

PROGRAMMED FROM SET: SONY PART NO. T-9413-956-3

This firmware set (P4.01.01.1) represents the Production and Service release Proms for APR-5000 Series tape machines. The firmware offers the following advantages:

1. Common to all APR-5000 Series machine.
2. Resolves specific defects in earlier version firmware.
3. Incorporates new features into the APR-5000 Series

A. DEFECT CORRECTIONS (Ref. Tech Memo AM87-0020). The corrections of significance are:

1. Improves MVC operation, particularly in conditions of undefined radius.
2. Corrects flaw in Auto TC mode; EBU synchronous CHASE operations were compromised when receiving alternating types of Timecode.
3. Corrects occasional false indications of "loss of lock" in EBU CHASE.
4. Prevents momentary "loss of lock" at repeatable Time Code boundaries during SMPTE Drop-Frame CHASE operations with specific OFFSET settings.
5. Corrects condition causing latch-up during regeneration of corrupted External Time Code.
6. Corrects non-symmetric, non-monotonic Timer roller count through zero. There is now a minus zero count.
7. Makes repeat function safe against improper user operation.
8. Provides supply reel hold back tension during DUMP EDIT.
9. Corrects non-recognition of a Capstan Reference Select change on the 50 pin parallel port during transitory modes in preparation of PLAY action.
10. Allows operation of the FADER START/FADER START ENABLE inputs to the 50 pin parallel port as described in sec. 3.3.7 of the APR O & M manual.

B. Improvements and New Features

1. SELF OPTIMIZING SYNCHRONIZATION SERVO w/ EXPANDED POWER-UP DIAGNOSTICS (APR 5003 only)

The Synchronization Servo System now has a self-optimizing capability which reduces time-to-lock over a variety of operation variations. This capability compensates for both external timecode absolute speed deviations, and normal variations in the internal Voltage to Frequency Converter centering alignment. A greater tolerance of timecode disturbances, either from the Master timecode source or from the internally reproduced timecode, has also been facilitated. All of this results in a significantly more robust synchronization system.

The Synchronization Servo assigns a correction factor to the V-F converter which optimizes lock time regardless of the V-F alignment centering. A similar correction factor is assigned to take into account absolute speed errors of the external timecode reference. During CHASE operations, the machine "learns" valuable information which can facilitate a more rapid time-to-lock.

To complement this new capability, a fourth power-up diagnostic has been added cautioning the user that calibration of the internal V-F converter may be required. A correct centering of the V-F circuit assures an accurate Vari-speed indication, and provides the widest possible performance window for external timecodes which may have absolute speed errors. On Power-up, should the diagnostic detect an error greater than $\pm 5\%$, an "E004" will be displayed along with a flashing STOP indication. This may be cleared and normal operation resumed by depressing the STOP key.

The following improper CHASE operations may give rise to an "E004" message at a subsequent power-up:

- a. CHASE operation was performed at an incorrect Fixed Speed relative to the internally reproduced timecode.
- b. CHASE operation was performed with timecode on tape that was recorded off-speed (recording timecode in vari-speed on an APR-5003 is prohibited).
- c. CHASE operation was attempted between timecodes of a different type, notably between types of significantly differing frame rates.
- d. CHASE operation was performed with a significant accumulation of debris on the capstan shaft, or a poorly engaging pinch roller.

Installing this issue of firmware on machines previously placed into service with earlier firmware revisions may also indicate an "E004" message on initial power-up. Should an "E004" message appear, the following prescribed procedure is recommended. It is not essential this procedure be done immediately; the next convenient opportunity requiring use of the CHASE function would be satisfactory.

- a. Perform a correct CHASE operation:
 - 1) Select AUTO TIMECODE mode (Store loc. 30=1)
 - 2) Assure that the timecode tape has been recorded at a normal, Xtal controlled speed. If in doubt, use the APR-5003 internal timecode generator to stripe a tape.
 - 3) Assure that the external timecode reference is of the same type as the timecode on tape.
 - 4) Assure that the selected fixed speed is correct for the timecode on tape.
 - 5) Perform the CHASE operations twice. Do not be alarmed should the first attempt to CHASE take a long time to achieve lock. This is a normal consequence of the Synchronization Servo Optimization process. Subsequent lock times will show a substantial improvement.
- b. Power-down and power-up.
- c. If the "E004" message remains, a manual readjustment of the V-F converter may be indicated (See the Operations and Maintenance manual Section 6.5.16). This may be confirmed by listening for substantial pitch changes in program material when switching between the Xtal reference fixed speed, and vari-speed operation when set to 00.0%

Should significant hardware problems exist in the V-F circuit, this diagnostic indication may not be a consistently reliable indication. If difficulties remain, a service check of the hardware may be required.

When this software is utilized in non-timecode configured machines, this diagnostic is not operative. Consequently, the "E004" display on power-up has no significance.

2. PUNCH IN/OUT OPERATION

Bias/Erase timing has been improved to virtually eliminate residual audio gaps in critical punch-in/out applications. The performance improvement is best perceived in operations which involve punch-in/out over identical, time aligned program material.

3. STALLED TAKE-UP REEL DETECTION

The APR-5000 will now detect a stalled take-up reel. Upon detection, the machine will stop in an un-tensioned manner. Manual recovery from this condition requires the user to press the STOP key thereby taking up the slack tape.

4. AUTO SHIFT DOWN OPERATION

Auto shift Down operation now transfers the Tape Position Display time to the Locate Position Display at the moment play operation is started, rather than when the PLAY key is hit.

5. WIND SPEED AUDIO MONITORING

The Shield Defeat facility, in addition to performing it's title role, now provides the Global Audio Mute Defeat. Lifter Defeat no longer performs this function.

6. TIMECODE OUTPUT DURING TIMECODE RECORD

The timecode output from the APR-5003 was previously coincident with the advanced Timecode head. Difficulties arose when using this output to simultaneously record timecode. This operation would result in an OFFSET between the two devices equal to the time delay between the Timecode head and the Audio Record head. Timecode may now be simultaneously striped on any other Longitudinally corrected Device without the need for a subsequent OFFSET adjustment for synchronization. This applies for code from the Internal generator, as well as External timecode which might be "daisy chained" through the machine.

7. ACCELERATION ALLOWANCE (Ref. Tech Memo #AM87-0020 & 0026)

During CHASE operation, the park positioning of the APR-5003 to a Master position is now user adjustable through Storage position #50. This "Acceleration Allowance" is the distance the transport positions itself in advance of the stopped Master Device. The Slave device can be closely tailored to a wide range of Master devices, covering a significant latitude of starting ballistics and start/stop reproduce performances.

To enable an "Acceleration Allowance", a value in the range of 0:01 to 1:29 for SMPTE or 0:01 to 1:24 for EBU should be stored in memory location 50. A value exceeding the maximum value will be truncated to the maximum value allowed. This value is retained through power-down and will remain in effect until changed by the user or disabled.

The "Acceleration Allowance is disabled by storing a 0:00 in memory location 50. While disabled, the machine will use the following default values:

7.5 ips	= 18 frames
15 ips	= 18 frames
30 ips	= 19 frames

In a related improvement, a received external LTC reference which continuously repeats the same timecode Frame Data, will now cause the APR-5003 to locate to the above identified "Acceleration Allowance" in advance of the time being received. Previously, the machine considered this code to be in error and would revert to tracking the received sync words.

8. TIMECODE OUTPUT OPTIONS

Three mutually exclusive modes of outputting timecode during High Speed Wind modes are now provided.

- a. Direct timecode from tape (Storage loc. 35&36=0)
For use primarily when the APR-5003 is used under the control of external synchronizers. Many of these devices read moderate speed timecode directly, and default to tape tach and direction outputs under conditions that exceed the timecode validity limits of the tape machine's reproduce system. (Available with previous revision software)
- b. Wind speed limit (Storage loc. 36=1)
For use primarily when the APR-5003 is used as a Master, this provides the means to limit the maximum wind speed, such that simple Timecode-only Chase synchronizers can follow (available with previous revision software). In addition, at absolute velocities (forward and reverse directions) within +/- 50% of the nominal play speed, the timecode is longitudinally corrected for the head positioning (new capability).
- c. BURST TIMECODE (Storage loc. 35=1)
For use when the APR-5003 is used as a Master, this type of Timecode is easy to decode, provides a buffered, accurate, locally interpolated representation of the tape position. The contemporary value of the interpolated data is output in a contiguously incrementing, realtime (nominal x1 frame rate) fashion. The Timecode output is presented in this manner independent of the direction or speed of the wind. The timecode stream is updated with the contemporary value of the interpolated tape position data every 15 frames. Additionally, when the machine reaches a stopping position, a final, contiguously incrementing, realtime "burst", 30 frames in duration, is output. This final second of timecode terminates with an accurate representation of the stopping position.

9. OFFSET CAPTURE

This provision allows the "capture" of the Frame OFFSET between the Master timecode and the internal tape timecode. This may be displayed for identification and subsequent storage in a memory register, or loaded into the OFFSET register for immediate use.

- a. RECALL 99 will display the current offset.
- b. STORE 99 will cause the current offset to be loaded into the FRAME OFFSET register (Storage loc. 00).

10. BITBUMP

Resolution of an OFFSET to 1/80th of a frame(.41ms resolution with SMPTE timecode) is provided. This feature allows a dynamic means for adjustment, even while performing synchronous CHASE operations. The MVC wheel provides the control means to manually adjust this Bit resolution offset. A recall (RCL) of storage loc. 98 will "call up" the BITBUMP function. At this time the "Locate" display will read: (-)Ss.Ff -Bb -

(-)	Sign, optional
-	dash
.	decimal point
S	Tens seconds
s	Units seconds
F	Tens frames
f	Units frames
B	Tens Bits }
b	units Bits } (Modulo 80)

When this display is present, the MVC wheel may be used to dynamically modify the Offset at the Bit level. Changes of the offset beyond 80 bits will cause an increment or decrement of the FRAME OFFSET. Changes to the Frame offset will not change the Bit offset selection. Once set, the Bit offset will be retained through power off. To "put away" the BITBUMP feature, the user should Store (STO) location #98.

11. AUDIO DEFAULT PRESETS

If for whatever reason the audio alignment presets are lost and a "PE" error indication is displayed on the alignment panel, an average set of operating parameters can be loaded into the preset memory for immediate use. Although this feature existed in the previous firmware revisions, the current revision is updated to represent better average values.

- a. Select desired speed
- b. Press "CONTROL" and the desired "PRESET" (1,2,or3) at the same time.

A correct audio alignment should be loaded into Preset Memory at the earliest opportunity.

12. TC DISPAY FREEZE

On previous firmware revisions, this feature would indicate any error when reading compromised timecode. Timecode Freeze now occurs when the TC error is found to be of a prolonged nature. Timecode errors may now be monitored in all modes by observing the TC Display M (master) and S (slave).

In a related change, the F decimal point now indicates a loss of valid radius. This indication may occur at power-up, or after a "tape break" detection.

C. UPDATED MEMORY LOCATIONS LIST (User Label)

<u>LOCATION</u>	<u>DESCRIPTION</u>	<u>FUNCTION</u>
00	Frame Offset (CHASE mode)	Store Offsets
01-29	Locate Time	Store Locate Pos.
28	Repeat Start	Store Start Pos.
29	Repeat Stop	Store Stop Pos.
30	Auto TC Select	0=Disable 1=Enable
31	TC Type	0=SMPTE 1=EBU
32	Drop Frame	0=NDF 1=DF
33	Chase Mode	0=Chase 1=Normal
35	Burst Time Code	0=Disable 1=Enable
36	Wind Speed Limiter	0=Normal 1=Limit
40	Auto Shift Down	0=Disable 1=Enable
41	Semitone and IPS	0=Disable 1=Enable
50	Acceleration Allowance	Store Pack Advance
98	BitBump	RCL=Enable Display STO=Disable Display
99	Offset Capture	RCL=Displays Offset STO=Store Offset Loc. 00

Notes: 1. Only Memory Locations 01-29,40 and 41 are applicable to non-Time Code machines.

2. Erroneous information may be located in memory loc. 50 after initial installation of this firmware.
To clear this information, a valid number (such as 0:00) should be stored in loc. 50.

3. Current part no. for user label is T-9453-313-2.