Technical Manual No.

799850-000F

OPERATION AND MAINTENANCE

INSTRUCTIONS FOR

MODEL 900X MAGNETIC TAPE TRANSPORT

(DUAL-MODE)

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February 1979

PREFACE

This manual presents information required for the operation and maintenance of the Cipher Model 900X Magnetic Tape Transport (dual-mode). Please read it thoroughly before unpacking, installing, or operating the transport. The manual consists of seven sections, as follows:

I Description and Specifications

II Unpacking, Inspection, and Installation

III Operation

IV Theory of Operation

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SECTION I

DESCRIPTION AND SPECIFICATIONS

1-1. GENERAL

1-2. The Model 900X Magnetic Tape Transport is a high-performance, digital, vacuum-buffered tape transport manufactured by Cipher Data Products, Inc., San Diego, California. It incorporates a dual-gap head, providing read-after-write capability. The transport is designed to operate on 95- to 135-Vac or 190- to 270-Vac, single-phase, 47 to 63-Hz line power. Reels to 10.5 inches in diameter can be accommodated. Various tape-speed and density capabilities and other options are available, as follows:

a. Overwrite

b. Tape speeds:

(1) Standard: 75, 45, or 37.5 ips

(2) Nonstandard: Any fixed speed within the range of 25 to 90 ips

c. Data Densities: 800 (NRZI); 1600 bpi (PE)

d. Dual-density combination: 800/1600 bpi (dual-mode NRZI/PE)

e. Local density selection

f. Remote density selection

g. Unit address switch

h. Facade color (white is standard)

1-3. PURPOSE

1-4. The transport is intended for use in data acquisition and computer processing systems in which data must be acquired and stored on magnetic tape. Writing and reading of digital data are performed in IBM-compatible, NRZI or PE format. Data recorded by a Model 900X transport is completely recoverable by IBM or similar equipment.

1-5. PHYSICAL DESCRIPTION

1-6. The Model 900X transport (Figure 1-1) is designed to be hinge-mounted in a standard, 19-inch equipment rack. All components are mounted on a precision-ground, cast-aluminum plate. When the equipment rack is securely anchored, the printed circuit boards and other internal components can be made accessible from the front by releasing the adjustable pawl fastener and swinging the transport open on its hinges. A transparent, hinged, front cover protects the transport from dust and other foreign matter while allowing observation of tape motion. The pushbutton controls and indicators are mounted on the front trim panel, where they are accessible with the cover closed. The power connector is a standard, three-pin, grounded plug.

1-7. Two printed wiring boards are used in the Model 900X, a read/write board and a control/servo board, mounted on the rear of the mounting plate.

1-8. TAPE DRIVE

1-9. The reel-to-reel drive mechanism employs two servo-controlled, direct-drive, dc torque motors to drive the tape reels. The reels are secured to their hubs by lever-actuated expanding rings. Vacuum columns maintain tape tension at 8 ounces and serve as tape-storage buffers.

1-10. The tape path includes both roller and fixed guides, the head, cross-feed shield, and a tape cleaner. The roller guides utilize precision bearings to minimize friction and reduce wear, and the wearing surfaces of the fixed guides are hard-chrome plated. The fixed guides, on each side of the head, are of the single-edge type. The outer (reference) flange of each guide is fixed to an exact dimension, and the bottom flange is spring loaded to force the tape against the reference edge at all times. This arrangement provides minimum skew and minimizes the effect of tape width variations. In addition, the head and cross-feed shield are mounted on an adjustable plate which provides for precise azimuth alignment.

1-11. A sapphire tape cleaner is mounted between the supply vacuum column and the head to minimize tape contamination.

1-12. FUNCTIONAL DESCRIPTION

1-13. Figure 1-2 is a system block diagram. The Model 900X transport uses a 180-degree-wrap capstan drive for controlling tape movement during write, read, and rewind operations. The capstan is controlled by a velocity servo. The velocity information is generated by a dc tachometer that is directly coupled to the capstan motor shaft and produces a voltage proportional to the angular velocity of the capstan. This voltage is compared to the reference voltage from the ramp generator by means of operational amplifier techniques, and

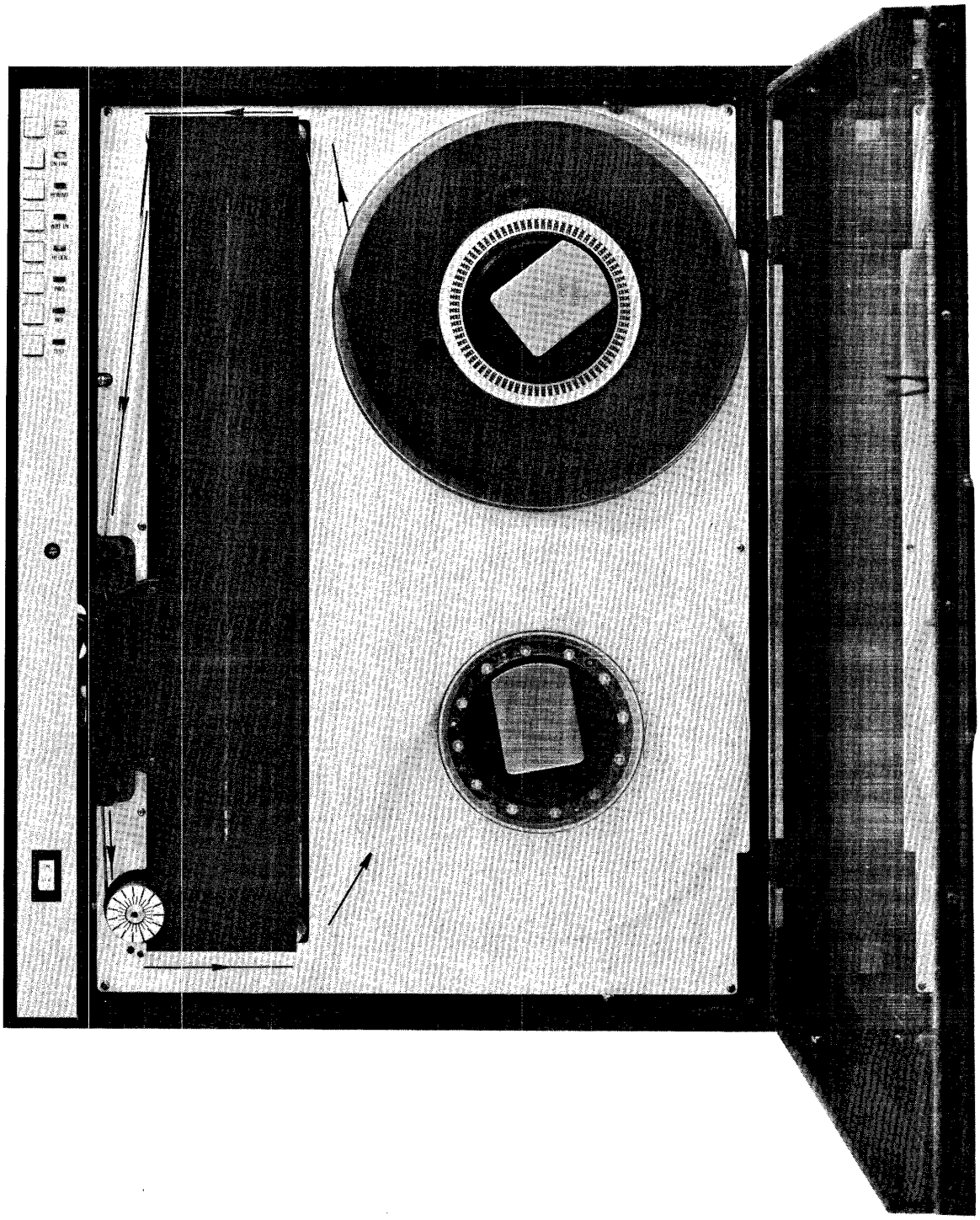
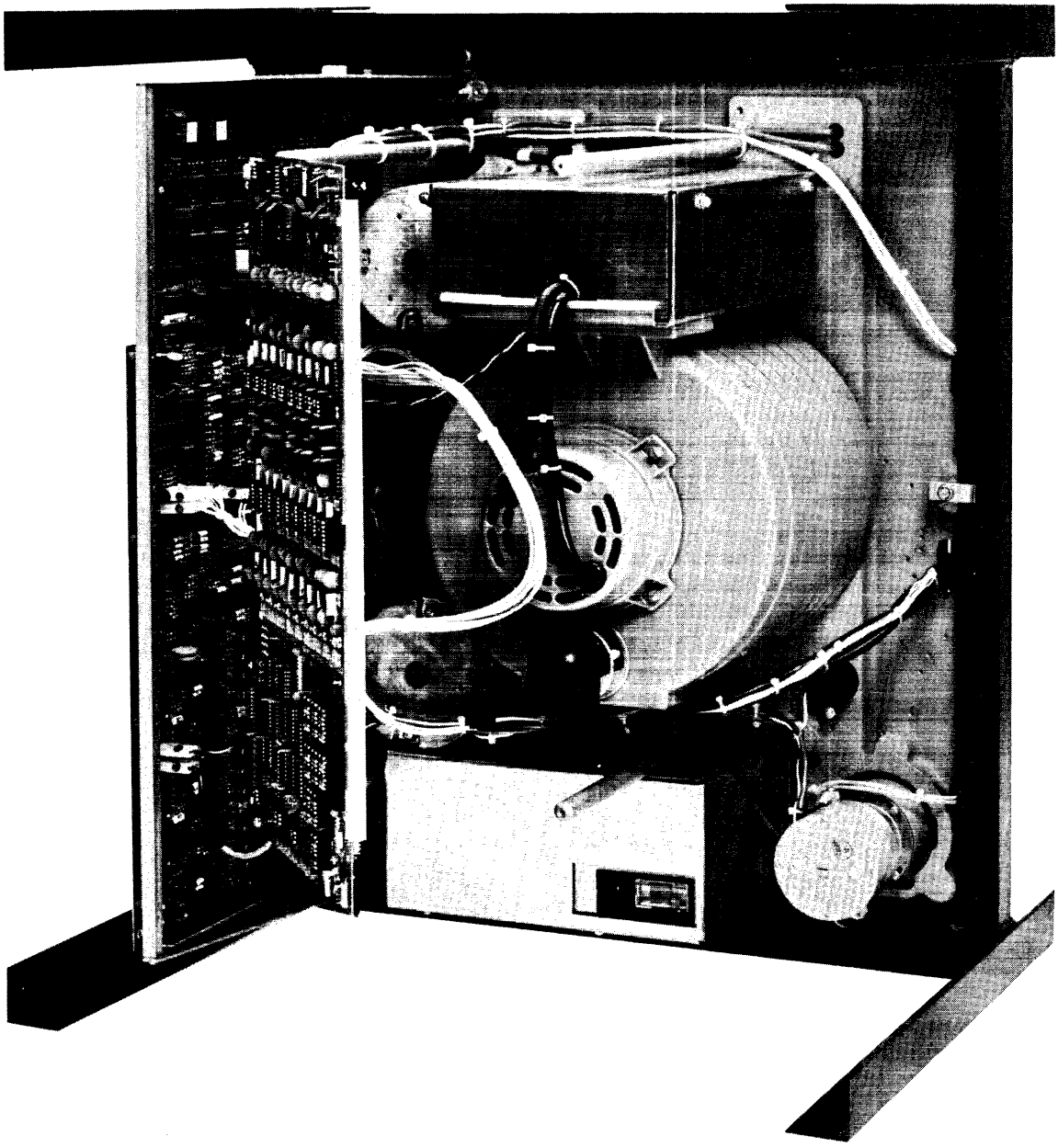


Figure 1-1. Model 900X Transport (Sheet 1)



(Shown in Shipping Frame, Data PWB Swung Outward)

REAR VIEW

Figure 1-1. Model 900X Transport (Sheet 2)

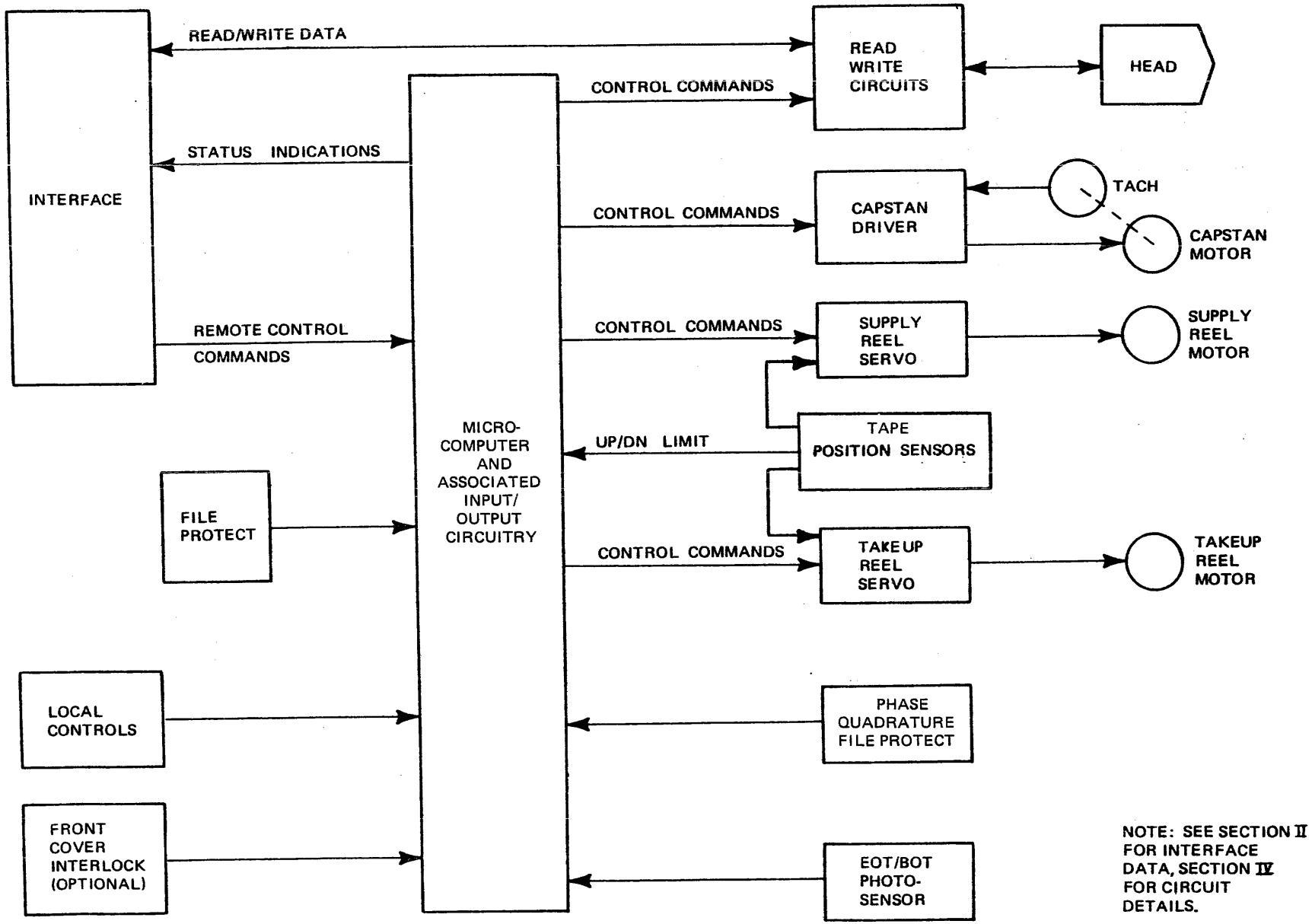


Figure 1-2. System Block Diagram

the difference is used to control the capstan motor. This capstan control technique gives precise control of tape accelerations and tape velocities, thus minimizing tape tension transients.

1-14. During a write operation, the tape is accelerated in a controlled manner to the required velocity. This velocity is maintained constant, and data characters are written on the tape at a constant rate. Thus, the following relationship exists:

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

1-15. When data recording is complete, the tape is decelerated to zero velocity in a controlled manner. Since the write operation relies on a constant tape velocity, inter-record gaps (IRG) must be provided to allow for the tape acceleration and deceleration periods. Control of tape motion to produce a defined IRG is provided externally by the customer controller, in conjunction with the tape acceleration and deceleration characteristics defined by the transport specifications.

1-16. An optional overwrite feature provides for editing of previously recorded data. The Overwrite signal causes Write Enable to ramp on and off, minimizing the change in inter-record gap magnetism in rewriting a record. Write Amplifier Reset, used with the overwrite option, causes both write head current and erase head current to be turned off immediately after writing of the new record to prevent destruction of data in the following record.

1-17. During a read operation, the tape is accelerated to the required velocity in a time interval sufficiently short to allow tape velocity to become constant before data signals are received. Nine data channels are presented to the interface. In NRZI operation they are accompanied by a Read Data Strobe (RDS) pulse derived from a monostable multivibrator circuit. The end of a record is detected in the customer controller by means of gap-detection circuits, and the tape is commanded to decelerate in a controlled manner. The transport can operate in the read mode in either the forward or reverse direction. When operating in a shuttling mode (e.g., synchronous forward, stop, synchronous reverse, and stop) no turnaround delay is required between the end of one motion command and the beginning of the next motion command in the opposite direction. To guarantee IBM-compatible tapes, with fully saturated gaps and precise dimensions, tape motion must be allowed to cease before switching of the motion control lines and Write Enable line.

1-18. In addition to the capstan control system, the transport incorporates supply and takeup reel servo systems, a vacuum buffer system, a magnetic head and associated read/write electronics, and the control logic.

1-19. The vacuum buffer columns compensate for differences in tape speed arising out of the relatively fast starts and stops of the capstan and those of the slower, high-inertia supply and takeup reels. When the rate of tape travel at the capstan differs from that at which the reels are supplying or taking up the tape, the supply and/or takeup reel tape loops move up or down in the vacuum columns to compensate for this difference. At the same time, a capacitive sensor measures the resulting displacement of each tape loop and feeds an error signal to the respective reel motor servo. This signal is amplified and is used to control the reel motor, raising or lowering the nominal tape loop operating position in the column. The vacuum buffer system is designed to provide a constant tape tension of 8 ounces, as long as the tape loops are within their operating regions. Tape spillage is prevented, in the event power is lost, by a controlled-halt feature designed into the servo circuitry.

1-20. The magnetic head, under control of the read/write electronics, writes and reads the flux transitions on the tape. The read function is operating continuously, while the write function must be enabled in order to operate. An erase head provides continuous dc erasure across the full width of the tape during write operations.

1-21. The control logic operates on manual commands to enable tape, once loaded, to be brought to the load point. At this stage remote commands control tape motion, writing, and reading. The logic also provides rewind and unload functions, in conjunction with the manual REWIND control. A photoelectric sensor assembly consisting of two LED's and two phototransistors is used to detect the beginning-of-tape (BOT) and end-of-tape (EOT) markers as well as unthreaded or broken tape. The detection area of the sensor assembly is approximately 1.2 inches from the write head gap.

1-22. MECHANICAL AND ELECTRICAL SPECIFICATIONS

1-23. The mechanical and electrical specifications for the transport are shown in Table 1-1.

1-24. INTERFACE SPECIFICATIONS

1-25. Section II contains a table of interface connections. Signal characteristics are as follows:

a. Levels

(1) True is low: 0 to 0.4 volt (approximately).

(2) False is high: +3 volts (approximately).

b. Pulses

(1) Levels as above.

(2) Edge transmission delay over 20 feet of cable is not greater than 200 nanoseconds.

1-26. The interface circuits are so designed that a disconnected wire results in a false signal. Figure 1-3 shows the interface configuration for which the transport is designed.

Net Weight	105 pounds (59.9 Kg)
Shipping Weight	135 pounds (73.0 Kg)
Dimensions:	
Height	24.0 inches (61.0 cm)
Width	19.0 inches (48.3 cm)
Depth (from mounting surface)	13.0 inches (33.1 cm)
Depth (total)	16.2 inches (41.2 cm)
Mounting (standard 19-in. RETMA rack)	EIA specifications
Power	95 to 135 or 190 to 270 Vac, 47 to 63 Hz, 450 watts, max.
Acoustic Noise	65 dBA, max., 1 meter, without cabinet
Fuse	6.0/3.0-ampere, 3AG, 115/230-Vac
Tape (computer grade):	
Width	0.5 inch (1.27 cm)
Thickness	1.5 mil (3.81 mm)
Reel Diameter	10.5 inches (26.67 cm), max.
Tape Tension	8 ounces (226.8 grams)

Table 1-1. Mechanical and Electrical Specifications

Recording Mode & Density:	
Nine-track: IBM-compatible NRZI	800 bpi
Nine-track: IBM-compatible PE	1600 bpi
Nine track: Dual-mode NRZI/PE	800/1600 bpi
Tape Speed: Standard	75/45/37.5 ips
Nonstandard Available	25 to 90 ips
Speed Variation:	
Instantaneous	±3% (max., byte-to-byte)
Long term	±1% (max.)
Rewind Speed	300 ips (nom.)
Start/Stop Time (inversely proportional to tape speed)	5.0ms (nom.) at 75 ips
Start/Stop Distance	0.19(±0.02) inch (0.48(±0.05) cm)
Interchannel Displacement Error	150 microinches (0.004 mm) max.
Beginning of Tape (BOT) and End of Tape (EOT) detectors	Solid-state, modulated photoelectric (IBM-compatible)
Interface	Industry-compatible TTL (Low True)
Electronics	Silicon-TTL including low power, MOS microprocessor
Operating Temperature	2° to 50°C
Relative Humidity	15 to 95%, noncondensing
Altitude	0 - 8200 feet (0 - 2500 meters)

Table 1-1. Mechanical and Electrical Specifications (Continued)

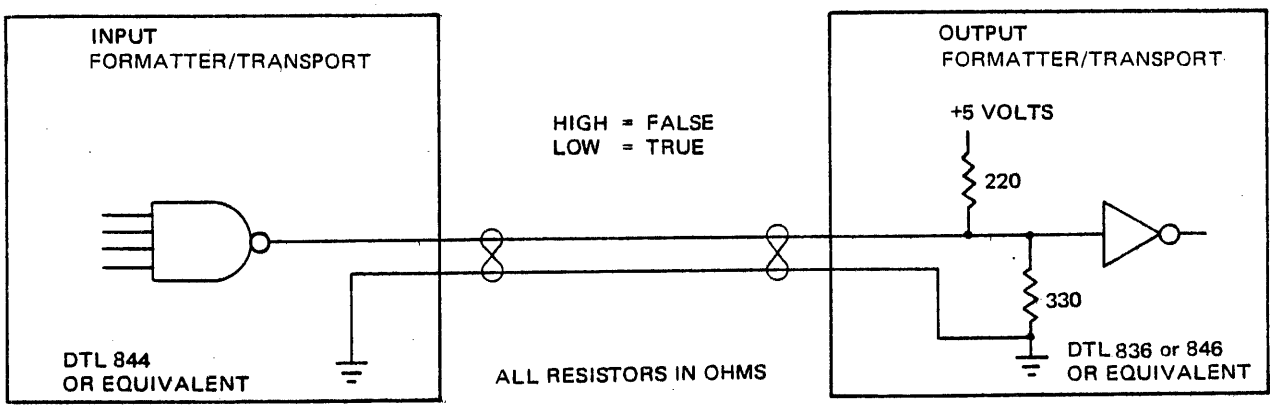


Figure 1-3. Interface Configuration

SECTION II

UNPACKING, INSPECTION, AND INSTALLATION

2-1. GENERAL

2-2. This section presents instructions for unpacking, inspecting, and installing the transport.

2-3. UNPACKING AND INSPECTION

2-4. The transport is shipped in a double container to minimize the possibility of damage during shipping. Unpack as follows:

a. With shipping container on floor or workbench, cut side and center tapes securing top of outer box.

b. Pull box-top flaps down along sides of box, and turn entire package over on open side of outer box. Lift off outer box and remove packing blocks.

CAUTION

Do not cut center tape of inner box without first cutting side tapes and pulling flaps away from top of container. Plastic door of transport can be damaged by failure to observe this precaution.

c. Cut side tapes securing top of inner box, pull flaps up as far as possible, and cut center tape. Open box, fold flaps back, turn over on open side, and lift off box.

d. Check contents of shipping container against packing slip, and inspect for possible damage. <u>If damage exists, notify carrier</u>.

e. Examine vacuum column, reel hubs, capstan, and other components in tape path for foreign matter.

f. Check printed circuit boards and all connectors for correct installation.

2-5. POWER CONNECTION

2-6. A removable power cord is supplied for plugging into a polarized 115-volt outlet. For other power sockets, the supplied plug must be removed and the correct plug installed.

2-7. OPERATING VOLTAGE SELECTION. The Model 900X can be operated over a wide range of line voltages with no changing of transformer taps. Four ranges are available: 90 to 110-Vac, 110 to 135 Vac, 190 to 230 Vac, and 230 to 270 Vac. Both a voltage selector PWB and the fuse are located in the power cord connector housing mounted in the power supply chassis. One side of the voltage selector PWB has the numbers 120 and 240, each printed upside down from the other, on one side of the PWB and numbers 100 and 220 similarly printed on the other side. When line voltage is 90 to 110 volts, the PWB should be plugged in so that number 100 is facing upward and right-side-up to the installer. For 190 to 230 volts, the number should be 220; 110 to 135 volts, number 120; and 230 to 270 volts, number 240. For the 90-to-135-volt ranges, the fuse should be of a 6-ampere rating; for the 190-to-270-volt ranges, a 3-ampere rating.

CAUTION

To prevent damage to the transport and ensure proper operation, be sure the voltage selector PWB and fuse are proper for the power source to be used before applying power to the transport.

2-8. INITIAL CHECKOUT

2-9. Section III contains a detailed description of all controls. To check for proper transport operation before placing in the system, proceed as follows:

a. Connect power cord.

b. Clean tape path as directed under paragraph 5-3.

c. Load tape in accordance with instructions in paragraph 3-5.

d. Turn power on by switching POWER switch.

e. Momentarily depress LOAD control to apply capstan-motor and reel-motor power.

f. Momentarily depress LOAD control to initiate load sequence. Tape will move forward until it reaches BOT tab. LOAD indicator should illuminate when BOT tab reaches photosensor and remain illuminated until tape moves off load point. At this point there will be no action when LOAD control is depressed.

g. Check ON LINE pushbutton by depressing repeatedly and observing that ON LINE indicator is alternately illuminated and extinguished.

h. With transport off line (ON LINE indicator not illuminated, press FWD control. Run several feet of tape onto takeup reel, and press FWD control again to stop tape.

i. Check components of tape path visually for correct tape tracking (tape riding smoothly in head, guides, etc.).

j. Press REV switch. Tape will move backward until BOT tab reaches photosensor, when it will stop.

k. Check tape tracking as in step i.

l. Using FWD control, run several feet of tape onto takeup reel. Depress FWD control again to stop tape. Depress REWIND control momentarily to initiate rewind mode and illuminate REWIND indicator. Tape will rewind to BOT tab and stop with BOT tab at load point. If REWIND control is momentarily depressed when tape is at BOT, REWIND indicator will illuminate and tape will unload from vacuum column and rewind at low speed. This procedure is used to unload tape (paragraph 3-7). Reel can then be removed.

m. Make final check of tape tracking, as in step i.

2-10. RACK MOUNTING

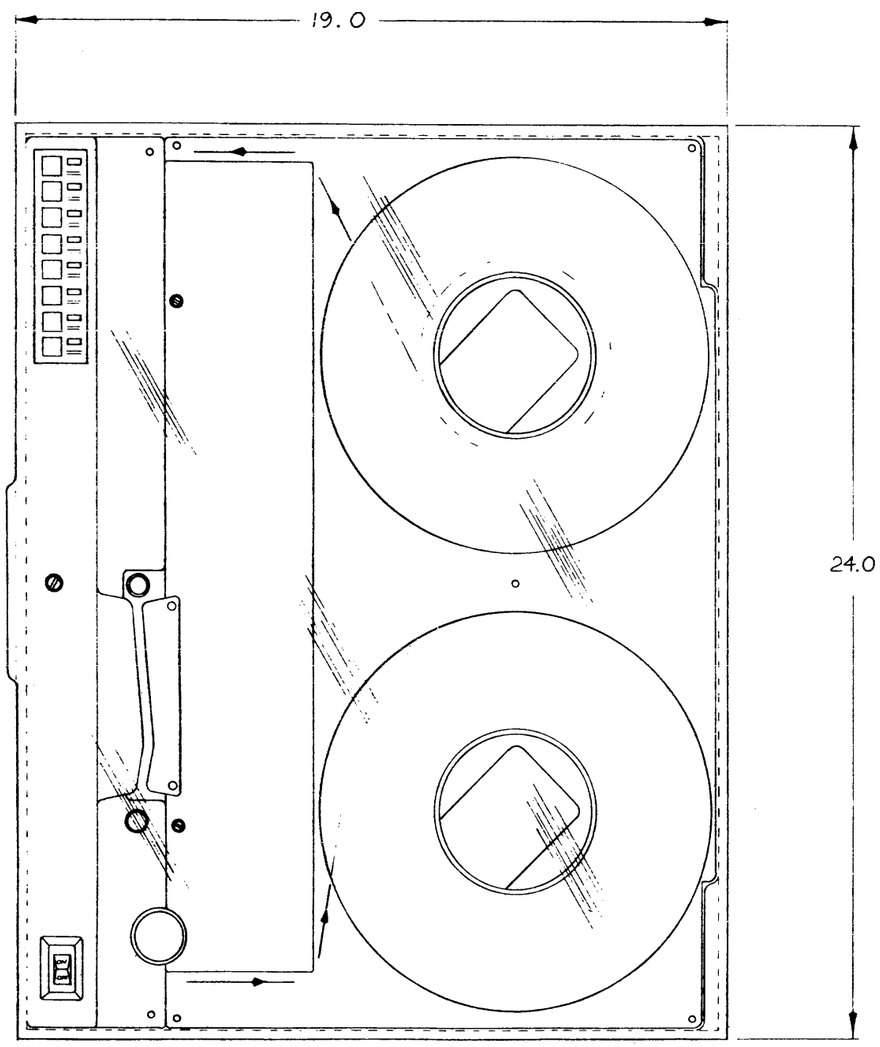
2-11. The transport is designed to be mounted in a standard, 19-inch-wide, RETMA equipment rack. A front panel height of 24 inches and a minimum depth of 12.5 inches behind the mounting surface are required. Note outline dimensions in Figure 2-1, and mount the transport as follows:

a. Install hinge pin blocks on equipment rack using three 10-32 pan-head screws per hinge. Do not fully tighten screws. Place No. 10 shim washer on each pin.

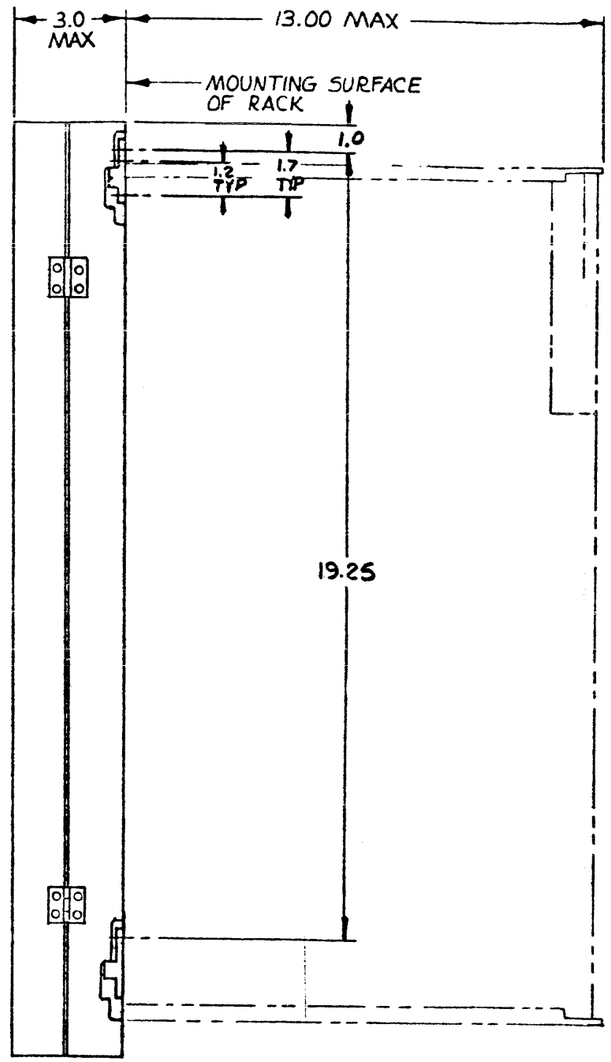
b. Set shipping frame down with front door of transport facing up (i.e., lying in horizontal position). Remove screws securing transport to frame.

c. Lift transport out of shipping frame, position 60 degrees from closed position, and hang on hinge pin blocks.

d. Adjust hinge blocks on equipment rack so that transport hangs symmetrically in rack. Tighten screws.



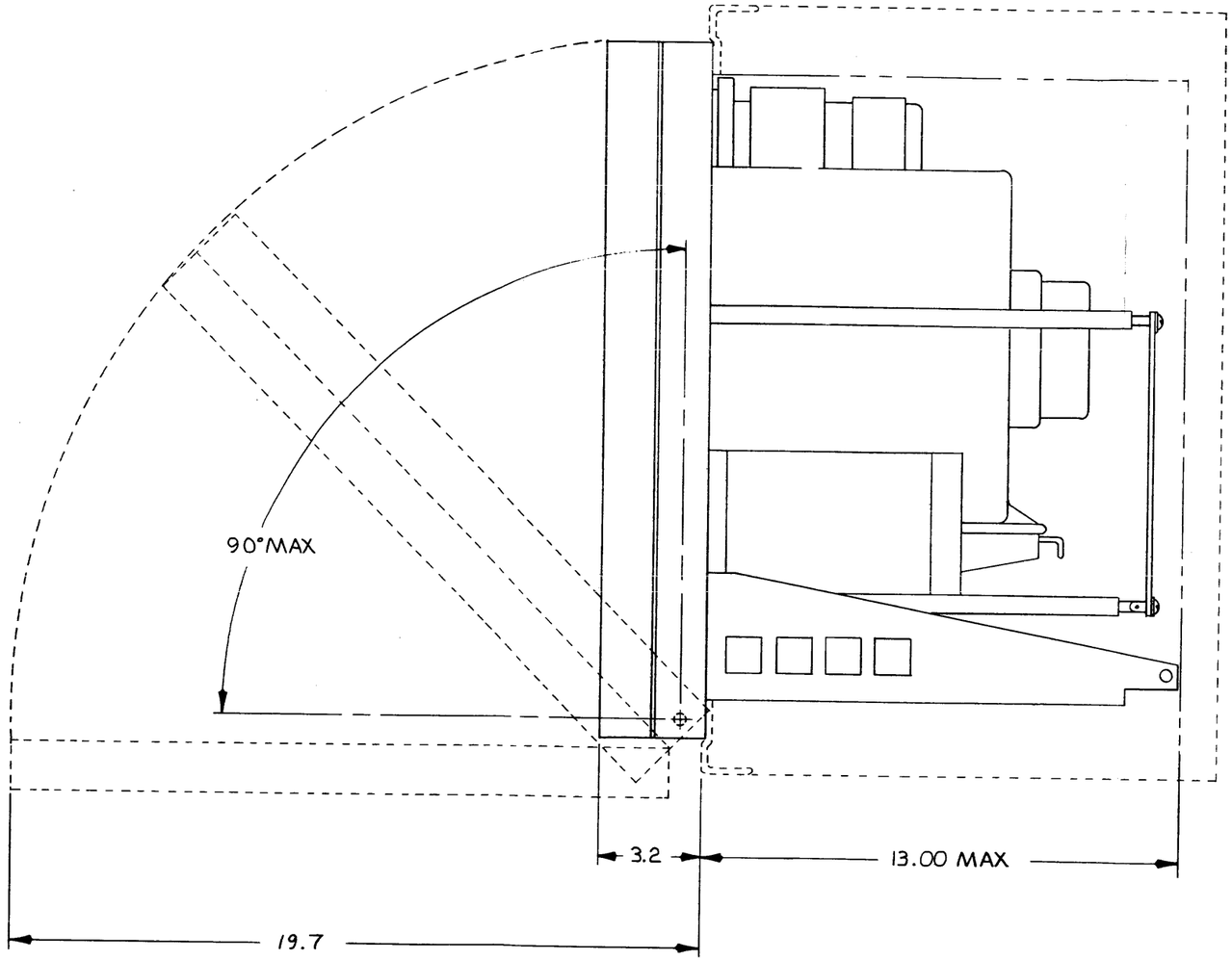
FRONT VIEW



PWB ASSY - CONTROL/SERVO
SHOWN IN DOTTED LINES

SIDE VIEW

Figure 2-1. Model 900X Outline Dimensions (Sheet 1)



TOP VIEW
INCLUDES RACK MOUNTING DIMENSIONS

Figure 2-1. Model 900X Outline Dimensions (Sheet 2)

e. Close tape transport into rack and install safety block, using 4-40 screw.

f. Check that adjustable pawl fastener engages behind equipment rack. Adjust if necessary.

2-12. INTERFACE CONNECTIONS

2-13. Optimally, interconnection of Cipher Data Products and customer equipment should be made with a harness of individual twisted pairs, each with the following characteristics:

a. Maximum length of 20 feet.

b. Not less than one twist per inch.

c. A 24-gauge conductor with minimum insulation thickness of 0.01 inch.

2-14. Alternatively, flat ribbon cable can be used, with some signal degradation, in low-noise environments.

2-15. It is important that the ground side of each twisted pair be grounded within a few inches of the driver to which it is connected. The mating connectors (ELCO part number 00-6007-036-980-002 or equivalent) must be wired by the customer. Interface signals are routed directly to and from the printed circuit boards. Strain relief should be provided. Table 2-1 shows the input/output lines required.

CONNECTOR	LIVE PIN	GROUND PIN	SIGNAL
Input Commands J101	J	8	Select 0 (ISLT0)
	A	8	Select 1 (ISLT1)
	18	8	Select 2 (ISLT2)
	V	8	Select 3 (ISLT3)
	C	3	Synchronous Forward Command (ISFC)
	E	5	Synchronous Reverse Command (ISRC)
	H	7	Rewind (IRWC)
	L	10	Off Line (IOFC)
	K	9	Set Write Status (IWEN)
	B	2	Overwrite (IOVW)
	D	4	Data Density Select (DDS)
Output Indications J101	T	16	Ready (RDY)
	M	11	On Line (IONLS)
	N	12	Rewinding (IRWDG)
	U	17	End of Tape (EOT)
	R	14	Load Point (ILP)
	P	13	File Protect (IFPT)
	F	6	Data Density Indicator (IDDI)
	S	-	+5V (Optional)
Write Inputs J102	A	1	Write Data Strobe (WDS)
	C	3	Write Amplifier Reset (WARS)
	E	5	NOT USED

Table 2-1. Interface Connections

CONNECTOR	LIVE PIN	GROUND PIN	SIGNAL
Write Inputs J102(Continued)	F	6	Read Threshold 2 (RTH2)
	L	10	Write Data Parity (WDP)
	M	11	Write Data 0 (WD0)
	N	12	Write Data 1 (WD1)
	P	13	Write Data 2 (WD2)
	R	14	Write Data 3 (WD3)
	S	15	Write Data 4 (WD4)
	T	16	Write Data 5 (WD5)
	U	17	Write Data 6 (WD6)
	V	18	Write Data 7 (WD7)
Read Outputs J103	2	B	Read Data Strobe (RDS)
	1	A	Read Data Parity (RDP)
	3	C	Read Data 0 (RD0)
	4	D	Read Data 1 (RD1)
	8	J	Read Data 2 (RD2)
	9	K	Read Data 3 (RD3)
(Optional)*	10	L	Non-Return-to-Zero (NRZ)
	11	M	NOT USED
	12	N	NOT USED
	13	P	NOT USED
	14	R	Read Data 4 (RD4)
	15	S	Read Data 5 (RD5)

*NRZ switches automatically. If HI DEN is true, NRZ is false. If HI DEN is false, NRZ is true.

Table 2-1. Interface Connections (Continued)

CONNECTOR	LIVE PIN	GROUND PIN	SIGNAL
Read Outputs J103(Continued)	17	U	Read Data 6 (RD6)
	18	V	Read Data 7 (RD7)

Table 2-1. Interface Connections (Continued)

SECTION III

OPERATION

3-1. GENERAL

3-2. This section describes the controls and indicators and provides instructions for operating the Model 900X transport.

3-3. CONTROLS AND INDICATORS

3-4. Figure 3-1 shows the controls and indicators. An ON/OFF rocker switch (not shown) is located near the bottom of the control panel. Control/indicator types, functions, and the conditions required for enabling the corresponding functions are given in Table 3-1.

NOTE

The head and guide-cleaning procedures described in paragraph 5-5 must be performed daily to maintain transport reliability.

3-5. LOADING TAPE

3-6. To load tape, proceed as follows:

a. Pull out reel-locking lever on supply hub. Ensure that tape reel has write enable ring installed if Write mode is to be utilized. Place reel of tape on hub so that tape will unwind when reel is rotated in clockwise direction. Press reel evenly and firmly against hub's back flange and push in locking lever. Spin reel counterclockwise while looking along its rim to ensure even mounting.

b. Install empty reel on takeup hub in same manner as loaded reel was mounted in step a.

c. Actuate ON/OFF switch.

d. Thread tape along path shown on facade. Wrap several turns clockwise around takeup reel. Check that tape is correctly seated on guides and properly threaded through photosensor and head assembly.

CAUTION

Ensure that tape is positioned correctly on all guides, or tape damage may result.

e. Close front cover to protect tape and transport from dust.

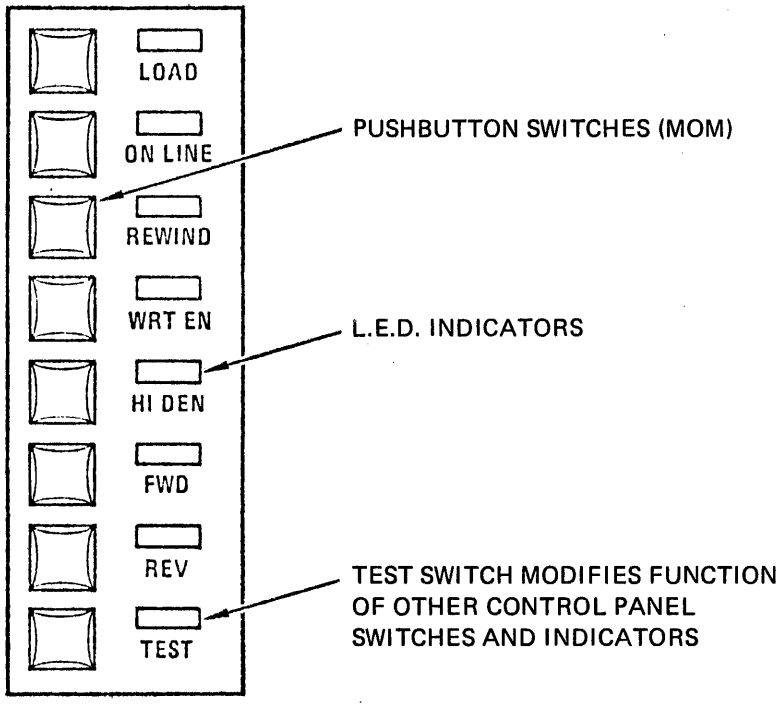


Figure 3-1. Control Panel

CONTROL OR INDICATOR	TYPE	FUNCTION	CONDITIONS
POWER	ON/OFF Rocker Switch	Switches line power on and off.	Fuse installed. Line cord connected.
LOAD	Momentary-Action Pushbutton and Indicator	Illuminates to indicate BOT tab is positioned at photosensor.	Power restored after being off. Loss of tape tension.
ON LINE	Momentary-Action Pushbutton and Indicator	Switches transport to on-line mode. Illuminates to indicate transport is on line.	Initial Load or Rewind actuation. Transport in off-line mode. (ON LINE indicator extinguished).
		Second actuation switches transport off line. Indicator extinguished to indicate transport is off line.	Transport in on-line mode. (ON LINE indicator illuminated).
REWIND	Momentary-Action Pushbutton and Indicator	Rewinds tape to load point. REWIND indicator illuminates during rewinding, then goes out.	Transport in off-line mode. (ON LINE indicator not illuminated.)
		Load indicator illuminates to indicate BOT tab is positioned at photosensor.	
		Second actuation of REWIND pushbutton unloads tape.	

Table 3-1. Controls and Indicators

CONTROL OR INDICATOR	TYPE	FUNCTION	CONDITIONS
WRT EN (Write Enable)	Indicator	Illuminates to indicate write function may be performed.	Tape reel with write enable ring installed mounted on supply hub.
HI DEN (High Density)	Momentary-Action Push-button and Indicator	First actuation (indicator illuminated): PE mode; second actuation (indicator extinguished): lower density (NRZI).	Executed by FWD or REV command following HI DEN actuation.
FORWARD	Pushbutton and Indicator	Starts/stops tape forward motion. Illuminates to indicate transport in forward mode.	Transport in off-line mode (ON LINE indicator extinguished).
REVERSE	Pushbutton and Indicator	Starts/stops tape reverse motion. Illuminates to indicate reverse mode.	Transport in off-line mode (ON LINE indicator extinguished.)
TEST	Pushbutton and Indicator	Selects alternate operational mode for other switches.	

Table 3-1. Controls and Indicators (Continued)

CAUTION

Dust cover must remain closed at all times when tape is on takeup reel. Data reliability may be impaired by contaminants if cover is left open.

f. Actuate LOAD pushbutton and observe that tape is tensioned, as shown in Figure 1-1, and advances until BOT tab is positioned at photosensor. LOAD indicator will illuminate, indicating transport is ready for use.

3-7. UNLOADING TAPE

3-8. To unload the tape, proceed as follows:

NOTE

Transport must be in off-line mode (ON LINE indicator extinguished).

a. If power is off, actuate POWER switch and proceed to step b. If power is on, start with step c.

b. Actuate LOAD pushbutton to tension tape.

c. Actuate REWIND pushbutton. REWIND indicator will illuminate. If tape is at load point, tape will be unloaded from vacuum column and rewound at low speed. If tape is not at load point, rewind ceases when BOT tab is reached. BOT tab is then positioned automatically at photosensor, and LOAD indicator illuminates. Actuate REWIND pushbutton second time to complete unload sequence.

3-9. INTERFACE DATA

3-10. Interface specifications are presented in paragraph 1-24. Interface inputs and outputs are listed in Tables 3-2 and 3-3, respectively.

INPUT	TYPE	FUNCTION
*Select i (SLTi)	Level	When true, enables all interface drivers and receivers in transport, thus connecting transport to controller.
Sync Forward Command (SFC)	Level	When true, with transport ready and on line, causes tape to move forward at specified speed.
Sync Reverse Command (SRC)	Level	When true, with transport ready and on line, causes tape to move in reverse at specified speed.
Rewind (RWC)	Pulse	With transport ready and on line, this pulse causes tape to move in reverse at 300 ips to BOT.
Off-Line (OFFC)	Level or Pulse (min. width, 1 microsecond)	Resets on-line flip-flop to 0 state, placing transport under manual control.
Write Data Strobe (WDS)	Pulse (min., 1 microsecond)	Trailing edge triggers code generator in transport.
Write Data (WD)	9 lines for 9-track; 7 lines for 7-track	When true from 0.5 microsecond before leading edge to 0.5 microsecond after trailing edge of Write strobe, results in recording of flux transition when in write mode.
Set Write Status (WEN)	Level	When true for 20 microseconds, minimum, after leading edge of FORWARD command, initiates write mode of operation.
Write Amplifier Reset (WARS)	Pulse (min., 2 microseconds)	When true, resets write amplifier circuits on leading edge. Purpose is to write LRCC at end of record, causing all channels to be erased in IRG.
Data Density Select (DDS)	Level	When true, conditions read electronics to operate at high density or PE. When false, operation is at low-density mode (NRZI).

*When optional unit select is used, i = switch setting. Otherwise, SLT0 must be true.

Table 3-2. Interface Inputs

INPUT	TYPE	FUNCTION
Overwrite (OVW)	Level	When true, conditions appropriate circuitry, in conjunction with Write Reset (WRS) pulse, for updating (rewriting) of select record. Transport must be in write mode.

Table 3-2. Interface Inputs (Continued)

INPUT	TYPE	FUNCTION
On-Line	Level	When true (on-line flip-flop) set), transport is under remote control. When false, transport is under local control.
Read Data (RD) (RDP, RD0-7)	Bits	Sampling of RDP, RD0-7 simultaneously on trailing edge of Read Data Strobe (RDS) provides complete data character. (In phase encode, these lines are self clocking.)
Read Data Strobe (RDS) (NRZI only)	Pulse(3/64 of data cell, NRZI 800 bpi)	Provides complete data character when RDP, RD0-7 sampled on trailing edge.
End of Tape (EOT)	Level	True for duration of EOT tab. Transitions to and from true state not to be assumed clean.
Data Density Select (DDS)	Level	True only when manual HI DEN switch on transport is set for high density.
Ready (RDY)	Level	True when load sequence is complete and transport is on line and not rewinding. (Transport ready to receive remote command.)
Load Point (LDP)	Level	True when BOT tab is under photosensor, initial load sequence is complete, and transport is not rewinding.

Table 3-3. Interface Outputs

INPUT	TYPE	FUNCTION
Rewinding (RWD)	Level	True only when transport is engaged in rewind operation.
File Protect (FPT)	Level	True when power is on and reel of tape without write ring is mounted on transport.
NRZI Transport Identification (NRZ)	Level (Optional)	True when transport is configured for NRZI data. False level indicates phase-encode configuration.
7-Track Head Identification (7TR)	Level (Optional)	True for 7-track transport; false for 9-track configuration.
Single-Gap Head Identification (SGL)	Level (Optional)	True when transport has single-gap head; false level indicates dual-gap head.
Transport Speed Identification (SPD)	Level (Optional)	True when transport has lower of two speeds available in multiple-transport system.

Table 3-3. Interface Outputs (Continued)

3-11. MULTIPLE-TRANSPORT (DAISY-CHAIN) SYSTEM MODIFICATION. When two or more transports are used in a "daisy-chain" system, the transmission line (cable) terminators in all transports except the last in the system must be removed, or the resulting impedance mismatch will cause undesirable signal reflections in the cable. The termination impedance networks in the Model 900X transport are all incorporated in one 330-ohm, one 220-ohm, and one 220/330-ohm resistor packs which plug into integrated circuit sockets. The 220/330-ohm pack is mounted on the data PWB, the others on the control/servo PWB. For multiple-transport operation, simply remove the three resistor packs from their sockets on all but the last transports.

SECTION IV

THEORY OF OPERATION

4-1. GENERAL

4-2. The basic concepts of digital recording, magnetic tape transport applications, and principles of operation of the Model 900X dual-mode transport are presented in this section. A thorough knowledge of this section will be of considerable value to the user in operating and, if necessary, in troubleshooting this equipment.

4-3. BASIC CONCEPTS OF DIGITAL RECORDING

4-4. The use of magnetic tape as a digital recording medium has increased steadily as a result of the increased use of digital techniques and the increasing versatility and decreasing cost of tape transports. The digital recording process involves methods and equipment capable of recording and reading information expressed in a digital (binary) code (various combinations of 1's and 0's).

4-5. DATA RECORDING/READING WITH MAGNETIC TAPE

4-6. The recording of data on magnetic tape originates with the input device, whose nine channels of digital signals are transmitted to the corresponding data channels of the transport. (One of these channels is the parity channel, which is used to detect and correct errors. The remaining channels correspond to actual encoded data to be recorded.) These signals produce corresponding electrical currents in the write head of the transport, which, in turn, produces positive and negative magnetic polarities corresponding to the original data and parity signals in the tracks of the tape passing over it.

4-7. In NRZI systems, a binary 1 signal in a given channel produces a transition from plus to minus (or vice versa) saturation magnetism (+SAT and -SAT, Figure 4-1) in its track on the tape, whereas a binary 0 signal produces no change in magnetism in its track. In phase-encode writing, a binary 1 signal produces a transition to the IBG polarity on the tape when running forward (Figure 4-2); a binary 0 produces a transition away from IBG.

4-8. As a written tape passes across the magnetic read head of a transport, the head responds to each change of flux arriving at its gap and produces a read voltage waveform for each track such as illustrated in Figure 4-1 (NRZI) or Figure 4-2 (PE). (See paragraph 4-14 for a detailed description of magnetic tape recording/reading in the NRZI mode, paragraph 4-22 for phase-encode.)

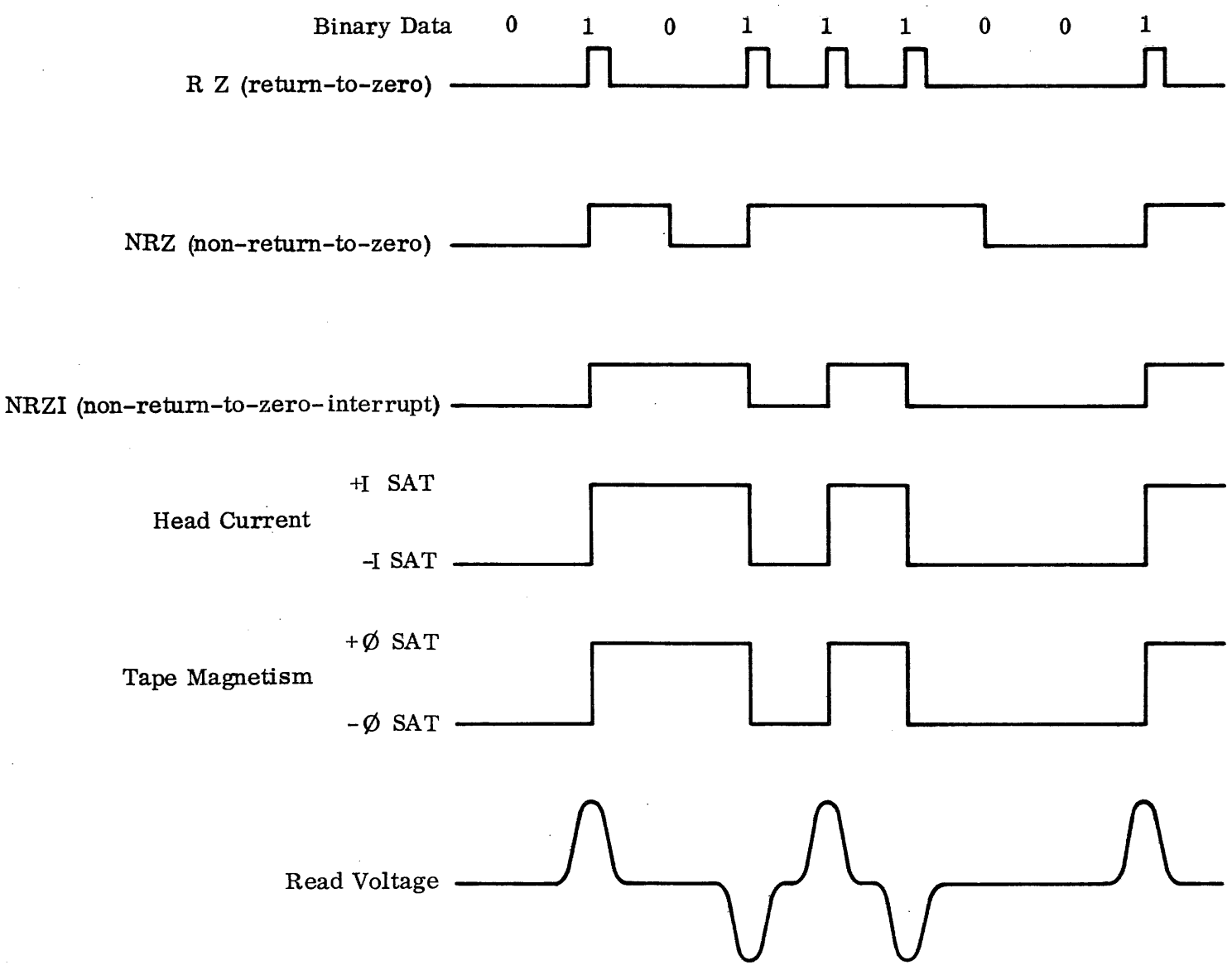


Figure 4-1. Magnetic Recording Waveforms

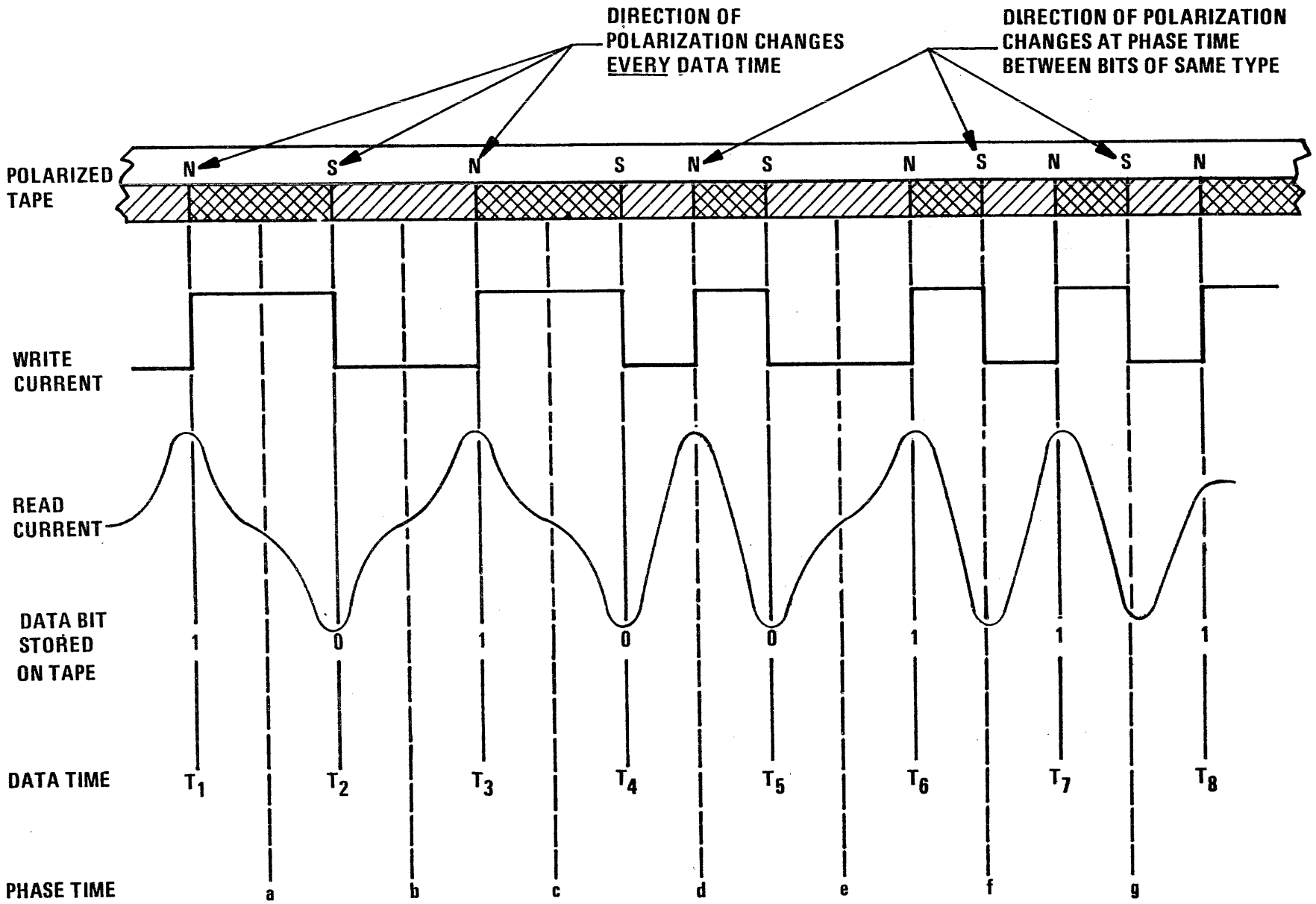


Figure 4-2. Phase-Encoded Tape Magnetization

4-9. MAJOR TRANSPORT COMPONENTS

4-10. The Cipher Model 900X transport is composed of four main assemblies (Figure 4-3): the drive assembly, which includes the tape drive components and the vacuum buffer system; the read/write system, consisting of a head assembly and a dual-mode data board; a control/servo board containing the transport control circuitry, the reel and capstan motor servos, and the power supply regulator circuits; and a power supply, consisting of the power transformer mounted on the rear of the mounting plate, the power supply assembly, and the front-panel-mounted power switch.

4-11. The schematic diagrams in Section VII should be referred to in studying circuit descriptions presented in this section.

4-12. HEAD ASSEMBLY

The Model 900X dual-mode transport has a dual-gap head, for read-after-write operation. Track locations, track width, and gap separation are all IBM-compatible (Table 4-1).

4-13. A cross-feed shield is provided to reduce the voltage induced in the read head when writing. The shield is composed of copper and ferrite flux blocks cemented to a hinge plate (Section V, Figure 5-6). The head has a hard chrome face that is guaranteed for 5000 hours of operating life.

4-14. NRZI CODING SYSTEM

4-15. In the NRZI system, recording is carried out by a saturation current driven through the head in a direction determined by a flip-flop which toggles for each 1 bit recorded. The NRZI system requires the recording of at least one bit for every character. Otherwise, in an all-0 character there would be no indication of the presence of that character.

4-16. NINE-TRACK CODING. Any 8-bit code, such as ASC11 or EBC1D1C, may be used. (See Figure 4-4).

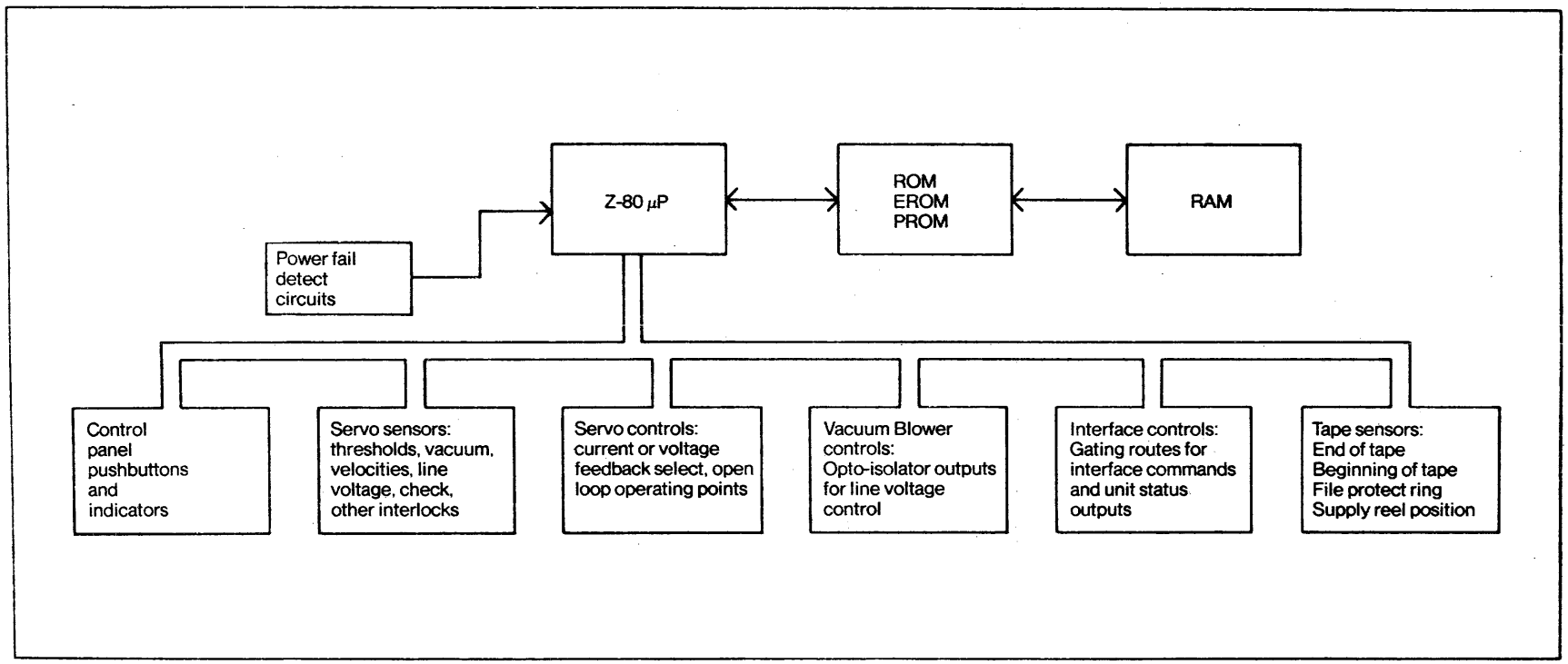
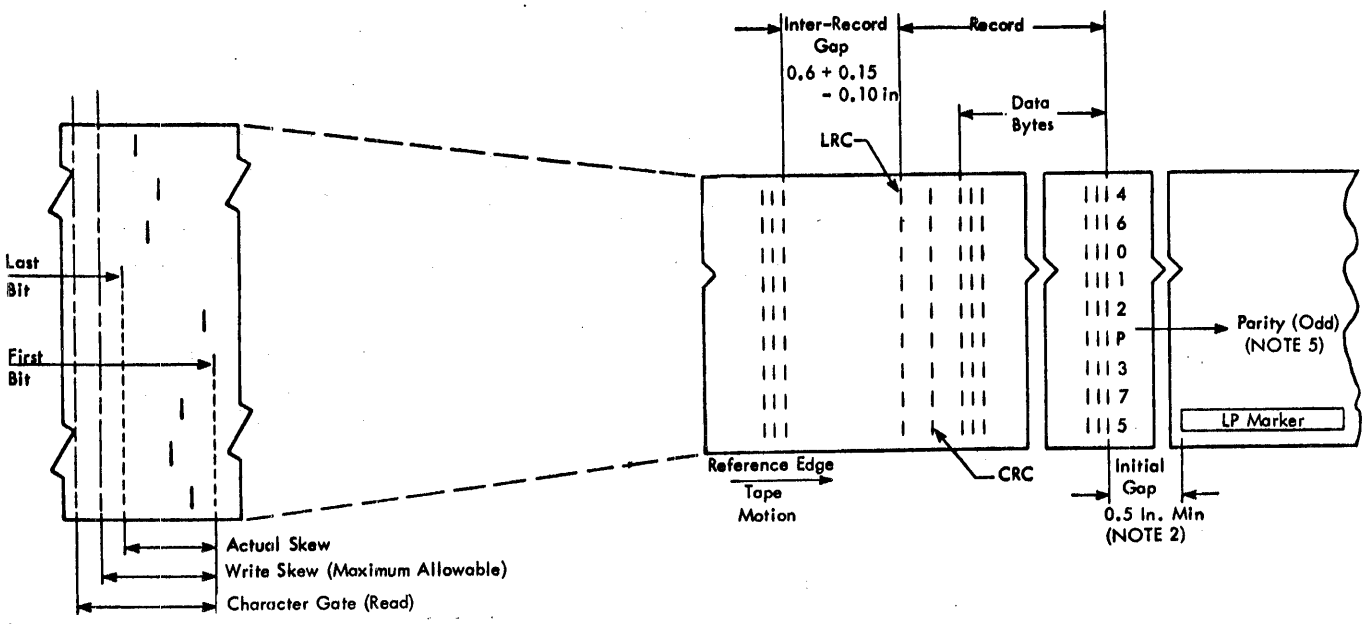


Figure 4-3. Recorder Organization

FUNCTION	DUAL-GAP READ AFTER WRITE
Track Locations	0.055(±0.001) inch, center to center
Effective Track Width	Write: 0.044(±0.001) inch Read: 0.040(±0.001) inch
Parallelism	±200 microinches (write to read)
Gap Separation (Write-Read)	0.150(±0.005) inch
Gap Line Azimuth Per Section	±150 microinches maximum from reference perpendicular to mounting surface
Gap Scatter Per Section	100 microinches, maximum
Crosstalk	
Read	2%, maximum, of nominal read voltage
Voltage Induced in Read Winding While Writing at 800 bpi	5% maximum, of read voltage
Inductance	Write: (each leg) 500 µH maximum Read: (each leg) 10 mH maximum
Dc Resistance	Write: (each leg) 10 ohms maximum Read: (each leg) 25 ohms maximum
Write Current (100% saturation)	35 mA ± 20%
Read Voltage	700 µV/inch/sec. ±10%
Self Erasure (Read Signal Reduction After 10 Passes)	10% maximum
Erase Head Resistance	80 ohms
Erase Current	50 mA

Table 4-1. Head Specifications



NOTES:

1. Tape shown with oxide side down; NRZI recording. Bit produced by reversal of flux polarity. Tape fully saturated with each direction.

2. Tape to be fully saturated in erased direction in initial gap and inter-record gap; tape to be magnetized so that rim end of tape is north-seeking pole.

3. CRCC: cyclic redundancy check character. Parity of CRCC determined by number of data characters in record. Odd number of data characters, even CRCC, etc. CRCC is spaced four bits from data characters.

4. LRCC: longitudinal redundancy check character, always odd parity. Spaced four bits from CRCC. Written with RES line.

5. Parity bit: vertical parity bit written for each data character containing even number of bits.

Figure 4-4. Nine-Track Data Format

4-17. LONGITUDINAL REDUNDANCY CHECK CHARACTER (LRCC). A longitudinal parity bit is written at the end of each record. This character is written by the return of the write head current to the reference condition.

4-18. Since the reference condition is established before the first character of the record and reestablished by writing of the LRCC, an even number of 1 bits in each track is written for each record. As the tape is read, the number of 1's read in each track is counted. If the sum is odd, an error is indicated. The LRCC is spaced four character spaces from the end of the block.

4-19. CYCLIC REDUNDANCY CHECK CHARACTER (CRCC). Nine-track, 800-bpi tapes include a CRCC located at the end of each record before the LRCC. The CRCC is generated by application of a modulo two polynomial of the data within the block.

4-20. This character makes the probability of an undetected error almost zero. The CRCC may be used with the computer read function to determine which track contains the error.

4-21. The information supplied by the CRCC, combined with that of the LRCC and vertical parity, may be used to correct detected errors. Errors involving more than one track within the same record are not correctable. All data and LRCC characters must have odd parity. However, the CRCC character may have either odd or even parity, and in fact, may be all 0's. Allowance must be made in the formatter electronics for the all 0's CRCC condition, since a read clock will not be returned from the drive.

4-22. PHASE-ENCODE SYSTEM. The differences between phase-encoded (PE) and NRZI writing are chiefly in presentation and phasing or coding. In NRZI coding, a single change of polarization on the tape represents a logical 1, while no change represents a logical 0. In PE writing, both the logical 1 and 0 involve changes in polarization. Phasing, however, is the key difference between PE and NRZI, The major advantages offered by PE are reduced possibility of losing data because of inadequate signal strength (making practical low read thresholds) and the fact that each track is self-clocking, reducing skew problems. PE writing is done only in a nine-track mode. Basic features of the PE system are as follows (Figure 4-2):

a. A change in tape polarity at the interface from negative to positive is a 1 bit.

b. A change from positive to negative is a 0 bit.

c. There must be a change of polarity between data bits of the same polarity (consecutive 1 or 0 bits) at phase time.

d. Data density in a PE transport is 1600 bits per inch (bpi) of tape travel.

4-23. For clarification, the term "change of polarity" is also referred to as a flux change or flux reversal. Henceforth, a change from negative to positive will be referred to as a positive flux reversal; positive to negative, a negative flux reversal. As noted above, there must be a flux reversal with each data bit, whether it be a 0 or 1. Therefore, 1600 bpi equates to a minimum of 1600 frpi in any given channel. (This would occur in the case of alternate 0 and 1 bits.) The maximum case would occur with consecutive 0 or 1 bits, resulting in 3200 frpi. The flux reversal at each bit time accounts for the self-clocking feature of PE writing.

4-24. Formatting. Phase-encode formatting is illustrated in Figure 4-5. The format includes an inter-record gap (IRG) and file gap (FG), a data generation and file mark, and identification burst. A block of PE data is preceded and immediately followed by a burst of bytes designated preamble and postamble, respectively. The sequence for a block of PE data is as follows:

a. Forty bytes of all 0's (including the parity bit).

b. One byte of all 1's (including the parity bit).

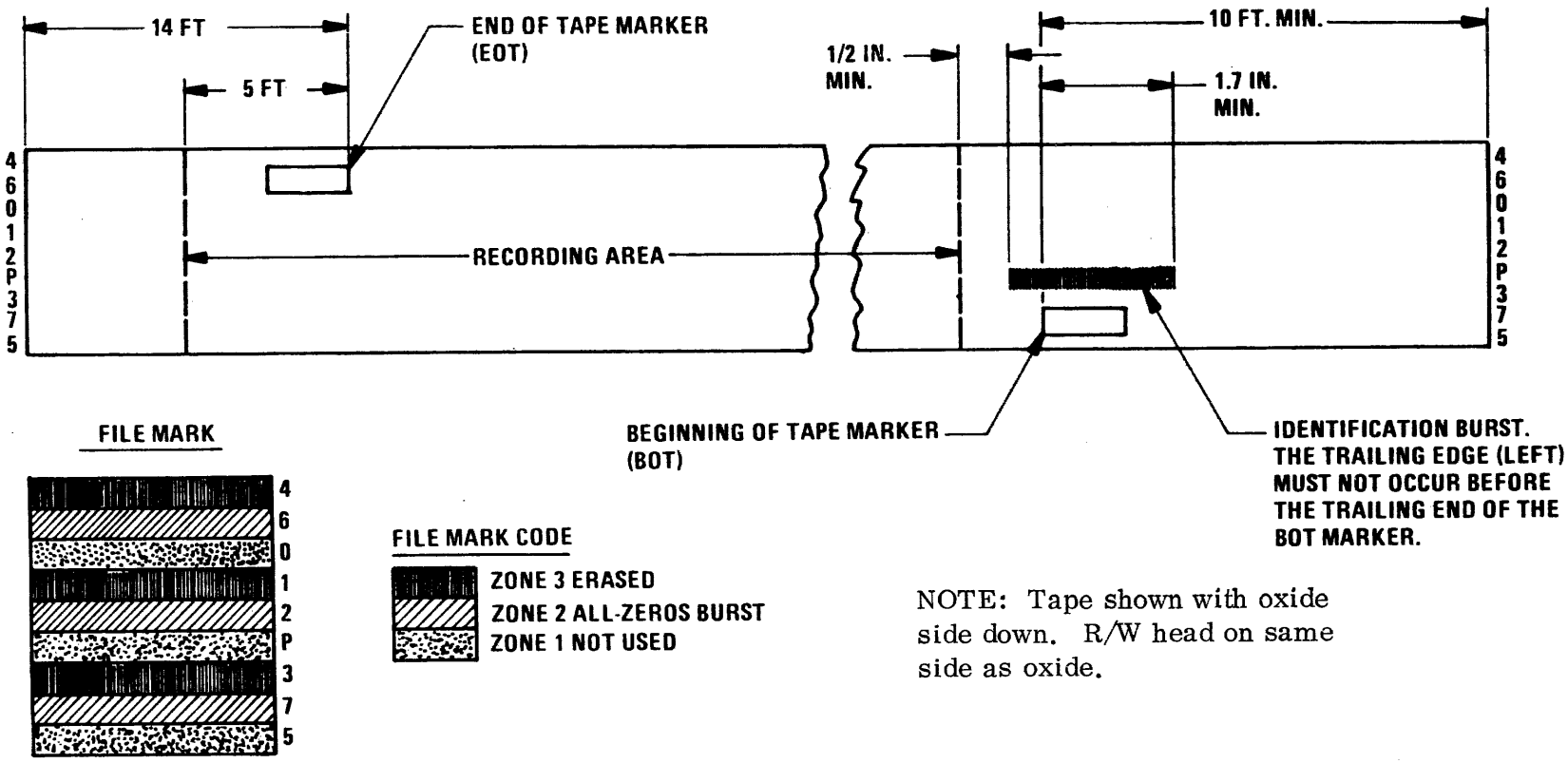
c. Data bytes.

d. One byte of all 1's.

e. Forty bytes of all 0's.

4-25. A phase-encoded tape requires an identification burst of 1600 frpi in the P channel and erasure in all other channels at the beginning of the tape. The burst must begin at least 1.7 inches ahead of the edge of the beginning of tape (BOT) marker and extend beyond the trailing edge of the marker. The load gap requirements are the same as those for NRZI, except that the 0.5-inch minimum gap is referenced from the identification burst. The typical distance for a load gap is 3.75 inches.

4-26. The PE file mark or tape mark consists of 80 flux reversals at 3200 frpi, written in channels 2, 6, and 7, with channels 1, 3, and 4 dc erased. Channels 0, 5, and P, in any combination, may be dc erased or recorded the same as channels 2, 6, and 7.



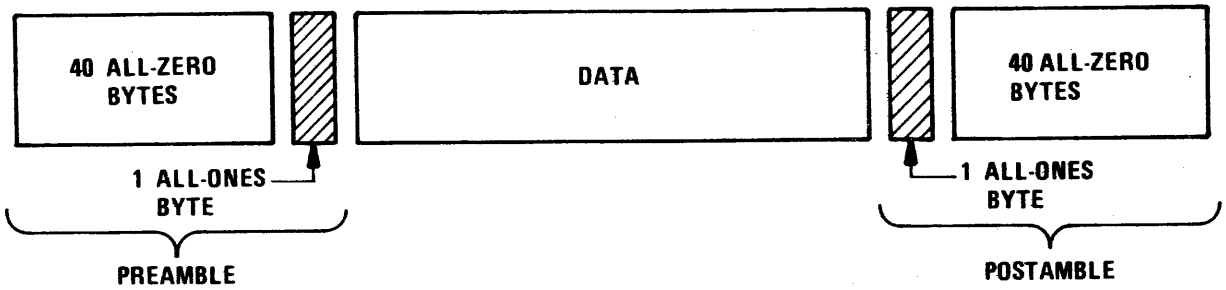


Figure 4-5. Phase-Encoded Tape Block Format

4-27. DUAL-MODE DATA BOARD THEORY (Drawing No. 354040-300)

4-28. CONTROL SECTION (Sheet 5). The data board control section consists of the following circuits:

a. Read threshold offset voltage.

b. PE or NRZI selection.

c. Transport select.

d. Voltage regulators.

e. Write voltage control.

4-29. The threshold circuitry selects a high read threshold when writing. RTH2 selects an extra low read threshold, which is helpful for reading old tapes. The threshold voltages are determined by resistors R14, R15, R25, R21, and R20. The voltage varies in relation to S2 (4-11), S2 (5-10), RTH2, and READ. The transistor driven by U17-12 allows some current to be shunted to ground through R16. This transistor is on for PE operation, and current being shunted in this manner will reduce the gain of U16-1 by a factor of two-thirds. The outputs of U16 cause the threshold detector of each channel to have a negative or positive offset, depending on whether TH- or TH+ is the input. The highest threshold can be obtained by closing both S2 (4-11) and S2 (5-10). When both switches are open, the lower threshold will be selected. With S2 (4-11) closed and S2 (5-10) open, normal threshold detection is used.

4-30. WRITE VOLTAGE CONTROL (Sheet 5). Control for the write voltage circuit is provided by the low-true NOR gate U114-8. When WTEST or the output of exclusive OR-gate U108-8 goes low, U92-4 goes low. This low causes Q5 to start conducting. The large capacitor, C103, gives the circuit a Miller integrator configuration. C103 charges to +12V through Q5. L4, which consists of ferrite beads, filters the switching noise to prevent it from being applied to the write circuitry. Zener diode CR4 allows the write circuitry to be used with both high- and low-speed tape heads without changing resistor values in the write-head drivers. The high-speed head requires more current, which is provided by closing of SW3 (2-7); this increases the current by about 50%. The write voltage is supplied to the center tap of the write head.

4-31. Q2 senses the voltage from the center taps of the write head, starts conducting, and supplies current for the erase bar, P21-H. Q6 and Q4 form a protection circuit to eliminate glitches from the write head when the transport is being powered up initially. This could cause data to be erased during the power-on sequence, as in the case of a file-protected tape. Initially, Q4 is on. As the +12 volts increases, the voltage divider action of R284 and R283 will cause the base emitter junction of Q6 to become

back-biased, and Q6 will turn off. With Q4 on, the base of Q5 will not become negative enough to turn on Q5.

4-32. VOLTAGE REGULATORS. There are two voltage regulators supplied on the board. Cipher's tape transports will supply either ±15 volts (Models 70X, 80X, and 100X) or ±12 volts (Model 900X) to the data board. The regulators are used to reduce the ±15 volts to a regulated ±12 volts. SW3 (4-5) and SW3 (3-6) are closed when the dual-mode data board is mounted on the Model 900X tape transport.

4-33. CONTROL SIGNALS. $\overline{\text{RUN}}$ comes from the control/servo board as a low true signal. It passes through inverter U21-4 and triggers a one-shot multivibrator, U2. U2-4 provides a positive, 5-µs pulse.

4-34. This pulse will clock D-type flip-flop U18. The D input is dependent upon the control signal, $\overline{\text{HIDEN}}$, which comes from the control servo PWB also. Since $\overline{\text{HIDEN}}$ is low true, it causes the data PWB to be PE selected. When $\overline{\text{HIDEN}}$ is high false, it initiates the NRZ mode of operation.

4-35. PE OR NRZI SELECTION. Switches S2 (8-7) and S2 (9-6) force density selection for test purposes. When both sections of S2 are open, NRZ is low true. If S2 (9-6) is closed, NRZ will be high false, which causes the PWB to operate in a PE mode. When S2 (7-8) is closed, the control signal $\overline{\text{HIDEN}}$ will control remotely the operable mode of the data electronics.

4-36. WRITE DATA SECTION. The write data section of the dual-mode PWB consists of the following:

a. Write input register.

b. NRZI write deskewing circuitry.

c. WDS and WARS generation circuitry.

d. Write output register.

e. Tape head drivers.

4-37. Referring to Figure 4-6 and sheet 1 of the schematic diagram, Drawing No. 354040-300, the theory presented herein is based on channel P but is applicable also to the eight additional channels. The write data interface lines at connector P102 have 220/330-ohm input terminators that provide impedance matching and serve as pull-up resistors for the transmitters at the other end of the data cable. U112-12, a hysteresis receiver, is used to buffer the data lines. The write input register, U105, is used to store the incoming data from the interface. The data is latched into the write input register when Write Strobe ($\overline{\text{WSTRB}}$) occurs. Referring to sheet 5 of the schematic, the Write Data Strobe (WDS) is brought from the formatter/controller. Its frequency is equal to the data rate in the NRZI mode and twice the data rate in the PE mode.

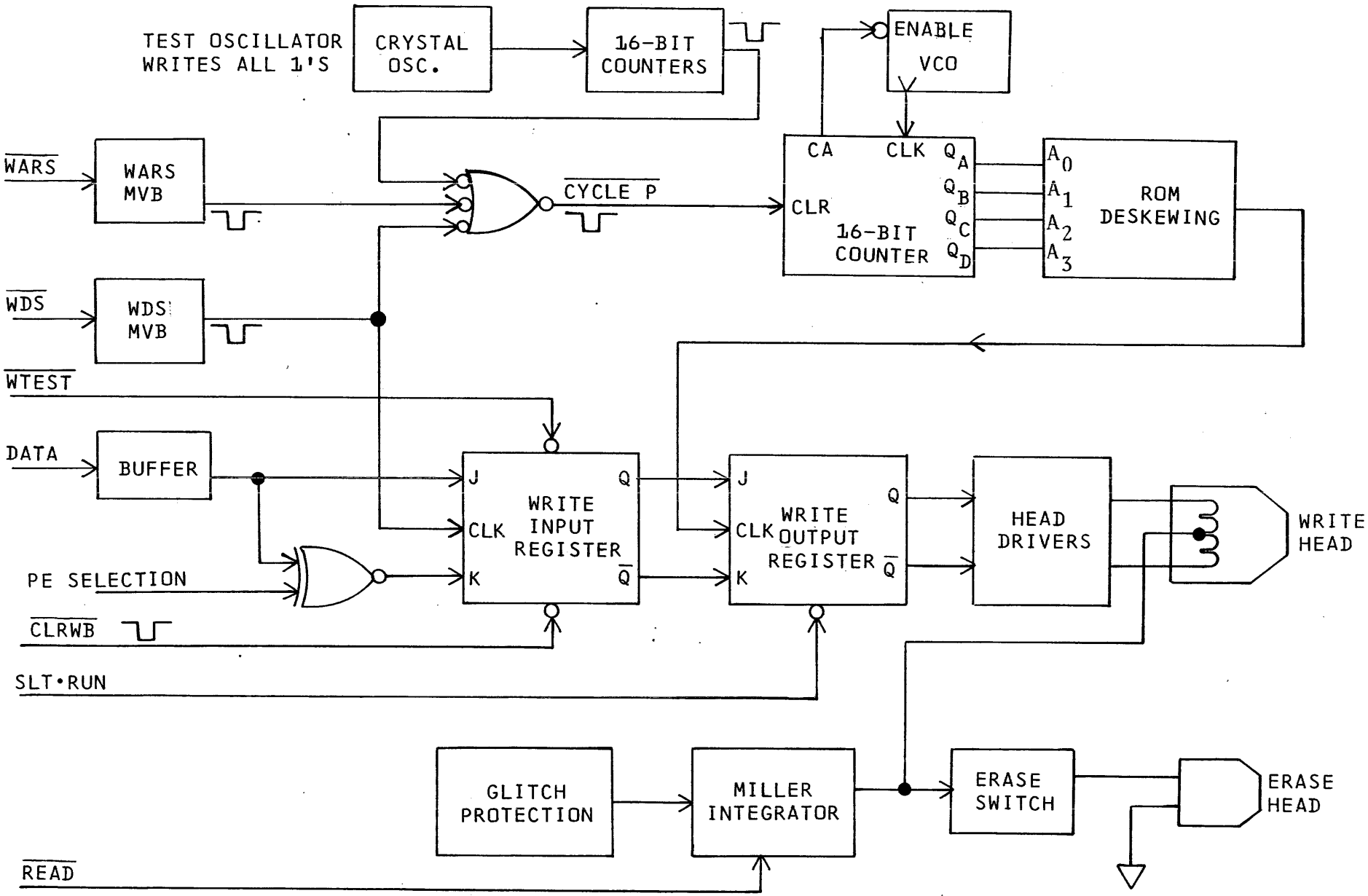


Figure 4-6. Write Data Block Diagram

NRZI WDS frequency = speed x 800 bpi

PE WDS frequency = 2 x speed x 1600 bpi

Date rate = speed x bit density

4-38. The WDS enters the data board at P102-A and propagates through U112-6. R259 and C113 provide noise filtering before the WDS fires the one-shot multivibrator, U115-12. The output will be a negative 100-ns pulse, which becomes $\overline{\text{WSTRB}}$ and clocks write input register U112. The exclusive OR gate, U108-3, causes the write input register to operate as a toggling J-K flip-flop in the NRZI mode for each 1 bit or follow the data bits (1's or 0's) in the PE mode, similar in operation to a D-type flip-flop. The control signal, Phase Encode (PE), will direct the exclusive OR gate as to the mode of operation.

4-39. The write output register (U99) will be clocked each transition time and will store the data from the write input register, U105. The clock for U99 is derived basically from the WDS also. The output of U115-12 (sheet 5) also goes to the low true NOR gate, U114-4. The output of U114-6 will be a negative 100-ns pulse designated $\overline{\text{CYCLE P}}$. This signal will initialize the operation of the NRZI write deskewing circuit.

4-40. NRZI Write Deskewing Circuit. This feature of the data PWB eliminates the need for nine adjustable one-shot multivibrators. The NRZI deskewing circuits make allowance for the gap scatter present in the write head. Electronically, the writing of each track is adjusted so that the final result is a precise vertical character written on the tape.

4-41. The circuit consists of a voltage-controlled oscillator, U89; synchronous, four-bit counter, U91; and a 256-bit, bipolar, programmable ROM (32x8 PROM), U90. The output frequency of the oscillator is controlled by the external capacitor, C92, which is chosen to match the tape transport speed; the resistor divider consisting of R213 and R212 restricts the frequency range of operation. U89-6 is the chip Enable input and goes low when the $\overline{\text{CYCLE P}}$ signal asynchronously clears the four-bit counter. The counter controls the address inputs of the PROM. The output of the PROM is all 1's, except for the specific channel that is being written. Channel 2 has a fixed count of eight, provided by exclusive OR gate U109-8. (Channel 2 was picked as the reference channel because it is the center track of the write head.)

4-42. The clock for the counter is supplied by the oscillator. The counter will count from 0 through 15; at this time, the carry output of the counter will disable the oscillator at U89-6. The counter increments on the positive edge of the clock, and the PROM writes on the negative edge. The write skew should hold near 6% of the byte time. (The PROMs are serialized with the tape head assembly, and they must be replaced as a pair if the need arises.)

4-43. There are four write head drivers following the write output register. The inner two head drivers are used for both PE and NRZI operation, while the outer two head drivers are used only for NRZI operation. P21-N and P21-K are attached to the write head winding with center taps (shown on sheet 5 of the schematic) P21-A, B, D, E, J, M, R, U, X. The control signal, NRZ VCC, is enabled by Q3, which activates the two head drivers, U96-10 and U96-14.

4-44. In the NRZI mode, an extra interface signal is required to write the longitudinal redundancy check character (LRCC) eight character spaces after the last data character. This signal is called Write Amplifier Reset ($\overline{\text{WARS}}$) and enters the data board at P102-C. After propagating through U112-8, it is noise filtered by R258 and C112. The one-shot multivibrator, U115-4, outputs a negative 100-ns pulse to U114-3. This generates the clock for the write output registers. The $\overline{\text{WARS}}$ pulse also passes through U112-10 and U114-12 to give the signal, Clear Write Buffer ($\overline{\text{CLRWB}}$). This pulse is applied to the Direct Clear inputs of the nine write input registers and sets them to a reference condition awaiting the next data character. The reference condition ensures erasure of the tape in the interrecord gap.

4-45. READ SECTION (Figure 4-7 and Sheet 2, Drawing No. 354040-300). The read section of the dual-mode data PWB consists of the following circuits:

a. Nine read amplifiers (PE or NRZI).

b. Signal threshold detection.

c. Phase-encode envelope detection.

d. NRZI Read Data strobe generation.

e. Read output register.

4-46. The read section theory presented herein pertains specifically to the P channel but is applicable to all nine read channels. The first read amplifier (U80) has an approximate gain of 200, a bandwidth of 700 kHz, external frequency compensation, and no crossover distortion. The gain is set by R60 and R63, in the feedback circuit of the general-purpose 709 operational amplifier. The read signal from the tape head is offset approximately -12 mV by the resistor divider network, R262 and R263. This is accomplished by connection of the center tap of the read head to this resistive divider. One end of the read head winding is left disconnected, and the other end is tied to the input of the amplifier. (The reason for offsetting the input is to eliminate the crossover distortion commonly present on the output of 709 operational amplifiers. This type of distortion cannot be tolerated in the reading of phase-encode data.) After amplification, the offset voltage will be approximately -2.5 volts. Capacitor C60 blocks the dc offset from the input of U33-3.

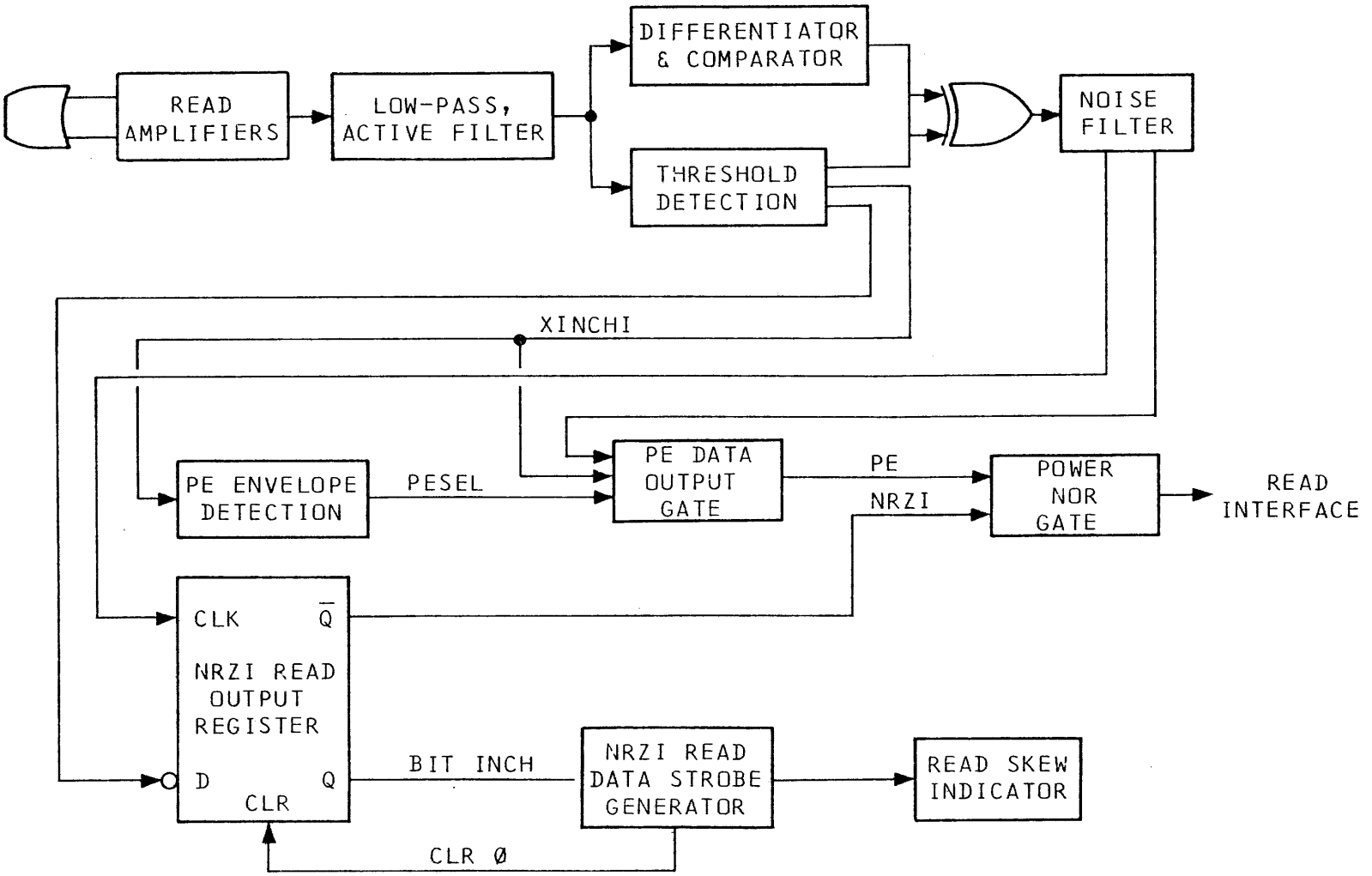


Figure 4-7. Read Data Block Diagram

4-47. The second stage of amplification is a TL082, JFET, input operational amplifier whose characteristics include high input impedance, unity gain bandwidth, internal frequency compensation, continuous short-circuit protection, and low input bias and offset currents. The amplifier has a read gain potentiometer in the feedback circuit. The gain can vary from unity to 11 over a speed range of 12.5 to 125 ips, even with the different read heads. The higher the transport speed, the less the gain required. Therefore, with the lowest gain there will be the greatest bandwidth at 125 ips. High read gain and narrow bandwidth are needed for optimum performance at 12.5 ips. The adjustment of R203 through R211 is the only read gain adjustment for both PE and NRZI operation. This adjustment can best be made by writing all 1's at 800 bpi (NRZI), monitoring TP-30 through TP-38, and setting the signal level for 8 volts peak-to-peak.

4-48. The next stage, U33-7, is a low-pass, active filter. The low-pass elements are R62, R61, and the two capacitors, which change with speed, on header A6. Capacitor C59 and resistor R92 help to maintain a low-input offset voltage. The output of the low-pass filter goes to threshold detectors U27 and comparator U30-7. In the signal path to the comparator is a differentiator consisting of A6 (8-7) and R54. The signal path through R51 goes to the inputs of the dual-voltage comparator, type LM319. The other input to the U27 comparator is tied to the read threshold circuit.

4-49. Threshold detectors U27-7 and U27-12 each have a dc offset voltage tied to U27-10, which is TH-, and U27-4, which is TH+, respectively. The two threshold voltages are set by U16 and associated circuitry (sheet 5 of the schematic). The read signal output of U33-7 is compared with the threshold reference, and when the positive read signal exceeds the threshold offset, U27-7 will go high. If NRZI mode is selected, the high will be transferred as a low by U31-6. Exclusive OR-gate U37-3 has the input condition of U37-1, which is high, and U37-2 is low when the read signal is a positive peak at U33-7. Thus, the output of U37-3 will be high.

4-50. If the read signal input to U27-9 is a negative peak, then U27-7 would stay low and the state at U37-2 would be high. Hence, the output at U37-3 would be low. The output of the exclusive OR-gate has the characteristic that the signal transition is in the same direction (negative-going) for both positive and negative peaks of the NRZI read signal.

4-51. The next group of components in the signal path consists of R45, A1 (1-14), and R39, which provide filtering action for the switching noise created by low-pass filter U30-7. The signal is inverted and delayed slightly before going to the clock input of U26-3, a D-type flip-flop. The initial condition of U26-6 is low.

4-52. Low true NOR gate U31-3 provides the D input to U26-2. Whenever data has been detected, U31-3 goes high. The signal goes through two inverters and is integrated by R43 and the capacitor on header A1 (7-8). Once the threshold of hysteresis gate U25-5 is reached, the input to D-type flip-flop U26-2 goes low. When the D-latch is clocked, output U26-6 goes high.

4-53. The interface, P103-1, is driven by a power buffer NOR-gate with open-collector output. When either input to U35 goes high, a low is transferred to the interface and interpreted as a 1 bit. The interface remains low until CLRØ clears flip-flop U26. When reading a 0 in the NRZI mode, the D flip-flop is clocked, but the D input, U26-2, is high. Hence, output U26-6 remains low, and the output of NOR gate U35-4 stays high. A high logic level at the interface is interpreted as a 0 bit.

4-54. AND gate U24-8 is used to pass the phase-encode data. The input, U24-9, is the control signal Phase Encode Select (PESEL), which is high true for PE operation. The other input, U24-10, is high when data has been detected in the channel. Low true NOR gate U31-3 goes high and is inverted by U28-12. Capacitor A1 (6-9) was intially charged to +5 volts. After about two bit cells of the preamble, A1 (6-9) is sufficiently discharged to cause U25-8 to go high. For a 1 bit, U24-11 will be high, and NOR gate U35-4 will go low. Just the opposite is true for a 0 bit. The output of U25-8 is the channel envelope detect output for the PE mode, Data In Channel - Phase Encode (XINCHIP).

4-55. The nine-channel envelope detect signals go to U23-1 (sheet 5), an analog majority gate. The analog voltage is varied for some channels by the different resistor values on input U23-3. Channel P has a 10 K-ohm resistor, R34, in series for detection of the identification burst. Note also that chanels 3, 6, and 7 have 33K-ohm resistors in series with the input; thus, a file mark will enable the circuit also. U23-1 will slew to a positive level after two or three bits have passed through the read channels. This high is passed through some subsequent logic to give control signal PESEL, which enables AND gate U24-9 (sheet 1).

4-56. NRZI Read Gate and RDS Generation (Sheet 5, Drawing No. 354040-300). All nine channels generate a signal BITINCH (P-7), which means a NRZI 1 bit has been detected in the respective channel. The first channel to detect data will cause U4-9 to go high. U4 and U13 are configured as a latch, which is reset at CLRØ time. The high at U4-9 goes to the D input of U8-6. U8-9 is clocked by a signal generated from Y1, the crystal oscillator, and is 64 times the data rate in the NRZI mode. The high on the D input is transferred to the Q output, U8-7, at clock time. Note that U8 would be disabled when the data board is PE selected, because a low would be presented on the clear input, U8-1. In the NRZI mode, U8 is enabled. When the Q output is high, the two counters, U12 and U15, are allowed to start counting the clock pulses applied to their clock inputs. Prior to this, the counters are loaded with a set count. The operation of the switches on the lead inputs is as follows: both open, read gate = 12% of byte

time; SW1 (1-16) open, SW1 (2-15) closed, read gate = 25% of byte time; SW1 (1-16) closed, SW1 (2-15) open, read gate = 37% of byte time; both closed, read gate = 50% of byte time.

4-57. When the carry output of U15-15 goes high, the next clock pulse will cause the D-type flip-flop, U8-15, to store this high. Two clock times then elapse before U5-12 goes low. On the fourth clock, U8-10 goes high and, with NRZI selected, U9-3 outputs the Read Data Strobe (RDS) to the formatter. The fifth clock time after U15-15 went high initiates CLRØ, which clears the NRZI read output registers. At CLRØ time, the U4-9, U13-6 latch is reset. This latch will now wait for the next BITINCH signal to go true at the next byte time.

4-58. TEST SECTION. The test section of the dual-mode data board consists of the following circuits:

a. Crystal oscillator.

b. Two 16-bit counters.

c. Read skew indicator.

d. Switch settings.

4-59. With the Cipher dual-mode data PWB, it is possible to write all 1's on a tape without the use of external test equipment. There is a visual indication of out-of-tolerance read skew, and a variety of DIP switch settings is available to aid the technician in troubleshooting.

4-60. The test circuitry is located on sheet 5, Drawing No. 354040-300. The crystal, Y1, supplies the clock for two counters, U11 and U7. Each counter contains four flip-flops and a divide-by-eight counter. When SW1 (3-14) is closed, the crystal oscillator frequency will be supplied to the NRZI Read Data Strobe generation circuit and to the divide-by-eight counter clock input, U11-1. When SW1 (4-13) is closed, the crystal frequency will be divided in half before application to the above circuits. Closing of SW1 (5-12) will provide the proper WDS frequency to test write 3200 fci for PE testing. Closing of SW1 (6-11) will provide the proper data rate to test write 800 fci for NRZI testing. When SW1 (8-9) is closed, the write head and erase bar current are enabled.

CAUTION

Closure of SW1 (8-9) bypasses all file-protect circuits. To provide test tapes or other needed recorded data, ensure that this switch is closed only when tape erasure is desired or immaterial.

4-61. All tapes will be written with this SW1 (8-9) closed. This switch also provides control signal $\overline{\text{W TEST}}$, which goes to the Direct Set inputs of the write input registers shown on sheet 1. The output of the write input registers is such that all 1's are written on the tape.

4-62. The clock for the write output registers is supplied by the output of the second counter, U7. The clock is passed through U10-4, U13-3, and U114-5 to generate $\overline{\text{CYCLE P}}$.

4-63. Another feature of the dual-mode data board is the skew indicator. The one-shot multivibrator, U2, will detect a skew overflow. U2 fires whenever U18-5 goes high, and another BITINCH signal sets the U4-U13 latch after the latch has been reset by a high setting of U8-2. Deskewing of even just one channel will cause the LED indicator to illuminate.

4-64. Closing of SW1 (7-10) allows TP-10 to display the read skew waveform. This will show the read skew within 10% of a byte time for normal operation. The switch should be left open for NRZI operation.

4-65. CONTROL/SERVO PWB

4-66. The control/servo PWB (Figure 4-8) is a multilayer board with a ground plane in the center to reduce system noise and the need for bypass capacitors. It incorporates circuitry for the following:

a. Power supply

b. I/O status indication

c. Microcomputer

d. Analog-to-digital converter

e. Vacuum control

f. Capstan servo control

g. Servo simulator

h. Transducer converter

i. Takeup and supply reel servos

j. File protect and EOT/BOT sensors

4-67. POWER SUPPLY. By means of a fixed-frequency, pulse-width-modulation, voltage-regulator control circuit, the power supply produces all required analog and digital supplies from its 48-Vdc input. They consist of ±12- and ±5-volt regulated supplies, which are used also by the data circuitry, as well as an unregulated +15-volt supply. These supplies are short-circuit protected and will execute a reset condition if V_{CC} drops below 30 volts.

4-68. Switching Regulator (Figure 4-9 and Sheet 1, Drawing No. 354012-300). The SG3524 integrated circuit (U97) is a fixed-frequency, pulse-width-modulation, voltage-regulator control circuit. Operating frequency, which is determined by R339 and C168, is 25 kHz. U97 is used in a push-pull circuit configuration in the transformer-coupled dc-to-dc converter.

4-69. Each U97 circuit includes an on-chip regulator, error amplifier, programmable oscillator, pulse-steering flip-flop, high-gain comparator, and current-limit sensing and shutdown circuitry. Voltage regulation is produced by varying the duty cycle of the square-wave outputs at E_A and E_B.

4-70. The square-wave outputs of E_A and E_B are applied to the bases of switching transistors Q56 and Q57, respectively. These transistors turn on and off to supply current to the primary of transformer T4. Q54 and Q55 are normally conducting when output switching transistors Q56 and Q57 are off. This reduces the storage time of the switching transistors, thereby allowing a faster switching rate.

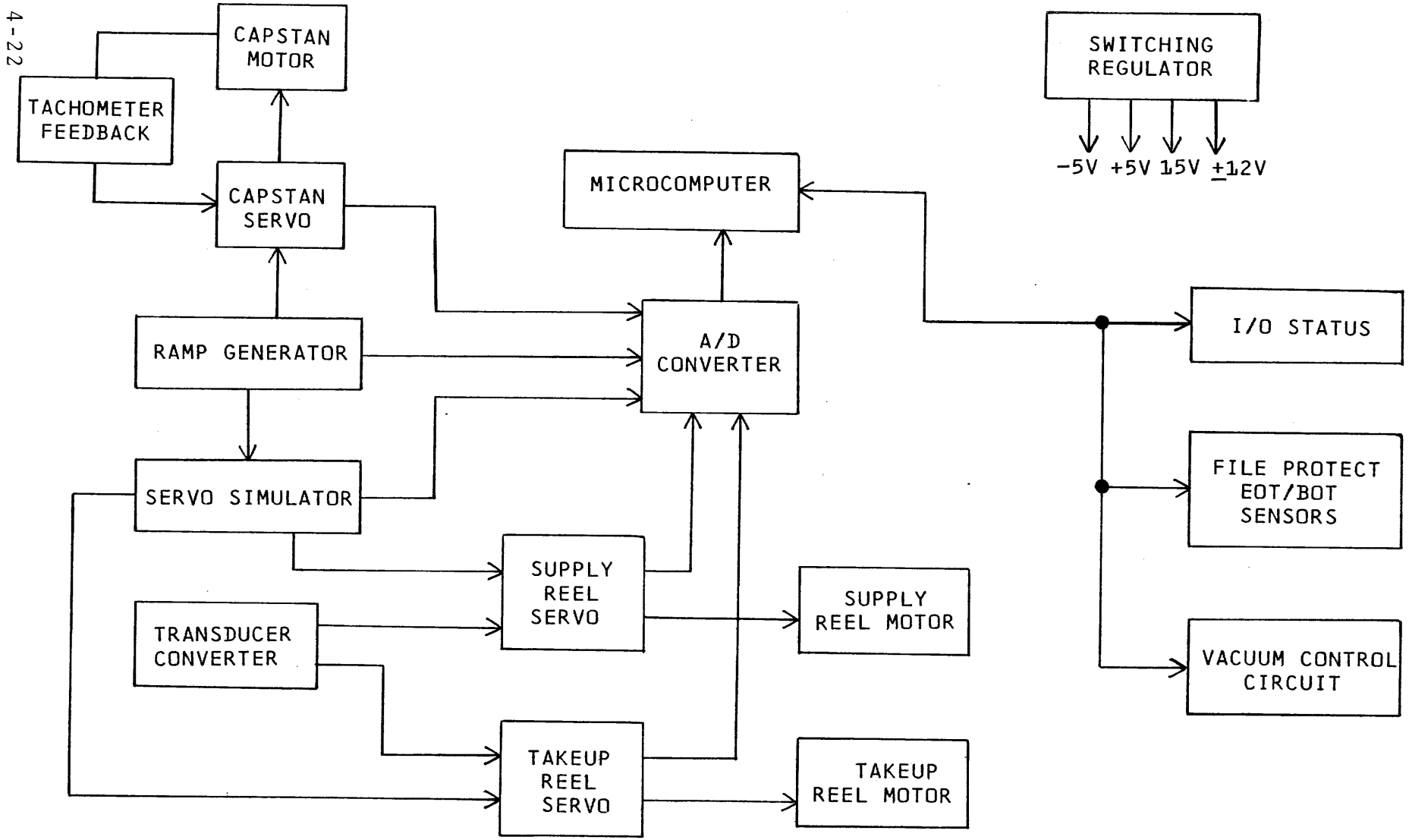


Figure 4-8. Control/Servo PWB, Block Diagram

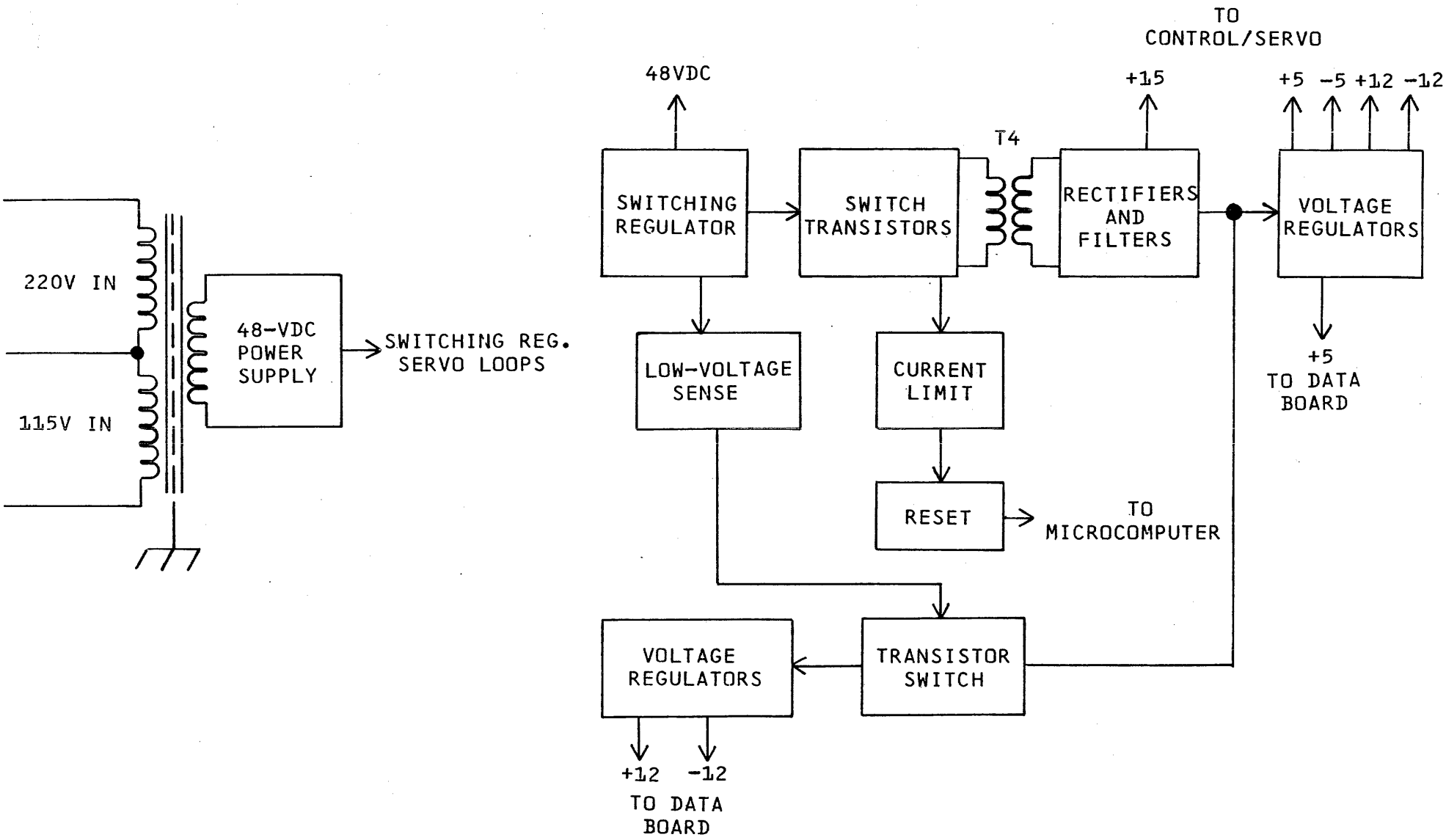


Figure 4-9. Switching Regulator, Block Diagram

4-71. The secondary of T4 consists of full-wave bridge rectifiers and inductive input filters. The fundamental frequency filtering is accomplished by L7, L8, and L9. Transformers T1, T2, and T3, in conjunction with C160 through C165, filter out the high-frequency noise caused by the switching regulator. The +5-volt output, adjustable by R367, is set at +5.00 (±0.1) volts. The ±12-volt and -5-volt outputs are regulated by VR1 through VR5. The -5-volt output is used by the EPROM's, and the V15 RAW supply is used by the vacuum-valve control circuitry. The outputs of VR2 and VR3 supply ±12 volts to the data board. The VRAW 15 signal is switched on by control signal V14SW and is sent to the intermediate sections of the servo loops.

4-72. The reset line (U96-14) $\overline{\text{RES}}$ is controlled by the +5-volt supply, the +48-volt V_{CC} unregulated input, and the current limit protection of the primary winding of transformer T4. To initiate a +5-volt reset condition, the charge on C166 must decrease until the low-input threshold of U96-1 is obtained. This will cause the reset line ($\overline{\text{RES}}$) to go low true. The +48-volt reset condition is sensed by comparator U95-1, which goes low when the unregulated +48-volt input is less than 30 volts.

4-73. Current Limit Protection. Zener diode CR103 (6.8V) is used to produce a reference voltage to the inverting input, U95-6. When U95-1 goes low, the low will be transferred by U95-2 as a low and then inverted twice to give $\overline{\text{RES}}$ low true. Current limit protection for the primary of transformer T4 is accomplished by R405 and U95-14. Sufficient current flow through R405 will cause U95-14 to go low, following the signal path through U95-2, U96-2, U96-4 to give $\overline{\text{RES}}$ low true. The Reset line (sheet 14) resets hex D-latches U81, U90, and U92A. It also goes to the control switch assembly, where it initially turns the LED's on during the power-up sequence. $\overline{\text{RES}}$ true resets D-latches U40, U51, U53, U58, and U69 (sheet 15).

4-74. Microprocessor-Controlled Shutdown. The Model 900X provides a microprocessor-controlled, power-failure sequence. Power supplied to the data board is shut off and is used by the control servo board to control the motion of the capstan and takeup and supply reel motors. Comparator U95-13 (sheet 1) uses the reference voltage supplied by zener diode CR103 for its inverting input, U95-10. The non-inverting input, U95-11, monitors the voltage in resistor divider network R368, R386, and R387. When U95-13 goes low true ($\overline{\text{LOWV}}$), transistor switches Q52 and Q51 open, cutting off power to the data board. $\overline{\text{LOWV}}$ is one of 32 machine status signals monitored by the microcomputer (sheet 14).

4-75. I/O STATUS INDICATION. In the case of remote commands, REWIND and ON LINE status indications are not directly controlled by the microprocessor. During the initial power-on sequence, $\overline{\text{RES}}$ is low true and resets D-latch U92 (sheet 14, Drawing No.

354012-300). After the power-on sequence is completed, the transport will be off line, and the REWIND command will be false. D-latch U92 is clocked by C7, one of eight microprocessor-controlled clocks derived from demultiplexer U91-7. The function of the latches is to speed up the presentation of the status to the formatter and/or controller.

4-76. When the D0 bit is high at C7 clock time, On-Line ($\overline{ONLS}$) will go low true. This would be the case if the ON LINE pushbutton on the control switch assembly is pressed. Under the conditions of being selected and on line (SLTONL true), an Off-Line (OFC) input at the interface line will reset U92 to cause $\overline{ONLS}$ to go high (false). When the D1 bit is high and the C7 clock occurs simultaneously, RWDG will go low (true). This would be the case if the REWIND pushbutton on the control switch assembly is pressed. The transport will rewind when given a remote RWC if the load point indication is false and the transport is selected and on line.

4-77. The microcomputer monitors the operating status of the transport and places this information on data lines D2 through D7. At C1 clock time, hex D-latch U40 (sheet 15) transfers this information to interface connector P101 via some gating logic. The status outputs are $\overline{LDP}$, $\overline{EOT}$, $\overline{FPT}$, $\overline{DDI}$, $\overline{RDY}$, and $\overline{OPT}$. The input interface has the standard 220Ω/330Ω terminator networks. Inputs $\overline{ISEL}$, $\overline{IOVW}$, $\overline{ISWS}$, $\overline{ISFC}$, $\overline{ISRC}$, $\overline{IDDS}$, and $\overline{IOPTC}$ are monitored by the microcomputer. This is done by means of the four-to-one multiplexers, U44, U55, U62, and U71 (sheet 14). For any given input condition, the microprocessor will interpret and perform the operation that is commanded by the formatter and/or controller.

4-78. MICROCOMPUTER (Figure 4-10 and Sheet 13). The microprocessor is the controlling entity in the Model 900X transport. It starts up when power is applied to the transport, addresses location 0 in memory initially, and is given an instruction. The instruction may be to jump to another location in memory, change a register, output a command, etc. There are about 500 different instructions in memory. The microprocessor obtains these instructions by way of address lines A0 through A15 and data lines D0 through D7. The instruction is fetched from memory by enabling of $\overline{MI}$ and interpretation of data lines D0 through D7. The actual data obtained by the fetch cycle will be read when $\overline{MI}$ goes false.

4-79. Memory Request (MREQ) goes true when the microprocessor (Z-80) is reading or writing from memory. Locations 0_{16} through $7FF_{16}$ in memory are set aside for the EPROM's. The RAM addresses are 2000_{16} through $20FF_{16}$. The 2708 EPROM is a 1024 x 8-bit device and is erasable by ultraviolet light. The 2111 is a 1024-bit (256 x 4) static MOSRAM with a common I/O and output disable. When I/O request ($\overline{IOREQ}$) goes true, it tells the microprocessor to read or write to the output port. The $\overline{RD}$ and $\overline{WRT}$ lines are strobed. The write command line, $\overline{WR}$, causes the microprocessor to output data on lines D0 through D7. The READ ($\overline{RD}$) command line would cause data to be input to the microprocessor on data lines D0 through D7.

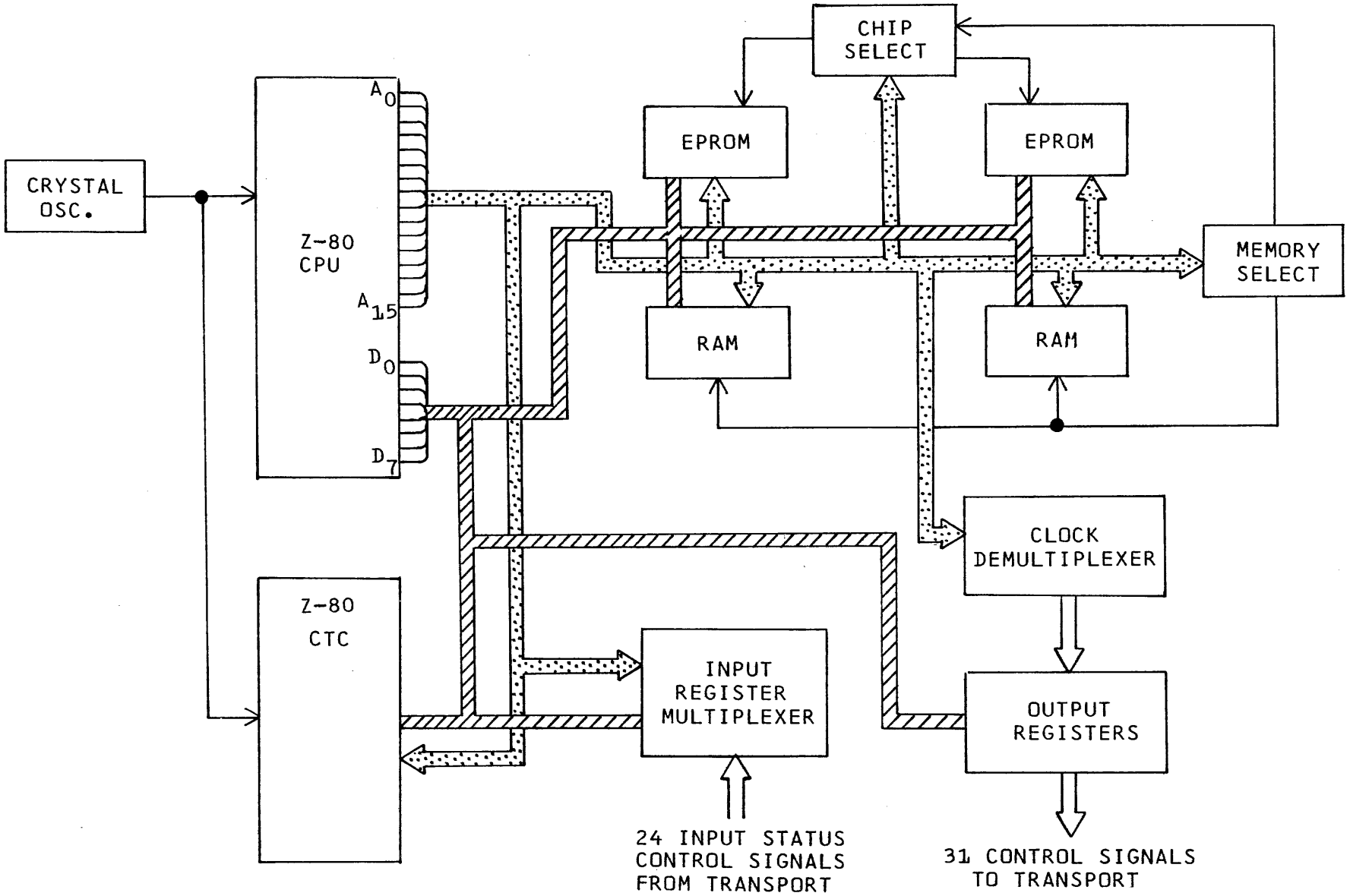


Figure 4-10. Microcomputer, Block Diagram

4-80. EPROM's. U94 (sheet 13) is the EPROM chip select decoder. It chooses the EPROM which will be used in the execution of an instruction. Address bits A13 through A15 will be input to U93, a decoder. According to the binary number presented on its A, B, and C inputs, U93 will cause $\overline{\text{ROM}}$, $\overline{\text{RAM}}$, $\overline{\text{OUTS}}$, and $\overline{\text{INS}}$ to go true. When the $\overline{\text{ROM}}$ output is true, it will enable one input to U94, and address bits A11, A10 will complete the binary number. This will present the option of selecting either EPROM U45 or U46.

4-81. The EPROM's have a self-test program stored in memory. This test program will check for proper operation of the microprocessor, RAM's, and EPROM's each time the transport is powered up. During power-up, all indicators will be on for approximately 1 second. The type of failure which has been detected will initiate a unique pattern of illuminated panel indicators and can then be matched against a list of fault indications (Section VI). The purpose of the self-test program is to minimize damage to tape or machine by detecting certain fault conditions and disabling machine operation.

4-82. Crystal Oscillator (Sheet 13). The timer chip (U72) Z-80-CTC is programmed by the microprocessor to generate four clock signals. The timer is synchronized to an initial frequency by the 3.840-MHz crystal oscillator, Y1. The clock signal (I) is used by the microprocessor and the timer. ZC/TO1 is the 30-kHz clock used by the servo sections; ZC/TO0 is frequency divided by two D-latches, U78 (sheet 15), to obtain the 5-kHz frequency for the capacitive transducers, EOT/BOT sense, and phase quadrature circuits. Interrupts are controlled by the microprocessor and the CLK/TRIG0 through CLK/TRIG3 signals of the timer and program command.

4-83. MICROCOMPUTER INTERFACING (Sheets 14 and 15, Drawing No. 354012-300). The microprocessor controls the data paths for the different functions of the transport. It controls the time at which statuses are reported (e.g., EOT/BOT and the rewind sequence), the motions in the test mode, FWD and REV cycles, and the loading and unloading of the tape. While the microprocessor does not do the actual servo loop stabilization, it gates the proper circuitry to allow control of tape speed and positioning within the vacuum columns.

4-84. Microcomputer Input Registers. All of the 32 transport statuses are sensed by four-to-one multiplexers U44, U55, U62, and U71. The different inputs will give status indications of transport operation at any given time. The binary code generated by address lines A_0, A_1 will result in selection of two input signals on the multiplexer input lines. A_0 and A_1, both low, will cause 1C0 and 2C0 inputs to be transferred to the microprocessor. If A_0 and A_1 are both high, 1C3 and 2C3 are read by the microprocessor.

4-85. Since the data lines are bidirectional, there must be an address decoding scheme for selection of the proper input register at the proper time. The four multiplexer chips are enabled by the logic of AND gate U70. When A_5 goes low, the status indications are made available to the microprocessor via data lines D_0 through D_7.

4-86. Control Switch Assembly. The control switch assembly consists of two integrated circuits, LED indicators, and pushbutton switches. Input lines A0 through A2 address each switch which has a binary code identification. Code 000 corresponds to the LOAD switch and 111 to the TEST switch. The two integrated circuits decode the output indicator displays and encode the switches that are pressed. The D0 line monitors the state (on or off) of the LED associated with the switch. C3 is pulsed low, telling the switch panel when to turn a LED indicator on or off. Reset ($\overline{RES}$) illuminates all indicators when power is first applied. Set Write Enable ($\overline{SWEN}$), when low true, reads data from the indicators. When $\overline{SWEN}$ is false, data is read from one of the switches.

4-87. Microcomputer Output Register. The output register consists of six hex D-latches, U40, U81, U90 (sheet 14), U58, U69, and U51 (sheet 15); one demultiplexer, U91 (sheet 14); and one multiplexer, U80 (sheet 15). The demultiplexer chip, U91, is used to generate the clock pulses for the six hex D-latches. The binary code set by address lines A_4, A_5, A_6 will determine the active time of clock pulses C_0 through C_7. The Q outputs of U81 and U90 are initially set low. They are clocked by C0 and C2, which are microprocessor-controlled clocks. The Q outputs are controlled by the statuses of the data bits on data lines D0 through D7. At clock time, the outputs will be set and will control different functions of the transport.

4-88. The CPSC0 and CPSC1 signals set up a binary code (Table 4-2) which controls the ramp generation circuit. There are four possible condtions:

a. No capstan motion

b. Ramps FWD

c. Ramps REV

d. Ramp generator controlled by interface command

4-89. These two lines go to U80 (sheet 15, Drawing No. 354012-300), a four-to-one multiplexer which decodes input commands CPSC0, CPSC1, and $\overline{SF}$ to give the transport the proper motion command. Basically, U80 controls FWD-REV direction commands and the selection of remote commands.

COMMAND	NO MOTION	FWD	REV	ON-LINE COMMAND
CPSC0	0	1	0	1
CPSC1	0	0	1	1

Table 4-2. Ramp Generation Binary Code

4-90. Microcomputer Output Register. $\overline{\text{REWUP}}$, REWCLAMP, and $\overline{\text{REWDN}}$ are control signals to the ramp generator circuit (sheet 2). S12 and S13 control FET switches which gate the analog circuitry of the servo section. When powered on, Enable 2, 3, and 4 go to the capstan and the supply and takeup reel servos to allow microprocessor control over them. Connector P29 goes to the blower motor, and when U90-10 goes high the motor will be enabled. V15 SW enables Q53 (sheet 1) to provide unregulated 15-volt power to the intermediate sections of the servo loops. The other three hex D-latches, U51, U58, and U69, transfer control signals to the transport circuitry. U58 outputs are S_1 through S_6, which go to the low-level sections of the capstan and takeup servos to control the FET switches. U69 outputs S_7 through S_{11} control the FET switches in the low-level sections of the supply reel servo. U69 outputs VALVE HV0 and VALVE HV1 are used by the vacuum valve control circuitry (sheet 12). Hex D-latch U51 transfers the following control signals: SSEL0 through SSEL2, which address demultiplexer U48 (sheet 12) and select the inputs to the A/D converter; VALVE 0 and VALVE 1, which control the opening and closing of the vacuum valve; and Read, which is sent to the data board to control the read/write electronics.

4-91. ANALOG-TO-DIGITAL (A/D) CONVERTER (Figure 4-11 and Sheet 12, Drawing No. 354012-300). The FET switches on the left of the schematic allow the analog-to-digital converter to sample eight different inputs. The microprocessor selects the input to be sampled and the frequency of sampling. The analog signal inputs may be positive or negative. D multiplexer U48 allows the microprocessor to turn on a FET switch when the A, B, C inputs are addressed in binary form. When the inputs are 000, Y_0 will be low true and enable the ramping FET switch. When the inputs are 111, Y_7 will be low true and will enable the +XOFF FET switch.

4-92. U38 is an inverter which inputs to comparator U39-2. The signal at TP32 will indicate the polarity of the input analog signal. SNEG will be high if the input signal is negative, low if the input signal is positive. The output of comparator U39-2 also enables the FET switch when the input analog signal is positive. The FET switch allows use of common circuitry for positive and negative analog signals.

4-93. U38-12 is an absolute value summer. Its output is one-quarter of the input analog signal, except for SUERR and TUERR, for which they are one-eighth of the original input signal. This is determined by the resistors in series with FET switches U36 and U37. The output of the summer is always positive and is sent to three comparators: U39-11, U39-9, and U39-7. The inverting inputs are connected to a resistive ladder network. The comparator outputs go high if the input from the absolute value summer exceeds the voltage supplied to the inverting input by the voltage divider. Consequently, TP37 will go high if the input is greater than 0.5 volt, TP38 will go high if the input is greater than 2.0 volts, and TP39 will go high if the input exceeds 8.0 volts. These signal levels are sent back to the microprocessor for evaluation via four-to-one multiplexers U44 and U62.

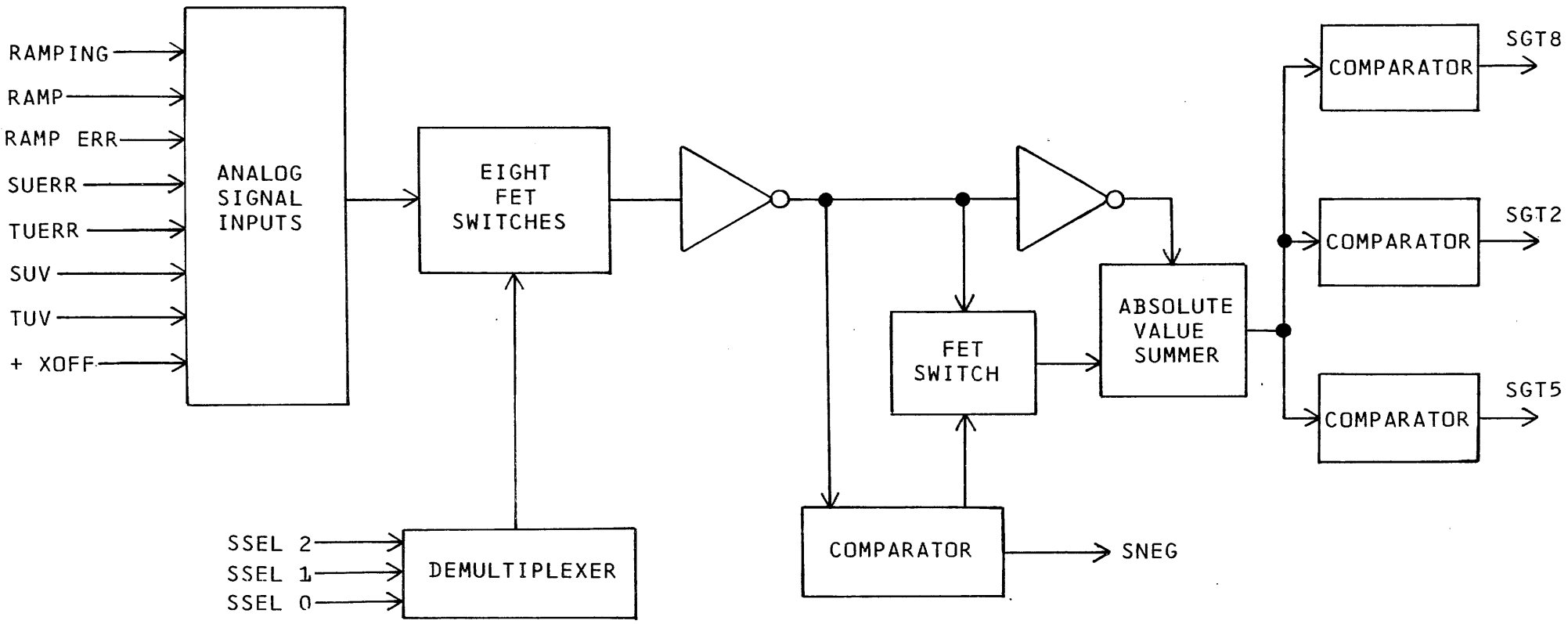


Figure 4-11. Analog-to-Digital Converter, Block Diagram

4-94. RAMP GENERATOR (Figure 4-12 and Sheet 2, Drawing No. 354012-300). Hex D-latch U81 (sheet 14) initiates the CPSC0 and CPSC1 control signals. In turn, CPSC0 and CPSC1 address four-to-one multiplexer U80 (sheet 15). U80 issues the RNFWD and RNREV commands. In addition, $\overline{\text{RUN}}$ is sent to the data board. The RNFWD and RNREV signals are sent to the ramp generator on sheet 2.

4-95. The motion command goes through isolation diodes CR98 and CR99. Operational amplifier stages U32-4 and U32-3 buffer the signal prior to acceptance by the ramp generator. Potentiometers R244 and R243 are, respectively, the forward and reverse speed adjustments.

4-96. The ramp generator circuit is basically an operational amplifier integrator with a variable slope. U32-12, U32-10, R242, and C116 are the more important components of the circuit. The output of U32-12 (RAMPING) is one of eight signals (sheet 12) processed by the A/D converter. The nominal ramp time at 75 ips is 5 milliseconds, but, because of circuit roll off and mechanical factors, R242 is set for 4.5 milliseconds at TP27. The Ramp signal output, U76-3, is sent to the low-level section of the capstan servo loop and to the A/D converter.

4-97. The Rewind ramp circuitry centers around operational amplifier integrator U76-12. REW CLAMP is normally high true, causing Q58 to be conducting and clamp output U76-12 to ground. Two control signals, $\overline{\text{REWUP}}$ and $\overline{\text{REWDN}}$, allow a different ramp time when starting to rewind and when ramping down from rewind speed. This time differential is brought about by R340 and R341, and the ramp-down time is approximately six times faster. Diode CR101 is used for temperature isolation.

4-98. CAPSTAN SERVO, LOW-POWER SECTION (Figure 4-13 and Sheet 11, Drawing No. 354012-300). The drive to the motor is controlled by the FET switch and control signal S1. When the FET switch is off, the motor still receives current feedback coming through R247. The current feedback is of such phase as to keep the capstan motor from rotating. In this static condition, the capstan motor voltage should be approximately 0 volts.

4-99. Operational amplifier U46-4 produces the error signal obtained from summing of the tachometer feedback with the ramp input signal. The output at U46-4 indicates how much current is driving the capstan motor at any point in time, assuming S1 has enabled the FET switch. The error signal is amplified and causes the capstan motor to maintain a constant velocity. When S1 enables the FET switch in the absence of a ramp input, the motor will tend to creep because of the offset voltages developed in the servo loop. R250, the offset adjustment pot, is adjusted to cancel out the offset voltage. The loop is then stabilized and ready for normal operation.

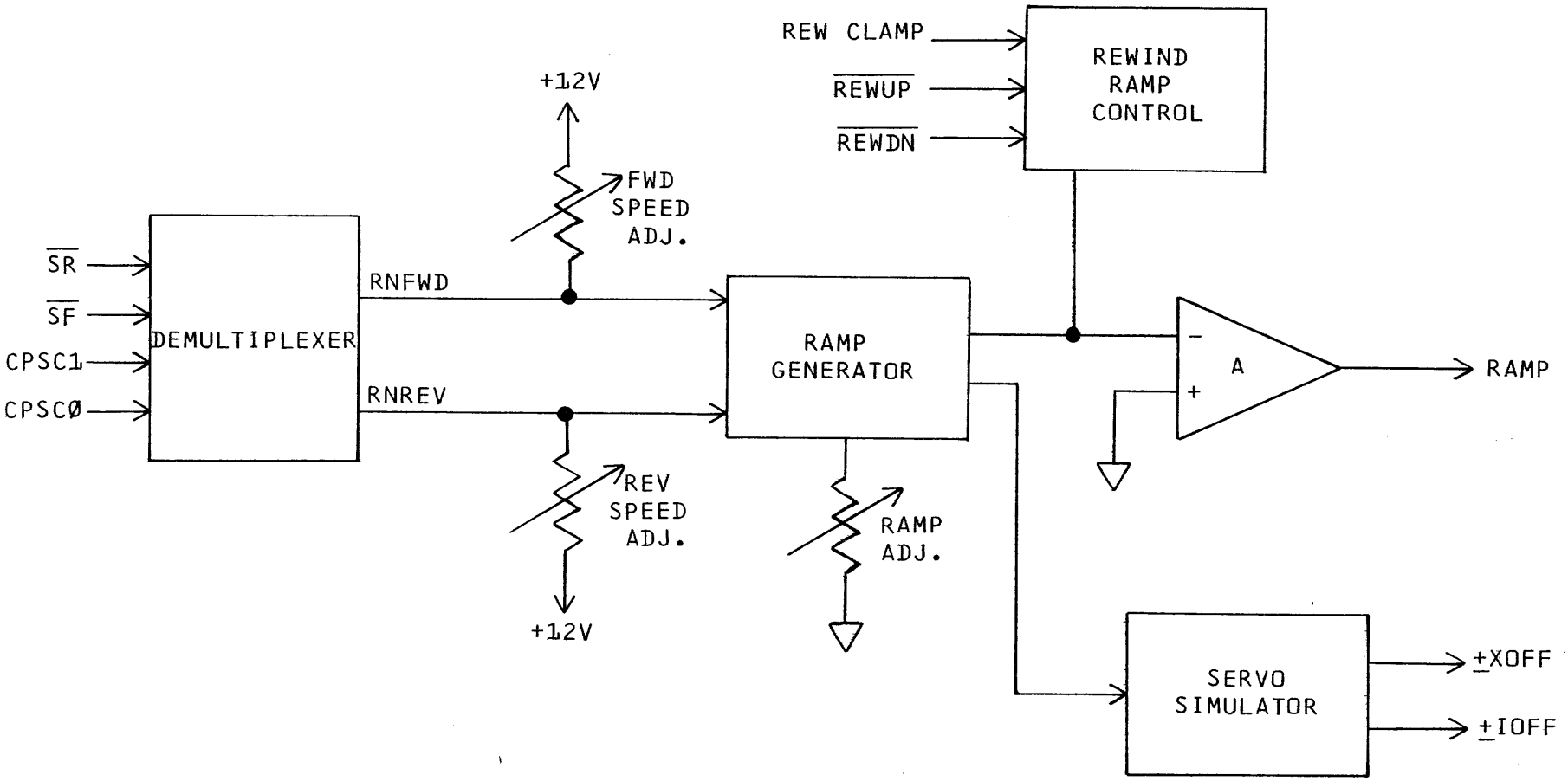


Figure 4-12. Ramp Generation, Block Diagram

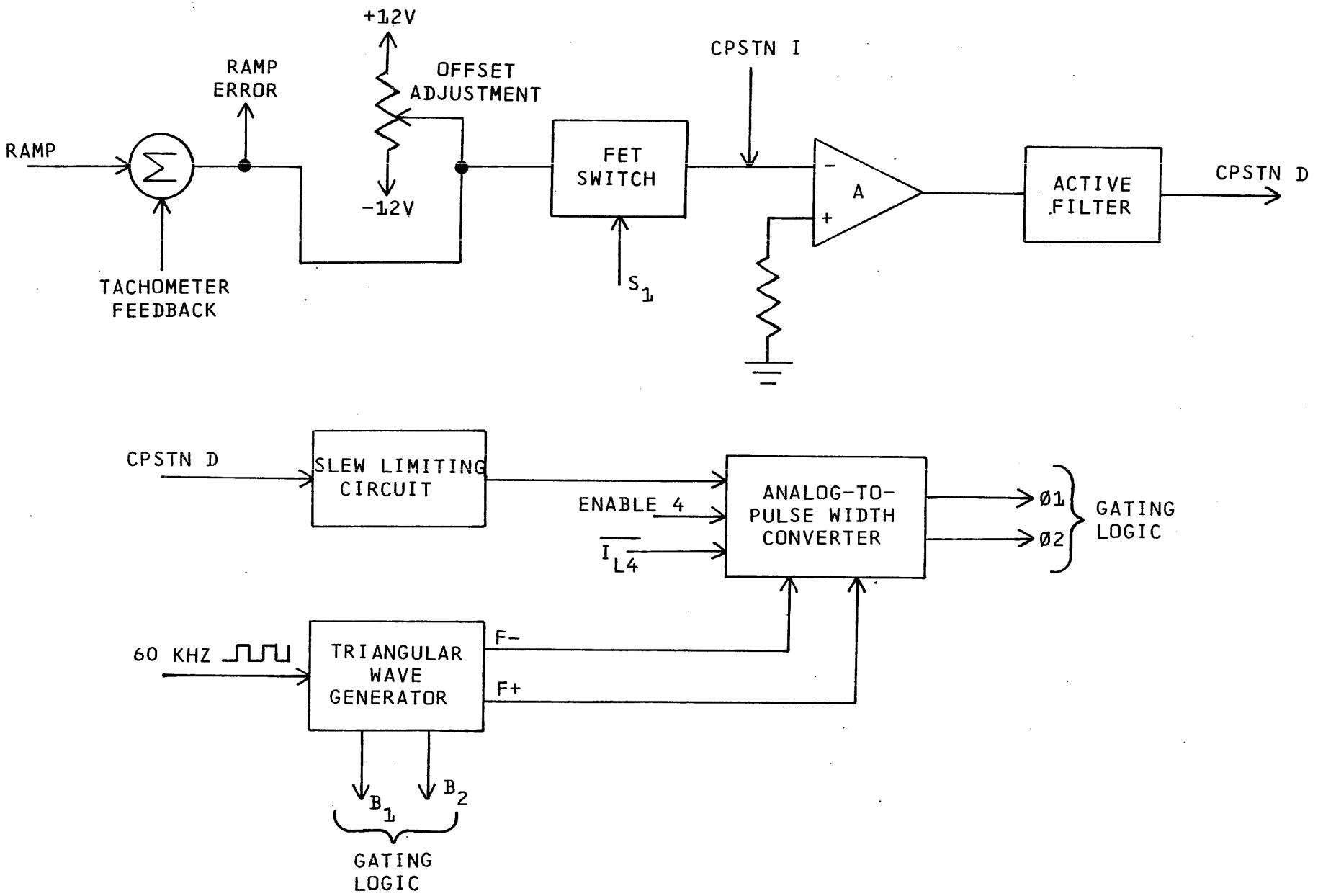


Figure 4-13. Capstan/Servo, Low-Power Section, Block Diagram

4-100. Ramp input polarity will be different for different directions of rotation. The ramp error signal at U46-4, one of eight signals processed by the A/D converter, is used by the microprocessor to control capstan motor velocity linearity during acceleration or deceleration of the motor.

4-101. The network consisting of R291, R292, R293, C127, C128, and U46-10 is a low-pass active filter with a rolloff of 3 to 4 kHz. The purpose of this filter is to eliminate any tachometer resonance problem or high-frequency ripple, introduced by the H-bridge switching network, which would come from the capstan current feedback loop. The CPSTN D signal is sent to the intermediate section of the capstan servo loop.

4-102. SUPPLY AND TAKEUP REEL SERVOS AND CAPSTAN SERVO, INTERMEDIATE SECTION (Sheets 3, 5, and 7, Drawing No. 354012-300). A clock signal (ZC/TO1) with a frequency of 60 kHz is used to clock the D-latch (U4). Its output is sent through a series of inverters and becomes B1 and B2. B1 and B2, which are 180° out of phase with each other, are used to enable one side of AND gates U8 and U10 (sheet 3). They are also used by the intermediate sections of the takeup and supply reel servo sections.

4-103. The output of U4 is also processed by a triangular wave generator, U1 and U2. The output of U1-6 is a dc bias voltage that is applied to U2-3. This bias voltage causes the triangular waveform to be symmetrical about the voltage reference. The rise-to-fall time ratio is one to one. The voltage divider consisting of R3, R4, R6, and R7 offsets the triangular waveform in plus and minus directions. This signal, f- and f+, is common to all three servo circuits.

4-104. The CPSTN D signal is brought in at U5-14, which, in conjunction with U5-3, comprises a slew-limiting circuit. Amplifiers U7-2 and U7-13 comprise an analog-to-pulse-width modulation converter. This square wave, in conjunction with B1 and B2, causes transformer drive transistors Q1 through Q8 to turn on and off. Because of the variable duty cycle, the times of conduction for these transistors may not be the same. The outputs of U7-2 and U7-13 are 180° out of phase with each other (Figure 4-14). The switching of U7 ensures that the two signals will not overlap in time; in fact, there is a 3 to 4-microsecond separation. With an equal duty cycle signal at U7, the voltage across the capstan motor will approximate 0 volts, and there should be little or no capstan motion.

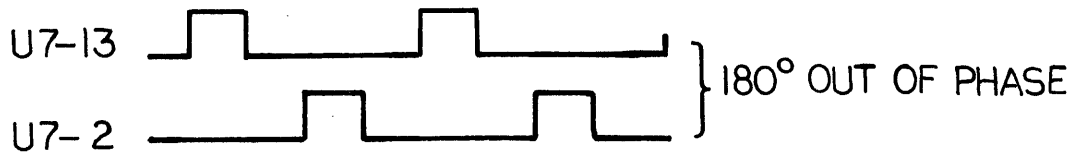


Figure 4-14. Outputs of Amplifiers U7-2 and U7-13

4-105. The transformer primary windings are driven by transistors Q1 through Q8 in a push-pull fashion. For example consider Q4 and Q1 in Figure 4-15. This produces current flow through T2-A, which turns on switching transistors Q9 and Q11 (sheet 4).

4-106. A1 (sheet 3) consists of the primary windings which turn the switching transistors of the capstan servo on or off. T4-A turns off servo transistors Q9 and Q11, and T2-A turns them on. T1-A turns on servo transistors Q10 and Q12, and T3-A turns them off.

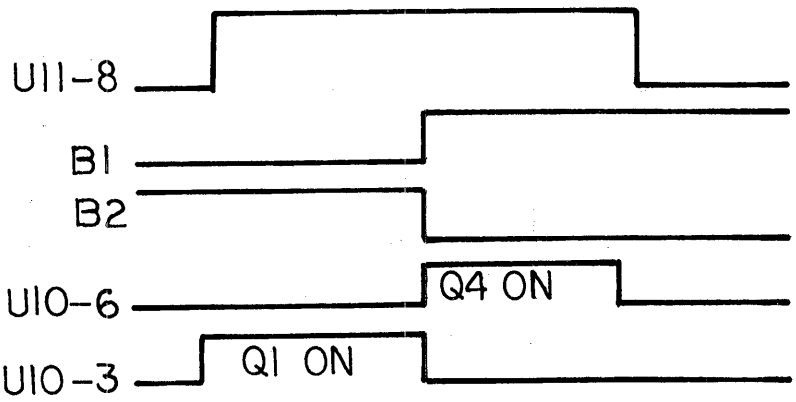


Figure 4-15. Push-pull Operation of Transistors Q1 through Q8

4-107. CAPSTAN, TAKEUP, AND SUPPLY REEL SERVOS, HIGH-POWER SECTION. The secondaries of transformer A1 (Figure 4-16 and Sheet 4) actually supply current to the switching transistors of the H-bridge configuration. The secondary output is rectified by diodes and drives the base of the respective transistor. The transistor is turned on for the complete pulse period of U11-8 (Figure 4-15).

4-108. Because of the switcher configuration, the transistors are turned on and off at 30 kHz, and there is a large amount of current conduction through the transistors. C29 through C31 filter the glitches caused by the transformer switching. In addition, flyback diodes CR25 through CR28 protect the transistors against the inductive kick caused by the inductors and transformers. The network consisting of L1, L2, C26, and C27 comprise a filtering circuit which takes the square-wave input and transforms it into a low-frequency sine wave displaced by 25 Vdc. This minimizes RFI and protects the transistors by limiting the current used by them.

4-109. A basic description of the H-bridge operation can best be shown by referring to Figure 4-17. Q10 and Q12 are switched on together, and Q11 and Q8 are switched on together. By turning the transistors on in pairs in this way, the H-bridge circuit reverses the current driving the motor, providing a means of driving a dc motor in either direction with a single-polarity power supply.

4-110. The circuitry at the bottom of sheet 4 monitors the current of the capstan motor. C10 and C11 filter the 30-kHz switching frequency, and R54 and R55 sense the motor current. The voltage at TP2 is proportional to the capstan motor current. The other circuit

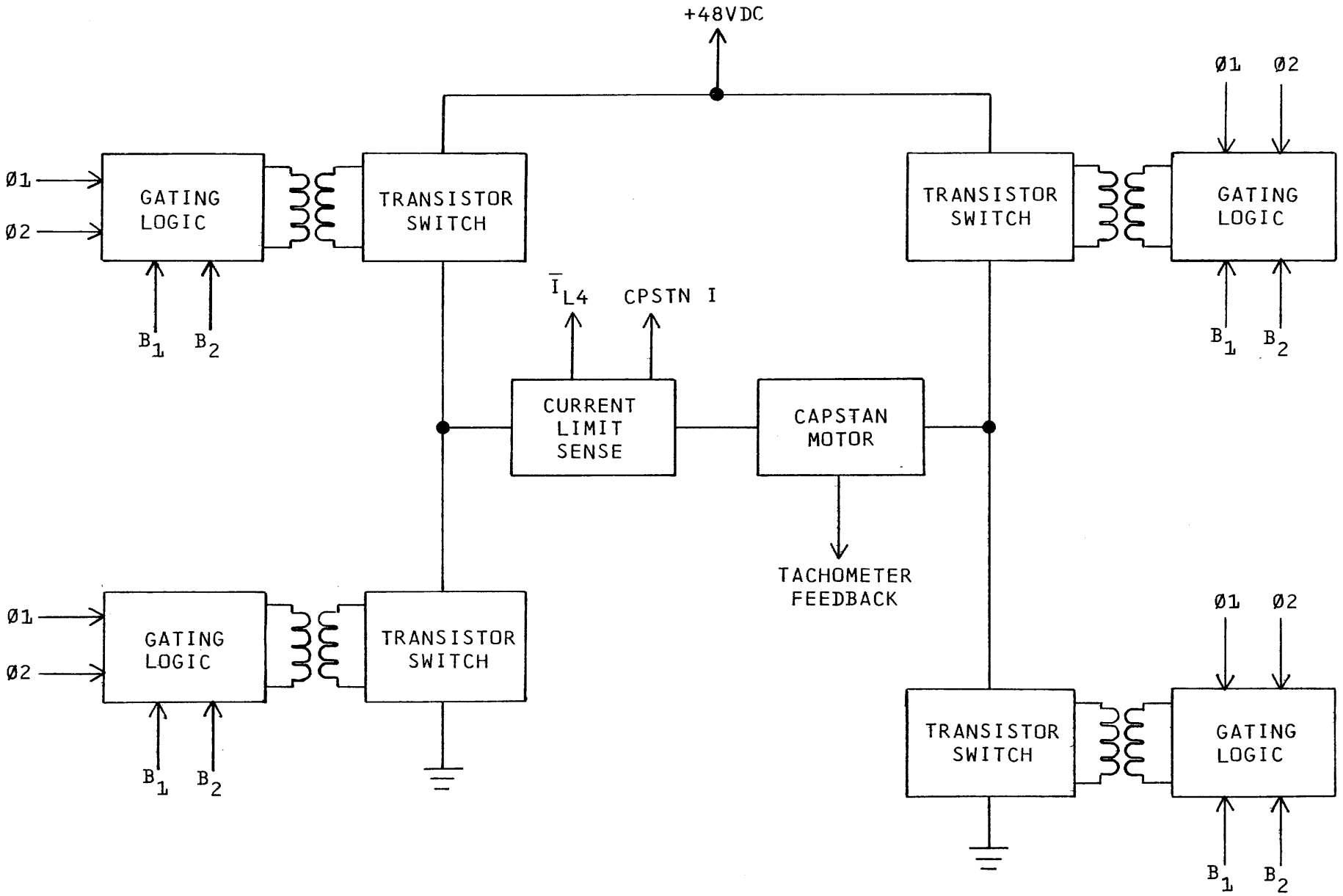


Figure 4-16. Capstan/Servo, High-Power Section, Block Diagram

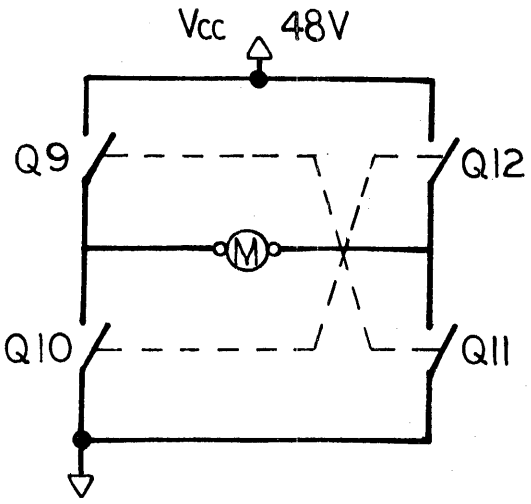


Figure 4-17. H-bridge Operation

shown around U6 is for current-limit protection of the capstan motor. When the capstan motor is drawing too much current, $\overline{I_{L4}}$ goes low to disable the intermediate section of the capstan servo loop.

4-111. SERVO SIMULATOR. The servo simulator is representative of an ideal servo, and the transport reel servos can only approximate the servo simulator outputs (±XOFF and ±IOFF). The circuit consists of quad operational amplifier U31 and output buffer stages U30. The circuit configuration comprises an active filter with a 3-pole, 2-zero-transfer function, so the capstan ramp input signal is used to give an ideal representation of an ideal servo. The ±XOFF outputs correspond to the proper positions of the tape within the vacuum columns. The ±IOFF signals indicate the amount of current needed by the ideal servo to overcome inertia and to take up or supply more tape to the vacuum columns. These signals are sent to the low-level section of the takeup and supply reel servo circuits (sheet 11). +XOFF is sent to the A/D converter (sheet 12) also.

4-112. TRANSDUCER CONVERTER (Figure 4-18). A crystal-controlled signal (CSCHOP) is used to drive a sawtooth waveform generator, U26. Rise-to-fall time ratio is three to one. U26-10 applies a dc bias voltage to U26-13, causing the waveform to be symmetrical about a reference line. This waveform is sent to both capacitive transducers. The capacitive transducer can be considered a variable capacitor with a range of 100 to 500 pf, capacitance varying as tape moves up and down in the column. These changes in capacitance produce proportional changes in input current to U26-1.

4-113. The first stages, U26-3 and U26-4, generate dc voltages in response to the changes in capacitance. The two diodes, CR96 and CR97, and the two capacitors, C79 and C100, form a half-wave rectifier which transforms the current variations to a dc voltage. The second stages, U27-7 and U27-1, compensate for the offset voltages caused by the operational amplifiers. There is also an offset adjustment which can be made for proper tape centering in the vacuum column. See paragraph 5-45.

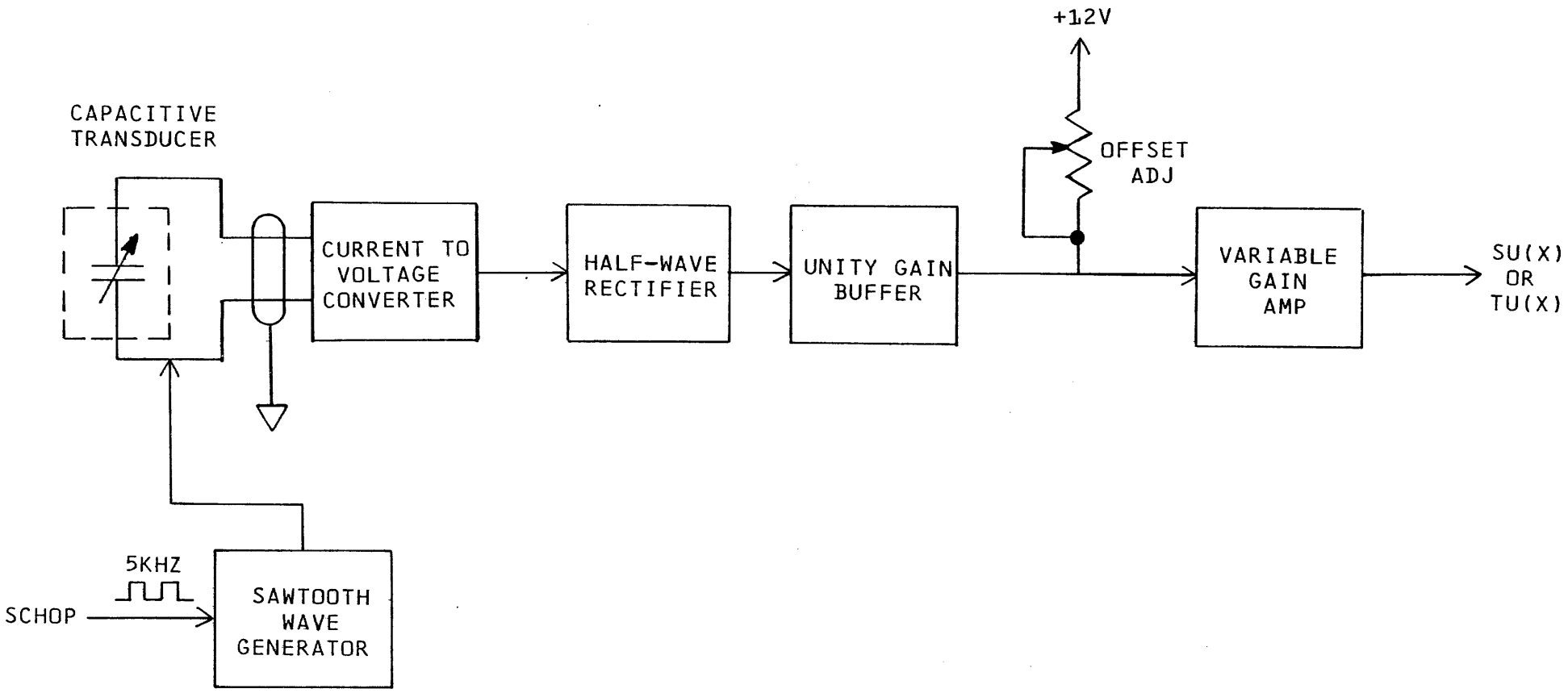


Figure 4-18. Transducer Converter, Block Diagram

4-114. The last stage, U27-14 and U27-8, is a variable-gain circuit which, for a given amount of tape movement in the vacuum columns, will produce the signals SU(X) and TU(X). These two signals are sent to the reel servo section, where they are added to the ideal servo simulator signals to produce a corrective error signal.

4-115. VACUUM VALVE CIRCUIT (Sheet 12, Drawing No. 354012-300). This circuit controls the airflow from the multistage centrifugal pump to the vacuum ports. Actuated in a fraction of a second, this control valve can shut off airflow in the vacuum columns completely, eliminating the sucking, hissing, and lapping sounds which frequently accompany unload and load sequences in more conventional vacuum-buffered tape transports.

4-116. The V15 RAW voltage is the portion of the switching power supply that is used in the operation of this circuit. Transistors Q45 and Q48 are controlled by microprocessor control signals HV0 and HV1. Their purpose is to allow leakage current to C174 and C175. Microprocessor command signals VALVE0 and VALVE1 control the closing and opening, respectively, of the vacuum port. VALVE0 and VALVE1 pulse the bases of Q46 and Q47 for approximately 100 milliseconds; the leakage current supplied to the two capacitors reduces the storage time of the transistors. Hence, the vacuum port can be opened or closed in a fraction of a second. The vacuum valve motor rotates only 90° during this operation.

4-117. The vacuum switch shown on sheet 9 is factory adjusted for 5 inches of water. TP24 goes low upon sensing vacuum in the columns. This signal, $\overline{\text{VAC}}$, is monitored by the microprocessor (sheet 14).

4-118. REEL SERVO, LOW-POWER SECTION (Figure 4-19 and Sheet 11, Drawing No. 354012-300). The description herein, based on the takeup reel servo, is equally applicable to the supply reel servo.

4-119. The output of capacitive transducer TU(X) goes to U64-14. This TU(X) signal represents the tape position within the vacuum column. A full excursion would produce a ±5-volt variation, but the normal signal is ±3 volts. The TU(X) signal is summed with the -XOFF signal from the servo simulator. The -XOFF signal represents a hypothetical tape position in the vacuum column assuming the use of an ideal servo. The error signal at TP26 is a corrective factor produced by the summing of -XOFF and TU(X), which indicates the discrepancy between the actual tape position and the hypothetical position assumed for the ideal servo.

4-120. U64-12 is a differentiator, and R321, R322, and C146 comprise a high-pass filter. At the node ahead of the FET switch, -IOFF is added to the corrective error signal. The -IOFF signal is representative of the ideal servo current needed to control the reel when overcoming the effect of inertia, supplying tape, or taking up tape slack. The error signal may vary positively or negatively and will cause the transport reel motor to track the servo simulator signals.

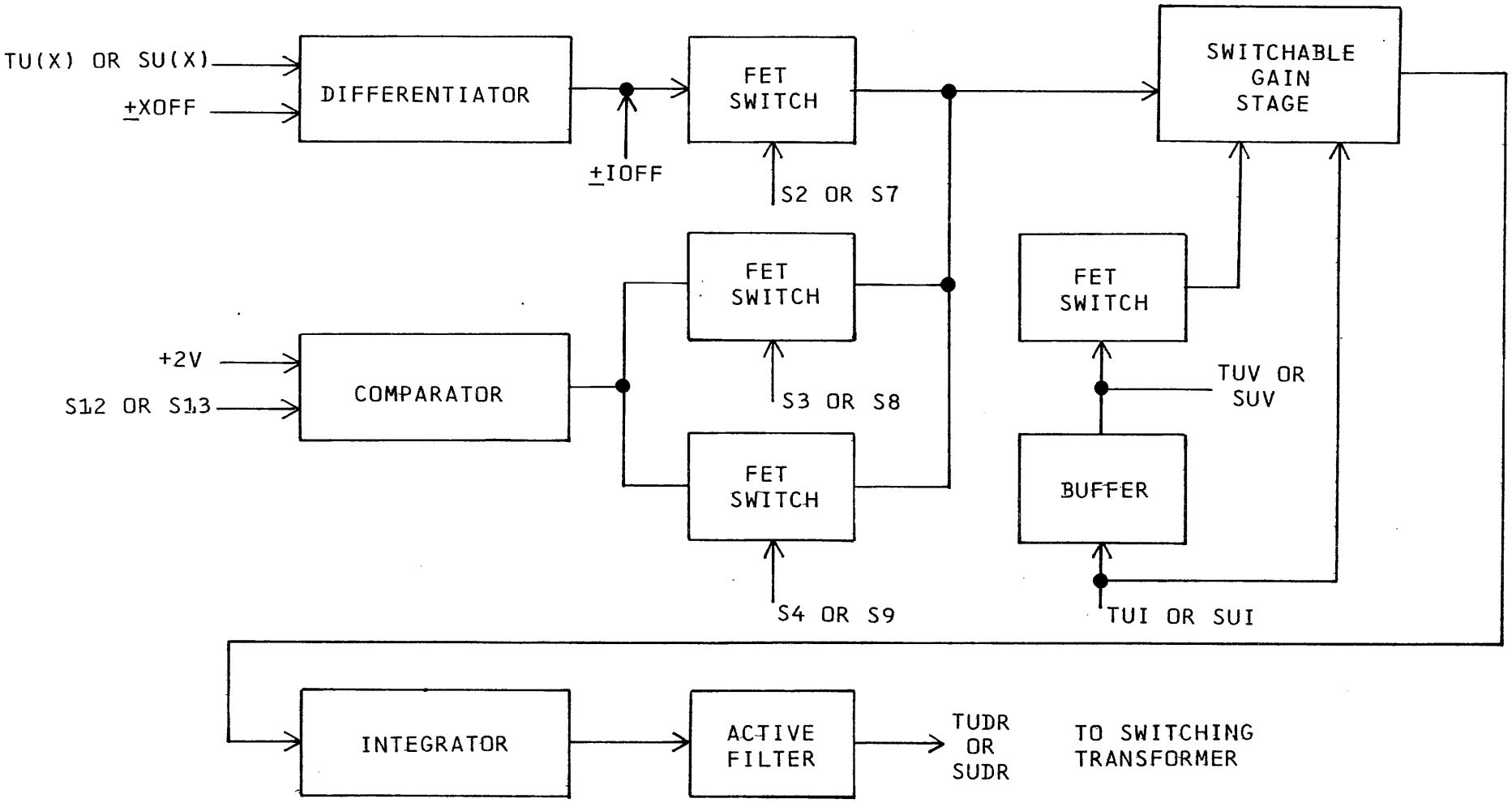


Figure 4-19. Reel Servo, Block Diagram

4-121. In normal operation, S2 and S5 enable the FET switches. S2 allows the error signal to pass, and S5 provides more gain to the signal. The amplified error signal corrects the reel motor position and the amount of torque applied to the reel of tape. In the event of a change in direction of tape motion or a variation of capstan motor velocity, the reel motors thus take corrective action to maintain a constant tape tension across the magnetic tape head.

4-122. Since the signals representing tape position in the vacuum column are not used during a load operation, S2 inhibits the FET switch during such operation. U64-4 supplies a predetermined amount of current, and control signal S12 controls the direction of rotation of the reel motor during load and unload operations. Control signal S4 allows twice the amount of current that S3 supplies. In some cases, when S3 and S4 enable the FET switches simultaneously, the current is tripled.

4-123. U64-6 is biased at approximately +2 volts, allowing control signal S12 to cause U64-4 to switch to ±11 volts. At the beginning of the load process, the tape moves forward slowly. S3 and S4 then increase the drive to the reel motors, and the tape moves faster and is drawn into the vacuum columns.

4-124. S6 allows selection of current or voltage drive to the reel motor. With current drive, the reel motor may accelerate to high speed with little torque. Voltage drive will cause the motor to accelerate quickly to a specified velocity, which it will hold, with a greater amount of torque than in the case of the current drive. During power-failure operation, S6 will be low true, enabling the FET switch. The higher torque capability provided by voltage drive is required during power failure to control the tape reel, with its large inertia.

4-125. TUV and TUI are representative of the voltage and current being supplied to the reel motor at some point in time and are added together at the output of U65-4, whose purpose is to compensate for the resistance of the reel motor windings. TUI, the current feedback, is always an active element in the servo loop, ensuring stability of the servo loop, and TUV, voltage feedback, is used specifically during load and unload operations.

4-126. Control signal S5 is low true, enabling the FET switch and providing an alternate current path with a greater amount of current for driving subsequent stages and eventually the reel motor. The U65-12 stage translates the motor current to a voltage signal and filters the switching noise introduced by TUI.

4-127. The last stage is a low-pass, active filter. The reel motors need not be as frequency sensitive as the capstan motor, since they follow the velocity and direction of the capstan motor.

4-128. EOT, BOT, FILE PROTECT, AND POSITION SENSORS (Figure 4-20 and Sheet 10, Drawing No. 354012-300). Each optical/electronic sensor comprises an infrared LED and phototransistor. Each depends

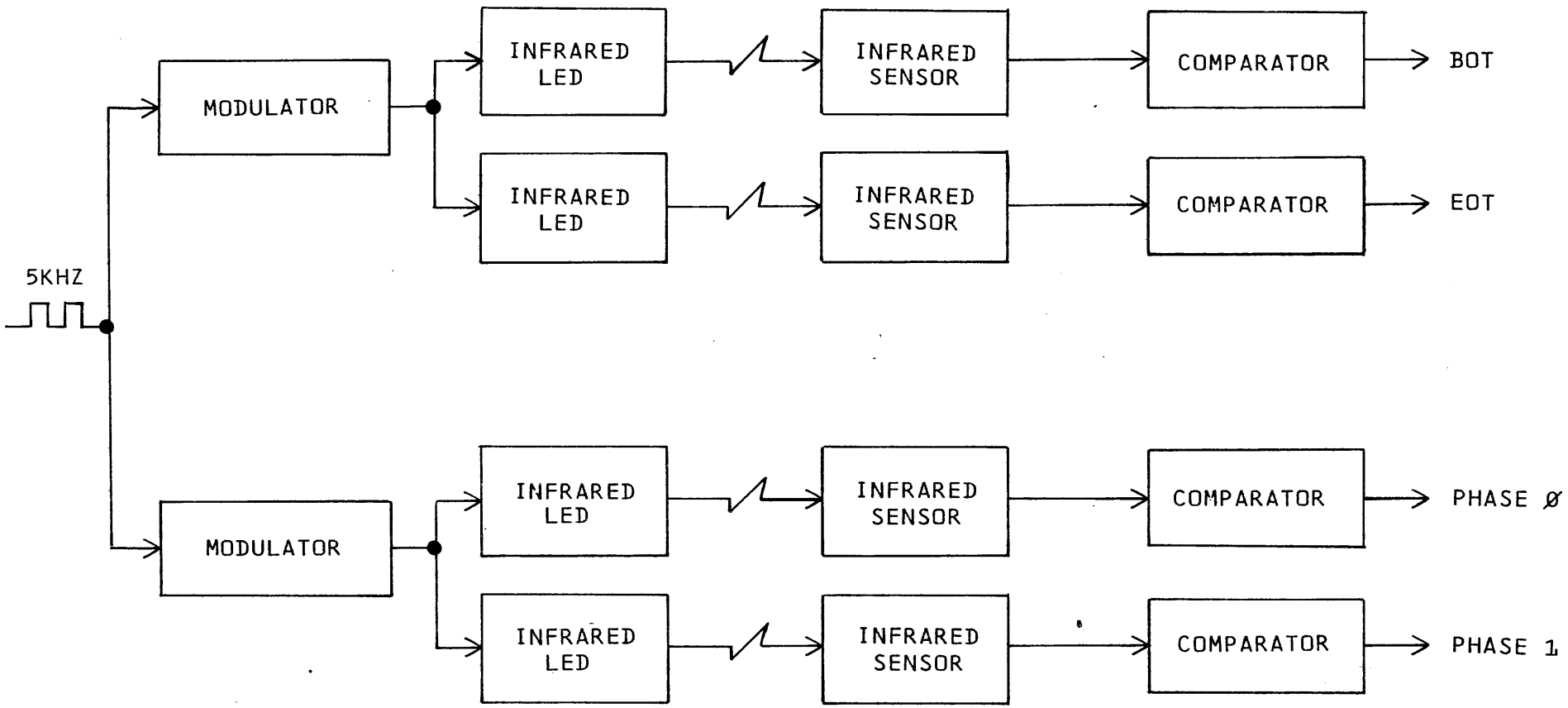


Figure 4-20. File Protect and EOT/BOT Sensors, Block Diagram

for actuation upon the positioning of a reflective tape strip in such a way as to reflect a modulated beam from its LED onto the sensing surface of its phototransistor.

4-129. EOT/BOT Sensors. The reflective strips for the EOT and BOT sensors are placed at the end and beginning, respectively, of the reel of magnetic tape. Thus these sensors provide the transport logic with the signals, used as described in previous paragraphs of this section, indicating the end and beginning of the tape with which the transport is loaded.

4-130. File Protect/Position Sensor Operation. The reflective strips for these sensors are positioned 90° apart on the supply reel hub, creating two signals (phase 0 and phase 1) which are 90° out of phase with each other. These signals produce a binary code which is used as data input for the phase quadrature on the supply servo. By means of this code the microprocessor can determine the direction of reel rotation, and, by counting the code iterations, the exact position of the tape within 6 inches. The tape position information is used during the rewind sequence to permit a very fast rewind (approximately 350 ips) with the ability to stop and return to load point at no risk of running out of tape leader.

4-131. When a supply reel with a file protect ring is placed on the hub, the collar on which the reflective strips are mounted is shifted in such a way as to change the phase of the binary count from what it would be with no file protect ring. Thus, by comparing the phase of the binary count with the commanded direction of tape motion, the microprocessor can determine the file-protected status of the installed reel.

4-132. Electronics. The operating current for the infrared LED's is modulated by a 5-kHz square wave. The 5-kHz frequency is derived originally from the Z-80-CTC (U72, sheet 13 of the schematic), a 20-kHz clock signal. The 20-kHz clock signal is frequency divided by a factor of four by the two D-latches, U78 (sheet 15), to provide the signal SCHOP, which is the driving signal for the LED's through transistors Q38 and Q41. As any one of the phototransistors is actuated as described above, the modulated signal passes through the corresponding capacitor (C103 – C106) to the inverting input of its section of comparator U29. The output corresponding to the actuated sensor, $\overline{\text{SEOT}}^{(L)}$, SBOT, $\overline{\text{SBOT}}^{(L)}$, Phase 1, or Phase 0, will go true.

SECTION V

MAINTENANCE

5-1. GENERAL

5-2. This section contains periodic maintenance information, removal and replacement instructions, and adjustment procedures. Table 5-1 presents the preventive maintenance schedule. Refer to Section VII for schematic diagrams, assembly drawings, and parts lists. The tape path and locations of tape-path-related parts are shown in Figure 5-9.

CAUTION

If transport is to be swung out from equipment rack on hinges for maintenance operations, ensure that rack is mounted securely. Weight of recorder in open position could upset an inadequately mounted equipment rack.

5-3. CLEANING

5-4. CAPSTAN. For routine capstan cleaning use Freon degreaser, Type TF. (Do not use Freon flux remover.) Wipe the capstan gently, using a lint-free, nonabrasive wipe saturated with Freon. If the capstan is excessively dirty with tape oxide/binder deposits, it may be cleaned with a Q-tip slightly moistened with Inhibisol, manufactured by Amerace Corporation, Penetone Division, Tenafly, New Jersey 07670.

CAUTION

Do not clean capstan with motor running. If Inhibisol is used, do not touch capstan surface or put tape on capstan for 5 minutes after cleaning, as Inhibisol softens capstan coating temporarily. Do not use head cleaner, Freon flux remover, alcohol, or other solvents to clean capstan sleeves.

5-5. HEAD AND GUIDES. Clean the head, its associated guides, and the roller guides with a lint-free, nonabrasive wipe or a cotton swab moistened with Inhibisol.

CAUTION

Use only Inhibisol to clean head and guides. Rough or abrasive materials can scratch metal parts; other solvents, such as alcohol, can cause problems such as increased ISV. Do not soak guides with cleaner, as excess solvent may break down bearing lubricant.

5-6. TAPE CLEANER. To clean the tape cleaner, use a cotton swab moistened with Freon or Inhibisol and wipe away any accumulated debris clinging to the tape cleaner blades or housing.

MAINTENANCE OPERATION	FREQUENCY (hours)	QUANTITY TO MAINTAIN	PROCEDURE PARAGRAPH
Clean Head, Guides, Roller Guides, and Capstan	daily	—	5-4 5-5
Clean Tape Cleaner	daily	1	5-6
Check Skew, Tape Tracking and Speed	500	—	5-49 through 5-50, 5-32, 5-40 through 5-44
Replace Reel Motors and Capstan Motor	10,000	3	Drawing No. 154000-101, Section VII, and paragraph 5-22

Table 5-1. Preventive Maintenance Schedule

5-7. HOUSING. The dust door and control panel may be cleaned, as necessary, with Miller-Stephenson Chemical Co. MS-260, Windex, or an equivalent commercial grade plastic cleaner.

CAUTION

Do not use rough or abrasive material to clean the plastic dust door, as permanent scratches may result.

5-8. OPERATING VOLTAGE SELECTION

5-9. The Model 900X can be operated over a wide range of line voltages with no changing of transformer taps. Four ranges are available: 90 to 110 Vac, 110 to 135 Vac, 190 to 230 Vac, and 230 to 270 Vac. Both a voltage selector PWB and the fuse are located in the power cord connector housing in the power supply chassis.

5-10. One side of the voltage selector PWB has the numbers 120 and 240, each upside down to the other, on one side of the PWB and numbers 100 and 220 similarly printed on the other side. When line voltage is 90 to 110 volts, the PWB should be plugged in so that number 100 is facing upward and right-side-up to the installer. For 190 to 230 volts, the number should be 220; 110 to 135 volts, number 120; and 230 to 270 volts, number 240. For the 90-to-135-volt ranges, the fuse should be of a 6-ampere rating; for the 190-to-270-volt ranges, a 3-ampere rating.

CAUTION

To prevent damage to the transport and ensure proper operation, be sure the voltage selector PWB and fuse are proper for the power source to be used before applying power to the transport.

5-11. REMOVAL, REPLACEMENT, AND MECHANICAL ADJUSTMENTS

5-12. Cipher transports are designed to operate for long periods of time without requiring adjustment. In the event a mechanical adjustment is required, it is recommended that the unit be returned to the Cipher factory for that purpose. Procedures for removal and replacement of damaged or defective mechanical parts, together with any needed adjustments following replacement, are discussed in the following subparagraphs.

5-13. PUSHBUTTON/INDICATOR REPLACEMENT. The pushbuttons are extremely long-life, momentary-contact devices, and the indicators are LED's. Both the pushbuttons and LED's are soldered directly into a PWB. Consequently, field repair is impractical, and the complete PWB should be replaced in the event of malfunction. However, individual components are available to facilitate service center repair of the PWB. Replace the PWB as follows:

a. Remove power cord from back of tape transport.

b. Remove brushed aluminum facade from front of switch housing by pulling loose adhesive that holds facade. Discard facade.

c. From back of top plate, remove four screws holding switch housing.

d. Remove four screws securing switch PWB to switch housing. Unplug switch harness connector from control/ servo PWB, feed cable and connector through hole in top plate casting, and withdraw switch PWB assembly.

e. Install replacement switch PWB assembly in reverse order of removal.

f. Install new brushed aluminum facade. Center openings for pushbutton switches carefully to avoid rubbing or binding.

5-14. SINGLE-EDGE TAPE GUIDE. To replace a damaged or worn single-edge tape guide (Figure 5-1) or one of its parts, proceed as follows:

a. Remove mounting screw from base plate and disassemble tape guide parts as required.

b. Replace defective part, reassemble parts in accordance with Figure 5-1, and secure to base plate with mounting screw. No adjustment is required. Be sure guide mounting surface is free of burrs and debris which could keep guide from seating solidly on machined casting surface. Note that sapphire washer has only one polished surface, which must be surface against which tape rides.

WARNING

Before performing any maintenance procedure requiring access to interior of recorder, disconnect power cord to eliminate possibility of severe electric shock.

5-15. ROLLER TAPE GUIDE REPLACEMENT. The roller tape guides should never require replacement during the life of the tape transport. However, if it becomes necessary to replace a damaged or defective roller guide, the complete assembly must be changed as a unit. Proceed as follows:

a. Loosen two press-lock fasteners and open vacuum column door.

b. Remove screw securing defective roller guide. Carefully withdraw roller guide, taking care not to drop any small parts or springs.

c. Using new screw provided with replacement roller guide assembly (discard nut and washer), secure roller guide in position. Take care that the springs are properly positioned, as shown in Figure 5-2, before tightening screw.

d. No adjustments are required.

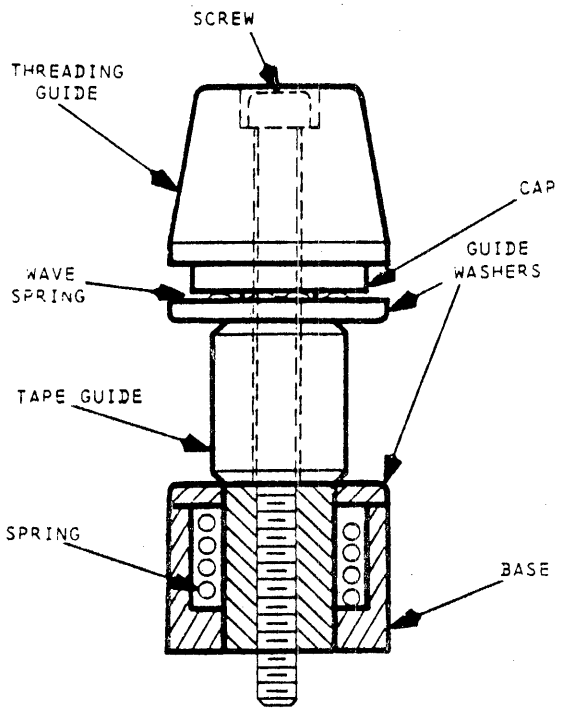


Figure 5-1. Single-Edge Tape Guide

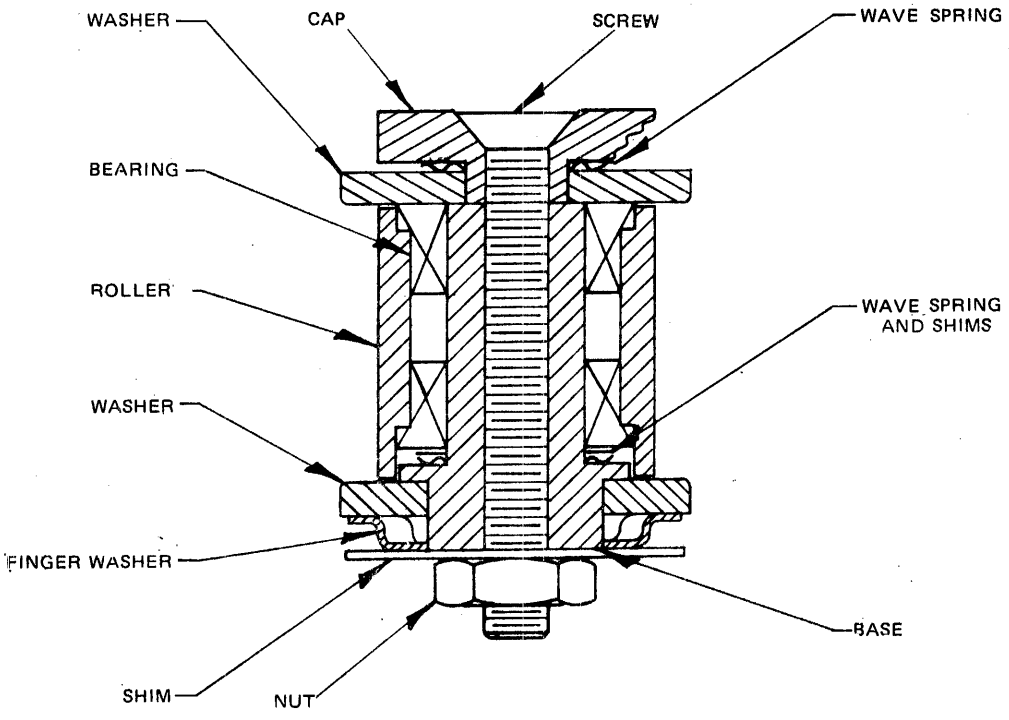


Figure 5-2. Roller Tape Guide

5-16. TAPE SENSOR. The complete EOT/BOT sensor assembly is built and tested as a single unit and must be replaced as such. Removal and replacement procedures are as follows:

a. Unplug electrical connector from control/servo PWB.

b. Loosen two press-lock fasteners and open vacuum column door.

c. Remove three screws securing sensor brackets and cable clamp to front of base plate.

d. Pulling wires and connector carefully through hole provided, remove sensor from base plate.

e. Install replacement sensor in reverse order of removal, being careful to mount sensor at correct distance from tape. Face of sensor elements should be 0.150 inch from tape.

f. No electrical adjustments are required.

5-17. REEL-HUB GRIP RING. Removal and replacement procedures for the reel-hub grip ring are as follows:

a. Lift reel lock lever to unclamp grip ring.

b. Pull old grip ring out of hub groove and remove.

c. Install new grip ring by stretching over reel hub into proper position.

CAUTION

Clean grip ring with Freon degreaser, Type TF only. Alcohol, head cleaner, and other solvents will damage grip ring.

5-18. REEL HUB. Replace and adjust the supply or takeup reel hub as follows (Figure 5-3):

a. Loosen socket-head screws and remove hub.

b. Install replacement hub on shaft to obtain dimension shown in Figure 5-3, and tighten socket-head screws.

c. Mount reel of tape on recorder, thread tape, and place recorder in load mode.

d. Run tape forward and reverse, noting tape position on reel for which replacement hub was installed. If necessary, readjust hub height to center tape on reel.

e. Using right-angle Allen wrench capable of applying 30 inch-pounds of torque, tighten socket-head screws securing hub as tightly as possible.

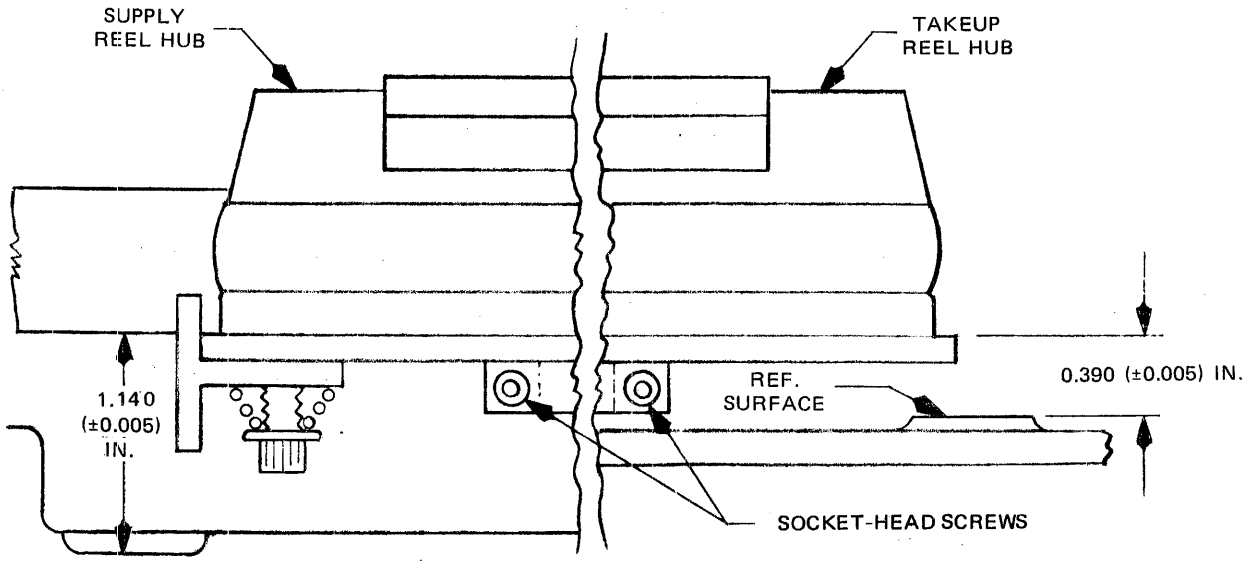


Figure 5-3. Reel Hub, Showing Adjustment Dimension

5-19. REEL HUB LOCK ADJUSTMENT. Referring to Figure 5-4, adjust the reel hub lock as follows:

a. Remove tape reel and leave lock open.

b. If lock has free play in open position, loosen locknut on adjustment setscrew. Turn adjustment setscrew into spacer until free play is removed, and tighten down locknut.

c. Close lock and note whether face of lock is parallel to top of cap. If not, open lock and turn buttonhead screw in or out as necessary to hold lock parallel to top of cap in closed position.

d. Place reel on hub, close lock, and check reel for tightness. If reel slips on hub, open lock and remove reel.

e. Loosen hex locknut on adjustment setscrew, turn adjustment setscrew slightly into spacer (depending upon looseness of reel), and retighten locknut.

f. Perform steps c and d.

g. Perform steps e, c, and d as necessary until reel does not slip.

NOTE

Hub compression ring contains oily preservative which tends to ooze out through pores and make surface oily. Ring should be cleaned periodically with isopropyl alcohol to prevent tape reel from slipping.

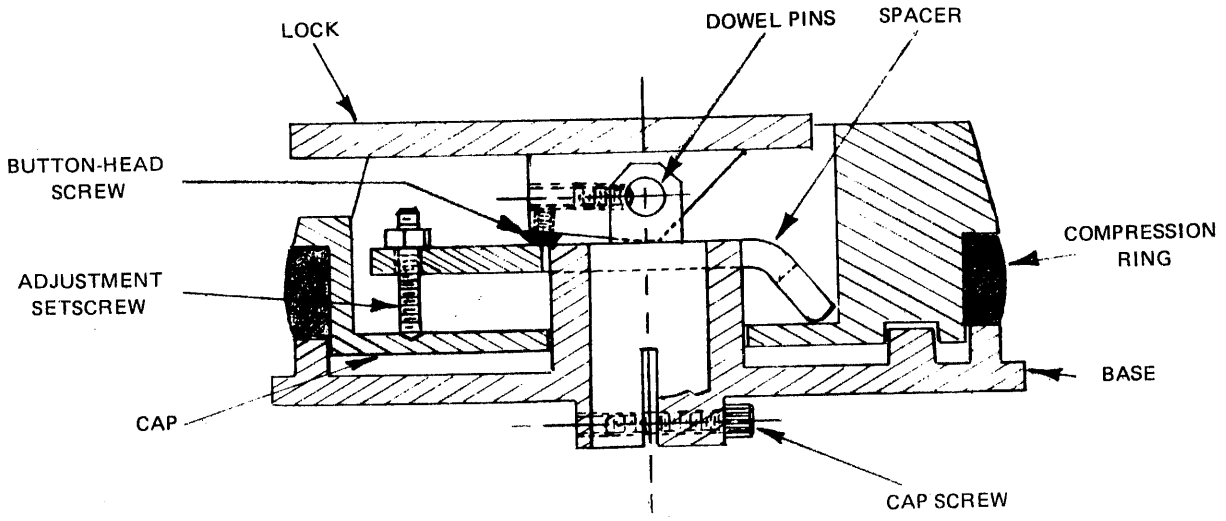


Figure 5-4. Reel Hub Assembly

5-20. HEAD ASSEMBLY. Remove and replace the head assembly in accordance with the following procedure:

NOTE

Hard-faced heads are very sensitive to tape wrap angle. After installing new head, lapping tape may be required for optimum head performance. Lapping tape and complete instructions may be obtained from Cipher by ordering Lapping Tape Kit P/N 154036-101.

a. Remove four screws securing switch housing/head cover to top plate casting.

b. Carefully remove switch housing/head cover by pulling gently away from top plate.

c. Loosen two press-lock fasteners and open vacuum column door.

d. Unplug head electrical connectors from read/write PWB.

e. Remove four screws securing head assembly to base plate (Figure 5-5).

NOTE

One of four mounting screws is small screw inside azimuth screw.

f. Withdraw head assembly, carefully feeding wires and connectors through hole in base plate.

g. Feed wires and connectors of replacement head assembly carefully through hole, and secure head assembly to base plate with three socket-head screws not used for azimuth adjustment. Thread outer azimuth adjustment screw into head assembly mount (Figure 5-5), and thread inner azimuth adjustment screw loosely into it.

h. Replace switch housing/head.

i. Make skew adjustment in accordance with paragraphs 5-49 through 5-51.

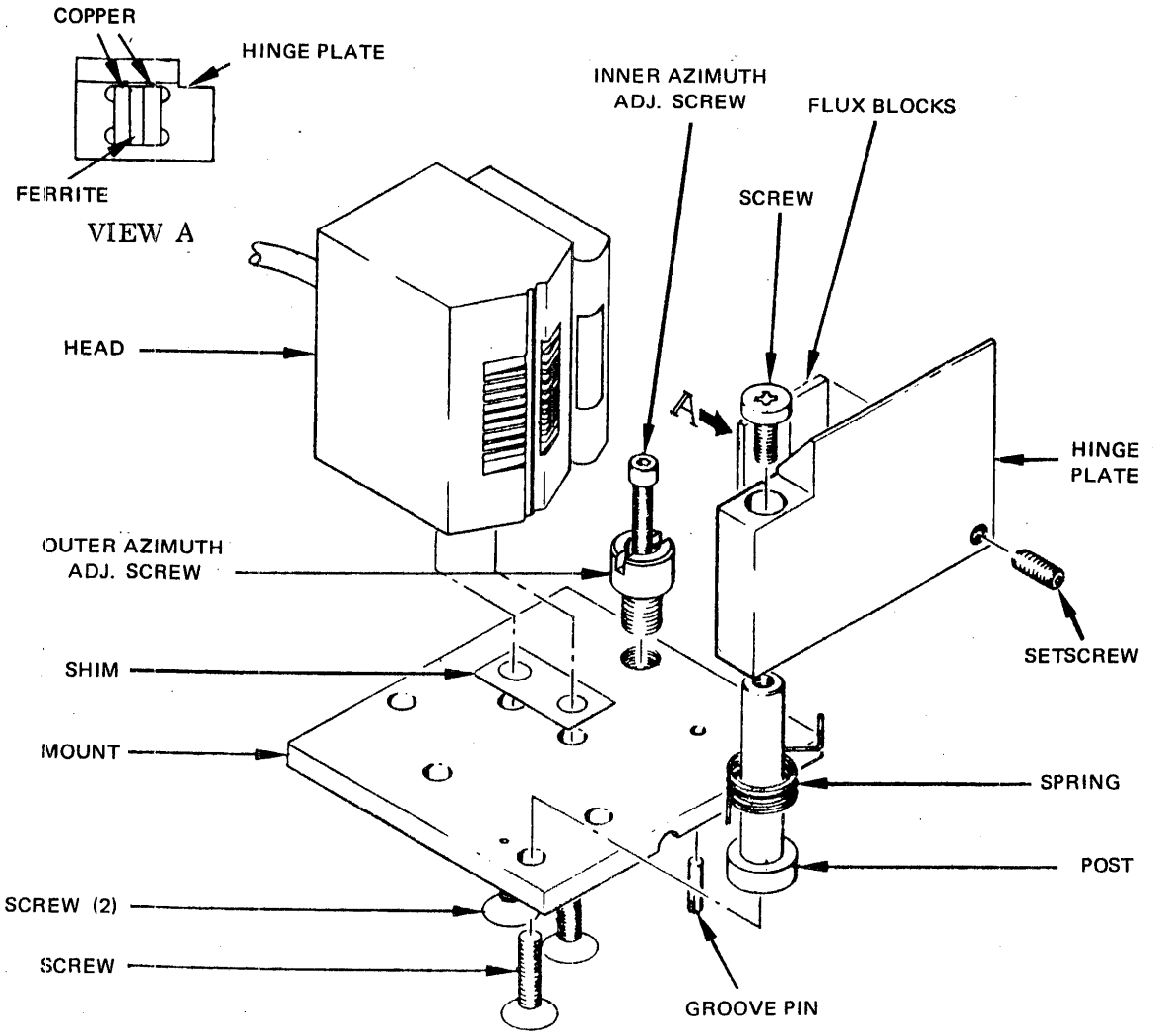


Figure 5-5. Head Assembly Adjustments

5-21. CAPSTAN. To replace a damaged or defective capstan, proceed as follows:

a. Screw 1-inch-long, 10-32 NF screw into end of capstan hub until it contacts end of motor shaft. Hold capstan with 1/4-inch open-end wrench (see Figure 5-6), and tighten screw. This will cause capstan sleeve to be pulled from motor shaft.

b. Install replacement capstan over motor shaft until resistance is felt. Insert 1/2-inch-long, 6-32 NC screw through hole in capstan hub, and screw it into threaded hole in motor shaft. Tighten screw until head of screw comes in contact with front of capstan hub. Hold capstan as shown in Figure 5-6, and continue to tighten screw, which will cause capstan to be pulled onto motor shaft. Correct height for capstan is shown in Figure 5-7 (centered in vacuum opening).

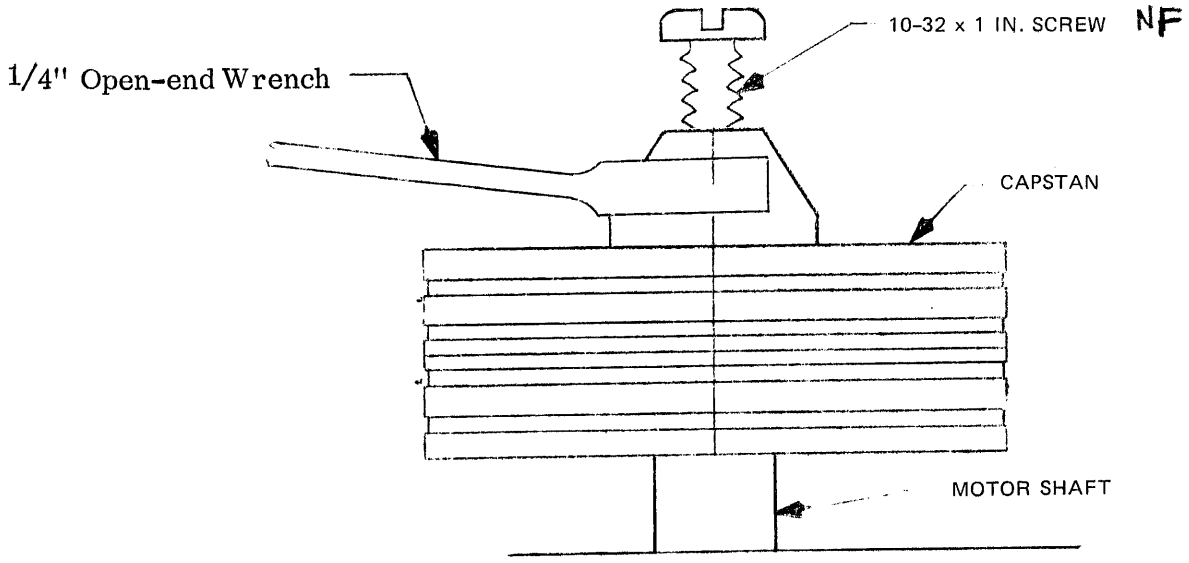


Figure 5-6. Capstan Removal

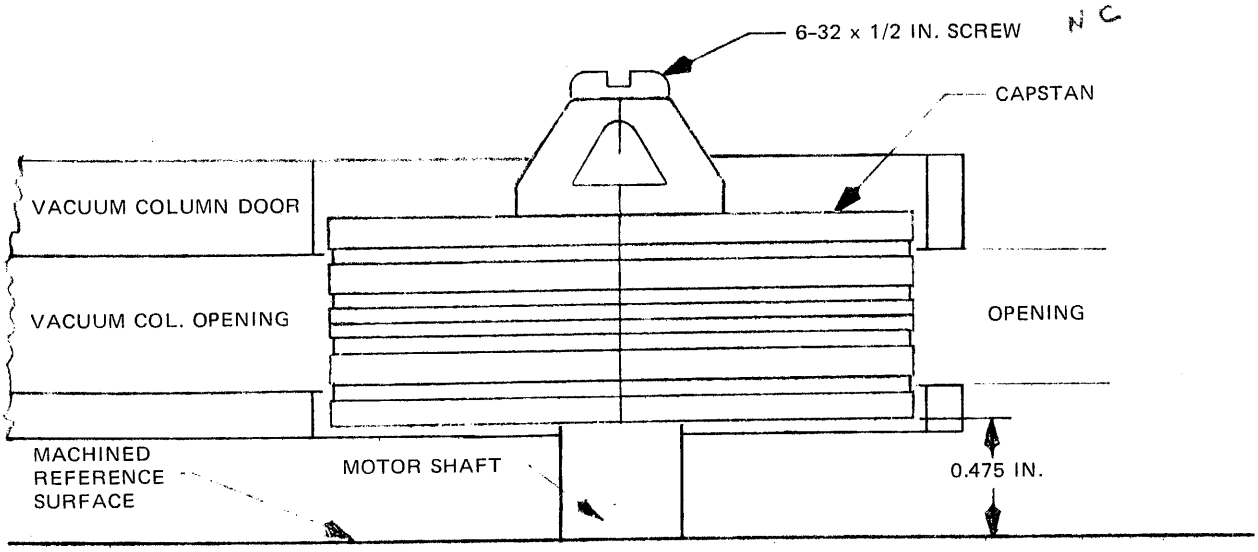


Figure 5-7. Replacement Capstan Positioning

CAUTION

Avoid contact with sensitive tape-driving surface of capstan sleeve. Damage to this surface will cause erratic performance and render capstan sleeve useless.

c. Mount reel of tape on transport, thread tape, and place in load mode. Check overall capstan performance and adjust if necessary in accordance with paragraph 5-32, steps g through i.

5-22. CAPSTAN MOTOR ASSEMBLY. To remove and replace the capstan motor assembly, proceed as follows:

a. Disconnect power cord from tape transport.

b. Remove vacuum column floor/transducer assembly as specified in paragraph 5-31. (See Top Assembly Drawing No. 154000-101, Section VII.)

NOTE

On some transports, an access hole is provided in the vacuum column floor to permit removal of the capstan motor without removing the vacuum column floor.

c. Remove facade.

d. Remove capstan sleeve from capstan motor shaft as specified in paragraph 5-21.

e. Unplug capstan motor and tachometer connectors from control/servo PWB.

f. Remove three screws securing capstan motor, and withdraw motor.

g. Install replacement capstan motor assembly in reverse order of removal.

h. Adjust capstan sleeve height and capstan motor tilt as specified in paragraph 5-21 and paragraph 5-32, steps g through i. Adjust capstan motor speeds, ramp times,and offset as specified in paragraphs 5-40 through 5-45.

5-23. VACUUM VALVE MOTOR ASSEMBLY. Remove and replace the vacuum valve motor assembly as follows:

a. Disconnect power cord from transport.

b. Remove vacuum column floor/transducer assembly as specified in paragraph 5-31.

c. Unplug valve motor connector from control/servo PWB. Remove contacts from connector housing using Molex Tool No. HT-2038.

d. Loosen two setscrews securing valve cord to motor shaft.

e. Remove screws, washer, and lockwashers that mount valve motor assembly and withdraw motor assembly. Feed motor cable through grommet, taking care not to damage grommet with sharp contacts.

f. Replace valve motor assembly in reverse order of removal. When tightening setscrew make sure valve rotor does not bind or drag against valve housing or housing mounting screw. Note that motor mounting bracket has slotted holes for adjustment.

5-24. VACUUM BLOWER. Remove and replace the vacuum blower as follows:

a. Disconnect power cord from transport.

b. Remove cover from blower mounting bracket.

c. Disconnect vacuum blower wires from terminal block and capacitor. Note colors and positions of wires.

d. Remove screws, washers, and lockwashers securing vacuum blower to mounting bracket. Support blower securely to prevent it from falling when mounting screws are removed. Install replacement blower in reverse sequence of removal. Be sure to compress rubber/foam gasket between vacuum blower face and top plate to ensure airtight seal.

5-25. VACUUM VALVE ASSEMBLY. Remove and replace the vacuum valve assembly as follows:

a. Remove vacuum blower as specified in paragraph 5-24.

b. Remove vacuum column floor/transducer assembly as specified in paragraph 5-31.

c. Loosen setscrew securing valve cord to valve motor shaft.

d. Remove two screws, washers, and lockwashers securing valve housing to top plate casting, and remove valve assembly.

NOTE

Ensure that valve rotor does not slide out of housing. If valve is to be reused, protect it carefully from damage that might cause binding. Clean parts thoroughly before reassembly, using Inhibisol.

e. Install new vacuum valve in reverse sequence of above steps.

CAUTION

To avoid damage and ensure proper operation of transport, when mounting valve housing to top plate ensure that mating surfaces are free of burrs and other foreign material and that housing is held tightly against top plate surfaces as screws are tightened. Insert valve rotor into housing fully before attaching housing to top plate to keep mounting screws from damaging valve rotor.

When attaching valve cord to valve motor shaft, position rotor so it does not touch housing mounting screw and so that stop pin does not drag on housing as valve rotates. Tighten setscrew securely and recheck for binding and drag.

5-26. VACUUM SENSE SWITCH ASSEMBLY. Remove and replace the vacuum sense switch assembly as follows:

a. Unplug power cord from tape transport.

b. Unplug vacuum sense switch connector from control/servo PWB.

c. Remove screws, washers, and lockwashers securing switch assembly to top plate casting, and withdraw switch. Clean RTV sealant off mating surface of top plate casting.

d. Apply small bead of RTV around nozzle of new switch assembly, and replace switch in reverse order of removal procedure.

5-27. POWER SUPPLY ASSEMBLY. Remove and replace the power supply assembly as follows:

a. Unplug power cord.

b. Remove four screws and lockwashers securing cover to power supply chassis, and withdraw cover.

c. Remove four screws and lockwashers securing cover to vacuum blower mounting bracket, and withdraw cover.

d. Pull Fast-On terminals off power switch lugs.

e. Remove power supply leads from terminal block and Optoisolator located on vacuum blower mounting bracket. Note color code.

f. Unplug power supply connector from control/servo PWB.

g. Remove screws and lockwashers securing power supply to top plate casting, and withdraw power supply.

h. Install replacement power supply in opposite sequence of above steps for removal.

i. Before applying power, verify that voltage selector PWB and correct fuse are properly installed with reference to power source voltage. (See paragraph 5-8.)

j. Check power supply voltages in accordance with paragraph 5-37.

5-28. CONTROL/SERVO PWB. Replace the control/servo printed wiring board in accordance with the following procedure:

a. Disconnect all cables from board.

b. Remove screws from corners of mounting bracket as shown in Figure 5-8.

c. Slide board out of top and bottom mounting brackets.

d. Slide in replacement board, and screw bracket back together at corners.

e. Reconnect all cables.

f. Turn on power and check power supply voltages.

g. Adjust control/servo in accordance with paragraphs 5-40 through 5-45 and 5-53.

5-29. DATA PWB. Replace the data PWB in accordance with the following procedure:

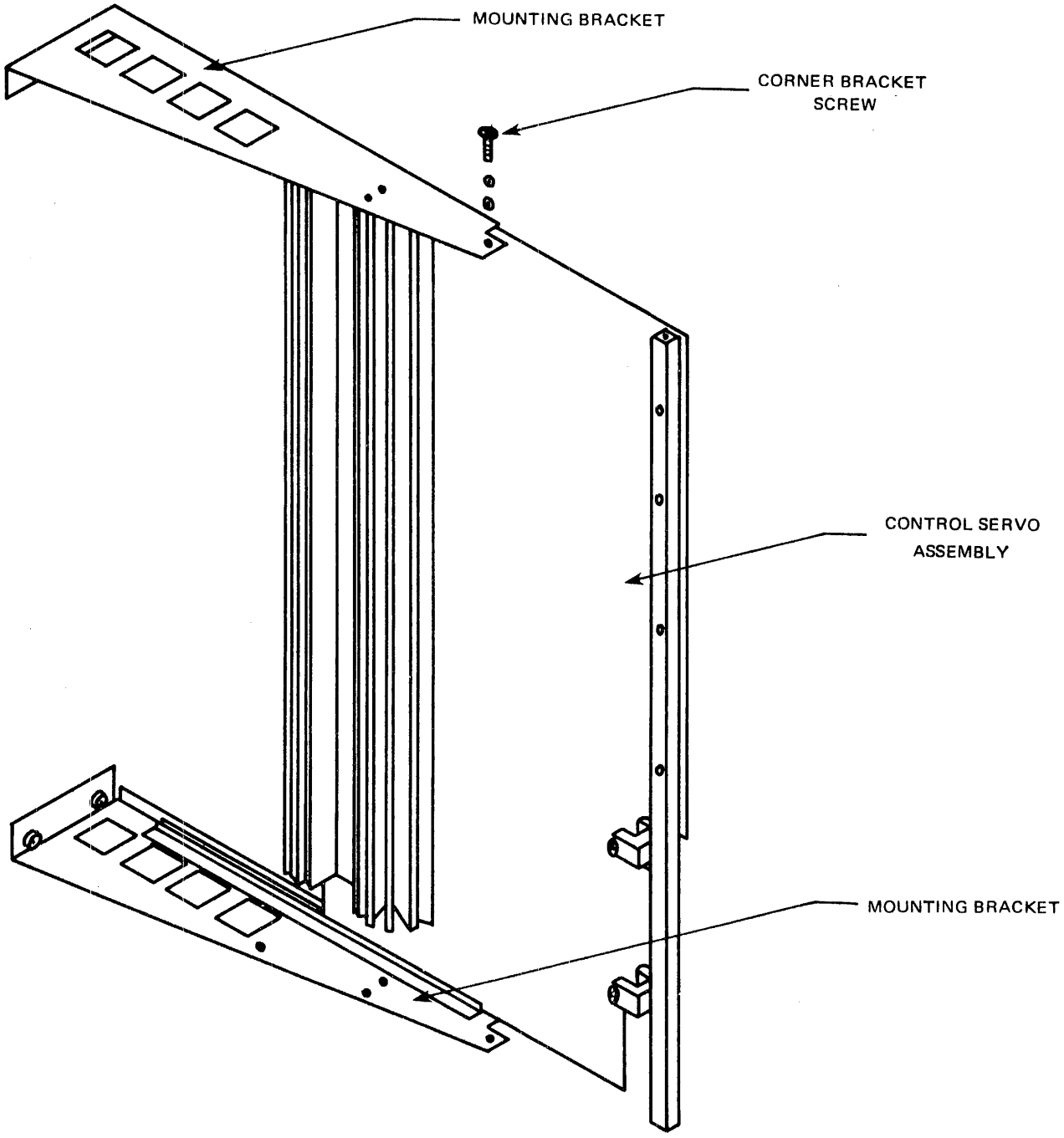


Figure 5-8. Control/Servo Board Removal

a. Remove two screws securing data PWB to hinged standoffs.

b. Swing PWB out on standoff hinges, and carefully remove head connectors and power/signal cable.

c. Support PWB, and remove two screws securing board to hinged standoffs.

d. Replace PWB in reverse sequence of removal.

e. Adjust new data PWB in accordance with paragraphs 5-46 through 5-52.

5-30. FILE PROTECT SENSOR. The complete file protect sensor is built and tested as an assembly and must be replaced as such. Removal and replacement procedures are as follows:

a. Unplug electrical connector from control/servo PWB.

b. Remove two screws securing sensor brackets and one screw securing cable clamp. Carefully pull cable and connector through hole provided in top plate casting.

c. Install replacement sensor in reverse order of removal. Adjust sensor-to-file protect ring distance to 0.100 inch. No electrical adjustments are required.

5-31. VACUUM COLUMN SENSE CAPACITORS. The vacuum column sense capacitors are supplied as a pair. The assembly includes the floor of the vacuum column chamber, to which the capacitors are bonded. Replace the complete assembly as follows:

NOTE

Assembly consisting of column chamber floor and sense capacitors can be returned to factory for repair at nominal charge.

a. Unplug two cables from control/servo PWB. Remove connector bodies from cable using Molex Tool Part No. HT-2038.

b. Loosen two press-lock fasteners, and open vacuum column door.

c. Remove screws securing vacuum column walls. Remove column walls and shims, and save shims.

d. Lift floor/capacitor assembly carefully from top plate, taking care not to damage capstan sleeve. Feed sense capacitor cables through rubber grommets and remove complete assembly.

e. Install replacement floor/capacitor assembly in reverse order of removal. Route capacitor cables carefully to

avoid pinching or other damage. Replace any shims removed in steps c and d.

f. Before tightening screws securing vacuum column walls, make sure walls do not touch capstan sleeve or tape guides. Door should close smoothly and not bind against capstan sleeve or guides.

g. Insert cable contacts into connector housings, as shown in Top Assembly Drawing No. 154000-001 (Section VII), and plug connectors into control/servo PWB.

h. Adjust control/servo PWB as specified in paragraph 5-53.

5-32. TAPE PATH ALIGNMENT. Referring to Figure 5-9, align the tape path in accordance with the following procedure:

a. Remove facade, head cover, and EOT/BOT cover.

b. Adjust takeup and supply reel hubs to proper heights, as shown in Figure 5-3.

c. Mount reel of tape, thread transport, and load tape. Before running tape, adjust EOT/BOT reflector parallel to and approximately 1/32 inch from tape. Adjust EOT/BOT sensor 0.150 inch from tape.

d. Run tape forward and reverse, and adjust reel hub height as required to center tape on reels.

e. Run tape forward for approximately half of reel. Run tape in reverse, and observe position of tape on capstan sleeve.

f. Stop tape and adjust height of capstan sleeve in accordance with paragraph 5-21 so that tape is centered on sleeve when running in reverse direction.

g. Run tape alternately forward and reverse, and observe tape position on capstan sleeve. Tape position should not shift when direction of tape travel is changed.

h. If tape shift is observed, capstan motor tilt must be adjusted. If tape moves away from top plate when running forward, capstan sleeve must be tilted away from head and guides. To tilt sleeve, use setscrew working in opposition to capstan motor mounting screw farthest from head and guides. Slightly loosen capstan motor mounting screw nearest setscrew, and tighten setscrew approximately one-eighth turn. Tighten mounting screw and run tape forward and reverse, watching for tape shift. Adjustment is correct when no shift is visible when tape direction is changed and all screws are securely tightened.

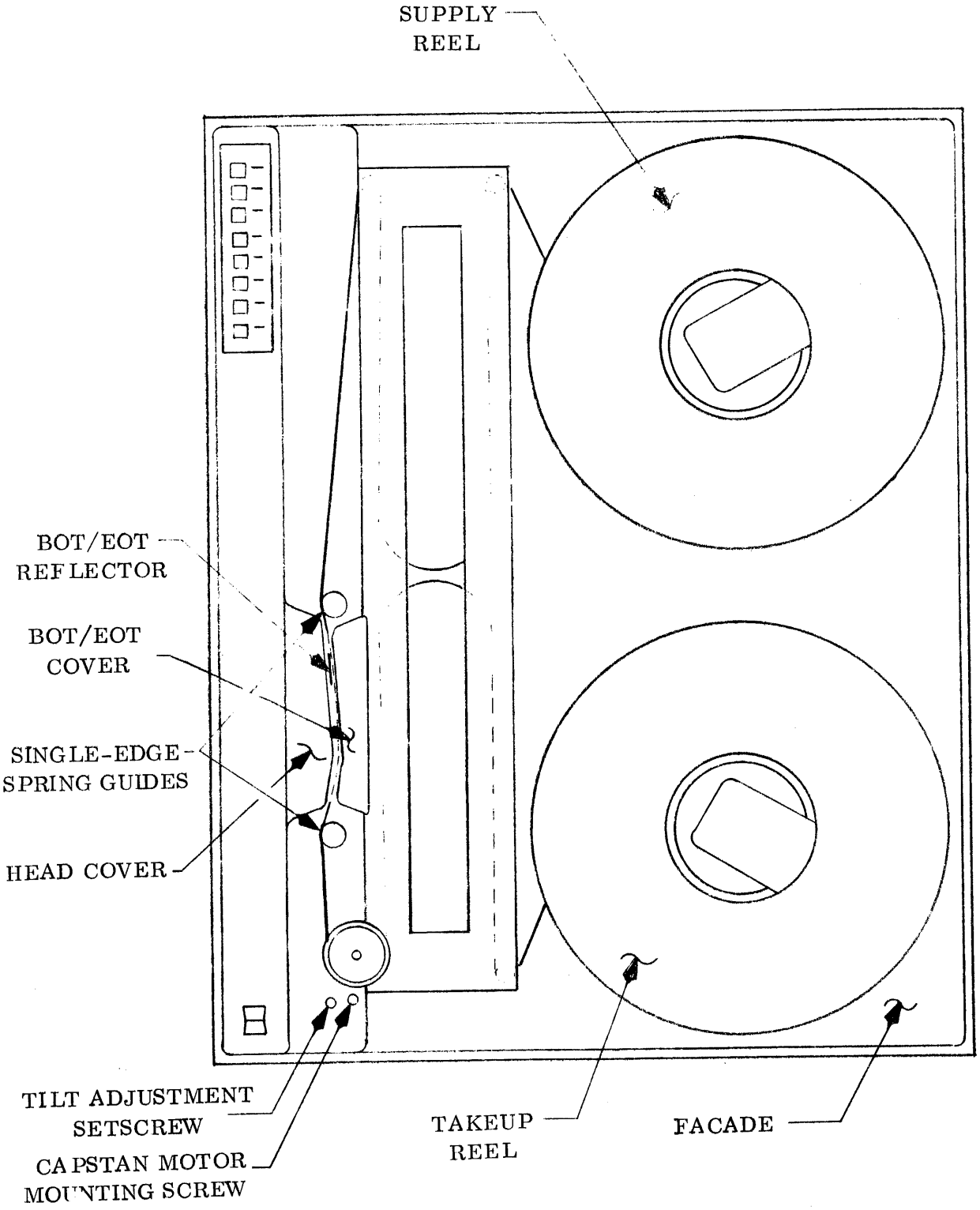


Figure 5-9. Tape Path Alignment

i. If tape moves toward top plate when running forward, capstan sleeve must be tilted toward head and guides. Loosen capstan motor mounting screw nearest setscrew, and loosen setscrew approximately one-eighth turn. Tighten mounting screw and run tape forward and reverse, watching for tape shift. Adjustment is correct when no shift is visible when tape direction is changed and all screws are securely tightened.

j. Run tape forward and reverse, and verify that tape is centered on reels and on capstan sleeve and that it does not shift or curl on any of tape guides or rollers.

k. Mount prerecorded master skew tape on transport and adjust head azimuth as outlined in paragraphs 5-49 through 5-51. Total skew (static and dynamic) must be less than 10% of a byte space in both forward and reverse directions of tape travel.

l. Reinstall facade, head cover, and EOT/BOT cover.

5-33. REMOVAL AND REPLACEMENT OF ELECTRONIC PARTS AND COMPONENTS

5-34. Replacement parts and components should be selected from the parts list in Section VII. Use standard tools and procedures in removing and installing parts, with the assistance of the drawings in Section VII. Observe the following special procedures in removing parts from and installing them on printed circuit boards:

CAUTION

To prevent excessive heat from damaging printed circuit boards and components, especially semiconductors, use a soldering iron rated at not more than 40 watts or 600°F, and do not heat solder for more than 10 seconds. When soldering, always use heat sink (alligator clip, long-nose pliers, etc.).

a. Use only 60-40 tin-lead solder with noncorrosive, nonconducting flux. Use alcohol or commercial flux-removing solvent to remove flux residue.

b. After component has been removed from board, clean all solder from connections (plated-through holes) with commercial solder sucker (Soldapullt desoldering tool, Edsyn Co., or equivalent).

c. Use only exact replacement parts. (Refer to Section VII).

d. Do not alter wiring or layout.

5-35. MULTIPLE-LEAD COMPONENTS. Follow instructions presented in paragraph 5-34 for removal of a defective two- or three-lead component. Bend the leads on the replacement component to the proper shape and install. Heat may be applied to either side of the printed circuit board, as necessary.

5-36. MULTIPLE-PIN COMPONENTS. The following special instructions apply to the removal and replacement of multiple-pin components, including integrated circuits:

CAUTION

Exercise great care in the removal of multiple-pin components from printed circuit boards to avoid damage to boards.

a. Remove defective component by carefully cutting each lead close to component, using jeweler-type diagonal cutter.

b. Remove lead ends and solder from holes in board in accordance with instructions in paragraph 5-34.

c. Straighten leads in replacement component for insertion in board and install.

5-37. POWER SUPPLY CHECKS AND ADJUSTMENTS

5-38. UNREGULATED VOLTAGE CHECKS. Check unregulated voltages on the power regulation portion of the control/servo PWB. Required values and tolerances are presented in Table 5-2.

NOTE

In checking voltages, ensure that input line voltage is set to the correct value (paragraph 5-8).

VOLTAGE TERMINAL	RETURN TERMINAL	REQUIRED READING
J14-4	J14-2	+48(±15%)V
TP54	TP42-49 (all grounds)	$+15(^{+2.0}_{-1.0})$V

Table 5-2. Power Supply Unregulated Voltages

5-39. REGULATED POWER SUPPLY ADJUSTMENTS. The potentiometer used for this adjustment is located on the power regulator portion of the control/servo PWB. Test point locations are shown in Figure 5-10. Referring to Table 5-3, for each of the power supplies listed measure voltage across the test points shown.

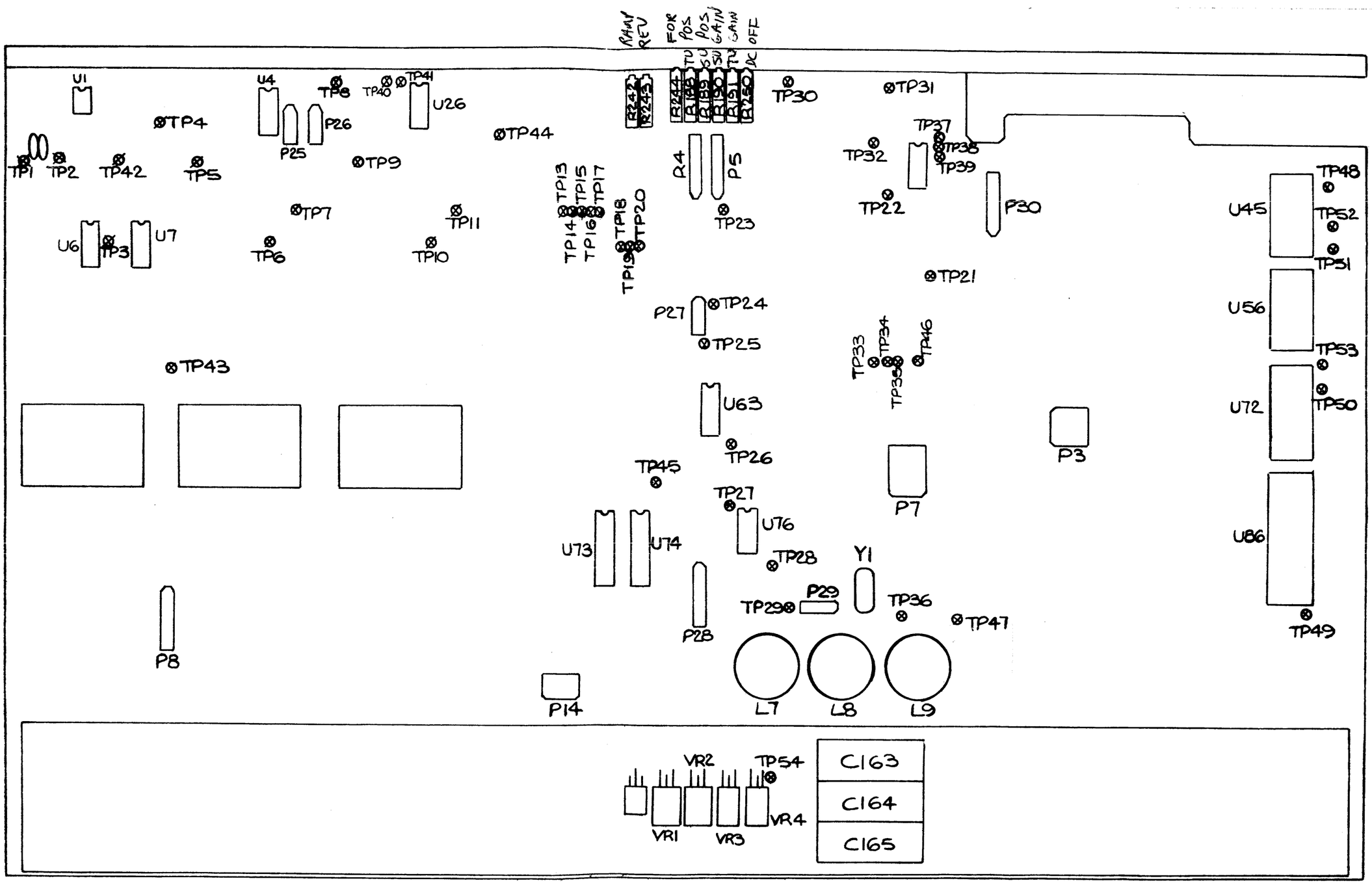


Figure 5-10. Control/Servo PWB Test Point Chart

SUPPLY	TEST POINT	RETURN TEST POINT	ADJUSTMENT POT	REQUIRED READING
+5V	TP50	TP42 - 49	R367	+5(±0.05)V
+12V	TP52	TP42 - 49	—	+12(±0.5)V
-12V	TP53	TP42 - 49	—	-12(±0.5)V
-5V	TP51	TP42 - 49	—	-5(±0.25)V
+12V	J7-9	TP42 - 49	—	+12(±0.5)V
-12V	J7-6	TP42 - 49	—	-12(±0.5)V

Table 5-3. Power Supply Regulated Voltages

5-40. CAPSTAN SERVO ADJUSTMENTS

5-41. DC OFFSET ADJUSTMENT. Connect a digital voltmeter to pins 1 and 2 of connector P8, and adjust potentiometer R250, on the control/servo PWB (Figure 5-10), for 0(±0.05) Vdc.

5-42. COARSE SPEED ADJUSTMENT. Make a coarse adjustment of speed in accordance with the following procedure:

a. Monitor voltage at TP27, located on capstan servo portion of control/servo board. (See Figure 5-10 for location of test points.)

b. With transport in off-line mode (ON LINE indicator not illuminated), depress FWD pushbutton.

c. Adjust forward potentiometer R244 until voltage at TP27 is approximately +1.5 Vdc at a speed of 75 ips.

d. Depress FWD pushbutton to stop tape motion, then depress REV pushbutton.

e. Adjust reverse potentiometer R243 until voltage at TP27 is approximately -1.5 Vdc for speed of 75 ips.

f. Depress REV pushbutton to stop tape motion.

5-43. FINE ADJUSTMENT PROCEDURE. If desired, a speed adjustment with an accuracy of 2% can be obtained with the use of the strobe disc (Figure 5-11) mounted on the capstan. (If not included on the transport, order Cipher Part No. 754010-601.) With the transport in off-line mode, depress the FWD pushbutton. Adjust forward potentiometer R244 until the strobe disc appears to be motionless (outside lines for 60 Hz, inside lines for 50 Hz). To adjust reverse speed, use the same procedure, but depress the REV push-button and adjust using reverse potentiometer R243.

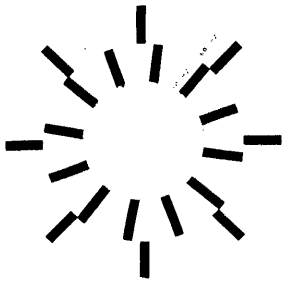


Figure 5-11. Strobe Disc

5-44. ALTERNATE FORWARD AND REVERSE FINE SPEED ADJUSTMENTS. Measure and make a fine adjustment of tape speed as follows:

a. Load known-density master skew tape on transport. Connect counter to TP10 on dual-mode data board (Figure 5-12).

b. With transport in off-line mode (ON LINE indicator not illuminated) depress FWD pushbutton and adjust counter to trigger on negative-going edge of data pulse.

c. Adjust forward speed control potentiometer R244 on capstan servo portion of control/servo board to obtain appropriate data rate of 60K (at 800 bpi, 75 ips).

d. Depress FWD pushbutton to stop tape motion.

e. Depress REV pushbutton.

f. Adjust reverse speed control potentiometer R243 to obtain appropriate data rate in step c.

g. Depress REV pushbutton to stop tape motion.

h. Readjust ramp time in accordance with paragraph 5-45.

5-45. RAMP ADJUSTMENT. This adjustment is to be made while starting and stopping the tape motion and observing the ramp in both forward and reverse modes. This can be done with the transport on line while writing blocks of data or off line by using the autocycle test mode (paragraph 6-5).

a. Use oscilloscope to monitor ramp tachometer test point TP27 on control/servo board with respect to ground.

b. Trigger oscilloscope with run command at TP27.

c. Adjust ramp potentiometer R242 to obtain ramp time of 4.5 ms at 75 ips. (See Figure 5-13.)

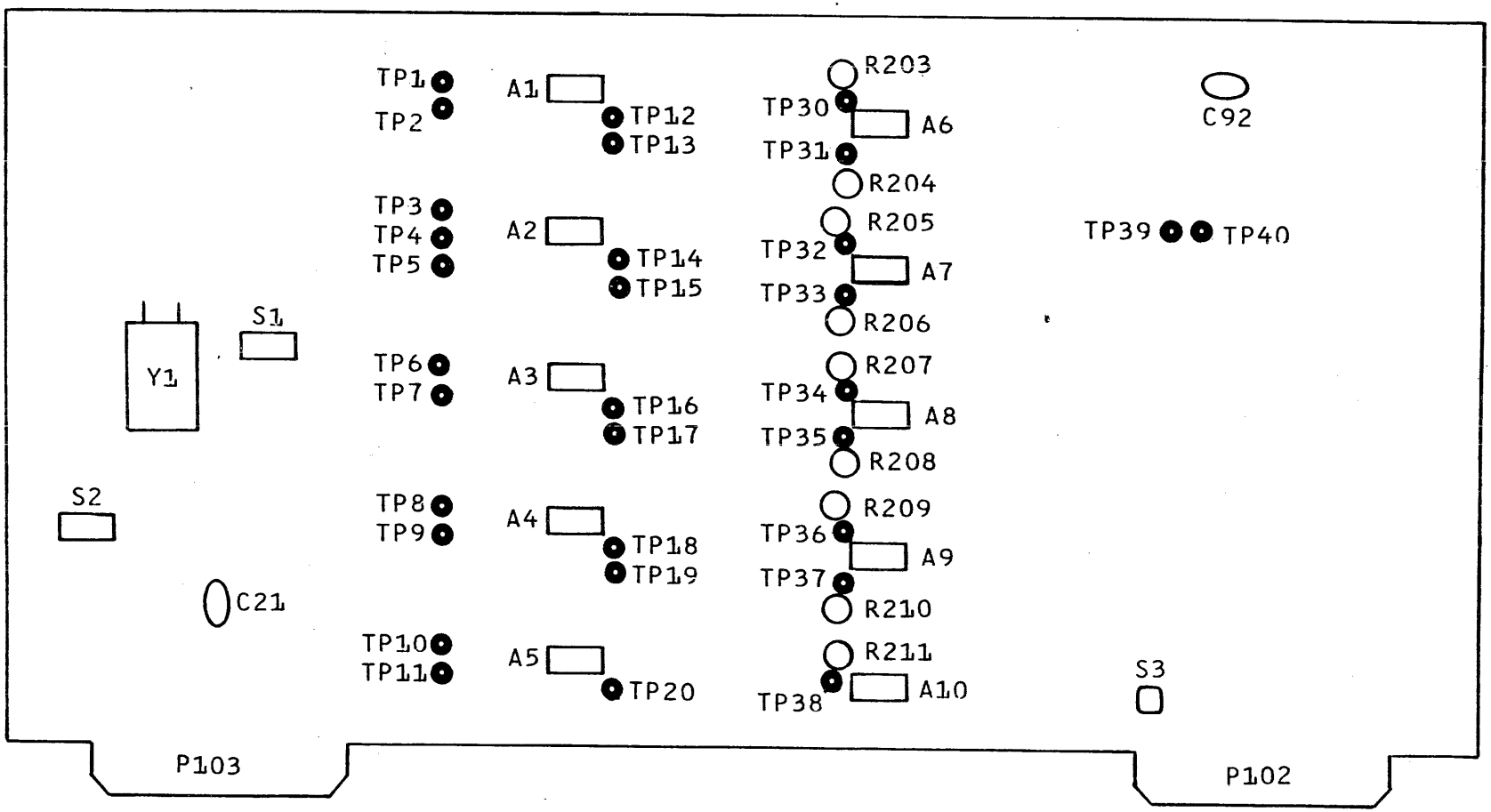


Figure 5-12. Locations of Test Points, Pots, Headers, and Switches

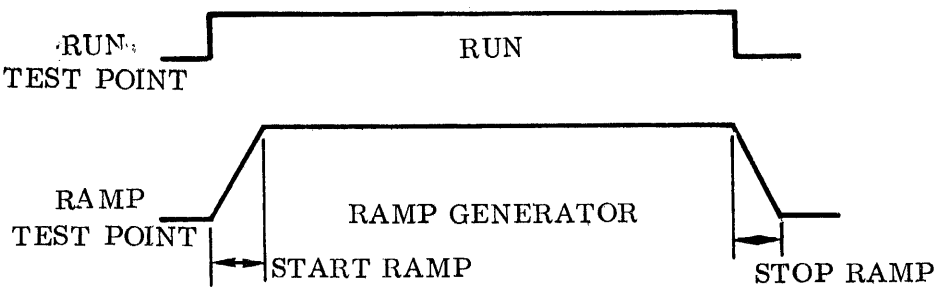


Figure 5-13. Ramp Adjustment Trace

5-46. READ AMPLIFIER ADJUSTMENTS

5-47. INITIAL SWITCH SETTINGS. Refer to Tables 5-4 and 5-5 for all switch settings and functions. Before making adjustments described in the following paragraphs, set the switches initially to the following positions:

a. Switch 1, positions 1 and 2: both closed.

b. Switch 1, positions 3 and 4: see Table 5-4 for settings at transport tape speed.

c. Switch 1, positions 5 through 8: all open.

d. Switch 2, positions 1 through 3: all open.

e. Switch 2, position 4: closed.

f. Switch 2, position 5: open.

g. Switch 2, positions 6 and 7: see Table 5-5.

h. Switch 3, position 1: open.

i. Switch 3, positions 2 through 4: see Table 5-5.

CAUTION

With switch 1, position 8 closed, all tapes will be write enabled. Ensure that this switch is open when test tape or other recorded tape is on transport to prevent erasure.

NOTE

Switch 3, positions 3 and 4, must be closed.

TAPE SPEED (ips)	CRYSTAL FREQUENCY (MHz)	SWITCH 1	
		Position 3	Position 4
12.5	1.280	Open	Closed
18.75	1.920	Open	Closed
25.0	1.280	Closed	Open
37.5	3.840	Open	Closed
45.0	4.608	Open	Closed
75.0	3.840	Closed	Open
90	4.608	Closed	Open
125	6.400	Closed	Open

Table 5-4. Tape Speed Crystal Frequencies and Switch 1 Settings

5-48. NRZI READ GAIN ADJUSTMENTS. Adjust read gain as follows:

a. Change switch settings as follows:

(1) Switch 1, position 6: closed.

(2) Switch 1, position 8: closed.

(3) Switch 2, position 1: closed.

(4) Switch 2, position 2: closed.

b. If HI DEN indicator is illuminated, actuate pushbutton to obtain low density (indicator extinguished).

c. Start writing all-1's record by depressing FWD pushbutton (indicator illuminated).

d. Referring to Figure 5-12, connect oscilloscope to TP30 and ground.

e. Adjust gain potentiometer R203 to obtain 8-volt reading (peak-to-peak) on oscilloscope. This adjusts gain for Channel P.

f. Repeat for Channels 0 through 7, using TP31 through TP38 and R204 through R211, respectively.

5-49. NRZI WRITE SKEW VERIFICATION. Check NRZI write skew as follows:

a. Close position 7 of switch 1.

b. Connect oscilloscope to TP10.

c. Proper waveform is shown in Figure 5-14.

SWITCH	POSITION		FUNCTION
1	1	2	
	Open	Open	Skew Gate = 12%
	Open	Closed	Skew Gate = 25%
	Closed	Open	Skew Gate = 37%
	Closed	Closed	Skew Gate = 50%
	3	4	
	Closed	Open	Running Freq. = Crystal Frequency
	Open	Closed	Running Freq. = 1/2 Crystal Frequency
	5 Closed		Write PE (3200 fci) in test mode
	6 Closed		Write NRZI (800 fci) in test mode
	7 Closed		To view skew at TP10 in skew test
	8 Closed		Write PE or NRZI in test mode; all tapes write enabled, file protect inoperative.
2	1 Closed		Selects transport
	2 Closed		Selects NRZI mode only
	3 Closed		Selects PE mode only
	4	5	
	Open	Open	Low threshold detect
	Closed	Open	Normal threshold detect
	Closed	Closed	High threshold detect
	6	7	
	Open	Open	Low Density
	Open	Closed	Remote density select
	Closed	Closed	High Density

Table 5-5. Switch Settings for Testing and Options

SWITCH	POSITION	FUNCTION
3	1 Closed	Enables write reset (WRT, P20-2) on control/servo or control/power PWB
	2 Closed	Enables higher write current (with head P/N 799010-601 only)
	3 and 4 Open	Enables 12V regulators on Models 70X, 80X, and 100X
	3 and 4 Closed	For use with Model 900X only

Table 5-5. Switch Settings for Testing and Options (Continued)

5-50. PHASE-ENCODE SKEW VERIFICATION. Check PE skew as follows:

a. Make the following changes in switch positions:
   (1) Switch 1, position 5: closed.
   (2) Switch 1, position 6: open.
   (3) Switch 1, position 7: open.
   (4) Switch 2, position 2: open.
   (5) Switch 2, position 3: closed.

b. If HI DEN indicator is extinguished, actuate push-button to obtain high density (indicator illuminated).

c. Start writing all-1's tape by actuating FWD pushbutton/indicator (indicator illuminated).

d. Verify 4-volt reading (peak-to-peak) at TP30 through TP38.

5-51. HEAD AZIMUTH ADJUSTMENT. Adjust read skew as follows:

a. Return all switches to initial settings (paragraph 5-47).

b. Close switch 1, position 7, and switch 2, positions 1 and 2.

c. Load and tension 800-bpi master skew tape.

d. Connect oscilloscope to TP10 on data board (Figure 5-12) and ground.

e. With transport in off-line, low-density mode (ON LINE and HI DEN indicators extinguished), depress FORWARD pushbutton.

f. Adjust azimuth screws (Figure 5-5) on head mounting plate so that outputs of all tracks, as monitored at TP10, fall within 10% or less of byte-to-byte period (Figure 5-14). Outer azimuth screw bears against transport mounting plate and pivots head assembly outward. Inner azimuth screw threads into transport mounting plate and pulls head assembly inward. Inner screw also serves to lock adjustment.

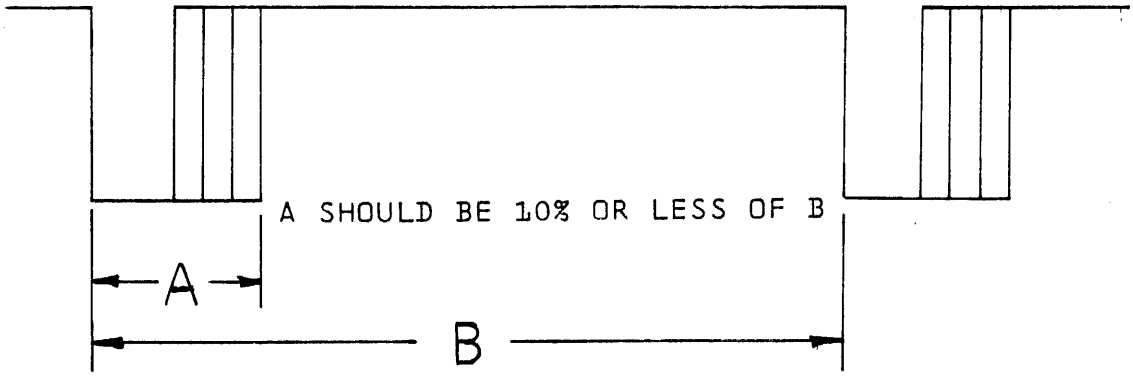


Figure 5-14. Skew Pulse at TP10

5-52. Return PWB to normal operating mode by setting all switch positions in accordance with paragraph 5-47.

5-53. CAPACITIVE TRANSDUCER ALIGNMENT

5-54. This alignment procedure requires the use of the diagnostic test procedure described in Section VI, paragraphs 6-6 through 6-15. Align the capacitive transducers as follows:

a. Cut piece of ½-inch masking tape approximate length of vacuum column and place alongside glass window in front of vacuum column as template as shown in Figure 5-15. Make pencil marks on masking tape, as in Figure 5-15, 1 inch from top and bottom of supply capacitive transducer (metallic strip in column floor in top half of column) and at center of transducer, approximately 3 inches from the top and bottom marks. Make same markings for takeup transducer, in bottom half of column.

NOTE

Diagnostic test programs 4 through 7 are used in this alignment procedure, and the diagnostic test procedure must be sequenced through test programs 1 through 3 to access 4. See paragraphs 6-6 through 6-15.

b. Using diagnostic test program 4, load reel of tape on transport.

c. Increment test diagnostic to test program 5 by pressing LOAD pushbutton once. LOAD and REWIND indicators will illuminate.

NOTE

No reel motor drive is supplied in this test. Restraining takeup and supply reels against force of vacuum in column, allow reels to turn slowly, supplying tape in both columns until curved tape loops are opposite center marks on masking tape. Hold tape at these points by placing strip of 2 or 3-inch masking tape across near edges of both reels.

d. Adjust zero-adjustment potentiometers R189 (supply servo) and R188 (takeup servo) on control/servo PWB (Figure 5-10) until REV and TEST lamps, respectively, change state (illuminate if previously extinguished or vice versa). Adjustments are correct at these points.

e. Press LOAD pushbutton to increment test diagnostic to test program 6 (REWIND and ON LINE indicators illuminated). This test is used to adjust supply and takeup servo gains for forward tape motion.

f. Move tape to 1-inch mark at top of supply transducer column and to 1-inch mark at top of takeup transducer column. Adjust potentiometer R190 for supply servo gain and R191 for takeup gain until TEST and REV lamps change state. Note positions of potentiometers.

g. Press LOAD pushbutton to increment test diagnostic to test program 7 (LOAD, ON LINE, and REWIND indicators illuminated). This program is used to set gain adjustment potentiometers for reverse tape motion.

h. Move tape to bottom 1-inch mark in supply transducer column and to bottom 1-inch mark in takeup transducer column. Adjust potentiometers as in step f, noting positions of potentiometers.

i. Check adjustments by operating transport in both forward and reverse directions. Readjust gain potentiometers to positions halfway between those noted in steps f and h.

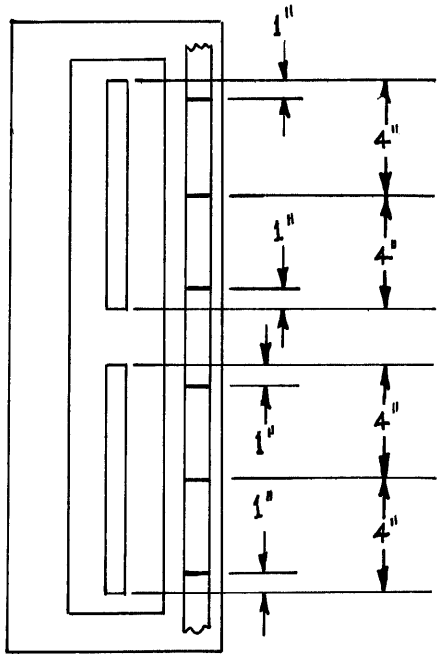


Figure 5-15. Transducer Alignment Measurements

5-55. PROGRAMMING WRITE DESKEW PROM

5-56. Inscribed on the tape head of the Cipher Model 900X transport is an eight-digit code number which describes the deskew pattern to be programmed into the write deskew PROM (U90, Drawing No. 154040-009) to implement a write deskew pattern on the dual-mode data PWB for that head. The position of each digit in the code corresponds to a head channel number, starting with channel 7 on the left, to channel 0 on the right. The one exception is that position 2 of the code corresponds to channel P (parity). Channel 2 is the reference channel. The numerical value of each digit of the code corresponds to the address of its channel for which a 0 must be programmed into the PROM.

5-57. Tables 5-6, 5-7, and 5-8 are illustrative examples of bit maps of programmed PROMs required for three different hypothetical head codings. Column heading numbers correspond to head channel numbers (except for 2). Each 1 in the tables represents a logic high, and each 0 represents a logic low. Note that there is one and only one 0 in each bit column and that there are no 0's from address 10 to address 1F. There may be none, one, or more than one 0's in each of addresses (rows) 00 through 0F.

5-58. PROCEDURE. To program a PROM with a specific code, proceed as follows:

a. Obtain unprogrammed PROM, Cipher Part No. 203565-123 (82S123 or equivalent).

b. Note code on tape head with which PROM is to be used.

c. Program PROM in accordance with manufacturer's specifications to obtain logic lows at address/bit locations indicated by code and logic highs at all other locations.

NOTE

Most PROM distributors are equipped to program PROMS.

ADDRESS	BIT LOCATION 7	6	5	4	3	2	1	0
00	1	1	1	1	1	1	1	1
01	1	1	1	1	1	1	1	1
02	0	1	1	1	1	1	1	1
03	1	0	1	1	1	1	1	1
04	1	1	0	1	1	1	1	1
05	1	1	1	0	1	1	1	1
06	1	1	1	1	0	1	1	1
07	1	1	1	1	1	0	1	1
08	1	1	1	1	1	1	0	1
09	1	1	1	1	1	1	1	0
0A	1	1	1	1	1	1	1	1
0B	1	1	1	1	1	1	1	1
0C	1	1	1	1	1	1	1	1
0D	1	1	1	1	1	1	1	1
0E	1	1	1	1	1	1	1	1
0F	1	1	1	1	1	1	1	1
10	1	1	1	1	1	1	1	1
11	1	1	1	1	1	1	1	1
12	1	1	1	1	1	1	1	1
13	1	1	1	1	1	1	1	1
14	1	1	1	1	1	1	1	1
15	1	1	1	1	1	1	1	1
16	1	1	1	1	1	1	1	1
17	1	1	1	1	1	1	1	1
18	1	1	1	1	1	1	1	1
19	1	1	1	1	1	1	1	1
1A	1	1	1	1	1	1	1	1
1B	1	1	1	1	1	1	1	1
1C	1	1	1	1	1	1	1	1
1D	1	1	1	1	1	1	1	1
1E	1	1	1	1	1	1	1	1
1F	1	1	1	1	1	1	1	1

Table 5-6. Bit Map, Code 23456789

ADDRESS	BIT LOCATION 7	6	5	4	3	2	1	0
00	1	1	1	1	1	1	1	1
01	1	1	1	1	1	1	1	1
02	1	1	1	1	1	1	1	1
03	1	1	1	1	1	1	1	1
04	1	1	1	1	1	1	1	1
05	1	1	1	1	1	1	1	1
06	1	1	1	1	1	1	1	1
07	0	0	0	0	0	0	0	0
08	1	1	1	1	1	1	1	1
09	1	1	1	1	1	1	1	1
0A	1	1	1	1	1	1	1	1
0B	1	1	1	1	1	1	1	1
0C	1	1	1	1	1	1	1	1
0D	1	1	1	1	1	1	1	1
0E	1	1	1	1	1	1	1	1
0F	1	1	1	1	1	1	1	1
10	1	1	1	1	1	1	1	1
11	1	1	1	1	1	1	1	1
12	1	1	1	1	1	1	1	1
13	1	1	1	1	1	1	1	1
14	1	1	1	1	1	1	1	1
15	1	1	1	1	1	1	1	1
16	1	1	1	1	1	1	1	1
17	1	1	1	1	1	1	1	1
18	1	1	1	1	1	1	1	1
19	1	1	1	1	1	1	1	1
1A	1	1	1	1	1	1	1	1
1B	1	1	1	1	1	1	1	1
1C	1	1	1	1	1	1	1	1
1D	1	1	1	1	1	1	1	1
1E	1	1	1	1	1	1	1	1
1F	1	1	1	1	1	1	1	1

Table 5-7. Bit Map, Code 77777777

ADDRESS	BIT LOCATION 7	6	5	4	3	2	1	0
00	1	1	1	1	1	1	1	1
01	1	1	1	1	1	1	1	1
02	1	1	1	1	1	1	1	1
03	1	1	1	1	1	1	1	1
04	1	1	1	1	1	1	1	1
05	1	1	1	1	1	1	1	1
06	0	1	1	1	1	1	1	1
07	1	0	1	1	1	1	1	0
08	1	1	0	1	1	1	0	1
09	1	1	1	0	1	0	1	1
0A	1	1	1	1	0	1	1	1
0B	1	1	1	1	1	1	1	1
0C	1	1	1	1	1	1	1	1
0D	1	1	1	1	1	1	1	1
0E	1	1	1	1	1	1	1	1
0F	1	1	1	1	1	1	1	1
10	1	1	1	1	1	1	1	1
11	1	1	1	1	1	1	1	1
12	1	1	1	1	1	1	1	1
13	1	1	1	1	1	1	1	1
14	1	1	1	1	1	1	1	1
15	1	1	1	1	1	1	1	1
16	1	1	1	1	1	1	1	1
17	1	1	1	1	1	1	1	1
18	1	1	1	1	1	1	1	1
19	1	1	1	1	1	1	1	1
1A	1	1	1	1	1	1	1	1
1B	1	1	1	1	1	1	1	1
1C	1	1	1	1	1	1	1	1
1D	1	1	1	1	1	1	1	1
1E	1	1	1	1	1	1	1	1
1F	1	1	1	1	1	1	1	1

Table 5-8. Bit Map, Code 6789A987

SECTION VI

TESTING AND TROUBLESHOOTING

6-1. TESTING

6-2. The Model 900X transport incorporates three separate types of internal testing facilities. These self-test and diagnostic systems detect certain fault conditions and provide alignment and test aids for preventive maintenance, all of them using built-in test controls at the operator control panel.

6-3. SELF TEST. During power-up operation, all indicator lights on the control panel will be illuminated for approximately 1 second. If all indicators are extinguished except LOAD following this period of time, no defect is indicated. If all indicators remain illuminated, a defect in the PROM, timer, or microprocessor is indicated. If all indicators but LOAD are illuminated, a defective RAM is indicated.

6-4. TEST MODE OPERATION. Off-line operation of the Model 900X in the test mode facilitates exercising of the transport for maintenance purposes without the use of an external text exerciser. The test mode, used primarily to set up and verify proper operation of the transport, is accessed by powering up the transport and loading a reel of tape.

6-5. Referring to Figure 3-1, which illustrates the controls and indicators of the Model 900X, the test modes, switch sequences for activating each mode, functions performed, and tests being made in each mode are as follows:

a. Press TEST and FWD pushbuttons momentarily. Transport performs alternate forward and stop operations to permit adjustment of start/stop ramp times. (See paragraph 5-35 for adjustment procedure.) To terminate test, press FWD pushbutton momentarily. FWD indicator is extinguished, and transport comes to stop.

b. Press REV pushbutton momentarily. Transport performs alternate reverse and stop functions to check start/stop ramp times. (See paragraph 5-35.) Press REV pushbutton momentarily to terminate.

c. Press FWD and REV pushbuttons momentarily while in TEST mode. Tape moves forward two unit times and reverse one unit time, continuing until EOT. Transport will then

perform rewind operation and continue forward and reverse operations. Purpose of this test is to check operation of servos. Reel hubs and capstan should operate simultaneously, starting, stopping, and turning in same direction.

6-6. DIAGNOSTIC MODE. The diagnostic mode is a more extensive mode of testing than the test mode. It is designed to aid troubleshooting by helping to locate and isolate fault conditions.

6-7. Referring to Figure 3-1, the upper three indicators on the control panel indicate, by base eight arithmetic, the number of the test being performed. Each of these, when illuminated, contributes its value to a number indicating the number of the test. The value of LOAD is 1, ON LINE is 2, and REWIND is 4. For example, if ON LINE is the only one illuminated, the test is number 2; if all are illuminated, it is number 7, etc. The remaining indicators are used to confirm proper operation of most of the major circuits in the transport.

6-8. To access the diagnostic mode, switch transport power to ON with no tape on the transport. Press simultaneously pushbuttons TEST, FWD, and WRT EN and hold, then press and hold in the LOAD pushbutton for 2 to 3 seconds. The LOAD indicator illuminates, after a slight delay, when Test 1 is accessed.

6-9. Test 1. This test enables all three servos, sequencing the reel hubs and capstan clockwise and counterclockwise and testing about 85% of the servo circuitry. Any polarity reversal will be detected, since a servo whose polarity is reversed will cause its reel to rotate in the opposite direction of the capstan motor.

6-10. To terminate this test, press the LOAD pushbutton momentarily. The LOAD indicator will be extinguished, and ON LINE will illuminate, indicating Test 2.

6-11. Test 2. Only the supply servo is activated in this test. Its purpose is to check operation of the modulated file-protect, EOT, and BOT sensors and electronics. While the supply reel rotates in one direction, displays for the BOT, EOT, quadrature phase 0, and phase 1 appear on the TEST, REV, HI DEN, and FWD indicators, respectively. These displays and their meanings in this test are as follows:

a. TEST illuminated, BOT operative; TEST extinguished, BOT defective.

b. REV illuminated, EOT operative; REV extinguished, EOT defective.

c. HI DEN flashing, WRT EN extinguished, quadrature phase 0 (paragraph 4-102) O. K. HI DEN flashing, WRT EN illuminated, phase 0 electronics defective. HI DEN extinguished, phase 0 sensor defective.

d. FWD flashing, WRT EN extinguished, quadrature phase 1 O. K. FWD flashing, WRT EN illuminated, phase 1 electronics defective. REV extinguished, phase 1 sensor defective.

6-12. To terminate Test 2, depress the LOAD pushbutton momentarily. LOAD and ON LINE indicators illuminate, indicating Test 3.

6-13. Test 3. This test is for diagnostic and repair purposes only. The rewind capstan circuitry is activated, and the capstan ramps up in a clockwise (rewind) direction, stops, and repeats this procedure until the test is terminated. Momentary actuation of the LOAD pushbutton at this point will illuminate the REWIND indicator (LOAD and ON LINE extinguished), accessing Test 4.

6-14. Tests 4, 5, 6, and 7. At Test 4, all servos are disabled to permit loading of tape for Tests 5 through 7. Mount a reel of tape and momentarily depress the LOAD pushbutton, loading the transport, accessing Test 5, and illuminating LOAD and REWIND indicators.

6-15. Refer to paragraph 5-54 for adjustment procedures performed in Tests 5, 6, and 7.

6-16. TROUBLESHOOTING

6-17. Before performing any troubleshooting operation, the technician must have a good understanding of the theory of operation of the transport and any associated equipment. He should check carefully to ensure that all equipment is connected properly and that all associated equipment is in good operating condition. He should be thoroughly familiar with operating instructions and follow them carefully in performing the troubleshooting procedure.

6-18. PROCEDURE. While it is recognized that each individual malfunction will require its own specific troubleshooting procedure, the following steps will serve as guidelines in the performance of any such operation:

a. As first step, inspect entire unit visually for any signs of damaged or overheated components. Also, listen for unusual noises, while transport is operating, which may indicate mechanical malfunctions.

b. When a defective component is located, identify it by referring to Section VII for part number and/or value.

c. If replacement part is available, substitute it for suspected defective part.

NOTE

If correction of any malfunction involves major realignment of transport, it is recommended that unit be returned to Cipher Data Products for factory repair and adjustment.

6-19. COMMON PROBLEMS. Table 6-1 lists common problems associated with operation of a tape transport, together with the probable cause and remedy for each.

6-20. SYSTEM TROUBLESHOOTING. Table 6-2, used in conjunction with the schematic diagrams in Section VII, provides an aid in the isolation of electrical/electronic system faults and their remedies.

TROUBLE	PROBABLE CAUSE	REMEDY
Reel flanges scrape tape	Reels improperly mounted	Reinstall reel evenly (See Section III)
BOT and EOT markers not sensed	Dirt covering reflective strip or sensor	Clean sensor or reflective strip
	EOT/BOT sensor or logic	Replace EOT/BOT assembly; repair logic
Tape fails to pull properly through machine or spills	Improper tape threading	Rethread tape (See Section III)
Excessive data dropout	Dirt on head or damaged tape	Clean head (Section V) and/or install new certified computer tape
Recorder will not function at all	Defective fuse	Replace fuse
POWER switch-light does not illuminate	No primary power	Check for primary power
	Defective indicator lamp	Replace control/ indicator

Table 6-1. Common Problems

TROUBLE	PROBABLE CAUSE	REMEDY
Machine does not accept commands	Improper interface	Check interface with DTL logic and correct as necessary
	More than one command true simultaneously	Enable only desired command; hold other inputs high
Tape continues to advance during Load mode	No BOT marker on tape	Affix marker to tape approximately 12 ft. from physical beginning of tape; place marker near reference edge on backing side of tape
Tape tensioned but does not advance when capstan turns	Tape not threaded over capstan properly	Rethread tape (See Section III)
Tape tensioned but slips	Dirty capstan	Clean capstan in accordance with Section V
Tape moves during a stop condition	Defective capstan assembly	Replace capstan assembly and realign servo
	Motor voltage not zero	Check capstan servo and adjust for zero offset; repair if adjustment does not correct
Tape not tensioned or tape is spilled when Ready mode is set	Improper tape threading	See Section III
	Reel servo or motor malfunctioning	Replace motor or repair reel servo
Transport responds to write commands but tape is not written	Write current not enabled	Check for write enable enable ring on reel; check write current command path to tape head; check that read is not enabled
Computer does not read tapes correctly	Data format incorrect	Use correct format
	Record length exceeds computer memory capability	Use correct record length

Table 6-1. Common Problems (Continued)

TROUBLE	PROBABLE CAUSE	REMEDY
Tape runs past BOT marker	BOT tab dirty or tarnished	Replace tab
	Photosensor or amplifier defective	Replace or repair photosensor assembly
Transport does not move tape in response to FORWARD or REVERSE commands	Interface cable fault or receiver fault	Check levels at outputs and inputs of receivers on servo board; replace or repair cable or repair cable or repair servo board
	Transport not in Ready mode	Bring tape to load point (Section III)
	Fault in ramp generator or capstan servoamplifier	Repair servo board
Transport responds to remote FORWARD command, but tape is not written	Write current is not enabled	Check presence of write enable ring on supply reel; WRT EN indicator should be illuminated. Check for +5V at write current transistor on write board while writing; if not present, check for +5V, at power connector. Also check for +5V on servo board.
	WRITE ENABLE signal not correct	Check receiver on control/power board; check for $\overline{\text{RUN}}$ signal on read/write board; repair read/write or control/power board if faulty
	Write data or write data strobe not received correctly from interface	Check presence of correct levels on write portion of read/write board; repair write portion of read/write board or interface cable if faulty
	Heads not plugged in correctly	Check J21 on read/write board

Table 6-2. System Troubleshooting

TROUBLE	PROBABLE CAUSE	REMEDY
Data incorrectly written	Incorrect data format	Use correct format (See Section IV)
	Fault on one track due to failure in write circuits	Check receiver and write amplifier on write portion of read/write board; repair if faulty
	Intermittent +5, $\overline{\text{RUN}}$, or WARS	Examine signals and repair servo or read/write board, as required
	Write deskew circuit faulty	Check skew adjustments (See Section V)
	Head and guides need cleaning	Clean head and guides
	Tape cleaner needs emptying	Remove tape cleaner and clean
Tape cannot be read	Interface cable or transmitter faulty	Replace or repair interface cable or transmitter on read/write board
	Head not plugged in	Check J22 on read/write board
	Read skew out of adjustment	Readjust in accordance with Section V
	Head and guides need cleaning	Clean head and guides
	Tape cleaner needs emptying	Remove tape cleaner and clean
	Read amplifier gains incorrectly adjusted	Check and adjust amplifier gains
	Read data storage register faulty	Check read gate on read/write board; check that duration of positive section of waveform is one-half bit time
	Other component fault in read channel	Check test point data; repair read/write board

Table 6-2. System Troubleshooting (Continued)

SECTION VII

ENGINEERING DOCUMENTATION

Parts lists, schematic diagrams, and assembly drawings applicable to the Model 900X transport are presented in this section.

Cipher Data Products

PARTS LIST

CODE IDENT 32274 | PL 154005-001

TITLE: PWB ASSY - SWITCHES | MODEL NO. 900X | SH 1 OF 2 | REV E

DWN		2-10 78	LTR	DESCRIPTION	INC	DATE	APP	DATE	LTR	DESCRIPTION	INC	DATE	APP	DATE
CHK		3-16 78	A	ENGR REL	DS	3-17 78		3-17 78						
N/C	B. Crane	3-17 78	B	INCORP ECO 3673	CW	5-15-78		5-15 78						
MFG		3-17-78	C	INCORP ECO 3707	CW	5-15-78		5-15 78						
QC		3-17-78	D	INCORP ECO 3720	CW	5-15-78		5-15 78						
REL		3-78	E	INCORP ECO 3957	JW	7-10-78		7-10 78						

ITEM NO.	QUANTITY	CIPHER PART NO.	DESCRIPTION	VENDOR NO.	VENDOR	REFERENCE DESIGNATOR
REF	DWG	354005-301	SCHEM. - PWB SWITCHES		CIPHER	
1	1	754005-101	PWB - SWITCHES		CIPHER	
2						
3	60"	208500-032	CABLE-STRD, PVC, 4 COND	3203	ALPHA	
4	2"	208415-112	WIRE-STRD, IR PVC, 22AWG BLK	7131-2	ALPHA	
5	3"	210415	TUBING-SHRINK 3/8 BLK	HIX-3/8-UL	ICO RALLY	
6	7	210229-523	TY-RAP - 1/16 TO 5/8	TY-23M	T & B	
7	1	205067	CONN-HOUSING, 9 POSN	03-09-1093	MOLEX	J3
8	1	205014	TERM-MALE, 18-22AWG, .093 DIA, REEL	02-09-2116	MOLEX	PIN 1
9	8	205015	TERM-FEM, 14-20AWG, .093 DIA, REEL	02-09-1116	MOLEX	PINS 2-9
10	1"	210408-012	TUBING-SHRINK 3/16 BLK	HIX-3/16-UL	ICO RALLY	
11	8	210806-500	SWITCH-PUSHBUTTON, MOM.	RS5035	ROCD SWITCH	S1 THRU 8
12	1	203052-259	IC-MULTIPLEXER/3 STATE OUTPUT	SN74259	T.I.	U1
13	1	203052-251	IC-8 BIT, ADDRESSABLE LATCH	SN74LS251	T.I.	U2

Cipher Data Products

PARTS LIST

TITLE: PWB ASSY - SWITCHES

CODE IDENT: 32274 | PL: 154005-001 | MODEL: 900X | SH 2 OF 2 | REV: E

ITEM NO.	QUANTITY	CIPHER PART NO.	DESCRIPTION	VENDOR NO.	VENDOR	REFERENCE DESIGNATOR
14	1	205299	RESISTOR NETWORK-10K	899-1-R10K	BERMAN	U3
15						
16	8	212000-101	DIODE-LIGHT EMITING, RED	5082-4670	HEWLETT-PACK.	CR1 THRU 8
17	8	200072-220	RES.-F.C., 220 OHMS, 1/4W, 5%	RCR07G221JM	MIL-R-39008	R1 THRU 8
18	1	20149-470	CAP.-P.C. .047uf, 50V, 5%	RA2A473J	IMB	C1
19						
20	4	210032-100	STANDOFF-SWAGED 4-40X1/8	9531B-A-0440	AMATOM	
21						
22	1	210229-300	CLAMP, CABLE, 1/4 WHT	3304	HEYCO	
23						
24	1	206607-011	SCREW, PAN HD, PHIL	6-32 X 7/16		
25	1	207605-021	WASHER, FLAT	#6		
26	1	207602-011	WASHER, SPLIT	#6		
27	1	207607-051	NUT, HEX	#6		

Cipher Data Products

PARTS LIST

CODE IDENT 32274 | PL 159011-201

TITLE SWITCH ASSY-THUMBWHEEL | MODEL NO. 900X | SH 1 OF 1 | REV A

			LTR	DESCRIPTION	INC	DATE	APP	DATE	LTR	DESCRIPTION	INC	DATE	APP	DATE
DWN	[illegible]	9.2.77	A	PROD REL	DS	10/26/77	[illegible]	11/14/77						
CHK	[illegible]	11-2-77												
N/C	R. Crane	11/11/77												
MFG	[illegible]	11-7-77												
QC														
REL	WMD	11-77												

ITEM NO.	QUANTITY			CIPHER PART NO.	DESCRIPTION	VENDOR NO.	VENDOR	REFERENCE DESIGNATOR
1	1			211031-500	SWITCH-THUMBWHEEL	T-71	CHERRY	
2								
3	1			205076	CONN.-5 POSN	03-09-1052	MOLEX	J30
4								
5	2			205014	TERM.-MALE, .093 DIA, REEL	02-09-2116	MOLEX	PINS 1 & 3
6								
7	3			205015	TERM.-FEM, .093 DIA, REEL	02-09-1116	MOLEX	PINS 2, 4 & 5
8								
9	150"			208915-111	WIRE-STRD, 22 AWG, IR, PVC, WHT	7134-1* CSA/UL	ALPHA	UL 1430 XL PVC
10								
11	6			210229-523	TY-RAP 1/16 TO 5/8	TY-23M	T & B	

5071 A CDP

Cipher Data Products

PARTS LIST

CODE IDENT 32274 | PL 154019-301

TITLE: REFLECTOR ASSY | MODEL NO. 900X | SH 1 OF 1 | REV A

			LTR	DESCRIPTION	INC	DATE	APP	DATE	LTR	DESCRIPTION	INC	DATE	APP	DATE
DWN	D Stan	2-7-78												
CHK	MDL MB	3-16-78	A	ENGINEERING REL	DS	3-17-78	MB	3-17-78						
N/C	K. Crane	3/18/78												
MFG	DB	3-17-78												
QC	TM	3-17												
REL	WMB	3-78												

ITEM NO.	QUANTITY			CIPHER PART NO.	DESCRIPTION	VENDOR NO.	VENDOR	REFERENCE DESIGNATOR
1	1			754019-901	BRACKET-REFLECTOR		CIPHER	
2								
3	15"			209999-015	TAPE-REFLECTIVE	530	3M	
4								
5	AR			209999-030	INHIBISOL		PENETONE	

5071 A

Cipher Data Products

PARTS LIST

CODE IDENT 32274 | PL 154019-801

TITLE: VACUUM PUMP ASSY | MODEL NO. 900X | SH 1 OF 1 | REV E

			LTR	DESCRIPTION	INC	DATE	APP	DATE	LTR	DESCRIPTION	INC	DATE	APP	DATE
DWN	GYGAX	2-13-8	A	ENGR REL	DS	3-16 78		3-17 78						
CHK		3-16 78	B	INCORP ECO 3669	RA	5-24 78		5-24 78						
N/C		3/17/78	C	INCORP ECO 3817	RA	5-24 78		5-24 78						
MFG		3-17-78	D	INCORP ECO 4131	RA	9-1 78		9-1-8						
QC		3-17	E	INCORP ECO 4209	RA	9-13 78		9-14-8						
REL		3-18												

ITEM NO.	QUANTITY	CIPHER PART NO.	DESCRIPTION	VENDOR NO.	VENDOR	REFERENCE DESIGNATOR
1	1	799017-101	BLOWER-MOTOR DRIVEN		CIPHER.	
2						
3						
4	1	754019-501	AIR DEFLECTOR		CIPHER	
5	2	210555-032	TERMINAL-SLIRON .250 TAB	S05300F	HOLLINGSWORTH	
6	1½"	210T6	TUBING-SHRINK 1/2 BLK	HIX-½-UL	ICO RALLY	
7						
8						
9	3	210555-025	TERMINAL-RING #6 SM.PAT.	R1881S	HOLLINGSWORTH	
10	1	210229-516	TY-RAP 8"	PLT21	T&B	
11	AR	209990-700	PLASTIC ADHESIVE	4475	3M	

Cipher Data Products

PARTS LIST

CODE IDENT 32274 | PL 154019-901

TITLE COLUMN SIDE ASSY-LEFT | MODEL NO. 900X | SH 1 OF 1 | REV A

DWN	2-14-78	LTR	DESCRIPTION	INC	DATE	APP	DATE	LTR	DESCRIPTION	INC	DATE	APP	DATE
CHK	3-16-78	A	ENGINEERING REL	DS	3-17-78		3-17-78						
N/C R. Crane	3/17/78												
MFG	3-17-78												
QC	3-17												
REL	3-17-78												

ITEM NO.	QUANTITY			CIPHER PART NO.	DESCRIPTION	VENDOR NO.	VENDOR	REFERENCE DESIGNATOR
1	1			759031-101	SIDE-COLUMN LEFT		CIPHER	
2								
3	24"			209999-114	TAPE-CONDUCTIVE FLUORGLAS	2852-5	DODGE FLUORGLAS	
4								
5	AR			209999-030	INHIBISOL		PENETONE	

5071 A

Cipher Data Products

PARTS LIST

CODE IDENT 32274 | PL 154027-001

TITLE: DOOR ASSY-DUST COVER | MODEL NO. 900X | SH 1 OF 1 | REV A

DWN G BODDY	8-11 78	LTR	DESCRIPTION	INC	DATE	APP	DATE	LTR	DESCRIPTION	INC	DATE	APP	DATE
CHK	8-11 78	A	ENGR RELEASE	GB	8-11 78		8-11 78						
X1 N/C C.KRICKHUHN	8-15-78												
MFG	8-11 78												
QC	8-14-8												
REL													

ITEM NO.	QUANTITY	CIPHER PART NO.	DESCRIPTION	VENDOR NO.	VENDOR	REFERENCE DESIGNATOR
1	1	754027-101	DOOR-DUST COVER		CIPHER	
2						
3	1	754019-601	STIFFENER-DUST DOOR		CIPHER	
4	1	731920-900	LATCH-DUST DOOR		CIPHER	
5	2	799003-800	HINGE-FLAT 1 X 1		CIPHER	
6						
7	7'	211113-600	FOAM TAPE-FLAME RETARDANT	NS82N	BURNETT	
8						
9	5	206406-062	SCREW-BTN HD SKT	4-40 x 3/8 BLK		
10	2	206408-062	SCREW-BTN HD SKT	4-40 x 1/2 BLK		
11	4	206608-062	SCREW-BTN HD SKT	6-32 x 1/2 BLK		
12	2	207408-021	WASHER-FL, SM, OD	#4		

Cipher Data Products

PARTS LIST

CODE IDENT 32274 | PL 154031-501

TITLE: COVER ASSY - COLUMN | MODEL NO. 900X | SH 1 OF 1 | REV A

			LTR	DESCRIPTION	INC	DATE	APP	DATE	LTR	DESCRIPTION	INC	DATE	APP	DATE
DWN	gygay	2-1-78	A	ENG REL	DS	3-16-78		3-17-78						
CHK		3-16-78												
N/C	R. Crain	3/17/78												
MFG	DB	3-17-78												
QC		3-17												
REL	WMB	3-24												

ITEM NO.	QUANTITY			CIPHER PART NO.	DESCRIPTION	VENDOR NO.	VENDOR	REFERENCE DESIGNATOR
1	1			754031-201	COVER - COLUMN		CIPHER	
2								
3	1			754008-901	GLASS - COLUMN COVER		CIPHER	
4	2			713005-700	HINGE - DUST DOOR		CIPHER	
5								
6	2			205289-001	LATCH - GROMMET	HN4G-44-1	HARTWELL	
7	2			205289-002	LATCH - PLUNGER	HN4P-44-4-1	HARTWELL	
8								
9								
10	4			206404-062	SCREW-BTN HD SOC.	4-40 X 1/4 BLK		
11								
12	AR			209990-072	ADHESIVE - SCREWLOCK	222	LOCKTITE CORP	
13	AR			209990-800	ADH. - STRL. SYN RESIN	3520 BA	3M	
*13	AR			209990-300	ADH. - STRL. MOD EPOXY	2216 B A	3M	

* ALTERNATE PART

5071 A C

Cipher Data Products

PARTS LIST

CODE IDENT 32274 | PL 154031-601

TITLE: MOTOR ASSY-VALVE | MODEL NO. 900X | SH 1 OF 1 | REV C

DWN [illegible]	2-14-78	LTR	DESCRIPTION	INC	DATE	APP	DATE	LTR	DESCRIPTION	INC	DATE	APP	DATE
CHK [illegible]	3-16-78	A	ENGR REL	DS	3-16-78	[illegible]	3-17-78						
N/C R. Cyr	3/17/78	B	INCORP ECO 3839	RA	6-1-78	[illegible]	6-8-78						
MFG [illegible]	3-17-78	C	INCORP ECO 4199	RA	9-1-78	[illegible]	9-7-78						
QC [illegible]	3-17-78												
REL [illegible]	3-78												

ITEM NO.	QUANTITY			CIPHER PART NO.	DESCRIPTION	VENDOR NO.	VENDOR	REFERENCE DESIGNATOR
1	1			754006-401	BRACKET-VALVE MOTOR		CIPHER	
2								
3	1			210179-500	MOTOR-DC, MINIATURE	KCN-26RS12D	PANASONIC MATSUSHITA	
4	24"			208500-041	CABLE, STRD, 24AWG, PVC	8641	BELDEN	
5	1			205014	TERM-MALE, 18-22AWG, .093 DIA, REEL	02-09-2116	MOLEX	
6	1			205015	TERM-FEM, 14-20AWG, .093 DIA, REEL	02-09-1116	MOLEX	
7								
8	1"			210409	TUBING-SHRINK 1/8 BLK	HIX-1/8-UL	ICO RALLY	
9	1.5"			210417	TUBING-SHRINK 3/16 BLK	HIX-3/16-UL	ICO RALLY	
10								
11								
12	3			206903-011	SCREW-PAN HD PHIL	4-40 X 3/16		
13	3			207903-011	WASHER-SP LK	#4		

Cipher Data Products

PARTS LIST

CODE IDENT 32274 | PL 154031-801

TITLE: CAPSTAN MOTOR ASSY | MODEL NO. 900X | SH 1 OF 1 | REV B

			LTR	DESCRIPTION	INC	DATE	APP	DATE	LTR	DESCRIPTION	INC	DATE	APP	DATE
DWN R. Story	2-17-78		A	ENGR REL	OS	3-16-78	MB	3-30-78						
CHK DS Mod	3-4-78		B	INCORP ECO 3613	RA	5-16-78	SDJ	5-25-78						
N/C R. Crane	3-30-78	2												
MFG [illegible]	3/30													
QC M. Tracker	3-30-78													
REL [illegible]	3-29													

ITEM NO.	QUANTITY			CIPHER PART NO.	DESCRIPTION	VENDOR NO.	VENDOR	REFERENCE DESIGNATOR
1	1			799013-101	MOTOR-DC CONTROL		CIPHER	
2								
3	1			205076	CONNECTOR-5 POSN	03-09-1052	MOLEX	J8
4	26"			208500-091	CABLE-STRD, 24AWG PVC	8691	BELDEN	
5	1½"			210417	TUBING-SHRINK 3/16 BLK	HIX-3/16-UL	ICO/RALLY	
6	26"			208910-113	WIRE-STRD, 20AWG, IR, PVC, RED	7132-3	ALPHA	UL 1430 XL PVC
7	26"			208910-111	WIRE-STRD, 20AWG, IR, PVC, WHT	7132-1	ALPHA	UL 1430 XL PVC
8	4			210229-523	TY-RAP, 1/16 TO 5/8	TY-23M	T&B	
9	1			205014	TERM-MALE, 18-22AWG, .093DIA, REEL	02-09-2116	MOLEX	PIN 1
10	4			205015	TERM-FEM, 14-20 AWG, .093DIA, REEL	02-09-1116	MOLEX	PINS 2 THRU 5
11								
12	2			210555-025	TERM-RING, #6 SM. PAT.	R1881S	HOLLINGSWORTH	
13	2			210565-026	TERM-RING, 26-22 AWG, #4	R26243	HOLLINGSWORTH	
14	3"			210413	TUBING, HT SHRINK, 1/4" BLK	HIX-1/4-UL	ICO/RALLY	

ITEM#	PART#.....	QTY	DESCRIPTION.....	MFG PART#.....	MFG	REF-DES.....	ALT PART#...	ECO#...	ST-USE.	END-U
1	731007-100	1	MOUNT,HEAD							
2	131017-500	1	PLATE ASSY-HINGE		32274					
3	710006-200	1	SHIM HEAD							
4	731007-500	1	SPRING - HEAD SHIELD							
5	799010-601	1	DUAL GAP HEAD-9TK,PE/NRZI		20000					
6	731902-900	1	POST-HEAD SHIELD							
7	713003-600	1	SCREW-AZIMUTH ADJUST							
8	210199	1	RING-RETAINING,CRESCENT	5103-18MD	00000					
			*							
9	203565-123	1	IC-MEM,PROM,32X8	N82S123N	203565					
10	206404-021	2	SCREW,FLT HD,PHIL,100 4-40X1/4 CAD		00000					
11	206406-021	1	SCREW,FLT HD,PHIL,100 4-40 X 3/8 CAD		00000					
12	206403-042	1	SCREW SOC SET CUP PT 4-40X3/16 BLK 0		00000					
13	209990-072	AR	ADHESIVE - SCREWLOCK	222						
			*							
14	205002	1	PIN,GROOV 1/16X3/8	GP2-062X0375-12	00000					
			*							

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Cipher Data Products

PARTS LIST

CODE IDENT	PL
32274	131017-500

TITLE: PLATE ASSY - HINGE

MODEL		REV
100X	SH 1 OF 1	D

DWN G. BODDY	1-75	LTR	DESCRIPTION	INC	DATE	APP	DATE	LTR	DESCRIPTION	INC	DATE	APP	DATE
CHK		D	ECR 1008	H.J.	2-75	G.B	2-75						
N/C			RETYPED - NO CHANGES	S.S.	4-77	RG	4/77						
APP G.B.													
PRODUCTION RELEASE													
J. WHITNEY 3/74													

ITEM NO.	QUANTITY			CIPHER PART NO.	DESCRIPTION	VENDOR NO.	VENDOR	REFERENCE DESIGNATOR
1	1			731920-400	HINGE PLATE		CIPHER	
2								
3								
4	1			799004-000	CROSS-FEED SHIELD		CIPHER	
5	AR			209990-084	CONTACT CEMENT	ELMERS	BORDENS	
6								

 BILL OF MATERIALS: 154050-101 REV A FLOOR ASSY-TRANSDUCER FIRST RELEASED: 11:10:51 25 JAN 1979

ITEM#	PART#.....	QTY	DESCRIPTION.....	MFG PART#.....	MFG	REF-DES.....	ALT PART#...	ECO#...	ST-USE.	END-US
1	154050-201	1	TRANSDUCER ASSY		32274					
2	154050-202	1	TRANSDUCER ASSY		32274					
3	754031-301	1	FLOOR COLUMN	----------	32274					
4	754050-301	1	BASE-TRANSDUCER		32274					
5	754050-501	2	COVER-TRANSDUCER		32274					
6	754045-201	1	TUBE-ALUMINUM	----------	32274					
7	754045-101	1	BRASS TUBE-MODIFIED	----------	32274					
8	799022-101	1.5	ALUMINIZED MYLAR, STRIDED	----------	32274					
9	754016-101	2	SCREEN-COLUMN FLOOR	----------	32274					
10										
11	209103-100	.9	TUBING-SILICONE, SUPER BLUE	197	05575					
12	209999-013	AR	TAPE-PLASTIC FILM "KAPTON" *	5413	76381					
13										
14										
15	211113-600	3.8	TAPE-FLAME RETARDANT POLYURETHANE	UNIFOAM N S82N	00000					
16										
17										
18	213681-412	12	SCREW-THREDSTUD 4-40 X 3/4	77-12-104-13	94222					
19	210408-000	.3	TUBING-SHRINK, BLACK	HIX-1/8 UL	20064					
20	213731-400	12	WASHER-SPLIT, LOCK #4		00000					
21	213851-400	12	NUT-HEX #4		00000					
22										
23	209990-107	AR	CONTACT CEMENT-PERMABOND	101	20247					
24	209990-072	AR	ADHESIVE - SCREWLOCK *	222						
25	209990-109	AR	ADHESIVE, BLK-RTV	RTV-103						
26	209990-800	AR	ADHESIVE-STRL, SYN RESIN	3520 B/A	76381					

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BILL OF MATERIALS: 154050-201 REV A TRANSDUCER ASSY FIRST RELEASED: 14:42:30 26 JAN 1979

ITEM#	PART#.....	QTY	DESCRIPTION.....	MFG PART#.....	MFG	REF-DES.....	ALT PART#...	ECO#...	ST-USE..	END-USE.
1	155022-001	1	VECTORBORD ASSY		32274					
2	755021-201	2	END-TRANSDUCER	----------	32274					
3	754050-401	1	HOUSING-TRANSDUCER		32274					
4										
5	755021-601	1	TUBE-TRANSDUCER		32274					
6										
7	722301-600	1	CLIP-GROUND	----------	32274					
8										
9	210229-200	1	CLAMP,CABLE-3/16 WHITE	3303	26000					
10										
11	210408-012	.2	TUBING-HEAT SHRINK	H1X-3/16						
12	210408-006	.3	TUBING-HEAT SHRINK,BLACK	H1X-3/32						
13	208500-041	3.7	CABLE-SHIELDED, TWO COND	8641	00000					
14	205015-100	2	TERM-MALE,24-30AWG .093 DIA REEL	02-09-2141	27264					
15	205016-100	1	TERM-FEM,24-30AWG .093 DIA REEL	02-09-1141	27264					
16	210169	1	LUG SOLDER	1485-4	83330					
17	208430-411	.1	WIRE-JAC,STRD,30AWG, TEFLON,WHT	30-TE-738	30111					
18	209999-028	AR	TAPE-ADHESIVE TRANSFER *	468	76381					
19										
20										
21										
22	213271-406	1	SCREW-PAN HD PHIL 4-40 X 3/8 CAD BLK ZINC		00000					
23	213701-400	1	WASHER-FLAT #4	#4	00000					
24										
25	209990-800	AR	ADHESIVE-STRL,SYN RESIN	3520 B/A	76381					
26	209990-109	AR	ADHESIVE,BLK-RTV	RTV-103						
27										
28	209990-072	AR	ADHESIVE - SCREWLOCK *	222						

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1 ITEMS PROCESSED

BILL OF MATERIALS: 154050-202 REV A TRANSDUCER ASSY FIRST RELEASED: 11:13:39 25 JAN 1979

ITEM#	PART#.....	QTY	DESCRIPTION.....	MFG PART#.....	MFG	REF-DES.....	ALT PART#...	ECO#...	ST-USE..	END-USE
1	155022-001	1	VECTORBORD ASSY		32274					
2	755021-201	2	END-TRANSDUCER	----------	32274					
3	754050-401	1	HOUSING-TRANSDUCER		32274					
4										
5	755021-601	1	TUBE-TRANSDUCER		32274					
6										
7	722301-600	1	CLIP-GROUND	----------	32274					
8										
9	210229-200	1	CLAMP,CABLE-3/16 WHITE	3303	26000					
10										
11	210408-012	.2	TUBING-HEAT SHRINK	H1X-3/16						
12	210408-006	.3	TUBING-HEAT SHRINK,BLACK	H1X-3/32						
13	208500-041	4.5	CABLE-SHIELDED, TWO COND	8641	00000					
14	205015-100	2	TERM-MALE,24-30AWG .093 DIA REEL	02-09-2141	27264					
15	205016-100	1	TERM-FEM,24-30AWG .093 DIA REEL	02-09-1141	27264					
16	210169	1	LUG SOLDER	1485-4	83330					
17	208430-411	.1	WIRE-JAC,STRD,30AWG, TEFLON,WHT	30-TE-738	30111					
18	209999-028	AR	TAPE-ADHESIVE TRANSFER *	468	76381					
19										
20										
21										
22	213271-406	1	SCREW-PAN HD PHIL 4-40 X 3/8 CAD BLK ZINC		00000					
23	213701-400	1	WASHER-FLAT #4	#4	00000					
24										
25	209990-800	AR	ADHESIVE-STRL,SYN RESIN	3520 B/A	76381					
26	209990-109	AR	ADHESIVE,BLK-RTV	RTV-103						
27										
28	209990-072	AR	ADHESIVE - SCREWLOCK *	222						

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5 ITEMS PROCESSED

ITEM*	PART#.....	QTY	DESCRIPTION.....	MFG PART#.....	MFG	REF-DES.....	ALT PART#...	ECO#...	ST-USE.	END-USE
1	154017-001	1	PWB ASSY-POWER SUPPLY	----------	32274					
2	799011-001	1	POWER TRANSFORMER	----------	32274					
	754018-701	1	BASE-POWER SUPPLY	----------	32274					
4	799005-101	1	FILTER-EMI,5 AMP,K SERIES	----------	32274	FL1				
5	205198-010	1	RECEPTACLE-POWER	6J1	05245					
6	202004-100	1	RECTIFIER BRIDGE	MDA-980-2	04713	CR1				
7	210229	1	CLAMP,CABLE-5/16 BLACK	774 P-CLIP	48000					
8	210288-000	.4	GROMMET STRIP	MS21266-2N	68000					
9	210409	.7	TUBING,SHRINK 1/8" BLK	H1X-1/8-UL BLK	00000					
10	210417	.5	TUBING,SHRINK 3/16" BLK	H1X-3/16-UL BLK				3842		
11	210132	1	GROMMET	2146	17000					
12	210229-523	8	TY-RAP-1/16 TO 5/8	TY-23M	85000			3842		
13										
14										
15	205241	2	TERMINAL,RING-16-14	R4158	14726					
16	210555-025	4	TERMINAL RING #6 SM PAT	R18815	81000			4517		
17	210555-033	4	TERMINAL,SLIP-ON 250 TAB	S05305F	46000			3842		
18	208400-500	3	WIRE-STRD,16AWG,IR PVC	HH0405 GRN/YEL	20322			4517		
19	208410-112	1.67	WIRE-STRD,20AWG,IRPVC,BLK	HH0317	[12703]			3842		
20	208410-111	1.67	WIRE-STRD,20AWG,IRPVC,WHT	HH0317	[12703]			3842		
21	208405-014	.5	WIRE-STRD,18GA,IR PVC GRN	7155-4						
22	208400-111	9.75	WIRE-STRD,16AWG,IRPVC,WHT	HH0405	[12703]			4517		
23	208400-112	2.17	WIRE-STRD,16AWG,IRPVC,BLK	HH0405	[12703]			3842		
24	208300-001	2	WIRE-STRD,14AWG,PVC,UL	3079-1 CSA/UL	92194					
25	209999-000	11	MARKER,WIRE- 1-50	VMM-0-49	00000					
26										
27	206604-031	2	SCREW SKT HD CAP 6-32X1/4 CAD		00000			4517		
29	206606-011	5	SCREW PAN HD PHIL 6-32X3/8 CAD		00000			3842		
30	206608-011	1	SCREW PAN HD PHIL 6-32X1/2 CAD		00000			4005		
31	206612-032	1	SCREW SKT HD CAP 6-32X3/4 BLK 0		00000					
32										
33										
34	213154-106	4	SCREW-FL HD PHIL,100 10-32 X 3/8	10-32X3/8	00000			4517		
35	207602-011	10	WASHER,SPLIT LOCK #6	WASHER #6 CAD.	00001			4005		
36	207608-021	1	WASHER,FLAT,SMALL OD #6	WASHER #6 CAD.	00000					
37	207605-021	3	WASHER,FLAT #6	WASHER #6 CAD.	00000					
38										
39	207102-011	4	WASHER,SPLIT LOCK #10	WASHER #10 CAD.	00000					
40	207104-021	4	WASHER, FLAT,#10	WASHER #10 CAD.	00000					
41										
42	207607-051	6	NUT, HEX #6 6-32	NUT #6 CAD.	00000			4005		
43	207102-051	4	NUT,HEX-LG PAT 10-32	NUT #10 CAD.	00000					

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6 ZMS PROCESSED

Cipher Data Products

PARTS LIST

CODE IDENT 32274 | PL 154017-001

TITLE PWB ASSY-POWER SUPPLY | MODEL NO. 900X | SH 1 OF 2 | REV C

			LTR	DESCRIPTION	INC	DATE	APP	DATE	LTR	DESCRIPTION	INC	DATE	APP	DATE
DWN		1-23-78	A	ENGR REL	OS	3-16-78		3-17-78						
CHK		3-16-78	B	ECO 3675	CW	5/1/78		5-4-78						
N/C		3/17/78	C	ECO 4338	CW	10-18-78		10-23-78						
MFG		3-12-78												
QC		3-17												
REL		3-18												

ITEM NO.	QUANTITY			CIPHER PART NO.	DESCRIPTION	VENDOR NO.	VENDOR	REFERENCE DESIGNATOR
1	1			154017-101	PWB-POWER SUPPLY		CIPHER	
2	4			154016-901	BRACKET-BASE		CIPHER	
3	1			205066-500	CONNECTOR-6 POS	03-09-1063	MOLEX	J14
4	1			205014	TERM-MALE, 18-22AWG, .093DIA, REEL	02-09-2116	MOLEX	PIN 1
5	2			201174-158	CAP-ELECT. 15,800 UF, 75V	91S75JF1582	ELECTRA/MIDLAND	C1,2
6	1			200123-300	RES-WW, 3K, 3.75W, 5%	CW-2B	DALE	R1
7	5			205015	TERM-FEM, 14-20AWG, .093DIA, REEL	02-09-1116	MOLEX	PINS 2-6
8	8			210229-523	TY-RAP 1/16 TO 5/8	TY-23M	T&B	
9	2			210555-033	TERM-SLIP ON .250 TAB	S05305F	HOLLINGSWORTH	
10	200"			208905-111	WIRE-STRD, 18AWG, IR, PVC, WHT	7133-1CSA-UL	ALPHA	1930-XL PVC
11	10"			208900-111	WIRE-STRD, 16AWG, IR, PVC, WHT	HH0405	JUDD WIRE DIV	1930-XL PVC
12	2			209999-000	MARKER-WIRE 1-50	VMM-0-49	BRADY	
13								

Cipher Data Products

PARTS LIST

CODE IDENT	PL
32274	154017-001

TITLE: PWB ASSY - POWER SUPPLY

MODEL	SH	OF	REV
900 X	2	2	C

ITEM NO.	QUANTITY	CIPHER PART NO.	DESCRIPTION	VENDOR NO.	VENDOR	REFERENCE DESIGNATOR
14	8	206606-011	SCREW-PAN HD PHIL	6-32 X 3/8"		
15						
16	4☆	206106-011	SCREW-PAN HD. PHIL	10-32 X 3/8		
16A	4	206108-011	SCREW-PAN HD. PHIL	10-32 X 1/2		
17	8	207602-011	WASHER-SP. LK	#6		
18	8	207608-021	WASHER-FL. SM. O.D.	#6		
19	4	207102-011	WASHER-SP. LK	#10		
20	4	207108-021	WASHER-FL, SM. O.D	#10		
21	8	207607-051	NUT-HEX	#6-32		

☆ USE THESE SCREWS IF CAPS DON'T ALREADY COME WITH THEIR OWN SCREWS.

PARTS LIST

CODE IDENT	PL
32274	154012-001-002

TITLE: PWB ASSY-CONTROL SERVO

MODEL NO.: 900X

SH 1 OF 15

REV: AT

DWN	WIDDOWSON	12-1-77	LTR	DESCRIPTION	INC	DATE	APP	DATE	LTR	DESCRIPTION	INC	DATE	APP	DATE
CHK	THACKER	12-1-77	AN	COVER SHT RETYPED					AT	INC ECO 5077	VLN	2-16-79		2-16-9
N/C	CRANE	12-1-77		INCORP. ECO 4330	CW	11-1-78		11-8-8						
MFG	MURPHY	12-1-77	AP	INCORP ECO 4433	CW	11-1-78		11-8-8						
QC	FRACKER	12-1-77	AR	INCORP ECO 4486	CW	11-8-78		11-8-8						
REL	BERLING	12-1-77	AS	INC ECO 4934 & 4966	VLN	2-16-79		2-16-9						

ITEM NO	QUANTITY 001	QUANTITY 002		CIPHER PART NO.	DESCRIPTION	VENDOR NO.	VENDOR	REFERENCE DESIGNATOR
DWG	REF	REF		354012-300	SCHEM.-CONTROL SERVO		CIPHER	
1	1	1		754012-101	PWB-CONTROL SERVO		CIPHER	
2								
3								
4	6	6		154013-901	INDUCTOR ASSY-SERVO/FILTER		CIPHER	L1-L6
5	1	1		154014-001	INDUCTOR ASSY-P.S./FILTER		CIPHER	L9
6	2	2		154014-002	INDUCTOR ASSY-P.S./FILTER		CIPHER	L7,L8
7	2	2		154014-201	XFMR ASSY-P.S./FILTER		CIPHER	T2,T3
8	1	1		154014-202	XFMR ASSY-P.S./FILTER		CIPHER	T1
9	1	1		154014-301	XFMR ASSY-PWR SUPPLY		CIPHER	T4
10	3	3		154015-401	XFMR ASSY		CIPHER	A1,A2,A3
11								
12	54	54		205026	TEST POINT .058 DIA PIN	60802-2	AMP	TP1-TP54
13								
14								
15	1	-		754013-810	EPROM, OPER. SYSTEM		CIPHER	U45
16	1	-		754013-811	EPROM, OPER. SYSTEM		CIPHER	U56
17	1	1		731006-800	LABEL-ASSY		CIPHER	

Cipher Data Products

PARTS LIST

CODE IDENT	PL
32274	154012-001-002

TITLE: PWB ASSY-CONTROL SERVO

MODEL:

SH 2 OF

REV. AT

ITEM NO.	QUANTITY 001	QUANTITY 002		CIPHER PART NO.	DESCRIPTION	VENDOR NO.	VENDOR	REFERENCE DESIGNATOR
18	2	2		731501-300	RETAINER-P.C. CONN.		CIPHER	
19	1	1		731524-600	STRUT		CIPHER	
20	4	4		210040-074	SPACER-ROUND 1/4X5/16 #4	9225A140	AMATOM	
21	9	9		754014-401	MTG PLATE-COIL		CIPHER	
22	6	6		754014-501	MTG PLATE-COIL		CIPHER	
23	1	1		754016-501	HEATSINK		CIPHER	
24	1	1		754016-701	INSULATOR-MYLAR, HEATSINK		CIPHER	
25								
26	2	2		205133-001	CONNECTOR-3 PIN MALE	09-18-5032	MOLEX	P10,P12
27	1	1		205133-002	CONNECTOR-3 PIN MALE	09-18-5031	MOLEX	P29
28	2	2		205133-033	CONNECTOR WAFER-3 PIN PC	09-18-5033	MOLEX	P25,26
29								
30	1	1		205133-037	CONNECTOR WAFER-3 PIN PC	09-18-5037	MOLEX	P27
31	1	1		205133-051	CONNECTOR WAFER-5 PIN PC	09-18-5051	MOLEX	P8
32	2	2		205133-059	CONNECTOR WAFER-5 PIN PC	09-18-5059	MOLEX	P4,5
33	1	1		205133-950	CONNECTOR WAFER-5 PIN PC	09-18-5950	MOLEX	P30
34	1	1		205133-951	CONNECTOR WAFER-5 PIN PC	09-18-5951	MOLEX	P28
35	1	1		205133-069	CONNECTOR WAFER-6 PIN PC	09-18-5069	MOLEX	P14
36	1	1		205133-094	CONNECTOR WAFER-9 PIN PC	09-18-5094	MOLEX	P3
37	1	1		205068	CONNECTOR-12 POSN	03-09-2121	MOLEX	P7
38								
39								
40								
41	3	3		201105-011	CAP-CER,.01UF,3000V	30GA-S10	SPRAGUE	C28,57,80

Cipher Data Products

PARTS LIST

CODE IDENT	PL
32274	154012-001-002

TITLE: PWB ASSY-CONTROL SERVO

MODEL: 900X

SH 3 OF

REV AT

ITEM NO.	QUANTITY 001	QUANTITY 002		CIPHER PART NO.	DESCRIPTION	VENDOR NO.	VENDOR	REFERENCE DESIGNATOR
42	4	4		201105-100	CAP-CER.DISC,.1UF,100V,+20%,-80%	TA010	MALLORY	C34,35,60,61
43	23	23		201105-101	CAP-CER.DISC,.1UF,10V,+80%,-20%	UK10-104	CENTRALAB	C29-32,54-56,58,81-84,13,39,65,108,136,138,140,142,180,183,184
44	20	20		201105-103	CAP- CER,DISC,,1UF,25V,+20%,-80%	563CY5SBA250AH	SPRAGUE	C24,25,50,51,76,77,107,121,139,141,170,181,4-7,137,177,178,182
45	24	24		201213-100	CAP-CER.DISC,.001UF,50V,10%	CW15C102K	CENTRALAB	C14-21,40-47,66-73
46	1	1		201105-010	CAP-CER.DISC.,.01UF,500V,+80%-20%	5HKS-S10	SPRAGUE	C 156
47	1	1		201121-470	CAP-D.M.,47PF,300V,5%	D153E470J0	SANGAMO	C 187
48	8	8		201122-100	CAP-D.M.,100PF,300V,5%	D153E101J0	SANGAMO	C12,38,64,120,122,123,134,173
49	1	1		201122-200	CAP-D.M.,200PF,300V,5%	D153E201J0	SANGAMO	C9
50	1	1		201122-470	CAP-D.M.,470PF,300V,5%	D153E471J0	SANGAMO	C125
51	1	1		201122-680	CAP-D.M.,680PF,300V,5%	D153E681J0	SANGAMO	C3
52	2	2		201123-151	CAP-D.M.,1500PF,100V,5%	FA1521J03	CORNELL-DUBILIER	C98,157
53	1	1		201122-150	CAP-DM,150PF,300V,5%	D153E151J0	SANGAMO	C 126
54	2	2		201121-300	CAP-DM,30PF,300V,5%	D153C300J0	SANGAMO	C94,95
55								
56								
57								
58	6	6		201140-201	CAP-PC,2.0UF,100V,5%	MCR1W2	CORNELL - DUBLIER	C26,27,52,53,78,79
59	1	1		201122-270	CAP-DM,270PF, 300V, 5%	D153E271J0	SANGAMO	C171

Cipher Data Products

PARTS LIST

CODE IDENT	PL
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TITLE: PWB ASSY-CONTROL SERVO

MODEL: 900X

SH 4 OF

REV AT

ITEM NO.	QUANTITY 001	QUANTITY 002	CIPHER PART NO.	DESCRIPTION	VENDOR NO.	VENDOR	REFERENCE DESIGNATOR
60	1	1	201144-120	CAP-PC,.012UF,50V,20%	BA2-123	IMB	C168
61	4	4	201148-100	CAP-PC,.1UF,50V,5%	650B4A104J	ELECTRO CUBE	C103-106
62	3	3	201148-150	CAP-PC,.15UF,50V,5%	RA2A154J	IMB	C116,131,147
63	11	11	201148-330	CAP-PC,.33UF,50V,5%	RA2A334J	IMB	C113,114,115,118, 132,133,145,146, 149,152,169
64	3	3	201149-022	CAP-PC,.0022UF,50V,5%	RA2A222J	IMB	C101,102,117
65	8	8	201149-047	CAP-PC,.0047UF,50V,5%	RA2A472J	IMB	C99,100, 127, 143,144,186,190,191
66	3	3	201149-100	CAP-PC,.01UF,50V,5%	RA2A103J	IMB	C8,97,192
67	4	4	201149-220	CAP-PC,.022UF,50V,5%	RA2A223J	IMB	C1,2,148,153
68	5	5	201149-390	CAP-PC,.039UF,50V,5%	RA2A393J	IMB	C 109-112,128
69	7	7	201149-470	CAP-PC,.047UF,50V,5%	RA2A473J	IMB	C10,11,36,37,62,63, 96
70	2	2	201149-680	CAP-PC,.068UF,50V,5%	650B1A683J	ELECTRO CUBE	C129,C130
71	1	1	201149-082	CAP-PC,..0082UF,50V,5%	RA2A822J	IMB	C119
72	2	2	201148-220	CAP-PC,.22UF, 50V, 5%	650B1A224J	ELECTRO CUBE	C33, 59
73	8	8	201159-022	CAP-MYLAR,.0022UF,200V,10%	WMF2D22	CORNELL-DUBILIER	C22,23,48,49,74, 75,150,151
74							
75							
76							
77							
78							
79	2	2	201160-220	CAP-TANT,2.2UF,35V,10%	CS13BF225K	NCI	C174,175

Cipher Data Products

PARTS LIST

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TITLE: PWB ASSY-CONTROL SERVO

MODEL: 900X

SH 5 OF

REV: AT

ITEM NO.	QUANTITY 001	QUANTITY 002		CIPHER PART NO.	DESCRIPTION	VENDOR NO.	VENDOR	REFERENCE DESIGNATOR
80								
81	5	5		201161-120	CAP-TANT,12UF,20V,10%	CS13BE126K	NCI	C135, 158,161, 162,172
82	3	3		201161-470	CAP-TANT,47UF,6V,10%	CS13BB476K	NCI	C166,185,167
83	1	1		201161-220	CAP-TANT,22UF,15V,10%	CS13BD226K	NCI	C154
84								
85								
86	1	1		201172-101	CAP-ELECT,100UF,150V	WBR100-150	CORNELL-DUBILIER	C159
87	1	1		201173-050	CAP-ELECT,500UF,10V,A/L	39D507G010EJ4	SPRAGUE	C160
88	2	2		799600-095	CAP-ELECT,1000UF,25V		CIPHER	C163,164
89	1	1		201173-200	CAP-ELECT, 2000UF,10V	39C10FJ23	ELECTRA/ MIDLAND	C165
90								
91								
92								
93								
94	1	1		210112	CRYSTAL-3.840 MHZ	815-A-3.840 MHZ	STANDARD-CRYSTAL	Y1
95								
96								
97	1	1		202011-744	DIODE-ZENER	1N4744	MOTOROLA	CR105
98	50	50		202013-717	DIODE-HOT CARRIER	1N5817	MOTOROLA	CR9-24,37-52,65,67, 69-73,75,77,78,79, 80, 109,111,66,
98	ALT	ALT		202013-818	DIODE-HOT CARRIER RECT	1N5818	MOTOROLA	68,74,76,
99								SAME AS ITEM 98

Cipher Data Products

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CODE IDENT	PL
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TITLE: PWB ASSY-CONTROL SERVO

MODEL		REV.
900X	SH 6 OF	AT

ITEM NO.	QUANTITY 001	QUANTITY 002		CIPHER PART NO.	DESCRIPTION	VENDOR NO.	VENDOR	REFERENCE DESIGNATOR
100								
101								
102								
103								
104								
105								
106	37	37		202018	DIODE-SWITCHING	IN914	T.I.	CR1-8,29-36,57-64, 94-98,101,102,104,106, 108,118,99
107	3	3		202019	DIODE-ZENER	IN957B	MOTOROLA	CR103,107,110
108	2	2		202034	DIODE-RECTIFIER,FAST RECOVERY	MR820	MOTOROLA	CR116,117,
109	4	4		202035	RECTIFIER-POWER	MR851	MOTOROLA	CR112,113,114,115
110	12	12		202005-500	RECTIFIER-PWR,HI EFF,GA	UES1302	UNITRODE	CR25-28,53-56, 81-84
111								
112	6	6		203003	IC-ANLG SW,4 CHNL	IH5012CPE	INTERSIL	U36,37,49,63,67,77
113								
114								
115								
116	1	1		203007-200	IC-OPER AMPLIFIER	LM318N	NCI	U2
117	1	1		203007-600	IC-OPER AMPL/BFR	LM324N	NCI	U27
118	9	9		203007-700	IC-VOLT COMPARATOR	LM339N	NATIONAL SEMICONDUCTORS	U6,7,13,14,20,21, 29,39,95
119								
120								

Cipher Data Products

PARTS LIST

CODE IDENT	PL
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TITLE: PWB ASSY-CONTROL SERVO

MODEL		REV
900X	SH 7 OF	AT

ITEM NO.	QUANTITY 001	QUANTITY 002		CIPHER PART NO.	DESCRIPTION	VENDOR NO.	VENDOR	REFERENCE DESIGNATOR
121								
122								
123	1	1		203008-741	IC-OPER AMPL	LM741C	NATIONAL SEMICONDUCTORS	U1
124	14	14		203012-136	IC-QUAD OPER AMPL	RC4136	T.I.	U5,12,19,26,30,31,32,38,46,64,65,66,76,33
125								
126								
137								
138								
129								
130								
131	2	2		203013-210	IC-VOLTAGE REGULATOR	MC7812CP	MOTOROLA	VR1,2
132	2	2		203013-300	IC-VOLTAGE REGULATOR	MC7912CP	MOTOROLA	VR3,4
133	1	1		203013-250	IC-VOLTAGE REGULATOR	MC79L05CP	MOTOROLA	VR5
134	1	1		203023-001	IC-QUAD 2 INP, POS NAND GT	SN74LS00N	T.I.	U83
135								
136	4	4		203024	IC-QUAD 2 INP,POS NOR GT	SN7402N	T.I.	U8,15,22,79
137	2	2		203026	IC-HEX INVERTER	SN7404N	T.I.	U3,88
138	3	3		203026-500	IC-HEX INVTR BFR/DRVR	SN7406N	T.I.	U57,68,89
139	4	4		203027	IC-QUAD 2 INP,POS AND GT	SN7408N	T.I.	U10,17,24,82
140	1	1		203027-001	IC-QUAD 2 INP,POS AND GT	SN74LS08N	T.I.	U52
141	3	3		203029-003	IC-TRPL 3 INP,AND GT	SN74LS11N	T.I.	U11,18,25
142	1	1		203035-032	IC-QUAD 2 INP,POS OR GT	SN74LS32N	T.I.	U70

Cipher Data Products

PARTS LIST

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TITLE: PWB ASSY-CONTROL SERVO

MODEL		REV
900X	SH 8 OF	AT

ITEM NO.	QUANTITY 001	QUANTITY 002		CIPHER PART NO.	DESCRIPTION	VENDOR NO.	VENDOR	REFERENCE DESIGNATOR
143	2	2		203036	IC-QUAD 2 INP,POS NAND BFR	SN7438N	T.I.	U41,42
144	4	4		203039-001	IC-DUAL-D TYPE FLIP FLOP	SN74LS74N	T.I.	U4,59,78, 92
145	1	1		203046-132	IC-QUAD 2 INP,POS NAND TRIG	SN74LS132N	T.I.	U60
146	4	4		203046-148	IC-3-8 LINE DECODER	SN74LS138N	T.I.	U48,91,93,94
147	1	1		203046-153	IC-4-1 LINE SEL/MLTP	SN74LS153N	T.I.	U80
148	6	6		203051-174	IC-HEX D TYPE FLIP FLOP	SN74LS174N	T.I.	U40,51,58,69,81,90
149	1	1		203051-100	IC-QUAD D TYPE FLIP FLOP	SN74LS175N	T.I.	U53
150	4	4		203052-253	IC-4-1 LINE SEL/MLTP	SN74LS253N	T.I.	U44,55,62,71
151	3	3		203085-001	IC-SCHM,TRIG INP,HEX IV	SN74LS14N	T.I.	U28,54,61,
152	1	1		203123	IC-REG PULSE WIDTH MOD	SG3524N	T.I.	U97
153								
154	2	—		203565-102	IC-MEM MOS RAM 256X4	2111A	INTEL	U84,85
155	1	—		203555-101	IC-CONTROL,MOS	Z-80-CTC	ZILOG	U72
156	1	—		203575-101	IC-MICRO PROCESSOR	Z-80-CPU	ZILOG	U86
157	1	1		203039	IC-DUAL D-TYPE FLIP-FLOP	SN7474N	T.I.	U87
158								
159	1	1		200200-101	POT-TRIMMING-1K	3299X-1-102	BOURNS	R367
160	3	3		200204-200	POT- 20K CERMET	ET34P203	ELECTRA MIDLAND	R242, 243, 244
161	5	5		200205-052	POTENTIOMETER-TRIMMING, 50K	3006P-1-503	BOURNS	R188, 189, 190, 191, 250
162	2	2		200070-470	RES-FC,4.7Ω,1/4W,5%	RCR07G4R7JM	MIL-R-39008	R403,404
163	13	13		200071-100	RES-FC,10Ω,1/4W,5%	RCR07G100JM	MIL-R-39008	R37-40,89-92,142-145,370
164	2	2		200071-150	RES-FC,15Ω,1/4W,5%	RCR07G150JM	MIL-R-39008	R210,408

Cipher Data Products

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TITLE: PWB ASSY-CONTROL SERVO | MODEL 900X | SH 9 OF | REV AT

ITEM NO.	QUANTITY 001	QUANTITY 002		CIPHER PART NO.	DESCRIPTION	VENDOR NO.	VENDOR	REFERENCE DESIGNATOR
165	3	3		200071-470	RES-FC,47Ω,1/4W,5%	RCR07G470JM	MIL-R-39008	R194,195,409
166								
167	1	1		200072-100	RES-FC,100Ω,1/4W,5%	RCR07G101JM	MIL-R-39008	R.400
168	6	6		200072-220	RES-FC,220Ω,1/4W,5%	RCR07G221JM	MIL-R-39008	R8,170-173,355
169								
170	14	14		200072-330	RES-FC,330Ω,1/4W,5%	RCR07G331JM	MIL-R-39008	R21,22,26,27,71,72,78,87,123,124,130,140,353,356
171	2	2		200072-470	RES-FC,470Ω,1/4W,5%	RCR07G471JM	MIL-R-39008	R6,7
172	24	24		200072-560	RES-FC,560Ω,1/4W,5%	RCR07G561JM	MIL-R-39008	R29-36,79-86,131-134,136-139
173	2	2		200072-680	RES-FC,680Ω,1/4W,5%	RCR07G681JM	MIL-R-39008	R351,352
174	3	3		200072-750	RES,FC,750Ω,1/4W,5%	RCR07G751JM	MIL-R-39008	R357,358,397
175								
176								
177								
178	1	1		200073-220	RES-FC,2.2K,1/4W,5%	RCR07G222JM	MIL-R-39008	R385
179	1	1		200073-680	RES,FC,6.8K,1/4W, 5%	RCR07G682JM	MIL-R-39008.	R380
180	8	8		200073-100	RES-FC,1K,1/4W,5%	RCR07G102JM	MIL-R-39008	R1,270,234,384,391,402,406,426
181	3	3		200073-110	RES-FC,1.1K,1/4W,5%	RCR07G112JM	MIL-R-39008	R28,88,141
182	1	1		200073-120	RES-FC,1.2K,1/4W,5%	RCR07G122JM	MIL-R-39008	R271
183	6	6		200073-150	RES-FC,1.5K,1/4W,5%	RCR07G152JM	MIL-R-39008	R196,197,198,199,342,343,342
184	1	1		200073-180	RES-FC,1.8K,1/4W,5%	RCR07G182JM	MIL-R-39008	R211
185	6	6		200073-200	RES-FC,2K,1/4W,5%	RCR07G202JM	MIL-R-39008	R2,292,328,334,399,427

Cipher Data Products

PARTS LIST

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TITLE: PWB ASSY-CONTROL SERVO

MODEL: 900X

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REV AT

ITEM NO.	QUANTITY 001	QUANTITY 002		CIPHER PART NO.	DESCRIPTION	VENDOR NO.	VENDOR	REFERENCE DESIGNATOR
186	3	3		200073-240	RES-FC,2.4K,1/4W,5%	RCR07G242JM	MIL-R-39008	R338,347,348
187	2	2		200073-300	RES-FC,3K,1/4W,5%	RCR07G302JM	MIL-R-39008	R3,4
188	1	1		200073-270	RES-FC,2.7K,1/4W,5%	RCR07G272JM	MIL-R-39008	R377
189	2	2		200073-360	RES-FC,3.6K,1/4W,5%	RCR07G362JM	MIL-R-39008	R272, 423
190	6	6		200073-430	RES-FC,4.3K,1/4W,5%	RCR07G432JM	MIL-R-39008	R291,293,327,329, 332,335
191	22	22		200073-470	RES-FC,4.7K,1/4W,5%	RCR07G472JM	MIL-R-39008	R9,18,20,25,73-75, 125,126,127,178, 192,193,231,260, 266,278,339, 378,398,422
192	2	2		200073-510	RES-FC,5.1K,1/4W,5%	RCR07G512JM	MIL-R-39008	R301,304
193	6	6		200073-750	RES-FC,7.5K,1/4W,5%	RCR07G752JM	MIL-R-39008	R17,19,69,70,121, 122
194								
195	29	29		200074-100	RES-FC,10K,1/4W,5%	RCR07G103JM	MIL-R-39008	R11,16,181,233,262 265,267,269,289, 298,300,302,303, 350,359,360,362, 365,366,369,275, 374,375,376, 330 331,392,407,425
196	4	4		200074-120	RES-FC,12K,1/4W,5%	RCR07G123JM	MIL-R-39008	R232,346,349,354,
197	13	13		200074-150	RES-FC,15K,1/4W,5%	RCR07G153JM	MIL-R-39008	R24,77,129,176,200 201,206,207,273, 218,413-415
198	1	1		200074-180	RES-FC,18K,1/4W,5%	RCR07G183JM	MIL-R-39008	R424
199	13	13		200074-200	RES-FC,20K,1/4W,5%	RCR07G203JM	MIL-R-39008	R67,68,119,120,202 204,208,209,212, 213,246,247,263

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CODE IDENT	PL
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TITLE: PWB ASSY-CONTROL SERVO

MODEL: 900X

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REV AT

ITEM NO.	QUANTITY 001	QUANTITY 002		CIPHER PART NO.	DESCRIPTION	VENDOR NO.	VENDOR	REFERENCE DESIGNATOR
200	17	17		200074-220	RES-FC,22K,1/4W,5%	RCR07G223JM	MIL-R-39008	R235,245,252,253, 255,256,258,264, 268,280,283,285, 286,288,294,295, 364
201	1	1		200074-270	RES-FC,27K,1/4W,5%	RCR07G273JM	MIL-R-39008	R274
202	6	6		200074-330	RES-FC,33K,1/4W,5%	RCR07G333JM	MIL-R-39008	R311,319,309,393 284,322
203								
204	2	2		200074-430	RES-FC,43K,1/4W,5%	RCR07G433JM	MIL-R-39008	R254,257
205	2	2		200074-470	RES-FC,47K,1/4W,5%	RCR07G473JM	MIL-R-39008	R5,10
206								
207	2	2		200074-680	RES-FC,68K,1/4W,5%	RCR07G683JM	MIL-R-39008	R58,110
208	7	7		200074-750	RES-FC,75K,1/4W,5%	RCR07G753JM	MIL-R-39008	R57,109, 287, 320,321, 390 310
209	4	4		200074-910	RES-FC,91K,1/4W,5%	RCR07G913JM	MIL-R-39008	R230,279,314,317
210	8	8		200075-100	RES-FC,100K,1/4W,5%	RCR07G104JM	MIL-R-39008	R177,223,236, ,313,318,340, 363,372
211								
212	1	1		200075-150	RES-FC,150K,1/4W,5%	RCR07G154JM	MIL-R-39008	R312
213	2	2		200075-200	RES-FC,200K,1/4W,5%	RCR07G204JM	MIL-R-39008	R215,373
214	8	8		200075-220	RES-FC,220K,1/4W,5%	RCR07G224JM	MIL-R-39008	R296,297,299,305, 306,307, 315, 316
215	4	4		200075-240	RES-FC,240K,1/4W,5%	RCR07G244JM	MIL-R-39008	R216,224,225,227
216	2	2		200075-270	RES-FC,270K,1/4W,5%	RCR07G244JM	MIL-R-39008	R411,412

Cipher Data Products

PARTS LIST

CODE IDENT	PL
32274	154012-001-002

TITLE: PWB ASSY-CONTROL SERVO

MODEL		REV
900X	SH 12 OF	AT

ITEM NO.	QUANTITY 001	QUANTITY 002		CIPHER PART NO.	DESCRIPTION	VENDOR NO.	VENDOR	REFERENCE DESIGNATOR
217	1	1		200075-360	RES-FC,360K,1/4W,5%	RCR07G364JM	MIL-R-39008	R226
218	4	4		200075-470	RES-FC,470K,1/4W,5%	RCR07G474JM	MIL-R-39008	R281,282,323,324
219	1	1		200075-510	RES-FC,510K,1/4W,5%	RCR07G514JM	MIL-R-39008	R214
220	1	1		200075-680	RES-FC,680K,1/4W,5%	RCR07G684JM	MIL-R-39008	R341
221	2	2		200075-750	RES-FC,750K,1/4W,5%	RCR07G754JM	MIL-R-39008	R56,108
222	1	1		200075-560	RES-FC,560K,1/4W,5%	RCR07G564JM	MIL-R-39008	R277
223	3	3		200076-220	RES-FC,2.2M,1/4W,5%	RCR07G225JM	MIL-R-39008	R205,259,203
224	1	1		200076-100	RES-FC,1.0M,1/4W,5%	RCR07G105JM	MIL-R-39008	R251
225	5	5		200076-470	RES-FC,4.7M,1/4W,5%	RCR07G475JM	MIL-R-39008	R23,128,182,183,76
226	2	2		200077-200	RES-FC,20M,1/4W,5%	RCR07G206JM	MIL-R-39008	R308,325
227								
228	1	1		200013-301	RES-FF.,3.01K,1/8W,1%	RN55D3011F	MIL-R-39008	R387
229	1	1		200013-681	RES-FF.,6.81K,1/8W,1%	RN55D6811F	MIL-R-39008	R371
230	1	1		200013-806	RES-FF.,8.06K,1/8W,1%	RN55D8061F	MIL-R-39008	R368
231	1	1		200014-909	RES-FF.,90.9K,1/8W,1%	RN55D9092F	MIL-R-39008	R386
232	2	2		200013-221	RES-FF,2.21K,1/8W,1%	RN55D2211F	MIL-R-39008	R240,241
233	3	3		200013-249	RES-FF,2.49K,1/8W,1%	RN55D2491F	MIL-R-39008	R237,238,239
234	1	1		200013-499	RES-FF,4.99K,1/8W,1%	RN55D4991F	MIL-R-39008	R337
235	23	23		200014-100	RES-FF,10.0K,1/8W,1%	RN55D1002F	MIL-R-39008	R14,15,61-64,113-116,179,180,184,185,219,220,221,222,336,388,290,420,421
236	1	1		200014-127	RES-FF,12.7K,1/8W,1%	RN55D1272F	MIL-R-39008	R248
237	2	2		200014-200	RES-FF,20.0K,1/8W,1%	RN55D2002F	MIL-R-39008	R217,229,
238	3	3		200014-301	RES-FF, 30.1K,1/8W,1%	RN55D3012F	MIL-R-39008	R186,187,228
239	6	6		200014-536	RES-FF,53.6K,1/8W,1%	RN55D5362F	MIL-R-39008	R12,13,59,60,111,112

Cipher Data Products

PARTS LIST

CODE IDENT	PL
32274	154012-001-002

TITLE: PWB ASSY-CONTROL SERVO

MODEL: 900X

SH 13 OF

REV AT

ITEM NO.	QUANTITY 001	QUANTITY 002		CIPHER PART NO.	DESCRIPTION	VENDOR NO.	VENDOR	REFERENCE DESIGNATOR
240	4	4		200015-100	RES-FF,100K,1/10W,1%	RN55D1003F	MIL-R-39008	R65,66,117,118
241	2	2		200015-150	RES-FF,150K,1/10W,1%	RN55D1503F	MIL-R-39008	174,175
242								
243	2	2		200082-390	RES-FC,390,1/2W,5%	RCR20G391JM	MIL-R-39008	R382,383
244	2	2		200080-270	RES-FC,2.7Ω,1/2W,5%	RCR20G2R7JM	MIL-R-39008	R344,345
245	25	25		200080-330	RES-FC,3.3Ω,1/2W,5%	RCR20G3R3JM	MIL-R-39008	R41,42,43,45,46,49, 50,52,93,94,95,97, 98,101,102,104,146 147,148,150,151, 154,157,155
246	11	11		200081-100	RES-FC,10Ω,1/2W,5%	RCR20G100JM	MIL-R-39008	R44,47,48,51,96, 99,100,103,149, 152,153,156
247	2	2		200082-560	RES-FC,560Ω,1/2W,5%	RCR20G561JM	MIL-R-39008	R381,401
248	1	1		200084-100	RES-FC,10K,1/2W,5%	RCR20G103JM	MIL-R-39008	R389
249	7	7		200128-100	RES-WW,.1Ω,3.75W,5%	CW-2B	DALE	R54,55,106,107,159 160,405
250	1	1		200122-750	RES-WW,750Ω,3.75W,5%	CW-2B	DALE	R379
251	2	2		205249	RESISTOR NETWORK-10K	899-1-R10K	BECKMAN	U47,50
252	1	1		205255-500	RESISTOR NETWORK-220/330	898- 5-R220/ 330	BECKMAN	U43
253	3	3		205253	RESISTOR NETWORK-560Ω	899-1-R560	BECKMAN	U9,16,23
254								
255								
256								
257	1	1		211007	SOCKET-DIP 16 PIN	CA-16S-10SD	CIRCUIT ASSY	XU43
258	2	2		211009-180	SOCKET-DIP 18 PIN	CA-18S-10SD	CIRCUIT ASSY	XU84,XU85

Cipher Data Products

PARTS LIST

CODE IDENT	PL
32274	154012-001-002

TITLE: PWB ASSY-CONTROL SERVO

MODEL		REV
900X	SH 14 OF	AT

ITEM NO.	QUANTITY 001	QUANTITY 002		CIPHER PART NO.	DESCRIPTION	VENDOR NO.	VENDOR	REFERENCE DESIGNATOR
259	2	2		211010-500	SOCKET-DIP-24 PIN	CA-24S-10SD	CIRCUIT ASSY	XU45,XU56
260	1	1		211010-280	SOCKET-DIP-28 PIN	CA-28S-10SD	CIRCUIT ASSY	XU72
261	1	1		211010-401	SOCKET-DIP-40 PIN	CA-40S-10SD	CIRCUIT ASSY	XU86
262	24	24		204027-014	TRANS-CORE DRVRS, NPN	2N4014	T.I.	Q1-8,13-20,25-32
263	AR	AR		210408-016	TUBING - SHRINK,BLK	HIX 1/4	ICO RALLY	
264	4	4		799603-100	TRANS-NPN, SILICON, SELECTED			Q39,40,42,43
265	1	1		204017-950	TRANS-NPN	MPS2222	MOTOROLA	Q58
266	1	1		204012	TRANS-PNP,SILICON	2N3702	T.I.	Q50
267	6	6		204013	TRANS-NPN,SILICON	2N3704	T.I.	Q37,38,41,49,59,60
268	2	2		204016-913	TRANS-NPN SILICON	2N4013	NATIONAL	Q54,55
269	4	4		204027-034	TRANS-PNP,SILICON	2N6034	MOTOROLA	Q45,48,52,53
270	3	3		204027-037	TRANS-NPN,SILICON	2N6037	MOTOROLA	Q46,47,51
271	12	12		204028-500	TRANS-NPN,SILICON	2N6338	MOTOROLA	Q9-12,21-24,33-36
272	2	2		204070-002	TRANS-SWITCHING	MJ10002	MOTOROLA	Q56,57
273								
274	AR	AR		209990-074	ADHESIVE-NUT LOCK	20076	LOCTITE	
275								
276								
277	1	1		206407-011	SCREW-PAN HD PHIL	4-40X7/16		
278	6	6		206410-011	SCREW-PAN HD PHIL	4-40 X5/8		
279	33	33		206607-011	SCREW-PAN HD PHIL	6-32X. 7/16		
280								
281	3	3		206614-011	SCREW-PAN HD PHIL	6-32X7/8		

Cipher Data Products

PARTS LIST

CODE IDENT	PL
32274	154012-001-002

TITLE: PWB ASSY-CONTROL SERVO

MODEL: 900X

SH 15 OF

REV: AT

ITEM NO.	QUANTITY 001	002		CIPHER PART NO.	DESCRIPTION	VENDOR NO.	VENDOR	REFERENCE DESIGNATOR
282	3	3		213274-132	SCREW-PAN HD PHIL	10-32 X 2		
283	3	3		207101-081	NUT-HEX RADIO PAT.	#10		
284	3	3		213703-109	WASHER-FLAT,SPL.#10	204-060-SS-12	ASM CO.	
285	4	4		207108-021	WASHER-FLAT SM OD	#10		
286	7	7		207403-011	WASHER-SPLIT LOCK	#4		
287	3	3		207406-081	NUT-HEX, RADIO PAT	#4		
288	7	7		207408-021	WASHER-FLAT, SM OD	#4		
289	7	7		207602-011	WASHER-SPLIT LOCK	#6		
290	36	36		207604-081	NUT-HEX RADIO PAT	#6		
291	7	7		207608-021	WASHER-FLAT, SM. O.D.	#6		
292	14	14		210613	INSULATOR-MYLAR,TO3	4303-2	THERMALLOY	
293	5	5		210613-050	INSULATOR-MYLAR	43-77-2	THERMALLOY	
294	33	33		213700-609	WASHER-FLAT NYLON, SM. PAT.	5610-46-62	SEASTROM	
295	28	28		207606-031	WASHER -INT.LK.	#6		
296								
297	12	12		208430-907	WIRE-SOLID,30 AWG,BLUE KYNAR	KN-30-130-6-7"		
298	3	3		213703-609	WASHER-FLAT,SPL #6	95-060-SS-12	ASM CO.	
299	10"	10"		208500-298	WIRE,BUSS,TINNED COPPER,22GA	298	ALPHA	
300	10"	10"		209100-552	TUBING-TEFLON, 22GA	TFT-200/22-1	ALPHA	
301	1	1		213274-128	SCREW-PAN HD,PHIL	10-32 X 1 3/4		

Cipher Data Products

PARTS LIST

CODE IDENT 32274 | PL 159013-901

TITLE: INDUCTOR ASSY-SERVO FILTER | MODEL NO. 900X | SH 1 OF 1 | REV A

DWN D Stone	9-13-77	LTR	DESCRIPTION	INC	DATE	APP	DATE	LTR	DESCRIPTION	INC	DATE	APP	DATE
CHK Jai	11-2-77	A	PROD REL	05	10-27-77	JJB	11/9/77						
N/C R. Crane	11/10/77												
MFG J3...	11-2-77												
QC [illegible]													
REL WMB	11-7-77												

ITEM NO.	QUANTITY			CIPHER PART NO.	DESCRIPTION	VENDOR NO.	VENDOR	REFERENCE DESIGNATOR
1	1			210910-250	CORE-MAGNETIC	A-291061-2	ARNOLD ENG	
2								
3	89"			208001-014	WIRE MAGNETIC-19AWG	2000	CNSLD WIRE	

Cipher Data Products

PARTS LIST

CODE IDENT 32274 | PL 154014-001-002

TITLE: INDUCTOR ASSY-P.S. FILTER | MODEL NO. 900X | SH 1 OF 1 | REV B

			LTR	DESCRIPTION	INC	DATE	APP	DATE	LTR	DESCRIPTION	INC	DATE	APP	DATE
DWN	[illegible]	9-12-77	A	PROD REL	05	10-27-77	[illegible]	11/14/77						
CHK	[illegible]	11-2-77	B	INCORP ECO 3171	RA	12-16-77	[illegible]	12-22-77						
N/C	R. Crane	11/11/77												
MFG	[illegible]	11-2-77												
QC	[illegible]													
REL	[illegible]	11-77												

ITEM NO.	QUANTITY 001	QUANTITY 002		CIPHER PART NO.	DESCRIPTION	VENDOR NO.	VENDOR	REFERENCE DESIGNATOR
1	1	1		210910-500	CORE-MAGNETIC	A300115-2	ARNOLD ENG.	
2								
3	57"	-		208001-016	WIRE-MAGNETIC 16 AWG	2000	CNSLD WIRE	
4	-	83"		208001-018	WIRE-MAGNETIC 18 AWG	2000	CNSLD WIRE	

Cipher Data Products

PARTS LIST

CODE IDENT 32274 | PL 159019-201-202

TITLE: TRANSFORMER ASSY P.S. FILTER | MODEL NO. 900X | SH 1 OF 1 | REV B

			LTR	DESCRIPTION	INC	DATE	APP	DATE	LTR	DESCRIPTION	INC	DATE	APP	DATE
DWN	Q Stow	9-19-77												
CHK	[illegible]	11-3-77	A	PROD REL	OS	10-27-77	[illegible]	11/14/77						
N/C	K. Crane	11/14/77	B	INCORP ECO 3389	JM	3-6-78	[illegible]	3-6-78						
MFG	[illegible]	11-22-77												
QC														
REL	WMH	11.77												

A

ITEM NO.	QUANTITY $Z0_1$	QUANTITY $Z0_2$		CIPHER PART NO.	DESCRIPTION	VENDOR NO.	VENDOR	REFERENCE DESIGNATOR
1	2	2		210909-002	POT CORE	1811P-L00-3C8	FERROXCUBE	
2								
3	1	1		210909-101	BOBBIN	1811 F I D	FERROXCUBE	
4	2"	2"		210408-004	TUBING-HEAT SHRINK	NIX-1/16	ICO RALLY	
5	46"	34"		208001-020	WIRE, MAGNETIC, 20 AWG	2000	CNSLD WIRE	
6								
7	1	1		206412-011	SCREW-PAN. HD, PHIL	4-40 X 3/4		
8	2	2		207407-080	WASHER-NYLON	#4		
9	1	1		207402-021	WASHER-FL.	#4		
10	1	1		207403-011	WASHER-S.P.LK.	#4		
11	1	1		207405-051	NUT-HEX	#4		
12								
13	AR			211113-026	TAPE-ELECTRICAL	P256	PERMACEL	
14	4	4		209999-000	MARKER-WIRE 1-50	VMM-D-49	BRADY	(1 THRU 4)
15	AR	AR		209999-033	STRIP-X	26-2	BC ELECTRONICS	

 BILL OF MATERIALS: 154014-301 REV E XFMR ASSY-SWITCHING RGLTR FIRST RELEASED: 11:26:08 15 JAN 1979

ITEM#	PART#.....	QTY	DESCRIPTION.....	MFG PART#.....	MFG	REF-DES.....	ALT PART#...	ECO#...	ST-USE..	END-USE
1	210909-003	2	POT CORE	4229P-L00-3C8	15000					
2	211113-026	AR	TAPE-ELECTRICAL	P256						
3	210910-210	1	BOBBIN	4229FID	15000					
4	210408-004	.5	TUBING-SHRINK,1/16 BLK	HIX-1/16	20064					
5	208001-022	20.2	WIRE MAGNETIC 22AWG	2000	73612					
6										
7	208001-018	5	WIRE-MAGNETIC 18AWG	2000	73612					
8										
9	206124-032	1	SCREW SKT HD CAP 10-32X1 1/2 BLK		00000					
10	207101-020	2	WASHER,FLAT, NYLON #10	#10 CAD						
11	207104-021	1	WASHER, FLAT,#10	WASHER #10 CAD.	00000					
12	207102-011	1	WASHER,SPLIT LOCK #10	WASHER #10 CAD.	00000					
13	207102-051	1	NUT,HEX-LG PAT 10-32	NUT #10 CAD.	00000					
14	209999-000	12	MARKER,WIRE- 1-50	VMM-0-49	00000					
15	209999-033	AR	STRIP-X	26-2	72653					

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Cipher Data Products

PARTS LIST

CODE IDENT: 32274 | PL: 154015-401

TITLE: TRANSFORMER ASSY | MODEL NO.: 900X | SH 1 OF 1 | REV B

			LTR	DESCRIPTION	INC	DATE	APP	DATE	LTR	DESCRIPTION	INC	DATE	APP	DATE
DWN	Mike Widd	12/13/77	A	eng release	-00	12-15-77	[illegible]	12/21/77						
CHK	Jas	12-10-77	B	INCORP ECO 3889	RA	6-27-78	[illegible]	6-28-78						
N/C	R. Crane	12/21/77												
MFG	[illegible]	1/2/78												
QC	T. H. Tracker	12/16/77												
REL	R. F. Berling	12/21/77												

ITEM NO.	QUANTITY 401			CIPHER PART NO.	DESCRIPTION	VENDOR NO.	VENDOR	REFERENCE DESIGNATOR
1	1			154013-001	PWB ASSY-TRANSFORMER		CIPHER	
2								
3								
4	1			754015-201	SHELL-XFMR ENCAPSULATION		CIPHER	
5	1			207403-021	WASHER, FLAT	#4		
6	1			207403-011	WASHER, SPLIT, LK.	#4		
7	1			207405-051	NUT, HEX	#4		

Cipher Data Products

PARTS LIST

CODE IDENT	PL
32274	154013-001

TITLE: PWB ASSY-TRANSFORMER

MODEL NO.: 900X

SH 1 OF 1

REV: C

DWN Pludd	12-1-77	LTR	DESCRIPTION	INC	DATE	APP	DATE	LTR	DESCRIPTION	INC	DATE	APP	DATE
CHK JaJ	12-9-77	A	ENG REL	--	12-7-77	[illegible]	12-12-77						
N/C K. Crane	12-12-77	B	INC ECO 4010	PVB	8/31/78	[illegible]	9-6-8						
MFG [illegible]	12/11/-	C	INCORP ECO 4590	RM	12-21-78	[illegible]	12-21-78						
QC M. Fraction	12-20-7												
REL L. Berling	12/21/77												

ITEM NO.	QUANTITY 001			CIPHER PART NO.	DESCRIPTION	VENDOR NO.	VENDOR	REFERENCE DESIGNATOR
DWG	REF			354013-300	SCHEM- PWB TRANSFORMER		CIPHER	
1	1			754013-101	PWB-TRANSFORMER		CIPHER	
2								
3								
4	2			154014-101	TRANSFORMER ASSY-SERVO		CIPHER	
5	2			154014-102	TRANSFORMER ASSY-SERVO		CIPHER	
6								
7								
8								
9								
10	2			213151-422	SCREW-FLT HD PHIL, 100°	4-40X1 3/8		
11	32			205023-100	TERM-SWAGE PIN	7720B-4	USECO	
12								
13								
14								
15								
16								
17								

 BILL OF MATERIALS: 154040-004 REV A PWB ASSY-DATA DUAL, FIRST RELEASED: 27 SEP 78 15:05:49 28 SEP 1978

ITEM*	PART#.....	QTY	DESCRIPTION.....	MFG PART#.....	MFG	REF-DES.....	ALT PART#...	ECO#...	ST-USE..	END-USE.
1	154040-009	1	PWB ASSY-DATA DUAL, 9TK,RAW (NO SPEED KIT)		32274					
2	154040-604	1	SPEED KIT-37.5IPS		32274					
3										
4	454040-000	REF	DASH NO INDEX/PWB ASSY-DATA DUAL		32274					
5	354040-300	REF	SCHEMATIC-DATA,DUAL MODE		32274					

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PARTS LIST

CODE IDENT: 32274 | PL: 154040-009

TITLE: PWB ASSY-DATA DUAL,9IK,RAM (NO SPEED KIT)

MODEL NO.: 70,80,100,900

SH 1 OF 8 | REV: G

DRN	L.SILVERNAIL	8/25/78	LTR	DESCRIPTION	INC	DATE	APP	DATE	LTR	DESCRIPTION	INC	DATE	APP	DATE
ENG	J. Williams	9/27/78	A	ENGR. RELEASE	J.W.	9/27/78	[illegible]	9/27/78	F	INC ECO 4529	[illegible]	12-6-78	[illegible]	12-13-78
MFG	[illegible]		B	INC ECO 4383	[illegible]	12-6-78	[illegible]	12-6-78	G	INC ECO 4735	CS	1-22-79	[illegible]	1-30-79
MFG	[illegible]	9/26/78	C	INC ECO 4439	[illegible]	[illegible]	[illegible]	12-6-78						
QC	[illegible]	9/27/78	D	INC ECO 4495	[illegible]	12-6-78	[illegible]	12-6-78						
REL	J. W. Williams	9/27/78	E	INC ECO 4498	[illegible]	12-6-78	[illegible]	12-6-78						

ITEM NO.	QUANTITY			CIPHER PART NO.	DESCRIPTION	VENDOR NO.	VENDOR	REFERENCE DESIGNATOR
1	1			754040-101	PWB-DATA,DUAL MODE		CIPHER	
2	1			731511-201	STIFFENER-LONG READ/WRITE		CIPHER	
3	1			731510-400	BAR STIFFENER		CIPHER	
4	4			731501-300	RETAINER-P/C CONNECTOR		CIPHER	
5	2			735000-402	SPACER		CIPHER	
6	37			205026	TEST POINT .058 DIA PIN	60802-2	AMP INC	
7	1			205068	CONNECTOR-12 POSN	03-09-2121	MOLEX	P20
8	12			205012	TERMINAL,MALE .093 DIA,PC	02-09-2134	MOLEX	(P20)
9	2			205061	CONNECTOR-29 POSN	SRE 29 PD4J	WINCHESTER	P21,22
10	1			211015-003	SWITCH-DUAL-IN-LINE,8 POS	1008-692	CTS	S1
11	1			211015-002	SWITCH-DUAL-IN-LINE,7 POS	1007-692	CTS	S2
12	1			211015-001	SWITCH-DUAL-IN-LINE,4 POS	1004-692	CTS	S3
13	11			205025-514	SOCKET-DIP,14 CONTACTS	514-AG10D	AUGAT	XA1-10,XU111
14	1			731006-800	LABEL-ASSY		CIPHER	
15	1			205025-516	SOCKET-DIP,16 CONTACTS	516-AG10D	AUGAT	XU90
16	4			201161-472	CAP-TANT,47UF,6V,10%	1980476X9006H1	SPRAGUE	C67,82,95,104
17	9			201121-680	CAP,DM,68 PF,300V,5%	D153E680J0	SANGAMO	C30,31,36,37,45,46,51,52,58

Cipher Data Products

PARTS LIST

CODE IDENT	PL
32274	154040-009

TITLE: PWB ASSY-DATA DUAL,9TK,RAW (NO SPEED KIT)

MODEL: -

SH 2 OF

REV G

ITEM NO	QUANTITY			CIPHER PART NO.	DESCRIPTION	VENDOR NO.	VENDOR	REFERENCE DESIGNATOR
18	20			201105-101	CAP-CER DISC,.1UF,10V	UK10-104	CENTRALAB	C1,2,4,8,9,15,17,20,22,25,40,55,96,99,107,108,109,110,111,116
19	4			201103-100	CAP-CER,.001UF 1000V GMV	5HK-D10	SPRAGUE	C3,11,12,16
20	35			201105-010	CAP-CER,DISC,.01UF,500V	5HKS-S10	SPRAGUE	C5,6,13,14,18,19,23,24,38,39,53,54,59,60,62,63,65,66,68,69,71,72,74,75,77,78,80,81,83,84,86,87,89,90,98
21	1			201122-150	CAP,DM,150PF,300V,5%	D153E151J0	SANGAMO	C7
22	1			201121-300	CAP,DM,30PF,300V,5%	D153C300J03	SANGAMO	C10
23	9			201121-200	CAP,DM,20PF,300V,5%	CD15ED220J03	SANGAMO	C61,64,70,73,76,79,85,88,91
24	9			201121-270	CAP,DM,27PF,300V,5%	D153E270J0	SANGAMO	C117,118,119,120,121,122,123,124,125
25	1			201105-103	CAP-CER,DISC,.1UF,25V	563CY5SBA250 AH104Z	SPRAGUE	C93
26	1			201160-100	CAP,TANT,1UF,35V,10%	CS13BF105K	NCI	C94
27	5			201161-100	CAP,TANT,10UF,20V,10%	CS13BE106K	NCI	C97,100,101,105,106
28	1			201104-501	CAP-CER,DISC,.05UF,20V,5%	UK20-503	CENTRALAB	C103
29	2			201122-220	CAP,DM,220PF,300V,5%	D153E221J0	SANGAMO	C112,113
30	2			201121-220	CAP,DM,22PF,300V,5%	D153E220J0	SANGAMO	C114,115
31	3			200074-330	RES,FC,33K,1/4W,5%	RCR07G333JM	MIL-R-39008	R30,32,37

Cipher Data Products

PARTS LIST

CODE IDENT	PL
32274	154040-009

TITLE: PWB ASSY-DATA DUAL,9TK,RAW (NO SPEED KIT)

MODEL		REV
-	SH 3 OF	G

ITEM NO	QUANTITY			CIPHER PART NO.	DESCRIPTION	VENDOR NO.	VENDOR	REFERENCE DESIGNATOR
32	1			799603-100	TRANSISTOR-NPN,SILICON, SELECTED		CIPHER	Q1
33	1			202006-100	DIODE-LIGHT EMITTING	MV5053	MONSANTO	CR1
34	2			202018	DIODE,SWITCHING	IN914	T.I.	CR2,3
35	1			202032-390	DIODE-ZENER,3.9V,5W	IN5335	MOTOROLA	CR4
36	2			204013	TRANSISTOR,NPN SILICON	2N3704	T.I.	Q2,6
37	2			204012	TRANSISTOR,PNP SILICON	2N3702	T.I.	Q3,4
38	1			204027-034	TRANSISTOR,PNP SILICON	2N6034	MOTOROLA	Q5
39	1			200073-430	RES,FC,4.3 K,1/4W,5%	RCR07G432JM	MIL-R-39008	R283
40	12			210915	FERRITE BEAD	21-170J	FERRONICS	L1,2,3,4
41	.5			208500-298	WIRE BUS TND COPPER,22AWG	298	ALPHA	L1,2,3,4
42	1			200073-680	RES,FC,6.8 K,1/4W,5%	RCR07G682JM	MIL-R-39008	R284
43	19			200073-270	RES,FC,2.7 K,1/4W,5%	RCR07G272JM	MIL-R-39008	R16,53-56,85-88,125-128,161-164,189,196 R203-211
44	9			200209-103	POT-CER,10K	3339P-1-103	BOURNS	
45	1			200073-330	RES,FC,3.3 K,1/4W,5%	RCR07G332JM	MIL-R-39008	R13
46	18			200082-430	RES,FC,430 OHM,1/2W,5%	RCR20G431JM	MIL-R-39008	R222,224,226,228, 230,232,234,236, 238,241,243,245, 247,248,250,252, 254,256
47	18			200082-470	RES,FC,470 OHM,1/2W,5%	RCR20G471JM	MIL-R-39008	R223,225,227,229, 231,233,235,237, 239,240,242,244, 246,249,251,253, 255,257
48	1			200075-220	RES,FC,220 K,1/4W,5%	RCR07G224JM	MIL-R-39008	R1
49	1			200072-220	RES,FC,220 OHM,1/4W,5%	RCR07G221JM	MIL-R-39008	R2

Cipher Data Products

PARTS LIST

CODE IDENT	PL
32274	154040-009

TITLE: PWB ASSY-DATA DUAL,9TK,RAW (NO SPEED KIT)

MODEL: -

SH 4 OF

REV: G

ITEM NO.	QUANTITY			CIPHER PART NO.	DESCRIPTION	VENDOR NO.	VENDOR	REFERENCE DESIGNATOR
50	22			200074-100	RES,FC,10 K,1/4W,5%	RCR07G103JM	MIL-R-39008	R3,4,5,9,10,17,18, 19,34,60,66,100,106 136,142,172,178, 197,217,219,262, 285
51	1			200072-390	RES,FC,390 OHM,1/4W,5%	RCR07G391JM	MIL-R-39008	R6
52	13			200072-680	RES,FC,680 OHM,1/4W,5%	RCR07G681JM	MIL-R-39008	R7,8,45,48,77,80, 117,120,153,156, 187,258,259
53	24			200073-470	RES,FC,4.7 K,1/4W,5%	RCR07G472JM	MIL-R-39008	R11,46,47,49,50, 78,79,81,82, 118,119,121, 122, 154, 155,157, 158, 191,193, 215,216,218 260,261
54	1			200074-240	RES,FC,24 K,1/4W,5%	RCR07G243JM	MIL-R-39008	R12
55	10			200073-150	RES,FC,1.5 K,1/4W,5%	RCR07G152JM	MIL-R-39008	R64,70,104,110, 140,146,176,182, 201,220
56	1			200075-150	RES,FC,150 K,1/4W,5%	RCR07G154JM	MIL-R-39008	R14
57	1			200075-430	RES,FC,430 K,1/4W,5%	RCR07G434JM	MIL-R-39008	R15
58	3			200075-510	RES,FC,510K,1/4W,5%	RCR07G514JM	MIL-R-39008	R20,21,25
59	8			200074-470	RES,FC,47 K,1/4W,5%	RCR07G473JM	MIL-R-39008	R22,23,24, 31, ,33,35,36, 38
60								
61	1			200073-510	RES,FC,5.1 K,1/4W,5%	RCR07G512JM	MIL-R-39008	R29

Cipher Data Products

PARTS LIST

CODE IDENT	PL
32274	154040-009

TITLE: PWB ASSY-DATA DUAL,9TK,RAW (NO SPEED KIT)

MODEL: -

SH 5 OF

REV C

ITEM NO.	QUANTITY			CIPHER PART NO.	DESCRIPTION	VENDOR NO.	VENDOR	REFERENCE DESIGNATOR
62	27			200074-150	RES,FC,15 K,1/4W,5%	RCR07G153JM	MIL-R-39008	R39,42,61,62,67, 68,71,74,101,102, 107,108,111,114, 137,138,143,144, 147,150,173,174, 179,180,192,198, 199
63	18			200074-220	RES,FC,22 K,1/4W,5%	RCR07G223JM	MIL-R-39008	R40,41,43,44,72, 73,75,76,112,113, 115,116,148,149, 151,152,185,186
64	19			200073-100	RES,FC,1 K,1/4W,5%	RCR07G102JM	MIL-R-39008	R28,51,58,59,83,90 93,97,99,123,130, 133,135,159,166, 169,171,188,194
65	18			200073-220	RES,FC,2.2 K,1/4W,5%	RCR07G222JM	MIL-R-39008	R52,57,84,89,124, 129,160,165,190, 286,287,288,289, 290,291,292,293, 294
66	9			200071-470	RES,FC,47 OHM,1/4W,5%	RCR07G470JM	MIL-R-39008	R63,65,103,105, 139,141,175,177, 200
67	18			200076-100	RES,FC,1 MEG,1/4W,5%	RCR07G105JM	MIL-R-39008	R69,91,92,94,95, 96,98,109,131,132, 134,145,167,168, 170,181,195,202
68	2			200071-750	RES,FC,75 OHM,1/4W,5%	RCR07G750JM	MIL-R-39008	R183,184
69	2			200073-200	RES,FC,2K,1/4W,5%	RCR07G202JM	MIL-R-39008	R212,264
70	1			200073-300	RES,FC,3 K,1/4W,5%	RCR07G302JM	MIL-R-39008	R213
71	1			200071-150	RES,FC,15 OHM,1/4W,5%	RCR07G150JM	MIL-R-39008	R214

Cipher Data Products

PARTS LIST

CODE IDENT 32274 | PL 154040-009

TITLE: PWB ASSY-DATA DUAL,9TK,RAW (NO SPEED KIT) | MODEL: - | SH 6 OF | REV G

ITEM NO.	QUANTITY			CIPHER PART NO.	DESCRIPTION	VENDOR NO.	VENDOR	REFERENCE DESIGNATOR
72	1			200071-100	RES,FC,10 OHM,1/4W,5%	RCR07G100JM	MIL-R-39008	R263
73	9			200066-150	RES,FC,1.5MEG,1/8W,5%	RCR05G155JM	MIL-R-39008	R265,268,269,272,273,276,277,280,282
74	9			200066-680	RES,FC,6.8MEG,1/8W,5%	RCR05G685JM	MIL-R-39008	R266,267,270,271,274,275,278,279,281
75	1			205255	RESISTOR NETWORK-220/330	899-5-R220/330	BECKMAN IND	U111
76	1			203027-001	IC-QUAD,2-IMP,POS-AND GT	SN74LS08N	T.I.	U1
77	2			203046-001	IC-RTRIG,MNST,MLTV	SN74LS123N	T.I.	U2,115
78	1			203095-500	IC-13 INPUT,POS-NAND GATE	SN74LS133N	T.I.	U4
79	1			203029-027	IC-TRIPLE THREE INPUT POSITIVE NOR GATE	SN74LS27N	T.I.	U5
80	2			203042-501	IC-4 BIT,BIN,CNTR	SN74LS93N	T.I.	U7,11
81	1			203051-174	IC,HEX,D-TYPE FLIP FLOP	SN74LS174N	T.I.	U8
82	1			203036	IC-QUAD,2-IMP,POS-NND BFR	SN7438N	T.I.	U9
83	1			203026	IC-HEX INVERTER	SN7404N	T.I.	U10
84	3			203048-100	IC-SYN,4 BIT COUNTER	SN74LS161N	T.I.	U12,15,91
85	1			203046-132	IC-QUAD,2 INPUT,POS-NAND TRIG	SN74LS132N	T.I.	U13
86	1			203010	IC-DUAL OPERATIONAL AMPL	N5558V	SIGNETICS	U16
87	1			203026-003	IC-TTL,HEX INVERTER,POS-NAND (OPEN COLLECTOR)	SN7405N	T.I.	U17
88	6			203039-001	IC-DUAL-D FLIP FLOP	SN74LS74N	T.I.	U26,38,49,61,75,18
89	8			203085-001	IC-SCHM,TRIG INPUT,HEX IV	SN74LS14N	T.I.	U21,25,36,48,59,71,112,113
90	1			203023	IC-QUAD,2 IMP,POS-NAND GT	SN7400N	T.I.	U22

Cipher Data Products

PARTS LIST

CODE IDENT	PL
32274	154040-009

TITLE: PWB ASSY-DATA DUAL,9TK,RAW (NO SPEED KIT)

MODEL: -

SH 7 OF

REV G

ITEM NO.	QUANTITY			CIPHER PART NO.	DESCRIPTION	VENDOR NO.	VENDOR	REFERENCE DESIGNATOR
91	1			203010-001	IC-VOLTAGE COMPARATORS	LM2903N	NATIONAL	U23
92	4			203029-003	IC-TRIP,3 INPUT,AND GATE	SN74LS11N	T.I.	U24,47,70,114
93	9			203007-350	IC-VOLT COMP/BFR	LM319N	NATIONAL	U27,32,39,44,50, 55,62,69,74
94	4			203026-600	IC-TTL,HEX INVERTER,POS-NAND (OPEN COLLECTOR)	SN74LS05N	T.I.	U28,40,51,63
95	9			203007-351	IC-VOLTAGE COMPARATOR	LM311N	NATIONAL	U29,30,41,42,52, 53,64,65,77
96	9			203130	IC-JEET INPUT,OP AMPS	TL082P	T.I.	U33,34,45,46,56, 57,66,67,79
97	6			203042-001	IC-QUAD,EXCLUSIVE OR GATE	SN74LS86N	T.I.	U37,60,76,108,109, 110
98	9			203043-500	IC-OP,AMP,HI PERFORMANCE	SN72709P	T.I.	U80-88
99	1			203046-002	IC-TTL,DUAL VOLTAGE CONTROLLED OSCILLATOR	SN74S124N	T.I.	U89
100								
101	1			203026-500	IC-HEX,INVERTER BFR/DRVR	SN7406N	T.I.	U92
102	6			203030-417	IC-HEX,BFR/DRIVER	SN7417N	T.I.	U93-98
103	9			203042-800	IC-DUAL,J-K FLIP FLOP	SN74LS112N	T.I.	U99-107
104	3			203032-501	IC-TTL,QUAD,2 INP,POS-NOR BUFFER,O/C	SN7433N	T.I.	U35,58,73
105	5			203023-001	IC-QUAD,2INPUT,POS-NAND GATE	SN74LS00N	T.I.	U31,54,68,78,43
106								
107	1			203013-300	IC-VOLTAGE REGULATOR	MC7912CP	MOTOROLA	VR1
108	1			203013-210	IC-VOLTAGE REGULATOR	MC7812CP	MOTOROLA	VR2
109								
110	1			210145	HEAT SINK	PA2-1CB	MIL-COMM	XVR2

Cipher Data Products

PARTS LIST

CODE IDENT 32274 | PL 154040-009

TITLE: PWB ASSY-DATA DUAL,9TK,RAW (NO SPEED KIT)

MODEL: -

SH 8 OF | REV G

ITEM NO.	QUANTITY			CIPHER PART NO.	DESCRIPTION	VENDOR NO.	VENDOR	REFERENCE DESIGNATOR
111	8			205061-004	WASHER FLAT FIBRE	2191	H.H. SMITH	
112	4			210030-171	STANDOFF 1/8 2-56 HEX BR	8100-B-0256	AMATOM	
113	6			206405-011	SCREW PAN,HD,PHIL,4-40X5/16 CAD			
114								
115	4			206409-011	SCREW PAN,HD,PHIL,4-40X9/16 CAD			
116	6			207406-081	NUT,HEX,RADIO PAT,#4	NUT #4 CAD		
117	12			207408-021	WASHER,FLAT,SMALL,OD #4			
118	12			207403-011	WASHER,SPLIT LOCK #4	WASHER #4 CAD		
119	4			205061-001	WASHER,FLAT FIBRE	2161	H.H. SMITH	
120	2			206407-011	SCREW PAN,HD,PHIL,4-40X7/16 CAD			
121								
122	4			211000-300	SOCKET TERMINALS	SLSG-10G8-1	AUGAT	XC21,92
123	1			211000-200	SOCKET ASSEMBLY,CRYSTAL	8000-DG1	AUGAT	XY1
124								
125					(NO SPEED KIT FOR 154040-009)			
126								
127								
128								
129								
130	REF			354040-300	SCHEMATIC-DATA,DUAL MODE			

ITEM*	PART#.....	QTY	DESCRIPTION.....	MFG PART#.....	MFG	REF-DES	ALT PART#...	ECO#...	ST-USE..	END-USE.
1	154040-404	5	HEADER ASSY		32274	A1,2,3,4,5		4311		
2	154040-412	5	HEADER ASSY		32274	A6,7,8,9,10		4311		
3	201213-668	1	CHP-CER.6800PF,100V,10%	CK05B682	04222	C21		4311		
4	201122-180	1	CAP CH 180PF 300V 5%	D15CE181J0	00853	C92		4311		
5	210111-515	1	CRYSTAL-QUARTZ 3.840 MHZ	815-A-3.840 MHZ	30149	Y1		4440		

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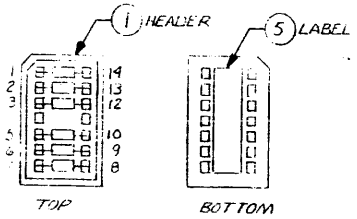
REVISION					
LTR	DESCRIPTION	DWN	DATE	APVD	DATE
A	ENGR. RELEASE	SGS	9/25/78	[illegible]	9/28/78
B	INCORP ECO 1997	RA	9.15.78	[illegible]	11-1-78

REV B



DASH NO.	SPEEDS	PIN NO.		ITEM NO.
401	12.5 IPS	1-14	5-10	3
		2-13	7-8	2
		3-12	6-9	4
402	18.75 IPS	1-14	5-10	3
		2-13	7-8	2
		3-12	6-9	4
403	25 IPS	1-14	5-10	3
		2-13	7-8	2
		3-12	6-9	4
404	37.5 IPS	1-14	5-10	3
		2-13	7-8	2
		3-12	6-9	4
405	45 IPS	1-14	5-10	2
		2-13	7-8	4
		3-12	6-9	3
406	75 IPS	1-14	5-10	2
		2-13	7-8	4
		3-12	6-9	3
407	90 IPS	1-14	5-10	3
		2-13	7-8	2
		3-12	6-9	4
408	12.5 IPS	1-14	5-10	4
		2-13	7-8	3
		3-12	6-9	2
409	12.5 IPS	1-14	6-9	2
		2-13	5-10	3
		3-12	7-8	4
410	18.75 IPS	1-14	6-9	2
		2-13	5-10	3
		3-12	7-8	4
411	25 IPS	1-14	6-9	2
		2-13	5-10	3
		3-12	7-8	4
412	37.5 IPS	1-14	6-9	2
		2-13	5-10	3
		3-12	7-8	4
413	45 IPS	1-14	6-9	2
		2-13	5-10	3
		3-12	7-8	4
414	75 IPS	1-14	6-9	3
		2-13	5-10	4
		3-12	7-8	2
415	90 IPS	1-14	6-9	2
		2-13	5-10	3
		3-12	7-8	4
416	12.5 IPS	1-14	6-9	2
		2-13	6-10	3
		3-12	7-8	4

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ARE:
DECIMALS ANGLES
.XX = ± —— ± ——
.XXX = ± ——

DO NOT SCALE DRAWING

APPROVALS	DATE
DWN J. SCHNEIDER	8/25/78
CHK R.J. Berlin	9/8/78
MECH ENG B. BARTON	9/27/78
ELEC ENG [illegible]	[illegible]
MFG ENG [illegible]	9-27-78
QC [illegible]	9-25-78
DOC CHK [illegible]	9/27/78

Cipher Data Products SAN DIEGO CALIF.

TITLE HEADER ASSY

SIZE	CODE IDENT NO.	DRAWING NO.	REV
C	32274	154040 -401 THRU -416	B

SCALE [illegible] 70,80,100,90 SHEET 1 OF 1

BILL OF MATERIALS: 154040-104 REV B HEADER ASSY 05:37:56 15 NOV 1978

ITEM#	PART#	QTY	DESCRIPTION	MFG PART#	MFG	REF-DES	ALT PART#	ECO#	ST-USE	END-USE
1	211001-100	1	HEADER DIP PLUG-14 PIN	CA-14P-08	49000					
2	201113-100	2	CAP,CER,1000PF,50V,10%	G1710050X7R102K	51642					
3	201113-220	2	CAP,CER,2200PF,50V,10%	G1710-050-X7R-2251	642					
4	201113-470	2	CAP,CER,.0047UF,50V,10%	G1710050X7R-472K	51642					
5	754040-504	1	LABEL-HEADER		00000					

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BILL OF MATERIALS: 154040-412 REV B HEADER ASSY 05:41:00 15 NOV 1978

ITEM*	PART#.....	QTY	DESCRIPTION.....	MFG PART#.....	MFG	REF-DES.....	ALT PART#...	ECO#...	ST-USE..	END-USE.
1	211001-100	1	HEADER DIP PLUG-14 PIN	CA-14P-00	49000					
2	201111-560	2	CAP,CER,56PF,50V,10%	G1710050NP0560K	J51642					
3	201112-100	2	CAP,CER,100PF,50V,10%	G2610050NP0101K	J51642					
4	201112-560	2	CAP-CER,560PF,50V,10%	G1710200X7R561K	J51642			4497		
5	754040-512	1	LABEL-HEADER		00000					

***

 BILL OF MATERIALS: 154040-005 REV A PWB ASSY-DATA DUAL, FIRST RELEASED: 27 SEP 78 15:07:08 28 SEP 1978

ITEM*	PART#.....	QTY	DESCRIPTION.....	MFG PART#.....	MFG	REF-DES.....	ALT PART#...	ECO#...	ST-USE..	END-USE.
1	154040-009	1	PWB ASSY-DATA DUAL, 9TK,RAW (NO SPEED KIT)		32274					
2	154040-605	1	SPEED KIT-45IPS		32274					
3										
4	454040-000	REF	DASH NO INDEX/PWB ASSY-DATA DUAL		32274					
5	354040-300	REF	SCHEMATIC-DATA/DUAL MODE		32274					

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 BILL OF MATERIALS: 154040-605 REV B SPEED KIT-45IPS FIRST RELEASED: 27 SEP 78 07:33:58 31 OCT 1978

ITEM#	PART#	QTY	DESCRIPTION	MFG PART#	MFG	REF-DES	ALT PART#	ECO#	ST-USE	END-USE
1	154040-405	5	HEADER ASSY		32274	A1,2,3,4,5		4312		
	154040-413	5	HEADER ASSY		32274	A6,7,8,9,10		4312		
3	201213-056	1	CAP-CER,5600PF,100V,10%	CK05BX562	04222	C21		4312		
4	201122-159	1	CAP DM 150PF 300V 5%	D15E151J0	J00853	C92		4312		
5	210111-511	1	CRYSTAL-QUARTZ,4.608 MHZ	815-R-4.608 MHZ	30149	Y1				

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BILL OF MATERIALS: 154040-405 REV B HEADER ASSY 05:38:20 15 NOV 1978

ITEM*	PART#.....	QTY	DESCRIPTION.....	MFG PART#.....	MFG	REF-DES.....	ALT PART#...	ECO#...	ST-USE.	END-USE
1	211001-100	1	HEADER DIP PLUG-14 PIN	CA-14P-08	49000					
2	201113-180	2	CAP-CER,1800PF,50VDC,10%	G2610-050-NPO-18	51642					
3	201113-390	2	CAP,CER,3900PF,50V,10%	G1710-050-X7R-39	51642					
4	201112-820	2	CAP-CER,820PF,50V,10%	G1710100X7R821K	[51642]					
5	754040-505	1	LABEL-HEADER		00000					

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BILL OF MATERIALS: 154040-413 REV B HEADER ASSY 05:41:22 15 NOV 1978

ITEM#	PART#.....	QTY	DESCRIPTION.....	MFG PART#.....	MFG	REF-DES.....	ALT PART#...	ECO#...	ST-USE..	END-USE.
1	211001-100	1	HEADER DIP PLUG-14 PIN	CA-14P-08	49000					
2	201111-470	2	CAP,CER,47PF,50V,10%	G2610050NP0470K	51642					
3	201111-820	2	CAP,CER,82PF,50V,10%	G1710-050-NP0-8251642	51642					
4	201112-470	2	CAP-CER,470PF,50V,10%	G1710200X7R471K	51642			4497		
5	754040-513	1	LABEL-HEADER		00000					

***

 BILL OF MATERIALS: 154040-006 REV A PWB ASSY-DATA DUAL, FIRST RELEASED: 27 SEP 78 15:08:39 28 SEP 1978

ITEM#	PART#	QTY	DESCRIPTION	MFG PART#	MFG	REF-DES	ALT PART#	ECO#	ST-USE	END-USE
1	154040-009	1	PWB ASSY-DATA DUAL, 9TK, RAW (NO SPEED KIT)		32274					
2	154040-606	1	SPEED KIT-75IPS		32274					
3										
4	454040-000	REF	DASH NO INDEX/PWB ASSY-DATA DUAL		32274					
5	354040-300	REF	SCHEMATIC-DATA, DUAL MODE		32274					

***

 BILL OF MATERIALS: 154040-606 REV C SPEED KIT-7.5IPS FIRST RELEASED: 27 SEP 78 05:42:52 15 NOV 1978

ITEM*	PART#.....	QTY	DESCRIPTION.....	MFG PART#.....	MFG	REF-DES.....	ALT PART#...	ECO#...	ST-USE..	END-USE.
1	154040-406	5	HEADER ASSY		32274	A1,2,3,4,5		4313		
	154040-414	5	HEADER ASSY		32274	A6,7,8,9,10		4313		
3	201213-033	1	CAP-CER,3300PF,100V,10%	CK05BX332	04222	C21		4313		
4	201122-100	1	CAP DM 100PF 300V 5%	D153E101J0	00853	C92		4313		
5	210111-515	1	CRYSTAL-QUARTZ 3.840 MHZ	815-A-3.840 MHZ	30149	Y1		4441		

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 BILL OF MATERIALS: 154040-406 REV B HEADER ASSY 05:38:44 15 NOV 1978

ITEM#	PART#	QTY	DESCRIPTION	MFG PART#	MFG	REF-DES	ALT PART#	ECO#	ST-USE	END-USE
1	211001-100	1	HEADER DIP PLUG-14 PIN	CA-14P-08	49000					
2	201113-100	2	CAP,CER,1000PF,50V,10%	G1710050X7R102K	I51642					
3	201113-220	2	CAP,CER,2200PF,50V,10%	G1710-050-X7R-2251	642					
4	201112-470	2	CAP-CER,470PF,50V,10%	G1710200X7R471K	I51642					
5	754040-506	1	LABEL-HEADER		00000					

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BILL OF MATERIALS: 154040-414 REV B HEADER ASSY 05:41:44 15 NOV 1978

ITEM#	PART#.....	QTY	DESCRIPTION.....	MFG PART#.....	MFG	REF-DES.....	ALT PART#...	ECO#...	ST-USE..	END-USE.
1	211001-100	1	HEADER DIP PLUG-14 PIN	CA-14P-08	49000					
2	201112-270	2	CAP,CER,270PF,200V,10%	G1710200X7R271K	J51642			4497		
3	201111-270	2	CAP-CER,27PF,100VDC,10%	G1710-100-NP0-275	1642					
4	201111-470	2	CAP,CER,47PF,50V,10%	G2610050NP0470K	J51642					
5	754040-514	1	LABEL-HEADER		00000					

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 BILL OF MATERIALS: 154000-999 REV M MIT-900 FIRST RELEASED: 01 SEP 78 09:21:56 12 FEB 1979

ITEM#	PART#.....	QTY	DESCRIPTION.....	MFG PART#.....	MFG	REF-DES.....	ALT PART#...	ECO# ..	ST-USE..	END-USE.
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23										
24										
25										
26	154014-601	1	SWITCH ASSY-VACUUM SENSING	----------32274						
27	154031-801	1	CAPSTAN MOTOR ASSY	----------32274						
28	154010-901	1	VACUUM VALVE ASSY	----------32274						
29	154031-601	1	MOTOR ASSY VALVE	----------32274						
30	154050-101	1	FLOOR ASSY-TRANSDUCER	32274				4977		
31	154008-002	1	PWB ASSY-FILE PROTECT EOT/BOT *	----------32274						
32	154008-001	1	PWB ASSY-FILE PROTECT EOT/BOT *	----------32274						
33	154019-901	1	COLUMN SIDE ASSY-LEFT	----------32274						
34	154015-101	1	COLUMN SIDE ASSY-RIGHT	----------32274						
35	131506-000	1	CABLE ASSY-R/W BOARD TO SERVO BOARD J7-J20	----------32274						
36	154002-101	3	ROLLER GUIDE ASSY	----------32274						
37	154016-201	1	TERMINAL BLOCK ASSY	----------32274						
38	154004-001	1	CAPSTAN ASSY	----------32274						
39	154003-001	1	FAN ASSY	----------32274				4809		
40	154019-301	1	REFLECTOR ASSY	----------32274						
41	754017-501	1	CAPSTAN COLLAR	----------32274						
42	754016-401	2	BASE-FIXED TAPE GUIDE	----------32274						
43	754004-901	2	CAP-ROLLER GUIDE	----------32274						
44	731001-700	2	THREADING GUIDE	----------32274						
45	710008-600	2	SPRING-TAPE GUIDE	----------32274						
46	754002-401	1	HOUSING-FAN FILTER	----------32274						
47	754003-101	1	FILTER-FAN	----------32274						
48	754007-301	2	WASHER-GUIDE	----------32274						
49	754005-601	1	BRACKET-CAPACITOR	----------32274						
50	754019-901	1	BRACKET-PUMP	----------32274						
51	754020-502	2	STANDOFF *	----------32274				4279		
52	754020-501	2	STANDOFF	----------32274				4279		

ITEM*	PART#.....	QTY	DESCRIPTION.....	MFG PART#.....	MFG	REF-DES.....	ALT PART#...	ECO#...	ST-USE..	END-USE.
			*							
53	731003-600	1	CATCH PIN-DUST DOOR	----------	32274					
54	754018-601	1	COVER-POWER SUPPLY	----------	32274					
55	754031-001	1	SHAFT-LATCH	----------	32274					
56	731911-102	2	SHIM .005THICK 1/4 IN ID	----------	32274					
57	752003-701	1	PAWL - LATCH	----------	32274					
58	754018-801	1	COVER-BRACKET	----------	32274					
59	754001-501	1	TOP PLATE-MACHING	----------	32274					
60	754017-701	1	FACADE	----------	32274					
61	754031-401	1	GASKET VACUUM PUMP	----------	32274					
62	131047-001	1	TAPE SCRAPER ASSY	----------	32274			4809		
63	131910-700	2	STANDOFF ASSY, HINGED	----------	32274			4809		
64	754007-202	2	WASHER-GUIDE	----------	32274					
65	754022-201	1	SHIPPING FRAME-900X	----------	32274					
			*							
66	754018-201	1	SENSOR COVER	----------	32274					
67	754012-801	2	TAPE GUIDE	----------	32274					
68	754018-001	1	SHIM-COLUMN LEFT	----------	32274					
69	754018-002	1	SHIM-COLUMN, LEFT	----------	32274					
70	754019-001	1	SHIM-COLUMN RIGHT	----------	32274					
71	754019-002	1	SHIM-COLUMN, RIGHT	----------	32274					
72	210009-001	2	SPRING, WAVE	W0242-006-5	05000					
73	201190-400	1	CAP ELECT AC MOT 40UF 370V	P150F402	30510	J0				
74	205073	2	CONNECTOR-HOUSING, 3 POS.	03-09-1032	27264	J25,26				
75	205076	1	CONNECTOR-5 POSN	03-09-1052	27264	J28				
76	154010-201	1	REEL HUB ASSY-SUPPLY	----------	32274			4809		
77	205297-020	3	GROMMET-INSULATION	Z-3007	76385					
78	754024-201	1	LABEL - FUSE REPLACEMENT	----------	32274					
79	131010-001	1	REEL HUB ASSY	----------	32274			4809		
80	210229-200	2	CLAMP, CABLE-3/16 WHITE	3303	25000					
81	210201	1	REEL 10 1/2"	5198GS	70000					
82	210229-523	15	TY-RAP-1/16 TO 5/8	TY-23M	85000					
83	205268-100	.5	GROMMET STRIP	GS3	0174					
94	210003-001	1	SPRING, COMPRESSION	LC-032E-SMW	94830					
85	210199-001	1	RING, RETAINING-CRESCENT	S103-25H	95000					
86	205034-003	1	PIN, ROLL 1/3 X 7/8	59-029-125-0875	72962					
87	205288-000	.5	GROMMET STRIP	GS2A	0174					
88	210040-074	2	STDOFF-3/16 HGD, 3/4, 4-40	9225A140	30013					
89	210031-400	2	STDOFF-3/16 HEX, 1-7/8, 4-40	8123-A 0440	06540			3784		
90	210229	1	CLAMP, CABLE-5/16 BLACK	774 P-CLIP	48000					
91	211051-575	1	SWITCH POWER, ON-NONE-OFF	TH201-T	16000					
92	211151-225	1	FUSE, 2AG, NORM-BLO, 6A, 250V	312006	10000					
93	211151-222	1	FUSE-2AG, NORM-BLO, 3A, 250V	312003	00000			4232		
94	209100	1	STRIPS-MARKER	MS600-6	J75382	J		4516		
95	211076	4	SCREW SHOULDER	7456-SS-0832	41000					
96	206210-032	1	SCREW SOC HD CAP 2-56X5/8 BLK		00000					
97	154012-001	1	PWR ASSY-CONTROL/SERVO	----------	32274			4809		
98	206402-072	2	SCREW SOC SET KNRL CUP PT 4-40X1/8 BLK 0		00000			3305		
99	213062-403	4	SCREW-BTN HD SKT, 4-40 4-40 X 3/16 BLK	4-40X3/16 BLK						
100										
101	206404-011	9	SCREW PAN HD PHIL 4-40X1/4 ORD		00000					
102	206404-062	2	SCREW BTN HD SOC							

ITEM#	PART#.....	QTY	DESCRIPTION.....	MFG PART#.....	MFG	REF-DES.....	ALT PART#...	ECO#...	ST-USE..	END-USE.
			4-40X1/4 BLK 0							
103										
104	206406-011	6	SCREW PAN HD PHIL 4-40X3/8 CAD		00000					
105	206406-032	10	SCREW-SKT HD CAP 4-40X3/8 BLK 0		00000					
106	206408-062	2	SCREW BTN HD SKT 4-40X1/2 BLK 0		00000					
107	206410-011	2	SCREW PAN HD PHIL 4-40X5/8 CAD		00000					
108	206412-031	14	SCREW SKT HD CAP 4-40X3/4		00000					
109	206414-011	2	SCREW, PAN HD, PHIL 4-40X7/8							
110										
111	213091-422	2	SCREW-SKT HD CAP 4-40X1 3/8"							
112										
113	206428-031	2	SCREW SKT HD CAP 4-40X1 3/4 CAD							
114										
115	206608-011	1	SCREW PAN HD PHIL 6-32X1/2 CAD		00000				4370	
116	206605-062	4	SCREW-BTN HD SKT 6-32X5/16 BLK							
117										
118	206606-011	13	SCREW PAN HD PHIL 6-32X3/8 CAD		00000					
119										
120	206607-011	3	SCREW PAN HD PHIL 6-32X7/16 CAD		00000					
121										
122										
123	206608-031	7	SCREW SKT HD CAP 6-32X1/2 CAD		00000					
124	206608-041	2	SCREW SKT SET CUP PT 6-32X1/2 CAD							
125										
126	206609-011	1	SCREW PAN HD PHIL 6-32X9/16 CAD		00000					
127	206620-011	1	SCREW PAN HD PHIL 6-32X1 1/4 CAD		00000					
128										
129										
130	213271-632	4	SCREW-PAN, HD, PHIL 6-32 X 2"		00000					
131										
132	206106-031	1	SCREW SOC HD CAP 10-32X3/8 CAD							
133	206108-031	5	SCREW, SKT HD, CAP 10-32X1/2 CAD							
134										
135	213351-108	3	SCREW-SET SKT CUP POINT *	10-32X1/2	00000					
136										
137	206110-032	10	SCREW SKT HD CAP 10-32X5/8 BLK 0		00000					

ITEM#	PART#.....	QTY	DESCRIPTION.....	MFG PART#.....	MFG	REF-DES.....	ALT PART#...	ECO#...	ST-USE..	END-USE.
138										
139	213091-116	2	SCREW SOC HD/CAP 10-32 X 1	10-32X1"	00000					
140										
141	206120-032	4	SCREW SOC HD CAP 10-32X1 1/4 BLK		00000					
142	213091-128	4	SCREW-SOCKET HEAD/CAP 10-32X1-3/4 *		00000					
143										
144	213091-010	4	SCREW-SKT HD, CAP	1/4-20X5/8	00000					
145	210028-200	2	WASHER-FLAT,NYLON	2257-N194	20000					
146	207403-011	12	WASHER,SPLIT LOCK #4	WASHER #4 CAD.	00000					
147	207402-021	10	WASHER,FLAT #4		] 00000					
148	207400-021	3	WASHER,FLAT,SMALL OD #4		00000					
149										
150	207602-011	25	WASHER,SPLIT LOCK #6	WASHER #6 CAD.	00001			4370		
151	207605-021	15	WASHER,FLAT #6	WASHER #6 CAD.	00000					
152	207608-021	8	WASHER,FLAT,SMALL OD #6	WASHER #6 CAD.	00000					
153										
154	207102-011	19	WASHER,SPLIT LOCK #10	WASHER #10 CAD.	00000					
155	207104-021	10	WASHER, FLAT,#10	WASHER #10 CAD.	00000					
156	207100-021	4	WASHER,FLAT, SMALL OD #10	WASHER #10 CAD.	00000					
157	213731-000	4	WASHER-SPLIT LOCK. 1/4"	1/4"	00000					
158	213701-000	4	WASHER-FLAT 1/4X5/8 O.D.	1/4X5/8 O.D.						
159	207607-051	2	NUT, HEX #6 6-32	NUT #6 CAD.	00000			4370		
160	207604-081	1	NUT-HEX RADIO PATTERN 6-32	NUT #6 CAD.	00000					
161										
162	207000-064	1	NUT-HEX,LIGHT,THIN	79NTE-048	72962					
163	131013-300	1	JUMPER ASSY-R/W	----------32274				4963		
164	210413	.1	TUBING,SHRINK 1/4" BLK	H1X-1/4-UL BLK	00000					
165										
166	209990-072	AR	ADHESIVE - SCREWLOCK *	222	05972					
167	209990-075	AR	VIBRA-TITE	VC 3						
168	209990-084	AR	CONTACT CEMENT	E-533	86142					
169	209990-109	AR	ADHESIVE,BLK-RTV	RTV-103						
170	210444	AR	LUBRIPLATE	23-025						
171	154016-301	1	BRACKET ASSY-CONTROL/ SERVO	----------32274				4809		
172	154016-302	1	BRACKET ASSY-CONTROL/SVO	----------32274				4809		
173	154014-301	1	RACK MTG. HARDWARE	----------32274				4809		
174	754023-301	1	FILTER-TRANSDUCER INLET	----------32274						
175	131014-000	2	REEL MOTOR ASSY	----------32274				4809		
176	731042-000	1	WARNING LABEL-CAPSTAN	----------32274						
177	131012-900	2	DOOR STAY ASSY	----------32274				4809		
178	154031-501	1	COVER ASSY-COLUMN	----------32274				4809		
179	754018-101	1	HEAD COVER	----------32274						
180	754017-501	1	CAPSTAN COLLAR	----------32274						
181	154019-801	1	VACUUM PUMP ASSY	----------32274				4809		
182	154017-901	1	POWER SUPPLY ASSY	----------32274				4809		

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ITEM#	PART#	QTY	DESCRIPTION	MFG PART#	MFG	REF-DES	ALT PART#	ECO#	ST-USE	END-USE
1	154000-999	1	MTT-900		32274			4265		
2	154040-006	1	PWB ASSY-DATA DUAL, 9TK,RAW,75IPS		32274			4393		
3	154019-501	1	SWITCH PANEL ASSY		32274			4265		
4	754010-601	1	STROBE DISC-75 IPS					4265		
5	154033-101	1	HEAD ASSY-9TK,DUAL GAP, HF,NS,RCM DES×EN		32274			4393		
6										
7										
8	754019-301	1	FACPDE-SWITCH PANEL					4265		
9	154027-001	1	DOOR ASSY-DUST COVER		32274			4393		

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Cipher Data Products

PARTS LIST

CODE IDENT	PL
32274	131010-001, 002

TITLE: REEL HUB ASSEMBLY

MODEL		REV
85 & 100X	SH 1 OF 2	H

DWN L. BROWN													
CHK	LTR	DESCRIPTION	INC	DATE	APP	DATE	LTR	DESCRIPTION	INC	DATE	APP	DATE
N/C	G	ECO 1959, 1960	G.B.	7/76	G.B.	7/76						
APP G.B.		RETYPED NO CHANGE	S.S.	4/77	RJ	4/77						
PRODUCTION RELEASE	H	ECO 2679	M.H.	677		7-77						
W. BARTON 4/76												

ITEM NO.	QUANTITY 001	QUANTITY 002		CIPHER PART NO.	DESCRIPTION	VENDOR NO.	VENDOR	REFERENCE DESIGNATOR
1	1	-		731910-101	BASE, REEL HUB		CIPHER	
1	-	1		731910-102	BASE, REEL HUB		CIPHER	
2	1	1		731910-200	CAP, REEL HUB		CIPHER	
3	1	1		731922-500	LOCK, REEL HUB		CIPHER	
4	1	1		731922-200	ADJUSTABLE SPACER, REEL HUB		CIPHER	
5	1	1		710010-400	COMPRESSION RING		CIPHER	
6								
7	2	2		731013-400	PIN, REEL HUB		CIPHER	
8								
9	1	1		206604-062	SCREW, SOC HD, BTN, BLK	6-32 X 1/4		
10	1	1		206610-072	SCREW, SOC SET, KNRL CUP PT, BLK	6-32 X 5/8		
11	1	1		207604-081	NUT, RADIO PATTERN, HEX	#6-32		
12								

Cipher Data Products

PARTS LIST

CODE IDENT	PL
32274	131010-001, 002

TITLE: REEL HUB ASSEMBLY

MODEL		REV
85 & 100X	SH 2 OF 2	H

ITEM NO.	QUANTITY 001	QUANTITY 002		CIPHER PART NO.	DESCRIPTION	VENDOR NO.	VENDOR	REFERENCE DESIGNATOR
13								
14	2	2		206612-032	SCREW, SOC HD, CAP, BLK	6-32 X 3/4		
15	2	2		206604-042	SCREW, SOC HD, SET, BLK	6-32 X 1/4		
16								
17	AR	AR		209999-031	STP LUBRICANT			
18	AR	AR		209990-075	VIBRA-TITE	VC 3	NY-LOK	
DWG	REF	REF		600103-100	PROCEDURE		CIPHER	

Cipher Data Products

PARTS LIST

CODE IDENT	PL
32274	131012-900

TITLE: DOOR STAY ASSY

MODEL: 100X

SH 1 OF 1

REV: D

DWN G.BODDY	
CHK	
N/C	
APP J.H.W.	
PRODUCTION RELEASE	
J. WHITNEY 11/74	

LTR	DESCRIPTION	INC	DATE	APP	DATE
A	NO CHANGE	H.J.	2/75	G.B	2/75
	RETYPED NO CHANGE	S.S.	4/77	RB	4/77
B	ECO 2685	DS	6/77	MB	7/77
C	INCORP ECO 3462	RA	3-29 78	SD	4-10 78
D	INCORP ECO 3749	RA	5-26 78	SD	5-26 78

LTR	DESCRIPTION	INC	DATE	APP	DATE

ITEM NO.	QUANTITY -1			CIPHER PART NO.	DESCRIPTION	VENDOR NO.	VENDOR	REFERENCE DESIGNATOR
1	1			731012-701	ARM - DOOR STAY		CIPHER	
2	1			731012-702	ARM - DOOR STAY		CIPHER	
3	1			731012-800	WASHER - FRICTION		CIPHER	
4								
5	AR			210444	LUBRIPLATE	23-02S	G.C.ELECT	
6								
7								
8	1			210709	RIVET - SEMI TUBLAR	H-100 X 5/16	STIMPSON	
9								
10	2			799017-201	SPRING- BELLVILLE		CIPHER	

 BILL OF MATERIALS: 131014-000 REV L REEL MOTOR ASSY FIRST RELEASED: 10:47:11 11 JAN 1979

ITEM#	PART#.....	QTY	DESCRIPTION.....	MFG PART#.....	MFG	REF-DES.....	ALT PART#..	ECO#...	ST-USE.	END-USE
1	799001-900	1	24 VDC PERM-MAGNET MOTOR 4" DIA *	----------32274						
3										
4	205073	1	CONNECTOR-HOUSING, 3 POS.	03-09-1032	00000	J10,12				
5										
6	205016-700	2	TERM-FEM 14-20AWG .093D1A	02-09-1101	1159-027264]		205016-701	3296		
7										
8										

Cipher Data Products

PARTS LIST

CODE IDENT 32274 | PL 131047-001

TITLE: TAPE SCRAPER ASSY | MODEL NO. 100X | SH 1 OF 1 | REV A

			LTR	DESCRIPTION	INC	DATE	APP	DATE	LTR	DESCRIPTION	INC	DATE	APP	DATE
DWN	Dalton	1-30-78	A	ENGR REL	05	3-16-78	[illegible]	3/24/78						
CHK	[illegible]	3-16-78												
N/C	R. Crane	3/17/78												
MFG	DB	3-17-78												
QC	[illegible]	3-17												
REL	[illegible]	3-78												

ITEM NO.	QUANTITY	CIPHER PART NO.	DESCRIPTION	VENDOR NO.	VENDOR	REFERENCE DESIGNATOR
1	1	731047-101	HOUSING-TAPE SCRAPER		CIPHER	
2	1	731047-201	CAP-TAPE SCRAPER		CIPHER	
3	2	731042-100	TAPE SCRAPER		CIPHER	
4						
5	AR	209990-800	ADH:-STRL, SYN RESIN	3520 BA	3M	
5*	AR	209990-300	ADH:-STRL, MOD EPOXY	2216 BA	3M	

*ALTERNATE PART

5071 A CODE

Cipher Data Products

PARTS LIST

CODE IDENT	PL
32274	131506-000

TITLE: CABLE ASSY - READ - WRITE BOARD TO CONTROL SERVO BOARD J7-J20

MODEL: 100X

SH 1 OF 1

REV H

DWN	G. BODDY
CHK	
N/C	
APP	G. BODDY

PRODUCTION RELEASE

J. WHITNEY 9/11/72

LTR	DESCRIPTION	INC	DATE	APP	DATE
G	ECR 2292 - RETYPED	D.S.	1-77	G.B.	1-77
	NO CHANGE	S.S.	4/77	RJ	4/77
H	ECO 2417	D.S.	4-6 77	XJ	4-13 77

ITEM NO.	QUANTITY 000	CIPHER PART NO.	DESCRIPTION	VENDOR NO.	VENDOR	REFERENCE DESIGNATOR
1	2	205069	CONNECTOR PLUG (12 PIN)	03-09-1122	MOLEX	J7, J20
2						
3	24	205015	TERMINAL .093DIA F (REEL)	02-09-1116	MOLEX	
3a	ALT	205016	TERMINAL .093DIA F (LOOSE)	02-09-1118	MOLEX	
4						
5	21	208405-311	WIRE,STRD,18AWG,IR,PVC,WHT	7155-1*CSA/UL	ALPHA	1429-XLPVC
6						
7	6	210229-523	TY-RAP 1/16 TO 5/8	TYB-23M	T&B	

5070 CDR

Cipher Data Products

PARTS LIST

CODE IDENT	PL
32274	131910-700

TITLE: STANDOFF ASSY - HINGED

MODEL		REV
100X	SH 1 OF 1	A

			LTR	DESCRIPTION	INC	DATE	APP	DATE	LTR	DESCRIPTION	INC	DATE	APP	DATE
DWN	G. BODDY	1/75	A	ECR 1033	H.J.	2-75	G.B	2-75						
CHK				RETYPED - NO CHANGE	S.S.	4-77	RB	4/77						
N/C														
APP	G.B.													
PRODUCTION RELEASE														
J. WHITNEY 8/74														

ITEM NO.	QUANTITY			CIPHER PART NO.	DESCRIPTION	VENDOR NO.	VENDOR	REFERENCE DESIGNATOR
1	1			731910-900	HINGE - STANDOFF, CLEVIS		CIPHER	
2	1			731910-800	HINGE - STANDOFF, SLOTTED		CIPHER	
3	1			210569	GROOVE PIN	GP24-062x250-14	GROOV-PIN	
3a	ALT			205008-001	ROLL PIN	52-012-062-0250	ESNA	

Cipher Data Products

PARTS LIST

CODE IDENT 32274 | PL 154002-101

TITLE: ROLLER GUIDE ASSY | MODEL NO. 900 X | SH 1 OF 1 | REV C

DWN		8-12-77
CHK		11-2-77
N/C		11/4/77
MFG		11-9
QC		
REL	WMB	11-77

LTR	DESCRIPTION	INC	DATE	APP	DATE
A	PROD. REL	OS	10-26-77		
B	INCORP ECO 3561	RA	4-13-78		
C	INCORP ECO 3493	RA	4-20-78		

LTR	DESCRIPTION	INC	DATE	APP	DATE

A

ITEM NO.	QUANTITY	CIPHER PART NO.	DESCRIPTION	VENDOR NO.	VENDOR	REFERENCE DESIGNATOR
1	1	754002-201	BASE-ROLLER GUIDE		CIPHER	
2	1	754009-901	CAP-ROLLER GUIDE		CIPHER	
3	1	754007-301	WASHER-GUIDE		CIPHER	
4						
5	1	754002-301	ROLLER-GUIDE		CIPHER	
6	1	754007-302	WASHER-GUIDE		CIPHER	
7	1	210008	WASHER-WAVE SPRING	5806-74-1	SEASTROM	
8	1	736008-603	SHIM-TAPE GUIDE .010 THK		CIPHER	
9	2	210067	BEARING-1/4 X 3/8	SSRIF-614 ZZ EE HA3P 25LG-54	NMB	
10	1	210009-001	SPRING-WAVE	W0242-006-S	ASSC. SPRING CORP	
11	1	210008-500	SPRING-FINGER-WASHER	F0595-010	ASSC. SPRING CORP	
12	1	731911-101	SHIM-TAPE	.004	CIPHER	
13	1	731911-102	SHIM-TAPE	.005	CIPHER	
14	1	731911-105	SHIM-TAPE	.010	CIPHER	
15						
16	1	206420-021	SCREW-FLAT HD., PHIL, 100°	4-40X1-1/4"		
17						
18	1	207405-051	NUT-HEX	#4		

BILL OF MATERIALS: 154003-001 REV B FAN ASSY FIRST RELEASED: 26 OCT 77 10:30:41 25 MAY 1979

ITEM#	PART#	QTY	DESCRIPTION	MFG PART#	MFG	REF-DES	ALT PART#	ECO#	ST-USE	END-USE
1	210698-000	1	FAN 50-60HZ 3.125" SQ	SP2A2	04000					
2										
3	209415-111	2.75	WIRE-STRD,22AWG,IRPVC,WHT	HH8314				3671		
4	210555-023	2	TERM-RING 26-22 AWG #6	R26244	30000					
5	210403	1	TUBING,SHRINK 1/8" BLK	H1X-1/8-UL	BLK 00000					

***

1 ITEMS PROCESSED

Cipher Data Products

PARTS LIST

CODE IDENT 32274 | PL 154004 -001 -002

TITLE CAPSTAN ASSY | MODEL NO. 900X | SH 1 OF 1 | REV B

			LTR	DESCRIPTION	INC	DATE	APP	DATE	LTR	DESCRIPTION	INC	DATE	APP	DATE
DWN	GYGAX	8/9/77	A	PROD REL	05	10-26-77	[illegible]	11/14/77						
CHK	[illegible]	11-2-77	B	INCORP ECO 3476	RA	3-13-78	[illegible]	3-23-78						
N/C	[illegible]	11/1/77												
MFG	[illegible]	11-7-77												
QC														
REL	[illegible]	11-77												

ITEM NO.	QUANTITY -001	QUANTITY -002		CIPHER PART NO.	DESCRIPTION	VENDOR NO.	VENDOR	REFERENCE DESIGNATOR
1	2	2		754004-201	SHELL - CAPSTAN		CIPHER	
2	1	-		754004-301	HUB - CAPSTAN		CIPHER	
2	-	1		754004-302	HUB - CAPSTAN		CIPHER	
4								
5	1	-		210201-901	RING - TOLERANCE	AN031025	ROLLER BEARING CO	
5	-	1		210201-902	RING - TOLERANCE	AN037025	ROLLER BEARING CO.	
7								
8	A/R	A/R		209990-107	CONTACT CEMENT-PERMABOND	101	PEARL CHEM. CO.	

5071 A CDP

Cipher Data Products

PARTS LIST

CODE IDENT 32274 | PL 154008 -001 THRU -003

TITLE: PWB ASSY - FILE PROTECT, EOT/BOT

MODEL NO. 900X | SH 1 OF 2 | REV J

DWN	C. W.	7-77
CHK	[illegible]	11-2-77
N/C	L. Crane	11/11/77
MFG	[illegible]	11-2-77
QC		
REL	[illegible]	11-2-77

LTR	DESCRIPTION	INC	DATE	APP	DATE
A	PROD REL	05	10-26-77	[illegible]	11/14/77
B	INCORP ECO 3252	RA	2-3-78	[illegible]	2-16-78
C	INCORP ECO 3390	RA	3-1-78	[illegible]	3-8-78
D	INCORP ECO 3674	CW	4/27/78	[illegible]	5-4-78
E	INCORP ECO 3719	CW	5/1/78	[illegible]	5-4-78
F	INCORP. ECO 3840	CW	5-31-78	[illegible]	6-12-78
G	INC ECO 3973	PVB	8/31/78	[illegible]	9-27-78
H	INC ECO 4101	PVB	8/31/78	[illegible]	10-27-78
J	INC ECO 4371	SCS	10/19/78	[illegible]	10-19-78

ITEM NO.	QUANTITY -001	-002	-003	CIPHER PART NO.	DESCRIPTION	VENDOR NO.	VENDOR	REFERENCE DESIGNATOR
1	1	1	1	754008-101	PWB-FILEPROTECT, EOT/BOT		CIPHER	
2	2	2	2	731017-800	BRACKET-EOT/BOT MTG.		CIPHER	
3	2	2	2	211131-100	REFLECTIVE OBJECT SENSOR	OPB 706	OPTRON	
4	2	2	2	200072-750	RES. FIX COMP, 750Ω, 1/4W, 5%	RCR07G 751JM		R1, R2
5	1	1	1	205076	CONNECTOR-5 POSN	03-09-1052	MOLEX	J4, J5
6	3	3	3	205015	TERM-FEM. 093 DIA, REEL	02-09-1116	MOLEX	PINS 3, 4 & 5
7	2	2	2	205014	TERM-MALE. 093 DIA, REEL	02-09-2116	MOLEX	PINS 1 & 2
8	1	1	1	210229-523	TY-RAP 1/16" TO 5/8"	TY-23M	T & B	
9								

Cipher Data Products

PARTS LIST

CODE IDENT	PL	
32274	154008	-001 THRU -003

TITLE PWB - FILE PROTECT / EOT, BOT

MODEL		REV
900X	SH 2 OF 2	J

ITEM NO.	QUANTITY 001	002	-003	CIPHER PART NO.	DESCRIPTION	VENDOR NO.	VENDOR	REFERENCE DESIGNATOR
10	4"	4"	4"	210417	TUBING - SHRINK, 3/16	HIX-3/16-ULBLK	ICO-RALLY	
11								
12	150"	150"	150"	208420-011	WIRE-STRD, 24 AWG, IR, PVC, WHT	7150-1	ALPHA	
13	2	-	2	206405-011	SCREW-PAN HEAD PHIL	4-40 x 5/16		
14	2	2	2	210708-420	RIVET - POP	AD42A	PCI	
15	2	-	2	207403-011	WASHER-SPLIT LOCK	#4		
16								
17	2	-	2	207408-021	WASHER-FL, SM. OD.	#4		
18	1	-	1	754013-501	SENSOR HOOD		CIPHER	
19								
20	2	-	2	207406-081	NUT, HEX RADIO PATTERN	#4		
REF DWG				359008-301	SCHEM.-FILE PROTECT, EOT/BOT		CIPHER	

Cipher Data Products

PARTS LIST

CODE IDENT 32274 | PL 154010-801

TITLE: REEL HUB ASSEMBLY-SUPPLY | MODEL NO. 900X | SH 1 OF 2 | REV A

			LTR	DESCRIPTION	INC	DATE	APP	DATE	LTR	DESCRIPTION	INC	DATE	APP	DATE
DWN	D. STONE													
CHK		11-2-77	A	PROD REL	05	10 26 77		11/4/77						
N/C		11/4/77												
MFG		11-2-77												
QC														
REL		11.7.77												

ITEM NO.	QUANTITY			CIPHER PART NO.	DESCRIPTION	VENDOR NO.	VENDOR	REFERENCE DESIGNATOR
1	1			754009-901	REEL HUB MODIFICATION		CIPHER	
2	1			731910-200	CAP- REEL HUB		CIPHER	
3	1			731922-500	LOCK- REEL HUB MACHINING		CIPHER	
4	1			731922-200	ADJUSTABLE SPACER- REEL HUB		CIPHER	
5	1			710010-400	COMPRESSION RING-REEL HUB		CIPHER	
6	1			154002-601	RING ASSY-FILE PROTECT		CIPHER	
7	2			731013-400	PIN- REEL HUB		CIPHER	
8	3			754003-501	CONICAL COMPRESSION SPRING		CIPHER	
9	1			206604-062	SCREW-BTN HD,SOC.	6-32X1/4 BLK		
10	1			206610-072	SCREW- SOC SET, KNRL CUP PT	6-32X5/8 BLK		
11	1			207604-081	NUT- RADIO PATTERN, HEX	#6		
12								
13								
14	2			206612-032	SCREW- SOC HD, CAP	6-32X3/4 BLK		
15	2			206604-042	SCREW-SOC,SET CUP PT	6-32X1/4 BLK		
16	3			206408-011	SCREW- PAN HD PHIL	4-40X1/2		

Cipher Data Products

PARTS LIST

CODE IDENT	PL
32274	154010-801

TITLE: REEL HUB ASSEMBLY-SUPPLY

MODEL		REV
900X	SH 2 OF 2	A

ITEM NO.	QUANTITY			CIPHER PART NO.	DESCRIPTION	VENDOR NO.	VENDOR	REFERENCE DESIGNATOR
17	AR			209999-031	STP OIL TREATMENT			
18	AR			209990-075	VIBRA-TITE	VC 3	N.D. IND	
DWG	REF			600103-100	REEL HUB ASSY-PROCEDURE		CIPHER	

Cipher Data Products

PARTS LIST

CODE IDENT 32274 | PL 154002-601

TITLE: RING ASSY-FILE PROTECT | MODEL NO. | SH 1 OF 1 | REV A

			LTR	DESCRIPTION	INC	DATE	APP	DATE	LTR	DESCRIPTION	INC	DATE	APP	DATE
DWN	M Hansen	9-9-77	A	PROD REL	DS	10-26-77	[illegible]	11/14/77						
CHK	[illegible]	11-[illegible]-77												
N/C	K. Crane	11/14/77												
MFG	[illegible]	11-2-77												
QC														
REL	[illegible]	11-7-77												

ITEM NO.	QUANTITY			CIPHER PART NO.	DESCRIPTION	VENDOR NO.	VENDOR	REFERENCE DESIGNATOR
1	1			754002-801	REFLECTOR-FILE PROTECT		CIPHER	
2								
3	1			754002-901	RING-FILE PROTECT		CIPHER	

5071 A (

Cipher Data Products

PARTS LIST

CODE IDENT 32274 | PL 1540X-901

TITLE VACUUM VALVE ASSY | MODEL NO. 900X | SH 1 OF 1 | REV C

			LTR	DESCRIPTION	INC	DATE	APP	DATE	LTR	DESCRIPTION	INC	DATE	APP	DATE
DWN	8-26-77		A	PROD REL	OS	10-26-77		11/4/77						
CHK	11-2-77		B	INCORP ECO 3906	RA	8-23-78		8-23-78						
N/C	11/1/77		C	INCORP ECO 4150	RA	9-1-78		9-1-8						
MFG	11-2-77													
QC														
REL	11.77													

ITEM NO.	QUANTITY			CIPHER PART NO.	DESCRIPTION	VENDOR NO.	VENDOR	REFERENCE DESIGNATOR
1	1			754009-601	VALVE - VACUUM		CIPHER	
2								
3	1			754004-701	PIN-VACUUM VALVE		CIPHER	
4								
5	1			754021-401	ADAPTOR-VALVE MOTOR		CIPHER	
6								
7	1			754005-801	CORD - VALVE		CIPHER	
8								
9	1			205002-800	PIN - GROOV 1/16 X 5/8	GP3-062X625-12	GROOV-PIN	
10	1			205002	PIN-GROOV 1/16 X 3/8	GP2-062X375-12	GROOV-PIN	

Cipher Data Products

PARTS LIST

CODE IDENT 32274 | PL 154014-601

TITLE SWITCH ASSY - VACUUM SENSING | MODEL NO. 900X | SH 1 OF 1 | REV C

DWN	9-19-77	LTR	DESCRIPTION	INC	DATE	APP	DATE	LTR	DESCRIPTION	INC	DATE	APR	DATE
CHK	11-2-77	A	PROD REL	DS	10-26-77		11/2/77						
N/C	11/14/77	B	INCORP ECO 4110	RA	8-23-78		8-23-78						
MFG	11-21	C	INCORP ECO 9191	RA	9-20-78		9-20-78						
QC													
REL	11-77												

ITEM NO.	QUANTITY	CIPHER PART NO.	DESCRIPTION	VENDOR NO.	VENDOR	REFERENCE DESIGNATOR
1	1	211075-310	SWITCH-DIFFERENTIAL PRESS.	PSF106-6	FAIRCHILD	
2	2	210555-036	TERMINAL - SLIP-ON .187 TAB	S05304F-TI	HOLLINGSWORTH	
3						
4	1	154039-901	MTG PLATE - VACUUM SENSOR		CIPHER	
5	48"	208415-111	WIRE-STRD, 22AWG, IR/PVC, WHT	7131-1 *CSA/UL	ALPHA	UL 1430 XL PVC
6	4	210229-523	TY-RAP 1/16 TO 5/8	TY-23M	T&B	
7	1	205073	CONN-HOUSING, 3 POSN	03-09-1032	MOLEX	J27
8	1	205015	TERM-FEM, .093 DIA, REEL	02-09-1116	MOLEX	PIN 1
9	1	205014	TERM-MALE, .093 DIA, REEL	02-09-2116	MOLEX	PIN 2
10	2	206412-011	SCREW, PAN HD., PHIL	4-40 X 3/4		
11	2	207903-011	WASHER, SP. LK.	#4		
12	AR	209990-109	ADHESIVE, BLK-RTV	RTV-103	G.E. SEMICONDUCT.	

Cipher Data Products

PARTS LIST

CODE IDENT 32274 | PL 154014-801

TITLE: RACK MOUNTING HARDWARE PKG. | MODEL NO. P.L. ONLY 900X | SH 1 OF 1 | REV A

			LTR	DESCRIPTION	INC	DATE	APP	DATE	LTR	DESCRIPTION	INC	DATE	APP	DATE
DWN	Dston	9-26-77	A	PROD REL	DS	10 26 77		11/4/77						
CHK	Qaw	11-2-77												
N/C	K. Cramp	11/4/77												
MFG		11-8-77												
QC														
REL	Comm	11-2-77												

ITEM NO.	QUANTITY	CIPHER PART NO.	DESCRIPTION	VENDOR NO.	VENDOR	REFERENCE DESIGNATOR
1	1	154014-901	HINGE BLOCK ASSY		CIPHER	
2						
3	1	154014-902	HINGE BLOCK ASSY		CIPHER	
4	1	731002-300	SAFETY BLOCK-TOP PLATE		CIPHER	
5						
6	6	206112-121	SCREW, BINDER HD, SLT, CAP	10-32 X 3/4		
7	1	206908-031	SCREW, SKT HD, CAP	4-40 X 1/2		
8	2	210028	WASHER-FL NYLON #10 X .062 THK	2319-N194	AMATOM	

Cipher Data Products

PARTS LIST

CODE IDENT 32274

PL 154014-901 902

TITLE HINGE BLOCK ASSY

MODEL NO. 900X

SH 1 OF 1

REV A

DWN R Stow	9-26-77	LTR	DESCRIPTION	INC	DATE	APP	DATE	LTR	DESCRIPTION	INC	DATE	APP	DATE
CHK Gary	11-7-77	A	PROD REL	05	10-26-77								
N/C R. Crane	11/11/77												
MFG [illegible]	11-7-77												
QC													
REL Combs	11-77												

ITEM NO.	QUANTITY 901	QUANTITY 902		CIPHER PART NO.	DESCRIPTION	VENDOR NO.	VENDOR	REFERENCE DESIGNATOR
1	1	1		759013-601	HINGE BLOCK - RACK		CIPHER	
2								
3	1	-		205037	PIN - DOWEL	3/16 DIA X 7/8 LG	ALLEN	
4	-	1		205038	PIN - DOWEL	3/16 DIA X 1.00 LG	ALLEN	
5								
6								
7	AR	AR		209990-076	RETAINING COMPOUND - FAST	601	LOCTITE	

5071 A

Cipher Data Products

PARTS LIST

CODE IDENT 32274 | PL 159015-101

TITLE COLUMN SIDE ASSY - RIGHT | MODEL NO. 900X | SH 1 OF 1 | REV C

DWN	9-28-77	LTR	DESCRIPTION	INC	DATE	APP	DATE	LTR	DESCRIPTION	INC	DATE	APP	DATE
CHK	11-2-77	A	PROD REL	05	10-26-77		11/11/77						
N/C	11/11/77	B	INCORP ECO 3519	RA	3-28-78		4-11-78						
MFG	11-2-77	C	INCORP ECO 3841	RA	6-1-78		6-8-78						
QC													
REL	11-77												

ITEM NO.	QUANTITY	CIPHER PART NO.	DESCRIPTION	VENDOR NO.	VENDOR	REFERENCE DESIGNATOR
1	1	759008-601	SIDE-COLUMN, RIGHT		CIPHER	
2						
3	24"	209999-114	TAPE-CONDUCTIVE FLUORGLAS	2852-5	DODGE FLUORGLAS	
4						
5	AR	209999-030	INHIBISOL		PENETONE	

Cipher Data Products

PARTS LIST

CODE IDENT 32274 | PL 154016-201

TITLE TERMINAL BLOCK ASSY | MODEL NO. 900X | SH 1 OF 1 | REV B

DWN		11-2-77	LTR	DESCRIPTION	INC	DATE	APP	DATE	LTR	DESCRIPTION	INC	DATE	APP	DATE
CHK		11-3-77	A	PROD REL	OS	11-2-77		11/4/77						
N/C		11/11/77	B	INCORP ECO 3705		5-15-78		5-15-78						
MFG														
QC														
REL		11-77												

ITEM NO.	QUANTITY	CIPHER PART NO.	DESCRIPTION	VENDOR NO.	VENDOR	REFERENCE DESIGNATOR
1	1	211115	TERMINAL BLOCK	6164	CINCH	
2	1	210197-600	RELAY-SOLID STATE, AC, OPT 1SO	601-1401	TELEDYNE	K1
3	13"	208905-111	WIRE-STRD, 18 AWG, IR, PVC, WHT	7133-1	ALPHA	UL 1430
4	9"	208500-000	CABLE-2 COND, 24AWG, TW, BLU/WHT	UL 1429/CSA		
5	2	210555-029	TERMINAL-RING, #6, 12-10 AWG	R5106	HOLLINGSWORTH	
6	2	210555-028	TERM-RING, 26-22 AWG, #6	R26294	HOLLINGSWORTH	
7	6	210555-025	TERMINAL-RING, #6 SM. PAT.	R1881S	HOLLINGSWORTH	
8						
9	1	205073	CONN HOUSING-3 POSN	03-09-1032	MOLEX	J29
10	1	205014	TERM-MALE, .093 DIA, REEL	02-09-2116	MOLEX	PIN 1
11	1	205015	TERM-FEM, .093 DIA, REEL	02-09-1116	MOLEX	PIN 2

Cipher Data Products

PARTS LIST

CODE IDENT 32274

PL 154016-301 -302

TITLE BRACKET ASSY-CONTROL/SERVO

MODEL NO. 900X

SH 1 OF 1

REV A

DWN D Stow	11-12-77	LTR	DESCRIPTION	INC	DATE	APP	DATE	LTR	DESCRIPTION	INC	DATE	APP	DATE
CHK RJB	11/14/77	A	PROD REL	05	11-12-77								
N/C R. Crane	11/14/77												
MFG													
QC													
REL WMB	11-77												

ITEM NO.	QUANTITY 301	QUANTITY 302	CIPHER PART NO.	DESCRIPTION	VENDOR NO.	VENDOR	REFERENCE DESIGNATOR
1	1	-	759010-301	BRACKET-PWB CONT/SERVO		CIPHER	
2	-	1	759010-302	BRACKET-PWB CONT/SERVO		CIPHER	
3	1	1	731024-100	GUIDE-CONTROL/SERVO BOARD		CIPHER	

Cipher Data Products

PARTS LIST

CODE IDENT 32274

PL 154018-501 / 154018-502

TITLE SWITCH PANEL ASSY

MODEL NO. 900 X

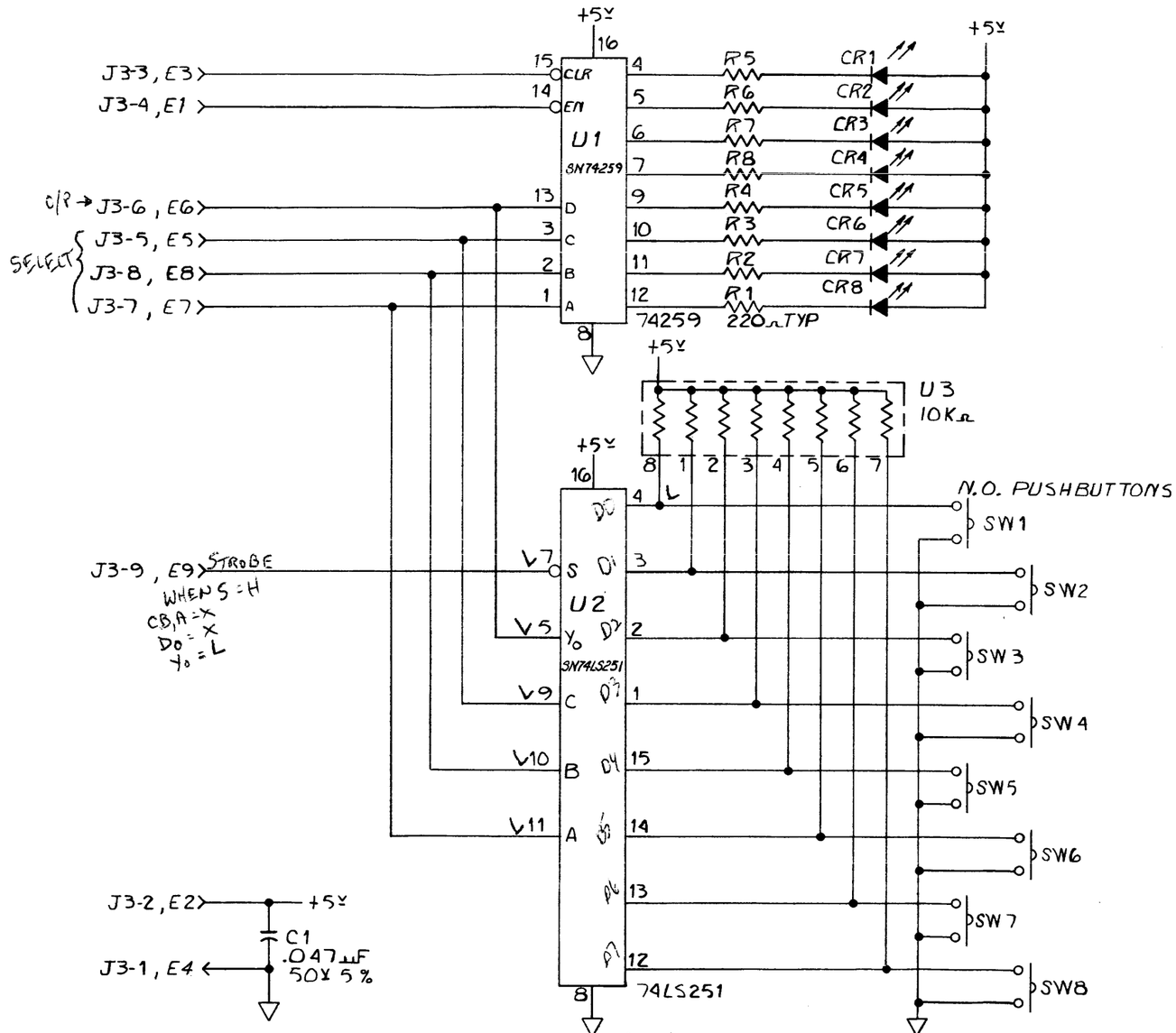
SH 1 OF 1

REV B

DWN		2-13-78	LTR	DESCRIPTION	INC	DATE	APP	DATE	LTR	DESCRIPTION	INC	DATE	APP	DATE
CHK		3-16-78	A	ENGR REL	DS	3-17-78		3-17-78						
N/C	L. Crane	3/17/78	B	INCORP ECO 3797	RA	5-26-78		5-26-78						
MFG		3-17-78												
QC		3-17												
REL		3-7-78												

ITEM NO.	QUANTITY 501	QUANTITY 502	CIPHER PART NO.	DESCRIPTION	VENDOR NO.	VENDOR	REFERENCE DESIGNATOR
1	1	1	154005-001	PWB ASSY-SWITCHES		CIPHER	
2	-	1	154011-201	SWITCH ASSY-THUMBWHEEL		CIPHER	
3							
4	1	1	754017-801	SWITCH PANEL		CIPHER	
5	1	1	754019-701	LABEL-SWITCHES		CIPHER	
6							
7							
8							
9	1	1	210582-010	BUSHING-NYLON MINIATURE	B-312-250	HEYCO	
10							
11							
12	4	4	206404-021	SCREW-FL HD PHIL, 100°	4-40 X 1/4		

REVISION					
LTR	DESCRIPTION	DWN	DATE	APVD	DATE
A	ENG RELEASE	KEEL	1/24/78	[illegible]	3-17-78
B	INCORP. ECO 3708	DAS	5-12-78	[illegible]	5-23-78



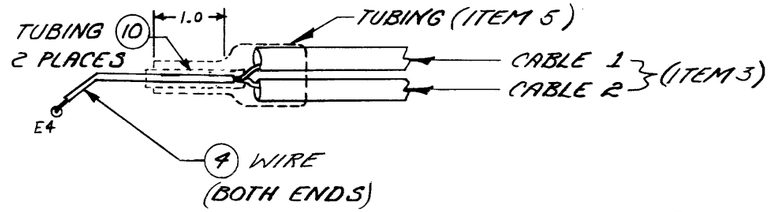
354005-301
REV B

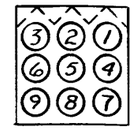
1. SCHEM. FOR ASSY 154005-001

NOTES:

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS ± DECIMALS .XX ± .XXX ± ANGLES ±	CONTRACT NO.		Cipher Data Products SAN DIEGO CALIF.
	APPROVALS	DATE	TITLE
	DWN KEEL	1/24/78	SCHEMATIC-PWB SWITCHES
	CHK	3-17-78	
	MFG ENG	3-17-78	
	QC	3-17-78	SIZE C · CODE IDENT NO. 32274 · DRAWING NO. 354005-301 · REV B
DO NOT SCALE DRAWING	COG ENG	3/16/78	
	PROD REL	3-18-78	SCALE NONE · 900X · SHEET 1 OF 1

REVISION					
LTR	DESCRIPTION	DWN	DATE	APVD	DATE
A	ENGR REL	DS	3-16-78	[illegible]	3-17-78
B	INCORP ECO 3673	CW	5/5/78	[illegible]	5-15-78
C	INCORP ECO 3707	CW	5/5/78	[illegible]	5-15-78
D	INCORP ECO 3720	CW	5/5/78	[illegible]	5-15-78
E	INCORP ECO 3957	JW	7/10/78	[illegible]	7-10-78

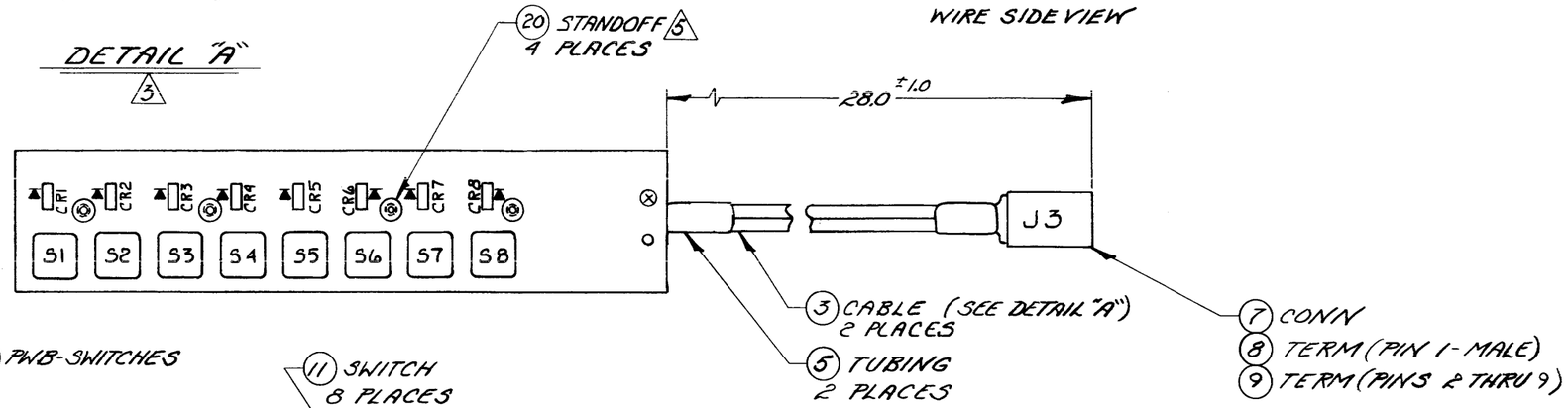


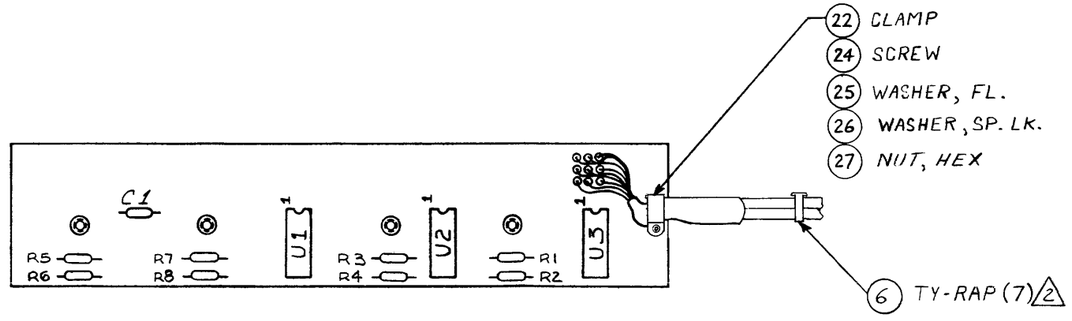


CONN. ORIENTATION

SCALE 2:1
WIRE SIDE VIEW

DETAIL "A"
3



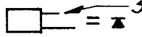


159005-001
REV E

WIRE TABLE

PWB	COLOR		J3
E4	SHIELD	BOTH CABLES	1
E2	RED	CABLE #1	2
E6	GRN	CABLE #1	6
E7	WHT	CABLE #1	7
E9	BLK	CABLE #1	9
E3	WHT	CABLE #2	3
E1	GRN	CABLE #2	4
E5	BLK	CABLE #2	5
E8	RED	CABLE #2	8

5 INSTALL STANDOFFS BEFORE ALL OTHER OPERATIONS OF ASSY.

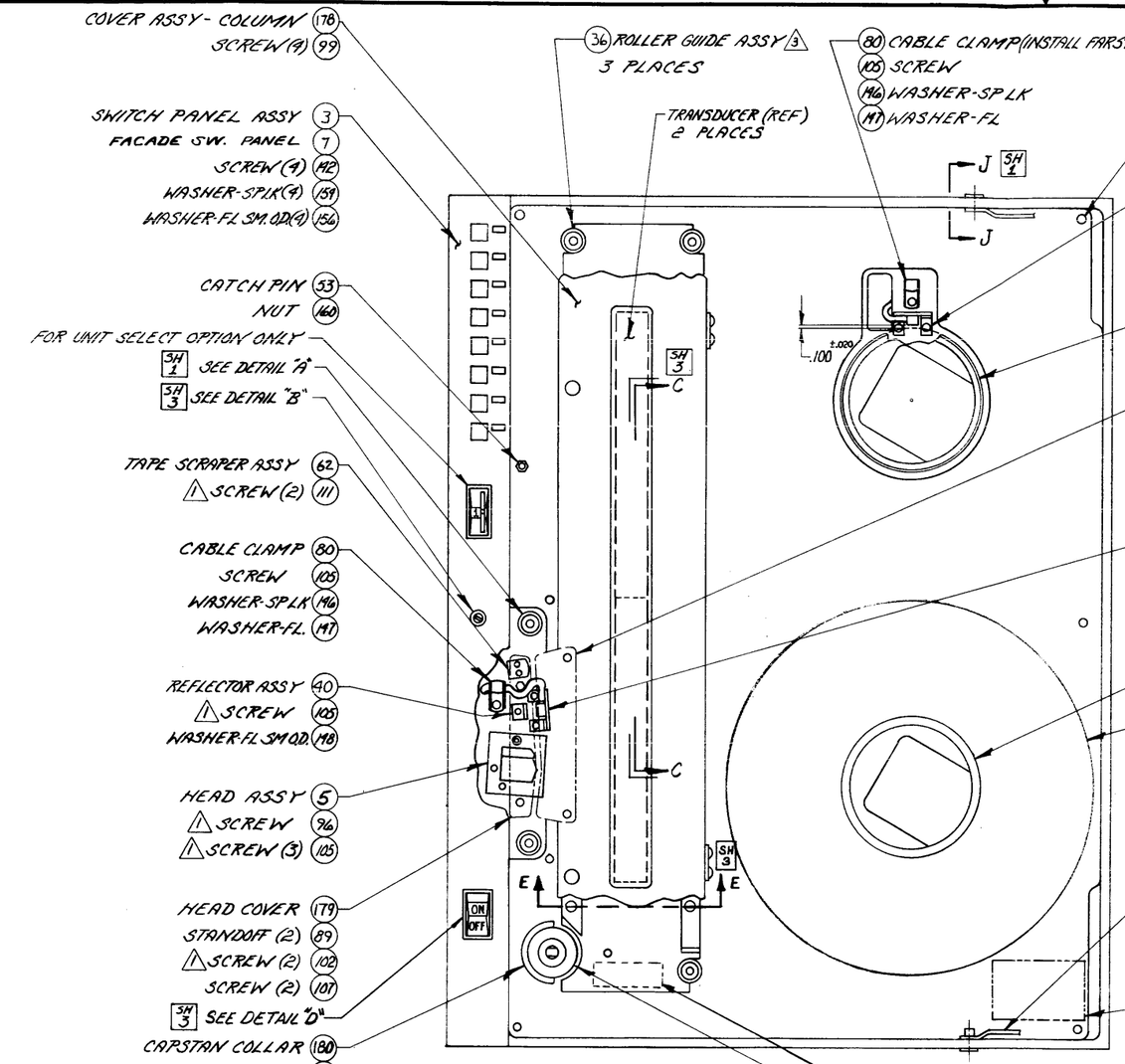
4. LED PIN ORIENTATION  = SHORT LEAD

3 SOLDER WIRE (ITEM 4) TO SHIELD WIRES & COVER WITH TUBING (ITEM 10) THEN INSTALL TUBING (ITEM 5) OVER ALL WIRES. TYP-BOTH ENDS.

2. EQUALLY SPACE TY-RAPS, 1 EVERY 4 INCHES.

1. FOR SCHEM. SEE DWG 359005-301

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS ± 5 DECIMALS .XX ± 5 .XXX ± 5 ANGLES ± 5	CONTRACT NO.		Cipher Data Products SAN DIEGO CALIF
	APPROVALS	DATE	TITLE: PWB ASSY-SWITCHES
	DWN [signature]	2-10-78	
	CHK [signature]	3-16-78	
	MFG ENG [signature]	3-17-78	
	QC [signature]	3-17-78	SIZE C · CODE IDENT NO. 32274 · DRAWING NO. 159005-001 · REV E
	CDG ENG [signature]	3-16-78	
DO NOT SCALE DRAWING	PROD REL [signature]	3-18-78	SCALE FULL · 900X · SHEET 1 OF 1



COVER ASSY - COLUMN (178)
SCREW (9) (99)

(36) ROLLER GUIDE ASSY △3
3 PLACES

TRANSDUCER (REF)
2 PLACES

(80) CABLE CLAMP (INSTALL FARSIDE)
(105) SCREW
(146) WASHER-SP LK
(147) WASHER-FL

(60) FACADE
(101) SCREW (9)

SWITCH PANEL ASSY (3)
FACADE SW. PANEL (7)
SCREW (9) (142)
WASHER-SPLK (9) (159)
WASHER-FL SM. OD (9) (156)

(31) PWB ASSY-FILE PROTECT, EOT/BOT
(105) SCREW (2)
(146) WASHER-SP LK (2)

CATCH PIN (53)
NUT (160)

(76) REEL HUB ASSY-SUPPLY
(REEL HUB SETTING - 1.077 ±.005)

FOR UNIT SELECT OPTION ONLY
SH 1 SEE DETAIL "A"
SH 3 SEE DETAIL "B"

(66) SENSOR COVER
(88) STDOFF-3/16 HGD, 3/8, 4-40
(106) SCREW (2) △1

TAPE SCRAPER ASSY (62)
△1 SCREW (2) (111)

(32) PWB ASSY-FILE PROTECT, EOT/BOT (HOOD NOT SHOWN) △8
(105) SCREW (2)
(148) WASHER-FL, SM, OD

CABLE CLAMP (80)
SCREW (105)
WASHER-SPLK (146)
WASHER-FL. (147)

(79) REEL HUB ASSY
(REEL HUB SETTING -.390 ±.005)

(81) REEL

REFLECTOR ASSY (40)
△1 SCREW (105)
WASHER-FL SM OD (148)

HEAD ASSY (5)
△1 SCREW (96)
△1 SCREW (3) (105)

(177) DOOR STAY ASSY
(95) SHOULDER SCREW (2)
(145) WASHER, FL. NYLON
(155) WASHER, FL
2 PLACES
TYP- SEE SECTION "J-J"

HEAD COVER (179)
STANDOFF (2) (89)
△1 SCREW (2) (102)
SCREW (2) (101)

SH 3 SEE DETAIL "D"

(15) NAMEPLATE
(LOCATE APPROX. WHERE SHOWN.)

CAPSTAN COLLAR (180)
CONTACT CEMENT (168)
(FASTEN AGAINST TOP PLATE)

(176) WARNING LABEL
(38) CAPSTAN ASSY
(4) STROBE DISC

REVISION					
LTR	DESCRIPTION	DWN	DATE	APVD	DATE
A	ENGR. RELEASE		7/1/8	J.W.	7-8-8
B	INCORP ECO 9232	RA	8-11-78		8-13-8
C	INCORP ECO 9279 & 9336	RA	10-11-78		11-13-8
D	NOT USED				
E	INCORP ECO 9370	RA	11-17-78		11-13-8
F	INCORP ECO 9382	RA	11-17-78		11-13-8
G	INCORP ECO 9516	RA	11-17-78		11-13-8
H	INCORP ECO 9673	RM	12-20-78		1-19-9
J	INCORP ECO 9809	RM	12-29-78		1-19-9
K	INCORP ECO 9887	RM	1-18-79		1-19-9
L	INCORP ECO 9963	RA	2-12-79		2-13-9
M	INCORP ECO 9977	RA	2-12-79		2-13-9

NOTES: (CONTINUED)

12. ITEMS NO. 26 AND ON ARE SHOWN IN PARTS LISTS 154000-999. ITEMS NO. 1 THRU 25 AS APPLICABLE, ARE SHOWN ON THE TOP ASSY, PARTS LIST, SEE DASH NO. INDEX 154000-000.

△13 CLEAN MATING SURFACES OF GASKET & TOP PLATE WITH INHIBISOL. WHEN THOROUGHLY CLEAN, APPLY CONTACT CEMENT (ITEM 168) TO BOTH SURFACES (TOP PLATE & GASKET). ALLOW CURING TIME. THEN INSTALL GASKET TO TOP PLATE.

CONN & COLOR CODE TABLE

FROM	CONN NO.	CONN COLOR	TO PWB CONN	CONN COLOR
POWER SUPPLY	J14	YEL	P14 C/S*	YEL
B3-CAPSTAN	J8	RED	P8 C/S	RED
B2-SUPPLY	J10	BLK	P10 C/S	BLK
B1-TAKE-UP	J12	BLU	P12 C/S	BLU
XDUCER-SUPPLY	J25	GRN	P25 C/S	GRN
XDUCER-TAKE-UP	J26	BLK	P26 C/S	BLK
FILE PROTECT	J4	RED	P4 C/S	RED
EOT/BOT	J5	RED	P5 C/S	RED
B5-VAC VALVE	J28	GRN	P28 C/S	GRN
TERM BLOCK ASSY	J29	BRN	P29 C/S	BRN
CONT. SWITCHES	J3	RED	P3 C/S	RED
SWITCH-VAC SENSE	J27	GRN	P27 C/S	GRN
SWITCH-THUMBWHEEL	J30	RED	P30 C/S	RED
TAPE HEAD	J21	RED	P21 R/W	WRITE
TAPE HEAD	J22	YEL	P22 R/W	READ
CABLE-R/W TO C/S	J7	YEL	P7 C/S	YEL
	J20	GRN	P20 R/W	GRN

* C/S = CONTROL/SERVO

154000-999 REV M

△11 USE ITEM 92 FUSE FOR 95/135 VOLT. USE ITEM 93 FUSE FOR 190/270 VOLT. PLACE EXTRA FUSE IN BAG & TIE TO ADJACENT STANDOFF

△10 APPLY .03 DIA BEAD (APPROX) OF RTV (ITEM 169) TO CORNERS INDICATED.

△9 MOUNT PUMP CLOSE AS POSSIBLE TO FAN, PRESS DOWN ON PUMP TO ITS MAXIMUM TRAVEL. COMPRESSING GASKET. TIGHTEN SCREWS.

△8 CLEARANCE BETWEEN SENSOR & TAPE TO BE .150 +.020

7. DUST DOOR REMOVED FOR CLARITY.

△6 INSTALL SHIMS UNTIL .503 DIM. IS OBTAINED.

△5 LOCATE & FASTEN TY-RAPS-1 EVERY 4 INCHES - AS REQ'D.

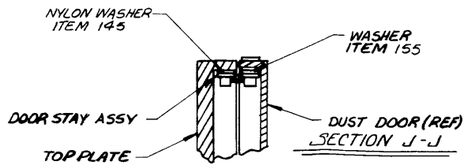
4 ITEMS NOT SHOWN: ITEM 20-RACK MTG. HDWR. PKG., ITEM 65-SHIPPING FRAME, ITEMS 137, 154, 155 - QTY 4 EACH, SHIPPING HDWR.

△3 REMOVE NUT & SHIM, ITEMS 8 & 18 OF ASSY 154002-101, & SCREW ROLLER GUIDE TO TOP PLATE.

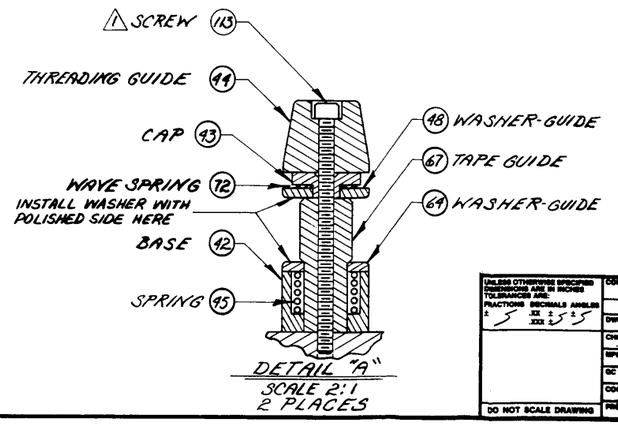
△2 APPLY VIBRA-TITE, ITEM 167, AT INSTALLATION.

△1 APPLY SCREWLOC LOCTITE, ITEM 166, AT INSTALLATION.

NOTES:



SECTION J-J



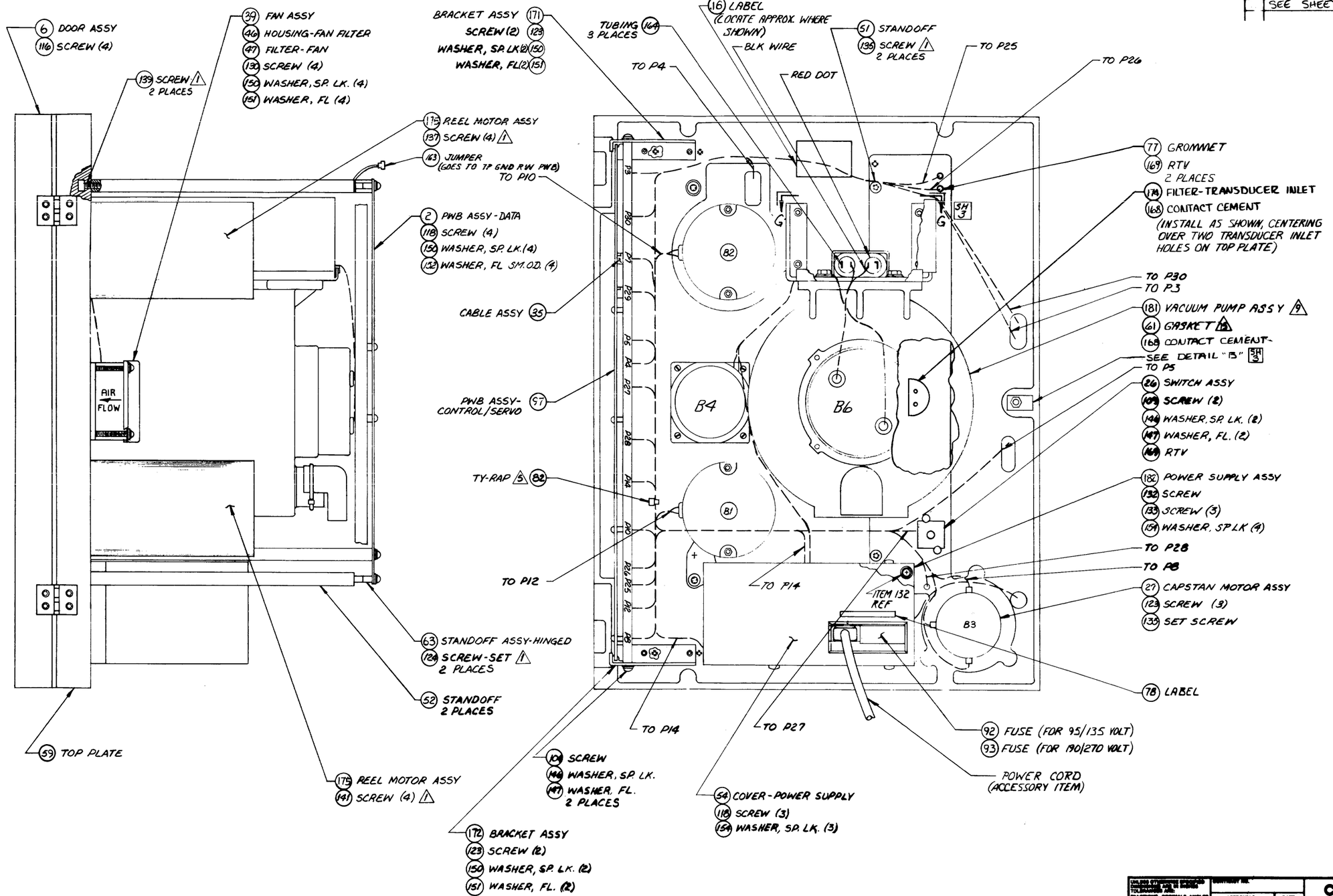
DETAIL "A"
SCALE 2:1
2 PLACES

FOR DASH NO. INDEX SEE 154000-100. REFER TO DASHED NUMBERED PARTS LISTS FOR SPECIFIC CONFIGURATIONS AND ASSY REVISION LETTERS.

DWG NO. 154000-999
SHEET 1 OF 3

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS ± 1/32, DECIMALS .XX ± .03, .XXX ± .005, ANGLES ± 5°	CONTRACT NO.		Cipher SAN DIEGO CALIF	
	APPROVALS	DATE	TITLE	MTT-900
	DWN S. SCHNEIDER	8-22-78		
	CHK	8-31-78		
	MFG ENGR	9-1-78		
	QC	9-1-78	SIZE D	CODE IDENT NO. 32274
	COG	9-1-78	DRAWING NO.	154000-999 REV M
DO NOT SCALE DRAWING	PROD SUP.		SCALE 1:2	800 X SHEET 1 OF 3

REVISION					
LTR	DESCRIPTION	DWN	DATE	APVD	DATE
	SEE SHEET 1				



154000-999 REV M

DWG NO. 154000-999
SHEET 2 OF 3

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS ± 1/32 DECIMALS .XX ± .05 .XXX ± .025 ANGLES ± 5°	APPROVALS	DATE
DO NOT SCALE DRAWING	DRAFTING SCHNEIDER	8-30-78
	ENGR	8-30-78
	PROJ ENGR	
	QC	
	CODE IDENT NO.	
	PROD ENGR	

Cipher SAN DIEGO CALIF.

TITLE MTT-900

SIZE	CODE IDENT NO.	DRAWING NO.	REV
D	32274	154000-999	M

SCALE 1:2 900X SHEET 2 OF 3

REVISION					
LTR	DESCRIPTION	DWN	DATE	APVD	DATE
	SEE SHEET 1				

55 SHAFT
170 LUBRIPLATE
85 RETAINING RING
56 SHIM 2 PLACES
84 SPRING
86 ROLL PIN
57 PAWL
142 NUT

DETAIL "B"
LATCH/SCALE 2:1

28 VACUUM VALVE (SEE DETAIL "L")
104 SCREW (2)
146 WASHER, SP. LK (2)
147 WASHER, FL. (2)
98 SCREW (2)
29 VALVE MOTOR ASSY
104 SCREW (2)
146 WASHER, SP LK. (2)
147 WASHER, FL. (2)
GROOVE PIN MUST NOT RUB ON VALVE HOUSING.
B5
VALVE PIN MUST TURN FREELY AFTER INSTALLATION. INSURE VALVE PIN DOESNT RUB AGAINST SCREWS - ITEM 104.
GROMMET 77
CLEAR WIRE TO PIN 1
BLK WIRE TO PIN 2
J28
75 CONN HOUSING

10
DETAIL "L"

VIEW C-C
SCALE 1:1

SCREW 144
WASHER, SP. LK. 157
WASHER, FL. 158
4 PLACES
BRACKET - PUMP 60
SCREW (2) 137
WASHER, SP. LK. (4) 154
WASHER, FL. (4) 155
COVER - BRACKET 58
SCREW (4) 118
WASHER, SP. LK. (4) 150
WASHER, FL. (4) 151
GROMMET STRIP 67
GROMMET STRIP 83
94 MARKER STRIP
37 TERM. BLOCK ASSY (SEE DETAIL "H")
120 SCREW (3)
150 WASHER, SP. LK. (4)
152 WASHER, FL. SM. OD. (4)
90 CABLE CLAMP
126 SCREW
127 SCREW
150 WASHER, SP. LK.
151 WASHER, FL.
49 BKT - CAPACITOR
73 CAPACITOR
118 SCREW (2)
150 WASHER, SP. LK. (2)
151 WASHER, FL. (2)
C500
K1
T&L
TOP PLATE (REF)
ITEM 137 REF QTY 2
FROM FAN (REF)
133 SCREW (2)

VIEW G-G
SCALE 1:2

91 SWITCH
FROM POWER SUPPLY ASSY

DETAIL D
SCALE 1:1

TRANSDUCER ASSY (REF)
74 CONN (.125, FLG) 2 PLACES
CLEAR WIRE PIN 3
BLACK WIRE PIN 2
SHIELD WIRE PIN 1

COLUMN SIDE ASSY - LEFT 33
SHIM-COLUMN, LEFT 68
SHIM-COLUMN, LEFT 69
SCREW (7) 108
COLUMN SIDE ASSY-RIGHT 34
SHIM-COLUMN, RIGHT 70
SHIM-COLUMN, RIGHT 71
SCREW (7) 108
.503 +.002 -.000 TYP 6
VACUUM FLOOR ASSY 30
ROUTE TUBING FROM TRANSDUCER TO HOLE IN TOP PLATE AT VACUUM SENSING SWITCH

SECTION E-E
SCALE 1:1
COVER NOT SHOWN

AC Relay
TO P29
115 SCREW
130 WASHER, SP. LK (2)
131 NUT (2)
WHT
BLK
GRN
GRN/YEL
FROM BLOWER
GRN/YEL FROM POWER SUPPLY
BLK WIRE FROM POWER SUPPLY
WHT WIRE FROM POWER SUPPLY
FROM FAN

DETAIL H
WIRING DIAGRAM

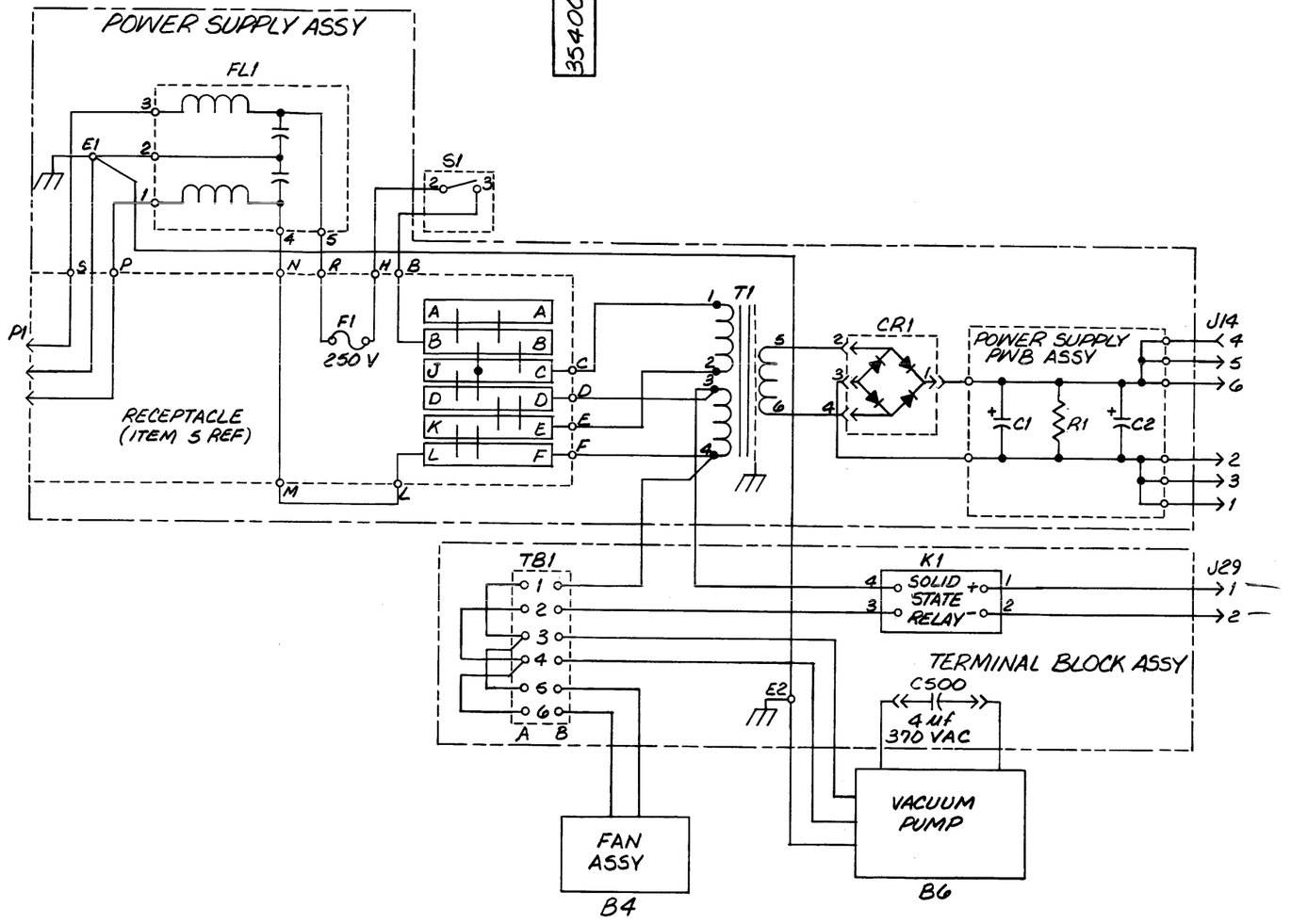
154000-999
REV M

DWG. NO. 154000-999
SHEET 3 OF 3

Cipher
MTT-900
SIZE D
CAGE IDENT NO. 32274
DRAWING NO. 154000-999
REV M
SCALE NOTED 900X
SHEET 3 OF 3
DO NOT SCALE DRAWING

REVISION					
LTR	DESCRIPTION	DWN	DATE	APVD	DATE
A	ENGR. RELEASE		8-22-78		9/6/78

354000-998 REV A



UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: DECIMALS .XX = ± .XXX = ± ANGLES ±	APPROVALS	DATE
	DWN	7/20/78
	CHK	7-24-78
	MECH ENG	9/2/78
	ELEC ENG	9/27/78
	MFG ENG	10/2/78
	QC	10-7-78
DO NOT SCALE DRAWING	DOC CONT	10/4/78

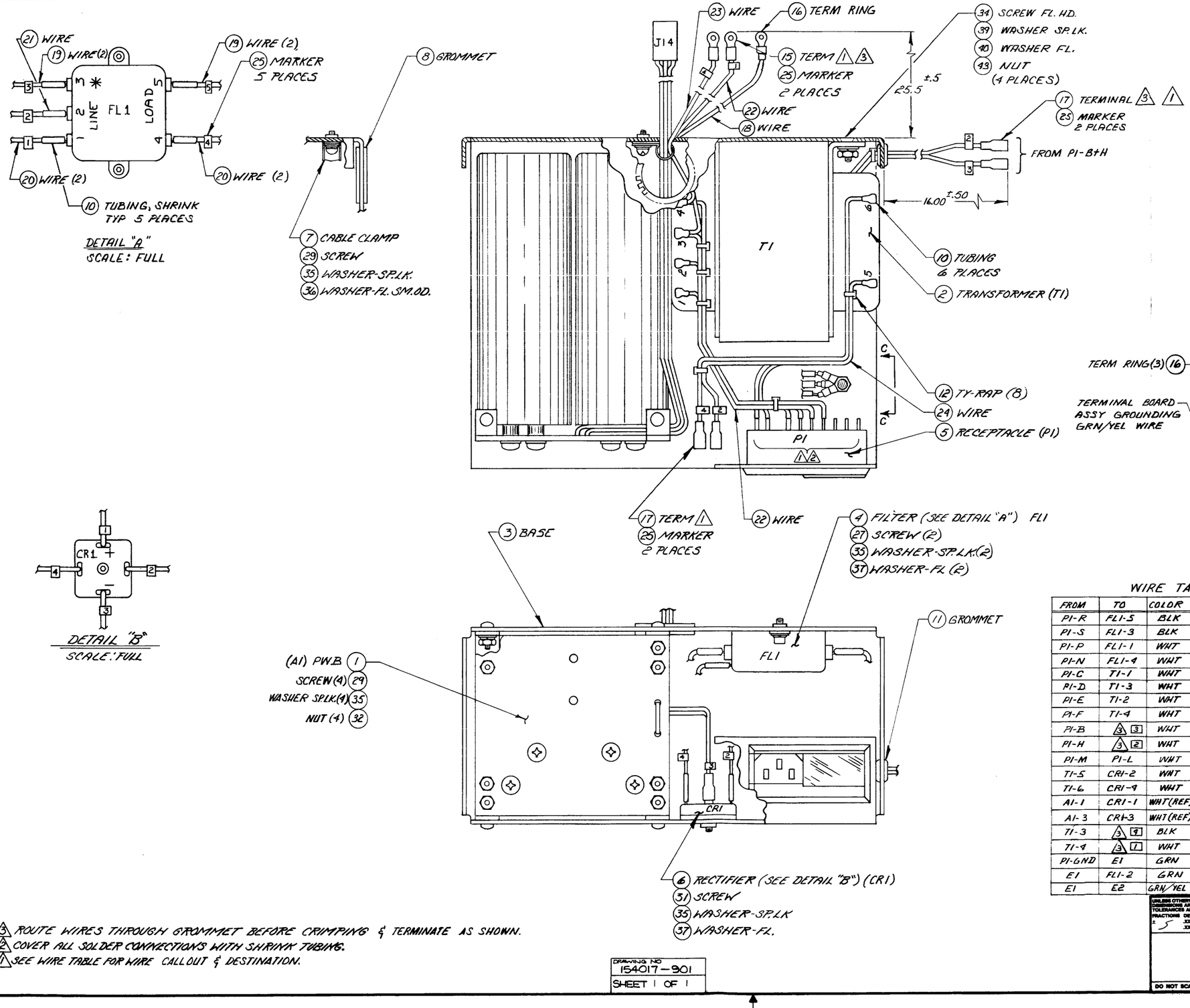
Cipher Data Products SAN DIEGO CALIF.

TITLE: SCHEMATIC DIAGRAM - MTT 900 POWER DISTR

SIZE	CODE IDENT NO.	DRAWING NO.	REV
C	32274	354000-998	A

SCALE NONE 900X SHEET 1 OF 1

REVISION					
LTR	DESCRIPTION	DWN	DATE	APVD	DATE
A	ENGR REL	DS	3-17-78	MB	3-17-78
B	INCORP ECO 3706	RA	5-15-78		5-15-8
C	INCORP ECO 3733	RA	5-15-78		5-15-8
D	INCORP ECO 3892	RA	6-1-78		6-1-78
E	INCORP ECO 4005	RA	8-23-78		9-12-8
F	INCORP ECO 4208	RA	9-12-78		9-13-8
G	INCORP ECO 4517	RA	2-12-79		2-13-9



WIRE TABLE

FROM	TO	COLOR	AWG	LG
P1-R	FL1-5	BLK	20	5.0
P1-S	FL1-3	BLK	20	5.0
P1-P	FL1-1	WHT	20	5.0
P1-N	FL1-4	WHT	20	5.0
P1-C	T1-1	WHT	16	9.0
P1-D	T1-3	WHT	16	10.0
P1-E	T1-2	WHT	16	9.0
P1-F	T1-4	WHT	16	10.0
P1-B	3 3	WHT	16	24.0
P1-H	3 2	WHT	16	24.0
P1-M	P1-L	WHT	16	1.5
T1-5	CR1-2	WHT	19	11.0
T1-6	CR1-4	WHT	19	13.0
A1-1	CR1-1	WHT(REF)	—	—
A1-3	CR1-3	WHT(REF)	—	—
T1-3	3 4	BLK	16	29.0
T1-4	3 1	WHT	16	29.0
P1-GND	E1	GRN	18	3.0
E1	FL1-2	GRN	18	5.0
E1	E2	GRN/YEL	16	35.0

3 ROUTE WIRES THROUGH GROMMET BEFORE CRIMPING & TERMINATE AS SHOWN.
2 COVER ALL SOLDER CONNECTIONS WITH SHRINK TUBING.
1 SEE WIRE TABLE FOR WIRE CALLOUT & DESTINATION.

DRAWING NO 154017-901
SHEET 1 OF 1

154017-901 REV G

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS ± 5 DECIMALS .XX ± 5 .XXX ± 5 ANGLES ± 5
DO NOT SCALE DRAWING

CONTRACT NO.

APPROVALS		DATE
DWN		2-2-78
CHK		3-17-78
RPG ENG		3-17-78
QC		3-17-78
CDS ENG		3-14-78
PROD REL		3-17-78

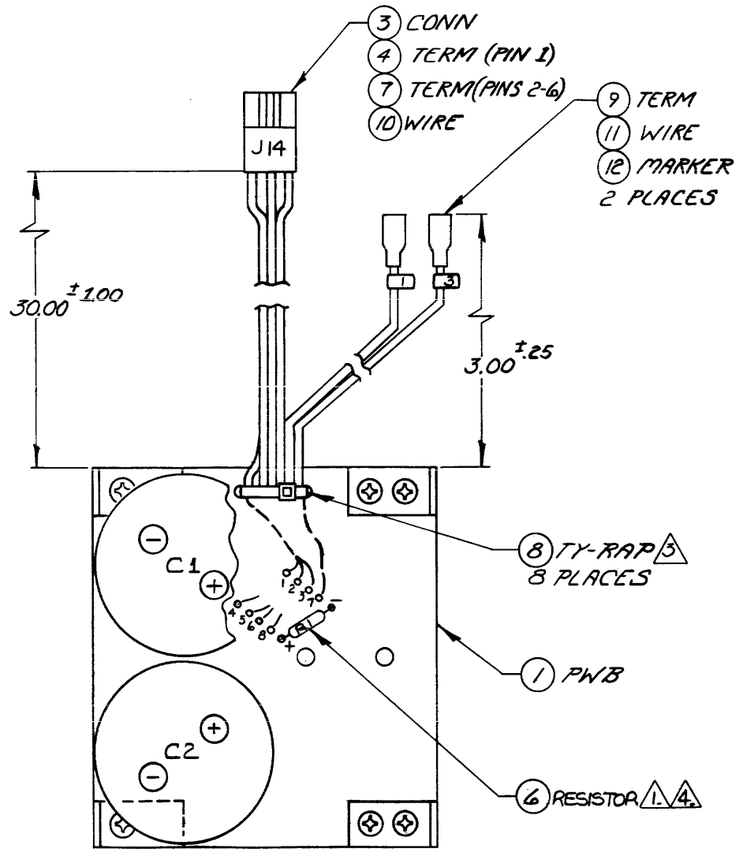
Cipher Data Products SAN DIEGO CALIF.

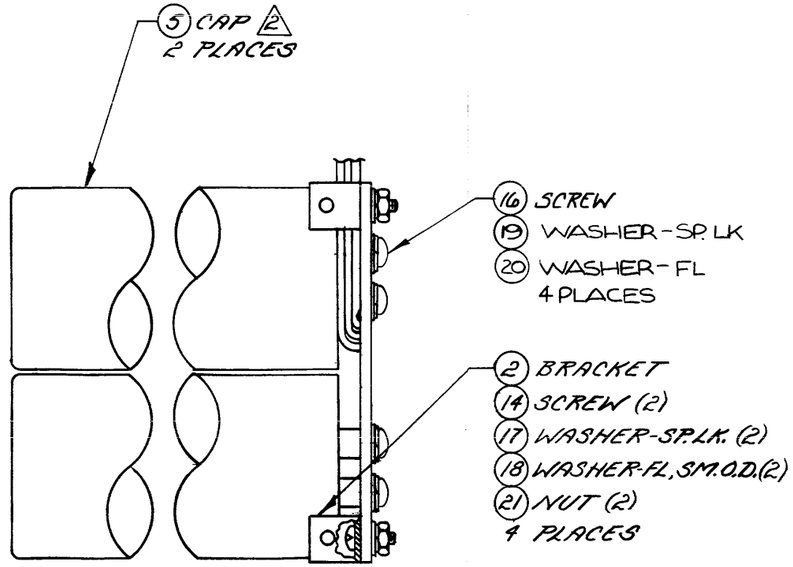
TITLE POWER SUPPLY ASSY

SIZE	CODE IDENT NO.	DRAWING NO.	REV
D	32274	154017-901	G

SCALE FULL 800X SHEET 1 OF 1

REVISION					
LTR	DESCRIPTION	DWN	DATE	APVD	DATE
A	ENGR REL	DS	3-16-78	[illegible]	3-17-78
B	INCORP ECO 3675	CW	5/1/78	[illegible]	5-4-8
C	INCORP ECO 4338	CW	10-20-78	[illegible]	10-23-8





154017-001 REV C

CONN-ITEM 3

WIRE SIDE VIEW

WIRE TABLE

WIRE ITEM NO.	FROM PWB PIN NO.	TO WIRE MARKER NO.	TO CONN PIN NO.	TERM TYPE
10	1	—	1	MALE
10	2	—	2	FEMALE
10	3	—	3	FEMALE
10	4	—	4	FEMALE
10	5	—	5	FEMALE
10	6	—	6	FEMALE
11	7	3	—	ITEM # 9
11	8	1	—	ITEM # 9

NOTES:

4. FORM LEADS OF R1 (ITEM 6) TO FIT HOLE PATTERN.
5. AFTER THIS TY-RAP, EVENLY SPACE REMAINING TY-RAPS (1 EVERY 4 INCHES) OVER LENGTH OF CONN WIRE BUNDLE.
2. NOTE POLARITY MARKING ON PWB BEFORE INSTALLING CAPS C1 & C2.
1. INSTALL RESISTOR R1 & SOLDER ALL WIRES TO PWB BEFORE INSTALLING CAPS C1 & C2.

DRAWING NO. 154017-001
SHEET 1 OF 1

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ARE:
FRACTIONS ± 5 | DECIMALS .XX ±.05 .XXX ±.025 | ANGLES ± 5
DO NOT SCALE DRAWING

CONTRACT NO.

APPROVALS	DATE
DWN [illegible]	1-22-78
CHK [illegible]	3-6-78
MFG ENG [illegible]	3-17-78
QC [illegible]	3-17-78
COG ENG [illegible]	3-16-78
PROD REL [illegible]	3-14-78

Cipher Data Products SAN DIEGO CALIF.

TITLE: PWB ASSY-POWER SUPPLY

SIZE	CODE IDENT NO.	DRAWING NO.	REV
C	32274	154017-001	C

SCALE FULL 900X SHEET 1 OF 1

REVISION			
LTR	DESCRIPTION	DATE	APPROVAL
P	INC ECO 3563	4/6/76	
R	INC ECO 3566	4/6/76	
S	INC ECO 3727	5/3/78	
T	INC ECO 3885	MH 6-20-78	
U	INC ECO 3888	MH 6-20-78	
V	INC ECO 4196	9/11/78	
W	INC ECO 4210	PVE 9/11/78	
Y	INC ECO 4337	CW 11/27/78	
Z	INC ECO 4381	CW 12/7/78	
AA	INC ECO 4967	MH 8/3/79	

REVISION					
LTR	DESCRIPTION	DWN	DATE	APVD	DATE
A	ENG RELEASE		12-7-77		
B	INCORP ECO 3285	RA	1-31-78		
C	INCORP ECO 3286	RA	1-31-78		
D	INCORP ECO 3411		2-24-78		2-24-78
E	INCORP ECO 3413		2-24-78		2-24-78
F	INCORP ECO 3415		2-23-78		2-24-78
G	INCORP ECO 3443	RossC	3/3/78		
H	INCORP ECO 3453	RossC	3/6/78		
J	INCORP ECO 3456		3/7/78		
K	INCORP ECO 3458		3/8/78		
L	INCORP ECO 3515	RossC	3/28/78		
M	INCORP ECO 3472	RossC	3/29/78		
N	INCORP ECO 3524	RossC	3/29/78		

VCC

R379 750Ω 3.75W

CR105 IN9749 15V

R389 10K 1/2W

R386 90.9K 1/8W 1%

R388 10K 1/8W 1%

CR103 6.8V IN957B

R371 6.81K 1/8W 1%

R387 3.01K 1/8W 1%

U35 339

R375 10K LOWV SH 14

R368 8.06K 1/8W 1%

(SH 13 14,15 RES)

+5V

R369 10K

R427 2K

R426 1K

R425 10K

Q59

Q60 2N3704

R370 10Ω

C166 47μf 6V

R374 10K

200K R373

U35 339

R372 100K

R393 33K

C172 12μf 20V

R377 2.7K

R398 9.7K

R378 9.7K

C170 .1μf 25V

R399 2K

C168 .012μf

R376 10K

CR104 IN914

C169 .33μf

C167 47μf 6V

R397 750Ω

U97 SG3524

VIN CA CB EA EB CL+ CL- OSC COMP GND VREF RT CT INV NI

R383 390Ω 1/2W

R382 390Ω 1/2W

R381 560Ω 1/2W CR108

CR106 IN914

CR109 IN914

CR110 6.8V IN957B

Q56 MJ10002

R403 9.7Ω CC

Q54 2N4013

R384 1K

R406 1K

100pf C173

IN5817 CR107

CR107 6.8V IN957B

R404 9.7Ω

Q55 2N4013

IN5817 CR111

R402 1K

Q57 MJ10002

R409 9.7Ω

C186 .0047μf

R405 .1Ω 3.75W

R380 6.8K

C171 270PF

R400 100Ω

R391 1K

R392 10K

U95 339

R390 75K

CW

R385 2.2K

R367 1K

T4

13T 7T 7T 11 13T 12

25T 2 3 25T 4

CR113 MR851

CR112 MR851

CR116 MR820

CR117 MR820

CR114 MR851

CR115 MR851

L8 65T

L9 42T

L7 65T

V15 SW (SH 14)

C163 1000μf 25V

T2 10T

C161 12μf 20V

VR1 7812

R354 12K

Q53 2N6034

VRAW 15

TP54

V15 RAW (SH 12)

TP52 +12V A

C165 2000μf 10V

T1 6T

C160 500μf 10V

TP50 +5V

C164 1000μf 25V

T3 10T

VR5 79L05

TP51 -5V

VR3 7912

TP53 -12VA

VR4 7912

P7 YEL -12VB

C162 12μf 20V

C141 .1μf 25V

C107 .1μf 25V

C139 .1μf 25V

R366 10K

R364 22K

2N3704 Q49

R363 100K

Q50 2N3702

Q52 2N6039

Q51 2N6037

R365 10K

VR2 7812

P7 YEL +12VB

354012-300 REV AA

P14 YEL

220 IN

115 IN

95-55 VDC

8 AMP 100 VDC BRIDGE

4200μf 100V

3K 3.75W

4200μf 100V

VCC 50V DC 1.5V AC ON TOP

C159 100μf 150V

TP42 THRU TP49

GROUND PLANE

AC IN BLOWER ASSY

— CKT NOT ON PCB —

4 Q39,40,42 & 43 ARE SELECTED TRANSISTORS. SEE SPEC DWG #799603-100.

3 THIS JUMPER WIRE TO BE REMOVED DURING TEST.

2. ALL JUMPERS FOR IN-HOUSE TESTING ONLY.

1. ALL RESISTORS ARE 1/4W, 5% CARBON COMP.

NOTES: UNLESS OTHERWISE SPECIFIED

DRAWING NO. 354012-300
SHEET 1 OF 15

SWITCHING REGULATOR

REV STATUS	REV	AA	V	AA	U	AA	Z	AA	Z	W	V	Z	U	J	G	R
	SH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS DECIMALS ANGLES .XX ±.— .XXX ±.— ±—

DO NOT SCALE DRAWING

CONTRACT NO.

APPROVALS		DATE
DSN		8-17-77
CHK		12-23-77
ENG		12-13-77
QC		12-16-77
CONT		12-8-77
PROD		12/14/77

Cipher Data Products SAN DIEGO CALIF.

TITLE SCHEMATIC — PWB CONTROL/SERVO

SIZE	CODE IDENT NO.	DRAWING NO.	REV
D	32274	354012-300	AA

SCALE — 900X SHEET 1

P7,14

REVISION					
LTR	DESCRIPTION	DWN	DATE	APVD	DATE
A	ENG REL				
B	INCORP ECO 3285	RA			
E	INCORP ECO 3413				
V	INC ECO 4196	DVB			

(SH 19) REV CLAMP
R339 4.7K
Q58 MPS2222
CR102 IN914
C154 22µF 15V
+12V
R341 680K
IH5012
U77
-12V
U76
4136
R338 2.4K
CR101 IN914
+12V REWUP (SH 19)
R340 100K
(SH 19) REWDN
TP27
R337 4.99K 1/8W 1%
R336 10.0K 1/8W 1%
RAMP (SH 11,12)
-12VB

+12VA
R240 2.21K 1/8W 1%
R241 2.21K 1/8W 1%
R243 20K
R244 20K
CW
RNFWD (SH 15)
CR99 IN914
R238 2.49K 1/8W 1%
R231 4.7K
C117 .0022µF 50V
R235 22K
R236 100K
C118 .33µF 50V
R230 91K
U131
R225 240K
TP33
+XOFF (SH 11,12)
R222 10.0K 1/8W 1%
R221 10.0K 1/8W 1%
-XOFF (SH 11)

RNREV (SH 15)
CR98 IN914
R239 2.49K 1/8W 1%
R237 2.49K 1/8W 1%
U32
R232 12K
R233 10K
C116 .15µF 50V
R234 1K
+12VB
R242 20K
RAMPING (SH 12)
U33
R227 240K
R226 360K
C115 .33µF 50V
C114 .33µF 50V
R224 240K
R223 100K
C113 .33µF 50V
R216 240K
R215 200K
R214 510K
R228 30.1K 1/8W 1%
R229 20.0K 1/8W 1%
R217 20.0K 1/8W 1%
TP21
R218 15K
+IOFF (SH 11)
R219 10.0K 1/8W 1%
R220 10.0K 1/8W 1%
-IOFF (SH 11)

359012-300 REV V

RAMP REWIND AND REEL OFFSET

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS ± DECIMALS .XX ± .XXX ± ANGLES ±	CONTRACT NO.	Cipher Data Products SAN DIEGO CALIF.	
DO NOT SCALE DRAWING	APPROVALS / DATE: DSN, CHK, MFG ENG, QC, COG ENG, PROD REL	TITLE: SCHEMATIC — PWB CONTROL/SERVO	
		SIZE D · CODE IDENT NO. 32274 · DRAWING NO. 359012-300 · REV V	
		SCALE — · 900X · SHEET 2 OF	

DRAWING NO. 359012-300
SHEET 2 OF

REVISION					
LTR	DESCRIPTION	DWN	DATE	APVD	DATE
A	ENG REL	[illegible]	1/7/77	[illegible]	2/4/77
B	INCORP ECO 3285	RA	7-31-78	[illegible]	8/11/78
D	INCORP ECO 3411	[illegible]	12-29-78	[illegible]	2-28-79
V	INC ECO 4196	DNB	9/11/78	[illegible]	9-13-84
AA	INC ECO 4967	NW	3/3/89	[illegible]	3-15-89

CAPSTAN SERVO

359012-300 REV AA

DRAWING NO. 359012-300 SHEET 3 OF

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS ± — DECIMALS .XX ±.— .XXX ±.— ANGLES ±.—	CONTRACT NO.	Cipher Data Products SAN DIEGO CALIF.	
	APPROVALS / DATE	TITLE	SCHEMATIC—PWB, CONTROL/SERVO,
	DWN		
	CHK		
	MFG ENG		
	QC	SIZE D	CODE IDENT NO. 32274
	COG ENG		DRAWING NO. 359012-300 REV AA
DO NOT SCALE DRAWING	PROD REL	SCALE —	900X SHEET 3 OF

REVISION					
LTR	DESCRIPTION	DWN	DATE	APVD	DATE
A	ENG REL	TD	12/1/71	[illegible]	12/1/71
B	INCORP ECO 3285	RA	1-31-78	[illegible]	2/1/78
E	INCORP ECO 3413	TD	2-27-78	[illegible]	3-28-78
H	INCORP ECO 3453	TD/RS C	3/4/78	[illegible]	3/7/78
U	INCORP ECO 3888	MH	6-21-78	[illegible]	6-21-78

A1

T4-C

T2-C

CR17 IN5817

CR9 IN5817

CR19 IN5817

CR11 IN5817

R47 10Ω 1/2 W

R41 3.3Ω 1/2 W

R42 3.3Ω 1/2 W 10J

C30 .1μF 10V

Q9 2N6338

CR26 UES1302

VCC4

C28 .1μF 100V

CR27 UES1302

Q12 2N6338

R50 3.3Ω 1/2 W

C31 .1μF 10V

A1

CR13 IN5817

CR21 IN5817

CR24 IN5817

CR23 IN5817

T3-C

T1-C

R44 10Ω 1/2 W

R45 3.3Ω 1/2 W

C27 2μF 100V

L2 150μh

C26 2μF 100V

L1 150μh

P8 RED

2 3 5 1

A1

T3-B

T1-B

CR22 IN5817

CR14 IN5817

CR15 IN5817

CR16 IN5817

R51 10Ω 1/2 W

R46 3.3Ω 1/2 W

R52 3.3Ω 1/2 W 10H 10G

C29 .1μF 10V

Q10 2N6338

CR25 UES1302

CR28 UES1302

Q11 2N6338

R49 3.3Ω 1/2 W 10N 10P

C32 .1μF 10V

A1

CR10 IN5817

CR18 IN5817

CR12 IN5817

CR20 IN5817

T4-B

T2-B

R48 10Ω 1/2 W

R43 3.3Ω 1/2 W

+12V

R54 .1Ω 3.75 W

R55 .1Ω 3.75 W

R26 330Ω

R27 330Ω

R24 15K

R23 4.7m

+5V

R25 4.7K

TP3

R413 15K

$\overline{I_L}$ (SH 3)

U6 339

U6 339

U6 339

C12 100pf 300V

-12V

C23 .0022μF 200V

R28 1.1K

C22 .0022μF 200V

R22 330Ω

R21 330Ω

C10 .047μF 50V

C11 .047μF 50V

R15 10.0K 1/8 W 1%

R14 10.0K 1/8 W 1%

R12 53.6K 1/8 W 1%

R13 53.6K 1/8 W 1%

TP2

U5 4136

CPSTN I (SH 11)

359012-300 REV U

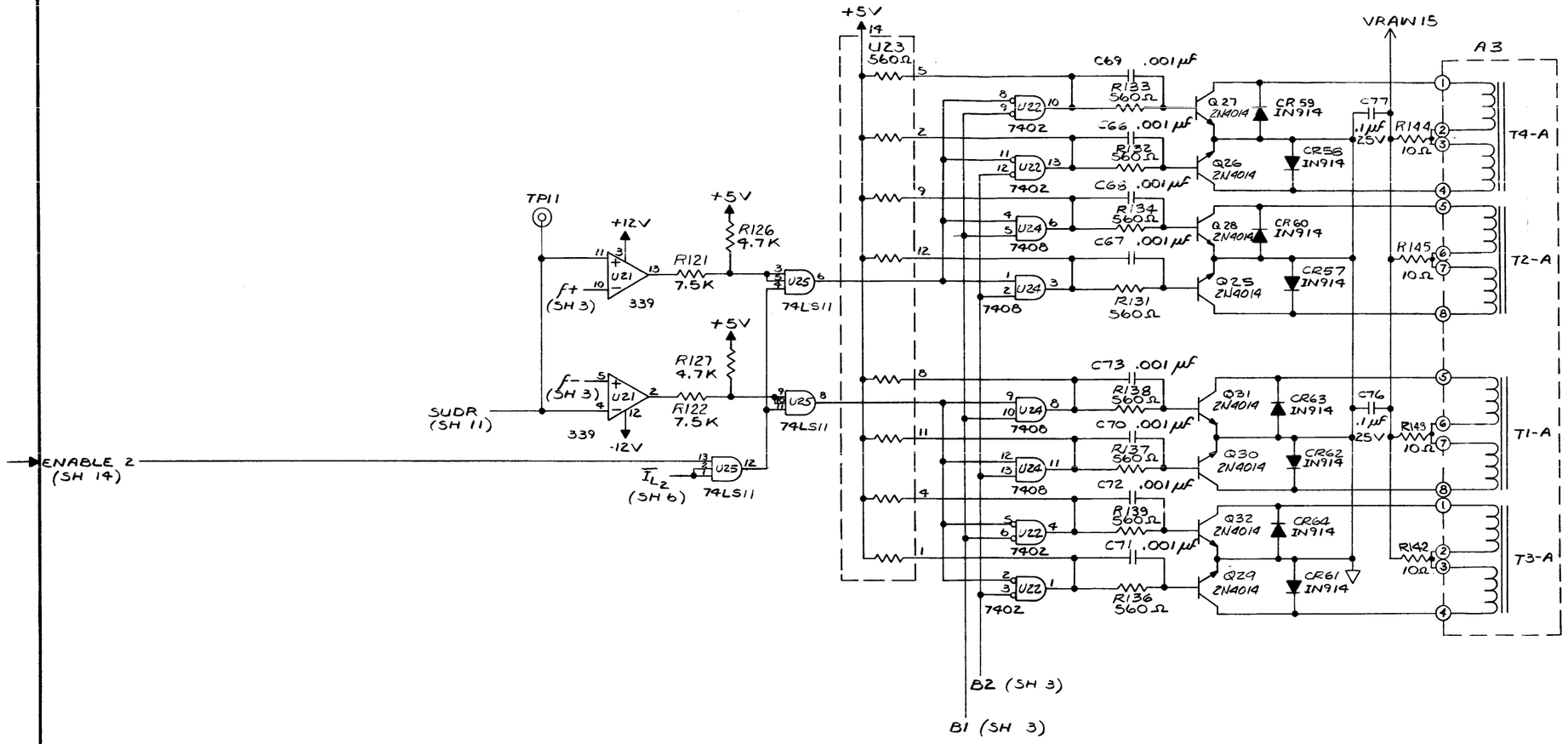
CAPSTAN SERVO

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS ± — DECIMALS .XX ± — .XXX ± — ANGLES ± —	CONTRACT NO.	Cipher Data Products SAN DIEGO CALIF	
	APPROVALS / DATE: DWN TD; CHK; MFG ENG; QC; COG ENG; PROD REL	TITLE: SCHEMATIC — PWB, CONTROL / SERVO	
DO NOT SCALE DRAWING		SIZE D; CODE IDENT NO. 32274; DRAWING NO. 359012-300; REV U	
		SCALE — ; 900X; SHEET 4 OF	

DRAWING NO. 359012-300
SHEET 4 OF

P8

REVISION					
LTR	DESCRIPTION	DWN	DATE	APVD	DATE
A	ENG REL	[illegible]	12/7/71	[illegible]	12/7/71
B	INCORP ECO 3285	RA	1-31-78	[illegible]	2/1/78
V	INC ECO 4196	DVB	9/11/78	[illegible]	9-12-78
AA	INC ECO 4967	VW	5/3/79	[illegible]	5-15-79



354012-300
REV AA

SUPPLY REEL SERVO

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS DECIMALS ANGLES ± — .XX ± — ± — .XXX ± —	CONTRACT NO.	Cipher Data Products SAN DIEGO CALIF.	
	APPROVALS / DATE	TITLE	SCHEMATIC — PWB, CONTROL / SERVO
	DWN [illegible]		
	CHK		
	SPG ENG		
	QC	SIZE D	CODE IDENT NO. 32274
	COG ENG	DRAWING NO.	354012-300 REV AA
DO NOT SCALE DRAWING	PROD REL	SCALE —	900X SHEET 5 OF

DRAWING NO. 354012-300
SHEET 5 OF

REVISION					
LTR	DESCRIPTION	DWN	DATE	APVD	DATE
A	ENG REL				
B	INCORP ECO 3285	RA	3-31-78		
E	INCORP ECO 3913		2-27-78		
F	INCORP ECO 3915		3-2-78		
H	INCORP ECO 3453		3/14/78		
U	INCORP ECO 3888	MM	6-2-78		
Z	INCORP ECO 4381	CW	11-2-78		11-8-78

A3 T4-C T2-C CR73 IN5817 CR65 IN5817 CR75 IN5817 CR67 IN5817 R152 10Ω 1/2W R146 3.3Ω 1/2W R147 3.3Ω 1/2W AD C82 0.1μF AC 10V Q33 2N6338 CR82 UES1302 VCC4 C80 .1μF 100V CR83 UES1302 L6 150 μh 50T C79 2μF 100V C78 2μF 100V L5 150 μh 50T CR84 UES1302 CR81 UES1302 Q34 2N6338 Q35 2N6338 Q36 2N6338 C83 .1μF AE AF R155 3.3Ω 1/2W C84 .1μF AG AH R154 3.3Ω 1/2W C81 0.1μF AA AB R157 3.3Ω 1/2W 10V

A3 T3-B T1-B CR78 IN5817 CR70 IN5817 CR71 IN5817 CR72 IN5817 R156 10Ω 1/2W R151 3.3Ω 1/2W

A3 T3-C T1-C CR69 IN5817 CR77 IN5817 CR80 IN5817 CR79 IN5817 R149 10Ω 1/2W R150 3.3Ω 1/2W

A3 T4-B T2-B CR66 IN5817 CR74 IN5817 CR68 IN5817 CR76 IN5817 R153 10Ω 1/2W R148 3.3Ω 1/2W

P10 BLK + 1 − 2

+12V R160 .1Ω 3.75W R159 .1Ω 3.75W R140 330Ω C75 .0022μF 200V C74 .0022μF 200V R141 1.1K R124 330Ω R123 330Ω C62 .047μF 50V C63 .047μF 50V

TP10 +5V R125 4.7K R414 15K $\overline{IL_2}$ (SH 5) R128 4.7m R129 15K +12V U20 339 C64 100pf 300V -12V

R120 20K R118 100K 1/8W 1% R115 10.0K 1/8W 1% C61 .10μF 100V 20% R109 75K R108 750K TP9 U19 9136 R110 60K C59 .22μF 50V SUV (SH 11 & 12) C60 .10μF 100V 20% R119 20K R117 100K 1/8W 1% R116 10.0K 1/8W 1% R114 10.0K 1/8W 1% R111 53.6K 1/8W 1% R113 10.0K 1/8W 1% R112 53.6K 1/8W 1% SUI (SH 11)

359012-300 REV Z

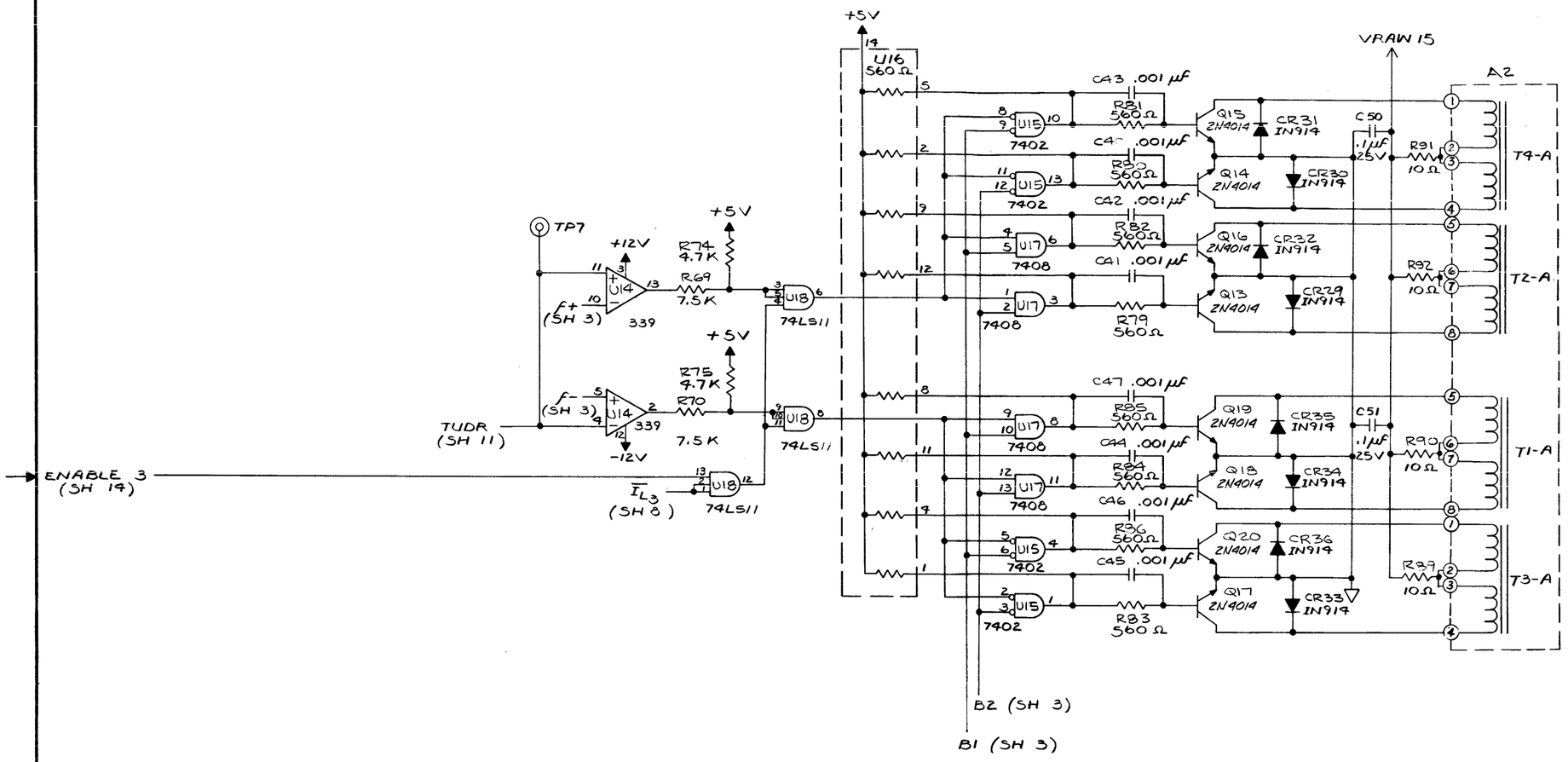
SUPPLY REEL SERVO

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS DECIMALS ANGLES ± — .XX ± .2 .XXX ± —	CONTRACT NO.	Cipher Data Products SAN DIEGO CALIF	
	APPROVALS / DWN	DATE	TITLE SCHEMATIC – PWB, CONTROL / SERVO
	CHK		
	MFG ENG		
	QC		SIZE D · CODE IDENT NO. 32274 · DRAWING NO. 359012-300 · REV Z
DO NOT SCALE DRAWING	COG ENG		
	PROD REL		SCALE — · 900X · SHEET 6 OF

DRAWING NO. 359012-300 SHEET 6 OF

P10

REVISION					
LTR	DESCRIPTION	DWN	DATE	APVD	DATE
A	ENG REL	[illegible]	7/1/77	[illegible]	12/31/77
B	INCORP ECO 3285	RA	1-31-78	[illegible]	3/1/78
V	INC ECO 4196	DVB	9/11/78	[illegible]	9-12-8
AA	INC ECO 4967	VLN	2/15/79	[illegible]	2-15-9



354012-300
REV AA

TAKE-UP REEL SERVO

DRAWING NO. 354012-300
SHEET 7 OF

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS DECIMALS ANGLES .XX ±.— .XXX ±.—	CONTRACT NO.	Cipher Data Products SAN DIEGO CALIF.	
	APPROVALS / DATE	TITLE	SCHEMATIC — PWB, CONTROL/SERVO
	DWN [illegible]		
	CHK		
	MFG ENG		
	QC	SIZE D	CODE IDENT NO. 32274
	CDG ENG		DRAWING NO. 354012-300
DO NOT SCALE DRAWING	PROD REL	SCALE —	900X SHEET 7 OF

REVISION					
LTR	DESCRIPTION	DWN	DATE	APVD	DATE
A	ENG REL		3/7/77		3/14/77
B	INCORP ECO 3285		1/31/78		2/1/78
E	INCORP ECO 3913		2-24-78		2/28/78
H	INCORP ECO 3453		3/14/78		3/16/78
U	INCORP ECO 3888	MH	6-7-78		6-11-78
Z	INCORP ECO 4381	CWI	11-2-78		11-8-78

A2 T4-C T2-C CR45 CR37 CR47 CR39 IN5817 R99 10Ω 1/2W R93 3.3Ω 1/2W R94 3.3Ω 1/2W Q21 2N6338 CR54 UES1302 C55 .1μf 10V VCC4 C57 .1μf 100V C53 2μf 100V L4 150μh 50T CR55 UES1302 Q24 2N6338 C56 .1μf 10V R102 3.3Ω 1/2W CR41 CR49 CR52 CR51 R96 10Ω 1/2W R97 3.3Ω 1/2W T3-C T1-C A2

P12 BLUE

A2 T3-B T1-B CR50 CR42 CR43 CR44 IN5817 R103 10Ω 1/2W R98 3.3Ω 1/2W R104 3.3Ω 1/2W* Q22 2N6338 CR53 UES1302 C54 .1μf 10V C52 2μf 100V L3 150μh 50T CR56 UES1302 Q23 2N6338 C58 .1μf 10V R101 3.3Ω 1/2W CR38 CR46 CR40 CR48 R100 10Ω 1/2W R95 3.3Ω 1/2W T4-B T2-B A2

+12V R107 .1Ω 3.75W R106 .1Ω 3.75W R76 4.7m R77 15K R78 330Ω R87 330Ω C49 .0022μf 200V R88 1.1K C48 .0022μf 200V R72 330Ω R71 330Ω C38 100pf 300V C36 .047μf 50V C37 .047μf 50V -12V

TP6 +5V R73 4.7K R415 15K IL30 SH 7 U13 339

R68 20K R66 100K 1/8 W 1% R63 10.0K 1/8 W 1% C35 .10μf 100V 20% C34 .10μf 100V 20% R67 20K R65 100K 1/8 W 1% R64 10.0K 1/8 W 1% U12 4136

R62 10.0K 1/8 W 1% R59 53.6K 1/8 W 1% R61 10.0K 1/8 W 1% R60 53.6K 1/8 W 1% U12 4136

TP5 R57 75K R56 750K R58 68K C33 .22 μf 50V U12 4136 TUV (SH11 & 12)

TUI (SH11)

354012-300 REV Z

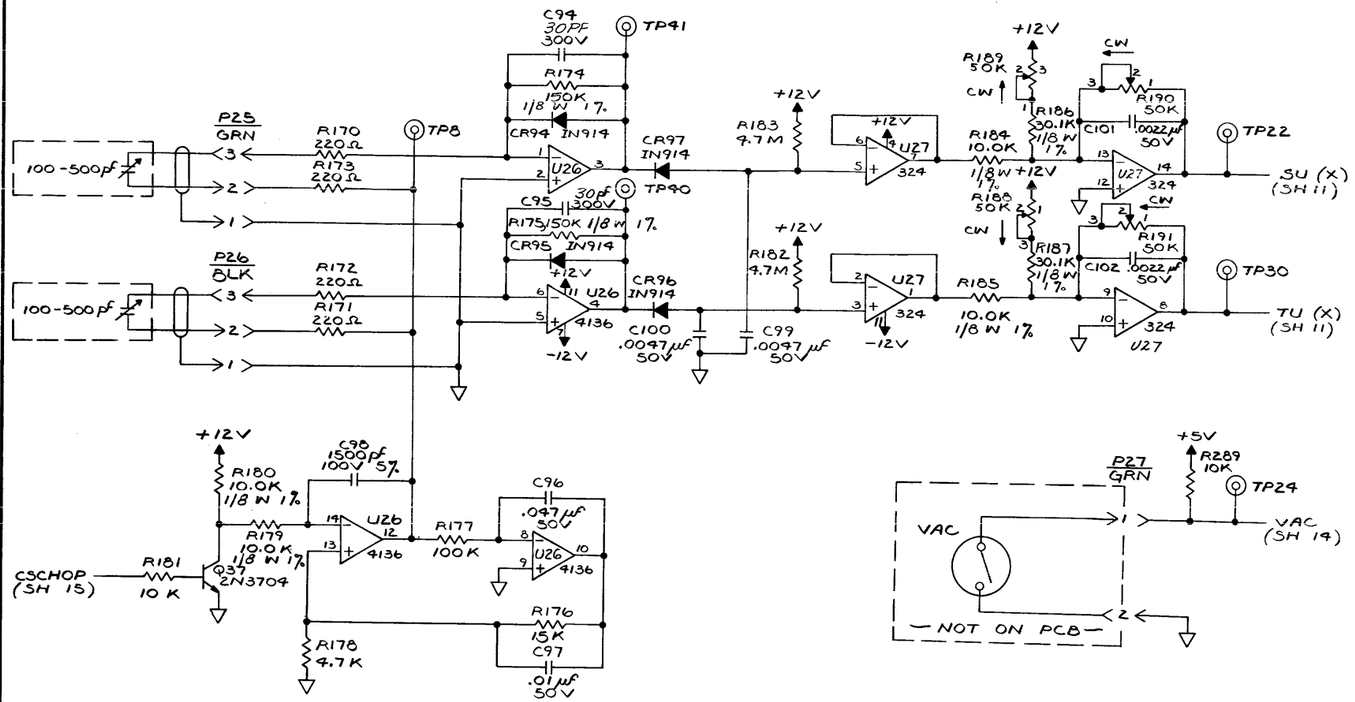
TAKE-UP REEL SERVO

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS ± — DECIMALS ANGLES .XX ± — .XXX ± —	CONTRACT NO.		Cipher Data Products SAN DIEGO CALIF
	APPROVALS	DATE	TITLE SCHEMATIC — PWB, CONTROL / SERVO
	DSN		
	CHK		
	MFG ENG		
	QC		SIZE D · CODE IDENT NO. 32274 · DRAWING NO. 354012-300 · REV Z
DO NOT SCALE DRAWING	COG ENG		
	PROD REL		SCALE — · 900X · SHEET 8 OF

DRAWING NO. 354012-300 SHEET 8 OF

P12

REVISION					
LTR	DESCRIPTION	DWN	DATE	APVD	DATE
A	ENG REL				
B	INCORP ECO 3285	RA	1-3478		
E	INCORP ECO 3413		2-23-78		
K	INCORP ECO 3458				
W	INC F.O 4210	DWB			



359012-300
REV W

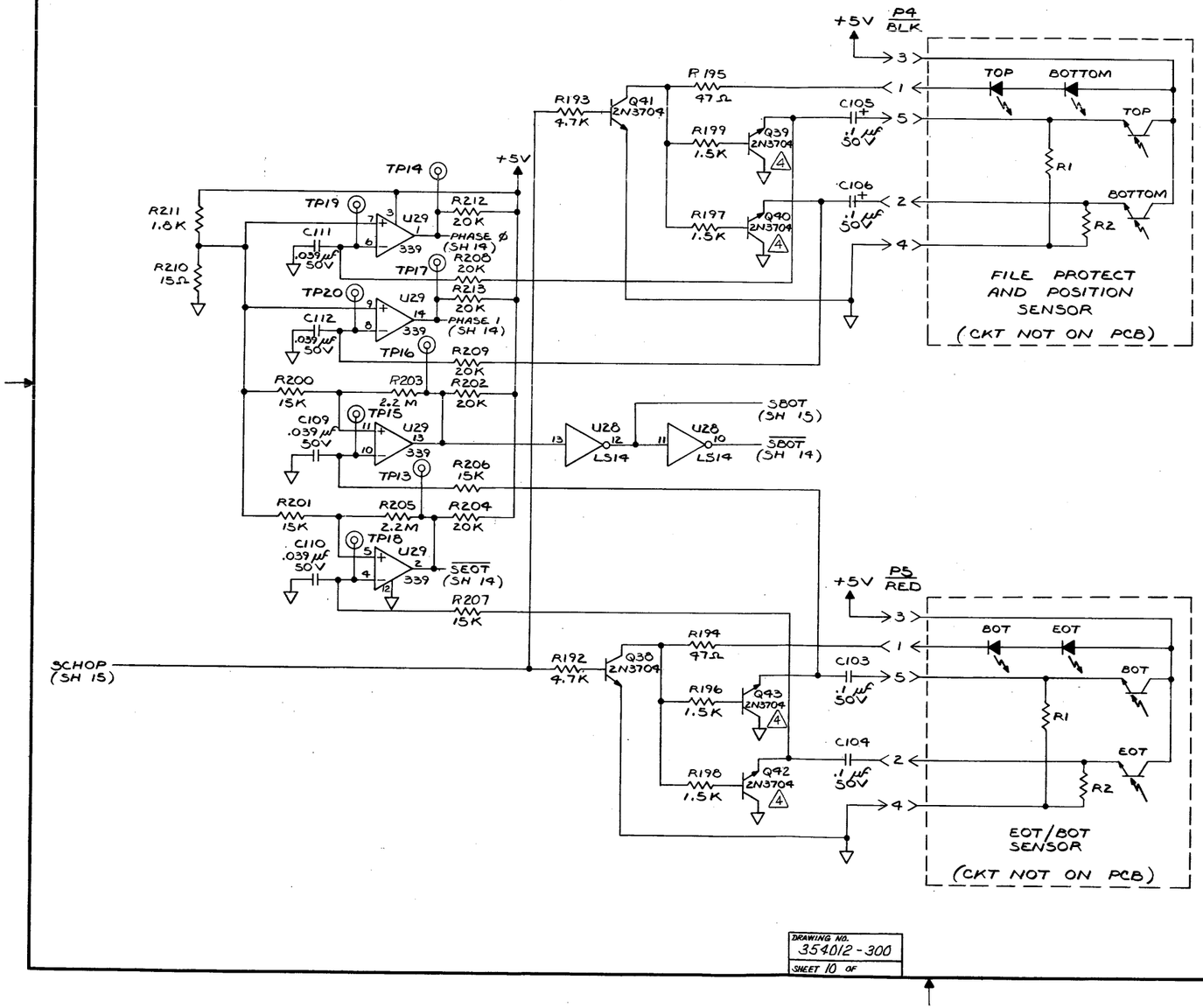
TRANSDUCER CONVERTER

DRAWING NO. 354012-300
SHEET 9 OF

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS DECIMALS ANGLES ± — XX ± — XXX ± —	CONTRACT NO.	Cipher Data Products SAN DIEGO CALIF	
	APPROVALS / DATE	TITLE	SCHEMATIC – PWB, CONTROL/SERVO
	DSN	SIZE D	CODE IDENT NO. 32274
	CHK	DRAWING NO.	359012-300
	MFG ENG	REV	W
	QC	SCALE —	900X
DO NOT SCALE DRAWING	COG ENG	SHEET	9 OF
	PROD REL		

P 25,26,27

REVISION					
LTR	DESCRIPTION	DWN	DATE	APVD	DATE
A	ENG REL	JO	9/7/77	RA	9/7/77
B	INCORP ECO 3285	RA	1-3-78	RA	1/3/78
F	INCORP ECO 3915	JO	2-23-78	RA	2/28/78
V	INC ECO 4196	PVB	9/11/78	RA	9-12-78



FILE PROTECT AND EOT/BOT SENSORS

354012-300 REV V

DRAWING NO. 354012-300 SHEET 10 OF

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS DECIMALS ANGLES .X ± — .XX ± — .XXX ± —	CONTRACT NO.		Cipher Data Products SAN DIEGO CALIF.
	APPROVALS	DATE	TITLE SCHEMATIC — PWB, CONTROL/SERVO
	DWN JO		
	CHK		
	MFG ENG		
	QC		SIZE D · CODE IDENT NO. 32274 · DRAWING NO. 354012-300 · REV V
	COG ENG		
DO NOT SCALE DRAWING	PROD REL		SCALE — · 900X · SHEET 10 OF

P4.5

REVISION					
LTR	DESCRIPTION	DWN	DATE	APVD	DATE
A	ENG REL		1/7/77	KB	2/1/77
B	INCORP ECO 3285	RA	1-31-78	RH	2/1/78
D	INCORP ECO 3411		2-24-78		2/24/78
E	INCORP ECO 3413		2-28-78		2/28/78
G	INCORP ECO3448	Ross E.	3/4/78		3/6/78
L	INCORP ECO 3515	Ross E.	4/24/78		5/28/78
R	INC ECO 3566	RH	9/13/78	RC	9/13/78
U	INC ECO 3888	MH	6/27/78		6/27/78
V	INC ECO 4196	DVB	9/11/78		9-11-8
Z	INCORP ECO 4381	CWJ	11/2/78		11-8-8

CAPSTN I (SH 9)
RAMP (SH 12)
TP12
P8 RED
TACH -4
TACH +5
SHIELD 3
R420 10K 1%
R421 10K 1%
U33 4136
C190 .0047µF 50V 5%
R423 3.6K
C191 .0047µF 50V, 5%
R422 4.7K
C192 .01µF 50V, 5%
R424 18K
+12V
-12V
R247 20K
R248 12.1K 1/8W, 1%
R290 10K 1/8W 1%
R277 56.0K
C126 150PF 300V
TP23
R250 50K
R251 1M
C121 .1µF 25V
C181 .1µF 25V
U49 IH5012
R279 91K
RMP ERR (SH 12)
S1 (SH 15)
R275 10K
C119 .0082µF 50V
C125 470PF 300V
R246 20K
C150 .0022µF 200V
R291 4.3K
R293 4.3K
C127 .0047µF 50V
R292 2K
C128 .039µF 50V
U46 4136
CPSTN D (SH 3)

-IOFF (SH 2)
-XOFF (SH 2)
R294 22K
R296 220K
R325 20M
C120 100PF 300V
R322 33K
R321 75K
C146 .33µF 50V
TP26
U63 IH5012
S2 (SH 15)
R313 100K
R314 91K
TP25
TUERR (SH 12)
U64 4136
R295 22K
R411 270K
+12V
S5 (SH 15)
R330 10K
C149 .33µF 50V
U65 4136
R327 4.3K
C198 .022µF 50V
R328 2K
R329 4.3K
C147 .15µF 50V
U64 4136
TUDR (SH 7)

R329 470K
R323 470K
C145 .33µF 50V
R309 33K
U63 IH5012
S3 (SH 15)
TU (X) (SH 9)
R297 220K
+12V
R312 150K
U64 4136
S12 (SH 14)
R310 75K
S4 (SH 15)
TUV (SH 8&12)
R300 10K
TUI (SH 8)
R301 5.1K
R315 220K
R298 10K
U65 4136
R299 220K
C129 .068µF 50V
TP35
S6 (SH 15)

+IOFF (SH 2)
+XOFF (SH 2)
R288 22K
R308 20M
C139 100PF 300V
CC
CB
CD
CE
R307 220K
R284 33K
R287 75K
C132 .33µF 50V
U67 IH5012
S7 (SH 15)
R318 100K
R317 91K
TP34
SUERR (SH 12)
U66 4136
R280 22K
R412 270K
+12V
S10 (SH 15)
R331 10K
C152 .33µF 50V
C151 .0022µF 200V
U65 4136
R332 4.3K
R335 4.3K
C153 .022µF 50V
R334 2K
C131 .15µF 50V
+12V
-12V
U66 4136
SUDR (SH 5)

R281 470K
R282 470K
C133 .33µF 50V
R319 33K
U67 IH5012
S8 (SH 15)
SU (X) (SH 9)
R306 220K
U66 4136
R320 75K
S13 (SH 14)
S9 (SH 15)
SUV (SH 6&12)
R303 10K
R304 5.1K
SUI (SH 6)
R316 220K
R302 10K
U65 4136
R311 33K
R305 220K
C138 .068µF 50V
S11 (SH 15)

354012-300
REV Z

DRAWING NO. 354012-300
SHEET 11 OF

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ARE:
FRACTIONS ± —
DECIMALS .XX ± —
.XXX ± —
ANGLES ± —
CONTRACT NO.
APPROVALS / DATE
DWN
CHK
ENG
QC
COG ENG
PROD REL
DO NOT SCALE DRAWING

Cipher Data Products SAN DIEGO CALIF.
TITLE SCHEMATIC — PWB, CONTROL/SERVO
SIZE D
CODE IDENT NO. 32274
DRAWING NO. 354012-300
REV Z
SCALE — 900X
SHEET 11 OF

PB

REVISION					
LTR	DESCRIPTION	DWN	DATE	APVD	DATE
A	ENG REL	[illegible]	12/1/77	[illegible]	[illegible]
B	INCORP ECO 3285	RA	1-31-78	[illegible]	2/1/78
E	INCORP ECO 3413	[illegible]	[illegible]	[illegible]	[illegible]
G	INCORP ECO 3448	[illegible]	[illegible]	[illegible]	[illegible]
H	INCORP ECO 3453	[illegible]	[illegible]	[illegible]	[illegible]
U	INCORP ECO 3888	MH	6-21-78	[illegible]	6-21-78

RAMPING (SH 2) R253 22K
RAMP (SH 2) R252 22K
RAMP ERR (SH 11) R295 22K
SUERR (SH 11) R254 43K
TUERR (SH 11) R257 43K
SUV (SH 6) R258 22K
TUV (SH 6 & 11) R255 22K
+ XOFF (SH 2) R256 22K

U36 IH5012
U37 IH5012

C123 100 pf 300V
R268 22K
U38 9136
TP31
R265 10K
R269 10K
R263 20K
C122 100 pf 300V
R266 4.7K
R267 10K
U49 IH5012
R264 22K
R259 2.2m
R262 10K
R260 4.7K
CR118 IN914
U39 339
R278 4.7K
+5V
R270 1K
R271 1.2K
R272 3.6K
R273 15K
R274 2.7K
R286 22K
R285 22K
R283 22K
TP39
TP38
TP37
TP32
SGT 8 (SH 14)
SGT 2 (SH 14)
SGT 5 (SH 14)
SNEG (SH 14)

U40 LS138
SSEL 2 (SH 15)
SSEL 1 (SH 15)
SSEL 0 (SH 15)

U47
10K

V15 RAW (SH 1)
VALVE HV1 (SH 15)
VALVE HVØ (SH 15)
R346 12K
R349 12K
Q48 2N6034
Q45 2N6034
VACCUM VALVE
P28 GRN
C156 .01 µf 500V
C175 2.2 µf 35V
R345 2.7Ω 1/2W
R343 1.5K
R344 2.7Ω 1/2W
R342 1.5K
C174 2.2 µf 35V
TP28
TP29
VALVE Ø (SH 15)
VALVE 1 (SH 15)
R347 2.4K
R348 2.4K
Q46 2N6037
Q47 2N6037
N/C

359012-300
REV U

DRAWING NO. 359012-300
SHEET 12 OF

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ARE:
FRACTIONS ± — DECIMALS .XX ± — .XXX ± — ANGLES ± —
DO NOT SCALE DRAWING

CONTRACT NO.
APPROVALS / DATE
DWN
CHK
MFG ENG
QC
COG ENG
PROD REL

Cipher Data Products SAN DIEGO CALIF.
TITLE SCHEMATIC — PWB, CONTROL / SERVO
SIZE D | CODE IDENT NO. 32274 | DRAWING NO. 359012-300 | REV U
SCALE — | 900X | SHEET 12 OF

P28

REVISION					
LTR	DESCRIPTION	DWN	DATE	APVD	DATE
A	ENG REL				
B	INCORP ECO 3285	RA			
E	INCORP ECO 3413				
F	INCORP ECO 3415				
G	INCORP ECO 3448				
J	INCORP ECO 3456				

U86 Z-80-CPU

U72 Z-80-CTC

U45 2708

U56 2708

U85 2111A

U84 2111A

U93 LS138

U99 LS138

U87 7474

U88 7404

R907 10K INT

R360 10K (N/C)

R362 10K (N/C)

R359 10K INT

C158 12 µf 20V

C157 1500 pf 100V

C187 47 pf 300V

R351 680Ω

R352 680Ω

Y1 3.840 MHz

R353 330Ω

TP36

P101

CR100 IN5817

C135 12 µf 20V

R355 220Ω

R356 330Ω

P30 RED

DRIVE SELECT SWITCH

CH0

OCK

OCL

OCM

OCJ

ISEL (SH 15)

U43-16 (SH 15)

354012-300 REV J

DRAWING NO. 354012-300

SHEET 13 OF

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS DECIMALS ANGLES ± — .XX ± — ± — .XXX ± —	CONTRACT NO.	Cipher Data Products SAN DIEGO CALIF.	
	APPROVALS / DATE: DWN, CHK, MFG ENG, QC, COG ENG, PROD REL	TITLE: SCHEMATIC — PWB, CONTROL/SERVO	
DO NOT SCALE DRAWING		SIZE D · CODE IDENT NO. 32274 · DRAWING NO. 354012-300 · REV J	
		SCALE — · 900X · SHEET 13 OF	

P101, 30

REVISION			
LTR	DESCRIPTION	DATE	APPROVAL
E	INCORP ECO 3413		3/8/78
F	INCORP ECO 3415		3/8/78
G	INCORP ECO 3448		3/8/78

REVISION					
LTR	DESCRIPTION	DWN	DATE	APVD	DATE
A	ENG REL		1/7/77		
B	INCORP ECO 3285	RA	1-21-78		
C	INCORP ECO 3286	RA	1-31-78		

SEL (SH 15) ONL (SH 15) BF BE SNEG (SH 12) OVW REW BH BG SGT.5 (SH 12) U94 LS253A → D∅ (SH 13), D1 (SH 13)

SRC (SH 15) PHASE∅ (SH 10) BK BJ OVWL (SH 15) DDS (SH 15) PHASE1 (SH 10) BR BP WENL (SH 15) U55 LS253A → D4 (SH 13), D5 (SH 13)

A1 (SH 13), A0 (SH 13)

WEN (SH 15) OVWLL (SH 15) BT BS SGT2 (SH 12) SFC (SH 15) LOWV (SH 1) BV BU SGT 8 (SH 12) U62 LS253A → D2 (SH 13), D3 (SH 13)

OPTC (SH 15) SEOT (SH 10) BY BW DDSL (SH 15) VAC (SH 9) SBOT (SH 10) CA BZ OPTCL (SH 15) U71 LS253A → D6 (SH 13), D7 (SH 13)

(SH 13) INS, RD — U70 LS32 — RDI — U70 LS32 — A5 (SH 13)

+5V, 19 U97, 10K 10K

(SH 13) Dø D1 D2 D3 D4 D5 Cø — U81 LS174 — CPSCø (SH 15), CPSC1 (SH 15), S12 (SH 11), S13 (SH 11), REWUP (SH 2), REWDN (SH 2)

(SH 1) RES

(SH 13) Dø D1 D2 D3 D4 D5 C2 — U90 LS174 — ENABLE 4 (SH 3), ENABLE 2 (SH 5), ENABLE 3 (SH 7), REV CLAMP (SH 2), U88 LS04, U89 LS04, V15 SW (SH 1)

+5V, R350 10K, P29 BRN, 1, 2

(SH 1) RES

(SH 13) OUT5, WR — U91 LS138 — Cø, C1 (SH 15), C2, C3, C4 (SH 15), C5 (SH 15), C6 (SH 15), C7 — A6 (SH 13), A5 (SH 13), A4 (SH 13)

+5V, 10 SJ — U92 LS74 — Do (SH 13), C7 11, CJ 13, Q 9

U82 7408 — RES (SH 1), (SH 15) SLTONL, (SH 15) OFC — U83 LS00

U83 LS00 — U92 LS74 — D1 (SH 13), SLT1, REW, C7 3, Q 6 REW (SH 15), CJ 1 RES (SH 1)

U92 7438 P101 — M ONLS, ONL (SH 15) 11

U92 7438 P101 — N RWDG, 12

U61 LS14 — LP1 (SH 15) — U82 LS08 — RWC (SH 15)

P3 RED

(SH 1) RES → 3 SYSRES
C3 → 4 WEN
(SH 13) Dø → 6 BDATA, A2 → 5 A2, A1 → 8 A1, Aø → 7 A0
RDI, (SH 13) A4 — U70 LS32 → 9 SWEN
+5V → 2 +5V
1 ← GND
CONTROL SWITCH ASSY

359012-300 REV G

DRAWING NO. 354012-300
SHEET 14 OF

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS DECIMALS ANGLES ± — .XX ± — .XXX ± —
DO NOT SCALE DRAWING

CONTRACT NO.		
APPROVALS	DATE	
DWN		
CHK		
MFG ENG		
QC		
COG ENG		
PROD REL		

Cipher Data Products SAN DIEGO CALIF

TITLE SCHEMATIC — PWB, CONTROL / SERVO

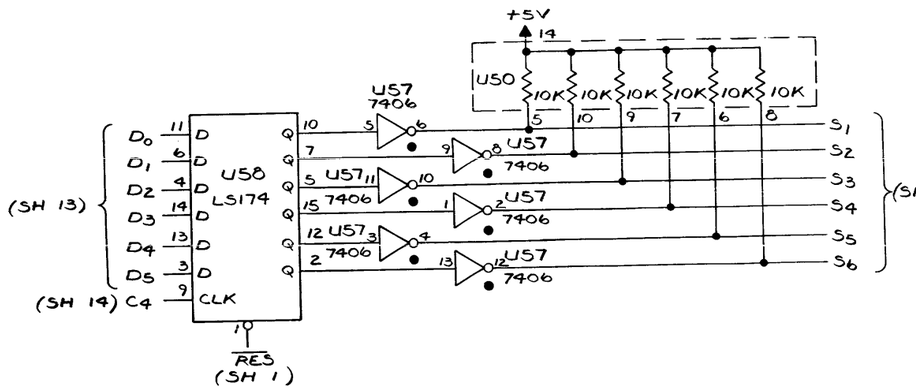
SIZE	CODE IDENT NO.	DRAWING NO.	REV
D	32274	359012-300	G

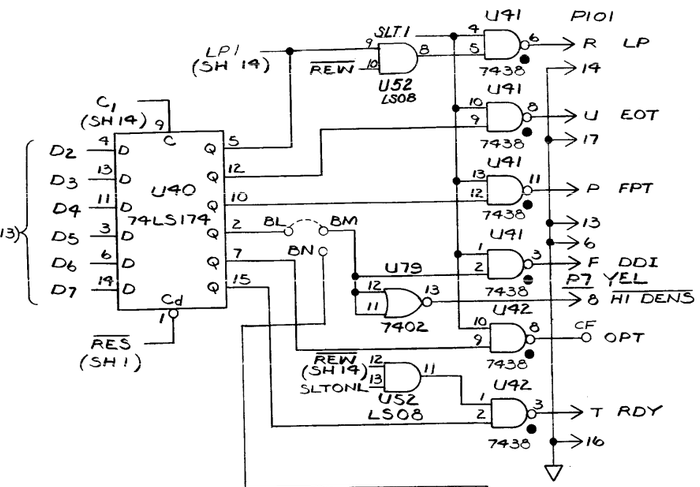
SCALE — 900X SHEET 14 OF

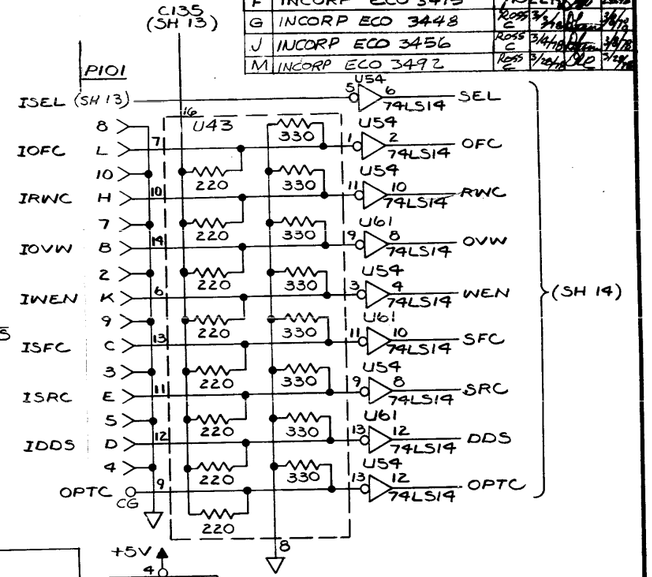
P3, 29, 101

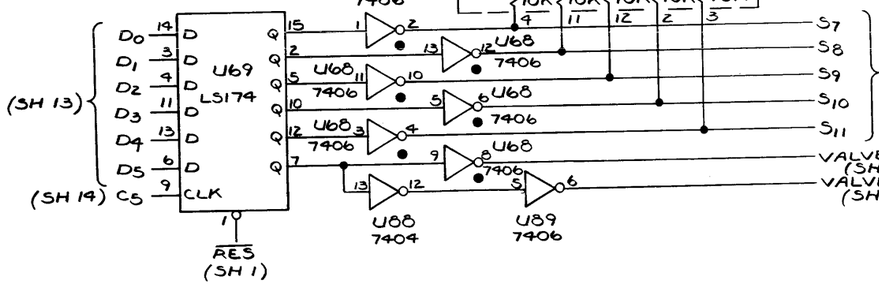
REVISION			
LTR	DESCRIPTION	DATE	APPROVAL
N	INCORP ECO 3524	Ross 3/28/78	
P	INC ECO 3563	BH 9/13/78	

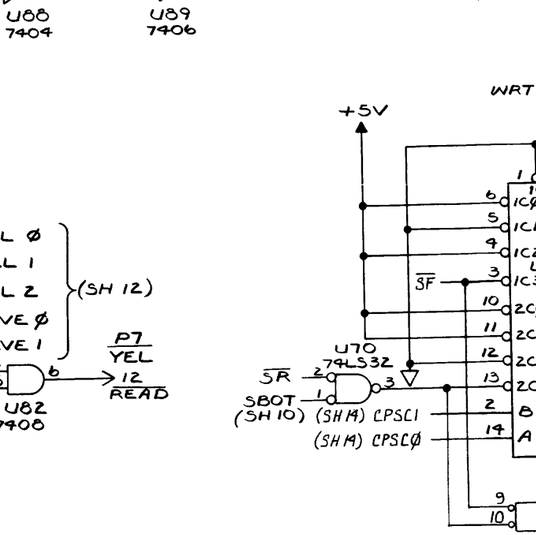
REVISION				
LTR	DESCRIPTION	DWN	DATE	APVD DATE
A	ENG. REL.			
B	INCORP ECO 3285	RA	1-31-78	
C	INCORP ECO 3286	RA	1-31-78	
E	INCORP ECO 3413		2-28	
F	INCORP ECO 3415		2-24	
G	INCORP ECO 3448	Ross C	3/1/78	
J	INCORP ECO 3456	Ross C	3/4/78	
M	INCORP ECO 3492	Ross C	3/29/78	

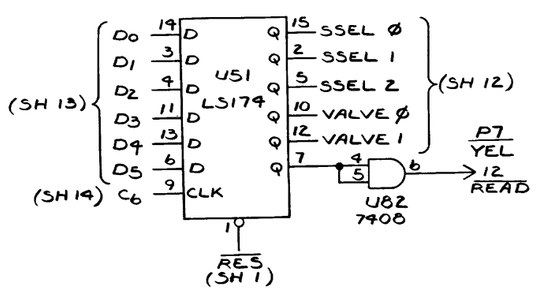


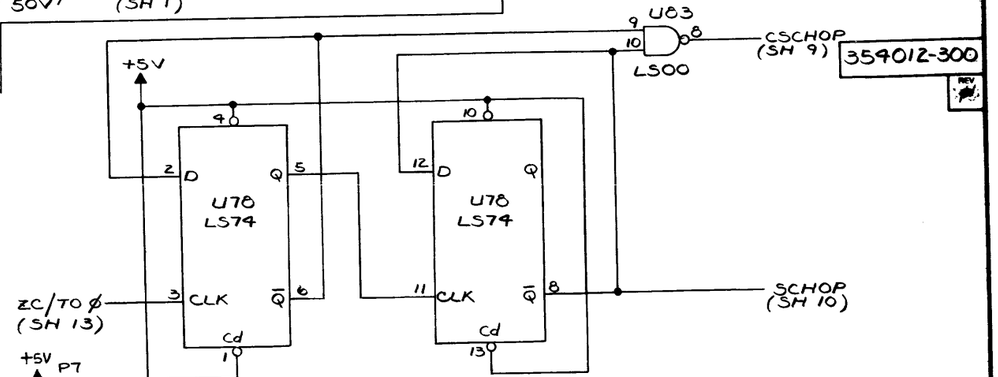












359012-300 REV P

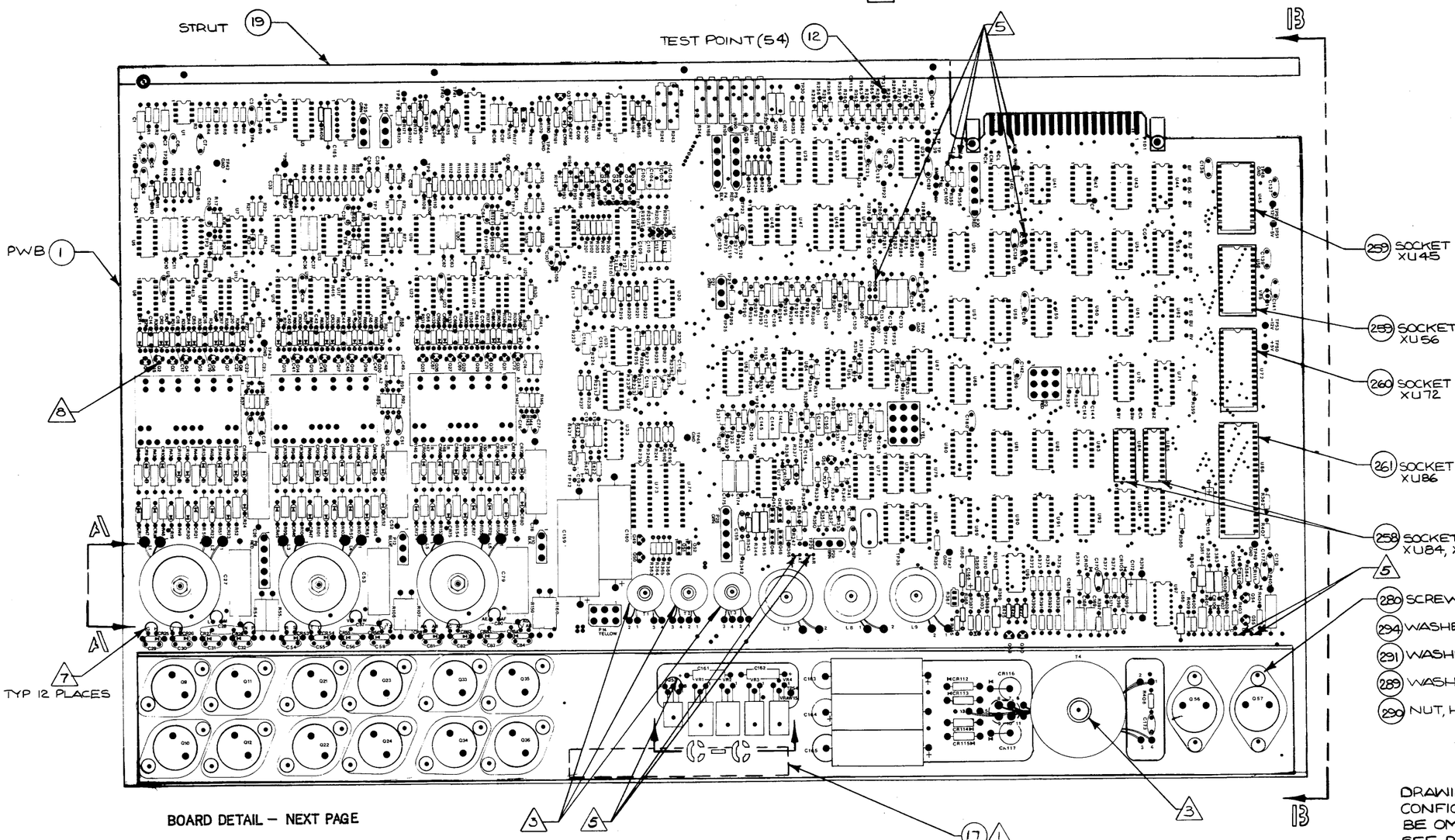
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS DECIMALS ANGLES ± — .XX ± — .XXX ± —	CONTRACT NO.		Cipher Data Products SAN DIEGO CALIF.
	APPROVALS	DATE	TITLE SCHEMATIC — PWB, CONTROL/SERVO
	DSN		
	CHK		
	MFG ENG		
	QC		
	COG ENG		SIZE D CODE IDENT NO. 32274 DRAWING NO. 359012-300 REV P
DO NOT SCALE DRAWING	PROD REL		SCALE — 900X SHEET 15 OF

DRAWING NO. 359012-300
SHEET 15 OF

P7,101

154012-001
-002
REV AT

REVISION					
LTR	DESCRIPTION	DWN	DATE	APVD	DATE
—	REDRAWN FROM REV AA WITH CHG	—	—	—	—
AB	INCORP ECO 3882	MH	6/5/78		7-5-78
AC	INCORP ECO 3884	MH	6/5/78		7-5-78
AD	INCORP ECO 3887	MH	6/5/78		7-5-78
AE	INCORP ECO 3940	MH	6/5/78		7-5-78
AF	INC ECO'S 4019 & 4100	PVB	8/30/78		9-12-78
AG	INC ECO 4148	PVB	8/30/78		9-12-78
AH	INC ECO 4197	PVB	9/11/78		9-12-78
AJ	INC ECO 4198	PVB	9/11/78		9-12-78
AK	INC ECO 4199	PVB	9/11/78		9-12-78
AL	INC ECO 4200	PVB	9/11/78		9-12-78
AM	INC ECO 4295	CW	10/10/78		10-12-78
AN	INC ECO 4390	CW	11-7-78		11-8-78
AP	INC ECO 4438	CW	11-7-78		11-8-78
AR	INC. ECO 4486	CW	11-28-78		11-28-78
AS	INC ECO 4934 & 4966	VLV	2-14-79		2-16-79
AT	INC ECO 5077	VLV	2-26-79		2-26-79



BOARD DETAIL — NEXT PAGE

DRAWING SHOWS FULLY LOADED CONFIGURATION. SOME PARTS MAY BE OMITTED FOR SOME CONFIGURATIONS. SEE PARTS LIST FOR DETAILS.

5 INSTALL JUMPER USING ITEM 299 & 300 10 PLACES AS SHOWN.

3 PRIOR TO MOUNTING XFMRS REMOVE EXSISTING HARDWARE (UPPER NYLON WASHER, LOWER NYLON WASHER, FLAT WASHER, SPLIT LOCK WASHER & HEX NUT) INSTALL THRU BOARD AND SECURE IN PLACE USING HARDWARE PREVIOUSLY REMOVED EXCEPT LOWER NYLON WASHER. TYP 3 PLACES (T1-T3). SOLDER LEADS TO APPROPRIATE LANDS. FOR T4 REPLACE SCREW (10-32 x 1 1/2) WITH ITEM 301 (10-32 x 1 3/4) REPLACE FLAT WASHER (#10) WITH ITEM 285 (#10). SOLDER LEADS AS ABOVE.

2 MARK ASSY PART NO. & REV LTR ON ASSY LABEL (ITEM 17) LOCATED FARSIDE.

1. FOR SCHEMATIC SEE 354012-001.

NOTES:

6 TUBING ITEM 263 TO BE ON TRANSISTORS Q2, 4, 6, 8, 14, 16, 18, 20, 26, 28, 30, 32.

7 INSTALL 7.0" LONG 30 GA KYNAR INSULATED WIRE JUMPER 12 PLACES AS SHOWN. (TO BE REMOVED IN TEST)

SHEET	REV	AT	AM
REV STATUS	SH	1	2

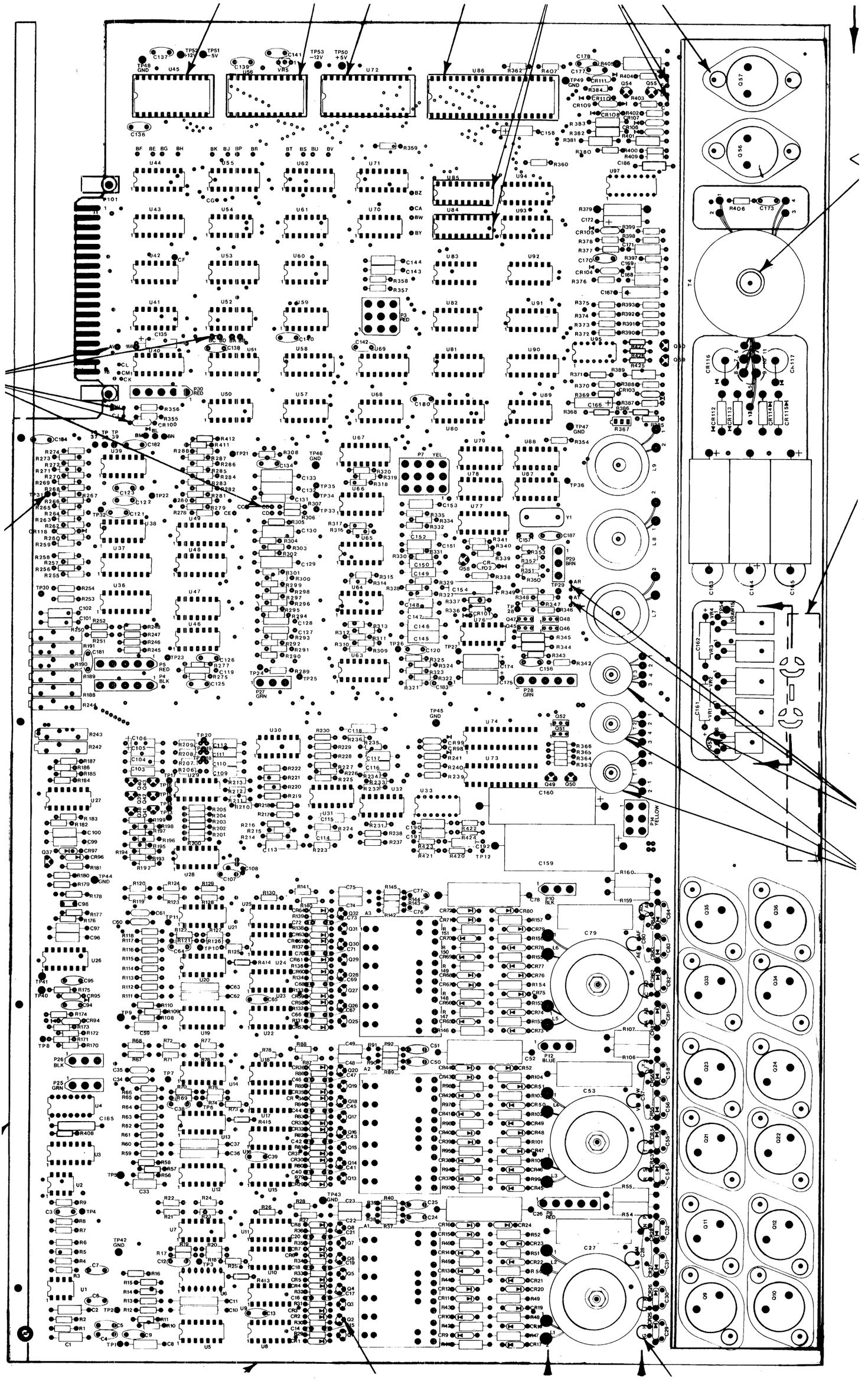
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: DECIMALS ANGLES XX ± ± XXX ±	APPROVALS	DATE
	DWN M. WIDD	11-30-77
	CHK G.B.	12-21-77
	MECH ENG	
	ELEC ENG	
	MFG ENG J.T	12-19-77
	QC M.F.	12-19-77
DO NOT SCALE DRAWING	DOC CHK K. B.	12-21-77

Cipher Data Products SAN DIEGO CALIF

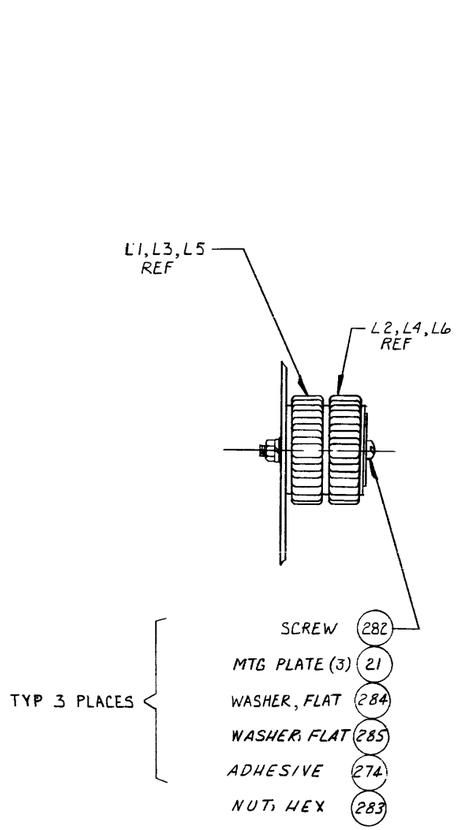
TITLE PWB ASSY — CONTROL SERVO

SIZE D | CODE IDENT NO. 32274 | DRAWING NO. 154012-001 -002 | REV AT

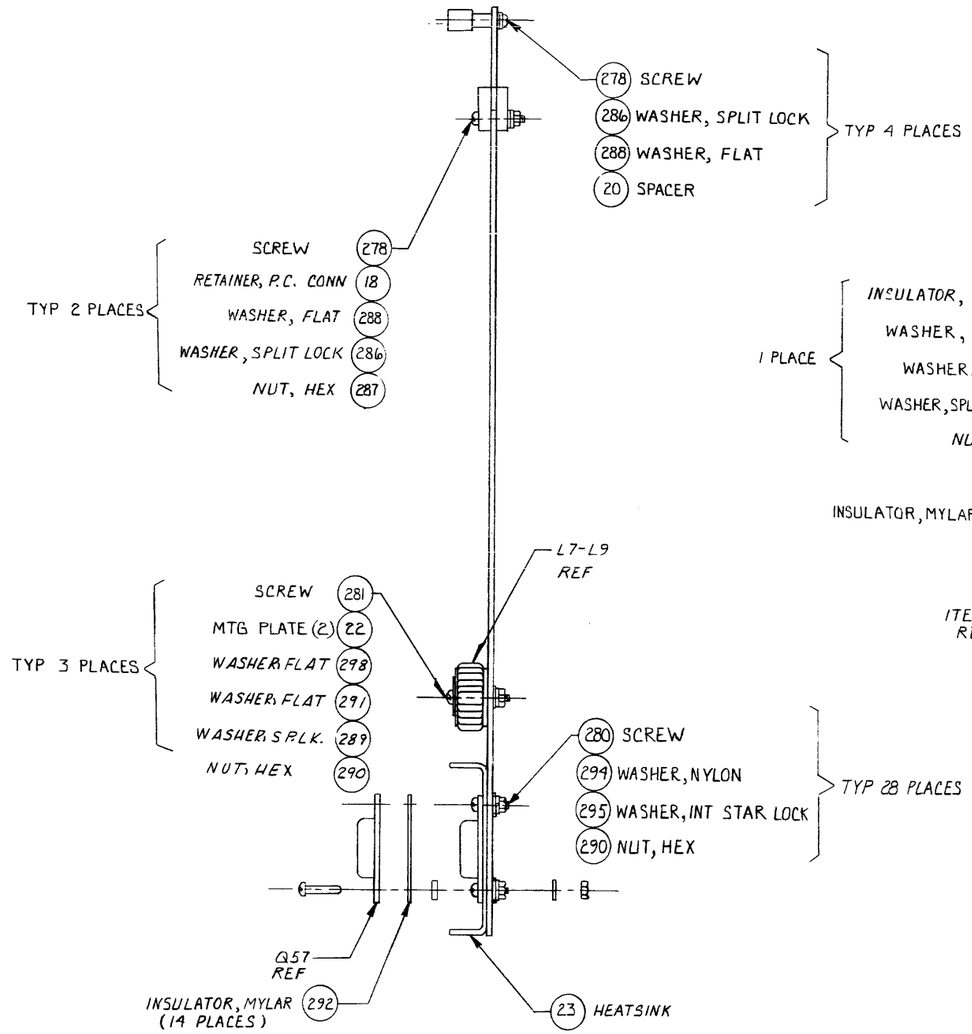
SCALE 1/1 | SHEET 1 OF 2



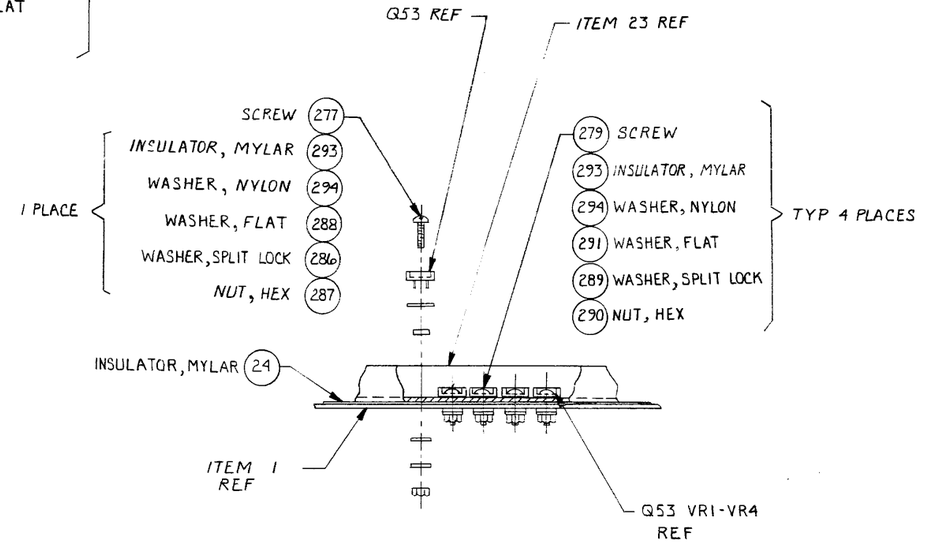
REVISION					
LTR	DESCRIPTION	DWN	DATE	APVD	DATE
—	ENG RELEASE-	MW	12-7-77	KB	12-21-77
AM	INCORP. ECO 4295	CW	10-10-78	[illegible]	10/12/78



VIEW A1-A1



VIEW B1-B1



VIEW C1-C1

154012-001
-002
REV AM

DRAWING NO. 001
154012 -002
SHEET 2 OF 2

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS ± — DECIMALS ANGLES .XX ± — .XXX ± —	CONTRACT NO.		Cipher Data Products SAN DIEGO CALIF.
	APPROVALS	DATE	
	DWN D. Fraser	10 MAR 78	TITLE PWB ASSY- CONTROL SERVO
	CHK		
	MFG ENG		
	QC		SIZE D | CODE IDENT NO. 32274 | DRAWING NO. 154012-001-002 | REV AM
DO NOT SCALE DRAWING	COG ENG		SCALE 1/1 | 900 X | SHEET 2 OF 2
	PROG ENG		

354040-300 REV G

REVISION					
LTR	DESCRIPTION	DWN	DATE	APVD	DATE
A	ENG. REL	LVS	3-1-78	[illegible]	3/31/78
B	ECO 4206	LVS	10-2-78	[illegible]	10-4-78
C	ECO 4301	LVS	10-27-78	[illegible]	10-30-78
D	ECO 4385	[illegible]	11-21-78	[illegible]	12-7-78
E	ECO 4496	[illegible]	11-21-78	[illegible]	12-7-78
F	ECO 4499	[illegible]	11-21-78	[illegible]	12-7-78
G	ECO 4622	[illegible]	12-5-78	[illegible]	12-7-78

4. SHEET AND SIGNAL REFERENCE CODE.
   (X) INDICATES SIGNAL SOURCE SHEET CO.
   "X" TO LEFT OF BUBBLE INDICATES FIRST SHT. THAT SIGNAL APPEARS ON.
   "X" TO RIGHT OF BUBBLE INDICATES LAST SHT. THAT SIGNAL APPEARS ON.
   INDICATES SHEET NO. SIGNAL IS GOING TO.
   INDICATES SHEET NO. SIGNAL IS COMING FROM.
3. COMPONENTS WITH REF. DES. STARTING WITH "A" ARE MOUNTED ON HEADERS
2. ALL RESISTORS ARE 1/4W, 5%
   ALL 3pf CAPS ARE INTRINSIC TO PWB.

NOTES: UNLESS OTHERWISE SPECIFIED

REGISTERED PROFESSIONAL ENGINEER — MARTIN D. GRAY — No. E 9119 — Electrical Engineer — STATE

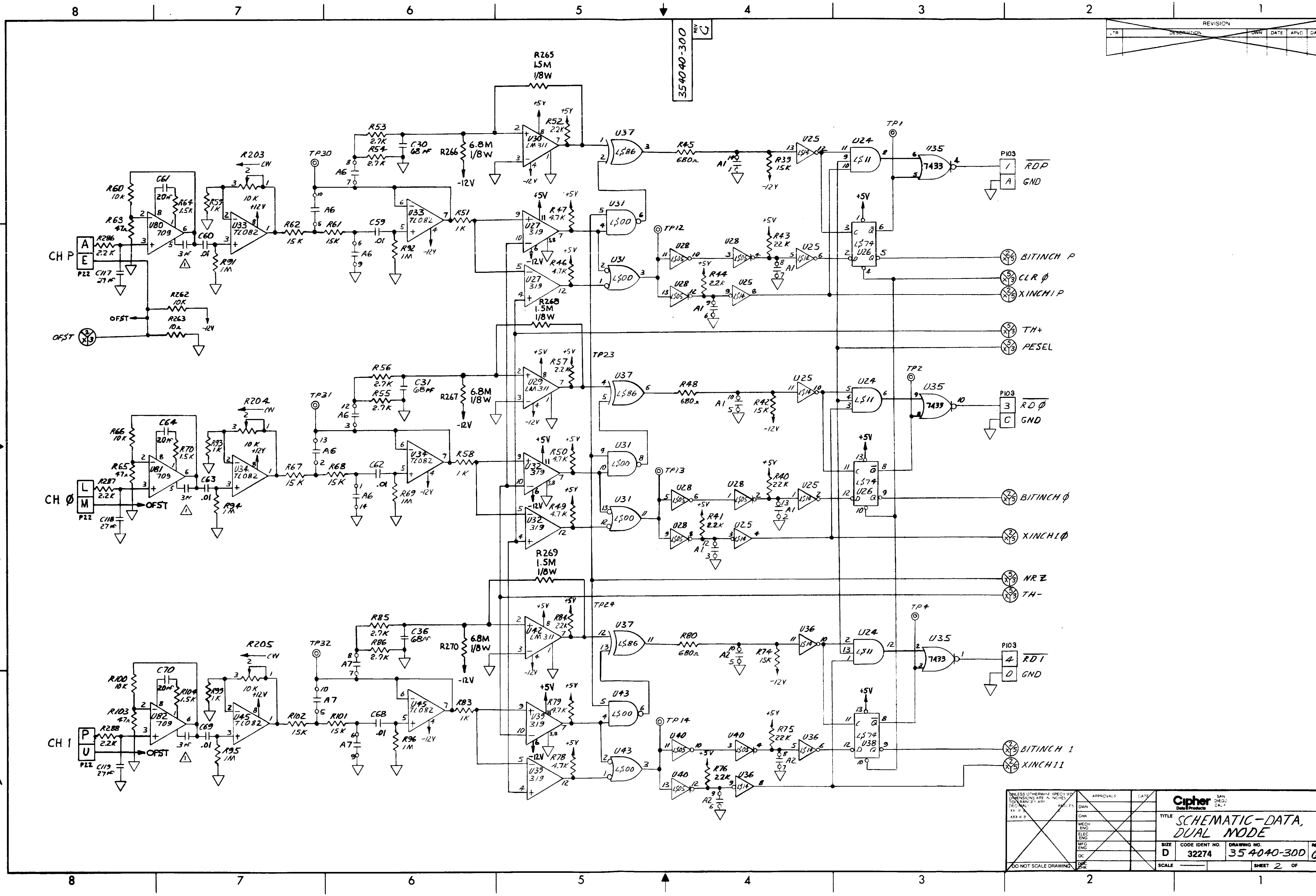
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. TOLERANCES ARE: DECIMALS XX ± .03, XXX ± .01; ANGLES ± 2°	APPROVALS	DATE
	DWN L.V. SILVERNAIL	8-3-78
	CHK [illegible]	8-22-78
	MECH ENG [illegible]	8-22-78
	ELEC ENG [illegible]	8/22/78
	MFG ENG [illegible]	8-22-78
	QC [illegible]	8-22-78
DO NOT SCALE DRAWING	DOC CHK [illegible]	8-22-78

Cipher Data Products, SAN DIEGO CALIF

TITLE: SCHEMATIC- DATA, DUAL MODE

SIZE	CODE IDENT NO.	DRAWING NO.	REV
D	32274	354040-300	G

SCALE — SHEET 1 OF 5



35 4040-300
REV G
REVISION
SCHEMATIC-DATA, DUAL MODE
Cipher Data Products
SIZE D
CODE IDENT NO. 32274
DRAWING NO. 35 4040-300
REV G
SHEET 2 OF
DO NOT SCALE DRAWING
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
CH P
CH Ø
CH 1
OFST
P22
P103
RDP
RDØ
RD1
GND
BITINCH P
CLR Ø
XINCH1P
TH+
PESEL
BITINCH Ø
XINCH1Ø
NRZ
TH-
BITINCH 1
XINCH11
TP1
TP2
TP4
TP12
TP13
TP14
TP23
TP24
TP30
TP31
TP32
R265 1.5M 1/8W
R268 1.5M 1/8W
R269 1.5M 1/8W
R266 6.8M 1/8W
R267 6.8M 1/8W
R270 6.8M 1/8W
R203
R204
R205
U30 LM311
U29 LM311
U42 LM311
U33 TL082
U34 TL082
U45 TL082
U80 709
U81 709
U82 709
U27 319
U32 319
U39 319
U37 LS86
U31 LS00
U43 LS00
U28 LS05
U40 LS05
U25 LS14
U36 LS14
U24 LS11
U26 LS74
U38 LS74
U35 7433

354040-300 REV G

REVISION					
LTR	DESCRIPTION	DWN	DATE	APVD	DATE

CH 2 — CH 3 — CH 4

OFST

R272 1.5M 1/8W — R271 6.8M 1/8W — R273 1.5M 1/8W — R274 6.8M 1/8W — R276 1.5M 1/8W — R275 6.8M 1/8W

U41 LM311 — U44 319 — U47 319 — U50 319 — U53 LM311 — U56 319 — U59 319 — U52 LM311

U46 TL082 — U56 TL082 — U57 TL082

U37 LS86 — U43 LS00 — U54 LS00 — U60 LS86

U36 LS14 — U48 LS14

U40 LS05 — U51 LS05

U47 LS11 — U35 7433 — U58 7433

U38 LS74 — U49 LS74

TP3 — TP6 — TP7 — TP15 — TP16 — TP17 — TP26 — TP27 — TP33 — TP34 — TP35

P103 8 RD2 GND — P103 9 RD3 GND — P103 14 RD4 GND

BITINCH 2 — CLR Φ — XINCH 12 — TH+ — PESEL — BITINCH 3 — XINCH 13 — NRZ — TH- — BITINCH 4 — XINCH 14

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE DECIMALS XX ± XXX ± ANGLES °	APPROVALS	DATE
DO NOT SCALE DRAWING	DWN	
	CHK	
	MECH ENG	
	ELEC ENG	
	MFG ENG	
	QC	
	DOC CONT	

Cipher Data Products SAN DIEGO CALIF

TITLE SCHEMATIC - DATA, DUAL MODE

SIZE	CODE IDENT NO.	DRAWING NO.	REV
D	32274	354040-300	G

SCALE — SHEET 3 OF

354040-300 REV G

REVISION					
LTR	DESCRIPTION	DWN	DATE	APVD	DATE

CH 5 · CH 6 · CH 7 · P22 · OFST · R277 1.5M 1/8W · R278 6.8M 1/8W · R279 6.8M 1/8W · R281 6.8M 1/8W · R282 1.5M 1/8W · R280 1.5M 1/8W · -12V · +5V · +12V · CW · TP36 · TP37 · TP38 · TP18 · TP19 · TP20 · TP9 · TP8 · TP11 · U60 LS86 · U68 LS00 · U59 LS14 · U70 LS11 · U58 7433 · U61 LS74 · U63 LS05 · U73 7433 · U75 LS74 · U71 LS14 · U76 LS86 · U78 LS00 · U62 3/9 · U65 LM311 · U66 TL082 · U67 TL082 · U69 3/9 · U64 LM311 · U77 LM311 · U79 TL082 · U74 3/9 · U86 709 · U87 709 · U88 709 · P103 · RD5 · RD6 · RD7 · GND · BITINCH 5 · CLR Ø · XINCH 15 · TH+ · PESEL · BITINCH 6 · XINCH 16 · N.R.Z · TH- · BITINCH 7 · XINCH 17

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: DECIMALS XX ± .5 XXX ± .2 ANGLES ±	APPROVALS	DATE
DO NOT SCALE DRAWING	DWN	
	CHK	
	MECH ENG	
	ELEC ENG	
	MFG ENG	
	QC	
	DOC CHK	

Cipher Data Products SAN DIEGO CALIF

TITLE: SCHEMATIC-DATA, DUAL MODE

SIZE	CODE IDENT NO.	DRAWING NO.	REV
D	32274	354040-300	G

SCALE — SHEET 4 OF

REVISION					
LTR	DESCRIPTION	DWN	DATE	APVD	DATE

354040-300 REV G

X INCH I (P) (0) (1) (2) (3) (4) (5) (6) (7)
R34 10K, R33 41K, R35 41K, R37 33K, R36 41K, R38 41K, R31 41K, R30 33K, R32 33K
U23 LM2903, R28 1K, R29 5.1K, +5V, C21, U21 LS14
SW 2, R23 47K, +5V
C3 1000pf, R5 10K, +5V
U18 LS74 NRZ PE
R22 47K, +5V, SW2
RUN P20 11
U21 LS14, U2 LS123
CLR Ø
SELECT P20 10
U22 00, SLT, R24 47K, +5V, SW2
TP10
U1 LS08
HIDEN P20 8
WSTRB
NRZ P103 10
GND L P103
S2
R19 10K, +5V
U17 7405
WB3 P102 A
WAR3 C
WRT RESET P20 2
CYCLE R
SLT
W TEST
RTH2 P102 F
READ P20 12
TH −
TH+
+15V/+12V 9
−15V/+12V P20 6
U111 220, U111 330, U112 LS14, R259 680, C113 220pf
U115 LS123, C115 22pf, R260 4.7K
C114 22pf, R261 4.7K
U114 LS11
R258 680, C112 220pf
U108 LS86
R25 510K, R21 510K, R20 510K
C12 1000pf, R12 24K, R11 4.7K, R17 10K
C16 1000pf, R18 10K
U16 1458, −12V
R15 430K, CR3 IN914
R14 150K, CR2 IN914
R16 2.7K, R13 3.3K, Q1 2N3704 SELECTED
BITINCH
U4 LS133, U13 LS132
U8 LS174
U12 LS161 CARRY, U15 LS161 CARRY
R9 10K, R10 10K, SW1
U10 7404, U5 LS27, R4 10K
PESEL, PE
U1 LS08, U5 LS27
R1 220K, .10uf C2, U2 LS123, CR1, R2 220
TP5, P20 1
C67,82,25 22uf 6V, .1uf 10V, C1,4,8,9,15,17,29,22,25,40,53,66,99,107,108,109,111,116,110 .1uf 10V, +5V
U9 7438
P103 2 RDS, 8 GND, NRZ
R3 10K, SW1
U11 LS93, U7 LS93
R6 390, C7 150pf, U13 LS132
CLR WB
C11 1000pf, C10 30pf 300V, R8 680, R7 680, Y1
R220 1.5K, R219 10K, R284 6.8K, R285 10K, R283 4.3K, C98 .01uf 500V
Q4 2N3702, Q5 2N6034, Q6 2N3704, L4
C103 .05uf 20V, R218 4.7K
U92 7406, R216 4.7K
CR4 IN5335
C94 1.0uf 35V, C93 .10uf 25V
TP40, TP39
R215 4.7K, Q2 2N3704, R214 15
R217 10K, Q3 2N3702
SW3, L2, C97 10uf 20V
A B D / E J M / R U X P21
H P21, F P21, NRZ VCC
VR2 7812, C105 10uf 20V, C106 10uf 20V, C5,14,18,24,39,54,66,81 .01uf 500V, +12V
VR1 7912, C100 10uf 20V, C101 10uf 20V, C6,13,19,23,38,53,65,80 .01 500V, −12V

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. TOLERANCES ARE: DECIMALS XX ± .1, XXX ± .2, ANGLES ±
DO NOT SCALE DRAWING

APPROVALS	DATE
DWN R. R. McGee	8/1/78
CHK	
MECH ENG	
ELEC ENG	
MFG ENG	
QC	
DOC CONT	

Cipher Data Products, SAN DIEGO CALIF

TITLE SCHEMATIC-DATA DUAL MODE

SIZE	CODE IDENT NO.	DRAWING NO.	REV
D	32274	354040-300	G

SCALE —— SHEET 5 OF

REVISION					
LTR	DESCRIPTION	DWN	DATE	APVD	DATE
A	ENGR RELEASE	SGS	8-8-78	J.W.	8-22-78
B	INC ECO 4383		12-8-78		12-13-78
C	INC ECO 4939		12-8-78		12-18-78
D	INC ECO 4995		12-8-78		12-18-78
E	INC ECO 4998		12-8-78		12-21-78
F	INC ECO 4821		12-8-78		12-19-78
G	INC ECO 4935	C.S.	1-27-79		1-30-79

154040-009 REV G

(2) STIFFENER
(113) SCREW (3)
(116) NUT HEX (3)
(117) WASHER FLAT (3)
(118) WASHER, LOCK (3)

(6) TEST POINT (37 PLACES)

(15) SOCKET (1) (XU90)

(122) TERMINALS, SOCKET (2) (2 PLACES, C92 & C21)

MALE PIN

MALE PIN

(1) PWB

SOCKET, CRYSTAL (123) (XY1)

(9) CONNECTOR 1. 2.
(111) WASHER, FLAT (4)
(112) STANDOFF (2) (TYP 2 PLACES)

5.

LABEL ASSY (14)

(13) SOCKET (11) (XA1 THRU XA10 XU111)

P21

(119) WASHER, FIBER (2) (2 PLACES, P21 & P22)

P22

P20

(4) RETAINER
(115) SCREW
(117) WASHER, FLAT
(118) WASHER, LOCK (4 PLACES)

(7) CONNECTOR 1. 2.
(8) PIN TERM (12)

(108) VOLT. REG. (VR2)
(110) HEAT SINK

(113) SCREW
(117) WASHER, FLAT
(118) WASHER, LOCK
(116) NUT, HEX (3 PLACES)

PWB (REF)
(5) SPACER
(3) STIFFENER
SCREW (120)
WASHER, FLAT (117)
WASHER, LOCK (118) (2 PLACES)

SECTION A-A (2-PLACES)

BOARD DETAIL – NEXT PAGE

5. DO NOT FLOW SOLDER DIP SWITCHES S1, S2&S3. ORIENT SWITCH NUMBERS WITH SILKSCREEN NUMBERS ON PWB.

4. FOR SCHEMATIC SEE 354040-300.

3. ASSY SHOWN IS FULLY LOADED PWB FOR SPECIFIC CONFIGURATIONS SEE APPROPRIATE PARTS LIST DASH NO. PARTS NOT NEEDED WILL BE OMITTED DURING FAB. OF ASSY.

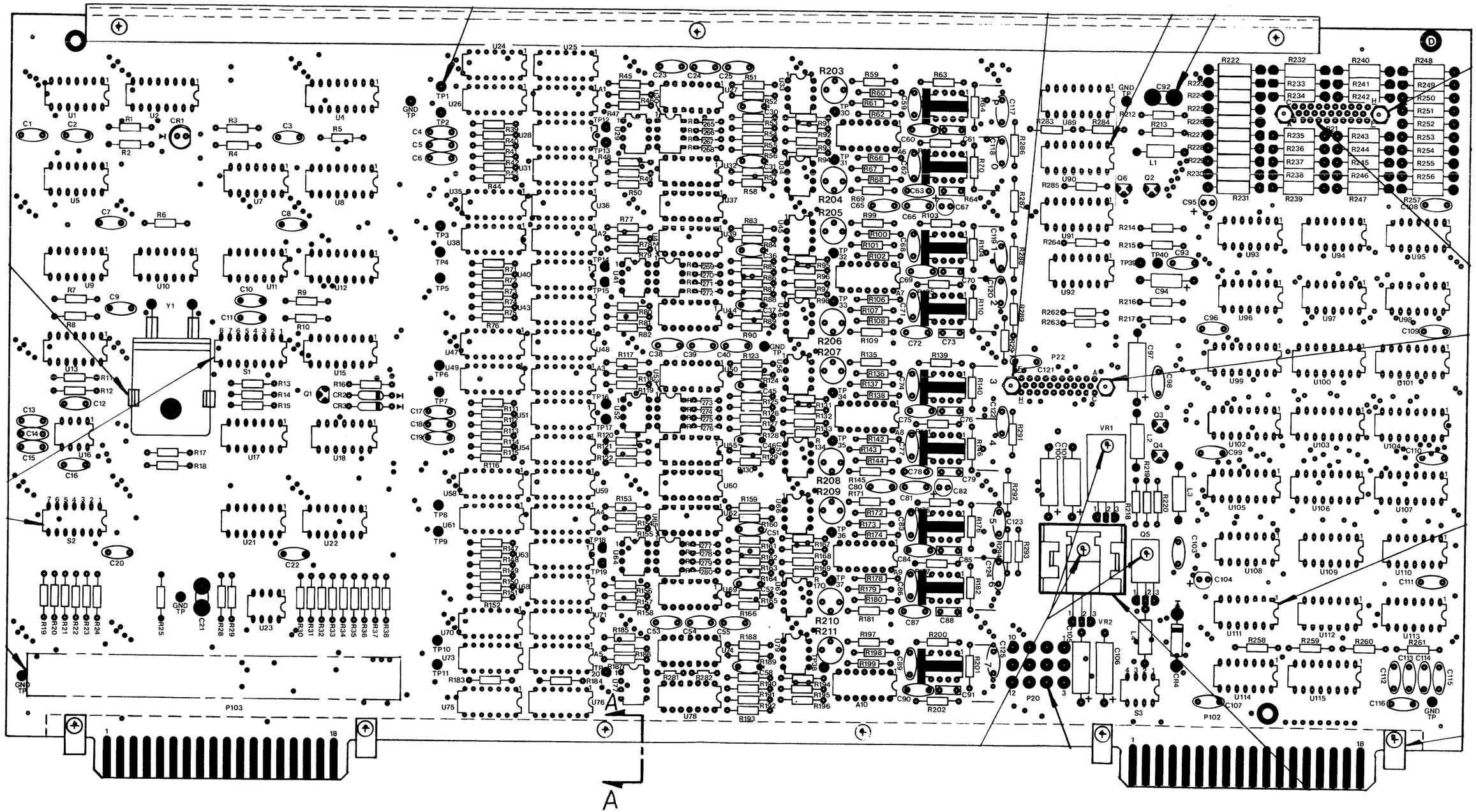
2. INSTALL CONNECTORS ON FARSIDE OF BOARD. DISCARD NUT FURNISHED WITH CONNECTOR AND REPLACE WITH WASHER (ITEM 100) AND STANDOFF (ITEM 101).

1. MARK EACH CONNECTOR WITH A COLORED PAINT DOT AS FOLLOWS P20-GREEN, P21-RED, P22-YELLOW.

NOTES:

FOR DASH NO. INDEX SEE 454040-000 REFER TO DASH NUMBERED PARTS LISTS FOR SPECIFIC CONFIG. AND ASSY REV LTRS.

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE DECIMALS XX ± ± — ANGLES ± — XXX ± ± —	APPROVALS	DATE	Cipher Data Products SAN DIEGO CALIF
	DWN S. SCHNEIDER	8-24-78	TITLE PWB ASSY - DATA, DUAL 9TK, RAW (NO SPEED K.T)
	CHK K. BERLING	9-15-78	
	MECH'L ENG R. BARTON	9/27/78	
	ELEC ENG M.D.G.	9/27/78	
	MFG ENG G. SPECHT	9/27/78	
DO NOT SCALE DRAWING	QC M. FRACKER	9-28-78	SIZE D CODE IDENT NO. 32274 DRAWING NO. 154040-009 REV G
	DOC CONT J. WILLIAMS	9-21-78	SCALE 1/1 10,80,100,900 SHEET 1 OF 1


A
A
P103
P20
P102
P22
S1
S2
S3
Y1
Q1
Q2
Q3
Q4
Q5
Q6
VR1
VR2
L1
L2
L3
CR1
CR2
CR3
CR4
GND TP
R203
R204
R205
R206
R207
R208
R209
R210
R211