TM 11-5835-239-35

TECHNICAL MANUAL

DS, GS, AND DEPOT MAINTENANCE MANUAL

SOUND RECORDER SET AN/ASH-23 AND SOUND REPRODUCER SET AN/ASH-24

HEADQUARTERS, DEPARTMENT OF THE ARMY

JANUARY 1971

WARNING

DANGEROUS VOLTAGES

When power to the playback unit is turned on and the front panel is removed from its case, 115 vac is present at the circuit breaker and power switch terminals.

CAUTION

To avoid damage to transistors and integrated circuits, make sure that all power to the units is disconnected before removing or replacing any component. Check the source voltage and polarity before making connections to the equipment. Use only the R X 1 or R X 10 scale when measuring resistance TRANSISTORS AND INTEGRATED CIRCUITS MAY BE PERMANENTLY DAMAGED BY IMPROPER VOLTAGE OR POLARITY.

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HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D. C., 30 January *1971*

DS, GS, and Depot Maintenance Manual

SOUND RECORDER SET AN/ASH-23 AND SOUND REPRODUCER SET AN/ASH-24

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*This manual supersedes TM 11-5835-239-35, 10 November 1969.

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CHAPTER 1

INTRODUCTION

1-1. Scope

a. This manual contains direct and general support and depot maintenance instructions for Sound Recorder Set AN/ASH-23 and Sound Reproducer Set AN/ASH-24. Included are general and detailed analysis of the equipment, and instructions appropriate to direct support, general support, and depot maintenance for troubleshooting, testing and repairing equipment, replacing parts and components, repairing specific parts. Also included is a list of tools, test equipment, and materials required for direct support, general support, and depot maintenance. Throughout this manual, Sound Recorder Set AN/ASH-23 is referred to as the CIPR and Sound Reproducer Set AN/ASH-24 is referred to as the playback unit.

b. The operational instructions for the CIPR and playback unit are included in TM 11-5835-239-12.

1-2. Indexes of Publications

a. *DA Pam 310-4.* Refer to the latest issue of DA Pam *310-4* to determine whether there are new editions, changes, or additional publications pertaining to the equipment.

b. DA Pam 310-7. Refer to the latest issue of DA Pam *310-7* to determine whether there are any modification work order (MWO's) pertaining to the equipment.

NOTE

Applicable forms and records are covered in TM 11-5835-239-35.

1-3. Reporting of Equipment Publication Improvements

The reporting of errors, omissions, and recommendations for improving this publication by the individual user is encouraged. Reports should be submitted on DA Form 2028 (Recommended Changes to Publications) and forwarded direct to Commanding General, US Army Electronics Command, ATTN: AMSEL-ME-NMP-EM, Fort Monmouth, N. J., 07703.

1-4. Use of Term Hertz

The National Bureau of Standards has officially adopted the term Hertz (Hz) to replace cycles *per* second (cps). This technical manual uses the term Hertz instead of cycles per second to express the unit of frequency. The following chart provides common equivalents.

Unit quantity	*Old term*	*Old abbrev*	*New Term*	*New abbrev*
Frequency	Cycles per second	cps	Hertz	Hz
10^{-3} cycle per second	Millicycle per second	mc	Millihertz	mHz
10^{3} cycles per second	Kilocycles per second	Kc	Kilohertz	kHz
10^{6} cycles per second	Megacycles per second	Mc	Megahertz	MHz
10^{9} cycles per second	Gigacycles per second	Gc	Gigahertz	GHz

CHAPTER 2

FUNCTIONING OF EQUIPMENT

Section I. GENERAL

2-1. Scope

This chapter contains general and detailed descriptions of the AN/ASH-23 Sound Recorder Set (CIPR) and the AN/ASH-24 Sound Reproducer Set (playback unit). Section II contains description of the CIPR and section III contains description of the playback unit

2-2. Purpose

The purpose of this chapter is to provide operational theory of the various circuits in the CIPR and the palyback unit. Familiarity with the equipment and its functions are valuable tools when troubleshooting the equipment.

Section II. CIPR DISCUSSION

2-3. General CIPR Discussion (fig. 2-1 and 2-2)

a. The CIPR provides a means of recording audio and timing signals. The CIPR accepts up to three externally applied audio signals and records them on three channels of magnetic tape. The three audio signals are pilot microphone or pilot alternate, voice warning system (VWS), and spare. The pilot microphone or pilot alternate audio signals, VWS message signals, and spare audio signals have individual recording channels. The fourth recording channel is used to record timing signals that are generated internally by the CIPR controller.

b. The external pilot, VWS, and spare record commands are applied to the CIPR motor drive and control circuits to achieve tape motion. The timing record command is generated internally by the CIPR. The VWS record command can be over-ridden by the application of an external VWS inhibit command. The VWS inhibit command is used to prevent unnecessary tape consumption during self-test of the VWS unit.

c. When the audio and its associated command signals are available at the CIPR, the command signal enables the motor drive circuit to drive the tape continuously at two-inch per second in the forward direction and record the amplified audio signal. The audio signal is recorded on the assigned "A" track of the magnetic tape. When the end of the "A" track tape is sensed by the tape sensors, a ground signal is supplied to the direction control circuit. This signal enables the direction control circuit to provide a direction control signal to the motor drive and control circuit and reverse the direction of the tape drive motor. Thus, enabling the audio signal to be recorded on the assigned "B" track of the magnetic tape.

d. The time generation circuit generates the timing signal which occurs at one-minute interval to be recorded on the magnetic tape. The timing signal generated by the time generation circuit is supplied to the wave shaping and delay, and motor drive and control circuits. The wave shaping and delay circuit processes the 100-millisecond square wave signal from the time generation circuit to provide a 30-millisecond time pulse for recording on the magnetic tape. The 100-millisecond square wave signal supplied to the motor drive and control circuit is processed to provide a motor drive signal. During absence of audio signals, the motor drive circuit drives the tape one-third of an inch each per minute to record only the timing signal. Figure 2-2 illustrates the recording heads signal assignment and configuration. The CIPR recording device is contained in a detachable CIPR magazine which is electrically and mechanically mated to the CIPR controller.

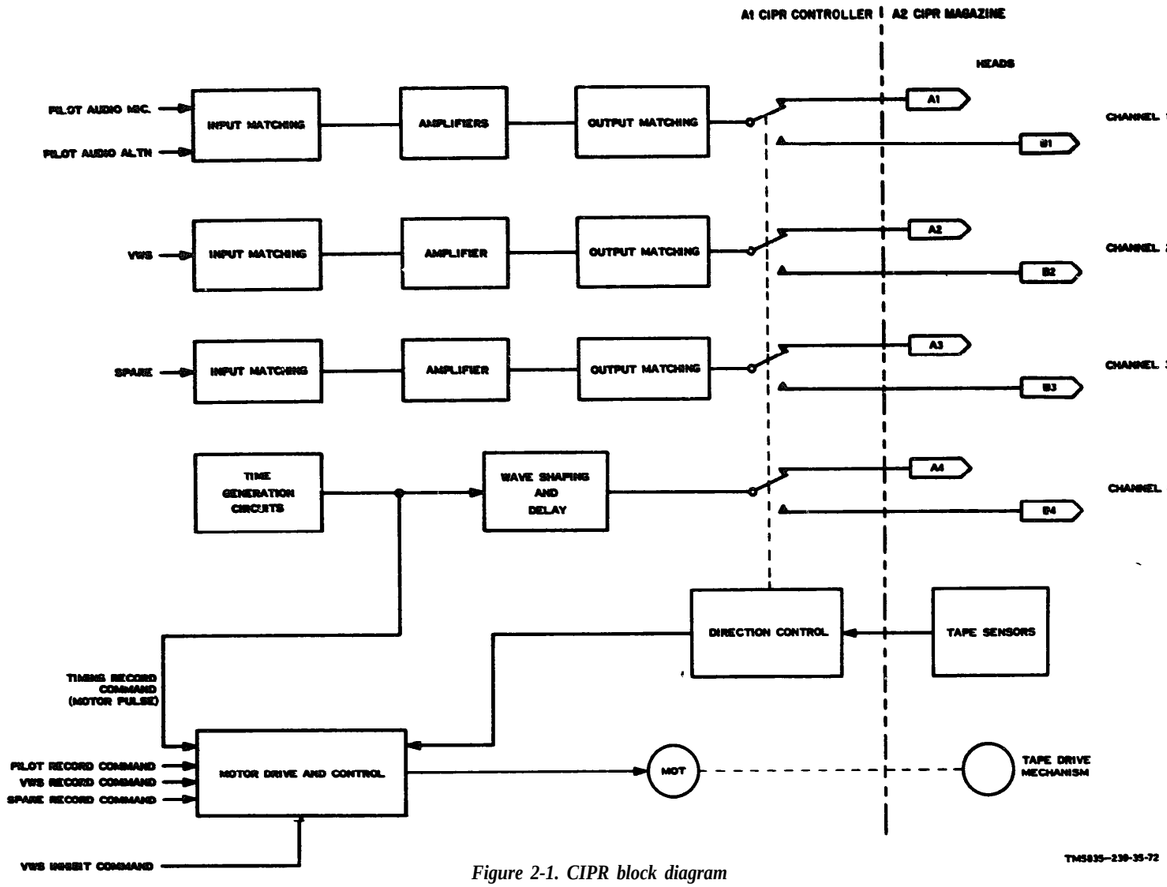


Figure 2-1. CIPR block diagram

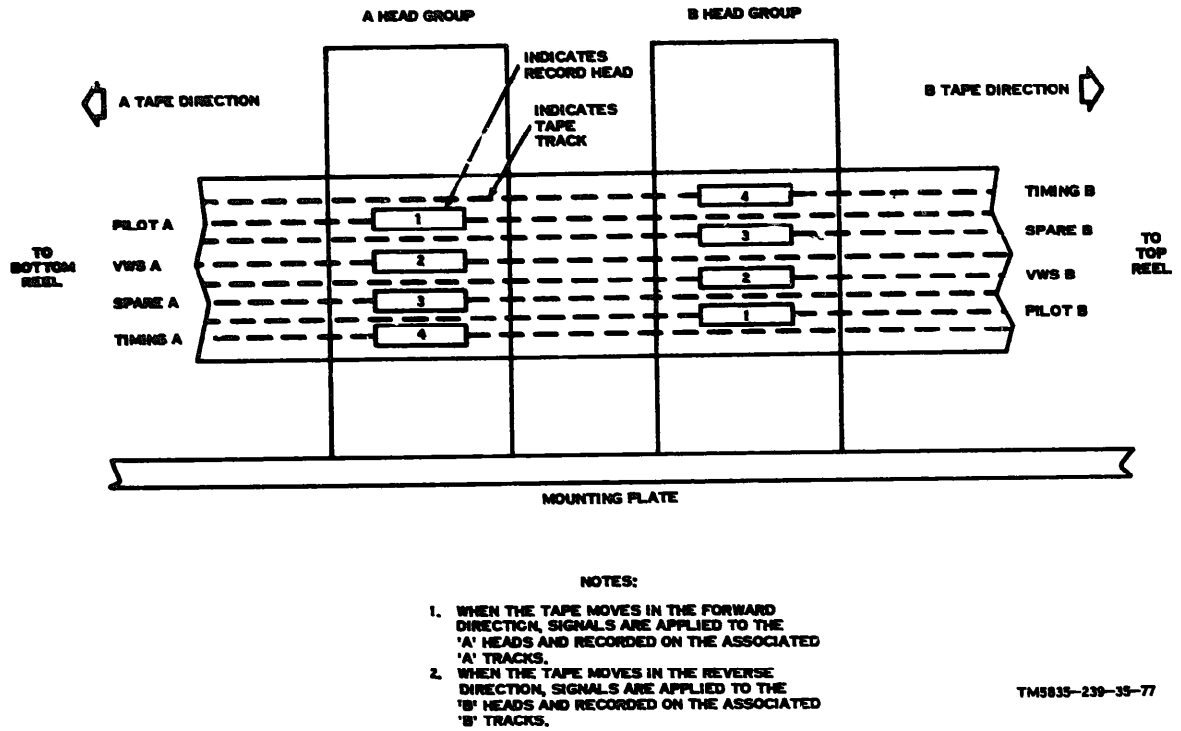


Figure 2-2. Tape track configuration.

2-4. Detailed Functional Discussion

a. General. The CIPR circuits and controls can be divided into five different functional categories. The five categories are-- (1) audio signals, (2) timing signal, (3) motor on-off control, (4) direction control and signal switching, and (5) power distribution. Detailed functional discussion of the circuits are provided in subsequent paragraphs and are referenced to the functional block diagram illustrated in figure 7-3.

b. Audio Signals. Four external audio signals are applied to the A1A2 record amplifier circuit card assembly. The pilot microphone or pilot microphone alternate is coupled through input transformer A1A2T1 to preamplifier A1A2AR1. The amplified output from A1A2AR1 is then summed with the CIPR generated 27-kHz signal at A1A2AR2. The summed output from A1A2-AR2 is coupled through transformer A1A2T4 to one of two A/B select relay A1A2K2. The relay is shown in the "A" position. The summed signal is applied through the relay to magazine record head A1 and recorded on an associated magnetic tape track. The VWS and spare audio signals are simularly recorded on tape tracks through heads A2 and A3. No preamplifiers are used in the VWS and spare signal circuits.

c. *Timing Signal.* The 1600-hertz oscillator located on the A1A4 static power inverter circuit card assembly (400-hertz inverter board) supplies a square wave signal to the 400-hertz generator. The generator contains two flip-flops that changes the 1600-hertz square wave signal into 400-hertz square wave signal. The 400-hertz square wave signal is applied to a counter located on the A1A3 timer controller circuit card assembly. The counter contains flip-flops which divides the 400-hertz signal to provide a one pulse per minute output. These pulses are re-shaped and delayed by an R-C network in the A1A2 record amplifier circuit card assembly. The delayed pulses constitute the CIPR timing signal and are supplied to record heads A4 and B4. With the A/B select relays as shown, only the return lines for the A heads are grounded and only the timing signal supplied to head A4 will be recorded.

d. Motor On-Off Control. The pilot, VWS, and spare record commands are supplied to the

400-hertz inverter board. Each command is a 28-volt dc signal and operates the motor enable control circuit. When operated, the control circuit supplies a (ground) enable signal to two motor drive circuits. During presence of the enable signal, the drive circuits provide two phases of 400-hertz signals to operate the motor. The motor operates and mechanically drives the tape reels. The tape moves at 2 inches per second and the signals applied to the tape heads are recorded. The timing record command is self-generated by the CIPR controller and applied to the motor enable control circuit. The timing command is a l00-millisecond pulse that occurs once per minute. When the timing command is the only command applied to the enable circuit, the circuit operates only for the duration of the pulse. During this time, the drive circuits are enabled and provide power to the motor. The brief application of power to the motor results in a pulsing action that moves the tape one-third of an inch. This is sufficient for recording the timing signal pulse that occurs during this movement. The VWS inhibit command is applied to the VWS inhibit switch. When the VWS inhibit command is present, the inhibit switch prevents the VWS record command from operating the motor enable circuit.

e. Direction Control and Signal Switching. The direction control and signal switching action can best be explained by describing a typical CIPR cycle of operation. A recording cycle begins with the tape loaded on the top reel. In this position, a metallic strip on the tape shorts two contacts of a sensing switch. This produces tape sensor No. 1-A (TS1-A) ground signal which is applied to the A/B select relays. When the aircraft power is supplied to the CIPR, the TS1-A signal operate the select relays in the A position. With the relays in the A position, the direction control (HA) ground signal is not applied to the logic switcb on the 400-hertz inverter board. Without the HA signal, the logic switch supplies 400-hertz, phase-two (PH 2) signal to one of the motor drive circuit while phase-one (PH 1) signal is supplied to the other motor drive circuit. With the TS1-A signal also supplied to the motor drive circuits, the motor circuit is enabled and supply the 400-hertz phase-one and phase-two signals to the motor. The phase-one and phase-two signals operate the motor in a direction that drive the top reel in the forward (counterclockwise) direction. When the metallic strip on the tape leaves the sensing switch, TS1-A signal [illegible] stops. During the operation just described, the TS1-A signal also energizes a relay in the power failure detection circuit to produce a failure signal. This signal is supplied to an external monitor to signify the presence of the nonreproducing metallic strip. The tape will continue to move in the forward direction if only the timing signal is present. The timing record command pulses the tape to move one-third of an inch per minute to record timing pulses. Also, the tape will continue to move in the forward direction if in addition to the timing signal, an audio signal and associated record command is present. Under this condition, the tape moves at a continuous rate of two inch per second to record the audio and timing signals. When the tape reaches its end, a tape sensor No. 2-B (TSB-B) ground signal is generated through a metallic strip on the tape in an action similar to the generation of the TS1-A signal. The TS2-B signal operates the A/B relays in the B position. This switches the signal lines to the B recording heads and provide a HA ground signal to the logic switch. The logic switch switches the 400-hertz power signal applied to one of the motor drive circuit from phase-two to phase-two (180 phase change). With phase-one and phase-two applied to the motor, the top reel moves in the clockwise direction and the tape moves in the reverse direction. Recording continues on the B heads until the tape reaches the initial load condition. When the tape reaches the loaded condition, one complete record cycle has been completed. Should tape breakage occur, the physical thickness of the tape will no longer separate the contacts of the TS1-A sensing switch, causing a TS1-A signal to be generated and supplied to the failure detection circuit.

f. Power Distribution. The 28 vdc aircraft power is filtered in the A1A5A1 filter subassembly and supplied to the A1A1 regulator circuit card assembly and the 400-hertz inverter board. The regulator circuit card assembly provides positive 20-volt, positive lo-volt, and positive 5-volt regulated dc voltages required for operation of the CIPR. The 28 vdc supplied to the 400-hertz inverter board is applied to the power failure detection circuit and is used to power the failure signal. The detection circuit produces a failure signal upon receiving the TS1-A signal previously discussed, or upon detection of an overload condition on either of the motor drive circuits

2-5. Detailed CIPR Assembly Discussion

a. Record Amplifier Circuit Card Assembly **(fig. 7-5). The A1A2 record amplifier circuit card assembly consists of four signal conditioning circuits with relay controlled output switching=**

(1) *Pilot mic/altn conditioning.* The *pilot* microphone or microphone alternate signals are applied to input impedance matching resistor A1A2R10 and transformer A1A2T1. The maximum level of the pilot microphone signal is 1.75 millivolts rms. This signal is reflected across transformer A1A2T1 to preamplifier A1A2AR1 input resistors A1A2R8 and A1A2R11. The A1A2AR1 preamplifier is a differential amplifier connected in an inverting configuration with a gain equal to the ratio of resistors A1A2R13 and A1A2R11. The A1A2AR1 preamplifier is operated at a positive 10-volt bias level supplied through resistor A1A2R9 and A1A2R49. Capacitors A1A2C5 and A1A2C6 and resistor A1A2R12 are external components required to operate the amplifier units. The output from the A1A2AR1 preamplifier is coupled through capacitor A1A2C14 to amplifier A1A2AR2. The A1A2AAR2 amplifier is connected in an inverting configuration. The gain is determined by the ratio of resistors A1A2R19 and A1A2R14. A 27kHz bias signal is also applied to the input of A1A2AR2 through resistor A1A2R18 and is summed with the audio signal. The summed output from the A1A2AR2 amplifier is coupled through step-up transformer A1A2T4 to contact 5 of A/B select relay A1A2K2. Resistors A1A2R24, A1A2R17, A1A2R15, and A1A2R48 are dc biasing resistors. When the summed output is applied to the record head, only the low audio frequency will be recorded. The 27 kHz signal reduces the effect of the magnetic biasing tendencies of the record heads. The pilot alternate signal is supplied to the same conditioning circuits as the pilot microphone. The pilot alternate signal has a maximum level of 0.53 volt rms and is attenuated to 1.75 millivolts rms by the voltage divider resistors A1A2R10 and A1A2R44. Resistor A1A2R45 is the input matching resistor.

(2) VWS audio conditioning. **The VWS audio signals have a maximum level of 0.53 volt rms and is applied to input matching resistor A1A2R21 and transformer A1A2T2. The signal is coupled through transformer A1A2T2 to the input resistors of amplifier A1A2AR3. The amplifier configuration and operation is similar to that of amplifier A1A2AR2. The summed output from the A1A2AR3 amplifier is stepped up through transformer A1A2T5 and applied to contact 8 of A/B select relay A1A2K2.**

(3) *Spare audio conditioning.* The spare audio conditioning circuit functions similar to that of the VWS audio conditioning circuit except the spare audio signal is amplified through amplifier A1A2AR4 and its output is supplied to contact 5 of A/B select relay A1A2K1.

(4) 27 kHz bias oscillator circuit. **The 27 kHz oscillations are generated in the tank circuit consisting of A1A2L1, A1A2C1, A1A2C2 and A1A2C3. The tank circuit is driven by transistor A1A2Q2 which is connected in a common base configuration. In this configuration, A1A2Q2 output is in phase with the generated oscillations applied to its input. The in-phase output from the emitter is capacitive coupled through capacitors A1A2C2 and A1A2C3 to the tank circuit to sustain the oscillation. The oscillator output is coupled through capacitor A1A2C4 to audio amplifiers A1A2AR2, A1A2AR3, and A1A2AR4. During test of the CIPR, it is desirable to inhibit the oscillator. This is accomplished by applying the bias inhibit signal (positive 28 volts) to the base of transistor A1A2Q1. Transistor A1A2Q1 operates and grounds the tank circuit to stop the oscillation.**

(5) Time signal conditioning. **The 100-millisecond time pulse is applied to the waveshaping and delay circuit (fig. 2-3). The waveshaping and delay circuit consists of capacitor A1A2C13 and resistor A1A2R42. The waveshaping and delay circuit generates a pulse of short duration (30 microseconds) for each transition of the input pulse. Diodes A1A2CR1 and A1A2CR2 allow only the positive pulse to be applied to the output connector. During CIPR operation when the timing signal is the only signal present, the motor operates and the tape moves during the 100 millisecond interval of the input pulse. The 30 microsecond timing pulse is recorded at the end of the 100 millisecond period.**

(6) *A/B select relays.* Relays A1A2K1 and A1A2K2 are connected in parallel and operate together. The relays are magnetic latch type relays with each relay having two energizing coil. Should coil 1-2 be energized, the relays will be in the A position as shown in figure 7-5. The signals applied to the contacts will be routed to the A record heads. When coil 3-4 is energized, the relays will switch to the B position and the signals will be applied to the B heads. If neither coil is energized, the relays will remain latched in the last position in which the relays were operated in. When the relays are in the B position,

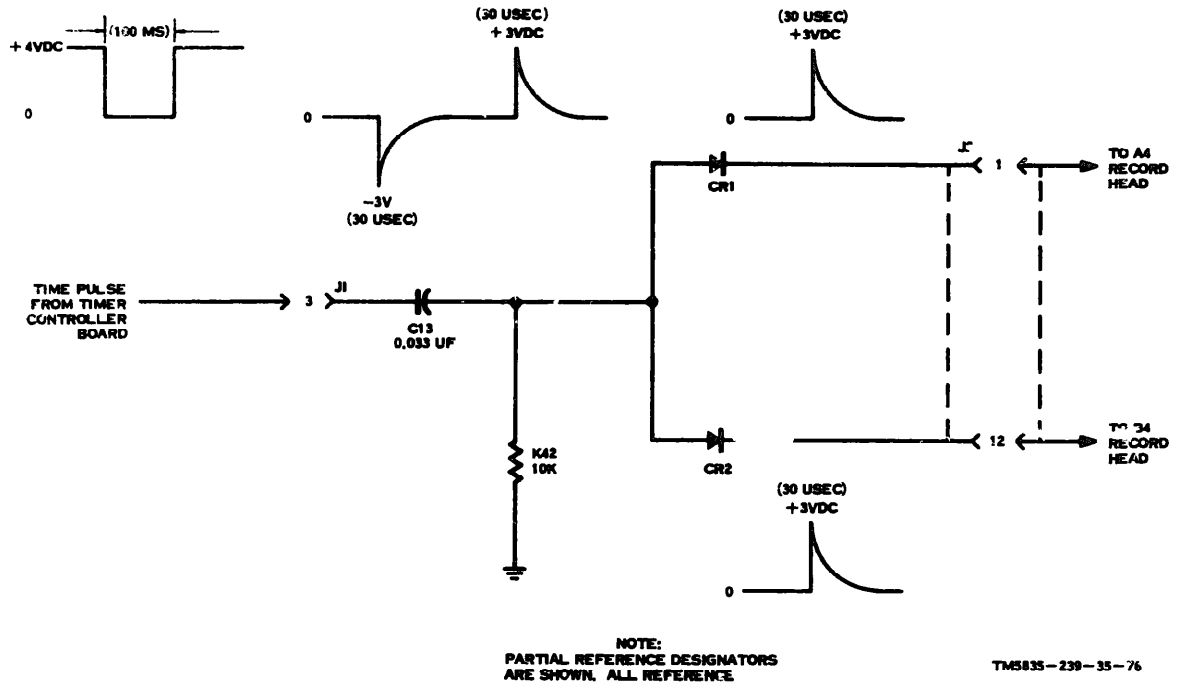


Figure 2-3. A1A2 Record amplifier delay circuit, simplified schematic diagram.

a ground HA signal is provided to energize the logic switching circuit in the 400-hertz inverter board. The relays are energized in the A position when the TS1-A ground signal is applied directly to one side of the A coils. The relays are energized in the B position when the TS2-B ground signal is applied through transistor A1A2Q3 to one side of the B coils. Transistor A1A2Q3 acts as a TS1-A priority switch. If both TS1-A and TS2-B are present at the same time, only TS1-A will be applied to the relay coils. This is accomplished as the TS1-A ground signal reduces the bias at transistor A1A2Q3 and prevents transistor A1A2Q3 from conducting.

b. Static Power Inverter Circuit Card Assembly (fig. 7-6). The A1A4 static power inverter circuit card assembly (400-hertz inverter board) provides 400-hertz signal, motor power on-off control, and circuits for changing direction in which the CIPR motor rotates. Also, a failure detection circuit is provided to inform the operator when a tape breakage occurs or excessive current is drawn by the motor drive circuit.

(1) *Motor enable control circuit.* The motor enable control circuit consists of transistor A1A-4Q3 and associated resistors and diodes. When either pilot, VWS, or spare 28 vdc record command is applied to the CIPR, transistor A1A4Q3 will conduct and its collector voltage will decrease to ground potential. This ground signal is applied to diodes A1A4CRl6 and A1A4CR26 in the phase-one (PH-1) motor drive circuit and to diodes A1A4CR17 and A1A4CR27 in the phase-two (PH-2) motor drive circuit. This enables the motor drive circuits and allows them to drive the motor. The resistors and diodes provide bias for the transistor and isolate the record commands from each other.

(2) *VWS on-off switch.* The VWS on-off switch circuit consists of transistor A1A4Q1 (SCR) and associated resistors and diodes. When positive 28 vdc inhibit signal is applied to transistor A1A4Q1, the transistor will conduct and provide a low resistance path to ground for the VWS record command signal. This prevents the record command from operating the motor enable control circuit. If the inhibit signal and the VWS record command signal are removed, transistor A1A4Q1 will recover and the VWS record command will again be able to operate the motor enable circuit.

(3) *1600-Hertz* oscillator. The 1600-hertz oscillator contains unijunction transistors A1A4-Q4 and A1A4Q8. Uni-junction transistor AiA4-Q4 is switched on and off to produce a 1600-hertz square wave signal. Transistor A1A4Q8 is used as an output emitter follower. Capacitors A1A4C4 and A1A4C5 charges through resistors A1A4R16, A1A4R17, and A1A4R18 to enable transistor A1A4Q4. Transistor A1A4Q4 will remain on until capacitors A1A4C4 and A1A4C5 are discharged through resistor A1A4R19. The 1600-hertz output from the emitter follower is used as clock pulses to drive the 400-hertz generator.

(4) *400-Hertz generator.* The 400-hertz generator circuit consists of flip-flops A1A4FF1-A and A1A4FF1-B. Flip-flops A1A4FF1-A and A1A4FF1-B are interconnected to divide the 1600-hertz clock pulses by 4 to produce a 400-hertz square wave signal. The operation of the circuit is illustrated in figure 2-4. Each flip-flop has its set (Q) output wired to its reset (R) input and its reset (Q) output wired to its set (S) input. The logic voltage is positive 4 vdc or open for a logic 1 condition and 0 vdc for a logic 0 condition. Each flip-flop will flip to a set condition (Q = 1) when the clock pulse is received with the reset input at 0 vdc. The flip-flop will reset (Q = 1) when either a clock pulse is received with the set input at 0 vdc or if a direct reset (Rd) 5 vdc pulse is applied. With the Q outputs of flip-flops A1A4FF1-A and A1A4FF1-B at zero, the set and reset inputs will be 0 and 1 respectively. In this configuration, only flip-flop AlA4FFl-A is setup to flip on the 1600-hertz clock pulse. The first clock pulse will flip AlA4-FFl-A. This *reverses* the setup of flip-flop A1A-4FFl-B and it flips on the second clock pulse. Flip-flop A1A4FFl-A will flip back to its original condition (Q = 0) on the third clock pulse and flip-flop A1A4FF1-B will flip back to its original condition (Q = 0) on the fourth clock pulse. This cycle is continuously repeated to obtain the waveforms illustrated in figure 2-4. It should be noticed that the Q outputs from flip-flops AlA4FF1-A and A1A4FF1-B are quarter cycle (90°) out of phase with each other. The Q outputs are 180° out of phase in reference to the Q outputs. Three of the outputs are used to drive the motor circuits. These outputs are identified as phase-one (PH-1), phase-two (PH-2), and phase-two (PH-2). The output (Q) from flip-flop A1A4FF1-B, pin 9 provided the phase-one signal. The output (Q) from flip-flop A1A-4FFl-A, pin 12 provide the phase-two signal. The output (Q) from flip-flop A1A4FF1-A, pin 13 provides the phase-two signal.

(5) *Logic switch and inverter.* NAND gates A1A4GQ1-A, B, and C comprise the logic switch and NAND gate A1A4GQ1-D is used as an inverter (fig. 24). Each NAND gate output will be 0 vdc when all inputs are open or at positive 4 vdc. The 400-hertz phase-one (PH-1) signal is inverted by A1A4GQ1-D to provide a 400-hertz PH-1 signal for the PH-1 motor drive circuit. When the HA ground signal is not present (open), A1A4GQ-1A is permitted to conduct and the 400-hertz PH-2 signal is inverted and applied to the PH-2 motor drive circuit If the HA ground signa1 is present, it is inverted and allows A1A4GQ1-B to conduct. NAND gate A1A4GQ-1-B inverts the 400-hertz PH-2 signal to provide a 400-hertz PH-2 signal for the motor drive circuit. When PH-1 and PH-2 signals are applied to the motor, the motor will drive the tape in the forward direction. When PH-1 and PH-2 signals are applied to the motor, the motor will drive the tape in the backward direction. In addition to supplying the motor drive circuits, the generator also provides a 400-hertz signal to drive a counter located on the A1A3 timer controller circuit card assembly

(6) *Motor drive circuit.* The two motor drive circuits are similar in operation (fig. 7-6) The phase-one motor drive circuit consists of transistors A1A4Q9, Q11, Q12, Q15, Q16, and Q19. The phase-two motor drive circuit consists of transistors A1A4Q10, Q13, Q14, Q17, Q18, and Q20. The 400-hertz phase-one and 400-hertz phase-two or phase-two input signals are applied through A1A4CR14 and A1A4CR15 to the motor drive circuits. Each motor drive circuit provides 100 milliampere driving current to the motor coils. A ground enable signal must be applied at A1A4CR16 and A1A4CR26 for the phase-one motor drive circuit to operate and a ground enable signal must be applied at A1A4CR17 and A1A4CR26 for the phase-two motor drive circuit to operate The ground enable signal is provided by the motor enable circuit or TS1-A signal If this ground signal is not present, the drive circuits will saturate and be functionally inoperative. The motor drive outputs are applied through isolatlng resistors for monitoring during test.

(7) Power failure detection circuit The power failure detection circuit provides a 28 vdc failure signal to the pilot's control panel when the motor drive circuits draw excessive current and protects the motor amplifier by removing the

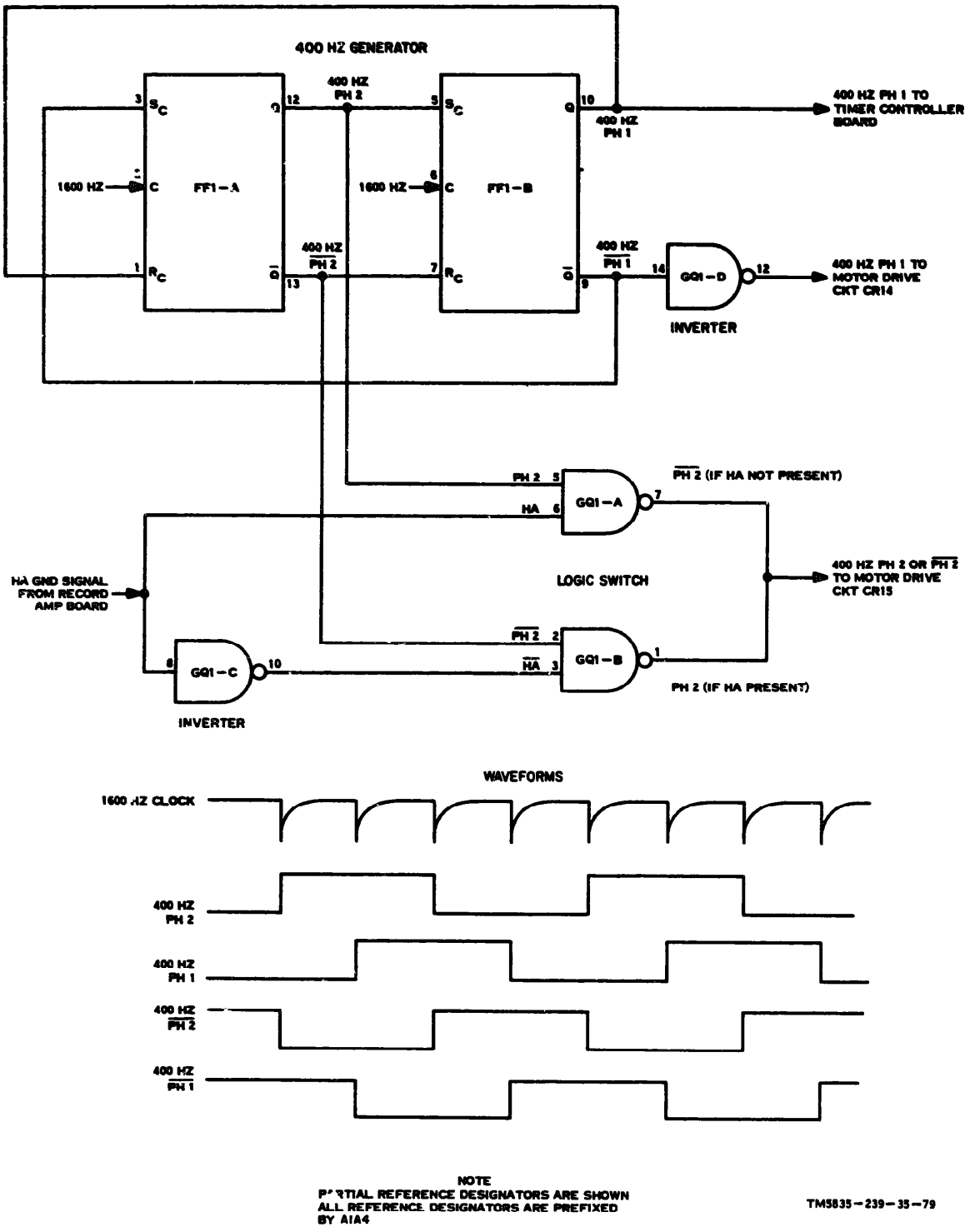


Figure 2-4. 400-hertz generator logic switch and inverter circuit simplified schematic diagram.

power. The power is re-applied when the excessive load condition is removed. For normal power on operation, relay A1A4K2 is energized by the control circuit (fig. 2-5). The positive 20 vdc power is applied through the detector circuit and A1A4K2 relay contacts to the motor drive circuits. Should the drive circuits become overloaded, the detection circuit senses the increase in current flow and provides a 20 vdc signal to motor drive power control circuit. The 20 vdc from the overload detection circuit causes relay A1A4K2 to deenergize. This removes the load from the motor circuits and sends a positive 28 vdc failure signal When the load is removed, the detection circuit no longer senses the overload condition and removes the 20 vdc signal from the motor drive power control circuit. The motor drive power control circuit will then allow relay A1A4K2 to energize again and enable power to be supplied to the motor drive circuits. If the overload condition still exists, the cycle of operation just described will be repeated. A failure signal will also be provided when the tape is in the loaded position. This loaded position is sensed by the metallic strip at the beginning of the tape. The metallic strip at the beginning of the tape will produce a TS1-A ground signal. This ground signal enables relay A1A4K1 to energize and provides 28 vdc to the pilot's control panel to indicate a failure signal. Transistor A1A4Q2 comprise the detection circuit and transistors A1A4Q5, A1A4Q6, and A1A4Q7 comprise the motor drive control circuit (fig. 2-5). Normally, transistor A1A4Q2 is off, permitting the base of transistor A1A4Q5 to be grounded through resistor A1A4R15. This ground allows transistors A1A4Q5 and A1A4Q6 to be forward biased (turned on). With transistor A1A4Q6 enabled, the ground at its collector is supplied to the base of transistor A1A4Q7. This forward biases transistor A1A4Q7 and keeps A1A4Q7 enabled. With transistor A1A4Q7 enabled, positive 20 vdc at the emitter will have a path through the collector to energize relay A1A4K2 and provide positive 20 vdc through the energized relay to the motor drive circuits. When an overload condition occurs, the voltage at the base of transistor A1A4Q2 will enable transistor A1-A4Q2. The enabled A1A4Q2 transistor supplies positive 20 vdc to the base of transistor AlAQQ5. The positive 20 vdc at the base of transistor A1A-4Q5 disables the transistor. The disabled A1A4Q5 also disables transistors A1A4Q6 and A1A4Q7. With transistor A1A4Q7 disabled, positive 20 vdc is removed from relay A1A4K2 and deenergizes the relay. The deenergized A1A4K2 relay removes positive 20 vdc from the motor drive circuits. With the load removed, the voltage at the base of transistor A1A4Q2 increases and enables transistor A1A4Q2. This re-establishes the circuit's initial condition and power will again be applied to the motor drive circuits.

c. Timer Controller Circuit Card Assembly (fig. 7-7). The A1A3 timer controller circuit card assembly provides the CIPR with a one-pulse per minute timing signal for recording. In addition, a similar pulse is provided to operate the CIPR motor. The timer controller circuit card assembly contains 16 flip-flops (contained in 8 flip-flop modules) and 4 NAND gates (contained in 2 NAND gate modules) which divides the input 400-hertz signal by 24,000 to produce a 1 pulse per minute timing signal. The logic voltage is positive 4 vdc or open for a logic 1 condition and 0 vdc for a logic 0 condition. Each flip-flop will flip to a set condition (Q = 1) when the clock pulse is received and the set input is at 0 vdc. The flip-flop will flip to the reset condition (Q = 1) when either a clock pulse is received when the reset input is a 0 vdc or when a direct (Rd) positive 5 vdc is applied. Each NAND gate output will be 0 vdc when all inputs are open or at the 4 vdc level and will provide a 4 vdc output when all inputs are not open or at the 4 vdc level. The 400-hertz input signal is provided by the generator circuit contained in the 400-hertz inverter board. The 400-hertz input is applied to flip-flop A1A4FF1-A. The flip-flops, except for A1A3FF6-A, form a counter. The last flip-flop in the counter, A1A3FF8-B, will set *Q* = 1) on the count of 15,808 and provide a positive 4 vdc input to one input of NAND gate A1A3GB1-A. A positive 4 vdc input will be provided to the other input of NAND gate A1A3GB1-A when the count reaches 24,000. At the count of 24,000, the output from NAND gate A1A3GB1-A goes negative and cause output flip-flop A1A3FF6-A to terminate the output pulse. This output pulse width is equal to 40 times the single cycle period of the 400-hertz signal, thus, generating a 100 millisecond pulse This 100 millisecond pulse occurs once every minute. The set output (Q) from flip-flop A1A3FF6-A is inverted through NAND gate A1A3GB1-B to provide the timing pulse illustrated in figure 7-7. The reset output (Q) from flip-flop A1A3FF6-A is inverted through NAND gate A1A3GB2-A to provide the motor pulse illustrated

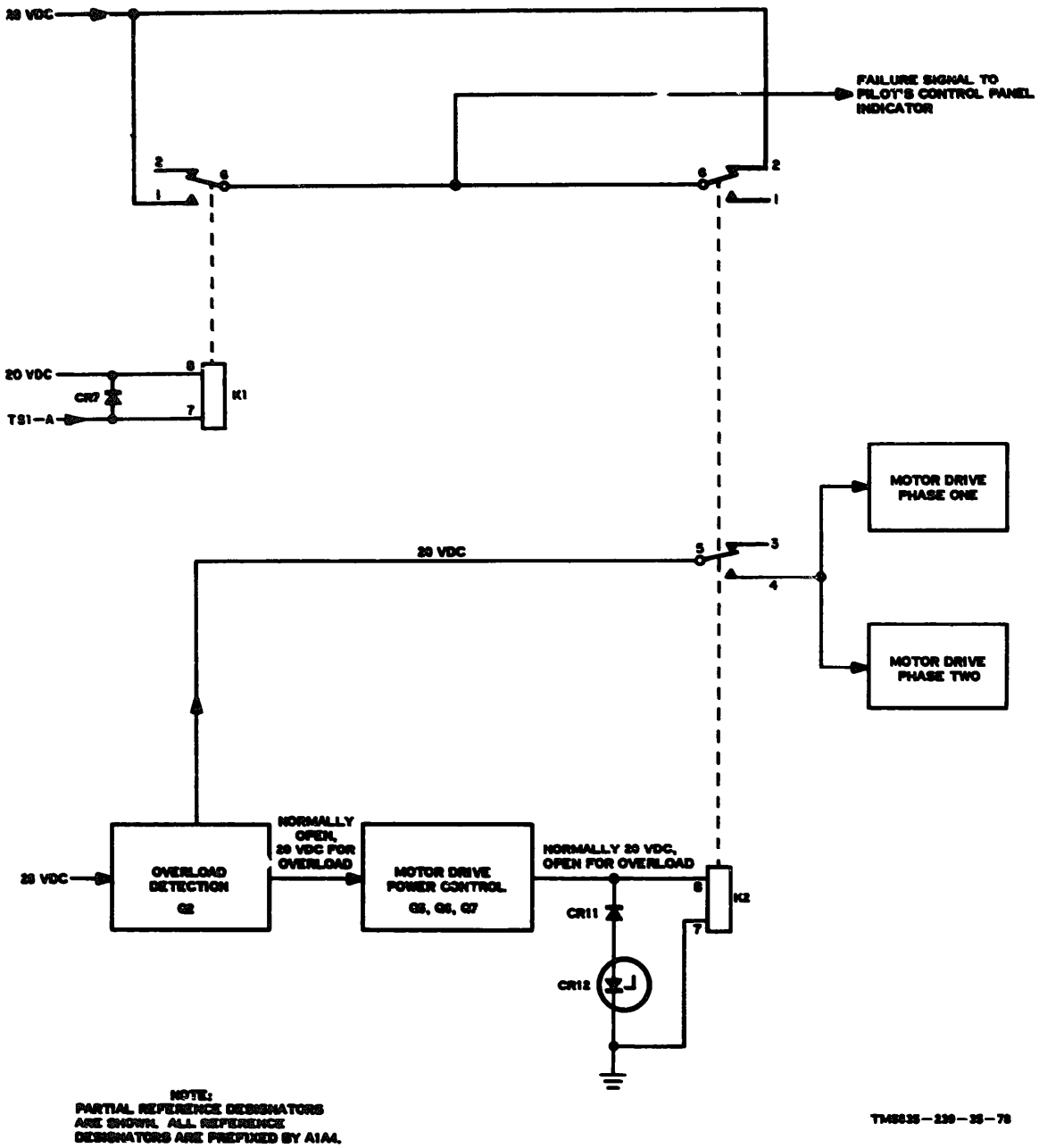


Figure 2-5. Power failure detection circuit simplified schematic diagram.

is also used during test. The motor and test outputs are inverted from the timing pulse.

d. Filter Assembly (fig. 7-4). The A1A5A1 filter assembly contains a double LC filter that provides a low impedance path to ground for high frequency noise. This reduces the radiated and conducted noise in the aircraft power line that is generated by the CIPR unit. Blocking diode A1A5A1CR5 prevents damage to the CIPR components if the input power polarity is inadvertantly reversed. Filters A1A5A1FL1 through A1ASA1FL5 are inductors that connect the motor phase signals with the test equipment. The inductors acts as filters to prevent high frequency radiation.

e. Regulator Circuit Card Assembly (fig. *7-8).* The A1A1 regulator circuit card assembly provides the CIPR with all required operating voltages and regulates them within the system tolerance. The regulator circuits is energized when aircraft 28 vdc power is applied to the CIPR. The 28 vdc power applied to the CIPR is first filtered through A1A5A1 filter assembly then applied to the regulator circuits. The regulator circuit card assembly contains three regulator circuits to provide regulated positive 20-volt, positive 10-volt, and positive 5-volt outputs. The positive 20 volts is routed in the CIPR as power voltage for the 400-hertz inverter board's motor drive amplifiers, 1600-hertz oscillator, switching circuits, and the record amplifier circuit card assembly's audio amplifiers and 27 kHz bias oscillator. The positive 10 volts is used to bias the audio amplifiers in the record amplifier circuit card assembly. The positive 5 volts is used by the logic flip-flops and gates in the timer controller circuit card assembly and the 400-hertz inverter board.

(1) *Positive 20-volt circuit* (fig. 7-8). The positive 20-volt regulator circuit contains transistors A1A1Q1 through A1A1Q4. When the positive 20 volt output decreases, the voltage on the base of transistor A1A1Q4 decreases. This increases the emitter-base potential and A1A1Q4 conduction increases. With A1A4Q4 drawing *more* current, the voltage at its collector decreases. This decreases the base-emitter bias at transistor A1A1Q3 and causing A1A1Q3 to conduct less, thus, cause base voltage at transistor A1A1Q2 to increase. The emitter-base bias at transistor A1A1Q2 is decreased by this action and lowers the collector voltage. This results in an increase of transistor A1A1Q1's emitter-base bias and causes the transistor to conduct more. This increase in conduction lowers A1A1Q1 emitter-collector resistance thereby increasing the potential at the collector. This voltage increase counteracts the original regulator drop and stabilizes the voltage at positive 20 volts. A similar action in reverse takes place should the output voltage rise.

(2) Positive 10-volt and 5-volt circuits (fig. 7-8). The positive 10-volt and 5-volt regulator circuits consist of transistors A1A1Q5 through A1A1Q8. The positive lo-volt regulation is controlled by transistors A1A1Q5 and A1A1Q6 while the positive 5-volt regulation is controlled by transistors A1A1Q7 and A1A1Q8. Input to the positive 10-volt and 5-volt regulator circuits is provided by the 20-volt regulator circuit. The positive lo-volt and positive 5-volt regulator circuits function similarily, therefore, only the 10-volt regulator circuit will be described in this paragraph. If transistor A1A1Q5 emitter voltage decreases, it will cause A1A1Q5 to conduct less and increase the emitter voltage. This will counteract the original voltage drop at the emitter of A1A1Q5. This increase will *cause* transistor A1-A1Q6 to conduct more and again raise the output to its normal level.

Section III. PLAYBACK UNIT DISCUSSION

2-6. General Overall Playback Unit Discussion (fig. 2-6)

a. The playback unit provides a means of monitoring audio and timing signals recorded by the AN/ASH-23 Sound Record Set (CIPR). During playback, the CIPR magazine is installed on the playback unit. The CIPR magazine is mechanically and electrically connected to the playback unit and supplies the recorded audio and timing signals to the playback unit electronics. The playback unit processes the audio and timing signals to enable the operator to monitor the recorded data at the front panel speaker and counter. When monitoring the recorded data, the playback unit can be operated in the rewind, play, reverse, and stop modes. The different operating modes allow the operator to select modes which are advantageous when evaluating the recorded data

b. The playback unit is energized by closing the circuit breaker and setting the power on switch to on. Closing the circuit breaker and setting the power switch to on supplies 115-volt ac power to the motor control and power supply circuits. The 115-volt ac power supplied to the motor control circuit provides operating power for the magazine drive motor. The 115-volt ac power supplied to the power supply circuit enables the power supply circuit to generate positive dc voltages required to operate and control the playback unit electronics.

c. The playback unit operating modes are selected by pressing the tape control switch-indicators. When the rewind, play, or reverse modes are selected, the motor control circuit is enabled and supplies 115-volt ac power to operate the magazine drive motor. The magazine drive motor can be operated to rotate in either the A (counter-clockwise) or B (clockwIse) direction The direc-

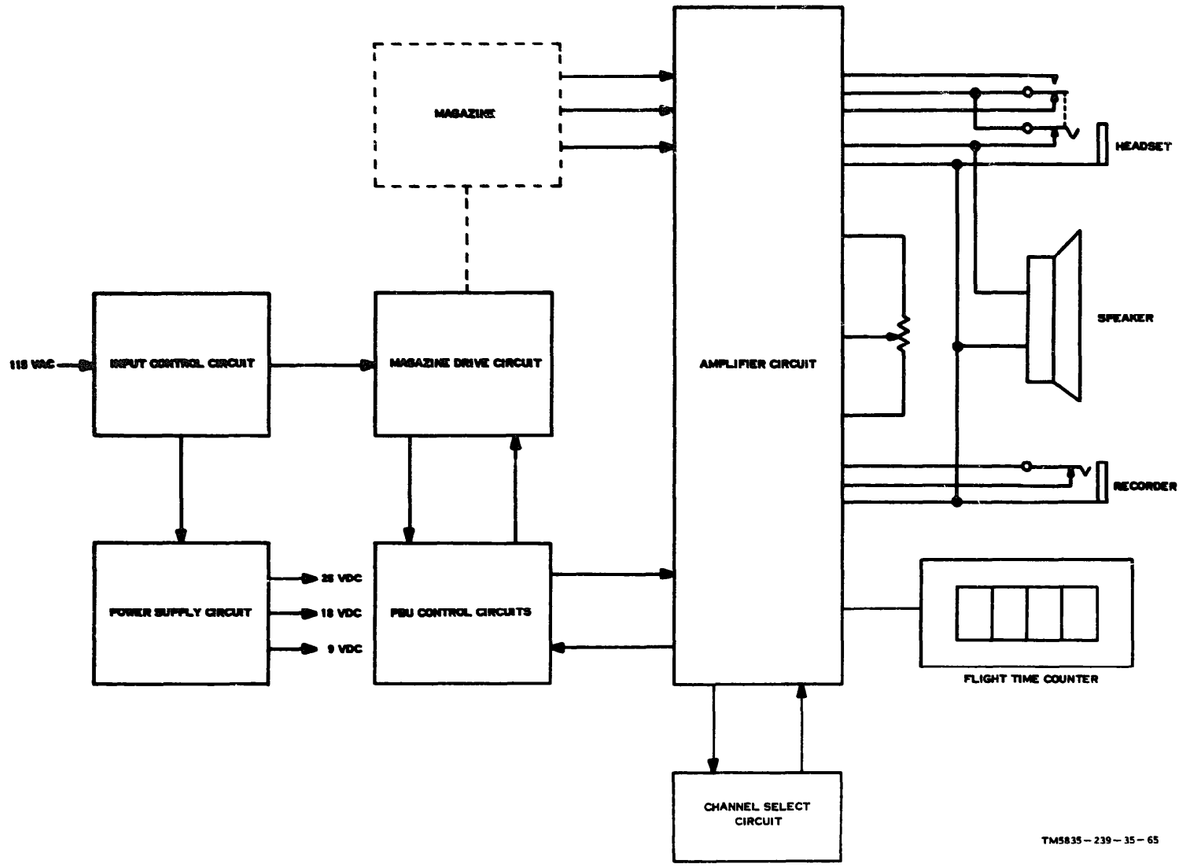


Figure 2-6. Playback unit block diagram.

tion in which the motor rotates depends on the mode selected and/or track (A or B) being monitored. When the stop mode is selected, the motor control circuit is disabled and prevents 115-volt ac power from being supplied to the magazine drive motor.

d. During playback, the recorded audio and timing signals are supplied to preamplifier units in the amplifier circuit card assembly. The amplified audio signal from the preamplifier unit is supplied through the channel selector switch and further amplified to enable the operator to monitor the recorded audio data at the front panel speaker or through a headset connected to the front panel connector. The audio signal can also be recorded by connecting an auxiliary tape recorder to the front panel connector. The channel selector switch enables the operator to select individual channel or all channels simultaneously for monitoring. The timing signal supplied to the preamplifier unit is processed through the timing circuit to provide a signal capable of driving the front panel flight time counter.

2-7. Detailed Playback Unit Functional Discussion

a. General. The operation of the playback unit can best be described by dividing the unit into five functional circuits. The five functional circuits are: (1) input power control, (2) dc power supply, (3) magazine drive control (4) playback unit operating modes, and (5) amplifier circuits. Detailed discussion for each circuit is provided in the subsequent paragraphs and are referenced to simplified schematic diagrams and/or detailed schematic diagrams provided in this manual.

b. Input Power Control Circuit (fig. 7-10). The input power control circuit provides a means of controlling primary 115-volt ac power sup plied to the motor control and power supply circuits. The primary 115-volt ac power is applied through low-pass filter network A1FL1 to circuit breaker A1CB1. The circuit breaker controls the 115-volt ac power supplied to power on-off switch A1S6 and provides overload protection. The power on-off switch is a two position toggle switch which controls 115-volt ac power supplied to the motor control and power supply circuits.

c. *DC Power Supply Circuit* (fig. 7-10, 7-11, and 7-12). The dc power supply circuit provides a means of generating dc voltages required for operation of the playback unit. Input transformer A1T1 on the playback control panel assembly, the full wave bridge rectifier circuit on the A1A4 electronic components assembly, and the regulator circuit on the A1AS control drive circuit card assembly comprise the dc power supply circuit. The dc power supply circuit is energized by setting power on-off switch A1S6 to the on position. The power switch set to the on position supplies 115 vac power to input transformer A1T1. The A1T1 transformer is a step-down transformer that provides 26 vac at its secondary. The 26 vac is supplied to the full wave rectifier circuit. The full wave rectifier circuit provides a positive 25-volt output. The positive 25-volt output is used as control and operating voltage for the playback unit electronics. The positive 25-volt output is also used as a reference voltage for the regulator circuit. The voltage regulator circuit provides positive 18-volt and positive 9-volt outputs required for operation of the integrated amplifier and preamplifier units.

d. Magazine Drive Control Circuit. The magazine drive control circuit provides a means of controlling magazine drive operation and rotation, and selecting speed of the magazine drive mechanism. The magazine drive motor circuit and the variable speed tape drive transmission assembly comprise the magazine drive control circuit.

(1) *Magazine drive motor circuit* (fig. 7-11). The magazine drive motor circuit controls motor operation. The magazine drive motor operates at a constant speed when 115 vac is supplied to the motor winding. The 115 vac sup plied to the motor is controlled by motor on-off relay A1A4K1 in the A1A electronic components assembly (magazine control assembly). When relay A1A4K1 is energized, 115 vac is sup plied to motor. The magazine drive motor can be operated to rotate in either A (counterclockwise) or B (clockwise) direction. The direction in which the motor rotates is changed by interchanging one of the three input leads to the motor. The motor rotates in the A direction when 115 vac return is applied to the B input of the motor and rotates in the B direction when 115 vac is applied to the B input of the motor. The direction in which the motor rotates can be controlled by front panel tape control switch-indicators and/or by the TS1 and TS2 signals.

(2) Variable speed tape drive transmission assembly (fig. 2-6). The variable speed tape drive transmission assembly provides a means of selecting operating speed of the tape drive mechanism. The tape drive mechanism can be operated in either the fast or normal mode. When the fast mode is selected, the tape drive mechanism operates five times faster than during normal operation. The speed of the tape drive mechanism is

controlled by mechanical means. When the fast mode is selected, the motor drives the flywheel assembly, while during normal mode, the motor drives a pully which drives the flywheel assembly.

e. Playback Unit Operating Modes (fig. 7-9). The playback unit can be operated in the rewind, play, reverse, and stop modes. The different operating modes are selected by the front panel tape control switch-indicators and controlled by the logic circuits in the A1A3 control drive circuit card assembly.

(1) *Rewind.* Rewind mode is selected by pressing front panel rewind switch-indicator A1S5. Once the mode has been selected, the switch-indicator interlock circuit prevents the rewind circuit from deenergizing until another mode is selected or tape sensor 1 (TS1) ground is present. Pressing rewind switch-indicator A1S5 provides positive 25 vdc to the rewind control circuit on the A1A control drive circuit card assembly. The positive 25 vdc enables capacitor A1A3C4 to charge. During A1A3C4 charge, transistor A1A3Q5 will conduct. As A1A3C4 conducts, a return is provided to energize rewind hold relay A1A3K1 on the A1A3 control drive circuit card assembly and motor on-off relay A1-A4K1 on the A1A electronic components assembly (magazine drive control assembly). The energized rewind hold relay provides ground return for the rewind logic circuit (A1A3Q6 and A1A3-Q7). The ground return for the rewind logic circuit enables transistor A1A3Q6 to conduct and keep transistor A1A3Q7 at cutoff. Keeping transistor A1A3Q7 at cutoff prevents motor on-off relay A1A4K1 off coil from energizing during the rewind mode. During the rewind mode, 115 vac power is supplied through the energized rewind switch-indicator to the motor B input and allow the motor to rotate in the B (clockwise) direction. The rewind mode will be completed when TS1 is grounded. When TS1 is grounded, the output from transistor A1A3Q3 disables transistor A1A3Q6 and cause transistor A1A3-Q7 to conduct. When transistor A1A3Q7 conducts, a return is provided to deenergize the motor on-off to stop motor operation. Also, when transistor A1A3Q7 conducts, a low input is provided for hold control transistor A1A3Q4 and disables the switch-indicator interlock circuit. The deenergized motor on-off relay and disabled switch-indicator interlock circuit allows the playback unit to go into the stop mode. When the playback unit is operated in the rewind mode, inputs to the audio power amplifier and timing signal conditioning circuits are grounded to prevent audio and timing signals from being monitored on the front panel speaker and counter.

(2) Play. The play mode is selected by pressng play switch-indicator A1S3. Once the play mode has been selected, the switch-indicator interlock circuit prevents the play circuit from deenergizing until another mode is selected or TS1 ground is present. For explanation purpose, the following discussion will assume that the rewind mode has been completed prior to selecting the play mode, thus, both track select relay A1A2K1 on the A1A playback amplifier circuit card assembly and motor direction control relay A1A4-K2 on the A1A electronic components assembly (magazine control drive assembly) are magnetically latched in the energized position. Pressing the play switch-indicator provides ground return to energize motor on-off relay A1A4K1 on the electronic components assembly and allow 115 vac to be supplied to the A input of the motor. Since both the track select and motor direction control relays are energized in the A position, A track information will be played back. When A track information is being played back, the magazine drive motor shall rotate in the A (counterclockwise) direction. When playback of A track information is completed, the C1PR magazine provides a TS2 ground signal. The TS2 ground signal causes transistor A1A3Q11 collector to rise and enable transistor A1A3Q2 to conduct. When transistor A1A3Q2 conducts, a return is provided to energize the track select and motor direction control relays to operate in the B position. The relays energized in the B position allow B track information to be played back and change the ac signal supplied to the B input of the motor to allow the magazine drive motor to rotate in the B (clockwise) direction. When playback of B track information is completed, the CIPR magazine provides a TS1 ground signal. The TS1 ground signal causes transistor A1A3-Q12 collector to rise and enable transistor A1A3-Q3 to conduct. Also, the TS1 ground signal prevents transistor A1A3Q11 from conducting. When transistor A1A3Q3 conducts, a return is provided to energize the track select and motor direction control relay to operate in the A position. Also, the low output from transistor A1A3-Q3 disables the hold control circuit. The disabled hold control circuit opens the return path in the switch-indicator interlock circuit and deenergizes the circuit. The deenergized switch-indicator circuit provides a ground return through the hold control circuit to deenergize (un-latch) the motor

on-off relay. The deenergized motor on-off relay stops the magazine drive motor from operating.

(3) Reverse. The reverse mode is selected by pressing reverse switch-indicator A1S2. Pressing reverse switch-indicator A1S2 provides positive 52 vdc to the reverse pulser circuit on the A1A control drive circuit card assembly. The positive 25 vdc enables capacitor A1A3C1 to charge. During A1A3C1 charge, transistor A1A3Q1 will conduct. As A1A3Q1 conducts, a return is provided to energize motor on-off relay A1A4K1 on the A1A4 electronic components assembly to the on position and allow 115 vac to be supplied to the A input of the motor The direction in which the motor rotates depend on the ac signal supplied to the B input of the motor. If the motor is rotating in the A direction, pressing reverse switch-indicator A1S2 deenergizes the motor direction control relay to the B position and allows 115 vac to be supplied to the B input of the motor. When the motor is rotating in the B direction, pressing reverse switch-indicator A1S2 energizes the motor direction control relay to the A position and allows 115 vac return to be supplied to the B input of the motor.

(4) *Stop.* The stop mode is selected by pressing stop switch-indicator A1S4. Pressing the stop switch-indicator disables the previously enabled circuits and removes the ground return from motor on-off relay A1A4K1 on coil and deenergizes the motor on-off relay. The deenergized motor on-off relay prevents 115 vac from being suppiled to the motor.

f. Amplifier Circuits (fig. 7-13). The amplifier circuits provide a means of amplifying recorded audio and timing signals. The amplifier circuit is also capable of conditioning the recorded timing pulses to drive the front panel flight time counter

(1) *.4ndio channel.* The recorded signals from the CIPR magazine are supplied to preamplifier units A1A2AR1 through A1A2AR3 and A1A2AR6 through A1A2AR8 on the A1A2 playback amplifier circuit card assembly. The output from the preamplifiers are supplied through channel selector switch A1S1 on the front panel and track select relay A1A2K1 to driver amplifier A1A2AR9 on the A1A2 playback amplifier circuit card assembly. The output from the driver amplifier is supplied to a volume control and an auxiliary tape recorder connector on the front panel. The adjusted output from the volume control is supplied to an audio power amplifier circuit on the A1A2 playback amplifier circuit card assembly The amplified audio signal from the audio power amplifier circuit is supplied to the speaker and headset connector on the front panel.

(2) *Timing channel.* The recorded timing signals from the CIPR magazine are supplied to preamplifier units A1A2AR4 and A1A2AR5. The output from the preamplifier units is timing pulse driver A1ABQ1. The output from the timing pulse driver triggers counter one-shot multivibrator A1AZQ2 and A1A2Q3. The square wave output from the one-shot multivibrator is supplied to counter driver amplifier A1A2Q4. The output from the counter driver amplifier enables the counter to count pulses as they appear on the tape.

2-8. Detailed Assembly Discussion

a. A1 Playback Control Panel Assembly (fig. 7-10). The playback control panel assembly provides controls for operating the playback unit. The input power control, mode select, and channel select circuits are by front panel controls.

(1) *Input power control.* The primary 115 vac power to the playback unit is supplied through low-pass filter A1FL1 to circuit breaker A1CB1. Closing the circuit breaker supplies 115 vac power to power on-off switch A1S6. The power on-off switch is a two position toggle switch. When the power on-off switch is set to on position, 115 vac power is supplied to the positive 25-volt power supply and motor control circuits.

(2) *Mode select.* The mode select circuit provides a means of selecting different modes of operating the playback unit. The different modes are selected by pressing front panel rewind (A1S5), play (A1S3), reverse (A1S2), and stop (A1S4) switch-indicators. Once a mode select switch-indicator is pressed, the interlock circuit keeps the selected switch-indicator energized until another mode is selected or TS1 is grounded (fig. 2-7). When another mode is selected, power and/or ground return path for the energized switch-indicator coil opens and deenergizes the switch-indicator. When TS1 is grounded, hold control transistor A1A3Q4 on the A1A control drive circuit card assembly becomes disabled and opens the return path for the energized switch-indicator coil and deenergizes the switch-indicator. During rewind mode, the deenergized motor on-off relay A1A4K1 on the A1A electronic components assembly also removes ground return provided for the rewind switch-indicator coil.

(3) *Channel select* (fig. 7-10). Channel select switch A1S1 provides a means of selecting recorded audio channels for playback. The operator can select VWS, pilot, and spare channels individually or all channels simultaneously during playback.

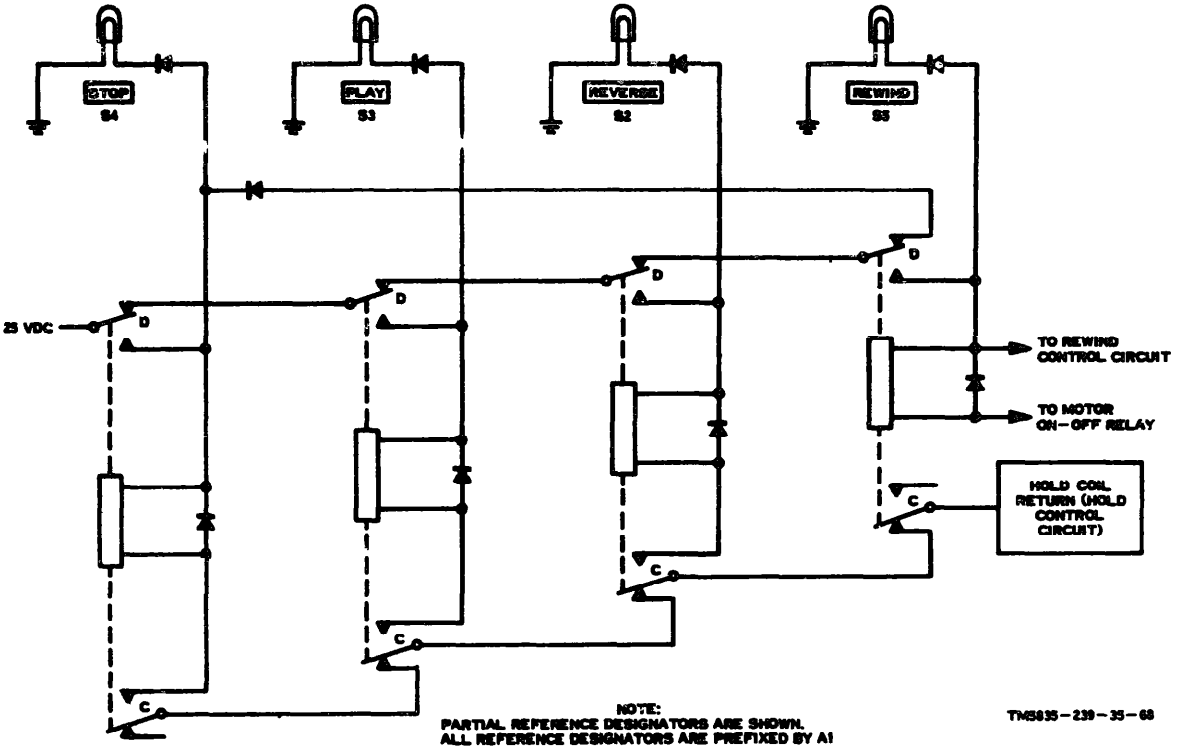


Figure 2-7. Tape control switch-indicator interlock circuit, simplified schematic diagram.

b. A1A4 Electronic Components Assembly (fig. 7-11). The A1A4 electronic components assembly (magazine control drive assembly) provides a means of controlling 115 vac power supplied to the magazine drive motor and generating dc operating voltage. The electronic components assembly contains motor on-off control, motor rotation control, and positive 25-volt dc power supply circuits.

(1) *Motor on-off control circuit.* The 115 vac power to operate the magazine drive motor is controlled by motor on-off relay A1A4K1. The motor on-off relay is magnetic latching type relay having two energizing coils. One coil is used to energize the relay while the other coil is used to deenergize the relay. The relay will energize when ground return is provided at A1A4K1-2. Once the relay is energized, the relay will remain energized until ground return is provided at A1-A4K1-4. The energized motor on-off relay allows 115 vac power from the input control circuit to be supplied to the magazine drive motor.

(2) Motor rotation control circuit (fig. 7-9 and 7-11). The direction in which the magazine drive motor rotates is controlled by motor direction control relay A1A4K2 and/or mode select switch-indicators. The direction in which the motor rotates during operation depend on the ac signal applied to the B input of the motor. The motor will rotate in A (clockwise) direction when 115 vac return is applied to the A input of the motor and in the B (counterclockwise) direction when 115 vac power is applied to the B input of the motor. Motor direction control relay A1A4K2 is also a magnetic latching type relay. The energized or deenergized condition of the relay is controlled by TS1 and TS2 ground signals and front panel switch-indicators. When TS1 is grounded, the A track select circuit on the A1A control drive circuit card assembly is enabled and provides a return at A1A4K2-4 to energize the relay. The energized relay allows 115 vac return to be supplied to the B input of the motor and allows the motor to rotate in the A direction. When TS2 is grounded, the B track select circuit on the A1A control drive circuit card assembly is enabled and provides a return at A1A4K2-2 to allow the relay to deenergize. The deenergized relay allows 115 vac power to be supplied to the B input of the motor and allows the motor to

rotate in the B direction. However, during the reverse mode, the signal supplied to the B input of the motor will be reversed through the reverse switch-indicator to change direction of the motor rotation.

(3) Positive 25-volt power supply (fig. 7-10 and 7-11). The positive 25-volt power supply circuit provides a means of generating operating voltage for the relays, switch-indicators, voltage regulator, control logic, and amplifier circuits. The power supply is energized when 115 vac power is supplied to input transformer A1T1 on the Al playback control panel assembly. The input transformer is a step-down transformer which provides 26 vac at its secondary. The 26 vac is applied across the full wave bridge rectifier circuit consisting of selenium rectifiers A1A1CR1 through A1A4CR4. The output from the bridge circuit is applied through RC filter network A1-A4C1, A1A4R2, and A1A4C2 to provide positive 25-volt output.

c. A1A3 Control Drive Circuit Card Assembly (fig. 7-12). The A1A3 control drive circuit card assembly provides a means of logically controlling the operation of the playback unit. The control drive circuit card assembly contains the priority, track select, hold control, reverse pulser. rewind control, and voltage regulator circuits.

(1) *Priority circuit* (fig. 7-9 and 7-12). The priority circuit provides a means of preventing incorrect tape sensor control at tape start. Incorrect tape sensor control can result in tape breakage during the rewind mode. During rewind mode, the magazine drive motor should stop automatically when the tape is completely rewound and the tape should be ready for playback in the A direction. To ensure this, a priority circuit was incorporated into the direction control logic circuit. The priority circuit prevents TS-2 ground signal from enabling the B track select circuit when TS-1 and TS-2 sensing switches in the CIPR magazine sense the ground strip on the magnetic tape at the same time. When both TS-1 and TS-2 sensing switches sense the ground strip at the same time, both switches will provide a ground signal to the priority circuit on the A1A control drive circuit card assembly. If TS-1 and TS-2 ground signals are supplied to the priority circuit at the same time, the TS-1 ground signal at the base of transistor A1A3Q12 enables its collector voltage to rise and allow A track select transistor A1A3Q3 to conduct. At the same time TS-2 ground signal is applied to the base of transistor A1A3Q11 and should enable its collector voltage to rise, but the TS-1 ground signal applied to transistor A1A3Q11 collector prevents the collector voltage from rising, thus, preventing B track select transistor A1A3Q2 from conducting. With transistor A1A3Q3 conducting and transistor A1A3Q2 disabled, the direction control logic circuit should allow direction control relay A1A-4K2 to energize. The energized A1A4K2 allows the magazine drive motor to operate in the A direction.

(2) *Track select circuit* (fig. 7-9 and 7-12). The track select circuit provides a means of controlling playback of A track and B track recorded data. The track select circuit is controlled by the outputs from the priority circuit.

(a) When TS-1 sensing switch senses the ground strip on the magnetic tape, a TS-1 ground signal is supplied to the priority circuit on the A1A3 control drive circuit card assembly. The TS-1 ground signal supplied to the priority circuit causes transistor A1A3Q12 collector to rise and enables A track select transistor A1A3Q3 to conduct. The TS-1 ground signal is also supplied to the collector of transistor A1A3Q11 to prevent B track transistor A1A3Q2 from conducting. When transistor A1A3Q3 conducts, a return is provided to energize direction control relay A1A-4K2 on the A1A electronic components assembly and track select relay A1A2K1 on the A1A playback amplifier circuit card assembly for A direction operation. The energized direction control relay allows 115 vac return signal to be supplied to the B input of the motor. The 115 vac return signal supplied to the B input of the motor permits the motor to rotate in the A direction. The energized track select relay allows A track recording to be supplied to audio driver amplifier A1A2AR9 on the A1A playback amplifier circuit card assembly.

(b) When TS-2 sensing switch senses the ground strip on the magnetic tape, a TS-2 ground signal is supplied to the priority circuit on the A1A control drive circuit card assembly. The TS-2 ground signal supplied to the priority circuit cause transistor A1A3Q11 collector to rise and enable B track select transistor A1A3Q2 to conduct. When transistor A1A3Q2 conducts, a return is provided to deenergize direction control relay A1A4K2 on the A1A4 electronic components assembly and track select relay A1A2K1 on the A1A2 playback amplifier circuit card assembly for B direction operation. The deenergized direction control relay allows 115 vac power to be supplied to the B input of the motor The 115 vac power supplied to the B in-

put of the motor permits the motor to rotate in the B direction. The deenergized track select relay allows B track recording to be supplied to audio driver amplifier A1A2AR9 on the A1A2 playback amplifier circuit card assembly.

(3) *Hold control circuit* (fig. 7-9 and 7-12). The hold control circuit provides return for the tape control switch-indicator interlock circuit. Hold control transistor A1A3Q4 is biased to conduct at times except when TS-1 is grounded. When transistor A1A3Q4 is conducting, a return is provided for the tape control switch-indicator interlock circuit. When TS-1 is grounded, the output from A track select transistor A1A3Q3 disables the hold control circuit. The disabled hold control circuit no longer provides a return for the interlock circuit, thus, causing the tape control switch-indicator interlock circuit to deenergize.

(4) Reverse pulser circuit (fig. 7-9 and 7-12). The reverse pulser circuit provides return for energizing motor on-off relay A1A4K1 during reverse mode of operation. Reverse pulser transistor A1A3Q1 conducts when the energized reverse switch-indicator A1S2 provides positive 25 vdc to charge capacitor A1A3C1. Transistor A1A3Q1 will conduct for 10 milliseconds while capacitor A1A3C1 is charging and provide a return to energize motor on-off relay A1A4K1 on the A1A4 electronic components assembly. When TS-1 is grounded, capacitor A1A3C1 will discharge and disable transistor A1A3Q1.

(5) Rewind control circuit (fig. 7-9 and 7-12) The rewind control circuit provides a means of energizing and deenergizing motor on-off relay A1A4K1 on the A1A4 electronic components assembly during rewind mode of operation. The rewind control circuit is energized when reverse switch-indicator A1S5 provides positive 25 vdc to charge capacitor A1A3C4. Transistor A1A3Q4 will conduct for 10 milliseconds while capacitor A1A3C4 is charging and provide a return to energize rewind hold relay A1A3K1 on the A1A3 control circuit card assembly and motor on-off relay A1A4K1 on the A1A4 electronic components assembly. The energized rewind hold relay provides ground return for transistors A1A3Q6 and A1A3Q7. Ground return enables transistor A1A-3Q6 to conduct and keep transistor A1A3Q7 collector high. Keeping transistor A1A3Q7 collector high prevents motor on-off relay A1A4K1 from deenergizing during rewind mode of operation. When TS-1 is grounded, transistor A1A3Q6 collector will rise and allow transistor A1A3QY to conduct. When transistor A1A3Q7 conducts, a return will be provided to deenerglze the motor on-off relay. Also, when TS-1 is grounded, the rewind hold relay will deenergize and remove ground from the rewind logic circuit.

(6) Voltage regulator circuit (fig. 7-12). The voltage regulator circuit provides positive IS-volt and 9-volt outputs for operating the preamplifier units. The voltage regulator circuit is energized when positive 25 vdc is applied to the voltage divider network consisting of resistors A1A3R24 and A1A3R25, diode A1A3CR28, and zener diode A1A3CR27. Zener diode A1A3CR27 regulates the base voltage for transistor A1A3Q-10. The regulated base voltage enables transistor A1A3Q10 to provide regulated l&volt output. The 18-volt output is supplied to voltage divider resistors A1A3R21 and A1A3R22. Resistors A1-A3R21 and A1A3R22 establish bias for transistor A1A3Q9. The output from transistor A1A3Q9 controls conduction of transistor A1A3Q8. Transistor A1A3Q8 provides regulated 9-volt output This regulated 9-volt output is further regulated by resistor A1A3R19 and capacitor A1A3C5.

d. A1A2 Playback Amplifier Circuit Card Assembly (fig. 7-13). The A1A2 playback amplifier circuit card assembly provides a means of amplifying audio and timing signals, controlling A or B track recording supplied to the output circuit, and conditioning timing signals. The playback amplifier circuit card assembly contains track select, audio amplifying, and timing signal conditioning circuits.

(1) *Track select circuit.* The track select circuit provides a means of controlling A or B track recorded data supplied to the output circuit. The track select circuit is controlled by track select relay A1A2K1. Relay A1AQK1 is controlled by TS-1 and TS-2 ground signals. When TS-1 is grounded, the relay will energize and allow A track recorded data to be supplied to the output circuit. When TS-2 is grounded, the relay will deenergize and allow B track recorded data to be supplied to the output circuits.

(2) Audio amplifying circuit. The audio amplifying circuit provides a means of amplifying the recorded audio signal sufficiently to drive the front panel speaker or headset and an auxiliary tape recorder. Since all audio amplifying channels function identically, this paragraph discusses the operation of the A-l channel circuit. The A-l recorded audio is supplied to preamplifier A1A3AR7. The preamplifier provide gains of 20 at 3000-hertz to 80 at 300-hertz. The varying gain compensates for the frequency response characteristics of the reproducing heads. The output from the preamplifier is supplied through channel selector switch A1S1 to audio driver amplifier A1-

A2AR9. The driver amplifier amplifies the input signal to provide a 1.2-volt rms signal. This signal is supplied to volume control A1R1 and tape recorder connector A1J2. Output from the volume control is supplied to audio power amplifier circuit consisting of transistors A1A2Q5 through A1A2Q8. The audio power amplifier circuit amplifies the audio signal to provide a l-watt output signal to drive the 8-ohm front panel speaker or a l-volt rms signal capable of driving a 600-ohm headset. The output from audio driver amplifier is also supplied to front panel recorder connector A1J2. This signal can be recorded by connecting an auxiliary tape recorder to the recorder connector. During rewind mode, input to the audio power amplifier circuit is grounded through diode A1A2CR22 to prevent audio signals from being supplied to the headset and the speaker.

(3) Timing signal conditioning circuit. The timing signal conditioning circuit processes recorded timing pulse signals to provide a square wave signal capable of driving front panel flight time counter A1M1. Since both the A and B track timing channels function identically, this paragraph discusses the operation of the A track timing circuit. The recorded A track timing pulse is supplied to preamplifier A1A2R5AR5. The preamplifier unit amplifies the 2-millivolt input signal to provide a 2-volt signal. This signal is supplied to timing pulse driver transistor A1A-2Q1. The timing pulse driver amplifies the signal to provide a 4-volt signal. This 4-volt signal is supplied to one-shot multivibrator transistors A1A2Q2 and A1A2Q3. When a pulse signal is not present at the one-shot multivibrator circuit, transistor A1A2Q2 is at cutoff and transistor A1-A2Q3 is at saturation. When the positive timing pulse is supplied to transistor A1A2Q2, the collector voltage begins to decrease and capacitor A1A2C23 begins to discharge through resistor A1A2R73. The regenerative signal from transistor A1A2Q2 is supplied to transistor A1A2Q3 and to counter driver transistor A1A2Q4. This places a maximum negative voltage at the base of transistor A1A2Q3. This negative voltage places a reverse bias on transistor A1A2Q3 to drive transistor A1A2Q3 to cutoff. As collector current through transistor A1A2Q3 decreases, the collector voltage increases. A portion of this collector voltage is applied through resistor A1A-2R75 to the base of transistor A1A2Q2, increasing its positive voltage. This regeneration results in a rapid change in both transistors, driving transistor A1A2Q2 further toward saturation and transistor A1A2Q3 toward cutoff. When the collector current ceases to flow, the collector voltage rises immediately to equal positive 25 vdc. When capacitor A1A2C23 reaches 0 volt, transistor A1A2Q3 no longer has the necessary reverse bias to keep transistor A1A2Q3 at cutoff. This causes the collector to rise and drive transistor A1A2Q3 into saturation and transistor A1A2Q2 to cutoff. With transistor AlA2Q2 at cutoff, capacitor AlA2C23 begins to charge again. When capacitor A1A2C23 is fully charged, the multivibrator will remain in that state until another timing pulse is supplied to transistor A1-A2Q2. The 50-millisecond square wave output signal from transistor A1A2Q2 is amplified by transistor A1A2Q4 and supplied to front panel flight time counter A1M1. During rewind mode of operation, the input to the one-shot multivibrator circuit is grounded through diode A1A-2CR21 to prevent the flight time counter from operating.

e. Tape Drive Transmission Assembly (fig. *2-*8). The magazine drive motor rotate at a constant speed (3600 rpm) during all modes of operation The speed of the tape drive mechanism is controlled by the method used to drive the flywheel assembly. The different speeds are selected by the moving the shift arm assembly. The shift arm assembly houses a rubber roller which is friction-driven by the magazine drive motor. When the shift arm assembly is set to the normal position, the motor driven rubber roller will drive the pully unit and the pully unit will then drive the flywheel unit. When the shift arm assembly is set to the fast position, the motor driven rubber roller will drive the flywheel, thus, increasing the speed of the tape drive mechanism. In the neutral position, the motor driven rubber roller will not drive either the pully unit or the flywheel, thus, preventing the tape drive mechanism from rotating.

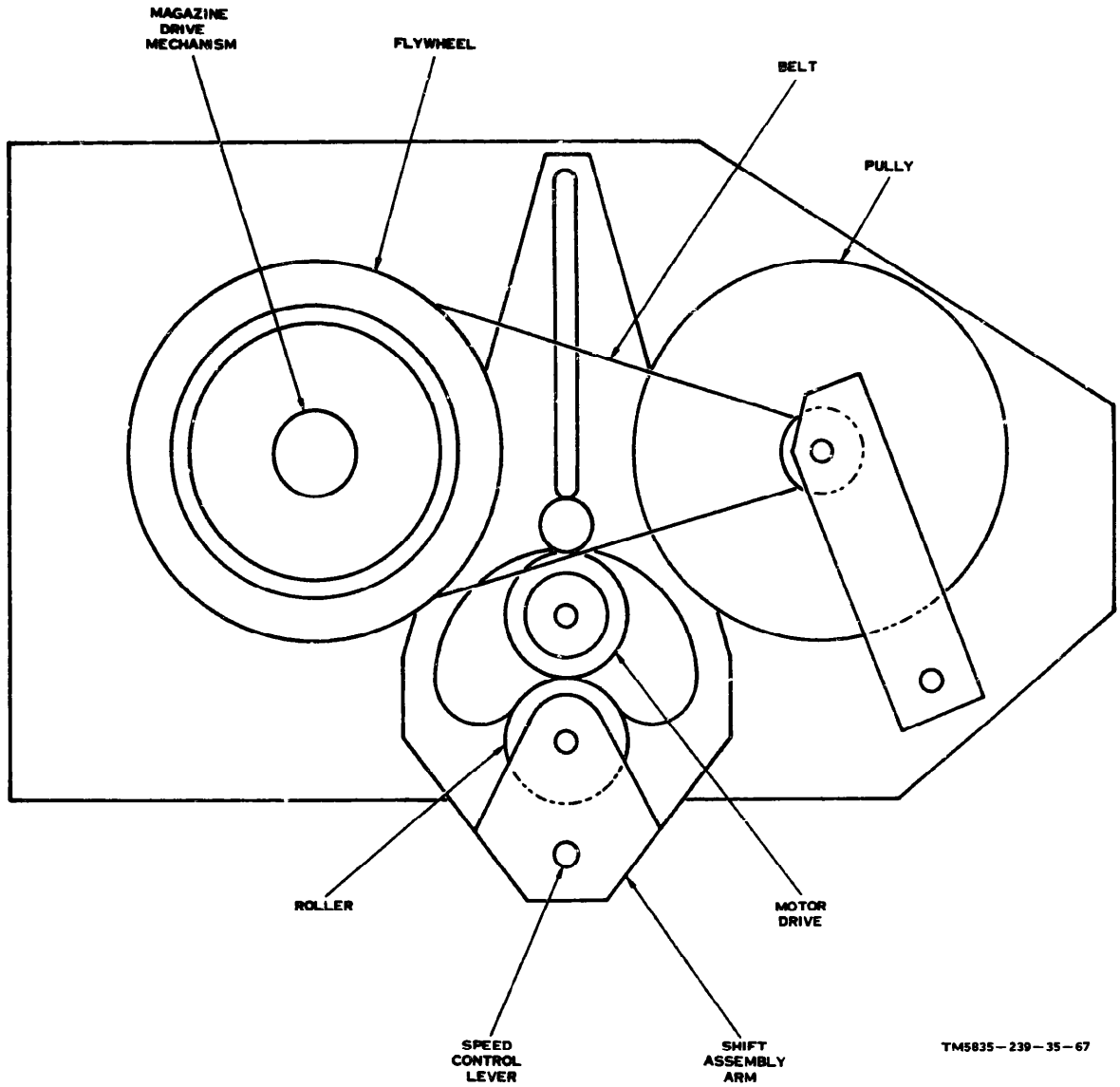


Figure 2-8. Tape drive mechanism, simplified diagram.

CHAPTER 3

DIRECT SUPPORT MAINTENANCE

Section I. GENERAL

3-1. Scope of Direct Support Maintenance

This chapter contains instructions for maintenance operation allocated to direct support maintenance of the CIPR and the playback unit. Instructions are provided for isolating troubles to a removable component, removal and replacement of defective components, and testing the unit to ensure that the unit can be operated within specifications. Troubleshooting, repair, removal and replacement, and testing procedures for the CIPR are provided in sections II, IV, and VI. Troubleshooting, repair, removal and replacement, and testing procedures for the playback unit are provided in sections III, V, and VII.

3-2. Tools, Test Equipment, and Materials Required

a. In addition to tools and test equipment allocated for organizational maintenance, the following tools and test equipment are required to maintain the CIPR at direct support maintenance.

Test equipment	*Common name*	*Federal stock number*
Reproducer Set, Sound AN/ASH-24	Playback unit	5835-179-4691
Sound Recorder Test Set, TS-2854/ASH-23	CIPR test set	5835-179-4690
Multimeter, TS-352/U	Multimeter	6625-242-5023
Oscilloscope, AN/USM-281	Oscilloscope	6625-053-3112
Voltmeter, Electronic ME-30E/U	VTVM	6625-669-0742
Generator, Signal SG-71/FCC	Oscillator	6625-669-0255
Counter, Electronic Digtal Readout AN/USM-207	Counter	6625-911-6368
Tool Kit, TK-100/G		5180-605-0079
Tool Kit, TK-105/G		5180-610-8177

b. In addition to tools and test equipment allocated for organizational maintenance, the following tools and test equipment are required to maintain the playback unit at direct support maintenance.

Test equipment	*Common name*	*Federal stock number*
Multimeter, TS-352/U	Multimeter	6625-242-5023
Tool Kit, TK-100/G		5180-605-0079
Tool Kit, TK-105/G		5180-610-8177

Section II. CIPR TROUBLESHOOTING

3-3. General

Troubleshooting the CIPR at direct support maintenance is limited to removal and replacement of circuit card assemblies in the recorder control (CIPR controller). Troubleshooting at direct support maintenance level includes all the techniques outlined for organizational maintenance and any special or additional techniques required to isolate to a defective circuit card assembly. The systematic troubleshooting proce-

dures which began with the operational and sectionalization performed at the organizational level are carried to a higher maintenance category in this section.

3-4. Organization of CIPR Troubleshooting Procedures

a. General. The first step in servicing a defective CIPR is to localize the fault to a particular circuit card assembly within the CIPR controller. After localizing the fault, the defective circuit card assembly should be forwarded to the next higher category of maintenance.

b. Localization. General information which can aid maintenance personnel in isolating troubles in the CIPR controller is listed below. Also, the following information may reduce unnecessary work in isolating the troubles.

(1) *Visual inspection.* Inspect the CIPR controller for burned components, arcing between components, broken or loose connections and components, and defective solder connection. These faults can often be located by sight, smell, or hearing.

(2) *Operational test.* Operational tests usually indicate the general location of the trouble. In many instances, the test will aid in determining the nature of the trouble. Operational tests to determine if the CIPR controller can be operated within specification are outlined in paragraph 3-16.

(3) *Troubleshooting chart.* Troubleshooting chart (para. 3-5) lists symptoms of common troubles and their corrective actions Maintenance personnel should use this chart as an aid when troubleshooting the CIPR controller.

c. Isolation. Faulty circuit card assembly can be isolated by substituting a known good circuit card assembly in place of the suspected defective circuit card assembly. The circuit card assemblies should be removed and replaced in accordance with instructions provided in paragraph 3-11.

d. Waveform. Waveforms required during maintenance of the CIPR controller are illustrated in figure 3-l.

3-5. CIPR Troubleshooting Chart

a. The CIPR troubleshooting chart lists failures observed during operation probable cause, and instructions for correcting the failures. Since troubleshooting the CIPR at direct support maintenance is limited to removal and replacement of defective circuit card assemblies in the recorder control, the corrective action column will list replacement of suspected defective circuit card assembly or assemblies. In all cases, if the trouble cannot be corrected by replacing the suspected defective card assembly, forward the defective recorder control to higher category of maintenance. Test condition and sequence followed for the troubleshooting chart corresponds to the test outlined in paragraph 3-16. When more than one problem exists for a failure, procedures for isolating the failure are listed in the chart. Testing should be repeated after each procedure until the failure is corrected. Figure 3-2 identifies connectors and card assemblies to aid maintenance personnel during troubleshooting. The defective card assemblies should be replaced in accordance with instructions provided in paragraph 3-11.

---

b.

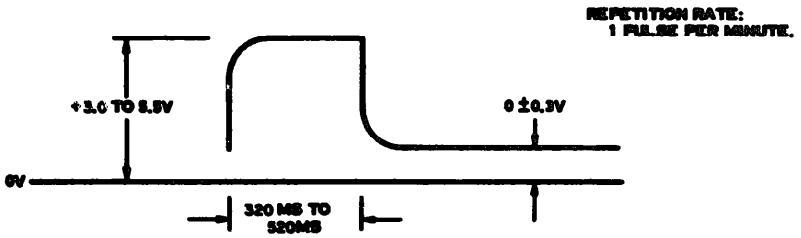
CAUTION

Turn off power to the CIPR prior to disconnecting connectors and removing circuit boards or subassemblies.

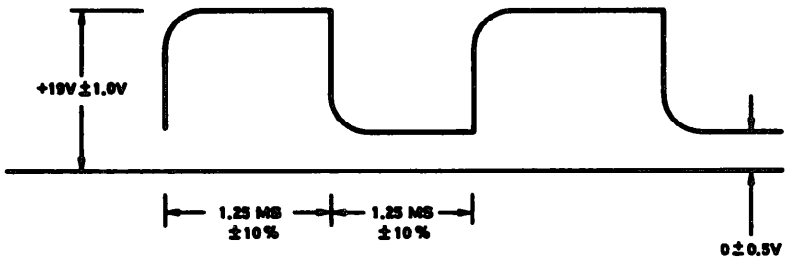
Item	Symptom	*Probable cause*	*Corrective action*
1	Test set circuit breaker deenergizes when attempting to turn power on.	Indicates short in one of the circuit boards.	Isolate trouble to a defective card as follows : (1) Disconnect A1A5P2 from A1A2 record amplifier circuit card assembly. If trouble is corrected, replace shorted A1A2 record amplifier circuit card assembly If trouble persists, proceed to the next step (2) Reconnect A1A5P2 to A1A2 record amplifier circuit card assembly Disconnect A1A5P4 from A1A3 controller timer circuit card assembly If trouble is corrected, replace

Item	Symptom	Probable cause	Corrective action
			shorted A1A3 controller timer circuit card assembly. If trouble persists, proceed to the next step. (3) Reconnect A1A5P4 to A1A3 timer controller circuit card assembly. Disconnect A1A5P5 from A1A4 static power inverter circuit card assembly. If trouble is corrected, replace shorted A1A4 static power inverter circuit card assembly. If trouble persists, proceed to the next step. (4) Reconnect A1A5P5 to A1A4 static power inverter circuit card assembly. Disconnect A1A5P1 from A1A1 regulator circuit card assembly. If trouble is corrected, replace shorted A1A1 regulator circuit card assembly. If trouble persist, proceed to the next step. (5) Reconnect A1A5P1 to A1A1 regulator circuit card assembly. If trouble persists, replace shorted A1A5A1 electrical filter assembly.
2	Test set FAILURE SIGNAL indicator illuminate when TAPE END SIMULATION NO. 1 switch is not pressed.	A1A4 static power inverter circuit card assembly.	Replace defective assembly. If trouble persists, forward CIPR controller to general support maintenance level.
3	Abnormal voltage indication at test set +20V, +l0V, or +5V test jacks.	a. A1A1 regulator circuit card assembly. *b.* A1AZ record amplifier, A1A3 controller timer, or A1A4 static power inverter circuit card assembly.	a. Replace defective A1A1 regulator circuit card assembly. If trouble persists, proceed to step *3b.* b. Isolate trouble in the same manner outlined for item 1. Replace defective circuit card assembly.
4	Abnormal timing pulse monitored at test set TIMING PULSE test jacks.	A1A3 controller timer and/or A1A4 static A1A4 static power inverter circuit card assembly.	Replace defective circuit card assembly If trouble persists, forward CIPR controller to general support maintenance level.
5	Abnormal motor phase signals monitored at test set MOTOR PHASE teat jacks.	A1A4 static power inverter circuit card assembly.	Replace defective assembly. If trouble persists, forward CIPR controller to general support maintenance level.
6	Abnormal sprocket operation. Does not rotate in the correct manner.	A1A4 static power inverter circuit card assembly.	Replace defective A1A4 static power inverter circuit card assembly If trouble persists, forward CIPR controller to general support maintenance level.
7	Sprocket does nut stop rotating.	A1A4 static power inverter circuit card assembly.	Replace defective A1A4 static power inverter circuit card assembly.
8	Sprocket does not rotate in the correct direction.	A1A4 static power inverter circuit card assembly.	Replace defective A1A4 static power inverter circuit card assembly.
9	Teat Set FAILURE SIGNAL does not illuminate when test & set TAPE END SIMULATION NO. I switch is pressed.	A1A4 static power inverter circuit card assembly.	Replace defective A1A4 static power inverter circuit card assembly.
10	Test set FAILURE SIGNAL does not extinguish when test set TAPE END SIMULATION NO. 1 switch i released.	A1A4 static power inverter circuit card assembly.	Replace defective A1A4 static power inverter circuit card assembly.

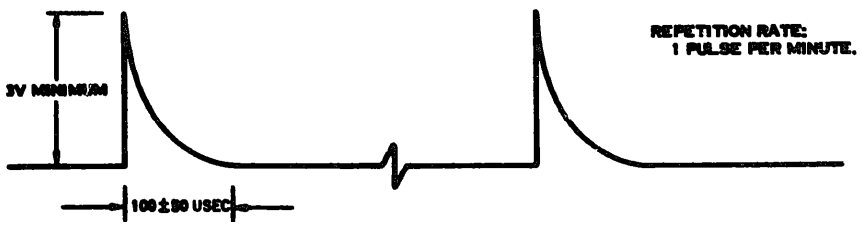
Item	Symptom	Probable cause	Corrective action
11	Abnormal timing pulse monitored at test set MONITOR 2 test jacks.	A1A2 record amplifier circuit card assembly.	Replace defective A1A2 record amplifier circuit card assembly.
12	Abnormal output voltage or db level measurements at test set MONITOR 1 test jacks.	A1A2 record amplifier circuit card assembly.	Replace defective A1A2 record amplifier circuit card assembly.



A. MOTOR TIMING PULSE WAVEFORM



B. MOTOR PHASE WAVEFORM



C. CIPR OUTPUT TIMING PULSE WAVEFORM.

Figure 3-1. CIPR controller operational test waveforms.

Section III. BACK UNIT TROUBLESHOOTING

3-6. General

Troubleshooting the playback unit at direct support maintenance is limited to removal and replacement of defective components on the playback control panel assembly, wiring harness, and circuit card assemblies. Troubleshooting at direct support maintenance level includes all the techniques outlined for organizational maintenance and any special or additional techniques required to isolate the trouble to an item authorized far direct support maintenance repair or replacement. The systematic troubleshooting procedures which began with the operational and sectionalization performed at the organizational level are carried to a higher maintenance category in this section.

3-7. Organization of Playback Unit Troubleshooting Procedures

a. General. The first step in servicing a defective playback unit is to localize the fault to a particular item authorized for direct support maintenance repair or replacement. After localizing the fault, the item should be repaired or forwarded to the next higher category of maintenance.

b Localization. General information which can aid maintenance personnel in isolating troubles in the playback unit is listed below. Also, the following information may reduce unnecessary work in isolating the troubles.

(1) *Visual inspection.* Inspect the playback unit for burned components, arcing between components, broken or loose connections and components, and defective solder connections. These faults can often be located by sight, smell, or hearing.

(2) *Operational* test. Operational tests usually indicate the general location of the trouble. In many instances, the test will aid in determining the nature of the trouble. Operational tests to determine if the playback unit can be operated within specification are outlined in paragraph 3-18.

(3) *Troubleshooting chart.* Troubleshooting chart (para 3-8) lists symptoms of common troubles and their corrective actions. The maintenance personnel should use this chart as an aid when troubleshooting the playback unit.

c. Isolation. Faulty items can be isolated by performing the voltage and continuity checks outlined in the troubleshooting chart. Also, the faulty items can be isolated by substituting a known good item in place of the suspected defective items.

3-8. Playback Unit Troubleshooting Chart

a. The playback unit troubleshooting chart lists failures observed during operation, probable cause, and instructions for correcting the cause, and instructions for correcting the failures. Since troubleshooting the playback unit at direct support maintenance is limited to removal and replacement of defective components on the playback control panel assembly, wiring harness, and circuit card assemblies, the corrective action column will list replacement of the suspected defective part. In all cases, if the trouble cannot be corrected by replacing the suspected defective part, forward the defective playback unit to the next higher category of maintenance. Test condition and sequence followed for the troubleshooting chart corresponds to the test outlined in paragraph 3-18. When more than one problem exists for a failure, procedures for isolating the failure are listed in the chart. Testing should be repeated after each procedure until the failure is corrected. Figures 3-3 and 7-10 identifies connectors, components, and circuit card assemblies to aid maintenance personnel during troubleshooting. The defective part should be replaced in accordance with instructions provided in paragraph 3-14.

WARNING

When power is turned on, 115 vac power is present at circuit breaker and power switch terminals.

Item	*Symptom*	*Probable cause*	*Corrective action*
1	STOP indicator does not light when POWER ON/ OFF switch IS set to ON.	a. Abnormal input voltage.	a. Verify that 115 ac power is supplied to the playback unit.
		b. Defective input power control circuit.	b. The following corrective actions should isolate trouble within the input power control circuit.

Item	Symptom	Probable cause	Corrective action
			(1) Check ac voltage between A1T1–1 and A1T1–2; voltmeter should indicate 115 vac. If indication is normal, check for defective power supply circuit. If indication is abnormal, proceed to the next step. (2) Check ac voltage between A1S6–2 and A1S6–5; voltmeter should indicate 115 vac. If indication is normal, replace A1S6. If indication is abnormal, proceed to the next step. (3) Check ac voltage between A1FL1–2 and A1FL1–4; voltmeter should indicate 115 vac. If indication is normal, replace A1CB1 and/or wiring between A1FL1 and A1S6. If indication is abnormal, proceed to the next step. (4) Check ac voltage between A1FL1–1 and A1FL1–3; voltmeter should indicate 115 vac. If indication is normal, replace A1FL1. If indication is abnormal, replace defective input power cable and/or wiring.
		c. Defective power supply circuit.	c. The following corrective actions should isolate troubles within the power supply circuit. (1) Check dc voltage between A1S4D–C (+) and E2 (–); voltmeter should indicate 27.5 ± 6.5 vdc. If indication is normal, replace defective wiring. If indication is abnormal, proceed to the next step. (2) Check ac voltage between A1T1–3 and A1T1–4; voltmeter should indicate 26 ± 3 vac. If indication is normal, replace defective A1A4 electronic components assembly and/or wiring. If indication is abnormal, replace defective A1T1.
2	REWIND indicator does not light.	a. Defective A1S5 switch-indicator.	a. The following corrective actions should isolate troubles within the switch-indicator circuit. (1) Check dc voltage between A1S5–1 (+) and A1S5–3 (–); voltmeter should indicate 27.5 ± 6.5 vdc. If indication is normal, replace defective A1S5. If indication is abnormal, proceed to the next step. (2) Check dc voltage between A1S5–6 (+) and A1S5–7 (–); voltmeter should indicate 27.5 ± 6.5 vdc. If indi-

Item	Symptom	Probable cause	Corrective action
			cation is normal, replace defective A1CR5. If indication is abnormal, interlocking latching circuit is defective.
		b. Defective interlocking latching circuit.	b. The following corrective actions should isolate troubles to components within the interlocking latching circuit. (1) Check dc voltage between A1S2D–NC (+) and E2 (–); voltmeter should indicate 27.5 ± 6.5 vdc. If indication is normal, replace defective A1S5 and/or wiring. If indication is abnormal, proceed to the next step. (2) Check dc voltage between A1S3D–NO (+) and E2 (–); voltmeter should indicate 27.5 ± 6.5 vdc. If indication is normal, replace defective A1S2 and/or wiring. If indication is abnormal, proceed to the next step. (3) Check dc voltage between A1S4D–NC (+) and E2 (–); voltmeter should indicate 27.5 ± 6.5 vdc. If indication is normal, replace defective A1S3 and/or wiring. If indication is abnormal, replace defective A1S4. If trouble persists, proceed to the next step. (4) Check for defective wiring between A1S5–7 and A1A4 electronic components assembly. If wiring is not defective, replace defective A1A4 electronic components assembly.
3	Coupling gear does not rotate or will not rotate in the correct direction.	Defective tape drive transmission assembly, A1A4 electronic components assembly, or A1A3 control drive circuit card assembly.	Disconnect motor connector A1A4A4P1 from A1A4 electronic components assembly and check ac voltage between pins 2 and 4 on connector A1A4J2; voltmeter should indicate 115 vac. If indication is normal, replace defective tape drive transmission assembly. If indication is abnormal, replace defective A1A4 electronic components assembly and/or A1A3 control drive circuit card assembly.
4	PLAY indicator does not light.	a. Defective A1S3 switch-indicator.	a. The following corrective actions should isolate troubles within the switch-indicator circuit. (1) Check dc voltage between A1S3–1 (+) and A1S3–3 (–); voltmeter should indicate 27.5 ± 6.5 vdc. If indication is normal, replace defective A1S3. If indication is abnormal, proceed to the next step.

Item	Symptom	Probable cause	Corrective action
			(2) Check dc voltage between A1S3–6 (+) and A1S3–7 (–); voltmeter should indicate 27.5 + 6.5 vdc. If indication is normal, replace defective A1CR1. If indication is abnormal, interlocking latching circuit is defective.
		b. Defective interlocking latching circuit.	b. The following corrective actions should isolate troubles to components within the interlocking latching circuit. (1) Check dc voltage between A1S4D–NC (+) and E2 (–); voltmeter should indicate 27.5 ± 6.5 vdc. If indication is normal, replace defective A1S3. If indication is abnormal, replace defective A1S4 and/or wiring. If trouble persists, proceed to the next step. (2) Check dc voltage between A1S2C–NC (+) and E2 (–); voltmeter should indicate 0 vdc. If indication is normal, replace defective A1S3. If indication is abnormal, proceed to the next step. (3) Check dc voltage between A1S5C–NC (+) and E2 (–); voltmeter should indicate 0 vdc. If indication is normal, replace defective A1S2. If indication is abnormal, replace A1A3 control drive circuit card assembly.
5	STOP indicator does not light during stop mode.	a. Defective A1S4 switch-indicator.	a. The following corrective actions should isolate troubles within the switch-indicator circuit. (1) Check dc voltage between A1S4–1 (+) and A1S4–3 (–); voltmeter should indicate 27.5 ± 6.5 vdc. If indication is normal, replace defective A1S3. If indication is abnormal, proceed to the next step. (2) Check dc voltage between A1S4–6 (+) and A1S4–7 (–); voltmeter should indicate 27.5 ± 6.5 vdc. If indication is normal, replace defective A1CR3. If indication is abnormal, interlocking latching circuit is defective.
		b. Defective interlocking latching circuit.	b. The following corrective actions should isolate troubles to components within the interlocking latching circuit. (1) Check dc voltage between A1S3C–NC (+) and E2 (–); voltmeter should indicate 0 vdc. If indication is normal, replace defective A1S4. If indication is abnormal, proceed to the next step.

Item	Symptom	Probable cause	Corrective action
			(2) Check dc voltage between A1S5C–NC (+) and E2 (–); voltmeter should indicate 0 vdc. If indication is normal, replace defective A1S3. If indication is abnormal, proceed to the next step.
			(3) Check dc voltage between A1S5C–NC (+) and E2 (–); voltmeter should indicate 0 vdc. If indicaton is normal, replace defective A1S2. If indication is abnormal, replace defective A1A3 control drive circuit card assembly.
6	REVERSE indicator does not light.	*a.* Defective A1S2 switch-indicator.	*a.* The following corrective actions should isolate troubles within the switch-indicator circuit.
			(1) Check dc voltage between A1S2–1 (+) and A1S2–3 (–); voltmeter should indicate 27.5 ± 6.5 vdc. If indication is normal, replace defective A1S2. If indication is abnormal, proceed to the next step.
			(2) Check dc voltage between A1S2–6 (+) and A1S2–7 (–); voltmeter should indicate 27.5 ± 6.5 vdc. If indication is normal, relace defective A1CR8. If indication is abnormal, interlocking latching circuit is defective.
		b. Defective interlocking latching circuit.	*b.* The following corrective actions should isolate troubles to components within the interlocking latching circuit.
			(1) Check dc voltage between A1S5C–NC (+) and E2 (–); voltmeter should indicate 0 vdc. If indication is normal, replace defective A1S2. If indication is abnormal, proceed to the next step.
			(2) Check dc voltage between A1S5C–C (+) and E2 (–); voltmeter should indicate 0 vdc. If indication is abnormal, replace A1A3 control drive circuit card assembly. If trouble persists, replace defective A1S5.
7	FLT TIME counter will not reset to zero.	Defective counter and/or A1CR7.	Check dc voltage between A1M1–1 (+) E2 (–); voltmeter should indicate 27.5 ± 6.5 vdc. If indication is normal, replace defective A1M1. If indication is abnormal, replace defective A1CR7 and/or wiring. If trouble persists, replace defective A1M1.
8	FLT TIME counter does not count correctly.	Defective counter and/or counter control circuit.	Replace A1A2 playback amplifier circuit card assembly. If trouble persists, replace A1M1.

Item	Symptom	Probable cause	Corrective action
9	Audio cannot be momtored at the speaker.	Defective A1A2 playback amplifier circuit card assembly, speaker and/ or headset jack.	Check for continuity between pins 2 and 5 on the HEADSET jack. If continuity is obtained, replace defective A1A2 playback amplifier circuit card assembly and/or speaker. If continuity cannot be obtained, replace defective HEADSET jack.
10	Audio level cannot be varied.	Defective A1R1 VOLUME control.	Replace defective A1R1 VOLUME control.
11	Poor audio quality.	Defective A1A2 playback amplifier circuit card assembly and/or speaker.	Replace defective A1A2 playback amplifier circuit card assembly. If trouble persists, replace speaker.

Section IV. CIPR ADJUSTMENT, REPAIR, AND REMOVAL REPLACEMENT

3-9. CIPR Adjustment

No adjustment is required on the CIPR during direct support maintenance.

3-10. CIPR Repair

Repair of the CIPR at direct support maintenance is limited to removal and replacement of defective circuit card assemblies. The defective circuit card assembly determined by the testing and troubleshooting procedures should be removed and replaced in accordance with instructions provided in paragraph 3-11.

3-11 1. Removing and Replacing CIPR Components

a. When removing or replacing components in the CIPR controller, ensure that power to the CIPR controller is disconnected. The cover must be removed before maintenance personnel can gain access to components authorized for removal and replacement at direct support maintenance. The cover is removed by removing a plain hexagon nut and a 6/32 by l/4-inch pan-head screw with associated flat washer from top of the cover and then sliding the cover away from the base control assembly (fig. 3-2).

b. Figure 3-2 is provided as an aid to maintenance personnel during removal and replacement of components at direct support maintenance. The following procedures provide instructions for removing and replacing components authorized at direct support maintenance.

NOTE

Two screws are used to secure each wiring harness connector to the circuit card assembly connector. The screws must be loosened before attempting to disconnect the connectors. The screws will remain with the wiring harness connectors. During installation, ensure that the connectors are properly mated before tightening the screws.

CAUTION

Disconnect all power to the CIPR controller before disassembly.

(1) *Removing A1A4 static power inverter circuit card assembly.*

(a) Insure that cover is removed (para 3-11a).

(b) Remove three 6/32 by 3-inch and one 6/32 by 2 1/2-inch flathead screws from the top of the electrical filter assembly.

(c) Disconnect wiring harness connectors A1A5P5 and A1A5P6 from the static power inverter circuit card assembly.

(d) Disconnect connector A1A6A2P1 (from motor) from the static power inverter circuit card assembly.

(e) Remove static power inverter circuit card assembly.

(2) *Installing A1A4 static power inverter circuit card assembly.* The static power inverter circuit card assembly can be installed by reversing the removal instruction.

(3) *Removing A1A3 timer controller circuit card assembly.*

(a) Insure that cover is removed (para 3-11 *a).*

(b) Remove three 6/32 by 3-inch and one 6/32 by 2 1/2-inch flathead screws from the top of the electrical filter assembly.

(c) Disconnect wiring harness connector A1A5P4 from the timing controller circuit card assembly.

(a) Remove timing controller circuit card assembly.

(4) *Installing A1A3 timer controller circuit card assembly.* The timing controller circuit card assembly can be installed by reversing the removal instruction.

(5) *Removing A1A2 record amplifier circuit card assembly.*

(a) Insure that cover is removed (para 3-11a).

(b) Remove three 6/32 by 3-inch and one 6/32 by 2 1/2-inch flathead screws from the top of the electrical filter assembly.

(c) Disconnect wiring harness connectors A1A5P2 and A1A5P3 from the record amplifier circuit card assembly.

(d) Remove record amplifier circuit card assembly.

(6) *Installing A1A2 record amplifier circuit card assembly.* The record amplifier circuit card assembly can be installed by reversing the removal instruction.

(7) Removing A1A1 regulator circuit card assembly.

(a) Ensure that cover is removed (para 3-11a).

(b) Remove three 6/32 by 3-inch and one 6/32 by 2 1/2-inch flathead screws from the top of the electrical filter assembly.

(c) Disconnect wiring harness connector A1A5P1 from the regulator circuit card assembly.

(d) Remove regulator circuit card assembly.

(8) *Installing A1A1 regulator circuit card assembly.* The regulator circuit card assembly can be installed by reversing the removal instruction.

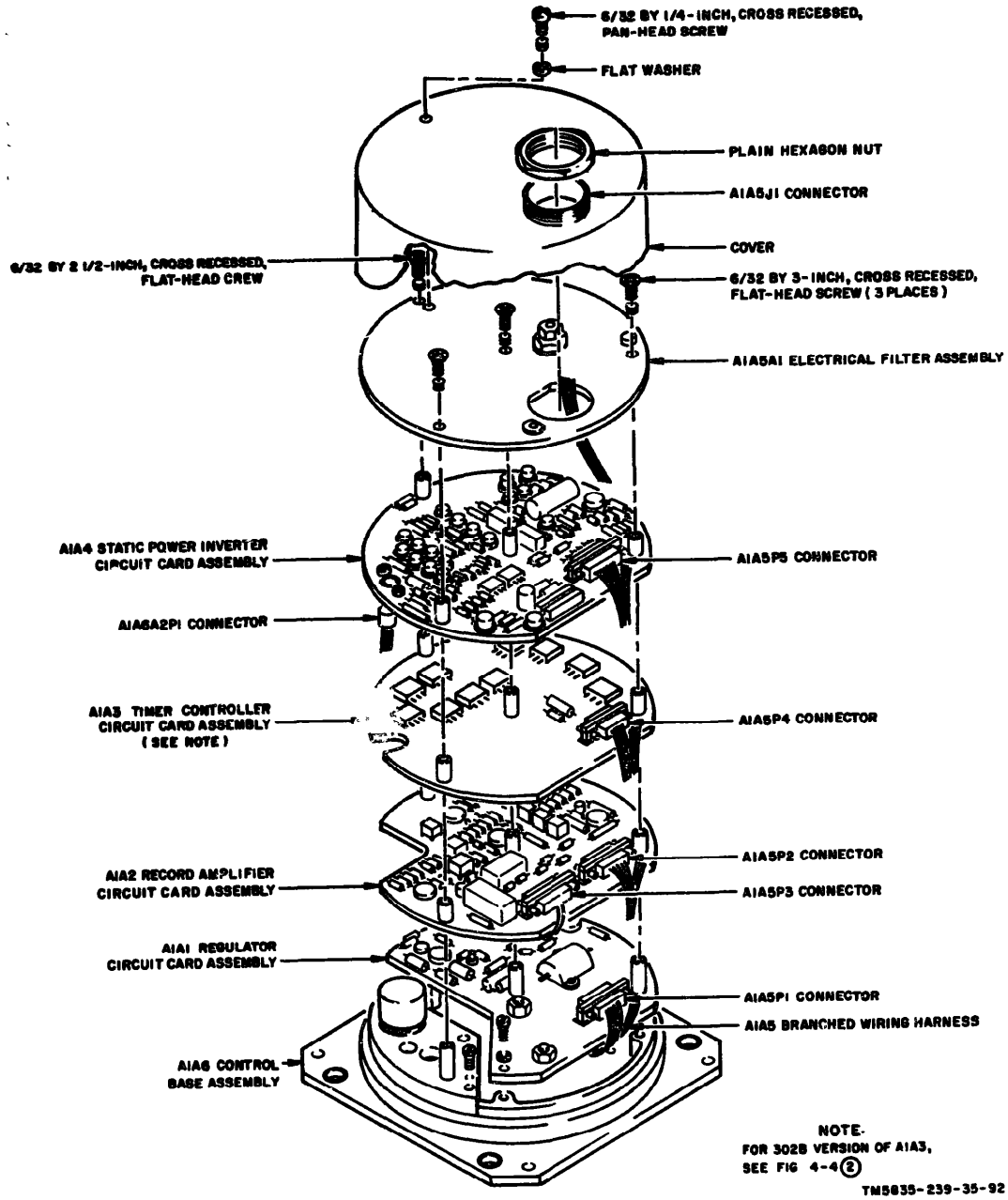


Figure 3-2. C8203/ASH-23 recorder control

Section V. PLAYBACK UNIT ADJUSTMENT, REPAIR, AND REMOVAL AND REPLACEMENT

3-12. Playback Unit Adjustment

No adjustment is required on the playback unit during direct support maintenance.

3-13. Playback Unit Repair

Repair of the playback unit at direct support maintenance is limited to removal and replace-

ment of components mounted on the playback control panel assembly (fig. 3-3), circuit card assemblies, electronic components assembly, and variable speed tape drive transmission assembly. The defective component determined by the the testing and troubleshooting procedures should be removed and replaced in accordance with instructions provided in paragraph 3-14.

3-14. Removing and Replacing Playback Unit Components

a. Disconnect power to the playback unit before removing or replacing playback unit components The playback unit must be removed from its case before maintenance personnel can gain access to components authorized for removal and replacement at direct support maintenance. The playback unit can be removed from its case by loosening 12 captive screws used to secure the playback control panel assembly to the case. Once the playback control panel assembly is removed from its case, most components are readily accessible and can easily he replaced. When replacing wired components, carefully mark each wire with tags to avoid any rewiring errors during re-assembly.

b. Figure 3-3 is provided as an aid to the maintenance personnel during removal and replacement of components at direct support maintenance. Figure 3-4 is provided to aid maintenance personnel during removal and replacement of the switch-indicator. The following procedures provide instructions for removal and replacement of components authorized at direct support maintenance.

NOTE

Two screws are used to secure each wiring harness connector to the circuit card assembly and electronic components assembly connectors. The screws must be loosened before attempting to disconnect the connectors. The screws will remain with the wiring harness connector. During installation, insure that the connectors are properly mated before tightening the screws.

CAUTION

Disconnect power to the playback unit.

(1) *Removing A1CB1 circuit breaker.*

(a) Tag wires to A1CB1 circuit breaker.

(b) Remove screws securing wiring to the circuit breaker and remove wires from the circuit breaker.

(c) Remove circuit breaker mounting hardware and remove circuit breaker from the rear of the playback control panel assembly.

(2) *Installing A1CB1 circuit breaker. The* A1CB1 circuit breaker can be installed by reversing the removal instruction.

(3) *Removing A1A2 through A1A5 switch-indicators* (fig. 3-4).

(a) Tag wires to the switch-indicator.

(b) Unsolder leads from the switch-indicator terminals.

(c) Pull indicator assembly from the switch housing assembly.

(d) Release sleeve assembly which holds the switch on the panel inserting a small slot screwdriver through the front of housing and turn each (2) small jack-screw in the counter-clockwise direction.

(e) Rush the holding lugs back into the switch housing assembly recess with a small screwdriver.

(f) Pull the switch housing assembly through the front of the playback control panel assembly.

(4) *Installing A1A2 through A1A5 switch-indicators* (fig. 3-4).

NOTE

The spare switch-indicator is supplied without a legend. If the original indicator assembly is not to be used with the new switch housing assembly, perform procedure removing and installing legend outlined in paragraph 3-14 *b* (5).

(a) With the switch housing assembly in the up position, install the switch housing assembly through the front of the playback control panel assembly.

(b) Slide the outer sleeve over the switch housing assembly with the gap in the outer sleeve exposing the switch label.

(c) Tighten each jack screw in a clockwise direction until the pressure on the outer sleeve firmly secures the switch housing assembly to the playback control panel assembly.

(d) Resolder the tagged wires to their proper switch terminals.

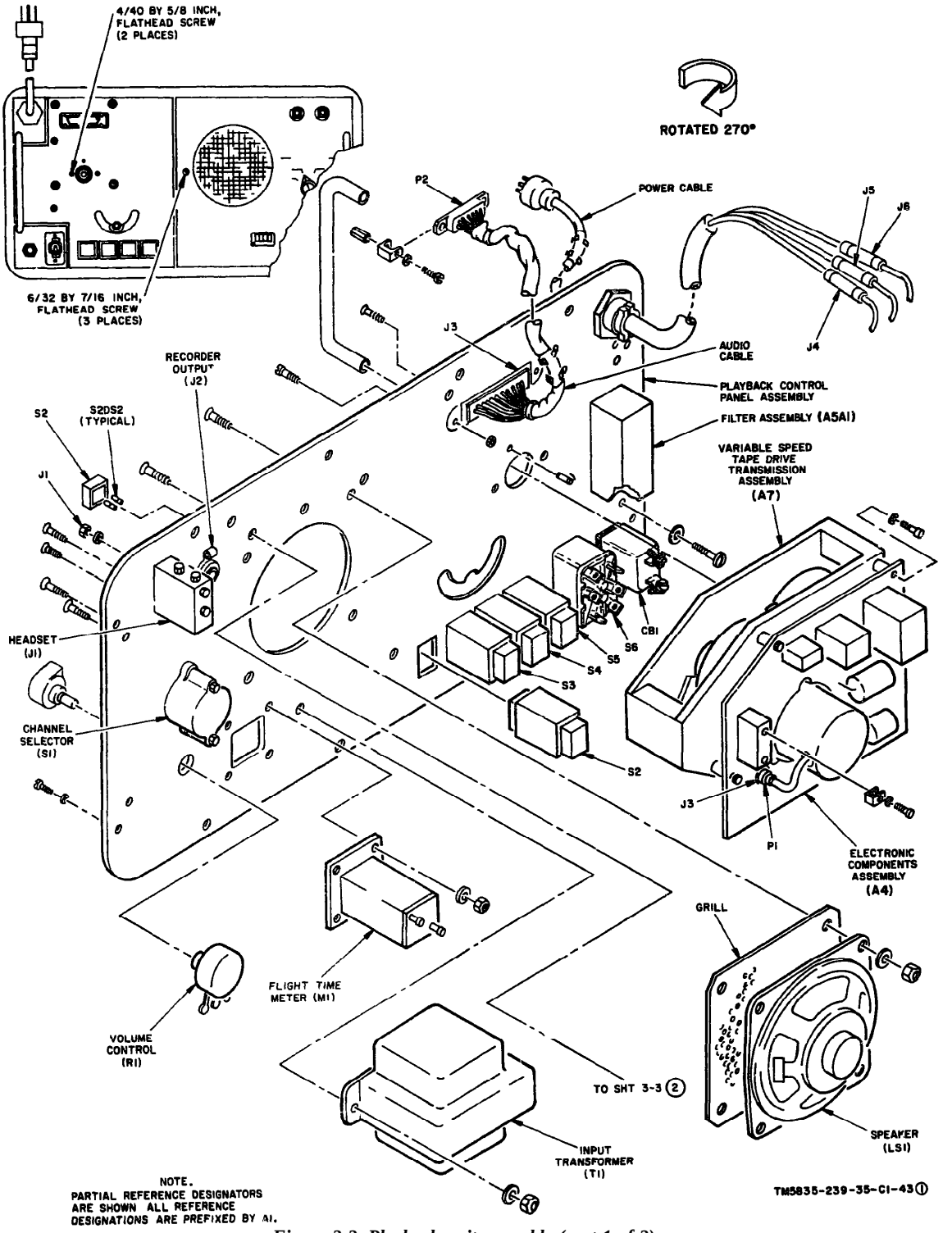


Figure 3-3. Playback unit assembly (part 1 of 2).

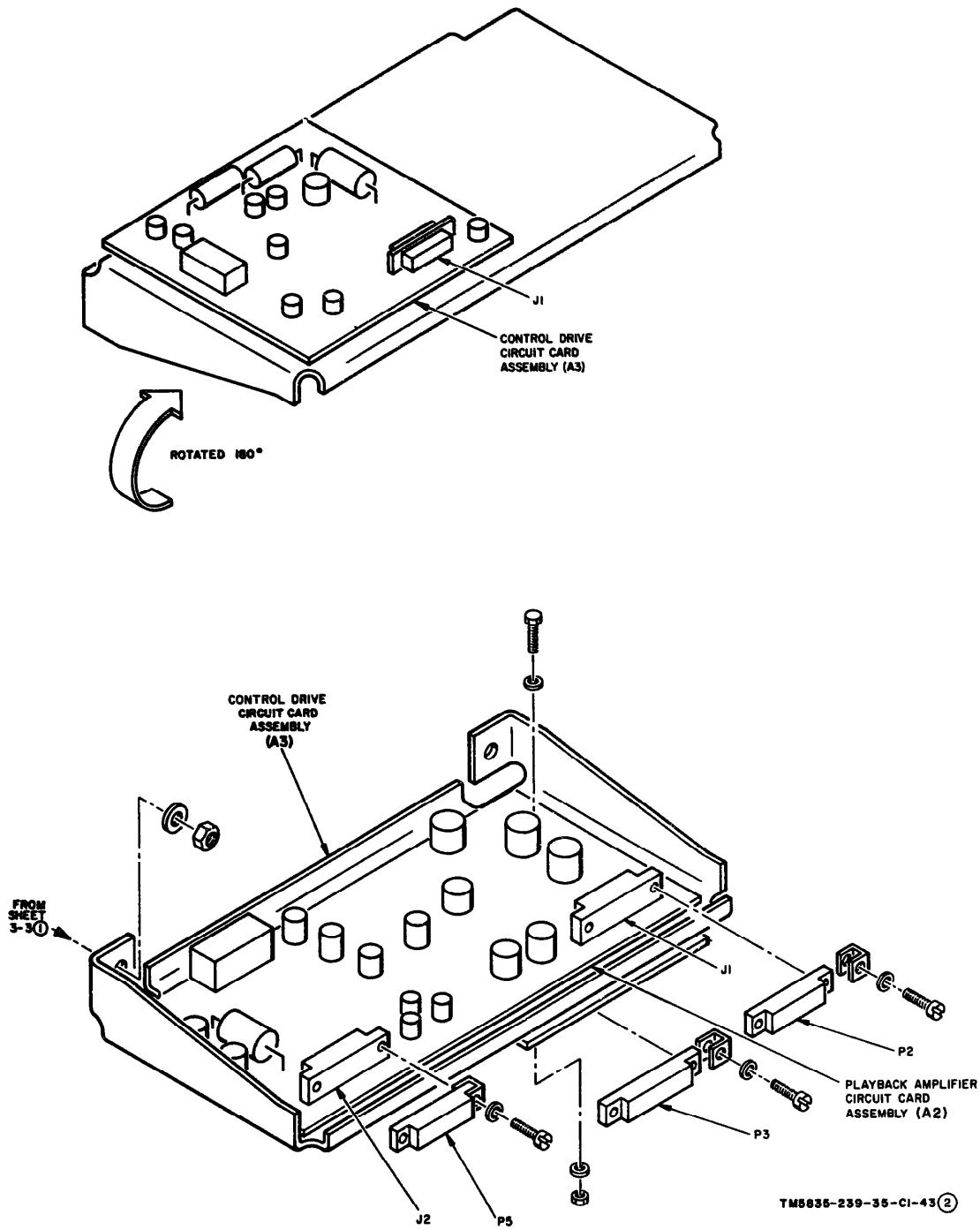


Figure 3-3. Playback unit assembly (part 2 of 2).

(5) ***Install legend.*** **The legend from the defective switch-indicator must be installed in the new switch-indicator before the switch-indicator is installed in the playback control panel assembly. The legend from the defective switch-indicator should be removed and installed in the new switch-indicator as follows:**

(a) **Remove the plastic indicator window by inserting a small knife blade (TL-29) into the top of the window and gently pry outward.**

The diffuser (legend is marked on the diffuser) will fall out of the opening.

(b) Place the marked diffuser into the new switch-indicator frame and secure in place with the plastic window.

(c) Place the indicator assembly into the switch housing assembly.

(d) Check switch action to ensure proper installation.

(6) *Removing A1M1 flight time meter (counter).*

(a) Tag wires of A1M1 flight time counter terminals.

(b) Unsolder all leads from the flight time counter terminals.

(c) Remove four 4/40 by 7/16-inch flathead screws and its associated hardware used to secure the flight time counter to the playback control panel assembly.

(7) *Installing A1M1 flight time meter. The* A1M1 flight time meter can be installed by reversing the removal instructions.

(8) Removing A1R1 volume control.

(a) Tag wires to A1R1 volume control.

(b) Unsolder all leads from the volume control.

(c) Loosen set screw on the knob and remove knob from the volume control shaft.

(d) Remove volume control mounting hardware and remove the volume control from the rear of the playback control panel assembly.

(9) *Installing A1R1 volume control.* The A1R1 volume control can be installed by reversing the removal instructions.

(10) *Removing A1S1 rotary channel selector switch.*

(a) Tag wires to A1S1 rotary channel selector switch.

(b) Unsolder all leads from the rotary channel selector switch.

(c) Loosen set screw on knob and remove knob from the rotary channel selector switch shaft.

(d) Remove rotary channel selector switch mounting hardware and remove the rotary channel selector switch from the rear of the playback control panel assembly.

(11) *Installing A1S1 rotary channel selector switch.* The A1S1 rotary channel selector switch can be installed by reversing the removal instructions.

(12) *Removing A1J1 headset and AlJ2 recorder output jacks.*

(a) Tag wires to the jack.

(b) Unsolder all wires from the jack.

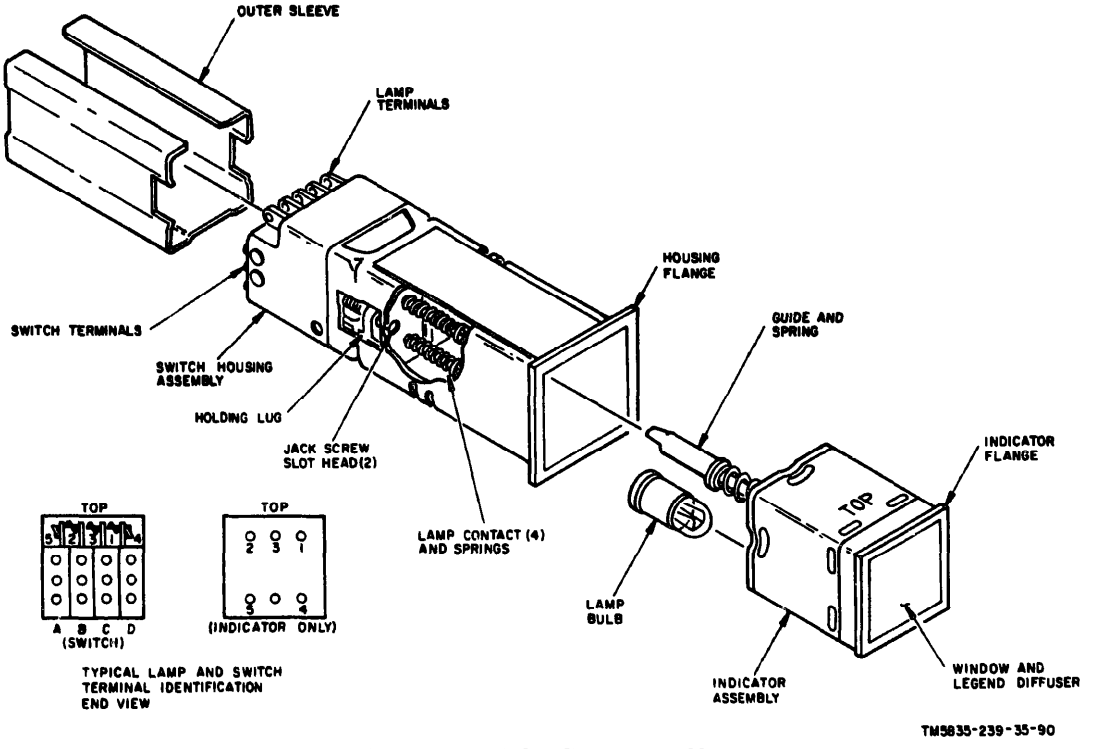


Figure 3-4. Switch-indicator assembly.

(c) Remove jack mounting hardware and remove the jack from the rear of the playback control panel assembly.

(13) *Installing A1J1 headset and A1J2 re-+* corder output jacks. The A1J1 headset and A1J2 recorder output jacks can be installed by reversing the removal instructions.

(14) *Removing A1LS1 speaker.*

(a) Tag wires to A1LS1 speaker.

(b) Unsolder all leads from the speaker.

(c) Remove four 6/32 by 1/2-inch flat-head screws and its associated hardware used to secure the speaker to the playback control panel assembly.

(d) Remove speaker.

(15) *Installing A1LS1 speaker.* The A1LS1 speaker can be installed by reversing the removal instruction.

(16) *Removing speaker* grill

(a) Remove four 6/32 by l/2-inch flat-head screws and its associated hardware used to secure the speaker to the playback control panel assembly.

(b) Remove the speaker grill while lifting the speaker.

(17) *Installing speaker grill. The speaker* grill can be installed by reversing the removal instructions.

(18) *Removing A1T1 input transformer.*

(a) Tag wires to A1T1 input transformer.

(b) Unsolder all leads from the input transformer.

(c) Remove four 4/40 by 7/16-inch flat-head screws and its associated hardware used to secure the input transformer to the playback control panel assembly.

(d) Remove input transformer.

(19) *Installing A1T1 input transformer. The* A1T1 input transformer can be installed by reversing the removal instruction.

(20) Removing A1A2 playback amplifier circuit card assembly.

(a) Disconnect audio cable connector W2-P2 from A1A2J1 and wiring harness connector A1P5 from A1A2J2.

(b) Remove five 6/32 by S/M-inch pan-head screws with *washers* used to secure the *circuit* card assembly to the support.

(c) Remove circuit card assembly from the support.

(21) *Installing A1A2 playback amplifier circuit card assembly.* The A1A2 playback amplifier circuit card assembly can be installed by reversing the removal instruction.

(22) *Removing A1A3 control drive card assembly.*

(a) Disconnect harness connector A1P3 from A1A3J1.

(b) viewed from the rear of the playback control panel assembly, remove the lower-right speaker mounting 6/32 by 1/2-inch flat-head screw and its associated hardware.

(c) Using a socket set, remove four 6/32 hexagon extended washer nuts used to secure the circuit card assembly to the support.

(d) Remove the circuit card assembly from the support.

(23) Installing A1A3 control drive circuit card assembly. The A1A3 control drive circuit card assembly can be installed by reversing the removal instruction.

(24) Removing A1A4 electronic component assembly.

(a) Disconnect wiring harness connector A1P4 from A1A4J1.

(b) Disconnect motor wiring connector A1A7A4P1 from A1A4J2.

(c) Loosen three clenching clamps and screws at the base of the tape drive motor and position clamps so they clear the slots in the motor housing.

(d) Set tape speed control lever on the front panel to the NEUT position.

(e) Remove the tape drive motor section.

(f) Remove four 4/40 by 3/4-inch pan-head screws, flat washers, and sleeve spacers used to secure the electronic component assembly to the A1A7 variable speed tape drive transmission assembly.

(g) Remove electronic component assembly.

(25) Installing A1A4 electronic component assembly. The A1A4 electronic component assembly can be installed by reversing the removal instruction.

NOTE

Insure that the sleeve spacers are properly positioned during installation of the electronic component assembly.

(26) Removing A1A7 variable speed tape drive transmission assembly.

(a) Remove A1A4 electronic component assembly in accordance with paragraph 3-14b (24).

(b) Remove three 6/32 by 7/16-inch flat head screws from front of the playback control panel assembly.

(c) Remove two 4/40 by 5/8-inch flat-head screws from the front of the playback control panel assembly.

(d) Remove the variable speed tape drive transmission assembly.

(27) *Installing A1A7 variable speed tape drive* transmission *assembly.* The A1A7 variable speed tape drive transmission assembly can be installed by reversing the removal instruction.

(28) *Removing* A1S6 *power switch.*

(a) Tag wires to A1S6 power switch.

(b) Unsolder leads from the switch terminals.

(c) Remove switch mounting hardware and remove switch from the rear of the playback control panel assembly.

(29) *Installing A1S6 power switch.* The A1-S6 power switch can be installed by reversing the removal instructions.

Section VI. CIPR TESTING PROCEDURE

3-15. General

This section contains procedures for testing the CIPR controller at the direct support maintenance level. Testing is performed to ensure that the equipment can be operated properly before issuing the unit to the organizational level and to assist in isolating troubles when repair is required. Procedural instructions are to be accomplished in the sequence in which they are presented. Troubleshooting procedures (para. 3-5) are to be used to correct any operational failures discovered during this test.

3-16. CIPR Operational Test

a. Test Equipment. Test equipment required to perform operational test are listed in paragraph 3-2.

b. Test Connections and Condition. Several test connection and condition are required to perform operational test. Test connections are illustrated in figures 3-5 through 3-6. The following preliminary procedure should be accomplished prior to performing the operational test outlined in paragraph 3-16c.

CAUTION

DC input to the CIPR must not exceed positive 30 volt.

(1) Verify that positive 28-volt dc power is available for test.

(2) Verify that Sound Recorder Test Set TS-2854/ASH-23 (CIPR test set) POWER CKT BRKR circuit breaker is deenergized (pulled out).

(8) Ensure that 28-volt dc power source is adjusted for positive 28 ± 1 volts.

(4) Connect CIPR test set power cable to the 28-volt power source.

(6) Press CIPR test test POWER CKT BRKR circuit breaker. The circuit breaker shall remain in the energized position.

(6) Press and release CIPR test set POWER ON switch-indicator. The POWER ON indicator and one-half of the TAPE END SIMULATION INTERNAL/EXTERNAL indicator shAll light and remain on.

(7) Press and hold CIPR test set POWER LAMP TEST switch-indicator. All remaining (8) indicators on the front panel shall light.

(8) Release POWER LAMP TEST switcb-indicator. All indicators except the POWER ON and one-half of the TAPE END SIMULATION INTERNAL/EXTERNAL indicators shall go out

(9) Rotate CIPR test set RECORD COMMAND and OUTPUT SELECT switches to OFF.

(10) Press and releaee CIPR test set POWER ON switch-indicator. The POWER ON and the illuminated half of the TAPE END SIMULATION INTERNAL/EXTERNAL indicators shall go out.

(11) Connect VTVM, oscilloscope, oscillator, and counter to 115-volt, 60-hertz power source.

(12) Connect CIPR teat set cables to the CIPR controller (fig. 3-5).

(13) Energize VTVM, oscilloscope, oscillator, and counter.

(14) Allow sufficient time for the test equipment to warm up.

NOTE

Connect test equipment to the CIPR test set as required during the test.

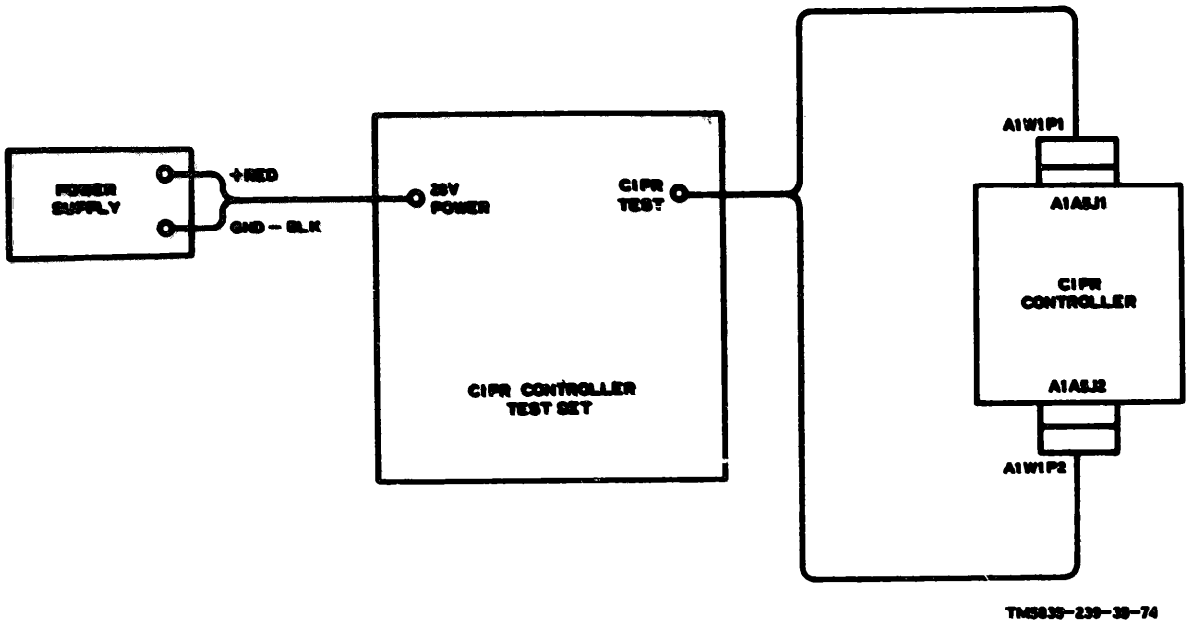


Figure 3-5. CIPR test setup.

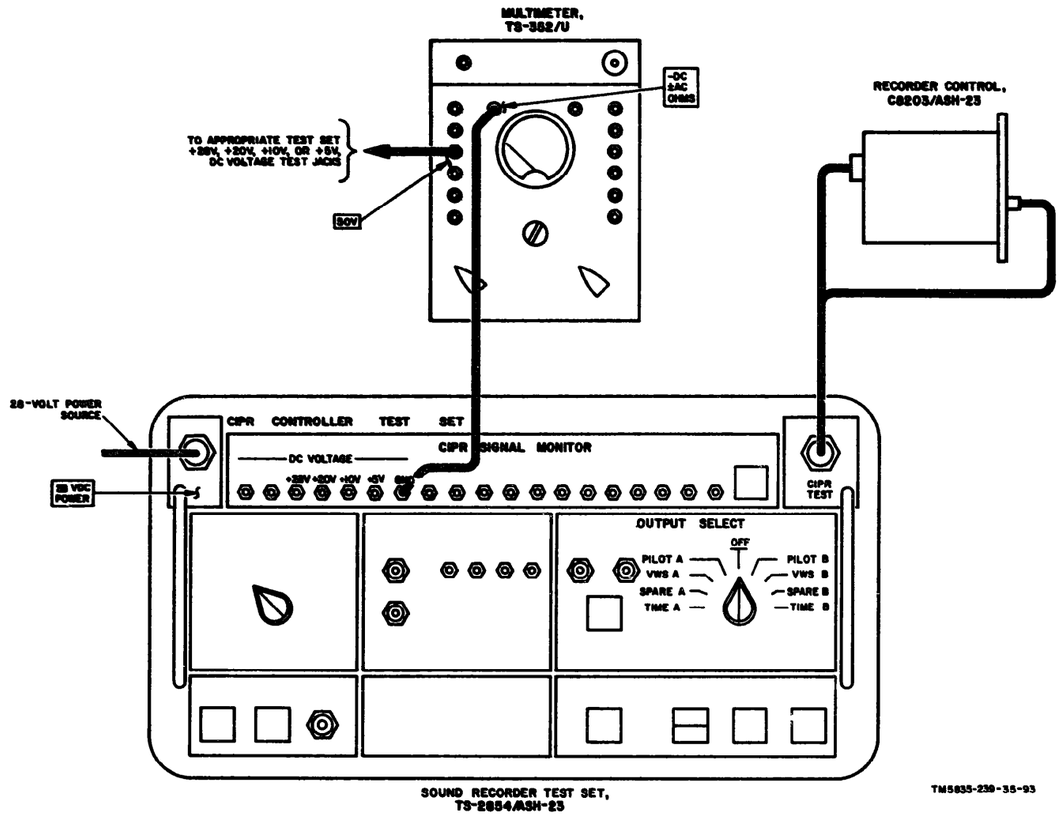


Figure 3-6. Test setup for checking dc voltages.

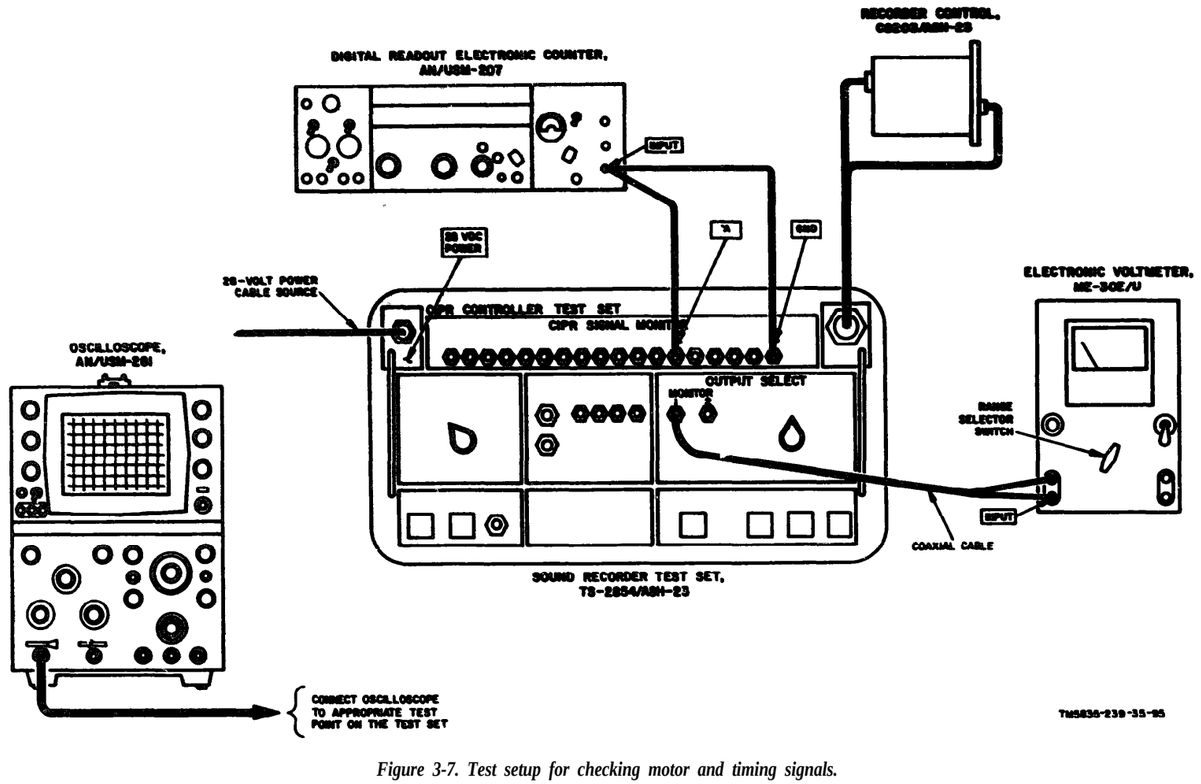


Figure 3-7. Test setup for checking motor and timing signals.

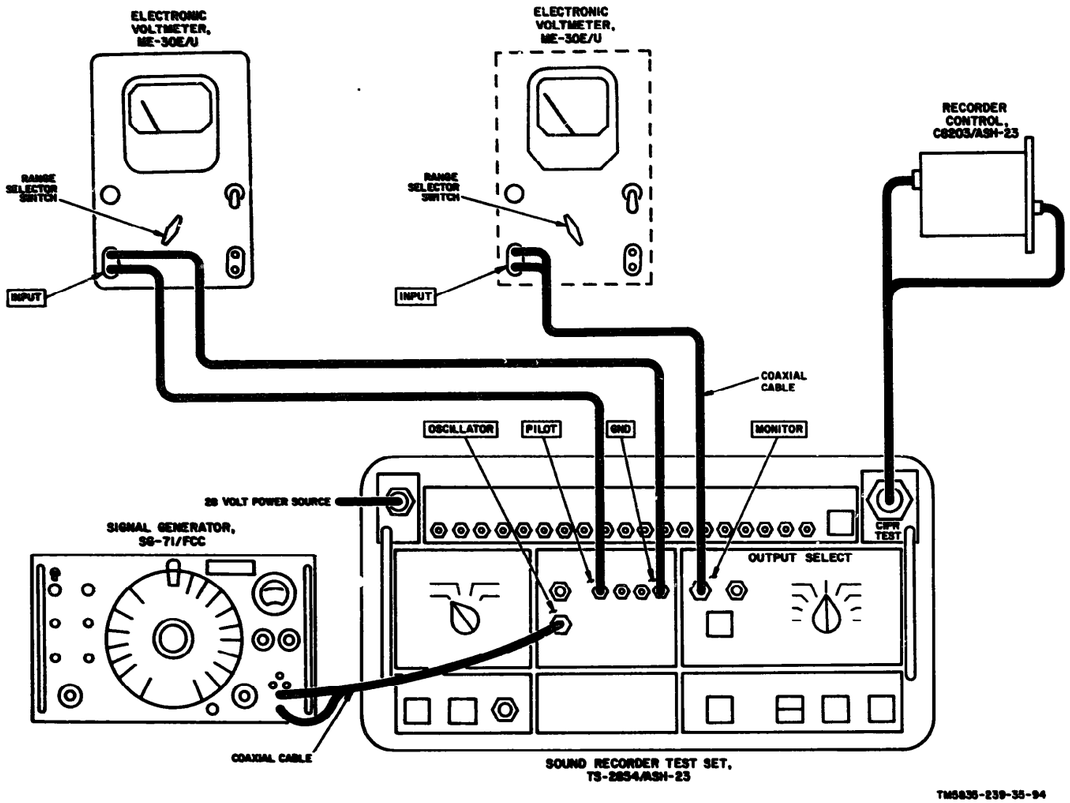


Figure 3-8. Test setup for checking CIPR controller output.

c. Test Procedure.

Step No.	Test equipment	Control settings / Equipment under test	Test procedure	Performance standard
1	Multimeter: Adjust as required for +28 vdc, +20 vdc, +10 vdc, and +5 vdc readings.	CIPR controller	a. Insure that preliminary procedure outlined in paragraph 3-16b has been completed.	a. N/A
			b. Press and release CIPR test set POWER ON switch-indicator.	b. CIPR test set POWER ON and one-half of the TAPE END SIMULATION INTERNAL/ EXTERNAL indicators shall light and remain on.
			c. Measure dc voltage between CIPR test set VOLTAGE +28V (+) and GND (–) test jacks.	c. Multimeter shall indicate +28 ± 2 vdc.
			d. Measure dc voltage between CIPR test set VOLTAGE +20V (+) and GND (–) test jacks.	d. Multimeter shall indicate +19 ± 2 vdc.
			e. Measure dc voltage between CIPR test set VOLTAGE +10V (+) and GND (–) test jacks.	e. Multimeter shall indicate +9.5 ± 1 vdc.
			f. Measure dc voltage between CIPR test set VOLTAGE +5V (+) and GND (–) test jacks.	f. Multimeter shall indicate +4.75 ± 0.5 vdc.
			g. Disconnect multimeter.	g. N/A
2	Oscilloscope: Adjust to observe waveform A illustrated in figure 3-1. This pulse will displayed once each minute.	CIPR controller	a. Rotate CIPR test set RECORD COMMAND switch to VWS.	a. Magazine drive sprocket shall begin to rotate.
			b. Check for motor timing pulse waveform between CIPR test set TIMING PULSE (+) and GND (–) test jacks.	b. Oscilloscope shall display waveform A illustrated in figure 3-1. Waveform will be displayed once each minute.
3	Oscilloscope: Adjust to observe waveform B illustrated in figure 3-1.	CIPR controller	a. Check for motor phase waveform between CIPR test set MOTOR PHASE 1A (+) and GND (–) test jacks.	a. Oscilloscope shall display waveform B illustrated in figure 3-1.
			b. Check for motor phase waveform between CIPR test set MOTOR PHASE 1B (+) and GND (–) test jacks.	b. Oscilloscope shall display waveform B illustrated in figure 3-1.
			c. Check for motor phase waveform between CIPR test set MOTOR PHASE 2A (+) and GND (–) test jacks.	c. Oscilloscope shall display waveform B illustrated in figure 3-1.
			d. Check for motor phase waveform between CIPR test set MOTOR PHASE 2B (+) and GND (–) test jacks.	d. Oscilloscope shall display waveform B illustrated in figure 3-1.
			e. Rotate CIPR test set RECORD COMMAND switch to OFF.	e. Magazine drive sprocket shall stop.
			f. Disconnect oscilloscope.	f. N/A

Step No.	Test equipment	Control settings / Equipment under test	Test procedure	Performance standard
4	CIPR test set: Set controls as required.	CIPR controller	a. Observe magazine drive sprocket.	a. Sprocket shall move approximately 1/3 revolution each minute. Movement can occur in either direction. Observe three movement.
			b. While observing magazine drive sprocket, rotate CIPR test set RECORD COMMAND switch to PILOT, VWS, and SPARE.	b. Magazine drive sprocket shall rotate continuously in the direction observed in 4a.
			c. Rotate CIPR test set RECORD COMMAND switch to OFF.	c. Magazine drive sprocket shall stop.
			d. Observe magazine drive sprocket.	d. Magazine drive sprocket shall move approximately 1/3 revolution each minute. Observe one movement.
5	CIPR test set: Set controls as required.	CIPR controller	a. Observe CIPR test set TAPE END SIMULATION INTERNAL/EXTERNAL switch-indicator.	a. If EXTERNAL segment is illuminated, press and release TAPE END SIMULATION INTERNAL/EXTERNAL switch-indicator until INTERNAL segment illuminates.
			b. Press and hold CIPR test set TAPE END SIMULATION NO. 1 switch-indicator.	b. FAILURE SIGNAL indicator shall light and magazine drive sprocket shall rotate continuously in the counterclockwise direction.
			c. Release CIPR test set TAPE END SIMULATION NO. 1 switch-indicator.	c. FAILURE SIGNAL indicator shall extinguish and magazine drive sprocket shall stop.
			d. Observe magazine drive sprocket.	d. Magazine drive sprocket shall move approximately 1/3 revolution in the counterclockwise direction. Movement shall occur once each minute. Observe one movement.
			e. Press and release CIPR test set TAPE END SIMULATION NO. 2 switch-indicator.	f. If timing pulse occurs at this time, magazine drive sprocket will move approximately 1/3 revolution in the clockwise direction.
			f. Observe magazine drive sprocket.	f. Magazine drive sprocket shall move approximately 1/3 revolution in the clockwise direction. Movement shall occur once each minute. Observe one movement.
			g. Rotate CIPR test set RECORD COMMAND switch to PILOT.	g. Magazine drive sprocket shall rotate continuously in the clockwise direction.
			h. Rotate CIPR test set RECORD COMMAND switch to OFF.	h. Magazine drive sprocket shall stop.

Step No.	Test equipment	Control settings / Equipment under test	Test procedure	Performance standard
6	CIPR test set: Set controls as required.	CIPR controller	a. Press and release CIPR test set POWER ON switch-indicator.	a. POWER ON indicator and INTERNAL segment of TAPE END SIMULATION INTERNAL/EXTERNAL indicator shall extinguish.
			b. Disconnect CIPR test set A1W1P1 connector from CIPR controller A1A5J2 connector.	b. N/A
			c. Press and release CIPR test set POWER ON switch-indicator.	c. POWER ON indicator and INTERNAL segment of the TAPE END SIMULATION INTERNAL/EXTERNAL indicator shall light.
7	CIPR test set: Set controls as required.	CIPR controller	a. Press and release CIPR test set TAPE END SIMULATION INTERNAL/EXTERNAL switch-indicator.	a. EXTERNAL segment of the TAPE END SIMULATION INTERNAL/EXTERNAL indicator shall light.
			b. Press and hold CIPR test set TAPE END SIMULATION NO. 1 switch-indicator.	b. FAILURE SIGNAL indicator shall light and magazine drive sprocket shall rotate continuously in the counterclockwise direction.
			c. Release CIPR test set TAPE END SIMULATION NO. 1 switch-indicator.	c. FAILURE SIGNAL indicator shall extinguish and magazine drive sprocket shall stop.
			d. Observe magazine drive sprocket.	d. Magazine drive sprocket shall move approximately 1/3 revolution in the counterclockwise direction. Movement shall occur once each minute. Observe one movement.
			e. Press and release CIPR test set POWER ON switch-indicator.	e. POWER ON indicator and EXTERNAL segment of the TAPE END SIMULATION INTERNAL/EXTERNAL indicator shall extinguish.
			f. Reconnect CIPR test set A1W1P1 connector to CIPR controller A1A5J2 connector.	f. N/A
			g. Press and release CIPR test set POWER ON switch-indicator.	g. POWER ON indicator and EXTERNAL segment of the TAPE END SIMULATION INTERNAL/EXTERNAL indicator shall light.
8	CIPR test set. Set controls as required. Counter: Adjust to read 400-hertz signal.	CIPR Controller	a. Connect counter to CIPR test set MOTOR PHASE 1A (+) and GND (–) test jacks.	a. N/A
			b. Rotate CIPR test set RECORD COMMAND switch to VWS.	b. Counter shall indicate 400 ± 8 herts.

Step No.	Test equipment	Control settings / Equipment under test	Test procedure	Performance standard
9	VTVM: Adjust to measure 0.95 to 3.8 volts rms. Oscilloscope: Adjust to observe waveform C illustrated in figure 3–1. This pulse will be displayed once each minute.	CIPR controller	c. Rotate CIPR test set RECORD COMMAND switch to OFF.	c. N/A
			d. Disconnect counter.	d. N/A
			a. Press and release CIPR test set TAPE END SIMULATION NO. 1 switch-indicator.	a. Magazine drive sprocket shall rotate momentarily in the counterclockwise direction.
			b. Connect VTVM to CIPR test set OUTPUT SELECT MONITOR 1 connector.	b. N/A
			c. Connect oscilloscope to CIPR test set OUTPUT SELECT MONITOR 2 connector.	c. N/A
			d. Rotate CIPR test set RECORD COMMAND switch to VWS.	d. N/A
			e. Rotate CIPR test set OUTPUT SELECT switch sequentially to PILOT A, VWS A, and SPARE A.	e. VTVM shall indicate between 0.95 and 3.8 volts rms at each switch position.
			f. Rotate CIPR test set OUTPUT SELECT switch to TIME A.	f. Oscilloscope shall display waveform C illustrated in figure 3–1. This pulse will be displayed once each minute.
			g. Press and release CIPR test set TAPE END SIMULATION NO. 2 switch-indicator.	g. Magazine drive sprocket shall begin to rotate in the clockwise direction.
			h. Rotate CIPR test set OUTPUT SELECT switch sequentially to PILOT B, VWS B, and SPARE B.	h. VTVM shall indicate between 0.95 and 3.8 volts rms at each switch position.
			i. Rotate CIPR test set OUTPUT SELECT switch to TIME B.	i. Oscilloscope shall display waveform C illustrated in figure 3–1. This pulse will be displayed once each minute.
			j. Rotate CIPR test set OUTPUT SELECT switch to OFF.	j. N/A
			k. Disconnect VTVM and oscilloscope.	k. N/A
10	VTVM: Adjust to measure 0.53 volt rms. Oscillator: Adjust for 300-herts, 0.53-volt rms input signal.	CIPR controller	a. Press and release CIPR test set TAPE END SIMULATION NO. 1 switch-indicator.	a. Magazine drive sprocket shall rotate momentarily in the counterclockwise direction.
			b. Connect VTVM to CIPR test set INPUT MONITOR PILOT/ ALTN (+) and GND (–) test jacks.	b. N/A
			c. Connect oscillator to CIPR test set INPUT MONITOR OSCILLATOR connector.	c. N/A

Step No.	Test equipment	Control settings / Equipment under test	Test procedure	Performance standard
			d. Adjust oscillator for 300-hertz, 0.53-volt rms input signal.	d. VTVM shall indicate 0.53-volt rms.
			e. Disconnect VTVM.	e. N/A
11	VTVM: Adjust to measure 0.47 to 1.9 volts rms.	CIPR controller	a. Connect VTVM to CIPR test set OUTPUT SELECT MONITOR 1 connector.	a. N/A
			b. Press and hold CIPR test set BIAS INHIBIT switch-indicator.	b. N/A
			c. While BIAS INHIBIT switch-indicator is pressed, rotate OUTPUT SELECT switch sequentially to PILOT A, VWS A, and SPARE A.	c. VTVM shall indicate between 0.47 and 1.9-volt rms at each switch position.
			d. Release BIAS INHIBIT switch-indicator.	d. N/A
			e. Press and release CIPR test set TAPE END SIMULATION NO. 2 switch-indicator.	e. Magazine drive sprocket shall begin to rotate in the clockwise direction.
			f. Press and hold CIPR test set BIAS INHIBIT switch-indicator.	f. N/A
			g. While BIAS INHIBIT switch-indicator is pressed, rotate OUTPUT SELECT switch sequentially to PILOT B, VWS B, and SPARE B.	g. VTVM shall indicate between 0.47 and 1.9-volt rms at each switch position.
			h. Release BIAS INHIBIT switch-indicator.	h. N/A
			i. Disconnect VTVM.	i. N/A
12	VTVM: Adjust to measure 0.53 volt rms. Oscillator: Adjust for 1000-hertz, 0.53-volt rms input signal.	CIPR controller	a. Press and release CIPR test set TAPE END SIMULATION NO. 1 switch-indicator.	a. Magazine drive sprocket shall begin to rotate in the counterclockwise direction.
			b. Connect VTVM to CIPR test set INPUT MONITOR PILOT/ALTN (+) and GND (-) test jacks.	b. N/A
			c. Insure that oscillator is connected to CIPR test set INPUT MONITOR OSCILLATOR connector.	c. N/A
			d. Adjust oscillator for 1000-hertz, 0.53-volt rms input signal.	d. VTVM shall indicate 0.53-volt rms.
			e. Disconnect VTVM.	e. N/A
13	VTVM: Adjust to measure 0.47 to 1.9 volts rms.	CIPR controller	a. Connect VTVM to CIPR test set OUTPUT SELECT MONITOR 1 connector.	a. N/A
			b. Repeat steps 11b through 11i.	b. Same indication should be monitored.

Step No.	Test equipment	Control settings / Equipment under test	Test procedure	Performance standard
14	VTVM: Adjust to measure 0.53 volt rms. Oscillator: Adjust for 3000-herts, 0.53-volt rms input signal.	CIPR controller	a. Press and release CIPR test set TAPE END SIMULATION NO. 1 switch-indicator.	a. Magazine drive sprocket shall begin to rotate in the counterclockwise direction.
			b. Connect VTVM to CIPR test set INPUT MONITOR PILOT/ ALTN (+) and GND (–) test jacks.	b. N/A
			c. Insure that oscillator is connected to CIPR test set INPUT MONITOR OSCILLATOR connector.	c. N/A
			d. Adjust oscillator for 3000-herts, 0.53-volt rms input signal.	d. VTVM shall indicate 0.53-volt rms.
			e. Disconnect VTVM.	e. N/A
15	VTVM: Adjust to measure 0.47 to 1.9 volts rms.	CIPR controller	a. Connect VTVM to CIPR test set OUTPUT SELECT MONITOR 1 connector.	a. N/A
			b. Repeat steps 11b through 11f.	b. Same indication should be monitored.
16	VTVM: Adjust to measure 1.76-millivolt rms.	CIPR controller	a. Connect VTVM to CIPR test set INPUT MONITOR PILOT MIC connector.	a. VTVM shall indicate 1.76 ± 0.18 millivolt rms.
			b. Disconnect VTVM.	
17	VTVM: Adjust to measure 0.53 volt rms. Oscillator: Adjust for 1000-herts, 0.53-volt rms input signal.	CIPR controller	a. Connect VTVM to CIPR test set INPUT MONITOR PILOT/ ALTN (+) and GND (–) test jacks.	a. N/A
			b. Insure that oscillator is connected to CIPR test set INPUT MONITOR OSCILLATOR connector.	b. N/A
			c. Adjust oscillator for 1000-herts, 0.53-volt rms input signal.	c. VTVM shall indicate 0.53-volt rms.
			d. Disconnect VTVM.	d. N/A
18	VTVM: Adjust to read decibels.	CIPR controller	a. Connect VTVM to CIPR test set OUTPUT SELECT MONITOR 1 connector.	a. N/A
			b. Press and hold CIPR test set BIAS INHIBIT switch-indicator.	b. N/A
			c. While BIAS INHIBIT switch-indicator is pressed, rotate OUTPUT SELECT switch sequentially to PILOT B, VWS B, and SPARE B.	c. Record db level indication monitored on the VTVM at each switch position.
			d. Release BIAS INHIBIT switch-indicator.	d. N/A
			e. Disconnect oscillator.	e. N/A

			f. Connect a jumper between CIPR test set INPUT MONITOR OSCILLATOR center pin and INPUT MONITOR GND test jack.	f. N/A
			g. Press and hold CIPR test set BIAS INHIBIT switch-indicator.	g. N/A
			h. While BIAS INHIBIT switch-indicator is pressed, rotate OUTPUT SELECT switch sequentially to PILOT B, VWS B, and SPARE B.	h. Record db level indication monitored on the VTVM at each switch position.
			d. Release BIAS INHIBIT switch-indicator.	d. N/A
			e. Compare db level recorded in 18c with db level recorded in 18h.	e. The db indications recorded in 18h shall be at least 38 db below the levels recorded in 18c for the same switch position.
			f. Disconnect VTVM.	f. N/A
19	CIPR test set: Set controls as required.	CIPR controller	a. Rotate CIPR test set RECORD COMMAND switch to PILOT.	a. Magazine drive sprocket shall rotate continuously.
			b. Press and hold CIPR test set VWS COMMAND INHIBIT switch-indicator.	b. Magazine drive sprocket shall continue to rotate.
			c. Release VWS COMMAND INHIBIT switch-indicator.	c. Magazine drive sprocket shall continue to rotate.
			d. Rotate CIPR test set RECORD COMMAND switch to VMS.	d. Magazine drive sprocket shall continue to rotate.
			e. Press and hold CIPR test set VWS COMMAND INHIBIT switch-indicator.	e. Magazine drive sprocket shall stop rotating.
			f. Release VWS COMMAND INHIBIT switch-indicator.	f. Magazine drive sprocket shall not rotate.
			g. Rotate CIPR test set RECORD COMMAND switch to SPARE.	g. Magazine drive sprocket shall begin to rotate.
			h. Rotate CIPR test set RECORD COMMAND switch to VWS.	h. Magazine drive sprocket shall continue to rotate.
			i. Rotate CIPR test set RECORD COMMAND switch to SPARE.	i. Magazine drive sprocket shall continue to rotate.
			j. Press and hold CIPR test set VWS COMMAND INHIBIT switch-indicator.	j. Magazine drive sprocket shall continue to rotate.
			k. Release VWS COMMAND INHIBIT switch-indicator.	k. Magazine drive sprocket shall continue to rotate.
			l. Rotate CIPR test set RECORD COMMAND switch to OFF.	l. Magazine drive sprocket shall stop.

Step No.	Test equipment	Control settings Equipment under test	Test procedure	Performance standard
			m. Rotate CIPR test set OUTPUT SELECT switch to OFF.	m. N/A
			n. Disconnect oscillator and oscilloscope.	n. N/A
			o. Deenergize power to the test equipment.	o. N/A
			p. Press and release CIPR test set POWER ON switch-indicator.	p. POWER ON indicator shall go out.
			q. Disconnect CIPR controller from the CIPR test set.	q. N/A
			r. Disconnect CIPR test set from 28-volt power source.	r. N/A

Section VII. PLAYBACK UNIT TESTING PROCEDURE

3-17. General

This section contains instructions for testing the playback unit at the direct support maintenance level. Testing is performed to ensure that the equipment can be operated prior to issue and to isolate troubles within the playback unit when repair is required. Procedural instructions should be accomplished in the sequence in which they are presented. Troubleshooting procedures (para 3-8) are to be used to correct operational failures discovered during the test.

3-18. Playback Unit Operational Test

a. Equipment and Materials. A jumper wire will be required to perform the operational test outlined in this paragraph.

b. Test Connection and Conditions. Prepare the playback unit for operational test as follows:

(1) Open playback unit case and visually inspect the panel and ac line cord.

(2) Verify that tape speed control lever is set to NEUT.

(3) Verify that magnetic equipment in the proximity of the playback unit is turned off.

(4) Verify that POWER ON/OFF switch is set to OFF.

(5) Verify that CHANNEL SELECT switch is set to ALL.

(6) Rotate VOLUME control to mid-point.

(7) Connect the playback unit ac line cord to 115-volt, 60-hertz, single-phase power source.

c. Test Procedure.

Step No.	Test equipment	Control settings	Equipment under test	Test procedure	Performance standard
1	N/A		Sound Reproducer Set AN/ASH-24 (playback unit)	a. Energize (push in) POWER CKT BRKR.	a. N/A
				b. Set POWER ON/OFF switch to ON.	b. STOP indicator shall light and remain on.
				c. Observe magazine drive gear.	c. Magazine drive gear should not be rotating.
				d. Set tape speed control lever to NORMAL.	d. N/A
				e. Momentarily ground pin 11 to pin 12 on front panel A1W2J3 connector.	e. This should unlatch direction control relay A1A4K2 on the A1A4 electronic component assembly and track select relay A1A2K1 on the A1A2 playback amplifier circuit card assembly.
				f. Press and release REWIND switch-indicator.	f. REWIND indicator shall light, STOP indicator shall go out, and the magazine drive gear shall rotate in the B clockwise direction.
				g. Press and release STOP switch-indicator.	g. REWIND indicator shall go out, STOP indicator shall light, and magazine drive gear shall stop rotating.
				h. Press and release PLAY switch-indicator.	h. STOP indicator shall go out, PLAY indicator shall light, and magazine drive gear shall rotate in the B (clockwise) direction.
				i. Press and release REVERSE switch-indicator.	i. PLAY indicator shall go out, REVERSE indicator shall light, and magazine drive gear shall rotate in the A (counterclockwise) direction.
				j. Press and release STOP switch-indicator.	j. REVERSE indicator shall go out, STOP indicator shall light, and magazine drive gear shall stop rotating.
				k. Momentarily ground pin 13 to pin 12 on front panel A1W2J3 connector.	k. This should energize direction control relay A1A4K2 on the A1A4 electronic components assembly and track select relay A1A2K1 on the A1A2 playback amplifier circuit card assembly.
				l. Press and release PLAY switch-indicator.	l. STOP indicator shall go out, play indicator shall light, and magazine drive gear shall rotate in the A (counterclockwise) direction.

r. Press and release REVERSE switch-indicator.	r. PLAY indicator shall go out, REVERSE indicator shall light, and magazine drive gear shall rotate in the B (clockwise) direction.
s. Press and release STOP switch-indicator.	s. REVERSE indicator shall go out, STOP indicator shall light, and magazine drive gear shall stop rotating.
t. Press and release REWIND switch-indicator.	t. STOP indicator shall go out, REWIND indicator shall light, and magazine drive gear shall rotate in the B (clockwise) direction.
u. Press and release STOP switch-indicator.	u. REWIND indicator shall go out, STOP indicator shall light, and magazine drive gear shall stop rotating.
v. Set tape speed control lever to FAST.	v. N/A
w. Press and release PLAY switch-indicator.	w. STOP indicator shall go out, PLAY indicator shall light, and magazine drive gear shall rotate in the A (counterclockwise) direction. Note the speed of rotation. The magazine drive gear should be rotating five times faster normal speed.
x. Press and release STOP switch-indicator.	x. PLAY indicator shall go out, STOP indicator light, and magazine drive gear shall stop rotating.
y. Press and release REVERSE switch-indicator.	y. STOP indicator shall go out, REVERSE indicator shall light, and the magazine drive gear shall rotate in the B (clockwise) direction at five times its normal speed.
z. Press and release STOP switch-indicator.	z. REVERSE indicator shall go out, STOP indicator shall stop, and magazine drive gear shall stop rotating.
aa. Set POWER ON/OFF switch to OFF.	aa. STOP indicator shall go out.
ab. Set tape speed control lever to NEUT.	ab. N/A
ac. Deenergize (pull out) POWER CKT BRKR.	ac. N/A
ad. Disconnect ac power cable from the ac power source.	ad. N/A
ae. Secure ac power cable in cover and secure cover on the unit.	ae. N/A

CHAPTER 4

GENERAL SUPPORT MAINTENANCE

Section I. General

4-1. Scope of General Support Maintenance

This chapter contains instructions for maintenance operation allocated for general support maintenance of the CIPR and playback unit. Instructions are provided for isolating troubles to a circuit on a circuit board assembly, removal and replacement of defective part, and testing of the required circuit board assembly to ensure that the assembly can function within specification. Also, procedure for fabricating test tape is provided in this chapter. Troubleshooting, repair, removal and replacement, and testing procedures for the CIPR subassemblies are provided in sections II, IV, and VI. Troubleshooting, repair, removal and replacement, fabricating test tape, and testing procedures for the playback unit subassemblies are provided in sections III, V, and VII.

4-2. Tools, Test Equipment, and Materials Required

a. No additional tools or test equipment other than tools and test equipment allocated for organizational and direct support maintenance are required to maintain the CIPR at general support maintenance.

b. In addition to tools and test equipment allocated for organizational and direct support maintenance, the following tools and test equipment are required to maintain the playback unit at general support maintenance.

Test equipment	Common name	Federal stock number
Reproducer Set, Sound AN/ASH–24	Playback unit (PBU)	5835-179-4691
Test Set, Recorder Set TS–2354/ASH–23	CIPR test set	6625-435-4779
Control, Recorder C3206/ASH–23	CIPR controller	5835-244-7310
Magazine, Sound Recorder Set MA–27/ASH	CIPR magazine	5835-144-7311
Generator, Signal SG–71/FCC	Oscillator	6625-669-0255
Counter, Electronic Digital Readout AN/USM–207	Counter	6625-911-6368
Voltmeter, Electronic ME–30E/U	VTVM	6625-669-0742
Bulk Tape Eraser MF–2/U	Tape eraser	5835-543-1910
Stopwatch	Stopwatch	
Phone Plug, PJ–055B	Phone plug	5935-192-4760

Section II. CIPR SUBASSEMBLY TROUBLESHOOTING

4-3. General

Troubleshooting at general support maintenance level includes all the techniques outlined for organizational and direct support maintenance and any special or additional technique required to isolate to a defective part. The systematic troubleshooting procedures which began with the operational and sectionalization performed at the organizational and direct support levels are carried to a higher maintenance category in this section.

4-4. Organization of CIPR Subassembly Troubleshooting Procedure

a. General. The first step in servicing a defective subassembly is to locate the fault to a particular circuit within the subassembly. After localizing the fault to a particular circuit, further troubleshooting shall be performed to isolate the trouble to a replaceable or repairable part.

b. Location. General information which can aid maintenance personnel in isolating troubles in the subassembly is listed below. Also, the

following information may reduce unnecessary work in isolating the troubles.

(1) *Visual inspection.* Inspect the subassemblies for burned components, arcing between components, broken or loose connections and components, and defective solder connections. These faults may often be located by sight, smell, or hearing.

(2) *Operational test.* Operational tests usually indicate the general location of the trouble. In many instances, the test will aid in determining the nature of the trouble. Operational tests to determine if the subassembly can be operated within specification are outlined in paragraph 4-18.

(3) *Troubleshooting chart.* Troubleshooting chart (para 4-6) lists symptom of common troubles and their corrective actions. The maintenance personnel should use this chart as an aid when troubleshooting the subassemblies.

c. Isolation. Faulty components may be isolated by voltage and resistance checks. Voltage and resistance data for the CIPR controller circuit card assemblies are provided in paragraph A. Use resistor and capacitor color code diagrams (fig. 7-l and 7-2) to determine the value of the resistors and capacitors.

d Waveform. Waveforms required during maintenance of the CIPR controller are illustrated in figure 3-l.

4-5. CIPR Controller Voltage and Resistance Data

a. Voltage and resistance data for the CIPR controller circuit card assemblies are provided in this paragraph. This infomation should be used with the troubleshooting data provided in paragraph 4-6 to isolate troubles in the circuit card assemblies.

b. The voltage and resistance measurements are made with all circuit card assemblies connected and properly grounded. Multimeter TS-352/U or equivalent should be used to make the voltage and resistance measurements. Unless otherwise specified, all measurements are made with respect to chassis ground. Tolerance for voltage readings is ± 10 percent while tolerance for resistance readings is ± 50 percent

NOTE

All voltage readings are made with CIPR test set POWER ON indicator and EXTERNAL segment of the TAPE END SIMULATION INTERNAL/EXTERNAL inducator illuminated and RECORD COMMAND and OUTPUT SELECT switches positioned to OFF. All resistance readings are made with the CIPR controller disconnected from the CIPR test set and with the multimeter scaling control positioned to the R X 10 scale. Since the R X 10 scale is used, all resistances in excess of 2000 ohms may indicate infinity.

CAUTION

When making resistance measurements, use only the R X 1 or R X 10 scale. Using a higher scale can damage the transistors.

(1) *A1A1 regulator circuit card assembly.*

Ref. des.	Transistor type	Transistor function	Collector Volts	Collector Ohms	Base Volts	Base Ohms	Emitter Volts	Emitter Ohms
A1A1Q1	2T040LS0683	20-volt regulator	18	60	26	160	26.5	600
A1A1Q2	2N2907A	20-volt regulator	5	160	26	450	26.5	600
A1A1Q3	2N1893	20-volt regulator	.8	8000	6	Inf.	6	Inf.
A1A1Q4	2N2907A	20-volt regulator	0	0	5.5	52	6	Inf.
A1A1Q5	2N2907A	5/10-volt regulator	8.4	Inf.	9	500	9	600
A1A1Q6	ST33056LB0655	5/10-volt regulator	15	140	9	600	10	300
A1A1Q7	2N2907A	5/10-volt regulator	2.6	100	5	180	5.4	Inf.
A1A1Q8	ST33056LB0655	5/10-volt regulator	7.7	400	5.4	Inf.	.8	35

(2) *A1A2 record amplifier circuit card assembly.*

(a) The following tabular information provides voltage and resistance data for the transistors in the A1A2 record amplifier circuit card assembly.

Ref. des.	Transistor type	Transistor function	Collector Volts	Collector Ohms	Base Volts	Base Ohms	Emitter Volts	Emitter Ohms
A1A2Q1	2N2222A	Inhibit switch	3.6	600	0	1200	0	0
A1A2Q2	2N2222A	Oscillator	4.5	450	3.6	600	18	500
A1A2Q3	2N2222A	Priority select	18	700	18	10K	18	3000

(b) The following tabular information provides voltage and resistance data for the integrated plug-in amplifier units in the A1A2 record amplifier circuit card assembly.

Ref. Des.	Plug-in amplifier type	Amplifier function	Pin No.	Volts	Ohms
A1A2AR1	ST3290PB3614	Preamplifier	1	15	250
			2	9	10K
			3	9	10K
			4	0	0
			5	0	10K
			6	8	350
			7	18	90
			8	16	165
A1A2AR2	ST3290PB3614	Amplifier	1	15	250
			2	9	7000
			3	9	7000
			4	0	0
			5	0	10K
			6	8	240
			7	19	60
			8	16	170
A1A2AR3	ST3290PB3614	Amplifier	1	15	250
			2	9	7000
			3	9	7000
			4	0	0
			5	0	10K
			6	9	240
			7	19	60
			8	16	170
A1A2AR4	ST3290PB3614	Amplifier	1	15	250
			2	9	7000
			3	9	7000
			4	0	0
			5	0	10K
			6	9	240
			7	19	60
			8	16	170

(3) *A1A3 timer controller circuit card assembly*. The following tabular information provides voltage and resistance data for the integrated circuit used in the A1A3 timer controller circuit card assembly.

NOTE

Unless specified, voltage at the integrated circuit pins are either 0 or 4 vdc. The voltage level depends on the count.

Ref. des.	Circuit type	Circuit function	Pin No.	Volts	Ohms
A1A3FF1	2M077LS8133	Counter	1	–	75
			2	–	87
			3	–	90
			4	5	87
			5	–	87
			6	–	Inf.
			7	–	80
			8	5	87
			9	–	75
			10	–	90
			11	0	0
			12	–	87
			13	–	80
			14	5	87
A1A3FF2	2M077LS8133	Counter	1	–	70
			2	–	75
			3	–	75

Pin No.	Volts	Ohms
	4	5	37
	5	–	75
	6	–	90
	7	–	70
	8	5	37
	9	–	70
	10	–	75
	11	0	0
	12	–	75
	13	–	70
	14	5	37
A1A3FF3 2M077LS8133 Counter	1	–	70
	2	–	75
	3	–	75
	4	5	37
	5	–	70
	6	–	75
	7	–	75
	8	5	37
	9	–	70
	10	–	75
	11	0	0
	12	–	75
	13	–	70
	14	5	37
A1A3FF4 2M077LS8133 Counter	1	–	75
	2	–	75
	3	–	75
	4	5	37
	5	–	90
	6	–	75
	7	–	75
	8	5	37
	9	–	75
	10	–	80
	11	0	0
	12	–	90
	13	–	75
	14	5	37
A1A3FF5 2M077LS8133 Counter	1	–	62
	2	–	70
	3	–	70
	4	5	37
	5	–	65
	6	–	80
	7	–	65
	8	–	85
	9	–	62
	10	–	70
	11	0	0
	12	–	65
	13	–	65
	14	–	85
A1A3FF6 2M077LS8133 Counter	1	–	70
	2	–	60
	3	–	80
	4	5	37
	5	–	75
	6	–	85
	7	5	37
	8	–	85
	9	–	75
	10	–	80
	11	0	0
	12	–	75
	13	–	70
	14	–	200

Ref. des.	Circuit type	Circuit function	Pin No.	Volts	Ohms
A1A3FF7	2M077LS8128	Counter	1	-	65
			2	-	70
			3	-	70
			4	5	87
			5	-	65
			6	-	80
			7	-	65
			8	-	85
			9	-	65
			10	-	70
			11	0	0
			12	-	67
			13	-	65
			14	-	85
A1A3FF8	2M077LS8128	Counter	1	-	65
			2	-	65
			3	-	65
			4	5	35
			5	-	65
			6	-	70
			7	-	68
			8	-	85
			9	-	68
			10	-	65
			11	0	0
			12	-	65
			13	-	70
			14	-	85
A1A3GB1	ST32905PB8711	Buffer	1	-	180
			2	-	75
			3	-	7000
			4	5	34
			5	-	7000
			6	-	190
			7	-	175
			8	-	165
			9	-	160
			10	-	85
			11	0	0
			12	-	85
			13	-	65
			14	-	65
A1A3GB2	ST32905PB8711	Buffer	1	-	75
			2	-	75
			3	-	7000
			4	5	34
			5	-	7000
			6	-	1000
			7	-	1000
			8	-	90
			9	-	-
			10	-	190
			11	0	0
			12	-	200
			13	-	80
			14	-	70

(4) *A1A4 static power inverter circuit card assembly.*

(a) The following tabular information provides voltage and resistance data for the transistors in the A1A4 static power inverter circuit card assembly.

Ref. des.	Transistor type	Transistor function	Collector Volts	Collector Ohms	Base Volts	Base Ohms	Emitter Volts	Emitter Ohms
A1A4Q1	2N2324	VWS inhibit switch	12	900	0	10K	0	0
A1A4Q2	2N2907	Overload detection	0	10K	18	1000	18	800
A1A4Q3	2N2222	Motor enable control	4.7	350	0	2000	0	0
A1A4Q4	2N491A	1600-hertz oscillator	9	100	20	1800	0.25	600
A1A4Q5	2N2907	Re-cycle time	0	0	0	50	0.5	50
A1A4Q6	2N2907	Overload control	0	^	0.5	50	1.5	10K
A1A4Q7	2N2907	Overload control	15	900	14	1200	15	1000
A1A4Q8	2N2369	Output	4.7	800	0	200	0	0
A1A4Q9	2N2222	PH-1 motor control	0	1000	0.7	1000	0	0
A1A4Q10	2N2222	PH-2 motor control	0	550	0.7	1000	0	0
A1A4Q11	ST33057LB0658	PH-1 motor control	19	42	19	350	19	44
A1A4Q12	ST33056LB0656	PH-1 motor control	19	42	0	1200	0	0
A1A4Q13	ST33057LB0658	PH-2 motor control	19	42	19	350	19	42
A1A4Q14	ST33056LB0	PH-2 motor control	19	42	0	900	0	0
A1A4Q15	ST33057LB0658	PH-1 motor control	19	42	19	370	19	44
A1A4Q16	ST33056LB0658	PH-1 motor control	19	42	0	250	0	0
A1A4Q17	ST33057LB0658	PH-2 motor control	19	42	19	350	19	44
A1A4Q18	ST33056LB0656	PH-2 motor control	19	42	0	1000	0	0
A1A4Q19	2N2222	PH-1 motor control	0	250	0.7	2000	0	0
A1A4Q20	2N2222	PH-1 motor control	0	1000	0.7	2000	0	0

(b) **The following tabular information provides voltage and resistance data for the in circuits used in the A1A4 static power inverter circuit card assembly.**

Ref. des.	Circuit type	Circuit function	Pin No.	Volts	Ohms
A1A4FF1	ST32905PB8711	400-hertz generator	1	2.2	80
			2	4.8	800
			3	2.2	72
			4	5	70
			5	2.2	80
			6	4.8	800
			7	0.5	70
			8	1	1500
			9	2.2	70
			10	2.2	80
			11	0	0
			12	2.2	80
			13	2.2	72
			14	1	1500
A1A4GQ1	ST32904LB8219	Logic card	1	0.8	500
			2	0.01	300
			3	2.2	70
			4	5	70
			5	2.2	80
			6	1.9	800
			7	0.8	500
			8	2.2	72
			9	1.1	1000
			10	0.8	300
			11	0	0
			12	0.01	300
			13	1.9	1000
			14	1.9	800

(5) *A1A5A1 filter assembly.* **The following information provides voltage and resistance data at terminals El through E6 on the A1ASA1 filter assembly.**

Terminal	Volts	Ohms
E1	0	0
E2	26	600
E3	0	0
E4	28	600
E5	28	Inf.
E6	28	600

4-6. CIPR Subassembly Troubleshooting Chart

a. General. The CIPR subassembly troubleshooting chart list failures observed during test, probable cause, and instructions for correcting the failures. The troubleshooting procedures provided in this section are to be used in conjunction with testing procedures (para 3-16 and 4-18) when performance standards are not met. When more than one problem exists for a failure, procedures for isolating the failure are listed in the chart. To troubleshoot the circuit card assemblies, remove the CIPR controller cover and the three screws holding the top plate and circuit card assemblies in place. The circuit card assemblies with the connectors in tact can be layed out for accessibility of the components on the circuit card assemblies. When the circuit card assemblies are layed out, a piece of paper should be placed between the card assemblies to prevent shorting of the components.

b. Troubleshooting Reference Data. Voltage and resistance data (para 4-5), circuit card assembly component location and wiring diagrams (fig. 4-2 through 4-6), schematic diagrams (fig. 7-4 through 7-8), and overall wiring diagram (fig. 7-14) should aid maintenance personnel when troubleshooting the CIPR controller.

c. A1A1 Regulator Circuit Card Assembly Troubleshooting Chart (fig. 4-2 and 7-8).

Item	Symptom	Probable cause	Corrective action
1	Abnormal indication at CIPR test set DC VOLTAGE +10V and +5V test jacks.	Defective +5-volt and/or +10-volt regulator circuit.	Replace defective component.
2	Abnormal indication at CIPR test set DC VOLTAGE +20V test jack.	Defective +20-volt regulator circuit.	Replace defective component.

d. A1A5A1 Filter Assembly Troubleshooting Chart (fig. 4-6).

Item	Symptom	Probable cause	Corrective action
1	Abnormal indication at filter capacitor A1A5A1C2 (E2).	Defective 28-volt filter circuit.	Replace defective component.

e. A1A3 Timer Controller Circuit Card Assembly Troubleshooting Chart (fig. 4-4 and 7-7).

Item	Symptom	Probable cause	Corrective action
1	Abnormal timing pulse displayed on the oscilloscope.	Defective counter circuit and/or gating circuit.	Replace defective component.

f. A1A4 Static Power Inverter Circuit Card Assembly Troubleshooting Chart (fig. 4-5 and 7-6).

Item	Symptom	Probable cause	Corrective action
1	Abnormal signal displayed at PHASE 1A or PHASE 1B test jacks (frequency is correct).	Defective phase-one motor drive circuit.	Replace defective component.
2	Abnormal signal displayed at PHASE 2A or PHASE 2B test jack (frequency is correct).	Defective phase-two motor drive circuit.	Replace defective component.
3	Abnormal frequency monitored at PHASE 1A, 1B, 2A, or 2B test jacks.	Defective 1600-hertz and/or 400-hertz generator circuit.	Replace defective components.
4	CIPR test set FAILURE SIGNAL indicator does not light.	Defective A1A4K1 relay circuit.	Replace defective component.
5	Abnormal CIPR test set FAILURE SIGNAL indication.	Defective motor drive circuit, motor drive power circuit, and/or relay A1A4K1.	Replace defective component.
6	Magazine drive sprocket moves in the wrong direction.	Defective logic switch circuit.	Replace defective component.
7	Magazine drive sprocket does not move.	Defective motor control enable switch circuit.	Replace defective component.

Item	Symptom	Probable cause	Corrective action
8	Magazine drive sprocket does not stop rotating when VWS record command and VWS inhibit signals are applied.	Defective VWS inhibit switch circuit.	Replace defective component.

g. A1A2 Amplifier Circuit Card Assembly Troubleshooting Chart (fig. 4-3 and 7-5).

Item	Symptom	Probable cause	Corrective action
1	Abnormal pilot, VWS, and/or spare output indication.	Defective pilot, VWS, and/or spare output circuit.	Replace defective component.
2	Abnormal timing pulse indication.	Defective timing control circuit.	Replace defective component.
3	Output present at either A or B position, but not present at both position.	Defective relay A1A2K1 and/or relay A1A2K2.	Replace defective component.

Section III. PLAYBACK UNIT SUBASSEMBLY TROUBLESHOOTING

4-7. General

Troubleshooting at general support maintenance level includes all the techniques outlined for organizational and direct support maintenance and any special or additional techniques required to isolate to a defective part. The systematic troubleshooting procedure which began with the operational and sectionalization performed at the organizational and direct support levels are carried to a higher maintenance category in this section.

4-8. Organization of Playback Unit Subassembly Troubleshooting Procedure

a. General. The first step in servicing a defective playback unit subassembly is to localize the fault to a particular circuit within the subassembly. After localizing the fault to a particular circuit, further troubleshooting shall be performed to isolate the trouble to a replaceable part.

b. Localization. General information which can aid maintenance personnel in isolating troubles in the playback unit subassembly are listed below. Also, the following information may reduce unnecessary work in isolating the trouble.

(1) *Visual Inspection.* Inspect the playback unit subassembly for burned components, arcing between components, broken or loose connections and components, and defective solder connections. These faults may often be located by sight, smell, or hearing.

(2) *Operational Test.* Operational test usually indicate the general location of the trouble. In many instances, the test will aid in determining the nature of the trouble. Operational tests to determine if the playback unit subassembly can be operated within specification are outlined in paragraph 4-20.

(3) *Troubleshooting Chart.* Troubleshooting chart (para 4-10) lists symptom of common troubles and their corrective actions. The maintenance personnel should use this chart as an aid when troubleshooting the playback unit subassemblies.

c. *Isolation.* Faulty components may be isolated by voltage and resistance checks. Voltage and resistance data for the playback unit circuit card assemblies are provided in paragraph 4-9. Use resistor and capacitor color code diagrams (fig. 7-l and 7-2) to determine the value of the resistors and capacitors.

4-9. Playback Unit Voltage and Resistance Data

a. Voltage and resistance data for the playback unit circuit card assemblies are provided in this paragraph. This information should be used with the troubleshooting data provided in paragraph 4-10 to isolate troubles in the circuit card assemblies.

b. The voltage and resistance measurements are made with all circuit card assemblies connected and properly grounded. Multimeter TS-352/U or equivalent should be used to make the voltage and resistance measurements. Unless otherwise specified, all measurements are made with respect to chassis ground. Tolerance for voltage readings is ± 10 percent while tolerance for resistance readings is ± 50 percent.

NOTE

All resistance readings are made with the playback unit disconnected from its power source and with the multimeter scaling control positioned to the R X 10 scale. Since the R X 10 scale is used,

all resistance in excess of 2000 ohms may indicate infinity. Before making any voltage or resistance measurements, the playback unit should be prepared as follows: last mode selected should be rewind, CHANNEL SELECTOR switch should be positioned to ALL, FLT TIME counter should be reset to 0000, tape speed control lever should be set to NORMAL and VOLUME control should be positioned to mid-pack Also, all voltage readings are made with the power supply circuit providing a positive 30 volt output.

CAUTION
When making resistance measurements, use only the R X 1 or R X 10 scale. Using a higher scale can damage the transistors.

(1) *A1A2 playback amplifier circuit card assembly.*

(a) The following tabular information provides voltage and resistance data for the transistors in the A1A2 playback amplifier circuit card assembly.

Ref. des.	Transistor type	Transistor function	Collector		Base		Emitter	
			Volts	Ohms	Volts	Ohms	Volts	Ohms
A1A2Q1	2N2222A	Timing pulse driver	22	2000	10	2000	10	2000
A1A2Q2	2N2222A	One-shot multivibrator	29.5	250	0	1000	0	300
A1A2Q3	2N2222A	One-shot multivibrator	0	2000	0.9	Inf.	0	0
A1A2Q4	2N4236	Counter Driver	0	0	27.5	35	30	500
A1A2Q5	2N4236	Audio driver	18	Inf.	30	150	30	180
A1A2Q6	2N2222A	Audio driver	30	150	5	Inf.	4	350
A1A2Q7	2N3767	Audio power amplifier	30	180	18	Inf.	17.5	2000
A1A2Q8	2N3741	Audio power amplifier	0	0	17	33	17.5	2000

(b) The following tabular information provides voltage and resistance data for the integrated plug-in amplifier units in the A1A2 playback amplifier circuit card assembly.

Ref. des.	Plug-in Amplifier type	Amplifier function	Pin No.	Volts	Ohms
A1A2AR1	ST32920PB8614	B–2 amplifier	1	19	35
			2	11	160
			3	0.8	Inf.
			4	0	0
			5	10.5	175
			6	10.5	175
			7	16.5	170
			8	16.5	150
A1A2AR2	ST32920PB8614	B–1 amplifier	1	19	32
			2	9.5	140
			3	0.8	Inf.
			4	0	0
			5	10.5	175
			6	10.5	175
			7	17.5	180
			8	17.5	140
A1A2AR3	ST32920PB8614	B–3 amplifier	1	19	35
			2	105	180
			3	0.9	Inf.
			4	0	0
			5	10.5	175
			6	10.5	175
			7	17	170
			8	17	150
A1A2AR4	ST32920PB8614	B–4 amplifier	1	19	35
			2	11	150
			3	0.9	Inf.
			4	0	0

Ref. des.	Plug-in Amplifier Type	Amplifier function	Pin No.	Volts	Ohms
			5	10.5	175
			6	10.5	175
			7	17	150
			8	17	33
A1A2AR5	ST32920PB8614	A–4 amplifier	1	19	33
			2	11	150
			3	0.9	Inf.
			4	0	0
			5	10.5	175
			6	10.5	175
			7	16.5	250
			8	16.5	250
A1A2AR6	ST32920PB8614	A–3 amplifier	1	19	65
			2	11	170
			3	0.8	Inf.
			4	0	0
			5	10.5	175
			6	10.5	175
			7	16.5	200
			8	16.5	200
A1A2AR7	ST32020PB8614	A–1 amplifier	1	19	41
			2	11	170
			3	0.8	Inf.
			4	0	0
			5	16.5	175
			6	16.5	175
			7	16	90
			8	16.5	90
A1A2AR8	ST32920PB8614	A–2 amplifier	1	19	35
			2	10.5	170
			3	0.9	Inf.
			4	0	0
			5	10.5	175
			6	10.5	175
			7	16	120
			8	16.5	110
A1A2AR9	ST32920PB8614	Driver amplifier	1	19	35
			2	10.5	160
			3	0.9	Inf.
			4	0	0
			5	10.5	175
			6	10.5	175
			7	16.5	110
			8	16.5	110

(2) A1A2 record amplifier circuit curd assembly.

Ref. des.	Transistor type	Transistor function	Collector Volts	Collector Ohms	Base Volts	Base Ohms	Emitter Volts	Emitter Ohms
A1A3Q1	2N2222A	Reverse control	30	750	1	Inf.	0	0
A1A3Q2	2N2222A	B select	7	900	0	2000	0	0
A1A3Q3	2N2222A	A select	29.5	500	0	6	0	0
A1A3Q4	2N2222A	Hold control	0	750	1	Inf.	0	0
A1A3Q5	2N2222A	Rewind control	29	205	0	42	0	0
A1A3Q6	2N2222A	Driver	7	2000	7	2000	7	2000
A1A3Q7	2N2222A	Rewind logic control	30	1500	7	Inf.	7	220
A1A3Q8	2N2222A	Regulator	15	400	11	2000	10.5	350
A1A3Q9	2N2222A	Regulator	5	1000	10.5	1000	11	2000
A1A3Q10	ST33056PB0655	Regulator	29	210	19.5	750	19	37
A1A3Q11		Priority select	1	2000	1.6	2000	1	2000
A1A3Q12		Priority select	1	2000	1.6	2000	1	2000

(3) A1A4 electronic components assembly.

The following voltage and resistance data at several terminals on the assembly should aid in troubleshooting the A1A4 electronic components assembly.

Terminal	Volts	Ohms
E2	32 vdc	220
E5	30 vdc	220
A1A4K1-1(E19)	30 vdc	200
A1A4K2-1(E24)	30 vdc	200
E9	0	0
Between E-7 and E-21	26 vac	-

4-10. Playback Unit Subassembly Troubleshooting Charts

a. General playback unit subassembly troubleshooting charts list failures observed during test, probable cause, and instructions for correcting the failures. The troubleshooting procedures provided in this section are to be used in conjunction with testing procedures (para 3-18 and 4-20) when performance standards are not met. When more than one problem exists for a failure, procedures for isolating the failure are listed in the chart.

WARNING

When power is turned on, 115 vac power is present at circuit breaker and power switch terminals.

b. Troubleshooting Reference Data. Voltage and resistance data (para 4-9), circuit card assembly component location and wiring diagrams (fig. 4-9 through 411), schematic diagrams (fig. 7-10 through 7-13), and overall wiring diagram (fig. 7-16) should aid maintenance personnel when troubleshooting the playback unit.

c. A1A4 Electronic Components Assembly Troubleshooting Chart (fig. 4-11 and 7-11).

Item	Symptom	Probable cause	Corrective action
1	No positive 25 vdc.	Defective power supply circuit.	Replace defective component.
2	Motor does not operate.	Defective motor on-off relay (A1A4K1) circuit.	Replace defective component.
3	Motor does not rotate in the correct direction.	Defective motor direction control relay (A1A4K2) circuit.	Replace defective component.
4	Motor does not stop.	Defective motor on-off relay A1A4K1 circuit.	Replace defective component.

d. A1A3 Control Drive Circuit Card Assembly Troubleshooting Chart (fig. 4-10 and 7-12).

Item	Symptom	Probable cause	Corrective action
1	Motor does not rotate in the A direction.	Defective A track (A1A3Q3) select circuit.	Replace defective component.
2	Motor does not rotate in the B direction.	Defective B track (A1A3Q2) select circuit.	Replace defective component.
3	Playback unit does not operate when rewind mode is selected.	Defective rewind control (A1A3Q5) circuit.	Replace defective component.
4	Playback unit does not operate when play mode is selected.	Defective A1A3CR29.	Replace defective component.
5	Motor does not operate in the correct direction when reverse mode is selected.	Defective reverse pulser (A1A3Q1) circuit.	Replace defective component.
6	Motor does not stop when rewind mode is completed.	Defective priority select (A1A3Q11 and A1A3Q12) circuit and/or rewind logic (A1A3Q6 and A1A3Q7) circuit.	Replace defective component.
7	Switch-indicator interlock circuit does not deenergize.	Defective hold control (A1A3Q4) circuit.	Replace defective component.
8	Abnormal +18-volt and/or +9-volt indication.	Defective voltage regulator (A1A3Q8, A1A3Q9, and A1A3Q10) circuit.	Replace defective component.

e. A1A2 Playback Amplifier Circuit Card Assembly Troubleshooting Chart (fig. 4-9 and 7-13).

Item	Symptom	Probable cause	Corrective action
1	All audio channels cannot be monitored.	a. Defective audio power amplifier (A1A2Q5, A1A2Q6, A1A2Q7, and A1A2Q8) circuit.	a. Check for audio signal at the volume control. If signal is present, replace defective audio power amplifier circuit component. If audio signal is not present, proceep to the next step.

Item	Symptom	Probable cause	Corrective action
		b. Defective driver amplifier (A1A3AR9) circuit.	b. Check for audio signal at A1S1A–C (A track) or A1S1B–C (B track). If audio signal is present, replace defective driver amplifier circuit component. If audio signal is not present, replace defective A1S1 and/or wiring.
2	Individual audio channel cannot be monitored.	Defective preamplifier circuit.	Replace defective component.
3	Poor quality audio	a. Defective audio power amplifier (A1A2Q5, A1A2Q6, A1A2Q7, and A1A2Q8) circuit.	a. Check quality of audio signal at the volume control. If audio signal is normal, replace defective audio power amplifier circuit component. If audio signal monitored is abnormal, proceed to the next step.
		b. Defective driver amplifier (A1A2AR9) circuit.	b. Check quality of audio signal at A1S1A–C (A track) or A1A1B–C (B track). If audio signal monitored is normal, replace defective driver amplifier circuit component. If audio signal monitored is abnormal, replace defective preamplifier circuit component.
4	Counter does not count timing pulses.	Defective flight time counter.	Check for timing pulse at A1M1–2. If timing pulse is present, replace defective A1M1. If timing pulse can-monitored, proceed to step 5.
5	Both A and B track timing pulses cannot be counted.	Defective timing pulse processing (A1A2Q1, A1A2Q2, A1A2Q3, and A1A2Q4) circuit.	Replace defective component.
6	A track timing pulses cannot be counted.	Defective A track preamplifier (A1A2AR5) circuit.	Replace defective component.
7	B track timing pulses cannot be counted.	Defective B track preamplifier (A1A2AR4) circuit.	Replace defective component.
8	A or B track channels cannot be selected for monitoring.	Defective track select relay (A1A2K1) circuit.	Replace defective component.

Section IV. CIPR SUBASSEMBLY ADJUSTMENT, REPAIR, AND REMOVAL AND REPLACEMENT

4-11. CIPR Subassembly Adjustment

No adjustment is required on the CIPR subassembly during general support maintenance.

4-12. CIPR Subassembly Repair

Repair authorized at general support maintenance consists of repairing circuit card assemblies removed at direct support maintenance and repair of defective control base assembly, filter assembly, and wiring. The circuit card assembly component location and wiring diagrams (fig 4-2 through 4-6) and overall wiring diagram (fig 7-14) should aid in repairing the CIPR controller.

4-13. Removal and Replacement of CIPR Subassemblies and Components

a. Circuit Card Assembly Components The removal and replacement of defective components on the circuit card assemblies is authorized at genera1 support maintenance. Care should be taken when components are removed or replaced on the circuit card assemblies. when removing or replacing soldered components, a pencil-type iron with a 25-watt maximum capacity should be used. If the iron must be used with ac power, use an isolating transformer between the iron and the ac power source. Do not use a soldering gun. when soldering transistor leads, solder quickly; wherever wiring permits, use a heat sink (such as a long-nose plier) between the solder joint and the transistor. Use approximately the same length lead and dress the transistor lead as used originally. Also, avoid making pin holes in the coating used on the circuit card assemblies. When pin holes are made, the following procedure should be used to seal the pin holes in the circuit card assemblies:

(1) Clean area to be touched up with naphtha or equivalent cleaning solvent.

(2) Blow dry with clean filtered air not to exceed 20 pounds per square inch (psi).

(3) Mix four ounces of resin (PT401) with fluorescent dye added, to 7.37 cc of H11 catalyst. If larger quantity is required, use the same ratio of resin to catalyst.

(4) Mix thoroughly and apply coating with a soft bristle brush.

(5) Air dry for 20 minutes.

(6) Cure in air circulating oven for one hour at 135 ± 5°F.

b. CIPR Motor.

(1) *Removing A1A6A2B1 CIPR motor* (fig. 4-1).

(a) Cover should be removed in accordance with paragraph 3-11a.

(b) Loosen two rim clenching clamps 18).

(c) Position the damps so that they clear the slot on the CIPR motor (26) housing.

(d) Slide the CIPR motor out from the cover plate (27).

(2) Installing A1A6A2B1 CIPR motor (fig. 4-1).

(a) Insert the CIPR motor shaft into ap propriate opening in the cover plate (27).

NOTE

Do not use force when installing the CIPR motor shaft into the cover plate opening. It may be necessary to re-position and/or rotate the shaft while inserting it into the opening to align the shaft with the spur gearshaft (29).

(b) Position the rim clenching clamps (18) in the slot provided on the motor housing.

(c) Secure the CIPR motor to the cover plate by tightening the rim clenching clamps.

(d) Install cover.

c. Control Base Assembly. The repair of the A1A6 control base assembly at general support maintenance shall be accomplished by replacing defective mechanical parts. The following disassembly and re-assembly data is provided as an aid for maintenance personnel during replacement of defective control base assembly parts.

(1) *Disassembly* (fig. 4-1).

(a) Remove A1A6A2B1 CIPR motor (126) in accordance with paragraph 4-13b(1).

(b) Remove three 4/40 by 7/16-inch flat-head screws (16).

(c) Remove cover plate (27).

NOTE

‘There are two 1/4-inch (28) and one 5/16-inch (38) bearings installed on the underside of the cover plate. The bearings may fall out when the cover plate is removed.

(d) If the bearings did not fall out, remove the bearing at this time.

(e) Remove two gearshafts (29 and 36).

(f) Remove two 1/4-inch bearings from the base plate (35).

(g) Remove sleeve bushing (19) from the base plate.

(h) While pushing the half shaft coupling (22) in, remove l/8-inch crescent type retaining clip (20).

(i) Remove half shaft coupling (22).

(j) Remove 3/64 by 1/4-9 inch spring pin (21).

(k) Remove 1/4-inch spring (23), flat washer (24), and 1/8-inch, “E” type retaining ring (26).

(l) Remove gearshaft (37).

(m) Remove 5/16-inch bearing (39) from the base plate.

(2) *Reassembly* (fig. 4-1).

(a) Install 5/16-inch bearing (39) in the base plate (35).

(b) Install gearshaft (37) through the 5/16-inch bearing (39) and base plate.

(c) Install 1/8-inch, “E” type retaining ring (25) on the gearshaft.

(d) Install the flat washer (24), then the 1/4-inch spring (23) on the gearshaft.

(e) Compressing the spring, insert the 3/64 by 1/4-inch spring pin into the hole on the gearshaft.

(f) Install half shaft coupling (22).

(g) While pressing the half shaft coupling in, install the 1/8-inch crescent type retaining ring (20) on the gearshaft.

(h) Install sleeve bushing (19) in the base plate.

(i) Install two 1/4-inch bearings in the base plate.

(j) Install two gearshaft (29 and 36).

NOTE

Insure that the gears are properly mated.

(k) Install one 5/16-inch bearing (38) and two 1/4-inch, bearings (28) in the cover plate.

(I) Install cover plate (27).

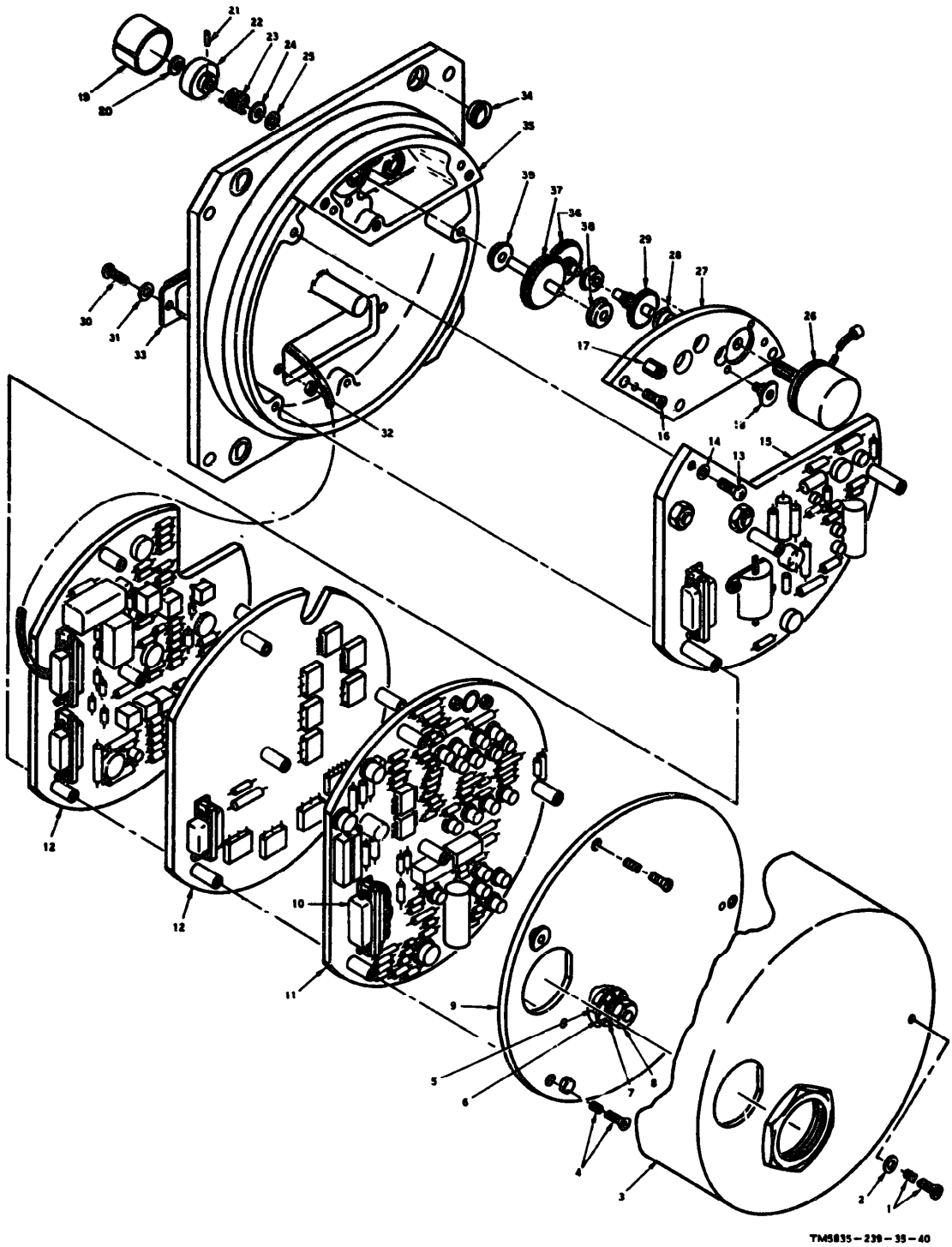


Figure 4-1. A1 recorder control.

1 Screw, pan-head
2 Washer, flat
3 Cover
4 Screw (4)
5 Nut
6 Ground disk
7 Washer
8 Nut
9 Plate
10 Connectors (5)
11 Inverter
12 Circuit card assembly
13 Screw
14 Washer
15 Circuit card assembly
16 Screw
17 Nut
18 Clamp
19 Bushing
20 Retaining ring
21 Pin
22 Coupling
23 Spring
24 Washer
25 Retaining ring
26 Motor
27 Cover plate
28 Bearing, ball
29 Gearshaft, spur
30 Screw, self-locking
31 Washer, flat
32 Nut, plain, hexagon
33 Connector
34 Fastener receptacle
35 Base plate
36 Gearshaft, spur
37 Gearshaft, spur
38 Bearing, ball
39 Bearing ball

Figure 4-1-Continued.

NOTE

Insure that the three gearshafts and the bearings are properly aligned.

(m) Using three 4/40 by 7/10-inch flat screws (16), secure the cover plate to the base plate.

(n) Install the A1A6A2B1 CIPR motor in accordance with paragraph 4-13b (2).

d. *Filter Assembly.* The repair of the A1A5A1 filter assembly at general support maintenance shall be accomplished by removing and replacing the entire assembly or replacing the individual component while the assembly is still wired in the system. The individual component should be removed and replaced in accordance with instructions provided in paragraph 4-13a. Paragraphs 4-13d(1) and 4-13d(2) provide instructions for removing and replacing the entire assembly.

(1) *Removing A1A5A1 filter assembly.*

***(a)* Remove cover in accordance with paragraph 3-11a.**

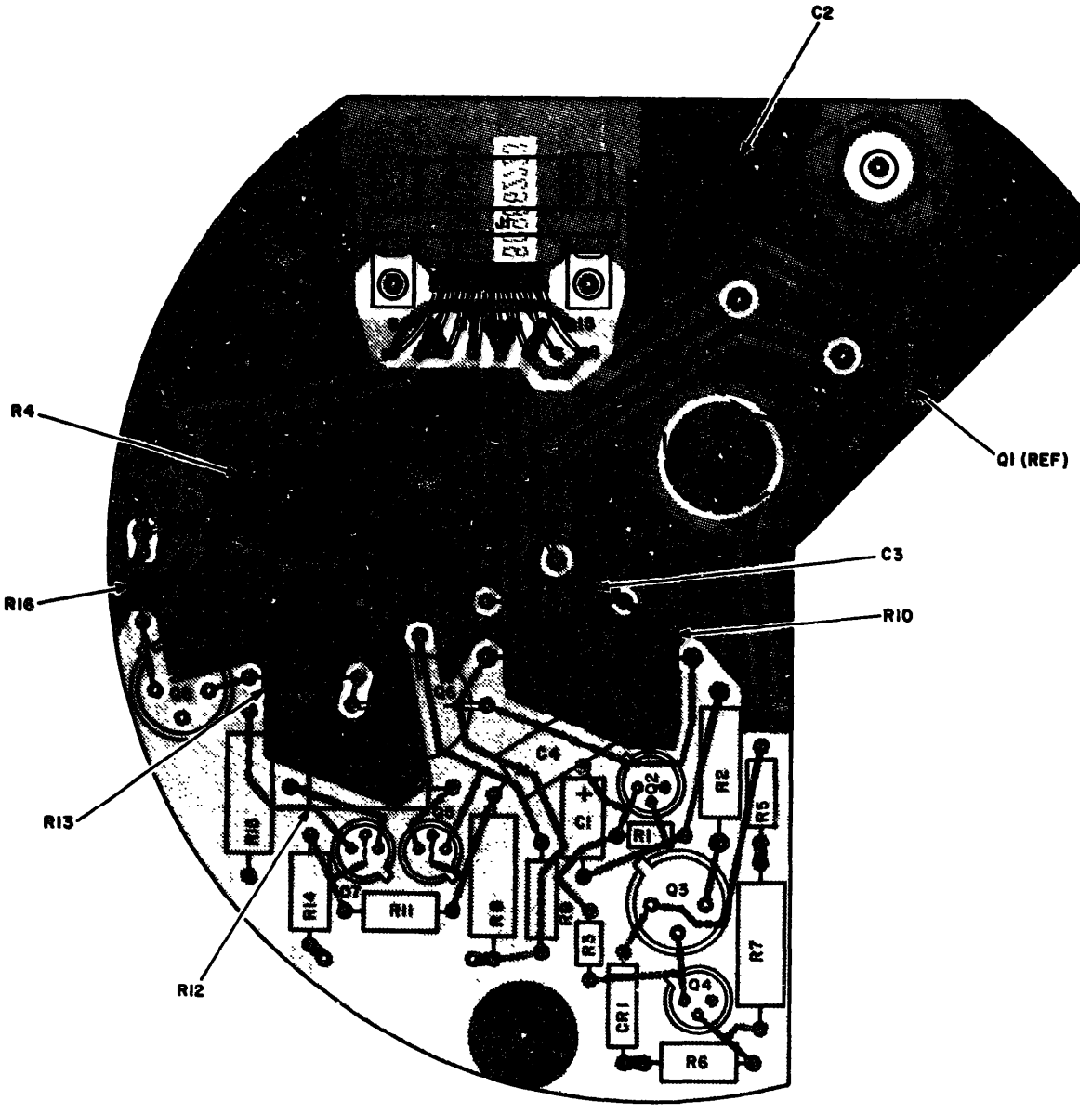
***(b)* Slide wiring harness A1A5J1 connector through the opening in the filter assembly.**

***(c)* Tag all wires to the filter assembly.**

***(d)* Unsolder all wires from the filter assembly.**

***(e)* Remove filter assembly.**

(2) *Installing A1A5A1 filter assembly. The* A1A5A1 filter assembly can be installed by reversing the removal instruction. Re-check wiring to the filter assembly (fig. 7-14) to ensure that wiring is correct before soldering.



NOTES

1 302A VERSION IS ILLUSTRATED.

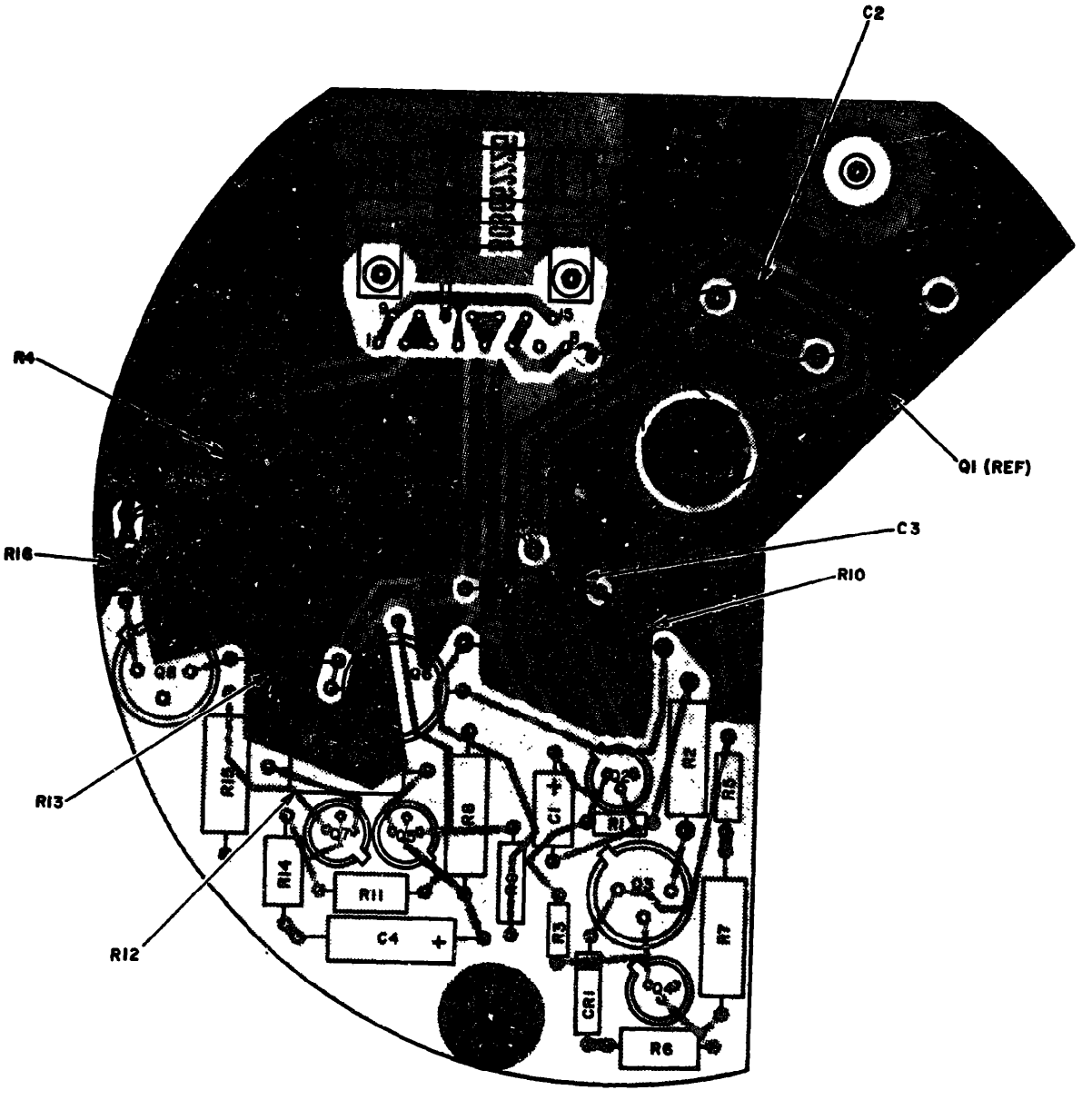
2. LIGHT SCREEN AREA REPRESENTS FRONT ETCHING

3. DARK SCREEN AREA REPRESENTS BACK ETCHING

4 PARTIAL REFERENCE DESIGNATIONS ARE SHOWN ALL REFERENCE DESIGNATORS ARE PREFIXED BY A1A1

TM5835-239-35-81 (1)

Figure 4-2. A1A1 regulator circuit card assembly component location and wiring diagram (part 1 of 2).



NOTES

1 301B VERSION IS ILLUSTRATED

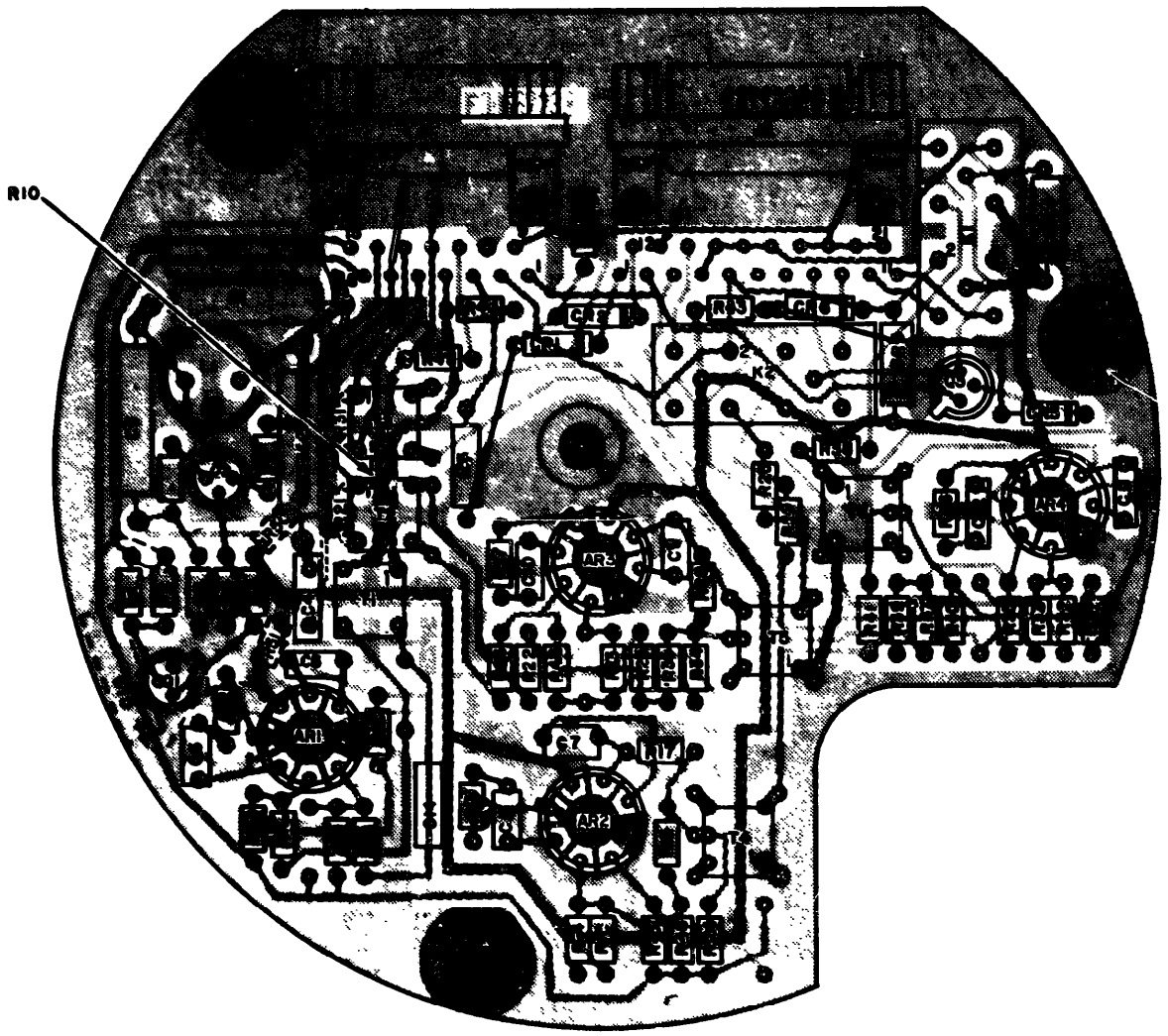
2 LIGHT SCREEN AREA REPRESENTS FRONT ETCHING

3 DARK SCREEN AREA REPRESENTS BACK ETCHING.

4 PARTIAL REFERENCE DESIGNATORS ARE SHOWN ALL REFERENCE DESIGNATORS ARE PREFIXED BY A1A1

TM5835-239-35-81 (2)

Figure 4-2. A1A1 regulator circuit card assembly component location and wiring diagram (part 2 of 2).

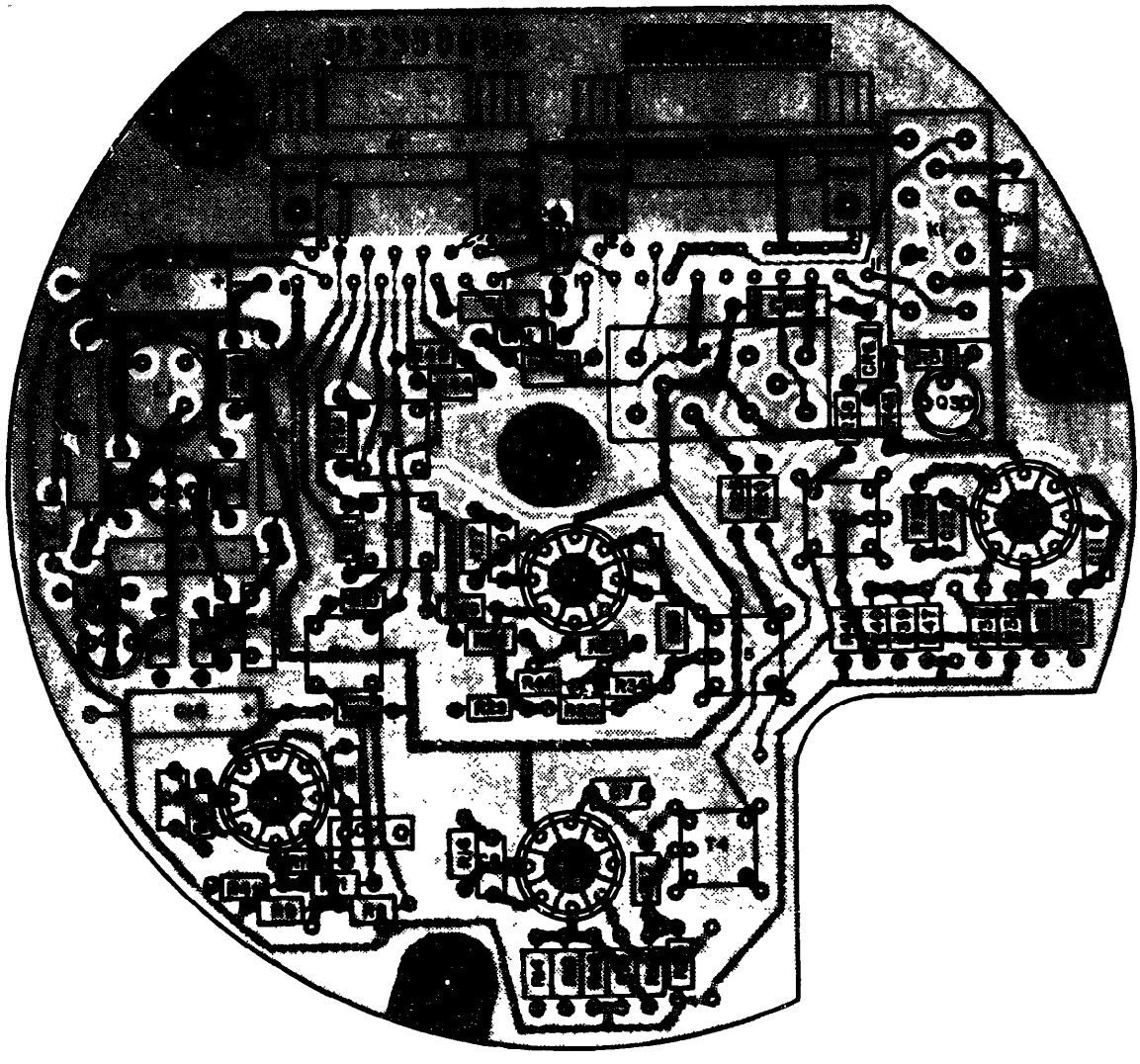


NOTES

1. 303A VERSION IS ILLUSTRATED
2. LIGHT SCREEN AREA REPRESENTS FRONT ETCHING
3. DARK SCREEN AREA REPRESENTS BACK ETCHING
4. PARTIAL REFERENCE DESIGNATORS ARE SHOWN ALL REFERENCE DESIGNATORS ARE PREFIXED BY A1A2

TM5835-239-35-83 (1)

Figure 4-3. A1A2 record amplifier circuit card assembly component location and wiring diagram (part 1 of 2).



NOTES:

1. 303B VERSION IS ILLUSTRATED
2. LIGHT SCREEN AREA REPRESENTS FRONT ETCHING.
3. DARK SCREEN AREA REPRESENTS BACK ETCHING
4. PARTIAL REFERENCE DESIGNATORS ARE SHOWN ALL REFERENCE DESIGNATORS ARE PREFIXED BY A1A2

TM5835-239-35-83 (2)

Figure 4-3. A1A2 circuit card assembly component location and wiring diagram (part 2 of 2)

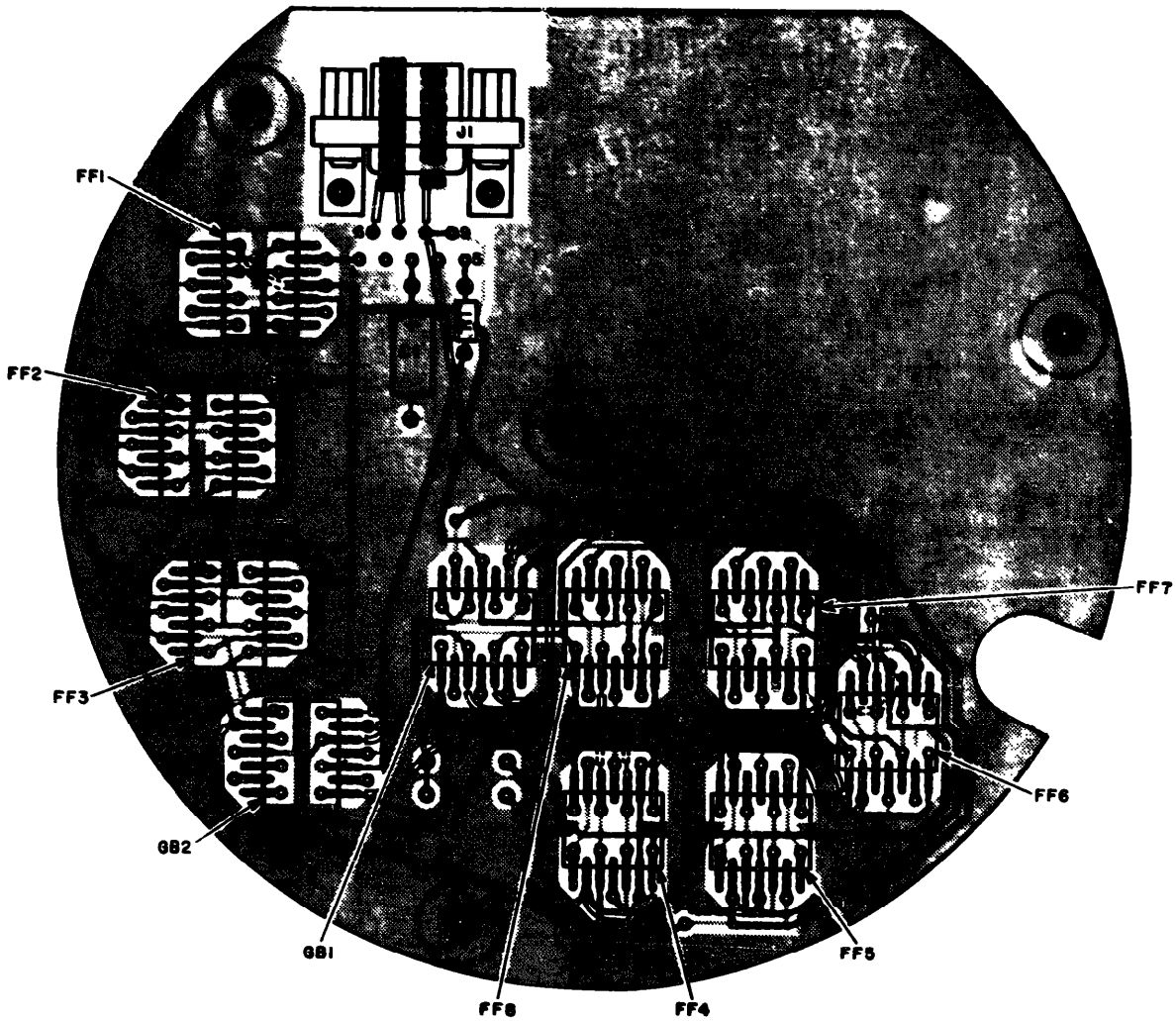
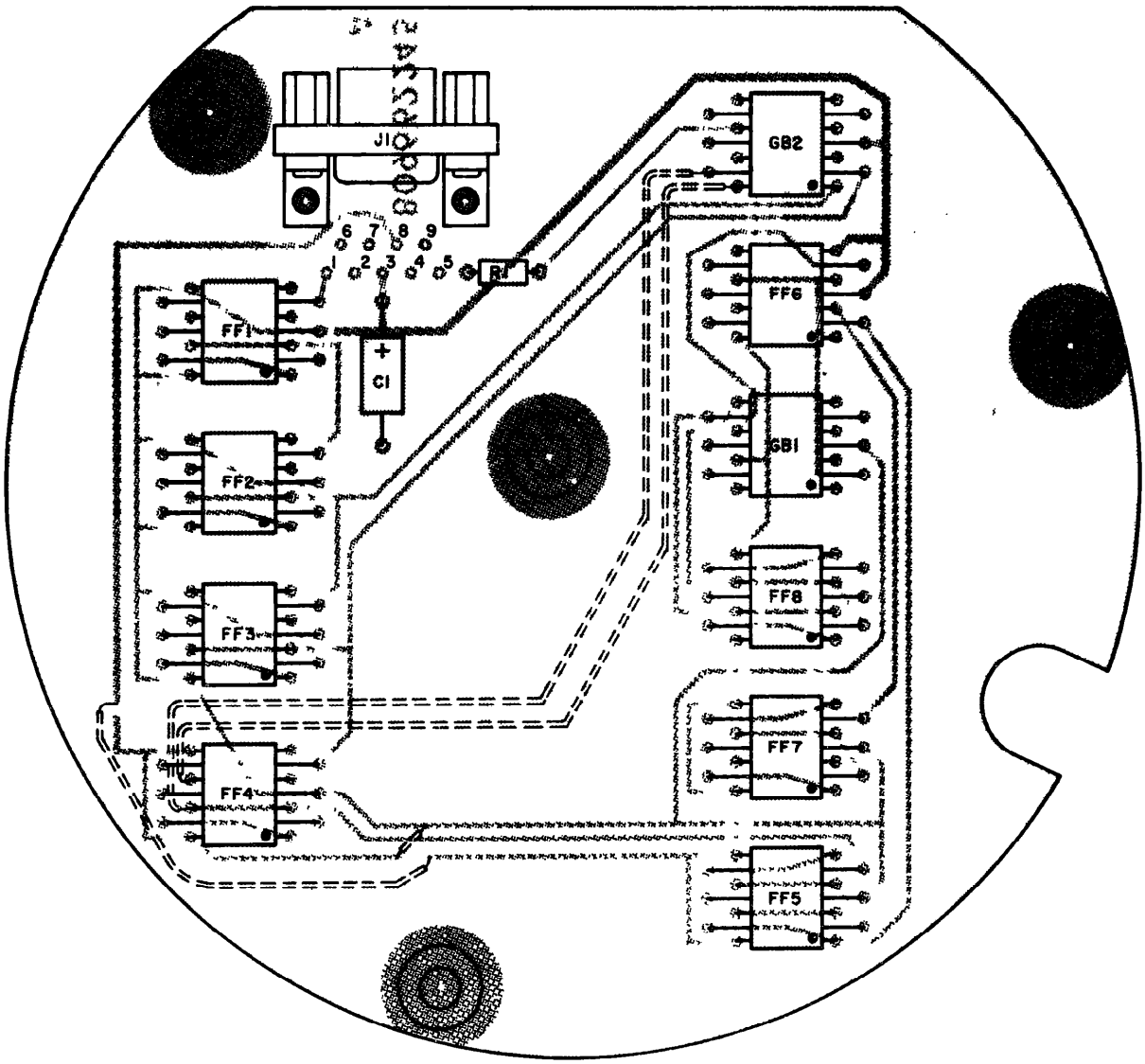


Figure 4-4. A1A3 timer controller circuit curd assembly component location and wiring diagram (part 1 of 2).

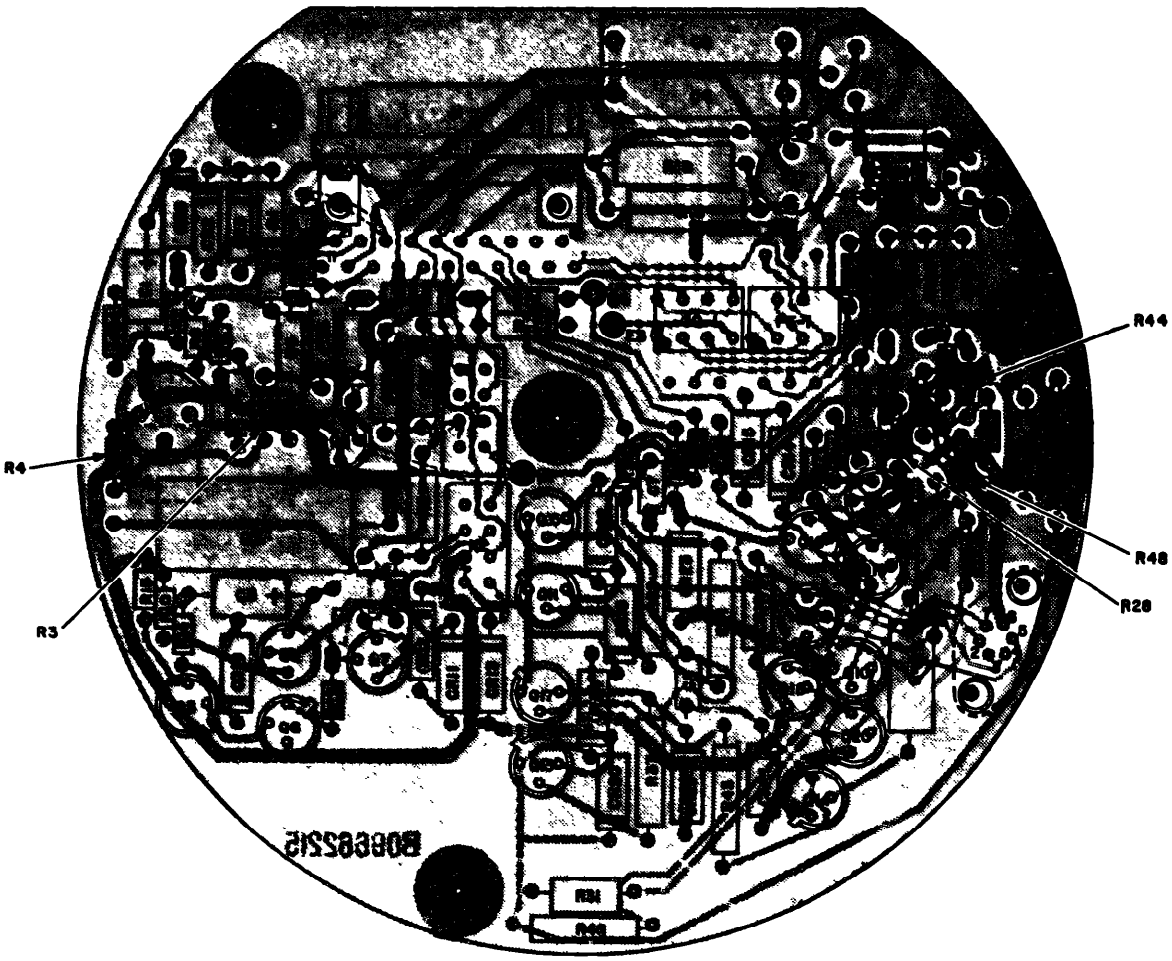


NOTES

1 3028 VERSION IS ILLUSTRATED
2 LIGHT SCREEN AREA REPRESENTS FRONT ETCHING
3. DARK SCREEN AREA REPRESENTS BACK ETCHING
4 PARTIAL REFERENCE DESIGNATIONS ARE SHOWN ALL REFERENCE DESIGNATORS ARE PREFIXED BY A1A3

TM5835-239-35-84 (2)

Figure 4-4 A1A3 timer controller circuit card assembly component location and wiring diagram (part 2 of 2)

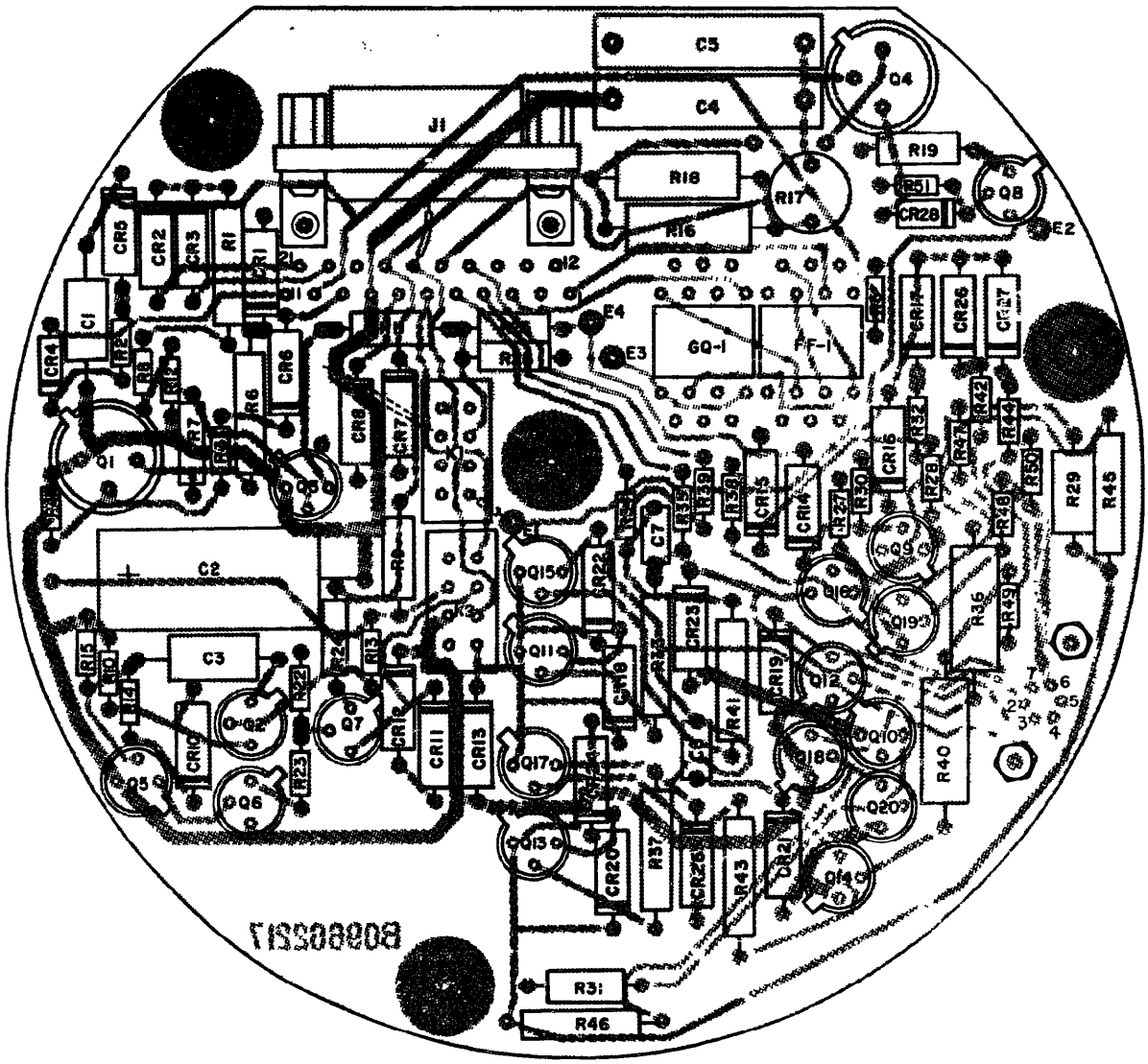


NOTES

1 304A VERSION IS ILLUSTRATED
2 LIGHT SCREEN AREA REPRESENTS FRONT ETCHING
3 DARK SCREEN AREA REPRESENTS BACK ETCHING
* PARTIAL REFERENCE DESIGNATORS ARE SHOWN ALL REFERENCE DESIGNATORS ARE PREFIXED BY A1A4

TM5835-239-35-82 (1)

Figure 4-5. A1A4 static power inverter circuit card assembly component location and wiring diagram (part 1 of 2).



NOTES

1 304B VERSION IS ILLUSTRATED
2 LIGHT SCREEN AREA REPRESENTS FRONT ETCHING
3 DARK SCREEN AREA REPRESENTS BACK ETCHING
4 PARTIAL REFERENCE DESIGNATORS ARE SHOWN ALL REFERENCE DESIGNATORS ARE PREFIXED BY A1A4

TM5835 239-82 (2)

Figure 4-5 A1A4 state power inverter circuit card assembly component location and wiring diagram (part 2 of 2)

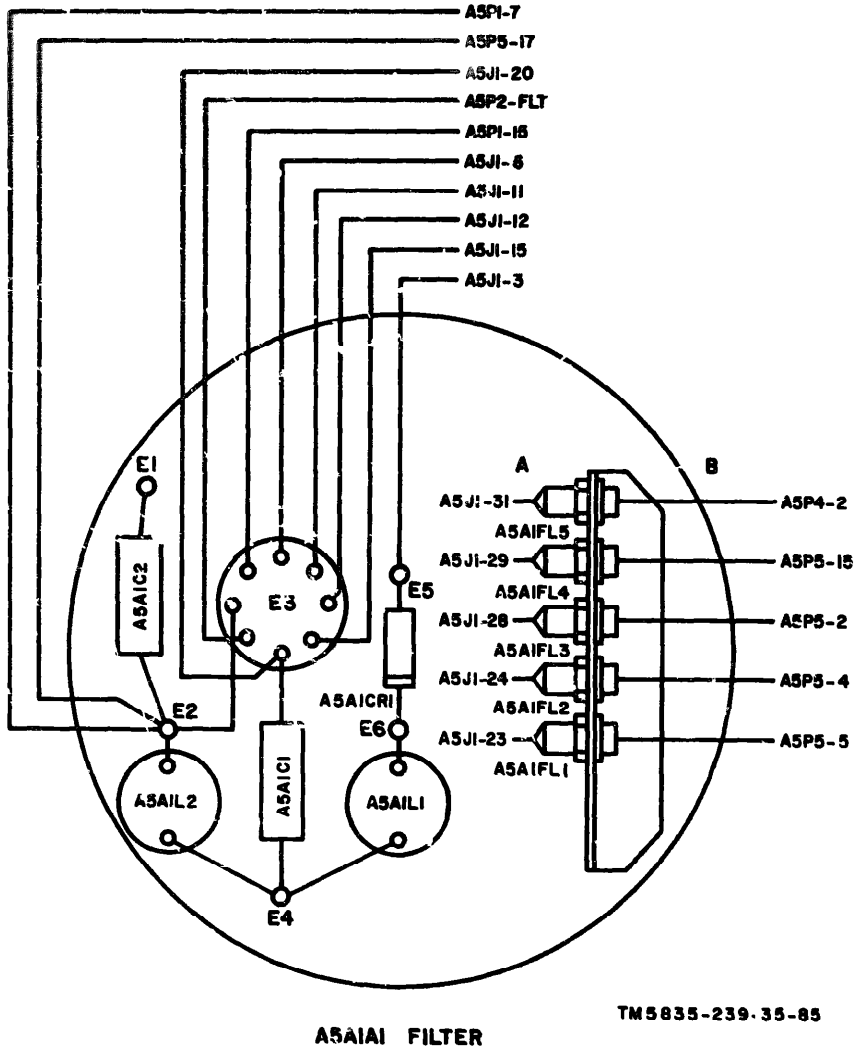


Figure 4-6. A1A5A1 filter assembly component location and wiring diagram.

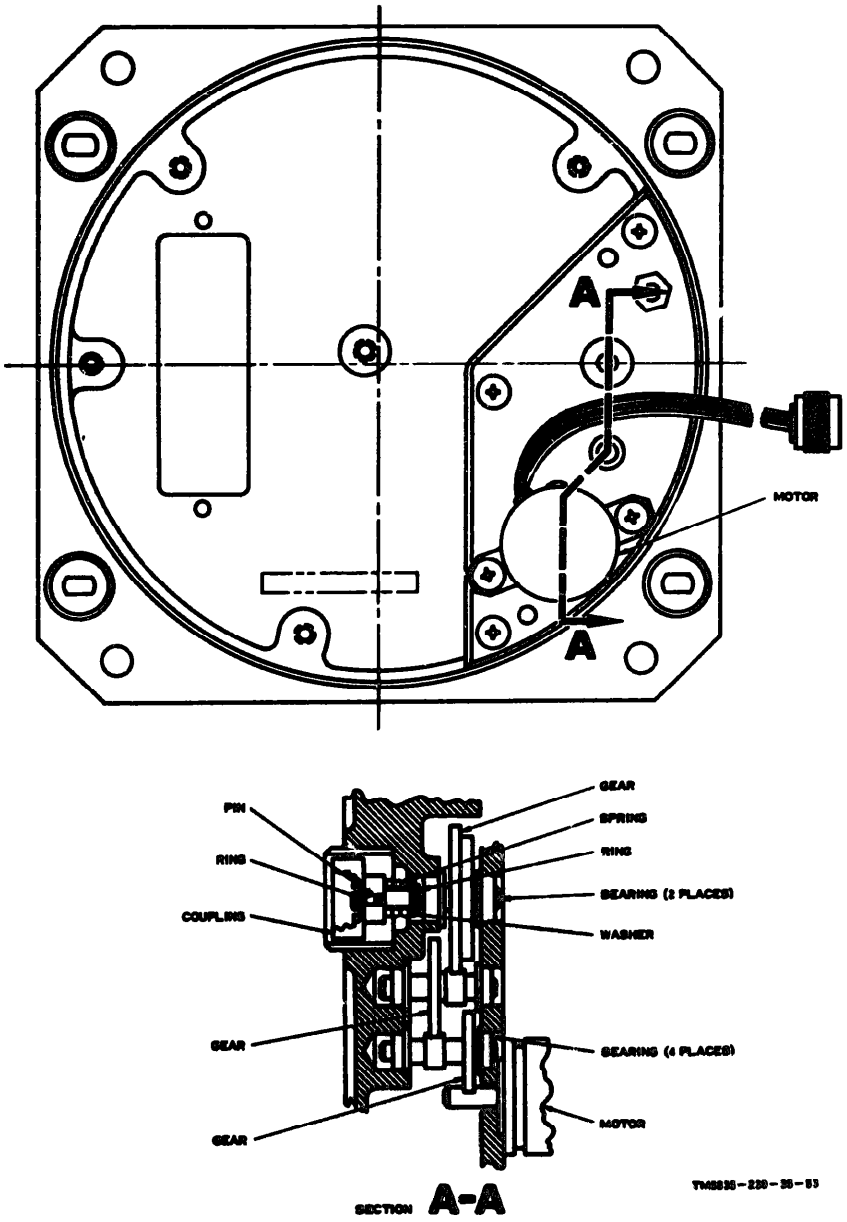


Figure 4-7. A1A6 control base assembly component location diagram.

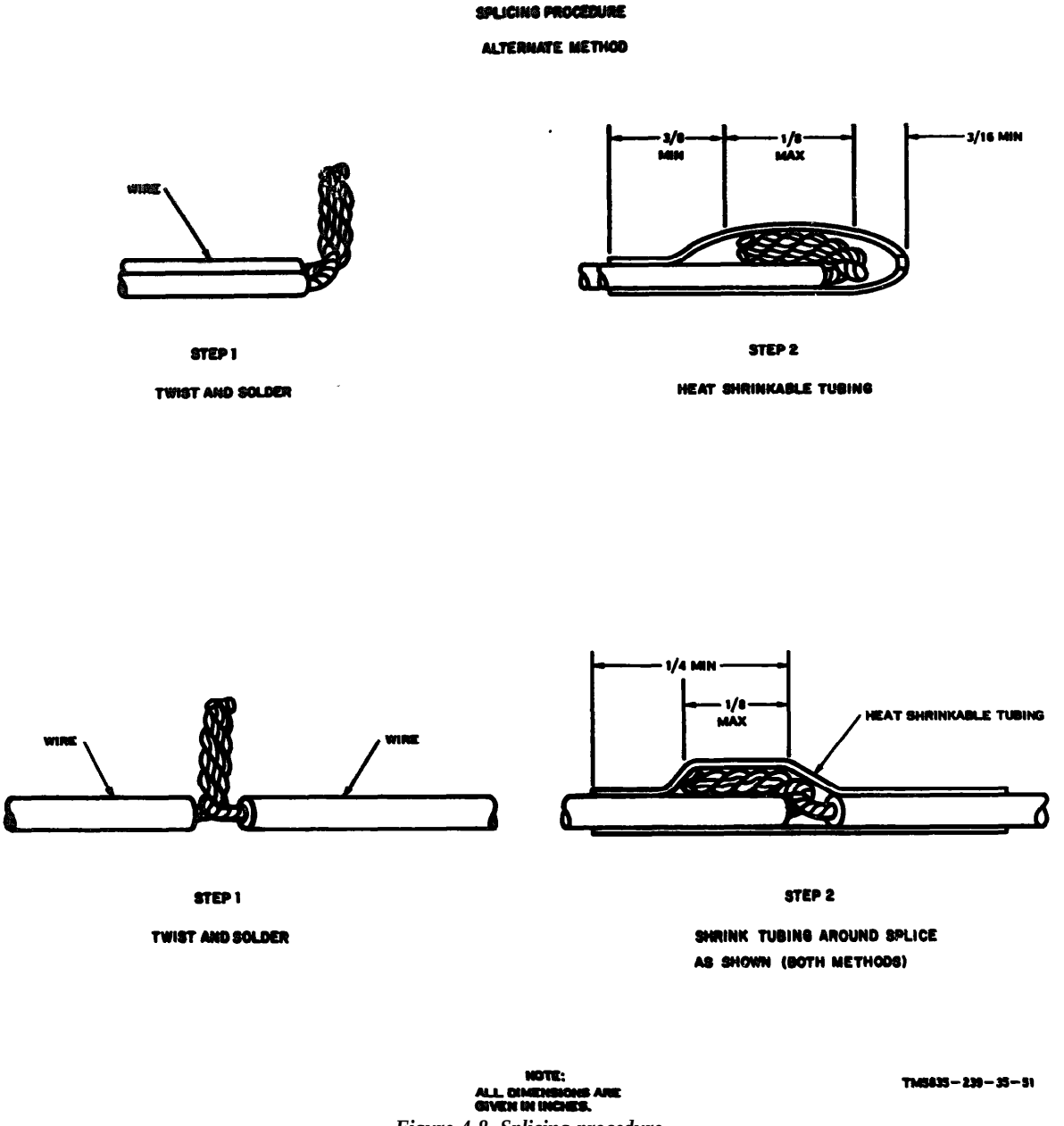


Figure 4-8. Splicing procedure.

Section V. PLAYBACK UNIT SUBASSEMBLY ADJUSTMENT, REPAIR, AND REMOVAL AND REPLACEMENT

4-14. Playback Unit Subassembly Adjustment

No adjustment is required on the playback unit subassemblies during general support maintenance.

4-15. Playback Unit Subassembly Repair

a. General. Repair authorized at general support maintenance consists of repairing circuit card assemblies removed at direct support mainte-

nance. The circuit card assembly component location and wiring diagrams (4–9 through 11) and overall wiring diagram (fig. 7–16) should aid in repairing the playback unit.

4-16. Removal and Replacement of Playback Unit Components

Removal and replacement of defective components on the circuit card assemblies removed at direct support maintenance are authorized at general support maintenance. Care should be taken when components are removed or replaced on the circuit card assemblies. When removing or replacing soldered components, a pencil-type iron with *a* 25-watt maximum capacity should be used. If the iron must be used with as power. use an isolating transformer between the iron and the ac power source. Do not use a soldering gun. When soldering transistor leads, solder quickly; wherever wiring permits, use a heat sink (such as a long-nose plier) between the solder joint and the transistor. Use approximately the same length lead and dress the transistor lead as used originally. Also, avoid making pin holes in the coating used on the circuit card assemblies. When pin holes are made, the pin holes should be sealed in accordance with instructions provided in paragraph 4-13a.

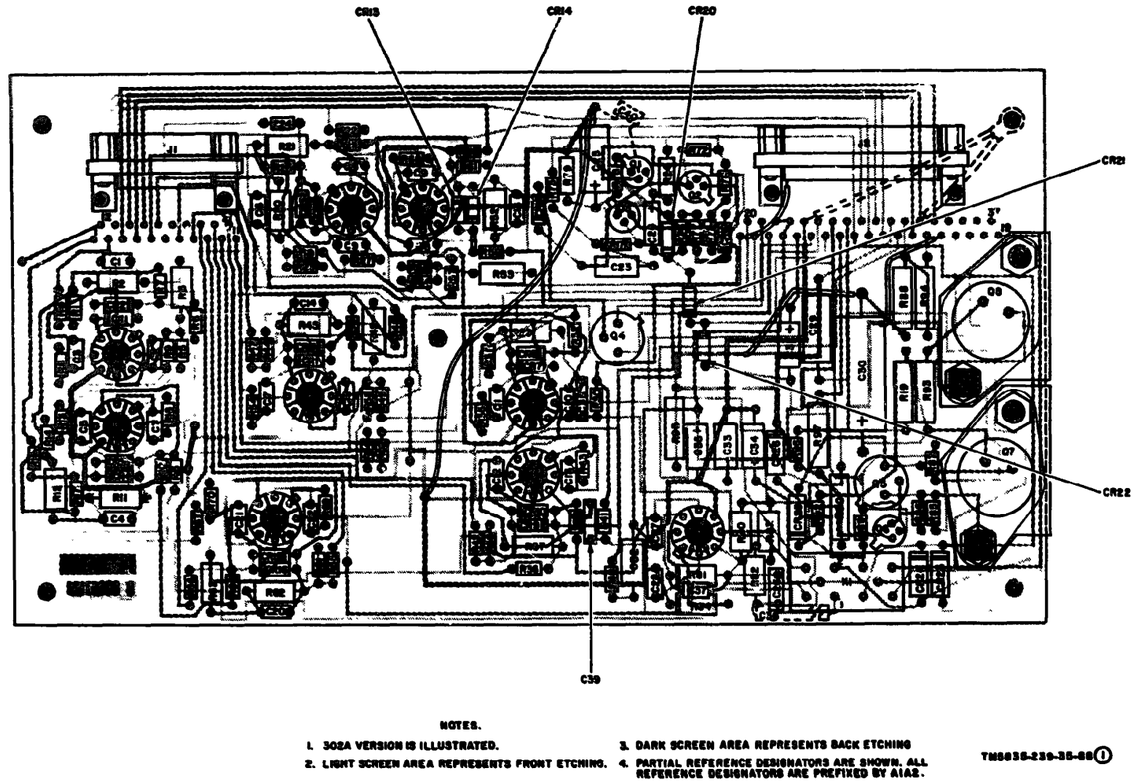
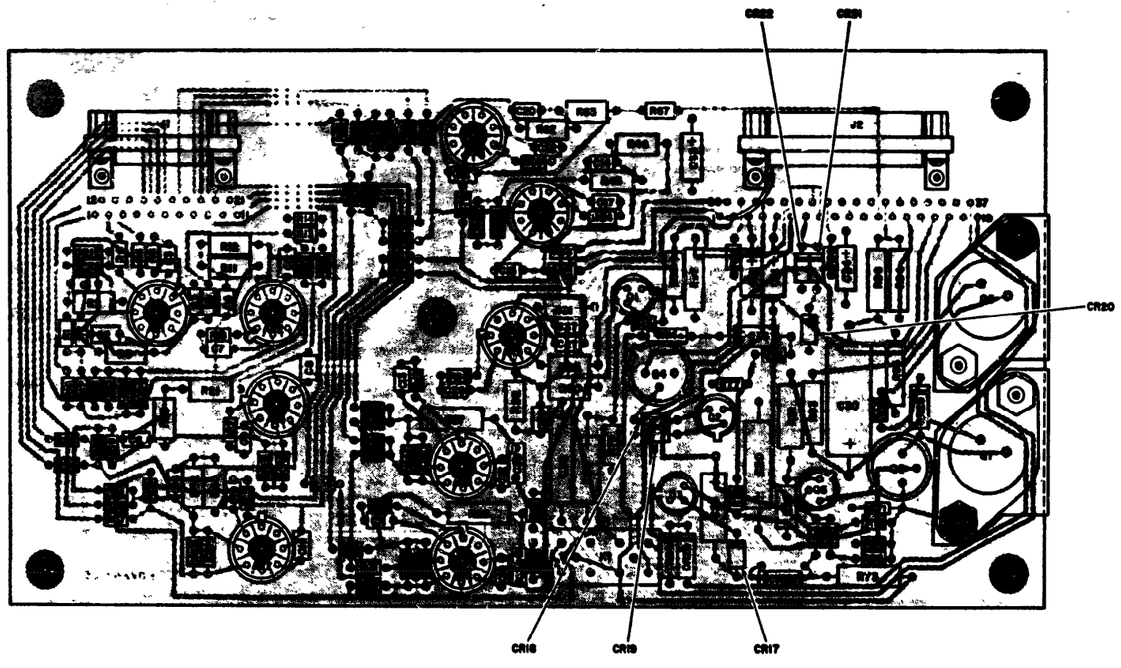


Figure 4-9. A1A2 playback amplifier circuit card assembly component location and wiring diagram (part 1 of 2).

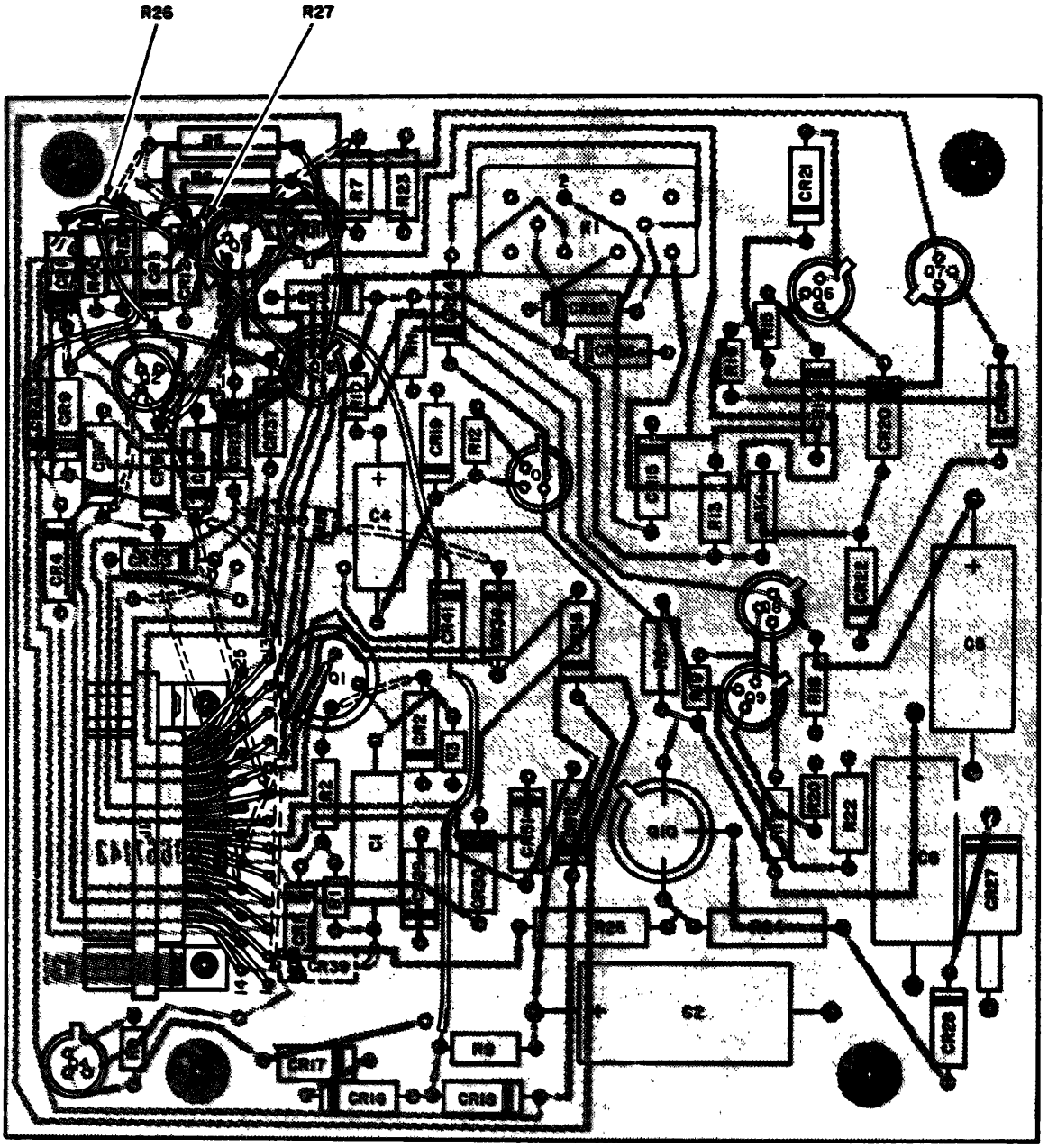


NOTES:

1. 3028 VERSION IS ILLUSTRATED.
2. LIGHT SCREEN AREA REPRESENTS FRONT ETCHING
3. DARK SCREEN AREA REPRESENTS BACK ETCHING.
4. PARTIAL REFERENCE DESIGNATORS ARE SHOWN. ALL REFERENCE DESIGNATORS ARE PREFIXED BY A1A2

TM5835-239-35-66 (2)

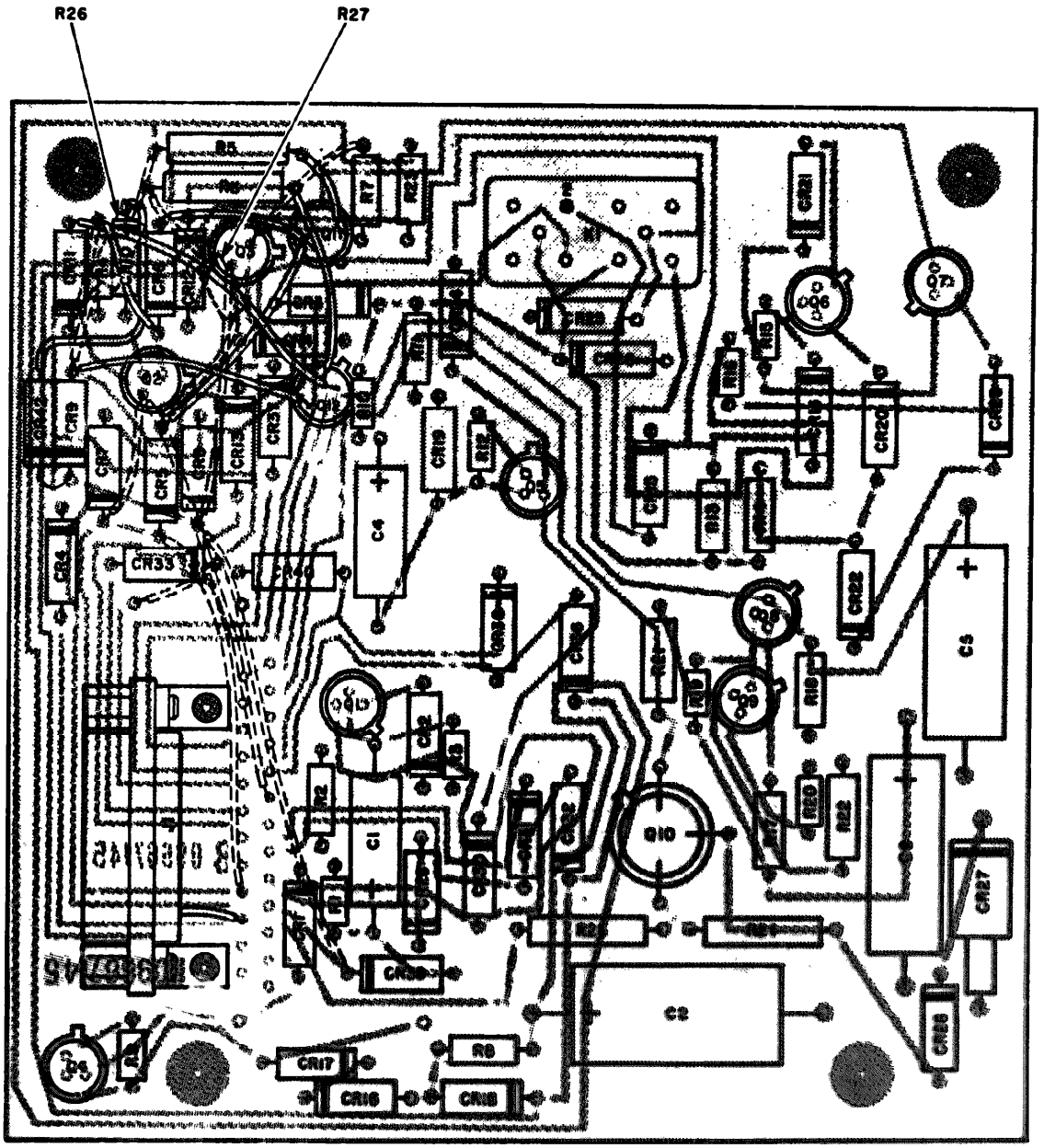
Figure 4-9. A1A2. playback amplifier circuit card assembly component location and wiring diagram (part 2 or 2).



NOTES:
1. 303A VERSION IS ILLUSTRATED.
2 LIGHT SCREEN AREA REPRESENTS FRONT ETCHING.
3. DARK SCREEN AREA REPRESENTS BACK ETCHING.
4. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN. ALL REFERENCE DESIGNATORS ARE PREFIXED BY A1A3.

TM5835-239-35-86 (1)

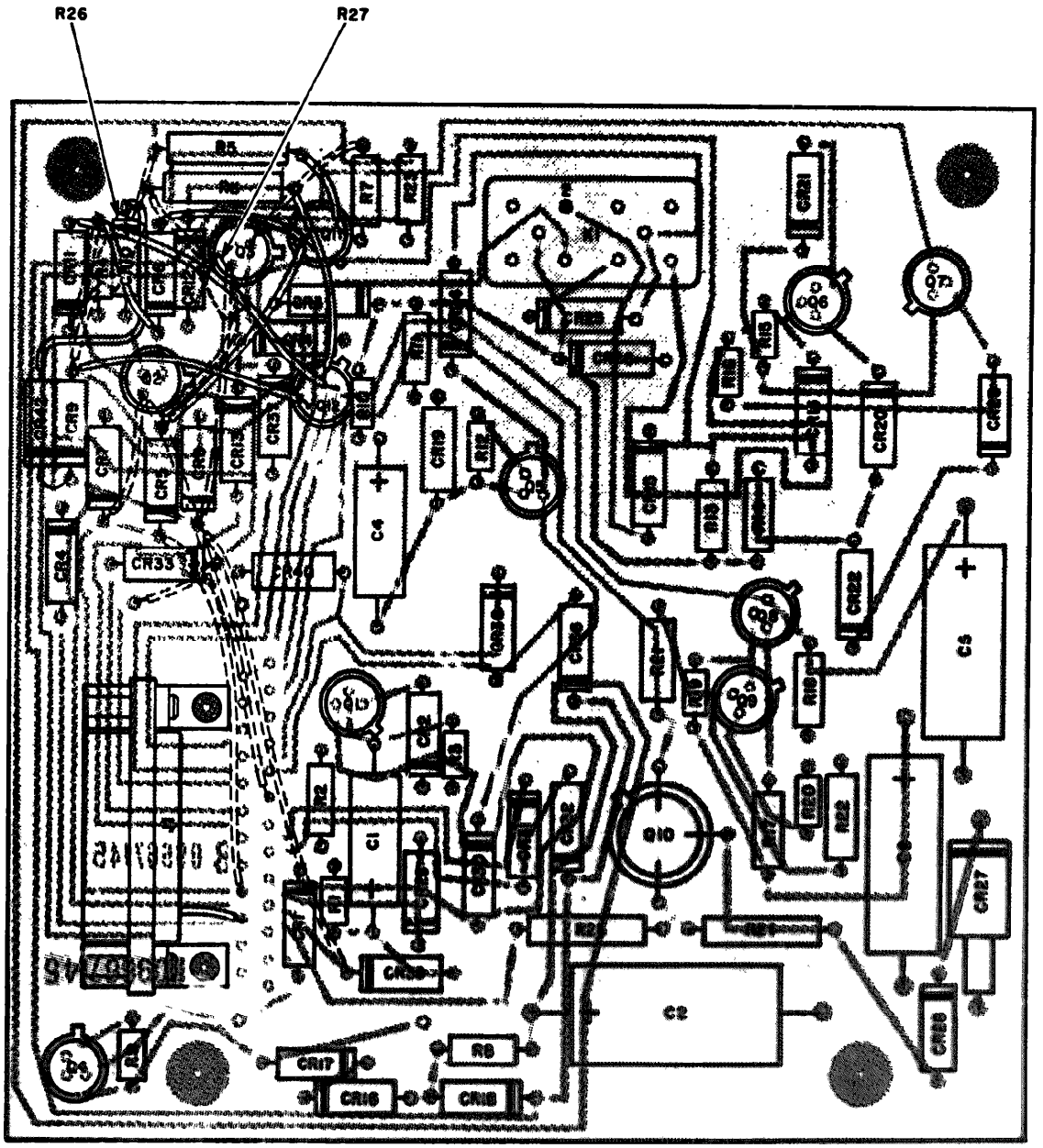
Figure 4-10. A1A3 control drive circuit card assembly component location and wiring diagram (part 1 of 2).



NOTES:
1. 303B VERSION IS ILLUSTRATED.
2. LIGHT SCREEN AREA REPRESENTS FRONT ETCHING.
3. DARK SCREEN AREA REPRESENTS BACK ETCHING.
4. PARTIAL REFERENCE DESIGNATORS ARE SHOWN. ALL REFERENCE DESIGNATORS ARE PREFIXED BY A1A3.

TM5835-239-35-06

Figure 4-10. A1A3 control drive circuit card assembly component location and wiring diagram (part 2 of 2).



NOTES:

1. 503B VERSION IS ILLUSTRATED.
2. LIGHT SCREEN AREA REPRESENTS FRONT ETCHING.
3. DARK SCREEN AREA REPRESENTS BACK ETCHING.
4. PARTIAL REFERENCE DESIGNATORS ARE SHOWN. ALL REFERENCE DESIGNATORS ARE PREFIXED BY A1A3.

TM5835-239-35-96 (P)

Figure 4-10. A1A3 control drive circuit card assembly component location and wiring diagram (part 2 of 2)

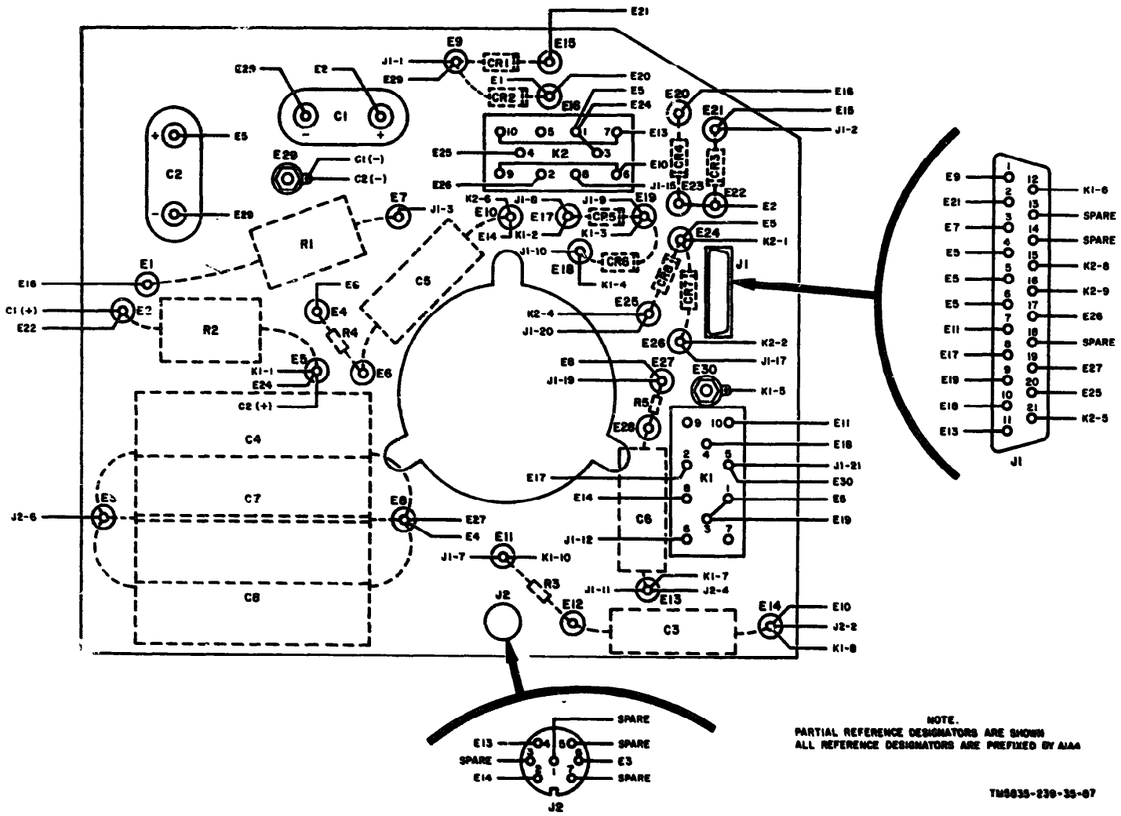


Figure 4-11. A1A4 electronic components assembly component location and wiring diagram.

SECTION VI. GENERAL SUPPORT CIPR TESTING PROCEDURE

4-17. General

This section contains instructions for testing the CIPR controller at the general support maintenance level. Testing is performed to ensure that the subassemblies repaired at general support can be operated properly prior to re-issue and to isolate troubles when repair is required. Procedural instructions are to be accomplished in the sequence in which they are presented. Troubleshooting procedures (para 4-6) are to be used to correct any operational failures discovered during the test outlined in this section.

4-18. CIPR Controller Test

A CIPR controller in good working condition shall be used when testing the repaired card assembly or when isolating trouble to a circuit within a defective circuit card assembly. The test at general support shall consist of removing a known good circuit card assembly and replacing it with the card assembly to be tested. Before removing or replacing the circuit card assembly, insure that power to the CIPR controller is disconnected. After replacing the card assembly with the card to be tested, perform the test outlined in paragraph 3-16.

Section VII. GENERAL SUPPORT PLAYBACK UNIT TESTING PROCEDURE

4-19. *General*

This section contains instructions for fabricating a test tape and the use of the test tape to checkout and maintain the playback unit at general support maintenance. Test procedures provided in this section can be used to ensure that the subassemblies can be operated properly prior to re-issue and to isolate troubles when repair is required. The procedural instructions are to be accomplished in the sequence in which they are presented. Troubleshooting procedures (para 4-8) are to be used to correct operational failures discovered during the test.

4-20. Playback Unit Operational Test

a. Equipment and Materials. Equipment and materials required to make the test tape and maintain the playback unit at general support maintenance are listed in paragraph 4–2.

b. Making Test Tape. The procedures outlined in this paragraph (4–20*b*(1) and 4–20*b* (2)) provide a means of fabricating a test tape which can be used to checkout the playback unit at general support maintenance.

(1) *Preliminary procedure.* The procedure outlined in this paragraph should be accomplished prior to making the test tape.

(*a*) Obtain an unrecorded CIPR magazine from storage.

(*b*) Connect playback unit to 115-volt, 60-hertz power source.

(*c*) Insure that the playback unit STOP indicator is not illuminated.

(*d*) Install CIPR magazine on the playback unit.

(*e*) Set playback unit tape speed control lever to NORMAL.

(*f*) Set playback unit CHANNEL SELECTOR switch to ALL.

(*g*) Make sure that the playback unit POWER CKT BRKR is closed.

(*h*) Set playback unit POWER ON/OFF switch to ON. The STOP indicator shall light.

(*i*) Press and release playback unit PLAY switch-indicator. The STOP indicator shall go out, PLAY indicator shall light, and tape shall move in the counterclockwise direction.

(*j*) Rotate playback unit VOLUME control to INCR and allow the playback unit to operate in the play mode for approximately one minute, then press and release the STOP switch-indicator. When the STOP indicator is pressed and released, the STOP indicator shall light, PLAY indicator shall go out, and tape shall stop.

(*k*) Set playback unit tape speed control lever to FAST.

(*l*) Press and release playback unit REWIND switch-indicator. The STOP indicator shall go out, REWIND indicator shall light, and the tape shall begin to rewind to the start position. When the tape is rewound to the start position, the REWIND indicator shall go out, STOP indicator shall light, and the tape shall stop.

(*m*) Set playback unit tape speed control lever to NEUT.

(*n*) Set playback unit POWER ON/OFF switch to OFF. The STOP indicator shall go out.

(*o*) Disconnect playback unit from the 115-volt, 60-hertz power source.

(*p*) Remove the CIPR magazine from the playback unit.

(q) Move the CIPR magazine to an ares sufficiently shielded from the playback unit.

(r) Connect the tape eraser to 115-volt, 60-hertz power source.

(s) Place the flat, magnetic-field surface on top of the CIPR magazine cover.

(t) Press and hold the tape eraser power switch and slowly move the eraser in a circular motion while maintaining contact between the flat surface of the tape eraser and the CIPR magazine cover.

(u) Continue to move the tape eraser at approximately two seconds per revolution for approximately 15 seconds.

(v) Gradually increase the diameter of the circular motion and simultaneously lift the eraser away from the CIPR magazine. When the tape eraser is approximately three feet away, release the eraser power switch.

(w) Disconnect the tape eraser from the 115-volt, 60-hertz power source.

(2) *Test tape fabrication.* The following procedure provides instructions for making the test tape required for checkout of the playback unit at general support maintenance. Figure 4-12 illustrates equipment setup for fabricating the test tape.

NOTE

Understand each of the following steps before attempting to make the test tape. Time between each step must be kept to a minimum,

(a) Obtain a known good CIPR test set.

(b) Obtain a known good CIPR controller.

(c) Insure that CIPR test set RECORD COMMAND and OUTPUT SELECT switches are set to OFF.

(d) Connect CIPR test set to positive 28-volt power source.

(e) Observe that CIPR test set POWER ON indicator is not illuminated. If POWER ON indicator is illuminated, press and release POWER ON switch-indicator until POWER ON indicator goes out.

(f) Install the demagnetized (para 4-30b (1)) CIPR magazine on the CIPR controller.

(g) Connect CIPR test set test cable connector A1W1P1 to CIPR controller A1A4J2 connector.

(h) Connect oscillator to CIPR test set INPUT MONITOR OSCILLATOR connector.

(i) Connect a counter and a VTVM to the oscillator output to monitor the oscillator output.

(j) Turn on power switches on the oscillator, counter, and VTVM.

(k) Allow sufficient warm-up time for the oscillator, counter, and VTVM before proceeding to the next step.

(l) Adjust the oscillator frequency control for 1000 ± 1 hertz.

(m) Adjust the oscillator attenuator control for 1-volt rms.

NOTE

Insure that VTVM indicates l-volt rms whenever the oscillator frequency is changed.

(n) Press and release CIPR test set POWER ON switch-indicator. The POWER ON indicator shall light.

(o) Observe CIPR test set TAPE END SIMULATION INTERNAL/EXTERNAL indicator. The EXTERNAL portion of the indicator shall be illuminated. If the INTERNAL portion is illuminated, press and release TAPE END SIMULATION INTERNAL/EXTERNAL switch-indicator until EXTERNAL portion is illuminated.

(p) Press and release CIPR test set TAPE END SIMULATION No. 1 switch-indicator. The NO. 1 indicator shall light momentarily while TAPE END SIMULATION NO 1 switch-indicator is pressed.

(q) Set CIPR test set RECORD COMMAND switch to PILOT and record 1000-hertz signal for two minutes, then set RECORD COMMAND switch to OFF. Observe tape movement during recording. The tape shall move in the counterclockwise direction.

(r) Ground CIPR test set INPUT MONITOR PILOT/ALTN and INPUT MONITOR SP test jacks.

(s) Adjust oscillator frequency control for 300 ± 1 hertz.

(t) Set CIPR test set RECORD COMMAND switch to VWS and record 300-hertz signal for one minute, then set RECORD COMMAND switch to OFF.

(u) Remove ground from CIPR test set INPUT MONITOR PILOT ALTN test jack and ground INPUT MONITOR VWS test jack.

(v) Adjust oscillator frequency control for 1000 ± 1 hertz.

(w) Set CIPR test set RECORD COMMAND switch to PILOT and record 1000-hertz signal for one minute, then set RECORD COMMAND switch to OFF.

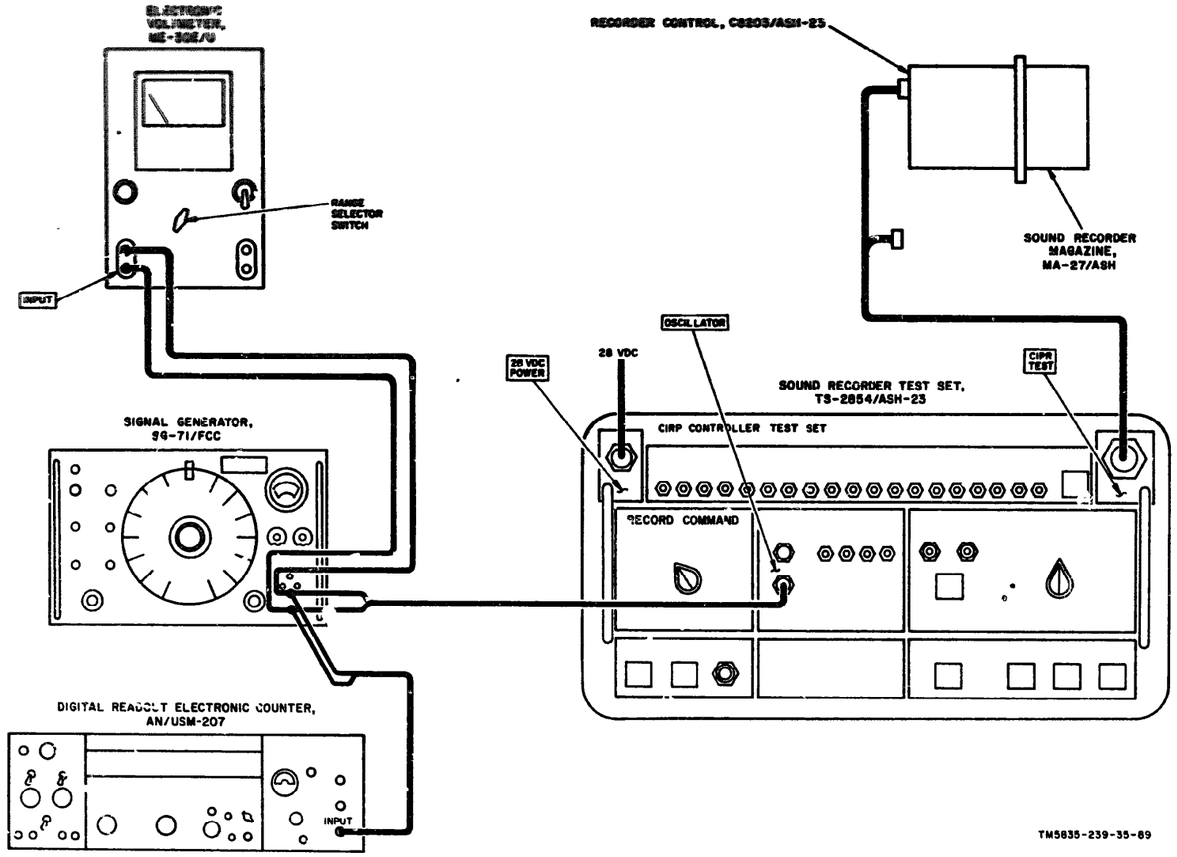


Figure 4-12. Setup for fabricating test tape.

(*x*) Remove ground from CIPR test set INPUT MONITOR SP test jack and ground INPUT MONITOR PILOT/ALTN test jack.

(*y*) Adjust oscillator frequency control for 3000 ±1 hertz.

(*z*) Set CIPR test set RECORD COMMAND switch to SPARE and record 3000-hertz signal for one minute, then set RECORD COMMAND switch to OFF.

(*aa*) Press and release CIPR test set POWER ON switch-indicator. The POWER ON indicator shall go out.

(*ab*) Remove ground from CIPR test set INPUT MONITOR PILOT/ALTN and INPUT MONITOR VWS test jack.

(*ac*) Disconnect oscillator input to the CIPR test set.

(*ad*) Press and release CIPR test set POWER ON switch-indicator. The POWER ON indicator shall light.

(*ae*) Set CIPR test set RECORD COMMAND switch PILOT and allow CIPR to operate in the record mode for 20 seconds, then set RECORD COMMAND switch to OFF.

(af) With CIPR test set RECORD COMMAND switch positioned at OFF, record timing pulses for 20 minutes.

(ag) After recording timing, pulses for 20 minutes, set CIPR test set COMMAND RECORD switch to PILOT and allow CIPR to operate in the record mode for 20 seconds, then set RECORD COMMAND switch to OFF.

(ah) Press and release CIPR test set POWER ON switch-indicator. The POWER ON indicator shall go out.

(ai) Reconnect oscillator input to the CIPR test set.

(aj) Press and release CIPR test set POWER ON switch-indicator. The POWER ON indicator *shall light.*

(ak) Adjust oscillator frequency control for 300 ± 1 hertz.

(*al*) Set CIPR test set RECORD COMMAND switch to PILOT and record 300-hertz signal for one minute, then set RECORD COMMAND switch to OFF.

(*am*) Adjust oscillator frequency control for 1000 ±1 hertz.

(*an*) Set CIPR test set RECORD COMMAND switch to PILOT and record 1000-hertz signal for one minute, then set RECORD COMMAND switch to OFF.

(*ao*) Adjust oscillator frequency control for 3000 ±1 hertz.

(*ap*) Set CIPR test set RECORD COMMAND switch to PILOT and record 3000-hertz signal for one minu'a, then set RECORD COMMAND switch to OFF.

(*aq*) Press and release CIPR test set POWER ON switch-indicator. The POWER ON indicator shall go out.

(*ar*) Disconnect oscillator input to the CIPR test set.

(*as*) Press and release CIPR test set POWER ON switch-indicator. The POWER ON indicator shall light.

(at) Set CIPR test set RECORD COMMAND switch to PILOT and allow CIPR to operate in the record mode for 20 seconds, then set RECORD COMMAND switch to OFF.

(au) With CIPR test set RECORD COMMAND switch positioned at OFF, record timing pulses for ten minutes.

(av) After reading timing pulses for ten minutes, set CIPR test set RECORD COMMAND switch to PILOT and allow CIPR to operate in the record mode for 20 seconds, then set RECORD COMMAND switch to OFF.

(aw) Press and release CIPR test set POWER ON switch-indicator. The POWER ON indicator shall go out.

(ax) Reconnect oscillator input to the CIPR text set.

(ay) Press and release CIPR test set POWER ON switch-indicator. The POWER ON indicator shall light.

(az) Adjust oscillator frequency control for 1000 ± hertz.

(ba) Set CIPR test set RECORD COMMAND switch to PILOT and record 100-hertz signal for two minutes, then set RECORD COMMAND switch to OFF.

(bb) Press and release CIPR test set POWER ON switch-indicator. The POWER ON indicator shall go out.

(bc) Disconnect oscillator input to the CIPR test set

(bd) Press and release CIPR test set POWER ON switch-indicator. The POWER ON indicator shall light.

(be) Set CIPR test set RECORD COMMAND switch to PILOT and allow CIPR to operate in the record mode for six minutes, then set RECORD COMMAND switch to OFF.

(*bf*) Press and release CIPR test set TAPE END SIMULATION NO. 2 switch-indicator. The NO. 2 indicator shall light momentarily while TAPE END SIMULATION NO. 2 switch-indicator is pressed.

(*bg*) Set CIPR test set RECORD COMMAND switch to PILOT and allow CIPR to operate in the record mode for one minute, then set RECORD COMMAND switch to OFF. Observe tape movement during recording. The tape shall move in the clockwise direction.

(*bh*) Press and release CIPR test set POWER ON switch-indicator. The POWER ON indicator shall go out.

(*bi*) Reconnect oscillator input to the CIPR test set.

(bj) Adjust oscillator frequency control for 1000 ± 1 hertz.

(bk) Press and release CIPR test set POWER ON switch-indicator. The POWER ON indicator shall light.

(bl) Set CIPR test set RECORD COMMAND switch to PILOT and record 1000-hertz signal for two minutes, then set RECORD COMMAND switch to OFF. Observe tape movement during recording. The tape shall move in the clockwise direction.

(bm) Repeat (r) through (bc).

(bn) Disconnect CIPR controller from CIPR test set.

(bo) Turn off operating power to the oscillator, counter, and VTVM.

(bp) Disconnect the counter and VTVM from the oscillator.

(bq) Disconnect CIPR magazine from CIPR controller and identify.

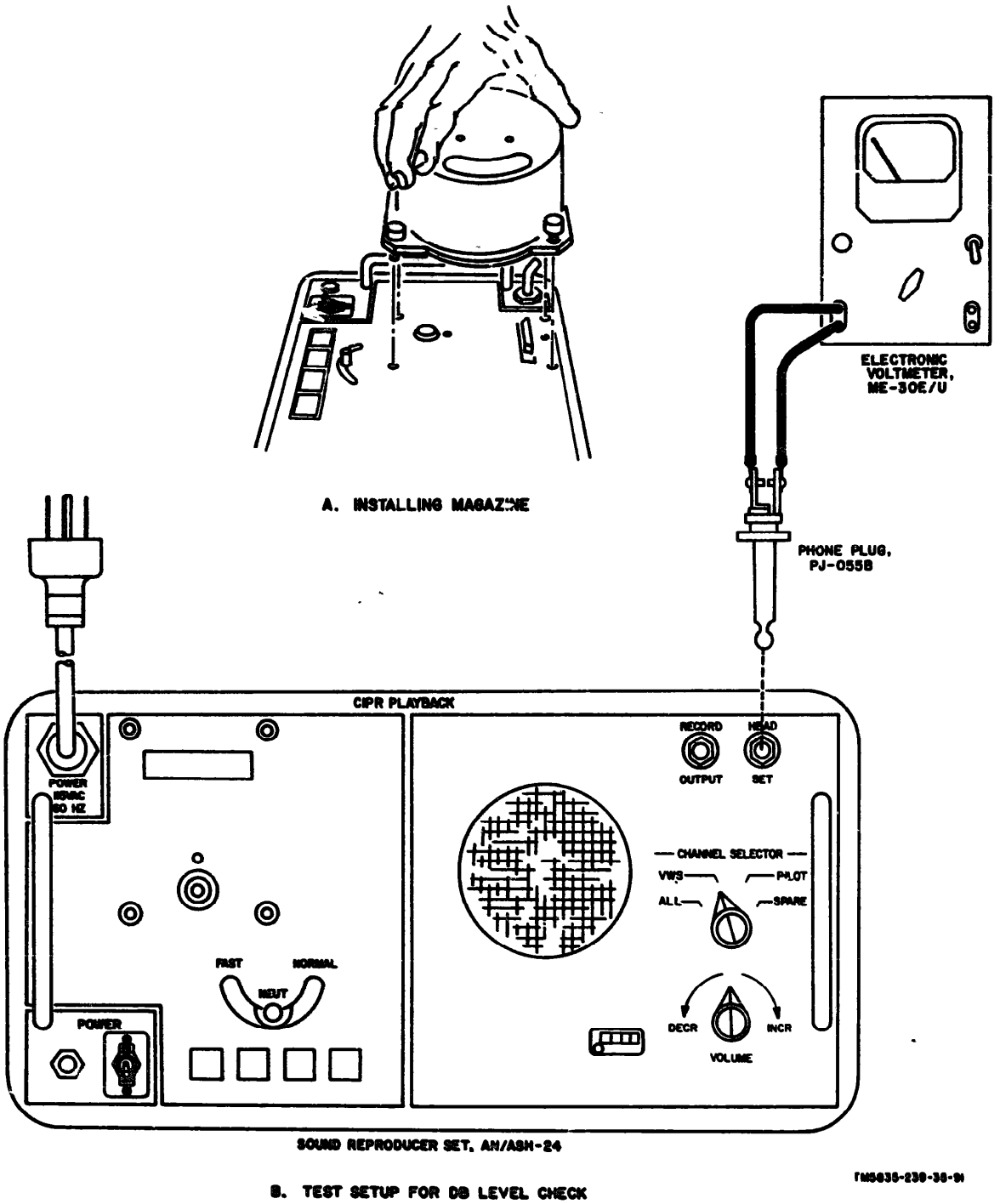


Figure 4-13. Setup for testing playback unit.

c. *Operational Test Using Fabricated Test Tape.* The test tape fabricated in paragraph 4–20*b* must be used to perform the following test. Figure 4–13 illustrates setup for testing the playbook unit.

Step No.	Test equipment	Control settings	Equipment under test	Test procedure	Performance standard
1	Test tape magazine		Sound Reproducer Set AN/ASH–24 (playback unit)	*a.* Obtain the test tape fabricated in paragraph 4–20*b*.	*a.* N/A
				b. Connect playback unit to 115-volt, 60-hertz power source.	*b.* N/A
				c. Observe playback unit POWER ON/OFF switch.	*c.* POWER ON/OFF switch shall be set to OFF.
				d. Install test tape magazine on the playback unit.	*d.* N/A
				e. Set playback unit tape speed control lever to NORMAL.	*e.* N/A
				f. Set playback unit CHANNEL SELECTOR switch to ALL.	*f.* N/A
				g. Insure that playback unit POWER CKT BRKR is energized (pushed in).	*g.* N/A
				h. Set playback unit POWER ON/OFF switch to ON.	*h.* STOP indicator shall light.
				i. Press and release playback unit PLAY switch-indicator.	*i.* STOP indicator shall go out, PLAY indicator shall light, and tape shall begin to move.
				j. Allow playback unit to operate in the play mode for approximately one minute, then press and release playback unit STOP switch-indicator.	*j.* When STOP switch-indicator is released, PLAY indicator shall go out, STOP indicator shall light, and the tape shall stop.
				k. Set playback unit lever to FAST.	*k.* N/A
				l. Press and release playback unit REWIND switch-indicator.	*l.* STOP indicator shall go out, REWIND indicator shall light, and the tape shall begin to rewind. When the tape is completely rewound, REWIND indicator shall light, and the tape shall stop.
				m. Set playback unit tape speed control lever to NORMAL.	*m.* N/A
				n. Reset playback unit FLT TIME counter.	*n.* FLT TIME counter shall indicate 0000.
				o. Insure that CHANNEL SELECTOR switch is set to ALL, then press and release playback unit PLAY switch indicator.	*o.* STOP indicator shall go out, PLAY indicator shall light, and a 1000-hertz tone shall be monitored at the speaker.
				p. Adjust playback unit VOLUME control to a comfortable listening level.	*p.* The 1000-hertz tone shall be monitored for approximately two minutes.

Step No.	Test equipment	Control settings	Equipment under test	Test procedure	Performance standard
				q. After the 1000-hertz tone ceases, listen for a 300-hertz tone.	q. When the 300-hertz tone is monitored, proceed to the next procedure.
				r. With the 300-hertz tone present, rotate playback unit CHANNEL SELECT switch to VWS, PILOT, and SPARE.	r. The 300-hertz tone shall be monitored when the CHANNEL SELECTOR switch is set to ALL and VWS, but shall not be monitored when the switch is positioned to PILOT and SPARE.
				s. Return playback unit CHANNEL SELECTOR switch to ALL and listen for a 1000-hertz tone.	s. When the 1000-hertz tone is monitored, proceed to the next procedure.
				t. With the 1000-hertz tone present, rotate playback unit CHANNEL SELECTOR switch to VWS, PILOT, and SPARE.	t. The 1000-hertz tone shall be monitored when the CHANNEL SELECTOR switch is set to ALL and PILOT, but shall not be monitored when the switch is positioned to VWS and SPARE.
				u. Return playback unit CHANNEL SELECTOR switch to ALL and listen for a 3000-hertz tone.	u. When the 3000-hertz tone is monitored, proceed to the next procedure.
				v. With the 3000-hertz tone present, rotate playback unit CHANNEL SELECTOR switch to VWS, PILOT, and SPARE.	v. The 3000-hertz tone shall be monitored when the CHANNEL SELECTOR switch is set to ALL and SPARE, but shall not be monitored when the switch is positioned to VWS and PILOT.
				w. Return playback unit CHANNEL SELECTOR switch to ALL and listen for the 3000-hertz tone to cease.	w. When the 3000-hertz tone ceases, proceed to the next procedure.
				x. Reset playback unit FLT TIME counter.	x. FLT TIME counter shall indicate 0000.
				y. Within 20 second, observe a burst of timing pulses on the FLT TIME counter.	y. FLT TIME counter shall indicate 20 ± 1 at the end of the burst of timing pulses.
				z. With playback unit CHANNEL SELECTOR switch set to ALL, listen for a 300-hertz tone.	z. When the 300-hertz tone is monitored, proceed to the next procedure.
				aa. With the 300-hertz tone present, rotate playback unit CHANNEL SELECTOR switch to VWS, PILOT, and SPARE.	aa. The 300-hertz tone shall be monitored at each switch position.
				ab. Return playback unit CHANNEL SELECTOR switch to ALL and listen for a 1000-hertz tone.	ab. When the 1000-hertz tone is monitored, proceed to the next procedure.

Step No.	Test equipment	Control settings	Equipment under test	Test procedure	Performance standard
				ac. With the 1000-hertz tone present, rotate playback unit CHANNEL SELECTOR switch to VWS, PILOT, and SPARE.	ac. The 1000-hertz tone shall be monitored at each switch position.
				ad. Return playback unit CHANNEL SELECTOR switch to ALL and listen for a 3000-hertz tone.	ad. When the 3000-hertz tone is monitored, proceed to the next procedure.
				ae. With the 3000-hertz tone present, rotate playback unit CHANNEL SELECTOR switch to VWS, PILOT, and SPARE.	ae. The 3000-hertz tone shall be monitored at each switch position.
				af. Return playback unit CHANNEL SELECTOR switch to ALL and listen for the 3000-hertz tone to cease.	af. When the 3000-hertz tone ceases, proceed to the next procedure.
				ag. Reset playback unit FLT TIME counter.	ag. FLT TIME counter shall indicate 0000.
				ah. With 20 seconds, observe a burst of timing pulses on the FLT TIME counter.	ah. FLT TIME counter shall indicate 10 ± 1 at the end of the burst of timing pulses.
				ai. Press and release playback unit STOP switch-indicator.	ai. PLAY indicator shall go out, STOP indicator shall light, and the tape shall stop.
				aj. Insert phone plug (PJ–056B) into playback unit HEADSET connector and connect a 100K-ohm load resistor across the phone plug output.	aj. N/A
	VTVM: Adjust to measure 1.5-volt rms.			ak. Connect the VTVM across the load resistor.	ak. N/A
				al. Rotate playback unit CHANNEL SELECTOR switch to VWS.	al. N/A
				am. Press and release playback unit PLAY switch-indicator.	am. Within 20 seconds, a 1000-hertz tone shall be played back. When the 1000-hertz tone is present, proceed to the next procedure. Note: Tone cannot be heard, but its presence can be verified by an indication on the VTVM.
				an. While the 1000-hertz tone is being played back, adjust playback unit VOLUME control for 1.5-volt rms indication.	an. VTVM shall indicate 1.5-volt rms.
				ao. Observe VTVM while the 1000-hertz tone is being played back (approximately two minutes).	ao. When the tone disappears, the VTVM shall indicate less than 48 millivolts (–30 db).

Step No.	Test equipment	Control settings	Equipment under test	Test procedure	Performance standard
				ap. When the VTVM indicates less than 48 millivolts, press and release playback unit STOP switch-indicator.	ap. When the STOP switch-indicator is released, PLAY indicator is released, PLAY indicator shall go out, STOP indicator shall light, and the tape shall stop.
				aq. Remove phone plug (PJ–055B) and load resistor from the playback unit HEADSET connector.	aq. N/A
				ar. Press and release playback unit REVERSE switch-indicator.	ar. STOP indicator shall go out, REVERSE indicator shall light, and within a few seconds, a 1000-hertz tone shall be monitored. When the tone is present, proceed to the next procedure.
				as. When the 1000-hertz tone ceases, press and release playback unit STOP indicator.	as. When the stop switch-indicator is released, REVERSE indicator shall go out, STOP indicator light and the tape shall stop.
				at. Rotate playback unit CHANNEL SELECTOR switch to PILOT.	at. N/A
				au. Insert phone plug with 100K-ohm load resistor connected into playback unit HEADSET connector.	au. N/A
				av. Insure that VTVM is connected across the load resistor.	av. N/A
				aw. Repeat test procedures am through as.	aw. Same indication should be monitored.
				ax. Rotate playback unit CHANNEL SELECTOR switch to SPARE.	ax. N/A
				ay. Insert phone plug with 100K-ohm load resistor connected into playback unit HEADSET connector.	ay. N/A
				az. Insure that VTVM is connected across the load resistor.	az. N/A
				ba. Repeat test procedures am through aq.	ba. Same indication should be monitored.
				bb. Set playback unit tape speed control lever to FAST.	bb. N/A
				bc. Press and release playback unit PLAY switch-indicator.	bc. STOP indicator shall go out, PLAY indicator shall light, and the tape shall begin to move in the counterclockwise direction.
				bd. Observe tape movement.	bd. When playback of the first half of the tape is completed, the play-

Step No.	Test equipment	Control settings	Equipment under test	Test procedure	Performance standard
					back unit will automatically reverse direction and the tape will begin to move in the clockwise direction.
				be. While the tape is moving in the clockwise direction, listen for a 1000-hertz tone. When the 1000-hertz tone is monitored, press and release playback unit STOP switch-indicator.	*be.* When the STOP switch-indicator is released, PLAY indicator shall go out, STOP indicator shall light, and the tape shall stop.
				bf. Set playback unit tape speed control lever to NORMAL.	*bf.* N/A
				bg. Press and release playback unit REVERSE switch-indicator. When the 1000-hertz tone ceases, press and release playback unit STOP switch-indicator.	*bg.* When the STOP switch-indicator is released, REVERSE indicator shall go out, STOP indicator shall light, and tape shall stop.
				bh. Repeat test procedures *e* through *bb.*	*bh.* Same indication should be monitored.
				bi. Press and release playback unit REWIND switch-indicator.	*bi.* STOP indicator shall go out, REWIND indicator shall light, and the shall begin to rewind. When the tape is completely rewound, the tape will automatically stop and REWIND indicator will go out and STOP indicator will light.
				bj. Set playback unit POWER ON/OFF switch to OFF.	*bj.* STOP indicator shall go out.
				bk. Remove test tape magazine from the playback unit.	*bk.* N/A
				bl. Disconnect playback unit from 115-volt, 60-hertz power source.	*bl.* N/A
				bm. Return test tape magazine to storage area.	*bm.* N/A
				bn. Deenergize test equipment and disconnect from the playback unit.	*bn.* N/A

CHAPTER 5

DEPOT MAINTENANCE

SECTION I. GENERAL

5-1. Scope of Depot Maintenance

This chapter contains maintenance instructions allocated for the A2 sound recorder set magazine (CIPR magazine) and the AlA7 variable speed tape drive transmission assembly (tape drive transmission assembly) at depot maintenance. Instructions are provided for isolating troubles to a removal part, disassembly and reassembly of the major assemblies, and testing the CIPR magazine and variable speed tape drive transmission assembly to insure that they can be operated within specification. Troubleshooting, repair, diasssembly and reassembly, and test procedure for the CIPR magazine are provided in sections II, IV, and VI. Troubleshooting, repair, disassembly and reassembly, and test procedure for the variable speed tape drive transmission assembly are provided in sections III, V, and VII.

5-2. Tools, Test Equipment, and Materials Required

a. In addition to tools and test equipment allocated for organizational, direct support maintenance, the following tools and test equipment are required to maintain the CIPR magazine at depot maintenance.

Test equipment	*Common name*	*Federal stock number*
Control Recorder C8203/ASH–23	CIPR controller	5835-144-7310
Flutter Indicator, ID–851	Flutter indicator	6760-776-6979
Spectrum Analyzer, TS–723	Spectrum analyzer	6625-668-9418
Bulk Tape Eraser, MF–2/U	Tape eraser	5835-543-1910
Stopwatch	Stopwatch	
Phone Plug, PJ–055B	Phone jack	5935-192-4760
Resistor, 620-ohms, 1/2-watt	Resistor	5905-279-1761
Resistor, 100-K ohms, 1/2-watt	Resistor	5905-190-8889

b. No additional tools or test equipment other than tools and test equipment allocated for organizational, direct support maintenance, and general support maintenance are required to maintain the tape drive transmission assembly at depot maintenance.

Section II. CIPR MAGAZINE TROUBLESHOOTING

5-3. General

Troubleshooting the CIPR magazine is authorized only at depot maintenance level. The defective CIPR magazine is isolated at the organizational maintenance level.

5-4. Organization of CIPR Magazine Troubleshooting Chart

a. General. The first step in servicing a defective CIPR magazine is to localize the fault to a particular circuit in the magazine assembly. After localizing the fault to a particular circuit, further troubleshooting shall be performed to isolate the trouble to a replaceable part.

b. Localization. General information which can aid maintenance personnel in isolating troubles in the CIPR magazine are listed below. Also, the following information may reduce unnecessary work in isolating the trouble.

(1) *Visual Inspection.* Inspect the magazine for any abnormal indication.

(2) *Operational Test.* Operational test usually indicates the general location of the trouble.

In many instances, the test will aid in determining the nature of the trouble. Operational test to determine if the magazine can be operated within specification is outlined in paragraph 5–18.

(3) *Troubleshooting Chart.* Troubleshooting chart (para 5–5) lists symptom of common troubles, probable cause, and their corrective actions. This should be used as an aid when troubleshooting the CIPR magazine.

5-5. CIPR Magazine Troubleshooting Chart

a. General. The CIPR magazine troubleshooting chart should be used in conjunction with testing (para 5–18) when performance standards are not met. When more than one problem exists for a failure, procedures for isolating the failure are listed in the chart. Replacement of defective part should be accomplished in accordance with instructions provided in paragraph 5–11.

b. CIPR Magazine Troubleshooting Chart.

Item	Symptom	Probable cause	Corrective action
1	Abnormal tape running time.	a. Incorrect tape length.	a. Replace tape.
		b. Faulty mechanical part and/or fitting.	b. Replace defective part and/or correct fitting.
2	START/END indicator does not transfer.	Faulty mechanical part or fitting in upper reel or indicating disc assembly.	Replace defective part and/or correct fitting.
3	Clear tape guide material erased.	Guide is cinched down too tight on the upper reel structure.	Replace and/or loosen tape guide.
4	Tape moves in only one direction.	Faulty yoke assembly.	Repair yoke assembly as required.
5	Tape will not start, stop, or change direction automatically.	Faulty sense switch.	Replace defective sense switch.
6	Abnormal readings from A head.	Faulty A head.	Replace defective A head.
7	Abnormal readings from B head.	Faulty B head.	Replace defective B head.
8	Excessive wow and/or flutter.	a. Improper tape installation.	a. Check installation. If not properly installed, install correctly. If installed correctly and trouble persists, proceed to the next step.
		b. Faulty part and/or fitting in main drive shaft assembly.	b. Replace defective part and/or correct fitting.

Section III. TAPE DRIVE TRANSMISSION ASSEMBLY TROUBLESHOOTING

5-6. General

Troubleshooting of the tape drive transmission assembly is authorized only at depot maintenance level. The defective tape drive transmission assembly is isolated at the direct support maintenance level.

5-7. Organization of Tape Drive Transmission Troubleshooting Chart

a. General. The first step in servicing a defective tape drive transmission assembly is to localize the fault to a particular area within the assembly. After localizing the fault to a particular area, further troubleshooting shall be performed to isolate the trouble to a replaceable part.

b. Localization. General information which can aid maintenance personnel in isolating troubles in the tape drive transmission assembly are listed below. Also, the following information may reduce unnecessary work in isolating the trouble.

(1) *Visual Inspection.* Inspect the tape drive transmission assembly for any abnormal indication.

(2) *Operational Test.* In many instances, the test will aid in determining the nature of the trouble. Operational test to determine if the tape drive transmission can be operated within specification is outlined in paragraph 5–19.

(3) *Troubleshooting Chart.* Troubleshooting chart (para 5–8) lists symptom of common

5-8. Tape Drive Transmission Assembly Troubleshooting Chart

a. General. The tape drive transmission assembly troubleshooting chart should be used in conjunction with testing (para 5–19) when performance standards are not met. When more than one problem exists for a failure, procedures for isolating the failure are listed in the chart. Replacement of defective part should be accomplished in accordance with instructions provided in paragraph 5–14.

b. Tape Drive Transmission Assembly Troubleshooting Chart.

Item	Symptom	Probable cause	Corrective action
1	Magazine drive coupling gear will not rotate.	a. Shift arm assembly not in proper position.	a. Set in either NORMAL or FAST position. If trouble persist, proceed to next step.
		b. Defective motor driver.	b. If motor driver is not rotating, check for loose set screw. If set screw is not loose, or cannot be tighten, replace motor driver. If trouble persists, proceed to next step.
		c. Defective roller.	c. If motor driver is rotating, but roller not rotating, replace roller and/or associated hardware.
		d. Defective motor.	d. Replace motor assembly.
2	Coupling gear rotates in the fast mode, but not in the normal mode.	Defective belt.	Replace defective belt.
3	Excessive induction noise or abnormal operation.	Defective bearing, ring, shim, spacer, spring, and/or washer.	Replace defective part.

Section IV. CIPR MAGAZINE, ADJUSTMENT, REPAIR, AND REMOVAL AND REPLACEMENT

5-9. Adjustment

No adjustment is required on the A2 sound recorder set magazine (CIPR magazine) during depot maintenance.

5-10. Repair

Repair authorized at depot maintenance on the CIPR magazine consists of replacing defective mechanical parts contained in the CIPR magazine assembly and replacing sound recording tape. The defective parts should be removed and replaced in accordance with instructions provided in paragraph 5-11. The sound recording tape should be installed in accordance with instructions provided in paragraph 5–13.

5-11. Removal and Replacement

a. To simplify maintenance on the CIPR magazine, the magazine should be disassembled in three separate sections. By disassembling the CIPR magazine into three separate sections, disassembling parts not necessary for repair will be eliminated. Therefore, disassembling only the section or sections necessary to replace the defective part. The CIPR magazine can be disassembled into cover (top), reel (center), and housing (bottom) sections. Figure 5-l illustrates a complete breakdown of the CIPR magazine.

b. The CIPR magazine should be rewound to the start position so that the greater portion of the sound recording tape is wound in the upper reel. If the CIPR magazine is not rewound to the start position, the magazine can be rewound as follows:

(1) Connect playback unit to 115-volt, 60-hertz power source.

(2) Ensure that playback unit POWER ON/0FF switch is set to OFF.

(3) Install CIPR magazine on the playback unit (fig. 4–13).

(4) Set playback unit tape speed control lever to FAST.

(5) Insure that playback unit POWER CKT BRKR circuit breaker is in the "in" position.

(6) Set playback unit POWER ON/OFF switch to ON. The STOP indicator shall light.

(7) Press and release playback unit RE-WIND switch-indicator. The STOP indicator shall go out, REWIND indicator shall light, and the tape shall begin to rewind to the start position. When the tape is rewound to the start position, the REWIND indicator shall go out, STOP indicator shall light, and tape shall stop.

(8) Set playback unit POWER ON/OFF switch to OFF. The STOP indicator shall go out

(9) Disconnect the playback unit from 115-volt 60-hertz power source.

(10) Remove CIPR magazine. The magazine should be ready for disassemble.

NOTE

If the magazine cannot be rewound, de-energize the playback unit, remove the magazine and proceed with the procedures outlined in paragraphs 5-11c through 5-11h.

c. Removing and Disassembling Cover (Top) Section.

(1) Remove 4/40 by 3/16-inch pan-head screw (1) with flat washer (2) and remove cover (3).

(2) Remove dial window (4) from housing plate (6).

(8) Remove two 4/40 by 7/8-inch flat-head screw (5) and two 4/40 by 1 1/4-inch, flat-head screw (67) and remove housing plate (6).

(4) In two places, remove two 3/16-inch bearings (11) and sleeve bearing (12).

(6) Remove 13/16-inch guide pin (68) and 1 1/4-inch guide pin (10).

(6) Remove 2/56 by 3/16-inch pan-head screw (8) and wiper (9).

(7) Remove indicator disc (18).

(8) Remove B/&inch bearing (14) from the underside of the indicator disc.

(9) Remove spring tension washer (16).

d. Reassembling and Installing Cover (Top) Section.

(1) Insure that the reel (center) section is fully assembled.

(2) Install spring tension washer (15) on the reel drive shaft (40).

(3) Install 3/8-inch bearing (14) on the underside of the indicator disc (13).

(4) Install the indicator disc with the 3/8-inch bearing installed on the reel drive shaft.

(6) Using 2/56 by 3/16-inch pan-head screw (8), secure the wiper (9) on the housing plate (6).

(6) Install the 1 1/4-inch guide pin (10) and 13/16-inch guide pin (63) on the base housing (66).

(7) On each guide pin, install one 3/16-inch bearing (11), one sleeve bearing (12), and another 3/16-inch bearing (11) in that order.

(8) Align homing plate (6) with appropriate guide pin and install the housing plate.

(9) Using 4/40 by 7/8-inch flat-head screw (5) and 4/40 by 1 1/4-inch flat-head screw (37), secure the housing plate (6) to the base housing (66).

(10) Install dial window (4) on the housing plate.

(11) Install cover (8).

(12) Using 4/40 by 3/16-inch pan-bead screw with associated washer, secure the cover to the housing plate.

e. Removing and Disassembling Reel (Center) Section.

(1) Remove *cover (top) section* in accordance with paragraph 5-11c.

(2) Remove three .004-inch shims (16) and three .0016=inch flat washers (17).

(8) Remove sound recording tape (47).

(4) Remove four 1/64 by 3/16-inch flat-head screws (18) and remove reel flange (19).

(6) Remove or loosen set screw (20) and remove sound recording tape reel (21).

(6) Remove two .004-inch shims (22) and one B/&inch bearing (28).

(7) Remove 4/40 by 3/8-inch flat-head screw (24) and remove lower reel flange (25).

(8) Remove l/4-inch bearing (26), from the underside of the lower reel flange (25).

(9) Remove planetary gear (27).

(10) In two places, remove 4/40 by 1/4-inch pan-head screw (28) and .016-inch flat washer (29).

(11) Remove spring retainer (30).

(12) Remove spiral torsion spring (32) with pin (81).

(13) Remove 1/4-inch bearing (33) from lower drive reel (34).

(14) Remove lower drive reel (34) and top reel drive gear (37).

(15) Remove 4/40 by 3/8-inch flat-head screw (36) and remove equipment post (35).

(16) Remove 3/8-inch bearing (38) installed between the two reel drive gears

(17) Remove reel drive shaft (40). The lower reel drive gear (69) will be attached to the reel drive shaft.

(18) Remove four 2/56 by 1/8-inch pan-head screw (39) and separate the lower drive gear from the reel drive shaft.

(19) Remove 1/2-inch bearing (41) and preload shim (42).

f. Reassembling and Installing Reel (Center) Section.

(1) Install preload shim (42) and then the 1/2-inch bearing (41).

(2) Using four 2/56 by 1/8-inch pan-head screws (39), secure the reel drive shaft (40) to the lower reel drive gear (69).

(3) Install 3/8-inch bearing (38) on the lower reel drive gear.

(4) Using 4/40 by 3/8-inch flat-head screw (36), secure equipment post (35) to the upper reel drive gear (37).

(5) Install upper reel drive gear (37) so that the 3/8-inch bearing (36) is properly seated between the two reel drive gears.

(6) Install lower drive reel (34).

(7) Install 1/4-inch bearing (33) in the lower drive reel.

(8) Install spiral torsion spring (32) with pin (31) in the lower drive reel.

(9) Install planetary gear (27) through the spring retainer (30) and install on the lower drive reel (34). Make sure that the gears are properly matched.

(10) Using 4/40- 1/4-inch *panhead screw* (28) and .016-inch flat washer (29), secure spring retainer (30) to lower drive reel (34) in two places.

(11) Install 1/4-inch bearing (26) on the planetary gear (27).

(12) Install lower reel flange (25). Make sure that 1/4-inch bearing (26) and the lower reel flange are aligned.

(13) Using 4/40 by 3/8-inch flat-head screw (24), secure lower reel flange (25) to the equipment post (35).

(14) Install 3/8- *inch bearing (23) and then* two .004-inch shims *(22) on reel drive shaft* (40).

(15) Install sound recording reel (21).

(16) Using 4/40 by 3/16-inch set screw (20), secure sound recording reel (21) to reel drive shaft (40).

(17) Install reel flange (19).

(18) Using four 1/64 by 3/16-inch flat-head screw (18), secure reel flange (19) to sound recording tape reel (21).

(19) Install three .0016-inch flat washers (17) and then three .004-inch shims (16) on the reel drive shaft (40).

(20) If repair is completed, install cover (top) section in accordance with paragraph 5-11d.

g. Removing and Disassembling Housing (Bottom) Section

(1) Remove cover (top) section in accordance with paragraph 5-11c.

(2) Remove reel (center) section as an assembled section as follows:

(a) Remove three .004-inch shims (16) and three .0016-inch flat washers (17).

(b) Remove assembled reel (center) section.

(c) Remove 1-2-inch bearing *(41) and* preload shim (42).

(3) Tag wires to recording heads *(46) and guides (44).*

(4) Unsolder wires.

(5) In four places, remove 2/56 by 5/16-inch flat-head screws (43) and then the housing plate (51).

(6) Disassemble housing plate (51) as follows:

(a) Remove guides (44) by removing 4/40 *by* 1/4-inch flat-head screws (70).

(b) Remove guide posts (45).

(c) Remove recording heads (46) by removing two 4/40 by 5/16-inch flat-head screws (71) in each head.

(7) In two places, remove 3/8-inch ball bearings (49), tape dampers (48), and preload shims (50).

(8) Disassemble the gear drive shaft (60) as follows:

(a) Remove tapered section type retaining ring (55) from gear drive shaft.

(b) Remove .004-inch shim (57) and 1/4-inch bearing (68).

(c) Remove housing plate (65) by removing three *2/56* by 5/16-inch flathead screws (53).

(d) Remove two spring tension washers (56) and 1/4-inch bearing (72).

(e) Remove yoke subassembly (64).

(f) Disassemble yoke subassembly as follows:

1. Remove E type retaining ring (78) in two places and straight shaft (62).

2. Remove .004-inch shims (74).

3. Remove idler gear (63) and two 1/4-inch bearings (75).

(g) Remove .004-inch shim (57) and spring tension washer (56).

(h) Remove remaining gear drive shaft (60) **assembly from the base housing (66).**

(i) Remove tapered section type retaining ring (76) from end of gear drive shaft (60).

(j) Remove two .016-inch flat washers (77) and coupling half shaft (61).

(k) Remove 3/64 by 5/16-inch spring pin (59).

(l) Remove bowed E type retaining ring (78).

(m) Remove .016-inch flat washer (79) and 3-8-inch bearing (80).

(n) Remove tapered section type retaining ring (81).

(o) Remove non-metallic washer (82) and 5/16-inch bearing (83) from gear drive shaft.

h. Reassembling and Installing Housing (Bottom) Section.

(1) Reassemble gear drive shaft (60) subassembly as follows:

(a) Install S/M-inch bearing (28).

(b) Install non-metallic washer (82).

(c) Secure bearing and non-metallic washer in place by installing tapered section type retaining ring (81).

(d) Install 3/8-inch bearing (80).

(e) Install .016-inch flat washer (79).

(f) Secure bearing and flat washer in place by installing bowed E type retaining ring (78).

(g) Install coupling half shaft (61).

(h) Install two .016-inch flat washers m l -

(i) Secure coupling half shaft and flat washers in place by installing a tapered section type retaining ring (76).

(j) Install 3/64 by 5/16-inch spring pin (59).

(k) Install partially assembled gear drive shaft subassembly through the base housing (66) from the bottom.

(1) Install spring tension washer (56).

(m) Install .004=inch shims (57).

(n) Reassemble the yoke (64) subassembly as follows:

***1.* Install 1/4-inch bearing (75) on each** end of the idler **gear (63).**

***2.* Install .004-inch shim (74) on top bearing.**

***3.* Install bearings, idler gear, and shim in the yoke.**

***4.* Using straight shaft (62), secure bearings, idler gear, and shim in the yoke.**

***5.* Using E type retaining ring (73), secure straight shaft (62) to the yoke at the top.**

6. Using tapered section type **retaining** ring (73), secure straight shaft (62) to **the yoke** at the bottom.

(o) Install the reassembled yoke subassembly on the gear drive shaft (60).

(p) Install 1/4-inch bearing (72).

(q) Install two spring tension washers (56).

(r) If necessary, install guide pin (54).

(s) Align with guide pin (54) and install housing plate (65).

(t) Using three 2/56 by 5/16-inch flat-head screws (53)) secure the housing plate (65) to base housing (66).

(u) Install 1/4-inch bearing (58) and then install .004-inch shim (57).

(u) Using tapered section type retaining ring (55), secure the remaining parts of the gear drive shaft (60) to the shaft.

(2) Install preload shim (50) in two places.

(8) Install 3/8-inch bearing (49) in two places.

(4) Install tape damper (48) in two places.

(5) Install B/&inch bearings (49) on each tape damper shaft

(6) If the plate housings (51) has been disassembled, reassemble as follows:

(a) Using two 4/40 by 5/16-inch flat-head screw (71), secure each recording head (46) to the housing plate.

(b) Install guide posts (45).

(c) Using 4/40 by 1/4-inch flat-head screw (70), install guides (44).

(7) Using four 2/56 by 5/16-inch **flat-head** screw (43), secure housing plate (51) **to base** housing (66).

(8) Resolder wires to recording **heads (46) and guides (44).**

(9) If the reel (center) section has been disassembled, reassemble in accordance with paragraph 5–11*f*. If the reel (center) section is assembled, install section as follows:

(*a*) Install preload shim (42).

(*b*) Install 1/2-inch bearing (41).

(*c*) Install assembled reel.

(*d*) Install three 0.016-inch flat washers (17).

(*e*) Install three 0.004-inch shims (16).

(10) Install cover (top) section in accordance with instructions provided in paragraph 5–11*d*.

5-12. Cleaning and Demagnetizing Magazine Tape Heads

a. **Partially disassemble the magazine to the extent necessary to gain access to the tape heads**

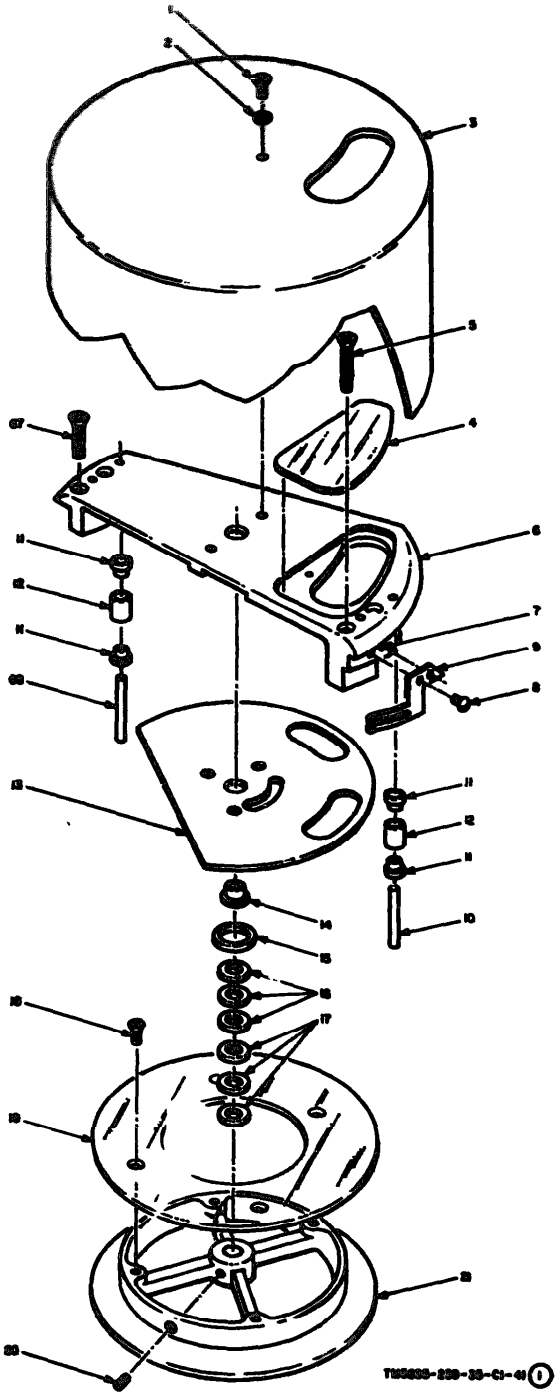


Figure 5-1. Sound recorder set magazine MA-27/ASH exploded view (part 1 of 3).

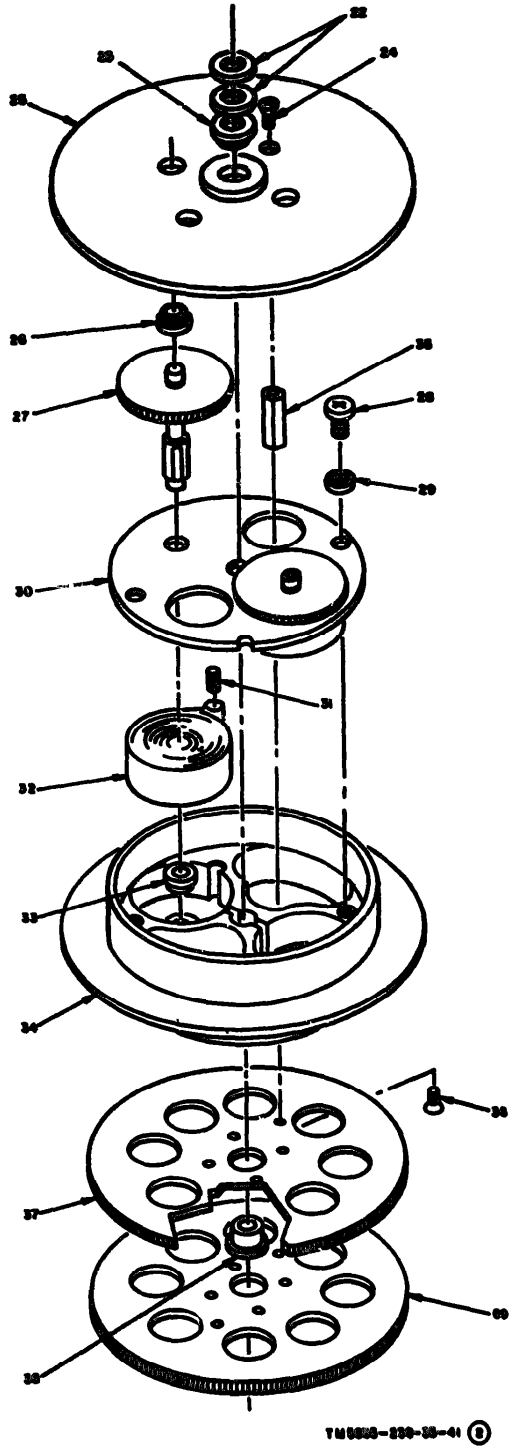
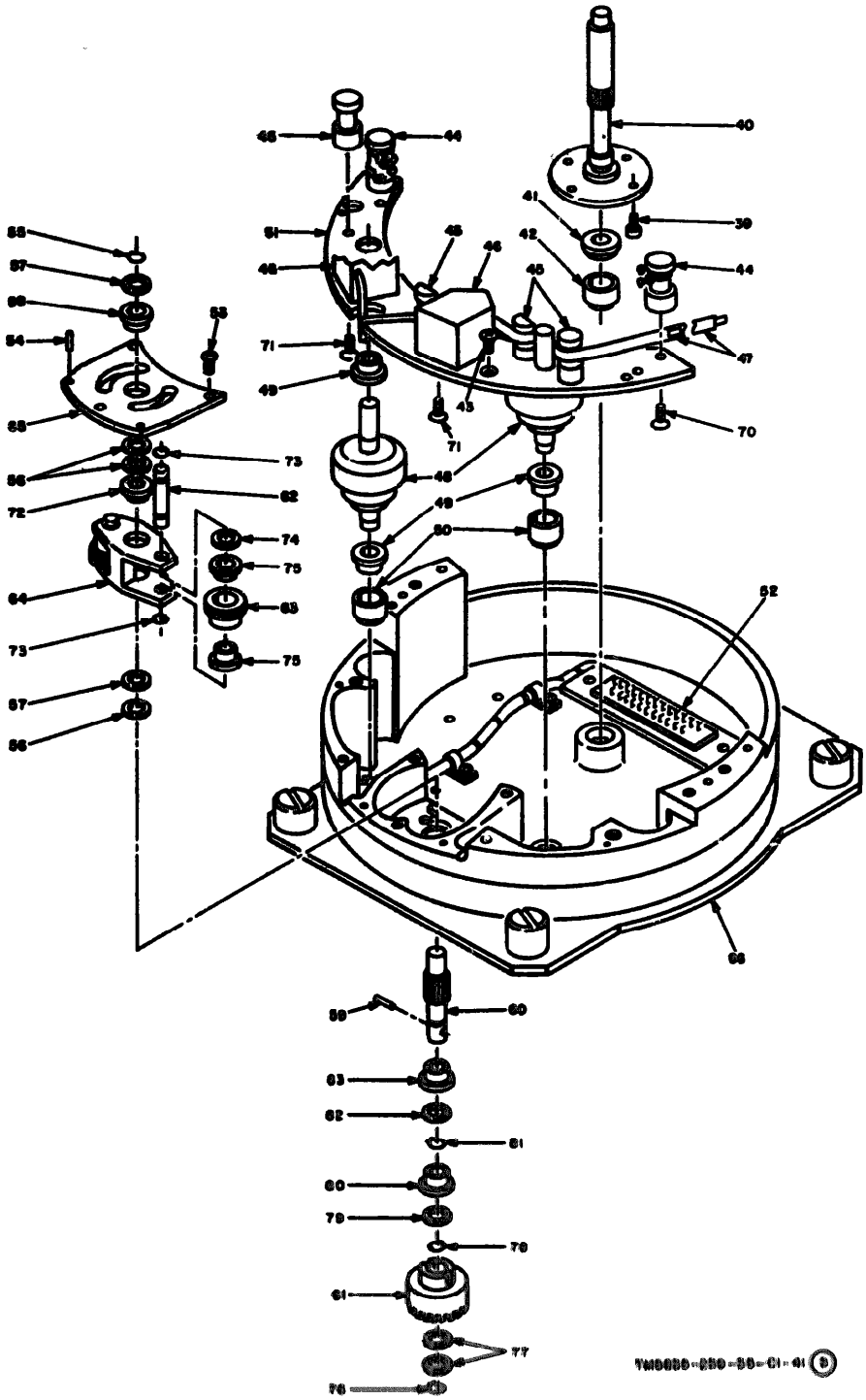


Figure 5-1. Sound recorder set magazine MA-27/ASH, exploded view (part 2 of 3).



1 Screw, pan-head, 4/40 by 3/16 inch
2 Washer, flat
3 Cover
4 Dial window
5 Screw, flat-head, 4/40 by 7/8 inch
6 Housing plate
7 Pin
8 Screw, pan-head, 2/56 by 3/16-inch

Figure 5-1. Sound recorder set magazine MA-27/ASH, exploded view (part 3 of 3).

9 Wiper
10 Pin, guide, 1 1/4-inch
11 Bearing, 3/16-inch
12 Bearing, sleeve
13 Indicator disc
14 Bearing, 3/8-inch
15 Washer, spring tension
16 Shim, .004-inch
17 Washer, flat, .0016-inch
18 Screw, flat-head, 1/64 by 3/16-inch
19 Reel flange
20 Set screw
21 Sound recording tape reel
22 Shim, .004-inch
23 Bearing, 3/8-inch
24 Screw, flat-head, 4/40 by 3/8-inch
25 Lower reel flange
26 Bearing, 1/4-inch
27 Planetary gear
28 Screw, pan-head, 4/40 by 1/4-inch
29 Washer, flat, .016-inch
30 Retaining spring
31 Pin
32 Spiral torsion spring
33 Bearing, 1/4-inch
34 Lower drive reel
35 Equipment post
36 Screw, flat-head, 4/40 by 3/8-inch
37 Top reel drive gear
38 Bearing, 3/8-inch
39 Screw, pan-head, 2/56 by 1/8-inch
40 Reel drive shaft
41 Bearing, 1/8-inch
42 Preload shim
43 Screw, flat-head, 2/56 by 5/16-inch
44 Guides
45 Lock posts
46 Recording heads
47 Tape
48 Tape dampers
49 Bearing, 3/8-inch
50 Preload shim
51 Housing plate
52 Connector
53 Screw, flat-head, 2/56 by 5/16-inch
54 Pins
55 Retaining ring
56 Tension spring washers
57 Shim, .004-inch
58 Bearing, 1/4-inch
59 Spring Pin, 3/64 by 5/16-inch
60 Gear drive shaft
61 Coupling half shaft
62 Straight shaft
63 Idler gear
64 Yoke subassembly
65 Housing plate
66 Base housing
67 Screw, flat-head, 4/40 by 1 1/4-inch
68 Guide pin, 13/16-inch
69 Lower reel drive gear
70 Screw, flat-head, 4/40 by 1/4-inch
71 Screw, flat-head, 4/40 by 5/16-inch
72 Bearing, 1/4-inch
73 Retaining ring
74 Shim, .004-inch
75 Bearing, 1/4-inch
76 Retaining ring
77 Washer, flat, .016-inch
78 Retaining ring
79 Washer, flat, .016-inch
80 Bearing, 3/8-inch
81 Retaining ring
82 Washer, non-metallic
83 Bearing, 5/16-inch

Figure 5-1 --Continued.

(46, fig. 5-1). Do not remove tape heads or disconnect electrical leads.

b. Apply power to the magnetic eraser.

c. Hold eraser directly over tape head at a distance of one to four inches. Do not allow eraser to contact tape head.

d. Move the eraser in a circular motion over the tape head for approximately 15 seconds. Remove power from the magnetic eraser.

e. Remove eraser from vicinity of tape head (3 feet minimum).

CAUTION

Do not touch or breath on surface of tape heads. Finger prints and moisture may cause corrosion damage to the heads.

f. Pour a small amount of ethyl alcohol in a separate container; do not use ethyl alcohol directly from storage container.

g. Dip cotton swab in ethyl alcohol, tie off excess, and carefully clean surface of tape head. Discard swab; do not dip in alcohol a second time,

h. Immediately dry head with a clean, lint-free cloth.

i. Repeat steps *g* and *h* several times, discarding each swab after one use.

j. Discard alcohol; do not pour into container.

5-13. Magazine Tape Installation

CAUTION

Wear tape handling gloves when installing tape magazine.

a. Assemble two 48-inch lengths of shorting tape.

b. Assembly 330 feet (minimum) of fresh magnetic recording tape.

c. Attach start of shorting tape 6 feet from lead edge of magnetic tape, and verify that shorting tape is bonded smoothly to magnetic tape.

d. Attach and load reel (21, fig. 5-i(1)) with magnetic tape.

e. Temporarily mark bottom reel location with respect to upper reel.

f. Hold lower reel (34), fig. 5-1(l)) and wind upper reel ((21), fig. 5-1(1) 55 ± 5 counterclockwise turns (when viewing upper reel through the window).

g. Attach magnetic tape to lower reel.

h. Thread tape in direction shown in figure 5-2.

i. Remove any end float in the drive shaft as required. If required, adjust the set screw (20, fig. 5-l) located under the nameplate within the frame.

j. Install magazine on playback unit.

k. Run tape from reel to reel (in both directions) at least one full cycle to determine operability of assembly.

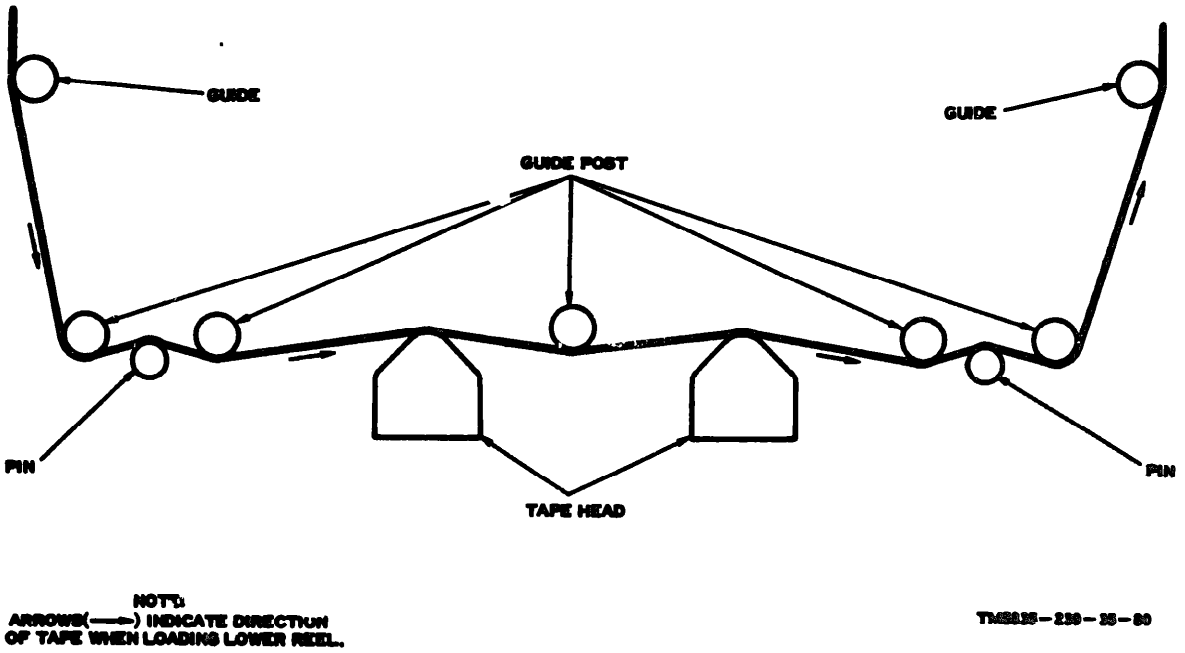


Figure 5-2. Magazine tape installation.

Section V. TAPE DRIVE TRANSMISSION ASSEMBLY ADJSUTMENT, REPAIR, AND REMOVAL AND REPLACEMENT

5-14 Adjustment

No adjustment is required on the A1A7 variabl speed tape drive transmission assembly durin depot maintenance.

5-15. Repair

Repair authorized at depot maintenance on the A1A7 variable speed tape drive transmission assembly consists of replacing defective mechanical parts contained in the assembly and replacing defective tape drive motor. The defective part or motor should be replaced in accordance with instructions provided in paragraph 5-16.

5-16. Removal and Replacement

a. General. **The A1A7 variable speed tape drive transmission assembly should be disassembled into separate sections. By disassembling the variable speed tape drive transmission assembly into separate sections, disassembling parts not necessary for repair will be eliminated. The variable speed tape drive transmission assembly can be disassembled into tape drive motor, cover plate, pully, flywheel, and shift arm sections Figure 5-3 illustrates a complete breakdown of the A1A7 variable speed tape drive transmission assembly. Refer to paragraphs 3-14b(26) and**

(27) for removal and replacement procedures of the A1A7 variable speed tape drive transmission assembly.

b. Removing and Disassembling A1A7A4B1 Tape Drive Motor Section.

(1) Remove or loosen three clenching clamps (16) by turning clamp screws (15).

(2) If loosened, position clamps so that they clear the slot in the tape drive motor (18) housing. Disconnect A1A7A4P1 from A1A4J2 on the electronic components assembly.

(3) Set tape speed control lever (22) to the neutral (NEUT) position.

(4) Remove tape drive motor section.

(5) Disassemble the tape drive motor section as follows:

(a) Remove shield (17) from the motor housing.

(b) Remove or loosen set screw (18) and remove driver (14) from the motor shaft.

c. Reassembling and Installing A1A7A4B1 Tape Drive Motor Section.

(1) Reassemble the tape drive motor section as follows:

(a) Install driver (14) on the motor (18) shaft.

(b) Install set screw (18) in the driver and tighten set screw to secure driver to the motor shaft.

(c) Install shield (17) on the motor housing.

(2) Insure that the tape speed control lever (22) is set to neutral (NEUT) position.

(3) Insert the tape drive motor section into the opening provided in the support (58).

(4) Position the rim clenching clamps (16) in the slot provided in the motor housing.

(5) Tighten the rim clenching clamp screws (15) to secure tape driver motor section to the support.

d. Removing and Disassembling Cover Plate Section.

(1) Loosen two set screws (21) in shift arm (38) and remove tape speed selector shaft (22) and 1/2-inch compression spring (23).

(2) Remove three 6/32 by 1/4-inch flat-head screws (51) securing the cover plate (52) to the support (53).

(3) Remove two 4/40 by 7/16-inch flat-head screws (11) securing the cover plate to the bearing ring (12).

(4) Remove the cover plate section from the support (53).

(5) Disassemble the cover plate section as follows:

(a) Remove 4/40 self-locking, ring base hexagon nut (27).

(b) Remove flat *washer (26)* and sleeve spacer (25).

(c) Remove aluminum guide washer (29) and teflon washer (28).

(d) Remove 4/40 by 7/16 inch flat-head screw (24) from the cover plate (52).

e. Reassembling and Installing Cover Plate Section.

(1) Reassemble the cover plate section as follows:

(a) Insert 4/40 by 7/16-inch flat-head screw (24) through the cover plate (52).

(b) Install teflon washer (28).

(c) Install aluminum guide washer (19).

(d) Install sleeve spacer (25).

(e) Install flat washer (26).

(f) Install 4/40 self-locking, ring base hexagon nut (27). Insure that the teflon and aluminum guide washers are properly aligned then tighten the nut.

(2) Install cover plate section on the support (53).

(3) Insure that the cover plate section is properly positioned on the support and aligned with the pull and flywheel sections.

(4) Using two 4/40 by 7/16-inch flat-head screws (11), secure cover plate to the bearing ring (12).

(5) Using three 6/32 by 1/4-inch flat-head screws (51), secure cover plate section to the support.

(6) Place 1/2-inch compression spring (28) between shift arm (38) and aluminum washer (29) and slide tape speed selector shaft (22) through the hole in teflon washer (28) aluminum washer (29), compression spring, and shift arm. Tighten set screws (21).

f. Removing and Disassembling Pulley Section

(1) Remove cover plate section in accordance with paragraph 5–16*d*, (1) through (4).

(2) Remove screw (19) to disconnect extension spring (20).

(3) Remove belt (44) from the flywheel (9).

(4) Remove pulley section from the support (53).

(5) Disassemble pulley section as follows:

(a) Remove E type retaining ring (39).

(b) Remove .031-inch flat washer (40).

(c) Remove pulley shaft (41).

(d) Remove 5/16-inch bearings (42), flat pulley (43), .013-inch flat washer (40), and belt (44).

(e) Separate the bearings, flat pulley, flat washer, and belt.

(f) Remove three E retaining ring (45) from straight shaft (46).

(g) Remove three .031-inch flat washers (47) and sleeve spacer (52).

(h) Remove straight shaft (47) from pulley arm (43).

g. *Reassembling and Installing Pulley Section.*

(1) Reassemble pulley section as follows:

(a) Insert straight shaft (46) through appropriate opening in pulley arm (48).

(b) Install three .031-inch flat washer (47) on the straight shaft and secure in place by installing E type retaining ring (45).

(c) Install 5/16-inch bearings (42) on each end of flat pulley (43).

(d) Install .03-inch flat washers (41) on each end of the bearings (42).

(e) Insert the washers, bearings, and flat pulley with belt (44) installed in the pulley arm (48) secure in place with the pulley shaft (41).

(f) Secure pulley shaft in place by installing E type retaining ring: (39) on the pulley shaft.

(2) Install sleeve spacer (52) on the straight shaft (46) and install pulley section in place in the housing (53).

(3) Install belt (44) on flywheel (9).

(4) Install extension spring (20) with screw (19) in the support (53).

(5) Install cover plate section in accordance with instructions provided in paragraph 5-16*e*, (2) through (6).

h. Removing and Disassembling Flywheel Section.

(1) Remove cover plate section in accordance with instructions provided in paragraph 5-16*d*, (1) through (4).

(2) Set shift arm assembly to the center position.

(3) Remove belt (44) from the flywheel (9).

(4) Remove flywheel section from the housing (53).

(5) Disassemble the flywheel section as follows:

(a) Press coupling (3) in and remove tapered section type retaining ring (1) from 1 5/8-inch pulley shaft (8).

(b) Remove flat washer (2) and coupling (3).

(c) Remove 1/16 by 3/8-inch spring pin (4) and compression spring (5).

(d) Remove E type retaining ring (6) from 1 5/8-inch pulley shaft (8) .

(e) Remove bearing ring (12).

(f) Remove 3/8-inch bearing (10) from the bearing ring.

(g) Remove 1/16 by 3/8-inch spring pin *(7)* from flywheel (9).

(h) Remove flywheel (9) and another 3/8-inch bearing (54).

i. Reassembling and Installing Flywheel Section.

(1) Reassemble the flywheel section as follows:

(a) Install flywheel (9) on the 1 5/8-inch pulley shaft (8) and secure in place with 1/16 by 3/8-inch spring pin (7).

(b) Install 3/8-inch bearing (10) on the bearing ring (12).

(c) Install the 3/8 inch bearing and bearing ring on the 1 5/8 inch pulley shaft (8).

(d) Install E type retaining ring (6) on the pulley shaft.

(e) Install compression spring (5) on the pulley shaft and secure in place by inserting 1/16 by 3/3-inch spring pin (4).

(f) Install coupling (3).

(g) Install flat washer (2) and secure in place by installing tapered section type retaining ring (1).

(2) Install 3/8-inch bearing (54) in its place on the housing (53).

(3) Install the flywheel section on the 3/8-inch bearing (54) installed on the housing (53).

(4) Set shift arm assembly to the center position.

(5) Install belt (44) on the flywheel.

(6) Install cover plate section in accordance with instructions provided in paragraph 5-16*e*, (2) through (6).

j. Removing and Disassembling Shift Arm Section.

(1) Remove A1A5A4B1 tape drive motor section in accordance with instructions provided in paragraph 5-16*b*, (1) through (4).

(2) Remove cover plate section in accordance with instructions provided in paragraph 5-16*d*, (1) through (4).

(3) Set shift arm assembly to the center position and remove the belt (44) from the flywheel (9).

CAUTION

Removing cap screw (30) will cause the expanded extension spring (32) to contact and let fly the washer, spring and bushing.

(4) Grasp the shift arm assembly while loosening the 8/32 by 1/2-inch socket-head cap screw (30).

(5) Remove 8/32 by 1/2-inch socket-head cap screw (30), 0.16-inch flat washer (31), and bushing insulator (55).

(6) Remove 1-inch extension spring (32) (optional).

(7) Slide out shift arm section.

(8) Disassemble shift arm section as follows:

(a) Remove tapered section type retaining rings (34) from straight shaft (35).

(b) Remove 3/8-inch bearings (36) and roller (37) from the shift arm (38).

(c) Remove straight shaft (86) from shift arm (38) and remove setscrews (21) from the shift arm.

k. Reassembling and Installing Shift Arm Section.

(1) Reassemble shift arm section as follows:

(a) Install set screws (21) in the shift arm (38).

(b) Install a 3/8-inch bearing (36) on each end of the roller (37).

in the shift arm.

(d) Secure the bearing and roller in the shift arm with straight shaft (35).

(e) Using two tapered section type retaining rings (34), secure straight shaft to the shift arm.

(2) Install .016-inch 1. , washer (31), bushing insulator (55) and 1-inch extension spring (31) on the 8/32 by 3/8-inch socket-head cap screw (30).

(3) Slide shift arm section into position on the housing (53).

(4) Install socket-head cap screw (30) through the housing. Do not tighten the cap screw..

(6) Grasp the shift arm assembly and hold it in the center position while replacing the belt (44) on the flywheel (9).

(6) Install cover plate section in accordance with instruction provided in paragraph 5-16e, (2) through (6).

(7) Operate the fully assembled shift arm section by adjusting the tape speed selector shaft (22) to determine the correct tightness of socket-head cap screw (30).

(8) Install A1A7A4B1 tape drive motor section in accordance with instructions provided in paragraph 5-16c, (2) through (6).

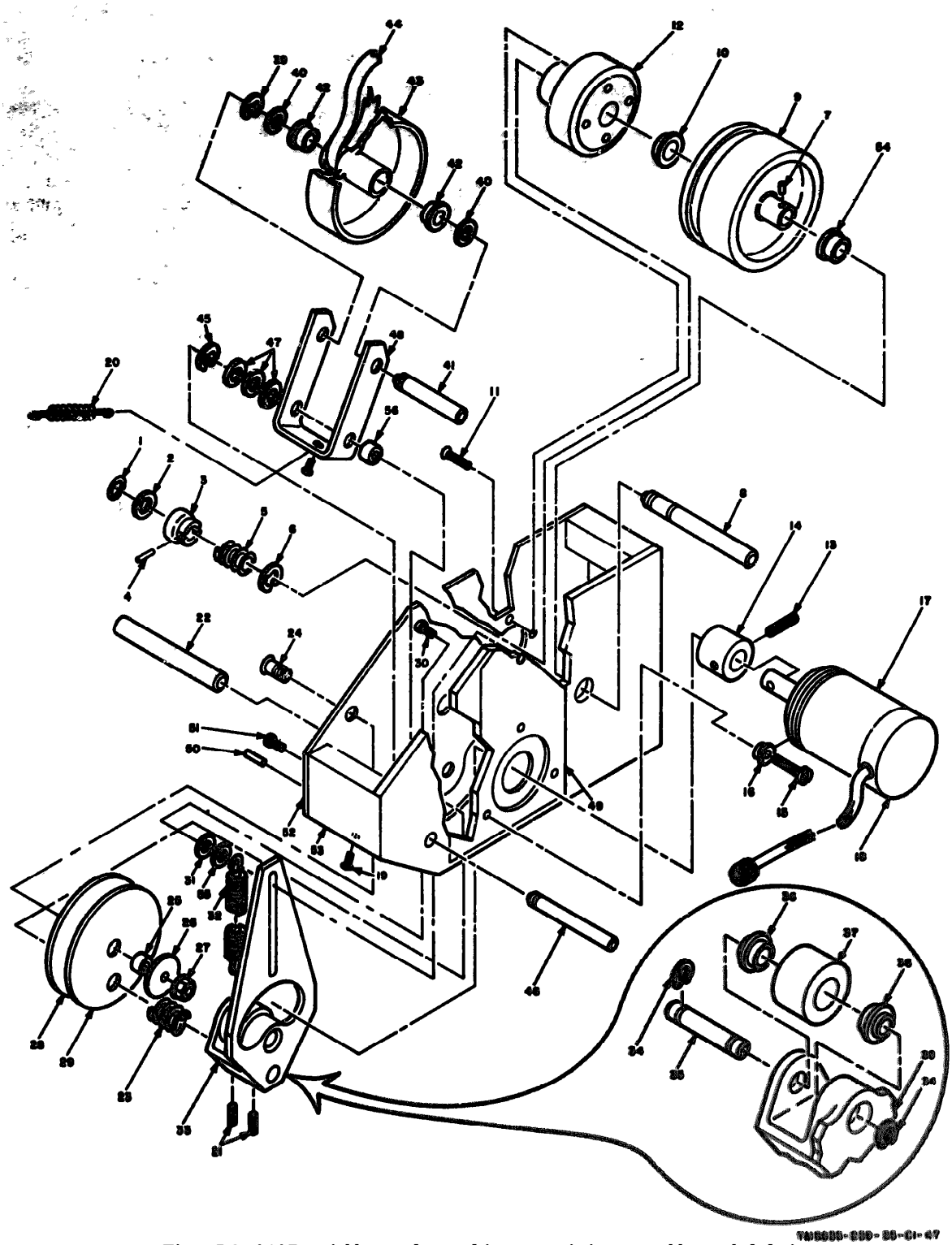


Figure5-3. A1A7 variable speed tape drive transmission assembly, exploded view.

1 Retaining ring
2 Washer, flat
3 Coupling
4 Spring, pin 1/16 by 3/8-inch
5 Compression spring
6 Retaining ring
7 Spring pin, 1/16 by 3/8-inch
8 Pulley shaft, 1 5/8-inch
9 Flywheel
10 Bearing, 3/8-inch
11 Screw, flat-head, 4/40 by 7/16-inch
12 Bearing ring
13 Set screw
14 Driver
15 Rim clenching clamp screw
16 Rim clenching clamp
17 Shield
18 Motor
19 Screw
20 Extension spring
21 Set screw
22 Tape speed selector shaft
23 Compression spring, 1/2-inch
24 Screw, flat-head, 4/40 by 7/16-inch
25 Sleeve spacer
26 Washer, flat
27 Nut, self-locking, 4/40-inch
28 Washer, teflon
29 Washer, aluminum
30 Screw, cap, 3/32 by 1/2-inch
31 Washer, Flat, .016-inch
32 Extension spring, 1-inch
33 Arm assembly
34 Retaining ring
35 Straight shaft
36 Bearing, 3/8-inch
37 Roller
38 Shift arm
39 Retaining ring
40 Washer, flat, .031-inch
41 Pulley shaft
42 Bearing, 5/16-inch
43 Flat pulley
44 Belt
45 Retaining ring
46 Straight shaft
47 Washer, .031-inch
48 Pulley arm
49 Teflon sheet
50 Pin
51 Screw, flat head, 6/32 by 1/4-inch
52 Cover plate
53 Support
54 Bearing, 3/8-inch
55 Bushing insulator
56 Sleeve spacer

Figure 5-3 --Continued.

Section VI. CIPR MAGAZINE TESTING PROCEDURE

5-17. General

This section contains instructions for testing the Sound Recorder Set Magazine MA-27/ASH (CIPR magazine). Testing is performed to ensure that the CIPR magazine repaired at depot maintenance can be operated properly prior to reissue and to isolate troubles when repair is required. Procedureal instructions are to be accomplished in the sequence in which they are presented. Troubleshooting procedures (para 5-5) are to be used to correct operational failure discovered during the test outlined in this paragraph.

5-18. CIPR Magazine Test

a. Test Equipment. Test equipment required during depot maintenance of the CIPR magazine are listed in paragraph 5–2

b. Test Connection and Condition. Figures 5–4 and 5–5 illustrates equipment setup for testing CIPR magazine. Prepare the CIPR magazine, playback unit, and CIPR test set for operational use as follows:

(1) Insure that 28-volt dc power source is available for Recorder Test Set TS–2854/ASH–23 (CIPR test set).

(2) Obtain a known good CIPR test set.

(3) Obtain a known good Recorder Control C-8203/ASH-23 (CIPR controller).

(4) Obtain a known good Sound Reproducer set AN/ASH44 (playback unit).

(5) Insure that playback unit POWER ON/ OFF switch is set to OFF.

(6) Connect playback unit to 115-volt, 60-hertz ac power source.

(7) Connect test equipment to their required power source.

NOTE

When using the test equipment, insure that the equipment is energized and sufficient time is allowed for equipment warmup.

(8) Rotate play-back unit VOLUME control to mid-point.

(9) Set playback unit CHANNEL SELECTOR switch to ALL.

(10) Rotate CIPR test set OUTPUT SELECT and RECORD COMMAND switches to OFF.

(11) Insure that nothing is connected to playback unit and CIPR test set front panel.

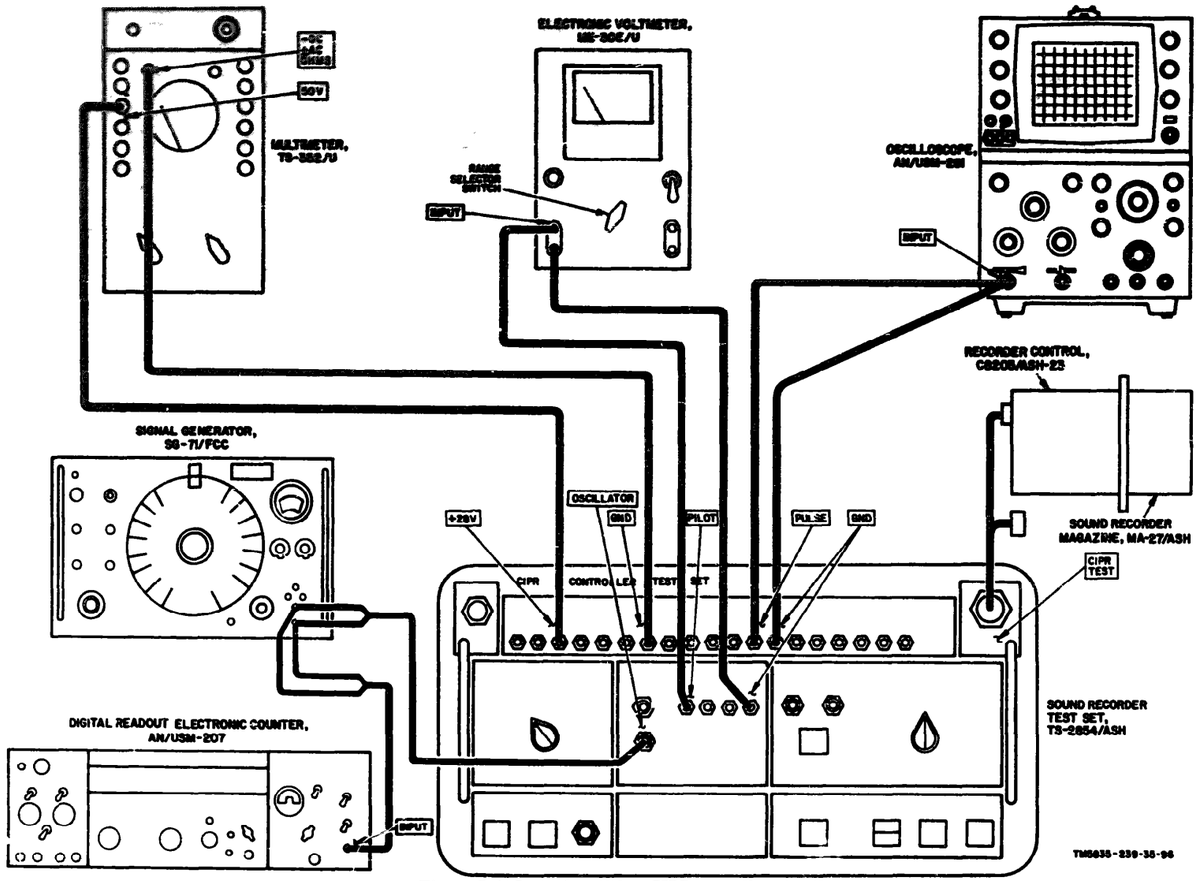


Figure 5-4. Setup for testing CIPR magazine.

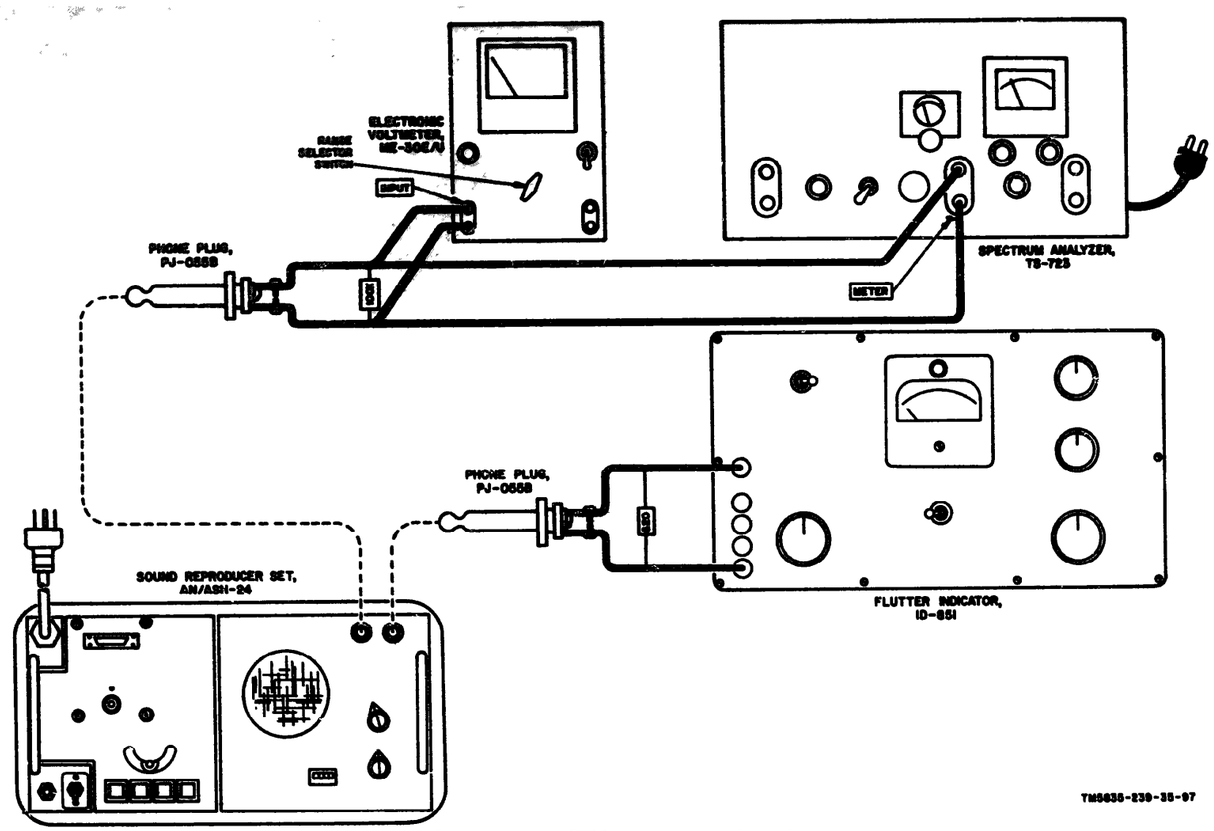


Figure 5-5. Setup for testing CIPR magazine recorder audio signals.

c. CIPR Magazine Test.

Step No.	Test equipment	Control settings	Equipment under test	Test procedure	Performance standard
1	Playback UNIT: Set control as required.		CIPR Magazine	a. Install CIPR magazine on the playback unit.	a. N/A
				b. Energize (push in) playback unit POWER CKT BRKR.	b. N/A
				c. Set playback unit POWER ON/OFF switch to ON.	c. STOP indicator shall light and remain on.
				d. Set playback unit tape speed control lever to NORMAL.	d. N/A
				e. Press and release playback unit PLAY switch-indicator.	e. PLAY indicator shall light, STOP indicator shall go out, and tape shall begin to move.
				f. Allow playback unit to operate in the play mode for ten minutes, then press and release playback unit STOP switch-indicator.	f. When the STOP switch-indicator is released, STOP indicator shall light, PLAY indicator shall go out, and tape shall stop.
				g. Set playback unit tape speed control lever to FAST.	g. N/A
				h. Press and release playback unit REWIND switch-indicator.	h. REWIND indicator shall light, STOP indicator go out, and tape shall begin to rewind. When tape is completely rewound, STOP indicator shall light, REWIND indicator shall go out, and tape shall stop.
	Stopwatch: Reset and wind to operate sufficiently for 15 minutes.			i. Press and release playback unit PLAY switch-indicator and start stopwatch.	i. PLAY indicator shall light STOP indicator shall go out, and tape shall begin to move.
				j. Allow tape to run its full length (both direction). When tape reaches its start position, tape will stop automatically. When tape stops, stop the stopwatch.	j. Stopwatch shall indicate 12 ± 1.2 minutes, STOP indicator shall light, and PLAY indicator shall go out.
				k. Set playback unit POWER ON/OFF switch to OFF.	k. STOP indicator shall go out.
				l. Remove CIPR magazine from the playback unit.	l. N/A
	CIPR test set: Set controls as required.			m. Connect CIPR test set to 28-volt power source.	m. N/A
				n. Observe CIPR test set POWER ON indicator.	n. POWER ON indicator should not be on. If POWER ON indicator is on, press and release POWER ON switch-indicator until POWER ON indicator extinguishes.

			r. Insure that CIPR test set POWER CKT BRKR is energized (pushed in).	r. N/A
			s. Press and release CIPR test set POWER ON switch-indicator.	s. POWER ON indicator and EXTERNAL segment of TAPE END SIMULATION INTERNAL/EXTERNAL indicator shall light. If INTERNAL segment is illuminated, press and release switch-indicator until EXTERNAL segment illuminates.
			t. Reset stopwatch to start.	t. N/A
			u. Rotate CIPR test set record command switch to PILOT and start stopwatch.	u. Tape shall begin to move.
			v. Allow tape to run its full length (both direction). When the tape reaches start position noted by indication observed through the window in the magazine cover, then rotate CIPR test set RECORD COMMAND switch to OFF and stop the stopwatch.	v. Elapsed time between start and stop shall not be less than 54 minutes.
			w. Press and release CIPR test set POWER ON switch-indicator.	w. POWER ON indicator and EXTERNAL segment of TAPE END SIMULATION INTERNAL/EXTERNAL indicator shall go out.
			x. Remove CIPR magazine from CIPR controller.	x. N/A
2	Playback unit: Set controls as required.	CIPR magazine	a. Insure that playback unit is connected to 115-volt, 60-hertz power source.	a. N/A
			b. Insure that playback unit POWER ON/OFF switch is set to OFF.	b. N/A
			c. Install CIPR magazine removed in step 1w on the playback unit.	c. N/A
			d. Insure that playback unit POWER CKT BRKR is energized (pushed in).	d. N/A
			e. Set playback unit POWER ON/OFF switch to ON.	e. STOP indicator shall light.

Step No.	Test equipment	Control settings	Equipment under test	Test procedure	Performance standard
				f. Set playback unit tape speed control lever to FAST.	f. N/A
				g. Press and release playback unit PLAY switch-indicator.	g. STOP indicator shall go out, PLAY indicator shall light, and tape shall begin to move.
				h. Allow playback unit to operate in the play mode for one minute, then press and release STOP switch-indicator.	h. STOP indicator shall light, PLAY indicator shall go out, and the tape shall stop.
				i. Press and release playback unit REWIND switch-indicator.	i. REWIND indicator shall light, STOP indicator shall go out, and tape shall begin to rewind. When tape is completely rewound, the tape will stop automatically and the STOP indicator will light and REWIND indicator shall go out.
				j. Set playback unit POWER ON/OFF switch to OFF.	j. STOP indicator shall go out.
				k. Disconnect playback unit from 115-volt, 60-hertz power source.	k. N/A
				l. Remove CIPR magazine from playback unit.	l. N/A
				CAUTION	
8	Tape eraser: Prepare to demagnetize CIPR magazine tape.	CIPR magazine		a. Connect tape eraser to 115-volt, 60-hertz power source.	a. N/A
				Lay a sheet of paper between the magazine and tape eraser when demagnetizing the tape to avoid scratching paint or window on the magazine.	
				b. Place the flat, magnetic field surface on the tape eraser on top of the CIPR magazine.	b. N/A
				c. Press and hold tape eraser power switch and slowly move the eraser in a circular motion (approximately two seconds per revolution) for approximately 15 seconds.	c. Demagnetizing CIPR magazine tape.
				d. Gradually increase the diameter of the circular motion and simultaneously lift the eraser away from the CIPR magazine. When the eraser is approximately three feet away, release the power switch.	d. N/A
				e. Disconnect tape eraser from 115-volt, 60-hertz power source.	e. N/A

Step No.	Test equipment	Control settings	Equipment under test	Test procedure	Performance standard
4	CIPR test set: Set controls as required.		CIPR magazine	a. Adjust 28-volt dc power source for +28 ± 1 vdc.	a. N/A
				b. Connect CIPR test set to 28-volt power source.	b. N/A
				c. Ensure that CIPR test set POWER CKT BRKR is energized (pushed in).	c. N/A
				d. Press and release CIPR test set POWER ON switch-indicator.	d. POWER ON indicator and EXTERNAL segment of TAPE END SIMULATION INTERNAL/EXTERNAL indicator shall light. If INTERNAL segment is illuminated, press and release TAPE END SIMULATION INTERNAL/EXTERNAL switch-indicator until EXTERNAL segment illuminates.
				e. Press and hold CIPR test set POWER LAMP TEST switch-indicator.	e. All remaining (8) front panel indicators shall light.
				f. Release CIPR test set POWER LAMP TEST switch-indicator.	f. All front panel indicators except POWER ON indicator and EXTERNAL segment of TAPE END SIMULATION INTERNAL/EXTERNAL indicator shall go out.
				g. Press and release CIPR test set POWER ON switch-indicator.	g. POWER ON indicator and EXTERNAL segment of TAPE END SIMULATION INTERNAL/EXTERNAL indicator shall go out.
	CIPR controller: Used to process audio and timing signals.			h. Install demagnetized CIPR magazine on CIPR controller.	h. N/A
				i. Connect CIPR controller to CIPR test set (fig. 5-4).	i. N/A
				j. Press and release CIPR test set POWER ON switch-indicator.	j. POWER ON indicator and EXTERNAL segment of TAPE END SIMULATION INTERNAL/EXTERNAL indicator shall light. If INTERNAL segment is illuminated, press and release TAPE END SIMULATION INTERNAL/EXTERNAL switch-indicator until EXTERNAL segment illuminates.

Step No.	Test equipment	Control settings	Equipment under test	Test procedure	Performance standard
	Oscillator: Adjust for 1000-hertz, 0.53-volt rms input signal. VTVM: Adjust to measure 0.53 volt rms. Stopwatch: Adjust t start.			k. Connect oscillator to CIPR test set INPUT MONITOR OSCILLATOR connector.	k. N/A
				l. Connect VTVM to CIPR test set INPUT MONITOR PILOT/ALTN (+) and GND (–) test jacks.	l. N/A
				m. Adjust oscillator for 1000-hertz, 0.53-volt rms input signal.	m. VTVM shall indicate 0.53 volt rms. If necessary, adjust attenuator control.
				n. Reset stopwatch to start.	n. N/A
				o. Rotate CIPR test set RECORD COMMAND switch to PILOT and start the stopwatch. Record oscillator signal for 60 ± 5 seconds, then rotate RECORD COMMAND switch to OFF.	o. Record oscillator signal for 60 ± 5 seconds.
				p. Disconnect oscillator from CIPR test set.	p. N/A
				q. Ground CIPR test set INPUT MONITOR OSCILLATOR connector center pin.	q. N/A
				r. Reset stopwatch to start.	r. N/A
				s. Rotate CIPR test set RECORD COMMAND switch to PILOT and start stopwatch. Record grounded input for 330 ± 10 seconds, then rotate RECORD COMMAND switch to OFF.	s. Record grounded input for 330 ± 10 seconds.
				t. Remove ground from CIPR test set INPUT MONITOR OSCILLATOR connector center pin.	t. N/A
				u. Connect oscillator to CIPR test set INPUT MONITOR OSCILLATOR connector.	u. N/A
				v. Adjust oscillator for 3000-hertz, 0.53-volt rms input signal.	v. VTVM shall indicate 0.53-volt rms. If necessary adjust attenuator control.
				w. Reset stopwatch to start.	w. N/A
				x. Rotate CIPR test set RECORD COMMAND switch to VWS and start stopwatch. Record oscillator signals for 90 ± 10 seconds, then RECORD COMMAND switch to OFF.	x. Record oscillator signal for 90 ± 10 seconds.

Step No.	Test equipment	Control settings	Equipment under test	Test procedure	Performance standard
				y. Adjust oscillator for 1000-hertz, 0.53-volt rms input signal.	y. VTVM shall indicate 0.53-volt rms. If necessary, adjust attenuator control.
				z. Press and release CIPR test set 2 switch-indicator.	z. The NO. 2 indicator shall light momentarily and direction of the tape shall change. The END indicator shall be visible through the window on the CIPR magazine.
				aa. Reset stopwatch to start.	aa. N/A
				ab. Rotate CIPR test set RECORD COMMAND switch to SPARE and start the stopwatch. Record oscillator signal for 30 ± 5 seconds, then rotate RECORD COMMAND switch to OFF.	ab. Record oscillator signal for 30 ± 5 seconds.
				ac. Disconnect oscillator from CIPR test set.	ac. N/A
				ad. Ground CIPR test set INPUT MONITOR OSCILLATOR connector center pin.	ad. N/A
				ae. Reset stopwatch to start.	ae. N/A
				af. Rotate CIPR test set RECORD COMMAND switch to PILOT and start stopwatch. Record grounded input for 180 ± 10 seconds, then rotate RECORD COMMAND switch to OFF.	af. Record grounded input for 180 ± 10 seconds.
				ag. Remove ground from CIPR test set INPUT MONITOR OSCILLATOR connector center pin.	ag. N/A
				ah. Connect oscillator to CIPR test set INPUT MONITOR OSCILLATOR connector.	ah. N/A
				ai. Adjust oscillator for 3000-hertz, 0.53-volt rms input signal.	ai. VTVM shall indicate 0.53-volt rms. If necessary, adjust attenuator control.
				aj. Reset stopwatch to start.	aj. N/A
				ak. Rotate CIPR test set RECORD COMMAND switch to VWS and start the stopwatch. Record oscillator signal for 90 ± 10 seconds, then rotate RECORD COMMAND switch to OFF.	ak. Record oscillator signal for 90 ± 10 seconds.
				al. Press and release CIPR test set POWER ON switch-indicator.	al. POWER ON indicator and EXTERNAL segment of TAPE

Step No.	Test equipment	Control settings	Equipment under test	Test procedure	Performance standard
					END SIMULATION INTERNAL/EXTERNAL indicator shall go out.
				em. Deenergize oscillator and VTVM.	em. N/A
				en. Disconnect oscillator and VTVM from CIPR test set.	en. N/A
				eo. Disconnect CIPR controller from CIPR test set.	eo. N/A
				ep. Remove CIPR magazine from CIPR controller.	ep. N/A
5	Playback unit: Set controls as required.	CIPR magazine		a. Insure that playback unit POWER ON/OFF switch is set to OFF.	a. N/A
				b. Insure that playback unit is connected to 115-volt, 60-hertz power source.	b. N/A
				c. Install the recorded CIPR magazine removed in dep on the playback unit.	c. N/A
				d. Insure that playback unit POWER CKT BRKR is energized (pushed in).	d. N/A
				e. Set playback unit tape speed control lever to FAST.	e. N/A
				f. Set playback unit POWER ON/OFF switch to ON.	f. STOP indicator shall light.
				g. Press and release playback unit REWIND switch-indicator.	g. REWIND indicator shall light, STOP indicator shall go out, and tape shall begin to rewind. When the tape is completely rewound, the tape will stop automatically and the STOP indicator will light and REWNID indicator will go out.
				h. Connect a 100K-ohm resistor on a PJ-055B phone plug and install into playback unit RECORD jack.	h. N/A
				i. Connect VTVM across the 100K-ohm load resistor.	i. N/A
				j. Press and release playback unit PLAY switch-indicator.	j. STOP indicator shall go out, PLAY indicator shall light, and tape shall begin to move.
	VTVM: Adjust to measure 0.25 to 1.0 volt rms.			k. While observing VTVM, rotate playback unit CHANNEL SELECTOR switch to VWS, PILOT, and SPARE. Record voltage and db level at each switch position.	k. VTVM shall indicate between 0.25 to 1 volt rms at each switch position.

Step No.	Test equipment	Control settings	Equipment under test	Test procedure	Performance standard
				l. Continue to monitor db level across the 100K-ohm load resistor. When db level drops considerably indicating a no-signal condition, rotate playback unit CHANNEL SELECTOR switch to VWS, PILOT, and SPARE. Record db level monitored at each switch position.	*l.* Record db level monitored at each switch position.
				m. Press and release playback unit STOP switch-indicator.	*m.* PLAY indicator shall go out, STOP indicator shall light, and tape shall stop.
				n. Compare db readings recorded in *k* with readings recorded in *l.*	*n.* Readings recorded in *l* shall be at least 30 db below their respective readings recorded in *k.*
				o. Press and release playback unit PLAY switch-indicator.	*o.* STOP indicator shall go out, PLAY indicator shall light, and tape shall begin to move.
	Stopwatch: Reset to zero.			*p.* Using a stopwatch, measure elapsed time indicated by the playback unit FLT TIME indicator. Start the stopwatch concurrent with a timing pulse and stop the stopwatch with the second timing pulse.	*p.* Stopwatch shall indicate 120 ± 3 seconds.
				q. Press and release playback unit STOP switch-indicator.	*q.* PLAY indicator shall go out, STOP indicator shall light, and tape shall stop.
				r. Connect a 620-ohm resistor on PJ-055B phone plug and install into playback unit HEADSET jack.	*r.* N/A
				s. Connect flutter indicator across the 620-ohm load resistor.	*s.* N/A
				t. Press and release playback unit PLAY switch-indicator.	*t.* STOP indicator shall to out, PLAY indicator shall light, and tape shall begin to move.
	Flutter Indicator: 1. Zero meter a. FUNCTION SW: LEVEL b. Adjust LEVEL control for 1.0. c. FUNCTION SW: DISC. d. Adjust DISCRIMINATOR CENTER for 0 indication.			*u.* Observe db level on VTVM. When db level rises indicating a 3000-hertz signal, rotate playback unit CHANNEL SELECTOR switch to VWS, PILOT, and SPARE. Record wow and flutter indication at each switch position.	*u.* Wow and flutter indications at each switch position shall not exceed 3 percent of the average value of the meter readings.
				v. Remove phone plug from playback unit HEADSET jack.	*v.* N/A

Step No.	Test equipment	Control settings	Equipment under test	Test procedure	Performance standard
	2. For flutter measurement: a. SELECTOR SW: FLUTTER 0-250 CPS b. FUNCTION SW: 2 X 2% c. Read meter 3. For Wow measurement: a. SELECTOR SW: WOW 0.5-6 CPS b. FUNCTION SW: 2 X 2% c. Read meter			w. Set playback unit tape speed control lever to FAST. x. Allow the playback unit to operate in this mode (approximately 10.5 minutes) until a 5000-hertz tone is monitored at the front panel speaker. The instant the 5000-hertz tone is monitored, press and release STOP switch-indicator. y. Set playback unit tape speed control lever to NORMAL. z. Press and release playback unit REVERSE switch-indicator and search for beginning of the 1000-hertz signal, then press and release STOP switch-indicator. aa. Press and release playback unit PLAY switch-indicator. ab. Repeat 5i through 5w. ac. Press and release playback unit STOP switch-indicator. ad. Set playback unit POWER ON/OFF switch to OFF. ae. Deenergize the test equipment and disconnect from the playback unit. af. Remove PJ-055B phone plugs from playback unit front panel jacks and remove load resistors from the phone plugs. ag. Disconnect playback unit from 115-volt, 60-hertz power source. ah. Remove CIPR magazine from the playback unit.	w. Tape shall begin to move at faster rate. x. PLAY indicator shall go out, STOP indicator shall light, and tape shall stop. y. N/A z. N/A aa. STOP indicator shall go out, PLAY indicator shall light, and tape shall begin to move. ab. Same indications should be monitored. ac. PLAY indicator shall go out, STOP indicator shall light, and tape shall stop. ad. STOP indicator shall go out. ae. N/A af. N/A ag. N/A ah. N/A

Section VII. TAPE DRIVE TRANSMISSION ASSEMBLY TESTING PROCEDURE

5-19. General

Test procedures outlined in paragraphs 3-18 and 4-20 should be used to determine if the repaired variable speed drive transmission assembly can be operated within the performance standards. Troubleshooting procedures (para 5-8) should be used to correct operational failure discovered during the tests outlined in paragraphs 3-18 and 4-20.

CHAPTER 6

DEPOT OVERHAUL STANDARDS

Section I. GENERAL

6-1. Applicability of Depot Overhaul Standards

The tests outlined in this chapter are designed to measure the performance capability of a repaired Sound Recorder Set AN/ASH-23 (CIPR) and Sound Reproducer Set AN/ASH-24 (playback unit). A CIPR or playback unit returned to stock should meet the standards provided in these tests. Section I contains general information, section II contains tests to ensure the operability of the CIPR, and section III contains tests to ensure the operability of the playback unit.

6-2. Applicable References

Additional information regarding the CIPR and **playback unit is provided in TM 11-5835-239-12, 16 July 1969.**

6-3. Test Equipment Required

a. The following equipment, or suitable equivalent, should be used when determining compliance with the requirements outlined in the tests for the CIPR.

Equipment	Stock No.	*Qty req*	*Applicable literature*
Sound Reproducer Set AN/ASH-24	5835-179-4891	1	TM 11-5835-239-35
Recorder Test Set TS-2354/ASH-23	6625-435-4779	1	TM 11-6625-1818-35
Multimeter TS-352B/U	6625-242-5023	1	TM 11-6625-366-15
Oscilloscope	6625-053-3112	1	TM 9-6625-2362-12
Electronic Voltmeter ME30E/U	6625-669-0742	1	TM 11-6625-320-12
Signal Generator SG-71/FCC	6625-669-0255	1	TM 11-6625-358-15
Electronic Digital Readout Counter AN/USM-207	6625-911-6368	1	TM 11-6625-700-25
Recorder Control C8203/ASH-23	5835-144-7810	1	TM 11-5835-239-35
Flutter Indicator ID-351	6760-776-6979	1	TM 11-6760-212-12
Spectrum Analyzer TS-723	6625-668-9418	1	TM 11-5097
Bulk Tape Eraser	5835-548-1910	1	
Stopwatch		1	
Phone Plug PJ-055B	5935-192-4760	2	
Resistor, 620-ohm 1/2-watt	5905-279-1761	1	
Resistor, 100K-ohm 1/2-watt	5905-190-8889	1	
Tool Kit TK-100/G	5180-605-0079	1	SB 11-604
Tool Kit TK-105/G	5180-610-8177	1	SB 11-604

b. The following equipment, or suitable equivalent, should be used when determining compliance with the requirements outlined in the tests for the playback unit.

Equipment	*Stock No.*	*Qty req*	*Applicable literature*
Sound Reproducer Set AN/ASH-24	5835-179-4691	1	TM 11-5835-239-35
Recorder Test Set TS-2354/ASH-23	6625-435-4770	1	TM 11-6625-1818-35
Recorder Control C8203/ASH-23	5835-144-7810	1	TM 11-5835-239-35
Sound Recorder Set Magazine MA-27/ASH	5835-144-7311	1	TM 11-5835-239-35
Signal Generator SG-71/FCC	6625-669-0255	1	6625-358-15
Electronic Digital Readout Counter AN/USM-207	6625-911-6363	1	TM 11-6625-700-25
Multimeter TS-352/U	6625-242-5023	1	TM 11-6625-366-15

[illegible]	[illegible]	1	[illegible]
[illegible]	[illegible]	1	
[illegible]		1	
Phone Plug PJ-068B	5935-[illegible]	2	
Resistor, 470-ohm 1/2-watt	5905-[illegible]	1	
Resistor, 100K-ohm 1/2-watt	5905-[illegible]	1	
Tool Kit TK-100/G	5180-[illegible]	1	SB 11-404
Tool Kit TK-105/G	5180-[illegible]	1	SB 11-404

Section II. CIPR DEPOT OVERHAUL STANDARDS

6-4. General

This section contains test procedures to determine the operability of Sound Recorder Set AN/ASH-23. The tests are outlined to allow maintenance personnel to test Recorder Control C8208/ASH-23 (CIPR controller) and Sound Recorder Set Magazine MA-27/ASH (CIPR magazine) separately.

6-5. CIPR Test

a. CIPR Controller Tests. **The following tests can be used to determine if CIPR controller can be operated within specification.**

(1) ***Preliminary procedure***

(*a*) Insure that 28-volt power source is available to provide operating power for Sound Recorder Test Set TS-2854/ASH-23 (CIPR test set).

(b) Verify that CIPR test set POWER CKT BRKR is deenergized.

(c) Adjust 28-volt power source for +28 ±1 volts.

(d) Connect CIPR test set power cable to 28-volt power source,

(e) Energize CIPR test set POWER CKT BRKR.

(f) Press and release CIPR test set POWER ON switch-indicator. The POWER ON and one-half of TAPE END SIMULATION INTERNAL/EXTERNAL indicators shall light.

(g) Press and hold CIPR test set POWER LAMP TEST switch-indicator. All (8) remaining front panel indicators shall light.

(h) Release CIPR test set POWER LAMP TEST switch-indicator. The POWER ON and one-half of TAPE END SIMULATION INTERNAL/EXTERNAL indicators shall remain on **and the remainder** of the front panel indicators **shall extinguish.**

(i) Press and release CIPR test set POWER ON switch-indicator; POWER ON indicator and the illuminated segment of TAPE END SIMULATION INTERNAL/EXTERNAL indicator shall go out.

(*j*) Set CIPR test set RECORD COMMAND and OUTPUT SELECT switches to OFF.

(*k*) Connect CIPR controller to CIPR test set (fig. 3-5).

(2) ***DC voltage check.*** **Figure 3-6 illustrated equipment setup for checking dc voltage.**

(*a*) Insure that preliminary procedure outlined in paragraph 6-5*a*(1) has been completed.

(*b*) Press and release CIPR test set POWER ON switch-indicator; POWER ON and one-half of TAPE END SIMULATION INTERNAL/EXTERNAL indicators shall light.

(*c*) Check dc voltage between CIPR test set DC VOLTAGE +28V (+) and GND (–) test jacks. The voltmeter shall indicate +28 ±2 volts.

(d) Check dc voltage **between** CIPR test set DC VOLTAGE +20V (+) and gnd (-) test jacks. The voltmeter shall indicate +19 ± 2 volts.

(e) check dc voltage between CIPR test & DC VOLTAGE ± 10V (+) and GND (-) *test jacks. The voltmeter shall indicate* +9.5 ± 1 volts.

(f) Check dc voltage between CIPR test set DC VOLTAGE +5V (+) and GND (-) test jacks. The voltmeter shall indicate +4.75 ±0.5 volts.

(g) Press and release CIPR test set POWER ON switch-indicator. The POWER ON indicator and the illuminated segment of TAPE END SIMULATION INTERNAL/EXTERNAL indicator shall go out.

(h) Remove voltmeter test leads from the front panel test jacks.

(3) Magazine *drive motor and timing signals check.* Figure 3-7 illustrated equipment setup for checking magazine drive motor and timing signals.

(a) Ensure that preliminary procedure outlined in paragraph 6-5(1) has been completed.

(b) Press and release CIPR test set POWER ON switch-indicator. The POWER ON and

one-half of the TAPE END SIMULATION INTERNAL/EXTERNAL indicators shall light.

(*c*) Insure that CIPR test set RECORD COMMAND switch is positioned to OFF.

(*d*) Using oscilloscope, check signal between CIPR test set TIMING PULSE (+) and GND (–) test jacks. The oscilloscope shall display waveform A illustrated in figure 3–1.

NOTE

Timing pulse will be displayed once every minute.

(*e*) Rotate CIPR test set RECORD COMMAND switch to VWS.

(*f*) Using oscilloscope, check signal between CIPR test set MOTOR PHASE 1A (+) and GND (–) test jacks. The oscilloscope shall display waveform B illustrated in figure 3–1.

(*g*) Using oscilloscope, check signal between CIPR test set MOTOR PHASE 1B (+) and GND (-) test jacks. The oscilloscope shall display wavefom B illustrated in figure 3-l.

(h) using oscilloscope, check signal between CIPR test set MOTOR PHASE 2A (+) and GND (-) test jacks. The oscilloscope shall display waveform B illustrated in figure 3-l.

(i) Using oscilloscope, check signal between CIPR test set MOTOR PHASE 2B (+) and GND (-) test jacks. The oscilloscope shall display waveform B illustrated in figure 3-l.

(j) Rotate CIPR test set RECORD COMMAND switch to OFF.

(k) Disconnect oscilloscope from CIPR test set.

(l) Connect a counter between CIPR test set MOTOR PHASE 1A (+) and GND (-) test jacks.

(m) Rotate CIPR test set RECORD COM-*MAND* switch to VWS. The counter shall indicate 400 ± 8 Hertz.

(n) Rotate CIPR test set RECORD COMMAND switch to OFF.

(o) Press and release CIPR test set POWER ON switch-indicator. The POWER ON indicator and illuminated segment of TAPE END SIMULATION INTERNAL/EXTERNAL indicator shall go out.

(p) Disconnect counter from CIPR test set.

(4) *Magazine drive sprocket check. The* recorder control should be connected to the CIPR teat set (fig. 3-6).

(a) Insure that preliminary procedure outlined in paragraph 6-5a(1) has been completed.

(*b*) Press and release CIPR test set POWER ON switch-indicator. The POWER ON and one-half of the TAPE END SIMULATION INTERNAL/EXTERNAL indicators shall light.

(*c*) Observe CIPR test set TAPE END SIMULATION INTERNAL/EXTERNAL indicator. If the EXTERNAL segment is illuminated, proceed to the next step. If the INTERNAL segment is illuminated, press and release TAPE END SIMULATION INTERNAL/EXTERNAL switch-indicator until the EXTERNAL segment illuminates.

(*d*) Observe magazine drive sprockets. The sprocket shall move approximately 1/3 revolution per minute. Observe at least three movement

(e) Press and release CIPR test set TAPE END SIMULATION NO. 1 switch-indicator. The NO. 1 indicator illuminates when the switch-indicator is pressed and extinguishes when the switch-indicator is released.

(f) Rotate CIPR test set RECORD COMMAND switch to PILOT. The magazine drive sprocket shall rotate in the counterclockwise direction at approximately 193 rpm.

(g) Rotate CIPR test set RECORD COMMAND switch to OFF. The magazine drive sprocket shall stop.

(h) Rotate CIPR test set RECORD COMMAND switch to VWS. The magazine drive sprocket shall rotate in the counterclockwise direction at approximately 193 rpm.

(i) Press and hold CIPR test set BIAS INHIBIT switch-indicator. The magazine drive sprocket shall stop.

(j) Release CIPR test set BIAS INHIBIT switch-indicator. The magazine drive sprocket shall rotate in the counterclockwise direction at approximately 193 rpm.

(k) Rotate CIPR test set RECORD COMMAND switch to OFF. The magazine drive sprocket shall stop.

(l) Rotate CIPR test set RECORD COMMAND switch to SPARE. The magazine drive sprocket shall rotate in the counterclockwise direction at approximately 193 rpm.

(m) Rotate CIPR test set RECORD COMMAND switch to OFF. The magazine drive sprocket shall stop.

(n) With CIPR test set RECORD COMMAND switch positioned at OFF, observe the magazine drive sprocket. The magazine drive sprocket shall move l/3 revolution per minute in the counterclockwise direction. Observe at least three movements.

(*o*) Press and release CIPR test set TAPE END SIMULATION NO. 2 switch-indicator. The NO. 2 indicator illuminates when the switch-indicator is pressed and extinguishes when the switch-indicator is released.

(*p*) With CIPR test set RECORD COMMAND switch position at OFF, observe the magazine drive sprocket. The magazine drive sprocket shall move 1/3 revolution per minute in the clockwise direction. Observe at least three movements.

(*q*) Rotate CIPR test set RECORD COMMAND switch to PILOT. The magazine drive sprocket shall rotate in the clockwise direction at approximately 193 rpm.

(*r*) Rotate CIPR test set RECORD COMMAND switch to OFF. The magazine drive sprocket shall stop.

(*s*) Rotate CIPR test set RECORD COMMAND switch to VWS. The magazine drive sprocket shall rotate in the clockwise direction at approximately 193 rpm.

(*t*) Press and hold CIPR test set BIAS INHIBIT switch-indicator. The magazine drive sprocket shall stop.

(*u*) Release CIPR test set BIAS INHIBIT switch-indicator. The magazine drive sprocket shall rotate in clockwise direction at approximately 193 rpm.

(*v*) Rotate CIPR test set RECORD COMMAND switch to OFF. The magazine drive sprocket shall stop.

(*w*) Rotate CIPR test set RECORD COMMAND switch to SPARE. The magazine drive sprocket shall rotate in the clockwise direction at approximately 193 rpm.

(*x*) Rotate CIPR test set RECORD COMMAND switch to VWS. The magazine drive sprocket shall continue to rotate in the clockwise direction at approximately 193 rpm.

(*y*) Momentarily press CIPR test set VWS COMMAND INHIBIT switch-indicator. The magazine drive sprocket shall stop.

(*z*) Rotate CIPR test set RECORD COMMAND switch to SPARE momentarily and then return RECORD COMMAND switch to VWS. The magazine drive sprocket shall rotate in the clockwise direction at approximately 193 rpm.

(*aa*) Rotate CIPR test set RECORD COMMAND switch to SPARE. The magazine drive sprocket shall continue to rotate in the clockwise direction at approximately 193 rpm.

(*ab*) Momentarily press CIPR test set VWS COMMAND INHIBIT switch-indicator. The magazine drive sprocket shall not stop and continue to rotate in the clockwise direction at approximately 193 rpm.

(*ac*) Rotate CIPR test set RECORD COMMAND switch to OFF. The magazine drive sprocket shall stop.

(*ad*) Press and release CIPR test set POWER ON switch-indicator. The POWER ON indicator and EXTERNAL segment of TAPE END SIMULATION INTERNAL/EXTERNAL indicator shall extinguish.

(5) *Recorder control output check.* Figure 3-8 illustrates equipment setup for checking recorder control outputs.

(*a*) Insure that preliminary procedure outlined in paragraph 6-5*a*(1) has been completed.

(*b*) Connect VTVM to CIPR test set OUTPUT SELECT MONITOR 1 connector.

(*c*) Connect oscilloscope to CIPR test set OUTPUT SELECT MONITOR 2 connector.

(*d*) Press and release CIPR test set POWER ON switch-indicator. The POWER ON and one-half of the TAPE END SIMULATION INTERNAL/EXTERNAL indicators shall light.

(*e*) Observe CIPR test set TAPE END SIMULATION INTERNAL/EXTERNAL indicator. If the EXTERNAL segment is illuminated, proceed to the next step. If the INTERNAL segment is illuminated, press and release TAPE END SIMULATION INTERNAL/EXTERNAL switch-indicator until the EXTERNAL segment illuminates.

(*f*) Press and release CIPR test set TAPE END SIMULATION NO. 1 switch-indicator. The NO, 1 indicator illuminates when the switch-indicator is pressed and extinguishes when the switch-indicator is released.

(*g*) Rotate CIPR test set OUTPUT SELECT switch sequentially to PILOT A, VWS A, and SPARE A. The VTVM shall indicate between 0.95 and 3.8 volts rms (bias head current) in each switch position.

(*h*) Rotate CIPR test set OUTPUT SELECT switch to TIME A. The oscilloscope shall display waveform C illustrated in figure 3-l.

(*i*) Rotate CIPR test set OUTPUT SELECT switch to OFF.

(*j*) Press and release CIPR test set TAPE END SIMULATION NO. 2 switch-indicator. The NO. 2 indicator illuminates when the switch-indicator is pressed and extinguishes when the switch-indicator is released.

(*k*) Rotate CIPR test set OUTPUT SELECT switch sequentially to PILOT B, VWS B, and SPARE B. The VTVM shall indicate between 0.95 and 3.8 volts rms (bias head current) in each switch position.

(*l*) Rotate CIPR test set OUTPUT SELECT switch to TIME B. The oscilloscope shall display waveform C illustrated in figure 8-1.

(m) Rotate CIPR test set OUTPUT SELECT switch to OFF.

(n) Press and release CIPR test set TAPE END SIMULATION NO. 1 switch-indicator. The NO. 1 indicator illuminates when the switch-indicator is pressed and extinguishes when the switch-indicator is released.

(o) Connect another VTVM between CIPR test set INPUT MONITOR PILOT/ALTN (+) and GND (–) test jacks.

(p) Connect oscillator to CIPR test set INPUT MONITOR OSCILLATOR connector.

(q) Energize oscillator and allow sufficient warmup time.

(r) Adjust oscillator frequency for 300 Hertz with an amplitude of 0.53-volt rms. Amplitude can be monitored on the VTVM connected between the INPUT MONITOR PILOT/ ALTN and GND test jacks.

(s) Press and hold CIPR test set BIAS INHIBIT switch-indicator.

(t) While CIPR test set BIAS INHIBIT switch-indicator is pressed, rotate CIPR test set OUTPUT SELECT switch sequentially to PILOT A, VWS A, and SPARE A. The VTVM connected to OUTPUT SELECT MONITOR 1 shall indicate between 0.47 and 1.9-volt rms in each switch position.

(u) Release CIPR test set BIAS INHIBIT switch-indicator and rotate OUTPUT SELECT switch to 0FF.

(v) Press and release CIPR test set TAPE END SIMULATION NO. 2 switch-indicator. The NO. 2 indicator illuminates when the switch-indicator is pressed and extinguishes when the switch-indicator is released.

(w) Press and hold CIPR test set BIAS INHIBIT switch-indicator.

(x) While CIPR test set BIAS INHIBIT switch-indicator is pressed, rotate CIPR test set OUTPUT SELECT switch sequentially to PILOT B, VWS B, and SPARE B. The VTVM connected to OUTPUT SELECT MONITOR 1 shall indicate between 0.47 and 1.0-volt rms in each switch position.

(y) Release CIPR test set BIAS INHIBIT switch-indicator and rotate OUTPUT SELECT switch to OFF?

(z) Adjust oscillator frequency for 1000 Hertz with an amplitude of 0.53-volt rms. Amplitude can be monitored on the VTVM connected between the INPUT MONITOR PILOT/ALTN and GND test jacks.

(aa) Repeat *s* through *y*.

(ab) Adjust oscillator frequency for 3000 Hertz with an amplitude of 0.58-volt rms. Amplitude can be monitored on the VTVM connected between the INPUT MONITOR PILOT/ ALTN and GND test jacks.

(ac) Repeat *s* through *y*.

(ad) Disconnect VTVM from CIPR test set OUTPUT SELECT MONITOR 1 connector and connect VTVM to CIPR test set INPUT MONITOR PILOT MIC connector. The VTVM shall indicate 1.76 ±0.18-millivolt rms.

(ae) Disconnect VTVM from CIPR test set INPUT MONITOR PILOT MIC connector and reconnect to CIPR test set OUTPUT SELECT MONITOR 1 connector.

(af) Adjust oscillator frequency for 1000 Hertz and maintain the amplitude of 0.53-volt rms.

(ag) - Press and hold CIPR test set BIAS INHIBIT switch-indicator.

(ah) Rotate CIPR test set OUTPUT SELECT switch to PILOT B and record db level monitored on the VTVM connected to OUTPUT SELECT MONITOR 1 connector.

(ai) Rotate CIPR test set OUTPUT SELECT switch to VWS B and record db level monitored on the VTVM connected to OUTPUT SELECT MONITOR 1 connector.

(aj) Rotate CIPR test set OUTPUT SELECT switch to SPARE B and record db level monitored on the VTVM connected to OUTPUT SELECT MONITOR 1 connector.

(ak) Disconnect oscillator from CIPR test set INPUT MONITOR OSCILLATOR connector.

(al) Ground CIPR test set INPUT MONITOR OSCILLATOR connector center pin.

(am) Rotate CIPR test set OUTPUT SELECT switch to PILOT B and record db level monitored on the VTVM connected to OUTPUT SELECT MONITOR 1 connector. The db level recorded during this step shall be at least 38 db below the level recorded in ah.

(an) Rotate CIPR test set OUTPUT SELECT switch to VWS B and record db level monitored on the VTVM connected to OUTPUT SELECT MONITOR 1 connector. The db level recorded during this step shall be at least 38 db below the level recorded in *ai*.

(ao) Rotate CIPR test set OUTPUT SELECT switch to SPARE B and record db level monitored on the VTVM connected to OUTPUT SELECT MONITOR 1 connector. The db level recorded during this step shall be at least 38 db below the level recorded in *aj*.

(*ap*) Release CIPR test set BIAS INHIBIT switch-indicator and rotate OUTPUT SELECT switch to OFF.

(*aq*) Press and release CIPR test set POWER ON switch-indicator. The POWER ON indicator and EXTERNAL segment of TAPE END SIMULATION INTERNAL/EXTERNAL indicator shall extinguish.

(*ar*) Deenergize test equipment and disconnect from the CIPR test set.

b. CIPR Magazine Tests. The following tests can be used to determine if the CIPR magazine can be operated within specification.

NOTE

The test outlined in this paragraph can also be used to determine if Sound Recorder Set AN/ASH-23 (CIPR) can be operated within specification.

(1) *Preliminary procedure.*

(*a*) Insure that 28-volt dc power source is available to provide operating voltage for Sound Recorder Test Set TS-2854/ASH-23 (CIPR test set) and 115-volt. 60-Hertz ac power is available to provide operating voltage for Sound Reproducer Set AN/ASH-24 (playback unit).

(*b*) Obtain a known good CIPR test set.

(*c*) Obtain a known good Recorder Control C8208/ASH-23 (CIPR controller).

(*d*) Obtain a known good playback unit.

(e) Insure that playback unit POWER ON/OFF switeh is positioned to OFF.

(f) connect playback unit to 115-volt, 60-Hertz power source.

(2) *Tape* length test

(a) Install CIPR magazine on playback unit (fig. 4-13).

(b) Energize (push in) playback unit POWER CKT BRKR.

(c) Set playback unit POWER ON/OFF switch to ON. The STOP indicator shall light.

(d) set playback unit tape speed control level to NORMAL.

(e) Press and release playback unit PLAY switch-indicator. The PLAY indicator shall light, STOP indicator shall go out, and the tape shall begin to move.

(f) Allow playback unit to operate in this mode for ten minutes, then press and release playback unit STOP switch-indicator. The STOP indicator shall light, PLAY indicator shall go out, and the tape shall stop.

(g) Set Playback unit tape speed control lever to FAST.

(h) Press and release playback unit REWIND switch-indicator. The REWIND indicator shall light, STOP indicator shall go out, and the tape shall begin to rewind. When the tape is completely rewound, STOP indicator shall light, REWIND indicator shall go out, and the tape shall stop.

(*i*) Set stopwatch to start.

(*j*) Press and release playback unit PLAY switch-indicator and start the stopwatch. The PLAY indicator shall light, STOP indicator shall go out, and the tape shall begin to move.

(*k*) Allow the tape to run its full length (both direction). When the tape reaches its start position the tape will automatically stop and the STOP indicator shall light and the PLAY indicator shall go out. When the tape stops, stop the stopwatch. The stopwatch shall indicate an elapsed time of 12 ±1.2 minutes.

(*l*) Set playback unit POWER ON/OFF switch to OFF. The STOP indicator shall go out.

(*m*) Remove CIPR magazine from the playback unit.

(*n*) Connect CIPR test set to 28-volt power source.

(o) Observe CIPR test set POWER ON indicator. If the POWER ON indicator is illuminated, press and release POWER ON switch-indicator until the POWER ON indicator extinguishes.

(p) Install the CIPR magazine removed in *(m)* on a CIPR controller.

(q) Connect CIPR controller to CIPR test set (fig. 5-4).

(r) Insure that CIPR test set POWER CKT BRKR is energized (pushed in).

(s) Press and release CIPR test set POWER ON switch-indicator. The POWER ON indicator and the EXTERNAL segment of TAPE END SIMULATION INTERNAL/EXTERNAL indicator shall light. If the INTERNAL SEGMENT of the TAPE END SIMULATION INTERNAL/EXTERNAL indicator is illuminated, press and release the TAPE END SIMULATION INTERNAL/EXTERNAL switch-indicator until the EXTERNAL segment illuminates.

(t) Set the stopwatch to start.

(u) Rotate CIPR test set RECORD COMMAND switch PILOT and start the stopwatch. The tape shall begin to move.

(v) Allow the tape to run its full length (both direction). When the tape reaches the start position noted by the indication observed through the window in the magazine cover, rotate the CIPR test set RECORD COMMAND m&h to OFF and stop the stopwatch. Total timer

elapsed between start and stop shall not be less than 54 minutes.

(w) Press and release CIPR test set POWER ON switch-indicator. The POWER ON indicator and the EXTERNAL segment of the TAPE END SIMULATION INTERNAL/EXTERNAL indicator shall go out.

(z) Remove the CIPR magazine from the CIPR controller.

(3) *Audio record test.*

(a) Insure that the playback unit is connected to 115-volt, 60-Hertz power source and the POWER ON/OFF switch is set to OFF.

(b) Install the CIPR magazine removed from the CIPR controller in previous paragraph on the playback unit.

(c) Insure that playback unit POWER CKT BRKR is energized (pushed in).

(d) Set playback unit POWER ON/OFF switch to ON. The STOP indicator shall light.

(e) Set playback unit tape speed control lever to FAST.

(f) Press and release playback unit PLAY switch-indicator. The PLAY indicator shall light STOP indicator shall go out, and the tape shall begin to move.

(g) Allow the playback unit to operate in the play mode for one minute, then press and release STOP switch-indicator. The STOP indicator shall light PLAY indicator shall go out, and the tape shall stop.

(h) Press and release playback unit REWIND switch-indicator. The REWIND indicator shall light, STOP indicator shall go out, and the tape shall begin to rewind. When the tape is completely rewound, the tape will automatically stop and the STOP indicator will light and REWIND indicator will go out.

(i) Set playback unit POWER ON/OFF switch to OFF.

(j) Disconnect playback unit from 115-volt, 60-Hertz power source.

(k) Remove the CIPR magazine from the playback unit.

(l) Connect tape eraser to 115-volt, 60-Hertz power source.

CAUTION

To prevent scratches to the magazine paint and window, lay a sheet of paper between the magazine and the tape eraser when demagnetizing the tape.

(m) Place the flat, magnetic-field surface on the eraser on top of the CIPR magazine.

(n) Press and hold the tape eraser power switch and slowly move the eraser in a circular motion (approximately two seconds per revolution) for approximately 15 seconds.

(o) Gradually increase the diameter of the circular motion and simultaneously lift the eraser away from the CIPR magazine. When the eraser is approximately three feet away, release the eraser power switch.

(p) Disconnect the tape eraser from 115-volt, 60-Hertz power source.

(q) Adjust 28-volt dc power source for +28 ±1 volts.

(r) Connect CIPR test set to the 28-volt power source.

(s) Insure that CIPR test set POWER CKT BRKR is energized (pushed in).

(t) Press and release CIPR test set POWER ON switch-indicator. The POWER ON indicator and the EXTERNAL segment of TAPE END SIMULATION INTERNAL/EXTERNAL indicator shall light. If the INTERNAL segment of the TAPE END SIMULATION INTERNAL/EXTERNAL indicator is illuminated, press and release the TAPE END SIMULATION INTERNAL/EXTERNAL switch-indicator until the EXTERNAL segment illuminates.

(u) Press and hold CIPR test set POWER lamp test switch-indicator. All remaining (8) front panel indicators shall light.

(v) Release CIPR test set POWER LAMP TEST switch-indicator. All front panel indicators except POWER ON and EXTERNAL *segment* of the TAPE END SIMULATION INTERNAL/EXTERNAL indicators shall go out.

(w) Press and release CIPR test set POWER ON switch-indicator. The POWER ON and EXTERNAL segment of the TAPE END SIMULATION INTERNAL/EXTERNAL indicators shall go out.

(x) Install the initialized and erased CIPR magazine on the CIPR controller.

(y) Connect CIPR controller to CIPR test set (fig. 64).

(z) Press and release CIPR test set POWER ON switch-indicator. The POWER ON indicator and the EXTERNAL segment of the TAPE END SIMULATION INTERNAL/EXTERNAL indicator shall light. If the INTERNAL segment is illuminated, press and release TAPE END SIMULATION INTERNAL/EXTERNAL switch indicator until EXTERNAL segment illuminates.

(aa) Connect oscillator to CIPR test set INPUT MONITOR OSCILLATOR connector.

[illegible] VTVM between CIPR test set INPUT MONITOR PILOT/ALTN (+) and GND (-) test jacks.

(*ac*) Adjust oscillator frequency control for 1000 Hertz and attenuator control for 0.58 volt rms.

NOTE

A stopwatch will be required to perform the following procedures.

(*ad*) Rotate CIPR test set RECORD Command switch to PILOT and record oscillator signal for 60 ±5 seconds, then rotate the RECORD COMMAND switch to OFF.

(*ae*) Disconnect the oscillator from CIPk test set.

(*af*) Ground CIPR test set INPUT MONITOR OSCILLATOR connector center pin.

(*ag*) Rotate CIPR test set RECORD COMMAND switch to PILOT and record grounded input for 880 ±10 seconds, then rotate the RECORD COMMAND switch to OFF.

(*ah*) Remove ground from INPUT MONITOR OSCILLATOR connector center pin and reconnect oscillator to INPUT MONITOR OSCILLATOR connector.

(*ai*) Adjust oscillator frequency control for 3000 Hertz and attenuator control for 0.58 volt rms.

(*aj*) Rotate CIPR test set RECORD COMMAND switch to VWS and record oscillator signal for 90 ±10 seconds, then rotate the RECORD COMMAND switch to OFF.

(*ak*) Adjust oscillator frequency control for 1000 Hertz and attenuator control for 0.68 Volt rms.

(*al*) Press and release CIPR test set TAPE END SIMULATION NO. 2 switch-indicator.

(*am*) Observe the word END through the window on the CIPR magazine.

(*an*) Rotate CIPR test set RECORD COMMAND switch to SPARE and record oscillator signal for 30 ± 5 seconds, then rotate RECORD COMMAND switch to OFF.

(*ao*) Disconnect the oscillator from CIPR test set.

(*ap*) Ground CIPR test set INPUT MONITOR OSCILLATOR connector center pin.

(*aq*) Rotate CIPR test set RECORD COMMAND switch to PILOT and record grounded input for 180 ± 10 seconds, then rotate RECORD COMMAND witch to OFF.

(*ar*) Remove grouud from INPUT MONITOR OSCILLATOR connector center pin and reconnect oscillator to INPUT MONITOR OSCILLATOR connector.

(*as*) Adjust oscillator frequency control for 3000 Hertz and attenuator control for 0.58 volt rms.

(*at*) Rotate CIPR test set RECORD COMMAND switch to VWS and record oscillator signal for 90 ±10 seconds, then rotate the RECORD COMMAND switch to OFF.

(*au*) Press and release CIPR test set POWER ON switch-indicator. The POWER ON indicator and EXTERNAL segment of the TAPE END SIMULATION INTERNAL/EXTERNAL indicator shall go out.

(*av*) Deenergize the oscillator and VTVM and disconnect from CIPR test set.

(*aw*) Disconnect CIPR controller from CIPR test set.

(*ax*) Remove the CIPR magazine from the CIPR controller.

(4) *Audio quality test.* Figure 5-5 illustrates equipment setup for CIPR magazine audio quality test.

(a) Insure that playback unit POWER ON/OFF switch is set to OFF.

(b) Insure that playback unit is connected to 115-volt, 60-Hertz power source.

(c) Install the CIPR magazine under test on the playback unit.

(d) Insure that playback unit POWER CKT BRKR is energized (pushed in).

(e) Set playback unit tape speed control lever to FAST.

(f) Set playback unit POWER ON/OFF switch to ON. The STOP indicator shall light.

(g) Press and release playback unit REWIND switch-indicator. The REWIND indicator shall light, STOP indicator shall go out, and the tape shall begin to rewind to the start position. When the tape is completely rewound, the tape will automatically stop and the STOP indicator will light and the REWIND indicator will go out.

(h) Connect a 100K-ohm load resistor on a PJ-055B phone plug and install the phone plug in the RECORD jack on the playback unit front panel.

(i) Connect a VTVM across the 100K-ohm load.

(j) Press and release playback unit PLAY switch-indicator. The STOP indicator shall go out, PLAY indicator shall light, and the tape shall begin to move.

(k) While observing the VTVM, rotate playback unit CHANNEL SELECTOR switch to VWS, PILOT, and SPARE. The VTVM shall

indicate between 0.25 and 1 volt rms at each switch position. Also, record db level at each switch position.

(*l*) Continue to monitor the db level across the 100K-ohm load. When the db level drops considerably indicating no-signal condition, rotate the playback unit CHANNEL SELECTOR switch to VWS, PILOT, and SPARE and record db level monitored at each switch position.

(*m*) Press and release playback unit STOP switch-indicator. The PLAY indicator shall go out, STOP indicator shall light, and the tape shall stop.

(*n*) Compare db readings recorded in step *k* with readings recorded in *l*. The readings recorded in *l* shall be at least 30 db below their respective readings recorded in *k*.

(*o*) Press and release playback unit PLAY switch-indicator. The STOP indicator shall go out, PLAY indicator shall light and the tape shall move.

(p) Using a stopwatch meas- the elapsed time indicated by the playback unit FLT TIME indicator. Start the stopwatch concurrent with a pulse and stop the stopwatch with the second timing pulse. The stopwatch shall indicate l20 ±3 seconds.

(q) Connect a 620-ohm load resistor on another PH-055B phone plug and install the phone plug in the HEADSET jack on the playback unit front panel.

(r) Connect a wow and flutter indicator across the 620-ohm load.

(*s*) When the db level indicated on the VTVM rises indicating a 3000 Hertz signal, rotate playback unit CHANNEL SELECTOR to VWS, PILOT, and SPARE and record wow and flutter indication observed at each switch position. The wow and flutter indications at each switch position shall not exceed 3 percent of the average value of the meter reading.

(*t*) Remove phone plug from playback unit HEADSET jack.

(*u*) Set playback unit tape speed control lever to FAST. The tape movement shall increase.

(*v*) Allow the playback unit to operate (approximately 10.5 minutes) in the fast mode until a 5000 Hertz tone is monitored at the front panel speaker. The instant the 5000 Hertz tone is monitored, set the tape speed control lever to NORMAL.

(w) Repeat *k through 8.*

(x) Press and release playback unit STOP switch-indicator. The PLAY indicator shall go out, STOP indicator shall light, and the tape shall stop.

(y) Set playback unit POWER ON/OFF switch to OFF. The STOP indicator shall go out.

(z) Deenergize the test equipment and disconnect from the load resistors.

(aa) Remove the PJ-055B phone plugs from the front panel and remove the resistors from the phone plugs.

(ab) Disconnect the playback unit from 115-volt, 60 Hertz power source.

(ac) Remove the CIPR magazine from the playback unit.

Section III. PLAYBACK UNIT DEPOT OVERHAUL

6-6. General

This section contains procedures to determine the operability of Sound Reproducer Set AN/ASH-24 (playback unit). Procedures are provided for fabricating a test tape, testing the playback unit without a test tape, and testing the playback unit using the fabricated test tape.

6-7. Fabricating Test Tape

a. Preliminary Procedure. The procedure outlined in this paragraph should be accomplished prior to making the test tape.

(1) Obtain known good unrecorded CIPR magazine from storage.

(2) Connect playback unit to 115-volt, 60-Hertz power source.

(3) Insure that playback unit POWER ON/OFF switch is set to OFF.

(4) Install CIPR magazine on the playback unit (fig. 4-12).

(5) Set playback unit tape speed control lever to NORMAL.

(6) Set playback unit CHANNEL SELECTOR switch to ALL.

(7) Insure that playback unit POWER CKT BRKR circuit breaker is energized (closed).

(8) Set playback unit POWER ON/OFF switch to ON. The STOP indicator shall light.

(9) Press and release playback unit PLAY switch-indicator. The STOP indicator shall go out, PLAY indicator shall light, and the tape shall begin to move.

(10) Rotate playback unit VOLUME control to INCR and allow the playback unit to operate in the play mode for approximately one minute, then press and release the STOP switch-indicator. When the STOP switch-indicator is pressed and released, the STOP indicator shall light, PLAY indicator shall go out, and the tape shall stop.

(11) Set playback unit tape speed control lever to FAST.

(12) Press and release playback unit REWIND switch-indicator. The STOP indicator shall go out. REWIND indicator shall light, and the tape shall begin to rewind to the start position. When the tape is rewound to the start position, the REWIND indicator shall go out, STOP indicator shall light, and the tape shall stop.

(13) Set playback unit tape speed control lever to NEUT.

(14) Set playback unit POWER ON/OFF switch to OFF. The STOP indicator shall go out.

(15) Disconnect playback unit from the 115-volt, 60-Hertz power source.

(16) Remove the CIPR magazine from the playback unit.

(17) Move the CIPR magazine to an area sufficiently shielded from the playback unit.

(18) Connect the tape eraser to 115-volt, 60-Hertz power source.

(19) Place the flat, magnetic-field surface of the tape eraser on top of the CIPR magazine cover.

(20) Press and hold the tape eraser power switch and slowly move the eraser in a circular motion while maintaining contact between the flat surface of the eraser and the CIPR magazine cover.

(21) Continue to move the tape eraser in a circular motion (approximately two seconds per revolution) for approximately 15 seconds.

(22) Gradual1y increase the diameter of the circular motion and simultaneously lift the eraser away from the CIPR magazine. When the tape eraser is approximately three feet away, release the tape eraser power switch.

(23) Disconnect the tape eraser from the 115-volt, 60-Hertz power source.

b.. Test Tape Fabrication. The Following procedure should be used to fabricate a test tape. Figure 4-12 illustrates equipment setup for fabricating a test tape.

NOTE

Read through this procedure and understand each step before attempting to make the test tape. Time between each step must be kept to a minimum.

(1) Obtain a known good Sound Recorder Test Set TS-2864/ASH-23 (CIPR test set).

(2) Obtain a known good Recorder Control C8208/ASH-23 (CIPR controller).

(3) Insure that CIPR test set RECORD COMMAND and OUTPUT SELECT switches are positioned to OFF.

(4) Connect CIPR test set to positive 28-volt power source.

(5) Observe CIPR test set POWER ON indicator. If POWER ON indicator is illuminated, press and release POWER ON switch-indicator until the POWER ON indicator goes out.

(6) Install the CIPR magazine processed in paragraph 6-5a on the CIPR controller.

(7) Connect CIPR test set test cable connector AlW2Pl to CIPR controller A1A5J2 connector.

(8) Connect an oscillator to CIPR test set OSCILLATOR connector.

(9) Connect a counter and a VTVM to the oscillator to monitor the oscillator output.

(10) Turn on power switches on the oscillator, counter, and VTVM.

(11) Allow sufficient warmup time for the oscillator, counter, and VTVM before proceeding to the next stop.

(12) Adjust oscillator frequency control for 1000 ± 1 Hertz.

(13) Adjust oscillator attenuator control for 1 volt rms.

NOTE

Insure that VTVM indicates 1 volt rms whenever the oscillator frequency is changed.

(14) Press and release CIPR test set POWER ON switch-indicator. The POWER ON indicator shall light.

(15) Observe CIPR test set TAPE END SIMULATION INTERNAL/EXTERNAL indicator. The EXTERNAL portion of the indicator shall be illuminated. If the INTERNAL portion is illuminated, press and release TAPE END SIMULATION INTERNAL/EXTERNAL switch-indicator until EXTERNAL portion is illuminated.

(16) Press and release CIPR test set TAPE END SIMULATION NO. 1 switch-indicator. The NO. 1 indicator shall light momentarily while

TAPE END SIMULATION NO. 1 switch-indicator is pressed.

(17) Set CIPR test set RECORD COMMAND switch to PILOT and record 1000-Hertz signal for two minutes, then set RECORD COMMAND switch to OFF. Observe tape movement during recording. The tape shall move in the counterclockwise direction.

(18) Ground CIPR test set INPUT MONITOR PILOT/ALTN and INPUT MONITOR SP test jacks.

(19) Adjust oscillator frequency control for 300 ±1 hertz.

(20) Set CIPR test set RECORD COMMAND switch to VWS and record 300-Hertz signal for one minute, then set RECORD COMMAND switch to OFF.

(21) Remove ground from CIPR test set INPUT MONITOR PILOT/ALTN test jack and ground INPUT MONITOR VWS test jack.

(22) Adjust oscillator frequency control for 1000 ±1 Hertz.

(23) Set CIPR test set RECORD COMMAND switch to PILOT and record 1000-Hertz signal for one minute, then set RECORD COMMAND switch to OFF.

(24) Remove ground from CIPR test set INPUT MONITOR SP test jack and ground INPUT MONITOR PILOT/ALTN test jack.

(26) Adjust oscillator frequency control for 3000 ± 1 Hertz.

(26) Set CIPR test set RECORD COMMAND switch to SPARE and record 3000-Hertz signal for one minute, then set RECORD COMMAND switch to OFF.

(27) Press and release CIPR test set POWER ON switch-indicator. The POWER ON indicator shall go out.

(28) Remove ground from CIPR test set INPUT MONITOR PILOT/ALTN and INPUT MONITOR VWS test jack

(29) Disconnect oscillator input to the CIPR test set.

(30) Press and release CIPR test set POWER *ON* switch-indicator. The POWER ON indicator shall light.

(31) Set CIPR test set RECORD COMMAND switch to PILOT and allow CIPR to operate in the record mode for 20 seconds, then set RECORD COMMAND switch to OFF.

(32) With CIPR test set RECORD COMMAND switch positioned at OFF, record timing pulses for 20 minutes.

(33) After recording timing pulses for 20 minutes, set CIPR test set COMMAND RECORD switch to PILOT and allow CIPR to operate in the record mode for 20 seconds, then set RECORD COMMAND switch to OFF.

(34) Press and release CIPR test set POWER ON switch-indicator. The POWER ON indicator shall go out.

(35) Reconnect oscillator input to the CIPR test set.

(36) Press and release CIPR test set POWER ON switch-indicator. The POWER ON indicator shall light.

(37) Adjust oscillator frequency control for 300 ±1 Hertz.

(38) Set CIPR test set RECORD COMMAND switch to PILOT and record 300-Hertz signal for one minute, then set RECORD COMMAND switch to OFF.

(39) Adjust oscillator frequency control for 1000 ± Hertz.

(40) Set CIPR test set RECORD COMMAND switch to PILOT and record 1000-Hertz signal for one minute, then set RECORD COMMAND switch to OFF.

(41) Adjust oscillator frequency control for 3000 ± Hertz.

(42) Set CIPR test set RECORD COMMAND switch to PILOT and record 3000-Hertz signal for one minute, then set RECORD COMMAND switch to OFF.

(43) Press and release CIPR test set POWER ON switch-indicator. The POWER ON indicator shall go out.

(44) Disconnect oscillator input to the CIPR test set.

(45) Press and release CIPR test set POWER ON switch-indicator. The POWER ON indicator shall light.

(46) Set CIPR test set RECORD COMMAND switch to PILOT and allow CIPR to op erate in the record mode for 20 seconds, then set RECORD COMMAND switch to OFF.

(47) With CIPR test set RECORD COMMAND switch positioned at OFF, record timing pulses for ten minutes.

(48) After recording timing pulses for ten minutes, set CIPR test set RECORD COMMAND switch to PILOT and allow CIPR to operate in the record mode for 20 seconds, then set RECORD COMMAND switch to OFF.

(49) Press and release CIPR test set POWER ON switch-indicator. The POWER ON indicator shall go out.

(50) Reconnect oscillator input to the CIPR test set.

(51) Press and release CIPR test set POWER ON switch-indicator. The POWER ON indicator shall light.

(52) Adjust oscillator frequency control for 1000 ±1 Hertz.

(53) Set CIPR test set RECORD COMMAND switch to PILOT and record 1000-Hertz signal for two minutes, then set RECORD COMMAND switch to OFF.

(54) Press and release CIPR test set POWER ON switch-indicator. The POWER ON indicator shall go out.

(55) Disconnect oscillator input to the CIPR test set.

(56) Press and release CIPR test set POWER ON switch-indicator. The POWER ON indicator shall light.

(57) Set CIPR test set RECORD COMMAND switch to PILOT and allow CIPR to operate in the record mode for six minutes, then set RECORD COMMAND switch to OFF.

(58) Press and release CIPR test set TAPE END SIMULATION NO. 2 switch-indicator. The NO. *2* indicator shall light momentarily while TAPE END SIMULATION NO. 2 switch-indicator is pressed.

(59) Set CIPR test set RECORD COMMAND switch to PILOT and allow CIPR to operate in the record mode for one minute, then set RECORD COMMAND switch to OFF. Observe tape movement during recording. The tape shall move in the clockwise direction.

(60) Press and release CIPR test set POWER ON switch-indicator. The POWER ON indicator shall go out.

(61) Reconnect oscillator input to the CIPR test set.

(62) Adjust oscillator frequency control for 1000 ± Hertz

(63) Press and release CIPR test set POWER ON switch-indicator. The POWER ON indicator shall light.

(64) Set CIPR test set RECORD COMMAND switch to PILOT and record 1000-Hertz signal for two minutes, then set RECORD COMMAND switch to OFF. Observe tape movement during recording. The tape shall move in the clockwise direction.

(65) Repeat 18 through 55.

(66) Disconnect CIPR controller from CIPR test set

(67) Turn off operating power to the oscillator, counter, and VTVM.

(68) Disconnect the counter and VTVM from the oscillator.

(69) Disconnect CIPR magazine from CIPR controller and identify.

6-8. Playback Unit Tests

a. Playback Unit Test without Test Tape. The following procedure can be used to determine the operability of the magazine drive circuit.

(1) *Preliminary procedure.*

(*a*) Insure that playback unit tape speed control lever is set to NEUT.

(*b*) Insure that playback unit POWER ON/OFF switch is set to OFF.

(*c*) Obtain a jumper wire.

(d) Connect the playback unit to 115-volt 60-Hertz ac power source.

(2) Test without test tape.

(a) Insure that preliminary procedure outlined in paragraph 6-5a(1) has been completed.

(b) Set playback unit POWER ON/OFF switch to ON. The STOP indicator shall light.

(c) Observe magazine drivecoupling gear. The gear is not rotating.

(d) Set playback unit tape speed control lever to NORMAL.

(e) Using a jumper wire, momentarily ground pin 11 to pin 12 on front panel AlW2J3 connector.

(f) Press and release playback unit REWIND switch-indicator. The STOP indicator shall go out, REWIND indicator shall light, and the magazine drive coupling gear shall rotate in the B (clockwise) direction.

(g) Press and release playback unit STOP switch-indicator. The REWIND indicator shall go out, STOP indicator shall light, and the magazine drive coupling gear shall stop rotating.

(h) Press and release playback unit PLAY switch-indicator. The STOP indicator shall go out, PLAY indicator shall light, and the magazine drive coupling gear shall rotate in the B (clockwise) direction.

(i) Press and release playback unit REVERSE switch-indicator. The PLAY indicator shall go out, REVERSE indicator shall light, and the magazine drive coupling gear shall stop momentarily and begin to rotate in the A (counterclockwise) direction.

(j) Press and release playback unit STOP switch-indicator. The REVERSE indicator shall go out, STOP indicator shall light, and the magazine drive coupling gear shall stop rotating.

(k) Using a jumper wire, momentarily ground pin 18 to pin 12 on front panel A1W2J3 connector.

(l) Press and release playback unit PLAY switch-indicator. The STOP indicator shall go out, PLAY indicator shall light, and the magazine drive coupling gear shall rotate in the A (counterclockwise) direction.

(m) Press and release playback unit REVERSE switch-indicator. The PLAY indicator shall go out, REVERSE indicator shall light, and the magazine drive coupling gear shall stop momentarily and begin to rotate in the B (clockwise) direction.

(n) Press and release playback unit STOP switch-indicator. The REVERSE indicator shall go out, STOP indicator shall light, and the magazine drive coupling gear shall stop rotating.

(o) Press and release playback unit REWIND switch-indicator. The STOP indicator shall go out, REWIND indicator shall light, and the magazine drive coupling gear shall rotate in the B (clockwise) direction.

(p) Press *and* release playback unit STOP switch-indicator. The REWIND indicator shall go out, STOP indicator shall light, and the magazine drive coupling gear shall stop rotating.

(q) Set playback unit tape speed control lever to FAST.

(r) Press and releaae playback unit PLAY switch-indicator. The STOP indicator shall go out, PLAY indicator shall light, and the magazine drive coupling gear shall rotate in the A (counterclockwise) direction.

(s) Observe speed of magazine drive coupling gear rotation. The magazine drive coupling gear shall be rotating at a speed five times faster than normal.

(t) Press and release playback unit STOP switch-indicator. The PLAY indicator shall go out, STOP indicator shall light, and the magazine drive coupling gear shall stop within five Seconds.

(u) Press and release playback unit REWIND switch-indicator. The STOP indicator shall go out, REWIND indicator shall light, and the magazine drive coupling gear shall rotate in the B (counterclockwise) direction at the speed observed in (s).

(v) Press and release playback unit STOP switch-indicator. The REWIND Indicator shall go out, STOP indicator shall light, and the magazine drive coupling gear shall stop within five seconds.

(w) Set playback unit POWER ON/OFF switch

(x) Set playback unit tape speed control lever to NEUT.

b. Playback Unit Test With Test Tape. Test tape fabricated in paragraph 6–7 must be used for the following test. Figure 4–13 illustrates equipment setup for testing the playback unit.

(1) *Preliminary procedure.*

(a) Obtain test tape fabricated in paragraph 6–7.

(b) Insure that test outlined in paragraph 6-5a has been completed satisfactorily.

(c) Set playback unit VOLUME control to DECR.

(d) Set playback unit CHANNEL SELECTOR to VWS.

(e) Insure that playback unit POWER ON/OFF switch is set to OFF.

(f) Insure that playback unit tape speed control lever is set to NEUT.

(g) Insure that nothing is connected to the front panel of the playback unit.

(h) Insure that playback unit is connected to 115-volt, 60-Hertz ac power source.

(2) *Test with test tape.*

(a) Insure that preliminary procedure outlined in paragraph 6-7b(1) has been completed.

(b) Install test tape on the playback unit (fig. 4-13).

(c) Set playback unit tape speed control lever to NORMAL.

(d) Set playback unit CHANNEL SELECTOR switch to ALL.

(e) Insure that playback unit POWER CKT BRKR is energized (pushed in).

(f) Set playback unit POWER ON/OFF switch to ON. The STOP indicator shall light.

(g) Press and release playback unit PLAY switch-indicator. The STOP indicator shall go out, PLAY light shall light, and recorded information shall play out. Adjust playback unit VOLUME control for a comfortable listening level.

(h) Allow the playback unit to operate in the play mode for approximately one minute, then press and release playback unit STOP switch-indicator. When the STOP switch-indicator is pressed and released, the PLAY indicator shall go out, STOP indicator shall light, and the tape shall stop.

(i) Set playback unit tape speed control lever to FAST.

(j) Press and release playback unit REWIND switch-indicator. The STOP indicator shall go out, REWIND indicator shall light, and the tape shall begin to rewind to the start posi-

tion. When the tape is completely rewound, the REWIND indicator shall go out, STOP indicator shall light, and the tape shall stop.

(k) Set playback unit tape speed control lever to NORMAL.

(l) Reset playback unit FLT TIME counter. The FLT TIME counter shall indicate 0000.

(m) Press and release playback unit PLAY switch-indicator. The STOP indicator shall go out, PLAY indicator shall light, and a 1000-Hertz tone shall be monitored at the speaker. If necessary, adjust VOLUME control.

(n) Continue to monitor 1000-Hertz tone. When the 1000-Hertz tone ceases, a 300-Hertz tone shall be monitored. As soon as the 300-Hertz tone shall be monitored at the speaker. If

(o) Rotate playback unit CHANNEL SELECTOR switch to VWS, PILOT, and SPARE. The 300-Hertz tone shall be monitored when the CHANNEL SELECTOR is positioned to ALL and VWS, but shall not be monitored when the switch is positioned to PILOT and SPARE.

(p) Rotate playback unit CHANNEL SELECTOR switch to ALL and listen for a 1000-Hertz tone. As soon as the 1000-Hertz tone is monitored, proceed to the next step.

(q) Rotate playback unit CHANNEL SELECTOR switch to VWS, PILOT, and SPARE. The 1000-Hertz tone shall be monitored when the CHANNEL SELECTOR switch is positioned to ALL and PILOT, but shall not be monitored when the switch is positioned to VWS and SPARE.

(r) Rotate playback unit CHANNEL SELECTOR switch to ALL and listen for a 3000-Hertz tone. As soon as the 3000-Hertz tone is monitored, proceed to the next step.

(s) Rotate playback unit CHANNEL SELECTOR switch to VWS, PILOT, and SPARE. The 3000-Hertz tone shall be monitored when the CHANNEL SELECTOR switch is positioned to ALL and SPARE, but shall not be monitored when the switch is positioned to VWS and PILOT.

(t) Return playback unit CHANNEL SELECTOR switch to ALL and listen for the 3000-Hertz to cease. As soon as the 3000-Hertz tone ceases, proceed to the next step.

(u) Reset playback unit FLT TIME counter. The FLT TIME counter shall indicate 0000.

(v) Within 20 seconds, observe a burst of timing pulses on the FLT TIME counter. After the burst of timing pulses, the FLT TIME counter shalt indicate 20 ± 1.

(w) With the playback unit CHANNEL SELECTOR switch positioned to ALL, listen for a 300-Hertz tone. As soon as the 300-Hertz tone is monitored, proceed to the next step.

(x) Rotate playback unit CHANNEL SELECTOR switch to VWS, PILOT, and SPARE. The 300-Hertz tone shall be monitored at each switch position.

(y) Rotate playback unit CHANNEL SELECTOR switch to ALL and listen for a 1000-Hertz tone. As soon as the 1000-Hertz tone is monitored, proceed to the next step.

(z) Rotate playback unit CHANNEL SELECTOR switch to VWS, PILOT, and SPARE. The 1000-Hertz tone shall be monitored at each switch position.

(aa) Rotate playback unit CHANNEL SELECTOR switch to ALL and listen for a 3000-Hertz tone. As soon as the 300-Hertz tone is monitored, proceed to the next step.

(ab) Rotage playback unit CHANNEL SELECTOR switch to VWS, PILOT, and SPARE. The 3000-Hertz tone shall be monitored at each switch position,

(ac) Rotate playback unit CHANNEL SELECTOR switch to ALL and listen for the 3000-Hertz tone to cease. As soon as the 3000-Hertz tone ceases, proceed to the next step.

(ad) Reset playback unit FLT TIME counter. The FLT TIME counter shall indicate 0000.

(ae) Within 20 seconds, observe a burst of timing pulses on the FLT TIME counter. After the burst of timing pulses, the FLT TIME counter shall indicate 10 ± 1.

(af) Press and release playback unit STOP switch-indicator. The PLAY indicator shall go out, STOP indicator shall light, ‘and the tape shall stop.

(ag) Connect a 100K-ohm load resistor across the PJ-055B phone plug output and insert the PJ-055B phone plug into the HEADSET jack on the playback unit front panel.

(ah) Connect a VTVM across the output of the phone plug.

(ai) Rotate playback unit CHANNEL SELECTOR switch to VWS.

(aj) Press and release playback unit PLAY switch. indicator. The STOP indicator shall go out, PLAY indicator shall light, and within 20 seconds, a 1000-Hertz tone shall be played back. The tone cannot be heard, but its presence can be verified by an indication on the VTVM. As soon as it can be verified that a 1000-Hertz tone is being played back, proceed to the next step.

(ak) Adjust playback unit VOLUME control to indicate 1.5-volt rms on the VTVM.

(*al*) Continue to monitor the 1000-Hertz tone on the VTVM. As soon as the 1000-Hertz tone ceases, proceed to the next step. The VTVM shall indicate less than 48 millivolts (–30db) when the tone ceases.

(*am*) Press and release playback unit STOP switch-indicator. The PLAY indicator shall go out, STOP indicator shall light, and the tape shall stop.

(an) Remove phone plug (PJ-055B) from the playback unit HEADSET jack.

(ao) Press and release playback unit REVERSE switch indicator. The STOP indicator shall go out, REVERSE indicator shall light, and within a few seconds, a 1000-Hertz tone shall be monitored. As soon as the 100-Hertz tone is monitored, proceed to the next step.

(ap) Continue to monitor the 1000-Hertz tone. As soon as the 1000-Hertz tone ceases, press and release playback unit STOP switch-indicator. The REVERSE indicator shall go out, STOP indicator shall light, and tape shall stop.

(aq) Rotate playback unit CHANNEL SELECTOR switch to PILOT.

(ar) Insert the phone plug (PJ-055B) into the playback unit HEADSET jack.

(as) Insure that a VTVM is connected across the 100K-ohm load resistor.

(at) Repeat *aj* through *ap.*

(au) Rotate playback unit CHANNEL SELECTOR switch to SPARE.

(av) Insert the phone plug (PJ-055B) into the playback unit HEADSET jack.

(aw) Insure that a VTVM is connected across the 100K-ohm load resistor.

(ax) Repeat *aj* through *an.*

(ay) Set playback unit tape speed control lever to FAST.

(az) Press and release playback unit PLAY switch-indicator. The STOP indicator shall go out, PLAY indicator shall light, and the tape shall move in the counterclockwise direction.

(*ba*) Observe tape movement. When the first half of the tape is played completely, the playback unit will automatically reverse the direction of the tape and the tape will move in the clockwise direction.

(bb) While the tape is moving in the clockwise direction, listen for a 1000-Hertz tone. As soon as the l000-Hertz tone is monitored, proceed to the next step.

(bc) Press and release playback unit STOP switch-indicator. The PLAY indicator shall go out, STOP indicator shall light, and the tape shall stop.

(bd) Set playback unit tape speed control lever to NORMAL.

(be) Press and release playback unit REVERSE switch-indicator. The STOP indicator shall go out, REVERSE indicator shall light, and the 1000-Hertz tone shall be monitored. As soon as the 1000-Hertz tone ceases, proceed to the next step.

(bf) Press and release playback unit STOP switch-indicator. The REVERSE indicator shall go out, STOP indicator shall light, and the tape shall stop.

(bg) Rotate the playback unit OUTPUT SELECT switch to ALL and repeat *m* through *ax.*

(bh) Press and release playback unit REWIND switch-indicator. The STOP indicator shall go out, REWIND indicator shall light, and the tape shall rewind to the start position. When the tape is rewound to the start position, the tape will automatically stop and the REWIND indicator will go out and the STOP indicator will light.

(bi) Set playback unit POWER ON/OFF switch to OFF. The STOP indicator shall go out.

(bj) Remove test tape magazine from the playback unit.

(bk) Disconnect playback unit from 115-volt, 60-Hertz ac power.

CHAPTER 7

FOLDOUT ILLUSTRATIONS

Figure No.	Title
7-1	Color code marking for MIL STD resistors.
7-2	Color code marking for MIL STD capacitors.
7-3	CIPR functional block diagram.
7-4	CIPR controller overall, schematic diagram.
7-5	CIPR A1A2 record amplifier circuit card assembly, schematic diagram.
7-6	CIPR A1A4 static power inverter circuit card assembly, schematic diagram.
7-7	CIPR A1A3 timing controller circuit card assembly, schematic diagram.
7-8	CIPR A1A1 regulator circuit card assembly, schematic diagram.
7-9	Playback unit control circuit, simplified schematic diagram.
7-10	Playback unit, overall schematic diagram (part 1 of 2).
7-10(2)	Playback unit, overall schematic diagram (part 2 of 2).
7-11	Playback unit A1A4 electronic components assembly, schematic diagram.
7-12	Playback unit A1A3 control drive circuit card assembly, schematic diagram.
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7-14	CIPR controller wiring diagram.
7-15	CIPR magazine wiring diagram.
7-16	Playback unit wiring diagram.

Figure 7-1. ***Color code marking for MIL STD resistors.***
(Located in back of manual)

Figure 7-2. ***Color code marking for MIL STD capacitors.***
(Located in back of manual)

Figure 7-3. ***CIPR functional block diagram.***
(Located in back of manual)

Figure 7-4. ***CIPR controller, overall schematic diagram.***
(Located in back of manual)

Figure 7-5. ***CIPR A1A3 record amplifier circuit card assembly, schematic diagram.***
(Located in back of manual)

Figure 7-6. ***CIPR A1A4 static power inverter circuit card assembly, schematic diagram.***
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Figure 7-7. ***CIPR A1A8 timing controller circuit card assembly, schematic diagram.***
(Located in back of manual)

Figure 7-8. ***CIPR A1A1 regulator circuit card assembly, schematic diagram.***
(Located in back of manual)

Figure 7-9. ***Playback unit control circuit, simplified schematic diagram.***
(Located in back of manual)

Figure 7-10 (1). ***(1). Playback unit, overall schematic diagram (part 1 of 2).***
(Located in back of manual)

Figure 7-10 (2). ***(2). Playback unit, overall schematic diagram (part 2 of 2).***
(Located in back of manual)

Figure 7-11. ***Playback unit A1A4 electronic components assembly, schematic diagram.***
(Located in back of manual)

Figure 7-12. ***Playback unit A1A3 control drive circuit card assembly, schematic diagram.***
(Located in back of manual)

Figure 7-13. ***Playback unit A1A2 playback amplifier circuit card assembly, schematic diagram.***
(Located in back of manual)

Figure 7-14. ***CIPR controller wiring diagram.***
(Located in back of manual)

Figure 7-15. ***CIPR magazine wiring diagram.***
(Located in back of manual)

Figure 7-16. ***Playback unit wiring diagram.***
(Located in back of manual)

APPENDIX A

REFERENCES

The following publications contain information for the operation and maintenance of Recorder Set, Sound AN/ASH-23 and Reproducer Set, Sound AN/ASH-24.

DA Pam 310-4	Index of Technical Manuals, Technical Bulletins, Supply Manuals (types 7, 8, and 9), Supply Bulletins, and Lubrication Orders.
DA Pam 310-7	U.S. Army Equipment Index of Modification Work Orders.
TM 9-6625-2362-12	Operator's and Organizational Maintenance Manual: Oscilloscope AN/USM-281.
TM 11-5097	Spectrum Analyzers TS-728A/U,. TW723B/U, TS-723C/U, and TS-723D/U.
TM 11-5835-239-12	Operator's and Organizational Maintenance Manual: Recorder Set, Sound AN/ASH-23 and Reproducer Set, Sound AN/ASH-24.
TM 11-6625-320-12	Operator's and Operational Maintenance Manual Voltmeter, Meter ME-30A/U and Voltmeters, Electronic ME-30B/U, ME-30C/U, and ME-30E/U.
TM 11-6625-358-15	Operator's, Organizational, DS, GS, and Depot Maintenance Manual: Signal Generators SG-71/FCC, SG-71A/FCC, SG71B/FCC, and SG-71C/FCC.
TM 11-6625-366-15	Operator's, Organizational, DS, GS, and Depot Maintenance Manual: Multimeter TS-352B/U.
TM 11-6625-700-25	Organizational, DS, GS, and Depot Maintenance Manual: Digital Readout Electronic Counter AN/USM-207.
TM 11-6625-1818-12	Operator's and Organizational Maintenance Manual: Recorder Test Set TS-2854/ASH-23.
TM 11-6760-212-12	Operator's and Organizational Maintenance Manual: Flutter Indicator ID-851/U.

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By Order of the Secretary of the Army:

W. C. WESTMORELAND,
General, United States Army,
Chief of Staff.

Official:

KENNETH G. WICKHAM,
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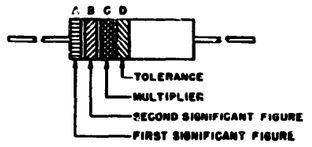
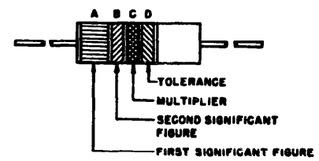
COLOR CODE MARKING FOR MILITARY STANDARD RESISTORS

COMPOSITION-TYPE RESISTORS



BAND A— Equal Width Band Signifies Composition-Type

WIREWOUND-TYPE RESISTORS

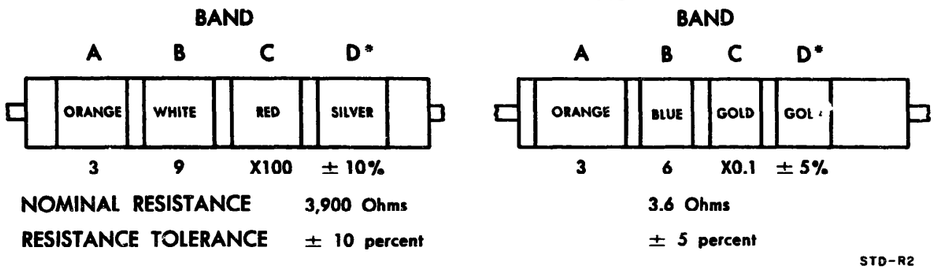


BAND A— Double Width Signifies Wire-wound Resistor

COLOR CODE TABLE

BAND A		BAND B		BAND C		BAND D*	
COLOR	FIRST SIGNIFICANT FIGURE	COLOR	SECOND SIGNIFICANT FIGURE	COLOR	MULTIPLIER	COLOR	RESISTANCE TOLERANCE (PERCENT)
BLACK	0	BLACK	0	BLACK	1		
BROWN	1	BROWN	1	BROWN	10		
RED	2	RED	2	RED	100		
ORANGE	3	ORANGE	3	ORANGE	1,000		
YELLOW	4	YELLOW	4	YELLOW	10,000	SILVER	± 10
GREEN	5	GREEN	5	GREEN	100,000	GOLD	± 5
BLUE	6	BLUE	6	BLUE	1,000,000		
PURPLE (VIOLET)	7	PURPLE (VIOLET)	7				
GRAY	8	GRAY	8	SILVER	0.01		
WHITE	9	WHITE	9	GOLD	0.1		

EXAMPLES OF COLOR CODING

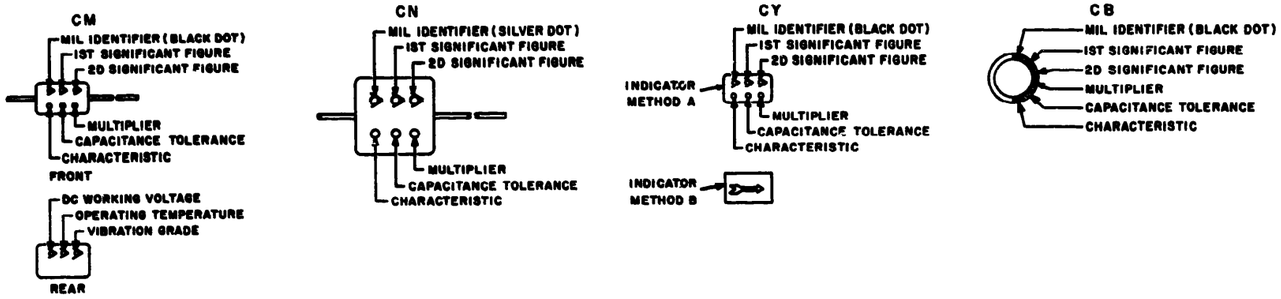


*If Band D is omitted, the resistor tolerance is ±20%, and the resistor is not Mil-Std.

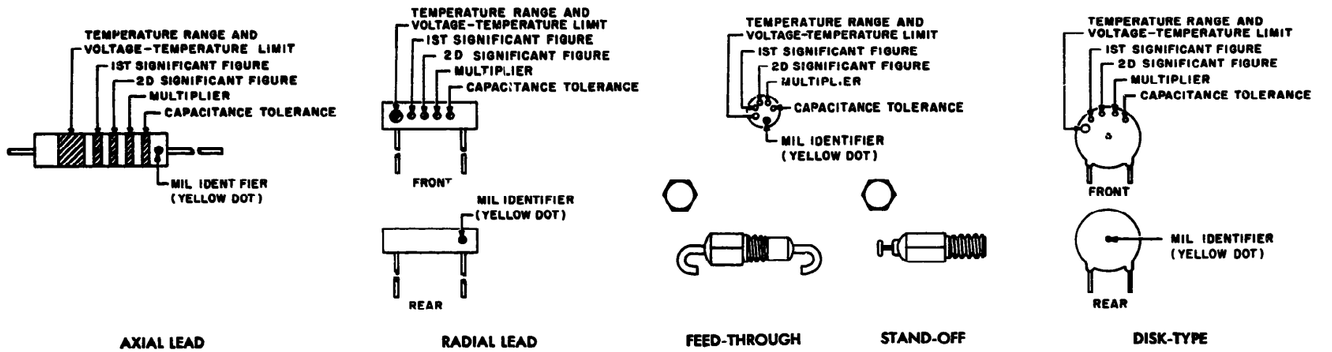
Figure 7-1. Color code marking for MIL STD resistors.

COLOR CODE MARKING FOR MILITARY STANDARD CAPACITORS

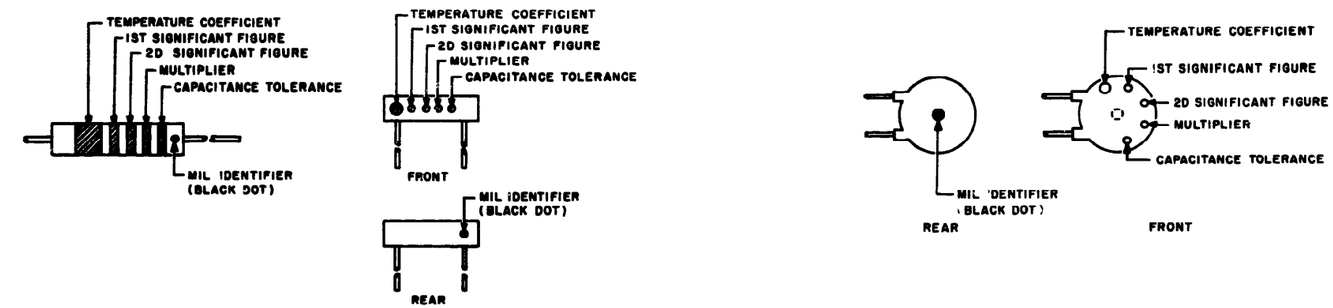
GROUP I Capacitors, Fixed, Various-Dielectrics, Styles CM, CN, CY, and CB



GROUP II Capacitors, Fixed Ceramic-Dielectric (General Purpose) Style CK



GROUP III Capacitors, Fixed, Ceramic-Dieletric (Temperature Compensating) Style CC



COLOR CODE TABLES

TABLE I – For use with Group I, Styles CM, CN, CY and CB

COLOR	MIL ID	1st SIG FIG	2nd SIG FIG	MULTIPLIER[1]	CAPACITANCE TOLERANCE				CHARACTERI		
					CM	CN	CY	CB	CM	CN	C
BLACK	CM, CY CB	0	0	1			± 20%	± 20%		A	
BROWN		1	1	10					B	E	
RED		2	2	100	± 2%		± 2%	± 2%	C		C
ORANGE		3	3	1,000		± 30%			D		
YELLOW		4	4	10,000					E		
GREEN		5	5		± 5%				F		
BLUE		6	6								
PURPLE (VIOLET)		7	7								
GREY		8	8								
WHITE		9	9								
GOLD				0 1			± 5%	± 5%			
SILVER	CN				± 10%	± 10%	± 10%	± 10%			

TABLE II – For use with Group II, General Purpose, Style CK

COLOR	TEMP. RANGE AND VOLTAGE – TEMP. LIMITS[3]	1st SIG FIG	2nd SIG FIG	MULTIPLIER[1]	CAPACITANCE TOLERANCE	MIL ID
BLACK		0	0	1	± 20%	
BROWN	AW	1	1	10	± 10%	
RED	AX	2	2	100		
ORANGE	BX	3	3	1,000		
YELLOW	AV	4	4	10,000		CK
GREEN	CZ	5	5			
BLUE	BV	6	6			
PURPLE (VIOLET)		7	7			
GREY		8	8			
WHITE		9	9			
GOLD						
SILVER						

TABLE III – For us

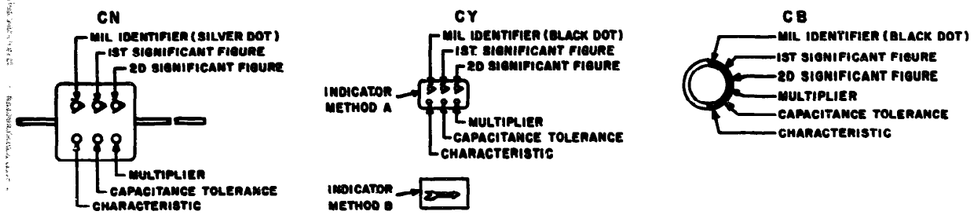
COLOR	TEMPER COEFFI
BLACK	
BROWN	
RED	
ORANGE	
YELLOW	
GREEN	
BLUE	
PURPLE (VIOLET)	
GREY	
WHITE	
GOLD	
SILVER	

1. The multiplier is the number by which the two significant (SIG) figures are multiplied to obtain the ca
2. Letters indicate the Characteristics designated in applicable specifications: MIL–C–5, MIL–C–91, MIL–
3. Letters indicate the temperature range and voltage-temperature limits designated in MIL–C–11015.
4. Temperature coefficient in parts per million per degree centigrade.

Figure 7-2. Color code marking for MIL STD capacitors.

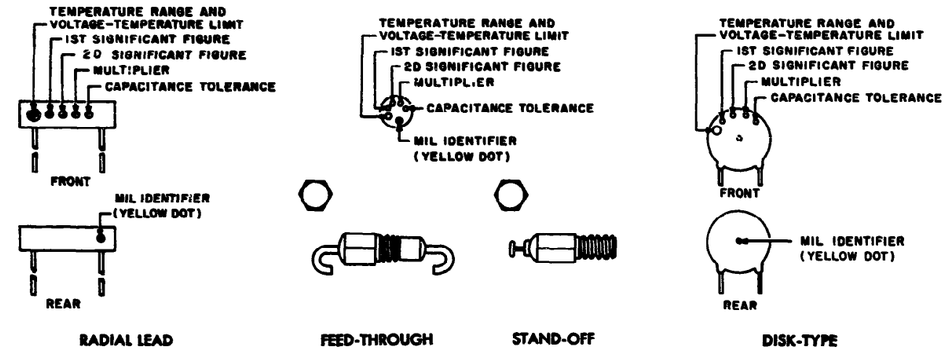
OR CODE MARKING FOR MILITARY STANDARD CAPACITORS

lectrics, Styles CM, CN, CY, and CB



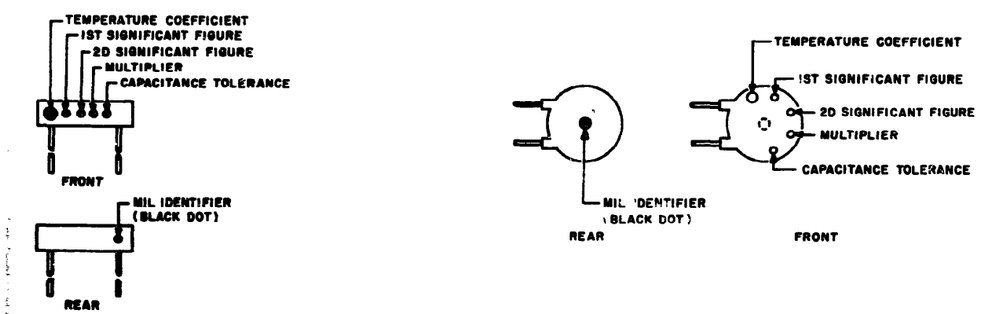
PAPER-DIELECTRIC | GLASS-DIELECTRIC, GLASS CASE | MICA, BUTTON TYPE

lectric (General Purpose) Style CK



RADIAL LEAD | FEED-THROUGH | STAND-OFF | DISK-TYPE

leletric (Temperature Compensating) Style CC



RADIAL LEAD | DISK-TYPE

COLOR CODE TABLES

TABLE I – For use with Group I, Styles CM, CN, CY and CB

COLOR	MIL ID	1st SIG FIG	2nd SIG FIG	MULTIPLIER[1]	CAPACITANCE TOLERANCE				CHARACTERISTIC[2]				DC WORKING VOLTAGE	OPERATING TEMP. RANGE	VIBRATION GRADE
					CM	CN	CY	CB	CM	CN	CY	CB	CM	CM	CM
BLACK	CM, CY CB	0	0	1			± 20%	± 20%		A				−55° to +70°C	10–55 cps
BROWN		1	1	10					B	E		B			
RED		2	2	100	± 2%		± 2%	± 2%	C		C			−55° to +85°C	
ORANGE		3	3	1,000		± 30%			D			D	300		
YELLOW		4	4	10,000					E					−55° to +125°C	10–2,000 cps
GREEN		5	5		± 5%				F				500		
BLUE		6	6											−55° to +150°C	
PURPLE (VIOLET)		7	7												
GREY		8	8												
WHITE		9	9												
GOLD				0 1			± 5%	± 5%							
SILVER	CN				± 10%	± 10%	± 10%	± 10%							

TABLE II – For use with Group II, General Purpose, Style CK

COLOR	TEMP. RANGE AND VOLTAGE – TEMP. LIMITS[3]	1st SIG FIG	2nd SIG FIG	MULTIPLIER[1]	CAPACITANCE TOLERANCE	MIL ID
BLACK		0	0	1	± 20%	
BROWN	AW	1	1	10	± 10%	
RED	AX	2	2	100		
ORANGE	BX	3	3	1,000		
YELLOW	AV	4	4	10,000		CK
GREEN	CZ	5	5			
BLUE	BV	6	6			
PURPLE (VIOLET)		7	7			
GREY		8	8			
WHITE		9	9			
GOLD						
SILVER						

TABLE III – For use with Group III, Temperature Compensating, Style CC

COLOR	TEMPERATURE COEFFICIENT[4]	1st SIG FIG	2nd SIG FIG	MULTIPLIER[1]	CAPACITANCE TOLERANCE		MIL ID
					Capacitances over 10uuf	Capacitances 10uuf or less	
BLACK	0	0	0	1		± 2.0uuf	CC
BROWN	−30	1	1	10	± 1%		
RED	−80	2	2	100	± 2%	± 0.25uuf	
ORANGE	−150	3	3	1,000			
YELLOW	−220	4	4				
GREEN	−330	5	5		± 5%	± 0.5uuf	
BLUE	−470	6	6				
PURPLE (VIOLET)	−750	7	7				
GREY		8	8	0 01			
WHITE		9	9	0.1	± 10%		
GOLD	+100					± 1.0uuf	
SILVER							

1. The multiplier is the number by which the two significant (SIG) figures are multiplied to obtain the capacitance in uuf.
2. Letters indicate the Characteristics designated in applicable specifications: MIL–C–5, MIL–C–91, MIL–C–11272, and MIL–C–10950 respectively.
3. Letters indicate the temperature range and voltage-temperature limits designated in MIL–C–11015.
4. Temperature coefficient in parts per million per degree centigrade.

STD–C2

Figure 7-2. Color code marking for MIL STD capacitors.

Army-Ft Monmouth,NJ-MON 524-61

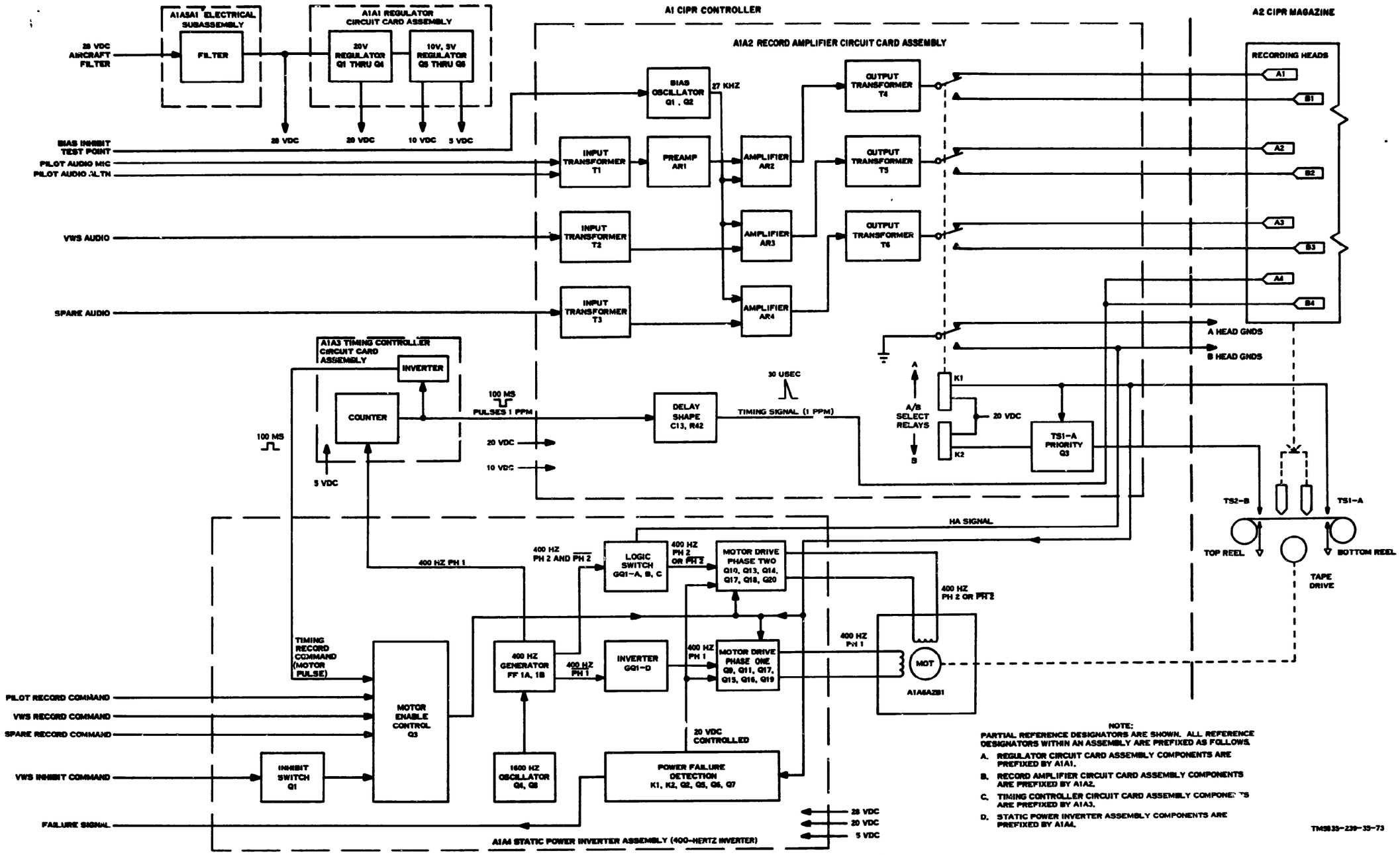


Figure 7-3. CIPR functional block diagram.

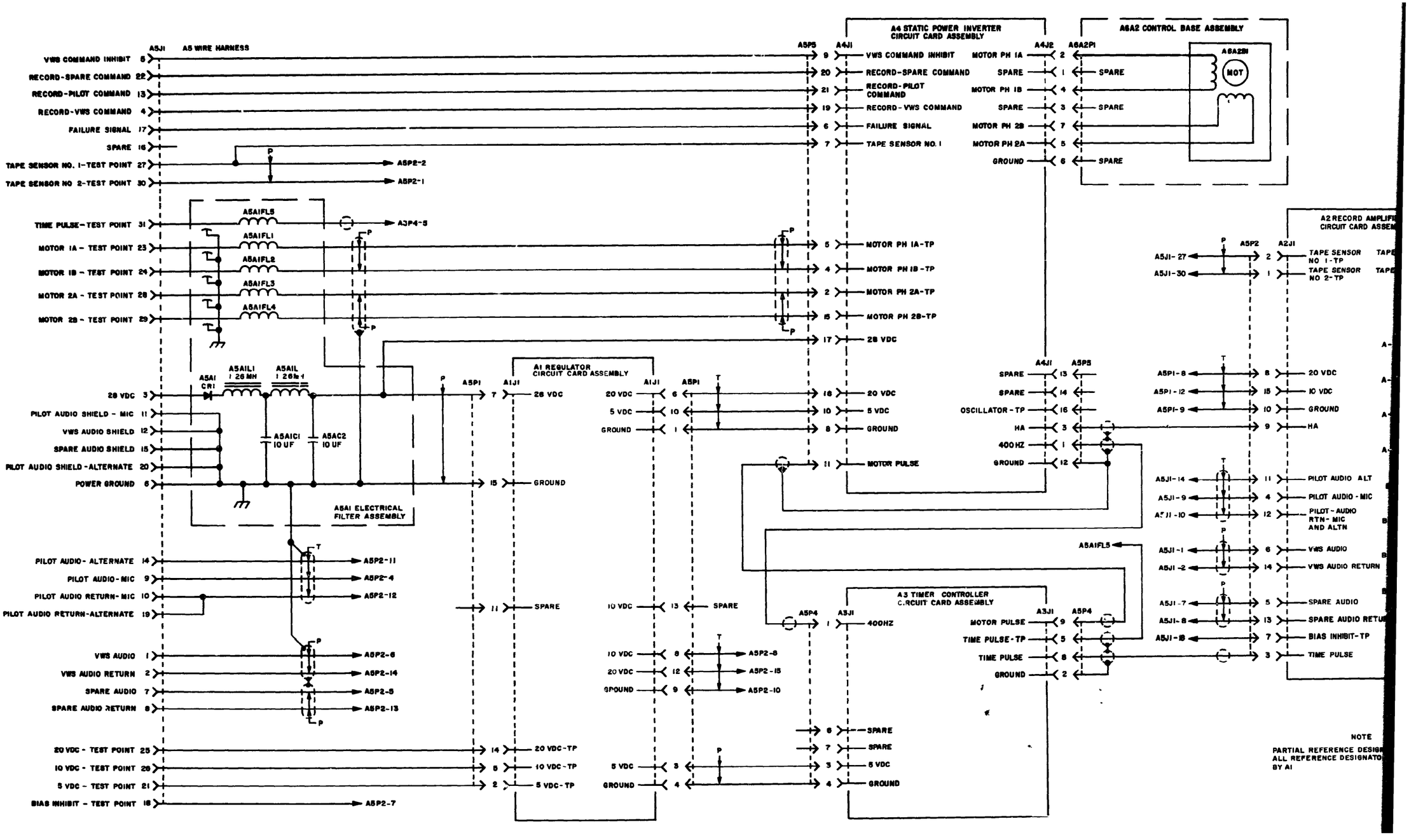


Figure 7-4. CIPR controller, overall schematic diagram.

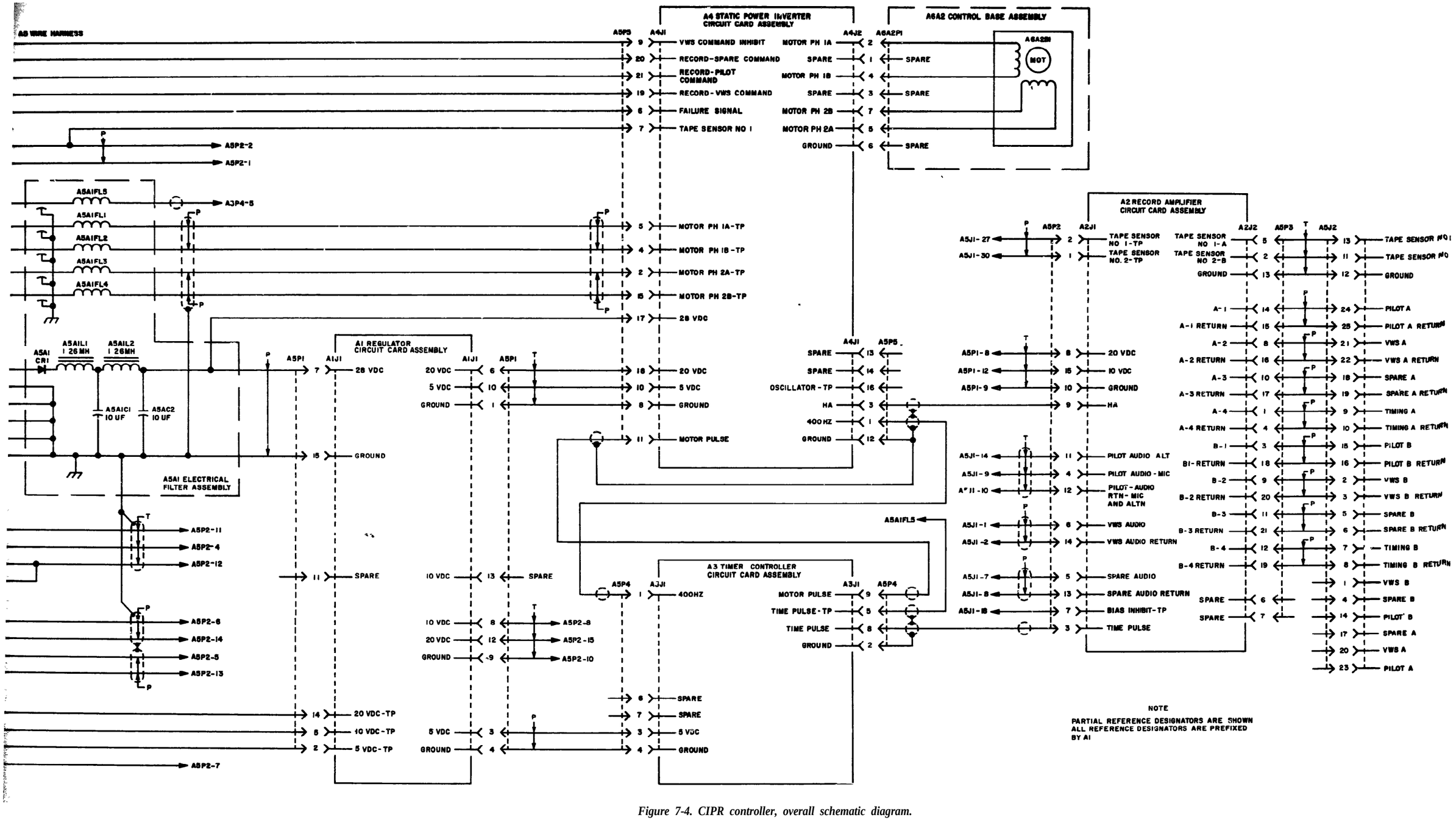
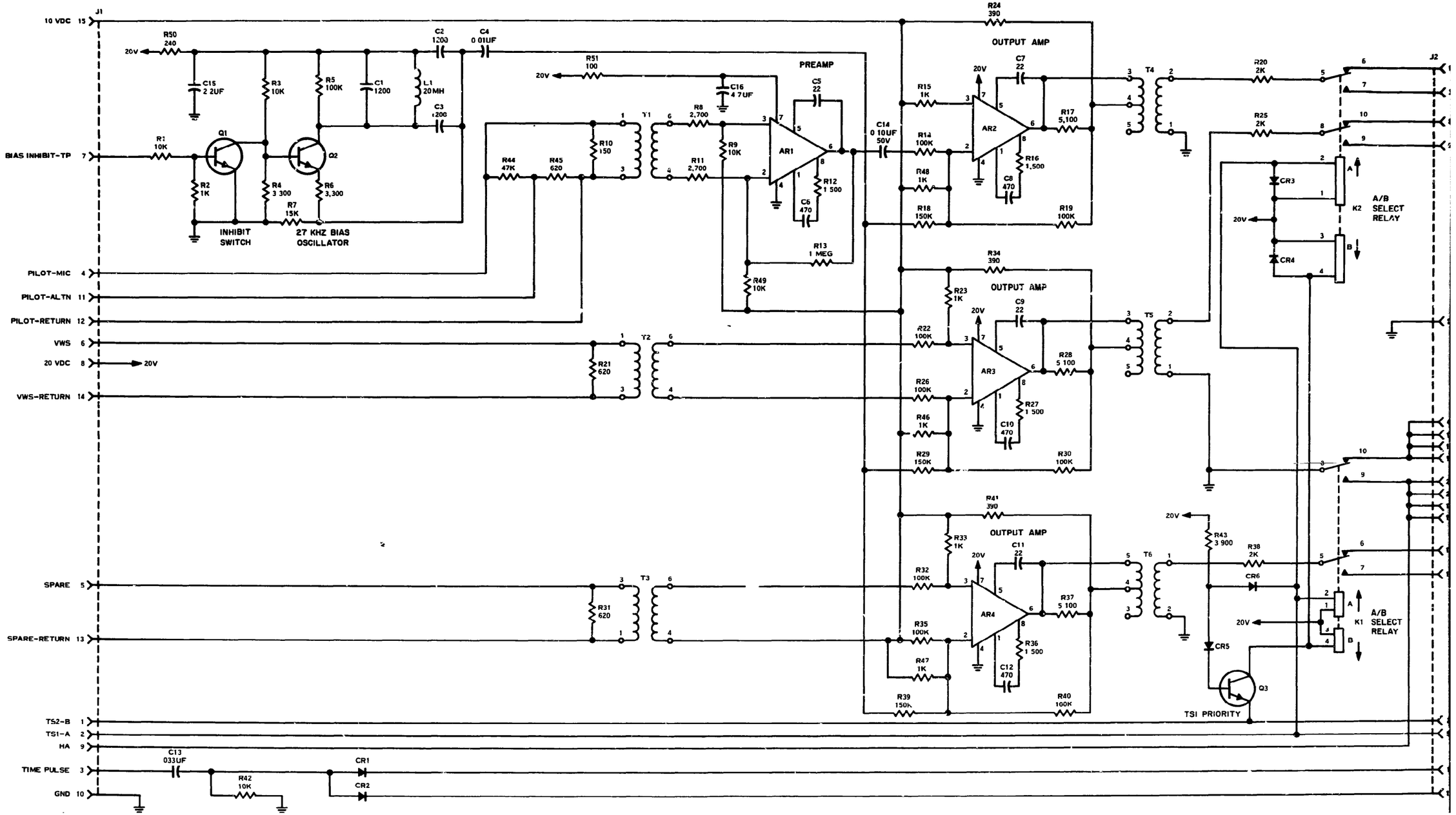


Figure 7-4. CIPR controller, overall schematic diagram.



Fzgure 7-5. CIPR A1A2 record amplifier circuit card assembly, schematic diagram.

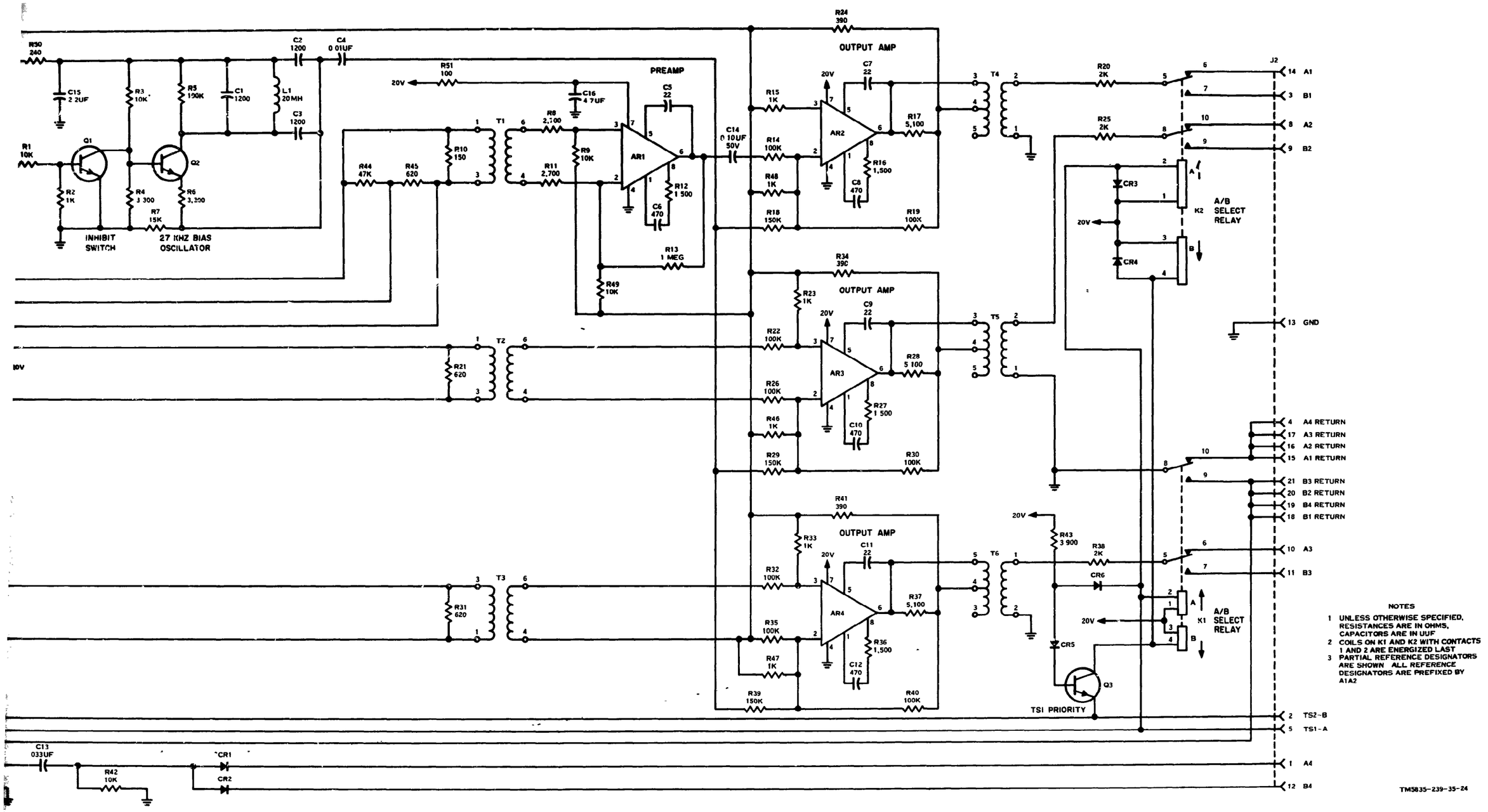


Figure 7-5. CIPR A1A2 record amplifier circuit card assembly, schematic diagram.

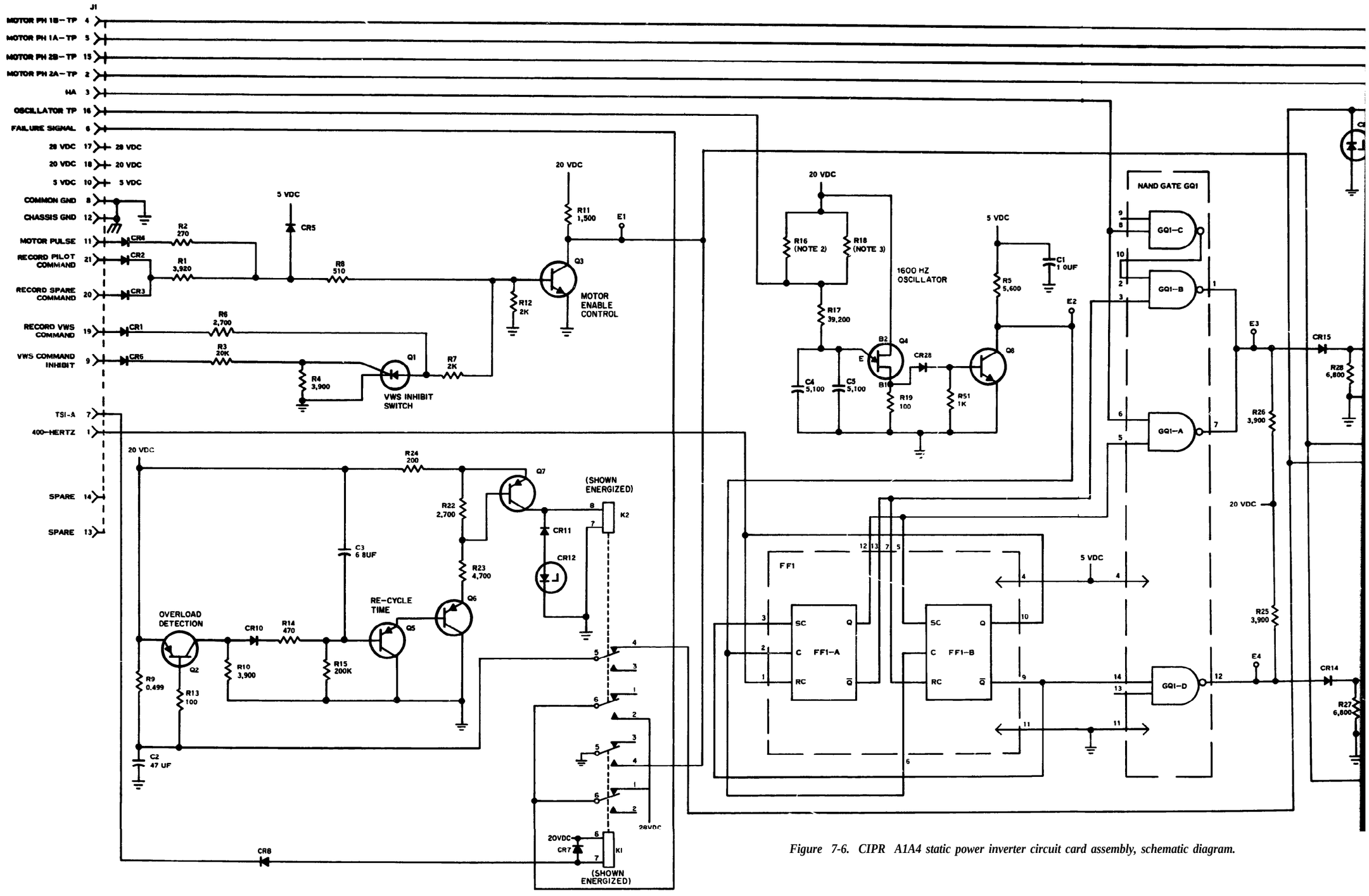


Figure 7-6. CIPR A1A4 static power inverter circuit card assembly, schematic diagram.

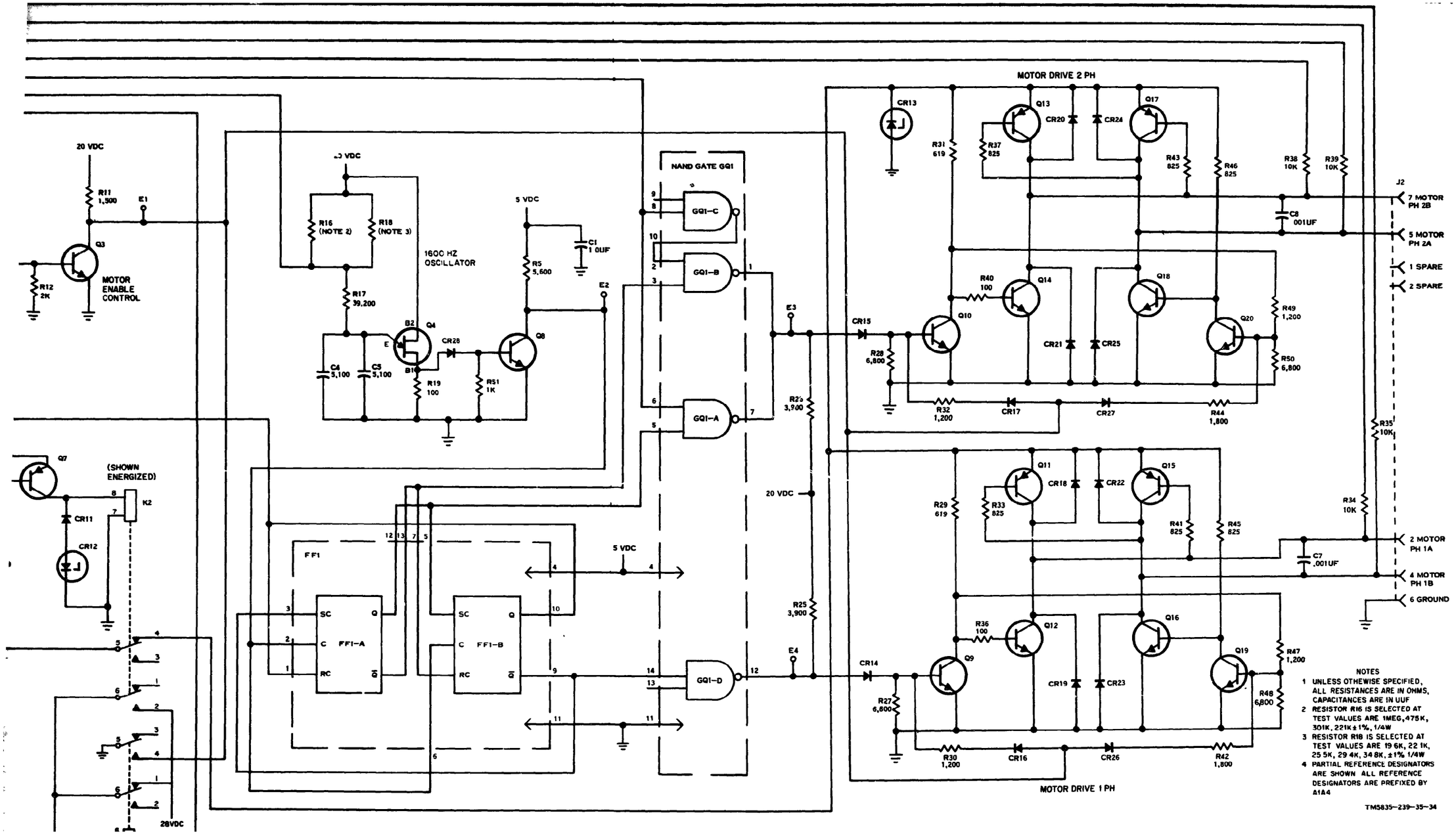


Figure 7-6. CIPR A1A4 static power inverted circuit card assembly, schematic diagram.

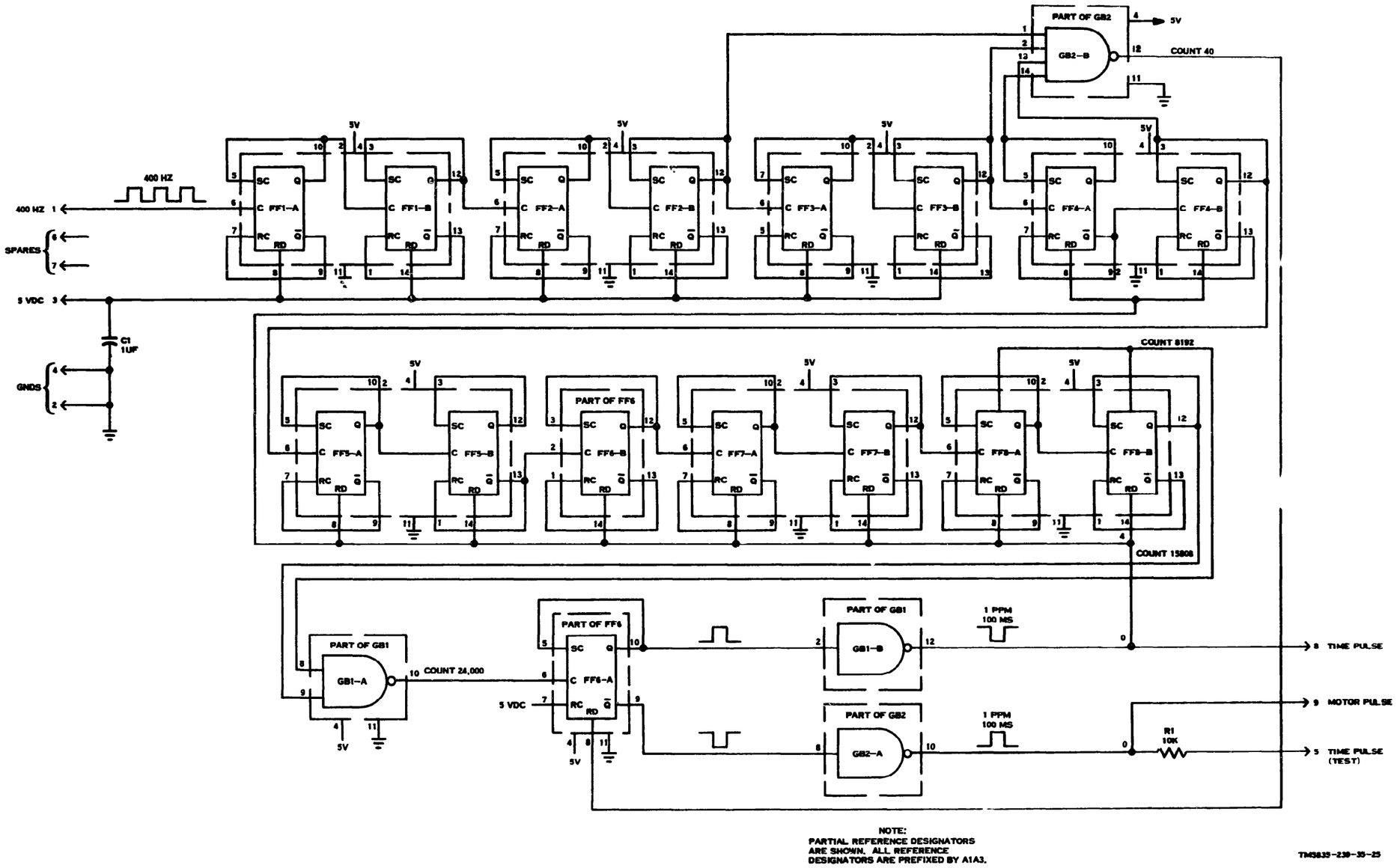


Figure 7-7. CIPR A1A3 timing controller circuit card assembly, schematic diagram.

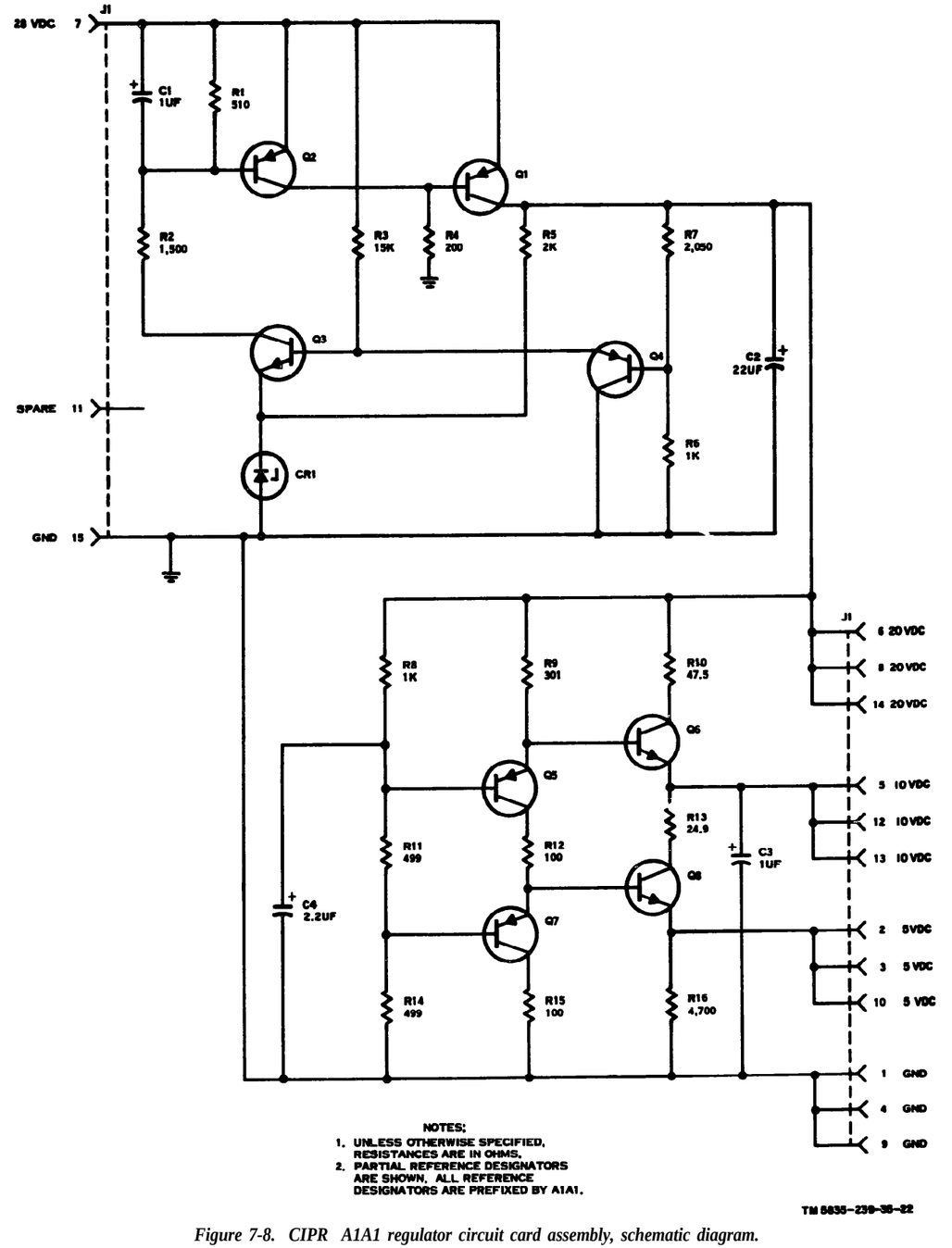


Figure 7-8. CIPR A1A1 regulator circuit card assembly, schematic diagram.

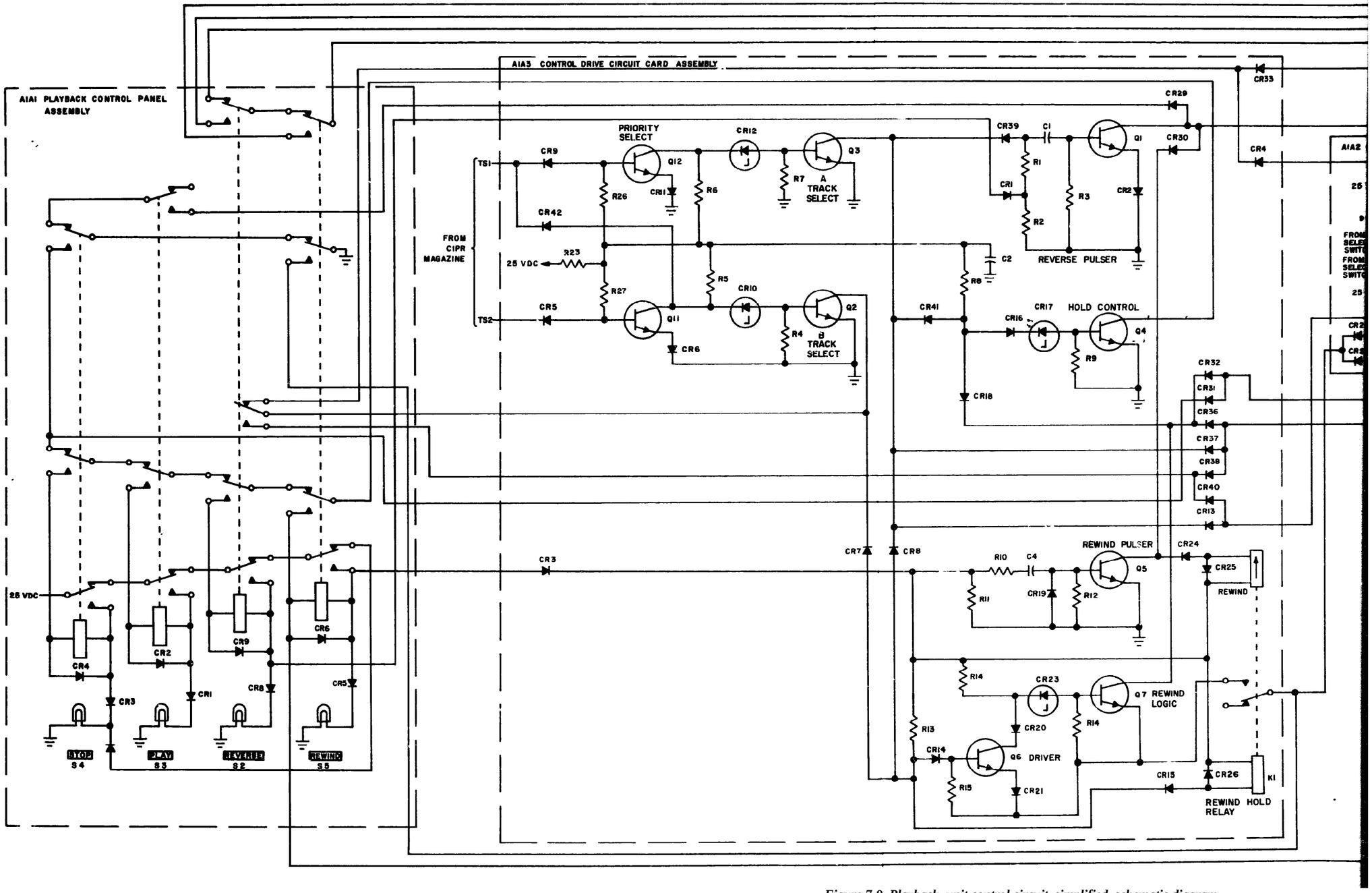


Figure 7-9. Playback unit control circuit, simplified schematic diagram.

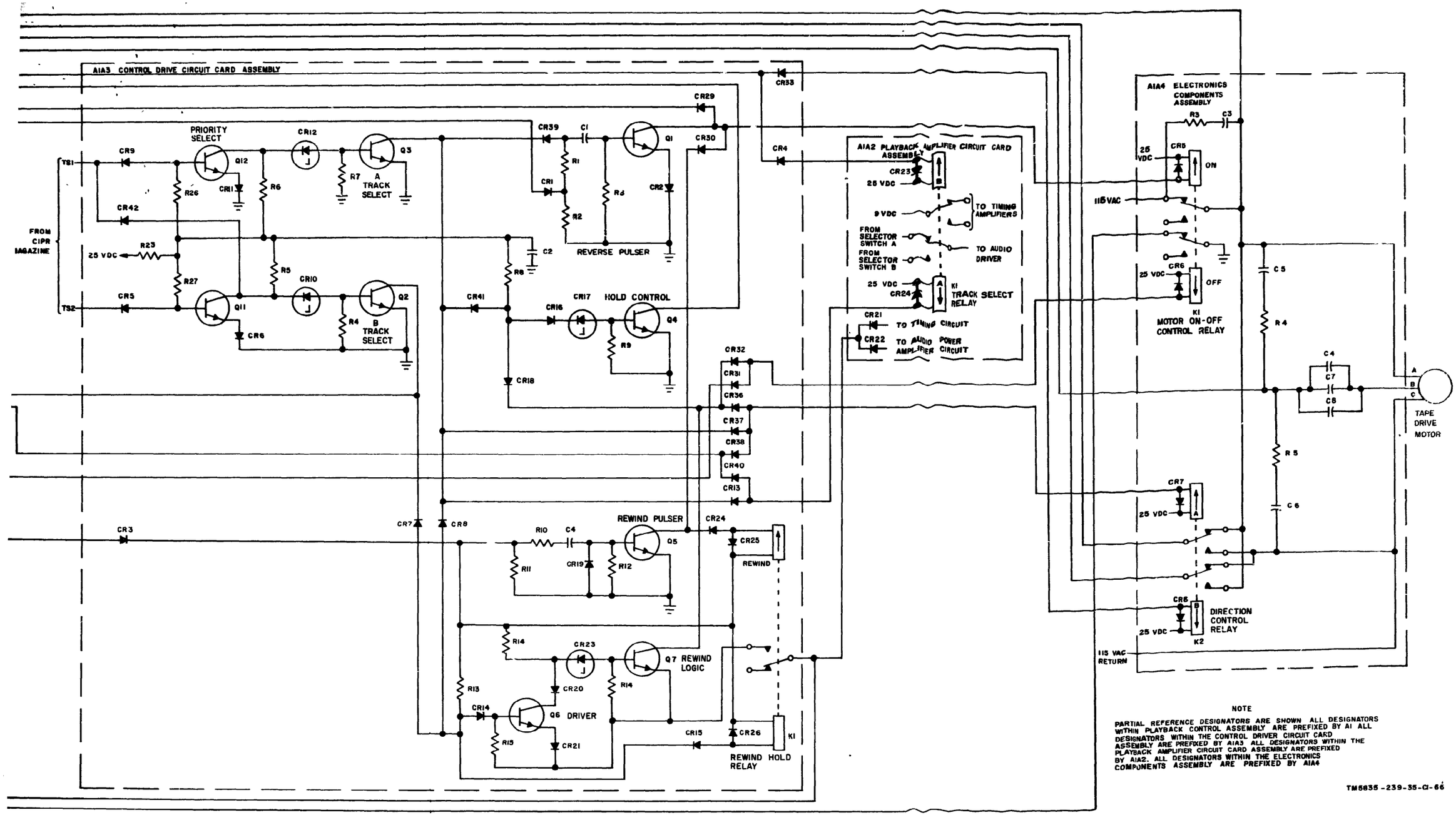


Figure 7-9. Playback unit control circuit, simplified schematic diagram.

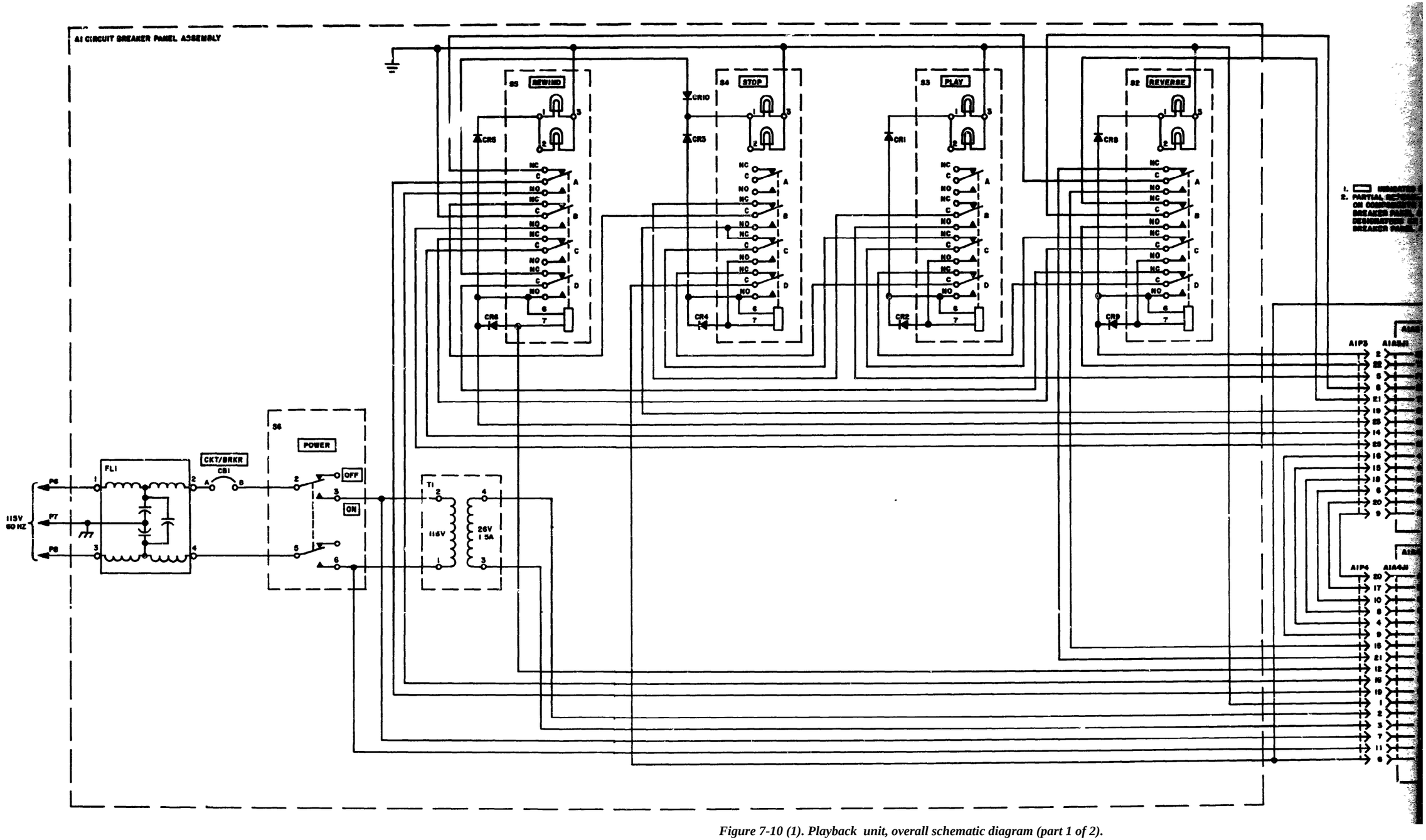


Figure 7-10 (1). Playback unit, overall schematic diagram (part 1 of 2).

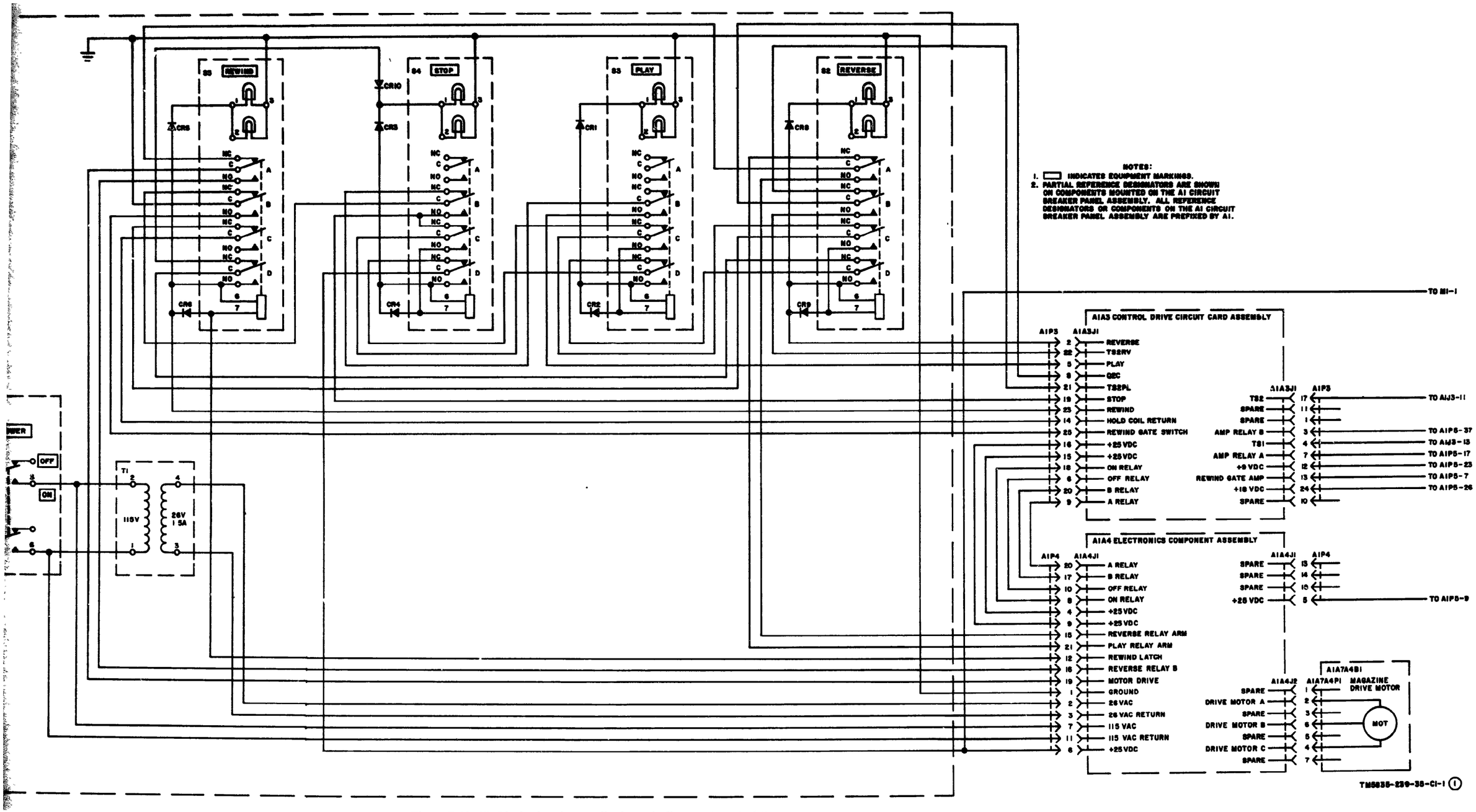


Figure 7-10 (1). Playback unit, overall schematie diagram (part 1 of 2).

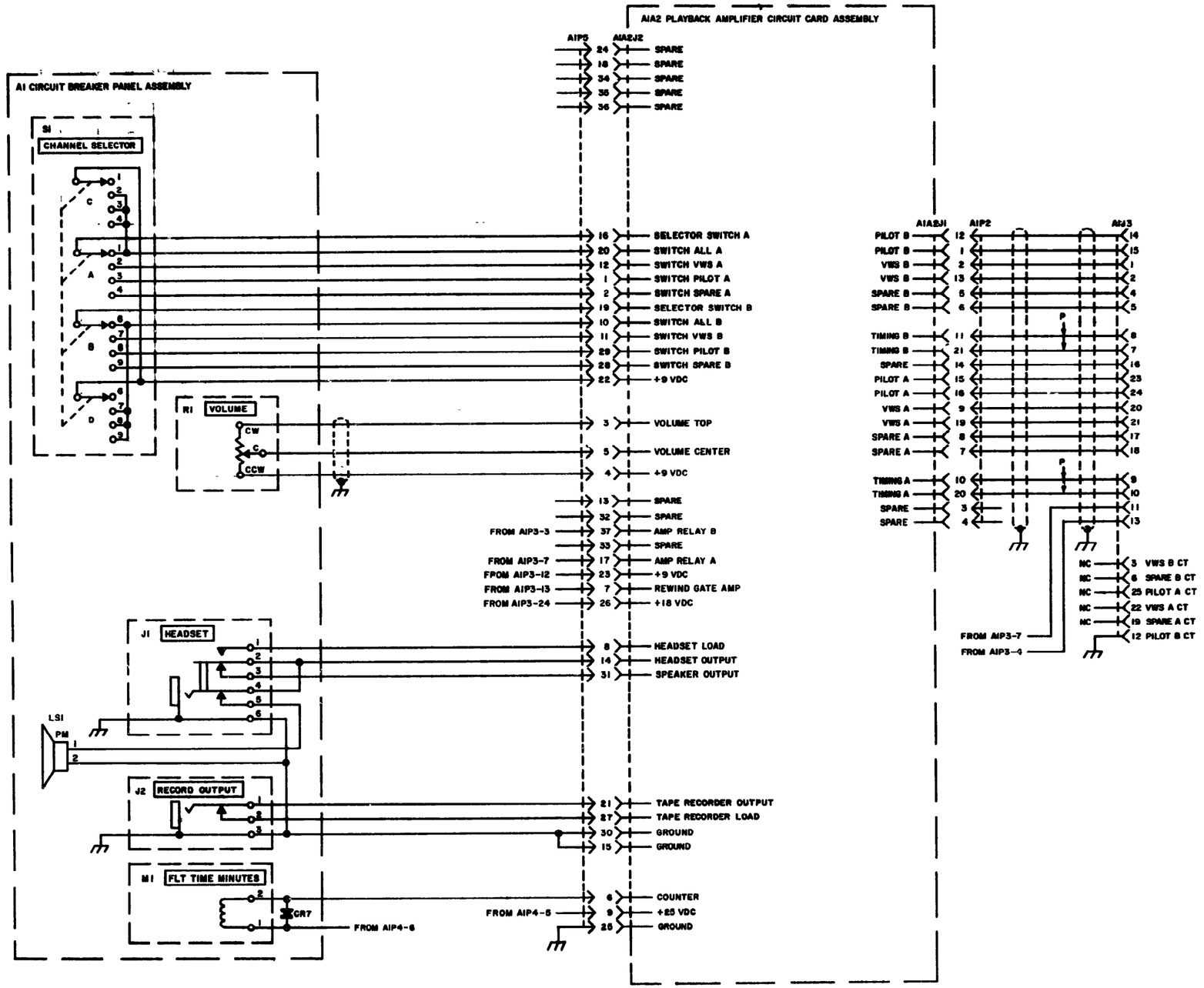


Figure 7-10 (2). Playback unit, overall schematic diagram (part 2 of 2).

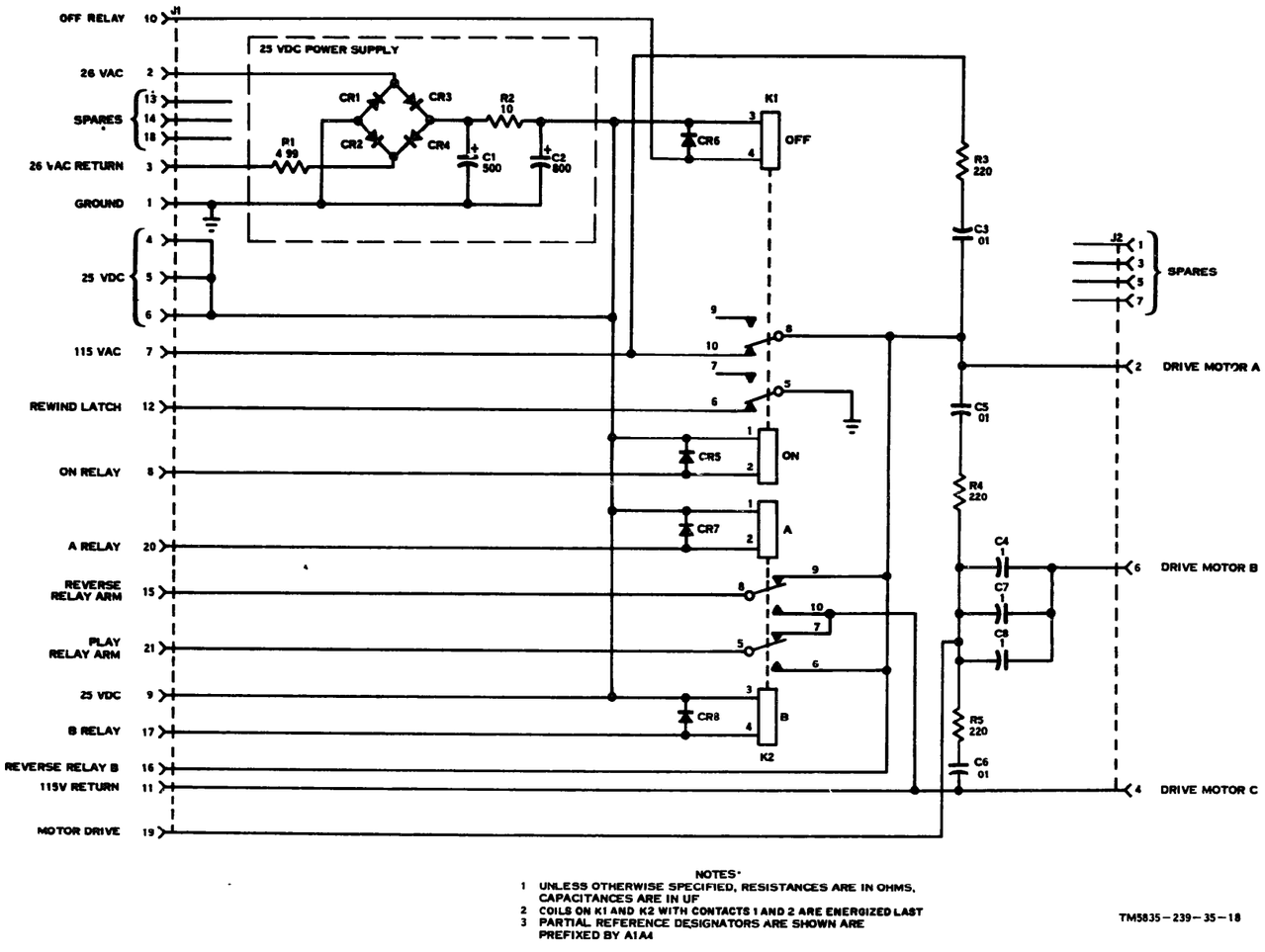


Figure 7-11. Playback unit A1A4 electronic components assembly, schematic diagram.

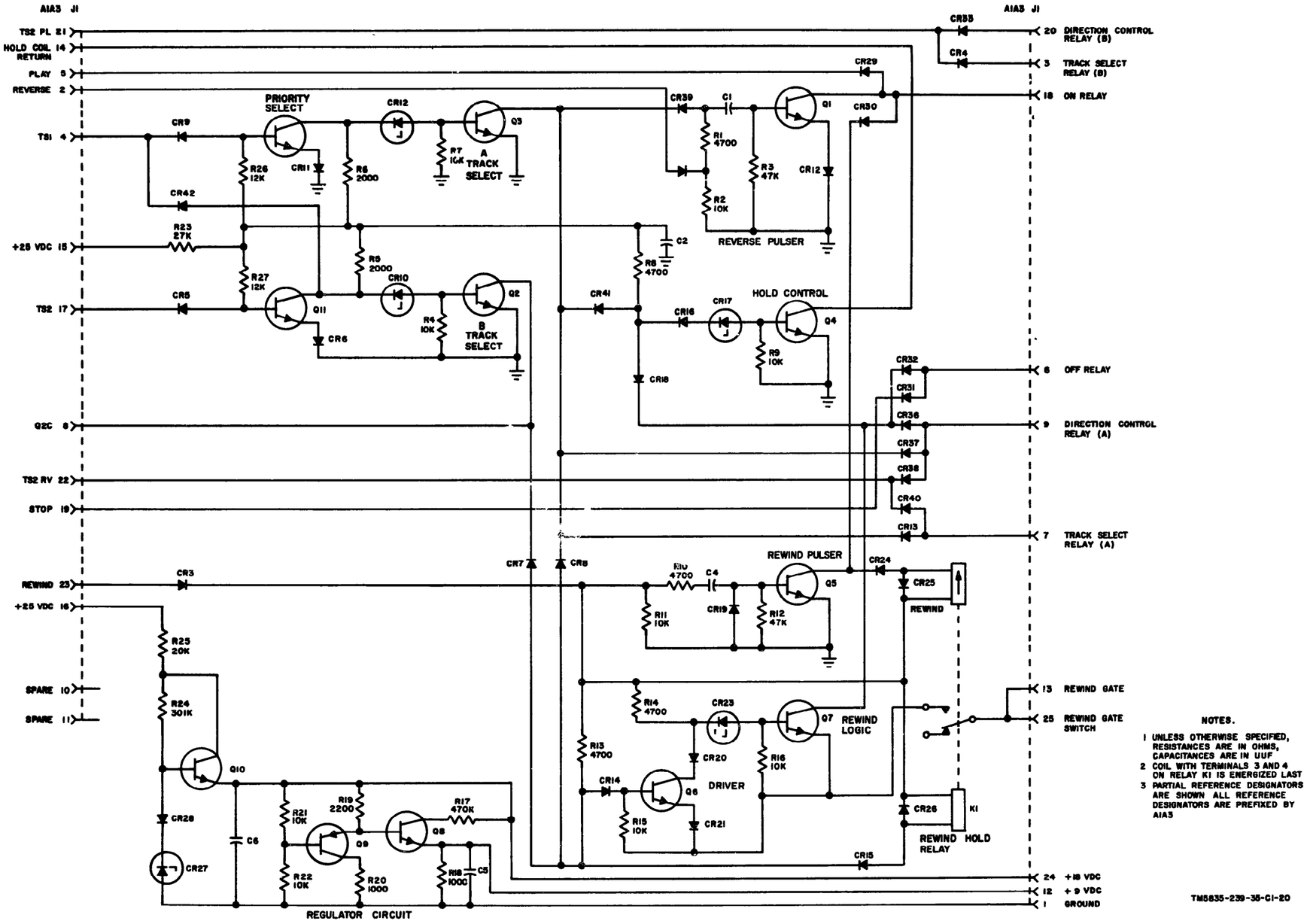


Figure 7-12. Playback unit A1A3 control drive circuit card assembly, schematic diagram.

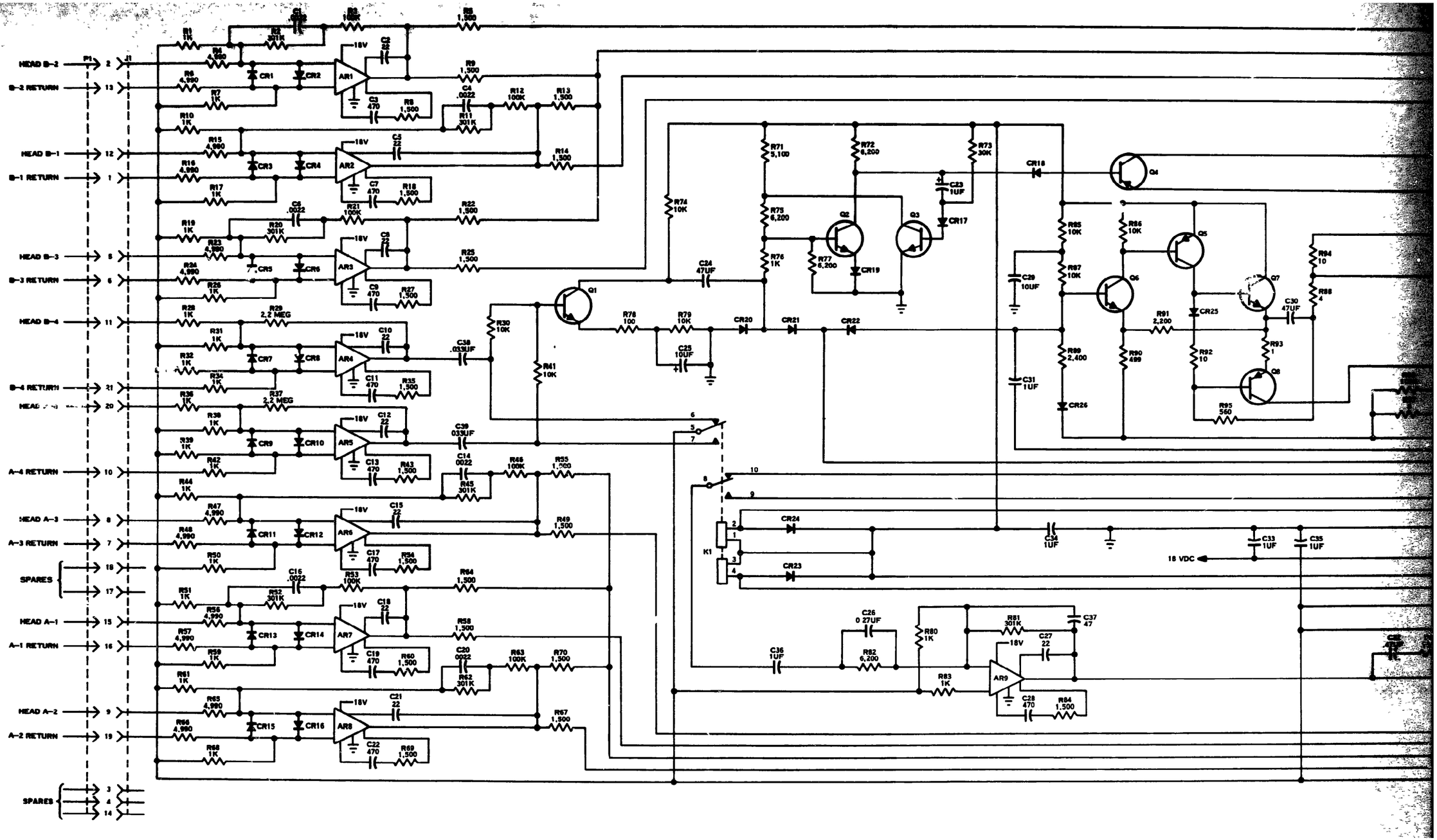


Figure 7-13. Playback unit A1A2 playback amplifier circuit card assembly, schematic diagram.

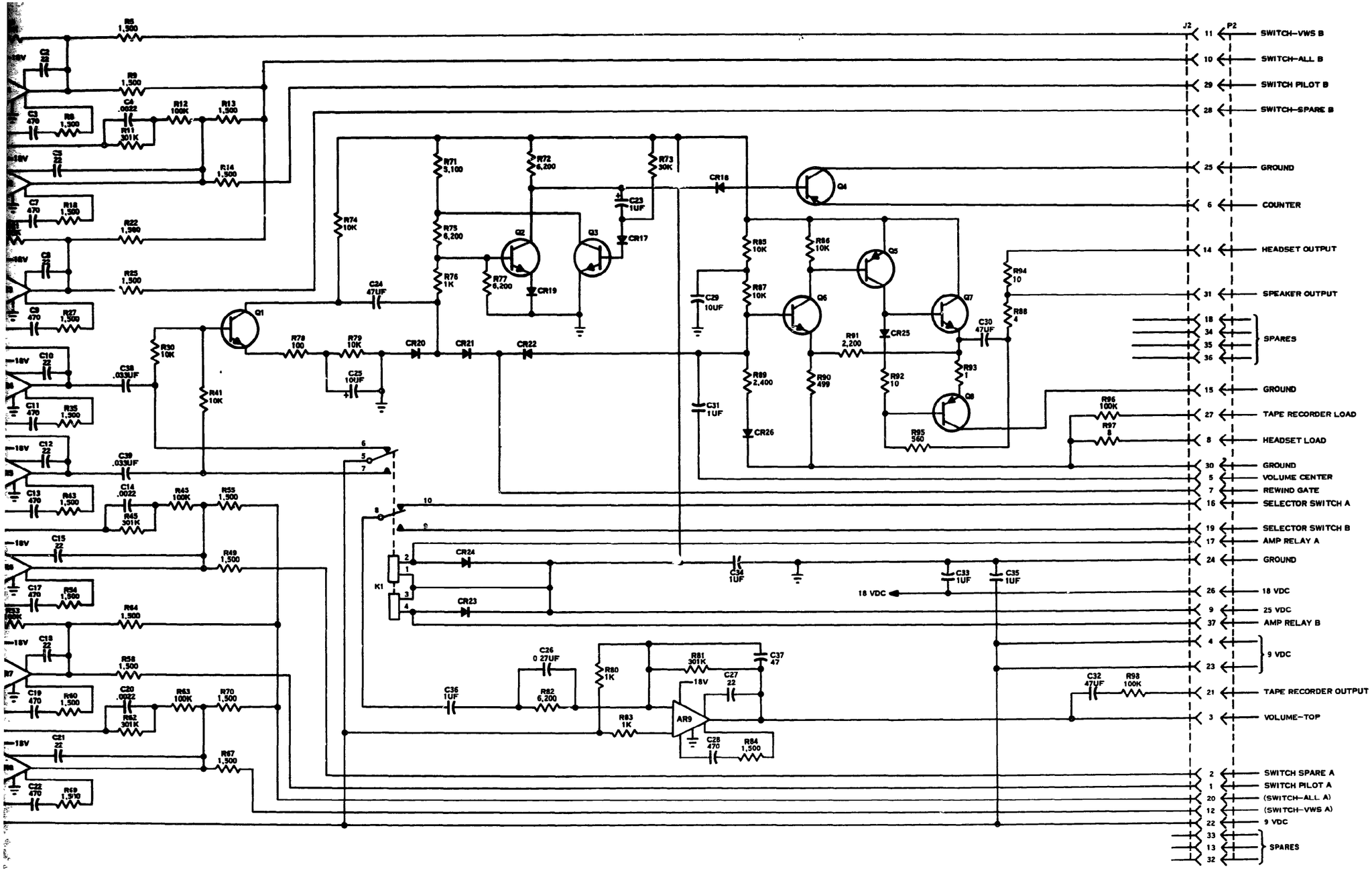


Figure 7-3. Playback unit A1A2 playback amplifier circuit card assembly, schematic diagram.

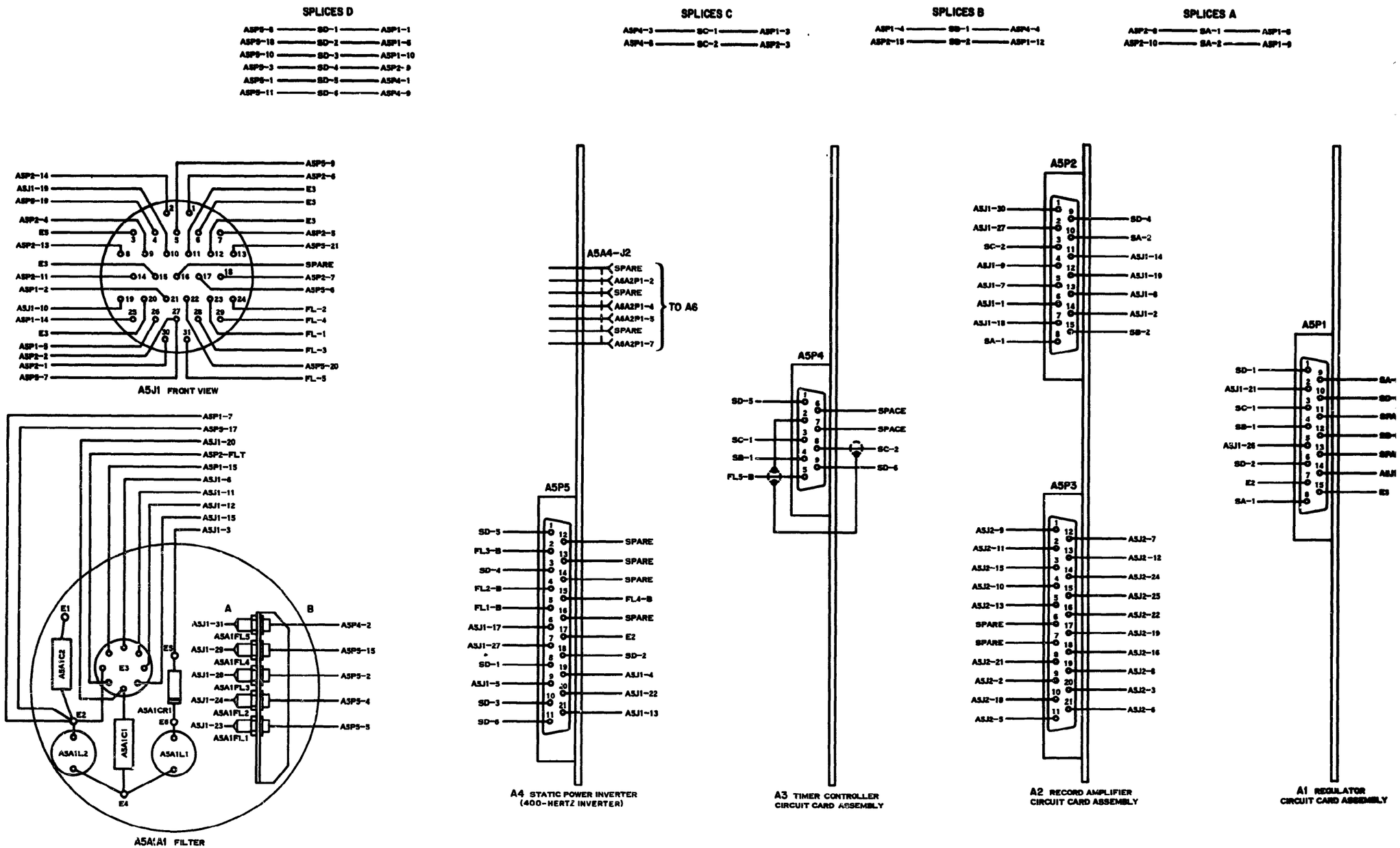


Figure 7-14. CIPR controller wiring diagram.

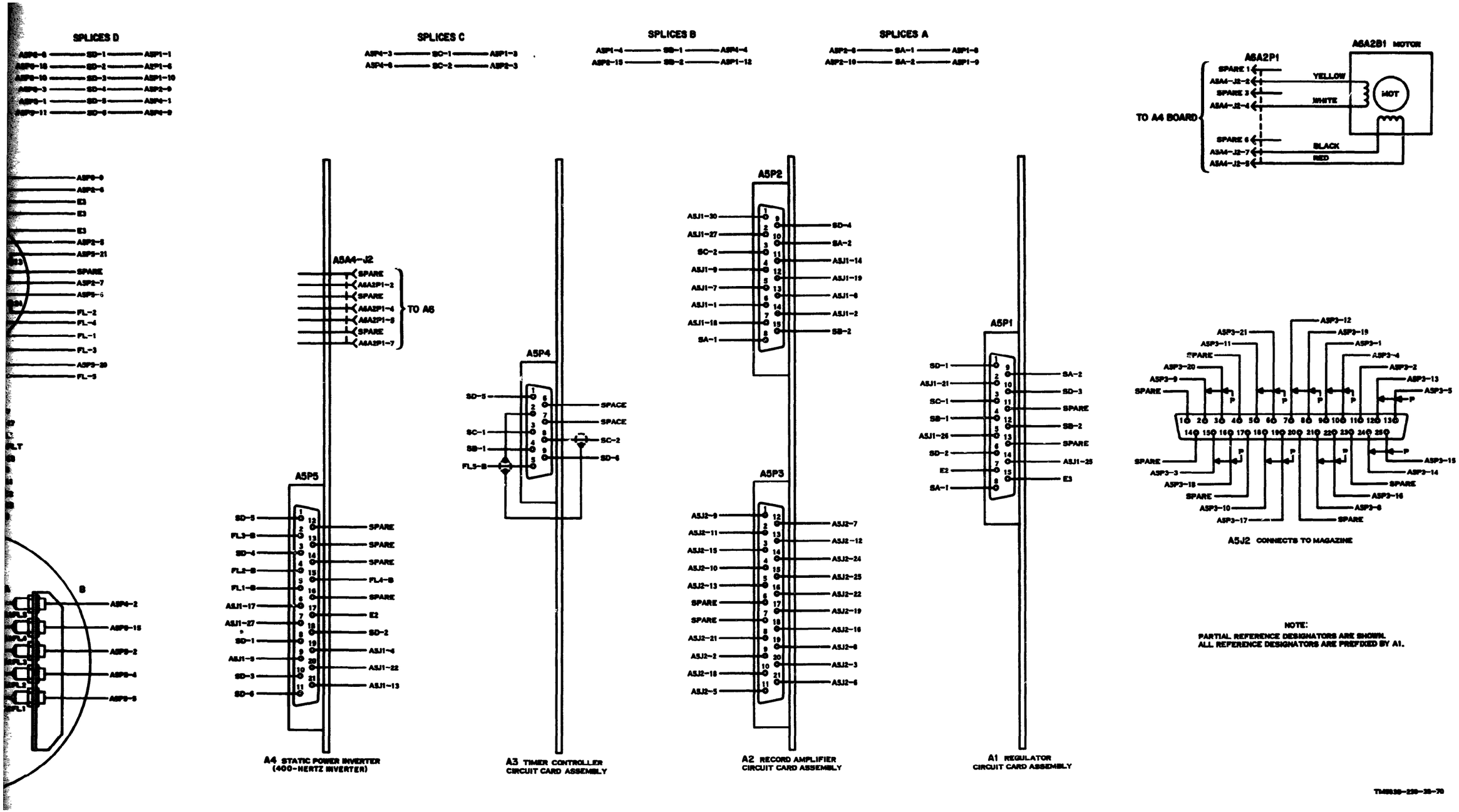


Figure 7-14. CIPR controller wiring diagram.

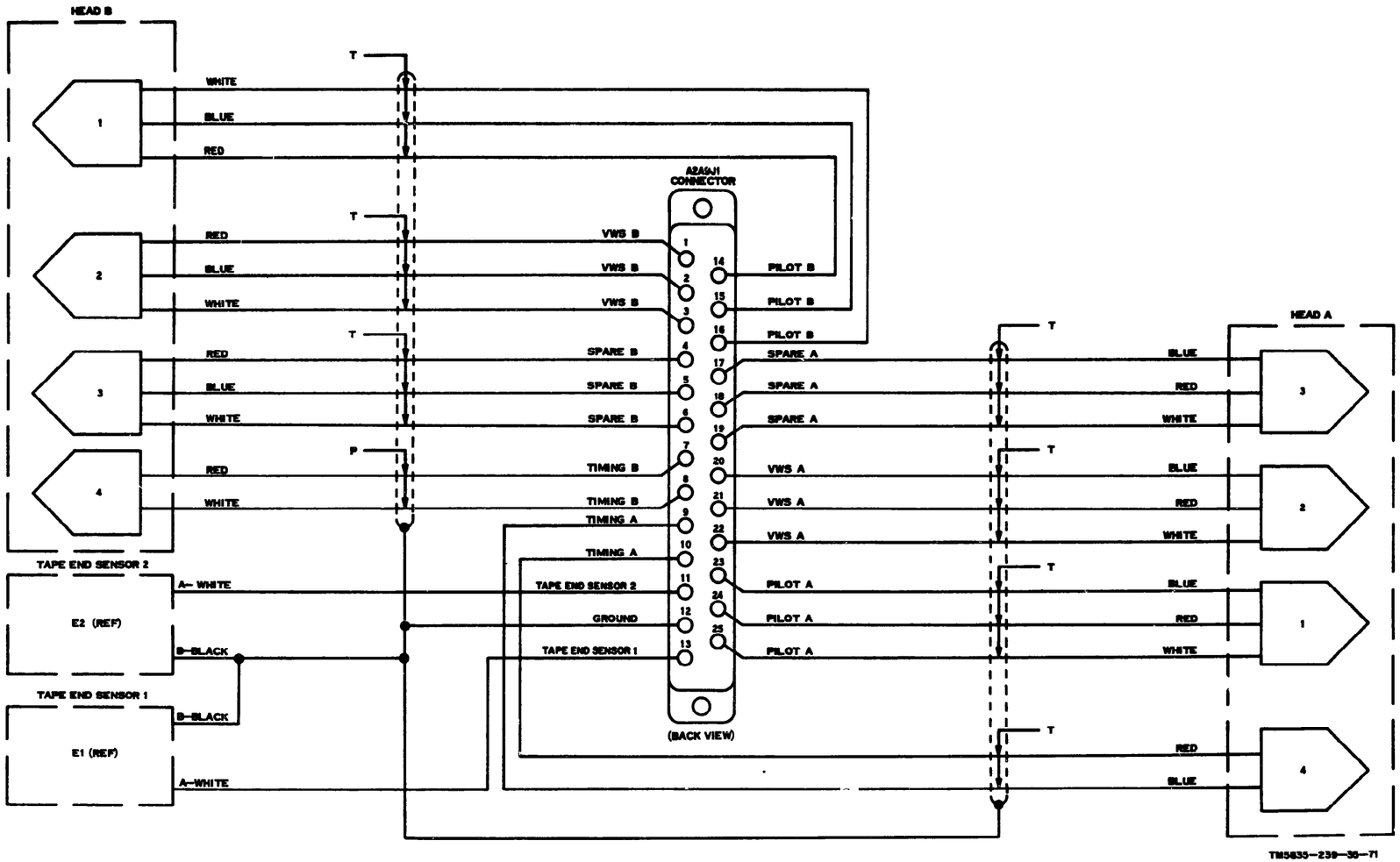
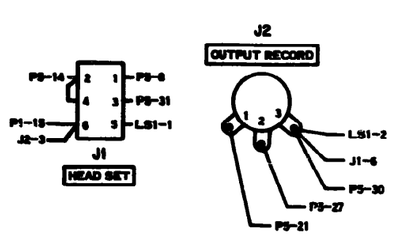
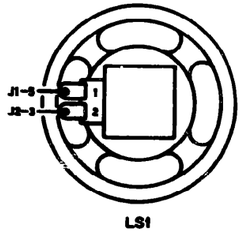
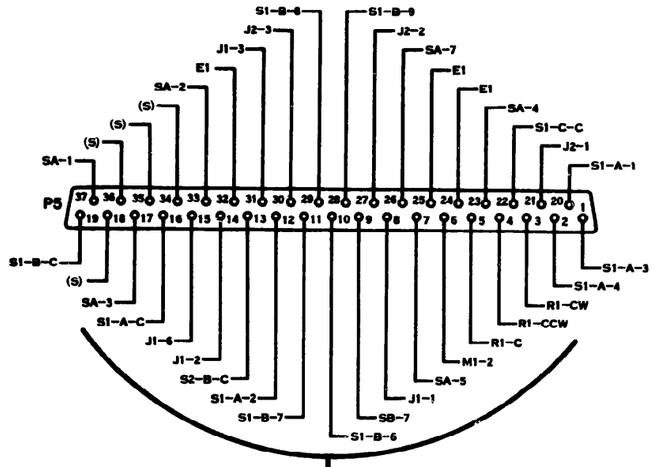
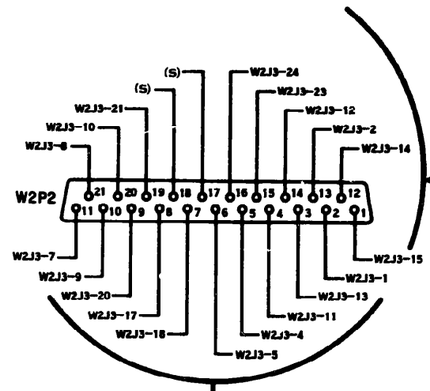


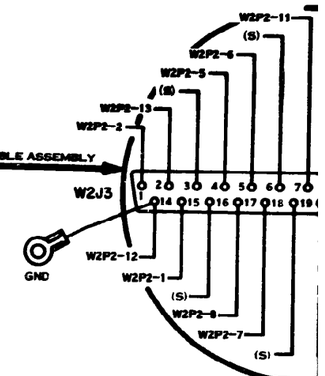
Figure 7-15. CIPR magazine wiring diagram.


J2
OUTPUT RECORD
P5-14
P5-6
P5-31
P1-15
LS1-1
J2-3
J1
HEAD SET
LS1-2
J1-6
P5-30
P5-27
P5-21

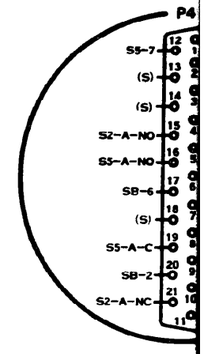

J1-5
J2-3
LS1

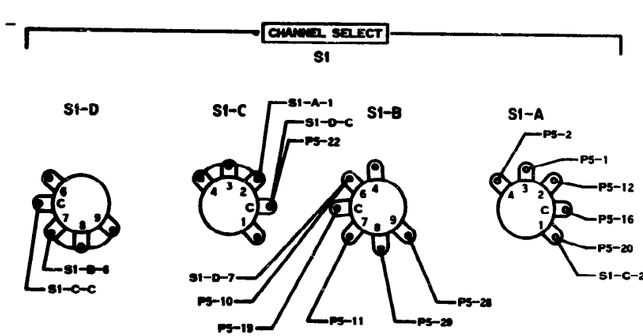

S1-B-8
S1-B-9
J2-3
J2-2
J1-3
SA-7
E1
E1
E1
SA-2
SA-4
S1-C-C
J2-1
S1-A-1
P5
S1-B-C
S1-A-3
SA-3
S1-A-4
S1-A-C
R1-CW
J1-6
R1-CCW
J1-2
R1-C
S2-B-C
M1-2
S1-A-2
SA-5
S1-B-7
J1-1
SB-7
S1-B-6
P5 MATES-WITH A2J2
A2J2
19
20

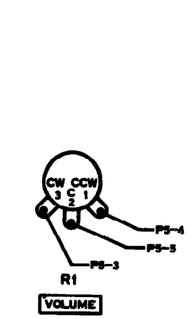

W2J3-24
W2J3-21
W2J3-23
W2J3-10
W2J3-12
W2J3-8
W2J3-2
W2J3-14
W2P2
W2J3-7
W2J3-15
W2J3-9
W2J3-1
W2J3-20
W2J3-13
W2J3-17
W2J3-11
W2J3-18
W2J3-4
W2J3-5
W2P2 MATES-WITH A2J1
A2J1
11
12

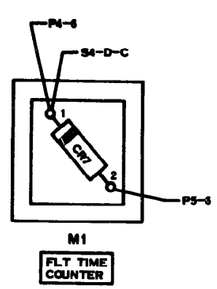

CABLE ASSEMBLY
W2P2-11
W2P2-6
W2P2-5
W2P2-13
W2P2-2
W2J3
GND
W2P2-12
W2P2-1
W2P2-8
W2P2-7

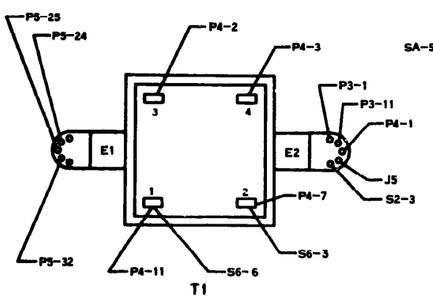
A3J1
1
25

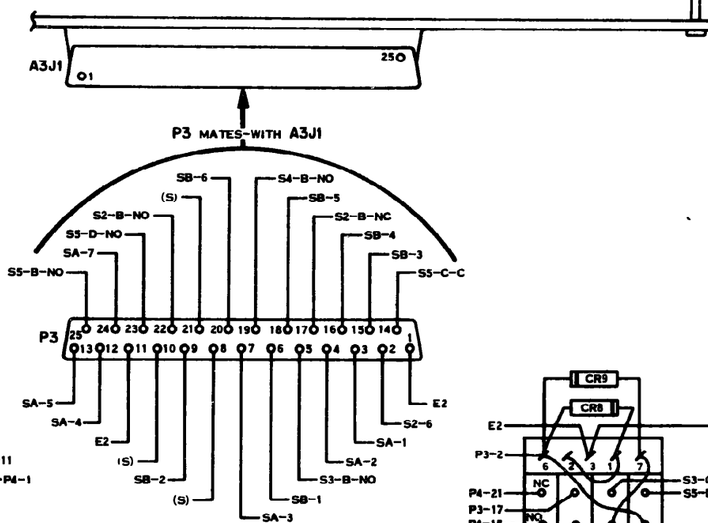

P4
S5-7
S5-A-NO
SB-6
S5-A-C
SB-2
S2-A-NC
P4 MATES-W

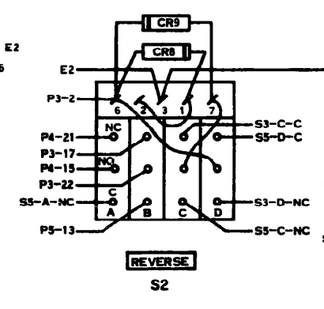

CHANNEL SELECT
S1
S1-D
S1-C
S1-A-1
S1-D-C
P5-22
S1-B
S1-A
P5-2
P5-1
P5-12
P5-16
P5-20
S1-C-2
S1-B-6
S1-C-C
S1-D-7
P5-10
P5-19
P5-11
P5-28
P5-29

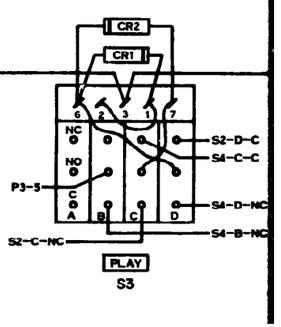

CW
CCW
P5-4
P5-5
P5-3
R1
VOLUME


P4-6
S4-D-C
CR7
P5-6
M1
FLT TIME
COUNTER


P5-25
P5-24
P4-2
P4-3
P3-1
P3-11
P4-1
E1
E2
J5
S2-3
P4-7
S6-3
P5-32
P4-11
S6-6
T1


P3 MATES-WITH A3J1
SB-6
S4-B-NO
(S)
SB-5
S2-B-NO
S2-B-NC
S5-D-NO
SB-4
SA-7
SB-3
S5-B-NO
S5-C-C
P3
SA-5
E2
SA-4
S2-6
E2
SA-1
(S)
S3-B-NO
SB-2
SA-2
(S)
SB-1
SA-3


CR9
CR8
E2
P3-2
S3-C-C
S5-D-C
P4-21
P3-17
P4-15
P3-22
S5-A-NC
S3-D-NC
P5-13
S5-C-NC
REVERSE
S2


CR2
CR1
P3-5
S2-D-C
S4-C-C
S4-D-NC
S2-C-NC
S4-B-NC
PLAY
S3

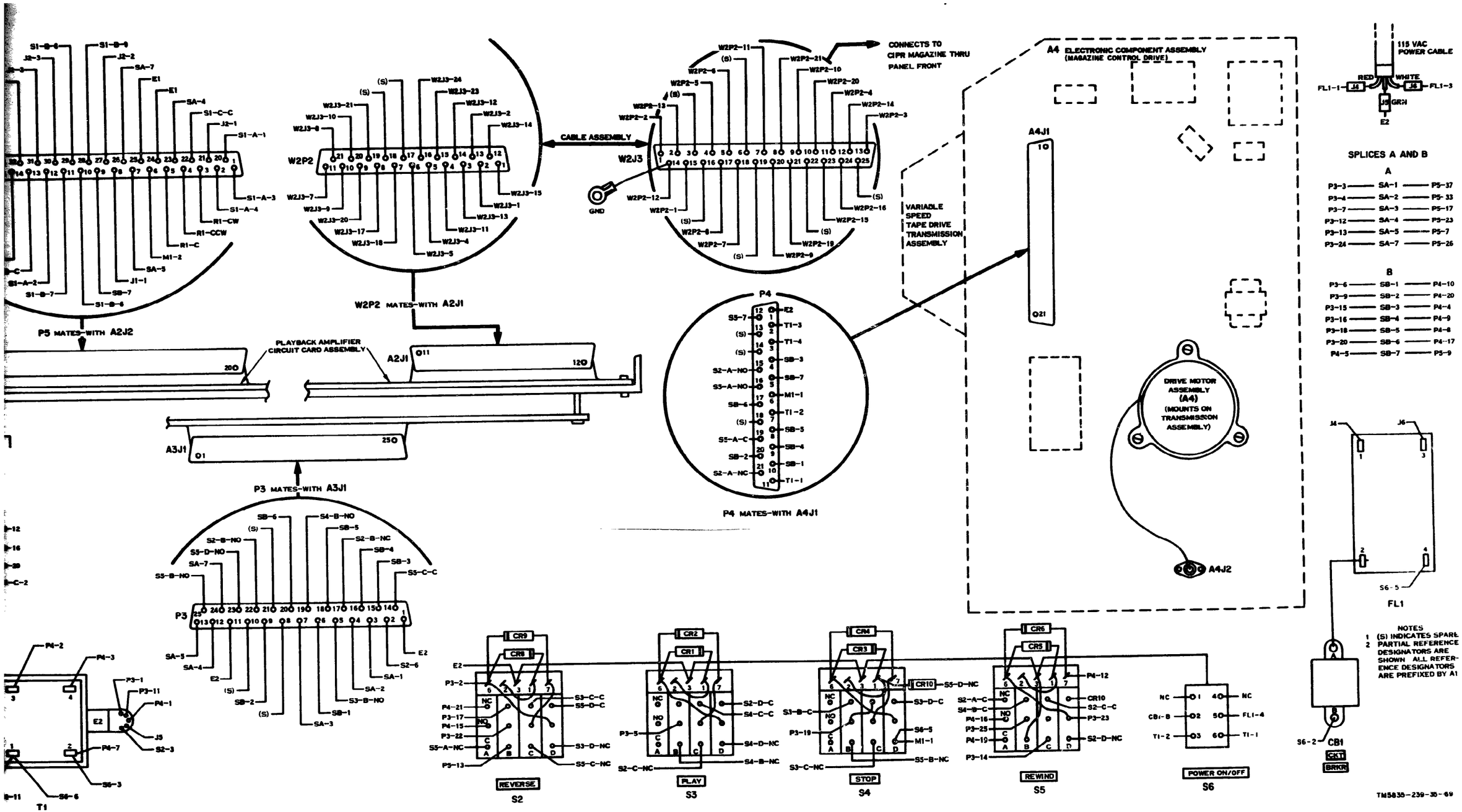
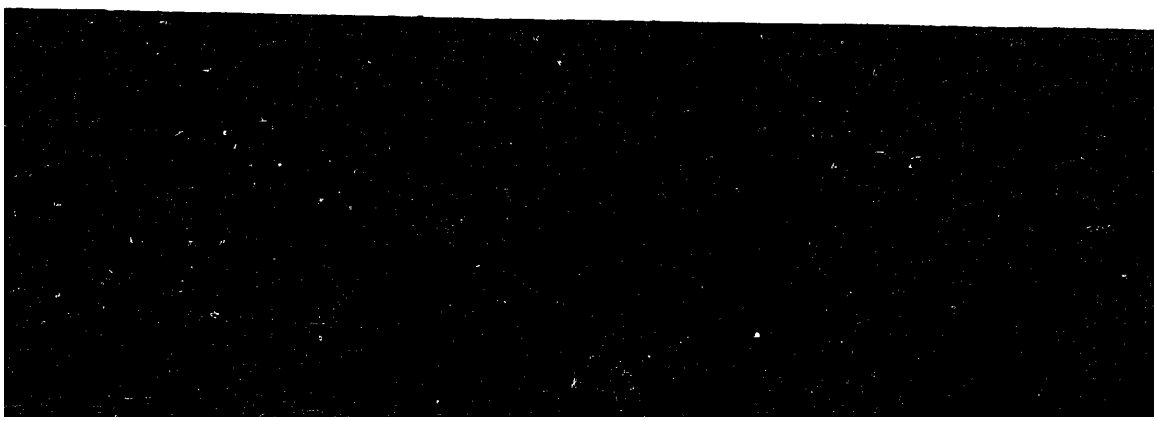


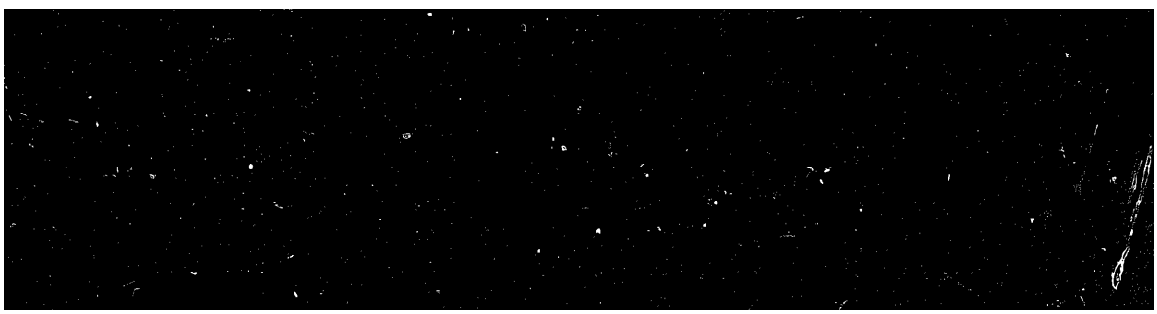
Figure 7-16. Playback unit wiring diagram.

END

12-03-82

DATE





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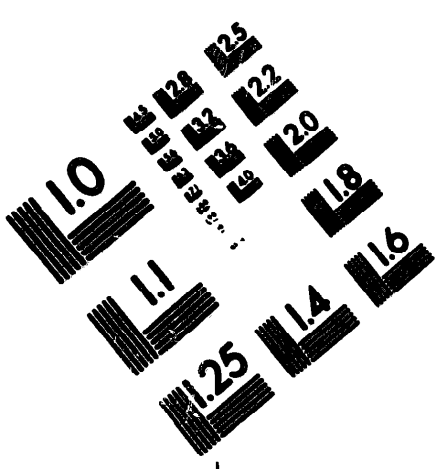
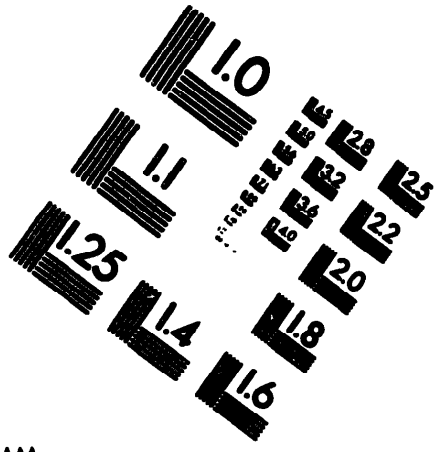
MICROFORM
TEST TARGET





150 MM

10 mm (e= 81 mm)

ABCDEFGHIJKLMNOPQRSTUVWXYZ1234567890
abcdefghijklmnopqrstuvwxyz$¢£/%#½¼¾—=+×&@*

15 mm (e= 1.09 mm)

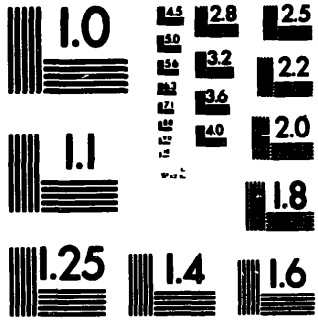
ABCDEFGHIJKLMNOPQRSTUVWXYZ1234567890
abcdefghijklmnopqrstuvwxyz$¢£/%#½¼¾—=+×&@*

2.0 mm (e= 1.37 mm)

ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
1234567890$¢£/%#½¼¾—=+×&@*

2.5 mm (e= 1.77 mm)

ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
1234567890$¢£/%#½¼¾—=+×&@*



10 mm (e= 81 mm)

ABCDEFGHIJKLMNOPQRSTUVWXYZ1234567890
abcdefghijklmnopqrstuvwxyz$¢£/%#½¼¾—=+×&@*

15 mm (e= 1.09 mm)

ABCDEFGHIJKLMNOPQRSTUVWXYZ1234567890
abcdefghijklmnopqrstuvwxyz$¢£/%#½¼¾—=+×&@*

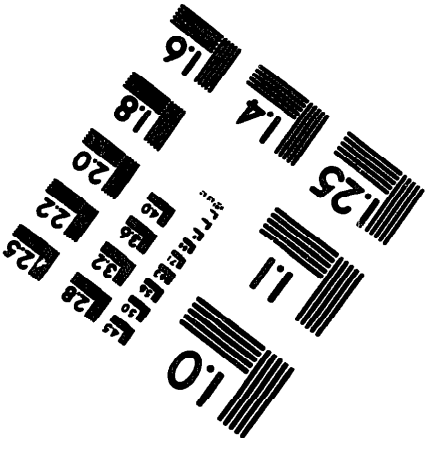
2.0 mm (e= 1.37 mm)

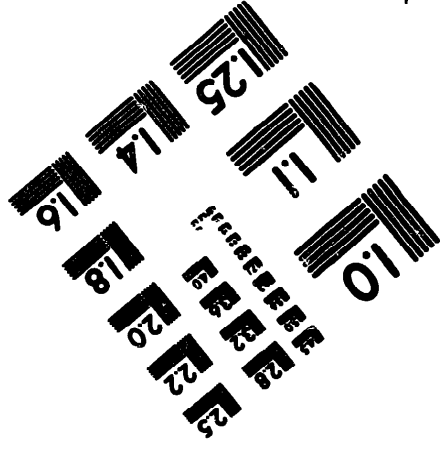
ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
1234567890$¢£/%#½¼¾—=+×&@*

2.5 mm (e= 1.77 mm)

ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
1234567890$¢£/%#½¼¾—=+×&@*

200 MM





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