

## OPERATION

**GENERAL**

The 351 Series recorder/reproducers are available for full (single) track, half track or two track stereophonic operation. All operating controls are located on the tape transport with the exception of the record control which is on the front panel of the electronic assembly. When the remote control unit is furnished, duplicate tape motion controls, a RECORD button and RECORD INDICATOR light and a TAPE MOTION indicator light are mounted on the remote unit.

The equipment can accommodate the NAB 10½ inch diameter tape reels or the EIA 5 and 7-inch reels. Provision is made for selection of proper tape tensioning at the REEL SIZE switch on the tape transport for the LARGE or SMALL size reels.

**NOTE**

*In the LARGE reel position both the rewind and take-up reels must be NAB type and in the SMALL reel position both reels must be EIA.*

Either of two capstan drive motor speeds can be selected at the LOW-HIGH TAPE SPEED switch on the tape transport.

On the front panel of the electronic assembly are facilities for setting RECORD LEVEL and (reproduce) PLAYBACK LEVEL, selecting LOW SPEED or HIGH SPEED EQUALIZATION, selecting three input arrangements by means of the INPUT TRANSFER SWITCH, and switching the vu meter at the METER and

OUTPUT switch so that (reproduce) PLAYBACK, RECORD, BIAS and ERASE LEVEL(S) can be read. A phone jack (PHONES) for monitoring, a RECORD button, a RECORD INDICATOR light, and a POWER OFF-ON switch are also mounted on the electronic as-

sembly front panel.

Another MONITOR AMPLIFIER phone jack and a line termination (LINE TERM) OFF-ON switch are located on the back of the amplifier chassis.

### SUMMARY OF CONTROLS, SWITCHES AND INDICATORS

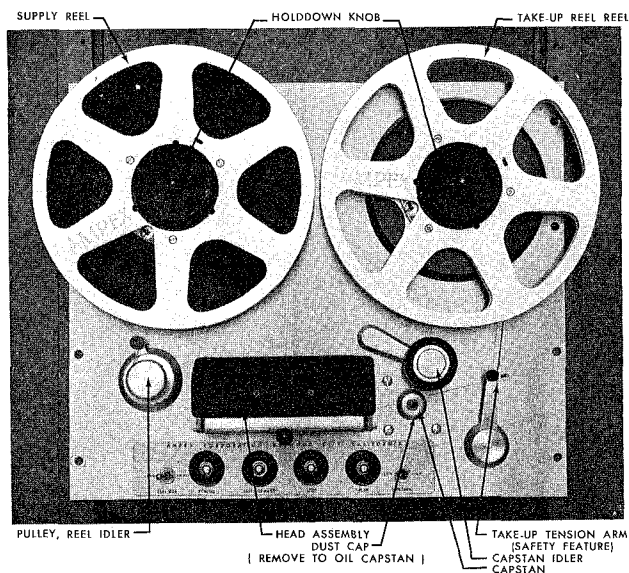
<i>Item</i>	<i>Schematic Reference Symbol</i>	<i>Location</i>	<i>Function</i>
POWER OFF-ON SWITCH	S-5	Electronic Assembly front panel	Controls power to the electronic and mechanical assemblies. When power is on capstan will rotate if tape is properly threaded or the safety switch is mechanically closed. The v-u meter lamps light when power is on, and are unaffected by the safety switch, remaining lighted till the power is turned off. For stereophonic 351-2 operation POWER switches of both electronic assemblies must be in the ON position.
TAPE SPEED	S503	Tape Transport control cluster	Determines speed of the capstan drive motor by high or low speed winding. Used in conjunction with EQUALIZATION switch S2.
EQUALIZATION LOW SPEED HIGH SPEED	S2	Electronic Assembly front panel	Used to select appropriate equalization circuitry for tape speed chosen.
REEL SIZE LARGE SMALL SWITCH	S504	Tape Transport	Adjusts tape tensioning circuitry for the reel size used.  The switch is closed when (LARGE position) NAB 10½ inch reels are used. In the SMALL position the switch is open, connecting resistance R502 in series with the torque motors, thereby reducing holdback and take-up tension.
METER AND OUTPUT SWITCH (FUNCTION SWITCH)	S3	Electronic Assembly front panel	Provides a means for switching the meter to read indications of record input, erase and bias, and reproduce output. In the reproduce (PLAYBACK) position, the meter indicates the signal level at the secondary of the output transformer. In the RECORD position the meter indicates a "flat" reading of the input signal. (See Figure of System Block Diagram).
RECORD LEVEL	R9	Electronic Assembly front panel	Adjusts record level.

PLAYBACK LEVEL	R36	Electronic Assembly front panel	Adjusts reproduce level.
VU METER	M1	Electronic Assembly front panel	Provides a means for visually monitoring record input level, reproduce level, and bias and erase.
INPUT TRANSFER SWITCH	S1	Electronic Assembly front panel	Provides a means for selecting the appropriate input circuitry to record with a microphone or from a balanced or unbalanced line.
LINE TERM OFF ON	S4	Electronic Assembly front panel	Controls output termination of the reproduce amplifier. In the ON position a 560 ohm resistor is across the output. In the OFF position, the resistor is out of the circuit and the amplifier must then feed a 600 ohm device.
PLAY button	S505	Tape Transport control cluster	Controls tape motion in the reproduce (PLAY) and record modes. Interlocked with rewind and fast forward modes.
RECORD button	S6	Electronic Assembly front panel	Controls the record relay in the electronic assembly. Power is applied to the bias erase oscillator and to the fourth stage of the record amplifier when this button is pressed. The PLAY button must be pressed to put the tape in motion before the record button is used.
REWIND button	S507	Tape Transport control cluster	Controls the rewind relay. Full a-c power is connected directly to the rewind (supply) motor when this button is pressed, the resistance R504 is placed in the a-c circuit to the take-up motor.
FAST FORWARD button	S506	Tape Transport control cluster	Controls the fast forward relay. Connects full a-c power to the take-up motor and places resistance R504 in the a-c circuit to the rewind motor when this button is pressed.
STOP button	S502	Tape Transport control cluster	When this button is pressed, the brake solenoids and all relays are de-energized.

## OPERATING TECHNIQUES

### Threading the Tape

Thread the tape as shown in the illustration. Unwind and inspect all new factory wound reels of tape by running them through in the FAST FORWARD mode. New tapes may be looped to the hub in such a manner that the tape will not come free at the end of the reel. This will prevent the safety switch (S501) from disengaging the capstan idler from the capstan, which in turn results in a flat being worn on the capstan idler wheel. (Any adhesive material accumulation on the reel hub may also keep the tape from coming free at the end of the reel, and should therefore be removed with solvent.)



Tape Threading Path

### Power

Power is supplied through power switch 4S5, which must be turned on to operate the electronic and mechanical assemblies. The mechanical assembly and electronic assembly are individually fused by the 3 ampere control circuit fuse 5F2 and the ½ ampere electronic fuse 5F1.

### Speed Switches

There are two switches associated with operating speed. The tape speed switch S503 determines the speed of the capstan drive motor, and the equalization switch 4S2 changes the equalization in the amplifiers appropriately.

### Tape Motion

The tape motion is controlled by means of four pushbuttons labeled REWIND, FAST FWD, STOP and PLAY.

### PLAY OR RECORD

The tape is set into play motion at the speed selected by the tape speed switch when the PLAY button S505 is pressed. To change from play to the record mode with the tape in motion, press the record button 4S6 on the electronic assembly.

### STOP

To stop the tape while it is moving in any mode, press the STOP button S502. The equipment will stop automatically if the tape breaks or runs off either reel.

### FAST FORWARD

The equipment can be started in fast forward or switched to fast forward from any of the operating modes by pressing the fast forward button S506.

### REWIND

The equipment can be started in rewind or switched to rewind from any of the operating modes by pressing the rewind button S507.

### NOTE

*In using either the fast forward or rewind mode, it is desirable to remove the tape from direct contact with the heads by opening the gate of the head assembly. This will reduce wear on the heads and prevent the oxide coating on the tape from depositing on the heads and impairing their performance.*

### Editing and Cueing

Indexing the tape as in editing or cueing, or when approaching the end of the reel, is simplified by holding down a combination of buttons. Tape motion can be reduced by holding down the fast forward and rewind buttons simultaneously, and then alternating between the two to control tape direction. When the desired point is reached, the STOP button must be held down until the fast forward and rewind buttons are released.

## CAUTION

*Never press the STOP and PLAY buttons in rapid sequence when the tape is traveling at high speed in the REWIND or FAST FORWARD modes. This will almost invariably break the tape since it does not allow the tape to stop before the capstan idler locks it to the capstan.*

### Reproduce (Playback)

To reproduce a previously recorded tape, turn the METER and OUTPUT SWITCH 4S3, to the extreme left position designated PLAYBACK LEVEL, then start the tape in motion as indicated under PLAY. A PLAYBACK LEVEL Control 4R36 has been provided on the front panel to adjust the tape level to plus 8 vu output (zero on the vu meter).

### Record

To record a new program on previously recorded tape, or on blank tape, turn the METER and OUTPUT SWITCH 4S3 to the second position from the left which is designated RECORD LEVEL. Turn the RECORD LEVEL CONTROL 4R9 clockwise until the level reads 0 (zero) on the vu meter on the most intense program peaks. The program can be audibly monitored through either the phone jacks (PHONES) 4J6, Monitor 5J4, or the line out connector (LINE OUTPUT) 5J5 before the tape is in motion. This direct monitor feature allows the program to be set up through the machine without actually recording during the set up period.

## NOTE

*For correct meter calibration it is important that the line out be properly terminated in a nominal 600 ohms either external to the machine or by the use of the line out termination switch (LINE TERM) 5S4.*

When the program level is properly set, start the tape in motion as indicated under PLAY.

Then press the RECORD BUTTON 4S6. The record indicator 4I1 next to the record button will now glow and the equipment is recording.

The erase position of the METER AND OUTPUT SWITCH provides for metering of erase current. The erase current is not critical and has been factory adjusted to read approximately  $-1/2$  on the vu meter for half track and stereophonic heads and  $+1$  for full track heads. Both the erase and bias current will vary directly with line voltage. The bias current is more critical and is factory set to read zero at 117 volt line voltage, using an average tape. It should read between  $-1/2$  and  $+1/2$  for optimum high frequency response at  $7 1/2$  and  $3 3/4$  ips using a median tape. For the flattest possible response with a given tape, the bias can be reset as described in the "Alignment and Performance Checks" paragraphs of SECTION 8.

The bias is adjusted by means of BIAS ADJUST capacitor 5C13, located on the electronic chassis. The meter calibration for bias measurement can be checked as indicated in SECTION 8.

### Half Track Operation

The tape is threaded and operated as described under TAPE THREADING and TAPE MOTION. However, only the upper half of the tape will be used on the half track equipment. To utilize the lower half of the tape, the full reel on the takeup turntable should be removed, turned over and placed on the tape supply turntable upside down. Place an empty reel on the takeup turntable. Repeat the operation as performed on the first track.

### Notes on Stereophonic Operation

Because the stereophonic equipment has a separate erase feature, permitting either track to be erased independently of the other, it is necessary to press the RECORD buttons on each amplifier to place both amplifiers in the record mode.

When using the remote control unit the single RECORD button will energize both electronics (concurrent record feature).