DASA

VISUAL-MAGNETIC MEMORY

MODEL VM 110

TECHNICAL DESCRIPTION

DASA COMPANY, INC.

235 Bear Hill Road, Waltham 54, Massachusetts

SECTION I: TECHNICAL DESCRIPTION

The DASA Model VM 110 is a general-purpose Visual-Magnetic Memory which can be used in any digital system application which requires visual access to fixed data, and the generation of codes in the form of serial pulses. Some of the main features of the Model VM 110 are its low cost, compactness, and high reliability. Versatility is provided through the use of interchangeable magnetic tape cartridges.

The VM 110 consists of three separate units as shown in Figure 1: the Visual-Magnetic Memory and a power supply electrically connected by a five conductor cord, and an auxiliary Dial Box arranged for connection to the memory unit by a plug.

The Visual-Magnetic Memory contains the magnetic tape cartridge, electronic circuitry, motorized scan mechanism, a mechanism operated by a knurled wheel to precisely align the tape in the viewing window, and two pushbutton controls for operation.

The power supply is provided with a two conductor, 8 foot cord terminated in a parallel plug for connection to a commercial 115 volt AC power source.

The Dial Box is equipped with a cord and plug for connection to the Memory Unit. It is provided with a dial and a ready lamp and is used when recording desired numbers onto the magnetic tape and may also be used as a variable input device.

PRINCIPLES OF OPERATION

Method of Writing

Writing of data onto the magnetic tape is accomplished in two ways:

1. Visual format – by typing or writing directly onto the front surface of the tape.

2. Digital format – by connecting the Dial Box to the VM 110 and entering in the digits.

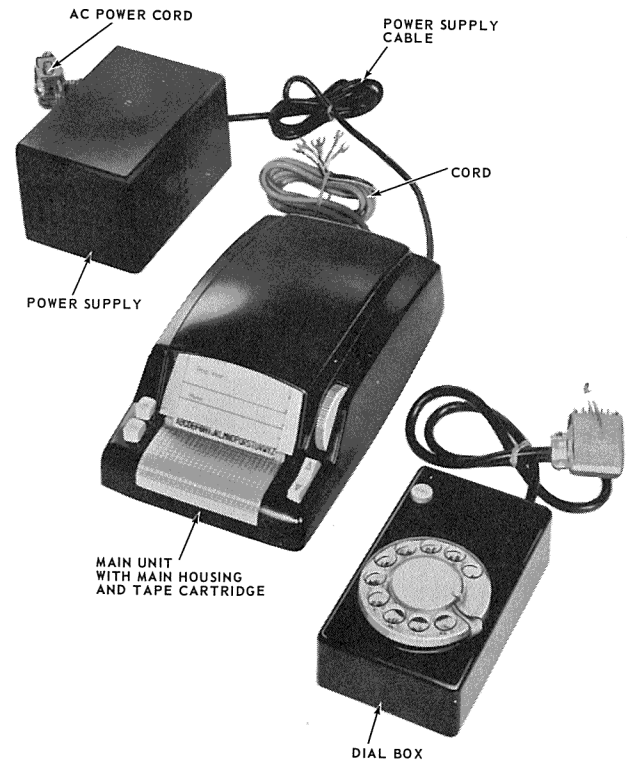


Fig. 1 - Model VM 110 Major Components

Visual information recorded on the front surface of the tape may be easily erased and rewritten; the digital code recorded on the magnetic tape memory may be changed by entering in a new pulse data and therefore erasing previously recorded data automatically.

Selection of Stored Data

The appropriate line on the tape is located by pressing the Tape Drive Key found on the right side of the instrument. The Tape Drive Key advances and reverses the tape until the desired data appears in the window of the unit. The tape speed is such that on the average 5.5 seconds are required to reach the desired line of information.

Read-Out of Stored Data

After locating the selected line, the operate button on the left side of the VM 110 is depressed, which places the read and write

head in contact with the magnetic tape and releases a clutch which automatically returns the head to its start position. Depression of the dial button also insures, by means of an indent mechanism, that the tape is correctly aligned for reading. Release of the dial button energizes the motor control circuit and the head commences to travel across the magnetic tape. As the head travels, it reads magnetically pre-recorded pulses on the tape at a 10 pps rate. The electrical signal is amplified in the pulse amplifier circuit, and passes through the slicer and inhibitor circuits to the pulsing circuit.

The pulsing circuit operates the data dialing contacts connected to the input of the digital system or computer in use.

Electrical Characteristics

The Memory Unit is capable of storing 14 digits representing 108 pulses plus interdigital time.

- The per cent break and wave shape of each pulse is 50%.
- The pulsing speed of each pulse is 10 pulses per second.
- The interdigital time is 600 milliseconds.
- The muting occurs 0.1 second minimum before start of pulsing and extends 0.15 second minimum after pulsing.

The following is a technical description of the Visual-Magnetic Memory and Dial Box.

VISUAL-MAGNETIC MEMORY

The Visual-Magnetic Memory contains the major circuitry, main mechanism and tape cartridge. Each one is discussed separately below.

MAJOR CIRCUITRY

The major circuits are identified in the block diagram in Figure 2. These are: Amplifier, Slicer, Inhibitor, Pulsing and Control Circuits. Reference should be made to the schematic which is included at the end of this section.

Amplifier and Slicer Circuits

These circuits are located on a printed circuit board on the right hand side of the main memory unit.

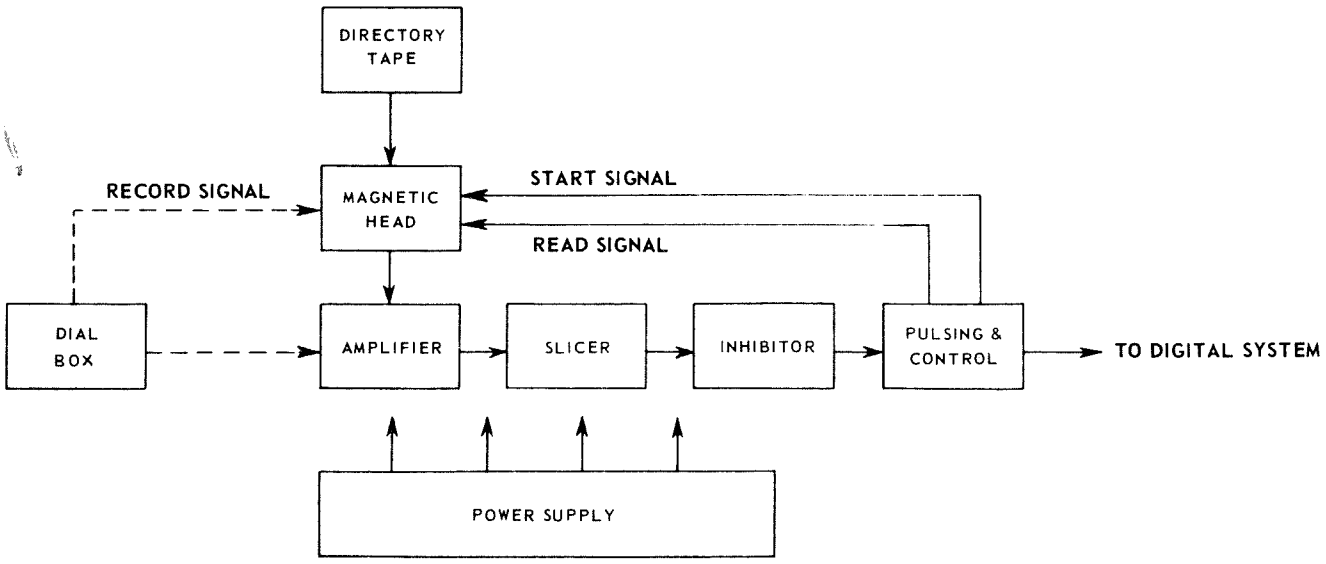


Fig. 2 - Model VM 110 Simplified Block Diagram

The record playback head is directly coupled to the first stage of the amplifier. One side of the head is connected to the emitter, the other is connected to the base of a transistor through a diode.

The second stage is a differential amplifier. Gain stabilization through negative feedback is provided by a resistor located in the emitter. High frequency roll-off is provided by a capacitor which is connected across a load resistor. The first and second stages are energized by a -12 volt supply which is stabilized by a zener diode. The third stage is another differential amplifier comprising two transistors. The frequency response of this stage is controlled by two capacitors in the bias network. The amplification provided by the three stage amplifier is linear. The frequency response of the amplifier is adjusted to accomplish two objectives. First, to alternate high frequency components, such as 60 cycle hum, and other noise. Second, to control "ringing" in the amplifier, the purpose of which is to improve the timing accuracy of the last pulse in each digit. From the amplifier the signal passes to a slicer transistor.

The differential is small between the signal required to cause the slicer transistor to just conduct and the one needed to cause complete saturation of the stage. The output from the slicer transistor is therefore a train of almost rectangular pulses whose leading and trailing edges are closely coincident in time with the zero crossings of the signal waveforms. From the slicer these modified signals pass to the inhibitor circuit.

Inhibitor Circuit

The inhibitor circuit prevents the triggering of the pulsing circuit during the return of the head to its starting position, at the beginning of a pulsing cycle.

The inhibitor circuit is energized by a start switch and a latching contact on a relay.

The output from the inhibitor is differentiated by a capacitor or resistor and the result of this differentiation is a train of positive and negative going spikes. The positive spikes are fed to the pulsing circuit via a diode which is reversed-biased by means of a potential divider. The threshold voltage of this divider prevents the triggering of the pulsing circuit by the small positive voltage which occurs when the inhibitor is de-energized at the end of a cycle.

Pulse Circuit

The pulsing circuit includes a single transistor and a four-layer diode. With no input signal the diode and the transistor are both in a conducting state. Upon receipt of a positive pulse, the transistor turns off, causing the pulsing relay contacts to open. The turning off of the transistor also forces the four-layer diode to become non-conducting, thus allowing a capacitor to charge, via four resistors. When the potential across the capacitor is sufficient to trigger the four-layer diode (approximately 22V), this diode conducts, and the voltage drop across it falls immediately to approximately 0.75 volt. This drop causes the transistor to conduct and once again close the pulsing contacts.

The period for which the pulsing contacts are open is determined by the firing voltage of the four-layer diode, the supply voltage, and the time constant of the charging circuit.

Control Circuit

The control circuit performs a timing function. The start switch closes momentarily at the beginning of a cycle and a transistor conducts, operating 2 relays. One of the contact pairs of one relay shunts the start switch, locking the circuit in the energized condition. The other pair energizes the magnetic head drive motor, and the head starts to move across the tape. The operation of the other relay opens the safety contacts, which are normally closed across the pulsing contacts, and operates the shunting contacts. A timing capacitor charges rapidly (in about 10 milliseconds) through a diode, which then becomes biased, and the charging

of the timing capacitor continues through the timing resistor chain.

If the pulsing circuit is not triggered before the potential across the timing capacitor reaches the firing voltage of the four-layer diode, the voltage across the diode contacts drops to about 0.75 volt and it is then held in conduction.

The release of one relay closes the safety contacts across the pulsing relay and returns the shunt contacts to their normal condition. The opening of the contacts of the other relay de-energizes the head motor, the inhibitor circuit and the control circuit itself.

TAPE DRIVE MECHANISM

The tape drive mechanism is designed around a 28 volt AC induction motor. The Tape Drive Key in the front of the VM Memory energizes the motor while also engaging the proper gears with the magnetic tape cartridge.

The Tape Drive Key also operates the motor switch. This mechanism is so designed that the motor will not start until the gears are properly engaged.

A separate gear train is engaged with the magnetic tape cartridge only when the selector wheel is depressed, in order to prevent the selector wheel from turning when the tape drive motor is running.

MAGNETIC HEAD MECHANISM

The magnetic head is a wide gap head. The wide gap decreases the sensitivity of the system to variations in head-to-tape spacing. It also provides greater head sensitivity, by effecting a better match between gap width and wave length on the tape. This head has a gap width of 0.003 inches and a gap length of 0.125 inches. The induced signal in the head during the dialing operation is approximately one millivolt peak to peak.

The head is driven across the tape by a 4 RPM (resulting in a head speed of 1/6" per second) synchronous motor which is connected to the back plate assembly by a flexible coupling that takes up any slight disalignment between the two shafts. When the head stops at the end of a message by detecting a no signal, a finger on the bead chain drive pulley operates the limit switch which de-energizes the control circuit.

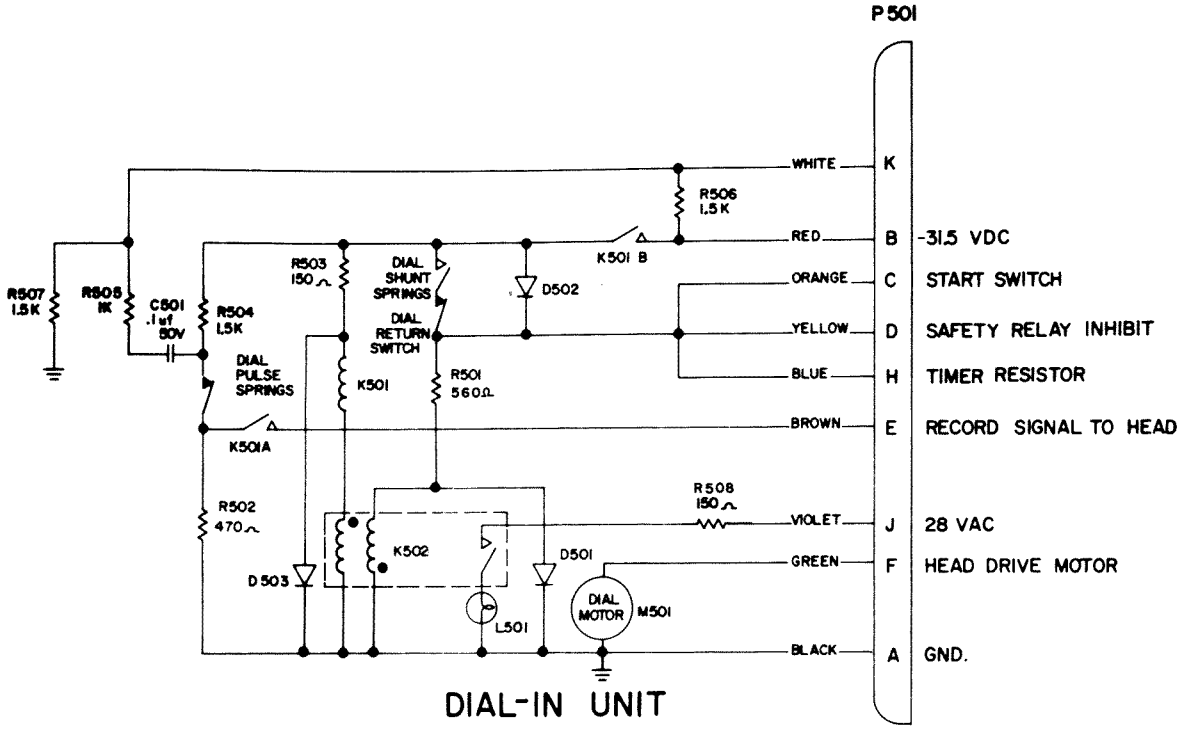
DIRECTORY TAPE CARTRIDGE

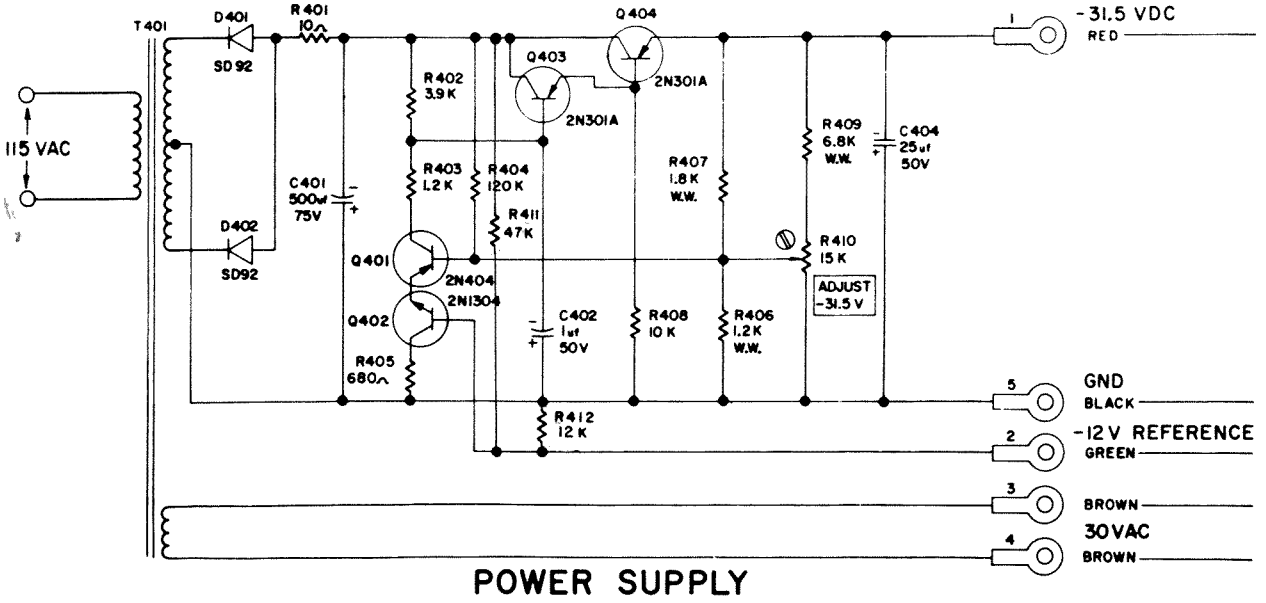
The cartridge containing the magnetic tape connects to the tape drive mechanism through a slip clutch and drive gear. This slip clutch protects the tape from tearing at the end of its travel. The tape consists of 0.002 inch Mylar base with a 0.001 inch coating of magnetic oxide transversely oriented and a 0.003 inch white plastic coating on the opposite side. The tape is contained in the cartridge with the magnetic oxide coating exposed to the playback head.

DIAL BOX

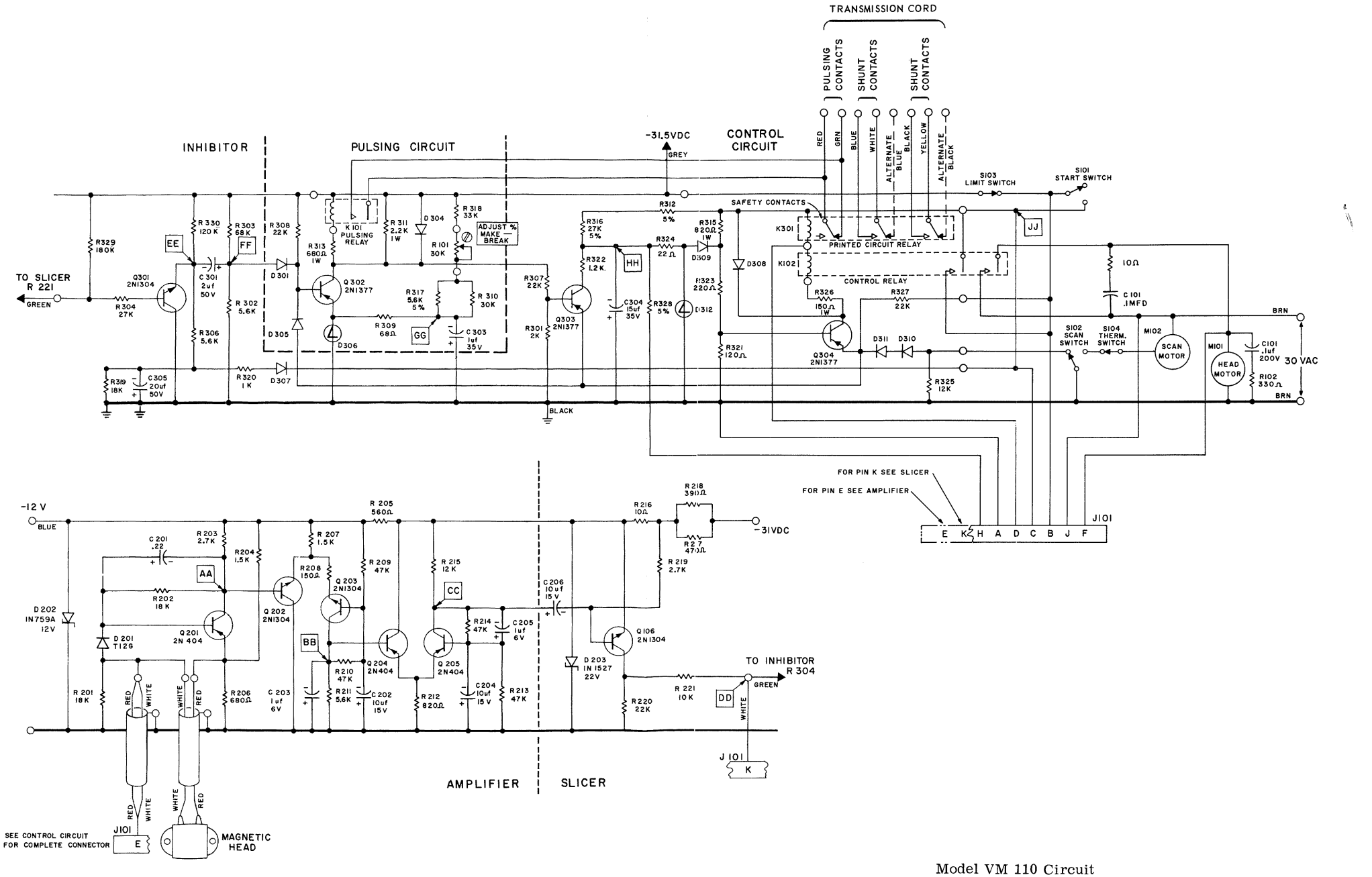
The dial wheel on the Dial Box is operated in a manner similar to a telephone dialer. The combination of the dial shunt springs and the dial return switch provides a momentary contact just after the release of the dial wheel. This momentary contact serves the same purpose as the closing of the start switch, energizing the control circuit, which in turn energizes the head drive motor and the synchronous dial motor. The operation of the dial pulse springs during the return of the dial wheel causes a variation of the potential across the magnetic head sufficient to cause full saturation of the magnetic tape. The operation of the dial pulse springs also causes a large variation of potential which is used to trigger the pulsing circuit.

The only function of the pulsing circuit during the record operation is to reset the control circuit timer.





Power Supply And Dial Box Circuits



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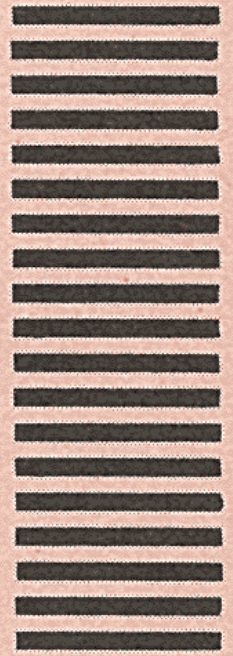

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