TENSION SERVO

Refer to Logic Diagrams located in Section 5 and block diagrams for circuit identification.

The tension servo system is comprised of two tension servo transducers, input operational amplifiers, reference voltage inputs, take-up motor error input, summing circuit, analog switch circuit for mode selection, and above/below tension level comparators for servo shut-down in the event of component failure.

The two tension sensors are located on either side of the magnetic head. One sensor is located between the velocity servo motor (take-up reel) and the magnetic head, and the second is located between the tension servo motor (supply reel) and magnetic head.

During a load sequence, prior to starting the pump motor, the microprocessor sweeps TTENOFF and FTENOFF levels from their maximum voltage to the minimum voltage. At the point at which the TTENOFF and FTENOFF zero their respective operational amps, the TTENZERO and FTENZERO signals toggle causing the microprocessor to stop the changing sweep levels. The effect of this action is to determine the point at which both tension transducers have a zero offset. The microprocessor maintains the TTENOFF and FTENOFF levels at the determined offset until the next load sequence.

Figure 4-13. TENSION SERVO - SIMPLIFIED

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The inputs to the tension servo circuit are TTENTRANS, FTENTRANS, +REF and TUER. The TTENTRANS and FTENTRANS signals come directly from the tension transducers with a signal input proportional to the variance of tension felt by the transducer. The tension reference is derived from a 6.9 volt supply and a 1.78M ohm resistor. This reference voltage is equivalent to 16 ounces of tape tension, and is used to bias the circuit so that 8 ounces of tension is developed. The fourth input is the TUER signal and is proportional to the current in the take-up motor at any given time.

At an optimum condition, where both sensors are sensing 8 ounces of tension, the 16 ounce (+REF) reference is effectively neutralized. The only dynamic effect on the circuit, at this time, would be the action of the take-up reel motor. With the TUER being summed with the neutralized tension/reference voltage inputs, the tension motor (supply) reacts proportionally to the current in the take-up motor, as indicated by TUER.

Any variance in tape tension would cause a change in the transducer op amps' outputs. This voltage output is subtracted from the tension reference, with the result summed with TUER. The difference of all these signals is multiplied by a high gain amplifier when tape is in motion.

The PRKD input term to the tension servo is active during a Parked or No Tape Motion condition. With PRKD active, the operational amplifier used as a high gain multiplier, after the summing network, is switched to a low gain amplifier.

The above/below tension limit protection circuits consist of a series of comparators, with inputs referenced to predetermined voltage levels corresponding to high or low tension levels. If above or below tension levels are sensed on either of the tension transducers, the microprocessor is notified via signals TAUTL, TBLTL, FAUTL or FBTL and a shut-down of the servo is initiated. Refer to Figure 4-12 for a simplified presentation of this circuit.

**VELOCITY SERVO**

The velocity servo consists of a digital-to-analog converter (DAC), decode flip-flops connected to a digital tachometer, operational amplifiers, and three presettable counters. The DAC converts 8 bits of information labeled "Demand Velocity" (DMDV) into a signal proportional to the desired velocity. The demand velocity can vary from 0 to 255 with complete control at any speed. The DAC output at 12.5 ips is 1.0 volt per radian per second; at 25 ips, the DAC output is 1/2 volt per radian per second. A radian per second is derived from the linear tape velocity (ips) divided by the radius of the take-up reel.