

NAVSHIPS 91682

INSTRUCTION BOOK

*for*

CODE, TAPE RECORDER

RD-110/U

*and*

RD-110A/U

WHITEFORD LABORATORY  
LYNN, MASSACHUSETTS

Naval Electronics Systems Command  
Southeast Division  
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NAVY DEPARTMENT

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**LIST OF EFFECTIVE PAGES**

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DEPARTMENT OF THE NAVY  
BUREAU OF SHIPS  
WASHINGTON 25, D. C.

IN REPLY REFER TO  
Code 993-100  
8 April 1953

From: Chief, Bureau of Ships  
To: All Holders of NAVSHIPS 91682  
Subj: Change 1 to the Instruction Book for  
Tape Code Recorder RD-110/U

1. This Change is in effect upon receipt. Insert the new pages in numerical order and record action in Record of Correction Page of the basic publication. The superseded pages shall be destroyed after the book has been checked for completeness against the revised List of Effective Pages.

2. Extracts from this publication may be made to facilitate the preparation of other Department of Defense Publications. It is forbidden to make extracts for any other purpose without specific approval of the Chief of the Bureau of Ships, except as provided for in the U. S. Navy Security Manual for Classified Matter.

3. 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 percent (10%) or more of any 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 percent (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 49122	Date of Contract, 4 May 1950
Contract Number NObsr 57254	
<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 failures 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 and short description of part.

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 of part and complete description.

3. Manufacturer's designation.

4. Contractor's drawing and part number.

5. JAN or Navy type number.

## DESTRUCTION OF ABANDONED MATERIAL IN THE COMBAT ZONE

In case it should become necessary to prevent the capture of this equipment, and when ordered to do so, DESTROY IT SO THAT NO PART OF IT CAN BE SALVAGED, RECOGNIZED, OR USED BY THE ENEMY. BURN ALL PAPERS AND BOOKS.

### *Means:*

1. Explosives, when provided.
2. Hammers, axes, sledges, machetes, or whatever heavy object is readily available.
3. Burning by means of incendiaries such as gasoline, oil, paper or wood.
4. Grenades and shots from available firearms.
5. Burying all debris, where possible and when time permits.
6. Throwing overboard or disposing of in streams or other bodies of water.

### *Procedure:*

1. Obliterate all identifying marks. Destroy nameplates and circuit labels.
2. Demolish all panels, castings, switch and instrument boards.
3. Destroy all controls, switches, relays, connections and meters.
4. Rip out all wiring and cut interconnections of electrical equipment. Smash gas, oil, and water cooling systems in gas engines, generators, etc.
5. Smash every electrical or mechanical part, whether rotating, moving or fixed.
6. Break up all operating instruments such as keys, phones, microphones, etc.
7. Destroy all classes of carrying cases, straps, containers, etc.
8. Bury or scatter debris.

**DESTROY EVERYTHING!**



## 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 voltages 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.

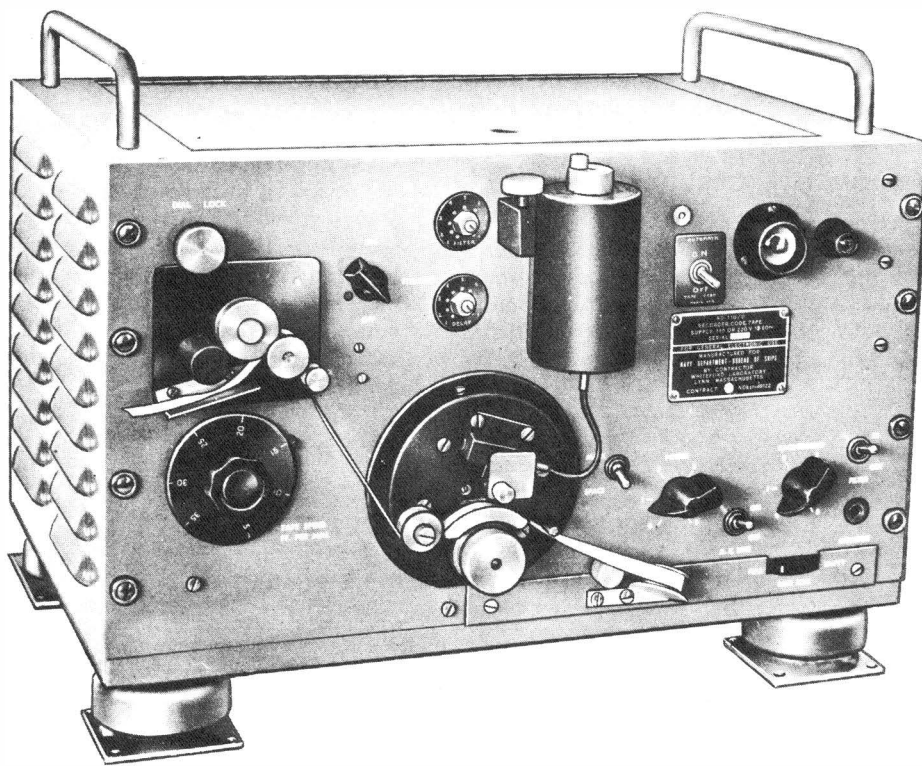


Figure 1-1. Code, Tape Recorder RD-110A/U

## SECTION 1

### GENERAL DESCRIPTION

#### 1. GENERAL.

The Navy Type RD-110A/U Code, Tape Recorder (See figure 1-1.) inscribes an ink trace of International Morse or similarly coded signals on paper tape suitable for manual transcription. Automatic transcription from the tape is possible in conjunction with automatic typewriters and suitable tape-scanning devices.

#### 2. PURPOSE.

The equipment is used to record signal code from several types of radio receiver outputs or from the output of an automatic (transmitting) typewriter.

#### 3. BASIC PRINCIPLES OF OPERATION.

The recorder pen, mechanically linked to the recorder head, inscribes an ink trace on the paper tape as the tape is pulled through the machine. When there is no incoming signal, a permanent magnet holds the head so that the pen remains in a fixed position; the trace made by the pen in this position is called the "space line". Any incoming signal is amplified and superimposed on the magnetic field to shift the recorder head to an alternate fixed position; for the duration of the signal the pen traces the "mark" line. At the end of each signal pulse, the pen returns to its "space" position. The "space" and "mark" positions are equi-distant from, but on opposite sides of, the tape centerline.

#### 4. REFERENCE DATA.

- a. Nomenclature.
  - (1) Navy Type RD-110A/U Code, Tape Recorder.
- b. Contract Number and Date.
  - (1) Contract Number NObsr-49122, dated May 4, 1950.
- c. Contractor.
  - (1) Whiteford Laboratory  
587 Washington Street  
Lynn, Massachusetts
- d. Cognizant Naval Inspector.
  - (1) Inspector Naval Material  
Boston, Massachusetts
- e. Number of Packages per Equipment.
  - (1) One.
- f. Total Cubical Contents
  - (1) 3.13 cubic feet crated.
  - (2) 1.79 cubic feet uncrated.
- g. Total Weight.
  - (1) 93 pounds crated.
  - (2) 82½" pounds uncrated.
- h. Power Supply.
  - (1) 115 or 230 volts a.c., single-phase, 60-cycle.
  - (2) 1.0 amperes at 115 volts, ship's supply.  
1.0 amperes at 230 volts, ship's supply.
- i. Heat Dissipation.
  - (1) 200 watts.

**TABLE 1-1. EQUIPMENT SUPPLIED**

QUAN- TITY PER EQUIP- MENT	NAME OF UNIT	NAVY TYPE DESIG- NATION	OVER-ALL DIMENSIONS			VOL- UME	WEIGHT
			HEIGHT	WIDTH	DEPTH		
1	Code, Tape Recorder (with cabinet)	RD-110A/U	10-15/32"	19"	15½"	1.79 cu. ft.	82.5 lbs.
2	Instruction Book	NAVSHIPS 91682					

#### 5. EQUIPMENT AND PUBLICATIONS REQUIRED BUT NOT SUPPLIED.

For mechanical transcription, no equipment or pub-

lications other than those listed in Table 1-1 are required. For automatic transcription, a tape-scanning device and an automatic typewriter (receiving) are required.

TABLE 1-2. SHIPPING DATA

SHIP- PING BOX NO.	CONTENTS		OVER-ALL DIMENSIONS			VOL- UME	WEIGHT
	NAME	DESIGNATION	HEIGHT	WIDTH	DEPTH		
1	Code, Tape Recorder (In Cabinet)  Instruction Books	RD-110A/U  NAVSHIPS 91682	15"	20"	18"	3.13 cu. ft.	92.5 lbs.

TABLE 1-3. VACUUM TUBE COMPLEMENT

UNIT	NUMBER OF TUBES OF TYPE INDICATED							
	5R4WGY	6AL5W	6E5*	6SL7WGT	6V6GT	6X4W	12AX7	Total No. of tubes
Ink Recorder	1	1	1	2	3	1	1	10

\* Electron Ray

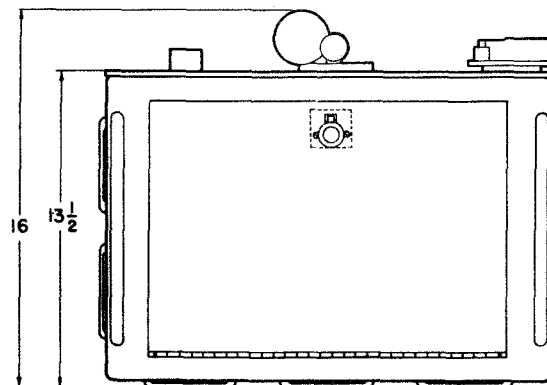
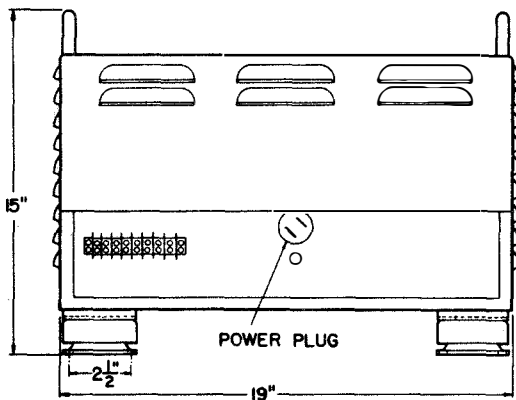


Figure 1-2. Outline Drawing

## SECTION 2

### THEORY OF OPERATION

#### 1. GENERAL DESCRIPTION OF CIRCUITS.

Input signals of a voltage range from 0.07 volts through 7 volts at 600 ohms impedance will operate the unit at constant output amplitude. A band-pass filter has been provided for use when necessary. With the filter out of the circuit frequencies from 1000 c.p.s. through 3000 c.p.s. will operate the unit with a flat response. With the filter cut into the circuit, input signals of 1875 c.p.s. are accepted and all other frequencies and noise are rejected.

The Automatic Tape Feed Model AT-2, may be cut in or out of the circuit as required by means of the "ON-OFF" switch located to the right of the inkwell.

Figure 2-1 shows a block diagram of the whole circuit. The input waveform is shown as it is received by the unit. This signal then enters the "frequency doubling" stage where the signal amplitude and "between signal" noise are automatically controlled and the input frequency doubled. The waveform leaving the "frequency doubler" stage shows a higher amplitude and twice the frequency.

The signal then enters the "rectifier" stage where it is rectified, "between signal" noise further reduced, and additional automatic gain control introduced. These first two stages produce a high degree of automatic gain control so that a manual control is un-

necessary. The waveform leaving the "rectifier" stage shows the rectified signal (the average value of  $\frac{1}{2}$  the wave).

A portion of this rectified signal is then fed into the "electronic eye" which acts as an "on-frequency" indicator when the input filter is used.

The main signal enters the "phase inverter" stage where automatic slope compensation for signals of varying amplitude is attained along with a phase inversion. The waveform leaving the "phase inverter" stage shows the inverted wave.

The output of the phase inverter is direct coupled to the grids of the two 6V6GT (V105 and V106) tubes of the "power amplifier" stage. The push-pull output of this stage supplies the power to the pen coil. The waveform leaving the "power amplifier" stage shows the signal delivered to the pen coil.

#### 2. CIRCUIT ANALYSIS.

The input of the recorder circuit accepts signals balanced to ground or with one side grounded. Signals varying from 0.07 volts through 7 volts at 600 ohms will operate the unit at constant output amplitude. Figure 2-2 shows the schematic wiring diagram of the unit.

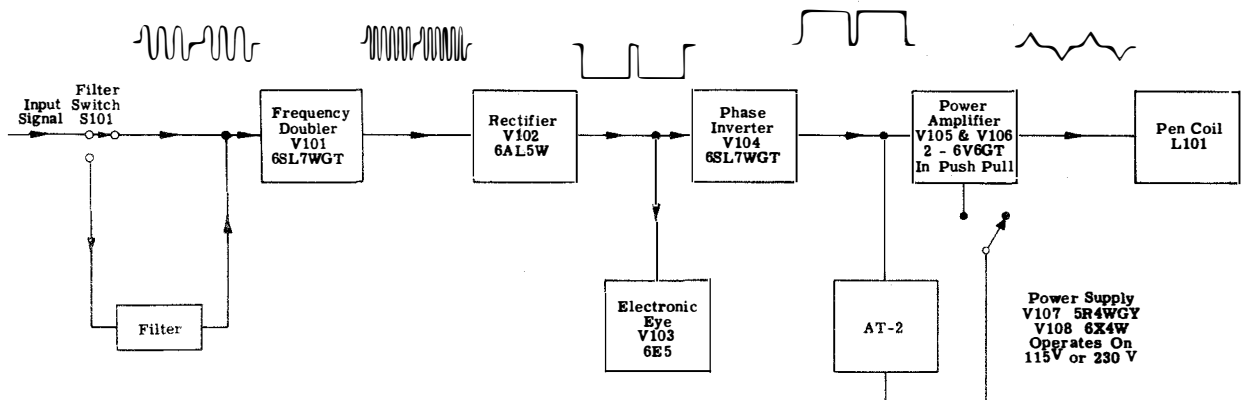


Figure 2-1. Electronic Circuit — Block Diagram

By means of front panel switch S101, the input signals may either be switched directly to input transformer T101 or through filter Z101 and then to the input transformer. When the filter is used, signals of 1875 c.p.s. are allowed to pass through to input transformer T101, while other frequencies (and noise) are attenuated. Figure 2-3 shows the amount of attenuation in D.B. for frequency values either side of 1875 c.p.s. With the filter cut out of the circuit, frequencies from 1000 c.p.s. through 3000 c.p.s. will operate the unit with substantially flat response.

Tube V101 is biased to cut-off by virtue of resistor R116 in the negative bias supply. The plates of V101 are tied together and connected to the primary of interstage transformer T102. This arrangement makes possible several desirable features.

Since the tube conducts on positive signal peaks only, in push-pull fashion, the common plate circuit acts as a frequency doubler resulting in amplified signals twice the original frequency appearing on the cathode of V102 for rectification. This means that the signal may be converted into D.C. using a very low value for the by-pass filter condenser C103, thereby causing much less distortion of the D.C. signal blocks due to capacity.

Another desirable feature is that tube V101 automatically controls signal amplitudes and "between signal" noise. Since the tube grids operate on positive halves of the signal, they draw current which appears as a D.C. voltage across resistor R101. This voltage has a negative polarity with respect to the grids. Since it does not disappear during immediate no-signal intervals, due to the presence of C101, it tends to drive the tube deeper into the cut-off region. This means that "between signal" noise will not trigger the grids and pass through V101 unless noise peaks are practically the same amplitude as signal peaks. Therefore, with the background control set at zero, the signal itself determines the amount of D.C. voltage across R101 (as the signal increases and decreases in amplitude, a corresponding increase and decrease in D.C. voltage prevails across R101). It is this automatically biasing voltage which tends to reduce noise between signals and also acts as an automatic signal leveller by affecting the gain to V101.

Values for R101 and C101 have been chosen so that the D.C. voltage will remain across R101 for approximately .3 seconds after the message has been completed. This means that .3 seconds after the message has stopped, the D.C. voltage across R101, held by C101, will leak off and background noise will pass through V101 to ultimately cause chatter at the drive pen.

If the time constant was made longer by using other values for R101 and C101, the received signal should be "dropped out" if the signal had a fading characteristic faster than the decreasing voltage across R101. The background chatter, if objectionable, may

be removed during no message periods by operating the background control.

The background control allows a predetermined amount of negative voltage, from the negative power supply, to bias V101. In operation, this control should be moved clockwise from zero at a very slow rate until the pen chatter stops. If more bias than necessary is applied, the sensitivity of the circuit will decrease and cause "drop-outs" on weak signals. For extremely weak and fading signals, the background control should remain at zero.

The rectified, or D.C. component, of the input signal appears across resistors R102 and R103. The voltage appearing across R103 is negative with respect to the diode plates of V102 and drives the first grid of the twin triode V104 to "cut-off". The voltage appearing across R102 is positive with respect to the cathodes of diode V102 and in combination with storage capacitor C102 acts to place an automatic bias on the cathodes of diode V102. This again tends to reduce "between signal" noise and the transfer gain of V102.

The biasing voltage appearing across the R102, C102 combination operates in a similar manner to that of the biasing voltage appearing across R101, C101 combination except with opposite polarity. The entire circuit operates as a two-stage device for reducing "between signal" noise and at the same time functions to produce such a high degree of automatic gain control that no manual gain control is necessary.

Due to the rise and decay time of the tuned circuit of the input filter Z101, the code characters appearing at the output of V102 will have sloping sides. This condition will become more pronounced as the dot cycle speed is increased.

In the absence of a signal, the first grid of the twin triode V104 is unbiased and the first triode section is in a highly conducting state. In the presence of a signal, this section is driven to cut-off. Changes in signal amplitude going into this first grid are likely to cause bias distortion of the resultant code signals due to the sloped side characteristic previously mentioned.

This bias distortion is greatly reduced by using resistors R121 and R122 to vary the operating point (the point at which the tube goes to "cut-off" from its conducting state) of the first triode section of V104 in step with changes in signal amplitude.

The resistor network allows a small amount (about  $\frac{1}{8}$ th the amplitude of the signal) of positive potential from the R102, C102 automatic biasing circuit to appear on the grid of the first triode of V104. This results in two distinct voltages operating on the grid of V104; a negative going signal voltage which drives the tube to "cut-off", and a smaller positive going holding voltage which tends to keep the tube more in its conducting region.

If a dot cycle of large amplitude appears on the grid of the first triode section of V104, the tendency would

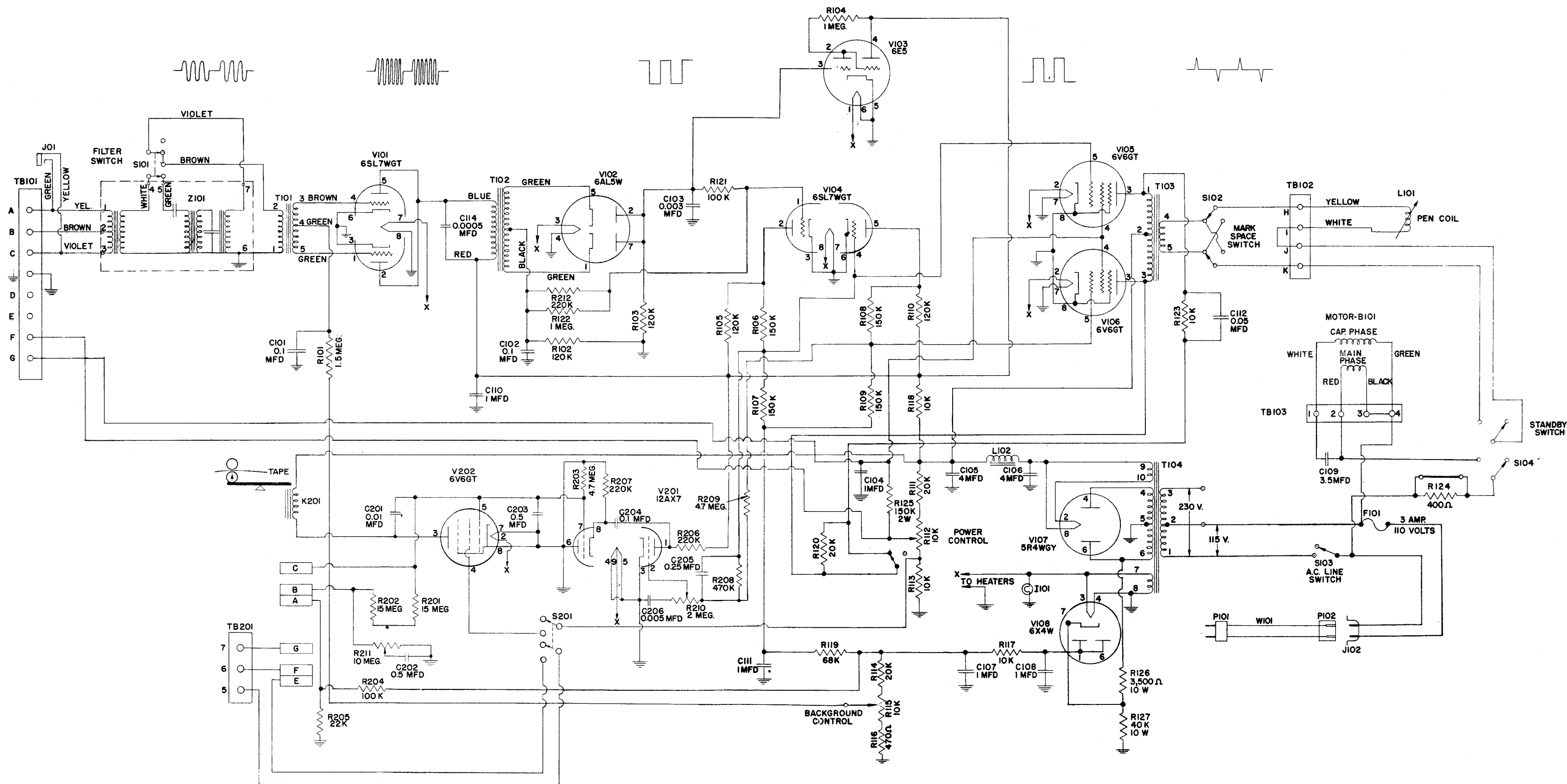


Figure 2-2. Schematic Wiring Diagram

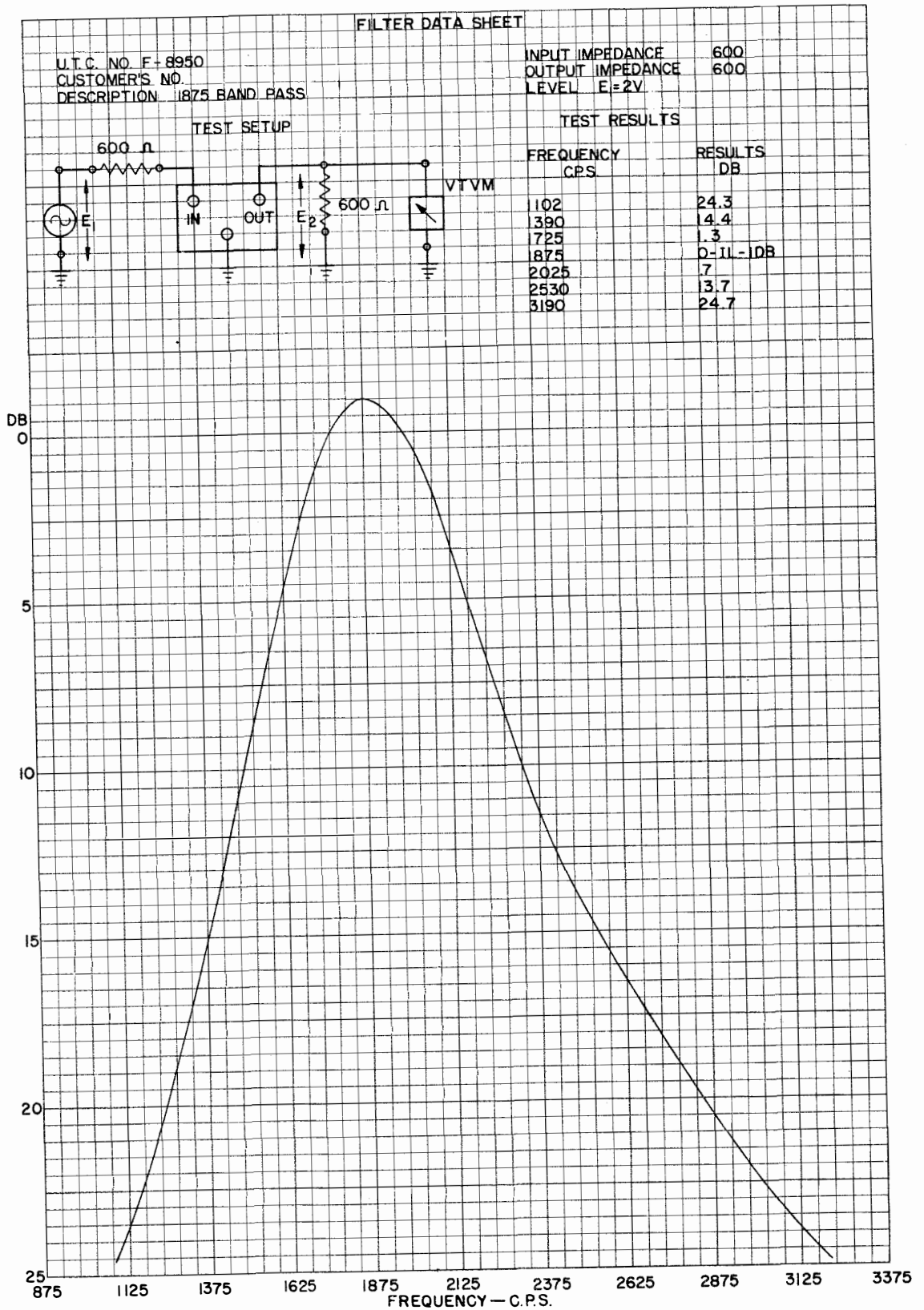


Figure 2-3. Filter Data Sheet



be for the sharp cut-off triode to "cut-off" practically on the base line of the dot cycle characters. However, R122 now allows a relatively large positive voltage (derived from the same dot cycle of large amplitude across R102) to also appear on the grid. This means that more of the negative signal voltage of the dot cycle character is now required to produce "cut-off". The tube now operates at a point considerably remote from the base line of the negative dot cycle character (on a narrower portion of the slope).

As the signal amplitude decreases, the positive bucking voltage also decreases allowing the tube to again cut off more sharply and again nearer the base line. However, the base line is now narrower because of the decreased signal amplitude.

In this manner, automatic slope compensation for signals of varying amplitude is attained.

Electron Ray Tube V103 is useful in indicating the presence of signals when the "standby" switch, S104, is in the "standby" position.

When filter Z101 is cut into the circuit, V103 acts as an "ON-frequency" indicator. The eye will fully close when a tone signal of approximately 1875 c.p.s. is applied to the input. It is sometimes desirable to reduce receiver gain so that a relatively weak signal reaches V103, allowing the eye to give a sharper "ON-frequency" indication. The receiver gain may then be brought up to the desired value. When used as an "ON-frequency" indicator in the presence of very strong signals, V103 will give a broad indication of the correct frequency because of the automatic volume control action present in the front end circuit which tends to bring any falling signal up to a constant level.

The second triode section of V104 is direct coupled to the output of the first triode section and acts as a direct-coupled phase inverter. The output of both triode sections is then direct coupled to the grids of V105 and V106. The push-pull output of V105 and V106 supplies the power for driving the pen coil.

The entire circuit from the output of V102 through V104, V105 and V106 represents a direct coupled or D.C. amplifier (no coupling capacitors are involved anywhere in the circuit). This means that the circuit will stay in the "ON" position during long dashes and will not "trigger off" until the dash terminates. Resistors R106, R107, R108 and R109 form the D.C. coupling network between V104, V105, and V106.

Power control resistor R112, may be varied to change the voltage supplied to the screen grids of V105 and V106, thereby varying the power supplied to the pen coil. Turning the control clockwise up to 90% of rotation (or about "5" on the panel indicator dial) increases the power supplied to the pen coil. This setting is usually sufficient for all speeds up to 75 or 80 dot cycles per second. For signals of higher speeds or where more power is required, the control may be advanced beyond this point to operate a toggle switch. This switch is built into the power control po-

tentimeter and opens when the control is completely advanced. The opening of the toggle switch decreases the resistive load across the primary of output transformer T103 by adding resistor R120 in series with R123. The combination of R123 and C113 at lower speeds and R123, C113 and R120 at higher speeds in shunt with the primary induction of T103 gives a slight delay to the rise and decay time of the primary. This reduces high amplitude, fast acting noise peaks which may sometimes penetrate through to the output transformer.

A "Mark-Space" switch, S102, is provided to allow a reversal of code signals when desired, as in receiving frequency-shift signals. These signals may be received by tuning one of the shift signals to agree with 1875 c.p.s., the other shift signal falling above or below this frequency.

One section of the "standby" switch, S104, is in series with the pen coil, L101, and the output transformer, T103, secondary. The other section is in series with the A.C. power supplied to the tape puller motor, B101.

A mechanical arrangement is also provided in conjunction with "standby" switch, S104, to lift the tape puller drive wheel from contact with the drive cone during standby periods to prevent flats from occurring on the composition rim of the drive wheel.

"Standby" switch, S104, is connected directly to the A.C. power line (independent of S103) so the "standby" switch must be used to turn off the power to the tape puller. In this way, the power cannot be removed from the tape puller while the drive wheel is still in contact with the cone.

### 3. AUTOMATIC TAPE FEED — MODEL AT-2

The AT-2 Automatic Feed Unit consists of two tubes, a special relay and various component parts mounted on a sub-chassis, suitable for mounting on the back of the RD-110/U Recorder panel. The Unit is mounted and arranged so that the arm of the special relay will engage the lift bar of the tape puller drive head (part of the RD-110/U Recorder) and will allow automatic tape pulling action.

When the Recorder is turned on and ready for operation, and the Recorder standby switch in "ON", the tape puller will operate to pull tape. If the "ON-OFF" switch of the Automatic Tape Feed Unit is in the "ON" position however, the relay will become energized and the relay arm engaging the lift bar of the tape puller drive head will raise, lifting the idler pulley from the drive pulley. The drive pulley will continue to turn, but tape will not be pulled. Tape will not be pulled even in the presence of a high background noise level.

With the advent of a code signal the relay will become de-energized instantly, allowing the idler pulley to drop against the drive pulley and cause tape to be pulled. At a predetermined interval, after the code signal has stopped the relay will become energized,

the idler pulley will raise and tape pulling action will cease.

Referring to the schematic diagram part dwg. B3025, it will be noted that one end of resistor R208 connects to pin #5 of V105 (6V6GT) on the Recorder chassis. The other end of R208 connects to one end of variable resistor R210 and the center arm of R210 goes to the grid of one section of the sharp cutoff triode V201 (12Ax7).

In the absence of a code signal pin #5 of XV105 has a negative potential of approximately 35 volts. This same potential occurs on the grid of the aforementioned triode V201 by direct coupling through resistors R208 and R210 causing a state of complete cutoff in this triode section.

With the advent of a code signal the initial pulse of the first character will drive the grid of the 6V6GT (pin #5 of V105) from a negative voltage of approximately 35 volts to 0 potential. This positive going voltage passing through C205 will also drive the first triode section of V201 into its conducting region, producing an amplified negative going voltage on its plate. This negative going pulse passes through capacitor C204 and is rectified in the diode connected circuit of the second section of V201. The resultant negative DC potential appears across resistor R203 and capacitor C203 and drives tube V202 (6V6GT) to cutoff. The collapse of current through V202 produces a no current condition in the coil of relay K201, causing the relay to become de-energized, the idler pulley to drop against the drive pulley and the start of tape pulling action.

Variable resistor R210 and capacitor C206 form an RC low pass filter network. When the variable arm of R210 is turned to its extreme position toward capacitor C206, full filtering action is obtained. When the variable arm of R210 is turned to its extreme position toward resistor R208, a complete absence of filtering action is obtained.

When the variable arm of R210 is positioned for full filtering action, fast acting noise peaks and all background noise in general will be prohibited from reaching the grid of the first section triode V201. Noise peaks at the grid of tube XV105 (pin #5) will produce approximately (35) thirty five volts of potential, however, after passing through the RC network R210, C206, these peaks are reduced to approximately (25) twenty five volts, leaving approximately (10) ten volts of bias still remaining on the grid of the first triode section of V201. Since this triode cuts off at approximately (4) four volts it will remain nonconducting in the presence of noise.

It is the action of this simple RC lowpass filter in connection with the direct coupled automatic bias derived from the grid of V105 which producing such a high degree of noise filtering action.

It will be noted that resistor R209 connects from pin #5 of V106 (the grid of the alternate output 6V6GT) to the input circuit network. This arrangement will

allow the absence of tape pulling action in the presence of a continuous and constant carrier which may occur during no signal intervals when receiving frequency shift transmissions. This arrangement operates as follows:

In the presence of a constant carrier the grid of V105 will remain at 0 potential, which means that the grid of the first triode section of V201 would ordinarily lose its bias and cause the relay to operate. However, at the same time the grid of V106 will now go negative by approximately (35) thirty five volts and remain at this potential for the duration of the constant carrier.

Resistor R209 allows a portion of this negative voltage to appear on the grid of the first triode section of V201, effectively keeping this tube in its nonconducting state so that no voltage transfer may continue on in the circuit to ultimately cause the release of the relay armature which will allow tape pulling action.

It should be noted and remembered that in the absence of a code signal (and/or in the presence of a constant carrier) tube V202 (6V6GT) has 0 bias allowing it to conduct and energize the relay coil, keeping the armature in the "pulled down" position. With the armature in the "pulled down" position the idler pulley is lifted away from the drive pulley and no tape pulling action occurs.

The "delay" action operates as follows: Referring to the schematic diagram B3025, relay contacts "A" and "B" are in contact when no signal is present (relay armature "pulldown" condition) this allows approx. 30 volts negative (derived from point "D" in negative network) to be applied across R211 and C202. C202 holds all or a portion of the voltage depending upon its setting with respect to R211. When a signal occurs the relay armature is released allowing contacts "B" and "C" to come together. The negative voltage held by the charged condition of C202 is now applied to the grid of V202 where it is augmented by the rectified negative signal pulses.

At the termination of a signal the relay will delay in pulling back to its original position until the charge on C202 is dissipated through R211 to ground. The delay period may be varied by rotating the variable arm of R211.

Resistors R201 and R202 provide a reduced relay coil holding current automatically as follows:

In the presence of a signal the relay is released and contacts "B" and "C" are together. In this position R201 and R202 are shorted out and produce no action. When a signal ends and the delay period has terminated, (C202 discharged) tube V202 will have no bias voltage and its plate current through the relay coil will go to approx. 25 ma. This will immediately operate the relay. When the relay operates, contacts "B" and "C" will open putting R201 and R202 in the circuit. These two resistors allow a small amount of predetermined negative voltage from the negative supply network to appear on the grid of V202 which

reduces the plate current through the relay coil to approx. 10 ma.

This means that during operational periods the relay coil is actuated with a heavy current but during standby periods the holddown current is reduced to a moderate value, so that there is no tendency for the coil to get warm during standby periods.

Auxiliary contacts E, F & G are brought out to a terminal strip on the automatic tape feed unit and may be used for a variety of purposes.

An indicator lamp, gong or other devices may be connected externally, using these contacts to produce an external indicating means to show the start and end

of certain texts or schedules.

By using these external contacts two recorders equipped with Automatic Tape Feed Units may be connected so that one recorder acts as a standby for the other. In this arrangement both recorder inputs are connected to a receiver output however, one side of the standby recorder input is connected to the receiver output through contacts 5 and 6 (as marked on the terminal strip) on the main recorder Automatic Tape Feed Unit.

When a signal starts, the main recorder will operate opening terminals 5 and 6 so that the standby recorder will not operate.

## SECTION 3 INSTALLATION

### 1. UNPACKING.

The entire equipment is packed in one box together with two Instruction Books. Use care in uncrating because the unit contains electron tubes and other fragile components

### 2. INSTALLATION.

The equipment should be installed in a protected location as close to a convenience outlet as possible. The cabinet is designed for standard Navy rack mounting.

The equipment is wired to operate on 115 volts A.C. but may be changed to operate on 230 volts A.C. by performing the following changes inside the chassis: (Refer to Figure 3-1.)

a. Remove shorting bus bar from resistor R124. This may be accomplished by loosening the two #6-32 screws and nuts located on the terminals of R124.

After the bus bar is removed, the screws and nuts should be replaced so that the leads to R124 remain firmly connected.

An alternate method is to cut the bus bar cleanly, at a point near its center, with a pair of cutters. Bend back the severed ends and either tape them up or place a piece of plastic tubing over each end. In this case when it is necessary to change back to 110 volt operation, each end may be bent back into its original position allowing the severed ends to touch and then firmly solder them together.

b. Unsolder wire from Terminal 2 on Power Transformer T104 and resolder to Terminal 3 on T104.

### 3. INITIAL ADJUSTMENTS.

a. No initial adjustments are necessary to prepare the recorder for operation. For the step-by-step procedure for operating the unit, refer to Section 4, OPERATION.

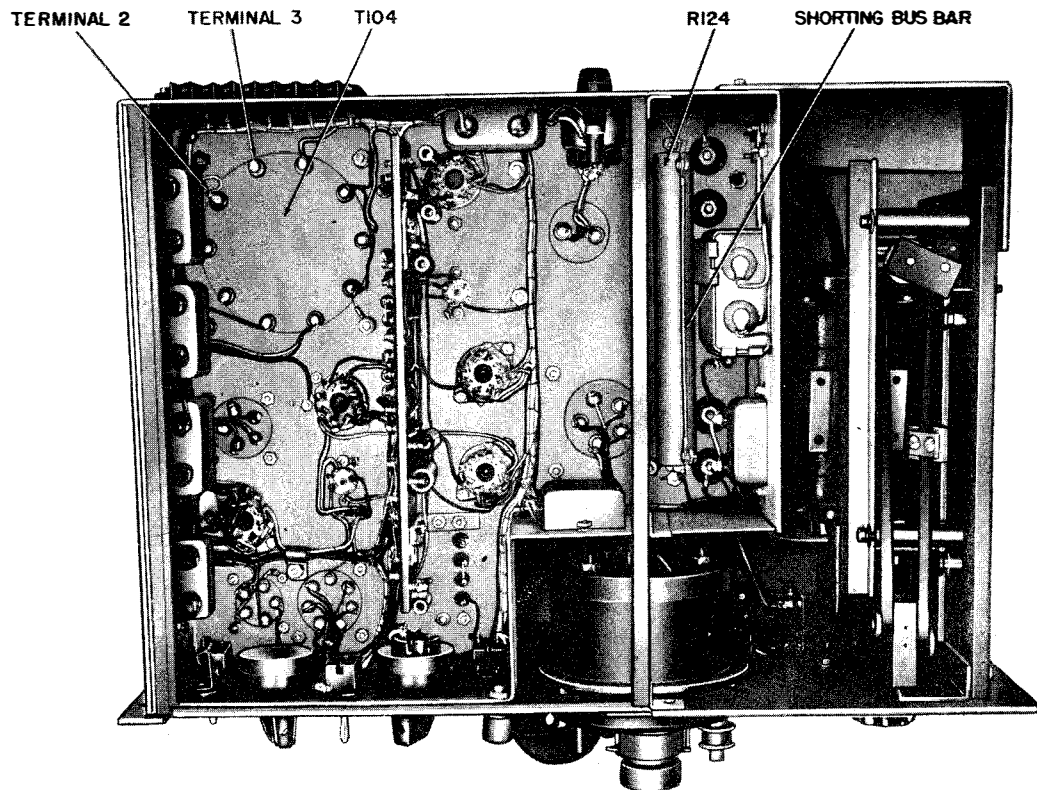


Figure 3-1. Changes for 230 VAC Operation

## SECTION 4 OPERATION

### 1. INTRODUCTION.

The Navy Type RD-110A/U Code, Tape Recorder inscribes coded signal text by means of an ink trace on paper tape suitable for manual transcription. The Ink Recorder is a complete piece of equipment composed of the following six units housed in one cabinet.

- a. Recorder Head
- b. Recorder Electronic Chassis
- c. Ink Well
- d. Tape Puller
- e. Tape Storage Chamber
- f. Automatic Tape Feed Model AT-2

- a. Power (to recorder head)
- b. Background Control
- c. Filter In-Out Switch
- d. Mark-Space Switch
- e. Monitor Jack
- f. Tape Speed Control
- g. Standby Switch
- h. AC line Switch
- i. Tape Puller Dial Lock
- j. Filter Control
- k. Delay
- l. Automatic Tape Feed on-off Switch

An Electron Ray Indicator Tube (electronic eye) is provided on the front panel for an ON-frequency indication when the input filter is used.

A pilot light is also included on the panel to indicate when the equipment is turned on.

As shown in Figure 4-1, the front panel has the following controls:

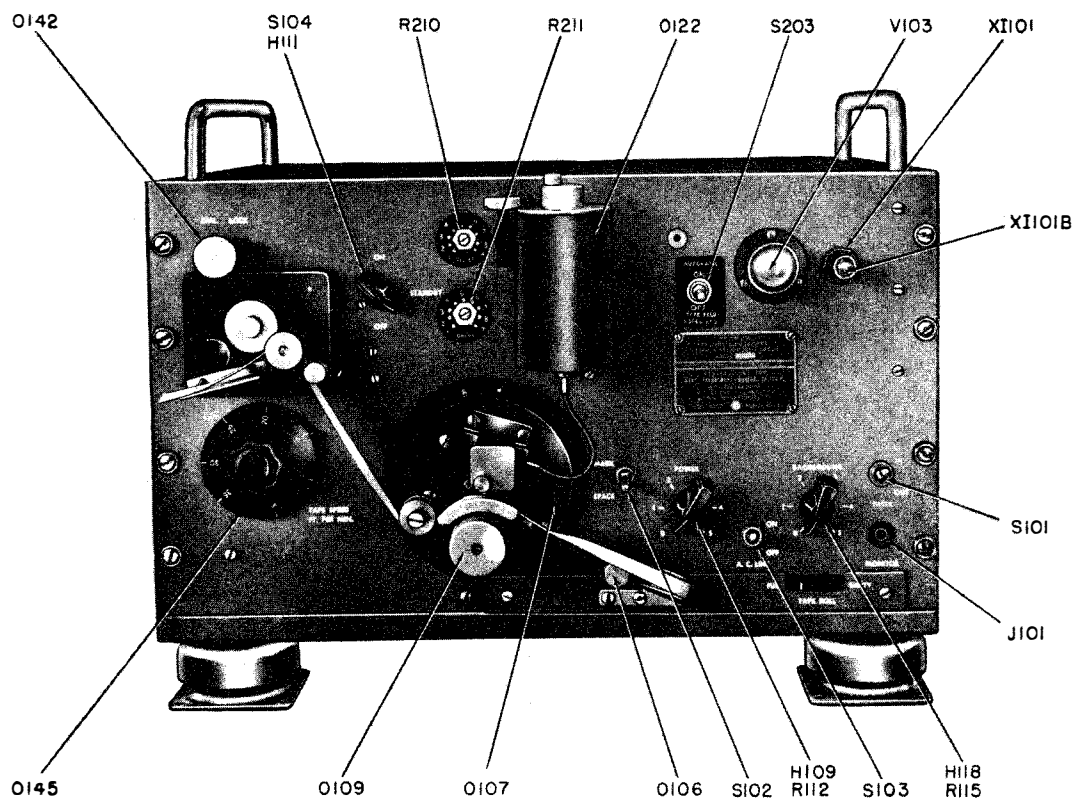


Figure 4-1. Front Panel

## 2. CAPABILITIES AND LIMITATIONS.

The recorder is capable of receiving signals of a voltage range from 0.07 volts to 7 volts at frequencies from 1000 c.p.s. through 3000 c.p.s. at a tape speed from 5 through 35 feet per minute.

The input terminal block TB101 provides the following terminals A and C as the 600 ohm input. Terminal B is the center tab. When an unbalanced to ground situation is required, either terminals A or C should be grounded to the ground terminal with a wire jumper. When a balanced to ground condition is required, terminal B should be connected to the ground terminal in the same manner.

## 3. NORMAL OPERATION.

a. FEEDING TAPE.—Place a blank roll of tape on the hub in the tape drawer (holding the tape indicating arm back out of the way with the fingers) with the free end of the tape coming from the left side of the roll. Place the tape roll firmly down on the hub so it will clear the top of the opening in the panel when the drawer is closed. Rotate the roll in a counterclockwise direction and feed the tape through the slot located at the side of the guide knob on the front edge of the tape drawer. Then bring it around the side of the guide knob, twist the tape 90° in a counterclockwise direction so it will pass under the tape guide pin on the recorder head, and feed it over the pen guides on the recorder head. Feed the tape under the large roller and on up to the tape puller drive pulley, passing it over the drive pulley centering pin.

b. INK WELL.—The ink well consists of a stainless steel reservoir, a valve, and a pump. When the large ink well knob is rotated in a counterclockwise direction, a gradual increase in ink flow will occur to suit operational requirements. Clockwise rotation will gradually decrease the ink flow, finally shutting it off completely. To initiate a flow of ink, a small pump is provided with its knob located on top of the valve knob. This pump is designed to overcome trapped air in the fuel line and to replace the air with ink. It is not meant to build up enough pressure to blow out a clogged pen (refer to Section 5, OPERATOR'S MAINTENANCE).

To fill the ink well, shut off (most clockwise position) the ink valve, lift off the cover and fill reservoir two thirds full of ink. Replace cover and open valve two full turns. Raise pump knob to maximum height and pause to allow ink to enter pump chamber. Let pump knob fall of its own weight or push knob back to its original position.

Repeat this operation until ink appears at the pen point and a steady flow of ink persists on the paper tape (which is being drawn under the pen point at slow speed). After ink is flowing freely, rotate the valve in a clockwise direction until the required weight of ink is applied on the tape.

c. RECORDER.—The pressure of paper tape under

the pen point is adjustable by rotating the tape guide knob located at the lower front of the cover assembly. After threading the paper tape over the guide, under the pen point, this knob should be turned clockwise until the paper tape just slightly more than touches the pen point and a good clean ink line is observed.

The preceding operation should be done while tape is being pulled which allows the spring loaded arm of the tape guide to remain in the "down" position.

When the tape puller standby switch S104 is turned to stop the tape pulling action, the absence of tape tension allows the spring loaded tape guide arm to move upward against the pen point thus effectively sealing off the ink supply. This allows the recorder to remain in the "standby" position for indefinite periods of time without the necessity of shutting off the ink at the ink well.

d. TAPE PULLER.—The tape puller is designed to allow paper tape to be pulled through the recorder head at speeds of from 5 to 35 feet per minute. Very accurate speeds may be realized at 5, 10, 15, 20, 25, 30 and 35 feet per minute and at the same time any speed between these distinct steps is available.

Power to the tape puller motor is turned off by turning the "standby" switch on the front panel to its "OFF" position. This operation also opens the circuit to the recorder head, raises the friction drive wheel from the cone and raises the idler roller from the drive pulley to keep "flats" from occurring on the friction drive wheel and drive pulley.

e. RECORDER ELECTRONIC CHASSIS FRONT PANEL.—The recorder electronic circuit has the following front panel contents:

(1) POWER CONTROL.—This control is a variable resistor which allows a voltage of from approximately 50 up to 100 volts +DC to be applied to the screen grids of V105 and V106 (6V6GTs). A switch is included in this control such that when the control is in its most clockwise position (power on full) the switch operates to open the circuit of C113 and R123 connecting them in series with R120, across the primary of the output transformer, T103.

Two distinct power level requirements can be met in the RD-110/U and RD-110A/U Ink Recorder. The unit when initially set up operates in the moderate power range; all nominal speed signals and schedules in general may be met with the recorder in this low power position. However, it must be remembered that in the low power setting, the power control on the front panel should in general be turned full on. If at any time higher power requirements are desired it is only necessary to short terminals "F" and "G" on the terminal board at the rear of the chassis. With terminals "F" and "G" shorted the power control may be set in any desired position to give appropriate power.

**CAUTION**

It should always be remembered that with terminals "F" and "G" shorted the recorder should not be left in the standby position with AC power on and no input signal. Under these conditions tube V106 might draw excessive standby current and become damaged. In other words, if the recorder must be left in the standby position terminals "F" and "G" should be temporarily in shorted. When using the Automatic Tape Feed in conjunction with the recorder a unique arrangement is possible whereby the shorting and unshorting of terminals "F" and "G" is done automatically, in step with the presence or absence of an input signal so that high power requirements may be met without damage to the output tubes even when the unit is placed in the standby position.

In order to accomplish this arrangement it is only necessary to bring two wires from terminals "F" and "G" up and across the chassis and connect to terminals "5" and "6" on the Automatic Tape Feed terminal board. In this way high power requirements may be met during operational periods while a low power condition exists during standby periods.

If anything happens to the main recorder at any time so that the signal does not reach its Automatic Tape Feed Unit, contacts E and F (#5 and #6) will close allowing the second recorder to take over.

This allows full power to be applied to the pen coil and is used only when extreme speed is required.

(2) BACKGROUND CONTROL.—The background control is a variable resistor which allows a variable negative voltage to be supplied to the grids of V101 (6SL7WGT).

This control may be left in its zero position or advanced just sufficiently to remove the prevailing background noise.

(3) FILTER SWITCH.—This D.P.D.T. toggle switch, S101, operates to throw an 1875 cycle input filter, Z101, in or out of the input circuit.

(4) MARK-SPACE SWITCH.—This D.P.D.T. toggle switch, S102, operates to reverse the current in the pen coil, L101, to give a reversed reading on the inked tape.

(5) STANDBY SWITCH.—This D.P.D.T. microswitch, S104, operates to turn the tape puller off and on and also the signal power supplied to the pen coil.

This switch is also mechanically arranged so that in its "OFF" position it slightly raises the friction drive wheel and tape drive pulley so that no flats will occur on these members during long periods of "standby".

(6) AC LINE SWITCH.—This S.P.S.T. toggle switch, S103, controls the total AC power for the equipment.

(7) MONITOR JACK.—A monitor jack, J101, is provided at the input of the circuit so that the quality of the input signal may be ascertained.

(8) TAPE PULLER DIAL LOCK.—A tape puller dial lock is provided so that the tape puller may be "Locked in" and held at any desired speed.

After selecting the desired speed as indicated on the dial, the dial lock knob may be turned in a clockwise manner which will maintain the tape puller in this fixed position. The tape puller speed cannot now be changed until the dial lock knob is turned in a counter-clockwise manner relieving the clamping action.

(9) AUTOMATIC TAPE FEED SWITCH.—This D.P.D.T. toggle switch, S201, cuts the Automatic Tape Feed Unit in or out of the circuit and at the same time closes or opens the series circuit connecting relay points E, F and Terminals 5 & 6 on TB201.

(10) FILTER ADJUSTMENT.—Variable resistor R210, located to the left of the inkwell, is part of an RC-low pass filter network. When the variable arm of R210 is turned to its extreme position, figure 1 on the scale, full filtering action is obtained. When turned to figure 9 on the scale, a complete absence of filtering action is obtained.

(11) DELAY ADJUSTMENT.—Variable resistor R211, located to the left of the inkwell and directly under the filter adjustment, controls the amount of time delay from the termination of a signal to the parting of contacts "B" and "C" on relay K201. This delay varies from one to three seconds after the code signal has stopped, allowing pulling action of the tape to continue smoothly during short breaks in the code text.

**4. SUMMARY OF OPERATION.**

To set recorder for standby, leave standby switch in "OFF" position and turn AC line switch to "ON". The filter switch should be set to the "IN" position if the received signal is to be at 1875 c.p.s.

To receive a message, set the standby switch to the "ON" position and the background control to its "ZERO" position (or advanced just sufficiently to remove prevailing background noise). The power control should be set so that a good strong signal is received on the tape. The tape feed control should be set to the number of feet per minute required, depending upon the speed of the incoming signals.

When the filter switch is set to the "IN" position, the "electronic eye" will be fully closed when the received signal is approximately 1875 c.p.s. The receiver gain should be reduced for tuning purposes only so that a relatively weak signal reaches the eye tube.

Frequency shift transmission may be recorded by tuning one of the shift signals to agree with 1875 c.p.s. On the recorder, the "mark-space" switch is turned to "Mark" or "Space", whichever position allows the information to be read "right side up"!

## SECTION 5

### OPERATOR'S MAINTENANCE

**1. ROUTINE CHECK CHARTS.**

Table 5-1 indicates items that are to be checked hourly and at the beginning of each watch.

**2. EMERGENCY MAINTENANCE.**

**Notice to Operators**

Operators shall not perform emergency maintenance procedures without proper authorization.

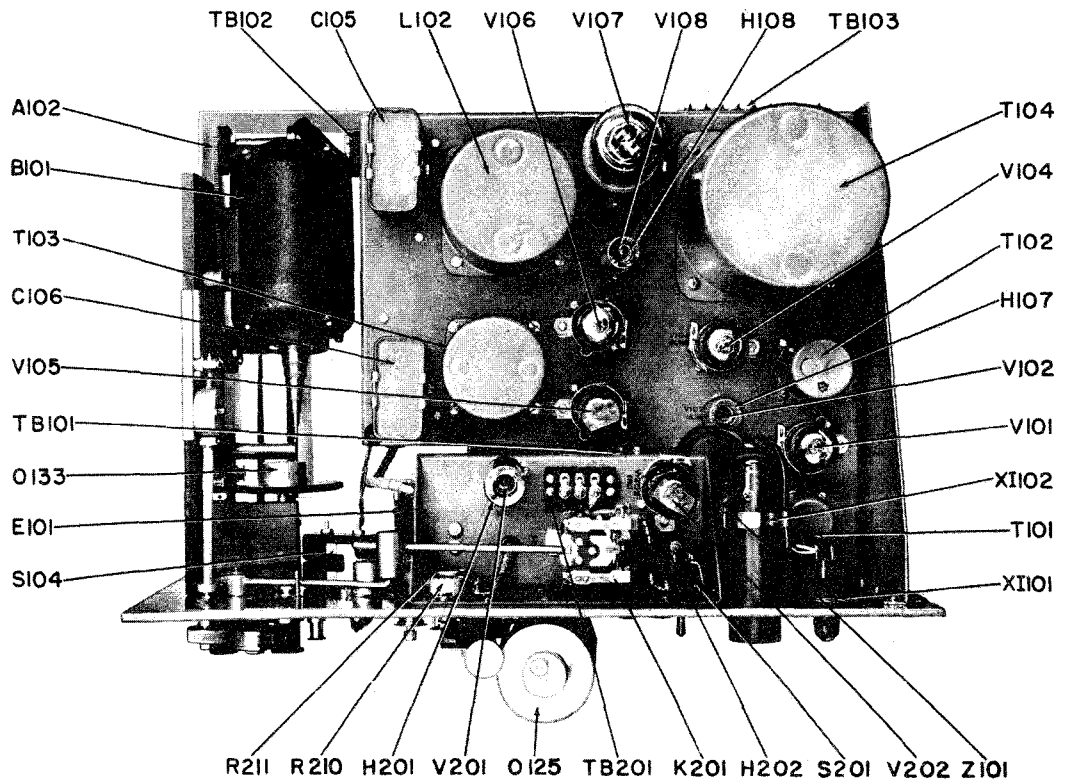
**a. REPLACEMENT OF ELECTRON TUBES.—**

There are ten electron tubes in the recorder, as shown in Figure 5-1. When removing tubes, use a gentle rocking motion. When inserting the replacement tube in the socket, align the tube guide and the socket slot; use a steady pressure and push straight down until the tube is seated properly. Do not force; otherwise damage to the socket terminal clamps and wiring may result.

b. There are no other items of equipment that can be replaced by operators.

**TABLE 5-1. ROUTINE CHECK CHART**

WHAT TO CHECK	HOW TO CHECK	PRECAUTIONS
Tape Supply	Read indicator on front of tape drawer.	Keep tape roll large enough to receive a complete message.
Ink Supply	Lift off ink well cover and visually check ink supply.	Keep well between $\frac{1}{3}$ and $\frac{2}{3}$ rds full.



**Figure 5-1. Top View**



## SECTION 6

### PREVENTIVE MAINTENANCE

#### 1. ROUTINE MAINTENANCE CHECK CHART.

The maintenance of radio equipment does not begin when the equipment fails to operate in a normal manner. Maintenance must begin when the equipment is first installed. By adhering to a regular schedule of preventive maintenance, most common faults and breakdowns will never occur. Only a few minutes each day are required to insure that the equipment is kept entirely free from dirt, dust, sand, excess moisture, vermin, or insects; that all cables and plugs of the equipment are clean and tight-fitting; and that no part of the equipment is being abused or neglected. Table 6-1 lists the minimum routine maintenance checks to be made at periodic intervals.

#### Note

THE ATTENTION OF MAINTENANCE PERSONNEL IS INVITED TO THE REQUIREMENTS OF CHAPTER 67 OF THE BUREAU OF SHIPS MANUAL, OF THE LATEST ISSUE.

#### 2. LUBRICATION.

The tape idler guide roller requires a drop of oil occasionally. A light grade of oil should be applied to the tape drive shaft once every four months. Vaseline or heavy grease should occasionally be applied to the slide guides, the edges of the motor slide plate, and over the surface of the flexible steel belt. The tape hub should be lifted off its spindle every two months, the steel and oilite bearing thrust faces cleaned, and a few drops of light machine oil applied to the oilite face.

#### 3. 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 BNS-383, which has been designed to simplify this requirement. The card must be filled out and forwarded to BUSHIPS in the franked envelope which is provided. 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 and shore stations, 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 Publications and Printing Office.

TABLE 6-1. ROUTINE MAINTENANCE CHECK CHART

	WHAT TO CHECK	HOW TO CHECK	PRECAUTIONS
DAILY	1. Transformers, capacitors, etc.	a. Visually and manually inspect all parts for overheating and damage.	a. Remedy any signs of breakdown, overheating, or breakage.
	2. Major connections such as plate caps, wire connections, lock nuts.	a. Feel connection for possible looseness.	a. Tighten where necessary.
	3. Accumulation of dust and dirt.	a. Visual inspection.	a. Remove by best means available. b. Take care not to hit tube envelopes with cleaning equipment.
WEEKLY	1. Rotary contacts and switch contacts.	a. Visually inspect for loss of tension, poor contact, or pitting.	a. Clean, repair, or replace as necessary. b. Crocus cloth and carbon tetrachloride may be used for cleaning.
MONTHLY	1. Tube sockets and connections.	a. Examine socket contacts. b. Visually examine tube pins for cleanliness and surface pitting.	a. Replace cracked or broken sockets. b. Clean with crocus cloth.
	2. All nut and screw connections.	a. Carefully observe for any signs of corrosion, dullness, or poor contact.	a. Use crocus cloth or No. 0000 sandpaper for cleaning.
	3. Plastic valve seat washer in valve and pump barrel.	a. Remove set screw on side of valve and pump barrel. Remove valve stem.	a. Replace washer as necessary.
	4. Compound tubing on link bearing between pen and pen coil.		a. Replace tubing as necessary.
QUARTERLY	1. Tube life and time in use.	a. Review past and present tube time meter reading. b. Review manufacturer's guarantee and specified tube life.	a. Replace tube as necessary.
ANNUALLY	1. Overhaul.	a. Disassemble and clean all components. b. Replace worn or defective parts.	a. Experienced technician should disassemble and reassemble.

## SECTION 7 CORRECTIVE MAINTENANCE

### 1. LOCALIZATION.

In the normal service life of any piece of equipment, faults and breakdowns will occur. In order that the necessary repairs may be carried out in a reasonably short time, a logical testing routine must be followed. In locating trouble, it must be determined as quickly and as accurately as possible. To do this, the trouble must be localized first by circuit or stage and then by component or part in the circuit or stage. Thorough familiarity with the theory of operation of the equipment will be of tremendous help in localizing trouble quickly and easily.

### 2. REPLACEMENTS.

In all repairs and replacements, every attempt should be made to duplicate the original condition of the equipment. Standard replacement parts, such as those supplied in the spare parts for this equipment or available from stock, should be used. Particular care should be taken to run any replacement wiring in the same position and manner as the original wiring. Soldering should be done with rosin-core solder only. Figures 7-1 through 7-5 show the location of all equipment items for replacement purposes.

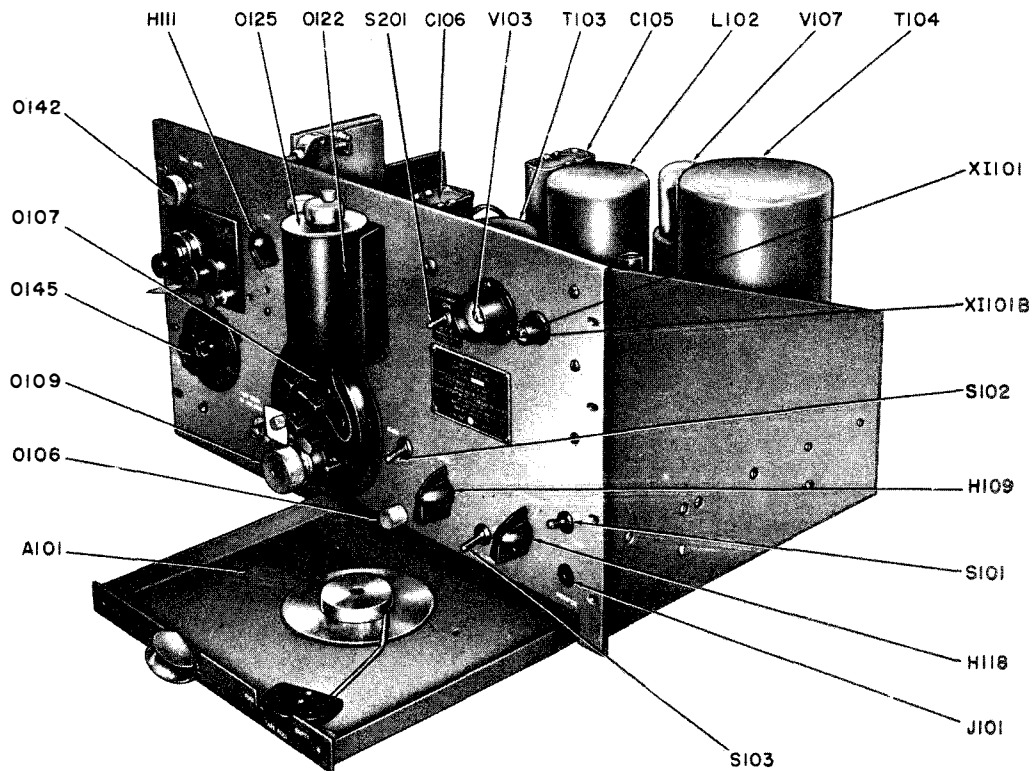


Figure 7-1. Front View

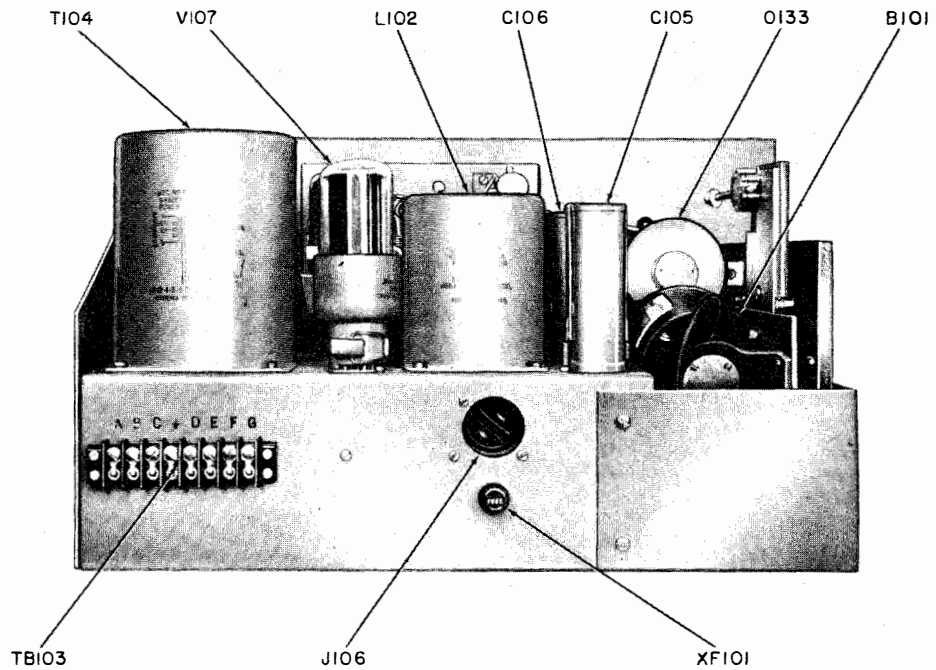


Figure 7-2. Rear View

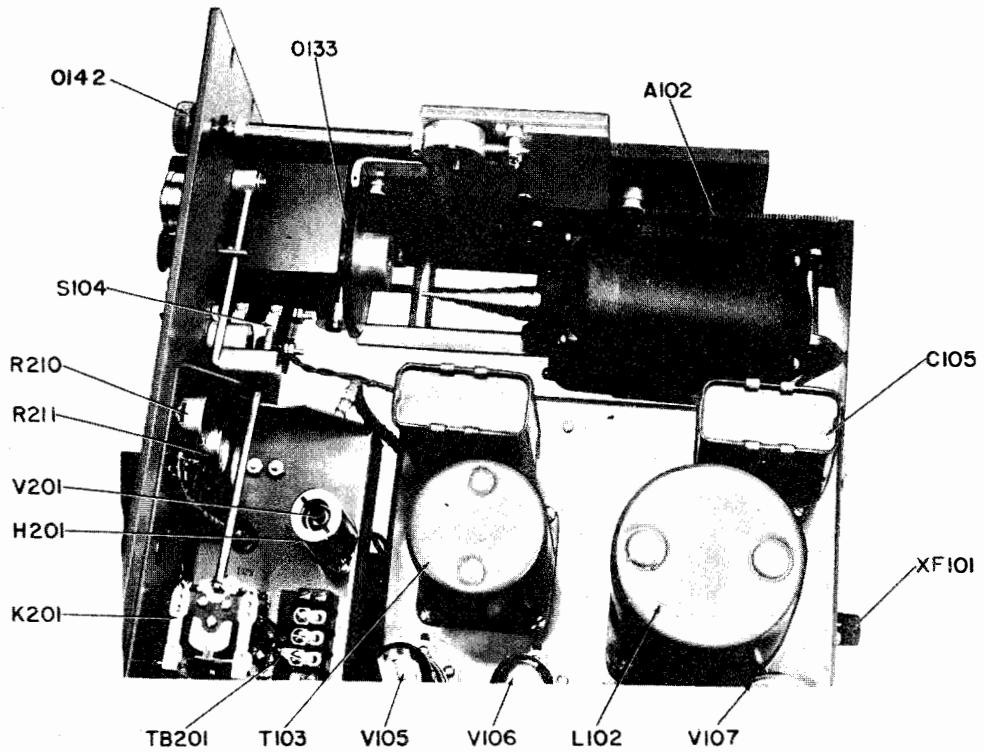


Figure 7-3. Speed Variation

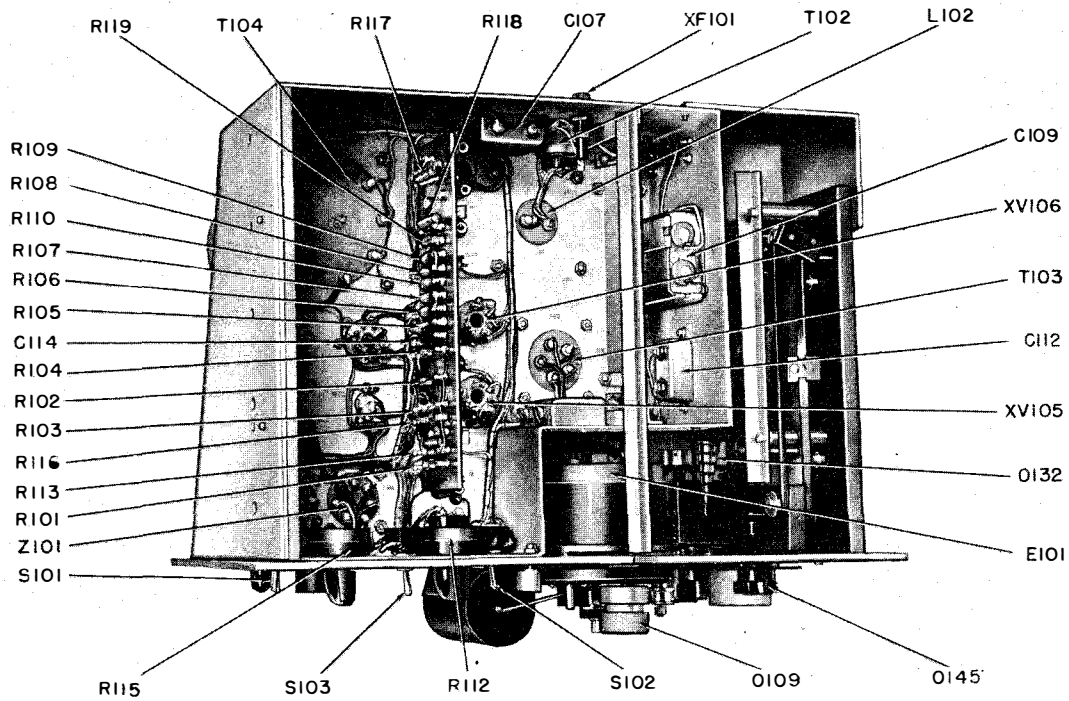


Figure 7-4. Bottom View (Left Side)

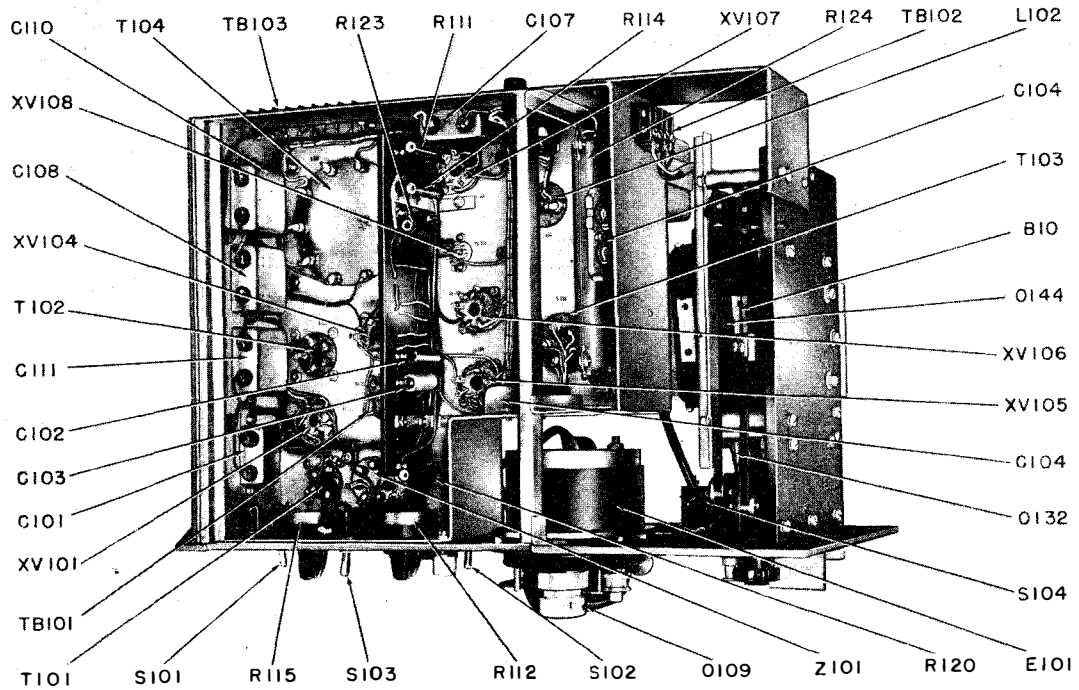


Figure 7-5. Bottom View (Right Side)

### 3. EMERGENCY REPAIRS.

In an emergency, when it is impossible to make exact replacement of parts, the same care in workmanship must be taken. The temporarily-repaired equipment should be conspicuously marked or tagged to indicate the temporary nature of the repair, and the equipment should be restored to its original condition at the first opportunity.

### 4. SPECIAL TOOLS.

Sufficient Allen wrenches for the various type Allen screws used in the equipment are kept in a tubular container located at the back of the tape drawer.

To remove the tape drawer from the unit, first slide it out as far as the stop will allow. Then press down on the stop at the center of the drawer to remove it completely.

### 5. LOCALIZING TROUBLE.

a. To replace the flexible steel belt, proceed as follows:

First loosen the old belt by releasing the tension of the "slack take up pulley" then remove the old belt from the motor slide clamp. Finally loosen the two screwdriver type screws located on the belt capstan hub. These screws are located on either side of #6 Allen setscrews in the hub. This releases the clamping action of the hub. Bring one end of the new belt along the inner side of the hub block. Bring it over and around the hub and insert it in the clamping slot, keeping it over to the left-hand side of the hub and tighten the two clamping screws. Rotate the hub in a clockwise manner until two and one half turns of the belt are around the hub. Bring the other end of the belt along over the hub block and insert it into the clamping slot from the other direction and on the right-hand side of the hub. The clamping screws will have to be loosened and then tightened again for this procedure. The belt can now be fed over the two pulleys on the hub block and brought to the rear of the tape puller and slid over the "slack take up pulley". The belt is then tightened and clamped to the motor slide plate; before tightening this clamp make sure that the motor position agrees with the dial markings.

This entire procedure is of course done with the tape puller removed from the panel.

Three screws hold the puller to the panel. The top screw (in back of the drive pulley mounting plate) and the bottom screw are #10 filister head types. The center screw (in back of the dial) is a #10 binder head type.

b. If the scraping of the pen coil occurs, proceed as follows:

Two sets of stops are used (designated as primary and secondary stops) so that the pen in itself will not have to absorb the coil impact.

To allow for any stroke requirements, the primary stops are adjustable as follows:

Loosen #8 Allen setscrew (located inside cover assembly) through hole in cover edge (see illustration). This will allow primary stops to turn freely. Using long end of #6 Allen wrench, rotate primary stops for any required stroke, then tighten #8 Allen setscrew.

Rotating the primary stops is easily accomplished through the slot made available along the top edge of the cover assembly.

The ink well which may be in the way during this operation is lifted up off its two ink well supports on the panel and hung on the single support provided farther over to the right on the panel.

In order to gauge the required pen stroke indicated by the primary stops, it is generally necessary first to rotate the secondary stops back out of the way so they will not hamper the desired stroke.

The secondary stops, mounted on top of the cover assembly near the pen point, are adjustable by first loosening the two #6 Allen setscrews located on the side of the secondary stop support and then turning the knurled secondary stops either by hand or with the long end of a #6 Allen wrench.

After the required stroke has been determined by the primary stops, the secondary stops are rotated in towards the pen until they just touch the pen at the point of its farthest excursion in and out. The secondary stops are then held in place by tightening the two #6 Allen setscrews. If any pen bounce shows during operation indicated by anything other than a straight ink line at the top and bottom of code characters, a slight re-adjustment of the secondary stops should rectify this situation.

c. If the pen does not move freely in its bearings proceed as follows:

Tightness of the pen in its bearings is an indication that ink has been allowed to seep into the right-hand bearing from the tank well tubing. Ink should be wiped off the pen shaft and the bearing. With the power control set in its lowest position, the pen should always be free enough to operate at full stroke.

Replacing and adjusting pen bearings.

Pen bearings may be removed and replaced by loosening the 2 #6-32 Allen set screws. Each set screw is located on the front face of the two legs of the pen bearing mount.

When replacing bearings they should first be inserted into the pen bearing mount and rotated so that the slit portion of each bearing is at right angles to the tightening screws. Tightening of the screws will allow any degree of adjustment or clamping action around the pen. The screws should be tightened sufficiently to allow the pen to move freely without excessive play.

The bearing with the shoulder extension should always be inserted on the right hand side (when facing

the recorder). This will allow the pen and the pen mount to be removed from the recorder head intact by removing the 2 binder head pen mount screws. After the 2 binder head pen mount screws are removed the pen mount assembly can be pushed to the left as far as it will go, slightly rotated in a counter clockwise manner and removed.

Adjustments to the pen and pen bearing mount can be made on the bench if desired and the assembly can then be replaced on the recorder head.

**Note**

It is very important that the new pen operates freely at all times.

d. To adjust the flexible steel belt on the tape puller, assembly is adjusted as follows:

The flexible steel belt passes over a slack "take up" pulley mounted at the rear of the assembly. Tension may be applied to the belt by turning the slack "take up" screw which can be reached from the left side of the aluminum mounting plate at the bottom rear. A #8 Allen wrench is necessary for this operation. In tightening the belt just enough tension should be permitted to remove backlash and no more.

e. If no signal is received at the pen coil, the trouble is probably located in the electronic circuit.

**6. ELECTRONIC CIRCUIT TROUBLE-SHOOTING AND REPAIR.**

Check the electron tubes first. If it is determined that the tubes are not at fault, check the defective

circuit systematically for continuity, defective resistors, shorted capacitors, and loose connections. When checking continuity or resistance measurements, take into account other components which may be in parallel with the part being checked. For accurate results, disconnect one lead of the part being checked before taking measurements.

**7. TUBE REPLACEMENT.**

**Note**

ALL TUBES OF A GIVEN TYPE SUPPLIED WITH THE EQUIPMENT SHALL BE CONSUMED PRIOR TO EMPLOYMENT OF TUBES FROM GENERAL STOCK.

In trouble shooting, it may be found necessary to replace a defective tube. It should be kept in mind, however, that the tube is the basis of the equipment and that no field substitute is available. Before discarding any tube, make sure that replacement will remedy the trouble. Check the tube in a standard tube tester or in actual operation and discard it only if it shows one of the following faults: Low emission that prevents minimum efficient operation; no filament continuity; microphonics (noise interfering with operation; shorted; or intermittent shorts).

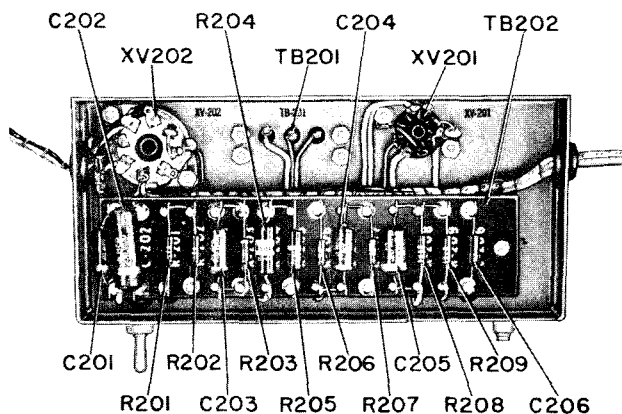


Figure 7-6. Automatic Tape Feed Unit — Rear View

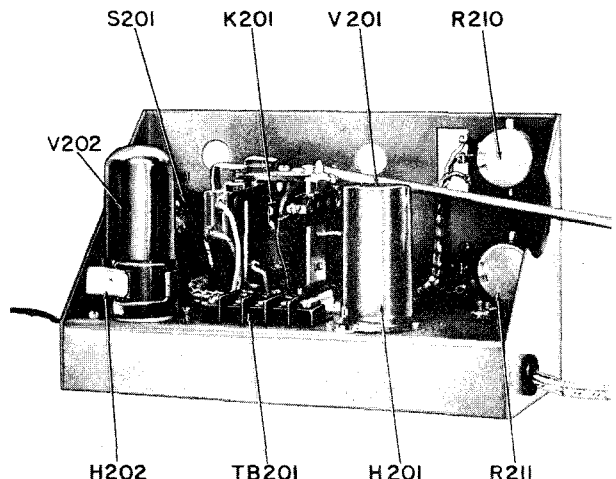


Figure 7-7. Automatic Tape Feed Unit — Bottom View

TABLE 7-1. VOLTAGE TABLE (No Signal Input)

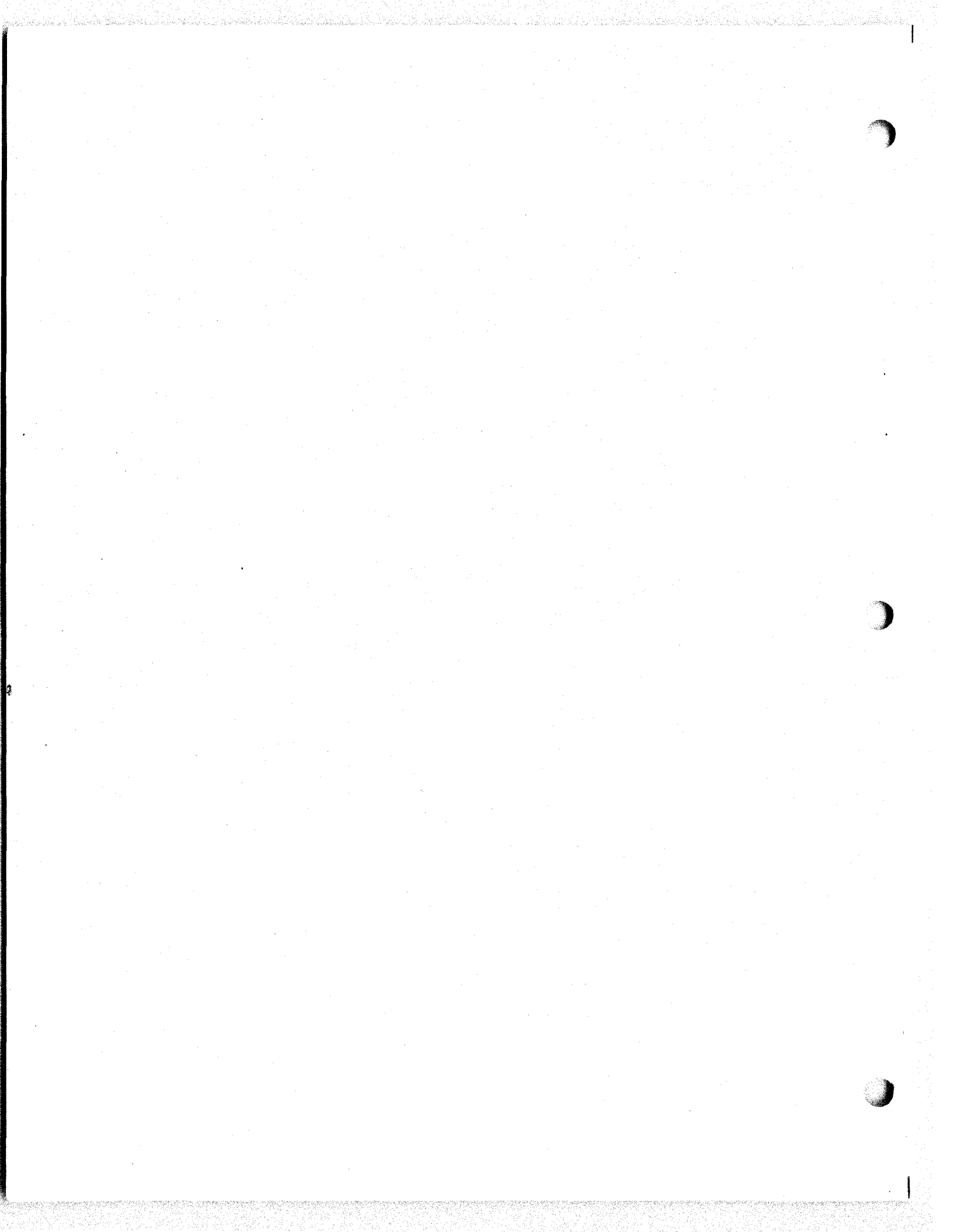
TUBE REF. SYMBOL	TUBE TYPE	PIN NUMBER								
		1	2	3	4	5	6	7	8	9
V101	6SL7WGT	4	375	0	4	375	0		0	
V102	6AL5W	0	0		0	0	0	0		
V103	6E5		30	0	375	0	0			
V104	6SL7WGT	0	112	0	-37.5	210	0	0		
V105	6V6GT			450	100	-37.5		0	0	
V106	6V6GT			450	100	0		0	0	
V107	5R4WGY								470	
V108	6X4W	-480			0		-480			
V201	12AX7	+350	-35	0	6.3	6.3	0	-6	0	0
V202	6V6GT		6.3AC	+350	+100	-6		0	0	

TABLE 7-2. RESISTANCE TABLE  
BACKGROUND CONTROL SET AT ZERO

TUBE REF. SYMBOL	TUBE TYPE	PIN NUMBER TO GROUND								
		1	2	3	4	5	6	7	8	9
V101	6SL7WGT	1.5 Meg	20 K		1.5 Meg	20 K				
V103	6E5		1.2 Meg		20 K					
V104	6SL7WGT		120 K		200 K	120 K				
V105	6V6GT					20 K				
V106	6V6GT					20 K				
V108	6X4W	40 K					40 K			
*V201	12AX7	300 K	2.6 Meg	0	0	0	0	4.7 Meg	220 K	0
*V202	6V6GT		0	20 K	8 K	4.7 Meg		0		

\*"Filter" and "Delay" Controls Set at Dial Marking #1.





**SECTION 8**  
**PARTS LISTS**

**TABLE 8-1. SHIPPING WEIGHTS AND DIMENSIONS OF SPARE PARTS BOX**

SHIPPING BOX NUMBER	SPARE PARTS BOX	OVER-ALL DIMENSIONS			VOLUME	WEIGHT
		H	W	D		
1	1	12"	12"	21"	1.7 cu ft	55 lbs

**TABLE 8-2. LIST OF MAJOR UNITS**

SYMBOL GROUP	QUANTITY	NAME OF MAJOR UNIT	NOMENCLATURE	STOCK NUMBER
101-199	1	Code, Tape Recorder	RD-110/U	

TABLE 8-3. TABLE OF REPLACEABLE PARTS

PARTS				
SYMBOL DESIG- NATION	STOCK NUMBER		NAME OF PART AND DESCRIPTION	FUNCTION
	SIGNAL CORPS	NAVY AIR FORCE		
TAPE CODE RECORDER RD-110/U				
A101	*		TAPE ASSEMBLY: Whiteford Laboratory, Lynn, Mass.; Dwg no D1200; includes: Drawer; part no B1201; Front, Drawer; part no A1203; Stop, Drawer; part no A1216; Stud; Tape Bearing; part no A1211; Bearing B46-3 Oilite; part no A1214; Hub, Tape; part no A1212; Ring, Tape Holder; part no A1215; Friction Washer, T.B. 920 Oilite; part no A1213; Washer; part no A1210; Arm, Indicator; part no A1209; Dial, Indicator; part no A1204; Bearing, Indicator Dial; part no A1205; Rivet, Bearing; part no A1206; Collar; part no A1207; Spring; part no A1208; Knob, Drawer; part no A1202; Tool Holder; part no A1218.	Holds tape
A102			PLATE, SLIDE: rectangular plate; 8 $\frac{5}{8}$ in lg, by 3 $\frac{1}{2}$ in wd, by $\frac{1}{8}$ in thick; corrosion resistant steel; cadmium plated; "V" toothed along one edge; 16 teeth per inch; Whiteford Laboratory, Lynn, Mass; Dwg no B-1402; for reference only.	Positions B101
A103		N17-M-75521-5627	ABSORBER, SHOCK: 3 in, by 3 in, 1 $\frac{1}{2}$ in high; square base has four $\frac{1}{4}$ in mounting holes; one $\frac{3}{8}$ in hole through center of mount; L. N. Barry Co., Watertown, Mass; Type C-2125-B6.	Absorbs shock of unit
A104			Same as A103.	Absorbs shock of unit
A105			Same as A103.	Absorbs shock of unit
A106			Same as A103.	Absorbs shock of unit
B101		N17-M-54310-2650	MOTOR, TAPE PULLER: synchronous; AC; 110V; 60 cy; single phase; .280 amps; power factor 100% at no load; 1/600 H.P.; 900 R.P.M.; single take off; clockwise rotation; closed frame; rated ambient temperature 60°C; continuous duty; plain shaft; motor 5 $\frac{1}{4}$ in lg, 3 $\frac{3}{16}$ in dia; shaft $\frac{3}{16}$ in diam, 1 $\frac{1}{8}$ in lg; 1 $\frac{5}{8}$ in from center of shaft to mounting surface; 4 pig tail wire leads; clamp mounted; capacitor for motor 3.5 mf; Cyclohm Mfg. Co., Newton, Mass. type no HBC-2918-11.	Power for O131
C101		N16-C-45735-2882	CAPACITOR, FIXED, PAPER DIELECTRIC: 1 section; case style no 33, MBCA Ref Dwg Group 1; 100,000 mmf; $\pm 5\%$ tolerance; 600 V.D.C.; hermetically sealed metal can; 2 $\frac{1}{2}$ in long, 1 in wide, $\frac{3}{4}$ in high; two terminals, solder lug type, 1 in apart, located on top; wax impregnated; no internally grounded connections; 2 mounting ears, 2 $\frac{1}{8}$ in apart; Aerovox Corp., New Bedford, Mass.; Type 630-R10; general purpose use.	Bias for V101
C102		N16-C-45731-8003	CAPACITOR, FIXED, PAPER DIELECTRIC: 1 section; case style no 2, MBCA Ref. Dwg Group 1; 100,000 mmf; $\pm 5\%$ tolerance; 400 V.D.C.; moulded phenolic case, 1 $\frac{1}{2}$ in long, by $\frac{1}{2}$ in dia; two wire leads, 1 in long, located one on each end; wax impregnated; no internally grounded connections; mounted by wire leads; Sprague Electric Co., North Adams, Mass.; Type 67P-10409; general purpose use.	Bias for V102
C103		N16-C-40418-4831	CAPACITOR, FIXED, PAPER DIELECTRIC: 1 section; case style no 2, MBCA Ref Dwg Group 1; 3000 mmf; $\pm 5\%$ tolerance; 1000 V.D.C.; cardboard case, 1 $\frac{3}{8}$ in long, $\frac{1}{2}$ in dia; two wire leads, 1 in long, located one on each end; wax impregnated; no internally grounded connections; wire lead mounted; Aerovox Corp., New Bedford, Mass.; Type 1089; general purpose use.	Audio filter
C104		N16-C-48775-3850	CAPACITOR, FIXED, PAPER DIELECTRIC: 1 section; case style no 33, MBCA Ref Dwg Group 1; 1 mf; $\pm 5\%$ tolerance; 600 V.D.C.; hermetically sealed metal can, 2 $\frac{3}{4}$ in long, 1 $\frac{3}{4}$ in wide, $\frac{3}{4}$ in high; two lug type terminals, 1 $\frac{1}{16}$ in apart; mounted by two mounting ears, 2 $\frac{3}{8}$ in apart; wax impregnated; no internally grounded connections; Micamald Corp., Brooklyn, N.Y.; Type A8B-5934; general purpose use.	Screen grid bypass for V105, V106

C105	N16-C-49981-9970	CAPACITOR, FIXED, PAPER DIELECTRIC: 1 section; case style no 33, MBCA Ref Dwg Group 1; 4 mfd; $\pm 5\%$ tolerance; 600 V.D.C.; hermetically sealed metal can, $3\frac{7}{8}$ in long, $2\frac{1}{2}$ in wide, $1\frac{3}{16}$ in thick; two standoff type terminals; $1\frac{1}{8}$ in apart; mounted by two mounting brackets; wax impregnated; no internally grounded connections; JAN no JAN CP 70E1EF405V; Sprague Electric Co., North Adams, Mass; Type 35-5437; general purpose use.	Positive supply filter
C106		Same as C105.	Filter capacitor
C107		Same as C104.	Negative supply filter
C108		Same as C104.	Negative supply filter
C109	N16-C-49762-8210	CAPACITOR, FIXED, PAPER DIELECTRIC: 1 section; case style no 17, MBCA Ref Dwg Group 1; 3.5 mfd; $\pm 5\%$ tolerance; 330 V.A.C.; hermetically sealed metal can, $3\frac{1}{4}$ in long, $2\frac{1}{8}$ in wide, $1\frac{1}{8}$ in thick; two solder lug type terminals, located on top, 1 in apart; clamp mounted; wax impregnated; no internally grounded connections; Gudeman Co., Chicago, Illinois; Type 8962; general purpose use.	Motor capacitor
C110		Same as C104.	
C111		Same as C104.	
C112	N16-C-44215-3169	CAPACITOR, FIXED, PAPER DIELECTRIC: 1 section; case style no 33, MBCA Ref Dwg Group 1; 50,000 mmf $\pm 5\%$ tolerance; 600 V.D.C.; hermetically sealed metal can, $2\frac{1}{2}$ in long, 1 in wide, $\frac{3}{4}$ in high; two stud type terminals, 1 in apart, located on top; wax impregnated; no internally grounded connections; Solar Co.; Type XDMRTW6; general purpose use.	Pulse filter
C113		Not used.	
C114	N16-C-30162-1515	CAPACITOR, FIXED, MICA DIELECTRIC, case style no 22, MBCA Ref Dwg Group 1; 500 mmf; $\pm 5\%$ tolerance; 600 V.D.C. moulded phenolic case, $\frac{5}{8}$ in long, $\frac{5}{8}$ in wide, $\frac{3}{16}$ in thick; two wire leads 1 in long; wire lead mounted; Solar Co.; for general purpose use.	Primary compensation for T102
E101	F17-H-38801-1002	HEAD, RECORDER, SOUND: tape recorder; electrical; magnetic type; 8 ohms impedance; 1 volt output, 20 volts input; 1000-3000 C.P.S.; 5 in high, 5 in diam; six 10-32 mounting holes along circumference; 2 wire leads; Whiteford Laboratory, Lynn, Mass; Dwg no E1500; includes O-114.	Produces code on tape
E102	*	TERMINAL BOARD: micarate; terminals included; 9 terminals, lug type; without barriers; $2\frac{5}{32}$ in long, $\frac{3}{8}$ in wide, $\frac{3}{8}$ in high; mounted by two $\frac{3}{16}$ in dia holes spaced $\frac{1}{2}$ in apart; Whiteford Laboratory, Lynn, Mass; Dwg no B1528.	Provides connections for C101
F101	N17-F-16302-120	FUSE, CARTRIDGE: 3 amps; 250V; instantaneous; cartridge typed; enclosed glass case; renewable one time; nonindicating type fuse; $1\frac{1}{4}$ in lg, $\frac{1}{4}$ in dia; Little Fuse Co.; type 3AG; Whiteford Laboratory, Lynn, Mass; Dwg no A1821; for general purpose use.	Line fuse
H101	N16-C-300798-631	CLAMP, ELECTRICAL: steel; cadmium plated; snap on type; $1\frac{1}{4}$ in closed diam; $\frac{3}{4}$ in high; foot mounted, one foot, $\frac{3}{4}$ in high, $\frac{3}{8}$ in lg, $\frac{1}{2}$ in wd; Birtchio Co., Los Angeles, Calif.; part no 926B-16; for general purpose use.	Tube clamp for V101
H102		Same as H101.	Tube clamp for V103
H103		Same as H101.	Tube clamp for V104
H104		Same as H101.	Tube clamp for V105
H105		Same as H101.	Tube clamp for V106

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

TABLE 8-3. TABLE OF REPLACEABLE PARTS (Cont.)

PARTS				
SYMBOL DESIGNATION	STOCK NUMBER		NAME OF PART AND DESCRIPTION	FUNCTION
	SIGNAL CORPS	NAVY AIR FORCE		
TAPE CODE RECORDER RD-110/U (Cont.)				
H106	N16-C-300798-866		CLAMP, ELECTRICAL: steel; cadmium plated; snap type 1½ in diam, ¾ in high; mounted by ⅛ in diam hole in mounting ear; Birtcher Co.; Los Angeles, Calif.; part no. 926C; for general purpose use.	Tube clamp for V107
H107	N16-S-34520-3873		SHIELD, ELECTRON TUBE: steel; cadmium plated; cylindrical shape; 1⅜ in lg; 1⅜ in diam; bayonet slot mounted; Eby. Mfg. Co.; New York, N.Y.; type no 7798; for general purpose use.	Shield for V102
H108	N16-S-34607-8353		SHIELD, ELECTRON TUBE: steel; cadmium plated; cylindrical shape; 2¼ in lg; 1⅜ in diam; bracket mounted; Eby. Mfg. Co.; New York, N.Y.; type no 8694; for general purpose use.	Shield for V108
H109	N16-K-7000076-201		KNOB: bar; pointer type; black plastic; accommodates ¼ in diam shaft; 2⅜ in deep; white line marking; 1½ in lg; ⅞ in diam; ⅞ in thk; set screw fastened; Kurz Kasch Co.; Dayton, Ohio; type no S246-3L.	Knob for R112
H110			Same as H109.	Knob for R115
H111			Same as H109.	Tape puller on-off knob
I101	N17-L-5207		LAMP, INCANDESCENT: 6.8V; 2 candle power, angle contact bayonet candelabra; 1⅜ in lg; bulb T-3, clear, daylight; one filament; tungsten, S-6; 1⅜ in long; over 500 hours rated life; any burning position; General Electric Co., Boston, Mass; Mazda no 55; for general purpose use.	Power indicator
J101	N17-J-39248-4418		JACK, TELEPHONE: for 2 conductor plug; contact arrangement J1, MBCA Ref Dwg Group 4; ¾ in diam; 1¼ in lg; ⅜ in mounting shanks, fitted with insulator bushings, nut and washer; Mallory Co., Indianapolis, Indiana; type SC-1A; for general purpose use.	Phone plug
J102	N17-C-73446-5848		CONNECTOR, RECEPTACLE: 2 contacts; male; flat; straight type; 1¼ in long; 1⅜ in dia; 10 amp., 250 volt; body cylindrical shape, steel, cadmium plated; molded black bakelite insert; 2 mounting holes; #19 drill size, 1¾ in between centers; Amphenol Co., Chicago, Illinois; type G1-M10; for general purpose use.	Carries line voltage
L101	N17-D-910001-103		DRIVER, STYLUS: rated operated frequency 0-400 cy; power requirement 1 to 10 watts; stainless steel; 2⅜ in long, 2⅛ in wd, 1⅞ in high; mounted by bearings; Whiteford Laboratory, Lynn, Mass; Dwg no B1524.	Actuates ink pen
L102	N16-R-29188-8618		REACTOR: filter choke; 1 section; 8HY-150MA-DC; 150 ohms DC; 1500 volt test voltage; hermetically sealed round metal case; 4⅞ in long; 3¼ in dia; mounted by four .201 in diam holes on centers 2⅜ in by 2⅜ in; 2 terminals, solder lug type; United Transformer Co.; N. Y. 13, New York; Type F-9789; general purpose use.	Filter choke
O101	*		ASSEMBLY, DIAL INDICATOR: approximately 6 in long, 1⅞ in wide, ⅜ in thick; material aluminum, and brass; includes dial indicator; part no A-1204; arm indicator, part no A-1209; bearing indicator dial, part no A-1205, rivet bearing, part no A-1206 collar, part no A-1207; Whiteford Laboratory, Lynn, Mass.; Dwg no B1219.	Indicates amount of tape on reel
O102	*		SPRING: 50 turns of .017 in steel piano wire; cadmium plated; 1⅜ in long at rest; ⅜ in diam; mounted by loop on each end. Whiteford Laboratory, Lynn, Mass.; Dwg no A-1208.	Applies tension on indicator dial A1204

O103	*	WASHER, FLAT: steel; cadmium plated; round; .196 in I.D.; 1¼ in O.D.; ¼ <sub>16</sub> in thick; Whiteford Laboratory, Lynn, Mass; Dwg no A1210; part of assembly A101.	Used with A101
O104	*	STUD, ASSEMBLY: brass; cadmium plated; ¾ <sub>8</sub> in long, ¼ in diam; 10-32 thread; screwdriver slotted; Whiteford Laboratory, Lynn, Mass.; Dwg no A1211; part of assembly A101.	Used with A101
O105	*N17-H-76415-1002	HOLDER REEL: part of assembly A101; includes: aluminum ring, part no A1215; aluminum hub; part no A1212. Oilite bearing B-46-3; Oilite bearing TB920; Whiteford Laboratory, Lynn, Mass., Dwg no B1220.	Holds tape reel
O106		LOCK, TAPED DRAWER: brass; satin chrome finish; ¼ <sub>16</sub> in long, ⅝ in dia; locks drawer by knob with an off center pivot; Whiteford Laboratory, Lynn, Mass.; Dwg no A1217; for reference only.	Locks tape drawer
O107	*	FRONT COVER, RECORDER, ASSEMBLY: Whiteford Laboratory, Lynn, Mass; Dwg no B1532; includes: Front cover; part no B1504; Stop Secondary; part no A1518; Support, Secondary Stop; part no A1520; Stud; part no A1513; Guide Tape; part no A1523; Retainer Slide; part no A1514; Adjustment Plate; part no A1504.	Cover for recorder head
O108	N17-H-77791-1007	HOLDER, TAPE GUIDE: part of assembly E101; brass; satin chrome finish; Whiteford Laboratory, Lynn, Mass.; Dwg no B1505.	Holds tape guide
O109	N17-K-700338-346	KNOB, CONTROL: Whiteford Laboratory, Lynn, Mass.; Dwg no B1506; part of assembly E101.	Regulates pressure of pen on tape
O110	N17-H-76L25-1001	HOLDER, PEN: Whiteford Laboratory, Lynn, Mass.; Dwg no B1507; part of assembly E101.	Holds pen
O111	N17-S-50541-1018	PEN AND BEARINGS: stainless steel, and brass; Whiteford Laboratory, Lynn, Mass.; Dwg no A1508; part of assembly E101.	Writes code on tape
O112	*	SHIELD, INK SPLATTER: 1 in long, by 1 in wide; rounded corners; no. 9 hole, ⅝ <sub>16</sub> in by ⅝ <sub>16</sub> in on centers; brass; satin chrome finish; includes; cap nut; ⅜ in O.D.; tapped for 10-32 thread; medium knurl on O.D.; brass; satin chrome finish; part no A1511; Whiteford Laboratory, Lynn, Mass.; Dwg no A1510; for reference only.	
O113	N17-H-77791-1006	PULLEY, TAPE: brass; satin chrome finish; 1 <sup>5</sup> / <sub>16</sub> in overall dia, ⅝ in overall thickness; Whiteford Laboratory, Lynn, Mass; Dwg no A1512; part of assembly E101.	Guides tape
O114	N43-N-9634-585	PRIMARY STOP: steel; cadmium plated; ¾ <sub>4</sub> in dia, ⅛ in thick; set of 2 stops; Whiteford Laboratory, Lynn, Mass.; Dwg no A1516; part of assembly E101.	Guides pen
O115		SUPPORT AND SECONDARY STOP: aluminum; black wrinkle finish; 1 in high, ⅜ in wide, 1 <sup>1</sup> / <sub>32</sub> in thick, ⅞ in wide, ⅜ <sub>16</sub> in from top; Whiteford Laboratory, Lynn, Mass.; Dwg no A1520; part of assembly E101; for reference only.	Support for pen guides
O116	N17-N-90011-1006	STOP, SECONDARY: Whiteford Laboratory, Lynn, Mass.; part dwg no A-1518; part of assembly E101.	Guides pen
O117	*	SCREW, BINDER: bakelite; Whiteford Laboratory, Lynn, Mass.; part of assembly E101.	
O118		TAPE GUIDE STUD: stainless steel; 2 <sup>7</sup> / <sub>32</sub> in long, ⅜ <sub>16</sub> in dia; ⅝ <sub>32</sub> in long; 10-32 thread on one end; Whiteford Laboratory, Lynn, Mass.; Dwg no A1523; part of assembly E101; for reference only.	Guides tape
O119		PRIMARY STOP BARREL: steel; cadmium plated; ½ in dia; ½ in thick; ½ in 20 thread on O.D.; ⅜ <sub>16</sub> in bore through center, circumscribed bore ⅝ <sub>16</sub> in dia, ¼ in deep; Whiteford Laboratory, Lynn, Mass.; Dwg no A1522; part of assembly E101; for reference only.	

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

TABLE 8-3. TABLE OF REPLACEABLE PARTS (Cont.)

PARTS				
SYMBOL DESIG- NATION	STOCK NUMBER		NAME OF PART AND DESCRIPTION	FUNCTION
	SIGNAL CORPS	NAVY AIR FORCE		
TAPE CODE RECORDER RD-110/U (Cont.)				
O120	N17-H-76338-1003		COIL BEARINGS: Whiteford Laboratory, Lynn, Mass.; part dwg no A-1525; part of assembly E101.	
O121	*		SPACER, FRONT PANEL: brass; cadmium plated; ¼ in dia; ⅛ in thick; no 18 hole through center; Whiteford Laboratory, Lynn, Mass.; Dwg no A1530; includes stud head: brass; cadmium plated; ¼ in dia, 3 in long; ¼ in 20 thread ½ in on each end; Whiteford Laboratory, Lynn, Mass.; Dwg no A1526; part of assembly E101.	Head stud
O122	N17-R-235001-103		INK WELL ASSEMBLY: Whiteford Laboratory, Lynn, Mass; Dwg no C1300; includes, ink-well, part no B-1313; bracket, part no A-1314; cover, part no A-1306; knob valve, part no A-1305; knob, pump, part no A-1304; valve, part no A-1312; plunger, part no A-1310; chamber valve and pump, part no A-1307; seat valve, part no A-1301; washer valve, part no A-1311; plug A, part no A-1308; plug B, part no A-1309; shield ink hose, part no A-1305; hose ink, part no A-1306.	Holds ink supply
O123	N17-R-47346-1007		ASSEMBLY, INKWELL VALVE AND PUMP: Whiteford Laboratory, Lynn, Mass. Dwg no B1319; includes, knob valve, part no A-1305, knob pump, part no A-1304; valve, part no A-1312; plunger, part no A-1310; washer, valve, part no A-1311; chamber, valve and pump, part no A-1307; seat, valve, part no A-1301; plug B, part no A-1309; plug A, part no A-1308; part of assembly O122; includes O-124, O-126, O-127.	Regulates ink flow
O124	N17-I-37741-1001		SEAT VALVE: Whiteford Laboratory, Lynn, Mass; Dwg no A-1301; part of assembly O123.	
O125			INK WELL COVER: brass; satin chrome finish; 2¼ in O.D.; ⅛ in overall thickness; 1¼ in dia hole through center; Whiteford Laboratory, Lynn, Mass.; Dwg no A1306; for reference only.	Cover for O123
O126			INK WELL CHAMBER VALVE: stainless steel; Whiteford Laboratory, Lynn, Mass.; Dwg no A1307; part of assembly O122; for reference only.	
O127			PLUNGER: stainless steel; 4⅞ in long, ⅜ in overall dia; Whiteford Laboratory, Lynn, Mass.; Dwg no A1310; part of assembly O123; for reference only.	
O128	N17-V-11101-1001		VALVE: Whiteford Laboratory, Lynn, Mass.; Dwg no A1320; part of assembly O123.	
O129	N17-T-901111-101		INK HOSE AND SHIELD: hose, 5½ in long, ⅛ in O.D. rubber tubing; shield, stainless steel, ⅜ in dia, ⅝ in long; Whiteford Laboratory, Lynn, Mass.; Dwg no A1316; part of assembly O122.	Delivers ink to tape
O130	*		CLAMP SCREW AND BLOCK: ⅞ in dia head, ¼ in thick; ¼ in screw, 32 threads per inch, overall length 1¾ in; brass; satin chrome finish; Whiteford Laboratory, Lynn, Mass.; Dwg no A1318; for reference only.	Ink well lock
O131	*		TAPE PULLER ASSEMBLY: Whiteford Laboratory, Lynn, Mass.; Dwg no E1400; includes; Plate, Side; part no C1401; Plate, Slide; part no B1402; Angle, Front; part no B-1403; Angle, Slide; part no B1404; Mounting, Motor Hanger; part no A1405; Cone, Step; part no B1406; Wheel and Hub, Drive; part no A1407; Clamp, Slide; part no A1408; Block, Adjusting, Dial Drive; part no A1410; Take-up, Dial Drive; part no A1411; Pin, Dial Drive; take-up, part no	Pulls tape to recorder head

ORIGINAL

		A1412; Pulley, Dial Drive take-up; part no A-1413; Pin, capstan; part no A1414; Support, Slide; part no A1415; Support, Slide Angle; part no A1416; Pulley, Capstan; part no A1417; capstan, Dial Drive Block; part no A1418; Shaft, capstan; part no A1419; capstan; part no A1420; Rod, Dial Lock; part no A1421; Guide, Dial Lock Rod; part no A1422; Collar, Dial Lock Rod; part no A1423; Guide, Slide Plate; part no A-1424; Slide, Tape; part no A1425; Pulley, Idler; part no A1426; Bearing, Idler Pulley; part no A1427; Stud, Idler pulley; part no A1428; Support, Idler Pulley; part no A1429; Shaft, Idler; part no A1430; collar, idler shaft; part no A1431; Arm, Idler, part no A1432; Angle, Idler Arm; part no A1433; Pulley, Drive; part no A1434; Spacer, Drive Pulley; part no A1435; pin centering, Drive Pulley; part no A1436; Shaft, Drive; part no A1437; Plate, Mounting; part no A1438; Support, Mounting Plate; part no A1439; Pin, Mounting Plate; part no A1439; Pin, Mounting Plate; part no A1440; Spacer, Mounting Plate; part no A1441; Belt, Drive; part no A1442; Dial, part no A1443; Plate, Dial Lock, part no A1444; Knob, Dial Lock, part no A1445; Shoulder Screw, Dial Lock Plate, part no A1446; Bearing, Ball; Type 400-14, Nice; Cotterpin, Spring Clip; Spring Holder, Backing Plate; part no A1447; Screw, Socket Head Cap, $\frac{7}{16}$ in 10-32 thread; Screw, Socket Head Cap, $\frac{1}{16}$ in 10-32 thread; Screw Socket Head Cap, 1 in 10-32 thread; Screw, Socket Head Cap, $\frac{1}{2}$ in 10-32 thread; Setscrew, Socket Head, $\frac{3}{4}$ in 10-32 thread; Nut, Hex 10-32 thread; Lockwasher, Ext Tooth, no 10; Screw, Fillister Head, $\frac{3}{16}$ in 6-32 thread; Screw, Fillister Head, $\frac{7}{16}$ in 6-32 thread; Screw, Fillister Head, $\frac{1}{4}$ in 10-32 thread; Spring Holder, Dial Lock Plate; part no A1448; Spring, Dial Lock; part no A1449; Backing Plate, Dial Lock; part no A1450; Screw, Fillister Head, $\frac{3}{8}$ in 8-32 thread.	
O132	N17-C-67231-1002	STEP CONE: brass; hard chrome finish, $2\frac{3}{8}$ in long, varying diameters .705 in dia, $\frac{3}{8}$ in lg, $\frac{1}{8}$ in chamfer; .605 in dia $\frac{3}{16}$ in lg, $\frac{1}{8}$ in chamfer; .505 in dia, $\frac{3}{16}$ in lg, $\frac{1}{8}$ in chamfer; .405 in dia, $\frac{3}{16}$ in lg, $\frac{1}{8}$ in chamfer; .305 in dia, $\frac{3}{16}$ in lg, $\frac{1}{8}$ in chamfer; .206 in dia, $\frac{3}{16}$ in lg, $\frac{1}{8}$ in chamfer; .108 in dia, $\frac{3}{16}$ in lg; Whiteford Laboratory, Lynn, Mass.; Dwg no B1406; part of assembly O131.	Adjusts speed of O131
O133	N17-W-220321-103	WHEEL DRIVE: aluminum; clear lacquer finish; $2\frac{13}{16}$ in dia, $\frac{1}{8}$ in thick; Whiteford Laboratory, Lynn, Mass. Dwg no A1407; part of assembly O131.	Drives tape puller
O134		BLOCK, ADJUSTING DIAL DRIVE: aluminum; black finish; $1\frac{1}{8}$ in long, $\frac{3}{4}$ in high, $\frac{3}{8}$ in thick; Whiteford Laboratory, Lynn, Mass., Dwg no A1410; part of assembly O131; for reference only.	
O135		TAKE UP DIAL DRIVE: aluminum; black finish, $1\frac{3}{8}$ in long, $\frac{3}{4}$ in wide, $\frac{3}{8}$ in thick; two holes tapped 6-32 threads per in on side; two $\frac{3}{16}$ in holes on top; Whiteford Laboratory, Lynn, Mass., Dwg no A1411; part of assembly O131; for reference only.	
O136		PULLEY CAPSTAN: brass; cadmium plated; $\frac{3}{4}$ in dia, $\frac{3}{8}$ in thick; $\frac{3}{16}$ in dia hole through center; Whiteford Laboratory, Lynn, Mass.; Dwg no A1417; part of assembly O131; for reference only.	Drive belt pulley
O137		CAPSTAN DIAL DRIVE BLOCK: aluminum; black finish; $2\frac{3}{4}$ in high, $1\frac{3}{4}$ in wide, $\frac{1}{2}$ in thick; cutout on top $\frac{3}{8}$ in from edge, $\frac{4}{64}$ in wide and $\frac{7}{8}$ in deep; Whiteford Laboratory, Lynn, Mass.; Dwg no A1418; part of assembly O131; for reference only.	Support for belt pulleys
O138		SHAFT, CAPSTAN: stainless steel; $2\frac{5}{8}$ in long, $\frac{1}{4}$ in dia; $\frac{3}{64}$ in deep flat on end $\frac{3}{8}$ in long; $\frac{1}{2}$ in down from top $\frac{3}{64}$ in deep no A1419; part of assembly O131; for reference only.	Adjusting shaft for O131
O139		CAPSTAN: brass; cadmium plated; .720 in dia, $\frac{5}{8}$ in high, $\frac{1}{4}$ in hole in center; Whiteford Laboratory, Lynn, Mass.; Dwg no A1420; part of assembly O131; for reference only.	
O140		DIAL LOCK ASSEMBLY: Whiteford Laboratory, Lynn, Mass.; Dwg no B1451; includes, Guide, Dial Lock Rod; part no A1422; Rod, Dial Lock; part no A1421; Collar, Dial Lock Rod; part no A1423; part of assembly O131; for reference only.	Locks O145

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



TABLE 8-3. TABLE OF REPLACEABLE PARTS (Cont.)

PARTS				
SYMBOL DESIG- NATION	STOCK NUMBER		NAME OF PART AND DESCRIPTION	FUNCTION
	SIGNAL CORPS	NAVY AIR FORCE		
TAPE CODE RECORDER RD-110/U (Cont.)				
O141			PLATE DIAL LOCK: steel; cadmium plated; 3¾ in high, 3½ in wide, ⅛ in thick; one 3½ in edge toothed, 16 teeth per inch; one hole ¼ in, tapped for 32 thread, on centers ¾ in by 1¾ in; cutout on each 3½ in side, 1¾ in from edge, ⅜ in by ⅜ in with inner end rounded; Whiteford Laboratory, Lynn, Mass.; Dwg no A1444; part of assembly O131; for reference only.	
O142	*		KNOB, DIAL LOCK: brass; satin chrome; 1 in dia knob, ⅜ in thick; O.D. knurled, ½ dia hub, ⅜ in thick, overall thickness 1⅛ in; set screw in hub, on centers ⅝ in by ¼ in; Whiteford Laboratory, Lynn, Mass.; Dwg no A1445; part of assembly O131.	Locks O141
O143	*		SPRING DIAL LOCK: 5 turns; spring wire; overall length at rest ½ in; coil length at rest ⅜ in; ⅜ in dia; fastened by loop on each end at right angles to each other; Whiteford Laboratory, Lynn, Mass.; Dwg no A-1449; part of assembly O131.	Release O141 when un- locked
O144		N17-B-71701-3401	BELT, DRIVE: steel, blue finish; ¼ in wide, 30 in long; Whiteford Laboratory, Lynn, Mass.; Dwg no A-1442; part of assembly O131.	Drives O131
O145		N16-D-46356-7294	DIAL: aluminum; black finish; 2¾ in dia, overall thickness ¾ in; knob dia 1⅜ in; 1⅛ in thick; Whiteford Laboratory, Lynn, Mass.; Dwg no A-1443; part of assembly O131.	Dial for O131
O146	*		SLIDE TAPE: steel; satin chrome finish; 2 in long, 1⅛ in wide, ⅛ in thick; right angle bend along one side ¼ in wide; Whiteford Laboratory, Lynn, Mass.; Dwg no A-1425; part of assembly O131.	Guides tape
O147		N17-P-800001-117	PULLEY IDLER: brass; satin chrome finish; 1¼ in dia, ½ in thick; 15/16 in hole in center; has oilite bearing part no A-1427; Whiteford Laboratory, Lynn, Mass.; Dwg no A-1426; part of assembly O131.	Guides tape
O148		N17-P-800001-118	PULLEY DRIVER: brass; satin chrome finish; 1 in dia, ⅜ in thick, ⅞ in dia hub, 1⅛ in thick; overall thickness 1 in; Whiteford Laboratory, Lynn, Mass.; Dwg no A-1434; part of assembly O131.	Pulls tape
O149	*		STUD, IDLER PULLEY: brass; cadmium plated finish; ⅞ in long, ⅜ in dia, ⅛ in thick head, ½ in dia; Whiteford Laboratory, Lynn, Mass.; Dwg no A-1428; part of assembly O131.	Shaft for O147
O150		N17-A-700161-105	ARM, IDLER: aluminum; black finish; 2¼ in long, 2 in wide, ½ in thick; 2 holes through 2¼ in edge; ⅜ in dia bore; each end of bore pressfit with oilite bearings I-305-5; Whiteford Laboratory, Lynn, Mass.; Dwg no A-1432; part of assembly O131.	
O151			PIN, CENTERING, DRIVE PULLEY: brass; satin chrome finish; ½ in dia, 7/16 in thick, ⅜ in dia hub, 23/64 in long, ½ in dia disc, 3/64 in thick; Whiteford Laboratory, Lynn, Mass.; Dwg no A-1436; part of assembly O131; for reference only.	Guides tape
O152		N17-S-37010-2471	SHAFT, DRIVE: stainless steel; 411/16 in lg, ¼ in dia; ¾ in from end, ⅜ in long, 3/64 in deep flat; opposite end ⅜ in long, 3/64 in deep flat; Whiteford Laboratory, Lynn, Mass.; Dwg no A-1437; part of assembly O131.	Shaft for O133
O153		N17-P-404181-159	ASSEMBLY, PLATE MOUNTING: includes, Plate, Mounting, part no A-1438; Support, Idler Pulley, part no A-1429; Support, Mounting Plate, part no A-1439; Pin, Mounting Plate, part no A-1440; Whiteford Laboratory, Lynn, Mass.; Dwg no B1452; part of assembly O131.	

O154		CLAMP, ELECTRICAL: steel; cadmium plated; screw type; $1\frac{3}{8}$ in long, $\frac{1}{4}$ in wide, $\frac{1}{32}$ in thick; mounted by screw; no 28 mounting hole on centers $\frac{1}{8}$ in by $\frac{3}{16}$ in; designed to hold material $\frac{1}{8}$ in dia; Whiteford Laboratory, Lynn, Mass.; Dwg no A1704; general purpose use.	Holds cable
O155		CLAMP, ELECTRICAL: steel; cadmium plated; screw type; $1\frac{1}{8}$ in lg, $\frac{3}{8}$ in wd, $\frac{1}{32}$ in thk; mounted by screw, mounting hole on centers $\frac{3}{16}$ in by $\frac{3}{16}$ in; designed to hold material $\frac{5}{8}$ in dia; Whiteford Laboratory, Lynn, Mass.; Dwg no A1705; for general purpose use; for reference only.	Holds cable
O156		CLAMP, ELECTRICAL: steel; cadmium plated; screw type; $\frac{3}{4}$ in long, $\frac{3}{8}$ in wide, $\frac{1}{32}$ in thick; mounted by screw; mounting hole on centers $\frac{3}{16}$ in by $\frac{3}{16}$ in; designed to hold material $\frac{3}{16}$ in dia; Whiteford Laboratory, Lynn, Mass.; Dwg no A1604; for general purpose use; for reference only.	Holds cable
O157		SUPPORT, WASHER, INK WELL; brass; satin chrome plated; $\frac{7}{16}$ in dia, $\frac{1}{16}$ in thk, $\frac{5}{16}$ in dia hub, $\frac{3}{64}$ in thk; no 10 hole through center, 32 threads per inch; Whiteford Laboratory, Lynn, Mass.; Dwg no A-1603; for reference only.	
O158		SWITCH, CONTROL, CAM: Whiteford Laboratory, Lynn, Mass.; Dwg no B1612; includes; cam, control; part no A-1605; bushing and nut, part no A-1606; shaft control cam; part no A-1607; for reference only.	Actuates S104
O159	*	LIFT BAR AND SPACER: stainless steel; cadmium plated; $3\frac{3}{8}$ in lg, $\frac{1}{8}$ in dia; spacer $\frac{3}{16}$ in dia, $3\frac{3}{4}$ in long; Whiteford Laboratory, Lynn, Mass; Dwg no A-1608.	
O160	N16-M-61145-2233	MOUNTING, CAPACITOR: steel; cadmium plated; 2 fasteners, bolt type; $4\frac{1}{4}$ in lg; $\frac{3}{4}$ in wide; $\frac{1}{8}$ in thick, including lip; designed to hold can type filter condenser to chassis; Sprague Electric Company, North Adams, Mass; type CPO7SB3; Jan. Spec. Jan-C-25; Spec type CPO7SB3; for general purpose use.	Bracket for C
O161		Same as O160.	
O162	N17-C-793201-101	CLEANER, RECORDER HEAD: stainless steel; round wire drawn to .0095 in diam; 4 in lg; Whiteford Laboratory, Lynn, Mass; Dwg no A1809; Precision Products Co., Waltham, Mass.	Cleaning wire
P101		Part of W101; Whiteford Laboratory, Lynn, Mass., for reference only.	Male power plug
P102		Part of W101; Whiteford Laboratory, Lynn, Mass., for reference only.	Female power plug
R101	N16-R-51021-231	RESISTOR, FIXED, COMPOSITION: body style no 14, MBCA Ref Dwg Group 2; 1.5 megs; $\pm 10\%$ tolerance; 1 watt; maximum allowable percent change in resistance from resistance at ambient temperature of 25 degrees Centigrade (77 degrees Fahrenheit) is; at -55 degrees Centigrade (-67 deg F) $\pm 26\%$ resistance change; at 105 degrees Centigrade (221 deg F) $\pm 18\%$ resistance change; $1\frac{1}{4}$ in long; .14 in dia; insulated; resistant to humidity and/or salt water immersion; 2 wire leads; Whiteford Laboratory, Lynn, Mass; JAN spec no JAN-R-11, JAN RC30BF155K general purpose use.	Voltage limiting resistor
R102	N16-R-50652-231	RESISTOR, FIXED, COMPOSITION: body style no 14, MBCA Ref Dwg Group 2; 120,000 ohms; $\pm 10\%$ tolerance; 1 watt; maximum allowable percent change in resistance from resistance at ambient temperature of 25 degrees centigrade (77 degrees Fahrenheit) is; at -55 degrees centigrade (-67 deg F) $\pm 20\%$ resistance change; at 105 degrees centigrade (221 deg F) $\pm 10\%$ resistance change; $1\frac{1}{4}$ in long, $\frac{1}{4}$ in dia; insulated; resistant to humidity and/or salt water immersion; 2 wire leads; Whiteford Laboratory, Lynn, Mass; JAN spec no JAN-R-11; JAN RC30BF124K; general purpose use.	Bleeder resistor
R103		Same as R102.	Plate balance for V102

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

TABLE 8-3. TABLE OF REPLACEABLE PARTS (Cont.)

PARTS				
SYMBOL DESIG- NATION	STOCK NUMBER		NAME OF PART AND DESCRIPTION	FUNCTION
	SIGNAL CORPS	NAVY AIR FORCE		
TAPE CODE RECORDER RD-110/U (Cont.)				
R104	N16-R-50975-811		RESISTOR, FIXED, COMPOSITION: body style no 14, MBCA Ref Dwg Group 2; 1 megohm; $\pm 10\%$ tolerance; $\frac{1}{2}$ watt; maximum allowable per cent change in resistance from resistance at ambient temperature of 25 degrees centigrade (77 deg F) is; at -55 degrees centigrade (-67 deg F) $\pm 20\%$ resistance change; at 105 degrees centigrade (221 deg F) $\pm 10\%$ resistance change; $\frac{1}{2}$ in long by $\frac{3}{32}$ in dia; insulated; resistant to humidity and/or salt water immersion; 2 wire leads; Whiteford Laboratory, Lynn, Mass; JAN spec No. JAN-R-11, JAN RC20BF105K; general purpose use.	Bias for V103
R105	N16-R-50652-711		RESISTOR, FIXED, COMPOSITION: body style no 14, MBCA Ref Dwg Group 2; 120,000 ohms; $\pm 10\%$ tolerance; 2 watts; maximum allowable per cent in resistance from resistance at ambient temperature of 25 degrees centigrade (77 deg F) is; at -55 degrees centigrade (-67 deg F) $\pm 20\%$ resistance change; at 105 degrees centigrade (221 deg F) $\pm 10\%$ resistance change; $1\frac{1}{4}$ in long, $\frac{1}{4}$ in dia; insulated; resistant to humidity and/or salt water immersion; 2 wire leads; Whiteford Laboratory, Lynn, Mass; JAN spec No. JAN-R-11, JAN RC41BF124K; for general purpose use.	Bias for V104
R106	N16-R-50679-711		RESISTOR, FIXED, COMPOSITION: body style no 14, MBCA Ref Dwg Group 2; 150,000 ohms; $\pm 10\%$ tolerance; 2 watts; maximum allowable per cent change in resistance from resistance at ambient temperature of 25 degrees centigrade (77 deg F) is; at -55 degrees centigrade (-67 deg F) $\pm 20\%$ resistance change; at 105 degrees centigrade (221 deg F) $\pm 10\%$ resistance change; $1\frac{1}{4}$ in long by $\frac{1}{4}$ in dia; insulated; resistant to humidity and/or salt water immersion; 2 wire leads; Whiteford Laboratory, Lynn, Mass; JAN spec No. JAN-R-11, JAN RC41BF154K; for general purpose use.	Plate coupling resistor for V104
R107			Same as R106.	Plate coupling resistor
R108			Same as R106.	Plate coupling resistor
R109			Same as R106.	Plate coupling resistor
R110			Same as R105.	Bias for V104
R111	N16-R-70768-7496		RESISTOR, FIXED, WIRE WOUND: body style no 23, MBCA Ref Dwg Group 2; inductive winding; 20,000 ohms; $\pm 10\%$ tolerance; 10 watts; maximum continuous operating temperature 300 degrees centigrade; $1\frac{3}{4}$ in lg, $\frac{3}{8}$ in dia; ceramic core; vitreous enamel coating; moisture resistant; 2 terminals solder lug type; mounted by terminals; Ohmite Mfg. Co., Chicago, Illinois; type "Brown Devil"; general purpose use.	Voltage divider
R112	N16-R-91291-8502		RESISTOR, VARIABLE: wire wound; 1 section; 10 megohms; $\pm 10\%$ tolerance; 4 watts; linear taper; 3 terminals; solder lug type; phenolic body; metal case; enclosed; $1\frac{5}{8}$ in diam; 1 in overall thickness; brass shaft; round; $\frac{1}{4}$ in dia; $\frac{5}{8}$ in lg; grounded to frame; no off position; Whiteford Laboratory, Lynn, Mass., Part Dwg A-1806; for general purpose use.	Power control
R113	N16-R-50283-711		RESISTOR, FIXED, COMPOSITION: body style no 14, MBCA Ref Dwg Group 2; 10,000 ohms $\pm 10\%$ tolerance; 2 watts; F temperature characteristic; $1\frac{1}{4}$ in long by $\frac{1}{4}$ in diam; insulated; resistant to humidity and/or salt water immersion; 2 wire leads; Whiteford Laboratory, Lynn, Mass; JAN spec No. JAN-R-11, JAN RC41BF103K; for general purpose use.	Voltage divider

R114		Same as R111.	Voltage divider
R115		RESISTOR, VARIABLE: wire wound; 1 section; 10,000 ohms $\pm 10\%$ tolerance; 4 watts; '5" taper; 3 terminals; solder lug type; phenolic body; metal case; enclosed; $1\frac{1}{8}$ in diam, $1\frac{1}{16}$ in thick; brass shaft, round; $\frac{3}{8}$ in lg; grounded to frame; off position at extreme clockwise rotation; S.P.S.T. switch; normally closed; $\frac{5}{16}$ in thk; 1 in dia; for general purpose use.	Background control
R116	N16-R-49769-811	RESISTOR, FIXED, COMPOSITION: body style no 14, MBCA Ref. Dwg Group 2; 470 ohms; $\pm 10\%$ tolerance; $\frac{1}{2}$ watt; F temperature characteristic; $\frac{1}{2}$ in lg, $\frac{3}{32}$ in dia; insulated; resistant to humidity and/or salt water immersion; 2 wire leads; Whiteford Laboratory, Lynn, Mass; JAN spec No. JAN-R-11, JAN RC20BF471K; for general purpose use.	Voltage divider
R117		Same as R113.	Bias resistor
R118		Same as R113.	Voltage divider
R119	N16-R-50553-711	RESISTOR, FIXED, COMPOSITION: body style no 14, MBCA Ref. Dwg Group 2; 68,000 ohms; $\pm 10\%$ tolerance; 2 watts; F temperature characteristic; $1\frac{1}{4}$ in lg; $\frac{1}{4}$ in dia; insulated; resistant to humidity and/or salt water immersion; 2 wire leads; Whiteford Laboratory, Lynn, Mass; JAN spec No. AN-R-11, JAN RC41BF683K; for general purpose use.	Coupling resistor
R120		Same as R111.	Filter choke
R121	N16-R-50633-811	RESISTOR, FIXED, COMPOSITION: body style no 14, MBCA Ref Dwg Group 2; 100,000 ohms; $\pm 10\frac{1}{4}\%$ tolerance; $\frac{1}{2}$ watt; F temperature characteristic; $1\frac{3}{32}$ in lg, $\frac{1}{8}$ in dia; insulated; resistant to humidity and/or salt water immersion; 2 wire leads; Whiteford Laboratory, Lynn, Mass; JAN spec No. JAN RC20BF104K; for general purpose use.	Coupling resistor
R122		Same as R104.	Bias resistor
R123	N16-R-70741-9476	RESISTOR, FIXED, WIRE WOUND: body style no 23, MBCA Ref Dwg Group 2; inductive winding; 10,000 ohms; $\pm 10\%$ tolerance; 10 watts; maximum continuous operating temperature; 40°C; $1\frac{3}{8}$ in lg, $\frac{1}{2}$ in diam; phenolic resin coating; 2 wire leads; mounted by wire leads; I.R.C. type A.B.; for general purpose use.	Filter choke
R124	N16-R-65851-5296	RESISTOR, FIXED, FIRE WOUND: body style no 20, MBCA Ref Dwg Group 2; inductive winding; 400 ohms; $\pm 10\%$ tolerance; 80 watts; maximum continuous operating temperature 40°C; $6\frac{1}{2}$ in lg; $\frac{7}{8}$ in diam; phenolic resin coating; 2 screw lug terminals; bracket mounted; Clorostat Mfg. Corp.; Dover, N. H.; type no K-80-1N; for general purpose use.	Supply voltage regulator
S101	N17-S-744575-7731	SWITCH, TOGGLE: double pole, double throw; 3 amps at 250 V, 6 amps at 125 V; phenolic body; $1\frac{3}{4}$ in long; 2 in high; $1\frac{1}{16}$ in wide; bat type handle; $\frac{5}{8}$ in long excluding bushing; locking action; 6 terminals, solder lug type located 2 on back, 2 on each side; single hole mounting type; $\frac{1}{2}$ in dia bushing; 32 threads per inch; $\frac{3}{8}$ in long; Arrow Hart and Hegeman Electric Co., Chelsea, Mass; type no 82305; general purpose use.	Filter switch
S102		Same as S101.	Mark space switch
S103	N17-S-71451-5983	SWITCH, TOGGLE: single pole, single throw; 3 amps at 250 V, 6 amps at 125 V; phenolic body; $1\frac{3}{4}$ in. lg. $1\frac{3}{4}$ in high; $1\frac{1}{16}$ in wide; bat type handle; $\frac{5}{8}$ in long excluding bushing; locking action; 2 terminals, solder lug type; located one on each side; single hole mounting type; $\frac{1}{2}$ in dia bushing; 32 threads per inch; $\frac{3}{8}$ in long; Arrow Hart and Hegeman Electric Co., Chelsea, Mass; type no 82301; general purpose use.	AC line switch
S104	N17-S-90138-3701	SWITCH, SENSITIVE: single throw single pole; 20 A at 125 V.A.C., 15 A at 250 V.A.C.; moulded phenolic body; $1\frac{13}{16}$ in long, $1\frac{3}{8}$ in wide, $1\frac{1}{16}$ in thick; roller leaf type; operating force 4 to 8 oz; normally open; 4 solder lug terminals; 2 mounting holes through side, on centers $\frac{3}{32}$ in by $\frac{7}{16}$ in; M.U. Switch Corp., Canton, Mass.; type MLG359; general purpose use.	Standby switch

TABLE 8-3. TABLE OF REPLACEABLE PARTS (Cont.)

PARTS				
SYMBOL DESIG- NATION	STOCK NUMBER		NAME OF PART AND DESCRIPTION	FUNCTION
	SIGNAL CORPS	NAVY AIR FORCE		
TAPE CODE RECORDER RD-110/U (Cont.)				
T101	N17-T-61593-7151		TRANSFORMER, AUDIO FREQUENCY: input type; primary 600 ohms; secondary 1 megohm, center tapped; hermetically sealed metal case; steel core; case dimension, 1 5/8 in. high; 1 1/4 in. diam; square base 1 3/8 in. by 1 3/8 in.; ratio of turns primary to secondary 40 to 1; rated frequency response 100 to 10,000 cy; 5 terminals, solder lug type; 4 mounting holes on centers 1 1/8 in. by 1 1/8 in.; United Transformer Corp., N.Y. 13, N.Y.; type F-9786A; for general purpose use.	Input transformer
T102	N17-T-65750-1856		TRANSFORMER, AUDIO FREQUENCY: plate coupling type; primary 15,000 ohms; secondary 80,000 ohms center tapped; primary 10 M.A.; hermetically sealed metal case; hiperm alloy core; 2 1/4 in. high; 1 1/2 in. diam; cylindrical shape; rectangular base, 1 5/8 in. by 1 5/8 in.; maximum audio operating level +7 DB; ratio of turns primary to secondary 2.3 to 1; rated frequency response 30 to 20,000 cy; 5 terminals; solder lug type; located on bottom; 4 mounting holes .144 in. diam. on centers 1 5/16 in. by 1 5/16 in.; not shielded; United Transformer Corp., N.Y. 13, N.Y.; type F-9787; for specific use on Code Tape Recorder, N BuShips Contract NObsr 49122; Navy type no. Recorder, Code Tape RD-110/U.	Plate coupling transformer
T103	N17-T-65035-3579		TRANSFORMER, AUDIO FREQUENCY: plate coupling type; primary 8000 ohms, center tapped; 11 ohms secondary; primary 200 M.A.; 1500 volts test voltage; hermetically sealed; metal case; hiperm alloy core; 3 1/4 in. high; 2 1/2 in. diam; base 2 1/2 in. square; maximum audio operating level 15 watts; ratio of turns primary to secondary 100 to 1; rated frequency response 40 to 10,000 cy; 5 terminals, solder lug type; located on bottom; 4 mounting holes on centers, 2 3/32 in. by 2 3/32 in.; United Transformer Co., N.Y. 13, N.Y.; type F-9788; for specific use; N BuShips Contract NObsr 49122, Navy type no. Recorder Code Tape RD-110/U.	Plate coupling output transformer
T104	N17-T-74053-3156		TRANSFORMER, POWER, STEP-DOWN AND STEP-UP: hermetically sealed metal case; 110-220 V.A.C.; 60 cy; single phase input; 3 output windings; no. 1 secondary 700V; no. 2 secondary 5V; no. 3 secondary 6.3V; no. 1 secondary 165M.A. center tapped; no. 2 secondary 3 amps; no. 3 secondary 3 amps; insulation test voltage 2500 volts; air cooled; 4 7/16 in. diam; 5 1/2 in. high; base 4 15/32 in. square; 10 terminals; solder lug type, located on bottom; 4 mounting holes on centers 3 7/16 in.; United Transformer Co., New York, 13, N.Y.; type No. F-9790; for general purpose use.	Power transformer
TB101	N17-B-77637-3411		TERMINAL BOARD: black bakelite board; includes terminals; 4 terminals, screw type with solder lug connections; barrier type 2 1/2 in. lg; 1 1/8 in. wd; 1/2 in. thk; 4 mounting holes; 2 on each end, on centers 1 1/16 in. by 1/16 in.; Jones Mfg. Corp., Chicago, Ill.; type 4-141-Y; for general purpose use.	Terminal board for input leads
TB102			Same as TB-101.	Terminal board for output leads
TB103	N17-B-77641-672		TERMINAL BOARD: black bakelite board; includes terminals; 8 terminals; screw type; with barriers; 4 1/4 in lg; 1 1/8 in wd; 1/2 in thk; 4 mounting holes; 2 on each end, on centers 1 31/32 in by 1/16 in; Jones Mfg. Corp., Chicago, Illinois; Type 8-141-Y; for general purpose use.	Terminal board for B101
TB104	*		TERMINAL BOARD: micarta; fungus coated; terminals included; without barriers; 9 3/4 in lg; 2 3/4 in wd; 4 mounting holes on centers 1 7/16 in by 1 1/16 in; Whiteford Laboratory, Lynn, Mass., Dwg no. V1701; general purpose use.	Mounts capacitors and resistors

V101	N16-T-56677-40	ELECTRON TUBE: twin triode glass envelope; Radio Manufacturers association envelope T-9; cylindrical shape; 8 terminals; pin type, located on bottom; amplifier; JAN type 6SL7-WGT; Sylvania Electric Co., Emporium, Pennsylvania; for general purpose use.	Amplifier
V102	N16-T-56195-50	ELECTRON TUBE: twin diode; glass envelope; Radio Manufacturers Association envelope T-5½; cylindrical shape; 7 terminals; pin type; located on bottom; rectifier; JAN type 6AL5W; Chatham, Electronics Co. general purpose application.	Half-wave rectifier
V103	N16-T-56255	ELECTRON TUBE: triode; glass envelope; Radio Manufacturers association envelope T-9; cylindrical shape; 6 terminals; small pin type; located on bottom; electron ray tube; JAN type 6E5; Sylvania Electric Products Co., Emporium, Pennsylvania; general purpose application.	Used to tune incoming signal
V104		Same as V101.	
V105	N-16-T-56758	ELECTRON TUBE: pentode; glass envelope; Radio Manufacturers Association envelope MT-8; cylindrical shape; 8 terminals; pin type; located on bottom; beam power amplifier; JAN type 6V6GT; Sylvania Electric Co., Emporium, Pa., type 6V6GT; general purpose application.	Amplifier
V106		Same as V105.	
V107	N16-T-55446	ELECTRON TUBE: diode; glass envelope; Radio Manufacturers association envelope ST-16; 4 terminals; pin type; located on bottom; full-wave rectifier; JAN type 5R4WGY; Chatham Electronics Co., type 5R4WGY; general purpose use.	Full-wave rectifier
V108	N16-T-56840-50	ELECTRON TUBE: triode; glass envelope, Radio Manufacturers Association envelope T-5½; cylindrical shape; 1 terminals; miniature pin type; located on bottom; full-wave high vacuum rectifier; JAN type 6X4W; Raytheon Electric Co., Waltham, Mass; type 6X4W; general purpose application.	Full-wave rectifier
W101	*	CORD, POWER	Power supply cord and slugs
XF101	N17-F-74267-5075	FUSEHOLDER: retainer type; 125V; 3 amp; accommodate fuse, one cartridge type, 1⅜ in long, ¼ in dia; phenolic body; brass contacts; cadmium plated; 1¾ in long, 1¼ in overall dia, one terminal, solder lug type mounted by ¾ in 20 thread on O.D.; Bussman Mfg. Co., St. Louis, Mo.; type H.K.P.; general purpose use.	Fuseholder for F101
XF102	N17-F-73772-1960	FUSEHOLDER: Clip type; accommodate fuse, one cartridge type, to hold spare fuse; general purpose use.	Holds spare fuse
XI101	N17-L-76854-4094	LIGHT, INDICATOR: supplied without lens; accommodates lens ½ in dia; lamp data MBCA Ref Dwg Group 7; accommodates T-3¼ lamp; Miniature bayonet base; brass shell; overall dim 1⅝ in lg, 2⅜ in OD; one mounting hole 1¼ in dia required; 2 terminals, solder lug type, located on opposite sides of base, both insulated from shell; Dial Light Co. of America; New York, N.Y.; type no 882210.	Indicates when heaters are on
XI101A	N17-L-51625-6315	LAMPHOLDER: accommodates miniature bayonet base lamp; MBCA Ref Dwg Group 7; used with 6.3 V lamp .100 amps; brass body 1⅝ in long, 2⅜ in dia; no switch; two terminals, solder lug type; mounts through panel; Dial Light Company of America, New York, N.Y.; Type no 88408 or 882210 for general purpose use.	Holder for I101
XI101B	N17-L-250177-925	LENS, INDICATOR LIGHT; clear; ½ in dia lens; hemispherical type; glass; ⅞ in lg, ⅝ in dia; mounted holder; brass; dark oxide finish threaded type mounting; ⅜ in dia, 1¼ in long; Dial Light Company of America, New York, N.Y.; Type no 88-637; for general purpose use; part of assembly XI-101.	Lens for XI101

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

TABLE 8-3. TABLE OF REPLACEABLE PARTS (Cont.)

PARTS			
SYMBOL DESIG- NATION	STOCK NUMBER	NAME OF PART AND DESCRIPTION	FUNCTION
	SIGNAL CORPS NAVY AIR FORCE		
TAPE CODE RECORDER RD-110/U (Cont.)			
XI102	*	HOLDER, TUBE, ELECTRON RAY: brass; black finish; cylindrical shape; 1¼ in diam; 3¾ in lg; flange mounted; 1¾ in dia flange; 3 mounting holes 120 degrees apart on mounting flange; Whiteford Laboratory, Lynn, Mass; Dwg no A-1602.	Holder for V103
XV101	N16-S-63519-1959	SOCKET, ELECTRON TUBE: 8 contacts; ceramic and brass; octal; 1¼ in diam; ½ in thk; 7/16 in I.D.; round ange mounted; 2 mounting holes 1½ in apart; Cinch Mfg. Corp; Chicago, Illinois; general purpose use.	Socket for V101
XV102		SOCKET, ELECTRON TUBE: 7 contacts, copper; miniature; includes center shield; 3/32 in I.D.; round; 25/32 in diam; 13/16 in thick; flange mounted; 2 mounting holes; 7/8 in apart; E.B.Y. Mfg. Co., N. Y., New York; type 103M; general purpose use.	Socket for V102
XV103	N16-S-62156-5593	SOCKET, ELECTRON TUBE: 6 contacts; bakelite socket; metal shell; 15/16 in long; 1¼ in dia; plug type; wire lead terminals; Amphenol Co., Chicago, Illinois; general purpose use.	Socket for V103
XV104		Same as XV101	Socket for V104
XV105		Same as XV101	Socket for V105
XV106		Same as XV101	Socket for V106
XV107		Same as XV101	Socket for V107
XV108		Same as XV102	Socket for V108
Z101	N16-F-32166-7817	FILTER, BAND PASS: operating frequency 1875 cycles; band width 1725 cy to 2025 cy; input 600 ohms, center tapped at 300 ohms; output 600 ohms; 2½ in high, 1 13/16 in diam; hermetically sealed metal case; cylindrical case; base 1 13/16 in square; four .144 in mounting holes, on centers 1½ in by 1½ in; 7 terminals, solder lug type; United Transformer Co., N. Y. 13, New York; type F-8950B for specific use on BuShips Contract NObsr 49122; Navy type no. Recorder, Code Tape RD-110/U.  CLEANER, RECORDER HEAD: stainless steel; round wire drawn to .0095 in diam; 4 in lg; Whiteford Laboratory, Lynn, Mass.; Dwg no A1809; Precision Products Co., Waltham, Mass.	Passes frequency of 1875 cycles only  Used to clean recorder pen
* "Not furnished as a maintenance part. If failure occurs, do not request replacement unless the item cannot be repaired or fabricated."			

NAVSHIPS 91682

RD-110/U  
PARTS LISTS

ORIGINAL

CHANGE 1

TABLE 8-3. TABLE OF REPLACEABLE PARTS (Cont.)

PARTS				
SYMBOL DESIG- NATION	STOCK NUMBER		NAME OF PART AND DESCRIPTION	FUNCTION
	SIGNAL CORPS	NAVY AIR FORCE		
<b>AUTOMATIC TAPE FEED - MODEL AT-2</b>				
A201	*		CHASSIS: 16 gauge steel; Navy gray finish 7-1/4 in. long, 4-1/4 in. high; 3-5/16 in. wide; Whiteford Laboratory, Lynn, Mass; part/dwg no. C3019.	Provides assembly base for component parts of Model AT-2
C201	16-C-42763-2781		CAPACITOR, FIXED, PAPER DIELECTRIC: 1 section; case style no. 18, less mounting bracket MBCA Ref. Dwg. Group 1; 10,000 mmf; plus or minus 20% tolerance; 200 V.D.C.; sealed cardboard case; 5/8 in. lg. by 5/16 in. in dia; two terminals, wire lead type, located on both ends of capacitor; Hyvol K impregnation, moisture resistant wax; no internally grounded connections; Aerovox Corp., New Bedford, Mass; Type P-282; general purpose use.	Provides negative feed back loop
C202	16-C-47323-4104		CAPACITOR, FIXED, PAPER DIELECTRIC: 1 section; case style no. 18, less mounting bracket, MBCA Ref. Dwg. Group 1; 500,000 mmf; plus or minus 20% tolerance; 200 V.D.C.; sealed cardboard case; 1-1/8 in. lg. by 7/16 in. in dia; two terminals, wire lead type, located on both ends of capacitor; Hyvol K impregnation, moisture resistant wax; no internally grounded connections; Aerovox Corp., New Bedford, Mass; Type P-282, general purpose use.	Provides storage for delay action
C203	16-C-42763-2781		Same as C201	Acts as filter for rectified signal voltage
C204	16-C-45803-1084		CAPACITOR, FIXED, PAPER DIELECTRIC: 1 section; case style no 18, less mounting bracket MBCA Ref. Dwg. Group 1; 100,000 mmf; plus or minus 20% tolerance, 200 V.D.C.; sealed cardboard case; 5/8 in. lg. by 5/16 in. in dia; two terminals, wire lead type, located on both ends of capacitor; Hyvol K impregnation, moisture resistant wax; no internally grounded connections; Aerovox Corp., New Bedford, Mass; type P-282, general purpose use.	Plate coupling capacitor
C205	16-C-46373-2781		CAPACITOR, FIXED, PAPER DIELECTRIC: 1 section; case style no. 18, less mounting bracket MBCA Ref. Dwg. Group 1; 250,000 mmf; plus or minus 20% tolerance; 200 V.D.C.; sealed cardboard case; 5/8 in. lg. by 7/16 in. in dia; two terminals, wire lead type, located on both ends of capacitor; Hyvol K impregnation, moisture resistant wax; no internally grounded connections; Aerovox Corp., New Bedford, Mass; type P-282, general purpose use.	Input signal coupling capacitor
C206	16-C-41243-2571		CAPACITOR, FIXED, METALLIZED DIELECTRIC: 1 section; case style no 18, less mounting bracket MBCA Ref. Dwg. Group 1; 5,000 mmf; plus or minus 20% tolerance, 200 V.D.C.; moulded thermo plastic case; 7/16 in. lg. by 3/16 in. in dia; two terminals, wire lead type, located on both ends of capacitor; Hyvol K impregnation, thermo plastic; no internally grounded connections; Aerovox Corp., New Bedford, Mass; type P-83Z, general purpose use.	Part of R.C. low pass filter network
H201			SHIELD, ELECTRON TUBE: brass, cadmium plated; cylindrical shape; 1- 5/16 in. lg., 1 in. in dia; mounts on shell of socket by clamping on with half twist; Eby Mfg. Co.; New York, N.Y. type no. 9704; general purpose use.	Shield for electron tube V201

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A201-H201  
PARTS LISTS

NAVSHIPS 91682

Section 8  
RD-110A/U



TABLE 8-3. TABLE OF REPLACEABLE PARTS (Cont.)

PARTS				
SYMBOL DESIG- NATION	STOCK NUMBER		NAME OF PART AND DESCRIPTION	FUNCTION
	SIGNAL CORPS	NAVY AIR FORCE		
<b>AUTOMATIC TAPE FEED - MODEL AT-1 (Cont.)</b>				
H202	N16-C-300798-631		CLAMP, ELECTRICAL: steel; cadmium plated; snap on type; 1-1/4 in. closed dia; 3/4 in. high; foot mounted, one foot, 3/4 in. high, 3/8 in. lg., 1/2 in. wd; Birtcher Co., Los Angeles, Calif., Part No. 926-B; for general purpose use	Secures V202
K201	17-R-65372-8369		RELAY, ARMATURE: pile-up type (break and made form C) MBCA Ref. Dwg. Group 4; normally closed; double break; voltage rating 115V, current rating 5 amps; one winding; inductive; D.C. 10,000 ohms, resistance; operating voltage 50V, operating current 25MA.; 6 terminals on contacts; 2 terminals on coil; no time delay; intermittent duty; 6-1/2 in. lg. 2-1/8 in. wd.; 2-1/2 in. high; relay is mounted by means of a bracket which is part of the relay itself with 2 holes 0.120 in. in dia; spaced 1-13/16 in. center to center; a tubular rod 5 in. lg. is attached to the armature of the relay, and is arranged to engage the lift bar of the tape puller drive head; this is used to operate the automatic tape pulling feature of the Navy Code Tape Recorder RD-110/U and RD-110A/U; Whiteford Laboratory, Lynn, Mass. part/dwg. no. B3008.	Provides mechanical lift for Automatic Tape Feed. Contacts also supply delay action.
N201	16-S-117101-838		DIAL, SCALE: application "filter"; zero to nine, left to right, operated clockwise thru 270 degrees; not graduated; 270 degree arc covered; round; 1-1/4 in. in dia; 3/8 in. dia. of center hole, mounts using 3/8 in. dia. center hole; aluminum; reversed etched and lacquered; Whiteford Laboratory, Lynn, Mass; part/dwg no. A3022; for specific use with Navy Code Tape Recorder RD-110/U and RD-110A/U.	Provides dial for R210
N202	16-S-117101-839		DIAL, SCALE: application "delay"; zero to nine, left to right, operated clockwise thru 270 degrees; not graduated; 270 degree arc covered; round; 1-1/4 in. in dia; 3/8 in. dia. of center hole, mounts using 3/8 in. dia. center hole; aluminum; reversed etched and lacquered; Whiteford Laboratory, Lynn, Mass; part/dwg no. A3022; for specific use with Navy Code Tape Recorder RD-110/U and RD-110A/U.	Provides dial for R211
N203	16-P-403621-188		DIAL, SCALE: application "on-off"; off-on top to bottom; not graduated; other markings "Automatic Tape Feed AT-2"; rectangular; 1-5/8 in. lg. 1-1/4 in. wd. 1/2 in. dia. of center hole; mounts using 1/2 in. dia. center hole; aluminum; reversed etched and lacquered; Whiteford Laboratory, Lynn, Mass; part/dwg no. A3022; for specific use with Navy Code Tape Recorder RD-110/U and RD-110A/U.	Provides indicator for S201
O201	*		IDLER LIFT BAR: brass; cadmium plated; 4 in. lg; by 1/8 in. dia; with integral hub 1/2 in. lg; 1/2 in. in dia; furnished with aluminum eccentric 1 in. lg., 5/8 in. in dia; Whiteford Laboratory, Lynn, Mass; Dwg. no. A3021.	Operates with relay arm to raise tape puller drive head
**"Not furnished as a maintenance part. If failure occurs, do not request replacement unless the item cannot be repaired or fabricated."				

CHANGE 1

R201	N16-R-51370-431	RESISTOR, FIXED, COMPOSITION: body style no. 14; MBCA Ref. Dwg. Group 2; 15 megohms total resistance; plus or minus 5% tolerance; 1/2 watt; resistance temperature F characteristic; 3/8 in. lg. 9/64 in. in dia; insulated, resistant to humidity and/or salt water immersion; two terminals wire lead type; Ohmite Mfg. Co., Chicago, Illinois, "Little Devil"; general purpose use.	Supplies auxiliary bias voltage to tube V202
R202	N16-R-51370-431	Same as R201	Function same as R201
R203	N16-R-51173-811	RESISTOR, FIXED, COMPOSITION: body style no. 14, MBCA Ref. Dwg. Group 2; 4.7 megohms total resistance; plus or minus 10% tolerance; 1/2 watt; F temperature characteristic; 3/8 in. lg. 9/64 in. in dia; insulated, resistant to humidity and/or salt water immersion; two wire leads; Ohmite Mfg. Co., Chicago, Illinois, "Little Devil", general purpose use.	Diode load resistor
R204	16-R-50634-554	RESISTOR, FIXED, COMPOSITION: body style no. 14, MBCA Ref. Dwg. Group 2; 100,000 ohms total resistance; plus or minus 10% tolerance; 2 watt; F temperature characteristic; 11/16 in. lg. 5/16 in. in dia; insulated, resistant to humidity and/or salt water immersion; two wire leads; Ohmite Mfg. Co., Chicago, Illinois, "Little Devil"; general purpose use.	Negative voltage divider network
R205	16-R-50373-236	RESISTOR, FIXED, COMPOSITION: body style no. 14, MBCA Ref. Dwg. Group 2; 22,000 ohms total resistance; plus or minus 10% tolerance; 1 watt; F temperature characteristic; 9/16 in. lg. 7/32 in. in dia; insulated; resistant to humidity and/or salt water immersion; two wire leads; Ohmite Mfg. Co., Chicago, Illinois, "Little Devil"; general purpose use.	Negative voltage divider network
R206	N16-R-50714-811	RESISTOR, FIXED, COMPOSITION: body style no. 14, MBCA Ref. Dwg. Group 2; 220,000 ohms total resistance; plus or minus 10% tolerance; 1/2 watt; F temperature characteristic; 3/8 in. lg. 9/64 in. in dia; insulated; resistant to humidity and/or salt water immersion; two wire leads; Ohmite Mfg. Co., Chicago, Illinois; "Little Devil"; general purpose use.	Plate load resistor
R207		Same as R206	Diode input resistor
R208	N16-R-50822-811	RESISTOR, FIXED, COMPOSITION: body style no. 14, MBCA Ref. Dwg. Group 2; 470,000 ohms total resistance; plus or minus 10% tolerance; 1/2 watt; F temperature characteristic; 3/8 in. lg. 9/64 in. in dia; insulated; resistant to humidity and/or salt water immersion; two wire leads; Ohmite Mfg. Co. Chicago, Illinois; "Little Devil"; general purpose use	Input bias supply
R209		Same as R203	Auxiliary bias supply
R210	16-R-88387-8693	RESISTOR, VARIABLE: composition element; 1 section 2.0 megohms total resistance, plus or minus 10% tolerance; 1/2 watt nominal power rating; standard A taper MBCA Ref. Dwg. Group 3; 3 terminals; solder lug type; phenolic body; metal case enclosed; 15/16 in. in dia; 7/16 in. deep; metal screw driver slotted, round 1/4 in. wide; 1/16 in. deep, slot in end 1/4 in. dia. shaft; 1/4 in. from mounting surface; normal torque; insulated; no "off" position; bushing mounted 3/8 in. in dia; 32 threads per inch; 1/2 in. lg. I.R.C., Philadelphia, Pa., type R.Q.-11-139; general purpose use.	Part of RC filter network (low pass)

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Section 8  
R201-R210

TABLE 8-3. TABLE OF REPLACEABLE PARTS (Cont.)

SYMBOL DESIG- NATION	STOCK NUMBER		NAME OF PART AND DESCRIPTION	FUNCTION
	SIGNAL CORPS	NAVY AIR FORCE		
<b>AUTOMATIC TAPE FEED - MODEL AT-1 (Cont.)</b>				
R211	16-R-88667-8693		RESISTOR, VARIABLE: composition element; 1 section; 10 megohms total resistance, plus or minus 10% tolerance; 1/2 watt nominal power rating; standard A taper MBCA Ref. Dwg. Group 3; 3 terminals; solder lug type; phenolic body; metal case enclosed; 15/16 in. in dia; by 7/16 in. deep; metal screw driver slotted, round, 1/4 in. wide; 1/16 in. deep, slot in end; 1/4 in. in dia.; shaft; 1/4 in. from mounting surface; normal torque; insulated; no "off" position; bushing mounted 3/8 in. in dia; 32 threads per inch 1/2 in. lg; I.R.C., Philadelphia, Pa.; type R.Q.-11-143; general purpose use.	Part of delay network
R212			Same as R206	Acts as a noise clipper. Connected in parallel with R122 in recorder chassis
S201	N17-S-71451-5983		SWITCH, TOGGLE: single pole, single throw; 3 amps at 250V, 6 amps at 125V; phenolic body; 1-3/4 in. lg; 1-3/4 in. high, 11/16 in. wd; bat type handle; 5/8 in. lg. excluding bushing; locking action; 2 terminals, solder lug type; located one on each side; single hole mounting type; 1/2 in. dia. bushing; 32 threads per inch; 3/8 in. lg; Arrow Hart and Hegeman Electric Co., Chelsea, Mass.; type no. 82301; general purpose use.	On-off switch for automatic tape feed
TB201	17-B-77585-4542		TERMINAL BOARD: moulded phenolic; includes terminals; 3 terminals; single screw type with barriers; 1-3/4 in. long; 7/8 in. wide; 13/32 in. thk; 4 mounting holes; 2 on each end on centers; 1-1/2 in. by 5/16 in.; Jones Mfg. Corp., Chicago, Illinois; type 3-140-Y; for general purpose use.	Connector terminals for auxiliary relay contacts.
TB202	17-B-78222-6076		TERMINAL BOARD: natural linen bakelite; fungus coated; terminals included; without barriers 6-1/4 in. lg; by 1-1/2 in. wd; by 1/8 in. thk; 2 mounting holes 0.120 in. in dia; spaced 5-1/2 in. apart from center to center; Whiteford Laboratory, Lynn, Mass; Dwg. no. B3006; for specific use Navy BuShips Contract NObsr 57254 Navy type Recorder Code Tape RD-110/U and RD-110A/U.	Mounts resistor and capacitor components for automatic tape feed
V201			ELECTRON TUBE: twin triode glass envelope; Radio Mfg. Association envelope cylindrical shape; 9 terminals; pin type, located on bottom; amplifier, JAN type 12AX7; Sylvania Electric Co., Emporium, Pa., for general purpose use.	Amplifier and diode rectifier
V202	N-16-T-56758		ELECTRON TUBE: pentode; glass envelope; Radio Mfg. Association envelope MT 8; cylindrical shape, 8 terminals; pin type; located on bottom; beam power amplifier; JAN type 6VGT; Sylvania Electric Co., Emporium, Pa.; type 6VGT; general purpose application.	Amplifier
XV201			SOCKET, ELECTRON TUBE: 9 contacts, copper, miniature; includes center shield; 3/16 in. ID; round; 15/16 in. in dia; 5/8 in. high with shock shield; flange mounted; 2 mounting holes; 1-1/8 in. apart; Eby Mfg. Co., New York, N.Y.; type 9714; for general purpose use.	Socket for V201

XV202	N16-S-63519-1959	SOCKET, ELECTRON TUBE: 8 contacts; ceramic and brass; octal; 1-1/4 in. dia; 1/2 in. thk; 7/16 in. D.I.; round; flange mounted; 2 mounting holes 1-1/2 in. apart; Cinch Mfg. Corp., Chicago, Illinois; general purpose use.	Socket for V202
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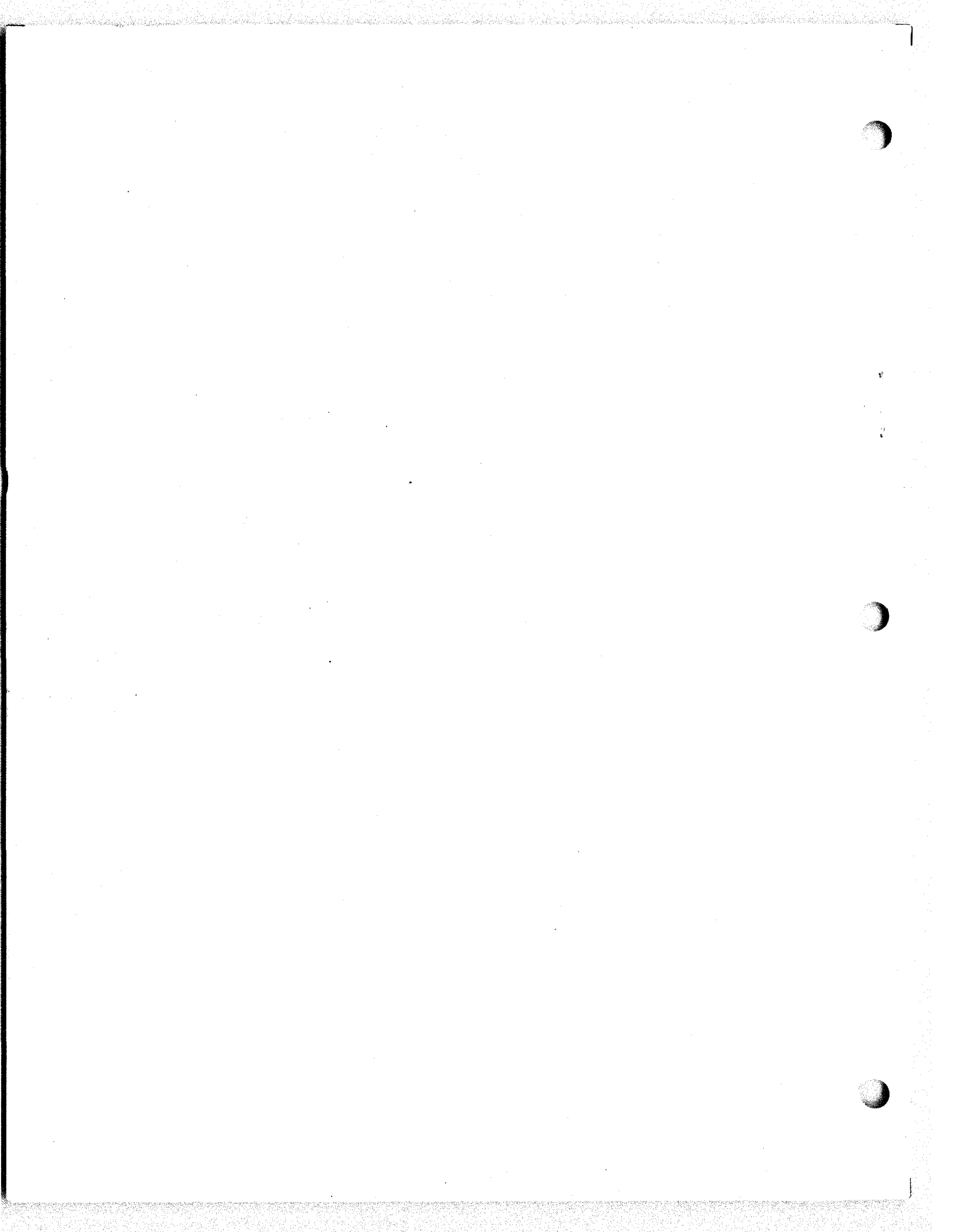


TABLE 8-4. MAINTENANCE PARTS KIT

NAME	SIZE	QUANTITY
Wrench, Allen	#4-40	1
Wrench, Allen	#6-32	1
Wrench, Allen	#8-32	1
Wrench, Allen	#10-32	1

