manual Control	All IF's
Over-all Pulse Response for 4-mc Bandwidth	Rise time or decay time no greater than 0.35 μsec. Pulse sag no greater than 10% for an 800 μsec pulse width.
Sensitivity	
100-kc Bandwidth	AM: 5 μv input, modulated 50% at 1-kc rate, produces 10 db (s plus n)/n, minimum FM: 5 μv input, modulated at 1-kc rate with 30-kc deviation, produces 21 db (s plus n)/n, minimum FM Sensitivity: 0.1V per kc deviation, minimum Pulse: -100 dbm tangential sensitivity, minimum
500-kc Bandwidth	AM: 11 μv input, modulated 50% at 1-kc rate, produces 10 db (s plus n)/n, minimum FM: 11 μv input, modulated at 1-kc rate with 150-kc deviation, produces 21 db (s plus n)/n, minimum FM Sensitivity: 0.02V per kc deviation, minimum Pulse: -93 dbm tangential sensitivity, minimum
4-mc Bandwidth	AM: 30 μv input, modulated 50% at 1-kc rate, produces 10 db (s plus n)/n, minimum FM: 30 μv input, modulated at 1-kc rate with 1-mc deviation, produces 21 db (s plus n)/n, minimum FM Sensitivity: 0.004V per kc deviation, minimum Pulse: -88 dbm tangential sensitivity, minimum
Audio Output	0.1 watt across 600 Ω, balanced or unbalanced
Video Output	0.7 volt rms across 100-ohm load
Video Amplifier Response	Within 3 db from 20 cps to 2 mc
FM Output Stability	Less than 2-db variation for inputs above 10 μv
AM Output Stability	Less than 10-db variation for 70-db input change above 10 μv
Signal Monitor Output Frequency	21.4 mc
Signal Monitor Output Bandwidth	Compatible with CEI signal monitors to produce 3-mc display
21.4-mc IF Output	100 mv minimum into 50-ohm load available during 4-mc operation only
Local Oscillator Output	50 mv minimum across 50 Ω
Beat Frequency Oscillator	Tunable over ± 15 kc on 100-kc CW operation only
Carrier Operated Relay (Type 775 only)	
Sensitivity	Less than 1 μv
Range	Adjustable to operate over an input signal level range of 1 μv to greater than 500 μv
Release Time	Slow: 6 second ± 20%; Fast: less than 0.5 second
Front Panel Switches	Power ON-OFF: RF tuning band, IF bandwidth selector, Function: AM, FM, CW, Pulse; Gain Control: AGC-Manual
Front Panel Controls	BFO Pitch, RF Gain, Video Gain, Audio Gain, Fine Tuning and Tuning
Front Panel Meters	Signal Strength, for AM, FM, and Pulse only; Tuning for AM and FM only
Dial Accuracy	Band A: 0.5%; Band B: 1.0%
Dial Resetability	0.25% (Fine tuning provided)
Power	115 vac, 50-400 cps, 60 watts (approximately)
Size	19 inches x 3.5 inches x 16 inches, rack mounted

PRICE: 770A - $3,700.00
775 - $3,800.00

FOB Rockville, Maryland. Taxes extra where applicable. Price and specifications subject to change without notice.

Technical Data

DATA SHEET 193.50

TYPE 903B VHF RECEIVER

The CEI type 903B Receiver is a highly compact unit which tunes the frequency range of 30 to 300 mc in two bands: 30 to 60 mc and 60 to 300 mc. Small size, low temperature rise, and high performance have been obtained by the use of solid-state devices for those functions for which they are best suited and the use of Nuvistors where high gain and stability at high frequencies are required. Particular attention to over-all size in the design of the receiver has resulted in a unit which requires 3.5-inches of vertical rack space and projects only about 13-inches back into the rack.

The receiver provides for the reception of AM, FM, and CW signals through IF bandwidths of 300 kc and 50 kc; the bandwidth of operation is controlled by a switch on the front panel of the unit. A built-in BFO operates with either IF bandwidth when the receiver is placed in the CW mode.

An automatic noise limiter (ANL) and a carrier operated relay (COR) are included in the receiver. The noise limiter removes noise peaks present on AM signals; this feature can be disabled with a front-panel switch. The COR provides for the operation of remote devices as a function of the received carrier level. Both the COR operating sensitivity and the COR release time can be adjusted by controls on the unit.

SPECIFICATIONS

Type of Reception	AM, FM, and CW
Frequency Range	30 to 300 mc in two bands: Band A, 30-60 mc; Band B, 60-300 mc
Dial Accuracy	± 1%
Input Impedance	50 ohms, type BNC connector
Noise Figure	Band A, 4 db maximum; Band B, 6.5 db maximum
Image Rejection	Band A, 60 db minimum; Band B, 50 db minimum
IF Rejection	54 db minimum at 30 mc; 80 db minimum above 50 mc
Oscillator Radiation at Antenna Input	15 μv maximum, 30 to 260 mc; 25 μv maximum, 260-300 mc.
Local Oscillator Frequency	Incoming signal plus 21.4 mc
Intermediate Frequency	21.4 mc
IF Bandwidths	50 kc or 300 kc, selectably by front-panel switch

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Sensitivity	
300-kc Bandwidth	AM: 4 μv input, modulated 50% at 1 kc rate, produces 10 db (s plus n)/n, minimum FM: 6 μv input, modulated at 1 kc with 100 kc deviation, produces 21 db (s plus n)/n, minimum
50-kc Bandwidth	AM: 1.75 μv input, modulated 50% at 1 kc rate, produces 10 db (s plus n)/n, minimum FM: 2 μv input, modulated at 1 kc with 18 kc deviation, produces 21 db (s plus n)/n, minimum.
Output Stability	AM: Output varies less than 2 db for input level range of 2 μv to 10 mv FM: Output varies less than 2 db for input levels above 1.5 μv
Manual Gain Control Range	Greater than 100 db
Noise Limiter	Automatically clips noise peaks of AM signals. Can be disabled by front-panel control
Video Output	1 volt rms into 100 ohms. Amplifier response: less than 3 db variation from 100 cps to 150 kc
Audio Output	100 mw into 600 ohms. Amplifier response: 100 cps to 40 kc at 3 db points
FM Deviation Sensitivity	Approximately 0.012 volts/kc deviation for 300 kc BW; 0.07 volts/kc deviation for 50 kc BW
Discriminator Linearity	1%
BFO	Crystal controlled at 21.4 mc; adjustable ± 20 kc by front-panel control
SM Output	Output at 21.4 mc center frequency provided to operate CEI Signal Monitors
IF Output	50 mv minimum into a 50-ohm load
Meters	Tuning and Signal Strength
Carrier Operated Relay	
Sensitivity	Less than 1 μv
Range	Adjustable to operate over an input signal level range of at least 1 μv to 500 μv
Delay	Adjustable for 0, 3, 5, or 10 second delay
Output	One set of SPDT contacts and two sets of SPST contacts
Front-Panel Controls	BANDWIDTH: 50-KC-300-KC; ANL-ON; BFO TUNING; VIDEO GAIN; AUDIO GAIN/PWR-OFF; Bandswitch; RF-IF GAIN; COR SENSITIVITY
Power Input	105-125 volts, 50-400 cps
Power Consumption	30 watts, approximately
Weight	20 lbs, approximately
Over-all Size	19-inches wide, 3.5-inches high, and 15-inches deep

PRICE: $2,409.00

FOB Rockville, Maryland. Taxes extra where applicable. Price and specifications subject to change without notice.

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Technical Data

DATA SHEET 194.50 6/3/65

TYPE 907 VHF RECEIVER

The CEI Type 907 VHF Receiver provides AM, FM, and CW reception in the frequency range of 30 to 300 mc. These frequencies are covered in two overlapping bands: 30 to 100 mc, and 60 to 300 mc. Separate RF tuners are used for each band. There are two IF bandwidths: 20 kc and 300 kc. The desired bandwidth is selected by means of a front-panel switch. A beat frequency oscillator for CW reception is available in both IF bandwidths. The outputs from the AM detector and FM discriminator are available as dc voltages at the rear of the receiver. Additional receiver outputs are audio, video, IF, and an output to operate a signal monitor. The audio output is available at a front-panel phones jack, and at a terminal strip on the rear apron of the receiver. Nuvistor-type tubes are used in the two RF tuners. All other active elements are solid state. Separate inputs are provided to permit using the optimum antenna for each band. Provision is also made for the use of a single antenna if desired. In this case the antenna is automatically switched to the RF tuner being used.

SPECIFICATIONS

Types of Reception	AM-FM-CW
Frequency Range	30-300 mc in two bands: Band A, 30-100 mc; Band B, 60-300 mc
Input Impedance	50 ohms, nominal
Noise Figure	Band A, 5.5 db, maximum; Band B, 6.5 db, maximum
IF Frequency	21.4 mc
IF Bandwidths	Two: 300 kc or 20 kc, selectable from front panel
IF Rejection	Band A, 54 db minimum; Band B, greater than 80 db
Image Rejection	Band A, 60 db; Band B, 50 db
Oscillator to Antenna Conduction	Band A, 15 μv maximum; Band B, below 260 mc, 15 μv maximum, above 260 mc, 25 μv maximum

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Sensitivity	
300-kc Bandwidth	AM: 4.0 μv input modulated 50%, produces 10 db (s plus n)/n, minimum. FM: 6 μv input, modulated at 1 kc with 100-kc deviation, produces 21-db (s plus n)/n, minimum
20-kc Bandwidth	AM: 1 μv input, modulated 50%, produces 10 db (s plus n)/n, minimum. FM: 2 μv input, modulated at 1 kc rate with 7-kc deviation, produces 21-db (s plus n)/n, minimum
Audio Output Power	100 milliwatts, minimum, into 600-ohm load, balanced or unbalanced
Audio Response	Within 3 db from 100 cps to 40 kc
Video Output	5 volts, rms, across a 10K-ohm load
Response of Video Amplifier	Within 3 db from 50 cps to 150 kc
IF Output	21.4-mc center frequency output; output level 100 mv into 50Ω load for input signal levels above AGC threshold
Signal Monitor Output	21.4-mc center frequency IF signal output
Special Outputs	FM discriminator as a dc voltage AM detector as a dc voltage
Output Stability with AGC	AM: Output varies less than 3 db for input range of 4-10,000 μv. FM: Output varies less than 2 db for input above 1.5 μv
BFO	Variable ±20 kc
Power Input	115 vac, 50-400 cps
Power Consumption	23 watts, approximately
Weight	15 pounds, approximately
Size	19 inches wide, 3.5 inches high, 15.5 inches deep

PRICE: $1,975.00

FOB Rockville, Maryland. Taxes extra where applicable. Price and specifications subject to change without notice.

Technical Data

DATA
SHEET
195.50
1/11/66

TYPES 960B AND 960B-2 RECEIVERS

TYPE 960B-2 RECEIVER

Designed for AM, FM, or CW reception, the CEI types 960B and 960B-2 Receivers are highly compact units which tune the 30-mc to 300-mc frequency range in two bands: 30 mc to 90 mc and 60 mc to 300 mc.

Solid state devices and electron tubes are both employed in the design for the functions for which they are best suited. This approach has produced instruments with high performance, low power requirements, and small size. The receivers draw less than 25 watts, weighs less than 20 lbs, and occupy only 3.5 inches of vertical rack space.

Three IF bandwidths have been included in each receiver; 2 mc, 200 kc, and 20 kc in the 960B, and 2 mc, 300 kc, and 20 kc in the 960B-2. The 2-mc IF bandwidth operates continuously, and separate AM video and FM video outputs from this strip are provided on the rear apron. The operation of the 20/200 kc (or 20/300 kc) bandwidth IF amplifier is controlled by a front-panel switch. Audio and video outputs are also provided on the rear apron from whichever of these two bandwidths is in operation.

The receivers include both manual and automatic gain control as selected by the operator. In addition, a built-in BFO is activated when the CW reception mode is selected. Other features include provisions for separate or common antenna operation, 21.4-mc IF (pre-detection) outputs from both the 2-mc bandwidth IF amplifier and the 20/200 kc (or 20/300 kc) bandwidth IF amplifier, a 21.4-mc IF output to operate a signal monitor, and a local oscillator output from the tuner in operation.

SPECIFICATIONS

Type of Reception	AM-FM-CW
Frequency Range	30-300 mc in two bands: Band A, 30-90 mc; Band B, 60-300 mc
Input Impedance	50 ohms, nominal
Noise Figure.	Band A, 4.5 db, maximum; Band B, 6.5 db, maximum
IF Frequency	21.4 mc

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IF Bandwidths	Two operating simultaneously: 2 mc, and either 200 kc (300 kc in 960B-2) or 20 kc selectable from front panel
IF Rejection	Band A, below 50 mc, 54 db minimum, above 50 mc, 60 db minimum; Band B, greater than 100 db
Image Rejection	Band A, 60 db; Band B, 50 db
Local Oscillator Output	50 mv, nominal, into 50-ohm load
Oscillator to Antenna Conduction	Band A, 15 μv maximum; Band B, below 260 mc, 15 μv maximum, above 260 mc, 25 μv maximum
Sensitivity	
200-kc Bandwidth (960B only)	AM: 1.5 μv input modulated 50%, produces 10 db (s plus n)/n, minimum FM: 4 μv input, modulated at 1 kc rate with 70-kc deviation, produces 21 db (s plus n)/n, minimum
300-kc Bandwidth (960B-2 only)	AM: 4 μv input modulated 50%, produces 10 db (s plus n)/n, minimum FM: 6 μv input, modulated at 1 kc rate with 100-kc deviation, produces 21 db (s plus n)/n, minimum
20-kc Bandwidth	AM: 1 μv input, modulated 50%, produces 10 db (s plus n)/n, minimum FM: 2 μv input, modulated at 1 kc rate with 7-kc deviation, produces 20 db (s plus n)/n, minimum
2-mc Bandwidth	AM: 11 μv input, modulated 50%, produces 10 db (s plus n)/n, minimum FM: 13 μv input, modulated at 1 kc rate with 750-kc deviation, produces 21 db (s plus n)/n, minimum
Audio Output Power	100 milliwatts, minimum, into 600-ohm load, balanced or unbalanced
Audio Response	Within 3 db from 100 cps to 40 kc
Video Output, 20/200 kc (or 20/300 kc)	5 volts, rms, across a 10K-ohm load
Response of Video Amplifier for 20/200-kc (or 20/300 kc) IF Bandwidth Video Output	Within 3 db from 50 cps to 150 kc
Video Outputs, 2-mc IF Bandwidth	0.7 volts, rms, across a 93-ohm load
Response of FM Video Amplifier for 2-mc IF Bandwidth	Within 3 db from dc to 1 mc
Response of AM Video Amplifier for 2-mc IF Bandwidth	Within 3 db from 30 cps to 1 mc
Signal Monitor Output	21.4-mc center frequency IF signal output
IF Outputs	21.4-mc output provided from both IF strips; output levels are 100 mv for input signal levels above AGC threshold
Output Stability	
20/200-kc (or 20/300 kc) IF Bandwidth with AGC	AM: Output varies less than 3 db for input range of 4-10,000 μv FM: Output varies less than 2 db for input above 1.5 μv
2-mc IF Bandwidth	AM: Output varies less than 3 db for input levels from 10 μv to 10 mv FM: Output varies less than 2 db for input levels above 4 μv
BFO	Variable ±20 kc: not used with 2-mc IF bandwidth
Power Input	115 vac, 50-400 cps
Power Consumption	23 watts, approximately
Weight	16 pounds, approximately
Size	19-inches wide, 3.5-inches high, and 15.5-inches deep

PRICE: $2,550.00

FOB Rockville, Maryland. Taxes extra where applicable. Price and specifications subject to change without notice.

NOTE: Nomenclatured versions of both the 960B and 960B-2 Receivers, complete with MIL-type technical manual and provisioning documentation, are available. Inquire for details.

Technical Data

DATA SHEET 196.50

TYPE 965 RECEIVER

The CEI Type 965 Receiver is designed for AM, FM, and CW reception in the frequency range of 10 to 90 mc. This frequency range is covered in two bands: 10 to 30 mc, and 30 to 90 mc. Separate RF tuners are used for each band. Three IF bandwidths are available: 10 kc, 50 kc, and 200 kc. The desired IF bandwidth is selected by means of a front-panel switch. A beat frequency oscillator for CW reception is available in all three bandwidth positions. Signal outputs from the receiver are audio output, video output, IF output, and an output to operate a signal monitor. The audio output is available at a front-panel phones jack, and at a terminal strip on the rear apron of the receiver. Nuvistor-type tubes are used in the two RF tuners. All other active elements are transistors.

SPECIFICATIONS

Type of Reception	AM-FM-CW
Frequency Range	10-90 mc in two bands: Band A, 10-30 mc; Band B, 30-90 mc
Input Impedance	50 ohms, nominal
Noise Figure	Band A, 8.0 db, maximum; Band B, 4.5 db, maximum
IF Frequency	21.4 mc
IF Bandwidths	10 kc, 50 kc, or 200 kc, selectable from front panel
IF Rejection	Band A, 50 db, minimum; Band B, 54 db, minimum
Oscillator to Antenna Conduction	Band A, 15 μv, maximum; Band B, 15 μv, maximum
Sensitivity	
10-kc IF Bandwidth	AM: 1.0 μv input, modulated 50% at 1 kc rate produces 10 db (s plus n)/n, minimum
50-kc IF Bandwidth	AM: 2.3 μv input, modulated 50% at 1 kc rate produces 10 db (s plus n)/n, minimum
	FM: 2.0 μv input, modulated at 1 kc rate with 17 kc deviation produces 21 db (s plus n)/n, minimum

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Sensitivity - (Cont'd)	
200-kc IF Bandwidth	AM: 4.7 μv input, modulated 50% at 1 kc rate produces 10 db (s plus n)/n, minimum FM: 4 μv input, modulated at 1 kc rate with a 70 kc deviation produces 21 db (s plus n)/n, minimum
Image Rejection	Band A, 60 db minimum; Band B, 60 db minimum
Audio Output Power	100 milliwatts, minimum, into 600-ohm load, balanced or unbalanced
Audio Response	Within 3 db from 100 cps to 40 kc
Video Output	5 volt, rms, across a 10K-ohm load
Video Response	Within 3 db from 50 cps to 150 kc
IF Output	21.4-mc center frequency output; output level 100 mv into 50Ω load for input signal levels above AGC threshold
Signal Monitor Output	21.4-mc center frequency IF signal output
Output Stability with AGC	AM: Output varies less than 3 db for input levels from 4 μv to 10 mv FM: Output varies less than 3 db for input levels above 1.5 μv
BFO	Variable ±20 kc
Power Input	115 vac, 50-400 cps
Power Consumption	20 watts, approximately
Weight	17 pounds, approximately
Dimensions	19 inches wide x 3.5 inches high x 15.5 inches deep

PRICE: $2,900.00

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1-7-65

CEI

Technical Data

DATA SHEET 197.50

TYPES 970A AND 975 RECEIVERS

TYPE 970A RECEIVER

The Types 970A and 975 Receivers are designed for the reception of AM, FM, CW and pulse signals in the VHF frequency range of 30-300 mc. Modern components and techniques have been used to obtain maximum performance and retain the advantages of small size and low power consumption. The Type 975 includes a carrier operated relay (COR) circuit not included in the Type 970A.

A feature of these receivers is the unique AGC circuit, which has a charge time sufficiently short to permit operation on pulse widths as narrow as 1 microsecond and a discharge time sufficiently long to operate with pulse repetition rates as low as 50 pps. The loop gain of the AGC circuitry will hold the output pulse amplitude within narrow limits with large RF input level changes.

The pulse handling capability and selectable IF bandwidths make these receivers very versatile instruments.

SPECIFICATIONS

Type of Reception	AM, FM, CW, or Pulse; CW available on 60 kc bandwidth only
Frequency Range	30-300 mc in two bands: Band A: 30-90 mc; Band B: 60-300 mc
Signal Inputs	Antenna input for Band A Antenna input for Band B Reference input for marker injection
Signal Outputs	Video output, audio output, signal monitor output, 21.4 mc IF output, local oscillator output
Noise Figure	Band A: 4.5 db, maximum; Band B: 7 db, maximum
Image Rejection	Band A: 60 db, minimum; Band B: 50 db, minimum
IF Rejection	Band A: 54 db, minimum to 40 mc, 60 db, minimum to 40-90 mc; Band B: 80 db, minimum
Oscillator Radiation at Input of Receiver	Band A: 15 μv, maximum; Band B: 15 μv, maximum to 260 mc, 25 μv, maximum above 260 mc
Antenna Input Impedance	Band A: 50 Ω, nominal; Band B: 50 Ω, nominal
IF Bandwidth	60 kc, 300 kc, and 3 mc switchable from front panel
IF Frequencies	21.4 mc; 2.5 mc, 60 kc bandwidth only

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Gain Control Characteristics	
Pulse AGC, 3-mc Bandwidth	Charge time is sufficiently short to permit pulse widths as narrow as 1 microsecond and as wide as a square wave. Discharge time is sufficiently long to operate with pulse repetition rates as low as 50 PPS.
Normal AGC	Charge time: 0.3 sec, Discharge time: 0.3 sec
Manual Control	All IF's
Over-all Pulse Response for 3-mc Bandwidth, Manual Operation	Rise time or decay time no greater than 0.35 μsec. Pulse sag no greater than 10% for an 800 μsec pulse width.
Sensitivity	
60-kc Bandwidth	AM: 1.75 μv input, modulated 50% at 1 kc rate, produces 10 db (s plus n)/n, minimum FM: 2 μv input, modulated at 1 kc rate with 15 kc deviation, produces 21 db (s plus n)/n, minimum FM Sensitivity: 0.7V per kc deviation, minimum Pulse: -106 dbm tangential sensitivity, minimum
300-kc Bandwidth	AM: 4 μv input, modulated 50% at 1 kc rate, produces 10 db (s plus n)/n, minimum FM: 6 μv input, modulated at 1 kc rate with 100 kc deviation, produces 21 db (s plus n)/n, minimum FM Sensitivity: 0.035V per kc deviation, minimum Pulse: -99 dbm tangential sensitivity, minimum
3-mc Bandwidth	AM: 13 μv input, modulated 50% at 1 kc rate, produces 10 db (s plus n)/n, minimum FM: 13 μv input, modulated at 1 kc rate with 750 kc deviation, produces 21 db (s plus n)/n, minimum FM Sensitivity: 0.007V per kc deviation, minimum Pulse: -94 dbm tangential sensitivity, minimum
Video Output	0.7 volt rms across 100 Ω load
Video Amplifier Response	Within 3 db from 20 cps to 2 mc
FM Output Stability	Less than 2 db variation for inputs above 3.5 μv
AM Output Stability	Less than 10 db variation for 70 db input change above 3.5 μv
Audio Output	0.1 watt across 600 Ω, balanced or unbalanced
Signal Monitor Output Frequency	21.4 mc
Signal Monitor Output Bandwidth	Compatible with CEI signal monitors to produce 3 mc display
21.4 mc IF Output	100 mv min. into 50 Ω load, available during 3-mc operation only
BFO	Tunable over ± 15 kc, on 60 kc CW operation only
Local Oscillator Output	50 mv min. across 50 Ω
Carrier Operated Relay (Type 975 only)	
Sensitivity	Less than 1 μv
Range	Adjustable to operate over an input signal level range of 1 μv to greater than 500 μv
Release Time	Slow: 6 second, ±20%; Fast: less than 0.5 second
Front Panel Switches	Power ON-OFF; RF band change; IF bandwidth selector; Function: AM, FM, CW, pulse; AGC-Manual gain
Front Panel Controls	BFO Pitch, RF Gain, Video Gain, Audio Gain, Fine Tuning and Tuning
Front Panel Meters	Signal strength, for AM, FM, and pulse only. Tuning for AM and FM only
Dial Accuracy	Band A: 0.5%; Band B: 0.75%
Dial Resetability	Band A: 0.15%; Band B: 0.25%
Power	115 vac, 50-400 cps; 45 watts, approximately
Size	19 inches x 3-1/2 inches x 16 inches, rack mounted

PRICE: 970A - $2,700.00
975 - $2,800.00

FOB Rockville, Maryland. Taxes extra where applicable. Price and specifications subject to change without notice.

4/2/65

Technical Data

DATA SHEET 199.50

TYPE RS-125-( ) RECEIVING SYSTEM

The CEI Type RS-125-( ) Receiving System is a highly versitle arrangement of equipment which provides AM, FM, CW, and Pulse reception over a frequency range as wide as 10 mc to 2000 mc. The frequency coverage is provided in seven bands utilizing four tuners. The received signals are processed by a demodulator utilizing plug-in modules. These modules are available in ten standard bandwidths ranging from 5 kc to 8 mc.

A typical RS-125-( ) system is shown in the photograph above. From top to bottom, this system contains:

(1)	SM-9401A	Signal Monitor
(2)	UT-1000C	UHF Tuner
(3)	VT-30C	VHF Tuner
(4)	SWP-104	Switching Panel
(5)	DM-4C	Demodulator with four plug-in modules
(6)	S-9901	Speaker Panel

The particular system shown provides AM, FM, CW, and Pulse reception over the 30 to 1000 mc frequency range. Five plug-in modules were furnished with the system providing IF bandwidths of 15 kc, 200 kc, 2 mc, and 8 mc, and a pulse-stretching AGC module. All four of the IF modules could be installed simultaneously or any three could be used with the pulse-stretching AGC module installed. The signal monitor input is controlled by the switching panel to monitor the output of either tuner. The switching panel also switches the output of the desired tuner to the input of the demodulator. The speaker panel monitors the audio output from the demodulator unit.

Many variations of the RS-125-( ) Receiving System have been supplied. Some of the combinations are noted. A 10 mc to 90 mc tuner can be included as well as a 1 gc to 2 gc tuner. With all four tuners, the system covers a range of 10 mc to 2 gc. All of the tuners can be supplied with internal motor drives. These drives feature

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sector scan whereby the operator can adjust the upper and lower frequency limits of the sector of interest. The demodulator can be supplied with a built-in front panel speaker, eliminating the need for the speaker panel in the rack. A dual signal monitor is available which occupies the same rack space as the single unit shown in the photograph.

The units listed below have been specially designed and are available for use in an RS-125-( ) Receiving System. The detailed specifications and price for each item are listed on the applicable data sheets. Our representatives will gladly assist in the selection of listed system components to fill particular requirements, and other CEI equipment for special applications.

AVAILABLE ITEMS

Description	Data Sheet Number
VT-10( ) Tuner (10-90 mc)	240.50
SVT-10( ) Tuner (10-90 mc with internal motor drive)	240.50
VT-30( ) Tuner (30-260 mc)	241.50
SVT-30( ) Tuner (30-260 mc with internal motor drive)	241.50
UT-1000( ) Tuner (235-1000 mc)	242.50
SUT-1000( ) Tuner (235-1000 mc with internal motor drive)	242.50
LT-1-2( ) Tuner (1-2 gc)	231.50
SLT-1-2( ) Tuner (1-2 gc with internal motor drive)	231.50
DM-4( ) Demodulator	724.50
IFD-5( ) through IFD-8000( ) IF Demodulator Modules (Ten available with bandwidths of 5 kc, 15 kc, 50 kc, 100 kc, 200 kc, 500 kc, 1 mc, 2 mc, 4 mc, and 8 mc)	724.56
AGC-PS/( ) Pulse Stretching AGC Module	724.54
AGC-BC/( ) Box Car AGC Module	724.52
NS-101( ) Noise Silencer Module	724.58
SM-9401A or SM-9402 Signal Monitors (4-mc sweep widths)	353.50
SM-9801 or SM-9802 Signal Monitors (8-mc sweep widths)	355.50
SWP-104 Switching Panel (or other switching panels as system requirements dictate)	785.50
S-9901 Speaker Panel (or speaker panels with amplifiers as desired)	511.50
Interconnecting Cables (connections between the various units)	------
Cabinet or Rack (to mount the system units)	------

CEI

Technical Data

APPLICATION NOTE 1100.50

EMI AND FIELD INTENSITY MEASUREMENTS WITH CEI VHF RECEIVERS

INTRODUCTION

This application note describes a relatively simple yet accurate method for measuring electromagnetic radiation. The technique requires an antenna of known characteristics, a calibrated signal generator, and a CEI VHF receiver which is used as a selective amplifier. With this equipment arranged as shown in Figure 1, measurements can be made in the frequency range of 30 mc to 300 mc, for signals with AM, FM, and CW modulation. For pulse modulation, a pulse generator is also required in order to modulate the signal generator. The basic procedure consists of comparing and matching the signal generator output to the transmission line output. It is then only necessary to multiply the generator output by an antenna factor relating field strength to antenna output voltage.

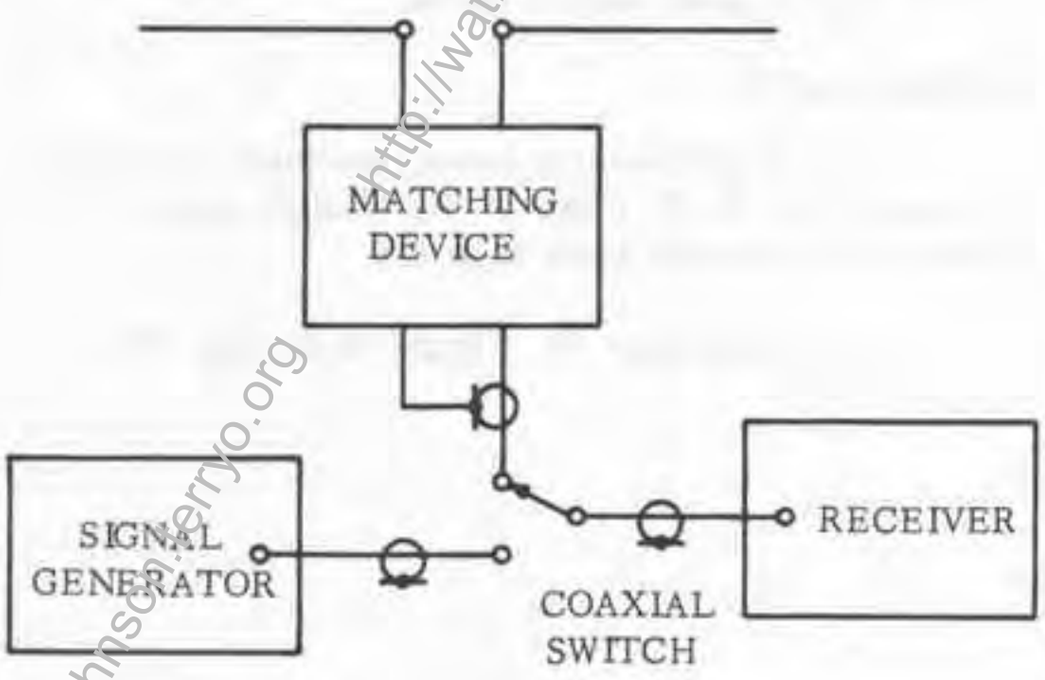

FIGURE 1. EQUIPMENT SETUP

THE ANTENNA

The effective length (l_e) of a thin one-half wavelength dipole is $\frac{\lambda}{\pi}$. (1)

$$l_e = \frac{\lambda}{\pi} = \frac{3 \times 10^8}{\pi f}$$

$$l_e = \frac{95.5}{f_{mc}} \text{ (effective length in meters)}$$

The effective length is therefore 1 meter at a frequency of 95.5 mc.

This relationship is derived from equation (31.5) in reference 1 as follows with $H = \beta h$ given:

$$2h_e = \frac{2}{\beta} \tan \frac{H}{2} = \frac{\lambda}{\pi} \tan \frac{H}{2}$$

From this equation, $\beta = \frac{2\pi}{\lambda}$

Substituting, $2h_e = \frac{\lambda}{\pi} \tan \frac{\beta h}{2} = \frac{\lambda}{\pi} \tan \frac{\pi h}{\lambda}$

For a one-half wavelength dipole, $\frac{h}{\lambda} = \frac{1}{4}$,

then $2h_e = \frac{\lambda}{\pi} \tan \frac{\pi}{4} = \frac{\lambda}{\pi} = \frac{2}{\pi} l_e$

The impedance of a dipole which is physically one-half wavelength long is

$$68 + j\,30 \text{ ohms} \quad (2)$$

and is practically independent of element thickness. If the antenna were shortened to eliminate the reactive term, the degree of shortening would be a function of thickness and would unnecessarily complicate the calculations.

The equivalent circuit of the one-half wavelength dipole is shown in Figure 2. The relationships were determined as follows from equation (31.6) of reference 1.

$$\text{Induced voltage } V_e = 2h_e \xi = l_e \xi$$

$$\text{since } l_e = \frac{95.5}{f_{mc}}$$

$$V_e = \xi \frac{95.5}{f_{mc}} = E_{ind}$$

MATCHING TECHNIQUES

It is desirable to keep the antenna current at a minimum. This will minimize the change in effective

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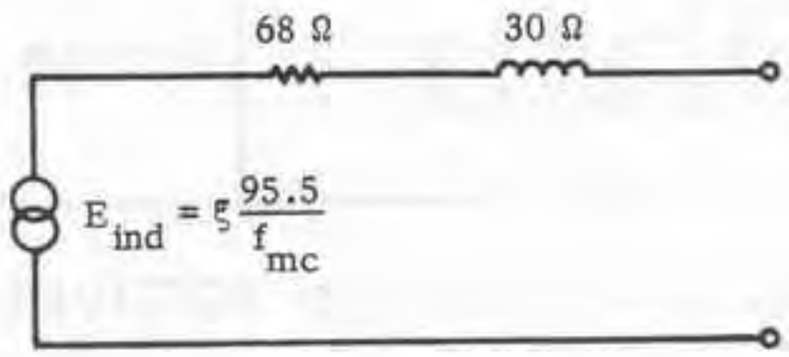


FIGURE 2. ANTENNA EQUIVALENT CIRCUIT

voltage due to reflections from re-radiation. A very high load impedance would cause a loss in sensitivity due to mismatch. A load of 200 ohms will produce only about 1.25 db loss in sensitivity compared to a conjugate match while reducing the current by a factor of 2.

A wideband 4 to 1 impedance matching device can be made of two baluns or a transformer. Such devices are available commercially. A lossless 4 to 1 impedance transformation of Figure 2 is shown in Figure 3. When this combination (Figure 3) is connected to a 51-ohm load, the load voltage (E_{load}) is:

$$E_{load} = \xi \frac{35.6}{f_{mc}}$$

In order to simplify the calculations, the factor K is defined as $\frac{f_{mc}}{35.6}$ and is plotted in Figure 6.

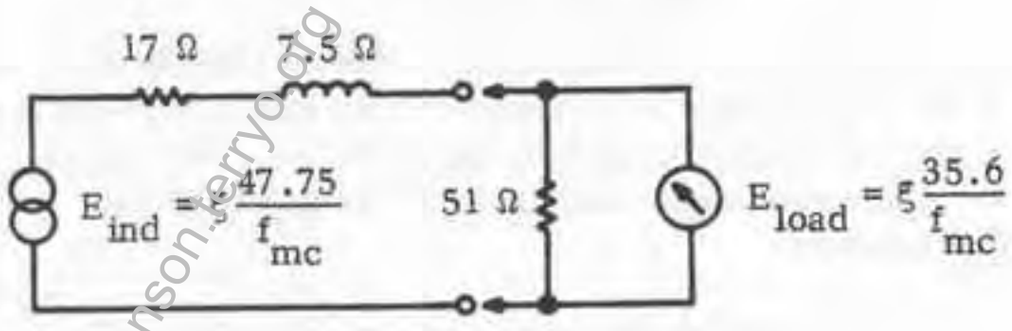


FIGURE 3. EQUIVALENT CIRCUIT, IMPEDANCE TRANSFORMED

PROCEDURE

The procedure to determine the field strength of a signal is shown in the following example. The signal of interest is at a frequency of 60 mc. From Figure 5, the antenna should be adjusted to an over-all length of 98 inches. With the equipment set up as shown in Figure 1, tune the CEI receiver to the 60-mc signal. Note the signal strength meter reading. Operate the coaxial switch to connect the signal generator output to the receiver input. Adjust the signal generator frequency for a maximum receiver signal strength meter reading. Then adjust the signal generator output level to produce the same meter reading that was obtained from the antenna. The signal generator output level is the load voltage (E_{load}). Assume that a 20 μv load voltage was obtained.

From Figure 6, K is 1.75 at 60 mc. From the relation

$$\xi = E_{load} K = (20)(1.75) = 35 \ \mu v/meter$$

If it is desired to correct for transmission line losses, the field intensity stated above should be increased by:

$$\log^{-1} \frac{db}{20}$$

where db is the loss in the length of 50-ohm coaxial cable being used. Figure 4 includes losses in db per 100 feet for commonly used coaxial cables.

For more accurate results, a VTVM can be substituted in the procedure for the receiver signal strength meter. Connect the VTVM to read the AM detector output. Under these conditions, maximum resolution will be obtained if the receiver is operated in the manual gain control mode.

REFERENCES

(1) Transmission Lines, Antennas and Wave Guides by R. W. P. King, H. R. Mimno, and A. H. Wing; McGraw-Hill 1945; page 165

(2) Ibid, page 99, Figure 10.5; page 100, Figure 10.6

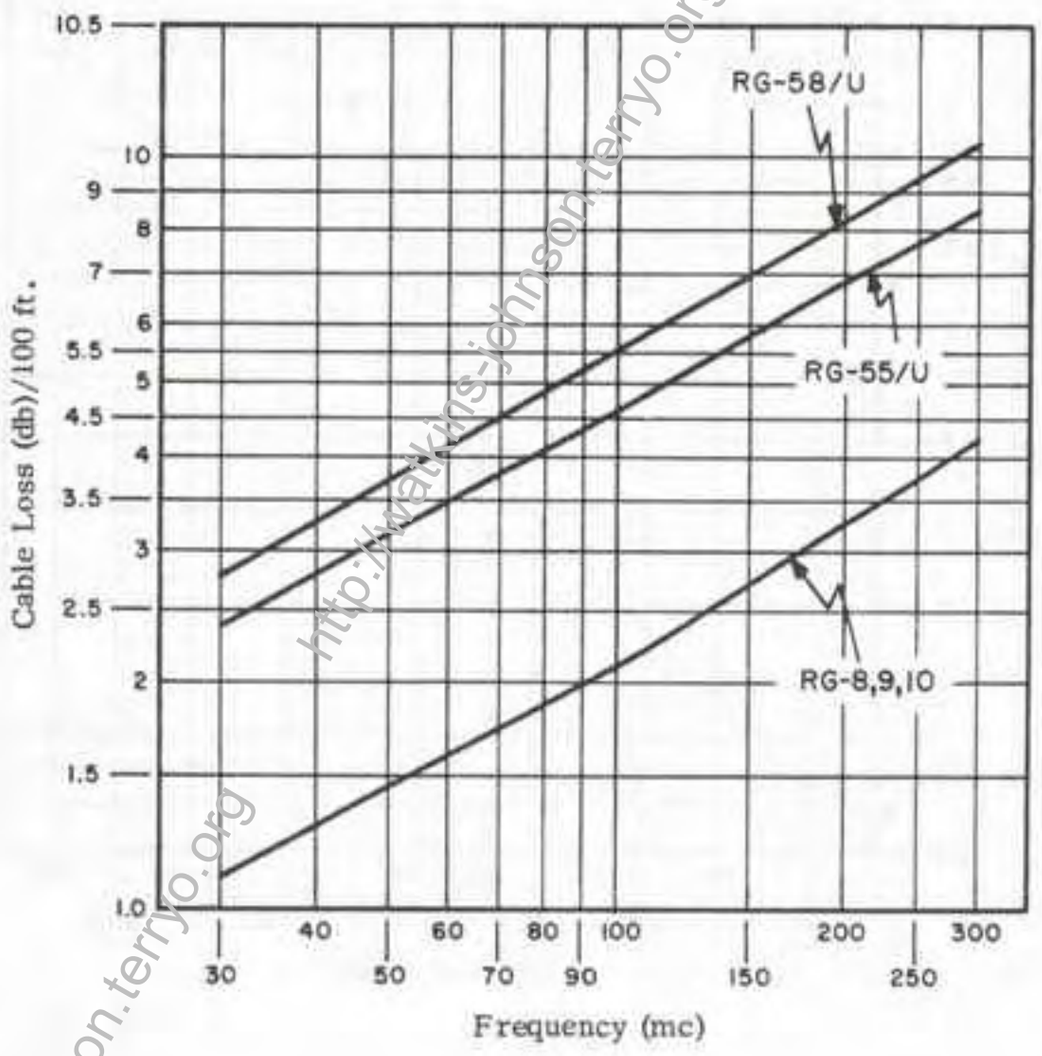
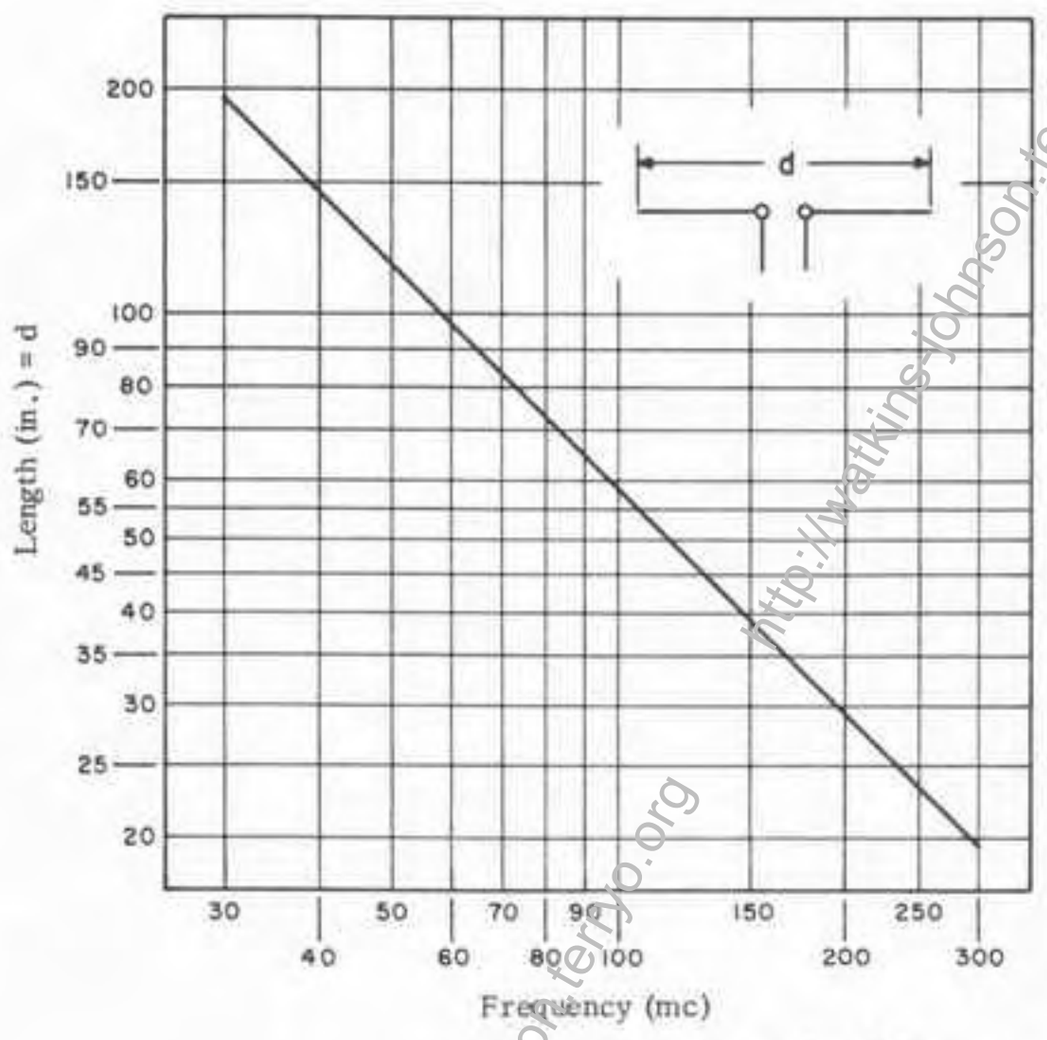
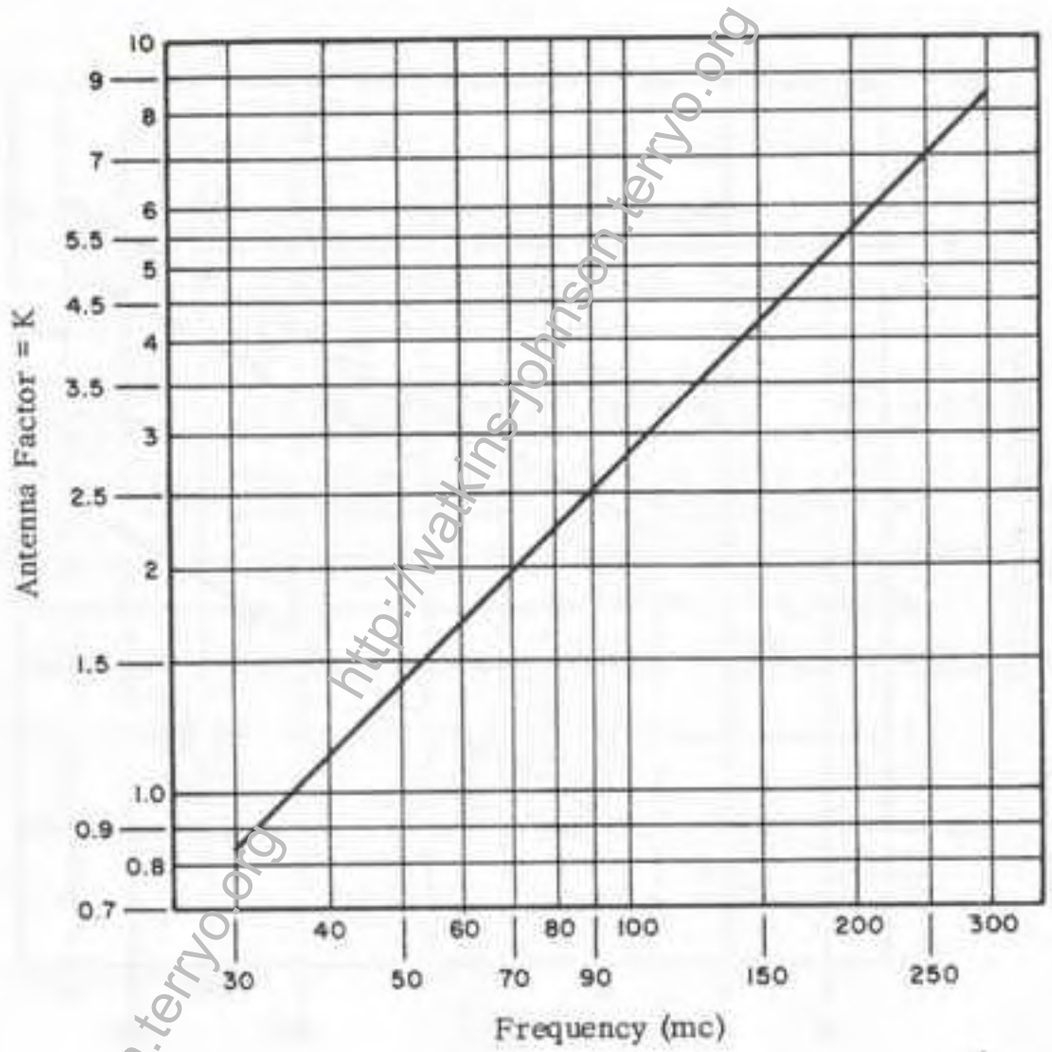


FIGURE 4. CABLE LOSS



$$d = \frac{\lambda}{2} = \frac{5900}{f_{mc}} \text{ inches}$$

FIGURE 5. DIPOLE LENGTH



$$K = \frac{f_{mc}}{35.6}$$

FIGURE 6. ANTENNA FACTOR

Technical Data

DATA SHEET 211.50 1/11/66

TYPE FE-1-2A FREQUENCY EXTENDER

The CEI Type FE-1-2A Frequency Extender tunes from 1 gc to 2 gc in a single band. The device converts signals in this frequency range to a 160-mc intermediate frequency output. The 160-mc output can then be tuned in on the CEI 900 series VHF Receivers and many other receivers which tune to 160 mc. The 160-mc output can be connected to the CEI Type IFC-21 Converter which will further convert the 160-mc IF to a 21.4-mc IF. The 21.4-mc signal can then be used as an input to a demodulator system such as the CEI Type DM-4.

The unit is electronically tracked across the band, thus avoiding the complex mechanical drives often used for tracking in this frequency range. With electronic tracking, there are no moving parts and no contact springs to wear out. A tunable, four-section YIG preselector has been included in the design to provide low oscillator radiation and high image rejection. The FE-1-2A is reliable and easy to operate. It has been designed using solid state devices except for the ceramic triode used in the highly-stable local oscillator. The average power consumption is only 25 watts and the panel height is only 3.5 inches.

SPECIFICATIONS

Frequency Range	990 to 2000 mc
Noise Figure	18 db, maximum
Image Rejection	70 db, minimum
IF Rejection	90 db, minimum
Output Frequency	160 mc
Bandwidth	8 mc, minimum
Oscillator Radiation	40 microvolts (-75 dbm) maximum
Overall Gain	20 db, nominal
Gain Variation	±3.5 db, maximum
Input Impedance	For use in 50-ohm system, type N connector
Input VSWR	2.5:1, maximum
Output Impedance	For use with 50-ohm load, type BNC connector
Dial Calibration	±1%
Dial Resetability	±0.5%

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SPECIFICATIONS (Cont'd.)

Local Oscillator FM	1 kc, peak, maximum
Local Oscillator Drift	50 parts in 10^6/°C
Dynamic Range	1 db compression, maximum, for -25 dbm input without external AGC 1 db compression, maximum, for -10 dbm input with external AGC applied
Fine Tuning Range	±250 kc, minimum
L. O. Output Level	-5 dbm, minimum
Power Requirements	115/230 vac, 50-400 cps
Average Power Consumption	25 watts
Size	3.5-inches high, 19-inches wide, and 15-inches deep
Weight	20 lbs., approximately

PRICE $4,000.00

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Technical Data

DATA SHEET 212.50 7/26/65

TYPE FE-2-4 FREQUENCY EXTENDER

The FE-2-4 Frequency Extender has been designed to increase the frequency range of a VHF receiver to cover the 2 gc to 4 gc range. The device tunes this range in a single band and converts incoming signals to a 160-mc output. The 160-mc output can be tuned in on the CEI 900 series VHF Receivers and many other receivers having sufficient bandwidth. Another method consists of connecting the 160-mc output to the CEI Type IFC-21 Converter which will further convert the 160-mc IF to a 21.4-mc IF. The 21.4-mc IF can then be used as an input to a demodulator system such as the CEI Type DM-4.

The unit is electronically tracked across the band, thus avoiding the complex mechanical drives often used for tracking in this frequency range. A tunable YIG preselector has been included in the design to provide low oscillator radiation and high image rejection.

SPECIFICATIONS

Frequency Range	2 to 4 gc
Noise Figure	18 db, maximum
Image Rejection	70 db, minimum
IF Rejection	90 db, minimum
Output Frequency	160 mc
Bandwidth	8 mc, minimum
Oscillator Radiation	40 microvolts (-75 dbm)
Over-all Gain	20 db, nominal
Gain Variation	±3.5 db, maximum
Input Impedance	For use in 50-ohm system, type N connector
Input VSWR	2:1, maximum
Output Impedance	For use with 50-ohm load, type BNC connector
Dial Calibration	±1%
Dial Resetability	±0.5%
Local Oscillator FM	750 cps, rms, maximum
Local Oscillator Drift	80 parts in 10^6/°C

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Dynamic Range	1 db compression, maximum, for -25 dbm input without external AGC 1 db compression, maximum, for -10 dbm input with external AGC applied
Input AGC Characteristics	Delayed to -10 volt input; approximately 2 db/volt to -24 volt input
Fine Tuning Range	±100 kc, minimum
Power Requirements	115 volts, 50-400 cps
Power Consumption	30 watts, approximately
Size	5.25-inches high, 19-inches wide, and 15-inches deep
Weight	20 lbs., approximately

PRICE: $4,000.00

FOB Rockville, Maryland. Taxes extra where applicable. Price and specifications subject to change without notice.

Technical Data

DATA SHEET 212.60 1/11/66

TYPE FE-1-4.5 FREQUENCY EXTENDER

The CEI type FE-1-4.5 Frequency Extender tunes from 1 gc to 4.5 gc in two bands: 1 gc to 2 gc and 2 gc to 4.5 gc. The unit converts signals in this frequency range to a 160-mc intermediate frequency output. The 160-mc output can then be tuned in on the CEI 900-series Receivers and many other receivers which tune to 160-mc. Another method of signal processing could consist of connecting the 160-mc output to a CEI type IFC-21 converter which will further convert the 160-mc IF to a 21.4-mc IF. The 21.4-mc signal can then be used as an input to a demodulator system such as the CEI type DM-4 (see data sheet 724.50).

The FE-1-4.5 represents a significant advance in the design of instruments which tune the 1 gc to 4 gc range, particularly in the area of size. The FE-1-4.5 is constructed in a standard 19-inch panel which is only 3.5-inches high. Previously, 10.5-inches of vertical rack space was required for coverage from 1 gc to 4 gc. The FE-1-4.5 also includes a tape frequency dial for increased readability and smooth, trouble-free operation.

The design of the FE-1-4.5 includes a tunable, four-section YIG preselector for each band to provide low oscillator radiation and high image rejection. The unit is electronically tracked across the two bands, thus avoiding the complex mechanical drives often used for tracking in this frequency range.

Special features of the FE-1-4.5 include an analog tuning voltage output, provisions for external AGC input, a 160-mc signal monitor output, a local oscillator output, a band indicator output, and provisions for external automatic phase or frequency control of the local oscillator. Please inquire for details concerning the application of these features.

SPECIFICATIONS

Frequency Range	950 to 4500 mc in two Bands: Band A: 950 to 2050 mc Band B: 1950 to 4500 mc
Noise Figure	18 db, maximum
Antenna Conducted L.O. Radiation	40 microvolts (-75 dbm), maximum
Image Rejection	70 db, minimum

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SPECIFICATIONS (Cont'd.)

IF Rejection	90 db, minimum
Output Frequency	160 mc
Overall Bandwidth	8 mc, minimum
Overall Gain	20 db, nominal
Gain Variation	±3.5 db, maximum
Input Impedance	50-ohms, nominal
Input VSWR	2.5:1, maximum
Output Impedance	For use with 50-ohm load
Dial Calibration	±1%
Dial Resetability	±0.5%
Local Oscillator FM	1 kc, peak, maximum
Local Oscillator Drift	50 parts in 10^6/°C
Local Oscillator Output Level	-5 dbm, minimum
Dynamic Range	1 db compression, maximum, for -25 dbm input without external AGC 1 db compression, maximum, for -10 dbm input with external AGC applied.
Input AGC Characteristics	Delayed to -10 volt input; approximate gain reduction 2 db/volt to -20 volt input
Fine Tuning Range	±250 kc, minimum
Frequency Readout	Tape display
Power Requirements	115/230 volts, 50-400 cps
Average Power Consumption	30 watts
Size	3.5-inches high, 19-inches wide and 18-inches deep
Weight	25 lbs., approximately

PRICE: $8,500.00

FOB Rockville, Maryland. Taxes extra where applicable. Price and specifications subject to change without notice.

Technical Data

DATA SHEET 213.50

TYPE FE-25-1 FREQUENCY EXTENDER

Designed for use with any receiver tuning to 60 mc, the CEI Type FE-25-1 Frequency Extender provides additional coverage in the UHF spectrum from 235 mc to 1000 mc.

Among the outstanding features of this instrument are extremely low oscillator radiation, low power consumption, small size, and light weight.

The FE-25-1 is designed and produced with the same care and attention to detail as given to the CEI line of receivers. It makes an ideal companion piece to the other CEI units.

SPECIFICATIONS

Frequency Range	235 mc - 1000 mc in two bands: Band A - 235 mc-500 mc Band B - 490 mc-1000 mc
Noise Figure	Band A - 10 db maximum Band B - 12 db maximum
Image Rejection	65 db minimum
I.F. Rejection	75 db minimum
I.F.	60 mc
Bandwidth	2 mc
Oscillator Radiation	Band A - 8 μv maximum Band B - 75 μv maximum
Input Impedance	50 ohms
Output Impedance	50 or 75 ohms
Power	115-230 V, 50-400 cps, 25 watts
Size	19 inches wide, 3.5 inches high, 12 inches deep
Weight	18 lbs.

PRICE $1,400.00 (7-31-64)

FOB Rockville, Maryland. Taxes extra where applicable. Price and specifications subject to change without notice.

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Technical Data

DATA SHEET 221.50

TYPE FE-103 FREQUENCY EXTENDER

The CEI Type FE-103 Frequency Extender tunes from 10 mc to 30 mc in a single band. The unit converts signals in this frequency range to a 60-mc IF output. The 60-mc output can then be tuned in on CEI VHF receivers and many other receivers which tune to 60 mc.

The FE-103 features an all solid-state design and a tape dial. The solid-state design provides a unit which has low power requirements and high reliability. The tape dial offers excellent readability and smooth, trouble-free operation.

A nomenclatured version of this unit, complete with MIL-type handbook and provisioning documentation, is available; inquire for details. Other frequency extenders are available which tune from 250 mc to 1 gc and from 1 gc to 2 gc; see data sheets 211.50 and 213.50 for information on these units.

SPECIFICATIONS

Frequency Range	10 to 30 mc
Noise Figure	6.0 db, maximum
Image Rejection	70 db, minimum
IF Rejection	60 db, minimum
Output Frequency	60 mc, nominal
Bandwidth	2 mc, minimum
Oscillator Radiation	5 μv, maximum
Input Impedance	50 ohms, nominal
Output Impedance	For use with 50-ohm load
Dial Accuracy	Better than 1%
Power Requirements	115/230 volts, 50-400 cps, 3 watts
Size	3.5-inches high, 19-inches wide, and 15.5-inches deep
Weight	12 lbs.

PRICE: $1,000.00

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Technical Data

DATA SHEET 231.50 5/18/65

TYPES LT-1-2( ) AND SLT-1-2( ) TUNERS

TYPE SLT-1-2B SHOWN

The CEI Types LT-1-2( ) and SLT-1-2( ) Tuners are designed to convert signals in the 1-2 gc frequency range to a 21.4-mc output. This frequency range is tuned in a single band. The 21.4-mc output is used as an input to a demodulator such as the CEI Type DM-4 series. The LT-1-2( ) and the SLT-1-2( ) are normally used in an RS-125-( ) Receiving System; see data sheet 199.50 for more information.

These tuners feature electronic tracking, thus avoiding the complex mechanical drives often used for tracking in this frequency range. With electronic tracking, there are no moving parts and no contact springs to wear out. A tunable, four-section YIG preselector has been included in the design to provide low oscillator radiation and high image rejection. Both the LT-1-2( ) and the SLT-1-2( ) have been designed using solid-state devices exclusively except for the ceramic triode used in the highly-stable local oscillator.

The SLT-1-2( ) includes an internal motor drive system not included in the LT-1-2( ). The motor drive features sector scan whereby the operator can set the upper and lower limits of the sector of the band being scanned. The unit can be switched to a manual mode to allow tuning in a conventional fashion as required.

Similar tuners are available which provide coverage in the spectrum between 10 mc and 1 gc; see data sheets 240.50, 241.50, and 242.50.

SPECIFICATIONS

Frequency Range	1000 to 2000 mc
Noise Figure	18 db, maximum
Image Rejection	70 db, minimum
IF Rejection	80 db, minimum
Output Frequency	21.4 mc
Bandwidth	8 mc, minimum

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Oscillator Radiation	40 microvolts (-75 dbm), maximum
Overall Gain	20 db, nominal
Gain Control Range	10 db, minimum
Gain Variation	±3 db, maximum
Input Impedance	For use in 50-ohm system, type N connector
Input VSWR	2:1, maximum
Output Impedance	For use with 50-ohm load, type BNC connector
Dial Calibration	±1%
Dial Resetability	±0.5%
Local Oscillator FM	500 cps rms, maximum
Local Oscillator Drift	50 parts in 10^6/°C
Dynamic Range	1 db compression, maximum, for -25 dbm input without external AGC
	1 db compression, maximum, for -10 dbm input with external AGC applied
Power Requirements	115 volts, 50-400 cps (LT-1-2( ))
	115 volts, 60 cps (SLT-1-2( ))
Average Power Consumption	25 watts
Size	5.25-inches high, 19-inches wide, and 18.7-inches deep
Weight	20 lbs., approximately (LT-1-2( ))
	23 lbs., approximately (SLT-1-2( ))

PRICE: LT-1-2( ) - $4,500.00
SLT-1-2( ) - $5,000.00

FOB Rockville, Maryland. Taxes extra where applicable. Price and specifications subject to change without notice.

Technical Data

DATA SHEET 240.50 1/11/66

TYPES VT-10( ) AND SVT-10( ) TUNERS

TYPE VT-10 SHOWN

The CEI Types VT-10( ) and SVT-10( ) Tuners are designed to convert a signal in the 10-mc to 90-mc frequency range to a 21.4-mc IF output. This frequency range is covered in two bands: 10 mc to 30 mc and 30 mc to 90 mc. The 21.4-mc IF output can be connected to a demodulator such as the CEI Type DM-4( ), where a wide variety of IF bandwidths and operating modes are available (see data sheets 199.50 and 724.50).

The SVT-10( ) contains an internal motor drive system for tuning which is not contained in the VT-10( ). The moter drive circuitry features sector scan operation, whereby the operator can adjust the upper and lower frequency limits of the sector being scanned. Separate sector scan controls are provided for each band. The SVT-10( ) can be switched to a manual mode for tuning in the conventional fashion.

Both tuners feature tape dial indicators for improved readability and smooth, trouble-free operation. Other features include dual 21.4-mc IF outputs, a signal monitor output, a band indicator output, separate antenna inputs for each band, and an analog tuning voltage output.

These tuners are constructed in compact mechanical packages which mount in a standard 19-inch rack and occupy only 3.5 inches of vertical rack space. Other tuners are available which provide frequency coverage in ranges starting at 30 mc and extending to 2 gc; see data sheets 231.50, 241.50, and 242.50, or inquire for details.

SPECIFICATIONS

Types of Reception	AM, FM, CW, and Pulse
Frequency Range	10-90 mc in two bands: Band A, 10-30 mc; Band B, 30-90 mc
Input Impedance	50 ohms, nominal
Noise Figure	7 db, maximum
IF Rejection	Band A, 50 db, minimum; Band B, 54 db, minimum

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SPECIFICATIONS (Cont'd.)

Image Rejection.	60 db, minimum
Oscillator to Antenna Conduction	15 μv, maximum
21.4-mc IF Outputs (No. 1 and No. 2)	30 db, nominal above input signal level into 50-ohm load
Signal Monitor Output	21.4-mc center frequency output
Over-all Bandwidth	2 mc, minimum
Fine Tuning Range	±0.1% of dial reading
Automatic Tuning Mode (Type SVT-10( ) only)	The tuning rate for sweeping a complete band is 15 seconds, maximum
Power Input.	VT-10( ): 115/230 vac, 50-400 cps SVT-10( ): 115 vac, 60 cps
Power Consumption	VT-10( ): 17 watts, approximately SVT-10( ): 30 watts, approximately
Weight.	VT-10( ): 16 pounds, approximately SVT-10( ): 22 pounds, approximately
Over-all Dimensions	19 inches wide x 3.5 inches high x 15.5 inches deep

PRICE: VT-10( ) - $1,800.00
SVT-10( ) - $2,550.00

FOB Rockville, Maryland. Taxes extra where applicable. Price and specification subject to change without notice.

Technical Data

DATA SHEET 241.50

TYPES VT-30( ) AND SVT-30( ) TUNERS

TYPE VT-30C SHOWN

The CEI Types VT-30( ) and SVT-30( ) Tuners are designed to convert a signal in the 30-260 mc frequency range to a 21.4-mc output. This frequency range is covered in two bands: 30 mc to 60 mc and 54 mc to 260 mc. These tuners are frequently used in an RS-125-( ) Receiving System where the 21.4-mc output from the tuners is demodulated by a DM-4 series Demodulator. Refer to data sheet 199.50 for information on the RS-125-( ).

The VT-30( ) and SVT-30( ) differ in that the SVT-30( ) contains an internal motor drive system not contained in the VT-30( ). The motor drive system features sector scan, and separate controls for this feature are provided for each band. This means that the operator can set the upper and lower frequency limits to be scanned on each band independently. The unit can be switched to a manual mode for tuning in a conventional fashion as required.

These tuners have a separate RF input for each band, a common L.O. output from the local oscillator in operation, and band indicator and analog tuning voltage outputs. The analog tuning voltage is obtained from potentiometers linked to the gear trains. These units also provide two 21.4-mc IF outputs and a 21.4-mc signal monitor output. An AGC input is provided for the connection of an external gain control voltage.

Similar tuners are available which provide frequency coverage starting at 10 mc and extending to 2 gc; see data sheets 231.50, 240.50, and 242.50. The VT-30 and SVT-30 series tuners have been supplied with special inputs and outputs to satisfy particular requirements; inquire for details.

SPECIFICATIONS

Types of Reception	AM, FM, CW, and Pulse
Frequency Range	30 to 260 mc in two bands: Band A: 30-60 mc Band B: 54-260 mc
Input Impedance	50 ohms

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Noise Figure	6.5 db, maximum
Image Rejection	55 db, minimum
IF Rejection	Band A: 50 db, minimum Band B: 60 db, minimum
Nominal Gain	33 db (below AGC threshold)
Gain Variation with Tuning	6 db, maximum
Over-all Bandwidth	3.0 mc, minimum
Over-all Bandpass Ripple	3 db, maximum
Oscillator Radiation	15 μv, maximum
Fine Tuning	±0.1% of dial reading, approximately
Tuning Stability with Signal Level (Signal level changes to -40 dbm)	0.001%, maximum
Tuning Dial Resetability	±1%
Local Oscillator Output	50 mv, minimum
AM Compression (Signal level to -20 dbm with AGC applied to tuner)	2 db, maximum
IF Outputs (No. 1 and No. 2)	21.4-mc center frequency
Signal Monitor Output	21.4-mc center frequency
Analog Tuning Output	Band A: -1.0 volt at 30 mc to -11.0 volts at 60 mc Band B: -1.0 volt at 54 mc to -11.0 volts at 260 mc
Band Indicator Output	6.3 vac outputs provided to light external band indicator lamps
Automatic Tuning Mode (Type SVT-30B only)	The tuning rate for sweeping a complete band is 15 seconds, maximum
Input Power	120 volts, ±10%, 60 cps
Power Consumption	VT-30( ): 28 watts, approximately SVT-30( ): 41 watts, approximately
Size	19-inches wide, 3.5-inches high, and 17-inches deep
Weight	VT-30( ): 15 lbs., approximately SVT-30( ): 21.5 lbs., approximately

PRICE: VT-30( ) $2,000.00
SVT-30( ) $2,750.00

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Technical Data

DATA SHEET 242.50 5/18/65

TYPES UT-1000( ) AND SUT-1000( ) TUNERS

TYPE UT-1000C SHOWN

The CEI Types UT-1000( ) and SUT-1000( ) Tuners are designed to convert a signal in the 235-1000 mc frequency range to a 21.4-mc output. The units cover this frequency range in two bands: 235 mc to 500 mc, and 490 mc to 1000 mc. These tuners are often supplied as items of an RS-125-( ) Receiving System (see data sheet 199.50).

The SUT-1000( ) contains an internal motor drive system which is not included in the UT-1000( ). The motor drive system features sector scan, and separate controls for this feature are provided for the two bands. This means that the operator can set the upper and lower frequency limits to be scanned. The unit can be switched to a manual mode for tuning in a conventional fashion as required.

These tuners each contain separate RF inputs for each frequency band and an AGC input. Two 21.4-mc IF outputs are provided for connection to demodulator units as well as a 21.4-mc signal monitor output. A rear-apron output is provided from whichever first local oscillator is in operation. An analog tuning voltage is also provided from potentiometers linked to the gear trains.

Other tuners of this type are available which provide frequency coverage from as low as 10 mc up to 2 gc; see data sheets 231.50, 240.50, and 241.50. Variations of the UT-1000 and SUT-1000 series have been supplied with special inputs and outputs; inquire for details.

SPECIFICATIONS

Types of Reception	AM, FM, CW, and Pulse
Frequency Range	235 to 1000 mc in two bands: Band A: 235-500 mc Band B: 490-1000 mc
Input Impedance	50 ohms
Noise Figure	Band A: 11 db, maximum Band B: 14 db, maximum

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Image Rejection	Band A: 65 db, minimum Band B: 75 db, minimum
IF Rejection	Band A: 80 db, minimum Band B: 90 db, minimum
Oscillator Radiation	Band A: 8 μv, maximum Band B: 75 μv, maximum
Over-all Bandwidth	Band A: 6 mc, minimum Band B: 8 mc, minimum
Ripple Across Pass Band	3 db, maximum
Nominal Gain	20 db (below AGC threshold)
Manual Gain Control	±6 db from nominal
Gain Variation with Tuning	8 db, maximum
Fine Tuning Range	±0.1% of dial reading, approximately
Dial Resetability	±1%
AM Compression (Signal Input up to -20 dbm with AGC applied to Tuner)	2 db, maximum
Local Oscillator Output	50 mv, minimum
IF Outputs (No. 1 and No. 2)	21.4-mc center frequency
Signal Monitor Output	21.4-mc center frequency
Analog Tuning Voltage Output	Band A: -1.0 volt at 235 mc to -11.0 volts at 500 mc Band B: -1.0 volt at 490 mc to -11.0 volts at 1000 mc
Band Indicator Output	6.3 vac outputs provided to light external band indicator lamps
Automatic Tuning Mode (Type SUT-1000( ) only	The tuning rate for sweeping a complete band is 15 seconds, maximum
Input Power	120 volts ±10%, 60 cps
Power Consumption	UT-1000( ): 40 watts, approximately SUT-1000( ): 53 watts, approximately
Size	19-inches wide x 3.5-inches high x 17-inches deep
Weight	UT-1000( ): 18.5 lbs., approximately SUT-1000( ): 25 lbs., approximately

PRICE: UT-1000( ) $2,500.00
SUT-1000( ) $3,250.00

FOB Rockville, Maryland. Taxes extra where applicable. Price and specifications subject to change without notice.

Technical Data

DATA SHEET 322.50 1/11/66

TYPES SM-4300 AND SM-4301A SIGNAL MONITORS

TYPE SM-4300

TYPE SM-4301A

The CEI Types SM-4300 and SM-4301A Signal Monitors are compact units which have been designed for use with CEI receivers. They operate from the receivers 21.4-mc IF output to provide a visual display of signals in a band around the received signal; both units have a bandwidth of 3 mc.

All active elements in these signal monitors are solid state except for the cathode ray tube. These devices therefore offer high reliability and low power requirements. The SM-4300 is supplied in a 4.5-inch wide by 5-inch high panel size while the SM-4301A is constructed in a 3.75-inch wide by 6.75-inch high panel.

The SM-4300 and SM-4301A Signal Monitors feature ease of operation, a high-light-output CRT, and a built-in 21.4-mc marker. Other signal monitors with 21.4-mc and 30-mc center frequency inputs are available with sweep widths of 3 mc, 4 mc, and 8 mc; see data sheets 351.50, 353.50, 355.50, and 356.50.

MOUNTING FRAME AVAILABLE

Specially designed mounting frames are available for use with the SM-4300 and SM-4301A Signal Monitors; see data sheet 725.50. In the inset photograph, an SM-4301A Signal Monitor is shown mounted in an EF-402 Equipment Frame along with a 416 Receiver. The EF-401 through EF-404 Equipment Frames mount one, two, three, or four units of this size. The SM-4300 mounts in an EF-301, EF-302, or EF-303 Equipment Frame; these frames mount one, two, and three units respectively.

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SPECIFICATIONS

Number of Inputs	One, type BNC: Signal Input
Number of Outputs	Two, type BNC: Aux, Vertical and Horizontal Outputs
Input Impedance	50 ohms
Input Center Frequency	21.4 mc
Range of Center Frequency Control	±200 kc
Flatness of Response	Determined by RF response of receiver being employed; particulars available on request.
Sweep Width	0-3 mc, continuously adjustable
Sweep Linearity	Linear over-all to within 5% of the total sweep width
Sweep Rate	25 cps ±5 cps
Resolution	Using approximately 100-kc sweep width, two signals 20-kc apart will be displayed with at least a 6-db valley between the peaks
IF Frequencies	13 mc and 1 mc
Oscillator Frequencies	
1st Local Oscillator	34.4 mc ±1/2 sweep width
2nd Local Oscillator	14.0 mc
Image Rejection	50 db, minimum
IF Rejection	60 db, minimum
Sensitivity	10 μv input at 21.4 mc produces at least one-inch vertical deflection on the CRT
Gain Control Range	60 db, minimum
Vertical Display Response	Linear
Marker Frequency	21.4 mc ±0.01%
CRT Display Type	3XP1
Front Panel Controls	Center Frequency, Sweep Width, Gain, Focus, Intensity, Power
Power Input	115/230 volts, 50-400 cps
Power Consumption	6 watts, approximately
Weight	7.5 lbs.
Size	SM-4300: 5.0-inches high, 4.5-inches wide, and 16.75-inches deep SM-4301A: 6.75-inches high, 3.75-inches wide, and 16.75-inches deep

PRICE: $850.00

FOB Rockville, Maryland. Taxes extra where applicable. Price and specifications subject to change without notice.

Technical Data

DATA SHEET 341.50 1/11/66

TYPE SM-8510 SIGNAL MONITOR

The CEI Type SM-8510 Signal Monitor has been designed for use with receivers having a 500-kc IF center frequency. It provides a visual display of signals in a band around the received frequency.

Base line break-up due to overload on strong signals has been eliminated in the SM-8510 by direct coupling of the detector to the CRT deflection plates. This makes it possible to observe weak signals close to very strong signals.

Nuvistors and solid state devices are used in the design to keep power consumption and size to a minimum.

SPECIFICATIONS

Number of Inputs	One, type BNC
Input Impedance	50 ohms
Input Center Frequency	500 kc
Flatness of Response	Determined by RF response of receiver being employed; particulars available on request.
Sweepwidth	50 kc, 20 kc, or 5 kc, switched by front-panel control
Sweep Linearity	Linear over-all to within 5% of the total sweep width
Sweep Rate	
50-kc Sweep Width	12 cps ± 2.5 cps
20-kc Sweep Width	8 cps ± 2.0 cps
5-kc Sweep Width	4 cps ± 1.0 cps

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SPECIFICATIONS - (Cont'd)

Resolution	
50-kc Sweep Width	Minimum 6-db valley between signals 2.5-kc apart
20-kc Sweep Width	Minimum 6-db valley between signals 1.2-kc apart
5-kc Sweep Width	Minimum 6-db valley between signals 250-cps apart
Image Rejection	50 db, minimum
Sensitivity	5 μv input at 500 kc produces at least one inch deflection on the CRT
Gain Control Range	60 db, minimum
Crystal Marker	
Frequency	500 kc
Tolerance	±0.01%
Amplitude Scales	
Linear	A signal 20 db down from the value that produces 100% vertical deflection will produce 10% deflection
Logarithmic	A signal 40 db down from the value that produces 100% deflection will produce 10% deflection
CRT Display Type	3XP2
Front Panel Controls	Center Frequency; Sweep Width; Gain; Marker On/Off; Vertical Display Lin/Log; Power; Intensity; Focus
Power Input	115/230 volts, 50-400 cps
Power Consumption	30 watts, approximately
Weight	15 lbs., approximately
Size	3.5-inches high, 19-inches wide, 15-inches deep

NOTE: A modification kit and instructions to modify the Collins 51J-4 or 51S-1 receivers are included with the SM-8510. Please specify receiver type when ordering.

PRICE: $1,400.00

FOB Rockville, Maryland. Taxes extra where applicable. Price and specifications subject to change without notice.

Technical Data

DATA
SHEET
342.50
1/11/66

TYPE SM-8511 SIGNAL MONITOR

The CEI Type SM-8511 Signal Monitor has been designed for use with receivers having a 500-kc IF center frequency. It provides a visual display of signals in a band around the received frequency.

Base line break-up due to overload on strong signals has been eliminated in the SM-8511 by direct coupling of the detector to the CRT deflection plates. This makes it possible to observe weak signals close to very strong signals.

Nuvistors and solid state devices are used in the design to keep power consumption and size to a minimum.

SPECIFICATIONS

Number of Inputs	One, type BNC
Input Impedance	50 ohms
Input Center Frequency	500 kc
Flatness of Response	Determined by RF response of receiver being employed; particulars available on request.
Sweepwidth	200 kc, 50 kc, 20 kc, or 5 kc, switched by front-panel control
Sweep Linearity	Linear over-all to within 5% of the total sweep width
Sweep Rate	
200-kc Sweep Width	12 cps ± 2.5 cps
50-kc Sweep Width	12 cps ± 2.5 cps
20-kc Sweep Width	8 cps ± 2.0 cps
5-kc Sweep Width	4 cps ± 1.0 cps

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SPECIFICATIONS - (Cont'd)

Resolution	
200-kc Sweep Width	Minimum 6-db valley between signals 6.0-kc apart
50-kc Sweep Width	Minimum 6-db valley between signals 2.5-kc apart
20-kc Sweep Width	Minimum 6-db valley between signals 1.2-kc apart
5-kc Sweep Width	Minimum 6-db valley between signals 250-cps apart
Image Rejection	50 db, minimum
Sensitivity	5 μv input at 500 kc produces at least one inch deflection on the CRT
Gain Control Range	60 db, minimum
Crystal Marker	
Frequency	500 kc
Tolerance	±0.01%
Amplitude Scales	
Linear	A signal 20-db down from the value that produces 100% vertical deflection will produce 10% deflection
Logarithmic	A signal 40-db down from the value that produces 100% deflection will produce 10% deflection
CRT Display Type	3XP2
Front Panel Controls	Center Frequency; Sweep Width; Gain; Marker On/Off; Vertical Display Lin/Log; Power; Intensity; Focus
Power Input	115/230 volts, 50-400 cps
Power Consumption	30 watts, approximately
Weight	15 lbs., approximately
Size	3.5-inches high, 19-inches wide, 15-inches deep

NOTE: A modification kit and instructions to modify the Collins 51J-4 or 51S-1 receivers are included with the SM-8511. Please specify receiver type when ordering.

PRICE: $1,600.00

FOB Rockville, Maryland. Taxes extra where applicable. Price and specifications subject to change without notice.

Technical Data

DATA SHEET 351.50 12/16/65

TYPES SM-9301 AND SM-9302 SIGNAL MONITORS

TYPE SM-9301 SIGNAL MONITOR

The CEI Types SM-9301 and SM-9302 Signal Monitors have been designed for use with the CEI series receivers. They operate from the receivers 21.4-mc IF output to provide a visual display of signals in a band around the received signal; both units have a bandwidth of 3 mc.

All active elements in these signal monitors are solid state except for the cathode ray tube. These devices therefore offer high reliability and low power requirements. The SM-9301 is supplied in a 3.5-inch high by 19-inch wide panel size while the SM-9302 is constructed in a half-rack size; two SM-9302 Signal Monitors can be supplied in a 19-inch frame which occupies only 3.5-inches of vertical space.

These signal monitors feature ease of operation, a high-light-output CRT, and a built-in 21.4-mc marker. Other signal monitors in this line are available with bandwidths of 4 mc and 8 mc at 21.4-mc center frequency and at 30-mc center frequency; we invite inquiries concerning these devices.

DUAL SIGNAL MONITOR

In the inset photograph, two SM-9302 Signal Monitors are shown installed in an EF-201A Equipment Frame; see data sheet 725.50 for information on the frame. One of these signal monitors could be replaced by an SWP-602 Switching Panel (data sheet 785.50). The signal monitor could then be switched between any of up to six inputs.

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SPECIFICATIONS

Number of Inputs	One, type BNC: Signal Input
Number of Outputs	Two, type BNC: Aux, Vertical and Horizontal Outputs
Input Impedance	50 ohms
Input Center Frequency	21.4 mc
Range of Center Frequency Control	±200 kc
Flatness of Response	Determined by RF response of receiver being employed; particulars available on request
Sweep Width	0-3 mc, continuously adjustable
Sweep Linearity	Linear over-all to within 5% of the total sweep width
Sweep Rate	25 cps ± 5 cps
Resolution	Using approximately 100-kc sweep width, two signals 20-kc apart will be displayed with at least a 6-db valley between the peaks
IF Frequencies	13 mc and 1 mc
Oscillator Frequencies	
1st Local Oscillator	34.4 mc ± 1/2 sweep width
2nd Local Oscillator	14.0 mc
Image Rejection	50 db, minimum
IF Rejection	60 db, minimum
Sensitivity	10 μv input at 21.4 mc produces at least one-inch vertical deflection on the CRT
Gain Control Range	60 db, minimum
Vertical Display Response	Linear
Marker Frequency	21.4 mc ± 0.01%
CRT Display Type	3XP1
Front Panel Controls	Center Frequency, Sweep Width, Gain, Focus, Intensity, Power
Power Input	115/230 volts, 50-400 cps
Power Consumption	6 watts, approximately
Weight	SM-9301: 8 lbs., approximately SM-9302: 7 lbs., approximately
Size	SM-9301: 3.5-inches high, 19-inches wide, and 15.5-inches deep SM-9302: 3.25-inches high, 7.9-inches wide, and 15.5-inches deep

PRICE

SM-9301	$850.00
SM-9302	$800.00

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Technical Data

DATA SHEET 353.50 12/8/65

TYPES SM-9401B AND SM-9402A SIGNAL MONITORS

TYPE SM-9401B SIGNAL MONITOR

The CEI Types SM-9401B and SM-9402A Signal Monitors operate from a 21.4-mc IF signal to provide a visual display of signals in a band around the received signal; both units have a bandwidth of 4 mc.

All active elements in these signal monitors are solid state except for the cathode ray tube. These devices therefore offer high reliability and low power requirements. The SM-9401B is supplied in a 3.5-inch high by 19-inch wide panel size while the SM-9402A is constructed in a half-rack size; two SM-9402A Signal Monitors can be supplied in a 19-inch frame which occupies only 3.5-inches of vertical space.

These signal monitors feature ease of operation, a high-light-output CRT, and a built-in 21.4-mc marker. Other signal monitors in this line are available with bandwidths of 3 mc and 8 mc at 21.4-mc center frequency and at 30 mc center frequency; we invite inquiries concerning these devices.

DUAL SIGNAL MONITOR

In the inset photograph, two SM-9402A Signal Monitors are shown installed in an EF-201A Equipment Frame; see data sheet 725.50 for information on the frame. One of these signal monitors could be replaced by an SWP-602 Switching Panel (data sheet 785.50). The signal monitor could then be switched between any of up to six inputs.

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SPECIFICATIONS

Number of Inputs	One, type BNC: Signal Input
Number of Outputs	Two, type BNC: Aux Vertical and Horizontal Outputs
Input Impedance	50 ohms
Input Center Frequency	21.4 mc
Range of Center Frequency Control	±200 kc
Flatness of Response	4 mc ±2 db
Sweep Width	0-4 mc, continuously adjustable
Sweep Linearity	Linear over-all to within 5% of the total sweep width
Sweep Rate	25 cps ±5 cps
Resolution	Using approximately 100-kc sweep width, two signals 20-kc apart will be displayed with at least a 6-db valley between the peaks
IF Frequencies	13 mc and 1 mc
Oscillator Frequencies	
1st Local Oscillator	34.4 mc ±1/2 sweep width
2nd Local Oscillator	14.0 mc
Image Rejection	50 db, minimum
IF Rejection	60 db, minimum
Sensitivivity	10 μv input at 21.4 mc produces at least one-inch vertical deflection on the CRT
Gain Control Range	60 db, minimum
Vertical Display Response	Linear
Marker Frequency	21.4 mc ±0.01%
CRT Display Type	3XP1
Front Panel Controls	Center Frequency, Sweep Width, Gain, Focus, Intensity, Power
Power Input	115/230 volts, 50-400 cps
Power Consumption	6 watts, approximately
Weight	SM-9401B: 8 lbs., approximately SM-9402A: 7 lbs., approximately
Size	SM-9401B: 3.5-inches high, 19-inches wide, and 15.5-inches deep SM-9402A: 3.25-inches high, 7.9-inches wide, and 15.5-inches deep

PRICE

SM-9401B - $850.00
SM-9402A - $800.00

FOB Rockville, Maryland. Taxes extra where applicable. Price and Specifications subject to change without notice.

Technical Data

DATA SHEET 355.50 12/8/65

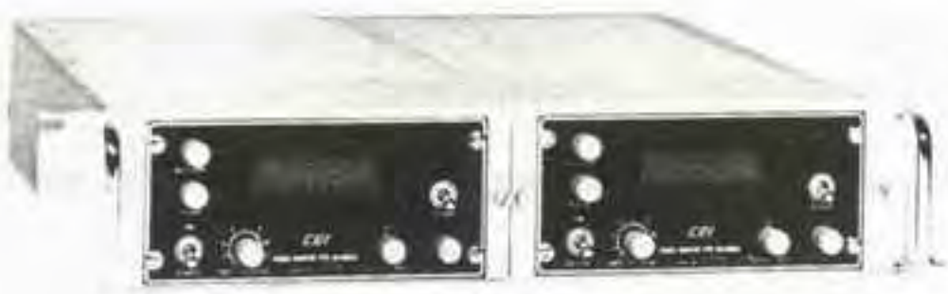
TYPES SM-9801 AND SM-9802A SIGNAL MONITORS

TYPE SM-9801 SIGNAL MONITOR

The CEI Types SM-9801 and SM-9802A Signal Monitors operate from a 21.4-mc IF signal to provide a visual display of signals in a band around the received signal; both units have a bandwidth of 8 mc.

All active elements in these signal monitors are solid state except for the cathode ray tube. These devices therefore offer high reliability and low power requirements. The SM-9801 is supplied in a 3.5-inch high by 19-inch wide panel size while the SM-9802A is constructed in a half-rack size; two SM-9802A Signal Monitors can be supplied in a 19-inch frame which occupies only 3.5-inches of vertical space.

These signal monitors feature ease of operation, high-light-output CRT, and a built-in 21.4-mc marker. Other signal monitors in this line are available with bandwidths of 3 mc and 4 mc at 21.4-mc center frequency and at 30-mc center frequency; we invite inquiries concerning these devices.



DUAL SIGNAL MONITOR

In the inset photograph, two SM-9802A Signal Monitors are shown installed in an EF-201A Equipment Frame; see data sheet 725.50 for information on the frame. One of these signal monitors could be replaced by an SWP-602 Switching Panel (data sheet 785.50). The signal monitor could then be switched between any of up to six inputs.

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SPECIFICATIONS

Number of Inputs	One, type BNC: Signal Input
Number of Outputs	Two, type BNC: Aux Vertical and Aux Horizontal Outputs
Input Impedance	50 ohms
Input Center Frequency	21.4 mc
Range of Center Frequency Control	±200 kc
Flatness of Response	8 mc ±2 db
Sweep Width	0-8 mc, continuously adjustable
Sweep Linearity	Linear over-all to within 5% of the total sweep width
Sweep Rate	25 cps ±5 cps
Resolution	Using approximately 100-kc sweep width, two signals 20-kc apart will be displayed with at least a 6-db valley between the peaks
IF Frequencies	13 mc and 1 mc
Oscillator Frequencies	
1st Local Oscillator	34.4 mc ±1/2 sweep width
2nd Local Oscillator	14.0 mc
Image Rejection	50 db, minimum
IF Rejection	60 db, minimum
Sensitivity	10 μv input at 21.4 mc produces at least one-inch vertical deflection on the CRT
Gain Control Range	60 db, minimum
Vertical Display Response	Linear
Marker Frequency	21.4 mc ±0.01%
CRT Display Type	3XP1
Front Panel Controls	Center Frequency, Sweep Width, Gain, Focus, Intensity, Power
Power Input	115/230 volts, 50-400 cps
Power Consumption	6 watts, approximately
Weight	SM-9801: 8 lbs., approximately SM-9802A: 7 lbs., approximately
Size	SM-9801: 3.5-inches high, 19-inches wide and 15.5-inches deep SM-9802A: 3.25-inches high, 7.9-inches wide and 15.5-inches deep

PRICE

SM-9801 - $950.00
SM-9802A - $900.00

FOB Rockville, Maryland. Taxes extra where applicable. Price and Specifications subject to change without notice.

Technical Data

DATA SHEET 356.50 7/27/65

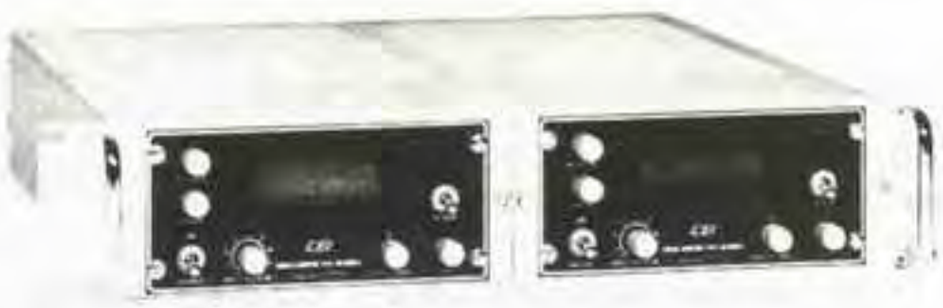
TYPES SM-9831 AND SM-9832 SIGNAL MONITORS

TYPE SM-9831 SIGNAL MONITOR

The CEI Types SM-9831 and SM-9832 Signal Monitors operate from a 30-mc IF output to provide a visual display of signals in a band around the received signal; both units have a bandwidth of 8 mc.

All active elements in these signal monitors are solid state except for the cathode ray tube. These devices therefore offer high reliability and low power requirements. The SM-9831 is supplied in a 3.5-inch high by 19-inch wide panel size while the SM-9832 is constructed in a half-rack size; two SM-9832 Signal Monitors can be supplied in a 19-inch frame which occupies only 3.5-inches of vertical space.

These signal monitors feature ease of operation, a high-light-output CRT, and a built-in 30-mc marker. Other signal monitors in this line are available with bandwidths of 3 mc and 4 mc at 21.4-mc center frequency and at 30-mc center frequency; we invite inquiries concerning these devices.



DUAL SIGNAL MONITOR

In the inset photograph, two SM-9832 Signal Monitors are shown installed in an EF-201A Equipment Frame; see data sheet 725.50 for information on the frame. One of these signal monitors could be replaced by an SWP-602 Switching Panel (data sheet 785.50). The signal monitor could then be switched between any of up to six inputs.

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SPECIFICATIONS

Number of Inputs	One, type BNC: Signal Input
Number of Outputs	Two, type BNC: Aux, Vertical and Horizontal Outputs
Input Impedance	50 ohms
Input Center Frequency	30 mc
Range of Center Frequency Control	±200 kc
Flatness of Response	8 mc ± 2 db
Sweep Width	0-8 mc, continuously adjustable
Sweep Linearity	Linear over-all to within 5% of the total sweep width
Sweep Rate	25 cps ± 5 cps
Resolution	Using approximately 100-kc sweep width, two signals 20-kc apart will be displayed with at least a 6-db valley between the peaks
IF Frequencies	13 mc and 1 mc
Oscillator Frequencies	
1st Local Oscillator	43 mc ± 1/2 sweep width
2nd Local Oscillator	14.0 mc
Image Rejection	50 db, minimum
IF Rejection	60 db, minimum
Sensitivity	10 μv input at 30 mc produces at least one-inch vertical deflection on the CRT
Gain Control Range	60 db, minimum
Vertical Display Response	Linear
Marker Frequency	30 mc ± 0.01%
CRT Display Type	3XP1
Front Panel Controls	Center Frequency, Sweep Width, Gain, Focus, Intensity, Power
Power Input	115/230 volts, 50-400 cps
Power Consumption	6 watts, approximately
Weight	SM-9831: 8 lbs., approximately SM-9832: 7 lbs., approximately
Size	SM-9831: 3.5 inches high, 19-inches wide, and 15.5 inches deep SM-9832: 3.25-inches high, 7.9-inches wide, and 15.5 inches deep

PRICE

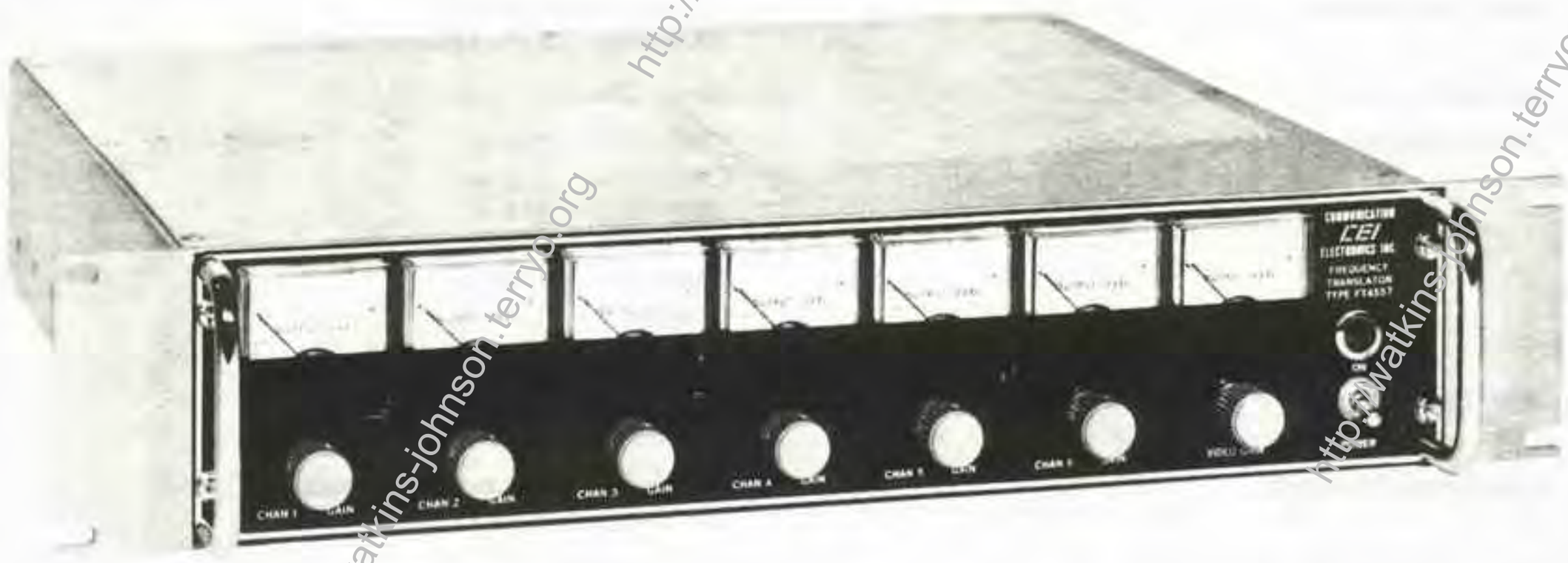
SM-9831 - $950.00
SM-9832 - $900.00

FOB Rockville, Maryland. Taxes extra where applicable. Price and Specifications subject to change without notice

Technical Data

DATA
SHEET
435.50
1/21/65

TYPE FT-4557 FREQUENCY TRANSLATOR



The CEI solid state Type FT-4557 Frequency Translator is designed for pre-detection recording from communication receivers having a 455-kc IF. The unit will simultaneously accept the IF outputs from as many as six receivers, and convert them to six staggered frequencies between 580 kc and 1.33 mc. Each of these six input channels has a data bandwidth of 50 kc. An additional video input is provided which is not translated, having the same output frequency as the input. This channel can be used to record such things as timing signals, demodulated video signals from an additional receiver, or voice announcements. The seven inputs are combined in a summing network into a single output signal for recording by a wideband tape recorder.

By using the FT-4557, the input capability of a wideband tape recorder can be tremendously increased. A single seven-track recorder, for example, can simultaneously accept the inputs from 42 receivers when used with seven FT-4557's. In addition, seven video signals within the frequency range of 400 cps to 1.5 mc can be recorded at the same time. By using a single fourteen-track recorder in conjunction with fourteen FT-4557's, the output from 84 receivers can be simultaneously recorded, with an additional fourteen video input channels available. Thus, the FT-4557 reduces the number of wideband recorders required when large numbers of 455-kc signals must be recorded, often making it unnecessary to purchase additional expensive recorders to accommodate increased requirements. The number of tapes which must be processed and stored are also correspondingly reduced.

Since the six 455-kc input signals are translated by the FT-4557 up to frequencies in the standard broadcast band, each recorded signal can be demodulated by tuning to its frequency with a high-quality communications receiver. The recorded video channel may be fed directly into, for example, a spectrum analyzer or oscillograph. If this channel contains only audio signals, they may be fed to an audio amplifier for aural monitoring.

SPECIFICATIONS

Number of Inputs	Seven
Number of Outputs	One

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Input Frequencies	455 kc (Channels 1-6) 400 cps to 1.5 mc (Video Channel)
Bandwidth	50 kc (Channels 1-6)
Output Frequencies of Input Channels	Channel 1 580 kc Channel 2 710 kc Channel 3 810 kc Channel 4 1080 kc Channel 5 1230 kc Channel 6 1330 kc Video Same as input
Input Impedance	50 ohms, nominal (Channels 1-6) 91 ohms, nominal (Video Channel)
Input Level Required	Between 2 and 20 mv rms (Channels 1-6) 100 mv rms (Video Channel)
Output Impedance	50 ohms, nominal
Output Level	1 volt rms
Harmonic Distortion	Less than 1%
Frequency Conversion Stability	Better than ±0.005%
Controls	Output level control and meter for each input channel
Type of Connectors	BNC
Power Input	115 volts, 50-400 cps
Power Consumption	12 watts, approximately
Over-all Dimensions	3.5 inches high, 19 inches wide, and 16.9 inches deep

PRICE: $2,900.00

FOB Rockville, Maryland. Taxes extra where applicable. Prices and specifications subject to change without notice.

Technical Data

DATA SHEET 433.50 1/11/66

TYPES FT-101A AND FT-201A IF-TAPE CONVERTERS

TYPE FT-201A IF-TAPE CONVERTER

The CEI Types FT-101A and FT-201A IF-Tape Converters are designed to accept the 21.4-mc IF output from CEI receivers and translate this signal to one which can be recorded on a wideband tape recorder. The FT-101A and the FT-201A are electrically identical units which are constructed in mechanically different packages. The FT-101A is supplied in a panel size of 3.5-inches high and 19-inches wide. The FT-201A is constructed in a half-rack size which has panel dimensions of 3.25-inches high and 8-inches wide. The FT-201A mounts in a CEI Type EF-101 single equipment frame or an EF-201A dual equipment frame (see data sheet 725.50).

These converters have a data bandwidth of 100 kc to 1.4 mc. The response over the data bandwidth varies less than 2 db. The units are supplied with an output center frequency of 750 kc, however, the user can easily adjust the converters to any output frequency between 100 kc and 1.4 mc by changing a plug-in crystal. Under these conditions, a reduction in data bandwidth will be encountered proportional to how far the center frequency is changed from 750 kc.

The FT-101A and FT-201A feature a compact, all solid-state design. Special techniques, including regulated power supplies, have been used to insure faithful translation of the signal with a minimum of signal degradation. When used as part of a complete pre-detection record-and-playback system, less than one db signal to noise impairment will be experienced as compared to direct demodulation of the incoming signal.

These converters also feature easy and reliable operation. Once the units are installed, it is necessary only to place them in the desired gain control mode and a successful recording should result. This simplicity greatly reduces the chance of operator error which could cause the unsatisfactory recording of a valuable transmission.

SPECIFICATIONS

Input Frequency	21.4 mc
Input Impedance	50 ohms, nominal

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SPECIFICATIONS (Cont'd)

Input Level	50 mv to 500 mv or 5 mv to 50 mv (separate high and low level inputs provided)
Output Center Frequency	750 kc (see note)
Center Frequency Stability	±0.005%
Data Bandwidth	100 kc to 1.4 mc at 3 db points
Passband Ripple	±1 db
Nominal Output Level	1 volt, rms, into 50-ohm load
Output Stability with AGC	Output level changes less than 3 db for input level changes between 50 mv and 500 mv (high level input) or between 5 mv and 50 mv (low level input)
Manual Gain Control Range	20 db
Total Harmonic Distortion	Less than 2% at nominal output level
Spurious Outputs	Minimum of 50 db below 1 volt
Type of Connectors	BNC
Front-Panel Controls	Power on/off; Manual Level Set; AGC/MAN Mode selector
Meter	Output level (0-1.5 volts, rms)
Input Power	115/230 volts, 50-400 cps
Power Consumption	4 watts, approximately
Weight	6 lbs., approximately
Size	FT-201A: 3.25-inches high, 8.0-inches wide, and 15.7-inches deep FT-101A: 3.5-inches high, 19-inches wide, and 15-inches deep

NOTE: 750 kc output center frequency is supplied as standard, however, any center frequency between 100 kc and 1.4 mc (such as 600 kc) may be used with a corresponding reduction in data bandwidth.

PRICE: FT-101A - $1,045.00
FT-201A - $ 995.00

FOB Rockville, Maryland. Taxes extra where applicable. Price and specifications subject to change without notice.

Technical Data

DATA SHEET 461.50 8/26/65

TYPES TF-101 AND TF-201 TAPE-IF CONVERTERS

TYPE-201 TAPE-IF CONVERTER

The CEI Types TF-101 and TF-201 Tape-IF Converters, all solid-state units, are designed to translate the output signal from a tape recorder up to 21.4 mc. They provide a data bandwidth of 1.3 mc when the input center frequency is 750 kc; however, any input center frequency between 100 kc and 1.4 mc may be used, but with a reduction in bandwidth directly proportional to how far the center frequency deviates from 750 kc. Response over the data bandwidth varies less than 2 db. Input signals of up to 10 volts rms can be accepted. The output level is up to 10 mv into a 50-ohm load, continuously variable by means of a front-panel control. A meter is provided to monitor the output level. In addition to the output to feed a demodulator unit, a second output is provided for attaching a signal monitor for visual monitoring of the output signal.

The TF-101 and TF-201 are electrically identical items in mechanically different packages. The TF-101 is constructed in a panel size of 3.5-inches high by 19-inches wide. The TF-201 is built in a half-rack size which has panel dimensions of 3.5-inches high and 8.0-inches wide. The TF-201 is designed to mount in an EF-101 single equipment frame or in an EF-201A dual equipment frame; see data sheet 725.50 for details on these frames.

SPECIFICATIONS

Input Center Frequency	750 kc, nominal (see note)
Input Impedance	50 ohms, nominal
Input Level	0.5 to 10 volts, rms
Output Center Frequency	21.4 mc
Center Frequency Stability	±0.005%
Output Level	10 mv, nominal
Output Impedance	50 ohms, nominal
Data Bandwidth	100kc to 1.4 mc
Modulation Capacity	Preserves modulation on input signal, consistent with data bandwidth
Harmonic Distortion	Less than 1.5% at 30% modulation

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Local Oscillator Rejection	40 db, minimum
Image Rejection	40 db, minimum
Controls	Level set, power switch
Type of Connectors	BNC
Power Input	115 vac, 50-400 cps
Power Consumption	5 watts, approximately
Weight	7 lbs., approximately
Dimensions	TF-201: 3.25-inches high, 7.9-inches wide, and 15.7-inches deep TF-101: 3.5-inches high, 19-inches wide, and 15-inches deep

NOTE: Any input center frequency between 100 kc and 1.4 mc may be used with a corresponding reduction in data bandwidth by changing a plug-in crystal.

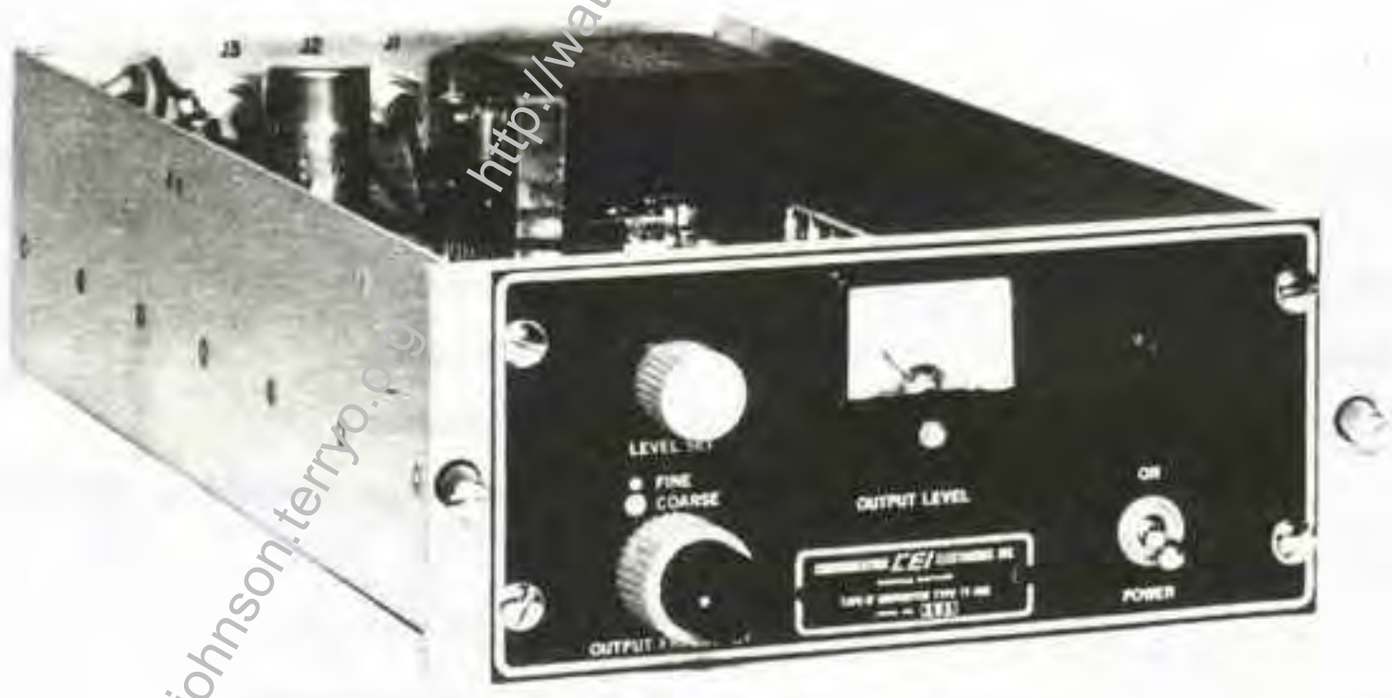
PRICE: TF-101 - $900.00
TF-201 - $850.00

FOB Rockville, Maryland. Taxes extra where applicable. Price and specifications subject to change without notice.

Technical Data

DATA SHEET 462.50 6/18/65

TYPES TF-102 AND TF-202 TAPE-IF CONVERTERS



TYPE TF-202 TAPE-IF CONVERTER

The CEI Types TF-102 and TF-202 Tape-IF Converters, all solid-state units, are designed to translate the output signal from a tape recorder up to 21.4 mc so that it can be demodulated by a unit such as the CEI Type IFD-201 IF Demodulator. They provide a data bandwidth of 1.3 mc when the input center frequency is 750 kc; however, any input center frequency between 100 kc and 1.4 mc may be used, but with a reduction in bandwidth directly proportional to how far the center frequency deviates from 750 kc. Response over the data bandwidth varies less than 2 db. A front-panel control permits maintaining the output frequency 21.4 mc for input center frequencies between 100 kc and 1.4 mc. Input signals of up to 10 volts rms can be accepted. The output level is up to 10 mv into a 50-ohm load, continuously variable by means of a front-panel control. A meter is provided to monitor the output level. In addition to the output to feed the demodulator unit, a second output is provided for attaching a signal monitor for visual monitoring of the output signal.

The TF-102 and TF-202 are electrically identical items in mechanically different packages. The TF-102 is constructed in a panel size of 3.5-inches high by 19-inches wide. The TF-202 is built in a half-rack size which has panel dimensions of 3.5-inches high and 8.0-inches wide. The TF-202 is designed to mount in an EF-101 single equipment frame or in an EF-201A dual equipment frame; see data sheet 725.50 for details on these frames. The associated demodulator units are covered in data sheet 741.50 while the IF-Tape Converters are presented in data sheet 433.50.

SPECIFICATIONS

Input Center Frequency	750 kc, nominal (see note)
Input Impedance	50 ohms, nominal
Input Level	0.5 to 10 volts, rms
Output Center Frequency	21.4 mc
Output Level	10 mv, nominal
Output Impedance	50 ohms, nominal
Data Bandwidth	100 kc to 1.4 mc

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Modulation Capability	Preserves modulation on input signal, consistent with data bandwidth
Harmonic Distortion	Less than 1.5% at 30% modulation
Local Oscillator Rejection	40 db, minimum
Image Rejection	40 db, minimum
Controls	Level set, output frequency, power switch
Type of Connectors	BNC
Power Input	115 vac, 50-400 cps
Power Consumption	5 watts, approximately
Weight	7 lbs., approximately
Dimensions	TF-202: 3.25-inches high, 7.9-inches wide, and 15.7-inches deep TF-102: 3.5-inches high, 19-inches wide, and 15-inches deep

NOTE: Second local oscillator is tunable by front panel control to allow a 21.4-mc output center frequency to be maintained from an input signal between 100 kc and 1.4 mc. Any input center frequency between 100 kc and 1.4 mc may therefore be used with a corresponding reduction in data bandwidth.

PRICE: TF-102 - $950.00
TF-202 - $900.00

FOB Rockville, Maryland. Taxes extra where applicable. Price and specifications subject to change without notice.

Technical Data

DATA SHEET 511.50 12/8/65

TYPES S-9901A AND S-9902A SPEAKER PANELS

TYPE S-9902A SHOWN

The CEI Speaker Panels were designed as companion units for the CEI line of receivers. They have also been used with other receiving systems, and as line monitors and playback monitors for multichannel tape recorder systems.

Through the use of a rectangular 2.5 inch by 10 inch speaker, all CEI speaker panels are 3-1/2 inches high and 19 inches wide requiring a minimum of rack space while still providing a high quality audio reproduction and response.

The types S-9901A and S-9902A are similar, each with an encapsulated input matching transformer of 600 ohms impedance. The S-9902A contains the additional feature of being able to switch to the output of any one of seven different receivers or to an OFF position. The switching has been designed so that unselected inputs are terminated in 600-ohm resistors. The signal level to a recorder or other device is therefore undisturbed when the speaker is connected across or removed from the line.

SPECIFICATIONS

Inputs	S-9901A: One S-9902A: Seven
Input Impedance	600 ohms
Input Connectors	Terminal Strip
Output Connectors	S-9901A: None S-9902A: Headphone jack
Maximum Input Level	4 watts
Response	200 cps to 10 kc at 3 db points
Speaker Size	2.5 inches by 10 inches
Panel Size	3.5 inches by 19 inches

PRICE: S-9901A: - $ 75.00
S-9902A: - $100.00

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Technical Data

DATA SHEET 512.50 12/8/65

TYPES S-9903D AND S-9908B SPEAKER PANELS

TYPE S-9903D SHOWN

The CEI Speaker Panels were designed as companion units for the CEI line of receivers. They have also been used with other receiving systems, and as line monitors and playback monitors for multichannel tape recorder systems.

Through the use of a rectangular 2.5 inch by 10 inch speaker, all CEI speaker panels are 3-1/2 inches high and 19 inches wide requiring a minimum of rack space while still providing a high quality audio reproduction and response.

The types S-9903D and S-9908B contain an integral, five-watt output, solid-state amplifier and power supply. Both of these units have a nominal input impedance of 10,000 ohms and are normally used to bridge rather than terminate the output of a receiver or line.

The type S-9903D is capable of selecting 1 of 7 different inputs while the type S-9908B is capable of selecting 1 of 8 different inputs, including a microphone input.

SPECIFICATIONS

Number of Inputs	S-9903D: Seven S-9908B: Seven plus microphone input
Input Impedance	10K ohms
Input Connectors	S-9903D: 7 BNC-type connectors S-9908B: 7 BNC-type connectors and jack for mike input
Output Connectors	S-9903D: Headphone jack S-9908B: Headphone jack and BNC monitor output
Maximum Input Level	7 volts
Output Power	5 watts, maximum
Amplifier Response	75 cps to 10 kc at 3 db points
Speaker Size	2.5 inches by 10 inches
Panel Size	3.5 inches by 19 inches
Power Requirements	115 vac, 50-400 cps, approximately 8 watts

PRICE: S-9903D - $160.00
S-9908B - $225.00

FOB Rockville, Maryland. Taxes extra where applicable. Price and specifications subject to change without notice.

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Technical Data

DATA SHEET 611.50 7/31/64

TYPE HFM-8 MULTICOUPLER

The CEI HFM-8 series Multicouplers provide optimum coupling between a single antenna and as many as eight receivers in the 2-30 mc frequency range. Compact in size (only 3.5-inches high), the HFM-8 provides a nominal gain of 8 db, a low noise figure of 10 db max., and high isolation between all outputs while keeping the intermodulation to a minimum. The use of Nuvistors keeps the power consumption at a minimum while providing high reliability. Quick change connectors are provided on the front panel of the type HFM-8 and on the rear apron of the HFM-8-1; BNC connectors on the front panel of the HFM-8-2 and on the rear apron of the HFM-8-3. The input and output impedance is normally supplied at 75 ohms, but other impedances can be provided.

SPECIFICATIONS

Frequency Range	2-30 mc, flat ±2 db
Input Impedance	75 ohms
Gain	8 db nominal
Noise Figure	10 db maximum
RF Connectors	Coaxial quick change (RCA dimensions) or BNC
Isolation between Outputs	50 db minimum
Isolation, Output to Input	60 db minimum
Output Impedance	75 ohms
Size	19 inches x 3.5 inches x 11 inches
Mounting	Standard 19-inch relay rack mount
Weight	8 lbs., approximately
Power	115/230 v, 50/60/400 cps, 32 watts

Price: $400.00

FOB Rockville, Maryland. Taxes extra where applicable. Price and specifications subject to change without notice.

Available Accessories:	High pass filter HPF-2 (Attenuates below 2 mc)	$25.00
	Coaxial Plug (Use with Models HFM-8 and HFM-8-1)	$ 5.00

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Technical Data

DATA SHEET 721.50

TYPE DA-1 DISTRIBUTION AMPLIFIER

The type DA-1 Distribution Amplifier is an all solid-state device which provides nine separate outputs from a common input video signal. Six of these nine outputs are identical data video outputs; a single control sets the level of all six data video outputs. The seventh output is an oscilloscope video output which is independent of any level controls. This output provides a signal which is at the level of the input signal (unity gain exists between the input and the oscilloscope video output). The remaining two outputs provide headset and loudspeaker audio sources. Each of these outputs has a front-panel level control. The unit has been conservatively designed for trouble-free operation over extended periods.

SPECIFICATIONS

Input Impedance	91-ohms or high impedance, selectable by switch on rear apron.
Input Level	5 volts peak-to-peak maximum
Input Connector	Type BNC, mounted on the rear apron.
Outputs	Nine total: six data video outputs, one oscilloscope video output, one loudspeaker audio output, and one headset audio output.
Data Video Outputs	
Impedance	91 ohms
Output Level	1.5 volt rms
Level Set	Screw driver adjustment recessed in the front panel. Simultaneously adjusts output level of all six data video outputs.

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Data Video Outputs - (Cont'd)	
Isolation	40 db minimum with respect to the input and to other outputs.
Bandwidth	50 cps to 1.5 mc, ± 0.5 db 30 cps to 2.0 mc, ± 1.5 db
Distortion	Total harmonic distortion of 0.5% with gain set at maximum.
Connector	Type BNC mounted on rear apron.
Oscilloscope Video Output	
Impedance	91 ohms, unbalanced
Output Level	Unity gain with respect to input.
Isolation	40 db minimum with respect to the input and to other outputs.
Bandwidth	50 cps to 1.5 mc, ± 0.5 db 30 cps to 2.0 mc, ± 1.5 db
Distortion	Total harmonic distortion of 0.5% with gain set at maximum.
Connector	Type BNC mounted on the rear apron.
Loudspeaker Audio Output	
Impedance	600 ohms, balanced or unbalanced
Output Level	100 milliwatts, with level set at maximum.
Level Set	Output level set by control located on front panel.
Bandwidth	200 cps to 15 kc, ± 1.5 db
Distortion	Total harmonic distortion of 10% maximum at maximum output.
Connector	Terminal strip mounted on rear apron.
Headset Audio Output	
Impedance	1,000 ohms, unbalanced
Output Level	10 mw, with level set at maximum.
Level Set	Output level set by control located on front panel.
Bandwidth	200 cps to 15 kc, ± 1.5 db
Distortion	Total harmonic distortion of 10% maximum at maximum output.
Connector	Standard telephone jack mounted on front panel.
Power Input	105 to 125 volts, 50-60 cps
Power Consumption	10 watts, approximately
Size	19-inches wide, 3.5-inches high and 12.75-inches deep.
Weight	9 lbs., approximately

PRICE: $1,200.00

FOB Rockville, Maryland. Taxes extra where applicable. Price and specifications subject to change without notice.

12/2/64

Technical Data

DATA SHEET 722.50

TYPE DRO-50 COUNTER

The Type DRO-50 Counter has been designed as a companion unit for the Hammarlund SP-600-( ) receiver which tunes from 0.54 to 54 mc. The counter provides a direct digital display of the frequency to which the receiver is tuned by counting the local oscillator frequency and automatically subtracting the intermediate frequency in use.

The 6-digit Nixie display continuously presents the receiver frequency with no visible flicker. The information is updated every 20 milliseconds, but only the final count is displayed. These features allow the counter to display the receiver frequency without interruption as the receiver is tuned or switched to a different band.

The receiver-counter combination provides a means for very accurate readout (±100 cps) of receiver tuning. This accurate readout allows precise logging of the frequency of an unknown signal. It also allows the receiver to be reliably pretuned when a transmission is expected on a specific frequency. In addition, the receiver can be tuned above or below a given frequency and then reset to within 100 cps of the original frequency. The readout is large, bright, and clear which tends to eliminate human error in reading the frequency dial on the receiver. Also, any drift of the receiver local oscillator will be immediately displayed.

The counter is extremely simple to operate; the only front-panel items are the off-on switch, a crystal oven lamp, and the display tubes. The DRO-50 has been designed using solid-state devices exclusively, except for the neon display tubes. The power consumption is therefore very low, averaging less than 23 watts.

A parts kit and modification instructions are included with the DRO-50 to modify the SP-600-( ) for use with the counter.

Counters of this design are also available to operate with other HF and VHF receivers having IF's such as 455 kc, 500 kc, 3.9 mc, and 21.4 mc.

We invite inquiries concerning the use of these counters with VHF and HF receivers.

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SPECIFICATIONS

Input Frequency Range	0.995 mc to 57.995 mc, for use with SP-600-( ) Receiver. Additional input frequency ranges available
Input Impedance	95 ohms, nominal, type BNC connector
Display	Six-digit decimal readout to the nearest 100 cycles
Accuracy	±100 cps (one count)
Stability	5 parts in 10^7 per week
Sampling	Display updated 50 times per second
Front-Panel Control	Power on-off switch
Warm-up Time	Less than 20 minutes from 0°C
Operating Temperature Range	0° to 60°C
Power Requirements	115/230 vac, 50-400 cps
Peak Power Consumption	Less than 35 watts (oven on)
Average Power Consumption	Less than 23 watts
Size	19-inches wide, 3.5-inches high, and 16.5-inches deep

PRICE: $2,500.00

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Technical Data

DATA SHEET 723.50

TYPE DRO-300 COUNTER

The type DRO-300 Counter has been designed as a companion unit for CEI VHF receivers which tune from 30 to 300 mc and have a 21.4-mc IF. The counter provides a direct digital display of the frequency to which the receiver is tuned by counting the local oscillator frequency and automatically subtracting the intermediate frequency.

The 6-digit Nixie display continuously presents the receiver frequency with no visible flicker. The information is updated every 20 milliseconds, but only the final count is displayed. These features allow the counter to display the receiver frequency without interruption as the receiver is tuned or switched to a different band.

The receiver-counter combination provides a means for very accurate readout (±1 kc) of receiver tuning. This accurate readout allows precise logging of the frequency of an unknown signal. It also allows the receiver to be reliably pretuned when a transmission is expected on a specific frequency. In addition, the receiver can be tuned above or below a given frequency and then reset to within 1 kc of the original frequency. The readout is large, bright, and clear which tends to eliminate human error in reading the frequency dial on the receiver. Also, any drift of the receiver local oscillator will be immediately displayed.

The counter is extremely simple to operate; the only front-panel items are the off-on switch, a crystal oven lamp, and the display tubes. The DRO-300 has been designed using solid-state devices exclusively, except for the neon display tubes. The power consumption is therefore very low, averaging only 23 watts.

Counters of this design are also available to operate with HF receivers having IF's such as 455 kc, 500 kc, and 3.9 mc. The accuracy of the display is then often increased to ±100 cps.

We invite inquiries concerning the use of these counters with VHF and HF receivers.

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SPECIFICATIONS

Input Frequency Range	51.4 mc to 321.4 mc; for receivers tuning 30-300 mc with 21.4 mc IF. Additional input frequency ranges available
Input Impedance	50 ohms, nominal, type BNC connector
Display	Six-digit decimal readout to the nearest kilocycle
Accuracy	±1 kc (one count)
Stability	5 parts in 10^7 per week
Input Level Required	50 millivolts minimum, 1 volt rms maximum
Sampling	Display updated 50 times per second
Front-Panel Control	Power on-off switch
Warm-up Time	Less than 20 minutes from cold start (0°C)
Operating Temperature Range	0° to 60°C
Power Requirements	115/230 vac, 50-400 cps
Peak Power Consumption	35 watts (oven on)
Average Power Consumption	23 watts
Size	19-inches wide, 3.5-inches high and 16.5-inches deep

PRICE: $2,800.00

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Technical Data

DATA SHEET 724.50

TYPE DM-4( ) DEMODULATOR

TYPE DM-4B SHOWN

The CEI Type DM-4( ) Demodulator is used in conjunction with several plug-in modules to provide AM, FM, CW, and Pulse reception from a 21.4-mc IF input signal. The DM-4( ) is completely transistorized with a self-contained power supply which provides all necessary operating voltages, including operating voltages for the plug-in modules. The DM-4( ) will accept four modules in any of the following arrangements: four IFD modules; three IFD modules and one AGC module; or three IFD modules and a noise silencer module.

There are ten different IFD modules available for use with the DM-4( ). These modules have bandwidths ranging from 5 kc to 8 mc; see data sheet 724.56. The AGC-BC/( ) Box Car AGC and the AGC-PS/( ) Pulse Stretching AGC modules are available for use and they are covered in data sheets 724.52 and 724.54. Information concerning the NS-101( ) Noise Silencer module may be found in data sheet 724.58.

The DM-4( ) Demodulator is normally used as an element of an RS-125-( ) Receiving System (data sheet 199.50). In such a system, the DM-4( ) receives the 21.4-mc IF output from a tuner and applies it to the plug-in modules. It provides five video and three audio output signals from the module selected for operation. The DM-4( ) also provides an AGC voltage which is furnished to control the gain of an associated tuner.

The DM-4 series Demodulators have been furnished without the front-panel speaker, and with special inputs and/or outputs to satisfy particular requirements; please inquire for further details. Also, a test module, module extension cable, and module storage panel are offered for use with the DM-4( ); see data sheet 724.60.

SPECIFICATIONS

Input Frequency	Operates from a 21.4-mc IF input
Input Bandwidth	±6 mc
Plug-in Modules	Accepts four simultaneously
Pre-detection Output	21.4-mc pre-detection signal from module in operation. Will produce 10 mv, min, into a 50-ohm load for input levels above AGC threshold.

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Audio Outputs	Three: Rear apron terminal strip, and front panel speaker and phone jack. When used, phone jack disables speaker.
Audio Output Level	100 mw, min, into a 600-ohm load
Audio Frequency Response	200 cps to 6 kc at 3-db points
Aural Enhancement	Pulse stretcher included in audio amplifier for aural enhancement of pulse signals. Pulse stretcher has a rise time of 0.1 μ seconds and a decay time of 80 μ seconds.
Tracking Video	0.5 volt rms into a 91-ohm load, with response from dc to 4 mc.
Aux. A-Scan Output	1 volt rms into 91-ohm load, with response from 10 cps to 4 mc.
High-Level Video Outputs	Three: Analysis, Recorder, and Tracking Video. Each provides 3.0 volt rms into a 91-ohm load, with response from 5 cps to 4 mc.
AGC Monitor Output	Delivers from 0 to -24 volts into a 10K load
Module Indicator Output	Provides 1-volt incremental steps into a 10K load to indicate module in use.
Tuner AGC Output	Delivers from 0 to -24 volts into a 10K load
Meters	Tuning and signal strength, operate from module in use
Input Power	105-125 volts, 48-62 cps
Power Consumption	20 watts, approximately, with four modules installed
Weight	25 lbs., approximately, with four modules installed
Over-all Size	5.25-inches high, 19-inches wide, and 18-inches deep

PRICE: $1,200.00

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Technical Data

DATA SHEET 724.52 6/3/65

TYPE AGC-BC/( ) BOX CAR AGC

TYPE AGC-BC/B SHOWN

The CEI Type AGC-BC/( ) Box Car AGC is a plug-in unit used with the DM-4( ) Demodulator. The AGC-BC/( ) is designed to automatically provide a sample-and-hold, peak-type AGC voltage from an incoming pulse video signal, or an averaged-type AGC voltage from an incoming AM or CW video signal. The unit derives these AGC voltages from a video input signal furnished by a different plug-in module.

The AGC-BC/( ) unit functions in module position 4 of the DM-4( ) Demodulator. With an AGC-BC/( ) module installed, the operator of the DM-4( ) can select an AGC voltage from the AGC-BC/( ) or from one of the other three plug-in modules. The AGC response time of the AGC-BC/( ) can be set for slow, medium or fast by a front-panel switch. A push-button switch has also been included on the front panel to allow the operator to manually override the sample-and-hold AGC and to recycle the unit.

Other special plug-in modules are described in data sheets 724.54 and 724.58. The plug-in IF modules are listed in data sheet 724.56 while the demodulator unit is covered in data sheet 724.50.

The AGC-BC/( ) features an all solid-state design. All necessary operating voltages for the unit are furnished by the associated DM-4( ) Demodulator.

SPECIFICATIONS

Types of Operation	Automatically provides special peak-type AGC from incoming pulse signals or average-type AGC from incoming AM or CW signals.
Dominant Filter Time Constants	Three: 0.8, 1.6, and 6.0 seconds, selectable by front-panel switch
Input Impedance	500 ohms, approximately
AGC Threshold Level	0.4 volts peak
AGC Voltage Gain	30, approximately

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AM Output Stability	The AM output signal from the associated IFD module will vary less than 3 db for signals above the AGC threshold level.
AGC Reset.	Front-panel push-button switch (Zero Order Dump) provided to instantaneously discharge AGC filter.
Input Power	+24 volts at 30 ma, max.; -24 volts at 10 ma, max.
Size	4.5-inches high, 2.25-inches wide, and 13-inches deep
Weight	2 lbs., approximately

PRICE: $1,200.00

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Technical Data

DATA SHEET 724.54 6/1/65

TYPE AGC-PS/( ) PULSE STRETCHING AGC

TYPE AGC-PS/B SHOWN

The CEI Type AGC-PS/( ) Pulse Stretching AGC is one of several plug-in modules used in conjunction with a type DM-4( ) Demodulator. This plug-in module automatically provides a peak-type AGC voltage from incoming pulse signals and an averaged-type AGC from CW signals. The unit derives these voltages from a video signal input supplied by associated plug-in modules. A front-panel switch has been included in the design to allow the operator to adjust the AGC response time to slow, medium, or fast. In addition, a front-panel, push-button switch allows the operator to quickly override the response time delay.

In a typical arrangement of equipment, the AGC-PS/( ) would be installed in a DM-4( ) Demodulator along with three plug-in IF modules. Under these conditions, the operator could select the AGC output from the AGC-PS/( ) module or the AGC output from an IF module.

Data sheets 724.52 and 724.58 describe two other special plug-in modules for use with a DM-4( ) Demodulator. The DM-4( ) is covered in data sheet 724.50; the associated plug-in IF modules are listed in data sheet 724.56.

The AGC-PS/( ) has been designed using solid-state components exclusively, providing a highly reliable unit. The associated DM-4( ) Demodulator supplies the operating voltages for the unit.

SPECIFICATIONS

Type of Operation	Automatically provides peak-type AGC from incoming pulse signals and average-type AGC from incoming AM and CW signals.
Incoming Pulse Range	58 to 20,000 pps
Dominant Filter Time Constants	Three: 1.9, 3.0, and 4.0 seconds, selectable by front-panel switch
Input Impedance	500 ohms, approximately

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Video Bandwidth	From dc to 4 mc
AGC Voltage Gain	Approximately 30
AGC Threshold Level	0.4 volts peak
AM Output Stability	The AM output signal from the associated IFD module will vary less than 2 db for signals above the AGC threshold level.
AGC Reset	Front-panel push-button switch (Zero Order Dump) provided to instantaneously discharge AGC filter.
Input Power	+24 volts at 7 ma, max.; -24 volts at 6 ma, max.
Size	4.5-inches high, 2.25-inches wide, and 13-inches deep
Weight	2 lbs., approximately

PRICE: $650.00

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Technical Data

DATA SHEET 724.56 6/2/65

IFD-SERIES IF DEMODULATORS

TYPE IFD-2000B SHOWN

The IFD-series plug-in modules are designed to operate in a DM-4( ) Demodulator. There are ten modules currently available, ranging in bandwidth from 5 kc to 8 mc. The modules are identified as the IFD-5( ), IFD-15( ), IFD-50( ), IFD-100( ), IFD-200( ), IFD-500( ), IFD-1000( ), IFD-2000( ), IFD-4000( ), and IFD-8000( ) respectively.

These modules provide AM, FM, and CW reception from an incoming 21.4-mc IF signal. They provide video outputs, an AGC monitor output, and a 21.4-mc pre-detection output which ultimately appear as outputs from the associated demodulator unit. A front-panel switch allows the operator to set the IFD modules in a manual gain mode, an internally-generated AGC mode, or in an externally-generated AGC mode. In the externally-generated mode, the gain of the IFD module will be controlled by a special AGC voltage furnished from an AGC-BC/( ) Box Car AGC module or from an AGC-PS/( ) Pulse Stretcher module (see data sheets 724.52 and 724.54).

As many as four of the IFD modules can operate in one DM-4( ) Demodulator as discussed in data sheet 724.50. All ten IFD modules feature an all-solid state design, high reliability, and low power consumption.

SPECIFICATIONS

Types of Reception	AM, FM, and CW
Input Center Frequency	21.4 mc
Bandwidth	IFD-5( ), 5 kc ±600 cps; IFD-15( ), 15 kc ±1.5 kc; IFD-50( ), 50 kc ±5 kc; IFD-100( ), 100 kc ±10 kc; IFD-200( ), 200 kc ±20 kc; IFD-500( ), 500 kc ±50 kc; IFD-1000( ), 1 mc ±100 kc; IFD-2000( ), 2 mc ±200 kc; IFD-4000( ), 4 mc ±400 kc; IFD-8000( ), 8 mc ±800 kc
Distortion	AM: 5%, maximum, when modulated 30% at 1-kc rate FM: 5%, maximum, when modulated at 1-kc rate with deviation corresponding to 1/5 of the IFD bandwidth

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Spurious Response	Response falls off smoothly to 60 db down without abrupt discontinuities or amplitude inversions
Input Impedance	50 ohms, nominal, VSWR 1.5 to 1 maximum
Types of Gain Control	Normal (AGC), tracking, or manual
Normal Gain Control	Internal AGC circuit maintains output level within 3 db over an input level range as follows: IFD-5( ), 25 μv to 25 mv; IFD-15( ), 40 μv to 40 mv; IFD-50( ), 75 μv to 75 mv; IFD-100( ), 110 μv to 0.1 v; IFD-200( ), 155 μv to 0.1 v; IFD-500( ), 250 μv to 0.1 v; IFD-1000( ), 350 μv to 0.1 v; IFD-2000( ), 500 μv to 0.1 v; IFD-4000( ), 700 mv to 0.1 v; IFD-8000( ), 1 mv to 0.1 v. The AGC will respond to signal variations up to 5 cycles and roll off at approximately 12 db per octave. The AGC will hold the second detector output level to approximately 1 vdc on CW signals.
Tracking Gain Control	Module gain controlled by an external high-performance, pulse-type AGC.
Manual Gain Control	A manual gain control is provided which will vary the gain from maximum to 60-db below maximum.
Stability with Normal (AGC) Gain Control	The center frequency will not vary more than ±10% or the bandwidth by more than ±5% over the AGC range.
AGC Voltage Gain	Approximately 30 db
FM Output Stability	Output varies less than 3 db over the AGC range
Beat Frequency Oscillator	Internal 21.4-mc BFO, adjustable ±5 kc from demodulator main chassis. BFO stable to 100 cycles per minute at constant temperature.
Video Output Bandwidth	Three, selectable by front-panel switch, which are functions of IF bandwidth.
Video Amplifier	Video amplifier will drive a 93-ohm load up to the maximum level of the video (AM or FM),
21.4-mc Pre-detection Output	20 mv, minimum, into a 50-ohm load for input levels above AGC threshold. Output exhibits all AGC characteristics.
Shape Factor (60 to 6 db)	3 to 1 for IFD-5( ) through IFD-100( ) and 5 to 1 for IFD-200( ) through IFD-8000( ).
Ripple within 3 db Bandwidth	±1 db, maximum
Input Power	+12 vdc and -12 vdc, supplied by DM-4( ) Demodulator
Size	4.5-inches high, 2.25-inches wide, and 13-inches deep
Weight	2.75 lbs., approximately

PRICES:

IFD-5 ( ), $800.00	IFD-15 ( ), $700.00	IFD-50 ( ), $700.00
IFD-100 ( ), $700.00	IFD-200 ( ), $500.00	IFD-500 ( ), $500.00
IFD-1000 ( ), $500.00	IFD-2000 ( ), $500.00	IFD-4000 ( ), $800.00
	IFD-8000 ( ), $800.00	

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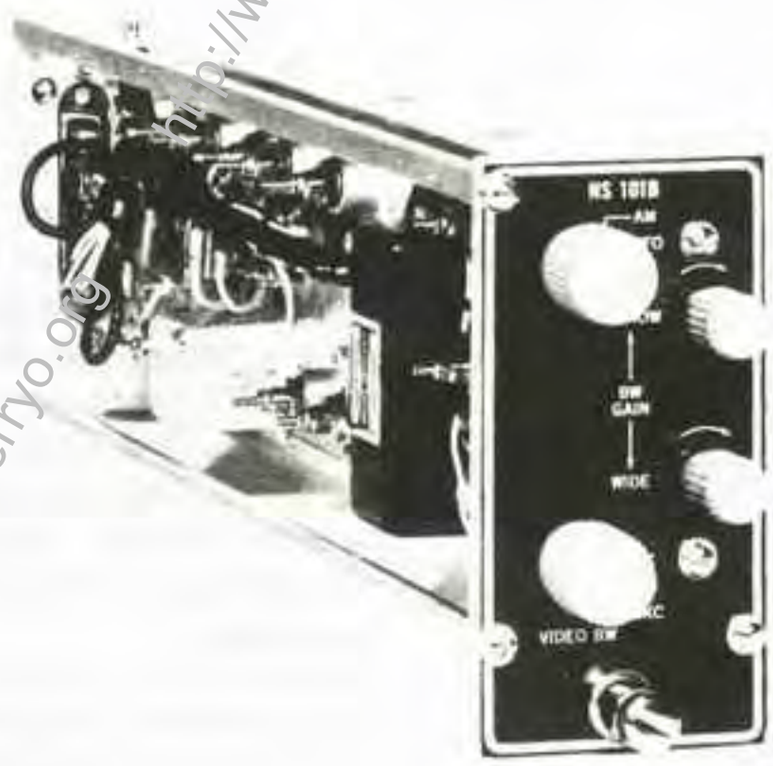
Technical Data

DATA SHEET 724.58 6/1/65

TYPE NS-101( ) NOISE SILENCER



TYPE NS-101B SHOWN

The CEI Type NS-101( ) Noise Silencer is a special plug-in module designed for use with a DM-4( ) Demodulator. The unit provides AM and CW reception from 21.4-mc center frequency input signals. It has the ability to remove pulse-type noise interference which is present on the amplitude of an incoming signal. The unit contains an internal 21.4-mc beat frequency oscillator for the reception of CW signals.

The NS-101( ) operates in module position 4 of a DM-4( ) Demodulator (see data sheet 724.50 for information on the demodulator). The NS-101( ) features high reliability and an all-solid-state design. A front-panel switch is provided to set the video bandwidth at 1 kc, 3 kc, or 10 kc. The 21.4-mc input signal and the necessary operating voltages for the NS-101( ) are supplied by the associated demodulator unit.

Other special plug-in modules are available for the DM-4( ); see data sheets 724.52 and 724.54 for details. The plug-in IF modules are described in data sheet 724.56.

SPECIFICATIONS

Types of Reception	AM and CW
Center Frequency	21.4 mc
Bandwidth	2-mc ±200 kc and 15 kc ±1.5 kc. The over-all bandwidth is 15 kc ±1.5 kc, with the 2-mc bandwidth section preceeding the limiters and the 15-kc bandwidth section.
Distortion	5%, maximum, when modulated 30% at 1 kc rate
Spurious Response	Response falls off smoothly to 60 db down without abrupt discontinuities or amplitude inversions.
Input Impedance	50 ohms; VSWR 1.5 to 1, maximum
Gain Control	Separate manual gain controls are provided for the 2-mc bandwidth section and the 15-kc bandwidth section.

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IF Amplifier	The gain of the 2-mc section of the IF amplifier is sufficient to produce full limiting on input signal levels of 200 μv. The associated manual gain control will vary the gain of this section from maximum to 20 db below maximum. The gain of the 15-kc section of the IF amplifier is sufficient to produce 1.0 volt of peak noise at the AM detector output when the noise input to the 15-kc crystal filter is fully limited. The associated manual gain control will vary the gain of this section from maximum to 30 db below maximum.
Beat Frequency Oscillator	Internal 21.4 mc BFO; adjustable ±10 kc from demodulator main chassis. The BFO is stable to 100 cycles per minute at a constant temperature.
Video Output Bandwidth	1 kc, 3 kc, or 10 kc selectable by front panel switch
Video Amplifier	Video amplifier will drive a 93-ohm load up to the maximum level of the video
Pre-detection Output	A 21.4-mc pre-detection output will provide 20 mv, minimum, into a 50-ohm load
Shape Factor (60 to 6 db)	3 to 1
Ripple Across Pass Band	2 db, maximum
Input Power	+12 vdc at 40 ma, maximum, and - 12 vdc at 30 ma, maximum
Size	4.5-inches high, 2.25-inches wide, and 13-inches deep
Weight	2.75 lbs., approximately

PRICE: $800.00

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Technical Data

DATA SHEET 724.60 6/18/65

DM-4( ) DEMODULATOR ACCESSORY ITEMS

The Types DTF-101( ) Test Module, EC-101( ) Extender Cable, and SP-101( ) Storage Panel are accessory items for use with the DM-4( ) Demodulator. These optional items facilitate servicing of the demodulator and the associated plug-in modules, and provide a convenient storage location for the plug-in modules not in use.

The Type DTF-101( ) Test Module is a plug-in unit designed for installation in a DM-4( ) Demodulator, in any of the four module positions. It is a servicing aid in checking various operational functions of the associated demodulator as follows. The power supply voltages in the demodulator and two control voltages can be measured, and the operation of the tuning meter can be checked. The three BNC connectors on the front-panel allow the multicoupler, predetection switch, and audio and video amplifiers to be tested. In addition, an AGC control provides a means of checking the AGC monitor amplifier, signal strength meter, squelch circuit, and the tuner AGC output.

DTF-101( ) TEST MODULE

EC-101( ) EXTENDER CABLE

The Type EC-101( ) Extender Cable is used to provide all connections between a DM-4( ) Demodulator and any plug-in unit. This accessory item permits servicing of a plug-in module external to the DM-4( ) main chassis but operating in a normal manner. The EC-101( ) will operate in any of the four module positions in the DM-4( ).

The Type SP-101( ) Storage Panel provides a convenient location to store the plug-in modules which are not in use. Since the modules are not equipped with covers, they could be damaged unless properly protected and stored while not in use. The SP-101( ) will mount up to six modules.

SP-101( ) STORAGE PANEL

PRICES: DTF-101 ( ), $225.00; EC-101 ( ), $150.00; SP-101 ( ), $125.00

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Technical Data

DATA SHEET 725.50 6/18/65

EQUIPMENT FRAMES

Various equipment frames are available which are used to install products in the CEI line in standard 19-inch racks. When a unit requires one of these frames for mounting, this fact is mentioned in the basic data sheet for the equipment. Special equipment frames and enclosures can be supplied to satisfy particular requirements, inquire for details.

The EF-101 single equipment frame and EF-201A dual equipment frame are designed to mount equipment which has a panel size of 3.25-inches high and 8.0-inches wide such as the SM-9302, TF-202, and IFD-201. The EF-201A is shown in the photograph below. Both frames have panel dimensions of 3.5-inches high by 19-inches wide.

CEI equipment with panel dimensions of 5.0-inches high and 4.5-inches wide is designed to mount in an EF-301, EF-302, or EF-303 equipment frame, which mount one, two, and three units respectively. The SM-4300 Signal Monitor is a typical equipment of this mechanical size. The EF-303 is shown in the photograph below; this equipment frame series has a panel size of 5.25-inches high by 19-inches wide.

The Types 415 Receiver, 416 Receiver, SM-4301 Signal Monitor, and other equipment with panel size of 6.75-inches high by 3.75-inches wide are designed to mount in the EF-401 through EF-404 equipment frames. These frames are used to install one through four units; the EF-402 is shown below. The panel size of the EF-401, EF-402, EF-403, and EF-404 is 7.0-inches high and 19-inches wide.

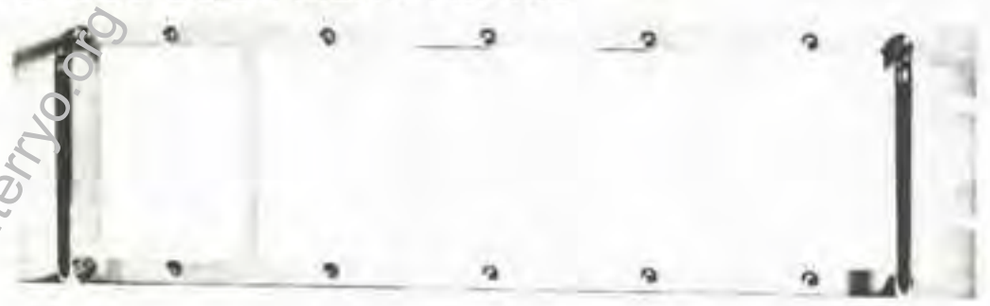
The EF-501 through EF-505 equipment frames are designed to mount type 402 Receivers and similar equipment with panel sizes of 5.0-inches high and 3.0-inches wide. The five versions available are used to mount one, two, three, four, or five units; the EF-505 is presented in the photograph below. All of these equipment frames have panel sizes of 5.25-inches high by 19-inches wide.

EF-201A EQUIPMENT FRAME

EF-303 EQUIPMENT FRAME

EF-402 EQUIPMENT FRAME

EF-505 EQUIPMENT FRAME



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PRICES: EF-101, $75.00; EF-201A, $100.00; EF-301 through EF-303, $75.00; EF-401 through EF-404, $75.00; EF-501 through EF-505, $25.00

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Technical Data

DATA SHEET 741.50 6/18/65

TYPES IFD-101 AND IFD-201 IF DEMODULATORS

TYPE IFD-201 IF DEMODULATOR

The CEI Types IFD-101 and IFD-201 IF Demodulators are designed to provide AM and FM detection of 21.4-mc input signals. These all-solid-state units are electrically identical but are constructed in mechanically different packages. The IFD-101 is furnished in a panel size of 3.5-inches high by 19 inches wide. The IFD-201 is constructed in a half-rack size which has panel dimensions of 3.25-inches high and 8.0-inches wide. The IFD-201 mounts in an EF-101 single equipment frame or an EF-201A dual equipment frame (see data sheet 725.50).

These demodulators are companion units to the TF-102 and TF-202 Tape-IF Converter which receive signals from a wideband recorder and translate the signals to 21.4 mc. A Tape-IF Converter and an IF Demodulator therefore comprise a tape demodulator system (see data sheets 433.50 and 462.50).

The IFD-101 and IFD-201 have four IF bandwidths: 10 kc, 50 kc, 300 kc, and 1 mc. A front-panel switch is used to select the desired bandwidth. Both the AM detector and the FM discriminator in the selected IF strip operate simultaneously, and separate video amplifiers for the discriminator and detector outputs are provided. These simultaneously-operating FM video and AM video outputs appear in BNC connectors on the rear apron. Tuning and signal strength have been provided as operating aids.

SPECIFICATIONS

Nominal Input Level	10 mv
Input Frequency	21.4 mc
Input Impedance	50 ohms
IF Bandwidths	10 kc, 50 kc, 300 kc, and 1 mc, front-panel selectable
Outputs	Simultaneous AM and FM video
Output Impedances	91 ohms, standard (50 ohms or 75 ohms, optional)
Output Level	1 volt, rms
Gain Control Range	±6 db from nominal input level
Meters	Signal strength and tuning

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Controls	AM output level, FM output level, IF Gain, Bandwidth switch, Power switch
Input Power	115 vac, 50-400 cps
Power Consumption	Less than 5 watts
Weight	8.5 lbs., approximately
Dimensions	IFD-201: 3.25-inches high, 7.9-inches wide, and 15.7-inches deep IFD-101: 3.5-inches high, 19-inches wide, and 15-inches deep

PRICE: $1000.00

FOB Rockville, Maryland. Taxes extra where applicable. Price and specifications subject to change without notice.

Technical Data

DATA SHEET 761.50 1/11/66

TYPES MD-50 AND MD-100 AUTOSCANS

TYPE MD-100 AUTOSCAN

The CEI Types MD-50 and MD-100 Autoscan units are used to externally drive the tuning knobs on an associated receiver. The MD-100 contains two channels; each channel controls one driving pulley. The MD-100 is therefore designed to operate with a receiver which has two tuning knobs and where only one tuning knob is used at a time. The MD-50 is a single channel unit which is used with a receiver which contains a single tuning knob. Both units have been constructed in a 3.5-inch high package which can be mounted directly above or below the associated receiver.

Features of these Autoscans include independent variable speed control and sector scan for each channel. By means of front-panel controls, the operator can adjust the rotational speed of either receiver tuning knob from about 0.6 rps to about 6 rps. (On a CEI UHF receiver, for example, 0.6 rps means the band is tuned in about 70 seconds while 6 rps means the band is tuned in about 7 seconds). Indicator lamps have been provided on the front panel to designate whether the receiver is being swept up or down in frequency. The sector scan feature allows the operator to preset the upper and lower limits of scan. This sector can be set to include any portion of the band. The MD-50 and the MD-100 can be set to a manual mode if desired, allowing the operator to tune the receiver manually in a conventional fashion.

SPECIFICATIONS
(applicable to either channel of the MD-100)

Type of Operation	Manual, or automatic with variable speed and sector scan
Driving Speed	Variable by front-panel control from about 0.6 rps to about 6 rps of receiver tuning shaft
Maximum Sector Scan	Full band of receiver
Minimum Sector Scan	Varies with driving speed from about 30° to 180° of rotation of receiver tuning knob
Input Required	Analog voltage of receiver dial position (from potentiometer linked to receiver tuning mechanism)

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Front Panel Indicators	Sweep up indicator; Sweep down indicator
Front Panel Controls	Sweep rate control, upper sweep limit control, lower sweep limit control, and scan mode switch
Power Requirements	115 volts, 60 cps
Over-all Size.	3.5-inches high, 19-inches wide, and 15.5-inches deep

PRICE: MD-50 - $ 850.00
MD-100 - $1,500.00

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Technical Data

DATA SHEET 763.50

TYPE MP-101 METER PANEL

The CEI Type MP-101 Meter Panel is an accessory device which is used to adapt receivers having a 21.4-mc IF output for use as a selective, transfer voltmeter. The MP-101 consists of an IF amplifier/driver, an AM detector, and provisions for metering a carrier level at the AM detector output. Either peak or average carrier level indication can be selected by a front-panel switch. For observing the amplitude of pulse signals, a video amplifier is provided from the output of the AM detector. In order to display pulse signals with a minimum amount of baseline noise, a variable slide-back-gate feature has been included in the video amplifier.

Although the MP-101 was designed to operate with many different receivers which include a 21.4-mc IF output, CEI has specially modified an RS-111-1B Receiving System (30 mc to 1000 mc) which offers additional advantages when used with the MP-101. The modified unit is designated the RS-111-1B-4 and differs from the RS-111-1B as follows:

(1) The bandwidth of the wideband IF amplifier has been increased from 2 mc to 3.5 mc, and manual gain control capability has been added. This allows the wideband IF amplifier to receive pulse-type signals.

(2) A 21.4-mc IF output and manual gain control capability in the FM mode have been added to the 20/75/300-kc bandwidth IF amplifier. These changes prepare the narrowband IF amplifier to operate with the MP-101 Meter Panel.

We invite inquiries concerning the use of the MP-101 with the RS-111-1B-4 and with many other CEI receivers.

SPECIFICATIONS

Input Center Frequency	21.4 mc
Input Level Range	10 mv to 300 mv
IF Bandwidth	1 mc
Input Impedance	50-ohms, nominal, type BNC connector
Video Output	2 volts, rms, into a 50-ohm load

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Front-Panel Meter	Two scales: 0 to 10 μv in 100 increments, and db above 1 μv in 1 db steps
Front-Panel Controls	Meter Response - Peak/Average; Meter Zero; Slide Back Gate Adjust; Video Gain; Power Switch and Indicator
Power Requirements	115/230 volts, 50-400 cps, 4 watts
Size	3.5-inches high, 19-inches wide, and 12-inches deep
Weight	9 lbs.

PRICE: $750.00

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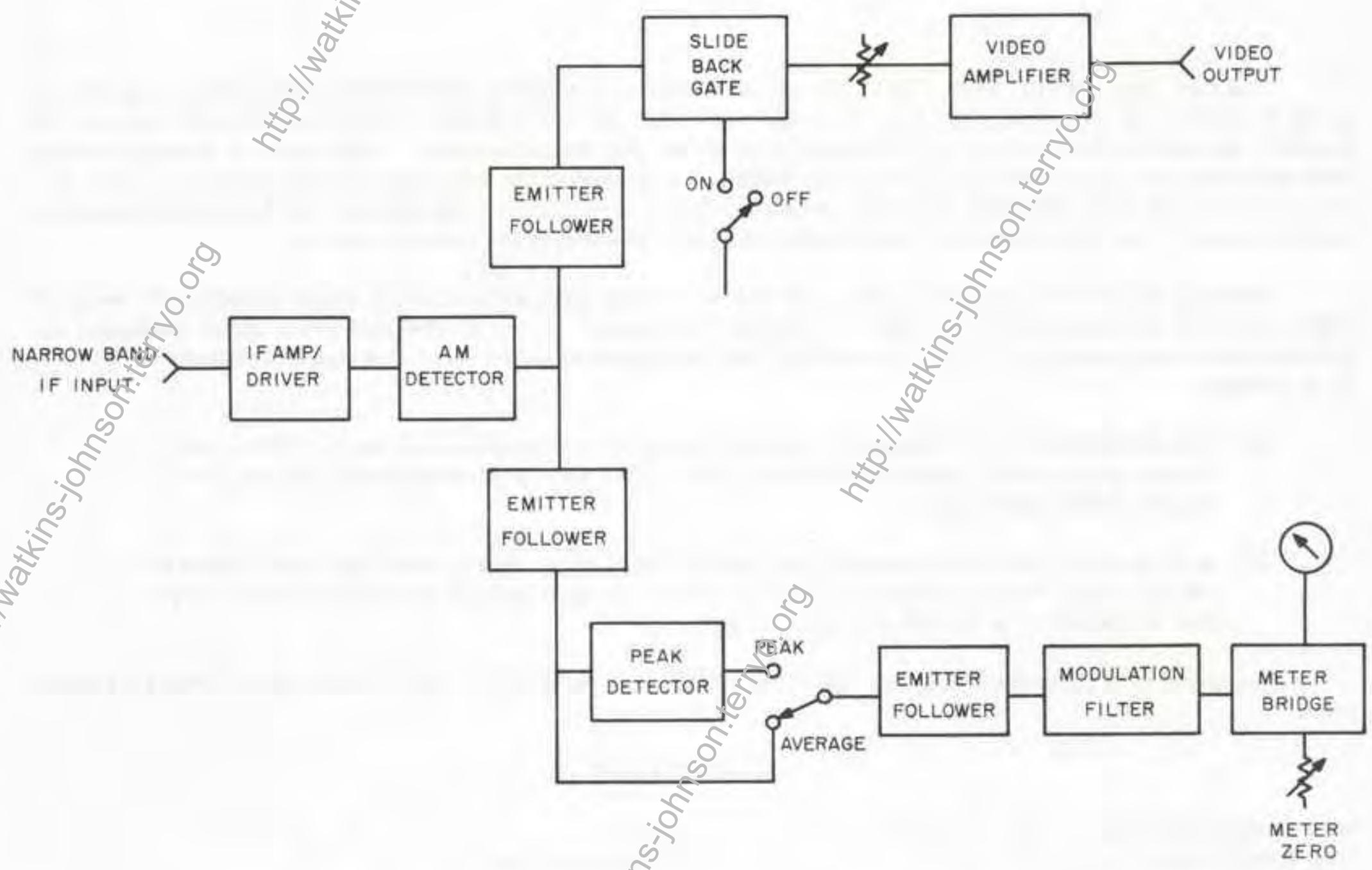

Type MP-101 Meter Panel, Functional Block Diagram

Technical Data

DATA SHEET 781.50

TYPE SFM-1 STANDARD FREQUENCY MULTIPLIER

The SFM-1 Standard Frequency Multiplier is designed to take a 1-mc standard reference frequency signal and multiply it up to 50, 100, 500 and 1000 mc. This provides a VHF and UHF signal source with the same stability and accuracy as the reference source. All four output signals are available simultaneously at the rear panel.

SPECIFICATIONS

Input Frequency	1 mc at 1 volt rms
Input Impedance	50 Ω, nominal
Output Frequencies	50, 100, 500 and 1000 mc
Output Amplitude	1 volt rms, minimum, all outputs
Output Impedance	50 Ω, nominal
Spurious Output	Greater than 30 db down from desired output frequency
Power Required	115 vac, 50/400 cps, 20 watts
Size	19 inches x 3-1/2 inches x 14 inches, rack mounted

PRICE $1,060.00

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Technical Data

DATA SHEET 785.50 6/18/65

SWITCHING PANELS

This data sheet on switching panels is intended only to illustrate a cross section of these items which are available. A switching panel can often add increased system versatility and provide an improvement in operating efficiency. Our representatives will gladly assist in the selection of a switching panel to satisfy particular requirements; please inquire for details.

The Type SWP-101 Switching Panel was used in an RS-125-( ) Receiving System (see data sheet 199.50) to perform various switching functions between three RF tuners and associated equipment. One of the front-panel switches connected the input of the system signal monitor to the output of the tuner desired. The other front-panel switch provided common 21.4-mc outputs from the 21.4-mc outputs of the tuner in operation and also provided a common local oscillator output from the tuner in operation.

SWP-101 SWITCHING PANEL

SWP-104 SWITCHING PANEL

The Type SWP-104 Switching Panel was also used in an RS-125-( ) Receiving System. It switched the 21.4-mc output of the tuner in operation to the input of the system demodulator. A second switch connected the signal monitor to the output of the desired system tuner.

The SWP-602 is a general purpose switching panel, designed to mount in an EF-101 or EF-201A Equipment Frame. This unit contains a six-position coaxial switch, providing a common output from up to six separate inputs. In a typical installation, the SWP-602 and a signal monitor (see data sheets 351.50, 353.50, 355.50, 356.50) are installed in an EF-201A Equipment Frame. The signal monitor can then be used in association with up to six receivers.

SWP-602 SWITCHING PANEL

PRICES: SWP-101, $325.00
SWP-104, $300.00
SWP-602, $150.00

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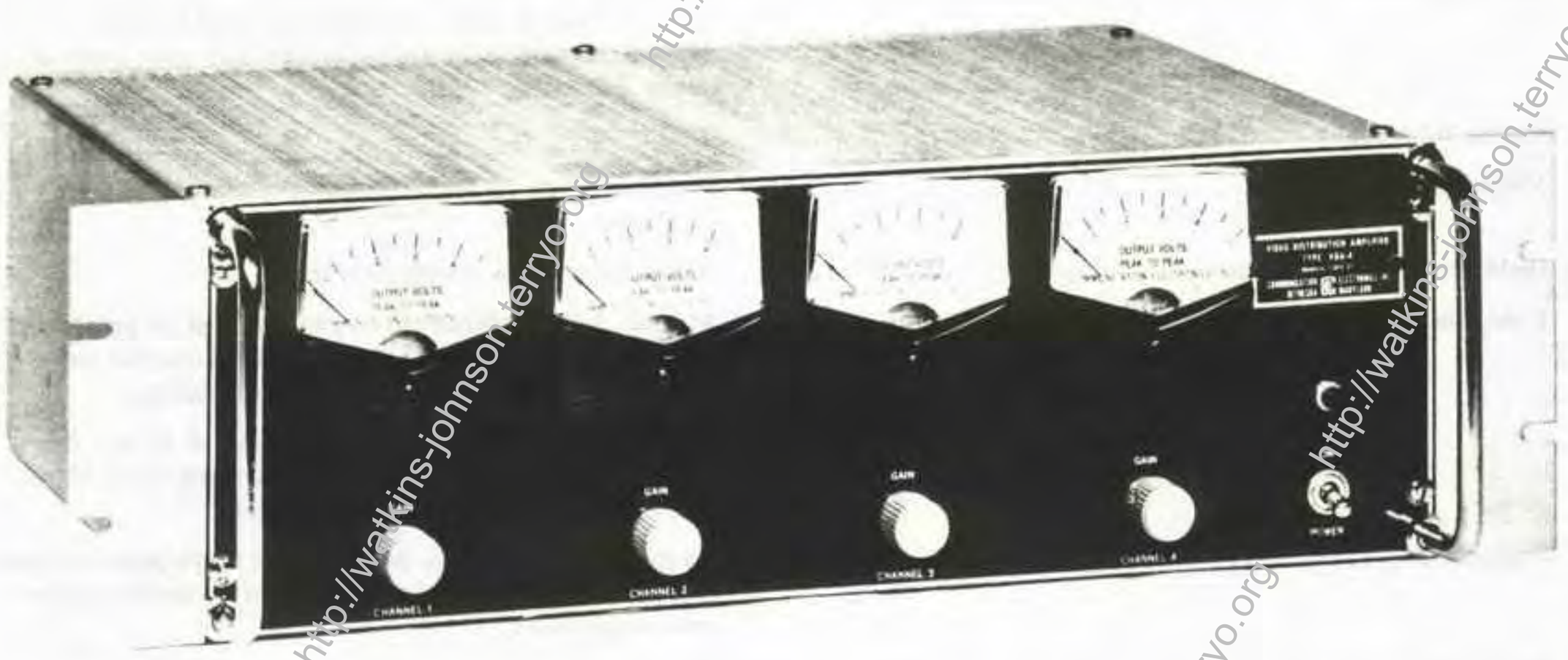
Technical Data

DATA SHEET 791.50

TYPE VDA-4 VIDEO DISTRIBUTION AMPLIFIER



The VDA-4 Video Distribution Amplifier was designed for insertion in a long video transmission line where the source has either high impedance or insufficient power driving capability. It contains four identical channels, each providing up to 20 db of gain throughout the bandwidth of 10 cps to 1.5 mc. Each channel is constructed as an individual plug-in module. All units are designed using solid state components to reduce size, heat and power requirements. Up to three amplifiers can be cascaded to give additional gain for small signal sources.

TYPICAL APPLICATIONS

1. Driving several loads from a single source.
2. Matching a high-impedance source, such as a tape recorder or demodulator to a low-impedance load, such as a computer.
3. Raising the power level of the receiver video output to drive a long line.

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SPECIFICATIONS

Number of Channels	4 (identical)
Input Impedance	Selectable by switch on rear panel. 75 Ω and 10K to 25K, depending on gain control setting. Shunt capacitance varies with gain control, never exceeding 70 pf.
Output Impedance	75 Ω ±30%
Voltage Gain	Variable up to 20 db, minimum, when loaded by a 75 Ω load.
Isolation Between Channels	60 db, minimum, using 75 Ω input
Frequency Response	Flat ±1.5 db, referenced to response at 10 kc, from 10 cps to 1 mc, when loaded by a 75 Ω coaxial cable terminated by its characteristic impedance.
	Flat ±1.5 db, referenced to response at 10 kc, from 10 cps to 100 kc minimum, when driving up to 100 feet of unterminated RG-58/U cable.
Distortion	No more than 2% when delivering 4 volts peak-to-peak into a 75 Ω coaxial cable terminated by its characteristic impedance.
Power Output	Minimum of 4 volts peak-to-peak when terminated by 75 Ω load.
Stability	Each amplifier is stable for loads varying from 35 Ω to open circuit with any phase angle from zero to 360°.
Meter Circuit	Meter reads across output and indicates from 0 to 5 volts peak-to-peak.
Dimensions	5.25-inches high, 19-inches wide, and 14-inches deep.
Weight	15 lbs., approximately
Power Requirement	115 vac, 50-400 cps
Power Consumption	19 watts, approximately

PRICE $1,000.00

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Technical Data

DATA SHEET 792.50

TYPE VOR-6 VOICE OPERATED RELAY

The Type VOR-6 Voice Operated Relay is a six-channel, solid-state device which provides one contact closure and one contact release per channel as a function of an incoming audio signal in the frequency range of 300 cps to 3 kc. An input filter is used to restrict the actuating frequencies to those in the voice range, thereby reducing the possibility of undesired operation on noise pulses.

The VOR function remains in operation for a specified period of time after the actuating signal has been removed; this period is adjustable in four steps by means of a front panel mounted switch. A combination light and pushbutton switch has been included for each channel to provide a visual indication of VOR action and also to enable momentary disabling of the time delay. A sensitivity control has been provided so that the operating threshold may be varied.

All channels are powered from a common power supply mounted on the main chassis. A phone jack on the front panel is connected in parallel with the audio input and can be used to monitor the input or as an auxiliary input point.

SPECIFICATIONS

Number of Channels	6
Sensitivity	Adjustable by front panel control to operate from input signal levels of 1 volt rms or greater
Frequency Range	Responds to signals in the range of 300 cps to 3 kc
VOR Delay	Return of relay to unactuated state after signal has been removed can be delayed for 5, 10, 15, or 20 seconds, as determined by front-panel switch setting
Output (Each Channel)	2 sets of relay contacts rated at 115 vac, 5 amperes
Power Input	115 vac, 50-400 cps
Size	3.5 inches x 19 inches x 17 inches
Weight	Approximately 20 lbs

PRICE: $815.00

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