

COMMON SYSTEMS RECORDED ANNOUNCEMENT FRAME (CSRAF)

SD-97725-01 AND SD-97725-02

REQUIREMENTS AND ADJUSTING PROCEDURES

1. GENERAL

1.01 This section contains operating requirements and adjusting procedures for the Common Systems Recorded Announcement Frame (CSRAF).

1.02 This section is reissued to add information covering the message synthesis version of the CSRAF and to generally update the section. This reissue affects the Equipment Test List.

1.03 *Asterisk (*)*: Requirements are marked with an asterisk when checking them would necessitate dismantling or dismounting apparatus or would affect the adjustment involved or other adjustments. Ordinarily these requirements need not be checked unless the apparatus or part is made accessible for other reasons or its performance indicates that such a check is advisable.

1.04 Unless otherwise specified, all requirement and adjusting procedures pertain to all versions of the CSRAF. When a requirement or adjustment pertains to a particular version, it will be specified by using VML for variable message length, MM for modular message, PM for phased message, or MMS for message synthesis service.

1.05 *Pulling the Recorder Unit Out on its Slides*: To gain access to the recorder unit, pull it out on its slides as follows.

- (1) Unlatch the door (Fig. 1) with the paddle latch and open the door.
- (2) If desired, the door can be removed by lifting it from the hinge blocks. Place the door in a suitable storage place.
- (3) Release the latch assembly securing unit in stored position (Fig. 2) by lifting it upward and pull the recorder unit out of the drum storage unit until it stops and locks.

1.06 *Pushing the Recorder Unit Into the Drum Storage Unit*

- (1) Release the slides by depressing the latches on both slides (Fig. 2) and push the recorder unit back into the drum storage unit until the latch secures it.
- (2) Remount the door if removed and close it, ensuring that it is secured with the paddle latch.

2. REQUIREMENTS

2.01 *Cleaning*

- (a) *General*: The drum storage unit and its slides shall be clean and free of dirt. Dust and lint shall not be allowed to accumulate. The drum storage unit shall be inspected regularly and cleaned when necessary.
- (b) *Magnetic Drum*: The magnetic drum, magnetic heads, and wiper shall be free of all foreign matter. To check, proceed as follows.

Caution: *Magnetized tools, equipment, or devices are not be placed in the immediate adjacent vicinity of the magnetic drum. Placement of magnetized items near the recorded surface can introduce noise as well as erase recorded information.*

- (1) Pull the recorder unit out on its slides (1.05).
- (2) Using the appropriate Allen wrench, remove the four dust cover retaining screws (Fig. 2).
- (3) Remove the dust cover by lifting it straight up and off the recorder unit. The parts are now accessible for inspection (Fig. 3).

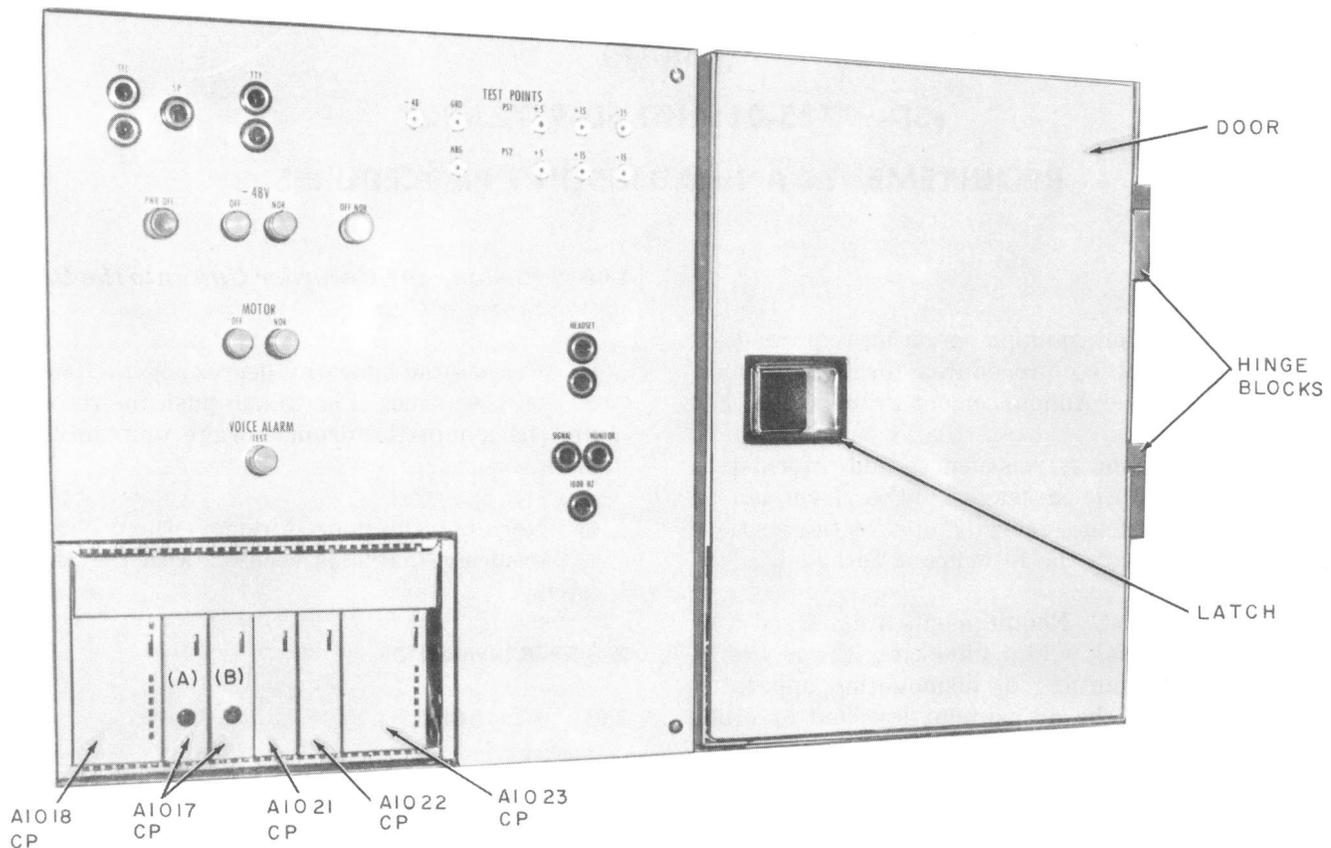


Fig. 1—Storage Module (Typical)

Prior to installation or reinstallation of the magnetic drum, the recording surface shall be cleaned.

- (c) **Dust Cover:** The dust cover shall be free of all fingerprints, dirt, and dust.
- (d) **Finish:** All painted surfaces shall be free of lubricant and dirt. Lubricant shall be removed from the finish as soon as possible to prevent discoloration.

2.02 Lubrication

- (a) **Magnetic Drum:** The wiper (Fig. 3) shall apply a uniform, light coat of lubricant (silicone fluid SF-1147, 200 centistokes viscosity) to the magnetic drum. This is done during the normal operation of the drum storage unit. Check as follows.

- (1) Pull the recorder unit out on its slides (1.05).
- (2) Using the appropriate Allen wrench, remove the four dust cover retaining screws (Fig. 2) and remove the dust cover.
- (3) Observe that the entire surface of the drum is thoroughly lubricated, as evidenced by a shiny, wet appearance.

Caution: The drum shall not be permitted to become dry.

The wiper shall be changed at normal intervals or immediately if the drum is not properly lubricated, as evidenced by a loss of the shiny appearance on the drum surface. After new wiper is installed, check daily for 1 week for proper lubrication.

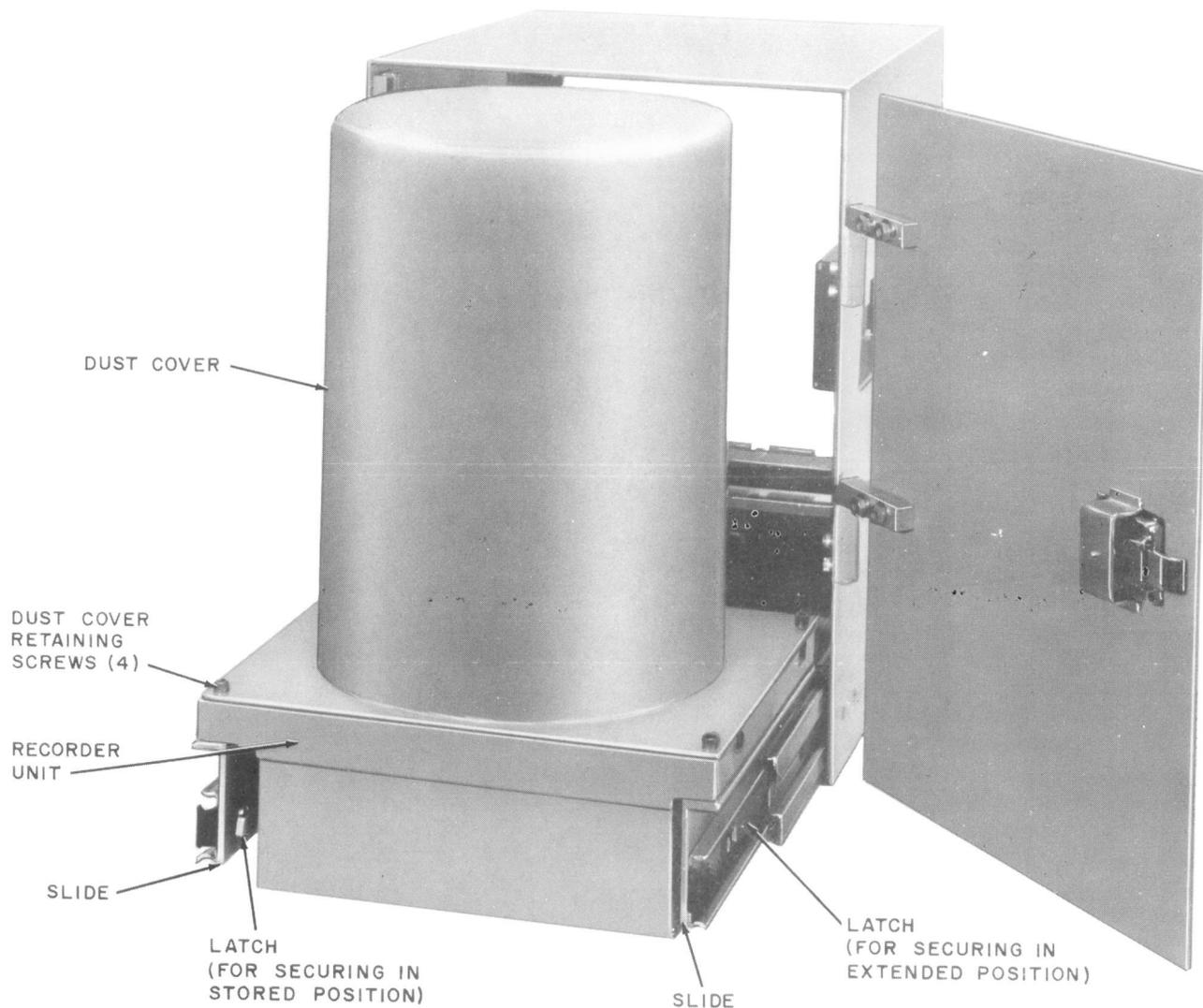


Fig. 2—Drum Storage Unit With Recorder Unit Out on Its Slides

- (b) **Wiper:** The wiper shall contact the entire surface of the magnetic drum as it rotates and shall apply sufficient lubrication thereto. The wiper shall be changed at 6-month intervals or more often if necessary. Check visually by pulling the recorder unit out on its slides (1.05) and remove the dust cover.
- (c) The recorder unit requires no further lubrication.
- 2.03 Brush Ring:** After 5 years, inspect the brush ring annually. Replace the brush ring when the brushes are worn to a thickness of **0.020**

inch. See Section 201-520-801 for access to brush ring for checking.

2.04 Hinged Front Door and Paddle Latch:

The hinged front door (Fig. 1) shall open and close freely without any binding. The securing latch shall operate smoothly and shall hold the hinged front door tightly closed when latched.

2.05 Slides and Latches:

The slides (Fig. 2 and 3) shall operate smoothly and evenly with minimal effort. The latches associated with the slides shall securely lock in both the open and closed positions.

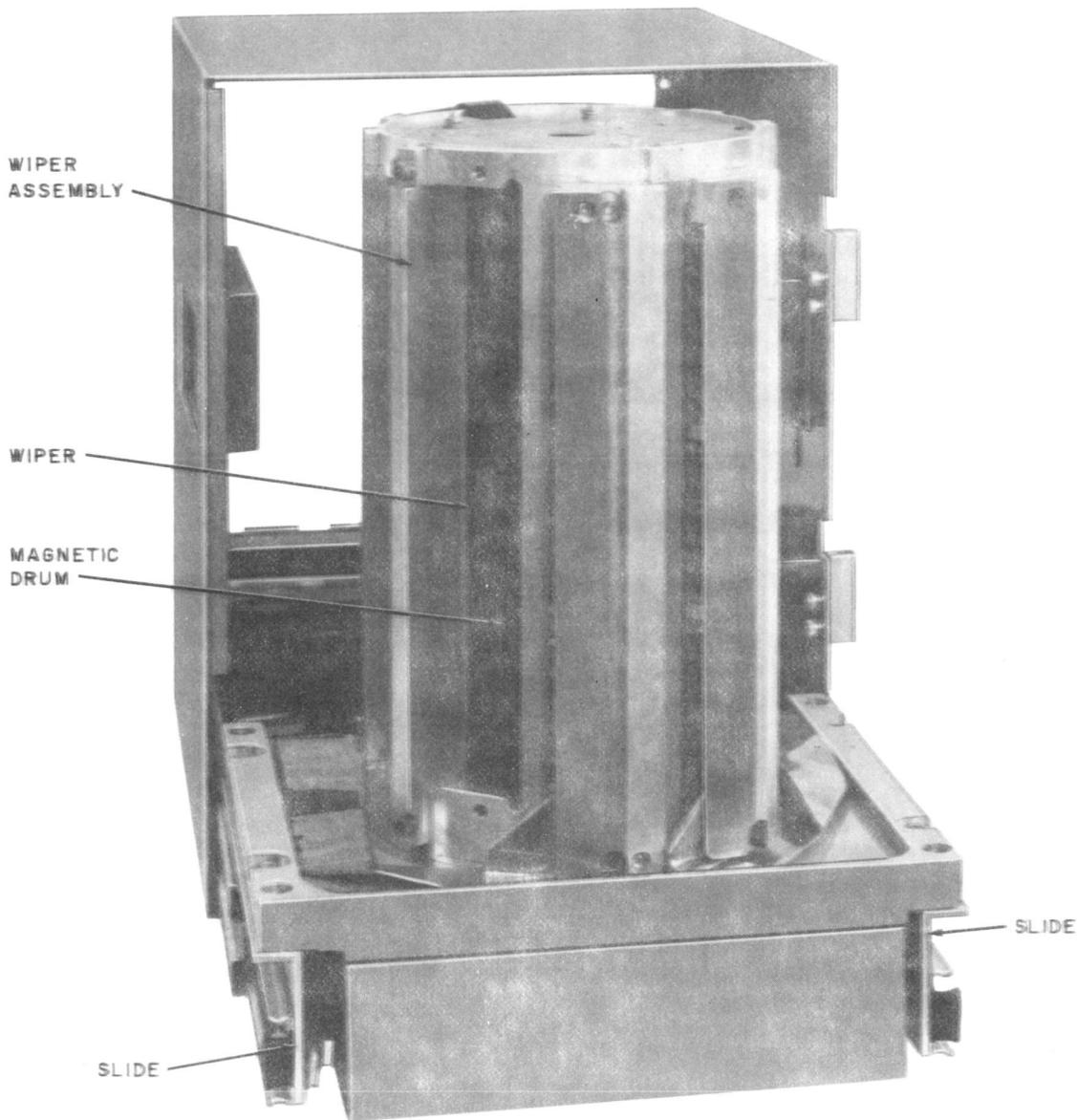


Fig. 3—Recorder Unit With Dust Cover Removed

2.06 Wires and Cables: The insulating materials of the wires and cables shall not be nicked or damaged in any way.

Check visually.

2.07 Magnetic Drum: The magnetic drum (Fig. 4 and 5) shall fit readily on its mounting surface and be held securely in place by the mounting nut.

(a) **Surface:** The recording surface of the magnetic drum (Fig. 5) shall be free of scratches, cuts, gouges, or grooves due to operation. Nothing shall come in contact with the magnetic drum recording surface except the pole pieces of the magnetic heads and the felt wick of the magnetic drum wiper.

Gauge by eye.

(b) **Drum Speed (Motor Control Circuit):** The speed of the drum shall be such that

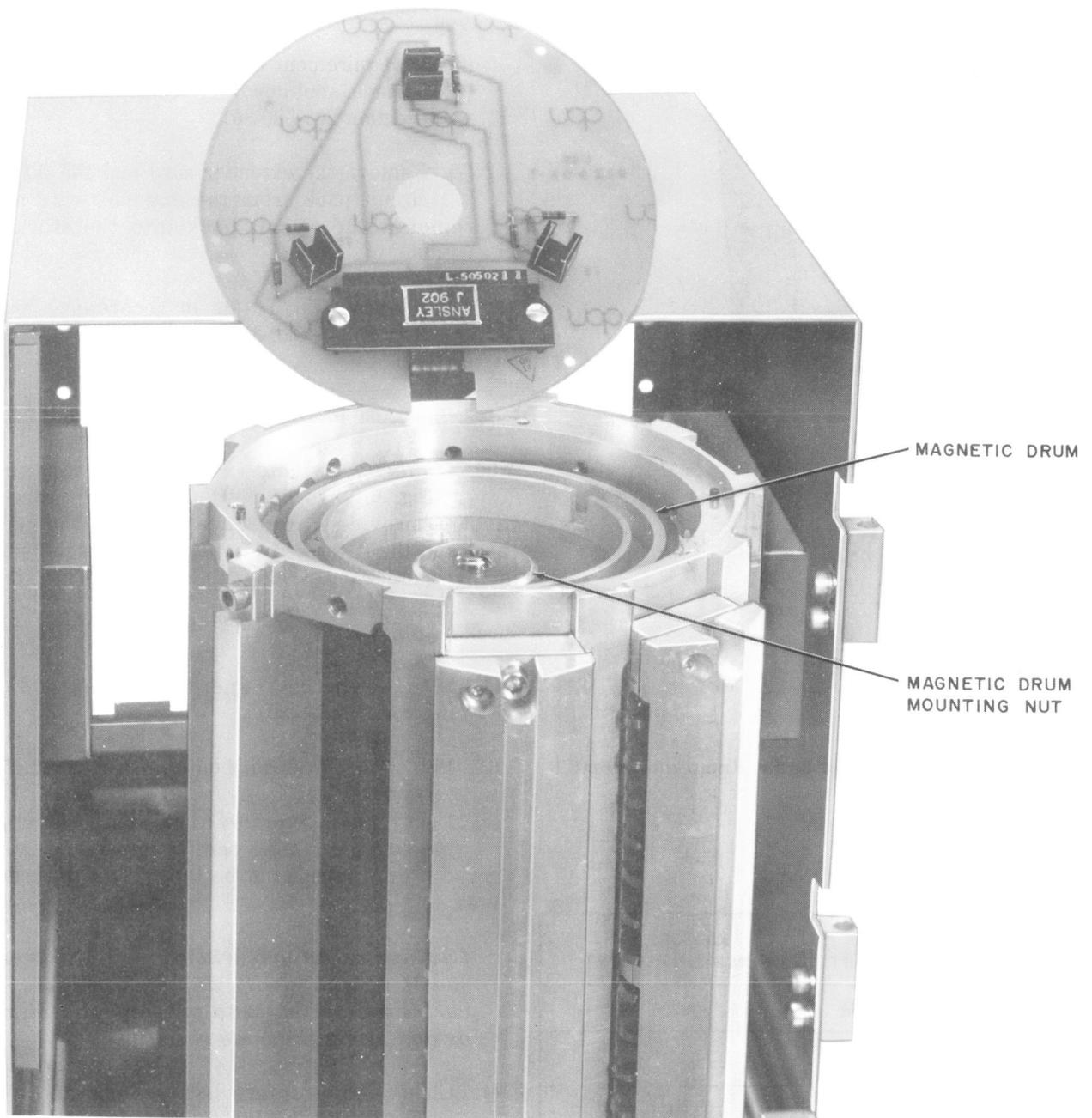


Fig. 4—Typical View of Top of Recorder Unit With Optical Switch Assembly Dismounted

the frequency from the code wheel at the motor control circuit is in accordance with that of Table A.

Check as follows.

- (1) Shut down the frame in accordance with Section 201-520-301.
- (2) Remove circuit pack A1022 (Fig. 1) from the storage module, place it in an extender card, and mount the extender card in the storage module.
- (3) Set the electronic counter to detect 3150 Hz (List 1 or List 2 Drum Storage Unit) or 4200 Hz (List 3 Drum Storage Unit) and

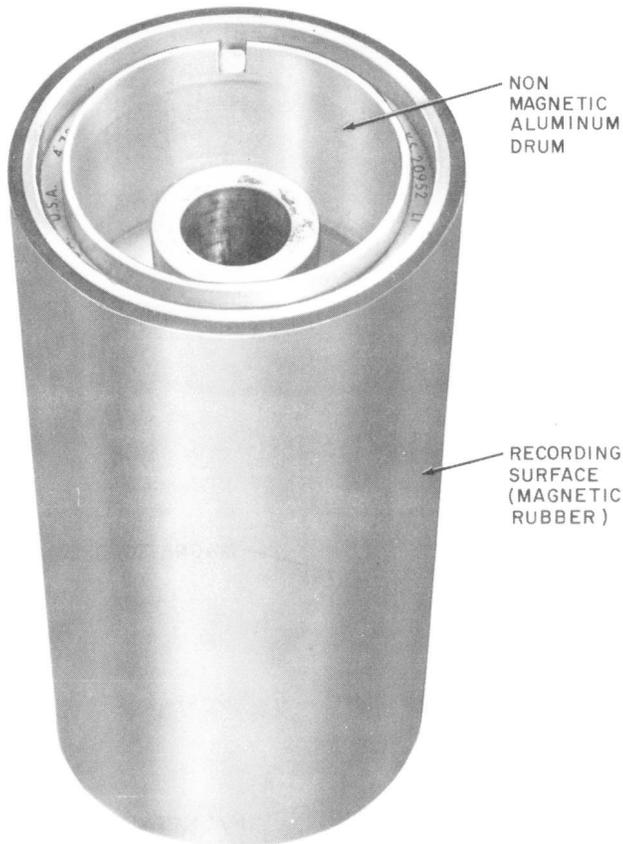


Fig. 5—Typical Magnetic Drum Removed From Recorder Unit

→TABLE A←

FREQ.	KS-20951, L1 OR L2 DRUM STORAGE UNIT	KS-20951, L3 DRUM STORAGE UNIT
	VML, MM, AND PM	MSS
MIN.	3120 Hz	4160 Hz
MAX.	3180 Hz	4240 Hz

Note: Values are ±1% nominal

connect the counter to pin 24 and ground (pin 15) of the circuit pack.

(4) Start up the recorder in accordance with Section 201-520-301 and allow the drum to rotate 5 minutes to stabilize before making any measurements.

- (5) Note the frequency indication on the counter.
- (6) If requirement is met or after adjustment is made, shut down the frame in accordance with Section 201-520-301.
- (7) Remove the extender card and the A1022 circuit pack from the extender card and remount the circuit pack into the storage module.
- (8) Start up the frame in accordance with Section 201-520-301.

Code Wheel Amplifier Assembly and Associated Parts

***2.08 Detector Assembly:** The detector assembly (Fig. 6) shall be positioned about the code wheel to provide a clearance between the code wheel and the detector of **0.005 inch**, gauged with the mylar stock.

Check as follows.

- (1) Shut down the frame in accordance with Section 201-520-301.
- (2) Pull the recorder unit out on its slides (1.05).
- (3) Using the appropriate Allen wrench, remove the cover retaining screws and remove the cover (Fig. 7) from the bottom of the recorder unit.

Caution: The code wheel assembly is very sensitive and easily damaged. Extreme care shall be taken to prevent scratching or damaging the code wheel.

- (4) Check the clearance between the detector assembly and the **lower surface** of the code wheel (Fig. 6) by inserting the mylar stock in the clearance. Do **not** apply undue pressure.
- (5) After checking the requirement and, if necessary, making the adjustments, remount the cover on the bottom of the recorder unit and secure with the screws (Fig. 7).
- (6) Push the recorder unit back into the drum storage unit.

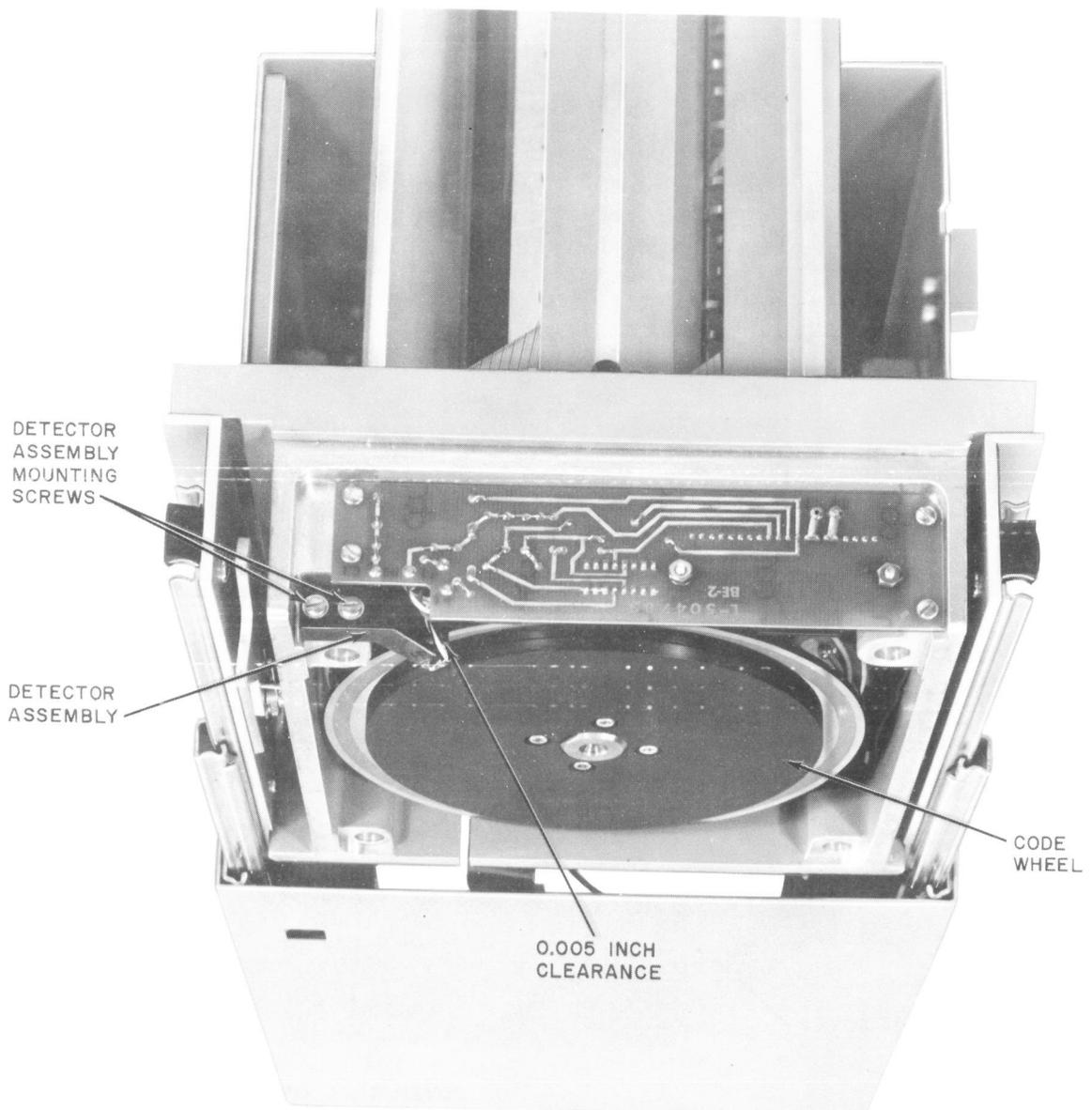


Fig. 6—Bottom of Recorder Unit With Cover Removed

- (7) Start up the frame in accordance with Section 201-520-301.
- *2.09 Detector Assembly Output:** With the code wheel rotating, the detector assembly output shall be a sine wave of amplitude

Min 30 mv, p-p (peak-to-peak)

Check as follows.

- (1) Pull the recorder unit out on its slides (1.05).
- (2) Remove the cover from the bottom of the recorder unit [2.08(3)] to expose the terminals on the code wheel amplifier (Fig. 6).
- (3) Connect the oscilloscope input to terminal E6 (refer to Fig. 8 for location) on the circuit board and set to display waveform in question. Observe the indication on the oscilloscope.

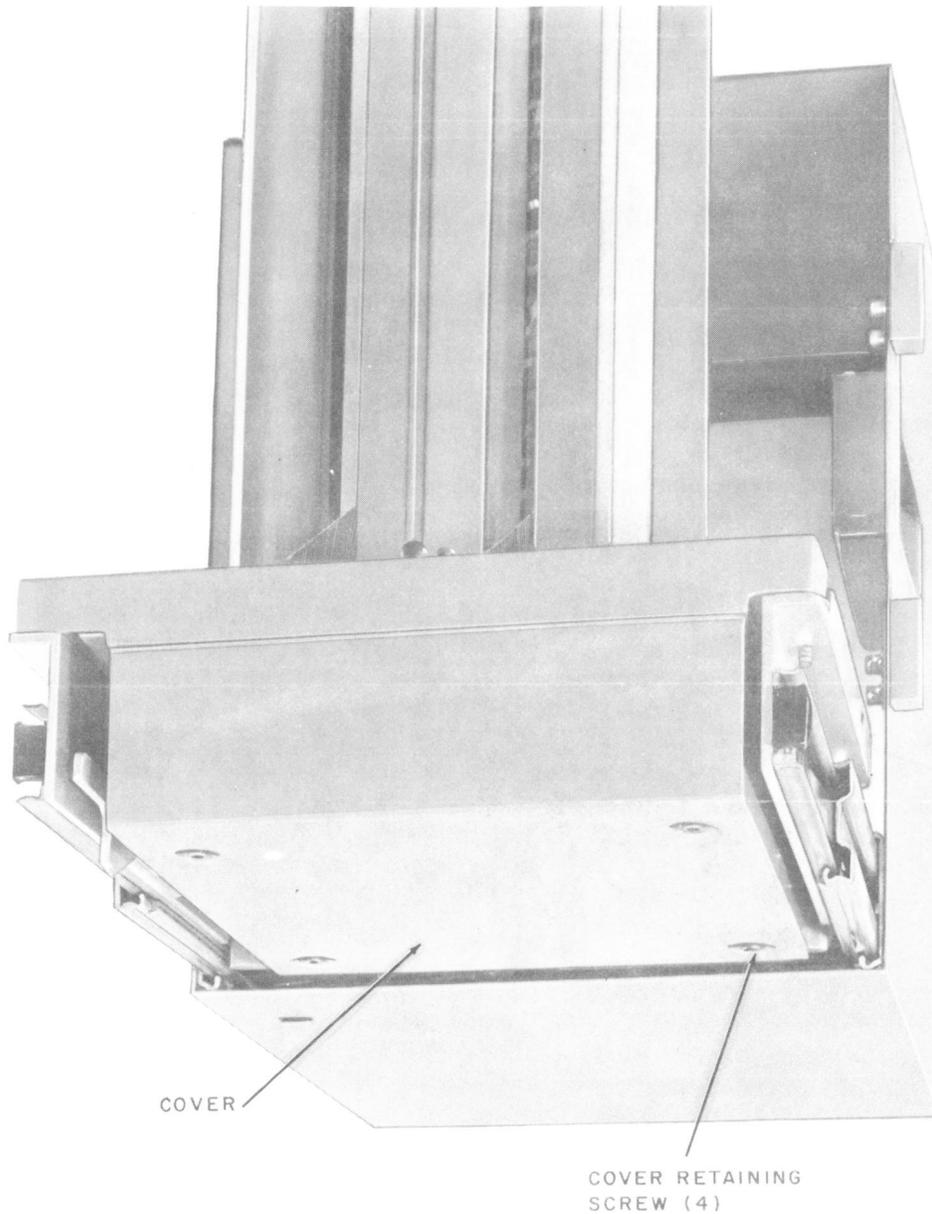


Fig. 7—Bottom View of Recorder Unit Pulled Out on Its Slides

- (4) After checking the requirement and, if necessary, making the adjustments, remount the cover on the bottom of the recorder unit and secure with the screws (Fig. 7).
- (5) Push the recorder unit back into the drum storage unit.
- (6) Start up the frame in accordance with Section 201-520-301.

***2.10 Code Wheel Amplifier Output:** With the code wheel rotating (drum rotating) at 4 seconds (for VML, MM or PM service) or at 3 seconds (for MSS) per revolution, the output measured at pin 16 of A1021 circuit pack shall be a square wave of the frequency and amplitude as indicated in Table B.

Check as follows.

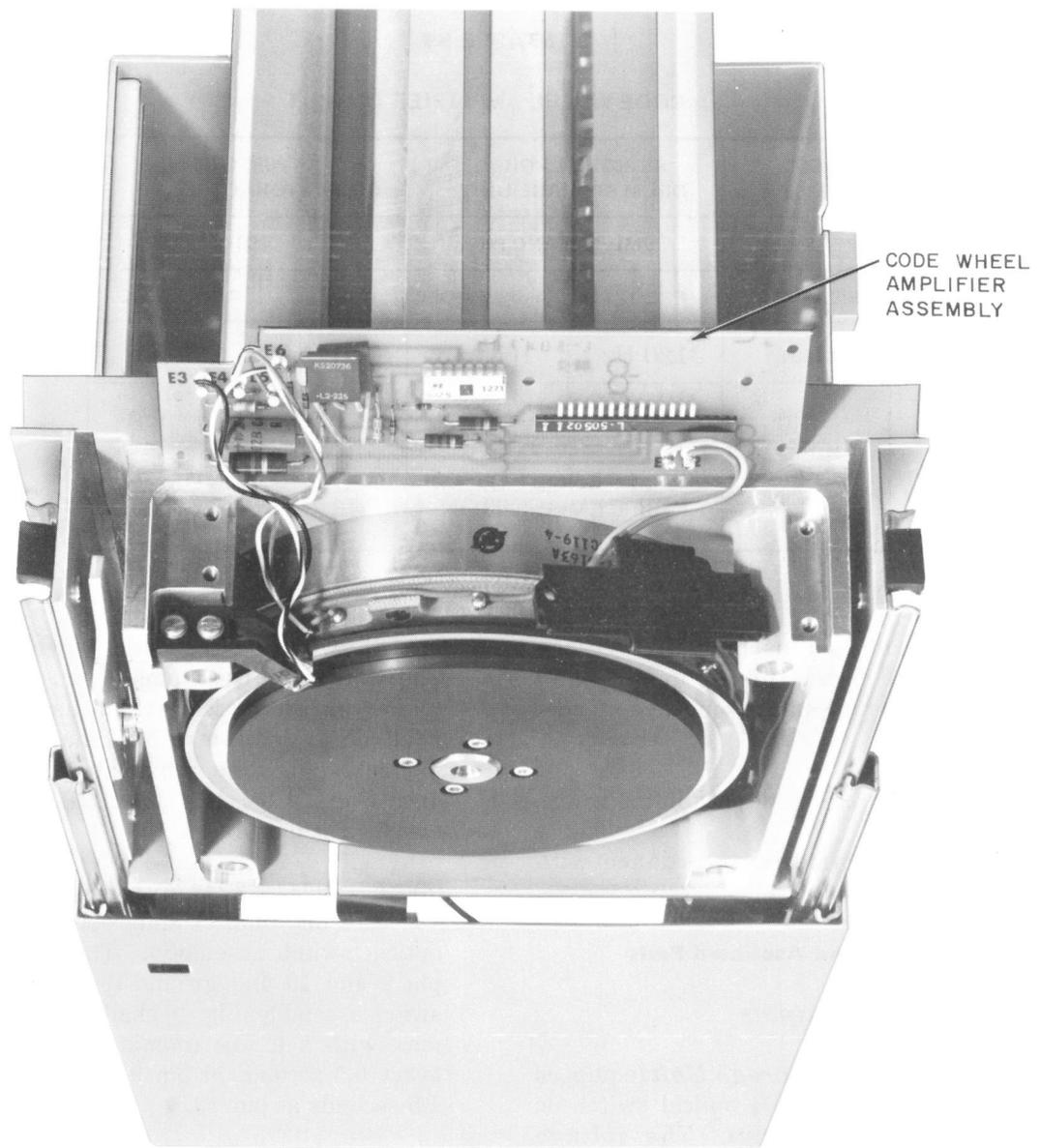


Fig. 8—Bottom View of Recorder Unit With Cover Removed and Code Wheel Amplifier Dismounted

- (1) Requirements 2.08 and 2.09 must be met.
- (2) Shut down the frame in accordance with Section 201-520-301.
- (3) Remove the A1021 circuit pack (Fig. 1) and place it on an extender card.
- (4) Connect the counter input to pin 16 and ground to pin 15 of A1021 circuit pack.
- (5) Start up the frame in accordance with Section 201-520-301.
- (6) Set the counter to measure the frequency and note the frequency indication.
- (7) Disconnect the counter. Connect the oscilloscope input to pin 16 and ground to pin 15 of the A1021 circuit pack. Note the ac voltage indication.

♦TABLE B♦

CODE WHEEL AMPLIFIER OUTPUT

DSU LIST	KS-20951, L1 OR L2 DRUM STORAGE UNIT		KS-20951, L3 DRUM STORAGE UNIT	
VERSION	VML, MM AND PM		MSS	
MEASURE	FREQ.	AMPLITUDE	FREQ.	AMPLITUDE
MIN.	3120 Hz	16V p-p	4160 Hz	16V p-p
MAX.	3180 Hz	24V p-p	4240 Hz	24V p-p
CODE WHEEL ROTATION	4 SECONDS PER REVOLUTION		3 SECONDS PER REVOLUTION	

- (8) Disconnect the oscilloscope, remove the extender card from the connector, and remove the A1021 circuit pack from the extender card.
- (9) Remount the A1021 circuit pack in the frame.
- (10) Start up the frame in accordance with Section 201-520-301.

Optical Switch Assembly and Associated Parts***2.11 Optical Switch Outputs**

- (a) **KS-20951 L1 Drum Storage Unit** (equipped with one ♦single channel♦ optical switch on the optical switch assembly): The voltage between pin 9 and ground (pin 8) on the optical switch assembly (Fig. 9) shall be 3 Vdc min/5 Vdc max with a 0 Vdc (nominal) pulse of approximately 100 ms duration every 4 seconds.
- (b) **KS-20951 L2 Drum Storage Unit**—Serial No. 1 through 8♦ (equipped with three optical switches on the optical switch assembly): The voltage between pins 9, 10, and 11 and ground (pin 8) on the optical switch assembly (Fig. 9) shall be 3 Vdc min/5 Vdc max with a 0 Vdc (nominal) pulse of approximately 100 ms duration once every 4 seconds at pin 9 and twice every 4 seconds at pins 10 and 11.
- (c) ♦**KS-20951 L2 Drum Storage Unit**—Serial No. 9 and Up (equipped with one dual channel

optical switch on the optical switch assembly): The voltage between pins 9 and 10 and ground (pin 8) on the optical switch assembly (Fig. 9) shall be 3 Vdc min/5 Vdc max with a 0 Vdc (nominal) pulse of approximately 100 ms duration once every 4 seconds at pin 9 and three times every 4 seconds at pin 10.

- (d) **KS-20951 L3 Drum Storage Unit** (equipped with one dual channel optical switch on the optical switch assembly): The voltage between pin 9 and 10 and ground (pin 8) on the optical switch assembly (Fig. 9) shall be 3 Vdc min/5 Vdc max with a 0 Vdc (nominal) pulse alternating every 0.5 seconds at pin 9 and alternating every 1.5 seconds at pin 10. ♦

Check as follows.

- (1) Pull the recorder unit out on its slides (1.05).
- (2) Using the appropriate Allen wrench, remove the dust cover retaining screws (Fig. 2) and remove the dust cover.
- (3) Set the oscilloscope to measure pulse 3-5 volts amplitude and approximately 100 ms duration. Connect it to the appropriate pins of the optical switch assembly.
- (4) Observe the indication on the oscilloscope.

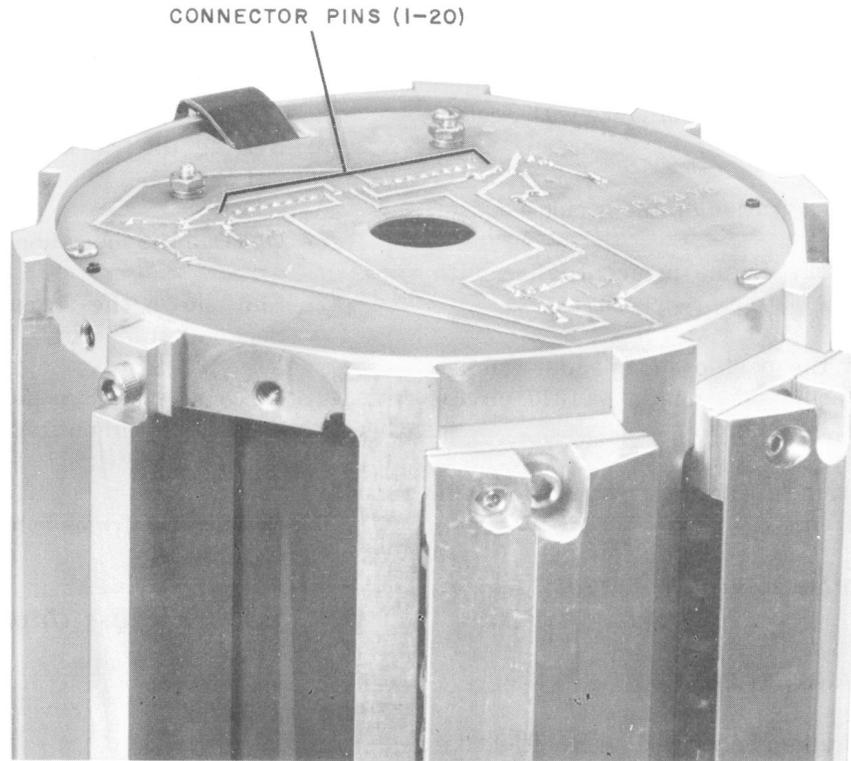


Fig. 9—Top View of Recorder Unit With Dust Cover Removed

- (5) Disconnect the oscilloscope. Remount the dust cover and secure with the mounting screws.
- (6) Push the recorder unit into the drum storage unit (1.06).

***2.12 Clock Pulse (Input to A1017 Circuit Pack)**

▶FOR VML, MM, AND PM ONLY◀

- (a) When the frame is equipped with a KS-20951 L1 drum storage unit (one ▶single channel◀ optical switch on the optical switch assembly), the voltage between pin 2 and ground (pin 27) of A1017 circuit pack A (Fig. 1) shall be 3 Vdc min/5 Vdc max with a 0 Vdc (nominal) pulse every 4 seconds.
- (b) When the frame is equipped with a KS-20951 L2 drum storage unit—Serial No. 1 through 8◀ (three optical switches on the optical switch assembly), the voltage between pin 5 and 2 and ground (pin 27) of A1017 circuit pack B (Fig. 1) shall be 3 Vdc min/5 Vdc max with a 0 Vdc

(nominal) pulse twice every 4 seconds at pin 5 and once every 4 seconds at pin 2.

- (c) ▶When the frame is equipped with a KS-20951 L2 drum storage unit—Serial No. 9 and up (one dual-channel optical switch on the optical switch assembly), the voltage between pin 5 and 2 and ground (pin 27) of A1017 circuit pack B (Fig. 1) shall be 3 Vdc min/5 Vdc max with a 0 Vdc (nominal) pulse three times every 4 seconds at pin 5 and once every 4 seconds at pin 2. ▶

Check as follows.

- (1) Requirement 2.11 must be met.
- (2) Shut down the frame in accordance with Section 201-520-301.
- (3) Remove the respective A1017 circuit pack (Fig. 1) and mount it in an extender card. Mount the extender card in the storage module.
- (4) Set the oscilloscope to measure a pulse 3-5 volts amplitude and 100 ms duration and

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connect it to the appropriate pins of the A1017 circuit pack on the extender card.

- (5) Start up the frame in accordance with Section 201-520-301.
- (6) Observe the indication on the oscilloscope.
- (7) Shut down the frame in accordance with Section 201-520-301.
- (8) Disconnect the oscilloscope leads, remove extender card, and remount A1017 circuit pack in the storage module.
- (9) Start up frame in accordance with Section 201-520-301.

*2.13 *Clock Pulse (Output of A1017 Circuit Pack)*

▶FOR VML, MM, AND PM ONLY◀

- (a) When the frame is equipped with a KS-20951 L1 drum storage unit (one ▶single channel◀ optical switch on the optical switch assembly), pin 21 of A1017 circuit pack A (Fig. 1) shall have a positive going **3 volts minimum** pulse once every 4 seconds.
- (b) When the frame is equipped with a KS-20951 L2 drum storage unit ▶there will be two A1017 circuit packs in the storage module. The output of A1017 circuit pack A (Fig. 1) shall be as specified in 2.13(a). Pin 13 of A1017 circuit pack B shall have a positive going **3 volts minimum** pulse three times every 4 seconds.▶

Check as follows.

- (1) Requirement 2.12 must be met.
- (2) Shut down the frame in accordance with Section 201-520-301.
- (3) Remove the respective A1017 circuit pack A1017 (Fig. 1) and mount it in an extender card. Mount the extender card in the storage module.
- (4) Set the oscilloscope to measure 3-5 volts amplitude and 100 ms duration. If checking A1017 circuit pack A (Fig. 1), connect the scope to pin 21 and ground (pin 27) of the circuit pack.

If checking A1017 circuit pack B (Fig. 1), connect the scope to pin 13 and ground (pin 27) of the circuit pack.

- (5) Start up the frame in accordance with Section 201-520-301.
- (6) Observe the indication on the oscilloscope.
- (7) Shut down the frame in accordance with Section 201-520-301.
- (8) Disconnect oscilloscope leads, remove extender card, and remount A1017 circuit pack in the storage module.
- (9) Start up the frame in accordance with Section 201-520-301.

*2.14 ▶Clock Pulse (Input to A1103 Circuit Pack)

FOR MSS ONLY

- (a) When the frame is equipped with a KS-20951 L3 drum storage unit (one dual channel optical switch on the optical switch assembly), pin 2 and ground (pin 27) of A1103 circuit pack (Fig. 10) shall have a square wave alternating between minimum 3 Vdc, maximum 5 Vdc for 0.5 seconds and 0 Vdc for 0.5 seconds. Pin 5 and ground (pin 27) of the A1103 circuit pack shall have a square wave alternating between minimum 3 Vdc, maximum 5 Vdc for 1.5 seconds and 0 Vdc for 1.5 seconds.

Check as follows.

- (1) Requirement 2.11 must be met.
- (2) Shut down the frame in accordance with Section 201-520-301.
- (3) Remove the A1103 circuit pack (Fig. 10) and mount it in an extender board. Mount the extender card in the storage module.
- (4) Set the oscilloscope to measure a pulse 3-5 volts amplitude and of the proper duration and connect it to the appropriate pins of the A1103 circuit pack on the extender card.
- (5) Start up the machine in accordance with Section 201-520-301.

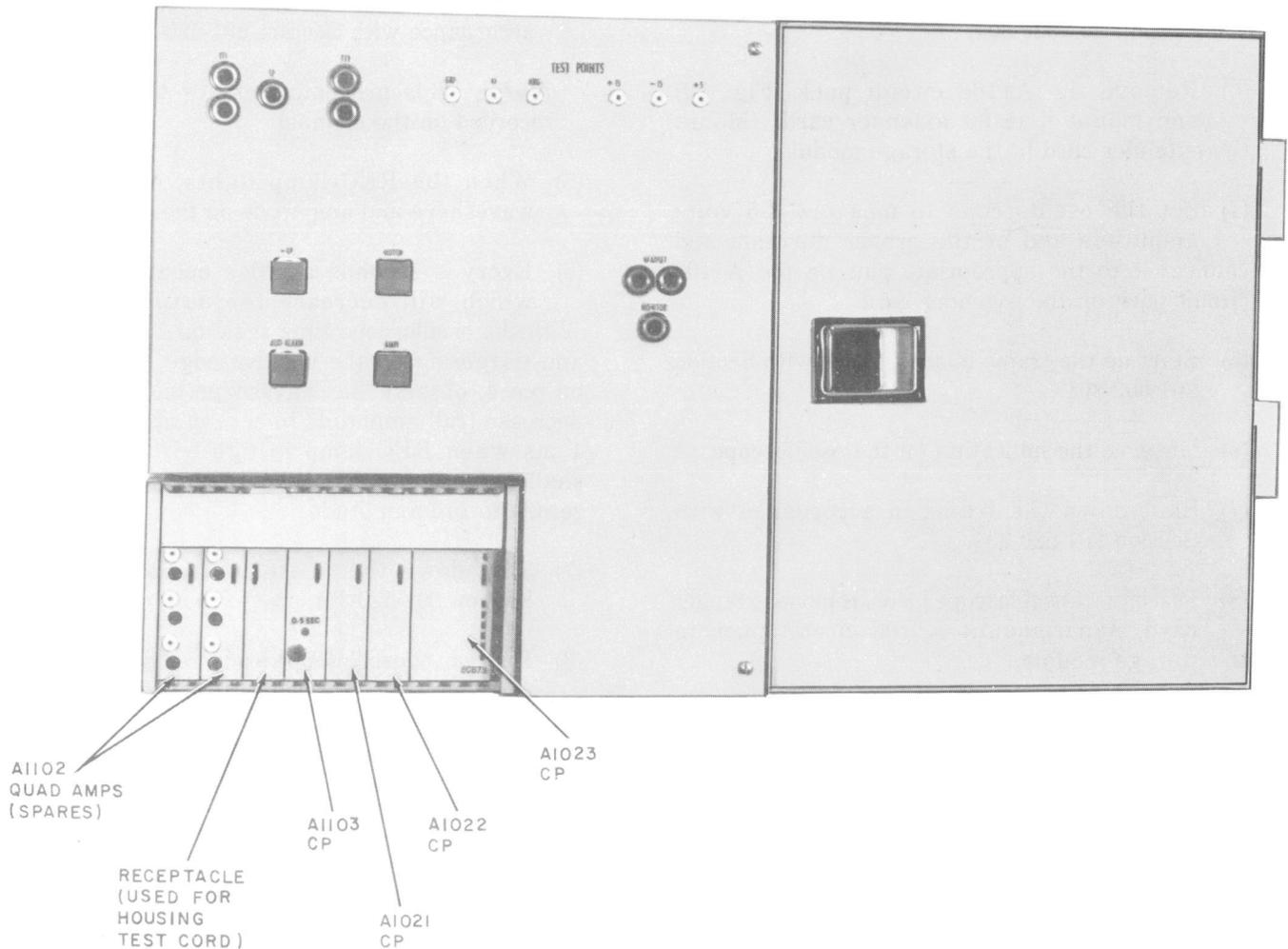


Fig. 10—Storage Module—(MSS Only)◄

- (6) Observe the indication on the oscilloscope.
- (7) Shut down the machine in accordance with Section 201-520-301.
- (8) Disconnect the oscilloscope leads, remove extender card, and remount A1103 circuit pack in the storage module.
- (9) Start up machine in accordance with Section 201-520-301.

***2.15 Clock Pulse (Output of A1103 Circuit Pack)**

FOR MSS ONLY

- (a) When the machine is equipped with a KS-20951 L3 drum storage unit (one dual channel optical switch on the optical switch assembly), pin 15 of A1103 circuit pack (Fig. 10) and ground (pin 16), shall have a square wave alternating between +0.4 Vdc minimum for 0.5 seconds and 0 Vdc for 0.5 seconds. Pin 21 of A1103 circuit pack (Fig. 10) and ground (pin 22), shall have a square wave alternating between +0.4 V dc minimum for 1.5 seconds and 0 Vdc for 1.5 seconds.

Check as follows.

- (1) Requirement 2.14 must be met.

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- (2) Shut down the frame in accordance with Section 201-520-301.
- (3) Remove the A1103 circuit pack (Fig. 10) and mount it in an extender card. Mount the extender card in the storage module.
- (4) Set the oscilloscope to measure 3-5 volts amplitude and of the proper duration and connect it to the appropriate pins on the A1103 circuit pack on the extender card.
- (5) Start up the frame in accordance with Section 201-502-301.
- (6) Observe the indication on the oscilloscope.
- (7) Shut down the frame in accordance with Section 201-520-301.
- (8) Disconnect oscilloscope leads, remove extender card, and remount A1103 circuit pack in the storage module.
- (9) Start up the frame in accordance with Section 201-520-301.♦

♦FOR VML, MM, AND PM ONLY♦

*2.16 *Bias Erase Oscillator (A1018 Circuit Pack)*

When any channel in the frame is in the record mode, the bias oscillator will supply a **18-22 kHz** sine wave of approximately **30 volts** peak-to-peak amplitude. This level is set at the time of manufacture, and no adjustment is required. When a pulse occurs on pin 4, the output on pin 23 will decrease continuously to zero in approximately 1 ms.

Check as follows.

- (1) Shut down the frame in accordance with Section 201-520-301.
- (2) Remove the A1018 circuit pack Fig. 1 and mount it in an extender card. Mount the extender card in the storage module.
- (3) Set the oscilloscope to 10 VOLTS/DIV and 0.1 mSEC. Connect the input to pin 23 and ground (pin 27) of the A1018 circuit pack on the extender card.

- (4) Put any channel into the record mode in accordance with Section 201-520-301.

Note: This procedure erases the message recorded on the channel.

- (5) When the REC lamp lights, observe the waveshape and amplitude on the oscilloscope.
- (6) Every 4 seconds a pulse occurs on pin 4 which will decrease the output to zero. With the oscilloscope time scale on 1 ms/division and triggering on the positive edge of the pulse on pin 4, observe the waveshape envelope for a decrease (full amplitude to zero in approximately 1 ms when REC lamp is lighted). The level shall be zero for approximately 7 ms and then return to full amplitude.
- (7) Shut down the frame in accordance with Section 201-520-301.
- (8) Disconnect oscilloscope leads, remove extender card, and remount the A1018 circuit pack in the storage module.
- (9) Start up the frame in accordance with Section 201-520-301.

♦FOR VML AND PM ONLY♦

*2.17 *Alarm Logic Circuit (A1014 Circuit Pack)*

- (a) **Variable Message Application:** With a known good recording on the channel, the drum rotating at proper speed, and the VOICE ALARM ADJ key depressed, the **lamp** on the alarm circuit (A1014 circuit pack) shall **light for approximately 1 second** at the end of the variable message.

Check as follows.

- (1) Monitor the message on the channel for verification of known good recording.
- (2) Operate the CONTROL OFF_ key associated with channel under test.
- (3) Remove the switching alarm circuit pack (A1020 circuit pack) from the channel under test.

- (4) Operate the CONTROL NOR key on the control panel. Reset the memory in accordance with Section 201-520-301.
- (5) Operate the VOICE ALARM ADJ key on the control unit (Fig. 11).
- (6) After 3-5 cycles through the complete message, the lamp on the alarm logic circuit (A1014 circuit pack) shall light for approximately 1 second at the end of the message.
- (7) If requirement is met or after making the adjustments, operate the CONTROL OFF₁ key associated with channel under test.
- (8) Remount the switching alarm circuit pack (A1020 circuit pack) into the channel module.
- (9) Operate the CONTROL NOR key on the control unit. Reset the memory in accordance with Section 201-520-301.
- (10) Operate the VOICE ALARM NOR key on the control unit.

(b) **Phased Message Application:** With a known good recording on the channel, the drum rotating at the proper speed, and the VOICE ALARM ADJ key depressed, the **lamp** on each A1014 circuit pack in that channel shall **light for approximately 1 second** at the end of the associated phase.

Check as follows.

- (1) Monitor the message on the channel for verification of known good recording.
- (2) After notifying the traffic personnel, operate the REQ OS ROS key. When channel is out of service, the OS lamp will light.
- (3) After OS lamp lights, operate the CONTROL OFF key.
- (4) Remove the four switching alarm circuit packs (A1020 circuit packs) from the channel module under test.
- (5) Operate the CONTROL NOR key of channel module under test.
- (6) Operate the VOICE ALARM ADJ key on the control unit (Fig. 12).
- (7) After 3-5 cycles through the complete message (all four phases), the lamp on each alarm circuit (A1014 circuit pack) should light for approximately 1 second at the end of the associated phase.
- (8) If the requirement is met or after making the adjustments, operate the CONTROL OFF key on control panel.
- (9) Remount the four switch alarm cards in the channel module.

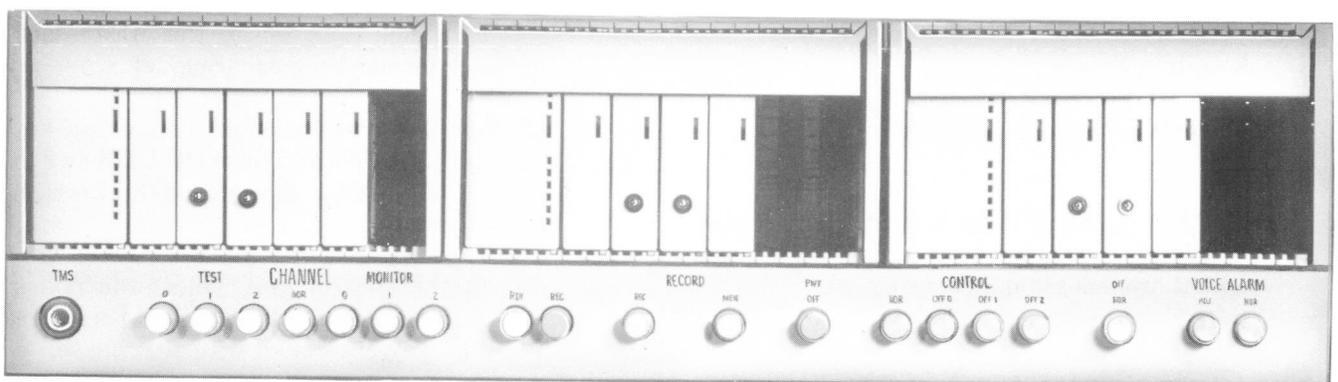


Fig. 11—Variable Message Length Channel Module and Control Unit

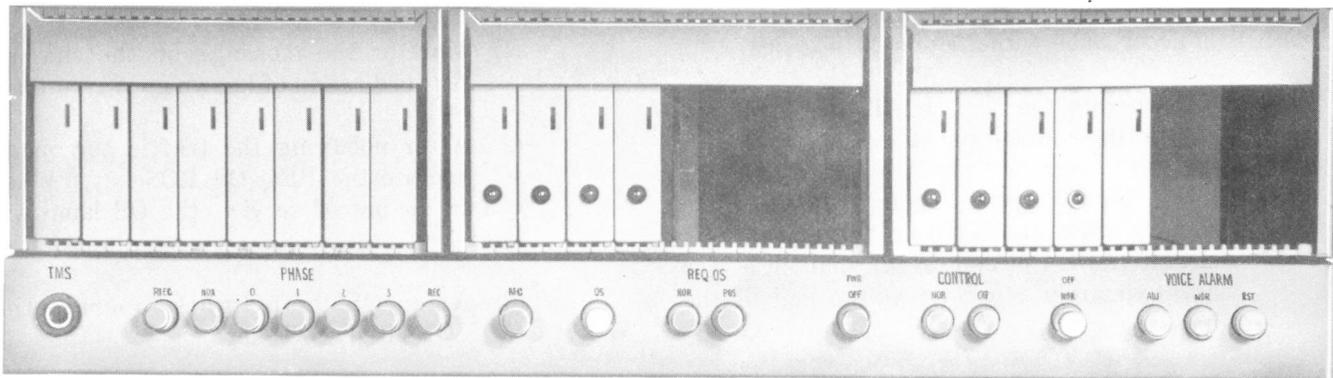


Fig. 12—Phased Message Channel Module and Control Unit

- (10) Operate the CONTROL NOR key and then the VOICE ALARM NOR key on the control panel.
- (11) After notifying the traffic department, operate the REQ OS NOR key.

▶FOR VML AND PM ONLY◀

***2.18 Record/Playback Amplifier (A1013 Circuit Pack)**

- (a) **Record Level:** The record level is set at the time of manufacture, and no adjustment is required. (It is set using the 1000 Hz from pins 11 and 12 of A1013 circuit pack.)
- (b) **Output Level:** The output transmission level of the CSRAF shall be in accordance with local requirements.

Check as follows.

● **Variable Message Length**

- (1) Using the W1 patch cord, connect the TMS jack (Fig. 11) to the MEAS jack of the transmission measuring set.
- (2) Set the transmission measuring set INPUT to 600 and the ADD DBM switch to the level closest to the nominal transmission level desired.

- (3) At the control panel, operate the CHANNEL MONITOR key of the channel to be measured.

- (4) Note the output indication on the transmission measuring set. The transmission level is equal to the average level on the meter plus the setting on the ADD DBM switch.

- (5) If requirements are met or after making adjustment, operate the CHANNEL NOR key and remove the patch cord from the TMS jack and from the transmission measuring set.

- **Phased Message:** The output transmission level of each of the four phases in the channel module must be checked.

- (1) Using the W1 patch cord, connect the TMS jack (Fig. 12) to the MEAS jack of the transmission measuring set.

- (2) Set the transmission measuring set INPUT to 600 and the ADD DBM switch to the level closest to the nominal transmission level desired.

- (3) At the control unit, select the phase to be measured by operating the PHASE key associated with that phase.

- (4) Note the output indication on the transmission measuring set. The transmission level is equal to the average

level on the meter plus the setting of the ADD DBM switch.

- (5) Operate the PHASE NOR key and remove the patch cord from the TMS jack and from the transmission measuring set.

▶FOR VML AND PM ONLY◀

***2.19 Switching Alarm (A1020 Circuit Packs)**

- (a) **Variable Message:** With a known good message recorded on the channel and the drum rotating at the proper speed, the voltage difference (in magnitude) between pins 4 and 3 of the switching alarm (A1020 circuit pack) shall be min 0.7 volts and max 1.1 volts for the 4-second silent interval and drop gradually to 0 the following 4-second interval. It shall then repeat the cycle with the voltage levels varying in sign.

Check as follows.

- (1) Monitor the message on the channel for verification of a known good recording.
- (2) Operate the CONTROL OFF_ key associated with the channel under test.
- (3) Remove the switching alarm (A1020 circuit pack) from the channel module. Mount the circuit pack in an extender card and place the extender card in the channel module.
- (4) Connect the two inputs of the oscilloscope to pins 3 and 4 of the A1020 circuit pack.
- (5) Set the oscilloscope to ADD MODE, pull the invert button, set both channels to 1 VOLTS/DIV, and TIME/DIV to 1 second.
- (6) Operate the CONTROL NOR Key on the control panel.
- (7) Set the message length to 4 seconds by operating and holding the RECORD MEM key during the silent interval and

release it during the first 4 seconds of the message.

- (8) Observe the oscilloscope display.
- (9) If requirement is met or after making the adjustments, operate the CONTROL OFF_ key (Fig. 11) associated with the channel under test.
- (10) Disconnect the oscilloscope leads, remove the extender card, and remount the A1020 circuit pack in the channel module.
- (11) Operate the CONTROL NOR key on the control unit. Reset the memory in accordance with Section 201-520-301.
- (12) Monitor to verify valid memory reset.

- (b) **Phased Message:** With a known good message recorded on the channel, the drum rotating at the proper speed, the voltage difference (in magnitude) between pins 4 and 3 of the switching alarm (A1020 circuit pack) shall be min 1.3 volts and max 2.1 volts for the 4-second silent interval and drop gradually to 0 volts at the end of the 12-second message. It shall then repeat the cycle with the voltage levels alternating in sign.

Check as follows.

- (1) Monitor the message on the phase in question for verification of a known good recording.
- (2) Operate the REQ OS ROS key and the CONTROL OFF key on the control unit (Fig. 12).
- (3) Remove the switching alarm (A1020 circuit pack) from the channel module associated with the phase in question. Mount the circuit pack in an extender card and place the extender card in the channel module.
- (4) Connect the two inputs of the oscilloscope to pins 3 and 4 of the A1020 circuit pack.
- (5) Set the oscilloscope to ADD MODE, pull the invert button, set both channels

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to 1 VOLTS/DIV, and set TIME/DIV to 1 second.

- (6) Select the phase in question by operating the PHASE (0-3) key.
- (7) Operate the CONTROL NOR key on the control unit (Fig. 12).
- (8) Observe the oscilloscope display.
- (9) If requirement is met or after making the adjustments, operate the CONTROL OFF key.
- (10) Disconnect the oscilloscope leads, remove the extender card, and remount the A1020 circuit pack in the channel module.
- (11) Operate the CONTROL NOR key and the REQ OS NOR key.

▶FOR MM ONLY◀

*2.20 ▶Amp-Log-Alarm◀ (A1019 Circuit Pack)

- (a) **Record Level:** With the 1000 Hz from the 1000 Hz-jack (-64 dBrn level) applied to the channel, the input level across the head (pins 2 and 0) shall be a sine wave of **1000 Hz 0.5 volt peak to peak** superimposed on the high-frequency bias.

Note: This test will erase the signal which was previously recorded on the channel.

Check as follows.

- (1) Notify the traffic personnel that the channel will be out of service.
- (2) Operate the CONTROL OFF key on the control unit (Fig. 13).
- (3) Using the W1 patch cord, connect the 1000-Hz jack to the TMS jack.
- (4) Remove the A1019 circuit pack associated with the channel selected to be used in the test. Mount the circuit pack in an extender card and mount the extender card in the channel module.

(5) Using the W2 patch cord, connect the selected channel circuit pack to the CHANNEL ACCESS jack.

(6) Set the oscilloscope to measure a sine wave of amplitude 0.5 volt peak to peak. Connect the oscilloscope leads to pins 2 and 0 (ground).

(7) Operate the CONTROL NOR key; then operate and hold the CHANNEL REC key.

(8) Note the indication on the oscilloscope. Release the CHANNEL REC key.

(9) If requirement is met or after making adjustment, operate the CONTROL OFF key. Remove the oscilloscope connections.

(10) Disconnect the W2 patch cord, remove the extender card from the channel module, and remove the A1019 circuit pack from the extender card. Remount the A1019 circuit pack in the channel module.

(11) Remove the W1 patch cord from the jacks.

(12) Operate the CONTROL NOR key.

- (b) **Output Level:** With a known good recording on a channel and the drum rotating at the proper speed, the output level of the channel shall be in accordance with local requirements.

Check as follows.

(1) Using the W1 patch cord, connect the transmission measuring set MEAS jack to the TMS jack.

(2) Set the transmission measuring set INPUT to 600 and the ADD DBM switch to the level closest the transmission level desired.

(3) Using the W2 patch cord, connect the CHANNEL ACCESS jack to the channel to be measured (Fig. 13).

(4) Operate the CHANNEL MONITOR key and note the indication on the transmission measuring set. The transmission level is

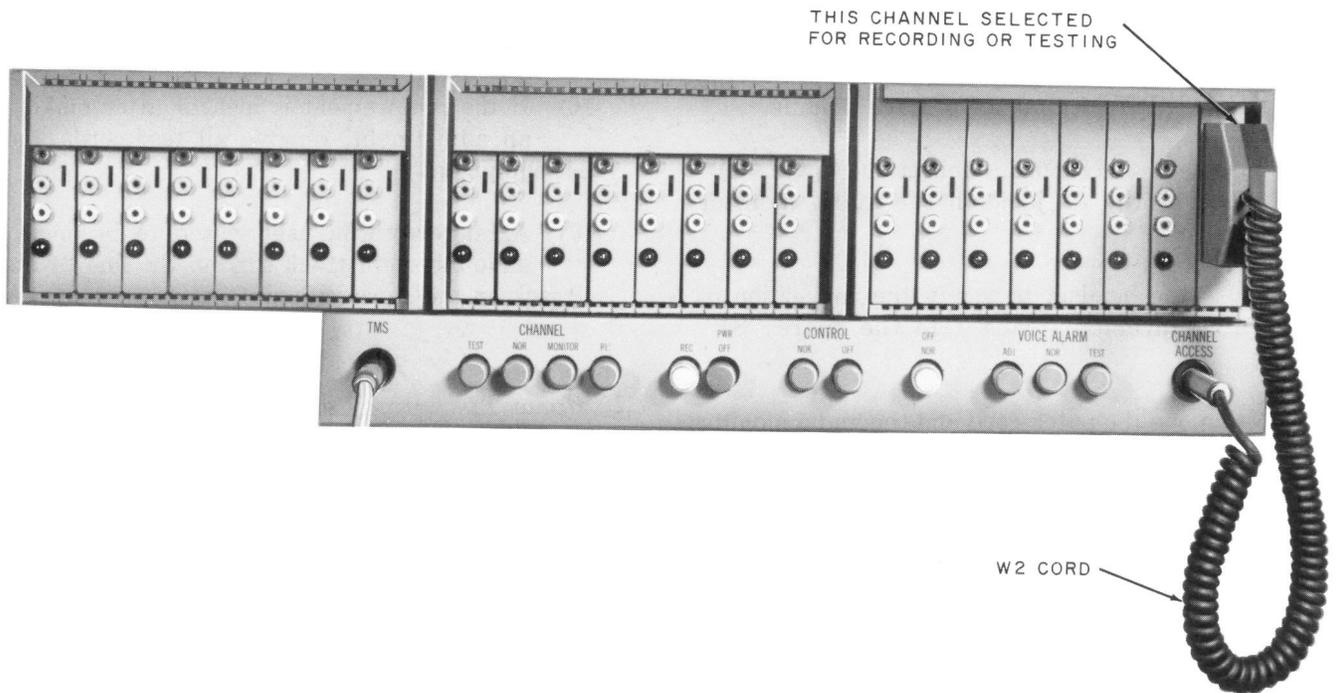


Fig. 13—Modular Message Channel Module and Control Unit

equal to the average level on the meter plus the setting of the ADD DBM switch.

(5) If requirement is met or after making adjustment, operate the CHANNEL NOR key and remove W1 patch cord from TMS jack and transmission measuring set. Remove W2 patch cord.

(c) **Voice Alarm:** With a known good recording on the channel and the drum rotating at the proper speed, the lamp on the A1019 circuit pack shall light **within approximately 30 seconds** after operating the VOICE ALARM TEST key.

Check as follows.

(1) Notify the traffic personnel that the channel module will be temporarily out of service.

Note: Operation of the VOICE ALARM TEST key inhibits the output of the complete channel module.

(2) Operate the VOICE ALARM TEST key (Fig. 13); within approximately 30 seconds, the lamp on the A1019 circuit pack will light.

(3) Operate the VOICE ALARM NOR key.

FOR MSS ONLY

2.21 Quad AIS Amplifier (A1102 Circuit Pack)

Transmission Level: With a known good recording on a channel and the drum rotating at the proper speed, the output level of the channel shall be in accordance with local requirements.

Check as follows. (Reference Section 250-430-501)

(1) Notify the traffic personnel that the announcement machine will be temporarily out of service.

(2) Arrange with the user system to provide means necessary to connect announced track 1 to the spare "SP" jack on the announcement frame.

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Note: Refer to Fig. 14 for the following steps using the KS-19725 Audio Monitor Circuit.

- (3) Connect the audio monitor circuit into the HEADSET jack on the storage module.
- (4) Using a 3P7B cord, connect the spare "SP" jack to the J2 jack on the audio monitor circuit.
- (5) Use the headset to verify the connection of announcement track 1 to the spare "SP" jack.
- (6) Remove the patch cord and the audio monitor circuit.

Note: Reference should be made to Fig. 15 in performing Steps 7 through 13.

- (7) Using a Marsland Model R18568C extended range VU meter, connect a 900-ohm resistor between input terminals.
- (8) Set VU meter attenuator control index to same figure for required transmission level for type of nominal loss trunks installed.
- (9) Set VU meter internal load condition switches to "OUT" and "600 ohms" position and set internal 60-Hz filter switch to "IN."
- (10) Using a 3W14B test cord, connect black lead to right input terminal of VU meter.
- (11) Connect red test lead to dc blocking condenser.
- (12) Connect free end of dc blocking condenser to left input terminal of VU meter.
- (13) Connect plug end of 3W14B cord to SP jack of storage module of announcement machine under test.

Note: White lead of 3W14B test cord not used.

- (14) Turn on VU meter and observe that the pointer on the meter is rapidly deflecting during repeated 1-1/2 second cycle of message.

- (15) An average pointer deflection of 0 VU is required on test meter during reproduced message.
- (16) If the requirement is met, or after making an adjustment, remove all test cords and test equipment.
- (17) Arrange with the user system to disconnect announcement track 1 from the line to the SP jack on the storage module.

Uniform Listening Level: Each announcement track shall sound as loud as announcement track 1 after it has been adjusted for the proper transmission level.

Note: This requirement shall be met after the requirement of transmission level is met.

Check as follows:

Note: Reference should be made to Fig. 16 for the following steps.

- (1) Connect the audio monitor circuit into the HEADSET jack on the storage module.
- (2) Connect red test lead of audio monitor circuit to test point on amplifier 1.
- (3) Connect green test lead of audio monitor circuit to test point on amplifier 2.
- (4) Using the W1 test cord supplied with the frame, connect the MONITOR jack on the storage module to the J1 jack of the audio monitor circuit.
- (5) Using the headset on the audio monitor circuit, monitor the announcement from amplifier 1 and adjust the volume control on the audio monitor circuit for a comfortable listening level.
- (6) Depress and hold the S1 switch on the audio monitor circuit to hear the announcement track that the green lead is connected to.
- (7) Release S1 to hear announcement track 1.

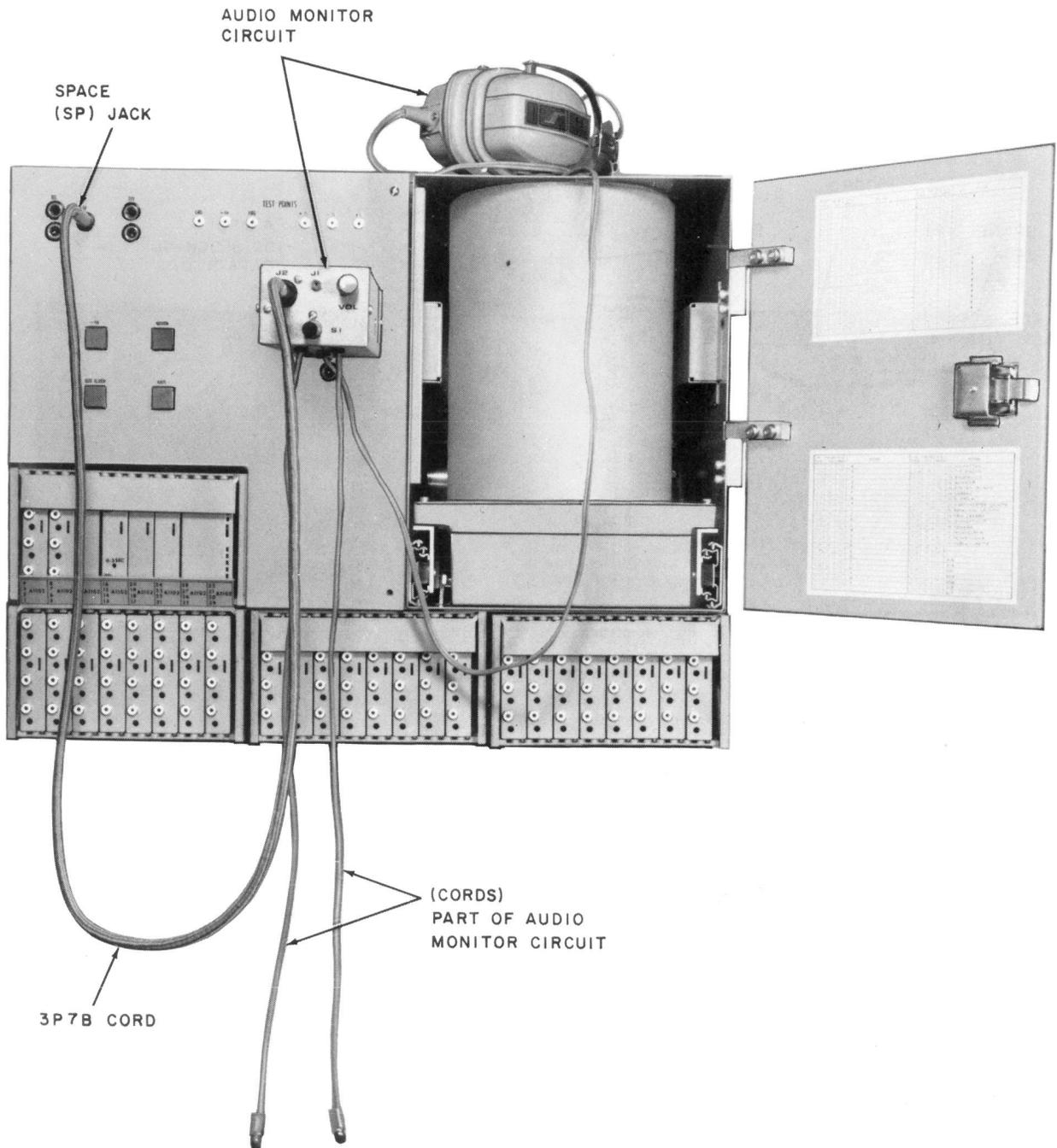


Fig. 14—KS-19725, L2 Audio Monitor Circuit—Verification of Announcement Track 1 Connection to SP Jack

Note: The procedure is continued by moving the green lead of the audio monitor to each of the 95 amplifiers in the channel module for a comparison to announcement track 1.

- (8) When the requirement is met, remove the test cords and the audio monitor circuit.
- (9) Start up the machine in accordance with Section 201-520-301.

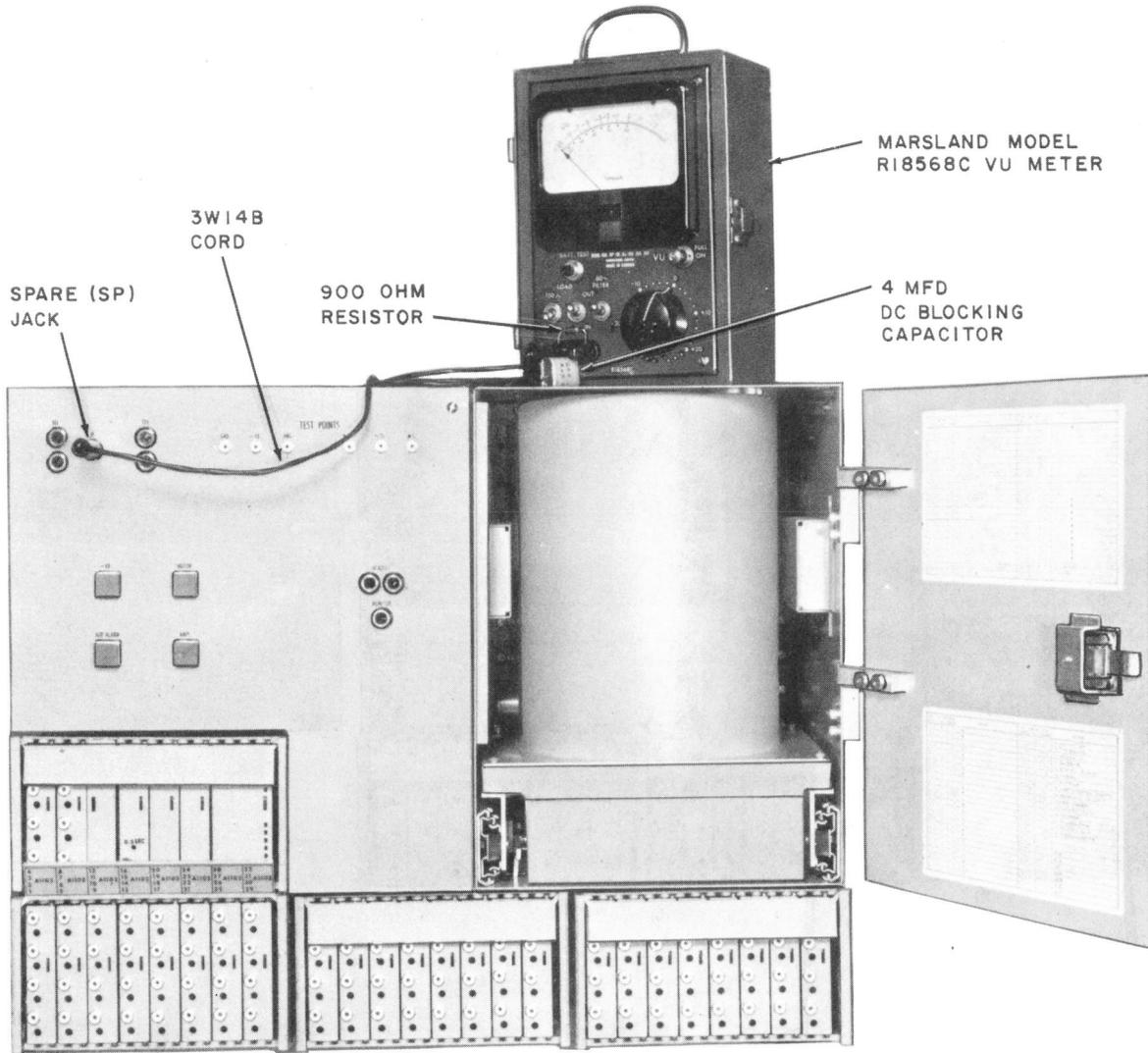


Fig. 15—VU Meter Arrangement for Setting Track 1 Reference Level

3. PROCEDURES

3.01 List of Tools, Materials, and Test Apparatus

CODE OR
SPEC NO.

DESCRIPTION

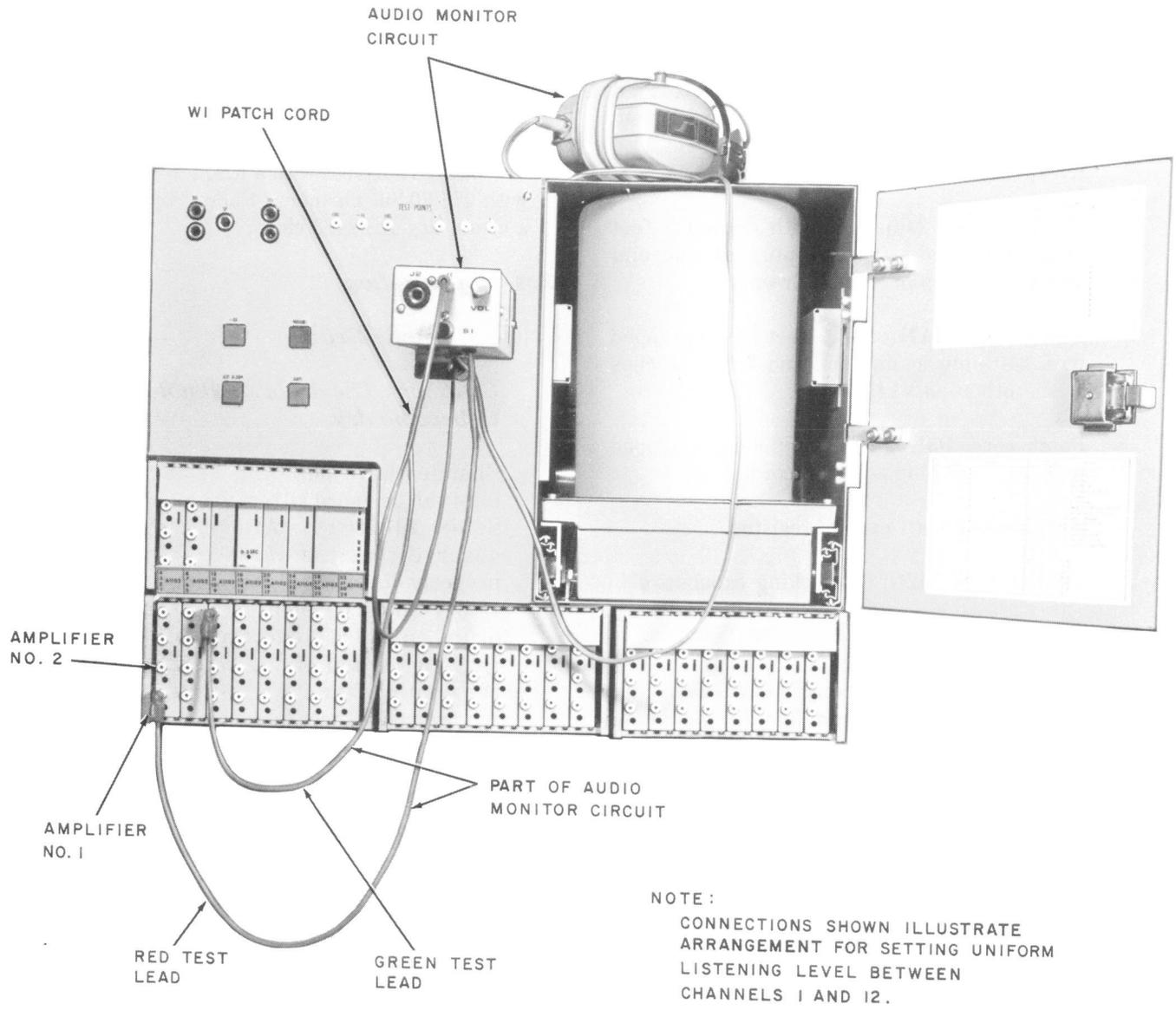
- Mylar stock, 1/2 inch by 3 inches by 0.005 inch thick
- 723B Tool (circuit pack extractor)
- Eye dropper (obtain locally)

TOOLS

- KS-14447 15 Vacuum cleaner with L30 nozzle
- 9/64-inch Allen socket screw wrench
- 3-inch C screwdriver
- 4-inch E screwdriver

MATERIALS

- KS-2423 Twill cloth
- KS-20406 Cleaner
- SF-1147 silicone fluid 200-centistoke viscosity, General Electric Company



NOTE:
 CONNECTIONS SHOWN ILLUSTRATE
 ARRANGEMENT FOR SETTING UNIFORM
 LISTENING LEVEL BETWEEN
 CHANNELS 1 AND 12.

Fig. 16—Audio Monitor Circuit—Uniform Listening Level Test Arrangement

TEST APPARATUS	—	Vacuum tube voltmeter
—	Oscilloscope, tektronix type 453A (or equivalent)	158A Adapter (extender card)
—	23D transmission measuring set (or equivalent)	W1 Patch cord (supplied with frame) (P3E slate cord, 4 feet long, equipped with two 310 plus—3P7E cord)
—	Electronic counter, capable of measuring 3150 Hz at 20 volts peak to peak	W2 Patch cord (supplied with frame) (ED-97753-30)

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◆ **Note:** The following is required for MSS Only

Marsland Model R18568C transistorized extended range volume indicator, or equivalent

KS-19725, L2 Audio Monitor Circuit

W1 Test cord (supplied with frame) 3 feet long, equipped with 347 plug at one end and a phone tip on the other end

Test cord, W3AN cord, 9 feet long equipped with 310 plug at one end and 3 No. 30 clips at the other—3W14B cord

Patch cord, P3E cord, 3 feet long, equipped with two 310 plugs—3P7B cord

900-ohm 1/2 watt carbon resistor

4 MFD, type 542G, dc blocking capacitor

3.01 Cleaning

(a) **General:** When necessary, vacuum any loose dust or dirt from inside the drum storage unit, circuit packs, power supply, and frame using the KS-14447 L5 vacuum cleaner and the flexible nozzle. Remove any remaining residue by wiping with a clean, dry KS-2423 cloth.

(b) **Magnetic Drum:** Prior to installation or reinstallation of the magnetic drum, clean as follows.

(1) Lightly moisten a KS-2423 cloth with SF-1147 silicone fluid and wipe the entire recording surface of the magnetic drum (Fig. 5).

(2) Wipe the surface lightly with a clean, dry KS-2423 cloth to remove excess fluid.

(3) Repeat the cleaning operation as necessary.

(4) After the cleaning process, lubricate the recording surface of the magnetic drum by applying a thin film of SF-1147 silicone fluid to the entire recording surface with a clean KS-2423 cloth and install immediately.

(c) **Dust Cover:** When cleaning becomes necessary, wipe with a KS-2423 cloth moistened with water. Follow by wiping with a clean, dry KS-2423 cloth.

(d) **Finish:** Clean any lubricant from the painted surfaces with a KS-2423 cloth moistened with KS-20406 cleaner. Follow by wiping with a clean, dry KS-2423 cloth.

3.02 Lubrication

(a) **Magnetic Drum**

Caution: The drum shall not be permitted to become dry.

Change the wiper (Fig. 3) at the specified interval or more often when necessary per Section 201-520-801. After changing the wiper, observe that the surface of the drum is properly lubricated (wet, shiny appearance). If dry spots develop on the surface of the drum, using the eye dropper, add silicone fluid to the top of the recording surface of the drum ahead of the wiper until the requirement is met (Fig. 17).

Warning: Wash hands thoroughly after using the silicone fluid. Keep this fluid away from the eyes.

(b) **Wiper:** At the normal interval or if the requirements are not met, replace the wiper (Section 201-520-801).

3.03 Brush Ring: Inspect the brush ring at normal intervals and replace the brush ring when required (Section 201-520-801).

3.04 Hinged Front Door and Paddle Latch: If the requirements are not met, replace the front door and paddle latch assembly.

3.05 Slides and Latches: If requirements are not met, replace the appropriate part or parts (Section 201-520-801).

3.06 Wires and Cables: If requirement is not met, replace the appropriate cable or assemblies.

3.07 Magnetic Drum

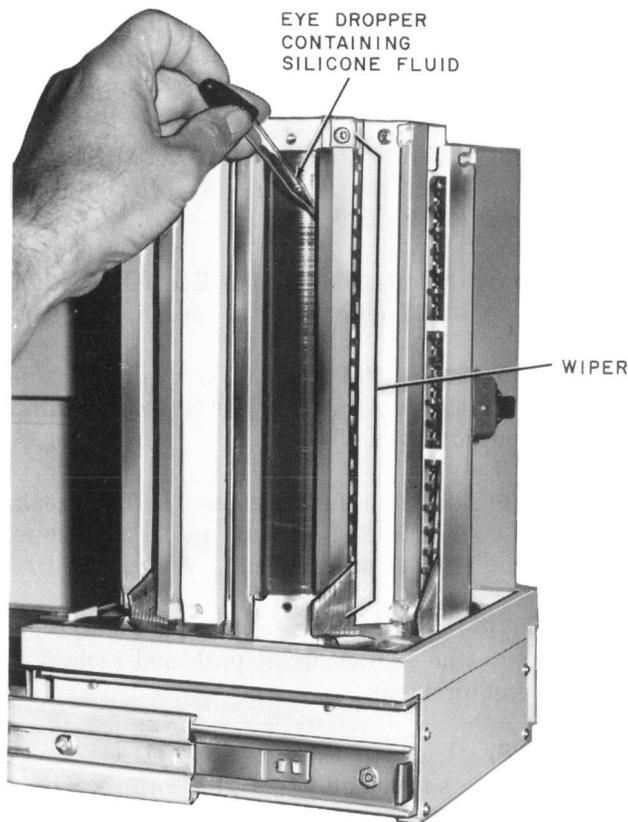


Fig. 17—Silicone Fluid Being Added to Top of Recording Surface—Using Eye Dropper

(a) **Surface:** If the recording surface of the magnetic drum is scratched, cut, or grooved, replace the magnetic drum (Section 201-520-801).

(b) **Drum Speed (Motor Control Circuit)**

(1) Using the 3-inch C screwdriver, adjust potentiometer R6 on the A1022 circuit pack (Fig. 1 or Fig. 10) to meet requirement.

(2) If requirement cannot be met, replace the A1022 circuit pack and adjust the new pack.

Code Wheel Amplifier Assembly and Associated Parts

3.08 Detector Assembly

(1) Using the 4-inch E screwdriver, loosen the detector assembly mounting screws (Fig. 6), being very careful not to damage the code wheel.

Leave the mounting screws snug enough to hold the assembly in position.

(2) Gauging with the mylar stock, position the detector assembly for proper clearance.

(3) Using the 4-inch E screwdriver, tighten the mounting screws ensuring the assembly does not move.

(4) Recheck the requirement and reposition the assembly if necessary.

3.09 Detector Assembly Output: If requirement is not met, recheck requirement 2.08. If requirement is still not met, replace the detector assembly (Section 201-520-801).

3.10 Code Wheel Amplifier Output: If requirements are not met, check requirement 2.09. If requirement 2.09 is met, replace the code wheel amplifier assembly (Section 201-520-801).

Optical Switch Assembly and Associated Parts

3.11 Optical Switch Outputs: If requirements are not met, replace the optical switch assembly.

◆Circuit Packs

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3.12 Clock Pulse (Input to A1017 Circuit Pack): If requirement is not met, recheck requirement 2.11 and the interconnections between the optical switch assembly and the A1017 circuit pack.

◆FOR VML, MM, AND PM ONLY◆

3.13 Clock Pulse (Output of A1017 Circuit Pack): If requirement is not met, recheck requirement 2.12 and if requirement is still not met, replace the A1017 circuit pack.

◆FOR MSS ONLY

3.14 Clock Pulse (Input to A1103 Circuit Pack): If requirement is not met, recheck requirement 2.11 and the interconnections between the optical switch assembly and the A1103 circuit pack.

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3.15 *Clock Pulse (Output of A1103 Circuit Pack):*

If requirement is not met, recheck requirement 2.12 and if requirement is still not met, replace the A1103 circuit pack.

FOR VML, MM AND PM ONLY

3.16 *Bias Erase Oscillator (A1018 Circuit Pack):*

If requirement is not met, replace the A1018 circuit pack.

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3.17 *Alarm Circuit (A1014 Circuit Pack)*

- (1) Operate the appropriate CONTROL OFF key and remove the appropriate A1014 circuit pack and mount it into an extender card. Mount the extender card in the channel module and operate the CONTROL NOR key. Reset the memory in accordance with Section 201-520-301.
- (2) Using the 3-inch C screwdriver, adjust the R2 potentiometer to meet the requirement.
- (3) If requirement cannot be met, replace the A1014 circuit pack.
- (4) Operate the appropriate CONTROL OFF key.
- (5) Remove the extender card and remount the A1014 circuit pack in the channel module.
- (6) Operate the appropriate CONTROL NOR key and reset the memory in accordance with 201-520-301.

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3.18 *Record/Playback Amplifier (A1013 Circuit Pack)*

- (a) *Record Level:* No procedure is required.
- (b) *Output Level*

• *Variable Message Length*

- (1) After notifying the traffic personnel, operate the CONTROL OFF_ key (Fig. 11) associated with the channel to be adjusted.

(2) Remove the associated A1013 circuit pack from the channel module and place it in an extender card. Mount the extender card in the channel module.

(3) Operate the CONTROL NOR key and reset the memory in accordance with Section 201-520-301.

(4) Operate the CHANNEL MONITOR key of the channel to be measured.

(5) Using the 3-inch C screwdriver, adjust the R21 potentiometer for the proper output level.

(6) If requirements cannot be met, replace the A1013 circuit pack and repeat adjustment procedure.

(7) If requirements still are not met, replace the A1012 circuit pack and recheck the requirement.

(8) Operate the CONTROL OFF_ key associated with the channel being adjusted.

(9) Remove the extender card and remove the A1013 circuit pack from the extender card. Remount the A1013 circuit pack in the channel module.

(10) Operate the CONTROL NOR and CHANNEL NOR keys on the control panel. Reset the memory in accordance with Section 201-520-301.

• *Phased Message*

(1) After notifying the traffic personnel, operate the CONTROL OFF_ key (Fig. 12) associated with the channel to be adjusted.

(2) Remove the associated A1013 circuit pack from the channel module and place it in an extender card. Mount the extender card in the channel module.

(3) Operate the CONTROL NOR key.

(4) Operate the PHASE (0-3) key of the channel to be measured.

- (5) Using the 3-inch C screwdriver, adjust the R21 potentiometer for the proper output level.
- (6) If requirement cannot be met, replace the A1013 circuit pack and repeat adjustment procedure.
- (7) Operate the CONTROL OFF_ key associated with the channel being adjusted.
- (8) Remove the extender card and remove the A1013 circuit pack from the extender card. Remount the A1013 circuit pack in the channel module.
- (9) Operate the CONTROL NOR and PHASE NOR keys on the control unit.

◆FOR VML AND PM ONLY◆

3.19 Switching Alarm (A1020 Circuit Pack)

- (1) Using the 3-inch C screwdriver, adjust R28 potentiometer to meet the requirement.

Note: After making an adjustment, allow the message to run through at least two cycles to respond to the adjustment.

- (2) If requirement cannot be met, replace the A1020 circuit pack and repeat the adjustment procedure.

◆FOR MM ONLY◆

3.20 ◆Amp-Log-Alarm◆ (A1019 Circuit Pack)

(a) **Record Level**

- (1) With the CHANNEL REC key operated and using the 3-inch C screwdriver, adjust potentiometer R14 associated with input level to obtain the proper level.

- (2) If requirement cannot be met, replace the circuit pack and recheck requirements (a), (b), and (c).

- (3) Check requirements (b) and (c) following any adjustment of the record level.

(b) **Output Level**

- (1) Notify the traffic personnel that the channel module in question will be temporarily out of service.

- (2) Operate the CONTROL OFF key on the control panel (Fig. 13).

- (3) Remove the A1019 circuit pack associated with the channel in question.

- (4) Mount the circuit pack in an extender card and mount the extender card back in the frame.

- (5) Using the W2 patch cord, connect the CHANNEL ACCESS jack to the circuit pack.

- (6) Operate the CONTROL NOR key and the CHANNEL MONITOR key.

- (7) Adjust potentiometer R3 for the proper output level transmission indication on the transmission measuring set.

- (8) If requirement cannot be met, operate the CONTROL OFF key; replace the circuit pack. Recheck requirements 2.20(a), (b), and (c).

- (9) Remove the W2 patch cord and W1 patch cord.

- (10) Remove the extender card from the channel module and remove the A1019 circuit pack from the extender card. Remount the circuit pack in the channel module.

- (11) Operate the CONTROL NOR key and the CHANNEL NOR key.

- (12) Check requirement (c) following the adjustment.

(c) **Voice Alarm**

- (1) Notify traffic personnel that the channel module will be temporarily out of service.

- (2) Operate the CONTROL OFF key on the control panel (Fig. 13).

- (3) Remove the A1019 circuit pack from the channel module and mount it in an extender

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card. Mount the extender card in the channel module.

- (4) Using the W2 patch cord, connect the CHANNEL ACCESS jack to the circuit pack to be adjusted.
- (5) Operate the CONTROL NOR key and the VOICE ALARM ADJ key on the control unit.
- (6) Using the 3-inch C screwdriver, turn potentiometer R4 counterclockwise until the lamp on the front of the circuit pack lights. Then turn the potentiometer clockwise until the lamp extinguishes.
- (7) Recheck the requirement.
- (8) Operate the CONTROL OFF key.
- (9) Remove the W2 patch cord and remove the extender card from the channel module. Remove the circuit pack from the extender card and mount it in the channel module.
- (10) Operate the VOICE ALARM NOR key and then the CONTROL NOR key.

▶FOR MSS ONLY

3.21 Quad AIS Amplifier (A1102 Circuit Pack)

Transmission Level:

- (1) Using a 3-inch C screwdriver, adjust announcement track 1 amplifier gain to obtain an average pointer deflection of 0 VU on the test meter during the reproduced message.
- (2) If the requirement cannot be met, replace the A1102 circuit pack associated with announcement tracks 1 through 4 and adjust as required.

Uniform Listening Level:

Note: The following steps provide the means for obtaining uniform output listening level for all prerecorded tracks (except track 1) on an active listening level comparison basis against the reference level previously set for track 1. Reference should be made to Fig. 16 for the following steps.

Caution: *The gain adjustment on announcement track 1 amplifier must not be adjusted during this procedure.*

- (1) Connect the audio monitor circuit into the HEADSET jack on the storage module.
- (2) Connect red test lead of audio monitor circuit to test point associated with announcement track 1.
- (3) Connect green test lead to test point associated with announcement track to be adjusted.
- (4) Using the W1 cord, connect the MONITOR jack on the storage module to the J1 jack of the audio monitor circuit.
- (5) Monitor output from announcement track amplifier 1 and adjust audio monitor circuit volume control for a comfortable listening level.
- (6) Depress audio monitor circuit test switch S1 and adjust gain control associated with track amplifier in question for equal loudness with announcement track 1.
- (7) Release audio monitor circuit test switch S1.
- (8) Monitor output from track 1 in headset for a few complete cycles and immediately following end of phrase depress and hold audio monitor circuit test switch S1.
- (9) Repeat Step 8 a few times to obtain a sense of timing and manual operation of audio monitor circuit test switch S1 for a smooth transfer of prerecorded phrases from track 1 to track in question.
- (10) While performing Step 9, note relative volume level differences presented in monitoring headset between track 1 and track in question.
- (11) If overall volume level of message from track 1 is judged to be greater than volume level from message presented on track in question, adjust output level control; gain adjustment on track amplifier in question in a clockwise direction until a uniform output level is reached on comparison with level from track 1.

(12) If overall volume level of message from track 1 is judged to be less than volume level produced in monitoring headset from track in question, adjust output level control; gain adjustment on track amplifier in question in a counterclockwise direction until a uniform output level is reached on comparison with level from track 1.

(13) Repeat Steps (8) through (12) as required until audible transmission level of amplifier track 1 is comparable to that of channel in question.

(14) If requirement cannot be met, shut down the machine in accordance with Section

201-520-301; replace the circuit pack associated with channel in question. **Recheck requirement 2.21 for each of the 4 amplifiers of the quad amplifier as required.**

Note: If the A1102 circuit pack for amplifiers 1 through 4 is replaced, the requirement of 2.21 (Transmission Level) must be rechecked.

(15) Remove all test apparatus and connections.

(16) Start up the machine in accordance with Section 201-520-301.♦