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Date: **July, 1989**

Subject: **FIRMWARE UPGRADE—P5.01.02.0**

Model: **APR-24**

Serial No: **ALL**

DESCRIPTION

Firmware release P5.01.02.0 for the APR-24 is now available. The two EPROMs to be replaced are IC13 and IC14 on the CPU Board. When updating the firmware, also perform the associated MRA Board modifications described in this bulletin.

This new version firmware requires that certain previously unused memory locations be set to the following specific values.

MEMORY LOCATION	ARGUMENT
#44 External Record Control Enable	0
#45 External Sync/Repro Control Enable	0
#46 Control Track Follow Enable	0
#53 Erase Ramp Rate	0
#54 Bias Ramp Rate	0

Also included in this bulletin is operational information regarding the use of punch in/out transitions vs. ramp durations. (The new firmware provides for customized ramp durations.)

P5.01.02.0 IMPROVEMENTS AND FEATURES

- Burst time code is now fully functional. Refer to the APR-24 Operation and Maintenance Manual or the Pocket Guide for information about this feature. When using the Burst Time Code feature, it is essential to wait a minimum of three (3) seconds before issuing a preset PLAY command from LOCATE. This is necessary because there is a delay (built into the software) before the first burst of time code is emitted. Pressing PLAY stops the burst code from being sent to the slave machine.
- The machine now locates faster to the end of reel.
- There is significantly improved performance with 8" plastic reels.
- In the fast wind mode, the shield defeat will un-dim audio only if the lifters are out. This allows the user to listen for slate tones and ensures that the audio channels mute when the lifters drop at the end of a LOCATE. Lifters no longer drop when LOCATE is aborted by pressing STOP.
- Chasing of high speed time code, such as provided by a BVE-950 w/BKU- 905, is now possible. (A hardware modification is also required for use of this new feature. See MODIFICATION PROCEDURES in this bulletin.)
- High speed follow of an external transport using control track pulses (one pulse per frame) is now possible. Previously unassigned pins on the parallel ports now will accept these signals.

50-Pin Parallel Port

37 External Direction*

38 External Control Track

*Sense is dependent on the argument held in Storage Location #46.

Storage Location #46 (non-volatile) enables the use of the following feature.

Storage Location #46: "Control Track Follow Enable"
Argument = 0 Normal high speed TC follow in Chase
Argument = 1 Direction line is low true for reverse
Argument = 2 Direction line is low true for forward

A hardware modification is also required for use of this new feature. (See MODIFICATION PROCEDURES in this bulletin.) If this modification is not performed, it is essential to store a zero (O) in memory location #46. If a zero (O) is not stored in this location, a system malfunction may occur.

Analog Audio

- In previous firmware releases, the command line (pin 32 on the parallel port) switched to REHEARSE status upon a negative going strobe to this line. This has been changed so that an active low on the command line will hold REHEARSE status true. REHEARSE can still be controlled manually via the remote control; therefore, a high on the REHEARSE command line does not assure a non-REHEARSE status. The parallel output line (pin 6 on the parallel port) indicates the status of the REHEARSE function. Note these changes on the MRA schematic on pages B-71 through B-73 in the Operation and Maintenance Manual (connector number CNJ800).

  If an external control device raises the REHEARSE line during an active REHEARSE operation, the REHEARSE mode will not be cancelled, even when the REHEARSE operation has been completed by a PLAY or STOP command. It is necessary for the external device to drop, then raise the REHEARSE command line to clear the REHEARSE mode.

  The most efficient way to use this line is to change the status of the control line just before, or in conjunction with the initiation of a RECORD command.

- Tape tensioning has been modified to reduce the amount of air trapped in the pack. Depending on the type of tape used, the very high wind speed of the APR-24 previously allowed an undesirable amount of air to be trapped in the pack. This could cause "pack skewing" if a high torque were to be suddenly applied to the reel (such as in the dynamic breaking invoked due to a tape break detection). This has been significantly improved with a negligible effect on speed of the transport.
- Audio alignments can now be adjusted through the JOG Dial, as well as through the use of the INCrement and DECrement Alignment keys.
- Bit resolution adjustment of Edit In and Out Points is now fully supported. (Refer to the APR-24 manual for specifications.)
- A triggered edit on the designated time code track is prohibited. Also, a triggered Edit operation is prohibited if there is no time code track assigned.
- Jog/Shuttle enable will now toggle, rather than require a STOP to exit the enable mode.
- Shield defeat will now toggle rather than requiring a PLAY to raise the shields.
- Punch-in and Punch-out Erase and Bias Envelope ramp durations can now be customized. The ramp rate can be controlled by storing a value of 1 through 16 in memory location #53 for erase and location #54 for bias. The default settings can be reset by storing a value of 0 in both locations. It should be noted that changing these rates may result in holes or overlaps in the transition from PLAY to RECORD and RECORD to PLAY

NOTE: The default ramp durations for the APR-24 have been chosen to provide the best sound and punch-in/out performance. Ramp duration alterations should not be made unless absolutely necessary. Selecting proper Erase and Bias envelope ramp durations for specific applications can be difficult.

PUNCH-IN/OUT TRANSITIONS VS RAMP DURATIONS

Low Frequency Artifacts

Longer transitions are quieter, while shorter transitions produce a more pronounced Low frequency artifact. This artifact is an unavoidable detection of the erase and bias ramp crossing through the non-linear magnetic transfer characteristic of the tape. Though the details are rather complicated, the audible effect is similar to that of listening to the ramp itself through a differentiator. (A differentiator is a circuit which has a constant 6dB/octave rise starting at zero frequency). The faster the ramp is, the larger the disturbance. Slower ramps show a smaller albeit more prolonged disturbance.

The shape of the ramp can also affect the sound of the artifact. Ramps which are created through simple RC networks can only produce exponential ramps. Exponential ramps change quickly at first and then slow down as they approach their end. Exponential ramps can produce exaggerated low frequency artifacts unless they are made over a long ramp duration. Exponential ramps also produce asymmetric punch-in and out characteristics.

Smoothed Linear ramping performs the transition in the shortest duration, with the least possible low frequency artifact.

Audio Transition Speed

Musically critical punch-in operations frequently require rapid punch-in operations. Likewise there is a need to perform the punch-in in the least amount of time without compromising the audio performance.

Audio Transition Fidelity

As transition times get longer, the length of the underbiased duration also gets longer. During underbias conditions, the tape's distortion performance is rather poor. The longer the underbiased condition exists, the more pronounced the Underbias Transition Distortion artifacts become to the ear. This is another reason to keep the ramp duration short. Exponential ramping is asymmetric in this regard as well, making punch-in and punch-out performances sound different in their distortion characteristics.

The best unified test for all of the above is to perform punch-ins on identical, synchronous program material. Tone-on-tone tests can be useful but do not give a good feel for the musical performance. If performing tone-on-tone testing, it is wise to use tones of different frequencies to avoid phase cancellation effects. (See Figure 1.)

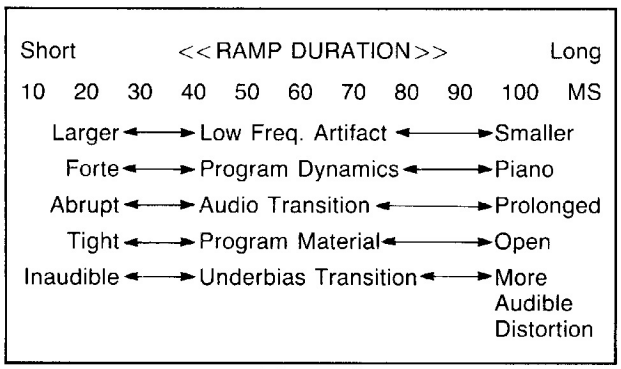

Figure 1

Storage Locations #53 and #54 provide the means to adjust the Erase and Bias Ramp durations respectively. As shown in Figure 4, the storage arguments may be set from 0 to 16. An argument value of 0 returns to machine to its default settings. Changing the tape speed or turning the machine off will automatically return the machine to the default conditions.

While it is permissible to set the erase and bias ramp durations to widely different settings, it is not likely to provide beneficial results, as this can create holes and/or overlaps in the transition.

Time code referenced In and Out points, such as used in programmed Edit operations, are specific to the center of the default bias ramp duration. To maintain this same relationship to the center of the bias ramp, adjust the In and Out Point Bit Delay to compensate for the change in bias ramp duration. This is not a significant concern unless the ramp's duration was changed to a time greater than 36ms.

Bit Adjustment = (Rb/.75) -32

Rb = the bias ramp duration (in milliseconds)

A negative bit adjustment value implies an earlier time or a smaller delay. A positive bit adjustment value implies a later time or a larger delay.

PARTS REQUIRED

Part No.	Description	Qty.
EAR-24-01	P5.01.02.0 Firmware Kit (IC13/14)	1
1-162-741-11	Cap, ceramic, 22pF (C126)	1
T-9411-074-1	Socket, 8-pin DIP	1
8-719-939-12	IC, HCPL-2531 (IC12)	1
1-249-425-11	Res, carbon, 4.7kΩ, 5%, 1/4W (R13/14)	2

EPROM INSTALLATION

CPU Board

Replace IC13 and IC14 with new version EPROMS.

MRA BOARD MODIFICATION PROCEDURE

MRA Board Access

1. Unscrew three (3) #4 Phillips head screws, holding the rear door in place.
2. Remove rear plastic overlay.
3. Remove standoffs (8) from D-sub connectors located on both sides of the serial, parallel, and remote ports.
4. Remove all ribbon and power connectors from the MRA Board.
5. Remove two (2) Phillips head screws holding the MRA Board to the back door.
6. Remove the MRA board from back door.

Modification for Time Code Chase

Replace C126 (150pF) with 22pF capacitor.

Modification for Control Track Follow Enable

Component Side (See Figure 2.)

1. Verify that R13 and R14 are 4.7kΩ. If not, change to proper value.
2. Locate and carefully remove IC12. Save this IC for later replacement. (If damaged during removal, use new IC.)
3. Cut traces going to and from IC12–3 (two cuts).
4. Install 8 pin DIP socket in IC12 location.

Solder Side (See Figure 3.)

5. Cut traces between R17 and IC12–4.
6. Solder jumpers between:
   - Ⓐ IC12–1 . . . IC12–4
   - Ⓑ IC12–3 . . . R17 (at trace cut)
   - Ⓒ IC12–4 . . . feed–thru hole near IC24–2/3
7. Mount IC12 in DIP socket (on component side).

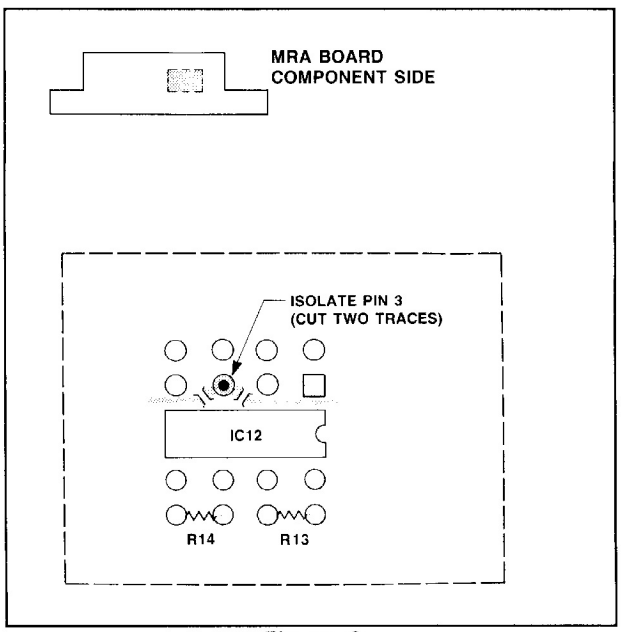

Figure 2

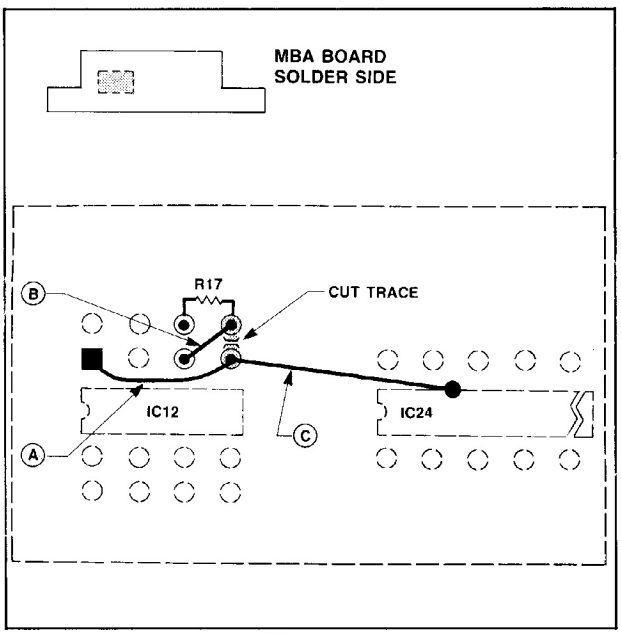

Figure 3

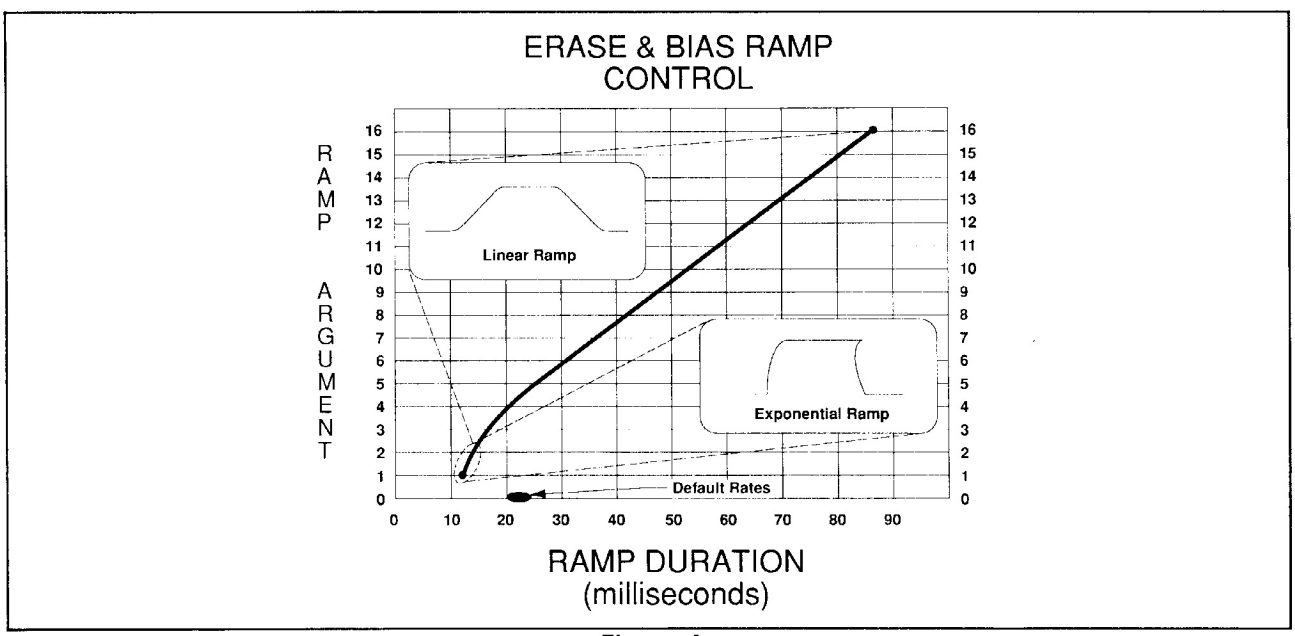

Figure 4

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