2021
2022

CARTRIDGE TAPE DRIVE

TECHNICAL MANUAL

WITH ILLUSTRATED PARTS BREAKDOWN

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2021
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CARTRIDGE TAPE DRIVE

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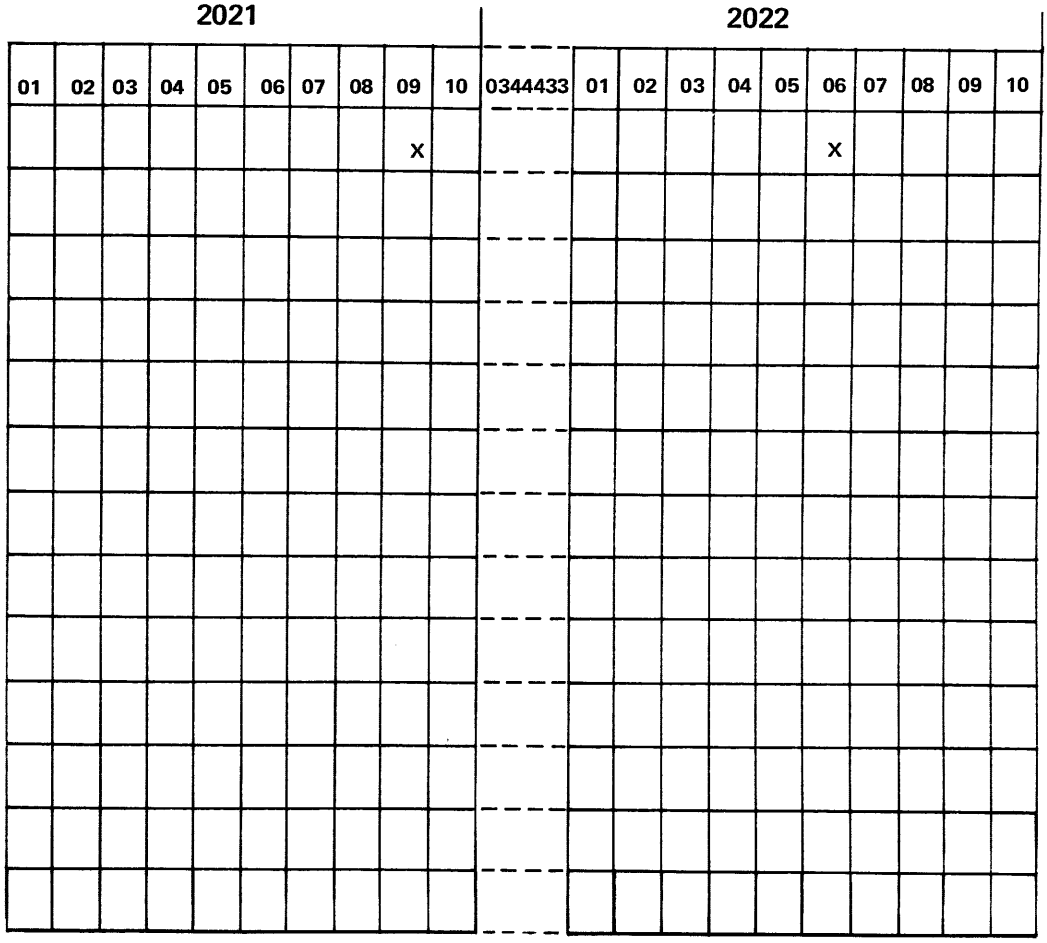
This manual supersedes

M-2530-0273

M-2932-0773

MACHINE DESIGN LEVEL



NOTE

Your machine carries an Equipment Summary Tag which calls out a nine digit Machine Design Level number. The last two digits of this number reflect the machine design level of your unit. The 'X' in the chart above ties the manual revision to the MDL number of the unit. If any significant change is made to the equipment, the machine design level will increment, and the information that is required to update your manual will be issued accordingly. The update package will also include a revised copy of this chart.

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SECTION I
GENERAL INFORMATION

1.1 SCOPE

This Technical Manual contains all of the necessary information required to operate and maintain the MDS Model 2021/2022 Cartridge Tape Transport. The manual is organized into eight sections for user convenience. Refer to the Table of Contents for section titles.

1.2 DESCRIPTION

The Cartridge Tape Transport is a constant speed device which provides for fast start/stop times as well as read-after-write capability. It receives a data tape cartridge inserted by an operator thereby eliminating the need to thread tape.

The basic elements of the cartridge tape transport are: a) Dual Gap Read Write Head, b) Tape Hole Sensors which detect BOT (Beginning of Tape), LP (Load Point), EW (Early Warning), EOT (End of Tape), c) Cartridge in Switch, d) File Protect Switch, e) Control Electronics, and Write Drivers and Read Back Digitizers.

The Cartridge Tape Transport uses a data cartridge (see Figure 1-2) developed by the *3M Company (3M designation DC 300A) which consists of two tape reels, 300 feet of 0.25 inch wide magnetic tape and a drive system. The cartridge has a file protect feature consisting of a rotatable plug that prevents or allows writing on the tape.

Data is recorded on the tape at densities from 200 to 1600 bits per inch. Data is not erased from the tape; but is "over written" by new data as presented by the tape controller.

The cartridge transport writes forward, reads forward and backspaces tape at a speed of thirty (30) inches per second. A fast forward search operation moves tape at a speed of ninety (90) inches per second. Tape rewinds at a speed of ninety (90) inches per second.

The recording format used to store data on the magnetic tape is determined by the controller. The transport write driver follows the write data signal and the standard readback receivers reproduce the write data signal which was used to record the data on the tape. The Bi-Phase readback receivers (optional) produce a downgoing signal transition for each flux reversal recorded on tape.

The transport interface input receivers and output drivers are TTL (Transistor Transistor Logic) circuits.

No AC power is required for the Transport. DC power requirements are supplied thru the interface cable. See Section II of this manual for power requirements.

The Models 2021/2022 Cartridge Transport is available in several variations. Table 1-a shows the difference in each variation of the Models 2022 or 2021.

*Minnesota Mining Manufacturing Company

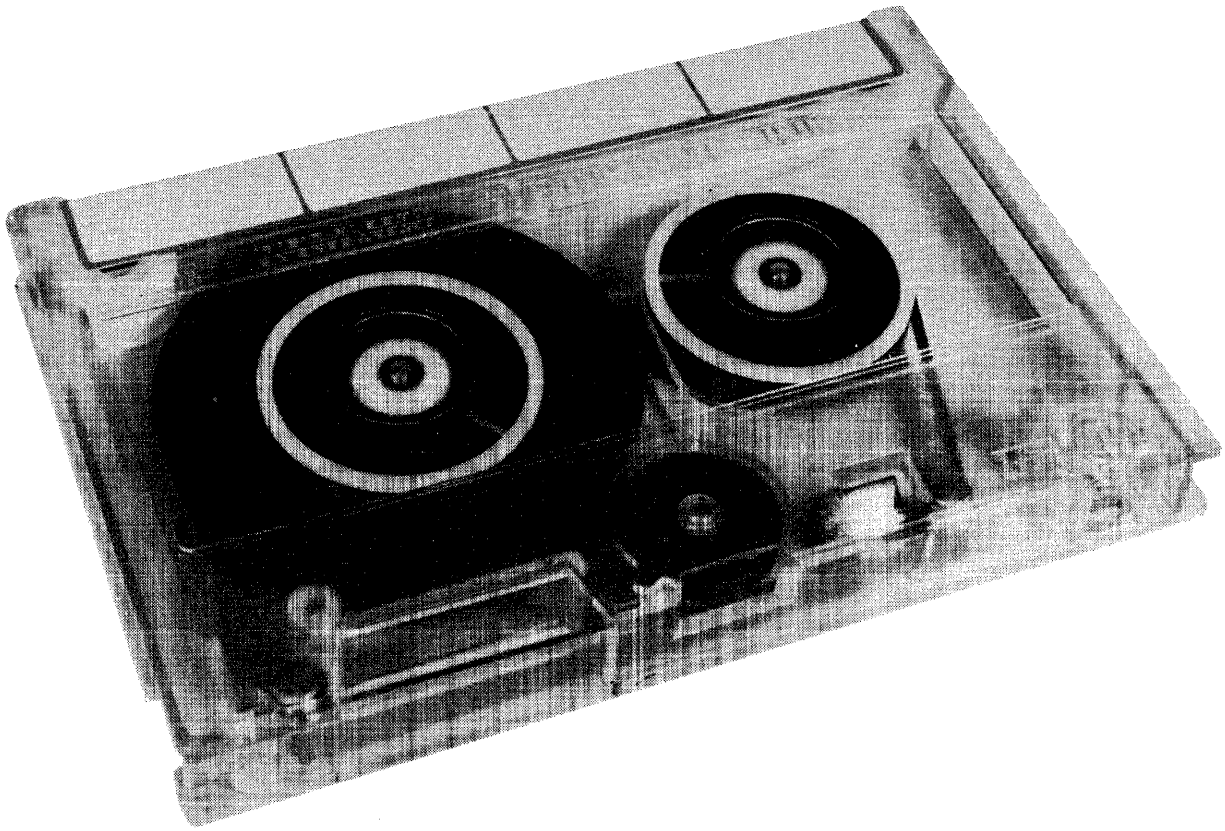


Figure 1-1. Magnetic Tape Cartridge

Table 1-a. Cartridge Transport 2021/2022 Variations

MODEL	DESCRIPTION
T2021-1	Table Top Unit with Electronics and Casework - Single Track
T2021-2	Table Top Unit with Electronics and Casework - Dual Track
T2022-2	Table Top Unit with Electronics and Casework - Dual Track
T2021-4	Table Top Unit with Electronics and Casework - Four Track
T2022-4	Table Top Unit with Electronics and Casework - Four Track
A2021-1	Rack Mounted with Electronics and *Cover - Single Track
A2021-2	Rack Mounted with Electronics and *Cover - Dual Track
A2022-2	Rack Mounted with Electronics and *Cover - Dual Track
A2021-4	Rack Mounted with Electronics and *Cover - Four Track
A2022-4	Rack Mounted with Electronics and *Cover - Four Track
M2021-1V	Mechanism with Read/Write Head * Single Track, No Electronics
M2021-2	Mechanism with Read/Write Head * Dual Track, No Electronics
M2021-4	Mechanism with Read/Write Head * Four Track, No Electronics
M2022-4	Mechanism with Read/Write Head * Four Track, No Electronics

*Specify vertical or horizontal mounting. (See figure 7-1)

SECTION II
SPECIFICATIONS

2.1 GENERAL
This section contains all specifications and special characteristics of the Cartridge Tape Transport.

2.2 ENCODING METHOD
The encoding method is determined by the controller. The PHASE ENCODED method is recommended. (Amplifiers specifically for the BI-PHASE ENCODING method are optional).

2.3 BIT DENSITY
Maximum Density: 1600 bits per inch (630 bits per centimeter)

2.4 TAPE SPEED
Read Forward: 30.0 inches per second (76.2 centimeters per second)
Write Forward: 30.0 inches per second (76.2 centimeters per second)
Backspace: 30.0 inches per second (76.2 centimeters per second)
Fast Forward Search: 90.0 inches per second (228.6 centimeters per second)
Rewind: 90.0 inches per second (228.6 centimeters per second)
Allowable Tape Speed Variation: 1. Short Term ±5.0%
2. Long Term ±4.0%
(1 and 2 ADDITIVE)

2.5 TRANSFER RATE
48,000 bits per second at 30.0 ips (76.2 centimeters per second) for a recorded density of 1600 BPI (Bits Per Inch).

2.6 START/STOP CHARACTERISTICS
Start Time: 25.0 milliseconds to a tape speed of 30 ips±5%.
Start Distance: 0.620 inches maximum
0.400 inches minimum (1.01 centimeters)
Stop Time: 25.0 milliseconds
Stop Distance: 0.420 inches maximum
0.300 inches minimum

2.7 INTER-RECORD GAP
1.2 inch minimum (3.05 centimeters)

2.8 TAPE CARTRIDGE
Dimensions: Height: 0.655 inch (1.689 centimeters)
Width: 6.0 inches (15.24 centimeters)
Depth: 4.0 inches (10.16 centimeters)
Weight: 9.0 ounces (254.7 grams)
File Protect: Operator rotatable plug to prevent writing on tape
Tape Length: 300 feet usable recording length (91.44 meters)
Tape Width: 0.247 ±0.001,−0.0015 inch (0.627 centimeter)
Tape Thickness: 0.00121 inch maximum (0.00307 centimeter)
Punched Hole Tape Marks: 1. Beginning of Tape (BOT)
2. End of Tape (EOT)
3. Load Point (LP)
4. Early Warning (EW)

Mechanical Properties: 1. Running torque 0.8 inch ounce nominal (57.5 centimeter grams)
2. Tape tension 2.0 ounces nominal (56.6 grams)
3. Guide separation 3.7 inches (9.4 centimeters)
4. Guide width 0.249 ±0.0005 inch (0.632 centimeter)

Tape Life: Greater than 5000 passes from beginning of tape to end of tape.

2.9 RECORDING HEAD

Single track dual gap Read/Write

(Two track and four track dual gap Read/Write heads optional):

Cell Time: 20.8 microseconds at 30 ips and 1600 bpi

Write current rise time: 2.0 microseconds for 1600 bpi at 30 ips

Write Current: 12.0 milliamps zero to peak.

Fixed tape tension: 2.0 ounces (56.6 grams)

Read back: 7.0 millivolts minimum at 30 ips (76.2 centimeters per second and 3200 flux changes per inch.)

Write to read feed thru: 8%

Gap to gap spacing: 0.15 inch (0.381 centimeter)

Winding configuration: READ - single
WRITE - bifilar with center tap

Track positions: The track on the single track head is in the same position as track 1 on the four track head. Track 1 and 2 on the two track head are in the same positions as track 1 and 2 respectively on the four track head.

2.10 PHYSICAL CHARACTERISTICS (without casework)

Height: 6 1/8 inches
Width: 8 3/4 inches
Depth: 9 3/8 inches
Weight: 4 pounds 6 ounces

2.11 POWER REQUIREMENTS

AC Power: None

DC Power: 1. +5 volts regulated 2.5% @ 1.0 ampere
2. +12 volts regulated 3.0% @ 4.0 amperes peak for 25.0 milliseconds. 1.0 ampere average running current.
3. −12 volts regulated 3.0% @ 4.0 amperes peak for 25.0 milliseconds. 1.0 ampere average running current.

NOTE:

+12 volts and −12 volts are not required to deliver peak current simultaneously.

2.12 OPERATING ENVIRONMENT

Temperature: +5 to +45°C

Humidity: 20 to 80% without condensation

2.13 SHIPPING AND STORAGE ENVIRONMENT

NOTE:

The Cartridge Transport should not be shipped or stored with the Tape Cartridge in place.

Temperature: −40 to +60 C
Humidity: 0 to 95% without condensation

NOTE:

Avoid abrupt environmental changes to the Cartridge transport from the lower limits of storage to the upper limits of operating environment.

2.14 INTERFACE SIGNAL LEVELS

Logical 0: +5.0 Volts maximum
+2.8 Volts minimum
Logical 1: +0.4 volts maximum (24.0 milliamps nominal)
0.0 Volts minimum

2.15 INTERFACE DRIVERS AND RECEIVERS

Drivers: Open collector TTL circuit
Receivers: TTL circuit with termination at input

2.16 INTERFACE CABLE

Cable: Twisted pair, maximum length 6.0 feet (1.829 meters)
Connector: MDS edge connector part number 145006602 (2021) with MDS crimp, snap-in contacts part number 146002701 (44 required) (2021)
or MDS edge connector with solder contacts part number 145013302 (2021), which includes Solder-type contacts.
Retaining spring MDS part number 145016501 (2022)
MDS edge connector part number 145012902 (2022) with MDS crimp-type
Contacts part number 146007003 (2022) or with solder-type contacts part number 146008001.

2.17 INTERFACE SIGNALS

a. 2022 Signals

INPUT SIGNALS

1. Forward Run
2. Backward Run
3. Fast Forward Run
4. Fast Backward (Rewind)
5. Write Enable Channel 1
6. Write Enable Channel 2
7. Write Enable Channel 3
8. Write Enable Channel 4
9. Write Data Channel 1
10. Write Data Channel 2
11. Write Data Channel 3
12. Write Data Channel 4
13. +12 Volts Logic
14. +5 Volts Logic
15. −12 Volts Logic
16. Logic Ground
17. +12 volts Motor Drive
18. −12 Volts Motor Drive
19. Motor Return Ground
20. Chassis Ground

OUTPUT SIGNALS

1. Ready
2. Read Data Channel 1
3. Read Data Channel 2
4. Read Data Channel 3
5. Read Data Channel 4
6. PC 1 (Photocell No. 1)
7. PC 2 (Photocell No. 2)
8. Not File Protect

b. 2021 Signals

INPUT SIGNALS

1. Forward Run
2. Backward Run
3. Fast Forward Run
4. Rewind
5. Write Enable
6. Write Data Channel 1
7. Write Data Channel 2
8. Write Data Channel 3
9. Write Data Channel 4
10. +12 Volts Logic
11. +5 Volts Logic
12. −12 Volts Logic
13. Logic Ground
14. +12 Volts Motor
15. −12 Volts Motor
16. Motor Return Ground
17. Chassis Ground

OUTPUT SIGNALS

1. Ready
2. Read Data Channel 1
3. Read Data Channel 2
4. Read Data Channel 3
5. Read Data Channel 4
6. PC 1 (Photocell #1)
7. PC 2 (Photocell #2)
8. Not File Protect

SECTION III
THEORY OF OPERATION

3.1 GENERAL

This section describes the theory of operation in general terms of the tape transport. For an in-depth understanding of the control circuitry and Read Write Electronics refer to Section VIII of this manual.

3.2 CARTRIDGE INSERTION

The cartridge is placed in the transport (see Figure 3-1) and pushed in until it is seated (see Figure 3-2) with the capstan and drive shaft engaged. An area of the cartridge opens automatically to allow the Read/Write head to contact the tape. It is normal procedure to rewind the cartridge prior to removing it from the transport.

NOTE:

It is recommended that a new cartridge be cycled to EOT then rewound to BOT to normalize tape tension before recording any data. Any cartridge suspected of exposure to sudden temperature variation and/or physical shock should be cycled before use.

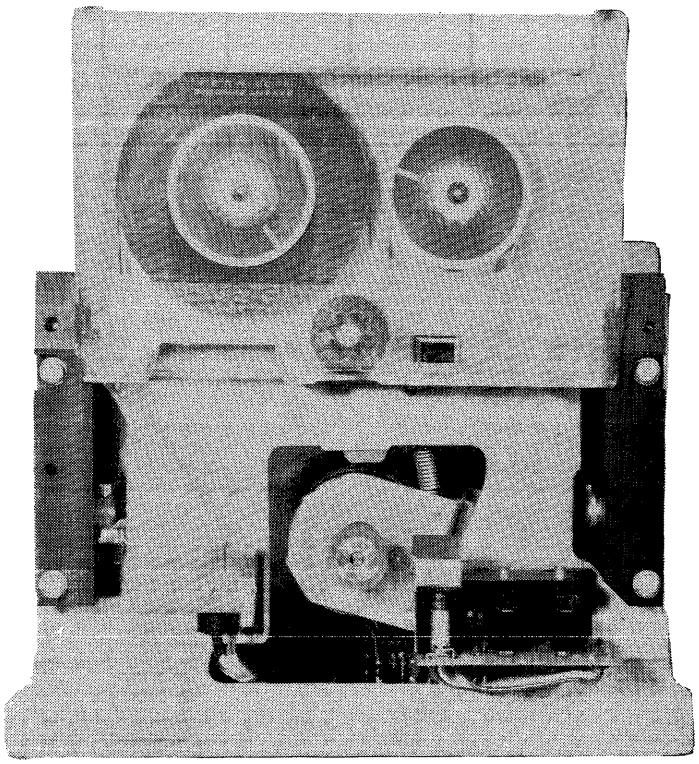


Figure 3-1. Tape Cartridge Partially Inserted

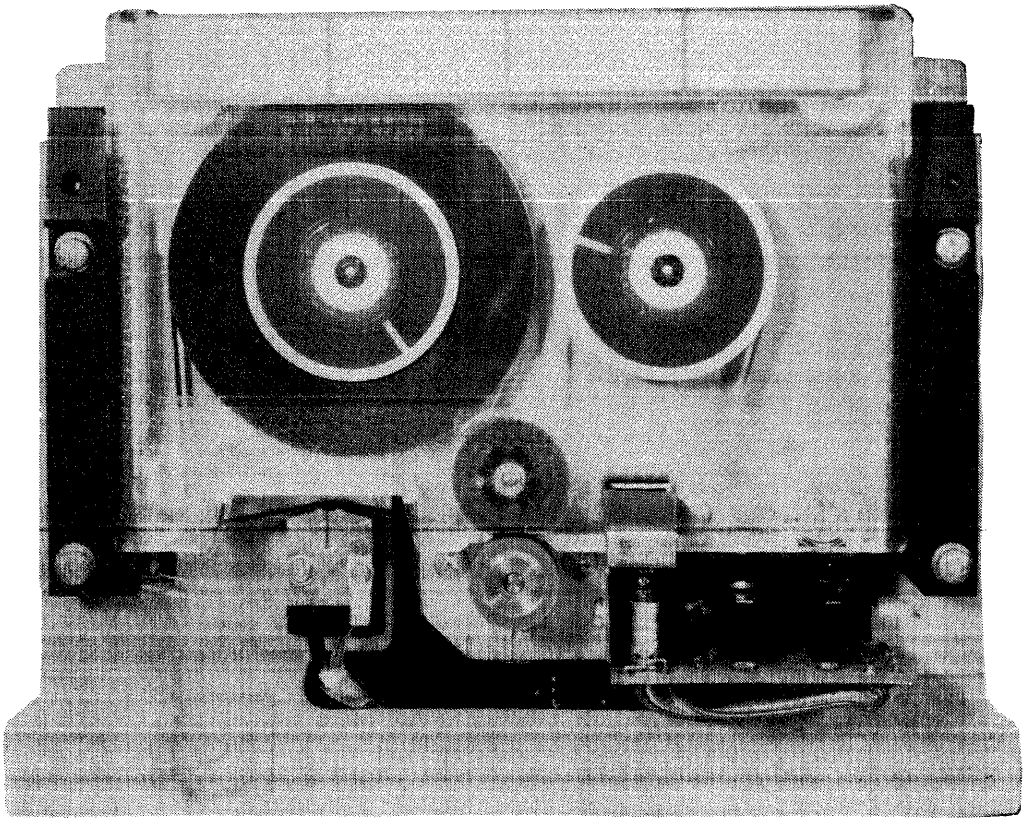


Figure 3-2. Tape Cartridge Seated In Transport

3.3 INTERFACE

The controller must supply through the interface the voltages (see Section VI of this manual) required to operate the Cartridge Transport. The controller also provides commands and write data through the interface.

The cartridge Transport supplies through the interface status signals, read data and punched hole detector signals.

The interface design is TTL (Transistor Transistor Logic). See Section II of this manual for the interface signal parameters.

3.4 READY STATUS

The READY interface output line on the cartridge transport is used to indicate that the cartridge is inserted in the transport and the punched hole lamp is activated.

3.5 TAPE MARKERS AND PUNCHED HOLE DETECTORS

The punched hole detector is used to monitor tape status. The tape has punched hole markers (see Figure 3-3) at four different positions. The punched hole detector indicates when the tape is at any of the four positions. The four positions are:

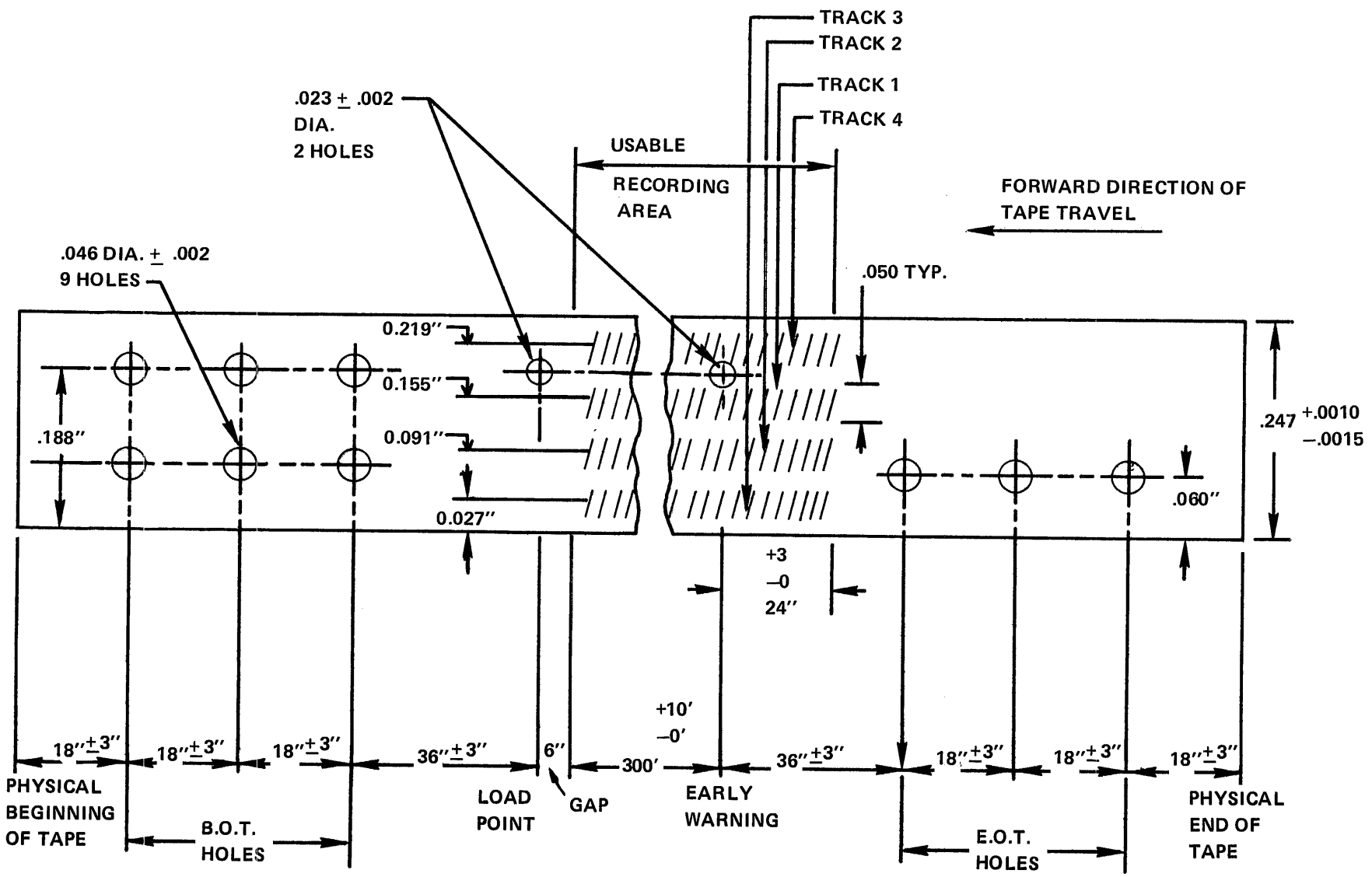


Figure 3-3. Punched Hole Tape Markers

a. BOT (Beginning of Tape)
This marker indicates the physical beginning of tape. It ends a rewind operation. There are three sets of two holes which activate PC-1 and PC-2 photocells.

b. LP (Load Point)
This marker indicates the beginning of permissible area on tape for recording data. A single hole is punched on the tape near the beginning which activates PC-1 photocell.

c. EW (Early Warning)
This marker indicates the approaching end of permissible recording are. A single hole is punched on the tape near the end but before the EOT marker. This hole activates PC-1 photocell.

d. EOT (End of Tape)
This marker indicates the recording of data should end at that position on tape. There are three holes punched on one side of the tape. These holes activate PC-2 photocell.

3.6 FORWARD READ OPERATION

A forward read operation moves the tape in the forward direction 30 inches per second. Tape data is supplied to the interface from the read head.

3.7 FAST FORWARD RUN OPERATION

The fast forward run operation moves the tape in the forward direction 90 inches per second. This operation may be used to search the tape for data blocks as required.

3.8 BACKSPACE OPERATION

The backspace operation moves the tape one block in the backward direction 30 inches per second. This operation permits a data block to be re-written during a Write or Re-Read during a Read. A Write-Edit operation is not permissible.

3.9 REWIND OPERATION

Rewind moves the tape in the backward direction 90 inches per second. The rewind operation is ended when the BOT marker is detected.

3.10 FILE PROTECT

The file protect plug on the tape cartridge must be placed in the safe position when it is desired to protect the data on the tape. When the cartridge is inserted in the transport with the file protect plug in the safe position the NOT FILE PROTECT interface line is false.

3.11 WRITE ENABLE LINES

The write enable lines allow write current to flow through the recording head. Each write data channel has its own write enable line. The write enable signal acts as a file protect in addition to the file protect signal.

SECTION IV

MAINTENANCE ADJUSTMENT PROCEDURES

4.1 GENERAL

Connect the Cartridge Transport to a controller to perform the maintenance procedures 4.2 through 4.8. Check the voltages at the input to the cartridge transport interface. See Table 6-a or 6-b.

An oscilloscope is required for the maintenance procedure in Section 4.2 through 4.8.

4.2 BOT/EOT ADJUSTMENT

Turn power on to the cartridge transport. Check to see if the BOT/EOT detector lamp is illuminated which indicates the detector is activated. Position the load point hole of a tape cartridge over the detector. This hole is the first hole beyond the BOT holes (See Fig. 3-3). Use an oscilloscope adjusted to observe 5.0 VDC and using the internal trigger connect Channel A to TP-6 (collector of Q1) on the control and motor drive printed circuit board (See Fig. 4-1). Manually move the load point hole back and forth across the front of the detector by turning the capstan. Let the load point hole come to rest in front of the detector at the point where the collector saturation voltage at TP-6 is a minimum. It is necessary to adjust the vertical sensitivity of the oscilloscope to 50 millivolts per centimeter or less to effectively observe the minimum voltage. Loosen the two screws holding the reflector to the side of the detector block, just enough so that the reflector can be moved upward or downward, and forward or backward. Obtain a position of the reflector so as to achieve the lowest collector saturation voltage at TP-6 on the control and motor drive printed circuit board. Now tighten the two screws which fasten the reflector to the detector block.

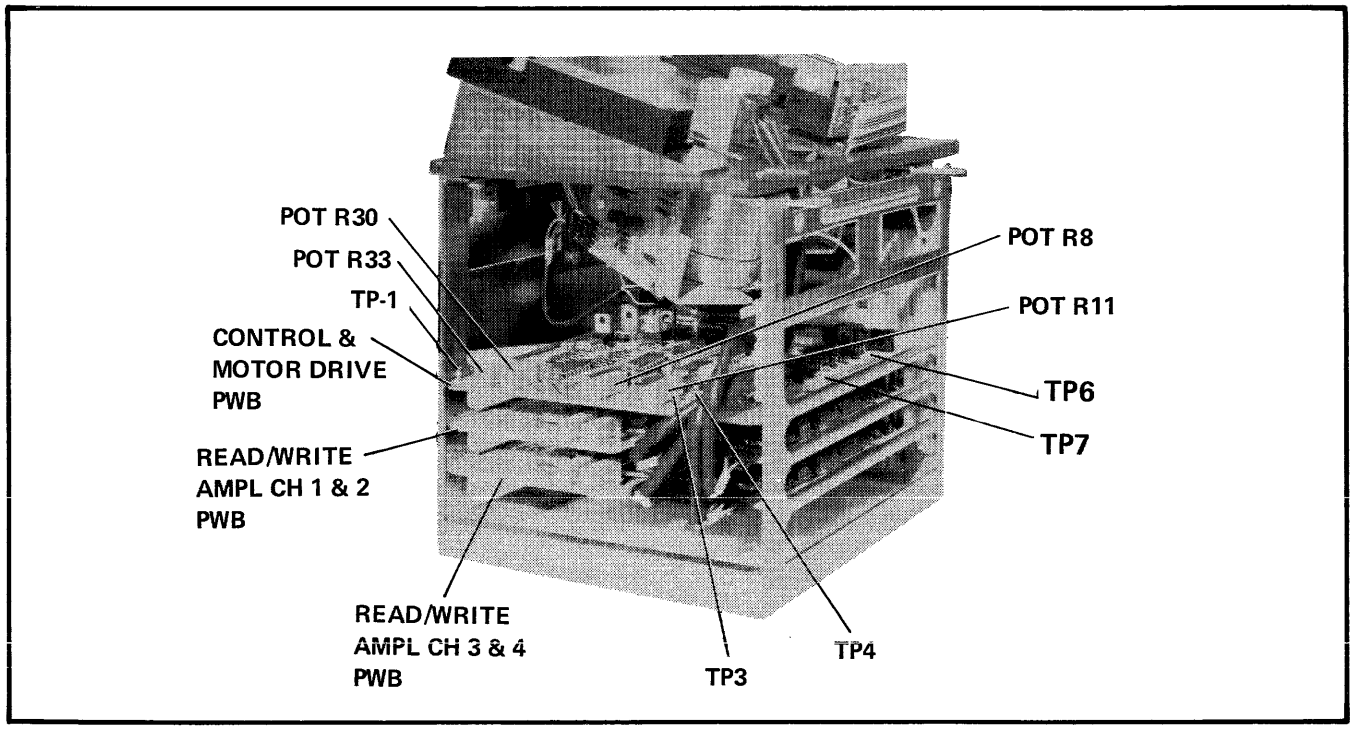


Figure 4-1. Printed Circuit Board Locations

Move the load point hole off the front of the detector so that no hole is in front of the detector. Adjust the vertical sensitivity of the oscilloscope to measure 5 VDC at TP-6 of the control and motor printed circuit board. Make certain that TP-6 is at 5 VDC with no hole in front of the detector and the tape cartridge is in its captive position in the guides. Now bottom the cartridge in the guides by pushing the tape cartridge as far forward as it will possibly go. With the tape cartridge in its captive position or bottomed position the voltage at TP-6 should remain at 5 VDC. If the voltage goes below 5 VDC then the reflector must be adjusted so that the detector is not activated with no hole present. Typically this is done by adjusting the reflector position slightly toward the rear of the detector block. After this is done, the collector saturation voltage must be rechecked to see that it is close to the minimum voltage level described in the above write-up.

When the load point hole adjustment is completed, the BOT holes are now placed in front of the detector. These are the three sets of two holes at the physical beginning of the tape (See Fig. 3-3). Using an oscilloscope adjusted to observe 5.0 VDC and using the internal trigger connect Channel A of the oscilloscope to TP-6 (Collector of Q1) and Channel B to TP-7 (Collector of Q4) of the control and motor drive printed circuit board, manually move the BOT hole back and forth across the front of the detector by the turning of the capstan. Both the voltage at TP-6 and TP-7 should go from +5VDC when the BOT holes are not in front of the detector to a minimum voltage when the BOT holes are in front of the detector. When measuring the minimum voltage, the vertical sensitivity of the oscilloscope should be 50 millivolts per centimeter or less. The resultant minimum collector saturation voltage observed at both TP-6 and TP-7 should be as low as the voltage observed at TP-6 with the load point hole in front of the detector.

The detection of the early warning hole and the EOT hole should be satisfactory when the above adjustment is completed. Move the tape from the controller to determine if the BOT and EOT circuits are functioning properly.

4.3 SPROCKET SHAPER

Connect an oscilloscope to the TP-1 on the sprocket shaper printed circuit board (See Fig. 4-2). Use

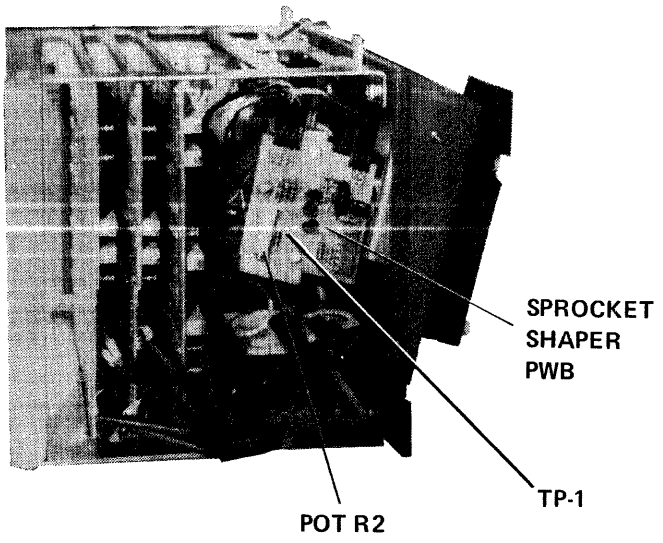


Figure 4-2. Sprocket Shaper Printed Circuit Board

the oscilloscope internal trigger and adjust the vertical sensitivity to observe a 5V P-P waveform. After inserting a tape cartridge, move the tape from the controller at 90 ips in the forward direction or 90 ips in the backward direction. Adjust potentiometer R2 on the sprocket shaper printed circuit board until a waveform with minimum jitter on the leading and trailing edges is obtained. The waveform at TP-1 should be an AC waveform with a period close to 74 microseconds at 90 ips. The period will depend on where the speed potentiometer is set (see speed adjustment). The waveform at TP-1 can be checked with the tape running at 30 ips, forward or backward. The period of the waveform should be close to 222 microseconds depending on where the speed potentiometer is set (see speed adjustment). Usually the sprocket signal requires no adjustment at 30 ips after being adjusted at 90 ips.

4.4 30 INCHES PER SECOND SPEED ADJUSTMENT

Connect an oscilloscope to TP-3 (See Fig. 4-1) on the control and motor drive printed circuit board. Use the internal trigger and adjust the vertical sensitivity to measure a 5 V P-P TTL waveform. Adjust potentiometer R8 on the control and motor drive printed circuit board (See Fig. 4-1) while running the tape forward or backward at 30 ips, to attain a sprocket waveform period of 222.0 microseconds. If a frequency meter is available, an alternate adjustment procedure is to connect the frequency meter to TP-3 on the control and motor drive printed circuit board, Adjust potentiometer R-8 on the control and motor drive circuit board until a sprocket waveform frequency of 4500 Hz is measured by the frequency meter, while running the tape forward or backward at 30 ips.

4.5 90 INCHES PER SECOND SPEED ADJUSTMENT

Connect an oscilloscope to TP-3 (See Fig. 4-1) on the control and motor drive printed circuit board. Use the internal trigger and adjust the vertical sensitivity to measure a 5 V P-P, TTL waveform. Adjust the potentiometer R11 on the control and motor drive printed circuit board (See Fig. 4-1) while running the tape forward or backward at 30 ips, to attain a sprocket waveform period of 74.0 microseconds. If the frequency meter is available, an alternate adjustment procedure is to connect the frequency meter to TP-3 on the control and motor drive printed circuit board. Adjust potentiometer R11 on the control and motor drive printed circuit board until a sprocket waveform frequency of 13,500 Hz is measured by the frequency meter, while running the tape forward or backward at 90 ips.

4.6 GAIN ADJUSTMENTS

Connect an oscilloscope to TP-1 on the printed circuit board in location J3 (See Fig 4-4). Use the internal trigger of the oscilloscope and adjust the vertical sensitivity to observe a 8 V P-P sinusoidal waveform. The period of the waveform will be a function of the density of the recorded data pattern. While reading a continuously recorded all "ones" or all "zeros" tape, adjust potentiometer R-37 on the Read/Write amplifier printed circuit board in location J3 for an output voltage of 8 volts peak to peak. This adjusts the gain of channel one. For units with more than one channel Table 4-a shows the test point and potentiometer for each channel. Adjust each channel for 8.0 volts peak to peak.

The cartridge recorder is capable of operating between a recording density of 250 bpi and 1600 bpi, at a tape speed of 30 ips. The readback gains of a standard, factory tested, recorder are adjusted with a continuously written, all "ones", data pattern at a density of 1600 bpi and a tape speed of 30 ips. If any density other than 1600 bpi is used, the readback gain must be adjusted according to the procedure described in the paragraph to yield a readback analog waveform of 8 volts peak to peak with a continuously recorded all "ones" or all "zeros", data pattern at the newly selected density and a tape speed of 30 ips.

4.7 FORWARD PLUG ADJUSTMENT

This adjustment is performed with a tape cartridge recorded with a continuous all "ones" or all "zeros" pattern. Connect Channel A of an oscilloscope to TP-1 on the Read/Write amplifier printed circuit board in location J3 (See Fig. 4-4). Connect Channel B of the oscilloscope to TP-2 on the control and motor drive printed circuit board (See Fig. 4-1 and Fig. 4-4). Adjust the vertical sensitivity of Channel A to display an 8 volt peak to peak sinusoidal wavefrom and the vertical sensitivity of Channel B to display a 5 volt TTL signal. Use the internal trigger of the scope and trigger off of Channel B. Operate the cartridge transport so that the tape starts and stops in the forward direction at a running tape speed of 30 ips. Observe the two waveforms on the oscilloscope (See Fig. 4-3). Adjust potentiometer R33 on the control and motor drive printed circuit board (See Fig. 4-1 or 4-4) for a stop time of 20 milliseconds, ± 2 milliseconds. The adjustment is made at normal room temperature and after the tape has completed at least two forward passes from BOT to EOT.

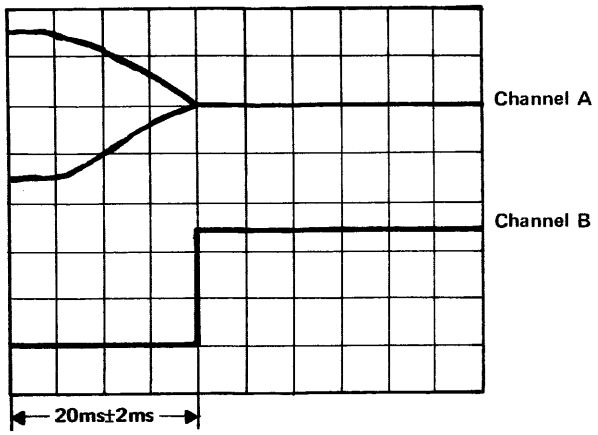


Figure 4-3 Deceleration

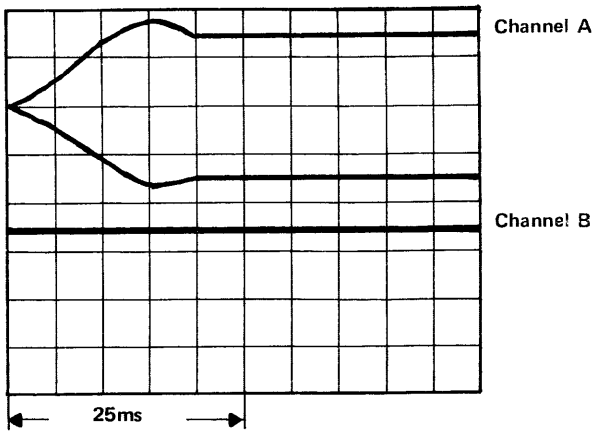


Figure 4-3a Acceleration

If a run signal is available on a test point in the Controller, it can be used to trigger the oscilloscope. In this case the external trigger input of the oscilloscope can be connected to the run signal. Trigger the oscilloscope on the absence of run edge of the signal. Then observe the waveform described in this paragraph on Channel A and Channel B of the oscilloscope and make the adjustment with potentiometer R33 on the control and motor drive printed circuit board (See Fig. 4-1 or Fig. 4-4) for a stop time of 20 milliseconds, ± 2 milliseconds. The start portion of the waveform can be observed on Channel A of the oscilloscope by now triggering the oscilloscope off of the presence of run edge of the trigger signal. There is no adjustment for the display but a properly functioning cartridge recorder will yield the display shown in Figure 4.3A.

4.8 BACKWARD PLUG ADJUSTMENT

Use the same procedure for the backward plus adjustment as described for the forward plug adjustment (See Section 4.7) except for running the tape backward in a START-STOP mode and adjusting potentiometer R30 (See Fig. 4-1 or 4-4).

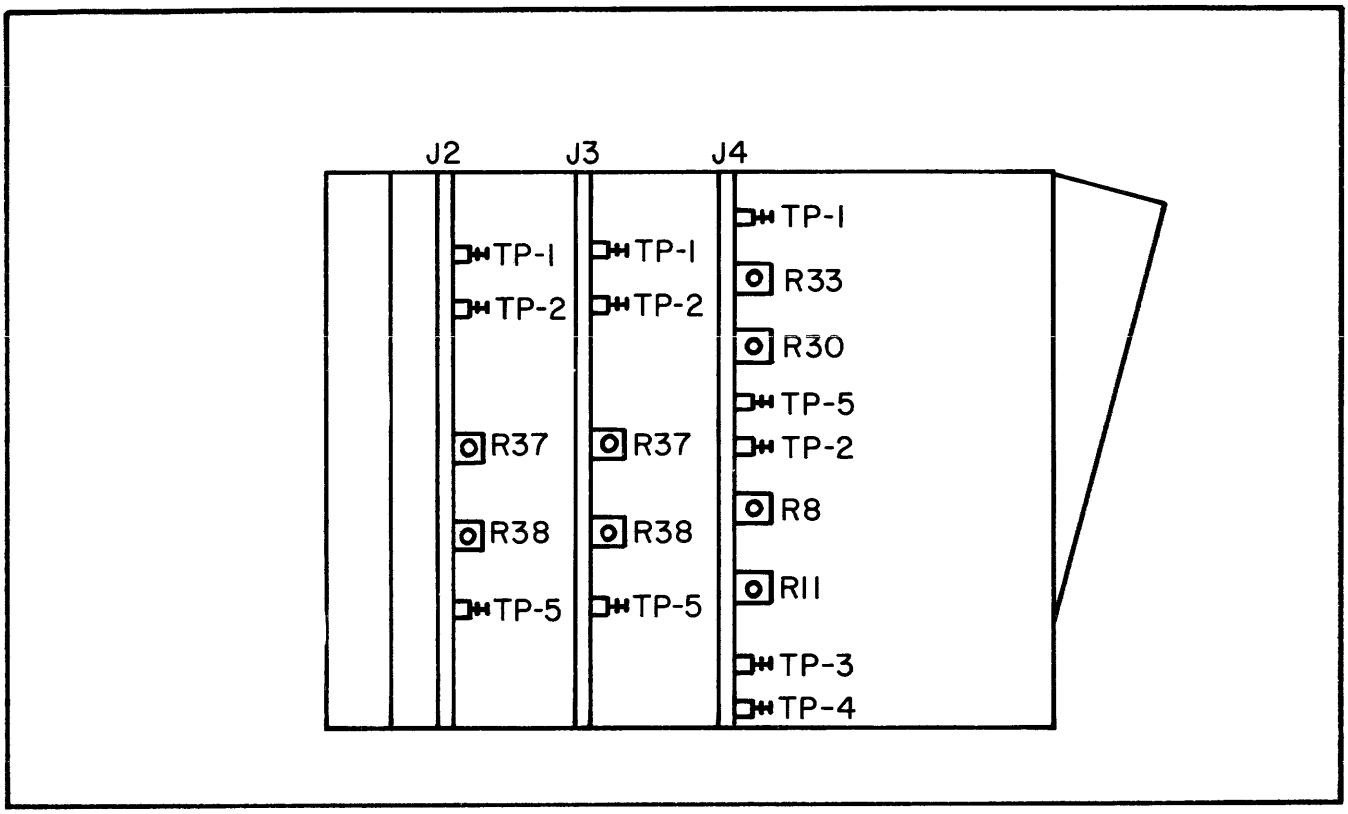


Figure 4-4 Adjustment Potentiometers And Test Points

		QTY.	M2021-1	T2021-1 A2021-1	M2021-2	T2021 2 A2021-2	M2021-4 M2022-4	T2021-4 A2022-4
034336901	Motor, Capstan Drive	1	X	X	X	X	X	X
034336203	Sprocket Shaper PCB Assy.	1	X	X	X	X	X	X
302004801	EOT/BOT Lamp	2	X	X	X	X	X	X
034335902	EOT/BOT Read Assy.	1	X	X	X	X	X	X
436007001	Photo Transistor FPT-100	1	X	X	X	X	X	X
034366701	Encoder Assy. (optical tach)	1	X	X	X	X	X	X
034359501	Head Assy. Dual Gap 1 Track	1	X	X				
034359601	Head Assy. Dual Gap 2 Track	1			X	X		
034373301	Head Assy. Dual Gap 4 Track	1					X	X
436011101	Power Transistor MJE2955	2		X		X		X
436007101	Power Transistor MJE3055	2		X		X		X
034334705	Control & Motor Drive PCB	1		X		X		X
*034382803	Read/Write Amp #1 PCB Phase Encoded 1 Track	1		X				
**034383003	Read/Write Amp #2 PCB Phase Encoded 2 Track	1				X		X

Table 4-a. Recommended Spare Parts

Model # Key

M = Mechanism Only
A = Mechanism & Electronics & Cover
T = Mechanism & Electronics & Housing
1 = Single Track 2 = Dual Track 4 = 4 Track

*034335003 Read Write Amp #1 PCB Bi-Phase 1 Track (Optional)
**034365203 Read Write Amp #2 PCB Bi-Phase 2 Track (Optional)

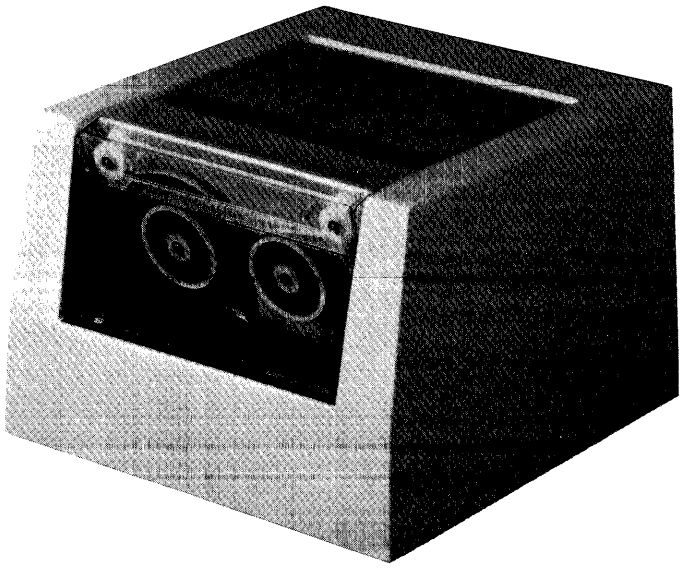
SECTION V
UNPACKING–INSTALLATION–TROUBLESHOOTING

5.1 UNPACKING

When unpacking the Cartridge Transport remove the tape used to support the capstan motor. There are no other special considerations for unpacking this device except to exercise normal care in handling. If desired the packing material can be retained for possible reshipment or storage.

5.2 INSTALLATION (Refer to NOTE under paragraph 4.9.0)

The Cartridge Transport is designed to be used with the cartridge in the upright vertical position as shown in Figure 5-1. However if it is desired that the transport operate in the horizontal position, the capstan support spring should be changed. See Figure 7-3 for correct extension spring.



Cartridge Tape Transport with Housing

Figure 5-1. Cartridge Transport In Vertical Operating Position

5.3 PRINTED CIRCUIT BOARDS

The Cartridge Transport has three printed circuit board locations. Figure 5-2 shows the connector location designation for each printed circuit board and the title of the printed circuit board for each location.

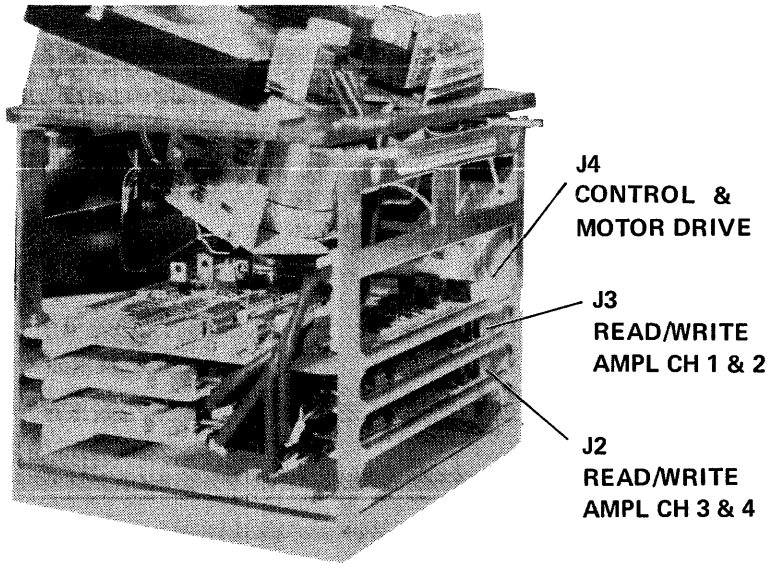
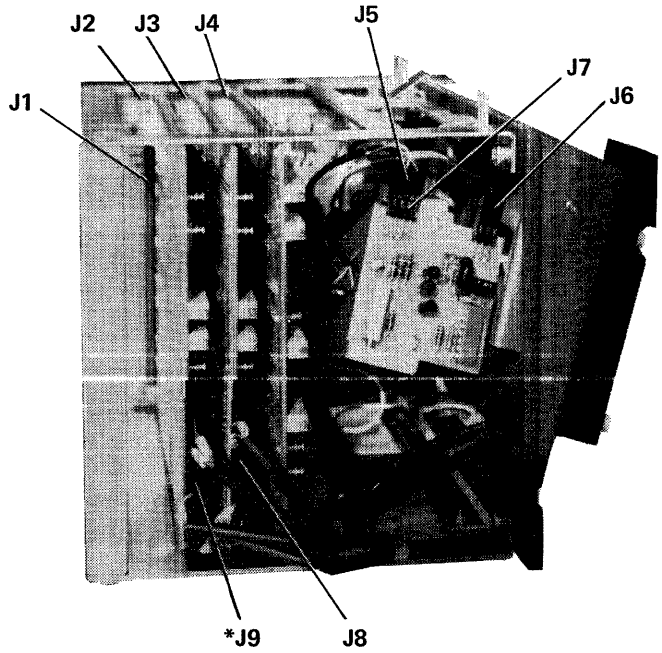


Figure 5-2. Printed Circuit Board Plug Locations

5.4 CONNECTOR LOCATIONS

Figure 5-3 shows the connector locations on the Cartridge Transport. Table 5-a shows the titles of each connector.



*NOTE:

J9 is on 4 track units only, it plugs into channels 3 and 4 PWB.

Figure 5-3. Cartridge Transport Connector Locations

Table 5-a. Connector Titles

CONNECTOR	TITLES
J1	Interface
J2	Read/Write Channels 3 & 4
J3	Read/Write Channels 1 & 2
J4	Control Motor Drive
J5	Chassis Connector
J6	Sprocket Connector
J7	Encoder Connector
J8	Read/Write Head Channels 1 & 2
*J9	Read/Write Head Channels 3 & 4

*NOTE: Four track units only.

5.5 PHOTOCELLS

The location of the photocells PC-1 and PC-2 are shown in Figure 5-4.

5.6 CARTRIDGE SWITCH AND FILE PROTECT SWITCH

The location of the cartridge switch and the file protect switch are shown in Figure 5-4.

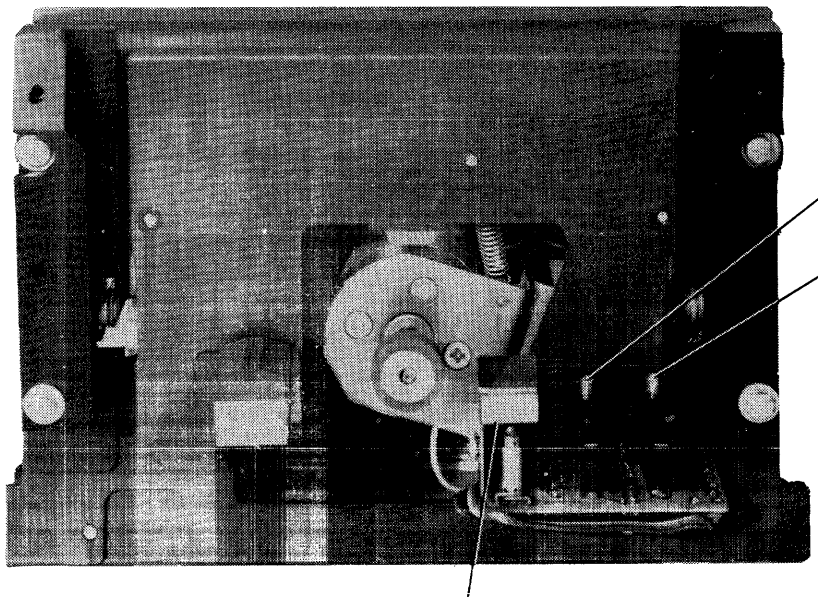


Figure 5-4. Photocell And Switch Locations

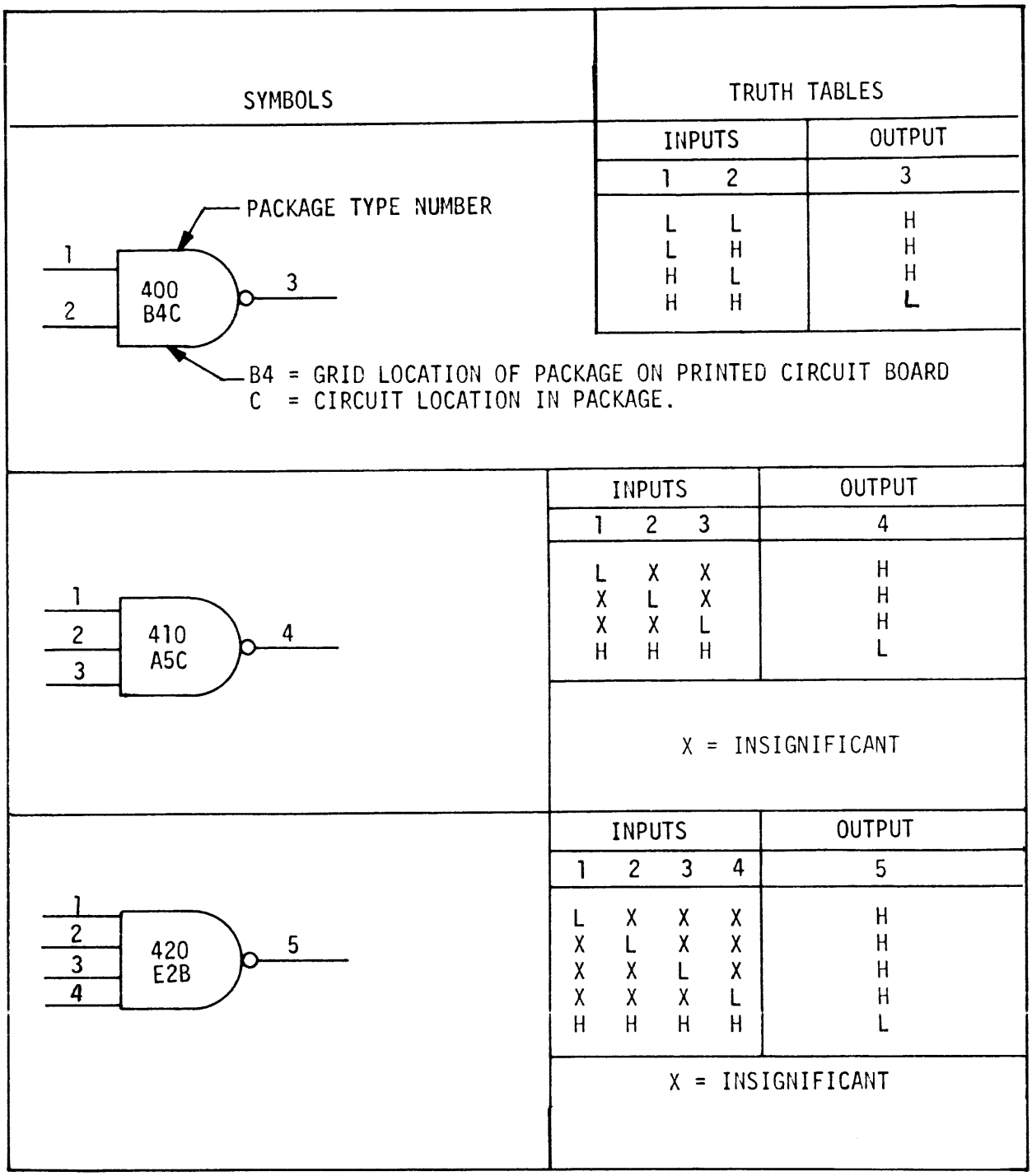


Figure 5-5. Types of Nand Gate Symbols With Truth Tables

5.7 INTERFACE

The interface connector location is shown in Figure 5-3. See section six of this manual for a description of the Cartridge Transport interface.

5.8 LOGIC SYMBOLS

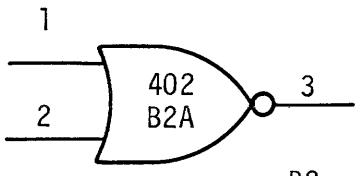
The various symbols used on the Tape Transport logic drawings are shown in Figures 5-5, thru 5-14.

5.8.1 Nand Gates

The Nand Gate (see Figure 5-5) is an electronic circuit with two or more inputs which control one output from the circuit. The truth tables shown in Figure 5-5 give the various combinations of input signals and what the output level is for each combination. A true level on all input lines to a Nand Gate gives a true level output. When any of the input lines to a Nand Gate are false the output line is false.

5.8.2 Nor Gates

The Nor Gate (see Figure 5-6) is an electronic circuit with two or more inputs which control one output from the circuit. The truth tables shown in Figure 5-6 gives the various combinations of input signals and what the output level is for each combination. A true level on any input line to a Nor Gate gives a true level output. When all the input lines to a Nor gate are false the output line is false.

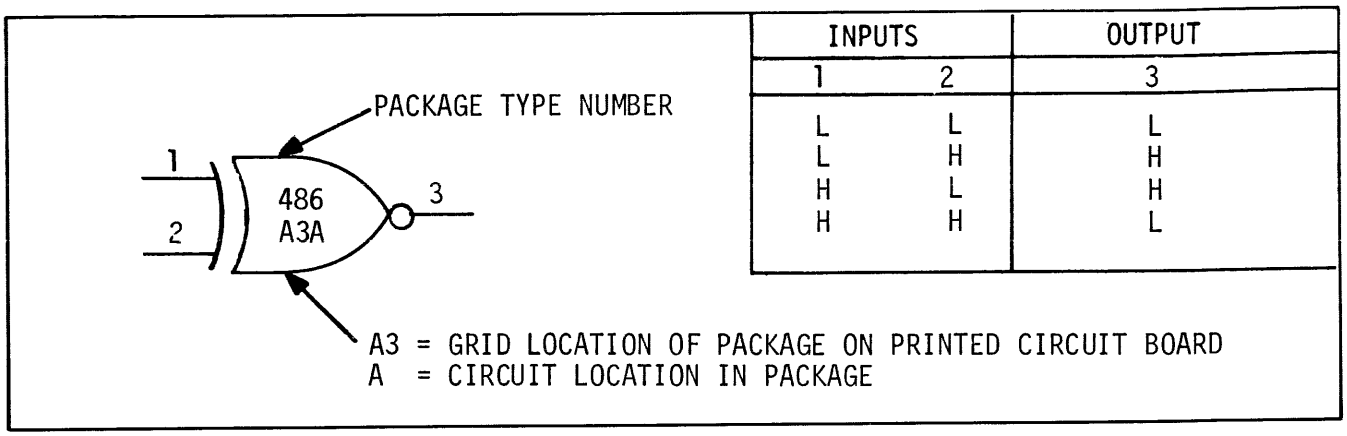
SYMBOL	TRUTH TABLE	
	INPUTS	OUTPUT
PACKAGE TYPE NUMBER	1 2	3
	L L L H H L H H	H L L L

B2 = GRID LOCATION OF PACKAGE ON PRINTED CIRCUIT BOARD
A = CIRCUIT LOCATION IN PACKAGE

Figure 5-6. Type of Nor Gate Symbol With Truth Table

5.8.3 Exclusive-Or Gate

The Exclusive-or Gate (see Figure 5-7) is an electronic circuit with two inputs which control one output from the circuit. The truth table shown in Figure 5-7 gives the various combinations of input levels and what the output level is for each combination. Like levels on both inputs the output is false. Different levels on the inputs the output is true.



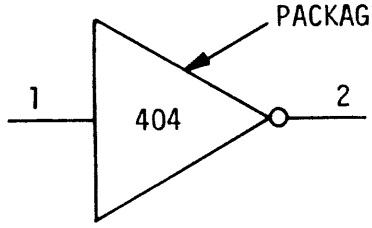
INPUTS		OUTPUT
1	2	3
L	L	L
L	H	H
H	L	H
H	H	L

Figure 5-7. Exclusive-or Gate With Truth Table

5.8.4 Inverters

The inverter (see Figure 5-8) is an electronic circuit with one input and one output. The truth table shown in Figure 5-8 gives the two conditions for an Inverter circuit. A low level input gives a high level output. A high level input gives a low level output.

SYMBOL



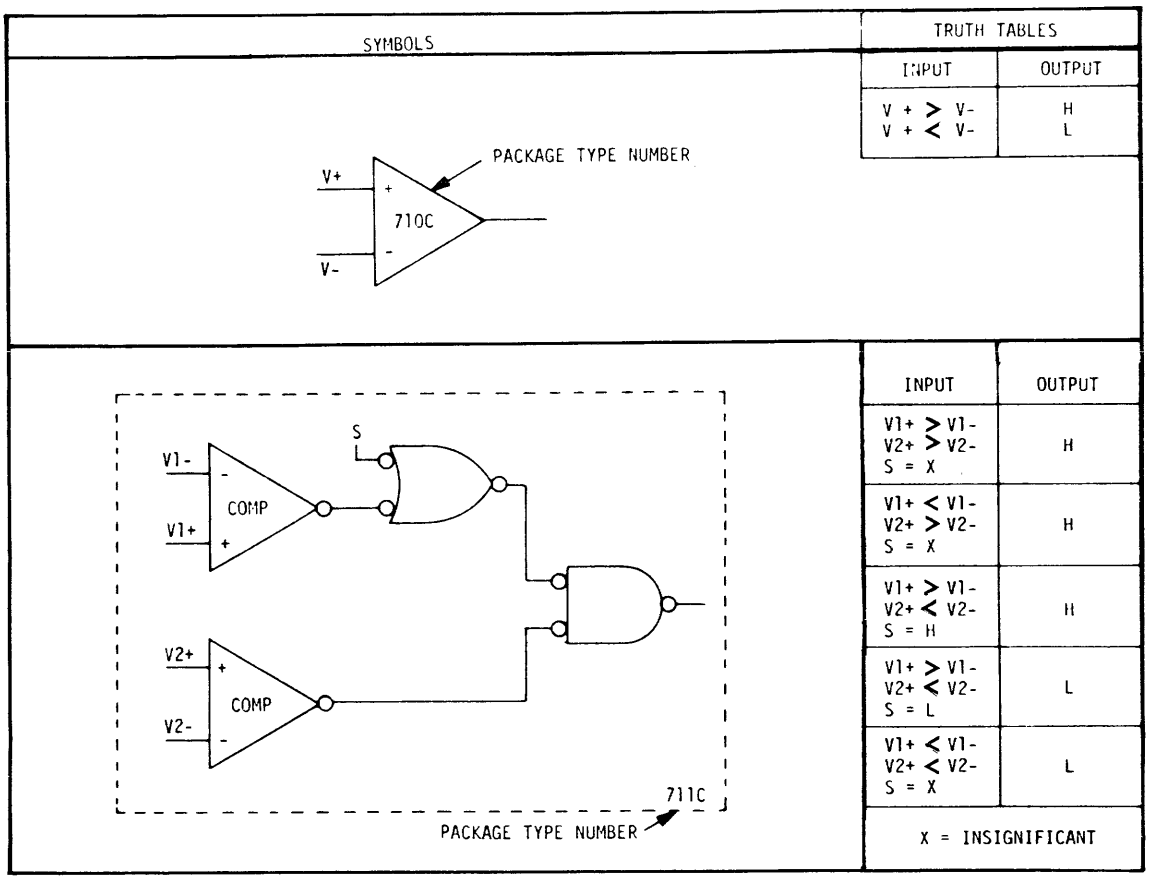
TRUTH TABLE

INPUT	OUTPUT
1	2
L	H
H	L

Figure 5-8. Type of Inverter Symbol With Truth Table

5.8.5 Comparators

The Comparator (see Figure 5-9) is an electronic circuit with two or more inputs and one output. Two input lines are compared for a difference in voltage levels. The output of the Comparator (see truth table in Figure 5-9) is a high level or low level determined by the input signals being equal in voltage levels, or one line is greater than or less than the other line.



TRUTH TABLES

INPUT	OUTPUT
V + > V-	H
V + < V-	L

INPUT	OUTPUT
V1+ > V1- V2+ > V2- S = X	H
V1+ < V1- V2+ > V2- S = X	H
V1+ > V1- V2+ < V2- S = H	H
V1+ > V1- V2+ < V2- S = L	L
V1+ < V1- V2+ < V2- S = X	L

X = INSIGNIFICANT

Figure 5-9. Types of Comparator Symbols With Truth Tables

5.8.6 Differential Operational Amplifiers

The Differential Operational Amplifier (see Figure 5-10) is an electronic circuit with two inputs and a single or dual output. The output of the amplifier is the difference between the two input lines multiplied by the gain of the circuit.

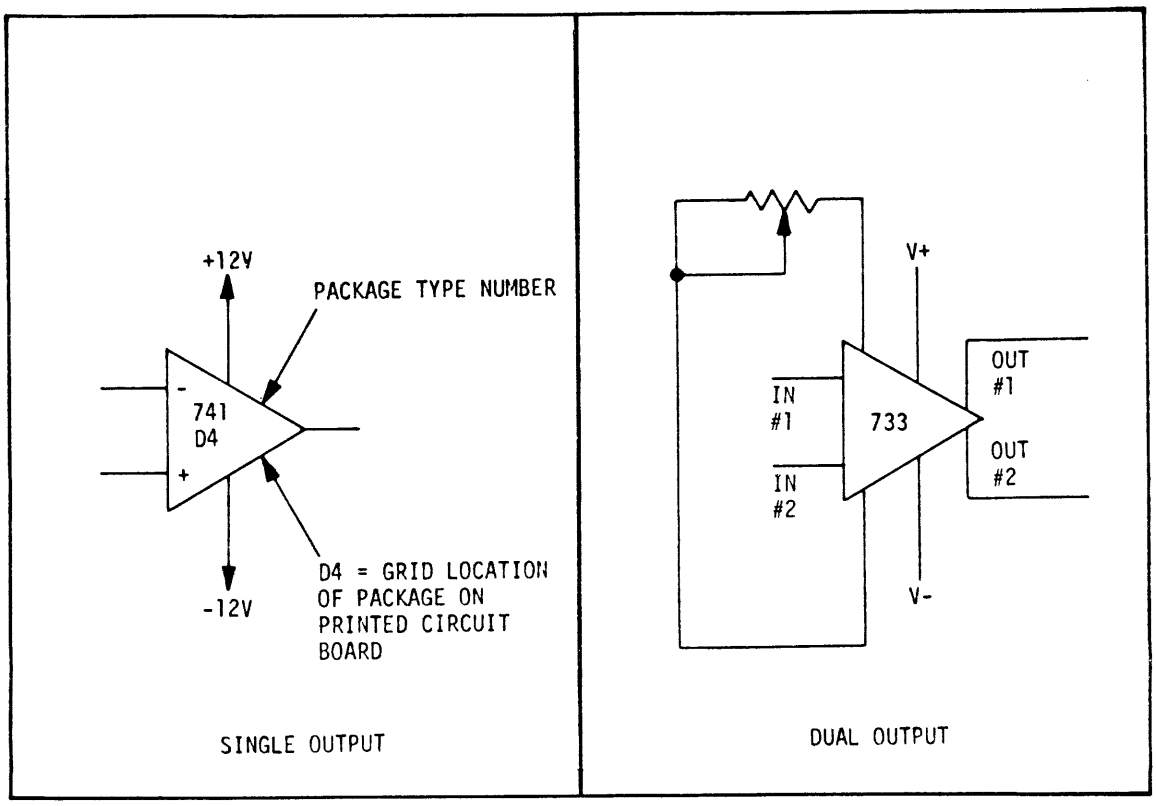


Figure 5-10. Type of Differential Operational Amplifier Symbols

5.8.7 Flip Flop

The Flip Flop (see Figure 5-11) is an electronic circuit with two or more inputs and two outputs. The set-reset Flip Flop shown has a set input line and a reset input line. The set output of a Flip Flop is generally used to alert gates. The reset output of a Flip Flop is generally used to inhibit gates. The Flip Flop serves as a memory in the set state indicating a signal was received on the reset input line.

The J-K Flop (see Figure 5-11) output is determined by the J and K input levels at the time a negative going signal is applied to the clock input.

The truth table in Figure 5-11 shows the signal level at the J and K inputs and the output levels when a signal is applied to the clock input for each condition. The four conditions shown in the truth table are described below.

a. When the J and K inputs are both low at the time a signal is applied to the clock input, there is no change at the Q output.
b. When the J input is low and the K input is high at the time a signal is applied to the clock input, the Q output is a low level.
c. When the J input is high and the K input is low at the time a signal is applied to the clock input, the Q output is a high level.
d. When the J and K inputs are both high at the time a signal is applied to the clock input, the Q output goes to the level which the Q output was before the signal to the clock input.

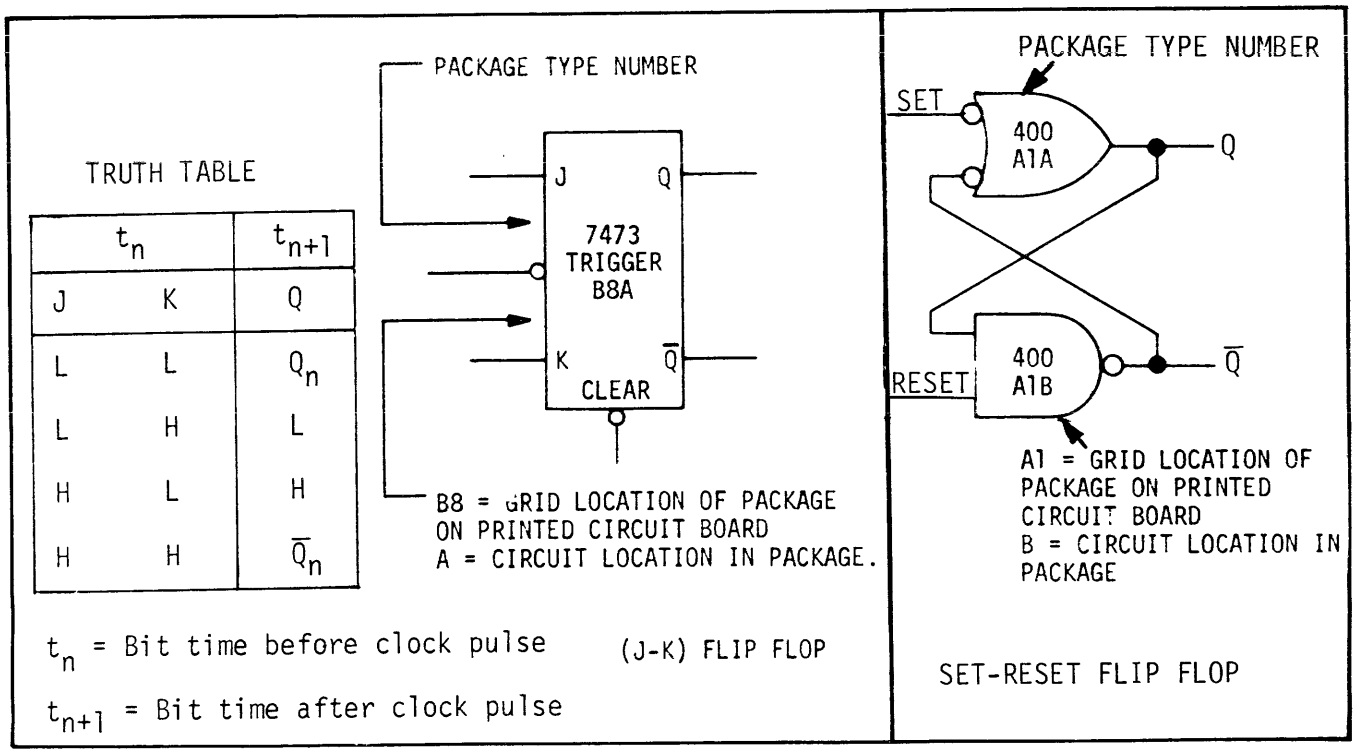


Figure 5-11. Types of Flip Flop Symbols

The D-type Flip Flop has a data input line (see Figure 5-12) and a clock input line. The output line is determined by the level in the input data line at the time a positive going signal is applied to the clock input.

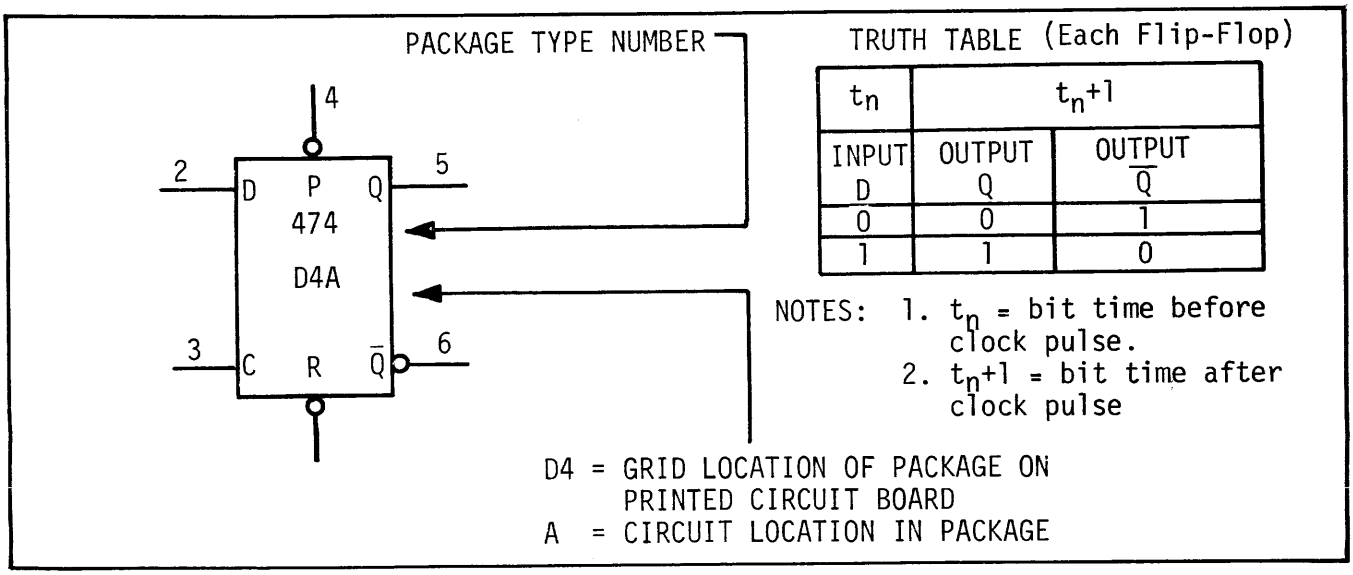


Figure 5-12. D—Type Flip Flop

5.8.8 Delay Circuits

The delay circuits shown in Figure 5-13 delay the leading edge of a positive going signal. The output signal ends at the same time the input signal ends. When the duration of the input signal is less time than the delay time of the circuit there is no signal output.

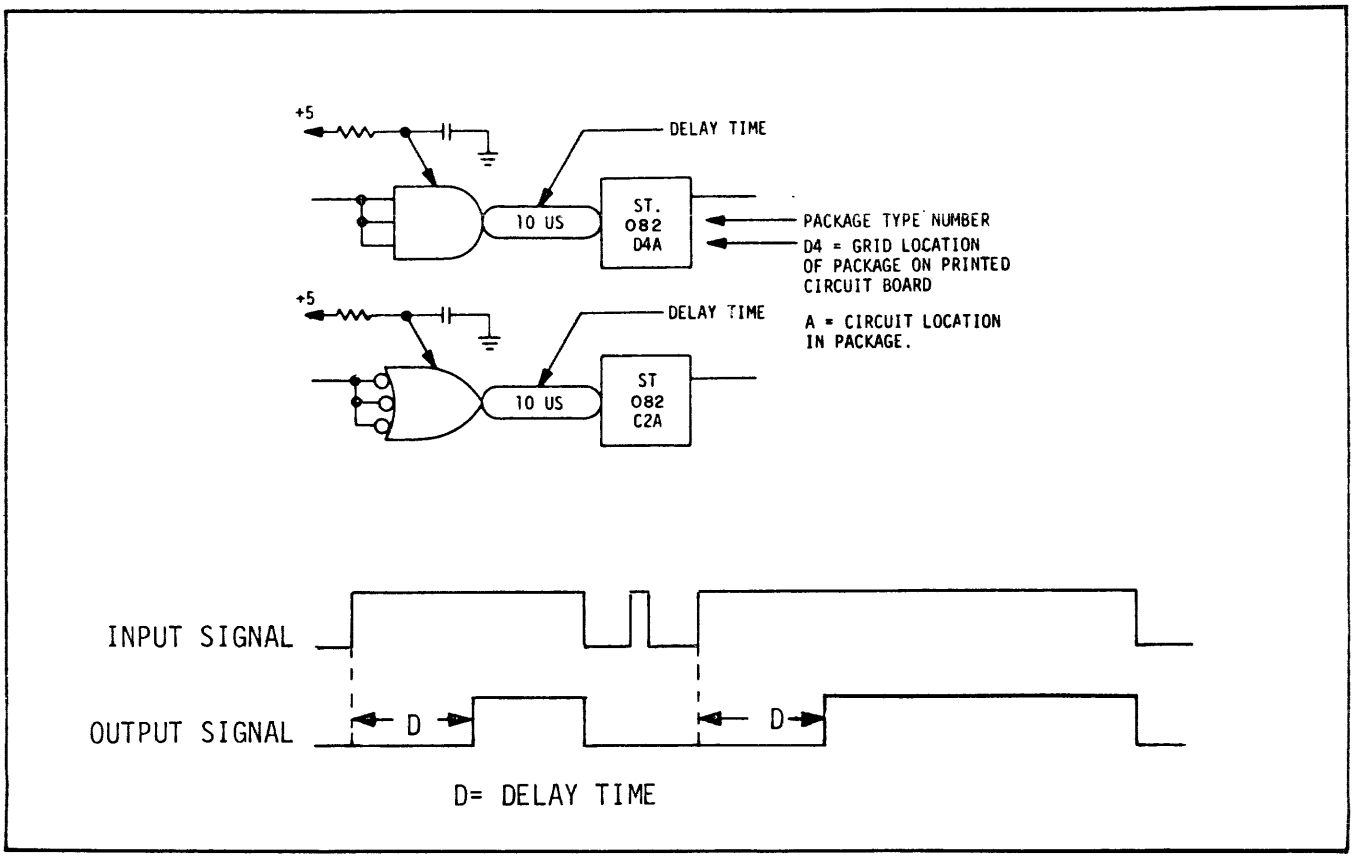


Figure 5-13. Delay Circuits

5.8.9 Retriggerable Delay Flop

The Retriggerable Delay Flop circuit is shown in Figure 5-14. When a signal is applied to the input of a Retriggerable Delay Flop the negative going edge of the signal triggers the delay flop. If no more negative going signals are applied to the input during the delay time of the circuit the delay flop is not retriggered. When a negative going signal occurs within the delay time of the circuit (before the delay time has elapsed) the delay flop is retriggered by the negative going input signal.

5.8.10 Non-Retriggerable Delay Flop

The Non-Retriggerable Delay Flop circuit is shown in Figure 5-15. When a signal is applied to the input of a Non-Retriggerable Delay Flop the negative going edge of the signal triggers the Delay Flop. The Delay Flop cannot be retriggered by another negative going signal that occurs before the delay time of the circuit has elapsed.

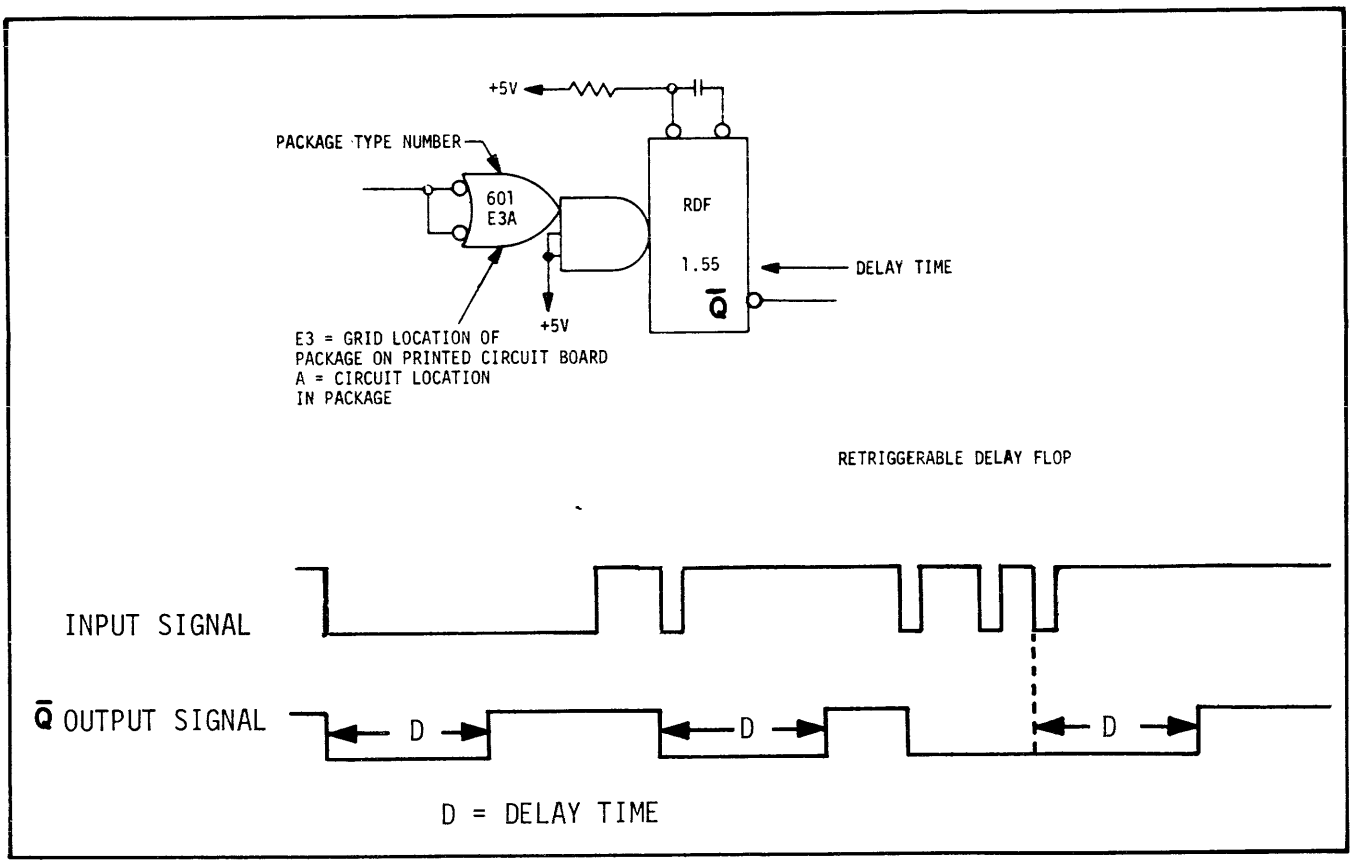


Figure 5-14. Retriggerable Delay Flop

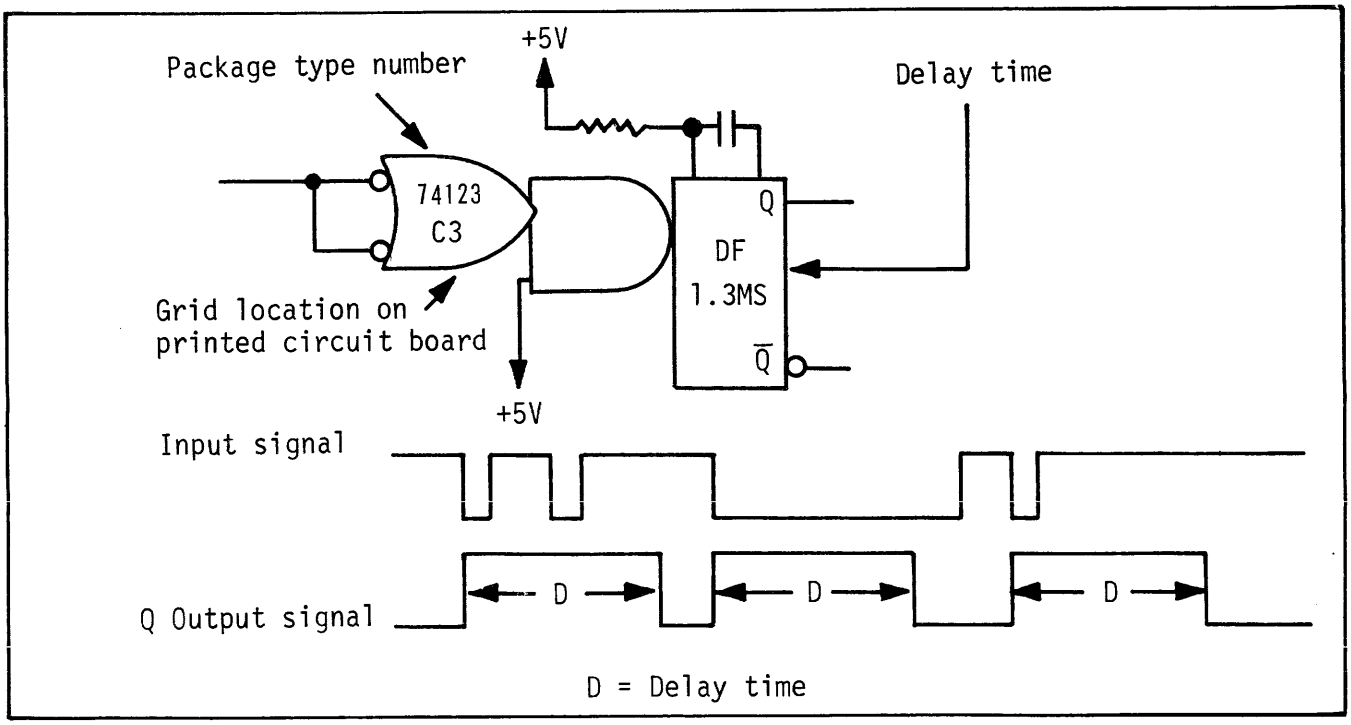


Figure 5-15. Retriggerable Delay Flop

5.8.11 Schmitt Trigger

The Schmitt Trigger circuit is designed to give an output at a preselected threshold of the input signal. The input signal level that produces an output is determined by the circuit design at the input of the integrated circuit package. Figure 5-16 shows the logic symbol for a Schmitt Trigger with input and output signals.

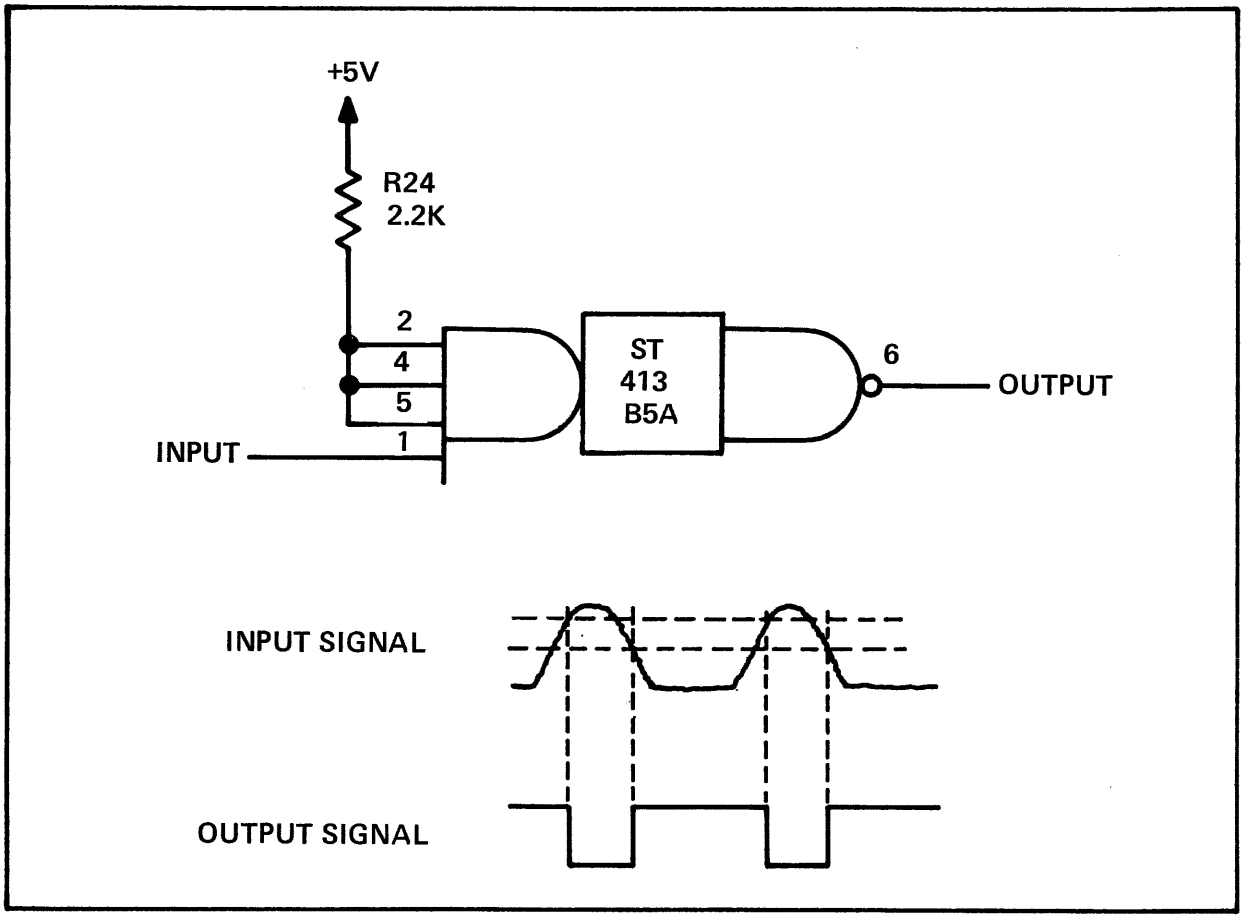


Figure 5-16. Schmitt Trigger

SECTION VI

INTERFACE

6.1 INTERFACE RECEIVERS

The Cartridge Transport Interface Receivers are TTL (Transistor Transistor Logic) circuits with input line terminations. Figure 6-1 shows a Cartridge Transport Receiver circuit.

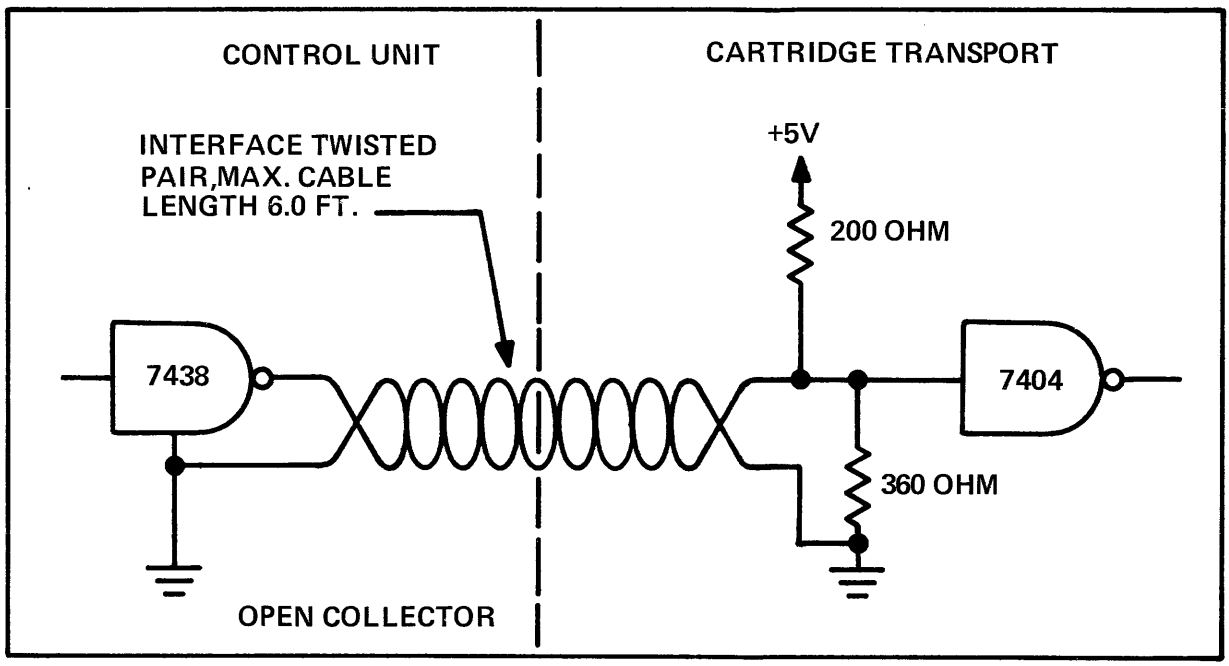


Figure 6-1. Typical Cartridge Transport Receiver Circuit

6.1.1 Receiver Voltage Parameters

Logical 0: +5.0 VDC maximum
+2.8 VDC minimum
Logical 1: 0.0 VDC minimum
+0.4 VDC maximum

6.2 INTERFACE INPUT SIGNAL FUNCTIONS

NOTE:

The controller must only activate one motion input line (see 6.2.1 thru 6.2.4) at a time.

6.2.1 Forward Run

When the DC level on this line is low it causes tape to move in the forward direction. Tape reaches operating speed 25 milliseconds after the application of a true level to the FORWARD RUN interface line. Tape movement stops 20 milliseconds after the removal of a true level from the FORWARD RUN interface line.

NOTE:

A BACKWARD or REWIND signal or consecutive FORWARD RUN signals, should not be applied for 20 milliseconds after a true level is removed from the FORWARD RUN interface line. Also the FORWARD RUN signal should not be applied once the EOT signal (see Section 6.4.2) is detected.

6.2.2 Backward Run

When the DC level on this line is low it causes tape to move in the backward direction. Tape reaches operating speed 25 milliseconds after the application of a true level to the BACKWARD RUN interface line. Tape movement stops 20 milliseconds after the removal of a true level from the BACKWARD RUN interface line.

NOTE:

A FORWARD RUN or FAST FORWARD RUN signal or consecutive BACKWARD RUN signals, should not be applied for 20 milliseconds after a true level is removed from the BACKWARD RUN interface line. Also the BACKWARD RUN signal should not be applied once the BOT signal (see Section 6.4.2) is detected.

6.2.3 Fast Forward Run

When the DC level on this line is low it causes tape to move in the forward direction 90.0 inches per second. Tape movement stops 60 milliseconds after the removal of a true level from the FAST FORWARD RUN interface line.

NOTE:

A BACKWARD RUN or REWIND signals should not be applied for 60 milliseconds after a true level is removed from the FAST FORWARD RUN interface line. Also the FAST FORWARD RUN signal should not be applied once the EOT signal (see Section 6.4.2) is detected.

6.2.4 Rewind

When the DC level on this line is low it causes tape to move in the backward direction 90.0 inches per second. Tape movement stops 60 milliseconds after the removal of a true level from the REWIND interface line.

NOTE:

A FORWARD RUN or FAST FORWARD RUN signals should not be applied for 60 milliseconds after a true level is removed from the REWIND interface line. Also the REWIND signal should not be applied once the BOT signal (see Section 6.4.2) is detected.

6.2.5 Write Enable Lines

On 6022's, when the DC level on this line is low it allows current to be in the write winding(s) of the recording head. This line acts as a write protect in addition to the file protect plug on the tape cartridge. Each write data channel has its own write enable line. On 2021's a single "Write Enable" controls all active channels.

6.2.6 Write Channels (data lines)

The write channel lines carry digitized signals which control the write current thru the recording head. Thus the signals on the write channel lines are the data recorded on tape. The controlling unit has the option of selecting the recording scheme, up to maximum of 3200 fcpi (flux changes per inch). A phase encoded method is recommended. Write channel lines should be at a low level during interblock time.

6.3 INTERFACE DRIVERS

The Cartridge Transport interface drivers are open collector TTL (Transistor Transistor Logic) circuits. Figure 6-2 shows a Cartridge Transport driver circuit.

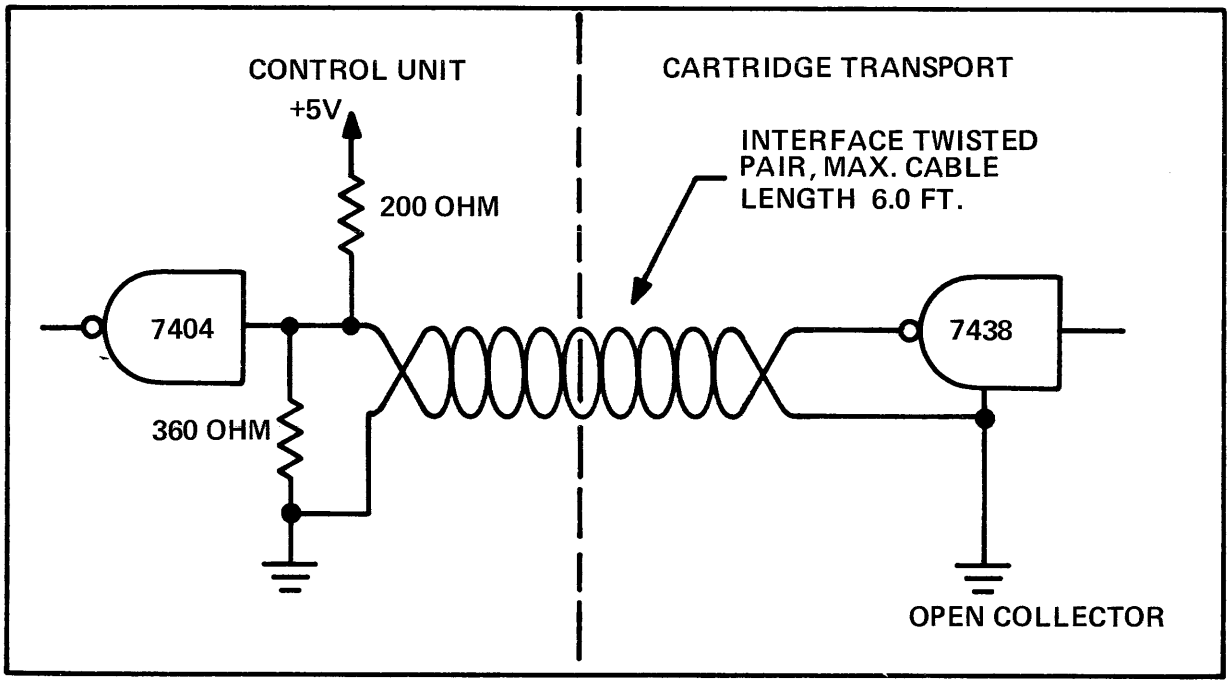


Figure 6-2. Typical Cartridge Transport Driver Circuit

6.3.1 Driver Voltage Parameter

Logical 0: +5.0 VDC maximum
+2.8 VDC minimum
Logical 1: 0.0 VDC minimum
+0.4 VDC maximum

6.4 INTERFACE OUTPUT SIGNAL FUNCTIONS

6.4.1 Ready

When the DC level on this line is low the Cartridge Transport is ready for operation. Ready status indicates the tape cartridge is loaded and the light source for the BOT, LP, EW and EOT detector is on.

6.4.2 PC-1 and PC-2

There are two photocell signal lines. When the photocell circuits detect holes on tape the DC level goes low. BOT (Beginning of Tape) is defined by a low level on both PC-1 and PC-2. The BOT signal remains low for approximately 1.5 milliseconds. EOT (End of Tape) is defined by a low level on PC-2 only. The EOT signal remains low for approximately 1.5 milliseconds. LP (Load Point) and EW (Early Warning) are defined by a low level on PC-1 only. The LP and EW signals remain low for approximately 750.0 microseconds.

NOTE:

The above times are for a tape speed of 30 inches per second. Divide the times by 3 for a tape speed of 90 inches per second.

6.4.3 Read Channels

The read channel lines carry the signals produced from the flux changes on tape. The data on these lines are a copy of the write data which recorded the flux changes on tape.

6.4.4 Not File Protect

When the DC level on this line is low it indicates the file protect plug on the tape cartridge is not in the safe position, this condition with a WRITE ENABLE allows current to be driven through the write head.

6.5 INTERFACE CABLE

6.5.1 Cable Length

The interface cable required should be twisted pairs and a maximum length of 6.0 feet. See Figure 6-1 and 6-2.

6.5.2 Cable Connector

See paragraph 2.16.

6.5.3 Signals and Connector Pin Assignments

Table 6-a and 6-b shows the interface cable signals and connector pin assignments.

Table 6-a. Interface Signals and Pin Assignments (2022)

Interface Cable Twisted Pair Input and Output Signals	Connector Pin Assignment
Retaining Spring	A
Chassis Ground	1
Spare	B
Not File Protect	2
+5 Volts Logic	C
Ground	3
−12 Volts Logic	D
Ground	4
+12 Volts Logic	E
Ground	5
Read Data Channel 1	F
Ground	6
Read Data Channel 3	H
Ground	7
Read Data Channel 2	J
Ground	8
Read Data Channel 4	K
Ground	9
Write Data Channel 1	L
Ground	10
Write Data Channel 3	M
Ground	11
PC 2 (Photocell #2)	N
Ground	12
Write Data Channel 4	P
Ground	13
Write Data Channel 2	R
Ground	14
Ready	S
Ground	15
PC 1 (Photocell #1)	T
Ground	16
Write Enable Channel 4	U
Ground	17
Write Enable Channel 2	V
Ground	18
Write Enable Channel 3	W
Ground	19
Write Enable Channel 1	X
Ground	20
Wired Spare to J2	Y
Ground	21
Wired Spare to J3	Z
Ground	22
Backward Run	a
Ground	23

Table 6-a. Interface Signals and Pin Assignments (Cont'd)(2022)

Interface Cable Twisted Pair Input and Output Signals	Connector Pin Assignment
Spare	b
Ground	24
Fast Backward (Rewind)	c
Ground	25
Spare	d
Ground	26
Fast Forward Run	e
Ground	27
Spare	f
Ground	28
Forward Run	h
Ground	29
Keying Plug	J
Keying Plug	30
Wired Spare to J2	k
Ground	31
Wired Spare to J3	l
Ground	32
Wired Spare to J2 (Terminated)	m
Ground	33
Wired Spare to J3 (Terminated)	n
Ground	34
Wired Spare to J2 (Terminated)	p
Ground	35
Wired Spare to J3 (Terminated)	r
Ground	36
−12 Volts Motor Drive	s
Motor Return	37
−12 Volts Motor Drive	t
Motor Return	38
+12 Volts Motor Drive	u
Spare	39
+12 Volts Motor Drive	v
Retaining Spring	40

Table 6-b. Interface Signals and Pin Assignments (2021)

Interface Cable Twisted Pair Input and Output Signals	Connector Pin Assignment
Forward Run (Input)	D
Ground	4
Backward Run (Input)	H
Ground	7
Fast Forward Run (Input)	E
Ground	5
Rewind (Input)	F
Ground	6
Read Channel 1 (Output)	W
Ground	19
Read Channel 2 (Output)	T
Ground	16
Read Channel 3 (Output)	V
Ground	18
Read Channel 4 (Output)	U
Ground	17
Write Enable (Input)	K
Ground	9
Write Channel 1 (Input)	N
Ground	12
Write Channel 2 (Input)	M
Ground	11
Write Channel 3 (Input)	S
Ground	15
Write Channel 4 (Input)	P
Ground	13
Ready (Output)	L
Ground	10
PC-1 (Photocell #1 Output)	J
Ground	8
PC-2 (Photocell #2 Output)	R
Ground	14

Table 6-b. Interface Signals and Pin Assignments (Cont'd.) (2021)

Interface Cable Twisted Pair Input and Output Signals	Connector Pin Assignment
Chassis Ground (Input)	22
+12.0 volts – logic (Input)	X
+5.0 volts – logic (Input)	Z
–12.0 volts – logic (Input)	Y
Logic Ground (Input)	20
+12.0 volts – motor (Input)	*1
+12.0 volts – motor (Input)	*A
–12.0 volts – motor (Input)	*2
–12.0 volts – motor (Input)	*B
Motor, Ground Return (Input	*3
Motor, Ground Return (Input)	*C
Not File Protect (Output)	21

NOTE:

Pins marked with * indicates the voltages share two pins to reduce the current thru the each individual voltage pin.

SECTION VII

ILLUSTRATED PARTS BREAKDOWN

7.1 GENERAL

7.1.1

This illustrated parts breakdown manual supports MDS Cartridge Tape Drive model number 2021/2022. The IPB is primarily intended to provide a means to identify part numbers for ordering purposes. Additionally the illustrations provide graphic representations of part to part relationships which will assist the customer engineer during the machine repair, disassembly or assembly.

7.2 PARTS BREAKDOWN

7.2.1

The IPB consists of illustrations and columnar listings of part and subassembly identifying numbers within assemblies.

Common hardware items are identified within the breakdowns by letters which cross reference to applicable part numbers in a table located at the rear of the manual.

Items such as wire and grease are not called out in the IPB. However, if it becomes necessary to advise the user regarding the use or application of such items, the information will be provided in the applicable maintenance manual.

7.2.2

The first figure in the IPB is provided as a visual index to the major assemblies and the figures in which they are illustrated.

7.2.3

Columnar data following each illustration is organized as follows: (For purposes of clarity, if a particular data column does not apply to a specific figure then the column will be omitted).

a. Index No. Each number relates to a part or assembly in the illustration. Some index designations may include both numbers and letters. In these cases, the letter indicates that the subject part has been added to the number sequence since the original publication of the IPB.

b. Order Part No. Column. Always use this column for ordering except as noted in d. below.

c. "Part of" Column. If an asterisk is entered in the "Order Part No. Column," there will be "See Item X" note in the adjacent location under the heading of "Part Of". The asterisk indicates that the part is a component of a larger "Factory Only" assembly which requires special fixtures or tools for assembling. Component part numbers of this factory only assembly are listed in adjacent reference part number column.

d. Reference Part Number Column. For Historical purposes, components of factory assemblies are listed.

e. The Description Column is self explanatory. Orders for parts should include the applicable description.

f. The used on column is provided to indicate the commonality of parts within the various model numbers.

g. Footnotes as required to provide explanation of any special considerations will appear below the parts list section.

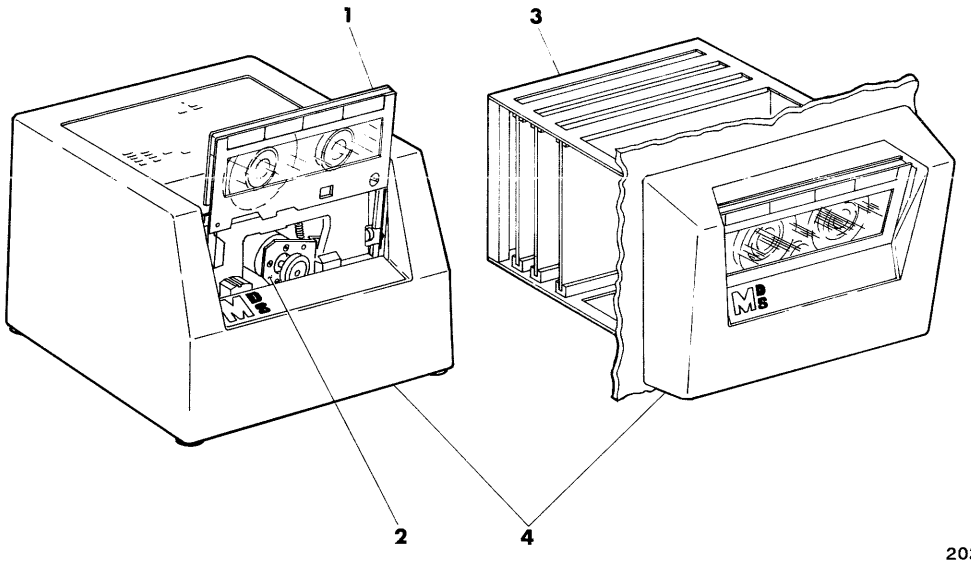


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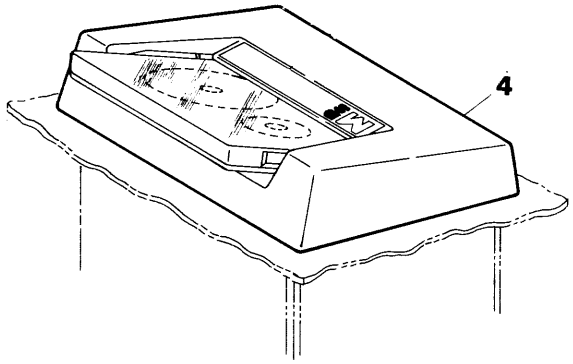
TABLE TOP UNIT **VERTICAL RACK MOUNTED UNIT**



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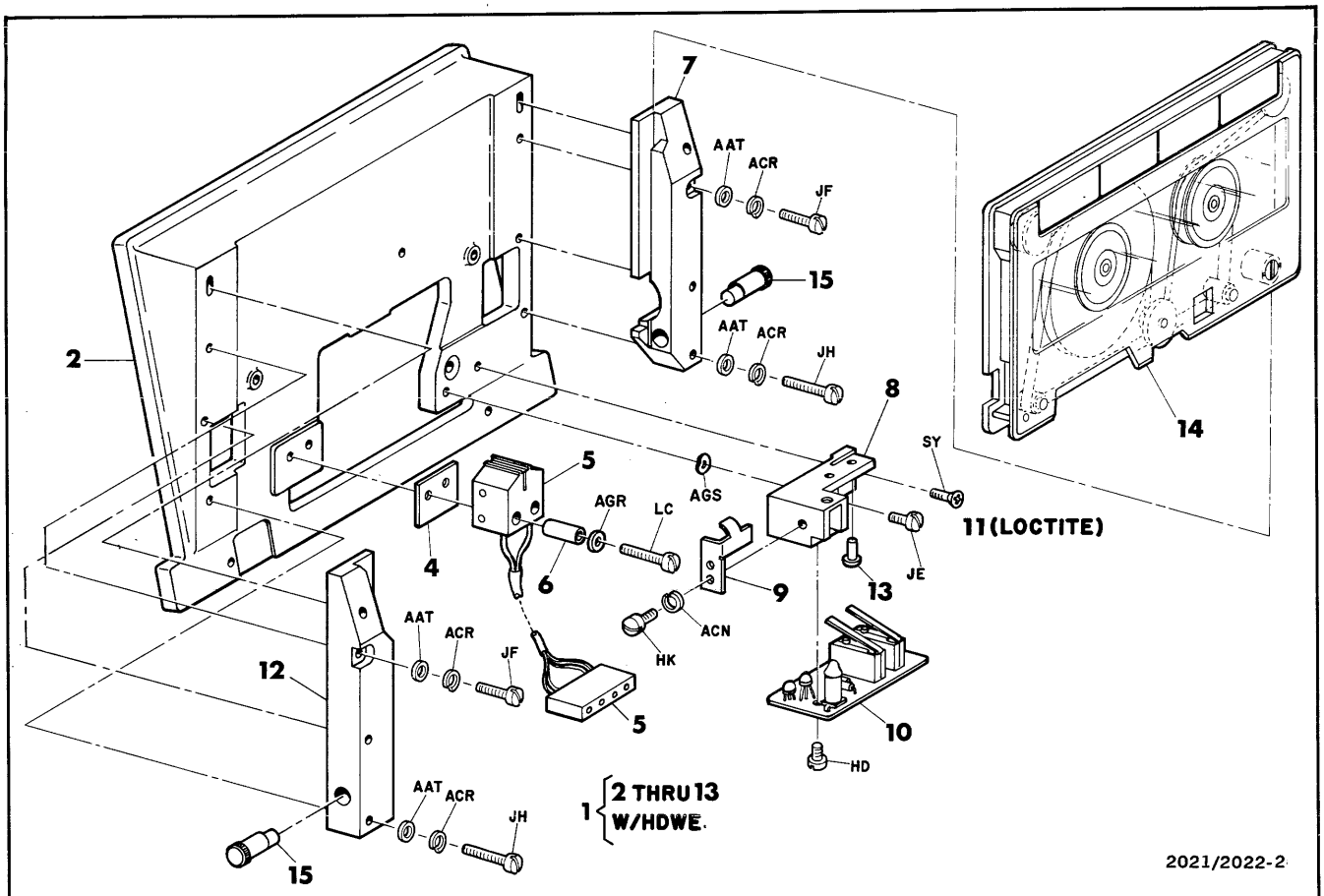
HORIZONTAL RACK MOUNTED UNIT

INDEX NO.		DESCRIPTION
1	Figure 7-2	Cartridge Base, Guide and Head Assembly
2	Figure 7-3	Cartridge Motor, Wheel Drive and Strobe Assembly
3	Figure 7-4	Cartridge Housing and P.C. Boards
4	Figure 7-5	Cartridge Recorder Control Assembly

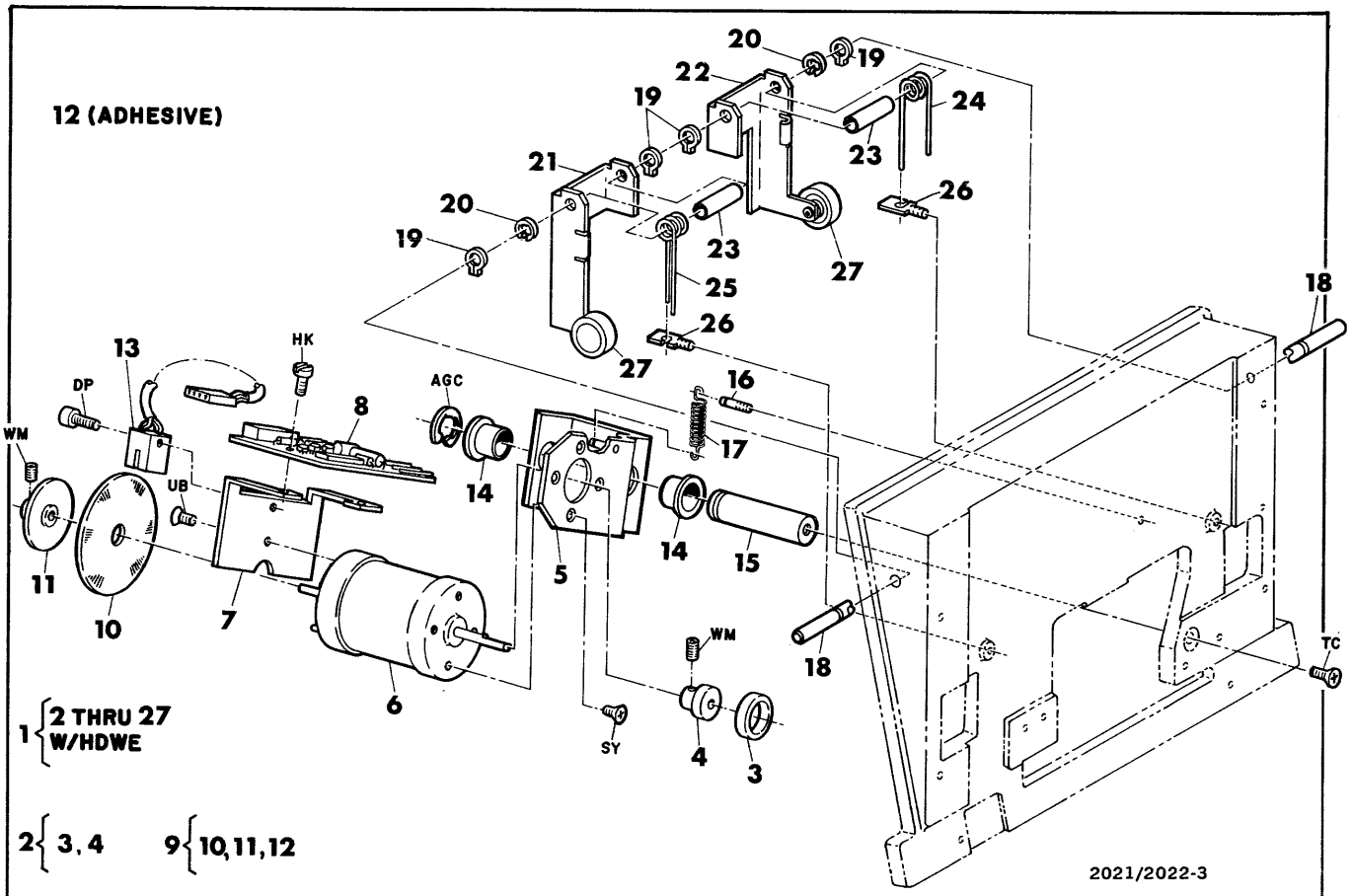
NOTE: See Table 1-a for Variable Model Configurations

Figure 7-1. 2022 Cartridge Transport



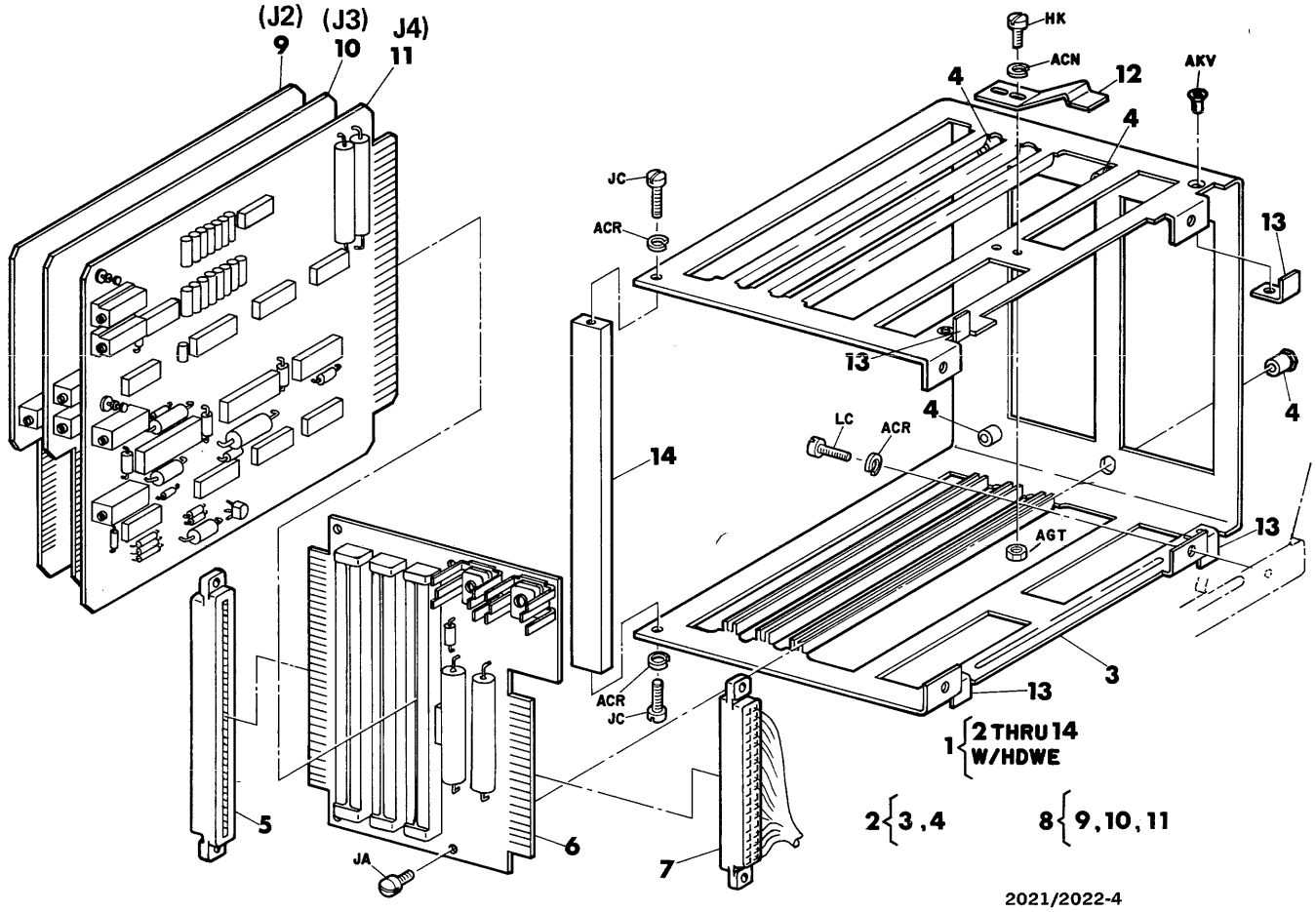
INDEX NO.	ORDER PART NUMBER	REFERENCE PART NUMBER	DESCRIPTION
1		034349201	Cartridge Recorder (Rack Mounted)
		034349202	Cartridge Recorder (Free Standing Unit)
2	034380701		Base Plate Machined
3	795109203		Pin, Spring .125 Dia. X .500 LG.
4	034363701		Insulator
5	034359501		One Track Head with Cable
	034359601		Two Track Head with Cable
	034373301		Four Track Head with Cable
6	406103017		Insulation, Sleeve, Teflon
7	034345601		Guide, Cartridge (Left)
8	034345701		Housing, (EOT-BOT)
9	034345901		Reflector (EOT-BOT)
10	034459301		PWB, Photo Cell
11	504111006		Sealing & Retaining Compound (Loctite)
12	034346801		Guide, Cartridge (Right)
13	831117003		Rivet, Sem-Tubular .125 Dia. X .31 LG.
14	034363801		Magnetic Tape Cartridge
15	034400601		Pin, Locating-Cartridge

Figure 7-2. Cartridge Base, Guide and Head Assy.



INDEX NO.	ORDER PART NUMBER	REFERENCE PART NUMBER	DESCRIPTION
1		034349201	Cartridge Recorder (Rack Mounted)
		034349202	Cartridge Recorder (Free Standing Unit)
2	034346701		Wheel Drive Assembly
3	034346703		Tire
4	034346702		Wheel, Brass
5	034345801		Bracket, Motor
6	034336901		Motor, Drive
7	034346901		Bracket, Speed Control
8	034336204		PWB Sprocket Shaper
9	034355701		Strobe Disk Assembly
10	034355601		Disk, Strobe
11	034346301		Holder, Disk
12	504001301		Adhesive Pliobond
13	034366701		Encoder Block Assembly
14	546104003		Bearing, Sleeve, Single Flange
15	034346101		Shaft, Bracket-Motor
16	795223062		Pin, Grooved, Headless .125 Dia. X .500
17	870201406		Spring Extension (Horizontal Rack Mounted Units)
	870201417		Spring Extension (Table Top, or Vertical Rack Mounted Units)
18	034346201		Shaft, Pivot Arm
19	829113004		Ring, Retaining, Ext., E
20	829107006		Ring, Retaining, Ext., Grip
21	034346002		Bracket, Bearing, L.H.
22	034346001		Bracket, Bearing, R.H.
23	034346401		Mandrel, Spring
24	870106007		Spring, Torsion, R.H.
25	870106008		Spring, Torsion, L.H.
26	034346601		Bolt, Spade
27	525009801		Bearing, Ball Stud Type

Figure 7-3. Cartridge Motor, Wheel Drive, Hand Strobe Assy.



INDEX NO.	ORDER PART NUMBER	REFERENCE PART NUMBER	DESCRIPTION
1		034349201	Cartridge Recorder (Rack Mounted)
		034349202	Cartridge Recorder (Free Standing Unit)
2	034333801		Housing, Library Assembly
3	034333401		Housing, Library
4	874000515		Standoff, Self-Clinching SOS — 8632-10
5	145013302		Connector (With Solder Contacts)
6	034443201		PWB Interconnection Board, 4 Track, 2022
	034419201		PWB Interconnection Board, 2 Track, 2022
	034335603		PWB Interconnection Board, 4 Track, 2021
	034443401		PWB Interconnection Board, 1 or 2 Track, 2021
7	034363901		Mechanism Harness, 2021/2022
* 8	034443101		PWB Package Complement, 2 Track Phase Encoding, 2022
	034443102		PWB Package Complement, 4 Track Phase Encoding, 2022
	034443103		PWB Package Complement, 2 Track Bi-Phase Encoding, 2022
	034443104		PWB Package Complement, 4 Track Bi-Phase Encoding, 2022
	034359701		PWB Package Complement, 1 Track Phase Encoding, 2021
	034359702		PWB Package Complement, 2 Track Phase Encoding, 2021
	034359703		PWB Package Complement, 1 Track Bi-Phase Encoding, 2021
	034359704		PWB Package Complement, 2 Track Bi-Phase Encoding, 2021
	034359705		PWB Package Complement, 4 Track Phase Encoding, 2021
	034359706		PWB Package Complement, 4 Track Bi-Phase Encoding, 2021
9	034383004		PWB Read/Write Amplifier-2, 2/4 Track Phase Encoding, 2021/2022
	034365204		PWB Read/Write Amplifier-2, 2/4 Track Bi-Phase Encoding, 2021/2022
10	034383004		PWB Read/Write Amplifier-2, 2/4 Track Phase Encoding, 2021/2022
	034365204		PWB Read/Write Amplifier-2, 2/4 Track Bi-Phase Encoding, 2021/2022
	034382804		PWB Read/Write Amplifier-1, 1 Trrack Phase Encoding, 2021
	034335004		PWB Read/Write Amplifier-1, 1 Track Bi-Phasing Encoding, 2021
11	034334705		PWB Control and Motor Drive, 2021/2022
12	034352701		Clip Spring
13	034460102		Clip, Locating
14	034346501		Spacer, Library

*Refer to Section VIII for Component Part Numbers.

Figure 7-4. Cartridge Housing and P.C. Boards

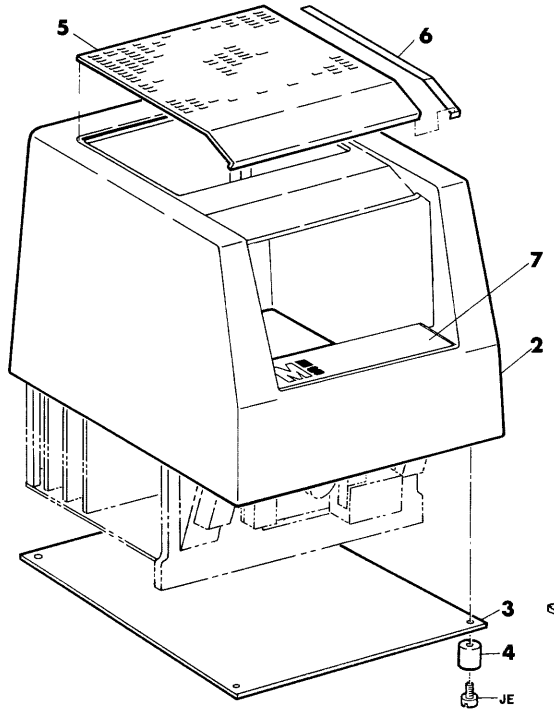
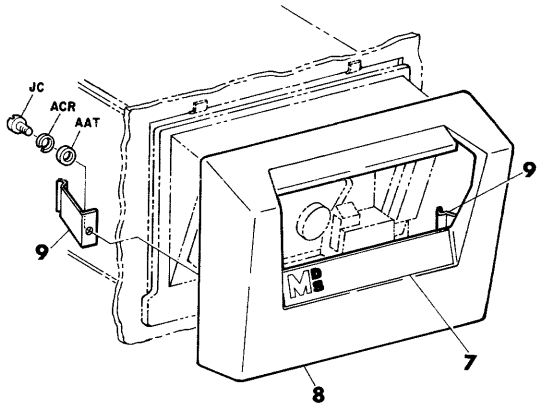


TABLE TOP UNIT



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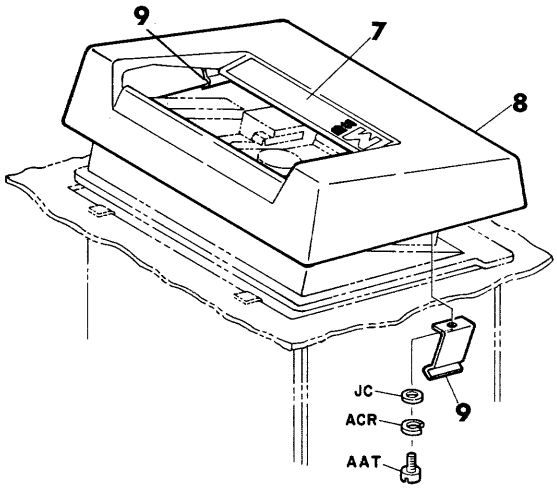
VERTICAL RACK MOUNTED UNIT



2021/2022-5A

HORIZONTAL RACK MOUNTED UNIT

INDEX NO.	ORDER PART NUMBER	REFERENCE PART NUMBER	DESCRIPTION
1		034381002	Control Assembly Cartridge Recorder
2	034380102		Housing, Free Standing
3	034352601		Plate, Bottom, Free Standing
4	544001501		Bumper, Recessed-Flat Top
5	034380300		Cover, Top, Free Standing
6	893003801		Tape, Double-Coated
7	034387701		Logo (2021)
	034387702		Logo (2022)
8	034419703		Cover
9	034419001		Spring

Figure 7-5. Cartridge Recorder Control Assy

Table 7-a. Hardware List

INDEX LETTER	PART NO.	DESCRIPTION
A	776001201	Nut, Hex 2-56
B	776001202	Nut, Hex 3-48
C	776001203	Nut, Hex 3-56
D	776001204	Nut, Hex 4-40
E	776001205	Nut, Hex 5-40
F	776001206	Nut, Hex 6-32
G	776001207	Nut, Hex 6-32
H	776001208	Nut, Hex 6-40
J	776001209	Nut, Hex 8-32
K	776001210	Nut, Hex 8-36
L	776001211	Nut, Hex 10-24
M	776001212	Nut, Hex 10-32
N	776001213	Nut, Hex 10-32
P	776001214	Nut, Hex 12-24
R	776001301	Nut, Hex, Self-Locking 2-56
S	776001302	Nut, Hex, Self-Locking 4-40
T	776001303	Nut, Hex, Self-Locking 6-32
U	776001304	Nut, Hex, Self-Locking 8-32
V	776001305	Nut, Hex, Self-Locking 10-32
W	776001306	Nut, Hex, Self-Locking 5-40
X	776001401	Nut, Hex 1/4-20
Y	776001402	Nut, Hex 1/4-28
Z	776001403	Nut, Hex 5/16-18
AA	776001404	Nut, Hex 5/16-24
AB	776001405	Nut, Hex 3/8-16
AC	776001406	Nut, Hex 3/8-24
AD	776001407	Nut, Hex 7/16-14
AE	776001408	Nut, Hex 7/16-20
AF	776001409	Nut, Hex 1/2-13
AG	776001410	Nut, Hex 1/2-20
AH	776001501	Nut, Hex, Nylon Insert 1/4-20
AJ	776001502	Nut, Hex, Nylon Insert 1/4-28
AK	776001503	Nut, Hex, Nylon Insert 5/16-18
AL	776001504	Nut, Hex, Nylon Insert 5/16-24
AM	776001505	Nut, Hex, Nylon Insert 3/8-16
AN	776001506	Nut, Hex, Nylon Insert 3/8-24
AP	776001507	Nut, Hex, Nylon Insert 7/16-14
AR	776001508	Nut, Hex, Nylon Insert 7/16-20
AS	776001509	Nut, Hex, Nylon Insert 1/2-13
AT	776001510	Nut, Hex, Nylon Insert 1/2-20
AU	776001511	Nut, Hex, Nylon Insert 1/4-20
AV	795001901	Pin, Slotted 1/4 x .062
AW	795001902	Pin, Slotted 5/16 x .062
AX	795001903	Pin, Slotted 3/8 x .062
AY	795001904	Pin, Slotted 7/16 x .062
AZ	795001905	Pin, Slotted 1/2 x .062
BA	795001906	Pin, Slotted 5/8 x .062
BB	795001907	Pin, Slotted 1 x .062
BC	795001908	Pin, Slotted 1/4 x .078
BD	795001909	Pin, Slotted 3/8 x .078
BE	795001910	Pin, Slotted 1/2 x .078
BF	795001911	Pin, Slotted 3/4 x .078
BG	795001912	Pin, Slotted 1/4 x .094
BH	795001913	Pin, Slotted 5/16 x .094
BJ	795001914	Pin, Slotted 3/8 x .094
BK	795001915	Pin, Slotted 7/16 x .094
BL	795001916	Pin, Slotted 1/2 x .094
BM	795001917	Pin, Slotted 5/8 x .094
BN	795001918	Pin, Slotted 3/4 x .094
BP	795001919	Pin, Slotted 1/4 x .125
BR	795001920	Pin, Slotted 3/8 x .125
BS	795001921	Pin, Slotted 7/16 x .125
BT	795001922	Pin, Slotted 1/2 x .125
BU	795001923	Pin, Slotted 5/8 x .125
BV	795001924	Pin, Slotted 3/4 x .125
BW	795001925	Pin, Slotted 7/8 x .125
BX	795001926	Pin, Slotted 1/2 x .187
BY	795001927	Pin, Slotted 1 1/4 x .187
BZ	795001928	Pin, Slotted 1 1/8 x .250
CA	795001929	Pin, Slotted 3/4 x .375
CB	795001930	Pin, Slotted 1 1/4 x .375
CC	795002001	Pin, Dowel 1/4 x .0313
CD	795002002	Pin, Dowel 5/8 x .0313
CE	795002003	Pin, Dowel 3/16 x .0626
CF	795002004	Pin, Dowel 3/8 x .0626
CG	795002005	Pin, Dowel 1/2 x .0626
CH	795002006	Pin, Dowel 3/16 x .0938
CJ	795002007	Pin, Dowel 1/2 x .0938
CK	795002008	Pin, Dowel 3/16 x .1252
CL	795002009	Pin, Dowel 7/16 x .1252
CM	795002010	Pin, Dowel 1/2 x .1252
CN	795002011	Pin, Dowel 5/8 x .1252
CP	795002012	Pin, Dowel 3/4 x .1252
CR	795002013	Pin, Dowel 7/8 x .1252
CS	795002014	Pin, Dowel 1/4 x .1562
CT	795002015	Pin, Dowel 1/2 x .1877
CU	795002016	Pin, Dowel 5/8 x .1877
CV	795002017	Pin, Dowel 3/4 x .1877
CW	795002018	Pin, Dowel 1 x .1877
CX	795002019	Pin, Dowel 3/8 x .2502
CY	795002020	Pin, Dowel 3/4 x .2502
CZ	795002021	Pin, Dowel 1 x .2502
DA	795002022	Pin, Dowel 1 1/4 x .5627
DB	795002023	Pin, Dowel 1 x .3752
DC	795002024	Pin, Dowel 1 1/4 x .3752
DD	795002025	Pin, Dowel 1 1/2 x .3752
DE	795002026	Pin, Dowel 1 1/2 x .5627
DF	795002027	Pin, Dowel 1 1/4 x .3127
DG	795002028	Pin, Dowel 1 3/4 x .3127
DH	842003701	Screw, Cap, Socket Head 2-56 x 1/4
DJ	842003702	Screw, Cap, Socket Head 2-56 x 3/8
DK	842003703	Screw, Cap, Socket Head 4-40 x 3/16
DL	842003704	Screw, Cap, Socket Head 4-40 x 1/4
DM	842003705	Screw, Cap, Socket Head 4-40 x 5/16
DN	842003706	Screw, Cap, Socket Head 4-40 x 3/8
DP	842003707	Screw, Cap, Socket Head 4-40 x 7/16
DR	842003708	Screw, Cap, Socket Head 4-40 x 1/2
DS	842003709	Screw, Cap, Socket Head 4-40 x 5/8
DT	842003710	Screw, Cap, Socket Head 4-40 x 3/4
DU	842003711	Screw, Cap, Socket Head 6-32 x 1/4
DV	842003712	Screw, Cap, Socket Head 6-32 x 5/16
DW	842003713	Screw, Cap, Socket Head 6-32 x 3/8
DX	842003714	Screw, Cap, Socket Head 6-32 x 7/16
DY	842003715	Screw, Cap, Socket Head 6-32 x 1/2
DZ	842003716	Screw, Cap, Socket Head 6-32 x 5/8
EA	842003717	Screw, Cap, Socket Head 6-32 x 3/4
EB	842003718	Screw, Cap, Socket Head 6-32 x 7/8
EC	842003719	Screw, Cap, Socket Head 6-32 x 1
ED	842003720	Screw, Cap, Socket Head 6-32 x 1 1/4
EE	842003721	Screw, Cap, Socket Head 8-32 x 1/4
EF	842003722	Screw, Cap, Socket Head 8-32 x 5/16
EG	842003723	Screw, Cap, Socket Head 8-32 x 3/8
EH	842003724	Screw, Cap, Socket Head 8-32 x 7/16
EJ	842003725	Screw, Cap, Socket Head 8-32 x 1/2
EK	842003726	Screw, Cap, Socket Head 8-32 x 5/8
EL	842003727	Screw, Cap, Socket Head 8-32 x 3/4
EM	842003728	Screw, Cap, Socket Head 8-32 x 7/8
EN	842003729	Screw, Cap, Socket Head 8-32 x 1
EP	842003730	Screw, Cap, Socket Head 8-32 x 1 1/4
ER	842003731	Screw, Cap, Socket Head 8-32 x 1 1/2
ES	842003732	Screw, Cap, Socket Head 10-32 x 3/8
ET	842003733	Screw, Cap, Socket Head 10-32 x 7/16
EU	842003734	Screw, Cap, Socket Head 10-32 x 1/2
EV	842003735	Screw, Cap, Socket Head 10-32 x 5/8
EW	842003736	Screw, Cap, Socket Head 10-32 x 3/4
EX	842003737	Screw, Cap, Socket Head 10-32 x 7/8
EY	842003738	Screw, Cap, Socket Head 10-32 x 1
EZ	842003739	Screw, Cap, Socket Head 10-32 x 1 1/8
FA	842003740	Screw, Cap, Socket Head 10-32 x 1 1/4
FB	842003741	Screw, Cap, Socket Head 10-32 x 1 3/8
FC	842003742	Screw, Cap, Socket Head 10-32 x 1 1/2
FD	842003743	Screw, Cap, Socket Head 10-32 x 1 3/4
FE	842003744	Screw, Cap, Socket Head 10-32 x 2 1/4
FF	842003745	Screw, Cap, Socket Head 10-32 x 2 1/2
FG	842003746	Screw, Cap, Socket Head 10-32 x 3
FH	842003747	Screw, Cap, Socket Head 1/4-20 x 3/8
FJ	842003748	Screw, Cap, Socket Head 1/4-20 x 1/2
FK	842003749	Screw, Cap, Socket Head 1/4-20 x 5/8
FL	842003750	Screw, Cap, Socket Head 1/4-20 x 3/4
FM	842003751	Screw, Cap, Socket Head 1/4-20 x 7/8
FN	842003752	Screw, Cap, Socket Head 1/4-20 x 1
FP	842003753	Screw, Cap, Socket Head 1/4-20 x 1 1/4
FR	842003754	Screw, Cap, Socket Head 1/4-20 x 1 1/2
FS	842003755	Screw, Cap, Socket Head 1/4-20 x 1 3/4
FT	842003756	Screw, Cap, Socket Head 1/4-20 x 2
FU	842003757	Screw, Cap, Socket Head 1/4-20 x 2 1/4
FV	842003758	Screw, Cap, Socket Head 1/4-20 x 2 1/2
FW	842003759	Screw, Cap, Socket Head 1/4-20 3
FX	842003760	Screw, Cap, Socket Head 5/16-18 x 3/4
FY	842003761	Screw, Cap, Socket Head 5/16-18 x 1
FZ	842003762	Screw, Cap, Socket Head 5/16-18 x 1 1/4
GA	842003763	Screw, Cap, Socket Head 5/16-18 x 1 3/4
GB	842003764	Screw, Cap, Socket Head 3/8-16 x 1
GC	842003765	Screw, Cap, Socket Head 3/8-16 x 1 3/4
GD	842003766	Screw, Cap, Socket Head 4-40 x 1 1/4
GE	842003767	Screw, Cap, Socket Head 10-32 x 5/16
GF	842003768	Screw, Cap, Socket Head 10-32 x 2
GG	842003769	Screw, Cap, Socket Head 5/16-18 x 2
GH	842003770	Screw, Cap, Socket Head 6-32 x 1 1/8
GJ	842003771	Screw, Cap, Socket Head 1/4-20 x 2 3/4
GK	842003772	Screw, Cap, Socket Head 2-56 x 3/16
GL	842003773	Screw, Cap, Socket Head 2-56 x 3/4
GM	842003774	Screw, Cap, Socket Head 6-32 x 1 3/4
GN	842003775	Screw, Cap, Socket Head 8-32 x 1 3/4
GP	842003776	Screw, Cap, Socket Head 8-32 x 2
GR	842003777	Screw, Cap, Socket Head 10-32 x 3/16
GS	842003778	Screw, Cap, Socket Head 10-32 x 1/4
GT	842003779	Screw, Cap, Socket Head 5/16-18 x 1 1/2
GU	842003780	Screw, Cap, Socket Head 4-40 x 9/16
GV	842003781	Screw, Cap, Socket Head 5/16-18 x 1 3/8
GW	842003782	Screw, Cap, Socket Head 3/8-16 x 3/4
GX	842003783	Screw, Cap, Socket Head 4-40 x 1
GY	842003784	Screw, Cap, Socket Head 4-40 x 1 3/8
GZ	842003785	Screw, Cap, Socket Head 1/4-20 x 1 3/8
HA	842003786	Screw, Cap, Socket Head 4-40 x 7/8
HB	842003787	Screw, Cap, Socket Head 3/8-16 x 1 1/2
HC	842003801	Screw, Pan Head, Phillips 2-56 x 1/8
HD	842003802	Screw, Pan Head, Phillips 2-56 x 1/4
HE	842003803	Screw, Pan Head, Phillips 2-56 x 3/8
HF	842003804	Screw, Pan Head, Phillips 2-56 x 7/16
HG	842003805	Screw, Pan Head, Phillips 2-56 x 3/4
HH	842003806	Screw, Pan Head, Phillips 4-40 x 1/8
HJ	842003807	Screw, Pan Head, Phillips 4-40 x 3/16
HK	842003808	Screw, Pan Head, Phillips 4-40 x 1/4
HL	842003809	Screw, Pan Head, Phillips 4-40 x 5/16
HM	842003810	Screw, Pan Head, Phillips 4-40 x 3/8
HN	842003811	Screw, Pan Head, Phillips 4-40 x 7/16
HP	842003812	Screw, Pan Head, Phillips 4-40 x 1/2
HR	842003813	Screw, Pan Head, Phillips 4-40 x 5/8
HS	842003814	Screw, Pan Head, Phillips 4-40 x 3/4
HT	842003815	Screw, Pan Head, Phillips 4-40 x 7/8
HU	842003816	Screw, Pan Head, Phillips 4-40 x 1
HV	842003817	Screw, Pan Head, Phillips 4-40 x 1 1/8
HW	842003818	Screw, Pan Head, Phillips 4-40 x 1 1/4
HX	842003819	Screw, Pan Head, Phillips 4-40 x 1 3/8
HY	842003820	Screw, Pan Head, Phillips 4-40 x 1 1/2
HZ	842003821	Screw, Pan Head, Phillips 6-32 x 3/16
JA	842003822	Screw, Pan Head, Phillips 6-32 x 1/4
JB	842003823	Screw, Pan Head, Phillips 6-32 x 5/16
JC	842003824	Screw, Pan Head, Phillips 6-32 x 3/8
JD	842003825	Screw, Pan Head, Phillips 6-32 x 7/16
JE	842003826	Screw, Pan Head, Phillips 6-32 x 1/2

Table 7-a. Hardware List (Cont'd)

INDEX LETTER	PART NO.	DESCRIPTION
JF	842003827	Screw, Pan Head, Phillips 6-32 x 5/8
JG	842003828	Screw, Pan Head, Phillips 6-32 x 3/4
JH	842003829	Screw, Pan Head, Phillips 6-32 x 7/8
JJ	842003830	Screw, Pan Head, Phillips 6-32 x 1
JK	842003831	Screw, Pan Head, Phillips 6-32 x 1 1/8
JL	842003832	Screw, Pan Head, Phillips 6-32 x 1 1/4
JM	842003833	Screw, Pan Head, Phillips 6-32 x 1 1/2
JN	842003834	Screw, Pan Head, Phillips 6-32 x 2
JP	842003835	Screw, Pan Head, Phillips 8-32 x 1/4
JR	842003836	Screw, Pan Head, Phillips 8-32 x 5/16
JS	842003837	Screw, Pan Head, Phillips 8-32 x 3/8
JT	842003838	Screw, Pan Head, Phillips 8-32 x 7/16
JU	842003839	Screw, Pan Head, Phillips 8-32 x 1/2
JV	842003840	Screw, Pan Head, Phillips 8-32 x 5/8
JW	842003841	Screw, Pan Head, Phillips 8-32 x 3/4
JX	842003842	Screw, Pan Head, Phillips 8-32 x 7/8
JY	842003843	Screw, Pan Head, Phillips 8-32 x 1
JZ	842003844	Screw, Pan Head, Phillips 8-32 x 1 1/4
KA	842003845	Screw, Pan Head, Phillips 8-32 x 1 3/8
KB	842003846	Screw, Pan Head, Phillips 8-32 x 1 1/2
KC	842003847	Screw, Pan Head, Phillips 8-32 x 1 3/4
KD	842003848	Screw, Pan Head, Phillips 8-32 x 2
KE	842003849	Screw, Pan Head, Phillips 10-32 x 1/4
KF	842003850	Screw, Pan Head, Phillips 10-32 x 3/8
KG	842003851	Screw, Pan Head, Phillips 10-32 x 7/16
KH	842003852	Screw, Pan Head, Phillips 10-32 x 1/2
KJ	842003853	Screw, Pan Head, Phillips 10-32 x 5/8
KK	842003854	Screw, Pan Head, Phillips 10-32 x 3/4
KL	842003855	Screw, Pan Head, Phillips 10-32 x 1
KM	842003856	Screw, Pan Head, Phillips 10-32 x 1 1/8
KN	842003857	Screw, Pan Head, Phillips 1/4-20 x 1/2
KP	842003858	Screw, Pan Head, Phillips 1/4-20 x 5/8
KR	842003859	Screw, Pan Head, Phillips 1/4-20 x 7/8
KS	842003860	Screw, Pan Head, Phillips 1/4-20 x 1
KT	842003861	Screw, Pan Head, Phillips 2-56 x 3/16
KU	842003862	Screw, Pan Head, Phillips 2-56 x 1/2
KV	* 842003863	Screw, Pan Head, Phillips 6-32 x 2 1/4
KW	842003864	Screw, Pan Head, Phillips 5/16-18 x 1
KX	842003865	Screw, Pan Head, Phillips 3/8-16 x 1
KY	842003866	Screw, Pan Head, Phillips 10-32 x 1 1/4
KZ	842003867	Screw, Pan Head, Phillips 6-32 x 1 3/4
LA	842003868	Screw, Pan Head, Phillips 2-56 x 5/16
LB	842003869	Screw, Pan Head, Phillips 2-56 x 5/8
LC	* 842003870	Screw, Pan Head, Phillips 2-56 x 1
LD	842003871	Screw, Pan Head, Phillips 6-32 x 1 3/8
LE	842003872	Screw, Pan Head, Phillips 8-32 x 3/16
LF	842003873	Screw, Pan Head, Phillips 1/4-20 x 3/4
LG	842003874	Screw, Pan Head, Phillips 1/4-20 x 1 1/2
LH	842003875	Screw, Pan Head, Phillips 1/4-20 x 2
LJ	* 842003876	Screw, Pan Head, Phillips 8-32 x 1 5/8
LK	842003877	Screw, Pan Head, Phillips 6-32 x 1/8
LL	842003878	Screw, Pan Head, Phillips 10-32 x 1 3/4
LM	842003879	Screw, Pan Head, Phillips 1/4-20 x 5/16
LN	842003880	Screw, Pan Head, Phillips 3/8-16 x 1 3/8
LP	842003901	Screw, Pan Head, Slotted 2-56 x 3/8
LR	842003902	Screw, Pan Head, Slotted 4-40 x 3/16
LS	842003903	Screw, Pan Head, Slotted 4-40 x 1/4
LT	842003904	Screw, Pan Head, Slotted 4-40 x 5/16
LU	842003905	Screw, Pan Head, Slotted 4-40 x 3/8
LV	842003906	Screw, Pan Head, Slotted 4-40 x 7/8
LW	842003907	Screw, Pan Head, Slotted 6-32 x 5/16
LX	842003908	Screw, Pan Head, Slotted 6-32 x 7/8
LY	842003909	Screw, Pan Head, Slotted 6-32 x 1 3/4
LZ	842003910	Screw, Pan Head, Slotted 8-32 x 1/4
MA	842003911	Screw, Pan Head, Slotted 8-32 x 1/2
MB	842003912	Screw, Pan Head, Slotted 10-32 x 3/4
MC	842003913	Screw, Pan Head, Slotted 1/4-20 x 5/8
MD	842003914	Screw, Pan Head, Slotted 3-48 x 3/16
ME	842003915	Screw, Pan Head, Slotted 6-32 x 1/4
MF	842003916	Screw, Pan Head, Slotted 10-32 x 7/8
MG	842003917	Screw, Pan Head, Slotted 4-40 x 1 1/4
MH	842003918	Screw, Pan Head, Slotted 2-56 x 1/4
MJ	842003919	Screw, Pan Head, Slotted 4-40 x 5/8
MK	842003920	Screw, Pan Head, Slotted 6-32 x 3/8
ML	842003921	Screw, Pan Head, Slotted 6-32 x 1/2
MM	842003922	Screw, Pan Head, Slotted 6-32 x 5/8
MN	842003923	Screw, Pan Head, Slotted 6-32 x 1 1/4
MP	842003924	Screw, Pan Head, Slotted 8-32 x 3/8
MR	842003925	Screw, Pan Head, Slotted 8-32 x 5/8
MS	842003926	Screw, Pan Head, Slotted 10-32 x 3/8
MT	842003927	Screw, Pan Head, Slotted 10-32 x 1/2
MU	842003928	Screw, Pan Head, Slotted 1/4-20 x 1/2
MV	842003929	Screw, Pan Head, Slotted 1/4-20 x 1 3/4
MW	842003930	Screw, Pan Head, Slotted 6-32 x 2
MX	842003931	Screw, Pan Head, Slotted 4-40 x 1/2
MY	842003932	Screw, Pan Head, Slotted 8-32 x 9/16
MZ	842003933	Screw, Pan Head, Slotted 2-56 x 3/16
NA	842003934	Screw, Pan Head, Slotted 3-48 x 1/2
NB	842003935	Screw, Pan Head, Slotted 4-40 x 7/16
NC	842003936	Screw, Pan Head, Slotted 4-40 x 3/4
ND	842003937	Screw, Pan Head, Slotted 6-32 x 3/4
NE	842003938	Screw, Pan Head, Slotted 10-32 x 5/8
NF	842003939	Screw, Pan Head, Slotted 6-32 x 7/16
NG	842003940	Screw, Pan Head, Slotted 2-56 x 1/8
NH	842003941	Screw, Pan Head, Slotted 2-56 x 5/16
NJ	842003942	Screw, Pan Head, Slotted 2-56 x 7/16
NK	842003943	Screw, Pan Head, Slotted 2-56 x 1/2
NL	842003944	Screw, Pan Head, Slotted 2-56 x 5/8
NM	842003945	Screw, Pan Head, Slotted 2-56 x 3/4
NN	842003946	Screw, Pan Head, Slotted 4-40 x 1/8
NP	842003947	Screw, Pan Head, Slotted 4-40 x 1
NR	842003948	Screw, Pan Head, Slotted 4-40 x 1 1/8
NS	842003949	Screw, Pan Head, Slotted 6-32 x 1/8
NT	842003950	Screw, Pan Head, Slotted 6-32 x 3/16
NU	842003951	Screw, Pan Head, Slotted 6-32 x 1
NV	842003952	Screw, Pan Head, Slotted 6-32 x 1 1/2
NW	842003953	Screw, Pan Head, Slotted 8-32 x 5/16
NX	842003954	Screw, Pan Head, Slotted 8-32 x 7/16
NY	842003955	Screw, Pan Head, Slotted 8-32 x 3/4
NZ	842003956	Screw, Pan Head, Slotted 8-32 x 7/8
PA	842003957	Screw, Pan Head, Slotted 8-32 x 1 1/8
PB	842003958	Screw, Pan Head, Slotted 8-32 x 1 1/4
PC	842003959	Screw, Pan Head, Slotted 8-32 x 1 1/2
PD	842003960	Screw, Pan Head, Slotted 8-32 x 1 3/4
PE	842003961	Screw, Pan Head, Slotted 8-32 x 2 1/2
PF	842003962	Screw, Pan Head, Slotted 10-32 x 1/4
PG	842003963	Screw, Pan Head, Slotted 10-32 x 7/16
PH	842003964	Screw, Pan Head, Slotted 10-32 x 1
PJ	842003965	Screw, Pan Head, Slotted 10-32 x 1 1/8
PK	842003966	Screw, Pan Head, Slotted 10-32 x 2 1/2
PL	842003967	Screw, Pan Head, Slotted 1/4-20 x 3/4
PM	842003968	Screw, Pan Head, Slotted 1/4-20 x 1
PN	842003969	Screw, Pan Head, Slotted 8-32 x 3/16
PP	842003970	Screw, Pan Head, Slotted 10-32 x 1 1/4
PR	842003971	Screw, Pan Head, Slotted 10-32 x 1 1/2
PS	842003972	Screw, Pan Head, Slotted 10-32 x 2 1/4
PT	842003973	Screw, Pan Head, Slotted 1/4-20 x 5/16
PU	842003974	Screw, Pan Head, Slotted 10-32 x 2
PV	842003975	Screw, Pan Head, Slotted 1/4-20 x 1 1/2
PW	842004001	Screw, Cap, Hex 8-32 x 3/4
PX	842004002	Screw, Cap, Hex 8-32 x 7/8
PY	842004003	Screw, Cap, Hex 10-32 x 3/8
PZ	842004004	Screw, Cap, Hex 10-32 x 1/2
RA	842004005	Screw, Cap, Hex 10-32 x 3/4
RB	842004006	Screw, Cap, Hex 10-32 x 1
RC	842004007	Screw, Cap, Hex 1/4-20 x 1
RD	842004008	Screw, Cap, Hex 1/4-20 x 1 1/4
RE	842004009	Screw, Cap, Hex 1/4-20 x 1 3/8
RF	842004010	Screw, Cap, Hex 1/4-20 x 2 1/4
RG	842004011	Screw, Cap, Hex 5/16-18 x 3/4
RH	842004012	Screw, Cap, Hex 2-56 x 1/4
RJ	842004013	Screw, Cap, Hex 8-32 x 3/8
RK	842004014	Screw, Cap, Hex 1/4-20 x 1 1/2
RL	842004015	Screw, Cap, Hex 1/4-20 x 2 1/2
RM	842004016	Screw, Cap, Hex 3/8-16 x 1
RN	842004017	Screw, Cap, Hex 7/16-14 x 2
RP	842004018	Screw, Cap, Hex 3/8-24 x 2 1/2
RR	842004019	Screw, Cap, Hex 1/4-20 x 5/8
RS	842004020	Screw, Cap, Hex 3/8-16 x 2 1/2
RT	842004021	Screw, Cap, Hex 3/8-16 x 2
RU	842004022	Screw, Cap, Hex 1/4-20 x 3/4
RV	842004023	Screw, Cap, Hex 1/4-28 x 3/4
RW	842004024	Screw, Cap, Hex 3/8-16 x 1 3/4
RX	842004025	Screw, Cap, Hex 1/4-20 x 7/8
RY	842004026	Screw, Cap, Hex 1/4-20 x 1 3/4
RZ	842004027	Screw, Cap, Hex 5/16-18 x 3/8
SA	842004028	Screw, Cap, Hex 5/16-18 x 1/2
SB	842004029	Screw, Cap, Hex 3/8-24 x 1/2
SC	842004030	Screw, Cap, Hex 3/8-24 x 7/8
SD	842004031	Screw, Cap, Hex 1/4-28 x 5/8
SE	842004032	Screw, Cap, Hex 1/4-28 x 1 1/4
SF	842004033	Screw, Cap, Hex 5/16-24 x 2 3/4
SG	842004034	Screw, Cap, Hex 1/4-20 x 1/2
SH	842004035	Screw, Cap, Hex 5/16-18 x 2 1/4
SJ	842004036	Screw, Cap, Hex 5/16-18 x 1 1/2
SK	842004037	Screw, Cap, Hex 1/4-28 x 7/8
SL	842004038	Screw, Cap, Hex 3/8-24 x 1
SM	842004039	Screw, Cap, Hex 3/8-24 x 1 1/2
SN	842004101	Screw, Flat Head, Phillips 2-56 x 1/4
SP	842004102	Screw, Flat Head, Phillips 2-56 x 3/8
SR	842004103	Screw, Flat Head, Phillips 2-56 x 1/2
SS	842004104	Screw, Flat Head, Phillips 4-40 x 1/4
ST	842004105	Screw, Flat Head, Phillips 4-40 x 5/16
SU	842004106	Screw, Flat Head, Phillips 4-40 x 3/8
SV	842004107	Screw, Flat Head, Phillips 4-40 x 1/2
SW	842004108	Screw, Flat Head, Phillips 4-40 x 5/8
SX	842004109	Screw, Flat Head, Phillips 4-40 x 1
SY	842004110	Screw, Flat Head, Phillips 6-32 x 1/4
SZ	842004111	Screw, Flat Head, Phillips 6-32 x 5/16
TA	842004112	Screw, Flat Head, Phillips 6-32 x 3/8
TB	842004113	Screw, Flat Head, Phillips 6-32 x 7/16
TC	842004114	Screw, Flat Head, Phillips 6-32 x 1/2
TD	842004115	Screw, Flat Head, Phillips 6-32 x 3/4
TE	842004116	Screw, Flat Head, Phillips 6-32 x 7/8
TF	842004117	Screw, Flat Head, Phillips 6-32 x 1
TG	842004118	Screw, Flat Head, Phillips 8-32 x 1/4
TH	842004119	Screw, Flat Head, Phillips 8-32 x 5/16
TJ	842004120	Screw, Flat Head, Phillips 8-32 x 3/8
TK	842004121	Screw, Flat Head, Phillips 8-32 x 1/2
TL	842004122	Screw, Flat Head, Phillips 8-32 x 5/8
TM	842004123	Screw, Flat Head, Phillips 8-32 x 1
TN	842004124	Screw, Flat Head, Phillips 8-32 x 1 1/4
TP	842004125	Screw, Flat Head, Phillips 10-32 x 3/8
TR	842004126	Screw, Flat Head, Phillips 10-32 x 7/16
TS	842004127	Screw, Flat Head, Phillips 10-32 x 1/2
TT	842004128	Screw, Flat Head, Phillips 10-32 x 5/8
TU	842004129	Screw, Flat Head, Phillips 2-56 x 5/16
TV	842004130	Screw, Flat Head, Phillips 4-40 x 7/16
TW	842004131	Screw, Flat Head, Phillips 4-40 x 7/8
TX	842004132	Screw, Flat Head, Phillips 8-32 x 3/4
TY	842004133	Screw, Flat Head, Phillips 2-56 x 3/16
TZ	842004134	Screw, Flat Head, Phillips 4-40 x 3/4
UA	842004135	Screw, Flat Head, Phillips 4-40 x 3/16
UB	842004136	Screw, Flat Head, Phillips 6-32 x 5/8
UC	842004137	Screw, Flat Head, Phillips 6-32 x 3/16
UD	842004138	Screw, Flat Head, Phillips 8-32 x 1 3/8
UE	842004139	Screw, Flat Head, Phillips 10-32 x 1 1/4
UF	842004140	Screw, Flat Head, Phillips 1/4-20 x 1/2
UG	842004141	Screw, Flat Head, Phillips 6-32 x 1 3/4
UH	842004142	Screw, Flat Head, Phillips 6-32 x 1 1/4
UJ	842004143	Screw, Flat Head, Phillips 8-32 x 7/16
UK	842004144	Screw, Flat Head, Phillips 2-56 x 1

Table 7-a. Hardware List (Cont'd)

INDEX LETTER	PART NO.	DESCRIPTION
UL	842004201	Screw, Hex, Flat Head 6-32 x 1/4
UM	842004202	Screw, Hex, Flat Head 6-32 x 3/8
UN	842004203	Screw, Hex, Flat Head 8-32 x 3/8
UP	842004204	Screw, Hex, Flat Head 8-32 x 1/2
UR	842004205	Screw, Hex, Flat Head 10-32 x 3/8
US	842004206	Screw, Hex, Flat Head 10-32 x 1/2
UT	842004207	Screw, Hex, Flat Head 10-32 x 3/4
UU	842004208	Screw, Hex, Flat Head 1/4-20 x 3/4
UV	842004209	Screw, Hex, Flat Head 10-32 x 1
UW	842004210	Screw, Hex, Flat Head 1/4-20 x 1 1/4
UX	842004211	Screw, Hex, Flat Head 3/8-16 x 2
UY	842004212	Screw, Hex, Flat Head 10-32 x 5/8
UZ	842004213	Screw, Hex, Flat Head 3/8-16 x 1
VA	842004214	Screw, Hex, Flat Head 10-32 x 1/4
VB	842004301	Screw, Pan Head, Phillips 3-48 x 5/16
VC	842004302	Screw, Pan Head, Phillips 3-56 x 1/2
VD	842004303	Screw, Pan Head, Phillips 6-40 x 3/4
VE	842004304	Screw, Pan Head, Phillips 8-36 x 3/4
VF	842004305	Screw, Pan Head, Phillips 8-36 x 1
VG	842004306	Screw, Pan Head, Phillips 10-24 x 3/8
VH	842004307	Screw, Pan Head, Phillips 5-40 x 1/2
VJ	842004308	Screw, Pan Head, Phillips 1/4-28 x 7/16
VK	842004309	Screw, Pan Head, Phillips 5-40 x 5/16
VL	842004310	Screw, Pan Head, Phillips 5-40 x 7/8
VM	842004311	Screw, Pan Head, Phillips 5-40 x 1 1/4
VN	842004312	Screw, Pan Head, Phillips 6-40 x 5/8
VP	842004313	Screw, Pan Head, Phillips 6-40 x 1 1/4
VR	842004314	Screw, Pan Head, Phillips 10-24 x 5/8
VS	842004315	Screw, Pan Head, Phillips 12-24 x 1 1/4
VT	842004316	Screw, Pan Head, Phillips 10-24 x 1/2
VU	842004317	Screw, Pan Head, Phillips 12-24 x 2 1/16
VV	842004318	Screw, Pan Head, Phillips 0-80 x 3/16
VW	842004319	Screw, Pan Head, Phillips 3-48 x 1/4
VX	842004401	Screw, Cap, Socket Head 10-24 x 1 3/4
VY	842004402	Screw, Cap, Socket Head 12-24 x 1/2
VZ	842004403	Screw, Cap, Socket Head 10-24 x 1/2
WA	842004404	Screw, Cap, Socket Head 10-24 x 3/8
WB	842004405	Screw, Cap, Socket Head 10-24 x 3/4
WC	842004406	Screw, Cap, Socket Head 1/4-28 x 1 3/4
WD	842004407	Screw, Cap, Socket Head 1/4-28 x 7/8
WE	842004408	Screw, Cap, Socket Head 1/2-13 x 1 1/4
WF	842004410	Screw, Cap, Socket Head 1/4-28 x 3/4
WG	842004411	Screw, Cap, Socket Head 1/2-13 x 7/8
WH	842004412	Screw, Cap, Socket Head 10-24 x 1 1/4
WJ	842004413	Screw, Cap, Socket Head 1/4-28 x 1/2
WK	842004414	Screw, Cap, Socket Head 1/4-28 x 5/8
WL	842004415	Screw, Cap, Socket Head 1/4-28 x 2
WM	845001501	Set Screw, Hex, Cup Point 4-40 x 1/8
WN	845001502	Set Screw, Hex, Cup Point 4-40 x 3/16
WP	845001503	Set Screw, Hex, Cup Point 4-40 x 1/2
WR	845001504	Set Screw, Hex, Cup Point 6-32 x 1/8
WS	845001505	Set Screw, Hex, Cup Point 6-32 x 3/16
WT	845001506	Set Screw, Hex, Cup Point 6-32 x 1/4
WU	845001507	Set Screw, Hex, Cup Point 6-32 x 5/16
WV	845001508	Set Screw, Hex, Cup Point 6-32 x 3/8
WW	845001509	Set Screw, Hex, Cup Point 8-32 x 1/8
WX	845001510	Set Screw, Hex, Cup Point 8-32 x 3/16
WY	845001511	Set Screw, Hex, Cup Point 8-32 x 1/4
WZ	845001512	Set Screw, Hex, Cup Point 8-32 x 5/16
XA	845001513	Set Screw, Hex, Cup Point 8-32 x 3/8
XB	845001514	Set Screw, Hex, Cup Point 8-32 x 1/2
XC	845001515	Set Screw, Hex, Cup Point 8-32 x 5/8
XD	845001516	Set Screw, Hex, Cup Point 10-32 x 3/16
XE	845001517	Set Screw, Hex, Cup Point 10-32 x 1/4
XF	845001518	Set Screw, Hex, Cup Point 10-32 x 5/16
XG	845001519	Set Screw, Hex, Cup Point 10-32 x 3/8
XH	845001520	Set Screw, Hex, Cup Point 10-32 x 7/16
XJ	845001521	Set Screw, Hex, Cup Point 10-32 x 1/2
XK	845001522	Set Screw, Hex, Cup Point 10-32 x 5/8
XL	845001523	Set Screw, Hex, Cup Point 1/4-20 x 3/16
XM	845001524	Set Screw, Hex, Cup Point 1/4-20 x 1/4
XN	845001525	Set Screw, Hex, Cup Point 1/4-20 x 5/16
XP	845001526	Set Screw, Hex, Cup Point 1/4-20 x 3/8
XR	845001527	Set Screw, Hex, Cup Point 1/4-20 x 1/2
XS	845001528	Set Screw, Hex, Cup Point 1/4-28 x 1/4
XT	845001529	Set Screw, Hex, Cup Point 1/4-28 x 1/2
XU	845001530	Set Screw, Hex, Cup Point 5/16-18 x 3/8
XV	845001531	Set Screw, Hex, Cup Point 5/16-18 x 5/8
XW	845001532	Set Screw, Hex, Cup Point 1/4-28 x 5/8
XX	845001533	Set Screw, Hex, Cup Point 6-32 x 1/2
XY	845001534	Set Screw, Hex, Cup Point 4-40 x 1/4
XZ	845001535	Set Screw, Hex, Cup Point 1/4-20 x 5/8
YA	845001601	Set Screw, Hex, Cup Point (Nylock) 4-40 x 3/16
YB	845001602	Set Screw, Hex, Cup Point (Nylock) 4-40 x 1/4
YC	845001603	Set Screw, Hex, Cup Point (Nylock) 6-32 x 3/16
YD	845001604	Set Screw, Hex, Cup Point (Nylock) 6-32 x 1/4
YE	845001605	Set Screw, Hex, Cup Point (Nylock) 6-32 x 3/8
YF	845001606	Set Screw, Hex, Cup Point (Nylock) 8-32 x 3/16
YG	845001607	Set Screw, Hex, Cup Point (Nylock) 8-32 x 1/4
YH	845001608	Set Screw, Hex, Cup Point (Nylock) 8-32 x 5/16
YJ	845001609	Set Screw, Hex, Cup Point (Nylock) 8-32 x 3/8
YK	845001610	Set Screw, Hex, Cup Point (Nylock) 8-32 x 5/8
YL	845001611	Set Screw, Hex, Cup Point (Nylock) 8-32 x 3/4
YM	845001612	Set Screw, Hex, Cup Point (Nylock) 10-24 x 1/4
YN	845001613	Set Screw, Hex, Cup Point (Nylock) 10-32 x 3/16
YP	845001614	Set Screw, Hex, Cup Point (Nylock) 10-32 x 1/4
YR	845001615	Set Screw, Hex, Cup Point (Nylock) 10-32 x 5/16
YS	845001616	Set Screw, Hex, Cup Point (Nylock) 10-32 x 3/8
YT	845001617	Set Screw, Hex, Cup Point (Nylock) 10-32 x 1/2
YU	845001618	Set Screw, Hex, Cup Point (Nylock) 10-32 x 1
ZA	847000901	Screw, Pan Head, Phillips, Self Tapping 4-24 x 3/16
ZB	847000902	Screw, Pan Head, Phillips, Self Tapping 4-24 x 1/4
ZC	847000903	Screw, Pan Head, Phillips, Self Tapping 4-24 x 3/8
ZD	847000904	Screw, Pan Head, Phillips, Self Tapping 4-24 x 7/16
ZE	847000905	Screw, Pan Head, Phillips, Self Tapping 4-24 x 5/8
ZF	847000906	Screw, Pan Head, Phillips, Self Tapping 6-20 x 1/4
ZG	847000907	Screw, Pan Head, Phillips, Self Tapping 6-20 x 3/8
ZH	847000908	Screw, Pan Head, Phillips, Self Tapping 6-20 x 1/2
ZJ	847000909	Screw, Pan Head, Phillips, Self Tapping 6-20 x 7/8
ZK	847000910	Screw, Pan Head, Phillips, Self Tapping 8-18 x 3/8
ZL	847000911	Screw, Pan Head, Phillips, Self Tapping 8-18 x 1/2
ZM	847000912	Screw, Pan Head, Phillips, Self Tapping 8-18 x 5/8
ZN	847000913	Screw, Pan Head, Phillips, Self Tapping 10-16 x 1/2
ZP	847000814	Screw, Pan Head, Phillips, Self Tapping 10-16 x 1
ZR	847001001	Screw, Pan Head, Phillips, Self Threading 4-40 x 1/4
ZS	847001002	Screw, Pan Head, Phillips, Self Threading 4-40 x 7/16
ZT	847001003	Screw, Pan Head, Phillips, Self Threading 4-40 x 1/2
ZU	847001004	Screw, Pan Head, Phillips, Self Threading 6-32 x 1/4
ZV	847001005	Screw, Pan Head, Phillips, Self Threading 6-32 x 3/8
ZW	847001006	Screw, Pan Head, Phillips, Self Threading 6-32 x 1/2
ZX	847001007	Screw, Pan Head, Phillips, Self Threading 8-32 x 3/8
ZY	847001008	Screw, Pan Head, Phillips, Self Threading 8-32 x 1/2
ZZ	847001009	Screw, Pan Head, Phillips, Self Threading 8-32 x 5/16
AAA	847001010	Screw, Pan Head, Phillips, Self Threading 10-32 x 3/4
AAB	847001011	Screw, Pan Head, Phillips, Self Threading 4-40 x 3/8
AAC	848001101	Screw, Shoulder 10-24 x 1/2
AAD	848001102	Screw, Shoulder 10-24 x 5/8
AAE	848001103	Screw, Shoulder 1/4-20 x 5/8
AAF	848001104	Screw, Shoulder 1/4-20 x 3/4
AAG	848001105	Screw, Shoulder 5/16-18 x 3/4
AAH	848001106	Screw, Shoulder 10-24 x 1
AAJ	848001107	Screw, Shoulder 1/4-20 x 1
AAK	848001108	Screw, Shoulder 3/8-16 x 1
AAL	848001109	Screw, Shoulder 1/4-20 x 1 1/4
AAM	848001110	Screw, Shoulder 3/8-16 x 1 1/4
AAN	932000901	Washer, Flat, Plain #2
AAP	932000902	Washer, Flat, Plain #3
AAR	932000903	Washer, Flat, Plain #4
AAS	932000904	Washer, Flat, Plain #5
AAT	932000905	Washer, Flat, Plain #6
AAU	932000906	Washer, Flat, Plain #8
AAV	932000907	Washer, Flat, Plain #10
AAW	932000908	Washer, Flat, Plain #12
AAX	932000909	Washer, Flat, Plain 1/4
AAY	932000910	Washer, Flat, Plain 5/16
AAZ	932000911	Washer, Flat, Plain 3/8
ABA	932000912	Washer, Flat, Plain 7/16
ABB	932000913	Washer, Flat, Plain 1/2
ABC	932000914	Washer, Flat, Plain 9/16
ABD	932000915	Washer, Flat, Plain #4
ABE	932000916	Washer, Flat, Plain -
ABF	932001201	Washer, Flat 1/2
ABG	932001202	Washer, Flat 9/16
ABH	933001001	Washer, Lock, Ext. Tooth #2
ABJ	933001002	Washer, Lock, Ext. Tooth #3
ABK	933001003	Washer, Lock, Ext. Tooth #4
ABL	933001004	Washer, Lock, Ext. Tooth #5
ABM	933001005	Washer, Lock, Ext. Tooth #6
ABN	933001006	Washer, Lock, Ext. Tooth #8
ABP	933001007	Washer, Lock, Ext. Tooth #10
ABR	933001008	Washer, Lock, Ext. Tooth #12
ABS	933001009	Washer, Lock, Ext. Tooth 1/4
ABT	933001010	Washer, Lock, Ext. Tooth 5/16
ABU	933001011	Washer, Lock, Ext. Tooth 3/8
ABV	933001012	Washer, Lock, Ext. Tooth 7/16
ABW	933001013	Washer, Lock, Ext. Tooth 1/2
ABX	933001201	Washer, Lock, Int. Tooth #2
ABY	933001202	Washer, Lock, Int. Tooth #3
ABZ	933001203	Washer, Lock, Int. Tooth #4
ACA	933001204	Washer, Lock, Int. Tooth #5
ACB	933001205	Washer, Lock, Int. Tooth #6
ACC	933001206	Washer, Lock, Int. Tooth #8
ACD	933001207	Washer, Lock, Int. Tooth #10
ACE	933001208	Washer, Lock, Int. Tooth #12
ACF	933001209	Washer, Lock, Int. Tooth 1/4
ACG	933001210	Washer, Lock, Int. Tooth 5/16
ACH	933001211	Washer, Lock, Int. Tooth 3/8
ACJ	933001212	Washer, Lock, Int. Tooth 7/16
ACK	933001213	Washer, Lock, Int. Tooth 1/2
ACL	933001301	Washer, Lock, Split #2
ACM	933001302	Washer, Lock, Split #3
ACN	933001303	Washer, Lock, Split #4
ACP	933001304	Washer, Lock, Split #5
ACR	933001305	Washer, Lock, Split #6
ACS	933001306	Washer, Lock, Split #8
ACT	933001307	Washer, Lock, Split #10
ACU	933001308	Washer, Lock, Split #12
ACV	933001309	Washer, Lock, Split 1/4
ACW	933001310	Washer, Lock, Split 5/16
ACX	933001311	Washer, Lock, Split 3/8
ACY	933001312	Washer, Lock, Split 7/16
ACZ	933001313	Washer, Lock, Split 1/2
ADA	632002108	Speed Nut Fastener, "U" Type
ADB	933000101	Washer, Flat .145 I.D.x.624 O.D.
ADC	829107011	Ring, Retaining - External Grip
ADD	829113009	Ring, Retaining
ADE	842001620	Screw, Button Hd. Soc. Cap #6-32 x .31 Lg.
ADF	842001601	Screw, Button Hd. Soc. Cap #4-40 x .19 Lg.
ADG	632003201	Nut, Speed - "J" Type
ADH	933141015	Washer, Spring Style - 3 (Curved)
ADJ	933107003	Washer, Nylon #8
ADK	842122071	Screw, Soc. Hd. Sstl. #8-32 x 1.25 Lg.
ADL	842141021	Screw, Soc. Hd. Cap #1-72 x 1/8"
ADM	776121004	Nut, Cap (Acorn)
ADN		
ADP	845004301	Screw, Set-Slotted Sstl - #4-40 x .75 Lg.
ADR	932000201	Washer, Flat Sml. Pattern Sstl #4
ADS	933113003	Washer, Lock, Split - Sstl =4
ADT	776111001	Nut, Hex, Sml. Pattern - Sstl #4-40
ADU	776110002	Nut, Jam 1/4 - 28
ADV	842122087	Screw, Soc. Hd. Sstl #10-32 x .62 Lg.
ADW	932000308	Washer, Flat Sstl #10
ADX	933113007	Washer, Lock, Split, Sstl #10

Table 7-a. Hardware List (Cont'd)

INDEX LETTER	PART NO.	DESCRIPTION
ADY	776000701	Nut, Decorative 5/16 x 40
ADZ	847000301	Screw, Self thread #4-24 x 5/8
AEA	932000110	Washer, Flat Nylon #4
AEB	842130043	Screw, B.H. #6-32 x 3/8 Nylon
AEC	932000103	Washer, Flat, Nylon #6
AED	829111007	Ring, Retaining
AEE	009030500	Washer, Rubber
AEF	632000902	Screw, Fastener
AEG	632001101	Retainer
AEH	842119129	Screw, Flat Head 1/4-20 x 3/4
AEJ	842001437	Screw, Pan Head 10/32 x 3/8
AEK	842001434	Screw, Pan Head 8-32 x 1/2
AEL	847001012	Screw, #6 x 5/8 Type "F"
AEM	842001433	Screw, Flat Head #8-3/8
AEN	842001611	Screw, #1/4-20 x 3/8 Button Head
AEP	009027500	Clip, Speed Nut
AER	933000905	Washer, Wavy Spring
AES	829113003	Ring, Retaining
AET	829113005	Ring, Retaining
AEU	847002101	Screw, Hex Hd. Tapping Type
AEV	845106023	Setscrew, Hex Soc. #6-32
AEW	842004147	Screw, Flat Hd. #6-32 x .56
AEX	842002410	Screw,But.HD.#10-32x.38
AEY	829121019	Retaining Ring
AEZ	795108044	Pin, Spring, Slotted
AFA	829002701	Ring Retaining, External
AFB	845116021	Set Screw 5-40 X 1/8
AFC	829111015	Ring Retaining, External
AFD	829109002	Ring Retaining, Interlock
AFE	795224004	Pin, Driv Loc 3/32 O.D.
AFF	776131004	Nut, Hex Slotted 5/16 - 24
AFG	795130068	Cotter Pin
AFH	933107002	Washer, Nylon #6
AFJ	845125089	Set Screw, 10-32 X 3/4
AFK	795108014	Pin Roll 1/8 X .63
AFL	933118004	Washer, Nylon
AFM	845001082	Set Screw
AFM	842004145	Screw, Flat Hd, Philips 4-40 X 1 3/8
AFP	776114014	Nut, Clinched Self Locking
AFR	632133003	Stud, Wing
AFS	632132001	Ring, Retaining Split
AFT	141101013	Cable Clamp 1 inch
AFU	511101001	Cable Clamp
AFV	803000302	Nut
AFW	803000303	Washer, Adj Stop
AFY		
AFZ	795109211	Roll Pin 1/8 X 1 inch
AGA	845126005	Set Screw 8-32 X 15/64
AGB	933105008	Washer Plain 5/16
AGC	829113008	Retaining Ring External
AGD	776130011	Nut, Hex, Self-Locking 3/8 X 24
AGE	845125089	Screw, Set Oval Pt 10-32 X 1/4
AGF	829111005	Retaining Ring
AGG	829113006	Retaining Ring
AGH	795123127	Pin Drive Loc 3/16 X 1 1/4
AGJ	842201011	Screw, Shoulder 10-32 X 3/4
AGK	571000408	Cable Clamp
AGL	829113007	Ring, Ret. Ext. .250 SF
AGM	829113013	Retaining Ring External
AGN	842212004	Screw, Shoulder 1/4w - 20 X 3/4
AGP	829113107	Ring Retaining
AGR	933118001	Washer, Nylon
AGS	933141020	Washer, Spring, Curved
AGT	697000409	Clinch Nut, Plain
AGU	842006501	Screw; Flat Hd, Undercut #6-32 X 1/4
AGV	302003701	Lamp
AGW	302003702	Lamp
AGX	302003703	Lamp
AG	302003704	Lamp
AGZ	842122192	Screw, Soc. Hd 1/2 - 13 - 1.50
AHA	842006317	Screw, 6 X 32 X 1/2 CSNK
AHB	845116061	Screw, Set 8-32 X 1/8 Soc.
AHC	842006323	Screw, 8-32 X 7/16 CSNK
AHD	848001303	Screw, Shoulder 10-32 S.S.
AHE	933150010	Washer, Belleville
AHF	842001411	Screw, Pan 4 - 40 X 3/8
AHG	842006309	Screw 4 - 40 X 1/4 CSNK
AHH	829101011	Ring, Ret. Int. 1.125
AHJ	829131014	Ring, Ret. Ext.
AHK	795109005	Pin Spg., Slot - 7/16
AHL	933103003	Washer, Lock #4 Ext.
AHM	842122052	Screw, Soc. 6-32 X 1 1/2
AHN	932000109	Washer, Flat, Nylon
AHP	848001111	Screw, Shoulder 3/8 - 16
AHR	842000205	Screw, 6-32 X .500
AHS	829113011	Ring, Ret. Ext. .500 SFT
AHT	845116043	Screw Set 6-36 X .25
AHU	845116002	Screw Set, 4-40 X 3/16 Soc.
AHV	842142017	Screw, Mach. Hd. Long Lok 6-32 X 7/16
AHW	934103002	Washer, Shoulder
AHX	795112313	Pin, Dowel 7/8 X 1/8
AHY	847001012	Screw, Self Tap 10-32 X .50
AHZ	932001202	Washer, Flat Special
AJA	571101001	Cable Clamp-P Nylon
AJB	192001901	Fastener, #6-32 Fan Mount
AJC	934103003	Washer, Shoulder Fiber Insulating
AJD	934103006	Washer, Nylon Shoulder
AJE	842130021	Screw, Nylon #4-40 X .188
AJF		
AJG	571101008	Cable Clamp
AJH	420004301	Terminal Tab .250 X 2
AJJ	874000106	Standoff 6-32 X 1.00

INDEX LETTER	PART NO.	DESCRIPTION
AJM	632002110	Speed Nut Fastener
AJN	847000601	Screw, Flat Hd. Self Tap Hd.
AJP	831001501	Rivet, Pop, 1/8 X 5/8
AJR	842003636	Screw, Self Tap 8-15 X 3/8
AJS	881104021	Cable Strap
AJT	571002901	Mounting Adhesive, Cable Strap
AJU	776111005	Nut, Hex. 8 - 32
AJV	867129009	Spacer Alum. #6
AJW	662001301	Grommet, Split .375 Dia.
AJX	302104001	Lamp, CM 327
AJY	302003602	Lamp
AJZ	867103032	Spacer
AKA	632002101	Speed Nut
AKB	932000108	Washer, Nylon
AKC	933109009	Washer, Flat #10
AKD	632004501	Ring, Retaining
AKE	632004401	Fastener, Wing
AKF	724002601	Latch, Swell
AKG	893000401	Tape
AKH	934000302	Washer, Nylon
AKL	851000184	Shim Washer .005 Thk
AKM	851000185	Shim Washer .010 Thk
AKN	851000186	Shim Washer .020 Thk
AKP	933001102	Washer Curved
AKR	933112005	Washer, Lock #6
AKS	842001620	Screw But Soc Hd #6
AKT	842003788	Screw Sch #4 X 1-7/8
AKU	829107015	Ring Ret Ext. Grip
AKV	842006501	Screw, Flat Hd, Undercut 6-32 X 1/4
AKW	729112609	Pin, Dowel, Precision
AKX	729112909	Pin, Dowel, 1-1/4 X 3
AKY	842001608	Screw, Button Head, Soc Cap. #8-32 X .38
AKZ	829102022	Ring Ret. Int. Bowed
ALA	829112012	Ring Retaining

* Are Non Standard Parts

SECTION VIII

LOGICS AND ASSEMBLY DRAWINGS

8.1 GENERAL

8.1.1

This section contains logic and printed circuit board assembly drawings for the 2021/2022 Cartridge Tape Drives. Refer to Table 8-a for the index of appropriate logic or printed circuit board page.

8.2 INTERFACE REFERENCES

8.2.1

Interpage references are reflected in various forms in the system logic packages. A brief definition of each form follows:

(3, 4-12)	=	pages 3 and 4 pin 12 on each page
(4-J8-115)	=	page 4, jack J8. pin 15
(2-1/51)	=	page 2 pins 1 and 51
(2, 3, 4-19/69)	=	pages 2, 3, and 4 pin 19 and 69 on each page

Table 8-a. Logic and Assembly Drawing Index

PAGE NO	DWG NO	SH NO	TITLE	TYPE
1	0343693	1	LOGIC INDEX	
2	0343348	1	CONTROL & MOTOR DRIVE	CMD
3	0343829	1	READ WRITE AMPLIFIER-1	RWA-1
4	0343831	1	READ WRITE AMPLIFIER-2	RWA-2
5		2		
6	0343357	1	INTERCONNECTION DIAGRAM	

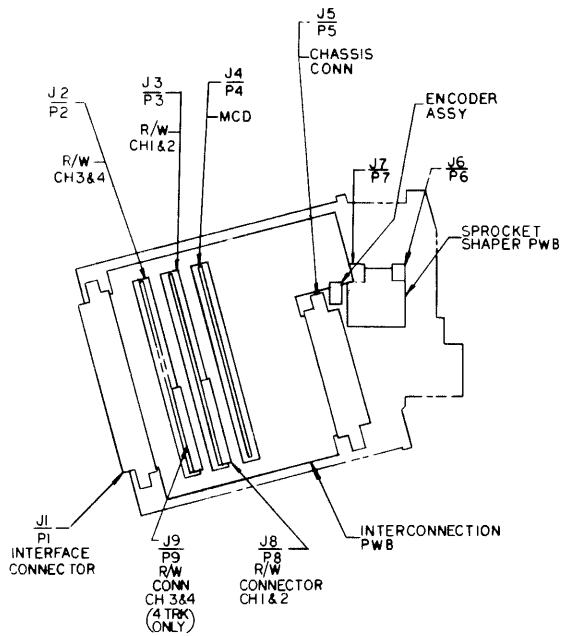
PHASE ENCODE UNITS

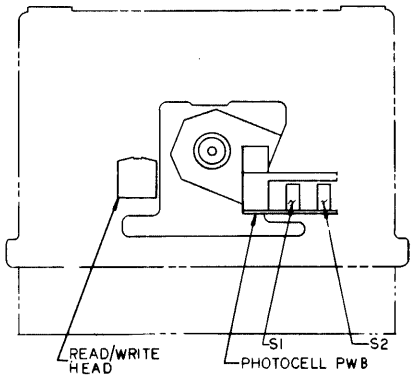
PAGE NO	DWG NO	SH NO	TITLE	TYPE
1	0343693	1	LOGIC INDEX	
2	0343348	1	CONTROL & MOTOR DRIVE	CMD
3A	0343351	1	READ WRITE AMPLIFIER-1	RWA-1
4A	0343653	1	READ WRITE AMPLIFIER-2	RWA-2
5A		2		
6	0343357	1	INTERCONNECTION DIAGRAM	

BI PHASE ENCODE UNITS

MFRY ASS'Y.	FIRST USED ON
	2021

REVISIONS				
REV	ECA	DESCRIPTION	DATE	APPROVAL
A	3100	RELEASE		
B	3142	REVISED		
C	3171	REVISED		
D	3254	REVISED		





FRONT VIEW

NOTES:

1. J1, 2, 3, 4 & 5 ARE LOCATED ON INTERCONNECTION PWB.
2. ENCODER ASST & SPROCKET SHAPER PWB ARE LOCATED ON SPROCKET CONTROL BRACKET OF MOTOR
3. J6 & J7 ARE LOCATED ON SPROCKET SHAPER PWB.
4. J8 IS LOCATED ON READ/WRITE AMPLIFIER PWB AT LOCATION J1.
5. J2 LOCATION RESERVED FOR CUSTOMER OPTION OF 1 & 4 CHANNEL READ/WRITE.
6. J1 IS PROVIDED FOR CUSTOMER INTERFACE.
7. S1 & S2 LOCATED ON PHOTOCELL PWB.
8. PHANTOM LINES INDICATE MACHINE OUTLINE.
9. J6 & J7 LOCATED ON READ/WRITE AMPLIFIER PWB AT LOCATION J2.
10. THIS SYSTEM LOGIC HAS BEEN ARRANGED TO BE USED WITH BI-PHASE AND PHASE ENCODED MACHINES WITH ONE, TWO OR FOUR READ/WRITE TRACKS. IF MACHINE IS A ONE TRACK - USE RWA-1 LOGIC. IF MACHINE IS TWO TRACK - USE RWA-2 LOGIC. IF MACHINE IS FOUR TRACK - USE RWA-2 LOGIC FOR TRACKS 1 &2 (2#) AND TRACKS 3 & 4 (2#).

REF NO 03436930I

CONTRACT NO.	
DRAFTSMAN	H.D. MENSACK
ENGINEER	
APPROVAL	
DATE	6/21/72

MOHAWK DATA SCIENCES CORP
PHILADELPHIA OPERATION

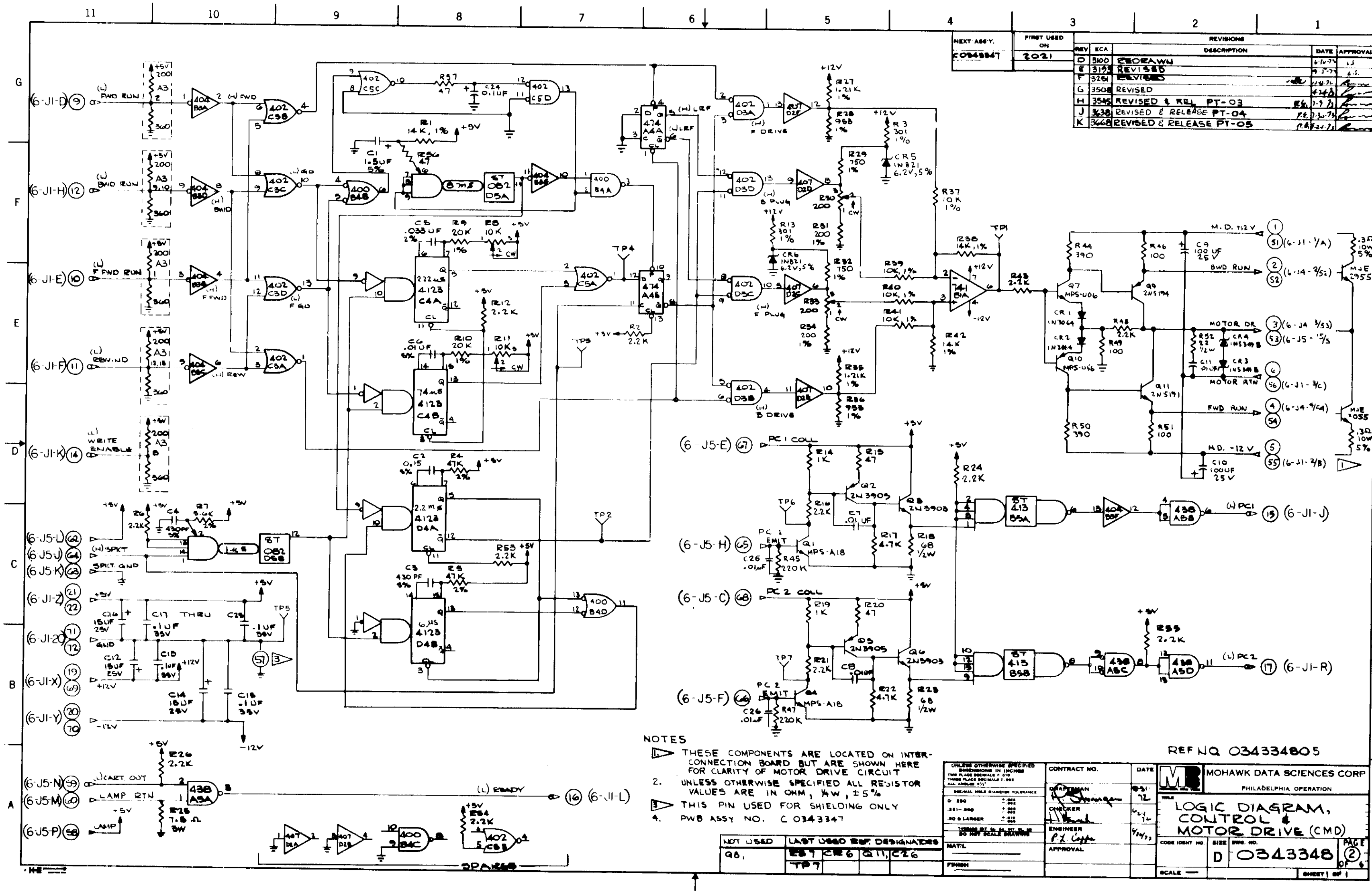
SYSTEM LOGIC INDEX

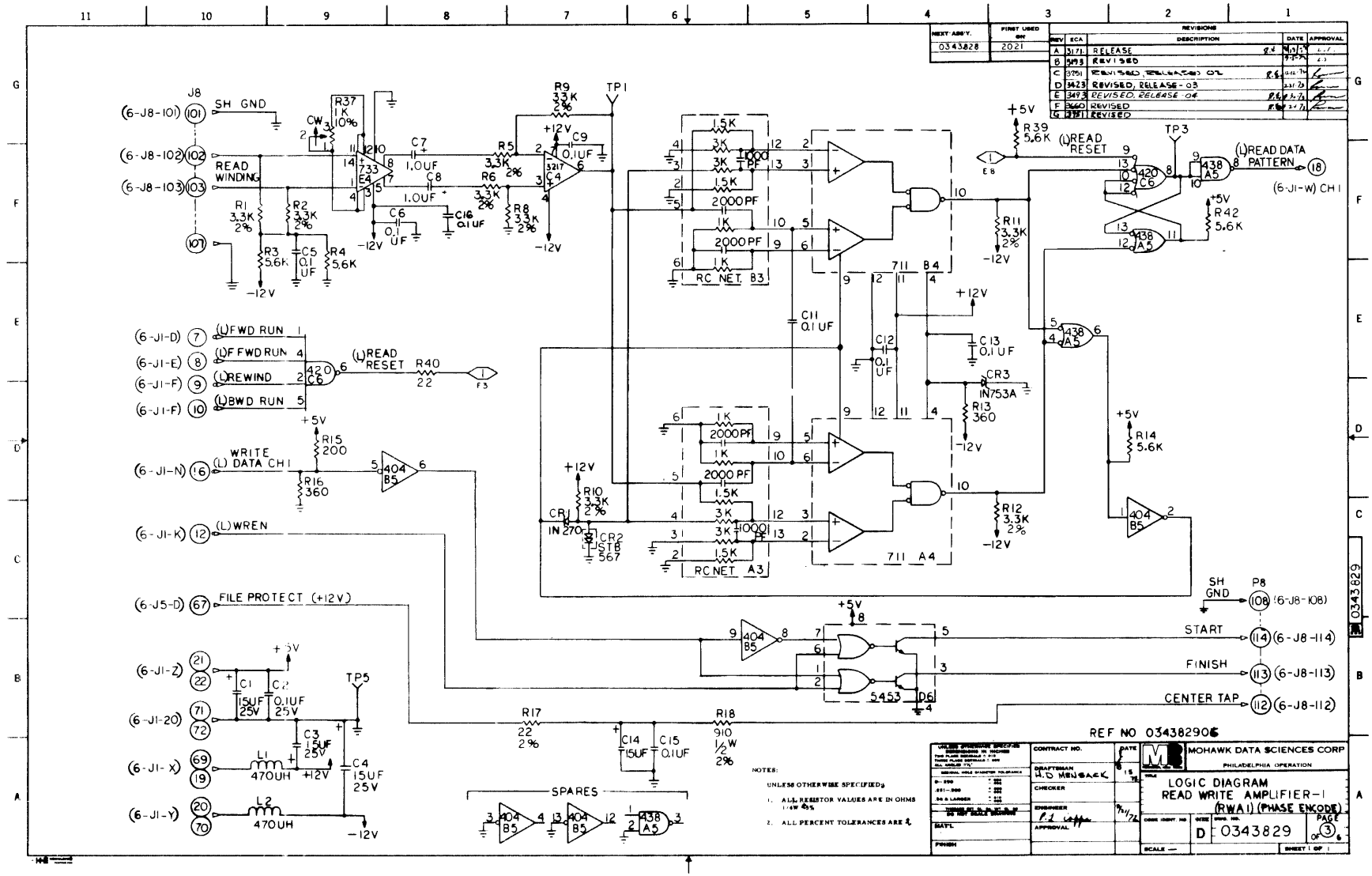
D 0343693

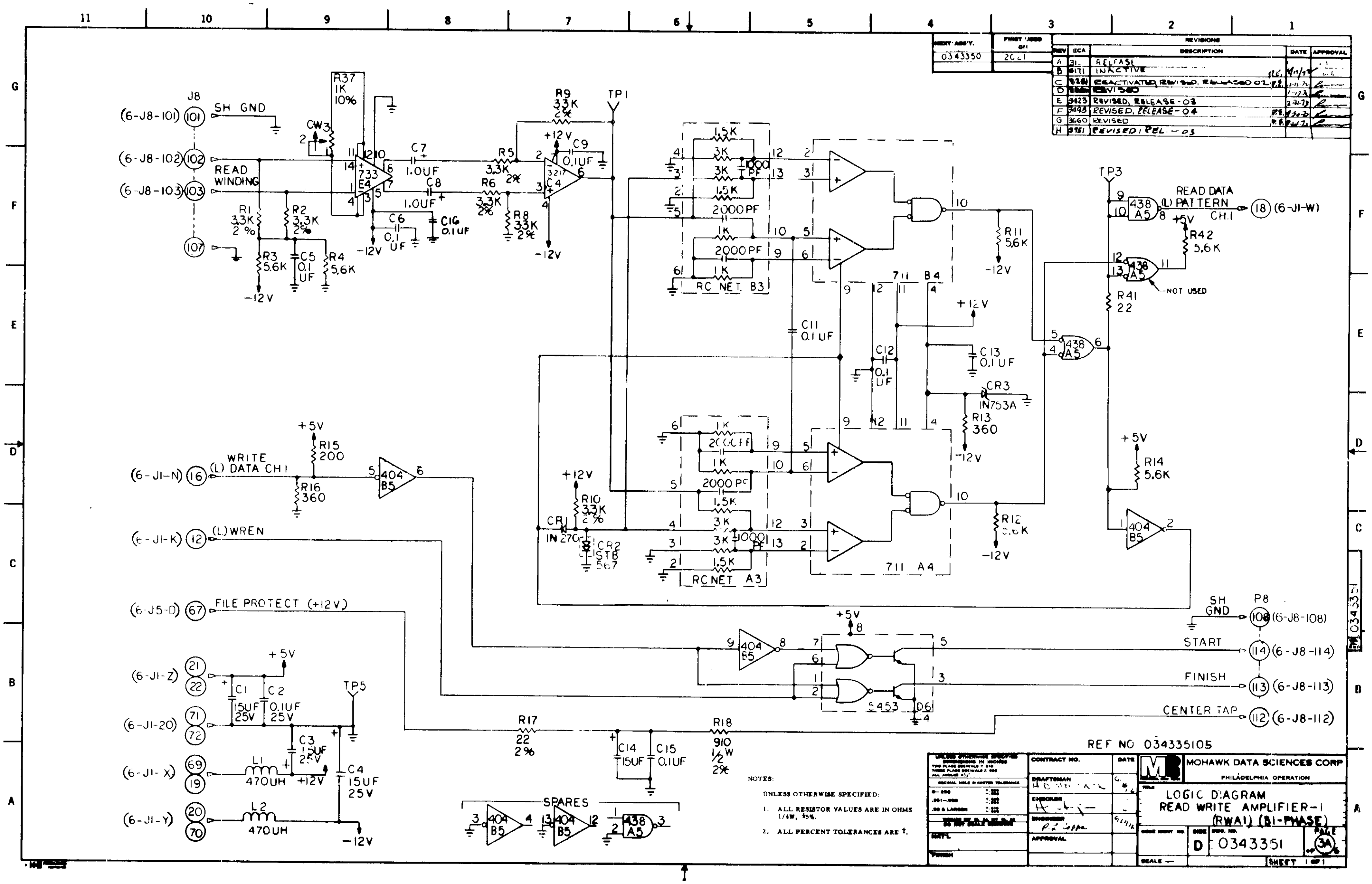
PAGE 1 OF 6

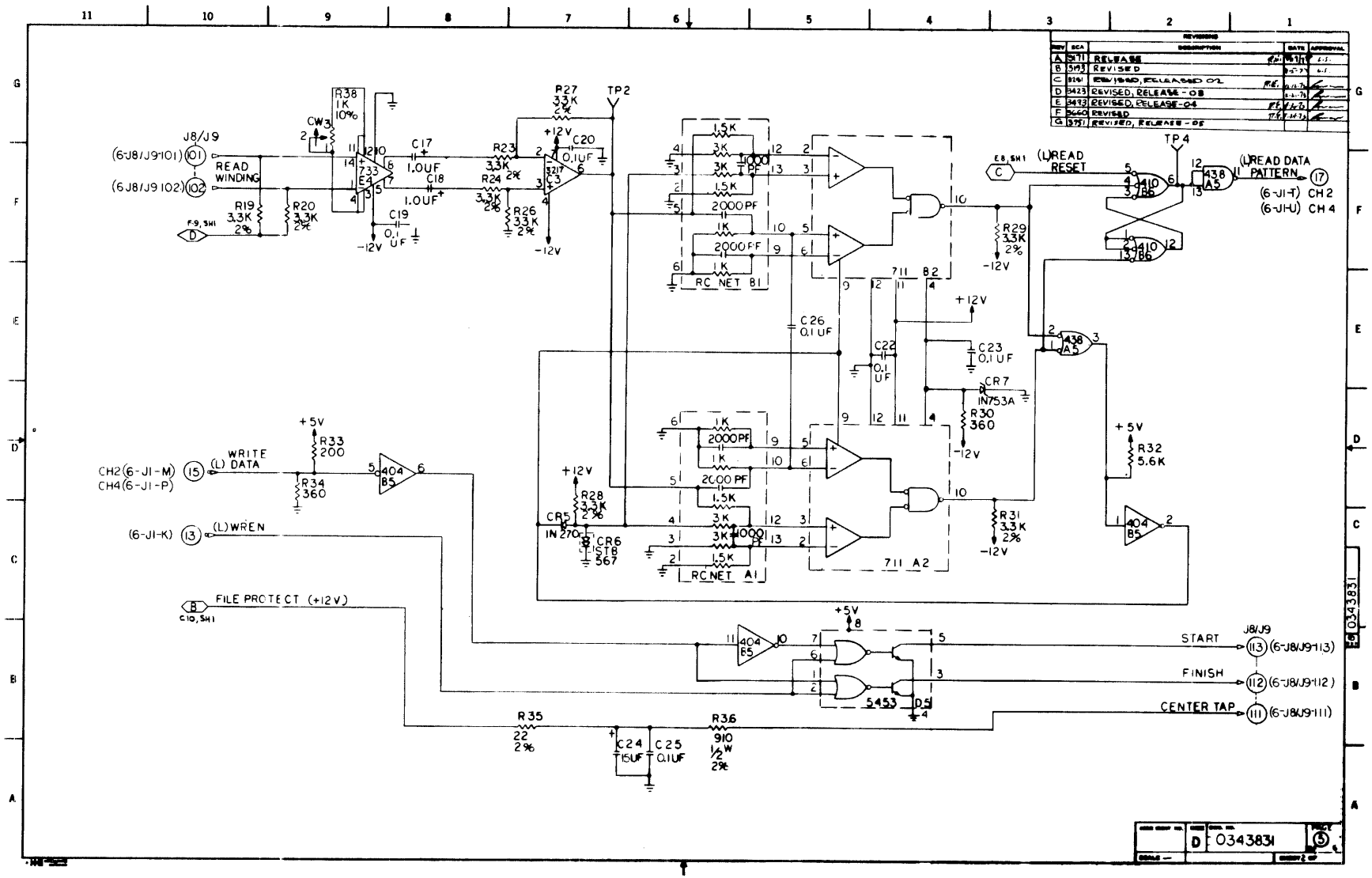
SHEET 1 OF 1

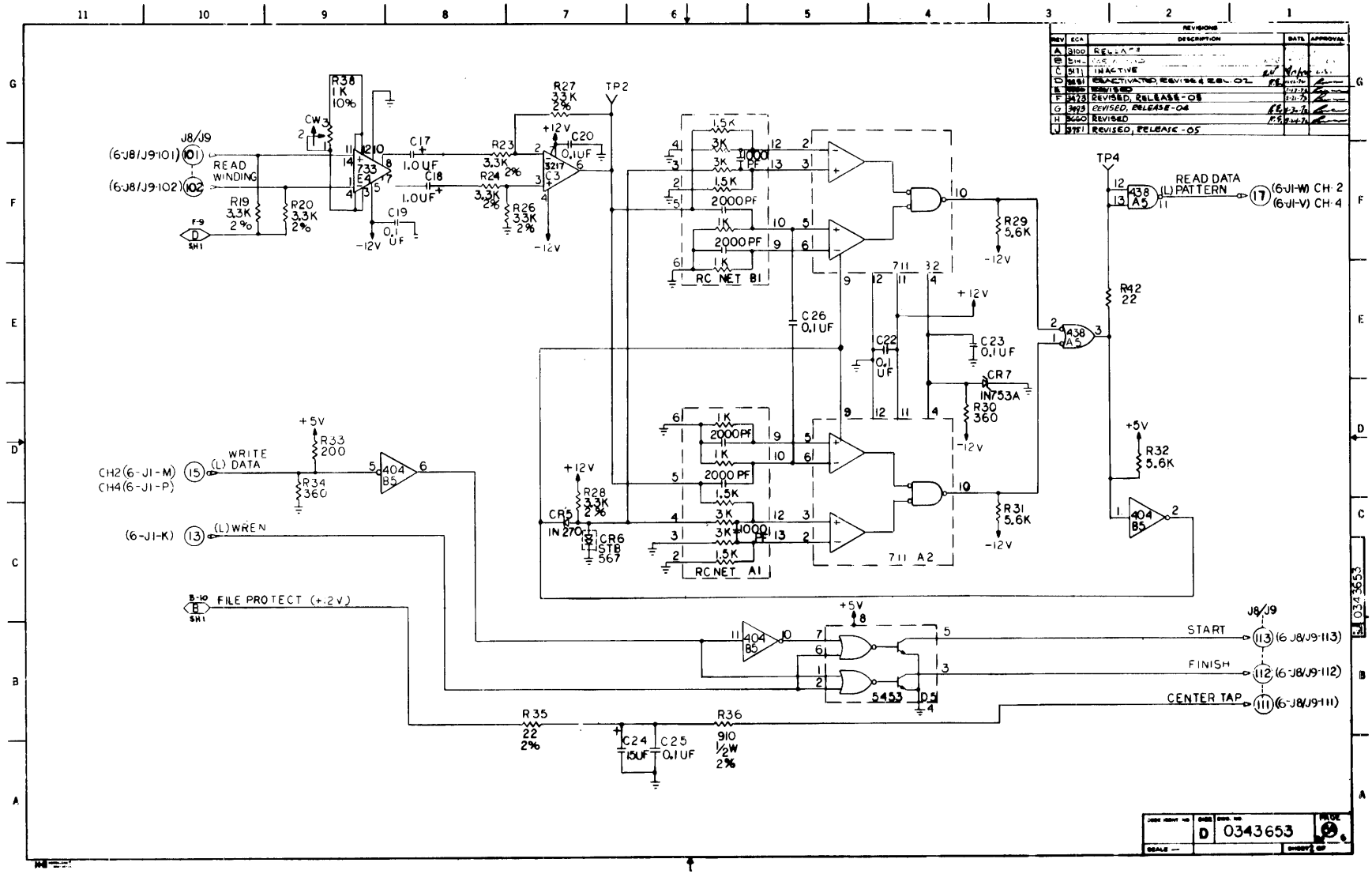
0343693


NOTES
1. THESE COMPONENTS ARE LOCATED ON INTER-CONNECTION BOARD BUT ARE SHOWN HERE FOR CLARITY OF MOTOR DRIVE CIRCUIT
2. UNLESS OTHERWISE SPECIFIED ALL RESISTOR VALUES ARE IN OHM, ¼W, ±5%
3. THIS PIN USED FOR SHIELDING ONLY
4. PWB ASSY NO. C 0343347
REF NO. 034334805
MOHAWK DATA SCIENCES CORP
PHILADELPHIA OPERATION
LOGIC DIAGRAM, CONTROL & MOTOR DRIVE (CMD)
D 0343348
REVISIONS
D 3100 REDRAWN
E 3192 REVISED
F 3261 REVISED
G 3508 REVISED
H 3545 REVISED & REL PT-03
J 3638 REVISED & RELEASE PT-04
K 3668 REVISED & RELEASE PT-05
NEXT ASS'Y. C0343347
FIRST USED ON 2021
NOT USED Q8
LAST USED REF. DESIGNATORS
SPARES


NEXT ASS'Y. 0343828
FIRST USED 2021
REVISIONS
REV ECA DESCRIPTION DATE APPROVAL
A 3171 RELEASE
B 3493 REVISED
C 3751 REVISED RELEASED 02
D 3823 REVISED, RELEASE-03
E 3493 REVISED, RELEASE-04
F 3660 REVISED
G 3781 REVISED
J8
(6-J8-101) SH GND
(6-J8-102) READ WINDING
(6-J8-103)
(6-J1-D) (L)FWD RUN
(6-J1-E) (L)F FWD RUN
(6-J1-F) (L)REWIND
(6-J1-F) (L)BWD RUN
(6-J1-N) WRITE (L) DATA CH1
(6-J1-K) (L)WREN
(6-J5-D) FILE PROTECT (+12V)
(6-J1-Z)
(6-J1-20)
(6-J1-X)
(6-J1-Y)
(L)READ RESET
(L)READ DATA PATTERN
(6-J1-W) CH1
RC NET B3
RC NET A3
711 A4
711 B4
IN753A
IN270
USTB 567
5453
SPARES
START
FINISH
CENTER TAP
SH GND P8
(6-J8-108)
(6-J8-114)
(6-J8-113)
(6-J8-112)
REF NO 034382906
NOTES:
UNLESS OTHERWISE SPECIFIED
1. ALL RESISTOR VALUES ARE IN OHMS 1/4W 5%
2. ALL PERCENT TOLERANCES ARE ±
CONTRACT NO.
DRAFTSMAN H.D MENSACK
CHECKER
ENGINEER P.J
APPROVAL
MATL
FINISH
MOHAWK DATA SCIENCES CORP
PHILADELPHIA OPERATION
LOGIC DIAGRAM
READ WRITE AMPLIFIER-I
(RWA I) (PHASE ENCODE)
D 0343829
SHEET 1 OF 1
0343829


MOHAWK DATA SCIENCES CORP
PHILADELPHIA OPERATION
LOGIC DIAGRAM
READ WRITE AMPLIFIER-1
(RWA1) (BI-PHASE)
D 0343351
REF NO 034335105
REVISIONS
A RELEASE
B INACTIVE
C REACTIVATED
D REVISED
E REVISED, RELEASE-03
F REVISED, RELEASE-04
G REVISED
H REVISED; REL.-05
NEXT ASS'Y. 0343350
FIRST USED ON 2021
NOTES:
UNLESS OTHERWISE SPECIFIED:
1. ALL RESISTOR VALUES ARE IN OHMS 1/4W, ±5%.
2. ALL PERCENT TOLERANCES ARE ±.
J8
SH GND
READ WINDING
(6-J8-101)
(6-J8-102)
(6-J8-103)
WRITE (L) DATA CH1
(6-J1-N)
(L) WREN
(6-J1-K)
FILE PROTECT (+12V)
(6-J5-D)
(6-J1-Z)
(6-J1-20)
(6-J1-X)
(6-J1-Y)
READ DATA (L) PATTERN CH.1
(18) (6-J1-W)
P8
START (114) (6-J8-114)
FINISH (113) (6-J8-113)
CENTER TAP (112) (6-J8-112)
(108) (6-J8-108)
RC NET B3
RC NET A3
711 B4
711 A4
5453
SPARES
TP1
TP3
TP5
CW3
R37 1K 10%
733 E4
C7 1.0UF
C8 1.0UF
R9 3.3K 2%
CR3 IN753A
CR1 IN270
CR2 STB 567
L1 470UH
L2 470UH
R17 22 2%
R18 910 1/2W 2%
C14 15UF
C15 0.1UF
NOT USED


J8/J9
(6-J8/J9-101) (101)
(6-J8/J9-102) (102)
READ WINDING
R38 1K 10%
CW3
C17 1.0UF
C18 1.0UF
C19 0.1 UF
R19 3.3K 2%
R20 3.3K 2%
R23 3.3K 2%
R24 3.3K 2%
R26 3.3K 2%
R27 3.3K 2%
C20 0.1UF
TP2
+12V
-12V
RC NET B1
RC NET A1
711 B2
711 A2
C26 0.1 UF
C22 0.1 UF
C23 0.1 UF
CR7 IN753A
R30 360
R29 3.3K 2%
R31 3.3K 2%
R28 3.3K 2%
CR5 IN 270
CR6 STB 567
TP4
(L)READ RESET
(L)READ DATA PATTERN
(6-J1-T) CH2
(6-J1-U) CH4
+5V
R32 5.6K
R33 200
R34 360
CH2(6-J1-M)
CH4(6-J1-P)
WRITE (L) DATA
(6-J1-K)
(L)WREN
FILE PROTECT (+12V)
R35 22 2%
C24 15UF
C25 0.1UF
R36 910 1/2W 2%
5453
START
FINISH
CENTER TAP
(6-J8/J9-113)
(6-J8/J9-112)
(6-J8/J9-111)
D 0343831


REVISIONS
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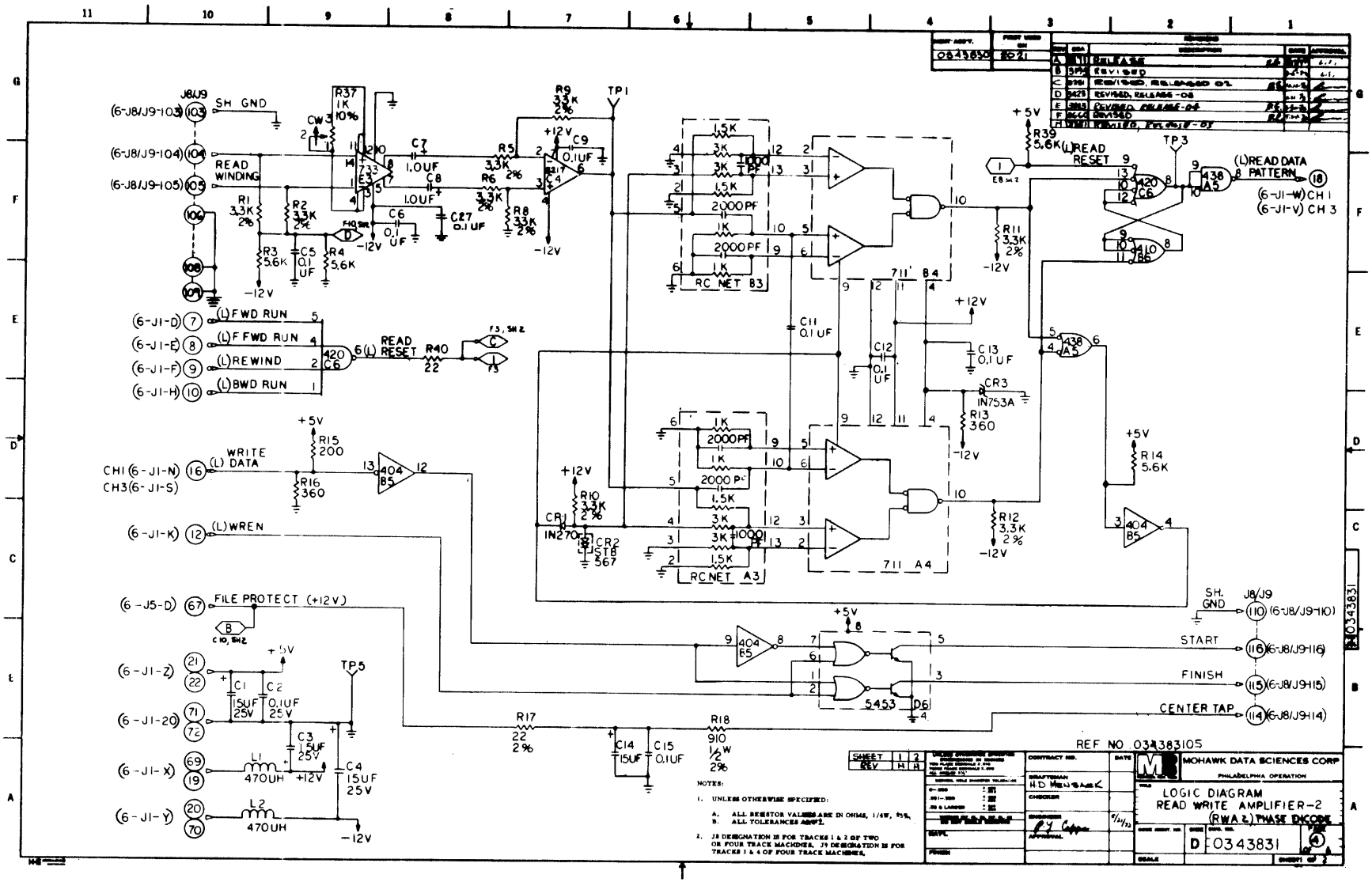
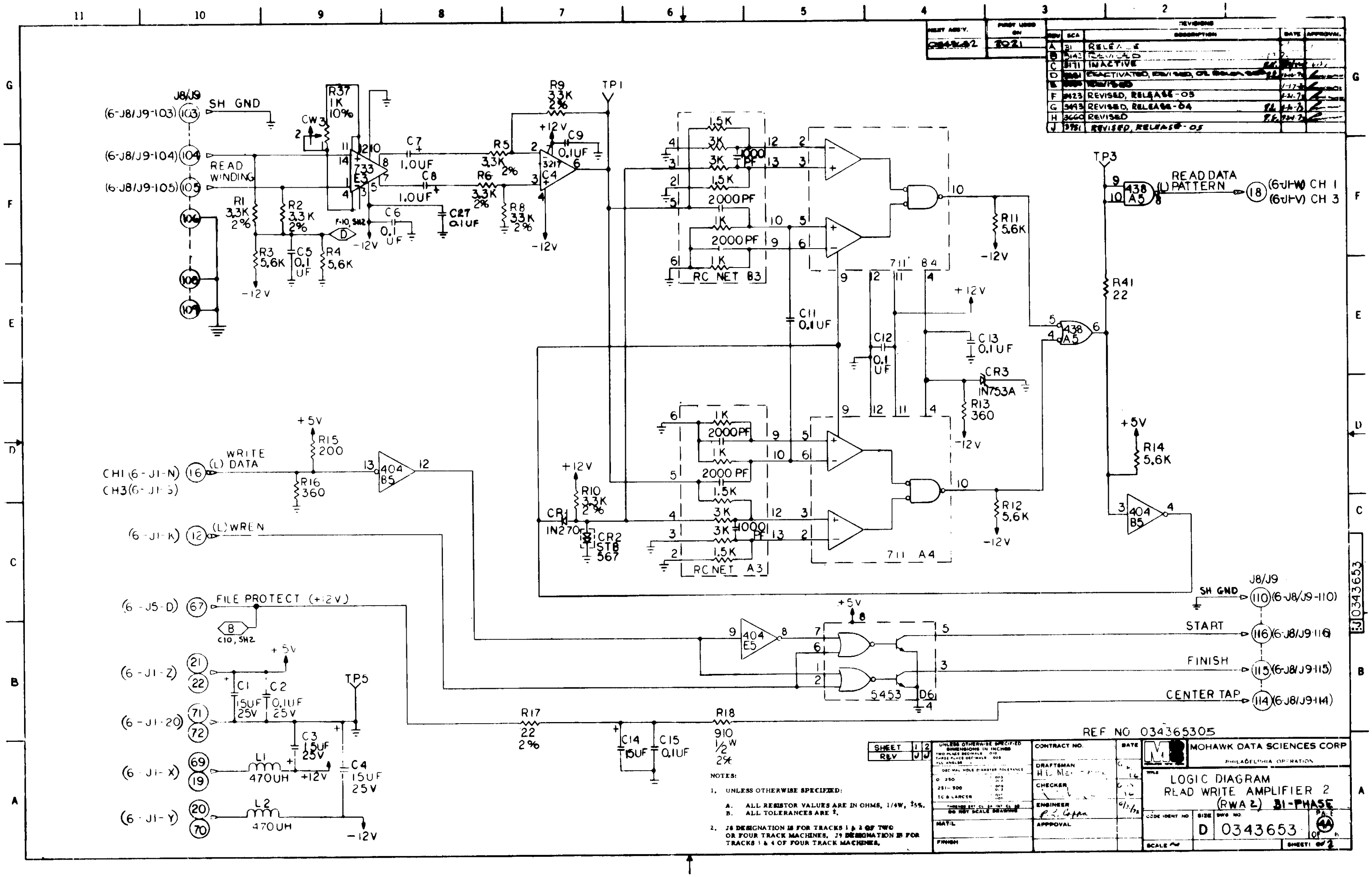
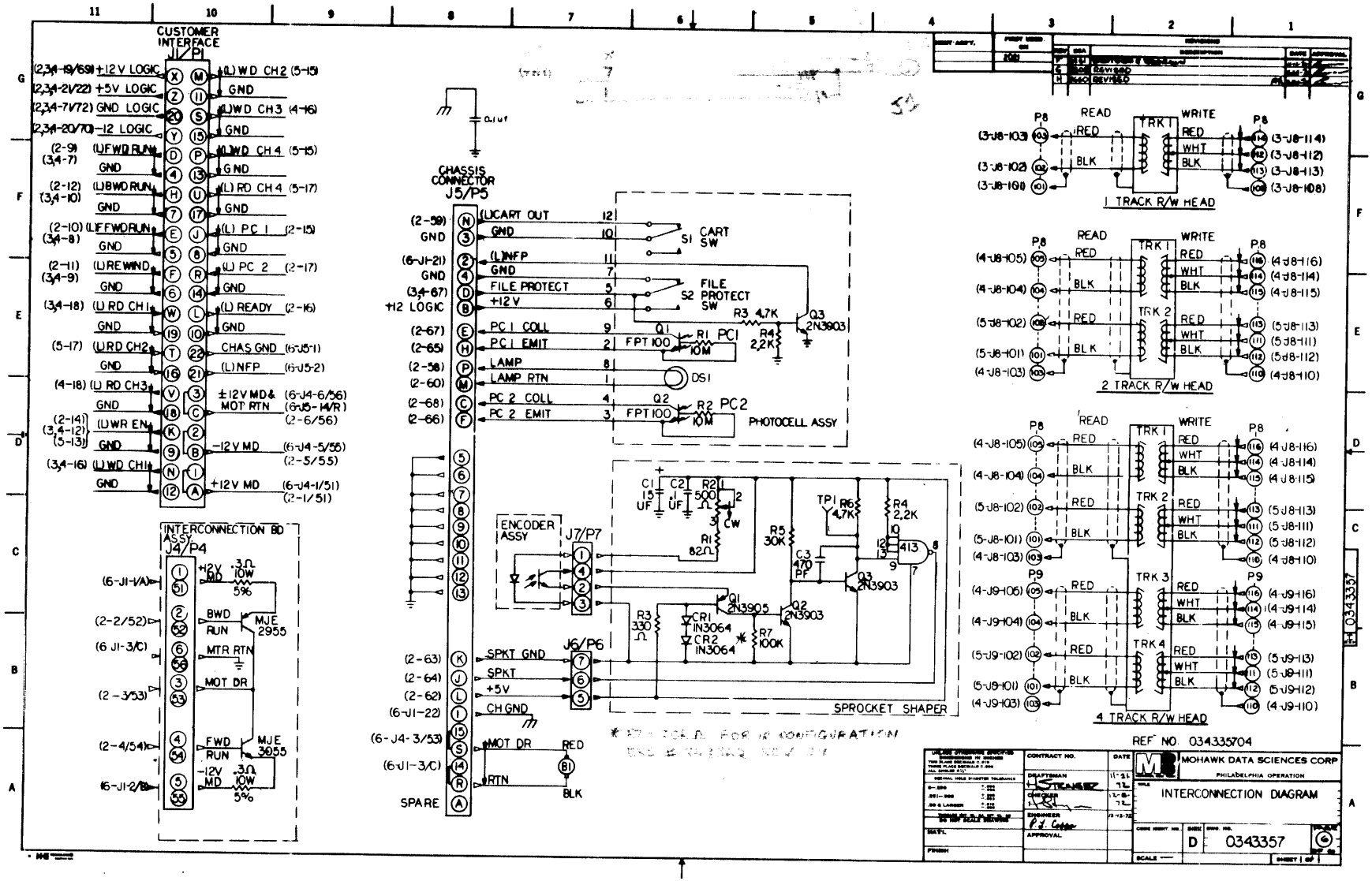
A 3100 RELEASED
C 3411 INACTIVE
D 3691 REACTIVATED, REVISED & REL. 02
F 3973 REVISED, RELEASE-06
G 3973 REVISED, RELEASE-04
H 3960 REVISED
J 3971 REVISED, RELEASE-05
R38 1K 10%
CW3
R19 3.3K 2%
R20 3.3K 2%
C17 1.0 UF
C18 1.0UF
C19 0.1 UF
R23 3.3K 2%
R24 3.3K 2%
R26 3.3K 2%
R27 3.3K 2%
C20 0.1UF
TP2
J8/J9
(6-J8/J9-101) 101
(6-J8/J9-102) 102
READ WINDING
-12V
+12V
RC NET B1
RC NET A1
2000 PF
1000 PF
1.5K
3K
1K
C26 0.1UF
C22 0.1 UF
C23 0.1UF
CR7 IN753A
R30 360
R29 5.6K
R31 5.6K
R32 5.6K
R42 22
TP4
READ DATA PATTERN
(6-J1-W) CH 2
(6-J1-V) CH 4
CH2(6-J1-M)
CH4(6-J1-P)
WRITE (L) DATA
R33 200
R34 360
+5V
(6-J1-K) (L) WREN
CR5 IN270
CR6 LITRONIX STB 567
R28 3.3K 2%
B-10 FILE PROTECT (+.2V)
R35 22 2%
R36 910 1/2W 2%
C24 15UF
C25 0.1UF
START
FINISH
CENTER TAP
(6-J8/J9-113)
(6-J8/J9-112)
(6-J8/J9-111)
711 A2
5453
D 0343653


LOGIC DIAGRAM
READ WRITE AMPLIFIER-2
(RWA 2) PHASE ENCODE
MOHAWK DATA SCIENCES CORP
PHILADELPHIA OPERATION
REF NO 0343831 05
D 0343831
READ WINDING
(L)FWD RUN
(L)F FWD RUN
(L)REWIND
(L)BWD RUN
READ RESET
WRITE (L) DATA
(L)WREN
FILE PROTECT (+12V)
START
FINISH
CENTER TAP
(L)READ RESET
(L)READ DATA PATTERN
RC NET B3
RC NET A3
711 B4
711 A4
5453
IN753A
IN270
NOTES:
1. UNLESS OTHERWISE SPECIFIED:
A. ALL RESISTOR VALUES ARE IN OHMS, 1/4W, 5%,
B. ALL TOLERANCES ARE ±2%.
2. J8 DESIGNATION IS FOR TRACKS 1 & 2 OF TWO OR FOUR TRACK MACHINES. J9 DESIGNATION IS FOR TRACKS 3 & 4 OF FOUR TRACK MACHINES.


MOHAWK DATA SCIENCES CORP
PHILADELPHIA OPERATION
LOGIC DIAGRAM
READ WRITE AMPLIFIER 2
(RWA 2) BI-PHASE
D 0343653
REF NO 034365305
REVISIONS
A RELEASE
C INACTIVE
F REVISED, RELEASE-03
G REVISED, RELEASE-04
H REVISED
J REVISED, RELEASE-05
NOTES:
1. UNLESS OTHERWISE SPECIFIED:
A. ALL RESISTOR VALUES ARE IN OHMS, 1/4W, ±5%.
B. ALL TOLERANCES ARE ±.
2. J8 DESIGNATION IS FOR TRACKS 1 & 3 OF TWO OR FOUR TRACK MACHINES. J9 DESIGNATION IS FOR TRACKS 1 & 4 OF FOUR TRACK MACHINES.
J8/J9
(6-J8/J9-103)
SH GND
(6-J8/J9-104)
READ WINDING
(6-J8/J9-105)
R37 1K 10%
CW
733 E3
C7 1.0UF
C8 1.0UF
C6 0.1 UF
C27 0.1UF
R1 3.3K 2%
R2 3.3K 2%
R3 5.6K
C5 0.1 UF
R4 5.6K
R5 3.3K 2%
R6 3.3K 2%
R8 3.3K 2%
R9 3.3K 2%
3217 C4
C9 0.1UF
TP1
+12V
-12V
RC NET B3
1.5K
3K
2000PF
1000PF
1K
711 B4
C11 0.1UF
C12 0.1 UF
C13 0.1UF
CR3 1N753A
R13 360
R11 5.6K
R12 5.6K
711 A4
RC NET A3
R10 3.3K 2%
CR1 1N270
CR2 STB 567
TP3
438 A5
(L) READ DATA PATTERN
(6-J1-W) CH 1
(6-J1-V) CH 3
R41 22
R14 5.6K
+5V
404 B5
CH1 (6-J1-N)
CH3 (6-J1-S)
(L) WRITE DATA
R15 200
R16 360
404 B5
(6-J1-K)
(L) WREN
(6-J5-D)
FILE PROTECT (+12V)
C10, 5H2
404 E5
5453 D6
J8/J9
SH GND (6-J8/J9-110)
START (6-J8/J9-116)
FINISH (6-J8/J9-115)
CENTER TAP (6-J8/J9-114)
(6-J1-Z)
(6-J1-20)
C1 15UF 25V
C2 0.1UF 25V
C3 15UF 25V
TP5
(6-J1-X)
L1 470UH
(6-J1-Y)
L2 470UH
C4 15UF 25V
R17 22 2%
R18 910 1/2W 2%
C14 15UF
C15 0.1UF


CUSTOMER INTERFACE J1/P1
CHASSIS CONNECTOR J5/P5
INTERCONNECTION BD ASSY J4/P4
ENCODER ASSY J7/P7
J6/P6
PHOTOCELL ASSY
SPROCKET SHAPER
1 TRACK R/W HEAD
2 TRACK R/W HEAD
4 TRACK R/W HEAD
INTERCONNECTION DIAGRAM
MOHAWK DATA SCIENCES CORP
PHILADELPHIA OPERATION
REF NO. 034335704
D 0343357

PAGE NO	DWG NO	SH NO	TITLE	TYPE
1	0344322	1	LOGIC INDEX	
2	0344322	2	CONTROL & MOTOR DRIVE	CMD
3	0344322	3	READ WRITE AMPLIFIER-1	RWA-1
4	0344322	5	READ WRITE AMPLIFIER-2	RWA-2
5		7		
6	0344322	9	INTERCONNECTION DIAGRAM	

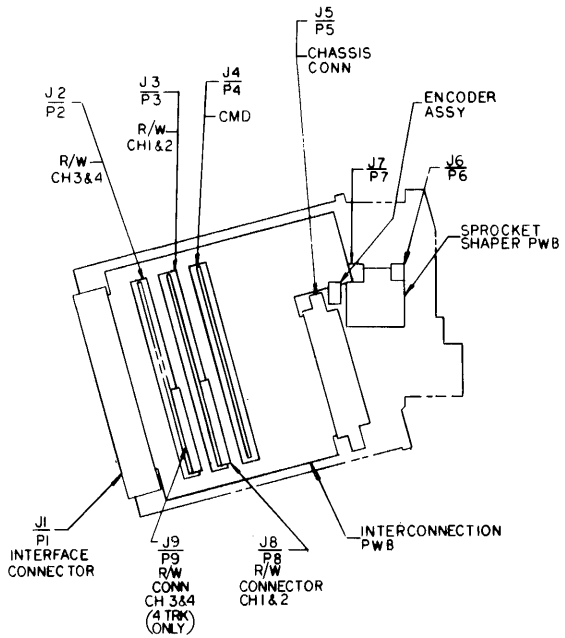
PHASE ENCODE UNITS

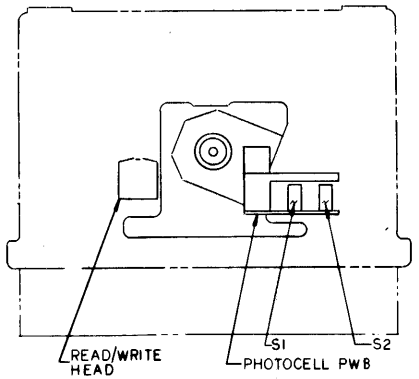
PAGE NO	DWG NO	SH NO	TITLE	TYPE
1	0344322	1	LOGIC INDEX	
2	0344322	2	CONTROL & MOTOR DRIVE	CMD
3A	0344322	4	READ WRITE AMPLIFIER-1	RWA-1
4A	0344322	6	READ WRITE AMPLIFIER-2	RWA-2
5A		8		
6	0344322	9	INTERCONNECTION DIAGRAM	

BI PHASE ENCODE UNITS

NEXT ASSY.	FIRST USED ON
	2022

REV	ECA	DESCRIPTION	DATE	APPROVAL
A	0396	RELEASE PT-01		
B	3423	REVISED, RELEASE -02		
C	3508	REVISED		
D	3545	REVISED, RELEASE PT-03		
E	3638	REVISED RELEASE -04		
F	3000	REVISED		
G	3668	REVISED RELEASE -05		
H	3781	REVISED RELEASE -06		





FRONT VIEW

NOTES:

1. J1, J2, J3, J4 & J5 ARE LOCATED ON INTERCONNECTION PWB.
2. ENCODER ASSY & SPROCKET SHAPER PWB ARE LOCATED ON SPEED CONTROL BRACKET OF MOTOR
3. J6 & J7 ARE LOCATED ON SPROCKET SHAPER PWB.
4. J8 IS LOCATED ON READ/WRITE AMPLIFIER PWB AT LOCATION J3.
5. J2 LOCATION RESERVED FOR CUSTOMER OPTION OF 3 & 4 CHANNEL READ/WRITE.
6. J1 IS PROVIDED FOR CUSTOMER INTERFACE.
7. S1 & S2 LOCATED ON PHOTOCELL PWB.
8. PHANTOM LINES INDICATE MACHINE OUTLINE.
9. J9 IS LOCATED ON READ/WRITE AMPLIFIER PWB AT LOCATION J2.
10. THIS SYSTEM LOGIC HAS BEEN ARRANGED TO BE USED WITH BI-PHASE AND PHASE ENCODED MACHINES WITH ONE, TWO OR FOUR READ/WRITE TRACKS. IF MACHINE IS A ONE TRACK - USE RWA-1 LOGIC. IF MACHINE IS TWO TRACK - USE RWA-2 LOGIC. IF MACHINE IS FOUR TRACK - USE RWA-2 LOGIC FOR TRACKS 1&2 (J8) AND TRACKS 3 & 4 (J9).

REF NO. 034432206

REV.	H	G	H	H	H	H	F	F	F
SHT.	1	2	3	4	5	6	7	8	9

CONTRACT NO.		DATE
DRAFTSMAN	D SCHELL	4/29/75
CHECKED		4/29/75
ENGINEER		4/29/75
APPROVAL		

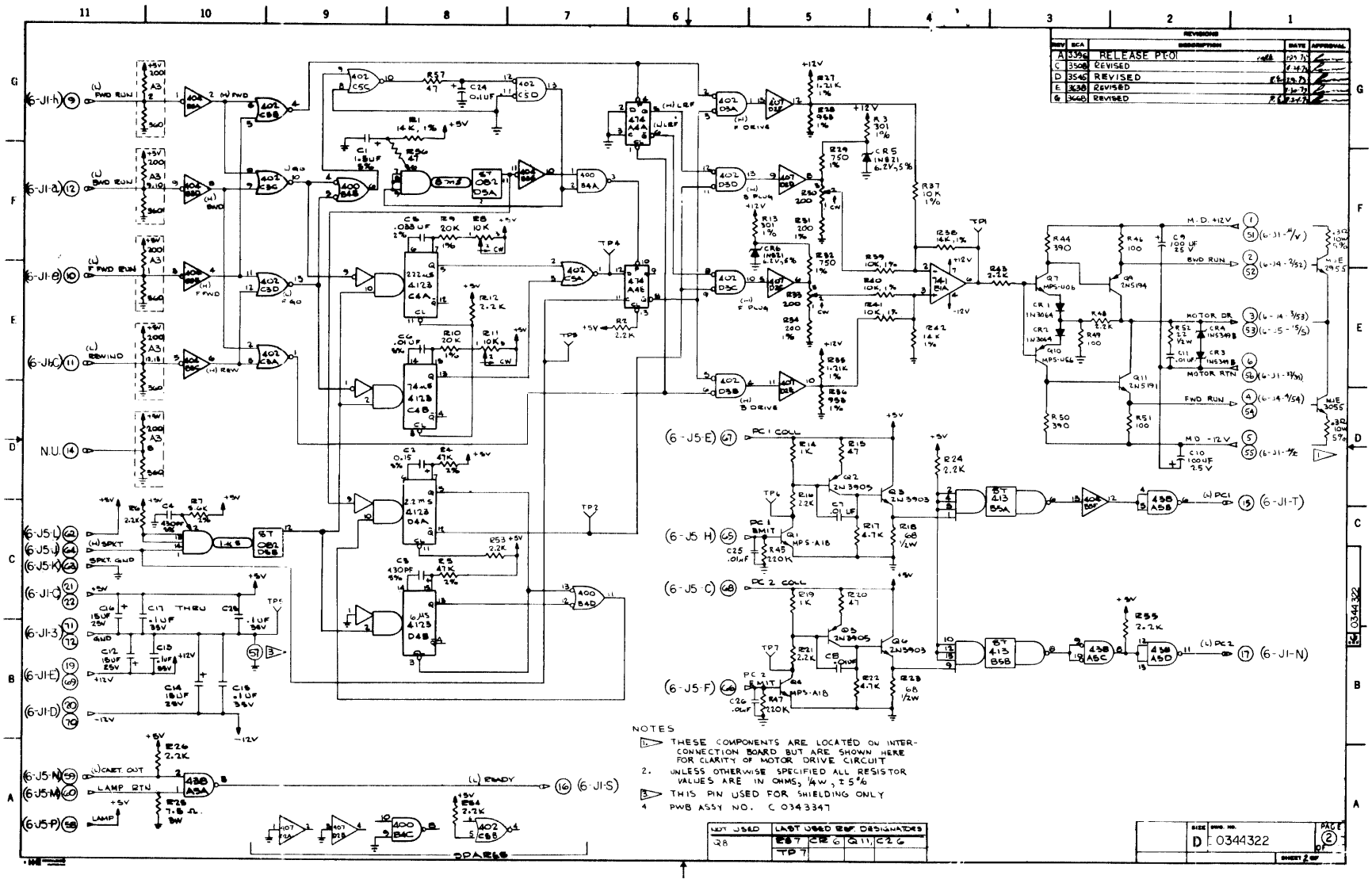
MOHAWK DATA SCIENCES CORP
PHILADELPHIA OPERATION

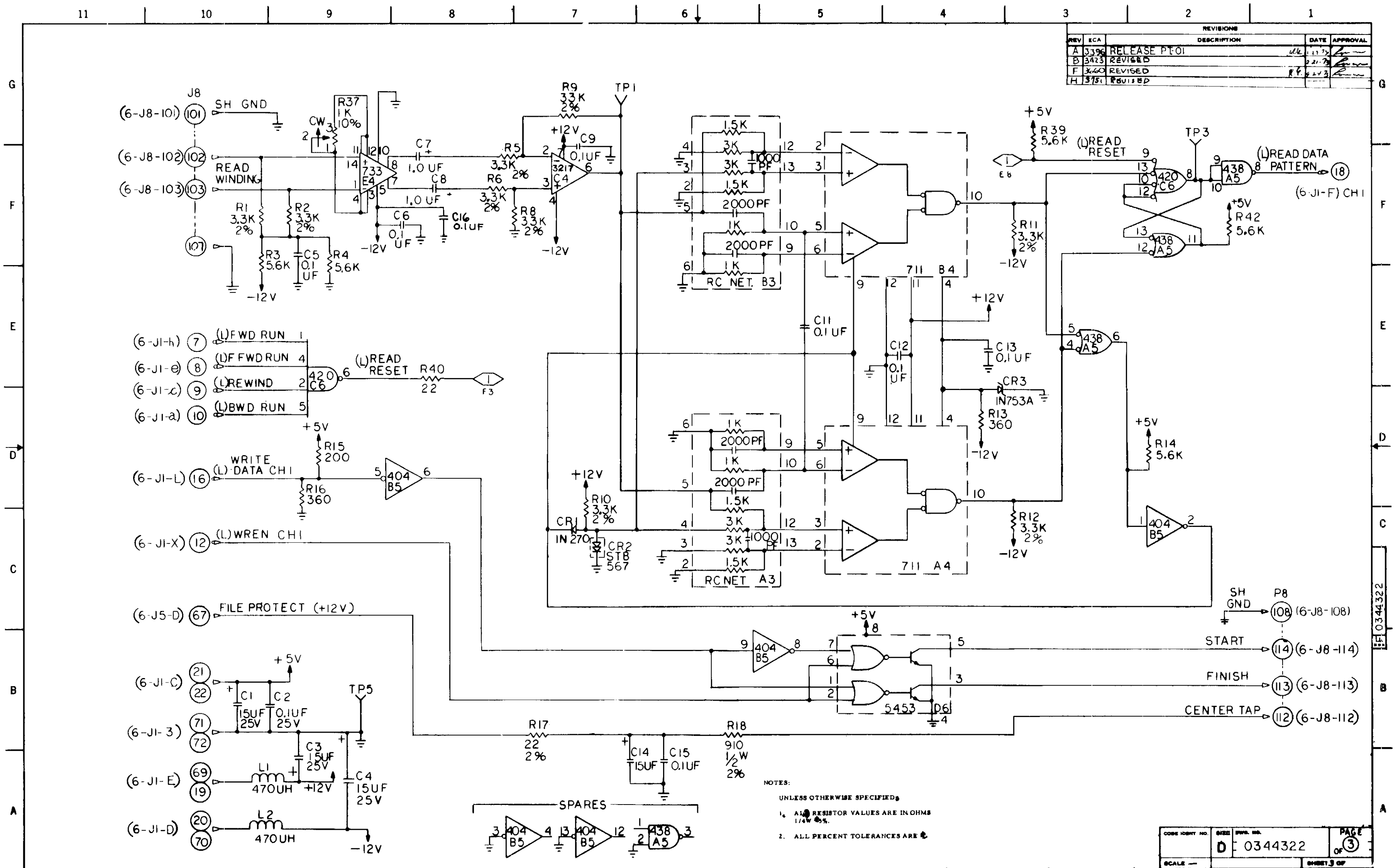
SYSTEM LOGIC INDEX SERIAL ENTRY

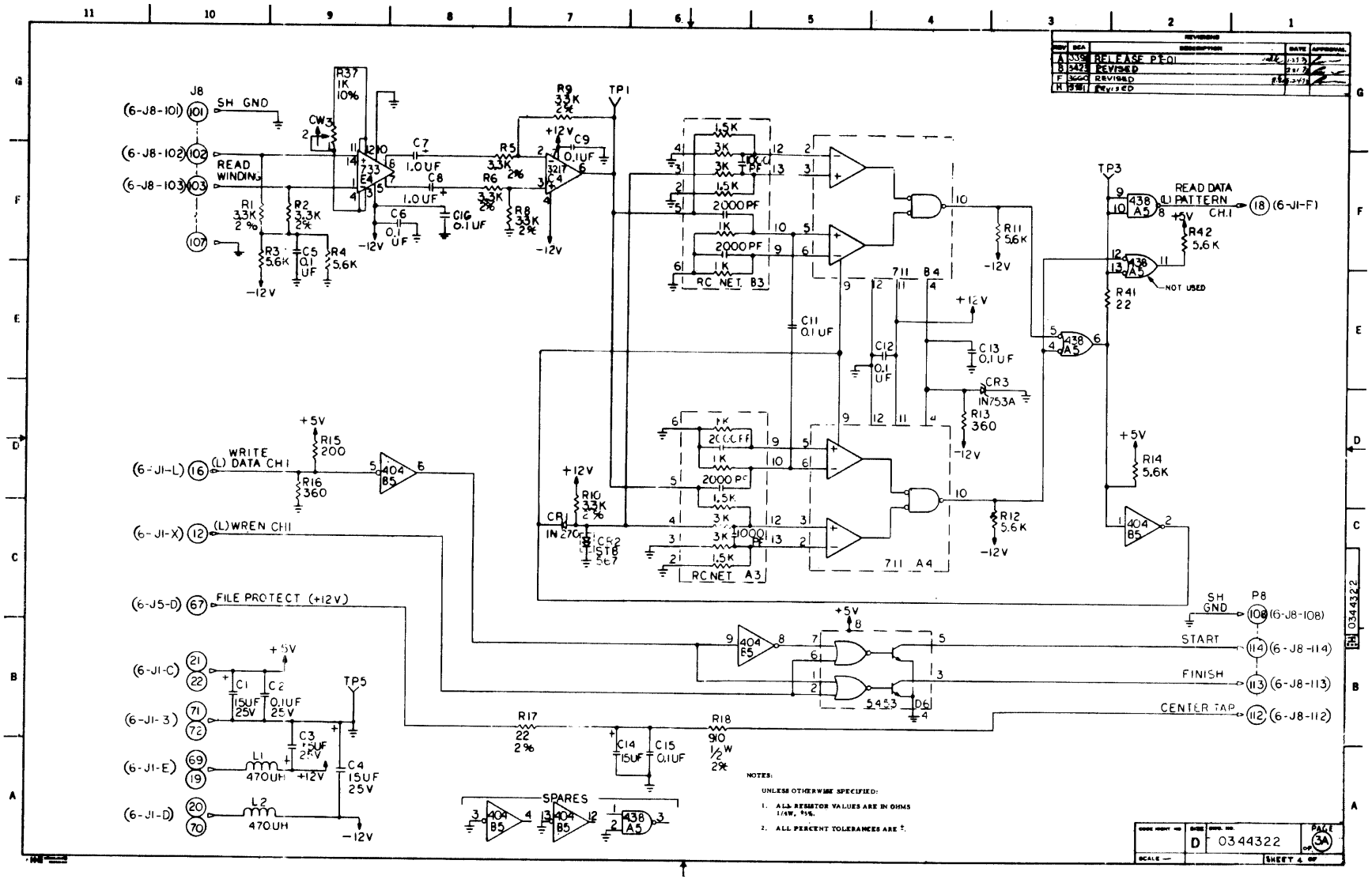
D 0344322

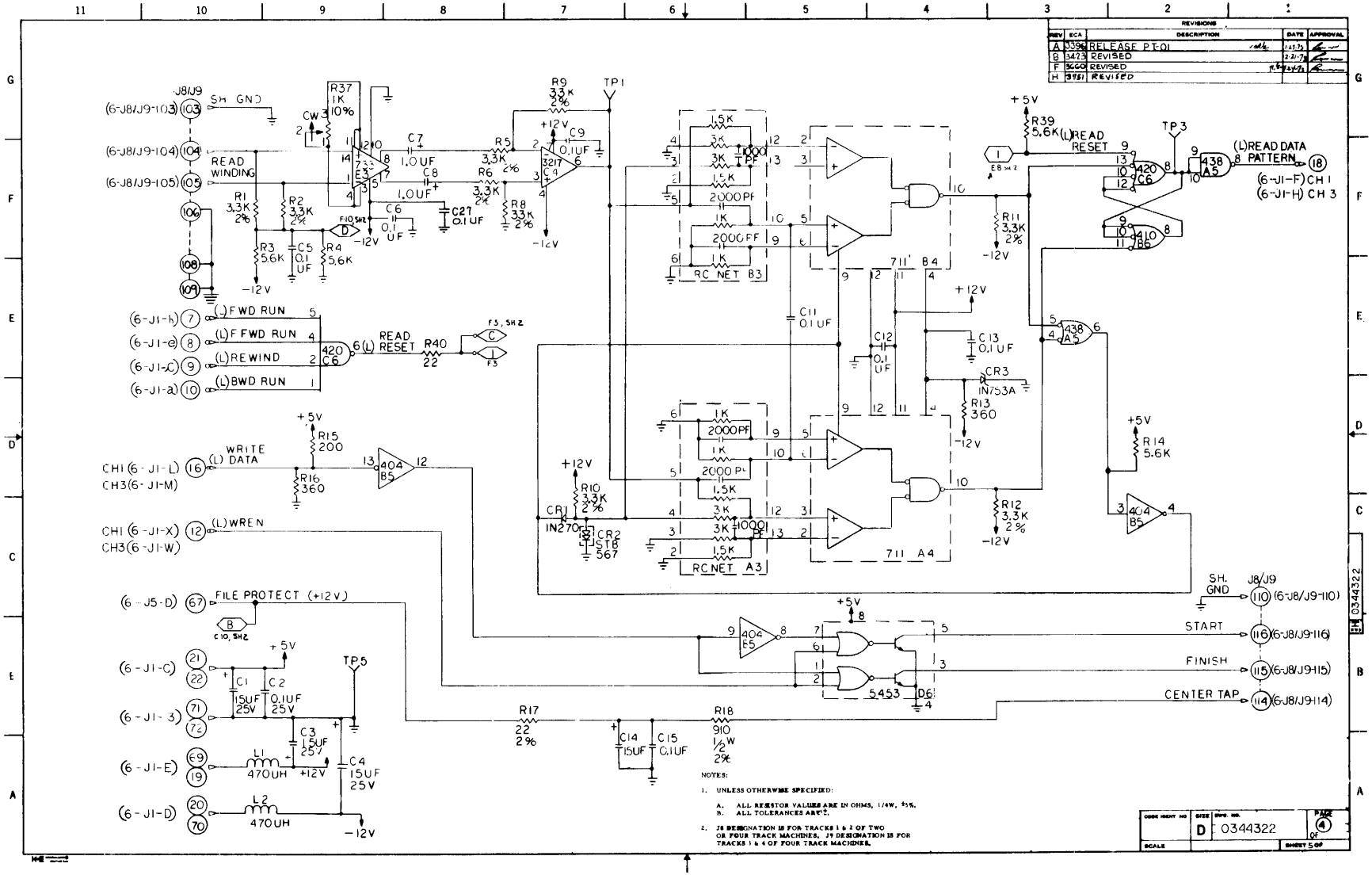
SHEET 1 OF 9

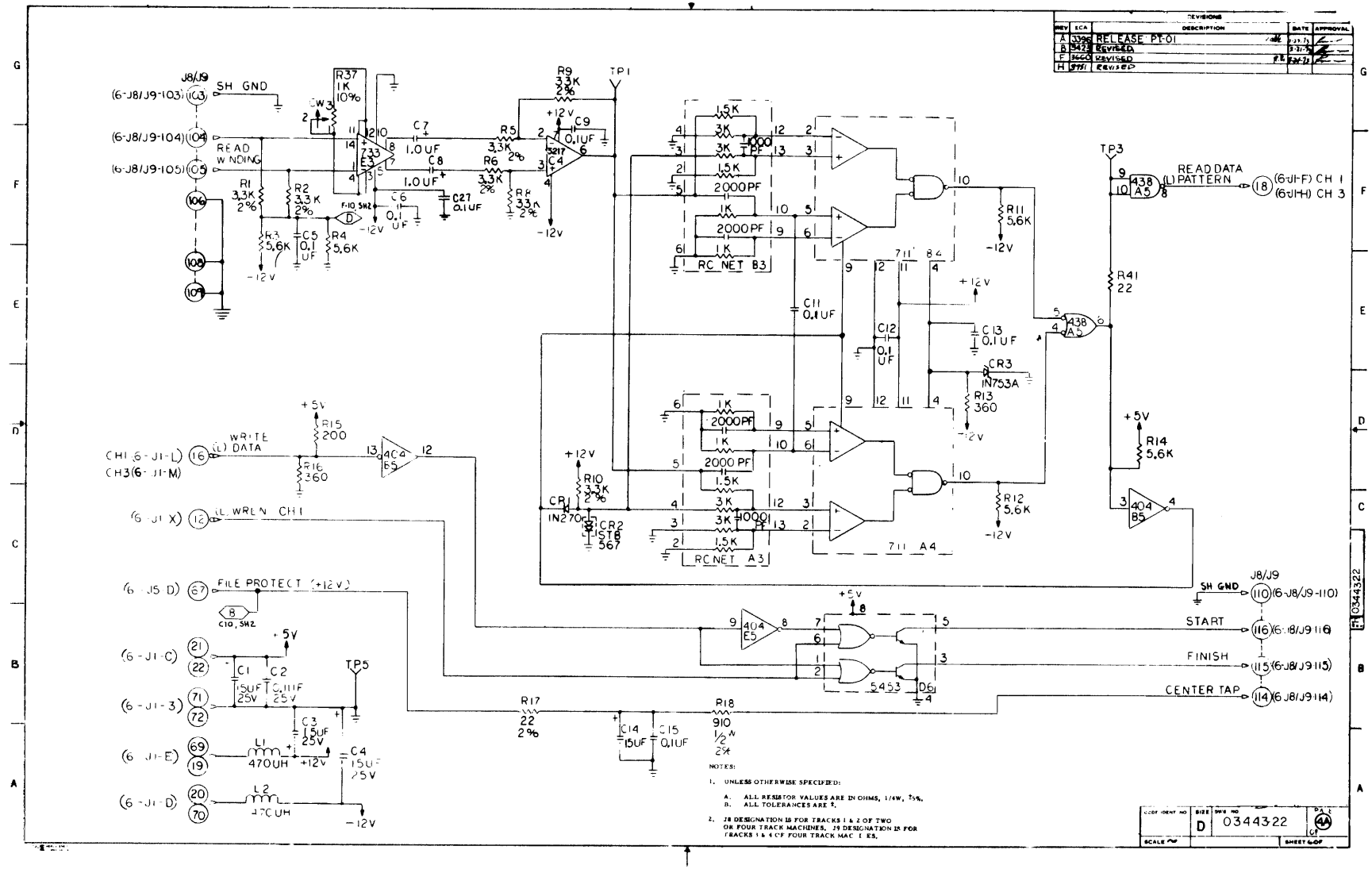
PM 0344322

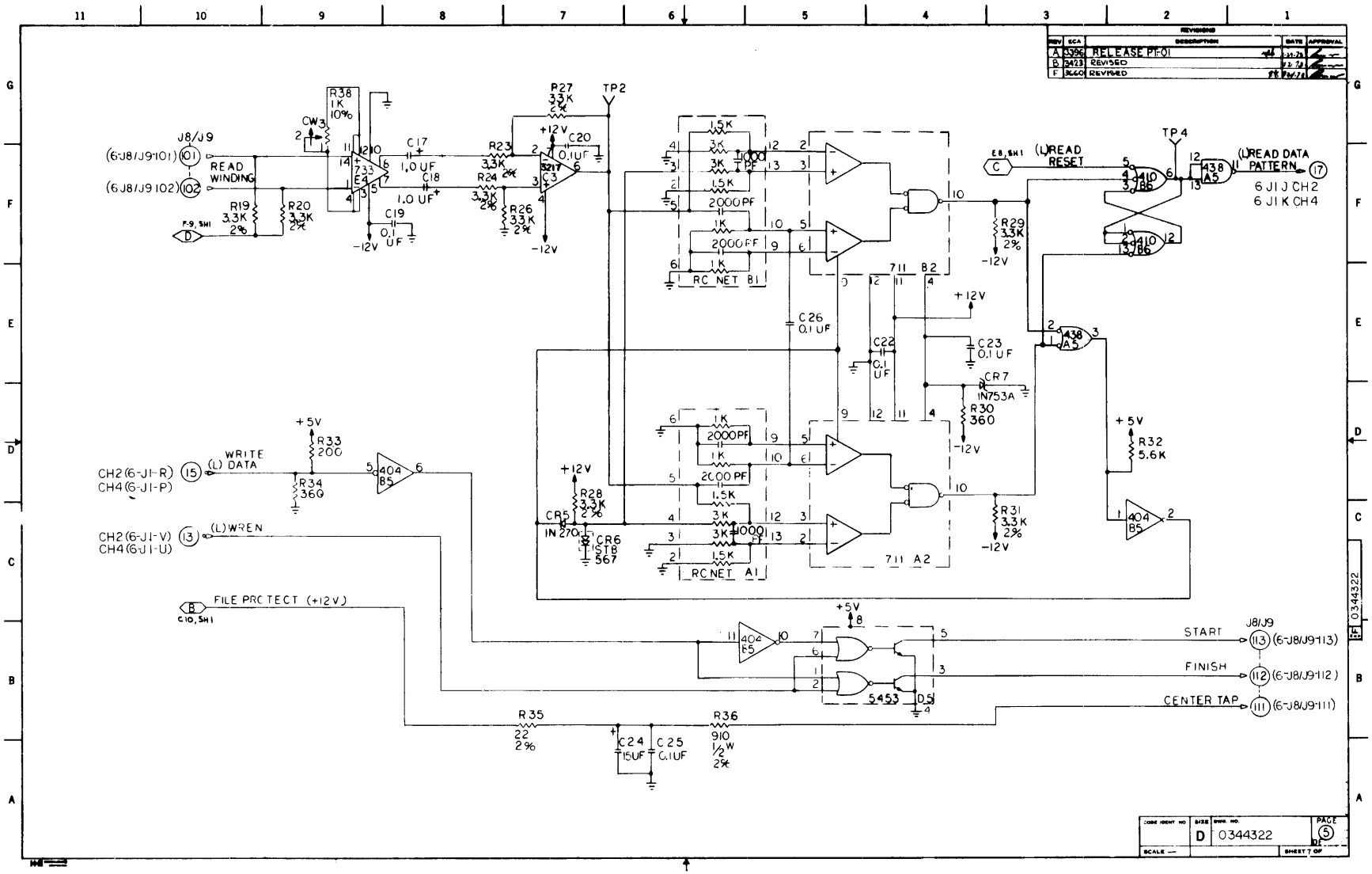

REVISIONS
A 3390 RELEASE PILOT
C 3508 REVISED
D 3545 REVISED
E 3638 REVISED
G 3660 REVISED
(6-J1-h) (9) (L) FWD RUN
(6-J1-a) (12) (L) REV RUN
(6-J1-e) (10) (L) F FWD RUN
(6-J1-c) (11) (L) F REWIND
N.U. (14)
(6-J5-L) (62) (W) SPKT
(6-J5-J) (64) SPKT. GND
(6-J5-K) (63)
(6-J1-C) (21) (22)
(6-J1-3) (11) (72)
(6-J1-E) (19) (69)
(6-J1-D) (20) (70)
(6-J5-N) (59) (L) CAPST OUT
(6-J5-M) (60) LAMP RTN
(6-J5-P) (58) LAMP
(L) RDY (16) (6-J1-S)
(6-J5-E) (67) PC 1 COLL
(6-J5-H) (65) PC 1 EMIT
(6-J5-C) (68) PC 2 COLL
(6-J5-F) (66) PC 2 EMIT
(L) PC1 (15) (6-J1-T)
(L) PC2 (17) (6-J1-N)
M.D. +12V (1) (51) (6-J1-M/V)
BWD RUN (2) (52) (6-J1-Z/52)
MOTOR DR (3) (53) (6-J1-B/53)
MOTOR RTN (6) (56) (6-J1-S/56)
FWD RUN (4) (54) (6-J1-Y/54)
M.D. -12V (5) (55) (6-J1-T/55)
SPARES
NOTES
1. THESE COMPONENTS ARE LOCATED ON INTERCONNECTION BOARD BUT ARE SHOWN HERE FOR CLARITY OF MOTOR DRIVE CIRCUIT
2. UNLESS OTHERWISE SPECIFIED ALL RESISTOR VALUES ARE IN OHMS, 1/4W, 5%
3. THIS PIN USED FOR SHIELDING ONLY
4 PWB ASSY NO. C 0343347
NOT USED: Q8
LAST USED REF. DESIGNATORS: CR7 CR2 Q6 Q11 C26 TP7
SIZE D DWG. NO. 0344322 PAGE 2
0344322

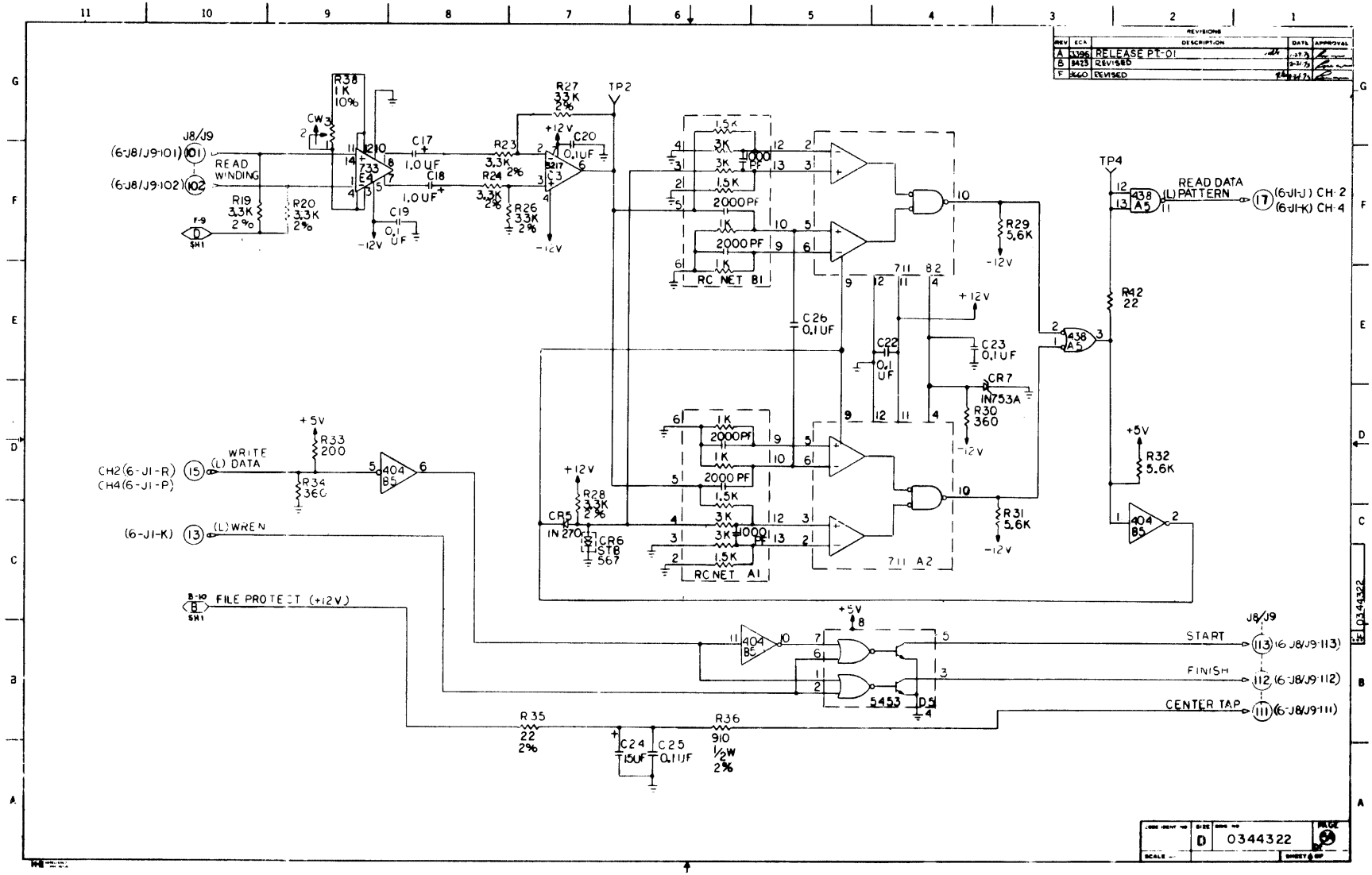

REVISIONS
REV ECA DESCRIPTION DATE APPROVAL
A 3396 RELEASE PT-01
B 3423 REVISED
F 3460 REVISED
H 3751 REVISED
J8
(6-J8-101) 101 SH GND
(6-J8-102) 102 READ WINDING
(6-J8-103) 103
107
R37 1K 10%
CW
733 E4
C7 1.0 UF
C8 1.0 UF
C6 0.1 UF
C16 0.1UF
R1 3.3K 2%
R2 3.3K 2%
R3 5.6K
C5 0.1 UF
R4 5.6K
R5 3.3K 2%
R6 3.3K 2%
R8 3.3K 2%
R9 3.3K 2%
TP1
+12V
C9 0.1UF
3217 C4
-12V
RC NET B3
RC NET A3
1.5K
3K
1000 PF
2000 PF
1K
711 B4
711 A4
C11 0.1 UF
C12 0.1 UF
C13 0.1 UF
CR3 IN753A
R13 360
+5V
R39 5.6K
(L)READ RESET
TP3
420 C6
438 A5
(L)READ DATA PATTERN
(6-J1-F) CH1
18
R42 5.6K
R11 3.3K 2%
R12 3.3K 2%
R14 5.6K
404 B5
(6-J1-h) 7 (L)FWD RUN
(6-J1-e) 8 (L)F FWD RUN
(6-J1-c) 9 (L)REWIND
(6-J1-a) 10 (L)BWD RUN
(L)READ RESET R40 22
F3
E6
R15 200
(6-J1-L) 16 WRITE (L) DATA CH1
R16 360
(6-J1-X) 12 (L)WREN CH1
R10 3.3K 2%
CR1 IN270
CR2 STB 567
(6-J5-D) 67 FILE PROTECT (+12V)
SH GND
P8
108 (6-J8-108)
START 114 (6-J8-114)
FINISH 113 (6-J8-113)
CENTER TAP 112 (6-J8-112)
5453 D6
(6-J1-C) 21 22
C1 15UF 25V
C2 0.1UF 25V
(6-J1-3) 71 72
C3 15UF 25V
TP5
(6-J1-E) 69 19
L1 470UH
C4 15UF 25V
(6-J1-D) 20 70
L2 470UH
-12V
R17 22 2%
C14 15UF
C15 0.1UF
R18 910 1/2W 2%
SPARES
NOTES:
UNLESS OTHERWISE SPECIFIED,
1. ALL RESISTOR VALUES ARE IN OHMS 1/4W 5%.
2. ALL PERCENT TOLERANCES ARE ±
D 0344322
PAGE 3
SHEET 3 OF
SCALE

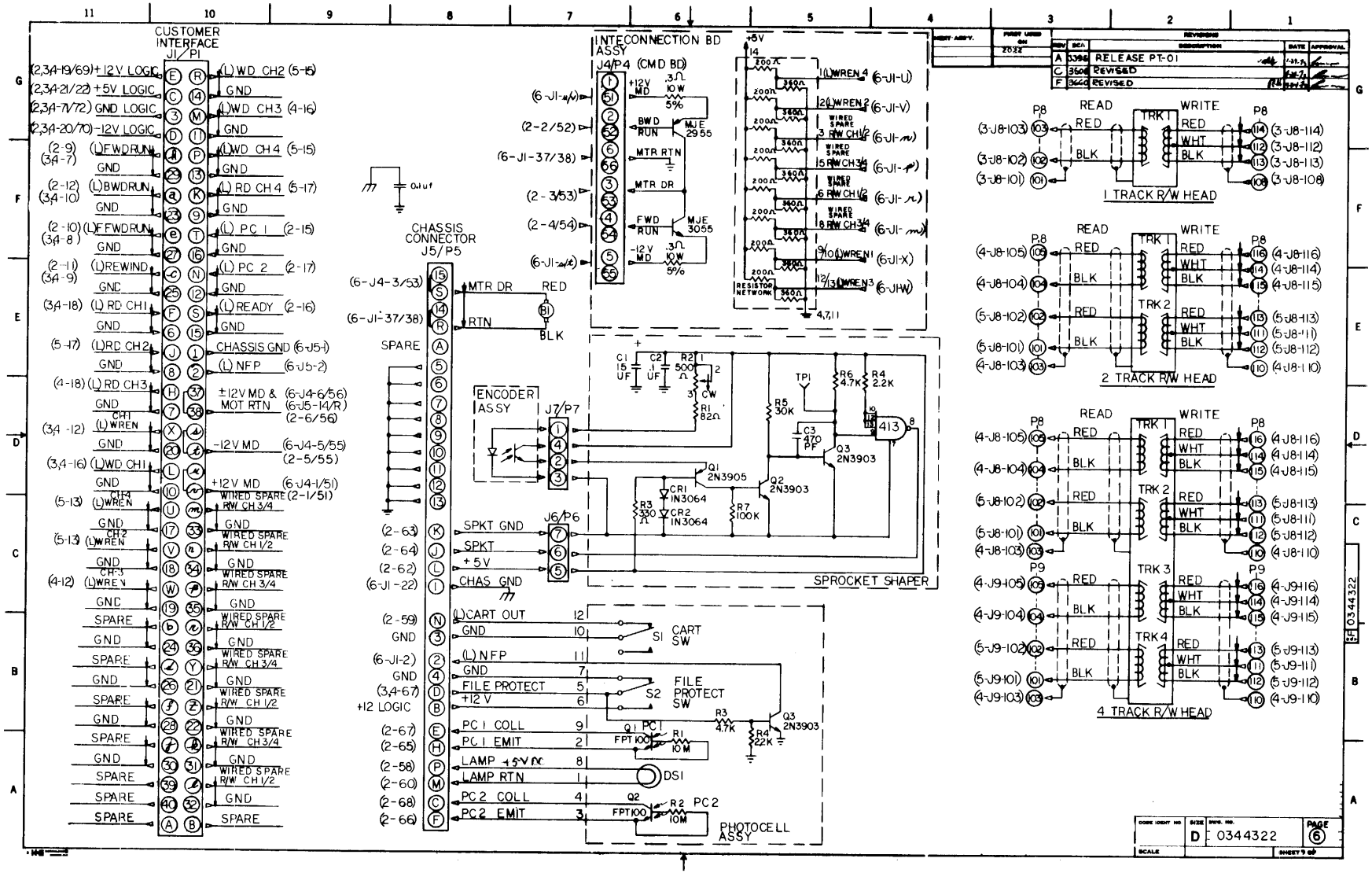

J8
(6-J8-101) 101
(6-J8-102) 102
(6-J8-103) 103
107
SH GND
READ WINDING
R1 3.3K 2%
R2 3.3K 2%
R3 5.6K
R4 5.6K
C5 0.1 UF
-12V
R37 1K 10%
CW3
C7 1.0UF
C8 1.0UF
C6 0.1 UF
C16 0.1 UF
R5 3.3K 2%
R6 3.3K 2%
R8 3.3K 2%
R9 33K 2%
+12V
C9 0.1UF
TP1
RC NET B3
RC NET A3
711 B4
711 A4
C11 0.1 UF
C12 0.1 UF
C13 0.1 UF
CR3 IN753A
R13 360
R10 3.3K 2%
CR1 IN 270
CR2 STB 567
R11 5.6K
R12 5.6K
TP3
READ DATA PATTERN (L) CH.1
18 (6-J1-F)
R42 5.6K
NOT USED
R41 22
R14 5.6K
+5V
(6-J1-L) 16 WRITE (L) DATA CH1
R15 200
R16 360
(6-J1-X) 12 (L)WREN CH1
(6-J5-D) 67 FILE PROTECT (+12V)
(6-J1-C) 21 22
(6-J1-3) 71 72
(6-J1-E) 69 19
(6-J1-D) 20 70
C1 15UF 25V
C2 0.1UF 25V
C3 15UF 25V
C4 15UF 25V
L1 470UH
L2 470UH
TP5
R17 22 2%
R18 910 1/2W 2%
C14 15UF
C15 0.1UF
SPARES
SH GND
P8
108 (6-J8-108)
START 114 (6-J8-114)
FINISH 113 (6-J8-113)
CENTER TAP 112 (6-J8-112)
NOTES:
UNLESS OTHERWISE SPECIFIED:
1. ALL RESISTOR VALUES ARE IN OHMS 1/4W, 5%.
2. ALL PERCENT TOLERANCES ARE ±.
REVISIONS
A RELEASE PRE-01
B REVISED
F REVISED
H REVISED
D 0344322
SHEET 4 OF
PAGE 34
0344322


REVISIONS
REV ECA DESCRIPTION DATE APPROVAL
A 3396 RELEASE PTR01
B 3473 REVISED
F 3660 REVISED
H 3981 REVISED
J8/J9
SH GND
(6-J8/J9-103) 103
(6-J8/J9-104) 104
(6-J8/J9-105) 105
106
108
109
READ WINDING
R1 3.3K 2%
R2 3.3K 2%
R3 5.6K
R4 5.6K
C5 0.1 UF
R37 1K 10%
CW
C6 0.1 UF
C7 1.0 UF
C8 1.0 UF
C27 0.1 UF
R5 3.3K 2%
R6 3.3K 2%
R8 3.3K 2%
R9 3.3K 2%
TP1
C9 0.1UF
3217
C9
+12V
-12V
(6-J1-h) 7 (L)FWD RUN
(6-J1-e) 8 (L)F FWD RUN
(6-J1-c) 9 (L)REWIND
(6-J1-a) 10 (L)BWD RUN
420 C6
6(L) READ RESET
R40 22
F3, SH2
CHI (6-J1-L) 16 (L) DATA
CH3 (6-J1-M)
WRITE
+5V
R15 200
R16 360
404 B5
CHI (6-J1-X) 12 (L)WREN
CH3 (6-J1-W)
(6-J5-D) 67 FILE PROTECT (+12V)
B C10, SH2
(6-J1-C) 21 22
(6-J1-3) 71 72
(6-J1-E) 69 19
(6-J1-D) 20 70
C1 15UF 25V
C2 0.1UF 25V
C3 15UF 25V
C4 15UF 25V
L1 470UH
L2 470UH
TP5
R17 22 2%
R18 910 1/2W 2%
C14 15UF
C15 0.1UF
1.5K
3K
1000 PF
2000PF
1K
RC NET B3
RC NET A3
711 B4
711 A4
C11 0.1UF
C12 0.1 UF
C13 0.1UF
CR1 IN270
CR2 STB 567
CR3 IN753A
R10 3.3K 2%
R11 3.3K 2%
R12 3.3K 2%
R13 360
R14 5.6K
R39 5.6K
READ RESET
TP3
438 A5
410 B6
(L)READ DATA PATTERN 18
(6-J1-F) CH 1
(6-J1-H) CH 3
5453 D6
START 116 (6-J8/J9-116)
FINISH 115 (6-J8/J9-115)
CENTER TAP 114 (6-J8/J9-114)
SH. GND J8/J9 110 (6-J8/J9-110)
NOTES:
1. UNLESS OTHERWISE SPECIFIED:
A. ALL RESISTOR VALUES ARE IN OHMS, 1/4W, 5%.
B. ALL TOLERANCES ARE ±2.
2. J8 DESIGNATION IS FOR TRACKS 1 & 2 OF TWO OR FOUR TRACK MACHINES. J9 DESIGNATION IS FOR TRACKS 1 & 4 OF FOUR TRACK MACHINES.
D 0344322
SCALE
SHEET 5 OF
PAGE 4 OF
0344322

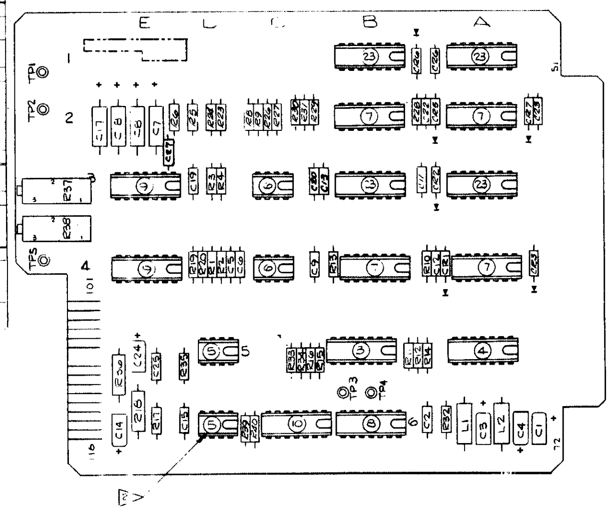

REVISIONS
REV ECA DESCRIPTION DATE APPROVAL
A RELEASE PT-01
B REVISED
F REVISED
H REVISED
J8/J9
SH GND
(6-J8/J9-103)
(6-J8/J9-104)
(6-J8/J9-105)
READ WINDING
R37 1K 10%
R1 3.3K 2%
R2 3.3K 2%
R3 5.6K
R4 5.6K
C5 0.1 UF
C6 0.1 UF
C7 1.0 UF
C8 1.0 UF
C27 0.1 UF
R5 3.3K 2%
R6 3.3K 2%
RR 33A 2%
R9 3.3K 2%
C9 0.1UF
TP1
+12V
-12V
1.5K
3K
1000 PF
2000PF
1K
RC NET B3
RC NET A3
711 A4
C11 0.1UF
C12 0.1 UF
C13 0.1UF
CR3 IN753A
R13 360
R11 5.6K
R12 5.6K
TP3
R41 22
R14 5.6K
438 A5
READ DATA (L) PATTERN
(6-J1-F) CH 1
(6-J1-H) CH 3
+5V
R15 200
R16 360
WRITE (L) DATA
CH1 (6-J1-L)
CH3 (6-J1-M)
404 C4
65
(6-J1-X) (L WRT EN CH1
R10 3.3K 2%
CR1 IN2705
CR2 1ST8 567
(6-J5-D) FILE PROTECT (+12V)
B C10, SH2
404 E5
5453 D6
J8/J9
SH GND
(6-J8/J9-110)
START
(6-J8/J9-116)
FINISH
(6-J8/J9-115)
CENTER TAP
(6-J8/J9-114)
(6-J1-C)
(6-J1-3)
(6-J1-E)
(6-J1-D)
C1 15UF 25V
C2 .111F 25V
C3 15UF 25V
C4 15UF 25V
L1 470UH
L2 470UH
TP5
R17 22 2%
R18 910 1/2W 2%
C14 15UF
C15 0.1UF
NOTES:
1. UNLESS OTHERWISE SPECIFIED:
A. ALL RESISTOR VALUES ARE IN OHMS, 1/4W, 5%.
B. ALL TOLERANCES ARE ±.
2. J8 DESIGNATION IS FOR TRACKS 1 & 2 OF TWO OR FOUR TRACK MACHINES. J9 DESIGNATION IS FOR TRACKS 1 & 4 OF FOUR TRACK MACHINES.
D 0344322
SHEET 6 OF 6


REVISIONS
REV ECA DESCRIPTION DATE APPROVAL
A 3396 RELEASE PF01
B 3423 REVISED
F 3660 REVISED
J8/J9
(6-J8/J9-101) 101
(6-J8/J9-102) 102
READ WINDING
R19 3.3K 2%
R20 3.3K 2%
R38 1K 10%
CW3
C17 1.0 UF
C18 1.0 UF
C19 0.1 UF
-12V
R23 3.3K 2%
R24 3.3K 2%
R26 3.3K 2%
R27 3.3K 2%
TP2
+12V
C20 0.1UF
RC NET B1
RC NET A1
711 B2
711 A2
C26 0.1 UF
C22 0.1 UF
C23 0.1 UF
CR7 IN753A
R30 360
R29 3.3K 2%
R31 3.3K 2%
R32 5.6K
+5V
TP4
(L)READ RESET
(L)READ DATA PATTERN 17
6 J1 J CH2
6 J1 K CH4
CH2 (6-J1-R) 15
CH4 (6-J1-P)
WRITE (L) DATA
R33 200
R34 360
CH2 (6-J1-V) 13
CH4 (6-J1-U)
(L)WREN
CR5 IN 270
CR6 ISTB 567
R28 3.3K 2%
FILE PROTECT (+12V)
C10, SH1
START J8/J9 113 (6-J8/J9-113)
FINISH 112 (6-J8/J9-112)
CENTER TAP 111 (6-J8/J9-111)
R35 22 2%
C24 15UF
C25 0.1UF
R36 910 1/2W 2%
5453
0.5
SIZE D
DWG. NO. 0344322
PAGE 5
SCALE —
SHEET 7 OF


REVISIONS
REV ECA DESCRIPTION DATE APPROVAL
A 3396 RELEASE PT-01
B 3423 REVISED
F 3460 REVISED
J8/J9
(6-J8/J9-101) 101
(6-J8/J9-102) 102
READ WINDING
R38 1K 10%
CW3
R19 3.3K 2%
R20 3.3K 2%
C17 1.0 UF
C18 1.0 UF
C19 0.1 UF
R23 3.3K 2%
R24 3.3K 2%
R26 3.3K 2%
R27 3.3K 2%
C20 0.1UF
TP2
+12V
-12V
RC NET B1
RC NET A1
711 A2
C26 0.1UF
C22 0.1 UF
C23 0.1UF
CR7 IN753A
R30 360
R29 5.6K
R31 5.6K
R28 3.3K 2%
CR5 IN 270
CR6 STB 567
TP4
R42 22
R32 5.6K
438 A5
READ DATA PATTERN
(6-J1-J) CH-2
(6-J1-K) CH-4
+5V
R33 200
R34 360
404 B5
CH2(6-J1-R)
CH4(6-J1-P)
WRITE (L) DATA
(6-J1-K) (L) WREN
B-10 B SH1 FILE PROTECT (+12V)
5453 D5
START
FINISH
CENTER TAP
(6-J8/J9-113)
(6-J8/J9-112)
(6-J8/J9-111)
R35 22 2%
R36 910 1/2W 2%
C24 15UF
C25 0.1UF
D 0344322


CUSTOMER INTERFACE J1/P1
INTECONNECTION BD ASSY J4/P4 (CMD BD)
CHASSIS CONNECTOR J5/P5
ENCODER ASSY J7/P7
J6/P6
SPROCKET SHAPER
PHOTOCELL ASSY
S1 CART SW
S2 FILE PROTECT SW
DS1
1 TRACK R/W HEAD
2 TRACK R/W HEAD
4 TRACK R/W HEAD
RELEASE PT-01
REVISED
D 0344322

COMPONENT CROSS REFERENCE CHART	
REFERENCE DESIGNATORS	FIND NO.
R15, R33	11
R16, R·5, R30, R34	12
R3, R4, R14, R32, R39	14
R8, R9, R26, R27	16
R1, R2, R5, R6, R10, R11, R12, R19, R20, R23, R24, R28, R29, R31	17
R17, R35	20
R18, R36	21
R37, R38	22
C1, C3, C4, C14, C24	24
	25
C7, C8, C17, C18	26
C2, C5, C6, C9, C11, C12, C13, C15, C19, C20, C22, C23, C25, C26, C27	27
CR1, CR5	28
CR3, CR7	30
CR2, CR6	31
L1, L2	32
R40	36



NEXT ASS'Y.	FIRST USED ON
0343492	2021

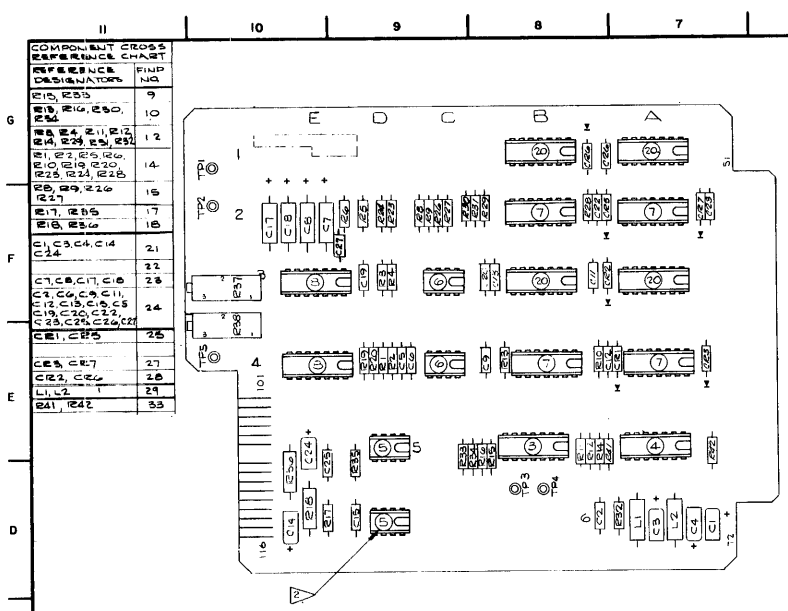
REVISIONS				
REV	CO	DESCRIPTION	DATE	APPROVAL
B	3251	REVISED, REDRAWN & RELEASED 02		
C	3423	REVISED, RELEASE - 03		
D	3493	REVISED, RELEASE - 04		
E	3660	REVISED		
F	3751	REVISED, RELEASE -05		

NUMBERS IN CIRCLES REPRESENT FIND NUMBERS OF CIRCUIT MODULES.

FIND NO.	PART NUMBER	QTY.	DESCRIPTION
03	261001601	1	Integrated Circuit (7404)
04	251016801	1	Integrated Circuit (7438)
05	261019201	2	Integrated Circuit (75453)
06	261044501	2	Integrated Circuit (SG3217M)
07	261004401	4	Integrated Circuit (711)
08	261000201	1	Integrated Circuit (410)
09	261008601	2	Integrated Circuit (733)
10	261000301	1	Integrated Circuit (420)
11	387000097	2	Resistor ¼W, +5%, 200Ω
12	387000148	4	Resistor ¼W, +5%, 360Ω
14	387000041	5	Resistor ¼W, 5%, 5.6K
16	387307068	4	Resistor ¼W, 2%, 33K
17	387307044	14	Resistor ¼W, 2%, 3.3K
20	387307089	2	Resistor ¼W, 2%, 22Ω
21	387305031	2	Resistor ½W, 2%, 910Ω
22	394110017	2	Potentiometer 1K, ¾W, 10%
23	261016503	4	Resistor/Capacitor Network
24	134906026	5	Capacitor 25V, +20%, 15uF
26	134202029	4	Capacitor 35V, 10%, 1.0uF
27	134007506	14	Capacitor 25V, +80 −20%, .1uF
28	168101001	2	Diode (1N270)
30	169102032	2	Diode (1N753A)
31	409000101	2	Stabistor (STB567)
32	257101002	2	Inductor 470 uH
33	420111002	5	Terminal Stud
34	420008301	15	"F" Post Contact
36	387000012	1	Resistor ¼W, 5%, 22Ω

PWB ASSY READ/WRITE AMP-2 (RWA 2) PHASE ENCODE

034383005



COMPONENT CROSS REFERENCE CHART	
REFERENCE DESIGNATORS	FIND NO
R15, R33	9
R13, R16, R30, R34	10
R3, R4, R11, R12, R14, R29, R31, R32	12
R1, R2, R5, R6, R10, R19, R20, R23, R24, R28	14
R8, R9, R26, R27	15
R17, R35	17
R18, R36	18
C1, C3, C4, C14, C24	21
	22
C7, C8, C17, C18	23
C2, C6, C9, C11, C12, C13, C15, C16, C19, C20, C22, C23, C25, C26, C27	24
CR1, CR5	25
CR3, CR7	27
CR2, CR6	28
L1, L2	29
R41, R42	33

NEXT ASS'Y.	FIRST USED ON
D0345492	2021

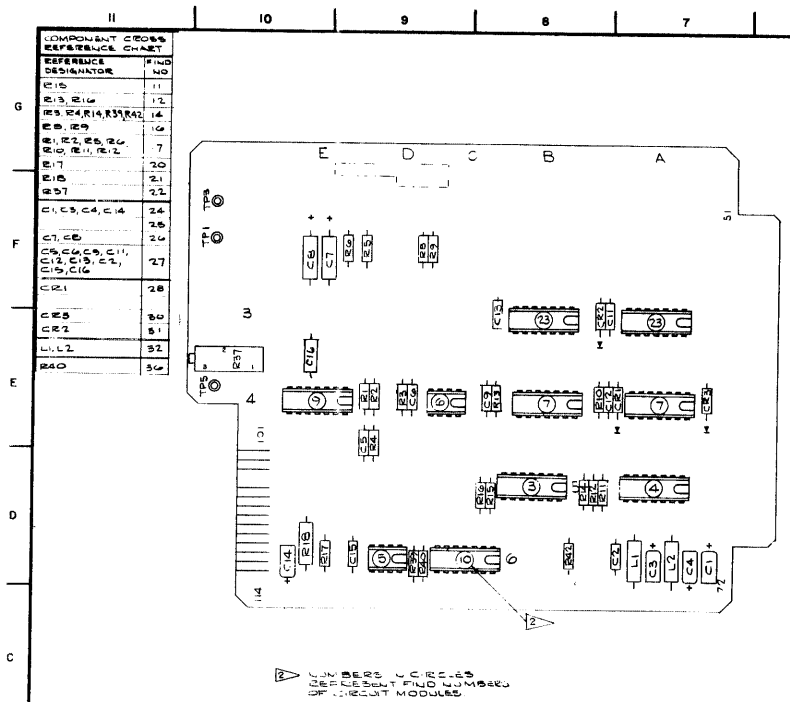
REVISIONS				
REV	ECO	DESCRIPTION	DATE	APPROVAL
C	3251	REACTIVATED REVISED REDRAWN RELEASED -02	11-4-70	
E	3423	REVISED, RELEASE -03	1-21-71	
F	3493	REVISED, RELEASE -04	4-16-71	
G	3660	REVISED	9-24-71	
H	3751	REVISED, RELEASE -05		

▷ NUMBERS IN CIRCLES REPRESENT FIND NUMBERS OF CIRCUIT MODULES.

FIND NO.	PART NUMBER	QTY.	DESCRIPTION
03	261001601	1	Integrated Circuit (7404)
04	261016801	1	Integrated Circuit (7438)
05	261019201	2	Integrated Circuit (75453)
06	261044501	2	Integrated Circuit (SG 3217M)
07	261004401	4	Integrated Circuit (711)
08	261008601	2	Integrated Circuit (733)
09	387000097	2	Resistor ¼W, +5%, 200Ω
10	387000148	4	Resistor ¼W, +5%, 360Ω
12	387000041	8	Resistor ¼W, 5%, 5.6K
14	387307044	10	Resistor ¼W, 2%, 3.3K
15	387307068	4	Resistor ¼W, 2%, 33K
17	387307089	2	Resistor ¼W, 2%, 22Ω
18	387305031	2	Resistor ½W, 2%, 910Ω
19	394110017	2	Potentiometer 1K, ¾W
20	261016503	4	Resistor/Capacitor Network
21	134906026	5	Capacitor 25V, +20%, 15 uF
23	134202029	4	Capacitor 35V, 10%, 1.0uF
24	134007506	14	Capacitor 25V, +80 −20%, .1uF
25	168101001	2	Diode (1N270)
27	169102032	2	Diode (1N7553A)
28	409000101	2	Stabistor (STB567)
29	257101002	2	Inductor 470 uH
30	420111002	5	Terminal Stud
31	420004301	15	"F" Post Contact
33	387000012	2	Resistor ¼W, 5%, 22

PWB ASSY READ/WRITE AMP-2 (RWA 2) BI-PHASE

034365205

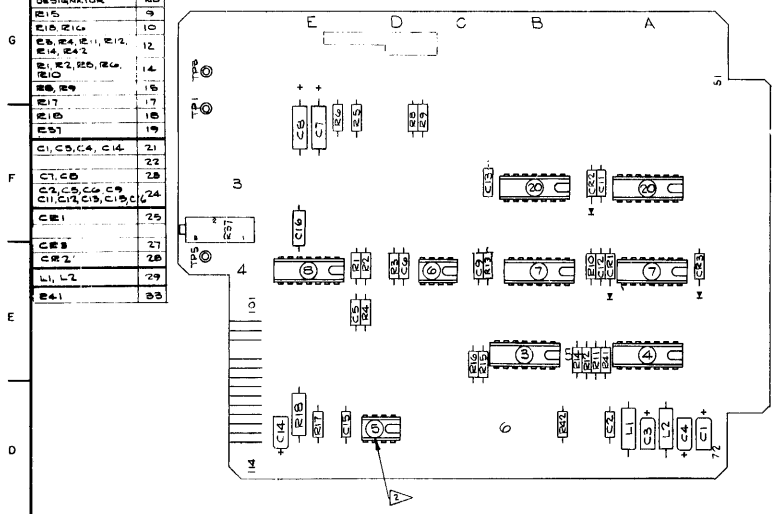


NEXT ASSY.	FIRST USED ON
034382	2021

REVISIONS			
REV	CO	DESCRIPTION	DATE / APPROVAL
B	3251	REV SEID. RELEASE - 02	
C	3423	REVISED, RELEASE - 03	
D	3493	REVISED RELEASE - 04	
E	3660	REVISED	
F	3751	REVISED, RELEASE - 05	

FIND NO.	PART NUMBER	QTY.	DESCRIPTION
03	261001601	1	Integrated Circuit (7404)
04	261016801	1	Integrated Circuit (7438)
05	261019201	1	Integrated Circuit (75453)
06	261044501	1	Integrated Circuit (SG3217M)
07	261004401	2	Integrated Circuit (711)
09	261008601	1	Integrated Circuit (733)
10	261000301	1	Integrated Circuit (420)
11	387000097	1	Resistor ¼W, +5%, 200Ω
12	387000148	2	Resistor ¼W, +5%, 360Ω
14	387000041	5	Resistor ¼W, 5%, 5.6K
16	387307068	2	Resistor ¼W, 2%, 33K
17	387307044	7	Resistor ¼W, 2%, 3.3K
20	387307089	1	Resistor ¼W, 2%, 22Ω
21	387305031	1	Resistor ½W, 2%, 910Ω
22	394110017	1	Potentiometer 1K, ¾W, 10%
23	261016503	2	Resistor/Capacitor Network
24	134906026	4	Capacitor 25V, +20%, 15uF
26	134202029	2	Capacitor 35V, 10%, 1.0uF
27	134007506	8	Capacitor 25V, +80 −20%, .1uF
28	168101001	1	Diode (1N270)
30	169102032	1	Diode (1N753A)
31	409000101	1	Stabister (STB567)
32	257101002	2	Inductor 470 uH
33	420111002	3	Terminal Stud
34	420008301	13	"F" Post Contact
36	387000012	1	Resistor ¼W, 5%, 22Ω

PWB ASSY READ/WRITE AMP-1 (RWA-1)
034382805



COMPONENT CROSS REFERENCE CHART	
REFERENCE DESIGNATOR	FIND NO
E15	9
E16, E16	10
E5, E4, E11, E12, E14, E4-2	12
E1, E2, E20, E6, E10	14
E8, E9	16
E17	17
E18	18
E31	19
C1, C3, C4, C14	21
	22
C7, C8	23
C2, C5, C6, C9, C11, C12, C13, C15, C16	24
CR1	25
CR3	27
CR2	28
L1, L2	29
R41	33

NEXT ASS'Y.	FIRST USED ON
034349-2	2021

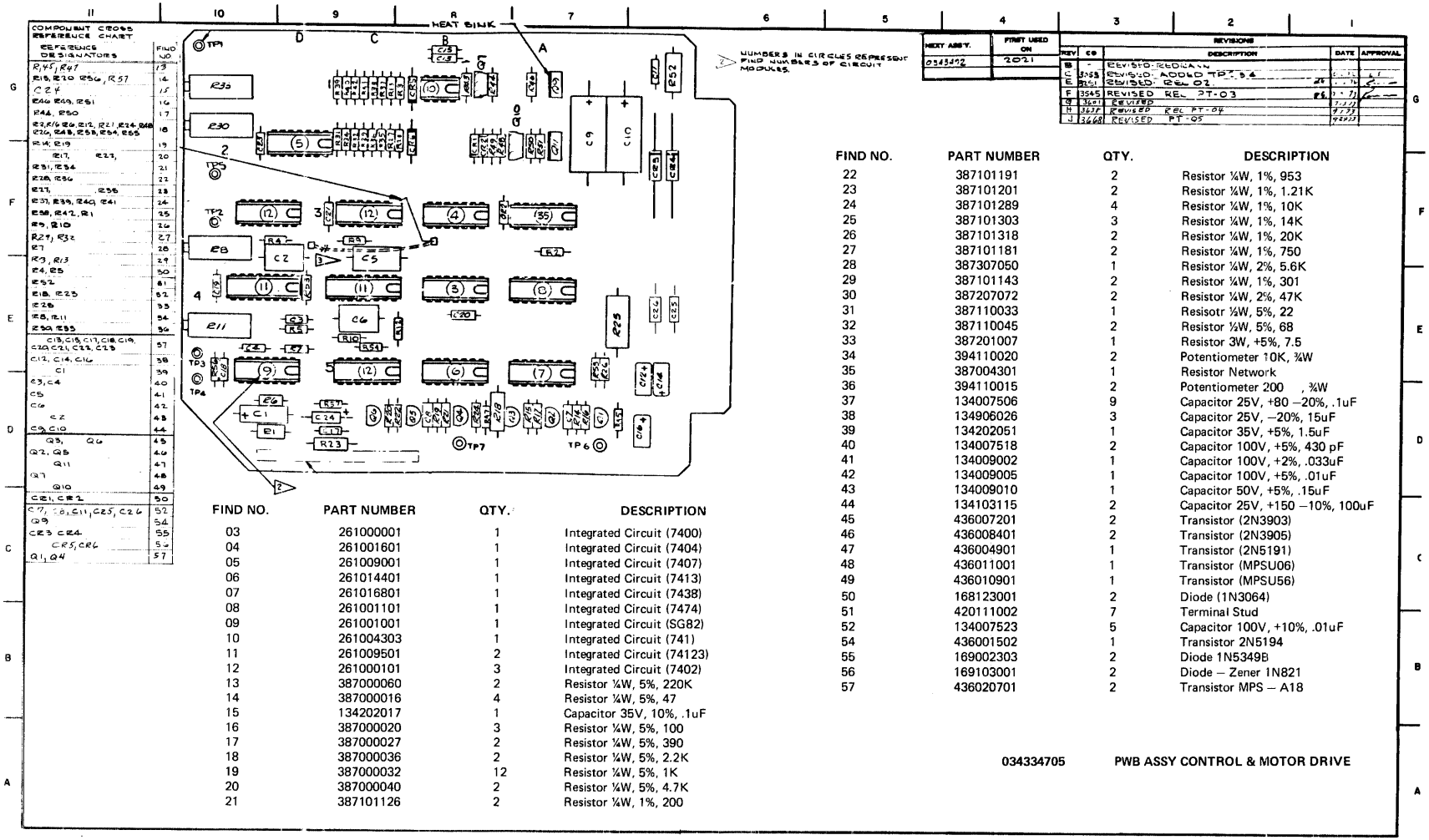
REVISIONS				
REV	CO	DESCRIPTION	DATE	APPROVAL
F	3251	REACTIVATED, REVISED, REDRAWN & RELEASED '02.	12-18-72	
H	3423	REVISED, RELEASE-03	3-7-73	
J	3498	REVISED, RELEASE-04	4-2-73	
K	3660	REVISED	11-14-73	
L	3751	REVISED, RELEASE-05		

(2) NUMBERS IN CIRCLES REPRESENT FIND NUMBERS OF CIRCUIT MODULES.

FIND NO.	PART NUMBER	QTY.	DESCRIPTION
03	261001601	1	Integrated Circuit (7404)
04	261016801	1	Integrated Circuit (7438)
05	261019201	1	Integrated Circuit (75453)
06	261044501	1	Integrated Circuit (SG3217M)
07	261004401	2	Integrated Circuit (711)
08	261008601	1	Integrated Circuit (733)
09	387000097	1	Resistor ¼W, +5%, 200Ω
10	387000148	2	Resistor ¼W, +5%, 360Ω
12	387000041	6	Resistor ¼W, 5%, 5.6K
14	387307044	5	Resistor ¼W, 2%, 3.3K
15	387207068	2	Resistor ¼W, 2%, 33K
17	387207089	1	Resistor ¼W, 2%, 22Ω
18	387305031	1	Resistor ½W, 2%, 910Ω
19	394110017	1	Potentiometer 1K, ¾W
20	261016503	2	Resistor/Capacitor Network
21	134906026	4	Capacitor 25V, +20%, 15uF
23	134202029	2	Capacitor 35V, 10%, 1.0uF
24	134007506	8	Capacitor 25V, +80 – 20%, .1uF
25	168101001	1	Diode (1N270)
27	169102032	1	Diode (1N753A)
28	409000101	1	Stabister (STB567)
29	257101002	2	Inductor 470 uH
30	420111002	3	Terminal Stud
31	420008301	13	"F" Post Contact
33	387000012	1	Resistor ¼W, 5%, 22

PWB ASSY READ/WRITE AMP-1 (RWA) (BI-PHASE)

034335005



FIND NO.	PART NUMBER	QTY.	DESCRIPTION
03	261000001	1	Integrated Circuit (7400)
04	261001601	1	Integrated Circuit (7404)
05	261009001	1	Integrated Circuit (7407)
06	261014401	1	Integrated Circuit (7413)
07	261016801	1	Integrated Circuit (7438)
08	261001101	1	Integrated Circuit (7474)
09	261001001	1	Integrated Circuit (SG82)
10	261004303	1	Integrated Circuit (741)
11	261009501	2	Integrated Circuit (74123)
12	261000101	3	Integrated Circuit (7402)
13	387000060	2	Resistor ¼W, 5%, 220K
14	387000016	4	Resistor ¼W, 5%, 47
15	134202017	1	Capacitor 35V, 10%, .1uF
16	387000020	3	Resistor ¼W, 5%, 100
17	387000027	2	Resistor ¼W, 5%, 390
18	387000036	2	Resistor ¼W, 5%, 2.2K
19	387000032	12	Resistor ¼W, 5%, 1K
20	387000040	2	Resistor ¼W, 5%, 4.7K
21	387101126	2	Resistor ¼W, 1%, 200

FIND NO.	PART NUMBER	QTY.	DESCRIPTION
22	387101191	2	Resistor ¼W, 1%, 953
23	387101201	2	Resistor ¼W, 1%, 1.21K
24	387101289	4	Resistor ¼W, 1%, 10K
25	387101303	3	Resistor ¼W, 1%, 14K
26	387101318	2	Resistor ¼W, 1%, 20K
27	387101181	2	Resistor ¼W, 1%, 750
28	387307050	1	Resistor ¼W, 2%, 5.6K
29	387101143	2	Resistor ¼W, 1%, 301
30	387207072	2	Resistor ¼W, 2%, 47K
31	387110033	1	Resisotr ½W, 5%, 22
32	387110045	2	Resistor ½W, 5%, 68
33	387201007	1	Resistor 3W, +5%, 7.5
34	394110020	2	Potentiometer 10K, ¾W
35	387004301	1	Resistor Network
36	394110015	2	Potentiometer 200 , ¾W
37	134007506	9	Capacitor 25V, +80 –20%, .1uF
38	134906026	3	Capacitor 25V, –20%, 15uF
39	134202051	1	Capacitor 35V, +5%, 1.5uF
40	134007518	2	Capacitor 100V, +5%, 430 pF
41	134009002	1	Capacitor 100V, +2%, .033uF
42	134009005	1	Capacitor 100V, +5%, .01uF
43	134009010	1	Capacitor 50V, +5%, .15uF
44	134103115	2	Capacitor 25V, +150 –10%, 100uF
45	436007201	2	Transistor (2N3903)
46	436008401	2	Transistor (2N3905)
47	436004901	1	Transistor (2N5191)
48	436011001	1	Transistor (MPSU06)
49	436010901	1	Transistor (MPSU56)
50	168123001	2	Diode (1N3064)
51	420111002	7	Terminal Stud
52	134007523	5	Capacitor 100V, +10%, .01uF
54	436001502	1	Transistor 2N5194
55	169002303	2	Diode 1N5349B
56	169103001	2	Diode – Zener 1N821
57	436020701	2	Transistor MPS – A18

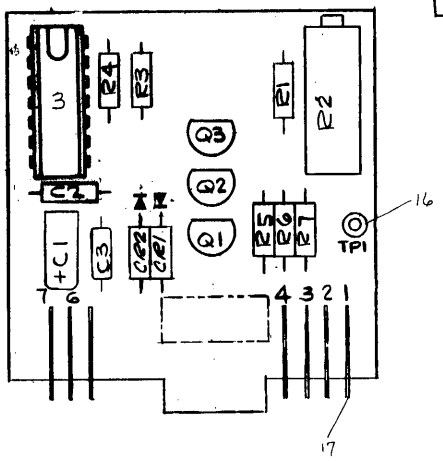
034334705 PWB ASSY CONTROL & MOTOR DRIVE

NEXT ASS'Y.	FIRST USED ON
00343492	2021

REVISIONS			
REV	CO	DESCRIPTION	DATE / APPROVAL
B			
C	3089	REVISED	
D	3250	REVISED C2 RELEASED	
E	3751	REVISED C3 RELEASED	P.E.

COMPONENT CROSS REFERENCE CHART

REFERENCE DESIGNATOR	FIND NO.
R1	4
R5	5
R7	6
R4	7
R6	8
R3	9
R2	10
C1	11
C2	12
C3	13
Q2, Q3	14
Q1	15
CR1, CR2	19



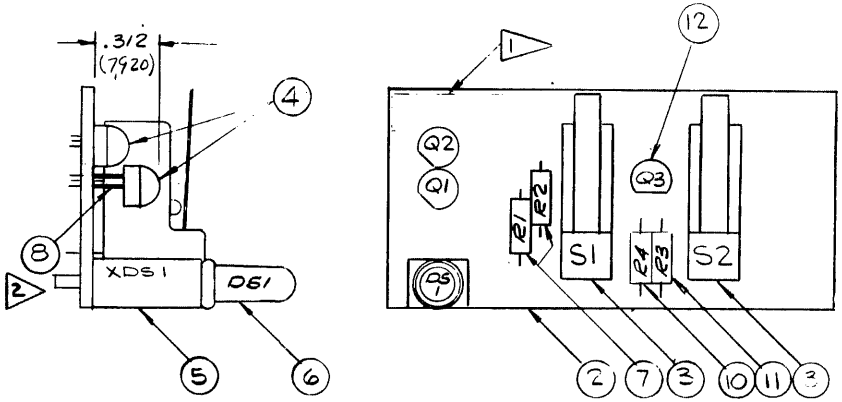
FIND NO.	PART NUMBER	QTY.	DESCRIPTION
03	261014401	1	Integrated Circuit (7413)
04	387000019	1	Resistor ¼W, 5%, 82 Ω
05	387000122	1	Resistor ¼W, 5%, 30K
06	387000056	1	Resistor ¼W, 5%, 100K
07	387000036	1	Resistor ¼W, 5%, 2.2K
08	387000040	1	Resistor ¼W, 5%, 4.7K
09	387000026	1	Resistor ¼W, +5%, 330 Ω
10	394110016	1	Potentiometer, 500 Ω , +10%
11	134906026	1	Capacitor 25V, +20%, 15uF
12	134007506	1	Capacitor 25V, +80 −20%, .1uF
13	134007509	1	Capacitor 50V, 5%, 470 pF
14	436007201	2	Transistor (2N3903)
15	436008401	1	Transistor (2N3905)
16	420111002	1	Terminal Stud
17	420008301	7	"F" Post-Gold Plated
19	168123001	2	Diode (1N3064)

PWB ASSY SPROCKET SHAPER (SS)

034336203

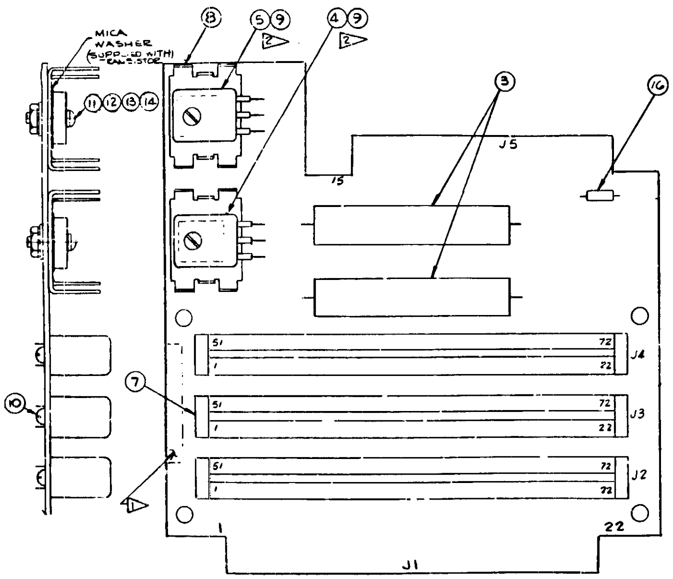
NEXT ASS'Y.	FIRST USED ON
0343492	2021

REVISIONS				
REV	CO	DESCRIPTION	DATE	APPROVAL
A	3545	RELEASE PT-01	7-7-75	



FIND NO.	PART NUMBER	QTY.	DESCRIPTION
03	416014001	2	Switch
04	436007001	2	Phototransistor FPT-100 ←
05	302006001	1	Lamp Holder 12
06	302004801	1	Lamp DS1
07	387000080	2	Resistor ¼W, 5%, 10 MEG
08	406103008	AR	Sleeving
10	387000036	1	Resistor ¼W, 5%, 2.2K
11	387000040	1	Resistor ¼W, 5%, 4.7K
12	436007201	1	Transistor - 2N3903

034459301 PWB ASSY PHOTOCELL (PC)



NOTES

1. MARK BOARD WITH ASSEMBLY NUMBER AND REVISION LETTER
2. APPLY HEAT SINK COMPOUND GREASE TO TRANSISTOR PRIOR TO ASSEMBLING TO BOARD (MOUNT TRANSISTOR WITH HEAT SINK DOWN)

NEXT ASSY.	FIRST USED ON
0343492	2021

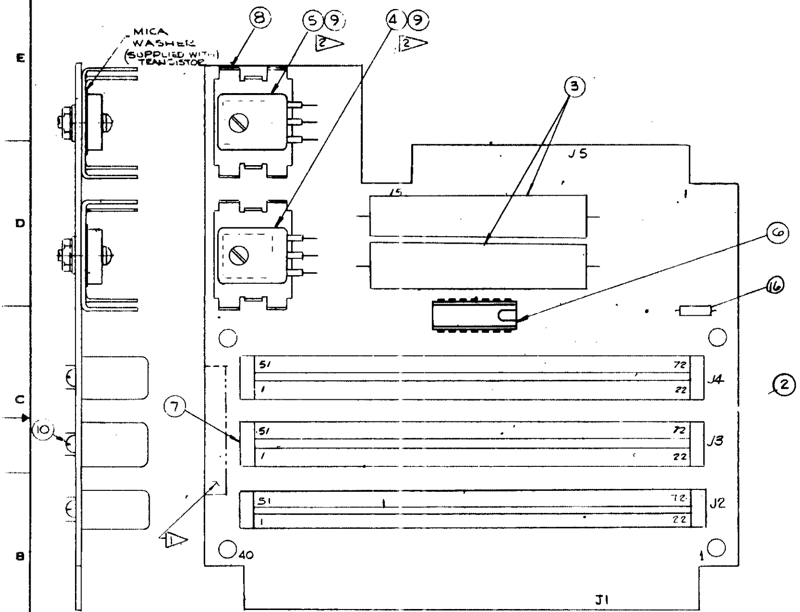
FIND NO.	PART NUMBER	QTY.	DESCRIPTION
03	387205072	2	Resistor 10 WWW, .3Ω , 5%
04	436007101	1	Transistor (MJE3055)
05	436011101	1	Transistor (MJE2955)
07	145014801	3	Connector
08	235000802	2	Heat Sink
10	842125003	6	Screw, Self-Tapping No. 2 X ¼" LG
11	842003826	2	Screw, Pan Hd No. 6-32 x ½" LG
12	932000905	2	Washer, Flat No. 6
13	933001305	2	Washer, Lock No. 6
14	776001206	2	Nut, Hex No. 6-32
16	134007506	1	Capacitor 0.1uF, 25V

2021 PWB ASSY INTERCONNECTION BOARD (ICBD)

034335603

NEXT ASS'Y.	FIRST USED ON
0344431	2022

REV	CO	DESCRIPTION	DATE	APPROVAL
A	34A	RELEASE PT-01		
B	3660	REVISED		

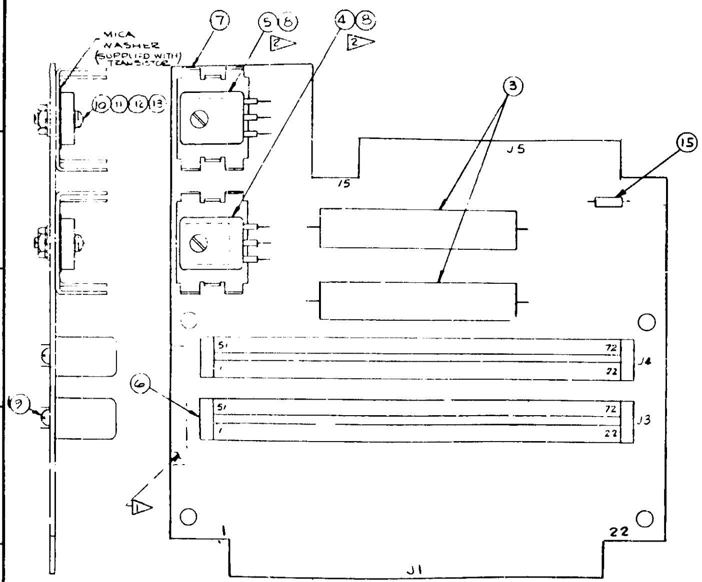


FIND NO.	PART NUMBER	QTY.	DESCRIPTION
03	387205072	2	Resistor 10 WWW, .3 , 5%
04	436007101	1	Transistor (MJE3055)
05	436011101	1	Transistor (MJE2955)
06	387004301	1	Resistor Network (Terminator)
07	145014801	3	Connector
08	235000802	2	Heat Sink
10	842125003	6	Screw, Self-tapping No. 2 x ¼" LG
11	842003826	2	Screw, Pan Hd No. 6-32 x ½" LG
12	932000905	2	Washer, Flat No. 6
13	933001305	2	Washer, Lock No. 6
14	776001206	2	Nut, Hex No. 6-32
16	134007506	1	Capacitor 0.1uF, 25V

2022 PWB ASSY INTERCONNECTION BOARD (ICBD) (SERIAL ENTRY) (4 TRK)

034443201

A 034443 2



NOTES

1. MARK BOARD WITH ASSEMBLY NUMBER
2. APPLY HEAT SINK COMPOUND GREASE TO TRANSISTOR PRIOR TO ASSEMBLING TO BOARD (MOUNT TRANSISTOR WITH HEAT SINK DOWN)

NEXT ASSY.	FIRST USED ON
0343492	2021

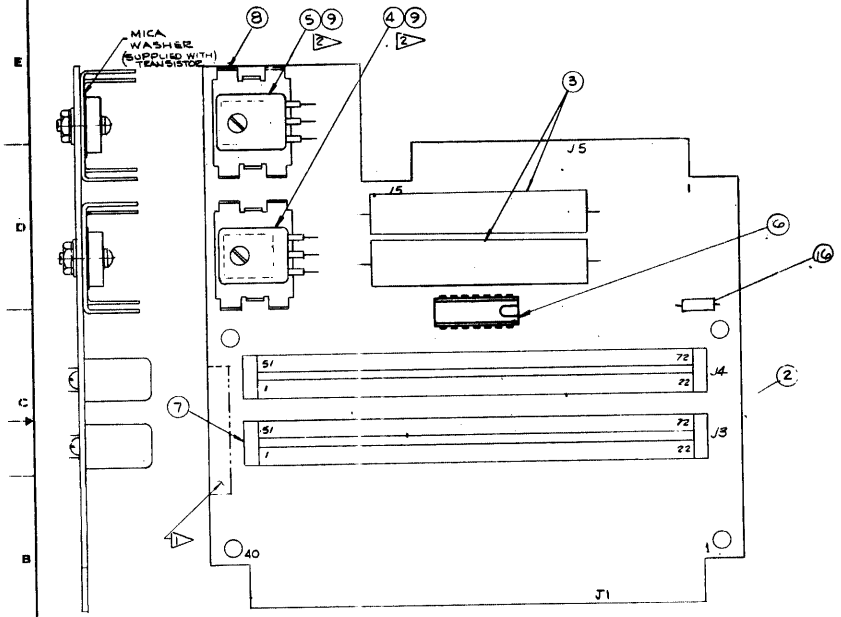
REVISIONS

REV	CO	DESCRIPTION	DATE	APPROVAL
A	[illegible]	RELEASE PT-01	[illegible]	[illegible]
B	[illegible]	REV SED	[illegible]	[illegible]

FIND NO.	PART NUMBER	QTY.	DESCRIPTION
03	387205072	2	Resistor 10 WWW' .3Ω , 5%
04	436007101	1	Transistor (MJE3055)
05	436011101	1	Transistor (MJE2955)
06	145014801	2	Connector
07	235000802	2	Heat Sink
09	842125003	4	Screw, Self-Tapping No. 2 x ¼" LG
10	842003826	2	Screw, Pan Hd No. 6-32 x ½" LG
11	932000905	2	Washer, Flat No. 6
12	933001305	2	Washer, Lock No. 6
13	776001206	2	Nut, Hex No. 6-32
15	134007506	1	Capacitor 0.1uF, 25V

2021 PWB ASSY INTERCONNECTION BOARD (ICBD)

034443401



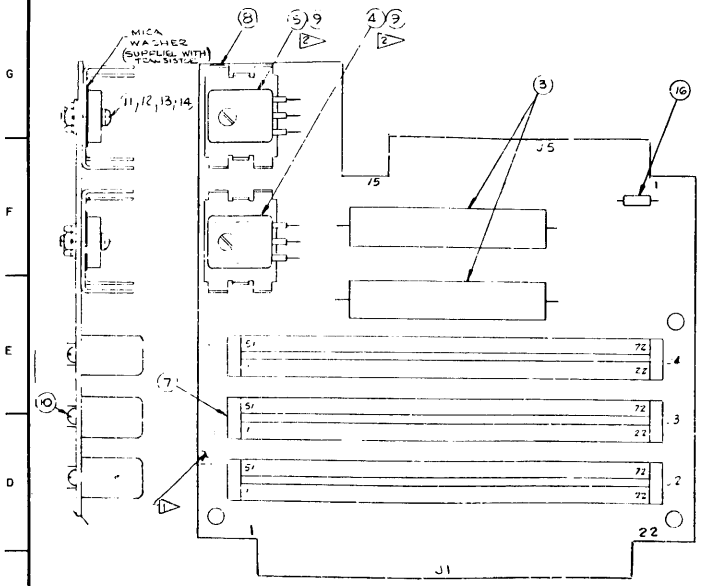
NEXT ASS'Y.	FIRST USED ON
034449	2022

REVISIONS				
REV	CO	DESCRIPTION	DATE	APPROVAL
A	349	RELEASE PT 01	1-13	
B	3660	REVISED		

FIND NO.	PART NUMBER	QTY.	DESCRIPTION
03	387205072	2	Resistor 10 WWW, .3Ω , 5%,
04	436007101	1	Transistor (MJE3055)
05	436011101	1	Transistor (MJE2955)
06	387004301	1	Resistor Network (Terminator)
07	145014801	2	Connector
08	235000802	2	Heat Sink
10	842125003	4	Screw, Self-Tapping No. 2 x ¼" LG
11	842003826	2	Screw, Pan Hd No. 6-32 x ½" LG
12	932000905	2	Washer, Flat No. 6
13	933001305	2	Washer, Lock No. 6
14	776001206	2	Nut, Hex No. 6-32
16	134007506	1	Capacitor 0.1uF, 25V

2022 PWB ASSY INTERCONNECTION BOARD (ICBD) (SERIAL ENTRY)

034419201



NOTES

1. MARK BOARD WITH ASSEMBLY NUMBER
2. APPLY HEAT SINK COMPOUND GREASE TO TRANSISTOR PRIOR TO ASSEMBLING TO BOARD (MOUNT TRANSISTOR WITH HEAT SINK DOWN).

NEXT ASSY.	FIRST USED ON
40394591	

REVISIONS				
REV	CO	DESCRIPTION	DATE	APPROVAL
A	8550	RELEASED PT-01		
B	3460	REVISED		

FIND NO.	PART NUMBER	QTY.	DESCRIPTION
03	387205072	2	Resistor 10 WWW' .3Ω , 5%
04	436007101	1	Transistor (MJE3055)
05	436011101	1	Transistor (MJE2955)
07	145014801	3	Connector
08	235000802	2	Heat Sink
10	842125003	6	Screw, Self-Tapping No. 2 x ¼" LG
11	842003826	2	Screw, Pan Hd No. 6-32 x ½" LG
12	932000905	2	Washer, Flat No. 6
13	933001305	2	Washer, Lock No. 6
14	776001206	2	Nut, Hex No. 6-32
16	134007506	1	Capacitor 0.1uF, 25V

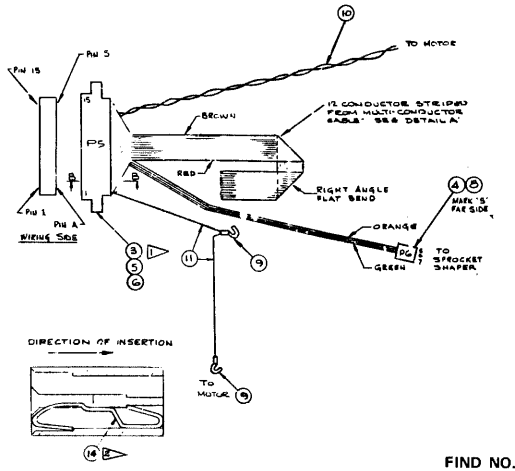
2021 PWB ASSY INTERCONNECTION BOARD (ICBD)

034459601

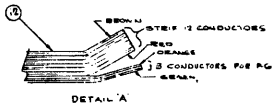
NEXT ASS'Y.	FIRST USED ON
034363902	2021

REV	ECO	DESCRIPTION	DATE	APPROVAL
A	3054	RELEASE		
B	3251	REVISED		
C	3537	REVISED		
D	3614	REVISED		

(12700)
5.00
THIS DWG IS USED AS A TEMPLATE CHANGES MUST BE MADE TO SCALE



NOTES
1. INSERT COMMONING SPRING P/N 7 BETWEEN P5-15 & P5-5, P6-1 & P5-11.
2. INSERT RETAINING SPRING, P/N 14, AT P3-7 & P3-11.



DETAIL 'A'

FIND NO.	PART NUMBER	QTY.	DESCRIPTION
03	145006606	1	Connector (P5) 30 Pos
04	145015201	1	Connector (P6) 3 Pos
05	146002702	18	Contact
06	146005602	2	Contact, Dummy
07	146007501	2	Commoning Spring
08	146007602	3	Contact, Crimp
09	420007901	2	Terminal Lug, Hook Type
12	465007901	12	Multi-Conductor Cable
14	145014702	2	Spring, Retaining

MECHANISM HARNESS

034363901