



300 SOUTH LEWIS ROAD • CAMARILLO, CALIFORNIA 93010 • TEL. 482-1911

Mincom Division

SUGGESTED PREVENTATIVE MAINTENANCE SCHEDULE

1. Daily or before each session:
  - A. Perform steps:
    - a. Visual inspection
    - b. Cleaning and degaussing
2. Weekly
  - A. Perform steps:
    - a. Visual inspection
    - b. Cleaning and degaussing
    - c. Transport and head adjustments
    - d. Playback level and equalization alignment
    - e. Record level and equalization alignment
3. Monthly
  - A. Perform steps:
    - a. Visual inspection
    - b. Cleaning and degaussing
    - c. Transport and head adjustments
    - d. Playback level and equalization alignment
    - e. Record level and equalization alignment
    - f. Bias and erase circuit alignment
4. Quarterly
  - A. Perform steps:
    - a. Visual inspection
    - b. Cleaning and degaussing
    - c. Transport and head adjustments
    - d. Playback level and equalization alignment
    - e. Record level and equalization alignment
    - f. Bias and erase circuit alignment
    - g. Noise balance adjustment
    - h. Linearizer adjustment
    - i. IM distortion adjustments



300 SOUTH LEWIS ROAD • CAMARILLO, CALIFORNIA 93010 • TEL. 482-1911

## Mincom Division

### TROUBLESHOOTING TIPS

The modular construction of the 3M Brand Series 500 Professional Audio Recorders provide not only a fast and easy method of repair but also an excellent method of troubleshooting. The signal electronics assembly is so arranged in modular form allowing individual circuit boards of any channel to be replaced or exchanged with a similar board from a known good channel. When boards are interchanged, alignment of the channel(s) may be necessary to provide peak performance.

Failure of the recorder to operate properly may be caused by a malfunction in the recorder, or be external causes. Before troubleshooting the recorder, verify that the power and signal connections are correct and that all of the operational controls are properly set.

The best troubleshooting tool is a familiarity with the equipment and a thorough understanding of its theory of operation.

The following paragraphs contain some general precautions which should be observed when performing maintenance on the recorder.

1. Do not strike the reversing idler. It is delicate and located in a vulnerable position at the front of the mechanism. If damaged, flutter will be excessively high.
2. Exercise great care in installing head mounting plates. They can be screwed into place with a head lead pinched between the mounting plate and the transport casting, thus breaking wire insulation or cutting a head lead. Be certain no leads will get in the way before installation.
3. Exercise great care in removing and replacing the mu metal cover over the playback head stack. The slot at the rear cover can slice head lead insulation, thereby grounding head leads or actually cutting through them. Be certain that this cover is fully seated so that the lower lip will not scrape on tape as it passes by. Otherwise tape edge may be cut and bad tracking over the heads may result.

4. Do not go from READY to SAFE when the recorder is operating in the RECORD mode. First stop the transport. This will prevent the possibility of a thump from being recorded on the tape and possible magnetization of the record head.
5. Do not remove any of the electronics cards when the power is on. It requires only a few seconds to turn off the power, remove a card, restore power and be ready to operate. Otherwise, it is possible to magnetize a head or damage a meter.

2. Give special instructions. If any changes in the instrument or assembly have been made, and it is desired to retain the modified form, please indicate this specifically.
3. To facilitate expeditious repair, your Contract or Purchase Order authorizing the work should be directed to Mincom Division - 3M Company - 300 South Lewis Road - Camarillo, California 93010 - Attn: Contracts Department.
4. Pack securely and label. Proper packaging saves money. The small amount of extra care and time it takes to cushion a part or instrument properly may prevent costly damage while in transit. Make certain that the address is both legible and complete; failure to do so often results in needless delay. Address all shipments and correspondence to:

Mincom Division  
 3M Company  
 300 South Lewis Road  
 Camarillo, California 93010

Attn: Receiving Inspection

5. Show return address on repair correspondence. Please clearly indicate the exact address the equipment should be returned to after repair is completed. Terms are net 30 days - f.o.b., Camarillo, California.

## FIELD SERVICE

Regular scheduled maintenance service is available from the Mincom Division service office on a contract basis. If immediate service is required, it may be obtained on an emergency basis. Every effort is made to furnish the needed repair as soon as possible. For a complete description of 3M's maintenance service plans and their costs, contact the Mincom Division service office.

## FACTORY REPAIR SERVICE

If desired, the recorder or major assemblies, may be returned to the factory (transportation prepaid) for repair. When recorder or assembly is returned:

1. Indicate the symptom of defect. State as completely as possible, both on an instrument tag and on the order form, the nature of the problem encountered. Too much information is far better than too little. If the trouble is intermittent, please be specific in describing the instrument's performance history.

Table 7. Troubleshooting Guide

Symptom	Cause	Correction
<b>TRANSPORT</b>		
1. Transport stops when leader passes photo cell V60.	Tape sensor adjustment R73 out of adjustment.	Adjustment R73 in accordance with Tape Sensor Adjustment procedure.
2. STOP button lights when tape is not threaded.	Lamp DS8 burnt out.	Replace DS8.

Table 7. Troubleshooting Guide (Cont.)

Symptom	Cause	Correction
<b>TRANSPORT (Cont.)</b>		
11. Tape lifter hangs up.	Misalignment or in need of lubrication.	Plunger must not drag too forcefully against core of solenoid. Body should be so positioned to avoid such side drag, and to provide best compromise of depth of travel to satisfy easy override yet adequate lifting power.  Loosen two mounting screws, lubricate plunger and shift body (holes are oversize) to achieve above requirements.  Replace with 5 amps slow blow.  Press a few times to observe if lights come on.  Replace Q60 after checking load resistance from collector to ground for short circuit defect. Clear defect before again applying power.  Replace Q60. Catcher diode CR51 will also require replacement if condition persisted for more than a few seconds. Check resistance of 27 volt load to be certain Q60 will not be overloaded. Transport may be operated without CR51 until replaced.  Localize cause of trouble using oscilloscope while referring to Transport Alignment Procedures in this section.
12. Tape lifter difficult to override manually.	Plunger approaches full seated position too closely.	
13. Tape lifter fails to lift tape from heads.	Plunger operating too far from seated position.	
14. Transport appears completely dead.	Blown fuse F1.  Intermittent operation of power switch S6.  C66 charged to greater than 30 volts but no 27 volt dc at collector of Q60 or at test point means Q60 is defective.	
15. All lamps excessively bright and short lived.	Regulator Q60 and associate circuit, Q1, R14, R15, and CR50 not functioning.	
16. Flutter and Wow excessive.	Numerous sources possible. Most likely are: a) Insufficient capstan idler pressure either ingoing or outgoing. b) Defective reversing idler. c) Capstan bell tension in need of adjustment. d) Dirty flywheel and motor pulley.	
<b>ELECTRONICS</b>		
1. A-B monitor lamps are dim or do not come on when POWER button on transport is pressed.	Short circuit on 28 vdc bus in electronic module assembly.  Defective 28 vdc power supply.	Remote one plug-in board at a time and re-insert to determine if fault is in cards or module wiring.  Troubleshoot power supply using instruction manual supplied with the unit as a guide.

Table 7. Troubleshooting Guide (Cont.)

Symptom	Cause	Correction
<b>ELECTRONICS (Cont.)</b>		
2. A-B transfer causes clicks in output.	Leaky capacitor C15 in output of record monitor amplifier on board 4 or at output of pre-amplifier C6 on board 7/9. Also can be leaky input capacitor on line amplifier board 6.	Exchange boards 4, 6, and 7/9 one at a time from known good channel to determine defective board. Troubleshoot defective board looking at capacitors mentioned as being most possible cause of trouble.
3. Loss of signal in record board 4.	Defective field effect transistor Q2. Easily damaged by static charge from soldering iron or tool held in hand.	Replace Q2. Be very careful to avoid static charges. Ground soldering iron to ground bus on board.
4. Noise or intermittent operation in any area of electronics module.	Dirty contacts at base of card plug.	Remove and reinsert board. Use ink eraser to clean contact surfaces.
5. High distortion.	Insufficient bias.  Magnetized head, either record or reproduce head.  Noise balance control mis-adjusted.	Adjust record bias as prescribed under Signal Electronics Alignment.  Degauss heads.  Adjust for minimum noise after degaussing all heads.
6. Poor noise figure.	Noisy Q1 or Q2 on preamplifier board 7/9.  Head cables badly routed, near hum fields.  Defective playback head requiring excessive gain.  Lack of good system ground can produce hum or buzzing. Third wire in power cord not always effective as good ground.	Substitute another preamplifier board to compare noise and replace transistors.  Reroute for minimum noise. Keep away from power cord. This can be very important.  Try breakin tape if head appears to be smeared over by oxide material. Replace head if necessary.  Connect casted frame of transport to good earth ground.
7. Wrong output level.	Improper choice of line impedance or termination.	Check TERMINATION switch position of the channel in question. Output transformer impedance may be changed from normal 600 ohm output to 150 ohms by moving lead from terminal 6 to terminal 4.