5700102800

SUPPLEMENTARY OPERATION MANUAL

# TASCAM

## TEAC Professional Division

# ES-50 ES-51

**Synchronizer** **Control Unit**

TO THE USER,

We have modified the ES-50/ES-51 and this supplementary manual contains update information and is intended to be used together with the current operation manual for the units (manual no. 5700096000).
In addition, since the units were first released, we have received feedback from users and this allows us to provide more detailed instructions than the current manual. As far as circumstances permitted, in this supplement we have tried to give more complete explanations of some of the information in the current operation manual.

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# 1. CONNECTIONS AND OPERATIONS

A single ES-51 can control up to three slaves. This section will provide information on the connections and operations about the three different configurations: one master interfaced to one slave, one master to two slaves, and one master to three slaves.

## 1-1. OPERATIONS BEFORE STARTING CHASE

Before letting the slave chase the master, be sure to perform the following:

1) Make sure to check that your system is set up as required (consult set-up diagrams below). Also make sure of a stable, firm connection of every cable. Lock the connection as regards the connectors that have a locking facility as with the ES-50's MASTER I/F and SLAVE I/F connectors.
2) After confirming that your system is correctly connected, switch on power to the system.
3) Check to make sure that the time code is correctly read and also that the machines involved are sensitive to the remote controls. If necessary, check for the firm, correct connections.
4) After confirming all the above, press the SET UP key on the ES-50. The unit will start learning the machines' tach pulses, transport direction signals, servo characteristics, reel brake force, etc. The LED on the SET UP key should light during the SET UP operations, turning off upon completion of the learning sequence.
   For as long as the same machines are used, there is no need of repeating the SET UP each time the system is turned on.

## 1-2. INTERFACING ONE MASTER TO ONE SLAVE

The table shows possible master-slave combinations. Cables used to interface machines with the ES-50/ES-51 should comply with the characteristics of the connectors on the machines. For details consult TASCAM or the nearest TASCAM dealer. See also the section, 4. INTERFACE CABLES.

| MASTER | SLAVE |
|---|---|
| ATR | ATR |
| DTR | ATR |
| VTR | ATR |
| VTR | VTR |
| VTR | DTR |
| DTR | DTR |

(DTR: Digital Tape Recorder)



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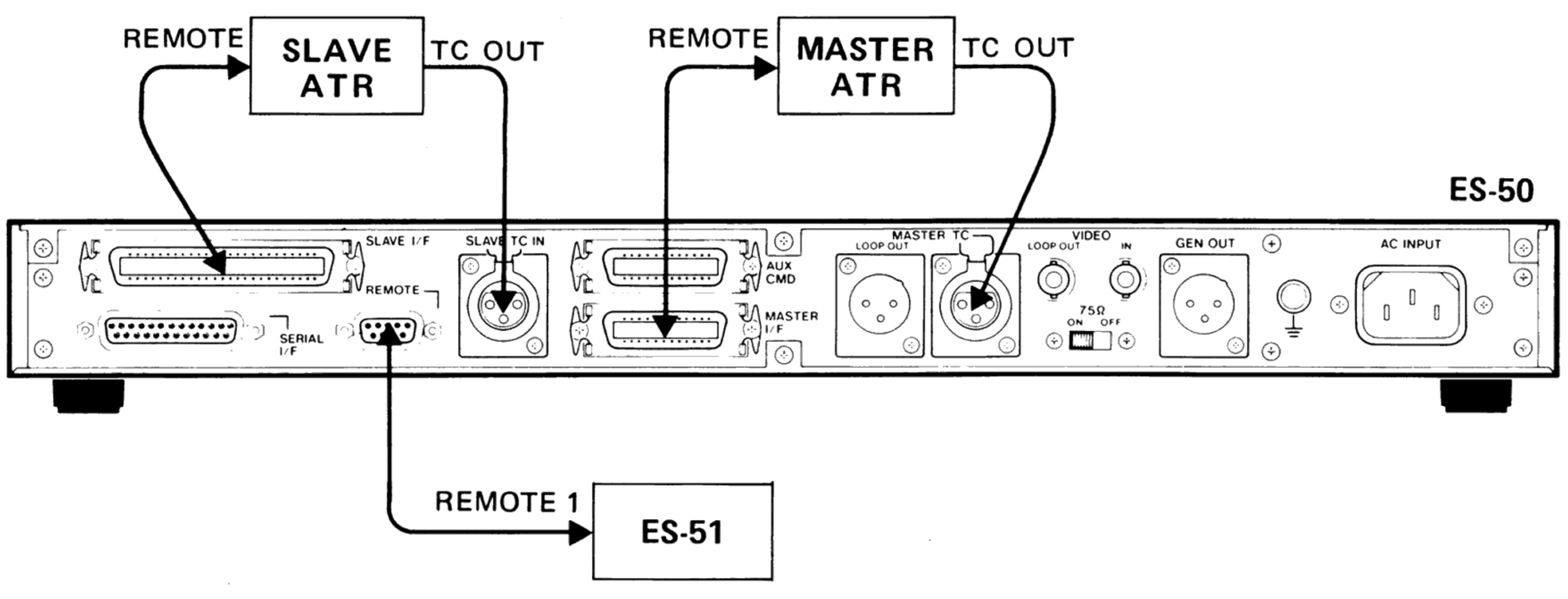
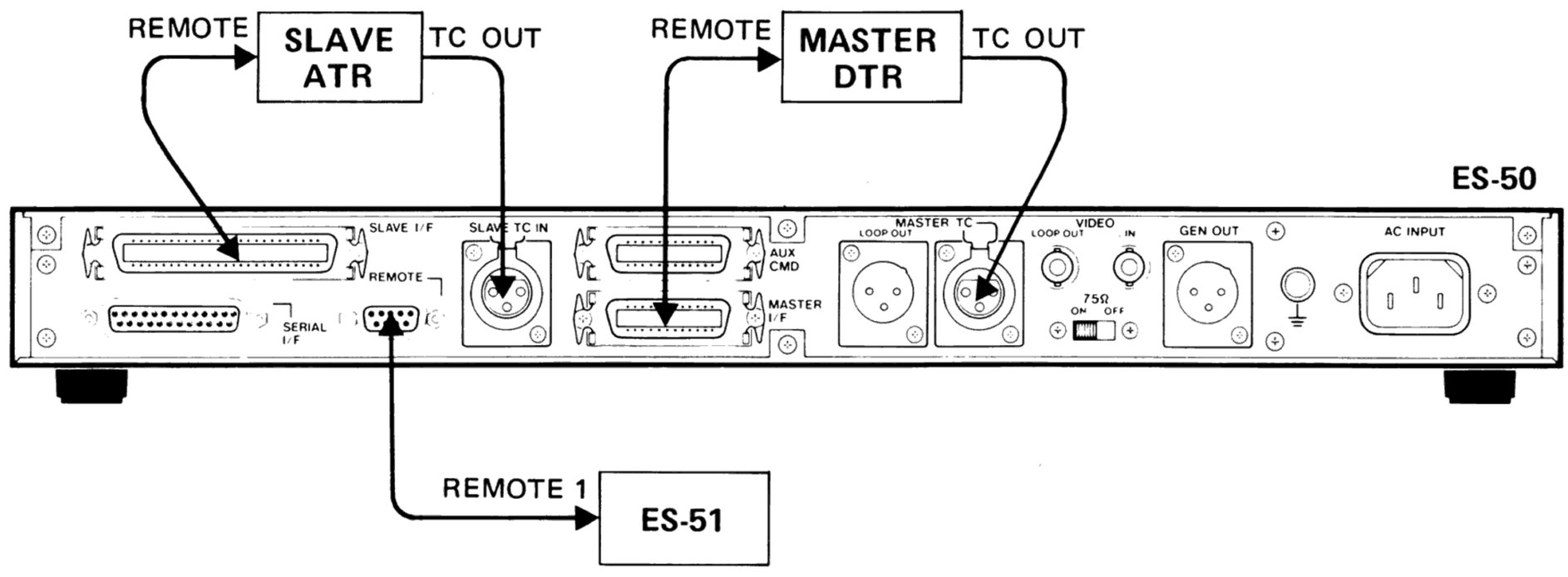
## 1-2-1. A — ATR slaved to ATR
## B — ATR slaved to DTR

### 1) Connections

**System A**




**System B**




### 2) Operations

1. Run the master in play, the ES-50 will read the timecode from the master.
2. Run the slave in play, the ES-50 will read the timecode from the slave.
3. Press the CHASE key. An LED will light on the key and the slave will start running after the master. When the slave catches up the master, the ES-50 will control the slave's capstan servo to lock the slave to the master. Once locked, the slave will follow anywhere the master goes. Pressing again the CHASE key will unlock the machines. If the PHASE key is used together with the CHASE key, the slave will drop into Phase Lock after once locked in terms of time-code addresses. Thereafter, each time the address difference between the machines reaches a certain limit, the slave will enter Chase mode to recapture the master.



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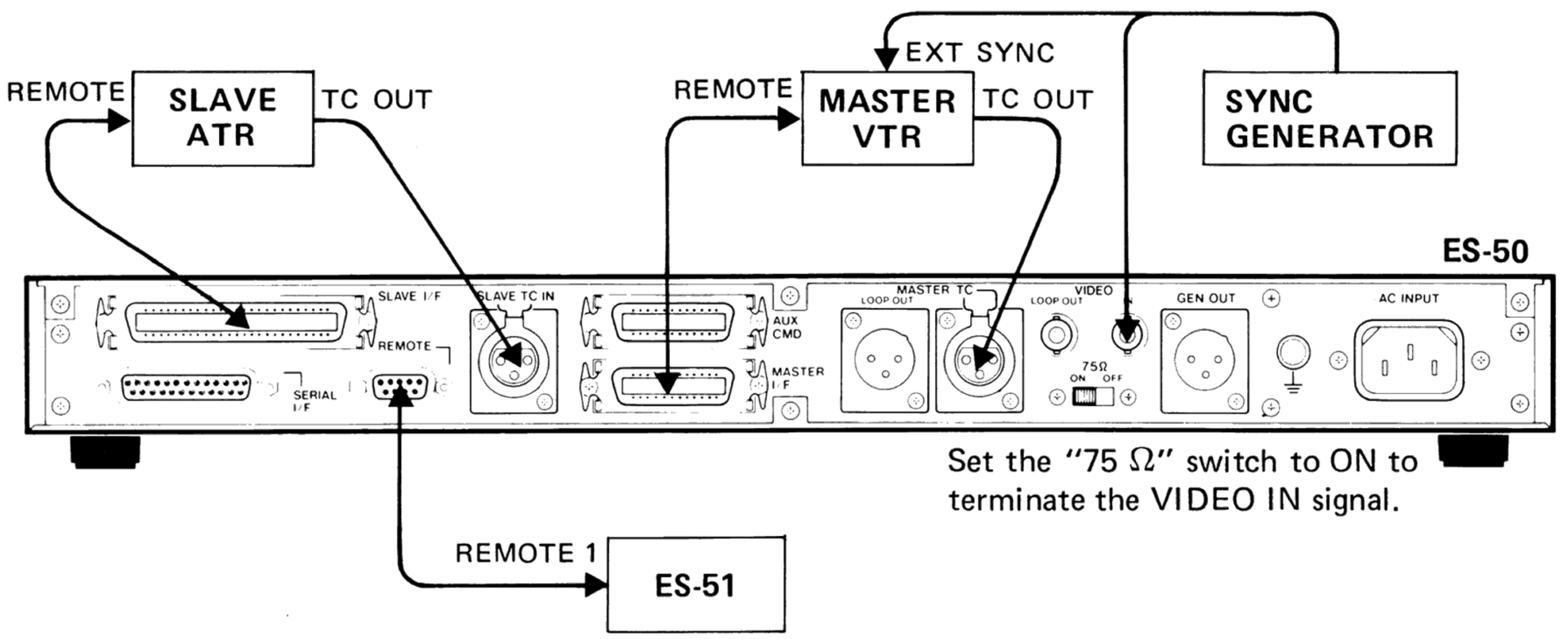
## 1-2-2. ATR slaved to VTR

### 1) Connections




Set the "75 Ω" switch to ON to terminate the VIDEO IN signal.

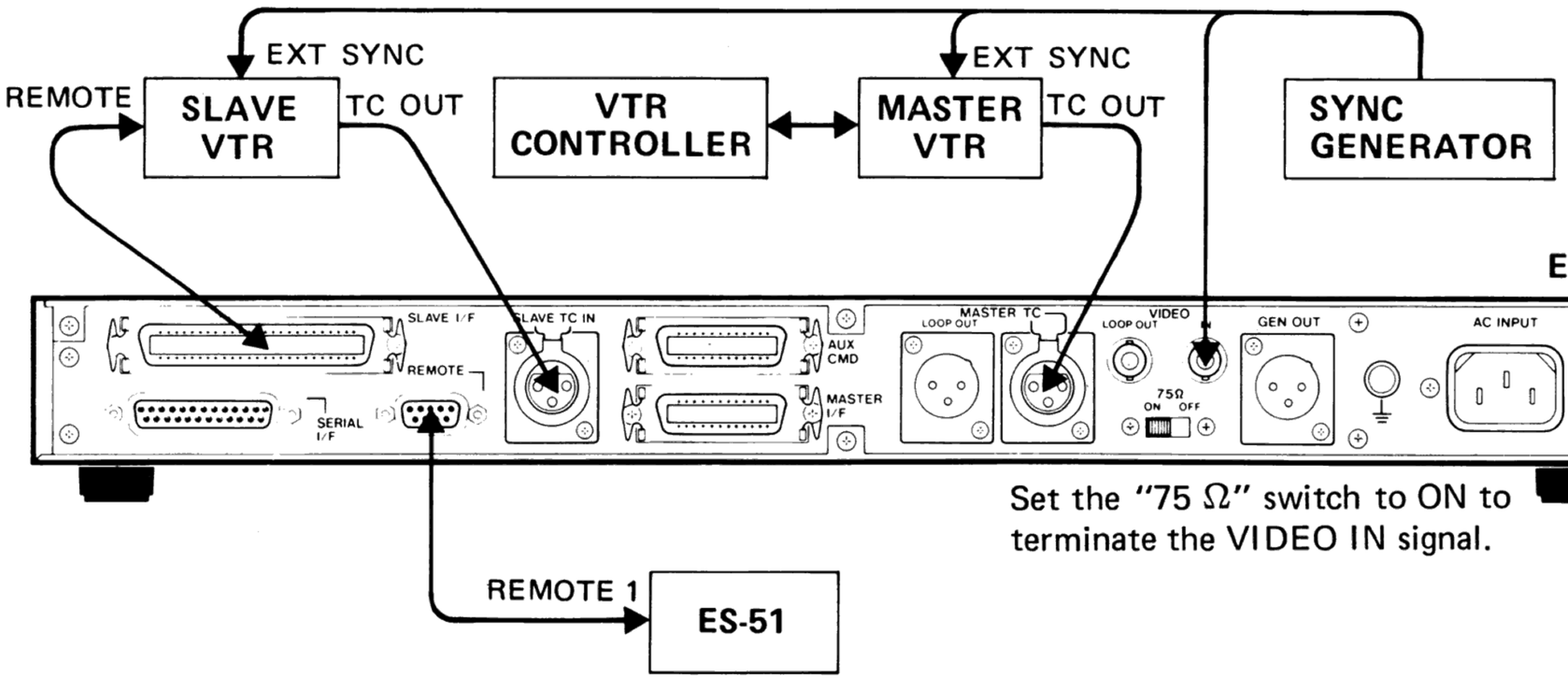
### 2) Operations

1. Read the timecode from the master and the slave by placing into play the master then the slave.
2. Press the CHASE key. The CHASE LED will light and the slave will start chasing the master. When the slave catches up the master, the ES-50 will control the slave's capstan servo, to lock the slave to the master. If PHASE is used in conjunction with CHASE, the slave will be sync-locked to the video signal (composite signal) after completion of the chase and lock sequence.

## 1-2-3. A – VTR slaved to VTR
## B – DTR slaved to VTR
## C – DTR slaved to DTR

### 1) Connections

### System A




Set the "75 Ω" switch to ON to terminate the VIDEO IN signal.

This setup provides access to 0-frame error electronic editings.



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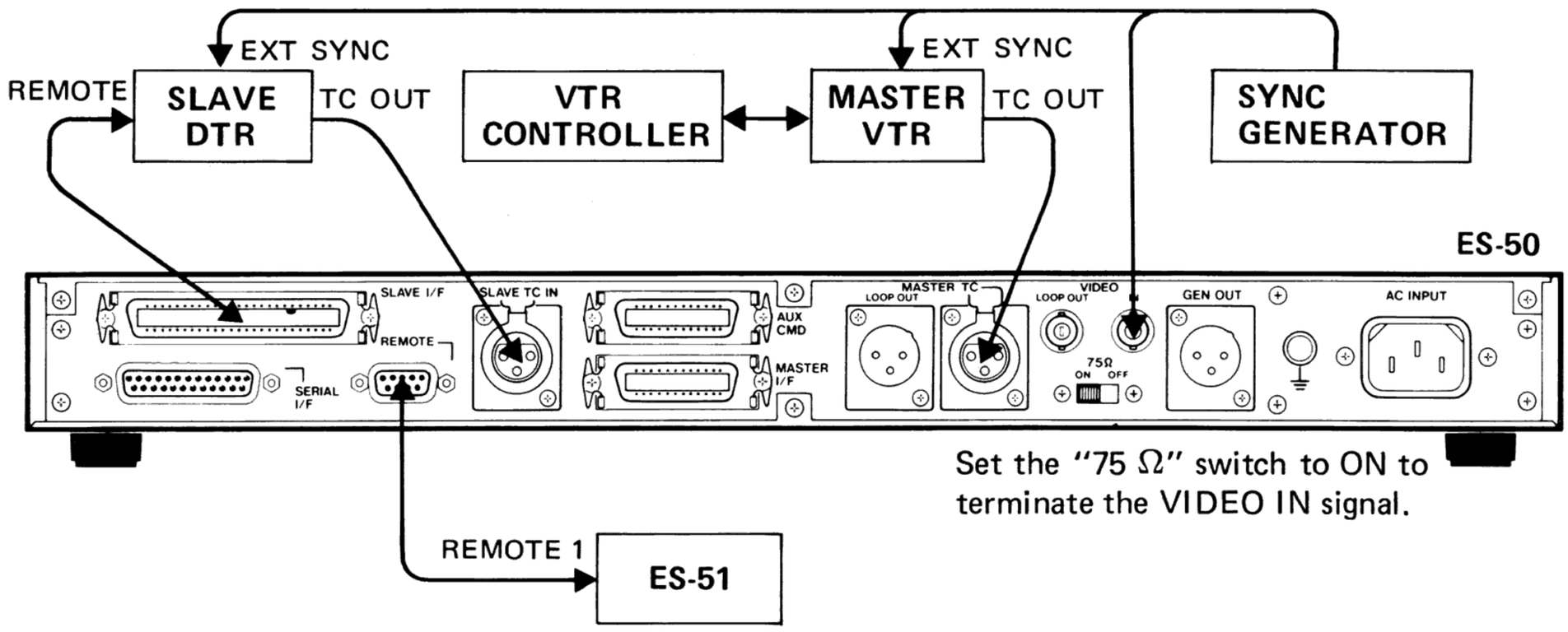
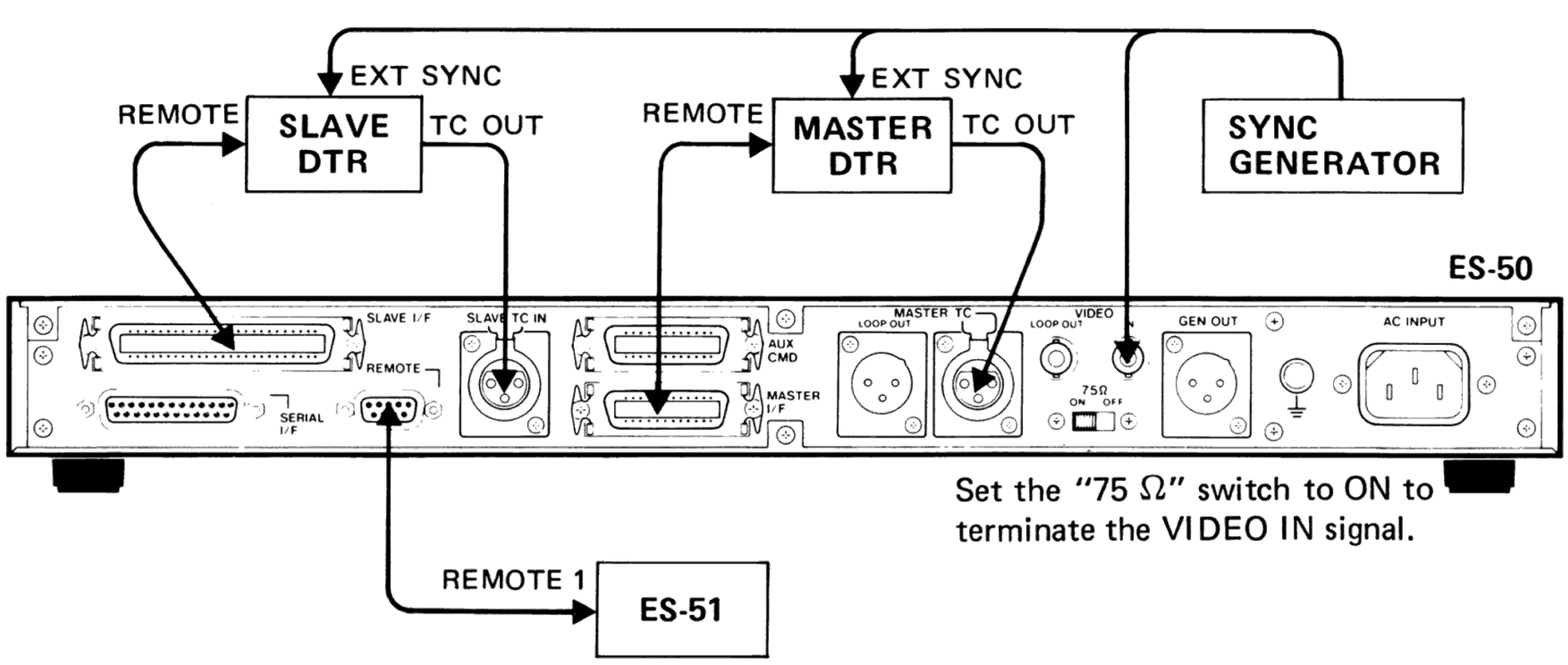
### System B




Set the "75 Ω" switch to ON to terminate the VIDEO IN signal.

Use a DTR that can be slaved to external sync references such as composite video signals.

### System C




Set the "75 Ω" switch to ON to terminate the VIDEO IN signal.

Use a DTR that can be slaved to external sync references such as composite video signals.

**2) Operations**

1. Run the master then the slave, in play, the ES-50 will read the timecode from each machine.
2. Press the CHASE key. After the slave catches up the master and locks to this, both machines will sync-lock to the video signal coming from the sync generator.



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### 1-2-4. Cautions and Recommendations

1) The ES-50 can put the involved machines into sync even if there is no tally feedback from the machines (the REW, F.FWD. STOP, PLAY, and RECORD tally lamps on the ES-51 do not then turned on). But remember this: the record entry and exit can not occur unless the Record Tally is given to the ES-50. If the necessary tally is not obtainable from the machines in use, connect pin 33 (RECORD!) to pin 6 (REC ?) of the ES-50's SLAVE I/F connector.

2) Do not designate VTR or DTR as the slave while ATR is designated as the master. Even if you want to slave VTR or DTR to external reference clocks to prevent wow and flutter from the master from being reproduced by the slave, you can't because you have then to slave the ATR master too to the external clocks but the ATR is not available to do so.

3) When using VTR or DTR as the slave, be sure to slave them to House Sync (genlock) to maintain precise synchronization.

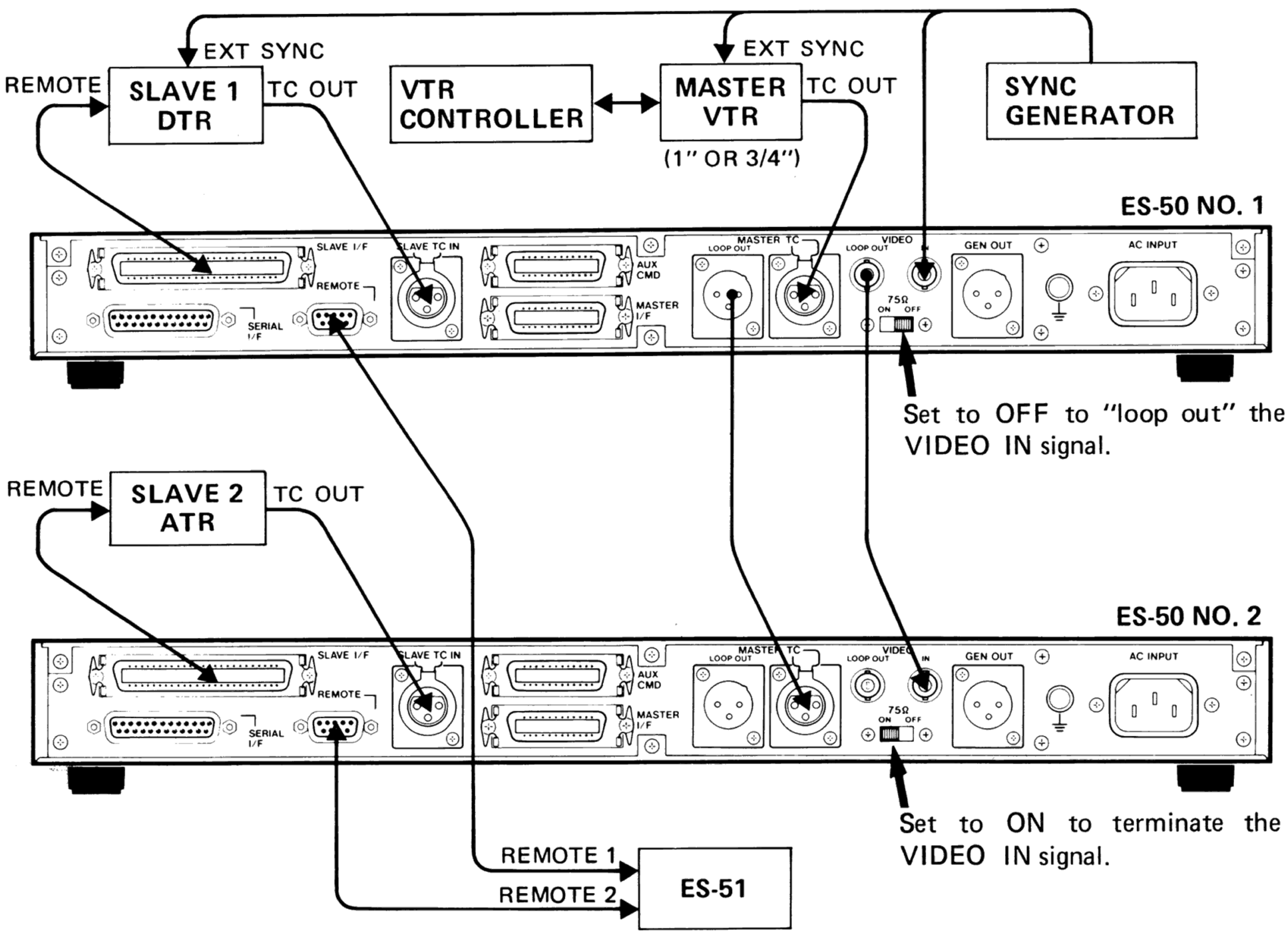
4) When using VTR or DTR as the master and ATR as the slave, connect a sync generator to both the master and the ES-50, which will ensure a more stable sync.

## 1-3. INTERFACING ONE MASTER TO TWO SLAVES

In the two-slave systems also, the same master-slave combinations as shown in the previous section may be used. In the following we will deal only with a system in which DTR and ATR are slaved to a VTR master.

### 1-3-1. DTR and ATR slaved to VTR

**1) Connections**




**NOTE:** The setup shown above assumes that the master has the capability of reading timecode in FF and REW (not only in PLAY) like 1" or 3/4" VTR's. Or else, use the next setup.



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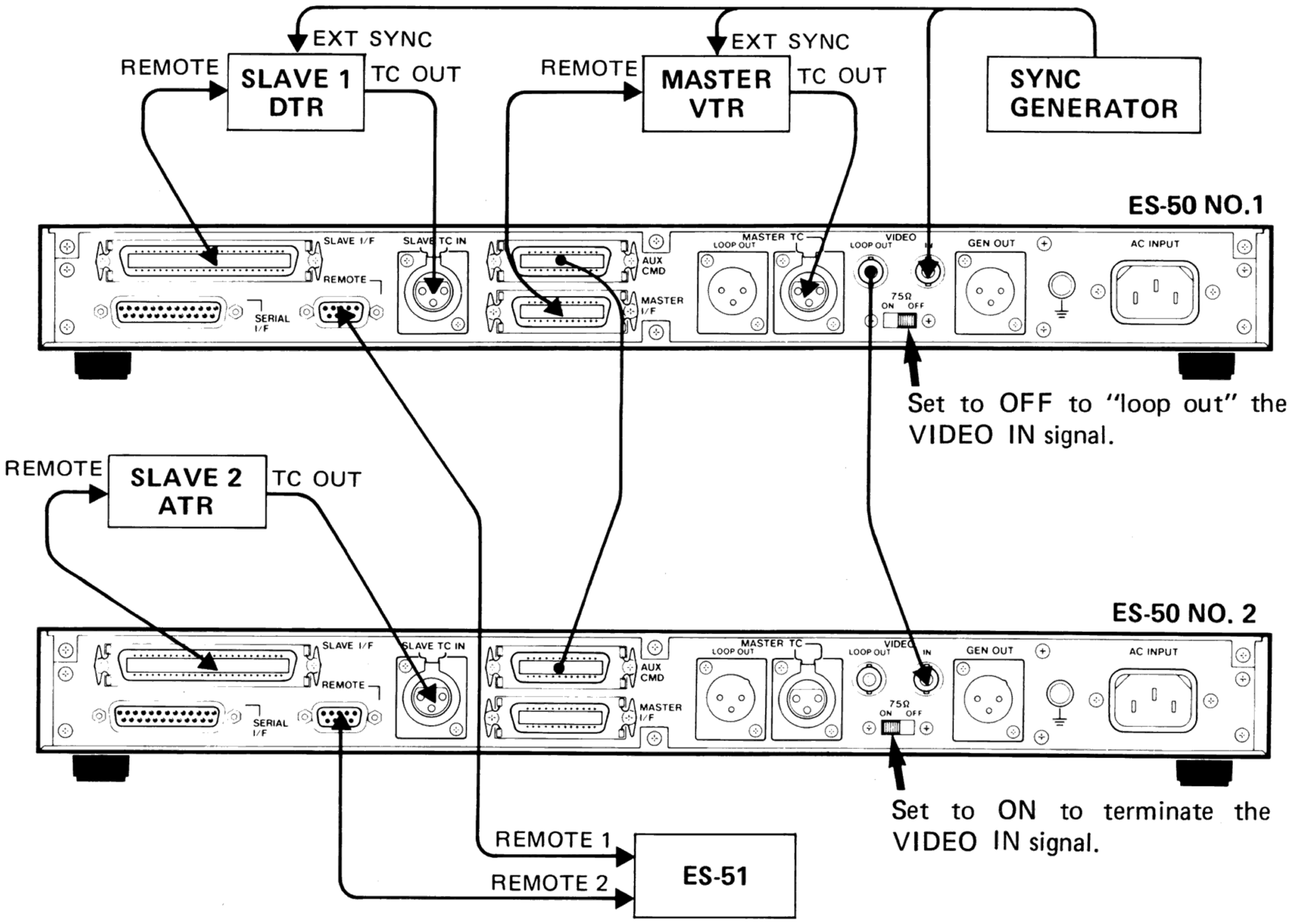
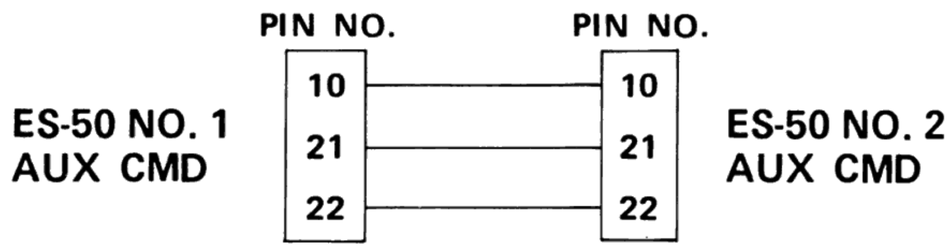
**With a master having no capability of reading timecode outside of play speeds.**




Two AUX CMD connectors must be connected each other as follows:




## 2) Operations

Press the machine selector switches on the ES-51 and the CHASE key in this order before pressing the MSTR key.

SLV 1 → CHASE → SLV 2 → CHASE →

→ finally MSTR

The two slaves have been programmed to follow the master, identically.

After you have programmed the two slaves to follow the master at a time, if you need to let either slave 1 or slave 2 follow the master, then press the SLV 1 or SLV 2 swtich to turn the LED on the switch off. Remember, however, that once you do this, the two slaves can not follow any more the master identically, unless you repeat the previous setting.

**CAUTION:** Settings of the machine selector switches determine the destination of all commands from the ES-51 including information on offset, cue points (scratchpad memories)... Check therefore to make sure of the lighting status of the machine selector switch LEDs before starting to control the machines from the ES-51.

MSTR and SLV 1 LEDs both lit: the ES-50 can control the master and slave 1 machines as if they were one single machine (via the ES-50 No. 1).

Only SLV 1 LED lit: the ES-51 can control only the slave 1 machine (via the ES-50 No. 1).

Only SLV 2 LED lit: slave 2 only can be controlled (via the ES-50 No. 2).



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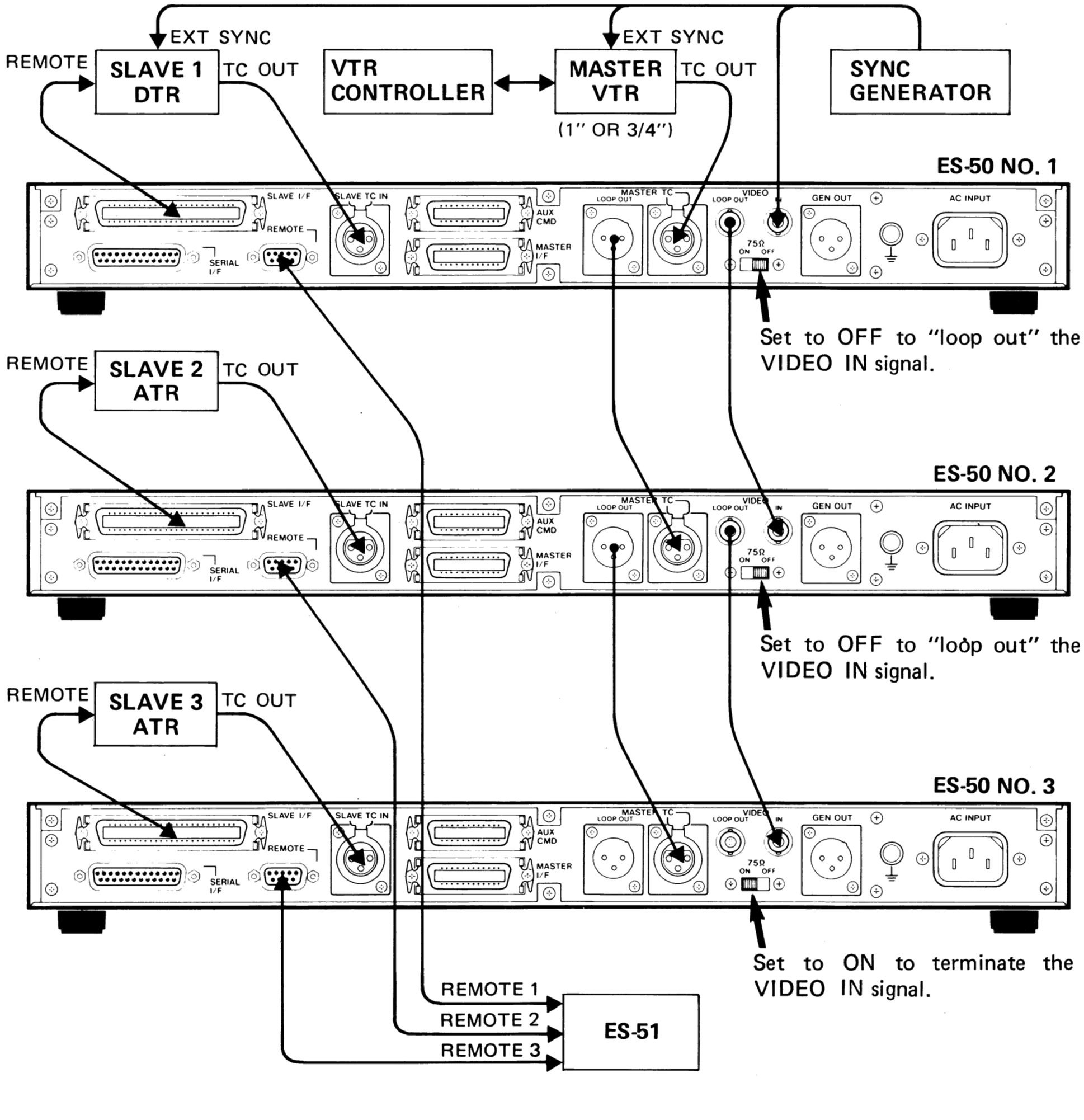
## 1-4. INTERFACING ONE MASTER TO THREE SLAVES

Essentially, the principles valid for the system with one master and two slaves (see 1-3) can be used as they are to slave three machines to one master. Here we show a system including a VTR as the master and, as slaves, one DTR and two ATR's.

### 1) Connections




**NOTE:** The setup shown above is effective only when the master is a type having the capability of reading timecode in fast-wind modes, such as 1" or 3/4" VTR's. Or else, use the next setup.



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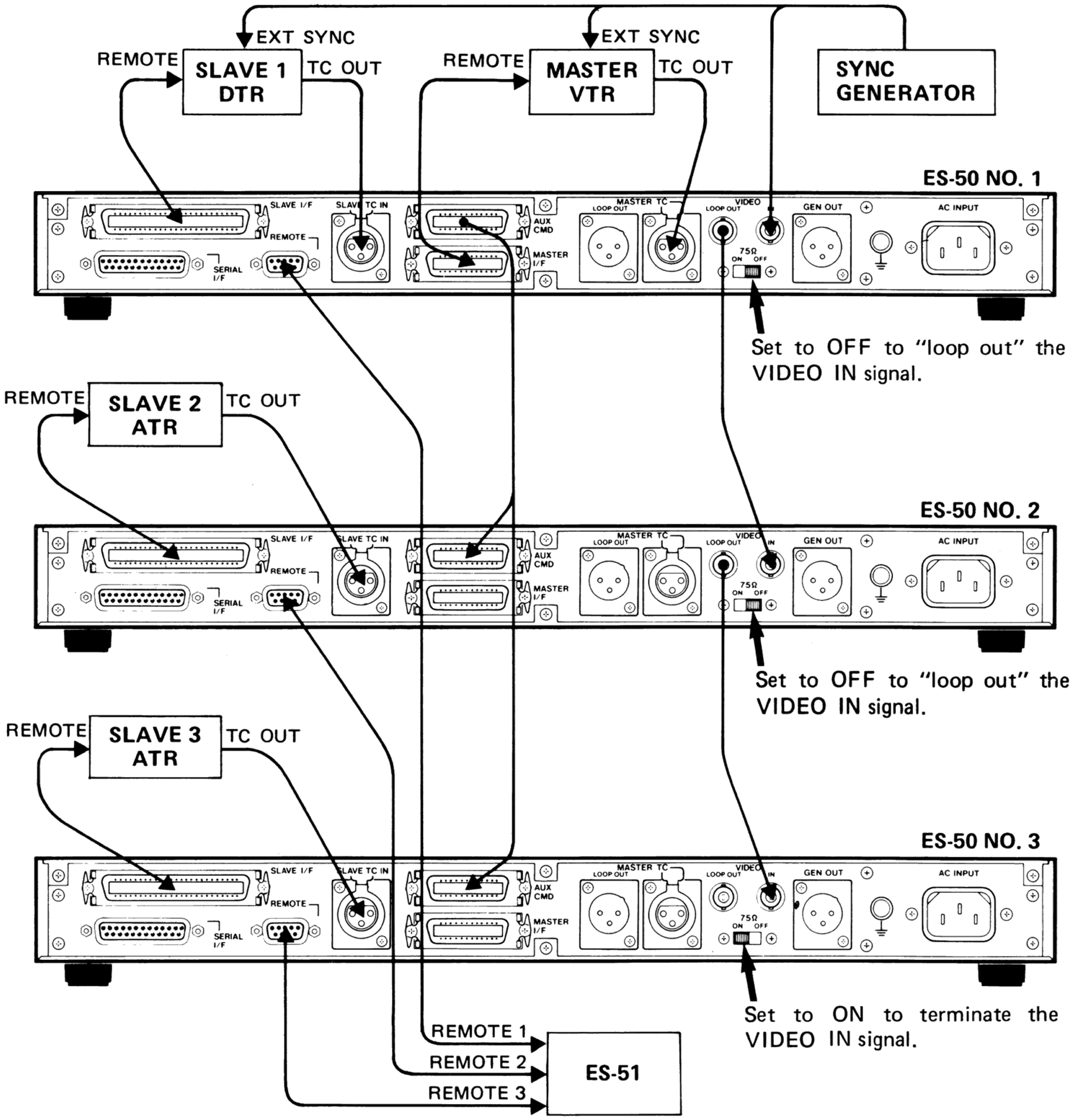
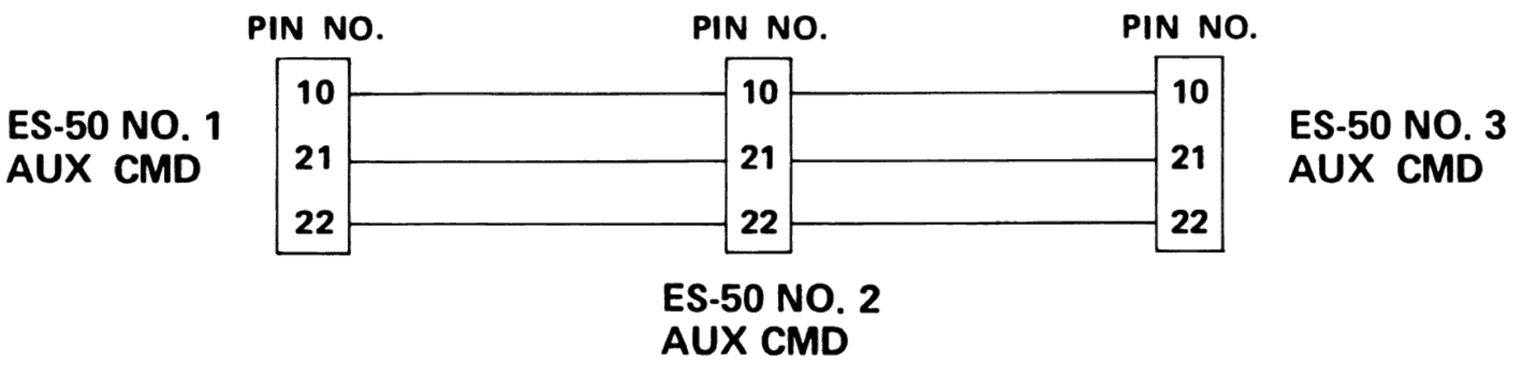
**With a master having no capability of reading timecode outside of play speeds.**




Three AUX CMD connectors must be connected one another as follows:



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# 2. "EVENT" FUNCTIONS

The basic functions of EVENT are explained in the current operation manual for the ES-50/ES-51. This section provides complimentary operational/functional information including some additional precautions.

## 2-1. EVENT REC FUNCTIONS

(a) The ES-51's AUTO REC functions can not be activated if the master and slave machines are not yet interlocked when they reach the programmed punch-in point, preventing thus erratic recordings.

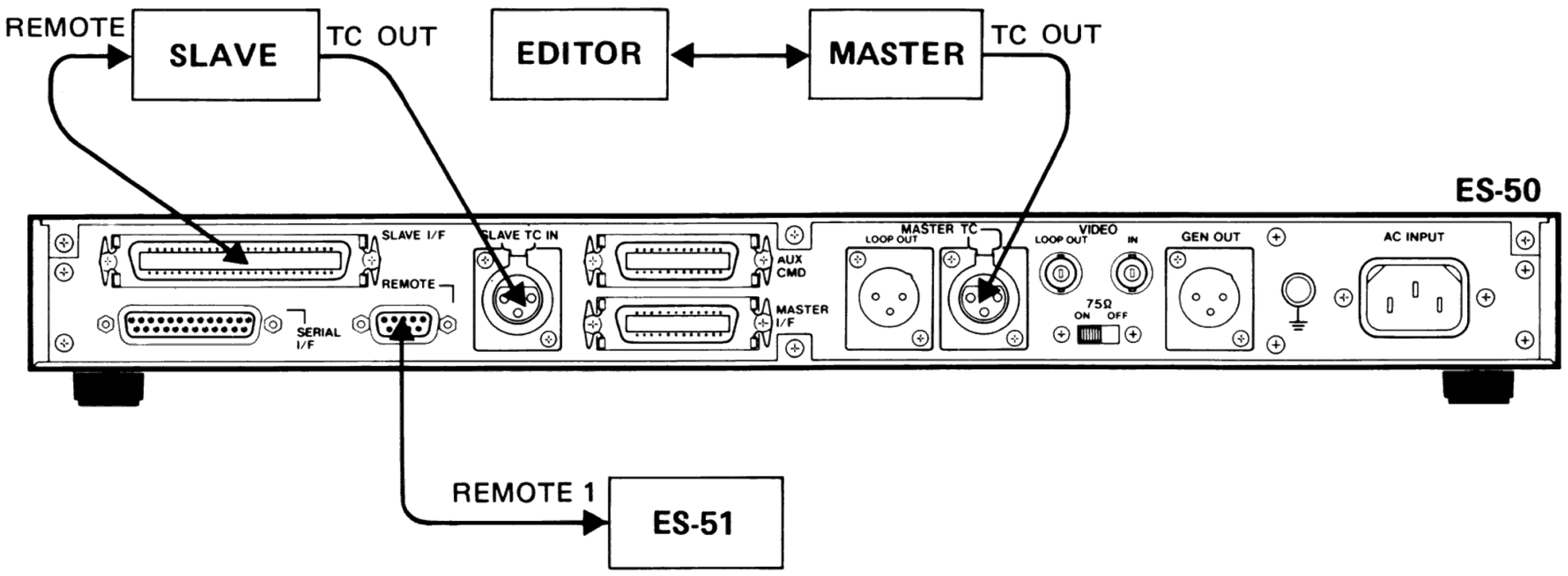
(b) The ES-50's AUX CMD connector incorpolates relays that operate in response to the record entry/exit. This suggests that you can control recordings by controlling these relay functions.

(c) Typical EVENT REC operations

1) The illustration below shows a setup in which all commands and controls are executed from the ES-50.




2) To yield the recrod entry/exit controls to external edit controllers, use the following setup.




Operate the external edit controller to rewind the master tape to the preroll start point then to run it in Play. The slave will then chase the master to perform the record entry/exit as programmed.



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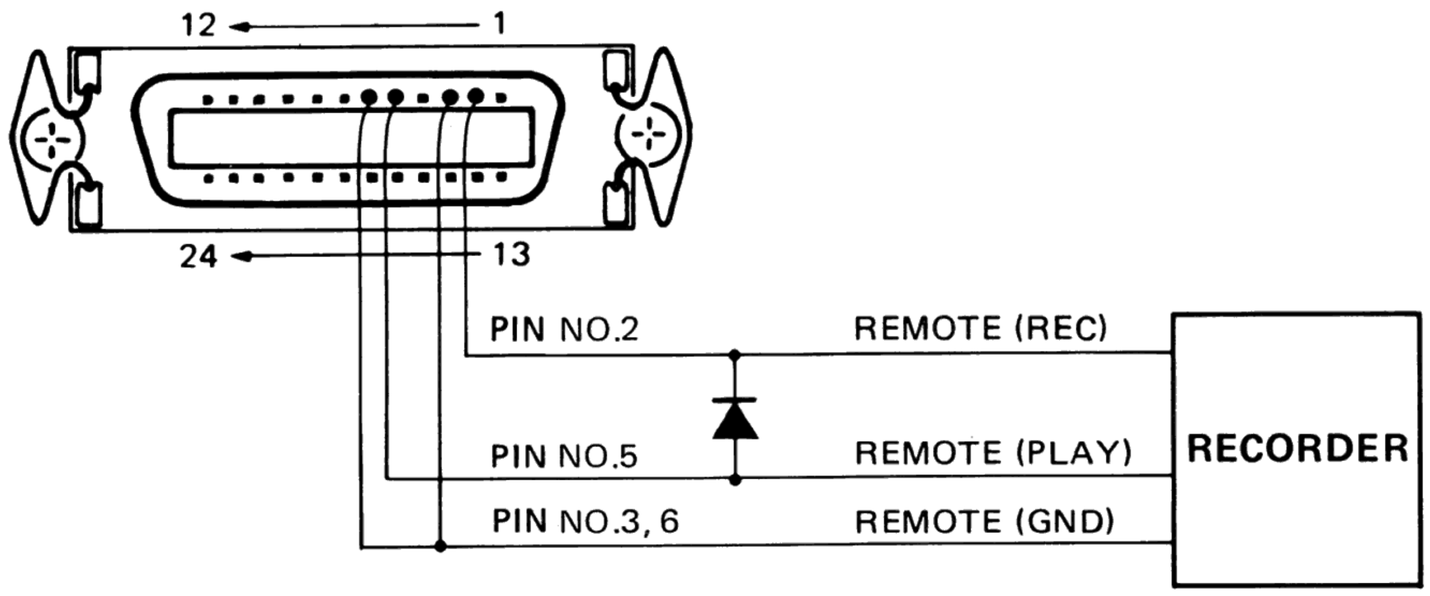
3) When the record entry/exit relay switch terminals of the AUX CMD connector on the ES-50 are intended to use to control EVENT REC, perform the connections shown below.

**AUX CMD on the ES-50**




When the programmed record entry point is reached, REC IN relays (pins 1, 2, and 3) will switch so that the external recorder goes into Record mode. At the record exit point, REC OUT relays (pins 4, 5, and 6) will switch so that the recorder stops recording. The above diagram assumes a recorder which enters record mode upon receipt of Rec and Play commands and punches out upon receipt of Play command. With recorders that enter record mode upon receipt of only Rec command and stop recording upon receipt of Play command, the diode shown need not be connected.

4) Precautions

(1) Do not set the preroll time too short. Too short a preroll time could cause AUTO REC not to occur because the security mechanism — see paragraph 2-1. (a) — is activated if, when the machines reach the preset record entry point, they are not yet interlocked.

(2) Ensure not to set the record entry and exit points inversely (IN higher than OUT). Otherwise, the record entry and exit will not occur as expected and previous recordings will be erased inadvertently. Use the REH (rehearse) function to check to make sure that the AUTO REC programs are correctly made.

(3) When the master is controlled from other devices than the ES-50, be sure to locate the master tape behind the preroll start point before putting the master into play mode (the timecode value representative of the master tape address must be lower than that representative of the preroll start point). Otherwise, EVENT REC can not occur.



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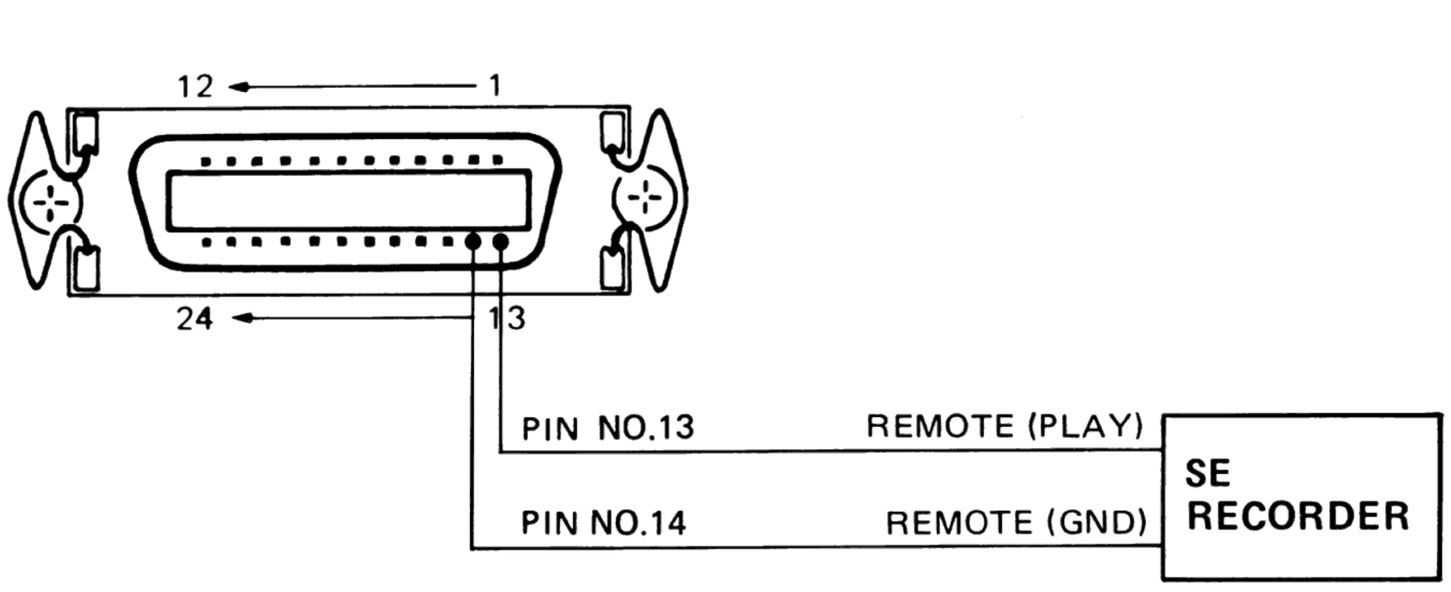
## 2-2. EVENT TRIGGERINGS

### 1) Applications of EVENTs

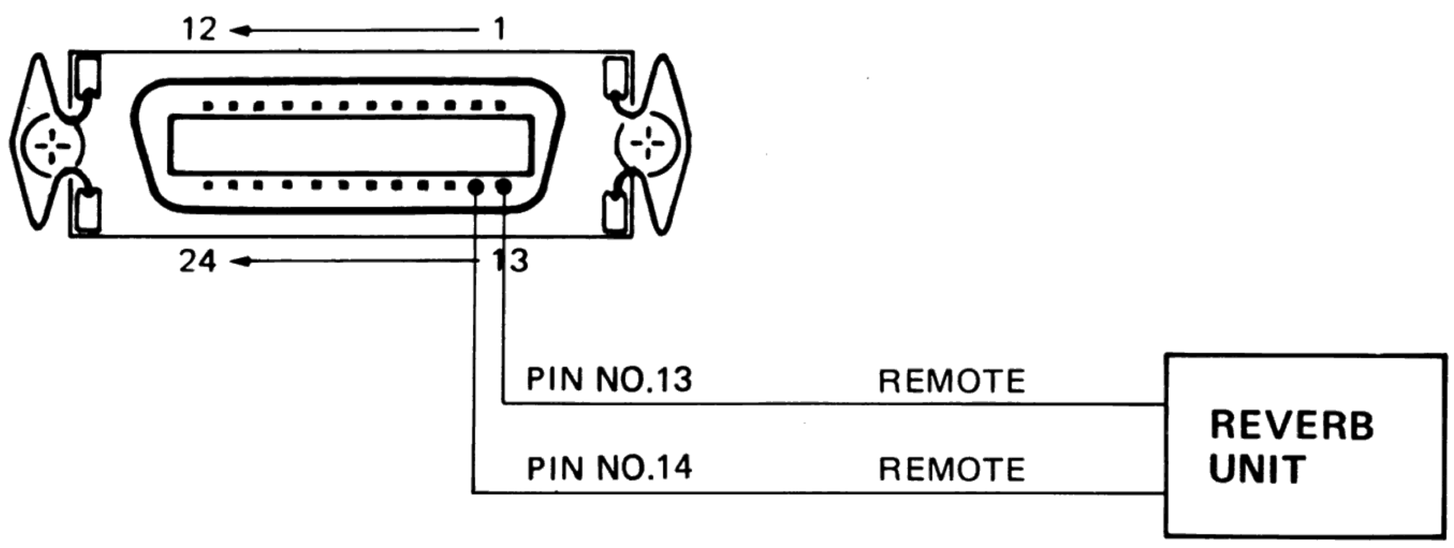
(1) Triggering effects units

i. Driving SE (Sound Effects) recorders




The diagram above shows that EVENT 1 is used to trigger an SE recorder. When the master timecode matches the timecode registered in EVENT 1, the EVENT 1 relay (of the AUX CMD connector) will switch so that the SE recorder starts.

ii. Driving reverb units




The diagram above shows the case in which the EVENT 1 program is used to trigger reverb unit. If you want to use other EVENTs, consult the pin chart contained in the separate current operation manual (page 8 ).



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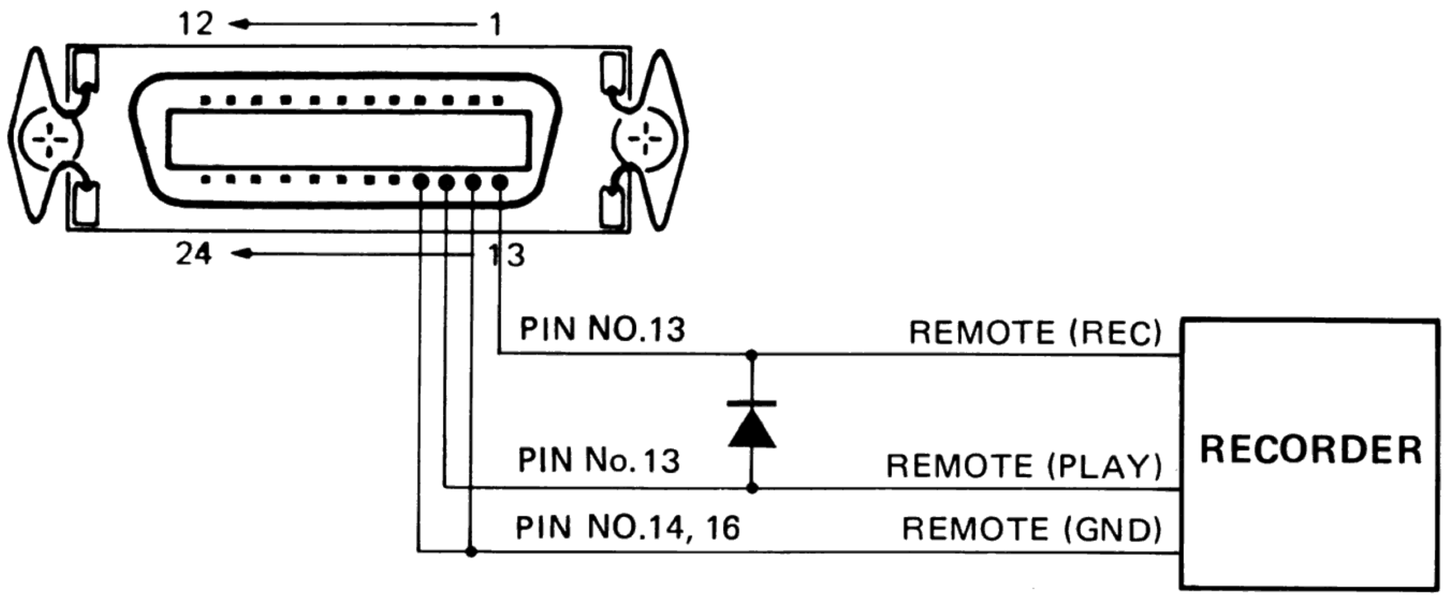
(2) Access to auto record entry/exit using trigger EVENTs

**AUX CMD on the ES-50**




In the diagram above, EVENT 1 is assigned for record entry and EVENT 2 for record exit. When the master timecode matches the timecode stored in the EVENT 1 register, the relay for EVENT 1 will swtich so that the recorder enters record mode. When the master timecode matches the timecode stored in the EVENT 2 register, the relay for EVENT 2 will switch so that the recorder stops recording.

The diode shown in the diagram need be inserted when the tape recorder associated is a type that enters record mode with a double command of Rec and Paly and stops recording with Play command. With machines that enter record mode upon receipt of only Rec command, the diode need not be connected.

**2) Precautions**

(1) The trigger EVENT signals are sent out through the AUX CMD connector on the ES-50, in "one-shot mode" (when the registered time comes, the corresponding output relay switches on only for a duration of 0.5 sec.) Check therefore to make sure that the external units is compatible with this "one-shot mode."

(2) In contrast to EVENT REC, that can not start unless the slave is already locked to the master when the programmed record entry point is reached, the trigger EVENTs operate whether or not the machines are locked.

(3) EVENTs are programmable regardless of the current transport status. But remember this: Trigger EVENTs can be set only ahead of the current master tape location. The EVENT registers 1 thru 4 are not available to store any points which are found behind the current master tape location. (An LED does not want to turn on any of the four EVENT keys.)



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# 3. PRECAUTIONS CONCERNING THE CHASE FUNCTION

The ES-50 has the capability of reading timecode in wide range (1/20 to 100 times the standard play speed), allowing to control the CHASE function even in FF or REW utilizing only the timecode (without resorting to any external references); and so (that is, thanks to the ES-50's high timocode readability) the CHASE function is also accessible by yielding transport controls to external edit controllers as well. The tally signals from machines are only utilized to turn on the tally lamps (LEDs on the transport control buttons on the ES-51), notifying the operator in what status are the involved machines. CHASE will operate whether or not the tally signals are fed back to the ES-50/ES-51. But you have to know the following:

**1. Activation of AUTO REC**

In principle the Rec Tally is requisite for AUTO REC and must be fed back to the ES-50. If the tally is not available from the machines, you can connect the record command available at pin 33 of the SLAVE I/F connector back to the ES-50 as the tally.

**2. Masters in use having no capability of reading timecode outside of play speeds**

For chase function with the master machines that can not read timecode at fast forward and rewind speeds, you have to connect to the ES-50 the tach pulses and the transport direction sense signals from the machine designated as the master.



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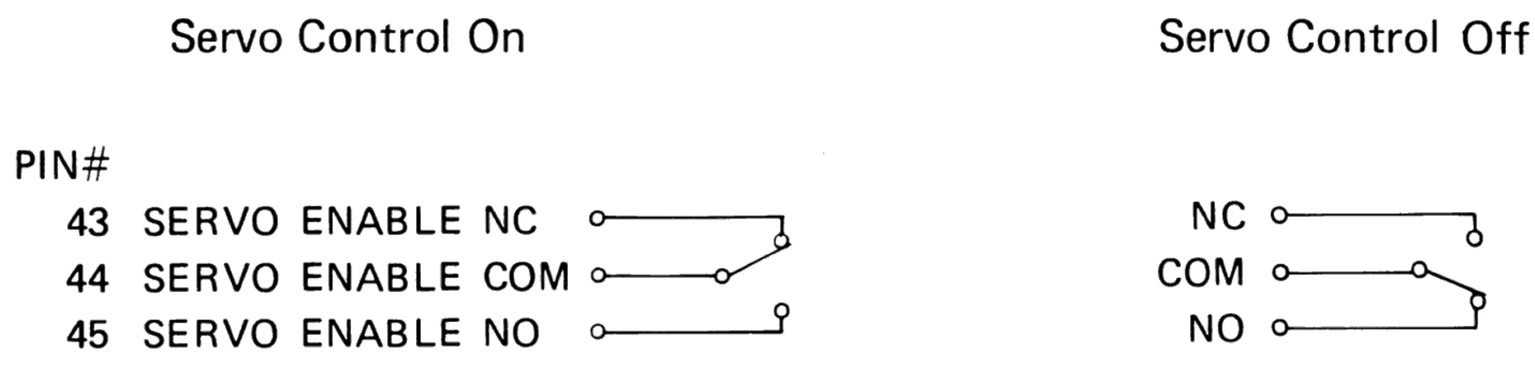
# 4. INTERFACE CABLES

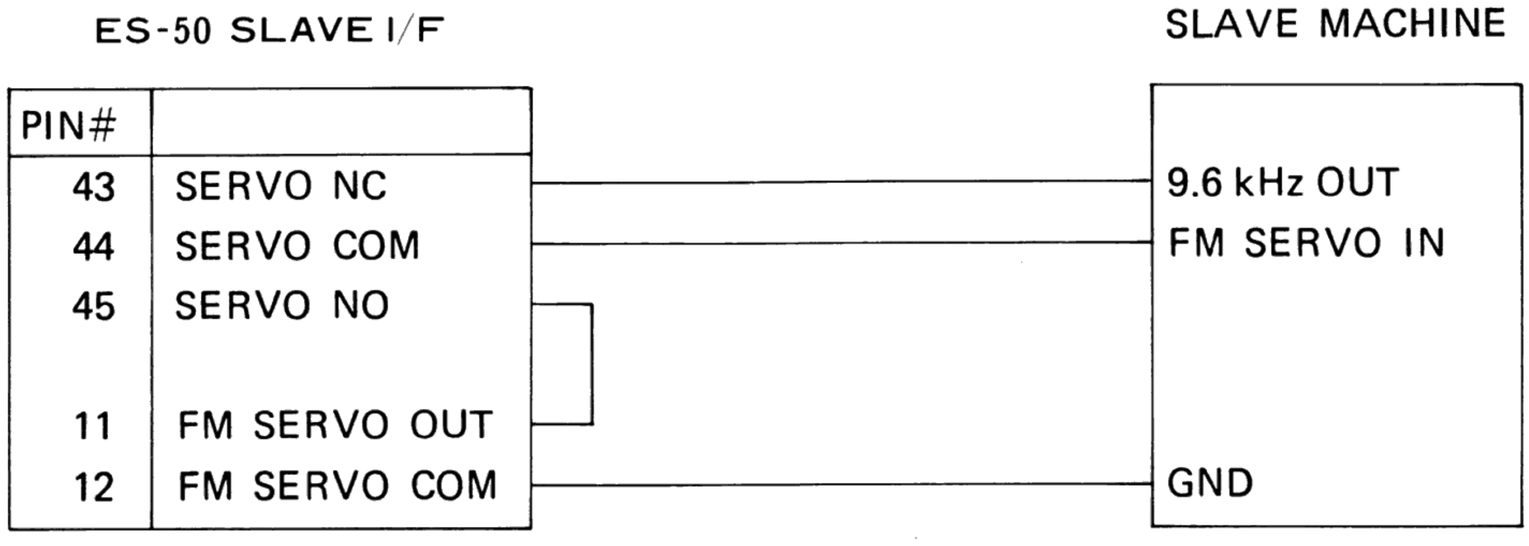
A host of interface cables are available from TASCAM. This section provides information on the interface cables on behalf of the users who intend to fabricate the cables by themselves.

## 4-1. SERVO ENABLE RELAY

Pins 43, 44, 45 of the SLAVE I/F connector constitute the SERVO ENABLE relay which switches as shown below.




In the following we will show how the SERVO ENABLE relay functions in a system.




The above diagram shows interfaces with a slave machine whose servo is controlled by a 9.6 kHz FM Servo frequency signal. In non-servo control mode, pins 43 and 44 of the SLAVE I/F connector are internally connected and the servo frequency signal coming from the slave is fed back into the slave's FM SERVO IN. In servo control mode, pins 44 and 45 become connected, enabling FM SERVO OUT at pin 11 to feed the slave's FM SERVO IN. Thus the slave becomes controllable from the ES-50. The SERVO ENABLE relay will function only when CHASE or PHASE is engaged on the ES-50.



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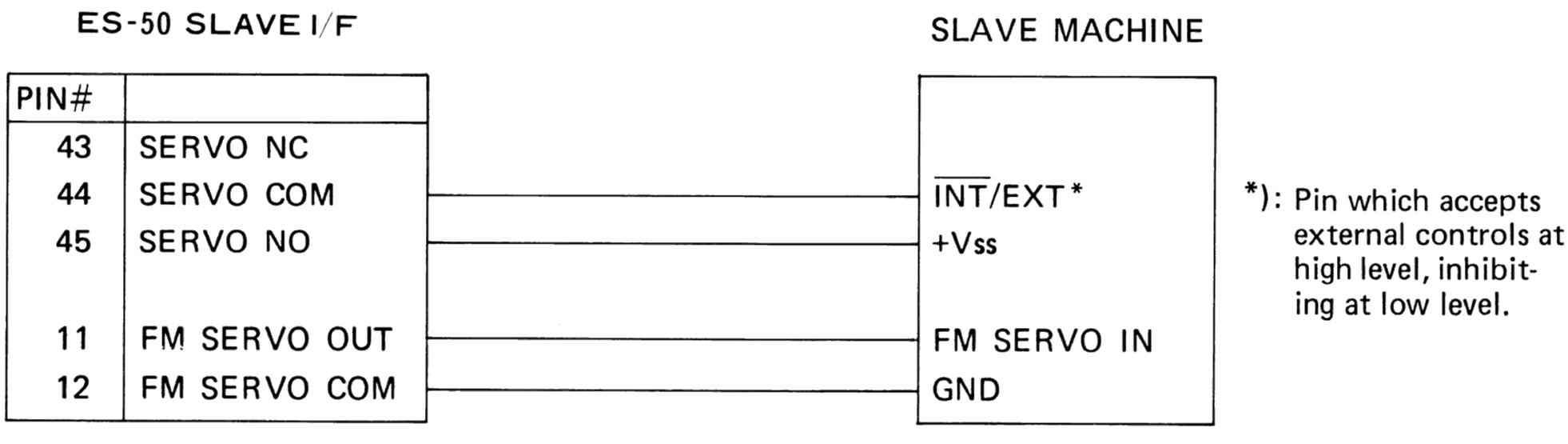
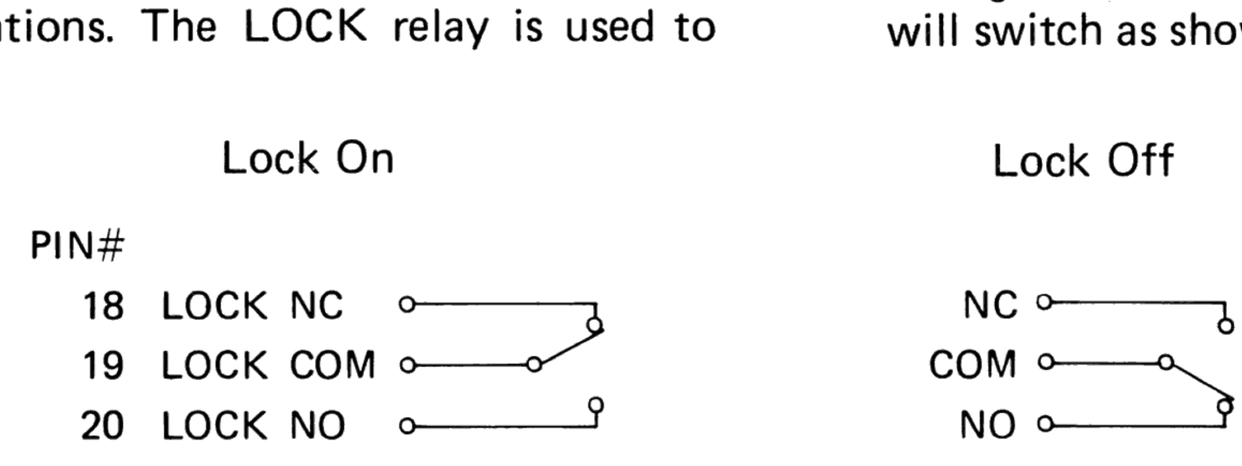


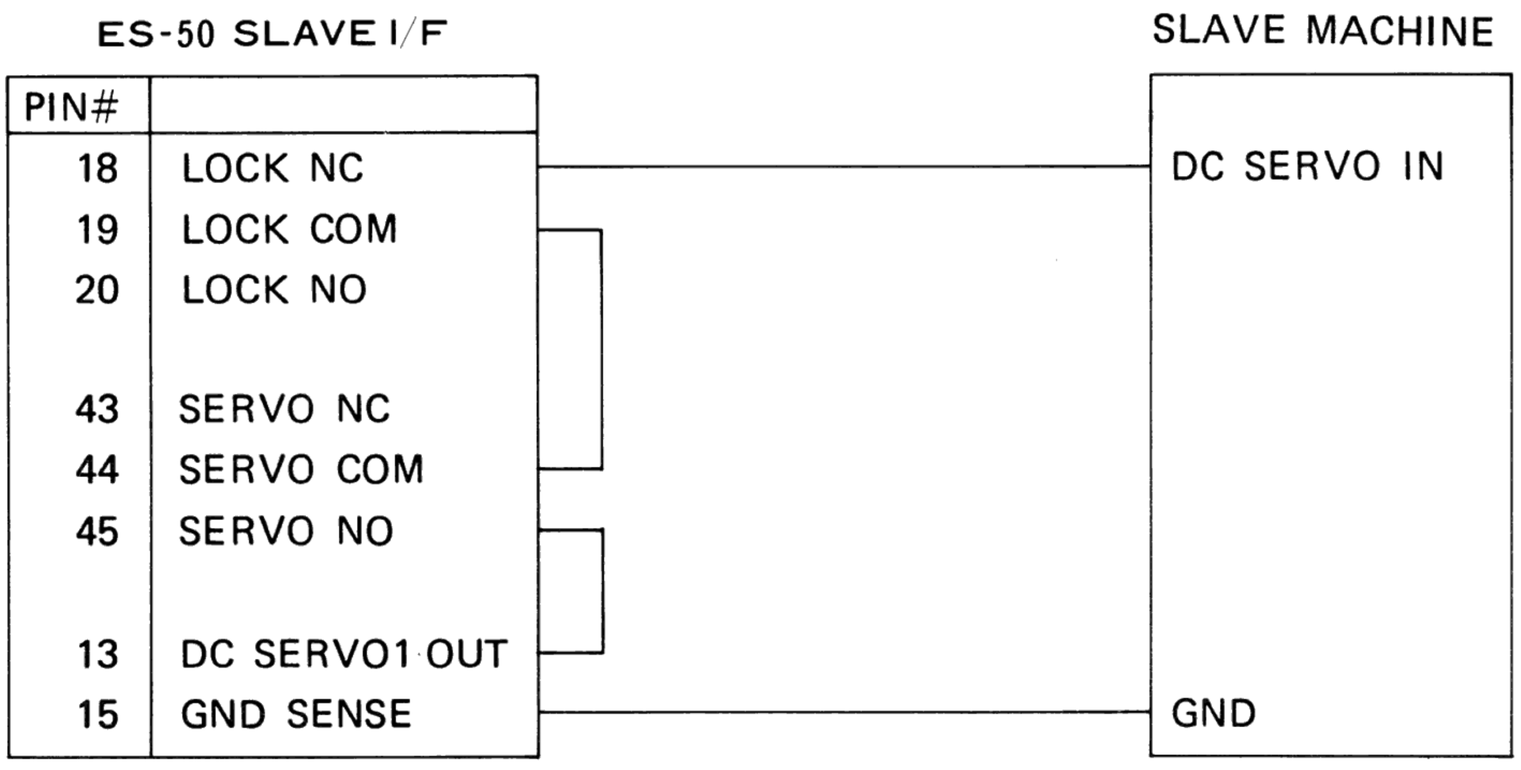

The above diagram shows interfaces with a slave machine which uses FM SERVO and has an input pin through which the machine is servo-controlled from the exterior. When the ES-50 is in no-servo control mode, pins 43 and 44 of the SLAVE I/F connector are internally connected and therefore the $\overline{\text{INT}}$/EXT pin on the slave is low, switching the servo to internal controls (external control inhibit status). When the ES-50 is enabled to servo-control the slave, pins 44 and 45 are connected and therefore the $\overline{\text{INT}}$/EXT pin on the slave goes high, accepting controls from the ES-50.

## 4-2. LOCK RELAY

When using VTRs or DTR as the slaves, it will be better to "slave" them to House Sync using video reference, in order to ensure stable sync operations. The LOCK relay is used to cut off the SERVO signal from the ES-50 when the slave is locked to the master, providing access to video sync. The LOCK relay will switch as shown below.




In the following will be explained how the LOCK relay functions in a system.



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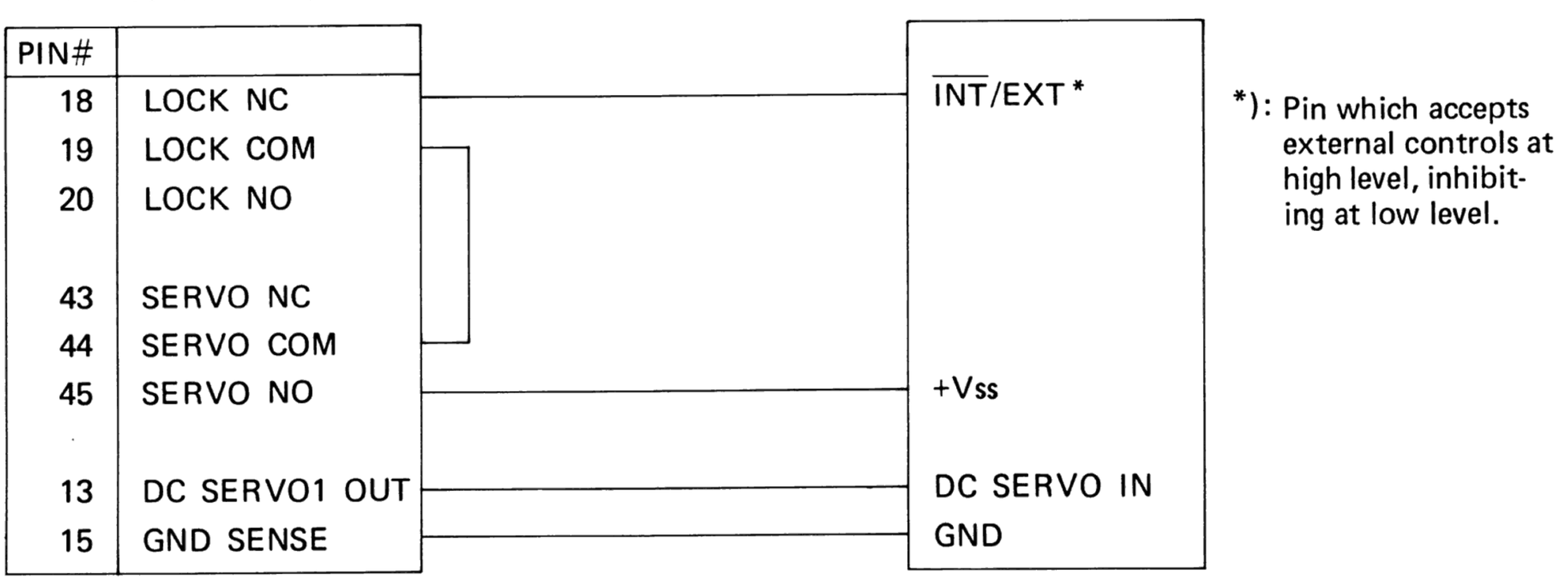
The diagram above shows interfaces with a DC-Servo-controlled VTR or DTR slave. The SERVO relay functions as already explained. The LOCK relay functions thus: When the slave is not yet locked to the master, pins 18 and 19 of the SLAVE I/F connector are internally connected and the DC SERVO OUT signal at pin 13 is enabled to feed DC SERVO IN on the slave, allowing the ES-50 to control the slave's servo. When the slave is locked to the master, pins 19 and 20 are connected and therefore DC SERVO OUT from the ES-50 is prevented from feeding DC SERVO IN on the slave, yielding the involved machines to Video Sync.




The diagram above shows interfaces with a DC-servo-controlled VTR (or DTR) having an input pin which permits external servo controls. When the master and the slave are not yet interlocked, pins 18 and 19 of SLAVE I/F of the ES-50 are internally connected and +Vss is applied to the $\overline{\text{INT}}$/EXT pin on the slave, making this pin go high. The slave's servo control is thus yielded to the ES-50. When the machines are interlocked, pins 19 and 20 become connected and, as no voltage is applied to the $\overline{\text{INT}}$/EXT pin, this pin goes low, inhibiting external servo controls, allowing instead the machines to yield to Video Sync.

For the functions of all the other pins, consult the pin charts contained in the operation manual supplied with this supplement.



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# 5. CALIBRATION

To get the full potential out of the machines, the ES-50 must be adjusted to match the characteristics of the specific machines. To this purpose the ES-50 is designed to be capable of being calibrated about 10 parameters, of which the sync-operation related ones are shown in the table below. If uncertain sync functions occur, it is necessary to check each of these items.

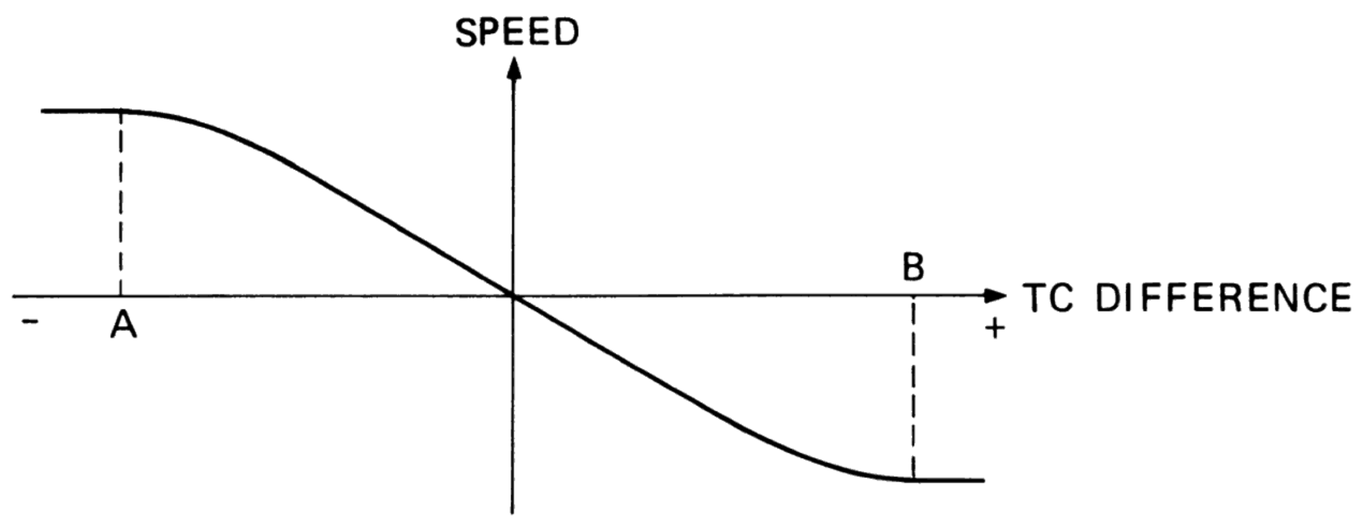
| Parameter No. | Definition | Maker | TEAC | | OTARI | | STUDER | | FOSTEX | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Tape width | 1/4" to 1" | 2" | 1/4" to 1" | 2" | 1/4" | 2" | 1/4" | 1/2" |
| 0 | Chase response | | 4 | | 4 | | 4 | | 4 | |
| 1 | Servo response | | 3-4 | | 3-4 | | 4-5 | 5-6 | 4-5 | |
| 2 | Servo damping | | 1-4 | | 3-4 | | 4-5 | | 4-5 | |
| 3 | Servo gain | | 3-4 | | 3-4 | | 4-5 | | DC: 6-8<br>FM: 3-4 | |
| 4 | Start advance | | 0-1 | 5-7 | 2-3 | 4-6 | 1-3 | 2-4 | 1-3 | |
| 5 | FM servo trim | | 5 | | 5 | | 5 | 1* | 5 | |
| 7 | Slave brake | | 3-5 | 1-3 | 3-5 | | 1-2 | | 2-4 | |

*) With STUDER A-800 MKII (its FM servo is set to 3.2 kHz), set the ES-50's SW2 (on MAIN PCB) to 2.4 kHz position and set the FM servo trim constant (parameter 5 in table) to 0 (zero).

If, after completion of SET UP, the involved machines cause a malfunction, it is possible that there is a connection problem in the system. Check to make sure for the correct connections. Besides, the manual calibrations with the CAL key remain ineffective until the ES-50 is reset by turning this once off then on again.

## BRIEF THEORETICAL DESCRIPTIONS ABOUT SERVO RESPONSE, SERVO DAMPING, AND SERVO GAIN

### 1. Servo Response




The above diagram depicts the relationships between TC (timecode) difference (or distance) and slave's capstan speed. When the TC difference is in the "+" region (that is, when the slave is ahead of the master), the slave's capstan speed is caused to start varying at B shown. In the "–" TC difference, the capstan speed starts varing at point A shown. Servo response is a parameter that defines the position of points A and B.



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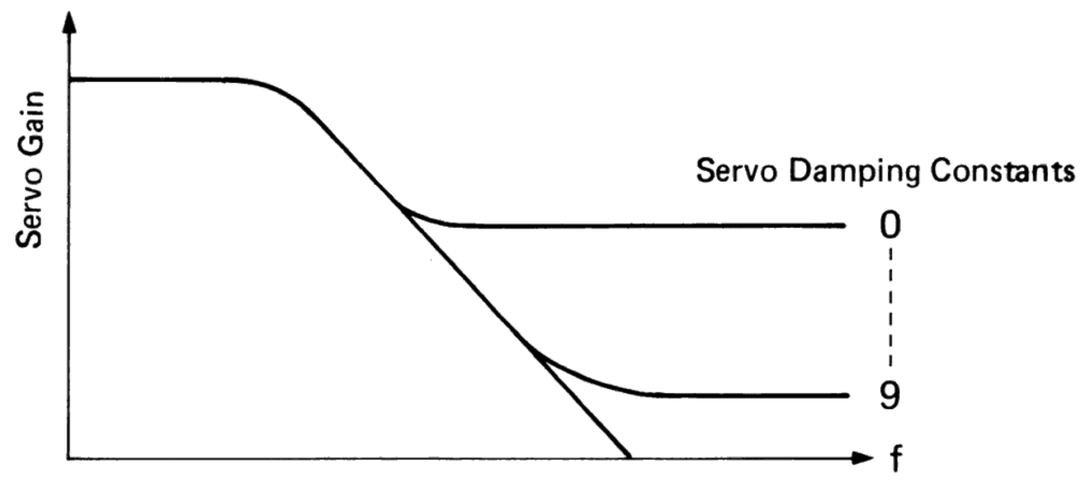
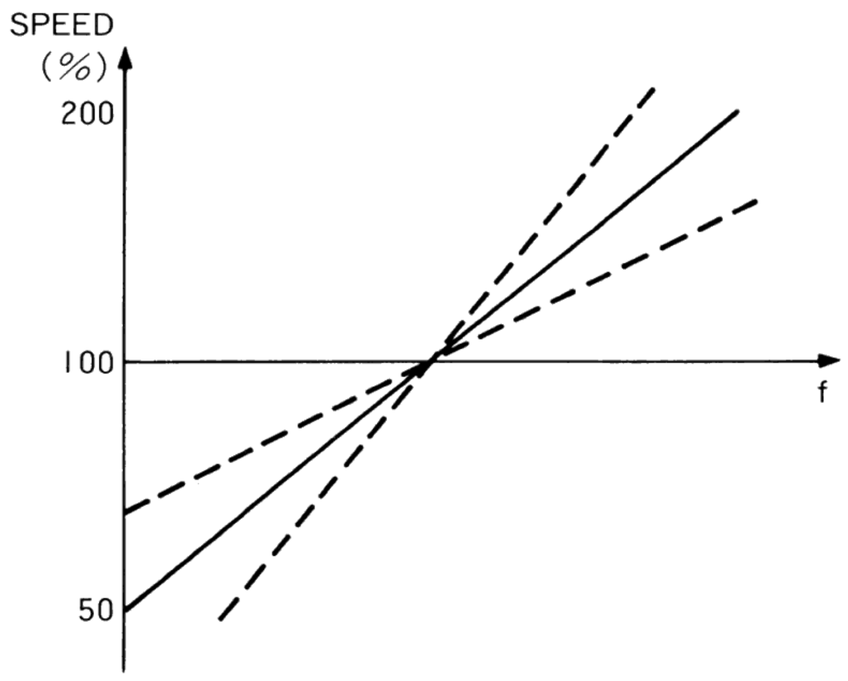
## 2. Servo Damping

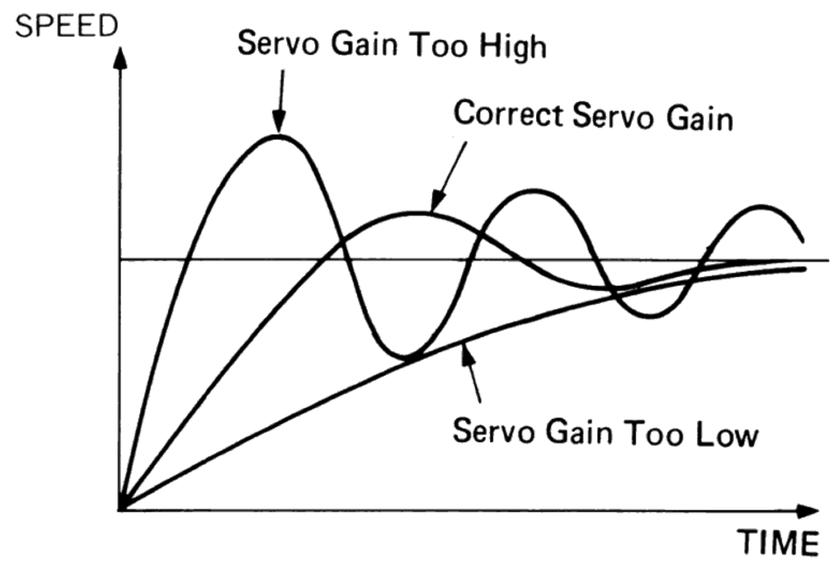



The above diagram shows the frequency characteristics of servo loop. Servo damping is a parameter that determines the servo loop gain in high frequency regions, to control external high frequency disturbance, thus increasing the total damping effect of the servo loop.

## 3. Servo Gain

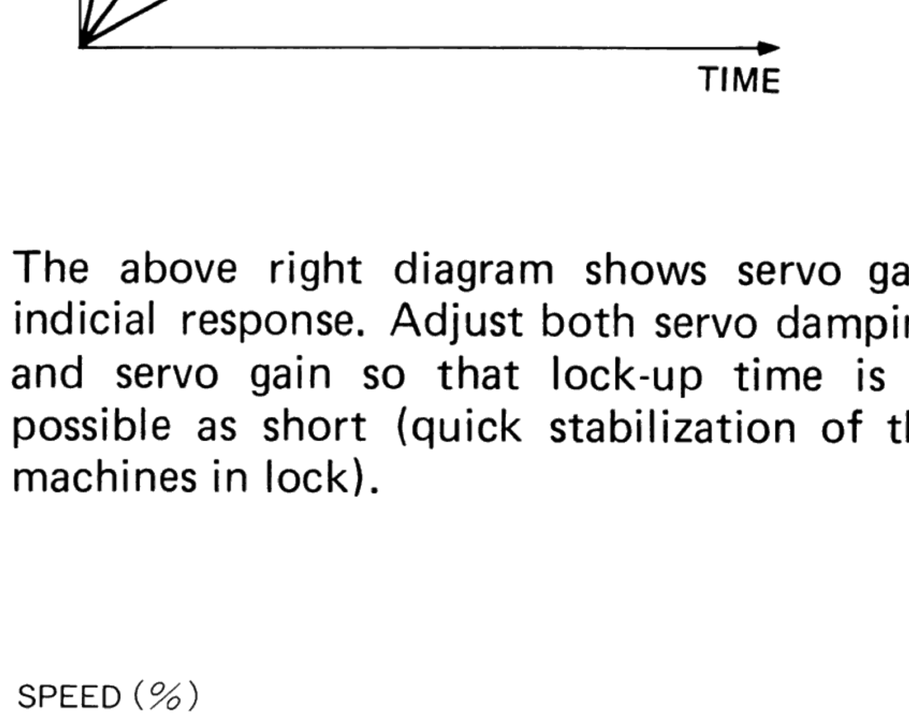



The above left diagram shows the relationships between capstan speed and FM servo frequency. The servo gain refers to a parameter that determines the angle of the oblique line shown.




The above right diagram shows servo gain indicial response. Adjust both servo damping and servo gain so that lock-up time is as possible as short (quick stabilization of the machines in lock).

For example, if the relationships between capstan speed and FM servo frequency are as shown in the right diagram, SET UP could possibly not ensure the correct behavior of the machines. The servo gain need then be adjusted using the CAL functions so that the servo gain represents a linear characteristic in the variable range C-D shown.



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# 6. TROUBLESHOOTING

Trouble 1: During operations the slave stopped suddenly.
Cause and Remedy 1: Check END LIMIT. If END LIMIT is set, the machine automatically stops upon reaching the set points. Clear END LIMIT or redo the settings.

T 2: In repeating the chase-lock sequence, lock is likely not to achieve or not to recover.
C & R 2: This occurrence points to drop-outs in the timecode. To override this trouble, enter the slow lock mode (the SLOW key pressed). This mode lessens, if not eliminates, the chance of unlocking the machines and, even if unlock occurs, enables the machines to regain the locked status with minimized audible effects.

T 3: When the master is yielded to an external controller (the MASTER I/F connector on the ES-50 unused), the slave chases the master in Play but not in FF/REW.
C & R 3: In the setup of this sort, the master must be a type having the capability of reading timecode in fast wind modes as well. Or else, the TACH pulses and the DIRECTION signals from the machines must be connected to the ES-50 via its MASTER I/F connector.

T 4: No chase occurs in FF/REW despite the master's TACH pulses and DIRECTION signals connected to the ES-50.
C & R 4: Check if that particular master machine is capable of transmitting the TACH and DIRECTION to the ES-50 while in FF/REW. Chase is accessible only in PLAY with machines that have neither the capability of issueing the TACH pulses and the DIRECTION signals nor the capability of reading timecode in fast wind modes.
In addition, when 1/2" VTRs are used as masters, chase can be made occur in FF/REW as in PLAY only if they enter half-loading mode in FF/REW and can continue to supply the ES-50 with the CTL pulses. But with machines that completely go out from loading mode in FF/REW, chase can not be made occur since the ES-50 can not then read the CTL pulses.

T5: Trigger EVENT can not be stored (any of the four EVENT LEDs does not want to turn on).
C & R 5: EVENTs 1-4 can not be programmed to occur when machines run in reverse direction. If the number you've typed into the KEYBOARD display is lower than the current master timecode address, the point you intend to serve as a trigger EVENT can not be stored because pressing of any of the four EVENT keys is then ineffective; you must first, in this case, rewind the master until this comes behind your typed point.

T 6: AUTO REC enables recording to start but does not execute the punch-out.
C & R 6: If the punch-out point is set behind the punch-in point (that is, the timecode value representative of the punch-out point is lower than that of the punch-in point), the punch-out point can not be reached. Be sure to set the punch-out point ahead of the punch-in point.

T 7: In timecode only master operations, lock is likely to ease.
C & R 7: The timecode read out from the VTRs' timecode track has by nature noticeable jitters, making firm lock impossible if it were used as it is. The ES-50 uses a mean-value control to override this problem, but the control range is not limitless. The best is to sync the machines to video references.

T 8: During the chase-lock sequence, the capstan speed oscillates in transit to servo lock status and the sequence can not be completed.
C & R 8: Reduce servo gain until oscillation stops. The same phenomenon can also occur when the servo damping calibration does not match the slave's capstan motor. So the damping also will need to be adjusted. In general, with motors having good response, increase damping value and, inversely, with motors having poor response, damping must be set low (setting the parameter constant lower increases the damping effect).

T 9: In CHASE, servo lock resolution is bad (overshoot occurs)
C & R 9: Reduce servo gain or servo response (select higher constants of the parameters concerned).



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T 10: In CHASE, servo lock is likely to delay or the slave stops chasing and does not catch up the master.
C & R 10: Increase servo gain or servo response (select lower constants of the parameters concerned).

T 11: Sync accompanies noticeable jitters.
C & R 11: Adjust servo damping (to reduce damping, select higher constants of the parameter).

T 12: When the master tape speed is varied after lock is once achieved, the slave does not re-lock to the master.
C & R 12: The machines have dropped into the SLOW sync mode. Press off the SYNCHRO MODE "SLOW" button.

T 13: Lock can not be achieved when the master runs at variable speeds (not at the standard speeds).
C & R 13: Check that the master speed does not exceed the vari-speed lock limits of the ES-50: ±30 % of the standard play speed. Too low a servo gain also impedes the vari-speed lock. Servo gain can be increased by selecting lower constants.

T 14: When the slave's capstan servo control yielded to the ES-50, the slave's speed noticeably alters, making its lock to the master impossible.
C & R 14: Servo control reference signal settings should not be in compliance with the machine. Consult the separate owner's manual, page 26.

T 15: When machines are located to the particular points or when the slave is let chase the master, overshoot occurs and parking takes excessive time.
C & R 15: Brake parameter musn't match the transports. Adjust the parameter for a minimum locate time and yet for a minimum overshoot (find a compromising constant).

T 16: Slave runs away in chasing master.
C & R 16: Check if the ES-50 reads the tach pulses correctly. SET UP musn't correctly be performed. Redo SET UP surely applying all the necessary parameters to the ES-50.

T 17: Toward the end of search modes, the slave causes oscillations and can not park.
C & R 17: It is possible that dust or debris are accumated on the heads, making the correct reading of timecodes impossible. Clean the heads and also check that the timecode recording level is not too low.

T 18: When the slave's STOP, FF, REW or other buttons was pressed during the chase-lock sequence, the machine stopped or run away.
C & R 18: This is because the ES-50 has judged the key/button operation on the slave as an interrupt demand. To escape from this status, press any transport control buttons (other than RECORD) on the ES-51.

T 19: Auto punch-in/out and rehearsal can not occur.
C & R 19: Check that REC TALLY is fed back to the ES-50. No feedback of REC TALLY does not allow the ES-50 to perform the punch-in/out. Also check that the record entry and exit commands from the ES-50/ES-51 are in accordance with the switching logic of the machines in use. Even the same model machines can differ in transport control logics, depending on the lots (in general, either single REC command or double REC-PLAY com mand will initiate the punch-in and PLAY command will terminate recording).

T 20: The SET UP LED blinks during the set up operation.
C & R 20: The LED on the SET UP key will flash on and off, indicating that some of the parameters that the ES-50 must learn are not given. (The LED will of course flash if you, thinking it's not necessary, don't let the ES-50 learn the tach pulses for example from a VTR master.) When SET UP failed, check the following:

1. Slave transport's servo input is surely set to "Ext" position.
2. All the interface cables and the time-code cables are properly connected.
3. The CODE STATUS indication matches the type of timecode in use.
4. Tach pulses and transport direction signals are given to the ES-50. (If the ES-50 failed to learn them, timecode can not be read at fast wind speeds and/or its readouts may progress against the tape running direction.)
5. The ES-50 is allowed to learn the machine's servo characteristics. (Failure in this will prevent the slave from locking to the master correctly because of overshoot or other troubles.)
6. The ES-50 is allowed to learn the machines' brake characteristics. (If the ES-50 failed to learn this parameter, overshoot will occur at the end of cue point search or chase operations, or the machines will be too slow in reaching the cue or lock points because they brake too early).



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# 7. REMOTE CONTROL INTERFACE PROTOCOL

This section of the supplementary manual is not intended to cover the entire protocol, which is outside of the scope of this supplement.

As serial interface connectors complying with the RS-232C standard, the ES-50 has 9-pin REMOTE connector and 25-pin SERIAL I/F connector.

## 7-1. TRANSMISSION SYSTEM

Command/data transmission performed in compliance with the standard has the following characteristics:

A full-duplex two-wire communications channel is utilized.

Commands/data are transmitted asynchronously (start-stop), bit serial, word serial and digitally.

The transmission rate is 150 to 19,200 bps.

A data word consists of one start bit, eight data bits, a parity bit (ODD), and one sotp bit.

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| START BIT | D0 LSB | D1 | D2 | D3 | D4 | D5 | D6 | D7 MSB | PARITY BIT | STOP BIT |

(ODD PARITY: A word is said to have odd parity when the sum of the 1 bits in its data bits (D0 thru D7) plus the parity bit is an odd number.)

## 7-2. COMMAND BLOCK FORMAT

A command block used to effect communications through the ES-50's REMOTE or SERIAL I/F connector comprises CMD-1, DATA COUNT, CMD-2, DATA, and CHECKSUM, the byte allocation of which is as shown below.

The value of 1 through n of DATA COUNT transmitted following CMD-1 indicates the number of bytes constituting the data which will be transmitted following CMD-2; the data is followed by CHECKSUM.

MSD LSD

| | | | | | |
|---|---|---|---|---|---|
| CMD-1 | DATA-COUNT | CMD-2 | DATA-1 | DATA-n (n = 10 max) | CHECKSUM |
| ← 1 BYTE → | ←1 BYTE→ | ←1 BYTE→ | ← → | ←1 BYTE→ | ←1 BYTE→ |

Where:

CMD-1: Message indicating the transmission direction and the general status of the given command block. Details of this message are shown in the table below.



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| CMD-1 | COMMAND STATUS | DIRECTION<br>CONTROLLING DEVICE \| CONTROLLED DEVICE |
|---|---|---|
| 0 | SYSTEM CONTROL | → |
| 1 | SYSTEM CONTROL RETURN | ← |
| 2 | TRANSPORT CONTROL | → |
| 4 | PRESET & SELECT CONTROL | → |
| 6 | SENSE REQUEST | → |
| 7 | SENSE RETURN | ← |

DATA-COUNT: When there are one or more data bytes in a command block, DATA-COUNT indicates how many bytes make up the data, in hexadecimal.

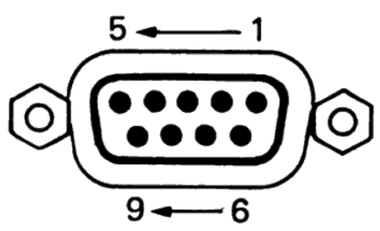
CMD-2: This message further specifies the status of the command classified by CMD-1.

DATA: When data is involved in a command block, its contents/meaning is defined depending on the number of bytes making up the data.

CHECKSUM: Indicates the value of the 8 lower order bits generated by totaling all the bytes (excepting the checksum byte) in a given complete command block.

## 7-3. PIN ALLOCATION OF THE REMOTE AND THE SERIAL I/F CONNECTORS ON THE ES-50

REMOTE (D-Sub 9 P)




| Pin # | ASSIGNMENT |
|---|---|
| 1 | 0 V |
| 2 | TX+ |
| 3 | RX- |
| 4 | +5 V |
| 5 | — |
| 6 | +5 V |
| 7 | TX- |
| 8 | RX+ |
| 9 | 0 V |



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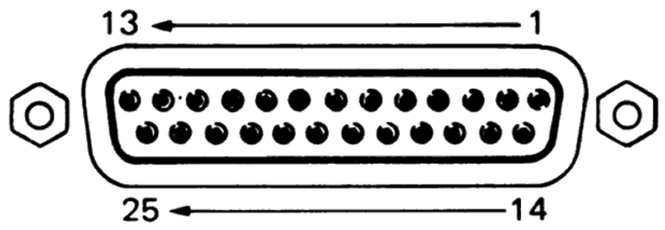
SERIAL I/F (D-Sub 25P)




| Pin # | ASSIGNMENT |
|---|---|
| 1 | FG |
| 2 | SD |
| 3 | RD |
| 4 | RTS |
| 5 | CTS |
| 6 | DTR |
| 7 | SG |
| 8 | |
| 9 | |
| 10 | |
| 11 | |
| 12 | |
| 13 | |
| 14 | |
| 15 | |
| 16 | |
| 17 | |
| 18 | |
| 19 | |
| 20 | DSR |
| 21 | |
| 22 | |
| 23 | |
| 24 | |
| 25 | |

## 7-4. COMMUNICATION CHARACTERISTICS

Communications through the ES-50's REMOTE and/or SERIAL I/F connections are performed as follows:

1) In communications through the REMOTE connector, the ES-51 controller takes priority over the ES-50. As for the communications through the SERIAL I/F connector, an external computer takes priority over the ES-50. In the following, the device having priority is referred to as the controlling device and the other as controlled decive.

2) Upon receipt of a legitimate command, the controlled device responds with ACK followed by data if appropriate. On encountering an error during reception or if undefined command blocks are received, the controlled device responds with NAK and a command block including data indicating the type of error. In addition, if the byte-to-byte transmission interval within a command block exceeds 20 msec. (with REMOTE) or 50 msec. (with SERIAL I/F), the controlled device recognizes it as time out, judges the currently received command block as unvalid and responds with NAK.



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3) The controlling device does not transmit the next command block before receiving a replay to the previous command block.

4) Upon receipt of NAK, the controlling device promptly interrupts the current command block transmission. During a period of 100 msec. following the transmission of NAK, the controlled device is not available to receive any commands transmitted by the controlling device.

5) If the controlling device does not receive any reply within 20 msec. (with REMOTE) or 50 msec. (with SERIAL I/F) after completion of the transmission of a complete command block, or if it failed to correctly receive ACK or any data from the controlled device, the controlling device transmits the last complete command block again 100 msec. after completion of the transmission of the previous command block.

6) Errors occuring during communications between the controlling and the controlled devices are checked using the following:
   In terms of bytes:
      Parity check (ODD)
      Overrun error
      Framing error
      Time out check
   In terms of command blocks:
      Checksum check
      Undefined command check



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## 7-5. COMMANDS TABLE

(The asterisks followed by numerals in the "Data" column indicate that information concerned can be found on pages 7-8 thru 7-9.)

| COMMAND | | | | REPLY | | | |
|---|---|---|---|---|---|---|---|
| CHARACTER | CMD1 | CMD2 | DATA | CHARACTER | CMD1 | CMD2 | DATA |
| DEVICE TYPE RQST | 00 | 10 | | DEVICE TYPE | 12 | 10 | |
| GEN RUN | 00 | 20 | | ACK | 10 | 01 | |
| GEN SLV LOCK | 00 | 21 | | ACK | 10 | 01 | |
| GEN TIME SET | 03 | 22 | *2 | ACK | 10 | 01 | *2 |
| GEN STOP | 00 | 23 | | ACK | 10 | 01 | |
| | | | | | | | |
| MST STOP | 20 | 00 | | ACK | 10 | 01 | |
| MST FF | 20 | 01 | | ACK | 10 | 01 | |
| MST REW | 20 | 02 | | ACK | 10 | 01 | |
| MST PLY | 20 | 03 | | ACK | 10 | 01 | |
| MST REC | 20 | 04 | | ACK | 10 | 01 | |
| MST LOCATE | 23 | 05 | *2 | ACK | 10 | 01 | |
| MST ROLL BACK | 23 | 06 | *2 | ACK | 10 | 01 | |
| | | | | | | | |
| SLV STOP | 20 | 10 | | ACK | 10 | 01 | |
| SLV FF | 20 | 11 | | ACK | 10 | 01 | |
| SLV REW | 20 | 12 | | ACK | 10 | 01 | |
| SLV PLY | 20 | 13 | | ACK | 10 | 01 | |
| SLV REC IN | 20 | 14 | | ACK | 10 | 01 | |
| SLV REC OUT | 20 | 15 | | ACK | 10 | 01 | |
| SLV LOCATE | 23 | 16 | *2 | ACK | 10 | 01 | |

(Table 1/3)



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(Continued)

| COMMAND | | | | REPLY | | | |
|---|---|---|---|---|---|---|---|
| CHARACTER | CMD1 | CMD2 | DATA | CHARACTER | CMD1 | CMD2 | DATA |
| SLV ROLL BACK | 23 | 17 | *2 | ACK | 10 | 01 | |
| REHEARSAL | 20 | 18 | | ACK | 10 | 01 | |
| AUTO REC | 20 | 19 | | ACK | 10 | 01 | |
| REVIEW | 20 | 1A | | ACK | 10 | 01 | |
| | | | | | | | |
| PRE ROLL TIME PRE SET | 42 | 00 | *3 | ACK | 10 | 01 | |
| POST ROLL TIME PRE SET | 42 | 01 | *3 | ACK | 10 | 01 | |
| END LIMIT TIME PRE SET | 46 | 02 | *4 | ACK | 10 | 01 | |
| CHASE MODE ON | 40 | 10 | | ACK | 10 | 01 | |
| CHASE MODE OFF | 40 | 11 | | ACK | 10 | 01 | |
| CODE MODE ON | 40 | 12 | | ACK | 10 | 01 | |
| CODE MODE OFF | 40 | 13 | | ACK | 10 | 01 | |
| SLOW MODE ON | 40 | 14 | | ACK | 10 | 01 | |
| SLOW MODE OFF | 40 | 15 | | ACK | 10 | 01 | |
| EVENT ON (INV) | 41 | 16 | *11 | | | | |
| EVENT OFF | 41 | 17 | *11 | | | | |
| OFFSET TRIM | 41 | 20 | *5 | ACK | 10 | 01 | |
| FRAME OFFSET | 43 | 21 | *6 | ACK | 10 | 01 | |
| CUE STORE | 44 | 30 | *7 | ACK | 10 | 01 | |
| EVENT STORE | 47 | 31 | *8 | ACK | 10 | 01 | |
| CAL STORE | 42 | 32 | *9 | ACK | 10 | 01 | |

(Table 2/3)



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(Continued)

| COMMAND | | | | REPLY | | | |
|---|---|---|---|---|---|---|---|
| CHARACTER | CMD1 | CMD2 | DATA | CHARACTER | CMD1 | CMD2 | DATA |
| MST TIME SENSE | 60 | 00 | | MST TIME | 74 | 00 | *14 |
| SLV TIME SENSE | 60 | 01 | | SLV TIME | 74 | 01 | *14 |
| DIFFERENCE SENSE | 60 | 02 | | DIFFERENCE TIME | 74 | 02 | *14 |
| OFFSET SENSE | 60 | 03 | | OFFSET TIME | 73 | 03 | *6 |
| TC GEN SENSE | 60 | 04 | | TC GEN TIME | 74 | 04 | *14 |
| PRE ROLL TIME SENSE | 60 | 10 | | PRE ROLL TIME | 72 | 10 | *3 |
| POST ROLL TIME SENSE | 60 | 11 | | POST ROLL TIME | 72 | 11 | *3 |
| END LIMIT SENSE | 60 | 12 | | POST ROLL TIME | 76 | 12 | *4 |
| CUE RECALL | 61 | 20 | *10 | CUE DATA | 74 | 20 | *7 |
| EVENT RECALL | 61 | 21 | *11 | EVENT DATA | 77 | 21 | *8 |
| CAL RECALL | 61 | 22 | *12 | CAL DATA | 72 | 22 | *9 |
| STATUS SENSE | 61 | 30 | *13 | STATUS DATA | 7X | 30 | *15 |
| | | | | | | | |
| | | | | NAK | 11 | 12 | *1 |

(Table 3/3)



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## Data Format

***1**

| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|---|---|
| TIME OUT | | FRAMING ERROR | OVERRUN ERROR | PARITY ERROR | CHECKSUM ERROR | | UNDIFINED ERROR |

***2**

| MSB | ⟷ | LSB |
|---|---|---|

TIME DATA AND FRAME NUMBER

***3**

| MSB | LSB |
|---|---|

MAX. FFFFH ≒ 36 min (NTSC)

***4**

| MSB | ⟷ | LSB | MSB | ⟷ | LSB |
|---|---|---|---|---|---|

START TIME ADDRESS | END TIME ADDRESS

***5**

| +/- | DATA 6 bit |
|---|---|

FLAG

(+) 0 ~ 99 = 0 ~ 63H

(–) –1 ~ –99 = 80 ~ E3H

| +/- | F/SF |
|---|---|
| FF | +1F |
| FO | +1SF |
| OF | –1F |
| OO | –1SF |

***6**

| | MBS | ⟷ | LSB |
|---|---|---|---|

-FLAG

NTSC
(+) 0 ~ 278CFFH (23:59:59:29)
(–) 800001 ~ A78CFFH

***7**

| CUE NUMBER | MSB | ⟷ | LSB |
|---|---|---|---|

0 ~ 19 | TAPE TIME ADDRESS

***8**

| EVENT NUMBER | MSB | ⟷ | LSB | MSB | ⟷ | LSB |
|---|---|---|---|---|---|---|

0 ~ 4

0: REC
1 ~ 4: EVENT RELAY

***9**

| CAL NUMBER | DATA |
|---|---|

0 ~ 9

***10**

| CUE NUMBER |
|---|

0 ~ 19



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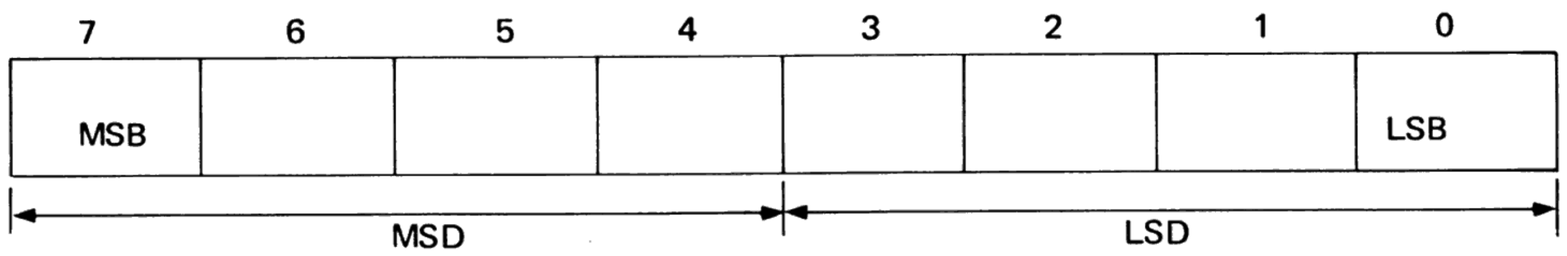
***11** EVENT NUMBER — 0 ~ 4 (0: REC)

***12** CAL NUMBER

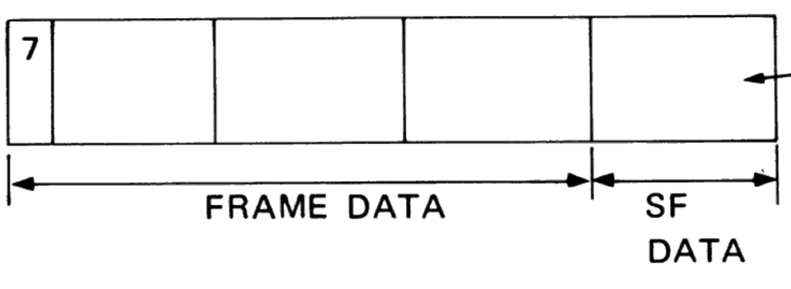
***13**




MSD : indicates the head of STATUS DATA to be received as reply.

LSD : indicates the number of bytes making up the STATUS DATA to be received as reply.

***14**




| | |
|---|---|
| b0 | 24F |
| 1 | 25F |
| 2 | 30F |
| 3 | DF |

***15**

| BIT / DATA | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|---|---|---|
| 0 | | MST ROLL BACK | MST LOC | MST REC | MST PLY | MST REW | MST FF | MST STP |
| 1 | | SLV ROLL BACK | SLV LOC | SLV REC | SLV PLY | SLV REW | SLV FF | SLV STP |
| 2 | EV4 | EV3 | EV2 | EV1 | EV REC | REVIEW | AUTO REC | RE-HEARS-AL |
| 3 | | | RUN | | OFFSET | SLOW | CODE | CHASE |
| 4 | 30F | 25F | 24F | DF | 30F | 25F | 24F | DF |
| | ← SLAVE → | | | | ← MASTER → | | | |
| 5 | | | | LEAD | LOCK | LAG | SLV ERROR | MST ERROR |
| | | | | | | | | |



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# TASCAM

TEAC Professional Division

# ES-50 ES-51


| | |
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