A 9490
CASSETTE TAPE DRIVE
TECHNICAL MANUAL

Burroughs

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SECTION 1

INTRODUCTION AND OPERATION

GENERAL DESCRIPTION

The Burroughs A 9490 Cassette Tape Drive (cassette unit) is a digital recorder capable of reading and writing on a cassette tape cartridge of the miniature coplanar type with a capacity of 300 feet (91 meters) of tape. The cassette unit operates at a speed of 10 inches per second in the start/stop mode, or in a continuous mode at speeds of 10 or 30 inches per second. The cassette unit including its associated electronics form a plug-in module intended for panel mounting (see figure 1-1).

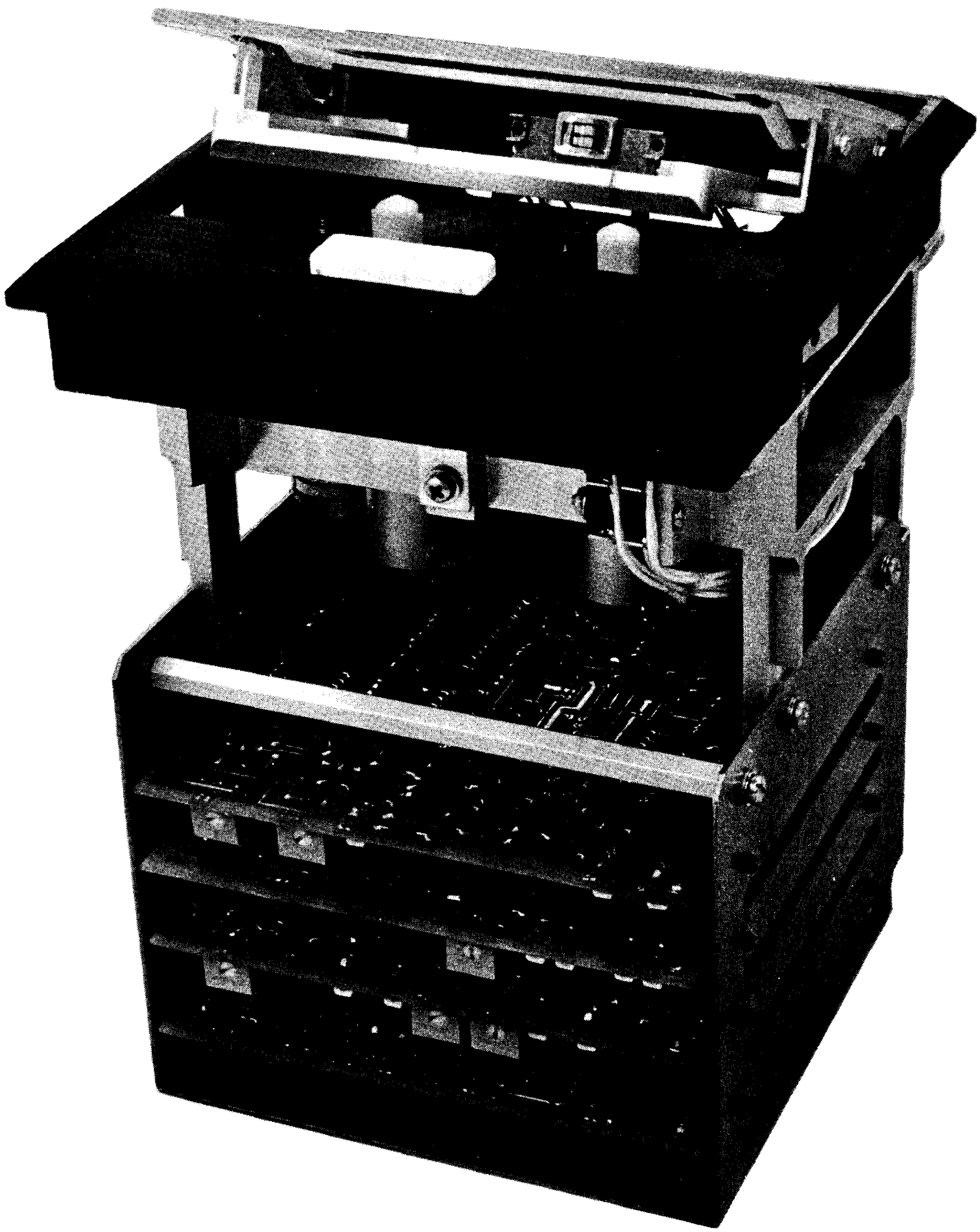


Figure 1-1. Cassette Tape Drive

Reading a tape is accomplished at 10 inches per second in either the forward or the reverse direction. Writing is accomplished at 10 inches per second in the forward direction only. Data is written serially in the NRZI format at densities up to 800 bits per inch using two channels, one for data and the other for a synchronous clock.

SIGNAL CHARACTERISTICS AND DEFINITIONS

The following information defines the logical levels transmitted to and received by the cassette unit from the controlling device or system to which it is interfaced. A logical true is defined as a signal in the range of +2.5 volts to +5.0 volts. A logical false is defined as a signal in the range of 0.0 volts to 0.5 volts.

INTERFACE CONNECTOR PIN ASSIGNMENTS

Table 1-1 lists the pin assignments for the signals at the cassette unit interface connector J2. All the numbered pins are ground pins. Information transfer lines, pins H, F, S, and R, are twisted pair. The twisted pair ground wires are connected to the ground pins opposite their respective lettered pins.

Table 1-1. Interface Connector Pin Assignments

Signal	Pin	Description
TWL/	K	Tape Write Level
TWRL/	V	Tape Write Ready Level
FDL/	M	Forward Drive Level
TREL/	W	Tape Ready Level
TWCP/	H	Tape Write Clock Pulse
TPRL/	U	Tape Position Ready Level
CLPL/	T	Clear Leader Position Level
TWIL/	F	Tape Write Information Level
TRIL/	S	Tape Read Information Level
BDL/	N	Backward Drive Level
TRCP/	R	Tape Read Clock Pulse
-12V	C	-12 Volts Regulated
TRWP/	E	Tape Rewind Pulse
CSL/	P	Cassette Select Level
+12V	B	+12 Volts Regulated
HSL/	L	High Speed Level
RCL/	J	Read Clipping Level
+5V	A	+5 Volts Regulated
RL/	X	Ready Level

INPUT AND OUTPUT SIGNAL DESCRIPTIONS

The following paragraphs describe the cassette unit input and output signals.

Input Lines to Cassette Unit

FDL/ Forward Drive Level. This line when held low causes the tape to be driven in the forward direction.

BDL/ Backward Drive Level. This line when held low causes the tape to be driven in the backward direction.

TWL/ Tape Write Level. This line when low holds the drive in write status. TWL must be low before forward drive is turned on, and must remain low until tape motion stops (approximately 50 milliseconds after forward drive is removed).

TWRP/ Tape Rewind Pulse. The negative going (leading) edge of this pulse (0.5 to 5.0 microseconds in duration) initiates a rewind cycle. The rewind cycle terminates automatically when tape is positioned at the beginning of tape (BOT).

RCL/ Read Clipping Level. This line when low selects the high clipping level and is used when a read-after-write check is made to verify that the written information was recorded properly. This line is held high during a read operation. The clipping level can be changed on alternate read retries after an initial read failure, which increases the probability of data recovery.

TWIL/ Tape Write Information Level. This line when low any time during a clock pulse (TWCP/) causes a 1-bit (flux change) to be written in the data track. A high level results in a 0-bit (no flux change) being written in the data track at TWCP time.

TWCP/ Tape Write Clock Pulse. The low level of the Tape Write Clock Pulse (0.5 to 5.0 microseconds in duration) indicates that the write information line TWIL/ is being sensed, and then strobes the resulting data bit into the write amplifier. The clock and, if required, the data flux change, are recorded on tape at the positive going (trailing) edge of the clock pulse. A clock pulse must be transmitted with each information bit.

HSL/ High Speed Level. When low, this line causes the tape to be driven at approximately 30 inches per second in the direction determined by FDL/ or BDL.

CSL/ Cassette Select Level. When low, this line enables all input and output lines. This line is used for multi-unit configurations.

Output Lines from Cassette Unit

TREL/ Tape Ready Level. When low, this line indicates that the recorder is ready to accept a tape command via the interface.

TWRL/ Tape Write Ready Level. When low, this line indicates that the cassette is properly inserted in the recorder and has a write enable tab installed to allow writing on tape.

TPRL/ Tape Position Ready Level. When low, this line indicates that the tape is positioned properly and that the recorder can be operated in the write or read mode. This level will be set low when the tape has moved forward approximately 17.7 inches, which is sensed when the BOT hole passes the EOT/BOT photocell. It remains low until the EOT hole passes the BOT/EOT sensor. The record being written or read at the time EOT is sensed should be completed within one foot of forward tape travel.

CLPL/ Clear Leader Position Level. When low, this line indicates that the tape is positioned at clear leader at the physical beginning or end of tape. The tape can be driven only in the forward direction from this position.

TRIL/ Tape Read Information Level. When low, this line indicates that a 1-bit is being read for the cell period defined by TRCP/. More than one pulse during any one cell period will also be interpreted as a single 1-bit for that particular cell. No pulse during cell time is interpreted as a 0-bit.

TRCP/ Tape Read Cell Pulse. This pulse when low indicates cell duration time. The negative going edge defines the beginning of cell period and the positive going trailing edge defines the end of the cell period. One or more TRIL's during TRCP/ time indicates that a 1-bit is being read and no TRIL during TRCP/ time indicates that a zero is being read.

CONTROLS AND INDICATORS

There are no controls provided with the cassette unit. Control functions are represented by signal levels at the unit interface connector J2 and any manual controls associated with these signal levels would be a part of the controlling device. The ready status (RS) indicator on the cassette unit is controlled by the input level RL/ from the device to which the cassette unit is interfaced. The write status (WS) indicator is internally activated when the write circuits are enabled by the presence of a write tab on the cassette tape cartridge (see figure 1-2).

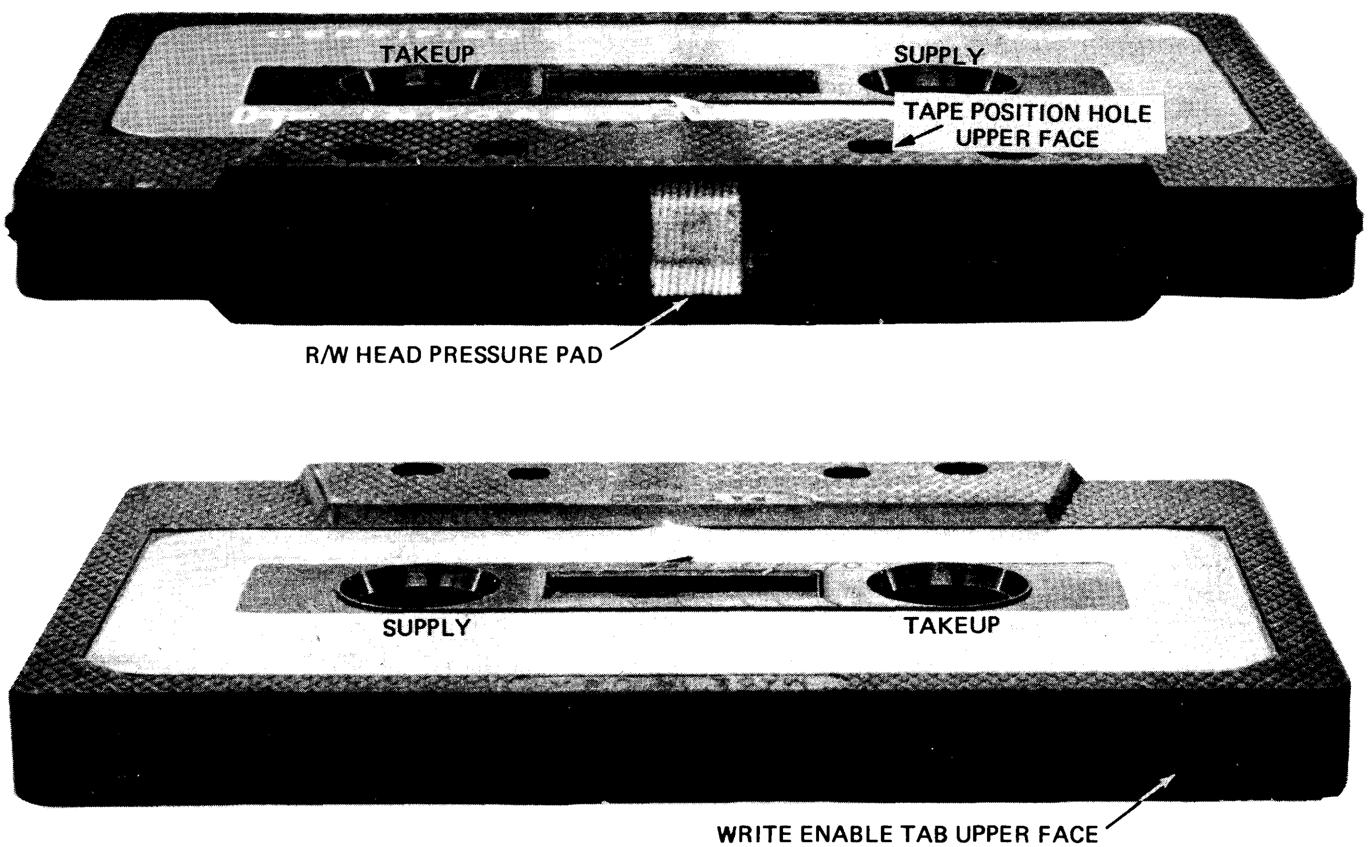


Figure 1-2. Cassette Tape Cartridge

CASSETTE TAPE CARTRIDGE

The cassette cartridge is a twin-hub coplanar type, loaded with 300 feet (91 meters) of 0.150 inch (3.8 millimeters) wide magnetic tape. The magnetic tape is provided with beginning of tape (BOT) and end of tape (EOT) markers, consisting of holes 0.025 inch in diameter positioned 38 inches (94.5 centimeters) from each physical end of the tape. The first 20 inches (50.8 centimeters) of tape at each end of the tape is clear leader.

Write enable tabs are located on the back side of the cassette tape cartridge (see figure 1-2). The cartridge can be inserted with either side up, so there are two write enable tabs. When looking at the back side of the cartridge, the tab on the right side is for the upper face. To enable the write circuitry, the tab must be moved to cover the hole adjacent the tab.

INPUT POWER

The cassette unit operates on dc power derived from the system to which it is interfaced. The power requirements are as follows:

+5.0 volts, 1.0 amp maximum at 10 percent regulation

+12.0 volts, 0.9 amp maximum at 10 percent regulation

-12.0 volts, 0.125 amp maximum at 10 percent regulation

The specified regulation is measured at the regulator. An additional one percent of regulation can be allowed for wire length and size. In addition to filtering of the power within the power source, each logic card in the cassette unit provides filtering for the voltages used on that card.

INTERNAL SIGNAL LEVEL DEFINITIONS

The following paragraphs define the signals that are internal to the cassette unit.

CL/	Clear Leader. High when clear leader is not sensed.
CNT	Output of spindle counter assembly. High when photocell is activated.
CPL-IN	Cassette Present Level. High when a cassette cartridge is loaded.
CV	Clutch Voltage. +12 volts from servo card.
FC	Forward Clutch.
(FL)	Filtered. Used on the card input voltages.
FM	Forward Motor.
FMC	Forward Motor Control. A function of the forward drive level from the control interface.
HS/	High Speed. A function of the high speed level from the control interface. This level is low for high speed.

HSG/	High Speed Gated. A function of HSL/ from the control interface (low for high speed).
POSS	Position Sensor. POSS will be high when sensing either clear leader or the beginning of tape mark.
RC	Reverse Clutch.
RCG	Read Clipping Gated. A function of the read clipping level from the control interface.
RL/	Ready Level. When low this level turns on the ready status indicator.
RM	Reverse Motor.
RMC	Reverse Motor Control. A function of the backward drive level from the control interface.
TPP	Tape Position Pulse. A function of POSS stating that the beginning of tape (BOT) has been sensed.
WRITE/	A function of the tape write level from the control interface.
WS	Write Status. When low, this level turns on the write status indicator which is controlled by the level WTL.
WTL	Write Tab Level. This level will be high when the cassette cartridge which is loaded in the cassette unit has a write enable tab installed.

MISCELLANEOUS DEFINITIONS

Clock Cell Time	The time measured from the mid-point of the positive pulse to the mid-point of the next positive pulse of the Tape Read Clock (TRCL).
Clock Pulse Time	The time during which the clock pulse TRCL is low.
Clock Duty Cycle	The ratio of the clock pulse width to the cell time multiplied by 100.
System Skew Error	The sum of errors caused by static and dynamic skew along with system delays which cause the data pulse to be displaced from the mid-point of the clock cell time. It is determined by measuring the time between the mid-points of the TRCL and TRIP pulses when low, divided by the clock cell period, and multiplied by 100.
Temporary Error	A temporary error is an error found in reading a record on the first pass which is corrected within five subsequent read retries.

SECTION 2

FUNCTIONAL DETAIL

INTRODUCTION

This section describes the theory and circuitry of the cassette unit. Due to engineering and production changes, the schematics provided in this manual may not corelate directly to any given cassette unit, but will provide the information required to understand the circuits and their functions. The schematics in this section are not intended for any purpose other than training.

REWIND AND READY FUNCTIONS

When a tape cartridge is loaded and the tape is not positioned at clear leader, the drive automatically rewinds the tape to clear leader before it declares itself ready (TREL/ = low). The rewind operation may also be initiated from the controlling device to which the cassette unit is interfaced. The rewind operation is terminated by the level CL/ going low, indicating that clear leader has been sensed (see figure 2-1 and table 2-1). Figure 2-2 illustrates the tape position holes and clear leader.

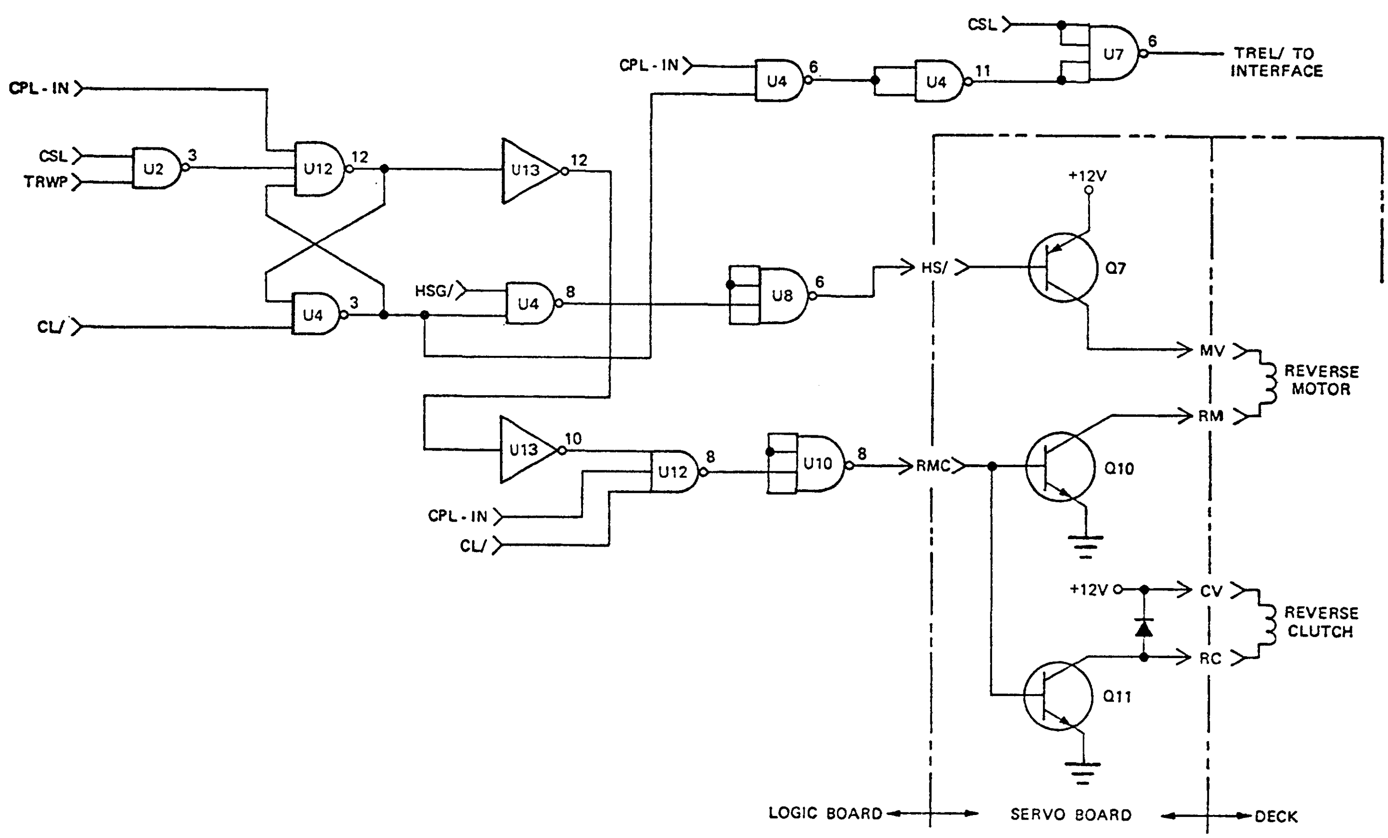


Figure 2-1. Rewind and Ready Logic

Table 2-1. Rewind and Ready Logic Terms

Rewind	Ready
CPL-IN = Hi CSL = Hi TRWP = * CL/ = ** HS/ = Low RMC = Hi TREL/ = Hi	CPL-IN = Hi CSL = Hi TRWP = Low CL/ = Low HS/ = Hi RMC = Low TREL/ = Low
* Hi = Rewind initiated from interface. ** Hi = Rewind initiated from loading a tape cassette with tape not positioned at clear leader.	

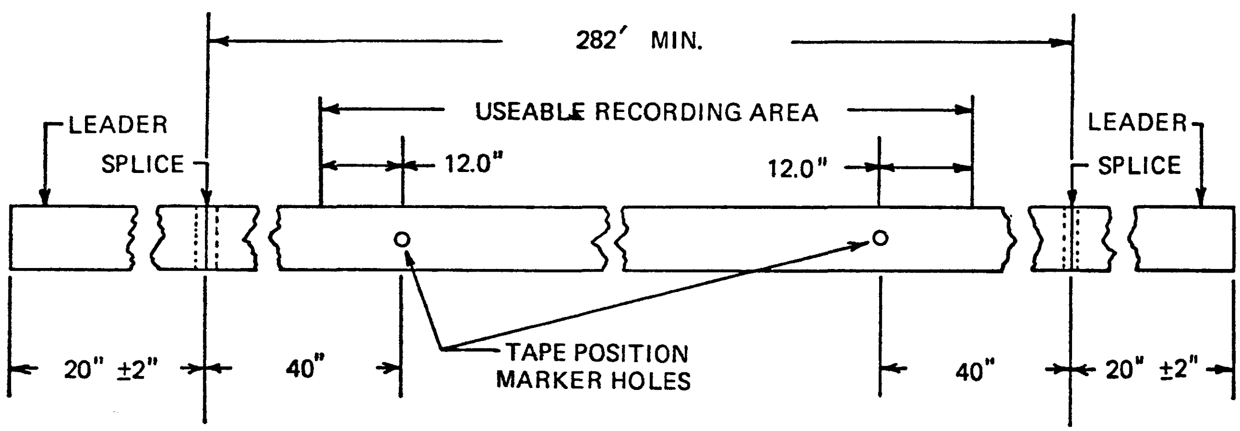


Figure 2-2. Tape Dimensional Requirements

POWER SUPPLIES

The cassette unit operates on dc power which is supplied by the system to which it is connected. The cassette unit does not produce its own power, but does provide additional filtering of the input power on each logic card. On cassette units with dual light pipe sensing the Write Card has a regulator circuit that uses +12 volts to produce a regulated +8.2 volts, which in turn is used to reference the differential comparators in the tape position sensing circuits and the operational amplifiers in the servo logic. There is no adjustment required for the +8.2 volts. The required supply voltages and regulation limits are specified in section 6.

TAPE POSITION AND CLEAR LEADER SENSING

Two methods are used to sense the tape position (BOT and EOT) and clear leader. The first method uses a single light pipe and photo-transistor and is used in the early model cassette units. The single light pipe unit is identified by the presence of only one photo-transistor positioned next to the read/write head and one lamp positioned in front of it when the carriage is closed (the lamp will be lit when power is on). The second method uses two lamps and two photo-transistors (one on each side of the read/write head), and is referred to as the "dual light pipe."

SINGLE LIGHT PIPE SENSING

See figure 2-3. The input POSS (Position Sensor) is from the photo-transistor PC2 located in the read/write head assembly (figure 5-1). The same sensor is used to detect both clear leader and the tape position hole (see figure 2-2).

A photo-transistor with no light being sensed represents a very high resistance, and thus a very small current flows through it. As light is sensed the photo-transistor conducts more current; the amount of current increases with the amount of light being sensed. In figure 2-3, Q1 forms an emitter follower (the emitter reflects what is at the base). With no light sensed, the base sees +5 volts across R19, and the emitter will be at +5 volts. The voltage at the negative input to AR1 goes high when the input voltage goes below that of the reference input. AR3 is referenced to 0.26 volt and its input is at +2.5 volts.

When the tape position hole is sensed, the photo-transistor conducts sufficient current to drop Q1 emitter voltage to slightly less than +2 volts, which is divided by R13 and R12. The input to AR1 drops below its +1.8 volt reference after a short delay (less than 1 microsecond as set by R13 and C12). The output TPP goes high, setting the TPRL flip-flop on the Logic Card (figure 2-4). This same +2 volts is divided by R21 and R22 but does not go low enough to switch AR3. A safety factor is added by the fact that the emitter of Q1 is not at +2 volts long enough for C18 to discharge through R21, so the input to AR3 drops very little.

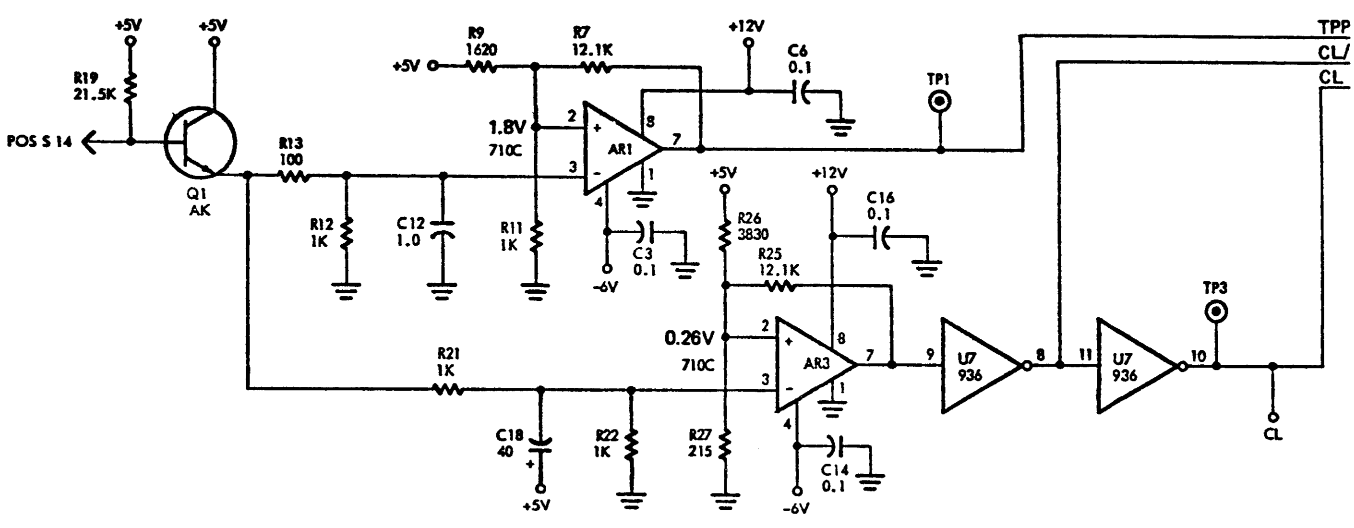


Figure 2-3. Single Light Pipe Sensing Circuit

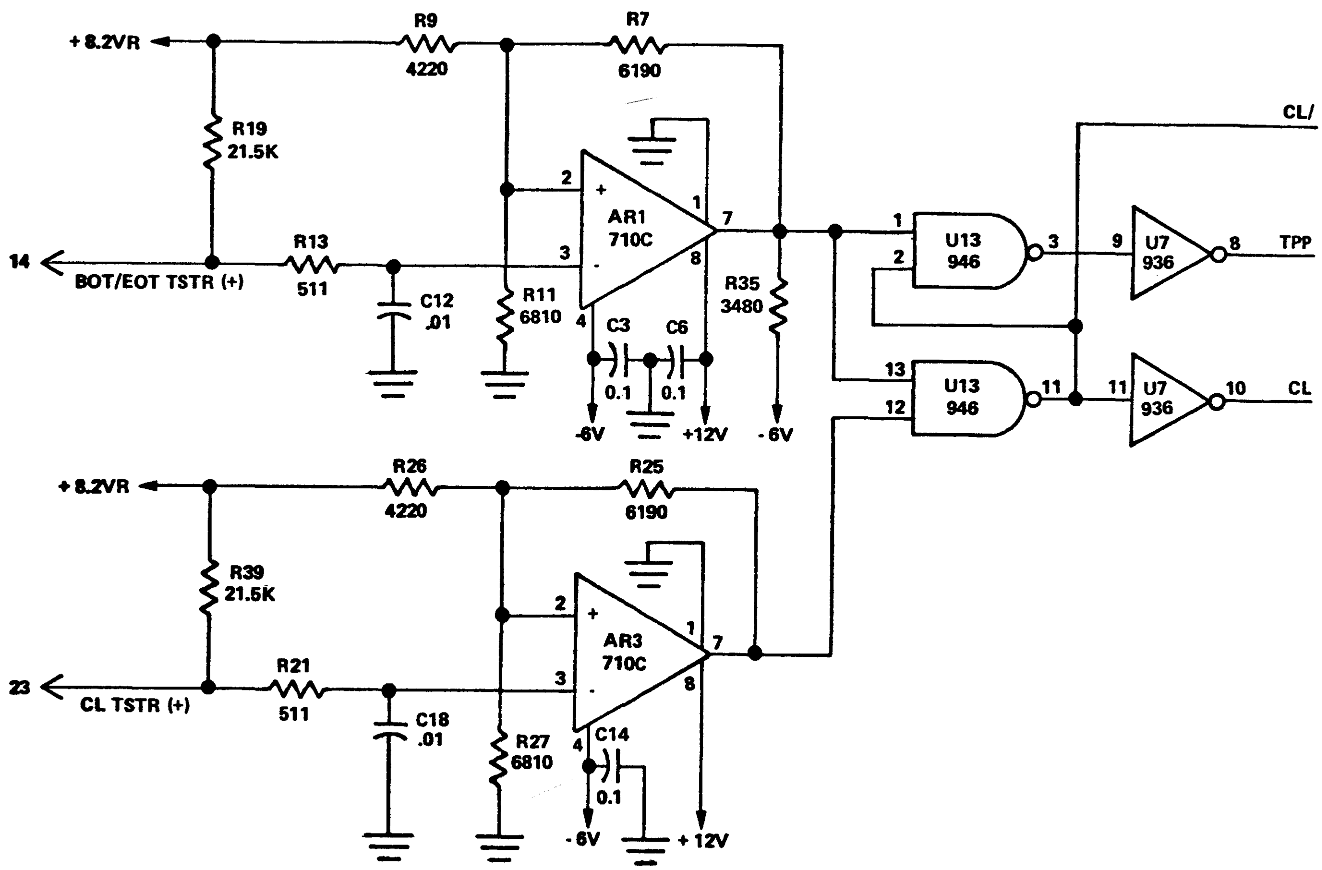


Figure 2-4. Dual Light Pipe Sensing Circuit

When clear leader is sensed, the photo-transistor conducts much more current than when sensing the tape position hole. This drops Q1 emitter voltage to a value low enough and for a period long enough to allow C18 to discharge, and the output of AR3 (CL) goes high. TPP also is sensed at this time; but at the same time, CL resets the TPRL flip-flop on the Logic Card (figure 2-4).

DUAL LIGHT PIPE SENSING

See figure 2-4. The dual light pipe circuit uses two photo-transistors and two lights, one for sensing of clear leader and the other for sensing the end-of-tape (EOT) and beginning-of-tape (BOT) markers. Each sensor has its own circuit, and the two are identical in operation. When light is sensed by the photo-transistor, it begins to conduct and drops the voltage level at the negative input to its associated differential comparator (AR1 or AR3) below the reference voltage at the positive input. The differential comparator input goes high. The output pin 3 of gate U13 goes low, indicating the sensing of either BOT or EOT as long as clear leader is not being sensed (U13 pin 1 is high). When clear leader is sensed, the output of both differential comparators goes high, causing the output pin 11 of gate U13 to go high, indicating clear leader and disabling the indicating of TPP (EOT or BOT).

FORWARD AND BACKWARD DRIVE

See figure 2-5. To initiate forward drive, the input level FDL/ must go low. This level is then gated with Cassette Select Level (CSL) at U4-3 (the dash number refers to the output pin) whose output is then gated with Cassette Present Level (CPL-IN) and Reverse Motor Control (RMC/) at U12-6. The output of U12-6 is then used to develop the terms FMC, FMC/, and FWD.

See figure 2-6. The term FMC is input to the card at pin J and is fed to pin 9 of gate U2-8, whose other input is fed by the 50 millisecond delay U3 triggered by the same drive command FMC. This delay ensures that after completion of a drive command, at least 50 milliseconds will pass before another drive command can be initiated. This allows time for the mechanics of the drive to settle down. When 50 milliseconds times out, U2-8 goes low turning on Q16 through gate U1-4, thus energizing the forward clutch [FC(-)]. It also turns on Q6 which turns off Q11 and Q12, thus releasing the dynamic braking (described further on). The output of U2-8 is also delayed for 15 milliseconds by U3-9 and then gated with itself to turn on Q15 through U2-10 to start the forward motor [FC(-)]. The 15 millisecond delay ensures that the clutches are energized prior to turning on the motor to prevent jerking of the tape during the start of the drive command.

The term FWD, which was generated on the Logic Card (figure 2-4) during the initial portion of the drive command, is sent to the NRZ Write Card (figure 2-7) input pin R and enables gate U1-6 whose other input is fed as described under Servo Control in this section. Gate U1-6 is used with the reverse gate U1-3 to control the direction of the counter circuit. Backward drive is selected in the same manner by BDL/ going low; and the term REV is used to control the direction of the counter circuit (figure 2-7) through gate U1-3.

SERVO CONTROL

Tape motion is caused by driving the cassette cartridge hubs as opposed to the capstan and pinchroller drive method. In order to maintain a constant tape speed across the read/write head, the speed of the take-up hub must be controlled to vary its speed inversely with its diameter as it increases in size. In other words, as the reel size increases on the take-up hub, its speed decreases.

FORWARD DRIVE

See figure 2-7. The CNT PHOTO CELL (+) is a pulse developed by a photo-transistor which senses light through a hole in the supply reel spindle once each revolution. As the photo-transistor senses light, the output of the differential comparator AR2 goes low, and thus the output of U1-8 goes high. The trailing edge of the pulse generated by the photo-transistor and seen at U1-8 causes capacitor C4 to discharge, which in turn will cause a very short negative-going spike to ground at pins 12 and 13 of U1-11. The output of U1-11 is a short positive pulse which is used to up-count or down-count the counter circuit (U2, U3, and U4) through U1-6 (forward drive, up-count) or U1-3 (reverse drive, down-count).

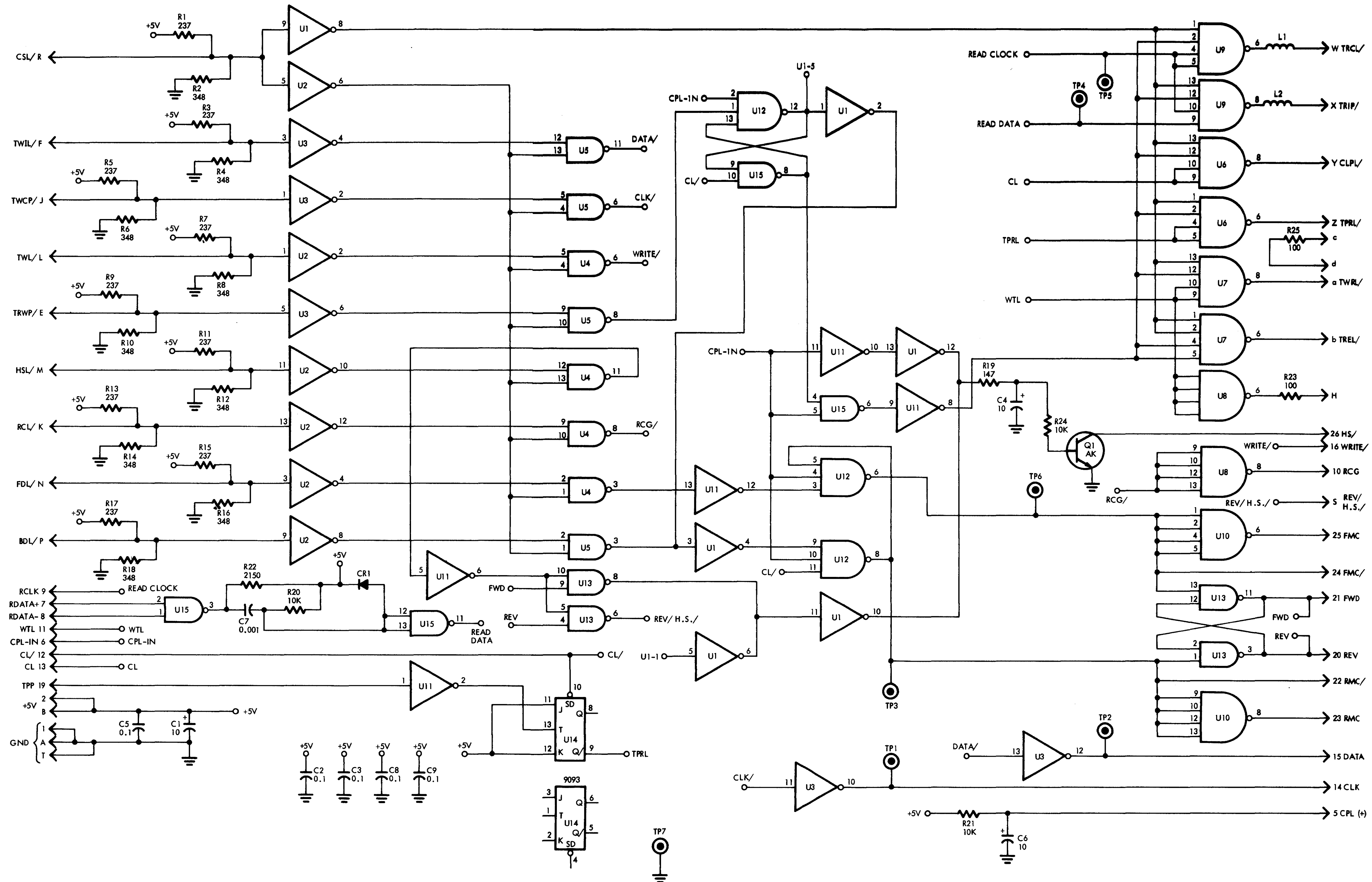


Figure 2-5. Logic Card

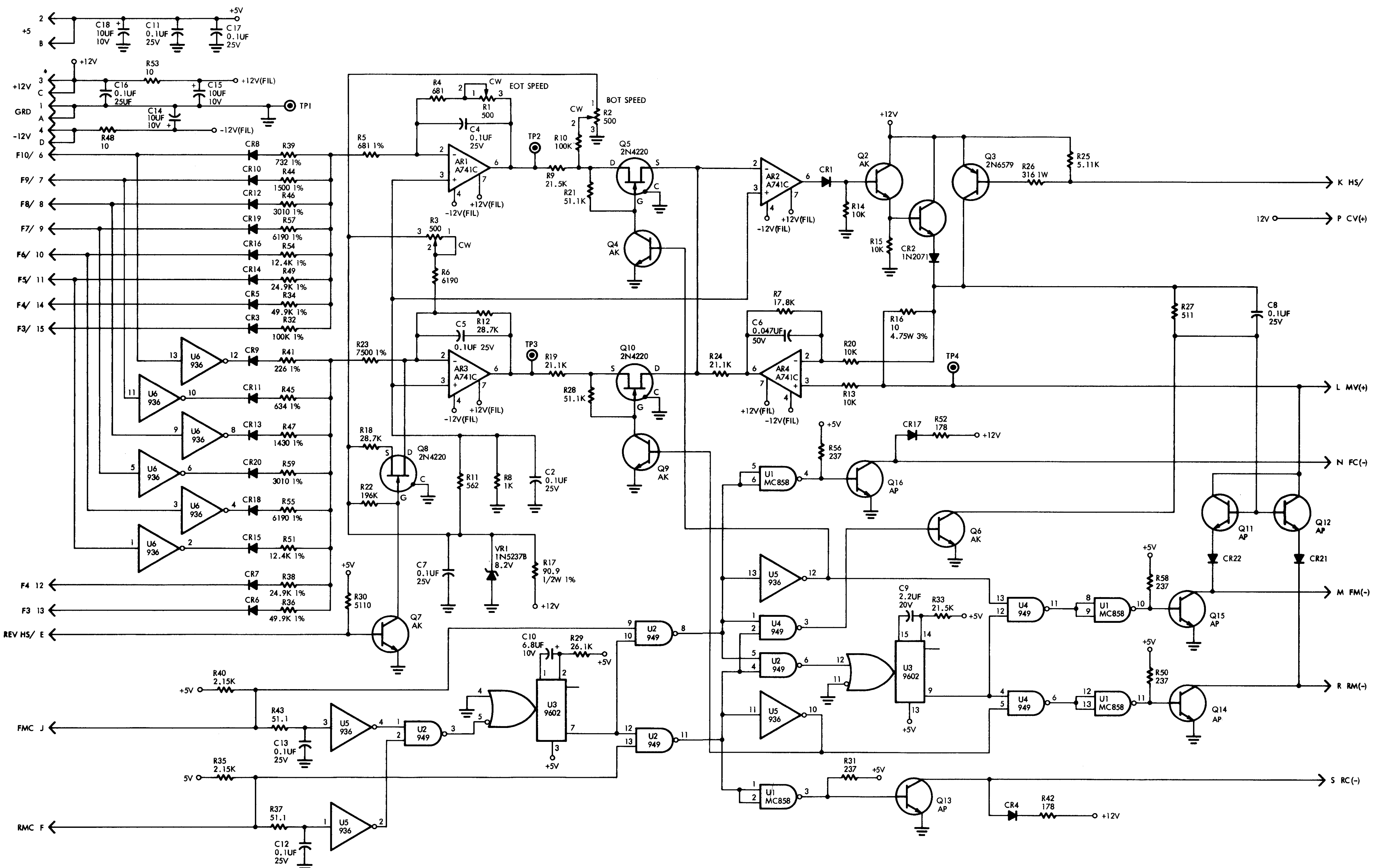


Figure 2-6. Servo Card

U4, U3, and U2 are 4-bit binary counters connected to form a ten bit BCD (binary coded decimal) counter with a maximum count of 1024. Running through a normal 300 foot cartridge up-counts the counter to approximately 807. For the counter to operate, one of the inputs (pin 4 or 5) must be held high, while the other is pulsed, and the count is changed when the pulse transition is from low to high. The outputs from the counter are high when set and low when clear. The outputs are fed into inverter gates which are used as switches to provide an open (high) or ground (low) to the binary weighted resistors on the Servo Card (figure 2-6).

Resistors R39 down to R32 form a D to A (Digital to Analog) converter. At the count of zero the diode end of each resistor is held to approximately +5 volts and no current flows. At this time, the current at the input of AR1 is nominal. As the counter counts upwards, current flows in the binary weighted resistors and is summed in resistor R5. The value of R5 is selected to provide a non-linear output of the D to A converter which closely matches the desired spindle speed curve (spindle size versus RPM to maintain constant tape speed).

The output of AR1 drives the input summing resistor R9, connected to the negative input of amplifier AR2. The voltage from potentiometer R2 is also summed through resistor R10 with the output of AR1. These two summed levels form an inverted motor speed reference voltage. The inversion takes place at about +5 volts rather than ground (the entire motor speed reference circuit is referenced to +5 volts). The inverted motor speed reference voltage is summed with the back EMF (electromotive force) of the spindle drive motor through resistor R24 at the negative input of amplifier AR2.

The output of amplifier AR2 feeds Q2 and Q1, which form a Darlington driver to supply the spindle drive motors. Transistor Q3 is controlled by the high speed level resulting from the HSL command at the interface, or when a rewind command exists, and applies nearly full +12 volts to the motor winding.

A constant +12 volts is connected to one end of each of the clutch coils. The other end of each of the clutch coils are returned to ground through transistors Q13 and Q16. The motor windings are connected to ground through Q14 and Q15. In a forward drive condition, Q15 and Q16 are turned on as a pair, causing the forward motor and clutch to be energized.

Upon termination of the Forward Drive command, the output from gate U4 pin 3 goes low, thus turning off transistor Q6. In turn, transistor Q11 conducts shorting the windings of the forward motor. This action provides dynamic braking to prevent the motor from coasting.

Two tape speeds are available in the forward direction. Ten inches per second (IPS) is used for the forward read and write operation. Thirty IPS is used for a forward search in the read mode only. This speed is accomplished by the term HS/ (input pin K) going low, turning on Q3, and applying nearly full +12 volts to the motor windings.

REVERSE DRIVE AND REWIND

Basically the circuitry for the reverse mode operates the same as for forward. Q9 is turned on enabling AR3 through Q10 to control the servo speed. The inputs F3 thru F10 from the counter circuit are again inverted by inverters U6 and sensed by the binary weighted resistors between R41 and R36. The reason for the difference in binary weight of these resistors with respect to their forward components is that the gear ratio of the reverse drive clutch and spindle are twice that of the forward to obtain a 60 IPS rewind speed (HS/ going low in reverse drive). The normal 10 IPS reverse speed is maintained like the forward drive. The 30 IPS reverse search is made possible by the input term REV. HS/ goes low, turning Q7 off, allowing Q8 to conduct. This action provides extra current to AR3 in order to increase its output to obtain the desired 30 IPS for reverse read.

DRIVE DELAYS AND HOLDOVERS

There are no delays or holdover circuits within the cassette unit. All circuits used in the creation of the initial gap and the interrecord gap are a part of the system to which the cassette unit is interfaced.

READ INFORMATION FLOW

DATA FLOW

See figure 2-8. Data Read (+) and (-) and Clock Read (+) and (-) come directly from the read head through connector J1 on the interconnect board.

The network consisting of R1 through R4, CR1, CR2 and C1, is used to couple the dual purpose read/write head to the data input amplifier AR1. Both inputs are biased just below +5 volts. The two diodes have approximately 0.1 volt across them and exhibit a sufficiently large impedance that they need not be considered during the read mode. Capacitor C1 is used to provide high frequency filtering during the read mode and to filter switch transients during a write operation.

R5 is a 500 ohm potentiometer used for adjusting the read gain. Increasing the resistance of R5 decreases the gain of the amplifier. The output of AR1 is ac coupled to the following stage by 1.0 uf capacitors C3 and C4.

See figures 2-8 and 2-9. The output of AR2 is fed into two packages, AR3 and AR6, each consisting of two comparators with a common OR output. For the common output to go low, both comparator outputs must be low. Comparators AR3 are used to sense positive pulses, with the upper comparator sensing the peak of the pulse and the lower comparator sensing the amplitude of the pulse. The amplitude at which the lower comparator switches is dependent upon the state of the input RCG (read clipping level) which, when high, increases the bias level at the positive input to the comparator so that it senses the input at approximately 40 percent of its peak value during a write operation. With RCG low (read mode), the clipping level is approximately 20 percent. The common output of the comparators is normally high and will go low when the positive pulse is correctly sensed. Comparators AR6 function in the same manner for sensing negative pulses.

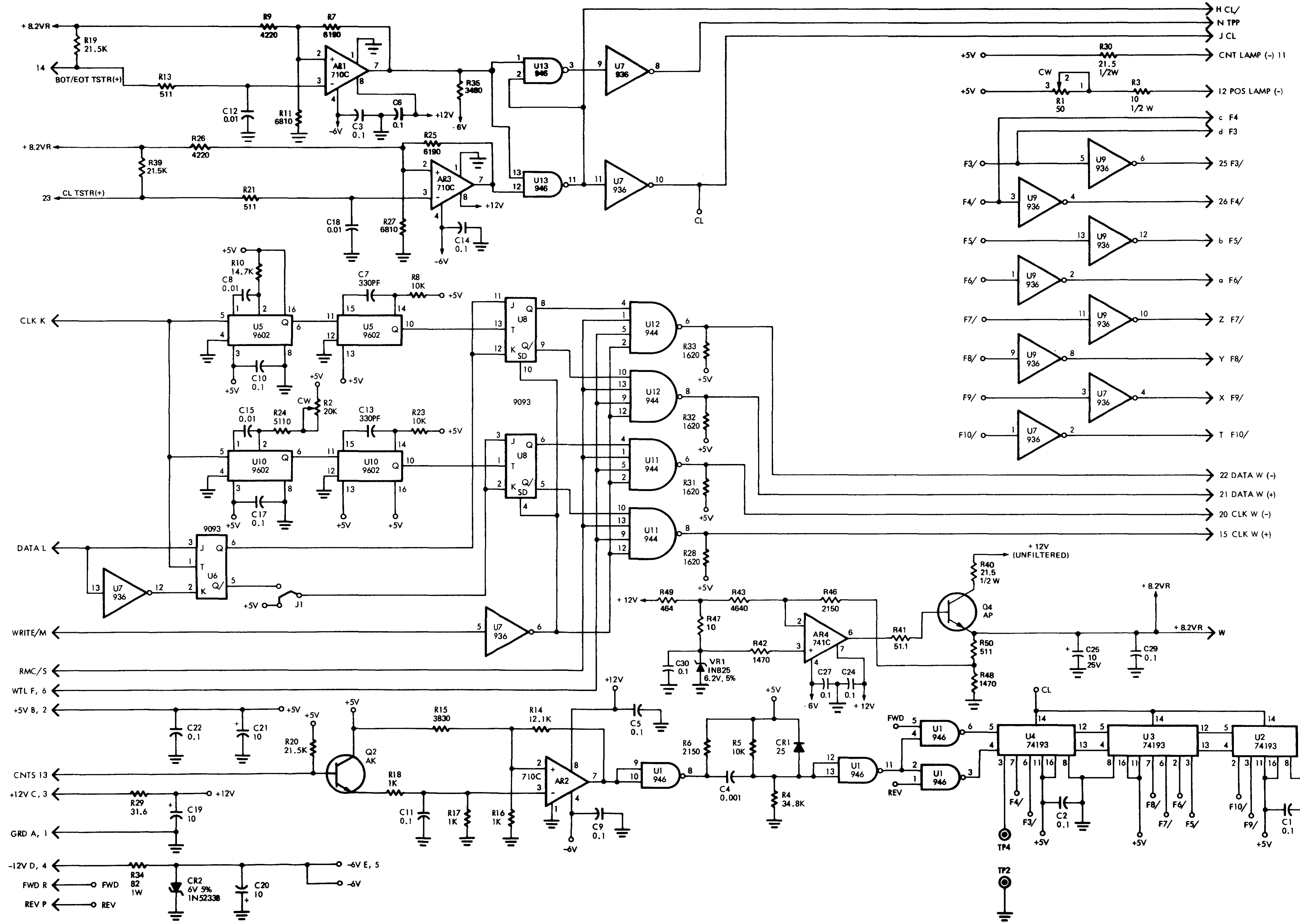


Figure 2-7. Write Card

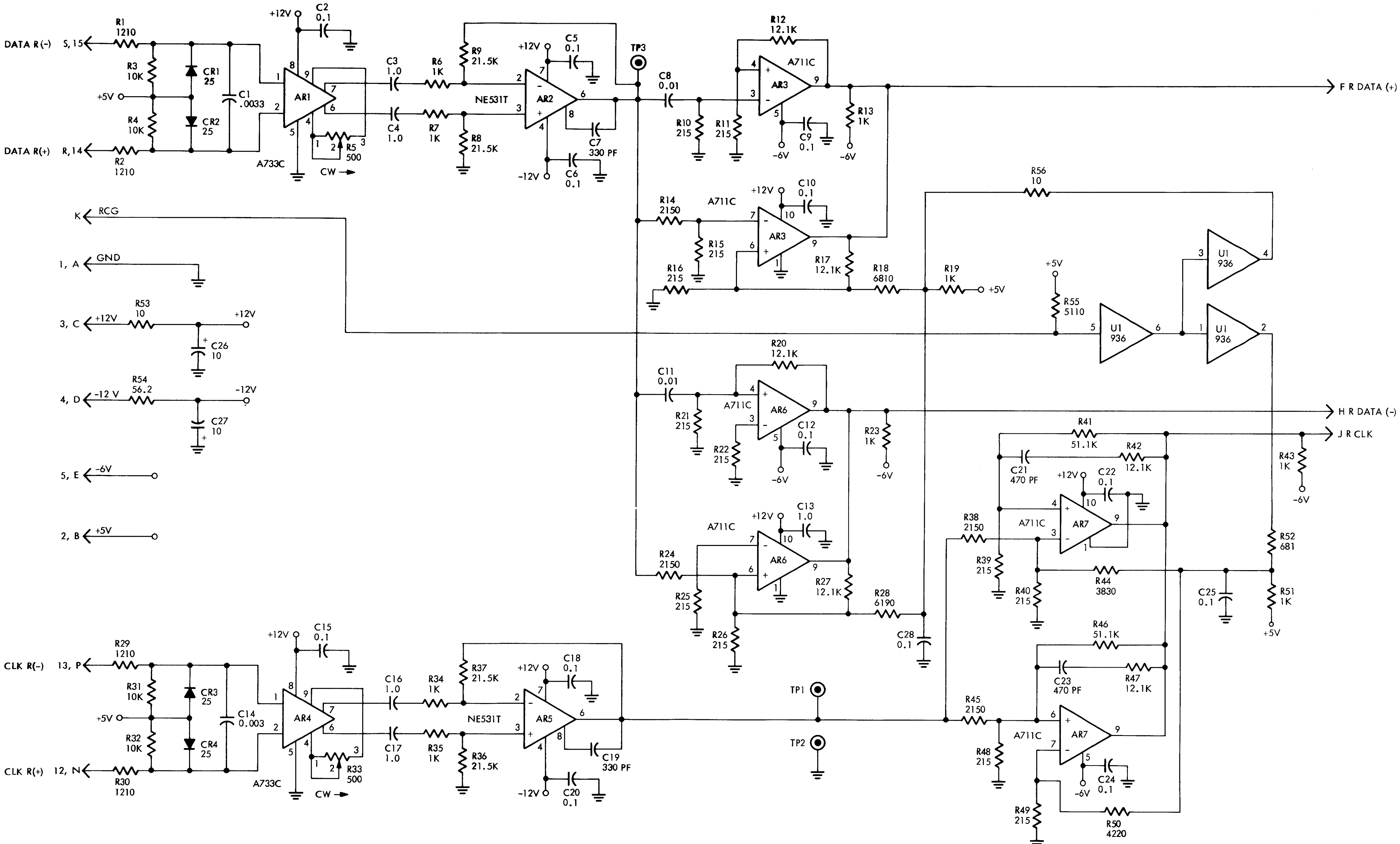


Figure 2-8. Read Card

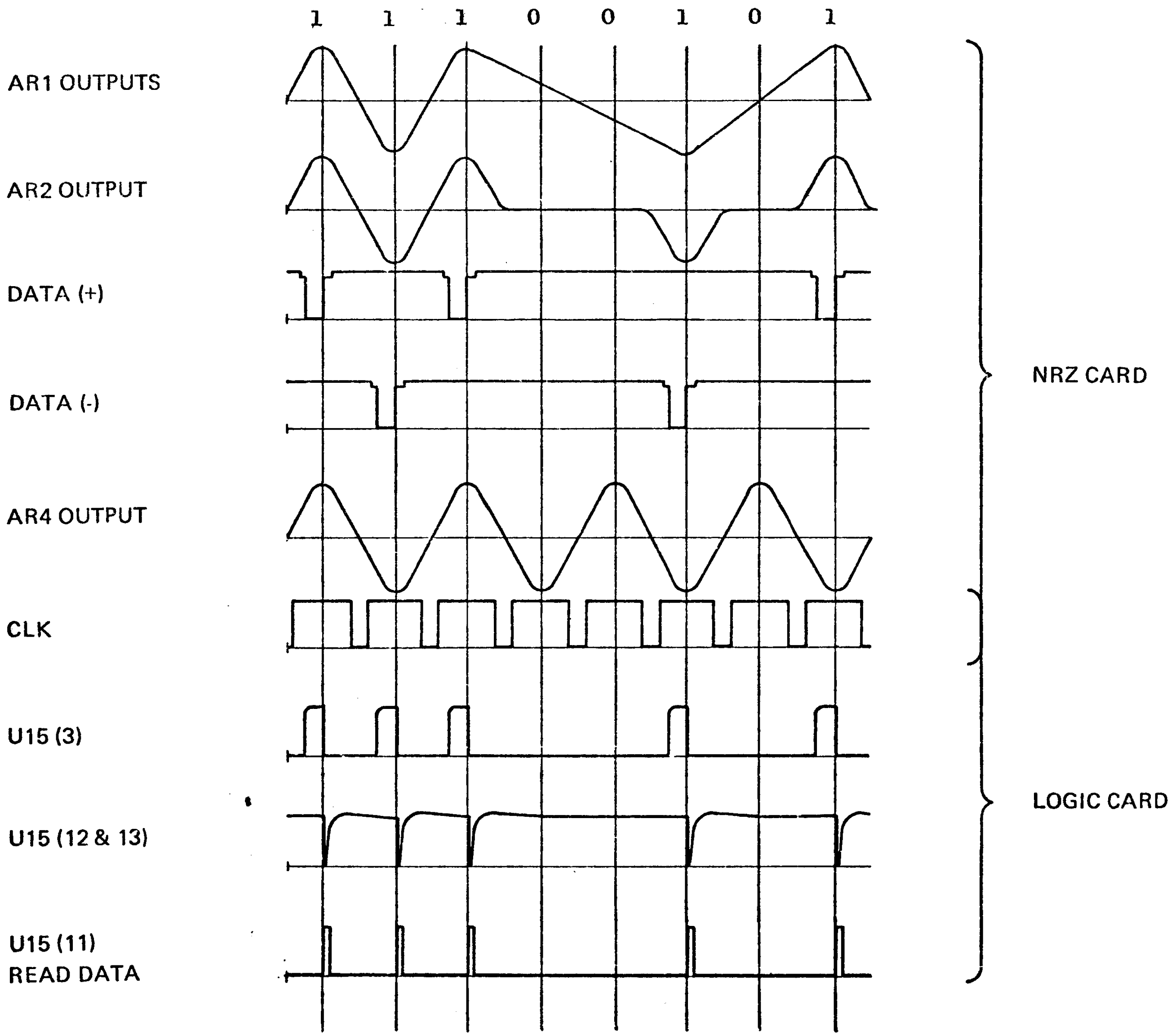


Figure 2-9. Read Data and Clock Levels

See figures 2-8 and 2-9. The inputs Data (+) and (-) are fed into gate U15-3. Its output is normally low and goes high when a 1-bit is sensed (either Data (+) or Data (-) going low). While the output of U15-3 is low, capacitor C7 is charged to +5 volts and the inputs of U15-11 are high. The trailing edge of a positive pulse at the output of gate U15-3 causes C7 to discharge very quickly, causing a sharp negative going spike to ground at the input to U15-11 whose output is a positive going level of short duration. This positive level is then gated with Cassette Select Level, Tape Ready Level and Read Clock, all high at the same time, to give a low pulse at the output of U9-8 (Tape Read Information Pulse) indicating that a 1-bit has been sensed.

CLOCK FLOW

The clock information is handled in the same manner as the read data up to the inputs of comparators AR7. The upper comparator is used to sense negative pulses and the lower for positive pulses. The input RCG (read clipping level) is high during a read after write operation, setting the reference inputs to the comparators for an amplitude detection of 40 percent (there is no peak detection used in the clock circuitry). With RCG low, the amplitude detection will be 20 percent for a read operation. The outputs of AR7 are normally low and go high when a positive or negative pulse is correctly sensed.

See figures 2-5 and 2-9. The clock information is fed into gates U9-8 and U9-6. The period of time that the clock pulse is high is called the cell time and it is during this time that a data pulse is allowed to get through gate U9-8. The output TRCL/ U9-6 is low during cell time.

WRITE FLOW

See figures 2-5 and 2-9. TWIL/ (Tape Write Information Level) and TWCP/ (Tape Write Clock Pulse) enter the logic card and are inverted twice by gates U3-4 and -3 and U5-11 and -6, to become DATA/ and CLK/. The TWIL/ and TWCP/ pulses are low to indicate a 1-bit and cell time, respectively. The TWCP/ pulse width must be between 0.5 and 5.0 microseconds to be within specifications. DATA/ and CLK/ are again inverted by gates U3-12 and -10 and sent to the Write Card.

See figure 2-7. The clock and data lines enter the card at pins K and L. At clock time the data toggles the J-K flip-flop if a 1-bit is to be written. If a 0-bit is to be written, no pulse will be on the data line at clock time and the flip-flop will remain in its prior state. The delays U5-6 and U10-6 are triggered by the same clock pulse and are used to displace the time between the data and clock pulses in order to compensate for delays inherent in the write circuitry and write head. The displacement in time will be seen at the negative transition at the end of the multi time. U5-6 has a fixed time of 50 microseconds, and U1-6 is variable between 16.3 and 80.3 microseconds. Multis U5-10 and U10-10 are fixed at 1 microsecond and are triggered by the negative transition of their prior multi. These 1 microsecond pulses toggle the data and clock information flip-flop (U8) which switches the write head coils through gates U11 and U12, thus writing the information on tape. With the delays properly adjusted, the data pulse and its clock pulse will be in perfect alignment when written on tape.

The inputs WRITE/ (low) and WTL (Write Tape Level) (high) are used to enable the write circuitry. The inputs CL (Clear Leader) (high) and RMC (Reverse Mode Control) (low) will disable the write circuitry if the cassette unit is at clear leader or in a reverse mode.

DECK WIRING

Figure 2-10 is a schematic diagram of the cassette unit deck wiring for the single light pipe unit. Figure 2-11 is a schematic diagram of the deck wiring for the dual light pipe unit.

RECORDING TAPE CHARACTERISTICS

The following discussion concerns the recording methods and format used in recording on the cassette tape cartridge.

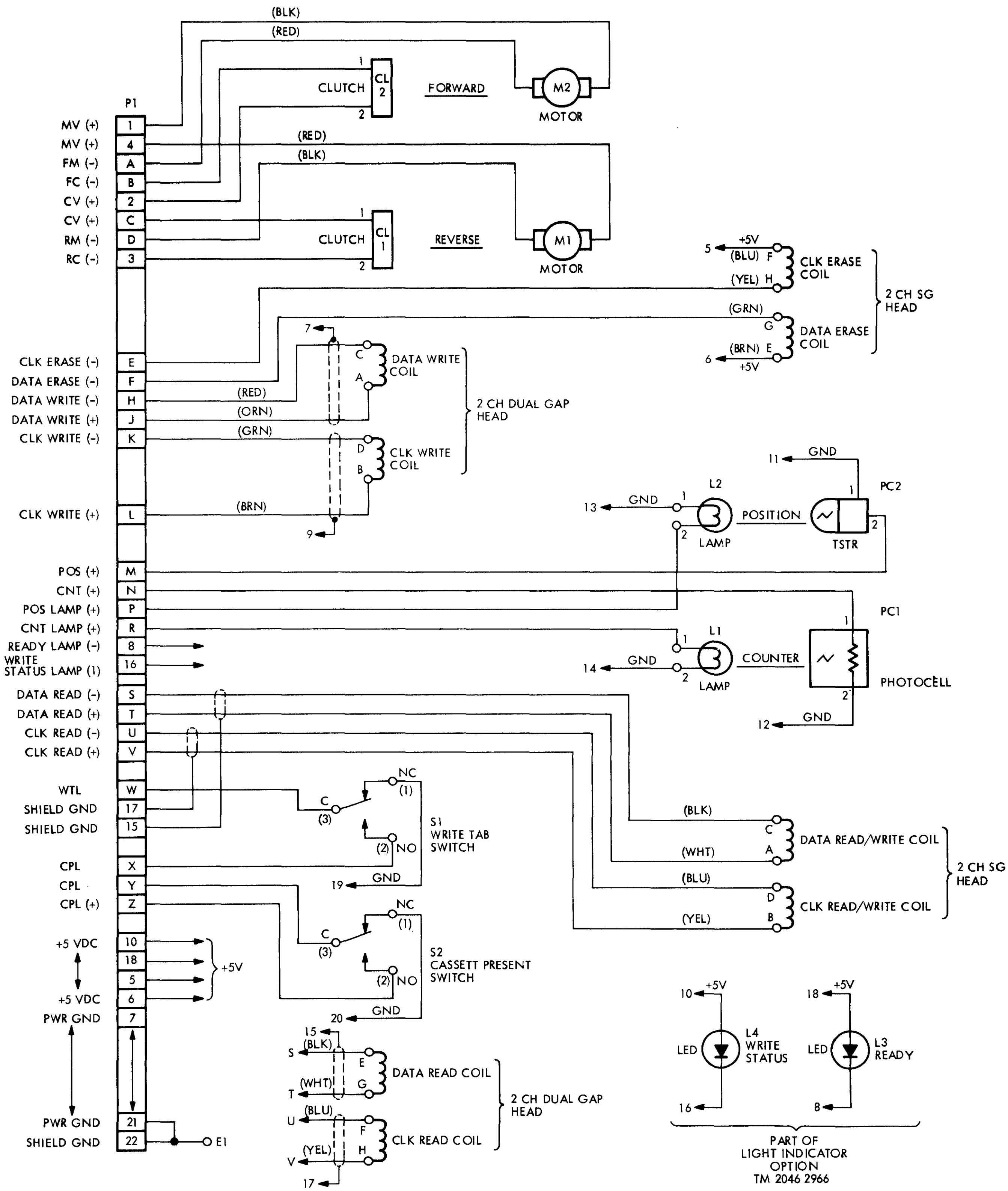


Figure 2-10. Deck Wiring (Single Light Pipe)

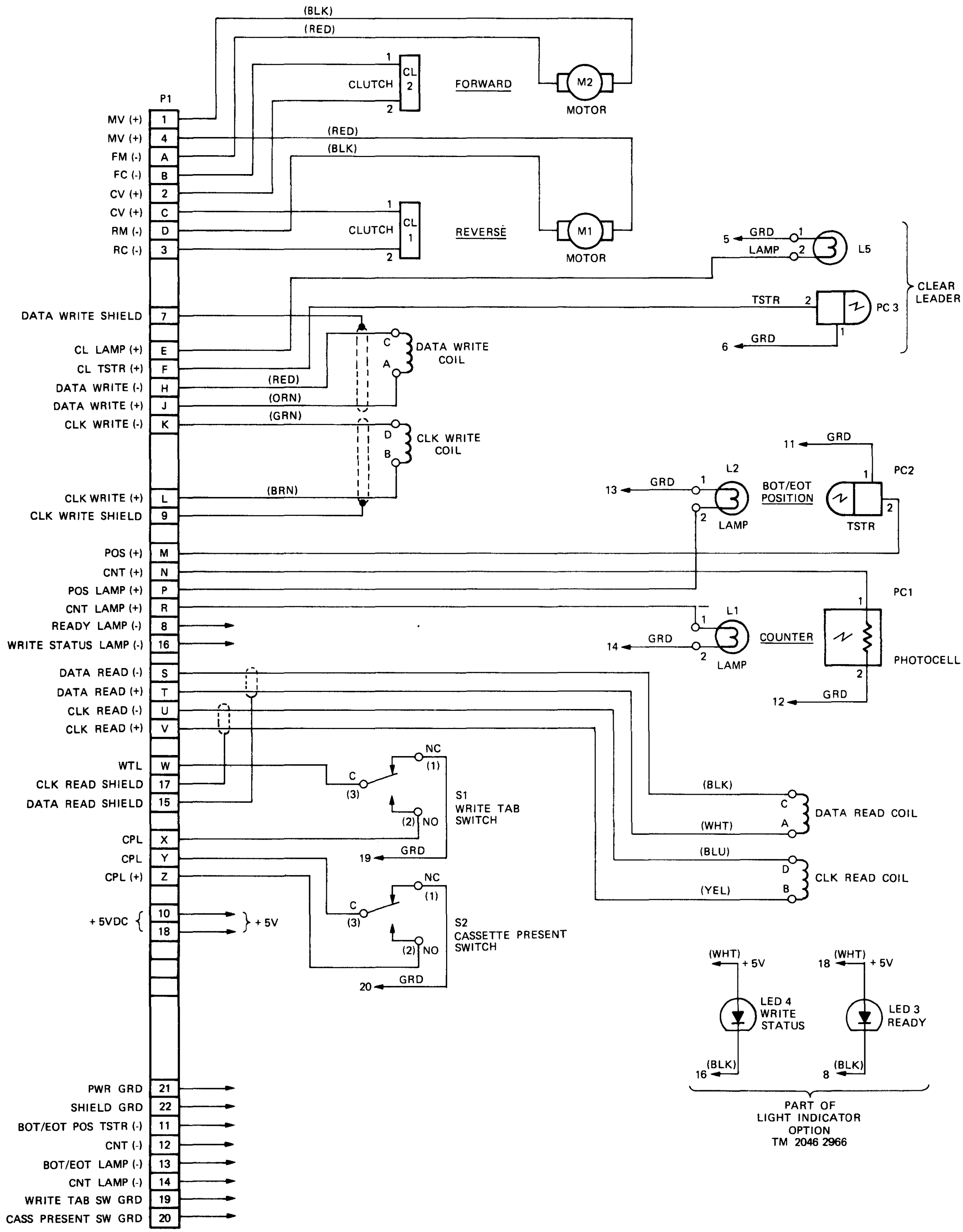


Figure 2-11. Deck Wiring (Dual Light Pipe)

POLARITY

The tape must be fully saturated with the same polarity before the first block of information, between blocks, and after the last block. The length of these areas, called gaps, is specified further on in this section. This saturation process, called dc erasing, is part of the recording process.

TRACK DIMENSIONS

The width of each track is 0.057 inch nominal. Track separation is between 0.0292 and 0.40 inch.

TRACK DESIGNATION

When referring to the cartridge as shown in the upper portion of figure 1-2, the bottom track is designated Track 1, and is the data track. When the cartridge is in the unit, Track 1 is closest to the carriage casting. Track 2 is the top track and is the clock track.

MAGNETIC REPRESENTATION OF BITS

A 0-bit is defined as an absence of any flux transistion at the tape location corresponding to the bit being read or written. A 1-bit is defined as a flux transition at the location corresponding to the bit being read or written.

During a write action, the data bit position is derived from the clock signal provided by the controlling device. This signal establishes each bit time; it is recorded on the clock track as a continuous train of 1-bits for each data bit. The data track may or may not be written on, depending on the information being written. During a read action, the location of a data flux change is determined by the clock signal provided by reading the clock track; a flux transition in both tracks corresponds to a 1-bit, and a flux transition in the clock track only corresponds to a 0-bit.

PREAMBLE

In accordance with the Burroughs NRZI format specifications, each block of data or tape mark must be preceded by a preamble consisting of seven 1-bits followed by one 0-bit. The reason for this is to eliminate the possibility of picking up random bits or remnant records and attempting to decode them as legitimate data.

REPRESENTATION OF CHARACTERS

Each character is located in a byte (octet) of eight bit positions along the track. There is no character parity bit. The ASCII seven bit code is recorded in the seven least significant bit positions of the byte. The eighth bit position, i.e., the most significant bit position in the byte, always contains a zero bit.

The information is recorded serially by bit and by character. Within each character or byte the least significant digit is recorded first. The sequence of characters within each block of data corresponds to the normal left to right sequence of a written line.

DATA BLOCK FORMAT

A data block consists of a preamble, the data, and cyclic redundancy character (CRC). The preamble is a character (11111110) that is recorded immediately preceding the data in every block. The zero occupies the most significant bit position and thus is recorded as the last bit of the preamble. When reading data in the forward direction, the first seven bits of every block are 1-bits and the eighth bit is a 0-bit.

The data, which excludes the preamble and CRC, contains at least eight bits (one character) and no more than 2048 bits (256 characters) in accordance with ASCII specifications.

The CRC is recorded immediately following the data portion of every block. It consists of 16 bits; which are generated by the following polynomial: X(16) + X(15) + X(2) + X(0) (or 1). Refer to the explanation of the CRC in this section.

CONTROL BLOCK (TAPE MARK)

The control block consists of two characters: a preamble and a data character (00010011). No CRC is generated in a control block.

GAPS

The tape must be dc erased in all gaps (refer to POLARITY in this section). The initial gap is the gap between the BOT hole and the first recorded character on tape. Its minimum length is 1.30 inches and its maximum is 19.70 inches.

An interblock gap is the gap between two consecutive blocks of data (or tape marks). Its minimum length is 0.7 inch with a nominal length of 0.80 inch. Its maximum length is 19.70 inches. An elongated gap is an interblock gap whose length exceeds 2.0 inches.

The trailer gap is the area on tape that is dc erased after the last record character on tape. Its minimum length is 0.70 inch and its end must be no more than 13.8 inches beyond the EOT hole.

DENSITY

The maximum recording density for NRZ is 800 BPI, but lower density may be used if it is more advantageous with respect to environment, or if input power is outside of the tolerances as stated in section 6 of this manual.

LOGICAL END OF DATA

Any gap that exceeds 19.7 inches is considered the logical end of the data recorded.

CYCLIC REDUNDANCY CHARACTER (CRC) THEORY

Because no character parity bit is written in the data, the cyclic redundancy character (CRC) is used as a method for checking for correct information. The method for determining the CRC may differ according to the type of device to which the cassette unit is connected, but the outcome is always the same.

Functional Detail

The principle of the CRC is to modify the data block so that is arithmetic value is evenly divisible by a common divisor. Changing the data itself, however, would destroy the meaning it contains. Therefore, one character position (8-bits) is reserved, immediately following the data, into which a number (the CRC) is inserted so that the data including the CRC is evenly divisible by the common, or standard, divisor.

Within the controlling device there is an arithmetic register capable of dividing the data being written or read by the common divisor. During a write operation, the register determines the CRC character and transfers it to the data line to be written immediately following the data. During a read operation, the register divides the data and CRC character by the common divisor to check for a zero remainder, indicating that the information read is correct.

DECIMAL DATA EXAMPLE

The following example illustrates development of a CRC using decimal data instead of digital data. In this example, the data, 63217, is divided by 8 (selected for illustrative purposes only.) The CRC is that character which, when placed in an added character position will produce a remainder of zero. The following illustrates the method:

```
   79021
8 )632170
   56    ^-- Added Character Position
   --
    72
    72
    --
     017
      16
      --
       10
        8
       --
        2 <- Remainder
```

The remainder is now subtracted from the divisor to get the CRC:

```
 8 <- Divisor
-2 <- Remainder
--
 6 <- CRC
```

The CRC is inserted in the added character position to be written along with the data:

```
   DATA    CRC
 _________  |
 6 3 2 1 7  6
```

This data, including the CRC, when read back by the controlling device is divided by the divisor (8) to check for zero remainder and thus to check for correct information.

BINARY DATA EXAMPLE

Development of the CRC for binary data is essentially the same as for the decimal data example, except that each character in binary data consists of 8 bits, and thus the CRC also contains 8 bits. The binary divisor is contained in the polynomial "X(8) + X(6) + X(3) + X(0) (or 1)" containing 9 bits and may be broken down as follows:

```
                    X(8) + X(6) + X(3) + X(0)

X(8)  X(7)  X(6)  X(5)  X(4)  X(3)  X(2)  X(1)  X(0)

Divisor   1     0     1     0     0     1     0     0     1
```

The binary number "1 0 1 0 0 1 0 0 1" extracted from the polynomial is the divisor. This divisor has been selected by the American Standard Code for Information Interchange (ASCII) and is common throughout the cassette industry.

Using the "exclusive OR" process for binary division, the data is divided by the divisor to determine the CRC. There is one difference in the binary calculation with respect to the decimal example previously discussed. That is, the CRC is equal to the remainder and need not be subtracted from the divisor. The following is an example of calculating the CRC using binary data. The data can consist of any number of characters, but for simplicity, only one character (8 bits) will be used. As with the decimal example, one character (8 bits) which will eventually contain the CRC has been added to the data.

```
                                   1 0 0 1 0 1 1 1
1 0 1 0 0 1 0 0 1 √1 0 1 1 0 1 1 0 0 0 0 0 0 0 0 0
                   1 0 1 0 0 1 0 0 1                  Added
                         1 0 0 1 0 1 0 0 0            Character
                         1 0 1 0 0 1 0 0 1
                             1 1 0 0 0 0 1 0 0
                             1 0 1 0 0 1 0 0 1
                               1 1 0 0 1 1 0 1 0
                               1 0 1 0 0 1 0 0 1
                                 1 1 0 1 0 0 1 1 0
                                 1 0 1 0 0 1 0 0 1
                                   1 1 0 1 1 1 1 1 ← CRC
```

Figure 2-12 is a typical CRC register. The placement of the exclusive OR gates can be determined from the polynomial discussed above.

At the beginning of a write operation the register contains all zeros (see figure 2-12). With the control input high, gates 2 and 3 are enabled and the register is in parallel with the data line. At the same time, the data flows through gates 3 and 4 on the write lines to the unit; data is sensed at one input to exclusive OR Gate C, and the bit shift starts.

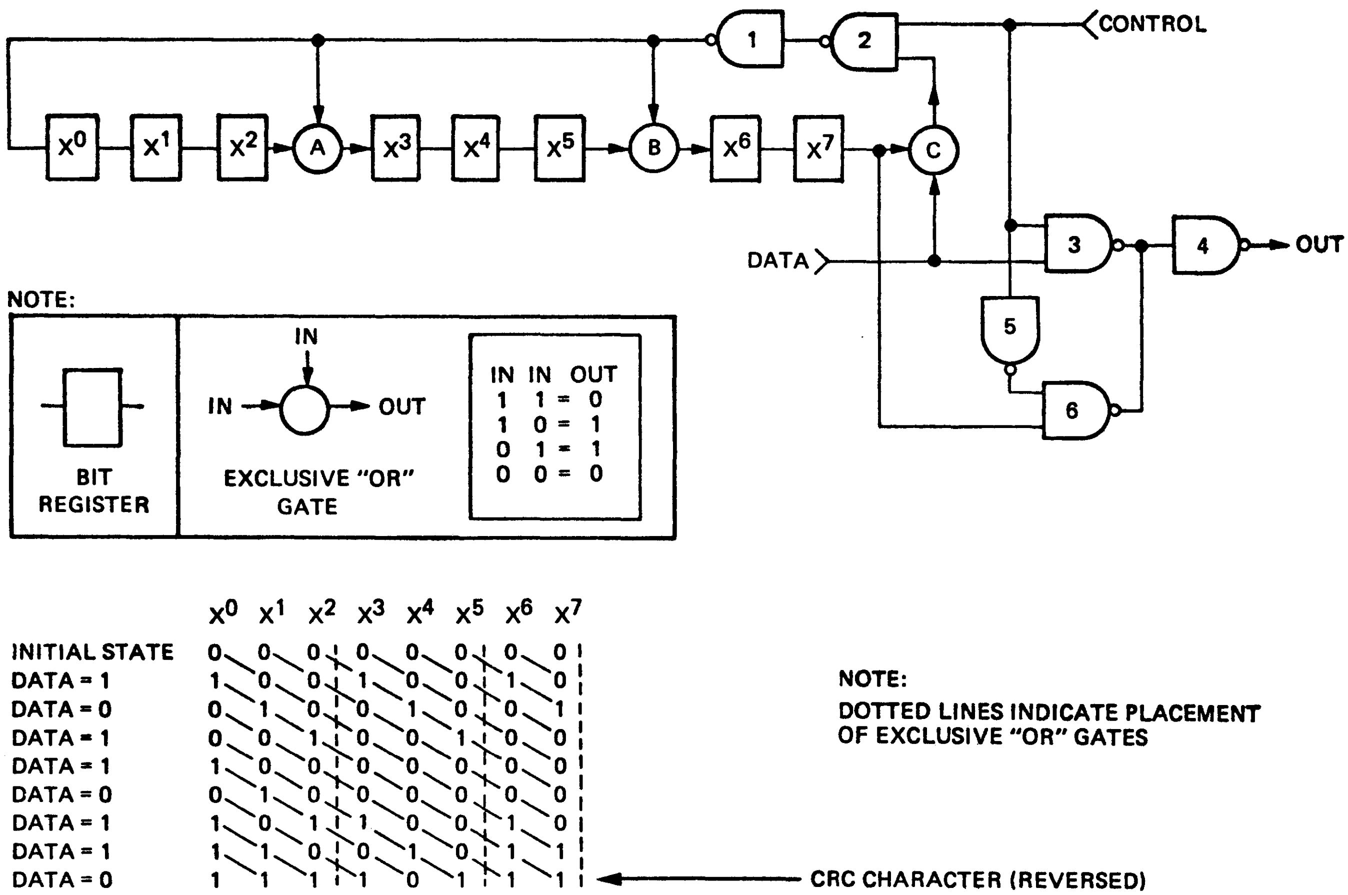


Figure 2-12. Typical CRC Register and Bit Shift Flow

The first data bit is a 1-bit and is sensed at one input to exclusive OR Gate C. The other input to OR Gate C, provided by register X(7), is a 0, so the bit passing through Gate C is not inverted and is thus a 1. This 1-bit is inverted by Gate 1 and again by Gate 2 and sets register X(0) to a 1 state. All the registers shift one place to the right. The exclusive OR Gates A and B are controlled by the 1-bit being sensed, so the information contained in registers X(2) and X(5) (both 0 at this time) is inverted while shifting, so that registers X(3) and X(6) now contain a 1-bit. The information now contained in the registers is as shown in the first line under the initial state on the chart in figure 2-12.

When the last data character is passed, the register contains the CRC in the proper sequence to be clocked onto the write line (by "Control" being low which enables Gate 6) immediately following the data.

The block of information written on tape will look like this:

$$\overbrace{1\ 1\ 1\ 1\ 1\ 1\ 1\ 0}^{\text{Preamble}}\ \overbrace{1\ 0\ 1\ 1\ 0\ 1\ 1\ 0}^{\text{Data}}\ \overbrace{1\ 1\ 1\ 0\ 1\ 1\ 1\ 1}^{\text{CRC Character}}$$

During a read operation, this register works exactly the same as during a write operation. At the end of the data transfer, the register contains the CRC. The register continues to shift through the reading of the CRC as it is read from the tape. (This CRC is written during the write operation, and in the absence of errors, this character is the same as the one contained in the register at the end of the read operation prior to reading the CRC on tape). If the information read is correct, the register at the end of the read operation, including the reading of the CRC from the record, contains all zeros.

NOTE

> The preceding binary method (ASCII) is also used for the cassette NRZI format, except that the CRC used for NRZI format contains 16 bits, and the polynomial is X(16) + X(15) + X(2) + X(0) (or 1).

SECTION 4

ADJUSTMENTS

INTRODUCTION

The following procedures are written in the sequence in which they must be performed. Do not perform any adjustment without verifying all preceding adjustments.

POWER SUPPLIES

The cassette unit does not contain power supplies. The power is obtained from the system to which the cassette unit is interfaced, and in the values and tolerances listed below:

Volts dc	Current (amps)	Regulation (%)
+5.0	1.0	10
+12.0	0.9	10
-12.0	0.125	10

DRAG BRAKE ADJUSTMENT

The drag brake is adjusted to provide correct drag on the take-up reel and supply reel to keep the proper tape tension across the read/write head.

a. Separate the electronics module (figure 4-1) from the cassette unit to gain access to the brake mechanism and spindle shafts. Make certain that the cassette unit is resting on a solid surface.

b. Screw the torque adjust tool (figure 4-2) into the base of the spindle shaft. Position the weight against the outer stop of the tool (see figure 4-3).

c. Rotate the lever to the horizontal position (see figure 4-3). Adjust the screw adjacent to the spindle being adjusted so that the lever will remain horizontal, but a slight tapping on the main casting with the finger or small screw driver will cause the weight to drop thru about 25 degrees of rotation. (The tapping simply overcomes the resting friction between the brake-shoe surface and the spindle shaft.) In this test, a drag greater than 0.45 inch-ounces is required to keep the weight horizontal, but the drag is less than 0.55 inch-ounces if the tapping allows the weight to drop thru 20 to 25 degrees of rotation. These limits are well within the minimum and maximum allowable drag torques.

d. Repeat steps b. and c. on the other spindle shaft.

e. Re-check the adjustment on the spindle shaft that was adjusted first.

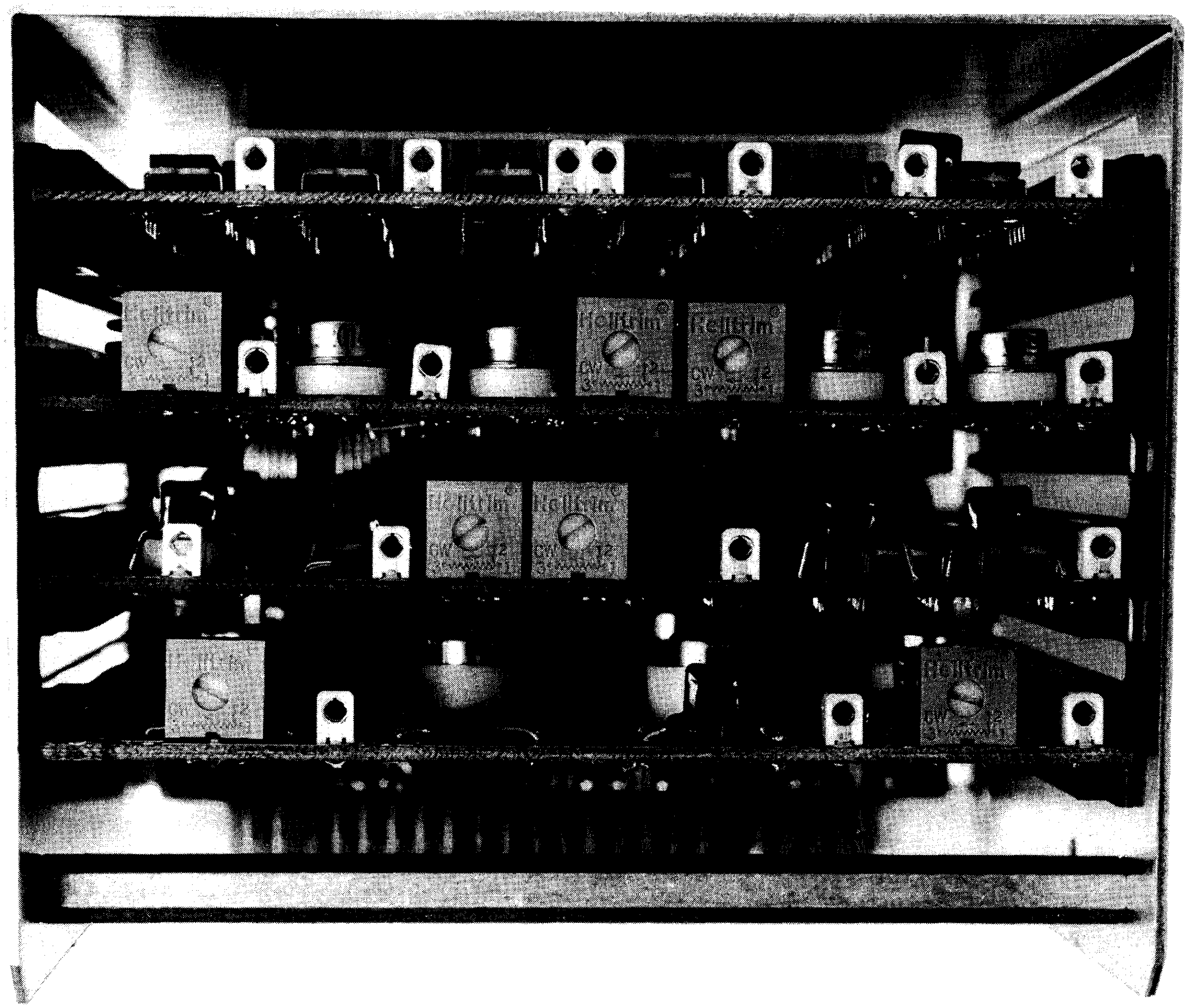


Figure 4-1. Cassette Unit Electronics Package

NOTE

On older units without the external brake assembly, the drag is created in the clutches. The adjustment procedure is the same as for later models, except that the adjustment is made at the clutch base (end-bell) of the appropriate clutch using a spanner wrench, part number 2042 3851.

CAUTION

Never clean the accumulated carbon from the brake shoes or shafts.

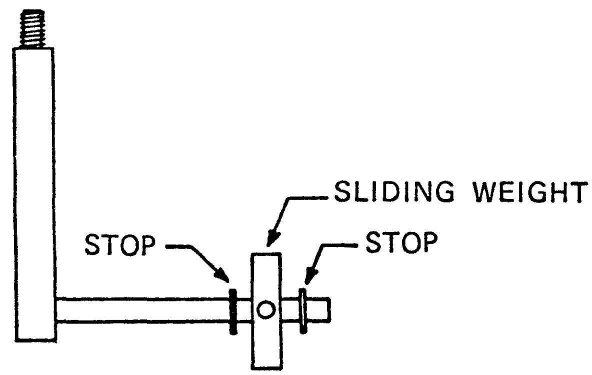


Figure 4-2. Drag Adjust Tool

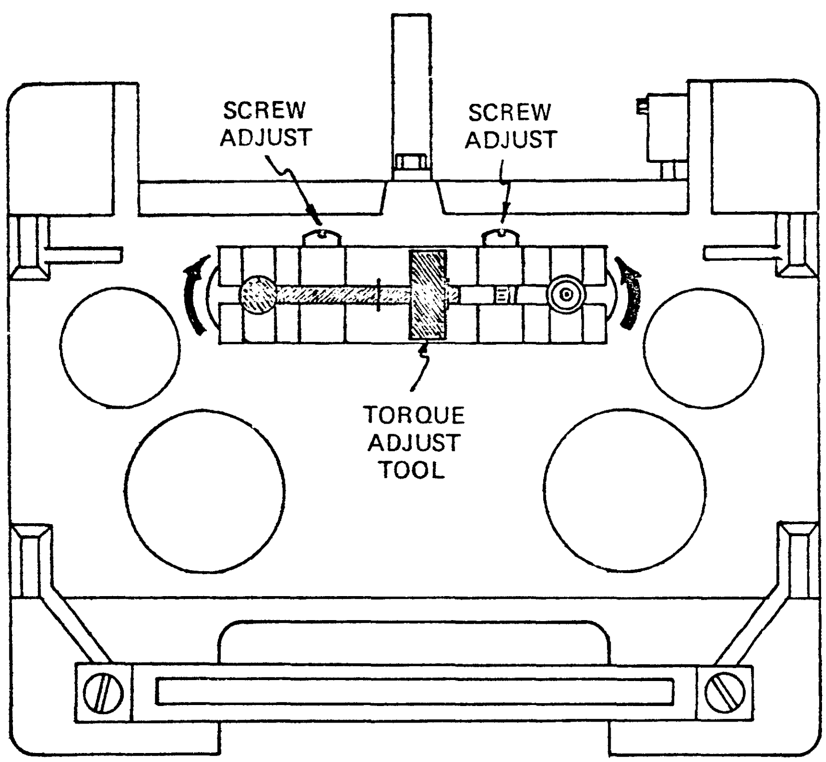


Figure 4-3. Brake Adjustment

START/STOP CHECK

The following check is made to ensure that the cassette unit drive brings the tape up to speed within the specified time after being initiated, which will minimize the possibility of tape incompatability with other drives.

a. Create an "all bits" tape using the cassette exerciser by writing all 1-bits in the continuous mode at 10 inches per second.

b. Rewind the tape.

c. Read the tape in the forward direction in the start/stop mode.

d. Set the scope as follows:

   Main Sweep = 10 milliseconds, chopped
   A-trace = 2 volts, at TP-1 of Read Card (CLK)
   B-trace = 2 volts, at TP-6 of Logic Card (FWD/)
   Trigger = External negative, at TP-6 of Logic Card

e. Adjust the start/stop ON and OFF potentiometers on the exerciser for approximately 80 milliseconds on and 80 milliseconds off time.

f. Refer to the profiles shown in figures 4-4A and B. The start time, measured from the start of the trace to the point where the amplitude is 90 percent of the maximum, should not exceed 80 milliseconds (it is usually around 40 milliseconds). Stop time, measured from the removal of the drive command (B-trace going positive) until all the analog signal is gone, should not exceed 30 milliseconds (it is usually around 15 milliseconds).

g. Move the external trigger and the B-trace to TP-3 of the Logic Card (REV/).

h. Read the tape in the backward direction in the start/stop mode.

i. Verify the start/stop times as in step f.

j. Figure 4-4C depicts a poor start profile due to a loose drag brake setting (note the overshoot at the start of the profile, implying loose tape). Figure 4-4D depicts an acceptable start time, but with a marginally excessive drag brake setting (note the slow rise rate of the profile).

TAPE POSITION LIGHT ADJUSTMENT

This procedure is not applicable to drives with dual-light pipes, which can be identified by the NRZ Write Card having only one potentiometer. There is no adjustment to be made on units with the dual light pipe feature.

a. Monitor the tape position pulse (TPP) at TP-1 (with the A-trace) and clear leader (CL) at TP-3 (with the B-trace) on the Counter NRZ Write Card.

b. Load a tape cassette and manually position tape (by moving the small white output gear on the take-up clutch) so that the BOT hole is positioned over the tape position photo sensor (located beside the read/write head). This position is indicated by TPP going true.

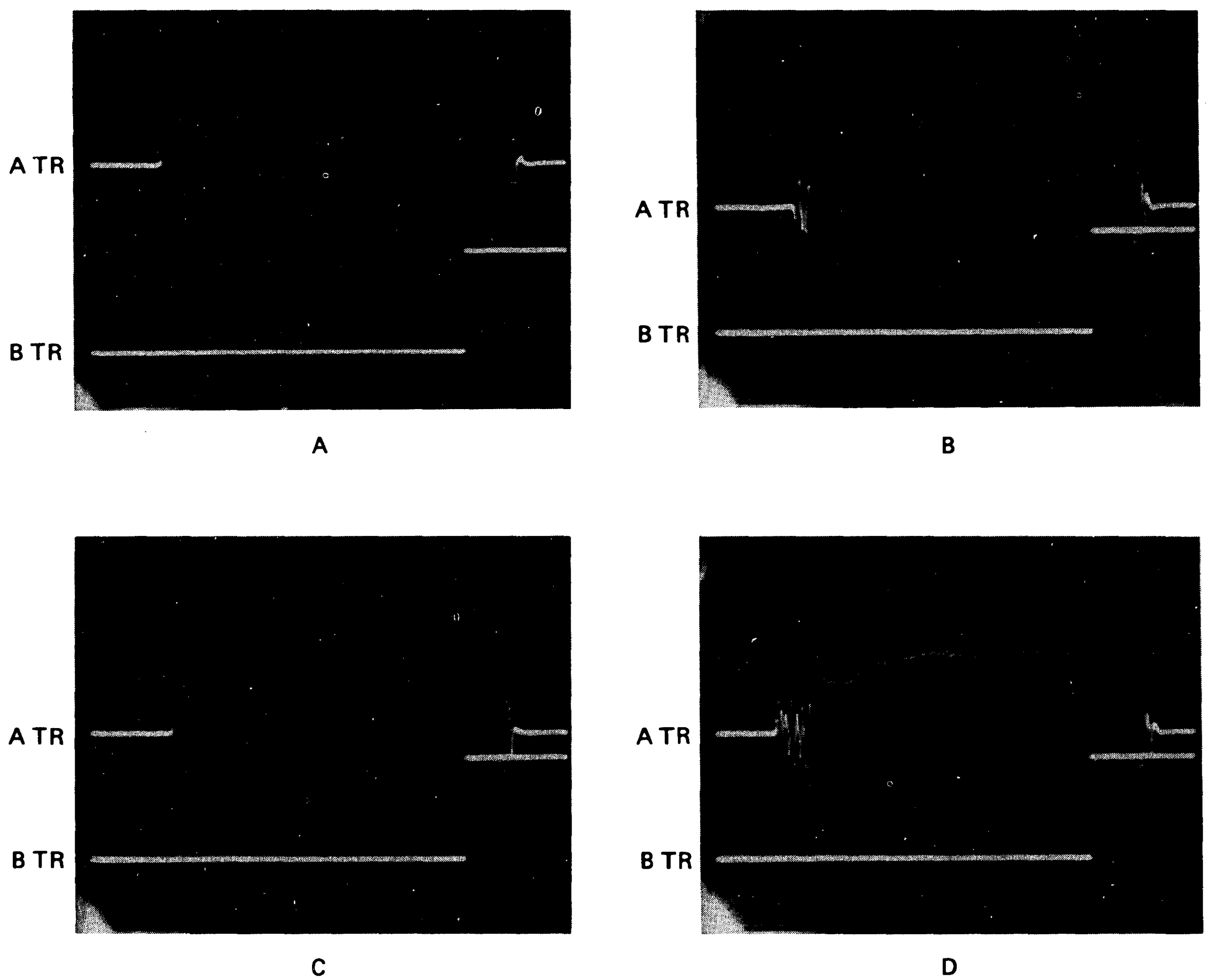


Figure 4-4. Start/Stop Profiles

c. Turn potentiometer R1 fully CW (maximum light).

d. Manually move tape so that the BOT hole passes back and forth over the photo sensor. (This is easily done by turning first one clutch output gear, then the other. Maintain tension on the tape by applying drag to the opposite gear you are turning). Both TPP and CL should be switching as the hole crosses the sensor.

e. Decrease lamp intensity (turn potentiometer R1 CCW) in small increments and repeat step d. each time. Note and record the voltage at connection 1 or 2 of potentiometer R1 when CL stops switching (remains false).

f. Continue decreasing lamp intensity in small increments and moving the tape so that BOT passes back and forth over the photo sensor. Note and record the voltage at connection 1 and 2 of potentiometer R1 just before TPP stops switching (remains false).

g. Now set R1 to obtain a voltage midway between the voltages recorded in steps e. and f.

DRIVE SPEED ADJUSTMENT

The following adjustment is made to ensure that the tape speed of the cassette unit is within the specified limits. The tape speed directly affects the information packing density and interchangeability of the tape with other drives.

a. Load a cassette skew alignment tape (part number 2040 0610) on the unit.

b. Set the scope as follows:

Main Sweep = 20 microseconds per division.
A-trace = 1 volt at TP-4 of Logic Card (DATA/)
(TP1 on early models of the Logic Card)

c. Initiate forward drive from clear leader using the cassette exerciser, and adjust R2 on the Servo Card so that the period between the leading edges of two consecutive pulses is 125 +10 microseconds (8 kHz $\pm$10 percent) during the first five feet of tape (six second drive from clear leader). (See figure 4-5.) It may be necessary to rewind the tape several times in order to make this adjustment within the specified area of tape.

d. Drive the tape forward to within 50 feet of the end of tape (EOT).

e. Adjust R1 on the Servo Card for an end of tape speed of 125 $\pm$10 microseconds between the leading edges of two consecutive pulses (see figure 4-5).

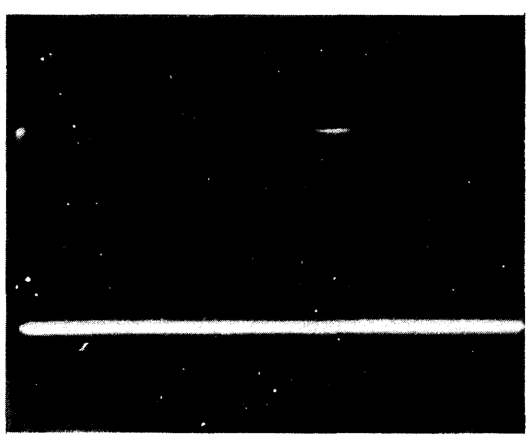


Figure 4-5. Drive Speed Adjustment

f. Initiate a backward drive to position the tape within 50 feet of the beginning of tape (BOT).

g. Adjust R3 on the Servo Card for 125 ±10 microseconds while driving the tape backwards within 50 feet of BOT (refer to figure 4-5).

h. Re-verify the procedure to ensure the accuracy of the adjustments made. This re-verification must be made because of the interaction between adjustments.

ANALOG SIGNAL GAIN ADJUSTMENT

The following procedure adjusts the gain of the analog read signal at a tape speed of 10 inches per second (IPS). The gain is directly affected by the speed of the tape, so the tape speed must be correct before making this adjustment.

a. Create an "all bits" tape in the continuous mode, at 10 inches per second, using the cassette exerciser.

b. Rewind the tape and read forward at 10 IPS.

c. Set up the scope as follows:

Main Sweep = 50 microseconds
A-trace = 1 volt, at TP-3 of Read Card (DATA)
Trigger = Internal positive

d. Adjust R5 for a peak-to-peak amplitude of 7.5 volts (if LIN 7402-002 is not installed, adjust to 10 volts).

e. Move the A-trace to TP-1 (CLOCK) and adjust R33 as in step d.

READ SKEW ADJUSTMENT

This adjustment must be made prior to performing the write skew adjustment. The read skew adjustment (see figure 4-6), is a factory adjustment and is sealed; it normally needs readjustment only if the head is replaced or has moved for some reason. As can be seen in figures 4-7A and B, perfect skew alignment results in ±40 to 50 microseconds of margin before a parity error condition occurs (data pulse falling outside of the clock window). Changing the read head alignment to correct minimal skew alignment (15 microseconds or less) will not improve the unit performance very much and will never resolve solid read problems. Moreover, changing the alignment may cause other problems, such as jitter and amplitude dropout due to the tape tracking differently over the head, which may already have a wear pattern corresponding to the original head alignment.

a. Ensure that the analog signal gains are correct as described above.

b. Insert an alignment tape (2040 0610) into the cassette unit and initiate a continuous forward read at 10 IPS using the cassette exerciser.

Adjustments

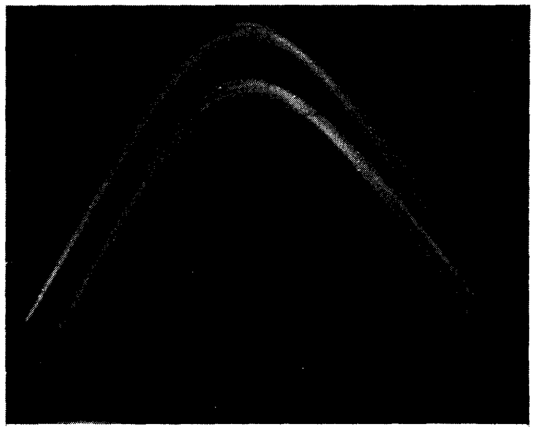
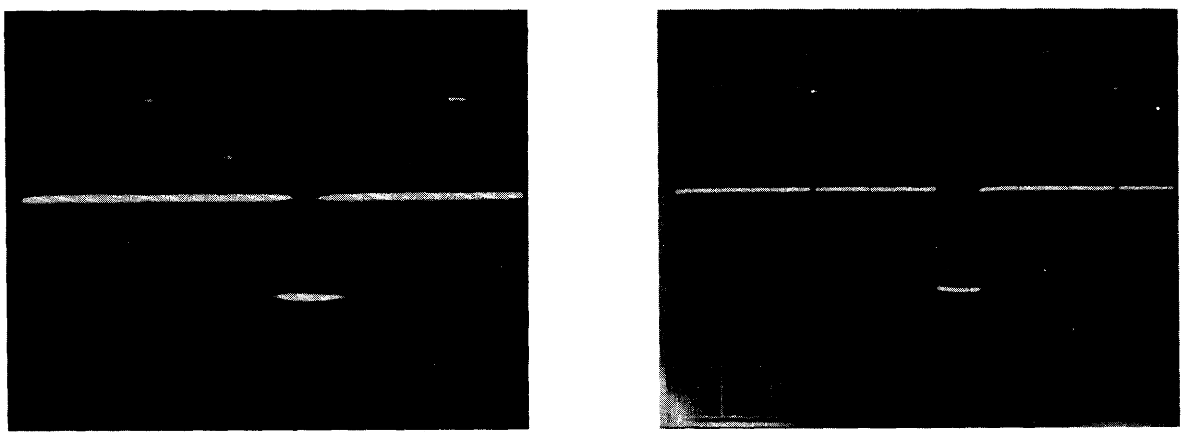


Figure 4-6. Read Skew Adjustment



A B

Figure 4-7. Read Skew Pulses

c. Set up the scope as follows:

Main Sweep = 10 microseconds, Alternate
A-trace = 0.5 volt, at TP-1 of Read Card (CLOCK)
B-trace = 0.5 volt, at TP-3 of Read Card (DATA)
Trigger = Internal positive on one channel only

NOTE

Ground the A and B trace and set the reference levels near the bottom of the scope face; then remove the ground.

d. If adjustment is necessary, remove the lid and adjust the screw on the left side of the read/write head to align the two positive peaks to within ±5 microseconds of each other (see figure 4-6). Re-install the lid, and re-verify this adjustment by performing the Read Skew Check in this section. If the read skew adjustment is changed, the write skew adjustment must be made.

READ SKEW CHECK

The following check should be made after completing the read skew adjustment or as a performance verification of the adjustment at anytime.

a. Insert an alignment tape into the cassette unit and initiate a continuous forward read at 10 IPS using the cassette exerciser.

b. Set up the scope as follows:

Main Sweep	=	20 microseconds, algebraic add
A-trace	=	2 volts, at TP-5 of Logic Card (CLOCK) (TP-3 on earlier model cards).
B-trace	=	2 volts, at TP-4 of Logic Card (DATA) (TP-1 on earlier model cards).
Trigger	=	Internal positive

The data pulse should fall near or at the center of the clock cell time as shown in figure 4-7A and B. The cell time should be approximately 100 microseconds. Figure 4-7A depicts normal jitter, and figure 4-7B is a single sweep photo for reference.

WRITE SKEW ADJUSTMENT

This adjustment is made while creating a tape on the cassette unit; its accuracy depends on correct read skew alignment. Prior to making this adjustment, verify the read skew by performing the Read Skew Check in this section.

a. Set up the scope as described in step c. of the read skew adjustment procedure.

b. Insert a blank tape into the cassette unit and write "all bits" at 10 IPS in the continuous mode using the cassette exerciser.

c. Adjust R2 on the NRZ Write Card to align the two positive peaks to within 5 microseconds of each other (see figure 4-6).

d. Verify this adjustment by performing the Read Skew Check in this section.

SECTION 5

MAINTENANCE PROCEDURES

INTRODUCTION

This section provides information relating to scheduled and unscheduled maintenance of the cassette unit. This section also provides instructions for the use of special tools used in maintenance and troubleshooting of the cassette unit.

MAINTENANCE TOOLS

Table 5-1 lists tools required to properly maintain the cassette unit.

Table 5-1. Tool Requirements for the Cassette Unit

Part Number	Description
*	Oscilloscope, dual trace (453 or equivalent)
1622 9478	VOM - (630 NA preferred)
*	Group III basic tool kit
	Soldering set consisting of:
1623 0047	Handle and cord
1623 0104	Transformer
1623 9659	Solder
1623 0062	Tip, small
1623 0054	Tip, large
1623 1185	Trimpot adjusting screwdriver
1622 7159	Cotton swabs
1622 3778	Lint free wiper
1622 0484	Pliers, needlenose
1622 6939	Forceps
1623 0625	.035 allen wrench
1623 9337	.050 allen wrench
	Allen wrench handle
1623 2332	.048 "L" bristol wrench
1623 9576	.060 "L" bristol wrench
1622 2838	Pin extract tool
2026 2507	Cassette exerciser
2040 0610	Cassette skew alignment tape
2040 6419	52 pin card extender
2040 6443	30 pin card extender
2040 7011	Clutch torque adjust tool
* Refer to the field engineering tool catalog.	

TAPE CLEANERS

The only recommended cleaner is TP35 (Burroughs tape path cleaner). This cleaner is available in kit form (P/N 25-1110-511), which includes lint-free cloths, wipers, and cotton swabs.

SCHEDULED MAINTENANCE

Table 5-2 lists the regular schedule of maintenance on an actual-on-time (AOT) basis. AOT is the power-on time, whether or not the tape is in motion. The number in the "Procedure" column of table 5-2 refers to the paragraph following the table which contains detailed information on the procedure to be followed.

Table 5-2. Maintenance Schedule

Schedule	Procedure
8 Hours AOT	
Operator clean the following:	
Read/write head	1
Tape path	1
500 Hours AOT	
Check the following:	
Gear drive assembly	2
Clutch and brake assemblys	3
Amplifier gains and skew	4
Tape speed	5

1. Read/Write Head

   The tape path and read/write head must be cleaned with a cotton swab and Burroughs tape path cleaner (TP35). Care must be taken not to leave any cotton in the tape path after cleaning.

2. Gear Drive Assembly

   The gears and the gear area must be kept free of dust and foreign matter. Use cotton swabs and lint free cloths. Do not clean the drag brake or spindle shaft surfaces.

3. Clutches

   Perform the start/stop check and drag brake adjustments (section 4).

4. Amplifier Gains and Skew

   Check the amplifier gains and read and write skew (section 4).

5. Tape Speed

   The tape speed must be consistent over the entire legnth of tape. Refer to section 4 for the procedure.

COMPONENT LOCATIONS

See figure 5-1 for letter designations of components on the deck assembly. See figure 4-1 for card loading.

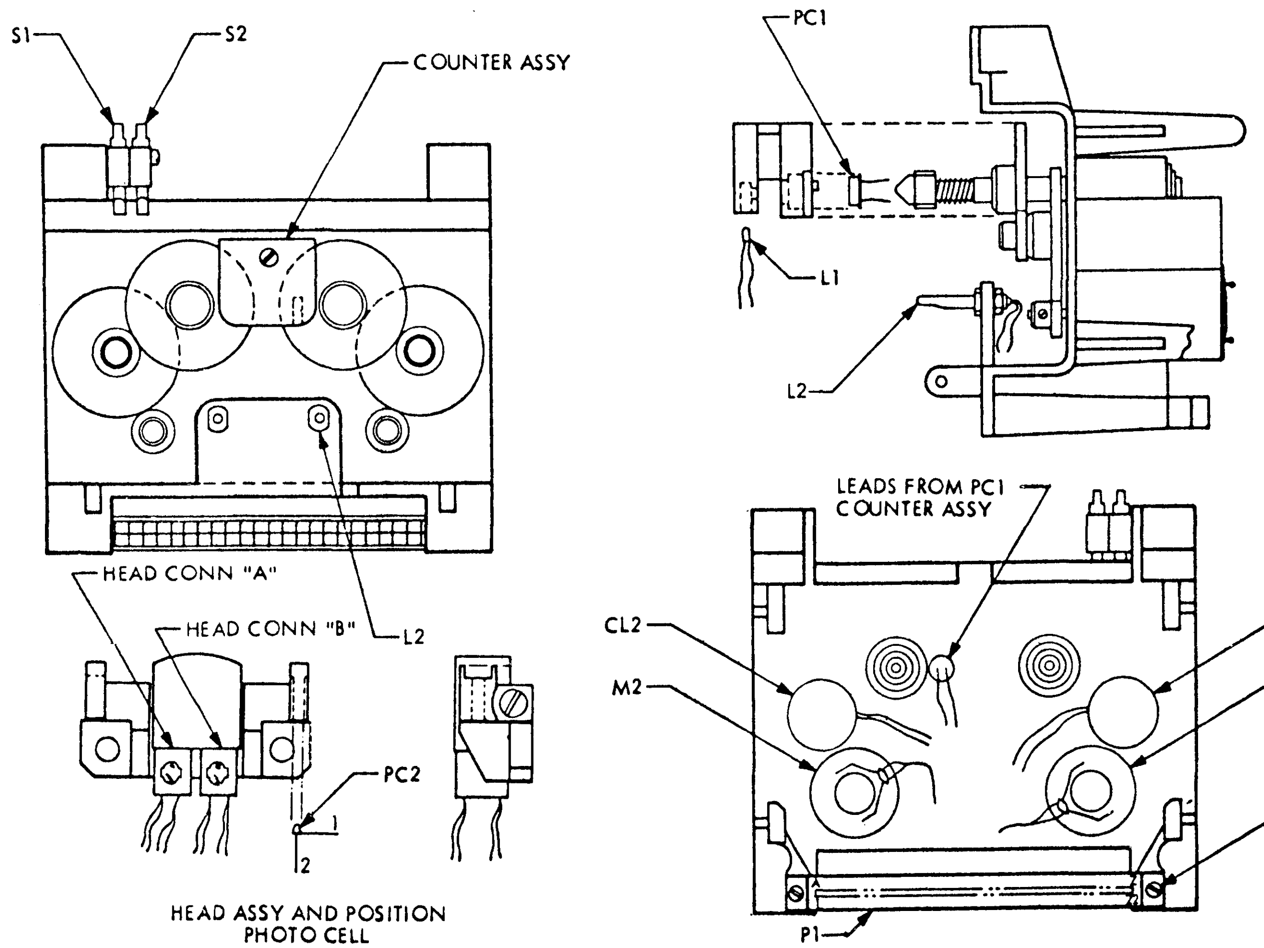


Figure 5-1. Deck Component Designations

TAPE CARTRIDGE MAINTENANCE

TRANSPORTATION AND STORAGE

During transportation and storage, it is recommended that recorded cassettes be kept under the following conditions:

Temperature:	40 to 122 degrees Farenheit
Relative humidity:	20 to 80 percent (no condensation)

During transportation and storage, it is recommended that a means be provided to secure the reels (the cartridge containers provide this) to prevent any tendency to unwind. The containers must be clean and must have a construction that will keep dust and moisture out.

When transporting, it is recommended that a space of not less than 3.15 inches be provided between the cassette tape and the outer surface of the final container when risks of damage due to stray magnetic fields may be encountered.

Whether recorded or unrecorded, every effort must be made to keep the cassettes within the above environment during shipping and storage to avoid degradation of their intended performance.

ACTIVE OPERATION ENVIRONMENT

It is recommended that cassettes being actively used for data interchange be operated under the same conditions as those specified for the cassette unit (refer to section 6).

TAPE LIBRARY MAINTENANCE

For proper library maintenance, the following information must be recorded upon receipt of new tapes. A method should be provided to label the cartridge or its container with the following information:

a. Cartridge serial number (matching number on container).

b. Date of purchase.

c. Date of last cleaning.

d. Date of last certification.

NOTE

> Necessity for cleaning is based on the error rate encountered and its acceptability to the user. Recertification should be based upon the same error rate percentage or decrease after cleaning.

Each cassette must be clearly identified when put into use. Identification should consist of a date code and identification number. Master file tapes should be clearly marked for ease of identification.

A performance history should be maintained for each cassette tape, noting date entering use, error history, certifications, tape cleaning history, and maintenance intervals required.

Periodic visual inspection should be performed on each cassette, noting non-uniformly wound reels, or contamination buildup on any of the open end surfaces that would prevent the proper loading and unloading of the cassette cartridge.

Tape damage of any type that causes permanent deformation or distortion of the tape will result in unpredictable operation, and the cassette tape should be discarded. Splicing is to be avoided because the permanent flaw created by the splice will result in unpredictable operation.

If possible, the tapes should be degaussed prior to each writing to ensure full erasure of old information.

The useful life of the cassette tape should be determined for each application. In general, cassette tape life is reduced more by operator handling than by cassette use. The end of tape life can be determined by the performance history of the tape. Analysis of time in service, the number of temporary errors, and a visual inspection should provide guidelines in determining the end of a cassette tape useful life. In general, 5000 passes on a cassette or any part of a cassette can be considered as normal tape life expectancy, assuming Burroughs approved tape and recommended tape handling procedures have been used.

TAPE HANDLING

The following rules must be observed when handling the cassette tape cartridge if reliability is to be maintained:

a. Always replace the cartridge in its container after use.

b. Rewind the tape before removing it from the cassette unit.

c. Never touch the recording surface of the tape with the fingers.

d. Never force the cartridge into the cassette unit or damage will result to both.

e. Tapes should be degaussed prior to each writing.

f. Throwing or dropping a cartridge may distort it, causing the tape to bind or mistrack.

g. Do not place the cartridge in hot places or on devices which produce magnetic fields. The recorded information will be altered or distroyed.

h. Do not attempt to splice on any portion of the tape or erratic tape speed will result and errors will be created.

i. Do not leave the tape cartridge open when not in use.

Cassette tape load and unload access is gained by pressing the LOAD/UNLOAD button at the top of the cassette unit face. The cassette tape should be gently inserted with its open edge down, and the "A" side facing the operator. Tape drive motion and the amount of tape on the supply reel can be seen through the front view window. Optional indicators are available, one for file protect indication and another, externally controlled through the interface, to indicate a ready condition. Unloading should be attempted only with the drive stopped and the cassette tape in the rewound position. After use, the cassette carriage should be closed to prevent the accumulation of dirt and dust in the cassette drive mechanism. Do not actuate rewind by opening and closing the carriage assembly door. The rewind mode must be actuated only by the controller. To avoid possible tape damage, do not open the carriage assembly door unless the tape is positioned at clear leader.

CASSETTE EXERCISER

The cassette unit exerciser has been released as a branch tool to facilitate cassette unit adjustments and repair. Designed with sturdiness and compactness in mind, it may easily and safely field transported.

Although its purpose is to permit cassette unit maintenance in an off-line mode, it nevertheless requires power from the host system. It is therefore recommended that power be turned off at the host system when connecting the exerciser. However, the exerciser may be connected with host system power applied if the situation calls for uninterrupted system operation; in any event care must be exercised.

EXERCISER CONNECTION

The following procedure must be followed to connect the exerciser to the cassette unit and the host system. To disconnect the exerciser, reverse the procedure.

a. Turn the system power off (if possible).

b. Carefully disconnect the interface cable from the connector at the rear of the cassette unit.

c. Carefully connect the exerciser signal cable (18 inch multi-colored ribbon type) to the connector at the rear of the cassette unit. This connector is keyed so that the unused pins contact the underside of the interconnect board.

d. Carefully connect the exerciser power cable (36 inch, 4 wire) to the connector of the interface cable removed from the cassette unit in step b. This cable is also keyed to ensure proper mating, but extra care should be taken if power has not been turned off.

e. Turn the host system power on.

EXERCISER CONTROLS AND INDICATORS

The exerciser is equipped with eight slide switch controls, fifteen indicators, and two adjustable potentiometers (see figure 5-2). These controls and indicators provide the ability to perform and monitor all tape functions.

Switches

RUN — When on (slide left), this switch enables all exerciser functions.

HSL — When on (slide left), this switch enables 30 OPS operation. When off (slide right), 10 IPS operation is enabled.

RCL — When on (slide left), enables high clipping level (for 30 IPS). When off (slide right), enables normal clipping level (for 10 IPS).

RWD — A spring loaded switch. When activated, (slide left) a rewind is initiated. Rewind terminates by clear leader detection. This switch will override any other selected function and will extinguish their respective indicators.

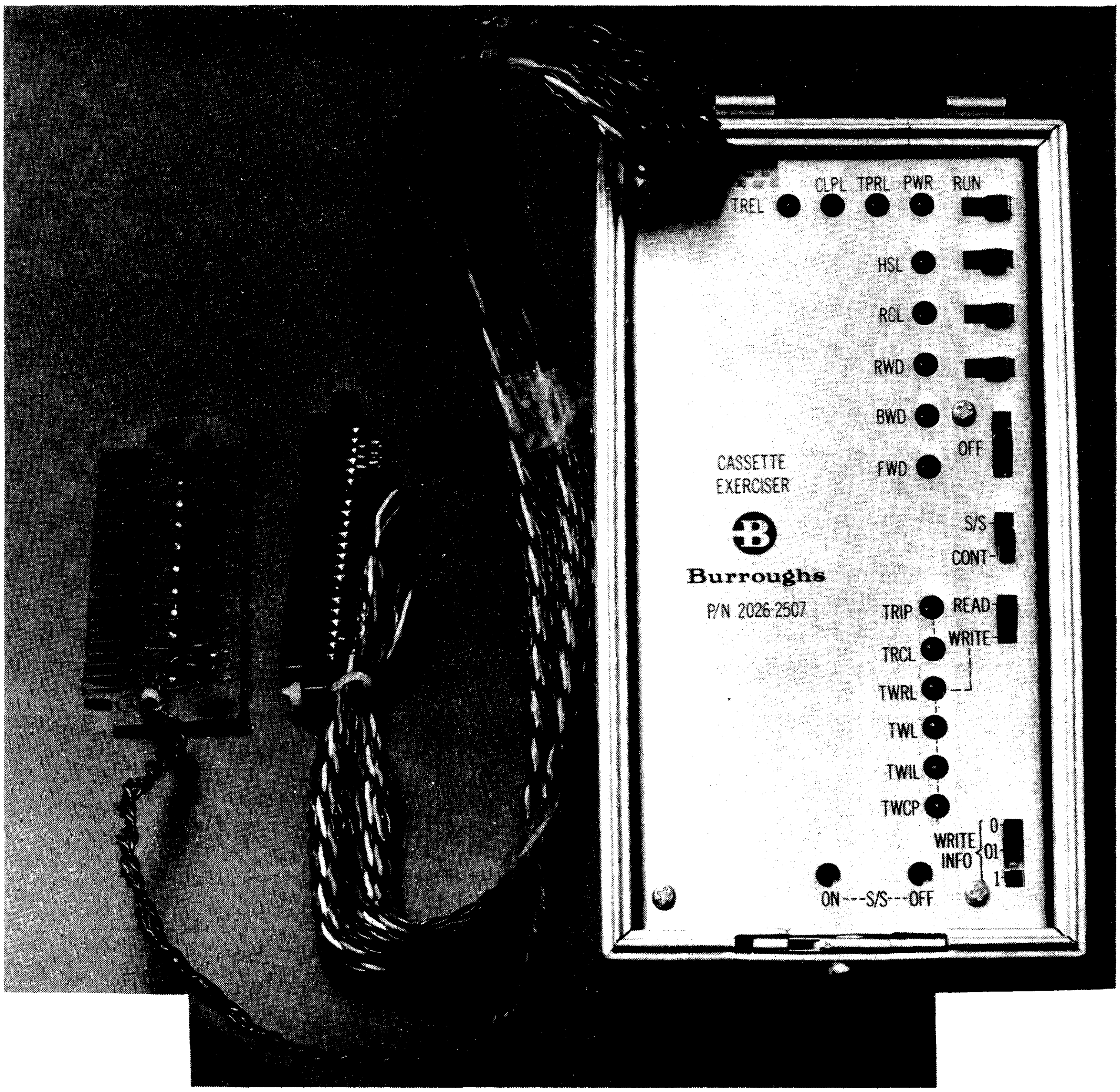


Figure 5-2. Cassette Exerciser

BWD/OFF/FWD — A 3-position switch. When up, initiates reverse drive; in center, no drive; when down, initiates forward drive.

S/S - CONT — When up, initiates drive in a start/stop mode. When down, initiates drive in a continuous mode.

READ/WRITE — When up, initiates a read operation. When down, initiates a write operation.

WRITE INFO — A 3-position switch working in conjunction with the READ/WRITE switch in the WRITE (down) position. When up, all 0-bits will be written in the data track. When in middle, alternate 0-bits and 1-bits will be written in data track. When down, all 1-bits will be written in data track.

Potentiometers

S/S-ON — Adjusts duration of tape run time when in start/stop mode. Minimum on time should be 50 milliseconds.

S/S-OFF — Adjusts duration of tape stop time when in start/stop mode. Minimum off time should be 50 milliseconds.

Indicators (LED's)

TREL — Illuminated once a cassette has been inserted and fully rewound to clear leader.

CLPL — Illuminated when cassette is at clear leader.

TPRL — Illuminated when tape is positioned somewhere between the BOT hole and the EOT hole.

PWR — Illuminated when dc voltages are applied to the exerciser from the host system.

HSL — Illuminated when high speed (30 IPS) has been selected by the HSL switch.

RCL — Illuminated when high level read clipping has been selected by the RCL switch.

RWD — Illuminated when a rewind is initiated by the RWD switch.

BWD — Illuminated when the drive switch is up, selecting backward tape drive.

FWD — Illuminated when the drive switch is down, selecting forward tape drive.

TRIP — Illuminated when 1-bits are being read from the data track. This indicator actually goes on and off but appears to be on constantly.

TRCL — Illuminated when 1-bits are being read from the clock track. This indicator actually goes on and off but appears to be on constantly.

TWRL — Illuminated when the write tab on the cassette is in the position to permit writing.

TWL — Illuminated when the READ/WRITE switch is in the WRITE position.

TWIL — Illuminated when 1-bits are being written in the data track. This indicator actually goes on and off but appears to be on constantly. It reflects the pattern generated by the WRITE INFO selector.

TWCP — Illuminated when 1-bits are being written in the clock track. This indicator actually goes on and off but appears to be on constantly.

EXERCISER OPERATIONAL USES AND PRECAUTIONS

This exerciser should be used in performing all prescribed adjustments and to facilitate troubleshooting. It should not be used to create tapes to be used for head skew or drive speed adjustments, because the write clock frequency is not closely regulated or adjustable. The alignment tape, P/N 2040 0610, must be used for these adjustments. The start/stop mode is implemented to permit verification of the mechanical and electrical start/stop characteristics of the unit and is done by reading a previously created "all bits" tape in a start/stop mode while monitoring the analog read signal (TP1 or 3 on the NRZ Read card), as described in section 4. The start/stop feature is of no value in the write mode. It does not create valid records with normal inter-record gaps, because the drive is simply permitted to start and stop while the write logic runs continuously.

EXERCISER COMPONENTS

Figure 5-3 illustrates the location of the cassette exerciser components. Figure 5-4 shows the complete schematic diagram of the exerciser.

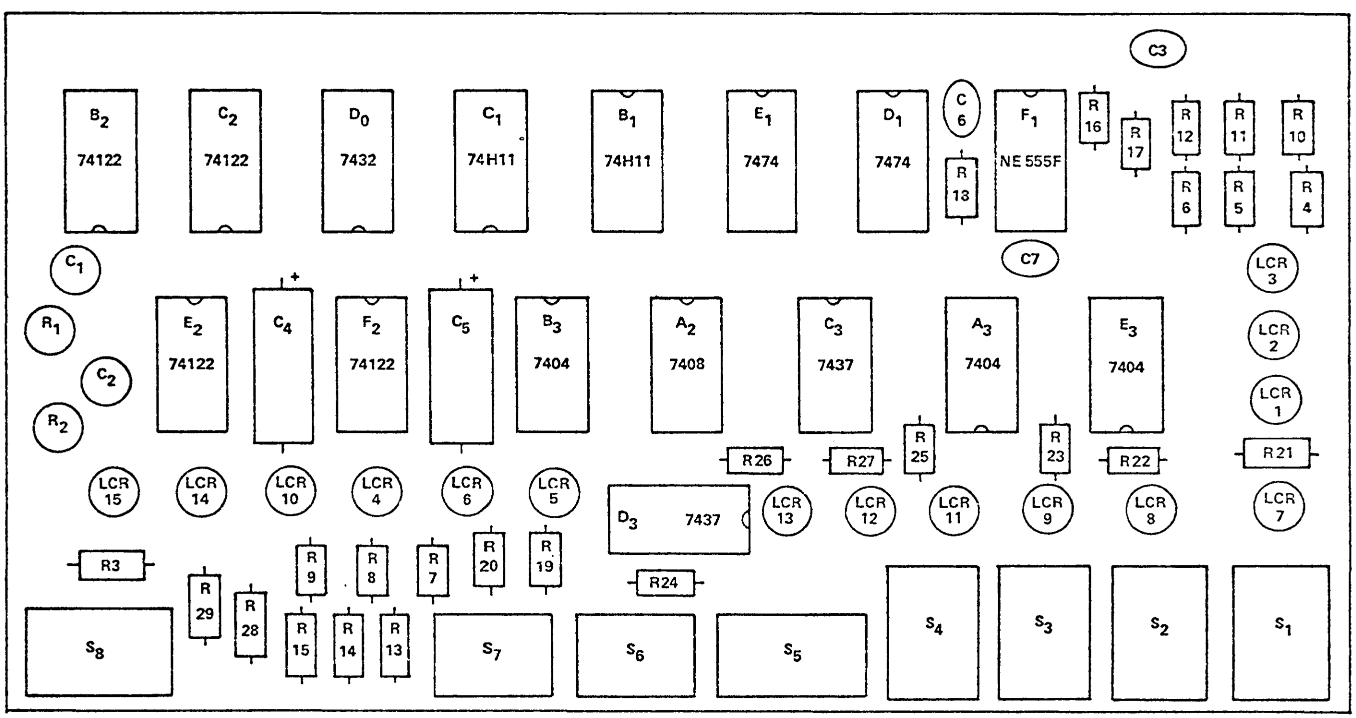


Figure 5-3. Cassette Exerciser Component Locations

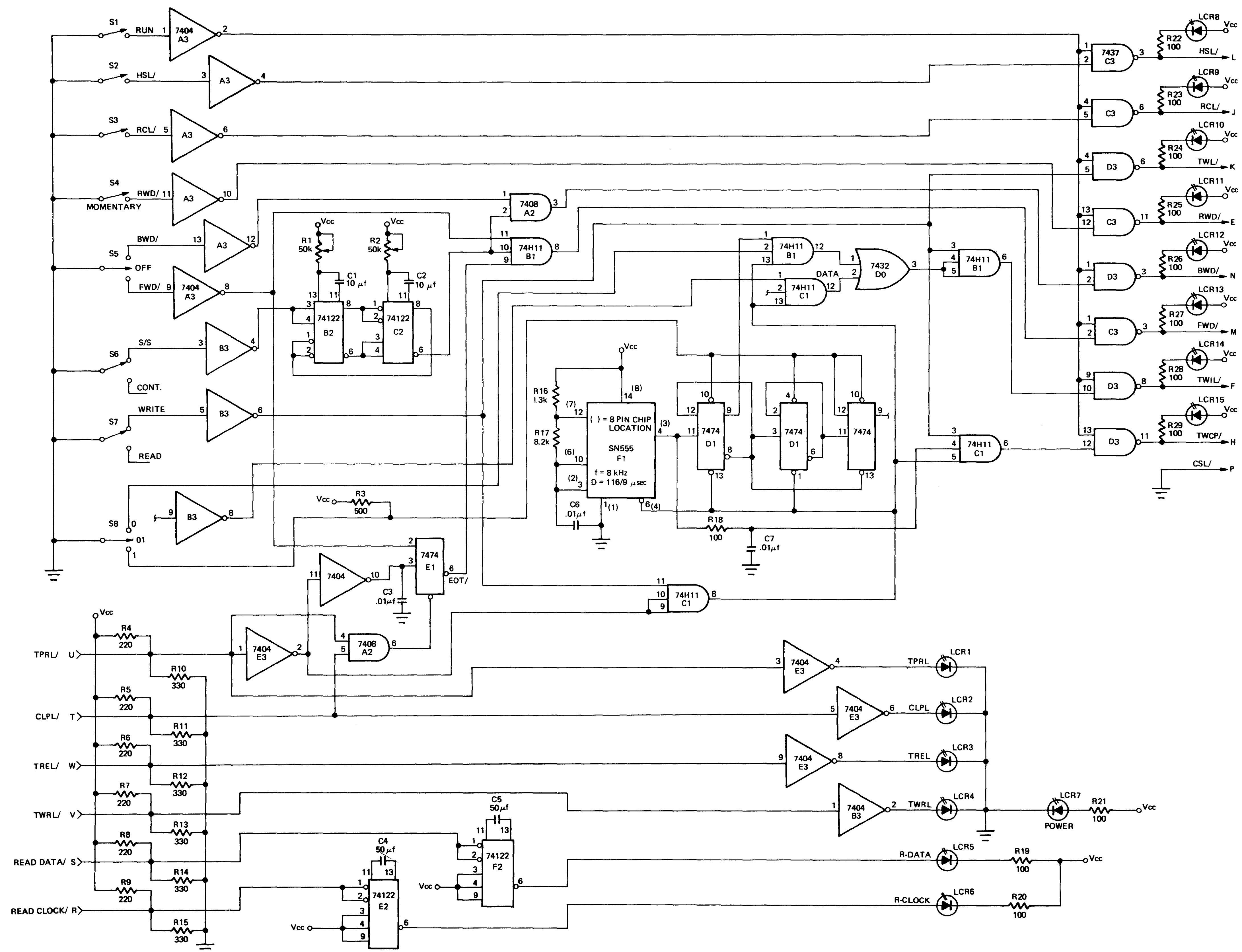
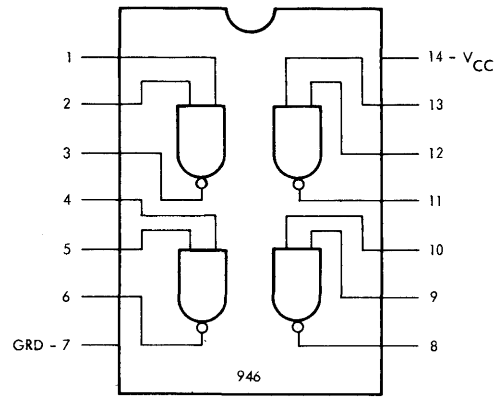


Figure 5-4. Cassette Exerciser Schematic

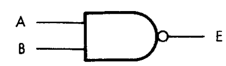
LOGIC DEFINITIONS

Figure 5-5 (3 sheets) illustrates the chip logic and special purpose electronic components used in the cassette unit.



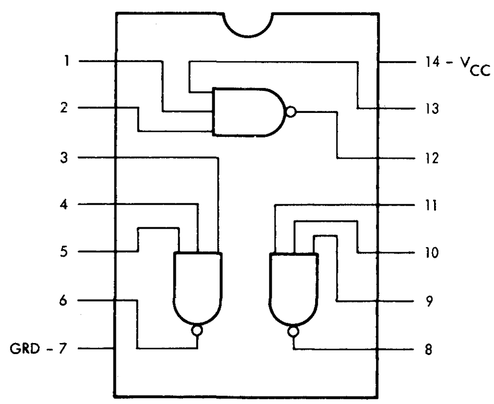
(1471 4364)
DTμL 4 x 2 GATE

POSITIVE NAND LOGIC



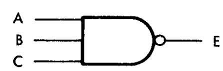
TRUTH TABLE

A	B	E
0	0	1
1	0	1
0	1	1
1	1	0



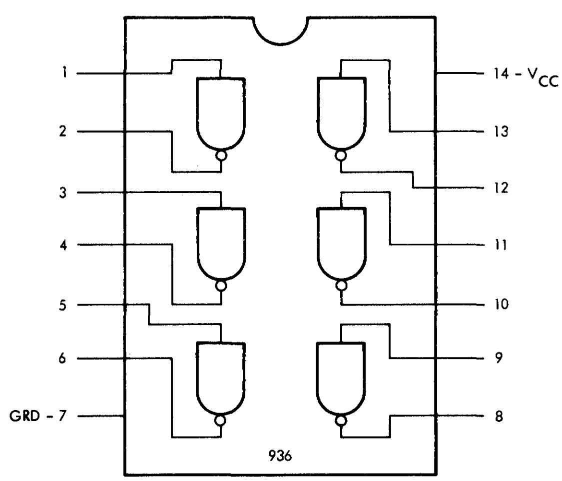
(1471 4372)
DTμL 3 x 3 GATE

POSITIVE NAND LOGIC



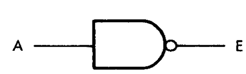
TRUTH TABLE

A	B	C	E
0	0	0	1
0	0	1	1
0	1	0	1
0	1	1	1
1	0	0	1
1	1	0	1
1	0	1	1
1	1	1	0



(1471 4356)
DTμL 6 x 1 GATE

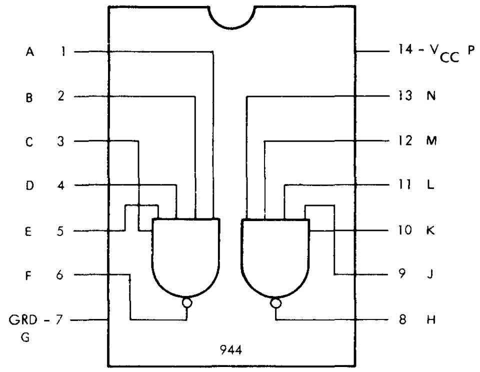
POSITIVE NAND LOGIC



TRUTH TABLE

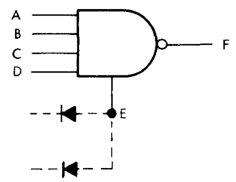
A	E
1	0
0	1

Figure 5-5. Chips and Special Components (sheet 1)



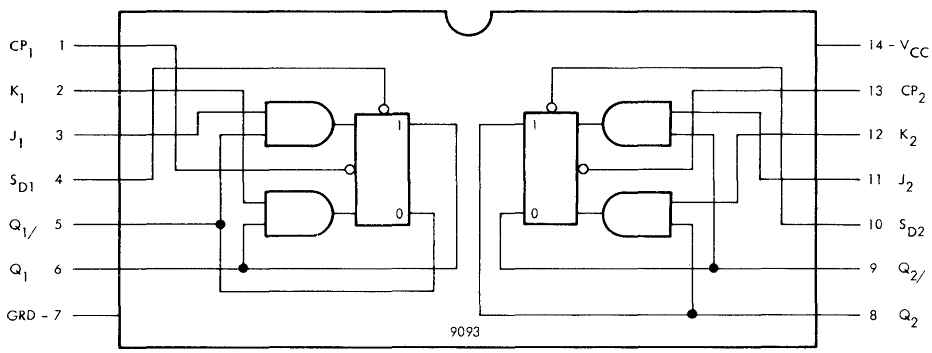
(1471 4398)
DTμL 2 x 4 BUFFER

POSITIVE NAND LOGIC



$F = \overline{A \cdot B \cdot C \cdot D \cdot E}$

NOTE:
EXTENDER INPUT "E" CAN BE USED FOR ADDING INPUTS. THIS INPUT CAN EITHER BE LEFT FLOATING (HI) OR TIED TO +5 VOLTS (HI) WHEN NOT USED.



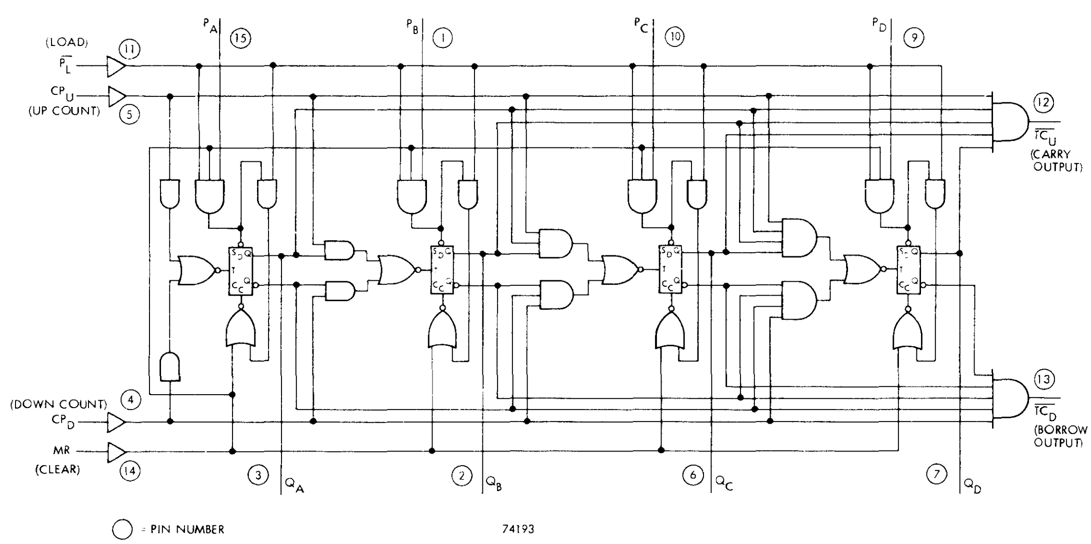
(1472 7721)
DUAL J-K FLIP-FLOPS
SEPARATE CLOCKS

J-K TRUTH TABLE		
t_N		t_{N+1}
J_1, J_2	K_1, K_2	Q_1, Q_2
0	0	Q_{1_N}, Q_{2_N}
1	0	1
0	1	0
1	1	$Q_{1_N/}, Q_{2_N/}$

0 = LOW STATE (MORE NEGATIVE)
1 = HIGH STATE (MORE POSITIVE)

ASYNCHRONOUS TRUTH TABLE		
S_{D1}, S_{D2}	Q_1, Q_2	$Q_{1/}, Q_{2/}$
1	NC	NC
0	1	0

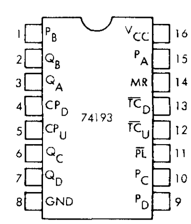
NC = NO CONTROL
0 = LOW STATE (MORE NEGATIVE)
1 = HIGH STATE (MORE POSITIVE)



○ = PIN NUMBER

74193

CONNECTION DIAGRAM
DIP (TOP VIEW)

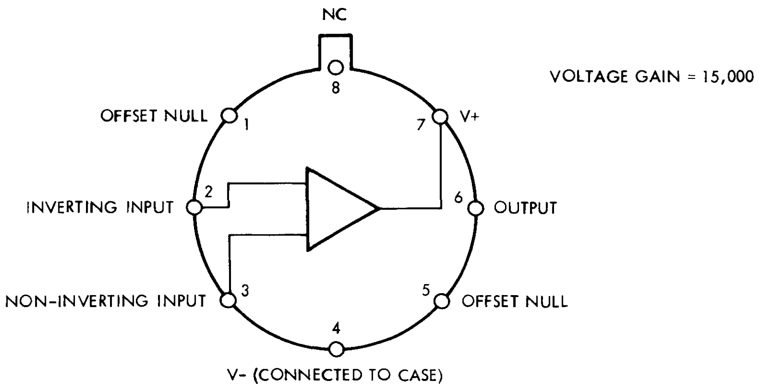


SET OUTPUT = HI
CLEAR OUTPUT = LOW

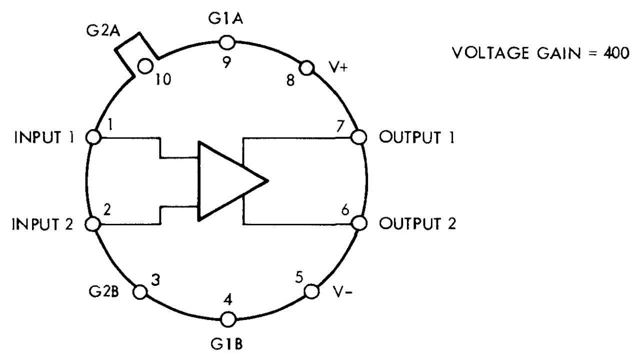
UPCOUNT:
(1) CP_D = HI
(2) CP_U = PULSED

DOWNCOUNT:
(1) CP_D PULSED
(2) CP_U = HI

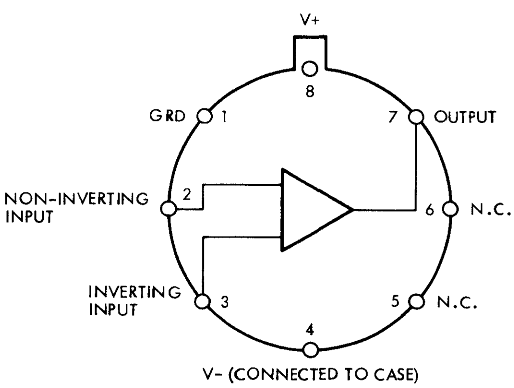
Figure 5-5. Chips and Special Components (sheet 2)



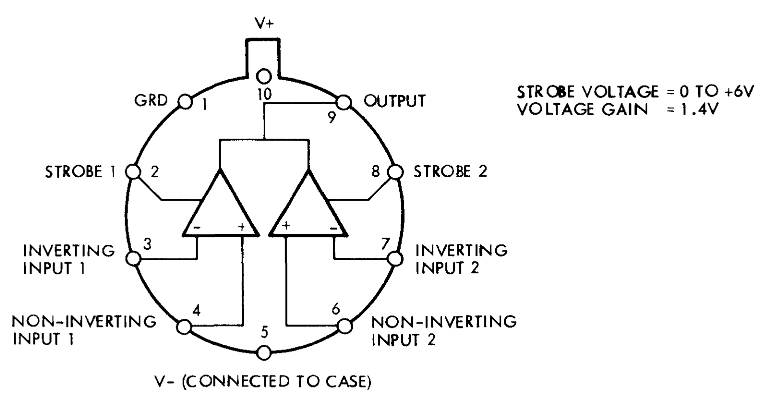
(2014 6684)
INTEGRATED CIRCUIT, AMPLIFIER



(2157 1393)
AMPLIFIER, DIFFERENTIAL



(1127 2077)
COMPARATOR-VOLTAGE, DIFFERENTIAL



(1474 3736)
DUAL DIFF COMPARATOR

Figure 5-5. Chips and Special Components (sheet 3)

SECTION 6

INSTALLATION PROCEDURES

INTRODUCTION

The following section provides information required to install the Cassette Tape Unit in either the free standing or panel mounted configuration. Information is also provided concerning power and environmental requirements, and for checkout procedure.

INPUT POWER

The cassette unit contains no power supplies. All power for the cassette unit must be supplied by the system to which it is interfaced. The power requirements are as follows:

+5.0 volts, 1.0 amp at 10 percent regulation
+12 volts, 0.5 amp at 10 percent regulation
-12 volts, 0.125 amp at 10 percent regulation

OPERATING ENVIRONMENT

It is recommended that the cassette unit operate under the following environmental conditions:

Temperature:	50 to 90 degrees F.
Relative Humidity:	20 to 80 percent (no condensation)

The immediate operation environment must be free of liquid or particulate contaminates, such as coffee, soft drinks, cigarette ashes, paper dust, etc. Rapid changes in temperature or humidity should be avoided. The cassette tapes should not be used or stored near strong magnetic fields or "hot spots". These can damage the tapes and/or the information on them.

TAPE LIBRARY AND STORAGE ENVIRONMENT

It is recommended that cassette tapes be stored under the following conditions:

Temperature:	40 to 122 degrees F.
Relative Humidity:	20 to 80 percent (no condensation)

CABLE REQUIREMENTS

The cassette unit requires one cable to connect it with the host system. In the case of B 1700 and B x383 program loaders, this cable is an integral part of the system mainframe. In all other applications, (B 700 series, L 8000 series, AE300, DC140) one of two cables is shipped with the cassette unit, as follows:

P/N 2046 2008 - 7 foot cable for the panel mount option
P/N 2046 1992 - 10 foot cable for the cabinet mount option

An optional 15 foot cable (P/N 2048 0703) is also available for use where the extra length is necessary. In all cases, the connector used at the cassette end of the cable is part number 2041 2516 and uses contact pin part number 2041 2524.

CASSETTE UNIT DIMENSIONS

The following cassette unit dimensions are provided for mounting of the cassette unit. Installation can be at any angle. The installed unit will extend approximately 3/8 inch (9.5 mm) above the panel mounting surface. Provisions are made within the unit for panel mounting lugs. These lugs will accommodate mounting panel thicknesses ranging from 1/16 inch (1.6 mm) to 3/8 inch (9.5 mm). The total dimensions of the unit within the case or for panel mounting are as follows:

Width (includes bezel):	5.4 inches (137 mm)
Height (includes bezel):	5.4 inches (137 mm)
Depth (includes bezel):	7.5 inches (190 mm)

The recess dimensions required for the panel mounting of the cassette unit are as follows:

Width:	5.4 inches (137 mm)
Height:	5.4 inches (137 mm)
Depth:	9.0 inches (228 mm)

SPECIAL GROUNDING REQUIREMENTS

The cassette unit obtains dc ground via the signal cable from the host system. This ground is then tied to chassis ground within the cassette unit.

In panel mount applications, such as B 1700 and B x383 where the cassette unit is mounted in a metal system chassis, ground loops are possible. To eliminate this possibility, it is recommended that the internal dc to chassis ground jumper in the cassette unit be cut (E1 to P21) and a suitable external ground from the cassette unit chassis be provided.

Although the correct grounding of the cassette unit is incorporated through the host system, it is advisable to verify during installation that there are no ground loops or poor grounds that will cause intermittent read problems.

CHECKOUT PROCEDURE

Drawings showing the location of parts and plugs are located in section 5 of this manual and in the test and field document package. The following procedure should be performed after the installation of the cassette unit to ensure that all procedures were followed correctly.

a. Read section 1 of this manual.

b. Connect the signal cable to the host system but do not connect it to the cassette unit.

c. Power up the system and check the dc voltages at the cassette unit end of the cable (P2) as follows:

Pin A +5 volts dc $\pm$10 percent
Pin B +12 volts dc $\pm$10 percent
Pin C -12 volts dc $\pm$10 percent

d. With power off, plug the cable into the cassette unit. Turn the power on. The counter and BOT lamps should be on.

e. Load a cassette cartridge with the tape positioned beyond BOT (the tape may be positioned beyond BOT by inserting a pencil into the take-up reel hole and turning for a period of time). After the cassette is inserted, the unit should automatically rewind to clear leader.

f. Run all applicable routines to ensure the proper operation of the cassette unit (routines are provided by the host system).

NOTE

If problems are encountered, refer to section 2 for detailed unit descriptions, section 4 for adjustment checks and procedures, and section 5 for maintenance procedures.

INDEX

INDEX (Cont)

INDEX (Cont)

This package includes Rin -006 thru -010

Burroughs FIELD ENGINEERING	RELIABILITY IMPROVEMENT NOTICE	SYSTEM SERIES B1700/Bx383	NO. R7402-006
		STYLE/MODEL A/B9490	PAGE 1 OF 3
ORIGINATOR: TIO Westlake		TOP UNIT NO. 2040 5080	
STD. INSTALL. TIME 1.0 hour	UNITS AFFECTED * ~~(EC 30844 & 30933)~~	UNIT DESCRIPTION .150 Cassette Tape Drive	
TITLE Improved Door Latch and Cassette Positioning			DATE 6/27/75

TYPE OF CHANGE
☐ FUNCTIONAL ☐ IMPROVED MAINTAINABILITY ☐ IMPROVED RELIABILITY

*Only affects program loader cassette drives with the early version latch and Bezel (white button)

PROBLEM: 1. Door latch failures of various types: Failures to latch, failure to open, door unlatching during operation.

2. Intermittent read errors.

CAUSE: Marginal design of latch mechanism, and no facility to hold cassette in position.

CORRECTION: Install improved latch and Bezel assemblies which insures more positive latch and also holds cassette down, insuring more constant tape contact to the read head.

PARTS REQUIRED:

Part Number	Description	Qty	Unit List Price
2047 5174	Bezel Assembly	1	$31.54
2046 6942	Latch	1	1.33
2046 6959	Latch, Base	1	.67
2011 2090	Screw, 4-40x1	1	.13
1126 1781	Spacer	1	.19
1256 8069	Washer	1	.08
2158 4479	Washer	1	.53
2045 9384	Spring	1	.08
2300 4419	Screw 4-40x3/8	1	.08
1256 4035	Screw	1	.08

INSTRUCTIONS:

1. Remove cassette drive from its mounting and disconnect cable.
2. Remove old Bezel from the drive and discard. Retain 3 of the self tapping screws.
3. Remove and discard old spring latch from top of chassis. Retain one flat and one lock washer.
4. Assemble the new latch as shown in Figure 1, using the same tapped holes that secured the old latch. Use washers retained in Step 3 under screw 2300 4419, but do not tighten at this time.
5. Install new Bezel 2047 5174 using the 3 screws retained in Step 2 and screw 1256 4035 provided by this RIN. Screw 1256 4035 is shorter and should be used in the upper left corner (besides the two micro switches) to eliminate interferring with the release button travel.

☐ THIS CHANGE IS A RESULT OF FIELD REPORTING

F.E. Dist. Code BM

FOR LIBRARY BINDER 7
FOR F.E. TECHNICAL MANUAL FORM 1067402

Printed in U.S. America

6. Insert cassette in carriage, close carriage so that latch enters slot in carriage. Adjust base (Item 1), to obtain .033 Dim. with latch contacting carriage and tang on latch in contact with slot in base as shown in Figure 1. Tighten screw, Item 2. There should exist approximately .02 inch button pretravel. If not, bend latch away from button to obtain pretravel. Depress button to lift latch and release carriage. Should pretravel be excessive, latch may not be lifting sufficiently to release carriage. To correct, bend latch toward button.

7. Re-install unit and test for proper operation.

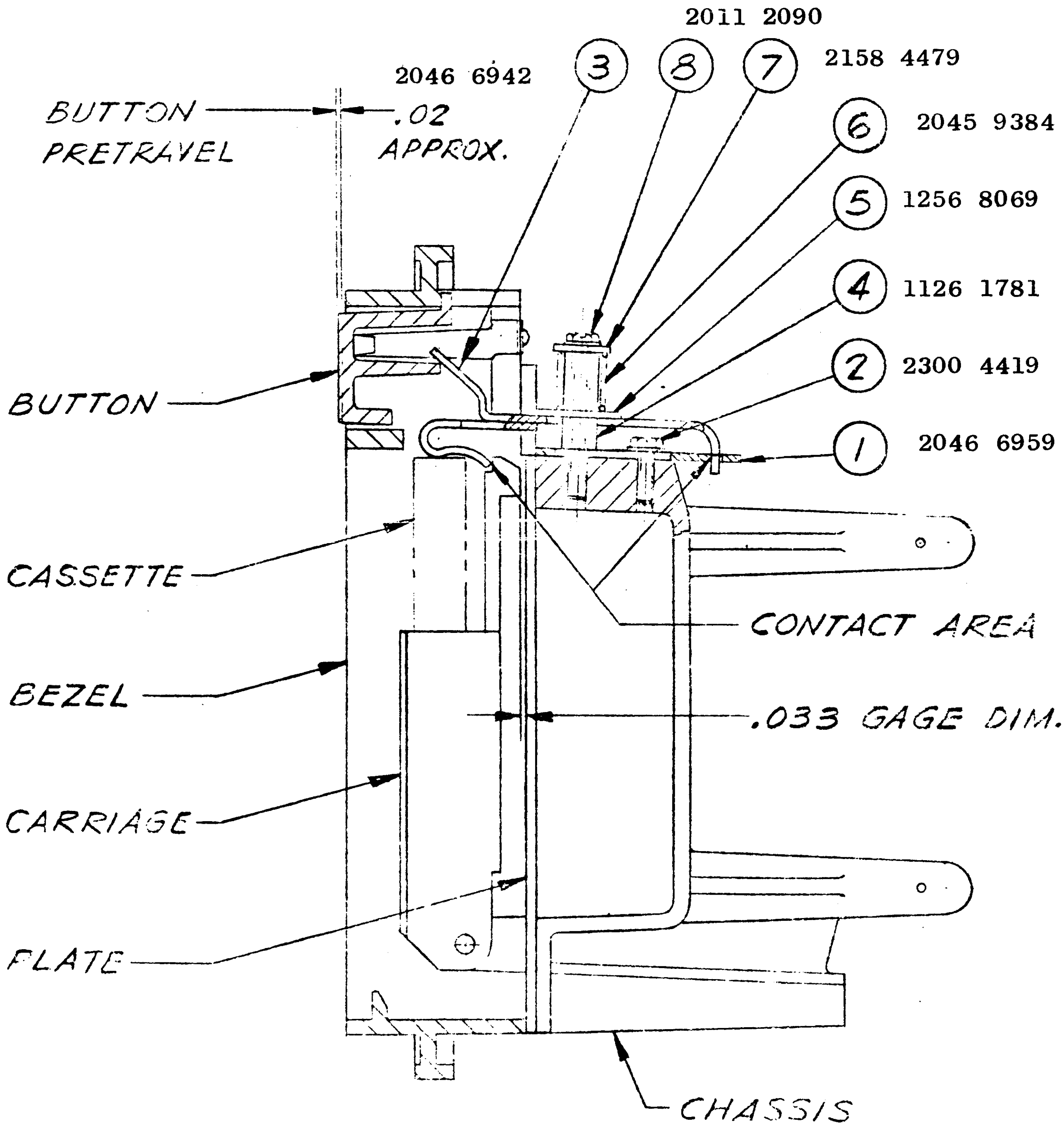

2011 2090
2046 6942
3
8
7
2158 4479
BUTTON PRETRAVEL
.02 APPROX.
6
2045 9384
5
1256 8069
4
1126 1781
2
2300 4419
1
2046 6959
BUTTON
CASSETTE
CONTACT AREA
BEZEL
.033 GAGE DIM.
CARRIAGE
PLATE
CHASSIS

FIG. 1

Burroughs FIELD ENGINEERING	RELIABILITY IMPROVEMENT NOTICE	SYSTEM SERIES L8000, TC3500	NO. R7402-007
		STYLE/MODEL A/B 9490	PAGE 1 OF 5
ORIGINATOR: TIO Westlake		TOP UNIT NO. 2040 5080	
STD. INSTALL. TIME 3/4 hour	UNITS AFFECTED See checkpoint	UNIT DESCRIPTION .150 Cassette Tape Drive	
TITLE (EC 31752) Prevent Counter Reset Due to False CLEAR LEADER			DATE 9/20/75
TYPE OF CHANGE ☐ FUNCTIONAL	☐ IMPROVED MAINTAINABILITY	☒ IMPROVED RELIABILITY	

*Check point: This RIN only applies to single light pipe units (between B95000 and B97500 approximately) on L8000 & TC3500's.

PREREQUISITE: Must be installed in conjunction with L8000/TC3500 Cassette control RIN 0498-022.

SYMPTON: Speed variations.

CAUSE: Turns counter being reset by false CLEAR LEADER signals.

CORRECTION: Implement logic to remove CL from the counter reset circuit and replace it with a new term, TRELP.

PARTS REQUIRED:
None

PROCEDURE:

1. Disconnect power from the cassette drive.
2. Remove the NRZ Write card (2047 9507) and rework as follows: (Refer to Figure 1).
   a. Cut two etches on solder side as shown.
   b. Add a wire between U3-14 and U2-14 on solder side as shown.
   c. Re-identify board as 2027 0070.
   d. Revise schematic 2026 3469 in T & F package as per page 4 of this RIN.
   e. Re-install card.
3. Remove the 10/30 IPS servo card (2047 1934) and rework as follows: (Refer to Figure 2).
   a. Cut etching between feedthrough hole above pin "P" and feedthrough hole above pin "V".
   b. Add jumper wire from feedthrough hole above pin "P" to U15-6.
   c. Add jumper wire from U12-10 to U3-9.
   d. Add jumper wire from hole above pin "V" to U3-8.
   e. Re-identify with P/N 2027 0088.
   f. Revise schematic 2042 4164 in the T & F package as per page 5 of this RIN.

☐ THIS CHANGE IS A RESULT OF FIELD REPORTING

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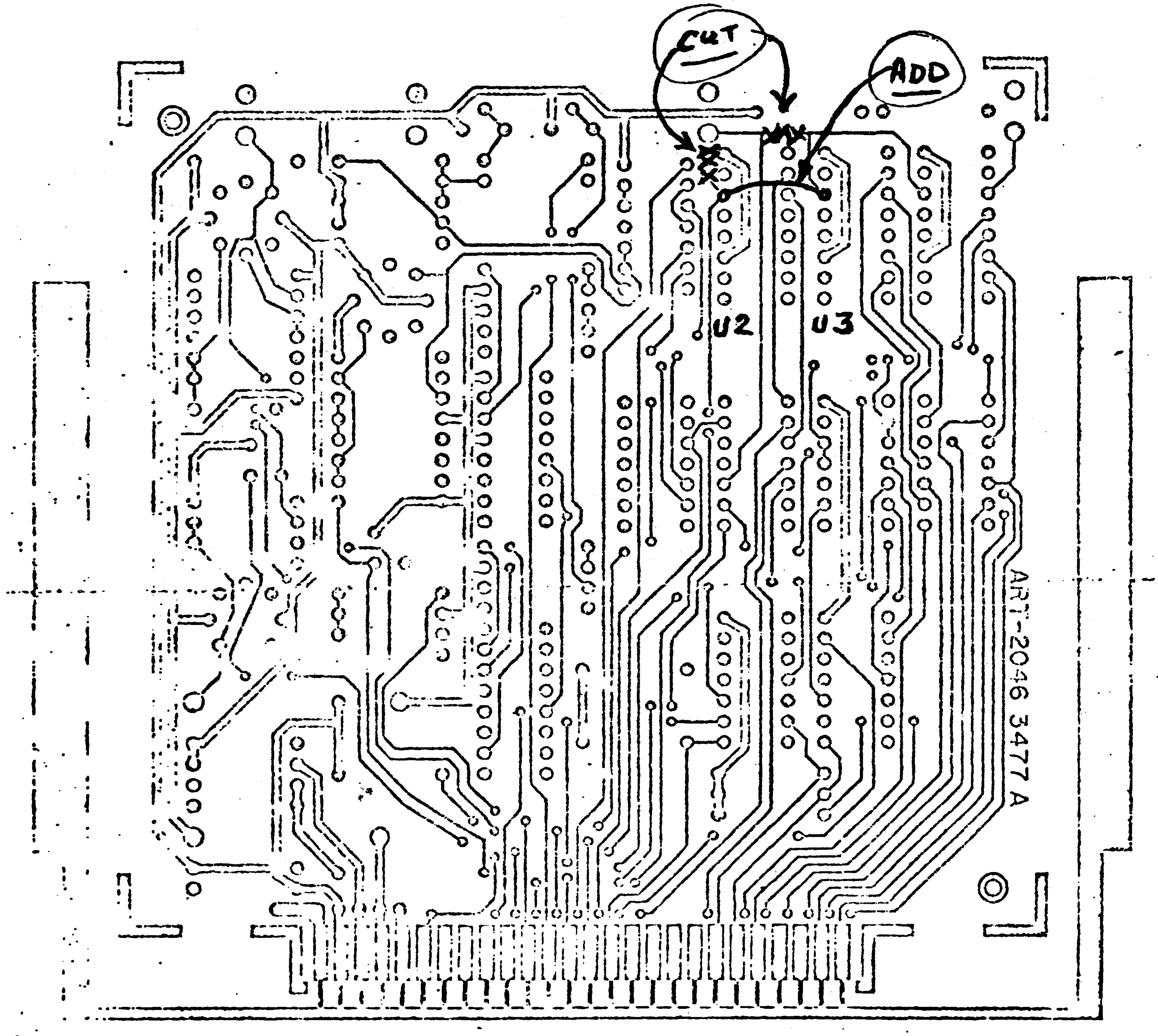


Figure 1

4. Re-install card.
5. Reconnect power and verify unit operation.

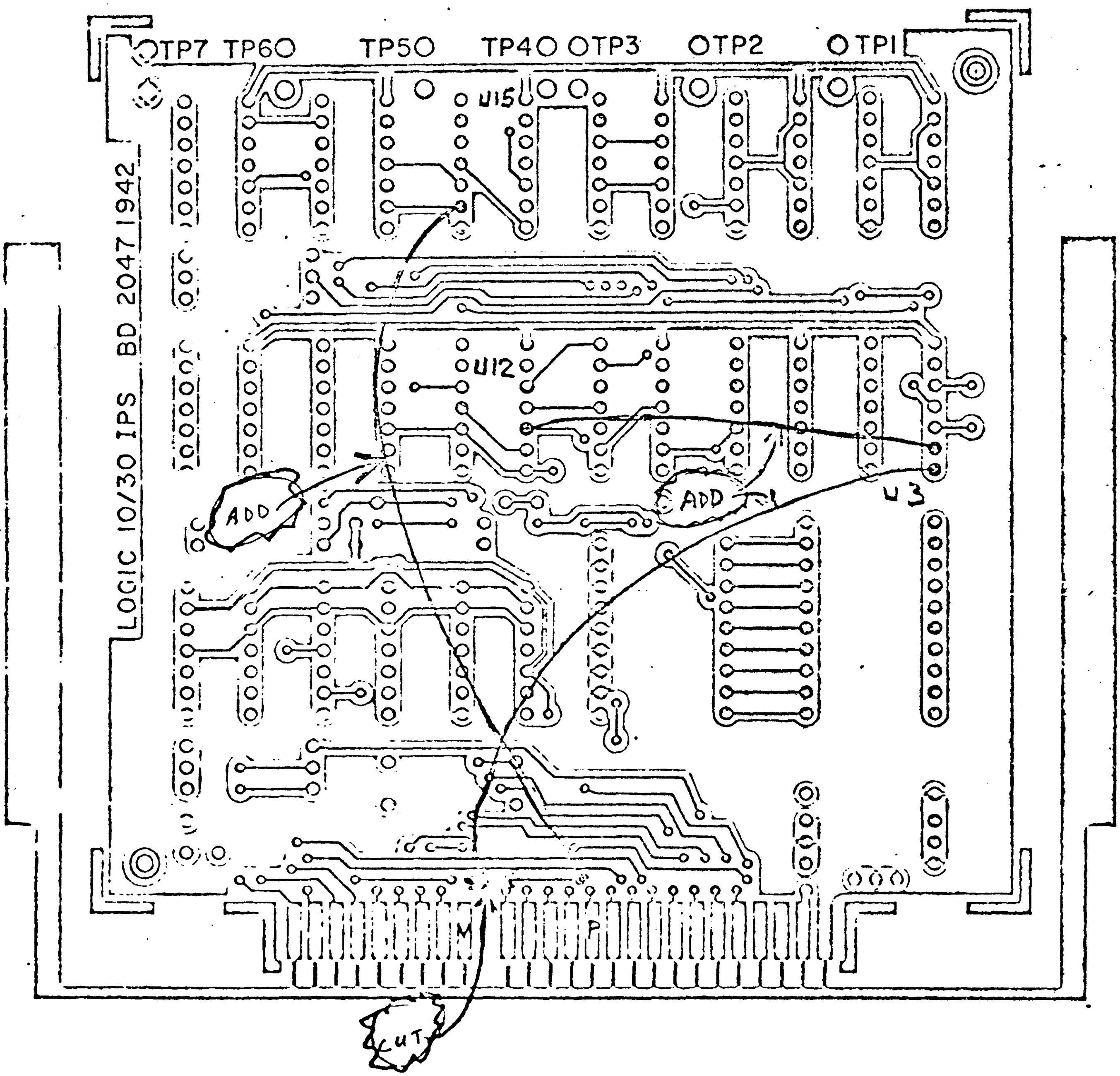
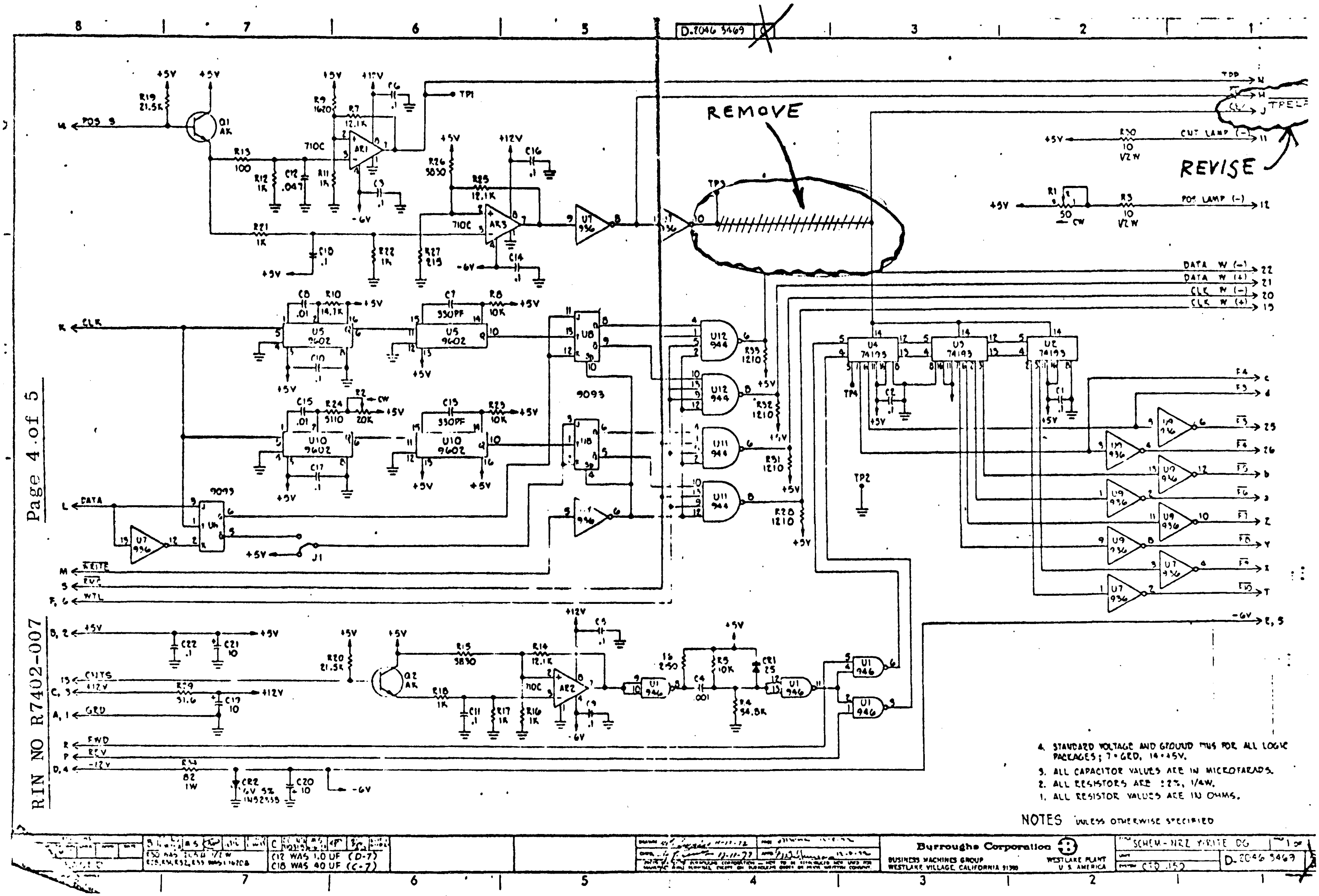
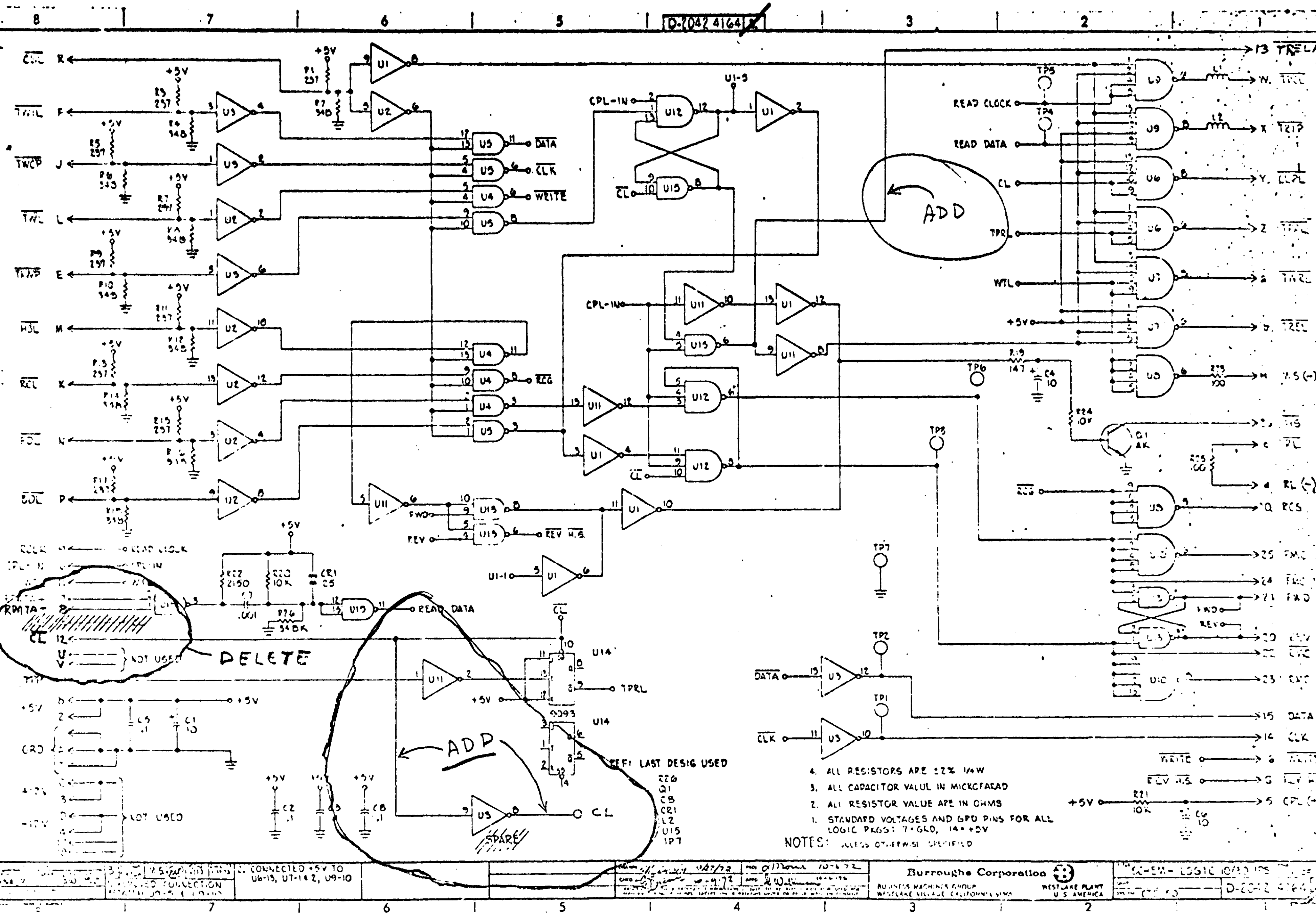

OTP7 TP6O
TP5O
TP4O OTP3
OTP2
OTP1
U15
U12
U3
ADD
ADD
CUT
LOGIC 10/30 IPS BD 2047 1942

Figure 2



D.2046 3469
REMOVE
REVISE
Page 4 of 5
RIN NO R7402-007
POS 9
CLK
DATA
WRITE
EWD
WTL
FWD
REV
CUT LAMP (-)
POS LAMP (-)
DATA W (-)
DATA W (+)
CLK W (-)
CLK W (+)
U5 9602
U10 9602
U8 9093
U4 74195
U3 74195
U2 74195
U12 944
U11 944
AR1 710C
AR3 710C
AR2 710C
Q1 AK
Q2 AK
4. STANDARD VOLTAGE AND GROUND PINS FOR ALL LOGIC PACKAGES; 7=GRD, 14=+5V.
3. ALL CAPACITOR VALUES ARE IN MICROFARADS.
2. ALL RESISTORS ARE ±2%, 1/4W.
1. ALL RESISTOR VALUES ARE IN OHMS.
NOTES UNLESS OTHERWISE SPECIFIED
C12 WAS 1.0 UF (D-7)
C18 WAS 40 UF (C-7)
Burroughs Corporation
BUSINESS MACHINES GROUP
WESTLAKE VILLAGE, CALIFORNIA 91360
WESTLAKE PLANT
U.S. AMERICA
SCHEM-NRZ WRITE DG
D.2046 3469


D-2042 4164
ADD
DELETE
ADD
SPARE
NOT USED
READ CLOCK
READ DATA
CPL-IN
DATA
CLK
WRITE
RCG
REV H.S.
FWD
REV
TPRL
WTL
CL
13 TRELA
REF: LAST DESIG USED
R26
Q1
C8
CR1
L2
U15
TP7
4. ALL RESISTORS ARE ±2% 1/4W
3. ALL CAPACITOR VALUE IN MICROFARAD
2. ALL RESISTOR VALUE ARE IN OHMS
1. STANDARD VOLTAGES AND GRD PINS FOR ALL LOGIC PKGS: 7=GRD, 14=+5V
NOTES: UNLESS OTHERWISE SPECIFIED
CONNECTED +5V TO U6-13, U7-1 & 2, U9-10
Burroughs Corporation
BUSINESS MACHINES GROUP
WESTLAKE VILLAGE, CALIFORNIA
WESTLAKE PLANT
U.S. AMERICA
SCHEM - LOGIC 10/30 IPS

Burroughs FIELD ENGINEERING	RELIABILITY IMPROVEMENT NOTICE	SYSTEM SERIES TC3500 B1700/L8000/B700	NO. R7402-008
ORIGINATOR: TIO Westlake		STYLE/MODEL A/B 9490	PAGE 1 OF 2
		TOP UNIT NO. 2040 5080	
STD. INSTALL. TIME .5 hours	UNITS AFFECTED *	UNIT DESCRIPTION .150 Cassette Tape Drive	
TITLE Eliminate Microswitch Actuator Damage (EC 30972)			DATE 10/3/75

TYPE OF CHANGE
☐ FUNCTIONAL ☒ IMPROVED MAINTAINABILITY ☒ IMPROVED RELIABILITY

*Affects units in the following serial number range:

B95000 through B96500 (approximately)

SYMPTOM: Actuators on "Cassette Present" and "Write Tab" switches bend or break.

CAUSE: No limit on acutator travel, allowing them to interfere with carriage closing.

CORRECTION: Install the mounting bracket provided by this RIN.

PARTS REQUIRED:

Part Number	Description	Qty	Unit List Price
2047 5604	Bracket, Microswitch actuator	1	$4.92

INSTRUCTIONS:

1. Disconnect power from the cassette drive.
2. Remove drive from cabinet or panel.
3. Loosen and remove the nuts and associated washers from the two screws holding the micro switches to the chassis.
4. Install the 2047 5604 bracket onto the screws as shown in Figure 1.
5. Replace hardware removed in step 3. Hand tighten the nuts.
6. If present, remove the plastic bumper glued to the chassis plate below the switch actuators. This temporary limit is no longer needed.
7. Visually observe switch action as the carriage is opened and closed. Position switches so that actuators make initial contact with the beveled surfaces on the carriage. Actuator arms and/or bracket arm may be formed to obtain proper relationship. Tighten nuts.
8. Re-connect power and verify proper switch operation by insuring that:
   a. Unit automatically rewinds a tape when the cassette is first inserted.
   b. That WS indicator reflects correct status of Write Tabs.
9. Re-install cabinet or replace unit in panel and verify unit operation.

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FOR F.E. TECHNICAL MANUAL FORM 1067402

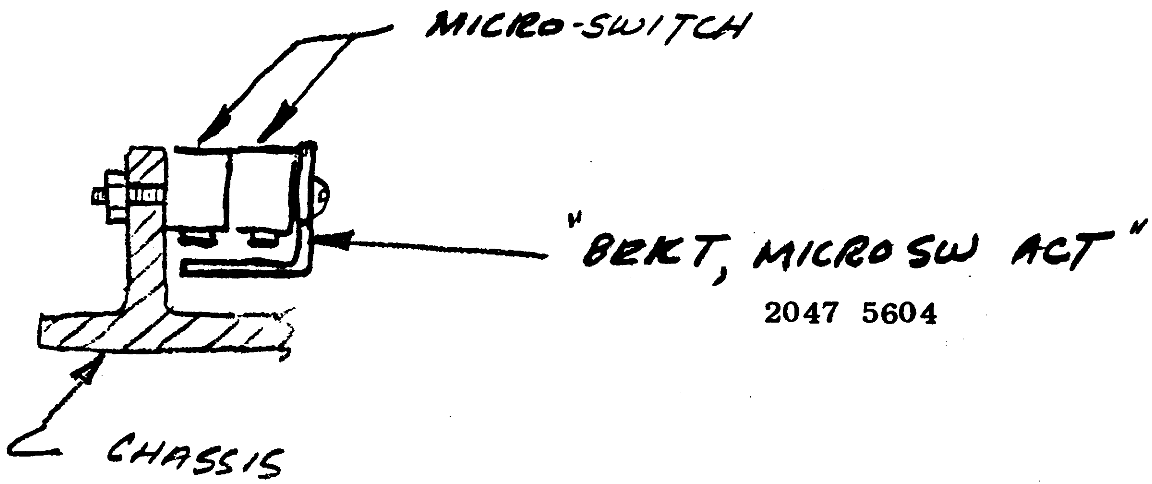

Figure 1

Burroughs FIELD ENGINEERING	**RELIABILITY IMPROVEMENT NOTICE**	SYSTEM SERIES B700 B1700, L8000, TC3500	**NO.** R7402-009
ORIGINATOR: TIO Westlake		STYLE/MODEL A/B 9490	PAGE 1 OF 1
		TOP UNIT NO. 2040 5080	
STD. INSTALL. TIME 3.5 Hours	UNITS AFFECTED *See checkpoint	UNIT DESCRIPTION .150 Cassette Tape Drive	
TITLE Increase Available Drive Motor Torque on Single Lite Pipe Drives (ECN 31681)			DATE 1/4/77
TYPE OF CHANGE ☐ FUNCTIONAL	☐ IMPROVED MAINTAINABILITY	☒ IMPROVED RELIABILITY	

CHECKPOINT: This RIN applies to single lite pipe drives only. Approximate serial number range is:

10/30 IPS units: B95000 to 97500
10 IPS units: B95000 to B98500

SYMPTOM: Intermittent or sluggish servo drive, resulting in "stalls" or speed variations.

CAUSE: Marginal drive current to DC servo motors.

CORRECTION: Increase drive current capability.

PARTS REQUIRED:

Part Number	Description	Qty	Unit List Price
2026 8991	Kit, 10/30 Servo	1	$18.83
OR			
2026 9007	Kit, 10 IPS Servo	1	16.30

INSTRUCTION MEDIA PACKAGE 1088697

14 pages consisting of 4 text and 10 drawings

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Burroughs FIELD ENGINEERING	RELIABILITY IMPROVEMENT NOTICE	SYSTEM SERIES B1700/L/TC	NO. R7402-010
		STYLE/MODEL A/B 9490	PAGE 1 OF 2
ORIGINATOR: TIO Westlake		TOP UNIT NO. 2040 5080	
STD. INSTALL. TIME .5 Hr	UNITS AFFECTED * Below B99999-088	UNIT DESCRIPTION .150 Cassette Tape Drive	
TITLE Improve Signal Cable Seating (ECN 31330)			DATE 1/4/77

TYPE OF CHANGE ☐ FUNCTIONAL ☐ IMPROVED MAINTAINABILITY ☒ IMPROVED RELIABILITY

*Inspect the cable seating on the rear of the cassette drive. If not fully seated, install this RIN. New cable assemblies have modified clamps and do not require this RIN.

SYMPTOM: Plug P1 on some old version signal cables (2046 1992, 2046 2008 or 2048 0703) will not seat fully on the cassette interconnect card.

CAUSE: Cable clamp too short to permit full seating of cable.

CORRECTION: Add the standoff provided with this RIN to increase seating of cable.

PARTS REQUIRED:

Part Number	Description	Qty	U.S. List Price
1117 5833	Standoff, 1/8"	2	$ .15
1256 0389	Screw	2	.15

PROCEDURE:

1. Dissassemble cable and add standoffs as shown in figure 1. Use longer screw provided when reassembling,

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FOR F.E. TECHNICAL MANUAL FORM 1067402

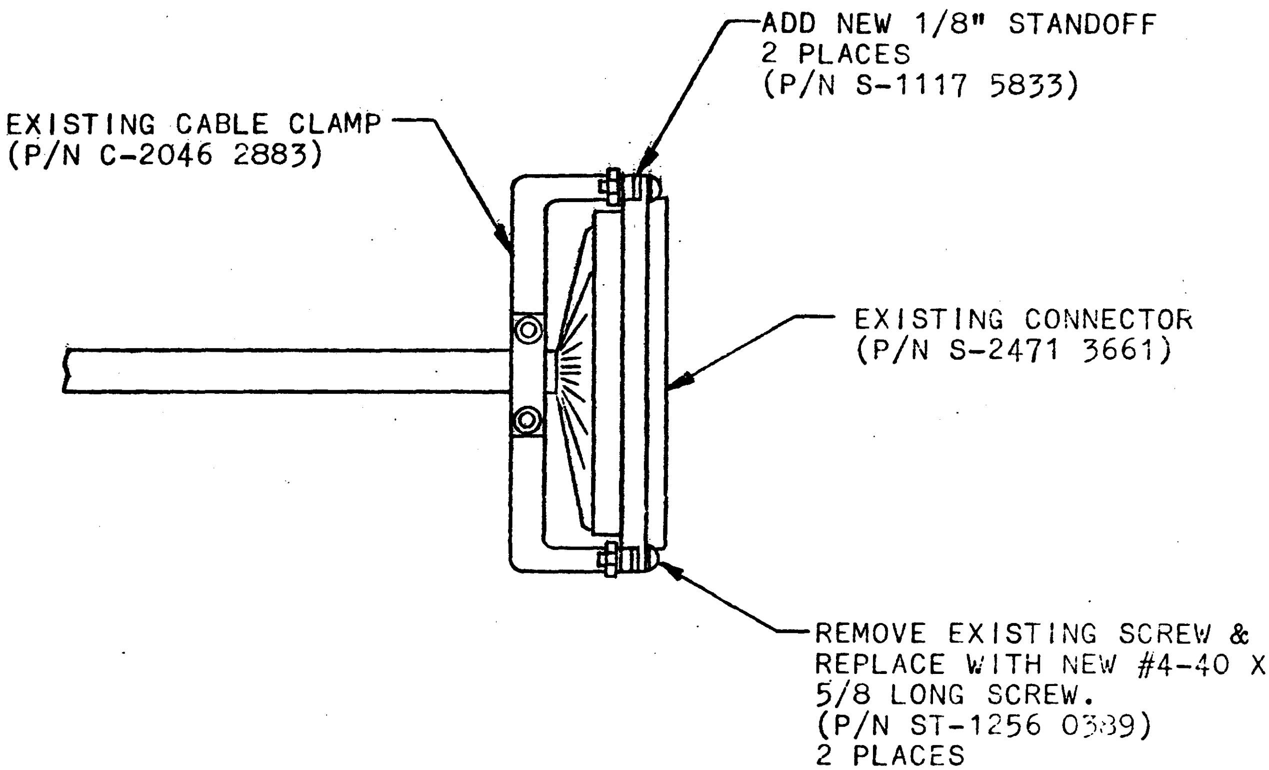
ADD NEW 1/8" STANDOFF
2 PLACES
(P/N S-1117 5833)
EXISTING CABLE CLAMP
(P/N C-2046 2883)
EXISTING CONNECTOR
(P/N S-2471 3661)
REMOVE EXISTING SCREW &
REPLACE WITH NEW #4-40 X
5/8 LONG SCREW.
(P/N ST-1256 0389)
2 PLACES

Figure 1