MODEL NO. ____________

SERIAL NO. ____________

75 IPS MODELS 6640 AND 6660 SYNCHRONOUS WRITE SYNCHRONOUS READ TAPE TRANSPORTS

PERTEC
PERIPHERAL EQUIPMENT

9600 IRONDALE AVE., CHATSWORTH, CALIF. 91311
PHONE (213) 882-0030 TWX (910) 494-2093

OPERATING AND SERVICE MANUAL NO. 101731

FOREWORD

This manual provides operating and service instructions for the High Performance Synchronous Write/Synchronous Read Tape Transports, Models 6640 and 6660, manufactured by PERTEC Peripheral Equipment, Chatsworth, California.

The content includes a detailed description, specifications, installation instructions and checkout of the transport. Also included is the theory of operation and preventive maintenance instructions. Section VII contains the schematics and parts lists.

All graphic symbols used in logic diagrams conform to the requirements of MIL-STD-806 and all symbols used in schematic diagrams are as specified in MIL-STD-15.

SERVICE AND WARRANTY

This PERTEC product has been rigorously checked out by capable quality control personnel. The design has been engineered with a precise simplicity which should assure a new level of reliability. Ease of maintenance has been taken into consideration during the design phase with the result that all components (other than mechanical components) have been selected wherever possible from manufacturer s "off the shelf" stock. Should a component fail, it may be readily replaced from PERTEC or your local supplier. The unit has been designed for "plug-in" replacement of circuit boards or major components which will ensure a minimum of equipment down time.

PERTEC warrants products of its manufacture to be free from defects in design, workmanship, and material under normal and proper use and service for a period of twelve (12) months after the date of shipment. PERTEC agrees to repair or replace at the place of manufacture, without charge, all parts of said products which are returned, for inspection, to its factory within the applicable warranty period, provided such inspection discloses that the defects are as above specified and provided also that the equipment has not been altered or repaired other than with authorization from PERTEC and by its approved procedures, subjected to misuse, improper maintenance, negligence, or accident, damaged by excessive current or otherwise, or had its serial number or any part thereof altered, defaced or removed. This warranty is in lieu of all other warranties, expressed or implied, including those of merchantability or fitness for purpose.

Please read the instruction manual thoroughly as to operation, maintenance, and component reference list. Should you require additional assistance in servicing this equipment, please contact the following regional service centers. A trained service representative will be pleased to assist you.

SALES AND SERVICE REPRESENTATIVES

*Los Angeles, Calif.	(213) 996-1333	Munich, Germany	18-48-53
*Chicago, Ill.	(312) 696-2460	Nieuwkoop, Holland	2614
*Waltham, Mass.	(617) 890-0720	India	50443
Sydney, Australia	69-0444	Haifa, Israel	(04) 68234
Brussels, Belgium	2-480586	Milano, Italy	5462641
Toronto, Canada	(613) 224-1221	Tokyo, Japan	210-4602
Vancouver, Canada	(604) 926-3411	Oslo, Norway	550750
Naerum, Denmark	(01) 804200	Johannesburg, So. Africa	42-1939
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Helsinki, Finland	460844	Solna, Sweden	820410
Clamart, France	6445530		

*Indicates PERTEC-operated service center

PROPRIETARY NOTICE

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SECTION I
GENERAL DESCRIPTION AND SPECIFICATIONS

1.1 INTRODUCTION

This section provides a physical description, functional description, and specifications for the High Performance Synchronous Write/ Synchronous Read Tape Transports, Models 6640 and 6660 manufactured by PERTEC Peripheral Equipment, Chatsworth, California.

1.2 PURPOSE OF EQUIPMENT

The tape transport has the capability of recording digital data on 9-track magnetic tape at a speed of 75 ips in 1600 cpi Phase Encoded IBM compatible format. The data can be completely recovered when the tape is played back on any IBM and ANSI compatible transport or equivalent.

The transport can also synchronously read any 9-track Phase Encoded magnetic tape, at a speed of 75 ips, which has been recorded in Phase Encoded IBM and ANSI compatible format.

The 75 ips Model 6640 transport utilizes a dual-gap head which has the read and write heads separated by 0.15 inch. This enables simultaneous read and write operations to be performed so data just recorded by the write head can be read by the read head after the tape has moved approximately 0.15 inch. This technique allows writing and checking of data in a single pass.

The 75 ips Model 6660 transport utilizes a single head for both reading and writing data. Therefore, changing from the read to the write mode is accomplished through internal switching logic when the mode is selected.

Both 75 ips models (6640 and 6660) are designed to operate directly from voltages of 95 to 250v ac single phase, 48 to 400 Hz power.

1.3 PHYSICAL DESCRIPTION OF EQUIPMENT

The High Performance Model 6640 transport is shown in Figure 1-1 (the High Performance Model 6660 transport is identical in appearance). Tape reels up to 10-1/2 inches in diameter may be used. All electrical and mechanical components necessary to operate the transport are mounted on the deck which is designed to be hinge-mounted in a standard 19-inch EIA rack.

The transport is equipped with an erase head which is automatically activated when writing.

Access to the printed circuit boards is from the rear. The hinged dust cover protects the magnetic tape, magnetic head, capstan, and other tape path components from dust and other contaminants.

The operational controls, which light when the relevant functions are being performed, are mounted on a control panel on the front trim and are accessible with the dust cover door closed. Power is supplied through a strain-relieved cord with a standard three-pin plug. Interface signals are routed through three printed circuit connectors that plug directly into the printed circuit boards.

PEC multi-loop tape path transports incorporate a load-unload system which provides the operator with the same ease of operation as single-loop tape path transports.

Figure 1-1. Model 6640/6660 High Performance Tape Transports

1.4 FUNCTIONAL DESCRIPTION

Figures 1-2 and 1-3 are block diagrams of the 75 ips 6640 and 6660 models, respectively. The transports use a single capstan drive for controlling tape motion during the Synchronous Write, Synchronous Read, and Rewind modes. The tape is maintained under a constant tension of 8 ounces.

The capstan is controlled by a velocity servo. The velocity information is generated by a dc tachometer directly coupled to the capstan motor shaft and produces a voltage proportional to the rotational velocity of the capstan. This voltage is compared to the reference voltage from the ramp generators using operational amplifier techniques and the difference is used to control the capstan motor. This capstan control technique gives precise control of tape accelerations and tape velocities, thus minimizing tape tension transients.

During a writing operation, the tape is accelerated in a controlled manner to the required velocity. This velocity is maintained constant and data characters are written on the tape at a constant rate such that:

$$\text{Bit density} = \frac{\text{Character Rate}}{\text{Tape Velocity}}$$

When data recording is complete, the tape is decelerated to zero velocity in a controlled manner.

Since the writing operation relies on a constant tape velocity, Inter-Record Gaps (IRGs) (containing no data) must be provided to allow for the tape acceleration and deceleration periods. Control of tape motion to produce a defined IRG is provided externally by the customer controller, in conjunction with the tape acceleration and deceleration characteristics defined within the transport.

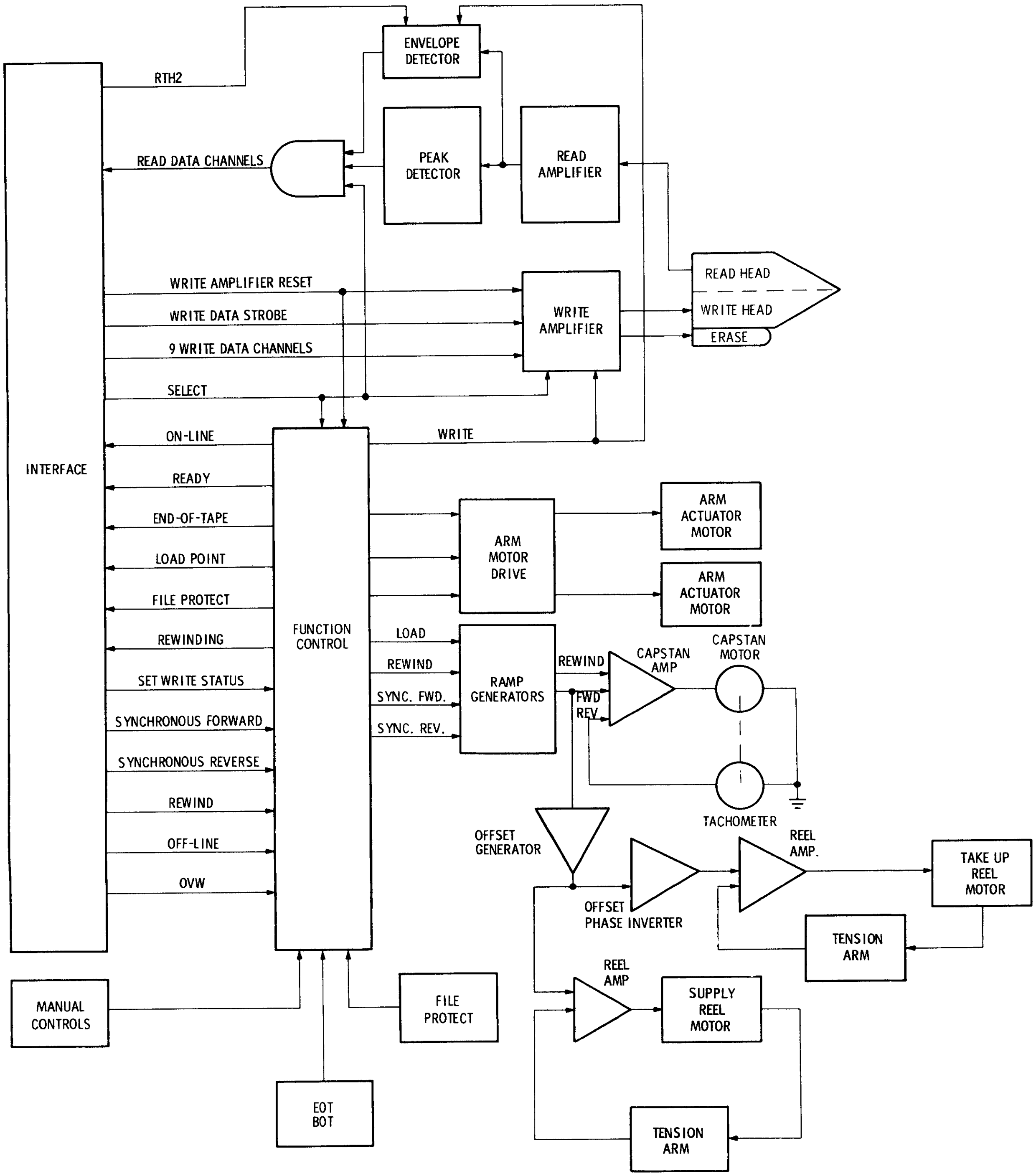

Figure 1-2. Block Diagram of Model 6640, High Performance Tape Transport

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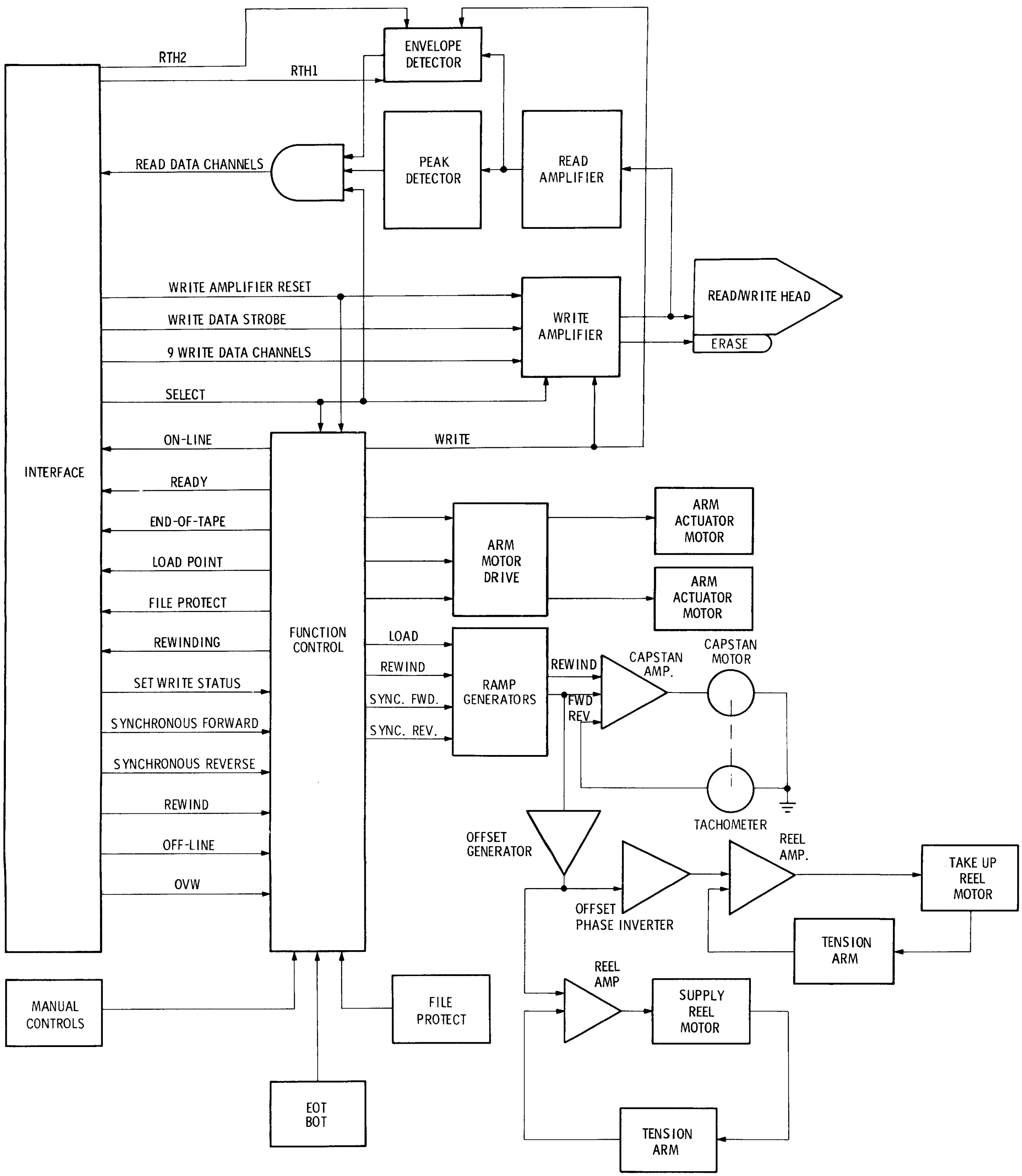

Figure 1-3. Block Diagram of Model 6660, High Performance Tape Transport

During a reading operation, tape is accelerated to the required velocity. The acceleration time is such that the tape velocity becomes constant before data signals are received.

Nine data channels are presented to the interface.

The end of a record is detected in the customer's controller by using "Missing Pulse Detector" circuits and the tape is commanded to decelerate in a controlled manner.

The transport can operate in the Read mode in either the forward or reverse direction.

When operating in a "shuttling" mode (e.g., synchronous forward, stop, synchronous reverse, and stop), no turnaround delay is required between the end of one motion command and the beginning of the next motion command in the opposite direction.

In addition to the capstan control system, the transport consists of a mechanical tape storage system, supply and take-up reel servo systems, magnetic head and its associated electronics, control logic, and a control system to move the tension arms into the load position.

The mechanical storage system buffers the relatively fast starts and stops of the capstan from the high inertia of the supply and take-up reels. As tape is taken from or supplied to the storage system, a photoelectric sensor measures the displacement of the storage arm and feeds an error signal to the reel motor amplifier. The capstan ramp signal is amplified and used to control the reel motor such that the reel will either supply or take up tape to maintain the storage arm in its nominal operating position. The storage arm system is designed to give a constant tape tension as long as the arm is within its operating region. This tape path design minimizes tape wear because there is relative motion of the tape oxide only at the magnetic head and tape cleaner.

The magnetic head writes and reads the flux transitions on the tape under control of the data electronic. Switching from the read after write to the read only mode on the 6640 model is accomplished by remote command. Switching from the write to the read mode on the 6660 model is also accomplished by remote command.

The control logic operates on manual commands to enable tape, once loaded, to be brought to the Load Point. At this stage, remote commands control tape motion, writing, and reading. The logic also provides rewind and unload functions in conjunction with the manual REWIND control.

The transport is supplied with a photoelectric sensor for detection of the Beginning-of-Tape (BOT) tab and End-of-Tape (EOT) tab. The BOT and EOT signals are sent as a voltage level to the customer's equipment. The BOT signal is also used internally in the transport for control purposes.

A photoelectric sensor for detecting the presence or absence of tape threaded on the transport is also provided. Retraction of the tension arms is inhibited when tape is installed and threaded on the transport.

The transport is designed with an interlock to protect the tape from damage due to component or power failure, or incorrect tape threading. A tape cleaner is provided to minimize tape contamination.

1.5 MECHANICAL AND ELECTRICAL SPECIFICATIONS

Table 1-1 details the mechanical and electrical specifications for the 75 ips 6640 transport; Table 1-2 details the mechanical and electrical specifications for the 75 ips 6660 transport.

1.5.1 INTERFACE SPECIFICATIONS

Levels: True = Low = 0v (approximately)
False = High = +3v (approximately)

Pulses: Levels as above. Edge transmission delay over 20 feet of cable is not greater than 200 nanoseconds.

The interface circuits are designed so that a disconnected wire results in in a false signal.

Figure 1-4 shows the configuration for which the transmitters and receivers have been designed.

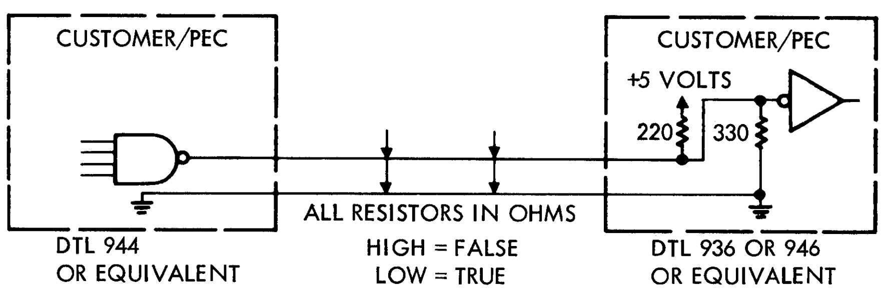

Figure 1-4. Interface Configuration

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Table 1-1

Mechanical and Electrical Specifications, 6640

Tape (computer grade) Width (inches) Thickness (mil)	 0.5 1.5
Tape Tension (ounces)	8.0
Reel Diameter (inches)	10.5 maximum
Recording Mode (ANSI and IBM compatible)	1600 cpi Phase Encoded
Magnetic Head	Dual Stack (with erase head)
Tape Speed (ips) Standard	75
Instantaneous Speed Variation (%)	±3
Long-Term Speed Variation (%)	±1
Rewind Speed (ips)	150 nominal
Interchannel Displacement Error Read Write	 400* 200**
Stop/Start Time (milliseconds) at 75 ips (inversely proportional to tape speed)	4 ±0.5
Stop/Start Displacement (inch)	0.19 ±0.02
Beginning of Tape (BOT) and End of Tape (EOT) Detectors	Photoelectric*** IBM compatible
Weight (pounds)	85
Dimensions (inches) Height Width Depth (from mounting surface) Depth (total)	 24.5**** 19.0 14.25 17.25
Operating Temperature	2°C (35°F) to 45°C (113°F)
Non-Operating Temperature	-45°C (-50°F) to 71°C (160°F)
Operating Altitude (feet)	0 to 20,000
Non-Operating Altitude (feet)	0 to 50,000
Power Volts ac Watts (maximum on high line) Hertz	 95, 100, 110, 115, 125, 190, 200, 210, 215, 220, 225, 230, 235, 240, 250 480 48 to 400
Mounting — Standard 19-inch EIA Rack	—
Electronics	All Silicon

*The maximum displacement between any two bits of a character when reading an IBM master tape using the Read section of the Read After Write head is 400 μinches.

**The maximum displacement between any two bits of a character on a tape written with all ones using the Write section of the Read After Write head is 200 μinches.

***Approximate distance from detection area to head gap = 1.2 inches.

****Includes one-half-inch spacer furnished with unit.

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Table 1-2

Mechanical and Electrical Specifications, 6660

Tape (computer grade) Width (inches) Thickness (mil)	 0.5 1.5
Tape Tension (ounces)	8.0
Reel Diameter (inches)	10.5 maximum
Recording Mode (ANSI and IBM compatible)	1600 cpi Phase Encoded
Magnetic Head	Single Stack (with erase head)
Tape Speed (ips) Standard	75
Instantaneous Speed Variation (%)	±3
Long-Term Speed Variation (%)	±1
Rewind Speed (ips)	150 nominal
Interchannel Displacement Error	200 maximum*
Stop/Start Time (milliseconds) at 75 ips (inversely proportional to tape speed)	4 ±0.5
Stop/Start Displacement (inch)	0.19 ±0.02
Beginning of Tape (BOT) and End of Tape (EOT) Detectors	Photoelectric** IBM compatible
Weight (pounds)	85
Dimensions (inches) Height Width Depth (from mounting surface) Depth (total)	 24.5*** 19.0 14.25 17.25
Operating Temperature	2°C (35°F) to 45°C (113°F)
Non-Operating Temperature	-45°C (-50°F) to 71°C (160°F)
Operating Altitude (feet)	0 to 20,000
Non-Operating Altitude (feet)	0 to 50,000
Power Volts ac Watts (maximum on high line) Hertz	 95, 100, 110, 115, 125, 190, 200, 210, 215, 220, 225, 230, 235, 240, 250 480 48 to 400
Mounting — Standard 19-inch EIA rack	—
Electronics	All silicon

*The maximum displacement between any two bits of a character when reading an IBM master tape on the transport.

**Approximate distance from detection area to head gap = 1.2 inches.

***Includes one-half-inch spacer furnished with unit.

SECTION II
INSTALLATION AND INITIAL CHECKOUT

2.1 INTRODUCTION

This section contains a summary of interface lines, information for uncrating the transport, as well as the procedure for electrically connecting and initially checking out the transport.

2.2 UNCRATING THE TRANSPORT

The transport is shipped in a protective container to minimize the possibility of damage during shipping.

Place the shipping container in the position indicated on the container.

Open the shipping container and remove the packing material so that the transport and its shipping frame can be lifted from the container.

Lift the transport out of the container using the shipping frame and set it down so that access to both front and rear of the deck is available.

Check the contents of the shipping container against the packing slip and investigate for possible damage. If there is any damage, notify the carrier.

Check the printed circuit boards and all connectors for correct installation. Check the plug-in relays on the printed circuit board associated with the heatsink.

Check that the identification label on the back of the tape deck bears the correct model number and line voltage requirement. If the actual line voltage at the installation differs from that on the identification label, the power transformer taps should be changed as shown in Figure 4-4. The power switch indicator wires and fan power wires should not be moved.

2.3 POWER CONNECTIONS

A fixed power cord is supplied for use in a polarized 115v outlet. For other power sockets, the supplied plug must be removed and the correct plug installed.

2.4 INITIAL CHECKOUT PROCEDURE

A detailed description of the operating controls and indicators is contained in Section III. To check the proper operation of the transport before placing it in the system, follow the specified procedure.

(1) Connect the power cord (replace power plug and change power transformer wiring if necessary).

(2) Depress and release the POWER control. Power is applied to the transport.

(3) Load tape on the transport as described in Paragraph 3.3.

(4) Depress the LOAD control momentarily to initiate the load cycle. The tension arms will move down and power will be applied to the capstan motor and reel motors when the arms have moved approximately three-quarters of their total allowable travel.

(5) Depress the LOAD control momentarily a second time to continue the Load sequence. Tape will move forward until it reaches the BOT tab. The LOAD indicator will light when the BOT tab reaches the photosensor and will remain lit until the tape moves off the Load Point. At this point, there will be no action should the LOAD control be depressed.

(6) Check ON LINE by depressing the control repeatedly and observing that the ON LINE indicator is alternately lit and extinguished.

(7) With the transport off-line (ON LINE indicator extinguished) depress and release the FORWARD control. The FORWARD control will be illuminated and the tape will wind from the supply reel to the take-up reel. After allowing several feet of tape to wind onto the take-up reel, depress and release the FORWARD control, tape motion will cease and the FORWARD control will become extinguished.

Check that the action of the FORWARD control is inhibited when the transport is on-line.

(8) Depress and release the REVERSE control. The REVERSE control will be illuminated and the tape will wind from the take-up reel to the supply reel. Depress and release the REVERSE control again, tape motion will cease and the REVERSE control will become extinguished.

Check that the action of the REVERSE control is inhibited when the transport is on-line.

(9) Depress and release the FORWARD control to start forward tape motion. Depress and release the REVERSE control, forward tape motion will cease and the tape will then accelerate in the reverse direction. Depress and release the FORWARD control, tape motion in the reverse direction will cease and the tape will accelerate in the forward direction. Depress and release the FORWARD control; tape motion will cease.

(10) Depress and release the REWIND control to initiate the Rewind mode and light the REWIND indicator. Tape will go into rewind 0.1 second after the control is depressed,

rewind past the BOT tab, enter the Load sequence, return to the BOT tab and stop with the LOAD indicator illuminated. If the REWIND control is momentarily depressed when the tape is at BOT, the LOAD indicator will be extinguished, the REWIND indicator will light, the tension arms will move closer to the lower stop, and tape will run in reverse until tape tension is lost. The tension arms will then move to the load position.

(11) Visually check the components of the tape path for correct tape tracking (tape rides smoothly in the head guides, etc.).

(12) Unload the tape as outlined in Paragraph 3.5.

2.5 INTERFACE CONNECTIONS

It is assumed that interconnection of PERIPHERAL EQUIPMENT CORPORATION and Customer equipment uses a harness of individual twisted pairs, each with the following characteristics.

(1) Maximum length of 20 feet.

(2) Not less than one twist per inch.

(3) 22- or 24-gauge conductor with minimum insulation thickness of 0.01 inch.

It is important that the ground side of each twisted pair is grounded within a few inches of the board to which it is connected.

Three printed circuit edge connectors are supplied with each transport. These must be wired by the customer and strain relieved as shown in Figure 2-1. Interface signals are thus routed directly to and from the printed circuit boards. Table 2-1 shows the Input/Output lines for the 6640 transport; Table 2-2 shows the Input/Output lines for the 6660 transport. Details relating to the interface are contained in Section III.

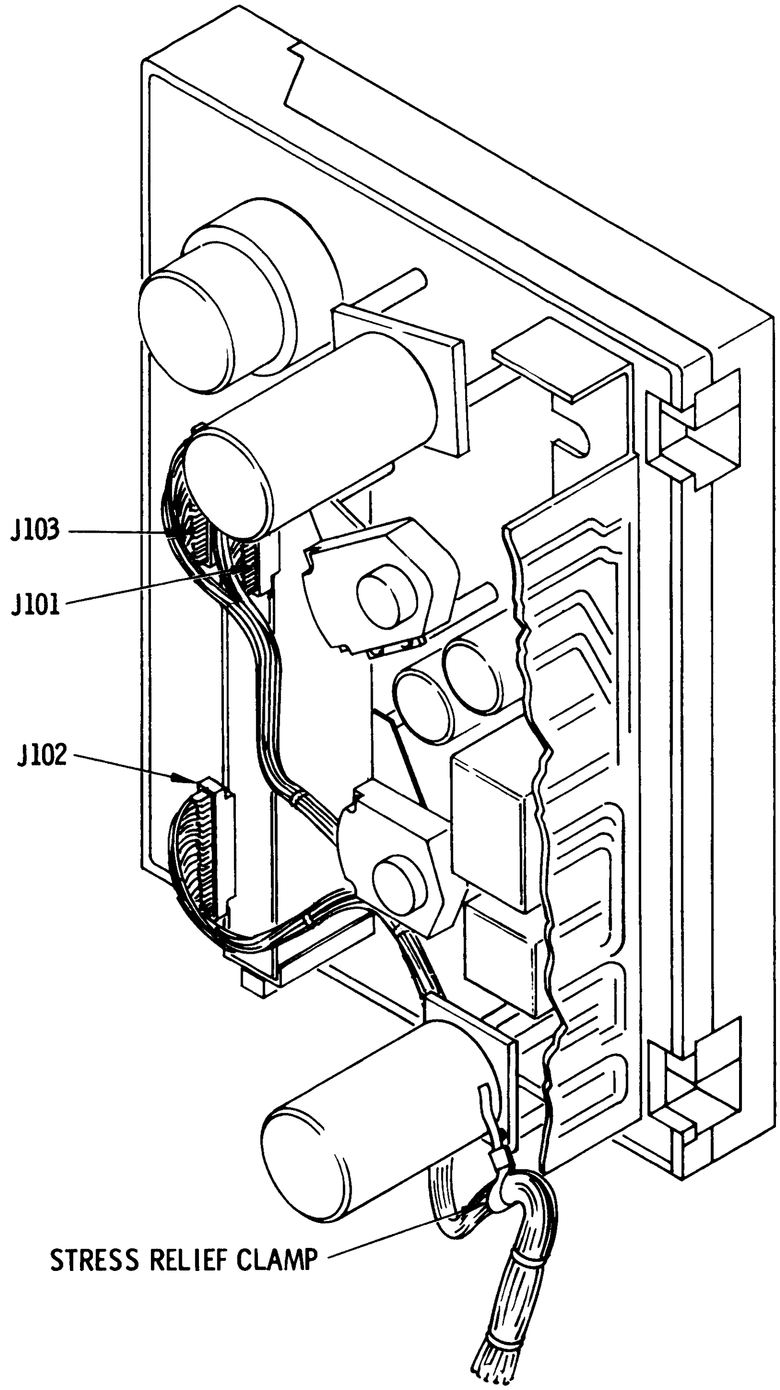

Figure 2-1. Interface Cable Installation

Table 2-1

Interface Connections, 6640 Transports

Transport Connector	36 Pin Etched PC Edge Connector		
Mating Connector	36 Pin ELCO 00-6007-036-980-002		
Connector (Reference Figure 2-1)	**Live Pin**	**Ground Pin**	**Signal***
J101	J	8	→ SELECT (SLT)
	C	3	→ SYNCHRONOUS FORWARD Command (SFC)
	E	5	→ SYNCHRONOUS REVERSE Command (SRC)
	H	7	→ REWIND Command (RWC)
	L	10	→ OFF-LINE Command (OFFC)
	K	9	→ SET WRITE STATUS (SWS)
	B	2	→ OVERWRITE Command (OVW)
	T	16	← READY (RDY)
	M	11	← ON-LINE Command
	N	12	← REWINDING (RWD)
	U	17	← END OF TAPE (EOT)
	R	14	← LOAD POINT (LDP)
	P	13	← FILE PROTECT (FPT)
J102	A	1	→ WRITE DATA STROBE (WDS)
	C	3	→ WRITE AMPLIFIER RESET (WARS)
	F	6	→ READ THRESHOLD (RTH2)
	L	10	→ WRITE DATA PARITY (WDP)
	M	11	→ WRITE DATA 0 (WD0)
	N	12	→ WRITE DATA 1 (WD1)
	P	13	→ WRITE DATA 2 (WD2)
	R	14	→ WRITE DATA 3 (WD3)
	S	15	→ WRITE DATA 4 (WD4)
	T	16	→ WRITE DATA 5 (WD5)
	U	17	→ WRITE DATA 6 (WD6)
	V	18	→ WRITE DATA 7 (WD7)
J103	1	A	← READ DATA PARITY (RDP)
	3	C	← READ DATA 0 (RD0)
	4	D	← READ DATA 1 (RD1)
	8	J	← READ DATA 2 (RD2)
	9	K	← READ DATA 3 (RD3)
	14	R	← READ DATA 4 (RD4)
	15	S	← READ DATA 5 (RD5)
	17	U	← READ DATA 6 (RD6)
	18	V	← READ DATA 7 (RD7)

* See Section III for definitions of interface functions.

Table 2-2

Interface Connections, 6660 Transports

Transport Connector: 36 Pin Etched PC Edge Connector
Mating Connector: 36 Pin ELCO 00-6007-036-980-002

Connector (Reference Figure 2-1)	Live Pin	Ground Pin	Signal*
J101	J	8	→ SELECT (SLT)
	C	3	→ SYNCHRONOUS FORWARD Command (SFC)
	E	5	→ SYNCHRONOUS REVERSE Command (SRC)
	H	7	→ REWIND Command (RWC)
	L	10	→ OFF-LINE Command (OFFC)
	K	9	→ SET WRITE STATUS (SWS)
	B	2	→ OVERWRITE Command (OVW)
	T	16	← READY (RDY)
	M	11	← ON-LINE Command
	N	12	← REWINDING (RWD)
	U	17	← END OF TAPE (EOT)
	R	14	← LOAD POINT (LDP)
	P	13	← FILE PROTECT (FPT)
J102	A	1	→ WRITE DATA STROBE (WDS)
	C	3	→ WRITE AMPLIFIER RESET (WARS)
	E	5	→ READ THRESHOLD 1 (RTH1)
	F	6	→ READ THRESHOLD 2 (RTH2)
	L	10	→ WRITE DATA PARITY (WDP)
	M	11	→ WRITE DATA 0 (WD0)
	N	12	→ WRITE DATA 1 (WD1)
	P	13	→ WRITE DATA 2 (WD2)
	R	14	→ WRITE DATA 3 (WD3)
	S	15	→ WRITE DATA 4 (WD4)
	T	16	→ WRITE DATA 5 (WD5)
	U	17	→ WRITE DATA 6 (WD6)
	V	18	→ WRITE DATA 7 (WD7)
J103	1	A	← READ DATA PARITY (RDP)
	3	C	← READ DATA 0 (RD0)
	4	D	← READ DATA 1 (RD1)
	8	J	← READ DATA 2 (RD2)
	9	K	← READ DATA 3 (RD3)
	14	R	← READ DATA 4 (RD4)
	15	S	← READ DATA 5 (RD5)
	17	U	← READ DATA 6 (RD6)
	18	V	← READ DATA 7 (RD7)

*See Section III for definitions of interface functions.

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2.6 RACK MOUNTING THE TRANSPORT

The physical dimensions of the transport are such that it may be mounted in a standard 19-inch EIA rack; 24.5 inches of panel space is required. It requires a depth behind the mounting surface of at least 14.25 inches.

Figures 2-2 and 2-3 illustrate the procedure for mounting the transport as follows.

(1) Install the hinge pin blocks on the EIA rack (see Figure 2-2 for correct position) using 10-32 pan head screws. Do not fully tighten the screws. Place a No. 10 shim washer on each pin.

(2) Set the shipping frame down with the front door of the transport facing up (i.e., lying in a horizontal position). Remove the screws securing the Z-shaped shipping brackets to the shipping frame.

(3) Lift the transport out of the shipping frame and hang the transport on the hinge pin blocks (see Figure 2-3). Hang the transport by placing it up to the hinge pin blocks on an angle of 60 degrees to its closed position.

(4) Remove the Z-shaped shipping brackets from the tape deck.

(5) Adjust the hinge pin blocks on the EIA rack so that the transport hangs symmetrically in the rack. Tighten the screws.

(6) Open the tape deck to 90 degrees and install the safety block using 4-40 screws (see Figure 2-3).

(7) Check that the fastener engages behind the EIA rack.

(8) Clean the tape deck as described in the maintenance procedure.

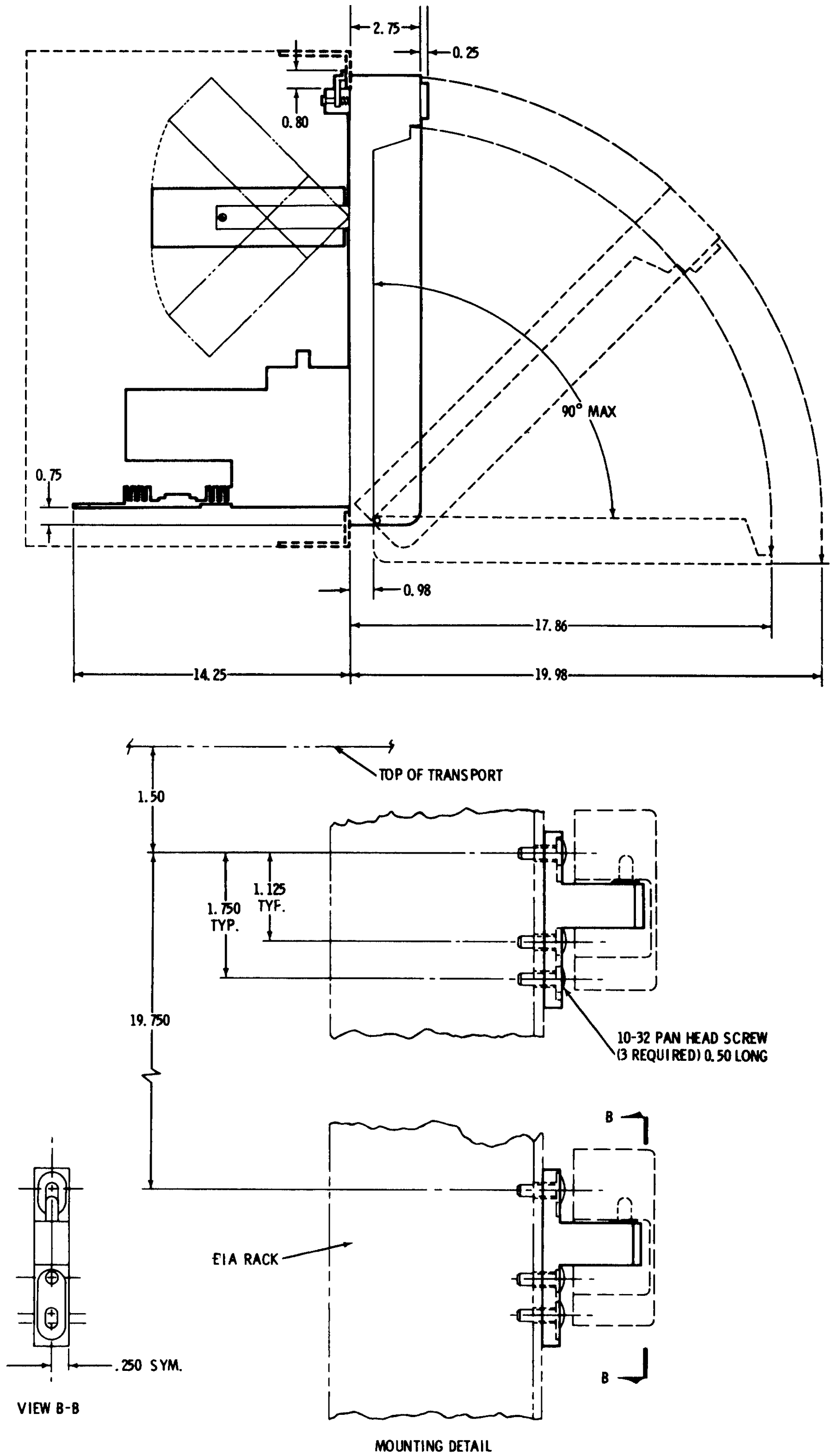

Figure 2-2. Rack Mounting the Transport

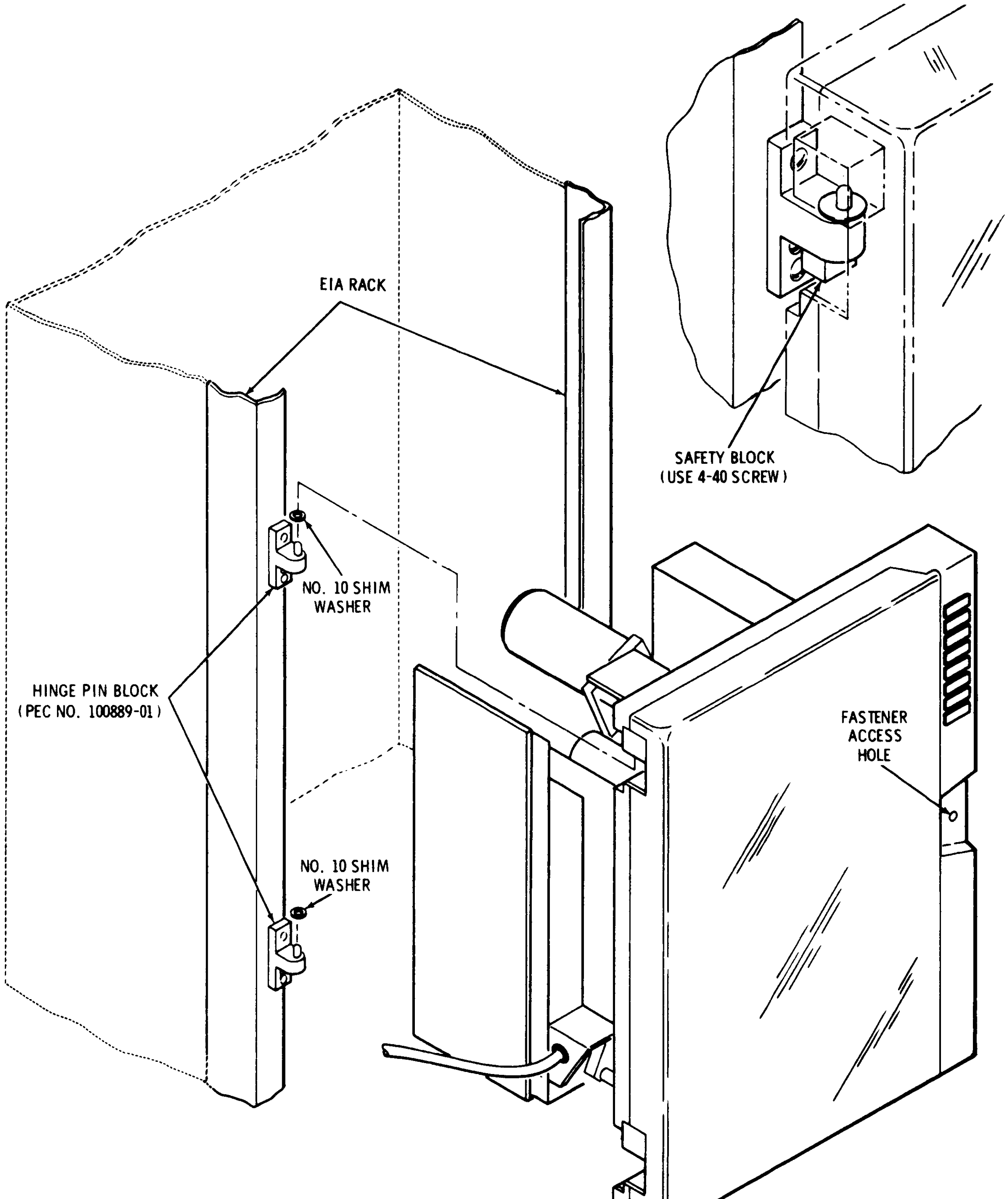

Figure 2-3. Installation Diagram

SECTION III
OPERATION

3.1 INTRODUCTION

This section explains the manual operation of the transport and defines the interface functions with regard to timing, levels, and interrelationships.

3.2 CLEANING THE HEAD AND GUIDES

The brief operation described in Paragraph 6.4 should be performed daily to realize the data reliability capabilities of the transport.

3.3 LOADING TAPE ON TRANSPORT

The High Performance Models 6640 and 6660 transports both have the supply reel (reel to be recorded or reproduced) at the bottom (see Figure 3-1). The tape must unwind from the supply reel when the reel is turned in a clockwise direction. Note that the presence of a Write Enable ring on the reel is required to close the interlocks which allow writing.

To load a tape reel (maximum reel size is 10-1/2 inches in diameter with 2400 feet of tape), position the reel over the quick-release hub and depress the center plunger. This allows the reel to slip over the rubber ring on the hub. Press the reel evenly and firmly against the back flange of the hub with the center plunger depressed. Release the center plunger. The reel is now properly aligned in the tape path and ready for tape threading.

Thread the tape along the path shown in Figure 3-1.

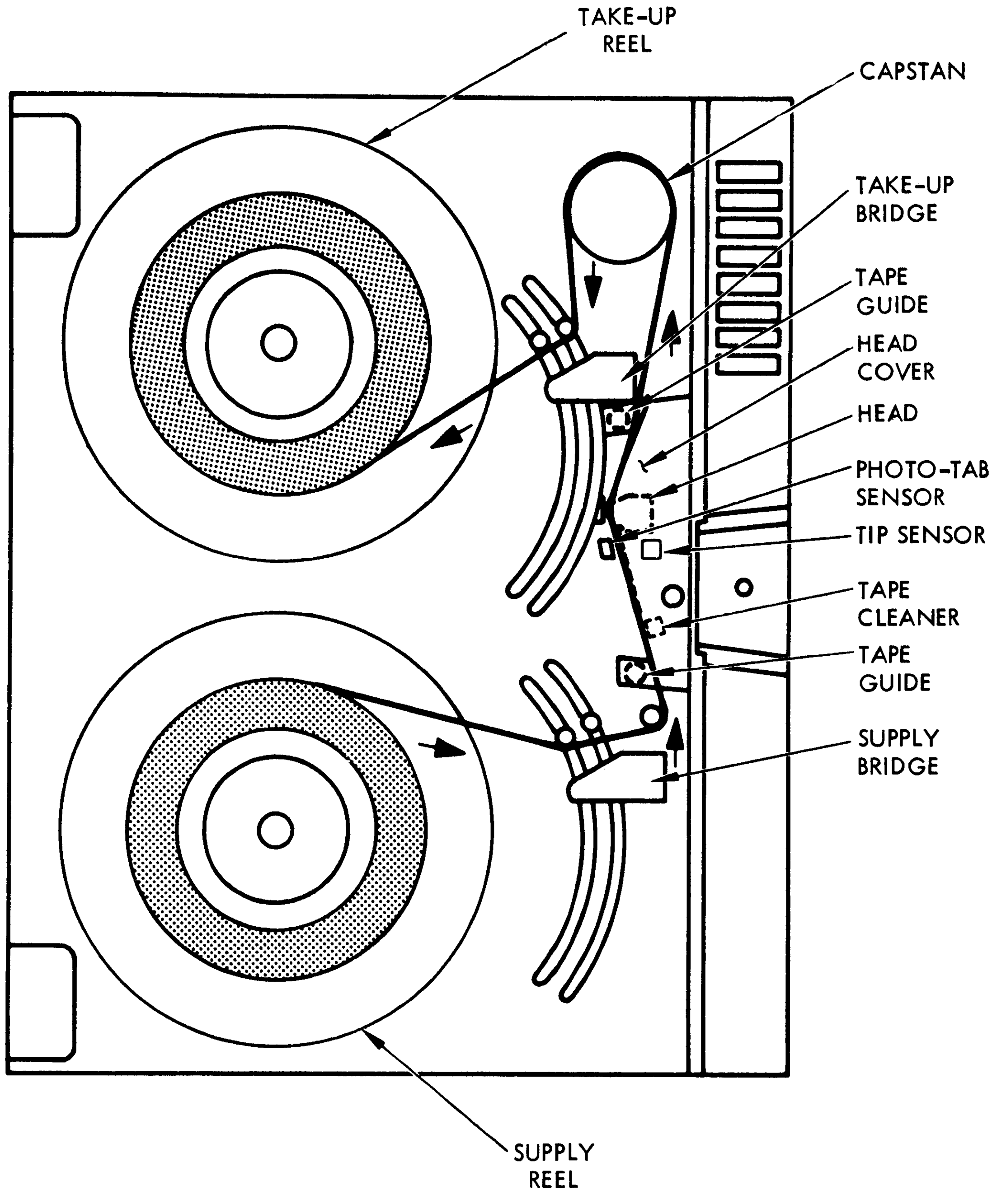

Figure 3-1. Tape Path and Controls

Wrap the tape leader onto the take-up reel so that the tape will be wound onto the reel when it is rotated clockwise. Wind at least three turns onto the take-up reel, then turn the supply reel counterclockwise until the slack has been taken out of the threaded tape.

3.4 BRINGING TAPE TO LOAD POINT (BOT)

After the tape has been manually tensioned and checked for correct seating in the guides, then, to bring the tape to Load Point:

(1) Turn the power on by depressing the POWER control.

(2) Depress and release the LOAD control. This will enable the arm actuator motors and start the arms moving down. When the arms are past the three-quarter position of the total arm movement, power will be applied to the capstan and reel servos. This brings the tape to the correct operating tension. The tape storage arms are now in the operating position.

CAUTION

CHECK THAT THE TAPE IS POSITIONED CORRECTLY ON ALL GUIDES OR TAPE DAMAGE MAY RESULT.

(3) Depress and release the LOAD control a second time. This will cause tape to move forward at the operating velocity. Recheck tape tracking in the guides and close the dust cover.

CAUTION

THE DUST COVER SHOULD REMAIN CLOSED AT ALL TIMES WHEN TAPE IS ON THE TAKE-UP REEL. DATA RELIABILITY MAY BE IMPAIRED BY CONTAMINANTS IF THE COVER IS LEFT OPEN.

When the reflective tab at the Load Point (the BOT tab) is detected, the tape stops with the front edge of the tab approximately one inch from the magnetic head gap. The transport is now ready to receive external commands.

3.5 UNLOADING THE TAPE

To unload a recorded tape, complete the following procedure if the power has been switched off. (If power is on, start at step (3).)

(1) Turn the power on by depressing the POWER control.

(2) Depress and release the LOAD control, which moves the arm into the operating area and applies tape tension.

(3) Depress and release the REWIND control. When the tape has rewound to the BOT tab, it comes to a controlled stop. The arms overshoot and the transport enters the Load sequence to bring the tape to rest at the BOT.

(4) Depress and release the REWIND control a second time. This initiates an unload cycle which will move the tension arm close to the lower stop and run the tape in the reverse direction until tape tension is lost.

(5) Open the dust cover and wind the end of the tape onto the supply reel. Depress the hub center plunger and remove the reel. Close the dust cover.

3.6 MANUAL CONTROLS

Eight operational controls with indicators are located on the control panel on the front of the transport (see Figure 1-1). The following paragraphs describe the function of these controls.

3.6.1 POWER

The POWER control is an alternate action switch/indicator which connects line voltage to the power transformer. When power is turned on:

(1) All power supplies are established.

(2) All of the motors are open-circuited (a low value resistor is connected in series with the reel motors).

(3) A reset signal is applied to key control flip-flops.

(4) Tension arms will move to the load position.

3.6.2 LOAD

The LOAD control is a momentary switch/indicator. Depressing and releasing the control for the first time after power is switched on with the tension arms in the load position will start the tension arms moving into the operating area. The servo systems are energized after the arms have moved more than 75 percent into the operating area. The tape will now be tensioned. The reset signal is removed after the tension arm actuator motors have moved the arm drive cam out of the normal tension arm operating area.

Depressing and releasing the control for the first time after power is switched on with the arms at the bottom of the operating area energizes the servo systems by connecting the motors to the drive circuits. The reset signal is removed and the tape will now be tensioned.

Depressing and releasing the control for the second time (which can be done before the above load cycle is completed) causes the tape to move to and stop at the load point. While the BOT tab is located over the photo-tab sensor the LOAD indicator is illuminated. The LOAD control is disabled after the second LOAD or manual REWIND command has been given and can only be re-enabled by loss of tape tension or restoration of power after power has been off.

3.6.3 REWIND

The REWIND control is a momentary switch/indicator which is enabled only in the Off-line mode. Depressing and releasing the control causes tape to rewind at 150 ips after a 0.1 second delay. Upon reaching the BOT tab, the rewind drive ceases and the Load sequence is automatically entered. The BOT tab will overshoot the photo-tab sensor, move forward, and stop at the Load Point.

If the REWIND control is depressed and released when the tape is at Load Point (LOAD indicator lit), the tension arms will move close to the lower stop and the tape will run in reverse until tape tension is lost.

The REWIND indicator is illuminated throughout any rewind operation including the subsequent Load sequence where relevant. A manual REWIND command will override the Load sequence.

3.6.4 ON LINE

The ON LINE control is a momentary switch/indicator which is enabled after an initial Load or Rewind sequence has been initiated.

Depressing and releasing the switch after an initial Load or Rewind sequence is initiated switches the transport to an On-line mode and lights the indicator.

In this condition the transport can accept external commands provided it is also Ready and Selected.

The transport will revert to the Off-line mode if the following occur.

(1) ON LINE is depressed a second time.

(2) An external Off-line command (OFFC) is received.

(3) Tape tension is lost.

3.6.5 WRT EN (Write Enable)

This is an indicator which is illuminated whenever power is on and a reel of tape with a Write Enable ring installed is mounted on the transport.

3.6.6 1600 CPI

This is an indicator which is illuminated whenever power is applied to the transport.

3.6.7 FORWARD

The FORWARD control is a momentary action switch/indicator which is enabled only when the transport is in the Off-line mode.

When the control is depressed the tape is accelerated in the forward direction to the synchronous speed and the control is illuminated. When the switch is depressed again, the tape is decelerated to rest in a controlled manner and the control becomes extinguished.

Depressing the REVERSE control (Paragraph 3.6.8) while the tape is moving in the forward direction causes the tape to decelerate to zero velocity, then immediately accelerate to the synchronous speed in the reverse direction. The FORWARD control will become extinguished and the REVERSE control will be illuminated.

If the EOT tab is encountered while the tape is moving in the forward direction, tape motion will cease and the indicator will be extinguished. Depressing ON LINE or REWIND will also reset the FORWARD function.

3.6.8 REVERSE

The REVERSE control is a momentary action switch/indicator which is enabled only when the transport is in the Off-line mode.

When the control is depressed the tape is accelerated in the reverse direction to the synchronous speed and the control is illuminated. When the switch is depressed again, the tape is decelerated to rest in a controlled manner and the control becomes extinguished.

Depressing the FORWARD control (Paragraph 3.6.7) while the tape is moving in the reverse direction causes the tape to decelerate to zero velocity, then immediately accelerate to the synchronous speed in the forward direction. The REVERSE control will become extinguished and the FORWARD control will be illuminated.

If the BOT tab is encountered while the tape is moving in the reverse direction, tape motion will cease and the indicator will be extinguished. Depressing ON LINE or REWIND will also reset the REVERSE function.

3.7 INTERFACE INPUTS (Controller to Transport)

All waveform names are chosen to correspond to the logical true condition. Receivers belong to the DTL 930 series where the True level is 0v and the False level is nominally +3v. Figure 1-4 is a schematic of the interface circuit.

3.7.1 SELECT (SLT)

This is a level which, when true, enables all of the interface drivers and receivers in the transport, thus connecting the transport to the controller.

It is assumed that all of the interface inputs discussed in the following paragraphs are gated with SELECT.

3.7.2 SYNCHRONOUS FORWARD COMMAND (SFC)

This is a level which, when true and the transport is Ready (see Paragraph 3.8.1) causes the tape to move forward at the specified velocity. When the level goes false, tape motion ceases. The velocity profile is trapezoidal with nominally equal rise and fall times. An SFC will be terminated upon encountering the EOT tab.

3.7.3 SYNCHRONOUS REVERSE COMMAND (SRC)

This is a level which, when true and the transport is Ready (see Paragraph 3.8.1), causes the tape to move in the reverse direction at the specified velocity. When the level goes false, tape motion ceases. The velocity profile is trapezoidal with nominally equal rise and fall times. An SRC will be terminated upon encountering the BOT tab, or ignored if given when the tape is at Load Point.

3.7.4 REWIND COMMAND (RWC)

This is a pulse (minimum width of 1μsecond) which, if the transport is Ready, causes the tape to move in the reverse direction at 150 ips after an 0.1 second delay. Upon reaching BOT, the rewind ceases and the Load sequence is automatically initiated. The tape now moves forward and comes to rest at BOT.

The REWIND indicator is illuminated for the duration of the Rewind and the following Load sequence.

An RWC is ignored if the tape is already at BOT.

The velocity profile is trapezoidal with nominally equal rise and fall times of approximately 0.5 second.

3.7.5 SET WRITE STATUS (SWS)

This is a level which must be true for a minimum period of 20 μseconds after the front edge of an SFC (or SRC) when the Write mode of operation is required. The front edge of the delayed SFC (or SRC) is used to sample the SWS signal and sets the Write/Read flip-flop in the transport to the Write state.

If the Read mode of operation is required, the SWS signal must be false for a minimum period of 20 μseconds after the front edge of a SFC (or SRC), in which case the Write/Read flip-flop will be set to the Read state.

3.7.6 WRITE DATA LINES (WDP, WD0-7)

These are levels which, when true, at Write Data Strobe (WDS) time (when the transport is in the Write status) result in a flux reversal being recorded on the corresponding tape track.

These lines must be held steady during the WDS, and for 0.5 μsecond before and after the WDS pulse.

3.7.7 WRITE DATA STROBE (WDS)

This is a pulse (1 μsecond minimum width) for each flux reversal to be recorded. The frequency of the WDS is twice the character transfer rate. The WDP and WD0-7 levels must be steady for 0.5 μsecond before, during, and after the WDS. The trailing edge of WDS is employed to copy the phase encoded waveform into the transport.

3.7.8 WRITE AMPLIFIER RESET (WARS)

This is a pulse (1 μsecond minimum width) which, when true, turns off the write current in the transport. This signal occurs coincidental with the last flux transition of the postamble.

3.7.9 OFF-LINE (OFFC)

This is a level or pulse of a minimum width of 1 μsecond which resets the On-line flip-flop to the false state, placing the transport under manual control.

It is gated in the transport by SELECT only, allowing an OFF-LINE command to be given while a rewind is in progress.

OFF-LINE must be separated by at least 1 μsecond from a REWIND command.

3.7.10 OVERWRITE (OVW)

This is a level which, when true, conditions appropriate circuitry in the transport to allow updating (rewriting) of a selected record. The transport must be in the Write mode of operation to utilize the OVW feature. The Set Write Status (SWS) signal must be employed in conjunction with OVW when updating isolated records.

3.7.11 READ THRESHOLD (RTH2) (6640 TRANSPORT)

This is a level which, when true, selects a low threshold level for the Read circuits in the 6640 transport. This level is selected only when it is required to recover very low amplitude data. RTH2 must be held steady for the duration of each recording being read.

3.7.12 READ THRESHOLD (RTH1) (6660 TRANSPORT)

This is a level which, when true, conditions the read electronics of the 6660 transport to operate in the high read threshold mode. When false, the read electronics of the transport reverts to the normal read threshold. The true level will normally be used only when it is required to perform a read-after-write data check.

3.7.13 READ THRESHOLD (RTH2) (6660 TRANSPORT)

This is a level which, when true and the 6660 transport is in the Read mode and RTH1 is false, selects an extra low threshold level for the Read circuits in the transport. This level will normally be made true only when it is required to recover very low amplitude data. RTH2 must be held steady for the duration of the record.

3.8 INTERFACE OUTPUTS (TRANSPORT TO CONTROLLER)

It is assumed that all the Interface outputs discussed in the following paragraphs are gated with SELECT.

3.8.1 READY (RDY)

This is a level which is true when the transport is ready to accept any external command; i.e., when

(1) Tape tension is established.

(2) The initial LOAD or REWIND command has been completed.

(3) There is no subsequent REWIND command in progress.

(4) The transport is On-line.

3.8.2 READ DATA (RDP, RD0-7)

The signals on these 9 lines are the outputs of the 9 peak detectors, individually gated with the outputs of an envelope detector associated with each channel. These signals are a replica of the PE waveforms used to drive the write amplifiers.

The characteristics of any threshold detector are such that the signal from approximately four successive bits must exceed the threshold level before the detector will enable the output gate for its channel. If the signal suddenly ceases (e.g., due to a dropout) the threshold detector disables the output gate to its channel approximately two bits after the dropout.

3.8.3 ON-LINE

This is a level which is true when the On-line flip-flop is set. When true, the transport is under remote control. When false, the transport is under local control.

3.8.4 LOAD POINT (LDP)

This is a level which is true when the transport is Ready and the tape is at rest with the BOT tab under the photo-tab sensor. The signal goes false after the tab leaves the photosensor area.

3.8.5 END OF TAPE (EOT)

This is a level which, when true, indicates that the EOT reflective tab is positioned under the photo-tab sensor.

3.8.6 REWINDING (RWD)

This is a level which is true when the transport is engaged in any Rewind operation or the Load sequence following a Rewind operation.

3.8.7 FILE PROTECT (FPT)

This is a level which is true when power is on and a reel of tape, without a Write Enable ring installed, is mounted on the transport.

3.9 INTERFACE TIMING

3.9.1 WRITE AND READ WAVEFORMS

Figure 3-2 shows the Phase Encoded Write and Read waveforms. The controller generates all command waveforms.

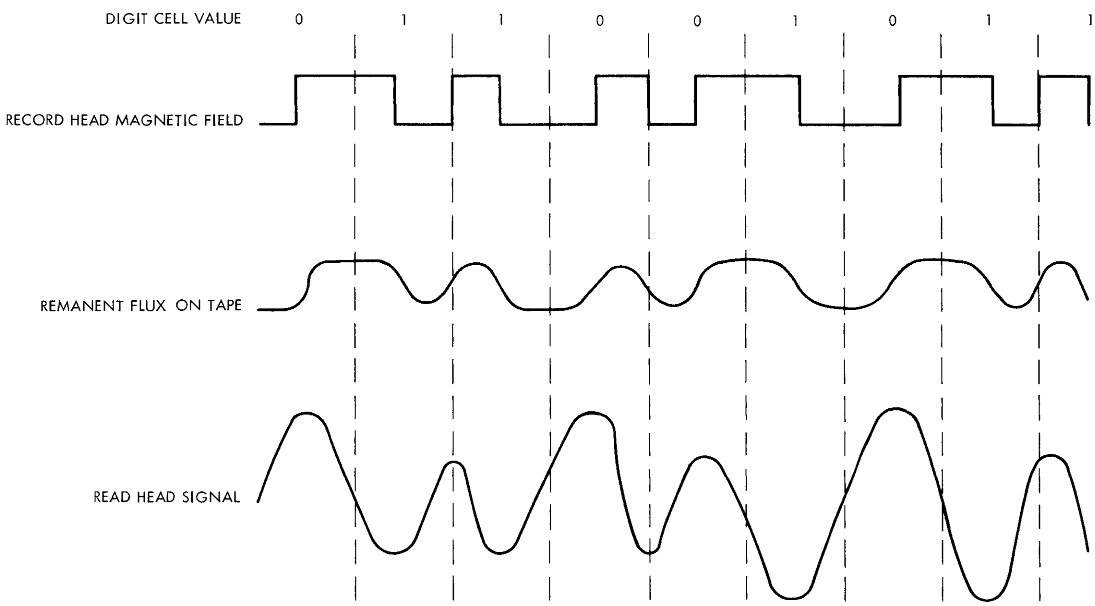

Figure 3-2. PE Write and Read Waveforms

SECTION IV
THEORY OF OPERATION

4.1 INTRODUCTION

This section provides a description of the High Performance Models 6640 and 6660 tape transports.

These tape transports have the mechanical and electronic facilities to record and reproduce 1600 cpi Phase Encoded magnetic tape recorded on IBM (or equivalent) tape transports.

The transport consists of the following components.

(1) Power supply

(2) Capstan drive system

(3) Tape storage and reel servo systems

(4) Magnetic head and associated tape guides and cleaner.

(5) Tape load-unload system

(6) Data electronics.

(7) Tape control system

4.2 ORGANIZATION OF THE TRANSPORT

A highly modular construction has been adopted with all of the major components and subassemblies interconnected by means of connectors rather than the more conventional wiring techniques. Refer to Figure 4-1 for the 75 ips 6640 tape transport configuration; refer to Figure 4-2 for the 75 ips 6660 tape transport configuration.

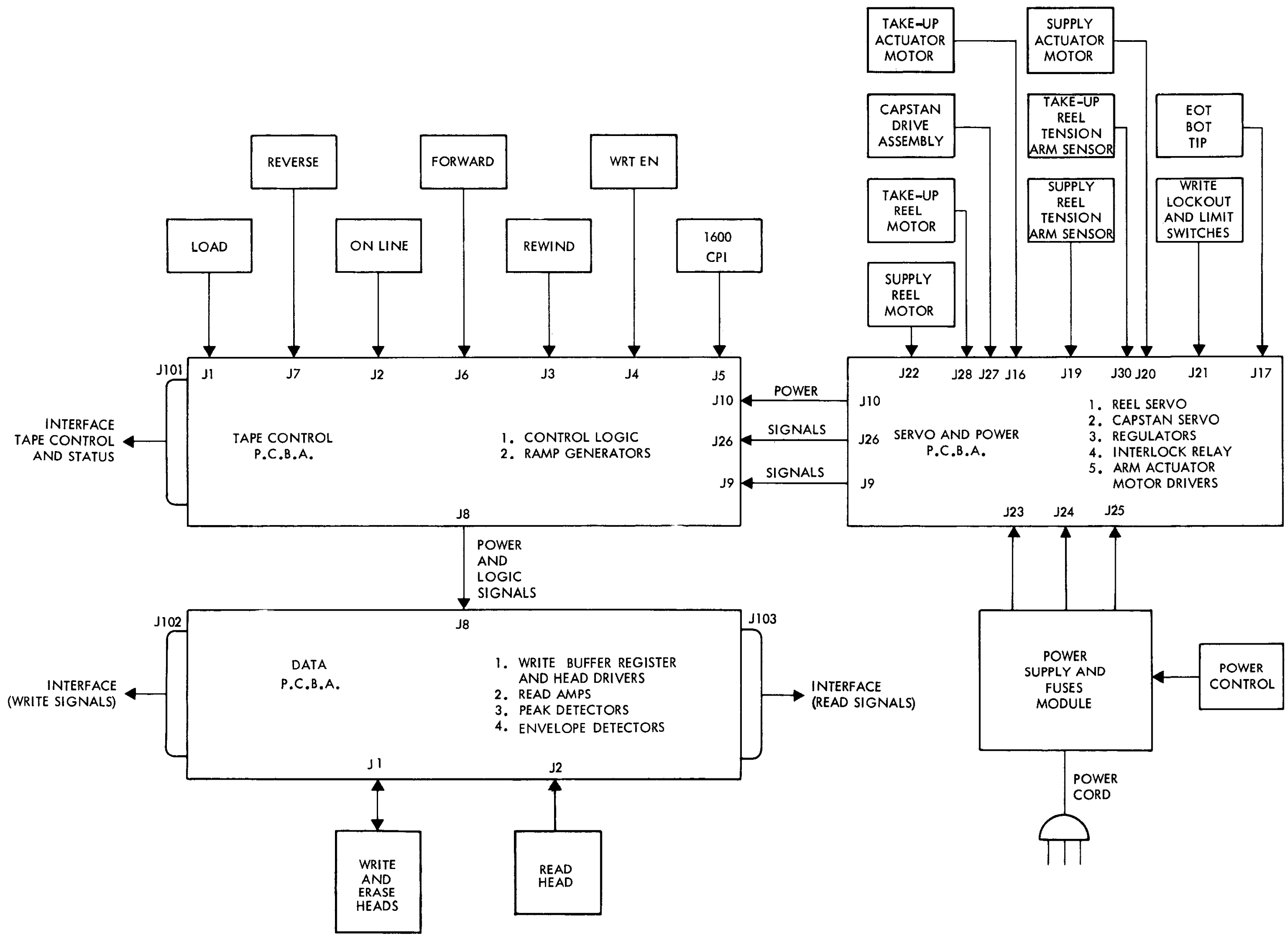

Figure 4-1. Organization of Model 6640 High Performance Tape Transport

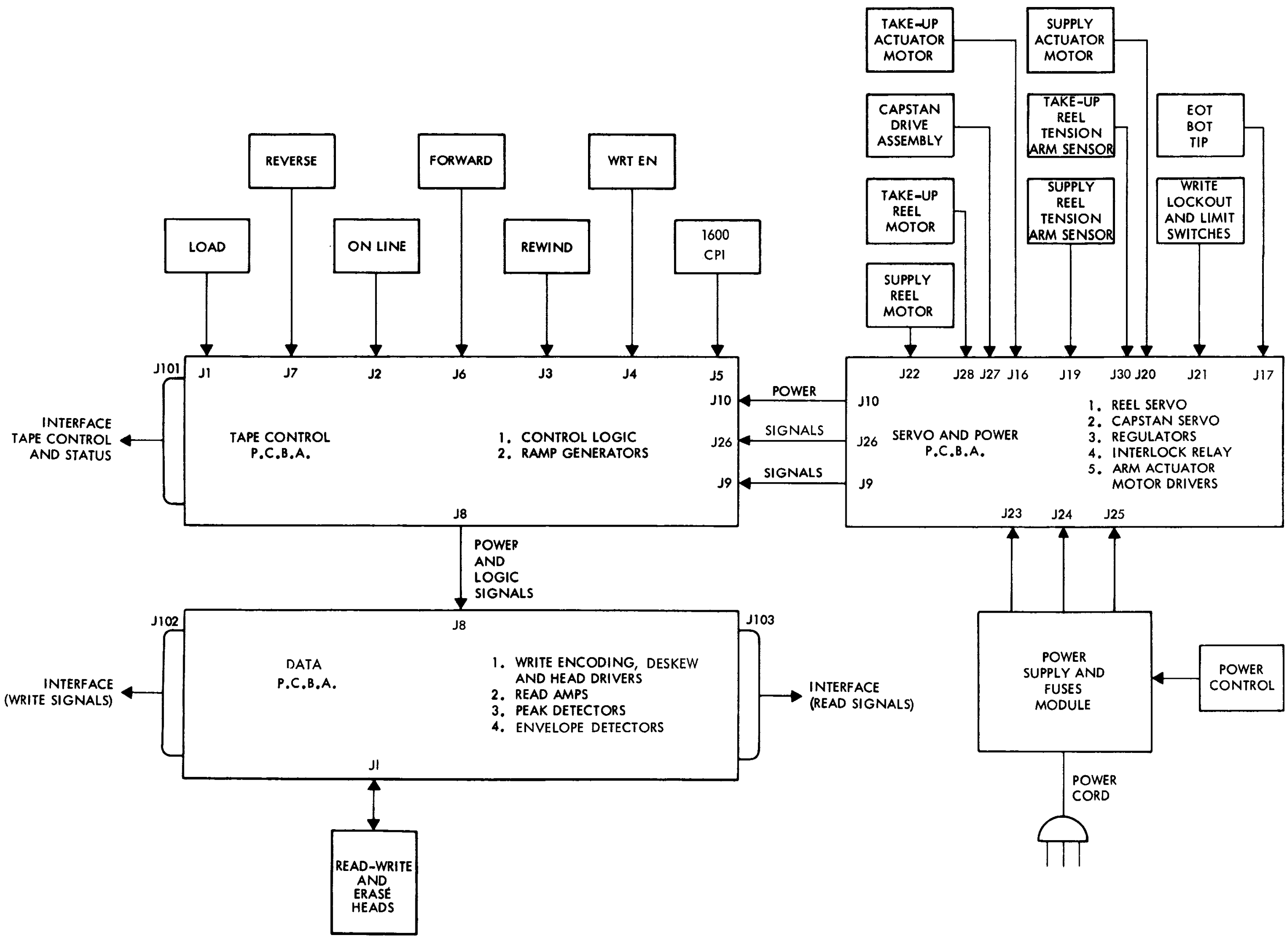

Figure 4-2. Organization of Model 6660 High Performance Tape Transport

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Three printed circuit boards are employed. The first, the Servo and Power Supply circuit board, is mounted to a common heatsink extrusion secured to the power supply module. The circuit board consists of the reel servo amplifiers, capstan servo amplifier, voltage regulators, tension arm motor drivers, photo-tab sensor amplifiers, and interlock relays. With the exception of the magnetic head and the manual control switches, all of the deck-mounted components (power supply, motors, tension arm position sensors, photo-tab sensors, etc.) plug directly into locations on the circuit board.

The other two boards are mounted in slides perpendicular to the rear of the deck plate. They are the Data circuit board and the Tape Control circuit board.

The Data circuit board (nearest the head) is concerned with the writing and reading of data. Write data signals enter by means of a printed circuit edge connector on one end of the board; they are buffered and transferred to the write head through a connector (one of two) in the middle of the board. Read signals enter the circuit board via the second of the two connectors and are fed to the amplifiers, peak detectors, envelope detectors, and transmitters. Digital read signals are transmitted by means of a second interface edge connector.

DC power and three control levels are obtained from the Tape Control circuit board through a single harness.

The Tape Control circuit board contains the ramp command generators for the capstan servo, together with the control logic. All of the manual controls except POWER plug directly into this circuit board. The printed circuit edge connector carries interface signals to and from the circuit board. DC power and control signals are supplied to this board from the Servo and Power Supply circuit board via three connectors.

4.3 FUNCTIONAL SUBSYSTEMS DESCRIPTION

4.3.1 POWER SUPPLY

Figure 4-3 is a block diagram of the power supply which is in two parts. The first part, the power supply module, is fastened to the deck plate and contains the power transformer, rectifier, capacitors, fuses, and a number of power resistors. Two unregulated supplies are generated at a nominal voltage of ±22v.

The second part consists of the ±10v and ±5v voltage regulators which are located on the Servo and Power Supply circuit board. Interconnection between the two parts is provided by a harness from the Power Supply module which plugs into the Servo and Power Supply circuit board via two 9-pin connectors and one 6-pin connector.

The transformer primary connections are shown in Figure 4-4 for several line voltages. Line voltage is connected to the transformer via the POWER control. The POWER control neon indicator and the fan motor are always connected across 115v ac, independent of line voltage. Unregulated dc (at a nominal ±22v under load) is used to power the motors and voltage regulators. Four regulated supplies are generated. The 10v supplies can supply up to 1.0 amp. The ±5v supplies are adjusted, regulated, and can supply 3.0 amps and 1.0 amp, respectively.

SCR "crowbar" protection is employed on all regulated supplies and protects against an over-voltage condition. The SCRs are connected between the +22v and 0v and between the -22v and 0v. The activation of either SCR will blow the fuse in series with it and turn off the regulators on the other supply line. A short circuit on any regulator output will turn off all of the regulators.

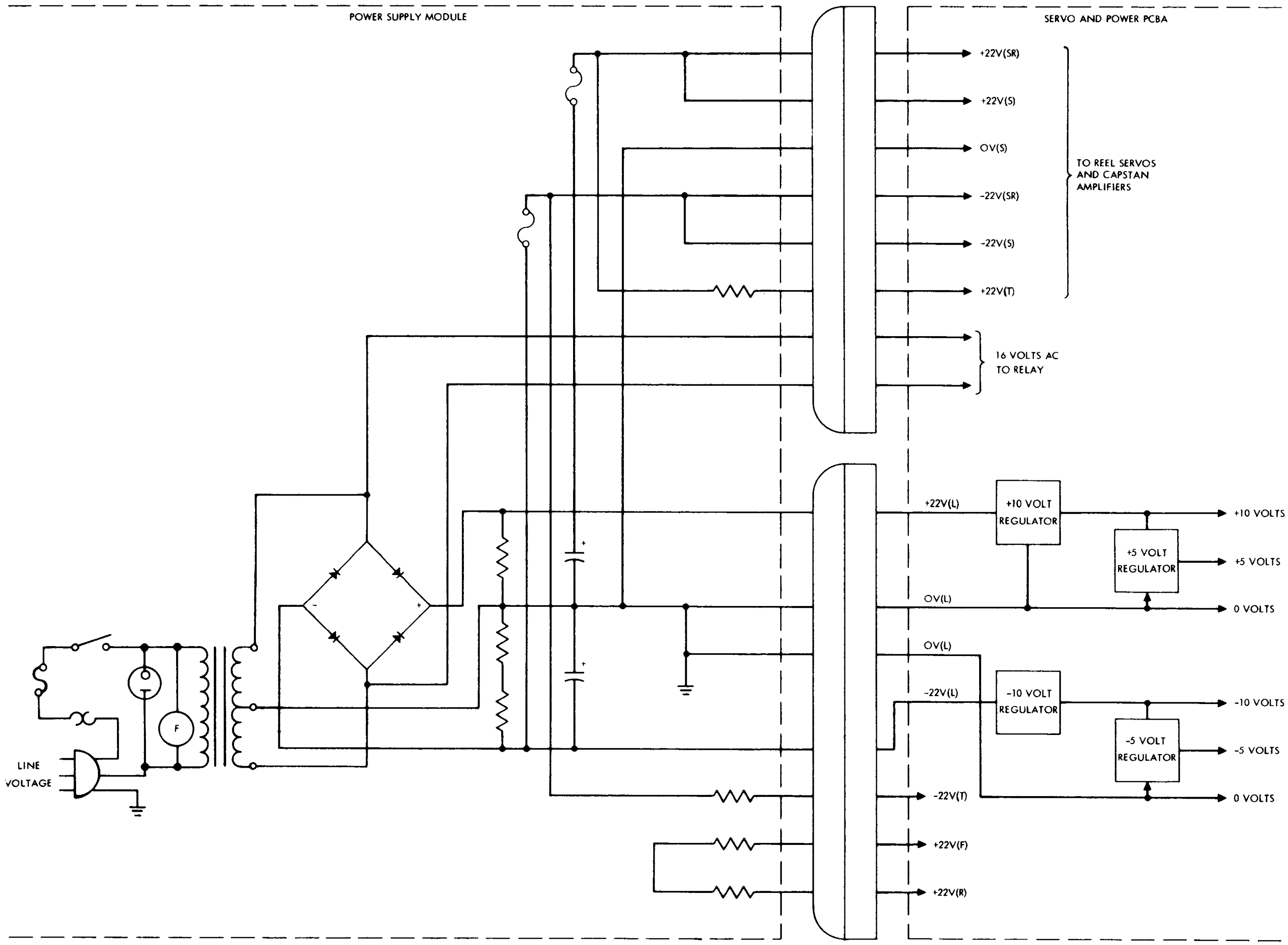
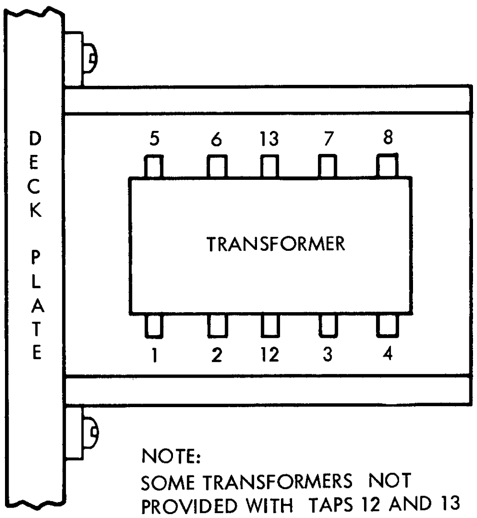


Figure 4-3. Block Diagram of Power Supply



LINE VOLTAGE	LINE BETWEEN	CONNECT
95	12 AND 3	12 TO 13 AND 3 TO 7
100	2 AND 3	2 TO 6 AND 3 TO 7
110	1 AND 3	1 TO 5 AND 3 TO 7
115	2 AND 4	2 TO 6 AND 4 TO 8
125	1 AND 4	1 TO 5 AND 4 TO 8
190	12 AND 7	4 TO 13
200	2 AND 7	3 TO 6
210	1 AND 7	3 TO 6
215	2 AND 7	4 TO 6
220	1 AND 7	3 TO 5
225	2 AND 7	4 TO 5
230	2 AND 8	4 TO 6
235	1 AND 7	4 TO 5
240	1 AND 8	4 TO 6
250	1 AND 8	4 TO 5

Figure 4-4. Transformer Primary Connections

4.3.2 FUNCTIONAL BLOCK DIAGRAM

Figure 4-5* is a functional block diagram illustrating the operation of the capstan servo, reel servo, and the tape load and unload system. This diagram should be referred to in conjunction with the following description.

4.3.3 CAPSTAN DRIVE SYSTEM

Figure 4-6 is a block diagram of the capstan servo. It consists of three parts: the deck-mounted capstan drive assembly, consisting of the motor-tachometer combination and the capstan; the ramp generators on the Tape Control circuit board; and, the capstan drive amplifier on the Servo and Power Supply circuit board. A relay contact disconnects the motor when tape tension is lost.

The tape is moved by the capstan at a velocity determined by the velocity servo and the output of one of the two ramp generators. If

*Foldout drawing, see end of this section.

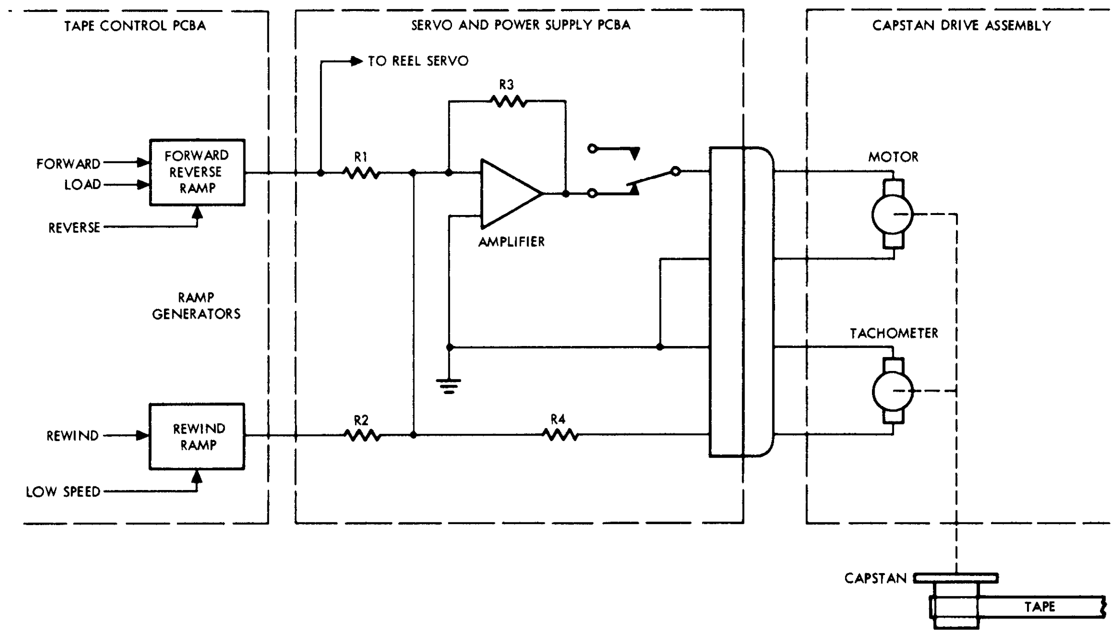


Figure 4-6. Capstan Servo Block Diagram

the Forward ramp generator is selected by the logic, the voltage at resistor R1 rises at a rate corresponding to the required start time of the tape. The amplifier then accelerates the motor and the tape; the feedback voltage from the tachometer produces current in resistor R4, which tends to reduce the amplifier input current produced by the selected ramp generator. The voltage at resistor R1 stops rising after the required start time and the velocity builds up to the point where the currents in resistors R4 and R1 are approximately equal and opposite.

The Forward ramp generator is activated by the SYNCHRONOUS FORWARD command (SFC) or a Load sequence. The Reverse ramp generator is activated by a SYNCHRONOUS REVERSE command (SRC) and the Rewind ramp generator by a REWIND command (RWC), either remote or manual. When the transport is in the standby condition, neither ramp generator is activated. In this case, the velocity servo holds the capstan stationary.

Both Forward and Reverse ramps rise and fall in a time calculated to produce start-stop distances of 0.19 ±0.02 inch, e.g., 4 milliseconds for a 75 ips transport. Typical waveforms are shown in Figure 4-7.

The Rewind ramp rise and fall times are not critical; they are approximately 0.5 second and are chosen so as to allow the reel servos to keep up with the rise and fall in tape speed.

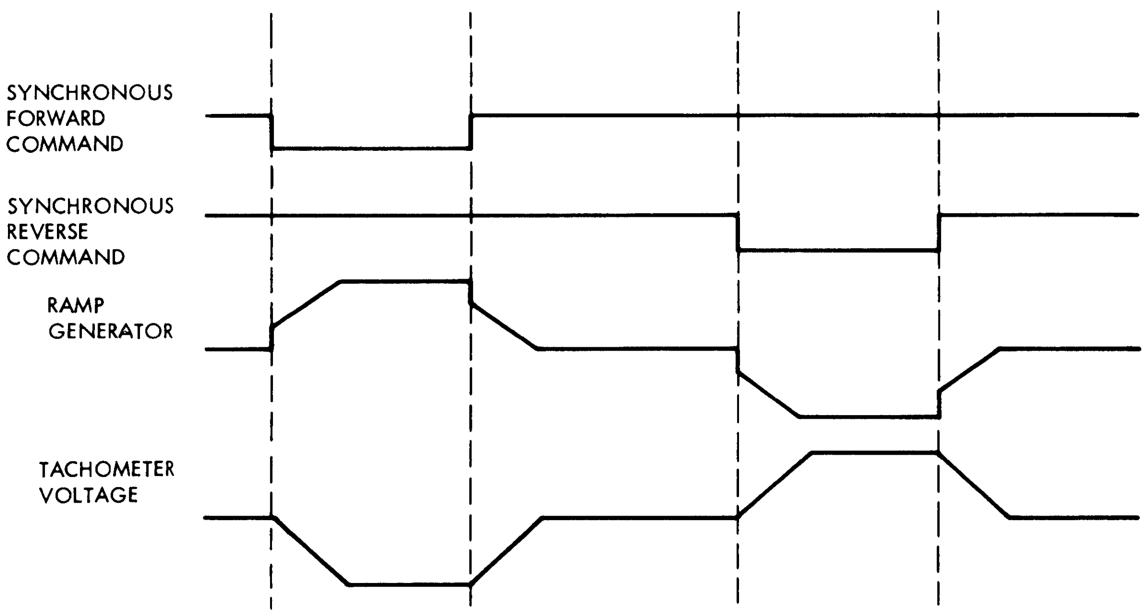


Figure 4-7. Typical Capstan Servo Waveforms

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4.3.4 TAPE STORAGE AND REEL SERVO SYSTEMS

Identical non-linear position servos control the supply and take-up of tape by the reels. Figure 4-8 is a diagram of one complete reel servo together with part of a second and the relevant interconnections.

The components of the servo are:

(1) Tension arm position sensor.

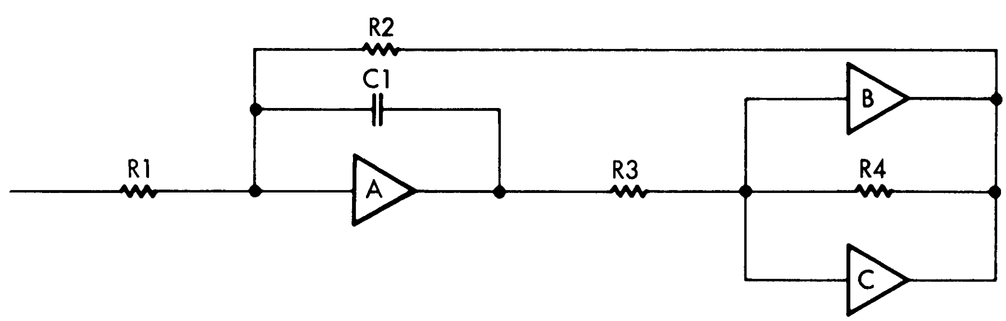
(2) Pulleys, belt, tension arm, and tape reel.

(3) Reel motor.

(4) Servo amplifiers (delay network, preamplifier, current limiter, and switching amplifier) on the Servo and Power Supply circuit board.

Refer to Figure 4-5*for the functional interconnection of the servo systems.

The switching amplifier, shown in the following example, drives the reel motors. It is a closed loop, self-oscillating type whose input frequency or amplitude will vary both the output frequency and mark to space ratio.



*Foldout drawing, see end of this section.

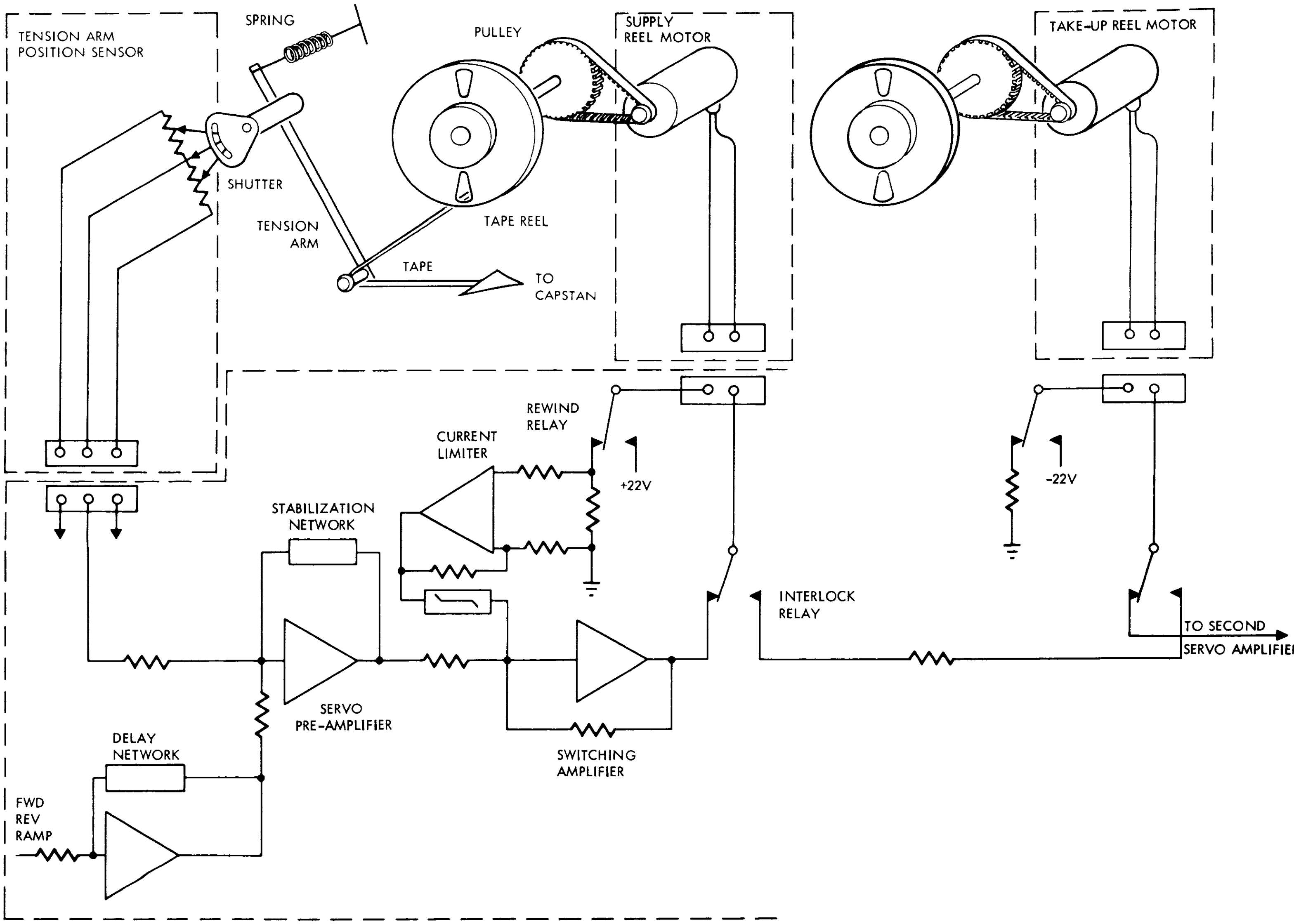


Figure 4-8. Reel Servo Diagram

Amplifier A, resistor R1, and capacitor C1 form an integrator employing the Miller principle. Resistor R2 provides negative feedback. Resistors R3 and R4 provide a positive feedback network around amplifiers B and C. A negative input to R1 will be amplified at the output by amplifier B switching on and off; a positive input to R1 is amplified at the output by amplifier C switching on and off.

The tension arms establish tape tension and isolate the inertia of the reels from the capstan. Low-friction ball bearing guides are used to minimize tape tension variations. The angular position of the tension arm is sensed by a photosensitive potentiometer which produces a voltage output proportional to the arm position. This output is amplified and drives the reel motor in the direction to center the tension arm. The geometry of the tension arm and spring ensures that only negligible tape tension changes occur as the storage arm moves through a 60-degree arc.

With the tape stationary, the storage arms take a position such that the amplified tension arm sensor output, when applied to the reel motor, provides sufficient torque to balance the tension arm spring torque.

Initially, the sensor is set by rotating the shutter on the tension arm shaft for 0v output when the tension arm is in the center of its range.

When the capstan injects a tape velocity transient in either direction the arm moves and the high gain amplifier, together with the current limiter, cause a predetermined current to flow in the reel motor in such a direction to stop the arm at a predtermined position. In addition, a voltage from the Forward/Reverse capstan ramp generator, suitably delayed, is subtracted from the arm sensor input. This causes the steady state displacement of the arm to be large in spite of the high amplifier gain so that storage associated with the complete arm movement is available when the capstan velocity reverses. The high amplifier gain ensures little variation in arm displacement as the reel velocity varies due to changes in the effective reel diameter from an empty to full reel condition.

The amplifier gain is 67 volts per volt, the motor gain is 7.5 radian per second per volt, and the motor velocity is stepped down by four to one. If the arm is displaced 0.4 radian (half the total possible swing) the output from the arm sensor gain (4.2 volts per radian) is $0.4 \times 4.2 = 1.68$v. The magnitude of the voltage from the Forward/Reverse ramp generator is 4.8v and the normalized gain of the delay network is 0.3 volt per volt. Thus, the output of the delay network is $0.3 \times 4.8 = 1.44$v. The angular velocity of the reel is therefore:

$$(1.68 - 1.44) \times 67 \times 7.5 \div 4 = 30 \text{ radian per second}$$

This corresponds to a linear tape speed of 75 ips for an empty reel (5-inch diameter). Thus, the arm displacement from 75 ips forward to 75 ips reverse is 0.8 radian. When the reel is full (10-inch diameter) the required velocity is only 15 radian per second. This requires an arm sensor input of 1.56v instead of 1.68v which corresponds to a change of arm displacement of 0.03 radian or less than 8 percent.

Without tape, the arms are in the load position and the tension arm limit switch opens, de-energizing the interlock relay. When the relay is de-energized, the two reel motors are disconnected from their respective amplifiers and connected together through a low resistor (see Figure 4-8); thus providing a dynamic braking effect. The characteristics of the system ensure that when power is lost in the Rewind mode, the two reels come to rest in such a manner that proper tape tension is not exceeded and significant tape spillage does not occur. The dynamic braking feature is also useful when tape tension is lost in the tape unload operation.

In the Rewind mode, the reel servo is altered by switching the motor lead going to 0v to -22v or +22v. This allows sufficient voltage across the motor to enable the reel servo to operate at a tape speed of 150 ips.

4.3.5 TAPE LOAD-UNLOAD SYSTEM

The 75 ips tape transports provide a tape load-unload system having the same ease of operation possible with single-loop tape path transports.

At the end of an unload operation the tape storage arms are brought to the up postion and tape can be threaded without repeated looping around the tension arm rollers (see Figure 3-1). During a load operation, the arms are brought down to complete the loops and establish tape tension. The up and down movements are provided by actuator motors (gear motors) which get driving voltages (positive and negative) via UP-STOP and DOWN-STOP switches. The cams mounted on the actuators push the arms up against the mechanical force of the tension springs. Hence, as the cams move down, the arms follow them.

Consider the normal operation cycle of the transport. Initially, tape has not been mounted. Power is turned on. If the tension arms are not all the way up in the tape threading position, the actuator motors will move them into the proper position. Tape is then mounted. The LOAD switch indicator is depressed (once or twice). The actuator motors move the arms down, and the tape is tensioned when the tension arms are approximately three-fourths of the way down. The actuator motors move the arm driving cams all the way down and open the DOWN-STOP switches. The LOAD switch indicator is depressed again (not necessary if it was originally depressed twice). The tape advances to the BOT tab and stops. The ON LINE switch/indicator is depressed, and the transport is connected to the controller.

To unload the tape, the ON LINE switch/indicator is depressed again. The transport is disconnected from the controller. The REWIND switch/indicator is depressed and the tape rewinds to the BOT tab, overshoots and comes to rest at the BOT tab. The REWIND switch/indicator is depressed again and the tape is completely rewound onto the supply reel, clearing the tape path and letting the tension arms open the ARM-INTERLOCK switches. The actuator motors then move the arms up to the tape threading position. The tape is removed, and the cycle is complete.

Referring to the functional block diagram of the Servo and Power Supply (Figure 4-5*) let us consider the normal operation of the transport where, initially, tape has not been mounted. For purposes of discussion, all logic variables are high-true.

When power is turned on, TIP (Tape-In-Path) becomes false (low) (Pin 6, J17). Hence, the output of TIP AMP (NTIP) becomes true and diode CR33 is back-biased. Initially, relay K1 is unlatched and CR36 is also back-biased. If the tape storage arms are in any position other than the load (up) position the Up-Stop switches will be closed and TIP and K1 SENSE will cause the ACTUATOR UP DRIVERS to raise the arms until the UP-STOP SWITCHES are opened and the arm motion is stopped.

Tape is now mounted on the transport and TIP becomes true, forward-biasing CR33 and disabling the ACTUATOR UP DRIVERS.

When the LOAD switch/indicator is depressed, NMLOAD (No Motor Load) becomes false (Pin 1, J26). With NTIP false NMLOAD and NTIP SENSE cause the ACTUATOR DOWN DRIVERS to move the tape storage arms down. When the arms reach a position approximately three-fourths of the way down, NERS (No Enable Reel Servo) from

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*Foldout drawing, see end of this section.

NERS GEN becomes false. NERS is applied to the Tape Control PCBA via Pin 9, J9, and causes MINTLK (Make Interlock) to become true (Pin 2, J26). MINTLK SENSE causes the ACTUATOR DOWN DRIVERS to become insensitive to differences in tape storage arm position sensor voltages. Additionally, MINTLK activates INTLK RELAY K1 DRIVER which energizes relay K1. This causes the tape to be tensioned, INTLK-A to become true, and NERS to be reset true.

When the tape becomes tensioned the ACTUATOR DOWN DRIVERS continue operation until the DOWN-STOP SWITCHES open and actuator motion is stopped. This allows the SUPPLY and TAKE-UP ACTUATOR SENSE to enable INTLK-A to set the output of NINTLK-B DRIVER (Interlock-B) false via R126. This resets MINTLK false and NMLOAD true on the Tape Control PCBA via Pin 6, J3. Also, INTLK-A and NINTLK-B SENSE maintain INTLK RELAY K1 DRIVER activated. This holds K1 energized regardless of the state of MINTLK. Hence, the tape loading sequence is completed.

The unloading sequence begins when the tape has reached BOT, and the REWIND switch/indicator is depressed. This causes MINTLK to become true and maintain INTLK RELAY K1 DRIVER activated, which in turn keeps K1 energized regardless of the state of INTLK-A. Additionally, AOS (Arm Offset) and ULOS (Unload Offset) become true respectively at Pins 5 and 6, J26, causing the tape storage arms to take two and two-and-one-half inches of offsets, while the remaining tape rewinds slowly onto the supply reel. When tape tension is lost, INTLK-A becomes false but rewind continues until TIP becomes false and resets MINTLK false. This action inactivates INTLK RELAY K1 DRIVER and K1 is de-energized. Reel motion ceases and the actuators move the tension arms to the tape threading position thus ending the unload operation.

4.3.6 DATA ELECTRONICS

Information is recorded on tape in the Phase Encoded (PE) mode. The PE system interprets a flux change toward the magnetization direction of the IBG as a one bit. A flux change in the opposite direction represents a zero bit. A phase flux reversal is written between successive one bits or between successive zero bits to establish proper polarity. Thus, up to two flux changes are required per bit for the PE method of data decoding.

The PE method of recording data differs from the NRZI method in that the NRZI employs only one flux change in either direction to represent a one bit, and the lack of a flux change to represent a zero bit.

Figure 4-9 illustrates the basic recording waveform components of the NRZI and PE modes. Note that in the PE mode there is a flux shift within each cell period indicative of a one or zero bit. The direction of magnetic flux change on the tape at the center of the bit cell determines its value (zero or one).

Figure 4-10 illustrates the relevant 9-track allocation, spacing, and format of 1600 cpi PE tape. Consecutive data channels are not allocated to consecutive tracks. This organization increases tape system reliability because the most used data channels are located near the center of the tape. Consequently, they are least subject to errors caused by contamination of the tape.

The data block is preceded by a preamble consisting of 40 bytes of all zeros and one byte of all ones. Note that the data block is followed by a postamble which is the mirror image of the preamble, i.e., one byte of all ones followed by 40 bytes of all zeros.

NOTE

The preamble and postamble bursts are configured so that during a Read Reverse operation their functions are interchangeable.

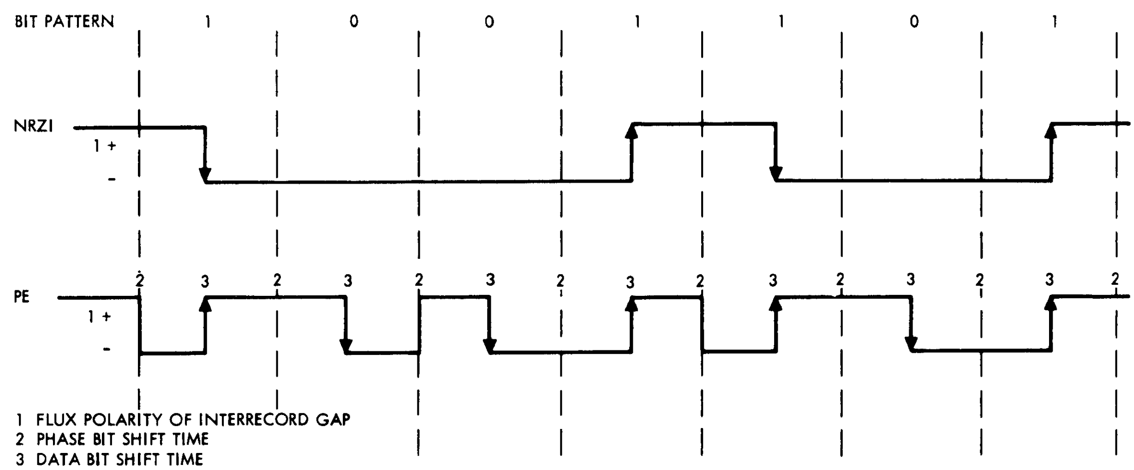

Figure 4-9. Comparison of NRZI and PE Recording Modes

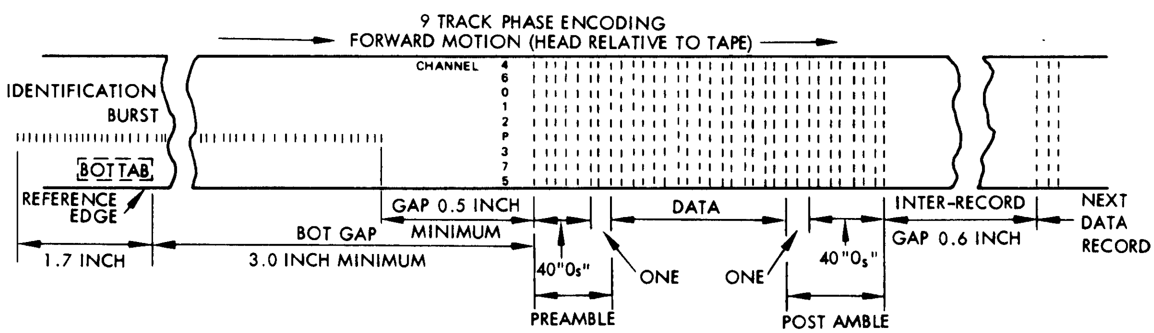

Figure 4-10. 9-Track PE Allocation, Spacing, and Format

During a Read operation, as the tape passes over the read/ white head, any flux pattern recorded on the tape (one or zero) generates a waveform in its appropriate data track. It is important to note that during a Read Reverse operation the read signal is inverted, i.e., a one bit is a negative transition and a zero bit is a positive transition.

Illustrated in Figure 4-11* are waveforms that occur on a channel during a write and read-back operation. Magnetization transitions recorded on the tape are not perfectly sharp because of the limited resolution of the magnetic recording process.

During read-back, the voltage induced in the head is amplified, differentiated, and then applied to a Schmitt trigger and an envelope detector. The differentiator and Schmitt trigger form a peak detector. The envelope detector performs a gating function. Thus, the output is present on the interface line only when a data block is present.

Figure 4-12* is a functional logic diagram of one channel of data electronics (6640) and the relevant common control logic. This diagram is to be used only for purposes of describing system operation.

Figure 4-13* is a functional logic diagram of one channel of data electronics (6660) and the relevant common control logic. This diagram is to be used only for purposes of describing system operation.

4.3.6.1 <u>Operation with Dual- and Single-Gap Heads</u>

The 6640 transport utilizes a dual-gap head which enables simultaneous read and write operations to take place, thus allowing writing and checking of data in a single pass.

Gap scatter in both the write and read heads is held within tight limits so that correction is not necessary. Conversely, the azimuth

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*Foldout drawing, see end of this section.

angle of both heads is not held within such tight limits and correction is therefore necessary.

The read head azimuth adjustment is provided by shimming the fixed head guides adjacent to the head so that the tape tracks at 90 degrees to the read head gap. Since the write and read heads are constructed in the same block, an independent method of azimuth adjustment is required for the write head. This is achieved electronically by triggering the write waveform generator for different channels sequentially and at such times that the azimuth error in the write head is nullified.

The 6660 transport utilizes a single gap head for both read and write operations. Azimuth alignment is accomplished again by shimming the fixed head guides adjacent to the head so that the tape tracks at exactly 90 degrees to the head gap. Since the same gap is used for both reading and writing, no additional azimuth compensation is necessary.

4.3.6.2 Data Recording (Dual Gap Model 6640)

Assume that the transport is Selected, Ready, On-line, and has a Write Enable ring installed. The WRT PWR control line will therefore be at +5v providing power for the head driver circuits.

When a SYNCHRONOUS FORWARD command is received, the MOTION signal generated on the Tape Control circuit board goes high, removing one input of OR gate U7.

In operation, the front edge of the SYNCHRONOUS FORWARD command is delayed and differentiated and the resulting pulse used to sample the condition of the SET WRITE status line. If this is true, the following action takes place.

(1) The Write/Read mode flip-flop (U20, see Paragraph 4.3.7.5) is set.

(2) The NWRT waveform becomes low.

(3) The -5v driver (Q3) is turned on.

(4) The erase head is energized.

(5) The C_D input of U3 goes high. The polarity of the field from the erase and write heads under these conditions is such that tape will be erased in an IBM-compatible direction.

Figure 4-14* is a timing diagram illustrating relationships of signals during data recording and should be referred to in conjunction with Figure 4-12*. The SFC command (Plot 1) enables the ramp generator, which causes the tape to accelerate to the prescribed velocity (Plot 2). After a time (T1) determined by the required inter-record gap (IRG) displacement, the WRITE DATA inputs (Plot 4) together with the WDS (Plot 3) are supplied to the interface connector. Preamble, data block, and postamble are recorded.

The WRITE DATA (IWD**) input is received by interface receiver U1 and is strobed into flip-flop U3 at the trailing edge of the WRITE DATA STROBE (IWDS). On the Write Data lines (IWDP - IWD7) a one is a positive going edge at data flux reversal time and a zero is a negative going edge. The phase edge can be positive or negative going. Both outputs of flip-flop U3 are fed to head driver transistors Q1 and Q2, which cause current to flow in one half or the other of the center-tap head winding. Consequently, magnetization on the tape is maintained in the appropriate direction between change-overs and changes direction in accordance with the input signal IWD.

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*Foldout drawing, see end of this section.

**Interface lines connecting transport to controller are prefixed by "I".

At the completion of the postamble, SFC goes false after the post-record delay time (T2). The ramp generator is disabled and the tape velocity decelerates to zero.

The IRG displacement consists of the following.

(1) The stop distance: the distance traveled during the tape deceleration period to zero velocity.

(2) The start distance: the distance traveled while the tape is accelerating to the prescribed velocity.

(3) An additional distance determined by the pre-record time (T1), from the SFC command going true to the time of the first WDS and the post-record time (T2), from the end of the postamble to SFC going false. (Time delays T1 and T2 are provided by the customer's controller.)

4.3.6.3 Overwrite Operation (Model 6640)

The Overwrite function allows updating (rewriting) of a selected record. The new data block to be inserted must be exactly the same length as the data block being replaced. This restriction is necessary since replacing a block of data with a block longer than the original could result in an IRG distance which is less than the minimum allowed, or in writing over the next record. If the new data is shorter than the existing block, errors could result since some unerased portion of the old data would remain.

Additionally, when write and erase currents are switched off abruptly there is a small area of tape which is influenced by the collapsing magnetic fields of the heads. This constitutes flux transients on the tape which appear as spurious signals when read back. The Overwrite feature of the transport has effectively eliminated this problem by turning the write current off slowly while the tape is still in motion.

NOTE

Refer to PERTEC Application note concerning the control and timing restrictions associated with Overwrite.

To update a previously recorded record the transport must be Selected, Ready, On Line, and have a Write Enable ring installed. Additionally, the Overwrite (OVW) signal from the controller must be true and coincident with SWS and SFC.

Figure 4-15 is a functional logic diagram of the Write/Overwrite circuitry employed in the transport. When an SFC is received, the MOTION signal is delayed, differentiated, and supplied to the toggle inputs of flip-flops U8 and U9 and to the set input of flip-flop U10. Flip-flop U8 sets if the SWS line is true coincident with the trailing edge of the GO pulse. Flip-flop U10 sets, providing a true input to gate U6.

Flip-flop U9 sets if the OVW signal is coincident with the trailing edge of the GO pulse.

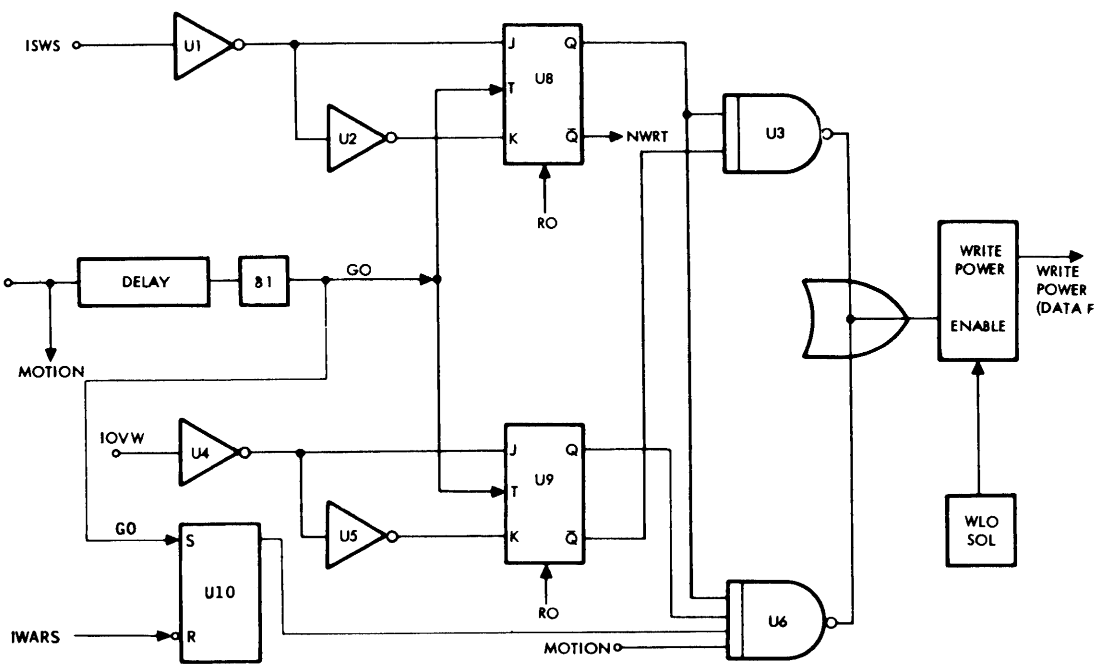

Figure 4-15. Functional Logic and Timing Diagram, Write/Overwrite

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The Q outputs of flip-flops U8 and U9, the Set output of U10, and the MOTION signal are ANDed at gate U6.

NOTE

> AND gate U3 is disabled during an Overwrite operation by the low $\overline{Q}$ output of flip-flop U9.

The low true output of gate U3 causes the Write Power Enable output voltage to ramp from 0v to +5v, nominal.

The output of the Write Power Enable circuit is applied to the Write logic on the Data circuit board to enable writing of the new record.

Overwrite operation is terminated by resetting U10 with IWARS. Resetting U10 disables gate U6 causing the Write Power Enable output voltage to ramp from +5v to 0v, thus removing the power to the write circuits.

4.3.6.4 Data Recording (Single-Gap Model 6660)

Assume that the transport is Selected, Ready, On-line, and has a Write Enable ring installed. The WRT PWR control line will therefore be at +5v, providing power for the head driver circuits.

When a SYNCHRONOUS FORWARD command is received, the MOTION signal generated on the Tape Control circuit board goes high, removing one input of OR gate U7 via U6.

In operation, the front edge of the SYNCHRONOUS FORWARD command is delayed and differentiated and the resulting pulse used to sample the condition of the SET WRITE STATUS line. If this is true, the following action takes place.

(1) The Write/Read mode flip-flop U20 is set.

(2) The NWRT waveform becomes low.

(3) The -5v driver (Q3) is turned on.

(4) The erase head is energized.

(5) The C_D input of U3 goes high. The polarity of the field from the erase and write heads under these conditions is such that tape will be erased in an IBM-compatible direction.

Figure 4-16* is a timing diagram illustrating relationships of signals during data recording and should be referred to in conjunction with Figure 4-13*. The SFC command (Plot 1) enables the ramp generator, which causes the tape to accelerate to the prescribed velocity (Plot 2). After a time (T1) determined by the required inter-record gap (IRG) displacement, the WRITE DATA inputs (Plot 3) together with the WDS (Plot 4) are supplied to the interface connector. Preamble, data block, and postamble are recorded.

The WRITE DATA (IWD**) input is received by interface receiver U1 and is strobed into flip-flop U3 at the trailing edge of the WRITE DATA STROBE (IWDS). On the Write Data lines (IWDP – IWD7) a one is a positive-going edge at data flux reversal time and a zero is a negative-going edge. The phase edge can be positive- or negative-going. Both outputs of flip-flop U3 are fed to head driver transistors Q1 and Q2, which cause current to flow in one half or the other of the center-tap head winding. Consequently, magnetization on the tape is maintained in the appropriate direction between change-overs and changes direction in accordance with the input signal IWD.

At the completion of the postamble, SFC goes false after the post-record delay time (T2). The ramp generator is disabled and the tape velocity decelerates to zero.

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*Foldout drawing, see end of this section.

**Interface lines connecting transport to controller are prefixed by "I".

The IRG displacement consists of the following.

(1) The stop distance: the distance traveled during the tape deceleration period to zero velocity.

(2) The start distance: the distance traveled while the tape is accelerating to the prescribed velocity.

(3) An additional distance determined by the pre-record time (T1), from the SFC command going true to the time of the first WDS and post-record time (T2), from the end of the postamble to SFC going false. (Time delays T1 and T2 are provided by the customer's controller.)

4.3.6.5 Overwrite Operation (Model 6660)

The Overwrite function allows updating (rewriting) of a selected record. The new data block to be inserted must be exactly the same length as the data block being replaced. This restriction is necessary since replacing a block of data with a block longer than the original could result in an IRG diatance which is less than the minimum allowed, or in writing over the next record. If the new data is shorter than the existing block, errors could result since some unerased portion of the old data would remain.

Additionally, when write and erase currents are switched off abruptly there is a small area of tape which is influenced by the collapsing magnetic fields of the heads. This constitutes flux transients on the tape which appear as spurious signals when read back. The Overwrite feature of the transport has effectively eliminated this problem by turning the write current off slowly while tape is still in motion.

NOTE

Refer to PERTEC application note concerning the control and timing restrictions associated with Overwrite.

To update a previously recorded record the transport must be Selected, Ready, On Line, and have a Write Enable ring installed. Additionally, the Overwrite (OVW) signal from the controller must be true and coincident with SWS and SFC.

Figure 4-16 is a functional logic diagram of the Write/Overwrite circuitry employed in the transport. When an SFC is received, the MOTION signal is delayed, differentiated, and supplied to the toggle inputs of flip-flops U8 and U9 and to the set input of flip-flop U10. Flip-flop U8 sets if the SWS line is true coincident with the trailing edge of the GO pulse. Flip-flop U9 sets if the OVW signal is coincident with the trailing edge of the GO pulse.

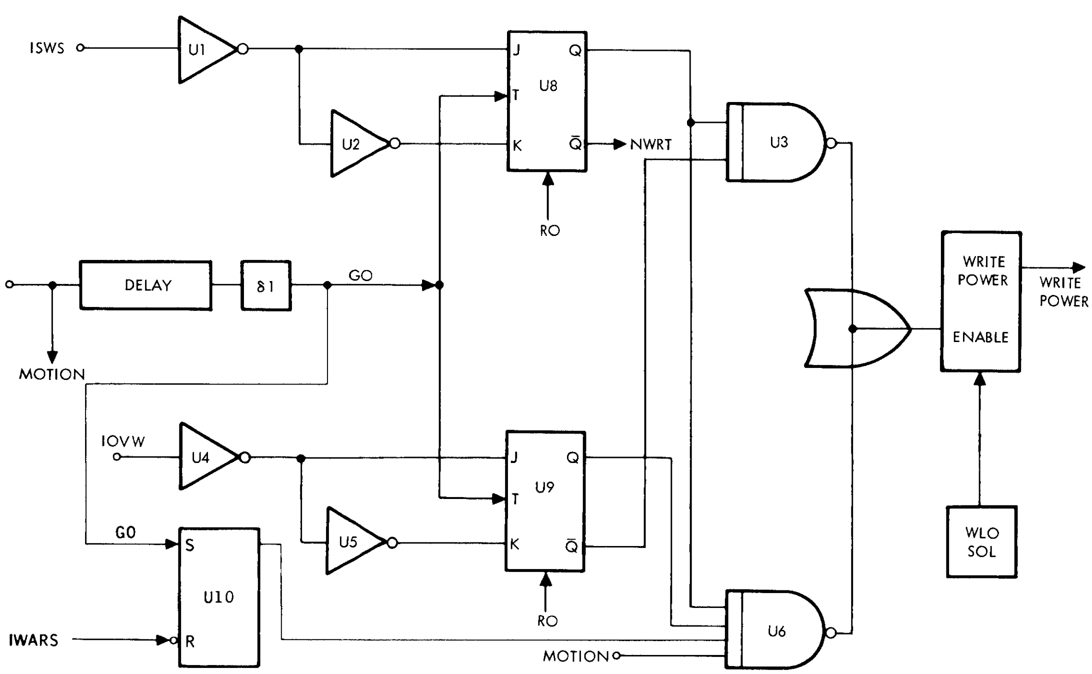

Figure 4-16. Functional Logic and Timing Diagram, Write/Overwrite

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The Q outputs of flip-flops U8 and U9, the Set output of U10, and the MOTION signal are ANDed at gate U6.

NOTE

AND gate U3 is disabled during an Overwrite operation by the low $\overline{Q}$ output of flip-flop U9.

The low true output of gate U3 causes the Write Power Enable output voltage to ramp from 0v to +5v, nominal.

The output of the Write Power Enable circuit is applied to the Write logic on the Data circuit board to enable writing of the new record.

Overwrite operation is terminated by resetting U10 with IWARS. Resetting U10 disables gate U6 causing the Write Power Enable output voltage to ramp from +5v to 0v, thus removing the power to the write circuits.

4.3.6.6 Data Reproduction (Dual-Gap Model 6640)

When an SFC is received, the following occur.

(1) The MOTION signal generated on the Tape Control circuit board goes true so that NAND gate U4 (Figure 4-12) is enabled.

(2) The Forward ramp generator is enabled and the tape accelerates to the prescribed velocity.

Figure 4-17* illustrates typical PE read timing and waveforms and should be referred to in conjunction with Figure 4-12. Data signals from the magnetic head at a level of approximately 5 to 15 millivolts peak-to-peak are fed by a shielded cable to the read amplifier. The read amplifier gain is adjusted so that the output of the differentiator is 6v peak-to-peak.

*Foldout drawing, see end of this section.

The differentiated signal is fed to a Schmitt trigger which squares the signal and outputs it to LINE DRIVER U4. The differentiated signal is also applied to the envelope detector which requires four successive characters greater than the threshold before its output goes high to enable the LINE DRIVER U4. The output of the envelope detector goes false when the differentiated read signal envelope goes below the threshold for more than two successive characters.

When the transport is in the Read While Write mode, a threshold level of approximately 30 percent is generated regardless of the IRTH2 waveform levels. When the transport is in the Read mode, and IRTH2 is hig high, the threshold level is approximately 10 percent which is only sufficient to reject system noise.

The IRTH2 line, when low and the transport is in the Read mode, will generate a read threshold of approximately five percent to enable the user to recover very low amplitude data. Operation at this threshold is recommended only after an attempt has been made to read the data at the normal read threshold level.

4.3.6.7 Data Reproduction (Single-Gap Model 6660)

When an SFC is received, the following occur.

(1) The MOTION signal generated on the Tape Control circuit board goes true so that NAND gate U4 (Figure 4-13) is enabled.

(2) The Forward ramp generator is enabled and the tape accelerates to the prescribed velocity.

Figure 4-17* illustrates typical PE read timing and waveforms, and should be referred to in conjunction with Figure 4-13. Data signals from the magnetic head at a level of approximately 5 to 15 millivolts

* Foldout drawing, see end of this section.

peak-to-peak are fed by a shielded cable to the read amplifier. The read amplifier gain is adjusted so that the output of the differentiator is 6v peak-to-peak.

The differentiated signal is fed to a Schmitt trigger which squares the signal and outputs it to LINE DRIVER U4. The differentiated signal is also applied to the envelope detector which requires four successive characters greater than the threshold before its output goes high to enable the LINE DRIVER U4. The output of the envelope detector goes false when the differentiated read signal envelope goes below the threshold for more than two successive characters.

When the transport is in the Read mode, and both IRTH1 and IRTH2 waveforms are high, a threshold level of approximately 10 percent is generated which is only sufficient to reject system noise. When IRTH1 is low, the threshold level is 30 percent regardless of IRTH2 level.

When the IRTH2 line is low, the IRTH1 line is high, and the transport is in the Read mode, a read threshold of approximately five percent is generated to enable the user to recover very low amplitude data. Operation at this threshold is recommended only after an attempt has been made to read the data at the normal read threshold level, i. e., when both IRTH1 and IRTH2 are high.

4.3.7 TAPE CONTROL SYSTEM

The tape control subsystem consists of the circuits necessary to control tape motion. This includes manual controls, interlocks, and logic. The operation can best be described by detailing the Bring-to-Load-Point sequence, subsequent tape motion commands, the Rewind sequence, and the subsequent unloading of the tape.

Figure 4-18* is a functional logic diagram of the tape control system and is used only for purposes of describing the system operation.

4.3.7.1 Bring-to-Load-Point System

The system will be described by considering the methods of bringing tape to BOT or Load Point. Figures 4-19*, 4-20* and 4-21* show the waveforms using each of these methods.

Associated with each of the manual control switches is a switch "clean-up" flip-flop (U1, U2, U25) which eliminates the problems of switch contact bounce. Relay K1 has four changeover contacts, three of which (K1A, K1B, and K1C) are used to disconnect the reel and capstan servo motors, and the fourth (K1D) is used in conjunction with the tension-arm limit switches as a system interlock. The tension arm limit switches are operated by a cam on the tension arm and is closed when the cam is in its normal operating position. The tension arm limit switch opens at both extremes of the arm travel so that protection against over-tension as well as under-tension conditions is provided.

When power is turned on initially the tension arm can be either in the load position or on the bottom stop. If there is no tape in the tape path TIP will be high and the arms will be moved to the load position. Tape in the tape path will make TIP low which will disable the up-drive

*Foldout drawing, see end of this section.

arm circuits. The INTLK signal is low at this time since the relay contacts on K1 are open and INTLK is connected either directly or through a gate to the reset inputs to control flip-flops RW1, RW2, RW3, Load, and FLR (U15, U16, U17, U18, and U31). The second interlock signal NINTLK-B is ORed with CLR (clear) and resets U50.

4.3.7.2 Depress LOAD Control — Tension Arms in Load Position

Figure 4-19* illustrates representative waveforms and should be referred to in conjunction with Figure 4-18*.

When the LOAD switch/indicator is depressed for the first time the clean-up flip-flop U1 sets (Plot 3) which sets flip-flop U50 (Plot 4), generating the NMLOAD signal (Plot 7), and flip-flop U51 (Plot 6) is set. The signal from flip-flop U50 is delayed thus setting flip-flop U53 (Plot 5) during the time the LOAD switch/indicator is depressed. The NMLOAD signal enables the arm drive circuits (Plot 21) to drive the tension arms down. When both tension arms are past the center of the arm operating range NERS goes low via U58. This signal resets U51 (Plot 6) which enables the NAND gate U56 making MINTLK (Plot 11) go high; this turns on the relay driver for K1, thus activating the reel servos which tension the tape. This occurs since the contacts on K1 and the arm limit switches are closed and the INTLK-A signal (Plot 14) is high. The MINTLK signal is also used to force the arm actuator drive circuit to drive the actuators at a high speed moving the drive cam out of the arm operating range. The NINTLK-B signal goes low (Plot 10) when the drive cam is out of the arm operating range. If the LOAD switch/indicator is depressed for a second time before NINTLK-B goes low, flip-flop U52 (Plot 9) will be set. Thus, INTLK-B going low not only clears U50, which disables NMLOAD and MINTLK, it enables INTLK via OR gate U67 to go high transferring the set from U52 to the load flip-flop U18 (Plot 12). Flip-flop U18 sets the FLR flip-flop

*Foldout drawing, see end of this section.

U31 (Plot 18) through NOR gates U33 and U32. The FLR flip-flop resets U52 via OR gate U55. If the LOAD switch/indicator is depressed for a second time after INTLK goes high, flip-flop U52 will not be set but flip-flop U18 is set through NAND gate U10. Figure 4-20* illustrates representative waveforms which occur if the LOAD switch/indicator is depressed for the second time after the interlocks are made.

The Q output of U18 is fed to one input of OR gate U21. The output of OR gate U21 goes low, enabling the Forward ramp generator that drives the capstan servo (not shown). The tape accelerates to the specified speed (Plot 15), and continues to move until the BOT tab is detected by the BOT sensor, at which time the BOT signal goes high (Plot 16), enabling one input of NAND gate U29. In addition, the single-shot is triggered, generating an 0.5-second negative-going waveform (NBOTD) (Plot 17).

Since the LOAD waveform (Plot 12) and the output of gate U28 are high at this time, NAND gate U29 is enabled (Plot 19) and the Load flip-flop is reset. This causes the tape to decelerate to rest with the BOT tab under the photo-tab sensor. At this time, all three inputs to NAND gate U41 are high so that the NLDP waveform is low (Plot 20), indicating that the transport is at Load Point and enabling the Load lamp driver.

At the end of the 0.5-second delay, the NBOTD waveform (Plot 17) goes high and, since the other two inputs to NAND gate U38 are both high at this time, the NREADY waveform at the output of gate U38 goes low (Plot 22), enabling one input of NAND gate U39.

The setting of the FLR flip-flop causes the NFLR waveform to go low, disabling NAND gate U10, thus inhibiting the possibility of further manual LOAD commands.

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*Foldout drawing, see end of this section.

4.3.7.3 <u>Depress LOAD Control — Tension Arms in Down Position</u>

Figure 4-21* illustrates representative waveforms and should be referred to in conjunction with Figure 4-18*.

When power is lost with tape on the machine the tension arms will not return to the load position when power is reapplied because TIP (Tape In Path) is low.

Depressing the LOAD switch/indicator for the first time will set flip-flop U50 generating an NMLOAD signal (Plot 7) and enabling NAND gate U56. MINTLK (Plot 11) goes high since flip-flop U51 has been reset by NERS being low (Plot 8). The high state of MINTLK causes the relay driver for K1 to turn on, thus activating the reel servos. This action tensions the tape and closes the contacts on the arm limit switches. INTLK-A (Plot 14) goes high and NINTLK-B (Plot 10) goes low, thus enabling INTLK (Plot 13) to go high.

Flip-flop U50 is reset (Plot 4) by NINTLK-B going low completing the first part of the last cycle.

If, at any time, the tension arms move outside their operating region, the interlock relay de-energizes, power is disconnected from the motors, and INTLK-A returns to the low state, resetting the control flip-flops.

Depressing the LOAD switch/indicator a second time will set the load flip-flop U18 (Plot 12) either at the time the switch is depressed or when INTLK goes high. The Q output of U18 is fed to one input of OR gate U21. The output of OR gate U21 goes low, enabling the Forward ramp generator that drives the capstan servo (not shown). The tape accelerates to the specified speed (Plot 15), and continues to move until the BOT tab is detected by the BOT sensor, at which time the BOT signal goes high

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*Foldout drawing, see end of this section.

(Plot 16), enabling one input of NAND gate U29. In addition, the single-shot is triggered, generating an 0.5-second negative-going waveform (NBOTD) (Plot 17).

Since the LOAD waveform and the output of gate U28 are high at this time, NAND gate U29 is enabled (Plot 19) and the load flip-flop is reset. This causes the tape to decelerate to rest with the BOT tab under the photo-tab sensor. At this time, all three inputs to NAND gate U41 are high so that the NLDP waveform is low (Plot 20), indicating that the transport is at Load Point and enabling the load lamp driver.

At the end of the 0.5-second delay, the NBOTD waveform (Plot 17) goes high and, since the other two inputs to NAND gate U38 are both high at this time, the NREADY waveform at the output of gate U38 goes low (Plot 22), enabling one input of NAND gate U39.

The setting of the FLR flip-flop causes the NFLR waveform to go low, disabling NAND gate U10, thus inhibiting the possibility of further manual LOAD commands.

4.3.7.4 Depress ON LINE Control

If the ON LINE switch/indicator is momentarily depressed, On-line flip-flop U26 is set (if it is depressed a second time, U26 is reset), enabling the second input of NAND gate U39. The $\overline{Q}$ output of the flip-flop U26 enables the On-line lamp driver. The output of gate U39 goes high, indicating that the transport is Ready and On-line (RO). If the transport is also selected, the output of NAND gate U40, the Selected, Ready, On-line (SRO) waveform goes high.

When the transport is On-line, the output of the manual REWIND control flip-flop is disabled by NONLINE at gate U12.

If the transport is Selected, the ISLT* waveform is low. The following options are available.

(1) If W4 is not present, then the SLT waveform goes high when the transport is Selected.

(2) If W4 is present, SLT goes high only if the transport is Selected and On-line.

(3) If W3 is not present, the SLTA waveform is permanently high and the status lines are enabled. This option is used when interrogation of transport status lines is required, whether the transport is Selected or not.

(4) If W3 is present, the status lines are gated with the SLT waveform.

When the FLR or INTLK signals are low, the On-line flip-flop is held reset by OR gates U23 and U24, ensuring that the On-line flip-flop cannot be set until the interlock has been made and the Load or Rewind sequence has been entered. The On-line flip-flop can also be reset from the interface by the OFF-LINE command (OFFC) via interface receiver U22 and OR gate U24.

An option is available allowing the On-line flip-flop to be set without entering the Load or Rewind sequence. This is accomplished by removing jumper W2 connecting FLR to the input of U23. See Paragraph 4.3.7.10.

The transport is now ready to receive external commands.

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* All interface lines connecting transport to controller are prefixed by "I".

4.3.7.5 Operation From External Commands

Assuming the transport is Selected, Ready, and On-line (SRO is high), receipt of a SYNCHRONOUS FORWARD command (SFC) will cause the output of interface receiver U4 to go high and the output of AND gate U6 to go low. The MOTION signal will go high and the Forward ramp generator will be enabled via OR gate U21.

The MOTION signal is delayed approximately 10 μseconds, differentiated, and a positive-going "GO" pulse generated at the output of differentiator δ1. This pulse samples the status of the SET WRITE STATUS (SWS) line. If SWS is true, indicating that the Write mode is required, then Write/Read flip-flop U20 is set and the NWRT waveform goes low. If SWS is false, U20 is reset and NWRT waveform goes high. For a SYNCHRONOUS REVERSE command (SRC) a similar sequence of events occurs.

If the BOT tab is encountered during the execution of an SRC, the BOT signal goes high, the NBOT signal goes low, and the single-shot is triggered. As a result, AND gate U7 is disabled, inhibiting the action of the SRC and the NBOTD waveform goes low for 0.5 second so that the transport becomes Not Ready for this period of time.

4.3.7.6 Operation From Control Panel — Forward

Forward tape motion in response to a remote input command was described in Paragraph 4.3.7.1. When the transport is in the Off-line mode (NONLINE is true) and the FORWARD switch/indicator is depressed, tape will advance at the specified speed until one of the following occurs.

(1) The FORWARD switch/indicator is depressed again.

(2) The REVERSE switch/indicator is depressed.

(3) The transport is placed in the On-line mode.

(4) The EOT tab is encountered.

(5) A BOT tab is encountered.

(6) Tape tension is lost.

As described in Paragraph 3.6.7, activation of the REVERSE switch/indicator while the tape is advancing in response to activation of the FORWARD switch/indicator will cause the tape to decelerate to rest then immediately accelerate to the synchronous velocity in the reverse direction.

4.3.7.7 Operation From Control Panel — Reverse

Reverse operation is identical to Forward operation described in Paragraph 4.3.7.6 except for direction of tape motion. The reverse flip-flop is not reset if an EOT tab is encountered.

4.3.7.8 Rewind Sequence — Tape Not at Load Point

This is the normal Rewind-to-Load-Point sequence that results from either a remote or manual command. Figure 4-22* shows the waveforms that occur during the operation.

In response to either a remote or manual rewind command, the RW1 flip-flop is set (Plot 3). The Q output of the flip-flop enables NAND gate U28 (since the $\overline{Q}$ output of the RW3 flip-flop is high at this time) it also triggers 0.1-second single-shot and goes to NAND gate U73. After the delay of the single-shot the rewind ramp generator is enabled via NAND gate U73 and the tape accelerates to a reverse velocity of 150 ips (nominal) in approximately 0.5 second (Plot 14).

*Foldout drawing, see end of this section.

In addition, when flip-flop RW1 is set, the output of gate U33 goes low, disabling NAND gate U38 and causing the SRO waveform to go false (Plot 13).

When the BOT tab is detected, flip-flop RW2 is set on the leading edge of the BOT waveform (Plot 6), flip-flop RW3 is set on the trailing edge (Plot 7) and the 0.5-second single-shot NBOTD is triggered (Plot 8). The Q output of flip-flop RW3 goes low, disabling NAND gate U28 and U73. The output of gate U73 goes high, disabling the Rewind ramp generator so that the tape decelerates to rest.

At the end of the 0.5-second delay, the trailing edge of the NBOTD waveform is differentiated by differentiator δ2 generating a positive-going BOTDP pulse (Plot 9). Since the Q output of flip-flop RW3 is high at this time, Load flip-flop U18 is set via gates U9 and U11. This enables the Forward ramp generator.

The characteristics of the ramp generators are such that the BOT tab overshoots the photosensor and then returns. When the BOT tab is detected for the second time, the 0.5-second single-shot NBOTD is triggered (Plot 8), NAND gate U29 is enabled and its output goes low, resetting the RW1, RW2, RW3, and Load flip-flops (Plots 3, 6, 7, and 12). The Forward ramp generator is thus disabled and the tape decelerates to rest. The delay between the LOAD waveform and NAND gate U29 ensures that the reset waveform is the appropriate length. At the end of the 0.5-second period, the NBOTD waveform goes high and, since the other two inputs are high at this time, gate U38 is enabled and the SRO waveform goes true.

The RW1 waveform (Plot 3) is true throughout the Rewind sequence and is used to generate the IRWD (REWINDING) interface waveform.

4.3.7.9 Rewind Sequence — Tape at Load Point

This is the normal way to unload a tape from the transport. Figure 4-23* shows the waveforms that occur during the operation.

In response to a manual REWIND command flip-flop U54 is set (Plot 2) the Q output of the flip-flop generates the AOS signal (Plot 5) which is used to position the tension arms close to the lower stop. This output is also used to enable NOR gate U57 making MINTLK high (Plot 9), to enable the rewind ramp generator and switch the REWIND ramp generator output to a lower voltage, thus limiting the reverse tape velocity (Plot 10) to a velocity lower than 150 ips.

The INTLK signal goes low when the tension arm limit switch opens and NAND gate U72 is enabled. The output of U72 generates the ULOS signal (Plot 4) which limits the maximum reel motor speed.

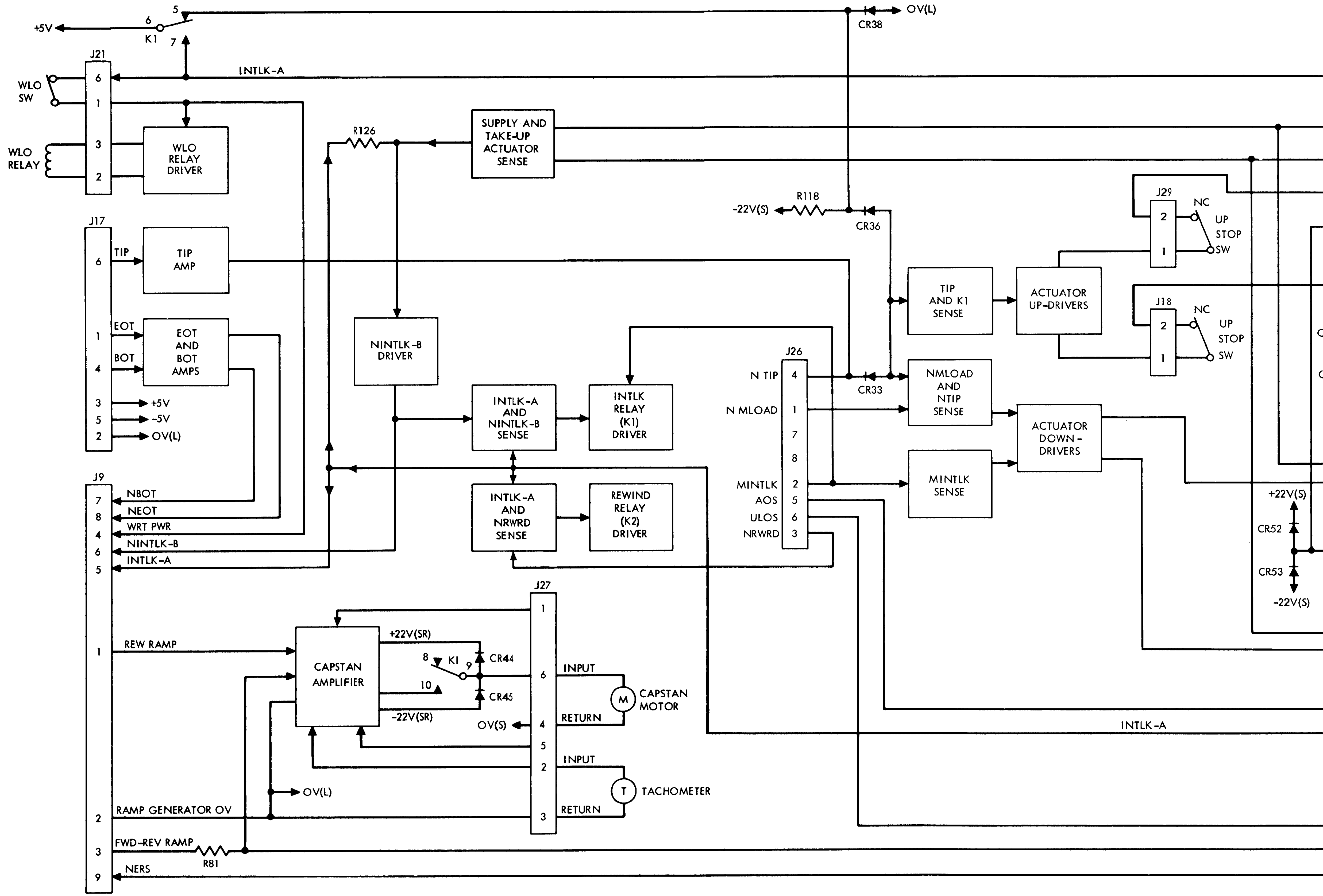
As the tape clears the head plate area NTIP (Plot 6) goes high resetting flip-flop U54. This action terminates the unload cycle and enables the tension arm actuator drivers to position the tension arms in the load position.

4.3.7.10 Ready Mode from Tape Not at Load Point

An option is available which allows the transport to be placed in the Ready mode after a Power-off, Power-on sequence (e.g., in the middle of a reel). This is accomplished by removing jumper W2 which connects FLR to the input of U23.

When this option is present (by deleting jumper W2), depress the LOAD switch/indicator once to establish tape tension, then depress the ON LINE switch/indicator. The READY line will go true and the transport can accept remote commands.

*Foldout drawing, see end of this section.



+5V
K1
OV(L)
CR38
J21
WLO SW
WLO RELAY
INTLK-A
WLO RELAY DRIVER
R126
SUPPLY AND TAKE-UP ACTUATOR SENSE
-22V(S)
R118
CR36
J29
NC
UP STOP SW
J17
TIP
TIP AMP
EOT
BOT
EOT AND BOT AMPS
+5V
-5V
OV(L)
NINTLK-B DRIVER
TIP AND K1 SENSE
ACTUATOR UP-DRIVERS
J18
J26
N TIP
N MLOAD
CR33
NMLOAD AND NTIP SENSE
INTLK-A AND NINTLK-B SENSE
INTLK RELAY (K1) DRIVER
ACTUATOR DOWN-DRIVERS
MINTLK
AOS
ULOS
NRWRD
MINTLK SENSE
INTLK-A AND NRWRD SENSE
REWIND RELAY (K2) DRIVER
J9
NBOT
NEOT
WRT PWR
NINTLK-B
INTLK-A
+22V(S)
CR52
CR53
-22V(S)
J27
REW RAMP
CAPSTAN AMPLIFIER
+22V(SR)
CR44
CR45
-22V(SR)
INPUT
RETURN
CAPSTAN MOTOR
OV(S)
TACHOMETER
OV(L)
RAMP GENERATOR OV
FWD-REV RAMP
R81
NERS

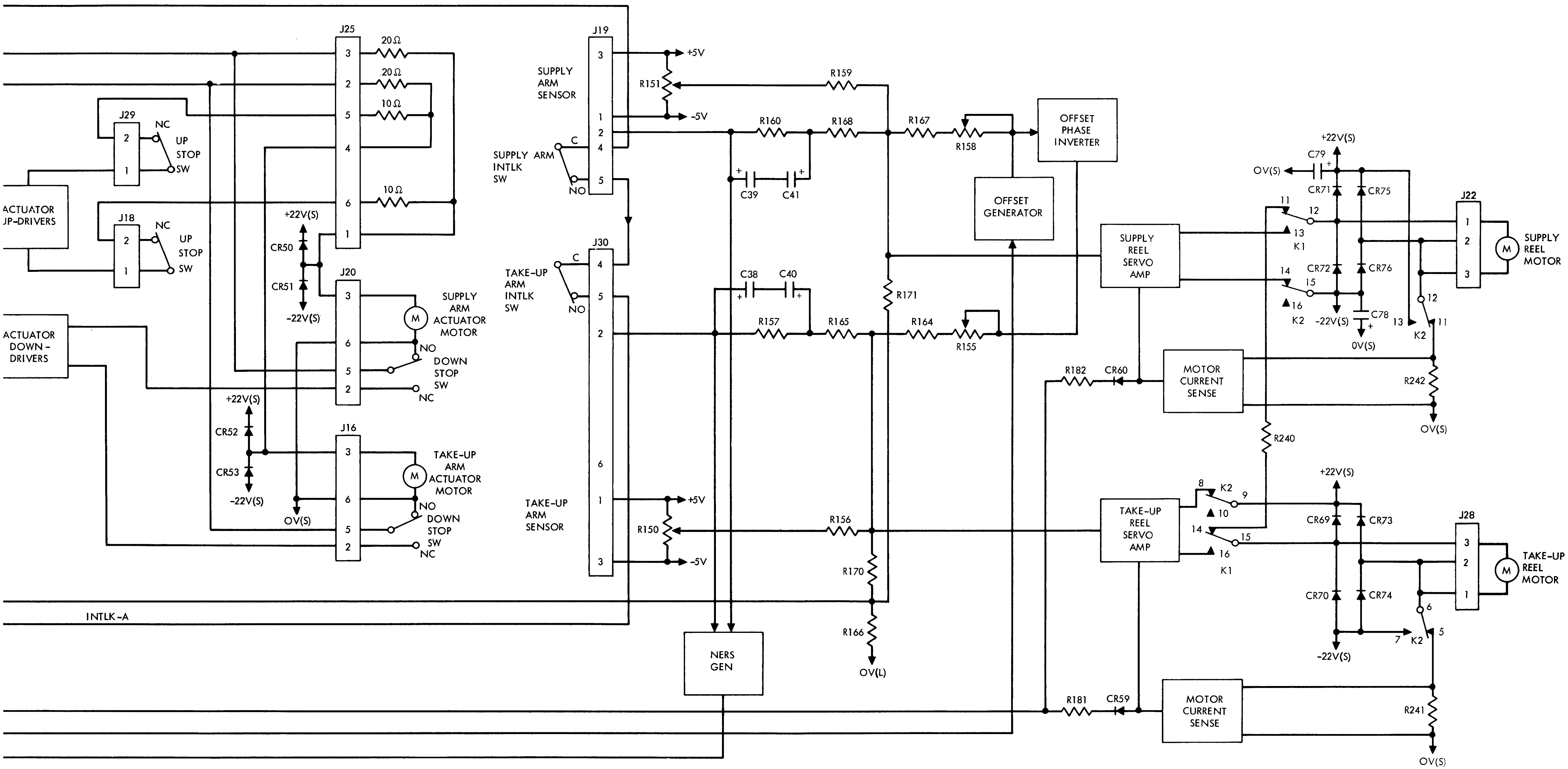


Figure 4-5. Functional Block Diagram, Servo and Power Supply System

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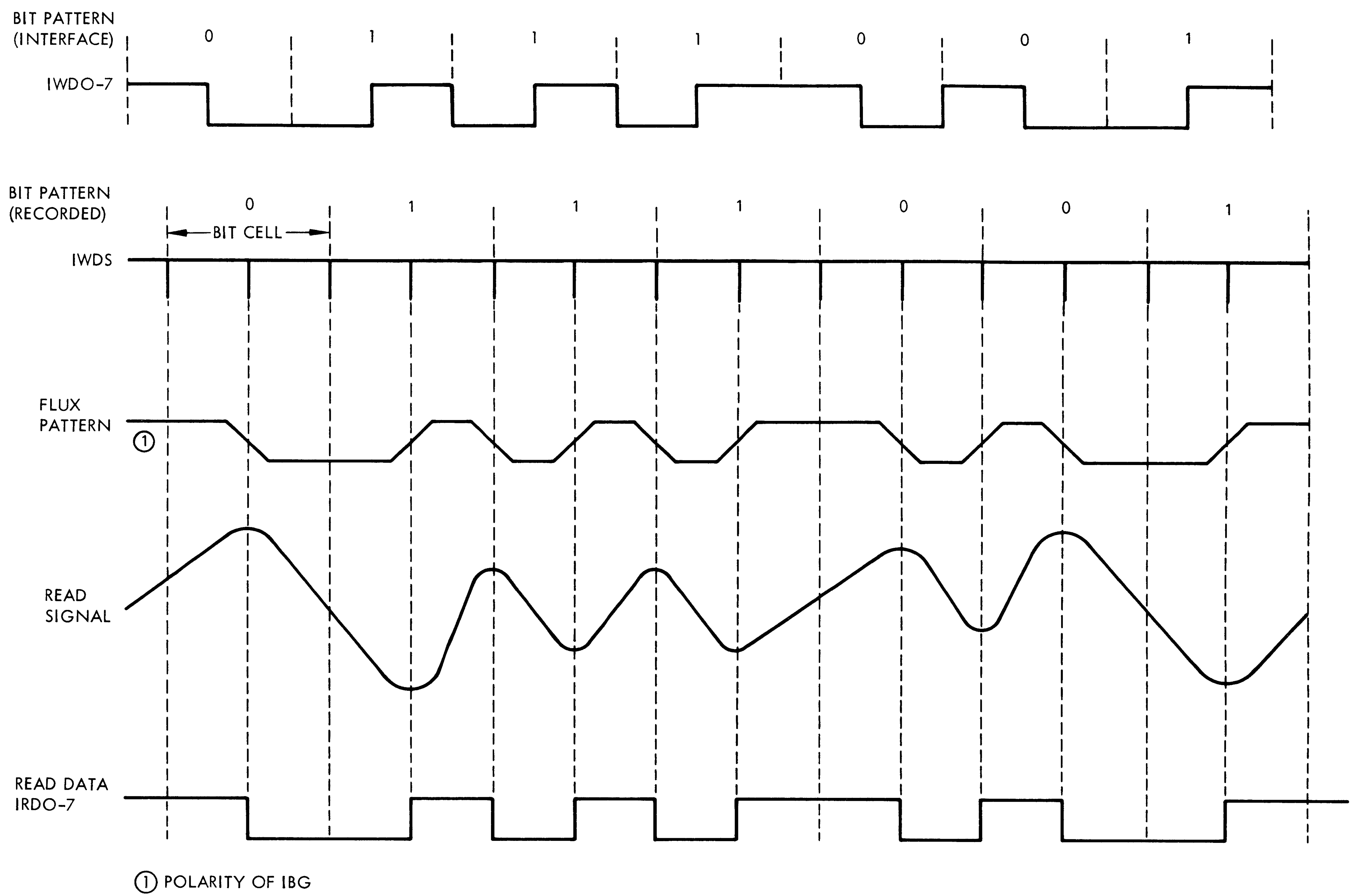
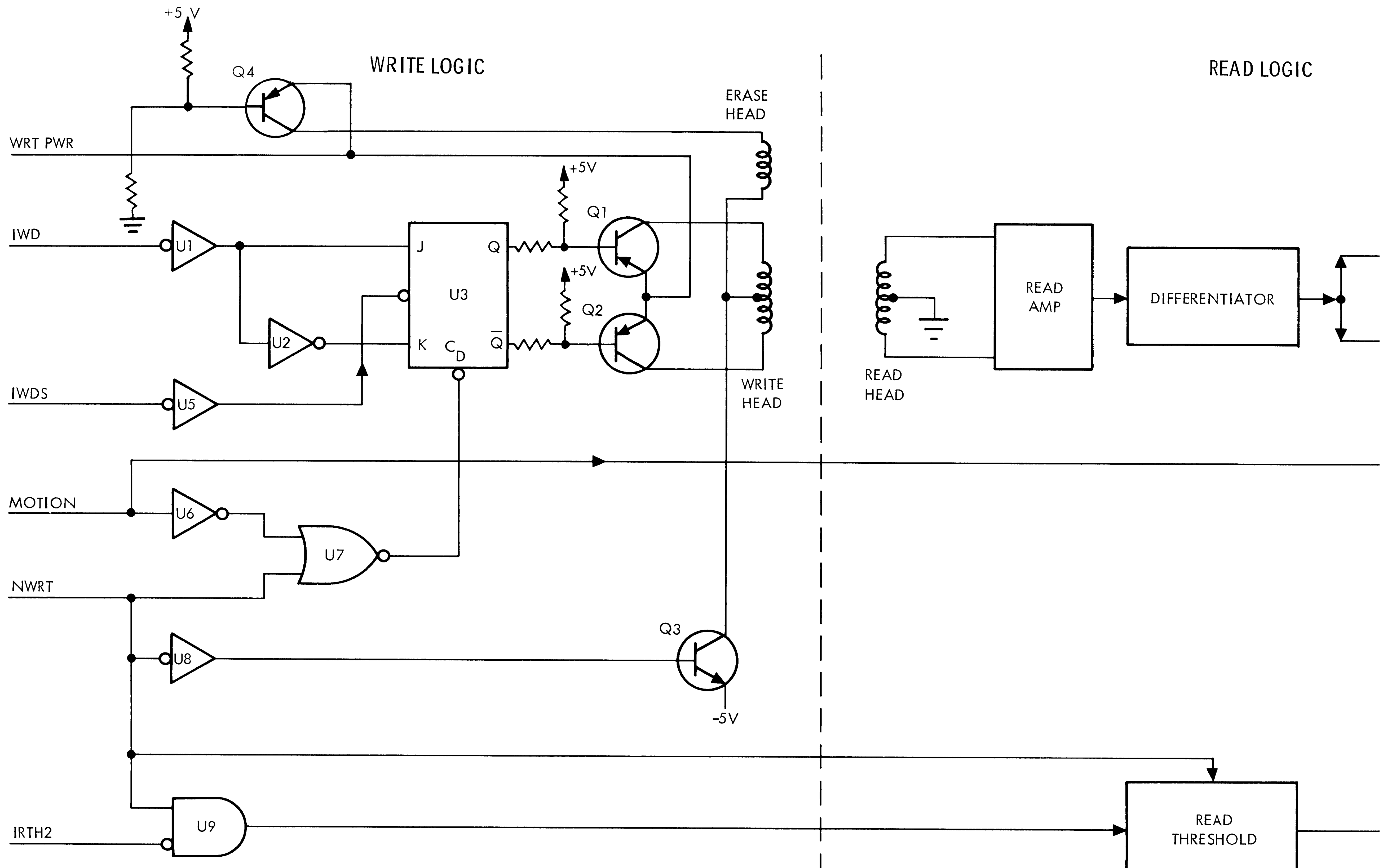


Figure 4-11. PE Write and Read Waveforms


WRITE LOGIC
READ LOGIC
+5 V
Q4
WRT PWR
ERASE HEAD
+5V
Q1
Q2
IWD
U1
J
Q
U3
U2
K
C_D
$\overline{Q}$
IWDS
U5
WRITE HEAD
READ HEAD
READ AMP
DIFFERENTIATOR
MOTION
U6
U7
NWRT
U8
Q3
-5V
U9
IRTH2
READ THRESHOLD

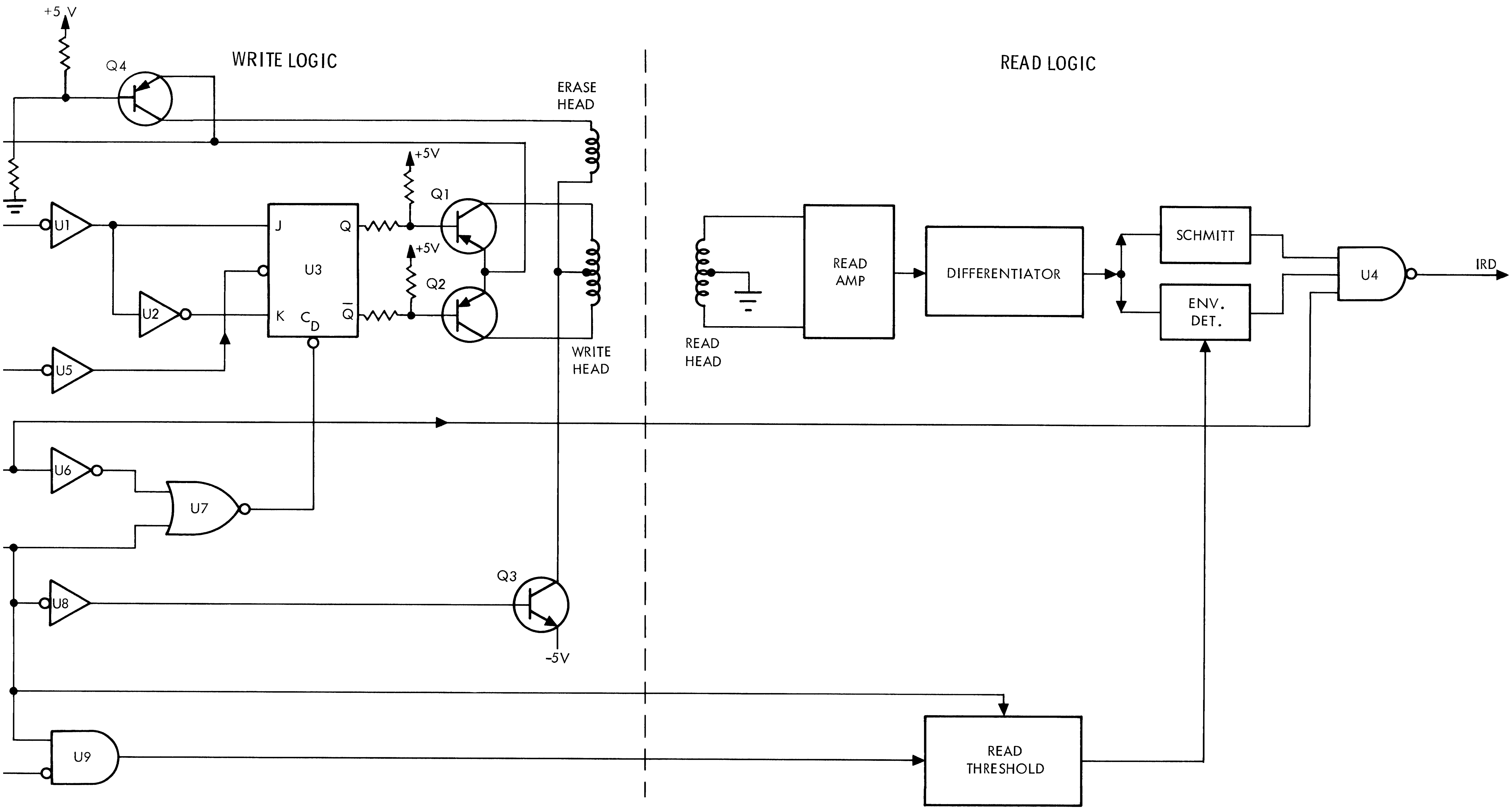
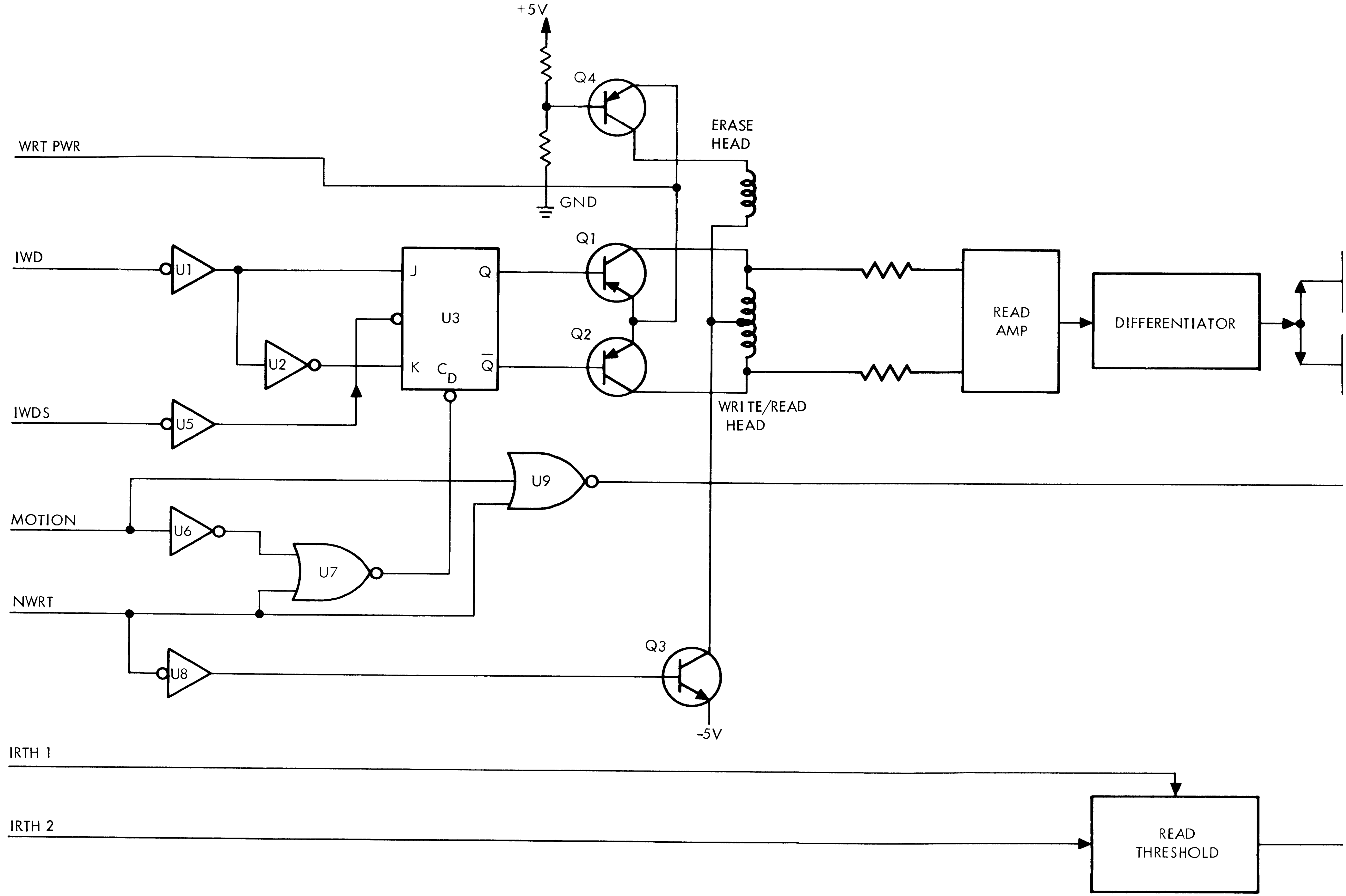


Figure 4-12. One Channel of Data Electronics, 6640



+5V
Q4
ERASE HEAD
WRT PWR
GND
IWD
U1
Q1
J
Q
U3
U2
K
CD
Q
Q2
READ AMP
DIFFERENTIATOR
IWDS
U5
WRITE/READ HEAD
U9
MOTION
U6
U7
NWRT
Q3
U8
-5V
IRTH 1
IRTH 2
READ THRESHOLD

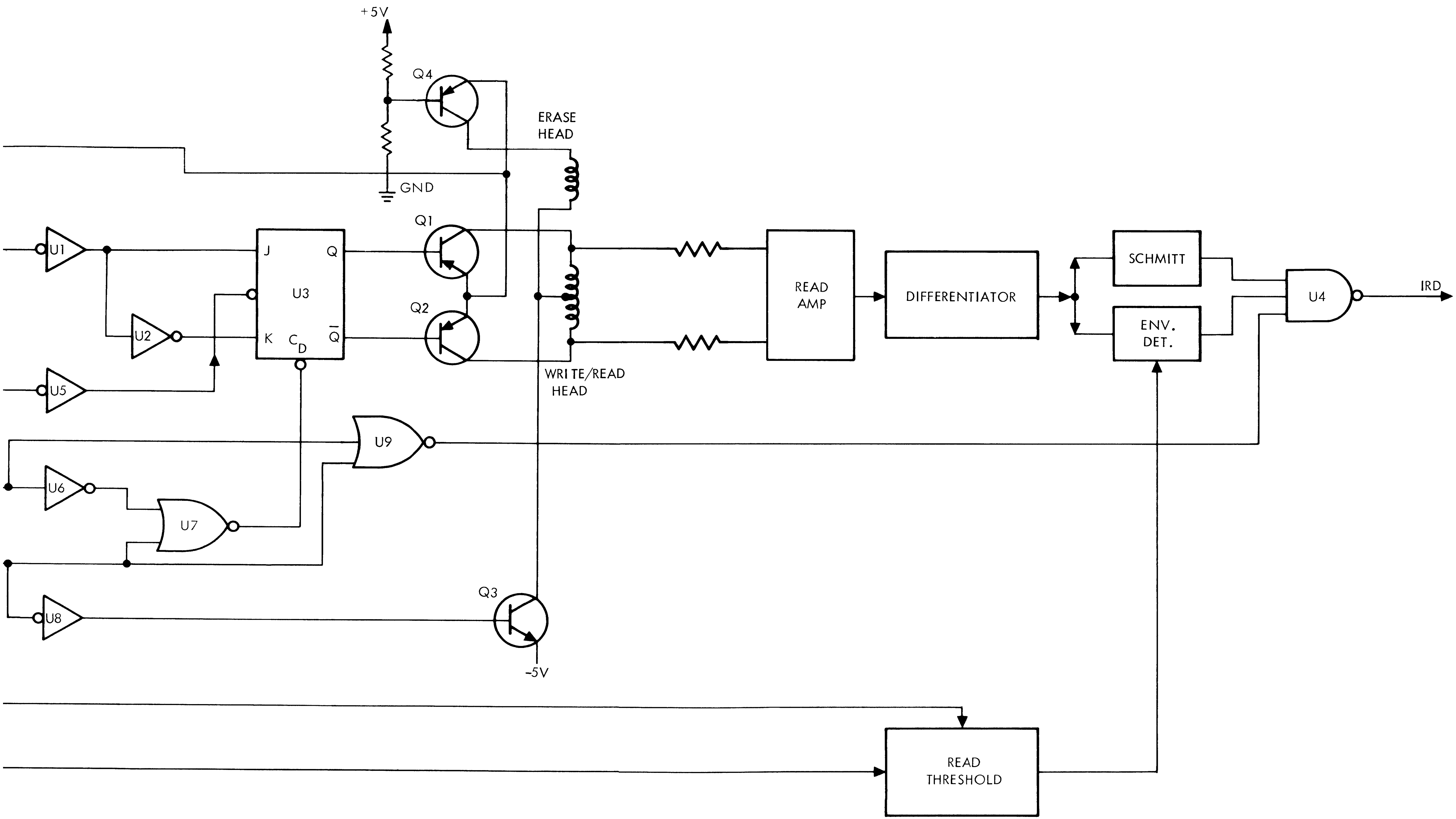


Figure 4-13. One Channel of Data Electronics, 6660

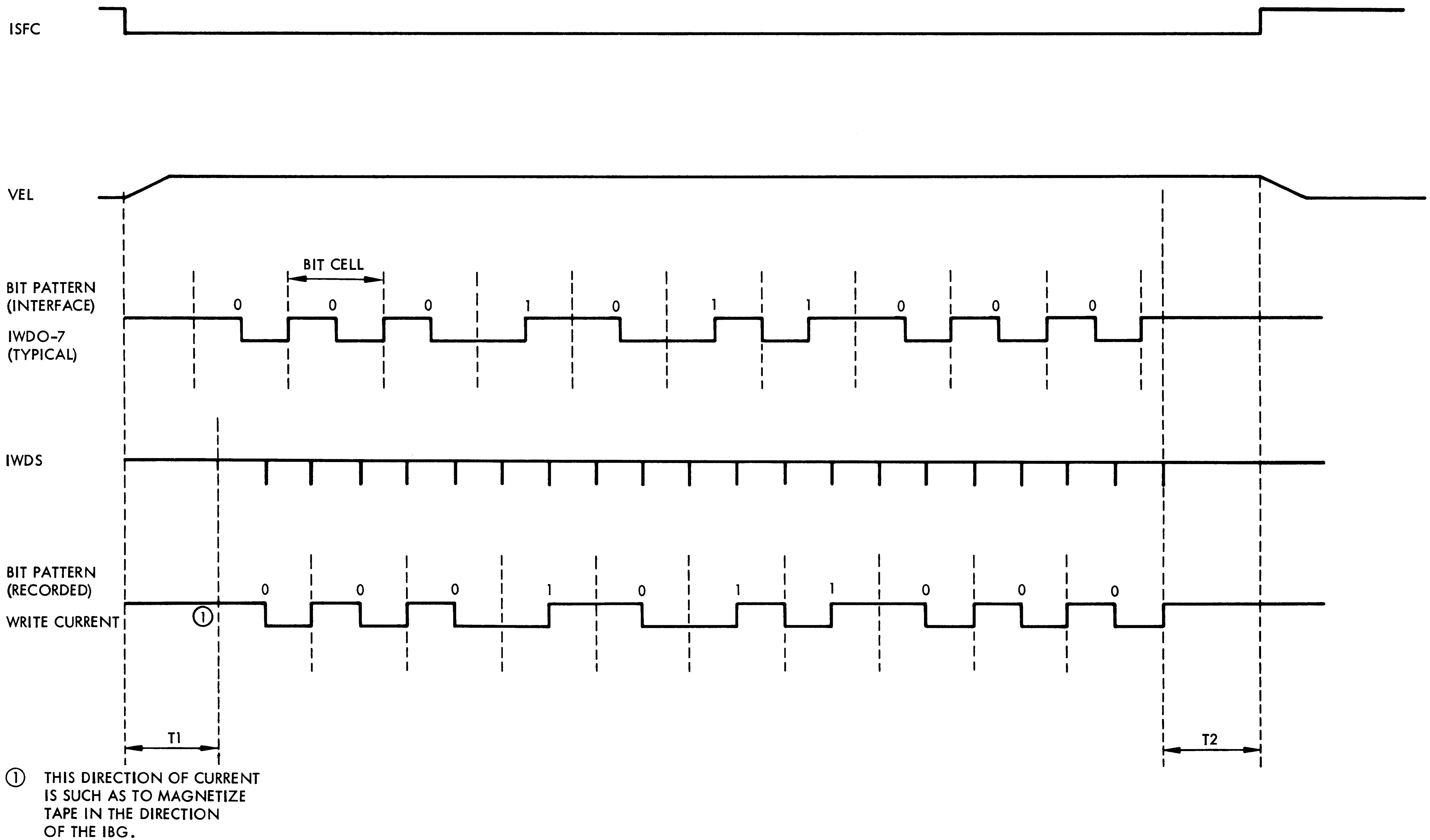
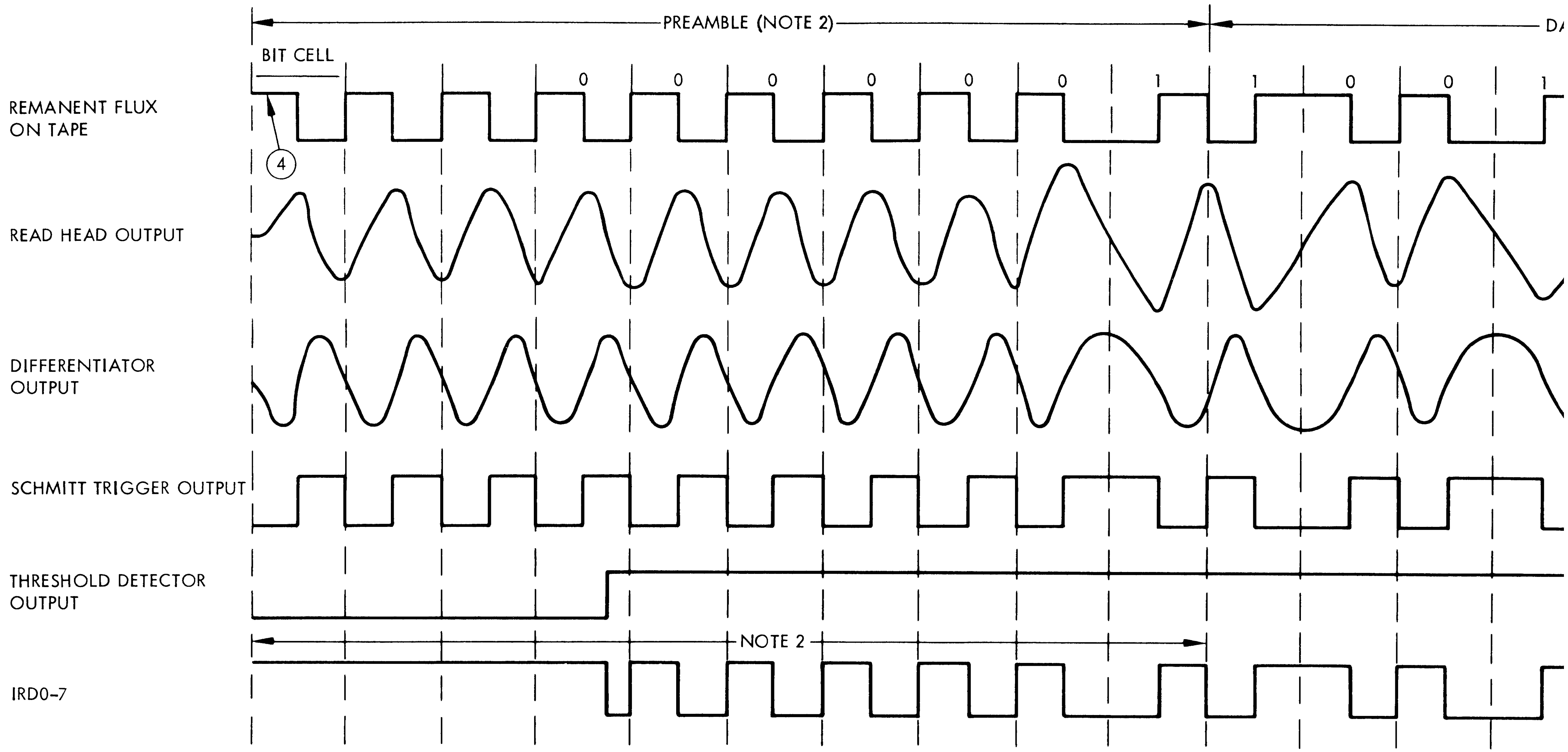
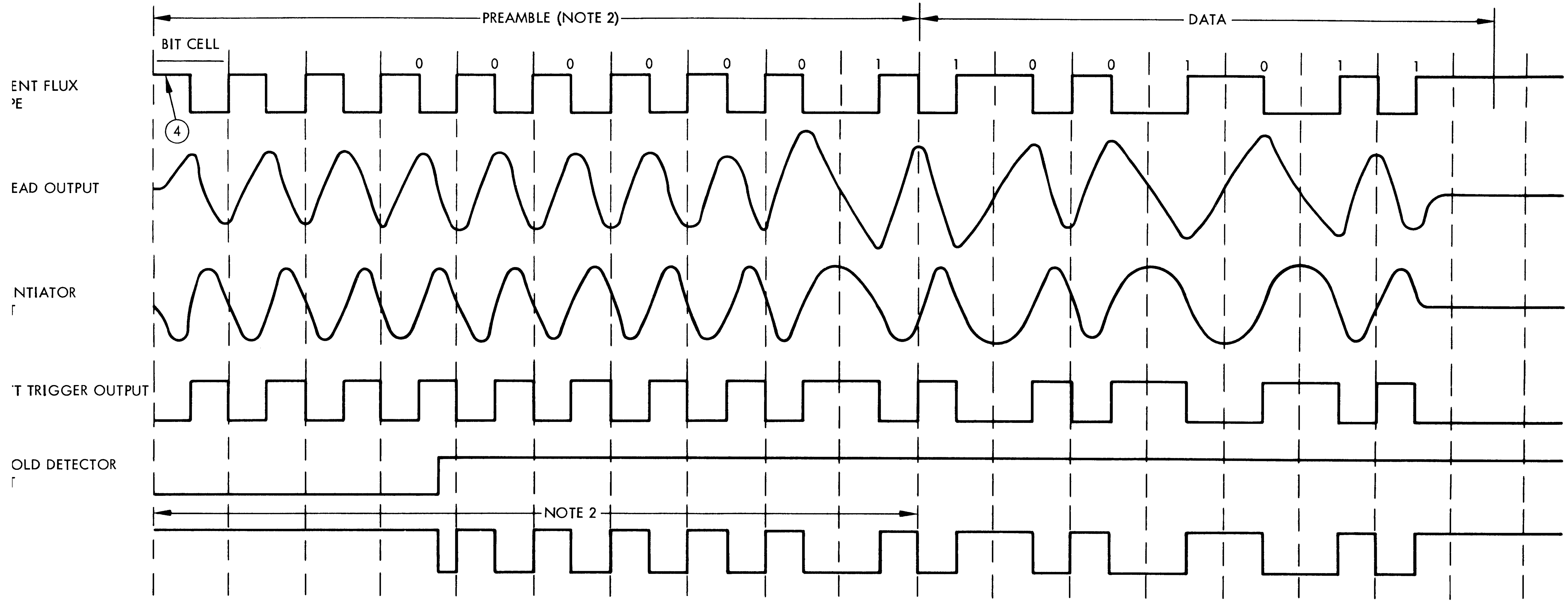


Figure 4-14. Timing Diagram, Data Recording



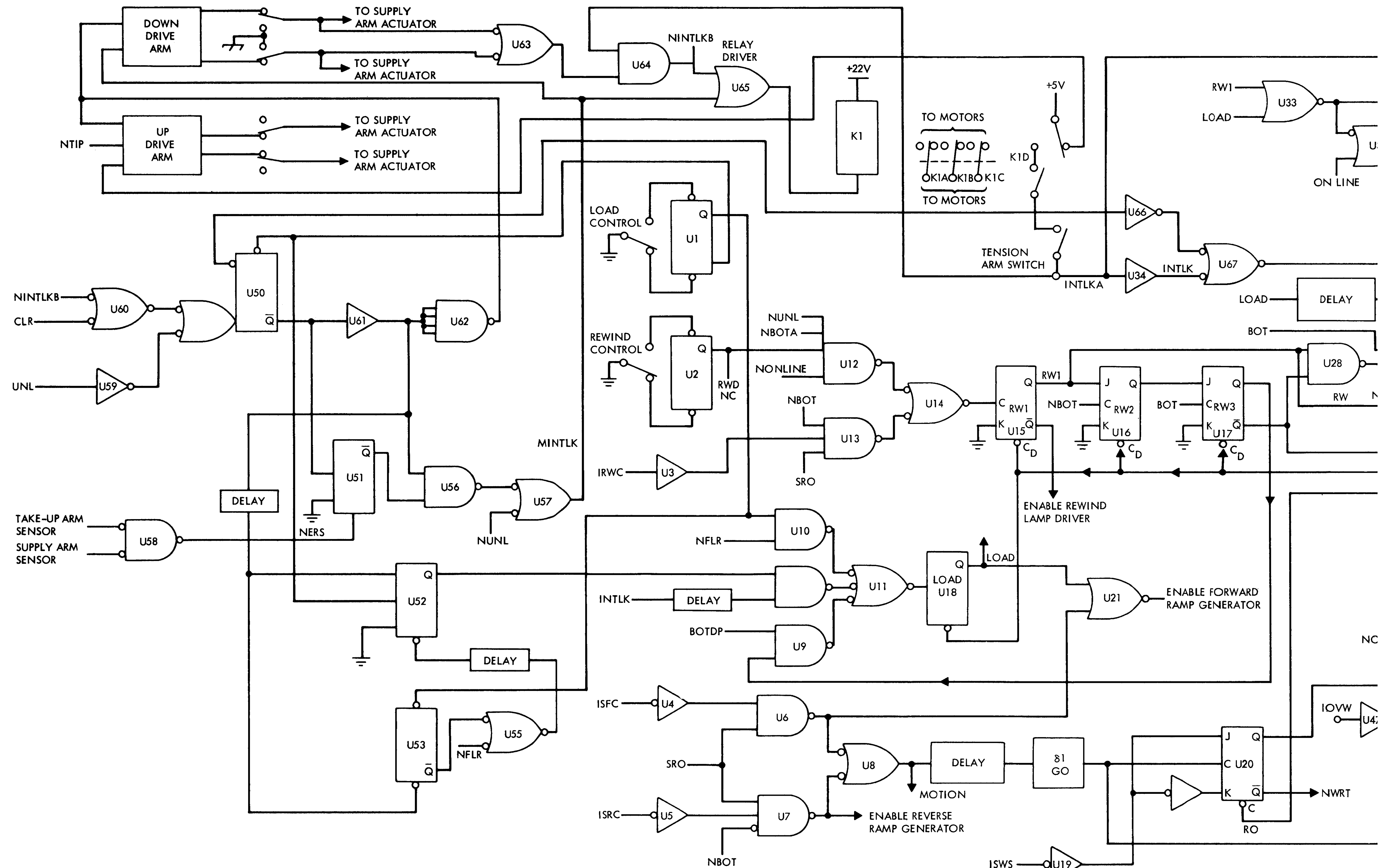
NOTES:

1. TRANSPORT MUST BE SELECTED, READY, AND ON-LINE AND GATED WITH SFC OR SRC.
2. PREAMBLE IS SHOWN SHORTENED TO SIMPLIFY DRAWING. PREAMBLE CONSISTS OF 40 ZEROS FOLLOWED BY ONE 1.
3. POSTAMBLE NOT SHOWN. POSTAMBLE CONSISTS OF ONE 1 FOLLOWED BY 40 ZEROES.
4. FLUX POLARITY OF INTERBLOCK GAP.



:
ANSPORT MUST BE SELECTED, READY, AND ON-LINE AND GATED WITH SFC OR SRC.
EAMBLE IS SHOWN SHORTENED TO SIMPLIFY DRAWING. PREAMBLE CONSISTS OF 40 ZEROS FOLLOWED BY ONE 1.
)STAMBLE NOT SHOWN. POSTAMBLE CONSISTS OF ONE 1 FOLLOWED BY 40 ZEROES.
UX POLARITY OF INTERBLOCK GAP.

Figure 4-17. Timing Diagram, Data Reproduction


DOWN DRIVE ARM
TO SUPPLY ARM ACTUATOR
TO SUPPLY ARM ACTUATOR
U63
U64
NINTLKB
RELAY DRIVER
U65
+22V
K1
+5V
TO MOTORS
K1D
K1A K1B K1C
TO MOTORS
RW1
LOAD
U33
ON LINE
NTIP
UP DRIVE ARM
TO SUPPLY ARM ACTUATOR
TO SUPPLY ARM ACTUATOR
LOAD CONTROL
U1
Q
U66
TENSION ARM SWITCH
INTLKA
U34
INTLK
U67
LOAD
DELAY
NINTLKB
CLR
U60
U50
Q̄
U61
U62
REWIND CONTROL
U2
Q
NUNL
NBOTA
NONLINE
U12
RWD NC
BOT
U28
UNL
U59
NBOT
U14
RW1
NBOT
BOT
U15
U16
U17
RW
MINTLK
U13
IRWC
U3
SRO
U51
Q̄
U56
U57
DELAY
NERS
NUNL
ENABLE REWIND LAMP DRIVER
TAKE-UP ARM SENSOR
SUPPLY ARM SENSOR
U58
U10
NFLR
LOAD
LOAD U18
U11
U52
INTLK
DELAY
U21
ENABLE FORWARD RAMP GENERATOR
BOTDP
U9
DELAY
ISFC
U4
U6
U53
U55
NFLR
SRO
U8
DELAY
81 GO
U20
MOTION
IOVW
ISRC
U5
U7
ENABLE REVERSE RAMP GENERATOR
NWRT
RO
NBOT
ISWS
U19

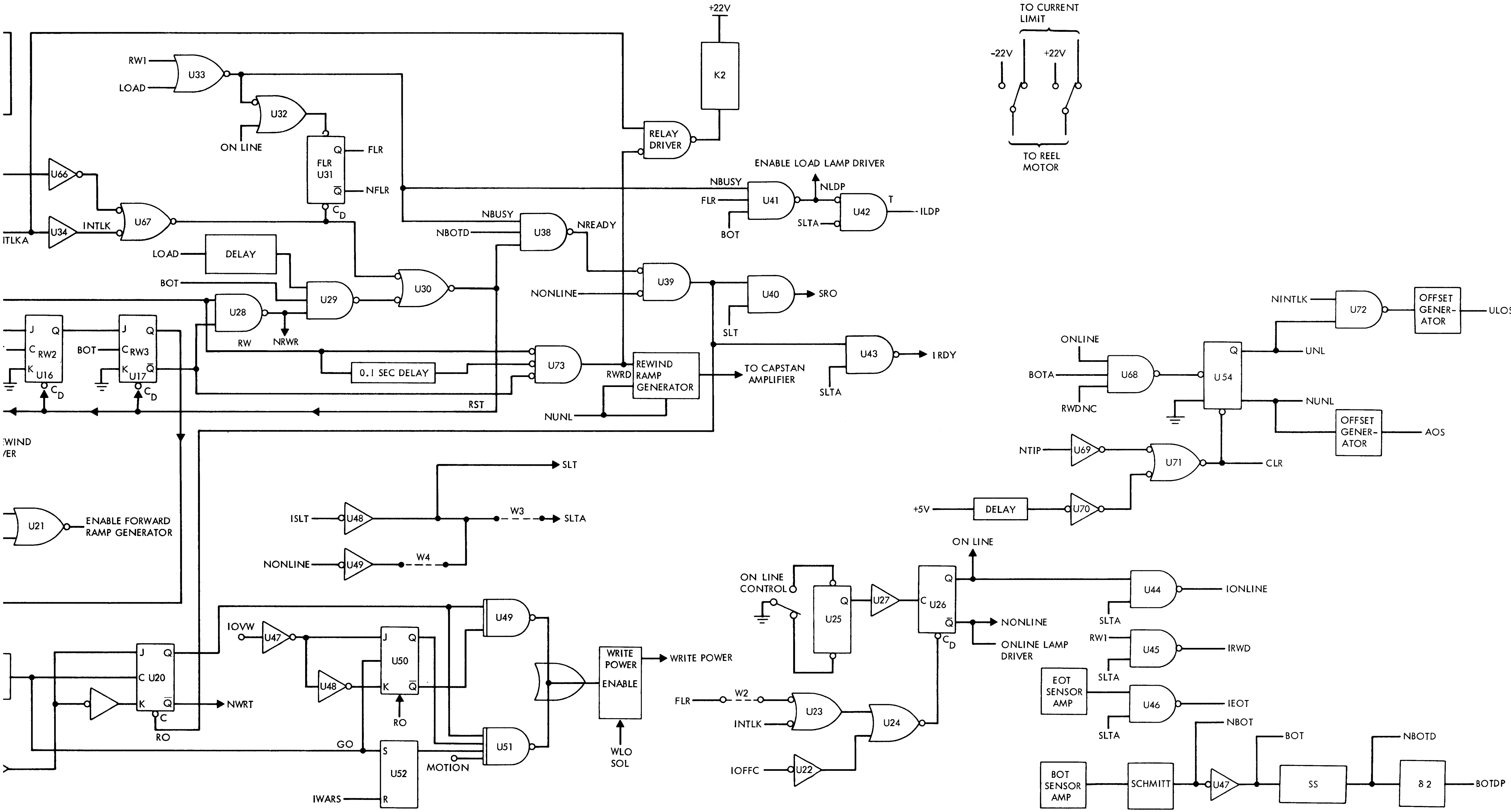


Figure 4-18. Logic Diagram, Tape Control System

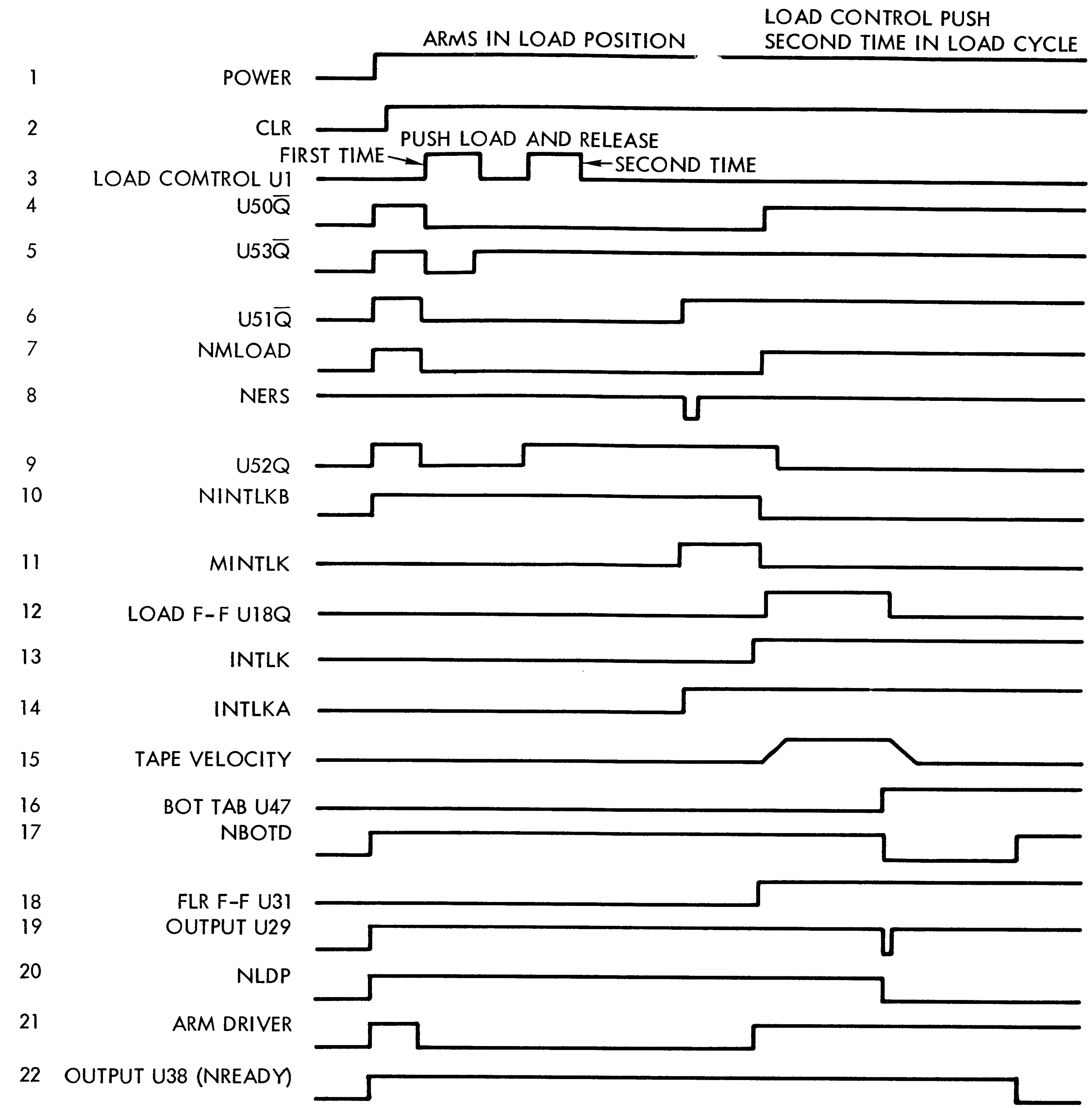


Figure 4-19. Bring-to-Load-Point Waveforms

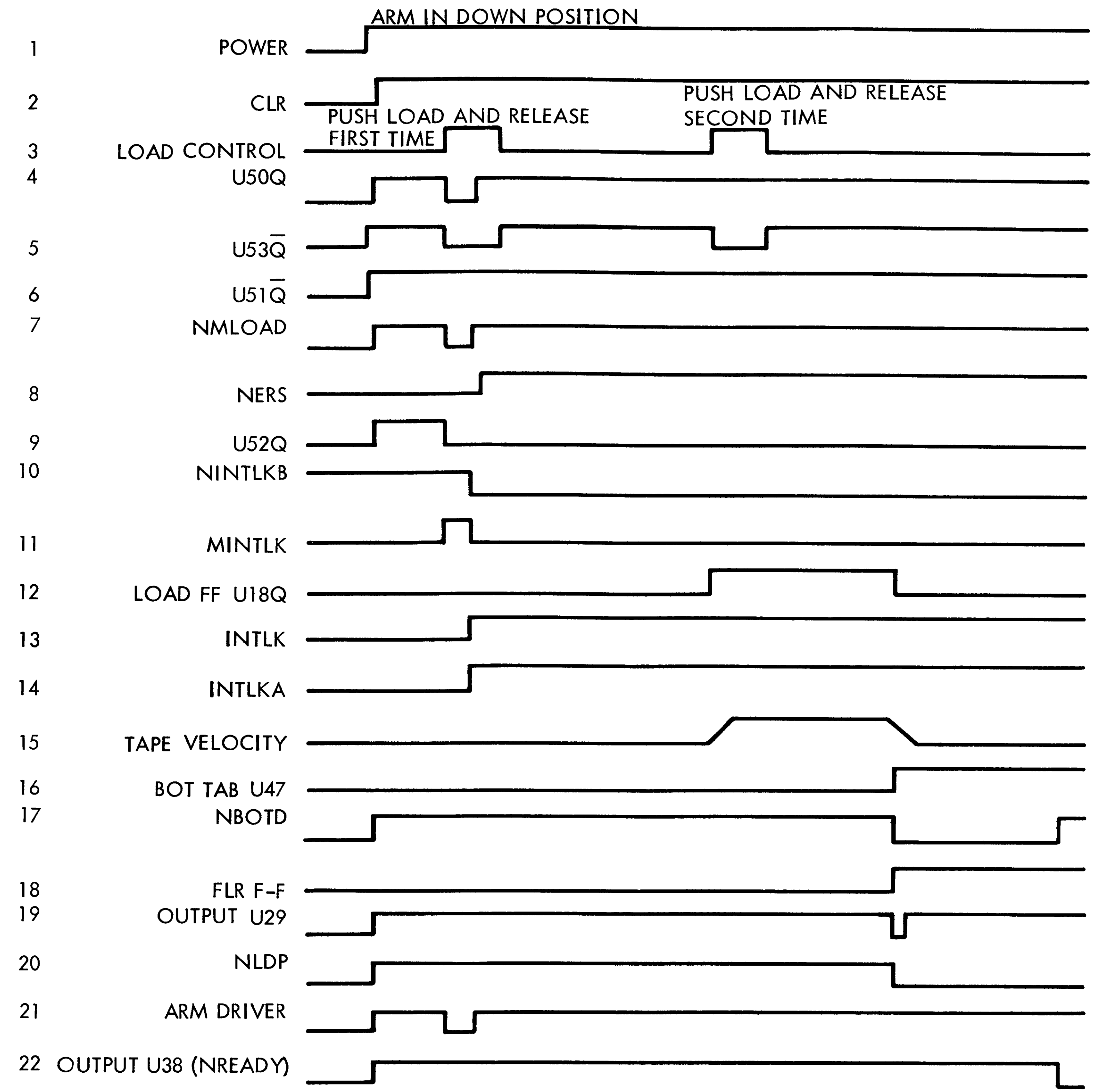


Figure 4-20. Bring to Load Point Waveforms

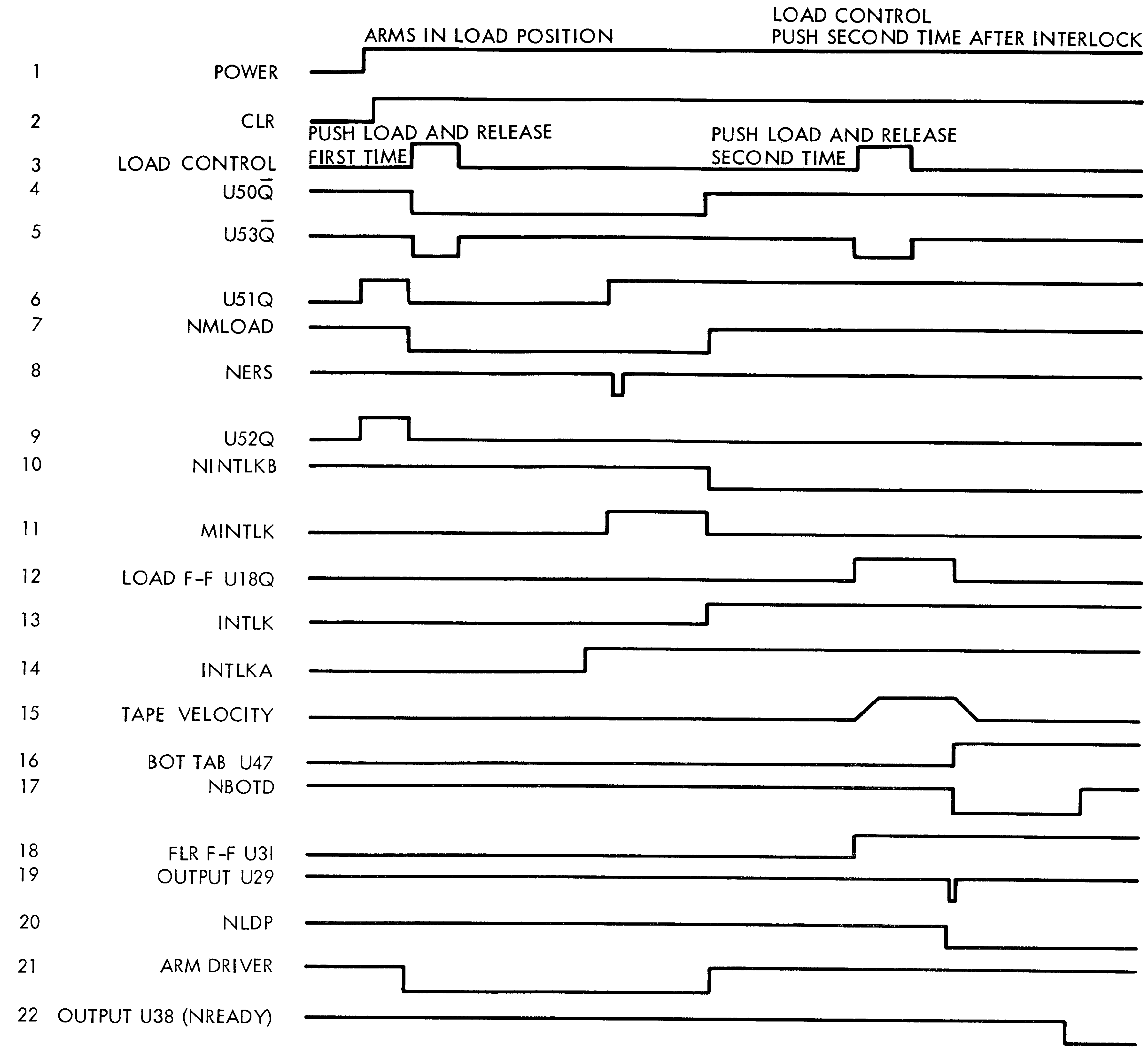


Figure 4-21. Bring to Load Point Waveforms

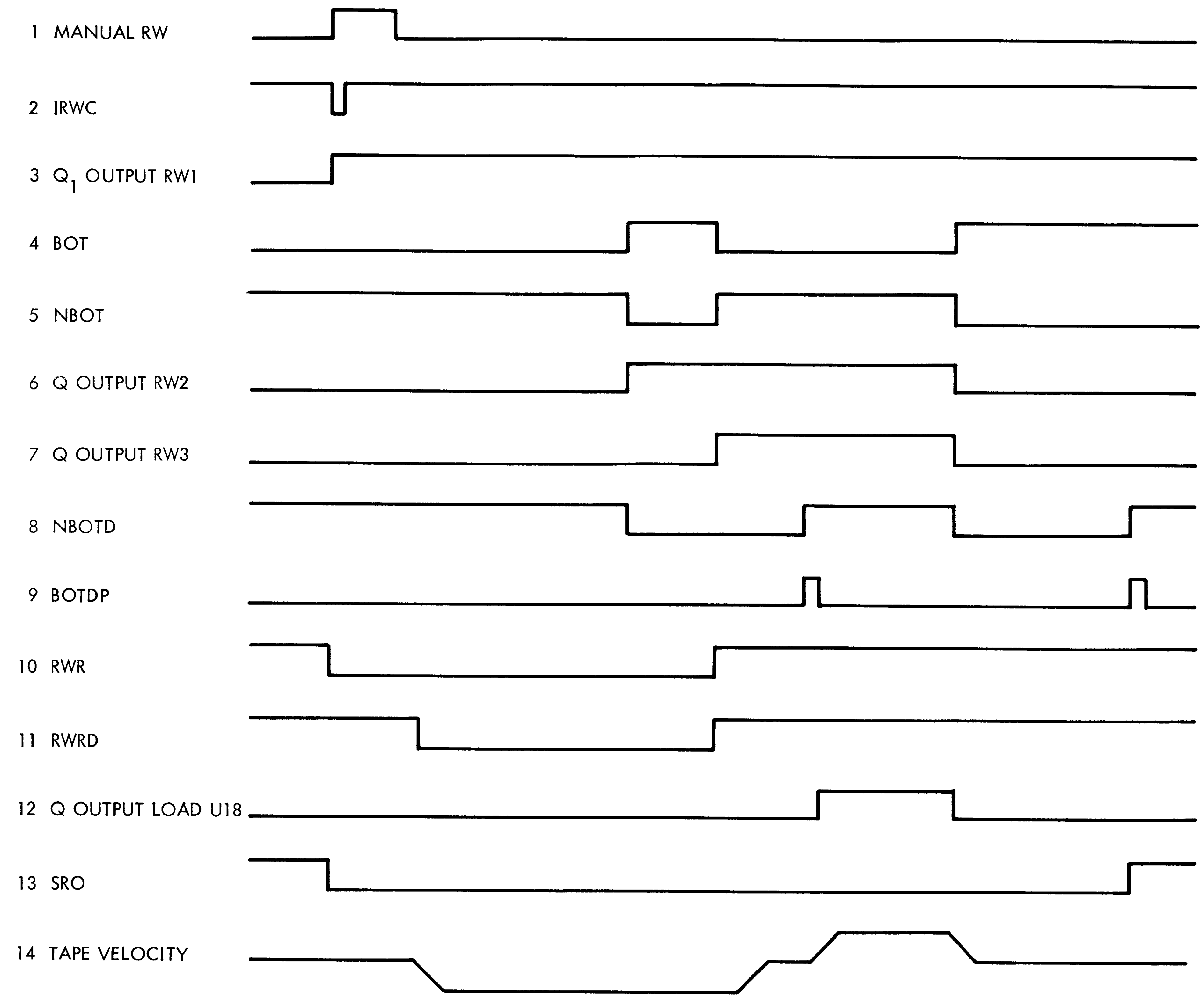


Figure 4-22. Rewind to Load Point Waveforms

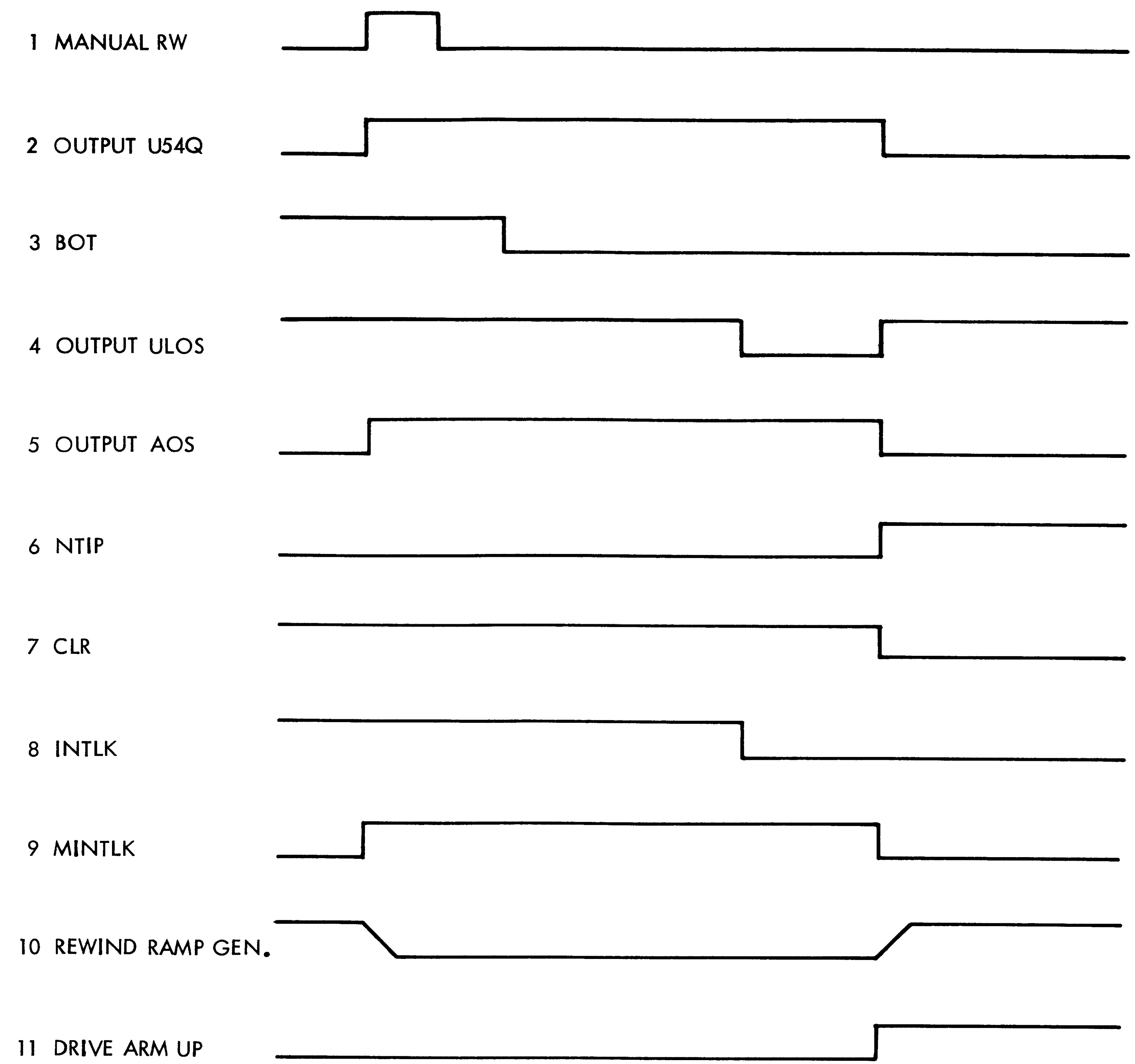


Figure 4-23. Rewind, Tape at Load Point Waveforms

SECTION V

PRINTED CIRCUIT BOARDS THEORY OF OPERATION

5.1 INTRODUCTION

This section contains the theory of operation of the printed circuit boards used in the High Performance Models 6640 and 6660 Tape Transports. The schematics and assembly drawings for the relevant PCBAs is contained at the end of Section VII.

A better understanding of the logic used in the tape transport can be gained when the operation of the J-K flip-flop is fully understood. The following paragraphs provide a summary of the 852 J-K flip-flop operation, a type most commonly used in the system.

This flip-flop operates on a "master-slave" principle. A logic diagram of the flip-flop is shown in Figure 5-1. The flip-flop is designed so the threshold voltage of AND gates 101 and 102 is higher than the threshold voltage at AND gates 103 and 104. Since operation depends exclusively on voltage levels, any waveform of the proper voltage level can trigger the J-K flip-flop.

Assume that the trigger voltage is initially low. As the trigger voltage goes high, AND gates 103 and 104 are disabled. Subsequently, AND gates 101 and 102 are enabled by the trigger pulse, the J and K inputs, and the information previously stored at the output of the "slave" unit.

The J and K input information at this time is transferred to the input of the "master" unit. As the trigger voltage goes low, AND gates 101 and 102 are disabled. AND gates 103 and 104 are then enabled and the information stored in the "master" unit is transferred to the output of the "slave" unit.

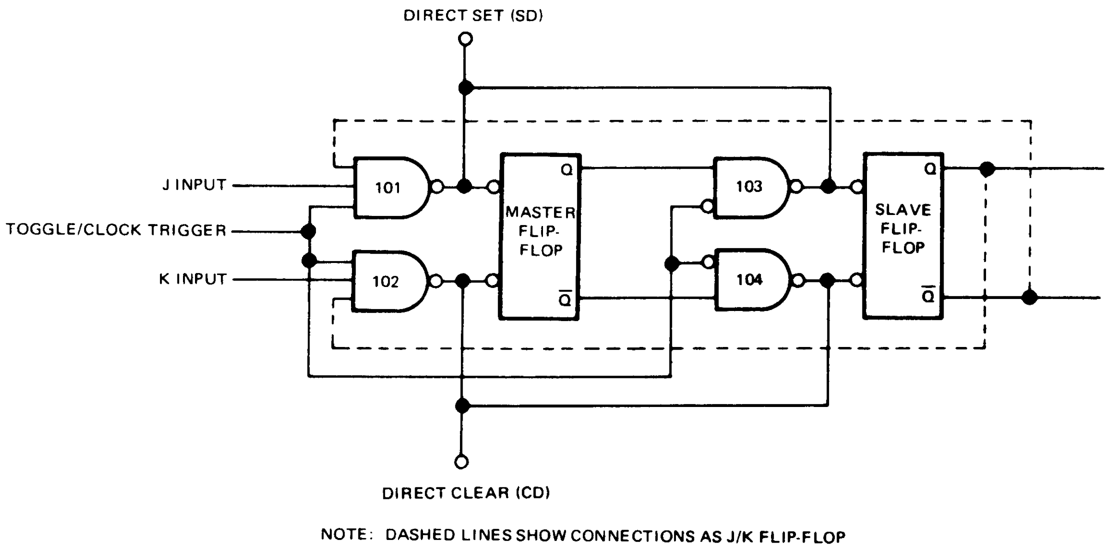


Figure 5-1. Simplified Logic Diagram, "Master-Slave" Flip-Flop

5.2 DATA F (6640)

The following is a description of the Data F printed circuit board assembly (refer to Schematic 101345 and Assembly 101346).

The Data F is approximately 16.5 inches long with edge connectors (J102 and J103) at each end along one edge. These are the interface connectors and are slotted to mate with keys in the mating plugs. There are three additional connectors on the Data F. J8 is used to connect power and control signals from the Tape Control circuit board. J1 and J2 are the connectors into which the write and read head cables plug.

5.2.1 CIRCUIT DESCRIPTION

The board operation is described with reference to circuit 100 which is identical to circuits 200 through 900. All interface signals relevant to writing data (nine Write Data signals (IWD0, etc.), and Write Data Strobe (IWDS)), enter via J102 and are terminated by a resistor combination and an IC inverter.

Referring to circuit 100, the Write Data Parity (IWDP) data line is terminated by resistors R101, R102, and inverter U6-E. IWDP and its complement are applied to the "J" and "K" inputs of write buffer flip-flop U8-A. At the trailing edge of IWDS (TP3), which is applied to the toggle input of U8-A from power gate U10-A, flip-flop U8-A copies in the inverse of IWDP.

The outputs of the write buffer flip-flop drive write amplifier transistors Q101 and Q102, whose emitters are taken to +5v when the WRT POWER line (J8-4) is high. The transistor connected to the low (approximately 0v) output of the flip-flop will conduct and a current will flow in the associated half of the head winding. The center taps of all the windings are connected to the collector of Q3 which goes to -5v when the NWRT signal is false (i.e., the transport is in the Write mode). When the WRT POWER line is low (approximately 0v) or the NWRT signal is true, writing is inhibited because the write amplifier transistors c cannot conduct. Similarly, the erase current supplied by transistor Q1 is inhibited when the WRT POWER line is low or the NWRT signal is true. In operation, the write current is defined by resistors R107 and R108. R109 is the associated damping resistor.

To improve the writing characteristics at 3200 frpi, the write compensation capacitors C101 and C102 are used to cause an overshoot of current on each leading edge.

The head windings are phased so that the output of the write buffer flip-flops, when reset, cause current to flow in the standard "erase" direction. The write buffer register is held reset unless the transport is in the Write mode (NWRT is false) and the tape is moving (MOTION, J8-6, is false).

The IWARS signal is received by resistors R22 and R23 but is not used on the Data PCBA. A jumper from J102-C (Data PCBA) to J101-15 (Tape Control PCBA) routes IWARS to the Overwrite circuitry on the Tape Control PCBA. IWARS is issued at the end of writing the postamble and is used in conjunction with IOVW to reset the WRT flip-flop on the Tape Control PCBA. The purpose of this is to turn off the write and erase current so that the adjacent record will not be erased during an Overwrite operation.

When reading data from tape, signals from the read head at a level of 5 to 15 millivolts are fed via connector J2 to the read amplifier (U16-B) which is one-half of a dual operational amplifier IC. The amplifier output is maintained close to 0v in the absence of an input signal by the feedback path of resistors R114 and R116. The cutoff frequency of the amplifier is determined by C104 and R114. The operating gain of the amplifier is defined by resistor network R114, R116, and R117. R117 is a variable resistor used in the initial setup to set the differentiator output peak-to-peak amplitude.

Figure 5-2 illustrates typical read signal and timing relationships and should be referred to in the following discussion.

Amplifier U21-B is connected as a differentiator so that a peak in the output voltage of U16-B (TP103) is changed to a zero crossing at the output of amplifier U21-B (TP104). The gain of U21-B is determined by R118, R119, and C105. Since the capacitive reactance of C105

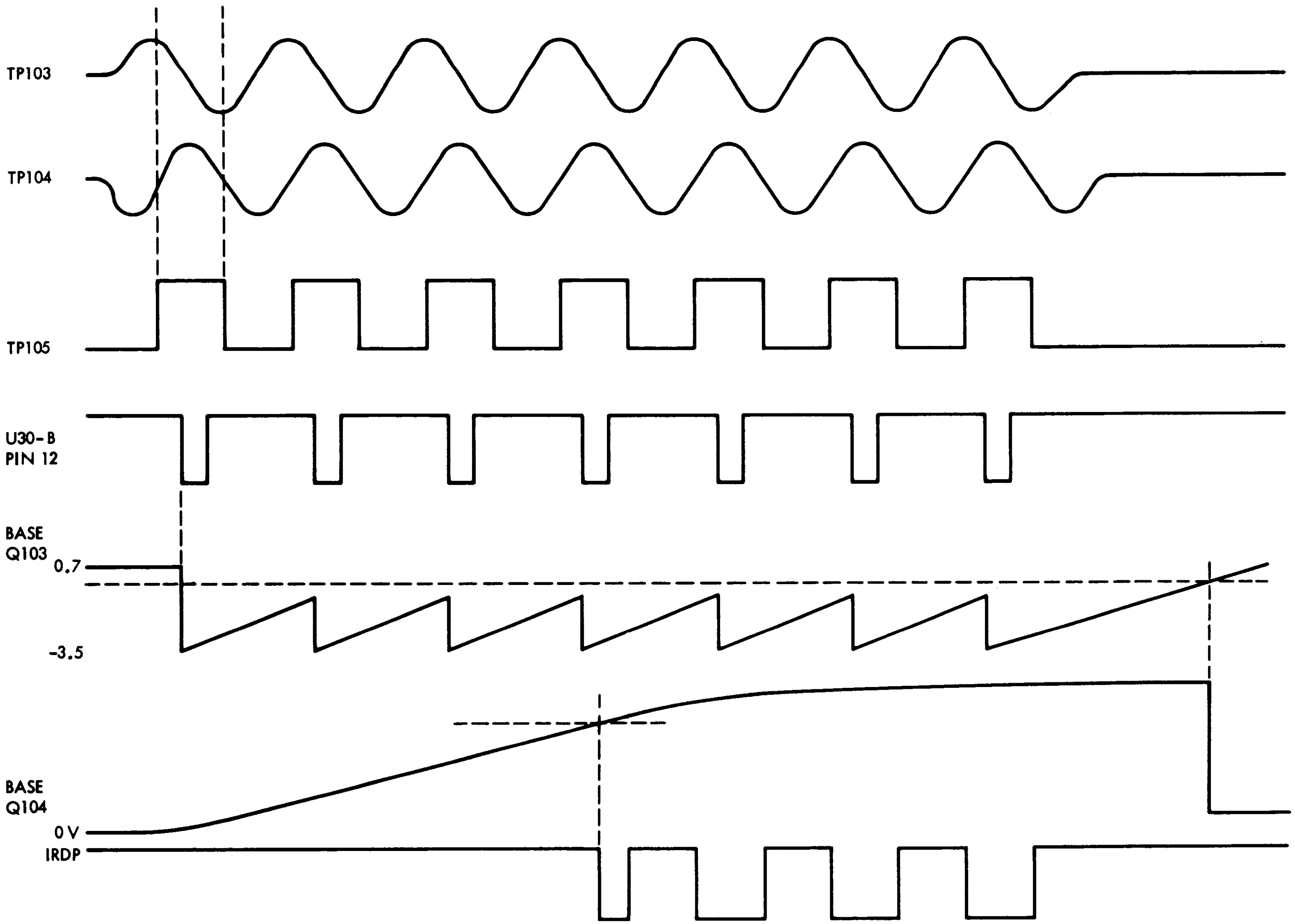


Figure 5-2. Timing and Signal Relationships, One Channel Read Electronics

decreases as frequency increases, the gain of U21-B increases with frequency until cut off by C106 and R119. Therefore, the amplitude of the envelope at TP104 is essentially independent of the data pattern. R117 should be adjusted so that the amplitude at TP104 is 6v peak-to-peak.

The differentiated signal is fed to U30-A, a Schmitt trigger (an amplifier with a small amount of positive feedback) which yields a square signal (TP105). The read data is then applied to the power NAND gate U35-A.

The output of the differentiator (U21-B) is also fed to the input of the Envelope Detector (U30-B). The envelope detector compares the positive peaks of the differentiator signal (TP104) on Pin 9 of U30-B against the divided threshold level on Pin 8 of U30-B. The threshold level, when the transport is in the Write mode, is 30 percent and is determined by R18 and R19. Q4 and Q5 are cut off during a Write operation. During a normal Read operation Q4 is conducting and the' threshold is approximately 10 percent. If RTH2 is true during a Read operation Q5 also conducts and the threshold drops to 5 percent.

During the portion of the positive peak of the differentiated signal the output at Pin 12 of U30-B goes to -4v; this also pulls C111 to -3v through CR104 and causes Q103 to cut off. When the peak falls below the threshold the output of U30-B goes positive and C111 is charged by R131 until Q103 conducts. The charge time for C111 is two times the period for a single character. While Q103 is cut off, C109 is charging through R132. When the voltage on C109 reaches approximately +2v the conduction level of emitter follower Q104 enables power NAND gate U35-A. Read data from U30-A is presented to the interface line when U35-A is enabled by the outputs of U30-B, and the MOTION signal being true. The charge time for C109 is about four character times. If no positive peaks exceed the threshold for two consecutive character periods C111 will charge to +0.7v and cause Q103 to conduct. C109 will discharge, until Q104 conducts, and disables U35-A. Since C109 requires four character periods to enable U35-A, there must have been four continuous peaks of the differentiated signal before U35-A was enabled.

5.3 DATA G (6660)

The following is a description of the Data G printed circuit board assembly (refer to Schematic 101375 and Assembly 101376).

The Data G is approximately 16.5 inches long with edge connectors (J102 and J103) at each end along one edge. These are the interface connectors and are slotted to mate with keys in the mating plugs. There are two additional connectors on the Data G; J8 is used to connect power and control signals from the Tape Control circuit board; the read/write head cable plugs into connector J1.

5.3.1 CIRCUIT DESCRIPTION

The board operation is described with reference to circuit 100, which is identical to circuits 200 through 900. All interface signals relevant to writing data (nine WRITE DATA signals (IWD0, etc.) and WRITE DATA STROBE (IWDS)), enter via J102 and are terminated by a resistor combination and an IC inverter.

Referring to circuit 100, the Write Data Parity (IWDP) data line is terminated by resistors R101, R102, and inverter U6-E. IWDP and its complement are applied to the "J" and "K" inputs of write buffer flip-flop U8-A. At the trailing edge of IWDS (TP3), which is applied to the toggle input of U8-A from power gate U10-A, flip-flop U8-A copies in the inverse of IWDP.

The outputs of the write buffer flip-flop drive write amplifier transistors Q101 and Q102, whose emitters are taken to +5v when the WRT POWER line (J8-4) is high. The transistor connected to the low (approximately 0v) output of the flip-flop will conduct and a current will flow in the associated half of the head winding. The center taps of all the windings are connected to the collector of Q3 which goes to -5v when the NWRT signal is false (i.e., the transport is in the Write mode). When the WRT POWER line is low (approximately 0v) or the NWRT signal is true, writing is inhibited because the write amplifier transistors cannot conduct. Similarly, the erase current supplied by transistor Q1 is inhibited when the WRT POWER line is low or the NWRT signal is true. In operation, the write current is defined by resistors R107 and R108.

To improve the writing characteristics at 3200 frpi the write compensation capacitors C101 and C102 are used to cause an overshoot of current on each leading edge.

The head windings are phased so that the output of the write buffer flip-flops, when reset, cause current to flow in the standard "erase" direction. The write buffer register is held reset unless the transport is in the Write mode (NWRT is false) and the tape is moving (MOTION (J8-6) is false).

The IWARS signal is received by resistors R25 and R26 but is not used on the Data PCBA. A jumper from J102-C (Data PCBA) to J101-15 (Tape Control PCBA) routes IWARS to the Overwrite circuitry on the Tape Control PCBA. IWARS is issued at the end of writing the postamble and is used in conjunction with IOVW to reset the WRT flip-flop on the Tape Control PCBA. The purpose of this is to turn off the write and erase current so that the adjacent record will not be erased during an Overwrite operation.

When reading data from tape, signals from the read head at a level of 5 to 15 millivolts are fed via connector J1 to the read amplifier (U16-B) which is one-half of a dual operational amplifier IC. The amplifier output is maintained close to 0v in the absence of an input signal by the feedback path of resistors R114 and R116. The cutoff frequency of the amplifier is determined by C104 and R114. The operating gain of the amplifier is defined by resistor network R114, R116, and R117. R117 is a variable resistor used in the initial setup to set the differentiator output peak-to-peak amplitude.

Figure 5-3 illustrates typical read signal and timing relationships and should be referred to in the following discussion.

Amplifier U21-B is connected as a differentiator so that a peak in theoutput voltage of U16-B (TP103) is changed to a zero crossing at the output of amplifier U21-B (TP104). The gain of U21-B is determined by R118, R119, and C105. Since the capacitive reactance of C105 decreases as frequency increases, the gain of U21-B increases with frequency until cut off cy C106 and R119. Therefore, the amplitude of the envelope at TP104 is essentially independent of the data pattern. R117 should be adjusted so that the amplitude at TP104 is 6v peak-to-peak.

The differentiated signal is fed to U30-A, a Schmitt trigger (an amplifier with a small amount of positive feedback) which yields a square signal (TP105). The read data is then applied to the power NAND gate U35-A.

The output of the differentiator (U21-B) is also fed to the input of the Envelope Detector (U30-B). The envelope detector compares the positive peaks of the differentiator signal (TP104) on Pin 9 of U30-B against the voltage-divided threshold level on Pin 8 of U30-B. During a normal Read operation Q4 is conducting and the threshold is approximately 10 percent. If RTH2 is true during a Read operation, Q5 also conducts and the threshold drops to approximately 5 percent. If RTH1 is true, the threshold is 30 percent regardless of the condition of RTH2.

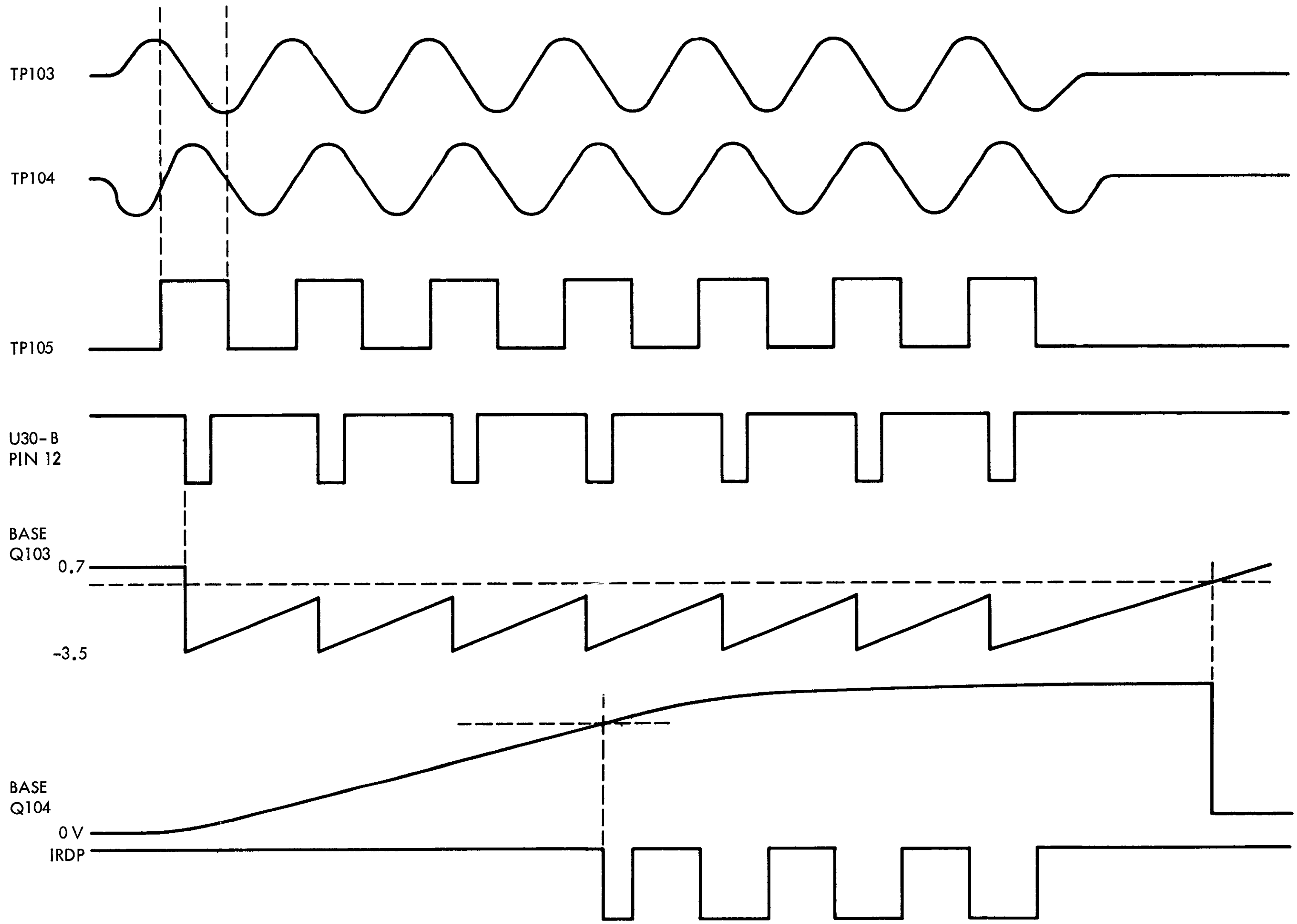


Figure 5-3. Timing and Signal Relationships, One Channel Read Electronics

During the portion of the positive peak of the differentiated signal the output at Pin 12 of U30-B goes to approximately -4v; this also pulls C111 to approximately -3v through CR104 and causes Q103 to cut off. When the peak falls below the threshold the output of U30-B goes positive and C111 is charged by R131 until Q103 conducts. The charge time for C111 is approximately two times the period for a single character. While Q103 is cut off, Q109 is charging through R132. When the voltage on C109 reaches approximately +2v the conduction level of emitter follower Q104 enables power NAND gate U35-A. Read data from U30-A is presented to the interface line when U35-A is enabled by the outputs of U30-B, and the MOTION signal being true. The charge time for C109 is about four character times. If no positive peaks exceed the threshold for two consecutive character periods C111 will charge to +0.7v and cause Q103 to conduct. C109 will discharge, until Q104 conducts, and disable U35-A. Since C109 requires four character periods to enable U35-A, there must have been four continuous peaks of the differentiated signal before U35-A was enabled.

5.4 SERVO AND POWER SUPPLY

The following is a description of the Servo and Power Supply printed circuit board assembly (refer to Schematic 101659 and Assembly 101660).

The Servo and Power Supply circuit board is approximately 22 inches long and contains the reel servo amplifiers, capstan servo amplifiers, regulators, write enable and interlock circuitry, and the EOT/BOT sensor amplifier. The power transistors associated with the circuits are mounted on a 22-inch long heatsink.

The circuit board is secured to the heatsink by utilizing screws which also serve as connections between the transistor cases and the printed circuit.

Connections are made to the board via connectors which are strategically located with respect to their associated circuitry. These connectors are used to:

(1) Connect all the deck-mounted assemblies to the board; e.g., power supply, motors, tension arm sensors, photo-tab sensors, Write Lockout assembly, and the tension-arm limit switch.

(2) Feed power and signal levels to the Tape Control circuit board.

The Servo and Power Supply PCBA consists of six functionally distinct sections which are described separately in the following paragraphs.

(1) Tape Load-Unload System

(2) Reel Servo Amplifiers

(3) Capstan Servo Amplifier

(4) Regulated Power Supply

(5) EOT/BOT Amplifier

(6) Write Lockout Circuit

5.4.1 TAPE LOAD-UNLOAD SYSTEM, CIRCUIT DESCRIPTION

Operation of the Tape Load-Unload System consists of a series of logical events. Therefore, the description of the circuits responsible for these events has been chosen to be in the sequence which occurs during the normal operation of the transport, where initially there is no tape mounted on the transport. This is the same sequence which has been functionally described in Section IV with reference to the block diagram in Figure 4-19*.

When power is applied, the light from the EOT/BOT sensor assembly crosses the tape path and strikes the photoresistor mounted across from it. The voltage on the photoresistor drops to -5v, setting TIP (Tape-In-Path) low via Pin 6, J17, which causes the normally conducting Q31 to cut off. The output of Q31, NTIP (No-Tape-In-Path), becomes high causing diode CR33 to become back-biased, and Q47, Q48, Q51 to conduct. The +22v from the emitter of Q51 is connected to the supply and take-up actuator motors via the UP-STOP switches which are mounted on the deck plate (Pin 1, J18, Pin 1, J29). If the supply and take-up tape storage arms are not positioned in the tape threading position, the UP-STOP switches will be closed. Hence, the +22v will drive the actuator motors, and the motor cams will move the arms up until they open these switches removing the +22v.

When tape is mounted on the transport, the light from the EOT/BOT sensor is prevented from reaching the photoresistor. TIP goes high and NTIP goes low as Q31 conducts. Q47, Q48, Q51 cut off and

*Foldout drawing, see end of Section IV.

the +22v is removed from the actuator motors as long as there is tape in the tape path. A design feature protects this effort against failure of Q31 through incorporation of CR36 and R118. During operation of the transport when relay K1 is latched, the junction of CR36 and R118 is not clamped to +5v. Therefore, Q47, Q48, Q51 remain cut off regardless of the state of Q31.

When the LOAD switch/indicator is depressed NMLOAD (No-Motor-Load) on the Tape Control PCBA goes low. This level is felt on the emitter of Q37 via Pin 1, J26.

Q37 and Q50 conduct and +10v becomes available to the emitter resistor R144 of the differential amplifier Q49 - Q52. This amplifier is driven by the two tension arm position sensor voltages. The negative output voltages from the power transistors Q54 and Q56 are connected to the actuator motors and to the cathodes of diodes CR48 and CR49 via the DOWN-STOP switches. The DOWN-STOP switches are mounted on the same plate as the actuator motors. Unless the motor cams are in the extreme down position, the DOWN-STOP switches will be closed. Hence, the negative output voltages from the differential amplifier drive the actuators down. The tension arms follow the actuator cams downward (up to three-fourths of the way down) under the mechanical forces of the tension springs. The differential amplifier ensures that the tension arms move down at the same rate.

When the arms have moved to the three-quarter down position, the tension arm sensor voltages, maintained equal throughout the arm movement, set NERS (No-Energize-Reel-Servo) low via differential AND circuit Q57 - Q60. This in turn sets MINTL (Make-Interlock) high on the Tape Control PCBA via Pin 9, J9.

The high level of MINTL returns to the Servo and Power Supply PCBA via Pin 2, J26, back-biasing diodes CR34 and CR21. The back-bias of CR34 causes Q40 to conduct. This action clamps the junction of R132 and R133 to approximately 0v. Thus, the negative outputs of the down-driver differential amplifier (Q49 - Q52) become independent, i.e., not subject to the possibility of one side cutting off as a result of sufficient inequality in the input arm sensor voltages.

The effect of the back-bias of CR21 causes Q34 to conduct and relay K1 to energize. The reel and capstan motors are thus connected to their respective amplifiers. The tape is tensioned with the tension arms positioned at the mid-point of their travel. NERS is reset high via Q57 - Q60. Relay voltage to energize K1 is derived from diodes CR28 and CR24 which are connected to the secondary of the power supply transformer via Pins 8 and 9, J23. This ensures that the relay drops out rapidly upon loss of line voltage, and motor power and write current are removed before the main power supplies have had time to decay to the point where inadvertent motor motion or writing could occur.

Except in the case where the tension arms are in the extreme up or down position, the ARM-INTERLOCK switches will be closed. Therefore when K1 is energized, INTLK-A (Pin 5, J30) becomes high and causes Q33 and Q44 to conduct. Q44 stays in conduction as long as its emitter remains connected to the negative outputs of the down driver differential amplifier via either diodes CR48 or CR49 and the DOWN-STOP switches.

At this point in the cycle the DOWN-STOP switches will normally be closed. Hence, the negative output voltages from the differential amplifier (by now, independent) will continue to drive the actuators down until the cams open the DOWN-STOP switches. The negative outputs of the differential amplifier are removed from the actuator motors and the emitter of Q44. Q44 cuts off and enables the high level of INTLK-A to turn Q41 on, setting NINTLK-B (No-Interlock B) low. Thus, Q33 cuts off.

When NINTLK-B goes low, MINTLK is reset to low on the Tape Control PCBA via Pin 6, J9. MINTLK (Pin 2, J26) forward-biases diode CR34 and Q40 cuts off. The voltage at the junction of resistors R132 and R133 is unclamped from near ground. NMLOAD is reset high on the Tape Control PCBA and cuts off Q37, Q50 via Pin 1, J26. The +10v is removed from emitter resistor R144 of the actuator down-driver differential amplifier. With the junction of resistors R132 and R133 unclamped from near ground the amplifier cuts off.

Since Q33 is cut off the high level of INTLK-A keeps Q34 conducting and relay K1 energized regardless of the state of MINTLK. The delaying action of NINTLK-B on INTLK-A to keep Q34 conducting has been incorporated to ensure that the actuator cams have moved all the way down before relay K1 is permanently latched and tape can be moved by the capstan.

The unload operation is initiated when the tape has been rewound to BOT and the REWIND switch/indicator is depressed. Depressing the REWIND switch/indicator causes MINTLK to go high on the Tape Control PCBA, maintaining Q34 in a conduction state and relay K1 energized regardless of the state of INTLK-A. Tape is slowly rewound off of the reel until tape tension is lost. This causes the ARM INTERLOCK switches to open and INTLK-A to go low, thus cutting off Q41 and Q33. NINTLK-B becomes high. As the tape path is cleared, TIP becomes low and resets MINTLK low on the Tape Control PCBA. Q34 cuts off and relay K1 is de-energized, disconnecting the reel and capstan motors from their respective amplifiers and reconnects the reel motors to each other via resistor R240. As a result of TIP becoming low, the arms are moved to the tape threading position as previously described.

5.4.2 REEL SERVO AMPLIFIERS, CIRCUIT DESCRIPTION

Two dc switching amplifiers drive the supply and take-up reel motors (refer to Schematic 101659, Sheet 3 of 3). Relay K1 connects these amplifiers to the motors. When K1 is de-energized contacts 11, 12, 14, and 15 connect the two reel motors by resistor R240. This provides a dynamic braking effect when the interlock is lost due to power failure, tape breaking or reaching the end of the tape leader.

Referring to the take-up reel amplifier circuit, the input (C38, C40, R157, R165) and feedback (C48, C51, R175, R178) circuits of the operational amplifier stage U3-A provide lead-lag phase compensation. The feedback capacitor C59 of U3-B together with R201 determines the switching frequency. For example, for a given positive dc voltage at the output of U3-A, the output of U3-B is a negative-going ramp voltage. When the ramp exceeds -0.5v, Q64 and Q68 conduct, causing Q72 to saturate. The -22v at the collector of Q72 is fed back via R201 to the input of U3-B whose output then becomes a positive-going ramp. When this ramp becomes less than -0.2v it cuts off Q64, Q68, and Q72. The feedback current through R201 becomes zero and the output of U3-B again becomes a negative-going ramp voltage. The cycle is repeated saturating and cutting off Q72. For a negative dc voltage at the output of U3-A, Q74 is switched between cutoff and saturation. The ratio of the time when Q74 or Q72 is saturated to the time when they are cut off is proportional to the output voltage of U3-A. Thus, the output of the switching amplifier is a pulse-width-modulated voltage whose average value (as filtered by the motor inductance) is proportional to the input dc voltage. The dc gain of the amplifier is given by the product of the ratios R201/R187 and R178/R157. Current limiting is provided by amplifying the voltage developed by the motor current across R241 and applying it in proper phase to the input of U3-B. Diodes CR63 and CR64 ensure that current limiting is not initiated at low levels. The offset voltage from the output of U3-B provides for the four-inch swing of the take-up tension arm. The swing is adjusted by potentiometer R155. The offset voltage from potentiometer R150 adjusts the arm center position.

The supply reel amplifier circuit is identical to the take-up reel circuit in all respects except for the offset voltage which provides for the four-inch swing of the supply tension arm. This voltage comes from the output of U2-B and furnishes the necessary phase reversal for the supply reel servo.

In the Rewind mode NRWRD (Rewind Ramp Delayed) becomes false, cuts Q35 off (refer to Schematic 101659, Sheet 2 of 3) and allows the high level of INTLK-A to turn Q36 on. Hence, relay K2 is energized and connects the emitter of Q70 to -22v and the collector of Q74 to +22v (Schematic 101659, Sheet 3 of 3) via a one-ohm power resistor. This action provides current limiting during acceleration and allows the amplifiers to supply sufficient output voltage to enable the reel servos to follow tape speeds of 150 ips. Also, offset voltages being zero, the tension arms move only about one-fourth-inch.

In the Rewind-after-BOT mode, AOS (Arm Offset) true introduces two-inch offsets in the tension arms, and after tension is lost ULOS (Unload Offset) true provides additional offset to allow the reels to continue to rotate as the tape is completely rewound onto the supply reel. When tension is lost, the arms move down a distance and impact on the stops. The AOS offsets are then necessary to reduce this distance. The ULOS offsets provide the amplifiers with small driving voltages so that the remaining tape is rewound very slowly.

Diodes CR73, CR74, CR75, and CR76 prevent the contacts of relay K2 from arcing when they are opened. Diodes CR69, CR70, CR71, and CR72 protect Q74, Q72, Q73, and Q70 from the induced emf of the motor inductances and, together with capacitors C76 and C77, prevent the contacts of relay K1 from arcing when they are opened.

5.4.3 CAPSTAN SERVO AMPLIFIER, CIRCUIT DESCRIPTION

Relay K1 connects the capstan servo amplifier to the capstan motor (refer to Schematic 101659, Sheet 2 of 3). The amplifier uses one-half of a dual operational amplifier U1A as the input stage and discrete transistors to drive the high currents in the motor. The overall gain of the amplifier is determined by the sum of R114 and R137 divided by the sum of R88 and R92 for Micro Switch motor-tachometers (Part No. 500-7533). When the alternate motor-tachometer (Assembly No. 101743) is employed the overall gain of the amplifier is determined by the sum of R114 and R137 divided by the sum of R89 and R92, and R137 is grounded by jumping pin 1 to pin 4 on J27. Diodes CR44 and CR45 prevent the contacts of relay K1 from arcing when they are opened. Potentiometer R87 adjusts the initial output offset of the operational amplifier to zero and potentiometer R86 adjusts the rewind speed of the motor.

5.4.4 REGULATED POWER SUPPLY, CIRCUIT DESCRIPTION

Transistors Q5-Q11, Q6-Q12, Q16-Q22, and Q17-Q23 provide regulated +5v, -5v, +10v, and -10v, respectively (refer to Schematic 101659, Sheet 1 of 3). The regulators are driven by the unregulated +22v and -22v from the power supply module (J24). Potentiometers R16 and R17 adjust the +5v and -5v levels. Zener diodes CR3 and CR6 provide the reference voltage for the positive and negative regulators, respectively. The majority of the currents to these diodes come from the regulated +10v and -10v lines via R14, CR2 and R15, CR7. This technique provides improved ripple characteristics for the regulators. Starting initial currents, however, come from +22v and -22v lines via R11 and R13. CR4 and CR5 improve the temperature stability of the supplies.

Short circuit protection is provided to the +22v(L) and -22v(L) lines by causing Q1 and Q2 to conduct when the voltages across R3 and R9 exceed 0.7v. As a result, Q3 is brought into conduction and

Q4 saturates. Thus, the zener reference voltages are clamped to near ground through CR1. The +22v (L) and -22v (L) line currents are thereby limited to approximately 3 amperes each.

If regulation is disrupted as a result of component failure and any or all of the voltages increase by 60 percent or more, a "crowbar" overvoltage protection circuit removes the zener reference voltages. This is accomplished by CR12 and Q14 for the +10v line, and CR10 for the +5v line. An overvoltage condition on either line will trigger SCR1 to fire and blow fuse F1. The same protection is provided to the -10v and -5v lines by CR13 and Q15 for the -10v line, and CR11 for the -5v line. An overvoltage on either the -10v or -5v line will trigger SCR2 to fire and blow fuse F2. These conditions will additionally bring Q3 into conduction and cause Q4 to saturate as before, clamping the zener references to ground.

5.4.5 EOT/BOT AMPLIFIER, CIRCUIT DESCRIPTION

J17 connects the photo-tab sensor mounted on the tape deck to EOT/BOT amplifier circuit on the Servo and Power Supply PCBA (refer to Schematic 101659, Sheet 2 of 3). Transistors Q25 and Q27 form a differential amplifier which compares the BOT sensor output voltage NBOT with the reference voltage supplied by the EOT sensor on the bases of transistors Q26 and Q28. When this voltage difference is negative by more than 0.6v, transistor Q25 conducts, causing Q29 to conduct. The output of Q29 is connected to a Schmitt trigger circuit to remove the possibility of multiple pulses on the leading and trailing edges of the BOT tab. The Schmitt trigger utilizes one-half of dual operational amplifier U1B connected in a positive feedback mode and set to switch at approximately 2.3v. The output of the Schmitt trigger is inverted by Q32. Thus, when NBOT goes low, so does the output of Q32.

With the exclusion of the Schmitt trigger circuit, the EOT circuits have complete symmetry with the BOT circuits and the system provides excellent rejection of photosensor drifts.

5.4.6 WRITE LOCKOUT, CIRCUIT DESCRIPTION

Refer to Schematic 101659, Sheet 2 of 3. When the write enable ring which is mounted on the supply reel closes the write lockout switch, WRT POWER becomes true and causes the write lockout solenoid driver transistor Q24 to turn on. The solenoid in turn keeps the write lockout switch closed by retracting the write enable ring probe.

5.5 TAPE CONTROL F

The following is a description of the Tape Control F printed circuit board assembly (refer to Schematic 101670 and Assembly 101671).

The board contains the transport control logic together with the capstan servo ramp generators. The Tape Control PCBA is approximately 16.5 inches long with an edge connector (J101) at one end. This is the interface connector and is slotted to mate with a key in the mating plug. At the opposite end of the board is a row of connectors which are used to connect the manual control switches to the Tape Control PCBA. In addition, two connectors (J9 and J10) transmit power and control signals from the Servo and Power Supply PCBA to the Tape Control while connector J8 and/or J11 supply power and control signals to the Data PCBA.

A description of the logic sequences employed in the Tape Control PCBA is detailed in Paragraphs 4.3.7 through 4.3.7.10. The remaining circuitry is concerned with the generation of ramp signals for the capstan servo, format selection, and the BOT single-shot.

The Tape Control PCBA is interconnected to the other PCBAs by means of five cable assemblies which terminate in Molex plugs. Additionally, the Tape Control PCBA is equipped with three jumper connectors which configure the transport as required by the various models. Table 5-1 lists the connectors and the destination or function of the cabling.

Table 5-1

Tape Control Connector Cross Reference

Connector Number	Destination/Function
J1	LOAD Switch/Indicator
J2	ON LINE Switch/Indicator
J3	REWIND Switch/Indicator
J4	WRT EN
J5	HI DEN Switch/Indicator
J6	FORWARD Switch/Indicator
J7	REVERSE Switch/Indicator
J8	Status Signals and Power to Data PCBA
J9	Control Signals from Power and Servo PCBA, Ramp Generator Output
J10	Power from Power and Servo PCBA
J11*	Status Signals to Data K PCBA
J12*	9 TRACK Switch/Indicator
J13*	Format Select Jumper Assembly
J14	Speed Select Jumper Assembly
J15	Option Select Jumper Assembly
J101	Interface Connector

*Not relevant to 6640 and 6660 transports.

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Forward commands may be generated by the front panel FORWARD switch/indicator. Activation of the control operates a "latch" consisting of U32C and U32D which prevents switch contact bounce. The output of the latch is employed to toggle flip-flop U33A. The $\overline{Q}$ output of U33A is fed to the Forward ramp generator (circuit 900, input D), and to the associated lamp driver. The low state of the $\overline{Q}$ output activates the ramp generator and lamp driver.

The low-true interface SFC is received via J101 (pin C) inverted by U1C and passed to NAND gate U3A. SFC is gated at U3A with the Selected, Ready, and On-line (SRO) signal and fed to input C of the Forward ramp generator.

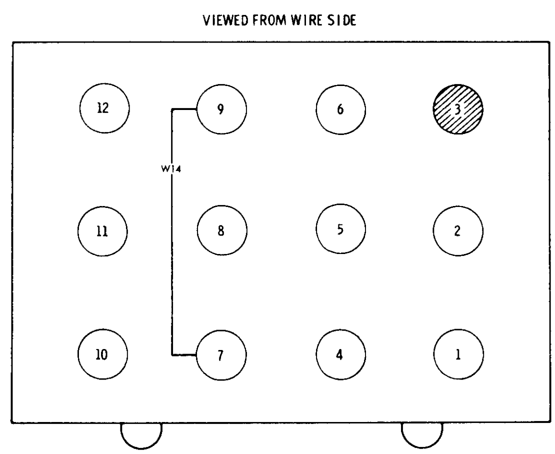
The output of U3A is also passed through NOR gate U3D and fed to inverters U22B and U22E. The output of U22E is the MOTION signal. Additionally, the output of U3D is delayed, inverted, differentiated, and fed to the base of transistor Q1. The negative-going signal on the base of Q1 causes the transistor to cut off, generating the positive-going GO pulse at the collector of transistor Q1.

Reverse commands are generated in the same manner as described for SFC, except the REVERSE switch/indicator is employed. The $\overline{Q}$ output of flip-flop U33-B drives the Reverse ramp generator input.

The low-true SRC is received via J101 (Pin E) after which it operates in the same manner as the ISFC, with the exception that the inverted (high-true) ISRC is ANDed with the inverted BOT signal. This is done to ensure that tape motion will stop upon encountering the BOT tab when the transport is operating in the synchronous reverse mode. The two reverse commands are NORed by U3C to provide the REVERSE control signal for the Data PCBA.

The Forward and Reverse ramp generator (circuit 900) converts the digital signals to analog levels with controlled transition times, which are the inputs to the capstan servo. The SFC, or SRC, is fed via transistors Q901, or Q902, to the dual operational amplifier circuits (U10A and U10B) whose output levels are determined by the +5v and -5v lines, and the ratio of R913 to R905 and R907, respectively. The circuit rise and fall times are determined by the +5v and -5v lines R915, R916, R917, R918, and C904. Tape speed is a function of the current entering the capstan servo circuit located on the Servo and Power Supply PCBA from the output of the ramp generator. The proper current for the selected speed is provided by a voltage divider and one of the series resistors at the output of U10B.

A jumper wire is utilized to select the resistance necessary to operate the transport at the specified speed. Figure 5-4 illustrates the proper jumper placement for the available tape speed. Provisions have been made for multiple speed machines which utilize two jumpers for selecting one of the three pairs of resistors R933 and R936, R934 and R937, or R935 and R938. Variable resistors R931 and R932 provide for minor speed adjustments.



SPEED IPS	P14 PART NUMBER	JUMPER USED		
		W12	W14	W17
75	101898-01		X	

Figure 5-4. Jumper Connections, SPEED

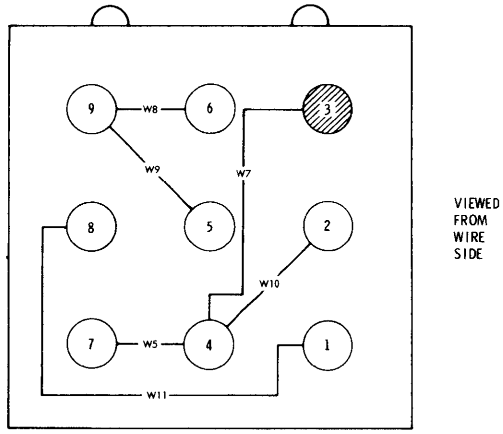
Field Effect Transistors (FET) Q908 and Q909 are used as switching devices to select one of the two specified speeds on dual speed models. Q903 and Q904 select the appropriate ramp times for the two speeds. Bias for the gates of Q903, Q904, Q908, and Q909 is provided by a polarity reversing network consisting of Q905, Q906, and Q907 which is controlled by the HIGH SPEED signal from the speed control circuit at the base of transistor Q905.

The REWIND command is fed to circuit 800 which includes transistors Q801 and Q802. The rewind speed is determined by the -5v line to which transistor Q802 saturates when a rewind to BOT is in progress. Rewind from BOT is accomplished in the same manner, except that Q803 is saturated by NUNL going low, thus decreasing the available driving voltage to the capstan drive amplifier located on the Servo and Power Supply PCBA.

The rise and fall times of the REWIND command are determined by resistor R802 in conjunction with capacitors C801 and C802.

The BOT single-shot consists of the components in circuit 700. The circuit is triggered by the leading edge (positive-going) of the BOT waveform, producing a pulse approximately 0.5-second wide. This width is determined by capacitors C701 and C702 in conjunction with resistors R703 and R704. The single-shot pulse (NBOTD) is inverted and the trailing edge is differentiated by capacitor C5 in conjunction with resistors R24 and R25 and fed to inverter U17A. In this manner a narrow pulse (BOTDP) is generated whose width is determined by capacitor C5 and resistors R24 and R25.

Read Only transports only employ the 9 TRACK switch/indicator to select the 7-track or 9-track head. The switch/indicator is not included in Read/Write transports although the hardware is included on the PCBA. Figure 5-5 illustrates the jumper placement for selection of either 7- or 9-track heads.



TRANSPORT CONFIGURATION	P 13 PN 101897	JUMPERS USED W5	W7	W8	W9	W10	W11
9 TRACK, P.E., R.O.T.	01				X	X	
9 TRACK, PE/NRZI, R.O.T.	02		X		X		
7/9 TRACK, PE/NRZI, R.O.T.	03		X	X			
9 TRACK, NRZI, R.O.T.	04				X		
7 TRACK, NRZI, R.O.T./7 TRACK NRZI, READ AND WRITE HI-DENSITY LOCAL	05		X				
7/9 TRACK, NRZI, R.O.T.	06		X	X			X
7 TRACK, NRZI, READ AND WRITE, HI-DENSITY REMOTE	07	X					
9 TRACK, P.E., READ AND WRITE	NOT USED						
9 TRACK, NRZI, READ AND WRITE	NOT USED						

Figure 5-5. Jumper Connections, FORMAT

Transports which are equipped to operate in only the high density mode utilize jumper W10. Jumper W7 is omitted in these transports, thereby forcing the input of inverter U35E low through jumper W10. The output of U35E is therefore permanently high. Since the output of U35E is coupled to the input of inverter U35F, the output of U35F (NHID) is forced low. Note that the switch/indicator contacts are disabled. The 1600 CPI switch/indicator is permanently illuminated since the low output of U35F continuously enables transistor Q301 (circuit 300).

In transports equipped to operate in only the low density mode, both jumpers W7 and W10 are omitted. The output of inverter U35E is therefore permanently high through resistor R36. Since the low output of U35E is directly coupled to the input of inverter U35F, the output of U35F is permanently high. The HI DEN switch/indicator switching contacts are permanently disabled and the lamp is extinguished due to transistor Q301 (circuit 300) being cut off.

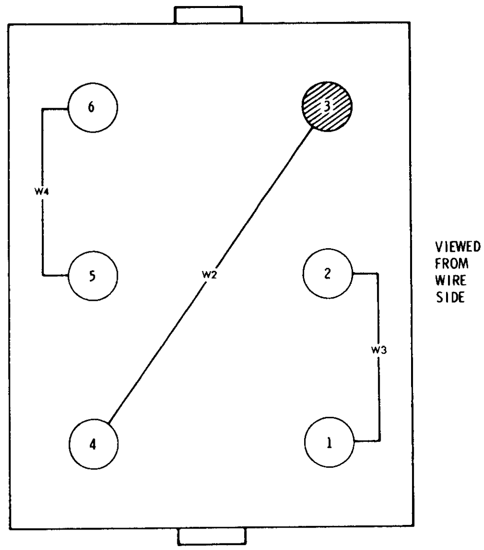
Transports configured to operate in the dual density mode have jumper W7 only installed (W10 is omitted). The data density and associated indicator are controlled by the HI DEN switch/indicator.

When high density is selected via the HI DEN switch/indicator on transports equipped for dual density operation, the input of U35E is connected to 0v via the contacts of the HI DEN switch/indicator. This causes NHID to be low and the transport is conditioned to operate in the high density mode. When the HI DEN switch/indicator is deactivated, NHID is high and the transport is conditioned to operate in the low density mode.

The interface Data Density Select (IDDS) option provides for the external selection of the packing density on dual density transports. Jumper W5 provides the electrical connection to U35E necessary for this feature.

In 9-track transports, the Hi Den mode of operation is automatically selected by installing a jumper to 0v on the Data PCBA which forces J8-5 (NHID) continuously low.

Certain options may be included on the transport to facilitate additional On-line and interface output capabilities. Figure 5-6 illustrates the possible combinations of jumpers W2, W3, and W4. Jumper W2 determines the On-line capabilities of the transport. Transports are normally equipped with jumper W2 which protects the transport from being placed On-line before FLR (First Load or Rewind) goes true. When jumper W2 is omitted the transport can be placed On-line any time after the interlock has been completed, provided that IOFFC (Off-line Input command) is false.



OPTIONS AVAILABLE			P15	JUMPERS USED		
ON-LINE AT	OUTPUT INTERFACE ENABLED BY	INPUT AND OUTPUT INTERFACE LINES ENABLED BY	P/N 101896	W2	W3	W4
MIDDLE OF TAPE	SLTA	SELECT	01			
MIDDLE OF TAPE	SLTA	SELECT AND ON-LINE	02			X
MIDDLE OF TAPE	SELECT	SELECT	03		X	
MIDDLE OF TAPE	SELECT	SELECT AND ON-LINE	04		X	X
BOT	SLTA	SELECT	05	X		
BOT	SLTA	SELECT AND ON-LINE	06	X		X
BOT	SELECT	SELECT	07	X	X	
BOT	SELECT	SELECT AND ON-LINE	08	X	X	X

Figure 5-6. Jumper Connections, OPTIONS

Jumper W3 determines the relationship between the SLT command and the SLTA command. SLT is generated by the inversion of ISLT through gate U6A. All interface inputs except IDDS are disabled when SLT is low (false). SLTA is controlled by the output of U6A when jumper W3 is installed, or SLTA is permanently high (true) through R15 when jumper W3 is omitted. All interface outputs are gated with SLTA and are disabled when SLTA is low.

The presence of jumper W4 causes the ON-LINE command to be wire "ANDed" with SLT, requiring the transport to be selected by the interface and On-line before SLT (and SLTA if W3 is installed) can go true. Transports are not normally equipped with jumper W4.

SECTION VI
MAINTENANCE AND TROUBLESHOOTING

6.1 INTRODUCTION

This section provides information necessary to perform electrical and mechanical adjustments, parts replacement, and troubleshooting. Sections IV and V contain the theory of operation and schematics required for reference when electrical adjustments or troubleshooting are necessary.

6.2 FUSE REPLACEMENT

A total of five fuses are located at the rear of the tape transport. See Table 6-1.

A thermally activated breaker switch is installed on the fan shroud. This breaker protects the power transistors located on the heatsink should a cooling fan fail and allow the temperature to rise to 200 degrees F.

Manual reset of the breaker is made by depressing the plunger in the center of the breaker after a suitable cooling cycle. The cause of overheating should be determined and corrected before restarting the transport.

Table 6-1

Fuse Location

	Location	Function	Type
F1	Power Supply Module	Line Fuse	5 amp, 3AG, SB, 125v and below or 3 amp, 3AG, SB, 190v and above
F2		+22v (S)	10 amp, 3AG
F3		-22v (S)	10 amp, 3AG
F1	Servo and Power Supply PCBA	+22v (L)	5 amp, 3AG
F2		-22v (L)	5 amp, 3AG

6.3 SCHEDULED MAINTENANCE

The tape transport is designed to operate with a minimum of maintenance and adjustments. Replacement of parts is planned to be as simple as possible. Repair equipment is kept to a minimum and only common tools are required in most cases. A list of hand tools required to service the tape transport is given in Paragraph 6.7.

To ensure reliable operation of the transport at its optimum design potential, and to assure high MTBF, a scheduled preventive maintenance program is recommended. This schedule is given in Table 6-2.

Table 6-2

Preventive Maintenance Schedule

Maintenance Operation	Frequency (hours)	Quantity to Maintain	Time Required (minutes)	Manual Paragraph Reference
Clean Head, Head Guides, Roller Guides Tape Cleaner, and Capstan	8 (or start of operating day)	—	5	6.3.1
Check Skew, Tape Tracking, and Speed	500	—	15	6.6.7, 6.6.8, 6.5.6
Check Head Wear	2,500	1	3	6.6.9
Replace Reel Motors and Capstan Motor	10,000	3	30	6.6.14
Replace Tension Arm Springs	10,000	2	25	6.6.17
Adjust Slip Clutches	10,000	2	5	6.6.5.2

6.3.1 CLEANING THE TRANSPORT

The transport requires cleaning in these major areas: head and associated guides, roller guides, tape cleaner, and capstan.

To clean the head, head guides, and tape cleaner, use a lint-free cloth or cotton swab moistened in isopropyl alcohol or Du Pont Freon TF. Wipe the head carefully to remove all accumulated oxide and dirt.

CAUTION

ROUGH OR ABRASIVE CLOTHS SHOULD NOT BE USED TO CLEAN THE HEAD AND HEAD GUIDES. USE ONLY ISOPROPYL ALCOHOL OR FREON TF. OTHER SOLVENTS, SUCH AS CARBON TETRACHLORIDE, MAY RESULT IN DAMAGE TO THE HEAD LAMINATION ADHESIVE.

To clean the capstan, use only a cotton swab moistened with isopropyl alcohol or Freon TF to remove accumulated oxide and dirt.

To clean the roller guides, use a lint-free cloth or cotton swab moistened in isopropyl alcohol or Freon TF. Wipe the guide surfaces carefully to remove all accumulated oxide and dirt.

CAUTION

DO NOT SOAK THE GUIDES WITH EXCESSIVE SOLVENT. EXCESSIVE SOLVENT MAY SEEP INTO THE PRECISION GUIDE BEARINGS, CAUSING CONTAMINATION AND A BREAK-DOWN OF THE BEARING LUBRICANT.

6.4 PART REPLACEMENT ADJUSTMENTS

Tables 6-3 and 6-4 define the adjustments that may be necessary when a part is replaced for the 6640 and 6660 transports, respectively. The details are given in Paragraphs 6.5 and 6.6.

6.5 ELECTRICAL ADJUSTMENTS

In addition to the tools listed in Paragraph 6.7, the following equipment (or equivalent) will be required for electrical adjustments.

(1) Oscilloscope, Tektronix 561 (vertical and horizontal sensitivity specified to ±3 percent accuracy); a type 3A6 Dual Trace Amplifier is recommended for use with the Model 561 oscilloscope.

(2) Digital Volt Meter, Fairchild 7050 (±0.1 percent specified accuracy).

(3) Counter Timer, Monsanto Model 100B (±0.1 percent specified accuracy).

(4) Master Skew Tape, IBM No. 432640.

(5) Optical Encoder, 500-Line, PEC Part No. 512-1100.

6.5.1 ADJUSTMENT PHILOSOPHY

Acceptable limits are defined in each adjustment procedure, taking into consideration the assumed accuracy of the test equipment specified in Paragraph 6.5.

When the measured value of any parameter is within the specified acceptable limits NO ADJUSTMENTS should be made. Should

Table 6-3

6640 Part Replacement Adjustments

Part Replaced	Auxiliary Adjustments	Time Required (minutes)	Manual Paragraph Reference
Arm Actuator Motor	Down-Stop Limit Switch	15	6.6.4
Capstan	Capstan Height, Read Skew	10	6.6.14, 6.6.9
Capstan Motor	*Capstan Servo Offset, Tape Speed and Ramp Timing on Tape Control PCBA; Torsional Resonance Suppressor and Rewind Speed on Servo and Power Supply PCBA; and, Read Skew	40	6.5.4, 6.5.4, 6.5.5, 6.5.11, 6.5.7, 6.6.7
Control Switch	None	2	—
Data PCBA	*Tape Speed, Read Amplifier Gain, Write Deskew	20	6.5.6, 6.5.8, 6.6.7
Down-Stop Limit Switch	Switch Adjustment	15	6.6.4, 6.6.4.1
Head	Write Deskew, Read Skew, Read Amplifier Gain, Flux Gate	30	6.6.8, 6.6.7, 6.5.8, 6.6.12
Interlock Switch	Switch Adjustment	10	6.6.1
Photo-Tab Sensor	*EOT/BOT Potentiometers on Servo and Power Supply PCBA	10	6.6.10
Power Supply Assy	None	20	—
Reel Hub Assy	Reel Hub Assembly Height, Write Lockout Plunger	10	6.6.18, 6.6.19
Reel Motor Assy	*Belt Tension, Tension Arm Position Sensor	10	6.6.15, 6.6.6
Reel Motor Drive Belt	Belt Tension	5	6.6.15.1
Roller Guide Barrel Guide Bearing	Read Skew	10	6.6.16.1
Roller Guide Assy	Read Skew	60	6.6.16.2
Servo and Power Supply PCBA	*Torsional Resonance Suppressor, EOT/BOT Potentiometer, Rewind Speed, Capstan Servo Offset, Tension Arm Position Sensor		6.5.11, 6.5.3, 6.5.7, 6.5.4, 6.6.6
Tape Control PCBA	*Ramp Timing, Tape Speed, Tension Arm Position Sensor	20	6.5.5, 6.5.6, 6.6.6
Tape-In-Position (TIP) Sensor	None	10	6.6.11
Tension Arm Position Sensor	*Ramp Timing, Tape Speed, Tension Arm Position Sensor	20	6.5.5, 6.5.6, 6.6.6
Tension Arm Spring	Tape Tension	30	6.6.17
Up-Stop Limit Switch	Switch Adjustment	10	6.6.1, 6.6.3
Write Lockout Assy	Plunger Height	10	6.6.19

*The +5 and -5 regulator voltages must be checked prior to attempting any electrical adjustments.

Table 6-4
6660 Part Replacement Adjustments

Part Replaced	Auxiliary Adjustments	Time Required (minutes)	Manual Paragraph Reference
Arm Actuator Motor	Down-Stop Limit Switch	15	6.6.5
Capstan	Capstan Height, Read Skew	10	6.6.14, 6.6.9
Capstan Motor	*Capstan Servo Offset, Tape Speed and Ramp Timing on Tape Control PCBA; Torsional Resonance Suppressor and Rewind Speed on Servo and Power Supply PCBA; and, Read Skew	40	6.5.4, 6.5.6, 6.5.5, 6.5.11, 6.5.7, 6.6.7
Control Switch	None	2	—
Data PCBA	*Tape Speed, Read Amplifier Gain,	20	6.5.6, 6.5.8,
Down-Stop Limit Switch	Switch Adjustment	15	6.6.4, 6.6.4.1
Head	Read Skew, Read Amplifier Gain	30	6.6.7, 6.5.8
Interlock Switch	Switch Adjustment	10	6.6.1
Photo-Tab Sensor	*EOT/BOT Potentiometers on Servo and Power Supply PCBA	10	6.6.10
Power Supply Assy	None	20	—
Reel Hub Assy	Reel Hub Assembly Height, Write Lockout Plunger	10	6.6.18, 6.6.19
Reel Motor Assy	*Belt Tension, Tension Arm Position Sensor	10	6.6.15, 6.6.6
Reel Motor Drive Belt	Belt Tension	5	6.6.15.1
Roller Guide Barrel Guide Bearing	Read Skew	10	6.6.16.1
Roller Guide Assy	Read Skew	60	6.6.16.2
Servo and Power Supply PCBA	*Torsional Resonance Suppressor, EOT/BOT Potentiometer, Rewind Speed, Capstan Servo Offset, Tension Arm Position Sensor		6.5.11, 6.5.3, 6.5.7, 6.5.4, 6.6.6
Tape Control PCBA	*Ramp Timing, Tape Speed, Tension Arm Position Sensor	20	6.5.5, 6.5.6, 6.6.6
Tape-In-Position (TIP) Sensor	None	10	6.6.11
Tension Arm Position Sensor	*Ramp Timing, Tape Speed, Tension Arm Position Sensor	20	6.5.5, 6.5.6, 6.6.6
Tension Arm Spring	Tape Tension	30	6.6.17
Up-Stop Limit Switch	Switch Adjustment	10	6.6.1, 6.6.3
Write Lockout Assy	Plunger Height	10	6.6.19

*The +5 and -5 regulator voltages must be checked prior to attempting any electrical adjustments.

the measured value fall outside the specified acceptable limits, adjustments should be made in accordance with the relevant procedure.

NOTE

Some adjustments may require corresponding adjustments in other parameters. Ensure corresponding adjustments are made as specified in the individual procedures. The +5 and -5 regulator voltages must be checked prior to attempting any electrical adjustments.

When adjustments are made, the value set should be the exact value specified (to the best of the operator's ability).

CAUTION

PRIMARY POWER SHOULD BE REMOVED FROM THE TRANSPORT WHEN REAR ACCESS IS REQUIRED EXCEPT IN CASES OF ELECTRICAL TESTING AND ADJUSTMENTS.

6.5.2 +5V AND -5V REGULATORS

The +5v and -5v regulators are located on the Servo and Power Supply Board and are adjusted by means of variable resistors R16 and R17. The numerical value of the voltage difference, disregarding polarity, between the +5v and -5v lines must be less than 0.07v since tape speed is dependent upon these voltages.

6.5.2.1 Test Configuration

(1) Apply power to the transport.

(2) Load a reel of tape on the transport.

(3) Depress and release the LOAD control twice to establish interlock and tension the tape, and to advance the tape to the Load Point.

6.5.2.2 Test Procedure

(1) Using a Fairchild DVM Model 7050 (or equivalent) measure and note the voltage difference between TP2 (+5v) on the Tape Control PCBA, and TP18 (0v) on the Servo and Power Supply PCBA.

(2) Measure and note the voltage difference between TP11 (-5v) on the Tape Control PCBA, and TP18 (0v) on the Servo and Power Supply PCBA.

(3) Acceptable Limits

(a) +5v Regulator

- +4.85v minimum
- +5.15v maximum

(b) -5v Regulator

- -4.85v minimum
- -5.15v maximum

(4) Compare the voltages obtained in Steps (1) and (2). Voltages must fall within the acceptable limits and the absolute difference between the +5v and -5v lines must be less than 0.07v.

6.5.2.3 Adjustment Procedure

When the acceptable limits are exceeded or the voltage difference between the +5 and -5 voltages exceeds 0.07v, the following adjustments are performed.

(1) Adjust variable resistor R16 on the Servo and Power Supply PCBA to +5.0v as observed at TP2 on the Tape Control PCBA (using TP18 on the Servo and Power Supply as the 0v reference).

(2) Adjust variable resistor R17 on the Servo and Power Supply PCBA to -5.0v as observed at TP11 on the Tape Control PCBA (using TP18 on the Servo and Power Supply as the 0v reference).

(3) Verify that the voltage difference between TP2 and TP11 on the Tape Control PCBA falls within the acceptable limits and the absolute difference between the +5v and -5v lines is less than 0.07v.

6.5.2.4 Related Adjustments

The EOT/BOT Amplifier, Capstan Servo Offset, Ramp Timing, Tape Speed, Rewind Speed, and Read Amplifier Gain (Paragraphs 6.5.3 through 6.5.8.5) must be checked and adjusted if necessary subsequent to adjusting the +5v and -5v regulators.

6.5.3 EOT/BOT AMPLIFIER

The EOT/BOT Amplifier circuit is located on the Servo and Power Supply D PCBA (Schematic 101659 and Assembly 101660).

NOTE

The 5v regulators must be checked and adjusted if necessary prior to adjusting the EOT / BOT amplifier system.

6.5.3.1 Test Configuration

(1) Apply power to the transport.

(2) Load a reel of tape on the transport.

(3) Depress and release the LOAD control twice to establish interlocks and tension the tape, and to advance tape to the Load Point.

6.5.3.2 Test Procedure

(1) Advance tape until the reflective BOT tab is past the photosensor.

(2) Using a Fairchild DVM Model 7050 (or equivalent) measure and note the off-tab voltage between TP6 (NEOT) and TP18 (0v) on the Servo and Power Supply PCBA.

(3) Measure and note the off-tab voltage between TP4 (NBOT) and TP18 (0v) on the Servo and Power Supply PCBA.

(4) Acceptable Limits (off-tab)

- +3.80v minimum
- +4.20v maximum

(5) Compare the voltages obtained in Steps (2) and (3). Voltages must fall within the acceptable limits and the difference between TP6 (NEOT) and TP4 (NBOT) voltages must be less than than 0.10v.

(6) Position the tape so that the reflective BOT tab is located under the photosensor.

(7) Measure and note the on-tab voltage between TP4 (NBOT) and TP18 (0v) on the Servo and Power Supply PCBA.

(8) Advance tape until the EOT tab is positioned under the photosensor.

(9) Measure and note the on-tab voltage between TP6 (NEOT) and TP18 (0v) on the Servo and Power Supply PCBA.

(10) Acceptable Limits (on-tab)

- +2.80v maximum

6.5.3.3 Adjustment Procedure

When the acceptable limits are exceeded or the off-tab voltage difference compared in Paragraph 6.5.3.2, Step (5), is greater than 0.10v the following adjustments are performed.

(1) Position tape so that the EOT and BOT reflective tabs are clear of the photosensor area.

(2) Adjust variable resistor R53 on the Servo and Power Supply PCBA to +4.0v as observed at TP6 (NEOT).

(3) Adjust variable resistor R52 on the Servo and Power Supply PCBA to +4.0v as observed at TP4 (NBOT).

(4) Verify that the voltage at TP6 on the Servo and Power Supply PCBA is within 0.10v of the voltage at TP4. Repeat Steps (3) and (4) if necessary.

(5) Position tape so that the EOT reflective tab is located under the photosensor.

(6) Verify that the on-tab voltage at TP6 on the Servo and Power Supply PCBA meets the criterion established in Paragraph 6.5.3.2, Step (10).

(7) Depress and release the REWIND control. Tape will rewind to the BOT, enter a Load sequence, and stop.

(8) Verify that the on-tab voltage at TP4 on the Servo and Power Supply PCBA meets the criterion established in Paragraph 6.5.3.2, Step (10).

6.5.3.4 Related Adjustments

- None

6.5.4 CAPSTAN SERVO OFFSET

The Capstan Servo Offset potentiometer, R87, is located on the Servo and Power Supply PCBA and should be checked and adjusted prior to adjusting tape speed.

NOTE

The 5v regulators must be checked and adjusted if necessary prior to adjusting the Capstan Servo Offset potentiometer.

6.5.4.1 Test Configuration

(1) Apply power to the transport.

(2) Load a reel of tape on the transport.

(3) Depress and release the LOAD control twice to establish interlocks and tension tape, and to advance tape to Load Point.

6.5.4.2 Test Procedure

(1) Using a Fairchild DVM Model 7050 (or equivalent) measure the voltage between TP3 and TP21 of the Servo and Power Supply PCBA. Measured voltage is the voltage across the capstan motor.

(2) Acceptable Limits

- +0.1v maximum
- -0.1v minimum

6.5.4.3 Adjustment Procedure

When the acceptable limits are exceeded, perform the following adjustment.

(1) Establish test configuration described in Paragraph 6.5.4.1.

(2) Using a Fairchild DVM Model 7050 (or equivalent) measure the voltage between TP3 and TP21 on the Servo and Power Supply PCBA.

(3) Adjust variable resistor R87 to obtain 0v, nominal.

6.5.4.4 Related Adjustments

The Ramp Timing, Tape Speed, and Read Amplifier Gain must be checked and adjusted after adjustments are made to the Capstan Servo Offset.

6.5.5 RAMP TIMING

The four tape acceleration and deceleration ramps (Forward and Reverse, Start and Stop) are controlled by a single potentiometer adjustment located on the Tape Control PCBA.

The adjustment controls the Start/Stop time and its value is chosen to ensure that the correct Start/Stop distance is obtained.

NOTE

The 5v regulators must be checked and adjusted prior to adjusting the ramp timing.

6.5.5.1 Test Configuration

(1) Apply power to the transport.

(2) Load a reel of tape on the transport.

(3) Depress and release the LOAD control twice to establish interlocks and tension the tape, and to advance tape to the Load Point.

6.5.5.2 Test Procedure

(1) Connect a signal probe of a Tektronix Model 561 (or equivalent) oscilloscope to TP12 on the Tape Control PCBA.

(2) Connect the oscilloscope reference (ground) probe to TP16 (0v) on the Tape Control PCBA.

(3) Apply a 5Hz symmetrical square wave with a 3v amplitude (+3.0v to 0v) to the interface line ISFC (J101 pin C or TP7).

(4) Trigger the oscilloscope externally on the negative-going edge of the square wave input.

(5) Adjust the oscilloscope Vertical output control to display 0 to 100 percent of the ramp waveform over four large divisions of the oscilloscope graticule.

(6) Observe that the ramp adjustment time intersects 90 percent of the ramp amplitude (18 small divisions of oscilloscope graticule). Figure 6-1 illustrates ramp levels and timing.

(7) Acceptable Limits (90 percent of actual speed at 75 ips).

- 4.0 - 4.4 milliseconds.

(8) Remove the square wave input from J101 pin C (ISFC) and apply the square wave input to ISRC line (J101 pin E or TP5).

(9) With the oscilloscope connected as specified in Step (5) observe that the reverse ramp timing is within the limits specified in Step (7).

NOTE

For reverse operation the ramp is a negative-going waveform.

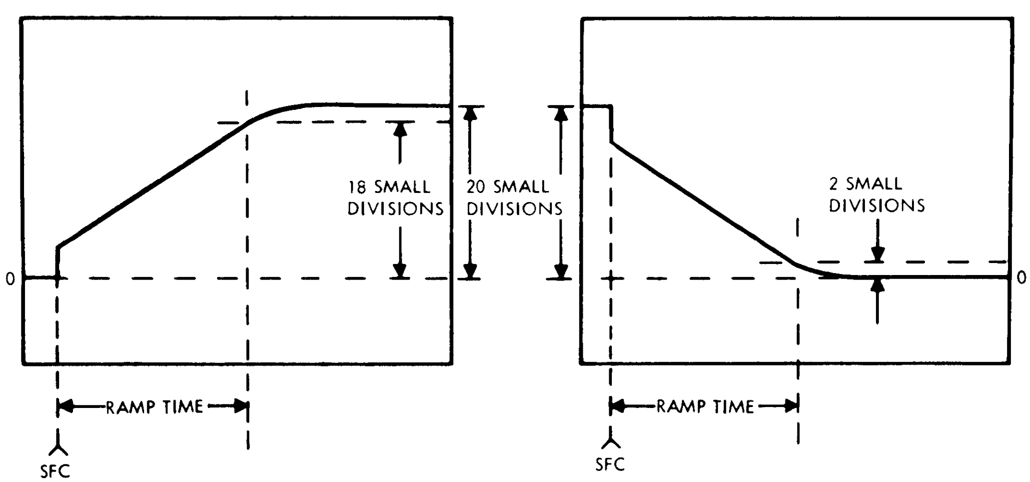


Figure 6-1. Ramp Levels and Timing

6.5.5.3 Adjustment Procedure

When the acceptable limits are exceeded the following adjustments are performed.

(1) Establish test configuration described in Paragraph 6.5.5.1.

(2) Perform test procedure described in Paragraph 6.5.5.2, Steps (1) through (5).

(3) Adjust variable resistor R916 on Tape Control PCBA to obtain ramp adjustment time of 4.2 milliseconds.

NOTE

Specified time results in oscilloscope display illustrated in Figure 6-1. The ramp adjustment time intersects 90 percent of ramp amplitude when accelerating and 10 percent of ramp amplitude when decelerating.

(4) Remove the square wave input from ISFC line (J101 pin C) and apply the square wave input to the interface line ISRC (J101 pin E or TP5).

(5) Observe oscilloscope display of the reverse ramp. The ramp time should be as specified in Paragraph 6.5.5.2, Step (7).

6.5.5.4 Related Adjustments

- None

6.5.6 TAPE SPEED

In the Synchronous mode, only the forward speed is adjustable. The Synchronous Reverse function utilizes the same voltage reference as Synchronous Forward and is not independently adjustable. It is mandatory that the 5v regulators be checked and adjusted prior to adjusting tape speed.

Tape speeds are checked and adjusted utilizing a 500-line optical encoder and a frequency counter, or by utilizing a 60 Hz fluorescent light source and a strobe disc which is mounted on the face of the capstan.

6.5.6.1 Test Configuration — Optical Encoder Method

(1) Apply power to the transport.

(2) Load a reel of tape.

(3) Depress and release the LOAD control twice to establish interlocks and tension the tape, and to advance the tape to the Load Point.

(4) Couple an Optical Encoder PEC Part No. 512-1100 to the front of the capstan. Five volts dc must be applied to the Optical Encoder lamp input (pins 1 and 2). This voltage can be obtained between TP11 (-5v) and TP1 (0v) on the Tape Control PCBA.

6.5.6.2 Test Configuration - Strobe Disk Method

(1) Apply power to the transport.

(2) Load a reel of tape.

(3) Depress and release the LOAD control twice to establish interlocks and tension the tape, and to advance the tape to the Load Point.

(4) Illuminate the strobe disk located on the front of the capstan with a 60 Hz fluorescent light source.

6.5.6.3 Test Procedure – Optical Encoder Method

(1) Connect input probes of Counter Timer Monsanto Model 100B (or equivalent) to pins 6 and 7 of the Optical Encoder.

(2) Depress and release the FORWARD control. Tape will move in the forward direction.

(3) Adjust the sample interval of the counter timer to monitor the encoder output over a one-second interval.

(4) Acceptable Limits

- 6030 Hz maximum
- 5910 Hz minimum

(5) Depress and release the REVERSE control. Tape will move in the reverse direction.

(6) With the counter timer connected as specified in Step (1) monitor the output of the optical encoder.

(7) Acceptable Limits

- 6140 Hz maximum
- 5800 Hz minimum

6.5.6.4 Test Procedure – Strobe Disk Method

(1) Establish test configuration described in Paragraph 6.5.6.2.

(2) Depress and release the FORWARD control. Tape will move in the forward direction.

(3) Observe the strobe disk image. The image should appear to be stationary.

6.5.6.5 Adjustment Procedure — Optical Encoder Method

When the forward or reverse tape speed exceeds the specified limits the following adjustments are performed.

(1) Establish the test configuration described in Paragraph 6.5.6.1.

(2) Perform the test procedure described in Paragraph 6.5.6.3, Steps (1) through (3).

(3) Depress and release the FORWARD control. Tape will move in the forward direction.

(4) Adjust the variable resistor R931 on the Tape Control PCBA for 5970 Hz counter timer value.

(5) Monitor the counter timer to ensure that the reverse speed is within the acceptable limits established in Paragraph 6.5.6.3, Step (7). Repeat Steps (2) through (5) as necessary.

6.5.6.6 Adjustment Procedure — Strobe Disk Method

(1) Establish the test configuration described in Paragraph 6.5.6.2.

(2) Depress and release the FORWARD control. Tape will move in the forward direction.

(3) Adjust variable resistor R931 on the Tape Control PCBA until the strobe disk image appears to be stationary.

6.5.6.7 Related Adjustments

The Read Amplifier Gain must be checked and adjusted after adjustments are made to the Tape Speed.

6.5.7. REWIND SPEED

The tape Rewind Speed must be checked and adjusted after adjustments are made to the 5v regulators. The rewind speed should be within the following limits.

- 135 ips minimum
- 165 ips maximum

6.5.7.1 Test Configuration — Optical Encoder Method

(1) Apply power to the transport.

(2) Load a reel of tape.

(3) Depress and release the LOAD control twice to establish interlocks and tension the tape, and to advance the tape to the Load Point.

(4) Couple an Optical Encoder PEC Part No. 512-1100 to the front of the capstan. Five volts dc must be applied to the Optical Encoder lamp input (pins 1 and 2). This voltage can be obtained between TP11 (-5v) and TP1 (0v) on the Tape Control PCBA.

6.5.7.2 Test Configuration — Strobe Disk Method

(1) Apply power to the transport.

(2) Load a reel of tape.

(3) Depress and release the LOAD control twice to establish interlocks and tension the tape, and to advance the tape to the Load Point.

(4) Illuminate the strobe disk located on the front of the capstan with a 60 Hz fluorescent light source.

6.5.7.3 Test Procedure — Optical Encoder Method

(1) Connect input probes of Counter Timer Monsanto Model 1100B (or equivalent) to pins 6 and 7 of the optical encoder.

(2) With a full reel of tape on the take-up reel, depress and release the REWIND control.

(3) Adjust the sample interval of the counter timer to monitor the encoder output over a one-second interval.

(4) Acceptable Limits

- 13,140 Hz maximum
- 10,750 Hz minimum

6.5.7.4 Test Procedure — Strobe Disk Method

(1) With a full reel of tape on the take-up reel, depress and release the REWIND control.

(2) Observe the strobe disk image. The image should appear to be stationary.

6.5.7.5 Adjustment Procedure — Optical Encoder Method

(1) Establish the test configuration described in Paragraph 6.5.7.1.

(2) Perform the test procedure described in Paragraph 6.5.7.3, Steps (1) through (3).

(3) Adjust the variable resistor R86 on the Servo and Power Supply to obtain a counter timer value of

- 11,940 Hz

This corresponds to 150 ips rewind speed.

6.5.7.6 Adjustment Procedure — Strobe Disk Method

(1) Establish the test configuration described in Paragraph 6.5.7.2.

(2) With a full reel of tape on the take-up reel, depress and release the REWIND control.

(3) Adjust the variable resistor R86 on the Servo and Power Supply until the strobe disk image appears stationary.

6.5.7.7 Related Adjustments

- None

6.5.8 READ AMPLIFIER GAIN

The gain of each of the read amplifiers, located on the Data PCBA, is independently adjustable.

Read amplifier gain may be determined by reading (in the Read Only mode) an all-ones or all-zeros tape (3200 frpi) which was recorded on the transport. Paragraph 6.5.8.4 details a method for generating an all-ones tape. A quality tape, such as 3M 777 should be used for this purpose.

NOTE

The read amplifier gain must be checked and adjusted after adjustment is made to the 5v regulators or synchronous tape speed.

6.5.8.1 Test Configuration

(1) Clean the head assembly and tape path as described in Paragraph 6.3.1.

(2) Apply power to the transport.

(3) Load a pre-recorded all-ones or all-zeros tape.

(4) Depress and release the LOAD control twice to establish interlocks and tension the tape, and to advance tape to Load Point.

6.5.8.2 Test Procedure

(1) Depress and release the FORWARD control. Tape will move forward.

(2) Using the signal probe of a Tektronix 561 oscilloscope (or equivalent) measure and record the peak-to-peak amplitude of the read amplifier waveforms viewed at the output of each differentiator (TP104 through TP904) on the Data PCBA.

NOTE

Oscilloscope vertical sensitivity should be set to display 1v per division.

(3) Acceptable limits (peak-to-peak when using an all-ones or all-zeros tape generated on the transport).

- 6.5v maximum
- 5.5v minimum

6.5.8.3 Adjustment Procedure

When the acceptable limits are exceeded the following adjustments are performed.

(1) Establish test configuration described in Paragraph 6.5.8.1.

(2) Depress and release the FORWARD control.

(3) Using the signal probe of a Tektronix 561 oscilloscope (or equivalent) observe TP104 through TP904 on the Data PCBA. Adjust variable resistors R117 through R917 associated with test points to 6.0v peak-to-peak.

6.5.8.4 Generation of an All-Ones or All-Zeros Tape

An all-ones or all-zeros tape may be generated as follows.

(1) Ensure that head assembly and tape path are clean.

(2) Load a good quality work tape.

(3) Bring tape to Load Point.

(4) Apply a ground to the interface line ISWS (J101 pin K).

(5) Apply a ground to the interface line ISFC (J101 pin C).

(6) Apply a 0 to +3v square wave signal to the interface lines WDP - WD7 on J102 pins L, M, N, P, R, S, T, U, and V to establish frequency f1 which is: f1 = 1600 × tape speed.

(7) Apply to interface line IWDS on J102 pin A, negative-going pulses (+3v to 0v) of 1 μsecond duration to establish f2 which is defined as: f2 = 3200 × tape speed. Two negative-going pulses must occur during the f1 time interval.

(8) Maintain the transport in this record mode for approximately 3 minutes.

(9) Remove the signal source from the interface line IWDS (J102 pin A).

(10) Remove the ground from the interface line ISWS and ISFC (J101 pin K and J101 pin C, respectively).

(11) Remove the signal connected to the interface in Step (6).

(12) Depress and release the REWIND control. Tape will rewind to the Load Point and stop.

In considering the overall gain of the read system it is important to note that the output of the read head is particularly dependent upon the type of magnetic tape used and the condition of the tape, i.e., new or used.

The read amplifier output should be adjusted as detailed in Paragraph 6.5.8.3, Step (3). A read amplifier whose gain is adjusted too high will result in amplifier saturation; gain which is set too low will increase the susceptibility to data errors due to dropouts.

6.5.8.5 Related Adjustments

The Read Skew must be checked and adjusted if necessary after adjustment is made to the Read Amplifier Gain.

6.5.9 THRESHOLD GENERATOR (6640)

The output voltage of the threshold generator can be checked at TP6 on the Data F PCBA in the different modes of operation. The following values are included as a check only; no adjustment procedure is applicable. If the listed limits are exceeded, this is indicative of a fault in the threshold circuitry.

(1) Write Mode

- +8.65v maximum
- +8.15v minimum

(2) Read Mode

(a) IRTH2 False

- +2.65v maximum
- +2.15v minimum

(b) IRTH2 True

- +1.45v maximum
- +0.95v minimum

6.5.10 THRESHOLD GENERATOR (6660)

The output voltage of the threshold generator can be checked at TP6 on the Data G PCBA in the different modes of operation. The following values are included as a check only; no adjustment procedure is applicable. If the listed limits are exceeded, this is indicative of a fault in the threshold circuitry.

(1) Write Mode. IRTH1 is used in the true condition when performing a read check immediately after writing data.

- +8.65v maximum
- +8.15v minimum

(2) Read Mode (IRTH1 must be false)

(a) IRTH2 False

- +2.65v maximum
- +2.15v minimum

(b) IRTH2 True

- +1.45v maximum
- +0.95v minimum

6.5.11 TORSIONAL RESONANCE SUPPRESSOR

A variable inductor is installed in the capstan motor servo system to minimize the effect of mechanical resonances. The inductor, L1, located near the top of the Servo and Power Supply PCBA, is adjusted as follows.

(1) Apply power to the transport.

(2) Load a reel of tape on the transport.

(3) Depress and release the LOAD control twice to establish interlocks and bring the tape to Load Point.

(4) Set the vertical sensitivity on the oscilloscope to 0.1v per cm and the input selector to ac.

(5) Attach the signal probe of the oscilloscope to the tachometer output TP1 (or TP2 depending on the motor used) and TP20 (0v) on the Servo and Power Supply PCBA.

(6) Cause the tape to shuttle by alternately depressing and releasing the FORWARD and REVERSE controls.

(7) Observe the amplitude of the tachometer oscillations and adjust inductor L1 on the Servo and Power Supply PCBA for minimum amplitude.

6.6 MECHANICAL ADJUSTMENTS

6.6.1 TENSION ARM LIMIT SWITCHES

There are three limit switches employed with each tension arm.

(1) Tension arm interlock switch.

(2) Up-Stop limit switch.

(3) Down-Stop limit switch.

When adjusting these limit switches, it will be necessary to move the tension arms up or down from time to time. This can be accomplished as follows.

(1) Down. The arms can be rotated down (retracted) by either of two methods. The arms can be lowered by pushing on the roller guides, or they can be electrically retracted as follows.

CAUTION

NEVER EXERT MORE THAN 3 POUNDS OF PRESSURE ON A TENSION ARM ROLLER IN ATTEMPTING TO MOVE A TENSION ARM. DAMAGE TO THE ARM ACTUATOR GEAR MOTOR OR TO THE ROLLER GUIDE SHAFT MAY RESULT.

(a) Remove both tape reels.

(b) Block the light path to the Tape In Path (TIP) sensor.

(c) Depress and release the LOAD control.

(d) Remove power from the transport.

(2) Up. The arms can be raised (extended) only be applying power to the transport. If the arms are in the down position, open the light path to the TIP sensor and depress and release the POWER control. The arms will begin to rise. When the desired position is reached, remove power.

6.6.2 TENSION ARM INTERLOCK SWITCH

6.6.2.1 Test Procedure

The tension arm interlock switches are located on the tension sensor bearing housing. To check for proper adjustment the following procedure is performed.

(1) Remove both tape reels and retract both tension arms as described in Paragraph 6.6.1.

(2) Remove power from the transport.

(3) Remove connector P19 (supply reel) and P30 (take-up reel) from the Servo and Power Supply PCBA.

(4) Monitor the switch contact closure of the interlock switch. The contacts should be open when the arm is fully retracted (down).

(5) Manually rotate the tension arms and observe that switch closures occur when an imaginary line through the center of both rollers is within 0.2 inch of the triple dot indicators. These indicators are located between the rollers on the overlay.

6.6.2.2 Adjustment Procedure

If the position of the arm at switch closure is not correct, the following adjustment is performed.

(1) Assure that the switch roller utilizes the cam lobe marked MHP during normal arm rotation as illustrated in Figure 6-2 (Section A-A).

(2) Loosen the cam retaining set-screw.

(3) Rotate the cam on its shaft until the limit switch roller is in the correct position.

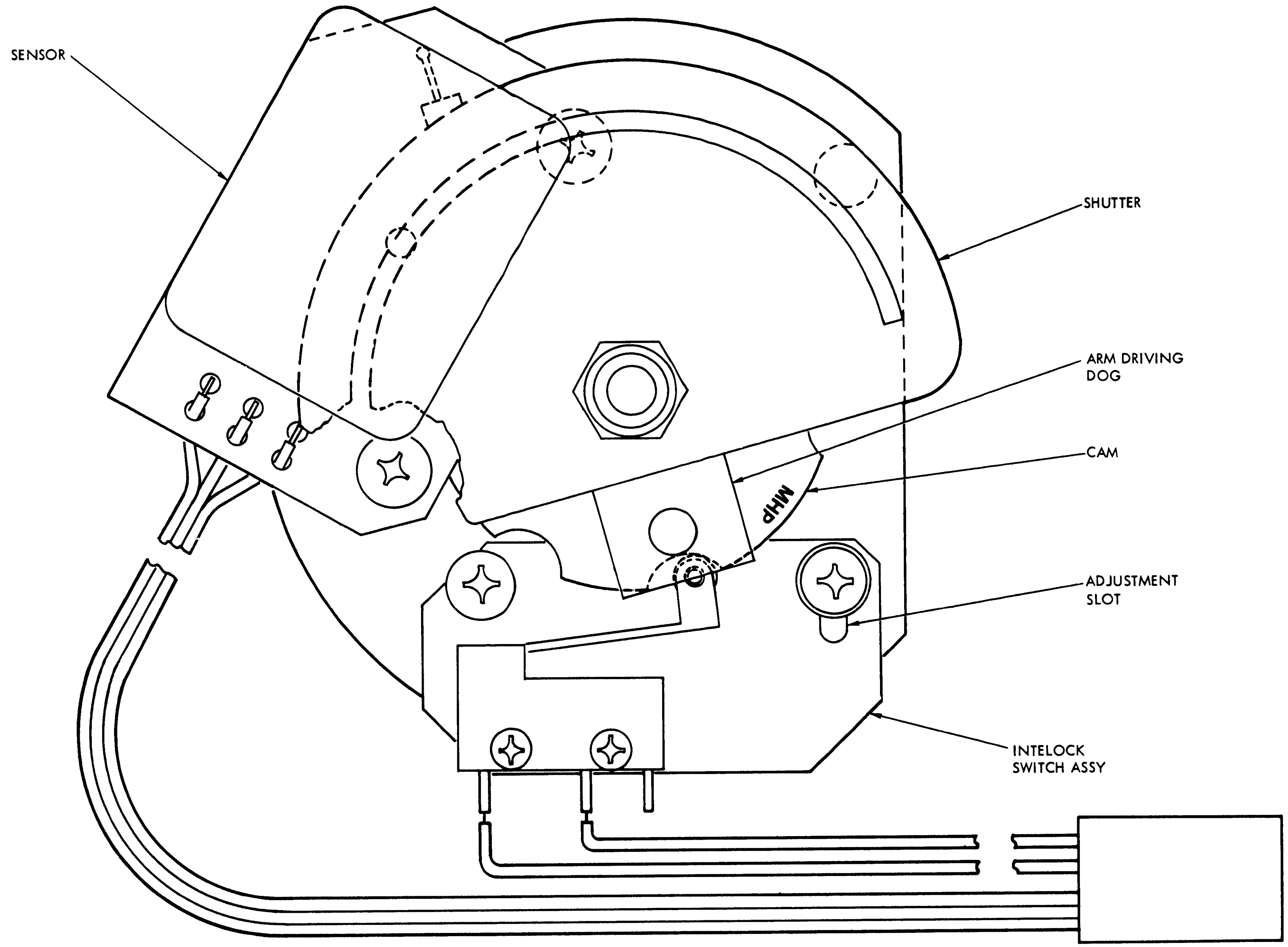
(4) Firmly tighten the cam retaining set-screw.

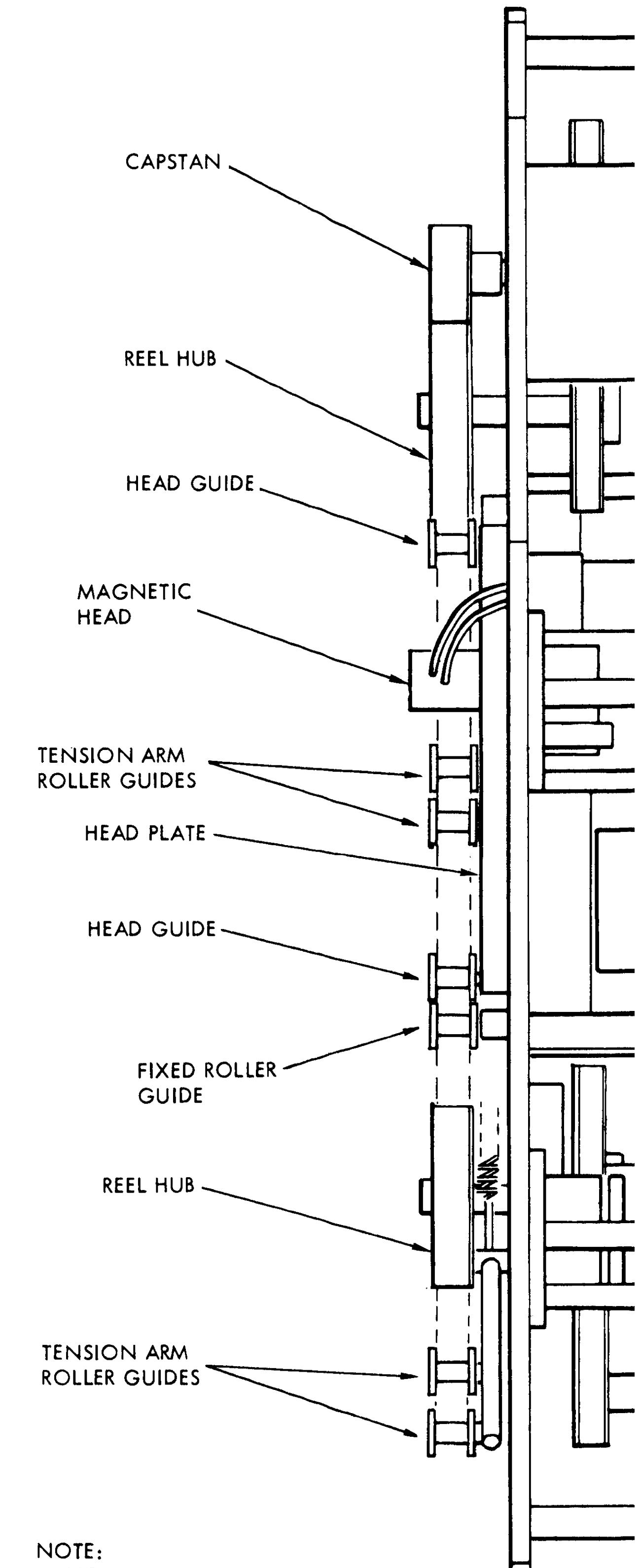
CAUTION

THE CAM RETAINING SET-SCREW MUST BE TIGHTENED SUFFICIENTLY TO PREVENT ROTATION OF THE CAM WHEN THE TENSION ARM IMPACTS ON ITS BACKSTOP.

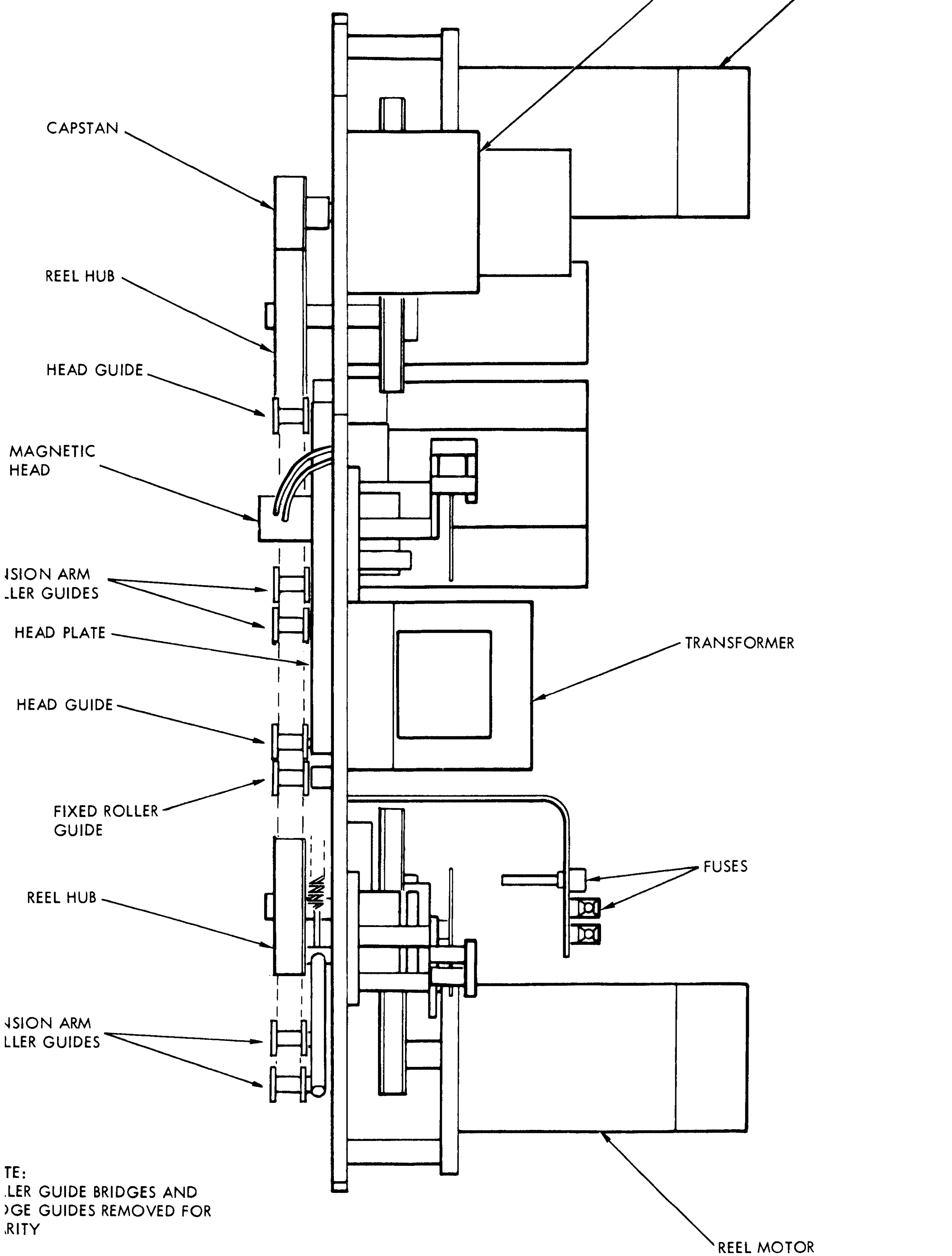
The limit switch plate (refer to Figure 6-2, view A-A) is slotted at one mounting screw and may be rotated about the second screw to facilitate setting the switching point of the limit switch. The plate should be rotated to a position where the limit switch trips with its roller one-half of the distance up the slope from its rest position. The switch should be closed when the roller moves on the cam lobe between the semi-circular cutouts. The slotted switch plate can provide adequate adjustment range in most situations. However, if more adjustment should be needed, the switch itself can be rotated with respect to the plate by loosening the screws which hold the switch to the plate and rotating the switch.

A-A





NOTE:
ROLLER GUIDE BRIDGES AND BRIDGE GUIDES REMOVED FOR CLARITY



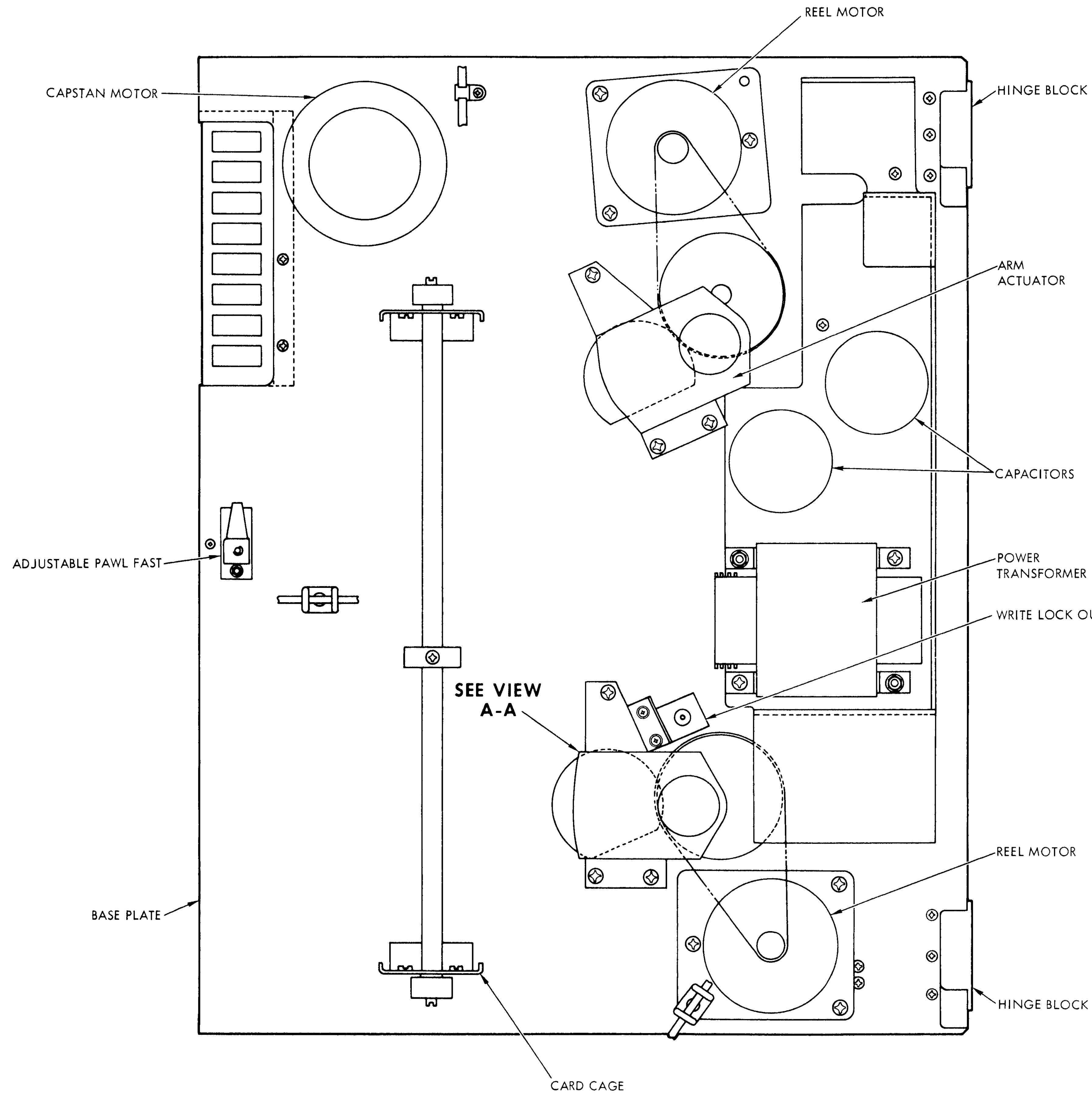


Figure 6.2 Tape Deck Diagram
(Rear View)

6.6.2.3 Replacement Procedure

Replacement of the interlock limit switch is accomplished as follows.

(1) Remove power from the transport.

(2) Remove the two mounting screws which secure the limit switch plate to the bearing housing.

(3) Remove the switch plate assembly and unsolder the leads.

(4) Remove the old switch and install the new one. Ensure that the switch is centered within its adjustment range. (The rear edge of the switch will be parallel to the plate when the switch is centered.)

(5) Resolder the leads to the new switch and install the switch plate assembly.

(6) Perform the relevant adjustment procedure.

6.6.3 UP-STOP LIMIT SWITCH

Each tension arm is provided with an Up-Stop limit switch. The switches are mounted on the tape deck and are accessible from the rear. The Up-Stop limit switch serves to turn off the arm actuator motor driver when the arm reaches the Load position.

6.6.3.1 Adjustment Procedure

The Up-Stop limit switch should be adjusted so that the contacts close approximately 1/8-inch before the switch roller reaches the center (highest point) of the tension arm. Adjustment is accomplished by loosening the switch mounting screws and rotating the switch to the desired position, then retightening the mounting screws.

6.6.3.2 Replacement Procedure

Replacement of the Up-Stop limit switch is accomplished as follows.

(1) Remove power from the transport.

(2) Remove the Up-Stop limit switch connector (P18 or P29) from the Servo and Power Supply PCBA.

(3) Remove the Up-Stop switch assembly from the transport plate and unsolder the leads.

(4) Remove and replace the limit switch taking care to re-tighten the switch near the center of its adjustment region.

(5) Solder the leads to the new switch and reinstall the assembly.

(6) Check that the switch contacts close approximately 1/8-inch before the switch roller reaches the highest point of the tension arm. Readjust if necessary.

(7) Reinstall connector P18 or P29.

6.6.4 DOWN-STOP LIMIT SWITCH

A Down-Stop limit switch is attached to each arm actuator motor mounting plate. This switch is used to indicate to the relevant logic that the arm actuator is fully retracted.

6.6.4.1 Adjustment Procedure

The Down-Stop limit switch should be adjusted so that when the actuator is retracting, the switch contacts close when the switch roller is approximately half-way up the semi-circular cam lobe. Adjustment can be accomplished by removing the assembly from the transport, removing the clutch and motor from the assembly, then loosening the standoff screws and rotating the switch.

CAUTION

DO NOT ATTEMPT TO REMOVE OR INSTALL THE ARM ACTUATOR ASSEMBLY WITH THE TENSION ARMS IN ANY POSITION EXCEPT THE FULLY RETRACTED DOWN POSITION. DAMAGE TO THE ACTUATOR MOTOR OR TO THE TENSION ARM COULD RESULT.

6.6.4.2 Replacement Procedure

Replacement of the Down-Stop limit switch can be accomplished as follows.

(1) Remove both tape reels and retract both tension arms as described in Paragraph 6.6.1.

(2) Remove power from the transport.

(3) Remove the arm actuator connector P16 (take-up reel) or P20 (supply reel) from the Servo and Power Supply PCBA.

(4) Remove the arm actuator assembly from the transport.

(5) Unsolder the leads and remove the old switch.

(6) Install the new switch and resolder the leads.

(7) Loosen the set-screw which holds the clutch assembly to the motor shaft and rotate the clutch to check switch adjustment. Retighten the set-screw.

(8) If adjustment is required, remove the motor and adjust the switch.

(9) Reinstall the motor and clutch assembly onto the motor mounting plate. Rotate the actuator assembly to the fully retracted position then reinstall the assembly.

(10) Reinstall P16 or P20 on the Servo and Power Supply PCBA.

6.6.5 ARM ACTUATOR MOTOR

No adjustment is required for the arm actuator gear motor. When replacing the motor, however, the Down-Stop limit switch may require adjustment as described in Paragraph 6.6.4.

6.6.5.1 Gear Motor Replacement

Replacement of the gear motor is accomplished as follows.

(1) Remove both tape reels and retract both tension arms as described in Paragraph 6.6.1.

(2) Remove power from the transport.

(3) Remove the arm actuator connector P16 (take-up) or P20 (supply) from the Servo and Power Supply PCBA.

(4) Remove the arm actuator assembly from the transport.

(5) Remove the clutch, then the motor leads and the motor.

NOTE

When replacing the motor note that the red motor lead connects to the positive (+) terminal.

(6) Install the replacement motor and check the down-stop limit switch adjustment before tightening the clutch mounting set-screw.

(7) Tighten the clutch mounting set-screw. The motor shaft may require rotation in order to align the flat on the motor

shaft with the set-screw. It may be necessary to apply 5v to 12v dc to the motor terminals to accomplish this.

CAUTION

DO NOT ATTEMPT TO TURN THE MOTOR SHAFT BY HAND AS DAMAGE TO THE GEAR DRIVE COULD RESULT.

(8) Attach the motor leads, fully retract the actuator, then reinstall the actuator assembly.

(9) Reinstall P16 or P20 on the Servo and Power Supply PCBA.

6.6.5.2 Slip Clutch Adjustment

Slip clutches are provided at each arm actuator to protect the motor gear box. The clutch adjustment is accomplished as follows.

CAUTION

NEVER APPLY MORE THAN 3 POUNDS OF PRESSURE ON A TENSION ARM ROLLER IN ATTEMPTING TO MOVE A TENSION ARM. DAMAGE TO THE ARM ACTUATOR GEAR MOTOR OR TO THE ROLLER GUIDE SHAFT MAY RESULT.

(1) Retract the arm to the center position and remove power.

(2) Apply a force gauge to the base of the outside tape guide at 90 degrees to the tension arm and apply pressure until the clutch begins to slip. Note this value. The clutch should be adjusted to slip between 1-1/2 and 2 pounds.

(3) If the reading is other than 1-1/2 to 2 pounds, adjust the set-screw on the slip clutch (larger of two set-screws on the actuator assembly) until a proper reading is obtained.

NOTE

Turning the set-screw clockwise will increase the slipping force and counter-clockwise will reduce the force.

6.6.6 TENSION ARM POSITION SENSOR

There are two tension arm position sensors: one on the take-up tension arm, the second on the supply arm. The sensor outputs are connected to the reel servo amplifier inputs on the Servo and Power Supply PCBA.

NOTE

Ensure that the 5v Regulators, Ramp Timing, and Tape Speed are correct as detailed in Paragraphs 6.5.2, 6.5.5, and 6.5.6, respectively, before adjusting the tension arm position sensors.

6.6.6.1 Preliminary Adjustment

The tension arm position sensors on the supply reel and take-up reel are initially adjusted as follows.

(1) Remove both tape reels and retract both arms as described in Paragraph 6.6.1.

(2) Remove power from the transport.

(3) Remove arm actuator assemblies.

(4) Loosen the No. 10 nut that attaches the optical shutter. Ensure that there is sufficient friction to prevent the setting from changing when the nut is tightened.

(5) Apply power to the transport and block the light path to the TIP sensor. Depress and release the LOAD control. The reel motors will rotate.

(6) To place the shutters in approximately the correct position, rotate each shutter until moving the tension arm to the middle of its range (single dot mark on the overlay) stops reel motion. Tighten the No. 10 retaining nut taking care not to disturb the shutter setting.

(7) After mechanically positioning the shutter, finer adjustments are made electrically with the appropriate potentiometer as outlined in Paragraphs 6.6.6.2 and 6.6.6.3.

(8) Remove power from the transport.

(9) Reinstall the arm actuators and open the light path to the TIP sensor. Load tape on the transport.

(10) Establish an environment which ensures that the tension arm sensors are shielded from high ambient light. Failure to do so might result in a shift in the arm operating region when the unit is rack-mounted.

6.6.6.2 Take-up Arm Adjustment

When the preliminary adjustments are completed, proceed as follows.

(1) Ensure that the take-up reel is nearly empty.

(2) Alternately depress and release the FORWARD and REVERSE controls to cause tape to "shuttle" back and forth.

(3) If Step (2) causes loss of tape tension because the supply arm exceeds its operating range, re-tension tape by depressing LOAD. Adjust R155 on the Servo and Power Supply PCBA five turns CCW so as to reduce the total supply arm movement. Repeat this step as required.

(4) Adjust variable resistor R155 on the Servo and Power Supply PCBA until the extreme arm movement is equal to the distance between the double dot marks on the overlay.

NOTE

The actual arc of the movement may not coincide with that specified because the shutter may not yet be perfectly centered.

(5) Readjust the shutter position (using R150) so that the arc of the arm movement and the marks coincide.

(6) The arm position during Forward and Reverse motion should be such that at the extreme of travel the tension arm remains directly beneath the double dot indicators on the overlay within ±0.2 inch.

6.6.6.3 Supply Arm Adjustment

When the preliminary adjustments are completed, proceed as follows.

(1) Ensure that the supply reel is nearly empty.

(2) Alternately depress and release the FORWARD and REVERSE controls to cause tape to "shuttle" back and forth.

(3) If Step (2) causes loss of tape tension because the supply arm exceeds its operating range, re-tension tape by depressing LOAD. Adjust R155 on the Servo and Power Supply PCBA five turns CCW so as to reduce the total supply arm movement. Repeat this step as required.

(4) Adjust variable resistor R158 on the Servo and Power Supply PCBA until the extreme arm movement is equal to the distance between the double dot marks on the overlay.

NOTE

The actual arc of the movement may not coincide with that specified because the shutter may not yet be perfectly centered.

(5) Readjust the shutter position (by using R151) so that the arc of the arm movement and the marks coincide.

(6) The arm position during Forward and Reverse motion should be such that at the extreme of travel the tension arm remains directly beneath the double dot indicators on the overlay within ±0.2 inch.

6.6.6.4 Tension Arm Sensor Replacement

The tension arm optical sensors are replaced as follows.

(1) Remove both tape reels and retract both arms as described in Paragraph 6.6.1.

(2) Remove power from the transport and remove the appropriate arm actuator assembly.

(3) Remove the connector (P19 or P30) from the Servo and Power Supply PCBA and remove pins 1, 2, and 3.

(4) Loosen the No. 10 retaining nut which secures the optical shutter to the tension arm shaft.

(5) Rotate the shutter to clear the right-hand countersunk screw which retains the tension arm sensor printed circuit board to the standoffs.

(6) Remove the right-hand screw, then manually rotate the tension arm to gain access to the left-hand screw.

(7) Remove the left-hand mounting screw and remove the sensor assembly.

(8) Mount the replacement assembly in the (reverse) order above.

NOTE

Check for correct installation of the shutter. The assembly mark (F6) should be facing the deck (not visible) when the shutter is properly installed.

(9) Partially tighten the shutter in place.

(10) Insert the pins of the new sensor leads into the connector (P19 or P30) as follows.

(a) Brown wire - Pin 1

(b) Red wire - Pin 2

(c) Orange wire - Pin 3

(11) Plug the connector (P19 or P30) into the Servo and Power Supply PCBA.

(12) Perform the relevant adjustment procedure (see Paragraphs 6.6.6.1 and 6.6.6.2 or 6.6.6.3).

6.6.7 SKEW MEASUREMENT AND ADJUSTMENT (6640)

Transport skew is adjusted by first checking and, if necessary, adjusting write skew, then checking the read skew. The requirements on PE read skew are not severe since the system uses a multiple buffer register per channel for read data recovery.

6.6.7.1 Write Skew Measurement

An indication of the write skew may be obtained by observing the algebraic sum of the peak detectors at TP10 on the Data F PCBA with the write head connector plugged into the read head receptacle (J2) on the Data F PCBA.

Figure 6-3 illustrates an example of correctly adjusted skew; Figure 6-4 is an example of poorly adjusted skew. This method of determining the system write skew is accomplished as follows.

(1) Disconnect the write head and read head connectors from J1 and J2, respectively, on the Data F PCBA.

(2) Plug the write head connector into the read head connector (J2) on the Data F PCBA.

(3) Set the vertical sensitivity on the oscilloscope to 1.0 volt per cm.

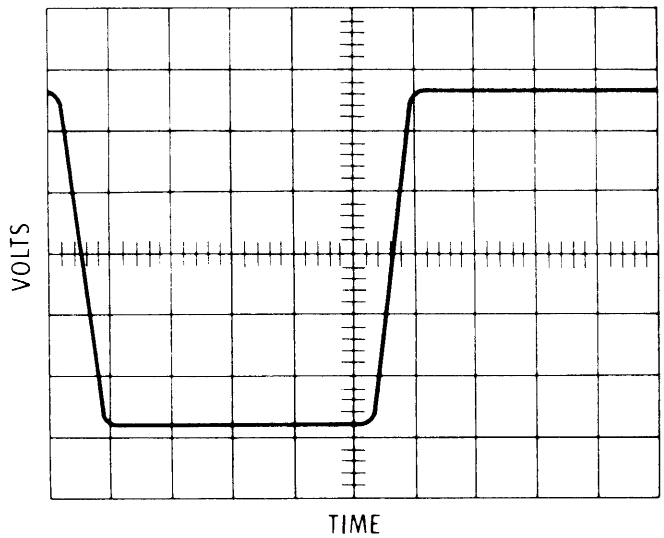


Figure 6-3. Skew Waveform (Good)

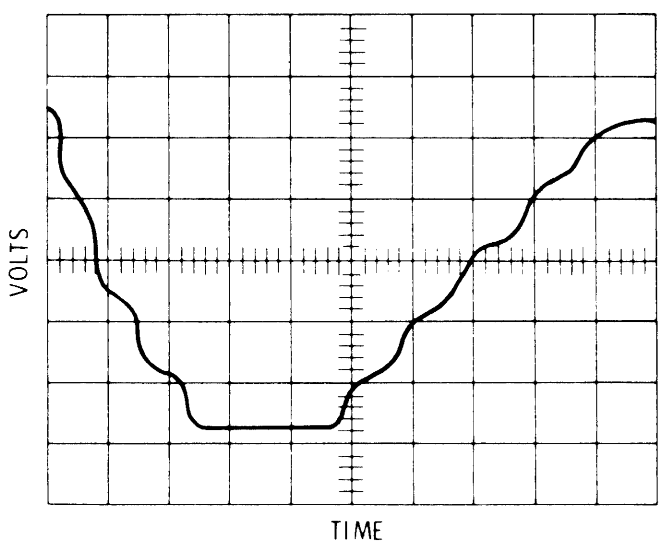


Figure 6-4. Skew Waveform (Poor)

(4) Set the oscilloscope to trigger on Channel 1 negative slope, alternate mode.

(5) Load an 800-cpi master tape on the transport, bring to BOT and activate the FORWARD control.

(6) Observe oscilloscope waveform and adjust the horizontal time/division fixed and variable controls to display one complete cycle.

NOTE

With an 800 cpi tape, each cycle represents 1250 μinches. The scope graticule is divided into 10 major divisions, each of which is divided into 5 divisions; therefore

$$\frac{1250\ \mu\text{inch}}{50\ \text{divisions}} = 25\ \mu\text{inch/division}$$

(7) Observe that the fall time of the waveform viewed at TP10 is less than eight small divisions of the oscilloscope graticule, i.e., 200 μinches. This measurement should be taken between the 95- and 5-percent points of the waveform.

(8) Disconnect the write head connector from the read head receptacle (J2). Connect the write and read head connectors to J1 and J2 respectively on the Data PCBA.

6.6.7.2 Write Skew Adjustment

To reduce skew to within acceptable limits the following procedure is followed.

(1) Perform skew measurement procedure described in Paragraph 6.6.7.1 Steps (1) through (5).

(2) While observing the waveform at TP10 on the Data PCBA with the tape moving in the forward direction, ease the edge of the tape off the head guide cap toward the spring-loaded washer. This should be done on first one guide, then the other.

NOTE

Moving the tape one to two-thousandths of an inch from one of the guides will reduce the skew to within the specified range.

(3) Observe the waveform and determine which movement (upper guide or lower guide) improves the display. If moving the tape off the upper guide improved the display, the lower guide should be shimmed.

NOTE

The shims are burr-free, etched, one-half of a thousandths inch thick berrylium copper.

(4) Observe and note the fall time of the waveform observed at TP10 with the oscilloscope set up as described in Paragraph 6.6.7.1 (Step 4).

(5) Since the character spacing at 800 cpi is 1250 μinches, the actual skew can be calculated. The skew correction provided by the addition of one shim (each shim is 500 μinches thick) is $\frac{500}{12}$ = 42 μinches. The number of shims used must satisfy the following.

(a) Skew must be reduced to a minimum consistent with the maximum number of shims allowable.

(b) The maximum number of shims used must not exceed four.

Therefore, if, for example, the measured skew is 250 μinches, four shims will yield a skew correction of 168μinches (i.e., $4 \times \frac{500}{12} = 168$ μinches). This satisfies the requirements listed in (a) and (b).

(6) Depress and release the FORWARD control. Tape motion will cease.

(7) Remove the head guide retaining scew (accessible from the rear of the deck) and remove the guide.

NOTE

When removing the guide care should be taken not to drop the spring and washer.

(8) Insert the required number of shims and replace the head guides.

NOTE

Shim only one head guide.

(9) Recheck skew measurement as described in Paragraph 6.6.7.1, Steps (1) through (6).

6.6.7.3 <u>Read Skew Measurement</u>

Measurement of read skew is accomplished by reading an all-ones or all zeros tape with the read head connector plugged into the read head receptacle (J2) on the Data PCBA. This measurement is accomplished as follows.

(1) Set the vertical sensitivity of a Tektronix 561 oscilloscope (or equivalent) to 1.0 volt per cm.

(2) Set the oscilloscope to trigger on Channel 1, negative slope, alternate mode.

(3) Load an 800-cpi master tape on the transport, bring to BOT.

(4) Depress and release the FORWARD control.

(5) Observe oscilloscope waveform and adjust the horizontal time/division fixed and variable controls to display one complete cycle.

NOTE

With an 800 cpi tape, each cycle represents 1250 μinches. The scope graticule is divided into 10 major divisions, each of which is divided into 5 divisions; therefore

$$\frac{1250\ \mu\text{inch}}{50\ \text{divisions}} = 25\ \mu\text{inch per division}$$

(6) Observe that the fall time of the waveform viewed at TP2 is less than 16 small divisions of the oscilloscope graticule; i.e., 400 μinches. This measurement should be taken between the 95- and 5-percent points of the waveform.

6.6.8 SKEW MEASUREMENT AND ADJUSTMENT (Model 6660)

Transport skew is adjusted mechanically as outlined in the following paragraphs. The requirements on PE read skew are not severe since the PE system uses a mutliple buffer register per channel for read data recovery.

6.6.8.1 Skew Measurement

An indication of skew may be obtained by observing the algebraic sum of the peak detectors at TP10 on the Data G PCBA.

Figure 6-5 illustrates an example of correctly adjusted skew. Figure 6-6 is an example of poorly adjusted skew. This method of determining the system write head skew is accomplished as follows.

(1) Set the vertical sensitivity on the oscilloscope to 1.0 volt per cm.

(2) Set the oscilloscope to trigger on Channel 1 negative slope, alternate mode.

(3) Load an 800-cpi master tape on the transport, bring to BOT.

(4) Depress and release the FORWARD control.

(5) Observe oscilloscope waveform and adjust the horizontal time/division fixed and variable controls to display one complete cycle.

NOTE

With an 800 cpi tape, each cycle represents 1250 μinches. The scope graticule is divided into 10 major divisions, each of which is divided into 5 divisions; therefore

$$\frac{1250\ \mu\text{inch}}{50\ \text{divisions}} = 25\ \mu\text{inch per division}$$

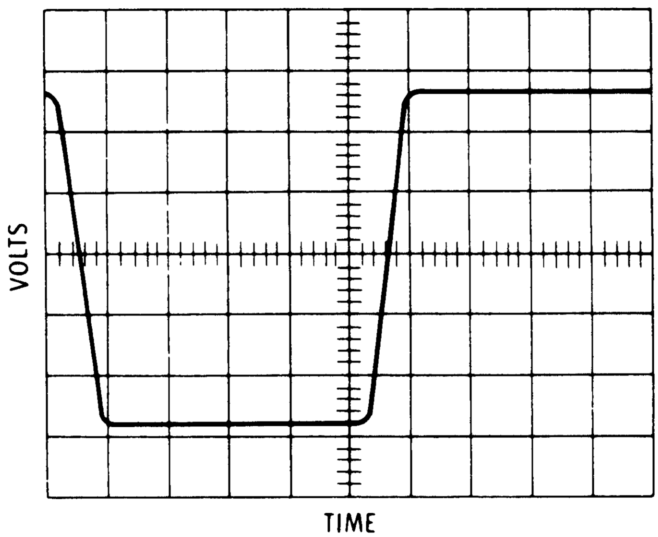


Figure 6-5. Skew Waveform (Good)

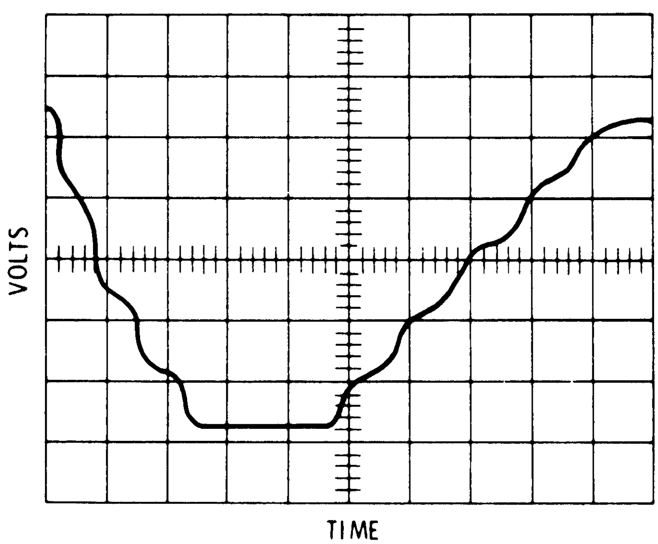


Figure 6-6. Skew Waveform (Poor)

(6) Observe that the fall time of the waveform viewed at TP10 is less than eight small divisions of the oscilloscope graticule, i.e., 200 μinches. This measurement should be taken between the 95- and 5-percent points of the waveform.

6.6.8.2 Skew Adjustment

Reduction of skew to within acceptable limits is accomplished as follows.

(1) Perform skew measurement procedure described in Paragraph 6.6.8.1, Steps (1) through (6).

(2) While observing the waveform at TP10 on the Data PCBA with the tape moving in the forward direction, ease the edge of the tape off the head guide cap toward the spring-loaded washer. This should be done on first one guide, then the other.

NOTE

Moving the tape one to two-thousandths of an inch from one of the guides will reduce the skew to within the specified range.

(3) Observe the waveform and determine which movement (upper guide or lower guide) improves the display. If moving the tape off the upper guide improved the display, the lower guide should be shimmed.

NOTE

The shims are burr-free, etched, one-half of a thousandths inch thick berrylium copper.

(4) Observe and note the fall time of the waveform observed at TP10 with the oscilloscope set up as described in Paragraph 6.6.8.1, Step (5).

(5) Since the character spacing at 800 cpi is 1250 μinches, the actual skew can be calculated. The skew correction provided by the addition of one shim (each shim is 500 μinches thick) is $\frac{500}{12} = 42$ μinches. The number of shims used must satisfy the following.

(a) Skew must be reduced to a minimum consistent with the maximum number of shims allowable.

(b) The maximum number of shims used must not exceed four.

Therefore, if, for example, the measured skew is 250 μinches, four shims will yield a skew correction of 168 μinches (i.e., $4 \times \frac{500}{12} = 168$ μinches). This satisfies the requirements listed in (a) and (b).

(6) Depress and release the FORWARD control. Tape motion will cease.

(7) Remove the head guide retaining screw (accessible from the rear of the deck) and remove the guide.

NOTE

When removing the guide care should be taken not to drop the spring and washer.

(8) Insert the required number of shims and replace the head guides.

NOTE

Shim only one head guide.

(9) Recheck skew measurement as described in Paragraph 6.6.8.1, Steps (1) through (6).

6.6.9 HEAD REPLACEMENT

The head may require replacement for one of two reasons: internal fault in the head or cable, or wear. The first reason can be established by reading a master tape, the second can be verified by measuring the depth of the wear on the head crown. In those heads which have "guttering" (grooves cut on the crown, each side of the tape path), the head should be replaced when it has worn down to the depth of the gutter. In those heads which do not have guttering, the head wear should be measured with a brass shim that is ten-thousandths of an inch thick. The shim width should be less than the minimum tape width (0.496 inch). The shim should be placed in the worn portion of the head crown with one side butted against the outer worn edge. When the upper surface of the shim is below the unworn surface of the head crown (i.e., the head has worn to a depth of greater than 0.010 inch) the head should be replaced.

Replacement of the head is accomplished as follows.

(1) Remove the head cover.

(2) Disconnect the head connector(s) from the Data PCBA.

(3) Remove the two screws that attach the head to the head plate.

(4) Ease the head cable(s) through the hole in the deck.

(5) Check the replacement head for particles adhering to the mounting surface.

NOTE

The mounting surface must be free of all foreign substances or excessive skew will result.

(6) Route the head connector(s) and cable(s) through the deck.

(7) (a) For 6640 transports, plug the write head connector into J1, and the read head connector into J2 on the Data PCBA.

NOTE

The read head is the one farthest from the erase head (nearest the take-up reel).

(b) For 6660 transports, plug the head connector into J1 on the Data PCBA.

(8) Attach the head with the two screws removed in Step (3).

NOTE

Two sets of screw holes are provided for mounting the head. The upper set (nearest the capstan) is used for dual-stack heads (6640s); the lower set is used for single-stack heads (6660s).

(9) Verify that the case of the replacement head is electrically isolated from chassis ground.

(10) Load a reel of tape on the transport.

(11) Bring tape to Load Point by depressing and releasing the LOAD control twice.

(12) Operate the transport in a shuttling mode (i.e., forward, then reverse) and observe the oscilloscope signal amplitude at the output of the read amplifiers; while operating in the shuttling mode, mechanically rotate the head assembly until the observed amplitude difference between forward and reverse operation is minimum.

(13) Set up the read amplifier gain, read skew, write skew (6640 only), and flux gate (6640 only) as described in Paragraphs 6.5.8, 6.6.7, 6.6.8, and 6.6.12, respectively.

NOTE

Shim only one head guide.

(14) Replace the head cover.

6.6.10 PHOTO-TAB SENSOR REPLACEMENT

Replacement of the photo-tab sensor is accomplished as follows.

(1) Disconnect the cable connecting the photo-tab sensor and TIP sensor to the Servo and Power Supply PCBA (P17).

(2) Remove the screw that retains the sensor assembly. The screw is accessible from the rear of the deck.

(3) Remove the pins from the plug by using the extractor tool and feed the pins through the hole in the deck then through the hole in the head plate.

(4) Insert the cable of the replacement photosensor through the head plate and deck.

(5) Replace the connector pins in the plastic connector body as follows.

- (a) Brown wire - pin 1
- (b) Red wire - pin 2
- (c) Orange wire - pin 3
- (d) Yellow wire - pin 4

(6) Align the surface of the photosensor parallel to the tape and tighten the retaining screw.

(7) Adjust the BOT and EOT amplifiers as described in Paragraph 6.5.3.3.

6.6.11 TAPE-IN-PATH (TIP) SENSOR REPLACEMENT

Replacement of the TIP sensor is accomplished as follows.

(1) Disconnect the cable connecting the photo-tab sensor and TIP sensor to the Servo and Power Supply PCBA (P17).

(2) Remove the head cover then the screw that holds the TIP sensor assembly to its bracket.

(3) Remove the pins from the plug by using an extractor tool and feed the pins through the hole in the deck.

(4) Insert the cable of the replacement TIP sensor through the hole in the deck.

(5) Replace the connector pins in the plastic connector body as follows.

   (a) Green wire - pin 5
   (b) Blue wire - pin 6

(6) Align the photo-resistor with the photo-tab sensor light source and check to see that the TIP sensor clears the head cover before tightening the mounting screw.

(7) Replace the head cover.

6.6.12 FLUX GATE ADJUSTMENT (6640 Only)

Crosstalk can be checked and, if necessary, reduced to within acceptable limits by mechanically positioning the flux gate. The check and adjustment procedure is accomplished as follows.

(1) Load a reel of tape with a write enable ring installed on the transport.

(2) Apply power to the transport.

(3) Bring the transport to the Load Point.

(4) Place transport on-line.

(5) Write a short block of all-ones tape (or all-zeros, i.e., 3200 frpi).

(6) Figure 6-7 illustrates the delay between Write and Read data due to the spacing between the read and write heads.

(7) Observe waveform on any test points between TP104 and TP904 on the Data PCBA.

NOTE

Synchronize the oscilloscope with a suitable signal such as IWDS or SFC at the signal interface. Observe the crosstalk on the Read waveform by using the oscilloscope magnifier or delayed See Figure 6-7.

(8) Observe that the waveforms viewed in Step (7) are approximately sinusoidal with no pronounced peaks. The crosstalk should be maintained at the lowest possible level and should not exceed 1.0v peak-to-peak.

NOTE

If the observed waveforms in Step (7) falls within the limit specified in Step (8) no adjustment should be attempted.

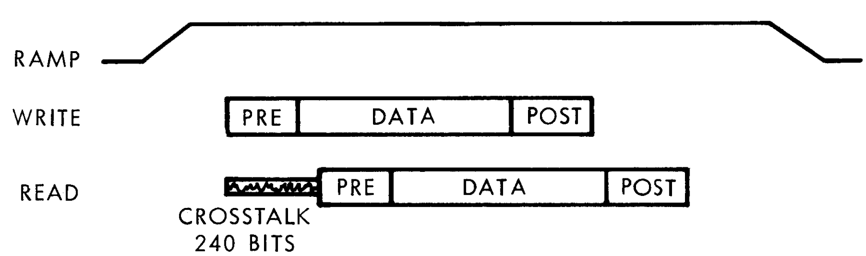


Figure 6-7. Write and Read Spacing

(9) Partially loosen the screws which secure the flux gate assembly. Care should be taken to ensure that the flux gate spring does not move the assembly.

(10) Place a white card (e.g., business card) between the flux gate and the magnetic head and press the flux gate assembly lightly against the head.

(11) Figure 6-8 illustrates the correct relationship between the magnetic head and the flux gate.

NOTE

It may be necessary to move or rotate the assembly slightly to achieve the best compromise between all tracks.

(12) Tighten the flux gate assembly screws and repeat Steps (1) through (11).

CAUTION

ENSURE ADEQUATE CLEARANCE BETWEEN THE FLUX GATE AND THE MAGNETIC HEAD (0.005 INCH MINIMUM). FAILURE TO ALLOW CORRECT CLEARANCE WILL RESULT IN DAMAGE TO THE HEAD OR TAPE.

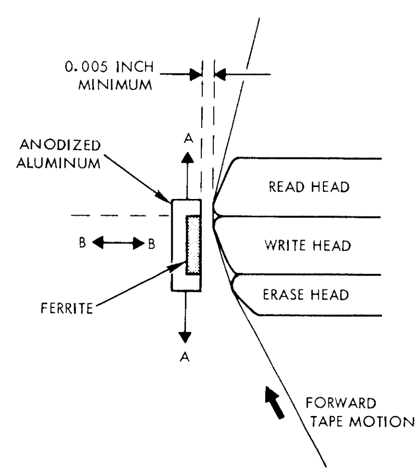


Figure 6-8. Flux Gate Adjustment

6.6.13 OVERLAY AND TRIM REMOVAL

Occasionally it will be necessary to remove the overlay, or both the overlay and trim, in order to perform other maintenance. Removal is accomplished as follows.

(1) Remove both tape reels and retract both tension arms as described in Paragraph 6.6.1.

(2) Remove power from the transport.

(3) Loosen the two screws at the top of the door which secure the mounting block to the pastic door (do not remove the screws).

(4) Slide the door with respect to the mounting, to align the hole in the top of the door with the corresponding hole in the block.

(5) Insert a rod of less than 1/16-inch diameter in the hole located in Step (4). Using the rod, push down the spring plunger. This action releases the top of the door.

(6) Carefully pull the top of the door forward (approximately 2 inches). Ease the door downward to clear the bottom spring plunger and remove the door.

(7) Remove both guide bridges, five guide covers, and the head cover.

(8) Unplug the Molex connectors from the Tape Control and Data PCBAs and remove the circuit boards.

(9) Remove the eight 4-40 screws holding the overlay to the base plate.

(10) Gently remove the overlay, taking care to clear the door stop arm.

(11) If the trim is also to be removed, remove the ten 4-40 screws around the outer perimeter of the trim assembly.

(12) Remove the upper spring plunger from the hinge blocks using the special spring plunger wrench (No. VW-52). Remove the lower plunger using an Allen wrench.

(13) Ease the trim slowly past the tape guides and head. Gently pry out the plastic trim to clear the hinge blocks. Remove the trim.

Reinstallation of the trim and overlay is accomplished by reversing the above procedure.

NOTE

Apply a drop of Loctite Sealant Grade C to the threads of each guide roller cover before installation.

6.6.14 CAPSTAN MOTOR REPLACEMENT

Capstan motor replacement is accomplished as follows.

(1) Remove the overlay and trim as described in Paragraph 6.6.13.

(2) Disconnect the motor leads.

(a) If the motor has terminals, disconnect the leads at the motor and tachometer terminals.

(b) If the motor does not have terminals, disconnect the motor connector P27 at the Servo and Power Supply PCBA.

(3) Remove the four mounting screws from the capstan motor assembly. Remove the motor. Remove any shims under the motor mounting screws.

(4) Mount the replacement motor and replace the four retaining screws.

NOTE

The mounting surface must be free of all foreign substances to ensure the perpendicularity of the capstan to the tape path.

(5) Remove the capstan from the old motor and slide it onto the shaft of the new motor. Adjust the back side of the capstan to 0.82 ±0.01 inch (height of a U.S. nickel standing on end) above deck surface and line the set-screw up with the flat on the motor shaft before tightening the set-screw.

(6) Connect the motor leads as follows.

(a) For motors with terminals:
18-gauge white — motor (+) terminal
18-gauge black — motor (-) terminal
22-gauge white — tachometer (+) terminal
22-gauge black — tachometer (-) terminal

(b) For motors without terminals, install connector P27 to the Servo and Power Supply PCBA.

(7) Temporarily install the guide bridges and the Data and Tape Control PCBAs.

NOTE

The shorter of the two bridges is used on the take-up side.

(8) Adjust the torsional resonance suppressor as described in Paragraph 6.5.11.

(9) Adjust the tape speed and rewind speed as described in Paragraphs 6.5.6 and 6.5.7.

(10) Perform a check of the read system skew as described in Paragraph 6.6.7.

(11) Return the arms to the down position and remove all power.

(12) Remove the guide bridges and the Data and Tape Control PCBAs.

(13) Reinstall the overlay and trim as described in Paragraph 6.6.13.

NOTE

Apply a drop of Loctite Sealant Grade C to the threads of each roller guide cover before installation.

6.6.15 REEL SERVO BELT TENSION

The toothed belts that couple the motors to the reel hubs must have sufficient tension to prevent the teeth from skipping or servo instability due to backlash may result. The belts must not have excessive tension as this will cause overloading of the motor or reel shaft bearings.

6.6.15.1 Belt Tension Adjustment Procedure

The reel servo belt tension can be adjusted as follows.

(1) Loosen the three screws that fasten the motor mounting plate to the deck stand-offs.

NOTE

The slots in the motor mounting plate allow motion of the motor in the line of action of belt tension.

(2) Adjust the pulley so that the timing belt is snug. Note the last belt tooth that is completely seated in a slot on the large pulley (refer to Figure 6-9).

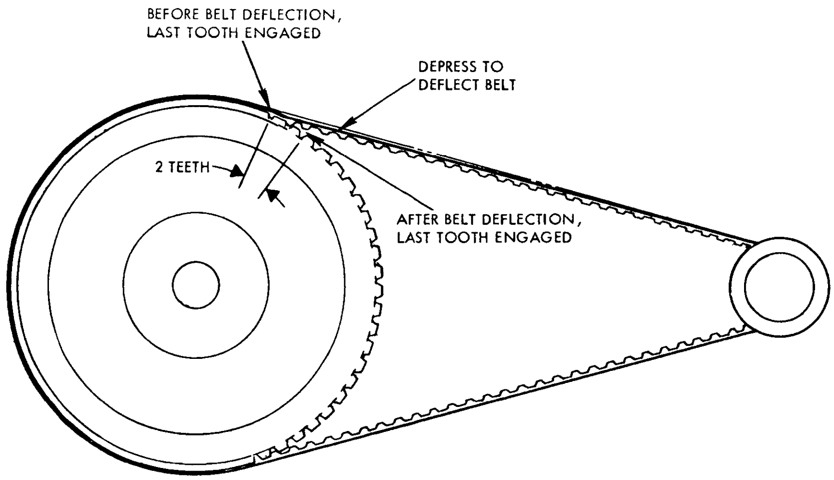


Figure 6-9. Reel Servo Belt Tension Adjustment

(3) Count two to three teeth from the last engaged tooth. Hold the large pulley to ensure that it does not turn. Depress the toothed belt at the point between the second and third teeth with sufficient force to deflect the belt flush against the pulley.

CAUTION

DO NOT APPLY EXCESSIVE FORCE ON THE TOOTHED BELT.

(4) Adjust the drive motor assembly so that the second tooth is firmly engaged in a slot on the large pulley but the third belt tooth is not engaged.

(5) Tighten the three screws on the motor mounting plate and recheck for the condition in Step (2).

6.6.16 ROLLER GUIDE ASSEMBLIES

Three different roller guide assemblies are used on the transport. They differ in shaft length and shaft orientation only. The three assemblies are shown in Figure 6-10, and are as follows.

(1) Fixed roller guide assembly, one required.

(2) Bridge roller guide assembly, four required.

(3) Tension arm roller guide assembly, four required.

If replacement of a roller guide assembly should become necessary, considerable time can be saved by replacing only the components (barrel or bearings) without disturbing the guide shaft alignment.

6.6.16.1 Roller Guide Component Replacement

The fixed roller and the tension arm roller components may be replaced as follows. (Refer to Figure 6-10.)

(1) Remove the roller guide cover by turning it counterclockwise.

(2) Remove the "E" retaining ring.

(3) Remove the 0.25-inch diameter washer, spring washer, the 0.19-inch diameter washer, barrel, and bearings, in that order.

(4) After replacing the barrel and/or bearings, reinstall in the reverse order as above. Apply a drop of Loctite Sealant Grade C to the threads of the roller guide cover before installation.

The bridge roller components may be replaced as follows.

(1) Remove the bridge by loosening the two No. 10 screws at the rear of the transport.

(2) Remove the crescent retaining ring.

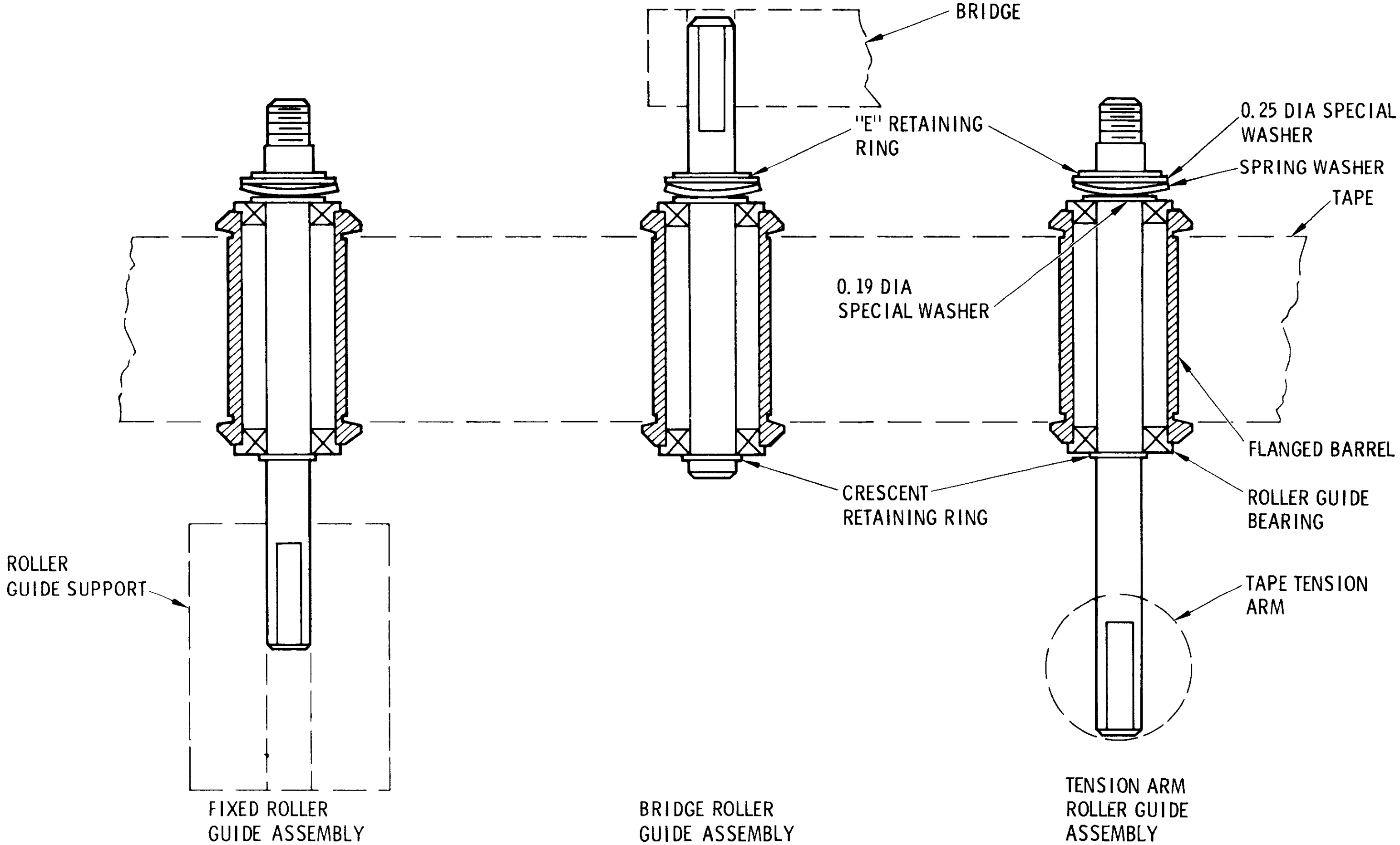


Figure 6-10. Roller Guide Assemblies

(3) Remove the barrel and bearings, taking care that the 0.19-inch diameter washer remains on the shaft.

(4) Install the replacement barrel and/or bearings.

(5) Reinstall the crescent retaining ring.

(6) Check the bridge mounting surface and the deck for burrs or dirt. Clean as required and reinstall the bridge.

(7) Perform a check of the read skew.

6.6.16.2 Roller Guide Assembly Replacement

Should replacement of an entire fixed roller guide assembly be required proceed as follows.

(1) Remove the roller guide cover by turning it counterclockwise.

(2) Remove the guide assembly and guide support by loosening the No. 10 screw at the rear of the transport.

(3) Loosen the set-screw in the guide support and replace the guide assembly taking care to line up the flat on the shaft with the set-screw.

(4) Very lightly tighten the set-screw.

(5) Temporarily install the guide assembly and support on the transport.

(6) Load a reel of tape.

(7) With the transport operating in a shuttling mode, adjust the guide height so that light may be seen between the tape edge and each guide barrel flange.

(8) Remove the tape and assembly, and tighten the set-screw, the reinstall the assembly.

(9) Perform a check of the read skew.

(10) Reinstall the roller guide cover. Apply a drop of Loctite Sealant Grade C to the threads of the roller guide cover before reinstallation.

Replacement of a bridge roller guide assembly or a tension arm roller guide assembly may be accomplished as follows.

(1) Remove the overlay as described in Paragraph 6.6.13.

(2) Carefully remove the decorative underlay from the area under the tension arm where the guide is to be replaced.

NOTE

Replace only one guide at a time as the height of remaining guides is used as a reference point for setting up the new guide.

(3) Remove the guide assembly to be replaced and install the new one. Check to see that the flat is in line with the set-screw, then tighten the screw very lightly.

(4) Temporarily install the guide bridges.

(5) Loop a piece of magnetic tape around the arm rollers and pull the rollers up into the bridge area. Secure the tape so that the arm will remain in that position.

(6) Install a 1/16-inch diameter half ball point on the dial test indicator and adjust the indicator to average zero on the bottom flange of the three remaining guides. (The three guides should be at the same height within ±0.002 inch.)

(7) Adjust the replaced roller guide assembly to 0 ±0.001 inch, then lock the set-screw.

(8) Perform a check of the read skew.

(9) Remove the bridges and reinstall the decorative underlay.

(10) Reinstall the overlay as described in Paragraph 6.6.13.

NOTE

Apply a drop of Loctite Sealant Grade C to the threads of each roller guide cover before installation.

6.6.17 TAPE TENSION ADJUSTMENT

Tape tension is controlled by the spring attached to each of the tension arms. The tension is adjusted by means of the spring anchor. Figure 6-11 shows the measurement and adjustment of the supply tape tension. A three-foot length of tape with loops at each end is used and, after removing the overlay as described in Paragraph 6.6.13, the tape is mounted as shown. A one-pound force gauge is used to measure the tape tension. Care must be taken to zero the scale in the correct orientation of the gauge and to pull on the tape in the direction shown. The anchor is adjusted until the tension is 8 ounces with the arm in the center of its operating region.

Figure 6-12 shows the measurement and adjustment of the take-up tape tension. Using the same piece of tape mounted as shown with the gauge zeroed against the correct orientation, the anchor is adjusted until the tape tension is 8 ounces with the arm in the center of its operating region.

When spring replacement is required, remove the overlay as described in Paragraph 6.6.13 with both arms in the down position, replace both springs, four clevis pins, and both felt damping pads. Apply a small quantity of lubricant, Bendix-brake lube or Lubriplate brake lubricant, to the spring hook before installation into the arm clevis pin. Rotate both springs so that the hook at the arm end is perpendicular to the deck surface and facing away from the deck. Adjust tape tension as described above.

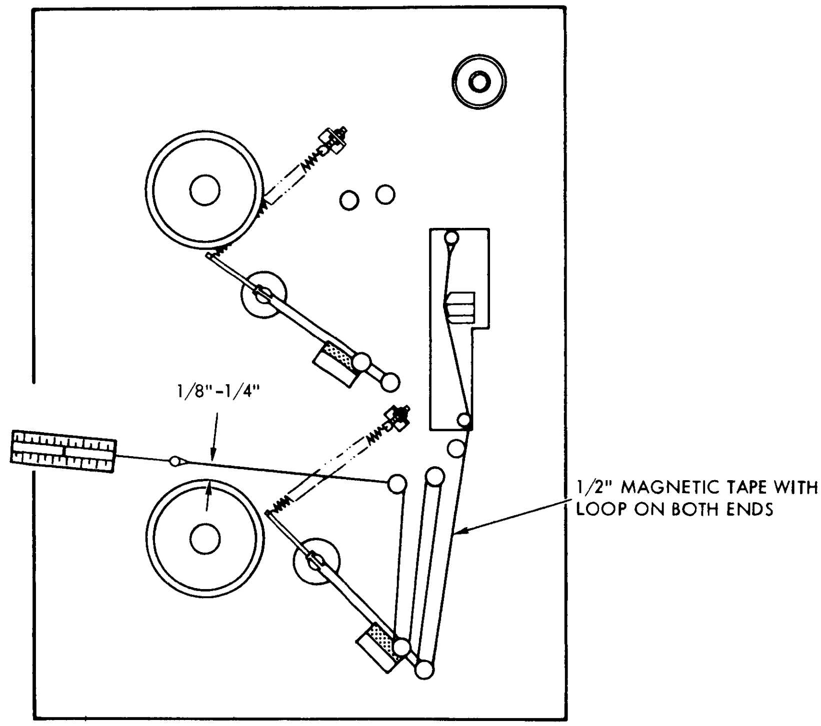


Figure 6-11. Supply Tape Tension Adjustment

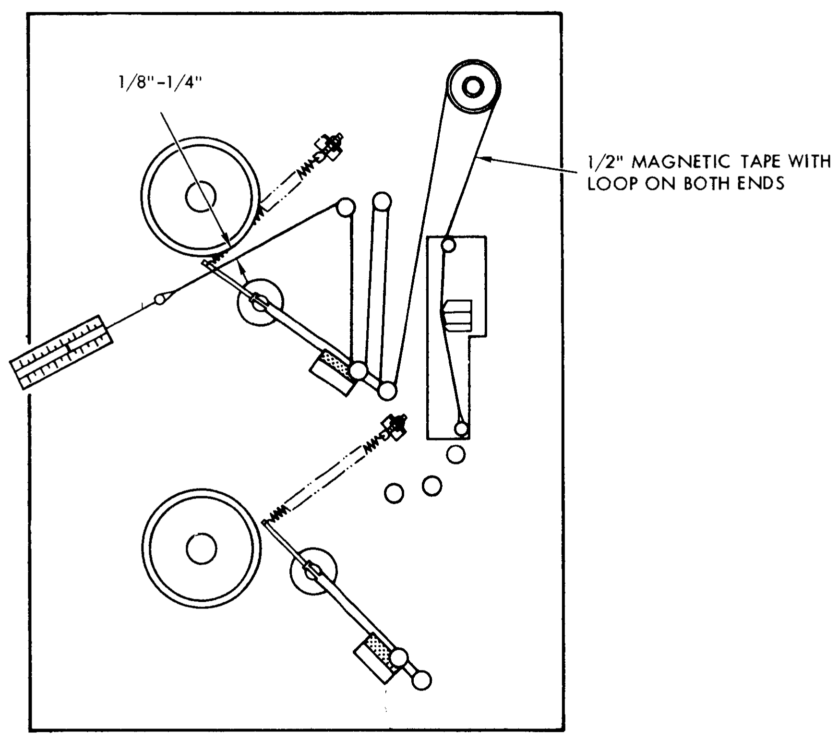


Figure 6-12. Take-up Tape Tension Adjustment

6.6.18 REEL HUB ASSEMBLY REPLACEMENT

Replacement of the reel hub assembly can be accomplished as follows.

(1) Remove the existing hub by loosening the two 1/4-inch set-screws attaching it to the shaft.

NOTE

Access to the set-screws can be gained by gently depressing the overlay in the hub area.

(2) Install the replacement hub assembly taking care to line up each set-screw with the appropriate flat on the shaft.

(3) Adjust the hub height before locking the set-screws in place. Proper height is achieved when the tape winds onto a properly-seated reel mid-way between the reel flanges.

(4) Adjust the write lockout plunger as required. See Paragraph 6.6.19.

6.6.19 WRITE LOCKOUT ASSEMBLY

When a supply reel hub assembly or a write lockout assembly has been replaced, adjustment of the write lockout plunger may be required. The plunger height should be adjusted so that when the plunger is fully retracted, the plunger end is just flush with the back side of the reel hub assembly flange. Adjustment may be accomplished by removing the write lockout assembly, loosening the safety nut and rotating the plunger adjusting screw to the desired position. The safety nut is then tightened.

6.7 MAINTENANCE TOOLS

The following is a list of tools required to maintain the tape transport.

(1) Hex socket key set 0.050 through 5/32 sizes.

(2) Open-end wrenches, sizes 3/16", 1/4", 5/16", and 3/8".

(3) Long-nose pliers.

(4) Phillips screwdriver set.

(5) Standard blade screwdriver set.

(6) Soldering aid.

(7) Soldering iron.

(8) One-pound and five-pound force gauges.

(9) Lint-free cloth.

(10) Cotton swabs.

(11) Isopropyl alcohol or Freon TF

(12) Torque wrench, 0-35 in/lbs.

(13) Molex pin extractor.

(14) Spring plunger wrench, Vlier VW-52.

(15) Last Word (Starrett) dial test indicator No. 711GCS with No. 56A surface gauge base.

(16) Loctite Sealant, Grade C.

6.8 TROUBLESHOOTING

Table 6-5, System Troubleshooting chart, provides a means of isolating faults, possible causes, and remedies. The troubleshooting chart should be used in conjunction with the schematics and assembly drawings in Section VII.

Table 6-5

System Troubleshooting

Symptom	Probable Cause	Remedy	Reference
Tape does not tension and the capstan shaft rotates freely when the LOAD control is depressed for the first time after the arms have moved down.	Interlock relay K1 does not close.	Check operation of relay. Replace if necessary.	Paragraph 5.4.1
	LOAD control is not operative.	Check operation of control. Replace if necessary.	Paragraph 5.4.1
	Relay driver defective.	Check collector voltage of Q34 with LOAD control depressed. It should be less than +1v. If greater, isolate defective relay driver component and replace.	Paragraph 5.4.1
After the tension arms have moved down, tape is tensioned when the LOAD control is depressed, but tension is lost when control is released.	Relay latching contacts 6 and 7 do not make.	Check that voltage at J26-2 goes to +5v when the LOAD control is depressed.	Paragraph 5.4.1
	Interlock switch is not operative.	Adjust as described in Paragraph 6.6.2; possibly replace limit switch assembly.	Paragraph 6.6.2.3
Arms do not move down to load the tape.	Down driver amplifier faulty.	Check appropriate transistors (Q54-Q56) on Servo and Power Supply PCBA.	Paragraph 5.4.1
Actuator motors fail to deactivate, driving tension arms up onto limit stops.	Up-Stop limit switch malfunction.	Check that P16 and P20 are properly connected. Check Up-Stop switch adjustment, replace if necessary.	Paragraph 6.6.3
Tension arms travel downward but tape does not tension. Actuator motors do not deactivate.	Down-Stop limit switch malfunction.	Check that P19 and P30 are properly connected. Adjust or replace Down-Stop limit switch if necessary.	Paragraph 6.6.4
	ERS generator malfunction.	Check Q57 - Q60 on Servo and Power PCBA.	Paragraph 5.4.1

Table 6-5

System Troubleshooting (continued)

Symptom	Probable Cause	Remedy	Reference
Tension arms fail to move when power is applied to transport and tape path is open.	Actuator motor or TIP sensor defective.	Check operation of actuator motor, check TIP sensor and related circuits.	Paragraph 6.6.5 and Paragraph 6.6.11
Tape unwinds or tension arm hits stop when the LOAD control is depressed for the first time.	Tape is improperly threaded.	Rethread tape (see Figure 3-1).	Paragraph 3.3
	+5v or -5v is missing from tension arm sensor.	Check tension arm sensor lamps. Isolate problem if lamp is extinguished.	Paragraph 6.6.6
	Fault in reel servo amplifier.	Check that movement of reels responds to tension arm position without tape on the transport.	Paragraph 5.4.2
Tape "runs away" or rewinds when the LOAD control is depressed for the second time.	Fault on Tape Control or capstan motor assembly.	Replace or repair Tape Control PCBA or capstan motor assembly.	Paragraph 5.5 Paragraph 6.6.14
Arms hit interlock switches at rewind.	Relay K2 does not latch.	Check the relay for faulty contacts. Check transistors Q35-Q36.	Paragraph 5.4.2
At rewind after BOT the arms do not move down 2 and 2-1/2 inches.	AOS and ULOS signals are not reaching Servo and Power Supply PCBA.	Check Tape Control PCBA.	Paragraph 5.4.2
Tape runs past the BOT marker.	BOT tab dirty or tarnished.	Replace tab or increase sensitivity of photosensor amplifier.	Paragraph 6.5.3 or Paragraph 6.6.10

Table 6-5

System Troubleshooting (continued)

Symptom	Probable Cause	Remedy	Reference
Tape runs past the BOT marker. (continued)	Photosensor not properly adjusted.	Adjust photosensor amplifier.	Paragraph 6.5.3
	Photosensor or amplifier defective.	Check for appropriate voltage levels in sensor systems with tab not over photosensor. Check appropriate voltage levels in sensor systems when tab is over photosensor.	Paragraph 6.5.3 or Paragraph 6.6.10
	Logic fault (Load flip-flop does not reset).	Replace or repair Tape Control PCBA.	Paragraph 5.4.1
Transport does not move in response to SYNCHRONOUS FORWARD or SYNCHRONOUS REVERSE commands.	Interface cable fault or receiver fault.	Check levels at outputs and inputs of receivers on Tape Control PCBA. Replace or repair cable or Tape Control PCBA.	Paragraph 5.4
	Transport is not READY.	Replace or repair Tape Control PCBA.	Paragraph 5.4
	Fault in ramp generator or capstan servo amplifier.	Check Tape Control PCBA. Replace or repair Tape Control or Servo and Power Supply PCBA.	Paragraph 5.3 or Paragraph 5.4
Transport responds to SYNCHRONOUS FORWARD command, but tape is not written.	Write current is not enabled.	Check presence of Write Enable ring on supply reel, WRT EN indicator should be lit. Check TP1 on Tape Control PCBA (should be +5v for writing). Replace Write Lockout assembly if faulty. Check that WRT POWER level is +5v on Data PCBA.	Paragraph 5.2, Paragraph 5.4 and Paragraph 6.6.19

Table 6-5

System Troubleshooting (continued)

Symptom	Probable Cause	Remedy	Reference
Transport responds to SYNCHRONOUS FOR-WARD command, but tape is not written. (continued)	Write status or MOTION signal to Data PCBA is not correct.	Check receiver on Tape Control PCBA for WRITE status and on Data PCBA for WRITE status.	Paragraph 5.2 and
		Check Data PCBA for MOTION signal. Replace or repair Data PCBA or Tape Control PCBA if faulty.	Paragraph 5.2
	WRITE DATA or WRITE DATA STROBE is not received correctly on Data PCBA from inter-face.	Check presence of correct levels on Data PCBA. Replace or repair Data PCBA or inter-face cable if faulty.	Paragraph 5.2
	Heads not plugged in correctly.	Check J1 and J2 on Data PCBA Read head (cable enters head nearest the take-up reel) uses J2.	Paragraph 5.2
Data are incorrectly written.	Incorrect data format.	Use correct format.	IBM Form A22-6589-3 (729 or 727 Series) IBM Form A22-6866-3 (2400 Series)
	Fault on one track due to failure in write cir-cuits.	Check receiver and write ampli-fier on Data PCBA. Replace or repair Data PCBA if faulty.	Paragraph 5.2
	Intermittent WRT POW-ER, WRITE, MOTION, or WARS signal.	Examine those signals and re-place or repair Tape Control PCBA or Write Lockout assem-bly on Data PCBA if faulty.	Paragraph 5.2 and Paragraph 6.6.19

Table 6-5

System Troubleshooting (continued)

Symptom	Probable Cause	Remedy	Reference
Correct tape cannot be read.	Interface cable or transmitter fault.	Replace or repair interface cable or Data PCBA.	Paragraph 5.2
	Head is not plugged in.	Check J1 on Data PCBA. Check J2 on Data PCBA.	Paragraph 5.2
	Tape tracking on skew is badly adjusted.	Readjust according to description in Section VI.	Paragraph 6.6.7
	Head and guides need cleaning.	Clean head and guides.	Paragraph 6.3.1
	Tape cleaner needs emptying.	Remove tape cleaner and clean.	Paragraph 6.3.1
	Read amplifier gains are incorrectly adjusted.	Check and adjust amplifier gains.	Paragraph 6.5.8
	Faulty write amplifier causes current to be passed through head while reading.	Check write amplifier output test points and replace or repair Data PCBA if faulty.	Paragraph 5.2
	Component fault in read channel.	Check test points on Data PCBA. Replace or repair Data PCBA.	Paragraph 5.2
	Envelope detector delays are incorrect.	Check TP106 - TP906 on Data PCBA for correct on and off times. Replace or repair Data PCBA.	Paragraph 6.5.8
	Threshold level incorrect.	Check level at TP6 on Data PCBA. Replace or repair Data PCBA.	Paragraph 6.5.9, Paragraph 6.5.10

SECTION VII

SCHEMATICS, PARTS LISTS, LOGIC LEVELS, AND WAVEFORMS

7.1 INTRODUCTION

This section includes the schematics, assembly drawings, illustrated parts lists, interconnect lists, and logic level and waveform definitions.

7.2 ILLUSTRATED PARTS BREAKDOWN (IPB)

Figures 7-1 through 7-3, used in conjunction with Tables 7-1 through 7-3, respectively, provide identification by PERTEC part number of the mechanical and electrical components of the 75 IPS 6000 Series Tape Transports.

When part numbers for a particular part differ due to a change in transport configuration, descriptions and part numbers for all configurations are listed.

7.3 SPARE PARTS

Table 7-4 and 7-5 provide a description of the suggested spare parts for the 75 ips 6640 and the 75 ips 6660 tape transports, respectively. The Customer should always furnish model number and serial number of the transport when ordering parts.

7.4 PART NUMBER CROSS REFERENCE

Table 7-6, Part Number Cross Reference, provides a cross reference to the manufacturer's part number from typical PERTEC part numbers.

7.5 LOGIC LEVELS AND WAVEFORMS

The transport control and interface logic uses the DTL800 series of logic elements. Logic levels are defined as follows.

+5v	logical true
+0.4v	logical false

All basic waveform names are chosen to correspond to the logical true condition, e.g., SET WRITE STATUS (SWS) enables the write circuits when it is logically true (+5v), or disables the write circuits when it is logically false (0v).

The inverse of a waveform is denoted by the prefix "N". Therefore, NBOT will be 0.4v when the BOT tab is under the photosensor head, or +5v otherwise.

All interface lines connecting the transport to the controller are prefixed by "I". Each line must be terminated at the receiver end of the cable by a 220/330-ohm divider chain between +5v and 0v.

All interface waveforms are low-true with logic levels as follows.

+3v	logical false
0.4v	logical true

For example, ISFC (SYNCHRONOUS FORWARD command) will be 0.4v when the transport is being driven in the forward direction, or +3v otherwise.

The Glossary contains the waveform mnemonics referred to in this manual.

NOTES

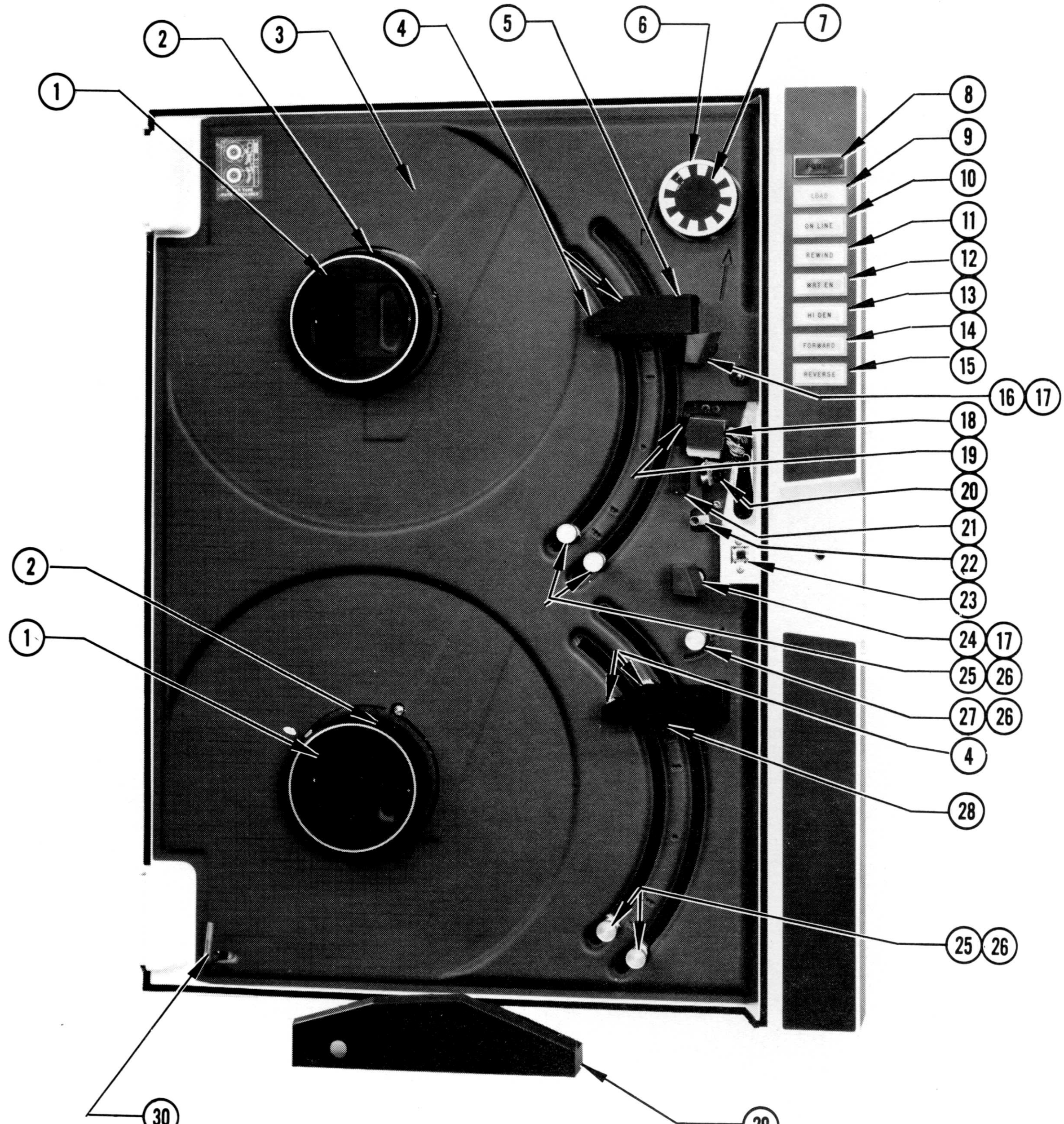


Figure 7-1. 75 ips 6000 Series Transports, Photo Parts Index

Table 7-1

75 ips 6000 Series Transports, Photo Parts Index

Figure and Index No.	Part Number	Description
Figure 7-1		
-1	102261-01	Reel Hub
-2	102277-01	Grip Ring
-3	101649-02	Overlay
-4	101646-01	Bridge Roller Guide Assembly
-5	101638-01	Bridge, Upper
-6	101678-01 101690-01	Capstan Capstan Cover
-7	101744-01	Strobe Disk (60 Hz)
-8	505-1801	POWER Switch, Illuminated (Horizontal Marking)
-9	505-1803	LOAD Switch, Illuminated (Horizontal Marking)
-10	505-1804	ON LINE Switch, Illuminated (Horizontal Marking)
-11	505-1805	REWIND Switch, Illuminated (Horizontal Marking)
-12	505-1806	WRT EN Switch, Illuminated (Horizontal Marking)
-13	505-1807 505-1827	HI DEN Switch, Illuminated (NRZI Only)(Horizontal Marking) 1600 CPI Switch, Illuminated (P. E. Only)(Horizontal Marking)
-14	505-1828	FORWARD Switch, Illuminated (Horizontal Marking)
-15	505-1829	REVERSE Switch, Illuminated (Horizontal Marking)
-16	101657-01	Guide Cover, Top
-17	100810-01	Head Guide
-18	510-6187 510-6189 510-5187 510-5189 510-5369 510-6169	Head, Dual Gap, NRZI, 7-track Dual Gap, NRZI, 9-track Single Gap, NRZI, 7-track Single Gap, NRZI, 9-track Single Gap, PE, 9-track Dual Gap, PE, 9-track
-19	103221-01	Flux Gate (Dual Gap Only)
-20	101694-01	Out Of Tape Sensor Assembly
-21	100807-01	Photo-tab Sensor
-22	101655-01	Tape Cleaner
-23	615-0007	Catch, Spring
-24	101658-01	Guide Cover, Bottom
-25	101647-01	Arm Roller, Guide Assembly
-26	101642-01	Cover, Roller Guide (5 Req'd)
-27	101647-02	Fixed Roller Guide Assembly
-28	101637-01	Bridge, Lower
-29	101676-01	Head Cover
-30	101027-01 615-0005 615-9755	Limit Shaft, Cover Compression Spring (For Limit Shaft) Hitch Pin Clip (For Limit Shaft)

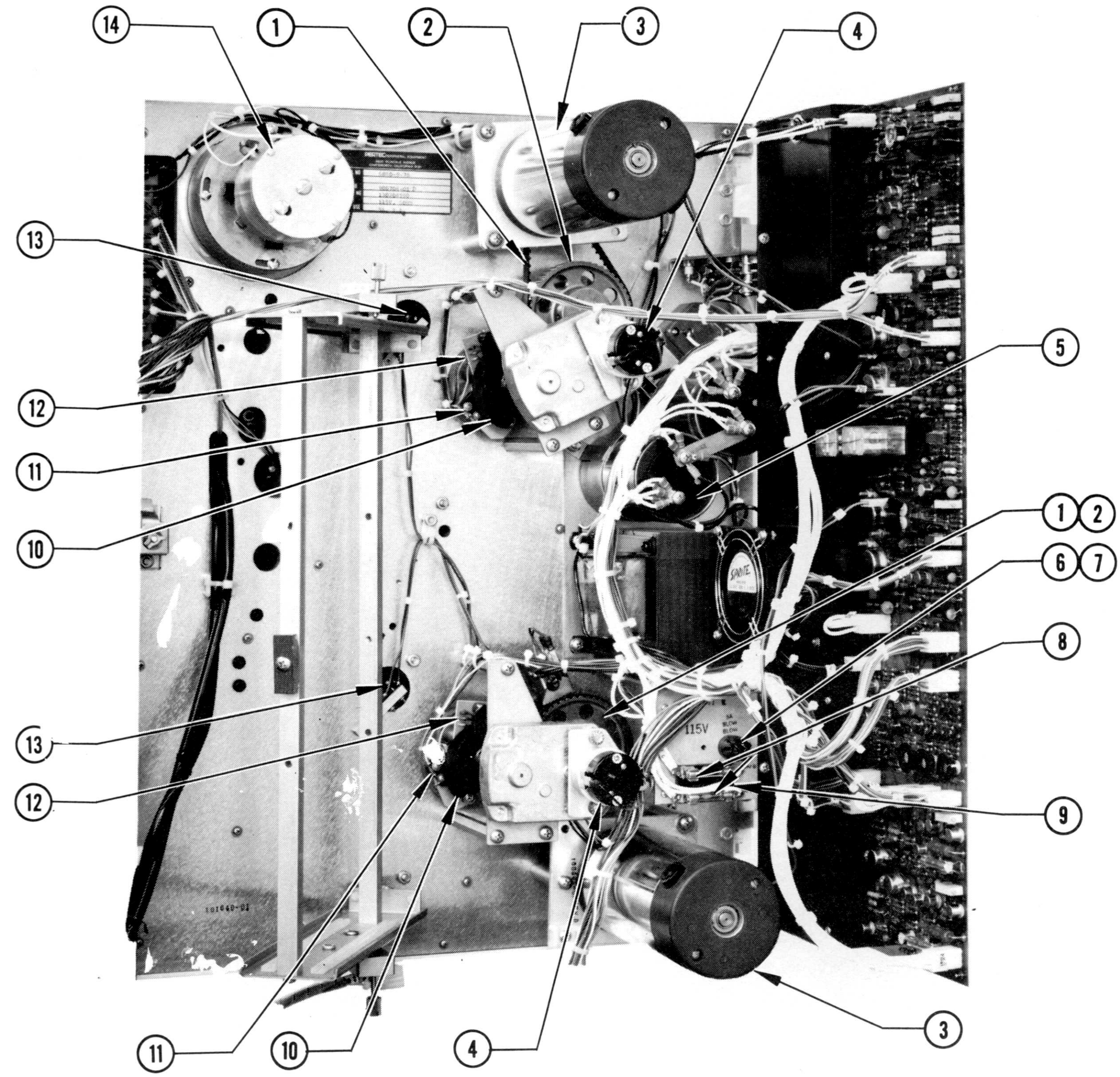


Figure 7-2. 75 ips 6000 Series Transports, Photo Parts Index

Table 7-2

75 ips 6000 Series Transports, Photo Parts Index

Figure and Index No.	Part Number	Description
Figure 7-2		
-1	610-0007	Timing Belt
-2	102595-01	Pulley
-3	500-0677	Reel Motor, Electro-Craft
-4	101703-01	Arm Actuator Assembly
-5	101702-01	Power Supply Assembly
-6	658-9160	Fuse Holder, 3 AG Minature
-7	663-3550	Fuse, 5A, 3 AG Slow Blow
-8	663-3100	Fuse, 10A, 3AG Fast Blow
-9	658-4408	Holder, Fuse, Dual
-10	100925-01	Shutter
-11	506-6360	Limit Switch
-12	100858-02	Tension Arm Sensor
-13	506-0004	Switch Tension Arm Up-Stop
-14	500-7533	Capstan Motor

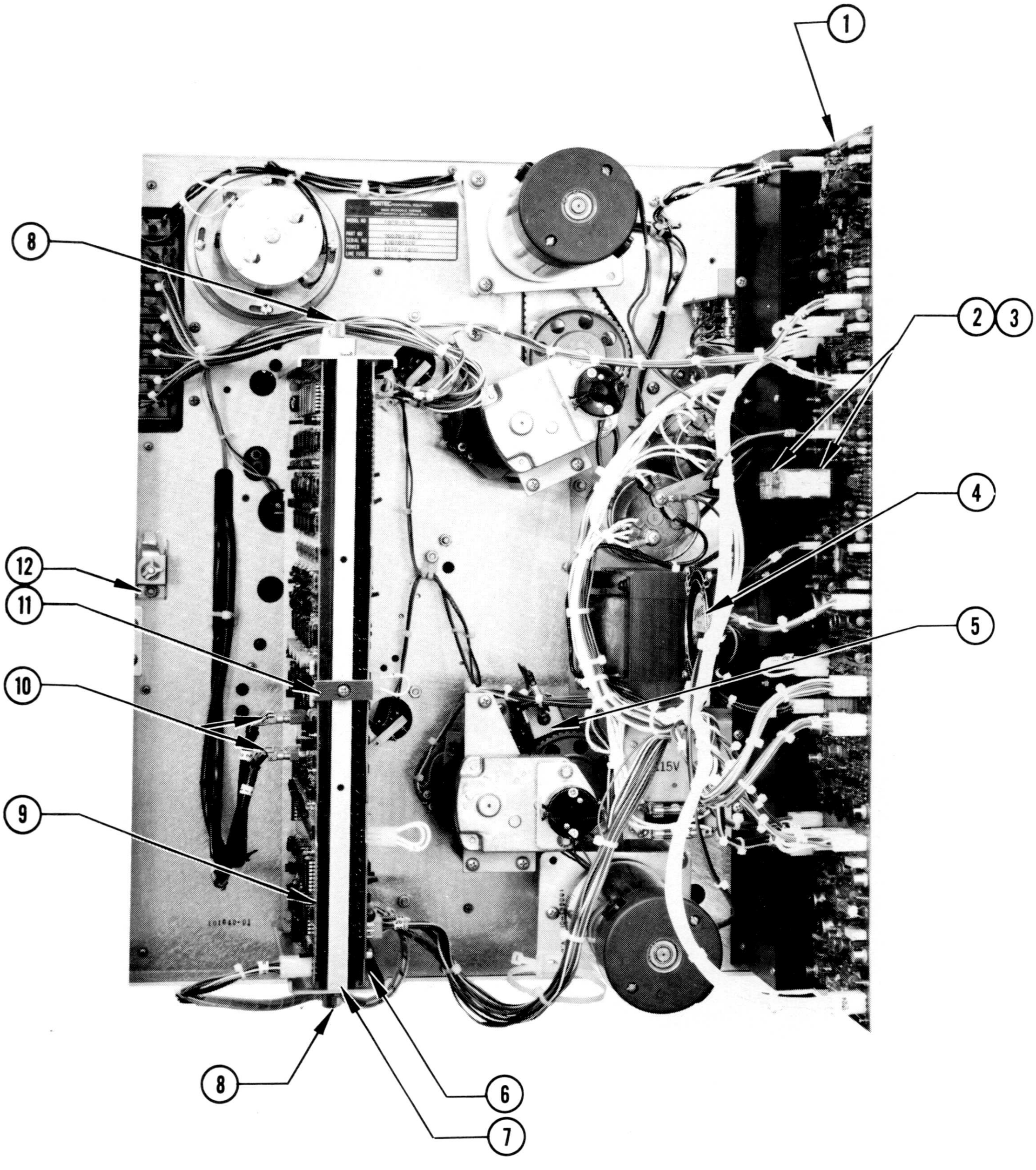


Figure 7-3. 75 ips 6000 Series Transports, Photo Parts Index

Table 7-3

75 ips 6000 Series Transports, Photo Parts Index

Figure and Index No.	Part Number	Description
Figure 7-3		
-1	101660-01*	Power and Servo D PCBA
-2 -3	502-1243	Relays K1, K2, 12 vdc, 4 PDT: Contact Rating 10A at 28 vdc
-4	101752-01 518-0002 518-0001 506-0810	Fan Assembly Fan, Propeller Type, Sleeve Bearing Fan, Propeller Type, Ball Bearing Switch Thermostat
-5	101003-02 506-6360	Write Lockout Assembly Switch Only
-6	101671-01*	Tape Control F PCBA
-7	101704-01	Card Cage
-8	615-7501	Captive Screw, 10-32 X 1" Long
-9	101721-01* 101711-01* 101716-01* 101346-01* 101376-01*	Data D1 9-Track PCBA Data E19 9-Track PCBA Data E17 7-Track PCBA Data F 9-Track PCBA Data G 9-Track PCBA
-10	-	Head Cables (reference Only)
-11	101653-01	Card Retainer Block
-12	615-4410	Adjustable Pawl Fastener

*Specify version as detailed on schematic.

Table 7-4

75 ips 6640 Transport, Spare Parts List

Item	Part No.
1. Bridge Roller Guide Assembly	101646-01
2. Arm Roller Guide Assembly	101647-01
3. Fixed Roller Guide Assembly	101647-02
4. Tension Arm Spring Set (2 Req'd)	101639-01
5. Reel Hub Assembly	102261-01
6. Reel Hub Grip Ring	102277-01
7. Photo-tab Sensor	100807-01
8. Tension Arm Position Sensor	100858-02
9. Tape-In-Path (TIP) Sensor	101694-01
10. Write Lockout Assembly	101003-02
11. Decorative Underlay	101656-01
12. Arm Actuator Motor	500-4518
13. Reel Servo Motor (Electro-Craft Only)	500-0677
14. Timing Belt	610-0007
15. Capstan	101678-01
16. Capstan Cover	101690-01
17. Capstan Motor	500-7533
18. Capstan Strobe Disk (60 Hz)	101744-01
19. Tape Cleaner	101655-01
20. Flux Gate Assembly	103221-01
21. Magnetic Head	510-6169
22. Tape Control F PCBA	101671-01*
23. Data F PCBA	101346-01*
24. Servo and Power Supply D PCBA	101660-01*
25. Door Latch	615-0007
26. Front Door	101643-01**
27. Controls	
(a) LOAD (Horizontal Marking)	505-1803
(b) ON LINE (Horizontal Marking)	505-1804
(c) REWIND (Horizontal Marking)	505-1805
(d) WRT EN (Horizontal Marking)	505-1806
(e) 1600 CPI (Horizontal Marking)	505-1827
(f) FORWARD (Horizontal Marking)	505-1828
(g) REVERSE (Horizontal Marking)	505-1829
28. POWER Control (Horizontal Marking)(125v)	505-1801
29. Fuse, 3AG, 5 Amp, SB, 125v and Below	663-3550
30. Fuse, 3AG, 3 Amp, SB, 190v and Above	663-3030
31. Fuse, 3AG, 10 Amp, FB (2 Req'd)	663-3100
32. Fuse, 3AG, 5 Amp, FB (2 Req'd)	663-3050
33. Relay, 4PDT, 12v, 10 Amp (2 Req'd)	502-1243
34. Microswitch	506-6360
35. Fan	518-0002
36. Thermal Switch, Heatsink	506-0810

*Specify version as detailed on schematic.

**Specify color if nonstandard.

Table 7-5
75 ips 6660 Transport, Spare Parts List

Item	Part No.
1. Bridge Roller Guide Assembly	101646-01
2. Arm Roller Guide Assembly	101647-01
3. Fixed Roller Guide Assembly	101647-02
4. Tension Arm Spring Set (2 Req'd)	101639-01
5. Reel Hub Assembly	102261-01
6. Reel Hub Grip Ring	102277-01
7. Photo-tab Sensor	100807-01
8. Tension Arm Position Sensor	100858-02
9. Tape-In-Path (TIP) Sensor	101694-01
10. Write Lockout Assembly	101003-02
11. Decorative Underlay	101656-01
12. Arm Actuator Motor	500-4518
13. Reel Servo Motor (Electro-Craft Only)	500-0677
14. Timing Belt	610-0007
15. Capstan	101678-01
16. Capstan Cover	101690-01
17. Capstan Motor	500-7533
18. Capstan Strobe Disk (60 Hz)	101744-01
19. Tape Cleaner	101655-01
20. Magnetic Head	510-5369
21. Tape Control F PCBA	101671-01*
22. Data G PCBA	101376-01*
23. Servo and Power Supply D PCBA	101660-01*
24. Door Latch	615-0007
25. Front Door	101643-01**
26. Controls	
(a) LOAD (Horizontal Marking)	505-1803
(b) ON LINE (Horizontal Marking)	505-1804
(c) REWIND (Horizontal Marking)	505-1805
(d) WRT EN (Horizontal Marking)	505-1806
(e) 1600 CPI (Horizontal Marking)	505-1827
(f) FORWARD (Horizontal Marking)	505-1828
(g) REVERSE (Horizontal Marking)	505-1829
27. POWER Control (Horizontal Marking)(125v)	505-1801
28. Fuse, 3AG, 5 Amp, SB, 125v and Below	663-3550
29. Fuse, 3AG, 3 Amp, SB, 190v and Above	663-3030
30. Fuse, 3AG, 10 Amp, FB (2 Req'd)	663-3100
31. Fuse, 3AG, 5 Amp, FB (2 Req'd)	663-3050
32. Relay, 4PDT, 12v, 10 Amp (2 Req'd)	502-1243
33. Microswitch	506-6360
34. Fan	518-0002
35. Thermal Switch, Heatsink	506-0810

*Specify version as detailed on schematic.
**Specify color if nonstandard.

Table 7-6

Part Number Cross Reference

PERTEC Part No. (Typical)	Manufacturer (or equivalent)	Description or Part Number*
Carbon Comp. Resistors		
100-1525	Allen Bradley	RC07 (1500Ω, 5%, 1/4w)
101-1525	Allen Bradley, Speer	RC20 (1500Ω, 5%, 1/2w)
102-1525		RC32 (1500Ω, 5%, 1w)
103-1525		RC42 (1500Ω, 5%, 2w)
Precision Resistors		
104-2612	Corning, IRC	RL20C, (26,100Ω, 1%, 1/4w)
Variable Resistors		
Multi-turn		
121-1020	Beckman Helipot	79PR1K (1000Ω, 1%, 3/4w)
121-1030		79PR10K (10,000Ω, 10%, 3/4w)
Single-turn		
122-5020	Spectrol	53-1-1-502 (5000Ω, 10%, 1/2w)
Wire Wound Resistors		
109-0002	Dale	INC RS-5 (0.1 ohm ±3%, 5w)
111-0205	Dale	HLM20 (20Ω)
113-0103	Dale	RS-1A (1.0 ohm ±3%, 1w)
115-0003	Kelvin Associates	KS350 (0.03 ohms ±5%, 4w)
Photo Cell		
129-0001	Clairex Electronics, Inc.	CL705 H L 1/2, Dual Photo Conductive Cell
Dipped Mica Capacitors		
130-1515	El Menco	CM05CJ03 (150 picofarads, 500v, 5%)
Mylar Capacitors		
131-1540	Cornell - Dubilier	WMF1P15 (0.15 μfarads, 100v, 10%)

*Typical part numbers only are shown for resistors and capacitors.

Table 7-6

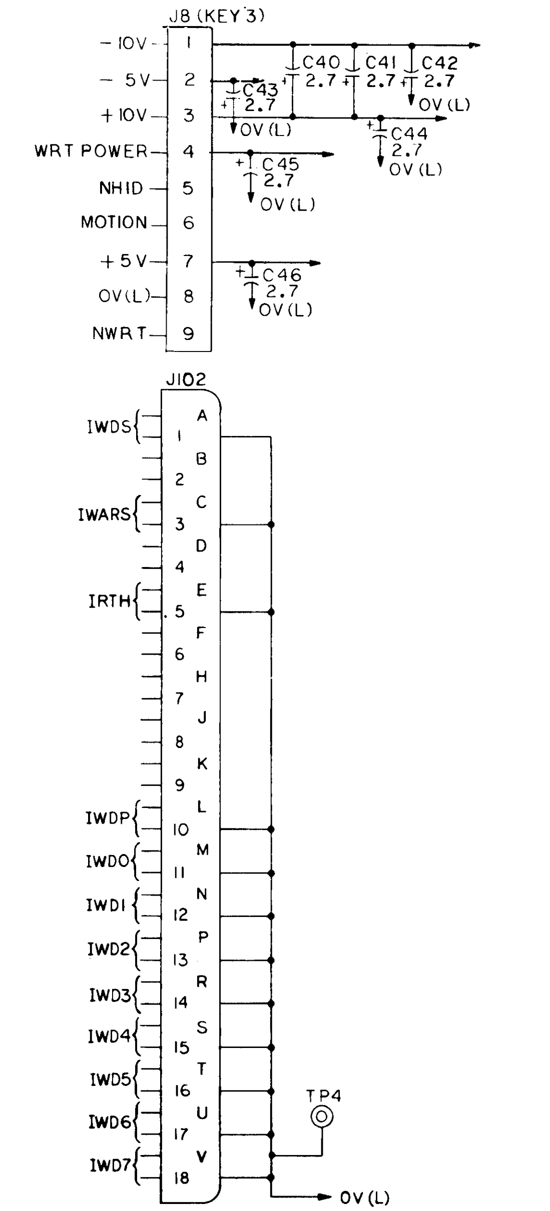
Part Number Cross Reference (continued)

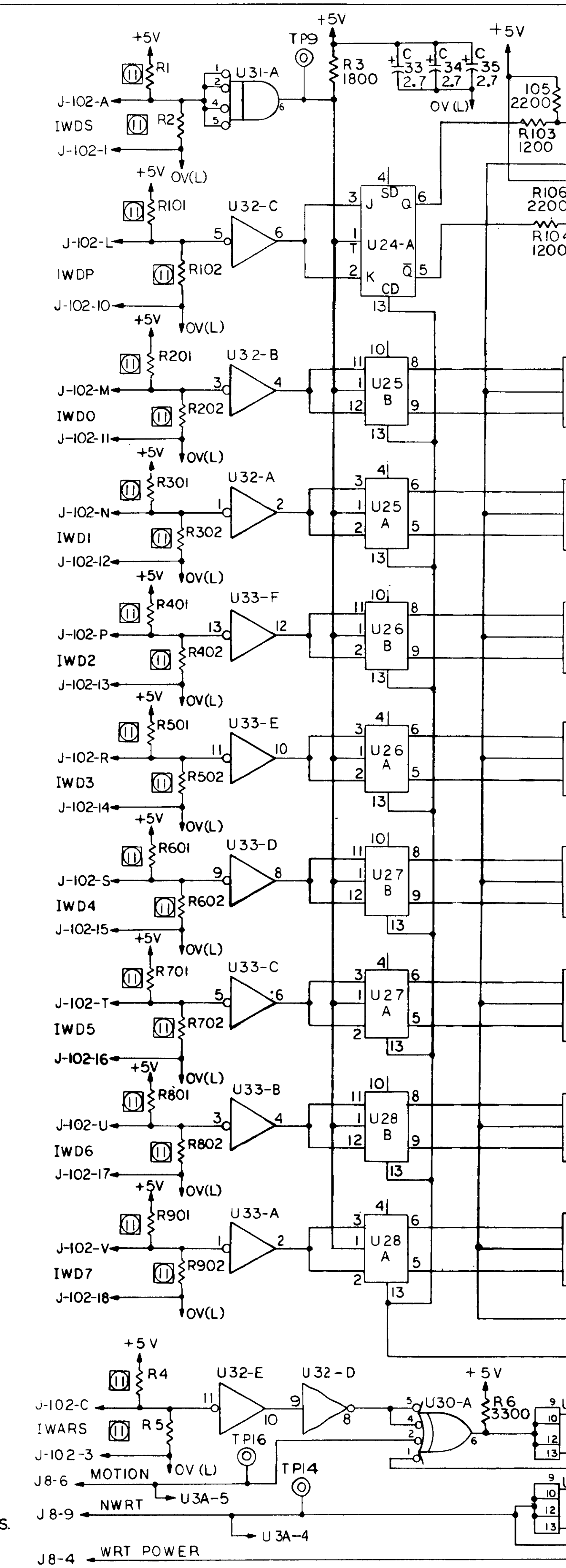
PERTEC Part No. (Typical)	Manufacturer (or equivalent)	Description or Part Number*
Solid Tantalum Capacitors		
132-2752	Kemet	TK2R7W35 (2.7 μfarads, 35v, 20%)
132-1062	Kemet	K10W10 (10 μfarads, 10v, 20%)
Aluminum Electrolytic Capacitors		
134-2493	Mallory	CGS243U030W4C3PL (24,000 μfarads, 30v)
Ceramic Capacitor		
135-4740	Sprague	7C023474D8500E
Transistors		
200-4123	Motorola	2N4123 (NPN switching)
200-4125	Motorola	2N4125 (PNP switching)
200-3053	RCA	2N3053 (NPN, T05, medium power)
200-4037	RCA	2N4037 (PNP, T05, medium power)
200-3055	RCA	2N3055 (NPN, T03, power)
200-5321	RCA	2N5321 (NPN, T05, medium power)
200-5323	RCA	2N5323 (PNP, T05, medium power)
200-3772	Motorola	2N3772 (NPN, T03, power)
Diodes		
300-4002	Motorola	1N4002
300-4446	TI	1N4446 (logic diode)
300-8810	Motorola	MR881, (12amp, 100v)
Rectifier Bridge		
320-9622	Motorola	MDA 962-2 (100v, 10amp)

Table 7-6

Part Number Cross Reference (continued)

PERTEC Part No. (Typical)	Manufacturer (or equivalent)	Description or Part Number *
Zener Diodes		
330-0685	Motorola	1N4736A (6.8v, 5%)
OP Amplifier		
400-1437	Motorola	MC1437L
Relay		
500-1243	Potter & Brumfield	R102E-1 W4 V185 12vdc, 4PDT, Contact Rating 10A at 28vdc
SRC		
201-3228	RCA	2N3228, Rectifier
Lamp		
659-6830	L. A. Miniature Products, Inc.	No. 11
Digital IC		
700-8360	Fairchild	U6A993659
700-8440	Fairchild	U6A994459
700-8460	Fairchild	U6A994659
700-8530	Fairchild	U6A909359
700-7476	Texas Instruments	SN7476N
700-7496	Texas Instruments	SN7496N

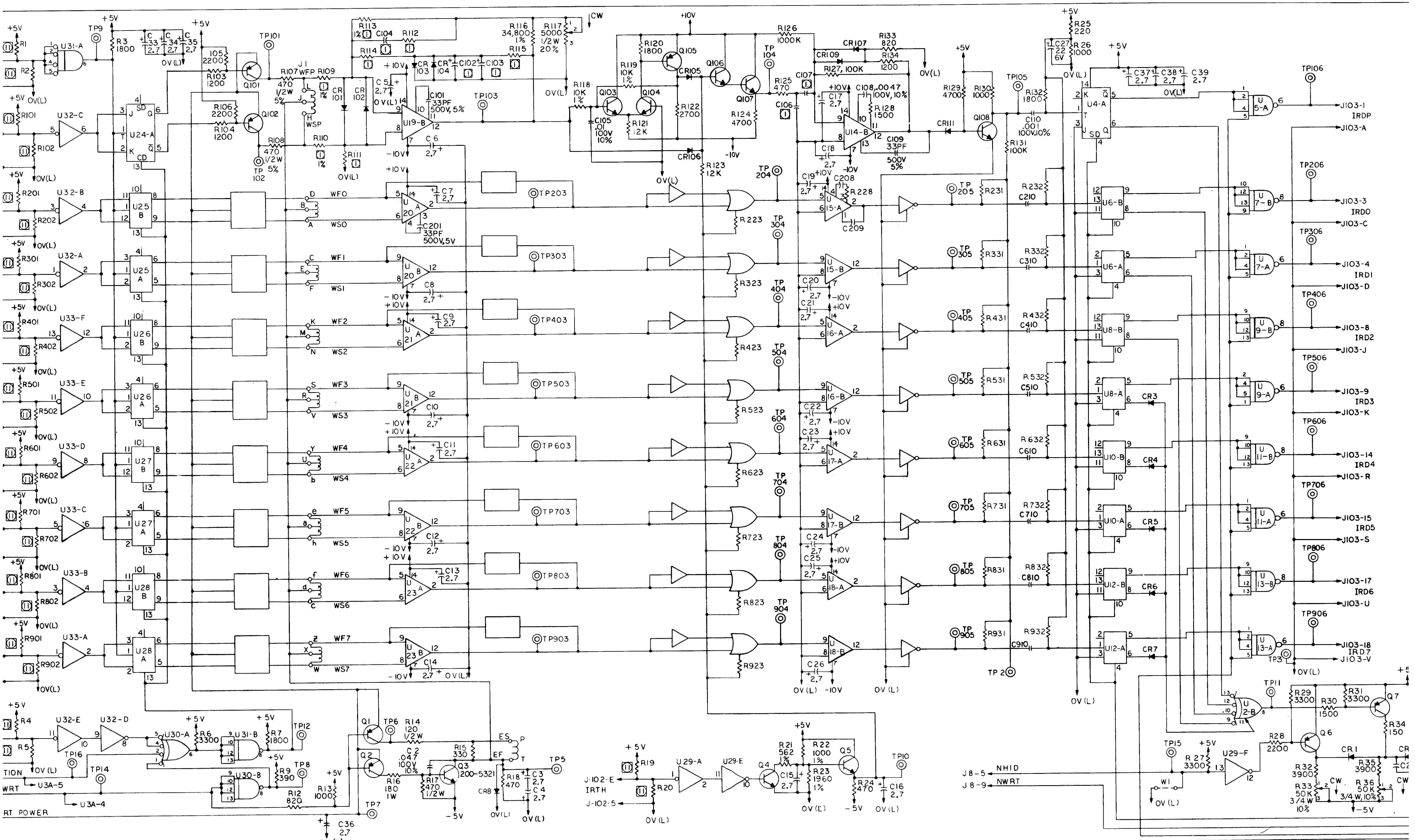




NOTES: UNLESS OTHERWISE SPECIFIED

1. SEE VERSION TABLE FOR VALUE
2. 3 DIGIT REF NOS. ARE ASSIGNED TO REPETITIOUS CIRCUITS. EX: TP101 IS CIRCUIT 100, TP901 IS CIRCUIT 900 SINGLE DIGIT NOS. ARE ASSIGNED TO NON-REPETITIVE CIRCUITS: EX: TP1-TP2
3. CIRCUIT 100 IS TYPICAL OF CIRCUIT 200 THRU 900.
4. ALL RESISTORS IN OHMS, 1/4W, 5%
5. ALL DIODES ARE PEC 300-4446.
6. ALL CAPACITORS IN MICROFARADS, 35V, 20%.
7. ALL NPN TRANSISTORS ARE PEC 200-4123. ALL PNP TRANSISTORS ARE PEC 200-4125.
8. PIN 7 OF ALL IC'S IS OV. PIN 14 OF ALL IC'S IS +5V.
9. FOR ASSY SEE DRAWING 101721. FOR SPEC SEE DRAWING 101724.
10. U1, 29, 32, 33, ARE 700-8520. U2, 3, 5, 7, 9, 11, 13, 30, 31, 34 ARE PEC 700-8440. U24-28 ARE PEC 700-8520. U4, 6, 8, 10, 12 ARE PEC 700-8530. U14-23 ARE PEC 400-1437.
11. VERSIONS WITHOUT TERMINATOR RESISTORS ARE FOR USE WITH MTA.
12. C31 IS 500V 5% FOR -01 THRU -08, AND 100 V, 10% FOR -09 THRU -24

20	19	18	17



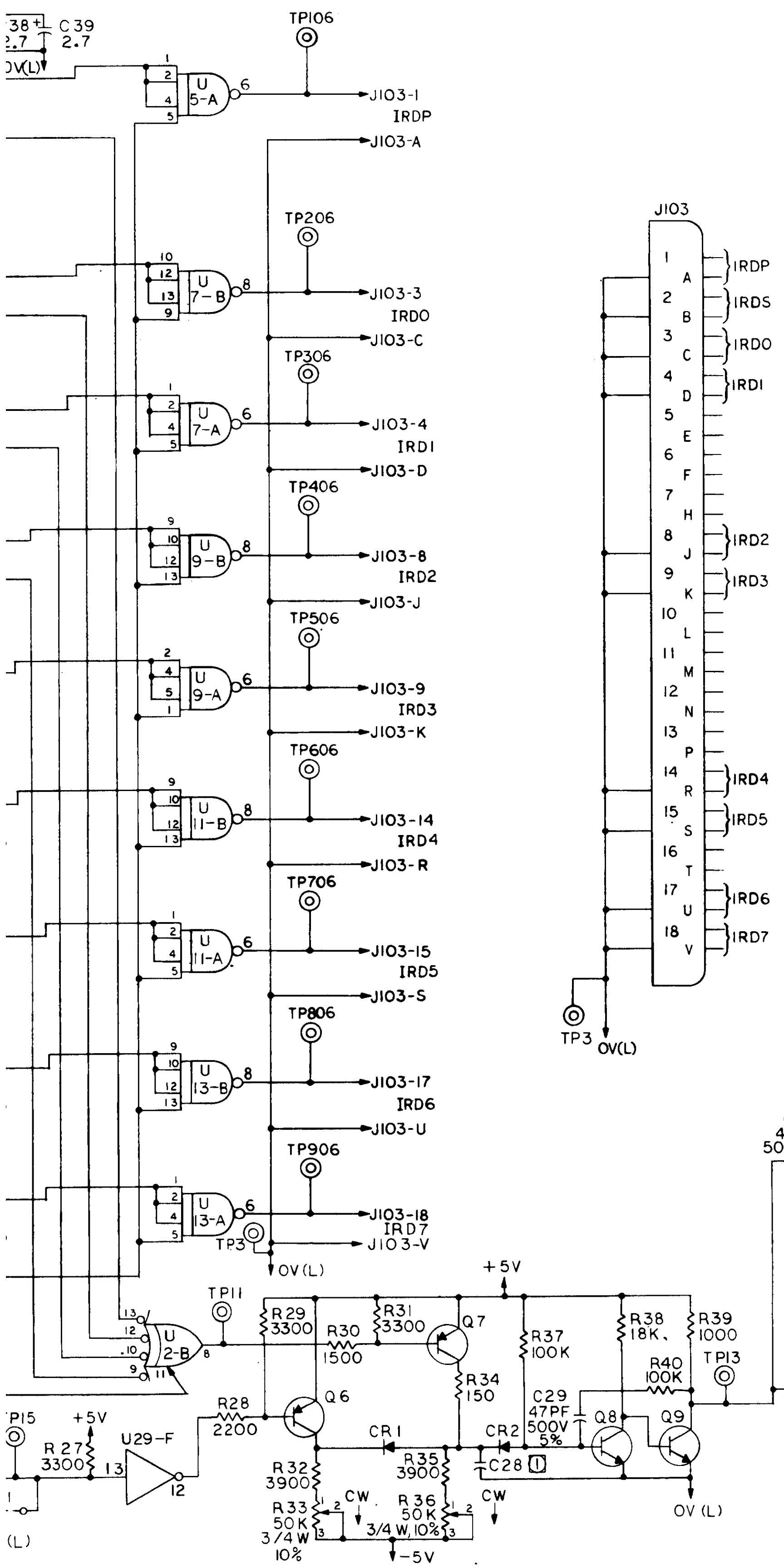
18	17	16	15	14	13	12	11	10	9

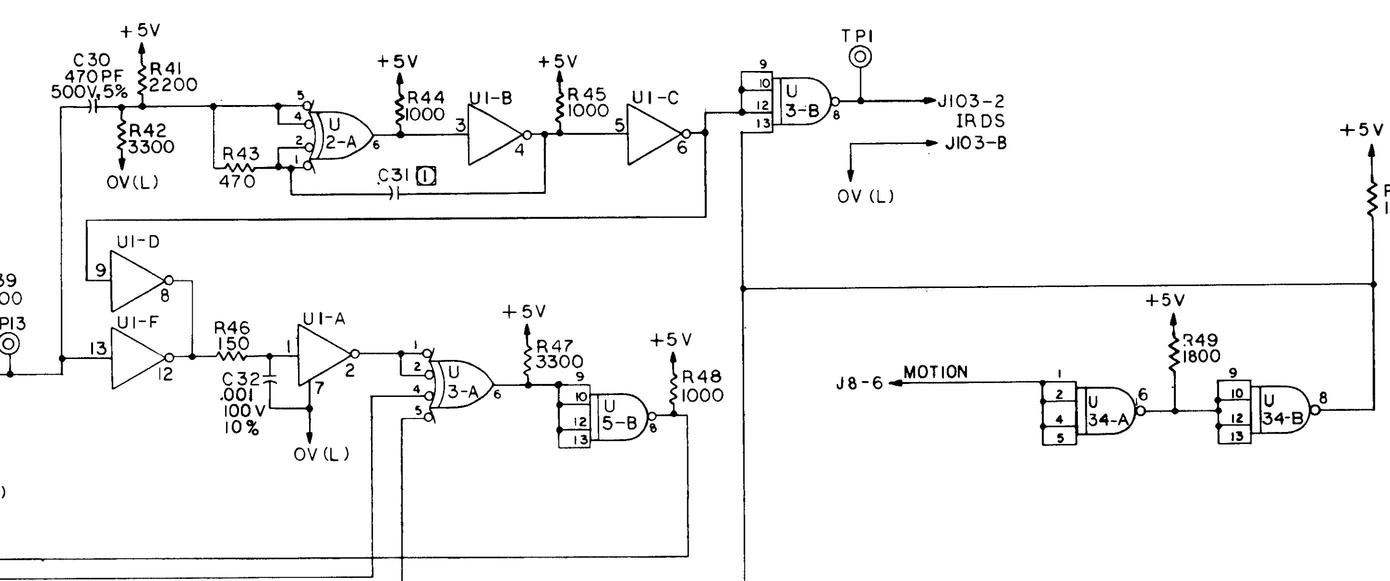
VERSION TABLE

VERSION	SPEED IPS	HEAD TRACKS	CIRCUITS USED	W1	R109-909 R110-910	R111-911	R112-912	R113-913	R114-914	R115-915	C102-C902	C103-903	C104-904 500V5%	C106-906 500V10%	C107-907 100V10%	C28 100V 10%	C31 [12]		R1,4,101-901,19 [11]	R2,5,102-902,20 [11]
-01	75	9	ALL	USE	3,160	6810	6.8K	68,100	8,200	6.8K	2.7	2.7	33 PF	.0015	.001	.0015	470PF		220	330
-02		7	100, 400-900	OMIT															↑	↑
-03	45	9	ALL	USE	3,160	6810	10K	110K	8,200	6.8K	OMIT	10	33 PF	.0022	.0015	.0022	470PF		↓	↓
-04		7	100, 400-900	OMIT															220	330
-05	75	9	ALL	USE	3,160	6810	6.8K	68,100	8,200	6.8K	2.7	2.7	33 PF	.0015	.001	.0015	470PF		OMIT	OMIT
-06		7	100, 400-900	OMIT															↑	↑
-07	45	9	ALL	USE	3,160	6810	10K	110K	8,200	6.8K	OMIT	10	33 PF	.0022	.0015	.0022	470PF		↓	↓
-08		7	100, 400-900	OMIT															OMIT	OMIT
-09	37.5	9	ALL	USE	1620	23,700	6.8K	68,100	27K	3.9K	OMIT	12	56 PF	.0033	.0022	.0022	.0015		220	330
-10																			OMIT	OMIT
-11		7	100, 400-900	OMIT															220	330
-12																			OMIT-	OMIT
-13	25	9	ALL	USE	1620	23,700	10K	90,900	27K	6.8K	OMIT	10	56 PF	.0047	.0033	.0033	.0015		220	330
-14																			OMIT	OMIT
-15		7	100, 400-900	OMIT															220	330
-16																			OMIT	OMIT
-17	18.75	9	ALL	USE	1620	23,700	15K	133K	33K	6.8K	OMIT	10	56 PF	.0068	.0047	.0047	.0015		220	330
-18																			OMIT	OMIT
-19		7	100, 400-900	OMIT															220	330
-20																			OMIT	OMIT
-21	12.5	9	ALL	USE	1620	23,700	18K	178K	27K	6.8K	OMIT	10	56 PF	.01	.0068	.0068	.0015		220	330
-22																			OMIT	OMIT
-23		7	100, 400-900	OMIT															220	330
-24																			OMIT	OMIT

REVISIONS

REV	DESCRIPTION	DATE	DR	CHK	APPR
A	ERN 3-EW	[illegible]	[illegible]	[illegible]	[illegible]
B	ECN 2727A	[illegible]	[illegible]	[illegible]	[illegible]
C	ECN 2851A	[illegible]	T.B	[illegible]	RCA
D	ECN 3370	4-17-72	[illegible]	[illegible]	RCA
E	ECN 3762	6-6-72	[illegible]	[illegible]	RCA
F	ECN 4531	11-22-[illegible]	[illegible]	[illegible]	DB
G	ECN 4894	[illegible]	I.J.	[illegible]	KN





REFERENCE DESIGNATORS

LAST USED		DELETED
R934	R50	R10, R11
C910	C46	CR108 THRU CR908
CR911	CR8	CR110 THRU CR910
Q908	Q9	R8
	U34	C1
TP906	TP16	
	W1	

101721	TOP ASSY
NEXT ASSY	1ST USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES:
.XX ± .010 ANGULAR
.XXX ± .005 ± 1/2°
X/X ± 1/32
BREAK ALL SHARP CORNERS APPROX. .010

FINISH:

SIGNATURES	DATE
DR [illegible]	4-7-71
CHK [illegible]	5/14/71
DES [illegible]	5/19/71
ENGR [illegible]	5/25/71
ENG [illegible]	[illegible]

MATL:

PEC PERIPHERAL EQUIPMENT CORPORATION

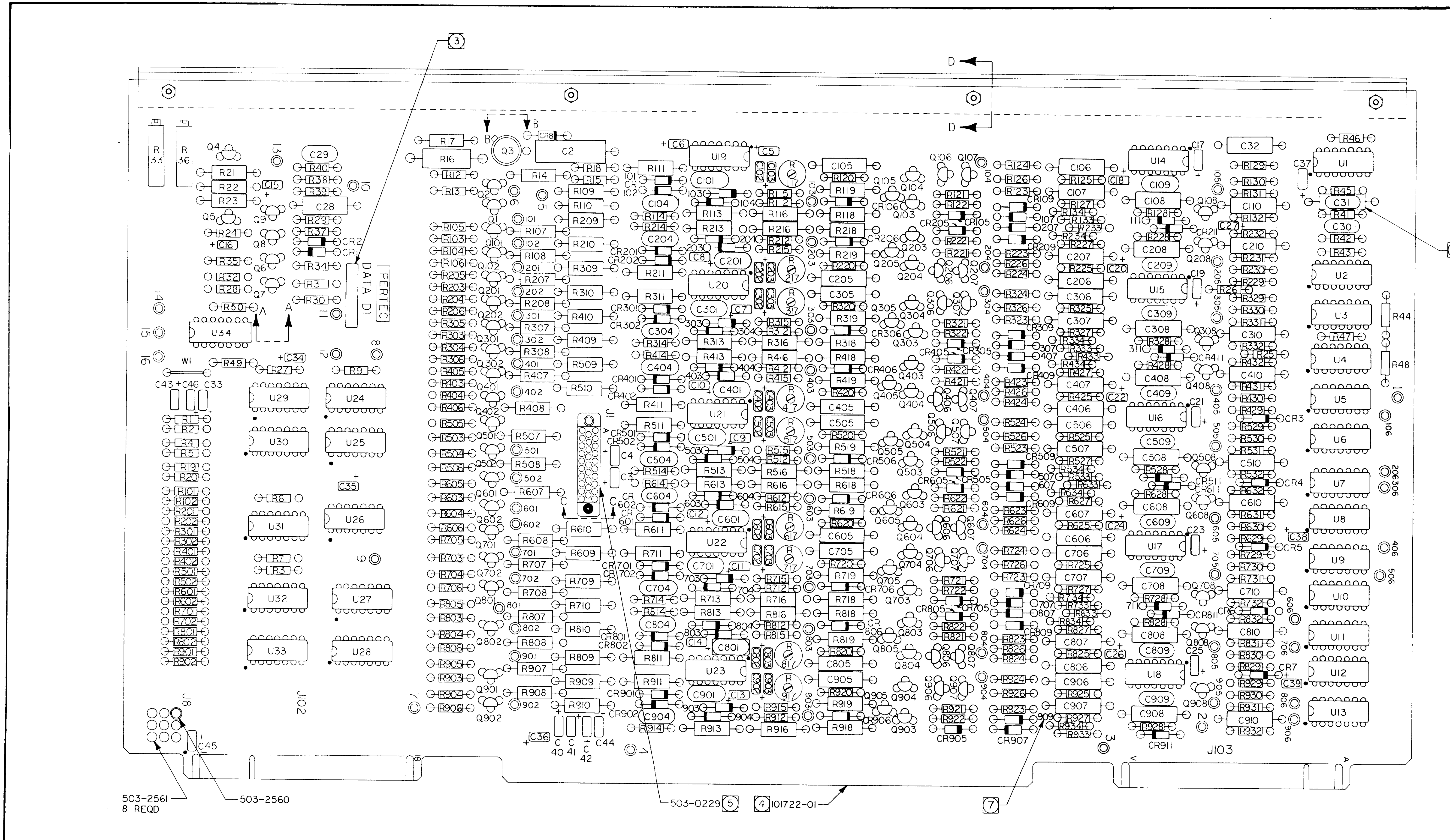
TITLE SCHEMATIC DATA D-1

SIZE J | CODE IDENT. NO. | DWG NO. 101720 | REV G

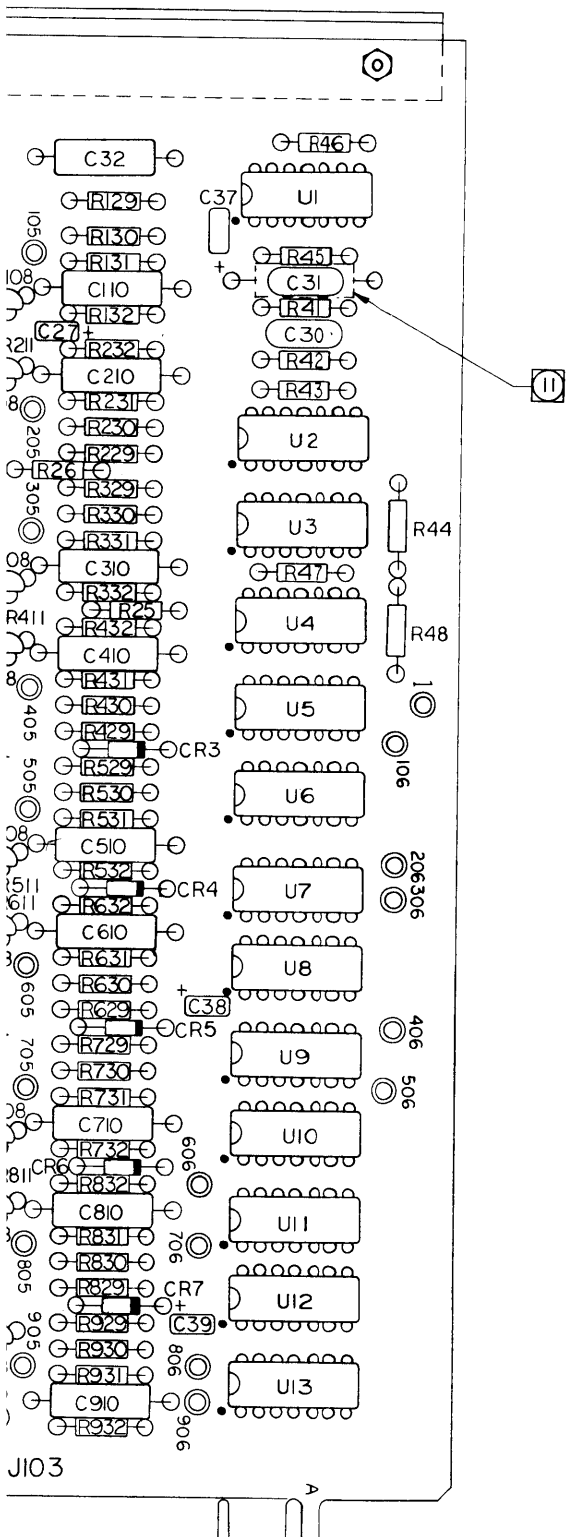
SCALE | DO NOT SCALE DWG | SHEET 1 OF 1

10 9 8 7 6 5 4 3 2 1

H G F E D C B A



PERTEC
DATA D1
J102
J103
J8
J1
U34
W1
503-2561
8 REQD
503-2560
503-0229
101722-01
3
5
4
7
11



11. ALTERNATE CONFIGURATION OF C31 SHOWN IN PHANTOM.

10. VERSIONS WITHOUT TERMINATOR RESISTORS ARE FOR USE WITH MTA.

9. BEFORE INSTALLING SUPPORT ANGLE 101124-01. TO THE BOARD ASSY. VINYL TAPE 667-4476 SHOULD BE APPLIED TO THE PC BOARD AS SHOWN ON VIEW D-D FOR -03,-04,-07 THRU -24 ONLY.

8. FOR PART NUMBERS WHICH ARE ARE AFFECTED BY VERSION NUMBERS SEE TABLE II.

7. DESIGNATION "CR" IS INTENTIONALY OMITED ON SOME DIODES FOR CLARITY.

6. FOR PART NUMBERS WHICH ARE NOT AFFECTED BY VERSION NUMBERS SEE TABLE I.

5. ORIENTATE CONNECTOR J2 AS SHOWN.

4. THIS ASSY SHALL BE MADE FROM PROCESS BOARD 101722-01 REV 'K' AND SUBSEQUENT.

3. MARK PART NO. 101721 INCLUDING VERSION NO. AND VERSION ISSUE LETTER.

2. ASSEMBLE PER STANDARD MFG METHODS.

1. REFERENCE DRAWINGS: SCHEMATIC-101720
SPECIFICATION-101724

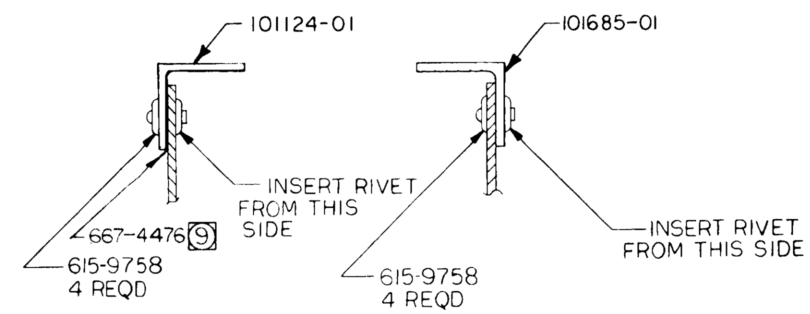
NOTES: UNLESS OTHERWISE SPECIFIED

TABLE I (6)

PART NO	REFERENCE DESIGNATION
100-1025	R13,26,39,44,45,48,130,430-930
100-1045	R37,40,127,427-927,131,431-931
100-1055	R126,426-926
100-1225	R103,403-903,104,404-904 R134, 434-934
100-1515	R34,46
100-1525	R30,128,428-928
100-1825	R3,7,120,420-920,132,432-932 R49,50
100-2215	R25
100-2225	R28,41,105,405-905,106,406-906
100-2725	R122,422-922
100-3315	R15
100-3325	R6,27,29,31,42,47
100-3915	R9
100-3925	R32,35
100-4715	R18,24,43,125,425-925
100-4725	R124,424-924,129,429-929
100-8215	R12, 133, 433-933
101-1215	R14
101-4715	R17,107,407-907,108,408-908
102-1815	R16
104-1001	R22
104-1002	R118,418-918,119,419-919
104-1961	R23
104-3482	R116,416-916
104-5620	R21
121-5030	R33,36
123-5020	R117,417-917
100-1235	R121,421-921,123,423-923
100-1835	R38

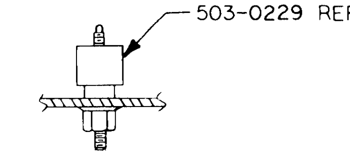
TABLE I (CONT)

PART NO	REFERENCE DESIGNATION
130-3305	C101,401-901,109,409-909
130-4705	C29
130-4715	C30
131-1020	C110,410-910, 32
131-1030	C105,405-905
131-4720	C108,408-908
131-4730	C2
132-2262	C27
132-2752	C3-26, 33-46
200-4123	Q4,5,8,9,103,403-903,104,404-904, Q106,406-906,107,407-907, Q108,408-908
200-4125	Q1,2,6,7,101,401-901,102,402- Q902,105,405-905
200-5321	Q3
300-4446	CR1-8,101,401-901,102,402-902, CR103,403-903,104,404-904, CR105,405-905,106,406-906, CR107,407-907, 111, CR109,409-909, CR411-911
400-1437	U14, 16-19, 21-23
503-0229	J1
700-8360	U1,29,33,32
700-8440	U2,3,5,9,11,13,30,31,34
700-8520	U24,26-28
700-8530	U4,8,10,12



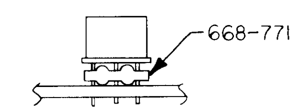
VIEW D-D (-03 & -04) (-07 THRU -24)

VIEW D-D (-01 & -02) (-05 & -06) AS SHOWN



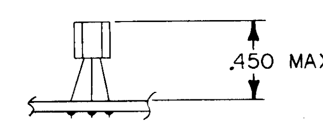
SECTION C-C

MTG DETAIL FOR J1



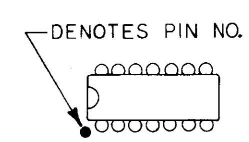
VIEW B-B

TYP TRANSISTOR MTG (TO-5)



VIEW A-A

TYP TRANSISTOR MTG HEIGHT (TO-92)



I C ORIENTATION

REV	
A	ERN 3-E
B	ECN 2665
C	ECN 2727
D	ECN 2851
E	ECN 3105
F	ECN 3762
G	ECN 4531
H	ECN 4821
H1	ECN 4996
H2	ECN 5177
J	ECN 5415
K	ECN 489
L	ECN 598
L1	ECN 651

FOR LIST OF MATERIALS SEE LM101721 AND APPLICABLE DASH NUMBER. FOR ASSY VERSION INFORMATION SEE SCHEMATIC 101720.

DIOD

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES: .XX ± .010 .XXX ± .005 $\frac{X}{X} \pm \frac{1}{32}$
ANGULAR ± 1/2°
BREAK ALL SHARP CORNERS APPROX. .010
FINISH:

SIGNATURES
DR W.S. E Bea
CHK
DES
ENGR
ENGR
MATL:

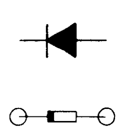
THE INFORMATION HEREON IS PROPERTY OF PERIPHERAL EQU CORPORATION. NO REPRODUCT UNAUTHORIZED USE SHALL BE

TOP ASSY	6000
NEXT ASSY	1ST USED ON
APPLICATION	

REVISIONS

REV	DESCRIPTION	DATE	DR	CHK	APPR
A	ERN 3-EW	[illegible]	[illegible]		
B	ECN 2665	[illegible]	[illegible]		
C	ECN 2727A	29.71	[illegible]	KJK	[illegible]
D	ECN 2851A	10/26/71	T.B	[illegible]	[illegible]
E	ECN 3105 A	6-6-72	D.C	[illegible]	
F	ECN 3762	6-6-72	DC	[illegible]	
G	ECN 4531	11-22-72	D.C	KJK	
H	ECN 4821	1/24/73	[illegible]	[illegible]	[illegible]
H1	ECN 4996	3/15/73	[illegible]	[illegible]	
H2	ECN 5177	7/16/73	[illegible]	[illegible]	[illegible]
J	ECN 5415	8/22/73	[illegible]	[illegible]	[illegible]
K	ECN 4894	10/10/73	J.J.	[illegible]	KW
L	ECN 5988	1/30/74	[illegible]	[illegible]	[illegible]
L1	ECN 6519	8/7/74	[illegible]	[illegible]	[illegible]

FOR LIST OF MATERIALS SEE LM101721 AND APPLICABLE DASH NUMBER.
FOR ASSY VERSION INFORMATION SEE SCHEMATIC 101720.



DIODE ORIENTATION

PART NO. 101721 REV

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. TOLERANCES: .XX ± .010, .XXX ± .005, $\frac{X}{X} \pm \frac{1}{32}$; ANGULAR $\pm \frac{1}{2}°$ ✓. BREAK ALL SHARP CORNERS APPROX. .010	THE INFORMATION HEREON IS THE PROPERTY OF PERIPHERAL EQUIPMENT CORPORATION. NO REPRODUCTION OR UNAUTHORIZED USE SHALL BE MADE.	PEC PERIPHERAL EQUIPMENT CORPORATION	
	SIGNATURES: DR W.S. L. Bean 4/28/71; CHK [illegible]; DES [illegible] 5/14/71; ENGR [illegible] 5/22/71; ENGR	TITLE: PCBA DATA D-1	
FINISH:	MATL:	SIZE E; CODE IDENT. NO. ——; DWG NO. 101721	REV L1
		SCALE 2:1; DO NOT SCALE DWG	SHEET OF 2

ASSY	6000
NEXT ASSY	1ST USED ON
APPLICATION	

TABLE II (8)

PART NUMBER

REFERENCE DESIGNATION	-01	-02	-03	-04	-05	-06	-07	-08
TRK	9	7	9	7	9	7	9	7
IPS	75		45		75		45	
R230, 330	100-1025		100-1025		100-1025		100-1025	
R112, 412-912	100-6825	100-6825	100-1035	100-1035	100-6825	100-6825	100-1035	100-1035
R212, 312	100-6825		100-1035		100-6825		100-1035	
R227, 327, 231, 331	100-1045		100-1045		100-1045		100-1045	
R226, 326	100-1055		100-1055		100-1055		100-1055	
R203,303,204,304,234,334	100-1225		100-1225		100-1225		100-1225	
R221, 321, 223, 323	100-1235		100-1235		100-1235		100-1235	
R228, 328	100-1525		100-1525		100-1525		100-1525	
R220, 320, 232, 332	100-1825		100-1825		100-1825		100-1825	
(10) R201, 301	100-2215		100-2215					
R205, 305, 206, 306	100-2225		100-2225		100-2225		100-2225	
R222, 322	100-2725		100-2725		100-2725		100-2725	
(10) R202, 302	100-3315		100-3315					
R225 325	100-4715		100-4715		100-4715		100-4715	
R224, 324, 229, 329	100-4725		100-4725		100-4725		100-4725	
R114, 414 914	100-8225	100-8225	100-8225	100-8225				100-8225
R214, 314	100-8225		100-8225		100-8225		100-8225	
R215, 315	100-6825		100-6825		100-6825		100-6825	
R115, 415-915	100-6825	100-6825	100-6825	100-6825	100-6825	100-6825	100-6825	100-6825
R207, 307, 208, 308,	101-4715		101-4715		101-4715		101-4715	
R109,409-909,110,410-910	104 3161							104-3161
R209, 309, 210, 310,	104-3161		104-3161		104-3161		104-3161	
R218, 318, 219, 319,	104-1002		104-1002		104-1002		104-1002	
R113, 413-913	104-6812	104-6812	104-1103	104-1103	104-6812	104-6812	104-1103	104-1103
R213, 313	104-6812		104-1103		104-6812		104-1103	
R216, 316	104-3482		104-3482		104-3482		104-3482	
R111, 411-911	104-6811							104-6811
R211, 311	104-6811		104-6811		104-6811		104-6811	
R217, 317	123-5020		123-5020		123-5020		123-5020	
C201, 301, 209, 309	130-3305		130-3305		130-3305		130-3305	
C104, 404-904	130-3305							130-3305
C204, 304	130-3305		130-3305		130-3305		130-3305	
C31	130-4715							130-4715
C107, 407-907	131-1020	131-1020	131-1520	131-1520	131-1020	131-1020	131-1520	131-1520
C207, 307	131-1020		131-1520		131-1020		131-1520	
C210, 310	131-1020		131-1020		131-1020		131-1020	
C205, 305	131-1030		131-1030		131-1030		131-1030	
C106, 406-906	131-1520	131-1520	131-2220	131-2220	131-1520	131-1520	131-2220	131-2220
C206, 306	131-1520		131-2220		131-1520		131-2220	
C208, 308	131-4720		131-4720		131-4720		131-4720	
C102, 402-902.	132-2752	132-2752			132-2752	132-2752		
C202, 302	132-2752	132-2752			132-2752	132-2752		
C203, 303	132-2752	132-2752	132-1062	132-1062	132-2752	132-2752	132-1062	132-1062
C103, 403-903	132-2752	132-2752	132-1062	132-1062	132-2752	132-2752	132-1062	132-1062
Q203, 303, 204, 304, 206, 306, 207, 307, 208, 308	200-4123		200-4123		200-4123		200-4123	
Q201, 301, 202, 302, 205, 305	200-4125		200-4125		200-4125		200-4125	
CR201, 301, 202, 302, 203, 303, 204, 304, 205, 305, 206, 306, 207, 307, 209, 309, 211, 311	300-4446		300-4446		300-4446		300-4446	
C28	131-1520	131-1520	131-2220	131-2220	131-1520	131-1520	131-2220	131-2220
U15, 20	400-1437		400-1437		400-1437		400-1437	
U7	700-8440		700-8440		700-8440		700-8440	
U25	700-8520		700-8520		700-8520		700-8520	
U6	700-8530		700-8530		700-8530		700-8530	
W1	100373-02		100373-02		100373-02		100373-02	
(10) R1, 4, 19, 101, 401-901	100-2215			100-2215				
(10) R2, 5, 20, 102, 402-902	100-3315			100-3315				
R233, 333	100-8215		100-8215		100-8215		100-8215	

REFERENCE DESIGNATION	-09	-10	-11	-12	-13	-14	-15	-16	-17	-18	-19	-20	-21
TRK	9		7		9		7		9		7		
IPS	37.5				25				18.75				
R230, 330	100-1025	100-1025			100-1025	100-1025			100-1025	100-1025			100-1
R112, 412-912	100-6825			100-6825	100-1035			100-1035	100-1535			100-1535	100-18
R212, 312	100-6825	100-6825			100-1035	100-1035			100-1535	100-1535			100-18
R227, 327, 231, 331	100-1045	100-1045			100-1045	100-1045			100-1045	100-1045			100-10
R226, 326	100-1055	100-1055			100-1055	100-1055			100-1055	100-1055			100-10
R203,303,204,304,234,334	100-1225	100-1225			100-1225	100-1225			100-1225	100-1225			100-12
R221, 321, 223, 323	100-1235	100-1235			100-1235	100-1235			100-1235	100-1225			100-12
R228, 328	100-1525	100-1525			100-1525	100-1525			100-1525	100-1525			100-1
R220, 320, 232, 332	100-1825	100-1825			100-1825	100-1825			100-1825	100-1825			100-1
(10) R201, 301	100-2215				100-2215				100-2215				100-2
R205, 305, 206, 306	100-2225	100-2225			100-2225	100-2225			100-2225	100-2225			100-2
R222, 322	100-2725	100-2725			100-2725	100-2725			100-2725	100-2725			100-2
(10) R202, 302	100-3315				100-3315				100-3315				100-3
R225 325	100-4715	100-4715			100-4715	100-4715			100-4715	100-4715			100-4
R224, 324, 229, 329	100-4725	100-4725			100-4725	100-4725			100-4725	100-4725			100-4
R114, 414 914	100-2735							100-2735	100-3335			100-3335	100-2
R214, 314	100-2735	100-2735			100-2735	100-2735			100-3335	100-3335			100-2
R215, 315	100-3925	100-3925			100-6825	100-6825			100-6825	100-6825			100-6
R115, 415-915	100-3925			100-3925	100-6825								
R207, 307, 208, 308,	101-4715	101-4715			101-4715	101-4715			101-4715	101-4715			101-4
R109,409-909,110,410-910	104-1621												
R209, 309, 210, 310,	104-1621	104-1621			104-1621	104-1621			104-1621	104-1621			104-1
R218, 318, 219, 319,	104-1002	104-1002			104-1002	104-1002			104-1002	104-1002			104-1
R113, 413-913	104-6812			104-6812	104-9092			104-9092	104-1333			104-1333	104-1
R213, 313	104-6812	104-6812			104-9092	104-9092			104-1333	104-1333			104-1
R216, 316	104-3482	104-3482			104-3482	104-3482			104-3482	104-3482			104-3
R111, 411-911	104-2372												
R211, 311	104-2372	104-2372			104-2372	104-2372			104-2372	104-2372			104-2
R217, 317	123-5020	123-5020			123-5020	123-5020			123-5020	123-5020			123-5
C201, 301, 209, 309	130-3305	130-3305			130-3305	130-3305			130-3305	130-3305			130-3
C104, 404-904	130-5605												
C204, 304	130-5605	130-5605			130-5605	130-5605			130-5605	130-5605			130-5
C31	131-1520												
C107, 407-907	131-2220			131-2220	131-3320			131-3320	131-4720			131-4720	131-6
C207, 307	131-2220	131-2220			131-3320	131-3320			131-4720	131-4720			131-6
C210, 310	131-1020	131-1020			131-1020	131-1020			131-1020	131-1020			131-1
C205, 305	131-1030	131-1030			131-1030	131-1030			131-1030	131-1030			131-1
C106, 406-906	131-3320			131-3320	131-4720			131-4720	131-6820			131-6820	131-1
C206, 306	131-3320	131-3320			131-4720	131-4720			131-6820	131-6820			131-1
C208, 308	131-4720	131-4720			131-4720	131-4720			131-4720	131-4720			131-4
C102, 402-902.													
C202, 302													
C203, 303	132-1262	132-1262			132-1062	132-1062			132-1062	132-1062			132-1
C103, 403-903	132-1262			132-1262	132-1062								
Q203, 303, 204, 304, 206, 306, 207, 307, 208, 308	200-4123	200-4123			200-4123	200-4123			200-4123	200-4123			200-
Q201, 301, 202, 302, 205, 305	200-4125	200-4125			200-4125	200-4125			200-4125	200-4125			200-
CR201, 301, 202, 302, 203, 303, 204, 304, 205, 305, 206, 306, 207, 307, 209, 309, 211, 311	300-4446	300-4446			300-4446	300-4446			300-4446	300-4446			300-
C28	131-2220			131-2220	131-3320			131-3320	131-4720			131-4720	131-6
U15, 20	400-1437	400-1437			400-1437	400-1437			400-1437	400-1437			400-
U7	700-8440	700-8440			700-8440	700-8440			700-8440	700-8440			700-
U25	700-8520	700-8520			700-8520	700-8520			700-8520	700-8520			700-
U6	700-8530	700-8530			700-8530	700-8530			700-8530	700-8530			700-
W1	100373-02	100373-02			100373-02	100373-02			100373-02	100373-02			1003
(10) R1, 4, 19, 101, 401-901	100-2215		100-2215		100-2215		100-2215		100-2215		100-2215		100-
(10) R2, 5, 20, 102, 402-902	100-3315		100-3315		100-3315		100-3315		100-3315		100-3315		100-
R233, 333	100-8215	100-8215			100-8215	100-8215			100-8215	100-8215			100-

TOP ASSY	6000
NEXT ASSY	1ST USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. TOLERANCES: .XX ± .01, .XXX ± .005, $\frac{X}{X} \pm \frac{1}{32}$; ANGULAR $\pm \frac{1}{2}°$ ✓. BREAK ALL SHARP CORNERS APPROX. .010

FINISH:

MATL:

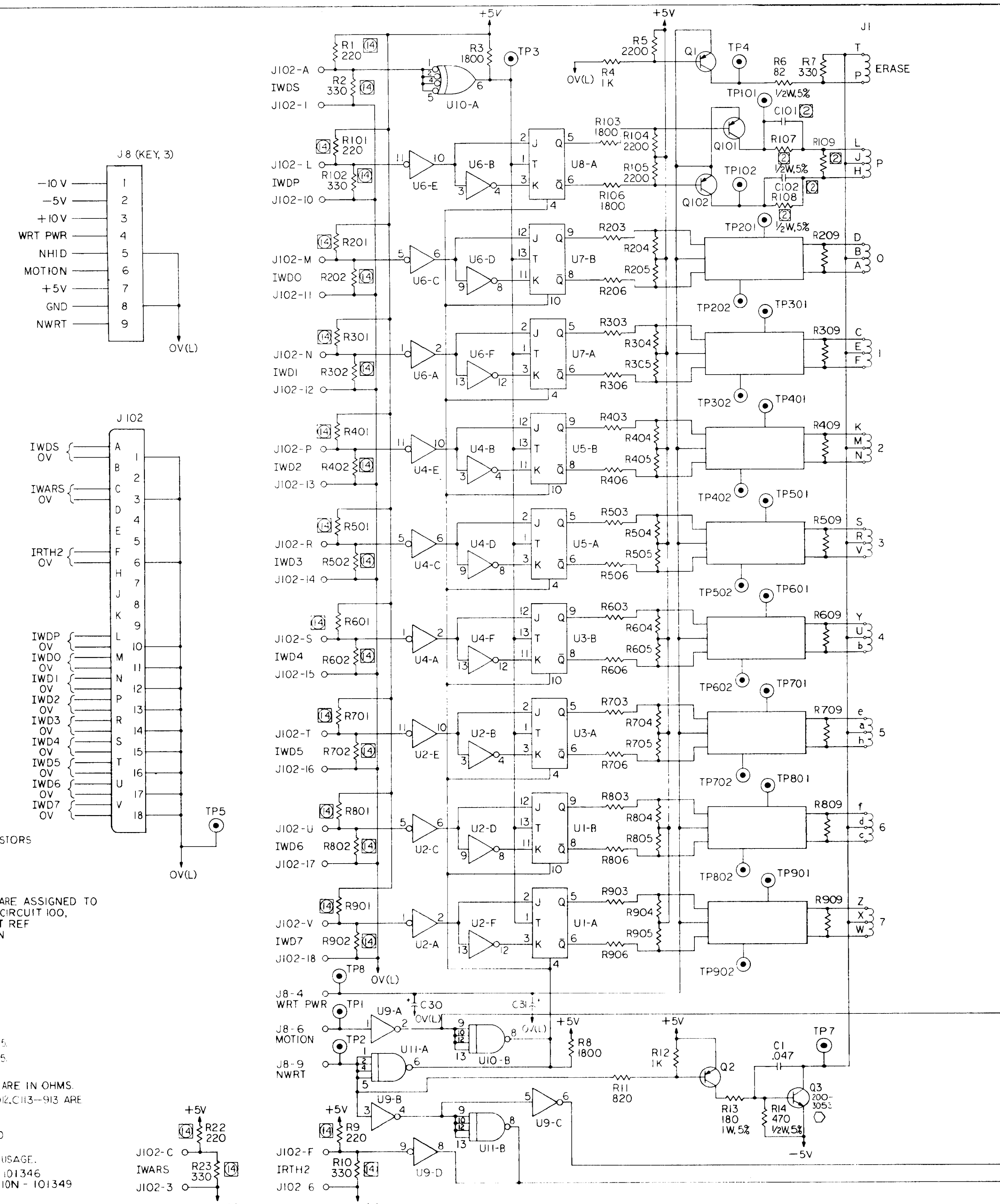
REV	DESCRIPTION	DATE	DR	CHK	APPR
	SEE SHT 1				

TABLE II (8)

REFERENCE DESIGNATION	PART NUMBER																							
TRK	9	7	9	7	9	7	9	7	9		7		9		7		9		7		9		7	
IPS	75		45		75		45		37.5				25				18.75				12.5			
VER	-01	-02	-03	-04	-05	-06	-07	-08	-09	-10	-11	-12	-13	-14	-15	-16	-17	-18	-19	-20	-21	-22	-23	-24
R230, 330	100-1025		100-1025		100-1025		100-1025		100-1025	100-1025			100-1025	100-1025			100-1025	100-1025			100-1025	100-1025		
R112, 412-912	100-6825	100-6825	100-1035	100-1035	100-6825	100-6825	100-1035	100-1035	100-6825	←	→	100-6825	100-1035	←	→	100-1035	100-1535	←	→	100-1535	100-1835	←	→	100-1835
R212, 312	100-6825		100-1035		100-6825		100-1035		100-6825	100-6825			100-1035	100-1035			100-1535	100-1535			100-1835	100-1835		
R227, 327, 231, 331	100-1045		100-1045		100-1045		100-1045		100-1045	100-1045			100-1045	100-1045			100-1045	100-1045			100-1045	100-1045		
R226, 326	100-1055		100-1055		100-1055		100-1055		100-1055	100-1055			100-1055	100-1055			100-1055	100-1055			100-1055	100-1055		
R203, 303, 204, 304, 234, 334	100-1225		100-1225		100-1225		100-1225		100-1225	100-1225			100-1225	100-1225			100-1225	100-1225			100-1225	100-1225		
R221, 321, 223, 323	100-1235		100-1235		100-1235		100-1235		100-1235	100-1235			100-1235	100-1235			100-1235	100-1225			100-1235	100-1235		
R228, 328	100-1525		100-1525		100-1525		100-1525		100-1525	100-1525			100-1525	100-1525			100-1525	100-1525			100-1525	100-1525		
R220, 320, 232, 332	100-1825		100-1825		100-1825		100-1825		100-1825	100-1825			100-1825	100-1825			100-1825	100-1825			100-1825	100-1825		
(10) R201, 301	100-2215		100-2215						100-2215				100-2215				100-2215				100-2215			
R205, 305, 206, 306	100-2225		100-2225		100-2225		100-2225		100-2225	100-2225			100-2225	100-2225			100-2225	100-2225			100-2225	100-2225		
R222, 322	100-2725		100-2725		100-2725		100-2725		100-2725	100-2725			100-2725	100-2725			100-2725	100-2725			100-2725	100-2725		
(10) R202, 302	100-3315		100-3315						100-3315				100-3315				100-3315				100-3315			
R225, 325	100-4715		100-4715		100-4715		100-4715		100-4715	100-4715			100-4715	100-4715			100-4715	100-4715			100-4715	100-4715		
R224, 324, 229, 329	100-4725		100-4725		100-4725		100-4725		100-4725	100-4725			100-4725	100-4725			100-4725	100-4725			100-4725	100-4725		
R114, 414 914	100-8225	100-8225	100-8225	100-8225	←		→	100-8225	100-2735	←					→	100-2735	100-3335	←	→	100-3335	100-2735	←	→	100-2735
R214, 314	100-8225		100-8225		100-8225		100-8225		100-2735	100-2735			100-2735	100-2735			100-3335	100-3335			100-2735	100-2735		
R215, 315	100-6825		100-6825		100-6825		100-6825		100-3925	100-3925			100-6825	100-6825			100-6825	100-6825			100-6825	100-6825		
R115, 415-915	100-6825	100-6825	100-6825	100-6825	100-6825	100-6825	100-6825	100-6825	100-3925	←	→	100-3925	100-6825	←									→	100-6825
R207, 307, 208, 308,	101-4715		101-4715		101-4715		101-4715		101-4715	101-4715			101-4715	101-4715			101-4715	101-4715			101-4715	101-4715		
R109, 409-909, 110, 410-910	104 3161	←					→	104-3161	104-1621	←													→	104-1621
R209, 309, 210, 310,	104-3161		104-3161		104-3161		104-3161		104-1621	104-1621			104-1621	104-1621			104-1621	104-1621			104-1621	104-1621		
R218, 318, 219, 319,	104-1002		104-1002		104-1002		104-1002		104-1002	104-1002			104-1002	104-1002			104-1002	104-1002			104-1002	104-1002		
R113, 413-913	104-6812	104-6812	104-1103	04-1103	104-6812	104-6812	104-1103	104-1103	104-6812	←	→	104-6812	104-9092	←	→	104-9092	104-1333	←	→	104-1333	104-1783	←	→	104-1783
R213, 313	104-6812		104-1103		104-6812		104-1103		104-6812	104-6812			104-9092	104-9092			104-1333	104-1333			104-1783	104-1783		
R216, 316	104-3482		104-3482		104-3482		104-3482		104-3482	104-3482			104-3482	104-3482			104-3482	104-3482			104-3482	104-3482		
R111, 411-911	104-6811	←					→	104-6811	104-2372	←													→	104-2372
R211, 311	104-6811		104-6811		104-6811		104-6811		104-2372	104-2372			104-2372	104-2372			104-2372	104-2372			104-2372	104-2372		
R217, 317	123-5020		123-5020		123-5020		123-5020		123-5020	123-5020			123-5020	123-5020			123-5020	123-5020			123-5020	123-5020		
C201, 301, 209, 309	130-3305		130-3305		130-3305		130-3305		130-3305	130-3305			130-3305	130-3305			130-3305	130-3305			130-3305	130-3305		
C104, 404-904	130-3305	←					→	130-3305	130-5605	←													→	130-5605
C204, 304	130-3305		130-3305		130-3305		130-3305		130-5605	130-5605			130-5605	130-5605			130-5605	130-5605			130-5605	130-5605		
C31	130-4715	←					→	130-4715	131-1520	←													→	131-1520
C107, 407-907	131-1020	131-1020	131-1520	131-1520	131-1020	131-1020	131-1520	131-1520	131-2220	←	→	131-2220	131-3320	←	→	131-3320	131-4720	←	→	131-4720	131-6820	←	→	131-6820
C207, 307	131-1020		131-1520		131-1020		131-1520		131-2220	131-2220			131-3320	131-3320			131-4720	131-4720			131-6820	131-6820		
C210, 310	131-1020		131-1020		131-1020		131-1020		131-1020	131-1020			131-1020	131-1020			131-1020	131-1020			131-1020	131-1020		
C205, 305	131-1030		131-1030		131-1030		131-1030		131-1030	131-1030			131-1030	131-1030			131-1030	131-1030			131-1030	131-1030		
C106, 406-906	131-1520	131-1520	131-2220	131-2220	131-1520	131-1520	131-2220	131-2220	131-3320	←	→	131-3320	131-4720	←	→	131-4720	131-6820	←	→	131-6820	131-1030	←	→	131-1030
C206, 306	131-1520		131-2220		131-1520		131-2220		131-3320	131-3320			131-4720	131-4720			131-6820	131-6820			131-1030	131-1030		
C208, 308	131-4720		131-4720		131-4720		131-4720		131-4720	131-4720			131-4720	131-4720			131-4720	131-4720			131-4720	131-4720		
C102, 402-902.	132-2752	132-2752			132-2752	132-2752																		
C202, 302	132-2752	132-2752			132-2752	132-2752																		
C203, 303	132-2752	132-2752	132-1062	132-1062	132-2752	132-2752	132-1062	132-1062	132-1262	132-1262			132-1062	132-1062			132-1062	132-1062			132-1062	132-1062		
C103, 403-903	132-2752	132-2752	132-1062	132-1062	132-2752	132-2752	132-1062	132-1062	132-1262	←	→	132-1262	132-1062	←									→	132-1062
Q203, 303, 204, 304, 206, 306, 207, 307, 208, 308	200-4123		200-4123		200-4123		200-4123		200-4123	200-4123			200-4123	200-4123			200-4123	200-4123			200-4123	200-4123		
Q201, 301, 202, 302, 205, 305	200-4125		200-4125		200-4125		200-4125		200-4125	200-4125			200-4125	200-4125			200-4125	200-4125			200-4125	200-4125		
CR201, 301, 202, 302, 203, 303, 204, 304, 205, 305, 206, 306, 207, 307, 209, 309, 211, 311	300-4446		300-4446		300-4446		300-4446		300-4446	300-4446			300-4446	300-4446			300-4446	300-4446			300-4446	300-4446		
C28	131-1520	131-1520	131-2220	131-2220	131-1520	131-1520	131-2220	131-2220	131-2220	←	→	131-2220	131-3320	←	→	131-3320	131-4720	←	→	131-4720	131-6820	←	→	131-6820
U15, 20	400-1437		400-1437		400-1437		400-1437		400-1437	400-1437			400-1437	400-1437			400-1437	400-1437			400-1437	400-4137		
U7	700-8440		700-8440		700-8440		700-8440		700-8440	700-8440			700-8440	700-8440			700-8440	700-8440			700-8440	700-8440		
U25	700-8520		700-8520		700-8520		700-8520		700-8520	700-8520			700-8520	700-8520			700-8520	700-8520			700-8520	700-8520		
U6	700-8530		700-8530		700-8530		700-8530		700-8530	700-8530			700-8530	700-8530			700-8530	700-8530			700-8530	700-8530		
W1	100373-02		100373-02		100373-02		100373-02		100373-02	100373-02			100373-02	100373-02			100373-02	100373-02			100373-02	100373-02		
(10) R1, 4, 19, 101, 401-901	100-2215	←	→	100-2215					100-2215		100-2215		100-2215		100-2215		100-2215		100-2215		100-2215		100-2215	
(10) R2, 5, 20, 102, 402-902	100-3315	←	→	100-3315					100-3315		100-3315		100-3315		100-3315		100-3315		100-3315		100-3315		100-3315	
R233, 333	100-8215		100-8215		100-8215		100-8215		100-8215	100-8215			100-8215	100-8215			100-8215	100-8215			100-8215	100-8215		

TOP ASSY 6000	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES: .XX ± .01 .XXX ± .005 ANGULAR ± 1/2° BREAK ALL SHARP CORNERS APPROX. .010	PEC PERIPHERAL EQUIPMENT CORPORATION
NEXT ASSY / 1ST USED ON	FINISH:	TITLE PCBA DATA D1
APPLICATION	MATL:	SIZE E DWG NO. 101721 REV L1 SHEET 2 OF 2

DO NOT SCALE



Ⓜ14 VERSIONS WITHOUT TERMINATOR RESISTORS ARE FOR USE WITH MTA.

13. CIRCUIT 100 IS TYPICAL OF CIRCUITS 200 THRU 900.

12. 3 DIGIT REFERENCE DESIGNATIONS ARE ASSIGNED TO REPETITIVE CIRCUITS. EX: TP101 IS CIRCUIT 100, TP901 IS CIRCUIT 900. SINGLE DIGIT REF DESIGNATIONS ARE ASSIGNED TO NON REPETITIVE CIRCUITS. EX: TP1, TP2.

11. PIN 14 OF ALL IC'S IS +5V.

10. PIN 7 OF ALL IC'S IS OV(L).

9. INTEGRATED CIRCUITS:
U2, 4, 6, 9 ARE 700-8360.
U10, 11, 31-35 ARE 700-8440.
U1, 3, 5, 7, 8 ARE 700-8530.
U12-30 ARE 400-1437.

8. ALL PNP TRANSISTORS ARE 200-4125.

7. ALL NPN TRANSISTORS ARE 200-4135.

6. ALL DIODES ARE 300-4446.

5. ALL RESISTORS ARE ¼W, 5%, VALUES ARE IN OHMS.

4. CAPACITORS C2-28, 30 THRU 44, C112-912, C113-913 ARE 2.7UF, 35V, 20% ALL OTHERS IN MICROFARADS. 100V, 10%.

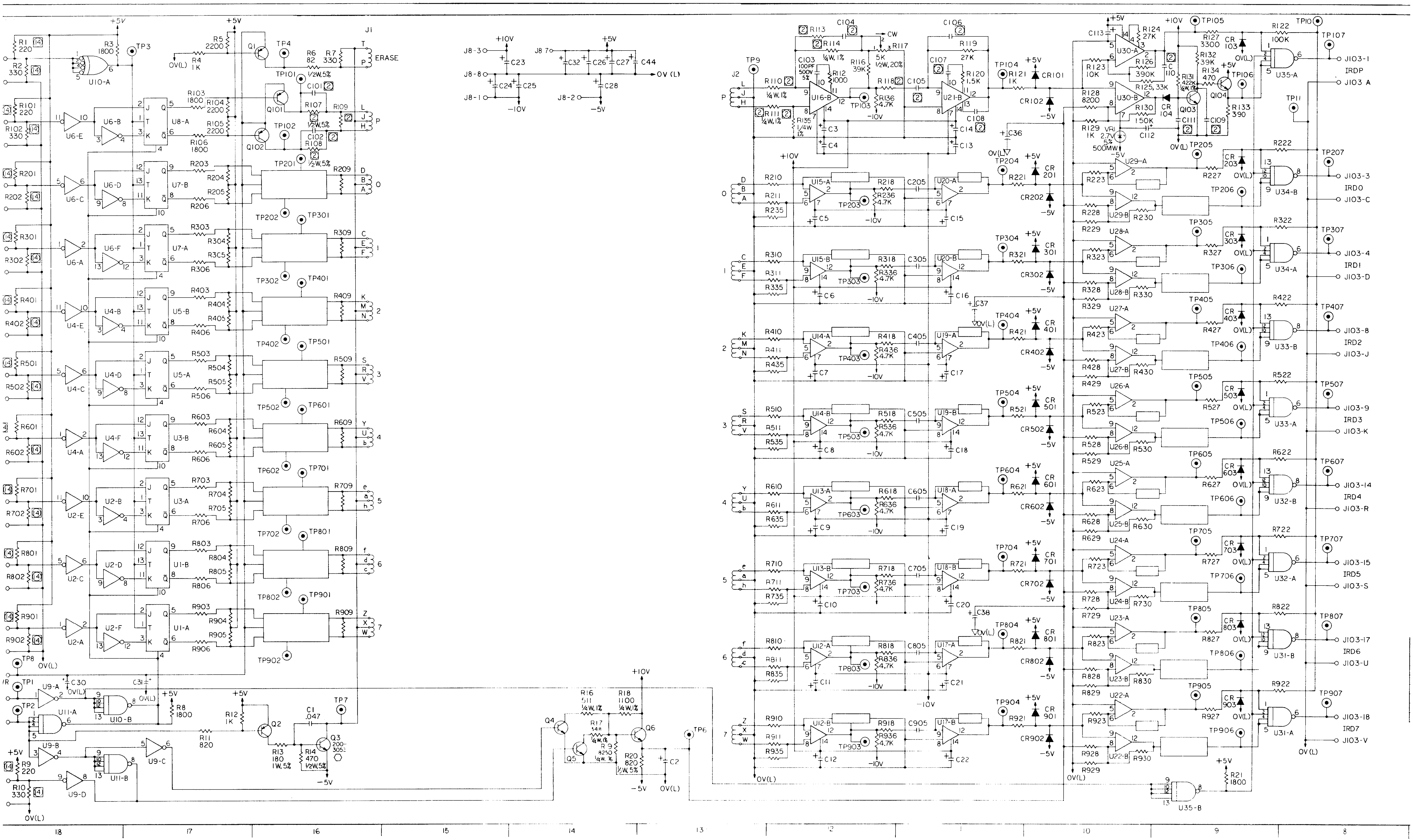
3. ⬡ INDICATES TRANSISTOR MOUNTED HEATSINK.

2 SEE VERSION TABLE FOR VALUE OR USAGE.

1. REFERENCE DRAWINGS: ASSEMBLY - 101346
SPECIFICATION - 101349

NOTES: UNLESS OTHERWISE SPECIFIED:

21 20 19 18 17 16 15

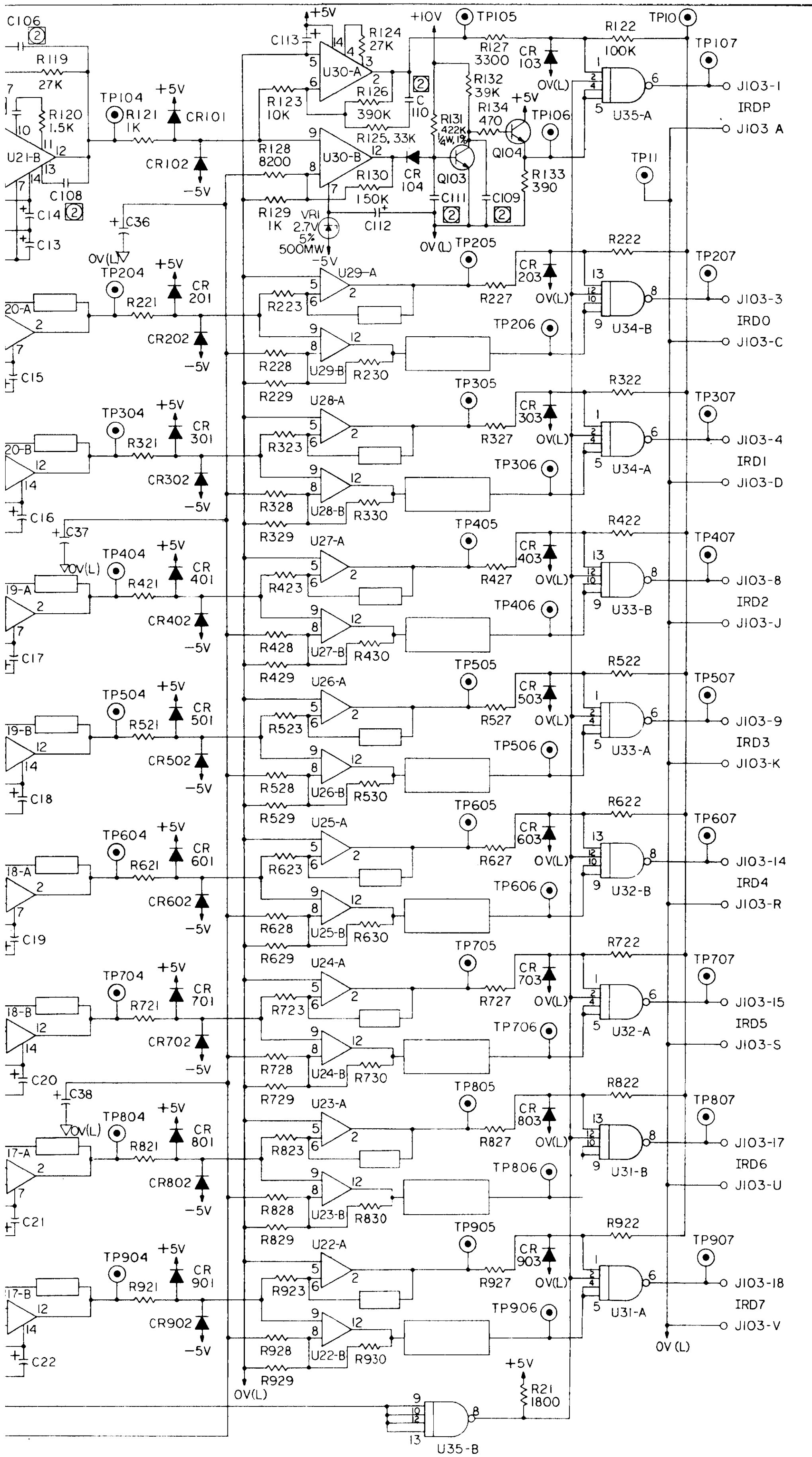


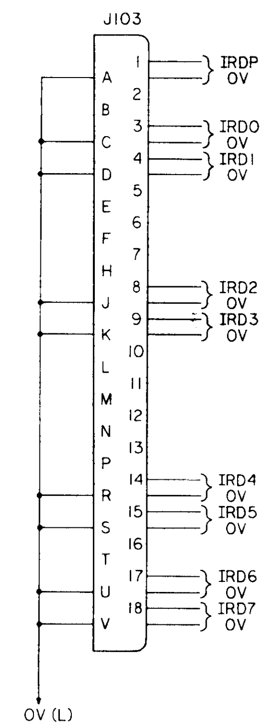
J1
ERASE
J2
J8-3
J8-8
J8-1
J8 7
J8-2
+10V
+5V
-10V
-5V
OV (L)
TP1
TP2
TP3
TP4
TP6
TP7
TP8
TP9
TP10
TP11
TP101
TP102
TP103
TP104
TP105
TP106
TP107
U10-A
U8-A
U7-B
U7-A
U5-B
U5-A
U3-B
U3-A
U1-B
U1-A
U16-B
U21-B
U30-A
U30-B
U35-A
U35-B
Q1
Q2
Q3
Q4
Q5
Q6
Q101
Q102
Q103
Q104
IRDP
IRD0
IRD1
IRD2
IRD3
IRD4
IRD5
IRD6
IRD7
J103-1
J103 A
J103-3
J103-C
J103-4
J103-D
J103-8
J103-J
J103-9
J103-K
J103-14
J103-R
J103-15
J103-S
J103-17
J103-U
J103-18
J103-V
18
17
16
15
14
13
12
11
10
9
8

SCHEMATIC DATA 'F' READ WHILE WRITE

REVISIONS

REV	DESCRIPTION	DATE	DR	CHK	APPR
A	ERN 2-SP				
B	ECN 1886				
C	ECN 1933				
D	ECN 1947				
E	ECN 2148				
F	ECN 2368				
G	ECN 2533				
H	ECN 2546				
J	ECN 2659				
K	ECN 2702				
L	ECN 2846				
M	ECN 3002				
N	ECN 3179A				
P	ECN 4840				
R	ECN 4967				
S	ECN 5308				
T	ECN 6012				
U	ECN 6112				
V	ECN 6116				
W	ECN 6130				
Y	ECN 6406				
Y1	ECN 6440				
Z	ECN 6620				



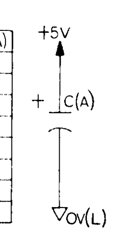


REFERENCE DESIGNATION

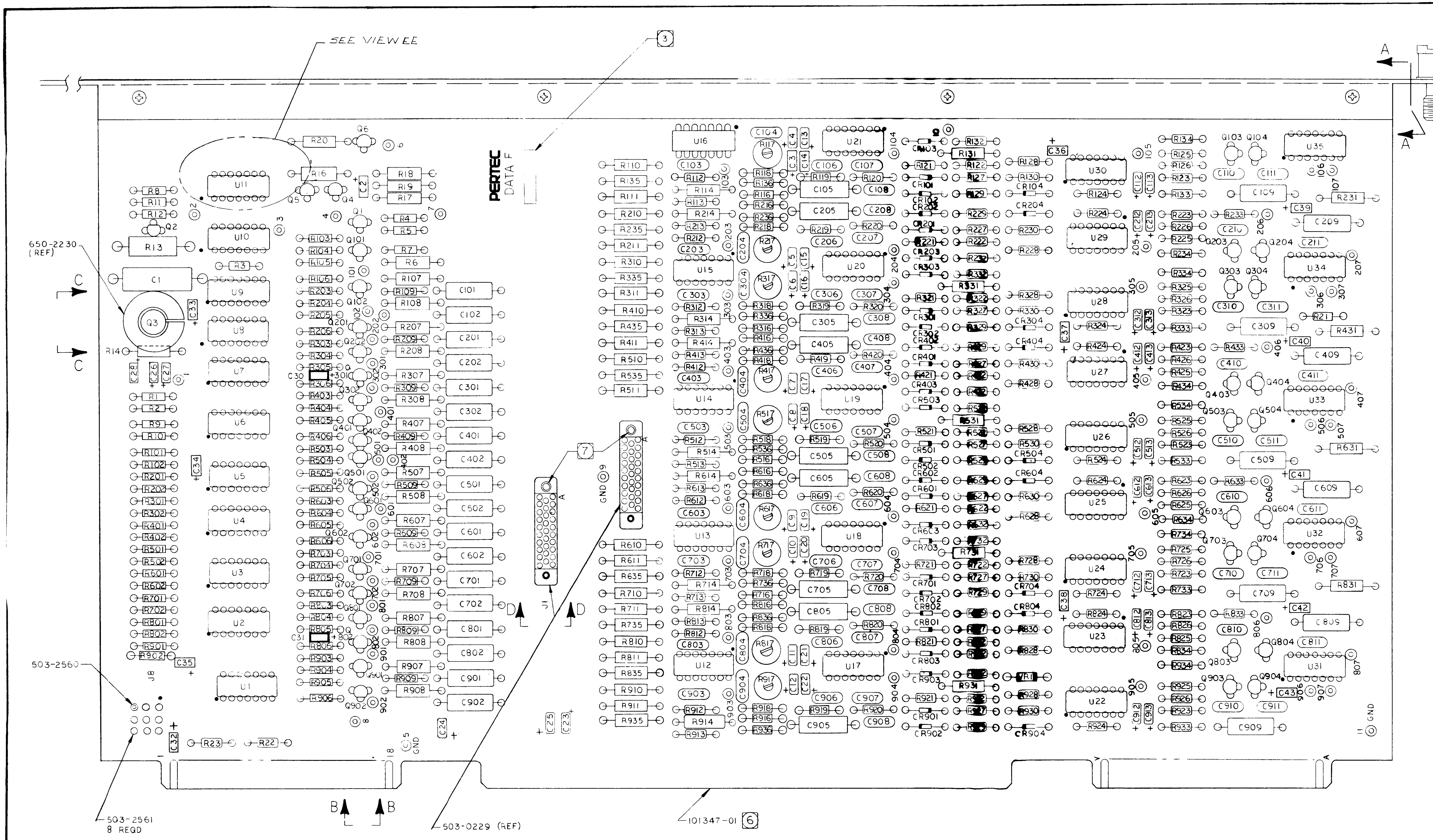
LAST USED		DELETED
C44	C913	C29
	CR904	
Q6	Q904	
R23	R936	R15,115-915
U35		
TP11	TP907	
VR1		

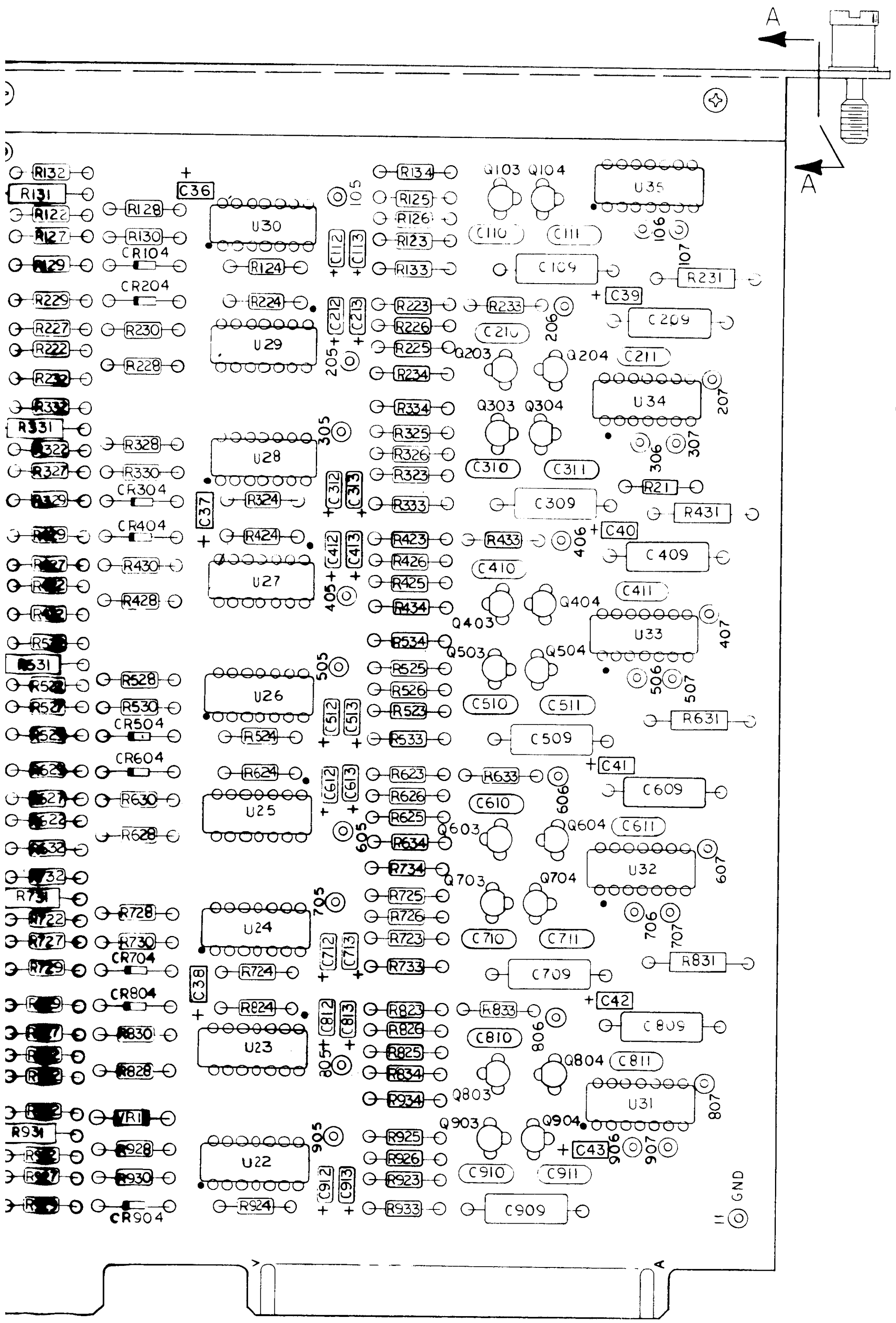
VERSION	SPEED (IPS)	R110-910 R111-911 1/4W,1%	R113-913 1/4W,5%	R114-914 1/4W,1%	C101-901 100V,10%	C102-902 100V,10%	C105-905 100V,10%	C109-909 100V,10%	C110-910 500V,5%	C111-911 500V,5%	R109-909 1/4W,5%	C104-904 500V,5%	R118-918 1/4W,5%	C106-906 500V,5%	C107-907 500V,5%	C108-908 500V,5%	R119-919 1/4W,5%	R107-907 R108-908 1/2W,5%	R101-901, 1,9,22 (14)	R102-902 2,10,23 (14)	R135-935 1/4W,1% (14)
-01	37.5	5110	2700	26100	.01	.022	.001UF	.0068UF	22PF	330PF	2700	33PF	1.5K	33PF	470PF	22PF	27K	270	220	330	OMIT
-02	25	5620	3300	31600	.01	.022	.0015UF	.01UF	33PF	470PF	1500	33PF	1.2K	33PF	470PF	22PF	27K				
-03	18.75	6.19K	6.8K	75K	.01	.022	.0022UF	.01UF	47PF	560PF	1500	33PF	1.2K	33PF	470PF	22PF	27K				
-04	12.5	2610	2200	31600	OMIT	OMIT	.0033UF	.015UF	68PF	560PF	680	68PF	1K	33PF	470PF	22PF	27K				
-05	45	6190	2.2K	21.5K	.01	.022	.001UF	.0047UF	15PF	220PF	2700	33PF	1K	33PF	470PF	22PF	27K				
-06	75	10K	2700	13300	.01	.022	.001UF	.0033UF	10PF	150PF	2700	33PF	680	22PF	100PF	10PF	22K		220	330	
-07	37.5	5110	2700	26100	.01	.022	.001UF	.0068UF	22PF	330PF	2700	33PF	1.5K	33PF	470PF	22PF	27K		OMIT	OMIT	
-08	25	5620	3300	31600	.01	.022	.0015UF	.01UF	33PF	470PF	1500	33PF	1.2K								
-09	18.75	6.19K	6.8K	75K	.01	.022	.0022UF	.01UF	47PF	560PF	1500	33PF	1.2K								
-10	12.5	2610	2200	31600	OMIT	OMIT	.0033UF	.015UF	68PF	560PF	680	68PF	1K								
-11	45	6190	2.2K	21.5K	.01	.022	.001UF	.0047UF	15PF	220PF	2700	33PF	1K	33PF	470PF	22PF	27K				
-12	75	10K	2700	13300	.01	.022	.001UF	.0033UF	10PF	150PF	2700	33PF	680	22PF	100PF	10PF	22K		OMIT	OMIT	
-13	45	6190	2.2K	21.5K	.01	.022	.001UF	.0047UF	15PF	220PF	2700	33PF	1K	33PF	470PF	22PF	27K		220	330	
-14	45	6190	2.2K	21.5K	.01	.022	.001UF	.0047UF	15PF	220PF	2700	33PF	1K	33PF	470PF	22PF	27K		OMIT	OMIT	
-15	37.5	5110	2700	26100	.01	.022	.001UF	.0068UF	22PF	330PF	2700	33PF	1.5K	33PF	470PF	22PF	27K		220	330	
-16	37.5	5110	2700	26100	.01	.022	.001UF	.0068UF	22PF	330PF	2700	33PF	1.5K	33PF	470PF	22PF	27K	270	OMIT	OMIT	OMIT

I.C. NO. (REF)	FILTER CAP. (A)
U1	C35
U5	C34
U8	C33
U31	C43
U32	C42
U33	C41
U34	C40
U35	C39



UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. TOLERANCES: .XX ± .010 .XXX ± .005 X/X ± 1/32 ANGULAR ± 1/2° BREAK ALL SHARP CORNERS APPROX. .010	THE INFORMATION HEREON IS THE PROPERTY OF PERIPHERAL EQUIPMENT CORPORATION. NO REPRODUCTION OR UNAUTHORIZED USE SHALL BE MADE.	PEC PERIPHERAL EQUIPMENT CORPORATION	
101346 NEXT ASSY / TOP ASSY 1ST USED ON / APPLICATION	SIGNATURES: DR L.G. Smith; CHK; DES; ENGR; ENGR	TITLE SCHEMATIC DATA 'F' READ WHILE WRITE	
FINISH:	MATL:	SIZE J	DWG NO. 101345 REV Z
		SCALE	DO NOT SCALE DWG SHEET 1 OF 1


SEE VIEW EE
3
PERTEC
DATA F
650-2230
(REF)
C
C
A
A
7
D
D
B
B
503-2560
503-2561
8 REQD
503-0229 (REF)
101347-01
6
GND



(9) VERSIONS WITHOUT TERMINATOR RESISTORS ARE FOR USE WITH MTA.

(8) BEFORE INSTALLING SUPPORT ANGLE, 101685-01, TO THE BOARD ASSY, VINYL TAPE, 667-4476, SHOULD BE APPLIED TO THE PC BOARD AS SHOWN ON VIEW A-A FOR -06, 12 THRU 16 VERSIONS ONLY.

(7) ORIENTATE CONNECTORS, J1 & J2 AS SHOWN.

(6) THIS ASSY SHALL BE MADE FROM PROCESS BOARD 101347-01 REV.M AND SUBSEQUENT.

(5) FOR PART NO'S WHICH ARE AFFECTED BY VERSION NO. SEE TABLE II.

(4) FOR PART NO'S WHICH ARE NOT AFFECTED BY VERSION NO. SEE TABLE I.

(3) RUBBER STAMP ASSY PART NO. INCLUDING VERSION AND ISSUE LETTER.

2. ASSEMBLE PER STANDARD MFG METHODS.

1. REF DWGS: SCHEMATIC - 101345
SPECIFICATION - 101349

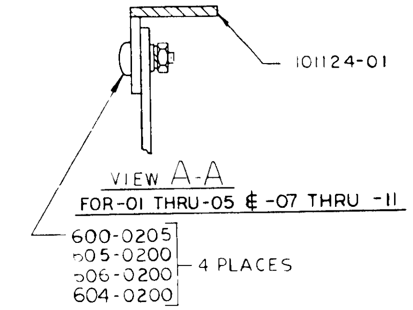
NOTES: UNLESS OTHERWISE SPECIFIED:

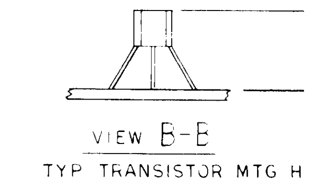
(4) TABLE I

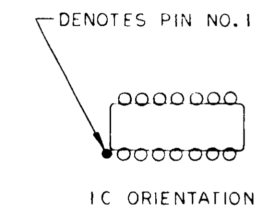
PART NO.	REF DESIGNATION
100-1025	R121-921, 129-929,
	4, 12, 112-912
100-1035	R123-923
100-1045	R122-922
101-4715	R14
100-1545	R130-930
100-1825	R103-903, 106-906,
	3, 8, 21
100-4725	R136-936
100-2225	R104-904, 105-905, 5
100-1525	R120-920
100-3935	R132-932
100-2735	R124-924
100-3315	R7
100-3325	R127-927
100-3335	R125-925
100-3915	R133-933
100-3935	R116-916
100-3945	R126-926
100-4715	R134-934
100-8215	R11
100-8225	R128-928
101-8205	R6
101-8215	R20
102-1815	R13
104-3480	R17
104-1101	R18
104-4223	R131-931
104-5110	R16
104-8251	R19
123-5020	R117-917
130-1015	C103-903
131-4730	C1
132-2752	C2-28, 30, C112-912
	C113-913, 31 THRU 44
200-3053	Q3

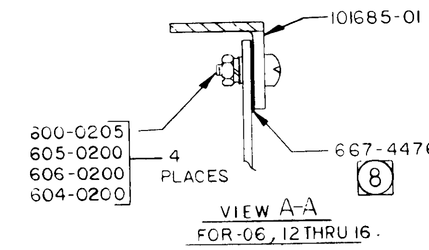
TABLE I CONT

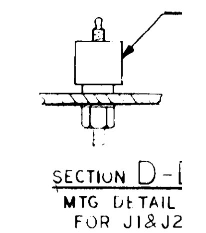
PART NO.	REF DESIGNATION
200-4123	Q103-903, 104-904,
	4-6
200-4125	Q101-901, 102-902,
	1, 2
300-4446	CR101-901, 102-902,
	103-903, 104-904
400-1437	U12-30
503-0229	J1, 2
700-8360	U2, 4, 6, 9
700-8440	U10, 11, 31-35
700-8530	U1, 3, 5, 7, 8
331-0275	VR1





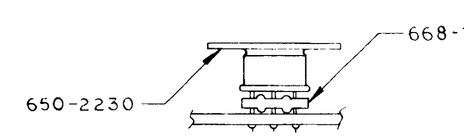






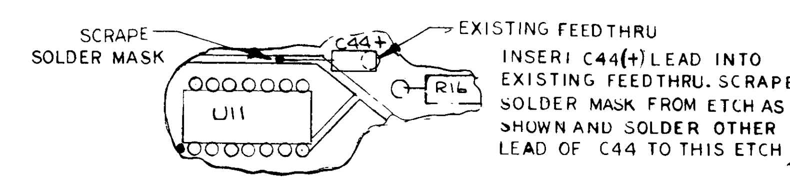
(5) TABLE II

REF DESIGNATION	PART NO'S								
IPS	37.5	25	18.75	12.5	45	75	37.5	25	18.75
VER	-01	-02	-03	-04	-05	-06	-07	-08	-09
R110-910/111-911	104-5111	104-5621	1C4-6191	104-2611	104-6191	104-1002	104-5111	104-5621	104-6191
R113-913	100-2725	100-3325	100-6825	100-2225	100-2225	100-2725	100-2725	100-3325	100-6825
R114-914	104-2612	104-3162	104-7502	104-3162	104-2152	104-1332	104-2612	104-3162	104-7502
C101-901	131-1030	←→	131-1030	OMIT	131-1030	←		→	131-1030
C105-905	131-1020	131-1520	131-2220	131-3320	131-1020	131-1020	131-1020	131-1520	131-2220
C109-909	131-6820	131-1030	131-1030	131-1530	131-4720	131-3320	131-6820	131-1030	131-1030
C110-910	130-2205	130-3305	130-4705	130-6805	130-1505	130-1005	130-2205	130-3305	130-4705
C111-911	130-3315	130-4715	130-5615	130-5615	130-2215	130-1515	130-3315	130-4715	130-5615
R109-909	100-2725	100-1525	100-1525	100-6815	100-2725	100-2725	100-2725	100-1525	100-1525
C104-904	130-3305	←→	130-3305	130-6805	130-3305	←		→	130-3305
R118-918	100-1525	100-1225	100-1225	100-1025	100-1025	100-6815	100-1525	100-1225	100-1225
C106-906	130-3305	←		→	130-3305	130-2205	130-3305	←	
C107-907	130-4715	←		→	130-4715	130-1015	130-4715	←	
C108-908	130-2205	←		→	130-2205	130-1005	130-2205	←	
R119-919	100-2735	←		→	100-2735	100-2235	100-2735	←	
R135-935	OMIT	←							
R107-907, 108-908	101-2715	←							
(9) R101-901, 1, 9, 22	100-2215	←			→	100-2215	OMIT	←	
R102-902, 2, 10, 23	100-3315	←			→	100-3315	OMIT	←	
C102-902	131-2230	←→	131-2230	OMIT	131-2230	←		→	131-2230



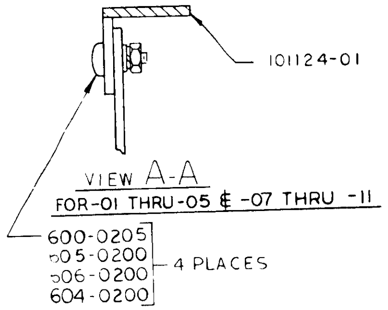
VIEW C-C

TO-5 MTG CONFIGURATION

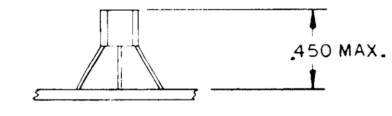


VIEW E-E

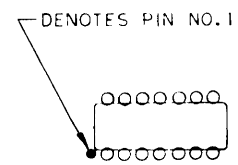
TOP AS
NEXT AS



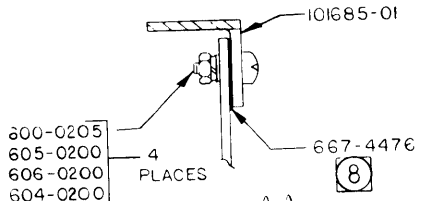
VIEW A-A
FOR-01 THRU-05 & -07 THRU -11



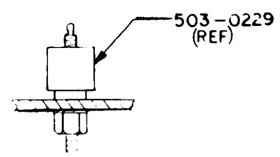
VIEW B-B
TYP TRANSISTOR MTG HEIGHT (TO 92)



I C ORIENTATION



VIEW A-A
FOR-06, 12 THRU 16.



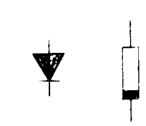
SECTION D-D
MTG DETAIL
FOR J1 & J2

REVISIONS					
REV	DESCRIPTION	DATE	DR	CHK	APPR
A	ERN 2-SP	1/27	EL	[illegible]	R.M.
B	ECN 1845A	8.19.70	T.B	[illegible]	[illegible]
C	ECN 1850	8.19.70	T.B	[illegible]	[illegible]
D	ECN 1887A	[illegible]	T.B	[illegible]	[illegible]
E	ECN 1934	9.18.70	T.B	[illegible]	[illegible]
F	ECN 1945A	9.18.70	T.B	[illegible]	[illegible]
G	ECN 1948	9.18.70	T.B	[illegible]	[illegible]
H	ECN 2149	12/4/70	T.B	[illegible]	R.B
J	ECN 2368	3/1/71	T.B	[illegible]	R.B
K	ECN 2484	4/28/71	C.J.	[illegible]	ABR
L	ECN 2533	4/28/71	C.J.	[illegible]	ABR
M	ECN 2485A	4/28/71	C.J.	[illegible]	ABR
N	ECN 2546	4/28/71	C.J.	[illegible]	ABR
P	ECN 2465 A	6/8/71	[illegible]	[illegible]	ABR
R	ECN 2659	6/8/71	[illegible]	[illegible]	ABR
S	ECN 2704A	6/8/71	[illegible]	[illegible]	ABR
T	ECN 2846	9/10/71	T.B	[illegible]	[illegible]
U	ECN 3002	2/2/72	RAS	L.B	RCA
V	ECN 3105A - CANCELLED	3/3/72	[illegible]	L.B.	RCA
W	ECN 3179A	3/22/72	[illegible]	L.B.	RCA
Y	ECN 4629	12/5/72	J.M.	[illegible]	RCA
Z	ECN 4823	1/17/73	[illegible]	[illegible]	RCA
AA	ECN 4840	1/17/73	[illegible]	[illegible]	RCA
AB	ECN 4967	2/21/73	[illegible]	[illegible]	RCA
AB1	ECN 5181	5-8-73	[illegible]	[illegible]	RCA
AC	ECN 5308	7/11/73	[illegible]	[illegible]	[illegible]
AD	ECN 5413	8/22/73	[illegible]	[illegible]	RCA
AE	ECN 6012	2/6/74	[illegible]	[illegible]	[illegible]
AF	ECN 6112	[illegible]	[illegible]	[illegible]	[illegible]
AG	ECN 6116	3/13/74	[illegible]	[illegible]	[illegible]
AH	ECN 6130	5/15/74	[illegible]	CCA	[illegible]
AJ	ECN 6406	6.21.74	AV	CCA	[illegible]
AJ1	ECN 6445	7.17.74	AV	[illegible]	[illegible]
AK	ECN 6620	8/23/74	[illegible]	[illegible]	[illegible]

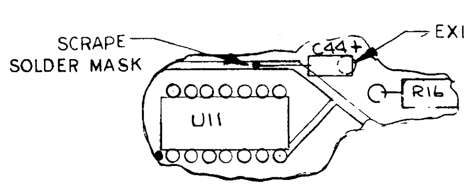
5 TABLE II

REF DESIGNATION	PART NO'S															
IPS	37.5	25	18.75	12.5	45	75	37.5	25	18.75	12.5	45	75	45	45	37.5	37.5
VER	-01	-02	-03	-04	-05	-06	-07	-08	-09	-10	-11	-12	-13	-14	-15	-16
R110-910/111-911	104-5111	104-5621	104-6191	104-2611	104-6191	104-1002	104-5111	104-5621	104-6191	104-2611	104-6191	104-1002	104-6191	104-6191	104-5111	104-5111
R113-913	100-2725	100-3325	100-6825	100-2225	100-2225	100-2725	100-2725	100-3325	100-6825	100-2225	100-2225	100-2725	100-2225	100-2225	100-2725	100-2725
R114-914	104-2612	104-3162	104-7502	104-3162	104-2152	104-1332	104-2612	104-3162	104-7502	104-3162	104-2152	104-1332	104-2152	104-2152	104-2612	104-2612
C101-901	131-1030	←→	131-1030	OMIT	131-1030	←		→	131-1030	OMIT	131-1030	←			→	131-1030
C105-905	131-1020	131-1520	131-2220	131-3320	131-1020	131-1020	131-1020	131-1520	131-2220	131-3320	131-1020	←			→	131-1020
C109-909	131-6820	131-1030	131-1030	131-1530	131-4720	131-3320	131-6820	131-1030	131-1030	131-1530	131-4720	131-3320	131-4720	131-4720	131-6820	131-6820
C110-910	130-2205	130-3305	130-4705	130-6805	130-1505	130-1005	130-2205	130-3305	130-4705	130-6805	130-1505	130-1005	130-1505	130-1505	130-2205	130-2205
C111-911	130-3315	130-4715	130-5615	130-5615	130-2215	130-1515	130-3315	130-4715	130-5615	130-5615	130-2215	130-1515	130-2215	130-2215	130-3315	130-3315
R109-909	100-2725	100-1525	100-1525	100-6815	100-2725	100-2725	100-2725	100-1525	100-1525	100-6815	100-2725	←			→	100-2725
C104-904	130-3305	←→	130-3305	130-6805	130-3305	←		→	130-3305	130-6805	130-3305	←			→	130-3305
R118-918	100-1525	100-1225	100-1225	100-1025	100-1025	100-6815	100-1525	100-1225	100-1225	100-1025	100-1025	100-6815	100-1025	100-1025	100-1525	100-1525
C106-906	130-3305	←		→	130-3305	130-2205	130-3305	←		→	130-3305	130-2205	130-3305	←	→	130-3305
C107-907	130-4715	←		→	130-4715	130-1015	130-4715	←		→	130-4715	130-1015	130-4715	←	→	130-4715
C108-908	130-2205	←		→	130-2205	130-1005	130-2205	←		→	130-2205	130-1005	130-2205	←	→	130-2205
R119-919	100-2735	←		→	100-2735	100-2235	100-2735	←		→	100-2735	100-2235	100-2735	←	→	OMIT
R135-935	OMIT	←													→	101-2715
R107-907, 108-908	101-2715	←													→	OMIT
R101-901, 1, 9, 22	100-2215	←			→	100-2215	OMIT	←			→	OMIT	100-2215	OMIT	100-2215	OMIT
R102-902, 2, 10, 23	100-3315	←			→	100-3315	OMIT	←			→	OMIT	100-3315	OMIT	100-3315	131-2230
C102-902	131-2230	←→	131-2230	OMIT	131-2230	←		→	131-2230	OMIT	131-2230	←			→	

9



DIODE ORIENTATION



INSERT C44(+) LEAD INTO EXISTING FEEDTHRU. SCRAPE SOLDER MASK FROM ETCH AS SHOWN AND SOLDER OTHER LEAD OF C44 TO THIS ETCH.

VIEW E-E

PART NO. 101346- REV

TOP ASSY	6000
NEXT ASSY	1ST USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES:
.XX ± .010
.XXX ± .005
$\frac{X}{X} \pm \frac{1}{32}$
ANGULAR ± 1/2°
✓
BREAK ALL SHARP CORNERS APPROX. .010

FINISH:

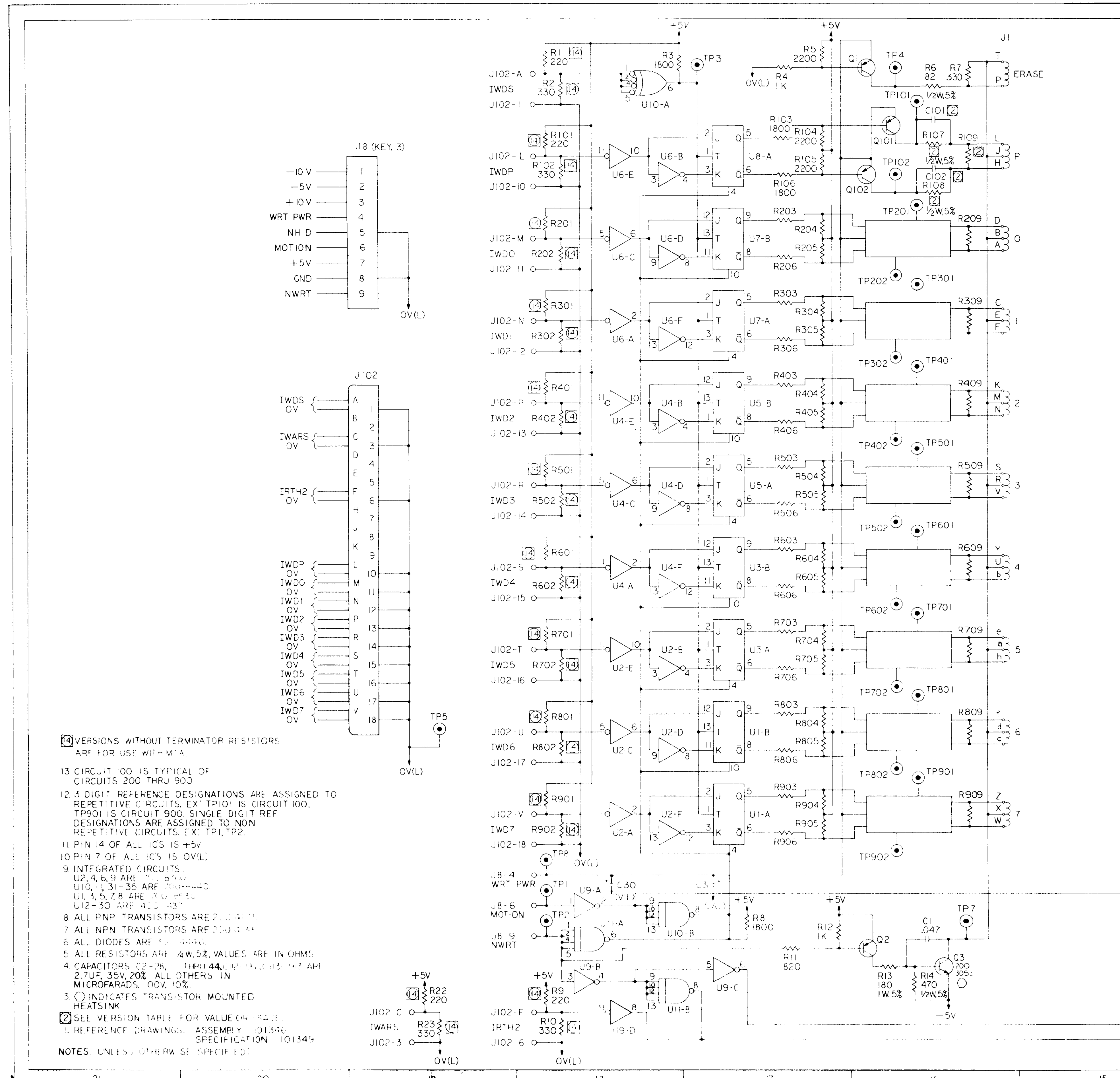
SIGNATURES	DATE
DR [illegible]	7/13/70
CHK [illegible]	[illegible]
DES [illegible]	[illegible]
ENGR [illegible]	[illegible]
ENGR	

MATL:

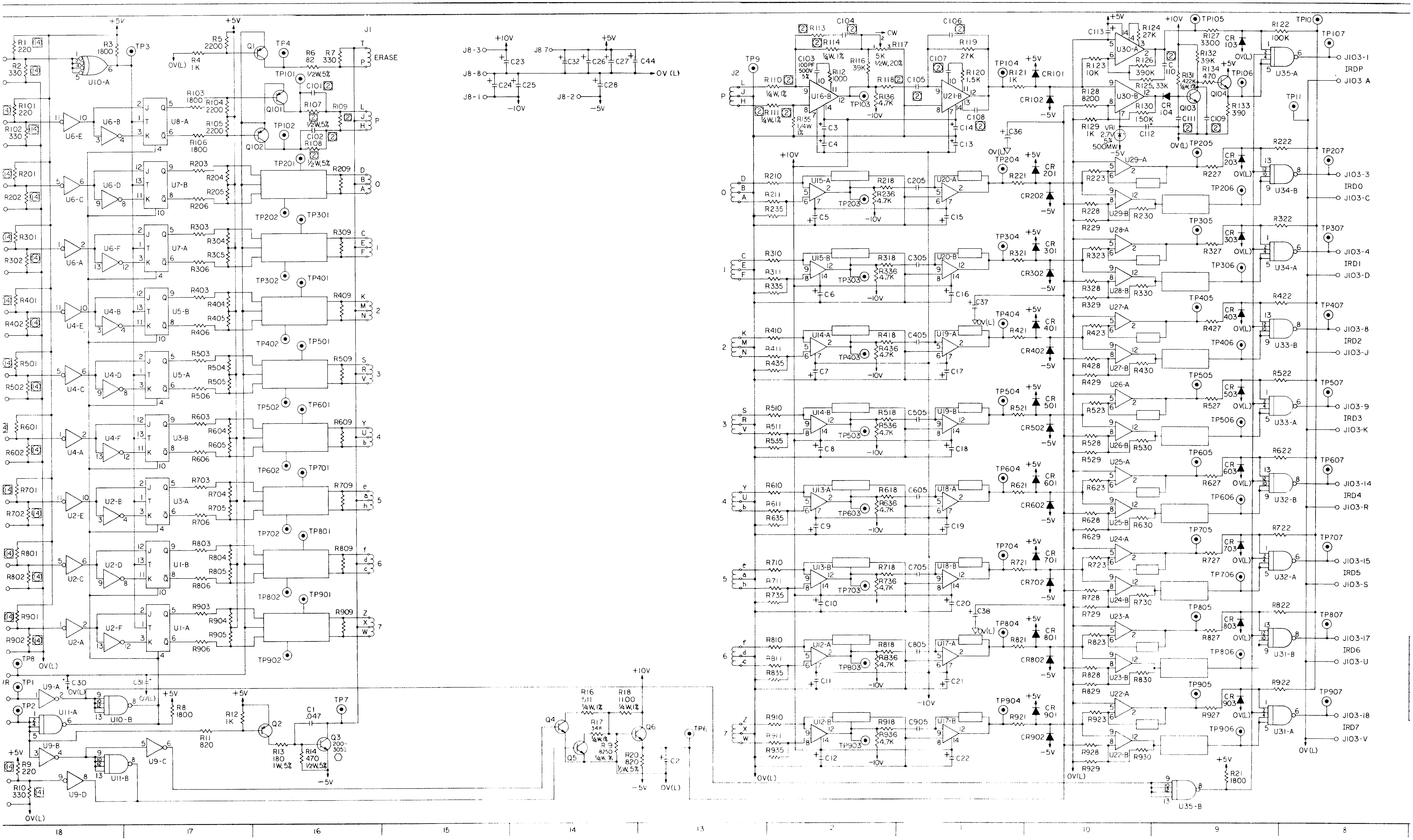
PEC PERIPHERAL EQUIPMENT CORPORATION

TITLE PCBA - DATA - F READ WHILE WRITE

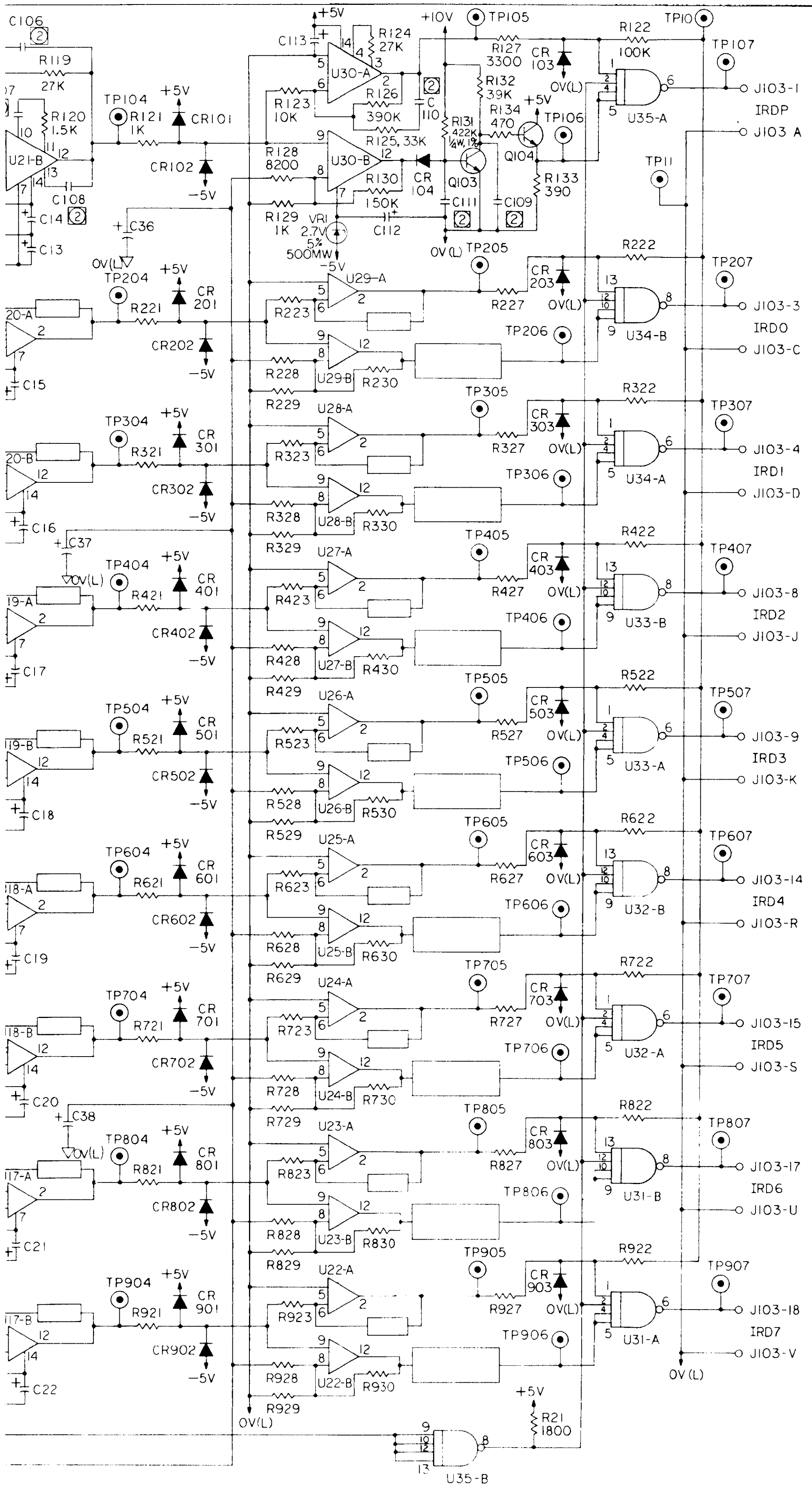
SIZE	CODE IDENT. NO.	DWG NO.	REV
E		101346	AK
SCALE 2/1		DO NOT SCALE DWG	SHEET 1 OF 1

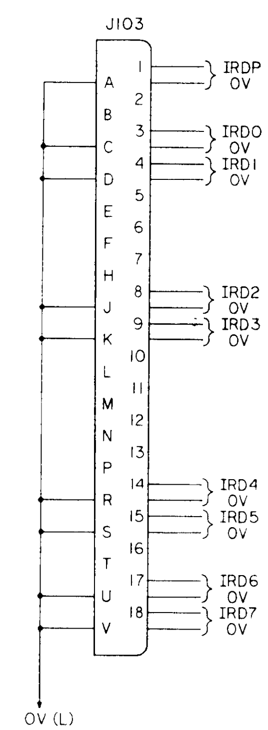


J8 (KEY, 3)
-10 V
-5V
+10V
WRT PWR
NHID
MOTION
+5V
GND
NWRT
OV(L)
J102
IWDS
IWARS
IRTH2
IWDP
IWD0
IWD1
IWD2
IWD3
IWD4
IWD5
IWD6
IWD7
TP5
J1
ERASE
U10-A
U6-E
U6-B
U8-A
U6-C
U6-D
U7-B
U6-A
U6-F
U7-A
U4-E
U4-B
U5-B
U4-C
U4-D
U5-A
U4-A
U4-F
U3-B
U2-E
U3-A
U2-C
U2-D
U1-B
U2-A
U2-F
U1-A
U9-A
U10-B
U11-A
U9-B
U11-B
U9-C
U9-D
Q1
Q2
Q3
Q101
Q102
WRT PWR
MOTION
NWRT
14 VERSIONS WITHOUT TERMINATOR RESISTORS ARE FOR USE WITH MTA.
13. CIRCUIT 100 IS TYPICAL OF CIRCUITS 200 THRU 900
12. 3 DIGIT REFERENCE DESIGNATIONS ARE ASSIGNED TO REPETITIVE CIRCUITS. EX: TP101 IS CIRCUIT 100, TP901 IS CIRCUIT 900. SINGLE DIGIT REF DESIGNATIONS ARE ASSIGNED TO NON REPETITIVE CIRCUITS. EX: TP1, TP2.
11. PIN 14 OF ALL IC'S IS +5V
10 PIN 7 OF ALL IC'S IS OV(L)
9. INTEGRATED CIRCUITS:
U2, 4, 6, 9 ARE
U10, 11, 31-35 ARE
U1, 3, 5, 7, 8 ARE
U12-30 ARE
8. ALL PNP TRANSISTORS ARE
7 ALL NPN TRANSISTORS ARE
6 ALL DIODES ARE
5 ALL RESISTORS ARE ¼W, 5%, VALUES ARE IN OHMS
4. CAPACITORS C2-28, THRU 44, ARE 2.7UF, 35V, 20% ALL OTHERS IN MICROFARADS, 100V, 10%.
3. ⬡ INDICATES TRANSISTOR MOUNTED HEATSINK.
2 SEE VERSION TABLE FOR VALUE OR USAGE.
1. REFERENCE DRAWINGS: ASSEMBLY 101346
SPECIFICATION 101349
NOTES: UNLESS OTHERWISE SPECIFIED:
21
20
19
18
17
16
15



REVISIONS					
REV	DESCRIPTION	DATE	DR	CHK	APPR
A	ERN 2-SP	6/9/70	[illegible]	[illegible]	
B	ECN 1886	8-20-70	TB	KJK	[illegible]
C	ECN 1933	9-18-70	T.B	[illegible]	[illegible]
D	ECN 1947	9-18-70	TB	[illegible]	[illegible]
E	ECN 2148	12/4/70	T.B	[illegible]	[illegible]
F	ECN 2368	3/26/71	T.B	[illegible]	[illegible]
G	ECN 2533	4/28/71	C.J.	[illegible]	ABR
H	ECN 2546	4/28/71	C.J.	[illegible]	ABR
J	ECN 2659	6/28/71	[illegible]	[illegible]	ABR
K	ECN 2702	7/20/71	[illegible]	[illegible]	ABR
L	ECN 2846	9/10/71	T.B	[illegible]	[illegible]
M	ECN 3002	2/2/72	RAS	[illegible]	RCA
N	ECN 3179A	3/3/72	DC	[illegible]	RCA
P	ECN 4840	[illegible]	[illegible]	[illegible]	RCA
R	ECN 4967	[illegible]	[illegible]	[illegible]	RCA
S	ECN 5308	7/11/73	[illegible]	[illegible]	[illegible]
T	ECN 6012	[illegible]	[illegible]	[illegible]	[illegible]
U	ECN 6112	[illegible]	[illegible]	[illegible]	KW
V	ECN 6116	[illegible]	[illegible]	[illegible]	KW
W	ECN 6130	[illegible]	[illegible]	[illegible]	KW
Y	ECN 6406	[illegible]	[illegible]	CCA	KW
Y1	ECN 6443	[illegible]	[illegible]	[illegible]	[illegible]
Z	ECN 6620	[illegible]	[illegible]	[illegible]	KW





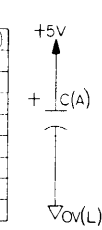
REFERENCE DESIGNATION

LAST USED		DELETED
C44	C913	C29
	CR904	
Q6	Q904	
R23	R936	R15, 115-915
U35		
TP11	TP907	
VR1		

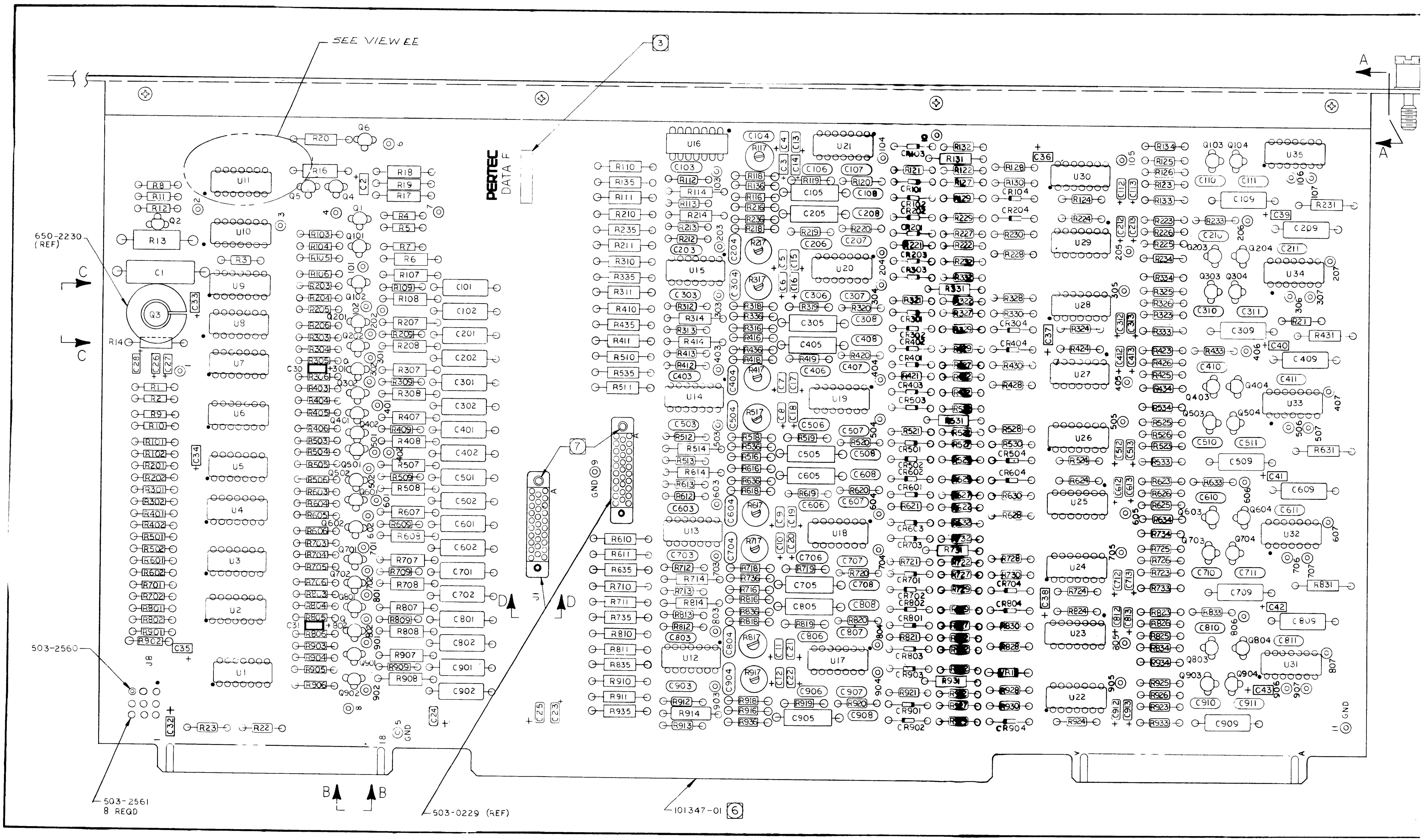
14

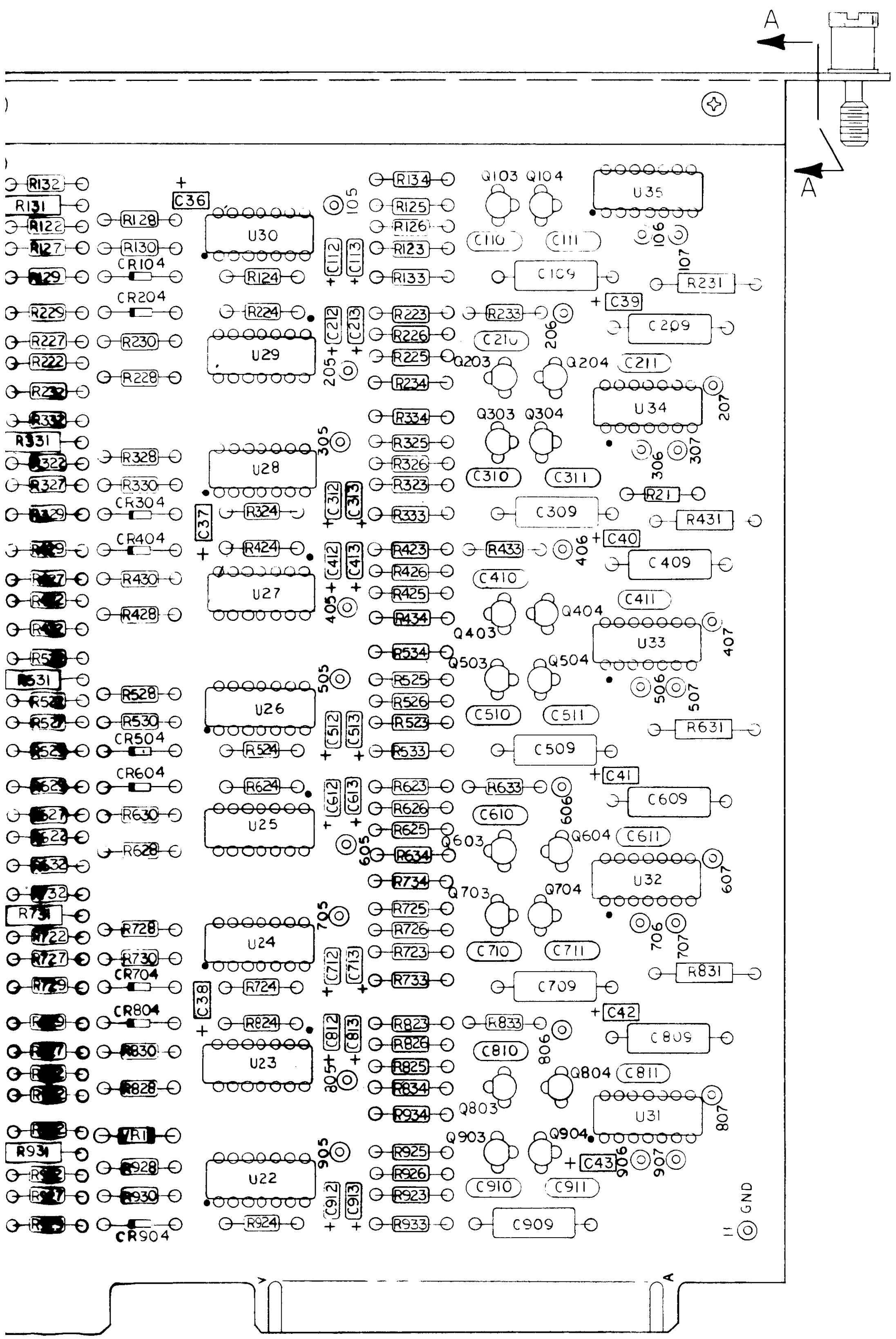
VERSION	SPEED (IPS)	R110-910 R111-911 1/4W, 1%	R113-913 1/4W, 5%	R114-914 1/4W, 1%	C101-901 100V, 10%	C102-902 100V, 10%	C105-905 100V, 10%	C109-909 100V, 10%	C110-910 500V, 5%	C111-911 500V, 5%	R109-909 1/4W, 5%	C104-904 500V, 5%	R118-918 1/4W, 5%	C106-906 500V, 5%	C107-907 500V, 5%	C108-908 500V, 5%	R119-919 1/4W, 5%	R107-907 R108-908 1/2W, 5%	R101-901, 1, 9, 22	R102-902 2, 10, 23	R135-935 1/4W, 1%
-01	37.5	5110	2700	26100	.01	.022	.001UF	.0068UF	22PF	330PF	2700	33PF	1.5K	33PF	470PF	22PF	27K	270	220	330	OMIT
-02	25	5620	3300	31600	.01	.022	.0015UF	.01UF	33PF	470PF	1500	33PF	1.2K	33PF	470PF	22PF	27K				
-03	18.75	6.19K	6.8K	75K	.01	.022	.0022UF	.01UF	47PF	560PF	1500	33PF	1.2K	33PF	470PF	22PF	27K				
-04	12.5	2610	2200	31600	OMIT	OMIT	.0033UF	.015UF	68PF	560PF	680	68PF	1K	33PF	470PF	22PF	27K				
-05	45	6190	2.2K	21.5K	.01	.022	.001UF	.0047UF	15PF	220PF	2700	33PF	1K	33PF	470PF	22PF	27K				
-06	75	10K	2700	13300	.01	.022	.001UF	.0033UF	10PF	150PF	2700	33PF	680	22PF	100PF	10PF	22K		220	330	
-07	37.5	5110	2700	26100	.01	.022	.001UF	.0068UF	22PF	330PF	2700	33PF	1.5K	33PF	470PF	22PF	27K		OMIT	OMIT	
-08	25	5620	3300	31600	.01	.022	.0015UF	.01UF	33PF	470PF	1500	33PF	1.2K								
-09	18.75	6.19K	6.8K	75K	.01	.022	.0022UF	.01UF	47PF	560PF	1500	33PF	1.2K								
-10	12.5	2610	2200	31600	OMIT	OMIT	.0033UF	.015UF	68PF	560PF	680	68PF	1K								
-11	45	6190	2.2K	21.5K	.01	.022	.001UF	.0047UF	15PF	220PF	2700	33PF	1K	33PF	470PF	22PF	27K				
-12	75	10K	2700	13300	.01	.022	.001UF	.0033UF	10PF	150PF	2700	33PF	680	22PF	100PF	10PF	22K		OMIT	OMIT	
-13	45	6190	2.2K	21.5K	.01	.022	.001UF	.0047UF	15PF	220PF	2700	33PF	1K	33PF	470PF	22PF	27K		220	330	
-14	45	6190	2.2K	21.5K	.01	.022	.001UF	.0047UF	15PF	220PF	2700	33PF	1K	33PF	470PF	22PF	27K		OMIT	OMIT	
-15	37.5	5110	2700	26100	.01	.022	.001UF	.0068UF	22PF	330PF	2700	33PF	1.5K	33PF	470PF	22PF	27K		220	330	
-16	37.5	5110	2700	26100	.01	.022	.001UF	.0068UF	22PF	330PF	2700	33PF	1.5K	33PF	470PF	22PF	27K	270	OMIT	OMIT	OMIT

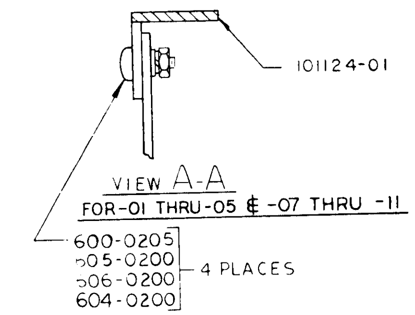
IC NO. (REF)	FILTER CAP. (A)
U1	C35
U5	C34
U8	C33
U31	C43
U32	C42
U33	C41
U34	C40
U35	C39



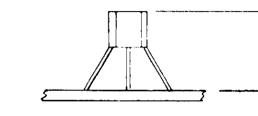
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES: .XX ± .010 .XXX ± .005 X/X ± 1/32 ANGULAR ± 1/2° BREAK ALL SHARP CORNERS APPROX. .010	THE INFORMATION HEREON IS THE PROPERTY OF PERIPHERAL EQUIPMENT CORPORATION. NO REPRODUCTION OR UNAUTHORIZED USE SHALL BE MADE.	PEC	PERIPHERAL EQUIPMENT CORPORATION
	SIGNATURES: DR L.D. Smith; CHK; DES; ENGR; ENGR	TITLE	SCHEMATIC DATA 'F' READ WHILE WRITE
101346 TOP ASSY / NEXT ASSY 1ST USED ON / APPLICATION	FINISH:	MATL:	SIZE J; CODE IDENT. NO.; DWG NO. 101345; REV Z; SCALE; DO NOT SCALE DWG; SHEET 1 OF 1

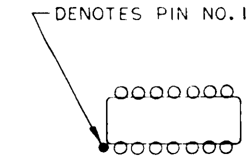

SEE VIEW EE
3
A
650-2230 (REF)
C
PERTEC
DATA F
7
GND
J1
D
503-2560
J8
503-2561
8 REQD
B
503-0229 (REF)
101347-01
6



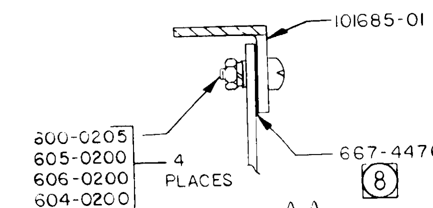


VIEW A-A
FOR -01 THRU -05 & -07 THRU -11

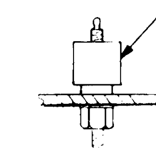

VIEW B-B
TYP TRANSISTOR MTG HI



I C ORIENTATION



VIEW A-A
FOR -06, 12 THRU 16


SECTION D-D
MTG DETAIL FOR J1&J2

9. VERSIONS WITHOUT TERMINATOR RESISTORS ARE FOR USE WITH MTA.
8. BEFORE INSTALLING SUPPORT ANGLE, 101685-01, TO THE BOARD ASSY, VINYL TAPE, 667-4476, SHOULD BE APPLIED TO THE PC BOARD AS SHOWN ON VIEW A-A FOR -06, 12 THRU 16 VERSIONS ONLY.
7. ORIENTATE CONNECTORS, J1 & J2 AS SHOWN.
6. THIS ASSY SHALL BE MADE FROM PROCESS BOARD 101347-01 REV.M AND SUBSEQUENT.
5. FOR PART NO'S WHICH ARE AFFECTED BY VERSION NO. SEE TABLE II.
4. FOR PART NO'S WHICH ARE NOT AFFECTED BY VERSION NO. SEE TABLE I.
3. RUBBER STAMP ASSY PART NO. INCLUDING VERSION AND ISSUE LETTER.
2. ASSEMBLE PER STANDARD MFG METHODS.
1. REF DWGS: SCHEMATIC - 101345
SPECIFICATION - 101349

NOTES: UNLESS OTHERWISE SPECIFIED:

(4) TABLE I

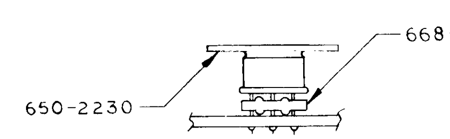
PART NO.	REF DESIGNATION
100-1025	R121-921, 129-929,
	4, 12, 112-912
100-1035	R123-923
100-1045	R122-922
101-4715	R14
100-1545	R130-930
100-1825	R103-903, 106-906,
	3, 8, 21
100-4725	R136-936
100-2225	R104-904, 105-905, 5
100-1525	R120-920
100-3935	R132-932
100-2735	R124-924
100-3315	R7
100-3325	R127-927
100-3335	R125-925
100-3915	R133-933
100-3935	R116-916
100-3945	R126-926
100-4715	R134-934
100-8215	R11
100-8225	R128-928
101-8205	R6
101-8215	R20
102-1815	R13
104-3480	R17
104-1101	R18
104-4223	R131-931
104-5110	R16
104-8251	R19
123-5020	R117-917
130-1015	C103-903
131-4730	C1
132-2752	C2-28, 30, C112-912
	C113-913, 31 THRU 44
200-3053	Q3

TABLE I CONT

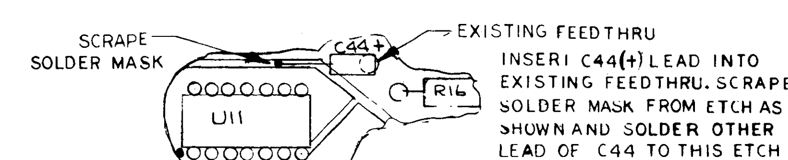
PART NO.	REF DESIGNATION
200-4123	Q103-903, 104-904,
	4-6
200-4125	Q101-901, 102-902,
	1, 2
300-4446	CR101-901, 102-902,
	103-903, 104-904
400-1437	U12-30
503-0229	J1, 2
700-8360	U2, 4, 6, 9
700-8440	U10, 11, 31-35
700-8530	U1, 3, 5, 7, 8
331-0275	VR1

(5) TABLE II

REF DESIGNATION	PART NO'S								
IPS	37.5	25	18.75	12.5	45	75	37.5	25	18.75
VER	-01	-02	-03	-04	-05	-06	-07	-08	-09
R110-910, 111-911	104-5111	104-5621	104-6191	104-2611	104-6191	104-1002	104-5111	104-5621	104-6191
R113-913	100-2725	100-3325	100-6825	100-2225	100-2225	100-2725	100-2725	100-3325	100-6825
R114-914	104-2612	104-3162	104-7502	104-3162	104-2152	104-1332	104-2612	104-3162	104-7502
C101-901	131-1030	← →	131-1030	OMIT	131-1030	←		→	131-1030
C105-905	131-1020	131-1520	131-2220	131-3320	131-1020	131-1020	131-1020	131-1520	131-2220
C109-909	131-6820	131-1030	131-1030	131-1530	131-4720	131-3320	131-6820	131-1030	131-1030
C110-910	130-2205	130-3305	130-4705	130-6805	130-1505	130-1005	130-2205	130-3305	130-4705
C111-911	130-3315	130-4715	130-5615	130-5615	130-2215	130-1515	130-3315	130-4715	130-5615
R109-909	100-2725	100-1525	100-1525	100-6815	100-2725	100-2725	100-2725	100-1525	100-1525
C104-904	130-3305	← →	130-3305	130-6805	130-3305	←		→	130-3305
R118-918	100-1525	100-1225	100-1225	100-1025	100-1025	100-6815	100-1525	100-1225	100-1225
C106-906	130-3305	←		→	130-3305	130-2205	130-3305	←	
C107-907	130-4715	←		→	130-4715	130-1015	130-4715	←	
C108-908	130-2205	←		→	130-2205	130-1005	130-2205	←	
R119-919	100-2735	←		→	100-2735	100-2235	100-2735	←	
R135-935	OMIT	←							
R107-907, 108-908	101-2715	←							
(9) R101-901, 1, 9, 22	100-2215	←			→	100-2215	OMIT	←	
(9) R102-902, 2, 10, 23	100-3315	←			→	100-3315	OMIT	←	
C102-902	131-2230	← →	131-2230	OMIT	131-2230	←		→	131-2230



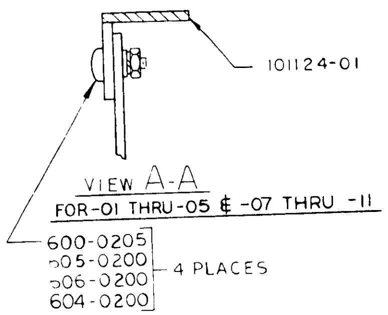
VIEW C-C
TO-5 MTG CONFIGURATION



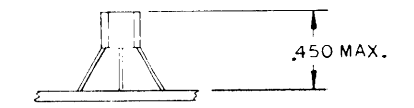
VIEW E-E

TOP A
NEXT A

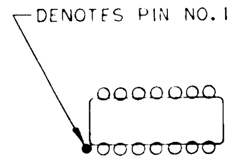
REVISIONS					
REV	DESCRIPTION	DATE	DR	CHK	APPR
A	ERN 2-SP	1/27	EL	[illegible]	R.M.
B	ECN 1846A	8.19.70	T.B	[illegible]	[illegible]
C	ECN 1850	8.19.70	T.B	[illegible]	[illegible]
D	ECN 1887A	[illegible]	T.B	[illegible]	[illegible]
E	ECN 1934	9.18.70	T.B	[illegible]	[illegible]
F	ECN 1945A	9.18.70	T.B	[illegible]	[illegible]
G	ECN 1948	9.18.70	T.B	[illegible]	[illegible]
H	ECN 2149	12/4/70	T.B	[illegible]	BB
J	ECN 2368	3/1/71	T.B	[illegible]	BB
K	ECN 2484	4/28/71	C.J.	[illegible]	ABR
L	ECN 2533	4/28/71	C.J.	[illegible]	ABR
M	ECN 2485A	4/28/71	C.J.	[illegible]	ABR
N	ECN 2546	4/28/71	C.J.	[illegible]	ABR
P	ECN 2465 A	6/8/71	[illegible]	[illegible]	ABR
R	ECN 2659	6/8/71	[illegible]	[illegible]	ABR
S	ECN 2704A	6/8/71	[illegible]	[illegible]	ABR
T	ECN 2846	9/10/71	T.B	[illegible]	[illegible]
U	ECN 3002	2/2/72	RAS	L.B	RCA
V	ECN 3105A - CANCELLED	3/3/72	[illegible]	L.B	RCA
W	ECN 3179A	3/22/72	[illegible]	L.B	RCA
Y	ECN 4629	12/5/72	J.M.	[illegible]	RCA
Z	ECN 4823	1/17/73	[illegible]	[illegible]	RCA
AA	ECN 4840	1/17/73	[illegible]	[illegible]	RCA
AB	ECN 4967	2/21/73	K	[illegible]	RCA
AB1	ECN 5181	8-8-73	[illegible]	[illegible]	RCA
AC	ECN 5308	7/11/73	[illegible]	[illegible]	[illegible]
AD	ECN 5413	8/22/73	[illegible]	[illegible]	RCA
AE	ECN 6012	2/6/74	[illegible]	[illegible]	[illegible]
AF	ECN 6112	4/22/74	[illegible]	[illegible]	[illegible]
AG	ECN 6116	3/13/74	[illegible]	[illegible]	[illegible]
AH	ECN 6130	5/15/74	[illegible]	CCA	[illegible]
AJ	ECN 6406	6.21.74	RV	CCA	[illegible]
AJ1	ECN 6440	7.17.74	RV	[illegible]	[illegible]
AK	ECN 6620	8/23/74	[illegible]	[illegible]	[illegible]



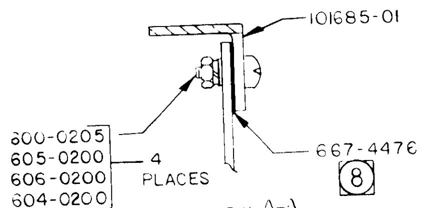
VIEW A-A
FOR -01 THRU -05 & -07 THRU -11



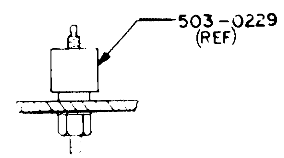
VIEW B-B
TYP TRANSISTOR MTG HEIGHT (TO 92)



I C ORIENTATION



VIEW A-A
FOR -06, 12 THRU 16.

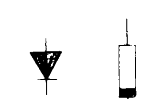


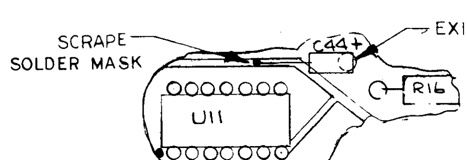
SECTION D-D
MTG DETAIL
FOR J1 & J2

(5) TABLE II

REF DESIGNATION	IPS	37.5	25	18.75	12.5	45	75	37.5	25	18.75	12.5	45	75	45	45	37.5	37.5
	VER	-01	-02	-03	-04	-05	-06	-07	-08	-09	-10	-11	-12	-13	-14	-15	-16
R110-910, 111-911		104-5111	104-5621	104-6191	104-2611	104-6191	104-1002	104-5111	104-5621	104-6191	104-2611	104-6191	104-1002	104-6191	104-6191	104-5111	104-5111
R113-913		100-2725	100-3325	100-6825	100-2225	100-2225	100-2725	100-2725	100-3325	100-6825	100-2225	100-2225	100-2725	100-2225	100-2225	100-2725	100-2725
R114-914		104-2612	104-3162	104-7502	104-3162	104-2152	104-1332	104-2612	104-3162	104-7502	104-3162	104-2152	104-1332	104-2152	104-2152	104-2612	104-2612
C101-901		131-1030	←→	131-1030	OMIT	131-1030	←		→	131-1030	OMIT	131-1030	←			→	131-1030
C105-905		131-1020	131-1520	131-2220	131-3320	131-1020	131-1020	131-1020	131-1520	131-2220	131-3320	131-1020	←			→	131-1020
C109-909		131-6820	131-1030	131-1030	131-1530	131-4720	131-3320	131-6820	131-1030	131-1030	131-1530	131-4720	131-3320	131-4720	131-4720	131-6820	131-6820
C110-910		130-2205	130-3305	130-4705	130-6805	130-1505	130-1005	130-2205	130-3305	130-4705	130-6805	130-1505	130-1005	130-1505	130-1505	130-2205	130-2205
C111-911		130-3315	130-4715	130-5615	130-5615	130-2215	130-1515	130-3315	130-4715	130-5615	130-5615	130-2215	130-1515	130-2215	130-2215	130-3315	130-3315
R109-909		100-2725	100-1525	100-1525	100-6815	100-2725	100-2725	100-2725	100-1525	100-1525	100-6815	100-2725	←			→	100-2725
C104-904		130-3305	←→	130-3305	130-6805	130-3305	←		→	130-3305	130-6805	130-3305	←			→	130-3305
R118-918		100-1525	100-1225	100-1225	100-1025	100-1025	100-6815	100-1525	100-1225	100-1225	100-1025	100-1025	100-6815	100-1025	100-1025	100-1525	100-1525
C106-906		130-3305	←		→	130-3305	130-2205	130-3305	←		→	130-3305	130-2205	130-3305	←	→	130-3305
C107-907		130-4715	←		→	130-4715	130-1015	130-4715	←		→	130-4715	130-1015	130-4715	←	→	130-4715
C108-908		130-2205	←		→	130-2205	130-1005	130-2205	←		→	130-2205	130-1005	130-2205	←	→	130-2205
R119-919		100-2735	←		→	100-2735	100-2235	100-2735	←		→	100-2735	100-2235	100-2735	←	→	100-2735
R135-935		OMIT	←													→	OMIT
R107-907, 108-908		101-2715	←													→	101-2715
R101-901, 1, 9, 22		100-2215	←			→	100-2215	OMIT	←			→	OMIT	100-2215	OMIT	100-2215	OMIT
R102-902, 2, 10, 23		100-3315	←			→	100-3315	OMIT	←			→	OMIT	100-3315	OMIT	100-3315	OMIT
C102-902		131-2230	←→	131-2230	OMIT	131-2230	←		→	131-2230	OMIT	131-2230	←			→	131-2230

(9)


DIODE ORIENTATION



VIEW E-E

INSERT C44(+) LEAD INTO EXISTING FEEDTHRU. SCRAPE SOLDER MASK FROM ETCH AS SHOWN AND SOLDER OTHER LEAD OF C44 TO THIS ETCH.

PART NO. 101346- REV

TOP ASSY	6000
NEXT ASSY	1ST USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES:
.XX ± .010
.XXX ± .005
X/X ± 1/32
ANGULAR ± 1/2°
BREAK ALL SHARP CORNERS APPROX. .010

FINISH:

SIGNATURES		DATE
DR	[illegible]	7/13/70
CHK	[illegible]	[illegible]
DES	[illegible]	[illegible]
ENGR	[illegible]	[illegible]
ENGR		

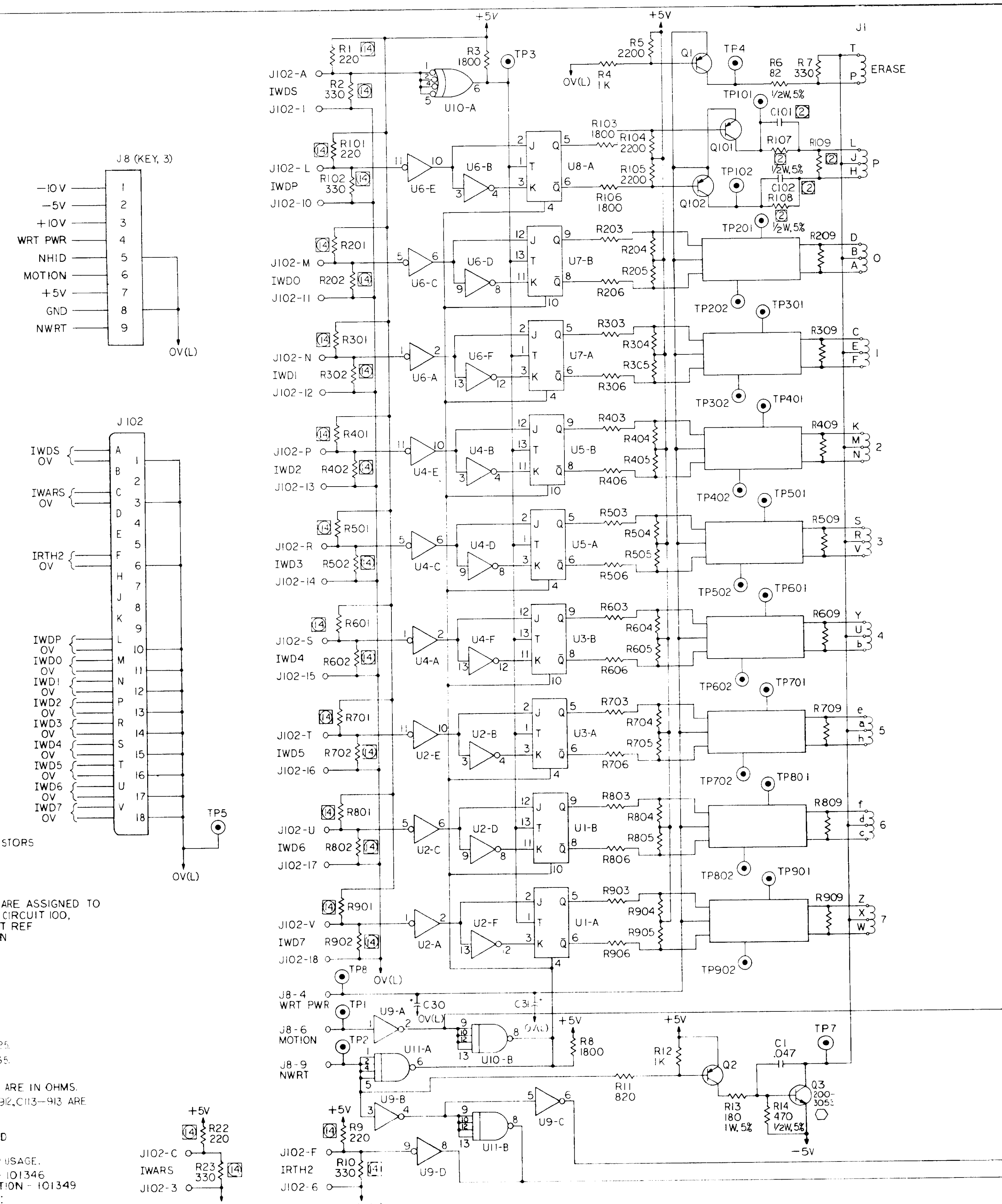
MATL:

PEC PERIPHERAL EQUIPMENT CORPORATION

TITLE PCBA - DATA - F READ WHILE WRITE

SIZE E | CODE IDENT. NO. | DWG NO. 101346 | REV AK

SCALE 2/1 | DO NOT SCALE DWG | SHEET 1 OF 1



[14] VERSIONS WITHOUT TERMINATOR RESISTORS ARE FOR USE WITH MTA.

13. CIRCUIT 100 IS TYPICAL OF CIRCUITS 200 THRU 900.

12. 3 DIGIT REFERENCE DESIGNATIONS ARE ASSIGNED TO REPETITIVE CIRCUITS. EX: TP101 IS CIRCUIT 100, TP901 IS CIRCUIT 900. SINGLE DIGIT REF DESIGNATIONS ARE ASSIGNED TO NON REPETITIVE CIRCUITS. EX: TP1, TP2.

11. PIN 14 OF ALL IC'S IS +5V.

10. PIN 7 OF ALL IC'S IS OV(L).

9. INTEGRATED CIRCUITS:
U2, 4, 6, 9 ARE 700-8360.
U10, 11, 31-35 ARE 700-8440.
U1, 3, 5, 7, 8 ARE 700-8530.
U12-30 ARE 400-1437.

8. ALL PNP TRANSISTORS ARE 200-4125.

7. ALL NPN TRANSISTORS ARE 200-4135.

6. ALL DIODES ARE 300-4446.

5. ALL RESISTORS ARE 1/4W, 5%, VALUES ARE IN OHMS.

4. CAPACITORS C2-28, 30 THRU 44, C112-912, C113-913 ARE 2.7UF, 35V, 20% ALL OTHERS IN MICROFARADS, 100V, 10%.

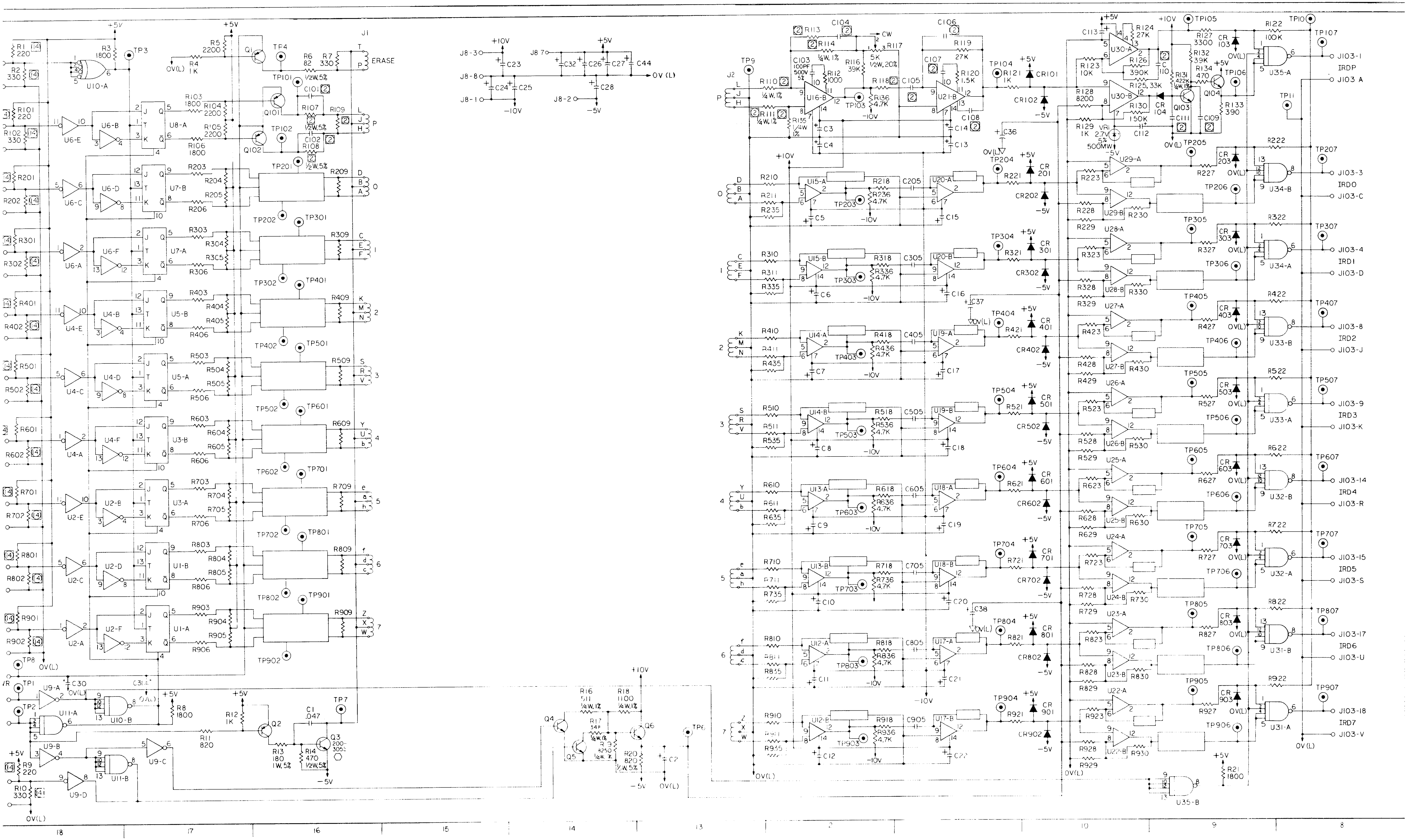
3. ⬡ INDICATES TRANSISTOR MOUNTED HEATSINK.

[2] SEE VERSION TABLE FOR VALUE OR USAGE.

1. REFERENCE DRAWINGS: ASSEMBLY - 101346
SPECIFICATION - 101349

NOTES: UNLESS OTHERWISE SPECIFIED:

21 20 19 18 17 16 15


ERASE
J1
J2
U10-A
U8-A
U7-B
U7-A
U5-B
U5-A
U3-B
U3-A
U1-B
U1-A
U9-A
U9-B
U9-C
U9-D
U10-B
U11-A
U11-B
U16-B
U21-B
U30-A
U30-B
U35-A
U35-B
Q1
Q2
Q3
Q4
Q5
Q6
Q101
Q102
Q103
Q104
J8-3
J8-8
J8-1
J8-2
C23
C24
C25
C32
C26
C27
C44
C28
OV (L)
+5V
+10V
-5V
-10V
IRDP
IRD0
IRD1
IRD2
IRD3
IRD4
IRD5
IRD6
IRD7
J103-1
J103 A
J103-3
J103-C
J103-4
J103-D
J103-8
J103-J
J103-9
J103-K
J103-14
J103-R
J103-15
J103-S
J103-17
J103-U
J103-18
J103-V
R21
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CW
500MW
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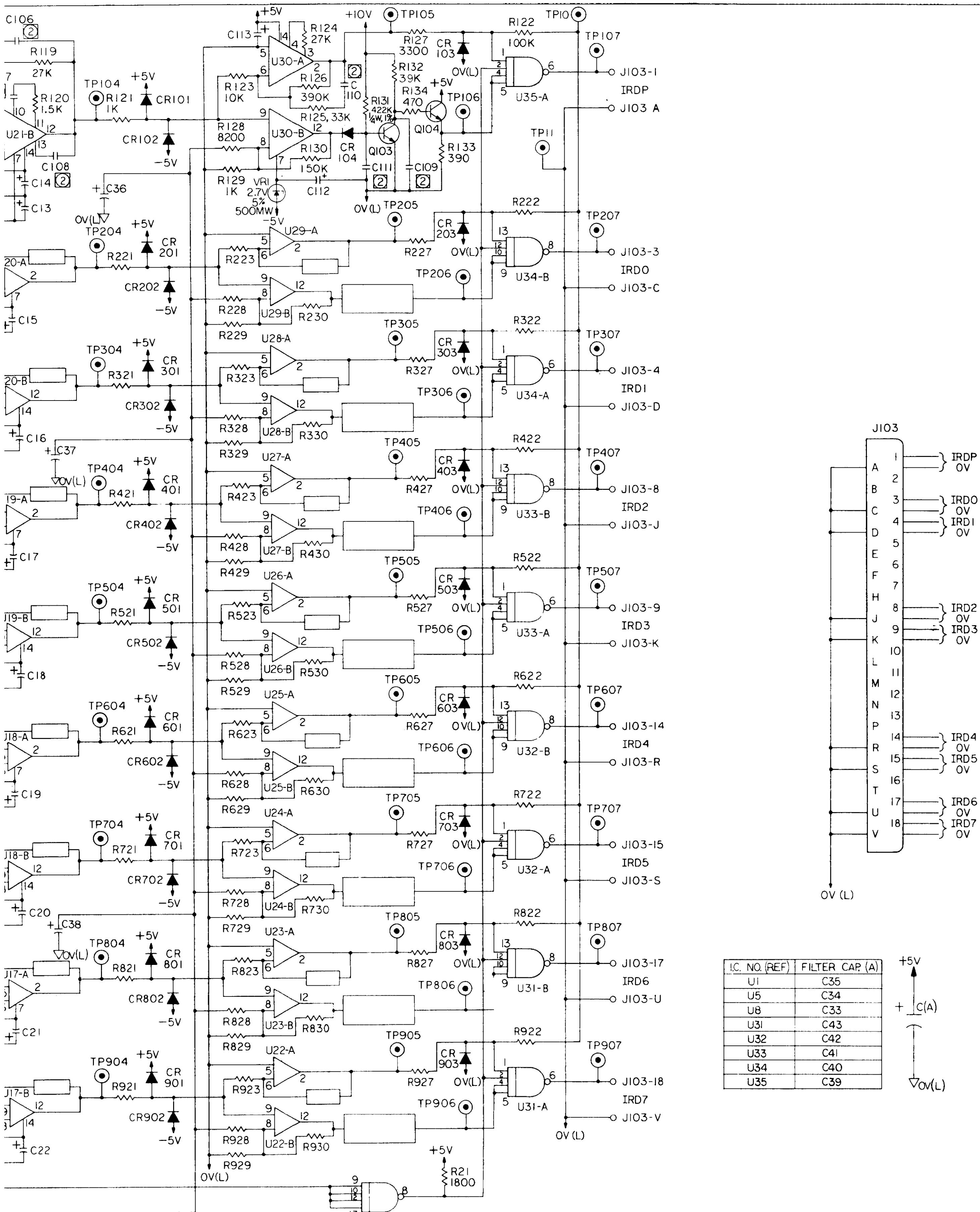


REFERENCE DESIGNATION		
LAST USED		DELETED
C44	C913	C29
	CR904	
Q6	Q904	
R23	R936	R15, 115-915
U35		
TP11	TP907	
VR1		

VERSION	SPEED (IPS)	R110-910 R111-911 1/4W, 1%	R113-913 1/4W, 5%	R114-914 1/4W, 1%	C101-901 100V, 10%	C102902 100V, 10%	C105-905 100V, 10%	C109-909 100V, 10%	C110-910 500V, 5%	C111-911 500V, 5%	R109-909 1/4W, 5%	C104-904 500V, 5%	R118-918 1/4W, 5%	C106-906 500V, 5%	C107-907 500V, 5%	C108-908 500V, 5%	R119-919 1/4W, 5%	R107-907 R108-908 1/2W, 5%	(14) R101-901, 1, 9, 22	(14) R102-902 2, 10, 23	R135-935 1/4W, 1%
-01	37.5	5110	2700	26100	.01	.022	.001UF	.0068UF	22PF	330PF	2700	33PF	1.5K	33PF	470PF	22PF	27K	270	220	330	OMIT
-02	25	5620	3300	31600	.01	.022	.0015UF	.01UF	33PF	470PF	1500	33PF	1.2K	33PF	470PF	22PF	27K				
-03	18.75	6.19K	6.8K	75K	.01	.022	.0022UF	.01UF	47PF	560PF	1500	33PF	1.2K	33PF	470PF	22PF	27K				
-04	12.5	2610	2200	31600	OMIT	OMIT	.0033UF	.015UF	68PF	560PF	680	68PF	1K	33PF	470PF	22PF	27K				
-05	45	6190	2.2K	21.5K	.01	.022	.001UF	.0047UF	15PF	220PF	2700	33PF	1K	33PF	470PF	22PF	27K				
-06	75	10K	2700	13300	.01	.022	.001UF	.0033UF	10PF	150PF	2700	33PF	680	22PF	100PF	10PF	22K		220	330	
-07	37.5	5110	2700	26100	.01	.022	.001UF	.0068UF	22PF	330PF	2700	33PF	1.5K	33PF	470PF	22PF	27K		OMIT	OMIT	
-08	25	5620	3300	31600	.01	.022	.0015UF	.01UF	33PF	470PF	1500	33PF	1.2K								
-09	18.75	6.19K	6.8K	75K	.01	.022	.0022UF	.01UF	47PF	560PF	1500	33PF	1.2K								
-10	12.5	2610	2200	31600	OMIT	OMIT	.0033UF	.015UF	68PF	560PF	680	68PF	1K								
-11	45	6190	2.2K	21.5K	.01	.022	.001UF	.0047UF	15PF	220PF	2700	33PF	1K	33PF	470PF	22PF	27K				
-12	75	10K	2700	13300	.01	.022	.001UF	.0033UF	10PF	150PF	2700	33PF	680	22PF	100PF	10PF	22K		OMIT	OMIT	
-13	45	6190	2.2K	21.5K	.01	.022	.001UF	.0047UF	15PF	220PF	2700	33PF	1K	33PF	470PF	22PF	27K		220	330	
-14	45	6190	2.2K	21.5K	.01	.022	.001UF	.0047UF	15PF	220PF	2700	33PF	1K	33PF	470PF	22PF	27K		OMIT	OMIT	
-15	37.5	5110	2700	26100	.01	.022	.001UF	.0068UF	22PF	330PF	2700	33PF	1.5K	33PF	470PF	22PF	27K		220	330	
-16	37.5	5110	2700	26100	.01	.022	.001UF	.0068UF	22PF	330PF	2700	33PF	1.5K	33PF	470PF	22PF	27K	270	OMIT	OMIT	OMIT

I.C. NO. (REF)	FILTER CAP. (A)
U1	C35
U5	C34
U8	C33
U31	C43
U32	C42
U33	C41
U34	C40
U35	C39

REVISIONS

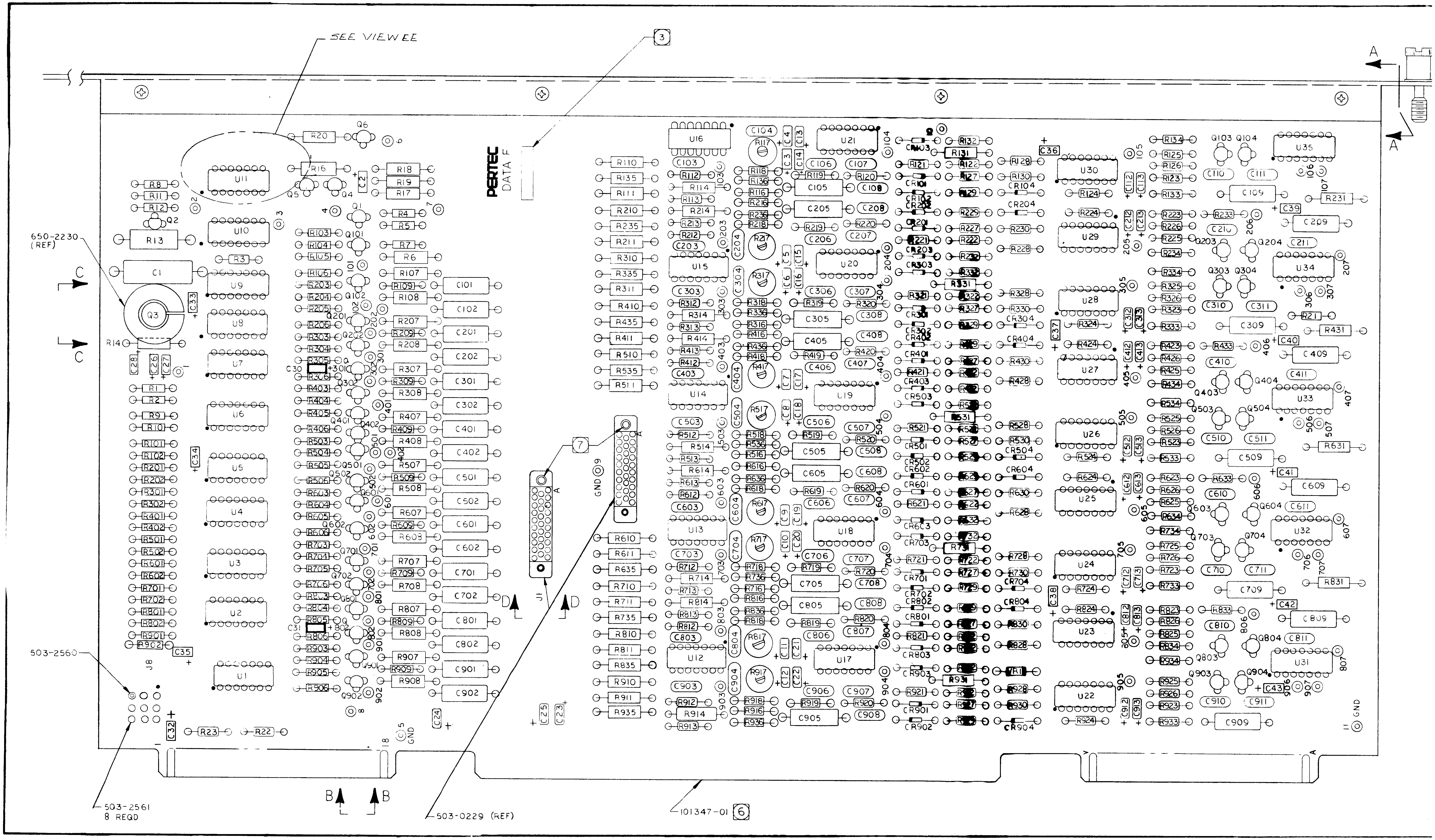
REV	DESCRIPTION	DATE	DR	CHK	APPR
A	ERN 2-SP	6/9/70			
B	ECN 1886	8-20-70	TB	KJE	
C	ECN 1933	9-18-70	TB		
D	ECN 1947	9-18-70	TB		
E	ECN 2148	12/4/70	TB		
F	ECN 2368	2/26/71	TB		
G	ECN 2533	4/29/71	C.J.		
H	ECN 2546	4/28/71	C.J.		
J	ECN 2659	6/22/71			
K	ECN 2702	7/20/71			
L	ECN 2846	9/10/71	TB		
M	ECN 3002	2/2/72	RAS		RCA
N	ECN 3179A	3/3/72	PC		RCA
P	ECN 4840				RCA
R	ECN 4967				RCA
S	ECN 5308				
T	ECN 6012				
U	ECN 6112				
V	ECN 6116				
W	ECN 6130				
Y	ECN 6406			CCA	
Y1	ECN 6440				
Z	ECN 6620				

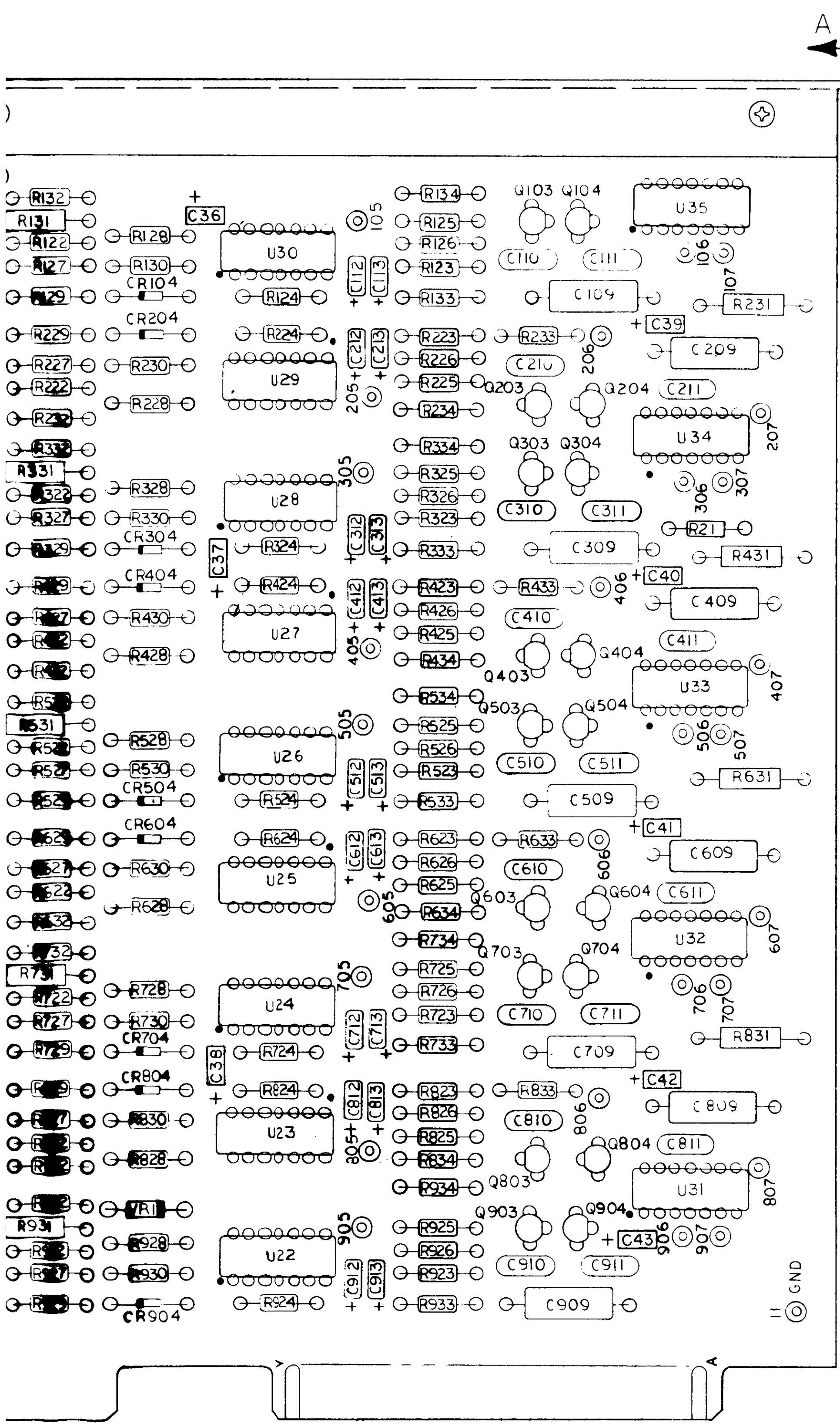
PEC PERIPHERAL EQUIPMENT CORPORATION

TITLE SCHEMATIC DATA 'F' READ WHILE WRITE

101346	TOP ASSY
NEXT ASSY	1ST USED ON
APPLICATION	

SIZE J DWG NO. 101345 REV Z


SEE VIEW EE
3
A
650-2230 (REF)
C
PERTEC
DATA F
7
GND 9
J1
D
503-2560
J8
503-2561
8 REQD
B
503-0229 (REF)
101347-01
6



9. VERSIONS WITHOUT TERMINATOR RESISTORS ARE FOR USE WITH MTA.

8. BEFORE INSTALLING SUPPORT ANGLE, 101685-01, TO THE BOARD ASSY, VINYL TAPE, 667-4476, SHOULD BE APPLIED TO THE PC BOARD AS SHOWN ON VIEW A-A FOR -06, 12 THRU 16 VERSIONS ONLY.

7. ORIENTATE CONNECTORS, J1 & J2 AS SHOWN.

6. THIS ASSY SHALL BE MADE FROM PROCESS BOARD 101347-01 REV.M AND SUBSEQUENT.

5. FOR PART NO'S WHICH ARE AFFECTED BY VERSION NO. SEE TABLE II.

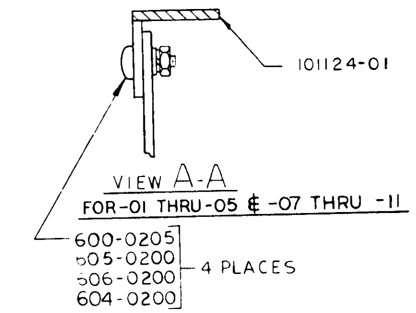
4. FOR PART NO'S WHICH ARE NOT AFFECTED BY VERSION NO. SEE TABLE I.

3. RUBBER STAMP ASSY PART NO. INCLUDING VERSION AND ISSUE LETTER.

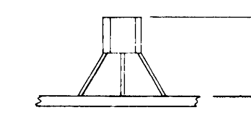
2. ASSEMBLE PER STANDARD MFG METHODS.

1. REF DWGS: SCHEMATIC - 101345
   SPECIFICATION - 101349

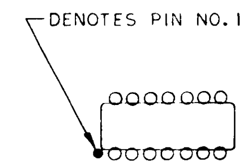
NOTES: UNLESS OTHERWISE SPECIFIED:



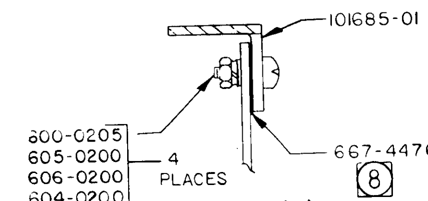
VIEW A-A
FOR -01 THRU -05 & -07 THRU -11



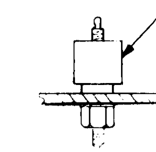
VIEW B-B
TYP TRANSISTOR MTG H



IC ORIENTATION



VIEW A-A
FOR -06, 12 THRU 16



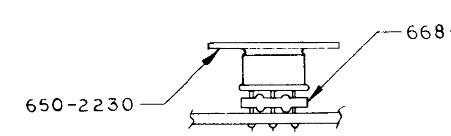
SECTION D-D
MTG DETAIL FOR J1 & J2

4 TABLE I

PART NO.	REF DESIGNATION
100-1025	R121-921, 129-929,
	4, 12, 112-912
100-1035	R123-923
100-1045	R122-922
101-4715	R14
100-1545	R130-930
100-1825	R103-903, 106-906,
	3, 8, 21
100-4725	R136-936
100-2225	R104-904, 105-905, 5
100-1525	R120-920
100-3935	R132-932
100-2735	R124-924
100-3315	R7
100-3325	R127-927
100-3335	R125-925
100-3915	R133-933
100-3935	R116-916
100-3945	R126-926
100-4715	R134-934
100-8215	R11
100-8225	R128-928
101-8205	R6
101-8215	R20
102-1815	R13
104-3480	R17
104-1101	R18
104-4223	R131-931
104-5110	R16
104-8251	R19
123-5020	R117-917
130-1015	C103-903
131-4730	C1
132-2752	C2-28, 30, C112-912
	C113-913, 31 THRU 44
200-3053	Q3

TABLE I CONT

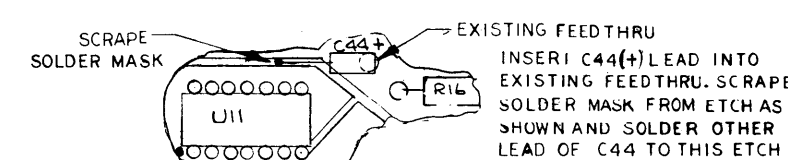
PART NO.	REF DESIGNATION
200-4123	Q103-903, 104-904,
	4-6
200-4125	Q101-901, 102-902,
	1, 2
300-4446	CR101-901, 102-902,
	103-903, 104-904
400-1437	U12-30
503-0229	J1, 2
700-8360	U2, 4, 6, 9
700-8440	U10, 11, 31-35
700-8530	U1, 3, 5, 7, 8
331-0275	VR1



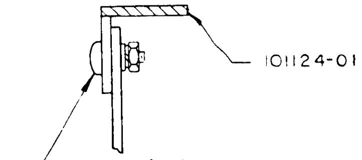
VIEW C-C
TO-5 MTG CONFIGURATION

5 TABLE II

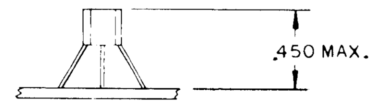
REF DESIGNATION	PART NO'S								
IPS	37.5	25	18.75	12.5	45	75	37.5	25	18.75
VER	-01	-02	-03	-04	-05	-06	-07	-08	-09
R110-910, 111-911	104-5111	104-5621	104-6191	104-2611	104-6191	104-1002	104-5111	104-5621	104-6191
R113-913	100-2725	100-3325	100-6825	100-2225	100-2225	100-2725	100-2725	100-3325	100-6825
R114-914	104-2612	104-3162	104-7502	104-3162	104-2152	104-1332	104-2612	104-3162	104-7502
C101-901	131-1030	←→	131-1030	OMIT	131-1030	←		→	131-1030
C105-905	131-1020	131-1520	131-2220	131-3320	131-1020	131-1020	131-1020	131-1520	131-2220
C109-909	131-6820	131-1030	131-1030	131-1530	131-4720	131-3320	131-6820	131-1030	131-1030
C110-910	130-2205	130-3305	130-4705	130-6805	130-1505	130-1005	130-2205	130-3305	130-4705
C111-911	130-3315	130-4715	130-5615	130-5615	130-2215	130-1515	130-3315	130-4715	130-5615
R109-909	100-2725	100-1525	100-1525	100-6815	100-2725	100-2725	100-2725	100-1525	100-1525
C104-904	130-3305	←→	130-3305	130-6805	130-3305	←		→	130-3305
R118-918	100-1525	100-1225	100-1225	100-1025	100-1025	100-6815	100-1525	100-1225	100-1225
C106-906	130-3305	←		→	130-3305	130-2205	130-3305	←	
C107-907	130-4715	←		→	130-4715	130-1015	130-4715	←	
C108-908	130-2205	←		→	130-2205	130-1005	130-2205	←	
R119-919	100-2735	←		→	100-2735	100-2235	100-2735	←	
R135-935	OMIT	←							
R107-907, 108-908	101-2715	←							
9 R101-901, 1, 9, 22	100-2215	←			→	100-2215	OMIT	←	
R102-902, 2, 10, 23	100-3315	←			→	100-3315	OMIT	←	
C102-902	131-2230	←→	131-2230	OMIT	131-2230	←		→	131-2230



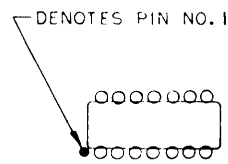
VIEW E-E



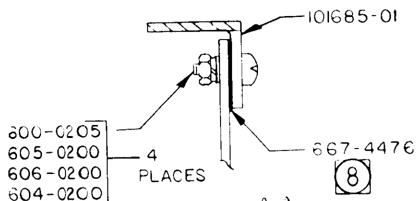
VIEW A-A
FOR-01 THRU -05 & -07 THRU -11



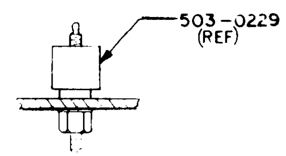
VIEW B-B
TYP TRANSISTOR MTG HEIGHT (TO 92)



I C ORIENTATION



VIEW A-A
FOR-06, 12 THRU 16.



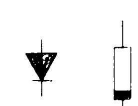
SECTION D-D
MTG DETAIL FOR J1 & J2

REVISIONS

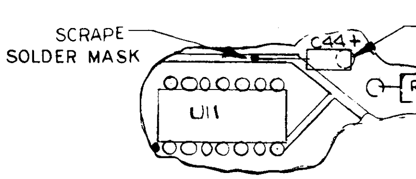
REV	DESCRIPTION	DATE	DR	CHK	APPR
A	ERN 2-SP	1/27	EL		
B	ECN 1846A	8 19 70	T B		
C	ECN 1850	8 19 70	T.B		
D	ECN 1887A		TB		
E	ECN 1934	9 18 70	T.B		
F	ECN 1945A	9.18.70	T.B		
G	ECN 1948	9.18.70	T.B		
H	ECN 2149	12/4/70	T.B		
J	ECN 2368	3/1/71	T.B		
K	ECN 2484	4/28/71	C.J.		
L	ECN 2533	4/28/71	C.J.		
M	ECN 2485A	4/28/71	C.J.		
N	ECN 2546	4/28/71	C.J.		
P	ECN 2465 A	6/8/71			
R	ECN 2659	6/8/71			
S	ECN 2704A	6/8/71			
T	ECN 2846	9/10/71	T.B		
U	ECN 3002	2/2/72	RAS		RCA
V	ECN 3105A - CANCELLED	3/3/72			RCA
W	ECN 3179A	3/22/72			RCA
Y	ECN 4629	12/5/72	J.M.		RCA
Z	ECN 4823	1/17/73			RCA
AA	ECN 4840	1/17/73			
AB	ECN 4967	2/21/73			RCA
AB1	ECN 5181	5-8-73			RCA
AC	ECN 5308	7/11/73			
AD	ECN 5413	8/22/73			RCA
AE	ECN 6012	2/6/74			
AF	ECN 6112	4/22/74			
AG	ECN 6116	3/13/74			
AH	ECN 6130	5/15/74		CCA	
AJ	ECN 6406	6.21.74		CCA	
AJ1	ECN 6445	7.17.74			
AK	ECN 6620	8/23/74			

(5) TABLE II

REF DESIGNATION	PART NO'S															
IPS	37.5	25	18.75	12.5	45	75	37.5	25	18.75	12.5	45	75	45	45	37.5	37.5
VER	-01	-02	-03	-04	-05	-06	-07	-08	-09	-10	-11	-12	-13	-14	-15	-16
R110-910/111-911	104-5111	104-5621	104-6191	104-2611	104-6191	104-1002	104-5111	104-5621	104-6191	104-2611	104-6191	104-1002	104-6191	104-6191	104-5111	104-5111
R113-913	100-2725	100-3325	100-6825	100-2225	100-2225	100-2725	100-2725	100-3325	100-6825	100-2225	100-2225	100-2725	100-2225	100-2225	100-2725	100-2725
R114-914	104-2612	104-3162	104-7502	104-3162	104-2152	104-1332	104-2612	104-3162	104-7502	104-3162	104-2152	104-1332	104-2152	104-2152	104-2612	104-2612
C101-901	131-1030	←→	131-1030	OMIT	131-1030	←	—	→	131-1030	OMIT	131-1030	←	—	—	→	131-1030
C105-905	131-1020	131-1520	131-2220	131-3320	131-1020	131-1020	131-1020	131-1520	131-2220	131-3320	131-1020	←	—	—	→	131-1020
C109-909	131-6820	131-1030	131-1030	131-1530	131-4720	131-3320	131-6820	131-1030	131-1030	131-1530	131-4720	131-3320	131-4720	131-4720	131-6820	131-6820
C110-910	130-2205	130-3305	130-4705	130-6805	130-1505	130-1005	130-2205	130-3305	130-4705	130-6805	130-1505	130-1005	130-1505	130-1505	130-2205	130-2205
C111-911	130-3315	130-4715	130-5615	130-5615	130-2215	130-1515	130-3315	130-4715	130-5615	130-5615	130-2215	130-1515	130-2215	130-2215	130-3315	130-3315
R109-909	100-2725	100-1525	100-1525	100-6815	100-2725	100-2725	100-2725	100-1525	100-1525	100-6815	100-2725	←	—	—	→	100-2725
C104-904	130-3305	←→	130-3305	130-6805	130-3305	←	—	→	130-3305	130-6805	130-3305	←	—	—	→	130-3305
R118-918	100-1525	100-1225	100-1225	100-1025	100-1025	100-6815	100-1525	100-1225	100-1225	100-1025	100-1025	100-6815	100-1025	100-1025	100-1525	100-1525
C106-906	130-3305	←	—	→	130-3305	130-2205	130-3305	←	—	→	130-3305	130-2205	130-3305	←	→	130-3305
C107-907	130-4715	←	—	→	130-4715	130-1015	130-4715	←	—	→	130-4715	130-1015	130-4715	←	→	130-4715
C108-908	130-2205	←	—	→	130-2205	130-1005	130-2205	←	—	→	130-2205	130-1005	130-2205	←	→	130-2205
R119-919	100-2735	←	—	→	100-2735	100-2235	100-2735	←	—	→	100-2735	100-2235	100-2735	←	→	100-2735
R135-935	OMIT	←	—	—	—	—	—	—	—	—	—	—	—	—	→	OMIT
R107-907, 108-908	101-2715	←	—	—	—	—	—	—	—	—	—	—	—	—	→	101-2715
(9) R101-901, 1, 9, 22	100-2215	←	—	—	→	100-2215	OMIT	←	—	—	→	OMIT	100-2215	OMIT	100-2215	OMIT
R102-902, 2, 10, 23	100-3315	←	—	—	→	100-3315	OMIT	←	—	—	→	OMIT	100-3315	OMIT	100-3315	OMIT
C102-902	131-2230	←→	131-2230	OMIT	131-2230	←	—	→	131-2230	OMIT	131-2230	←	—	—	→	131-2230



DIODE ORIENTATION



INSERT C44(+) LEAD INTO EXISTING FEEDTHRU. SCRAPE SOLDER MASK FROM ETCH AS SHOWN AND SOLDER OTHER LEAD OF C44 TO THIS ETCH.

VIEW E-E

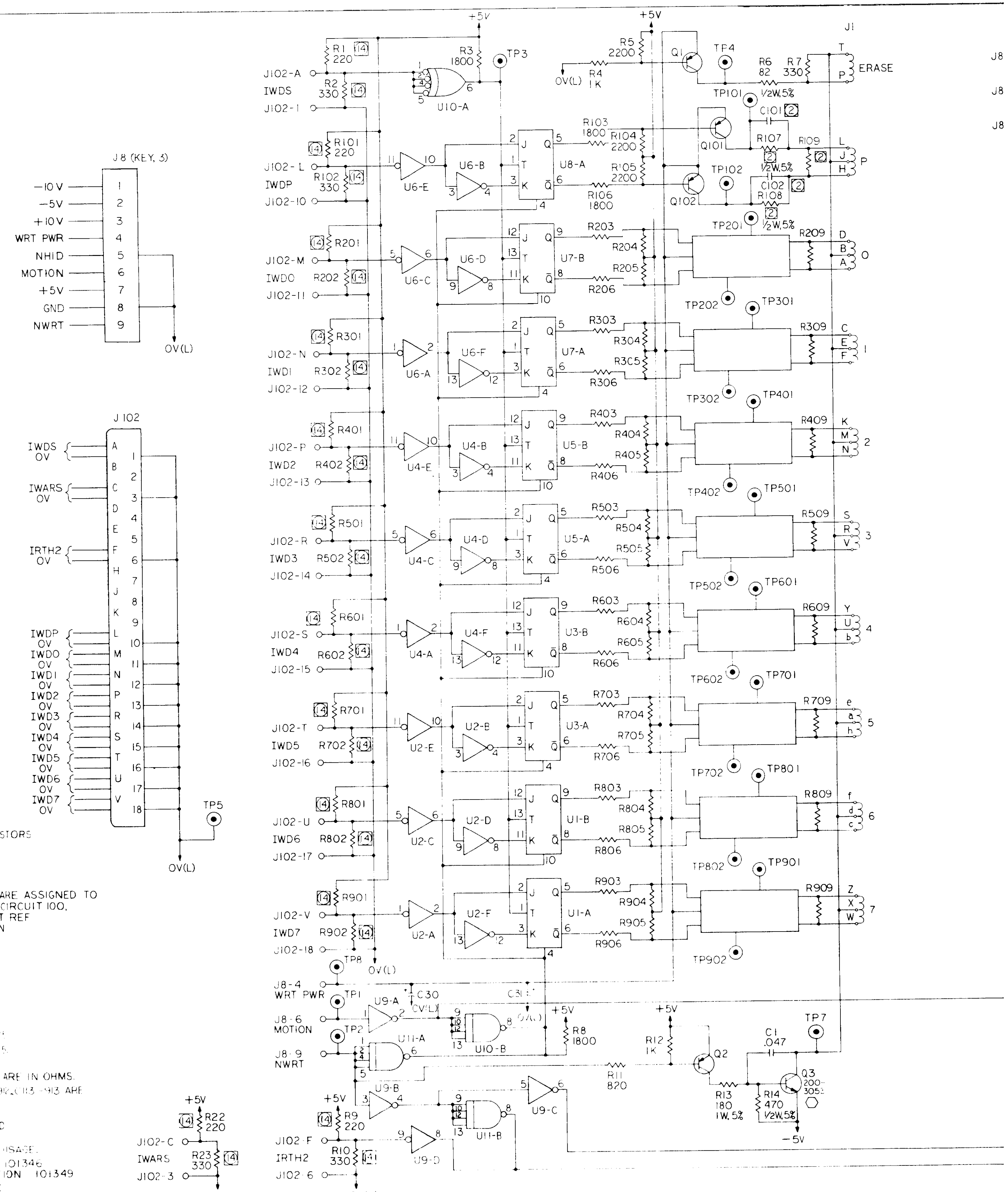
PART NO. 101346- REV

UNLESS OTHERWISE SPECIFIED	DIMENSIONS ARE IN INCHES. TOLERANCES: .XX ± .010, .XXX ± .005, X/X ± 1/32; ANGULAR ± 1/2°. BREAK ALL SHARP CORNERS APPROX. 010
	THE INFORMATION HEREON IS THE PROPERTY OF PERIPHERAL EQUIPMENT CORPORATION. NO REPRODUCTION OR UNAUTHORIZED USE SHALL BE MADE.
SIGNATURES	DATE
DR	7/13/70
CHK	
DES	
ENGR	
ENGR	
TOP ASSY	6000
NEXT ASSY	1ST USED ON
APPLICATION	
FINISH:	
MATL:	

PEC PERIPHERAL EQUIPMENT CORPORATION

TITLE PCBA - DATA - F READ WHILE WRITE

SIZE	CODE IDENT. NO.	DWG NO.	REV
E		101346	AK
SCALE 2/1		DO NOT SCALE DWG	SHEET 1 OF 1



14 VERSIONS WITHOUT TERMINATOR RESISTORS ARE FOR USE WITH MTA.

13. CIRCUIT 100 IS TYPICAL OF CIRCUITS 200 THRU 900.

12. 3 DIGIT REFERENCE DESIGNATIONS ARE ASSIGNED TO REPETITIVE CIRCUITS. EX: TP101 IS CIRCUIT 100, TP901 IS CIRCUIT 900. SINGLE DIGIT REF DESIGNATIONS ARE ASSIGNED TO NON REPETITIVE CIRCUITS. EX: TP1, TP2.

11. PIN 14 OF ALL IC'S IS +5V.

10. PIN 7 OF ALL IC'S IS OV(L)

9. INTEGRATED CIRCUITS:
U2, 4, 6, 9 ARE 700-8360.
U10, 11, 31-35 ARE 700-[illegible].
U1, 3, 5, 7, 8 ARE 700-[illegible]
U12-30 ARE [illegible]

8. ALL PNP TRANSISTORS ARE [illegible]

7. ALL NPN TRANSISTORS ARE 200-4135.

6. ALL DIODES ARE 300-4446.

5. ALL RESISTORS ARE 1/4W, 5%, VALUES ARE IN OHMS.

4. CAPACITORS C2-28, [illegible] THRU 44, C112-912, C113-913 ARE 2.7UF, 35V, 20% ALL OTHERS IN MICROFARADS. 100V, 10%.

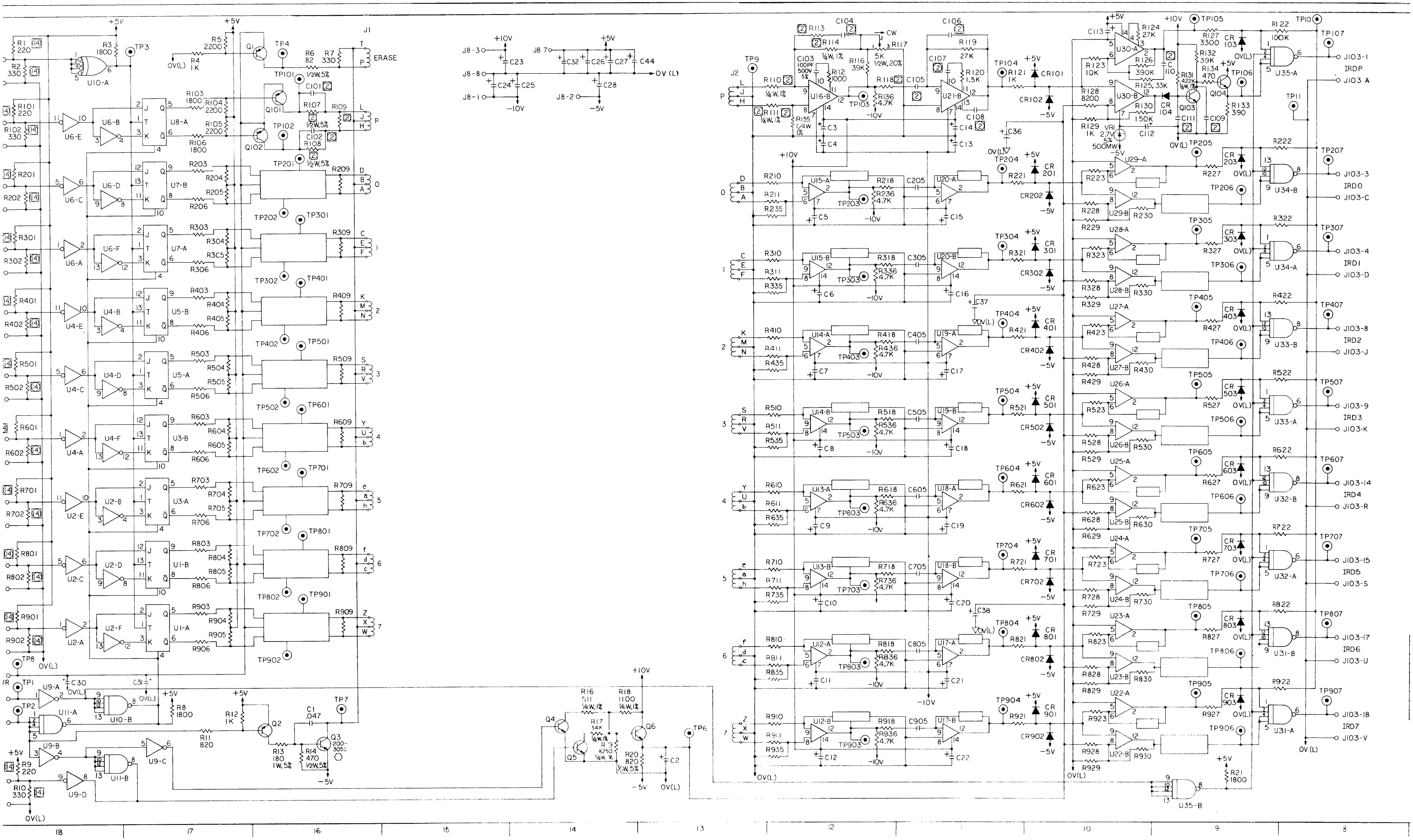
3. ⬡ INDICATES TRANSISTOR MOUNTED HEATSINK.

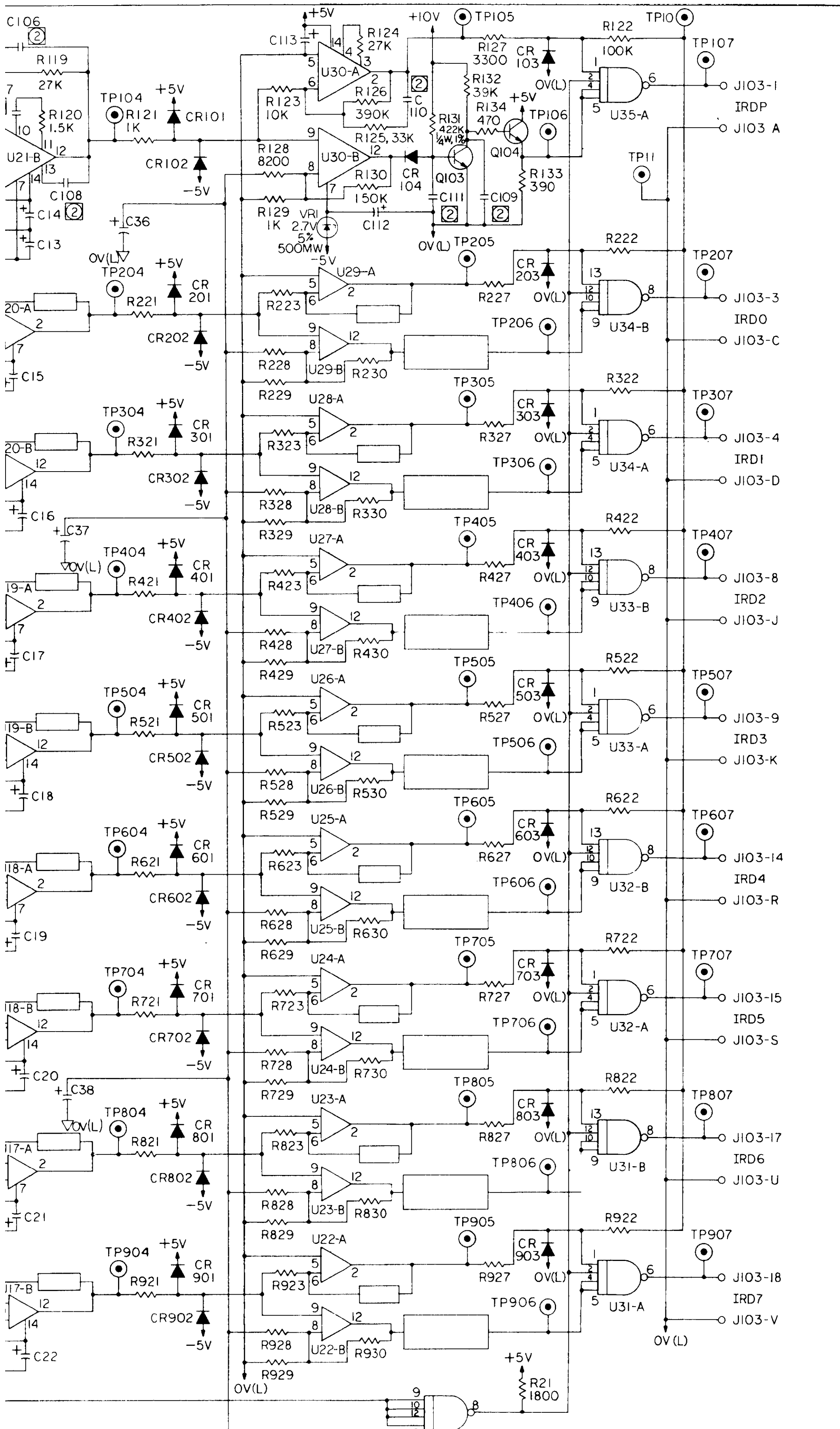
2 SEE VERSION TABLE FOR VALUE OR USAGE.

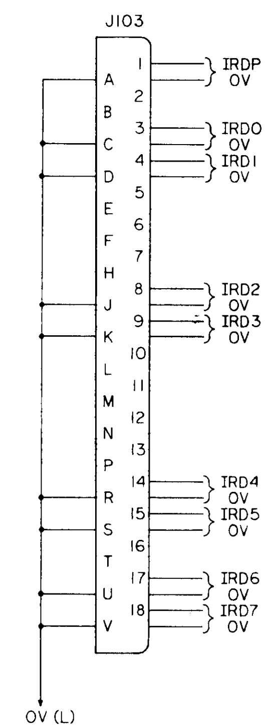
1. REFERENCE DRAWINGS: ASSEMBLY 101346
SPECIFICATION 101349

NOTES: UNLESS OTHERWISE SPECIFIED:

21 20 19 18 17 16 15







REVISIONS					
REV	DESCRIPTION	DATE	DR	CHK	APPR
A	ERN 2-5P	[illegible]	[illegible]	[illegible]	
B	ECN 1886	8-20-70	TB	KJR	[illegible]
C	ECN 1933	9-18-70	T.B	[illegible]	[illegible]
D	ECN 1947	9-18-70	T.B	[illegible]	[illegible]
E	ECN 2148	12/4/70	T.B	[illegible]	[illegible]
F	ECN 2368	3/26/71	T.B	[illegible]	[illegible]
G	ECN 2533	4/20/71	C.J.	[illegible]	[illegible]
H	ECN 2546	4/28/71	C.J.	[illegible]	[illegible]
J	ECN 2659	6/28/71	[illegible]	[illegible]	[illegible]
K	ECN 2702	7/20/71	[illegible]	[illegible]	[illegible]
L	ECN 2846	9/10/71	T.B	[illegible]	[illegible]
M	ECN 3002	2/2/72	RAS	R.B.	RCA
N	ECN 3179A	3/3/72	DC	R.B.	RCA
P	ECN 4840	[illegible]	K	[illegible]	RCA
R	ECN 4967	[illegible]	K	[illegible]	RCA
S	ECN 5308	7/11/75	[illegible]	[illegible]	[illegible]
T	ECN 6012	[illegible]	[illegible]	[illegible]	[illegible]
U	ECN 6112	[illegible]	[illegible]	[illegible]	[illegible]
V	ECN 6116	[illegible]	[illegible]	[illegible]	[illegible]
W	ECN 6130	[illegible]	[illegible]	[illegible]	[illegible]
Y	ECN 6406	6-21-76	AV	CCA	KW
Y1	ECN 6440	7.12.76	AV	[illegible]	[illegible]
Z	ECN 6620	[illegible]	[illegible]	[illegible]	[illegible]

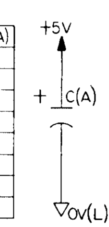
REFERENCE DESIGNATION

LAST USED		DELETED
C44	C913	C29
	CR904	
Q6	Q904	
R23	R936	R15,115-915
U35		
TP11	TP907	
VR1		

VERSION	SPEED (IPS)	R110-910 R111-911 1/4W,1%	R113-913 1/4W,5%	R114-914 1/4W,1%	C101-901 100V,10%	C102-902 100V,10%	C105-905 100V,10%	C109-909 100V,10%	C110-910 500V,5%	C111-911 500V,5%	R109-909 1/4W,5%	C104-904 500V,5%	R118-918 1/4W,5%	C106-906 500V,5%	C107-907 500V,5%	C108-908 500V,5%	R119-919 1/4W,5%	R107-907 R108-908 1/2W,5%	R101-901, 1,9,22	R102-902 2,10,23	R135-935 1/4W,1%
-01	37.5	5110	2700	26100	.01	.022	.001UF	.0068UF	22PF	330PF	2700	33PF	1.5K	33PF	470PF	22PF	27K	270	220	330	OMIT
-02	25	5620	3300	31600	.01	.022	.0015UF	.01UF	33PF	470PF	1500	33PF	1.2K	33PF	470PF	22PF	27K				
-03	18.75	6.19K	6.8K	75K	.01	.022	.0022UF	.01UF	47PF	560PF	1500	33PF	1.2K	33PF	470PF	22PF	27K				
-04	12.5	2610	2200	31600	OMIT	OMIT	.0033UF	.015UF	68PF	560PF	680	68PF	1K	33PF	470PF	22PF	27K				
-05	45	6190	2.2K	21.5K	.01	.022	.001UF	.0047UF	15PF	220PF	2700	33PF	1K	33PF	470PF	22PF	27K				
-06	75	10K	2700	13300	.01	.022	.001UF	.0033UF	10PF	150PF	2700	33PF	680	22PF	100PF	10PF	22K		220	330	
-07	37.5	5110	2700	26100	.01	.022	.001UF	.0068UF	22PF	330PF	2700	33PF	1.5K	33PF	470PF	22PF	27K		OMIT	OMIT	
-08	25	5620	3300	31600	.01	.022	.0015UF	.01UF	33PF	470PF	1500	33PF	1.2K								
-09	18.75	6.19K	6.8K	75K	.01	.022	.0022UF	.01UF	47PF	560PF	1500	33PF	1.2K								
-10	12.5	2610	2200	31600	OMIT	OMIT	.0033UF	.015UF	68PF	560PF	680	68PF	1K								
-11	45	6190	2.2K	21.5K	.01	.022	.001UF	.0047UF	15PF	220PF	2700	33PF	1K	33PF	470PF	22PF	27K				
-12	75	10K	2700	13300	.01	.022	.001UF	.0033UF	10PF	150PF	2700	33PF	680	22PF	100PF	10PF	22K		OMIT	OMIT	
-13	45	6190	2.2K	21.5K	.01	.022	.001UF	.0047UF	15PF	220PF	2700	33PF	1K	33PF	470PF	22PF	27K		220	330	
-14	45	6190	2.2K	21.5K	.01	.022	.001UF	.0047UF	15PF	220PF	2700	33PF	1K	33PF	470PF	22PF	27K		OMIT	OMIT	
-15	37.5	5110	2700	26100	.01	.022	.001UF	.0068UF	22PF	330PF	2700	33PF	1.5K	33PF	470PF	22PF	27K		220	330	
-16	37.5	5110	2700	26100	.01	.022	.001UF	.0068UF	22PF	330PF	2700	33PF	1.5K	33PF	470PF	22PF	27K	270	OMIT	OMIT	OMIT

14

I.C. NO. (REF)	FILTER CAP. (A)
U1	C35
U5	C34
U8	C33
U31	C43
U32	C42
U33	C41
U34	C40
U35	C39



UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES:
.XX ± .010
.XXX ± .005
ANGULAR ± 1/2°
BREAK ALL SHARP CORNERS APPROX. .010

THE INFORMATION HEREON IS THE PROPERTY OF PERIPHERAL EQUIPMENT CORPORATION. NO REPRODUCTION OR UNAUTHORIZED USE SHALL BE MADE.

SIGNATURES: DR L.G. Smith | CHK | DES | ENGR | ENGR

PEC PERIPHERAL EQUIPMENT CORPORATION

TITLE SCHEMATIC DATA 'F' READ WHILE WRITE

101346	TOP ASSY
NEXT ASSY	1ST USED ON
APPLICATION	

FINISH:

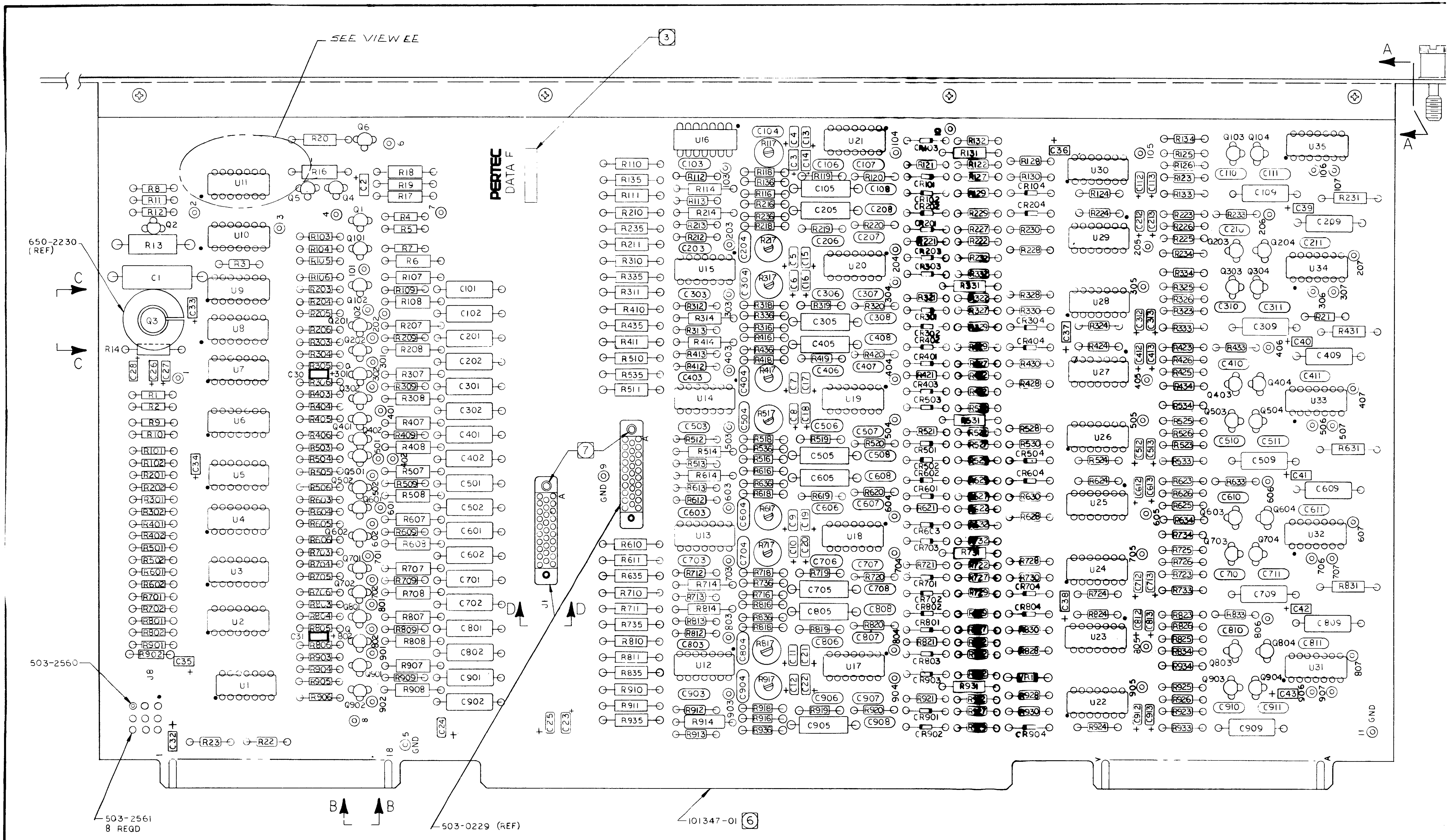
MATL:

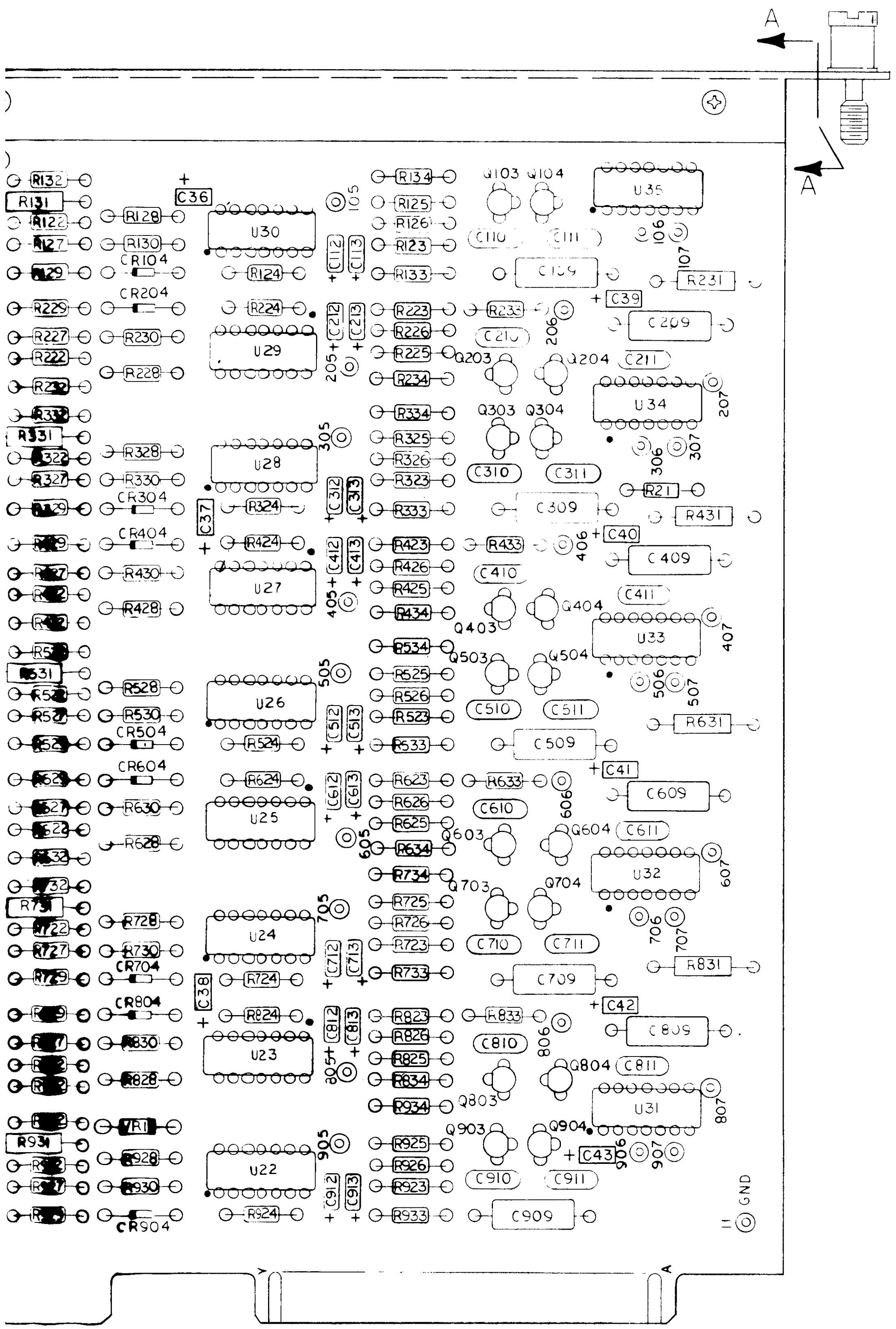
SIZE J | CODE IDENT. NO. | DWG NO. 101345 | REV Z

SCALE | DO NOT SCALE DWG | SHEET 1 OF 1

10 9 8 7 6 5 4

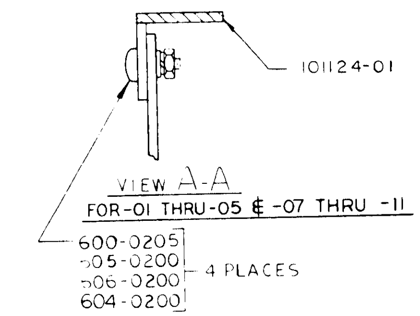
H G F E D C B A


SEE VIEW EE
3
650-2230
(REF)
C
C
PERTEC
DATA F
7
GND
D
D
503-2560
503-2561
8 REQD
B
B
503-0229 (REF)
101347-01
6
A
A
GND

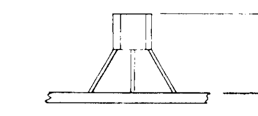


NOTES: UNLESS OTHERWISE SPECIFIED:

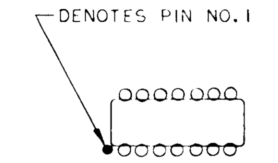
1. REF DWGS: SCHEMATIC - 101345
   SPECIFICATION - 101349
2. ASSEMBLE PER STANDARD MFG METHODS.
3. RUBBER STAMP ASSY PART NO. INCLUDING VERSION AND ISSUE LETTER.
4. FOR PART NO'S WHICH ARE NOT AFFECTED BY VERSION NO. SEE TABLE I.
5. FOR PART NO'S WHICH ARE AFFECTED BY VERSION NO. SEE TABLE II.
6. THIS ASSY SHALL BE MADE FROM PROCESS BOARD 101347-01 REV.M AND SUBSEQUENT.
7. ORIENTATE CONNECTORS, J1 & J2 AS SHOWN.
8. BEFORE INSTALLING SUPPORT ANGLE, 101685-01, TO THE BOARD ASSY, VINYL TAPE, 667-4476, SHOULD BE APPLIED TO THE PC BOARD AS SHOWN ON VIEW A-A FOR -06, 12 THRU 16 VERSIONS ONLY.
9. VERSIONS WITHOUT TERMINATOR RESISTORS ARE FOR USE WITH MTA.



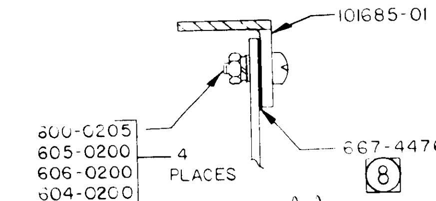
VIEW A-A
FOR-01 THRU-05 & -07 THRU -11



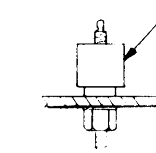
VIEW B-B
TYP TRANSISTOR MTG H



IC ORIENTATION



VIEW A-A
FOR -06, 12 THRU 16



SECTION D-
MTG DETAIL
FOR J1&J2

(4) TABLE I

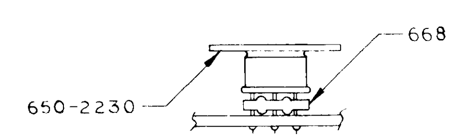
PART NO.	REF DESIGNATION
100-1025	R121-921, 129-929, 4, 12, 112-912
100-1035	R123-923
100-1045	R122-922
101-4715	R14
100-1545	R130-930
100-1825	R103-903, 106-906, 3, 8, 21
100-4725	R136-936
100-2225	R104-904, 105-905, 5
100-1525	R120-920
100-3935	R132-932
100-2735	R124-924
100-3315	R7
100-3325	R127-927
100-3335	R125-925
100-3915	R133-933
100-3935	R116-916
100-3945	R126-926
100-4715	R134-934
100-8215	R11
100-8225	R128-928
101-8205	R6
101-8215	R20
102-1815	R13
104-3480	R17
104-1101	R18
104-4223	R131-931
104-5110	R16
104-8251	R19
123-5020	R117-917
130-1015	C103-903
131-4730	C1
132-2752	C2-28, 30, C112-912
	C113-913, 31 THRU 44
200-3053	Q3

TABLE I CONT

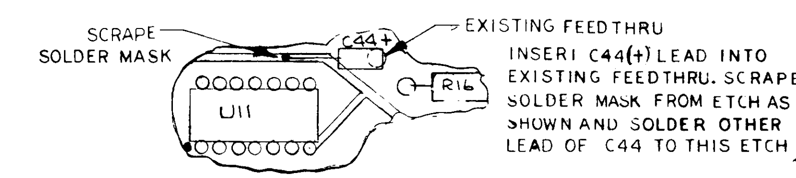
PART NO.	REF DESIGNATION
200-4123	Q103-903, 104-904, 4, 6
200-4125	Q101-901, 102-902, 1, 2
300-4446	CR101-901, 102-902, 103-903, 104-904
400-1437	U12-30
503-0229	J1, 2
700-8360	U2, 4, 6, 9
700-8440	U10, 11, 31-35
700-8530	U1, 3, 5, 7, 8
331-0275	VR1

(5) TABLE II

REF DESIGNATION	PART NO'S								
IPS	37.5	25	18.75	12.5	45	75	37.5	25	18.75
VER	-01	-02	-03	-04	-05	-06	-07	-08	-09
R110-910, 111-911	104-5111	104-5621	104-6191	104-2611	104-6191	104-1002	104-5111	104-5621	104-6191
R113-913	100-2725	100-3325	100-6825	100-2225	100-2225	100-2725	100-2725	100-3325	100-6825
R114-914	104-2612	104-3162	104-7502	104-3162	104-2152	104-1332	104-2612	104-3162	104-7502
C101-901	131-1030	← →	131-1030	OMIT	131-1030	←		→	131-1030
C105-905	131-1020	131-1520	131-2220	131-3320	131-1020	131-1020	131-1020	131-1520	131-2220
C109-909	131-6820	131-1030	131-1030	131-1530	131-4720	131-3320	131-6820	131-1030	131-1030
C110-910	130-2205	130-3305	130-4705	130-6805	130-1505	130-1005	130-2205	130-3305	130-4705
C111-911	130-3315	130-4715	130-5615	130-5615	130-2215	130-1515	130-3315	130-4715	130-5615
R109-909	100-2725	100-1525	100-1525	100-6815	100-2725	100-2725	100-2725	100-1525	100-1525
C104-904	130-3305	← →	130-3305	130-6805	130-3305	←		→	130-3305
R118-918	100-1525	100-1225	100-1225	100-1025	100-1025	100-6815	100-1525	100-1225	100-1225
C106-906	130-3305	←		→	130-3305	130-2205	130-3305	←	
C107-907	130-4715	←		→	130-4715	130-1015	130-4715	←	
C108-908	130-2205	←		→	130-2205	130-1005	130-2205	←	
R119-919	100-2735	←		→	100-2735	100-2235	100-2735	←	
R135-935	OMIT	←							
R107-907, 108-908	101-2715	←							
(9) R101-901, 1, 9, 22	100-2215	←			→	100-2215	OMIT	←	
(9) R102-902, 2, 10, 23	100-3315	←			→	100-3315	OMIT	←	
C102-902	131-2230	← →	131-2230	OMIT	131-2230	←		→	131-2230



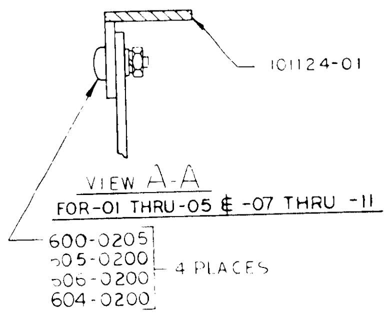
VIEW C-C
TO-5 MTG CONFIGURATION



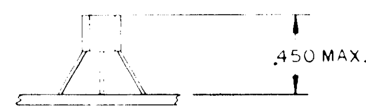
INSERT C44(+) LEAD INTO EXISTING FEEDTHRU. SCRAPE SOLDER MASK FROM ETCH AS SHOWN AND SOLDER OTHER LEAD OF C44 TO THIS ETCH.

VIEW E-E

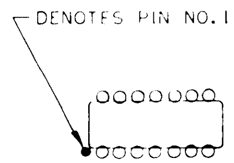
TOP A
NEXT A



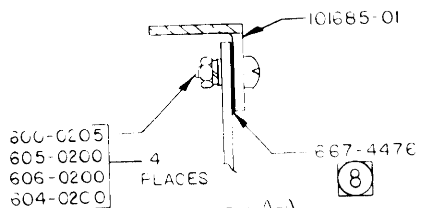
VIEW A-A
FOR-01 THRU-05 & -07 THRU -11



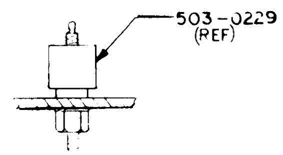
VIEW E-E
TYP TRANSISTOR MTG HEIGHT (TO 92)



I C ORIENTATION



VIEW A-A
FOR-06, 12 THRU 16



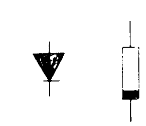
SECTION D-D
MTG DETAIL FOR J1&J2

REVISIONS					
REV	DESCRIPTION	DATE	DR	CHK	APPR
A	ERN 2-SP				
B	ECN 843A		TB		
C	ECN 1850		TB		
D	ECN 1887A		TB		
E	ECN 1934		TB		
F	ECN 1945A		TB		
G	ECN 1948		TB		
H	ECN 2149		TB		
J	ECN 2368		TB		
K	ECN 2484	4/28/71			
L	ECN 2533	4/28/71			
M	ECN 2485A	4/28/71			
N	ECN 2546	4/28/71			
P	ECN 2465 A				
R	ECN 2659				
S	ECN 2704A				
T	ECN 2846		T.B		
U	ECN 3002		RAS		
V	ECN 3105A - CANCELLED				
W	ECN 3179A				
Y	ECN 4629	12/5/72	J.M.		
Z	ECN 4823				
AA	ECN 4840				
AB	ECN 4967				
AB1	ECN 5181				
AC	ECN 5304				
AD	ECN 5413				
AE	ECN 6012				
AF	ECN 6112				
AG	ECN 6116				
AH	ECN 6130				
AJ	ECN 6406	6.21.74			
AJ1	ECN 6445				
AK	ECN 6620				

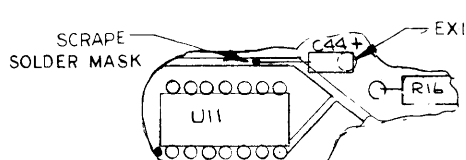
(5) TABLE II

REF DESIGNATION	PART NO'S															
IPS	37.5	25	18.75	12.5	45	75	37.5	25	18.75	12.5	45	75	45	45	37.5	37.5
VER	-01	-02	-03	-04	-05	-06	-07	-08	-09	-10	-11	-12	-13	-14	-15	-16
R110-910/111-911	104-5111	104-5621	104-6191	104-2611	104-6191	104-1002	104-5111	104-5621	104-6191	104-2611	104-6191	104-1002	104-6191	104-6191	104-5111	104-5111
R113-913	100-2725	100-3325	100-6825	100-2225	100-2225	100-2725	100-2725	100-3325	100-6825	100-2225	100-2225	100-2725	100-2225	100-2225	100-2725	100-2725
R114-914	104-2612	104-3162	104-7502	104-3162	104-2152	104-1332	104-2612	104-3162	104-7502	104-3162	104-2152	104-1332	104-2152	104-2152	104-2612	104-2612
C101-901	131-1030	←→	131-1030	OMIT	131-1030	←		→	131-1030	OMIT	131-1030	←			→	131-1030
C105-905	131-1020	131-1520	131-2220	131-3320	131-1020	131-1020	131-1020	131-1520	131-2220	131-3320	131-1020	←			→	131-1020
C109-909	131-6820	131-1030	131-1030	131-1530	131-4720	131-3320	131-6820	131-1030	131-1030	131-1530	131-4720	131-3320	131-4720	131-4720	131-6820	131-6820
C110-910	130-2205	130-3305	130-4705	130-6805	130-1505	130-1005	130-2205	130-3305	130-4705	130-6805	130-1505	130-1005	130-1505	130-1505	130-2205	130-2205
C111-911	130-3315	130-4715	130-5615	130-5615	130-2215	130-1515	130-3315	130-4715	130-5615	130-5615	130-2215	130-1515	130-2215	130-2215	130-3315	130-3315
R109-909	100-2725	100-1525	100-1525	100-6815	100-2725	100-2725	100-2725	100-1525	100-1525	100-6815	100-2725	←			→	100-2725
C104-904	130-3305	←→	130-3305	130-6805	130-3305	←		→	130-3305	130-6805	130-3305	←			→	130-3305
R118-918	100-1525	100-1225	100-1225	100-1025	100-1025	100-6815	100-1525	100-1225	100-1225	100-1025	100-1025	100-6815	100-1025	100-1025	100-1525	100-1525
C106-906	130-3305	←		→	130-3305	130-2205	130-3305	←		→	130-3305	130-2205	130-3305	←	→	130-3305
C107-907	130-4715	←		→	130-4715	130-1015	130-4715	←		→	130-4715	130-1015	130-4715	←	→	130-4715
C108-908	130-2205	←		→	130-2205	130-1005	130-2205	←		→	130-2205	130-1005	130-2205	←	→	130-2205
R119-919	100-2735	←		→	100-2735	100-2235	100-2735	←		→	100-2735	100-2235	100-2735	←	→	100-2735
R135-935	OMIT	←													→	OMIT
R107-907, 108-908	101-2715	←													→	101-2715
R101-901, 1, 9, 22	100-2215	←		→	100-2215	OMIT	←			→	OMIT	100-2215	OMIT	100-2215	OMIT	
R102-902, 2, 10, 23	100-3315	←		→	100-3315	OMIT	←			→	OMIT	100-3315	OMIT	100-3315	OMIT	
C102-902	131-2230	←→	131-2230	OMIT	131-2230	←		→	131-2230	OMIT	131-2230	←			→	131-2230

(9)



DIODE ORIENTATION



INSERT C44(+) LEAD INTO EXISTING FEEDTHRU. SCRAPE SOLDER MASK FROM ETCH AS SHOWN AND SOLDER OTHER LEAD OF C44 TO THIS ETCH.

VIEW E-E

PART NO. 101346- REV

TOP ASSY	6000
NEXT ASSY	1ST USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES: .XX ± .010 .XXX ± .005 X/X ± 1/32 ANGULAR ± 1/2°
BREAK ALL SHARP CORNERS APPROX. .010
FINISH:

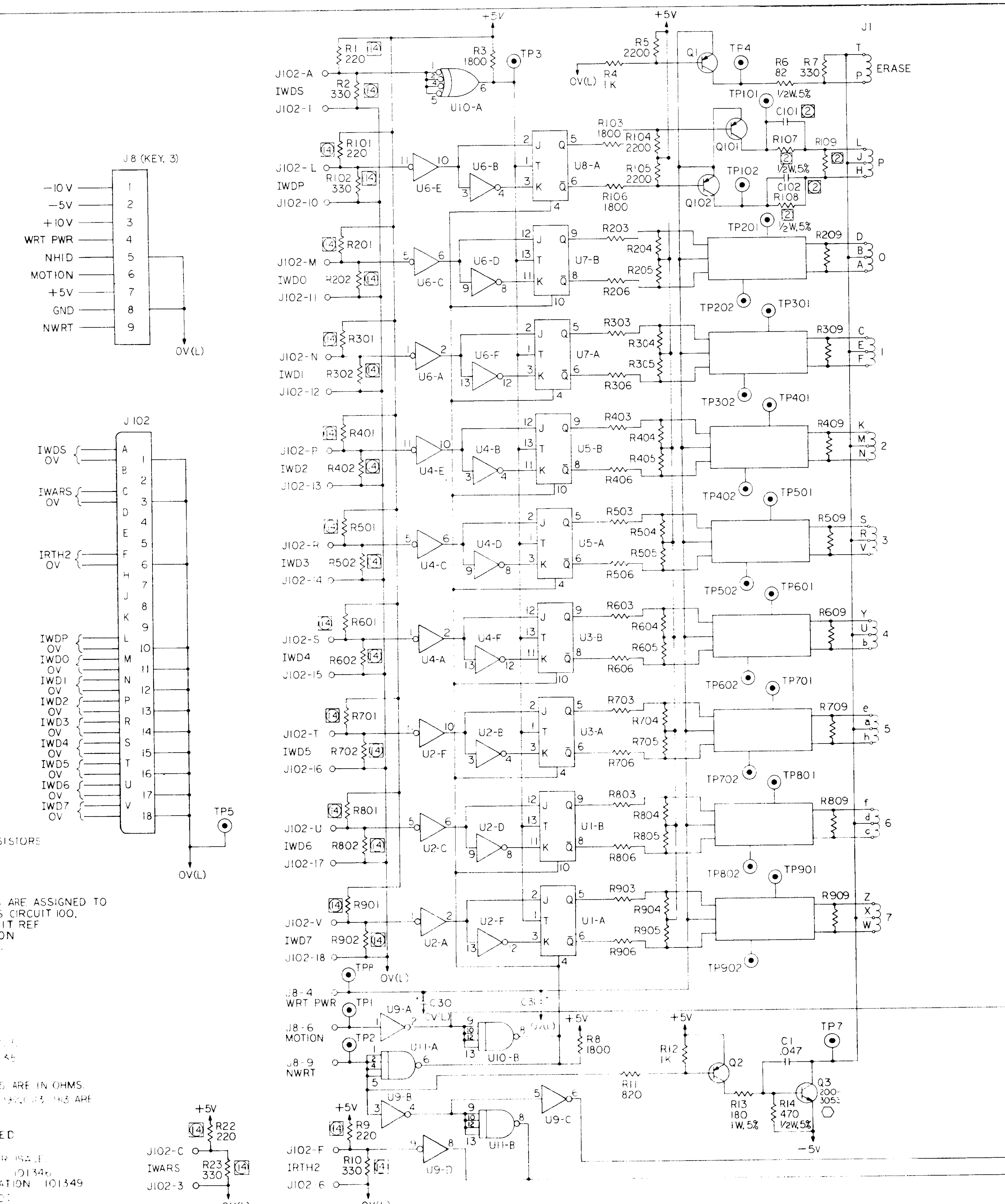
SIGNATURES	DATE
DR	
CHK	
DES	
ENGR	
ENGR	

MATL:

PEC PERIPHERAL EQUIPMENT CORPORATION

TITLE PCBA - DATA - F READ WHILE WRITE

SIZE E | CODE IDENT. NO | DWG NO. 101346 | REV AK
SCALE 2/1 | DO NOT SCALE DWG | SHEET 1 OF 1



(14) VERSIONS WITHOUT TERMINATOR RESISTORS ARE FOR USE WITH MTA.

13. CIRCUIT 100 IS TYPICAL OF CIRCUITS 200 THRU 900

12. 3 DIGIT REFERENCE DESIGNATIONS ARE ASSIGNED TO REPETITIVE CIRCUITS. EX: TP101 IS CIRCUIT 100, TP901 IS CIRCUIT 900. SINGLE DIGIT REF DESIGNATIONS ARE ASSIGNED TO NON REPETITIVE CIRCUITS. EX: TP1, TP2.

11. PIN 14 OF ALL IC'S IS +5V.

10. PIN 7 OF ALL IC'S IS OV(L)

9. INTEGRATED CIRCUITS:
U2, 4, 6, 9 ARE 700-8360.
U10, 11, 31-35 ARE 700-8440.
U1, 3, 5, 7, 8 ARE 700-8530
U12-30 ARE 400-437.

8. ALL PNP TRANSISTORS ARE [illegible]

7. ALL NPN TRANSISTORS ARE 200-4135

6. ALL DIODES ARE 300-4446.

5. ALL RESISTORS ARE ¼W, 5%, VALUES ARE IN OHMS.

4. CAPACITORS C2-28, [illegible] THRU 44, C112 [illegible] ARE 2.7UF, 35V, 20% ALL OTHERS IN MICROFARADS. 100V, 10%.

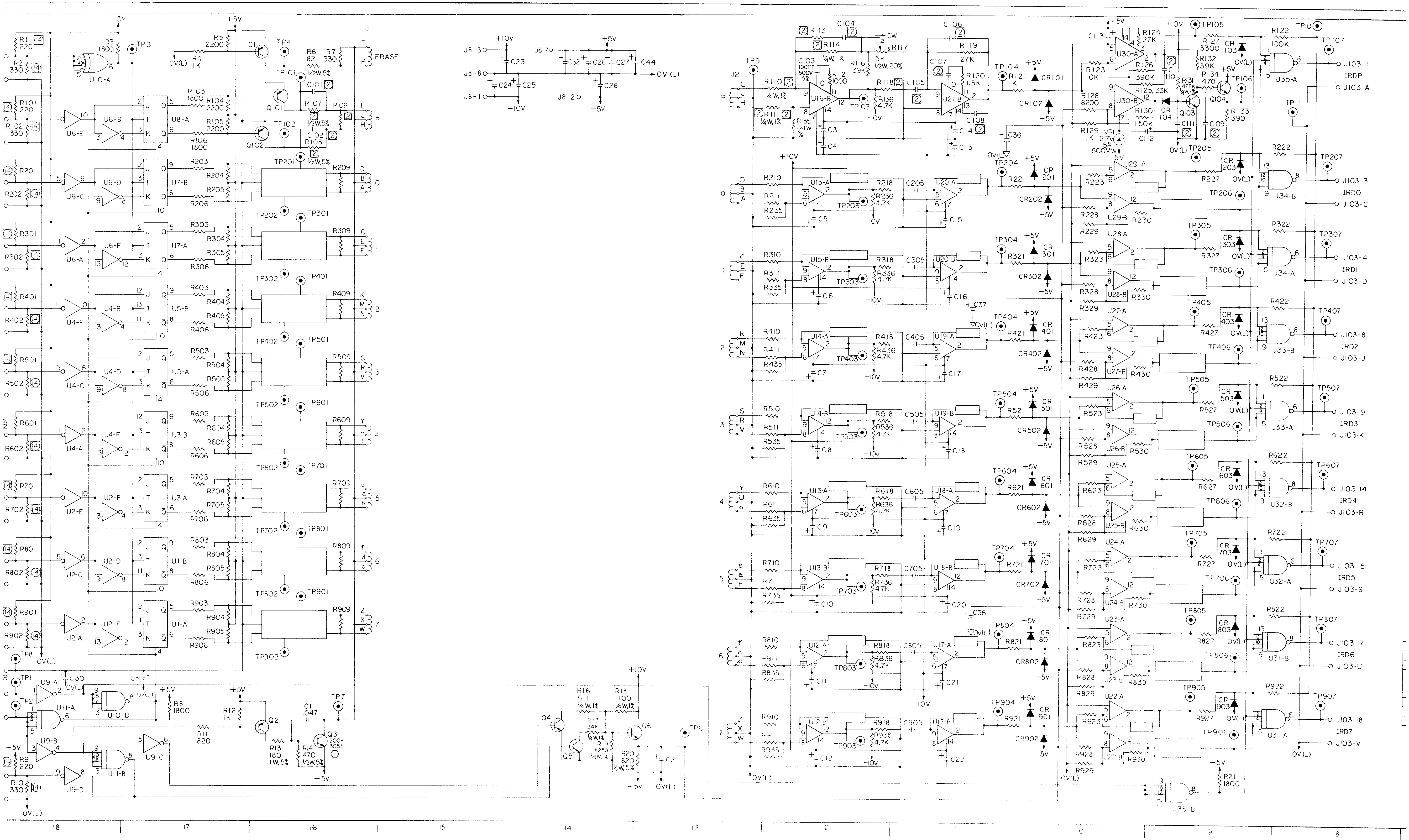
3. ⬡ INDICATES TRANSISTOR MOUNTED HEATSINK.

(2) SEE VERSION TABLE FOR VALUE OR USAGE.

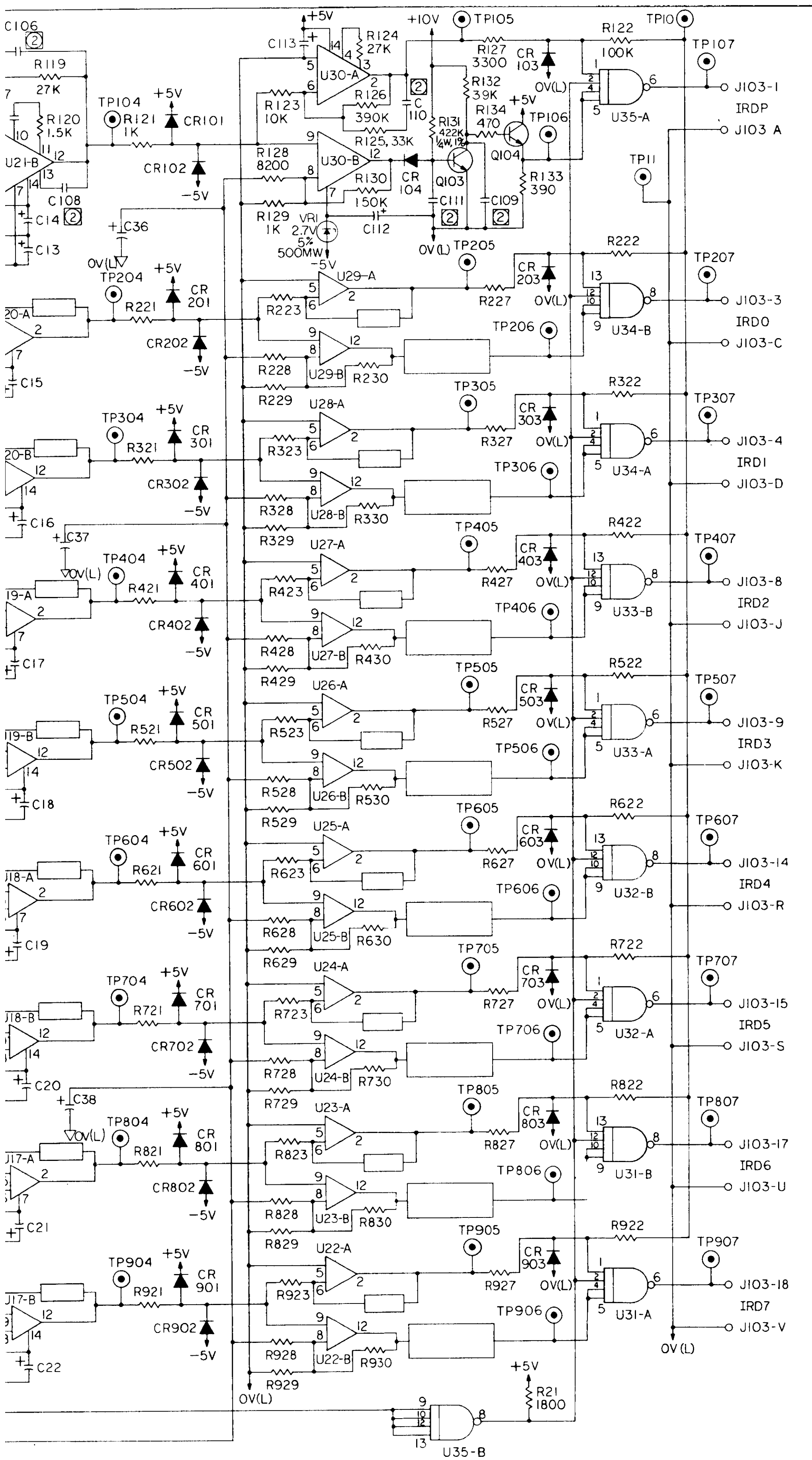
1. REFERENCE DRAWINGS: ASSEMBLY 101346
SPECIFICATION 101349

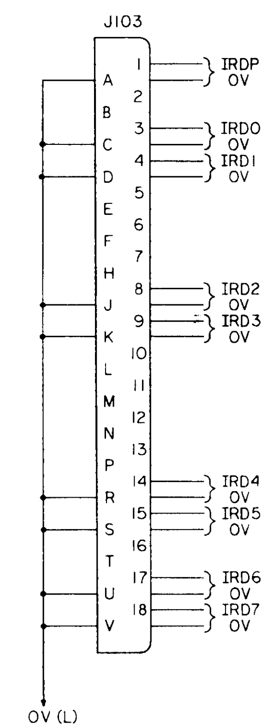
NOTES: UNLESS OTHERWISE SPECIFIED:

21 20 19 18 17 16 15



J1
ERASE
J2
J8-3
J8-8
J8-1
J8-7
J8-2
+10V
-10V
+5V
-5V
OV(L)
U10-A
U6-B
U8-A
U6-E
U6-C
U6-D
U7-B
U6-A
U6-F
U7-A
U4-E
U4-B
U5-B
U4-C
U4-D
U5-A
U4-A
U4-F
U3-B
U2-E
U2-B
U3-A
U2-C
U2-D
U1-B
U2-A
U2-F
U1-A
U9-A
U10-B
U11-A
U9-B
U9-C
U11-B
U9-D
Q1
Q2
Q3
Q4
Q5
Q6
Q101
Q102
Q103
Q104
U16-B
U21-B
U30-A
U30-B
U35-A
U35-B
U29-A
U29-B
U34-B
U34-A
U28-A
U28-B
U33-B
U33-A
U27-A
U27-B
U26-A
U26-B
U32-B
U32-A
U25-A
U25-B
U24-A
U24-B
U31-B
U31-A
U23-A
U23-B
U22-A
U22-B
U15-A
U15-B
U20-A
U20-B
U14-A
U14-B
U19-A
U19-B
U13-A
U13-B
U18-A
U18-B
U12-A
U12-B
U17-A
U17-B
J103-1
IRDP
J103 A
J103-3
IRD0
J103-C
J103-4
IRD1
J103-D
J103-8
IRD2
J103-J
J103-9
IRD3
J103-K
J103-14
IRD4
J103-R
J103-15
IRD5
J103-S
J103-17
IRD6
J103-U
J103-18
IRD7
J103-V
18
17
16
15
14
13
12
10
9
8





REVISIONS					
REV	DESCRIPTION	DATE	DR	CHK	APPR
A	ERN 2-SP	6/9/70	[illegible]	[illegible]	
B	ECN 1886	8-20-70	TB	KJR	[illegible]
C	ECN 1933	9-18-70	T.B	[illegible]	[illegible]
D	ECN 1947	9-18-70	T.B	[illegible]	[illegible]
E	ECN 2148	12/4/70	T.B	[illegible]	[illegible]
F	ECN 2368	3/26/71	T.B	[illegible]	[illegible]
G	ECN 2533	4/28/71	C.J.	[illegible]	ABR
H	ECN 2546	4/28/71	C.J.	[illegible]	ABR
J	ECN 2659	6/22/71	[illegible]	[illegible]	ABR
K	ECN 2702	7/20/71	[illegible]	[illegible]	ABR
L	ECN 2846	9/10/71	T.B	[illegible]	[illegible]
M	ECN 3002	2/2/72	RAS	R.B.	RCA
N	ECN 3179A	3/3/72	DC	R.B.	RCA
P	ECN 4840	[illegible]	K	[illegible]	RCA
R	ECN 4967	[illegible]	K	[illegible]	RCA
S	ECN 5308	7/11/73	[illegible]	[illegible]	[illegible]
T	ECN 6012	[illegible]	[illegible]	[illegible]	[illegible]
U	ECN 6112	[illegible]	[illegible]	[illegible]	[illegible]
V	ECN 6116	[illegible]	[illegible]	[illegible]	[illegible]
W	ECN 6130	[illegible]	[illegible]	[illegible]	[illegible]
Y	ECN 6406	6-21-76	[illegible]	CCA	[illegible]
Y1	ECN 6440	[illegible]	[illegible]	[illegible]	[illegible]
Z	ECN 6620	[illegible]	[illegible]	[illegible]	[illegible]

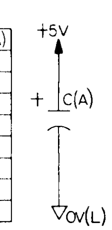
REFERENCE DESIGNATION

LAST USED		DELETED
C44	C913	C29
	CR904	
Q6	Q904	
R23	R936	R15,115-915
U35		
TP11	TP907	
VR1		

(14)

VERSION	SPEED (IPS)	R110-910 R111-911 1/4W,1%	R113-913 1/4W,5%	R114-914 1/4W,1%	C101-901 100V,10%	C102902 100V,10%	C105-905 100V,10%	C109-909 100V,10%	C110-910 500V,5%	C111-911 500V,5%	R109-909 1/4W,5%	C104-904 500V,5%	R118-918 1/4W,5%	C106-906 500V,5%	C107-907 500V,5%	C108-908 500V,5%	R119-919 1/4W,5%	R107-907 R108-908 1/2W,5%	R101-901, 1,9,22	R102-902 2,10,23	R135-935 1/4W,1%
-01	37.5	5110	2700	26100	.01	.022	.001UF	.0068UF	22PF	330PF	2700	33PF	1.5K	33PF	470PF	22PF	27K	270	220	330	OMIT
-02	25	5620	3300	31600	.01	.022	.0015UF	.01UF	33PF	470PF	1500	33PF	1.2K	33PF	470PF	22PF	27K	↑	↑	↑	↑
-03	18.75	6.19K	6.8K	75K	.01	.022	.0022UF	.01UF	47PF	560PF	1500	33PF	1.2K	33PF	470PF	22PF	27K				
-04	12.5	2610	2200	31600	OMIT	OMIT	.0033UF	.015UF	68PF	560PF	680	68PF	1K	33PF	470PF	22PF	27K				
-05	45	6190	2.2K	21.5K	.01	.022	.001UF	.0047UF	15PF	220PF	2700	33PF	1K	33PF	470PF	22PF	27K		↓	↓	
-06	75	10K	2700	13300	.01	.022	.001UF	.0033UF	10PF	150PF	2700	33PF	680	22PF	100PF	10PF	22K		220	330	
-07	37.5	5110	2700	26100	.01	.022	.001UF	.0068UF	22PF	330PF	2700	33PF	1.5K	33PF	470PF	22PF	27K		OMIT	OMIT	
-08	25	5620	3300	31600	.01	.022	.0015UF	.01UF	33PF	470PF	1500	33PF	1.2K	↑	↑	↑	↑		↑	↑	
-09	18.75	6.19K	6.8K	75K	.01	.022	.0022UF	.01UF	47PF	560PF	1500	33PF	1.2K								
-10	12.5	2610	2200	31600	OMIT	OMIT	.0033UF	.015UF	68PF	560PF	680	68PF	1K	↓	↓	↓	↓				
-11	45	6190	2.2K	21.5K	.01	.022	.001UF	.0047UF	15PF	220PF	2700	33PF	1K	33PF	470PF	22PF	27K		↓	↓	
-12	75	10K	2700	13300	.01	.022	.001UF	.0033UF	10PF	150PF	2700	33PF	680	22PF	100PF	10PF	22K		OMIT	OMIT	
-13	45	6190	2.2K	21.5K	.01	.022	.001UF	.0047UF	15PF	220PF	2700	33PF	1K	33PF	470PF	22PF	27K		220	330	
-14	45	6190	2.2K	21.5K	.01	.022	.001UF	.0047UF	15PF	220PF	2700	33PF	1K	33PF	470PF	22PF	27K		OMIT	OMIT	
-15	37.5	5110	2700	26100	.01	.022	.001UF	.0068UF	22PF	330PF	2700	33PF	1.5K	33PF	470PF	22PF	27K	↓	220	330	↓
-16	37.5	5110	2700	26100	.01	.022	.001UF	.0068UF	22PF	330PF	2700	33PF	1.5K	33PF	470PF	22PF	27K	270	OMIT	OMIT	OMIT

I.C. NO. (REF)	FILTER CAP. (A)
U1	C35
U5	C34
U8	C33
U31	C43
U32	C42
U33	C41
U34	C40
U35	C39

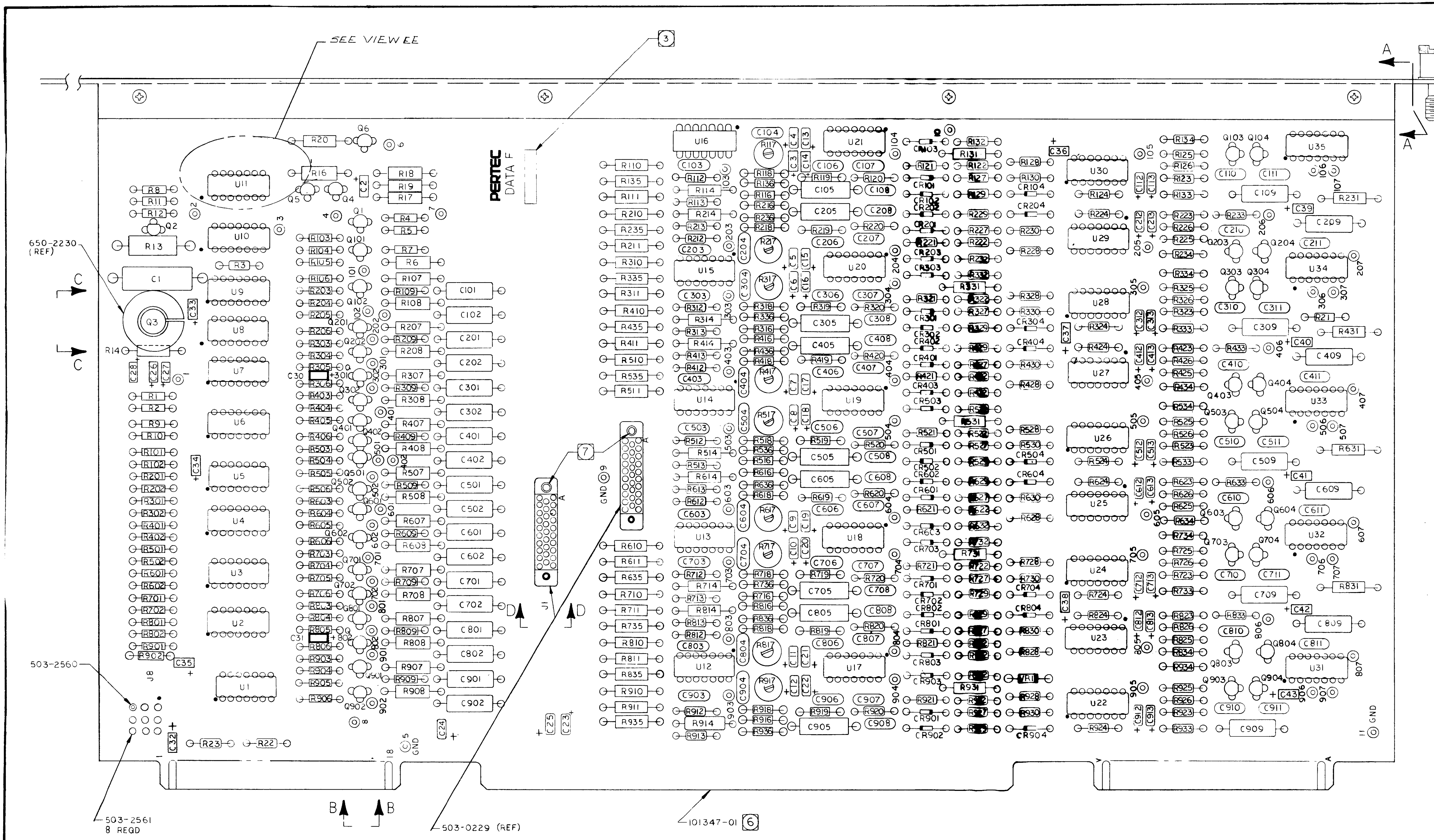


PEC PERIPHERAL EQUIPMENT CORPORATION

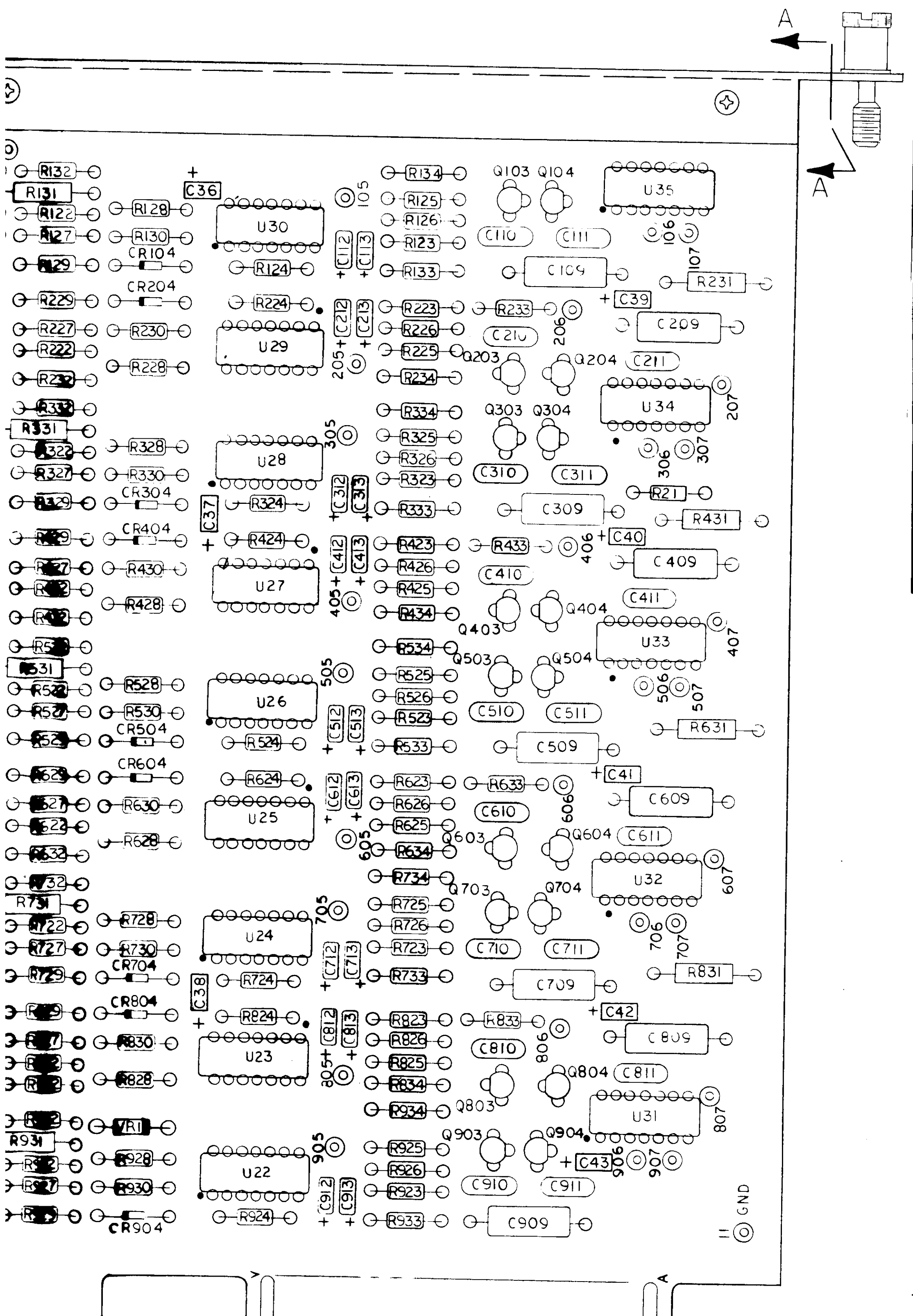
TITLE SCHEMATIC DATA 'F' READ WHILE WRITE

SIZE J | DWG NO. 101345 | REV Z

101346 | TOP ASSY
NEXT ASSY | 1ST USED ON
APPLICATION



SEE VIEW EE
3
A
A
650-2230 (REF)
C
C
PERTEC
DATA F
7
GND
J1
D
D
503-2560
503-2561
8 REQD
B
B
503-0229 (REF)
101347-01 6



(9) VERSIONS WITHOUT TERMINATOR RESISTORS ARE FOR USE WITH MTA.

(8) BEFORE INSTALLING SUPPORT ANGLE, 101685-01, TO THE BOARD ASSY, VINYL TAPE, 667-4476, SHOULD BE APPLIED TO THE PC BOARD AS SHOWN ON VIEW A-A FOR -06, 12 THRU 16 VERSIONS ONLY.

(7) ORIENTATE CONNECTORS, J1 & J2 AS SHOWN.

(6) THIS ASSY SHALL BE MADE FROM PROCESS BOARD 101347-01 REV.M AND SUBSEQUENT.

(5) FOR PART NO'S WHICH ARE AFFECTED BY VERSION NO. SEE TABLE II.

(4) FOR PART NO'S WHICH ARE NOT AFFECTED BY VERSION NO. SEE TABLE I.

(3) RUBBER STAMP ASSY PART NO. INCLUDING VERSION AND ISSUE LETTER.

2. ASSEMBLE PER STANDARD MFG METHODS.

1. REF DWGS: SCHEMATIC - 101345
SPECIFICATION - 101349

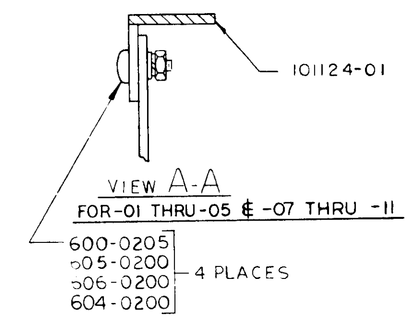
NOTES: UNLESS OTHERWISE SPECIFIED:

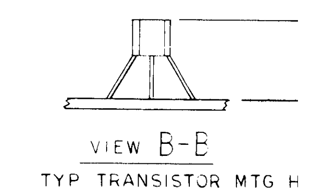
(4) TABLE I

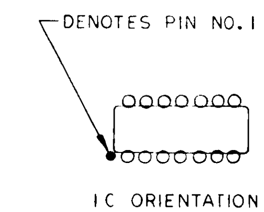
PART NO.	REF DESIGNATION
100-1025	R121-921, 129-929,
	4, 12, 112-912
100-1035	R123-923
100-1045	R122-922
101-4715	R14
100-1545	R130-930
100-1825	R103-903, 106-906,
	3, 8, 21
100-4725	R136-936
100-2225	R104-904, 105-905, 5
100-1525	R120-920
100-3935	R132-932
100-2735	R124-924
100-3315	R7
100-3325	R127-927
100-3335	R125-925
100-3915	R133-933
100-3935	R116-916
100-3945	R126-926
100-4715	R134-934
100-8215	R11
100-8225	R128-928
101-8205	R6
101-8215	R20
102-1815	R13
104-3480	R17
104-1101	R18
104-4223	R131-931
104-5110	R16
104-8251	R19
123-5020	R117-917
130-1015	C103-903
131-4730	C1
132-2752	C2-28, 30, C112-912
	C113-913, 31 THRU 44
200-3053	Q3

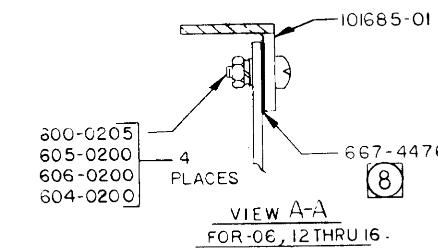
TABLE I CONT

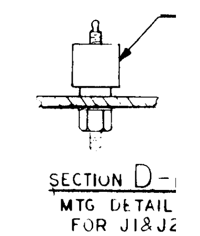
PART NO.	REF DESIGNATION
200-4123	Q103-903, 104-904,
	4-6
200-4125	Q101-901, 102-902,
	1, 2
300-4446	CR101-901, 102-902,
	103-903, 104-904
400-1437	U12-30
503-0229	J1, 2
700-8360	U2, 4, 6, 9
700-8440	U10, 11, 31-35
700-8530	U1, 3, 5, 7, 8
331-0275	VR1





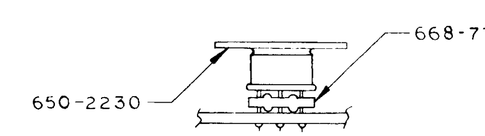




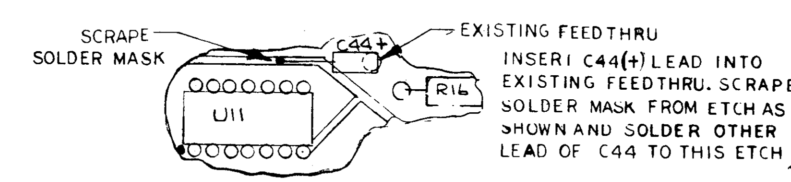


(5) TABLE II

REF DESIGNATION	PART NO'S								
IPS	37.5	25	18.75	12.5	45	75	37.5	25	18.75
VER	-01	-02	-03	-04	-05	-06	-07	-08	-09
R110-910, 111-911	104-5111	104-5621	104-6191	104-2611	104-6191	104-1002	104-5111	104-5621	104-6191
R113-913	100-2725	100-3325	100-6825	100-2225	100-2225	100-2725	100-2725	100-3325	100-6825
R114-914	104-2612	104-3162	104-7502	104-3162	104-2152	104-1332	104-2612	104-3162	104-7502
C101-901	131-1030	←→	131-1030	OMIT	131-1030	←		→	131-1030
C105-905	131-1020	131-1520	131-2220	131-3320	131-1020	131-1020	131-1020	131-1520	131-2220
C109-909	131-6820	131-1030	131-1030	131-1530	131-4720	131-3320	131-6820	131-1030	131-1030
C110-910	130-2205	130-3305	130-4705	130-6805	130-1505	130-1005	130-2205	130-3305	130-4705
C111-911	130-3315	130-4715	130-5615	130-5615	130-2215	130-1515	130-3315	130-4715	130-5615
R109-909	100-2725	130-1525	100-1525	100-6815	100-2725	100-2725	100-2725	100-1525	100-1525
C104-904	130-3305	←→	130-3305	130-6805	130-3305	←		→	130-3305
R118-918	100-1525	100-1225	100-1225	100-1025	100-1025	100-6815	100-1525	100-1225	100-1225
C106-906	130-3305	←		→	130-3305	130-2205	130-3305	←	
C107-907	130-4715	←		→	130-4715	130-1015	130-4715	←	
C108-908	130-2205	←		→	130-2205	130-1005	130-2205	←	
R119-919	100-2735	←		→	100-2735	100-2235	100-2735	←	
R135-935	OMIT	←							
R107-907, 108-908	101-2715	←							
(9) R101-901, 1, 9, 22	100-2215	←			→	100-2215	OMIT	←	
R102-902, 2, 10, 23	100-3315	←			→	100-3315	OMIT	←	
C102-902	131-2230	←→	131-2230	OMIT	131-2230	←		→	131-2230

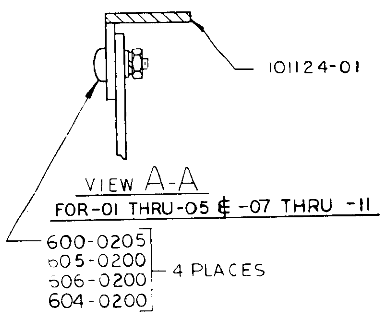


VIEW C-C
TO-5 MTG CONFIGURATION

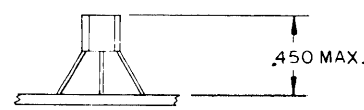


VIEW E-E

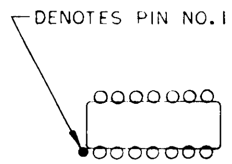
TOP AS
NEXT A



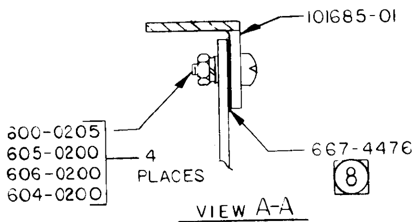
VIEW A-A
FOR-01 THRU-05 & -07 THRU -11



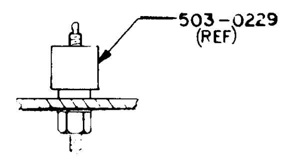
VIEW B-B
TYP TRANSISTOR MTG HEIGHT (TO 92)



I C ORIENTATION



VIEW A-A
FOR-06, 12 THRU 16



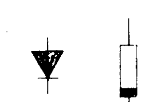
SECTION D-D
MTG DETAIL
FOR J1& J2

REVISIONS					
REV	DESCRIPTION	DATE	DR	CHK	APPR
A	ERN 2-SP	7/27	RL		
B	ECN 1846A	8.19.70	TB		
C	ECN 1850	8.19.70	T.B		
D	ECN 1887A		TB		
E	ECN 1934	9.12.70	T.B		
F	ECN 1945A	9.18.70	T.B		
G	ECN 1948	9.18.70	T.B		
H	ECN 2149	12/4/70	T.B		BB
J	ECN 2368	3/1/71	T.B		BB
K	ECN 2484	4/28/71	C.J.		
L	ECN 2533	4/28/71	C.J.		
M	ECN 2485A	4/28/71	C.J.		
N	ECN 2546	4/28/71	C.J.		
P	ECN 2465 A	6/8/71			
R	ECN 2659	6/8/71			
S	ECN 2704A	6/8/71			
T	ECN 2846	9/10/71	T.B		
U	ECN 3002	2/2/72	RAS	L.B	RCA
V	ECN 3105A - CANCELLED	3/3/72		L.B	RCA
W	ECN 3179A	3/22/72		L.B	RCA
Y	ECN 4629	12/5/72	J.M.		RCA
Z	ECN 4823	1/17/73			RCA
AA	ECN 4840	1/17/73			RCA
AB	ECN 4967	2/21/73			RCA
AB1	ECN 5181	8-8-73			RCA
AC	ECN 5308	9/11/73			
AD	ECN 5413	9/22/73			RCA
AE	ECN 6012	2/6/74			
AF	ECN 6112	4/22/74			
AG	ECN 6116	3/13/74			
AH	ECN 6130	5/15/74		CCA	
AJ	ECN 6406	6.21.74	RV	CCA	
AJ1	ECN 6440	7.17.74	RV		BB
AK	ECN 6620	8/23/74	HL		

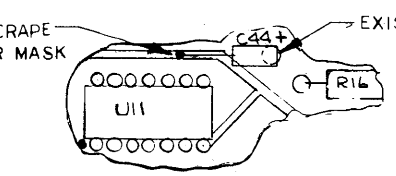
5 TABLE II

REF DESIGNATION	PART NO'S															
IPS	37.5	25	18.75	12.5	45	75	37.5	25	18.75	12.5	45	75	45	45	37.5	37.5
VER	-01	-02	-03	-04	-05	-06	-07	-08	-09	-10	-11	-12	-13	-14	-15	-16
R110-910/111-911	104-5111	104-5621	104-6191	104-2611	104-6191	104-1002	104-5111	104-5621	104-6191	104-2611	104-6191	104-1002	104-6191	104-6191	104-5111	104-5111
R113-913	100-2725	100-3325	100-6825	100-2225	100-2225	100-2725	100-2725	100-3325	100-6825	100-2225	100-2225	100-2725	100-2225	100-2225	100-2725	100-2725
R114-914	104-2612	104-3162	104-7502	104-3162	104-2152	104-1332	104-2612	104-3162	104-7502	104-3162	104-2152	104-1332	104-2152	104-2152	104-2612	104-2612
C101-901	131-1030	←→	131-1030	OMIT	131-1030	←		→	131-1030	OMIT	131-1030	←			→	131-1030
C105-905	131-1020	131-1520	131-2220	131-3320	131-1020	131-1020	131-1020	131-1520	131-2220	131-3320	131-1020	←			→	131-1020
C109-909	131-6820	131-1030	131-1030	131-1530	131-4720	131-3320	131-6820	131-1030	131-1030	131-1530	131-4720	131-3320	131-4720	131-4720	131-6820	131-6820
C110-910	130-2205	130-3305	130-4705	130-6805	130-1505	130-1005	130-2205	130-3305	130-4705	130-6805	130-1505	130-1005	130-1505	130-1505	130-2205	130-2205
C111-911	130-3315	130-4715	130-5615	130-5615	130-2215	130-1515	130-3315	130-4715	130-5615	130-5615	130-2215	130-1515	130-2215	130-2215	130-3315	130-3315
R109-909	100-2725	100-1525	100-1525	100-6815	100-2725	100-2725	100-2725	100-1525	100-1525	100-6815	100-2725	←			→	100-2725
C104-904	130-3305	←→	130-3305	130-6805	130-3305	←		→	130-3305	130-6805	130-3305	←			→	130-3305
R118-918	100-1525	100-1225	100-1225	100-1025	100-1025	100-6815	100-1525	100-1225	100-1225	100-1025	100-1025	100-6815	100-1025	100-1025	100-1525	100-1525
C106-906	130-3305	←		→	130-3305	130-2205	130-3305	←		→	130-3305	130-2205	130-3305	←	→	130-3305
C107-907	130-4715	←		→	130-4715	130-1015	130-4715	←		→	130-4715	130-1015	130-4715	←	→	130-4715
C108-908	130-2205	←		→	130-2205	130-1005	130-2205	←		→	130-2205	130-1005	130-2205	←	→	130-2205
R119-919	100-2735	←		→	100-2735	100-2235	100-2735	←		→	100-2735	100-2235	100-2735	←	→	100-2735
R135-935	OMIT	←													→	OMIT
R107-907, 108-908	101-2715	←													→	101-2715
R101-901, 1, 9, 22	100-2215	←			→	100-2215	OMIT	←			→	OMIT	100-2215	OMIT	100-2215	OMIT
R102-902, 2, 10, 23	100-3315	←			→	100-3315	OMIT	←			→	OMIT	100-3315	OMIT	100-3315	OMIT
C102-902	131-2230	←→	131-2230	OMIT	131-2230	←		→	131-2230	OMIT	131-2230	←			→	131-2230

9



DIODE ORIENTATION



INSERT C44(+) LEAD INTO EXISTING FEEDTHRU. SCRAPE SOLDER MASK FROM ETCH AS SHOWN AND SOLDER OTHER LEAD OF C44 TO THIS ETCH.

VIEW E-E

PART NO. 101346- REV

TOP ASSY	6000
NEXT ASSY	1ST USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES:
.XX ± .010
.XXX ± .005
$\frac{X}{X} \pm \frac{1}{32}$
ANGULAR ± 1/2°
BREAK ALL SHARP CORNERS APPROX. 010

FINISH:

SIGNATURES		DATE
DR		7/13/70
CHK		
DES		
ENGR		
ENGR		

MATL:

PEC PERIPHERAL EQUIPMENT CORPORATION

TITLE PCBA - DATA - F READ WHILE WRITE

SIZE	CODE IDENT. NO.	DWG NO.	REV
E		101346	AK
SCALE 2/1		DO NOT SCALE DWG	SHEET 1 OF 1

APPENDIX A
GLOSSARY

GLOSSARY

Symbol	Description	Symbol	Description
AOS	Arm Off-Set	CUR	Clean-up Ramp
B1B	Buffer 1 Busy	D8CT	Disable 8 Count
BCD10	Binary Coded Decimal	DBY	Data Busy
BOT*	Beginning of Tape	DDI	Data Density Indicator
BOTD	Beginning of Tape Delay	DDS	Data Density Select
BOTDP	Beginning of Tape Delay Pulse	DDSX	Data Density Select External
BOTI	Beginning of Tape Input	DMC	Disable Manual Controls
BOTO	Beginning of Tape Output	EAO	Encoder Amplifier Output
CBY	Command Busy	ECC	Enable Check Character
CCS	Check Character Strobe	ECD	Echo Check Disable
CMP1, 2	Clamp Waveform 1, 2	ECE	Echo Check Error
CPI	Characters Per Inch	ECO0 through ECO7	Echo Check Output, Channels 0 through 7
CRC0 through CRC7	Cyclic Redundancy Check, Channels 0 through 7	ECOP	Echo Check Output Parity
CRCC	Cyclic Redundancy Check Character	ECR	Echo Check Reset
		ECRC	Enable CRC
CRCP	Cyclic Redundancy Check Parity	EEC	Enable Echo Check
CT0 through CT7	Center Tap 0 through 7	EEP	Enable Encoder Pulse
		EF	Erase Winding Finish
CTP	Center Tap Parity	EFM	Enable File Mark
CT4	Count 4	EOT*	End of Tape
CT8	Count 8	EOTI	End of Tape Input

*An "N" preceding these symbols indicates a false condition.

GLOSSARY (continued)

Symbol	Description	Symbol	Description
EOTO	End of Tape Output	LFC	Load Forward Command
EPNP	Encoder Pulse Narrow Powerful	LFR	Load Forward Ramp
EPS	Erase Power Start	LRCC	Longitudinal Redundancy Check Character
EPW	Encoder Pulse Wide	MINTLK	Make Interlock
ERS	Enable Reel Servos	MOTION	Tape Motion as a result of SFC or SRC Command
ES	Erase Winding Start	MLOAD	Motor Load
EWPC	Enable Write Power Control	OFFC	Off-Line Input Command
EWRS	Enable Write/Read Status	OOLL	On-Line/Off-Line Lamp
FGC	File Gap Command	ORD	ORed Data
FGL	File Gap Lamp	OVW	Overwrite
FGR	File Gap Ramp	PSO0 through PSO7	Peak Sensor Output, Channels 0 through 7
FLR	First Load - or Rewind	PSOP	Peak Sensor Output Parity
FM	File Mark	PSP	Peak Sensor Parity
FPT	File Protect	RA01, RA02	Read Amplifier Track 0 Output 1, Output 2
GIP	Gap In Process	RA11 RA12 RA21, etc.	Read Amplifier Track n, Output 1 or 2
GRS	General Reset	RAC	Read Amplifier Clamp
HID	Hi Density	RACT	Read Amplifier Center Tap
INTLK	Transport Interlock Signal	RAP1, RAP2	Read Amplifier Parity, Output 1, Output 2
INTLK-A	Transport Interlock Signal - A		
INTLK-B	Transport Interlock Signal - B		
IRGC	Record Gap Command		
LD	Lamp Driver		
LDP	Load Point		

GLOSSARY (continued)

Symbol	Description	Symbol	Description
RD0 through RD7	Read Data, Channels 0 through 7	RWRD	Rewind Ramp Delayed
RDI	Relay Driver Input	RYC	Ready Command
RDP	Read Data Parity	SBY	Start Busy Delay
RDS	Read Data Strobe	SFC	Synchronous Forward Command
RDY	Ready	SFCD	Synchronous Forward Command Delayed
RF0 through RF7	Read Finish 0 through 7	SFL1 through SFL4	Step Forward Level 1 through 4
RFP	Read Finish Parity	SLT	Select Transport
RGC	Inter-Record Gap Command	SRC	Synchronous Reverse Command
RGR	Inter-Record Gap Ramp	SRO	Select, Ready, and On-Line
RRS	Remote Reset	SWS	Set Write Status
RS0 through RS7	Read Start 0 through 7	TAD	Turnaround Delay
RSP	Read Start Parity	TBY	Turnaround Busy
RST	Reset	TIP	Tape In Path
RTH	Read Threshold	TNT	Tape Not Tensioned
RTN1	Front Panel Switches Ground Return 1	TRR	Transport Ready
RWC	Rewind Command	ULOS	Unload Off-set
RWD	Rewinding	WARS	Write Amplifier Reset
RWR	Rewind Ramp	WCRC	Write CRC
		WD0 through WD7	Write Data, Channels 0 through 7

GLOSSARY (continued)

Symbol	Description	Symbol	Description
WDP	Write Data Parity	WS0 through WS7	Write Start, Channels 0 through 7
WDS	Write Data Strobe	WSC	Write Step Command
WDSN	Write Data Strobe Narrow	WSP	Write Start Parity
WDSW	Write Data Strobe Wide		
WF0 through WF7	Write Finish, Channels 0 through 7		
WFM	Write File Mark		
WFP	Write Finish Parity		
WLO	Write Lockout		
WPC	Write Power Control		
W/RF0 through W/RF7	Write/Read Head Winding Finish, Channels 0 through 7		
W/RFP	Write/Read Head Winding Finish Parity		
WRO	Write/Read Output		
WRP	Write Pulse		
WRS	Write/Read Status		
W/RS0 through W/RS7	Write/Read Head Winding Start, Channels 0 through 7		
W/RSP	Write/Read Head Winding Start, Parity		
WRT EN	Write Enable		

ERRATA SHEET

Manual No. 101731
75 ips 6660/6640 Transports
May 1973

Incorporate the following changes into subject manual.

Item 1, page 6-42, Paragraph 6.6.7.1, Step (6); correct Note as follows.

FROM	TO
....each cycle represents.....	....each half cycle represents...
$\frac{1250\ \mu\text{inch}}{50\ \text{divisions}} = 25\ \mu\text{inch/division}$	$\frac{2500\ \mu\text{inches}}{50\ \text{divisions}} = 50\ \mu\text{inch/division}$

Item 2, page 6-42, Paragraph 6.6.7.1, Step (7), correct as follows.

FROM	TO
...is less than eight small divisions....	...is less than four small divisions....

Item 3, page 6-45, Paragraph 6.6.7.3, Step (5), correct Note as follows.

FROM	
...each cycle represents....	....each half cycle represents...
$\frac{1250\ \mu\text{inch}}{50\ \text{divisions}} = 25\ \mu\text{inch/division}$	$\frac{2500\ \mu\text{inches}}{50\ \text{divisions}} = 50\ \mu\text{inch/division}$

Item 4, page 6-45, Paragraph 6.6.7.3, Step (6), correct as follows.

FROM	TO
...is less than 16 small divisions...	...is less than 8 small divisions...

Errata Sheet (continued)

Item 5, page 6-46, Paragraph 6.6.8.1, Step (5), correct Note as follows.

FROM	TO
...each cycle represents....	...each half cycle represents...
$\frac{1250\ \mu\text{inch}}{50\ \text{divisions}} = 25\ \mu\text{inch/divisions}$	$\frac{2500\ \mu\text{inches}}{50\ \text{divisions}} = 50\ \mu\text{inch/division}$

Item 6, page 6-48, Paragraph 6.6.8.1, Step (6), correct as follows.

FROM	TO
...is less than eight small divisions...	...is less than four small divisions...