

NAVSHIPS 91900

INSTRUCTION BOOK
for
AUDIO LEVEL TEST PANEL
TS-629 A/U

REINER ELECTRONICS COMPANY
NEW YORK, NEW YORK

BUREAU OF SHIPS

NAVY DEPARTMENT

Contract: NObsr-57509

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i to iii	Original	5-1 to 5-6	Original
1-0 to 1-2	Original		
2-1	Original		

DEPARTMENT OF THE NAVY
BUREAU OF SHIPS
WASHINGTON 25, D. C.IN REPLY REFER TO
Code 993-100
3 April 1953

From: Chief, Bureau of Ships
To: All Activities Concerned with the
Installation, Operation and Main-
tenance of the Subject Equipment

Subj: Instruction Book for Audio Level
Test Panel TS-629A/U, NAVSHIPS
91900

1. This is the instruction book for the subject equipment and is in effect upon receipt.
2. When superseded by a later edition, this publication shall be destroyed.
3. Extracts from this publication may be made to facilitate the preparation of other Department of Defense Publications.
4. All Navy requests for NAVSHIPS Electronics publications should be directed to the nearest District Publications and Printing Office. When changes or revised books are distributed, notice will be included in the Bureau of Ships Journal and in the Index of Bureau of Ships General and Electronics Publications, NAVSHIPS 250-020.

H. N. WALLIN
Chief of Bureau

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GUARANTEE

The equipment, including all parts and spare parts, except vacuum tubes, batteries, rubber and material normally consumed in operation, is guaranteed for a period of one year from the date of delivery of the equipment to and acceptance by the Government with the understanding that all such items found to be defective as to material, workmanship or manufacture will be repaired or replaced, f.o.b. any point within the continental limits of the United States designated by the Government, without delay and at no expense to the Government; provided that such guarantee will not obligate the Contractor to make repair or replacement of any such defective items unless the defect appears within the aforementioned period and the Contractor is notified thereof in writing within a reasonable time and the defect is not the result of normal expected shelf life deterioration.

To the extent the equipment, including all parts and spare parts, as defined above, is of the Contractor's design or is of a design selected by the Contractor, it is also guaranteed, subject to the foregoing conditions, against defects in design with the understanding that if ten per cent (10%) or more of any such said item, but not less than two of any such item, of the total quantity comprising such item furnished under the contract, are found to be defective as to design, such item will be conclusively presumed to be of defective design and subject to one hundred per cent (100%) correction or replacement by a suitably redesigned item.

All such defective items will be subject to ultimate return to the Contractor. In view of the fact that normal activities of the Naval Service may result in the use of equipment in such remote portions of the world or under such conditions as to preclude the return of the defective items for repair or replacement without jeopardizing the integrity of Naval communications, the exigencies of the service, therefore, may necessitate expeditious repair of such items in order to prevent extended interruption of communications. In such cases the return of the defective items for examination by the Contractor prior to repair or replacement will not be mandatory. The report of a responsible authority, including details of the conditions surrounding the failure, will be acceptable as a basis for affecting expeditious adjustment under the provisions of this contractual guarantee.

The above one year period will not include any portion of time the equipment fails to perform satisfactorily due to any defects, and any items repaired or replaced by the Contractor will be guaranteed anew under this provision.

INSTALLATION RECORD

Contract Number NObsr-57509	Date of Contract, 12 June 1952
<i>Serial Number of equipment</i>	
<i>Date of acceptance by the Navy</i>	
<i>Date of delivery to contract destination</i>	
<i>Date of completion of installation</i>	
<i>Date placed in service</i>	

Blank spaces on this page shall be filled in at time of installation. Operating personnel shall also mark the "date placed in service" on the date of acceptance plate located below the model nameplate on the equipment, using suitable methods and care to avoid damaging the equipment.

REPORT OF FAILURE

Report of failure of any part of this equipment, during its entire service life, shall be made to the Bureau of Ships in accordance with current regulations using form NAVSHIPS NBS 383 (revised) except for Marine Corps equipment, in which case the "Signal Equipment Failure Report" form shall be used and distributed in accordance with instructions pertaining thereto. The report shall cover all details of the failure and give the date of installation of the equipment. For procedure in reporting failure, see Chapter 67 of the *Bureau of Ships Manual* or superseding instructions.

ORDERING PARTS

All requests or requisitions for replacement material should include the following data:

1. Federal stock number or, when ordering from a Marine Corps or Signal Corps supply depot, the Signal Corps stock number.
2. Name of part and complete description.
If the appropriate stock number is not available, the following shall be specified:
 1. Equipment model or type designation, circuit symbol, and item number.
 2. Name or part and complete description.
 3. Manufacturer's designation.
 4. Contractor's drawing and part number.
 5. JAN or Navy type number.

SAFETY NOTICE

The attention of officers and operating personnel is directed to Chapter 67 of the *Bureau of Ships Manual* or superseding instructions on the subject of radio-safety precautions to be observed.

This equipment employs voltage which are dangerous and may be fatal if contacted by operating personnel. Extreme caution should be exercised when working with the equipment.

While every practicable safety precaution has been incorporated in this equipment, the following rules must be strictly observed:

KEEP AWAY FROM LIVE CIRCUITS:

Operating personnel must at all times observe all safety regulations. Do not change tubes or make adjustments inside equipment with high voltage supply on. Under certain conditions dangerous potentials may exist in circuits with power controls in the off position due to charges retained by capacitors. To avoid casualties

always remove power and discharge and ground circuits prior to touching them.

DON'T SERVICE OR ADJUST ALONE:

Under no circumstances should any person reach within or enter the enclosure for the purpose of servicing or adjusting the equipment without the immediate presence or assistance of another person capable of rendering aid.

DON'T TAMPER WITH INTERLOCKS:

Do not depend upon door switches or interlocks for protection but always shut down motor generators or other power equipment. Under no circumstances should any access gate, door, or safety interlock switch be removed, short-circuited, or tampered with in any way, by other than authorized maintenance personnel, nor should reliance be placed upon the interlock switches for removing voltages from the equipment.

RESUSCITATION

AN APPROVED POSTER ILLUSTRATING THE RULES FOR RESUSCITATION BY THE PRONE PRESSURE METHOD SHALL BE PROMINENTLY DISPLAYED IN EACH RADIO, RADAR, OR SONAR ENCLOSURE. POSTERS MAY BE OBTAINED UPON REQUEST TO THE BUREAU OF MEDICINE AND SURGERY.

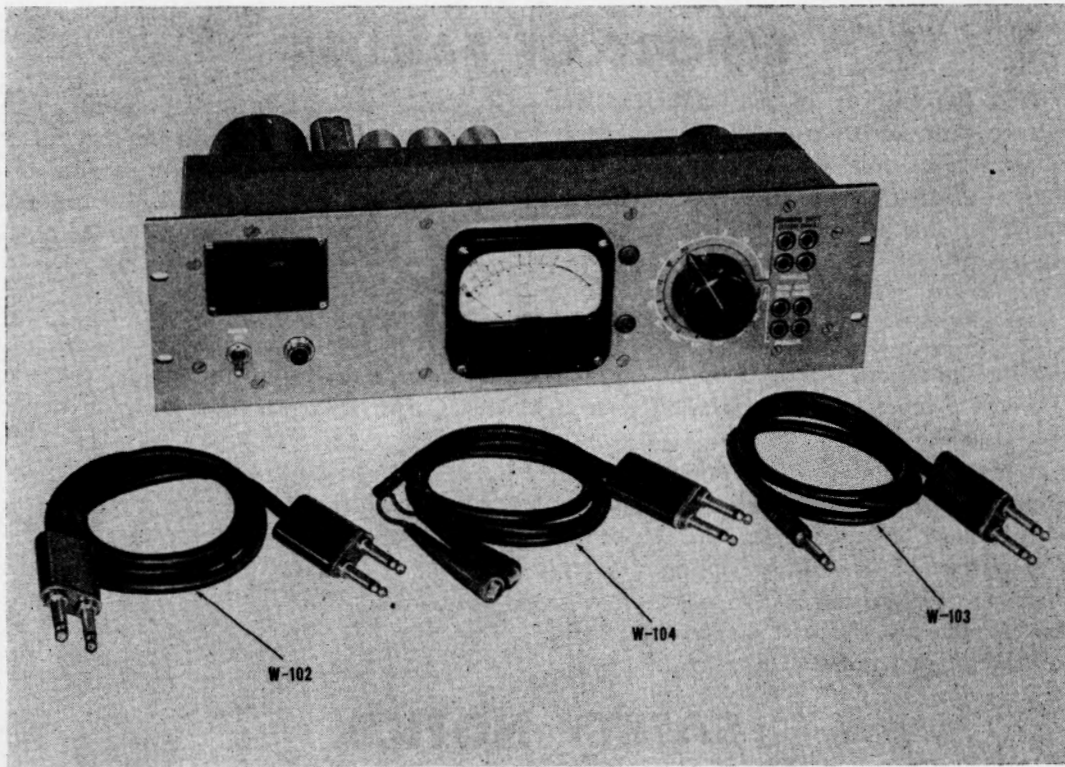


Figure 1-1. Audio Level Test Panel, TS-629A/U

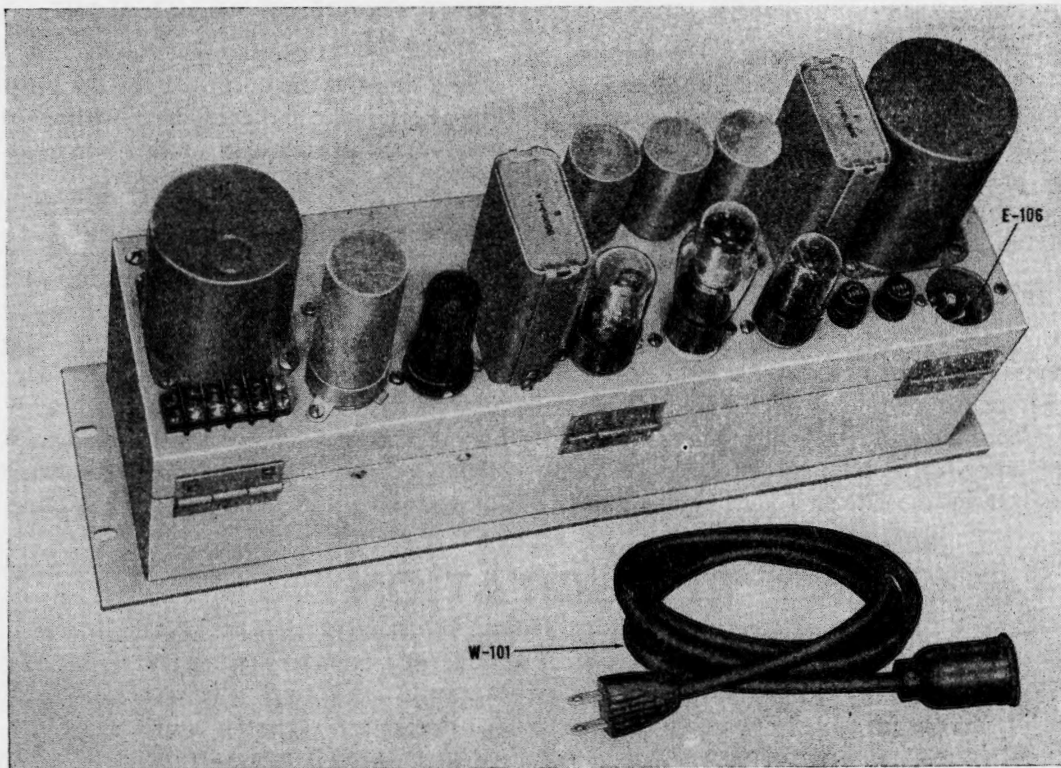


Figure 1-2. Audio Level Test Panel, TS-629A/U, Rear View

SECTION 1

GENERAL DESCRIPTION

1. EQUIPMENT.

Figure 1-1 is a front view of the Audio Level Test Panel TS-629A/U with three patch cords. Figure 1-2 is rear view with power cord. All electrical components are impregnated and insulated for satisfactory operation under conditions up to 90% relative humidity.

2. PURPOSE AND BASIC PRINCIPLES.

The Audio Level Test Panel TS-629A/U is designed to accurately measure audio levels in broadcasting, sound recordings, telephone transmission and allied fields where precise monitoring over the audio range is required.

3. DESCRIPTION OF UNIT.

The equipment consists primarily of a precision type wide range Volume Level Indicator, utilizing an internal audio frequency amplifier and its associated power supply, mounted on a standard 5 $\frac{1}{4}$ in. x 19 in. rack type panel. A thermal relay, with a 20 second delaying action protects the meter from voltage "kick" when the power is turned on. Two screw-driver type controls are located on the front panel for meter calibration to adjust for any variations in component tolerances.

Two sets of input jacks allow for use either as a bridging unit with an input impedance of 12,500 ohms or as a terminating type having an input of 600 ohms.

The meter is adjusted for a reference level of 0 VU (1 milliwatt into 600 ohms). Any source of 105-120 V, 50-60 cycle power may be connected to the rear of the case through the cable and connections provided. The control knob is used to set range of the instrument between the limits of -40 + 20 db on the outer scale (Terminating) and -20 to + 20 on the inner scale (Bridging).

4. REFERENCE DATA.

a. NOMENCLATURE.—This equipment is known as the Audio Level Test Panel TS-629A/U.

b. CONTRACT.—NObsr 57509, dated 12 June 52.

c. CONTRACTOR.—Reiner Electronics Company, Inc., New York, New York.

d. COGNIZANT NAVAL INSPECTOR.—Inspector of Naval Material, New York, New York.

e. NUMBER OF PACKAGES INVOLVED PER COMPLETE SHIPMENT.—One.

f. TOTAL CUBICAL CONTENTS.—2.5.

g. TOTAL WEIGHT.—36 lbs.

WEIGHT AND DIMENSIONS

Item Unit	Unpacked		Packed	
	Weight Pounds	Dimensions Inches	Weight Pounds	Dimensions Inches
	20	11 x 19 x 5 $\frac{1}{4}$	36	12 x 22 $\frac{1}{2}$ x 12

TABLE 1-1. EQUIPMENT SUPPLIED

QUAN- TITY PER EQUIP- MENT	NAME OF UNIT	NAVY TYPE DESIGNA- TION	OVER-ALL DIMENSIONS			VOL- UME	WEIGHT
			HEIGHT	WIDTH	DEPTH		
1	Audio Level Test Panel	TS-629A/U	5 $\frac{1}{4}$	19	11	.63	20
3	Cable Assemblies						
1	Power Cord						
2	Instruction Books						

Unless otherwise stated, dimensions are inches, volume cubic feet, weight pounds.

TABLE 1-2. SHIPPING DATA

SHIP- PING BOX NO.	CONTENTS		OVER-ALL DIMENSIONS			VOL- UME	WEIGHT
	NAME	DESIGNATION	HEIGHT	WIDTH	DEPTH		
1	Audio Level Test Panel Cable Assemblies Power Cord Instruction Books	TS-629A/U	12	22 $\frac{1}{2}$	12	2.5	36

Unless otherwise stated, dimensions are inches, volume cubic feet, weight pounds.

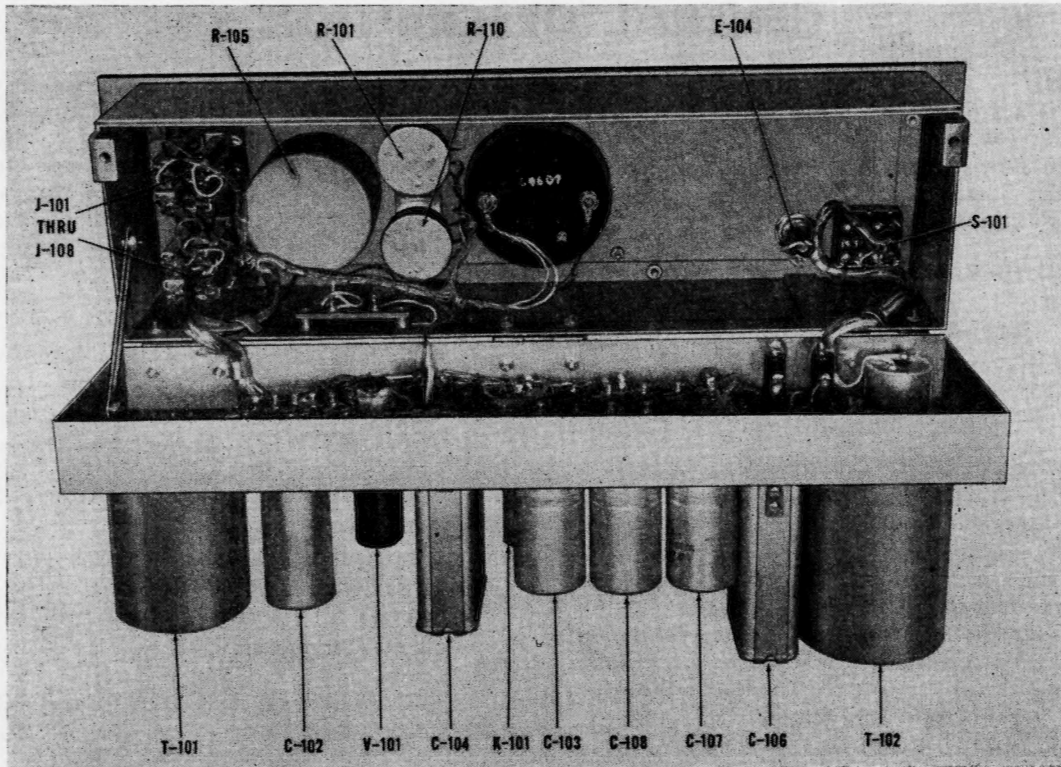


Figure 1-3. Audio Level Test Panel, TS-629A/U,
Case Open Showing Rear of Front Panel

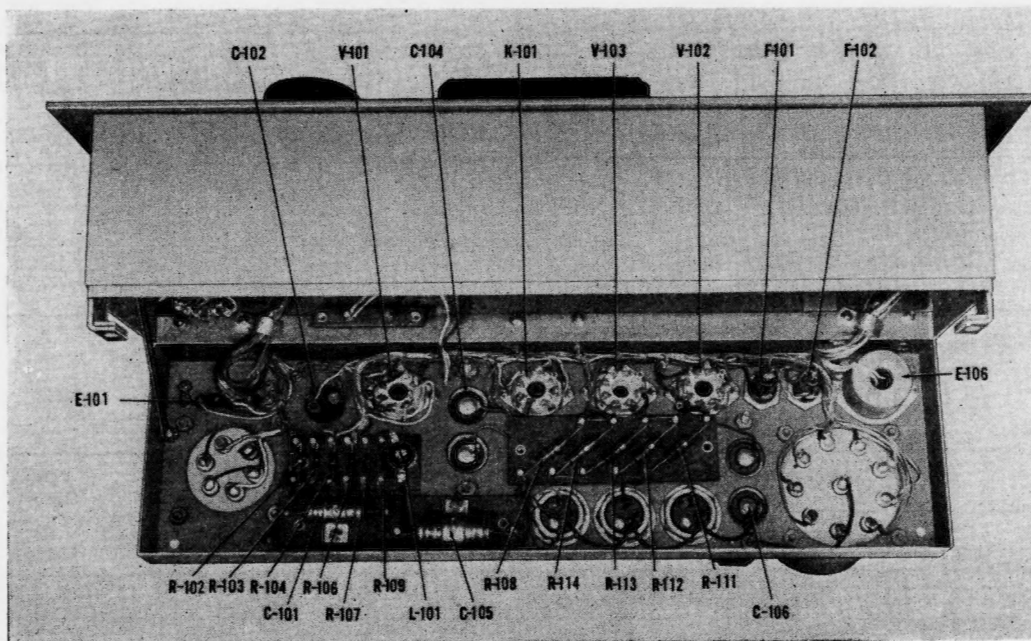


Figure 1-4. Audio Level Test Panel, TS-629A/U,
Case Open Showing Chassis

SECTION 2

THEORY OF OPERATION

1. The Audio Level Test Panel TS-629A/U consists of the following:

a. A conventional transformer coupled, single phase, full wave power supply complete with R. C. type filter and voltage regulator tube.

b. A shielded, balanced, transformer input type, wide range audio amplifier complete with calibrated volume control.

c. A VU type indicating meter to accurately measure the output of the audio amplifier.

2. The panel controls consist of:

a. Power switch for turning Test Panel ON and OFF.

b. A pilot indicator light.

c. A VU meter calibrated in both VU and per cent utilization.

d. A calibrated meter range switch for setting the meter to 0 VU.

e. Two sets of Bridging Jacks, input impedance approximately 12,500 ohms for high impedance input.

f. Two sets of terminating Jacks, input impedance 600 ohms for low impedance input.

The input circuit of the Audio Level Test Panel TS-629A/U consists of a shielded type input transformer, tapped for either 600 ohm input, or 12,500 ohm input (with appropriate series primary resistors). This transformer is designed to cover the range - 40 to + 20 VU, and function properly under the following condition for both bridging and terminating operation:

(a) Incoming line, neither side grounded.

(b) Incoming line, center grounded.

(c) Incoming line, either side grounded.

The secondary of this transformer is loaded with a 60,000 ohm step type, grid potentiometer, calibrated in 30 steps of 2 db per step to cover this range - 40 to + 20 VU. This grid potentiometer is followed by one stage of amplification, using a 6AG7, pentode connected. The plate circuit of this amplifier stage is capacitor coupled to the VU type indicating meter.

The incoming signal passes from line transformer to the potentiometer (range control) to the amplifier and hence to the meter. The signal level is adjusted by means of the range control knob so as to be within the range of the indicating meter. The signal being measured is the sum of the dial reading and VU meter reading. Two screw driver operated rheostats are located on the front panel for meter calibration. A thermal relay is used to keep the meter shorted for approximately 20 seconds to prevent damage by voltage surge when the power is turned on. Auxiliary contacts on the power switch protect the meter when the power is turned off. An additional period of at least 20 seconds should be allowed before measuring the signal, to assure correct operating temperatures.

The useful frequency range with accuracy of ± 0.1 db is 200 to 10,000 cps. The roll off at 30 and 15,000 cps is approximately 0.5 db. A typical correction curve is shown. For accurate measurements, correct readings as indicated on this curve.

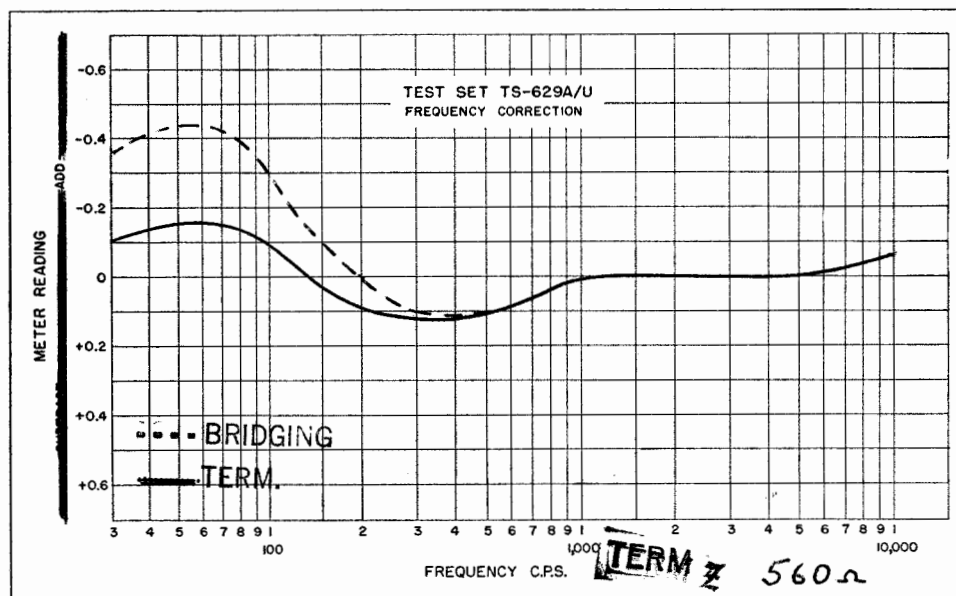


Figure 2-1. Frequency Correction Chart

SECTION 3 INSTALLATION

1. UNPACKING.

CAUTION:

THIS EQUIPMENT INCORPORATES DELICATE AND FRAGILE PARTS, WHICH HAVE BEEN PACKED CAREFULLY. ALL PARTS SHOULD BE UNPACKED AND HANDLED IN LIKE MANNER.

Open the carton and remove the equipment. Remove outer paper wrapping, from the equipment proper, open box and remove cushioning, dessicant, cords and equipment.

2. INSTALLATION.

a. EQUIPMENT MOUNTING. The equipment is designed to mount on a standard 19 in. relay rack.

b. CONNECTION. Use the A.C. power cable W-101 to connect equipment to any 60 cycle, 105-120 volt source (Fig. 1-2). Connection is made to power receptacles E-106 located on rear of panel (Fig. 1-2). Cables W-102, W-103, W-104, are used for connecting to Bridging and Terminating Jacks (Fig. 1-1).

3. INITIAL ADJUSTMENTS.

Calibration. Two screw-driver type rheostats located at the right of the meter are provided for zero adjustments. Rheostat #2 controls both terminating and bridging calibration. Rheostat #1 controls only bridging and should be used only after #2 has been correctly set. To calibrate, set the external oscillator to 1,000 cycles at 0.775 volts, plug into Terminating Jacks, set range con-

trol to O Terminating (outside scale), then readjust the oscillator to 0.775 volts. With calibrating meter reading 0.775 volts, remove button plugs, adjust #2 control for O VU reading. After Terminating Input has been calibrated, set range switch (inside scale) to O VU Bridging; plug into Bridging Jacks, reset the oscillator to 0.775 volts and adjust #1 rheostat for O VU.

4. OPERATION.

To operate, turn on power switch, the ^{Green} ~~red~~ indicator lamp should glow. Allow 1 minute for tubes to warm up, then turn range control to full clockwise position, to prevent over-loading the meter. Connect the equipment under test by means of the appropriate patchcord and required jacks. Turn the range control knob until the input signal indicator is on approximately O VU on the meter. This reading is added to the dial readings, to give the audio level.

If it is desirable to terminate the line to be measured with 600 ohms, connect the line to Terminating Jacks. To monitor, without disturbing the signal, plug into the bridging jacks and tap across the line.

FAILURE REPORTS

A FAILURE REPORT must be filled out for the failure of any part of the equipment whether caused by defective or worn parts, improper operation, or external influences. It should be made on Failure Report, form NAVSHIPS 383, which has been designed to simplify this requirement. The card must be filled out and forwarded to BUSHIPS. Full instructions are to be found on each card.

Use great care in filling the card out to make certain it carries adequate information. For example under "Circuit Symbol" use the proper circuit identification taken from the schematic drawings, such as T-803, in the case of a transformer, or R-207, for a resistor. Do not substitute brevity for clarity. Use the back of the card to completely describe the cause of failure and attach an extra piece of

paper if necessary.

The purpose of this report is to inform BUSHIPS of the cause and rate of failures. The information is used by the Bureau in the design of future equipment and in the maintenance of adequate supplies to keep the present equipment going. The cards you send in, together with those from hundreds of other ships, furnish a store of information permitting the Bureau to keep in touch with the performance of the equipment of your ship and all other ships of the Navy.

This report is not a requisition. You must request the replacement of parts through your Officer-in-Charge in the usual manner.

Make certain you have a supply of Failure Report cards and envelopes on board. They may be obtained from the nearest District Printing and Publication Office.

SECTION 4 — MAINTENANCE

1. OPERATOR'S MAINTENANCE.

a. FUSES.—If a second fuse fails upon replacement, circuit should be checked for component and circuit defects.

CAUTION:

DO NOT CONTINUE TO REPLACE FUSES UNTIL CAUSE OF FAILURE IS DETERMINED.

b. PILOT LAMP.—When the lamp is burned out, remove the pilot light jewel cap at front of panel and replace the lamp.

c. METER ZERO.—With the power switched off, the mechanical zero of Meter may be set by turning zero corrector screw (located below the scale opening) until the pointer is on the outer line at the left hand side of the meter.

d. TUBES.—The tubes should be replaced after 5,000 hours of use or at failure.

2. PREVENTIVE MAINTENANCE.

a. METER.—(1) If meter pointer sticks, tap scale glass lightly with finger tip. If meter pointer shows excessive friction, repair or replace meter.

(2) Always use the power switch on the unit for turning power on and off, allowing ample time between switching operations. This permits the relay to function properly, thus preventing meter damage.

(3) Before measuring an unknown signal, turn the range control knob as far clockwise as possible, to protect the meter.

3. CORRECTIVE MAINTENANCE.

a. TESTING.—The following information will be helpful in trouble shooting on the equipment covered in this Instruction Book. D.C. Voltages from terminal to terminal should be checked with a 20,000ohm/volt voltmeter.

b. TUBE OPERATING VOLTAGES.

Tube Type	Function	Heater A.C.	Regulating Voltage D.C.	Current ma.
6AG7	Amplifier	6.3		Plate 12 Screen 3
6X5	Rectifier	6.3		30
VR150	Regulator		150	16.5

c. TUBE CHARACTERISTICS

- 6AG7—Amplifier
- Heater—6.3 V
- Heater Current—.65 Amp.
- Pin 1—Shell
- Pin 2—Heater
- Pin 3—Interlead Shield
- Pin 4—Grid
- Pin 5—Cathode
- Pin 6—Screen
- Pin 7—Heater
- Pin 8—Plate

6X5GT—Full Wave Rectifier

Heater 6.3 V

Heater Current 0.6 Amp.

Pin 1—No conn.

Pin 2—Heater

Pin 3—Plate #2

Pin 5—Plate #1

Pin 7—Heater

Pin 8—Cathode

Peak Inverse Voltage—1,250 V

Peak Plate Current Per Plate—210 max. ma.

d. WINDING DATA.

(1) Reactor—Audio Choke

Inductance—16 mh

No. turns—1,550

Wire Size—# 38 or #40 Copper

(2) Transformer—Input

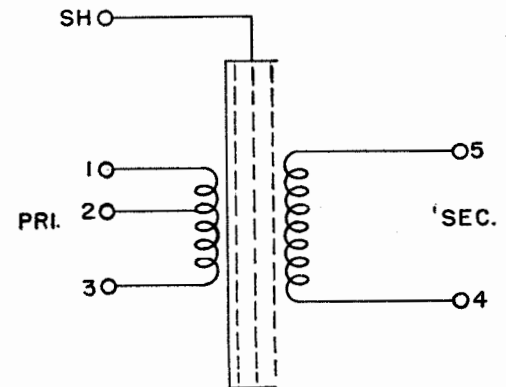
Impedance—Pri. #1—600 Ohms, Pri. #2—12,500 ohms

Impedance—Secondary 50,000 Ohms

Turns Ratio—Pri. #1 to Sec. 1:9

Turns Ratio—Pri. #2 to Sec. 1:2

Frequency Response—50-20,000 cps. ± 0.5 db



(3) Transformer—Power

Primary—115 Volts, 50-60 cycles

Secondary—#1—600 V CT .020 Amp. total current with CT. grounded

Secondary—#2—6.3 V, 0.6 amps (Fil. of 6X5GT)

Secondary—#3—6.3 V, 1.2 amps

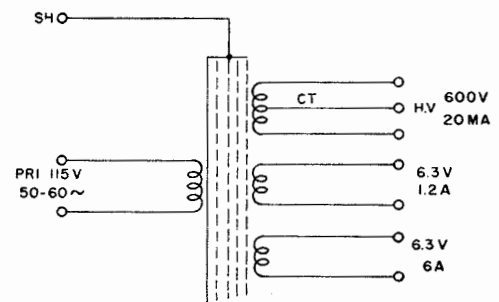
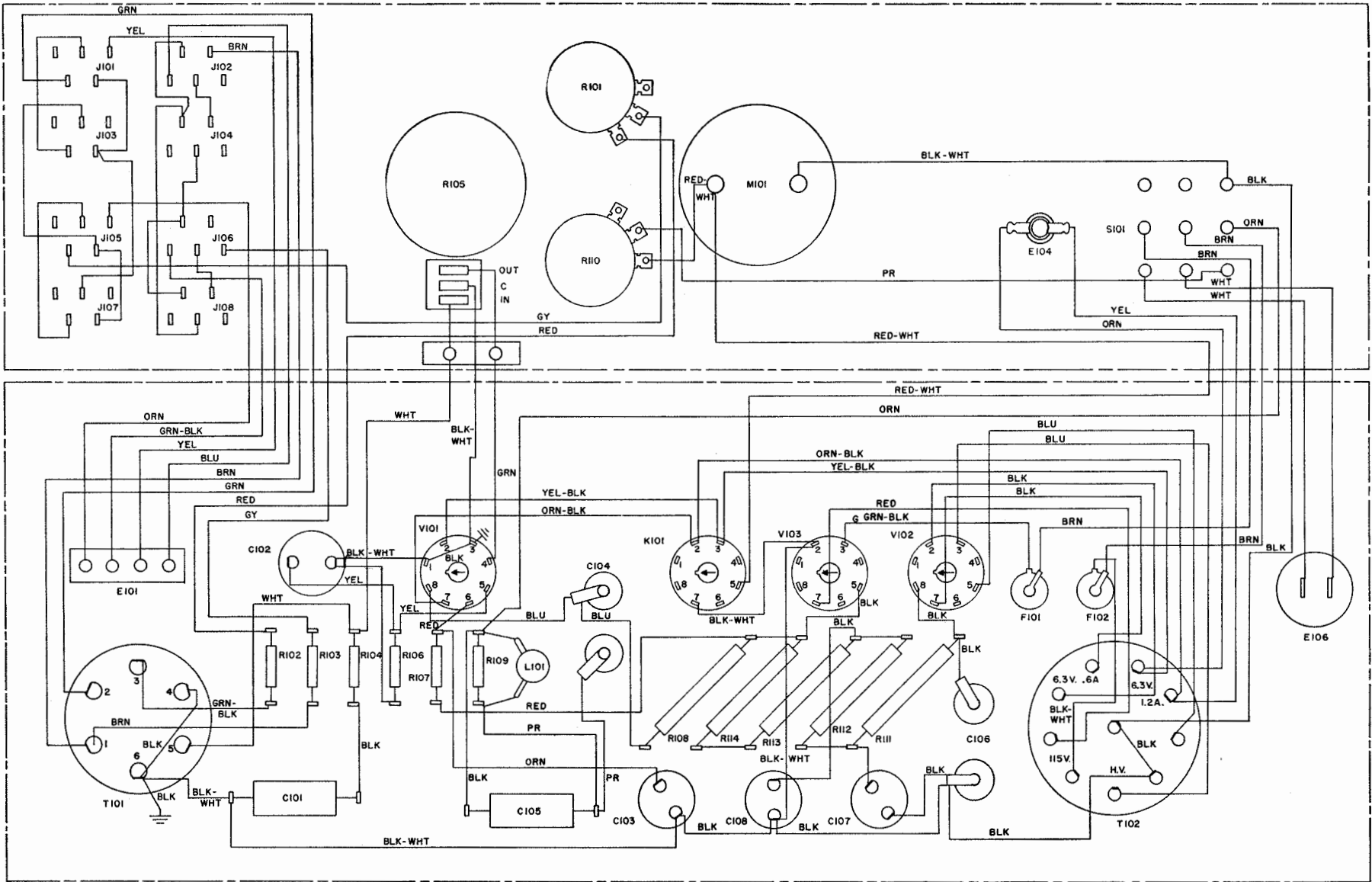


Figure 4-1. Wiring Diagrams for Transformers



NAVSHIPS 91900
TS-629A/U

Figure 4-2. Wiring Diagram, Audio Level Test Panel TS-629A/U

TABLE 5-1. LIST OF MAJOR UNITS

SYMBOL GROUP	QUANTITY				NAME OF MAJOR UNIT	NAVY TYPE	DESIGNATION
	115 V A.C.	230 V D.C.	220/ 3/60	440/ 3/60			
TS	1				Audio Level Test Panel	629A/U	U

TABLE 5-2. PARTS LIST

REF. SYMBOL	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE)	MFR.	MFR.'S DESIGNATION	CONTRACTOR'S PARTS
C-101	CAPACITATOR, Fixed Paper Dielectric .006 mfd. \pm 20 600V DC W	Compensating	CP29AIEF602M (N16-C-4-1627-5675)	19		
C-102	CAPACITATOR, Fixed Electrolytic, 1,000 mfd. — 10 plus max 25 V DC W	Cathode V-101	CE31F102F	1		
C-103	CAPACITATOR, Fixed Electrolytic, 10 mfd. — 10 plus max 450 V DC W	Filter V-102	CE41F100R (N16-C-19568-8052)	1		
C-104	CAPACITATOR, Fixed Paper Dielectric 4 mfd. + 20% — 10% 600 V DC W	Coupling V-101 and Metering Compensating R-109, C-105, L-101	CP70BIEF405V (N16-C-49981-9971)	1		
C-105	CAPACITATOR, Fixed Paper Dielectric .06 mfd. \pm 10% 400 V DC W	Meter Compensating		19		
C-106	Same as C-104	Filter V-101				
C-107	Same as C-103	Filter V-102				
C-108	CAPACITATOR, Fixed Electrolytic 25 mfd. — 10 plus max 450 V DC W	Filter V-101	CE41F250R (N16-C-14793-8189)	1		
E-101	TERMINAL BOARD, 4 terminals screw type $2\frac{1}{8}$ in. lg, $\frac{7}{8}$ in. wide, $\frac{7}{16}$ in. thick, over-all dim. $2\frac{1}{8}$ in. holes $1\frac{1}{8}$ in. c to c mtg holes	Input Line Connection		14	4140Y	
E-102	FUSE HOLDER, extractor post type, for single #4AG cartridge fuse, black bakelite; panel mtg $1\frac{1}{4}$ in. lg 0.28 in. over-all dim. 2 solder lug terminals	Line Fuse	(N17-F-74267-6101)	5	HCM	
E-103	Same as E-102					
E-104	LIGHT INDICATOR, w/ red ^{Green} frosted lens for bayonet base lamp; chrome polish shell $2\frac{3}{8}$ in. lg, $\frac{7}{8}$ in. max dia. over-all panel mtg, 2 solder lug terminals	Pilot Light		10	81410-621	

SECTION 5
PARTS LIST

TABLE 5-2. PARTS LIST (Continued)

REF. SYMBOL	NAME OF PART AND DESCRIPTION	FUNCTION	JAN AND (NAVY TYPE)	MFR.	MFR.'S DESIGNATION	CONTRACTOR'S PARTS
E-105	KNOB, round w/small pointer, accommodates 1/4 in. dia shaft 2 1/8 in. dia 1 1/4 in. thick over-all dim.	Control knob	(N16-K-700408-519)	15	Type C Item 8	
E-106	CONNECTOR, Receptacle, 2 contacts, male, 1 1/10 in. high 1 5/10 in. dia. over-all dim. Two 1/8 in. holes 1 11/10 in. c to c mtg.	Power Receptacle	(49757)	12	6808	
E-107	CLIP, ELECTRICAL, battery style, pee wee clip, over-all dim. 1 1/2 in. lg, 1/2 in. wd, 3/8 in. jaw opening when fully spread, used with rubber insulating sleeve. p/o of CABLE ASSEMBLY W-104	Used with cable assembly W-104			Type 45G	
F-101	FUSE, Type 4AG 2 Amp.	Line Fuse	28025-2 (N17-F-14305-340)	5	4AG-2	
F-102	Same as F-101					
I-101	PILOT LIGHT, 6.3 V 0.15 Amp.; bulb clear, 1 1/8 in. x 25/64 in. dia. over-all; miniature bayonet base	Pilot Light	(G17-L-6297)	11	47	
J-101	JACK, Telephone	Bridging and Terminating	JJ-072 (491395)	21	JJ-072	
J-102	Same as J-101					
J-103	Same as J-101					
J-104	Same as J-101					
J-105	Same as J-101					
J-106	Same as J-101					
J-107	Same as J-101					
J-108	Same as J-101					
K-101	RELAY, Thermal	Meter Protection	291619 (N17-R-72914-8101)	3	6C20	
L-101	REACTOR, Audio Choke Coil 16 mh	Meter Compensation		18	39-6	
M-101	METER, Audio Level VU - 20 to + 3 range, Rectangular.	Meter VU		20		
P-101	PLUG, Telephone, twin shank, 2 conductors, 2 27/32 in. over-all lg.	Part of cable assembly W-103	PJ-055B (N17-P-61264-5423)	23	49109	
P-102	PLUG, Telephone, twin shank, 2 conductors, 3 1/2 in. over-all lg.	Part of cable assemblies W-102, W-103, W-104	PJ-241 (N17-P-61684-9946)	4	491813	
P-103	CONNECTOR: PLUG. 2 contacts, female, not polarized, straight type, over-all dimensions. 2 in, lg, 1 1/4 in. dia	Used with cable assembly power electrical W-101			Type CC-1	
P-104	CONNECTOR, PLUG. 2 contacts, male not polarized, straight type, over-all dimensions 2 in. lg, 1 in. wd	Used with cable assembly power electrical W-101			Type A-1	
R-101	RHEOSTAT, 1000 ohms, ± 10%	Calibrating	RA30A1SA102AK	6		
R-102	RESISTOR, Fixed, 4,500 ohms ± 5%, 1/2 Watt	Terminating	RC20BF452J	2		
R-103	RESISTOR, Fixed, 4,700 ohms, ± 5%, 1/2 Watt	Terminating	RC20BF472J (N16-R-50128-431)	2		

R-104	RESISTOR, Fixed, 0.2 Meg. ohms, ± 5%, 1/2 Watt	Compensating T-101	RC20BF204J (N16-R-50704-431)	2	
R-105	POTENTIOMETER, 60,000 ± 1% 30 Steps at 2Db	Range Control	636284-1 (N16-R-91632-1001)	9	1956
R-106	RESISTOR, Fixed, 150 ohms ± 5%, 1/2 Watt	Cathode V-101	RC20BF151J (N16-R-49624-431)	2	
R-107	RESISTOR, Fixed, 24,000 ohms ± 5%, 1/2 Watt	Screen V-101	RC20BF243J (N16-R-50380-431)	2	
R-108	RESISTOR, Fixed, 2,700 ohms ± 5%, 2 Watt	Plate V-101	RC40BF272J not valid Jan.	2	
R-109	RESISTOR, Fixed, 560 ohms ± 5%, 1/2 Watt	Meter Compensating	RC20BF561J (N16-R-49804-431)	2	
R-110	RESISTOR, Variable, 2,500 ohms ± 10%	Calibrating	RA30A1SA252AK (N16-R-90868-6835)	6	
R-111	RESISTOR, Fixed, 1,500 ohms ± 5%, 2 Watt	Filter V-102	RC40BF152J	2	
R-112	Same as R-111				
R-113	Same as R-111				
R-114	Same as R-111				
S-101	SWITCH, Power, 4 pole 2 position	Line Power		8	7665K5
T-101	TRANSFORMER, Line to Grid	Line to Grid		22	UTC-B-8237
T-102	TRANSFORMER, Power	Power		22	UTC-B-2991
V-101	TUBE, Type 6AG7	Amplifier	JAN6AG7 (N16-T-56177)	17	6AG7
V-102	TUBE, Type 6X5GT	Full Wave Rectifier	JAN6X5GT/G (N16-T-56855)	17	6X5GT
V-103	TUBE, Type VR150/30	Regulator	JANOD3/VR150 (N16-T-53050)	17	VR150/30
W-101*	POWER CORD	Connects equipment to power source		7	CD-370
W-102*	CABLE ASSEMBLY, Consists of 2 twin tel. plug Navy Type CUD-491813 and 4 ft. Cable	For correction to bridging and terminating jacks		18	W102
W-103*	CABLE ASSEMBLY, Consists of 1 twin tel. plug, Navy Type 491813 and 1 single tel. plug Navy type #49109, 4 ft. Cable	For correction to bridging and terminating jacks		18	W103
W-104*	CABLE ASSEMBLY, Consists of 1 twin tel. plug, Navy Type CUD-491813 and 2 Test Clips #45-C w/Insulated Sleeves #47, 4 ft. Cable	For correction to bridging and terminating jacks		18	W104
W-105	CABLE, FLEXIBLE: twin conductor No. 18 AWG, copper wire stranded. 41 strands No. 34 AWG wire, rubber insulated conductors, one white, one black, end in black rubber jacket	Used with cable assemblies W-101, W-102, W-103, W-104			
X-101	SOCKET, Tube	Socket for V-101	TSB8L102 (N16-S-63515-4156)	13	
X-102	Same as X-101	Socket for V-102			
X-103	Same as X-101	Socket for V-103			
X-104	Same as X-101	Socket for relay			

* Not furnished as a maintenance part if failure occurs, do not request replacement unless the item cannot be repaired or fabricated.

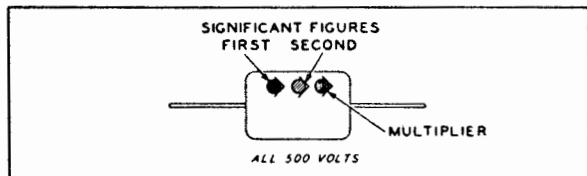
TABLE 5-3. CROSS REFERENCE PARTS LIST

JAN DESIGNATION	KEY SYMBOL	NAVY TYPE	KEY SYMBOL	ARMY-NAVY TYPE	KEY SYMBOL	ITEM NUMBER	KEY SYMBOL	ITEM NUMBER	KEY SYMBOL
CP29A1EF602M	C-101	N16-C-41627-5675	C-101			1	C-101	24	R-102
		N16-C-19568-8052	C-103			2	C-102	25	R-103
		N16-C-49981-9971	C-104			3	C-103	26	R-104
CE31F102F	C-102	N16-C-19793-8139	C-108			4	C-104	27	R-105
CE41F100R	C-103	N17-F-74267-6101	E-102			5	C-105	28	R-106
CP70B1EF405V	C-104	N16-K-700408-519	E-105		FEDERAL STOCK NO.	6	C-108	29	R-107
CP29A1EF603K	C-105	49757	E-106			7	E-101	30	R-108
CE41F250R	C-108	N17-F-14305-340	F-101			8	E-102	31	R-109
JJ-072	J-101	G17-L-6297	I-101			9	E-104	32	R-110
PJ-055B	P-101	491395	J-101			10	E-105	33	R-111
PJ-241	P-102	N17-R-72914-8101	K-101			11	E-106	34	S-101
RA30A1SA102-AK	R-101	N17-P-61264-5423	P-101		SIGNAL CORPS STOCK NO.	12	E-107	35	T-101
RC20BF452J	R-102	N17-P-61684-9946	P-102			13	F-101	36	T-102
RC20BF472J	R-103	N16-R-50128-431	R-103			14	I-101	37	V-101
RC20BF204J	R-104	N16-R-50704-431	R-104			15	J-101	38	V-102
RC20BF151J	R-106	N16-R-91632-1001	R-105			16	K-101	39	V-103
RC20BF243J	R-107	N16-R-49624-431	R-106	2Z8678-122		17	L-101	40	W-101
RC20BF272J	R-108	N16-R-50380-431	R-107			18	M-101	41	W-102
RC40BF272J	R-109	N16-R-49804-431	R-109			19	P-101	42	W-103
RC20BF561J	R-110	N16-R-90868-6835	R-110	3Z2880-2	X-101	20	P-102	43	W-104
RA30A1SA252AK	R-111	N16-T-56177	V-101			21	P-103	44	W-105
RC40BF162J	V-101	N16-T-56855	V-102			22	P-104	45	X-101
6AG7	V-102	N16-T-53050	V-103		E-102	23	R-101		
6X5GT/G	V-103	N16-S-63515-4156	X-101						
OD3/VR150	X-101								
TSB8L102									

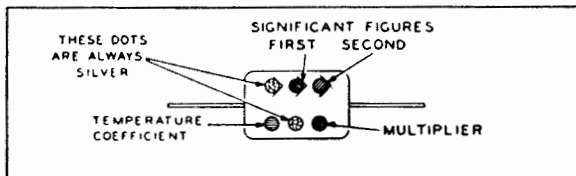
TABLE 5-4. APPLICABLE COLOR CODES AND MISCELLANEOUS DATA

CAPACITOR COLOR CODES

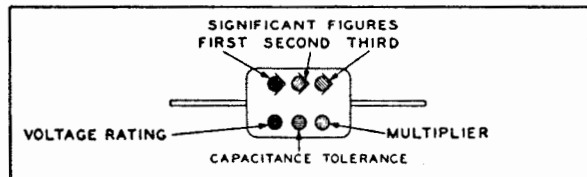
RMA 3-DOT COLOR CODE FOR MICA-DIELECTRIC CAPACITORS



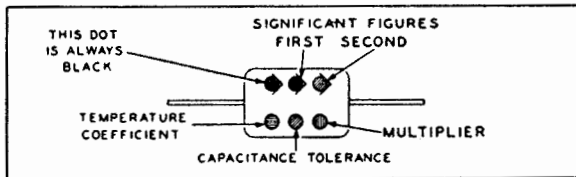
JAN 6-DOT COLOR CODE FOR PAPER-DIELECTRIC CAPACITORS



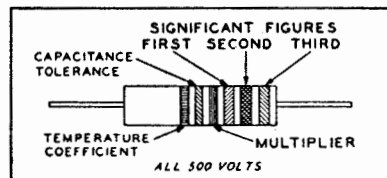
RMA 6-DOT COLOR CODE FOR MICA-DIELECTRIC CAPACITORS



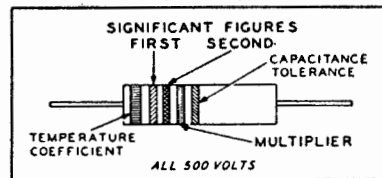
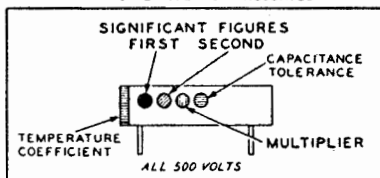
JAN 6-DOT COLOR CODE FOR MICA-DIELECTRIC CAPACITORS



RMA COLOR CODE FOR TUBULAR CERAMIC-DIELECTRIC CAPACITORS



JAN COLOR CODE FOR FIXED CERAMIC-DIELECTRIC CAPACITORS

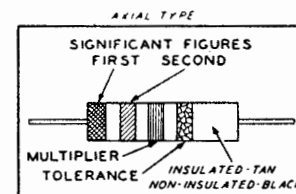


RMA: RADIO MANUFACTURERS ASSOCIATION
JAN: JOINT ARMY-NAVY

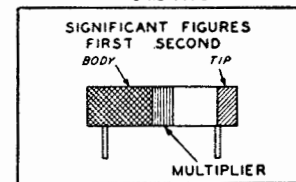
RESISTORS				CAPACITORS				
TOLERANCE	MULTIPLIER	SIGNIFICANT FIGURE	COLOR	MULTIPLIER			VOLTAGE RATING	TEMPERATURE COEFFICIENT
				RMA MICA AND CERAMIC-DIELECTRIC	JAN MICA AND PAPER-DIELECTRIC	JAN CERAMIC DIELECTRIC		
	1	0	BLACK	1	1	1		A
	10	1	BROWN	10	10	10	100	B
	100	2	RED	100	100	100	200	C
	1000	3	ORANGE	1000	1000	1000	300	D
	10000	4	YELLOW	10000			400	E
	100000	5	GREEN	100000			500	F
	1000000	6	BLUE	1000000			600	G
	10000000	7	VIOLET	10000000			700	
	100000000	8	GRAY	100000000		0.01	800	
	1000000000	9	WHITE	1000000000		0.1	900	
5	0.1		GOLD	0.1	0.1		1000	
10	0.01		SILVER	0.01	0.01		2000	
20			NO COLOR				500	

RESISTOR COLOR CODES

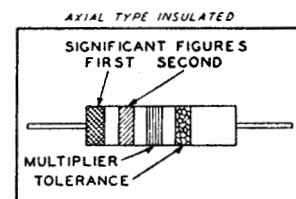
RMA COLOR CODE FOR FIXED COMPOSITION RESISTORS



RADIAL TYPE



JAN COLOR CODE FOR FIXED COMPOSITION RESISTORS



RADIAL TYPE NON-INSULATED

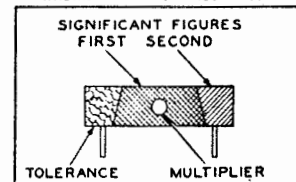


TABLE 5-5. LIST OF MANUFACTURERS

CODE NO.	MFR. PREFIX	NAME	ADDRESS
CAN	1	Aerovox Corporation	New Bedford, Mass.
CBZ	2	Allen Bradley	Milwaukee 4, Wisconsin
CAGK	3	Amperite Company	561 Broadway, New York City
CUD	4	Audio Developments	c/o Burlingame Associates 11 Park Place, New York New York
CFA	5	Bussman Manufacturing	53 Park Place, New York City
CTC	6	Chicago Telephone Supply	Elkhart, Indiana
CO1	7	Cords, Ltd.	780 Frelinghuysen Avenue, Newark, New Jersey
CAE	8	Cutler Hammer, Inc.	8 West 40th Street, New York, New York
CDN	9	The Daven Company	191 Central Avenue Newark, New Jersey
CAYZ	10	Dial Light Company of America	900 Broadway, New York, New York
CG	11	General Electric Company	Schenectady 5, New York
CHU	12	Harvey Hubbel, Inc.	State and Thomas Streets, Bridgeport, Conn.
CEB	13	Hugh H. Eby	Philadelphia 44, Pa.
CJC	14	Jones, H. B. Division of Cinch Manufacturing Corporation	Chicago 24, Ill.
MOI	15	Molded Insulation Co.	Philadelphia, Pa.
CBIT	16	Mueller Electric Co.	Cleveland 14, Ohio
RCA	17	Radio Corporation of America	Harrison, New Jersey
CALN	18	Reiner Electronics Co.	125 W. 25th Street, New York, New York
CAN	19	Sangamo Electric Co.	Springfield, Ill.
CSV	20	Simpson Electric Co.	5281 Wilkinzie Street, Chicago, Ill.
CBIM	21	Switchcraft Inc.	1328-20 N. Halsted Street, Chicago 22, Ill.
CUT	22	United Transformer Co.	150 Varick Street New York 13, New York
	23	Waltham Horological Co.	711 Broad Street, Lynn, Mass.