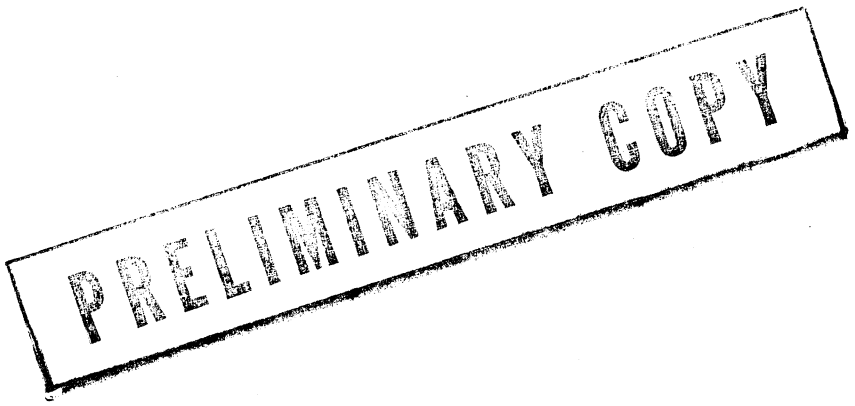
Digital Equipment Corporation
Maynard, Massachusetts

digital

Maintenance Manual

PCO5 HIGH-SPEED PAPER TAPE READER/PUNCH



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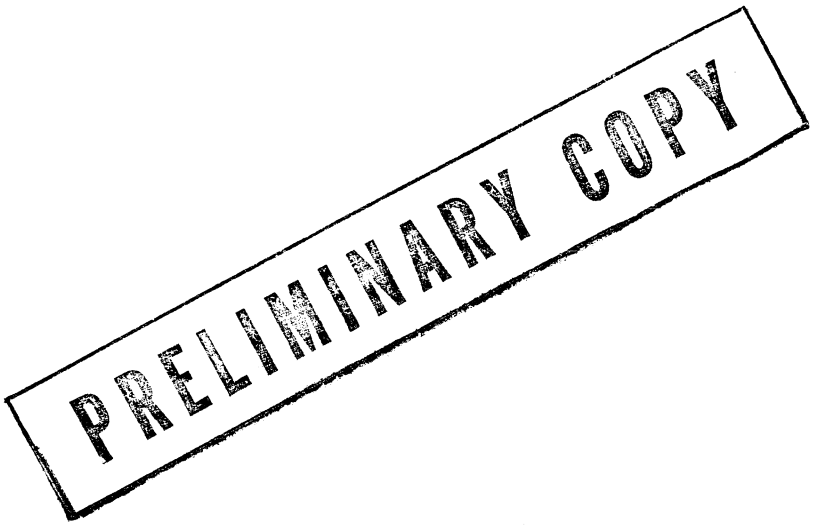
PC05 HIGH-SPEED PAPER TAPE READER/PUNCH MAINTENANCE MANUAL



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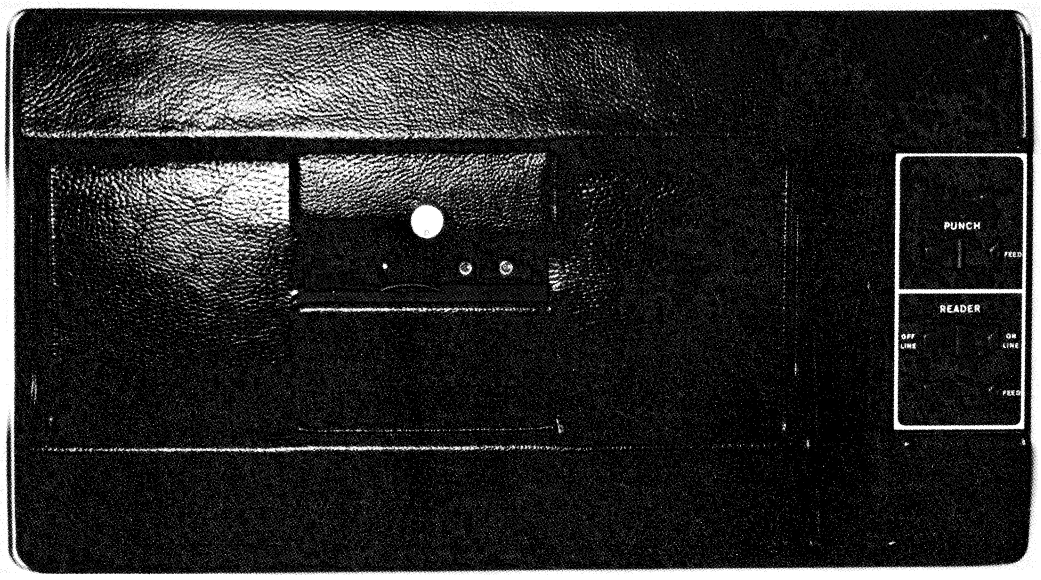
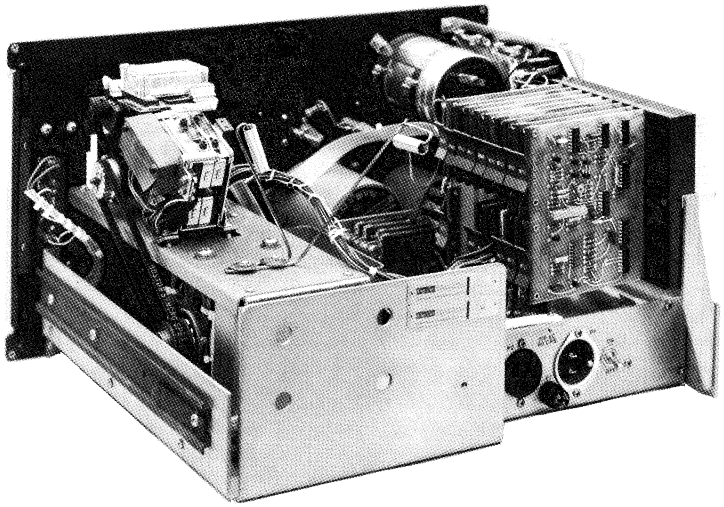


PC05 Front View



PC05 Rear View

Chapter 1
General Information

1.1 SCOPE

This manual contains maintenance information for the PC05 High-Speed Paper Tape Reader and Punch manufactured by Digital Equipment Corporation (DEC). The PC05 is currently used with PDP-11, PDP-12, and PDP-15 computer systems, each with its own unique interface and control characteristics. Consequently, this manual discusses only the mechanical and electrical operations of the basic reader and punch and considers the computer as an external piece of equipment. For information on how the PC05 is used with each computer, refer to the respective manuals listed in the table of related publications (Table 1-1).

For some time now the PC05 has been an established DEC product. However, because of the wide range of uses and state-of-the-art changes, the unit has undergone significant revision throughout its history. This manual describes the PC05 as of the date of printing. To aid maintenance personnel in determining the status of a specific PC05, a list of all applicable Engineering Change Orders (ECO) is provided in Appendix E.

Table 1-1
List of Related Publications

Product Line	Title	Document No.
PDP-11	System Manual	DEC-11-HR1A-D
	KA11 Central Processor	DEC-11-HR2A-D
	KY11-A Programmer Console	DEC-11-HR7A-D
	PDP-11 Conventions	DEC-11-HR6A-D
	UNIBUS Interface	DEC-11-HIAA-D
	PC11 Reader/Punch Control	DEC-11-HPCA-D
PDP-12	Maintenance Manual, Vol 1	DEC-12-HRIA-D
	Maintenance Manual, Vol 2	DEC-12-HR2A-D
	System Reference Manual	DEC-12-SRZA-D
PDP-15	Installation Manual	DEC-15-H2AB-D
	Interface Manual	DEC-15-HOAB-D
	User's Handbook	DEC-15-H2DA-D
	Maintenance Manual	DEC-15-H2BA-D
	Reference Manual	DEC-15-BRZA-D
Vendor Manual for Punch	Roytron Punch Maintenance Manual	

1.2 GENERAL DESCRIPTION

The PC05 High-Speed Reader and Punch is supplied as an option to the PDP-11, PDP-12, and PDP-15 computer systems and is available in three configurations:

PC05P, (PC05PA)*	Basic Punch
PC05R	Basic Reader
PC05C, (PC05CA)*	Basic Punch and Reader

The reader/punch configuration (PC05C), as shown in the frontispiece, is mounted on one chassis. All of the configurations contain their own power supply, and control and drive circuitry.

The tape reader mechanism is manufactured by DEC and contains an electromechanical tape-feed system, with associated current drivers, and a nine-channel photoelectric tape-read head, including photocell amplifiers. Information is read from eight-level, 1-inch perforated tape, at a maximum rate of 300 characters per second or at a single character rate of 25 characters per second.

The tape punch mechanism is a Roytron Model 500 modified by DEC. Contained in the unit is an electromechanical tape feed and punch system capable of punching five, seven or eight level tape. In addition, an SCR Driver is included that switches the ac power to the punch motor after a command to punch is received.

1.3 FUNCTIONAL DESCRIPTION

1.3.1 Reader

A functional block diagram of the tape reader is shown in Figure 1-1. The read head, located below the tape, contains nine photocells: eight for sensing data and one for sensing the out-of-tape condition.

The light source is located directly above the tape channel and read head. As the tape passes over the read head, each photocell senses the presence (a hole) or absence (no hole) of light. When a hole is detected, that photocell is activated and feeds an individual photo amplifier. The output of the photo amplifier is sent to the M705 Reader Control Module which temporarily stores the eight data bits in a buffer and then signals the central processor that data is available. The central processor responds with a command that strobes the data (RD holes 1 through 8) into the central processor via the Input-Output Bus lines.

The reader FEED switch, when pressed, enables the reader control, which advances the tape through the read head without actually reading.

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*These designations indicate 50-Hz models. The 50- and 60-Hz models are identical with the exception of the punch motor pulley.

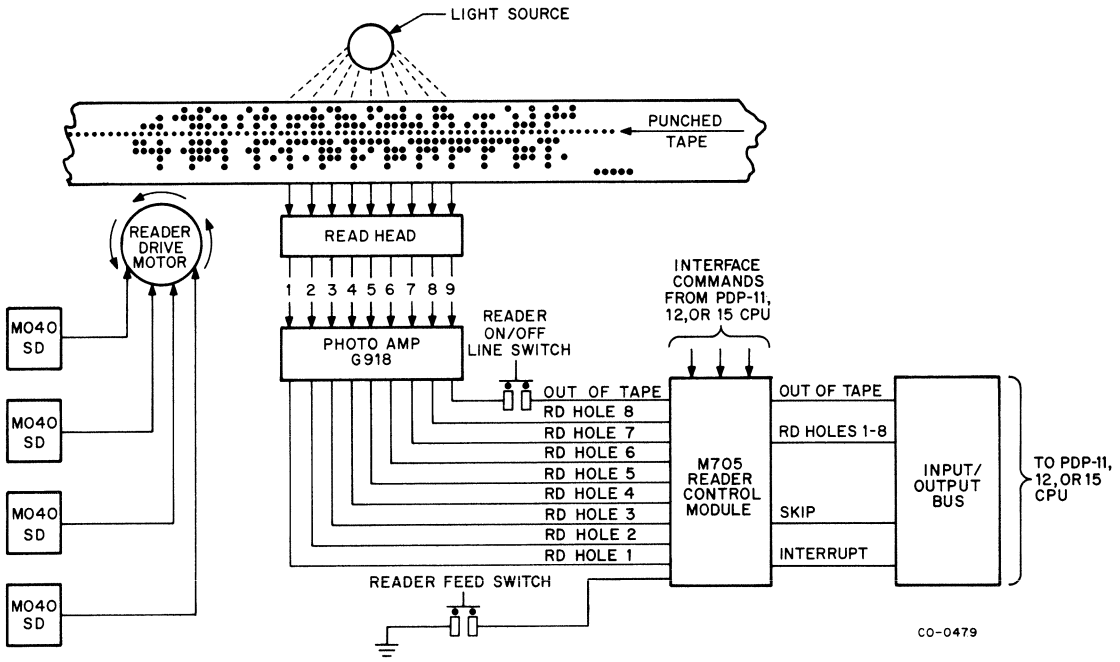

Figure 1-1 Reader Functional Block Diagram

Tape is advanced through the read station in a stepping motion by a sprocket wheel connected to the shaft of the reader drive motor. The M040 Solenoid Driver Modules provide drive current to the two center-tapped motor windings in turn. As each half of a winding is activated, the motor and, hence, the sprocket wheel, rotate to pull the tape through the read station.

1.3.2 Punch

The punch unit performs three basic operations: It moves the paper tape, positions the tape, and punches the tape. Moving, positioning, and punching of paper tape all occur during one rotation of the punch mainshaft.

A functional block diagram of the punch is shown in Figure 1-2. A punch command and the data to be punched are sent from the respective central processor (PDP-11, 12, or 15) and are stored in the M710 Punch Control Module. Once it has been determined that the punch mainshaft is at the beginning of a punch cycle, the M710 activates the M044 Solenoid Interposer Drivers which, in turn, initiate operation of the punch pins. The M710 then signals the central processor that another punch command may be initiated.

The punch drive motor, which advances the tape through the punch block, is controlled by the SCR Driver. The object of the SCR is to run the motor only when punching to eliminate unnecessary noise and wear. There are two ways of enabling the SCR Driver:

1. A punch command from the CPU.
2. Pressing the PUNCH FEED switch (overrides a punch command from the CPU).

The motor requires 1 sec to reach full speed, at which time the punch command is executed. A timer in the punch circuitry allows the motor to run for 3 sec after the last punch command in the event more punching is to occur.

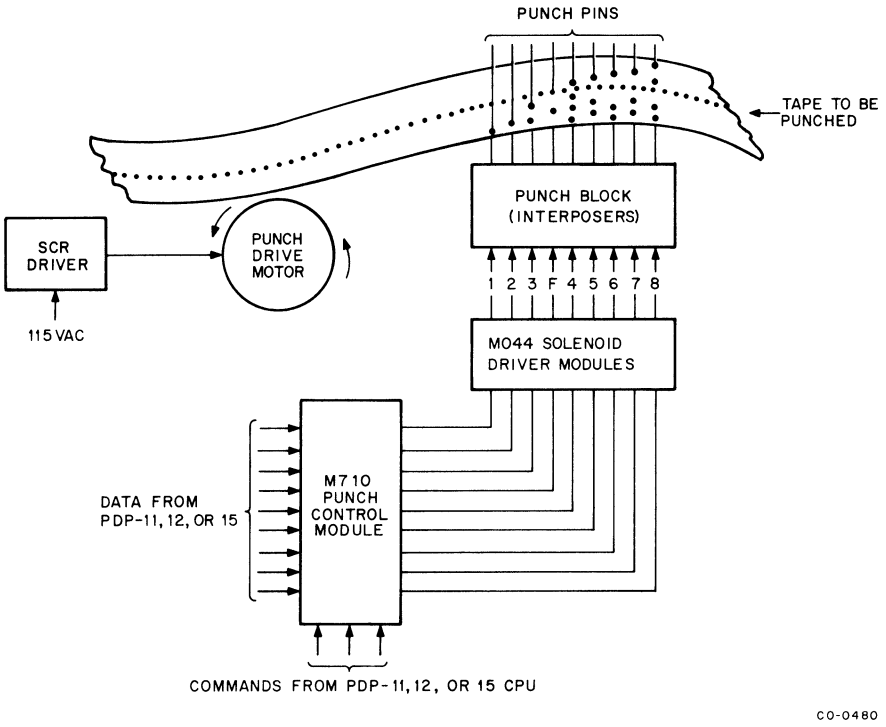

Figure 1-2 Punch Functional Block Diagram

1.4 SPECIFICATIONS

Table 1-2 lists the mechanical, electrical, and environmental specifications for the PC05C Reader/Punch.

Table 1-2
PC05C Specifications

Specification	Description
Physical dimensions	Height: 10.5 in. Width: 19 in. Depth: 15 in.
Tape characteristics	Reader: Gray, unoiled, fan-folded Punch: Oiled or unoiled, fan-folded
Tape tension (in punch)	6 oz, maximum
Power requirements	115 vac ±10%, 50 or 60 Hz
Power supplies	Regulated, -15V ±1V Regulated, +5V ±0.25V Unregulated, -36V ±4V
Logic levels	Logic 1 (H): +2.0V, input +2.4V, output Logic 0 (L): +0.8V, input +0.4V, output
Temperature (Operating)	Reader: 55° to 110°F Punch: 55° to 100°F
Temperature (Nonoperating)	Reader: 30° to 130°F Punch: 10° to 150°F
*Humidity (Operating)	Reader: 20 to 95% (w/o condensation) Punch: 20 to 95% (w/o condensation)
Humidity (Nonoperating)	Reader: 5 to 95% (w/o condensation) Punch: 5 to 95% (w/o condensation)

*The humidity specifications are for the reader/punch mechanism. Paper tape manufacturers' recommendations for operating environment should be followed. Suppliers of paper tape include Digital Equipment Corporation and Carter Rice Storrs and Bement.

Chapter 2
Installation

2.1 INSPECTION

Upon receipt, inspect the equipment for any visible signs of damage in transit, such as dents or abrasions. Inspect the logic modules for any foreign material which may have lodged in them during shipment. Any damage observed should be reported immediately to both the carrier and DEC. Check the contents of the carton with the shipping document and report any omissions immediately to DEC. Installation is not recommended until all materials are in hand.

2.2 INSTALLATION

2.2.1 Mounting

As noted previously, the PC05 is used with different computer systems, and therefore a specific mounting procedure cannot be included in this manual. The unit is normally mounted in the central processor cabinet above the control panel. It can, however, be mounted in an accessory cabinet or can be left free-standing.

2.2.2 Connections

The PC05 is shipped with its modules already connected in the slots. In addition, the PC05 contains its own power supply, so no special power connections are required. The only connections needed for operation are the ac power cord and the two flat ribbon interface cables that connect to the central processor. Refer to the applicable central processor manual for the required connection points for these two cables.

2.2.3 Module Configurations

Because the PC05 is available in three configurations, the quantity and type of modules vary. Table 2-1 lists the modules required for each configuration.

Table 2-1
PC05 Module Configurations

DEC Module Designation	Description	Quantity/Configuration		
		PC05-C (PC05-CA)	PC05-P (PC05-PA)	PC05-R
G918	Photo-amplifier	1	0	1
K303	Timer	1	1	0
M040	Solenoid Driver	4	0	4
M044	Solenoid Driver	3	3	0
M705	Reader Control	1	0	1
M710	Punch Control	1	1	0
M715	Reader Clock	1	0	1

2.3 POWER REQUIREMENTS

The 3-terminal 110-Vac power connectors (P1 and P2), located at the rear of the chassis, provide both an input and an output point for primary power. The connectors, one male and one female, permit the inclusion of the PC05 in a power chain with other system devices.

Power and signal connections are made in accordance with the procedures given in the applicable DEC interface, installation, or maintenance manual.

2.4 CHECKOUT

Once the PC05 has been installed, proceed as follows to check the unit.

a. Apply power to the computer system and turn on the punch and reader.

b. Load a new carton of tape in the punch tape well located at the rear of the chassis, and feed the tape through the punch unit (refer to section 3.3.1).

c. Press the punch FEED switch on the front panel. Tape should feed out of the tape slot and should be unpunched except for feed holes.

d. Hold the punch FEED switch on until a few feet of tape have been punched. Tear off the tape and insert it in the reader head, feeding from left to right.

e. Press the reader FEED switch and observe that the tape feeds evenly without binding on the edges of the tape guide.

f. Load and run the applicable MAINDEC diagnostic test (listed in Appendix B) using the instructions contained with the diagnostic test. If any errors occur, refer to Chapter 5 of this manual.

Chapter 3
Operation

3.1 INTRODUCTION

This chapter contains information on the PC05 controls, and loading of tape. All programming is done via the computer. Refer to the respective user's guide or maintenance manual for this programming information.

3.2 CONTROLS AND FUSES

The controls and fuses for the PC05 are listed in Table 3-1.

Table 3-1
PC05 Controls and Fuses

Nomenclature	Function
PUNCH FEED (SW)	Punches leader tape.
READER ON LINE/OFF LINE (SW)	Allows or disallows reading of tape (on line).
READER FEED (SW)	Manually feeds tape through read station.
SBF1	Fuses the ac power to the unit.
SBF2	Fuses the +5V regulated power input.
SBF3	Fuses the -15V regulated power input.
UNIT ON/OFF (SW)	Switches ac power into the unit.

3.3 OPERATING INSTRUCTIONS

For routine operation of the PC05, refer to Table 3-1, which describes controls and fuses. Tape loading procedures are given below.

3.3.1 Loading Blank Tape (refer to Figure 3-1)

To load blank tape for punching, proceed as follows:

a. Pull the unit straight out of the rack on its drawer slides, then bend the tape feed bracket and remove and discard the exhausted tape supply carton.

b. Press the FEED button on the tape punch until the stub end of tape stops moving out of the machine.

c. Pull the stub out of the exit slot.

d. Install a carton of tape in the tape well provided on the rear of the tape punch chassis.

NOTE

Under certain conditions, such as low humidity, chad tends to build-up in the plastic punch cover and subsequently the punch assembly. This condition can be avoided by dipping the plastic punch cover in an anti-static solution. Also, if the chad box is full, it is good practice to empty it during this procedure.

e. Feed the new tape out of the carton, with the printing face down. Route the tape through the two rollers, over the out-of-tape switch and guide plate, directly into the punch block (Figure 3-1).

f. Guide the tape out over the sprocket and down through the feed-chute tray.

g. Press and hold the PUNCH FEED switch until several folds of tape are present in the bin. It is necessary to stack the first few folds by hand to guarantee proper stacking.

Do not run the tape directly out of the punch and into the reader with only a short length of tape between the two. The tape may snag in the bin or it may be skewed as it crosses the reader, thus creating a malfunction.

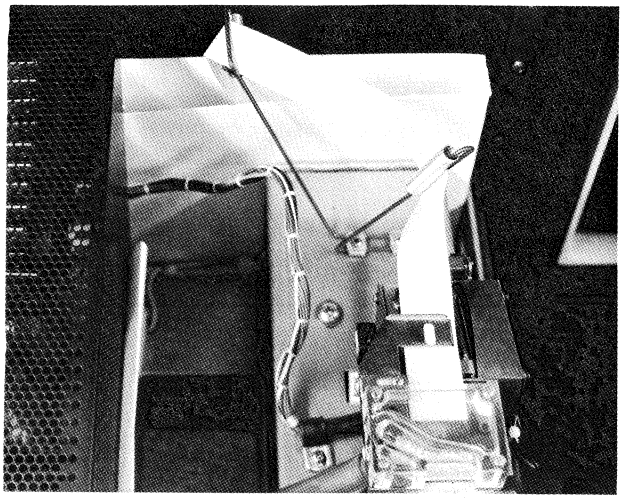

Figure 3-1 Paper Tape Path, Top View

3.3.2 Loading Prepunched Tape (Figure 3-2)

To load prepunched tape for reading, proceed as follows:

a. Raise the tape depressor and load the tape into the right-hand bin. Thread the tape under the tape hold-down bracket.

b. Place the tape on the sprocket teeth and lower the tape depressor fork. Press the READER FEED switch. Run the tape leader into the left-hand bin and dress the tape folds.

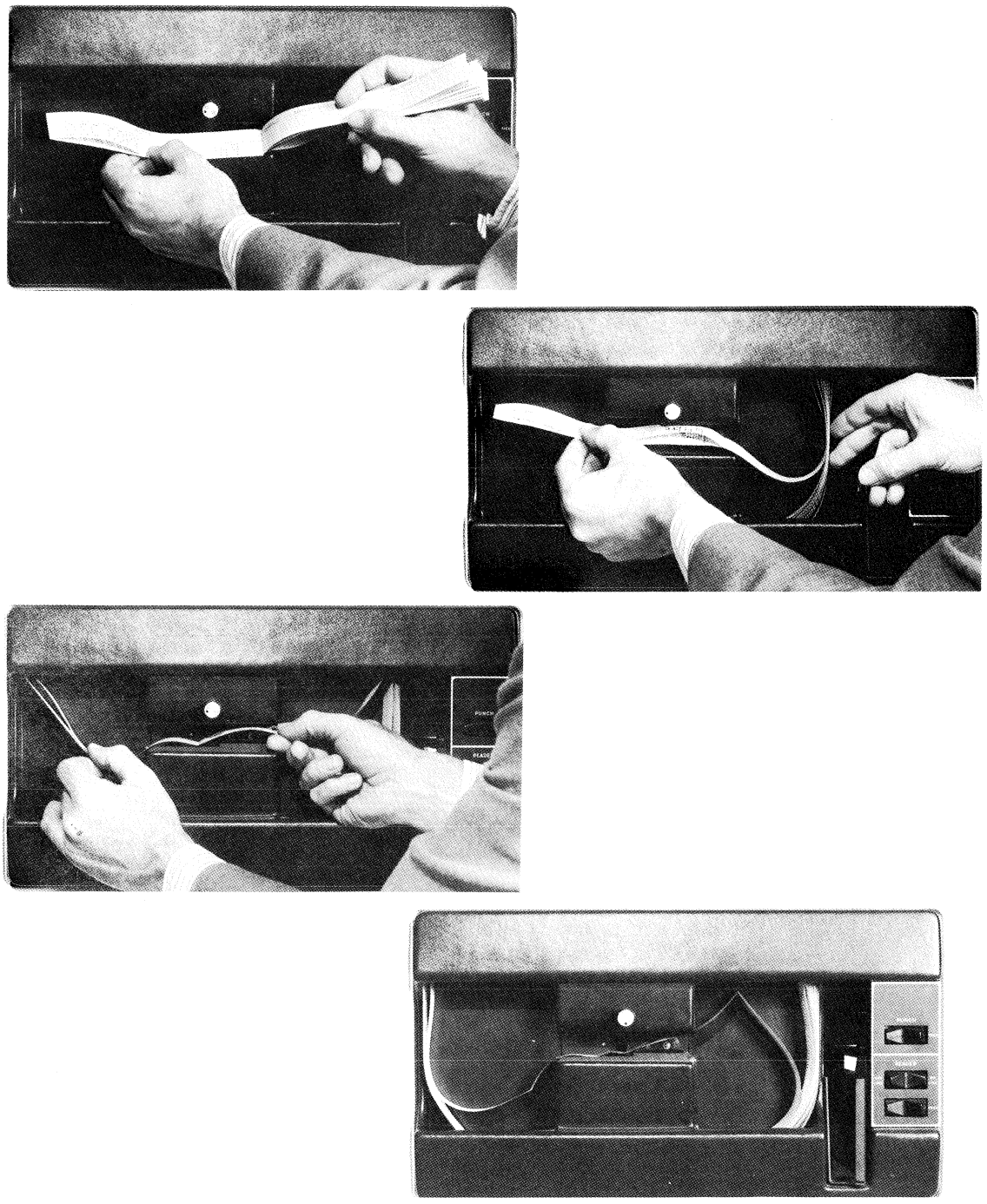

Figure 3-2 Installing Tape in Paper-Tape Reader

Chapter 4
Principles of Operation

This chapter describes the principles of operation for the paper tape reader (paragraph 4.1) and the paper tape punch (paragraph 4.2). The engineering drawings referenced in this chapter are contained in Chapter 6.

4.1 PAPER TAPE READER

The power and control schematic for the paper tape reader appears on engineering drawing D-BS-PC05-0-4, sheets 1 and 3.

4.1.1 Tape Feed Operation (Figure 4-1)

Rotation of the reader motor is dependent upon the simultaneous actuation of two halves of its two center-tapped windings. The drive current for the windings is provided by four M040 Solenoid Driver Modules. There are actually two drivers per module resulting in eight current drivers or two for each half winding. The stepped activation of both drivers in each of two selected modules supplies the current necessary to produce the required torque.

Independent gates are provided at the input of each of the eight current drivers. The output of the A or B flip-flop activates one driver of each pair. Each of these drivers feeds into a series-connected current-dividing resistor. The jumpered ends of the resistors from each module connect to one side of a winding of the motor. Each section of a driver module provides 600 mA to a motor winding. With the A and B flip-flop outputs active, only one driver in each of the two selected modules is activated. Therefore, only 600 mA is applied to a winding, and the torque produced by this current, although insufficient to produce motor rotation, acts as an efficient holding force.

To fully actuate a motor winding, the second driver in the two selected modules is enabled. This is accomplished by applying the set output of the POWER flip-flop to the second driver. With both drivers in each of the two modules enabled, the output current rises to 1.2A which is the current required to rotate the motor.

For example, with flip-flop A (0) and flip-flop B (0) a +3V-level is applied to pins D2 and K2 of the two modules located at A09 and B07. This condition supplies two of the three required inputs. (Therefore levels

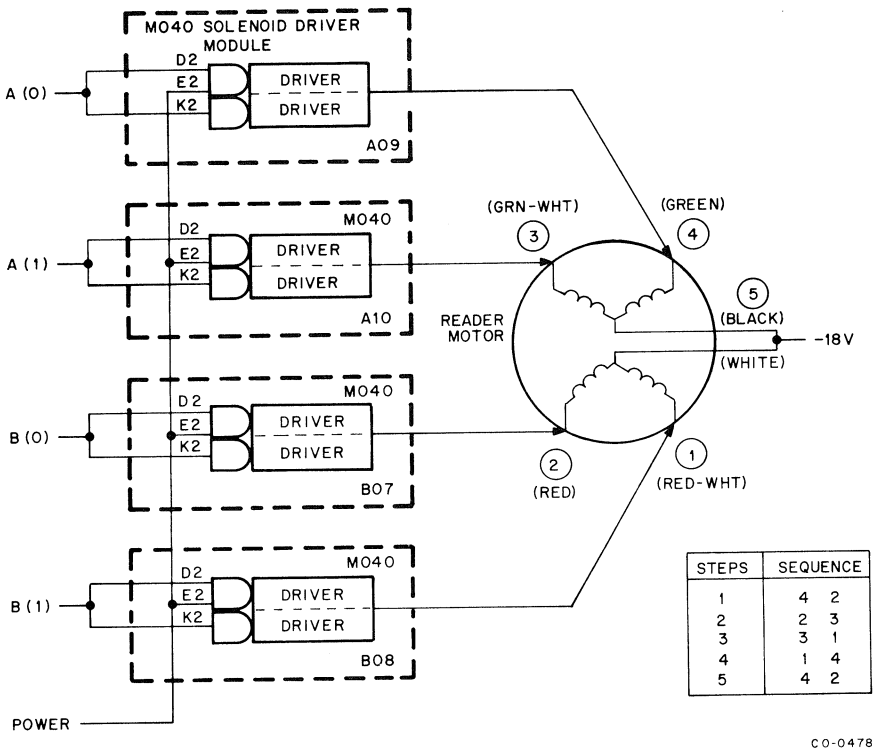

Figure 4-1 Tape Feed Operation

A (1) and B (1) are false, thereby disabling the drivers located in slots A10 and B08.) The application of a +3V-level (POWER (1)) to pin E2 of all modules provides the third input required to the drivers in A09 and B07.

As a result of these three inputs, both sections of drivers in A09 and B07 conduct, providing drive current to windings 4 and 2. This drive current rotates the motor 1.8 degrees. Switching the driver inputs 200 times, therefore, results in one complete revolution of the motor (1.8 degrees x 200 = 360 degrees). One motor revolution is equivalent to 100 character positions. Continuous stepping of the inputs in the proper sequence (see chart in Figure 4-1) at the rate of 1.667 ms per step produces a tape-feed rate of 300 characters per second.

4.1.2 Tape Reading

The photo-array, consisting of nine photosensitive diodes, is arranged below the tape track perpendicular to the direction of tape movement. A light source, located directly above the diodes, provides the light necessary for sensing holes in the tape. Eight of the diodes sense the coded holes; the ninth diode senses the presence of tape.

The phototransistor, when shuttered from light, controls an output which is below the threshold of the photo-amplifier. If the phototransistor is exposed to light, its output current increases in a positive direction and overcomes the circuit threshold.

The photo-amplifier, which consists of nine amplifiers, is used to monitor the outputs of the photo-array. The photo-amplifier provides an output of 5 Vdc when a hole is sensed, and an output of 0.2 Vdc when no hole is sensed.

The following discussion describes the operation of the channel 1 phototransistor amplifying circuit. All other channels operate in an identical manner. The referenced amplifying circuit is at the top left of engineering drawing D-BS-PC05-0-4, sheet 1.

The photo-amplifier (G918) accepts the output of the photocell for channel 1, at terminal BP2. When the photocell does not sense light (no hole), the bias level (determined by the setting of the threshold sensitivity potentiometer) is not overcome, which causes a 0 Vdc output at EA2. When the photocell senses light, a positive current change occurs at terminal BP2, which is enough to overcome the circuit current threshold, and the output switches to +5V at AE2.

By synchronizing the sampling of the photo-amplifier outputs with its inputs to the solenoid drivers, the M705 controller selects the output levels of the photo-amplifiers which represent valid punched data.

4.1.3 Tape Reader Control

Regardless of the central processor, the control for the PC05 is such that the next character to be read is already directly over the photo-array. The following discussion outlines the cycle involved in reading a character.

a. The central processor issues a fetch character command that generates a tape-advance signal to the reader. Before this tape-advance signal is actuated, however, the data which is already over the photohead is strobed into the buffer register.

b. Once the data is stored in the buffer register, the reader control module M705 senses the reader flag.

c. Upon detecting the reader flag, the processor issues a command which strobes or gates the data onto eight input-output bus lines and to the central processor.

d. The tape-advance signal generated in step 1 brings the next character over the photo-array, and the process described above is repeated.

4.2 PAPER TAPE PUNCH

The power and control schematic for the paper tape punch appears on engineering drawing D-BS-PC05-0-4, sheets 1 and 2.

4.2.1 Feed Control

A reluctance pick-up (Pulse Generator) signals the M710 Punch Control Module when the punch mainshaft has rotated to an angular position marking the beginning of the punch cycle. If a character is in the punch buffer at the time that the pulse generator signal occurs, the punch control immediately applies a voltage across the index magnet coil and appropriate punch magnet coils.

When the flux in the index magnet coil has built up enough to overcome the spring return force, the magnet armature "pulls in" and engages a tooth on the feed ratchet. Continued rotation of the punch mainshaft tries to draw the ratchet past the magnet armature. The armature however, is held stationary and acts as a pawl, resulting in a rotation of the ratchet. The feed ratchet drives the sprocket wheel through a pair of gears. In this manner, motion of the paper tape is initiated.

A ball detent on the sprocket wheel shaft is now assigned to accurately position the tape and then hold the tape motionless during the ensuing punching operation.

Energization of the punch magnets by the solenoid drivers causes interposers to be set up. As rotation of the punch mainshaft continues, these interposers push the punch pins through the paper. As the punch pins are being retracted from the paper, the punch mainshaft is just completing one revolution. The reluctance pick-up again signals the logic that the machine is starting a new cycle and is ready to punch another character.

4.2.2 Tape Punch Control

General

The punch is selected for operation when it senses its device code or address from the current instruction. Command pulses or data lines are then asserted by the central processor, which subsequently causes IOT pulses to be generated within the M710 Punch Control Module. The IOT pulses clear the punch buffer, load the buffer with new data, and cause various flags to indicate the state of the punch to the central processor.

A typical operation follows (refer to Figure 4-2). The punch control senses its device code being transmitted by the central processor unit (CPU). The CPU checks if the punch is currently active and, if not, sends a command to clear the punch buffer. Data is then strobed into the buffer from the CPU input-output bus.

A punch command is then sent by the CPU or is generated by the punch FEED switch, and 10 ms later the punch motor is activated by the SCR. After a 1-sec delay, to allow the motor to reach full speed, the solenoid drivers are activated, and the punch is allowed to start punching the data in the buffer (PB0-7).

Once the punch command is disabled or the punch FEED switch is released, the K303 Module will time-out after three seconds, unless another punch command is received, and then stops the motor.

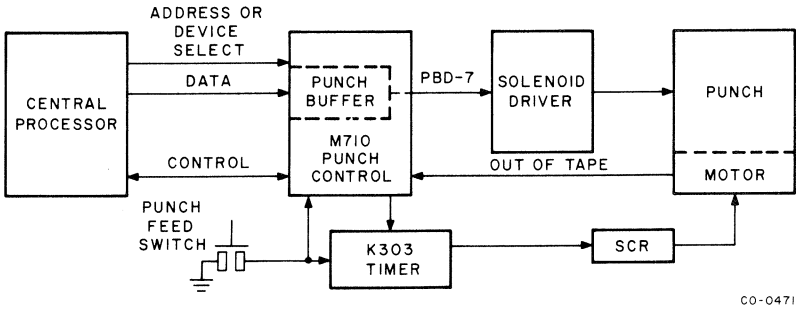

Figure 4-2 Simplified Block Diagram, Punch Operation

The OUT-OF-TAPE signal provides a warning when approximately 2 in. of tape remains.

Chapter 5
Maintenance

5.1 INTRODUCTION

This chapter contains both preventive and corrective maintenance procedures. An optimum amount of preventive maintenance, performed on a routine schedule, can eliminate costly equipment breakdowns and allow the detection of impending failures. If a specific item does fail, equipment design is such that replacement of modular elements can restore the equipment to service in a minimum amount of time. The design objective of the PC05 High-Speed Paper Tape Reader/Punch is to provide a dependable and relatively maintenance-free assembly. The tape reader motor is electromagnetically driven so that it does not experience the mechanical failures normally inherent in systems using ratchets, detent, and clutch-brake mechanisms.

5.2 PREVENTIVE MAINTENANCE

Preventive maintenance tasks should be performed at periodic intervals to ensure proper equipment operation and to minimize unscheduled downtime. These tasks consist of visual inspection, operational checks, cleaning, lubrication, adjustment, and replacement of borderline, or partially defective parts.

Preventive maintenance scheduling is contingent upon the environmental and operating conditions at the installation site. Under normal environmental and work-load conditions routine preventive maintenance should be performed after every 600 hours of operation (or every four months, whichever occurs first). this schedule, of course, should be modified when extreme temperature, humidity, dust, or work load conditions exist.

Maintenance activities for the PC05 require the standard test equipment and special materials listed in Table 5-1.

5.2.1 Preventive Maintenance Procedures

Preventive maintenance procedures for the tape punch can be found in the Roytron Maintenance Manual, which is supplied with the equipment.

Table 5-1
Required Maintenance Equipment

Equipment	Manufacturer	Designation
Multimeter	Triplett or Simpson	Model 630-NA or 260
Oscilloscope	Tektronix	Type 547 or 453
Plug-in Unit	Tektronix	Type CA (for 547 scope)
X10 Probe	Tektronix	P6008
Module Extender	DEC	Type W980
Tape Registration Gauge		

5.2.1.1 Mechanical Checks - Inspect the Tape Reader periodically as follows:

a. Visually inspect the general condition of the tape reader.

b. Clean the interior and exterior of the tape reader, using a vacuum cleaner or a clean cloth which has been moistened with a nonflammable solvent.

c. Lubricate the chassis slide mechanisms with a light machine oil. Wipe off excess oil.

d. Inspect all wiring and cables for cuts, breaks, fraying, deterioration, kinks, strain, and mechanical security. Tape, solder, or replace any defective wiring or cable covering.

e. Inspect the following components for mechanical security: READER FEED switch, READER ON/OFF LINE switch, light condensor, phototransistor assembly, depressor arm, hold-down bracket, all connectors and circuit modules, tape-feed motor, front cover, and resistor assembly.

5.2.1.2 Electrical Checks - Perform the power supply output checks described in Table 5-2. With the normal load connected, use a multimeter to measure the output voltages and an oscilloscope to measure the peak-to-peak ripple content on all dc outputs of the supply. The +5 Vdc, -15 Vdc, and -36 Vdc supplies are not adjustable; therefore, if any output voltage or ripple content is not within specifications, consider the power supply defective and initiate appropriate troubleshooting procedures.

5.3 READER ADJUSTMENT PROCEDURES

5.3.1 General

This section contains mechanical and electrical adjustment procedures for the PC05 Reader. Each procedure has been established and verified by DEC engineers and field service personnel. For successful results, the procedures should be performed in the exact manner and sequence in which they are presented.

Table 5-2
Power Supply Output Checks

Terminal	Nominal Output (Vdc)	Acceptable Output Range (Vdc)	Maximum Output Current (A)	Maximum Peak-to-Peak Output Ripple (V)
Tab 1 on Regulator	+5	+5 ±0.25	2	0.150
Tab 2 on Regulator	-15	-15 ±1	1	0.150
A10V2 on Logic Block	-36V	-36V ±4	4	2.5

The diagnostics referenced in the procedures are noted in a general manner only because of the operational differences among PDP-11, 12, and 15 systems. Maintenance personnel should become familiar with the respective computer console operation, loading in of diagnostics, and interpreting error printouts. This information can be found in the applicable user's (system) manual and diagnostic write-up.

NOTE

Before beginning the procedures, it is helpful to load the diagnostic into the machine to take advantage of the tape bins on the front cover. By doing this, the cover can then be left off for the entire procedure. Also, if an alternate ONE-ZERO tape is not available, it may be advantageous to punch one before beginning the procedures. Appendix D lists some test tape programs.

5.3.2 Preliminary Procedures

Ensure that the PC05 is turned off and that power is removed from the computer. Detach the front cover by removing the four Phillips screws (one on each corner) and loosening the two Allen screws that secure the tape depressor knob. Also, remove the protective screen cage that covers the reader logic and power supply.

5.3.3 Tape Depressor (Figure 5-2a)

The tape depressor is mounted on a shaft and is spring-loaded to hold the paper tape against the feed wheel. The object of this adjustment is for the tape depressor to have contact with the feed wheel at four points with no tape in the reader, as shown in Figure 5-1.

a. Loosen the two Phillips screws attaching the depressor to the shaft.

b. Apply light finger pressure to both legs of the depressor until they make even contact with the feed wheel. Tighten the two screws.

c. If contact is too heavy against the feed wheel, manually spring the depressor legs up.

Care should be taken not to let the depressor legs drag against the pins on the feed wheel. Ideally, the pins should be centered between the two depressor legs.

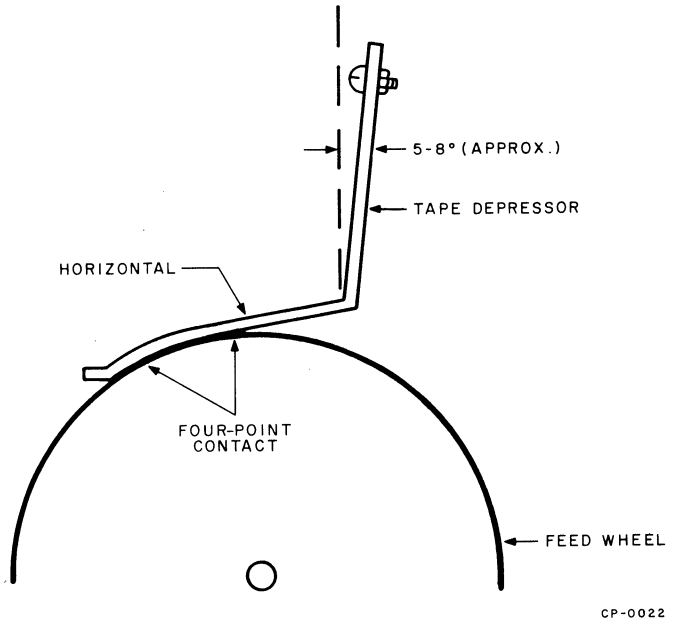

Figure 5-1 Tape Depressor Alignment

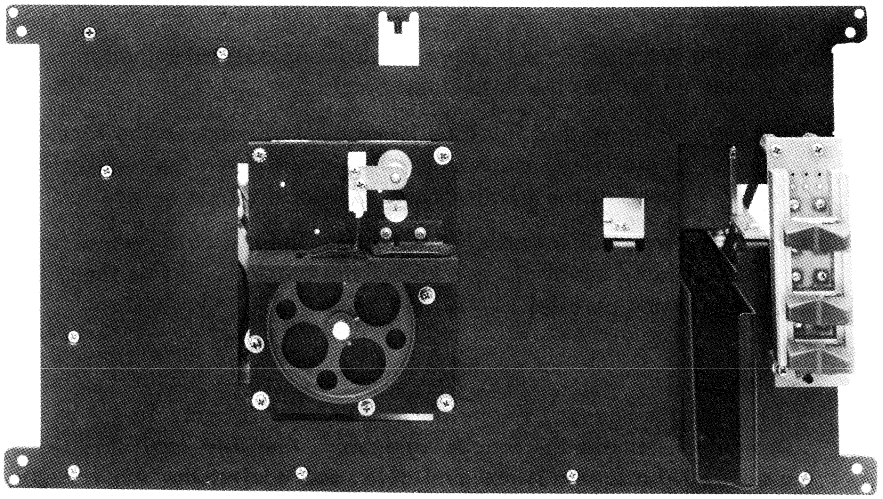

Figure 5-2a Front View, Cover Removed

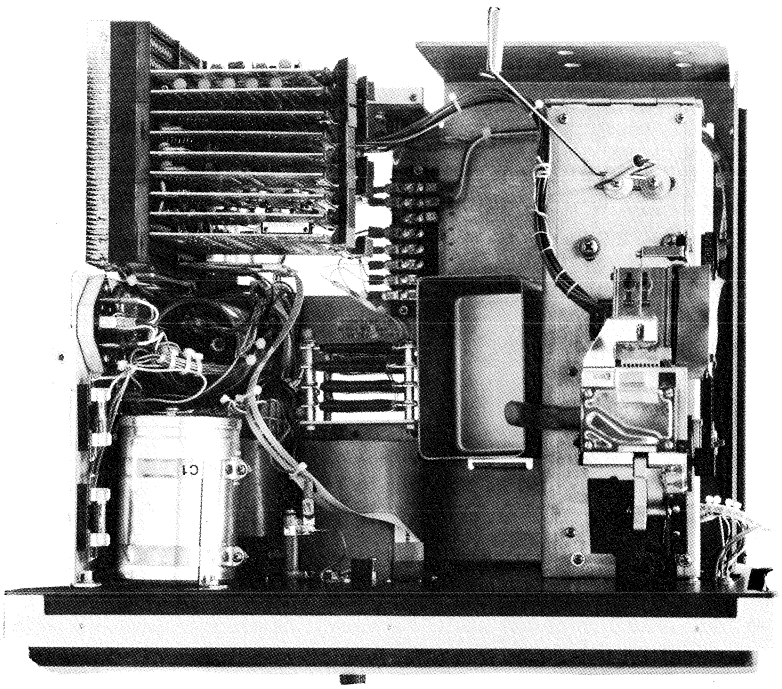

Figure 5-2b Top View

5.3.4 Tape Hold-Down Bracket (Figure 5-2a)

The object of this adjustment is to have a tight, three-tape thickness gap between the hold-down bracket and the tape guide plate.

a. Remove power and test tape from the unit.

b. Use a small knife or file to remove any sharp edges on the hold-down bracket.

c. Loosen the two small Phillips screws that fasten the bracket to the back plate.

d. Place three pieces of unpunched tape (with no folds included) under the hold-down bracket. The tape should be at least as long as the hold-down bracket.

e. Lower the hold-down bracket so that the tape is compressed between the tape guide and bracket. Then slide the bracket to the left as much as possible and tighten the two Phillips screws. Be certain that no tape is being jammed at the front or back edge of the tape guide.

f. Pull the triple thickness tape out towards the operator. There should be a definite drag as the tape is withdrawn and it should be equal at each end of the bracket. At this time, the hold-down bracket should be straight across and parallel to the tape guide.

NOTE

If the drag is uneven, the hold-down bracket is bent. To straighten, remove the bracket and bend, then test against a square. If a square is not available, test against the angle formed by the back plate and tape guide plate.

5.3.5 Photosensor Coarse Adjustments

The reader can be adjusted to operate at almost any light level; however, the unit is much less sensitive to stray light when set up for maximum brightness. Perform these adjustments:

a. Set the clamp on the adjustable resistor (Figure 5-2b) all the way back from the front of the PC05.

b. Level the flat top of the plastic lens so that the light beam is concentrated over the photo-array as shown in Figure 5-3. The lens is adjusted by a mounting screw on the rear of the back plate. Be careful when tightening mounting screws since the plastic lens may be broken by too much force.

5.3.6 Feed Wheel Position (Figure 5-2a)

a. Mechanical Adjustments

When a piece of tape is positioned on the feed wheel and held down by the depressor, the back edge of the tape must be as close as possible to the back plate without jamming or buckling. To adjust the feed wheel position, proceed as follows:

(1) Loosen the two Allen screws holding the feed wheel to the motor shaft.

(2) Slide the feed wheel in or out until the tape is as close as possible to the back plate. Do not rotate the wheel on the shaft; this affects another adjustment. Some wheels may require a little force to slide them. Apply an evenly distributed amount of force when sliding the wheel to prevent wobble or crooked alighment. With the wheel in the correct position, tighten the Allen screws.

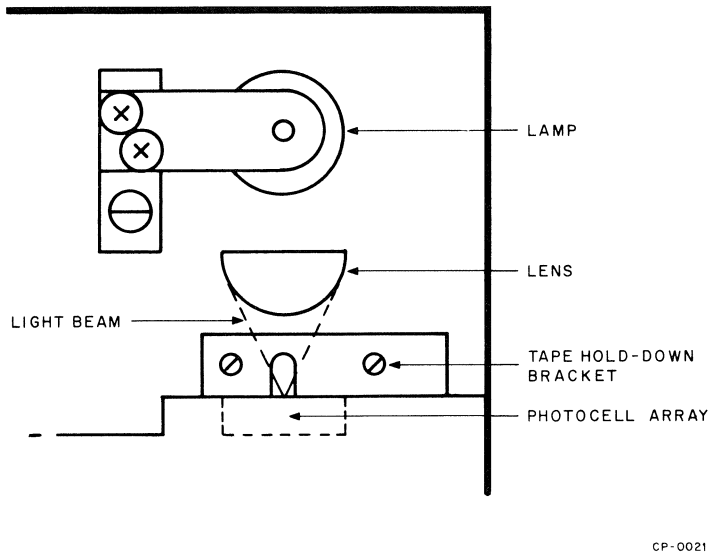

Figure 5-3 Plastic Lens Alignment

(3) If the Allen screws have dented the shaft, it may be difficult to make a small correction since the screws tend to slide back to the original dents. To correct this condition, loosen the two Allen screws again and observe the relationship of the holes in the tape over the wheel to the holes in the tape hold-down bracket slot.

(4) Advance the tape one or two holes by rotating the feed wheel, leaving the same relationship of holes. This action allows the Allen screws to be set in new positions on the shaft.

(5) Before tightening the Allen screws, check that the tape does not buckle or jam against the back plate.

NOTE

If the feed wheel adjustment is considerable, the tape depressor may not make uniform contact. If this is the case, repeat the steps in 5.3.3.

b. Feed Wheel Wobble

Feed wheel wobble can be electronically checked using the procedures in paragraph 5.3.7, Data Pulse Width and Threshold Adjustments.

5.3.7 Data Pulse Width and Threshold Adjustments

a. Using an alternate one-zero, looped test tape, operate the reader at full speed using either program control or the feed switch.

b. Set the oscilloscope to 1 ms/cm, trigger internally, set polarity to positive, and check the outputs of the eight data bits of the G918 module.(Refer to Appendix A for location of test points.)

c. Determine the shortest data pulse, which should be in the range of 2 to 2.5 ms. (A rough adjustment of the G918 threshold (Figure 5-2b) may be required to do this).

d. Rotate the bulb to make this shortest data pulse as long as possible. Disregard any seams or shadows since the photo-array takes them into account in determining the pulse width.

e. If the shortest pulse width oscillates more than 500 μs, feed wheel wobble is too great and the wheel must be replaced. Do not mistake the passage of a tape loop splice for a variation. Also, do not attempt to straighten the wheel.

f. If one or more data pulses are considerably shorter than the others, loosen the mounting screw of the photo-array and take up the play either in toward the back plate or out towards the operator. Do not apply any more than gentle finger pressure to the array and be sure to leave the aluminum shim between the tape guide. (This same adjustment is necessary when the photo-array is too far toward the operator as evidenced by the tape stopping at various points due to an out-of-tape signal.)

g. Locate the longest data pulse and adjust the threshold potentiometer on the G918 module so that this pulse is 3 ±0.1 ms between average rise and fall times (50 percent points). There will be some scattering of rising and falling edges. Disregard these and any jump that occurs when the splice in tape loop passes through the reader.

h. Locate the shortest data pulse. With the longest pulse set for 3 ±0.1 ms, the shortest pulse must be at least 2.2 ms as shown in Figure 5-4.

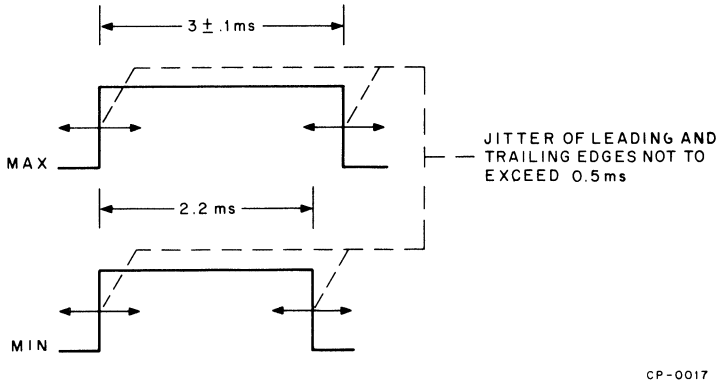

Figure 5-4 Minimum and Maximum Data Pulse Width

5.3.8 Skew Determination

Skew is defined as the difference between the earliest and latest rise times or the earliest and latest fall times. Skew can be introduced by the position of the photo assembly in the mounting hole, the placement of individual chips on the assembly, and the relative output of a chip when exposed to light. To determine skew, proceed as follows:

a. Using both channels of scope and internal sync, locate the data pulse having the earliest rise time. Using the rising edge of the data pulse as the sync point, record the difference between the midpoint of its rise and the midpoints of all other data pulse rises. Determine and record the same information for falls. Figure 5-5 shows a typical set of waveforms for determining skew.

b. Use the larger of the above (difference in earliest and latest rise times or difference in earliest and latest fall times) as PC05 skew. If skew is greater than 1 ms, the unit probably cannot be adjusted. The photo-array and/or lamp should be replaced and the procedures in paragraphs 5.3.6 through 5.3.8 must be performed again.

c. If skew is 0.5 ms to 1 ms, strobe adjustment (paragraph 5.3.12) may be difficult but is feasible. If skew is less than 0.5 ms, the strobe normally can be adjusted without difficulty.

NOTE

An accurately registered tape along with running rate adjustment and acceleration adjustments are prerequisites for accurate strobe adjustments.

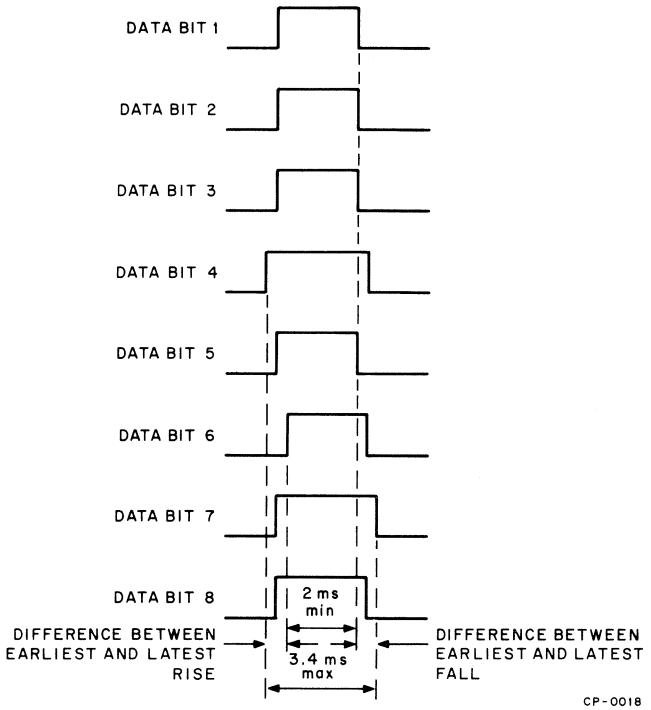

Figure 5-5 Skew Determination Waveforms

5.3.9 Test Tape Registration

The reader adjustment procedures that follow use the tape output from the punch. If this tape is not in accurate registration (10 characters per in.), the reader will not be able to read any other tapes, such as DEC Program Library tapes.

a. Punch a test tape of alternate ONES and ZEROS.

b. Use the pins on the tape gauge to check that the punch registration is not off by more than 1/2 feed hole per six in. of tape (±0.023 in.).

c. The tape gauge provides holes 1 in. apart. Check that every one of these holes is uncovered. If some holes are covered, and the feed holes line up with two pins, 6 in. apart, registration is off by more than one hole per 6 in.

d. It is also important that the feed holes be evenly spaced 0.1 in. from each other. This can be checked by sighting along the punched tape at a shallow angle. The punch adjustment procedure in this manual contains a detailed description of data hole specifications.

5.3.10 Running Rate Adjustment

a. To measure the time between transitions of the A (0) flip-flop, connect an oscilloscope probe on pin A9D2. Check that the time is 3.33 ms (300 characters per second) as shown in Figure 5-6.

b. If the time is not equal to 3.33 ms, adjust R6 (10K pot) on the M715 module to correct it. Once this procedure is completed, it is not affected by any other adjustment.

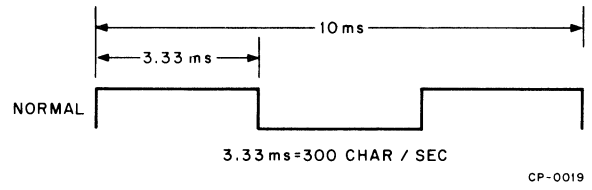

Figure 5-6 Running Rate

5.3.11 Acceleration

a. Load a program that reads one character and then stalls for approximately 5 ms. If the respective MAINDEC programs (Appendix B) are not already in the computer, use the stall program suggested in Appendix C. The short stall allows the internal stop delay circuit of the reader to operate. This circuit holds the reader flag off for a minimum of 40 ms to allow the reader feed wheel to come to rest.

b. The interval between characters under control of this program must not be less than 40 ms plus stall time. The interval can be as great as 150 ms but will normally be between 40 to 100 ms.

c. Examine the waveform at pin AV2 of the M715 module. The waveform should be a negative pulse approximately 2.5 ms long followed by a negative spike. The interval between the negative-going edge of the pulse and the spike must be 4 ms. If this interval is off, adjust R8 (small one-turn pot) on the M715 for the specified 4 ms.

5.3.12 Strobe Adjustment

a. Display

(1) Load a ONE-ZERO tape loop that has been checked for registration. A reader adjusted with an improperly registered tape will not be able to read correct tapes.

NOTE

Do not continue to use a tape loop after it has become worn, because the feed holes tend to elongate and give the effect of bad registration.

(2) Select a test, from the MAINDEC program previously loaded in, that reads 12 characters and then stalls before reading again. If the MAINDEC does not contain this test program, use the appropriate program listed in Appendix C.

(3) With the tape running, set the oscilloscope for 10 ms/cm and trigger channel A on the transition of the A (0) flip-flop (pin A902).

(4) Observe a burst of pulses at the left of the screen and a level on the right. If the level is low, set the trigger positive; if the level is high, set the trigger negative.

(5) On Channel B, display the G918 data bit outputs in turn (see Appendix A for pin numbers). Observe the slot in the tape hold-down bracket while the tape is being stepped. If the character in the slot is all holes, the data bit pulse at the left of the screen should be positive. If the character in the slot is blank, the data bit pulse at the left should be at ground.

(6) Turn on the X10 sweep magnifier. Every other edge of A (0) waveform should fall into a positive data pulse on Channel B.

(7) Turn the horizontal position control so that every positive data bit is shown with the A (0) flip-flop transition that strobes it out. If the leading edge of the strobe is less than 0.5 ms from either the leading or trailing edge of the positive data bit, that bit is likely to be missed by the strobe (see Figure 5-7). Each of the eight data bits on the G918 module must be checked against the strobe in the above manner.

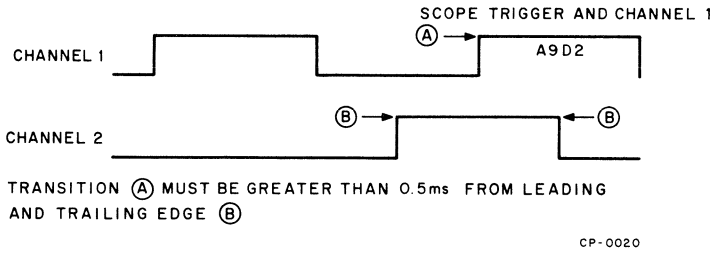

Figure 5-7 Strobe Adjustment

(8) The preceding procedure tests the positive data bits only. With a ONE-ZERO tape, every other data bit is positive. To check the others, observe the character in the tape hold-down bracket slot. Place reader off-line, then press and release the feed switch to advance the tape for the opposite character.

(9) Place reader on-line, start program, resync the oscilloscope for the opposite mode and check all eight data bits against the strobe as before.

b. Adjustment

(1) Locate the closest approach of strobe and data bit edges.

(2) Loosen the four machine screws (three in front, one in rear) securing the motor to the back plate, and rotate the motor shaft slightly to obtain a 0.5 ms margin. Take up to 1 ms margin, if possible or necessary, but remember that at some point, increasing the margin for one data bit will decrease the margin for another bit. Each data bit must be checked to ensure that the adjustment of one has not deteriorated another. Tighten all four screws when adjustment is completed.

NOTE

If the rotational adjustment range of the motor is insufficient, the feed wheel must be adjusted. Stop the program, but leave the power on and the ONE-ZERO tape loop in. Loosen the two Allen screws fastening the feed wheel to the motor shaft. Observe the tape at the slot in the hold-down bracket. If the strobe is required later in the data bit, turn the feed wheel counter-clockwise until the tape moves about one-half data hole to the left. After checking that the tape is not buckling or jamming, tighten the two Allen screws. Run the program again and check for the 0.5 ms margin.

It is important that the leading edge of the strobe be as nearly centered as possible on the first five to six data outputs, since this is the significant acceleration period of the motor.

5.3.13 Testing

With all adjustment procedures completed, test the reader for proper operation by reading a tape for which there is an error-checking routine. This tape can be punched using the appropriate program. Refer to the applicable MAINDEC for operating instructions and interpretation of printouts.

If the MAINDEC diagnostic was not loaded in at the beginning of these adjustment procedures, reinstall the plastic front cover to make use of the tape buckets and load the diagnostic.

There are two types of errors that may be detected: (a) data bits are being picked up and (b) data bits are being dropped.

a. If a data bit is being picked up, it means one of two things:

(1) The photocell is staying on too long. Return to Threshold Adjustment (paragraph 5.3.7) where the width of the largest positive data pulse was set to 3.0 ms ±0.1 ms. To cause a bit pick-up, the pulse would have to be on much longer than 3.0 ms.

(2) The photocell is being exposed to stray light. If the tape hold-down bracket is bent so that the gap between the bracket and tape guide plate is more than a three-tape thickness, it is possible that stray light can enter the photocell. This condition is possible only for the outer two or three bits (8, 7, and 6). Adjust the hold-down bracket in accordance with paragraph 5.3.4.

NOTE

If both of these adjustments have been rechecked and are within specifications, there is probably some system problem. For example, the flex-print output cables of the PC05 may have been taped together; there may be a bad logic channel between the PC05 and the processor, or perhaps the kick suppressor of some magnetic driver is not connected to the supply (pin V2 of the M040).

b. If a data bit is dropped, there are two possibilities:

(1) The photocell is not turning on. Set the data pulse widths between 2.2 and 3.0 ms in accordance with paragraph 5.3.7.

(2) The strobe misses the positive data pulse. This item is a common cause of data bits dropping. Return to the procedures in paragraph 5.3.12 and check again that the strobe is no closer than 0.5 ms from either edge of the data bit that is dropping. If this test checks out correctly and data bits are still dropping, test for the following possibilities:

Compare the registration (10 holes to the inch) of the ONE-ZERO test loop and the diagnostic tape against a tape gauge. The specifications should agree with those outlined in paragraph 5.3.9.

The punch can throw a single character out of registration. When an error printout occurs, stop the tape and examine that area of the tape. One character may be shifted as much as 0.020 inches which is equivalent to 0.5 ms to 1 ms change in the timing of the reader. If this is the case, the punch feed mechanism needs an adjustment which is covered in section 5.4 of this manual. Check the adjustment of the hold-down bracket in accordance with paragraph 5.3.4.

NOTE

Data bits can also be picked up or dropped if one or more M040 motor drivers is malfunctioning. To verify the M040 operation, check the output with an oscilloscope. With the M040 drivers on and the reader motor running, the waveform must have rapid rises and falls and level states as shown below.

ACCEPTABLE M040 WAVEFORM

UNACCEPTABLE M040 WAVEFORM

CO-0477

5.3.14 Acceptance Testing

With all adjustments complete, the PC05 is capable of running any program. A reasonable acceptance program consists of running one box of tape which is equivalent to 6 in. of vertical stacked height. For reference, each vertical inch represents 6 to 8 minutes of full-speed punching time.

5.4 PUNCH ADJUSTMENT PROCEDURES

5.4.1 General

This section contains adjustment procedures for the punch mechanism. Additional information can be obtained from the Roytron maintenance manual which is supplied with each unit.

5.4.2 Tape Output Quality

At times, troubles relating to data being dropped or picked up can be caused by incorrect alignment of feed and data holes. Figure 5-8 shows the correct dimensions for paper tape in accordance with the USA Standard for 1-in. perforated paper tape.

Punched-hole diameters and transverse centerline dimensions are almost never out of specification since the punches and die blocks are made from hard tooling. There are no adjustments involved in setting up these dimensions.

Two dimensions which do involve mechanical adjustments are the 0.392 in.-dimension from the feed hold centerline to the reference edge of the tape, and the 0.100-in. dimension between adjacent feed holes. Both of these dimensions depend upon properly positioning the sprocket wheel on its shaft. If the 0.100-in. dimension is consistently long or consistently short, adjustment of the angular position of the sprocket wheel on its carrier shaft will eliminate the problem.

5.4.2.1 Burrs on the sides of the feed holes indicate that the sprocket wheel is not positioned to pull tape squarely through the punch. Adjust the sprocket wheel as follows:

a. Loosen the set screws on the sprocket wheel and slide the wheel along its shaft until the sprocket teeth are directly in line with the feed hole punch.

b. Lining up the sprocket can best be accomplished by removing the tape skew guide at the rear of the die block and then placing a punched length of good tape in the die block. Make certain that the reference edge of the tape is squarely against the guiding edge of the die block. The feed hole in the tape can be used to accurately gauge the position of the sprocket.

c. Longitudinal registration may require adjustment after repositioning the sprocket. Once proper registration has been achieved, the set screws in the sprocket wheel must be tightened firmly so that the sprocket wheel does not creep sideways back into its original position.

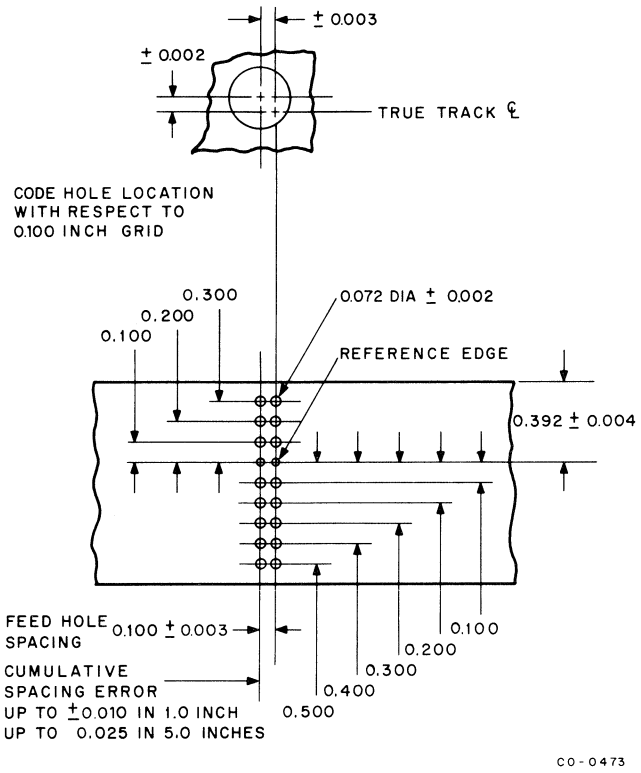

Figure 5-8 Specifications for One-Inch Paper Tape

5.4.2.2 Burrs on the front or back edges of the feed holes can be caused by excessive drag on the tape by having the lucite cover which holds tape against the sprocket set too high off of the sprocket, and/or by a timing problem in the sprocket wheel motion.

5.4.2.3 If the paper drive sprocket moves while the punches are piercing the paper, then the feed holes in the tape will be elongated or burred. There are several ways in which this can happen.

a. An eccentric shaft around which the entire punch yoke pivots determines the length of time allowed between the initiation of paper feed motion and the instant the punch pins enter the paper. Improper angular positioning of this shaft may leave too little time for paper motion. The sprocket will still be moving the paper as the punches enter the paper. The punch pins will lock the paper in place, and the subsequent settling motion of the sprocket wheel will cause the feed holes engaged with the sprocket teeth to be elongated.

   The time allowed between the feeding and punching operations is 7 ms ±0.3 ms or 126 degrees ±5 degrees of the punch cycle. The paper feed motion begins at 105 degrees in the punch cycle; the punch pins begin to pierce the paper at 231 degrees. The difference is the time allowed for paper motion.

b. A large diameter knob installed on the sprocket shaft of the punch will greatly increase the rotary inertia of the paper-positioning mechanism and will lengthen the time required to position the paper tape. As a result, even in a properly timed punch, the paper will still be moving when the punches enter the paper. The large knob must be replaced by a smaller plastic knob having an outside diameter no greater than 3/4 in. This knob is stocked as DEC part no. 12-09904.

c. A final adjustment affecting the motion of the paper concerns the forward indexing magnet. Specification of the adjustment of this magnet is in paragraph 5.4.6. If the magnet armature engages too far out on the ratchet tooth, the ratchet and sprocket will receive a larger than normal acceleration and a longer period of time will be required for the tape to be positioned. Punch pins will enter the paper before the paper has been properly positioned.

   At 205 degrees in the punch cycle, the magnet armature must just miss contacting the ratchet tooth; otherwise the paper drive sprocket will be disturbed and will not be able to reposition the tape before the punch pins enter the paper.

   A simple registration adjustment will eliminate burrs on feed holes only if the feed hole spacing is drastically incorrect (more than 0.100 in. error per inch; i.e., 9 or 11 holes per in. instead of 10). In all other cases, the cause for burring must be corrected before attempting to register the punch.

5.4.3 Tape Depressor

There are two types of tape depressors which hold the paper tape against the drive sprocket. The first is a hinged lucite cover which is spring-loaded away from the sprocket. The lucite cover is held in position by a latch, and it is this latch which determines the gap between the cover and the sprocket. The latch must be adjusted so that the gap between the lucite cover and the sprocket wheel measures one to two tape thicknesses across. If this lucite piece is set too tightly against the sprocket wheel, it will be quickly worn away by the folds in the paper. If the cover is set too high, the tape will not follow a consistent path as it passes over the sprocket, and registration will wander.

The second depressor (Figure 5-9) mechanism is a new device that is added, by DEC, to the punch in place of the lucite cover and hinge. This mechanism is in the form of an assembly which is held on the punch platen by two spring clamps and two screws. The assembly is properly positioned when the radius of the tape depressor arm conforms to the radius of the drive sprocket, and when the sprocket teeth pass through the slot provided in the tape depressor arm. The whole assembly is shifted to make these adjustments.

The latch is still used with this second tape depressor but, now that the tape depressor is spring-loaded against the drive sprocket, the latch serves only to hold the depressor in place when tape is first started through the unit. In normal operation, there should be about 0.010-in. free play between the latch and the depressor tab.

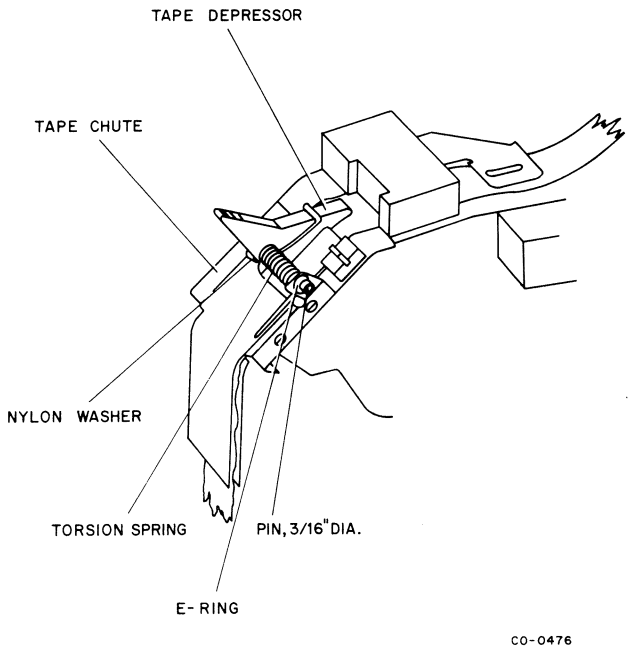

Figure 5-9 Improved Tape Depressor

5.4.4 Electrical Parameters (see Figure 5-10)

Basic timing for the punch system comes from a reluctance type pulse generator which supplies a positive-going and a negative-going pulse for every revolution of the punch mainshaft. The positive-going pulse signals the beginning of the punch cycle. If the amplitude of this signal is not great enough to trigger the electronics, the generator air gap must be reduced. This is done by loosening the generator coil assembly and moving it closer to the generator disc. The coil must not rub against the disc.

It is possible for the coil core to become demagnetized. A weak signal will result. The core may be remagnetized by momentarily applying 30V to the coil. The voltage polarity is important. Proceed as follows:

a. With power off, remove punch cable card from slot B06. Make a temporary connection from Pin F of cable card to -30V and connect Pin V to Ground. Turn the power on, then off, The coil is polarized.

b. Remove temporary jumper wires and plug cable punch card back into B06.

c. If the SYNC PUN signal remains below an acceptable level, the coil assembly may be defective. If placing a screwdriver blade against the exposed core end causes a significant rise in output level, it is an indication that the assembly should be replaced.

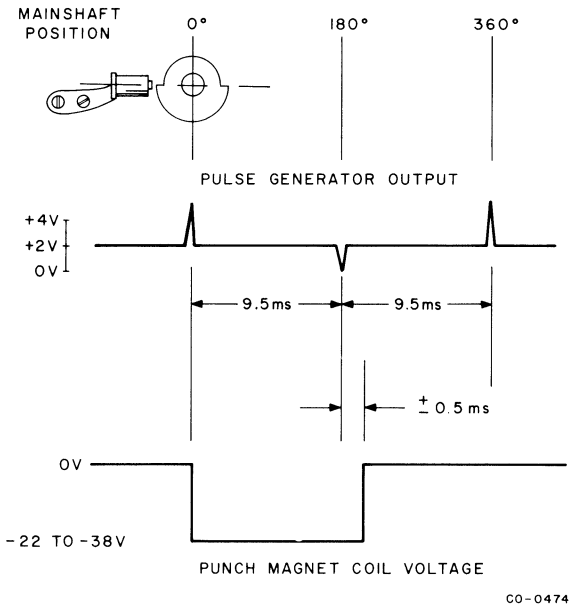

Figure 5-10 Electrical Parameters

Magnets in the punch must be energized by some voltage between 22 and 38V. Voltages are applied to the magnets at the beginning of the punch cycle and must remain for exactly half of the punch cycle. This is usually 9.5 ms but it can vary slightly depending upon line voltage, line frequency, and upon the hole pattern being punched. (Punching all holes requires much more torque than punching only feed holes. The punch motor slows down slightly under increased load.) Turning the magnets off early may cause dropping of bits. Leaving magnets on too long will wear out the forward index magnet armature at its tip.

The gear ratio between the electric motor and the punch is critical. The punch mainshaft pulley has 18 grooves; 60-cycle motor pulleys have 16 grooves; 50-cycle motor pulleys have 20 grooves. A 50-cycle gear ratio unit plugged into a 60-cycle outlet will cause the punch to run too fast. Registration will be exceedingly poor.

5.4.5 Basic Timing

There are three basic adjustments which affect the times at which events occur within the punch.

When the punch starts its cycle, the first event is the engagement of the forward index magnet armature with the ratchet wheel. The magnet armature actually pulls in against the ratchet wheel and the ratchet moving past the armature causes a tooth to be engaged and paper motion begins. This engagement must occur as early as possible in the punch cycle. As soon as the punch pins have been withdrawn from the paper during the preceding punch cycle, the new paper motion can occur. This is placed at 105 degrees in the punch cycle.

The next event is the piercing of the paper by the punch pins. This operation must be delayed for a period of time (7 ms) while the detent positions the paper. Piercing the paper begins at 231 degrees in the punch cycle.

Neither the 105 nor the 231 degree settings are critical in themselves. What is critical is the difference between these two settings, or the time allowed for paper to move from one character position to the next. In general, if the difference in these two settings is less than 119 degrees, the punch probably will burr feed holes and will wander in and out of registration depending on the hole pattern being punched, the fold position in relation to the punch die block at the time the hole is punched, etc.

Proper ratchet and pawl (armature) engagement is checked with the mainshaft rotated to the 205-degree position. At this point, with the pawl in its energized position, the ratchet and pawl are at their nearest point following the paper feed. The pawl should just contact the ratchet at this time, but no motion of the ratchet should result. If this adjustment is not correct the ratchet must be repositioned on its shaft. This is easily done by loosening the two set screws in the ratchet. After making this adjustment be sure that the pawl is about 0.005 in. from contacting the root of the ratchet tooth when the pawl and ratchet are engaged.

Once the ratchet and pawl have been adjusted, the alloted time between feeding and punching of paper can be set. There are two methods to determine whether the proper amount of time is being alloted, but only one adjustment, the Pawl Carrier Eccentric Shaft, actually affects this time.

5.4.5.1 Method (1) - Refer to Figure 5-11. Remove the lucite punch cover and install gauges (DEC No. 29-15194) in the number 1 and 8 holes in the die assembly.

Select the number 1 and 8 punches and rotate the mainshaft (7) until the high point of shaft (7) is completely to the rear (307 degrees on the timing dial). The previously inserted pins must raise 0.080 ±0.010 above the surface of the plate (2).

When adjustment is required, loosen lock nuts (11) on both sides of the unit and turn Pawl Carrier eccentric shaft (10) to increase or decrease the amount of movement imparted to the punch pins.

5.4.5.2 Method (2) - Insert a feeler gauge or other hard flat device between the die blocks (1) and (2) so that the punch travel is obstructed. Set up a punch, and rotate the mainshaft (7) until the punch comes up against the feeler gauge. This should occur at 231 degrees in the punch cycle, or 126 degrees after the initiation of the paper feed motion (which should occur at 105 degrees).

If adjustment is required, loosen lock nuts (11) on both sides of the unit and turn Pawl Carrier Eccentric Shaft (10) until the desired 126-degree difference is reached.

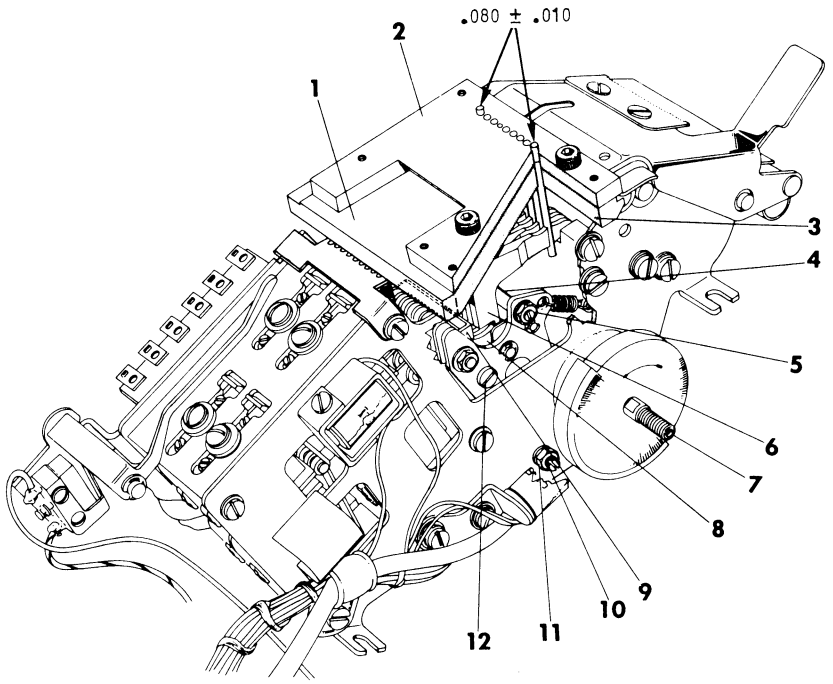

Figure 5-11 Punch Assembly (Reprinted with permission of Royal Typewriter Company, Inc., A Division of Litton Industries; all rights reserved.)

NOTE

Changing the position of the eccentric shaft (10) may necessitate the adjustment of all 8-punch magnet air gaps. It is not recommended that this magnet adjustment be attempted in the field.

5.4.6 Magnet Adjustments

There are three magnet air gap adjustments; all are critical.

5.4.6.1 The Pulse Generator Air Gap is the easiest to adjust. Firmly pinch a single layer of paper tape between the coil pole piece and the pulse generator disc and tighten the pole piece in place.

5.4.6.2 The Forward Index Magnet Armature Adjustments (Figure 5-12) are by far the most critical adjustments in the machine and most frequently the adjustments in need of attention.

a. The Armature Assembly (7), when operated, must have 0.005 ±0.001-in. gap between Magnet Shell (9) and Armature (7). Adjustment may be made by loosening Binding Screws (6) and (11) and repositioning either the Armature Assembly (7) or Plate (10).

b. Prior to performing the adjustments to the Indexing Ratchets, the Detent Wheel must be secure on the Sprocket Shaft, and the Detent Balls must be located in the Teeth of the Detent Wheel.

c. Index Magnet (8), when called, must bring Interposer (4) to within 0.005 in. of the bottom of Forward or Reverse Feed Ratchets (2).

d. The Index Magnet Armature may be held in its energized position by looping a rubber band around the armature and coil.

e. To adjust the Index Magnets, loosen Binding Screws (5), and move Magnet and Interposer Assembly to obtain the above clearance.

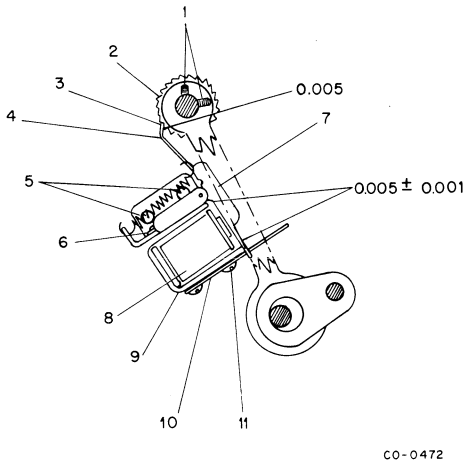

Figure 5-12 Forward Index Magnet Armature

f. Rotate the Timing Dial to 205 degrees and operate Forward Interposer (4). Interposer (4) must contact Ratchet (2) with no play between the top of Interposer (4) and Ratchet Tooth (3). If adjustment is necessary, loosen Set Screws (1), and reposition Ratchet (2). Check this adjustment on all Teeth of the Ratchet.

g. On late style units, the Forward Index Magnet Rear Mounting Screw Hole has been enlarged to permit the Forward Index Magnet adjustment to be made in the following manner: Loosen Screws (5) and pull Magnet (8) to the rear of the Unit so the Rear Screw rests on the edge of the enlarged hole. Rotate Magnet (8) forward until Interposer (4) meets the 0.005-in. clearance as previously described. Tighten Screws (5).

5.4.6.3 The Punch Magnet Adjustments (Figure 5-13) are very difficult to measure without taking a side frame off the machine. It is not recommended that this be attempted in the field. The punch magnet adjustments are the least critical of the magnet adjustments, and very seldom does a machine require attention in this area.

a. If adjustment proves necessary, loosen Binding Screws (1) and move Plate (2) so there is 0.004 in. (+0.004, -0.000-in.) clearance between Armature (6) and Shell (5) as indicated, with Bowed Spring (3) in the position shown.

b. Set the Timing Dial at 127 degrees. There must be 0.002 to .008 in. air gap between Armature (6) and Point (7) of Shell (5). When required, loosen Screw (4) and move the Magnet forward or backward to obtain the aforementioned clearance.

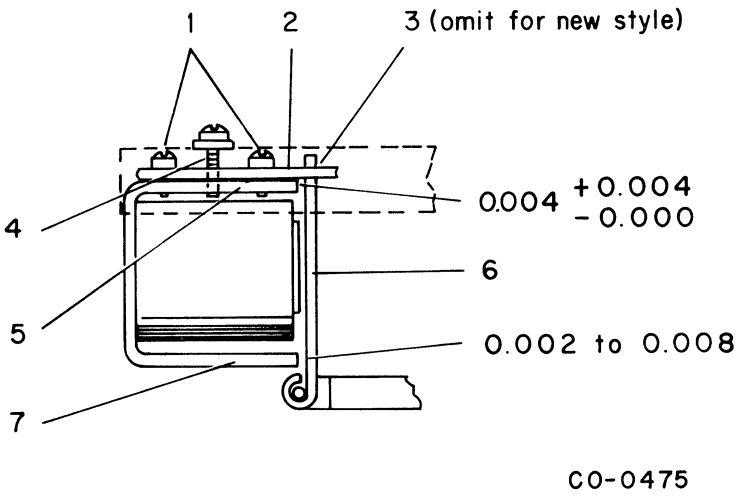

Figure 5-13 Punch Magnet

Chapter 6
Reference Drawings

This chapter contains the reference drawings required for maintenance of the PC05. Table 6-1 lists the drawings by number and title.

Table 6-1
PC05 Drawings

This drawing and specifications, herein, are the property of Digital Equipment Corporation and shall not be reproduced or copied or used in whole or in part as the basis for the manufacture or sale of items without written permission.

MODEL	DESCRIPTION	CY	FIND NUMBER 2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
PCØ5-C	PUNCH, READER, DRIVER	60	-1	X	X	X	X	X	X	X	X	X	X	X	-4	-4	-3	X	X
PCØ5-CA	PUNCH, READER, DRIVER	50	-2	X	X	X	X	X	X	X	X	X	X	X	-4	-4	-3	X	X
PCØ5-P	PUNCH, DRIVER	60	-1					X	X	X	X	X	X	X	-5	-5	-1	X	X
PCØ5-PA	PUNCH, DRIVER	50	-2					X	X	X	X	X	X	X	-5	-5	-1	X	X
PCØ5-R	READER			X	X	X	X	X	X	X	X				-3	-3	-2	X	X

- (2) PUNCH ASSY (60CY) D-AD-7006248-1-0
  PUNCH ASSY (50CY) D-AD-7006248-2-0
- (3) READER ASSY D-AD-7006247-0-0
  - (4) PHOTO-TRANSISTOR ASSY C-AD-7006267-0-0
    - (5) PHOTO-TRANSISTOR BOARD ASSY B-IA-5408306-0-0
      - (6) ETCH BOARD C-IA-5008305-0-0
- (7) CHASSIS & POWER SUPPLY ASSY D-AD-7006246-0-0
  - (8) POWER REGULATOR ASSY C-AD-7006512-0-0
    - (9) POWER REGULATOR BD ASSY C-IA-5408918-0-0
      - (10) ETCH BD D-IA-5008919-0-0
- (11) SCR DRIVER ASSY C-AD-7006520-0-0
  - (12) TERMINAL BOARD ASSY B-IA-5408384-0-0
    - (13) TERMINAL BOARD C-IA-5008383-0-0
- (14) COVER ASSY D-AD-7006252-5-0
  COVER ASSY D-AD-7006252-3-0
  COVER ASSY D-AD-7006252-4-0
  - (15) BEZEL SWITCH C-IA-7407134-5-0
    BEZEL SWITCH C-IA-7407134-3-0
    BEZEL SWITCH C-IA-7407131-4-0
- (16) SWITCH ASSY C-AD-5408310-1-0
  SWITCH ASSY C-AD-5408310-2-0
  SWITCH ASSY C-AD-5408310-3-0
  - (17) ETCH BOARD D-IA-5008309-0-0
- (18) PCØ5 BUS BAR C-AD-7006253-0-0

NOTES:
1. THE KEY TO SYMBOLS IN THE FIND NO. COLUMNS IN FIND BLOCK IS:
   AN "X" MEANS THE ASSY. IS USED.
   A BLANK SPACE MEANS THE ASSY. IS NOT USED.
   A DASH AND NUMBER (-1 -2 ETC.) MEANS THE ASSY. IS USED AND THAT VARIATION OF THE ASSY. HAVING THAT PARTICULAR DASH NUMBER AS PART OF ITS DWG. NUMBER IS USED.
   EXAMPLE:
   A READER MODEL FROM FIND COLUMN 14 USES A -3 (OR A D-AD-7006252-3-0) COVER ASSY.

UNIT ASSY. DWG. NO. D-UA-PCØ5-Ø-Ø

REVISIONS CHK	CHANGE NO	REV
GB	PCØ5-00001	A
GB	PCØ5-00002	B
GB	TU55-00014	C
KC	PCØ5-0000	D
GB	PCO-00002	E
GB	PCØ5-00014	F
GB	PCØ5-00015	H
GB	PCØ5-00016	K
GB	PC04-00021	J
GB	PC04-00028	L
GB	PC04-00032	M

QTY.	DESCRIPTION	PART NO.	ITEM NO.

PARTS LIST

FIRST USED ON OPTION/MODEL: PCØ5

DO NOT SCALE DRAWING
UNLESS OTHERWISE SPECIFIED
DIMENSION IN INCHES
TOLERANCES
DECIMALS ± .005 FRACTIONS ± 1/64 ANGLES ± 0°30'
FINAL SURFACE QUALITY
REMOVE BURRS AND BREAK SHARP CORNERS
MATERIAL
FINISH

DRN. G. Becker 6/29/67
CHK'D. G. Connelly 6/29/67
ENG. [illegible] 7/1/67
PROJ ENG. [illegible] 7/1/67
MOD. [illegible] 7/7/67

digital EQUIPMENT CORPORATION MAYNARD, MASSACHUSETTS

TITLE: DRAWING INDEX LIST PCØ5

NEXT HIGHER ASSY: A-ML-PCØ5

SIZE D | CODE DI | NUMBER PCØ5-Ø-1 | REV. M

SCALE

SHEET 1 OF 2

DIST.

DEC FORM NO. DRD 100

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MECHANICAL FIND NO.	DESCRIPTION	PART NO.	DEPT USAGE PROD	CUST	F/C
1	PCØ5-C READER, PUNCH, DRIVER	D-UA-PCØ5-C-Ø			
	PCØ5-CA READER, PUNCH, DRIVER	D-UA-PCØ5-CA-Ø			
	PCØ5-P PUNCH, DRIVER	D-UA-PCØ5-P-Ø			
	PCØ5-PA PUNCH, DRIVER	D-UA-PCØ5-PA-Ø			
	PCØ5-R READER	D-UA-PCØ5-R-Ø			
	PCØ5 READER & PUNCH (PL)	A-PL-PCØ5-Ø-Ø			
	CHAD BOX	B-MD-7405300-0-0			
	TAPE CONTAINER	D-MD-7407131-0-0			
	BRKT, RESISTOR	C-MD-7408091-0-0			
	POWER SUPPLY COVER	E-IA-7407439-0-0			
	TIMER	C-AD-5408231-0-0			
2	PUNCH ASSY (60 CY)	D-AD-7006248-1-0			
	PUNCH ASSY (50 CY)	D-AD-7006248-2-0			
	PUNCH ASSY (PL)	A-PL-7006248-0-0			
	CHAD TUBE	B-MD-7407386-0-0			
	PUNCH MTG CHASSIS	D-IA-7407071-0-0			
	HINGE	B-MD-7407063-0-0			
	SHIELD PUNCH CONTACTS	B-MD-7407132-0-0			
	TAPE DEPRESSOR PIN	0-SC-1209915-0-0			
		B-MD-7408172-0-0			
	PULLY (60CY)	B-MD-7406089-1-0			
	PULLY (50CY)	B-MD-7406089-2-0			
	PAPER TAPE PUNCH FEED BRKT	D-MD-7408098-0-0			
	TAPE CHUTE	D-IA-7408171-0-0			
	TORSION SPRING	0-SC-1209924-0-0			
3	READER ASSY	D-AD-7006247-0-0			
	READER ASSY (PL)	A-PL-7006247-0-0			
	TAPE PATH GUIDE	D-MD-7407076-0-0			
	READER PLATE	D-MD-7407095-0-0			
	BLOCK READER	B-MD-7407119-0-0			
	SHAFT READER PLATE	B-MD-7407120-0-0			
	ARM, SPRING	B-MD-7407118-0-0			
	SPRING, BULB	A-MD-7407116-0-0			
	DEPRESSOR TAPE	C-MD-7407121-0-0			
	BRKT TAPE HOLD DOWN	C-MD-7407144-0-0			
	SLO SYN MOTOR REWORK	B-IA-7407684-0-0			
	SHIM	B-MD-7407800-0-0			
	LENS	B-MD-7404989-0-0			

MECHANICAL FIND NO.	DESCRIPTION	PART NO.	DEPT USAGE PROD	CUST	F/C
4	PHOTO TRANSISTOR ASSY	C-IA-7006267-0-0			
5	PHOTO TRANSISTOR BD ASSY	B-IA-5408306-0-0			
	PHOTO TRANSISTOR (REWORK)	B-MD-5308818-0-0			
6	ETCH BOARD	C-IA-5008305-0-0			
	FLIP CHIP MODULE (NO NOTCHES)	D-MD-1402230-0-0			
7	CHASSIS & POWER SUPPLY ASSY	D-AD-7006246-0-0			
	CHASSIS & POWER SUPPLY (PL)	A-PL-7006246-0-0			
	PANEL FRONT	D-IA-7407075-0-0			
	BRKT MTG BAR RIGHT HAND	C-MD-7407065-1-0			
	BRKT MTG BAR LEFT HAND	C-MD-7407065-2-0			
	CHASSIS	E-IA-7407074-0-0			
	COVER, JONES STRIP	B-MD-5303184-0-0			
	HARNESS, CONTROL	D-IA-7006311-0-0			
	HARNESS I/O 110 VAC	D-IA-7006310-0-0			
	HARNESS POWER SUPPLY	D-IA-7006309-0-0			
	DECAL (PCØ4)	A-DC -7407476-0-0			
8	PWR REGULATOR ASSY	C-AD-7006512-0-0			
	PWR REGULATOR (PL)	A-PL-7006512-0-0			
	HEATSINK, PWR REGULATOR	C-MD-7407069-0-0			
	CIRCUIT SCHEMATIC	B-CS-5408308-0-1			
9	PWR REGULATOR BOARD ASSY	C-IA-5408918-0-0			
10	ETCH BOARD	D-IA-5008919-0-0			
11	SCR DRIVER ASSY	C-AD-7006520-0-0			
	SCR DRIVER ASSY (PL)	A-PL-7006520-0-0			
	SCR DRIVER CHASSIS	C-IA-7407070-0-0			
12	TERMINAL BD ASSY	B-IA-5408384-0-0			
13	TERMINAL BOARD	C-IA-5008383-0-0			
14	COVER ASSEMBLY	D-AD-7006252-3-0			
	COVER ASSEMBLY	D-AD-7006252-4-0			
	COVER ASSEMBLY	D-AD-7006252-5-0			
	COVER ASSEMBLY (PL)	A-PL-7006252-0-0			
	COVER, PCO (BASIC & COMB)	E-SC-1209396-2-0			
	COVER, PCO (PUNCH)	E-SC-1209396-4-0			
	COVER, PCO (READER)	E-SC-1209396-6-0			
	BEZEL PCO	D-MD-7407099-0-0			
	SHIM, BEZEL	C-MD-7407849-0-0			
15	BEZEL SWITCH	C-IA-7407134-5-0			
	SILK SCREEN	A-SS-7407134-5-1			
	BEZEL SWITCH	C-IA-7407134-3-0			
	SILK SCREEN	A-SS-7407134-2-0			
	BEZEL SWITCH	C-IA-7407134-4-0			
	SILK SCREEN	A-SS-7407134-4-1			

MECHANICAL FIND NO.	DESCRIPTION	PART NO.	DEPT USAGE PROD	CUST	F/C
16	SWITCH ASSY	C-AD-5408310-1-0			
	SWITCH ASSY	C-AD-5408310-2-0			
	SWITCH ASSY	C-AD-5408310-3-0			
	SWITCH ASSY (PL)	A-PL-5408310-0-0			
	BAR SPACER SW.BD.	B-MD-7407175-9-0			
17	PCO SWITCH BOARD	D-IA-5008309-0-0			
	FLIP CHIP MODULE	D-MD-1402230-0-0			
18	PCØ5 BUS BAR	C-AD-7006253-0-0			
	MTG. BAR (6 IN.)	B-IA-7407077-0-0			

ELECTRICAL FIND NO.	DESCRIPTION	PART NO.	DEPT USAGE PROD	CUST	F/C
1	PCØ5-C READER & PUNCH & DRIVER	A-ML-PCØ5-C			
	PCØ5-CA READER & PUNCH & DRIVER	A-ML-PCØ5-CA			
	PCØ5-P PUNCH	A-ML-PCØ5-P			
	PCØ5-PA PUNCH	A-ML-PCØ5-PA			
	PCØ5-R	A-ML-PCØ5-R			
	POWER & CONTROL SCHEMATIC DIAGRAM	D-BS-PCØ5-Ø-4			
	MODULE UTILIZATION	C-MU-PCØ5-3			
	MODULE UTILIZATION (PL)	A-PL-PCØ5-3			
7	CHASSIS & POWER SUPPLY ASSY	D-AD-7006246-0-0			
11	SCREW DRIVER ASSY	C-AD-7006520-0-0			
	CIRCUIT SCHEMATIC	B-CS-7006520-0-1			
18	BUS BAR (PCØ5)	C-AD-7006253-0-0			
8	PWR REGULATOR ASSY	C-AD-7006512-0-0			
	CIRCUIT SCHEMATIC	B-CS-5408308-0-1			

FIRST USED ON OPTION/MODEL: PCØ5

DO NOT SCALE DRAWING

UNLESS OTHERWISE SPECIFIED
DIMENSION IN INCHES
TOLERANCES
DECIMALS ± .005 | FRACTIONS ± 1/64 | ANGLES ± 0°30'
FINAL SURFACE QUALITY
REMOVE BURRS AND BREAK SHARP CORNERS

MATERIAL

FINISH

		DATE
DRN	[illegible]	6/29/67
CHK'D	D. Darrell	6/29/67
ENG.	[illegible]	DATE
PROJ. ENG.	[illegible]	DATE
PROD.	[illegible]	DATE

NEXT HIGHER ASSY: A-ML-PCØ5

SCALE

SHEET 2 OF 2

digital EQUIPMENT CORPORATION
MAYNARD, MASSACHUSETTS

TITLE: DRAWING INDEX LIST PCØ5

SIZE	CODE	NUMBER	REV
D	DI	PCØ5-Ø-1	M

DIST.

QTY.	DESCRIPTION	PART NO.	ITEM NO.

PARTS LIST

REVISIONS: REV | CHANGE NO | CHK

DEC FORM NO DRD 100

M Add DI PCØ5-Ø-1 D 2

REV M | SIZE D | CODE DI | NUMBER PCØ5-Ø-1

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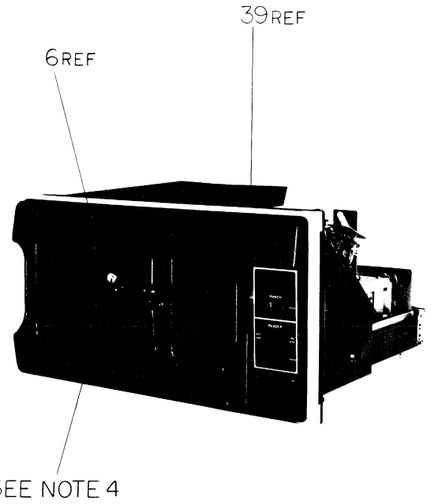
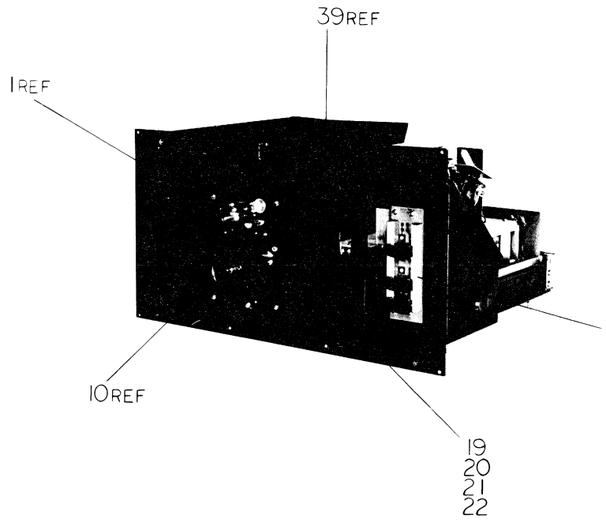
LEGEND		
MODEL	VARIATION	
	CY	COMPOSITION
PCØ5-C	60	READER PUNCH & DRIVER
PCØ5-CA	50	READER PUNCH & DRIVER
PCØ5-P	60	PUNCH
PCØ5-PA	50	PUNCH
PCØ5-R	X	READER

NOTES:

1. WIRING OF SWITCHES VARIES DEPENDING ON UNIT MODEL BEING BUILT. FOR SWITCH CONFIGURATION, FOR WIRING PURPOSES SEE DETAIL "A" FOR MODEL "C" AND "CA", DETAIL B FOR MODEL "P" AND "PA", AND DETAIL "C" FOR MODEL "R". 50 60 CY HAS NO EFFECT.
2. IF THE SCR DRIVER UNIT IS USED, THIS WIRE WILL CONNECT TO SCR DRIVER TERMINAL T1. IF THE UNIT IS NOT USED, THIS WIRE WILL CONNECT TO TS-6 AND END. FOR CORRECT WIRING WHEN THE UNIT IS USED, SEE SCR DRIVER WIRE LIST. (SHEET 3).
3. ~~REMOVE CLAMP FROM CHASSIS, PLACE CABLE IN POSITION, THEN REINSTALL CLAMP IN POSITION OVER CABLE~~.
4. COVER ASSY TO BE ATTACHED TO CHASSIS ASSY AFTER ALL OTHER INSTALLATIONS ARE COMPLETE. TO DO SO, READER KNOB MUST BE REMOVED, COVER INSTALLED, THEN KNOB REPLACED ON READER SHAFT.
5. ON MODELS "P" AND "PA" THIS WIRE WILL BE TIED BACK AND WHITE SHRINKABLE TUBING (ITEM 43) ADDED AS REQD.
6. FOR REFERENCE SEE DRAWING INDEX D-DI-PCØ5-Ø-1
7. ON MODELS PCØ5-C, CA, P, & PA THESE WIRES WILL BE BUSSED TOGETHER AT COMMON TERMINAL ON SWITCH PANEL. ON "R" MODEL THESE WIRES WILL BE CONNECTED AS USUAL TO THEIR APPROPRIATE TERMINALS.





REVISIONS			
CHK	CHANGE NO.	REV.	
		A	
		B	
		C	
	PCØ5-00014	D	
	PCØ4-00021	E	
	PCØ3-00016	F	
	PCØ4-00025	H	
	PCØ4-00027	J	

FIRST USED ON OPTION / MODEL	QTY.	DESCRIPTION	PART NO.	ITEM NO.
PCØ5		PARTS LIST		

UNLESS OTHERWISE SPECIFIED
DIMENSION IN INCHES
TOLERANCES
DECIMALS ± .005 FRACTIONS ± 1/64 ANGLES ± 0°30'
FINAL SURFACE QUALITY √
REMOVE BURRS AND BREAK SHARP CORNERS

MATERIAL —

FINISH —

DRN.	Moratti	DATE 6/14/67
CHK'D.		DATE 6/21/67
ENG.		DATE 7/1/67
PROD. ENG.		DATE 7/1/67
PROD.		DATE 7/10/67

NEXT HIGHER ASSY A-ML-PCØ5-Ø
SCALE NONE
SHEET 1 OF 3

digital EQUIPMENT CORPORATION MAYNARD, MASSACHUSETTS

TITLE PCØ5 PEADER AND PUNCH

SIZE	CODE	NUMBER	REV.
D	UA	PCØ5-Ø-Ø	

DIST.

DEC FORM NO. DRC

SIZE D | CODE UA | NUMBER PCØ5-Ø-Ø | REV. J

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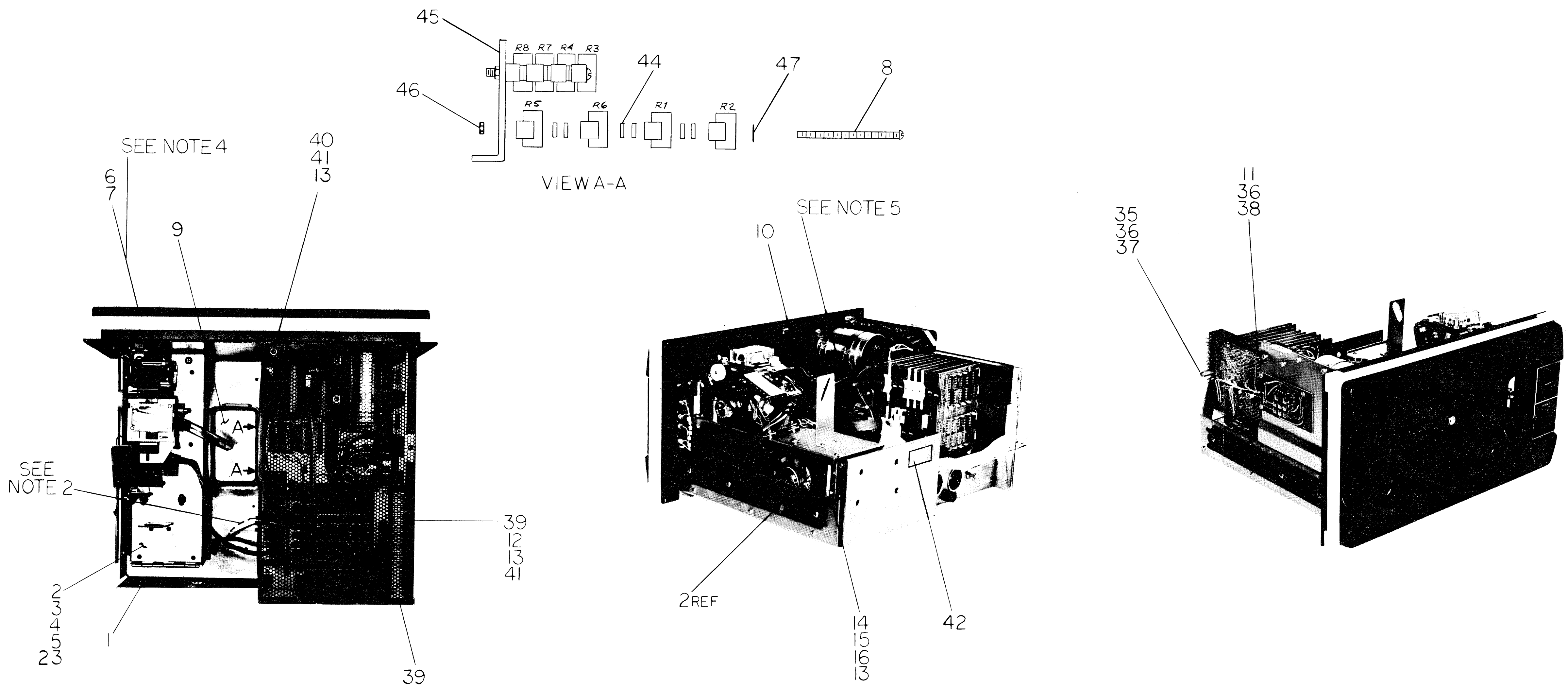

FIRST USED ON OPTION/MODEL	QTY.	DESCRIPTION	PART NO.	ITEM NO.
PCØ5		PARTS LIST		

UNLESS OTHERWISE SPECIFIED

UNLESS OTHERWISE SPECIFIED
DIMENSION IN INCHES
TOLERANCES
DECIMALS ± .005 FRACTIONS ± 1/64 ANGLES ± 0°30'
FINAL SURFACE QUALITY ✓
REMOVE BURRS AND BREAK SHARP CORNERS

MATERIAL

FINISH

DRN.	DATE 6/12/69
CHK'D.	DATE 6/23/69
ENG.	DATE 7/1/69
PROJ. ENG.	DATE 7/1/69
PROD.	DATE 7/2/69

NEXT HIGHER ASSY
A-ML-PCØ5-Ø

SCALE NONE
SHEET 2 OF 3

digital EQUIPMENT CORPORATION
MAYNARD, MASSACHUSETTS

TITLE
PCØ5
READER AND PUNCH

SIZE	CODE	NUMBER	REV.
D	UA	PCØ5-Ø-Ø	

DIST.

REVISIONS: REV. | CHANGE NO. | CHK

DEC FORM NO. DRC

D UA PCØ5-Ø-Ø J

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SCR DRIVER WIRE LIST

JUMPER CONNECTIONS

WIRE	COLOR	CONNECTION	REMARKS
HARN WIRE *9	RED	SCR T1	SEE NOTE 2
PUNCH MOT. LEAD	BLK/YEL	SCR T2	
T3	WHT/BLU	A11B2	
T6	WHT/GRN	A12C2	
T4	RED	A11A2	
T5	GRN	A12N2	

PUNCH WIRE LIST

HARNESS CONNECTIONS

COLOR	WIRE NO.	LOCATION	REMARKS
BLK	5	PNCH SW1 TAB 5	SEE NOTE 1 SHEET 1
WHT	6	PNCH SW1 TAB 6	
RED	7	SWITCH PANEL TAB 7	SEE NOTE 7 SHEET 1
RED	8	SWITCH PANEL TAB 8	
RED	9	TS6	SEE NOTE 2 SHEET 1
GY/RED	8	DO NOT CONNECT	SEE NOTE 5
BLK	15	B12C2 (GND)	
WHT	16	AØ5T2	

JUMPER CONNECTIONS

WIRE		CONNECTIONS			
ITEM NO.	COLOR	TYPE ITEM	FROM	TO	TYPE ITEM
25	WHT	26	SEE BELOW*	TS-7	26

*THIS END CONNECTS TO CAPACITOR ON PUNCH CHASSIS, ON TERMINAL WITH BLUE WIRE ATTACHED

READER WIRE LIST

HARNESS CONNECTIONS

COLOR	WIRE NO.	LOCATION	REMARKS
YEL	1	RDR SW2 TAB 1	SEE NOTE 1 SHEET 1
WHT/BLK	2	RDR SW2 TAB 2	
WHT/YEL	3	RDR SW1 TAB 3	
BRN	4	RDR SW1 TAB 4	
YEL	11	BØ4M1	
WHT/BLK	12	B11A2 (+5)	
WHT/YEL	13	A11T2	
BRN	14	BØ9H1	
GY/RED	8	R9	

JUMPER CONNECTIONS

WIRE		CONNECTIONS			
ITEM NO.	COLOR	TYPE ITEM	FROM *	TO	TYPE ITEM
27	WHT/VIO	NONE	R1 & R2	TS-1	26
28	WHT/YEL		R3 & R4	TS-2	26
29	WHT/ORN		R5 & R6	TS-3	26
30	WHT/BRN		R7 & R8	TS-4	26
31	VIO		R1	B08R2	NONE
31	VIO		R2	B08S2	
32	YEL		R3	B07R2	
32	YEL		R4	B07S2	
33	ORN		R5	A10R2	
33	ORN		R6	A10S2	
34	BRN		R7	A09R2	
34	BRN	NONE	R8	A09S2	NONE

* FOR RESISTOR CONFIGURATION SEE VIEW A-A SHEET 2

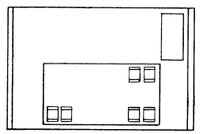
READER MOTOR CONNECTIONS

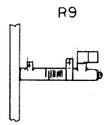
COLOR	FROM	TO	REMARKS
WHT/RED	RDR MOTOR	TS-1	
RED		TS-2	
WHT/GRN		TS-3	
GRN		TS-4	
WHT & BLK	RDR MOTOR	TS-5	

HARNESS CONNECTIONS

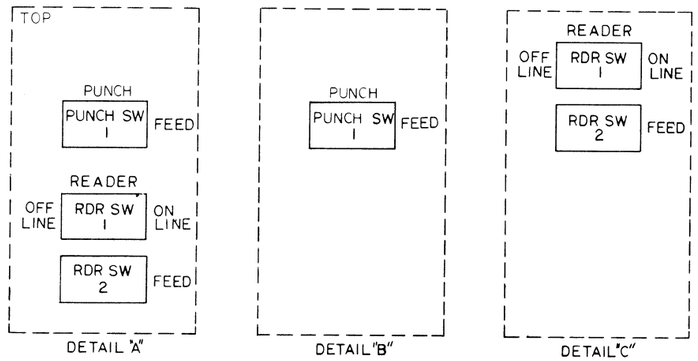
COLOR	WIRE NO.	LOCATION	REMARKS
BLK	27	GND LUG	
GY/YEL	29	A12B2	
GRN	31	AØ3V2	
BLK	28	GND LUG	
GY/RED	30	A12A2	
GRN	32	A1Ø V2	

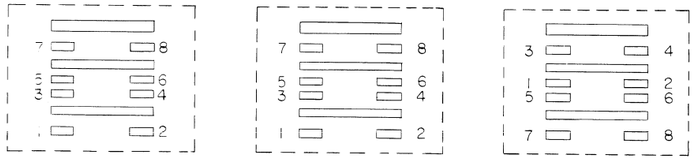
TS
1
2
3
4
5
6
7
8





FRONT VIEW





FIRST USED ON OPTION / MODEL	QTY.	DESCRIPTION	PART NO.	ITEM NO.
PCØ5		PARTS LIST		

UNLESS OTHERWISE SPECIFIED

UNLESS OTHERWISE SPECIFIED
DIMENSION IN INCHES
TOLERANCES
DECIMALS ± .005 FRACTIONS ± 1/64 ANGLES ± 0°30'
FINAL SURFACE QUALITY √
REMOVE BURRS AND BREAK SHARP CORNERS

MATERIAL

FINISH

DRW	J. Morette	DATE 6/27/69
CHK'D	G. Carroll	DATE 6/27/69
ENG	G. Graham	DATE 7/1/69
PROJ. ENGR	G. Graham	DATE 7/1/69
PROD	P. Chatman	DATE 7/1/69

digital EQUIPMENT CORPORATION MAYNARD, MASSACHUSETTS

TITLE
PCØ5
READER AND PUNCH

NEXT HIGHER ASSY
A-ML-PCØ5-Ø

SIZE D | CODE UA | NUMBER PCØ5-Ø-Ø | REV.

SCALE NONE

SHEET 3 OF 3

DIST.

REVISIONS | REV. | CHANGE NO. | CHK

DEC FORM NO. DRD 100

REV J | SIZE D | CODE UA | NUMBER PCØ5-Ø-Ø

DIGITAL EQUIPMENT CORPORATION
MAYNARD, MASSACHUSETTS

PARTS LIST

MADE BY P. MARCOTTE DATE 6/19/69
CHECKED R Carwell DATE 6/24/69
SECTION 1
ENG DATE Jos. Beaton 7/1/69
PROD DATE
ISSUED SECT. 1

ITEM NO.	DWG NO. / PART NO.	DESCRIPTION	QUANTITY / VARIATION											
			PCØ5-C	PCØ5-CA	PCØ5-P	PCØ5-PA	PCØ5-R							
1	D-AD-7006246-0-0	CHASSIS AND POWER SUPPLY ASSY	1	1	1	1	1							
2	D-AD-7006248-1-0	PUNCH ASSY (60 CY)	1		1									
2	D-AD-7006248-2-0	PUNCH ASSY (50 CY)		1		1								
3	9006021-1	SCR, PHL PAN HD 6-32 x 5/16 LG SST	6	6	6	6	4							
4	9006560	NUT, KEPS 6-32	2	2	2	2								
5	9006070-1	SCR PHL PAN HD 10-32 x 5/16 LG SST	2	2	2	2								
6	D-AD-7006252-5-0	COVER ASSY (PUNCH)			1	1								
6	D-AD-7006252-3-0	COVER ASSY (READER)					1							
6	D-AD-7006252-4-0	COVER ASSY (COMB)	1	1										
7	9006021-2	SCR, PHL FH 6-32 x 5/16 LG SST	4	4	4	4	4							
8	9006083-1	SCR, PHL PAN HD 10-32 x 2-1/2 LG SST	4	4			4							
9	C-MD-7405300-0-0	CHAD BOX	1	1	1	1								
10	D-UA-7006247-0-0	READER ASSY	1	1			1							
11	C-AD-7006253-0-0	BUS BAR PCØ5	1	1	1	1	1							
12	9006022-1	SCR, PHL PAN HD 6-32 x 3/8 LG SST	3	3	3	3	3							
13	9006633	WASHER, INT TOOTH #6	15	15	9	9	13							
14	C-AD-7006520-0-0	SCR DRIVER ASSY	1	1	1	1								
15	9006026-1	SCR, PHL PAN HD 6/32 x 3/4 LG SST	2	2										
16	9006801	SPACER 1/4 AF x 3/8 LG #6 HOLE	2	2										
~~17~~	~~D-UA-BCØ8A-1-Ø~~	~~BCØ8A CABLE~~	~~2~~	~~2~~	~~1~~	~~1~~	~~1~~							
18	C-AD-5408310-1-0	SWITCH ASSY			1	1								
18	C-AD-5408310-2-0	SWITCH ASSY					1							

TITLE: PCØ5 READER, PUNCH, DRIVER
ASSY NO. D-UA-PCØ5-Ø-Ø
SHEET 1 OF 3
SIZE A | CODE PL | NUMBER PCØ5-Ø-Ø | REV. J | ECO NO. PC04 00027
DIST. G5

DEC FORM NO. DRA 110

DIGITAL EQUIPMENT CORPORATION
MAYNARD, MASSACHUSETTS

PARTS LIST

MADE BY P. MARCOTTE DATE 6/19/69
CHECKED R Carwell DATE 6/24/69
SECTION 1
ENG DATE Jos. Beaton 7/1/69
PROD DATE
ISSUED SECT. 1

ITEM NO.	DWG NO. / PART NO.	DESCRIPTION	QUANTITY / VARIATION											
			PCØ5-C	PCØ5-CA	PCØ5-P	PCØ5-PA	PCØ5-R							
18	C-AD-5408310-2-0	SWITCH ASSY	1	1										
19	D-MD-7407131-0-0	TAPE CONTAINER	1	1	1	1								
20	9006011-2	SCR, PHL FH 4-40 x 3/8 LG SST	2	2	2	2								
21	9006556	NUT, HEX 4-40	2	2	2	2	8							
22	9006632	WASHER, INT TOOTH #4	2	2	2	2	8							
23	9006635	WASHER, INT TOOTH #10	2	2	2	2								
24	1309896	RES, 25 OHM 40W ± 5%	8	8			8							
25	9107360-99	18 AWG STRD TEFLON WHT	A/R	A/R	A/R	A/R	A/R							
26	9007917	SOLDERLESS CONN	6	6	6	6	4							
27	9107400-97	22 AWG STRD TEFLON TRACER WHT/VIO	A/R	A/R			A/R							
28	9107400-94	22 AWG STRD TEFLON TRACER WHT/YEL	A/R	A/R			A/R							
29	9107400-93	22 AWG STRD TEFLON TRACER WHT/ORN	A/R	A/R			A/R							
30	9107400-91	22 AWG STRD TEFLON TRACER WHT/BRN	A/R	A/R			A/R							
31	9107470-97	24 AWG SOLID KYNAR VIO	A/R	A/R			A/R							
32	9107470-44	24 AWG SOLID KYNAR YEL	A/R	A/R			A/R							
33	9107470-43	24 AWG SOLID KYNAR ORN	A/R	A/R			A/R							
34	9107470-11	24 AWG SOLID KYNAR BRN	A/R	A/R			A/R							
35	9006043-1	SCR, PHL PAN HD 8-32 x 1" LG SST	1	1	1	1	1							
36	9006634	WASHER INT TOOTH #8	2	2	2	2	2							
37	9006823	SPACER 3/8 AF x 3/4 LG	1	1	1	1	1							
38	9006040-1	SCR, PHL PAN HD 8-32 x 5/8 LG SST	1	1	1	1	1							
39	E-IA-7407438-0-0	POWER SUPPLY COVER	1	1	1	1	1							

TITLE: PCØ5 READER, PUNCH, DRIVER
ASSY NO. D-UA-PCØ5-Ø-Ø
SHEET 2 OF 3
SIZE A | CODE PL | NUMBER PCØ5-Ø-Ø | REV. J | ECO NO.
DIST. G5

DEC FORM NO. DRA 110

DIGITAL EQUIPMENT CORPORATION
MAYNARD, MASSACHUSETTS

PARTS LIST

MADE BY P. MARCOTTE	CHECKED R Canelli	SECTION 1
DATE 6/19/69	DATE 6/24/69	
ENG [illegible] DATE 7/1/69	PROD [illegible] DATE 7/2/69	ISSUED SECT. 1

ITEM NO.	DWG NO. / PART NO.	DESCRIPTION	QUANTITY / VARIATION											
			PCØ5-C	PCØ5-CA	PCØ5-P	PCØ5-PA	PCØ5-R							
40	9006024-1	SCR, PHL PAN HD 6-32 x ½ LG SST	6	6	2	2	6							
41	9006653	WASHER, FLAT #6 SST	5	5	5	5	5							
42	9008141	DEC NAME TAG	1	1	1	1	1							
43	9107252-09	WHITE SHRINKABLE TUBING			A/RA/R									
44	9006664	WASHER #10 SST	24	24			24							
45	G-MD-7408091-0-0	BRKT, RESISTOR	1	1			1							
46	9006565	NUT, KEP 10-32 SST	4	4			4							
47	9006635	WASHER INT. TOOTH #10	4	4			4							

TITLE	ASSY NO.	SIZE	CODE	NUMBER	REV.	ECO NO.
PCØ5 READER, PUNCH, DRIVER	D-UA-PCØ5-Ø-Ø	A	PL	PCØ5-Ø-Ø	J	
	SHEET 3 OF 3	DIST.				

DEC FORM NO.
DRA 110

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NOTES:

1. DOTTED LINES INDICATE POSSIBLE CONNECTIONS BETWEEN POWER SUPPLY, READER, PUNCH AND SCR DRIVER. SEE LEGEND.
2. THE UNCIRCLED NUMBERS 1 THRU 7 REFER TO CONNECTIONS ON REGULATOR BOARD.
3. THIS PHOTO-TRANSISTOR USED TO DETECT OUT OF TAPE.
4. CIRCLED NUMBERS 1 THRU 53 ARE WIRE NUMBERS. SEE TABLE.
5. WIRE #15 AND #38 ARE BUSSED TOGETHER ON SWITCH PANEL ON 'C','CA','P','PA' MODELS ONLY. ON 'R' MODEL THESE WIRES WILL BE CONNECTED AS USUAL TO THEIR APPROPRIATE TABS.

WIRE TABLE

WIRE NO.	COLOR	WIRE NO.	COLOR
1	RED	24	WHITE-YELLOW
2	WHITE	25	BROWN
3	WHITE	26	WHITE-BROWN
4	RED	27	WHITE-ORANGE
5	ORANGE	28	WHITE-YELLOW
6	GRAY-BLUE	29	WHITE-VIOLET
7	GRAY-WHITE	30	BROWN
8	YELLOW	31	BROWN
9	BLUE	32	ORANGE
10	GREEN	33	ORANGE
11	GREEN	34	YELLOW
12	GRAY-VIOLET	35	YELLOW
13	GREEN	36	VIOLET
14	GREEN	37	VIOLET
15	RED	38	RED
16	WHITE	39	WHITE-BLUE
17	GRAY-RED	40	WHITE-GREEN
18	GRAY-RED	41	RED
19	GRAY-YELLOW	42	WHITE
20	WHITE	43	RED
21	BLACK	44	WHITE
22	YELLOW		
23	WHITE-BLACK	46	GRAY-YELLOW
48THRU 51	BLACK	47	GRAY-RED
52	GREEN	53	RED
54	BLUE		

LEGEND

CONNECTIONS	MODEL PC05-C PC05-CA	MODEL PC05-P PC05-PA	MODEL PC05-R
PWR SUP TO READER	+5 TO READER LAMP POT -18V T.S.S.		SAME AS PC05-C PC05-CA
PWR SUP TO PUNCH	-30 V TO A10V2 ON LOGIC 115V(HOT) TO SCR DRIVER 115V (NEUTRAL) TO PUNCH MOTOR	SAME AS PC05-C PC05-CA	
SCR DRVR TO PUNCH	115 V HOT (OUT) TO PUNCH MOTOR	SAME AS PC05-C PC05-CA	
PWR SUP TO SCR DRIVER	A11B2 TO -15 V INPUT A12C2 TO GND INPUT A11A2 TO +5V INPUT	SAME AS PC05-C PC05-CA	

REVISIONS	CHK	CHANGE NO.	REV
		PC05-0000 3	A
		PC05-0000 5	B
		PC05-0001 6	C
		PC04-0002 3	D
		PC04-0002 5	E

FIRST USED ON OPTION/MODEL	QTY.	DESCRIPTION	PART NO.	ITEM NO.
PC05		PARTS LIST		

UNLESS OTHERWISE SPECIFIED

UNLESS OTHERWISE SPECIFIED
DIMENSION IN INCHES
TOLERANCES
DECIMALS ± .005 FRACTIONS ± 1/64 ANGLES ± 0°30'
FINAL SURFACE QUALITY
REMOVE BURRS AND BREAK SHARP CORNERS

MATERIAL

FINISH

DRN. Earl Morse DATE 6/24/69
CHK'D. A Carnell DATE 6/24/69
ENG. [illegible] DATE 7/1/69
PROJ. ENG. [illegible] DATE 7/1/69
PROD. [illegible] DATE [illegible]
NEXT HIGHER ASSY. A-ML-PC05
SCALE NONE
SHEET 1 OF 3

digital EQUIPMENT CORPORATION MAYNARD, MASSACHUSETTS

TITLE
POWER AND CONTROL SCHEMATIC

SIZE D | CODE BS | NUMBER PC05-0-4 | REV E

DIST.

DEC FORM NO. DRD 102A

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+5V BIAS

-30V

BU2 +5

I/O BUS IN SKIP — BN2 — IOT 021

I/O BUS IN INT — BS2

+3

MØ44 AØ8

MØ44 AØ7

MØ44 AØ6

U2 T2 S2 R2 V2 SD

E2 D2 H2 F2 K2 J2 P2 N2

PUN FLAG — AU2 — PUN ACTIVE — PUN DONE

PB Ø — AK1 — AC4(1)

PB 1 — AL1 — AC5(1)

PB 2 — AM1 — AC6(1)

PB 3 — AN1 — AC7(1)

PB 4 — AK2 — AC8(1)

PB 5 — AL2 — AC9(1)

PB 6 — AM2 — AC1Ø(1)

PB 7 — AN2 — AC11(1)

C D — AH1 — AH2 — AF1 — AF2 — AE1 — AE2 — AD1 — AD2

NOTE (1) DELAY 10MSEC FOR ROYAL PUNCH
4.5 MSEC FOR BPRE PUNCH
(2) SIGNAL NAMES INDICATE ASSERTED STATES FOR HIGH(H) LEVELS PER DEC STD 054

M71Ø A,B5

QUALIFY BD2

IOP4(1) — AP2 — AJ2 — API

AR1 — IOP2(1) — INITIALIZE AS2 — AJ1

IOP1(1) — AR2 — ASI — IOT 021

PUNCH FEED SWITCH

SYNC AV2 PUN — AU1 — BJ2 — 4.5 OR MS — PUN DONE — BH2

AT2 — PUN ACTIVE (Ø)

SCR DRIVER

PUNCH ACT (Ø) — U2 T2 — V2 — K374 10 MSEC — R2 — S2

H2 F2 — J2 — K378 3 SEC — D2 — E2

N2 M2 — P2 — K376 1 SEC — K2 — L2

K303 A12

A12A2(+5V)

FIRST USED ON OPTION/MODEL: PCØ5	QTY.	DESCRIPTION	PART NO. / ITEM NO.
		PARTS LIST	
UNLESS OTHERWISE SPECIFIED: DIMENSION IN INCHES; TOLERANCES DECIMALS ± .005 FRACTIONS ± 1/64 ANGLES ± 0°30'; FINAL SURFACE QUALITY 7; REMOVE BURRS AND BREAK SHARP CORNERS	DRN. R. T. Hallen	DATE 6/18/69	digital EQUIPMENT CORPORATION MAYNARD, MASSACHUSETTS
	CHK'D. D. Carvelli	DATE 6/23/67	TITLE: POWER AND CONTROL SCHEMATIC (PUNCH)
	ENG. Lee Nielsen	DATE 7/1/67	
	PROJ. ENG. Lee Nielsen	DATE 7/1/67	
MATERIAL: —	PROD. [illegible]	DATE 7/2/67	
FINISH: —	NEXT HIGHER ASSY. A-ML-PCØ5	SIZE D CODE BS NUMBER PCØ5-Ø-4 REV. F	
	SCALE NONE	SHEET 2 OF 3	DIST.

REVISIONS | REV. | CHANGE NO. | CHK

DEC FORM NO. DRD 102A

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NOTE:
SIGNAL NAMES INDICATE ASSERTED STATES FOR HIGH(H) LEVELS PER DEC STD 054

I/O BUS IN SKIP — AK2 — AM2 — IOT 011 — +3
I/O BUS IN INT — AL2
RDR FLAG
RDR STROBE — RDR RUN (I)
AK1 — RDR RUN
RDR STROBE — AJ2 — +3 — RDR STROBE
BM2 — OUT OF TAPE
BP1 — INITIALIZE
IOP 4(I) — BK1 — AJ1
QUALIFY — BD2 — +3
AV2 — IOP 2(I)
IOP 1(I) — AU2 — +3 — IOT 011
STOP PULSE — AS2 — AT2 — SHIFT — ENABLE(I) — CLOCK 2
STOP ENABLE — RDR RUN (Ø) — RDR FEED SWITCH — BN1 — BM1 — +5
ENABLE (Ø) — AK2 — ENABLE (I) — 40MS SS O — AM2 — STOP DELAY
STOP COMPLETE — BN2
CLOCK 1

I/O BUS IN 4 — AP2 — RD 0 — AF1 — RD HOLE 8
I/O BUS IN 5 — AS2 — RD 1 — AF2 — RD HOLE 7
I/O BUS IN 6 — AR1 — RD 2 — AH1 — RD HOLE 6
I/O BUS IN 7 — AN2 — RD 3 — AH2 — RD HOLE 5
I/O BUS IN 8 — AS1 — RD 4 — AE1 — RD HOLE 4
I/O BUS IN 9 — AP1 — RD 5 — AE2 — RD HOLE 3
I/O BUS IN 10 — AR2 — RD 6 — AD1 — RD HOLE 2
I/O BUS IN 11 — AN1 — RD 7 — AD2 — RD HOLE 1
RDR STROBE

BA(Ø) — BA(1) — BSI — BP2 — A — BJI — B(Ø)
BB(Ø) — BB(1) — BRI — BU2 — B — A(I)
B PWR(1) — BR2 — POWER — BD1 SHIFT — T.P. BJ2
BK2 — ENABLE — CLOCK1

RDR STROBE — A(1) B(1) — STOP ENABLE — TP BV2 — A(Ø) B(Ø)

CLOCK 2 — AU5 — AU2 — CLOCK — CLOCK ACCEL — ENABLE (I) — 4MS SS O — STOP PULSE
RDR FEED SWITCH BP2 — BS2 RDR RUN (Ø) — STOP — STOP COMPLETE BR2
BS2 — CLOCK 1

M705 A,B4
M715 A,B3

FIRST USED ON OPTION/MODEL	QTY.	DESCRIPTION	PART NO.	ITEM NO.
PCØ5		PARTS LIST		

UNLESS OTHERWISE SPECIFIED
UNLESS OTHERWISE SPECIFIED DIMENSION IN INCHES
TOLERANCES DECIMALS ± .005 FRACTIONS ± 1/64 ANGLES ± 0°30'
FINAL SURFACE QUALITY √ REMOVE BURRS AND BREAK SHARP CORNERS

MATERIAL — FINISH

DRN. R.T. Hallen DATE 6/19/69
CHK'D. DATE 6/19/69
ENG. DATE
PROJ. ENG. DATE
PROD. DATE
NEXT HIGHER ASSY. A-ML-PCØ5
SCALE NONE
SHEET 3 OF 3

digital EQUIPMENT CORPORATION MAYNARD, MASSACHUSETTS

TITLE: CONTROL AND POWER SCHEMATIC (READER)

SIZE D CODE BS NUMBER PCØ5-Ø-4 REV
DIST.

REVISIONS — REV. — CHANGE NO. — CHK

DEC FORM NO. DRD 102

SIZE D CODE BS NUMBER PCØ5-Ø-Ø4 REV

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MODEL	MODULE LIST
PCØ5-C, PCØ5-CA	A3-A12 B6-B12
PCØ5-P, PCØ5-PA	A5, A6, A7, A8, A12, B6, B10
PCØ5-R	A3, A4, A9, A10, A11, B7, B8, B9, B12

*REF. C-AD-540525[illegible]

	1	2	3	4	5	6	7	8	9	10	11	12
A			M715 READER CLOCK	M705 READER CONTROL	M710 PUNCH CONTROL	MØ44	MØ44	MØ44	MØ40	MØ40	G918 PHOTO AMPLIFIER	K3Ø3 *
B						WØ23 TO PUNCH CONN	MØ40	MØ40	M903	M903		WØ77 TO PHOTO HEAD

REVISIONS

REV.	CHANGE NO.	CHK
A	PC05-00001	[illegible]

Order Memo P-[illegible]
G. BECKNER
[illegible] 9-3-69

FIRST USED ON OPTION/MODEL	QTY.	DESCRIPTION	PART NO.	ITEM NO.
PCØ5		PARTS LIST		

UNLESS OTHERWISE SPECIFIED

UNLESS OTHERWISE SPECIFIED
DIMENSION IN INCHES
TOLERANCES
DECIMALS ± .005 FRACTIONS ± 1/64 ANGLES ± 0°30'
FINAL SURFACE QUALITY ✓
REMOVE BURRS AND BREAK SHARP CORNERS

MATERIAL

FINISH

DRN.	G. Morrette	DATE 6/18/69
CHK'D.	R. Barnell	DATE 6/20/69
ENG.	[illegible]	DATE 7/1/69
PROJ. ENG.	[illegible]	DATE 7/1/69
PROD.		DATE

NEXT HIGHER ASSY. A-ML-PCØ5-Ø

SCALE

SHEET 1 OF 1

digital EQUIPMENT CORPORATION MAYNARD, MASSACHUSETTS

TITLE
MODULE UTILIZATION LIST PCØ5

SIZE	CODE	NUMBER	REV.
C	MU	PCØ5-Ø-3	A

DIST.

DEC FORM NO. DRC 100

REV. A
SIZE CODE C MU NUMBER PCØ5-Ø-3

DIGITAL EQUIPMENT CORPORATION
MAYNARD, MASSACHUSETTS

PARTS LIST

MADE BY P. MARCOTTE DATE 6/18/69	CHECKED R Carwell DATE 6/20/69	SECTION 1
ENG DATE Jas. Cochran 7/1/69	PROD DATE 7/2/69	ISSUED SECT. 1

ITEM NO.	DWG NO. / PART NO.	DESCRIPTION	QUANTITY / VARIATION											
			PCØ5-C	PCØ5-CA	PCØ5-P	PCØ5-PA	PCØ5-R							
1	G918	PHOTO AMPLIFIER	1	1			1							
2	C-AD-5408231-0-0	TIMER, (K303 WITH K374, K376 & K378)	1	1	1	1								
3	MØ4Ø	SOLENOID DRIVER	4	4			4							
4	MØ44	SOLENOID DRIVER	3	3	3	3								
5	M7Ø5	READER CONTROL	1	1			1							
6	M71Ø	PUNCH CONTROL	1	1	1	1								
7	M715	READER CLOCK	1	1			1							

TITLE	ASSY NO.	SIZE	CODE	NUMBER	REV.	ECO NO.
MODULE UTILIZATION	C-MU-PCØ5-Ø-3	A	PL	PCØ5-Ø-3	A	PC05-00001
	SHEET 1 OF 1	DIS				

DEC FORM NO.
DRA 110

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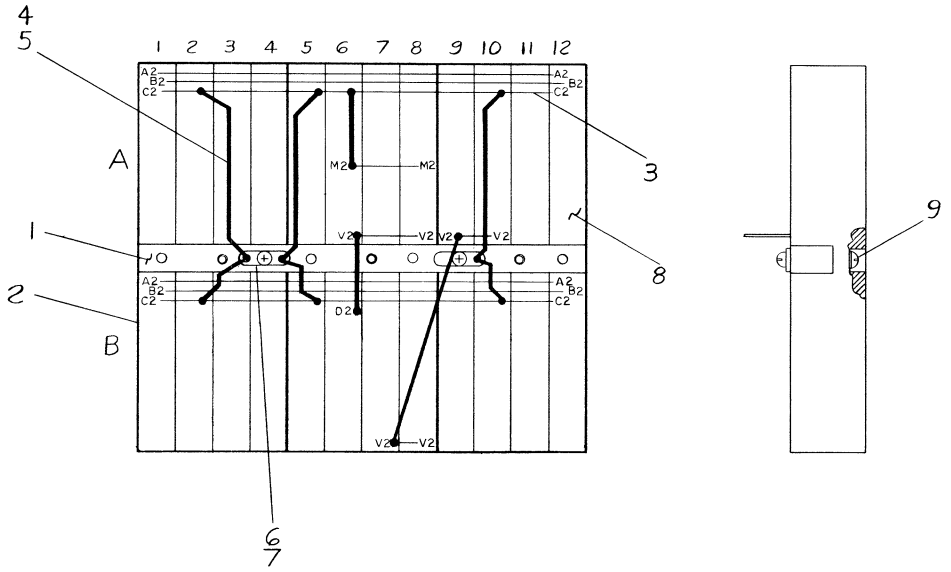
EXTERNAL COMPONENT TABLE						
ITEM	COMP.	POL	FROM	TO	POL	REMARKS
10	CAP	+	AØ3A2	AØ1C2	−	
10	CAP	+	BØ1C2	BØ3B2	−	
11	CAP	+	AØ5J1	AØ5C2	−	
13	RES		BØ9H1	BØ9A2		
13	RES		B1ØD1	B1ØA2		

NOTES:
1. CONNECTIONS ON ITEM 3 & 4 TO B SOLDERED AND LOCATED AT MINIMUM PRACTICAL HEIGHT ABOVE BLOCKS.
2. CONNECTOR BLOCKS TO BE GROUNDED TO GND. LUG AS SHOWN.



REVISIONS		
CHK	CHANGE NO.	REV.
[illegible]	PC05-00003	A
E. LUTTIG	PC05-00016	B
T. SOULE		

DEC FORM NO. ORG 100

FIRST USED ON OPTION/MODEL: PCØ5	QTY.	DESCRIPTION	PART NO. / ITEM NO.
		PARTS LIST	

UNLESS OTHERWISE SPECIFIED

UNLESS OTHERWISE SPECIFIED
DIMENSION IN INCHES
TOLERANCES
DECIMALS ± .005 FRACTIONS ± 1/64 ANGLES ± 0°30'
FINAL SURFACE QUALITY ✓
REMOVE BURRS AND BREAK SHARP CORNERS

MATERIAL

FINISH

DRN.	DATE 6/9/69
CHK'D.	DATE 6/19/69
ENG.	DATE 6/17/69
PROJ. ENG.	DATE 6/17/69
PROD.	DATE

NEXT HIGHER ASSY: D-UA-PCØ5-Ø-Ø

SCALE

SHEET 1 OF 1

digital EQUIPMENT CORPORATION MAYNARD, MASSACHUSETTS

TITLE: BUS BAR (PCØ5)

SIZE	CODE	NUMBER	REV.
C	AD	7006253-0-0	B

DIST.

SIZE C CODE AD NUMBER 7006253-0-0 REV. B

DIGITAL EQUIPMENT CORPORATION
MAYNARD, MASSACHUSETTS

PARTS LIST

MADE BY P. MARCOTTE	CHECKED R Carnell	SECTION
DATE 6/10/69	DATE 6/18/69	1
ENG Geo. Beckner 7/1/69	PROD [illegible]	ISSUED SECT.
DATE	DATE 7/2/69	1

ITEM NO.	DWG NO./PART NO.	DESCRIPTION	QUANTITY/VARIATION
1	B-IA-7407077-0-0	MTG. BAR 6IN.	1
2	1205348	288 PIN CONN. BLOCK WRAPTYPE	3
3	1205541	BUS STRIP - 44 HOLE	A/R
4	9107560-03	#18 AWG BUS WIRE	A/R
5	9107278-09	#18 TUBING TEFLON, WHITE	A/R
6	9007597	TERMINAL, SHAKEPROOF #2116-08-00	2
7	9006034	SCR PHL PAN HD #8-32 x.19 LG SST	2
8	9105740-44	30 AWG SOLID TEF INS. WIRE, YELLOW	A/R
9	9006120	SCR PHL FIL HD #8-32 x .62 LG SST	6
10	1005306	CAP 6.8 MFD 35V 10%	2
11	1001610	CAP .01 MFD 100V 20%	1
~~12~~	~~1002627~~	~~CAP 2.2 MFD 20V 10%~~	~~1~~
REF	K-WL-PCØ5-Ø-2	WIRE LIST	1
13	1300317	RES 470 OHM 1/4 W 10%	2

TITLE	ASSY NO.	SIZE	CODE	NUMBER	REV.	ECO NO.
BUS BAR (PCØ5)	C-AD-7006253-0-0	A	PL	7006253-0-0	B	PC05-00016
	SHEET 1 OF 1	DIST.	G			

DEC FORM NO.
DRA 110

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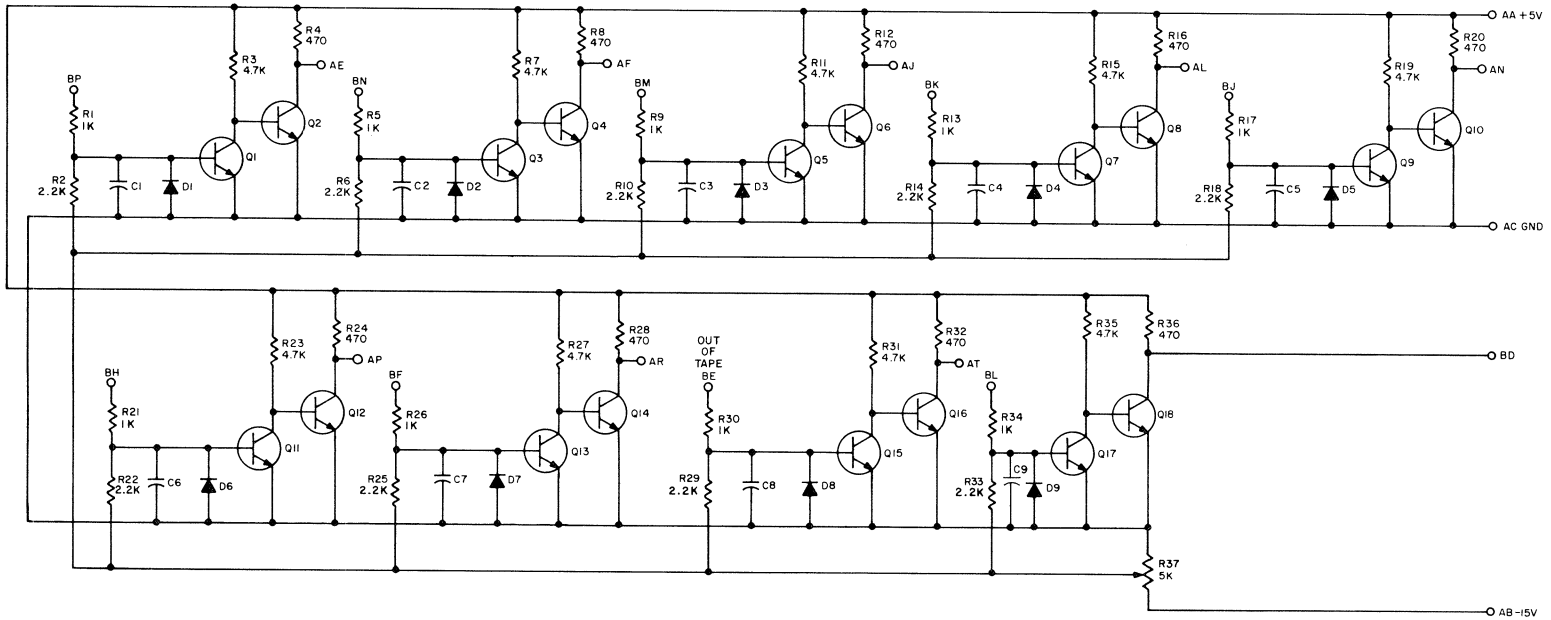

UNLESS OTHERWISE INDICATED:
DIODES ARE D664
RESISTORS ARE 1/4W, 5%
CAPACITORS ARE .01 MFD, 100V, 20%
TRANSISTORS ARE 2N3646

REVISIONS			
CHK	CHG NO.	REV.	
	00001	A	
	00002		

DRN. BUTLER	DATE	4/1/69
CHK'D G. Yunga	DATE	4/1/69
ENG. R. Ohl	DATE	6/1/69
PROD.	DATE	

TRANSISTOR & DIODE CONVERSION CHART

DEC	EIA	DEC	EIA
2N3646	2N3009		
D664	IN3606		

digital EQUIPMENT CORPORATION MAYNARD, MASSACHUSETTS

TITLE PHOTO TRANSISTOR AMPLIFIER G918

SIZE	CODE	NUMBER	REV.
C	CS	G918-0-1	A
PRINTED CIRCUIT REV.		C	

DEC FORM NO. DRC 102

5-

DIST. 324,434,436-3

PINK

REV. A | NUMBER G918-0-1 | CODE CS | SIZE C

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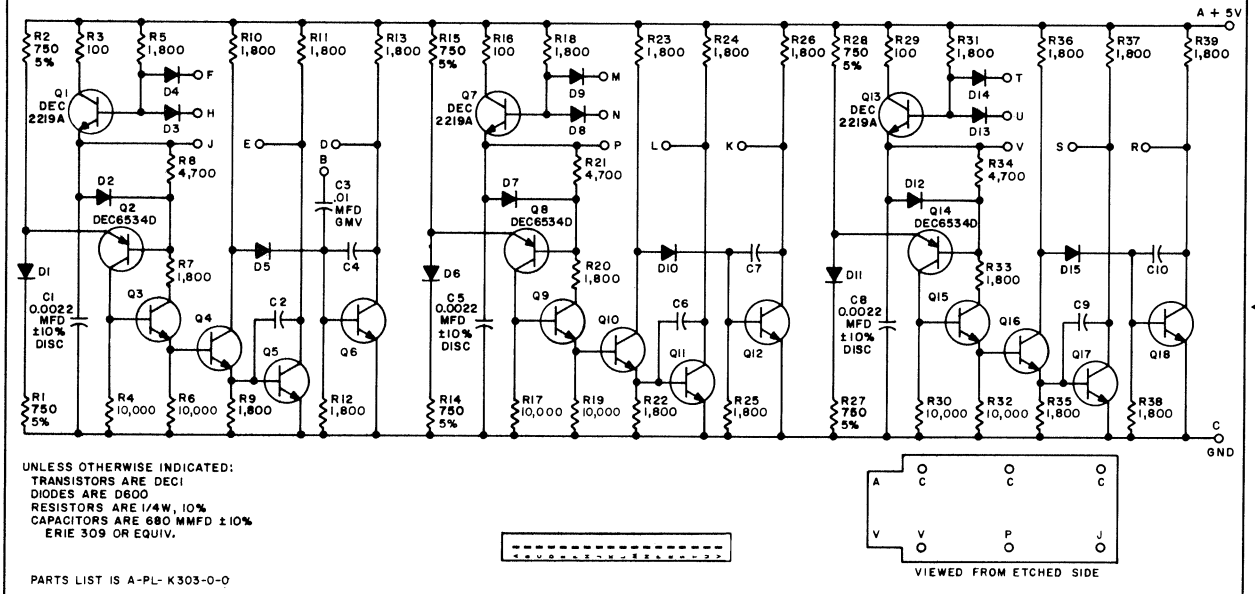

UNLESS OTHERWISE INDICATED:
TRANSISTORS ARE DEC1
DIODES ARE D600
RESISTORS ARE 1/4W, 10%
CAPACITORS ARE 680 MMFD ±10%
ERIE 309 OR EQUIV.

PARTS LIST IS A-PL- K303-0-0

VIEWED FROM ETCHED SIDE

REVISIONS			
CHK	CHG NO	REV	B
	6437		C
	00001		

DRN. M Hallen	DATE 4-18-67	
CHK'D E Gilbert	DATE 4/21/67	
ENG. R Doar	DATE 4/27/67	
PROD.	DATE	

TRANSISTOR & DIODE CONVERSION CHART

DEC	EIA	DEC	EIA
DEC1	2N3721		
DEC6534D	MP86534		
D600	1N4009		
DEC2219A	2N2219		

digital EQUIPMENT CORPORATION MAYNARD, MASSACHUSETTS

TITLE: THREE TIMERS K303

SIZE	CODE	NUMBER	REV.
B	CS	K303-0-1	C

PRINTED CIRCUIT REV. B

DEC FORM NO. DRB 102

DIST. 324, 434, 435 3

PINK

SIZE B | CODE CS | NUMBER K303-0-1 | REV C

SIZE	CODE	NUMBER	REV
B	CS	M040-0-1	E

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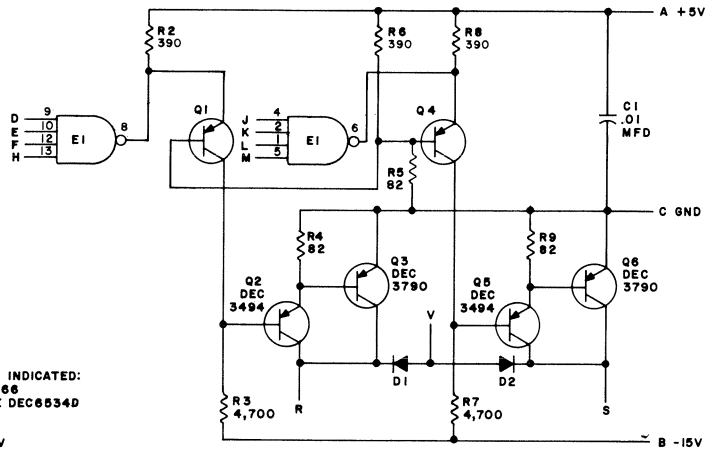

UNLESS OTHERWISE INDICATED:
DIODES ARE MR2066
TRANSISTORS ARE DEC6534D
E1 IS DEC7420N
PIN 7 ON IC = GND
PIN 14 ON IC = +5V
RESISTORS ARE 1/4W, 10%

PARTS LIST A-PL-M040-0-0

REVISIONS			
CHK	CHG NO	REV.	
[illegible]	00001	E	
[illegible]	00002		

DRN. D. Keller	DATE 9-14-67	
CHK'D [illegible]	DATE 9/22/67	
ENG [illegible]	DATE 9/14/67	
PROD. [illegible]	DATE	

TRANSISTOR & DIODE CONVERSION CHART

DEC	EIA	DEC	EIA
DEC3494	SAME		
DEC3790	2N3790		
DEC6534D	MPS6534		
D662	IN645		
MR2066	IN4003		

digital EQUIPMENT CORPORATION MAYNARD, MASSACHUSETTS

TITLE: SOLENOID DRIVER M040

SIZE	CODE	NUMBER	REV.
B	CS	M040-0-1	E

PRINTED CIRCUIT REV. E

DEC FORM NO. DRB 102

5 DIST. 224, 434, 436 3 PINK

SIZE	CODE	NUMBER	REV.
B	CS	M044-0-1	B

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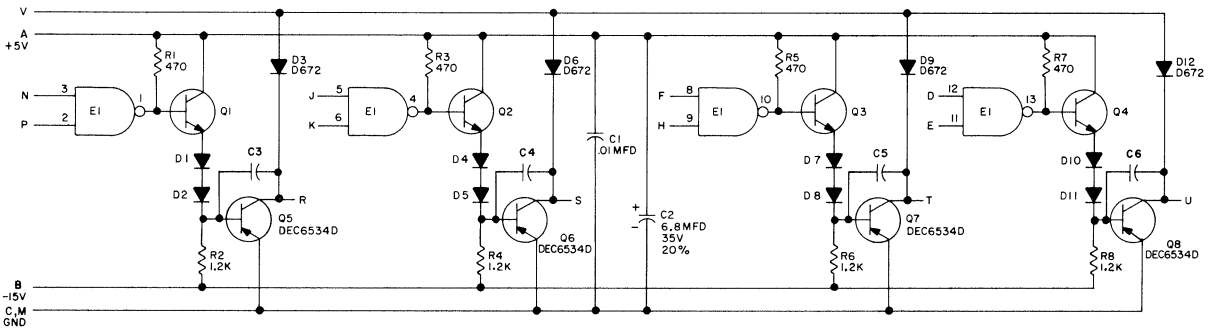

UNLESS OTHERWISE INDICATED:
RESISTORS ARE 1/4W, 10%
DIODES ARE D664
E1 IS DEC7401N
TRANSISTORS ARE DEC3009B
PIN 7 ON EACH IC = GND
PIN 14 ON EACH IC = +5V
CAPACITORS ARE 100pf, 100V, 5%

REVISIONS			
REV	B		
CHG NO	00001		
CHK	Ken		

DRN.	Butler	6/23/67
CHK'D	[illegible]	6/29/69
ENG.	[illegible]	7/15/69
PROD.		DATE

TRANSISTOR & DIODE CONVERSION CHART

DEC	EIA	DEC	EIA
D664	IN3606		
DEC6534D	MPS6534		
DEC3009B	2N3009		

digital EQUIPMENT CORPORATION MAYNARD, MASSACHUSETTS

TITLE 4-100MA SOLENOID DRIVER M044

SIZE	CODE	NUMBER	REV.
B	CS	M044-0-1	B

PRINTED CIRCUIT REV. B

DEC FORM NO. DRB 102

5 DIST. 324, 434, 435 3 PINK

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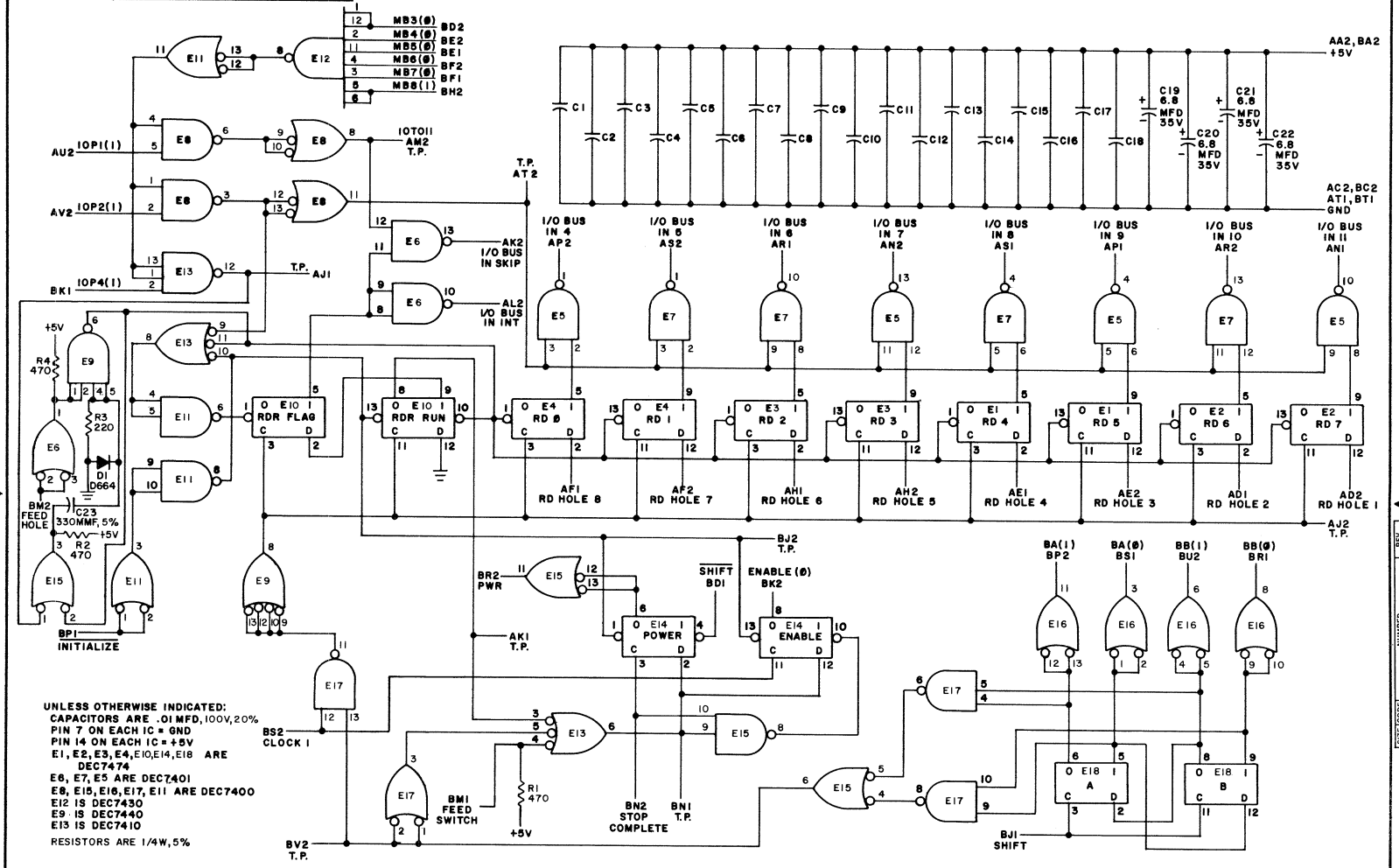

UNLESS OTHERWISE INDICATED:
CAPACITORS ARE .01 MFD, 100V, 20%
PIN 7 ON EACH IC = GND
PIN 14 ON EACH IC = +5V
E1, E2, E3, E4, E10, E14, E18 ARE DEC7474
E6, E7, E5 ARE DEC7401
E8, E15, E16, E17, E11 ARE DEC7400
E12 IS DEC7430
E9 IS DEC7440
E13 IS DEC7410
RESISTORS ARE 1/4W, 5%

REVISIONS								
CHK	CHG NO.	REV.	B	C	D	F	H	J
	7017		000001	000002	000003	000004	000005	

DRN. M. Keller DATE 10-6-67
CHK'D DATE
ENG. DATE
PROD. 2 DATE

TRANSISTOR & DIODE CONVERSION CHART			
DEC	EIA	DEC	EIA
D664	1N645		

digital EQUIPMENT CORPORATION MAYNARD, MASSACHUSETTS

TITLE: READER CONTROL M705

SIZE	CODE	NUMBER	REV
C	CS	M705-0-1	J

PRINTED CIRCUIT REV. J

DEC FORM NO. DRC 102

DINT 329

REV J | NUMBER M705-0-1 | CODE CS | SIZE C

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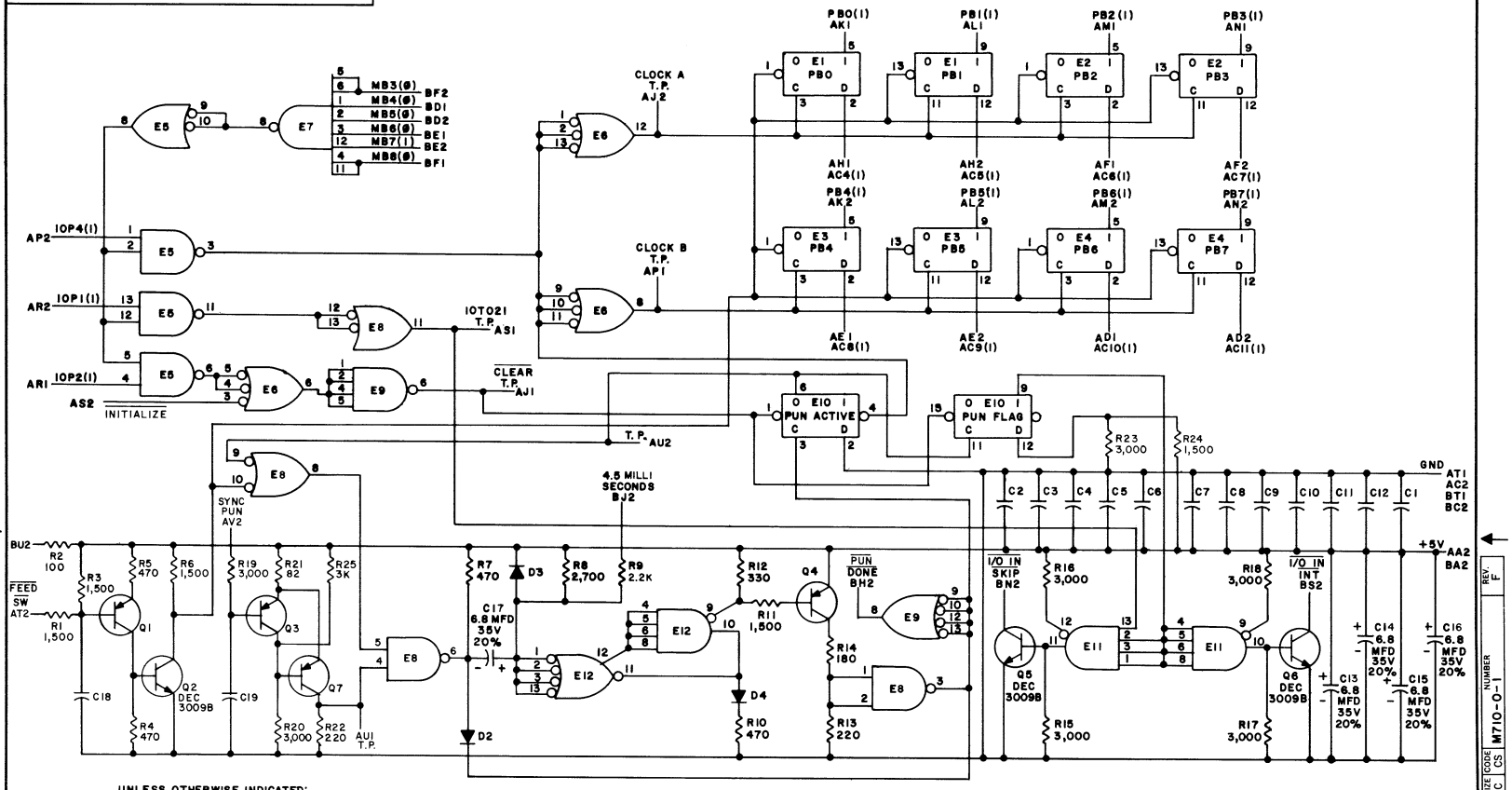

UNLESS OTHERWISE INDICATED:
RESISTORS ARE 1/4W, 5%
TRANSISTORS ARE DEC6534B
CAPACITORS ARE .01 MFD, 100V, 20%
PIN 7 ON EACH IC = GND
PIN 14 ON EACH IC = +5V
E1, E2, E3, E4, E10 ARE DEC7474
E5, E8 ARE DEC7400
E6 IS DEC7410
E7 IS DEC7430
E9 IS DEC7440
E11, E12 ARE DEC7460
DIODES ARE D664

PARTS LIST A-PL-M710-0-0

REVISIONS			
CHK	CHG NO	REV	
[illegible]	6924	C	
[illegible]	00001	D	
[illegible]	00002	E	
[illegible]	00003	F	

DRN. m Keller DATE 9-27-67
CHK'D. [illegible] DATE [illegible]
ENG. [illegible] DATE [illegible]
PROD. [illegible] DATE [illegible]

TRANSISTOR & DIODE CONVERSION CHART

DEC	EIA	DEC	EIA
DEC3009B	2N3009		
DEC6534B	MPS6534		
D664	IN3606		

digital EQUIPMENT CORPORATION MAYNARD, MASSACHUSETTS

TITLE: PUNCH CONTROL M710

SIZE	CODE	NUMBER	REV.
C	CS	M710-0-1	F

PRINTED CIRCUIT REV. E

DEC FORM NO. DRC 102

DISC 324

SIZE C CODE CS M710-0-1 REV F

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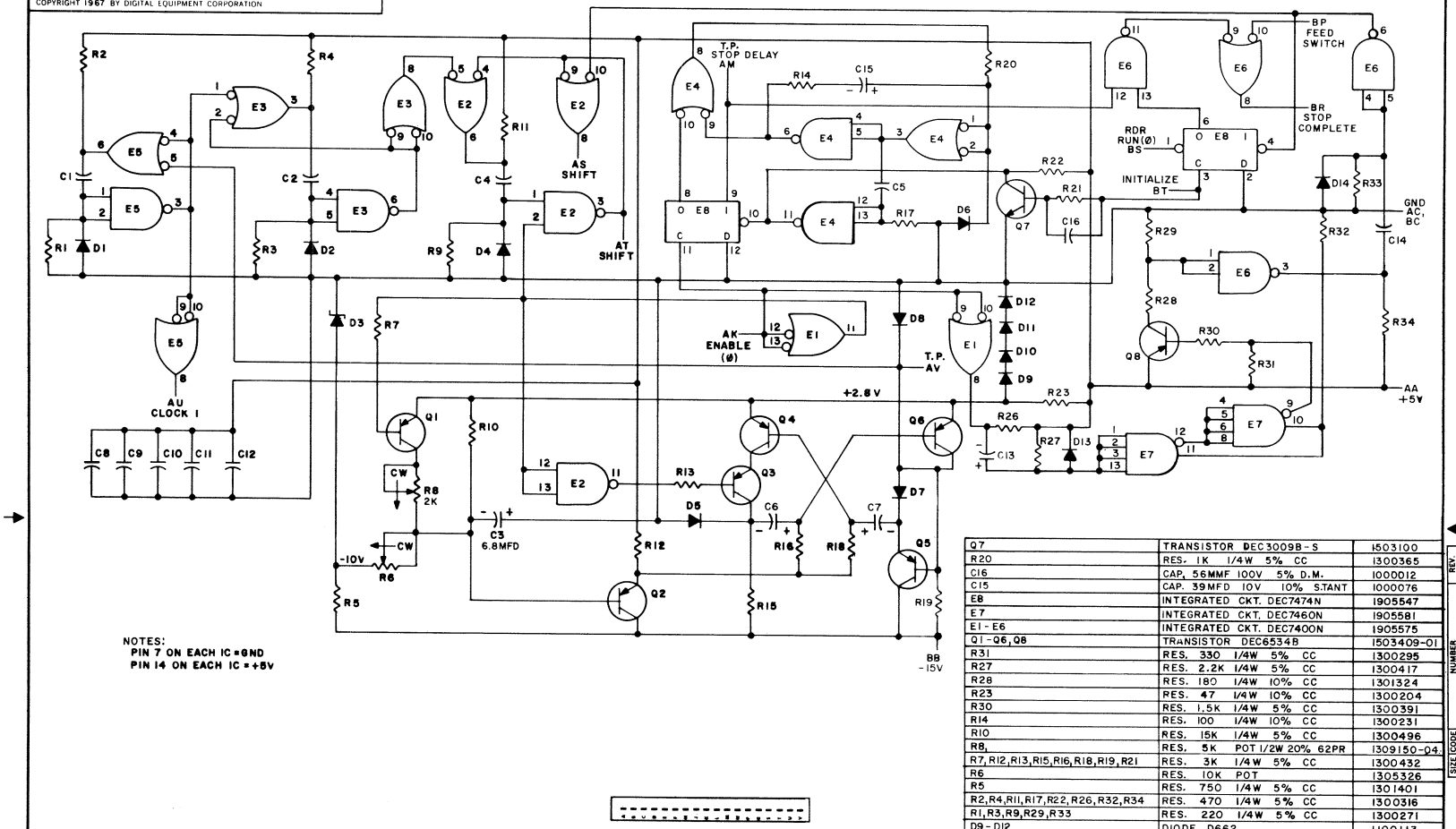

Q7	TRANSISTOR DEC3009B-S	1503100
R20	RES. 1K 1/4W 5% CC	1300365
C16	CAP, 56MMF 100V 5% D.M.	1000012
C15	CAP. 39MFD 10V 10% S.TANT	1000076
E8	INTEGRATED CKT. DEC7474N	1905547
E7	INTEGRATED CKT. DEC7460N	1905581
E1-E6	INTEGRATED CKT. DEC7400N	1905575
Q1-Q6,Q8	TRANSISTOR DEC6534B	1503409-01
R31	RES. 330 1/4W 5% CC	1300295
R27	RES. 2.2K 1/4W 5% CC	1300417
R28	RES. 180 1/4W 10% CC	1301324
R23	RES. 47 1/4W 10% CC	1300204
R30	RES. 1.5K 1/4W 5% CC	1300391
R14	RES. 100 1/4W 10% CC	1300231
R10	RES. 15K 1/4W 5% CC	1300496
R8,	RES. 5K POT 1/2W 20% 62PR	1309150-04
R7,R12,R13,R15,R16,R18,R19,R21	RES. 3K 1/4W 5% CC	1300432
R6	RES. 10K POT	1305326
R5	RES. 750 1/4W 5% CC	1301401
R2,R4,R11,R17,R22,R26,R32,R34	RES. 470 1/4W 5% CC	1300316
R1,R3,R9,R29,R33	RES. 220 1/4W 5% CC	1300271
D9-D12	DIODE D662	1100113
D1,D2,D4-D8,D13,D14	DIODE D664	1100114
D3	DIODE IN758	1103116
C13	CAP. 2.2MFD 35V 10% S.TANT	1002431
C6,C7	CAP. 1 MFD 35V 10% S.TANT	1001776
C5	CAP. 330MMF 100V 5% D.M	1000023
C3	CAP. 6.8MFD 35V 10% S.TANT	1005306
C2,C8-C12	CAP. .01 MFD 100V 20% DISC	1001610
C1,C4,C14	CAP. 560MMF 100V 5% D.M	1000025
	PARTS LIST	A-PL-M715-0-0
REFERENCE DESIGNATION	DESCRIPTION	PART NO.

PARTS LIST

REVISIONS					
DIM	CHG NO.	REV.			
	7018	B			
	7147	C			
	00001	D			
	00002	E			
	00003	F			
	00004	H			

DRN		DATE 10-16-67
CHKD		DATE 11/2/67
MFG		DATE 11/2/67
PROD.		DATE

TRANSISTOR & DIODE CONVERSION CHART			
DEC	EIA	DEC	EIA
DEC6534B	MP36534		
D662	IN645		
D664	IN3606		
IN758	SAME		

digital EQUIPMENT CORPORATION MAYNARD, MASSACHUSETTS

TITLE: READER CLOCK M715

SIZE C | CODE CS | NUMBER M715-0-1 | REV. H

PRINTED CIRCUIT REV. C

DIST. 324 434 435 5 PINK

DEC FORM NO. DRC 102

Appendix A
G918 Module Pin Numbers

Hole	Pin Number
1	A11E2
2	A11F2
3	A11J2
4	B11D2
5	A11L2
6	A11N2
7	A11P2
8	A11R2
Out-of-Tape	A11T2

Appendix B
MAINDEC Diagnostics

The following is a list of MAINDEC diagnostics to be used in the adjustment procedures contained in this section.

DEC Computer	Diagnostic No.
PDP-11	MAINDEC-11-D2BA
PDP-12	MAINDEC-08-D2GC
PDP-15	MAINDEC-15-D2CA

Appendix C
Suggested 5-ms Stall Programs

PDP-12

```
0200    CLL  CLA        7300
0201    TAD  211        1211
0203    DCA  212        3212
0204    RFC  RRB        6016
0204    RSF             6011
0205    JMP  .-1        5204
0206    ISZ  212        2212
0207    JMP  .-1        5206
0210    JMP  200        5200
0211    5651            5651
0212    0000            0
```

PDP-15

```
0200    LAS             750004
0201    AND  MSK1       500221
0202    CMA             740001
0203    DAC  COUNT      040217      Read
0204    RSA             700104      16
0205    RSF             700101      Lines
0206    JMP  .-1        600205
0207    ISZ  COUNT      440217
0210    JMP  READ       600204

0211    LAS             750004
0212    AND  MSK2       500222
0213    DAC  PAUSE      040220      Stall
0214    ISZ  PAUSE      440220      Between
0215    JMP  .-1        600214      Groups
0216    JPM  BEGIN      600200
```

```
Count  0217 0
Pause  0220 0
MSK1   0221  000777
MSK2   0222  777000
AC SWITCHES = 600017
```

PDP-11

```
250  012737  000001  177550   MOV  #1, @177550
256  000005                   RESET
260  105737  177550           TSTB @ # 177550
264  100775                   BMI  . -4
266  000137  000250           JMP  START
```

Appendix D
Suggested Programs for Punching Alternate 1s and 0s Test Tapes

PDP-12

```
0200    CMA       7040
0201    TLS       6026
0202    TSF       6021
0203    JMP-1     5202
0204    JMP 200   5200
```

PDP-11

```
200  012737  177777  1777556  MOV   #177777,@ #177556
206  105737  177554           TSTB  @177554
212  100375                   BPL   . -4
214  012737  000000  177556   MOV   #0,@#177556
222  105737  177554           TSTB  @177554
226  100375                   BPL   . -4
230  000137  000200           JMP   START
```

Appendix E
PC05 Engineering Change Orders

This appendix contains a description of Engineering Change Orders (ECO) applicable to the PC05, including the modules. The appendix is a guide for maintenance personnel in determining the status of a specific PC05 unit. Each ECO description is brief and therefore the complete ECO document should be read to understand the subject matter.

ECO Number	Description	Date of ECO
PC0-00001	Change to drawing B-MD-7406089-Punch	1-25-69
PC0-00002	Added new phototransistor, part #5308818	2-26-70
PC0-00003	Replaced punch knob with smaller knob part #12-09904	4-10-70
PC04-00004	Changed wording on switch bezel	6-4-69
PC04-00018	Corrects a "double punch" situation in units with SCR circuit	3-8-70
PC04-00022	Changed motor current-divider resistors	4-1-70
PC04-00024	Changed punch tape chute and added new tape depressor	7-15-70
PC04-00025	Wire changes to be made if unit contains switch board #5408310 Rev B	7-10-70
PC04-00026	Tolerance of bind angles set to $\pm 3^{\circ}$	6-11-70
PC04-00027	Changed wire harnesses	6-23-70
PC04-00030	Replaced connector #9006781 with 9007917	8-19-70
PC04-00032	Changed power regulator board and added bridge rectifier	8-6-70
PC05-00003	Deleted 2.2 μF cap. part #1002627	11-10-69
PC05-00004	Substituted new I/O cable #DUA BC08-0-4	11-13-69
PC05-00005	Added INITIALIZE line from M715 pin B03T2 to pin B09L1	11-12-69
PC05-00007	Added shim to provide slack on photo transistor board	12-2-69
PC05-00009	Corrected parts list to include washer, insulator, and solder terminal on SCR driver assembly	1-19-70
PC05-00010	Added 1-1/2 in. to length of chassis slide brace to prevent crimping of AC and I/O cables	1-28-70
PC05-00011	Corrected a terminator part no. on dwg. D-IA-7006310-0-0	2-2-70

ECO Number	Description	Date of ECO
PC05-00012	Corrected switch no. on parts list	2-5-70
PC05-00013	Deleted rolls pins - part no. 9006513	2-10-70
PC05-00014	Corrected parts list	3-15-70
PC05-00015	Corrected parts list	3-30-70
MODULES		
G-918-00001	Value of R2 changed to 3.3K	9-3-69
K30 3-00001	Value of Q3, A9, and Q15 base resistance changed to 10K	1-29-69
M040-00001	Replaced diode with jumper wire on internal reference source	7-12-68
M040-00002	Replaced DEC 7460N IC with DEC 7420N IC	7-12-68
M044-00001	Added 100pF cap. to each driver output stage	5-13-70
M705-00001	Replaced DEC 7410N with DEC 7440N	7-31-68
M705-00002	Corrected error on schematic	8-19-68
M710-00001	Added 3-K, 82-ohm, and 470-ohm resistors	12-6-68
M710-00003	Added 3-K resistor; refer to ECP PC04-00018	3-5-70
M715-00001	Changed HELITRIM potentiometers	1-14-69
M715-00002	Replaced 5-K pot with 2-K pot; changed time constant	9-4-69
M715-00003	Changed capacitor C15 to 39 mF	

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Maynard, Massachusetts

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