

# Modifications to VTR equipment to provide an Improved Method of Editing 1/2-inch Videotape Recordings

This is an excerpt of material from the National Film Board of Canada Technical Bulletin #10.

For copies of this bulletin write:  
 Jean Trudel  
 Production Services Branch  
 National Film Board of Canada  
 POB 6100  
 Montreal 101, Quebec,  
 Canada.

## Introduction

Editing with any 1/2-inch videotape recorder, such as the Sony AV 3650, was a tedious and time-consuming procedure.

Successful editing with clean picture cuts at precisely the right time was dependent, to some extent, upon guesswork and good luck! Even if the editor was fortunate enough occasionally to obtain a good picture cut, he was always faced with the problem of the sound cut being double recorded equal to the distance between the erase and the record heads.

It was after a considerable amount of frustration, trying to produce low-cost video programs within a reasonable amount of time, that Robert Forget conceived a method of eliminating the guesswork and achieving satisfactory results.

He discussed his idea with a group of NFB technicians who accepted the challenge and proceeded to convert the idea into reality.

## General Requirements

Devise a system for automatic editing of 1/2-inch videotape recordings.

It must be possible to select the first and last frames and the length of each scene, so that when they are assembled by transferring from one machine to another they produce a reasonable facsimile of the results obtainable with professional equipment.

## Specific Requirements

Modify the Sony AV 3650 videotape recorders and attach a push-button-operated control system to meet the general requirements.

When editing picture and sound, together or separately, the cut at the editing point must be technically and visually "clean".

The reasons why the 1/2-inch VTR equipment did not meet the general requirements were:

- 1 Difficulties existed in manually selecting and retaining in sync the exact picture cutting points on both the original videotape and the master assembly tape. Also, the procedure could not be repeated for rehearsal prior to the actual transferring process.
- 2 A perfect cut in the associated sound track was not obtainable due to a 1.7 seconds delay between the erase head and the record head. (Fig. 1)

## Phase 1

The difficulty in selecting and retaining the picture cutting points was largely overcome by:

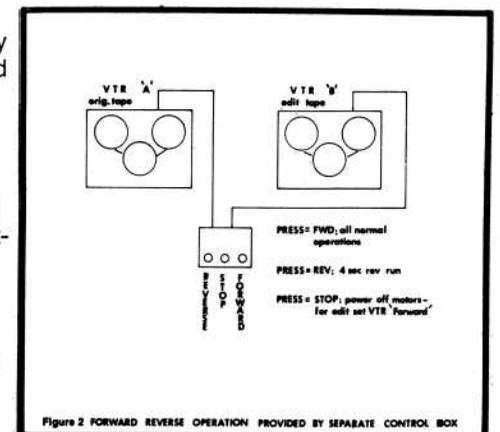
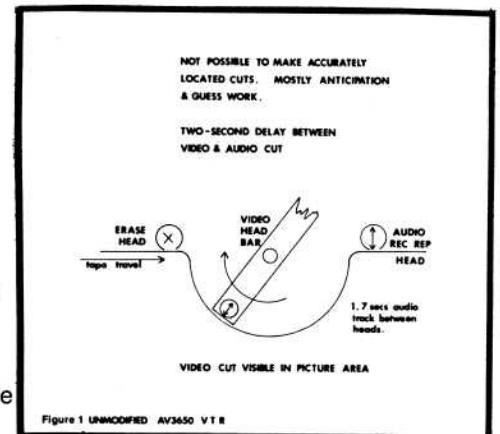
- (a) Stopping and starting the machines from one common switch.
- (b) Providing a method of reversing both machines so that together they would run forward and backward.

An operating procedure was then established:

- 1 Locate the first frame of the shot to be transferred by adjusting the tape manually and viewing the still frame on a monitor.
- 2 In the same way, select the last frame of the previously recorded shot on the master tape.
- 3 Reverse both tapes "in sync" for a few feet so that when they are run forward again, they will be at normal operating speed and locked before the record button is pushed at the selected editing point.

Phase 1 modifications, therefore, consisted of extending the capstan motor connections to the exterior of each machine and connecting them to one common switching circuit. (Fig. 2)

In the forward mode, all the motor wiring connections of both machines are normaled through the common switching circuit.



In the reverse mode, the motor wiring connections are reversed.

In the stop mode, the motor wiring connections are shorted and disconnected from the servo amplifiers. The short circuit provides dynamic braking to stop the motors instantly (Fig. 3).

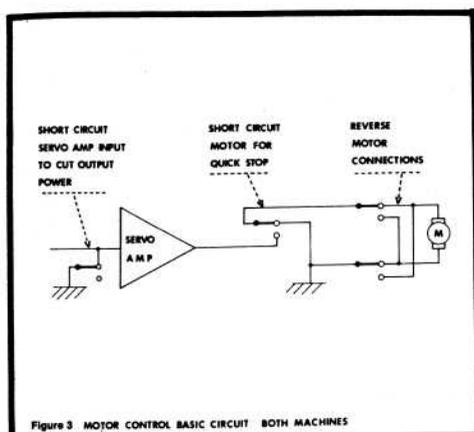


Figure 3 MOTOR CONTROL BASIC CIRCUIT BOTH MACHINES

As an additional safety precaution, the inputs to the motor servo amplifiers are shorted to prevent them operating at full power during the switching cycle.

The schematic (Fig. 4) shows the common switching circuit in the relay-operated control box.

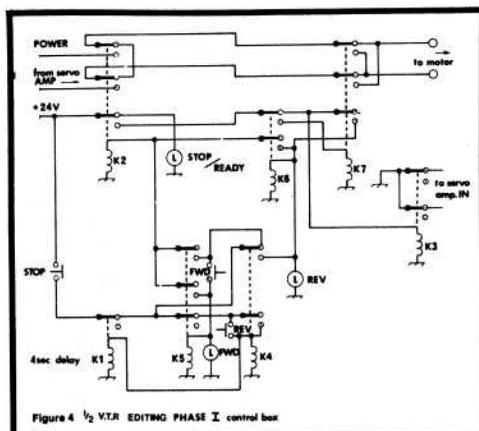


Figure 4 1/2 VTR EDITING PHASE I control box

K2 and K7 perform the motor switching operations.

K3 short circuits the servo amplifier inputs.

K1 is a delay relay that operates the drive motors in the reverse mode and stops the tape after four seconds.

The associated forward/reverse operations are controlled by other relays and they are interlocked to prevent a change in direction without first selecting the "stop" position. This allows the machine to come to rest each time to avoid damaging the tape.

The AV 3650 recorder was not originally designed to operate in the reverse mode. When the drive motor is modified to operate in reverse, the supply reel will not take up tape because it does not have a mechanically driven pulley.

The push-button and relay control box was designed to include an automatic stop at the end of the reverse mode, to allow the operator to give all his attention to the "tricky" business of reverse winding both supply reels at the same time.

Improvements to the sound editing operation during the Phase 1 modifications consisted only of eliminating the Sony delay circuits and permitting double recording at the edit point. Further studies of the inherent delay problems were required; solutions were found during the experimental stages, and were then incorporated into Phase 2 modifications.

## Phase 2

After some practical experience with the Phase 1 system, the possibilities of improving the editing system became apparent, and they are tabulated as follows:

- 1 Devise a means to mechanically operate the supply reel in the take-up mode when running in reverse.
- 2 If the length of the short run in reverse of both machines could be controlled by a time-delay circuit, it should also be possible to incorporate a method of switching the record function at the appropriate time and hence automate the editing routine.
- 3 If the switching of the record function can be made to operate automatically, it follows that it should also be possible to make the cut in the vertical interval.
- 4 If the bias to the video erase head, the audio erase head and the audio record head were controlled by time-delay circuits, then a clean sound cut could be obtained at the same time as the picture cut to produce an almost perfect editing sequence.

## Credits

*Concept Initiation:* Robert Forget  
*Concept Development:* Youssef Hasrouni  
*Mechanical Development:* Lester Dupuis and Anthony Zsiros  
*Drawings:* René St-Germain  
*Photography:* Jean Trudel  
*Author and Technical Coordinator:* Leo O'Donnell  
*Project Directed by:* Leonard A. Green