Obsolete

1961

CATALOG

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Vitro ELECTRONICS
A DIVISION OF VITRO CORPORATION OF AMERICA
PRODUCERS OF NEMS-CLARKE EQUIPMENT
919 JESUP-BLAIR DRIVE / SILVER SPRING, MARYLAND

1961 CATALOG

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A DIVISION OF VITRO CORPORATION OF AMERICA

PRODUCERS OF **NEMS-CLARKE** EQUIPMENT

919 JESUP-BLAIR DRIVE / SILVER SPRING, MARYLAND

SALES REPRESENTATIVES

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Electronics Division
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(Canada)
ELECTROMECHANICAL PRODUCTS
Markham Road, Agincourt
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(Hawaii)
RADIO-TV CORPORATION, LTD.
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Honolulu, Hawaii

Export Representative —
TELESCO INTERNATIONAL CORPORATION
Room 1301
121 Madison Avenue
New York 16, New York

WEST COAST SALES AND SERVICE
2301 Pontius Avenue
Los Angeles 64, California

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Vitro Electronics is pleased to present its **1961 CATALOG.** The publication of this comprehensive document not only lists the equipment available for purchase, but also lends insight to our related experience in designing and producing production run equipment and specially modifying precise electronic instrumentation.

The latter half of 1960 saw the emergence of Vitro Electronics from its former trade name Nems-Clarke Company, a Division of the Vitro Corporation of America. We will continue to manufacture the excellent Nems-Clarke equipment and in addition, Vitro Electronics will creatively expand toward a diversified product line and seek to enlarge its varied electronics systems management capabilities.

Before broadening this particular discussion to include systems management, perhaps the long and successful history of our company should be elaborated upon in greater detail.

Vitro Electronics and its corporate predecessors have for the past 60 years manufactured electrical apparatus. In February 1899, the original corporation, called National Electrical Supply Company, was incorporated.

When radio communication was in its infancy, this company developed transmitters and receivers under Signal Corps and Navy contracts. The oldest order of which we have a copy is for a transmitter-receiver for the Signal Corps and is dated April 24, 1910. The company archives, however, contain a photograph of a transmitter built for the Navy in 1909. This was our entry into the field of electronics. Hundreds of receivers, transmitters and high-frequency generators were built for the Navy and other branches of the Service during World War I. Between the two world wars the company continued as a prime contractor to various branches of the Service, building a great variety of communications and electronic equipment. The corporate name was changed in 1937 to National Electrical Machine Shops, Inc., better known as NEMS.

In 1951, Clarke Instrument Corporation, a firm engaged in the design and development of electronics equipment, was merged with NEMS. For several years Clarke Instrument continued as a division of the company, operating primarily for the development of new proprietary items in the field of electronics. In January 1955, the name of the company was changed to Nems-Clarke, Incorporated. In September 1957, Nems-Clarke became an operating division of Vitro Corporation of America. Since 1955 this company has undergone a transition from predominantly contract manufacturing to engineering development and manufacture of these developments. Our engineering staff has gradually expanded on a planned and sound basis. As a result we now have engineers second to none in their field. We are dedicated to a continued sound yet rapid expansion of our engineering staff, both in numbers and diverse ability. This will permit us to provide even greater service to our many valued customers who look to us for the complete package of product development and manufacture.

We are the oldest company in this country with a continuous history of manufacturing in electronics. The addition of extremely capable development engineering ability to our long manufacturing experience provides the ability to offer outstanding equipment in our proprietary product line and complete service on contract engineering and manufacturing.

The purpose of this catalog is to present as complete a picture as possible of our plant and facilities and to introduce to you our proprietary products now so widely used in the broadcasting, telemetering, photography, communication, medical electronics, and special equipment areas.

We extend a cordial invitation to you to visit us so that you may see at first hand one of the most complete operations in the industry for the development and manufacture of complex electronic equipment.

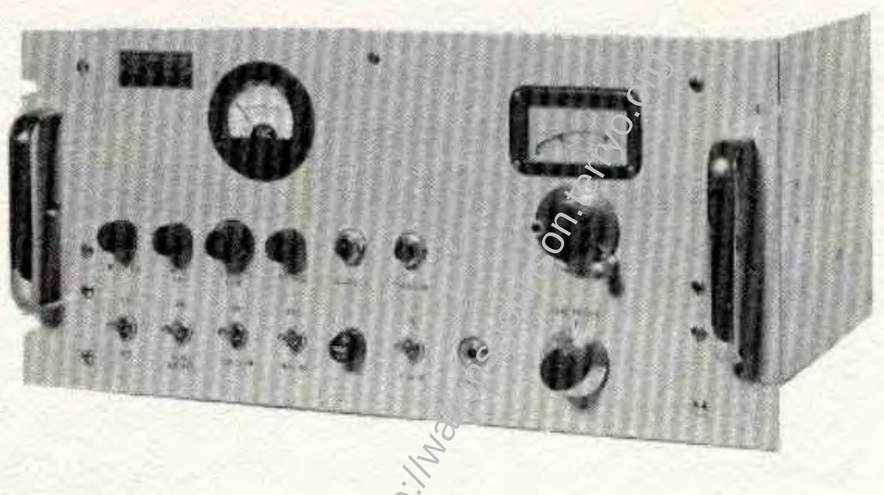
President

Vitro Electronics established a well defined dynamic pattern during the 1960-61 period. It was during this time frame that Vitro Electronics energetically pursued the scheduling of electronic subsystems and systems programs in order to effectively present technological advancements to the defense and industrial complex. These advancements and knowledge were thus available in a concentrated form for application to our defense and space posture. We established a West Coast Sales and Service facility to establish and expand our interests there.

Vitro Electronics played a vital and discerning role in many of our space programs. On an accelerated schedule we designed and delivered the receivers, preamplifiers, diversity combiners, spectrum display units, variable frequency oscillators and other electronic equipment for our man-in-space program MERCURY.

Under the auspices of Johns Hopkins University, Vitro designed and produced the 2501 doppler receiver and associated preamplifiers for the TRANSIT Satellite program. The performance and reliability of this equipment is such, that in all the Applied Physics Laboratories manned stations, this equipment operates without any backup support.

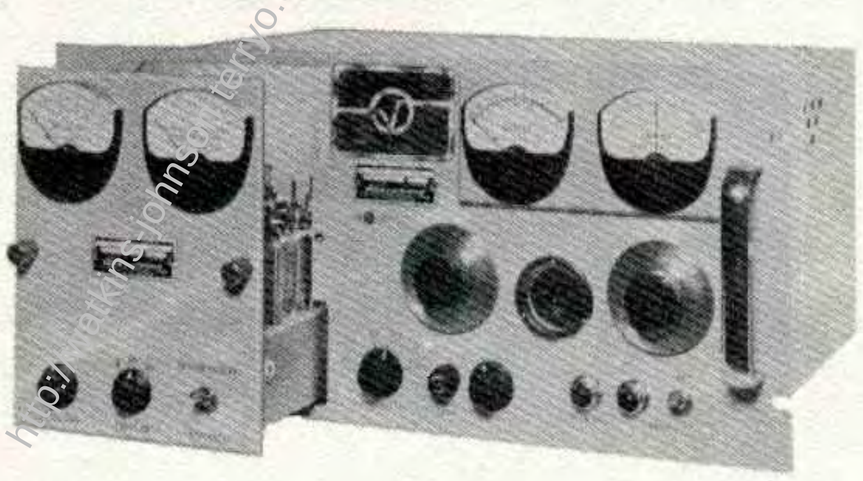
For the successful DISCOVERER program, we designed the diversity combiner which had such a large and necessary responsibility in effecting the first recovery of the ejected capsule.



Nems-Clarke 2501 Receiver

As the space search develops, Vitro Electronics is again providing key equipment. For CENTAUR we designed the Multiple Bandwidth Telemetry Receiver, the 1455. A receiver that covers the 100kc to 1.5mc bandwidth.

At both the Atlantic Missile Range and the Pacific Missile Range, you will find that over ninety-five percent of the receiver rack space is occupied by Nems-Clarke receivers, just another representation of the dependability placed in us by our defense customers.

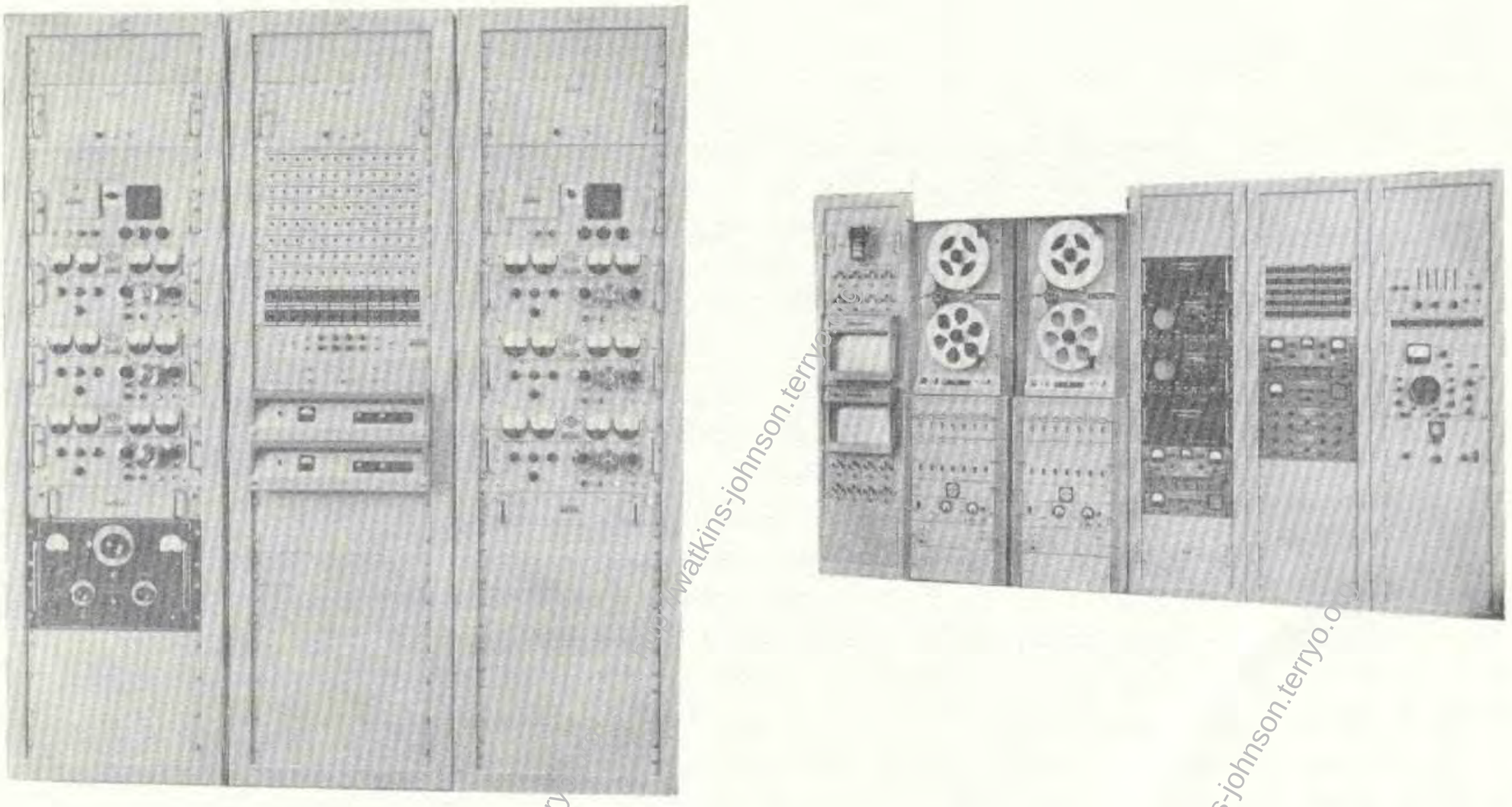


Nems-Clarke 1455 Telemetry Receiver

Requests were placed on Vitro Electronics during this period for systems ranging from a singular receiver system comprised of a basic four receivers up to entire roomfuls of telemetry equipment. These systems were not only designed by Vitro engineers, but were also installed in their respective facilities under the watchful and guiding hand of Vitro personnel.

The 1960-61 period saw the development and instrumenting of many down range instrumentation ships. Both the US Navy and the US Air Force invited Vitro Electronics to administer its technical skill in not only specifying the exact needs of these ships but also in designing the systems, manufacturing or procuring necessary equipment for the systems, and supervising the installation and checkout of equipment. As examples, Vitro Electronics supplied the complete RF system for the PMR Ships, Knox and Niantic Victory. For the Atlantic Missile Range MARS program, we proposed a complete telemetry package from antenna through data recording and display.

As we seek relentlessly to improve and provide, and as our country streamlines its needs, Vitro Electronics stands ready to do its share.



Nems-Clarke 1400-1 Receiver Telemetry System as installed on the Pacific Missile Range Instrumentation Ships Knox Victory and Niantic Victory

Not only in the defense posture do we perform exceptionally well, but also in the designing and provisioning of vital equipment for the Federal Aviation Agency. We furnish a tremendous amount of electronic gear for airports; equipment necessary to aid commercial and military aircraft in arriving safely at their destination.

We have made long and proud strides in the medical electronics department; our PULSARC and ZENARC, high intensity light sources for microscopy and photomicrography, have been accepted with alacrity by scientists and doctors across the land. Also in the medical line is our Air Particle Sampler. This very important instrument is used to collect radioactive particles from the air while measuring the volume of air from which the radioactive particles were extracted.

Within the realm of commercial photography, Vitro Electronics is proud of its Megalume light equipment. Although this particular area is highly competitive, we find that this equipment is being produced in ever-increasing quantities.

As you peruse this catalog, you will find many items that will be of interest whether you be military or civilian. We have a strong line of electromechanical instruments that might appeal to your specific need.

Our precise electronic equipment and our other products are displayed graphically for your attention; think not of only the exactness of the individual equipment, but be more aware of the technical and planning skill associated with the manufacture of this equipment.

Precision Electronics since 1909

Vitro ELECTRONICS

A DIVISION OF VITRO CORPORATION OF AMERICA

PRODUCERS OF NEMS-CLARKE EQUIPMENT

919 JESUP-BLAIR DRIVE / SILVER SPRING, MARYLAND

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Communications Equipment

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Vitro

Vitro Electronics Producers of Nems-Clarke equipment, is a division of the Vitro Corporation of America.

The various sister divisions of Vitro Electronics are pre-eminent in their specialized field of endeavor.

VITRO LABORATORIES

This Division is the largest in the Corporation in number of employees with approximately 2400 in three principal locations: Silver Spring, Maryland, West Orange, New Jersey and Eglin Air Force Base, Florida. It occupies laboratory space of about 137,000 square feet. Contracts are with all branches of the armed forces and industry.

Silver Spring Laboratory now occupies a fine new facility with over 1,400 personnel and 104,000 square feet of space. It is devoted chiefly to physical research and development in ordnance and related fields, including rocket propulsion, guided missile systems, torpedoes, directors, computers, mines, fire control, underwater acoustics, countermeasures and special weapons. The Laboratory is prominently known for its work on the Polaris Program.

West Orange Laboratory is engaged in chemical, electronic and physical research; process, instrument and equipment development; pilot plant operation; and electromechanical prototype fabrication. Chemical research is highlighted by radioactive waste treatment, radioisotope application, high energy fuels, nuclear processes, gas detection, rare metals technology and surface coatings. Research employing ultra-high temperature techniques is directed both toward chemical processes and materials testing. Electromechanical research is conducted in the fields of operations analysis; systems analysis and synthesis; range instrumentation; analog-to-digital converters; and data processing equipment.

Vitro Weapons Services at Eglin operates extensive and highly technical facilities for Air Force armament testing. Engineers and physicists are instrumenting missile, gunnery bombing and fire control projects. Technicians operate and maintain an elaborate range system, radars and electronic space-time data measuring systems employing cameras, phototheodolites, communications and timing equipment. They maintain digital computers and other test data processing equipment.

VITRO ENGINEERING COMPANY

Vitro Engineering Company specializes in design, construction and operation of advanced facilities for government and industry in the fields of nuclear energy, chemical processing, extractive metallurgy and defense.

In addition to typical architect-engineering services, Vitro Engineering regularly furnishes management, development, procurement, constructions, startup, and operational services in support of programs requiring diverse engineering skills.

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During the past 17 years, Vitro has furnished the design for the construction of over one billion dollars of advanced facilities. While many of these jobs have had constructed values in excess of $100 million, through its unique project system, Vitro can focus efficiently its diverse engineering skills in the design of pilot and production plants whose value is under $1 million.

Major areas of specialization include facilities for chemical processing, extractive metallurgy, nuclear processes, conventional and nuclear power; test ranges and missile launching facilities; advanced laboratory facilities; radiological facilities; extremes of pressure, temperature, and corrosion; handling of radioactive and noxious materials; chemical separations; problems of accelerated scale-up, and technical reports.

Vitro's work load is equally divided between industrial and government work. Current major assignments include the development of standard plans for an advanced missile base, a 275,000kw nuclear power plant, a 575,000 ton per year combined fertilizer-heavy water plant, modernization of a sugar refinery. Current consultancies include major utilities, manufacturers, universities, foreign governments, aircraft and chemical companies, the Department of Defense and the Atomic Energy Commission.

VITRO CHEMICAL COMPANY

Vitro Chemical Company, formerly Heavy Minerals Co., consists of a Rare Earth Division (Chattanooga Plant), and a Uranium Division, formerly Vitro Uranium Company (Salt Lake Plant). It produces uranium concentrate, thorium, rare earths and rare metal chemicals for sale to government and industry. It operates plant facilities at Salt Lake City, Utah, and Chattanooga, Tenn.

INTERNATIONAL GROUP

Vitro's international operations include Vitro International, a division, and Vitro Italiana, S.p.A., a wholly owned Italian subsidiary. Offices are maintained in Geneva, Switzerland; Milan, Italy; and an office in Bombay, India, was opened in early 1960.

International operations continued to expand in the field of design, engineering and construction of nuclear and process facilities. Five projects are now active in Italy and India.

Vitro International negotiated with the Government of India for the design, with technical assistance from Vitro Engineering Company, of a $4 million high level radiation laboratory. Negotiations were successfully concluded in early 1960 and led to the establishment of an operating office in Bombay. This laboratory, to be located at Trombay, the Indian Atomic Energy Department nuclear center, will be one of the largest integrated radioactive research facilities in the world. In the weapons systems fields, Vitro International is providing technical and liaison support to the Vitro Laboratories under its contract for the adaptation of the Terrier missile system to the Italian cruiser Garibaldi.

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PRICING INFORMATION

All equipment and prices quoted are F.O.B. Silver Spring, Maryland unless otherwise noted.

Prices are subject to change without notice.

Federal, State and Local Taxes
Extra Where Applicable.

Vitro Electronics reserves the right to make changes in specifications.

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Table of Contents

COMMUNICATIONS EQUIPMENT

Receivers

Ancillary Equipment

Ancillary Equipment (Cont'd)

Broadcast and Telecast Equipment

Scientific Research and Test Equipment

Photography Equipment

Electro-Mechanical Equipment and Components

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50 years of receiver development

Vitro ELECTRONICS
A DIVISION OF VITRO CORPORATION OF AMERICA

PRODUCERS OF NEMS-CLARKE EQUIPMENT

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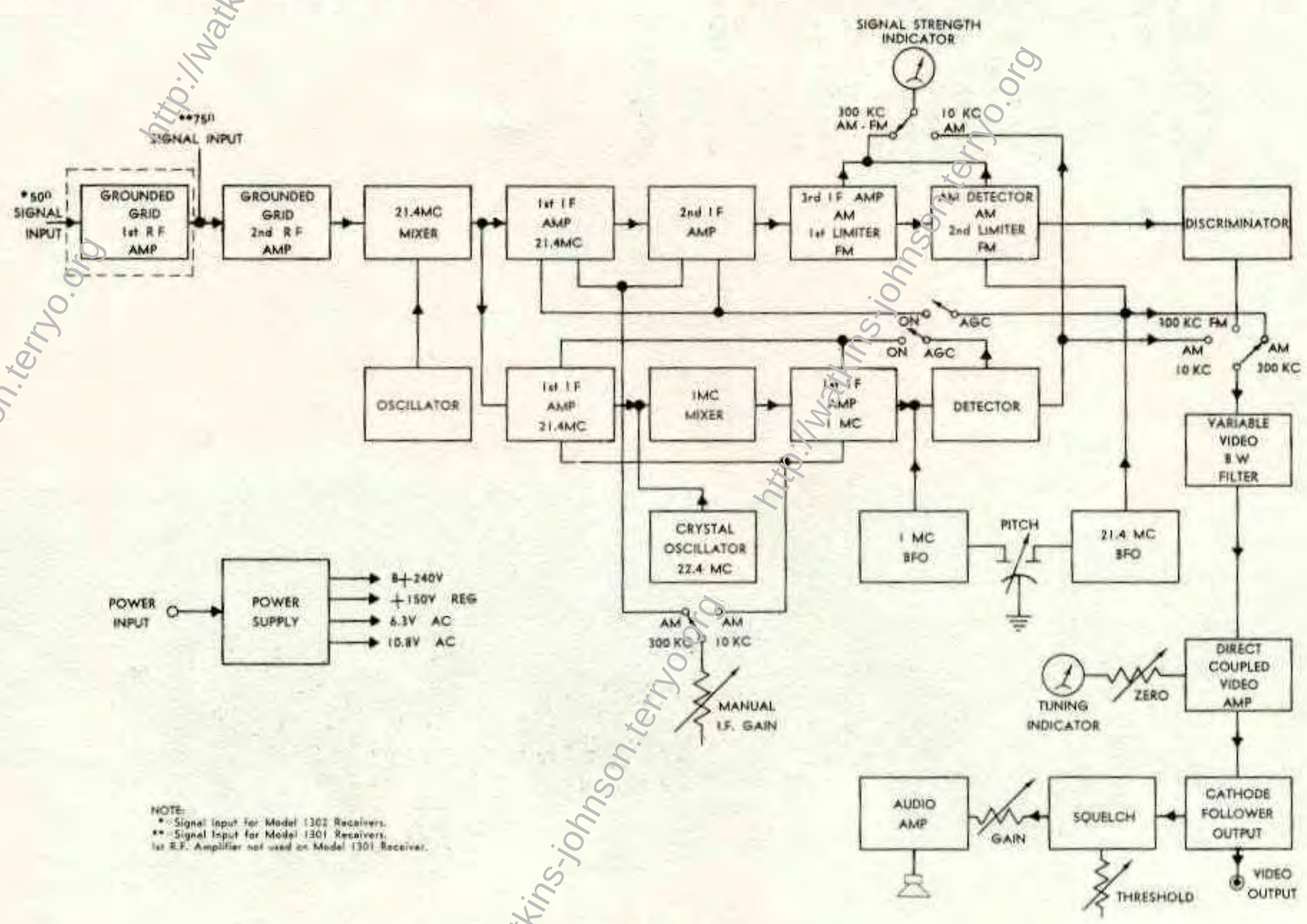
PRECISION SURVEILLANCE RECEIVER
NEMS-CLARKE 1301-A

The Nems-Clarke 1301-A Surveillance Receiver has been specifically designed to meet the requirements for a highly stable, extremely sensitive AM-FM-CW receiver, for critical application in the 55 to 260 megacycle range.

The 1301-A uses our standard front-end. This unit is very useful as a high quality general purpose laboratory receiver for telemetering and monitoring purposes.

SPECIFICATIONS

Type Reception — AM, FM, CW
Tuning Range — 55-260mc
IF Rejection — 70db, minimum
IF — 21.4mc and 1mc
IF Bandwidth — 300kc: AM, FM, CW — 10kc: AM, CW
Video Response — 10cps to 300kc
Video Bandwidth Control — 5 position: 1, 3, 10, 30 and 300kc
FM Output — 0.075v per kc (approximate)
AM Output Stability — Both IF Strips: 7 db maximum variation for 40db variation in input
Spectrum Display Unit — Provision for connecting a 21.4mc Spectrum Display Unit Nems-Clarke SDU-200-2)
Beat Frequency Oscillator — Adjustable front panel switch control
Squelch — Adjustable threshold
Input Impedance — 75 ohms, nominal
Noise Figure — 11.5db, maximum
Image Rejection — 40db minimum below 130mc; 30db minimum any frequency
AM Output, 300kc — 7-15v rms for 5mv input modulated 50% at 1kc
AM Output, 10 — 4-10v rms for 5mv input modulated 50% at 1kc
FM Output Stability — Varies less than 2db for inputs above 4μv
Sensitivity, FM — 8μv produces at least 23db s/n with 100kc deviation and 1kc modulation
Sensitivity, AM — 4μv produces at least 10db s/n with 50% modulation at 1kc
Power Input — 115/230v, 50-400cps
Power Consumption — 95w, approximate
Weight — 37 pounds
Size — 19×8¾×15¼ inches
Finish — Gray enamel, MIL-E-15090, Color #26329 Federal Standard 595



NOTE:
* Signal Input for Model 1302 Receivers.
** Signal Input for Model 1301 Receivers.
1st R.F. Amplifier not used on Model 1301 Receiver.

Price: $1,600.00

High Pass Filter (Type 150): $75

Special Panel Finish: $20 additional

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PRECISION SURVEILLANCE RECEIVER
NEMS-CLARKE 1302-A

The Nems-Clarke 1302-A Surveillance Receiver has been specifically designed to meet the requirements for a highly stable, extremely sensitive AM-FM-CW receiver, for critical application in the 55 to 260 megacycle range.
In the 1302-A, the choice of tube in the first RF stage assures that the noise figure does not exceed 6db at any frequency.

CIRCUIT DESCRIPTION

The tuner in the 1302-A receiver is designed to produce an extremely low noise figure and incorporates a practical tuning structure capable of tuning 55 to 260mc, with uniform performance over the band. The first RF stage employs a 416-B planar triode to assure that the noise figure of 6db is not exceeded at any frequency. A low noise second stage is used so that the overall noise figure (first RF, second RF and mixer) is essentially that of the first stage. Dual IF channels are provided, one of 300kc and one of 10kc bandwidth. A selector switch is mounted on the front panel to permit selection of the desired IF bandwidth.. Separate high-level, low impedance outputs from both IF amplifiers are brought to the rear apron of the chassis for external use. The signal outputs from the IF amplifier are fed into the input of a 5 position low pass filter. The cutoff frequency can be set to 300kc, 30kc, 10kc, 3kc, or 1kc by a front-panel selector switch. Beat frequency oscillators are incorporated for each IF frequency (21.4mc and 1mc) and the pitch is controlled from a single front panel control. A squelch circuit is provided with an adjustable threshold control mounted on the front panel. A new-type back-lighted spiral dial provides the equivalent of approximately 30 lineal inches. The receivers are constructed of the best possible components; all transformers and chokes are hermetically sealed; all components are operated within their safe design limits. The receivers are subjected to rigid inspection and alignment procedure. The 1302-A receiver reflects the high standard of design and construction characteristic of a company which for 50 years has been engaged in manufacturing radio communication equipment and electronic instruments to the rigid requirements of military service.

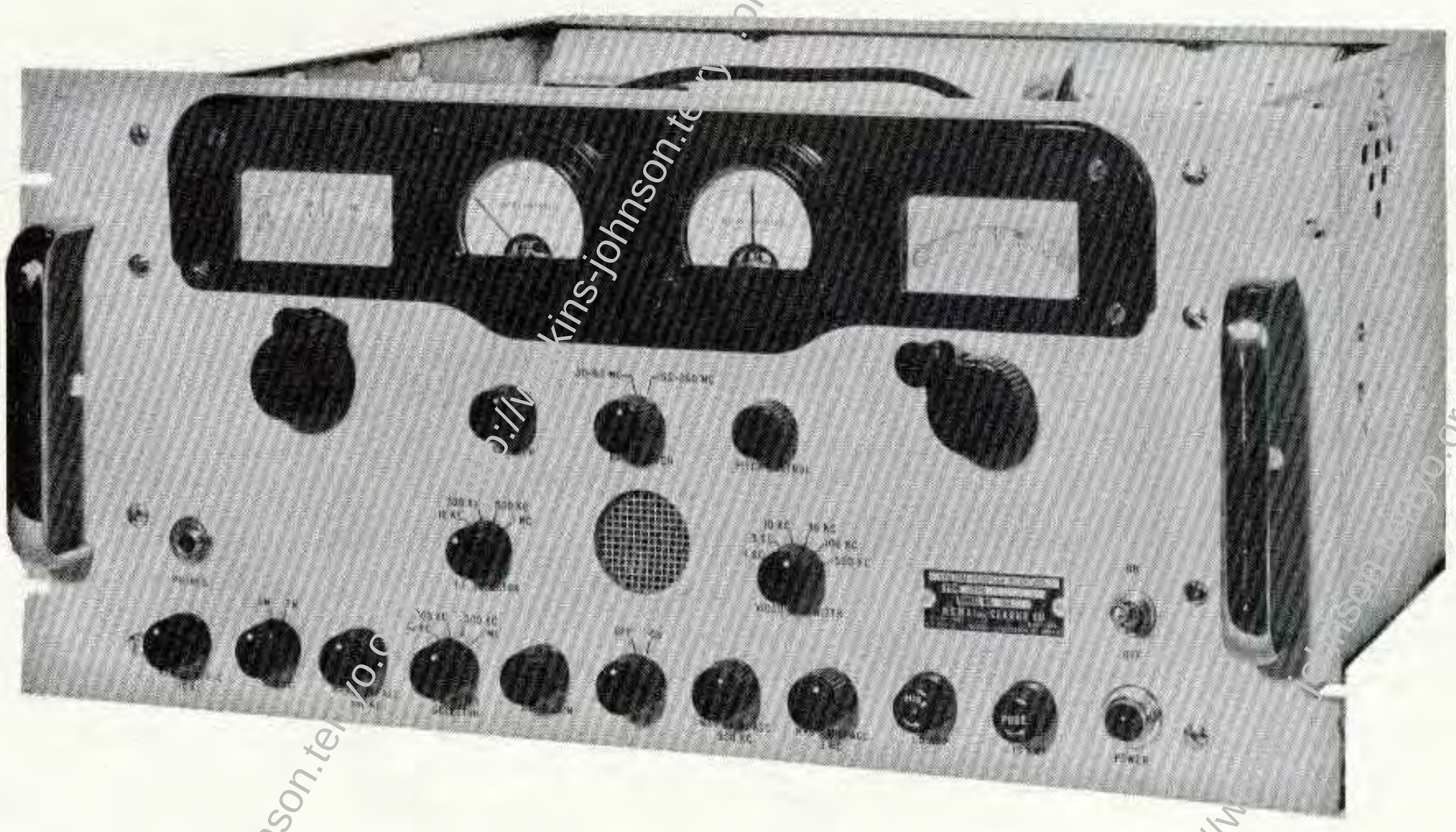
SPECIFICATIONS

Type Reception — AM, FM, CW
Tuning Range — 55-260mc
IF Rejection — 70db, minimum
IF — 21.4mc and 1mc
IF Bandwidth — 300kc: AM, FM, CW — 10kc: AM, CW
Video Response — 10cps to 300kc
Video Bandwidth Control — 5 position: 1, 3, 10, 30 and 300kc
FM Output — 0.075v per kc (approximate)
AM Output Stability — Both IF Strips: 7db maximum variation for 40db variation in input
Spectrum Display Unit — Provision for connecting a 21.4mc Spectrum Display Unit (Nems-Clarke SDU-200-2)
Beat Frequency Oscillator — Adjustable front panel pitch control
Squelch — Adjustable threshold
Input Impedance — 50 ohms, nominal
Noise Figure — 6db, maximum
Image Rejection — 58db, minimum
AM Output, 300kc — 7-15v rms for 500μv input modulated 50% at 1kc
AM Output, 10kc — 4-10v rms for 500μv input modulated 50% at 1kc
FM Output Stability — Varies less than 2db for inputs above 1μv
Sensitivity, FM — 4μv produces at least 23db s/n with 100kc deviation and 1kc modulation
Sensitivity, AM — 2μv produces at least 10db s/n with 50% modulation at 1kc
Power Input — 115/230v, 50-60cps
Power Consumption — 127w, approximate
Weight — 40 pounds
Size — 19×8¾×15¼ inches
Finish — Gray enamel, MIL-E-15090, Color #26329 Federal Standard 595

Price: $2,200.00

High Pass Filter (Type 150): $120.00
Special Panel Finish: $20 additional

SURVEILLANCE RECEIVERS
NEMS-CLARKE 1306



The Nems-Clarke 1306 Surveillance Receiver has been designed to answer the demand for a wide range precision surveillance receiver. Featuring wide bandwidth, AM-FM reception, low noise front end and 30-260mc frequency coverage, this receiver will satisfy a large percentage of surveillance applications.

Type Reception — AM, FM, CW

Tuning Ranges — 30mc- 60mc
55mc-260mc

Input Impedance — 50 ohms, nominal

Noise Figure — 6db maximum

S/N — 4μv produces at least 23db s/n with 100kc deviation, 1kc on 300kc FM IF strip 4μv produces at least 20db s/n on 10kc AM strip with 50% modulation at 1000cps

IF Rejection — 30- 60mc, greater than 40db
55-260mc, greater than 60db

Image Rejection — Greater than 58db

IF — 21.4mc

IF Bandwidths — 10kc, 500kc and 1mc for AM and CW operation; 300kc for AM, FM, and CW operation

AGC Time Constant — 0.1 sec. for 10kc AM and 300 kc FM; .005 sec. for 300kc AM, 500kc AM and 1mc AM

Discriminator — Linear to better than 1% over a bandwidth of ±100kc

Discriminator Peak Separation — 0.75mc

Video Response — 10cps-500kc into low impedance

Video Output Sensitivity — 0.10 minimum per kc of deviation. Frequency response within 3db

Video Bandwidth Control — 6 positions 1, 3, 10, 30, 100, and 500kc cut off frequency

AM Output Stability — 7db maximum variation for 40db variation in input

FM Output Stability — Varies less than 2db for voltages above 1μv

Internal Impedance of Output Circuit — 250 ohms

Output Impedance — 600 (output jack on front panel)

Power Input — 125mw

Response — 300 cycles to 8kc

Outputs provided — 4 low level high impedance video outputs

Spectrum Display Unit — SDU Output provided

Signal Strength Meter — linear scale

Tuning Meter — Zero center linear scale

Beat Frequency Oscillator — Adjustable front panel pitch control

Squelch — adjustable audio squelch on front panel

Gain Control — Separate gain controls for IF strips

Power Input — 110/230v, 50-60cps

Power Consumption — 150 watts

Size — 19 × 8¾ × 16⅞ inches

Weight — 46 pounds

Finish — Gray enamel, MIL-E-15090; Color #25329 Federal Standard 595

Price: $3,500.00

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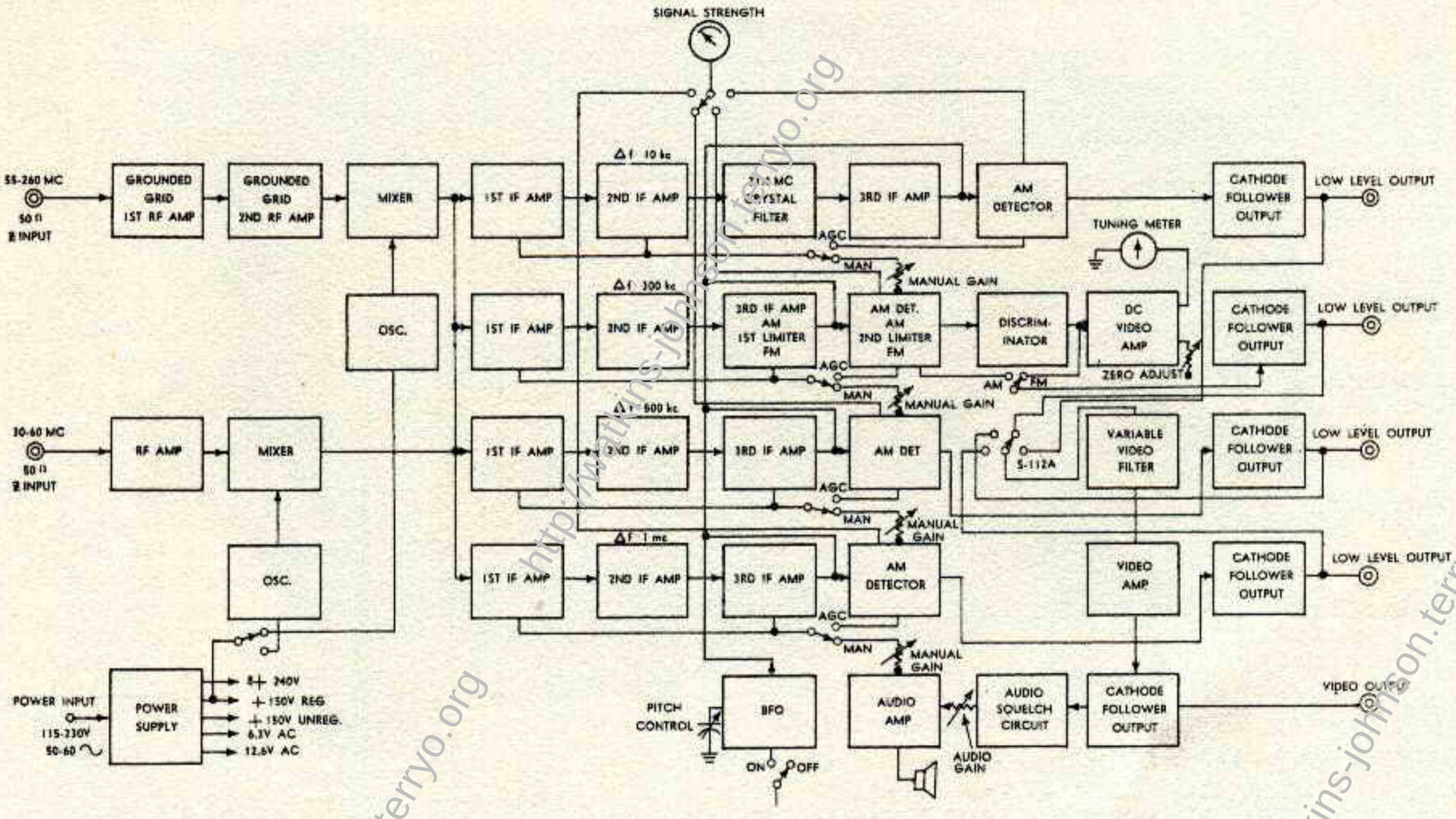
Block Diagram — 1306 Receiver



. . . . . The
Nems-Clarke
1400 Series Receivers

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PHASE-LOCK AIRBORNE TELEMETRY RECEIVER
NEMS-CLARKE 1403

The Nems-Clarke 1403 Telemetry Receiver is designed for airborne applications where performance is of greater importance than size and weight. This unit has the same electrical characteristics as the other receivers in our Phase-Lock Series. It is supplied with a shock-mounted tray.

This receiver is of the double superheterodyne type. A noise figure of less than 8db is obtained by use of a Western Electric 417A Grounded Grid RF amplifier followed by a 6AK5 triode connected mixer. To achieve the desired stability of ±.002 percent of the received frequency, the first local oscillator is quartz crystal controlled and is front panel mounted for quick changeability. The tuning of the final amplifier is ganged to that of the RF circuits thereby enabling the receiver to be put in operation on any frequency by plugging in the desired crystal and setting a single tuning dial to the appropriate frequency. The second oscillator is of the Hartley type and incorporates a vernier capacitor, tunable from the front panel to provide calibrated frequency deviations of ±150kc so that the receivers can be tuned to the exact transmitter frequencies.

One of the most unusual features of this receiver is the incorporation of phase-lock detection. The receiver also offers a choice of two IF amplifiers of different bandwidths which can be made from the front panel by means of a selector switch. The wide band amplifier has a bandwidth of 500kc at the 3db points with an attenuation of 60db 500kc each side of center frequency. The other amplifier has a bandwidth of 100kc with better than 60db attenuation 250kc each side of center frequency. This second amplifier is primarily intended for receiving PWM/FM and PTM/FM signals with a nominal deviation of ±50kc and is retained in the phase-lock receiver to provide additional adjacent channel selectivity when used to receive PWM/FM and PTM/FM signals.

Included in each receiver is a peak frequency deviation meter with full-scale ranges of 25, 75 and 150 kilocycles and is useful in setting up the desired frequency deviation of individual subcarriers using FM/FM or peak deviation of pulses used in PWM/FM. A VU meter is incorporated in the video output circuit and a front panel control is provided in order to adjust the output video signal level.

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SPECIFICATIONS

Frequency Range — 215 to 260mc

Input Impedance — 50 ohms nominal.

Noise Figure — Less than 8db.

Signal to Noise Ratio — 500kc Passband 40db for 1.5μv of input carrier when carrier is modulated ±100kc at a 1000cps rate.
100kc Passband: 40db for 1.7μv of input carrier when carrier is modulated ±50kc at a 1000cps rate.
Above s/n's measured with 2500cps low pass filter at receiver video output.

IF Rejection — Greater than 60db.

Image Rejection — Greater than 48db.

First Local Oscillator — Crystal controlled.

Second Local Oscillator — Tunable over a frequency range of ±150kc.

IF — 30mc First IF. 5mc Second IF.

IF Bandwidth—Wide band: 500kc bandwidth at 3db points. Attenuation ±500kc from center frequency greater than 60db.
Narrow band: 100kc bandwidth at 3db points. Attenuation ±250kc from center frequency greater than 60db.

AM Rejection — 50% AM reference carrier deviation ±100kc.
400cps — 10kc — greater than 50db.
10kc — 30 kc — greater than 35db.
30kc — 80kc — greater than 25db.

Detector — Linearity better than 1% oved a bandwidth of ±150kc.

Video Output — Sensitivity: 0.075v per kc of deviation. Frequency response within 3db. ac coupled, 10cps to 100kc per second. Adjustable output control on front panel.

Frequency Monitor Output — 30mc.

Signal Strength Recorder Output — High impedance, 0-15v.

Spectrum Display Unit — Provisions for connecting a 30mc Spectrum Display Unit NEMS-CLARKE SDU-203).

VU Meter in Video Output Circuit — Frequency response: flat over frequency range of 400 cycles to 80,000 cycles. Provided with front panel adjustable reference level control.

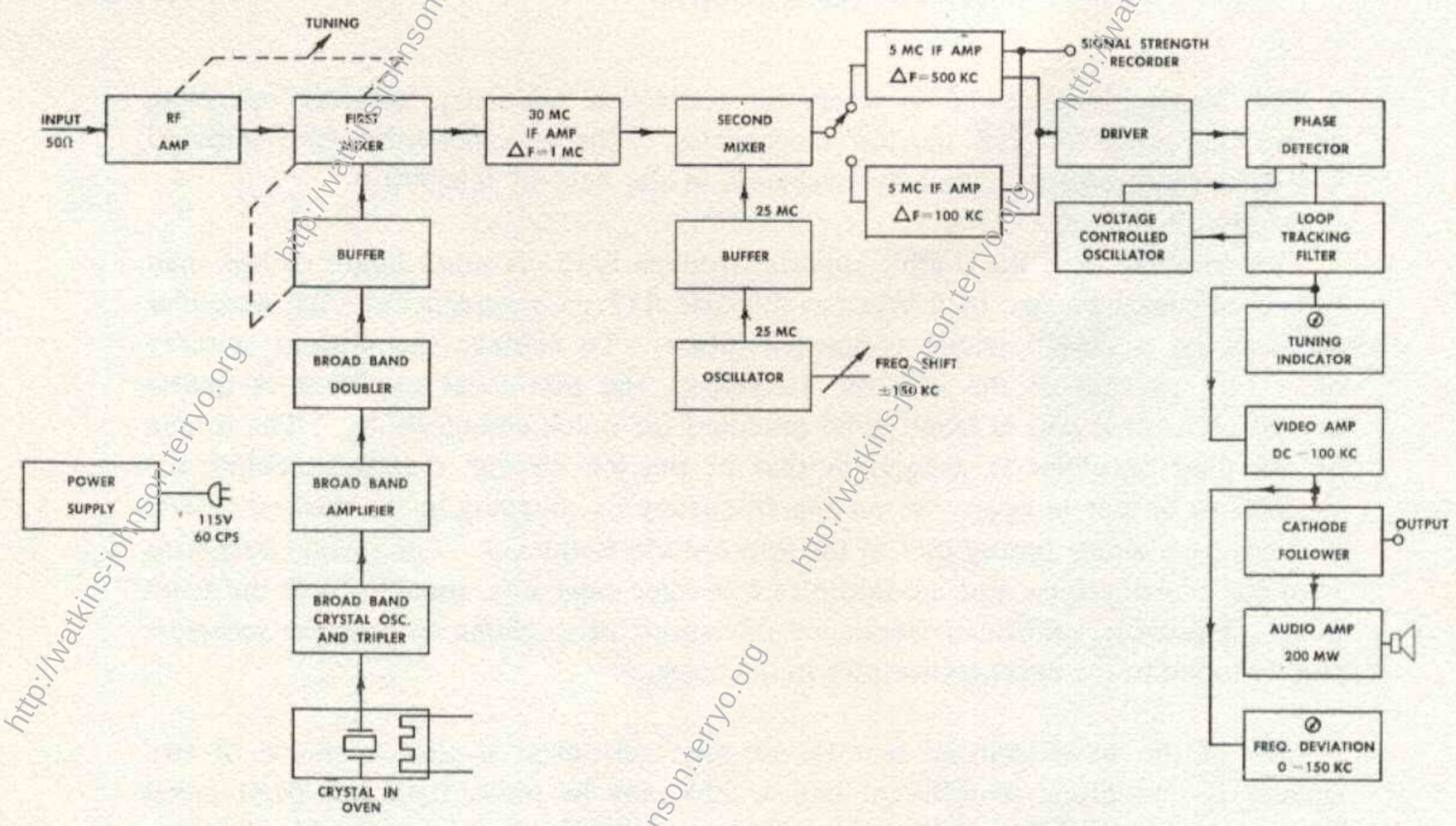
Frequency Deviation Meter — Peak reading over frequency range from 400 to 80,000cps. Three scales 25, 75, and 150kc.

Power Input — 117v ac. 60-450 cycles, approximately 150w.

Size — 8¾ × 19 × 16½ inches.

Weight — Approximately 40 pounds.

Finish — Gray enamel, MIL-E-15090; Color #26329 Federal Standard 595.



Price: $2,450.00

Crystal and Oven Combination (CO-400): $22.50

Crystal Adaptor (CA-100): $15.00

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STANDARD TELEMETRY RECEIVER
NEMS-CLARKE 1412

DESCRIPTION

The Nems-Clarke 1412 is a crystal controlled telemetry receiver operating within the range of 215 to 260 megacycles. The specifications were initiated based on requirements stated by engineers in the field of telemetry.

This receiver is of the double superheterodyne type. A noise figure of less than 8db is obtained by use of a Western Electric 417A Grounded Grid RF amplifier followed by a 6AK5 triode connected mixer. To achieve the desired stability of $\pm$.002 percent of the received frequency, the first local oscillator is quartz crystal controlled and is front panel mounted for quick changeability. The tuning of the final amplifier is ganged to that of the RF circuits thereby enabling the receiver to be put in operation on any frequency by plugging in the desired crystal and setting a single tuning dial to the appropriate frequency. The second oscillator is of the Hartley type and incorporates a vernier capacitor, tunable from the front panel to provide calibrated frequency deviations of $\pm$150kc so that the receivers can be tuned to the exact transmitter frequencies.

One of the most unusual features of this instrument is that a choice of two second IF amplifiers of different bandwidths may be made from the front panel by means of a selector switch. The wide band amplifier has a bandwidth of 500kc at the 3db points with an attenuation of 60db 500kc each side of center frequency. The other amplifier has a bandwidth of 100kc with better than 60db attenuation 250kc each side of center frequency. This second amplifier is primarily intended for receiving PWM/FM and PTM/FM signals with a nominal deviation of $\pm$50kc.

Included in the unit is a peak frequency deviation meter with full-scale ranges of 25, 75, and 150 kilocycles and is useful in setting up the desired frequency deviation of individual subcarriers using FM/FM or peak deviation of pulses used in PWM/FM. A VU meter is incorporated in the video output curcuit and a front panel control is provided in order to adjust the output video signal level.

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SPECIFICATIONS

Type Reception — PWM/FM, PTM/FM, FM/FM.

Frequency Range — 215 to 260mc. determined by plug in crystals.

Input Impedance — 50 ohms nominal.

Noise Figure — Less than 8db.

S/N (measured with 2.5kc RC low pass filter at video output)

500kc Passband: 40db for 2.3μv of input carrier when carrier is modulated ±100 kc at a 1000cps rate.

100kc Passband: 40db for 1.7μv of input carrier when carrier is modulated ±50kc at 1000cps rate.

IF Rejection — Greater than 60db.

Image Rejection — Greater than 48db.

First Local Oscillator — Crystal controlled.

Second Local Oscillator — Tunable over a frequency range of ±150kc.

IF — 30mc First IF. 5mc Second IF.

IF Bandwidth — Wide Band: 500kc bandwidth at 3db points. Attenuation ±500kc from center frequency greater than 60db.

Narrow band: 100kc bandwidth at 3db points. Attenuation ±250kc from center frequency greater than 60db.

AM Rejection — 50% AM reference carrier deviation ±100kc.
400cps — 10kc — greater than 50db.
10kc — 30kc — greater than 35db.
30kc — 80kc — greater than 25db.

Discriminator — Linear to better than 1% over a bandwidth of ±150kc.

Video Output — Sensitivity: 0.16v peak-to-peak per kc of deviation. Frequency response with 3db. ac coupled 10cps to 100kc per second. Adjustable output control on front panel.

Frequency Monitor Output — 30mc.

Signal Strength Recorder Output — High impedance, approximately 5v at 100μv input.

Spectrum Display Unit — Provisions for connecting a 30mc Spectrum Display Unit (NEMS-CLARKE SDU-200-3).

VU Meter in Video Output Circuit — Frequency response: flat over frequency range of 400 to 80,000cps. Provided with front panel adjustable reference level control.

Frequency Deviation Meter — Peak reading over frequency range from 488 to 80,000cps. Three scales 25, 75, and 150kc.

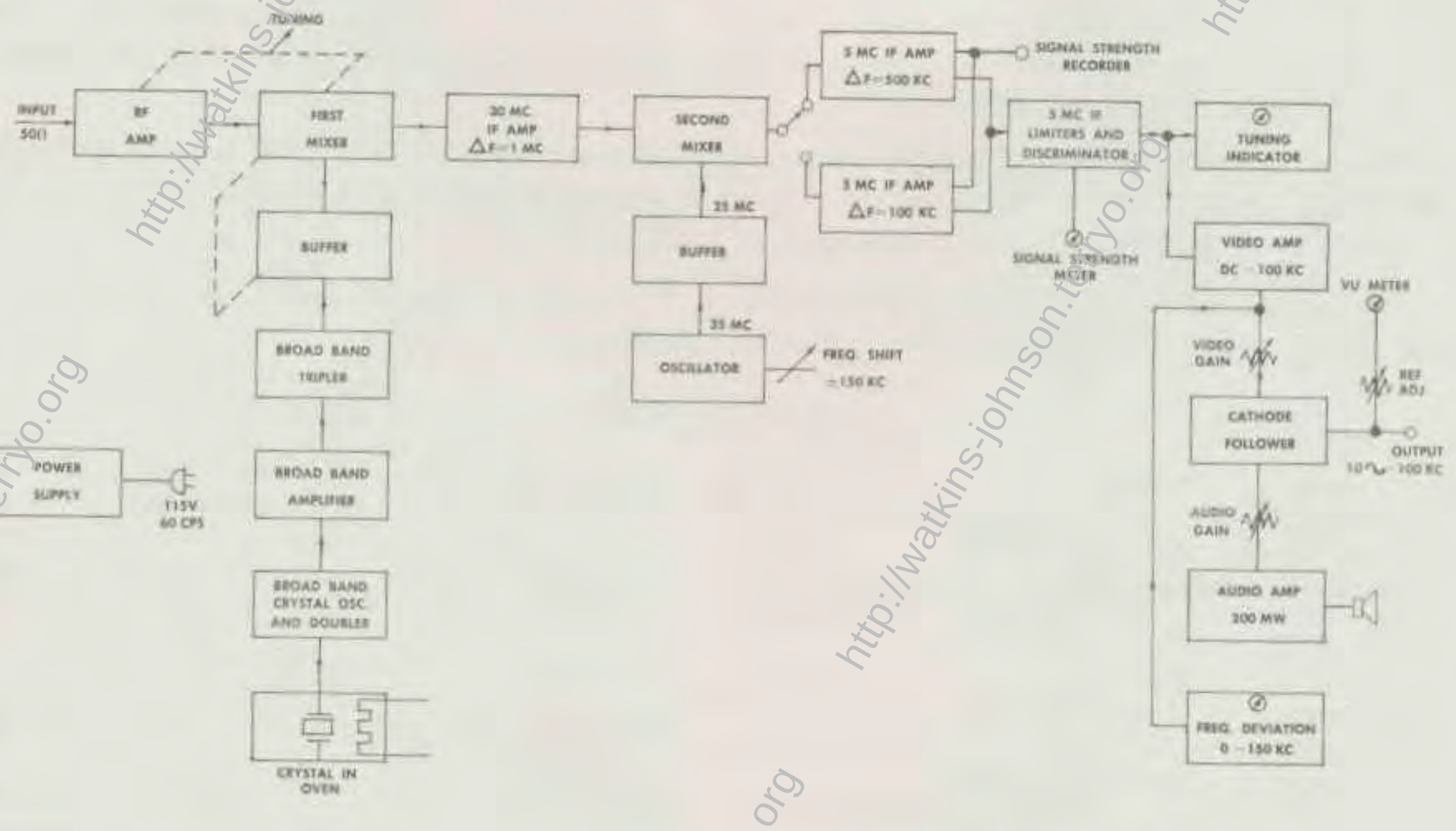
Power Input — 117v AC, 60 cycles.

Power Consumption — approximately 150w.

Size — 19 × 8¾ × 16⅛ inches.

Weight — Approximately 40 pounds.

Finish — Gray enamel, MIL-E-15090; Color #26329 Federal Standard 595.



Price: $2,250.00

Crystal and Oven Combination (CO-400)	$ 22.50
Slide Mounting (SMT-100)	100.00
Antenna Low Pass Filter (ALP-410)	25.00
Special Panel Finish	$20.00 additional

PHASE-LOCK DETECTION TELEMETRY RECEIVER
NEMS-CLARKE 1432

The Nems-Clarke Phase Lock Detection receivers are of the double superheterodyne type. A noise figure of less than 8db is obtained by use of a Western Electric 417A Grounded Grid RF amplifier followed by a 6AK5 triode connected mixer. To achieve the desired stability of ±.002 percent of the received frequency, the first local oscillator is quartz crystal controlled and is front panel mounted for quick changeability. The tuning of the final amplifier is ganged to that of the RF circuits thereby enabling the receiver to be put in operation on any frequency by plugging in the desired crystal and setting a single tuning dial to the appropriate frequency. The second oscillator is of the Hartley type and incorporates a vernier capacitor, tunable from the front panel to provide calibrated frequency deviations of ±150kc so that the receivers can be tuned to the exact transmitter frequencies.

One of the most unusual features of these receivers is the incorporation of phase-lock detection. The receiver also offers a choice of two second IF amplifiers of different bandwidths which can be made from the front panel by means of a selector switch. The wide band amplifier has a bandwidth of 500kc at the 3db points with an attenuation of 60db 500kc each side of center frequency. The other amplifier has a bandwidth of 100kc with better than 60db attenuation 250kc each side of center frequency. This second amplifier is primarily intended for receiving PWM/FM and PTM/FM signals with a nominal deviation of ±50kc and is retained in the phase-lock receiver to provide additional adjacent channel selectivity when used to receive PWM/FM and PTM/FM signals.

Included in each receiver is a peak frequency deviation meter with full-scale ranges of 25, 75, and 150kc and is useful in setting up the desired frequency deviation of individual subcarriers using FM/FM or peak deviation of pulses used in PWM/FM.

The 1432 Phase-Lock Receiver incorporates a VU meter in the video output circuit and a front panel adjustable reference level control is provided.

SPECIFICATIONS

Video Output — Adjustable.

Frequency response (3db) — 10cps to 100kc.

Frequency Monitor Output — 30 mc.

VU Meter Frequency Response in Video Output Circuit — Flat over 400cps to 80kc. Front panel adjustable reference control.

Type Reception — FM.

Tuning Range — 215 to 260mc.

Noise Figure — less than 8db.

Input Impedance — 50 ohms nominal.

S/N (measured with 2.5kc RC low pass filter at receiver video output).

500kc Passband — 40db for 1.5μv of input carrier when carrier is modulated ±100kc at 1kc rate.

100kc Passband — 40db for 1.7 μv of input carrier when carrier is modulated ±50kc at 1kc rate.

IF Rejection — Greater than 70db.

Image Rejection — Greater than 48db.

First Local Oscillator — Crystal controlled.

Second Local Oscillator — Tunable over frequency range of ±150kc.

IF — 30mc First IF. 5mc Second IF.

IF Bandwidth — Wide band: 500kc bandwidth at 3db points. Attenuation ±500kc from center frequency greater than 60db.

Narrow band: 100kc bandwidth at 3db points. Attenuation ±250kc from center frequency greater than 60db.

AM Rejection (500kc IF Bandwidth) — 50% AM reference carrier deviation ±100kc.
400cps — 10kc — greater than 50db.
10kc — 30kc — greater than 35db.
30kc — 80kc — greater than 25db.

Detector — Linearity better than 1% over a bandwidth of ±150kc.

Video Output Sensitivity — 0.075v per kc deviation.

Signal Strength Recorder Output — High impedance, 0-15v.

Spectrum Display Unit — Provisions for connecting 30mc Spectrum Display Unit (NEMS-CLARKE, SDU-200-3).

Frequency Deviation Meter — Peak reading over frequency range from 400cps to 80kc.
Three scales: 25, 75 and 150kc.

Power Input — 117v ac, 60cps, approx. 150w.

Size — 19 × 8¾ × 16⅛ inches.

Weight — Approximately 40 pounds.

Finish — Gray enamel, MIL-E-15090; Color #26329 Federal Standard 595.

The Nems-Clarke VF-1400 Variable Frequency Oscillator is available for use as an accessory to permit tuning through the frequency range of 215 to 260mc. It plugs into the socket which normally accepts the crystal and oven combination.

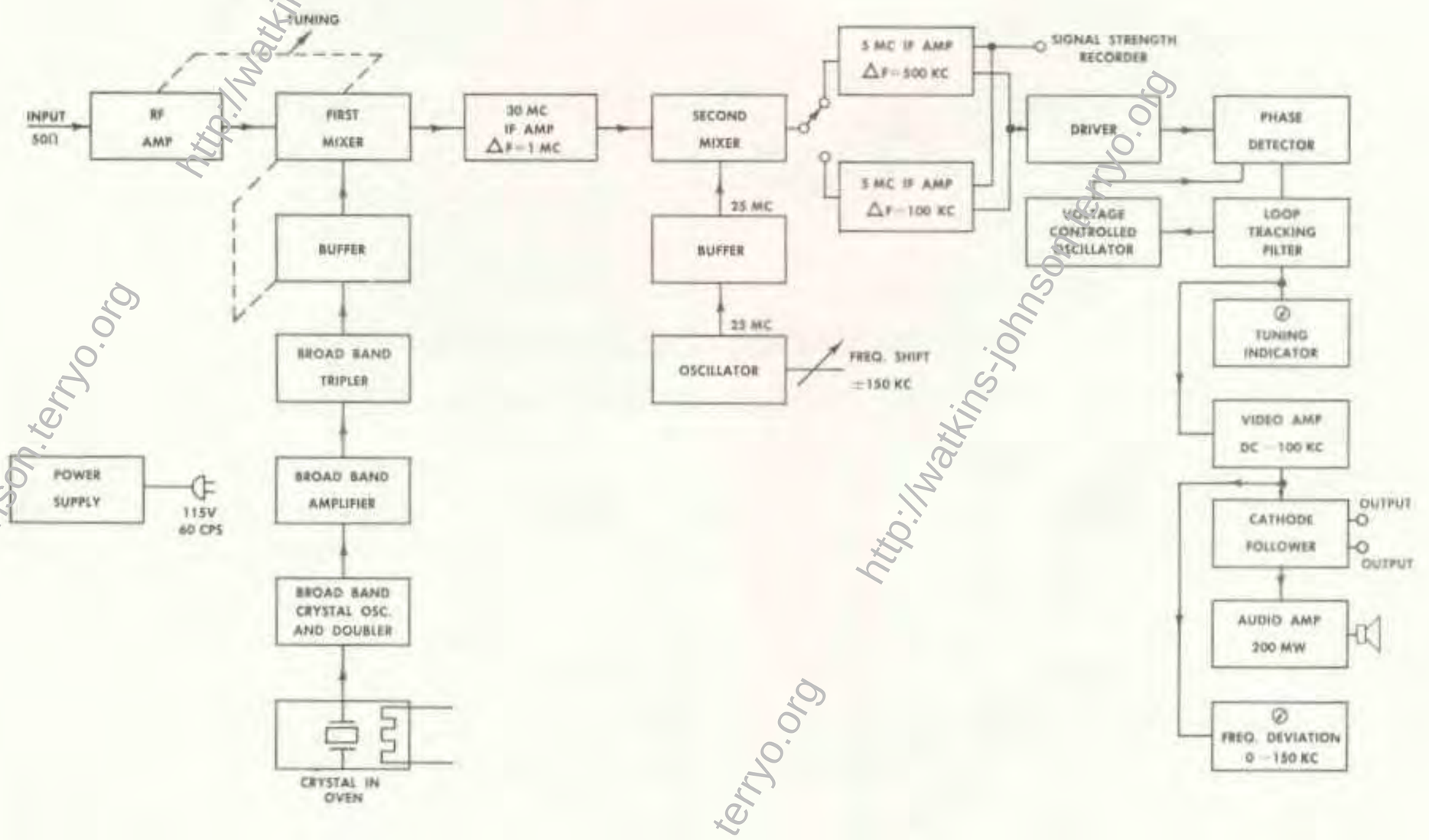
Other accessories are the Crystal Storage Drawers accommodating 28, 40, or 80 crystals; and the Crystal Energizer for either 4 or 8 crystals.

Vitro Electronics also provides a complete line of Preamplifiers, Multi-couplers, and Spectrum Display Units designed specifically for use with Nems-Clarke Receivers. Detailed specifications appear on later pages of this catalog.

PHASE DETECTOR OPERATION

A phase detector serves to determine the phase difference between the input IF signal and a second locally generated signal. An output which is proportioned to the phase difference is averaged by the Loop Tracking Filter and is used to control the frequency of an oscillator in such a manner as to keep the locally generated signal in phase synchronism with the input signal.

Since the voltage controlled oscillator has a linear frequency vs. voltage characteristic over the frequency range of interest, the voltage applied to the oscillator is proportional to the frequency of the incoming signal. In this manner output data can be obtained which is essentially identical to the input data.



Price: $2,350.00

Special Panel Finish: additional charge $ 20.00

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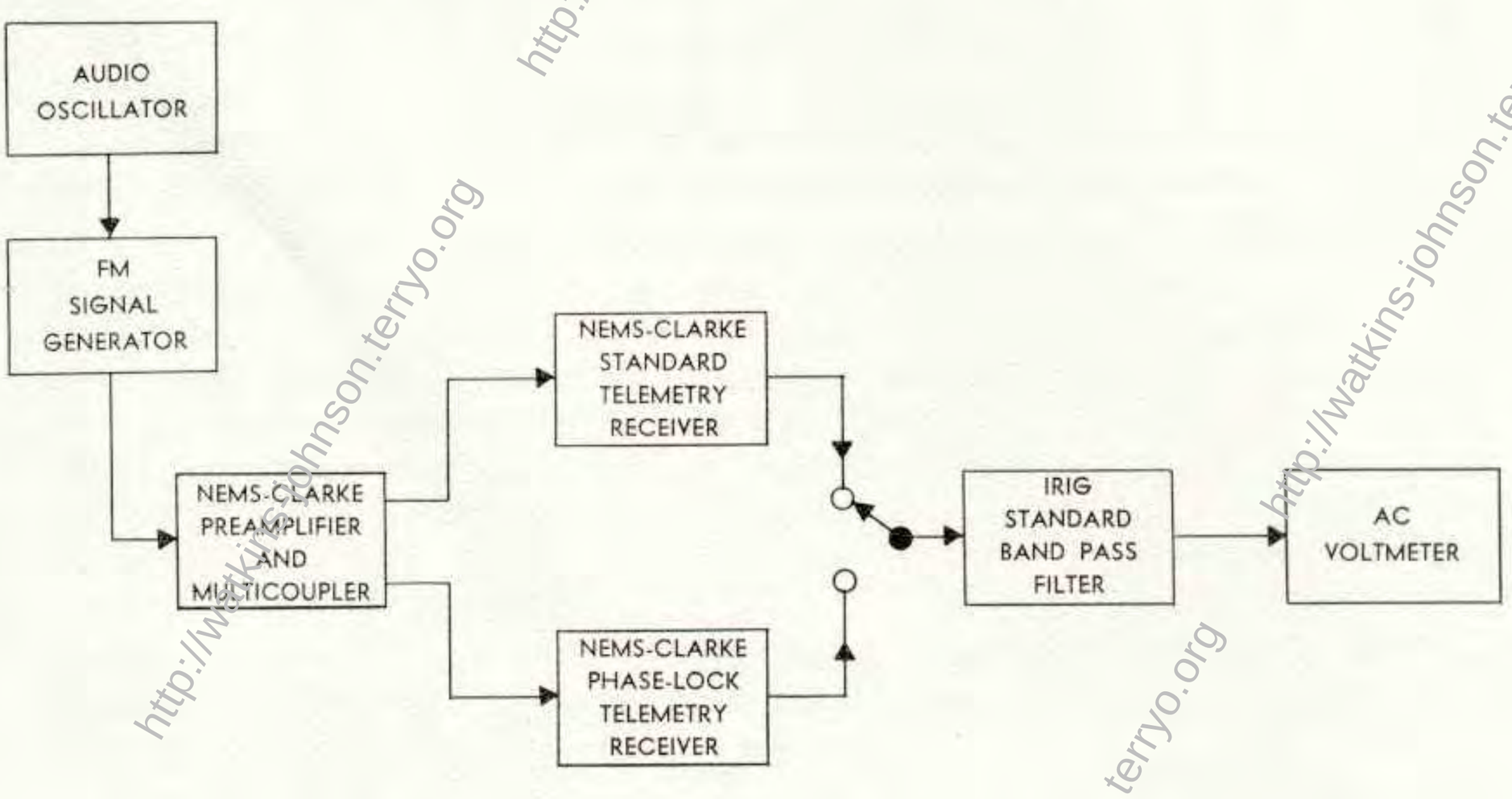
ADVANTAGE OF PHASE-LOCK

The primary advantages of phase-lock when used as a wide band receiver demodulator is a lowering of the receiver threshold.

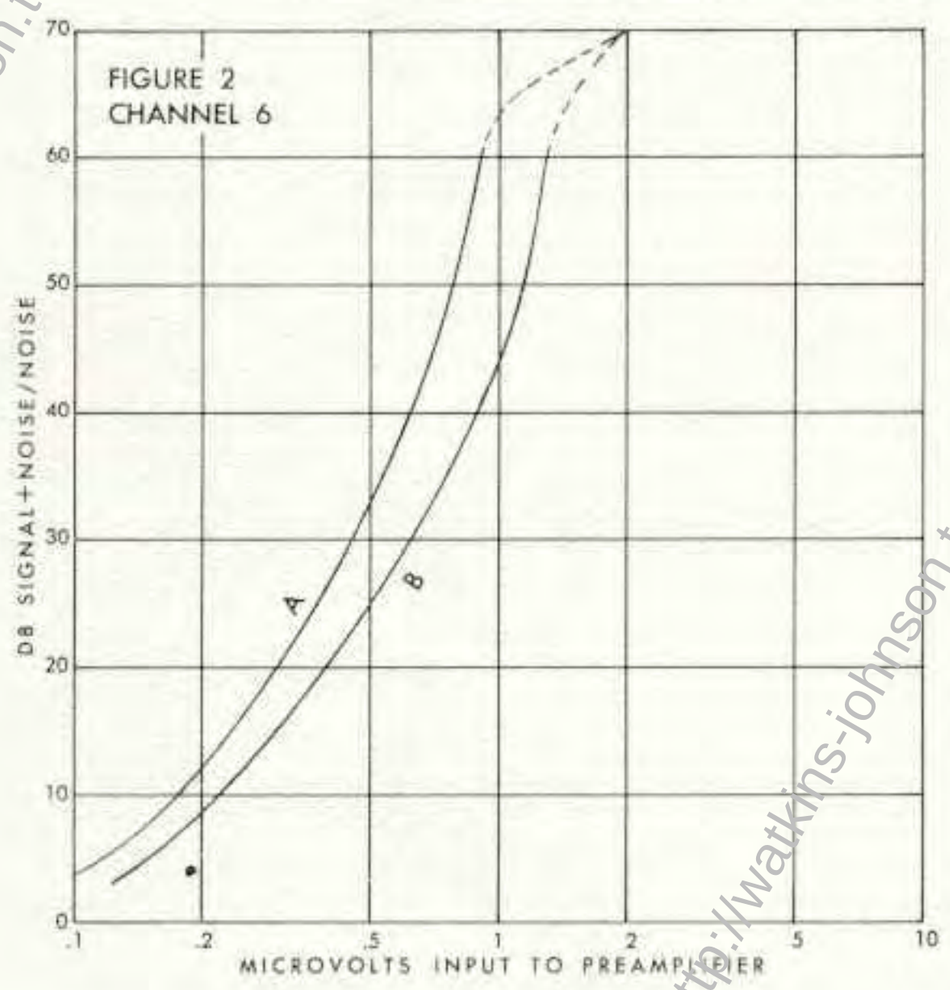
In order to evaluate the improvement gained with phase-lock detection, a test setup, illustrated in figure 1, was used in which the possible variations in receiver noise figure were eliminated by operating both the phase-lock and the standard receiver from a preamplifier-multicoupler.

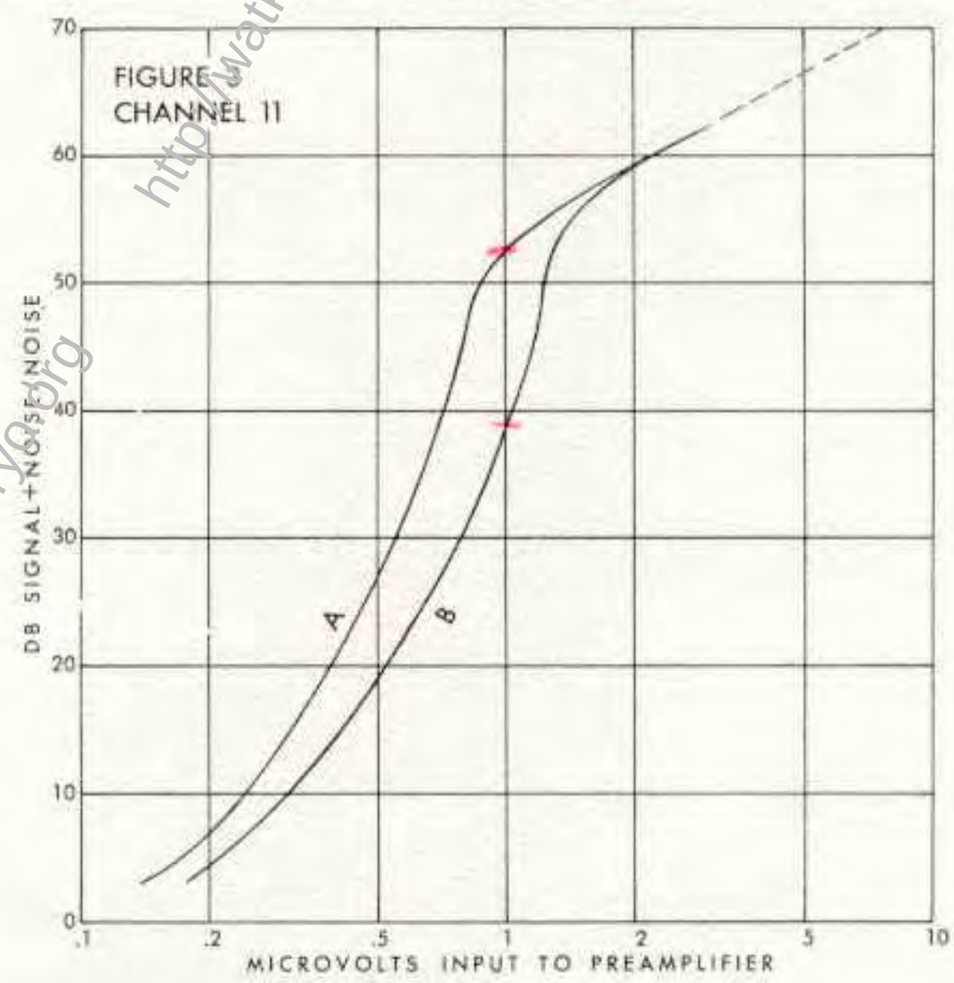
The curves shown in figures 2, 3, 4, and 5 are measured signal plus noise to noise ratios at the output of standard IRIG bandpass filters with the phase-lock receivers producing the superior curves. For all the curves deviation was ±125kc at 222.5mc. The dotted portions of the curves indicate test equipment limitations.



PERFORMANCE COMPARISON

Curve A — Phase-Lock Receiver Curve B — Standard Receiver





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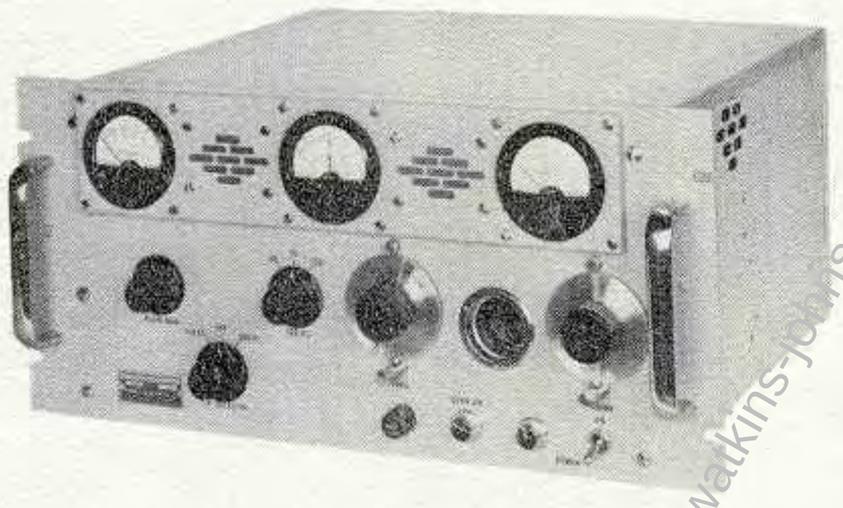
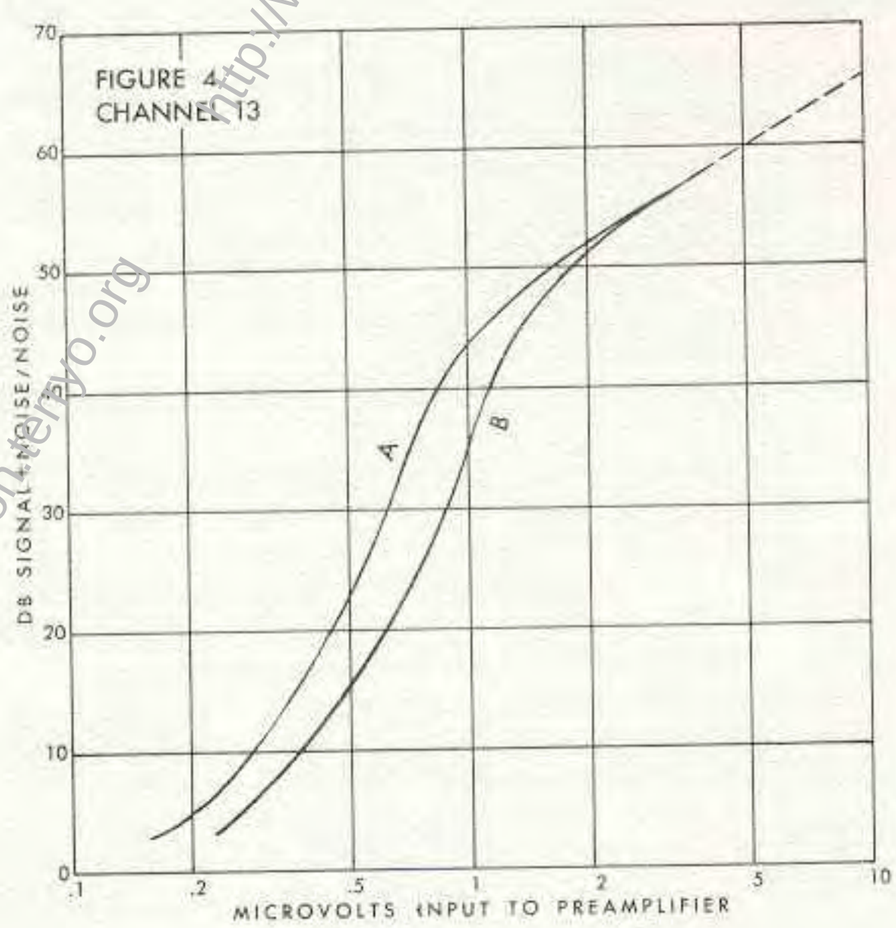
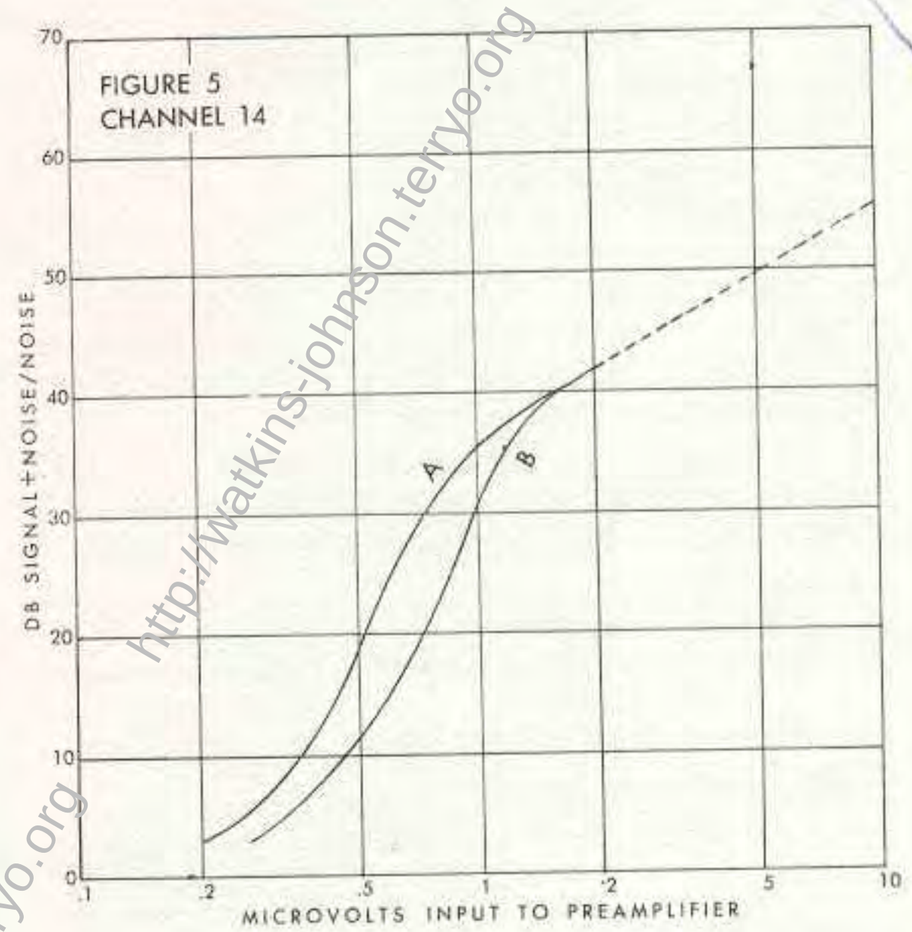
PHASE-LOCK TELEMETRY RECEIVER
NEMS-CLARKE 1433



The Nems-Clarke 1433 Telemetry Receiver has fixed video sensitivity and a frequency response from dc to 100kc. It has only three meters: Frequency Deviation, Signal Strength, a Tuning Meter with the following outputs: Video, Signal Strength Recorder, Spectrum Display, and, a Field Strength output of 10 ma into 500 ohms load for external meter connection. There are no VU Meter provisions in the video output circuit. Otherwise, its specifications are identical to the 1432 Receiver. This receiver is representative of custom-built variations possible in this line of telemetry receivers.

Price and delivery of custom-built equipment is determined on the merits of each inquiry.





These appear to belong with TRC-14?

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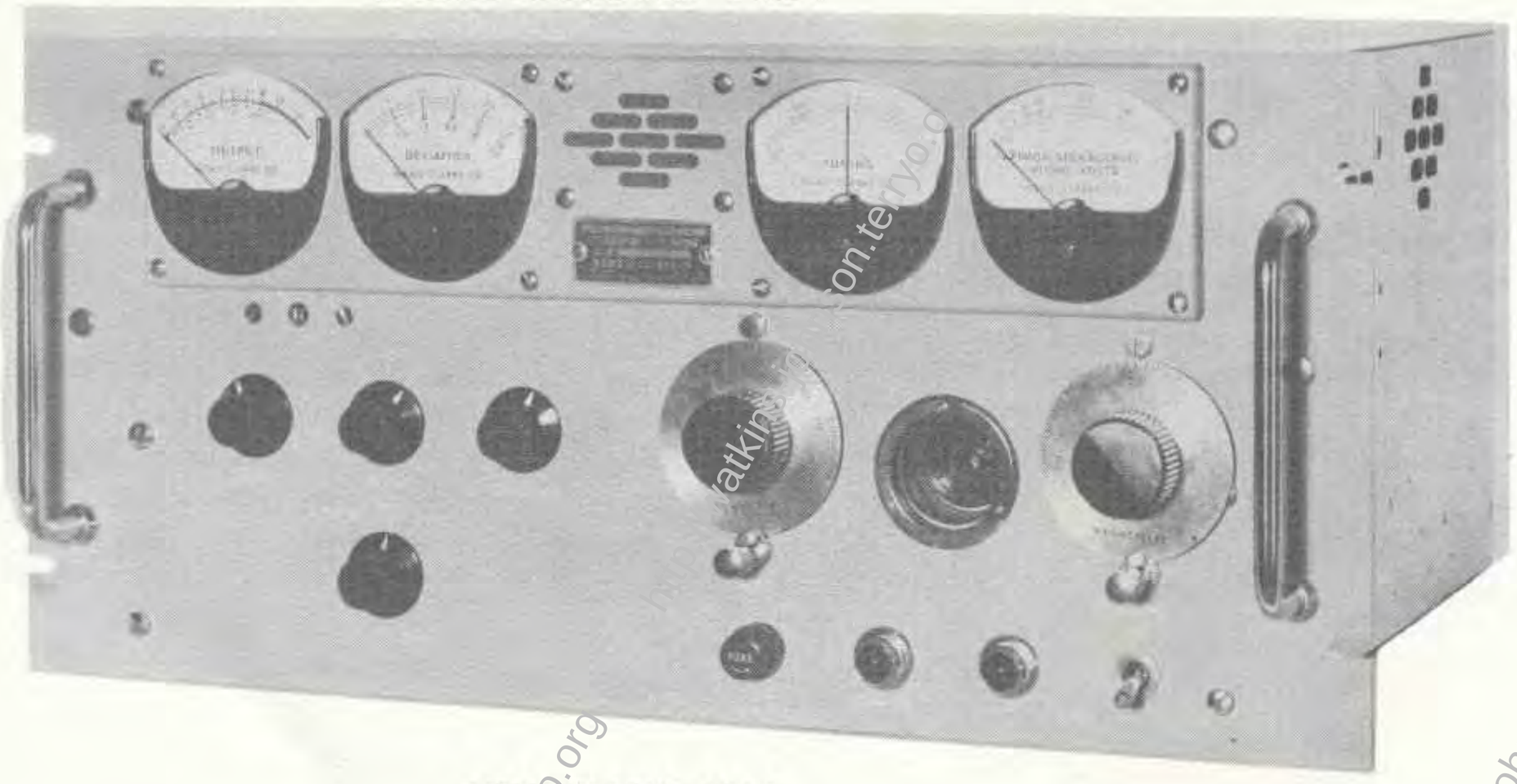
NARROW BAND PHASE-LOCK TELEMETRY RECEIVER
NEMS-CLARKE 1434



NEMS-CLARKE 1434

This crystal-controlled receiver offers the same fine quality features found in the Type 1432 Phase-Lock Receiver. However, it has, instead, two narrow bandwidth IF amplifiers, 100kc and 50kc bandwidths at 3db points attenuation of ±250kc from center frequency greater than 60db for the 100kc bandwidth, and ±150kc from center frequency greater than 60db for the 50kc bandwidth.

SPECIFICATIONS

Type Reception — FM
Tuning Range — 215-260mc
Input Impedance — 50 ohms
Noise Figure — Less than 8db
S/N, 100kc — 40db for 1.5μv of input carrier when carrier is modulated ±50kc at 1kc rate
S/N, 50kc — 40 db for 1.7 μv of input carrier when carrier is modulated ±20kc at 1kc rate
IF Rejection — Greater than 75db
Image Rejection — Greater than 48db
First oLcal Oscillator — Crystal Controlled
Second Local Oscillator—Tunable over range of ±150kc
IF — 30mc, first; 5mc, second
Detector — Linearity better than 1% over a bandwidth of ±150kc
Video Response — 10cps to 15kc
Video Output — Adjustable
Video Output Sensitivity — 0.3v per kc of deviation, minimum
Frequency Monitor Output — 30 mc
Signal Strength Recorder Output — High impedance approximately 5v output for 100μv input
Spectrum Display Unit — Provision for connecting 30mc Spectrum Display Unit, Nems-Clarke Company SDU-200-3
VU Meter Frequency Response in Video Output Circuit — 400cps to 15kc
Frequency Deviation Meter — Peak reading over frequency range from 400cps to 15kc. Three scales: 7.5, 15, and 25kc
Power Input — 117v ac, 60cps — approximately 150w
Size — 19 × 8¾ × 16⅛ inches
Weight — 40 pounds, (approximate)
Finish — Gray enamel, MIL-E-15090, Color #26329, Federal Standard 595

Price: $2,350.00

WIDE BAND PHASE-LOCK TELEMETRY RECEIVER
NEMS-CLARKE 1435

The 1435 Receiver is identical in every respect to the Type 1432 Receiver, but features a wide IF bandwidth of 850kc, and a narrow bandwidth of 100kc. Either bandwidth can be selected from a panel-mounted control. Other specifications and operational features are the same as the 1432 Receiver.

Video output Sensitivity 0.04 V per kc deviation (min)

Price: $2,350.00

1435-5 Has divide discriminator to handle 850kc bandwidth

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SATELLITE TRACKING FM RECEIVER
NEMS-CLARKE 1440

NEMS-CLARKE 1440

The Nems-Clarke 1440 is a crystal-controlled Phase-Lock FM Receiver designed specifically for operating in the recently assigned 130 to 140mc satellite band.

It has uniform, stable and accurate tuning characteristics over the entire band, which makes it ideal for tracking telemetry signals from instrumented space vehicles operating within the range.

This receiver provides outputs for video, spectrum display, frequency monitor and signal strength recorder; four panel mounted meters indicate tuning, output, deviation, and signal strength during operation.

The receiver has standard rack-mounting provisions.

SPECIFICATIONS

Type Reception — FM.
Tuning Range — 130mc-140mc.
Input Impedance — 50 ohms nominal.
Noise Figure — 6 db maximum.
S/N-100kc IF Bandwidth — 30 db for 1.0 for 1.0 μv of input when carrier is modulated ±20kc at 1kc rate.
50kc IF Bandwidth — 33db for 1.0μv of input when carrier is modulated ±20kc at 1kc rate.
IF Rejection — Greater than 75db.
Image Rejection — Greater than 50db.
First Local Oscillator — Crystal controlled.
Second Local Oscillator — Tunable over the frequency ranke of ±150kc.
IF — 30mc first IF; 5mc second IF.
IF Bandwidth —
Wide Band — 100kc bandwidth at 3db points: Attenuation ±250kc from center frequency greater than 60db.
Narrow Band — 50kc bandwidth at 3db points: Attenuation ±150kc from center frequency greater than 60db.
AM Receiver — 50% AM.
Reference carrier deviation, ±50kc measured on 100kc bandwidth. 400cps to 10kc greater than 30db.
Phase Lock Detector — Linear to better than 1% over a bandwidth of ±150kc.
Video Output — Adjustable.
Frequency Response — 10cps to 15kc.
Sensitivity — 0.3v peak-to-peak per kc of deviation, minimum.
Signal Strength Output — Provisions for connecting a 30mc Spectrum Display Unit, NEMS-CLARKE SDU-200-3.
Frequency Monitor Output — 30mc.
VU Meter — Frequency response in Video output circuit: 400cps to 15kc.
Frequency Deviation Meter — Peak reading over the frequency range from 400cps to 15kc. Three Scales: 7.5, 15, and 25kc.
Power Input — 117v, ac, 60cps, Approx. 150w.
Size — 19 × 8¾ × 16 1/9 inches.
Weight — Approximately 40 pounds.
Finish — Gray enamel, MIL-E-15090; Color #26329, Federal Standard 595.

Price: $2,600.00

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PRE-DETECTION TELEMETRY RECEIVER
NEMS-CLARKE 1450

The Nems-Clarke Pre-detection Telemetry receiver provides a means of collecting telemetry data for recording prior to demodulation when used in conjunction with an accessory Pre-Detection Converter, Nems-Clarke IFC-1400, and a magnetic tape recorder having a 1mc or higher frequency response. A front panel control permits playback of recorded date, through the pre-detection converter, for subsequent demodulation.

The receiver has a range of 215 to 260 megacycles, and features a crystal controlled local oscillator to achieve a stability of ±.002 percent of the received frequency. Plug-in crystals facilitate quick changeability for reception of any frequency within the range. The Hartley type second oscillator incorporates a vernier capacitor, tunable from the front panel, to provide calibrated frequency deviations of ±150kc which allows the receiver to tune to exact transmitter frequencies.

Selection of IF amplifiers of different bandwidths may be made from the front panel by means of a bandwidth selector switch. One amplifier has a bandwidth of 500kc at 3db points with an attenuation of 60db 500kc each side of center frequency. The other amplifier has a bandwidth of 100kc with better than 60db attenuation 250kc each side of center frequency, and is primarily used for receiving PDM/FM PMC/FM signals with a nominal deviation of ±50kc.

The peak frequency deviation meter has three full scale ranges, of 25, 75 and 150 kilocycles, useful in setting up the desired deviation of individual subcarrier using FM/FM or the peak deviation pulses used in PDM/FM and PMC/FM. Incorporated in the video output circuit is a VU type meter with front panel control to adjust the video output signal level.

SPECIFICATIONS

Type Reception — PDM/FM, PCM/FM, FM/FM.

Frequency Range — 215 to 260mc, determined by plug-in crystals, Nems-Clarke CO 400.

Input Impedance — 50 ohms nominal.

Noise Figure — Less than 8db.

Signal to Noise Ratio (measured with 2.5kc RC low pass filter at video output) —
500kc Passband: 40db for 2.3μv of input carrier when carrier is modulated ±100kc at a 1000 when carrier is modulated ±kc100kc at a 1000cps rate.
100kc Passband: 40db for 1.7μv for input carrier when carrier is modulated ±50kc at 1000cps rate.

IF Rejection — Greater than 60db.

Image Rejection — Greater than 48db.

First Local Oscillator — Crystal controlled.

Second Local Oscillator — Tunable over a frequency range of ±150kc.

First IF — 30mc

Second IF — 5mc

IF Bandwidths —
Wide Band: 500kc bandwidth at 3db points. Attenuation, ±500kc from center frequency greater than 60db.
Narrow Band: 100kc bandwidth at 3db points. Attenuation, ±250kc from center frequency greater than 60db.

AM Rejection — 50% AM reference carrier deviation ±100kc
400cps to 10kc greater than 50db.
10kc to 30kc greater than 35db.
30kc to 80kc greater than 25db.

Discriminator — Linear to better than 1% over a bandwidth of ±150kc.

Outputs: Video — sensitivity, 0.16v peak-to-peak per kc of deviation. 3db frequency response, ac coupled, 10cps to 100kc per second. Adjustable output control on front panel.
Frequency Monitor — 30mc. (Nems-Clarke 1402F)*
Signal Strength Recorder — high impedance, approximately 5v at 100μv input.
Spectrum Display — 30mc. (SDU-200-3).*
Pre-Detection Recording — 5mc. (For connection of IFC-1400 Pre-Detection Converter).

Meters: VU(in Video Output Circuit) — Frequency response: flat over frequency range of 400 to 80,000cps. Provided with front panel adjustable referecne level control.
Frequency Deviation — Peak reading over frequency range from 400 to 80,000cps. Three scales, 25, 75, and 150kc.
Tuning Indicator
Signal Strength

Inputs: Pre-detection Playback — 5mc. (For connection of IFC-1400 Pre-Detection Converter.)
Power — 117v ac, 60cps; Approx. 150 watts

Size — 19 × 8¾ × 16⅛ inches.

Weight — Net: approx. 40 lbs.; Shipping: approx. 60 lbs.

Finish — Gray enamel, MIL-E-15090; Color #26329 Federal Standard 595.

Price: $2,400.00

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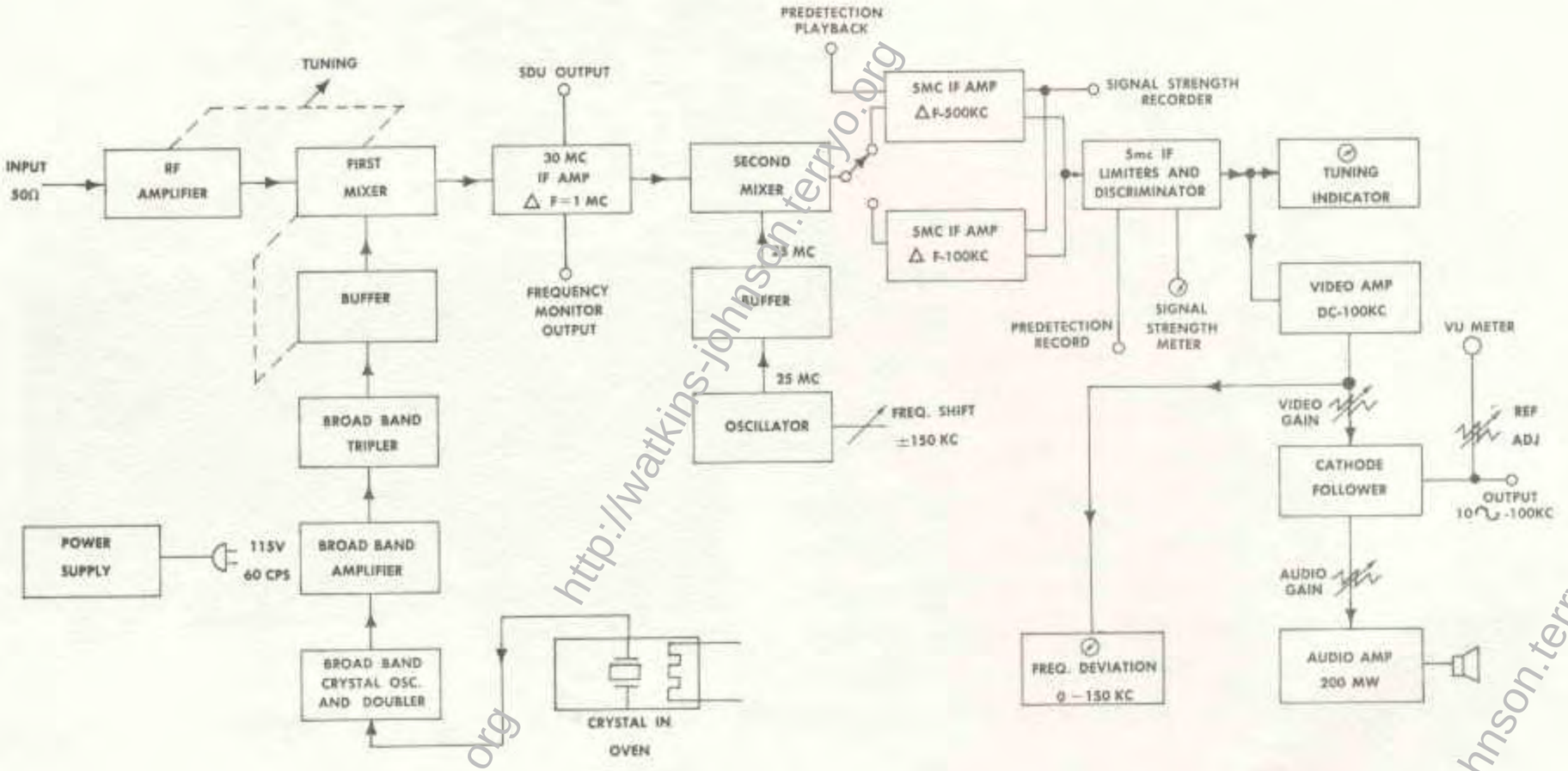
Block Diagram—1450 Receiver



Introducing The
Nems-Clarke 1455
Multiple Bandwidth Receiver

THE CENTAUR RECEIVER

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MULTIPLE BANDWIDTH TELEMETRY RECEIVER
NEMS-CLARKE 1455

Designed to provide a selectable bandwidth capability for PCM Telemetry, the 1455 approaches being the "universal" telemetry receiver. IF/Demodulator Modules inserted through an opening in the front panel are available in bandwidths ranging from 100kc to 1.5mc. Each module contains 3 independent demodulators with characteristics adjusted to the particular IF bandwidth. They are a Foster-Seeley Discriminator, a Phase-Lock Detector, and an AM envelope detector, each of which may be selected by a front panel switch.

As a further refinement in signal-to-noise ratio enhancement, the video amplifier incorporates a video bandwidth filter having a 6db per octave roll-off adjustable from 20kc to 1.2mc by means of a front panel switch. Thus this receiver is capable of receiving any known type of telemetry signal. Other features offered are a 5mc pre-detection recording output and playback input terminals, an integral VFO, and a crystal controlled tuning unit automatically actuated by a microswitch on the crystal socket.

The modulation sensitivity and deviation meter scales in each module provide output voltages and meter deflections which are essentially the same percentage of bandwidth in all modules. Thus, in changing bandwidths, no level adjustments need be made in using subsequent auxiliary equipment. Available as an accessory unit is the Nems-Clarke IFC-1400 Predetection Converter which permits use of the 1455 with stationary-head instrumentation tape recorders.

SPECIFICATIONS

Type Reception — AM-FM.

Tuning Range — 215-260mc.

Noise Figure — Less than 8db.

First IF — 30mc.

Second IF — 5mc.

IF Bandwidth — (Determined by plug-in modules, Type IFM)*

First Local Oscillator — VFO and Crystal Control (Frequency determined by plug-in crystal-and-oven assemblies, Type CO-400)*

Second Local Oscillator — Tunable, ±150kc

Video Filter — 6 positions: 20, 50, 100, 300, 500kc; 1.25mc (6db/octave)

Meters — Tuning and VU

Outputs: Video — 5cps to 1.5mc.
Spectrum Display — 30mc.
Signal Strength .0 to minus 15 VDC
Pre-Detector Recorder — 5mc

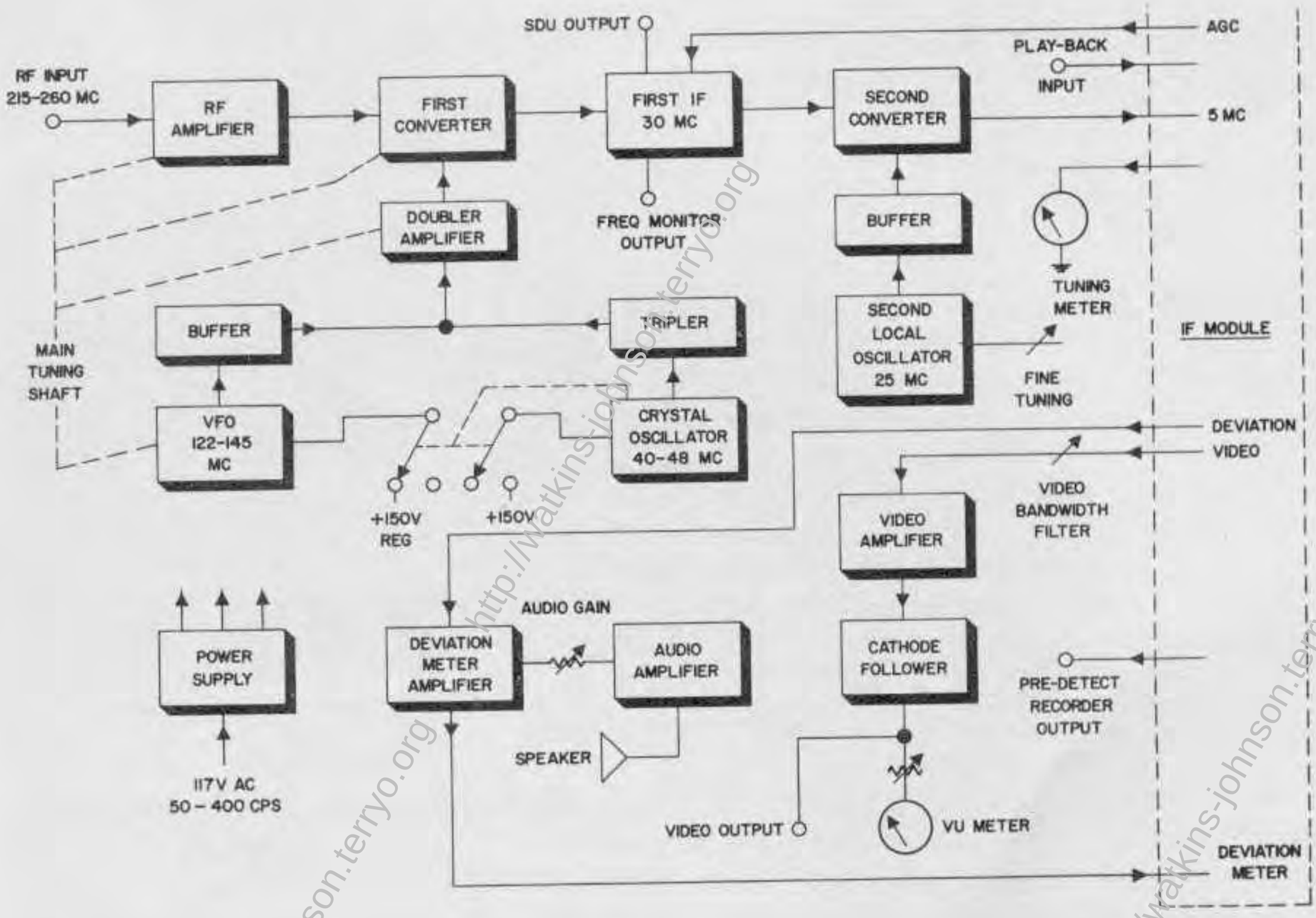
Inputs: RF — 50 ohms.
Pre-Detection Playback — 50 ohms.

Power Supply — 117v ac, 50- 400cps.

Panel Size — 19 × 8¾ inches.

*(Without plug-in crystal oven assemblies, or IF Modules which must be ordered separately)

Price: $1,500.00



IF/DEMODULATOR MODULE AM-FM NEMS-CLARKE 1455

For Nems-Clarke 1455 Multiple Bandwidth Telemetry Receivers

The IF/Demodulator plug-in modules determine the operating IF bandwidth of the Nems-Clarke 1455 Telemetry Receiver. All modules have AM envelope detector and conventional Foster-Seeley FM discriminator and FM Phase-Lock detector. The convenience offered by these plug-in modules makes possible the use of only one receiver in handling any type of signal used in the 215-260mc telemetering band.

Each module has its own signal strength meter and deviation meter, video gain control, and predetection recording and playback switch.

SPECIFICATIONS

Bandwidth designated — measured at 3db points.
Shape Factor — no greater than 2.5.
Demodulators — AM envelope detector Foster-Seeley FM discriminator FM Phase-Lock detector.
Sensitivity — 3v peak-to-peak video output for deviation equal to 1/5 of bandwidth.
Deviation Meter — Full scale deflection corresponds to a deviation of ½ of IF bandwidth.
Signal Strength Meter — 200K μv full scale deflection.

IF/DEMODULATOR MODULES

TYPE IFM-100	100kc bandwidth
TYPE IFM-200	200kc bandwdith
TYPE IFM-300	300kc bandwidth
TYPE IFM-500	500kc bandwidth
TYPE IFM-750	750kc bandwidth
TYPE IFM-1000	1.0mc bandwidth
TYPE IFM-1500	1.5mc bandwidth

Price: $800.00

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SURVEILLANCE RECEIVER
NEMS-CLARKE 1500 SERIES

The 1500 series receivers are designed for AM, FM, and CW operations in the VHF range and for applications in telemetering, guided-missile monitoring, television sound rebroadcasting and numerous other uses where superior performance is the primary requirement. Great stability, very high sensitivity, and video bandwidth control are a few of the outstanding features offered in these high quality receivers.

CIRCUIT DESCRIPTION

The major difference in the various types of 1500 Series Receivers are found in the tuning range, the RF amplifier, and the band-width of the IF amplifier. A low-noise ground-grid RF amplifier, employing a 6J4, is common to all types, and an additional ground-grid amplifier, using a 416B planar triode, is employed to precede the 6J4 in the 1502A, 1510A, and 1511A, where extreme sensitivity is demanded. All 1500 Series Receivers provide excellent tracking throughout tuning range, gain controlled IF amplifier, dual limiters, squelch circuit with adjustable threshold, and extremely linear video-frequency response up to 300kc. Video band-width can be switched from 1kc to 300kc in five steps from front panel, thus allowing an improved signal-to-noise ratio when full band-width is not needed. A BFO is included to facilitate reception of CW signals. Temperature compensation is incorporated in IF and discriminator transformers to insure high stability. Two indicators are mounted on front panel. One is a zero-center meter for accurate tuning, and the other is a signal-strength meter indicating relative signal voltage across input terminals of receiver. Signal strength meter is so arranged that remote indicators can be connected. All receivers equipped with output provision for use with Nems-Clarke Spectrum Display Unit, SDU-200-2.

SPECIFICATIONS

COMMON TO ALL 1500 SERIES RECEIVERS

Type Reception — AM, FM, CW.

IF — 21.4mc.

Video Response — 10cps to 300kc.

Video Band-width Control — 5 positions — 1, 3, 10, 30, and 300kc.

FM Output — 0.10v minimum per kc of deviation (approximate).

AM Output Stability — Varies not more than 7db for an input change of 40db.

Outputs Provided — *1. Signal:* wide band for supplying high-impedance load (internal impedance approximately 500 ohms).
2. Monitor: panel-mounted speaker, headphones, or 600 ohms balanced output for external use.

Spectrum Display Unit — Provisions for connecting a 21.4mc Spectrum Display Unit (NEMS-CLARKE SDU-200-2).

Meters — Approximate signal strength indicator and zero-center tuning indicator.

Beat Frequency Oscillator — Adjustable front panel pitch control.

Squelch — Operates on monitor circuit.

Gain — Automatic or manual control.

Size — 19 × 8¾ × 15⅝ inches

Panel Finish — Gray enamel, MIL-E-15090; Color #26329 Federal Standard 595.

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1501A

Tuning Range — 55mc to 260mc
Input Impedance — 75 ohms, nominal
Noise Figure — 11.5db maximum
IF Rejection — 70db minimum
Image Rejection — Not less than 40db below 130mc; 30db minimum at any frequency
IF Band-width — 300kc
AM Output — 7-15v rms for 5mv input modulated 50% at 1kc
FM Output Stability — Varies less than 2db for inputs above 4μv
Sensitivity — 8μv produces at least 23db s/n with 100kc deviation, 1kc modulation
Power Input — 115/230v, 50-400cps, approximately 100w
Weight — 32 pounds (approx.)

Price: $1,050.00

1503A

Tuning Range — 40mc to 180mc
Input Impedance — 75 ohms, nominal
Noise Figure — 13db maximum
IF Rejection — 50db minimum
Image Rejection — 40db minimum

IF Band-width — 300kc
AM Output — 7-15v rms for 5mv input modulated 50% at 1kc
FM Output Stability — Varies less than 2db for inputs above 4μv
Sensitivity — 10μv produces at least 23db s/n with 100kc deviation, 1kc modulation
Power Input — 115/230v, 50-400cp,s approximately 100w
Weight — 32 pounds (approx.)

Price: $1,050.00

1509A

Tuning Range — 55mc to 260mc
Input Impedance — 75 ohms, nominal
Noise Figure — 11.5db maximum
IF Rejection — 70db minimum
Image Rejection — Not less than 40db below 130mc; 30db minimum at any frequency
IF Band-width — 175kc
AM Output — 7-15v rms for 5mv input modulated 50% at 1kc
FM Output Stability — Varies less than 2db for inputs above 4μv
Sensitivity — 8μv produces at least 23db s/n with 75kc deviation, 1kc modulation
Power Input — 115/230v, 50-400cp,s approximately 100w
Weight — 32 pounds (approx.)

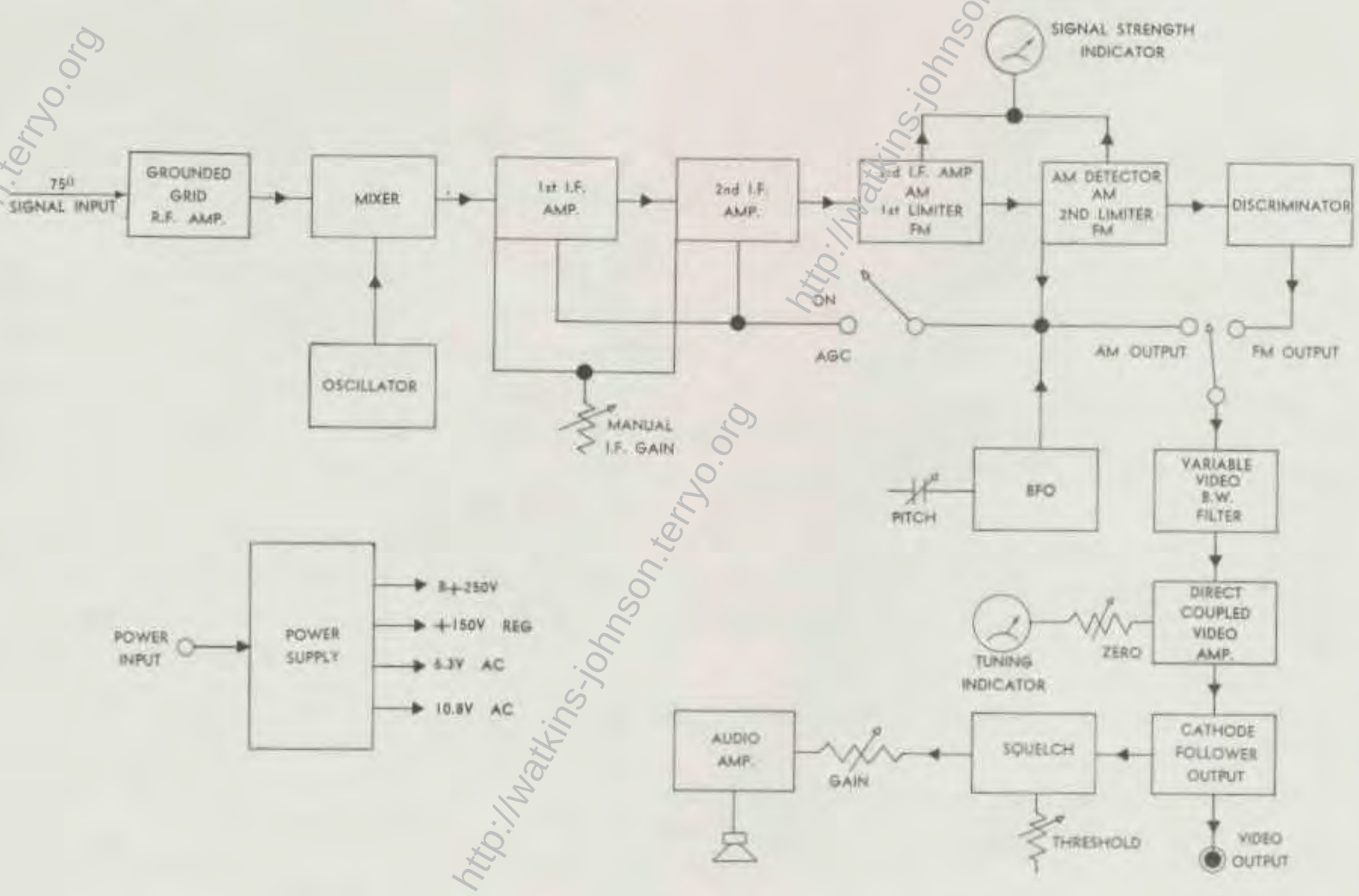
Price: $1,050.00

1512A

Tuning Range — 55mc to 260mc
Input Impedance — 75 ohms, nominal
Noise Figure — 11.5db maximum
IF Rejection — 70db minimum
Image Rejection — Not less than 40db below 130mc; 30db minimum at any frequency
IF Band-width — 500kc
AM Output — 7-15v rms for 5mv input modulated 50% at 1kc
FM Output Stability — Varies less than 2db for inputs above 4μv
Sensitivity — 8μv produces at least 21 db s/n with 125kc deviation, 1kc modulation
Power Input — 115/230v, 50-400cp,s approximately 100w
Weight — 37 pounds (approx.)

Price: $1,050.00

Special Panel Finish: $20.00 additional



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1502A

Tuning Range — 55mc to 260mc
Input Impedance — 50 ohms, nominal
Noise Figure — 6db maximum
IF Rejection — 70db minimum
Image Rejection — 58db minimum

IF Band-width — 300kc
AM Output — 7-15v rms for 500μv input modulated 50% at 1kc
FM Output Stability — Varies less than 2db for inputs above 1μv
Sensitivity — 4μv produces at least 23db s/n with 100kc deviation, 1kc modulation
Power Input — 115/230v, 50-60 cps, approximately 127w
Weight — 37 pounds (approx.)

Price: $1,750.00

1510A

Tuning Range — 55mc to 260mc
Input Impedance — 50 ohms, nominal
Noise Figure — 6db maximum
IF Rejection — 70db minimum
Image Rejection — 58db minimum

IF Band-width — 500kc
AM Output — 7-15v rms for 500μv input modulated 50% at 1kc
FM Output Stability — Varies less than 2db for inputs above 1μv
Sensitivity — 4μv produces at least 21db s/n with 125kc deviation, 1kc modulation
Power Input — 115/230v, 50-400cp,s approximately 127w
Weight — 37 pounds (approx.)

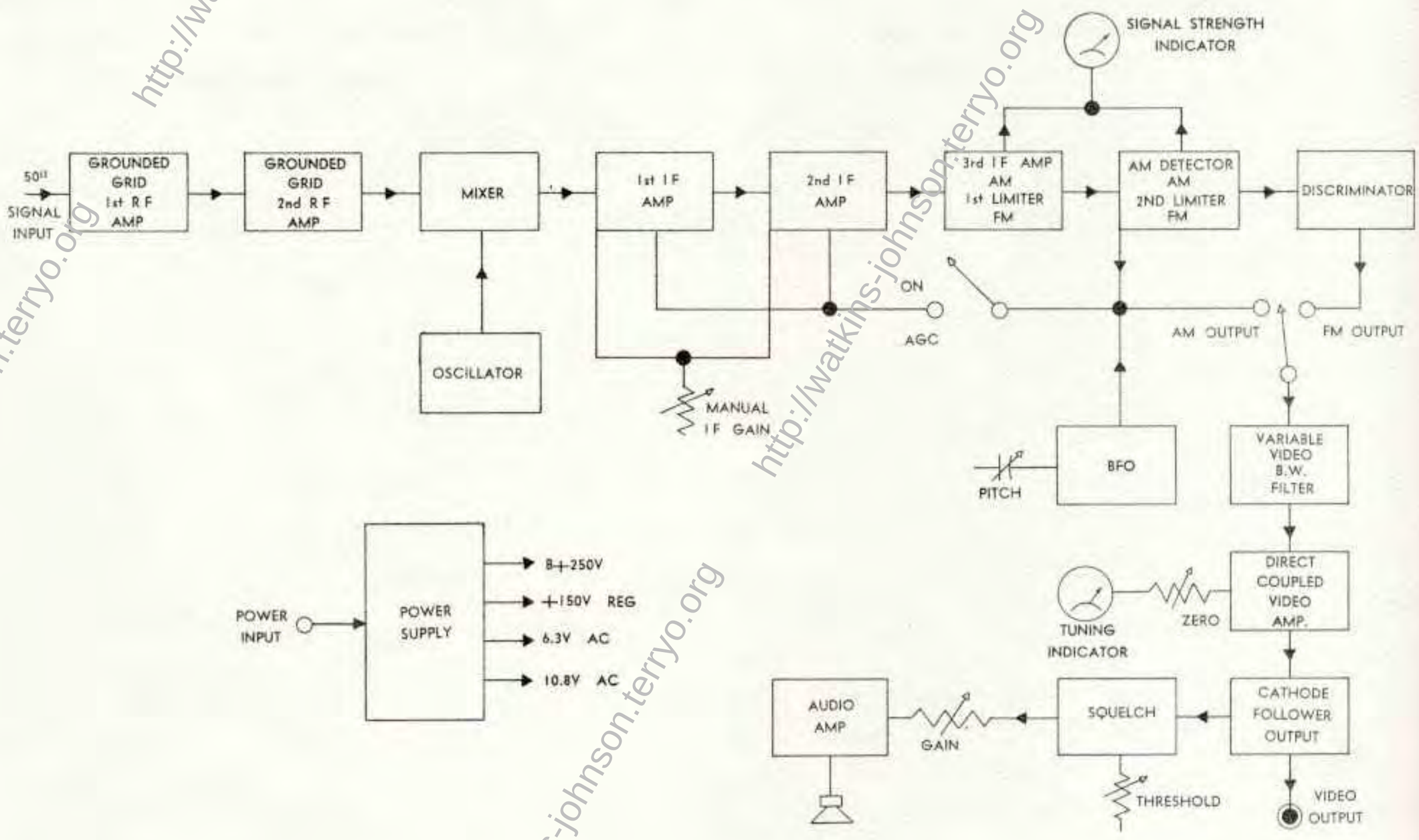
Price: $1,750.00

1511A

Tuning Range — 55mc to 260mc
Input Impedance — 50 ohms, nominal
Noise Figure — 6db maximum
IF Rejection — 70db minimum
Image Rejection — 58db minimum
IF Band-width — 175kc
AM Output — 7-15v rms for 500μv input modulated 50% at 1kc
FM Output Stability — Varies less than 2db for inputs above 1μv
Sensitivity — 4μv produces at least 23db s/n with 75kc deviation, 1kc modulation
Power Input — 115/230v, 50-400cp,s approximately 127w
Weight — 32 pounds (approx.)

Price: $1,750.00

Special Panel Finish: $20.00 additional



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GENERAL PURPOSE FM RECEIVERS
NEMS-CLARKE 1670 SERIES

The Nems-Clarke 1670 Series General Purpose Receivers are extremely versatile high quality instruments at a moderate price. These units are designed for FM reception in the frequency range from 55 to 260 megacycles and are for applications in telemetering, guided-missile monitoring, television sound rebroadcasting, and numerous other uses.

SPECIFICATIONS

Video Response — 20cps to 100kc into 20,000 ohms load.
Output — 0.075v per kc of deviation
Output Stability — 2db maximum for input voltages from 4μv to 10,000μv
Internal Impedance of Output Circuit — 400 ohms, approximately
Input Impedance — 75 ohms, nominal
IF Rejection — 70db, minimum
Automatic Frequency Control — 3-position switch: "OFF," "FAST" (2.5 milliseconds), "SLOW" (10 milliseconds)
IF — 21.4mc
Discriminator Linearity — ±150kc, minimum
Signal Strength Meter — 2μv to 10,000μv scale
Power Input — 117v, 50 to 400cps, 68w
Size — 19 × 8¾ × 13 inches
Weight — 27 pounds
Finish — Gray enamel, MIL-E-15090; Color #26329 Federal Standard 595

CIRCUIT DESCRIPTION

The 1670 series receivers are high quality FM receivers of great stability, both electrical and mechanical. The outstanding features consist of low-noise grounded-grid RF amplifier, excellent tracking throughout the whole tuning range, gain-controlled IF amplifier, dual limiters, AFC of fast or slow actions, and extremely linear video frequency response to 100kc. Temperature compensation is incorporated in the IF and discriminator transformers to insure extreme stability. There is a separate audio-frequency amplifier and monitoring speaker to facilitate identification of signals. Two indicating meters are provided on the front panel. One is a zero-center meter for tuning; and the other has a scale which is calibrated to indicate the approximate signal voltage in microvolts across the input terminals of the receiver. The signal strength indicator is arranged so that remote indicators can be connected if desired. All receivers are equipped with output provision for use with Nems-Clarke Spectrum Display Units.

The receivers are constructed of the best possible components; all transformers and chokes are hermetically sealed; no electrolytic condensers are used; all components are operated well within their safe design limits; and the entire assembly is treated to reduce the effect of moisture and fungus according to the best available practice. The receivers are subjected to rigid inspection and alignment procedures.

1671 (1670-E)
Tuning Range — 175-260mc
Noise Figure — 10db, maximum
Image Rejection — 40db, minimum

IF Bandwidth — 500kc
Sensitivity — 8μv produces at least 22db s/n with 125kc deviation and 1kc modulation.
Spectrum Display Unit (Nems-Clarke) — SDU-200-1

Price: $750.00

1672 (1670-F)
Tuning Range — 55-260mc
Noise Figure — 11.5db, maximum
Image Rejection — 40db below 130mc; 30db minimum any frequency.
IF Bandwidth — 500kc
Sensitivity — 8μv produces at least 21db s/n with 125kc deviation and 1kc modulation.
Spectrum Display Unit (Nems-Clarke) — SDU-200-1

Price: $750.00

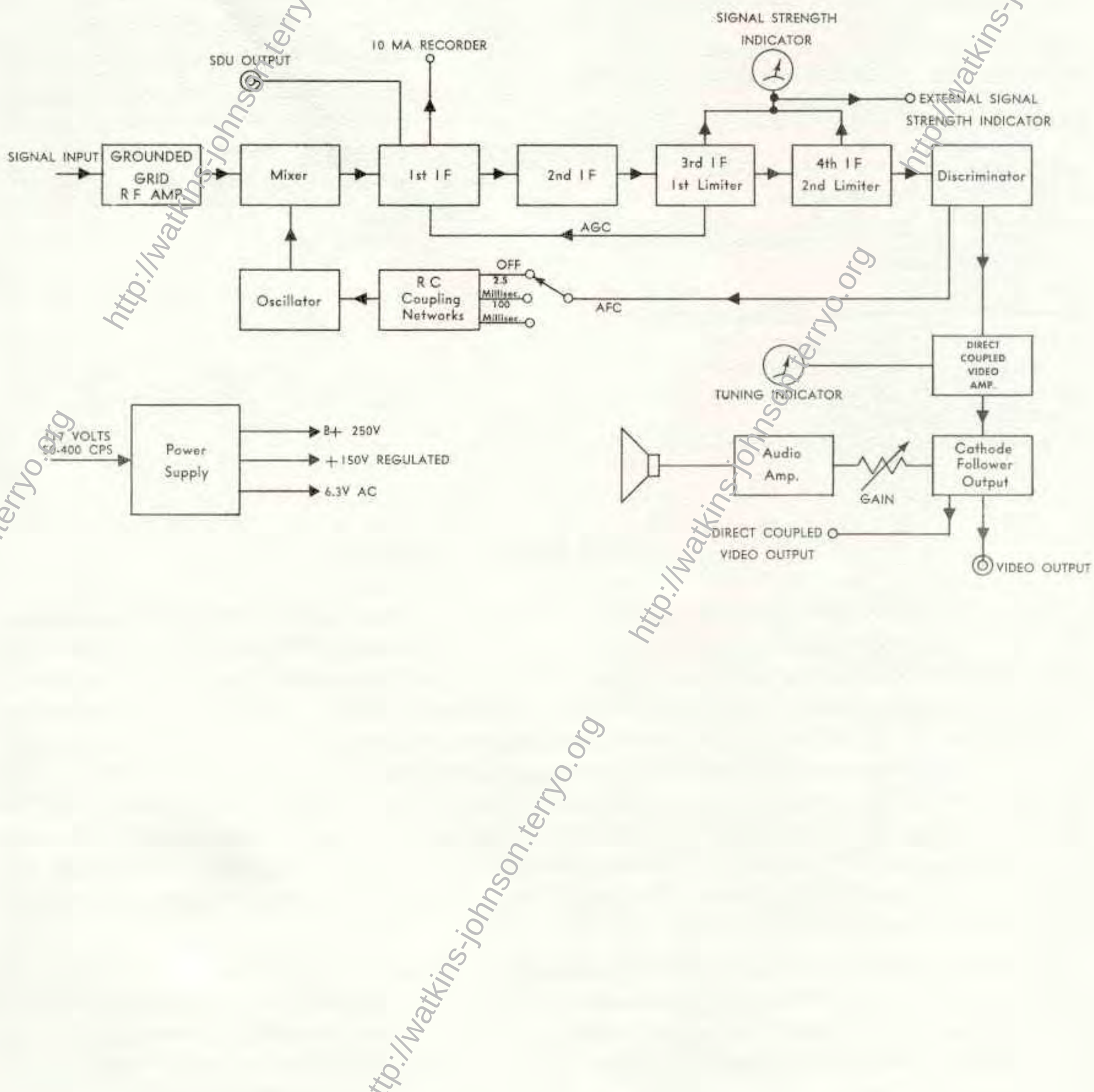
1673(1670-G)
Tuning Range — 175-260mc
Noise Figure — 10db, maximum
Image Rejection — 40db, minimum

IF Bandwidth — 300kc
Sensitivity — 8μv produces at least 24db s/n with 100kc deviation and 400 cps modulation.
Spectrum Display Unit (Nems-Clarke) — SDU-200-2

Price: $750.00

1674(1670-J)
Tuning Range — 55-260mc
Noise Figure — 11.5db, maximum
Image Rejection — 40db below 130mc; 30db minimum any frequency.
IF Bandwidth — 300kc
Sensitivity — 8μv produces at least 23db s/n with 100kc deviation and 400 cps modulation.
Spectrum Display Unit (Nems-Clarke) — SDU-200-2

Price: $750.00



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WIDE BAND VHF RECEIVERS
NEMS-CLARKE 1701-A and 1702-A

1701-A SPECIFICATIONS

Type Reception — FM
Tuning Range — 55-260mc
Input Impedance — 75 ohms, nominal
Noise Figure — 11db maximum
S/N — 10db minimum for 12μv input modulated ± 125kc deviation at 1kc
IF Rejection — Greater than 70db
Image Rejection — Greater than 40db below 130mc, 30db minimum
Automatic Frequency Control — 100 milliseconds
IF — 21.4mc
IF Bandwidth — 2mc nominal
Discriminator Linearity — ±200kc
Discriminator Peak Separation — 1.4mc
Video Response — Within 3db from 100cps to 2mc.
Video Output — 1mv input at 125kc deviation produces 3 to 5v rms into a 22K ohm load ac coupled.
FM Output Stability — Varies less than 2db for voltages above 6μv
Internal Impedance of Output Circuit — 150 ohms
Outputs provided — Video
Spectrum Display Unit — Provisions for connecting a 21.4mc Spectrum Display Unit (Nems-Clarke Company, Type SDU-300-5)
Signal Strength Meter
Tuning meter
Power Input — 115v, ac
Power Consumption — 70w
Size — 19 × 8¾ × 13 inches
Weight — 27 pounds
Finish — Gray enamel, MIL-E-15090; Color #25329 Federal Standard 595

1702-A SPECIFICATIONS

Type Reception — AM, FM, PM (pulse)
FM Video Output — 1mv input at 125kc deviation produces 2 to 3v rms into a 22K ohm load. ac coupled.
AM Output Stability — Varies less than 7db for input change of 40db
AM Sensitivity — 3v rms for 5v input, 50% modulated at 1kc
All other specifications same as 1701-A

Price: 1701-A $1,200.00
Price: 1702-A, $1,700.00

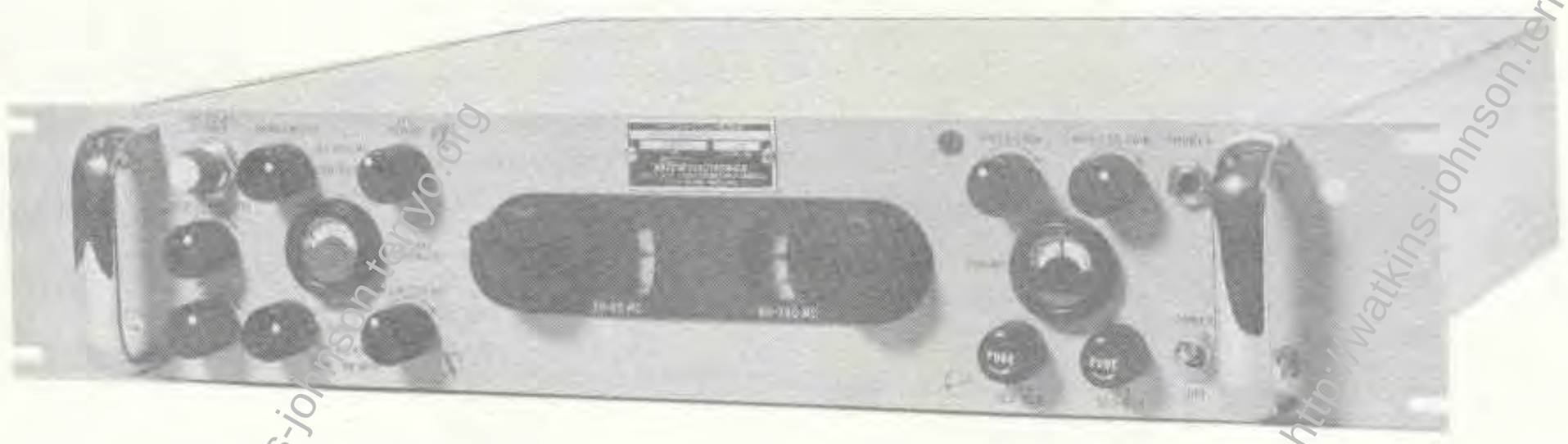
SINGLE-SIDEBAND V H F RECEIVER
NEMS-CLARKE 1801

SPECIFICATIONS

Type Reception — Single Side Band AM (lower frequency side band used)
Tuning Range — 175-230 mc
Input Impedance — 50 ohms
Noise Figure — 14db maximum
IF Rejection — 60db minimum
Image Rejection — 65db minimum
Automatic Frequency Control — 10 milliseconds time constant
AGC Time Constant — 10 milliseconds
IF — 60mc
IF Bandwidth — 10mc
Discriminator — For AFC and tuning only, 2mc peak separation
Video Response — 1kc to 10mc
Sensitivity — 50μv RF pulse input produces 5v peak output in 200-ohm load
Internal Impedance of Output Circuit — 100 ohms (approximate)
Power Input — 117v, 50/60cps, 95w
Size — 19 × 8¾ × 13 inches
Weight — 31 pounds
Panel Finish — Gray enamel, MIL-E-15090, Color #26329 Federal Standard 595

Price: $1,000.00

COMPACT TELEMETRY RECEIVERS
NEMS-CLARKE 1906 AND 1907



DESCRIPTION

These Nems-Clarke receivers are designed for compactness and are lightweight. They are built with the highest quality components to meet the requirements of high stability and sensitivity for outstanding performance.

The modern superheterodyne circuitry used is designed to tune over the range of the receivers in two bands: 30 to 60mc and 60 to 260mc. Each band has a separate RF unit, local oscillator, and mixer. A panel-mounted band selector controls a coaxial relay which automatically switches the antenna input to the selected band during single antenna operation. In two-antenna operation, each antenna may be directly connected to its respected RF band. A mode selector switch on the panel determines the IF bandwidth and mode: 300kc AM, 300kc FM, 20kc AM, or 20kc AM BFO.

The rugged and compact construction of these units make them ideal modules for modern mobile telemetry installations using standard 19-inch racks, since the panels have a vertical height of only 3½ inches. The chassis is 16½ inches deep, and the entire unit weighs only 25 pounds.

The 1907 Receiver is identical in every respect to the 1906 Receiver, but has the additional features of automatic auxiliary equipment actuation facilities, and an AM noise limiter. A carrier-operated relay, with two contacts, is actuated by a carrier to provide carrier-on, carrier-off control of auxiliary equipment. The action is indicated by a panel light. Time-delay of the carrier-off action is adjustable from 3 to 13 seconds following carrier-on operations. The AM noise limiter provides clipping action of the detector signal voltages. The extent of limiting, which depends on the carrier level and per cent modulation, is adjustable by means of a panel-mounted control.

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SPECIFICATIONS

Type Reception — AM-FM-CW

Tuning Ranges, switchable — Band A — 30-60mc, Band B, 60-260mc

Input Impedance — 50 ohms, nominal, unbalanced to ground

Noise Figure — Band A, 6db max., Band B, 6.5db max.

IF Rejection — Band A, 50db max., Band B, 70db min.

Image Rejection — 55db min., Band B, 58db min.

Oscillation Radiation — Band A, 40μv max., Band B, 5μv max.

IF — 21.4mc

IF Bandwidths, switchable from front panel: — 300 & 20kc

Wide Band—300kc bandwidth at 3db points. Attenuation ±800kc from center frequency greater than 60db.

Narrow Band—20kc bandwidth at 3db points.

AGC Range — 40db for 7db change in output

Discriminator Peak Separation — 0.75mc

Harmonic Distortion—

Wide Band: 300kc FM—500μv input, 100kc deviation, 1kc modulation frequency — less 1%

300kc AM—10μv input, 50% modulation, 1kc modulation frequency—less than 3%

Narrow Band: 20kc AM—100μv input, 50% modulation, 1kc modulation frequency—less than 7.0%

Video Response — 50cps to better than 100kc at 3db points in the 300kc bandwidth position only.

Video Output — To drive 600 ohms at 0.774v RMS with 50% AM, or 100kc deviation FM, with a modulation frequency of 1kc at 5μv and 4μv inputs for AM and FM respectively.

Sensitivity — 0.021v peak-to-peak per kc of deviation

AM Output Stability — 7db change in output for 40db change in input from 5μv

FM Output Stability — Varies less than 2db for voltages above 1.5μv input

AM Sensitivity — measured with 100kc low pass video filter:

300kc IF Bandwidth — 2μv produces at least 9db S/N with 50% modulation and 1kc modulation frequency

20kc IF Bandwidth — 2μv produces at least 16db S/N with 50% modulation and 1kc modulation frequency

FM Sensitivity — measured with 100kc low pass video filter:

300kc IF Bandwidth only — 4μv produces at least 21db S/N with 100kc deviation and 1kc modulation frequency

Monitor Output

Voltage — 0.774v (nominal) across 2000 ohms into standard phone jack on front panel

Monitor Output Response — 50cps to better than 100kc at 3db points in 300kc bandwidth position only

Beat Frequency Oscillator — Adjustable from front panel and interlocked with 20kc IF bandwidth position only

Outputs: Video — 600 ohms unbalanced, for external use

Monitor—Phone-jack — 2000 ohms

Spectrum Display — (SDU-200-7) — 21.4mc

Meters: Tuning — Zero-Center indicator

Signal Strength — Approximate indicator

Gain Controls — RF Gain, Video Gain, Monitor Gain

1907 only:

Shunt AM Noise Limiter — Adjustable for 50% to 100% modulation

Carrier Operated Relay — Adjustable Sensitivity Adjustable Delay: 3 to 13 sec.

Power Input:

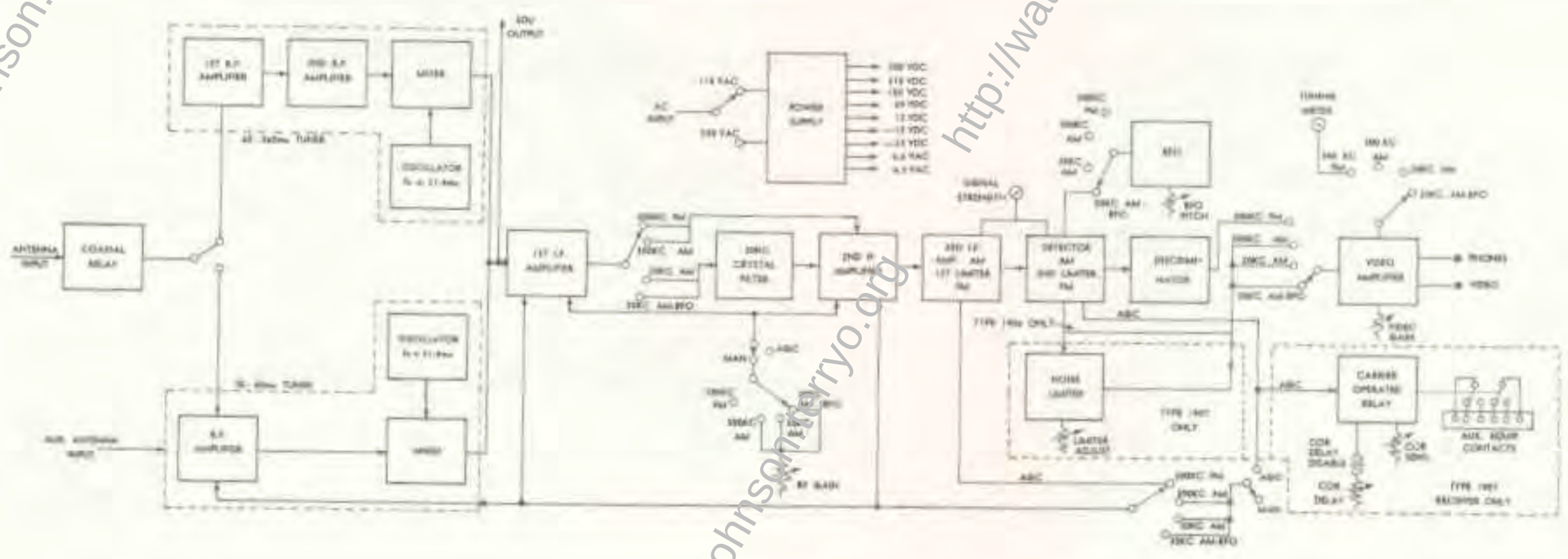
1906: 115/230v AC, 50/60cps, 60 watts approximate

1907: 115/230v AC, 50/400cps, 67 watts approximate

Size — 19 × 3½ × 16½ inches

Weight — Approx. 25 pounds

Finish — Gray enamel MIL-E-15090; Color #26329 Federal Standard 595.



Price: 1906, $2,250.00

Price: 1907, $2,350.00

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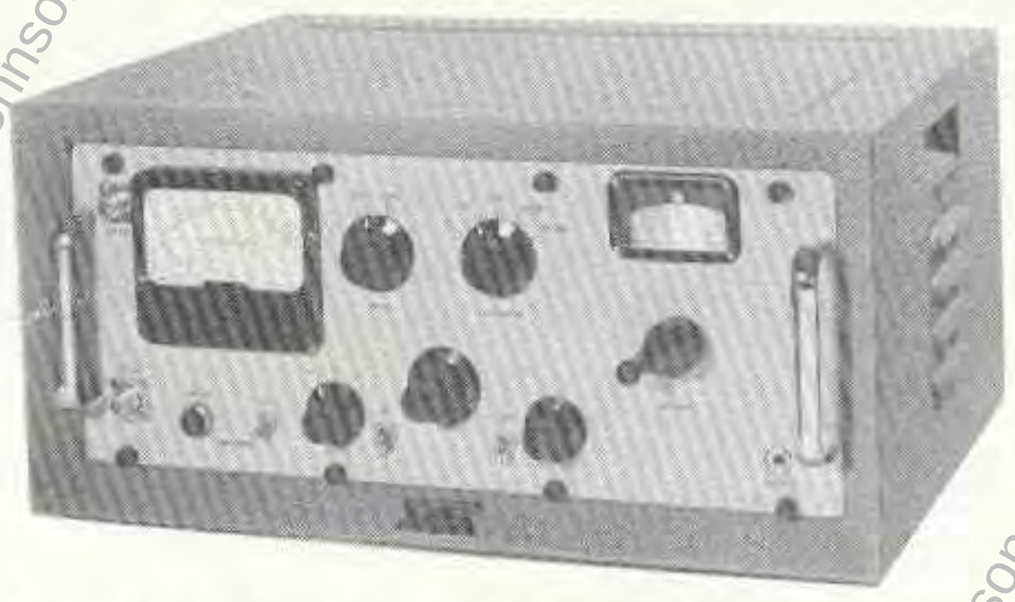
LABORATORY RECEIVER
NEMS-CLARKE 2000-A



The Nems-Clarke 2000A Laboratory Receiver has been designed to fill the need for a general purpose receiver in development laboratories. It is an extremely useful instrument in antenna development and RF filter design.

The receiver, in effect, operates as a linear voltmeter having a 1000db range in 20db steps. The receiver contains an output meter which has a logarithmic scale calibrated between 1 and 10. An IF gain control and a 20db step attenuator in this receiver permits the microvolt-meter to be set at any desired full-scale range from 10 microvolts to 0.1 volts.

Audio frequency circuits in the receiver permit aural monitoring of both AM and FM transmission. An output is provided for conection to a recorder to produce either linear or compressed scale (log) recordings of signal input.

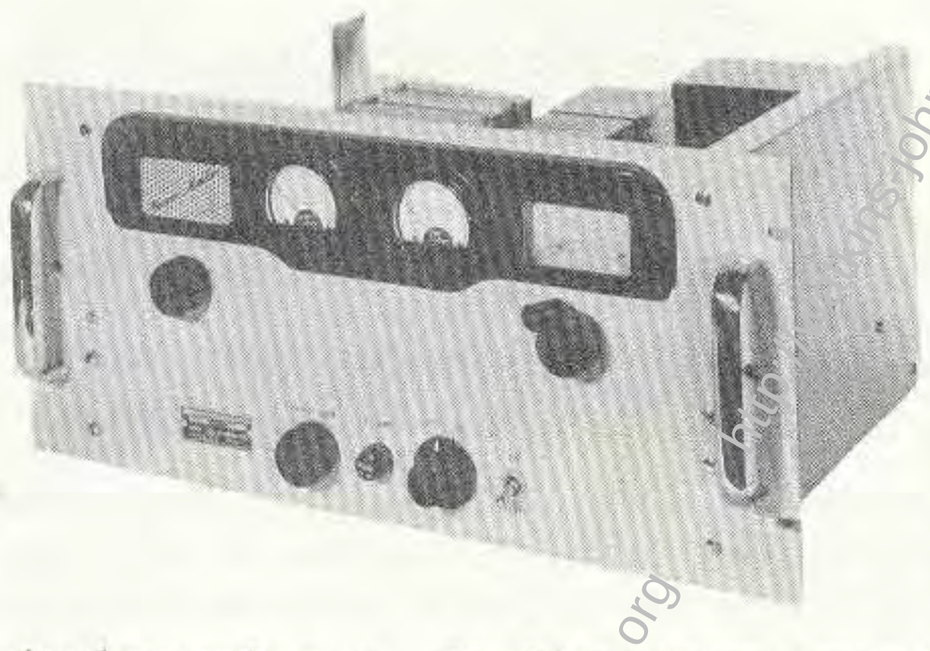
The power supply is self contained and operates from a 115 volt, AC, 50-60 cycle power source.

SPECIFICATIONS

Frequency range	54 to 250 megacycles
Sensitivity at input terminals as a voltmeter	1.0 microvolt
Maximum signal input direct to receiver	0.1 volt
Receiver input impedance	51 ohms
Intermediate frequency	21.4 megacycles
IF bandwidth	300 kilocycles
Output indicator	Panel meter with logarithmic scale
Auxiliary outputs	a. Audio for headphones; b. dc output to operate a 1-ma chart recorder.
Power input	115 volts ac, 50-60 cycles, 60 watts
Size—Case	21 × 10½ × 14 inches
Weight	40 lbs.
Finish—Case	Gray Wrinkle
—Panel	Gray Enamel—MIL-E-15090 Color #26329 Federal Standard 595

Price: $1,500.00

AM V H F RECEIVER
NEMS-CLARKE 2100-A



The Nems-Clarke 2100A Receiver is a relatively wide band AM receiver. It has a tuning range of 55-260mc. Although basically an AM receiver, the 2100A has a frequency detector for AFC purposes. The 2100A also has automatic gain control, video response extending to 240kc, low output distortion, and an audio monitoring amplifier and speaker. Proper tuning is indicated on a zero center tuning meter, and the approximate input level is shown on a signal strength meter. Provision has been made for connecting an external 10ma recorder for the permanent recording of signal strength. An output is provided for connection to a Nems-Clarke Spectrum Display Unit SDU300-4.

The 2100A Receiver is especially useful in telemetering high information rates in an AM system. A predetection bandwidth of 700kc, and a post-detection bandwidth of 240kc allows information rates of up to 240kc, with allowances made for up to 100kc of transmitter drift, Dopple, shifts, etc.

SPECIFICATIONS

Type Reception — AM

Tuning Range — 55-260mc

Input Impedance — 50 ohms nominal

Noise Figure — 12db maximum

S/N — 15μv produces at least 10db signal-to-noise ratio with 50% AM and 150kc modulation without band-restricting filters.

IF Rejection — 70db minimum

Image Rejection — 35db minimum

Automatic Frequency Control — 2-position switch: ON-OFF (2.5 milliseconds time constant)

AFC Drift Reduction Factor —
Minimum of 1.5 at 100mc
3.0 at 200mc
6.0 at 250mc

IF — 21.4mc

IF Bandwidth — 700kc

Video Response — 70-240kc, limit −2db less than 0.5db for any 6kc increment

Output — 0.5v RMS for a 15μv input modulated 50% at 150kc.

Output Stability — 8db maximum for input voltages from 50 to 10,000μv

Internal Impedance of Output Circuit — 400 ohms approximate

Signal Strength Meter — 2 to 10,000μv scale

Power Consumption — 117 volts, 60cps

Size — 19 × 8¾ × 13 inches

Weight — 27 pounds, approximate

Finish — Gray enamel — MIL-E-15090, Color #26329 Federal Standard 595

Price: $1,700.00

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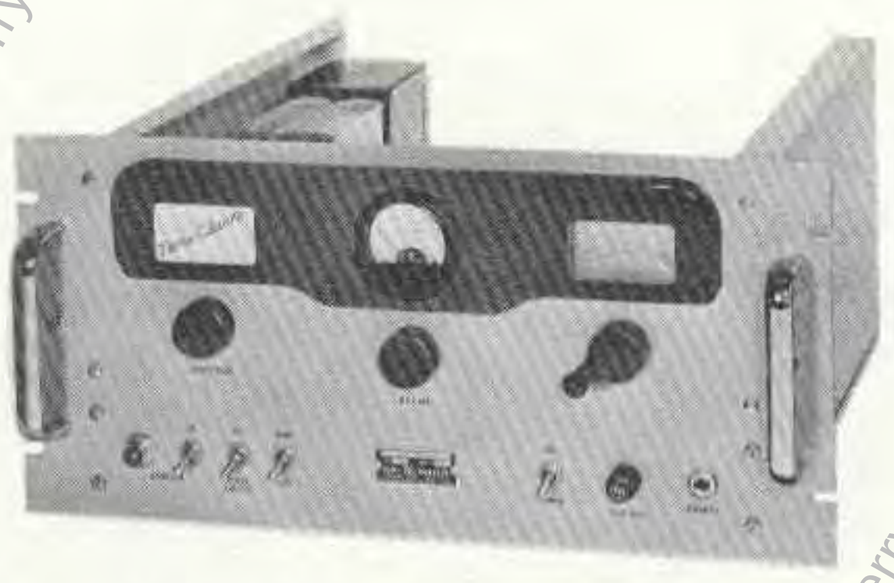
COMMUNICATIONS RECEIVER
NEMS-CLARKE 2201



The Nems-Clarke 2201 AM communications receiver is designed for commercial airport control tower use and other communication applications falling within the frequency range of 105 to 155 megacycles.

The receiver employs a superheterodyne circuit and includes two automatic noise limiters, delayed and amplified automatic volume control and carrier operated squelch circuits.

A tuning meter is provided on the front panel which has an approximately logarithmic response for ease in tuning over a wide range of input signals. Manually operated Audio gain and RF gain controls are also mounted on the front panel.

A highly efficient power supply using silicon diodes contribute to the low power consumption of this receiver and to its exceptionally trouble-free operation.

The 2201 communications receiver is designed for rack mounting and has a panel dimension of 19 by 8¾ inches with a maximum depth behind the panel of 15 inches. All necessary mating connectors are supplied with each receiver.

SPECIFICATIONS

Tuning Range — 105-155mc in one band
Type Reception — AM
Input Impedance — 50 ohms (approximate)
Sensitivity — 2μv 30% amplitude modulation at 1000cps for a 10db s/n
Selectivity — 50kc minimum at 6db. 180kc maximum at 60db
Image Rejection — Better than 80db
IF Rejection — Better than 90db
Audio Power Output — 1 watt
Audio Output Impedance — 600 ohms balanced and ungrounded
Audio Response — ±3db from 200 to 3000cps
Hum and Noise — At least 30db below 1 watt output
AVC — Audio output held constant with 2db with an input level change of 80db
Squelch Sensitivity — 0.5 μv at maximum RF gain
Squelch Muting — Adjustable to 30db below the unmuted level
Noise Limiters — Automatically adjusts to carrier level, series and shunt types
Power Input — 115/230 volts, 50-60cps
Power Consumption — 60 watts
Size — 19 × 8¾ × 15 inches
Finish — Gray enamel MIL-E-15090 Color #26329 Federal Standard 595

Price: $950.00

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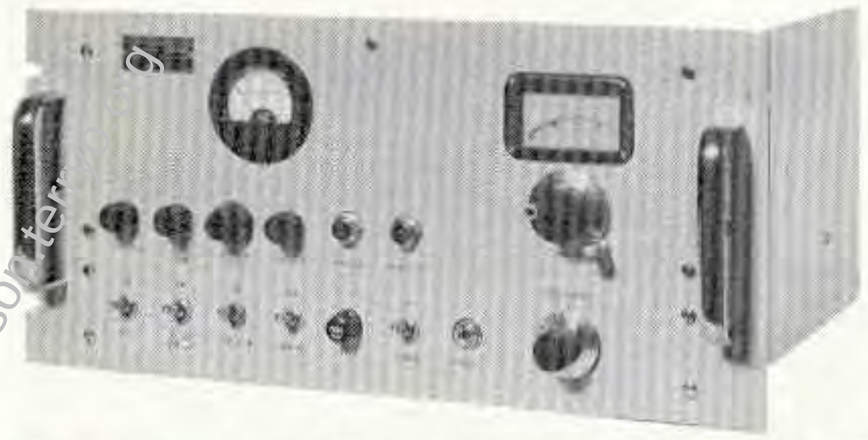
DOPPLER RECEIVER
NEMS-CLARKE 2501-A



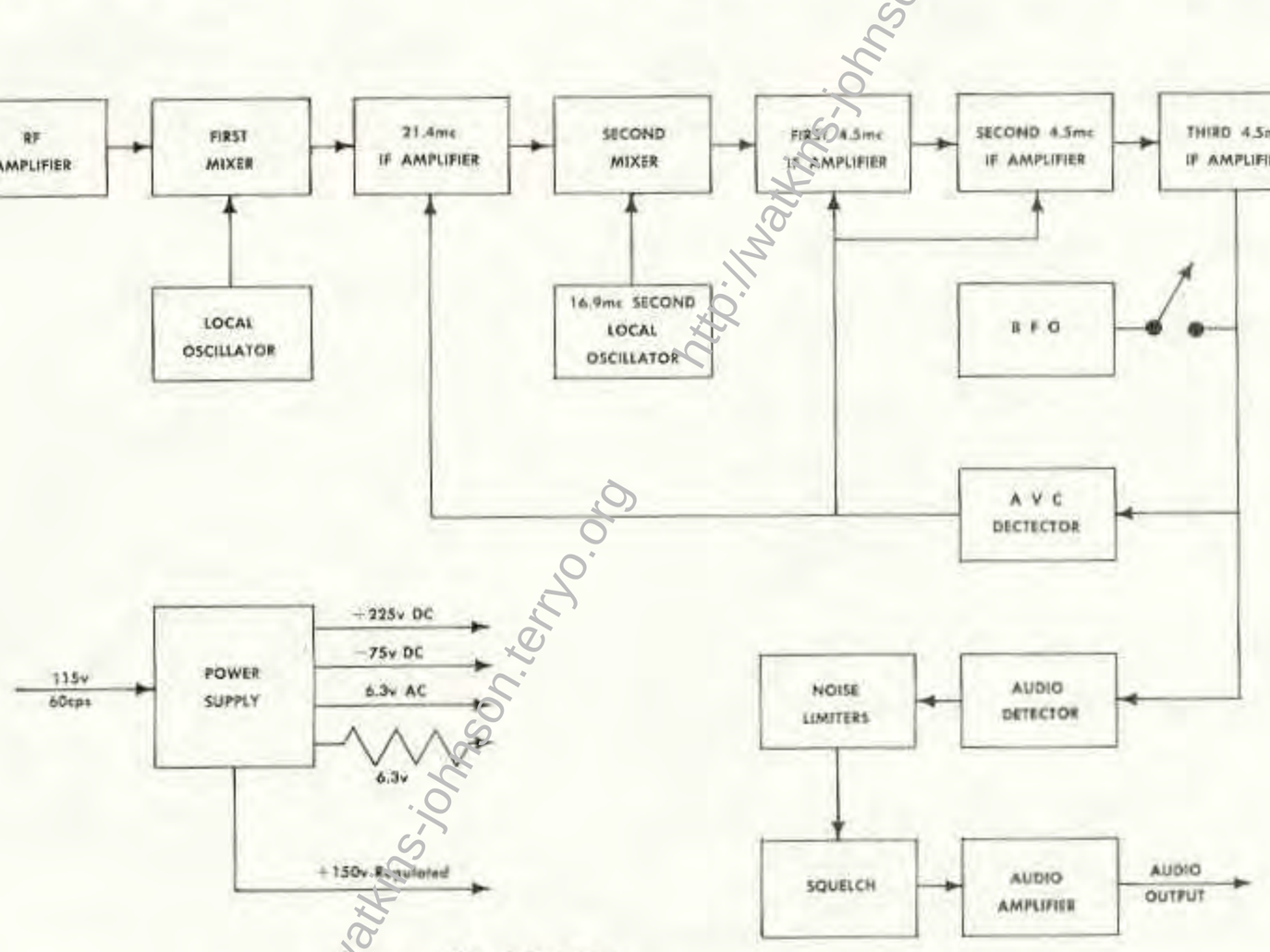
The Nems-Clarke 2501A Receiver has been designed specifically for measuring the Doppler shifts of incoming signals over a wide tuning range. Extensive use of these receivers is being made in satellite position determining stations.

The unit is continuously tunable from 55 to 260mc and features a low noise figure throughout the band. Two inputs are provided: one for the frequency to be measured, and a second input for a standard reference signal. In normal operation the reference input amplitude is adjusted to operate the detector in a linear fashion, and its frequency is offset by an amount slightly greater than the maximum Doppler shift expected. This produces detector action similar to a frequency mixer, the output being the difference frequency between the incoming signals. Operation in this manner produces an output signal in which the s/n has not been deteriorated due to detector action.

This specially designed receiver is usually followed by a commercial phase-lock tracking filter. The overall noise bandwidth then becomes the noise bandwidth of the tracking filter and is not increased by the characteristics of the receiver.

SPECIFICATIONS

Type Reception — AM-CW
Tuning Range — 55-260mc
Antenna Input Impedance — 50 ohm nominal
Reference Input Impedance — 50 ohm nominal
Noise Figure — 6db maximum at Antenna Input
IF Rejection — 70db minimum
Image Rejection — 58db minimum
IF Bandwidth — 50kc minimum at 6db
Sensitivity — 2μv 30% Amplitude modulated at 1000cps for a 10db s/n
Audio Output Impedance — 600 ohms balanced and ungrounded
Audio Power Output — 1 watt
Audio Response — ±3db 500cps to 25kc
AVC — Audio Output held constant within 2db with an input change of 65db
Squelch Sensitivity — (Antenna Input) 2μv at maximum gain
Squelch Sensitivity — (Reference Input) 700μv at maximum gain
Squelch Level — Adjustable to 30db below unmuted level
Noise Limiter — Automatically adjusts to carrier level, Series and Shunt Type
Power Input — 117v ac, 60cps
Power Consumption — 70 watts, approximate
Size — 19 × 8¾ × 15 inches
Finish — Gray enamel, MIL-E-15090, Color #26329 Federal Standard 595

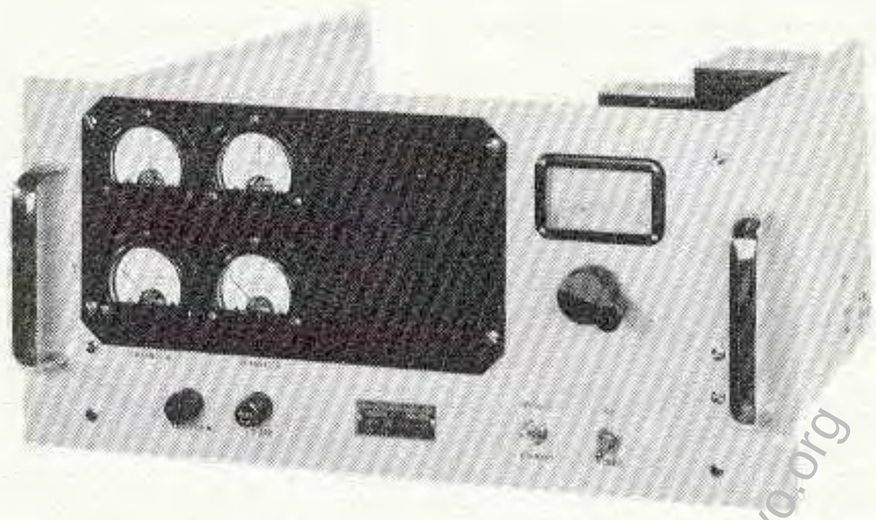


Price: $1,980.00

Slide Mounting (SMT-100): $100.00 additional

PHASE COMPARISON RECEIVER
NEMS-CLARKE 2701

This receiver consists of two RF tuning units ganged together and operating over a range of 55-260mc, two separate IF amplifiers with high level low impedance outputs, a common oscillator and a single audio monitor which may be switched to either of the channels, two signal strength meters and two tuning meters which are switched along with the audio monitor output.



SPECIFICATIONS

Type Reception — FM

Tuning Range — 55-260mc

Input Impedance — 75 ohms, nominal

Noise Figure — 11.5db maximum

S/N — 8 μv prodcues at least 21db s/n with 125kc deviation and 1000cps modulation

IF Rejection — Greater than 70db

Image Rejection — 40db minimum below 130mc, 30db minimum at any frequency

IF — 21.4mc

IF Bandwidth — 500kc

Discriminator — Linear to ±150kc

Channel Isolation — 30db minimum

IF Output — 1.0v into 50 ohm load

Video Response — 20cps to 100kc into 20,000 ohm load

Video Output Sensitivity — 0.10v per kc of deviation, approximate

Output Stability — Varies less than 2db for voltages from 4 to 10,000μv

Internal Impedance of Output Circuit — 400 ohms, approximate

Signal Strength Meter — 2μv to 10,000μv scale

Power Input — 117v, 50-400cps

Power Consumption — 130w

Size — 19 × 8¾ × 16⅛ inches

Weight — 47 pounds

Finish — Gray enamel, MIL-E-15090; Color #26329 Federal Standard 595

Price: $2,500.00

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DUAL RANGE U H F RECEIVER
NEMS-CLARKE 2801

The 2801 is an extended coverage surveillance receiver which tunes the spectrum between 250 and 1,000mc in two bands. Its AM, FM capability and bandwidth of 200kc and 1mc permit its use for a wide variety of UHF data acquisition and monitoring applications. An added feature is the carrier operated relay, which may be used to actuate auxiliary recording devices at predetermined signal levels.

SPECIFICATIONS

Type Reception — AM, FM, CW

BAND "A"

Tuning Range — 250-500mc

Input Impedance — 50 ohms unbalanced, approximate

Noise Figure — 10db maximum

IF Rejection — 65db minimum

Image Rejection — 40db minimum

Oscillator Radiation at Antenna Terminal — 150μv maximum

First Local Oscillator — Tunable

Second Local Oscillator — Fixed tuned LC

Bandwidths — 1mc

S/N — FM — 12μv produces at least 10db s/n with 100kc deviation and 1kc modulation

Bandwidths — 200kc AM

S/N — AM — 8μv produces at least 10db s/n with 50% AM modulation

Video Response — 50cps to 500kc

FM

Output Stability — Varies less than 2db above 1μv input

Harmonic Distortion 200kc IF — 1.0% maximum at 500μv, 100kc deviation and 1kc modulation

Audio Output — 600Ω or 150Ω at approximately 0.16 watt

Audio Output Response — 300cps to 25kc

Carrier Operated Relay Output — 2 form C relay contacts for remote switching (contact ratings 26 watts)

Carrier Operated Relay Operation Level — Adjustable from 1μv with instantaneous pick up, and variable drop out delay from 3 to 10 seconds. Delay disabling switch provided for setting up.

Spectrum Display Unit — Provision for connecting a 21.4mc Nems-Clarke SDU

Meters — Signal strength meter; tuning meter

Tuning Range — 250-1000mc in two bands

BAND "B"

Tuning Range — 490-1000mc

Input Impedance — 50 ohms unbalanced, approximate

Noise Figure — 12db maximum

IF Rejection — 65db minimum

Image Rejection — 50db minimum

Oscillator Radiation at Antenna Terminal — 300μv maximum

Beat Frequency Oscillator — Tunable from front panel

Intermediate Frequency — 21.4mc

Bandwidths — 200kc FM

S/N — FM — 8μv produces at least 22db s/n with 100kc deviation and 1kc modulation

AM

Output Stability — Varies less than 7db for 40db variation of input

Harmonic Distortion 200kc IF — 3.0% maximum at 100μv input, 50% and 1kc modulation

Squelch — Adjustable from 1μv input, giving 35db minimum muting

RF Connectors — Type N

Audio and Carrier Operated Relay Connectors — DS00-12S Deutsch

Power Input — 115/230v AC, 50-60 cps

Power Consumption — 100 watts, approximate

Size — 17 × 5¼ × 17 inches (chassis width suitable for 19 inches rack mounting)

Weight — 34 pounds, approximate

Finish — Gray enamel, MIL-E-105090; Color #26329 Federal Standard 595

Price: $3,000.00

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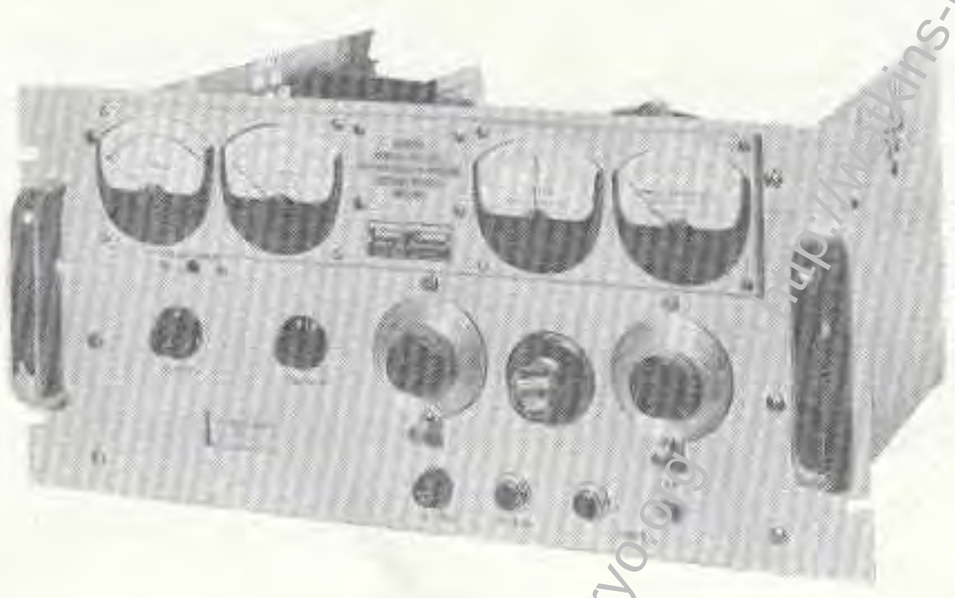
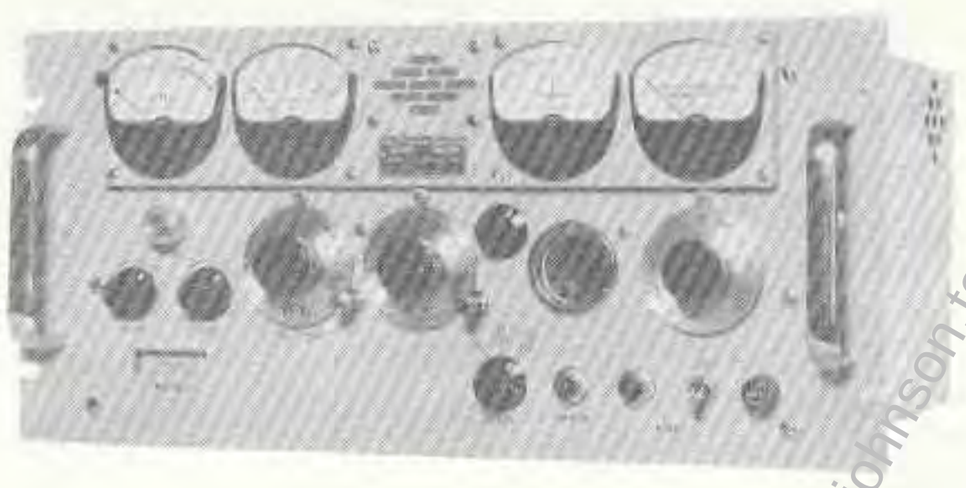
MICROWAVE TELEMETRY RECEIVERS
NEMS-CLARKE 3001 and 4001





For experimentation, evaluation or actual data reception in the 1435 and 2200mc bands, the Nems-Clarke 3001 and 4001 receivers offer precision performance and a number of advanced features. Plug-in IFs, crystal control, single control tuning, low noise figure, and many other operational advantages usually found in standard 215mc telemetry receivers are included. These advanced design receivers permit the "phase-over" to 2200mc, to be accomplished with a minimum of change in operational techniques or system configuration.

SPECIFICATIONS

Frequency Range — Determined by plug-in crystals or internal variable frequency oscillator:
Type 3001, 1435-1535mc
Type 4001, 2200-2300mc

Frequency Range — 2200-2300 megacycles determined by plug-in crystals or internal variable frequency oscillator.

Input Impedance — 50 ohms nominal; input VSWR 1.5 maximum.

Noise Figure — 8.5db maximum.

IF Rejection — Greater than 130db.

Image Rejection — Greater than 65db.

First Local Oscillator — Crystal controlled, or internal variable frequency oscillator controlled, switchable from the front panel.

Second Local Oscillator — Tunable over a frequency range of ±250kc.

Frequency Stability — Crystal controlled oscillator-±0.002%. Variable frequency oscillator-±0.01% after a 30 minute warm-up

IF Frequencies — 30 MC, first IF; 5 MC, second IF

Bandwidth — Plug-in second IF strips with bandwidth of 500kc or 1mc at 3db points. Bandwidths ranging from 100kc to 1.5mc are available on request.

IF Shape Factor — 60db to 6db ratio less than 3.0 to 1

Discriminator — 500kc bandwidth—Foster-Seely type linear to better than 1% over a bandwidth of ±150kc. 1mc bandwidth—Foster-Seely type linear to better than 2% over a bandwidth of ±450kc. Phase-lock detectors are available for narrow IF bandwidths.

Signal-to-Noise Ratio — 500kc—40db for 2μv input carrier when carrier is frequency modulated ±100kc at 1000cps rate. 1mc—40db for 2μv input carrier when carrier is modulated ±150kc at 1000cps rate.

Video Response — 10cps to 600kc

Video Output — 500kc approximately 0.06 volts per kc deviation, 1mc approximately 0.02 volts per kc deviation

Voltage Control — Adjustable output control on front panel

Frequency Deviation Meter — Peak reading over frequency range from 400cps to 400kc Three scales: 25, 75, and 150kc for 500kc BW; 75, 225 and 450kc for 1mc BW

VU Meter — Adjustable reference on video output —Frequency range from 10cps to 400kc

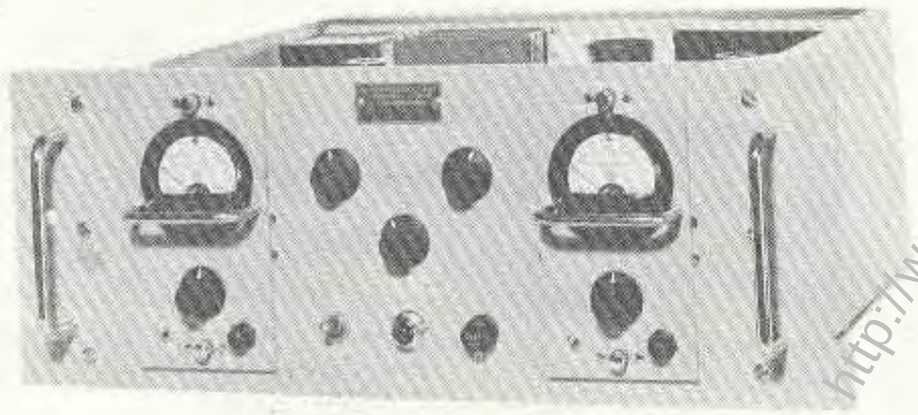
Spectrum Display Unit — Provisions for connecting a 30mc Nems-Clarke Spectrum Display Unit

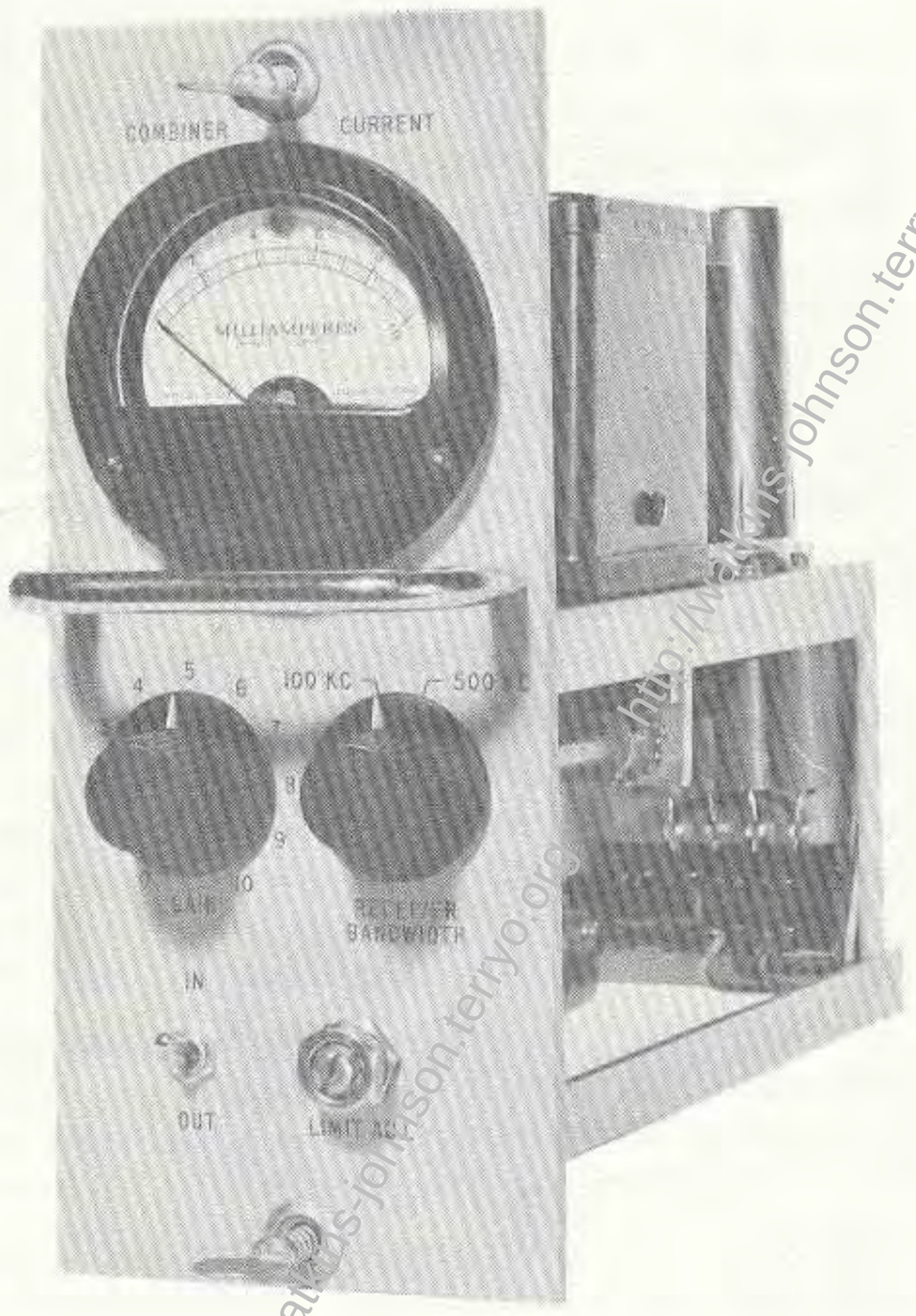
Signal Strength Recorder Output — Negative 5 volts across 0.5 megohms for a signal input of 100 microvolts

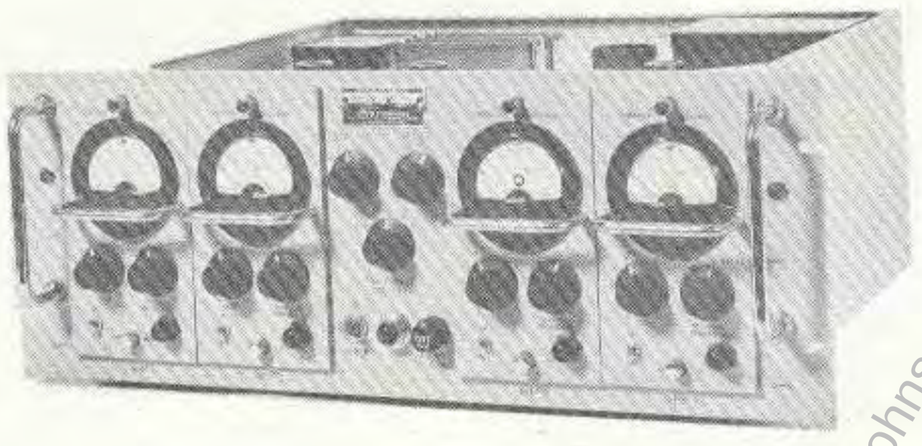
Power Input — 117v, 60cps, approximately 140 watts

Mounting — Standard 19 inch rack

Price: $4,000.00







Pioneers
in
Diversity Reception
For Telemetry

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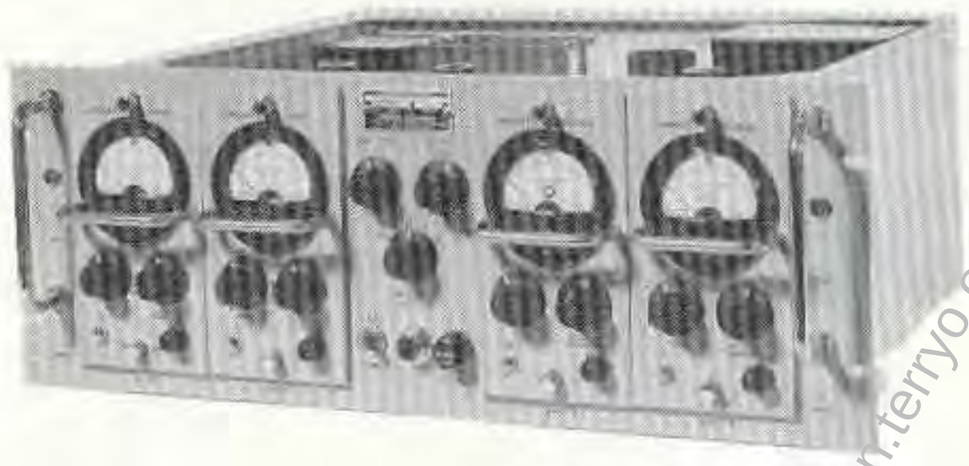
DIVERSITY COMBINER
NEMS-CLARKE DCA-1000-A AND DCA-500-A

IMPROVES SIGNAL-TO-NOISE RATIO BY COMBINING THE OUTPUTS OF UP TO 4 RECEIVERS



The Nems-Clarke Diversity Combiners are designed for use in installations in which several Nems-Clarke 1400 Series Receivers with 500kc and 100kc bandwidths receive the same RF transmission simultaneously from different antennas. The outputs of the receivers are connected to the inputs of the combiner, and the combiner mixes these signals into a single output, the signal-to-noise ratio of which is at least as good as the best input s/n ratio. When one of the combiner inputs has an s/n ratio much higher than the others, the output s/n ratio is equal to the high input; and, when all the input s/n ratios are equal, the output s/n is higher than any single input. Since combining is acomplished electronically, the units will respond instantly to rapid changes in signal-to-noise ratios.

Combining Action is obtained by sampling the noise output of each receiver by means of high-pass filters. A control voltage is developed from the output of the sampling filters and this voltage controls the contribution of each receiver to the combined output. The contribution of each signal is thus made smaller as the noise in the signal becomes greater. When the input s/n ratios are equal, an improvement in output s/n is possible because the noise output of the receivers is uncorrelated, and the noises do not add in the way in which the signals add. A cancellation circuit is used to prevent fluctuation in the control voltages from appearing in the combined output.

Two Fail-Safe Circuits are employed to guard against failure. One circuit prevents loss of one of the input video signals from causing degradation of the output signal; the other circuit connects the output terminal directly to a preselected input terminal to prevent complete loss of data if the combiner output should fail.

The DCA-1000A can handle the outputs of up to four receivers; while the DCA-500A can handle the outputs of two receivers. Either the 500kc or the 100kc bandwidth of the 1400 series receivers can be used. A switch on the combiner is set for operation on the desired bandwidth. Although the combiners are designed to handle FM/FM and PDM/FM telemetry signals, they can be modified for non-standard signals.

The combiner is contained in a 15-inch deep chassis mounted on a standard 19 inch rack panel seven inches high. PLUG-IN UNITS with operating controls on the front panel contain the circuits which are repeated for each input, and each may be removed from the chassis for servicing while the others continue to operate.

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RANGE CHARACTERISTICS

Recommended IRIG Telemetry Signals Modifications for non-standard signal reception, are available — PDM/FM

Bandwidth Position — 500kc

Maximum Data Frequency Range — 30cps to 35kc

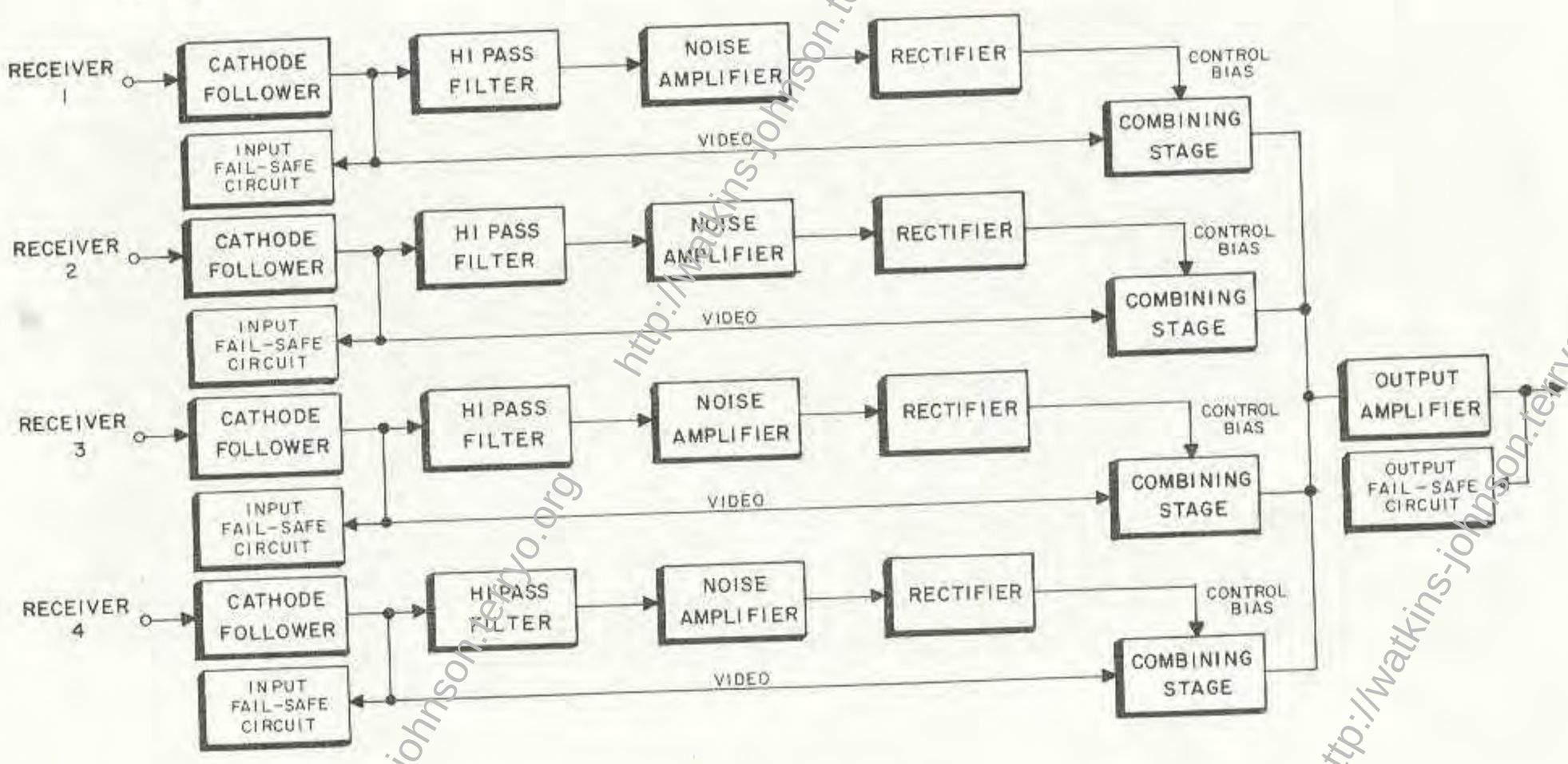
Minimum Available Noise-frequency Range — up to 70kc

Recommended IRIG Telemetry Signals Modifications for non-standard signal reception, are available — FM/FM

Bandwidth Position — 100kc

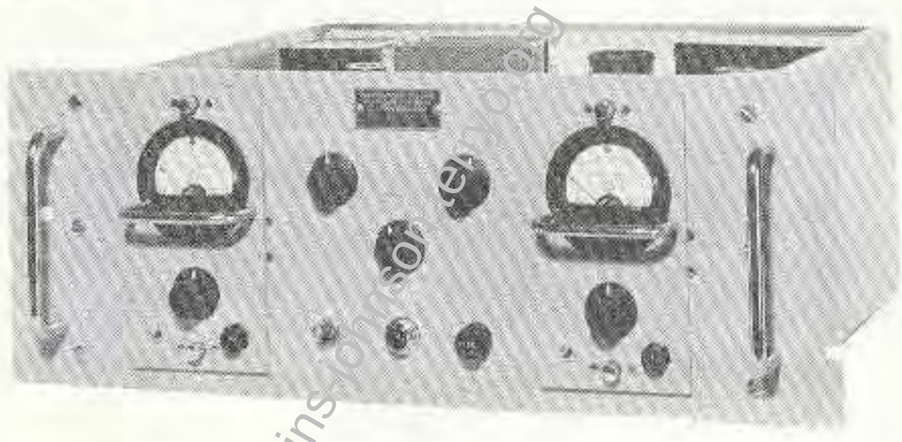
Maximum Data Frequency Range — 30cps to 85kc

Minimum Available Noise-frequency Range — up to 130kc



PERFORMANCE

S/N Improvements for equal Inputs ..... S/N ratio	4 inputs, 5-6 db 3 inputs, 4-4.7 db 2 inputs, 2-3 db
Input Level at .04 volt/kc deviation, approximate:	10% maximum difference between inputs; 8 volts RMS maximum
Input data Phase Shift	25 degrees maximum between any two inputs
Input Impedance	470,000 ohms in parellel with 30$\mu\mu$f
Load Impedance	500 ohms, minimum
Overall Gain	Variable up to +10db
Maximum Output Level	10 volts RMS
Overall Frequency Response	±2db, 30cps to 200kc
Response Time	2 milliseconds, approximate
Distortion	Less than 1%
Input Power	120 volts, 50-400cps, 150 watts
Size	19 × 7 × 15 inches
Weight DCA- 500A (2 channel)	Net 40 lbs: Shipping 60 lbs.
DCA-1000A (4 channel)	Net 45 lbs: Shipping 65 lbs.



Price: DCA-500A, $2,700.00
Price: DCA-1000A, $3,500.00

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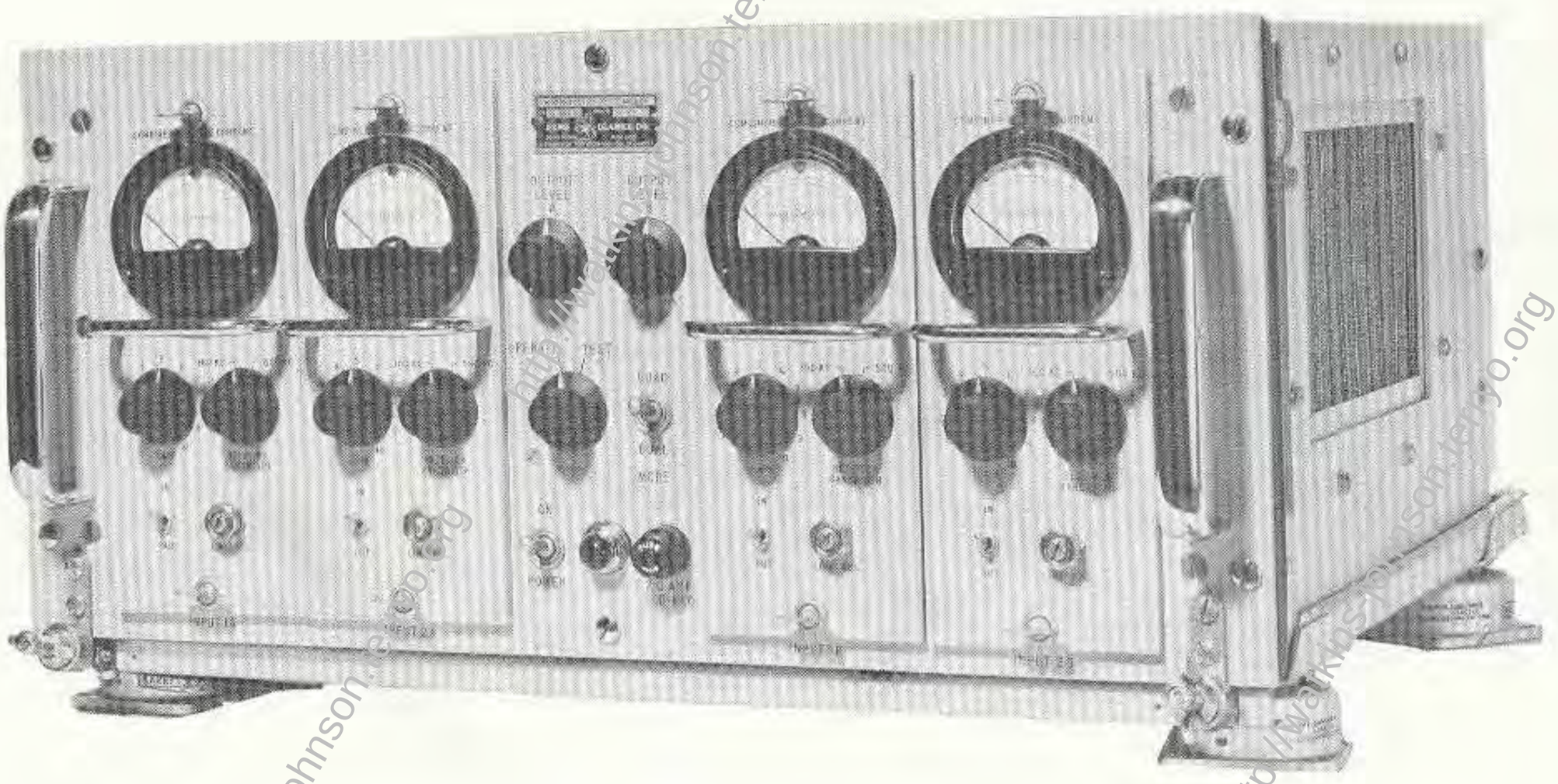
AIRBORNE DIVERSITY COMBINER
NEMS-CLARKE DCA-2000



The Nems-Clarke DCA-2000 airborne diversity combiner has been designed to operate in conjunction with 2, 3, or 4 model 1403 Airborne Telemetry receivers. Equipped with shock-mount tray, dust cover and 50-400cps power supply, it is capable of operating in a double-dual or single-quadruple mode. Common-cathode combining circuits are used to give signal-to-noise improvements similar to those attained with the DCA-1000 in ground station applications.

SPECIFICATIONS

Number of Receiver Outputs Accepted — 4, 3, 2, or 1

S/N Improvement, for Equal Input S/n's —
4 inputs, 5-6db;
3 inputs, 4-4.7db;
2 inputs, 2-3db

Response Time — 2 milliseconds, approximate

Bandwidth Position
500kc

Frequency Range — 30cps-85kc

Telemetry Signals — FM/FM

Noise-Frequency Range — up to 130kc

100kc

Frequency Range — 30cps-35kc

Telemetry Signals — PDM/FM

Noise-Frequency Range — up to 70kc

Input Level — 0.4 volt/kc deviation approximate: 10% maximum difference between inputs. 8 volts RMS maximum

Input Data Phase Shift — 25 degrees maximum between any two inputs

Input Impedance — 470,000 ohms in parallel with 30$\mu\mu$f

Load Impedance — 500 ohms, minimum

Overall Gain — Variable up to +10db

Maximum Output Level — 10 volts RMS

Overall Frequency Response — ±2db, 30cps-200kc

Distortion — less than 1%

Input Power — 120 volts, 50-450cps, 150 watts

Size — 19 × 8¾ × 15 inches

Weight — 45 pounds

Price: $3,600.00

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Ancillary Equipment For Communications Receivers

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PRE-DETECTION CONVERTER
NEMS-CLARKE IFC-1400

The Nems-Clarke IFC-1400 Pre-Detection Converter is an accessory unit designed for use in conjunction with Nems-Clarke 1450 FM Telemetry Receiver and an instrumentation tape recorders having response to 1mc. This unit permits the recording and reproduction of telemetry data prior to demodulation. Using this technique, there is no detector degradation of signal-to-noise ratios prior to recording. Any type of FM modulation within the IF band-pass can be recorded (i.e. FM/FM, PAM/FM, PDM/FM, PCM/FM), and various experimental as well as standard demodulation techniques may be attempted on successive playbacks.

The bandwidth of the IFC-1400 Converter is sufficiently broad so that the system bandwidth (500kc over the operating range of 215 to 260 mc) is determined by the receiver.

Existing FM Telemetry Receivers, Nems-Clarke Types 1400-A, 1401-B, 1410-A, 1411-A, and 1412 which have not been previously modified for phase-lock detection, may be factory modified to accept the converter by the addition of necessary connecting cables and apron-mounted jack.

SPECIFICATIONS

	RECORDING	REPRODUCING
Input Frequency	5mc	750kc
Output Frequency	750kc	5mc
Data Bandwidth	500kc Max	500kc Max
Source Impedance	93 ohms	50 ohms
Output Level	1VP-D (approx.)	

Spurious Signal Rejection — Greater than 40db

Power Requirements — 117v ac 40 watts (approx.)

Dimensions — 3½ × 6½ × 19 inches, designed for Standard Rack Mounting

Weight — Approx. 25 Lbs.

Price: $700.00

Modification for phase-lock detection: $250.00 additional

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NOISE FIGURE MEASURING SET
NEMS-CLARKE NTS-200

The NTS-200 Noise Figure Measuring Set has been designed to supply a standard basis for noise measurements in Preamplifiers, Multicouplers, and Receivers of the Nems-Clarke 1400 series.

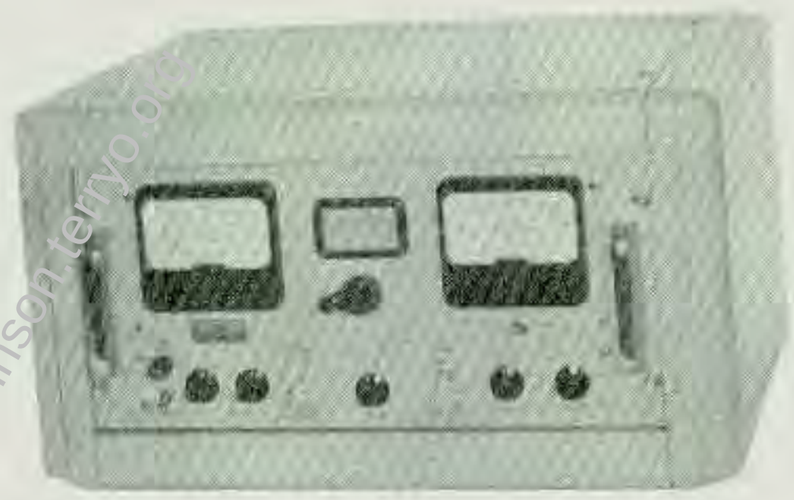
This instrument is comprised of a noise generator employing a temperature limited diode source, a low noise front end tuning over the frequency range of 55 to 260 megacycles, a 21.4 megacycle amplifier with a calibrated 3db pad, detector, and output indicator. Also included in this equipment is a 5 megacycle amplifier, 3db pad, detector, and output indicator for use when measuring the noise figure of the 1400 Series Receivers.

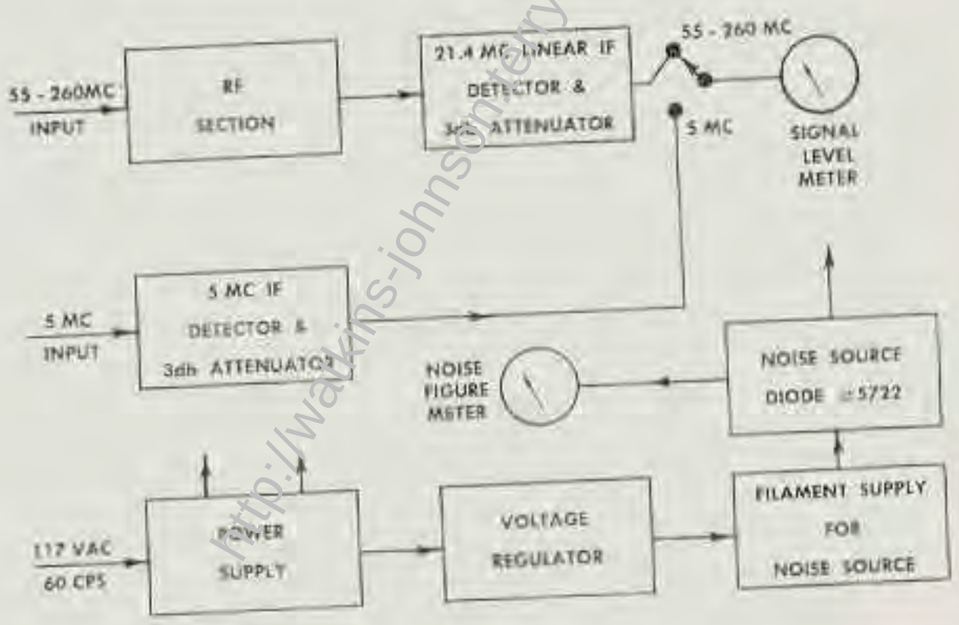
The RF impedance of this equipment is fixed at 50 ohms and all known sources of error that or normally associated with noise measurements have been minimized.

This equipment is mounted in a cabinet with a panel space of 8¾ inches and weighs approximately 67 pounds. The unit is designed so that it may be removed from the cabinet and placed in a standard 19-inch rack.

SPECIFICATIONS

Frequency range — 55-260mc and 5mc
Noise figure range — 0db to 14db
Accuracy — Better than 0.5db
Power — 115 volts, 60 cycles, approx. 110 watts
Size (Cabinet) — 24 × 13 × 16½ inches
Size (Rack Mounting) — 19 × 8¾ × 15 inches
Weight — approximately 67 pounds





Price: $2,500.00

AIRBORNE MULTICOUPLER
NEMS-CLARKE MC-202

Designed for use in Airborne Telemetry Receiving systems, the MC-202 is shock-mounted, and offers performance and reliability equal to ground station equipment.

Band-Pass	215-260mc
Uniformity of Response	±1db
Gain	0db (approx.)
Input Impedance	50 ohms (nominal)
Output Impedance	50 ohms (nominal)
Number of Outputs	8
Connectors	Type "C"
Isolation	37db minimum
Power	117v ac 50-450cps
Size	7 × 19 × 10 inches
Finish	Gray Enamel MIL-E-15090. Color #26329 Federal Standard 595

Price: $550.00

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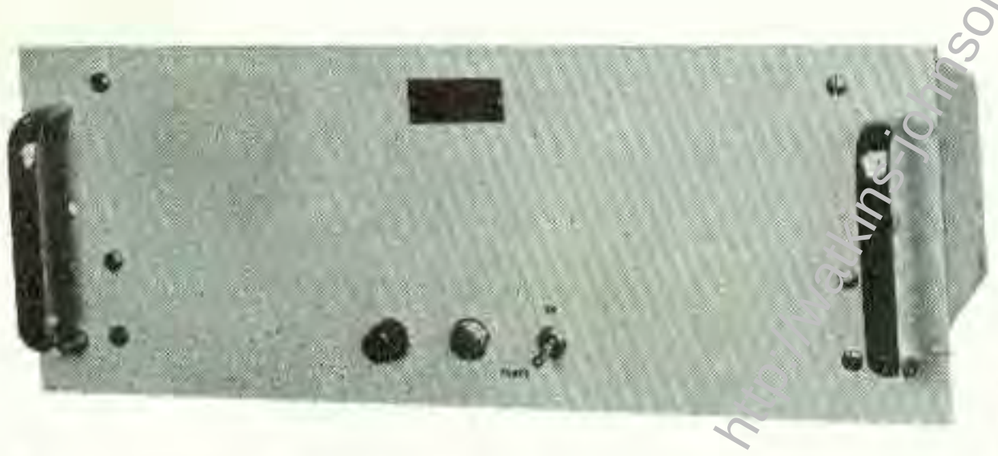
MULTICOUPLER
NEMS-CLARKE MC-406



By using this Multicoupler and a suitable Preamplifier, such as the Nems-Clarke PR-203 and any of the Nems-Clarke receivers designed for telemetry, a high-sensitivity receiving system is obtained in which up to eight receivers can be operated from one antenna. The MC-406 Multicoupler should only be used with preamplifiers of adequate gain. In such a system the overall noise figure is determined by the characteristics of the preamplifier. Passive linear networks are used for signal division thus eliminating the cross talk and distortion normally associated with tube circuits. Only two tubes are used in the complete multicoupler, providing a very high degree of reliability. High isolation between outputs, free of resonant effects, is thus attained. A typical figure for isolation at the upper end of the band is 55db.

SPECIFICATIONS

Pass Band	215-260 megacycles*
*Available in other frequencies from 50 to 500mc on special order.	
Uniformity of response	Within 1db
Gain	Approximately unity
Impedance	Designed to operate in 50-ohm system
Receiver outputs	8
Connectors (mating connectors supplied)	Type C
Isolation	37db minimum
Power input	117v, 50-450cps, approximately 17w
Size	7 × 19 × 10 inches
Tube complement	Two—5842/417A
Finish	Gray Enamel—MIL-E-15090 Color #26329 Federal Standard 595

Price. $450.00

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PREAMPLIFIER-MULTICOUPLER
NEMS-CLARKE PM-406

The PM-406 is a combination instrument comprised of a preamplifier and multicoupler located on a single chassis for rack mounting. This unit can also be used as a distribution amplifier, and in this application the overall gain can be adjusted downward, on special order, from approximately 22db to unity.

This unit permits the coupling of eight receivers to a single antenna and is designed for use as a preamplifier and multicoupler where short runs of cable from the antenna are employed. It is also valuable when a separate preamplifier is located at the antenna and an extremely long length of cable is employed. In this application the unit may be considered a distribution amplifier.

This equipment has uniform response within 3db in a pass band of 215 to 260 megacycles.

To minimize the effects of overloading receivers connected to this unit, the overall gain is no greater that that required for minimum system noise figure. Thus the noise figure of the system is no greater than the preamplifier-multicoupler.

The preamplifier section and the multicoupler section each have their own individually fused power supply controlled from a single front panel switch.

The PM-406 will improve the noise figure of the Nems-Clarke 1400 Series Receivers by approximately 3.5db, and the 1670 Series by approximately 4.5db.

As all Nems-Clarke receivers suitable for telemetering have high beat local oscillators, the isolation between outputs is made to increase at the high frequency end of the band. A typical figure for isolation for the PM-406 at 250mc is approximately 50db.

These units are of the "bath tub" chassis design having a 3-inch recessed front panel to permit patching cables to hang without protruding. Modifications of this design are available on special order.

SPECIFICATIONS

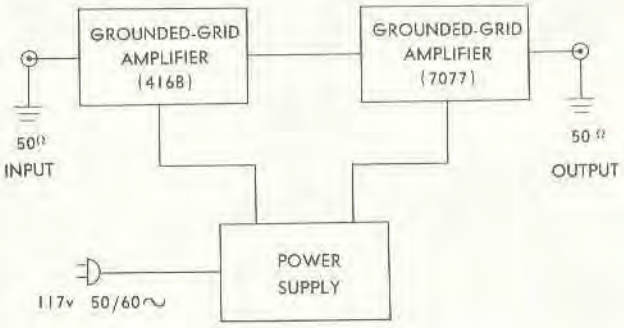
Pass Band	215-260 megacycles
Uniformity of Response	Within 3db
Gain	20db (approximate)
Impedance	Designed to operate in a 50-ohm system
Inputs	1
Outputs	8
Noise Figure	Less than 4.5db
Isolation between outputs	37db minimum
Tube Complement	1-6280/416B—2-5842/417A—1-5651—1-7077
Power Input	55w (approximate), 117v, 50/60cps
Size	19 × 7 × 16½ inches
Connectors (Mating connectors supplied)	Type C

Price: $1,050.00

SL-100 Slide: $60.00 additional

PREAMPLIFIER
NEMS-CLARKE PR-203

The Nems-Clarke PR-203 Preamplifier is a completely new design in Preamplifiers for use with telemetering receivers. The unit is weatherproofed and pressurized so that location at the antenna can be made without encountering moisture problems. Line losses as high as 6db will not decrease the sensitivity of the receiving system by more than a few tenths of a db when this preamplifier is used. The pass band has a uniform response within 3 db over the frequency range. This unit will improve the noise figure of the Nems-Clarke 1400 Series Receivers by approximately 3.5db, assuming loss-less connecting cables are used. The unit has a self-contained power supply which is controlled from a 1¾ inch power control panel designed for mounting in the relay rack with other receiving equipment. The panel contains a switch, pilot light, current transformer, terminal block, and fuse.



SPECIFICATIONS

Pass band	215-260 megacycles
Uniformity of response	With 3db
Gain	22db minimum in pass band
Impedance	Designed to operate in 50-ohm system
Noise figure	4.5db maximum
Tube complement	one 6280/416B, one 7077, one 5651
Power requirements	17w (approximate), 117v, 50/60cps
Weight (Preamplifier)	20 pounds (approximate)
Size (Preamplifier)	8½ × 7⅞ × 14 inches
Weight (Sun Shield)	8 pounds (approximate)
Size (Sun Shield)	12½ × 10¾ × 19¾ inches
Finish (Power Panel)	Gray Enamel—MIL-E-15090
Finish (Power Panel)	Gray Enamel—MIL-E-15090 Color #26329 Federal Standard 595

A shock mounted version Nems-Clarke PR-202 is available for airborne applications.

Price: $1,050.00

RANGE EXTENSION UNITS
NEMS-CLARKE REU-100-A, 200-A, 300C

The Nems-Clarke REU-100-A, REU-200-A and REU-300-C Range Extension Units were designed to provide extended frequency coverage to the Nems-Clarke Receiver Product Line.

The REU-100-A is used with receivers to extend frequency ranges from 250mc to 475mc. The REU-200-A will extend receiver frequency ranges from 475mc to 900mc. The REU-300-C is a combination of the REU-100-A and the REU-200-A on a single chassis. It is used with receivers which tune to 60mc.

All units are constructed for standard relay rack mounting and contain their own power supplies. The range switch on these units automatically connects the proper signal to the output.

SPECIFICATIONS

Frequency Ranges
REU-100-A — 250-475mc.
REU-200-A — 475-900mc.
REU-300-C — 250-900mc.

Noise Figure — 10db to 12db average, 14db maximum.

IF — 60mc.

Input Impedance — 50 ohms.

Output Impedance — designed for 50- or 75-ohm load.

Power Input — ~~110-220v~~ 115/230 ac, 50-400cps
REU-100-A, 20w — REU-200-A, 18w — REU-300c, 27w.

Size — 19 × 7 × 12 inches (standard rack mounting).

Finish — Gray enamel MIL-E-15090, Color #26329 Federal Standard 595

AM, FM, or CW, according to the receiver with which the range extension unit is operating.

Prices:

REU-100-A, $500.00

REU-200-A, $500.00

REU-300-C, $850.00

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CONVERTER AMPLIFIER
NEMS-CLARKE REU-900

DESCRIPTION

The Nems-Clarke REU-900 Converter-Amplifier is designed for use in conjunction with the Nems-Clarke 1400 Series crystal controlled Telemetry Receivers. This unit converts the frequency of received signals from 960mc down to 233mc, and amplifies the input to the receiver.

The oscillator circuit of the REU-900 can be operated either from an internal crystal controlled oscillator of approximately 40mc, or from an external signal source ("VFO") at approximately 120mc. In either case any frequency within approximately ±5mc of 960mc may be received by adjusting the frequency of the receiver being used 233mc ±5mc, approximately).

A cast metal case contains the chassis and power supply, the operation of which is remotely ntrolled from a 1¾ inch high module panel mounted at the receiver installation.

Since the unit is to be pole-mounted at a remote antenna layout, the case is pressure-sealed to contain a dry, inert gas under pressure for protection of component parts against the effects of atmospheric water vapor. Finned construction provides efficient heat dissapation to maintain ambient temperature within safe limits for the equipment within the case. A sun shield affords additional protection from the elements.

SPECIFICATIONS

Input Frequency	960mc
Output Frequency	233mc
Input Impedance	50 ohms
Noise Figure	10db maximum
Gain	22db minimum
Power Input	117v ac, 50-60cps

Size: Converter — 8½ × 7⅞ × 19⅞ inches,
Sun Shield — 12½ × 10¾ × 19⅜ inches

Price: $4,000.00 Complete with Sun Shade

http://watkins-johnson.terryo.org

SPECTRUM DISPLAY UNITS
NEMS-CLARKE SDU 200 AND 300

The Nems-Clarke SDU-200 and SDU-300 Spectrum Display Units provide companion instruments specifically designed for use with the Nems-Clarke line of Special Purpose and Telemetering Receivers.

The purpose of the Spectrum Display Unit is to provide a visual indication of the signal to which a receiver is tuned, as well as to provide a visual indication of signals in a band of frequencies above and below that being received. The signals are displayed on a cathode-ray tube. The CRT has a calibrated screen allowing both frequency and relative amplitude of received signals to be determined.

The frequency band being displayed is adjustable by means of a sweep width control. Maximum sweep width is normally used to search for other signals around the desired frequency. Reduced sweep width is used when evaluating the signal being received. From the display pattern the character of the signal being received and the type of modulation used can be determined.

The input signal for the SDU comes from an auxiliary IF output on the receiver. The usable bandwidth at the SDU output of the receiver is considerably less than the desired sweep width of the SDU, so it is necessary to build a broadband amplifier into the SDU to compensate this response. Each receiver type requires a different compensation to produce a relatively flat amplitude response over the frequency range corresponding to maximum sweep width. In order to provide the flatest response over the sweep frequency range, various models of the Spectrum Display Unit are available for the different receiver types.

A four-position Coaxial Switch is available for applications where it is necessary to change quickly to any one of four receivers.

Price: $570.00

Four-position Coaxial Switch (Type SWK-100), $80.00 extra

http://watkins-johnson.terryo.org

SPECIFICATIONS

SDU-200 AND SDU-300

Maximum Sweep Width — SDU-200 ..... 2 megacycles

SDU-300 ..... 3 megacycles

Input Center Frequency ..... 21.4mc or 30.0mc

Second IF Amplifier ..... 4.3 megacycles

Sensitivity for full deflection ..... 5 microvolts to receiver

*Resolution** ..... approximately 20kc

Power Input ..... 117v, 50-60cps, approximately 95w

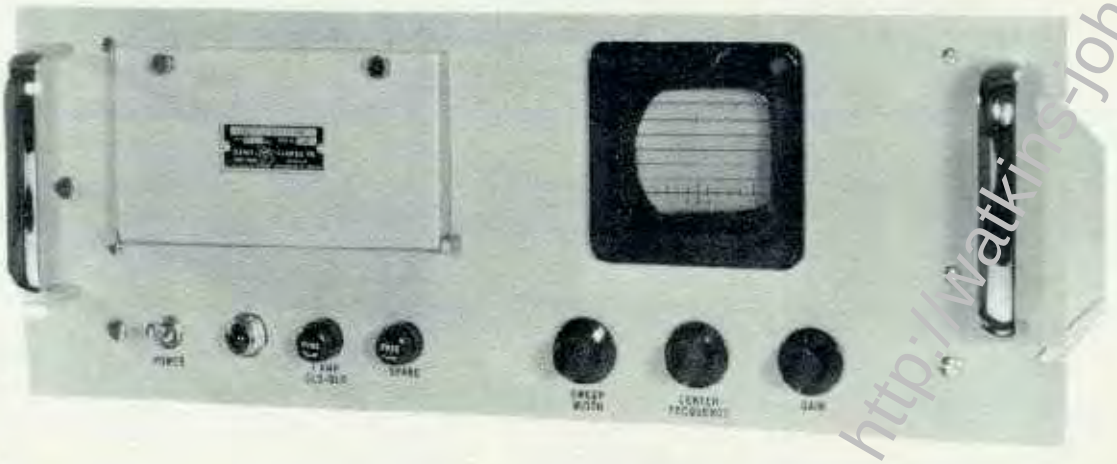
Size ..... 19 × 7 × 13 inches

Weight ..... 25 pounds

*Two equal-amplitude signals 20kc apart will appear as two separate pips with the point of intersection being at least 6db down.

The suffix number for each SDU unit is applicable to the particular type receivers as listed on the following chart:

RECEIVERS	SDU-200	SDU-300	RECEIVERS	SDU-200	SDU-300
1300 Series Receivers	−2		1674 Receiver	−2	
1400 Series Receivers	−3		1700 Series Receivers		5
1500 Series Receivers	−2		2301 Receiver	−2	
1671 Receiver	1	−1	2401 Receiver	−2	
1672 Receiver	−1	−1	2701 Receiver	−1	
1673 Receiver	−2				



AIRBORNE SPECTRUM DISPLAY UNIT SDU-203

COMPACT SPECTRUM DISPLAY UNIT
NEMS-CLARKE SDU-350-6

The Nems-Clarke Spectrum Display Unit SDU 350-6 has been designed as a small, lightweight, rugged instrument to meet the increasing demand for smaller equipment to use in mobile, airborne and ground support telemetry installations where space limitations exist.

High quality components and circuitry commensurate with the highest standards of the state-of-art characterize the quality performance and dependability of this unit attributed heretofore to the Nems-Clarke Spectrum Display units now in service in various telemetry installations. No sacrifice in quality has been made to achieve reduction in size, weight or utility of the unit.

A Cathode Ray Tube at the center of the front panel displays the signal spectrum. This is a visual indication of the signal to which the receiver is tuned. At maximum sweep width, frequency bands above and below the one being received can be viewed. Frequency and relative amplitude of received signals can be determined by means of the calibrations on the screen of the cathode ray tube.

The Sweep Width control adjusts the width of the frequency band being displayed. Maximum sweep width is normally used to search for other signals around the desired frequency. Reduced sweep width is used for evaluating the signal being received. Thus, the character of the signal being received and the type of modulation can be readily determined. Other panel controls include a Center Frequency adjust control, and a Gain Control. Accessibility to the cathode ray tube alignment controls is provided through a door on the front panel covering the recessed mounting board.

When the SDU is to be used to monitor up to four receivers, an accessory four-position coaxial switch is available for rapid connection to any one of the associated receivers.

The input signal for the SDU comes from an IF output connector on the receiver. Since the usable bandwidth at the SDU output of the receiver is considerably less than the desired sweep width of the SDU, a broadband amplifier has been built into the SDU to compensate for this response. Each receiver type requires a different compensation to produce a relatively flat amplitude response over the frequency range corresponding to the maximum sweep width.

The SDU-350-6 Spectrum Display Unit has been specifically designed for use with the Nems-Clarke 1306 Surveillance Receiver. Other models of the Compact Spectrum Display Unit are available for the latest models of the Nems-Clarke Telemetry Receiver line.

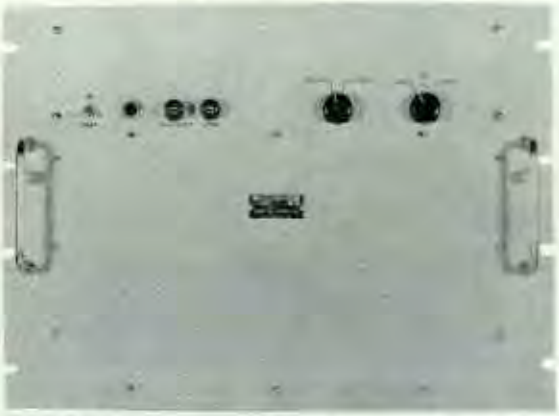
SPECIFICATIONS

Maximum Sweep Width	3 megacycles
Input Center Frequency	21.4mc
Second IF Amplifier Frequency	4.3mc
Sensitivity for full deflection	Approx. 5μv to receiver
*Resolution**	Approx. 20kc
Power Input	115 or 230v, 50-60cps, approximately 95w
Size	Panel: 19 in. wide, 3½ in. high
Weight	Approximately 18 pounds

*Two equal-amplitude signals 20kc apart will appear as two separate pips with the point of intersection being at least 6db down.

Price: $850.00

FREQUENCY MONITOR
NEMS-CLARKE 1402-F



The Nems-Clarke Type 1402-F Frequency Monitor is designed for use with the 1401 or 1401-A receiver. These receivers are double superhetrodyne receivers with a first IF frequency of 30 megacycles. The first local oscillator is crystal controlled, so any variation in center frequency of the received signal changes the frequency applied to the frequency monitor.

The signal that is applied to the Nems-Clarke 1402-F Frequency Monitor is amplified, limited, and applied to a discriminator which is contained within this unit.

When the center frequency of the applied signal is 30 megacycles, the discriminator dc output is zero. When the center frequency is other than 30 megacycles, there is a dc voltage output from the discriminator. This dc voltage is negative for frequencies below 30 megacycles and positive for frequencies above. The magnitude of this voltage is directly proportional to the difference between the frequency of the applied signal and the discriminator center frequency.

Four identical amplifiers are mounted in the unit to accommodate four channels. A crystal controlled valibrating oscillator is also contained in this unit to facilitate the setting of gain and position controls of a dc amplifier such as the Sanborn Model 150-2900.

The Nems-Clarke 1402-F Frequency Monitor has proved very useful in applications where a record of the frequency deviation from a controlled center frequency is desired.

SPECIFICATIONS

Operating frequency	30 megacycles.
Bandwidth	500 kilocycles
Deviation from center frequency normally used	±250 kilocycles.
Input impedance	93 ohms nominal.
Discriminator dc output	Approximately 2 volts dc for 250-c frequency deviation.
Gain	Negligible changes in discriminator dc output for signal inputs above 7.5 microvolts from a 93 ohm source.
Size	14 × 19 × 16½ inches.
Power line requirements	105-125 vols.

Price: $1,600.00

http://watkins-johnson.terryo.org

DEVIATION METER
NEMS-CLARKE DM-100

The Nems-Clarke DM-100 Deviation Meter is designed for use with many models of Nems-Clarke Company receivers in telemetry applications. A similar deviation meter built into the Nems-Clarke 1400 Series Receivers has proved to be an extremely useful feature.

The DM-100 Deviation Meter, its associated circuitry and power supply, are mounted on a 3½ x 19 inch panel for rack mounting. In operation the DM-100 Deviation Meter is bridged across the video output of the receiver. This unit permits a direct reading of the deviation, in kilocycles, of the subcarrier oscillators used in a telemetry system. A three-position switch is incorporated in the unit permitting full scale readings of 25, 75, and 150 kilocycles.

SPECIFICATIONS

Accuracy (Single Sub-Carrier)	10% (approx.)
Tube Complement	6AH6, 5814-A, 6X4
Input Impedance	12k ohms
Power Requirement	20 watts, 115v ac

Price: $250.00

http://watkins-johnson.terryo.org

VARIABLE FREQUENCY TUNING UNIT
NEMS-CLARKE VF-1400

The VF-1400 Tuning Unit is designed to provide continuous tuning for Nems-Clarke Models 1412, 1403, 1432, and 1433 Special Purpose Receivers of the frequency range of 215 to 260 megacycles.

The unit plugs directly into the existing crystal socket on the front panel of the receiver, and with only a minor modification within the receiver, the unit is ready to use.

The VF-1400. A Tuning Unit in place on a NEMS-CLARKE Model 1401-B Receiver

VF-1400-A

Miniature

The VF-1400 Tuner consists of a transistorized oscillator followed by a buffer-amplifier. Output frequency is from approximately 40 to 49 mc, and existing frequency multiplier stages within the receiver are utilized as with crystal operation. (Oscillator frequency is multiplied by six within the receiver, providing an injection frequency that is 30 mc higher than the received signal. See Receiver Instruction Manual.)

Tuning is accomplished within the Oscillator Coil, L-1, by a movable slug that is directly connected with the tuning dial mechanism. To avoid confusion, the tuning dial is calibrated in terms of the received frequency.

In operation, the unit is tuned to the desired frequency without the use of crystals, and any frequency within the range may be selected instantly.

Price: $250.00

CRYSTAL AND OVEN ASSEMBLIES
NEMS-CLARKE CO-400

DESCRIPTION

The Nems-Clarke CO-400 Crystal and Oven Assembly uses a single quartz crystal accurately calibrated to produce the frequency designated with an accuracy of ±0.002%.

Each crystal, for a specified frequency, is mounted in a constant temperature oven which maintains the temperature at 75°C, ±5°C. The entire assembly, heater, thermostat, and crystal, is mounted on an octal base plug, and is protected by a metal cover. The crystal frequency is clearly marked on the nameplate on the top of the cover. The plug-in construction provides quick and convenient installation into the receptacle provided for that purpose on the front panel of Nems-Clarke 1400 Series Telemetry Receivers requiring crystal control. Overall dimension: 1¼ inch dia., 2⅜ inches long. Weight: net, 1 oz.; shipping, 4 oz.

Except for physical damage to the unit, the life and stability of the assembly is indefinite. No repair or maintenance is required other than maintaining the contact pins clean. Components are not separately replaceable.

Ordering Information

First determine the crystal frequency needed for the operating frequency of the receiver by using the following formula:

$$F_c = \frac{F_r + 30}{6}$$

F_c = Crystal Frequency in megacycles

F_r = Receiver Operating Frequency in megacycles

NOTE: A crystal of the exact frequency computed to the sixth significant figure must be used to perform at the specified receiver frequency. (See Table on other side)

Price: $22.50

TABLE OF CORRESPONDING RECEIVER AND CRYSTAL OPERATING FREQUENCIES FOR STANDARD IRIG CHANNELS

Operating Frequency	Crystal Frequency	Operating Frequency	Crystal Frequency	Operating Frequency	Crystal Frequency	Operating Frequency	Crystal Frequency
225.7	42.6166	232.4	43.7333	243.8	45.6333	249.9	46.6500
226.2	42.7000	232.9	43.8166	244.3	45.7166	250.7	46.7833
226.7	42.7833	234.0	44.0000	244.8	45.8000	251.5	46.9166
227.2	42.8666	235.0	44.1666	245.3	45.8833	252.4	47.0666
227.7	42.9500	235.5	44.2500	245.8	45.9666	253.1	47.1833
228.2	43.0333	236.2	44.3666	246.3	46.0500	253.8	47.3000
229.9	43.3166	237.0	44.5000	246.8	46.1333	255.1	47.5166
230.4	43.4000	237.8	44.6333	247.3	46.2166	256.2	47.7000
230.9	43.4833	240.2	45.0333	247.8	46.3000	257.3	47.8833
231.4	43.5666	241.5	45.2500	248.6	46.4333	258.5	48.0833
231.9	43.6500	242.0	45.3333	249.1	46.5166	259.7	48.2833

WHEN ORDERING SPECIFY EXACT CRYSTAL FREQUENCY DESIRED.

Accessories

ACCESSORY FOR CO-400 CRYSTAL AND OVEN ASSEMBLIES

Available from NEMS-CLARKE COMPANY

COE-100	Crystal Energizer Panel (4)
COE-150	Crystal Energizer Panel (8)

COE-150 8-Unit CRYSTAL OVEN ENERGIZER

For use when frequent and rapid changes in receiver frequency operations are required.

CA-100	Crystal Holder
CSD-100	Crystal Storage Drawer (28)
CSD-150	Crystal Storage Drawer (40)
CSD-180	Crystal Storage Drawer (80)

http://watkins-johnson.terryo.org

Antenna Low Pass Filter

ALP-400 For 215-245mc Receivers
ALP-410 For 245-260mc Receivers
Price: $25.00

Phase-Lock Modification Kit
Price: $350.00

Standard Cabinet Rack Accessories

Slide Mounting Tray

The PLK-100 Phase-Lock Modification Kit Replaces the Limiter-Discriminator Chassis of Nems-Clarke Model 1400-A, 1401-B, 1410-A 1411-A and 1412 Receivers to convert to Phase-Lock Detector type Telemetry Receivers for improved performance by reducing receiver threshold.

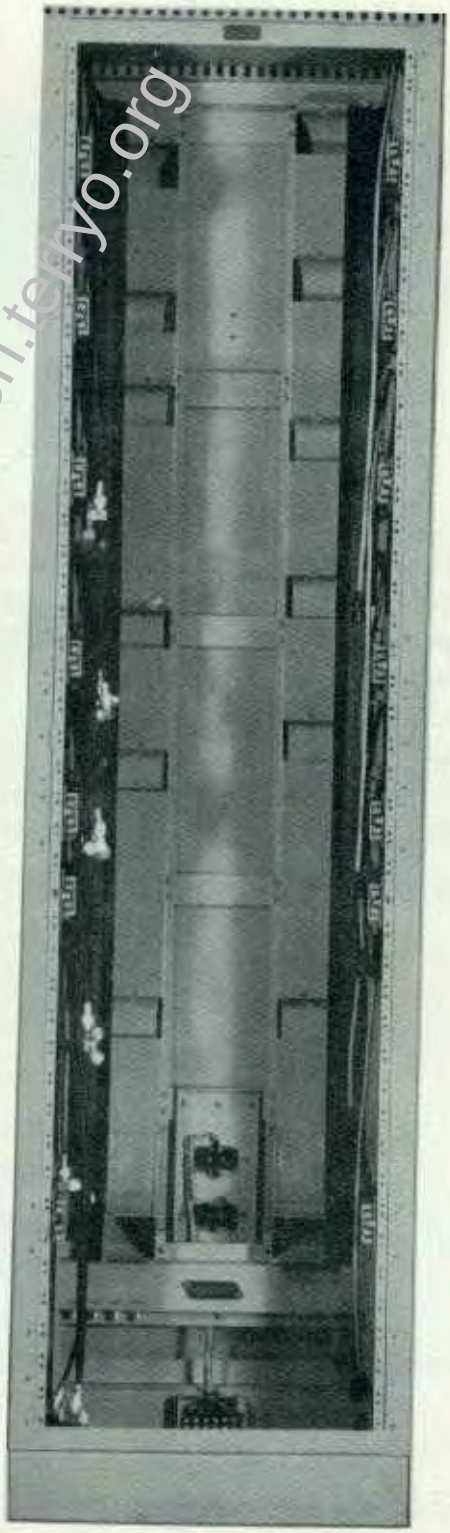
Slide Mounting

SMT-100 Slide Mounting Tray
Price: $100.00

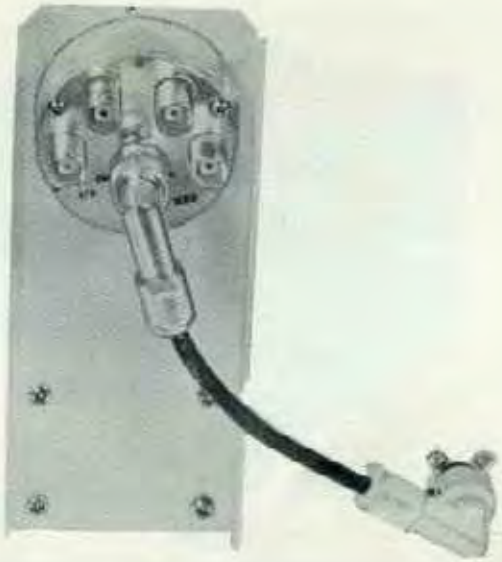
SL-100 Tiltable Slide Mount
Price: $60.00 per pair

Front Support only
Requires ~~Front~~ + ~~Rear Side~~ Support only
will not mount to side of rack. Requires mounting inside rack.

http://watkins-johnson.terryo.org



1401-R Cabinet Rack
ER-1000 Rack Assembly
Price: $1,000.00



SWK-100 Switch Kit Assembly
Price: $80.00

For monitoring up to four receivers with one Spectrum Display Unit.

Blower Unit
1401-B

http://watkins-johnson.terryo.org

SPARE PARTS KITS
NEMS-CLARKE SPK 1302A

SPK-1302-A KIT

These kits include replacement components based on 2000 hours of equipment operation and are contained in attractive metal cases with carrying handle. Finished in gray krinkle.

SPARE PARTS KITS

(Type number identification is the same as the equipment to which each supplies).

SPK-1302-A Receiver Kit	$710.00
SPK-1415 Receiver Kit	635.00
SPK-1672 Receiver Kit	315.00
SPK-2501 Receiver Kit	700.00
SPK-DC-510 Diversity Combiner Kit	435.00
SPK-DM-100 Deviation Meter Kit	70.00
SPK-PR-203 Preamplifier Kit	410.00
SPK-REU-300B Range Extension Kit	175.00
SPK-SDU-200-3 SDU Kit	390.00
SPK-SDU-300-1 SDU Kit	365.00

We reserve the right to make changes in component quantities comprising replacement kits, with corresponding price adjustment.

Spare parts kits for other equipment are available on special order.

Prices on request.

http://watkins-johnson.terryo.org

LINE MATCHING TRANSFORMER
NEMS-CLARKE MT-100

The Nems-Clarke MT-100 Line Matching Transformer has been designed to match the relatively high impedance of vacuum tubes to a low impedance line. It is particularly useful in matching the signal output of Nems-Clarke receivers to coaxial lines when long lengths are needed. The use of high permeability iron and interleaved windings has produced a unit of unusually wide frequency response.

For applications involving a considerable separation between a Nems-Clarke receiver and the demodulation or recording equipment, one MT-100 Line Matching Transformer can be used at the receiver to drive a coaxial cable and another MT-100 Transformer at the input to the demodulator recorder to step the voltage back up.

Input impedance	Approximately 12,000 ohms
Output impedance	50, 75, 93, or 600 ohms
Frequency response	50cps to 150kc ± 3db
Size	1 7/16 × 1¼ inch (seated).
Weight	2½ oz.

Price: $12.50

HELICAL ANTENNA FOR TELEMETERING
NEMS-CLARKE MAM 1000

The Nems-Clarke MAM 1000 Helical Antenna is adapted for Axial Mode Telemetering operating in the 215-260 megacycle bandwidth. The antenna has a Standing Wave Ratio of under 1.5 to 1 and has 50 ohm Input impedance.

The helical element of this antenna is made of ⅜ inch diameter by 0.049-inch wall aluminum tubing rolled into a uniform helix 16⅜ inches in diameter. It is supported by fiberglass insulators radiating from the 3-inch diameter supporting aluminum tube. The supporting tube extends 3 inches through the center of the ground plane.

A sturdy flange supports the one-piece, 35-inch aluminum disc. This ground plane disc is reinforced by eight radiating channel-aluminum supports which house the extension tubes used to increase the effective ground plane to 55 inches in diameter.

An RG-7/U cable feeds from the dielectric housing at the end of the helix to a type N connector near the center of the ground plane. The input lead connects at the underside of the ground plane. All surfaces of the antenna are irridited and painted.

The sturdy, ruggedly built mount consists of a 5-inch diameter support tube on a 15-inch diameter cast base. The upper casting, constituting the bearings for the elevation and azimuth axes, is made of manganese bronze.

Elevating adjustments and locking are accomplished by manipulating the steel pipe handles extending downward from the elevation axis. The azimuth axis locks by means of a knob at the top of the column. Both axes have position indicators and a built-in level to aid in initial adjustment when mounting on the pad. All parts and accesories for mounting the antenna are provided.

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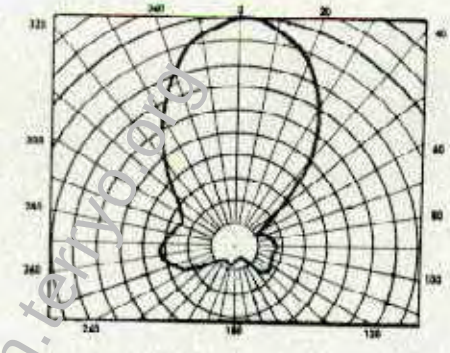
PERFORMANCE CHARACTERISTICS
TYPE MAM-1000-A HELICAL ANTENNA



PATTERN
CIRCULARLY POLARIZED TRANSMIT SOURCE

DETAIL OF ELEVATION AND AZIMUTH LOCKING DEVICES ON ANTENNA MOUNT

ANTENNA SPECIFICATIONS

Half-Power Beamwidth (Nominal)*	Directivity Gain* **	Turns	Coil Length	Overall Length	Net Weight
55°	11 db	4	52¼ in.	56 in.	22 lbs.

* At Center Frequency

** Directivity gain over circularly polarized isotropic radiator and based on tabulated half-power beamwidths.

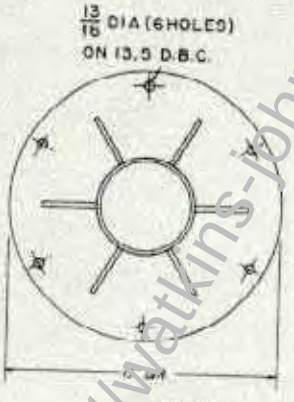
MOUNTING DATA

Mount

MOUNT SPECIFICATIONS

Elevation: −5° to 95° Azimuth: 0° to 360°

Cast Iron Base	Steel Tubing Support	5½ ft. high	175 lbs.



Base

MAM-1000-A HELICAL ANTENNA

Complete with Mount, mating connector and mounting accessories.

Shipping Weight: Approx. 300 lbs.

PRICE $ 750.00
F.O.B. SHERBURNE, N. Y.

HIGH PASS FILTERS
NEMS-CLARKE 150

In many receiving installations the receiving antenna must of necessity be located in proximity to transmitting antennas. Quite often signals picked up from transmitters operating at lower frequencies, such as the AM broadcast band or short wave communication bands, are strong enough to overload the input stages of the receiver and cause cross modulation resulting in extraneous signals in the desired band.

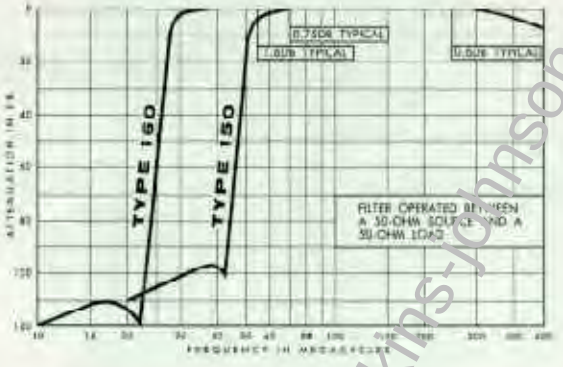
The Nems-Clarke 150 High Pass Filter is designed to be placed in the antenna cable between the antenna and receiver input for the purpose of providing a high degree of attenuation to signals below 55mc. The nominal frequency range of the pass band is 55 to 260mc, and there is a minimum insertion loss in this frequency range.

The Nems-Clarke 160 High Pass Filter is designed to be placed in the antenna cable between the antenna and receiver input for the purpose of providing a high degree of attenuation to signals below 30mc. The nominal frequency range of the pass band is 30 to 260mc, and there is a minimum insertion loss in this frequency range.

These filters consist of six constant -k mid sections and two m- derived end sections. A 100k resistor at each end provides a dc return to ground to prevent the build up of static charges in an ungrounded antenna.

The use of printed wiring techniques produces units that are mechanically stable. From an electrical standpoint this construction assures a uniformity of the distributed parameters that govern the high frequency performance.

The adjacent figure shows the measured performance of these filters.



SPECIFICATIONS

Nems-Clarke 150 Attenuation — 90db min. below 42mc

Nems-Clarke 150 Insertion Loss — 2db max. at 55mc 1db max. from 70 to 260mc

Nems-Clarke 160 Attenuation — 90db min. below 22mc

Nems-Clarke 160 Insertion Loss — 2bd max. at 30mc 1db max. from 50 to 260mc

Impedance — 50 ohms unbalanced

RF Connectors — Nems-Clarke type N

Physical Size — 7⅝ × 1⅞ × 1⅞ inches

Mounting Provisions — Four 6-32 threaded inserts on 5½ × 1¼ inches mounting centers

Price: 150, $120.00
160, $145.00

Broadcast
and Telecast
Equipment

http://watkins-johnson.terryo.org

The Nems-Clarke
Broadcast
and Telecast
Product Line

http://watkins-johnson.terryo.org

TV COLOR REBROADCAST RECEIVER
NEMS-CLARKE TRC-1

The Nems-Clarke TRC-1 TV Color Rebroadcast Receiver has been designed specifically to meet the requirements for a high-quality receiver for use in direct pickup and rebroadcast or monitoring of black and white and color signals. It embodies features which mercial use and provides signals of exceptional quality.

The mechanical construction of the receiver is the same as that normally used in transmitter input equipment. Bathtub construction provides maximum accessibility to all tubes and controls, the other components being readily accessible on the rear of the chassis.

Three outputs are provided by the receiver—video, audio, and stripped-sync. The video signal is available at the normal level and polarity provided by a network interconnection. The signal provided is exceptionally clean and every effort has been made to minimize the effects of impulse noise.

The RF section of the receiver is a separate crystal-controlled, plug-in unit. Where it is desirable, the station can obtain a separate RF unit for each channel to be received. The changeover from one channel to another can be accomplished during a station break with minimum interuption. By providing individual RF units for each channel, each RF unit can be aligned to give maximum performance for its particular channel without the compromises inevitable in a switching-type device.

A high-pass filter ahead of the RF amplifier eliminates interference due to radiation at frequencies below the television band.

The sound channel is separate from the video channel so that, in case of failure of the video transmitter, the sound is not lost. Also this allows the intercarrier buzz and intermodulation to be reduced to a low level not possible with the intercarrier system.

Considerable attention has been given to the design of the video IF in order to produce the very wide frequency response, low differential gain and phase errors, and optimum time delay so that color signals can be reproduced with minimum distortion.

SPECIFICATIONS

VIDEO CHANNEL

Output terminal	75 ohms, coaxial
Level	Adjustable up to approximately 1 volt, peak to peak
Polarity	Sync negative
Frequency response	±2db, 50cps—4.2mc

SOUND CHANNEL

System	Separate IF (not intercarrier)
Output level	Adjustable from 0 to +18dbm
Output impedance	60 ohms or 150 ohms, balanced or unbalanced
Frequency response	±1.5db from the standard de-emphasis curve, 30-15,000cps
Distortion	Less than 1%
Noise level	50db below +18dbm

SYNC CHANNEL

Output terminal	75 ohms, coaxial
Output level	3 volts, peak to peak
Polarity	Negative

MISCELLANEOUS

Gain control	Manual or keyed automatic
RF input connection	75 ohms, coaxial
Local oscillator stability	±.005%
Noise figure—Channels 2 through 6	10db maximum
Channels 7 through 13	12db maximum
Power supply	Self-contained
Power requirements	117 volts, 60 cycles, 120 watts

PHYSICAL

Height	13.75inches
Depth of bathtub chassis	5.25 inches
Maximum projection beyond rear of chassis	3.50 inches
Weight	30 pounds
Finish	Dark umber gray

Price:

Receiver equipped to receive any one VHF channel	**$1150.00**
Additional RF tuning unit for single VHF channel	150.00

http://watkins-johnson.terryo.org

TELESYNC
NEMS-CLARKE TS-1

The Nems-Clarke TS-1 Telesync equipment has been designed specifically to meet the requirements for a high quality unit for generating RETMA sync signals when used in conjunction with a high fidelity TV receiver such as Nems-Clarke TR-1 or equivalent. It embodies features which insure reliability for full-time commercial use and provides signals of exceptional quality.

The Nems-Clarke TS-1 telesync has been designed to supply the necessary synchronizing signals to operate a camera or slide chain. Its principal application is to replace a much more expensive synchronizing signal generator. In operation the TS-1 is supplied with a composite synchronizing signal usually obtained from an off-the-air receiver. The TS-1 breaks down this signal into its horizontal and vertical components and generates blanking signals.

The signals supplied to operate a camera chain or slide equipment are namely:

Vertical driving pulses
Horizontal driving pulses
Mixed blanking
Mixed sync

The low cost and simplicity of operation as compared to a regular synchronizing signal generator is obtained by using the radiated signal of a television broadcasting station. This signal is picked up by a high quality TV receiver such as the Nems-Clarke TR-1. The video is removed and the sync only is supplied to the TS-1. It is then separated, delayed and mixed in the following manner:

1 The vertical and horizontal sync signals are separated and used to synchronize vertical and horizontal pulse generators. These generators produce the 60cps vertical drive pulses and the 15,750cps horizontal drive pulses. These signals are used to drive the deflection circuits in a camera or flying spot scanner.

2 The mixed sync input signal is amplified and squared and applied to a delay line. From the delay line it is again amplified to drive an output line. Since the original front and back porches on the horizontal sync pulses were lost when the video was stripped they must be regenerated in the TS-1. This is the purpose of the delay line.

3 Since the vertical blanking signal was also lost in the process of video stripping it must be regenerated in the TS-1. This is accomplished by inserting a long delay ahead of a vertical blanking generator. This blanking intervals is adjustable both in starting time and duration.

The TS-1 has been designed for reliable continuous operation. Bathtub construction provides maximum accessibility to all tubes and controls from the front and small components from the rear. This construction is the same as that normally used in TV studio equipment.

http://watkins-johnson.terryo.org

SPECIFICATIONS
INPUT SIGNAL REQUIREMENTS

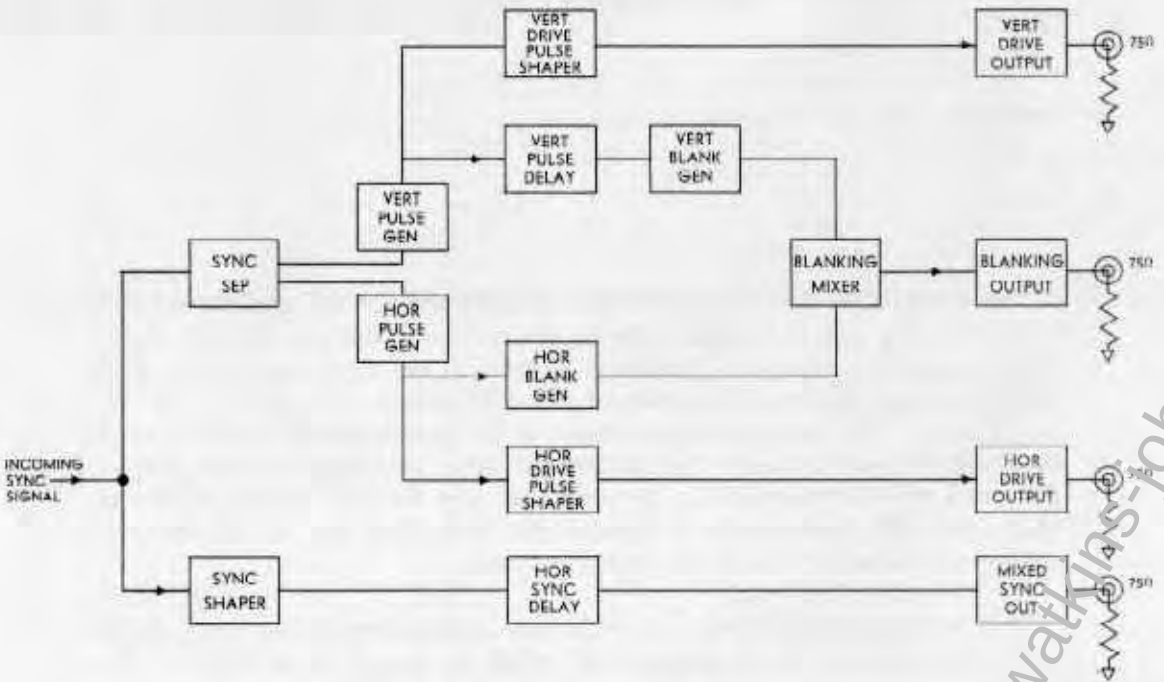
Type ..... Mixed sync
Level ..... 3 to 8 volts, peak-to-peak into a 75 ohm load
Polarity ..... Negative

OUTPUT SIGNAL DATA

Vertical Drive ..... 6 volts peak-to-peak at 60 cycles into a 75 ohm load
Horizontal Drive ..... 6 volts peak-to-peak at 15,750 cycles into a 75 ohm load
Mixed Blanking ..... 6 volts peak-to-peak at Standard RETMA signal into a 75 ohm load
Mixed Sync ..... 6 volt peak-to-peak at Standard RETMA signal into a 75 ohm load

MISCELLANEOUS

Power Supply ..... Self-Contained
Power Requirements ..... 117v, 60 cycles, 150 watts
Tube Complement ..... 1 Type 6C4, 1 Type 6AQ5, 10 Type 12AU7, 3 Type 12AT7, 2 Type 6SN7
Size ..... 13¾ × 19 × 3½ inches
Weight ..... 25 lbs.
Finish ..... Dark umber gray



Price: $650.00

MULTICOUPLER
NEMS-CLARKE AM-1A

The Nems-Clarke AM-1A Multicoupler connects one antenna to eight receivers with practically perfect isolation between the receivers, with gain in each multicoupler channel, and with a minimum increase in the noise figure of a good communications receiver plus multicoupler combination over that of the receiver alone. The increase in noise figure of the combination is so slight as to be negligible with respect to the atmospheric noise prevailing in most parts of the world in the portion of the frequency spectrum covered. In the matter of noise figure, this multicoupler is demonstrably better than that of any commercially available unit of which we have knowledge.

This multicoupler makes use of wide-band transformers of our own design and fabrication and circuit arrangements which we believe to be unique. The performance given in the attached specifications is not that of one laboratory model, but the figure have been compiled as the result of production tests on hundreds of these units which are already in use. They therefore can be taken as representative.

The multicoupler does not have any single RF tube common to all the channels. This feature, alone, means a decided increase in the reliability of the device. The unit occupies a minimum of rack space and contains its own built-in power supply.

http://watkins-johnson.terryo.org

SPECIFICATIONS

Frequency range	2 to 30mc. flat with ±2db
Number of receiver channels	eight
Input impedance	70 ohms, nominal. Coaxial input through SO-239 connector.
Output connections	NEMS-CLARKE 964 Coaxial Jack; 75 ohms nominal impedance. Mating plugs, NEMS-CLARKE 966, furnished for each output jack.
Gain of each channel	Nominal 2db
Isolation between any two receiver outputs	Greater than 55db
Radiation suppression	Greater than 60db
Cross Modulation	The spurious signal resulting from two equally strong signals separated by 2mc is more than 60db down below the individual signal strength of either signal providing the input level does not exceed 45 millivolts.
Noise figure	Production measurements are made using the multicoupler ahead of a Hammarlund SP600 Receiver known to be in good alignment. The noise figure of this multicoupler-receiver combination will vary between 9db and 13db, depending upon the receiver band used and tube variations in individual channels. On receivers of lesser quality an increase in sensitivity might be experienced due to the addition of this multicoupler.
Finish	Umber grey enamel, standard
Power requirements	117v, 60-cycle ac; 74 watts
Weight	24 lbs.
Tube complement	Eight 6BQ7A's; one 5Y3GT

Price: $550.00

ALSO AVAILABLE WITH CONNECTORS MOUNTED
ON REAR APRON

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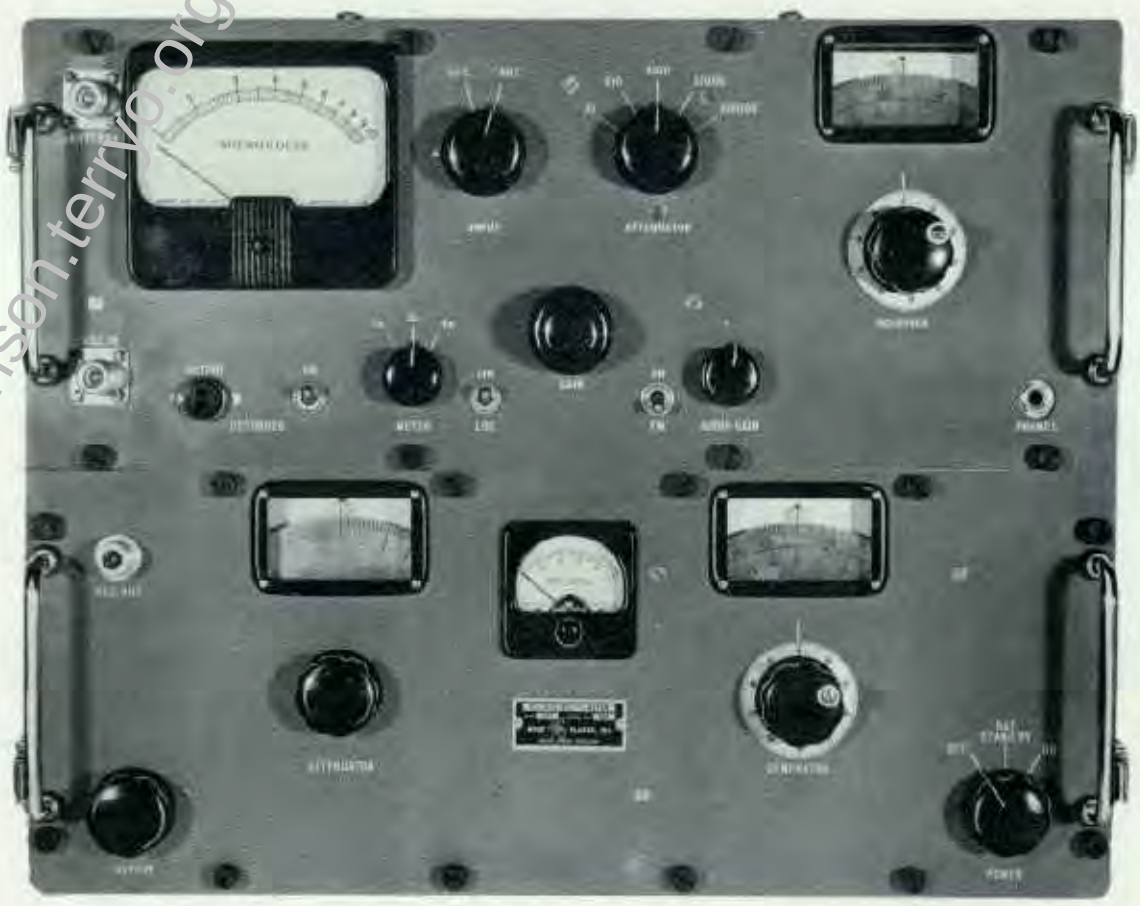
TEST SET AND FIELD INTENSITY METER
NEMS-CLARKE 107-A



The Nems-Clarke 107-A Test Set and Field Intensity Meter combines in one portable unit a radio receiver of laboratory quality with metered output and an accurate calibrated signal generator. These instruments, which can be used separately for a variety of test purposes, cover a frequency range of 54 to 240 megacycles without band changing. When used with the associated antenna assembly they form a highly accurate field intensity meter. Extreme sensitivity and high selectivity make the assembly suitable for the measurement of practically all types of radio-frequency emission even in congested bands. It is useful on AM, FM, Television, Aeronautical and Commercial service with assigned frequencies within its wide frequency range. Either average or peak of TV sync values of signal intensity may be read. Field intensity measurements are made with high accuracy by substituting a known RF voltage from the signal generator for the received signal voltage. Field intensity can then be obtained by applying a multiplying factor for the effective length of the antenna and coupling device. An alternate method is to calibrate the receiver by means of the signal generator to give a direct indication of field intensity. The receiver operates in effect as a linear voltmeter having a 100db range in 20db steps. The output meter has a logarithmic (approximate) scale calibrated between 1 and 10. A receiver IF gain control and the 20db step attenuator allow the microvolt meter to be set at any desired full scale voltage from 10 microvolts to 0.1 volt. The range can be extended to 10 volts full scale by using the 40db coaxial pad supplied with the equipment. The built-in power supply for the 107-A may be energized from either a 6v dc source or 115v 50 to 400 cycle ac power lines.

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SPECIFICATIONS

RECEIVER

Frequency Range	54-250mc
Input Impedance	51 ohms
IF Frequency	21.4mc
IF Bandwidth	300kc
Sensitivity at input terminals as a voltmeter	10μv
Field Strength at 54mc	1.6μv/m
Field Strength at 240mc	6.5μ/m
Maximum input using external pad supplied	10.0v
Field Strength at 54mc	1.6μv/m
Field Strength at 240mc	16.0 v/m
Output Indicator	Panel meter (approx. Logarithmic scale)
Output	1. To operate a 1.0 milliampere recorder 2. Audio for headphones

SIGNAL GENERATOR

Frequency Range	54-240mc
Output	1.0μv to 0.1v
Output Impedance	51 ohms

POWER REQUIREMENTS

117 volt ac, 50-400 cycle	60 watts
or	
6 volt, dc	8 amperes

MECHANICAL CHARACTERISTICS

(1) Field Intensity Meter	20 × 11¾ × 15¼ inches
Weight	56 lbs.
(2) Antenna Case	28 × 7 × 6½ inches
Weight	16 lbs.
Antenna — Maximum supported height	9½ feet
Antenna — Minimum supported height	4½ feet

High frequency elements adjustable from 11 to 26 inches

Low frequency elements adjustable from 25 to 67 inches

Price: $2650.00

Including antenna and accessory case.

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PHASE METER
NEMS-CLARKE 108-E

The Nems-Clarke 108-E Phasemeter is an instrument designed to provide an indication of the phase relations in directional antenna systems. Each instrument is tailored for the particular installation and usually incorporates provision for indicating the relative amplitudes of the currents in the various antennas, as well as the phase relation. The 108-E Phasemeter has found its principal use in broadcast stations employing directional antennas, but its wide frequency range makes it readily adaptable for other applications.

DESCRIPTION

Terminals are provided on the rear of the instrument for connection to the transmission lines from the sampling loops. These terminations are substantially resistive, having a nominal value of 70 ohms or 50 ohms as specified by the customer. The voltage appearing across the termination is rectified by the associated diode, and the direct current resulting from this rectification is metered by the remote antenna meter on the panel of the instrument. The constants of the circuit are so chosen that proportional relationship exists between the current in the regular antenna ammeter and the current flowing in the dc instrument on the phasemeter panel. Linear rectifiers are employed, and the indication does not vary with modulation as is the case when thermo-ammeters are used.

By means of Selector switches associated with the input to two amplifier channels, the voltage across the termination of any of the transmission lines can be fed to a potentiometer in the grid circuit of either channel's amplifier tube. These potentiometers are used to adjust the amplitudes of the amplifier inputs to provide for equal voltages across the amplifier outputs. The two amplifier channels feed into a common voltmeter circuit which adds the voltages and gives an indication of the vector sum. Since the outputs of the amplifiers have been individually adjusted to the same value, the channel meter gives an indication directly in degrees. A switching circuit permits the equal outputs of the two amplifiers to be combined in either of two ways. With the Range switch set in the 0-90 degree position the outputs of the amplifiers are combined in series, and the voltmeter reads the vector sum under this condition. With the switch in the 90-180 degree position the outputs of the two amplifiers are in parallel, and the meter reads the vector sum under this condition. Provision is made for indicating which one of the two elements being compared has a leading phase angle with respect to the other.

The operation of the instrument is simple. The two Selector switches are set to the two elements to be compared. The outputs of the amplifiers are adjusted to a red mark on the meter. The switch is thrown, and the phase difference is immediately indicated. This indication is not affected by modulation provided 100% modulation is not exceeded.

The simplicity of the instrument, its freedom from modulation "jitter," its direct indication, and its easy operation have combined to make it a favorite with station engineers and consultants.

SPECIFICATIONS

Frequency range — 100kc to 2mc
Phase angle range — 0 to 360 degrees
Monitoring accuracy — 1 degree
Resolution — ½ degree
RF input impedance — 50 or 70 ohms nominal
RF voltage range — 1 to 7 volts
Tube complement — 2 6AU6, 2 OB3, 1 5Y3, 3 6AL5
Power supply — 105 to 125 volts
Power consumption — 80 watts
Dimensions — 14 × 19 × 7 inches
Weight — 20 lbs.

Price:

Two Elements	**$700.00**	**Four Elements**	**$750.00**
Three Elements	**$725.00**	**Five Elements**	**$775.00**

Six Elements ..... price on request

FIELD INTENSITY METER
NEMS-CLARKE 120-E

The Nems-Clarke 120-E Field Intensity Meter is a compact, lightweight portable instrument for the measurement of a wide range of radio signal intensities in the broadcast band of 540 to 1600kc. Its range of sensitivity from 10μv per meter to 10v per meter, makes it equally effective for interference studies at low signal strengths and for close-in measurements on high-power directional arrays.

Because of the high selectivity considered necessary in a modern field intensity meter, the overall bandwidth of the 120-E is approximately 7kc at 1000kc at the one-half voltage response. Image response is approximately 80db down at all frequencies, and IF rejection is approximately 80db down at all frequencies above 600kc and 75db at 540kc.

Accuracy of measurement is assured by a calibration method that compensates for variations in tube characteristics and for voltage variations in the self-contained battery power supply. Operation is simple and measurement can be made rapidly, for the meter is direct-reading on all ranges and does not require the use of charts or multiplication factors. Since tubes are of the filament type, practically no warm-up period is necessary before taking readings.

The added feature of providing both linear and logarithmic indications permits its use with recording equipment for continuous observations.

The unit, as furnished, is designed to operate from internal batteries for field applications. In permanent installations for continuous monitoring it is suggested that the 120 E or 120-D be used in conjunction with the Nems-Clarke 121 Accessory Unit, which includes a recorder amplifier, audio monitor, and ac power supply.

SPECIFICATIONS

Frequency Range	540 to 1600kc
Field Intensity Range	10 microvolts per meter to 10 volts per meter
Accuracy of Attenuators	2%
Output Indicator	Panel meter, direct reading, with logarithmic scale graduated 1 to 10. Provisions for using recorder. Headphones, high impedance(not supplied).
Antenna	Shielded, unbalanced loop
Power Requirements	Batteries, 5—1½-volt, 2—67-½ volt. Provisions for external power supply
Battery Life	500 indications (approx.)
Electron Tube Complement	4 — RCA-1T4 2 — RCA-1R5
Overall Dimensions, closed	9 × 13 × 5¾ inches
Weight, Including batteries	12½ pounds

Price: $850.00

Complete Calibration, material additional: $70.00

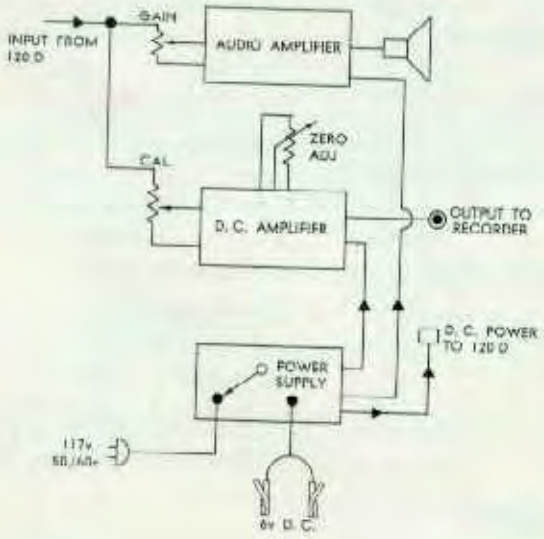
Spot Calibration at one frequency only: $30.00

ACCESSORY UNIT FOR FIELD INTENSITY METERS
NEMS-CLARKE 121

The Nems-Clarke 121 Accessory Unit is designed as a companion unit to the 120-E Field Intensity Meter (also the WX-2A, WX-2B, WX-2C, WX-2D, and WX-2E).

The principal function of the 121 is to operate 1 milliampere recorders of the Esterline Angus type to give a permanent record of field strength. This may be at a fixed remote location where commercial power is available or for mobile operation in which case a 6-volt storage battery is used for power. Filament and plate power for the 120-E's receiver is available; however it is still necessary to have reasonably good batteries installed in the 120-E for regulation and filtering purposes.

The 121 can also be used as a general purpose recording and monitoring amplifier when a high input impedance is desired and 5 volts dc is available.



SPECIFICATIONS

Input Required — Approximately 5v dc
Output — 1ma into loads up to 2000 Ω
Speaker — 4 inches Panel Mounted
Power Source — 117v 50/60cps or 6v dc
Power Input — approx. 15 watts on ac or approx. 2.5 amps on dc
Size — 12½ × 6½ × 4½ inches
Weight — 10 lbs.

Price: $175.00

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PORTABLE DIRECT READING FIELD INTENSITY METER
NEMS-CLARKE 166-A

The Model 166A Field Intensity Meter is direct reading in microvolts per meter without the aid or necessity of charts, curves or computations of any kind. Signal pickup is by means of a statically shielded, unbalanced loop which is an integral part of the instrument cover. The loop is designed so that its resonant frequency is much higher than the highest frequency in its operating range. The high side of the loop is loaded with a high "Q" coil to provide the total inductance required for the operating range. Injection of the calibrating voltage into the loop circuit is accomplished by means of a small toroidal-wound inductance. By careful design, spurious responses have been kept to a minimum. The use of crystal diodes for metering purposes eliminates the meter error due to varying cathode voltages of thermionic rectifiers. The crystals are used in special circuits which swamp out variations due to temperature, etc. The meter will indicate accurately with filament voltages as low as 1.1 volt and plate voltages as low as 50 volts.

Ordinary flashlight cells, obtainable everywhere, are used for the filament supply. A 67½ battery of the size in common use in small portable radio receivers is used for the plate supply. The total B current drain of the receiver portion of the instrument is 8ma. The filament drain is 300ma. Separate batteries are used for the calibrating oscillator. All batteries are carried in a compartment accessible through a door in the rear of the case of the instrument. Provision is made for checking the battery voltages with the same meter as used for the field intensity indication.

All tubes are quick-heating filament types so that the Model 166 stabilizes within a few seconds; thus it is not necessary to keep the instrument operating between readings.

The direct reading feature of the Model 166 simplifies field strength measurements and eliminates the need of the usual attenuator readings and multiplication factors. A wide senstivity range, 10 volts per meter to 10 microvolts per meter, permits maximum flexibility within the range of 200 to 540kc.

Despite its small size and compactness, nothing has been sacrificed in the way of excellence of workmanship. Components of the highest quality are used throughout. The design is such that all components are readily accessible.

Users find that the Model 166 offers extreme flexibility and fills a long-felt need for a lightweight, portable instrument. The instrument is a low frequency version of a similar field strength meter we manufacture for use at broadcast frequencies. Hundreds of these instruments are in use by consultants and broadcasting stations all over the world.

SPECIFICATIONS

Frequency Range — 200 to 540kc
Sensitivity — 10μv/m to 10 v/m
Spurious Signal Rejection — At least 50db*
Signal to Noise Ratio — Better than 2 to 1 at 10μv/m
Calibration Source — Sine wave generator

Size — 9 × 13 × 6 inches
Weight — 12.6 lbs. including batteries
Power Supply — 5 1½v flashlight cells
2 67½v B batteries
Low Voltage Limit — A 1.1v, B 50v
* Except IF signal (455kc)

Price: $750.00

MOBILE RECORDING ASSEMBLY
NEMS-CLARKE 110-R

The Nems-Clarke 110-R Mobile Recording Assembly was designed to meet the needs of consultants and station engineers to aid in the certification of transmitter performance. It can be used in conjunction with recording devices to obtain other information that can be translated into suitable current or voltages, plotting as a function of the distance travelled by the vehicle.

The complete assembly consists of a Model 101-BR Speedometer Tee, a Model 102-B Recorder Drive and all interconnecting flexible shafts with hardware necessary to connect speedometer drive and recorder drive to an Esterline-Angus 1 milliampere recorder. Since all automotive manufacturers have not adopted SAE standards for speedometer cables and fittings, it is necessary to specify the year, make and model of the car for which the equipment is intended.

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SPECIFICATIONS

Size ..... Model 101-BR Tee Width 4.50 inches overall
Length 4.00 inches overall
Height 1.25 inches overall
Model 102-B Recorder drive (Excluding mounting bracket)
Width 4.75 inches overall
Length 3.00 inches overall
Height 3.00 inches overall
(1.25 inches excluding control knob and driving gear)
Model 103L-H Uni-directional Drive
Width 3.20 inches overall
Length 5.50 inches overall
Height 1.75 inches overall

Weight ..... Model 101-BR Tee 2 lbs. net
Model 120-B Recorder drive 3 lbs. net
2 flexible shafts combined weight approximately 2.25 lbs.
Shipping weight of Model 110-R assembly 10 lbs.
Model 103L-H Uni-directional drive 3.16 lbs.

Finish ..... All parts plated white nickel except where material is stainless steel. All cases finished in durable, baked, fine grain black wrinkle.

Cables furnished ..... 2 total; 1 Model 101-13 (or 101-14 depending on make and model of car) 3 feet long for connecting Tee to speedometer and 1 Model 101-15, 8 feet long for connecting Tee to Recorder. Drive cable for 103L-H may be ordered to specific requirements.

Charts speeds ..... With standard gears furnished with Esterline Angus recorder, 1, 2, 4, 8 and 16 inches of chart per mile traveled may be selected at will.

Information Necessary to Order

Make, model and year of car with which the equipment is to be used.
Also if Recorder was manufactured before or after October, 1950.

Price: $82.50

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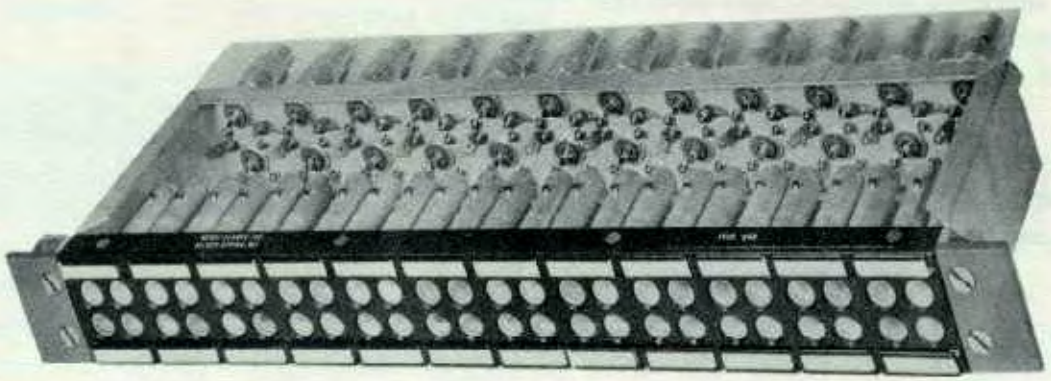
Audio, Video and RF
JACK PANELS
and Components



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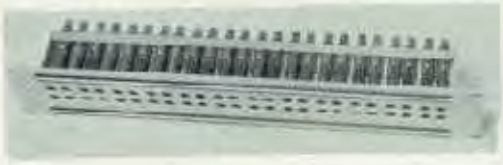
AUDIO, VIDEO AND RF JACK PANELS

The Nems-Clarke jack panel, units have been kept small to conserve rack space. Dimensions are as small as 19 × 1¾ inches, the standard dimension being only 19 × 2⅛ inches. Varied grouping of jacks are mounted on either black phenolic strips or on aluminum panels and are finished in light umber gray.

In the Video and RF Panels, sub-chassis can be furnished which provides 12, 18, or 24 Amphenol connectors and plugs to permit disconnection of long lines when necessary. Spring contacts in the jacks are made of heat-treated beryllium copper to give long, trouble-free service. Both silver and gold flash (.0001 inch) types are available.

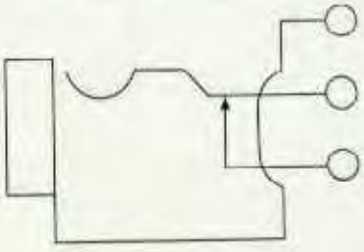
Audio Jack Panel contacts are of coin silver, the jacks spaced to eliminate the possibility of splitting the circuits. The jacks, which are made of nickel-plated steel, are mounted on a black phenolic strip. Ground lugs are aligned to allow a single ground bus to be run the full length of the strip.



The Video and RF Patch Cords are normally stocked employing RG58A/U coax with Type 966A gold flash (.00001 inch) plugs. They can also be furnished employing RG50/U coax.

The various types of plugs and jacks have low VSWR up to 400mc, when connected directly into a coaxial circuit.

CONTACT ARRANGEMENT



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NEMS-CLARKE 921

Nominal impedance of jacks ..... 70 ohms
Size ..... 19 × 1¾ × 2¾ inches
Number of jacks 12
Mounting ..... Relay rack
Finish ..... Light Umber Gray
BNC connectors on back of panel

NEMS-CLARKE 975 COLOR

Nominal impedance of jacks ..... 70 ohms
Size ..... 19 × 2⅛ × 2¾ inches
Number of jacks 36
Mounting ..... Relay rack
Finish ..... Light Umber Gray

NEMS-CLARKE 924
(without Sub-Chassis)

Nominal impedance of jacks ..... 70 ohms
Size ..... 19 × 2⅛ × 2¾ inches
Number of jacks 24
Mounting ..... Relay rack
Finish ..... Light Umber Gray
Type 924A ..... with 12-Connector Sub-Chassis
Type 924B ..... with 24-Connector Sub-Chassis

NEMS-CLARKE 912
(without Sub-Chassis)

Nominal impedance of jacks ..... 70 ohms
Size ..... 19 × 2⅛ × 2¾ inches
Number of jacks 12
Mounting ..... Relay rack
Finish ..... Light Umber Gray
Type 912A ..... with 12-Connector Sub-Chassis

NEMS-CLARKE 948
(without Sub-Chassis)

Nominal impedance of jacks ..... 70 ohms
Size ..... 19 × 2⅛ × 2¾ inches
Number of jacks 48
Mounting ..... Relay rack
Finish ..... Light Umber Gray
Type 948A ..... with 12-Connector Sub-Chassis
Type 948B ..... with 24-Connector Sub-Chassis

NEMS-CLARKE 928

Nominal impedance of jacks ..... 70 ohms
Size ..... 19 × 3½ × 2¾ inches
Number of jacks 24
Mounting ..... Relay rack
Finish ..... Light Umber Gray
BNC connectors on back of panel

NEMS-CLARKE 963
(without Sub-Chassis)

Nominal impedance of jacks ..... 70 ohms
Size ..... 19 × 2⅛ × 2¾ inches
Number of jacks 36
Mounting ..... Relay rack
Finish ..... Light Umber Gray
Type 963A ..... with 12-Connector Sub-Chassis
Type 963B ..... with 24-Connector Sub-Chassis
Type 963C ..... with 36-Connector Sub-Chassis

(3-1/4" wide sub-chassis)

NEMS-CLARKE 929

Nominal impedance of jacks ..... 70 ohms
Size ..... 19 × 3½ × 2¾ inches
Number of jacks 48
Mounting ..... Relay rack
Finish ..... Light Umber Gray
BNC connectors on back of panel

Number of jacks 48
Type of Jack ..... Double Jacks of standard closed circuit, telephone type.
Dimensions ..... 19 × 2⅛ × 2¾ inches

Type 99A has single designation strip at top.
Type 99B has designation strip top and bottom.

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VIDEO JACK COMPONENTS

NEMS-CLARKE Type 967G Patch Cords and Type 965A Looping Plugs are supplied for use with all types of Video Jack Panels. The design includes such features as chamfered edges to assure smooth insertion into the jacks, gold flash (.00001") on contact surfaces and positive strain relief on the RG58A/U cable. The 995 Color Patch Cords are available for handling unencoded color signals. Individual jacks and plugs are also available for replacement parts.

All items shown may also be obtained in the Western Electric Types.

966/866 VIDEO AND RF PLUG

991/891 (Short) OR 964/864 VIDEO AND RF JACK

965/865 OR 965A/865A VIDEO AND RF LOOPING PLUG

Also available—Type 925 Jack for use only with Types 921, 928, and 929 Panels

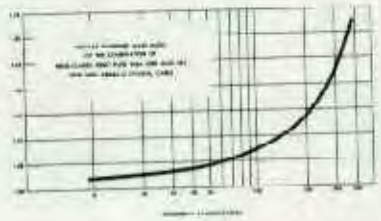
PATCH CORDS

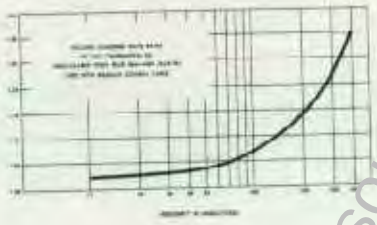
967GA
18 inches

967GB
24 inches

967GC
36 inches

RG58/U Coaxial Cable





• PRICES •

Video and RF Jack Panels

912	125.00	912A	150.00
921	130.00	924A	165.00
924	150.00	924B	175.00

925 A "B" size Panel with provisions for 24 Type 925 Jacks using BNC connecter mounted on back of Panel 200.00

929 Similar in dimension to Type 928 except provision is made for 48 Type 925 Jacks 325.00

948	250.00	948A	265.00
963	190.00	948B	275.00
963A	205.00	963B	215.00
975 Color	205.00	963C	275.00

Prewire Charge 40.00

Video and RF Plugs

940A/840A, 75ohm	5.00
965A/865A (Looping)	7.00
966A/866A	4.50
EA51 (European Adapter)	2.75

Video and RF Jacks

925 Designed for use with Types 921, 928, and 929 Video and RF Jack Panels. A modified version of Type 964/864 Video and RF Jack Panel 5.75

964/864 ... 4.50 991/891 ... 4.50

Patch Cords

967GA, 18" long	7.00
967GB, 24" long	7.25
967GC, 36" long	7.50
995A Color, 18" long	19.50
995B Color, 24" long	20.50
995C Color, 36" long	21.50

Audio Jack Panels

99A	60.00	...	62.50

900 Series above compatible with RCA • 800 Series above compatible with Western Electric

Customary delivery—14 days after receipt of order

http://watkins-johnson.terryo.org

Scientific Research and Test Equipment

Vitro Electronics
is diversified in
the production of
Scientific Research
and Test Equipment

MERC-ARC HIGH INTENSITY LIGHT SOURCE

For Microscopy and Photomicrography

Average Brightness
25 x 10_3 candles cm_2

The Merc-Arc provides a source of continuous high intensity light for photomicrography and for normal viewing in microscopy. The mercury lamps used in this unit give a light-continuum throughout the visible spectrum with strong ultra-violet lines in the near and middle ultra-violet regions, making possible the effective use of daylight-type color films in photomicroscopy without the use of corrective filters.

Characteristic of this unit is the exceptionally small size of the light source, a factor in providing light of high intrinsic brillance. The intensity of the light makes it particularly useful for darkfield, polarization, phase, and ultra-violet fluorescence microscropy or photomicroscopy.

The Type 520-P Merc-Arc has pyrex optical elements which withstand the intense heat generated by the mercury arc lamp.

The Nems-Clarke 520-Q Merc-Arc is fitted with quartz optical elements the characteristics of which make possible the full utilization of the ultra-violet portion of the spectrum, making the resulting light particularly useful where strong ultra-violet radiation is needed for fluorescence studies.

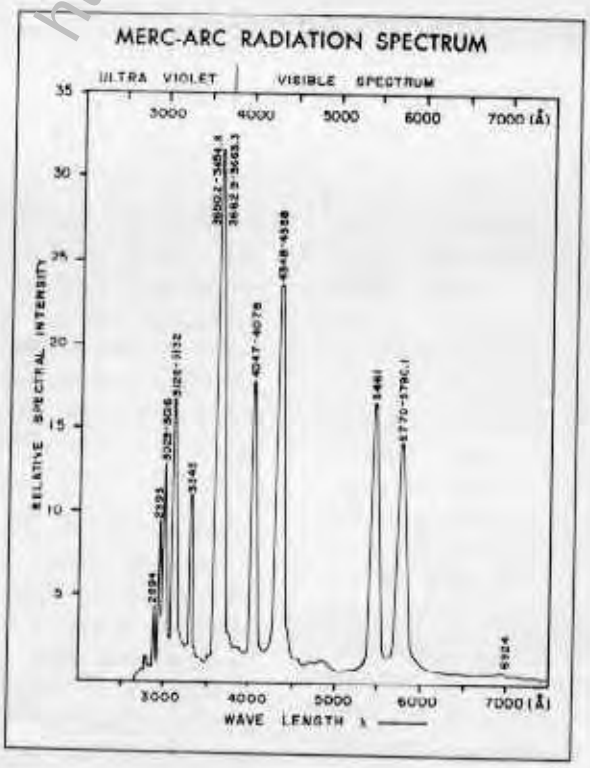
A small illuminator unit and an ac power unit comprise the Merc-Arc. The housing containing the lamp and optics is connected by a 2½ ft. long connecting cord making it possible to locate the larger power supply unit away from the work area near the microscope.

One feature of particular interest regarding the ac power supply is the use of a power-factor-correction capacitor which appreciably reduces the line current. This is particularly important when the illuminator is used on heavily loaded lines.

Where it is desired to obtain a pure, unmodulated light output, a dc converter unit is available for operation of the mercury arc lamp with dc current. This unit is connected between the ac power supply unit and the illuminator; thus the output of the ac unit is rectified and filtered, and the current flow limited to the proper value for lamp operation.

Both the power supply and the dc converter represent the utmost in careful design. All components operate well below their normal rating to insure long life and maximum efficiency.

The illuminator housing is finished in instrument black. The power supply units are finished in attractive hard-gloss blue-gray enamel.



SPECIFICATIONS

Power Input	117 volts, 50-60cps less than 4.0 amp, AC rms
Lamp Operating Voltage	50-57v
Lamp Operating Current	
Osram HBO-200 Type L_5	3.65, ±5% amperes
Osram HBO-200 Type L_4	4.15, ±5% amperes
Apparent Power	230 VA
Real Power	200 watts
Luminous Flux	9500 lumens
Luminous Efficiency	47.5 lumens/watt
Luminous Intensity (perpendicular to lamp axis)	1100 candles
Average Brightness	25 × 10^3 candles/cm²
Arc Dimensions	Height: 2.5 mm; Width: 1.3 mm.
Average Life	200 hours to 20% decrease in luminous flux

Distributed exclusively by American Optical Company, Distributors

Prices:

520-P MERC-ARC (Pyrex Optical): $500.00

520-Q MERC-ARC (Quartz Optics): $575.00

dc Converter Unit (on special order only). Price on request

http://watkins-johnson.terryo.org

PULSARC AND ZENARC

LIGHT SOURCES FOR PHOTOMICROGRAPHY

The Nems-Clarke PULSARC has been designed to meet a long-felt need for a light source for photomicrography which would provide a steady, high-intensity source of light for normal viewing and focusing capable of being pulsed at a very much higher input at the time the photographic exposure is made. The increased power in the pulse results in an increase in the intensity of the xenon-arc lamp without an appreciable increase in the size of the source. The increase in source brightness is approximately 36 times in the type 505-BP Pulsarc. The time of the light Pulse in the unit can be varied in four discrete steps up to a maximum of 135 milliseconds. Once initiated, the length of the pulse is independent of the operator. The pulse can then be synchronized by the camera shutter contacts.

The XENON-ARC LAMPS used in these light sources are designed for steady burning with all of the energy concentrated in a very small area rather than in the extended area used in most electronic flashtubes designed for singleflash operation. Such xenon-arc lamps are coming more and more into general use in Navy search-lights, motion picture projectors, and in other equipment where an intense source of light of small size is needed. The photographic effectiveness of the Pulsarc lamp, as normally used, exceeds by a factor of approximately 10, that of any electronic flash-tube of comparable size. In photomicroscopy, a conventional electronic flashtube is of little value, since a good optical system is difficult to design around a large area source.

Because the color temperature of the light source is close to that of daylight, photomicrographs can be made using high-speed color films. Normally, there is no need for any corrective filtering. The high intensity of the pulse xenon-arc, as used in the Pulsarc, makes photographic exposures possible in a fraction of the time needed for other sources previously used for photomicroscopy. Three pulses of 135-millisecond duration have been found to give emulsion density equal to a 30-second exposure using a ribbon-filament lamp. There is no appreciable heating of the specimen, vibration ceases to be a problem, and reciprocity failure of the film due to long exposure is eliminated.

The Pulsarc is offered with a choice of two different xenon-arc lamps. The specification table shows the differences in the source size and performance of the two lamps. The illuminators have been designed to offer every convenience to the microscopist. A smooth-working field-of-view diaphragm, and an adequate condensing lens with readily adjustable focusing mechanism are provided. Additional adjustments are provided for placing the arc on the optical axis, and for adjusting the mirror to super-impose the reflected image upon the transparent arc for greater intensity, or for displacing the image if it is desirable to increase the apparent size of the source. The unit operates cooler than conventional ribbon-filament lamp illunimators, since the conversion of electrical energy to light is much more efficient in an arc discharge than in a heated filament.

The ZENARC is designed for uses where the pulse feature of the Pulsarc is not required. With the exception of the omission of the pulsing circuits and the use of a different lamp, the Zenarc is identical to the Pulsarc and retains all the quality features, the same power supply, illuminator and general appearance.

Other Uses — The power supply and lamp unit of the Pulsarc or the Zenarc will find many uses in other fields, such as enlarging, projection, time-lapse photography, etc.

SPECIFICATIONS

	NEMS-CLARKE 505 BP PULSARC	NEMS-CLARKE 505-HP PULSARC	NEMS-CLARKE 505-H ZENARC
Lamp Used	FA-5 Tube	510C1 Tube	510C1 Tube
Arc Dimensions Length Width, Continuous Width, Pulsed	5mm 3mm 4 mm	4mm 2mm 3mm	4mm 2mm
	Mirror image adjustable beside real image to effectively double arc width.		
Brightness Continuous Pulsed	1,000 candles/cm² 36,000 candles/cm²	5,000 candles/cm² 25,000 candles/cm²	5,000 candles/cm²
Minimum Time Between Pulses	15 second intervals	(Pulse length inaccurate at shorter intervals.)	
Lamp Life	Approximately 5,000 flashes at 15-second intervals	Approximately 200 hours, to 85% light output.	Approximately 200 hours, to 85% light output
Lamp Wattage Ratings	150w	150w	150w
Power Requirements of Power Supply	115v, 60cps	117v, 60 cps	177v, 60 cps

Prices:

505-BP PULSARC	**$625.00**
Power Supply only	**410.00**
Illuminator only, with lamp	**215.00**
505-HP PULSARC	**700.00**
Power Supply only	**420.00**
Illuminator only, with lamp	**280.00**
505-H ZENARC	**$610.00**
Power Supply only	**320.00**
Illuminator only, with lamp	**290.00**

LAMPS

FA-Tube (for 505-BP)	**35.00**
510C1 Tube (for 505-HP and 505-H)	**85.00**

AIR PARTICLE SAMPLER

NEMS-CLARKE APS-11

The Nems-Clarke APS-11 Air Particle Sampler is used to collect radioactive particles from the air while measuring the volume of air from which the radioactive particles were extracted. It is designed for continuous 24-hour operation and features long-life, ruggedness, accuracy, and portability. The air metering rate of 16,800 liters (16.8 cubic meters) per hour is essentially constant due to the high efficiency of the cylindrical nine-stage turbine. The turbine turns in ball bearings at a relatively low rate of speed.

In place of a rate of flow metering device ordinarily used in units of this type, the APS-11 employs a rugged, reliable metering system which indicates the total volume of air that has passed through the filter during the sampling period. The reading appears on a resettable counter calibrated in cubic meters. Indicators calibrated in cubic feet are available also.

The absence of sparking commutators eliminates radio interference. Acoustic noise, because of the low rate of speed and ball bearing design is only that of a 3400 rpm motor driving a well-balanced turbine running on ball bearings. It can be equipped with either standard or explosion-proof motor as required. The filter holder is approximately two inches in diameter, but filter holders of any practical size or configuration can furnished.

SPECIFICATIONS

Collection Rate—16,800 liters (16.8 cu. meters) per hour

Meter—Resettable counter-type totalizer operating from measuring turbine. (Flow meter adjustable for calibration purposes.) Counter capacity, 99.9 cubic meters. Meter also available with calibrations in cubic feet—999 total.

Motor—3400rpm induction, 115v, 50-60 cycle. Either standard or explosion-proof types supplied as required.

Size—18½ inches long, 8½ inches wide, and 11¼ inches high (9¼ inches high without handle).

Weight—25 pounds.

Price: $500.00 with Standard Motor

Price: $800.00 with Explosion-Proof Motor

http://watkins-johnson.terryo.org

RADIAC CALIBRATOR SET

Custom-Built Equipment for Calibrating Radiation Counters, Probes and Dosimeters with a Radioactive Source of known intensity.

This is an example of non-electronic equipment built for use in the field of nucleonics. This equipment was custom-built for the Navy for use in calibrating radiacs (Geiger Counters), under controlled conditions, from a radioactive source of known intensity, the initial calibration of which is determined by the National Bureau of Standards. Both "high" and "low" intensity tests are possible for accurate calibration of radiation meters and probes of either low or high sensitivity.

The Radiac Calibrator is used to house a specific quantity of radioactive material. Radiation is emitted as a controlled beam of known intensity which is used as a standard in checking and calibrating radiac instruments such as Geiger-Mueller Counters, probes, and radiation dosimeters. The process consists of placing a known mass of a radioactive substance a known distance from the radiac instrument being calibrated which registers the pre-determined intensity to gamma rays emitted in a known time interval.

The Radiac Calibrator shown consists of three main units: the lead-lined Radiation Source Housing, and the Telescope and Radiac alignment stand with components comprising the Optical System. The three interdependent units, function as a single calibrating instrument.

Write stating your requirements. Our engineering staff will be glad to assist you in designing equipment suitable for the solution of your problems. Price and delivery determined on the merits of each request.

Optical Viewing Stand

Radiation Source Housing

Radiac Alignment Stand and Track

Photography

Megalume

is superior
in performance

Why *Megalume* is superior in performance

- *A trigger transformer of our own design and construction. The transformer is designed for maximum dependability and a minimum of current through the shutter contacts.*
- *The power transformer utilizes a type of winding and a grade of core material superior to those ordinarily employed.*
- *Low-leakage electrolytic condensers to reduce recycling time and battery drain during stand-by periods.*
- *The use of standard, easily obtained and easily replaceable vibrators.*
- *The use of selenium rectifiers, instead of self-synchronous vibrators.*

Megalume 1

. . . High output, dependable unit designed for long life and complete user satisfaction

SPECIFICATIONS

BCPS ..... 4000 Average
Light distribution ..... Half Light at 50°
Kodachrome Guide No. 30
Ektachrome Guide No. 90 w/normal development
Super Anscochrome Guide No. 160 w/normal development
Flash Duration ..... 1/2500 Second
Flashes per Battery Charge 125
Recycling Time ..... 8 Seconds to ½ stop
Operates from internal battery or A.C.

SPECIAL FEATURES

- *The battery is easily accessible.*
- *Provision of a fuse to prevent damage to the unit if accidentally connected to an improper source of power.*
- *Provision for charging the battery from an automobile battery. (A simple accessory is required.)*
- *Provision for supplying power to solenoids, focus spots, etc., from the Megalume battery.*
- *Built-in, entirely self-contained charger. Nothing to buy or connect.*
- *Unit protected by rugged aluminum case.*

Megalume 2

. . . Created for the professional photographer who needs the maximum light output in a portable unit

SPECIFICATIONS

BCPS ..... 8000 Average
Light Distribution ..... Half Light at 50°
Kodachrome Guide No. 70
Ektachrome Guide No. 125 w/normal development
Super Anscochrome Guide No. 225 w/normal development
Recycling Time—
6 Seconds to ½ stop, 100 watt-second position
10 Seconds to ½ stop, 200 watt-second position
Flash Duration—
1/2500 of a Second at 100 watt-second position
1/1400 of a Second at 200 watt-second position
Flashes per Battery Charge—
150 with the Sonotone Nickel-Cadmium 5-3L420
150 with the Willard ER-6-6B
200 with the Sonotone Nickel-Cadmium 5-5L420
Operates from internal battery or A.C.

SPECIAL FEATURES

- *The unit features a unique lighting control switch permitting use of 100 or 200 watt-seconds through one or two flash heads, whichever the user requires. Operates from the Sonotone Nickel-Cadmium 5-5L420, 5-3L420 or Willard ER-6-6B battery. When used with the Sonotone 5-5L420 the unit will deliver up to 200 flashes per battery charge under normal use and will give up to 150 flashes per battery charge with either the Willard or the smaller Sonotone.*
- *The battery is easily accessible.*
- *Provision of a fuse to prevent damage to the unit if accidentally connected to an improper source of power.*
- *Provision for charging the battery from an automobile battery. (A simple accessory is required.)*
- *Provision for supplying power to solenoids, focus spots, etc., from the Megalume battery.*
- *Built-in, entirely self-contained charger. Nothing to buy or connect.*
- *Unit protected by rugged aluminum case.*

Megalume 4

. . . Delivers the highest number of flashes of any unit employing a rechargeable battery

SPECIFICATIONS

BCPS ..... 4000 Average
Light Distribution ..... Half Light at 50°
Kodachrome Guide No. 50
Ektachrome Guide No. 90 w/normal development
Super Anscochrome Guide No. 160 w/normal development
Flash Duration ..... 1/2500 Second
Recycling Time ..... 5 Seconds to ½ stop
Flashes per Battery Charge 200
Operates from internal battery or A.C.

SPECIAL FEATURES

- *The Megalume 4 utilizes a 6v power supply and a 6v Sonotone Nickel-Cadmium battery providing optimum efficiency.*
- *The battery is easily accessible.*
- *Provision of a fuse to prevent damage to the unit if accidentally connected to an improper source of power.*
- *Provision for charging the battery from an automobile battery. (A simple accessory is required.)*
- *Provision for supplying power to solenoids, focus spots, etc., from the Megalume battery.*
- *Built-in, entirely self-contained charger. Nothing to buy or connect.*
- *Unit protected by rugged aluminum case.*

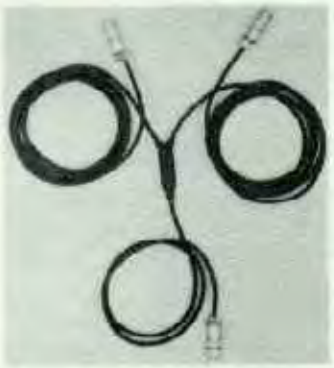
ACCESSORIES

WIDE ANGLE ADAPTER

Increases reflector coverage to 75°—attaches to flash head with metal filter holder listed below.

AUTO CHARGER ADAPTER

To permit charging of battery from your car battery by plugging into cigarette lighter outlet.



"Y" CORD

This cord is used to connect two flash-head units to a single MEGALUME.

NARROW ANGLE REFLECTOR

Increases output of Megalume 1, 2 or 4-4 times (multiply Guide No. by 2) and is interchangeable in all units except Megalume 3. Decreases reflector coverage to 20°.

CHARGE METER

Indicates when Nickel-Cadmium batteries used in Megalumes 1, 2, or 4 have reached full charge.

CHARGE-A-TIMER

Prevents overcharge of Megalume batteries. Selective charge times from 0-12 hours.

10 FOOT EXTENSION CORD

An extra-length cord to permit greater flexibility of use in studio work.

MEGATRIPPER

Provides tripping of a slave unit at a distance without direct wired connection.

FILTER HOLDER

Used to attach filters or wide angle adapter to flash head. Data on infra red filters available on request.

Megalume **WAS CREATED FOR THE PROFESSIONAL WHO DEMANDS TOP QUALITY**

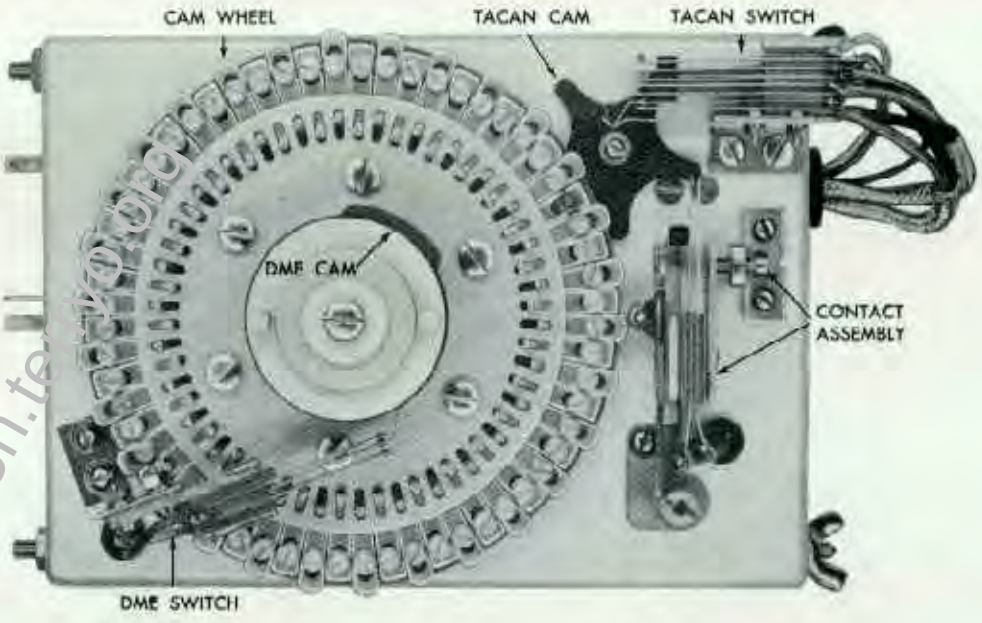
http://watkins-johnson.terryo.org

Electromechanical Equipment and Components

. . . high in quality
and dependability . . .

Electro Mechanical Equipment
and Components

CAM KEYER



Completely assembled, Cam Keyer, DME, and TACAN

The Nems-Clarke Cam Keyer is a motor-driven 60-segment device to be used with either the CA-1516 or CA-1673 Audio Oscillator-Keyer or other similar equipment. It is mounted on a 7-inch by 5-inch by 1-inch, 3/32-inch, aluminum chassis. In addition there is a motor capacitor, two cam-operated contact assemblies, a two-terminal plug for ac power, a four-terminal plug and a four-terminal receptable for signal connections. It will be furnished with either one of the two following motors: Borg 1003-4/N, 115v ac, 9.4 rpm; or Holtzer-Cabot RWC-2505, 120v ac, 9.5 rpm.

The keying is continuous. Any identification characteristic can be set up in International Morse Code by means of the adjustable segments; each of which is equal to approximately 1/10 second time interval. The characteristic is repeated 9.5 times per minute. A TACAN cam and switch is included for transferring the keying function from the VOR to TACAN during every fifth revolution of the identification cam wheel. A DME cam and contact assembly can be mounted on the keyer. This unit is manufactured in accordance with FAA Specification 755.

NEMS-CLARKE AND FAA DRAWING NUMBERS FOR

Keyer, DME, and TACAN (assembled) Nems-Clarke Nos. AD-9108-3
FAA Nos. D-2147-1, D-21474-2, D-21474-3 D-21524, D-21474-5,

Keyer and TACAN only (assembled) Nems-Clarke Nos. AD-9108-8
FAA Nos. D-21474-1, D-21474-2, D-21474-3, D-21474-4, D-21474-5

Keyer only, Nems-Clarke Nos. AD-9108-2
FAA Nos. D-21474-1, D-21474-2, D-21474-3

TACAN Kit and Chassis, Nems-Clarke Nos. C-17105
FAA Nos. D-21474-5

Contact Assembly, Nems-Clarke Nos. AD-9108-6
FAA Nos. D-21474-3

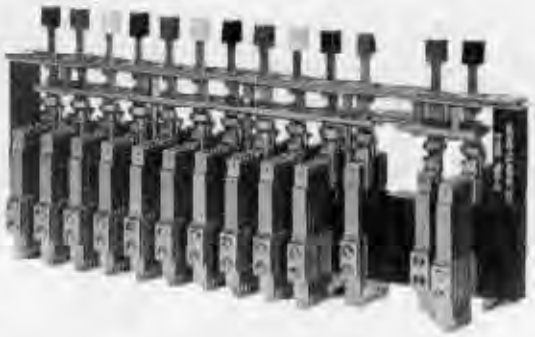
DME Kit only, Nems-Clarke Nos. AD-9108-7
FAA Nos. D-21524-27, D-21524-28

Cam Wheel only, Nems-Clarke Nos. AR-6278
FAA Nos. D-21474-2, Item 13

PRICE LIST

Keyer, DME and TACAN (assembled	$115.00
Keyer and TACAN only (assembled)	105.00
Keyer only	85.00
TACAN Kit and Chassis	24.00
TACAN Kit only	20.00
Contact Assembly	12.50
DME Kit only	10.00
Cam Wheel only	15.00

SWITCHING UNIT
NEMS-CLARKE PBS-10



This switching unit is designed to perform a two-fold function: first, to permit instant association of any equipment, printer, reperforator, transmitter distributor, etc., with any line; and second, to extend a ten-wire control bus from the switch-receiving apparatus to the device to be controlled.

The physical dimensions are 15 inches long, 3½ inches wide, and 7½ inches deep over-all. Each contact pile-up is operated by an individual push-key. The push-key buttons, arranged in a straight horizontal line, or vertical if desired, are grouped, color-coded, and labeled.

The line-receiving unit serves as a patching field for line terminations, making possible instant association of any unit for any one of 1-10 lines converging through the unit, and also provides a ten-wire control bus from the unit to the device being controlled.

Ten conductors issuing from the equipment are inserted into a ten-wire parallel bus which is multiplied through succeeding Line Switching Units in such fashion that all equipment associated with the ten-wire parallel bus corresponding to that signal line.

Ten control leads are thus switched whenever the associated line pair is switched. These control leads are employed to carry pulses concerned with automatic switching devices. Switching of the control leads simultaneously with the signal line pair provides complete changeability of equipment and lines. No equipment is permanently connected to a line or to another equipment.

The push-keys operate spring pile-ups which are so designed that a continuous contact exists between certain circuits when the switches are inoperative, but will break and make new contacts when a key is depressed. The key line mechanism is mechanically linked so that it is impossible to actuate more than one line switch key per Line Switching Unit at a time. The lockout switch key provides positive locking for all line keys, rendering them inoperative until the lockout key is depressed for permitting selection of a lines key. This assures that only one line key spring contact pile-up per Line Switching Unit is operative at any one time.

Except for the signal line current, and in some cases certain guard circuits, the push-keys do not ordinarily make or break a current, but merely prepare a path for subsequent currents to flow when the related automatic devices begin operation. Accordingly, contact life of the unit should be of prolonged duration.

The unit is designed to fit into a 19 inch standard panel and equipment rack. Once its location in the rack is determined the panel should be mounted, and the connecting wires permanently soldered to the terminals on a terminal block.

Caution should be employed in accordance with standard engineering practice that only direct currents should be employed internally to this Line Switching Unit. Alternating current should not be induced for any purpose. Associated fuse and alarm distribution panels providing direct current branch circuit protection should be employed as a standard accessory arrangement.

Prices:

1 to 24, $95.00 each
25 to 99, $85.00 each
100 to 499, $79.00 each
over 499, price on request

SUBMINIATURE TUBE SHIELDMOUNTS

The Nems-Clarke Shieldmounts are the standard for the industry, and those illustrated are the most used and accepted types specified by Government and industry. More than 5,000,000 of them have been sold to date. All types are recommended by the manufacturers of subminiature tubes because of these features.

Our shieldmounts are made of spring temper phosphor bronze and may be obtained silver plated, blackened or unfinished. There are two mounting holes for riveting directly to chassis or terminal board and the shieldmounts are provided with a grounding lug. The excellent heat dissipating qualities of Nems-Clarke shieldmounts make them highly desirable. They are available for immediate delivery and are economically priced.

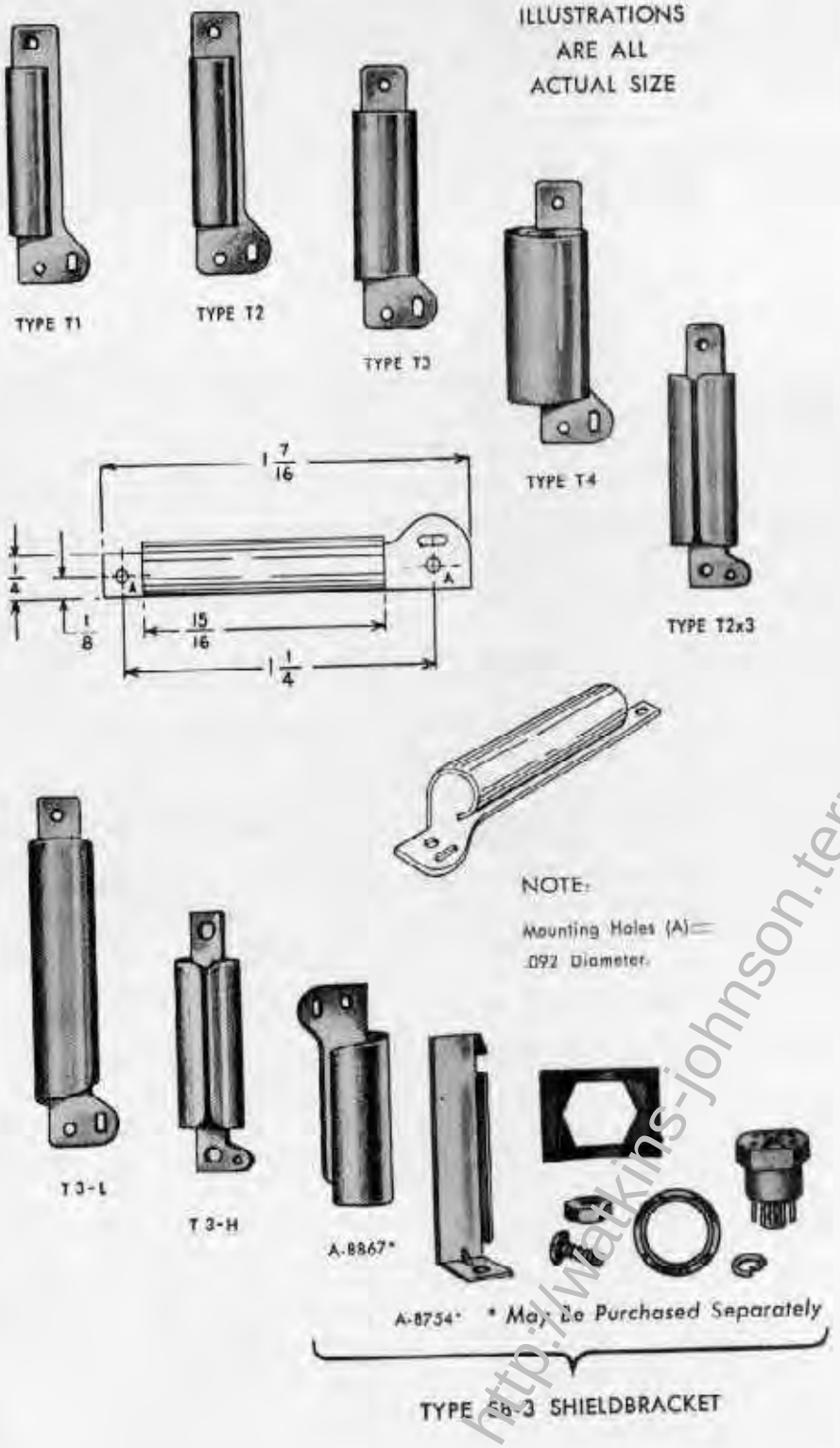
Now available are the T-1, T-2, T-3, T-4 and T-2x3 Shieldmounts which are a standard in the industry.

The T3-H Shieldmount is designed for heavy duty use and when higher period of vibrations is encountered. It is made of .015 tk. phosphor bronze and is available in plain, silver plated or black finish.

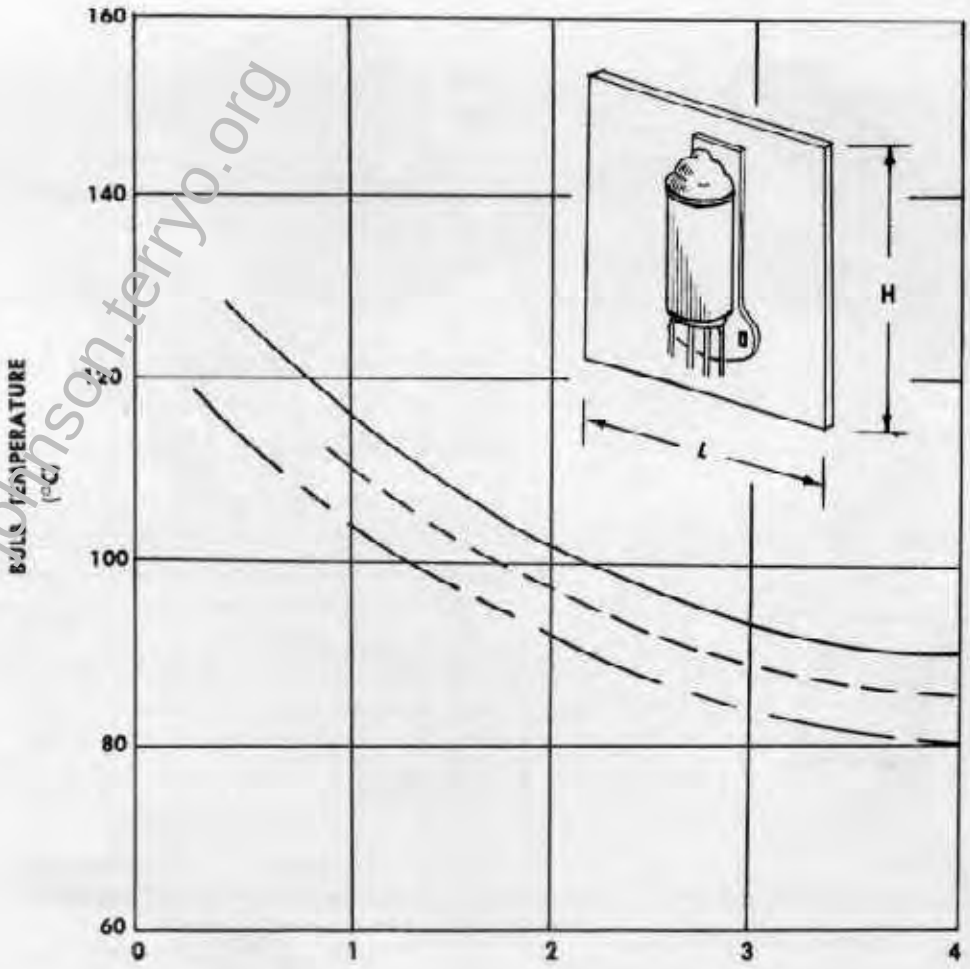
The T-3L is designed for use with T-3 bulb size tubes 1¾ in. in length. The greater surface contact area provides a higher degree of clamping and more surface area for additional heat dissipation. It is made of .008 phosphor bronze and can be provided in plain, silver plated or black finish.

The SB-3 Shieldbrackets are used when tubes are required to be mounted upright. They are composed of a Shieldmount, bracket, socket and necessary hardware, and are sold as complete units.

ILLUSTRATIONS ARE ALL ACTUAL SIZE



BULB TEMPERATURE VS RADIATION AREA



RADIATOR AREA
(SQ. IN.) LxH

_ _ _ _ _ _POLISHED BRASS RADIATOR, SILVERPLATED "SHIELDMOUNT."
_____SAND-BLASTED BRASS RADIATOR, SILVERPLATED "SHIELDMOUNT."
____ _ _____BLACKENED BRASS RADIATOR, BLACKENED "SHIELDMOUNT."

PRICES

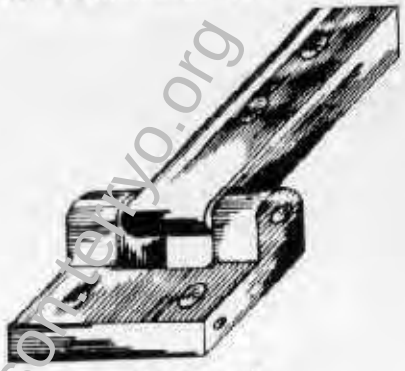
T-1, T-2, T-3, T-4 & T-2x3		T-3H & T-3L		Type S6-4	
1-99	$ .20 each	1-99	$ .25 each	1-99	$ .90 each
100-299	$ .18 each	100-299	$ .20 each	100-299	$ .85 each
300-499	$ .17 each	300-499	$ .18 each	300-499	$ .75 each
500-999	$ .12 each	500-999	$ .17 each	500-999	$ .70 each
1000-5000	$ .11 each	1000-4999	$ .15 each	1000-5000	$ .65 each
Over 5000	$ .10 each	5000 or over	$ .13 each	Over 5000	$ .60 each

Quantity prices based on bulk shipments.
Broken shipments: price will be based on quantity shipped.

FAA HINGES AND LATCHES

HINGE

FAA Drawing C-21278, Items 1, 2, and 4
Nems-Clarke Drawing A-6537-2

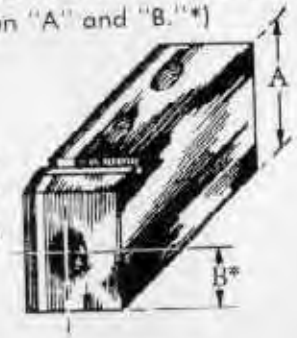


$1.15 each

HINGE BLOCK

FAA Drawing C-21278, Item 3
Nems-Clarke Drawing A-6321

(On ordering, advise chassis thickness and dimension "A" and "B."*)

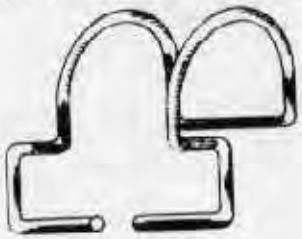


1 to 99, 60c each
100 to 499, 55c each
500 or more, 45c each

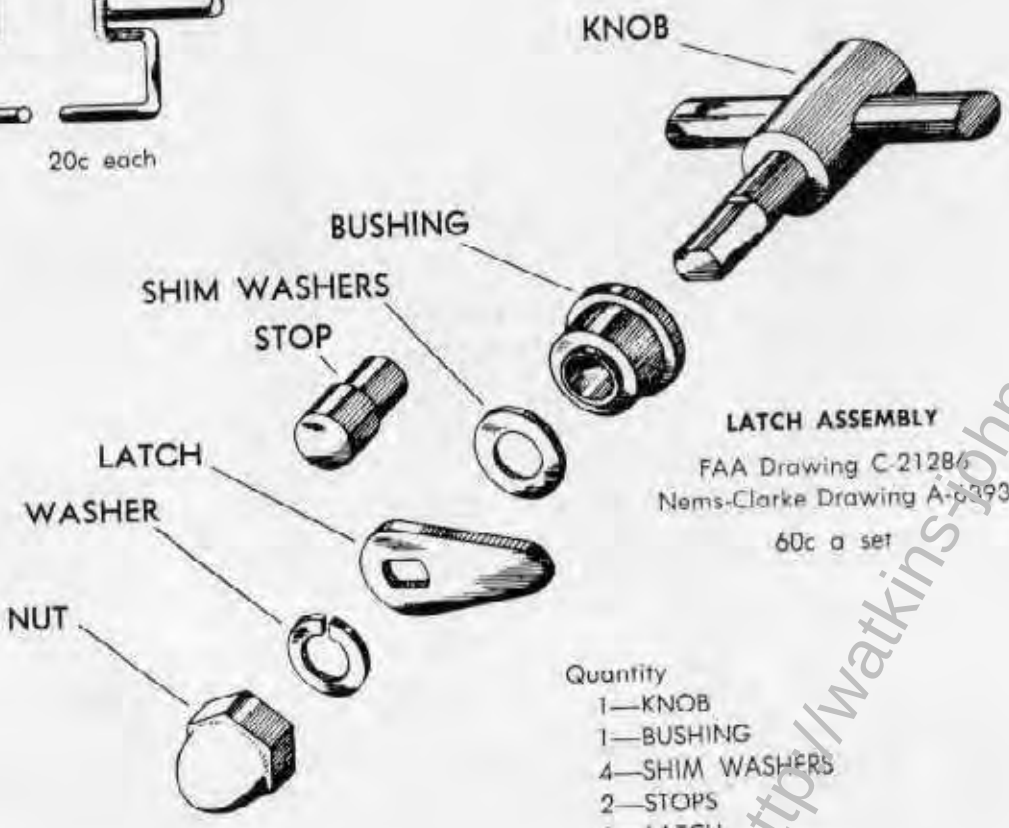
*FAA standard dimension is .250±.003 and will be supplied unless otherwise specified.

SPRING

FAA Drawing C-12178, Item 5
Nems-Clarke Drawing 8765



20c each



LATCH ASSEMBLY

FAA Drawing C-21286
Nems-Clarke Drawing A-6393

60c a set

Quantity
1—KNOB
1—BUSHING
4—SHIM WASHERS
2—STOPS
1—LATCH
1—LOCK WASHER
1—ACORN NUT

All items except Hinge Block available for immediate delivery from stock.

http://watkins-johnson.terryo.org

TRANSFORMERS, INDUCTORS AND FILTERS
VITRO ELECTRONICS NEW PRODUCTS LINE

TRANSFORMERS, INDUCTORS and FILTERS
Custom-Built for Designers and Suppliers

Designers of Electronic equipment can now use, and distributors of electronic components can now supply Vitro Electronics magnetic components.

Through its expanded manufacturing facilities, Vitro Electronics offers to the trade a wide selection of component transformers for various applications including printed circuit uses. These transformers can be made available according to your exacting specifications as research models, or in production quantities for inclusion in equipment of your own design. High quality transformers internally constructed to meet MIL-T-27A specifications can be supplied in the following types:

POWER TRANSFORMERS — to 1 KW, Step-down, Step-up, Step-down and Step-up. Multiple windings and taps.

FILTER CHOKES (REACTORS) for Power Supplies

AUDIO TRANSFORMERS

PULSE TRANSFORMERS

HI "Q" INDUCTORS

LINEAR INDUCTORS

CHARGING REACTORS

SATURABLE TRANSFORMERS

CURRENT TRANSFORMERS

AUDIO FILTER NETWORKS

TOROIDS

ENGINEERING AND DESIGN FACILITIES at your disposal. Our staff of expert transformer engineers is ready to assist you in solving your problems in magnetics and transformer design to meet your individual requirements.

DELIVERY

Engineering Models	2 to 6 weeks
Vitro Electronics Standard-Quality Transformers	6 to 8 weeks
MIL-T-27A Transformers, built and source inspected to meet specification requirements	8 to 10 weeks
Nems-Clarke replacement transformers	2 to 6 weeks

PRICE

Determined on the basis of design requirements and quality required. Submit your specifications for an estimate.

Quantity discounts to suppliers of electronic components. Write for prices stating your exact requirements for off-shelf delivery of your customers.

http://watkins-johnson.terryo.org

Facilities

LABORATORY and TEST EQUIPMENT

ATTENUATORS

2 w	Attenuators, 6db	Boonton 305A
1 w	Attenuator	Daven RF-A-541-50
1 w	Attenuator, 600 ohms	General Radio 249-H
1 w	Attenuator, R.F., 75 ohm 0-5mc	Muirhead, D-239-B
1 w	Audio Frequency Microvolter	General Radio 546C

BRIDGES

1 b	Bridge, Capacity	General Radio, 216
1 b	Bridge, Capacity	General Radio, 716C
1 b	Bridge, Capacity	General Radio, 740B
1 w	Bridge, Capacity	Simpson, 381
2 b	Bridges, Impedance	General Radio, 650A
1 w	Bridge, R.F.	General Radio, 916A
2 b	Bridges, Wheatstone	Leeds & Northrop, 5300
1 w	Capacitor-Resistor Analyzer	Sprague Electric TEL-OHMIKE
1 b	Decade Bridge	General Radio, 193
1 w	Megohmeter	General Radio, 487A
1 w	Test Set	Leeds & Northrop, 1-49
1 w	Thermistor Bridge	Nems-Clarke

CAPACITORS

2 b	Capacitors, decade	Cornell-Dubilier, CDA 5
2 b	Capacitors, decade	Cornell-Dubilier, CDB-3
1 b	Capacitor, decade	Cornell-Dubilier, CDB 5
2 b	Capacitors, decade	Cornell-Dubilier, CDC-3
2 b	Capacitors, Variable, precision, 110-1100 $\mu\mu$f	General Radio, 722-D

COUNTERS, EPUT METERS, ETC.

2 y	Counters	Hewlett-Packard 524B
2 y	Converters for 524 B Counter	Hewlett-Packard, 525-A
1 y	Electronic Counter	Hewlett-Packard 522B
2 y	Eput Meters	Berkeley 554M
1 w	Time Interval Meter	Beckman 7250

ENVIRONMENTAL TEST EQUIPMENT

1 g	Cabinet, cold	Aminco #6
1 g	Cabinet, humidity	Aminco #5 3720
1 g	Cabinet, salt spray, 3' x 3' x 7½'	Nems-Clarke
1 b	Chamber, temperature altitude, humidity, 3' x 3' x 7½'; temperature -100°F. to +200°F; humidity to 95% R.H.; altitude 80,000'	Bowser L-68-100VH
1 C-10	High Frequency Shaker powered by Type 151MC Amplifier with automatic cycling system, vibration meter and automatic transfer switch	MB Mfg.
1 g	Shock Testing Machine, 400 lbs. cap.	Barry Type 400 V.D.
1 b	Vibration Test Machine, freq. range 10-60 cps, excursion .062"; acceleration, 10g.	L.A.B., RVH-24-200
1 b	Vibration Pickup	MB-115
1 b	Vibration Meter	MB-M-1

FILTERS

1 g	Filter, 100 cps	General Radio 237C
1 g	Filter, band pass, 375 425cps, 600 ohms	General Radio 530-A
1 g	Select-O-Jet	National Company, SOJ3

FREQUENCY STANDARDS and FREQUENCY MEASURING EQUIPMENT

3 y	Crystal Calibrators	Measurements 111B
1 b	Crystal Frequency Indicator	Bendix BC221M
1 b	Crystal Frequency Indicator	Cardwell BC-221-Q
1 b	Crystal Frequency Indicator	Cardwell BC-221-Z
1 b	Crystal Oscillator	Bliley 1A
1 b	Crystal Oscillator, 100kc	Nems-Clarke
1 b	Crystal Oscillator, 455kc	Nems-Clarke
2 b	Crystal Standards, 1 and 5 mc	Nems-Clarke
1 w	Frequency Meter, absorption	Millen 90601
1 b	Frequency Meter	Signal Corps 221
1 w	Frequency Secondary Standard	Hewlett Packard 100D
1 w	Frequency Secondary Standard	Millen 90501
1 w	Frequency Standard, 85 cycle	American Time Products
1 w	Frequency Standard, low audio	Nems-Clarke
4 w	Grid Dip Meters	Millen 90651
2 w	Heterodyne Frequency Meters VHF	Nems-Clarke
1 w	Wave Meter, coaxial	Micro-Instrument 501
1 w	Wave Meter	General Radio 556A
1 w	Wave Meter	General Radio 758A
2 w	Wave Meters	Millen 90608
1 w	Wave Meter	General Radio 1140A

INDICATING INSTRUMENTS

1 y	Ammeter, 1% AC, 0-5 amps	Simpson Model 10
1 b	Ammeter, ¼% AC and DC, 0-2.5, 0-5	Weston Model 370
1 y	Ammeter, DC, 0-25, 0-10, 0-25 amps ½%	Simpson Model 9
1 g	Current Transformer	Weston 551
5 r	Electronic Voltmeters	Ballantine 300
3 r	Electronic Voltmeters	Ballantine 310A
1 r	Electronic Voltmeter	Ballantine 314
1 w	Electronic Voltmeter	Electronic Designs 100
1 g	Galvanometer	G.M. Labe 570
1 g	Galvanometer	Jewel 64
1 g	Galvanometer	Rubicon
1 w	Meter Multiplier	Ballantine Labe 1300-B
3 w	Microammeters, DC	RCA, WV-84A
1 b	Microammeter, DC	Weston 622
1 b	Milliammeter, DC	Westinghouse PX5
1 b	Milliammeter, DC	Weston Mod. 1
2 b	Output Power Meters	General Radio 583A

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1 b	Output Power Meter Type 486	General Radio 486
1 b	Polyranger, DC	Sensitive Research
1 w	Vacuum Tube Voltmeter	Electronic Design 100
1 w	Vacuum Tube Voltmeter	General Radio 726A
1 r	Vacuum Tube Voltmeter	Hewlett-Packard 400A
4 r	Vacuum Tube Voltmeters	Hewlett Packard 400C
2 r	Vacuum Tube Voltmeters	Hewlett-Packard, 410B
1 w	Vacuum Tube Voltmeter "Vomax"	McMurdo-Silver 900
12 w	Vacuum Tube Voltmeters	Simpson 303
1 b	Voltmeter, AC, 0-15, 0-150 0-300v, 1%	Simpson 10
2 b	Voltmeters, AC, 1% 0-150V	Weston 433
1 b	Voltmeter, DC, 1%, 0-1500v in steps	Rawson 511
1 b	Voltmeter, DC, ½%, 0-300v in steps	Simpson 9
1 b	Voltmeter, DC, 0-150v	Weston 1
1 w	Volt Ohm Milliammeter	Hickok 125
1 w	Volt Ohm Milliammeter	Hickok 209A
2 w	Volt Ohm Milliammeters	Hickok 450
3 w	Volt Ohm Milliammeters	Simpson 260
4 w	Volt Ohm Milliammeters	Simpson 270
12 w	Volt Ohm Milliammeters	Simpson 260R
2 w	Volt Ohm Milliammeters	Triplett 630
1 w	Volt Ohm Milliammeter	Triplett 630A
1 w	Voltohmyst Junior	RCA, WV-77A
1 w	Voltohmyst Master	RCA, WV-95A
7 b	Wattmeters	General Electric, Type 3
2 b	Wattmeters	Weston 432

INDUCTORS

1 b	Inductance, Standard, 1.0mh	General Radio 106-G
1 b	Inductance, Standard, 10mh	General Radio 106-I
1 b	Inductance, Standard, 100 mh	General Radio 106-K
1 w	Variable Inductor	General Radio 107-H

NOISE and FIELD INTENSITY MEASURING EQUIPMENT

1 b	Field Intensity Meter, High Frequency	Nems Clarke 107-A
1 y	Field Intensity Meter	Nems-Clarke 120-D
1 b	Noise and Field Intensity Meter	Stoddart Aircraft Radio #TS-587/U
2 b	Radio Frequency Test Sets	RCA-Nems-Clarke BW-3
1 b	Radio Frequency Test Set	RCA-Nems-Clarke BW-7
1 b	Radio Interference and Field Intensity Meter	Stoddart Aircraft Radio, NM-10A
1 b	Radio Interference and Field Intensity Meter	Stoddart Aircraft Radio, NM-20H

NOISE GENERATORS

1 b	Noise Generator, 50 ohm	Nems-Clarke
2 b	Noise Generators, 73 ohm	Nems-Clarke
1 b	Noise Generator, 0-20b, 50 ohms	PRD 904
2 b	Noise Test Set	Nems-Clarke

NUCLEAR RADIATION MEASURING EQUIPMENT

1 w	Radiac Calibrator	Nems-Clarke AN/UDM-1
1 w	Radiac Meter	Nems-Clarke 1M74B/PDR-27C
1 w	Radiac Meter	Tracerlabe SU-10A

OPTICAL and PHOTOGRAPHIC EQUIPMENT

1 g	Camera, Movie, 16mm	Eastman Kodak ModelBB
1 g	Camera, Oscillograph Record	Dumont 297
1 g	Camera, view, 4 x 5	Brand
1 b	Light Meter, Integrating	General Radio 1501A
1	Etcher w/Ferric Chloride Heater	Master Jr., Standard Model
1 g	Enlarger, Omega type D111	Simmons, Model D-3
1	Print Dryer	Stanley Aviation Type B-8
1	Print Washer	Eastman, Pakolux
1 g	Optical Bench	Central Scientific, Cat. 85801

OSCILLOSCOPES, CATHODE RAY

4 w	Oscilloscopes	Dumont 401A
2 w	Oscilloscopes	Dumont 350
1 w	Oscilloscope	Dumont 208B
1 w	Oscilloscope	Dumont 241
1 w	Oscilloscope	Dumont 274
1 b	Oscilloscope	Dumont 303A
8 b	Oscilloscopes	Dumont 304A
5 g	Oscilloscopes	RCA WO56A
2 g	Oscilloscopes	RCA WO60C
1 g	Oscilloscope	RCA WO60C
1 w	Oscilloscope, w/Preamps GA and H	Tektronik 531A
2 g	Oscilloscopes	RCA WO-88A
2 b	Oscilloscopes	Tektronic 511AD
1 w	Oscillosychroscope	Browning, ON5X
1 w	Panadapter	Radio Products, SA-3 Type T
3 b	Voltage Calibrators	Dumont 264B

PHASE MEASURING EQUIPMENT

1 b	Phasemeter	Deltron 100A

POWER SUPPLIES

1 g	Power Supply, Low Voltage (Battery Eliminator) Type 610	A.T.R. Model EL1B
2 g	Power Supplies, Voltage Regulated	Lambda 25
4 g	Power Supplies	Lambda 28
1 g	Power Supply, R.F., 10 KVA	Nems-Clarke
1 g	Power Supply	Sorenson 1505
3 g	Power Supplies	Tech Apparatus Builders T28V5ACC
2 g	Regulators, Power Supply	Sorenson 500S
3 g	Regulators, Power Supply	Sorenson, 2000S
1 g	Regulator, Power Supply	Sorenson, 3000S

PULSE GENERATORS

1 w	Pulse Generator	Hewlett-Packard, 212A
1 w	Pulse Generator	Measurements, 79B
1 w	Pulse Generator	Nems-Clarke

Q METERS

4 b	Q Meters	Boonton 160A
1 b	Q Meter	Boonton 190A
1 b	Q Standard	Boonton 513A

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RECEIVERS

1 g Receiver, Communications ..... Hallicrafters S-38
1 g Receiver, Communications ..... Hallicrafters S-40
1 g Receiver, VHF ..... Hallicrafters S-36
1 g Receiver, VHF ..... Nems-Clarke 167-j-2

RECORDERS

1 b Recorder ..... Weston 67001
1 b Recorder, paper, hot stylus ..... Sanborn 127

RESISTORS

1 b Decade Resistor ..... General Radio 1021
1 b Decade Resistor ..... General Radio 193
1 b Decade Resistor ..... General Radio 510
1 b Decade Resistor ..... General Radio 602G
1 b Decade Resistor ..... General Radio 1432M
1 b Decade Resistor ..... Leeds & Northrup 4750
1 b Decade Voltage Divider ..... General Radio 654A
1 w Phantom Antenna Resistor ..... General Radio 125A
1 b Resistance, Standard, 1 ohm ..... Rubicon
1 b Resistance, Standard, 10 ohms ..... Rubicon
1 b Resistance, Standard, 1000 ohms ..... Rubicon
1 g Termaline Coaxial Termination .... Bird Electronics 8ZC

SIGNAL GENERATORS

1 y Audio Oscillator ..... Hewlett-Packard 200BR
2 y Audio Oscillators ..... Hewlett-Packard 200C
10 y Audio Oscillators ..... Hewlett-Packard 200CD
2 y Audio Oscillators ..... Hewlett-Packard 200IR
1 w Audio Oscillator ..... Clough-Brengle 1794
1 w Audio Oscillator ..... Krohn-Hite 430A
1 w Beat Frequency Oscillator .... Clough-Brengle 282A
1 w Beat Frequency Oscillator ..... General Radio 713A
1 w Beat Frequency Oscillator .... General Radio 1304A
4 r Signal Generators ..... Boonton 202B
2 r Signal Generators, FM ..... Boonton 202-D
2 r Signal Generators ..... Boonton 202-G
1 w Signal Generator ..... Ferris Model 223
1 w Signal Generator ..... General Radio 605A
1 w Signal Generator, AM ..... Harvey Radio Labs, 205-TS
2 w Signal Generators, w/sweep ..... Jerrold 900A
2 y Signal Generators ..... Hewlett-Packard 608A
2 y Signal Generators ..... Hewlett-Packard 606A
1 y Signal Generator ..... Hewlett-Packard 608D
1 w Signal Generator ..... Hewlett-Packard 610B
1 w Signal Generator ..... Hewlett-Packard 616A
1 w Signal Generator ..... Hickock 610A
2 w Signal Generators ..... McMurdo Silver 906
5 y Signal Generators ..... Measurements 65B
7 y Signal Generators ..... Measurements 80
1 y Signal Generator ..... Measurements 96
1 w Signal Generator ..... Precision Instr. E-200
1 w Signal Generator ..... Signal Corps TS-155B/UP
1 w Signal Generator ..... Signal Corps 1-222A
3 y Signal Generators ..... Transitron SG 132
1 y Signal Generator ..... Transitron SG-132A
1 w Standard Signal Generator, UHF w/Power Suply, 250-290mc ..... General Radio 1021-A
1 w Signal Generator ..... General Radio 1021-AU
1 w Signal Generator, 900-2000 mc ..... General Radio 1021--AW

SQUARE WAVE GENERATORS

1 w Square Wave Generator ..... Measurements 71
1 w Square Wave Oscillator ..... Nems-Clarke

STANDARDIZING EQUIPMENT

1 b Potentiometer Indicator ..... Leeds & Northrup
1 b Potentiometer, w/standard cell volt box 3-705v and precision shunts ..... Rubicon
1 b shunt, .01 ohms, 100amp ..... Rubicon
1 b Shunt, 100 ohms ..... Ballantine Labs
1 b Volt Box ..... Rubicon
1 b Voltmeter, Dynamometer, AC and DC ..... Sensitive Research,D

SWEEP CALIBRATORS

2 w Crystal Calibrators ..... Boonton 111-B
2 w Crystal Calibrated Marker Generators ..... RCA WR89A
4 w Marker Generators ..... RCA WR39B
1 w Sweep Calibrator ..... Browning, GL-22A
1 w Crystal Diode Modulator ..... General Radio 1000-P6
1 w Signal Generator Calibrator ..... Boonton 245-D

SWEEP GENERATORS

1 w Sweep and Marker Generator, UHF ..... RCA WR40A
1 w Sweep Generator ..... RCA WR41B
3 w Sweep Generators ..... RCA WR59B
5 w Sweep Generators ..... RCA WR59C
1 w Univerter ..... Boonton 207A
2 w Univerters ..... Boonton 207B
1 w Sweep Generator, UHF w/detector ..... Telonic SD-4M

TUBE CHECKERS

1 b Tube Checker ..... Weston 79[illegible]
1 b Tube Checker ..... Weston 98[illegible]
1 w VT Bridge ..... General Radio 561-O

VACUUM EQUIPMENT

1 w Vacuum Test Set, Mechanical Pump, Oil Diffusion Pump and Ionization Gauge ..... Nems-Clarke

VSWR MEASURING EQUIPMENT

1 g Micro Match ..... Jones 261-2
1 g Slotted Line ..... Hewlett-Packard 805
1 g Slotted Line ..... Hewlett-Packard 805A
1 g Slotted Section ..... Hewlett-Packard 809B

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1 g Standing Wave Indicator ..... Hewlett-Packard 415A
1 g Test Set Unit 1 ..... US Navy TS-12AP
1 g Test Set Unit 2 ..... US Navy TS-12AP
1 w UHF Admittance Meter ..... General Radio 1602-B

WAVE FORM MEASURING EQUIPMENT

5 y Distortion Analyzers ..... Hewlett-Packard 330B
1 y Wave Analyzer ..... General Radio 736A
2 w Wave Analyzers ..... Sierra 121

MISCELLANEOUS

1 w Amplifier ..... Stromberg-Carlson AU42
1 w Amplifier, Mono ..... Thordarson T30W08
1 w Balun ..... General Radio 874-UB
1 w Bolometer ..... Hewlett-Packard 415A
1 w Bolometer ..... Hewlett-Packard 475B
1 b Megger, DC, 1000v ..... James G. Biddle, "MEG"
1 w Multiple Range Hand Tachometer ..... Jones, Type B, Class A, 74151
1 w pH Meter ..... Photovolt Model 115
5 w Powerstats ..... Superior Electric 116
1 w Variable Transformer ..... General Radio 358B
7 w Variacs ..... General Radio V5
1 w Variac ..... General Radio V5-MT
1 w Variac ..... General Radio 200-C
1 w High-Pot Test Transformer Nems-Clark, Ser. #203

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PLASTIC and RUBBER MOLDING EQUIPMENT

1 Compression Holding Machine .... Elmes Model K-508 6" stroke, 10 ton
1 Compression Molding Machine, Wabash Model 20-11 6" stroke, 20 ton
3 Compression Molding Ma..... Elmes (Hydrolair) chines, 6" stroke, 30 ton
1 Injection Molding Machine, ... Van Dorn Model 1 1 oz. cap
1 Vacuum Forming Machine ..... Auto-Vac

PRESSES

3 Arbor Presses ..... Famco #3
1 Arbor Press ..... Famco #3½R
2 Arbor Presses ..... Famco #C
11 Arbor Presses ..... Farmco #O
3 Kick Presses ..... Excelsior #15
2 Power Presses ..... Press-Rite #1
5 Power Presses, 5 ton, 1" ..... Perkins Machine Jr. E stroke
1 Power Press, 12 ton, 1⅜" ..... Pexto stroke
1 Power Press, 14 ton, 2" stroke ..... Sidney
1 Power Press, 20 ton, 2" stroke ..... Bliss
1 Power Press, 20 ton, 2" stroke ..... V & O
1 Press, 25 ton, 2" stroke ..... Frederick F25
1 Power Press, 25 ton, 2" stroke ..... Slaysman #4
1 Power Press, 30 ton ..... V & O
1 Power Press, 35 ton, 3½" ..... Press & Die #4 stroke
1 Power Press, 50 ton, 4" stroke ..... Robinson
1 Power Press, 75 ton ..... Rockford #6 ½S
1 Press, fabricator ..... Wales Strippit
1 Punch Press, 22 ton, 2½" ..... Marshalltown #3 stroke
1 Punch Press, hand operated ..... Whitney-Jensen 24" throat
2 Rotary Power Punch Presses .... Wiedemann RA 41P
3 Rotary Punch Presses, hand ..... Wiedemann #R-2 oper

PRESSES

1 Power Press, 135-ton ..... Niagara #5½

RIVETING EQUIPMENT

4 Riveters, pneumatic operated ..... Chicago Pneumatic compression
2 Riveters, automatic, hopper fed ..... Judson L. Thompson
1 Riveting Hammer, pedestal type ..... Oliver Model 1-AA
3 Riveting Hammers, pneumatic ..... Nems-Clarke
1 Rivnut Header, power operated ..... Goodrich #C 302

SANDERS

1 Vertical Sander ..... Delta
1 Vertical Sander, 6" belt ..... Porter-Cable
5 Horizontal Sander & Buffing Machines
3 Disc Sanders ..... Delta
1 Belt Sanding Machine, vertical ..... Hammond, VH- and horizontal 2D-D
1 Horizontal Sander, 8" belt ..... Simplex

SAWS

2 Band Saws, 14" throat ..... Delta
1 Band Saw ..... DoAll Model 36-W
1 Band Saw ..... DoAll Model ML
1 Chop Saw, 8" ..... Delta
1 Circular Saw ..... Walker-Turner 2450
1 Cut-off Saw, 16" dia. blade .. DeWalt Model GE-616
1 Metal Cutting Saw ..... Johnson Model J
1 Metal Cutting Saw ..... Kalamazoo
1 Table Saw, 10", heavy duty ..... Boyce & Crane

SHAPERS

1 Planer, heavy duty, 48" stroke ..... Ames
1 Shaper, heavy duty, 8" stroke .. Havir Mrg., Model B

SHEARS

1 Notcher, hand oper., 6" notch ..... Diacro #Q1053
1 Shears, hand operated, 12" ..... Diacro
1 Power Shears, cap. 3' 16 gage .. Peck, Stow & Wilcox, 1926
1 Power Shears, cap. 4' 14 gage ..... Wysong & Miles Shearmaster 552
1 Power Shears, cap. 6' 10 gage .... Peck, Stow & Wilcox G-372
1 Power Shears ..... Niagara #736
1 Power Shears, cap. 4' x 12 gage ....Wysong & Miles
1 Power Shears, cap. 8' x 3/16 ..... Lodge & Shipley Model 0308

WELDING EQUIPMENT

1 AC Arc Welder, 2/6 amp ..... Harnishfeger Mod. TM-200
1 AC Arc Welder, 350 amp. ..... Miller #202
1 AC Arc Welder, 400 amp ..... Miller 252AP
1 DC Welder, 180 amp. ..... Lincoln #1470
1 DC Welder, 300 amp. ..... Lincoln
1 Spot Gun Welder w/control ..... Airco Model 202 panel
1 Spot Welder, 15 KVA, air oper ..... Pier #97D
1 Spot Welder, 50 KVA, air .... National 50 AORA 24 oper.
1 Spot Welder, 100 KVA, air ... Taylor-Winfield EPB oper. cap. ⅜" aluminum 30-100 to ⅛ aluminum

WELDING EQUIPMENT

1 Portable Sigma Welder ..... Linde SWM 2

MISCELLANEOUS EQUIPMENT

1 Bender, precision ..... Diacro #3
1 Diehead, self opening ..... Geometric C 1¾
6 Dieheads, self opening ..... Geometric DS-5/16
2 Dieheads, self opening ..... Geometric DS-1
2 Die Making & Filing Machines ..... Oliver SP-2
1 Eyeleting Machine ..... United Shoe Mach. Mod. G
2 Finishing Barrels, precision ..... Lorco Model 100
1 Finishing Barrel, precision ..... Lorco Model 200 heavy duty
1 Hydraulic Lift Stacker ..... Shop Caddy Model 4054
1 Metal Shrinker, foot operated ..... Erco
1 Nibbler, 6" throat, cap. .25" ..... Campbell #1 thickness

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PRODUCTION MACHINERY

BENDING EQUIPMENT

1 Finger Brake, 3', cap. 16 gage .. Chicago Model L-30
1 Folding Brake, 1' ..... Diacro #2
1 Folding Brake, 2' ..... Diacro #4
2 Hydra Power Press Brakes ..... Diacro
1 Power Brake, 4', 2" stroke ..... Allsteel (Verson) cap. 15 tons
1 Power Brake, 8', cap. .312 ..... Chicago 508-D mild steel
1 Power Brake, 6', 2.5" stroke ..... Dual Press, #40-6 cap. 125 H.R.S.
1 Power Press Brake, 6', cap. ..... Verson 2078 45 ton

COIL WINDERS

1 Coil Winder ..... Meteor Precision ME301
1 Coil Winder, universal ..... Nems-Clarke
1 Coil Winder, universal ..... Stevens #125
1 Coil Winder, layer ..... Universal Winding #97
1 Coil Winder, bobbin ..... Universal Winding #102
2 Coil Winders, transformer .. Universal Winding #108

ENGRAVING MACHINES

4 Engraving Machines ..... Gorton #3V
1 Engraving Tool Grinder ..... Gorton #265-5
1 Nameplate Stamping Machine

GRINDING EQUIPMENT

3 Pedestal Grinders, 8" ..... Black & Decker Type F
1 Pedestal Grinder, 18" ..... US Model 80
2 Surface Grinders ..... Browne & Sharpe #2
1 Tool Post Grinder, external ..... South Bend
1 Tool Post Grinder, internal ..... Themac #J-15
1 Universal Tool & Cutter ..... Brown & Sharp #13 Grinder

HEAT TREATING EQUIPMENT

1 Furnace, controlled atmosphere, 2850°F (max.) ..... Delaware
1 Furnace, crucible ..... Hoskins FD 104
2 Furnaces, heat treating, electric, 1800°F (Max.) ..... Cooley
3 Furnaces, heat treating, electric, 1800°F (max.) ..... Tempco

LATHES

2 Turret Lathes, 14" swing, bed length 5' .. Bardons & Oliver #2
1 Lathe, 15" swing, 54" between centers quick-change gear with taper attachment, 12-speed head, speed range from 30 to 120 rpm ..... Cincinnatti
1 Jeweler's Lathe, with bed and cross-slide turrets ..... Derbyshire
1 Lathe, 10" x 3' bed, hand lever bed turret ..... Elgin
5 Lathes, 10" swing, six position turrets ..... Hardings DSM59
1 Lathe, 20" swing, bed length 113" ..... Heyligenstaedt
7 Bench Lathes, 9" swing, bed length 3.5' ..... South Bend Model A
6 Bench Lathes, 9" swing, bed length 3.5" with bed and cross-slide turrets ..... South Bend Model A
4 Lathes, 10" swing, bed length 3.5', quick change gear .. South Bend Model A
1 Lathe, 14" swing, bed length 7' quick change gear, with bed and cross-slide turrets ..... South Bend Model A
1 Lathe, 16"-24" x 7' bed quick change gear ..... South Bend Model A
4 Bench Lathes, 9' x 3' bed, quick change gear, square tool block and hand-lever bed turret, complete collet equip. ..... South Bend Model A
2 Bench Lathes, 9" x 3" bed quick change gear, hand-lever bed turret and double tool cross slide, complete collet equip. ..... South Bend Model A
1 Lathe, 13" swing, bed length 5', quick change gear ..... South Bend #113B
1 Lathe, 10" swing, bed length 5', quick change gear ..... South Bend #113B

MILLING MACHINES

9 Bench Millers ..... Burke #4
1 Horizontal Production Miller ... Brown & Sharpe #12
1 Turret Milling Machine, 13" Bridgeport Model 20886 table
1 Turret Milling Machine, 32" .. Bridgeort Model BRJ table
3 Turret Milling Machines, ... Bridgeport Model BRJ 42" table, one with optical system
3 Universal Milling Machines ..... Brown & Sharpe #2 with complete accessories
1 Vertical Milling Machine, 20" Brown & Sharpe #1 bed travel
2 Vertical Milling Machines, ... Brown & Sharpe #2 24" bed travel
1 Vertical Milling Machine ..... Cincinnati #3

PAINT SHOP EQUIPMENT

1 Acid Tank, 4' x 3' x 4'
2 Alodine Tanks, 4' x 5' x 3'
2 Baking Ovens, 6' x 4' x 4' ..... Dispatch #RS-3
1 Caustic Dip Tank, 6' x 3' x 4'
1 Degreasing Tank, 4' x 4' x 4'
1 Infrared Baking Room, 3' x 12' x 8'
2 Rinse Tanks (water, 3' x 7½' x 3')
1 Hydrofinish wet sandblast ..... Pangborn #2 unit
2 Spray Booths, paint, 3' x 10'

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1 Nibbler, 24" throat, cap. .25" ..... Gray Machine thickness
2 Ovens, drying ..... Universal
1 Oven, laboratory ..... Cole-Parmer, Stabil-Therm
1 Pig Tailor ..... Bruno N.Y. Ind., PT-1
1 Potting Tank ..... Sta-Warm #950CNV
1 Rolling Mill, 12", 3/16" max. ..... Nems-Clarke thickness
1 Router, pin, table 36" x 48" .... Onsrud Model A-244
1 Saw Filing Machine ..... Foley Model 61
1 Slip rolls, 4" x .180 mild steel .... Pexto Model 3481F
1 Sonblaster Ultrasonic Cleaner ..... Narda Ultrasonics with NT 602 Tank G-601-SW 807
1 Spring Winder ..... Perkins Machine
1 Tapper, portable electric ..... Black & Decker, Tapgun 586
2 Tumbling Barrels ..... Nems-Clarke
2 Vacuum Impregnating Equip. ..... Red Point Products (with heating facilities)
1 Wire Stripper ..... Rush Model D-1
1 Wire & Tubing Cutter ..... Nems-Clarke
2 Wire Cutting & Stripping ..... Artos Engineer Mach.
1 Wire Stripper ..... Eraser, RUSH Model D-1
1 Wire-Tinning Machine, ... Nems-Clarke 2-station

DRILL PRESSES

1 Brown & Sharpe Turret Drilling Machine
1 Edlund four spindle Drilling Machine
1 Edlund six spindle Drilling Machine
1 Delta Turret head Drill Press
3 Delta three spindle Drill Presses
1 Delta Two spindle Drill Press
27 Delta single spindle Drill Presses
2 Walker-Turner Radial Drill Presses
1 Walker-Turner three spindle Press
1 American Radial Drilling Machine

Letter code indicates calibration schedule corresponding to color code — Green - g No calibration required; Red - r Monthly calibration; Yellow - y Quarterly calibration; Blue - b Annual calibration; White - w Calibration when used or special

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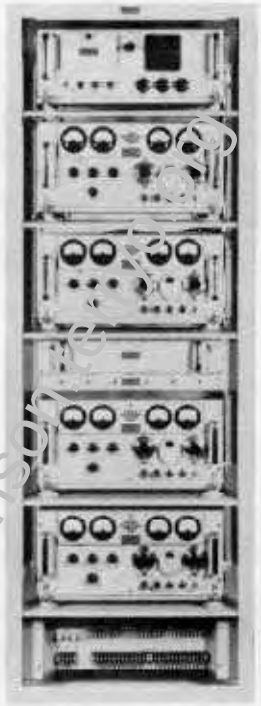
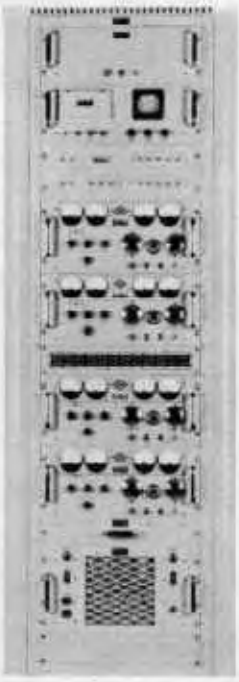


Airborne Telemetry Installation

Telemetry Installation of
DCA-1000 Diversity Combiners



Telemetry Installation

ILS Transmitter

Telemetry Installation

AMR Telemetry Installation

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PRICING INFORMATION

All equipment and prices quoted are F.O.B. Silver Spring, Maryland unless otherwise noted.

Prices are subject to change without notice.

Federal, State and Local Taxes
Extra Where Applicable.

Vitro Electronics reserves the right to make changes in specifications.

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