

Technical Manual No.
799855-000K

MODEL 920 MAGNETIC TAPE TRANSPORT

VOLUME I

OPERATION AND MAINTENANCE

Cipher Data Products
10225 Willow Creek Road
San Diego, California 92131

VOLUME I
TABLE OF CONTENTS

Section	Page No.
I DESCRIPTION	1-1
GENERAL	1-1
PURPOSE	1-1
II UNPACKING, INSPECTION, AND INSTALLATION	2-1
GENERAL	2-1
UNPACKING AND INSPECTION	2-1
POWER CONNECTION	2-2
Operating Voltage Selection	2-2
INITIAL CHECKOUT	2-2
RACK MOUNTING	2-3
INTERFACE CONNECTIONS	2-3
MULTIPLE TRANSPORT OPERATION	2-4
III OPERATION	3-1
GENERAL	3-1
CONTROLS AND INDICATORS	3-1
LOADING TAPE	3-1
UNLOADING TAPE	3-2
IV MAINTENANCE	4-1
GENERAL	4-1
CLEANING.....	4-2
Capstan.....	4-2
Head and Guides	4-2
Tape Cleaner	4-2
Housing.....	4-2
OPERATING VOLTAGE SELECTION.....	4-2
POWER SUPPLY CHECKS AND ADJUSTMENTS	4-3
Unregulated Voltage Checks	4-3
Regulated Power Supply Adjustments	4-3

IV	REMOVAL AND REPLACEMENT OF PARTS	4-5
	Pushbutton/Indicator	4-5
	Single-Edge Tape Guide	4-5
	Roller Tape Guide	4-6
	Tape Sensor	4-7
	Reel-Hub Grip Ring	4-7
	Reel Hub.....	4-8
	Head Assembly	4-9
	Capstan.....	4-10
	Capstan Motor Assembly	4-11
	Vacuum Valve Motor Assembly	4-12
	Vacuum Blower	4-12
	Vacuum Valve Assembly.....	4-12
	Vacuum Sense Switch Assembly	4-13
	Power Supply Assembly	4-13
	CAPSTAN SERVO ADJUSTMENTS	4-14
	DC Offset Adjustment	4-14
	Coarse Speed Adjustment	4-14
	Fine Speed Adjustment.....	4-14
	Alternate Forward and Reverse	
	Fine Speed Adjustments	4-15
	Ramp Adjustment	4-17
	DUAL MODE DATA BOARD	
	INITIAL SWITCH SETTINGS	4-17
	READ GAIN AND SKEW ADJUSTMENTS	4-22
	NRZI	4-22
	NRZI Write Skew Verification.....	4-22
	Phase-Encode Read Gain Verification	4-23
	Head Azimuth Adjustment.....	4-23
	CAPACITIVE TRANSDUCER ALIGNMENT	4-24
	MECHANICAL ADJUSTMENTS	4-25
	Tape Path Alignment	4-25
	Reel Hub Adjustment	4-27

Section	Page No.
IV	REPLACEMENT OF ELECTRONIC ASSEMBLIES 4-28
	Control/Servo Board 4-28
	Dual Mode Data PWB 4-28
	File Protect Sensor 4-30
	Vacuum Floor/Transducer Assembly 4-30
	REMOVAL AND REPLACEMENT OF ELECTRONIC
	PARTS AND COMPONENTS 4-31
	Multiple Lead Components 4-31
	Multiple Pin Components 4-31
	PROGRAMMING WRITE DESKEW PROM 4-32
	Programming Procedure 4-32
V	TESTING AND TROUBLESHOOTING 5-1
	TESTING 5-1
	Self Test 5-1
	Test Mode Operation 5-1
	Diagnostic Mode 5-2
	TROUBLESHOOTING 5-4
	Troubleshooting Procedure 5-4

LIST OF TABLES

Table No.		Page No.
1-1	Control/Servo Board Control Option Jumpers	1-2
1-2	Dual-Mode Data Board Control Option Jumpers	1-3
2-1	Interface Connections for Input Commands at Connector J101.....	2-5
2-2	Interface Connections for Output Commands at Connector J101.....	2-5
2-3	Interface Connections for Write Inputs at Connector J102.....	2-6
2-4	Interface Connections for Read Outputs at Connector J103.....	2-6
3-1	Controls and Indicators	3-3
4-1	Preventive Maintenance Schedule	4-1
4-2	Power Supply Unregulated Voltages	4-3
4-3	Power Supply Regulated Voltages.....	4-3
4-4	Tape Speed Crystal Frequencies and Switch I Settings	4-18
4-5	Switch Settings for Testing and Options	4-19
4-6	Bit Map, Code 23456789.....	4-23
4-7	Bit Map, Code 77777777.....	4-23
4-8	Bit Map, Code 6789A987	4-33
5-1	Photo-sensor Functions	5-3
5-2	System Troubleshooting	5-5

LIST OF ILLUSTRATIONS

Figure No.	Title	Page No.
3-1	Control Panel.....	3-1
4-1	Control/Servo PWB Test Point Chart.....	4-4
4-2	Single-Edge Tape Guide	4-6
4-3	Roller Tape Guide	4-7
4-4	Reel Hub, Showing Adjustment Dimension	4-8
4-5	Head Assembly Adjustments	4-10
4-6	Capstan Removal	4-10
4-7	Replacement Capstan Positioning	4-11
4-8	Strobe Disc.....	4-15
4-9	Location of Test Points, Pots, Headers, and Switches.....	4-16
4-10	Ramp Adjustment Traces.....	4-17
4-11	Skew Pulse at TP10.....	4-22
4-12	Tape Path Alignment	4-26
4-13	Motor Tilt Procedure	4-27
4-14	Reel Hub Assembly.....	4-28
4-15	Control/Servo Board Removal.....	4-29

VOLUME I

SECTION I

DESCRIPTION

GENERAL

1-1. The dual-mode, 125 ips Model 920 Magnetic Tape Transport is a high-performance, digital, vacuum-buffered tape transport manufactured by Cipher Data Products, Inc., San Diego, California. It has a dual-gap head, providing read-after-write capability, a record overwrite capability, and is designed to operate on 95 to 135 or 190 to 270 Vac, single phase, 49 to 61 Hz line power. It can accommodate reels to 10.5 inches in diameter. Various tape speeds, density capabilities, and options are available, as follows:

- a. Tape speeds: Standard - 125 ips; Optional - 75 ips.
- b. Data densities: 800 bpi (NRZI); 1600 bpi (PE).
- c. Local density selection.
- d. Remote density selection.
- e. Facade color (white is standard).
- f. Control options (See Tables 1-1, 1-2 and dual-mode data board switch settings in the Maintenance section).

PURPOSE

1-2. The transport is intended for use in data recording and computer processing systems in which data must be stored on magnetic tape. Writing and reading of digital data are performed in IBM-compatible, NRZI or PE format. Data recorded by a Model 920 transport is completely recoverable by IBM or similar equipment.

FUNCTIONAL TITLE	STANDARD SPECIFICATION	DESCRIPTION OF OPTION
Transport status indication	Status indications occur whenever transport is selected. Jumper BC-BD in.	Status indications occur only when transport is selected and on line. Jumper BA-BB in.
On-line/ready	After loss of tape tension (other than due to power failure which requires manual intervention), tape must be rewound to BOT and transport placed on-line before any remote commands can be executed. No jumper BJ-BK.	*After loss of tape tension, depressing the LOAD switch once; then the ON LINE switch forces the on-line ready status. Jumper BJ-BK in.
EOT signal	EOT is a pulse. No jumper BS-BT or BW-BY.*	**EOT remains as a level after it has been detected until a rewind command occurs. Jumper BS-BT or BW-BY in.
+5 volt provision	+5V is provided on J101, pin S, (for an embedded formatter or Mini-Tex). Jumper AV-AW in.	+5V is not provided on J101, pin S. No jumper AV-AW.
Density selection	Front panel density selection. Jumper BL-BM or switch 1, position 1 closed.	<p>Fixed PE (high density). Jumpers BE-BF, BG-BH, BL-BM or switch 1, positions 1, 3 and 4 closed.</p> <p>Fixed NRZI (low density). Jumpers BG-BH, BL-BM or switch 1, positions 1 and 4 closed.</p> <p>Interface density selection. Jumpers BE-BF, BM-BN, or switch 1, positions 2 and 3 closed.</p>
*Available only with EPROM sets 155033-810, 811 revision C (** - rev D) or later.		

Table I-1. Control/Servo Board Control Option Jumpers.

FUNCTIONAL TITLE	STANDARD SPECIFICATION	DESCRIPTION OF OPTION
Initial density	Transport powers up in NRZI mode. No jumper BP-BR.	*Transport powers up in PE mode. Jumper BP-BR in.
Rewind/Unload	An off-line command will cause the transport to go off-line. No jumper BU-BV.	*An off-line command will cause the transport to rewind, unload, and go off-line. Jumper BU-BV in.
Transport address	Transport address 0. Jumper CH-CJ in.	Transport address 1. Jumper CK-CJ in. Transport address 2. Jumper CL-CJ in. Transport address 3. Jumper CM-CJ in.
* Available only with EPROM sets 155033-810, 811 rev C (** - rev D) or later.		

Table I-1. Control/Servo Board Control Option Jumpers (Continued)

FUNCTIONAL TITLE	STANDARD SPECIFICATION	DESCRIPTION OF OPTION
Logic to earth ground.	A-B in. Connects data board logic ground to earth ground.	A-B out. Isolates data board logic ground from earth ground.
-15V/-12V to P102 pin 5	C-D out. Isolates -15V/-12V from P102 pin 5.	C-D in. Used only for special systems applications.
P102 pin 5 grounded	D-E in. Connects unused P102 pin 5 to ground.	D-E out. When C-D is installed.
RUN signal enables data board select.	F-G in. Data board enables only when RUN and SELECT are asserted.	F-G out. Used only for special systems applications.
Select - monitor cable.	J-K, L-M, out. Tape drive can be selected if P102 and P103 are not installed.	J-K, L-M, in. Tape drive can be selected only when P102 and P103 are installed.

Table I-2. Dual-Mode Data Board Control Option Jumpers.

VOLUME I

SECTION II

UNPACKING, INSPECTION, AND INSTALLATION

GENERAL

2-1. This section presents instructions for unpacking, inspecting, and installing the transport.

UNPACKING AND INSPECTION

2-2. 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 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 visible damage. If damage exists, notify carrier.
- e. Examine vacuum columns, reel hub, capstan, and other components in tape path for foreign matter.
- f. Check printed circuit boards and all connectors for correct installation.

POWER CONNECTION

2-3. 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.

2-4. **OPERATING VOLTAGE SELECTION.** The Model 920 can be operated over a wide range of line voltages without changing transformer taps. Four ranges are available: 95 to 110 Vac, 110 to 135 Vac, 190 to 230 Vac, and 230 to 270 Vac. Both a voltage selector, Printed Wire Board (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, and, on the other side, the numbers 100 and 220 are similarly printed. When line voltage is 95 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 95-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.

INITIAL CHECKOUT

2-5. 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 cleaning directions.
- c. Load tape in accordance with instructions in paragraph 3-3.
- d. Turn power on by pressing POWER switch.
- e. Momentarily press LOAD switch to apply power to the capstan-motor and reel-motor.
- f. Momentarily press LOAD switch a second time 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 switch is pressed.
- g. Check ON LINE switch by pressing repeatedly and observing that ON LINE indicator is alternately illuminated and extinguished.
- h. With transport off-line (ON LINE indicator not illuminated), press FWD switch. Run several feet of tape onto takeup reel, and press FWD switch 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 switch, run several feet of tape on to takeup reel. Press FWD switch again to stop tape. Press REWIND switch 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 switch is momentarily pressed when tape is at BOT, REWIND indicator will be illuminated, and tape will be unloaded from vacuum columns and rewound at low speed. This procedure is used to unload tape. Reel can then be removed.
- m. Make final check of tape tracking, as in step i.

RACK MOUNTING

2-6. 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 installation diagram, 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.
- 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.

INTERFACE CONNECTIONS

2-7. 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.

2-8. Alternatively, flat ribbon cable can be used, with some signal degradation, in low-noise environments.

2-9. It is important that the ground side of each twisted pair be grounded. 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. Tables 2-1 through 2-4 list interface connections.

MULTIPLE TRANSPORT OPERATION

2-10. The Model 920 transport is provided with signal termination. The termination impedance networks are all incorporated in 330 ohm, 220 ohm, and 220/330 ohm resistor packs which plug into integrated circuit sockets. The 220/330 ohm pack is mounted on the data PWB; the other on the control/servo PWB. For multiple transport operation, simply remove the three resistor packs from their sockets on all but the last transport.

LIVE PIN	GRD PIN	SIGNAL
J	8	Select 0 (SLT0)
A	8	Select 1 (SLT1)
18	8	Select 2 (SLT2)
V	8	Select 3 (SLT3)
C	3	Sync Forward Command (SFC)
E	5	Sync Reverse Command (SRC)
H	7	Rewind (RWC)
L	10	Off Line (OFFC)
K	9	Set Write Status (WEN)
B	2	Overwrite (OVW)
D	4	Data Density Select (DDS)

Table 2-1. Interface Connections for Input Commands at Connector J101

LIVE PIN	GRD PIN	SIGNAL
T	16	Ready (RDY)
M	11	On-Line (ONLS)
N	12	Rewinding (RWDG)
U	17	End of Tape (EOT)
R	14	Load Point (LDP)
P	13	File Protect (FPT)
F	6	Data Density Select (DDI) Indicator
S	-	+5V (Optional)

Table 2-2. Interface Connections for Output Signals at Connector J101

LIVE PIN	GRD PIN	SIGNAL
A	1	Write Data Strobe (WDS)
C	3	Write Amplifier Reset (WARS)
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)

Table 2-3. Interface Connections for Write Inputs at Connector J102

LIVE PIN	GRD PIN	SIGNAL
1	A	Read Data Parity (RDP)
2	B	Read Data Strobe (RDS) (NRZI only)
3	C	Read Data 0 (RD0)
4	D	Read Data 1 (RD1)
8	J	Read Data 2 (RD2)
9	K	Read Data 3 (RD3)
10	L	NRZI Transport Identification (NRZ)
13	P	Speed ID (ISpeed)
14	R	Read Data 4 (RD4)
15	S	Read Data 5 (RD5)
17	U	Read Data 6 (RD6)
18	V	Read Data 7 (RD7)

Table 2-4. Interface Connections for Read Outputs at Connector J103

VOLUME I

SECTION III

OPERATION

GENERAL

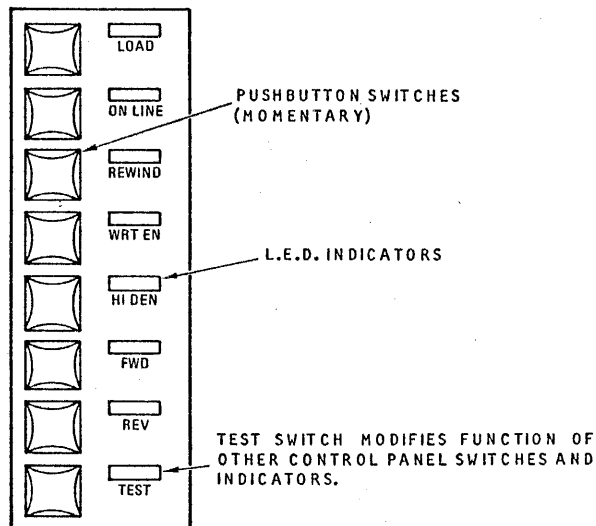
3-1. This section describes the Model 920 control switches and indicators, and it provides operating instructions.

CONTROLS AND INDICATORS

3-2. Figure 3-1 shows the control switches 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, capstan, and guide-cleaning procedures described in the Maintenance Section must be performed daily to maintain transport reliability.



920-1

Figure 3-1. Control Panel

LOADING TAPE

3-3. 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 used. 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. Press ON/OFF switch.
- c. Thread tape along path shown on facade. Wrap several turns counterclockwise around takeup reel. Check that tape is correctly seated on guides and properly threaded through photosensor and head assembly.



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

- d. Close front cover to protect tape and transport from dust.



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.

- e. Press LOAD switch 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.

UNLOADING TAPE

3-4. To unload the tape, proceed as follows:

NOTE

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

- a. If power is off, press POWER switch and proceed to step b. If power is on, start with step c.
- b. Press LOAD switch to tension tape.
- c. Press REWIND switch. REWIND indicator will illuminate. If tape is at load point, tape will be unloaded from vacuum columns 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. Press REWIND switch second time to complete unload sequence.

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 Switch 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 Switch and Indicator	Switches transport to on-line mode. Illuminates to indicate transport is on-line. Second actuation switches transport off-line. Indicator off to indicate transport is off-line.	Initial Load or Rewind actuation. Transport in off-line mode. (ON LINE indicator off.) Transport in on-line mode. (ON LINE indicator illuminated.)
REWIND	Momentary-Action Pushbutton Switch and Indicator	Rewinds tape to load point. REWIND indicator illuminates during rewinding; then goes out. Load indicator illuminates to indicate BOT is positioned at photosensor. Second actuation of REWIND pushbutton unloads tape.	Transport in off-line mode. (ON LINE indicator off.)
WRT EN (Write Enable)	Indicator	Illuminates to indicate write function may be performed.	Tape reel with write enable ring installed mounted on supply hub.

Table 3-1: Controls and Indicators (Sheet 1 of 2)

CONTROL OR INDICATOR	TYPE	FUNCTION	CONDITIONS
HI DEN (High Density)	Momentary-Action Pushbutton Switch and Indicator	First actuation (indicator illuminated): PE mode; second actuation (indicator off): lower density (NRZI) mode.	Transport in off-line mode (ON LINE indicator off).
FORWARD	Pushbutton Switch and Indicator	Starts/stops tape forward motion. Illuminates to indicate transport in forward mode.	Transport in off-line mode (ON LINE indicator off).
REVERSE	Pushbutton Switch and Indicator	Starts/stops tape reverse motion. Illuminates to indicate reverse mode.	Transport in off-line mode (ON LINE indicator off).
TEST	Pushbutton Switch and Indicator	Selects alternate operational mode for other switches.	Transport in off-line mode (ON LINE indicator off).

Table 3-1. Controls and Indicators (Sheet 2 of 2)

VOLUME I

SECTION IV

MAINTENANCE

GENERAL

4-1. This section contains periodic maintenance information, removal and replacement instructions, and adjustment procedures. Table 4-1 presents the preventive maintenance schedule.

CAUTION

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

MAINTENANCE OPERATION	FREQUENCY (hours)	QUANTITY TO MAINTAIN	PROCEDURE PARAGRAPH
Clean Head, Guides, Roller Guides, and Capstan	daily	---	4-2 4-3
Clean Tape Cleaner	daily	1	4-4
Check Skew Tape Tracking and Speed	500	---	4-33 through 4-35, 4-38, 4-25 through 4-28
Replace Reel Motors and Capstan Motor	10,000	3	4-19

Table 4-1. Preventive Maintenance Schedule

CLEANING

4-2. **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 or oxide/binder deposits, it may be cleaned with a Q-tip slightly moistened with Inhibisol (1,1,1 trichloroethane).

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, because Inhibisol softens capstan coating temporarily. Do not use head cleaner, Freon flux remover, alcohol, or other solvents to clean capstan sleeves.

4-3. **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, or excess solvent can cause increased ISV due to breakdown of bearing lubricant.

4-4. **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.

4-5. **HOUSING.** The dust door and control panel may be cleaned, as necessary, with a good grade of commercial plastic cleaner.

CAUTION

To prevent permanent scratches, do not use rough or abrasive material to clean the plastic dust door.

OPERATING VOLTAGE SELECTION

4-6. The Model 920 can be operated over a wide range of line voltages without changing the transformer taps. Two ranges can be used (95 Vac to 135 Vac and 190 Vac to 270 Vac) simply by changing the voltage selector PWB and the fuse. Both the selector PWB and fuse are located in the power cord connector housing mounted in the power supply chassis.

4-7. For the 95-Vac-to-135-Vac range, use a 6-ampere fuse and install the voltage selector PWB so that the number 120 is the only number visible on the board. For the 190-Vac-to-270-Vac range, use a 3-ampere fuse and install the voltage selector PWB so that the number 240 is the only number visible on the board.

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.

POWER SUPPLY CHECKS AND ADJUSTMENTS

4-8. **UNREGULATED VOLTAGE CHECKS.** Check unregulated voltages on the power regulation portion of the control/servo PWB. Required values and tolerances are listed in Table 4-2.

NOTE

When checking voltages, ensure that input line voltage is set to the correct value (See the Installation Section).

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 4-2. Power Supply Unregulated Voltages

4-9. **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 4-1. Refer to Table 4-3 and for each of the power supplies listed, measure the voltage across the test points.

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 4-3. Power Supply Regulated Voltages

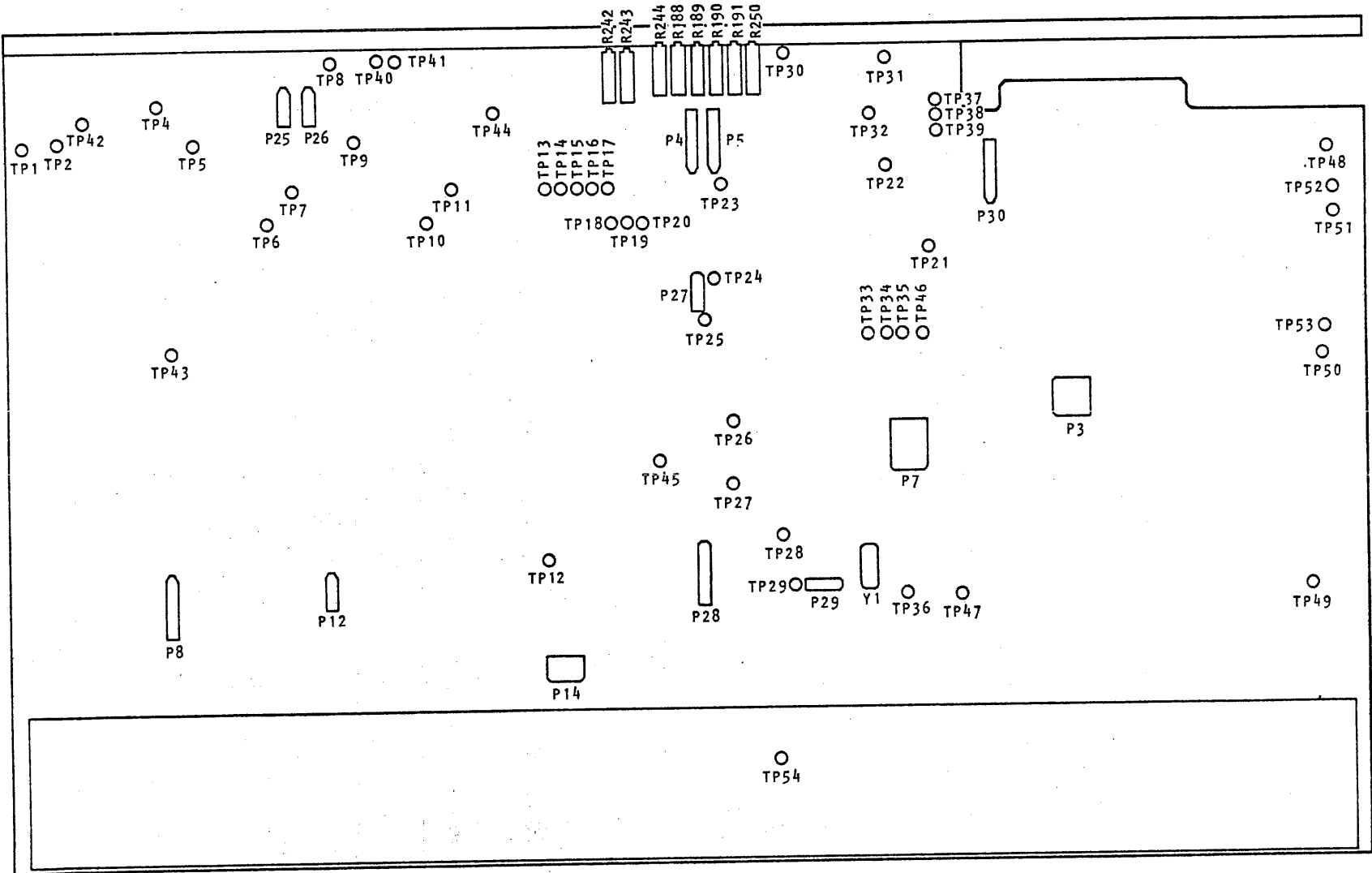


Figure 4-1. Control/Servo PWB Test Point Chart

REMOVAL AND REPLACEMENT OF PARTS

4-10. Cipher transports are designed to operate for long periods of time without requiring adjustment. In the event a mechanical adjustment is required, return the unit to the Cipher factory, or use the following procedures for removal and replacement of damaged or defective mechanical parts.

WARNING

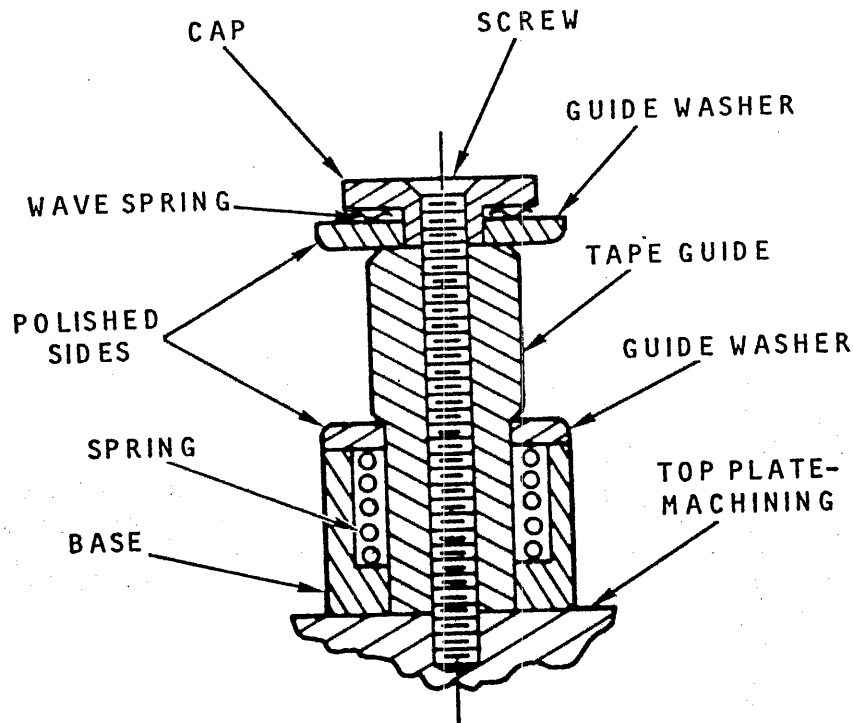
Before performing any maintenance procedure requiring access to interior of transport, disconnect power cord to eliminate possibility of severe electric shock.

4-11. **PUSHBUTTON/INDICATOR.** The pushbuttons are extremely long-lived, 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 for 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.

4-12. **SINGLE-EDGE TAPE GUIDE.** Replace a damaged or worn single-edge tape guide (Figure 4-2) or one of its parts, as follows:

- a. Loosen three press-lock fasteners and open bottom vacuum column door.
- b. Remove mounting screw from base plate and disassemble tape guide parts as required.
- c. Replace defective part, reassemble parts in accordance with Figure 4-2, 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 the surface against which tape rides.

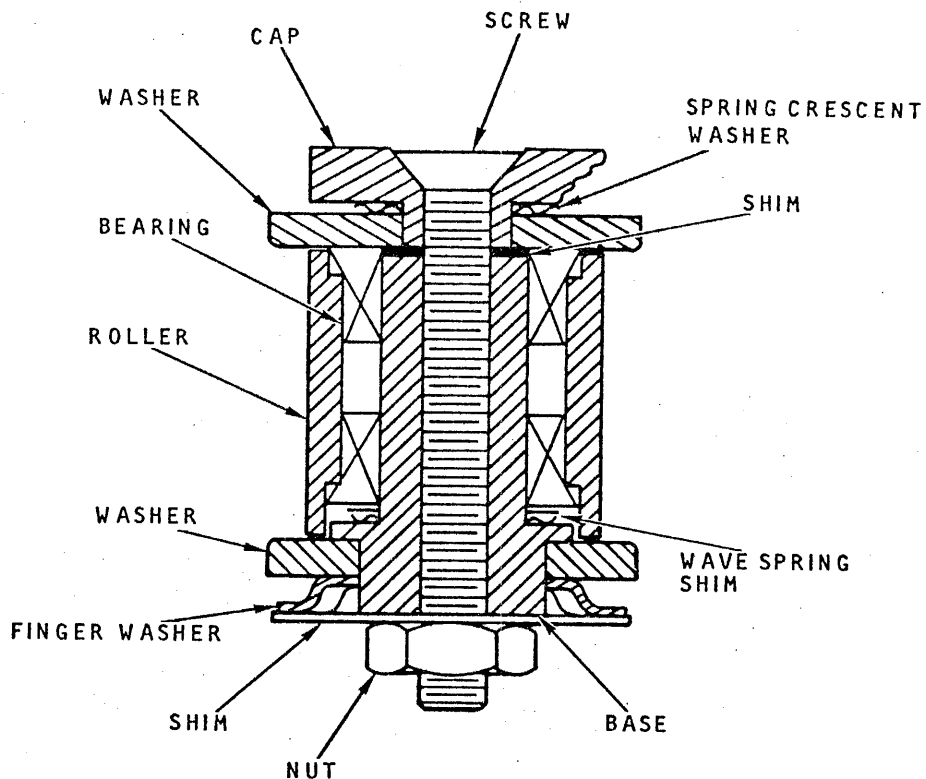


920-3

Figure 4-2. Single-Edge Tape Guide

4-13. **ROLLER TAPE GUIDE.** The roller tape guide should not 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 three press-lock fasteners and open side 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 4-3, before tightening screw.
- d. No adjustments are required.



920-4

Figure 4-3. Roller Tape Guide

4-14. **TAPE SENSOR.** The complete EOT/BOT sensor assembly is built and tested as a single unit and must be replaced as such. Remove and replace as follows:

- a. Unplug electrical connector from control/servo PWB.
- b. Remove four screws securing head cover to head cover standoffs.
- c. Remove three screws securing sensor brackets and cable clamp to front of base plate.
- d. Pull wires and connector carefully through hole provided and 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.

4-15. **REEL-HUB GRIP RING.** Remove and replace the reel-hub grip ring 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

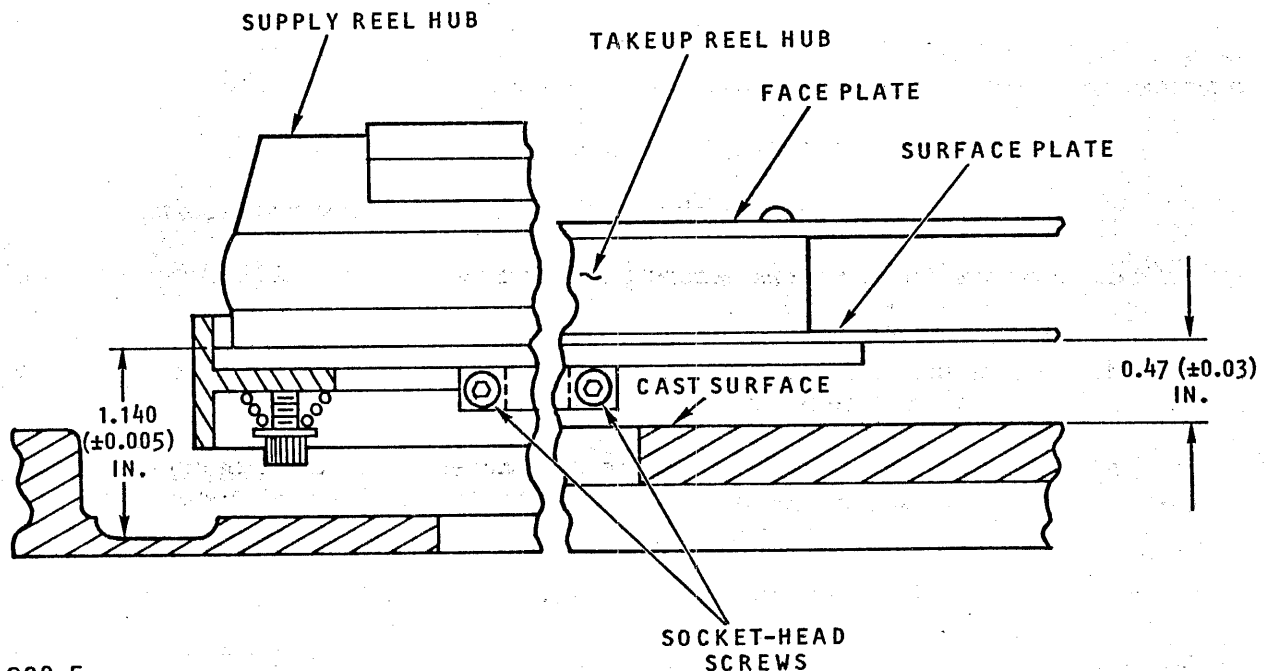
Clean grip ring with Freon degreaser, Type TF only. Alcohol, head cleaner, and other solvents will damage grip ring.

4-16. REEL HUB. Replace and adjust the supply or takeup reel hub as follows (Figure 4-4):

NOTE

Before removing, replacing, and/or adjusting takeup reel, remove attaching screws of surface plate and face plate and lift off plates.

- Loosen socket-head screws and remove hub.
- Install replacement hub on shaft to obtain dimension shown in Figure 4-4, and tighten socket-head screws.
- Mount reel of tape on transport, thread tape, and place transport in load mode.
- 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.



920-5

Figure 4-4. Reel Hub, Showing Adjustment Dimension

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

4-17. HEAD ASSEMBLY. Remove and replace the head assembly in accordance with the following procedure:

NOTE

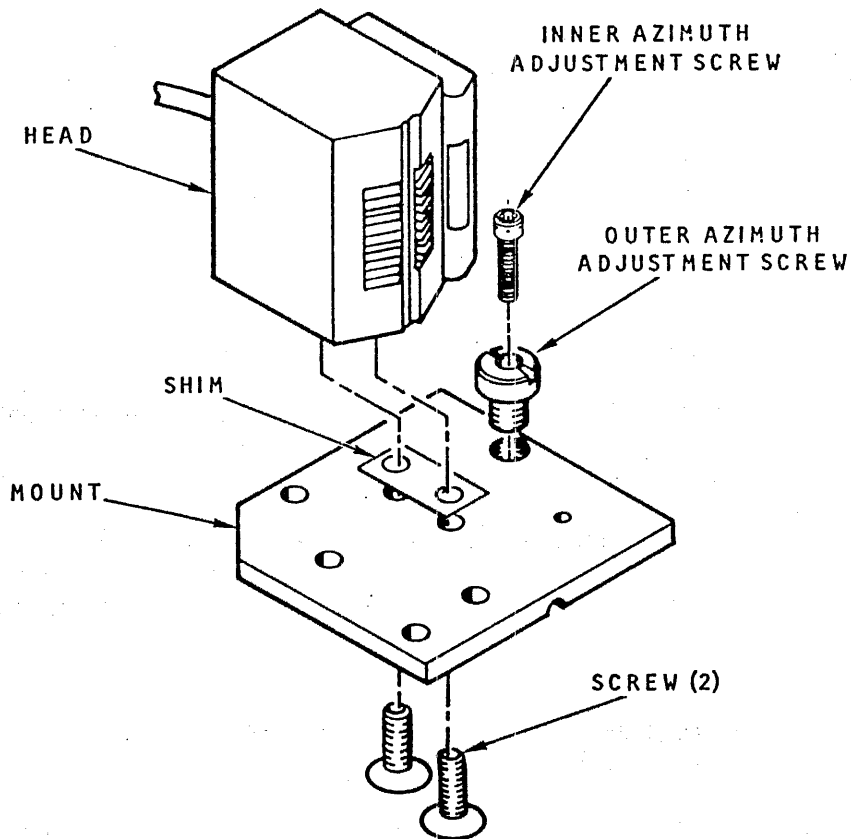
Hard-faced heads are very sensitive to tape wrap angle. After installing new head, lapping tape may be required for optimum head performance. Lapping tape and complete instructions may be obtained from Cipher by ordering Lapping Tape Kit P/N 154036-101.

- a. Remove four screws securing head cover to head cover standoffs.
- b. Loosen three press-lock fasteners and open bottom vacuum column door.
- c. Unplug head electrical connectors from read/write PWB.
- d. Remove four screws securing head assembly to base plate (Figure 4-5).

NOTE

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

- e. Withdraw head assembly, carefully feeding wires and connectors through hole in base plate.
- f. 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 4-5), and thread inner azimuth adjustment screw loosely into it.
- g. Make skew adjustment in accordance with paragraphs 4-33 through 4-35.

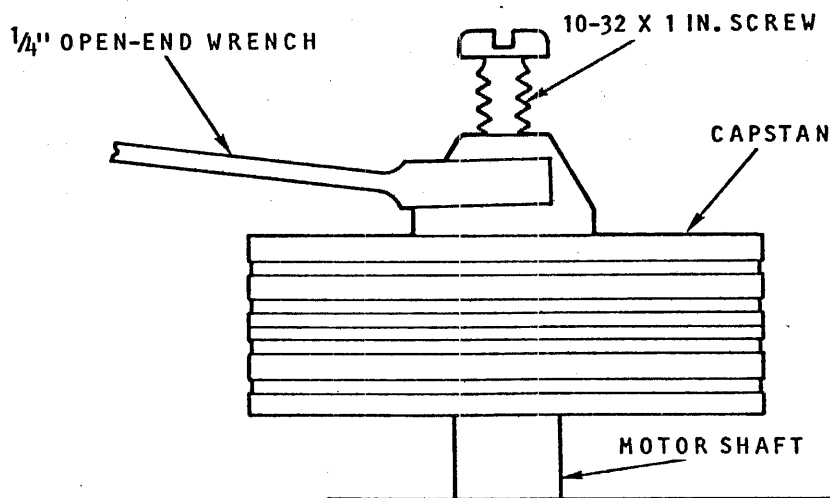


920-6

Figure 4-5. Head Assembly Adjustments

4-18. **CAPSTAN.** Replace a damaged or defective capstan 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 4-6), and tighten screw. This will cause capstan sleeve to be pulled from motor shaft.



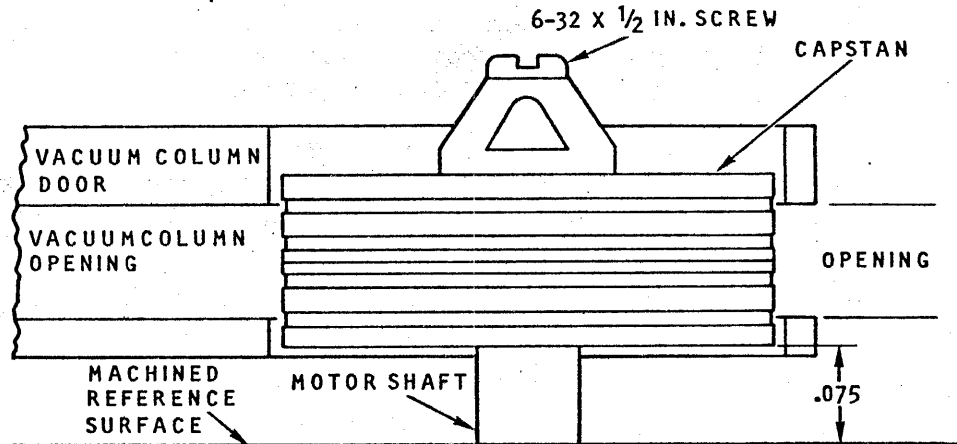
920-7

Figure 4-6. Capstan Removal

- 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 to be pulled onto motor shaft. Tighten screw until capstan is centered evenly in vacuum column opening (see Figure 4-7).

CAUTION

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



920-8

Figure 4-7. Replacement Capstan Positioning

- 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 4-38, steps g through i.

4-19. CAPSTAN MOTOR ASSEMBLY. Remove and replace the capstan motor assembly, proceed as follows:

- a. Disconnect power cord from tape transport.
- b. Remove capstan sleeve from capstan motor shaft as specified in paragraph 4-18.
- c. Unplug capstan motor and tachometer connectors from control/servo PWB.
- d. Remove three screws and motor clamps securing capstan motor to back of machine. Withdraw motor.
- e. Install replacement capstan motor assembly in reverse order of removal.
- f. Adjust capstan sleeve height and capstan motor tilt as specified in paragraph 4-18 and paragraph 4-38, steps g through i. Adjust capstan motor speeds, ramp times, and offset as specified in paragraphs 4-25 through 4-29.

4-20. **VACUUM VALVE MOTOR ASSEMBLY.** Remove and replace the vacuum valve motor assembly as follows:

- a. Disconnect power cord from transport.
- b. Remove right-side vacuum column floor assembly following procedure presented in paragraph 4-44.
- 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, washers, 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.

4-21. **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.

4-22. **VACUUM VALVE ASSEMBLY.** Remove and replace the vacuum valve assembly as follows:

- a. Remove vacuum blower as specified in paragraph 4-21.
- b. Remove vacuum column floor/transducer assembly as specified in paragraph 4-44.
- c. Loosen two setscrews 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 pin 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. Clean RTV sealant off mating surface of top plate.
- f. 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 pin 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.

- g. When valve assembly is installed and functions without bind or drag, seat with RTV.

4-23. 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 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.

4-24. 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. (Wires are number coded.)
- e. Remove power supply leads from terminal block and Optoisolator located on vacuum blower mounting bracket. (Wires are number coded.)
- 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 reverse sequence of above steps.
- i. Before applying power, verify that voltage selector PWB and correct fuse are properly installed with reference to power source voltage. (See paragraph 4-7.)
- j. Check power supply voltages in accordance with paragraphs 4-8 and 4-9.

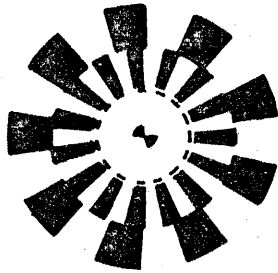
CAPSTAN SERVO ADJUSTMENTS

4-25. **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 4-1), for 0 ± 0.05 Vdc.

4-26. **COARSE SPEED ADJUSTMENT.** Make a coarse adjustment of speed using the following procedure:

- a. Monitor tachometer output voltage at TP 27, located on capstan servo portion of control/servo board. (See Figure 4-1 for location of test points.)
- b. With transport in off-line mode (ON LINE indicator not illuminated), press FWD pushbutton switch.
- c. Adjust forward potentiometer R244 until voltage at TP 27 is approximately +2.5 Vdc at a speed of 125 ips.
- d. Press FWD pushbutton switch to stop tape motion, then press REV pushbutton switch.
- e. Adjust reverse potentiometer R243 until voltage at TP 27 is approximately -2.5 Vdc for a speed of 125 ips.
- f. Press REV pushbutton switch to stop tape motion.

4-27. **FINE SPEED ADJUSTMENT.** If desired, a speed adjustment with an accuracy of 2% can be obtained with the use of the strobe disc (Figure 4-8) mounted on the capstan. (If not included on the transport, order Cipher Part No. 755005-401.) With the transport in off-line mode, press the FWD pushbutton switch. 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 press the REV pushbutton switch and adjust using reverse potentiometer R243.



920-9

Figure 4-8. Strobe Disc

4-28. 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 TP 10 on dual-mode data board (Figure 4-9).
- b. With transport in off-line mode (ON LINE indicator not illuminated) press FWD pushbutton switch 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 100K bits per second (at 800 bpi, 125 ips).
- d. Press FWD pushbutton switch to stop tape motion.
- e. Press REV pushbutton switch.
- f. Adjust reverse speed control potentiometer R243 to obtain appropriate data rate in step C.
- g. Press REV pushbutton switch to stop tape motion.
- h. Readjust ramp time in accordance with paragraph 4-29.

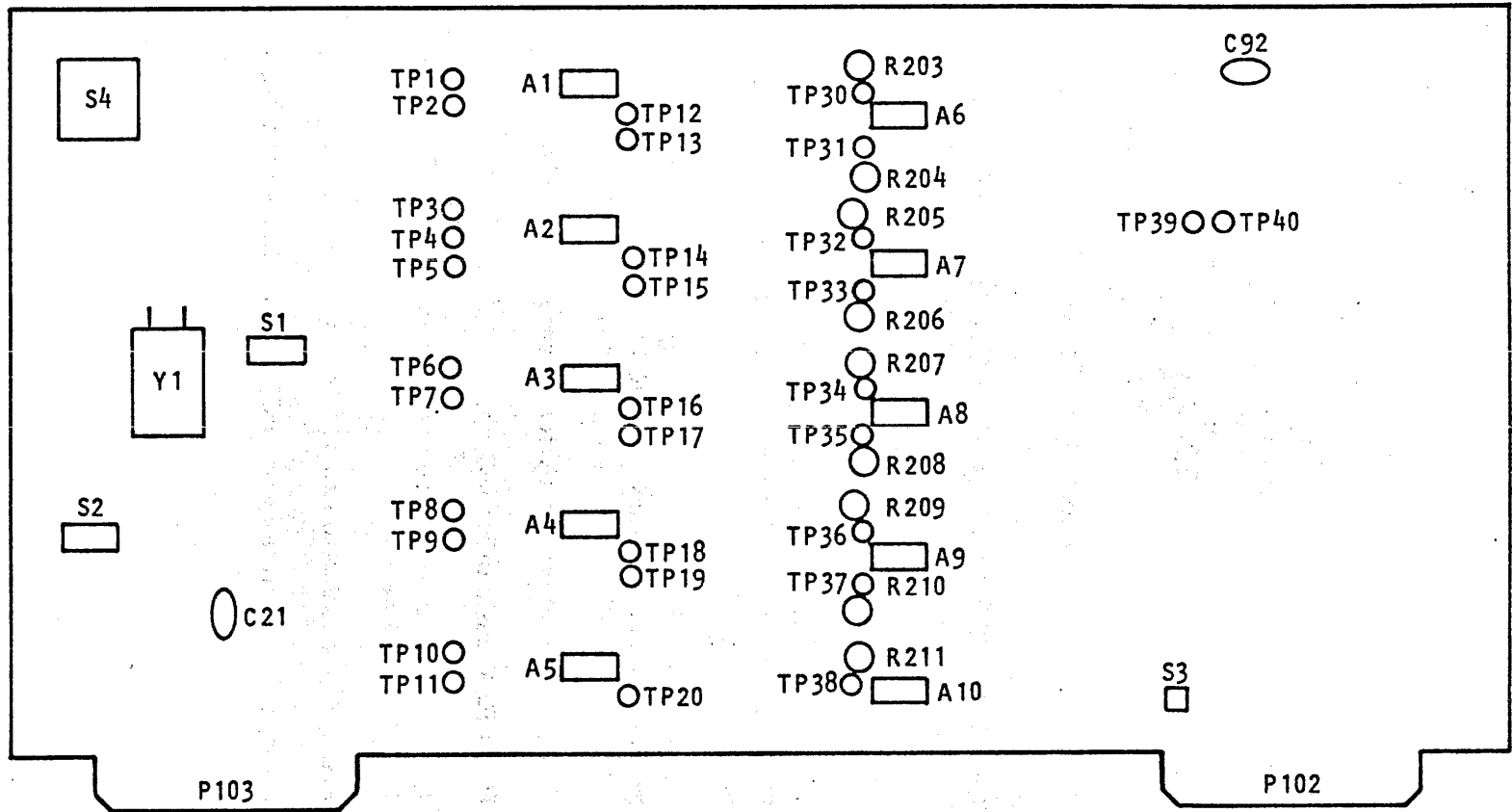
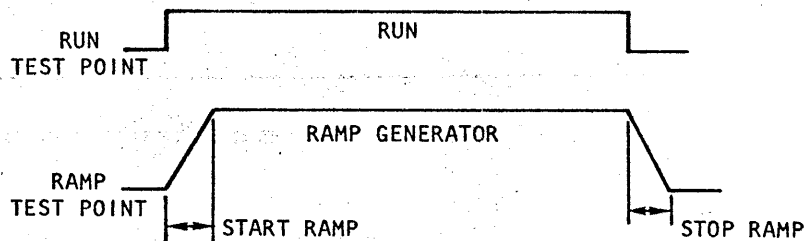


Figure 4-9. Dual-Mode PWB Test Points, Pots, Headers, and Switches

4-29. **RAMP ADJUSTMENT.** Make this adjustment 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 5-3).

- a. Use oscilloscope to monitor ramp tachometer test point TP 27 on control/servo board with respect to ground.
- b. Trigger oscilloscope with run command at U-89 pin 2.
- c. Adjust ramp potentiometer R242 to obtain ramp time of 3 ms at 125 ips. (See Figure 4-10.)



920-11

Figure 4-10. Ramp Adjustment Traces

DUAL MODE DATA BOARD INITIAL SWITCH SETTINGS

4-30. Refer to Tables 4-4 and 4-5 for all switch settings and functions.

4-31. Before making adjustments on the data PWB, 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 4-4 for position versus transport tape speed.

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

- c. Switch 1, positions 5 through 7: all open; position 8: closed.
- 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 4-5.
- h. Switch 3, position 1: open.
- i. Switch 3, positions 2 through 4: see Table 4-5.

CAUTION

With pushbutton SW4 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 for the Model 920.

POSITION		FUNCTION
1	2	Skew Gate
Open	Open	Skew Gate = 12%
Open	Closed	Skew Gate = 25%
Closed	Open	Skew Gate = 37%
Closed	Closed	Skew Gate = 50% (Normal Operation).
3	4	NRZI Read Clock Frequency
Open	Open	Not Allowed
Open	Closed	Running Freq = 1/2 Crystal Freq
Closed	Open	Running Freq = Crystal Freq
Closed	Closed	Not Allowed
5	6	Write Clock for write-all-1's in test mode.
Open	Open	Disables clock
Open	Closed	Provides NRZI write clock (800 fci) in test mode.
Closed	Open	Provides PE write clock (3200 fci) in test mode.
Closed	Closed	Not Allowed
7		Skew Test
Open		For normal operation.
Closed		To view skew at TP 10 in skew test.
8		Speed Status
Open		Selects low speed status.
Closed		Selects high speed status.

SWITCH I

Table 4-5. Switch Settings for Testing and Options (Sheet 1 of 3)

POSITION		FUNCTION
1		Board Select
Open Closed		Normal operation Forces transport select signal true for testing purposes. Overrides normal select.
2	3	Test Mode Density Select.
Open	Open	Normal Operation Density Select. Positions 6 and 7 determine density.
Open	Closed	Forces PE mode. Overrides normal Operation Density Select (positions 6 and 7).
Closed	Open	Forces NRZI mode. Overrides normal Operation Density Select (positions 6 and 7).
Closed	Closed	Not allowed
4	5	Threshold Detect
Open	Open	Low threshold detect
Open	Closed	Normal threshold
Closed	Open	Normal threshold
Closed	Closed	High threshold
6	7	Normal Operation Density Select. Overridden by positions 2 and 3
Open	Open	Low density
Open	Closed	Control/Servo density select
Closed	Open	High density
Closed	Closed	Not allowed

SWITCH 2

Table 4-5. Switch Settings for Testing and Options (Sheet 2 of 3)

POSITION		FUNCTION
1		Write Reset signal routing.
Open		This position is for Models 70X-80X and Model 100X Compliance Arm Tape Transports.
Closed		This position is for Model 910 and 920 Tape Transports.
2		Write Current
Open		This position is for Models 70X-80X and Model 100X Compliance Arm Tape Transports.
Closed		This position is for Model 910 and 920 Tape Transports.
3	4	Voltage Regulator Operation.
Open	Open	Allows voltage regulator operation in 70X-80X and 100X Compliance Arm Tape Transports.
Open	Closed	Not Allowed
Closed	Open	Not Allowed
Closed	Closed	Bypass VRI and VR2 for Model 910 and 920 transport operation.

SWITCH 3

POSITION	FUNCTION
Open	Normal Operation
Closed	Write all 1's in PE or NRZI in test mode.

SWITCH 4

WARNING

With Switch 4 closed (pressed), all tapes are write enabled and file protect is inoperative.

Table 4-5. Switch Settings for Testing and Options (Sheet 3 of 3)

READ GAIN AND SKEW ADJUSTMENTS

4-32. NRZI. Adjust NRZI read gain as follows:

- a. Change switch settings as follows:
 - (1) Switch 1, position 6: closed.
 - (2) Switch 2, position 1: closed.
 - (3) Switch 2, position 2: closed.

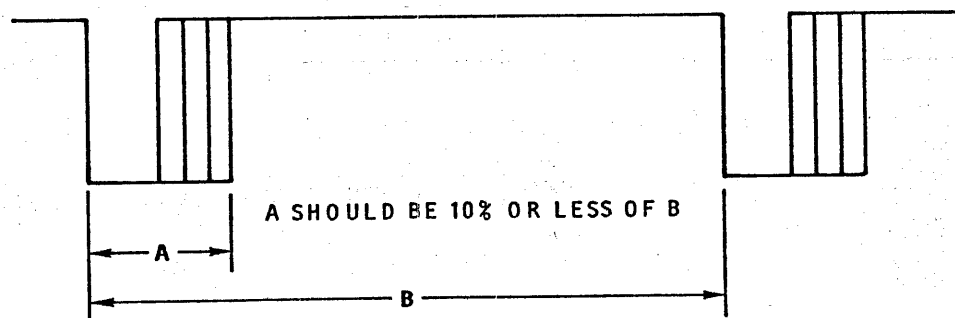
NOTE

Switch settings, on the data board for test mode, override the front panel HI DEN indicator.

- b. See Figure 4-9 to connect oscilloscope to TP 30 and to ground.
- c. Press FWD pushbutton switch (indicator illuminates).
- d. Start writing all-1's by pressing and holding pushbutton SW-4. File protect is inoperative.
- 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 TP 31 through TP 38 and R204 through R211, respectively.

4-33. NRZI WRITE SKEW VERIFICATION. Check NRZI write skew as follows:

- a. Close position 7 of switch 1.
- b. Connect oscilloscope to TP 10. Proper waveform is shown in Figure 4-11.



920-12

Figure 4-11. Skew Pulse at TP 10

4-34. **PHASE-ENCODE READ GAIN VERIFICATION.** Check PE read levels 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.

NOTE

Switch settings, on the data board for test mode, override the front panel HI DEN indicator.

- b. Press FWD switch (indicator illuminates).
- c. Start writing all I's by pressing and holding pushbutton Switch 4. File protect is inoperative.
- d. Verify 4-volt reading (peak-to-peak) at TP 30 through TP 38.

4-35. **HEAD AZIMUTH ADJUSTMENT.** Adjust read skew as follows:

- a. Return all switches to initial settings (paragraph 4-31).
- 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 TP 10 on data board (Figure 4-9) and ground.
- e. With transport in off-line, low-density mode (ON LINE and HI DEN indicators extinguished), press FWD pushbutton switch.
- f. Adjust azimuth screws (Figure 4-5) on head mounting plate so that outputs of all tracks, as monitored at TP 10, fall within 10% or less of byte-to-byte period in forward direction, and 12% in reverse direction. (See Figure 4-11.) 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.

4-36. Return PWB to normal operating mode by setting all switch positions in accordance with paragraph 4-31.

CAPACITIVE TRANSDUCER ALIGNMENT

4-37. This alignment procedure requires the use of the diagnostic test procedure described in Section V, paragraphs 5-5 through 5-14. Align the capacitive transducers as follows:

- a. Observe marks on facade at following points: on takeup column, at 1, $6\frac{1}{4}$ and $11\frac{1}{2}$ -inch distances from right edge of glass; on supply column, at 2, $7\frac{1}{4}$ and $12\frac{1}{2}$ -inch distances from top edge of glass.

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 5-5 through 5-14.

- b. During diagnostic test 4, load a full $10\frac{1}{2}$ reel of 1.5 mil tape approximately 10 ft past BOT marker.
- c. Increment test diagnostic to test 5 by pressing LOAD pushbutton switch once. LOAD and REWIND indicators will illuminate.

NOTE

Restrain takeup and supply reels by hand or masking tape to prevent excessive tape from entering vacuum column. Position tape loop at center of each column.

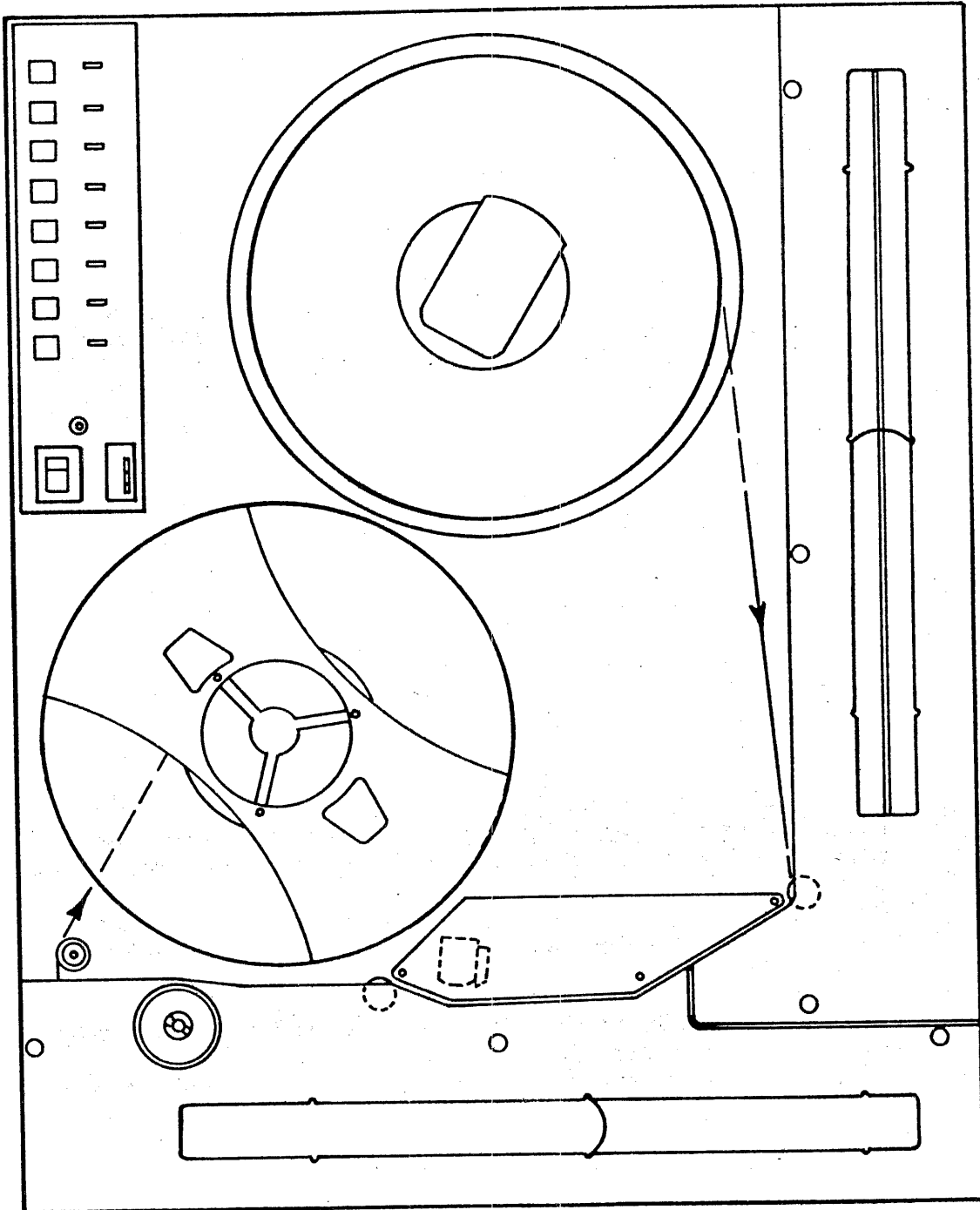
- d. Adjust zero-adjustment potentiometers R189 (supply servo) and R188 (takeup servo) on control/servo PWB (Figure 4-1) until REV and TEST lamps, respectively, change state (illuminate if previously extinguished or vice versa). Adjustments are correct at these points.
- e. Press LOAD pushbutton switch to increment test to diagnostic to test 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 mark at bottom of supply transducer column and to mark at right-hand side 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 switch 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 top mark in supply transducer column and to left-hand mark in takeup transducer column. Adjust potentiometers as in step f, noting positions of potentiometers.

- i. Readjust gain potentiometers to positions halfway between those noted in steps f and h.
- j. Check adjustments by loading a full 10- $\frac{1}{2}$ " reel of tape until an approximately equal mass of tape is obtained on both reels. Stop the tape motion and trim the offset for both the supply and take-up null points.

MECHANICAL ADJUSTMENTS

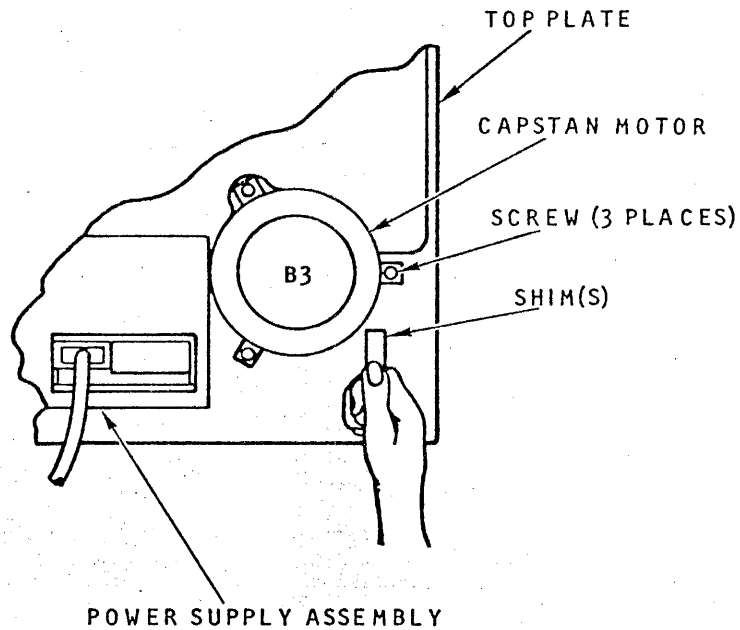
4-38. **TAPE PATH ALIGNMENT.** See Figure 4-12 and align the tape path using the following procedure:

- a. Remove facade, head cover, and EOT/BOT cover.
- b. Adjust takeup and supply reel hubs to proper heights, as shown in Figure 4-4.
- 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 4-18 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 slightly, loosen mounting screw farthest from head and guides, and install mylar shim(s) between motor and top plate as shown in Figure 4-13. Adjustment is correct when no shift is visible when tape direction is changed and all screws are securely tightened.
- i. If tape moves toward top plate when running forward, capstan sleeve must be tilted toward head and guides. Slightly loosen two motor mounting screws closest to head and install mylar shim(s) between motor and top plate, centering shims 180, from screw indicated in Figure 4-13. Adjustment is corrected when no shift is visible when tape direction is changed and all screws are securely tightened.



920-13

Figure 4-12. Tape Path Alignment



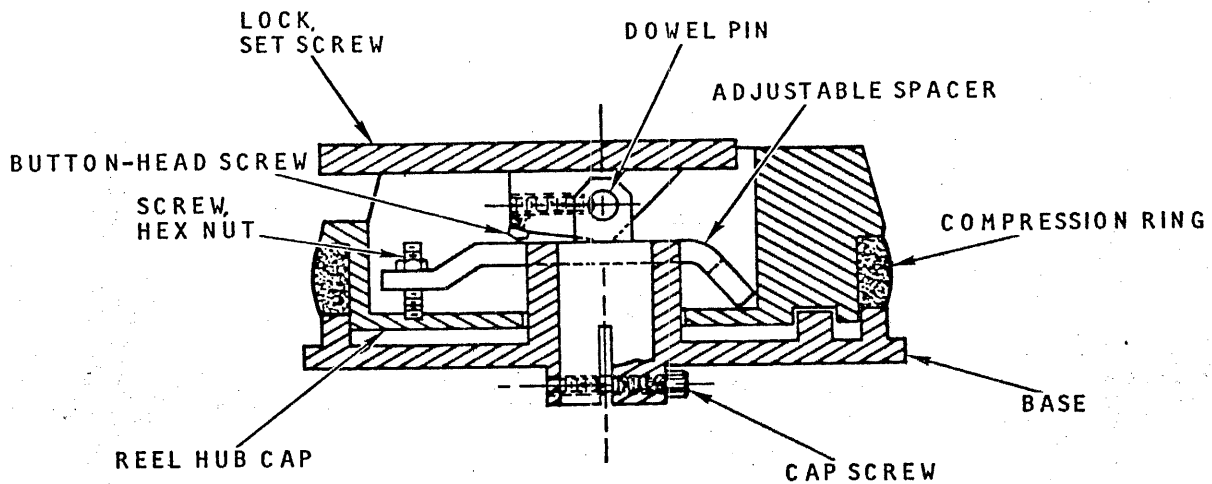
920-14

Figure 4-13. Motor Tilt Procedure

- j. Run tape forward and reverse to 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. Check read gain levels using the procedure in paragraphs 4-32 and 4-34.
 - l. Adjust head azimuth as outlined in paragraph 4-35.
 - m. Reinstall facade, head cover, and EOT/BOT cover.
- 4-39. REEL HUB ADJUSTMENT. See Figure 4-14 and adjust the reel hub 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.



920-15

Figure 4-14. Reel Hub Assembly

REPLACEMENT OF ELECTRONIC ASSEMBLIES

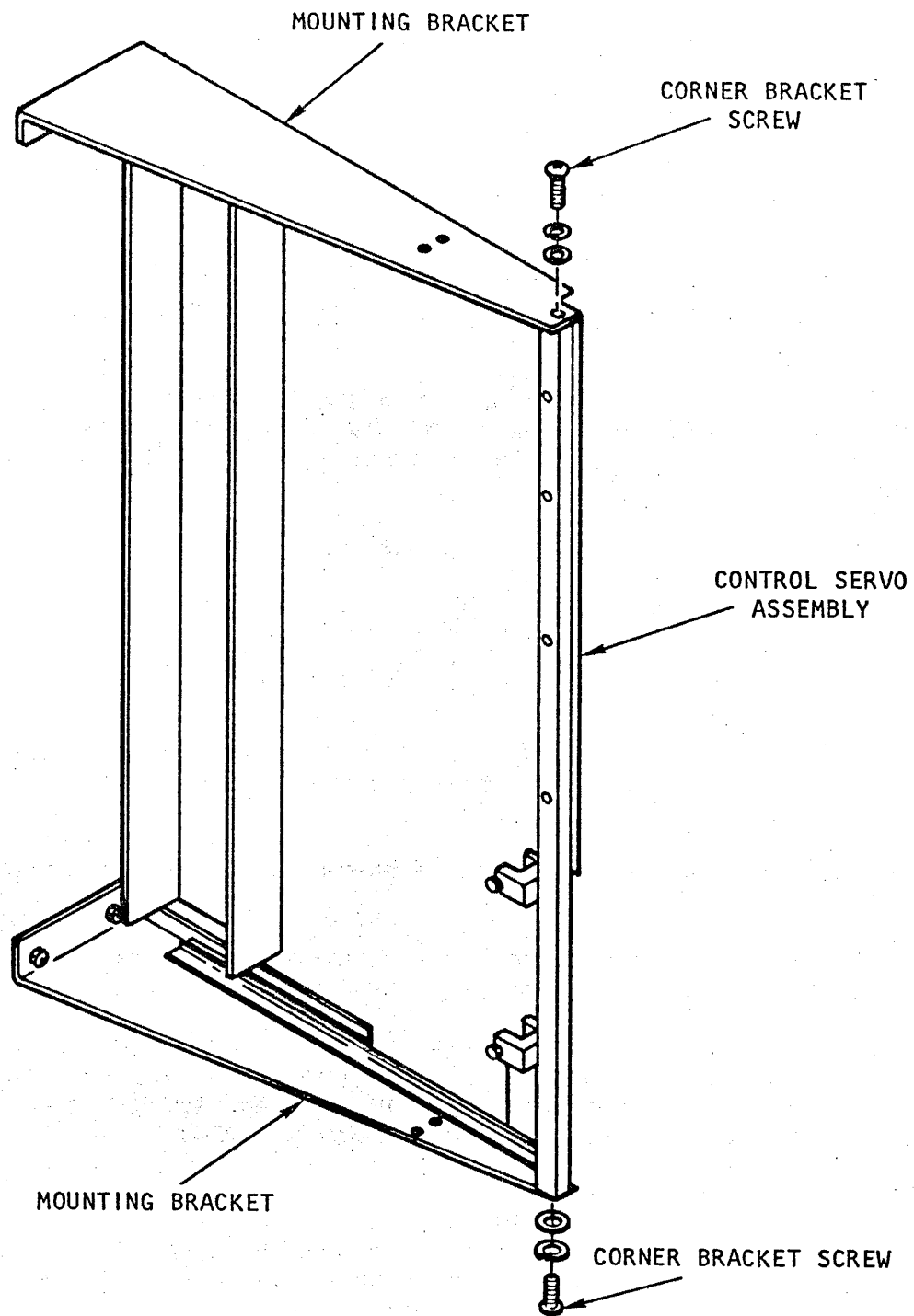
4-40. These instructions provide a logical procedure for replacing assemblies.

4-41. **CONTROL/SERVO BOARD.** Replace the control/servo board as follows:

- a. Disconnect all cables from board.
- b. Remove screws from corners of mounting bracket as shown in Figure 4-15.
- 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 the capstan servo, ramp time, and capacitive transducer in accordance with paragraphs 4-25 through 4-29 and 4-37.

4-42. **DUAL MODE DATA PWB.** Replace the data PWB as follows:

- a. Remove two screws securing PWB to unhinged standoffs.
- b. Swing PWB out on standoff hinges and carefully remove head connectors and power/signal cable.



920-16

Figure 4-15. Control/Servo Board Removal

- 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 4-30 through 4-36.

4-43. **FILE PROTECT SENSOR.** The complete file protect sensor is built and tested as an assembly and must be replaced as such. Remove and replace 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 0.1 inch. No electrical adjustments are required.

4-44. **VACUUM FLOOR/TRANSDUCER ASSEMBLY.** The Model 920 transport has two vacuum floor assemblies (supply and takeup) to which one transducer assembly is bonded. Determine which vacuum floor assembly is at fault, and replace the complete assembly as follows:

NOTE

Vacuum floor assemblies consisting of a vacuum column floor and a transducer assembly can be returned to factory for repair at a nominal charge.

- a. Determine which assembly is at fault. Unplug corresponding connector body from control/servo PWB. Remove cable from connector body using Molex Tool Part No. HT-2038.
- b. Loosen three press-lock fasteners securing defective vacuum floor/transducer assembly.
- c. Remove screws securing four vacuum column walls and vacuum floor assembly to top plate. Save any shims under wall or vacuum floor assembly.
- d. Lift floor/transducer assembly carefully from top plate. (When removing bottom floor/transducer assembly, take care not to damage capstan sleeve.) Disconnect silicone tubing from tee assembly in vacuum column. Feed transducer cable through rubber grommet, and remove complete assembly.
- e. Install replacement floor/transducer assembly in reverse order of removal. Push silicone tubing back over tee assembly, checking that all other tubing connections in vacuum column have not been disturbed. Replace any shims removed in step c or d.
- f. Before tightening screws that secure vacuum column walls, ensure that capstan sleeve does not rub on wall (in bottom vacuum column) closest to it and that roller guide does not rub against wall closest to it inside vacuum column.

- g. Insert cable contacts into connector housing, as shown in Top Assembly Drawing No. 155000-998 (Section VII), and plug connector into corresponding control/servo PWB.
- h. Adjust the capacitive transducer as specified in paragraph 4-37.

REMOVAL AND REPLACEMENT OF ELECTRONIC PARTS AND COMPONENTS

4-45. Select replacement parts and components from the parts list in the engineering drawing package provided with the equipment. Observe the following special procedures for removing and replacing parts 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 degrees 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 (Soldapull desoldering tool, Edsyn Co., or equivalent).

NOTE

Do not alter wiring or layout.

4-46. **MULTIPLE-LEAD COMPONENTS.** Follow instructions in paragraph 4-45 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.

4-47. **MULTIPLE PIN COMPONENTS.** Remove and replace multiple-pin components, including integrated circuits as follows:

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 4-45.
- c. Straighten leads in replacement component for insertion in board and install.

PROGRAMMING WRITE DESKEW PROM

4-48. Inscribed on the tape head of the Cipher Model 920 transport is an eight-digit code 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.

4-49. Tables 4-6, 4-7, and 4-8 illustrate 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 in each of addresses (rows) 00 through 0F.

4-50. **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.

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

Table 4-6. Bit Map,
Code 23456789

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

Table 4-7. Bit Map,
Code 77777777

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

Table 4-8. Bit Map,
Code 6789A987

VOLUME I

SECTION V

TESTING AND TROUBLESHOOTING

TESTING

5-1. The Model 920 transport incorporates three separate types of internal testing facilities called self-test, test mode operation, and diagnostic mode operation. These facilities are accessed with control panel pushbuttons to provide detection of certain fault conditions and to provide alignment and test aids for preventive maintenance.

5-2. **SELF TEST.** During power-up operation, all indicator lights on the control panel are illuminated for approximately one second. If all indicators are off 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 remain illuminated, a defective RAM is indicated.

5-3. **TEST MODE OPERATION.** Use off-line operation of the Model 920 in the test mode to adjust start and stop ramp times and to verify proper operation of the servos. To access the test mode, power up the transport and load a reel of tape.

5-4. Refer to Figure 3-1, which illustrates the controls and indicators of the Model 920, and use the following switch sequences to activate the various functions of the test mode.

- a. Press TEST and FWD pushbutton switches momentarily. Transport performs alternate forward and stop operations to permit adjustment of start/stop ramp times. (See paragraph 4-29 for adjustment procedure.) To terminate test, press FWD pushbutton switch momentarily. FWD indicator turns off and transport stops.
- b. Press REV pushbutton switch momentarily. Transport performs alternate reverse and stop functions to check start/stop ramp times. (See paragraph 4-29.) Press REV pushbutton switch momentarily to terminate.
- c. Press FWD and REV pushbutton switches 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.

5-5. **DIAGNOSTIC MODE.** The diagnostic mode is designed to aid troubleshooting by helping to locate and isolate fault conditions. This mode provides for verification of proper servo and sensor operation, for diagnostic functions, and for transducer alignment.

5-6. The upper three indicators on the control panel indicate in binary notation the number of the test being performed (refer to Figure 3-1). The value of LOAD is 1, ON LINE is 2, and REWIND is 4. For example, if ON LINE is the only one on, the test is number 2; if all are on, it is number 7. The remaining indicators are used to confirm proper operation of most of the major circuits in the transport.

5-7. To access the diagnostic mode, switch transport to ON and unload any tape. Press pushbutton switches TEST, FWD, and WRT EN simultaneously and hold; then press and hold in the LOAD pushbutton switch for 2 to 3 seconds. The LOAD indicator illuminates, after a slight delay, when test 1 is accessed.

5-8. 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 the reel for a servo with reversed polarity will rotate in the opposite direction of the capstan motor.

5-9. To terminate this test, press the LOAD pushbutton switch momentarily. The LOAD indicator turns off and ON LINE illuminates, indicating that Test 2 is accessed.

5-10. Test 2. Only the supply servo is activated in this test. Its purpose is to check operation of the write enable, file-protect, EOT, and BOT sensors and their electronics. The supply reel rotates in one direction. The displays that indicate the proper function or malfunction of BOT, EOT, quadrature phase 0, and phase 1 are listed in Table 5-1.

FUNCTION	DISPLAY
The BOT sensor detects reflected light and BOT electronics are operating.	TEST indicator illuminates
No reflected BOT light (tape in path) or inoperative electronics.	TEST indicator off
The EOT sensor detects reflected light and EOT electronics are operating.	REVERSE indicator illuminates
No reflected EOT light (tape in path) or inoperative electronics.	REVERSE indicator off
Quadrature phase 0 sensor detects reflected light and electronics are operating.	HI DENSITY indicator off
Phase 0 sensor not detecting reflected light.	HI DENSITY indicator illuminates
Rotating hub causes above two functions to alternate.	HI DENSITY indicator flashes
Quadrature phase I sensor detects reflected light and electronics are operating.	FORWARD indicator off
Phase I sensor not detecting reflected light.	FORWARD indicator illuminates
Rotating hub causes above two functions to alternate.	FORWARD indicator flashes
An illegal phase change has occurred or an illegal phase relationship exists.	WRITE ENABLE indicator illuminates

Table 5-1. Photo-sensor Functions

5-11. To terminate Test 2, press the LOAD pushbutton switch momentarily. LOAD and ON LINE indicators illuminate, indicating that Test 3 is accessed.

5-12. 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 switch at this point illuminates the REWIND indicator (LOAD and ON LINE off), accessing Test 4.

5-13. 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 press the LOAD pushbutton switch to load the transport and access Test 5. The LOAD and REWIND indicators illuminate for Test 5.

5-14. Refer to paragraph 4-37 for the capacitive transducer alignment procedure performed in Tests 5, 6, and 7. Press the LOAD switch to sequence these tests and, to exit the diagnostic mode, hold down the OFF LINE switch and press the LOAD switch.

TROUBLESHOOTING

5-15. Before performing any troubleshooting operation, be familiar with the theory of operation of the transport and any associated equipment. Check carefully to ensure that all equipment is connected properly and that all associated equipment is in good operating condition. Be familiar with operating instructions and follow them carefully while performing the troubleshooting procedure.

5-16. **PROCEDURE.** While it is recognized that each individual malfunction requires its own specific troubleshooting procedure, the following steps serve as general guidelines.

- a. As a 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 the engineering drawing package provided with the equipment 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.

5-17. Table 5-2 lists possible defects associated with the operation of a tape transport and describes probable causes and 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 defective	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 IV) 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
Machine does not accept commands	Improper interface	Check interface with DTL logic and correct as necessary.
	More than one command true simultaneously	Enables 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 IV

Table 5-2. System Troubleshooting (Sheet 1 of 4)

TROUBLE	PROBABLE CAUSE	REMEDY
Tape moves during a stop condition	Defective capstan	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
Computer does not read tapes correctly	Data format incorrect	Use correct format
	Record length exceeds computer memory capability	Use correct record length
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 servo board
	Transport not in Ready Mode	Bring tape to load point (Section III)
	Fault in ramp generator or capstan servo-amplifier	Repair servo board

Table 5-2. System Troubleshooting (Sheet 2 of 4)

TROUBLE	PROBABLE CAUSE	REMEDY
<p>Transport responds to remote FORWARD command, but tape is not written</p>	<p>Write current is not enabled</p> <p>WRITE ENABLE signal not correct</p> <p>Write data or write data strobe not received correctly from interface</p> <p>Heads not plugged in correctly</p>	<p>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.</p> <p>Check receiver on control/power board; check for RUN signal on read/write board; repair read/write or control/power board if faulty</p> <p>Check presence of correct levels on write portion of read/write board; repair write portion of read/write board or interface cable if faulty</p> <p>Check J21 on read/write board</p>
<p>Data incorrectly written</p>	<p>Incorrect data format</p> <p>Fault on one track due to failure in write circuits</p> <p>Intermittent +5V, RUN or WARS</p> <p>Write deskew circuit faulty</p> <p>Head and guides need cleaning</p> <p>Tape cleaner needs emptying</p>	<p>Use correct format</p> <p>Check receiver and write amplifier on write portion of read/write board; repair if faulty</p> <p>Examine signals and repair servo or read/write board, as required</p> <p>Check skew adjustments (See Section IV)</p> <p>Clean heads and guides</p> <p>Remove tape cleaner and clean</p>

Table 5-2. System Troubleshooting (Sheet 3 of 4)

TROUBLE	PROBABLE CAUSE	REMEDY
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 IV.
	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 5-2. System Troubleshooting (Sheet 4 of 4)

QTY GIVEN IS NUMBER OF PARTS OR LENGTH OF MATERIAL IN FEET

ITEM	CIPHER PART #	QTY	DESCRIPTION 1 DESCRIPTION 2	MFG-NAME MFG-PART#	REF-DES	ST-DATE	END-DATE
1	154017-001	1	PWB ASSY-POWER SUPPLY	CIPHER DATA PROD			
2	799000-210	1	TRANSFORMER-POWER	SEE DRAWING			
3	754035-301	1	BASE-POWER SUPPLY	CIPHER DATA PROD			
4	799016-801	1	FILTER-EMI,5AMP	RAYTHEON SK1R	FL1	08-01-82	L*47
5	205198-010	1	RECEPTACLE-POWER	CORCOM INC 6J1			
6	202004-100	1	RECTIFIER BRIDGE	MOTOROLA SEMI. MDA-980-2	CR1		
7	210229-050	1	CLAMP,CABLE-3/8 BLACK	NOT ON FILE 8944			
8	210288-000	.4	GROMMET STRIP	NOT ON FILE			
9	210408-008	.7	TUBING-HEAT SHRINK, 1/8,ELK	MS21266-2N ICO RALLY			
10	210408-012	.5	TUBING-HEAT SHRINK, 3/16,ELK	HIX-1/8 ICO RALLY			
11	210132	1	GROMMET	HIX-3/16 SMITH,HERMAN H. 2146			
12	210229-523	8	TY-RAF-1/16 TO 5/8	ICO RALLY WRN 3 1/2			
13							
14	731006-800	1	LABEL-ASSY	CIPHER DATA PROD			
15							
16	210555-025	5	TERMINAL RING #6 SM PAT	HOLLINGSWORTH TERM. CO. R1881S			
17	210555-033	4	TERMINAL,SLIP-ON,250 TAB	HOLLINGSWORTH TERM. CO. S05305F-T1			
18	208400-121	3.1	WIRE-STRD, 16AWG, IR, PVC	ALPHA WIRE 7134-1 CSA/UL			
19	208405-112	.7	WIRE-STED,18AWG,IR,PVC,ELK	JUDD WIRE HH0402			

QTY GIVEN IS NUMBER OF PARTS OR LENGTH OF MATERIAL IN FEET

ITEM	CIPHER PART #	QTY	DESCRIPTION 1 DESCRIPTION 2	MFG-NAME MFG-PART#	REF-DES	ST-DATE	END-DATE
20	208405-111	.7	WIRE,STRD,18AWG,IRPVC,WHT	JUDD WIRE HH0402			
21	208405-014	1.0	WIRE-STRD,18GA,IR PVC GRN	ALPHA WIRE 7155-4			
22	208400-111	11.6	WIRE-STRD,16AWG,IRPVC,WHT	JUDD WIRE HH0405			
23	208400-112	2.7	WIRE-STRD,16AWG,IRPVC,BLK	JUDD WIRE HH0405			
24	208300-001	2	WIRE-STRD,14AWG,PVC,UL	ALPHA WIRE 3079-1 CSA/UL			
25	209999-000	11	MARKER,WIRE- 1-50	ANY ACCEPTABLE SOURCE VMM-0-49			
26	754053-301	1	LABEL-RECTIFIER ID	CIPHER DATA PROD			
27	213274-604	2	SCREW-PAN HD PHIL 6-32 X 1/4,CAD,ZINC	ANY ACCEPTABLE SOURCE			
28							
29	213271-606	5	SCREW-PAN HEAD PHIL, 6-32 X 3/8,CAD BLK,OR ZIN	ANY ACCEPTABLE SOURCE			
30	213271-608	1	SCREW-PAN HD PHIL 6-32 X 1/2,CAD,BLK,ZINC	ANY ACCEPTABLE SOURCE			
31	213092-612	1	SCREW-SKT HD CAP, 6-32 X 3/4,BLK ONLY	ANY ACCEPTABLE SOURCE			
32							
33							
34	213151-108	4	SCREW-FLAT HD PHIL,100 10-32 X 1/2 CAD,BLK,ZINC	ANY ACCEPTABLE SOURCE			
35	207602-011	4	WASHER,SPLIT LOCK #6	ANY ACCEPTABLE SOURCE WASHER #6 CAD.			
36	207608-021	1	WASHER,FLAT,SMALL OD #6	ANY ACCEPTABLE SOURCE WASHER #6 CAD.			
37	207605-021	1	WASHER,FLAT #6	ANY ACCEPTABLE SOURCE WASHER #6 CAD.			
38							
39	207102-011	4	WASHER,SPLIT LOCK #10	ANY ACCEPTABLE SOURCE WASHER #10 CAD.			

QTY GIVEN IS NUMBER OF PARTS OR LENGTH OF MATERIAL IN FEET

ITEM	CIPHER PART #	QTY	DESCRIPTION 1 DESCRIPTION 2	MFG-NAME MFG-PART#	REF-DES	ST-DATE	END-DATE
40	207104-021	4	WASHER, FLAT, #10	ANY ACCEPTABLE SOURCE WASHER #10 CAD.			
41	213898-610	2	SPEED NUT-6-32,F	NOT ON FILE C8094-632			
42	207607-051	2	NUT, HEX #6 6-32	ANY ACCEPTABLE SOURCE NUT #6 CAD.			
43	207101-081	4	NUT, HEX, RADIO PAT. #10 10-32	NUT #10, CAD.			
44	210555-049	1	TERMINAL-RING, 16-14AWG, #8	HOLLINGSWORTH TERM. CO. R1902S			
45	*****						
46							
47	799005-101	1	FILTER-EM1,5 AMP,K SERIES	CORCOM INC 5K1	FL1	Lx4	07-31-82

ITEM	CIPHER PART #	QTY	DESCRIPTION 1 DESCRIPTION 2	MFG-NAME MFG-PART#	REF-DES	ST-DATE	END-DATE
1	754009-901	1	REEL HUB MODIFICATION	CIPHER DATA PROD			
2	731910-200	1	CAP-REEL HUB	CIPHER DATA PROD			
3	731922-500	1	LOCK-REEL HUB MACHINING	CIPHER DATA PROD			
4	731922-202	1	REEL HUB-SPACER,ADJ,MOD	CIPHER DATA PROD			
5	710010-400	1	COMPRESSION RING REEL HUB	CIPHER DATA PROD			
6	154002-601	1	RING ASSY-FILE PROTECT	CIPHER DATA PROD			
7	731013-400	2	PIN-REEL HUB	CIPHER DATA PROD			
8	754003-501	3	CONICAL CPRSN SPRING	CIPHER DATA PROD			
9	213062-604	1	SCREW-BTN HD SKT 6-32 X 1/4 BLK 0	ANY ACCEPTABLE SOURCE			
10	213622-608	1	SCREW-SKT SET KNURL CUP PT,6-32 X 1/2,BLK ONLY	ANY ACCEPTABLE SOURCE			
11	207604-081	1	NUT-HEX RADIO PATTERN 6-32	ANY ACCEPTABLE SOURCE NUT #6 CAD,			
12	210029-003	3	NUT-HEX,LIGHT,THIN #4	ESNA 22NTM-40			
13	209990-076	AR	RETAINING COMPOUND-FAST	LOCTITE 601			
14	213092-612	2	SCREW-SKT HD CAP, 6-32 X 3/4,BLK ONLY	ANY ACCEPTABLE SOURCE			
15	213352-604	2	SCREW-SKT SET CUP PT, 6-32 X 1/4,BLK ONLY	ANY ACCEPTABLE SOURCE			
16	213351-410	3	SCREW-SKT,SET,CUP,PT,CAD, BLK,ZINK,40-40X,5/8	ANY ACCEPTABLE SOURCE			
17	209999-031	AR	STP OIL TREATMENT	209999-031			
18	209990-075	AR	ADHESIVE-THREAD LOCKING, AEROBIC	VC 3			
19	* REF DWG 600103-100 REEL HUB ASSY-PROCEDURE						

ITEM	CIPHER PART #	QTY	DESCRIPTION 1 DESCRIPTION 2	MFG-NAME MFG-PART#	REF-DES	ST-DATE	END-DATE
.....

20 - 22 ARE BLANK.

23	210408-006	.2	TUBING-HEAT SHRINK, BLACK	ICO RALLY H1X-3/32			
----	------------	----	---------------------------	-----------------------	--	--	--

24

25 *****

ITEM	CIPHER PART #	QTY	DESCRIPTION 1 DESCRIPTION 2	MFG-NAME MFG-PART#	REF-DES	ST-DATE	END-DATE
1	754017-101	1	PWB-POWER SUPPLY	DIBBLE ELECTRONICS TYPE 1 OR 2			
2							
3	205066-500	1	CONNECTOR-6 POSN	MOLEX, INC. 03-09-1063			
4	205014	1	TERM-MALE, 18-22AWG, .093 DIA, REEL	MOLEX, INC. 02-09-2116			
5	201174-158	3	CAP-ELECT, 15800UF, 75V	SEE DRAWING 91S75JF1582	C1, 2, 3		
6	200123-300	1	RES-WW, 3K, 3.75W, 5%	DALE ELEC. INC. CW-2B .1-9K	R1		
7	205015	5	TERM-FEM 18-22AWG, .093DIA REEL	MOLEX, INC. 02-09-1116			
8	210229-523	8	TY-RAP-1/16 TO 5/8	ICD RALLY WRN 3 1/2			
9	210555-033	2	TERMINAL, SLIP-ON, .250 TAB	HOLLINGSWORTH TERM. CO. S05305F-T1			
10	208405-111	16.7	WIRE, STRD, 18AWG, IRPVC, WHT	JUDD WIRE HH0402			
11	208400-111	.10	WIRE-STRD, 16AWG, IRPVC, WHT	JUDD WIRE HH0405			
12	209999-000	2	MARKER, WIRE- 1-50	ANY ACCEPTABLE SOURCE VMM-0-49			
13							
14							
15	210032-240	4	STDOFF-1/4 RND, 1/2, 6-32, SWAGE	KEYSTONE 1604-3			
16	213271-106	6	SCREW-PAN HD PHIL, 10-32 X 3/8, CAD, BLK, ZINC	ANY ACCEPTABLE SOURCE			
ALT	213271-108		SCREW-PAN HEAD PHIL, 10-32 X 1/2, CAD, BLK, ZINC	ANY ACCEPTABLE SOURCE			
17							
18							

ITEM	CIPHER PART #	QTY	DESCRIPTION 1 DESCRIPTION 2	MFG-NAME MFG-PART#	REF-DES	ST-DATE	END-DATE
19	207102-011	6	WASHER,SPLIT LOCK #10	ANY ACCEPTABLE SOURCE WASHER #10 CAD.			
20	207108-021	6	WASHER,FLAT, SMALL OD #10	ANY ACCEPTABLE SOURCE WASHER #10 CAD.			

21

ITEM	CIPHER PART #	QTY	DESCRIPTION 1 DESCRIPTION 2	MFG-NAME MFG-PART#	REF-DES	ST-DATE	END-DATE
1	754005-101	1	PWB-SWITCHES	CIPHER DATA PROD			
2							
3	154076-101	1	CABLE ASSY-SWITCHES	CIPHER DATA PROD			
4	208415-112	.5	WIRE-STRD-22AWG,IRPVC,BLK	JUDD WIRE HH0314			
5							
6							
7							
8							
9							
10							
11	210806-500	8	SWITCH-PUSH BUTTON,MOM	ROOD SWITCH RS5035	S1-8		
12	203052-259	1	IC-MULTIPLEXER/3 ST OUT	TEXAS INSTRUMENTS SN74259	U1		
13	203052-251	1	IC-8BIT ADDRESSABLE LATCH	TEXAS INSTRUMENTS SN74LS251N	U2		
14	205249	1	RESISTOR NETWORK-10K, 14 PIN *	BECKMAN INSTRUMENTS,INC. 899-1-R10K	U3		
15							
16	212000-101	8	DIODE-LIGHT EMITTING RED	HEWLET PACKARD 5082-4670	CR1-8		
17	200072-220	8	RES FC 220 OHM 1/4W 5%	NOT ON FILE RCR07G221JM	R1-8		
18	201149-470	1	CAP FC .047UF 50V 5%	EL PAC C5A473J	C1		
19	201105-010	1	CAP,CER,DISC,.01UF,500V	SPRAGUE 5HKS-S10	C2		
20	810032-100	4	STDOFF-1/4 RND,1/8, 4-40,SWAGE	AMATOM ELECTRONIC HDW 9531B-A-140			

ITEM	CIPHER PART #	QTY	DESCRIPTION 1 DESCRIPTION 2	MFG-NAME MFG-PART#	REF-DES	ST-DATE	END-DATE
21	354005-301	REF	SCHEM-FWB,SWITCHES	CIPHER DATA PROD			
22	210229-300	1	CABLE,CLAMP 1/4 WHT	ANY ACCEPTABLE SOURCE 3304		04-01-82	L*31
23							
24	213271-607	1	SCREW-PAN HD PHIL, 6-32 X 7/16,CAD,BLK,ZINC	ANY ACCEPTABLE SOURCE			
25	207605-021	1	WASHER,FLAT #6	ANY ACCEPTABLE SOURCE WASHER #6 CAD,			
26	207602-011	1	WASHER,SPLIT LOCK #6	ANY ACCEPTABLE SOURCE WASHER #6 CAD,			
27	207607-051	1	NUT, HEX #6 6-32	ANY ACCEPTABLE SOURCE NUT #6 CAD,			
28							
29							
30	*****						
31	210229-200	1	CLAMP,CABLE-3/16 WHITE	NOT ON FILE 3303		L*22	03-31-82

PARTS LIST

154040-008

PWB ASSY-DATA DUAL,
9TK,RAW,125IPS

REV A

09-27-78

(PRINTED: 07-31-80)

PAGE 1

5 LINES

OF 1

ITEM	CIPHER PART #	QTY	DESCRIPTION 1 DESCRIPTION 2	MFG-NAME MFG-PART#	REF-DES	ST-DATE	END-DATE
1	154040-009	1	PWB ASSY-DATA DUAL, 9TK,RAW (NO SPEED KIT)	CIPHER DATA PROD			
2	154040-608	1	SPEED KIT-125 IPS	CIPHER DATA PROD			
3							
4	454040-000	REF	DASH NO INDEX/PWB ASSY- DATA DUAL	CIPHER DATA PROD			
5	354040-300	REF	SCHEMATIC-DATA,DUAL MODE	CIPHER DATA PROD			

PART LIST 154040-009 PWB ASSY-DATA DUAL,
9TK,RAW (NO SPEED KIT)

REV AJ ECO# 13977

08-20-82

(PRINTED: 08-20-82)
140 LINES

PAGE 1
OF 9

QTY GIVEN IS NUMBER OF PARTS OR LENGTH OF MATERIAL IN FEET

ITEM	CIPHER PART #	QTY	DESCRIPTION 1 DESCRIPTION 2	MFG-NAME MFG-PART#	REF-DES	ST-DATE	END-DATE
1	754040-101	1	PWB-DATA,DUAL MODE	DIBBLE ELECTRONICS TYPE 1 OR 2			
2	731511-201	1	STIFFENER-LONG READ/WRITE	CIPHER DATA PROD			
3	731510-400	1	BAR STIFFENER	CIPHER DATA PROD			
4	731501-300	4	RETAINER-P/C CONNECTOR	CIPHER DATA PROD			
5	735000-402	2	SPACER	CIPHER DATA PROD			
6	205026	37	TEST POINT .058 DIA PIN	AMP INC. 60802-2			
7	205068	1	CONNECTOR-12 POSN	MOLEX,INC. 03-09-2121	P20		
8	205012	12	TERMINAL,MALE.093 DIA.,PC	MOLEX,INC. 02-09-2134	(SEE-NOTE#136),P20		
ALT	205012-001		TERMINAL-MALE,,093DIA,PC LOOSE	NOT ON FILE 159-1050P			
9	205061	2	CONNECTOR-29 POSN	WINCHESTER ELECTRONICS SRE 29 PD4J	P21,22		
10	211015-003	1	SWITCH-DIP,8POS,SEALED	AMP INC. 2-435668-8	S1		
11	211015-002	1	SWITCH-DIP,7POS,SEALED	AMP INC. 2-435668-7	S2		
12	211015-001	1	SWITCH-DIP,4POS,SEALED	AMP INC. 3-435668-4	S3		
13	211011-014	11	SOCKET,14 PIN LOW PROFILE	AUGAT 214-AG39D	XA1-10,XU111		
ALT	205025-514		SOCKET-DIP, 14 CONTACTS	AUGAT 514-AG10D			
14	731006-800	1	LABEL-ASSY	CIPHER DATA PROD			
15	211011-016	1	SOCKET,16 PIN LOW PROFILE	AUGAT 216-AG39D	XU90		
ALT	205025-516		SOCKET-DIP, 16 CONTACTS	AUGAT 516-AG10D			

PARTS LIST 154040-009 PWB ASSY-DATA DUAL,
9TK,RAW (NO SPEED KIT)

REV AJ ECO# 13977

08-20-82

(PRINTED: 08-20-82)
140 LINES

PAGE 2

QTY GIVEN IS NUMBER OF PARTS OR LENGTH OF MATERIAL IN FEET

ITEM	CIPHER PART #	QTY	DESCRIPTION 1 DESCRIPTION 2	MFG-NAME MFG-PART#	REF-DES	ST-DATE	END-DATE
16	201191-063	5	CAPACITOR-ALUM WITH EPOXY END SEAL,22UFD,6.3V	PANASONIC CO. ECEBQJV220SR	C67,82,95,104,127		
17	201121-680	9	CAP,DM,68PF,300V,5Z	SANGAMO D153E680J0	C30,31,36,37,45,46, 51,52,58		
18	201105-101	21	CAP,CER DISC,.1UF,10V,	CENTRALAB UK10-104	C1,2,4,8,9,15,17,20, 22,25,40,55,96,99, 107,108,109,110,111, 116,126		
19	201103-100	4	CAP CER .001UF 1000V GMV	SPRAGUE 5HK-D10	C3,C11,C12,C16		
20	201105-010	35	CAP,CER,DISC,.01UF,500V	SPRAGUE 5HXS-S10	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 C7		
21	201122-150	1	CAP DM 150PF 300V 5Z	SANGAMO D153E151J0	C10		
22	201121-300	1	CAP,DM,30PF,300V,5Z	SANGAMO D153C300J03			
23	201121-200	9	CAP DM 20PF 300V 5Z	SANGAMO D153E200J0	61,64,70,73,76,79,85, 88,91		
24	201121-270	9	CAP DM 27PF 300V 5Z	SANGAMO D153E270J0	C117,118,119,120,121, 122,123,124,125		
25	201105-103	1	CAP-CER DISC,.1UF,25V	SPRAGUE 563CY5SBA250AH104Z	C93		
26	201160-100	1	CAP TANT 1UF 35V 10Z	NATIONAL COMPONENT IND. CS13BF105K	C94		
27	201191-025	5	CAPACITOR-ALUM WITH EPOXY END SEAL,10UFD,25V	PANASONIC CO. ECEBIEV100SR	C97,100,101,105,106		
28	201104-501	1	CAP-CER DISC,.05UF,20V,5Z	CENTRALAB UK20-503	C103		
29	201122-220	2	CAP DM 220PF 300V 5Z	SANGAMO D153E221J0	C112,113		
30	201121-220	2	CAP DM 22PF 300V 5Z	SANGAMO D153E220J0	C114,115		
31	200074-330	3	RES FC 33.00K 1/4W 5Z	NOT ON FILE RCR07G333JM	R30,32,37		

QTY GIVEN IS NUMBER OF PARTS OR LENGTH OF MATERIAL IN FEET

ITEM	CIPHER PART #	QTY	DESCRIPTION 1 DESCRIPTION 2	MFG-NAME MFG-PART#	REF-DES	ST-DATE	END-DATE
32	799603-100	1	TRANSISTOR-NPN,SILICON, SELECTED	CIPHER DATA PROD	Q1		
33	202006-100	1	DIODE-LIGHT EMITTING RED	GENERAL INSTRUMENT OPTO MV5053	CR1		
34	202018-100	11	DIODE,SWITCHING, SMALL BODY (DO-35)	FAIRCHILD IN4148	CR2,3,5-13		
35	202032-390	1	DIODE-ZENER,3.9V,20%	MOTOROLA SEMI. IN5335	CR4		
36	204013	2	TRANSISTOR, NPN SILICON	TEXAS INSTRUMENTS 2N3704	Q2,6		
37	204012	2	TRANSISTOR,PNP SILICON	TEXAS INSTRUMENTS 2N3702	Q3,Q4		
38	204027-034	1	TRANSISTOR P-N-P SILICON	MOTOROLA SEMI. 2N6034	Q5		
39	200073-430	1	RES FC 4.30K 1/4W 5%	NOT ON FILE RCR07G432JM	R283		
40	210915	12	FERRITE BEAD	FERRONICS,INC. 21-170J	L1,2,3,4		
41	208500-298	.7	WIRE BUS TND COPPER 22AWG	ALPHA WIRE CORP. 298	L1,2,3,4,A-B,F-G		
42	200073-680	1	RES FC 6.80K 1/4W 5%	NOT ON FILE RCR07G682JM	R284		
43	200073-270	19	RES FC 2.70K 1/4W 5%	NOT ON FILE RCR07G272JM	R16,53-56,85-88,125- 128,161-164,189,196 R203-211		
44	200204-005	9	POT-10K CERMET	BOURNS INC. 3386P-1-103			
45	200073-330	1	RES FC 3.30K 1/4W 5%	NOT ON FILE RCR07G332JM	R13		
46	200082-390	9	RES-FC,390 OHM,1/2W,5%	NOT ON FILE RCR20G391JM	R224,228,236,241,243, 247,248,252,256		
47	200082-470	27	RES FC 470 OHM 1/2W 5%	NOT ON FILE RCR20G471JM	R233,225,227,229,231, 233,235,237,239,240, 242,246,249,251,253, 255,257,222,226,230, 238,245,254,250,232, 234		

PARTS LIST 154040-009 PWB ASSY-DATA DUAL,
9TK,RAW (NO SPEED KIT)

REV AJ ECO# 13977

08-20-82

(PRINTED: 08-20-82)
140 LINES

PAGE 4

QTY GIVEN IS NUMBER OF PARTS OR LENGTH OF MATERIAL IN FEET

ITEM	CIPHER PART #	QTY	DESCRIPTION 1 DESCRIPTION 2	MFG-NAME MFG-PART#	REF-DES	ST-DATE	END-DATE
48	200075-220	1	RES FC 220.00K 1/4W 5Z	NOT ON FILE RCR07G224JM	R1		
49	200072-220	2	RES FC 220 OHM 1/4W 5Z	NOT ON FILE RCR07G221JM	R2,297		
50	200074-100	22	RES FC 10.00K 1/4W 5Z	NOT ON FILE RCR07G103JM	R3,4,5,9,10,17,18,19, 34,60,66,100,106,136, 142,172,178,197,217,, 219,262,285		
51	200072-390	1	RES FC 390 OHM 1/4W 5Z	NOT ON FILE RCR07G391JM	R6		
52	200072-680	13	RES FC 680 OHM 1/4W 5Z	NOT ON FILE RCR07G681JM	R7,8,45,48,77,80,117, 120,153,156,187,258,, 259		
53	200073-470	25	RES FC 4.70K 1/4W 5Z	NOT ON FILE RCR07G472JM	R11,46,47,49,50,78, 79,81,82,118,119,121, 122,154,155,157,158, 191,193,215,216,218, 260,261,299		
54	200074-240	1	RES FC 24.00K 1/4W 5Z	NOT ON FILE RCR07G243JM	R12		
55	200073-150	10	RES FC 1.50K 1/4W 5Z	NOT ON FILE RCR07G152JM	R64,70,104,110,140, 146,176,182,201,220		
56	200075-150	1	RES FC 150.00K 1/4W 5Z	NOT ON FILE RCR07G154JM	R14		
57	200075-430	1	RES FC 430.00K 1/4W 5Z	NOT ON FILE RCR07G434JM	R15		
58	200075-510	3	RES-FC,510K,1/4W,5Z	NOT ON FILE RCR07G514JM	R20,21,25		
59	200074-470	8	RES FC 47.00K 1/4W 5Z	NOT ON FILE RCR07G473JM	R22,23,24,31,33,35, 36,38		
60	200072-330	1	RES FC 330 OHM 1/4W 5Z	NOT ON FILE RCR07G331JM	R298		
61	200073-510	1	RES FC 5.10K 1/4W 5Z	NOT ON FILE RCR07G512JM	R29		

QTY GIVEN IS NUMBER OF PARTS OR LENGTH OF MATERIAL IN FEET

ITEM	CIPHER PART #	QTY	DESCRIPTION 1 DESCRIPTION 2	MFG-NAME MFG-PART#	REF-DES	ST-DATE	END-DATE
62	200074-150	27	RES FC 15.00K 1/4W 5Z	NOT ON FILE RCR07G153JM	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	200074-220	18	RES FC 22.00K 1/4W 5Z	NOT ON FILE RCR07G223JM	R40,41,43,44,72,73, 76,75,112,113,115, 116,148,149,151,152, 185,186		
64	200073-100	20	RES FC 1.00K 1/4W 5Z	NOT ON FILE RCR07G102JM	R28,51,58,59,83,90, 93,97,99,123,130,133, 135,159,166,169,171, 188,194,295		
65	200073-220	18	RES FC 2.20K 1/4W 5Z	NOT ON FILE RCR07G222JM	R52,57,84,89,124,129, 160,165,190,286,287, 288,289,290,291,292, 293,294		
66	200071-470	9	RES FC 47 OHM 1/4W 5Z	NOT ON FILE RCR07G470JM	R63,65,103,105,139, 141,175,177,200		
67	200076-100	18	RES FC 1.00MEG 1/4W 5Z	NOT ON FILE RCR07G105JM	R69,91,92,94,95,96, 98,109,131,132,134, 145,167,168,170,181, 195,202		
68	200071-750	2	RES FC 75 OHM 1/4W 5Z	NOT ON FILE RCR07G750JM	R183,184		
69	200073-200	2	RES FC 2K 1/4W 5Z	NOT ON FILE RCR07G202JM	R212,264		
70	200073-300	1	RES FC 3.00K 1/4W 5Z	NOT ON FILE RCR07G302JM	R213		
71	200071-150	1	RES-FC,15 OHMS,1/4,5Z *	NOT ON FILE RCR07G150JM	R214		
72	200071-100	1	RES FC 10 OHM 1/4W 5Z	NOT ON FILE RCR07G100JM	R263		
73	200066-150	9	RES-FC,1.5 MEG,1/8W,5Z	ANY ACCEPTABLE SOURCE RCR05G155JM	R265,268,269,272,273, 276,277,280,282		

QTY GIVEN IS NUMBER OF PARTS OR LENGTH OF MATERIAL IN FEET

ITEM	CIPHER PART #	QTY	DESCRIPTION 1 DESCRIPTION 2	MFG-NAME MFG-PART#	REF-DES	ST-DATE	END-DATE
74	200066-680	9	RES-FC,6.8 MEG,1/8W,5Z	ANY ACCEPTABLE SOURCE RCR05G685JM	R266,267,270,271,274, 275,278,279,281		
75	205255	1	RESISTOR NETWORK-220/330	BECKMAN INSTRUMENTS,INC. 899-5-R220/330	U111		
76	203027-001	1	IC-QUAD 2-INP POS-AND GT	TEXAS INSTRUMENTS SN74LS08N	U1		
77	203046-001	2	IC-RTRIG MNST MLTV	TEXAS INSTRUMENTS SN74LS123N	U2,115		
78	203095-500	1	IC-13INPUT POS NAND GATE	TEXAS INSTRUMENTS SN74LS133N	U4		
79	203029-027	1	IC-TRIPLE THREE INPUT POSITIVE NOR GATE *	TEXAS INSTRUMENTS SN74LS27N	U5		
80	203042-501	2	IC-4-BIT BIN CNTR	TEXAS INSTRUMENTS SN74LS93N	U7,U11		
81	203051-174	1	IC,HEX D-TYPE FLIP FLOP	TEXAS INSTRUMENTS SN74LS174N	U8		
82	203036	1	IC-QUAD 2-INP POS-MND BFR	TEXAS INSTRUMENTS SN7438N	U9		
83	203026	1	IC-HEX INVERTER	TEXAS INSTRUMENTS SN7404N	U10		
84	203048-100	3	IC-SYN,4-BIT COUNTER	NATIONAL SEMICONDUCTORS DM74LS161N	U12,15,91		
85	203046-132	1	IC-QUAD, 2 INPUT, POS-NAND-TRIG	TEXAS INSTRUMENTS SN74LS132N	U13		
86	203010	1	IC-DUAL OPERATIONAL AMPL	SIGNETICS N5558V	U16		
87	203026-003	1	IC-TTL HEX INVERTER POS NAND (OPEN COLLECTOR)	TEXAS INSTRUMENTS SN7405N	U17		
88	203039-001	6	IC-DUAL-D FLIP-FLOP	TEXAS INSTRUMENTS SN74LS74N	U18,26,38,49,61,75		
89	203085-001	8	IC-SCHM,TRIG INPUT,HEX IV	TEXAS INSTRUMENTS SN74LS14N	U21,25,36,48,59,71, 112,113		
90	203023	1	IC-QUAD 2-INP POS-NAND GT	TEXAS INSTRUMENTS SN7400N	U22		
91	203010-001	1	IC-VOLTAGE COMPARATORS	NATIONAL SEMICONDUCTORS LM2903N	U23		

QTY GIVEN IS NUMBER OF PARTS OR LENGTH OF MATERIAL IN FEET

ITEM	CIPHER PART #	QTY	DESCRIPTION 1 DESCRIPTION 2	MFG-NAME MFG-PART#	REF-DES	ST-DATE	END-DATE
92	203029-003	4	IC-TRIP,3-INPUT AND GATE	TEXAS INSTRUMENTS SN74LS11N	U24,47,70,114		
93	203007-350	9	IC-VOLT COMP/BFR	NATIONAL SEMICONDUCTORS LM319N	U27,32,39,44,50,55, 62,74,69		
94	203026-600	4	IC-TTL HEX,INVERTER POS NAND (OPEN COLLECTOR)	TEXAS INSTRUMENTS SN74LS05N	U28,40,51,63		
95	203007-351	9	IC-VOLTAGE COMPARATOR	NATIONAL SEMICONDUCTORS LM311N	U29,30,41,42,52,53, 64,65,77		
96	203130	9	IC-JFET INPUT OP AMPS	TEXAS INSTRUMENTS TL082P	U33,34,45,46,56,57, 66,67,79		
97	203042-001	6	IC-QUAD EXCLUSIVE OR GATE	TEXAS INSTRUMENTS SN74LS86N	U37,60,76,108,109,110		
98	203043-500	9	IC-OP AMP HI PERFORMANCE	TEXAS INSTRUMENTS SN72709P	U80-88		
99	203046-002	1	IC-TTL DUAL VOLTAGE CONTROLLED OSCILLATOR	TEXAS INSTRUMENTS SN74S124N	U89		
ALT	154040-701		HEADER ASSY-VOLTAGE CONTROLLED OSCILLATOR	CIPHER DATA PROD			
100							
101	203026-500	1	IC-HEX INVERTER BFR/DRV	MOTOROLA SEMI. MC7406P	U92		
102	203082-500	6	IC-HEX BUFF/DRIVERS	TEXAS INSTRUMENTS SN7407N	U93-98	09-01-82	L*140
103	203042-800	9	IC-DUAL J-K FLIP-FLOP	TEXAS INSTRUMENTS SN74LS112N	U99-107		
104	203032-501	3	IC-TTL QUAD,2INP,POS-NOR BUFFER,,O/C	TEXAS INSTRUMENTS SN7433	U35,58,,73		
105	203023-001	5	IC-QUAD 2-INP POS-NND GT	TEXAS INSTRUMENTS SN74LS00N	U31,54,68,73,43		
106							
107	203013-300	1	EC-VOLTAGE REGULATOR, -12V,1.5 AMP	MOTOROLA SEMI. MC7912CP	VR1		
108	203013-210	1	IC VOLTAGE REGULATOR	MOTOROLA SEMI. MC7812CP	VR2		
109	209991-002	10	INDUCTOR-2.7UH,+20%	DALE ELECTRONICS,INC. IR-4	L5-14		

QTY GIVEN IS NUMBER OF PARTS OR LENGTH OF MATERIAL IN FEET

ITEM	CIPHER PART #	QTY	DESCRIPTION 1 DESCRIPTION 2	MFG-NAME MFG-PART#	REF-DES	ST-DATE	END-DATE
110	210145	1	HEAT SINK	IERC PA2-1CB	XVR2		
111	205061-004	8	WASHER FLAT FIBRE	SMITH,HERMAN H. 2191			
112	210030-171	4	STANDOFF 1/8 2-56 HEX BR	AMATOM ELECTRONIC HDW 8100-B-0256			
113	213271-405	5	SCREW-PAN HD PHIL, 4-40 X 5/16,CAD,BLK,ZINC	ANY ACCEPTABLE SOURCE			
114	213271-407	3	SCREW-PAN HD,PHIL, 4-40 X 7/16,CAD,BLK,ZINC	ANY ACCEPTABLE SOURCE			
115	213271-409	4	SCREW-PAN HD PHIL, 4-40 X 9/16,CAD,BLK,ZINC	ANY ACCEPTABLE SOURCE			
116	207406-081	6	NUT,HEX,RADIO PAT. #4 4-40	ANY ACCEPTABLE SOURCE NUT #4 CAD.			
117	207408-021	12	WASHER,FLAT,SMALL OD #4	ANY ACCEPTABLE SOURCE			
118	207403-011	12	WASHER,SPLIT LOCK #4	ANY ACCEPTABLE SOURCE WASHER #4 CAD.			
119							
120							
121	210260-003	1	WASHER-LOCK,DISHED TYPE, # 4	SHAKEPROOF 4706-06-01			
122	211000-325	4	SOCKET-TERMINAL	AUGAT LSG-2DG8-1	XC21,XC92		
123	211000-200	1	SOCKET-ASSEMBLY,CRYSTAL	AUGAT 8000-DG1	XY1		
124							
125	209100-552	.15	TUBING TFL 22 GA	ALPHA WIRE CORP. TFT-200/22-NAT	4114*5414		
126							
127	210806-500	1	SWITCH-PUSH BUTTON,NOM	ROOD SWITCH RS5035	S4		

QTY GIVEN IS NUMBER OF PARTS OR LENGTH OF MATERIAL IN FEET

ITEM	CIPHER PART #	QTY	DESCRIPTION 1 DESCRIPTION 2	MFG-NAME MFG-PART#	REF-DES	ST-DATE	END-DATE
128	208500-605	1	WIRE-JUMPER,INSULATED	SQUIRES ELECTRONICS 0.500X0.125PVC22			
129							
130	354040-300	REF	SCHEMATIC-DATA,DUAL MODE	CIPHER DATA PROD			
131	- 134 ARE BLANK.						
135	* (NO SPEED KIT FOR 154040-009)						
136	* * DO NOT INTERMIX TERMINALS ITEM #8 (205012) & ALT PART (205012-001) IN ONE CONNECTOR						
137							
138							
139	*****						
140	203030-417	6	IC-HEX BFR/DRIVER	TEXAS INSTRUMENTS SN7417N	U93-98	L*102	08-31-82

PARTS LIST 154040-608 SPEED KIT-125 IPS

REV B ECO# 4315

09-29-78

(PRINTED: 07-31-80)
5 LINES

PAGE 1
OF 1

ITEM	CIPHER PART #	QTY	DESCRIPTION 1 DESCRIPTION 2	MFG-NAME MFG-PART#	REF-DES	ST-DATE	END-DATE
1	154040-408	5	HEADER ASSY	CIPHER DATA PROD	A1,2,3,4,5		
2	154040-416	5	HEADER ASSY	CIPHER DATA PROD	A6,7,8,9,10		
3	201213-018	1	CAP-CER,1800PF,100V,10%	AVX CERAMICS CK05BX182	C21		
4	201121-561	1	CAP-DM,56PF,500V,5%	SANGAMO CM05FD560J03	C92		
5	210111-512	1	CRYSTAL-QUARTZ,6.400 MHZ	STANDARD CRYSTAL CORP. 815-A-6.400 MHZ	Y1		

PARTS LIST 154004-002 CAPSTAN ASSY

REV C ECO# 7489

05-19-80

(PRINTED: 05-19-80) PAGE 1
8 LINES OF 1

ITEM	CIPHER PART #	QTY	DESCRIPTION 1 DESCRIPTION 2	MFG-NAME MFG-PART#	REF-DES	ST-DATE	END-DATE
1	754004-201	2	SHELL-CAPSTAN	CIPHER DATA PROD			
2	754004-302	1	HUB-CAPSTAN	CIPHER DATA PROD			
3							
4							
5	210201-902	1	RING, TOLERANCE	ROLLER BEARING CO., AMER. AN037025			
6							
7							
8	209990-107	AR	CONTACT CEMENT-FERMABOND	PEARL CHEMICAL CO. 101			

PARTS LIST 154004-001 CAPSTAN ASSY

REV C ECO# 7489

05-19-80

(PRINTED: 05-19-80)
8 LINES

PAGE 1
OF 1

ITEM	CIPHER PART #	QTY	DESCRIPTION 1 DESCRIPTION 2	MFG-NAME MFG-PART#	REF-DES	ST-DATE	END-DATE
1	754004-201	2	SHELL-CAPSTAN	CIPHER DATA PROD			
2	754004-301	1	HUB-CAPSTAN	CIPHER DATA PROD			
3							
4							
5	210201-901	1	RING, TOLERANCE	ROLLER BEARING CO., AMER. AN031025			
6							
7							
8	209990-107	AR	CONTACT CEMENT-PERMA-BOND	PEARL CHEMICAL CO. 101			

ITEM	CIPHER PART #	QTY	DESCRIPTION 1 DESCRIPTION 2	MFG-NAME MFG-PART#	REF-DES	ST-DATE	END-DATE
1	154005-001	1	PWB ASSY-SWITCHES	CIPHER DATA PROD			
2	154011-201	1	SWITCH ASSY-THUMBWHEEL	CIPHER DATA PROD			
3	755018-701	1	WASHER-CORK	CIPHER DATA PROD			
4	799017-201	2	SPRING-BELLEVILLE	CIPHER DATA PROD			
5	755005-101	1	SWITCH PANEL	CIPHER DATA PROD			
6	155018-601	1	SWITCH ASSY-VAC SENSE, DOOR INTERLOCK	CIPHER DATA PROD			
7	754019-701	1	LABEL-SWITCHES	CIPHER DATA PROD			
8	213271-212	1	SCREW-PAN HD PHIL, 2-56 X 3/4,CAD,BLK,ZINC	ANY ACCEPTABLE SOURCE			
9	213151-404	4	SCREW-FL HD PHIL,100, 4-40 X 1/4,CAD,BLK,ZINC	ANY ACCEPTABLE SOURCE			
10	207202-021	1	WASHER,FLAT #2	WASHER, #2 CAD, CARLINGSWITCH INC TA201-T			
11	211051-575	1	SWITCH POWER,ON-NONE-OFF	ESNA 22 NTK-26			
12	207000-065	1	NUT-HEX,LIGHT THIN,2-56	GROOV-PIN			
13	205000-000	1	PIN,GROOV-3/64X3/16	GP1-046X0187-12			
14	210229-523	1	TY-RAP-1/16 TO 5/8	ICO RALLY WRN 3 1/2			

ITEM	CIPHER PART #	QTY	DESCRIPTION 1 DESCRIPTION 2	MFG-NAME MFG-PART#	REF-DES	ST-DATE	END-DATE
1	755001-701	1	DOOR-DUST COVER	UL-BOLERO PLASTICS			
2							
3	731920-900	1	LATCH-DUST DOOR	CIPHER DATA PROD			
4							
5	799003-800	2	HINGE - FLAT 1 X 1	CIPHER DATA PROD			
6							
7	211113-600	7.5	TAPE-FLAME RETARDANT POLYURETHANE	BURNETT & CO. UNIFUAM N 582N			
8							
9	213062-408	2	SCREW-BTN HD SKT, 4-40 X 1/2, BLK ONLY	ANY ACCEPTABLE SOURCE			
10	213062-605	4	SCREW-BTN HD SKT 6-32 X 5/16, BLK ONLY	ANY ACCEPTABLE SOURCE			
11							
12	207408-021	2	WASHER, FLAT, SMALL OD #4	ANY ACCEPTABLE SOURCE			

ITEM	CIPHER PART #	QTY	DESCRIPTION 1 DESCRIPTION 2	MFG-NAME MFG-PART#	REF-DES	ST-DATE	END-DATE
1	755002-701	1	COVER-SIDE COLUMN	CIPHER DATA PROD			
2	755016-101	1	FACADE-COLUMN,SUPPLY	CIPHER DATA PROD			
3	755002-901	1	GLASS-SIDE COLUMN	CIPHER DATA PROD			
4	713005-700	2	HINGE-DUST DOOR	CIPHER DATA PROD			
5							
6	205289-001	3	LATCH - GROMMET *	HARTWELL CORP. HN4G-44-1			
7	205289-002	3	LATCH - PLUNGER *	HARTWELL CORP. HN4P-44-4-1			
8	- 10 ARE BLANK.						
11	213062-404	4	SCREW-BTN HD SKT, 4-40 X 1/4 BLK	4-40X1/4"BLACK			
12	209990-800	AR	ADHESIVE-STRL,SYN RESIN	MINNESOTA MINING 3520 B/A			
ALT	209990-300		ADHESIVE-STRL,MOD EPOXY	MINNESOTA MINING 2216 B/A CLEAR AMBER			
13	209990-072	AR	ADHESIVE-LOCTITE *	LOCTITE 222			
14	210040-096	104	CORD-NEOPRENE,1/16 DIA	ROYAL IND. SEE CAT SHEET			
ALT	210040-095		CORD-NEOPRENE,3/32 DIA	ROYAL IND. SEE CATALOG SHEET			

ITEM	CIPHER PART #	QTY	DESCRIPTION 1 DESCRIPTION 2	MFG-NAME MFG-PART#	REF-DES	ST-DATE	END-DATE
1	755002-601	1	COVER-COLUMN,BOTTOM	CIPHER DATA PROD			
2	755016-601	1	FACADE-COLUMN,TAKEUP	CIPHER DATA PROD			
3	755002-901	1	GLASS-SIDE COLUMN	CIPHER DATA PROD			
4	713005-700	2	HINGE-DUST DOOR	CIPHER DATA PROD			
5							
6	205289-001	3	LATCH - GROMMET *	HARTWELL CORP. HN4G-44-1			
7	205289-002	3	LATCH - PLUNGER *	HARTWELL CORP. HN4P-44-4-1			
8	- 10 ARE BLANK.						
11	213062-404	4	SCREW-BTN HD SKT, 4-40 X 1/4 BLK	4-40X1/4*BLACK			
12	209990-800	AR	ADHESIVE-STRL,SYN RESIN	MINNESOTA MINING 3520 B/A			
ALT	209990-300		ADHESIVE-STRL,MOD EPOXY	MINNESOTA MINING 2216 B/A CLEAR AMBER			
13	209990-0/2	AR	ADHESIVE-LOCTITE *	LOCTITE 222			

ITEM	CIPHER PART #	QTY	DESCRIPTION 1 DESCRIPTION 2	MFG-NAME MFG-PART#	REF-DES	ST-DATE	END-DATE
1	154014-901	1	HINGE BLOCK ASSY	CIPHER DATA PROD			
2							
3	154014-902	1	HINGE BLOCK ASSY	CIPHER DATA PROD			
4	731002-300	1	SAFETY BLOCK, TOP PLATE	CIPHER DATA PROD			
5							
6	213021-112	6	SCREW-BDR HD SLOT, 10-32 X 3/4, CAD, BLK, ZINC	ANY ACCEPTABLE SOURCE			
7	213091-408	1	SCREW-SKT HD CAP 4-40 X 1/2, CAD, BLK, ZINC	ANY ACCEPTABLE SOURCE			
8	210028	2	WASHER, FL, NYL, #10X.062 TK	AMATOM ELECTRONIC HDW 2319-N194			
9	209998-066	1	POLY BAG-3MIL, 3 X 6	RICO PLASTIC 3 X 6			
10	211200-160	1	LABEL-MOUNTING HARDWARE 2" X 3"	ANY ACCEPTABLE SOURCE ORDER BY DESC			

QTY GIVEN IS NUMBER OF PARTS OR LENGTH OF MATERIAL IN FEET

ITEM	CIPHER PART #	QTY	DESCRIPTION 1 DESCRIPTION 2	MFG-NAME MFG-PART#	REF-DES	ST-DATE	END-DATE
1	754072-101	1	PWB-CONTROL/SERVO	CIPHER DATA PROD			
2							
3							
4	154013-901	6	IDCTR ASSY,SERVO FILTER	CIPHER DATA PROD		L1-6	
5	154014-001	1	IDCTR ASSY,P.S. FILTER	CIPHER DATA PROD		L9	
6	154014-002	2	IDCTR ASSY,P.S. FILTER	CIPHER DATA PROD		L7,8	
7	154014-201	2	XFMR ASSY,P.S. FILTER	CIPHER DATA PROD		T2,3	
8	154014-202	1	XFMR ASSY,P.S. FILTER	CIPHER DATA PROD		T1	
9	154014-301	1	XFMR ASSY-SWITCHING RGLTR	CIPHER DATA PROD		T4	
10	799015-501	3	TRANSFORMER-900X SERVO	CIPHER DATA PROD		A1-3	
11							
12	205026	58	TEST POINT .058 DIA PIN	AMP INC. 60802-2		TP1-50,52-59	
13							
14							
15	155033-812	1	SOFTWARE ASSY-920X	CIPHER DATA PROD		U56	
16							
17	731006-800	1	LABEL-ASSY	CIPHER DATA PROD			
18	731501-300	2	RETAINER-P/C CONNECTOR	CIPHER DATA PROD			
19	760003-301	1	STRUT-CONT/SERVO,FMTR	CIPHER DATA PROD			
20	210040-074	4	SPACER-ROUND,1/4 X 5/16, #4	NOT ON FILE 9225A140			
21	754014-401	9	MTC PLATE-COIL	CIPHER DATA PROD			

QTY GIVEN IS NUMBER OF PARTS OR LENGTH OF MATERIAL IN FEET

ITEM	CIPHER PART #	QTY	DESCRIPTION 1 DESCRIPTION 2	MFG-NAME MFG-PART#	REF-DES	ST-DATE	END-DATE
22	754014-501	6	MTG PLATE-COIL	CIPHER DATA PROD			
23	754016-501	1	HEATSINK	CIPHER DATA PROD			
24	754016-701	1	INSULATOR-MYLAR HEATSINK	CIPHER DATA PROD			
25							
26	205133-001	2	CONNECTOR-3 PIN MALE	MOLEX, INC. 09-18-5032		P10,12	
27	205133-002	1	CONNECTOR-3 PIN	MOLEX, INC. 09-18-5031		P29	
28	205133-033	2	CONN WAFER 3 PIN, PC	MOLEX, INC. 09-18-5033		P25,26	
29							
30	205133-037	1	CONN WAFER 3 PIN, PC	MOLEX, INC. 09-18-9037		P27	
31	205133-051	1	CONN WAFER-5 PIN, PC	MOLEX, INC. 09-18-5051		P8	
32	205133-059	2	CONN WAFER-5 PIN, PC	MOLEX, INC. 09-18-5059		P4,5	
33	205133-950	1	CONN, WAFER 5 PIN, PC	MOLEX, INC. 09-18-5950		P30	
34	205133-951	1	CONNECTOR-WAFER 5PIN PC	MOLEX, INC. 09-18-5951		P28	
35	205133-069	1	CONN WAFER 6 PIN, PC	MOLEX, INC. 09-18-5069		P14	
36	205133-094	1	CONN WAFER 9 PIN, PC	MOLEX, INC. 09-18-5094		P3	
37	205068	1	CONNECTOR-12 POSN	MOLEX, INC. 03-09-2121		P7	
38	205012	12	TERMINAL, MALE. 093 DIA., PC	MOLEX, INC. 02-09-2134		P7	
39							
40							
41	201104-501	10	CAP-CER DISC, .05UF, 20V, 5%	CENTRALAB UK20,503		C109-112, 10, 11, 36, 37, 62, 63	

QTY GIVEN IS NUMBER OF PARTS OR LENGTH OF MATERIAL IN FEET

ITEM	CIPHER PART #	QTY	DESCRIPTION 1 DESCRIPTION 2	MFG-NAME MFG-PART#	REF-DES	ST-DATE	END-DATE
42	201105-100	7	CAP-CER DISC,.1UF,100V	MALLORY TA010	C34,35,60,61,28,57,80		
43	201105-101	41	CAP-CER DISK,.1UF,10V	CENTRALAB UK10-104	C13,29-32,39,54-56, 58,65,81-85,103-106, 108,136,138-140,142, 155,170,180,183,184, 196,197,206,208-211, 213,216,193		
44	201105-103	23	CAP-CER DISC,.1UF,25V	SPRAGUE 563CY5SBA250AH104Z	C24,25,50,51,76,77, 107,121,141,181,4-7, 137,177,178,182,204, 205,202,214,215		
ALT	201105-102		CAP-CER DISC,.1UF 25V 20%	CENTRALAB UK25-104	C14-21,40-47,66-73		
45	201104-010	24	CAP,CER,.001UF,50V,10%	CENTRALAB CW15C102K			
46	201105-010	1	CAP-CER,DISK,.01UF,500V	SPRAGUE 5HKS-S10	C156		
47	201121-470	1	CP-DM 47PF 300V 5% *	CORNELL-DUBILIER ELECT. CD15EC470J03	C187		
48	201122-100	8	CAP-DM 100PF 300V 5%	SANGAMO D153E101J0	C12,38,64,120,122, 123,134,173		
49	201122-200	1	CAP-DM 200PF 300V 5%	SANGAMO D153E201J0	C9		
50	201122-470	1	CAP-DM 470PF 300V 5%	SANGAMO D153E471J0	C125		
51	201122-680	1	CAP DM 680PF 300V 5%	SANGAMO D153E681J0	C9		
52	201123-151	1	CAP-DM,1500PF,100V,5%	CORNELL-DUBILIER ELECT. CD7FA152J03	C98		
53	201122-150	2	CAP-DM 150PF 300V 5%	SANGAMO D153E151J0	C94,95		
54	201105-150	1	CAP-CER,.0015UF,600V, +-10%	CF-152	C157		
55							
56							
57	201122-220	2	CAP-DM 220PF 300V 5%	SANGAMO D153E221J0	C117,126		

QTY GIVEN IS NUMBER OF PARTS OR LENGTH OF MATERIAL IN FEET

ITEM	CIPHER PART #	QTY	DESCRIPTION 1 DESCRIPTION 2	MFG-NAME MFG-PART#	REF-DES	ST-DATE	END-DATE
58	201226-205	6	CAPACITOR-MYLAR,2.0UF, 200V,+20%	EL PAC Z1A205X	C26,27,52,53,78,79		
59	201122-270	1	CAP-DM 270PF 300V 5%	SANGAMO D153E271J0	C171		
60	201144-120	2	CAP-PC .012UF 50V 20%	INB BA2-123	C168,119		
61	201149-018	1	CAP-PC,.018UF,50V,5%	EL PAC C5A183J	C192		
62	201148-150	3	CAP-PC .15UF 50V 5%	EL PAC C5A154J	C116,131,147		
63	201148-330	6	CAP-PC .33UF 50V 5%	EL PAC C5A334J	C133,145,146,149,152, 169		
64	201149-022	2	CAP-PC .0022UF 50V 5% 50V 5%	EL PAC C5A222J	C101,102		
65	201149-047	6	CAP-PC .0047UF 50V 5%	EL PAC C5A472J	C99,100,127,143,144, 186		
66	201149-100	3	CAP-PC .01UF 50V 5%	EL PAC C5A103J	C8,97,200		
67	201149-220	4	CAP-PC .022UF 50V 5%	EL PAC C5A223J	C1,2,148,153		
68	201149-390	1	CAP-PC .039UF 50V 5%	NOT ON FILE C5A393J	C128		
69	201149-470	1	CAP-PC .047UF 50V 5%	EL PAC C5A473J	C96		
70	201149-680	2	CAP-PC .068UF 50V 5%	EL PAC C5A683J	C129,130		
71	201149-091	2	CAP-PC,.0091UF,200V,5%	EL PAC C5A912J	C190,191		
72	201148-220	2	CAP-PC .22UF 50V 5%	EL PAC C5A224J	C33,59		
73	201159-022	8	CAP-MYLAR.0022UF 200V 10%	CORNELL-DUBILIER ELECT. WMF2D22	C22,23,48,49,74,75, 150,151		
74	201149-330	2	CAP-PC .033UF 50V 5%	EL PAC C5A333J	C194,195		
75	201140-001	4	CAP-PC,1UF,50V,2%	ELECTRO CUBE, INC. 650B1A105-G	C113,114,115,118		

QTY GIVEN IS NUMBER OF PARTS OR LENGTH OF MATERIAL IN FEET

ITEM	CIPHER PART #	QTY	DESCRIPTION 1 DESCRIPTION 2	MFG-NAME MFG-PART#	REF-DES	ST-DATE	END-DATE
76	-	78	ARE BLANK.				
79							
80							
81	201191-063	6	CAPACITOR-ALUM WITH EPOXY END SEAL,22UFD,6.3V	PANASONIC CO. ECEBOJV220SR	C135,158,166,167,185, 201		
82	201148-470	1	CAP-PC .47UF 50V 5%	EL PAC C5A474J	C132		
83	201161-220	1	CAP-TANT 22UF 15V 10%	NATIONAL COMPONENT IND. CS138D226K	C154		
84	201191-025	7	CAPACITOR-ALUM WITH EPOXY END SEAL,10UFD,25V	PANASONIC CO. ECEBIEV100SR	C161,162,172,174,175, 203,207		
85							
86	201172-101	1	CAP-ELECT,100UF,150V	CORNELL-DUBILIER ELECT. WBR100-150	C159		
87	201173-050	1	CAP-ELECT 500UF 10V A/L	SPRAGUE 39D507G010EJ4	C160		
88	799600-095	2	CAP-ELECT,1000UF,25V (SPEC CONTROL DWG) *	CIPHER DATA PROD -----	C163,164		
89	201173-200	1	CAPACITOR-ELECT,2000UF,10	ELECTRA/MIDLAND CORP 39C10FJ23	C165		
90	-	93	ARE BLANK.				
94	210112	1	CRYSTAL 3.84MHZ	STANDARD CRYSTAL CORP. 817-A-3.840MHZ	Y1		
95							
96	202009	2	DIODE RECTIFIER,1 AMP	MOTOROLA SEMI. 1N4001 THRU 1N4004	CR119,120		
97	202011-744	1	DIODE-ZENER,SILICON	MOTOROLA SEMI. 1N4744	CR105		
98	202013-718	50	DIODE-HOT CARRIER	GENERAL INSTRUMENT OPTO IN5817	CR9-24,37-52,65-80, 109,111	02-01-83	L*312
ALT	202013-819		DIODE-HOT CARRIER	GENERAL INSTRUMENT OPTO IN5818			
99	-	105	ARE BLANK.				

QTY GIVEN IS NUMBER OF PARTS OR LENGTH OF MATERIAL IN FEET

ITEM	CIPHER PART #	QTY	DESCRIPTION 1 DESCRIPTION 2	MFG-NAME MFG-PART#	REF-DES	ST-DATE	END-DATE
106	202018	37	DIODE, SWITCHING	TEXAS INSTRUMENTS IN914	CR1-8,29-36,57-64,94-99,101,102,104,106,108,118		
107	202019	3	DIODE-ZENER, 6.8V	FAIRCHILD IN957B	CR103,107,110		
108	202034	2	DIODE-RECT FAST RECOVERY	MOTOROLA SEMI. MR820	CR116,117		
109	202035	4	RECTIFIER-POWER	MOTOROLA SEMI. MR851	CR112-115		
110	202005-500	12	RECTIFIER-PWR,HI EFF,6A	UNITRODE CORP. UES1302	CR25-28,53-56,81-84		
111	203052-051	1	IC-MULTIPLXR,8 CH	MOTOROLA SEMI. MC14051BCP	U37		
112							
113	203052-053	5	IC-MULTIPLXR,TRIPLE 2 CH	MOTOROLA SEMI. MC14053BCP	U77,57,50,67,68		
114							
115							
116	203007-200	1	IC-OPER.AMPL	NATIONAL SEMICONDUCTORS LM318N	U2		
117	203007-600	1	IC-OPER AMPL/BUFFER	NATIONAL SEMICONDUCTORS LM324N	U27		
118	203007-700	9	IC-VOLTAGE COMPARATOR	NATIONAL SEMICONDUCTORS LN339N	U6,7,13,14,20,21,29,39,95		
119	-	122	ARE BLANK.				
123	203008-741	1	IC OP AMP	NATIONAL SEMICONDUCTORS LM741CN	U1		
124	203012-136	14	IC-QUAD OPER AMPLIFIERS	TEXAS INSTRUMENTS RC4136	U5,12,19,26,30-33,38,46,64-66,76		
125	-	129	ARE BLANK.				
130	203023	1	IC-QUAD 2-INP POS-NAND GT	TEXAS INSTRUMENTS SN7400N	U3		
131	203013-210	2	IC VOLTAGE REGULATOR	MOTOROLA SEMI. MC7812CP	VR1,2		

QTY GIVEN IS NUMBER OF PARTS OR LENGTH OF MATERIAL IN FEET

ITEM	CIPHER PART #	QTY	DESCRIPTION 1 DESCRIPTION 2	MFG-NAME MFG-PART#	REP-DES	ST-DATE	END-DATE
132	203013-300	2	EC-VOLTAGE REGULATOR, -12V,1.5 AMP	MOTOROLA SEMI. MC7912CP	VR3,4		
133							
134	203023-001	1	IC-QUAD 2-INP POS-NND GT	TEXAS INSTRUMENTS SN74LS00N	U83		
135	203046-001	1	IC-RTRIG MNST MLTV	TEXAS INSTRUMENTS SN74LS123N	U98		
136	203024	4	IC-QUAD 2-INP POS-NOR GT	TEXAS INSTRUMENTS IC-SN7402N	U8,15,22,79		
137	203026	1	IC-HEX INVERTER	TEXAS INSTRUMENTS SN7404N	U88		
138	203026-500	1	IC-HEX INVERTER BFR/DRVR	MOTOROLA SEMI. MC7406P	U89		
139	203027	5	IC-QUAD 2-INP POS AND GT	TEXAS INSTRUMENTS SN7408N	U10,17,24,82,99		
140	203027-001	1	IC-QUAD 2-INP POS-AND GT	TEXAS INSTRUMENTS SN74LS08N	U52		
141	203029-003	3	IC-TRIP,3-INPUT AND GATE	TEXAS INSTRUMENTS SN74LS11N	U11,18,25		
142	203035-032	1	IC,QUAD 2 INPUT POSORGATE	TEXAS INSTRUMENTS SN74LS32N	U70		
143	203036	2	IC-QUAD 2-INP POS-NND BFR	TEXAS INSTRUMENTS SN7438N	U41,42		
144	203039-001	4	IC-DUAL-D FLIP-FLOP	TEXAS INSTRUMENTS SN74LS74N	U4,59,78,92		
145	203046-132	1	IC-QUAD, 2 INPUT, POS-NAND-TRIG	TEXAS INSTRUMENTS SN74LS132N	U60		
146	203046-148	2	IC,3-8 LINE DECODER	TEXAS INSTRUMENTS SN74LS138N	U91,93		
147	203046-153	1	IC,4-1 LINE SEL/MLTP	TEXAS INSTRUMENTS SN74LS153N	U80		
148	203051-174	6	IC,HEX D-TYPE FLIP FLOP	TEXAS INSTRUMENTS SN74LS174N	U40,51,58,69,81,90		
149	203051-100	1	IC-QUAD D-TYPE FLIP-FLOP	TEXAS INSTRUMENTS SN74LS175N	U53		
150	203052-253	4	IC,4-1 LINE SEL/MLTP	TEXAS INSTRUMENTS SN74LS253N	U44,55,62,71		

QTY GIVEN IS NUMBER OF PARTS OR LENGTH OF MATERIAL IN FEET

ITEM	CIPHER PART #	QTY	DESCRIPTION 1 DESCRIPTION 2	MFG-NAME MFG-PART#	REF-DES	ST-DATE	END-DATE
151	203085-001	2	IC-SCHM,TRIG INPUT,HEX IV	TEXAS INSTRUMENTS SN74LS14N	U54,61		
152	203123	1	IC-REG PULSE WIDTH MODULA	TEXAS INSTRUMENTS SG3524N	U97		
153	200072-910	1	RES-FC 910 OHM 1/4W 5%	NOT ON FILE RCR07G911JM	R234		
154	203565-102	2	IC-MEMORY MOS RAM 256 X 2	SILICON GENERAL 2111A	U84,85		
155	203555-101	1	IC-CONTROL,MOS	ZILOG Z8430PS	U72		
156	203575-101	1	IC-MICRO PROCESSOR,MOS	ZILOG Z-80 CPU	U86		
157	203039	1	IC-DUAL D-TYPE FLIP-FLOP	TEXAS INSTRUMENTS SN7474N	U87		
158	200074-360	1	RES-FC 36.00K 1/4W 5%	NOT ON FILE RCR07G363JM	R294		
159	200200-101	1	POT-TRIMMING,1K	BURNS INC. 3299X-1-102	R367		
ALT	200200-102		POT-TRIMMING,1K	SPECTROL 64X102T000			
160	200204-200	3	POT 20K CERMET	ELECTRA/MIDLAND CORP ET34P203	R242-244		
161	200205-052	5	POT-TRIMMING, 50K	BURNS INC. 3006P-1-503	R188-191,250		
162	200070-470	14	RES-FC,4.7OHMS,1/4W, 5%	NOT ON FILE RCR07G4R7JM	R37-40,89-92,142-145, 403-404		
163	200071-100	1	RES-FC 10 OHM 1/4W 5%	NOT ON FILE RCR07G100JM	R370		
164	200071-150	2	RES-FC,15 OHMS,1/4,5%	NOT ON FILE RCR07G150JM	R210,408		
165	200071-470	3	RES-FC 47 OHM 1/4W 5%	NOT ON FILE RCR07G470JM	R194,195,409		
166	200073-910	3	RES-FC 9.1K,1/4W 5%	NOT ON FILE RCR07G912JM	R24,459,468		
167	200072-100	1	RES-FC 100 OHM 1/4W 5%	NOT ON FILE RCR07G101JM	R400		

QTY GIVEN IS NUMBER OF PARTS OR LENGTH OF MATERIAL IN FEET

ITEM	CIPHER PART #	QTY	DESCRIPTION 1 DESCRIPTION 2	MFG-NAME MFG-PART#	REF-DES	ST-DATE	END-DATE
168	200072-220	6	RES-FC 220 OHM 1/4W 5%	NOT ON FILE RCR07G221JM	R8,170-173,355		
169	200074-110	1	RES-F 11.00K 1/4W 5%	NOT ON FILE RCR07G113JM	R77		
170	200072-330	14	RES-FC 330 OHM 1/4W 5%	NOT ON FILE RCR07G331JM	R21,22,26,27,71,72, 78,87,123,124,130, 140,353,356		
171	200072-470	2	RES-FC 470 OHM 1/4W 5%	NOT ON FILE RCR07G471JM	R6,7		
172	200072-560	24	RES-FC 560 OHM 1/4W 5%	NOT ON FILE RCR07G561JM	R20-36,79-86,131-134, 136-139		
173	200072-680	2	RES-FC 680 OHM 1/4W 5%	NOT ON FILE RCR07G681JM	R351,352		
174	200072-750	2	RES-FC 750 OHM 1/4W 5%	NOT ON FILE RCR07G751JM	R357,358		
175	200072-430	2	RES-FC 430 OHM 1/4W 5%	NOT ON FILE RCR07G431JM	R347,348		
176	200122-750	1	RES-WW,750 OHMS,3.75W,5%	DALE ELEC. INC. CW-2B .1-9K	R379		
177	200073-820	1	RES-FC 8.20K 1/4W 5%	NOT ON FILE RCR07G822JM	R470		
178	200073-220	1	RES FC 2.20K 1/4W 5%	NOT ON FILE RCR07G222JM	R385		
179	200073-680	2	RES-FC 6.80 1/4W 5%	NOT ON FILE RCR07G682JM	R380,462		
180	200073-100	9	RES-FC 1.00K 1/4W 5%	NOT ON FILE RCR07G102JM	R1,270,384,391,402, 406,426,484,485		
181	200073-110	3	RES-FC 1.10K 1/4W 5%	NOT ON FILE RCR07G112JM	R28,88,141		
182							
183	200073-150	7	RES-FC 1.50K 1/4W 5%	NOT ON FILE RCR07G152JM	R196-199,342,343,397		
184	200073-180	1	RES-FC 1.80K 1/4 5%	NOT ON FILE RCR07G182JM	R211		
185	200073-200	7	RES-FC 2K 1/4W 5%	NOT ON FILE RCR07G202JM	R2,292,328,334,399, 427,436		

QTY GIVEN IS NUMBER OF PARTS OR LENGTH OF MATERIAL IN FEET

ITEM	CIPHER PART #	QTY	DESCRIPTION 1 DESCRIPTION 2	MFG-NAME MFG-PART#	REF-DES	ST-DATE	END-DATE
186	200073-240	5	RES FC 2.40K 1/4W 5%	NOT ON FILE RCR07G242JM	R271,272,338,428,429		
187	200073-300	2	RES-FC 3.00K 1/4W 5%	NOT ON FILE RCR07G302JM	R3,4		
188	200073-270	1	RES-FC 2.70K 1/4W 5%	NOT ON FILE RCR07G272JM	R377		
189							
190	200073-430	6	RES-FC 4.30K 1/4W 5%	NOT ON FILE RCR07G432JM	R291,293,327,329,332, 335		
191	200073-470	21	RES-FC 4.70K 1/4W 5%	NOT ON FILE RCR07G472JM	R9,18,20,25,73-75, 125-127,178,192,193, 260,266,278,339,378, 398,433,438		
192	200073-510	3	RES-FC 5.10K 1/4W 5%	NOT ON FILE RCR07G512JM	R301,304,461		
193	200073-750	6	RES FC 7.50K 1/4W 5%	NOT ON FILE RCR07G752JM	R17,19,69,70,121,122		
194	200074-390	1	RES-FC 39.00K 1/4W 5%	NOT ON FILE RCR07G393JM	R434		
195	200074-100	28	RES-FC 10.00K 1/4W 5%	NOT ON FILE RCR07G103JM	R11,16,181,233,262, 265,267,269,298,300, 302,359,360,362,365, 366,369,374,375,376, 330,392,407,331,437, 425,303,289		
196	200074-120	5	RES-FC 12.00K 1/4W 5%	NOT ON FILE RCR07G123JM	R129,232,346,349,354		
197	200074-150	14	RES-FC 15.00K 1/4W 5%	NOT ON FILE RCR07G153JM	R176,200,201,206,207, 218,273,275,295,280, 413-415,432		
198	200074-180	7	RES-FC 18.00K 1/4W 5%	NOT ON FILE RCR07G183JM	R471,473,474,475,477, 478,479		

QTY GIVEN IS NUMBER OF PARTS OR LENGTH OF MATERIAL IN FEET

ITEM	CIPHER PART #	QTY	DESCRIPTION 1 DESCRIPTION 2	MFG-NAME MFG-PART#	REF-DES	ST-DATE	END-DATE
199	200074-200	30	RES-FC 20.00K 1/4W 5%	NOT ON FILE RCR07G203JM	R67,68,119,120,202, 204,208,209,212,213, 246,247,263,455,456, 445,447,446,453,452, 457,442,440,451,450, 454,449,448,444,464		
200	200074-220	12	RES-FC 22.00K 1/4W 5%	NOT ON FILE RCR07G223JM	R245,252,253,255,256, 258,264,268,283,285, 286,364		
201	200074-270	5	RES-FC 27.00K 1/4W 5%	NOT ON FILE RCR07G273JM	R274,284,463,465,469		
202	200074-330	8	RES-FC 33.00K 1/4W 5%	NOT ON FILE RCR07G333JM	R288,309,311,319,322, 393,476,472		
203	200074-560	2	RES-FC 56.00K 1/4W 5%	NOT ON FILE RCR07G563JM	R467,460		
204	200074-430	2	RES-FC 43.00K 1/4W 5%	NOT ON FILE RCR07G433JM	R254,257		
205	200074-470	4	RES-FC 47.00K 1/4W 5%	NOT ON FILE RCR07G473JM	R5,10,231,279		
206	200074-510	2	RES FC 51.00K 1/4W 5%	NOT ON FILE RCR07G513JM	R287,481		
207	200074-680	3	RES-FC 68.00K 1/4W 5%	NOT ON FILE RCR07G683JM	R58,110,314		
208	200074-750	7	RES-FC 75.0K 1/4W 5%	NOT ON FILE RCR07G753JM	R57,109,310,317,320, 321,390		
209	200015-121	1	RES-FF,121K,1/8W,1% MIL-R-10509 STYLE	R-OHM RN55D1213F	R226		
210	200075-100	6	RES-FC 100.00K 1/4W 5%	NOT ON FILE RCR07G104JM	R177,313,318,340,363, 372		
211	200076-150	2	RES-FC 1.50MEG 1/4W 5%	NOT ON FILE RCR07G155JM	R430,431		
212	200075-150	1	RES-FC 150.00K 1/4W 5%	NOT ON FILE RCR07G154JM	R312		
213	200075-200	1	RES-FC 200.00K 1/4W 5%	NOT ON FILE RCR07G204JM	R373		
214	200075-220	7	RES FC 220.00K 1/4W 5%	NOT ON FILE RCR07G224JM	R235,296,297,299,305, 315,316		

QTY GIVEN IS NUMBER OF PARTS OR LENGTH OF MATERIAL IN FEET

ITEM	CIPHER PART #	QTY	DESCRIPTION 1 DESCRIPTION 2	MFG-NAME MFG-PART#	REF-DES	ST-DATE	END-DATE
215	200015-174	1	RES-FF,174K,1/8W,1% MIL-R-10509 STYLE	R-OHM RN55D1743F	R214		
216	200075-270	2	RES-FC 270.00K 1/4W 5%	NOT ON FILE RCR07G274JM	R411,412		
217	200075-330	2	RES-FC 330.00K 1/4W 5%	NOT ON FILE RCR07G334JM	R251,480		
218	200075-470	4	RES-FC 470.00K 1/4W 5%	NOT ON FILE RCR07G474JM	R281,282,323,324		
219	200075-390	1	RS-FC 390.00K 1/4W 5%	NOT ON FILE RCR07G394JM	R277		
220	200075-680	1	RES-FC 680.00K 1/4W 5%	NOT ON FILE RCR07G684JM	R341		
221	200075-750	2	RES-FC 750.00K 1/4W 5%	NOT ON FILE RCR07G754JM	R56,108		
222	200014-715	1	RES-FF,71.5K,1/8W,1% MIL-R-10509 STYLE	R-OHM RN55D7152F	R215		
223	200076-220	3	RES-FC 2.20MEG 1/4W 5%	NOT ON FILE RCR07G225JM	R205,259,203		
224	200013-196	1	RES-FF,1.96K,1/8W,1% MIL-R-10509 STYLE	R-OHM RN55D1961F	R422		
225	200076-470	5	RES-FC 4.70MEG 1/4W 5%	NOT ON FILE RCR07G475JM	R23,128,182,183,76		
226	200077-200	2	RES-FC,20M,1/4W,5%	NOT ON FILE RCR07G206JM	R308,325		
227	200073-390	2	RES-FC 3.90K 1/4W 5%	NOT ON FILE RCR07G392JM	R458,466		
228	200013-301	1	RES-FF,3.01K,1/8W,1% MIL-R-10509 STYLE	R-OHM RN55D3011F	R387		
229	200013-681	1	RES-FF,6.81K,1/8W,1% MIL-R-10509 STYLE	R-OHM RN55D6811F	R371		
230	200013-806	1	RES-FF,8.06K,1/8W,1% MIL-R-10509 STYLE	R-OHM RN55D8061F	R368		
231	200014-909	1	RES-FF,90.9K,1/8W,1% MIL-R-10509 STYLE	R-OHM RN55D9092F	R386		
232	200013-221	2	RES-FF,2.21K,1/8W,1% MIL-R-10509 STYLE	R-OHM RN55D2211F	R240,241		

QTY GIVEN IS NUMBER OF PARTS OR LENGTH OF MATERIAL IN FEET

ITEM	CIPHER PART #	QTY	DESCRIPTION 1 DESCRIPTION 2	MFG-NAME MFG-PART#	REF-DES	ST-DATE	END-DATE
233	200013-249	3	RES-FF,2.49K,1/8W,1X MIL-R-10509 STYLE	R-OHM RN55D2491F	R237,238,239		
234	200013-499	1	RES-FF,4.99K,1/8W,1X MIL-R-10509 STYLE	R-OHM RN55D4991F	R337		
235	200014-100	21	RES-FF,10.0K,1/8W,1X MIL-R-10509 STYLE	R-OHM RN55D1002F	R14,15,61-64,113-116, 179,184,185,219,220, 222,336,388,290,180, 221 R248		
236	200014-127	1	RES-FF,12.7K,1/8W,1X MIL-R-10509 STYLE	R-OHM RN55D1272F			
237	200014-200	2	RES-FF,20.0K,1/8W,1X MIL-R-10509 STYLE	R-OHM RN55D2002F	R217,229		
238	200014-301	5	RES-FF,30.1K,1/8W,1X MIL-R-10509 STYLE	R-OHM RN55D3012F	R186,187,228,420,421		
239	200014-536	6	RES-FF,53.6K,1/8W,1X MIL-R-10509 STYLE	R-OHM RN55D5362F	R12,13,59,60,111,112		
240	200015-100	4	RES-FF,100K,1/8W,1X MIL-R-10509 STYLE	R-OHM RN55D1003F	R65,66,117,118		
241	200015-150	2	RES-FF,150K,1/8W,1X MIL-R-10509 STYLE	R-OHM RN55D1503F	R307,435		
242	200014-309	1	RES-FF,30.9K,1/8W,1X MIL-R-10509 STYLE	R-OHM RN55D3092F	R230		
243	200082-390	2	RES-FC,390 OHM,1/2W,5Z	NOT ON FILE RCR20G391JM	R382,383		
244	200080-270	2	RES-FC,2.7 OHMS,1/2W, 5Z	NOT ON FILE RCR20G2R7JM	R344,345		
245	200080-330	24	RES-FC,3.30HMS,1/2W,5Z	NOT ON FILE RCR20G3R3JM	R41-43,45,46,49,50, 52,93-95,97,98,101, 102,104,146-148,150, 151,154,157,155		
246	200081-100	14	RES-FC,10 OHMS,1/2W,5Z	NOT ON FILE RCR20G100JM	R44,47,48,51,96,99, 100,103,149,152,153, 156,487,488		
247	200082-560	2	RES-FC 560 OHM 1/2W 5Z	NOT ON FILE RCR20G561JM	R381,401		
248	200084-100	1	RES-FC 10.00K 1/2W 5Z	NOT ON FILE RCR20G103JM	R389		

QTY GIVEN IS NUMBER OF PARTS OR LENGTH OF MATERIAL IN FEET

ITEM	CIPHER PART #	QTY	DESCRIPTION 1 DESCRIPTION 2	MFG-NAME MFG-PART#	REF-DES	ST-DATE	END-DATE
249	200128-100	7	RES-WW,.100HM,3.75W,5%	DALE ELEC. INC. CW-2B .1-9K	R54,55,106,107,159, 160,405		
250	200014-806	4	RES-FF,80.6K,1/8W,1% MIL-R-10509 STYLE	R-OHM RN55D8062F	R216,224,225,227		
251	200014-332	4	RES-FF,33.2K,1/8W,1% MIL-R-10509 STYLE	R-OHM RN55D3322F	R174,175,223,236		
252	205255-500	1	RESISTOR NETWORK-220/330	BECKMAN INSTRUMENTS,INC. 898-5-R220/330	U43		
253	205253	3	RESISTOR NETWORK-560 OHM	BECKMAN INSTRUMENTS,INC. 899-1-R560	U9,16,23		
254	200015-301	1	RES-FF,301K,1/8W,1% MIL-R-10509 STYLE	R-OHM RN55D3013F	R306		
255							
256	211015-001	1	SWITCH-DIP,4POS,SEALED	AMP INC. 3-435668-4	S1		
257	211011-016	1	SOCKET,16 PIN LOW PROFILE	AUGAT 216-AG39D	XU43		
258	200080-100	1	RES-FC,1.0 OHMS,1/2,5%	ANY ACCEPTABLE SOURCE RCR20G1R0JM	R486		
259	211011-024	1	SOCKET,24 PIN LOW PROFILE	AUGAT 224-AG39D	XU56		
260	211011-028	1	SOCKET,28 PIN LOW PROFILE	AUGAT 228-AG39D	XU72		
261	211011-040	1	SOCKET,40 PIN LOW PROFILE	AUGAT 240-AG39D	XU86		
262							
263	204027-014	24	TRANS-CORE DRVRS,NPN	TEXAS INSTRUMENTS 2N4014	Q1-8,13-20,25-32		
264	799603-100	4	TRANSISTOR-NPN,SILICON, SELECTED	CIPHER DATA PROD	Q39,40,42,43		
265	204017-950	1	TRANSISTOR,NPN-GENERAL PURPOSE	MOTOROLA SEMI. MPS2222	Q58		
266	204012	2	TRANSISTOR,PNP SILICON	TEXAS INSTRUMENTS 2N3702	Q50,61		
267	204013	6	TRANSISTOR, NPN SILICON	TEXAS INSTRUMENTS 2N3704	Q37,38,41,49,59,60		

QTY GIVEN IS NUMBER OF PARTS OR LENGTH OF MATERIAL IN FEET

ITEM	CIPHER PART #	QTY	DESCRIPTION 1 DESCRIPTION 2	MFG-NAME MFG-PART#	REF-DES	ST-DATE	END-DATE
268	204016-913	2	TRANSISTOR,NPN SILICON	NATIONAL SEMICONDUCTORS 2N4013	Q54,55		
269	204027-034	4	TRANSISTOR P-N-P SILICON	MOTOROLA SEMI. 2N6034	Q45,48,52,53		
270	204027-037	3	TRANSISTOR N-P-N SILICON	MOTOROLA SEMI. 2N6037	Q46,47,51		
271	204028-500	12	TRANSISTOR-NPN,SILICON	MOTOROLA SEMI. 2N6338	Q9-12,21-24,33-36		
272	199650-201	1	TRANSISTORS-MATCHED	CIPHER DATA PROD	Q56,57		
273							
274	209990-074	AR	ADHESIVE,NUT LOCK	LOCTITE 242			
275							
276							
277	213271-407	1	SCREW-PAN HD,PHIL, 4-40 X 7/16,CAD,BLK,ZINC	ANY ACCEPTABLE SOURCE			
278	213271-409	6	SCREW-PAN HD PHIL, 4-40 X 9/16,CAD,BLK,ZINC	ANY ACCEPTABLE SOURCE			
279	213271-607	4	SCREW-PAN HD PHIL, 6-32 X 7/16,CAD,BLK,ZINC	ANY ACCEPTABLE SOURCE			
280	213271-608	28	SCREW-PAN HD PHIL 6-32 X 1/2,CAD,BLK,ZINC	ANY ACCEPTABLE SOURCE			
281	213271-616	3	SCREW-PAN HD PHIL, 6-32 X 1,CAD,BLK,ZINC	ANY ACCEPTABLE SOURCE			
282	213274-132	3	SCREW-PAN HD PHIL CAD OR ZINC 10-32X2	ANY ACCEPTABLE SOURCE			
283	207102-051	3	NUT,HEX-LG PAT 10-32	ANY ACCEPTABLE SOURCE NUT #10 CAD.			
284	210168	2	LUG,SOLDER #6	SMITH,HERMAN H. 1416-6			
285	207104-021	6	WASHER, FLAT,#10	ANY ACCEPTABLE SOURCE WASHER #10 CAD.			
286	207403-011	6	WASHER,SPLIT LOCK #4	ANY ACCEPTABLE SOURCE WASHER #4 CAD.			
287	207406-081	3	NUT,HEX,RADIO PAT. #4 4-40	ANY ACCEPTABLE SOURCE NUT #4 CAD.			

QTY GIVEN IS NUMBER OF PARTS OR LENGTH OF MATERIAL IN FEET

ITEM	CIPHER PART #	QTY	DESCRIPTION 1 DESCRIPTION 2	MFG-NAME MFG-PART#	REF-DES	ST-DATE	END-DATE	
288	207408-021	7	WASHER,FLAT,SMALL OD #4	ANY ACCEPTABLE SOURCE				
289	207602-011	35	WASHER,SPLIT LOCK #6	ANY ACCEPTABLE SOURCE				
290	207604-081	35	NUT-HEX RADIO PATTERN 6-32	WASHER #6 CAD. ANY ACCEPTABLE SOURCE				
291	207608-021	38	WASHER,FLAT,SMALL OD #6	NUT #6 CAD. ANY ACCEPTABLE SOURCE				
292	210875-401	14	INSULATOR-THERMALLY CONDUCTIVE (T0-3)	WASHER #6 CAD. BERQUIST		05-01-83	L*307	
293	210613-050	5	INSULATOR-MYLAR	7403-09FR-05 THERMALLOY CO				
294	213700-609	33	WASHER-FLAT,NYLON,SM PAT 5610-46-62	43-77-2 SEASTROM				
295				5610-46-62				
296								
297	208430-907	17	WIRE-SOL 30AWG KYNAR 7"	SONIC WIRE SALES				
298	210408-016	.5	TUBING-HEAT SHRINK, 1/4,BLK	KN-30-130-6-7" ICD RALLY				
299	208500-298	.8	WIRE BUS TND COPPER 22AWG	HIX-1/4 UL ALPHA WIRE CORP.				
300	209100-552	.8	TUBING TFL 22 GA	298 ALPHA WIRE CORP.				
301	213274-128	1	SCREW-PAN HD PHIL 10-32 X 1-3/4	TFT-200/22-NAT ANY ACCEPTABLE SOURCE				
302	210260-003	1	WASHER-LOCK,DISHED TYPE, # 4	SHAKEPROOF 4706-06-01				
303								
304	211000-325	4	SOCKET-TERMINAL	AUGAT				
305	355072-300	REF	SCHEM-PWB,CONTROL-SERVO	LSG-2DGB-1 CIPHER DATA PROD			XR424,423	
306	*****							
307	210613	14	INSULATOR,MYLAR-T03	THERMALLOY CO 43-03-2			L*292 04-30-83	

PARTS LIST 155072-001 PWB ASSY-CONTROL/SERVO

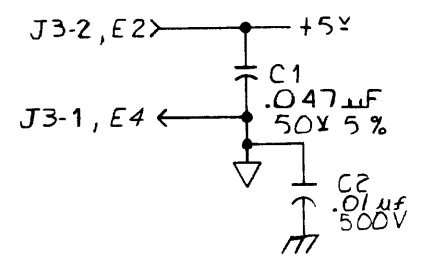
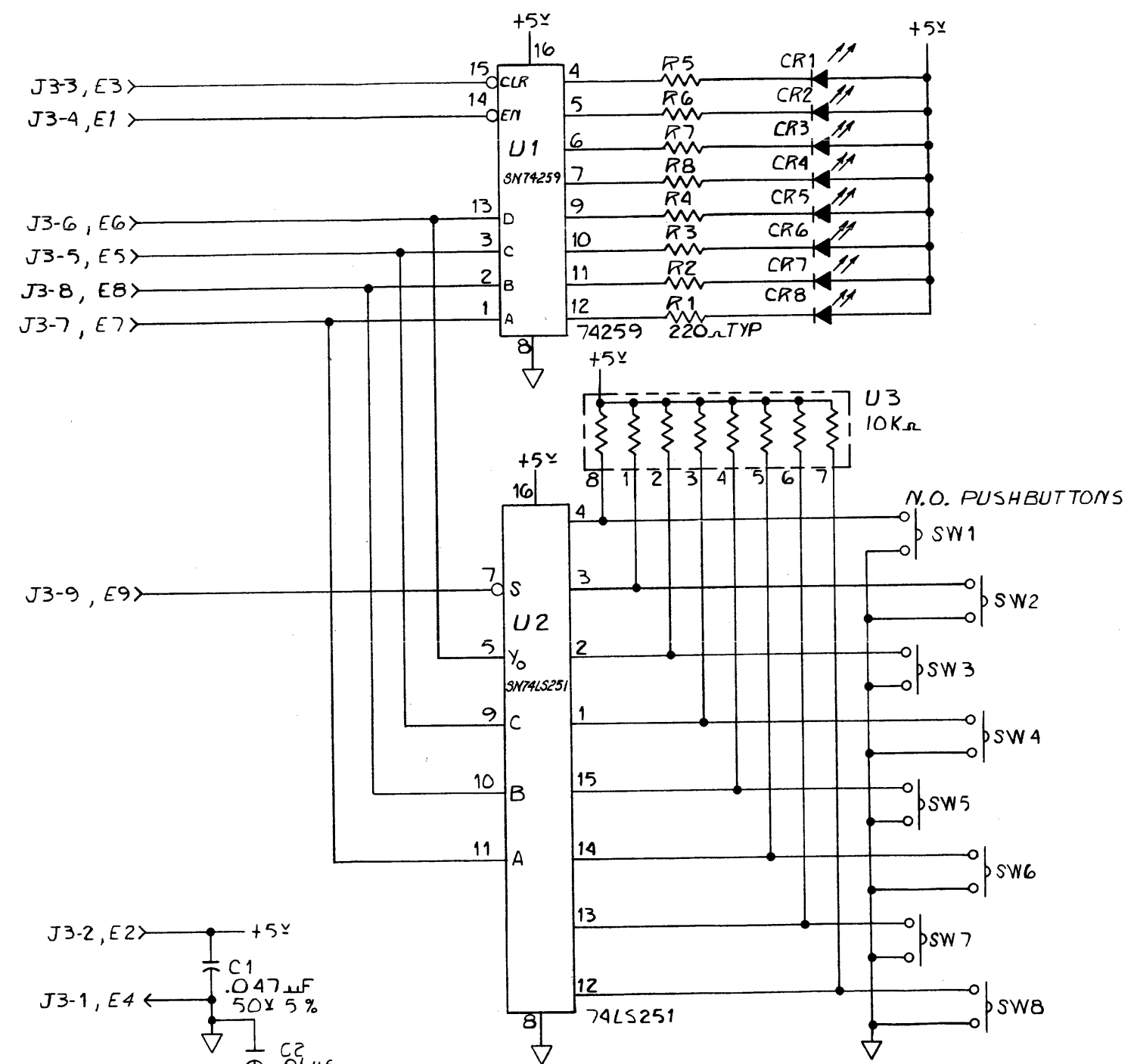
REV N ECO# 14667 12-07-82

(PRINTED: 12-08-82) PAGE 17
313 LINES

QTY GIVEN IS NUMBER OF PARTS OR LENGTH OF MATERIAL IN FEET

ITEM	CIPHER PART #	QTY	DESCRIPTION 1 DESCRIPTION 2	MFG-NAME MFG-PART#	REF-DES	ST-DATE	END-DATE
308	-		311 ARE BLANK.				
312	202013-717	50	DIODE-HOT CARRIER	MOTOROLA SEMI. 1N5817	CR9-24,37-52,65-80, 109,111	L*98	01-31-83
ALT	202013-818		DIODE-HOT CARRIER RECTIFIER,30V,1A	MOTOROLA SEMI. 1N5818			
313							

REVISION					
LTR	DESCRIPTION	DWN	DATE	APVD	DATE
A	ENG RELEASE	KEEL	1/29/78		3-17-78
B	INCORP. ECO 3708	DAS	5-12-78		5-27-78
C	INCORP. ECO 5668	LJ	9-24-78		5-22-79

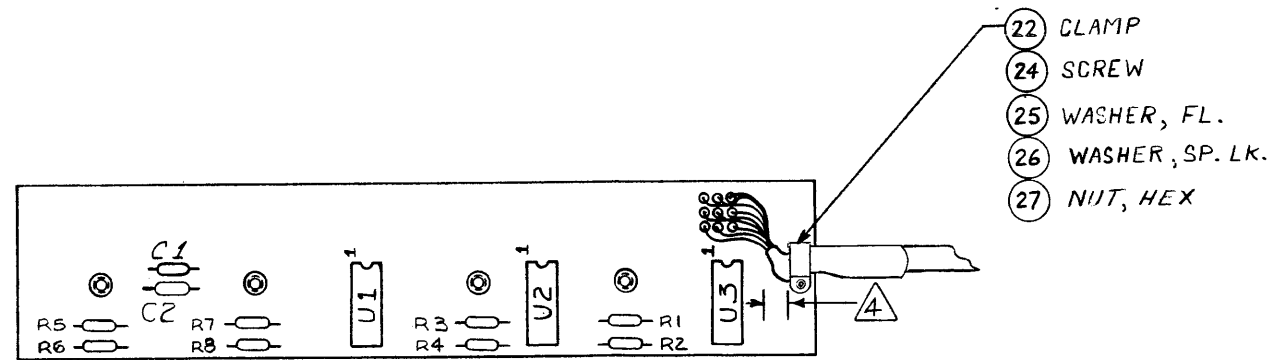
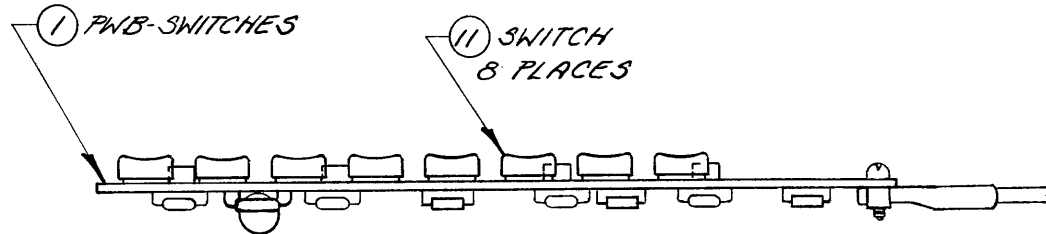
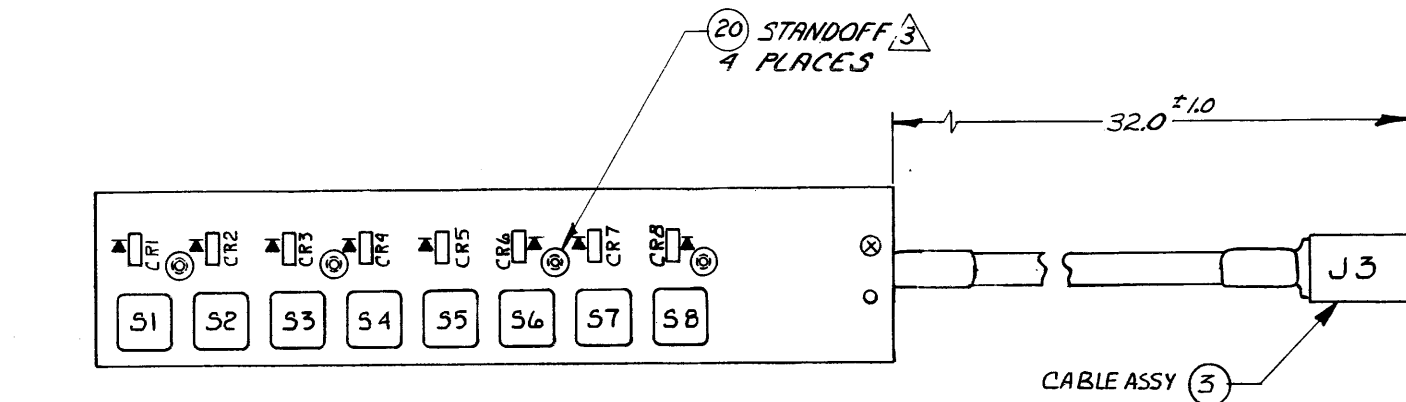


354005-301
REV C

1. SCHEM. FOR ASSY 154005-001
NOTES:

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS DECIMALS ANGLES ± 5 .XX ± .5 ± 5		CONTRACT NO.		CIPHER SAN DIEGO CALIF.	
APPROVALS		DATE		TITLE	
DWN KEEL		1/29/78		SCHEMATIC-PWB SWITCHES	
CHK		3-17-78			
MFG ENG		3-17-78			
QC		3-17-78			
CPG ENG		3-17-78			
PROJ REL		3-18-78			
DO NOT SCALE DRAWING	SCALE NONE	SIZE C	CODE IDENT NO. 32274	DRAWING NO. 354005-301	REV C
			900X	SHEET 1 OF 1	

REVISION					
LTR	DESCRIPTION	DWN	DATE	APVD	DATE
A	ENGR REL	DS	3-16-78		3-17-78
B	INCCORP ECO 3673	CW	5-5-78		5-15-78
C	INCCORP ECO 3707	CW	5-5-78		5-15-78
D	INCCORP ECO 3720	CW	5-5-78		5-15-78
E	INCCORP ECO 3957	JW	7-10-78		7-10-78
F	INCCORP ECO 5666	LJ	7-21-78		5-22-79
G	INC. ECO 5978	CW	7-15-78		7-18-79
H	INCCORP ECO 6273	RL	9-13-78		10-9-79
J	INCCORP ECO 6355	RL	9-20-78		11-9-79
K	INCCORP ECO 6835	RL	1-22-79		1-17-80
L	INCCORP ECO 6974	LJ	1-22-79		3-17-80
M	INCCORP ECO 10054	LJ	5-14-80		5-20-80
N	INCCORP ECO 10359	EC	7-21-80		8-4-81
P	INCCORP ECO 10490	EC	7-21-80		8-4-81
R	INCCORP ECO 11867	UA	1-27-82		2-24-82
S	INCCORP ECO 12246	UA	7-19-82		7-22-82



WIRE TABLE

PWB	COLOR	J3
E4	SHIELD	1
E2	RED	2
E6	BRN	6
E7	WHT	7
E9	BLK	9
E3	WHT/BLK	3
E1	BLUE	4
E5	DRG	5
E8	RED/BLK	8

159005-001
REV S

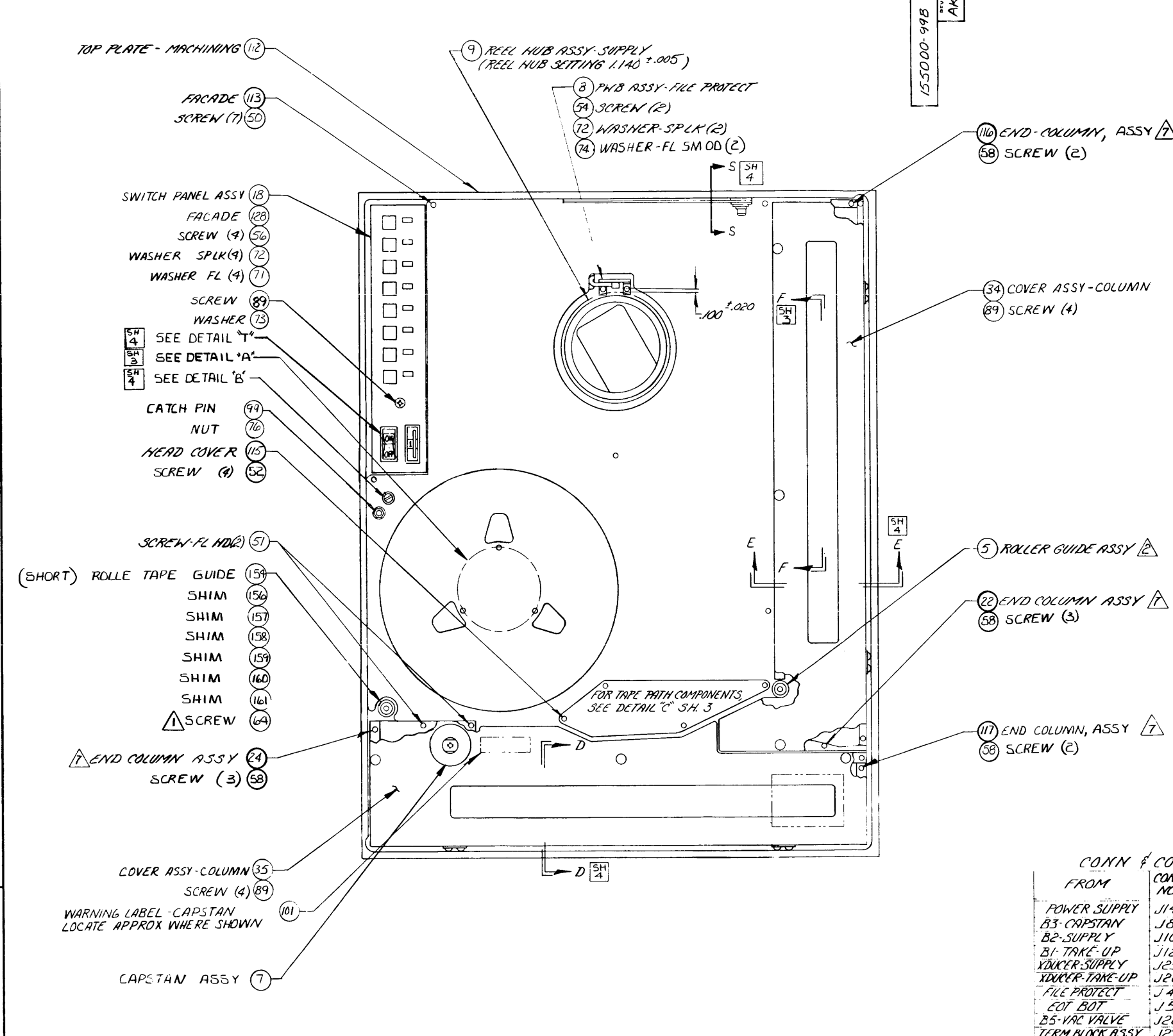
"All information contained in or disclosed by this document is considered CONFIDENTIAL and PROPRIETARY by Cipher Data Products, Inc. By accepting this material the recipient agrees that this material and the information contained therein is held in confidence and in trust and will not be used, reproduced in whole or in part, nor its contents revealed to others, except to meet the purpose for which it was delivered. It is understood that no right is conveyed to reproduce or have reproduced any item herein disclosed without express permission from Cipher Data Products, Inc."

- 4 INSTALL CABLE WITH SHRINK TUBING 1/4" THRU CLAMP.
- 3 INSTALL STANDOFF BEFORE ALL OTHER OPERATIONS OF ASSY
2. LED PIN ORIENTATION SHORT LEAD
1. FOR SCHEMATIC SEE DWG 354005-301
- NOTES:

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS DECIMALS ANGLES ± .005 ± .005 ± .005		CONTRACT NO.		CIPHER Data Products SAN DIEGO CALIF	
APPROVALS		DATE		TITLE	
DWN	<i>[Signature]</i>	2-10-78		PWB ASSY SWITCHES	
CHK	<i>[Signature]</i>	3-16-78			
MFG ENG	<i>[Signature]</i>	3-17-78			
QC ENG	<i>[Signature]</i>	3-17-78			
COG ENG	<i>[Signature]</i>	3-16-78			
PROD REL	<i>[Signature]</i>	3-18-78			
DO NOT SCALE DRAWING	SCALE FULL	SIZE C	CODE IDENT NO. 32274	DRAWING NO. 159005-001	REV S
		900X	SHEET 1 OF 1		

8 7 6 5 4 3 2 1

		REVISION			
LTR	DESCRIPTION	OWN	DATE	APVD	DATE
Z	INCCORP ECO 12035	UA	1/26/82	X	1-25-82
AA	INCCORP ECO 12393	UA	1/26/82	X	1-25-82
AB	INCCORP ECO 12425	UA	3/11/82	X	3-23-82
AC	INCCORP ECO 13160	UA	7/28/82	X	8-3-82
AD	INCCORP ECO 12894	UA	7/28/82	X	8-3-82
AE	INCCORP ECO 13610	UA	7/28/82	X	8-3-82
AF	INCCORP ECO 13878	UA	7/28/82	X	8-3-82
AG	INCCORP ECO 14130	UA	7/28/82	X	8-3-82
AH	INCCORP ECO 14111	UA	7/28/82	X	8-3-82
AI	INCCORP ECO 15229	UA	7/1/83	X	2-7-83
AK	INCCORP ECO 15094	UA	7/1/83	X	2-7-83
A	ENGR - RELEASE	JS	11/14	AK	11/14
B	INCCORP ECO 7123	LS	8-25	X	8-25
C	INCCORP ECO 7331	LS	9-16	X	9-21
D	INCCORP ECO 7839	LJ	7-29	X	7-25
E	INCCORP ECO 8048	LS	8-23	X	10-7
F	INCCORP ECO 8198	LS	9-18	X	10-7
G	INCCORP ECO 8249	LS	9-18	X	10-7
H	INCCORP ECO 8269	LS	10-13	X	10-13
J	INCCORP ECO 8335	LS	11-23	X	10-13
K	INCCORP ECO 8388	LS	10-13	X	10-13
L	INCCORP ECO 8396	LS	10-13	X	10-13
M	INCCORP ECO 8512	LS	11-5	X	11-7
N	INCCORP ECO 8564	LS	11-5	X	11-7
P	INCCORP ECO 8857	LS	11-20	X	12-13
R	INCCORP ECO 8924	LS	1-26	X	1-27
S	INCCORP ECO 9375	LS	2-3	X	2-1
T	INCCORP ECO 9439	LS	2-17	X	2-1
U	INCCORP ECO 9396	LS	3-5	X	2-10
V	INCCORP ECO 11318	EC	7/1/80	X	7-1
W	INCCORP ECO 11510	EC	7/26/81	X	7-1
Y	INCCORP ECO 11925	EC	7/26/81	X	7-1



- NOTES:
- APPLY SCREMLC LOCTITE, ITEM 79 AT INSTALLATION.
 - REMOVE NUT & SHIM, ITEMS 8 & 18 OF ASSY 154002-303 AND SCREW ROLLER GUIDE TO TOP PLATE.
 - DUST DOOR REMOVED FOR CLARITY.
 - ITEMS NOT SHOWN: ITEM 11 - RACK MTG HDWR PKG, ITEM 109 - SHIPPING FRAME & ITEMS 47, 68, 69 - QTY 4 EA SHIPPING HARDWARE.
 - CLEARANCE BETWEEN SENSOR & TAPE - .350 ± .020.
 - CENTER PUMP BETWEEN REEL MOTORS. PRESS PUMP ASSY DOWN TO COMPRESS GASKET APPROXIMATELY 50% TO ELIMINATE AIR LEAKS.
 - .504 MAX DIM. FROM FLOOR TO TOP OF RAILS AFTER ASSY.
 - APPLY .03 DIA BEAD (APPROX) OF RTV (ITEM 83) TO CORNERS INDICATED.
 - LOCATE & FASTEN TY-RAPS - 1 EVERY 4 INCHES AS REQD.
 - HOOK UP BLU & WHT WIRE FROM J27 PART OF 155005-001.
 - PRESS IN DIRECTION OF ARROW FAR AS POSSIBLE, THEN TIGHTEN SCREW(S).
 - CLEAN MATING SURFACES OF GASKET & TOP PLATE WITH INHIBISOL. WHEN THOROUGHLY CLEAN, APPLY CONTACT CEMENT (ITEM 80) TO BOTH SURFACES. (TOP PLATE & GASKET). ALLOW CURLING TIME. THEN INSTALL GASKET TO TOP PLATE.
 - APPLY RTV BETWEEN COVER & TOP PLATE TO EFFECT AN AIR-TIGHT SEAL.
 - SEE SCHEMATIC DIAGRAM 354000-99B FOR POWER DISTRIBUTION.
 - GLUE ITEM 127 USING LOCTITE ITEM 79 AT INSTALLATION. LOCTITE MUST NOT SMEAR OUT FROM EDGES.
 - REMOVE RETAINING NUT & SHIM BEFORE ASSY, REF DWG 154058-303.
 - APPLY SCREMLC, ITEM 94 AT INSTALLATION. SET SCREW IS TO BE BOTTOMED OUT IN THREADS OF TOP PLATE.

CONN & COLOR CODE TABLE

FROM	CONN NO.	CONN COLOR	TO PWB CONN	CONN COLOR
POWER SUPPLY	J14	YEL	P14 C15	YEL
B3-CAPSTAN	J8	RED	P8 C15	RED
B2-SUPPLY	J10	BLK	P10 C15	BLK
B1-TAKE-UP	J12	BLU	P12 C15	BLU
XDUCER-SUPPLY	J25	GRN	P25 C15	GRN
XDUCER-TAKE-UP	J26	BLK	P26 C15	BLK
FILE PROTECT	J4	BLK	P4 C15	BLK
EOT BOT	J5	RED	P5 C15	RED
B5-VAC VALVE	J28	GRN	P28 C15	GRN
TERM BLOCK ASSY	J29	BRN	P29 C15	BRN
CONT. SWITCHES	J3	RED	P3 C15	RED
SWITCH-VAC SENSE	J27	GRN	P27 C15	GRN
SWITCH-TIME/REEL	J30	RED	P30 C15	RED
TAPE HEAD	J21	RED	P21 R/W WRITE	
TAPE HEAD	J22	YEL	P22 R/W READ	
CABLE R/W TO C15	J7	YEL	P7 C15	YEL
CABLE R/W TO C15	J20	GRN	P20 R/W	GRN

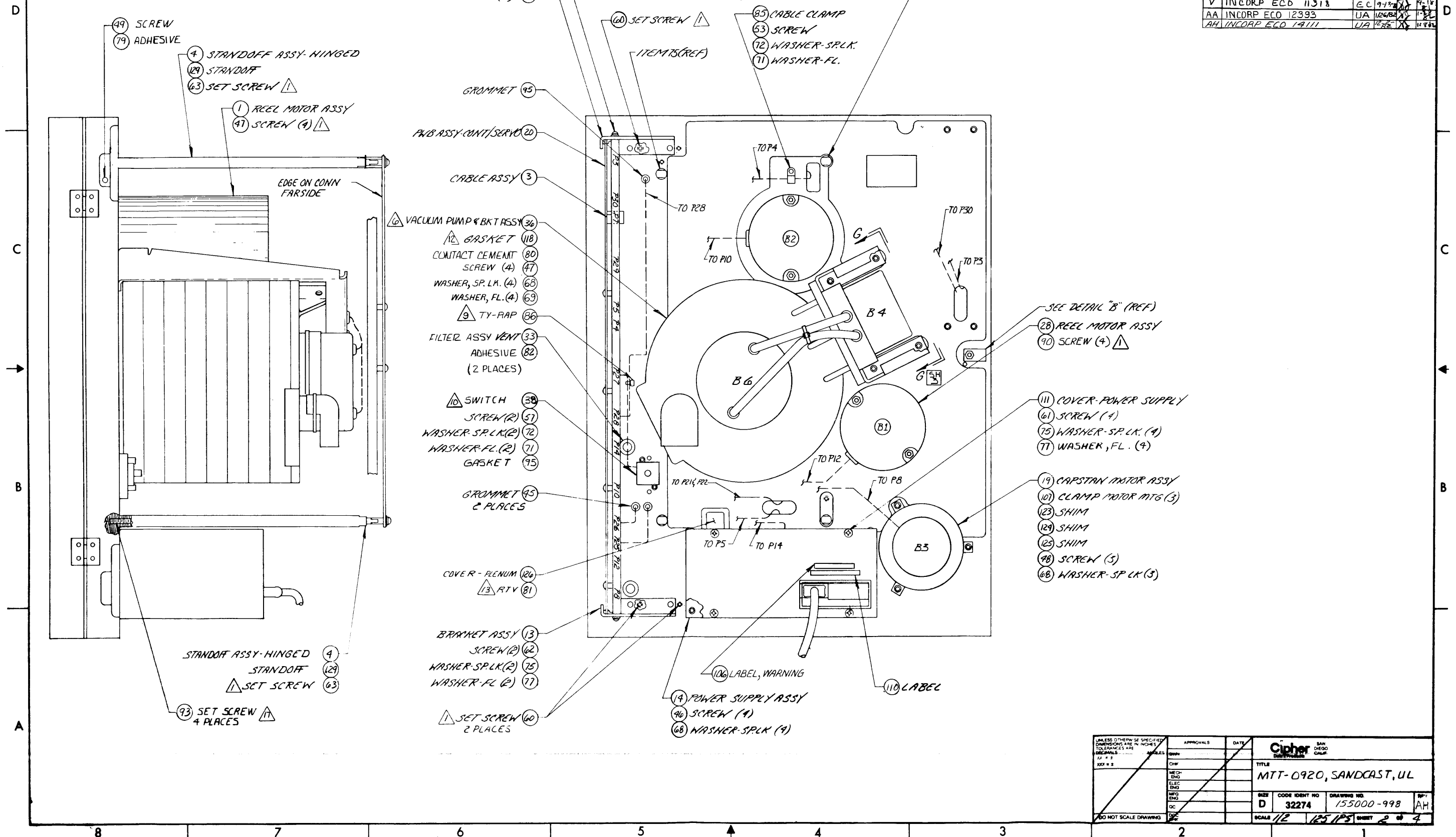
* C15 = CONTROL / SERVO

"All information contained in or disclosed by this document is considered CONFIDENTIAL and PROPRIETARY by Cipher Data Products, Inc. By accepting this material the recipient agrees that this material and the information contained therein is held in confidence and in trust and will not be used, reproduced in whole or in part, nor its contents revealed to others, except to meet the purpose for which it was delivered. It is understood that no right is conveyed to reproduce or have reproduced any item herein disclosed without express permission from Cipher Data Products, Inc."

REV STATUS	REV AK	AK	AE	AA
OF SHEETS	SH	1	2	3
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES				
APPROVALS		DATE		SAN DIEGO CALIF
DESIGNED BY: S. SCHEIDT		11/21/82		
CHECKED BY: [Signature]		11/21/82		CIPHER DATA PRODUCTS
DRAWN BY: [Signature]		11/21/82		
TITLE		MTT-0920, SANDCAST, UL		
SIZE		CODE IDENT NO.		DRAWING NO.
D		32274		155000-998
DO NOT SCALE DRAWING		SCALE		1/2" = 1" 125 IPS
		SHEET		1 OF 4

"Use or disclosure of information contained herein is subject to the restriction on the title page of this document."

REVISION					
LTR	DESCRIPTION	DWN	DATE	APVD	DATE
	SEE SHEET 1				
B	INCRP ECC 7123	LJ	2-15-80	X	2-24-80
H	INCRP ECD 8269	LJ	10-15-80	X	10-15-80
J	INCRP ECD 8335	LJ	10-15-80	X	10-15-80
N	INCRP ECD 8569	LJ	11-10-80	X	11-10-80
V	INCRP ECD 11318	EC	7-7-82	X	7-16-82
AA	INCRP ECD 12393	UA	11/26/84	X	11-26-84
AH	INCRP ECD 14111	UA	12-28-85	X	11-27-85



- BRACKET ASSY (12)
- SCREW (2) (62)
- WASHER-SPLK. (2) (75)
- WASHER-FL. (2) (77)
- WASHER-SPLK. (2) (75)
- WASHER-FL. (2) (77)

- SCREW (53)
- WASHER-SPLK. (75)
- WASHER-FL. (77)
- 2 PLACES

- VACUUM PUMP & BKT ASSY (36)
- GASKET (118)
- CONTACT CEMENT (80)
- SCREW (4) (47)
- WASHER, SP. LK. (4) (68)
- WASHER, FL. (4) (69)
- TY-RAP (9)

- FILTER ASSY VENT (33)
- ADHESIVE (82)
- (2 PLACES)
- SWITCH (38)
- SCREW (2) (57)
- WASHER-SPLK. (2) (72)
- WASHER-FL. (2) (71)
- GASKET (95)

- GROMMET (95)
- 2 PLACES
- COVER - PLENUM (126)
- RTV (81)

- BRACKET ASSY (13)
- SCREW (2) (62)
- WASHER-SPLK. (2) (75)
- WASHER-FL. (2) (77)

- SET SCREW (60)
- 2 PLACES

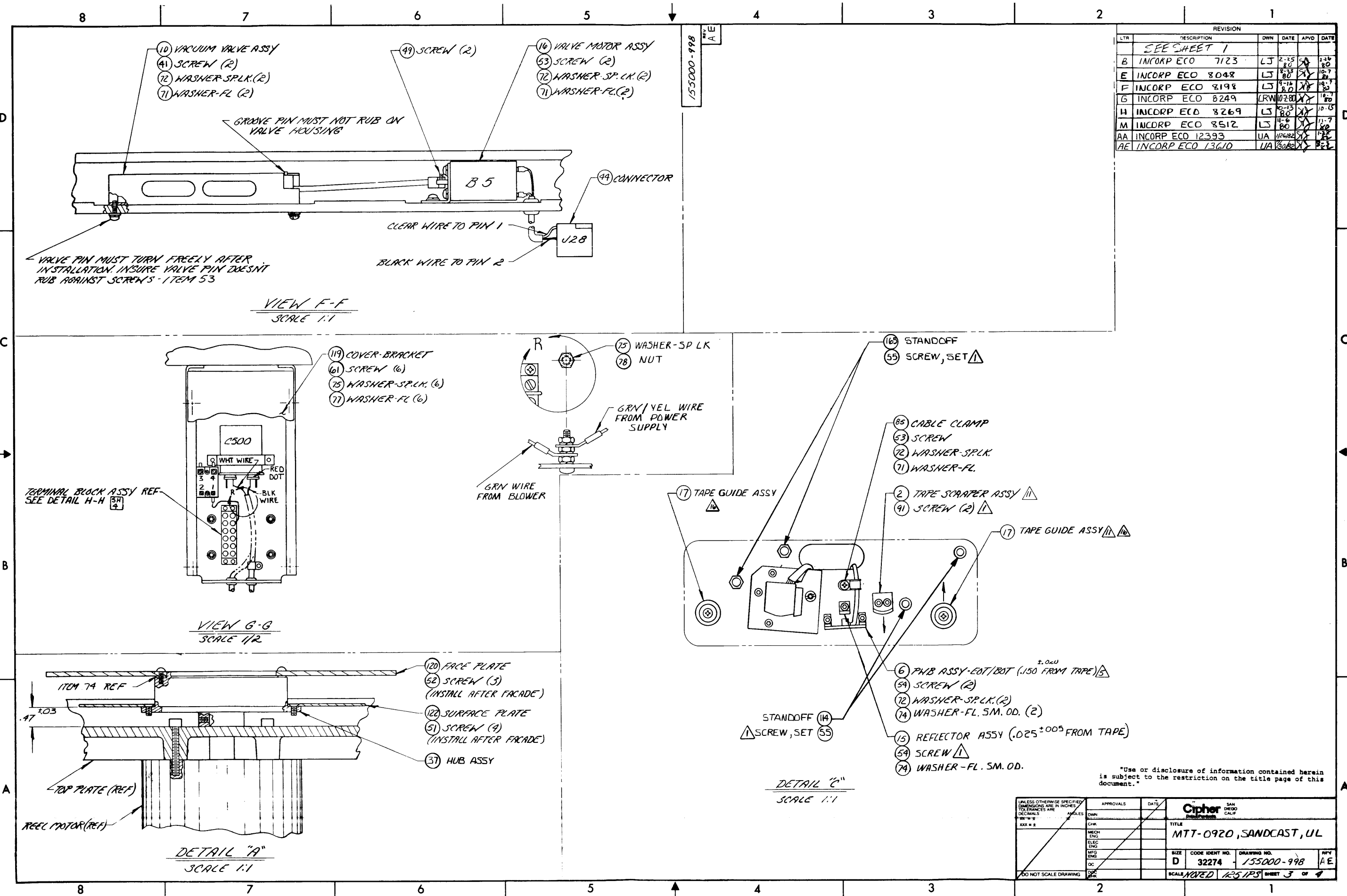
- POWER SUPPLY ASSY (14)
- SCREW (4) (46)
- WASHER-SPLK. (4) (68)

- SEE DETAIL "B" (REF)
- REEL MOTOR ASSY (28)
- SCREW (4) (90)

- COVER-POWER SUPPLY (11)
- SCREW (4) (61)
- WASHER-SPLK. (4) (75)
- WASHER, FL. (4) (77)

- CAPSTAN MOTOR ASSY (19)
- CLAMP MOTOR MTDG. (3) (10)
- SHIM (123)
- SHIM (129)
- SHIM (125)
- SCREW (5) (48)
- WASHER-SPLK. (3) (68)

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE DECIMALS .015" ± .005" .005" ± .001" .002" ± .001" .001" ± .001" .0005" ± .0001" .0002" ± .0001" .0001" ± .0001" .00005" ± .00001" .00002" ± .00001" .00001" ± .00001"	APPROVALS	DATE		SIZE CODE IDENT NO DRAWING NO D 32274 155000-998	SHEET 2 OF 4
	TITLE	DATE			
DO NOT SCALE DRAWING	SCALE 1/2	125 IPS			

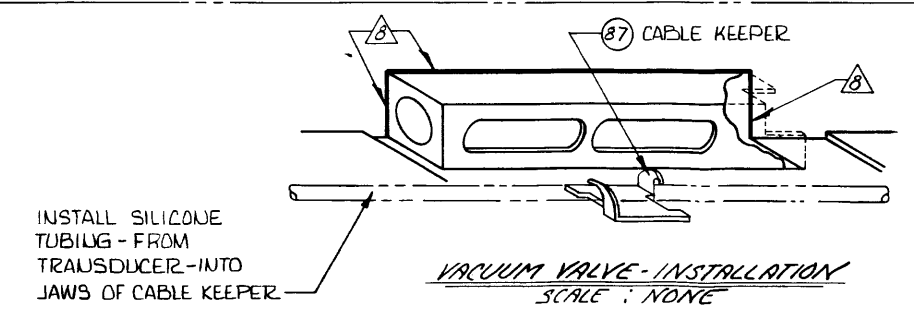
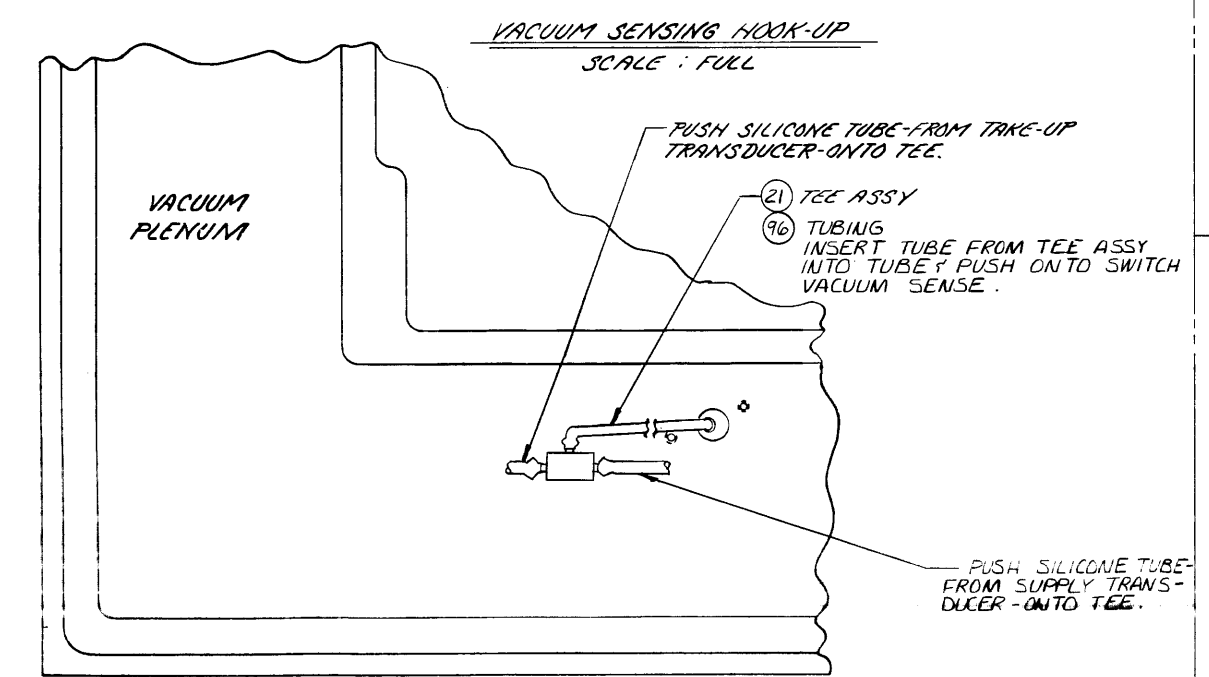
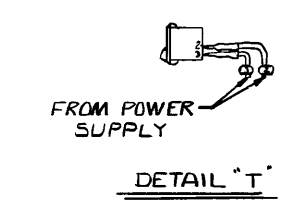
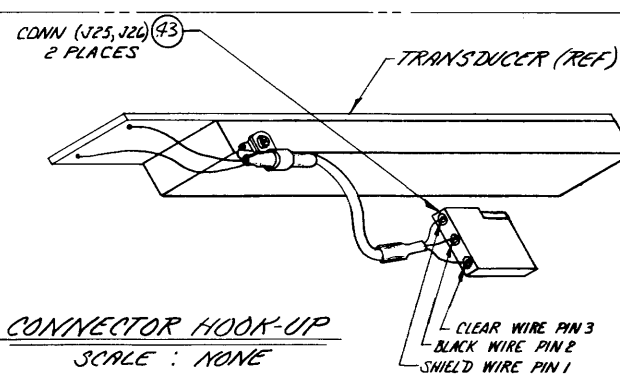
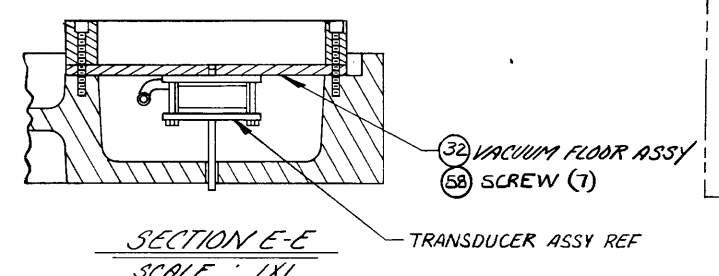
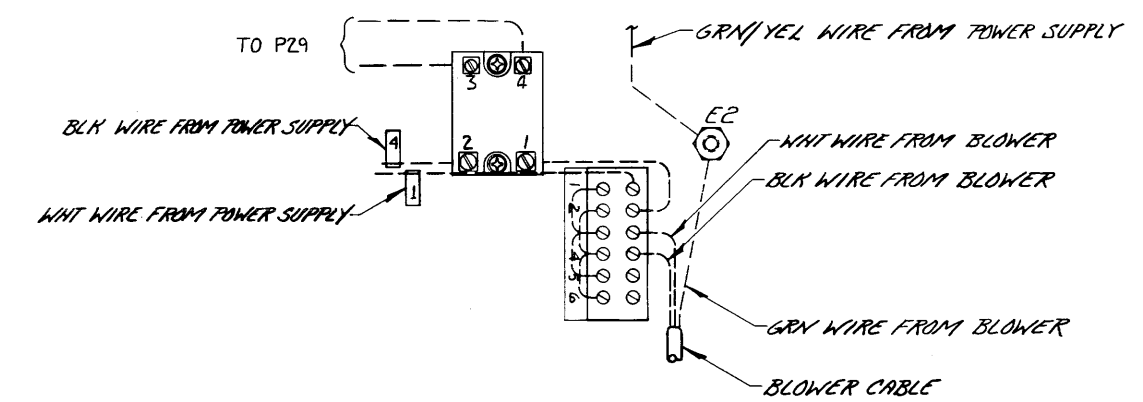
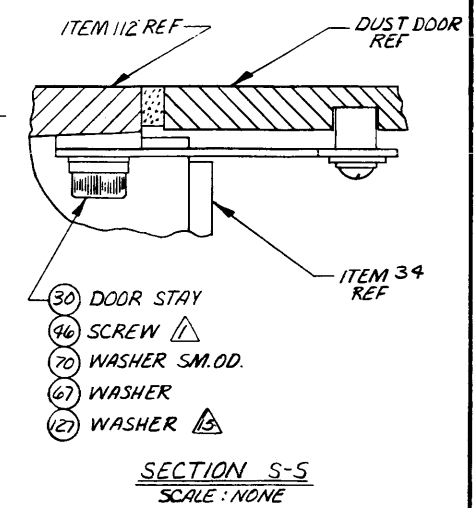
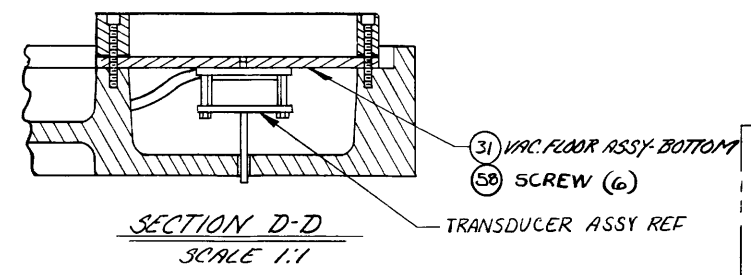
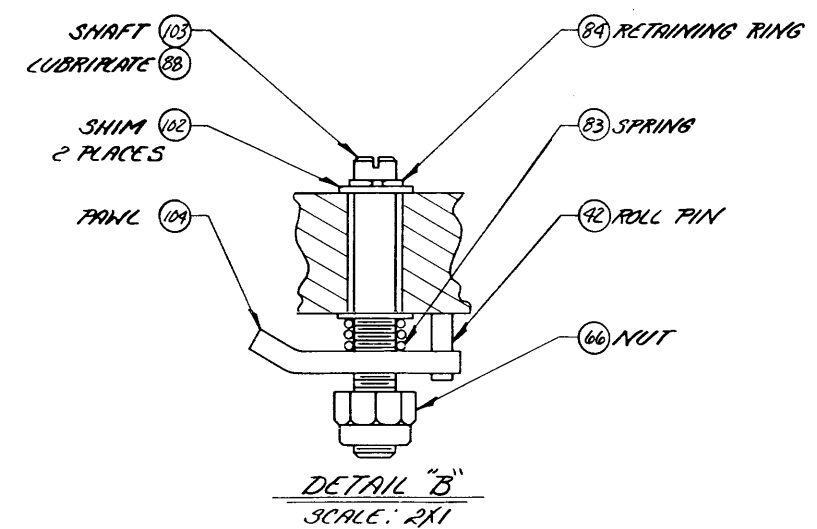


REVISION					
LTR	DESCRIPTION	DWN	DATE	APVD	DATE
	SEE SHEET 1				
B	INCRP ECO 7123	LJ	2-25-80	XX	2-26-80
E	INCRP ECO 8048	LJ	8-30-80	XX	10-7-80
F	INCRP ECO 8198	LJ	9-18-80	XX	10-7-80
G	INCRP ECO 8249	LRW	10-20-80	XX	10-7-80
H	INCRP ECO 8269	LJ	10-13-80	XX	10-13-80
M	INCRP ECO 8512	LJ	11-6-80	XX	11-7-80
AA	INCRP ECO 12393	UA	1/24/82	XX	1-25-82
AE	INCRP ECO 13610	UA	3/26/82	XX	3-27-82

"Use or disclosure of information contained herein is subject to the restriction on the title page of this document."

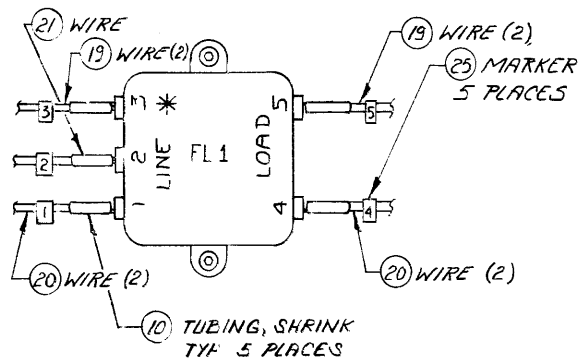
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES DECIMALS ARE ANGLES	APPROVALS	DATE	Cipher SAN DIEGO CALIF.
	DWN		
XXX # 2	CHK		TITLE
	MECH		MTT-0920, SANDCAST, UL
	ENG		SIZE
	ELEC		D
	ENG		CODE IDENT NO.
	MFG		32274
	DC		DRAWING NO.
	CHK		155000-998
			REV
			AE
DO NOT SCALE DRAWING	SCALE	NOTED	1/25 IPS
			SHEET 3 OF 4

REVISION					
LTR	DESCRIPTION	DWN	DATE	APVD	DATE
	SEE SHEET 1				
B	INCRP ECD 7123	LJ	2-25		2-26
G	INCRP ECD 8249	CRW	10-28		10-27
H	INCRP ECD 9269	LJ	10-13		10-15
L	INCRP ECD 8396	LJ	10-13		10-15
S	INCRP ECD 9375	LJ	2-3		2-1
U	INCRP ECD 9396	LJ	3-3		2-14
AA	INCRP ECD 12393	UA	8-2		7-11

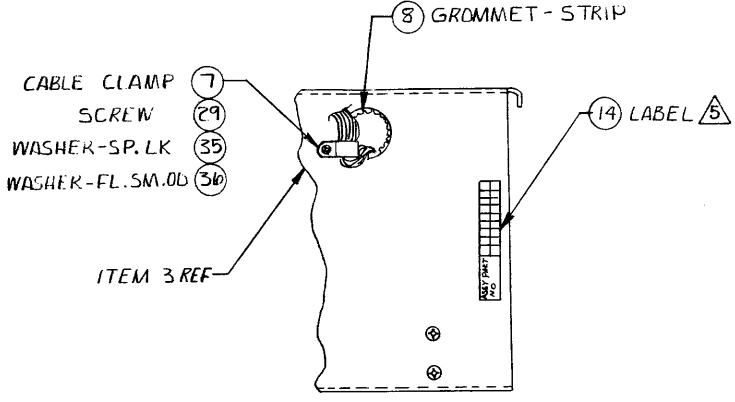


Use or disclosure of information contained herein is subject to the restriction on the title page of this document.

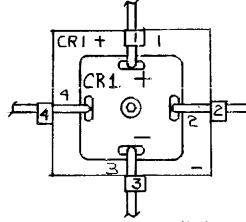
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE FRACTIONS		APPROVALS		DATE	
XXX ± .2		CHK			
		MECH			
		ELEC			
		MFG			
		OC			
		DEC			
DO NOT SCALE DRAWING		CIPHER		SAN DIEGO CALIF.	
TITLE		MTT-0920, SANDCAST, UL			
SIZE	CODE IDENT NO.	DRAWING NO.			
D	32274	155000-998	AA		
SCALE NOTED		1/25 1/32	SHEET 4 OF 4		



DETAIL "A"
SCALE: FULL

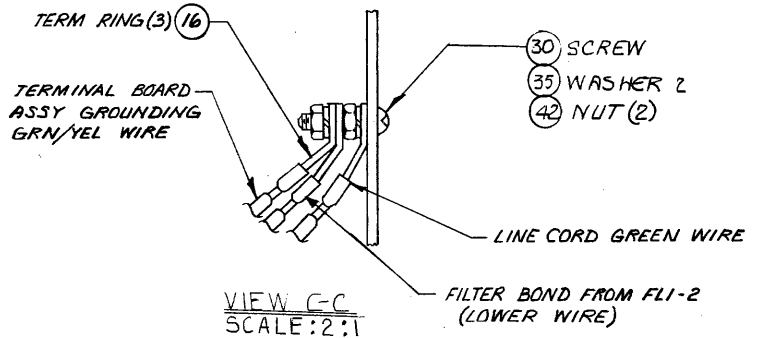
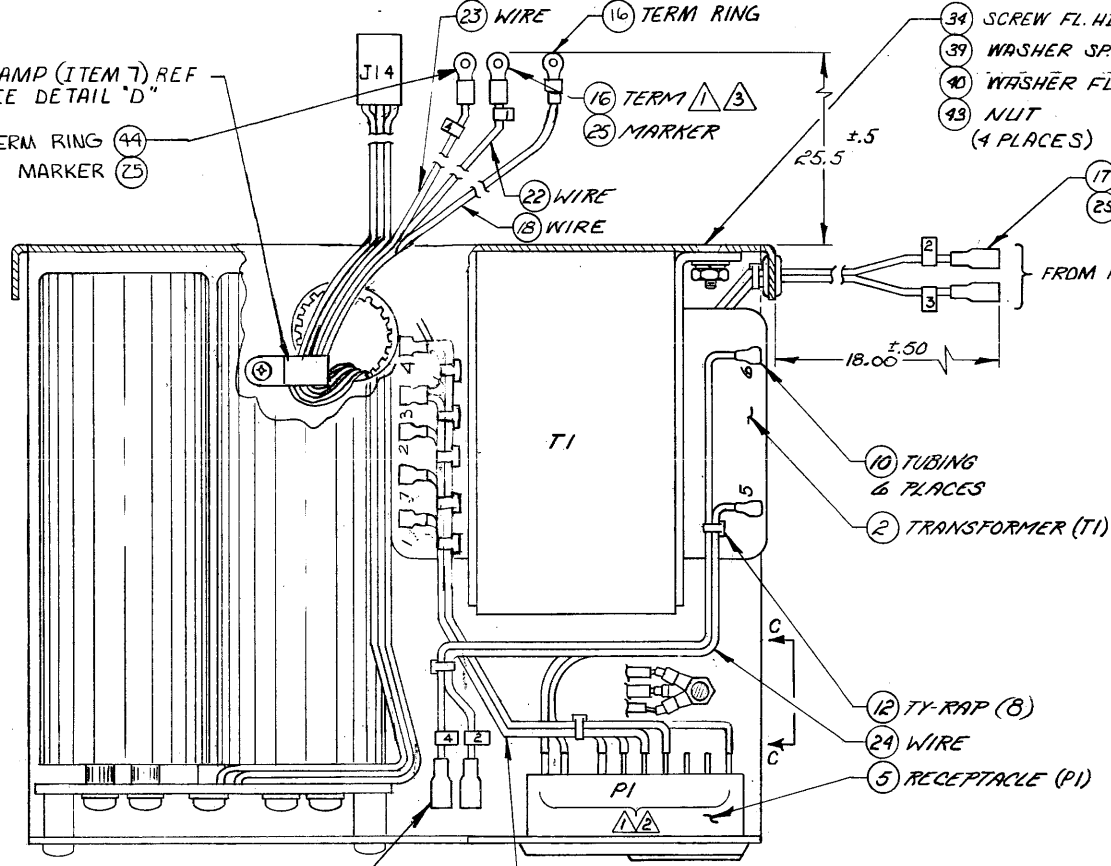


DETAIL "B"
SCALE: 1:1



DETAIL "C"
SCALE: FULL

CLAMP (ITEM 7) REF
SEE DETAIL "D"



VIEW C-C
SCALE: 2:1

WIRE TABLE				
FROM	TO	COLOR	AWG	LG
PI-A	TI-7	WHT	16	10.0
PI-R	FLI-5	BLK	18	5.0
PI-S	FLI-3	BLK	18	5.0
PI-P	FLI-1	WHT	18	5.0
PI-N	FLI-4	WHT	18	5.0
PI-C	TI-1	WHT	16	10.0
PI-D	TI-3	WHT	16	11.0
PI-E	TI-2	WHT	16	10.0
PI-F	TI-4	WHT	16	11.0
PI-B	FLI-3	WHT	16	27.0
PI-H	FLI-2	WHT	16	27.0
PI-M	PI-L	WHT	16	1.5
TI-5	CRI-2	WHT	14	11.0
TI-6	CRI-4	WHT	14	13.0
AI-1	CRI-1	WHT(REF)	-	-
AI-3	CRI-3	WHT(REF)	-	-
TI-3	FLI-7	BLK	16	31.5
TI-4	FLI-7	WHT	16	31.5
PI-GND	E1	GRN	18	3.5
E1	FLI-2	GRN	18	7.0
E1	E2	GRN/YEL	16	37.0

- 1. INSTALL LABEL AS SHOWN APPROX. CENTERED AND 1/4 INCH FROM EDGE. ENTER PART NO. AND REVISION LEVEL OF POWER SUPPLY.
- 2. FOR SCHEMATIC DIAGRAM SEE DRAWING 354000-998.
- 3. ROUTE WIRES THROUGH GROMMET BEFORE CRIMPING & TERMINATE AS SHOWN.
- 4. COVER ALL SOLDER CONNECTIONS WITH SHRINK TUBING.
- 5. SEE WIRE TABLE FOR WIRE CALLOUT & DESTINATION.

DRAWING NO
154017-901
SHEET 1 OF 1

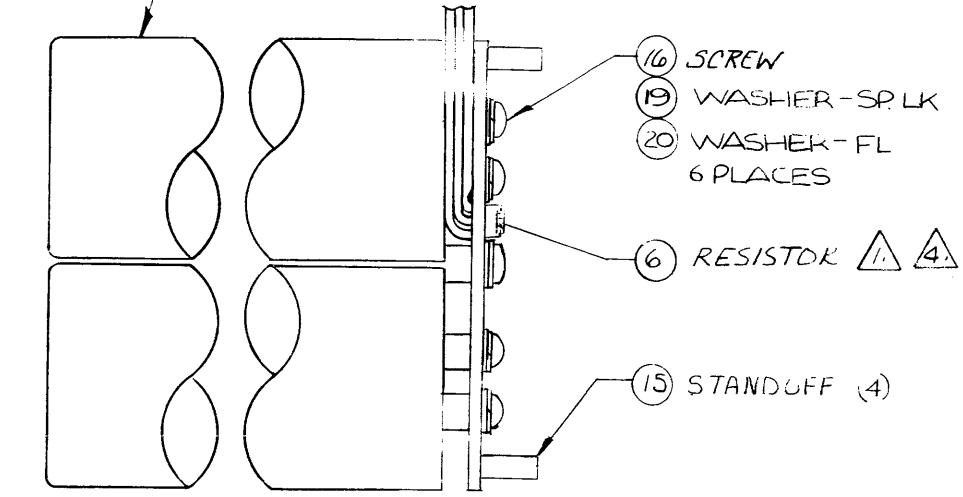
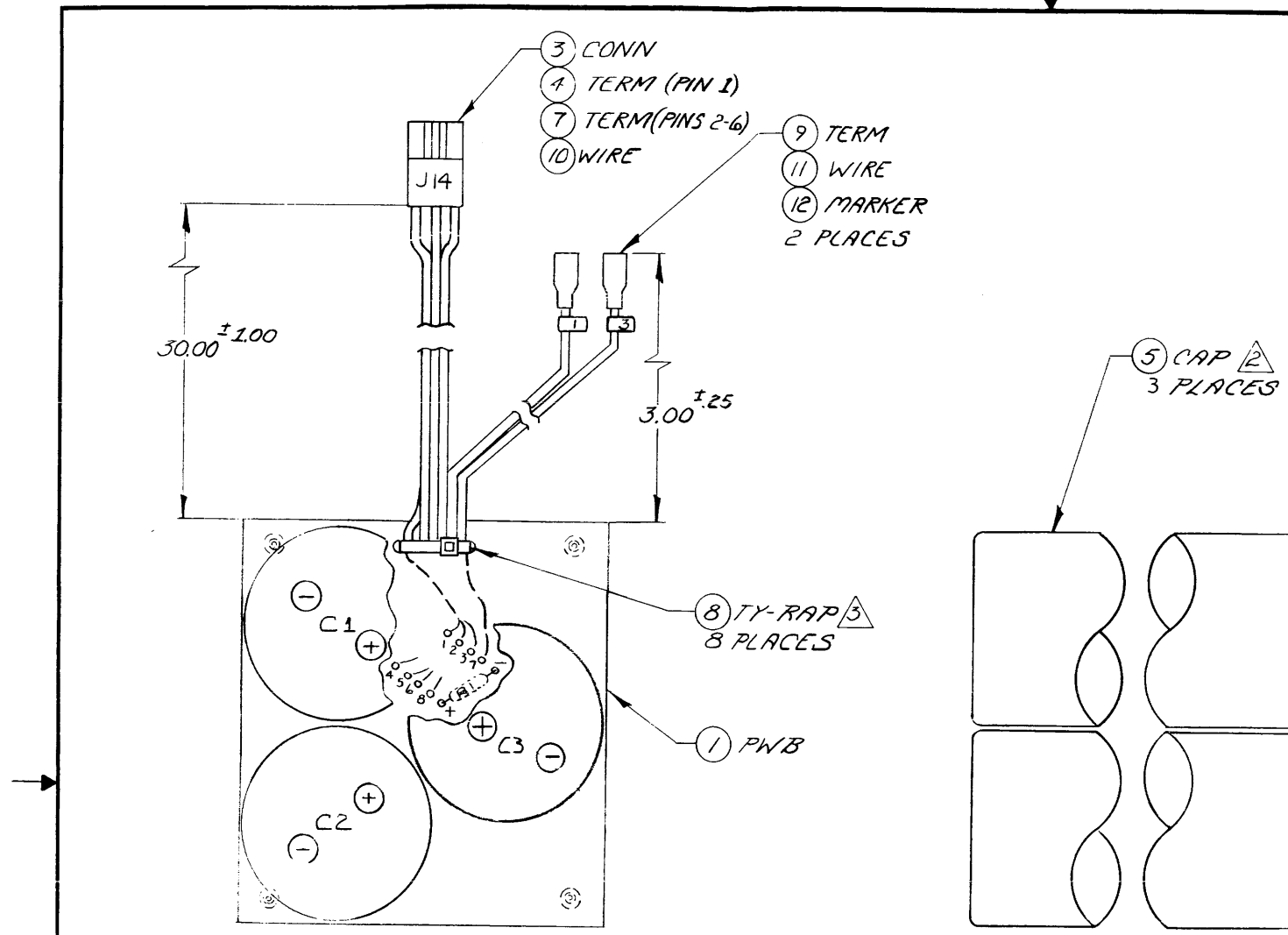
"All information contained in or disclosed by this document is considered CONFIDENTIAL and PROPRIETARY by Cipher Data Products, Inc. By accepting this material the recipient agrees that this material and the information contained therein is held in confidence and in trust and will not be used, reproduced in whole or in part, nor its contents revealed to others, except to meet the purpose for which it was delivered. It is understood that no right is conveyed to reproduce or have reproduced any item herein disclosed without express permission from Cipher Data Products, Inc."

APPROVALS		DATE		TITLE	
DESIGNED BY	DATE	APPROVED BY	DATE	POWER SUPPLY ASSY	
CHKD BY	3-17-78	DATE	3-17-78	SIZE	CODE IDENT NO.
DATE	3-17-78	DATE	3-17-78	D	32274
DATE	3-17-78	DATE	3-17-78	DRAWING NO.	154017-901 AD
DATE	3-17-78	DATE	3-17-78	SCALE	FULL 800X
DATE	3-17-78	DATE	3-17-78	SHEET	1 OF 1

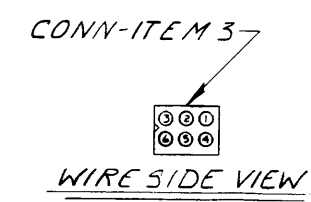
REVISION					
LTR	DESCRIPTION	OWN	DATE	APVD	DATE
A	ENGR REL	OS	3-17-78	AD	3-17-78
B	INCRP ECO 3706	RA	5-15-78	AD	5-15-78
C	INCRP ECO 3793	RA	5-15-78	AD	5-15-78
D	INCRP ECO 3892	RA	4-11-78	AD	4-11-78
E	INCRP ECO 4005	RA	8-23-78	AD	8-23-78
F	INCRP ECO 4208	RA	9-12-78	AD	9-12-78
G	INCRP ECO 4517	RA	2-12-79	AD	2-12-79
H	INCRP ECO 4524	LJ	2-12-79	AD	2-12-79
I	INCRP ECO 4545	LJ	9-14-79	AD	9-14-79
J	INCRP ECO 5622	LJ	5-8-81	AD	5-8-81
L	INCRP ECO 5803	LJ	4-13-81	AD	4-13-81
M	INCRP ECO 5897	LJ	7-8-81	AD	7-8-81
N	INCRP ECO 6040	LJ	7-8-81	AD	7-8-81
P	INCRP ECO 6432	LJ	10-25-81	AD	10-25-81
R	INCRP ECO 6652	LJ	11-7-81	AD	11-7-81
S	INCRP ECO 7032	LJ	3-13-82	AD	3-13-82
T	INCRP ECO 7223	LJ	3-25-82	AD	3-25-82
U	INCRP ECO 7491	LJ	5-27-82	AD	5-27-82
V	INCRP ECO 8243	CRW	8-14-82	AD	8-14-82
W	INCRP ECO 8561	LJ	11-12-82	AD	11-12-82
Y	INCRP ECO 9824	LJ	4-6-81	AD	4-6-81
Z	INCRP ECO 9877	LJ	5-13-81	AD	5-13-81
AA	INCRP ECO 9618	LJ	5-13-81	AD	5-13-81
AB	INCRP ECO 10178	FN	8-9-81	AD	8-9-81
AC	INCRP ECO 10337	FN	8-9-81	AD	8-9-81
AD	INCRP ECO 12240	EC	8-22-82	AD	8-22-82

154017-901
REV AD

REVISION					
LTR	DESCRIPTION	DWN	DATE	APVD	DATE
A	ENGR REL	DS	3-16-78	MS	3-17-78
B	INCRP ECO 3675	CW	5-1-78		
C	INCRP ECO 4338	CW	10-20-78		10-23-78
D	INCRP ECO 5412	LJ	4-19-78		4-23-78
E	INCRP ECO 5560	LJ	4-30-78		5-1-78
F	INCRP ECO 10264	FN	8-9-81		8-7-81
G	INCRPECO 10231	EC	9-15-81		9-17-81



154017-001
REV G



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:
1. FORM LEADS OF R1 (ITEM 6) TO FIT HOLE PATTERN.
 2. AFTER THIS TY-RAP, EVENLY SPACE REMAINING TY-RAPS (1 EVERY 4 INCHES) OVER LENGTH OF CONN WIRE BUNDLE.
 3. NOTE POLARITY MARKING ON PWB BEFORE INSTALLING CAPS C1 & C2.
 4. 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 DECIMALS ANGLES ± .XX ± .XX ± .XX	CONTRACT NO.		CIPHER Data Products SAN DIEGO CALIF.
	APPROVALS	DATE	
DWN	[Signature]	1-22-78	PAIR ISSY - POWER SUPPLY
CHK	[Signature]		
MFG ENG	[Signature]	3-17-78	
OC	[Signature]	2-23-78	
COG ENG	[Signature]	2-23-78	
PROD REL	[Signature]	2-19-78	
DO NOT SCALE DRAWING	SIZE C	CODE IDENT NO. 32274	DRAWING NO. 154017-001
	SCALE FULL	200A	SHEET 1 OF 1

4

3

2

1

D

C

B

A

D

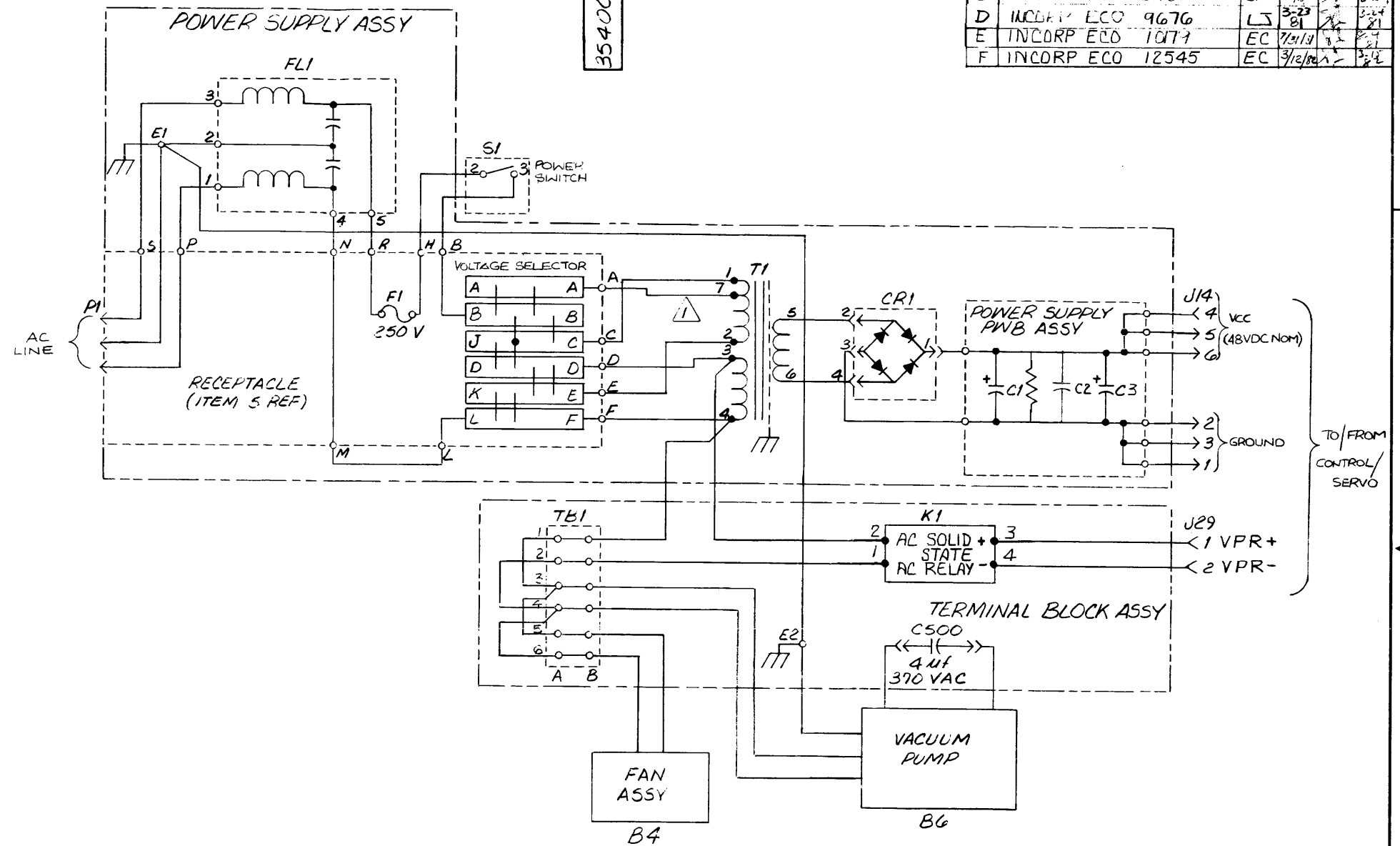
C

B

A

354000-998
REV F

REVISION					
LTR	DESCRIPTION	DWN	DATE	APVD	DATE
A	ENGR. RELEASE		3-22-78		10/1/78
B	INCRP ECO 5240	RA	3-27-78		3-30-78
C	INCRP ECO 5701	CM	6-18-78		6-18-78
D	INCRP ECO 9676	LJ	3-23-79		3-24-79
E	INCRP ECO 10179	EC	7/21/79		8-2-79
F	INCRP ECO 12545	EC	3/12/80		3-12-80



△ USED ON TRANSFORMER T99008-210 ONLY.

NOTES:

"All information contained in or disclosed by this document is considered CONFIDENTIAL and PROPRIETARY by Cipher Data Products, Inc. By accepting this material the recipient agrees that this material and the information contained therein is held in confidence and in trust and will not be used, reproduced in whole or in part, nor its contents revealed to others, except to meet the purpose for which it was delivered. It is understood that no right is conveyed to reproduce or have reproduced any item herein disclosed without express permission from Cipher Data Products, Inc."

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: DECIMALS ± XX ± .2 XXX ± .5		APPROVALS		DATE		TITLE		
DWY	CHK	MECH ENGR	ELEC ENGR	MFG ENGR		OC	DOC CHK	SIZE C CODE IDENT NO. 32274 DRAWING NO. 354000-998 REV F

4

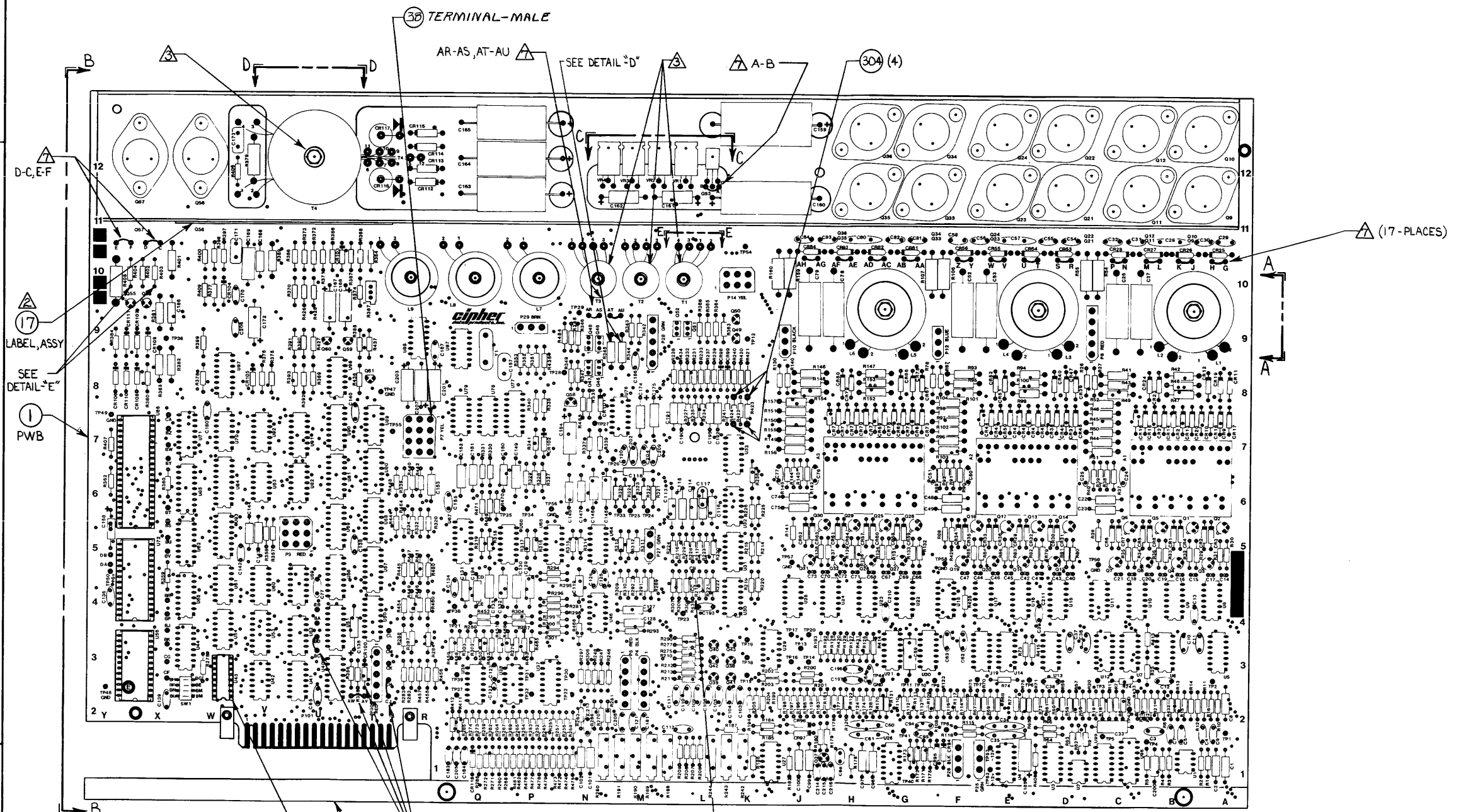
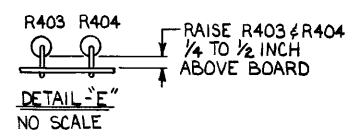
3

2

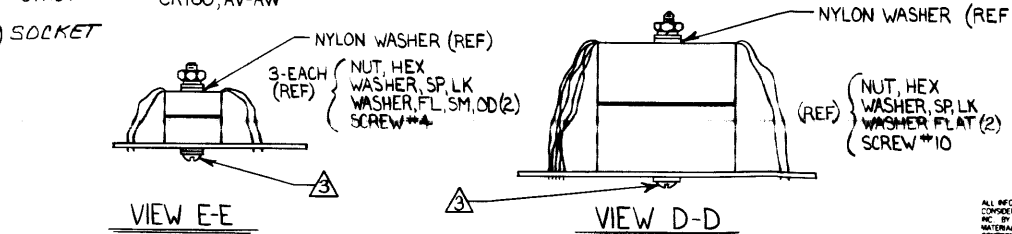
1

8 7 6 5 4 3 2 1

REVISION					
LTR	DESCRIPTION	DWN	DATE	APVD	DATE
C	REDRAWN INCORP 12679	L.G.	3-23-68	714	3-23-68
D	INCRP ECO 12829	L.G.	3-23-68	715	3-23-68
E	INCRP ECO 12809	L.G.	3-23-68	716	3-23-68
F	INCRP ECO 13047	EC	7-23-68	717	7-23-68
G	INCRP ECO 13212	EC	7-24-68	718	7-24-68
H	INCRP ECO 13832	EC	7-24-68	719	7-24-68
J	INCRP ECO 13811	EC	7-24-68	720	7-24-68
K	INCRP ECO 14079	EC	7-26-68	721	7-26-68
L	INCRP ECO 14095	EC	7-26-68	722	7-26-68
M	INCRP ECO 1430B	EC	7-26-68	723	7-26-68
N	INCRP ECO 14667	SS	7-26-68	724	7-26-68



- 7 INSTALL 7.0" LONG 30 GA. KYNAR INSULATED WIRE JUMPER 17 PLACES USING ITEM 297: A-B, C-D, E-F, G-H, J-K, L-M, N-P, R-S, T-U, V-W, Y-Z, AA-AB, AC-AD, AE-AF, AG-AH, AU-AT, AS-AR (TO BE REMOVED IN TEST)
- 5 INSTALL SLEEVED JUMPERS USING ITEM 299, 5 PLACES: BC-BD, CC-CB, CJ-CH, CR100, AV-AW. USE ITEM 300 WHEN CROSSING LAND.
- 3 MOUNT XFRMS USING EXISTING HARDWARE AS SHOWN ON THIS DWG. DISCARD HARDWARE NOT SHOWN.
- 2 MARK ASSY PART NO. & REV LTR ON ASSY LABEL (ITEM 17) INSTALL ON HEATSINK.
- 1 FOR SCHEMATIC SEE 355072-300.



155072-001
REV N

REWORK REQUIREMENTS	
PWB NO & REV	ECO NO
754072-101	12679
REV D & PRIOR	

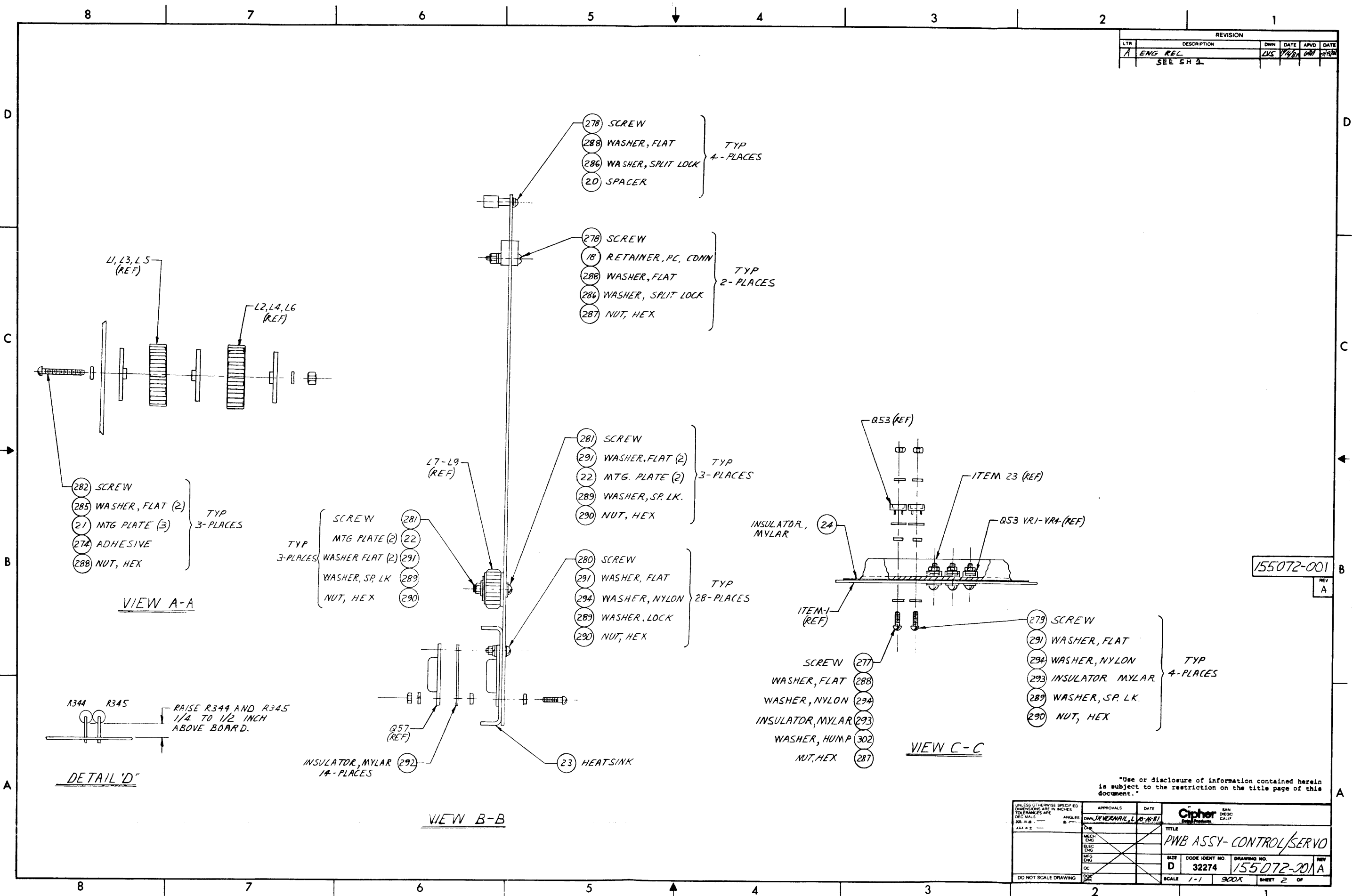
SHEET REV	REV LTR	N	A	DRAWING SHOWS FULLY LOADED CONFIGURATION. SOME PARTS MAY BE OMITTED FOR SOME CONFIGURATIONS. SEE PARTS LIST FOR DETAILS.
STATUS	SH NO	1	2	
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES	APPROVAL	DATE	DWN	SILVERMAN 10-16-68
TOLERANCES ARE DECIMALS	MECH G. BODDY 10-16-68	CHN	LVS 10-16-68	elphel SAN DIEGO CALIF
XXX = ANGLES DO NOT SCALE DRAWING	ELEC G. GREEN 10-16-68	TITLE	PWB ASSY - CONTROL/SERVO	
	MATL	CODE IDENT	SIZE	DWG NO
	QA	32274	D	155072-001
	MKT	ISSUED	DUCELL 10-16-68	SCALE 1/1
			MOD	SH 1 OF 2

ALL INFORMATION CONTAINED HEREIN IS UNCLASSIFIED EXCEPT WHERE SHOWN OTHERWISE. THIS DOCUMENT IS THE PROPERTY OF THE AIR FORCE AND IS LOANED TO YOU. IT AND ITS CONTENTS ARE NOT TO BE DISTRIBUTED OUTSIDE YOUR ORGANIZATION WITHOUT EXPRESS PERMISSION FROM THE AIR FORCE.

NOTES:

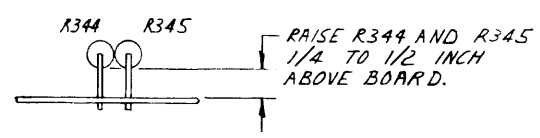
8 7 6 5 4 3 2 1

REVISION				
LTR	DESCRIPTION	OWN	DATE	APVD
A	ENG REL	LVS	1/14/61	CHD
SEE SH 1				



- (282) SCREW
 - (285) WASHER, FLAT (2)
 - (21) MTG PLATE (3)
 - (274) ADHESIVE
 - (288) NUT, HEX
- TYP 3-PLACES

VIEW A-A



DETAIL "D"

- SCREW (281)
 - MTG PLATE (2) (22)
 - WASHER FLAT (2) (291)
 - WASHER, SP LK (289)
 - NUT, HEX (290)
- TYP 3-PLACES

VIEW B-B

- (278) SCREW
 - (288) WASHER, FLAT
 - (286) WASHER, SPLIT LOCK
 - (20) SPACER
- TYP 4-PLACES

- (278) SCREW
 - (18) RETAINER, PC, CONN
 - (288) WASHER, FLAT
 - (286) WASHER, SPLIT LOCK
 - (287) NUT, HEX
- TYP 2-PLACES

- (281) SCREW
 - (291) WASHER, FLAT (2)
 - (22) MTG. PLATE (2)
 - (289) WASHER, SP. LK.
 - (290) NUT, HEX
- TYP 3-PLACES

- (280) SCREW
 - (291) WASHER, FLAT
 - (294) WASHER, NYLON
 - (289) WASHER, LOCK
 - (290) NUT, HEX
- TYP 28-PLACES

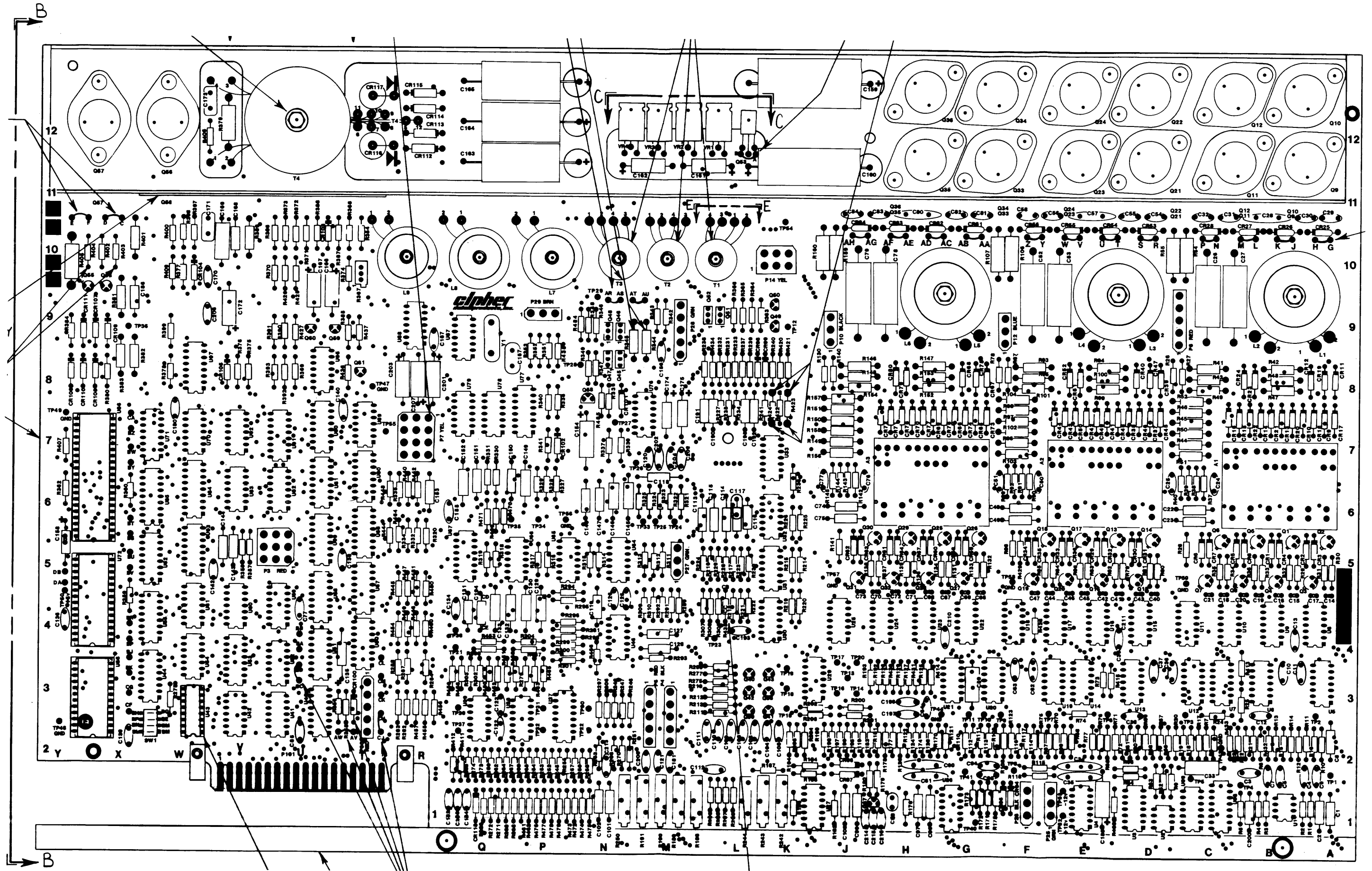
- (279) SCREW
 - (291) WASHER, FLAT
 - (294) WASHER, NYLON
 - (293) INSULATOR MYLAR
 - (289) WASHER, SP. LK.
 - (290) NUT, HEX
- TYP 4-PLACES

VIEW C-C

155072-001
REV A

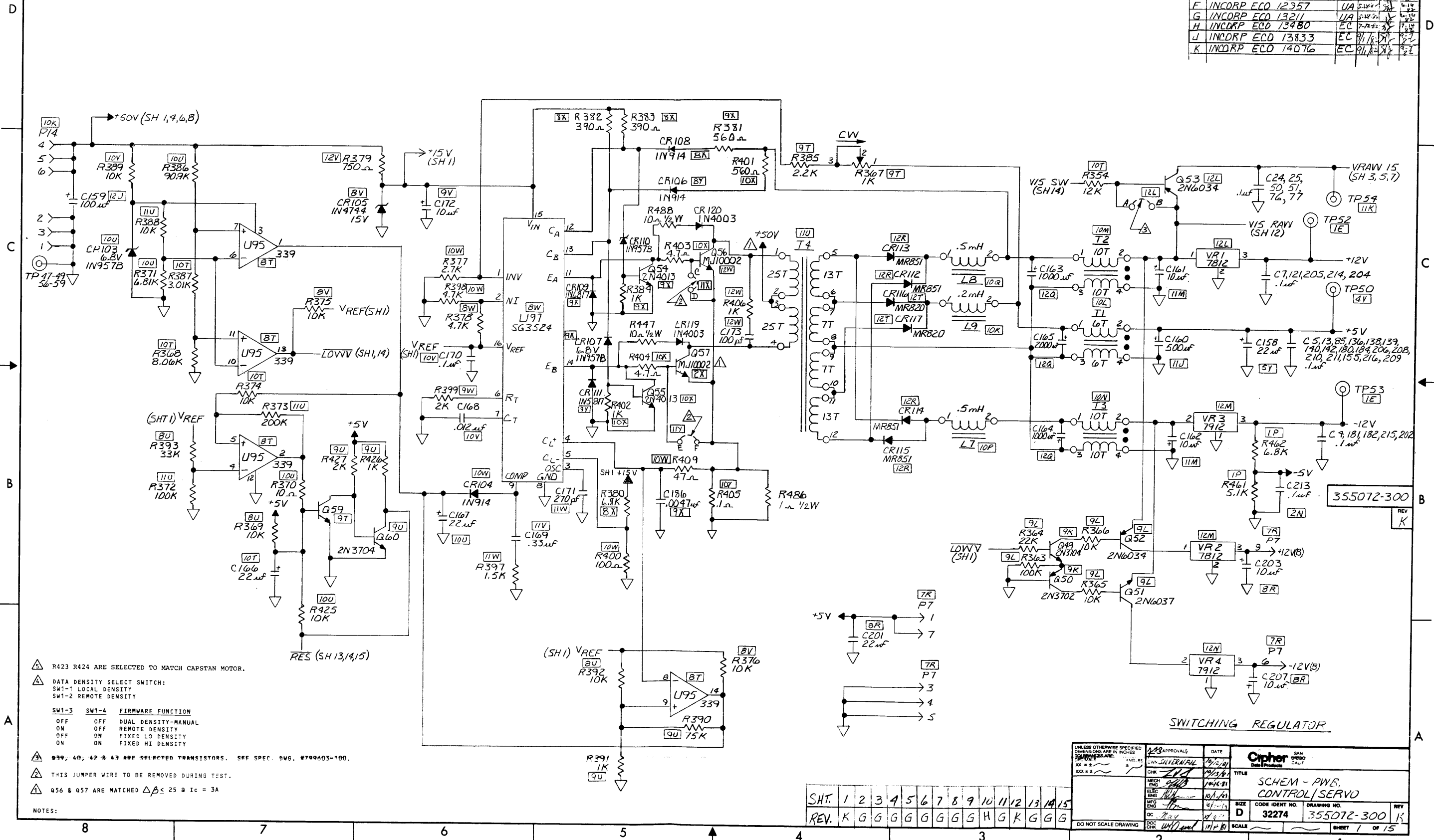
"Use or disclosure of information contained herein is subject to the restriction on the title page of this document."

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS ANGLES DECIMALS XX ± .2	APPROVALS	DATE	CIPHER SAN DIEGO CALIF
	ONE	10-16-61	
	TITLE	PWB ASSY-CONTROL/SERVO	
	SIZE	CODE IDENT NO	DRAWING NO.
	D	32274	155072-001A
DO NOT SCALE DRAWING	SCALE	1-1	SHEET 2 OF



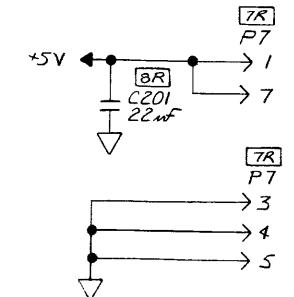
All information contained in or disclosed by this document is considered CONFIDENTIAL and PROPRIETARY by Cipher Data Products, Inc. By accepting this material the recipient agrees that this material and the information contained therein is held in confidence and in trust and will not be used, reproduced in whole or in part, nor its contents revealed to others, except to meet the purpose for which it was delivered. It is understood that no right is conveyed to reproduce or have reproduced any item herein disclosed without express permission from Cipher Data Products, Inc.

REVISION					
LTR	DESCRIPTION	DWN	DATE	APVD	DATE
	ENG REL		1/21/81	MD	1/21/81
B	INCORP ECO 12542	UA	3-5-82		3-5-82
C	INCORP ECO 12677	UA	3-5-82		3-5-82
D	INCORP ECO 12826	UA	3-5-82		3-5-82
E	INCORP ECO 13072	UA	5-28-82		5-28-82
F	INCORP ECO 12957	UA	5-28-82		5-28-82
G	INCORP ECO 13211	UA	5-28-82		5-28-82
H	INCORP ECO 13480	EC	7-24-82		7-24-82
J	INCORP ECO 13833	EC	9/1/82		9/1/82
K	INCORP ECO 14076	EC	9/1/82		9/1/82



- △ R423 R424 ARE SELECTED TO MATCH CAPSTAN MOTOR.
- △ DATA DENSITY SELECT SWITCH:
 SW1-1 LOCAL DENSITY
 SW1-2 REMOTE DENSITY
- | SW1-3 | SW1-4 | FIRMWARE FUNCTION |
|-------|-------|---------------------|
| OFF | OFF | DUAL DENSITY-MANUAL |
| ON | OFF | REMOTE DENSITY |
| OFF | ON | FIXED LO DENSITY |
| ON | ON | FIXED HI DENSITY |
- △ Q39, 40, 42 & 43 ARE SELECTED TRANSISTORS. SEE SPEC. DWG. #790603-100.
- △ THIS JUMPER WIRE TO BE REMOVED DURING TEST.
- △ Q56 & Q57 ARE MATCHED $\Delta\beta \leq 25$ & $I_c = 3A$

NOTES:



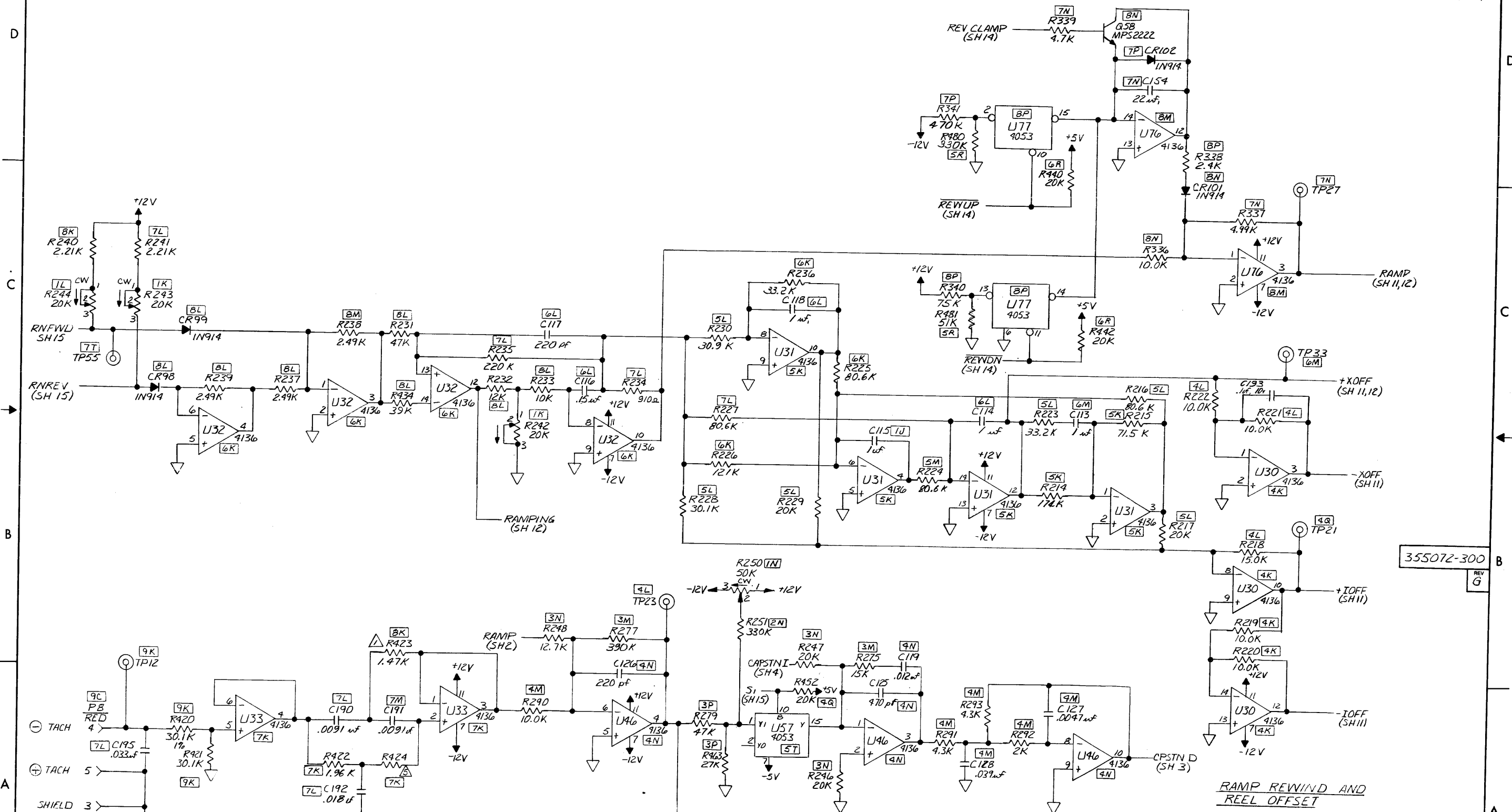
SWITCHING REGULATOR

APPROVALS	DATE	CIPHER Data Products	TITLE SCHEM - PWR, CONTROL/SERVO
DESIGNED BY: SULLERWAL	10/2/81		
CHKD BY: ZIA	10/2/81	DRAWING NO. 355072-300	REV K
ELDS BY: [Signature]	10/1/81	DO NOT SCALE DRAWING	
MFG BY: [Signature]	10/1/81	SCALE	
DC BY: [Signature]	10/1/81	SHEET 1 OF 15	

SHT.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
REV.	K	G	G	G	G	G	G	G	H	G	K	G	G	G	G

Use or disclosure of information contained herein is subject to the restriction on the title page of this document.

REVISION				
LTR	DESCRIPTION	DWN	DATE	APVD
	SEE SHT. 1			



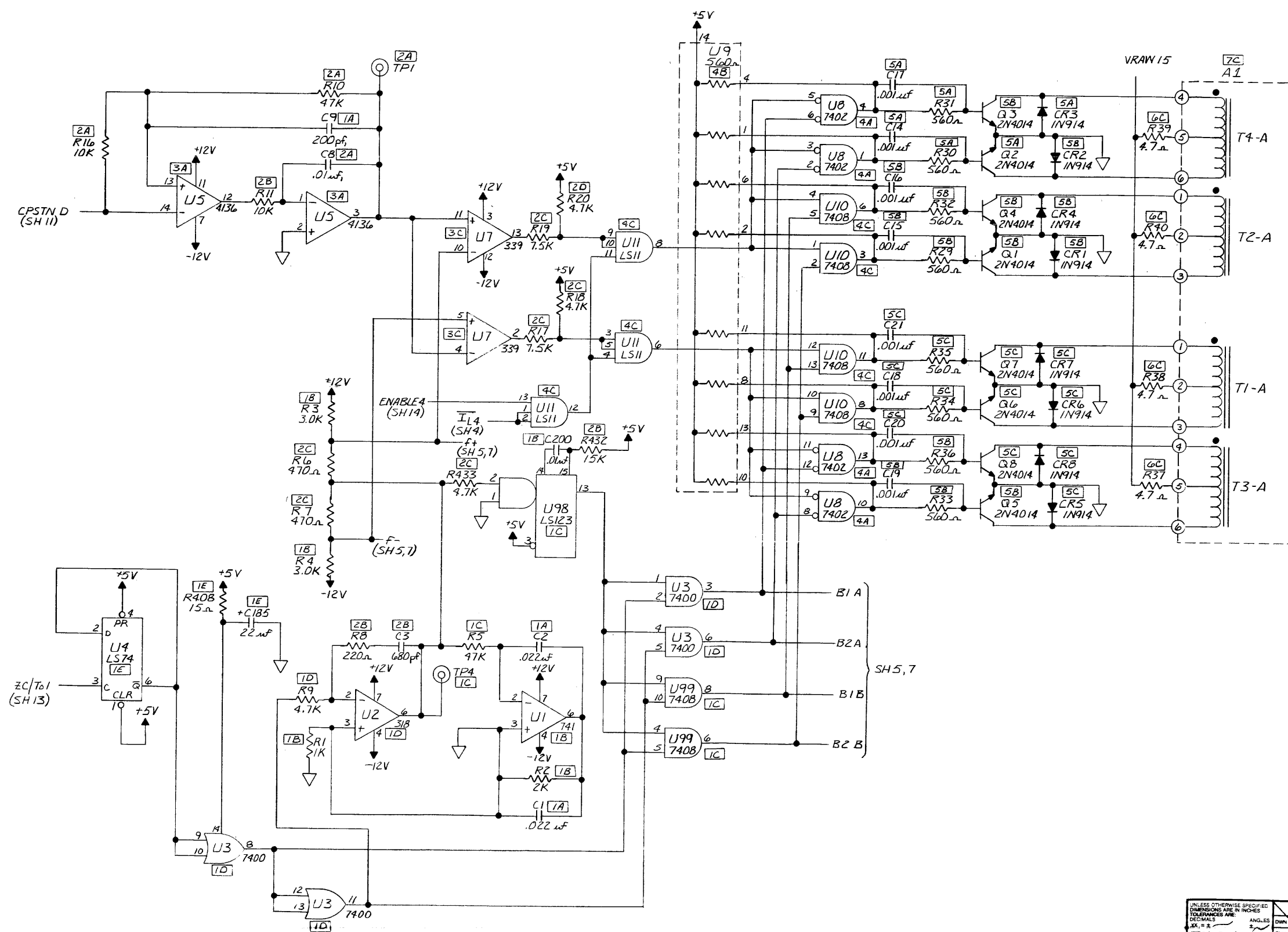
355072-300
REV G

RAMP REWIND AND REEL OFFSET

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE DECIMALS ANGLES XXX ± .2		APPROVALS		DATE
DESIGNED	CHKD			
MECH	ENG			
ELEC	ENG			
WFO	ENG			
OC				
DO NOT SCALE DRAWING				
Cipher SAN DIEGO DATA PRODUCTS TITLE: SCHEM - PW3 CONTROL/SERVO SIZE: D CODE IDENT NO.: DRAWING NO.: 355072-300 REV: G SHEET 2 OF 3		DATE: _____ APPROVALS: _____ DATE: _____		

Use or disclosure of information contained herein is subject to the restriction on the title page of this document.

REVISION				
LTR	DESCRIPTION	DWN	DATE	APVD
	SEE SH.1			



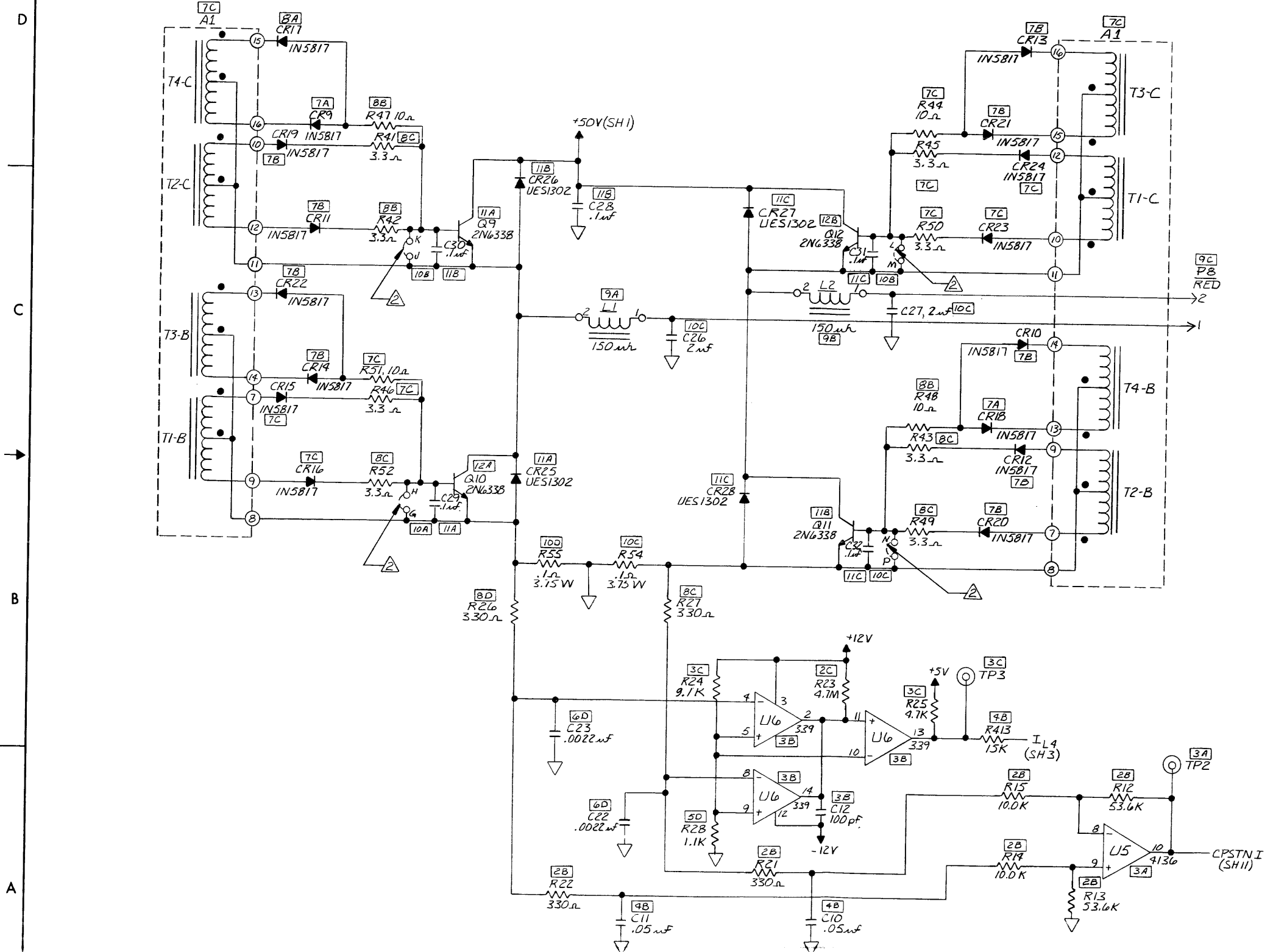
355072-300
REV G

CAPSTAN SERVO

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE:		APPROVALS		DATE
XXX ± .01	ANGLES	DWN		
		CHK		
		MECH		
		ELEC		
		ENG		
		MFG		
		QC		
		DR		
		ZSR		
DO NOT SCALE DRAWING		TITLE		SCALE
		SCHEM - 9148 CONTROL/SERVO		
SIZE	CODE IDENT NO.	DRAWING NO.	REV	
D	32274	355072-300	3	
		SHEET 3 OF		

"Use or disclosure of information contained herein is subject to the restriction on the title page of this document."

REVISION				
LTR	DESCRIPTION	DWN	DATE	APVD
	SEE SHT. 1			



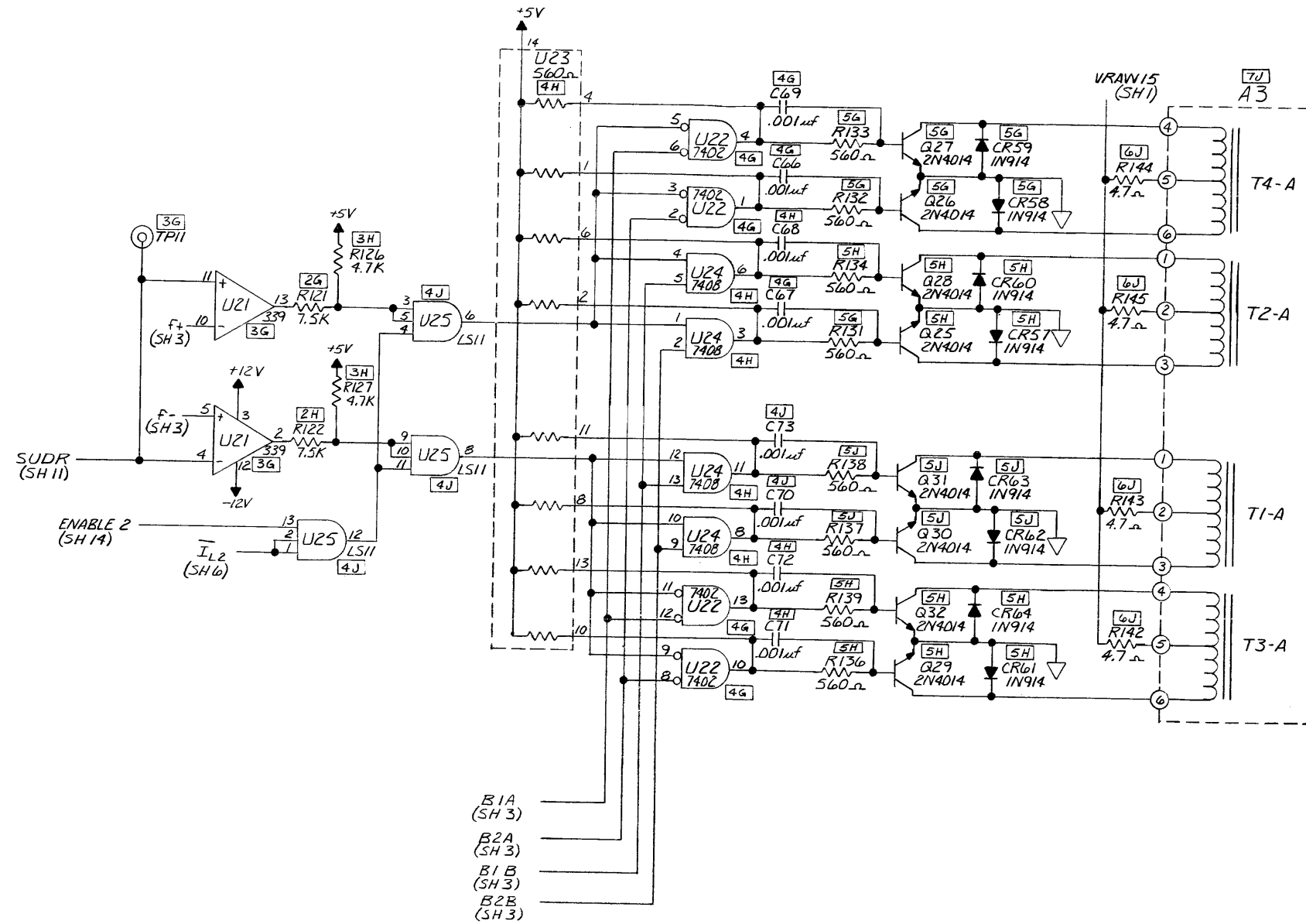
355072-300
REV G

CAPSTAN SERVO

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE DECIMALS ANGLES ±		APPROVALS		DATE	CIPHER Data Products	
DO NOT SCALE DRAWING	CHK	ENGR	DATE		TITLE	SAN DESIG CAL'R
	Mech				SCHEM - P.V.B. CONTROL/SERVO	
	Elec				SIZE D	CODE IDENT NO. 32274
	Eng				DRAWING NO.	355072-300
					REV	G
					SCALE	SHEET 4 OF

"Use or disclosure of information contained herein is subject to the restriction on the title page of this document."

REVISION				
LTR	DESCRIPTION	DWN	DATE	APVD
	SEE SHT. 1			

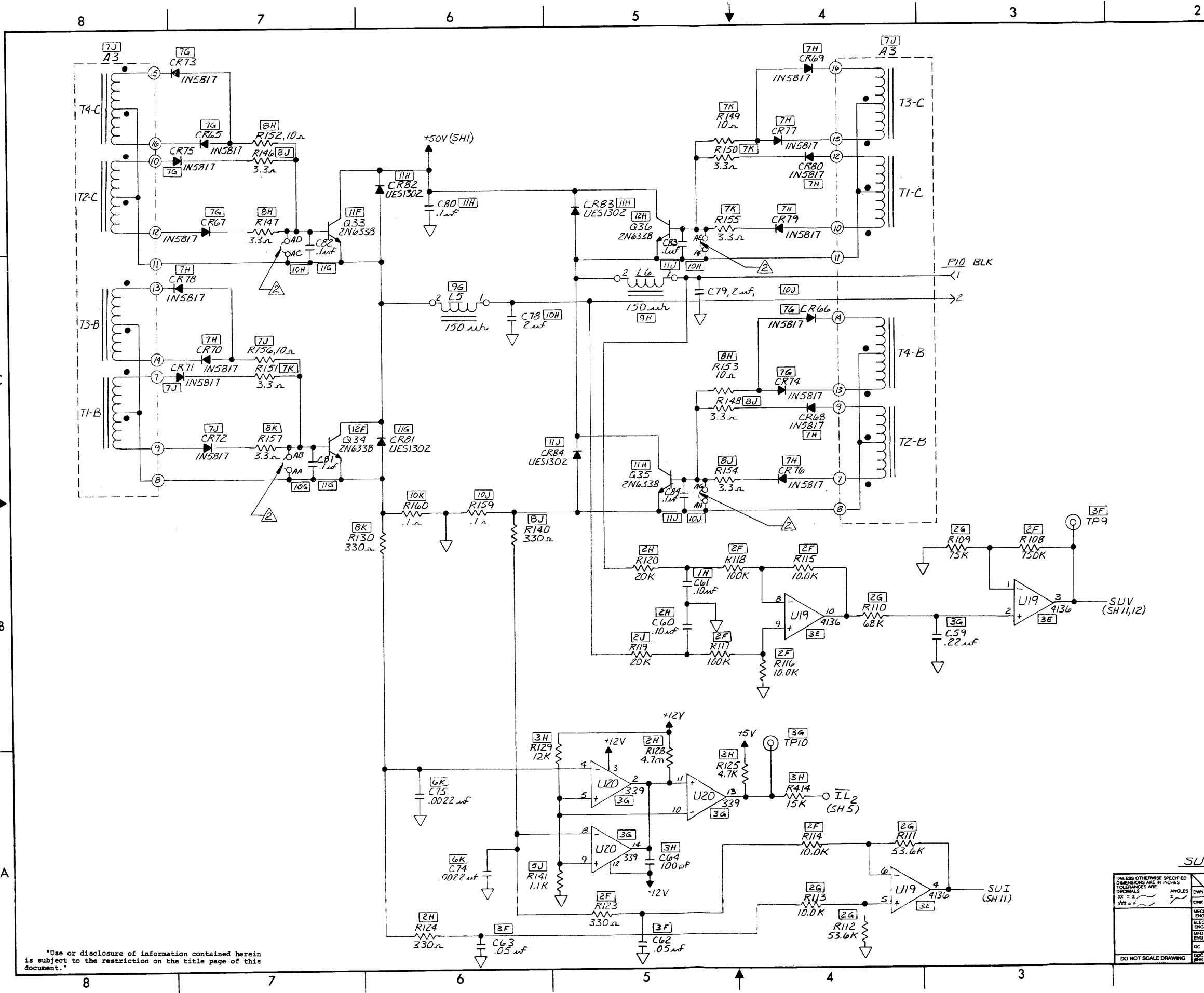


355072-300
REV G

SUPPLY REEL SERVO

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: .XXX ± .005 ANGLES: XXX ± .2		APPROVALS	DATE		TITLE SCHEM - PW 3 CONTROL / SERVO
DO NOT SCALE DRAWING		DWN CHK MECH ENG ELEC ENG MFG ENG QC SPC			
		SCALE NONE		DRAWING NO. 355072-300	
		SHEET 5 OF		REV G	

REVISION				
LTR	DESCRIPTION	DWN	DATE	APVD
	SEE SH. 1			



355072-300
REV G

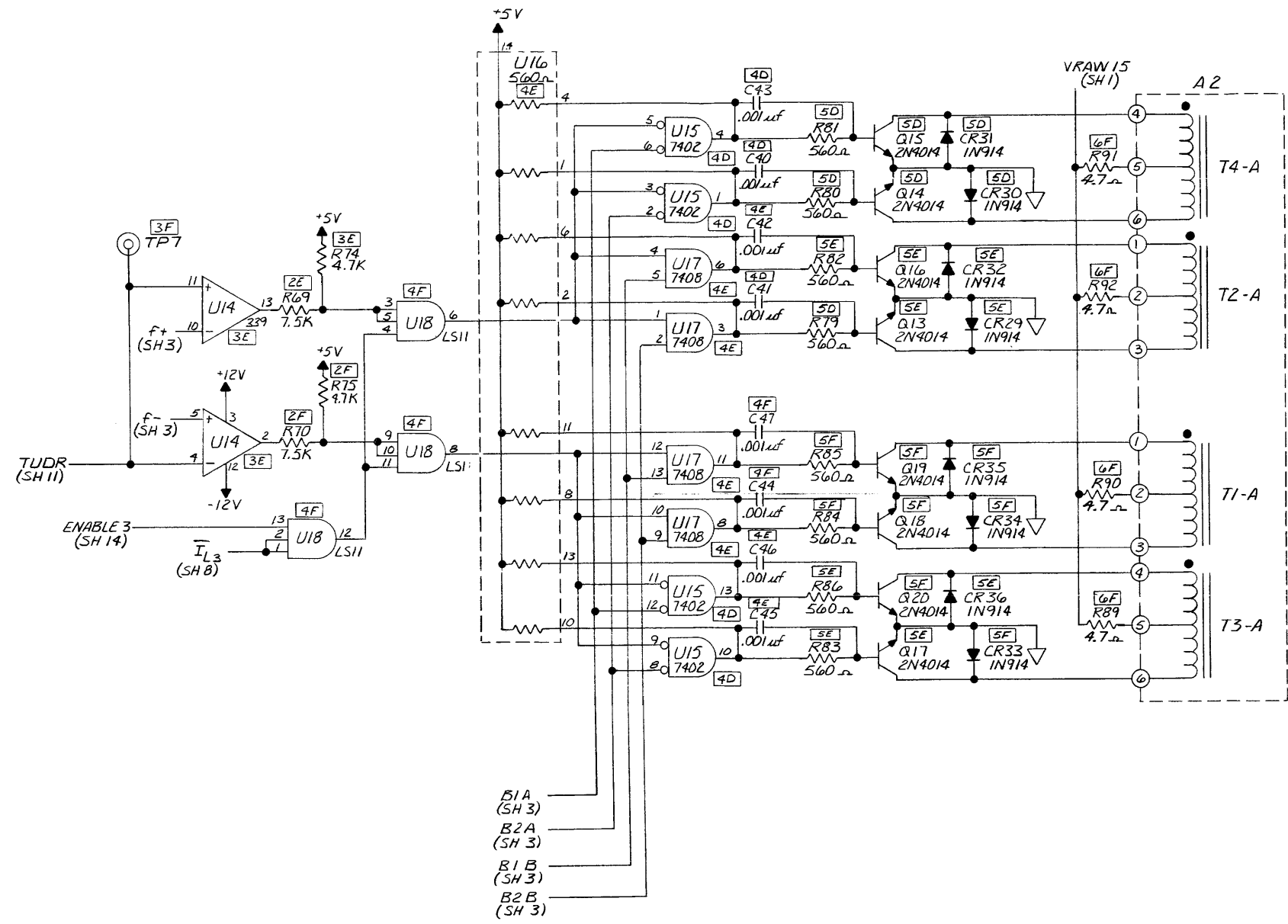
SUPPLY REEL SERVO

APPROVALS		DATE	CIPHER	
DWN	ENG		SAN DIEGO	CALIF.
TITLE: SCHEM - PW/B CONTROL/SERVO				
SIZE: D	CODE IDENT NO: 32274	DRAWING NO: 355072-300	REV: E	
DO NOT SCALE DRAWING		SCALE	SHEET 6 OF 6	

Use or disclosure of information contained herein is subject to the restriction on the title page of this document.

Use or disclosure of information contained herein is subject to the restriction on the title page of this document.

REVISION				
LTR	DESCRIPTION	DWN	DATE	APVD
	SEE SH 1			

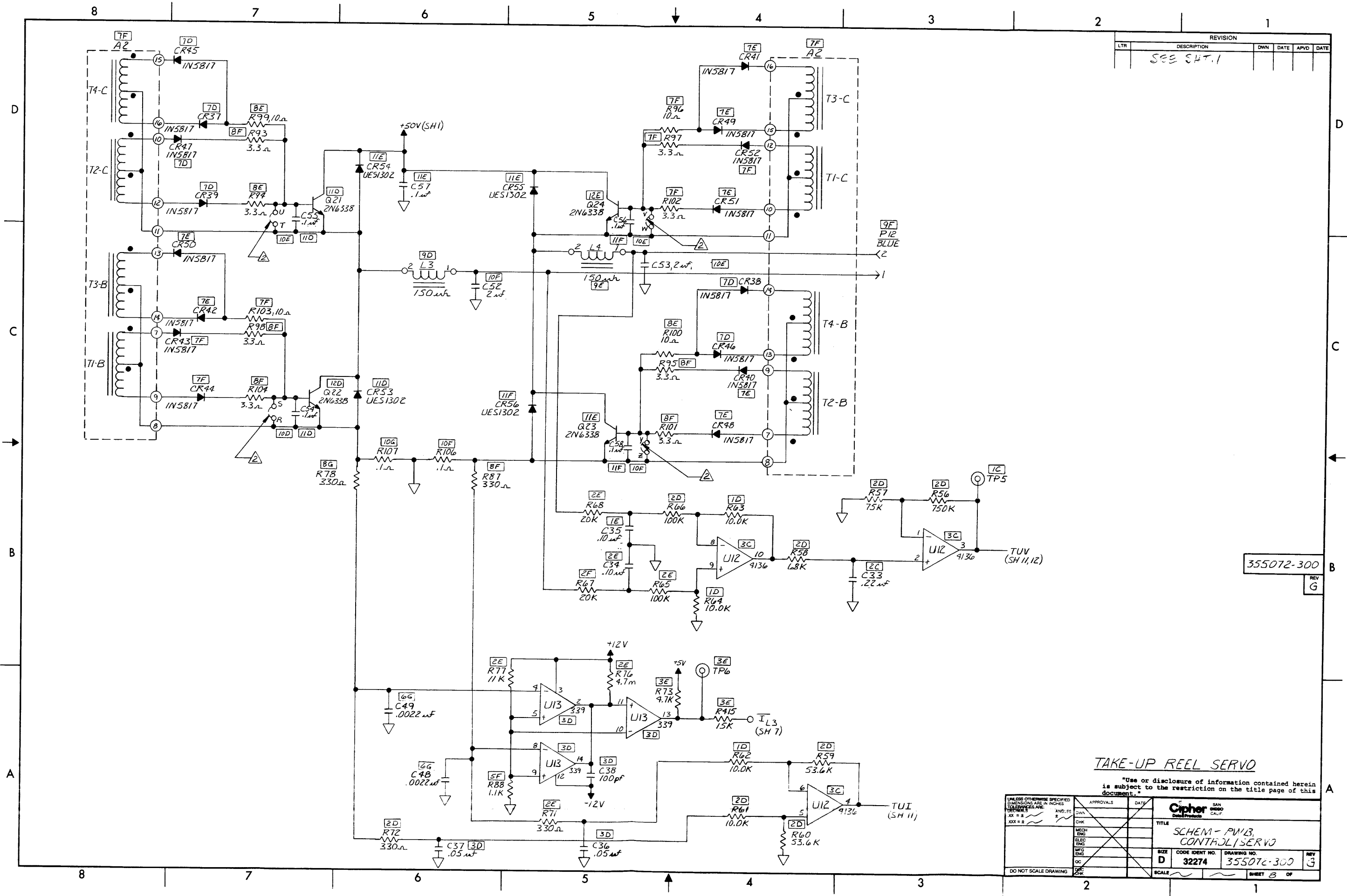


355072-300
REV G

TAKE-UP REEL SERVO

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES DECIMALS .XXX = .3 ANGLES 5°	APPROVALS	DATE		SAN DIEGO CALIF DATE
	DWN ENGR ELEC MFG QC DCC PWR			
DO NOT SCALE DRAWING	SCALE NONE		SIZE D	CODE IDENT NO. 32274
			DRAWING NO. 355072-300	REV G
			SHEET 7 OF	

REVISION				
LTR	DESCRIPTION	OWN	DATE	APVD
	SEE SH. 1			



355072-300
REV G

TAKE-UP REEL SERVO

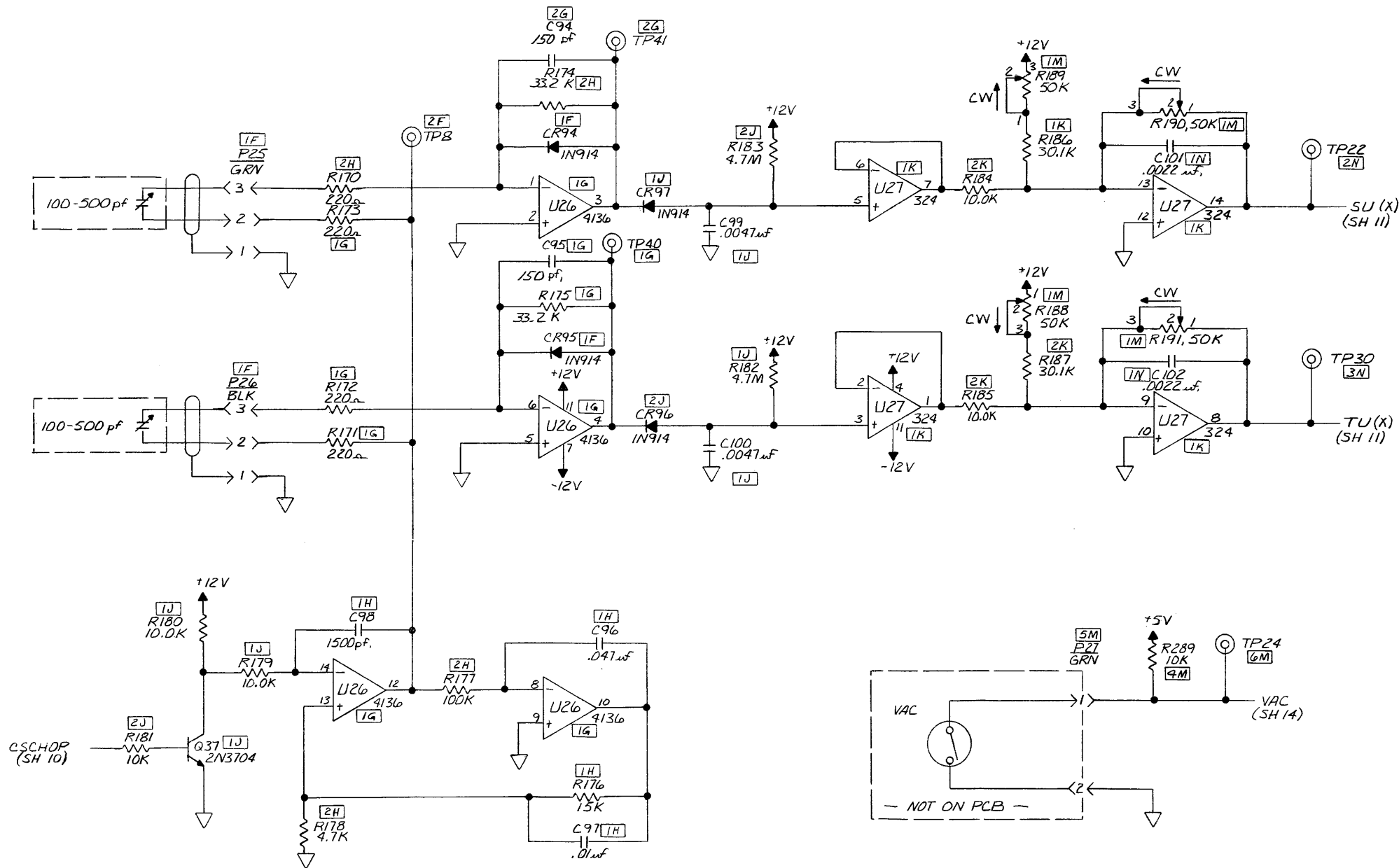
"Use or disclosure of information contained herein is subject to the restriction on the title page of this document."

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE:		APPROVALS		DATE
1/16" ± .005	1/32" ± .002	DESIGN	DATE	
1/8" ± .005	3/16" ± .005	CHK		
1/4" ± .005	1/2" ± .005	MECH		
3/8" ± .005	1" ± .005	ELEC		
1/2" ± .005	2" ± .005	ENG		
3/4" ± .005	4" ± .005	OC		
1" ± .005	2" ± .005	DO NOT SCALE DRAWING		

CIPHER		SAN DIEGO CALIF.	
TITLE			
SCHEM - P11/13, CONTNOL/SERVO			
SIZE	CODE IDENT NO.	DRAWING NO.	REV
D	32274	355072-300	3
SCALE		SHEET 8 OF	

"Use or disclosure of information contained herein is subject to the restriction on the title page of this document."

REVISION					
LTR	DESCRIPTION	DWN	DATE	APVD	DATE
	SEE SH 1				



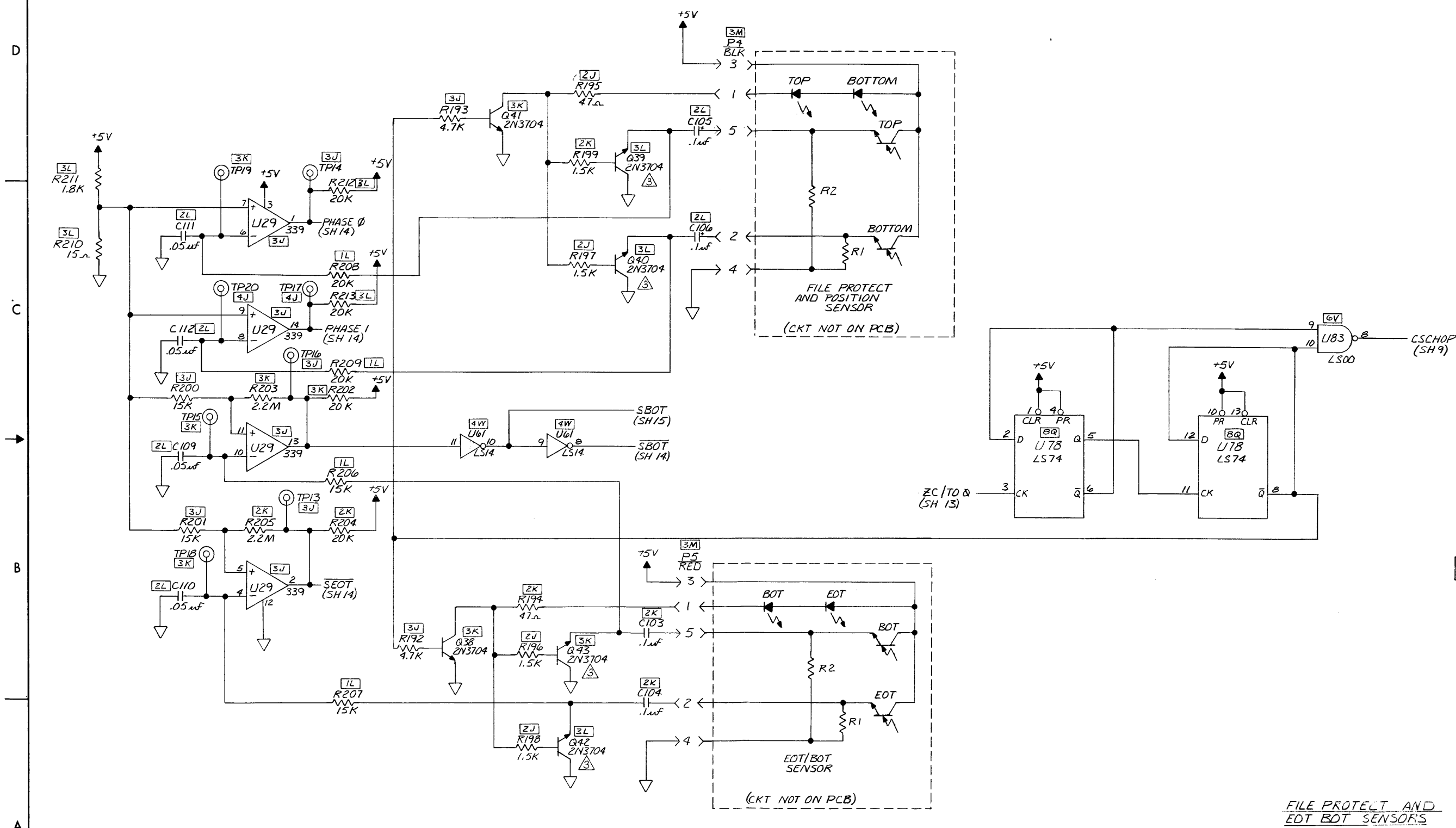
355072-300
REV G

TRANSDUCER CONVERTER

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE DECIMALS ±	APPROVALS	DATE	CIPHER SAN DIEGO CALIF
	DWN		
DO NOT SCALE DRAWING	CHK		TITLE SCHEM - PW3 CONTRU - SERIAL
	MFG		SIZE D
	ENG		CODE IDENT NO. 32274
	OC		DRAWING NO. 355072-300
	DC		SCALE NONE
	DR		SHEET 9 OF

"Use or disclosure of information contained herein is subject to the restriction on the title page of this document."

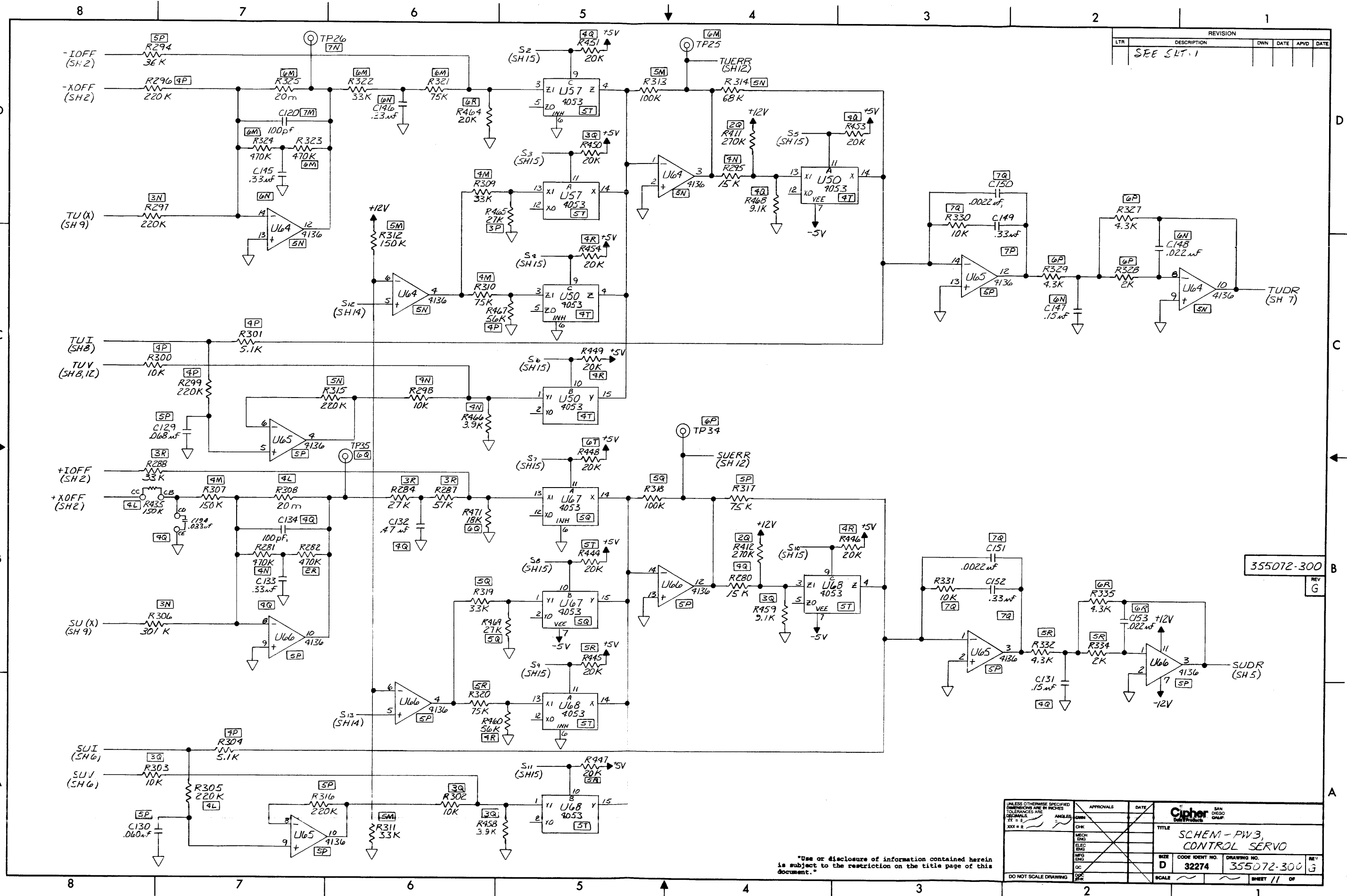
REVISION					
LTR	DESCRIPTION	OWN	DATE	APVD	DATE
	SEE S4T.1				



355072-300
REV H

FILE PROTECT AND EOT BOT SENSORS

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: DIMENSIONS IN PARENTHESES ARE: XX ± .5 XXX ± .2	APPROVALS	DATE		SAN DESIG CAL #	
	DWN				TITLE
	CHK				SCHEM-FW.3 CONTROL SERVO
	MECH ELEC ENG				SIZE D CODE IDENT NO. 32274 DRAWING NO. 355072-300 REV H
DO NOT SCALE DRAWING	SCALE NONE	SHEET 10 OF			



REVISION					
LTR	DESCRIPTION	OWN	DATE	APVD	DATE
	SEE SLT.1				

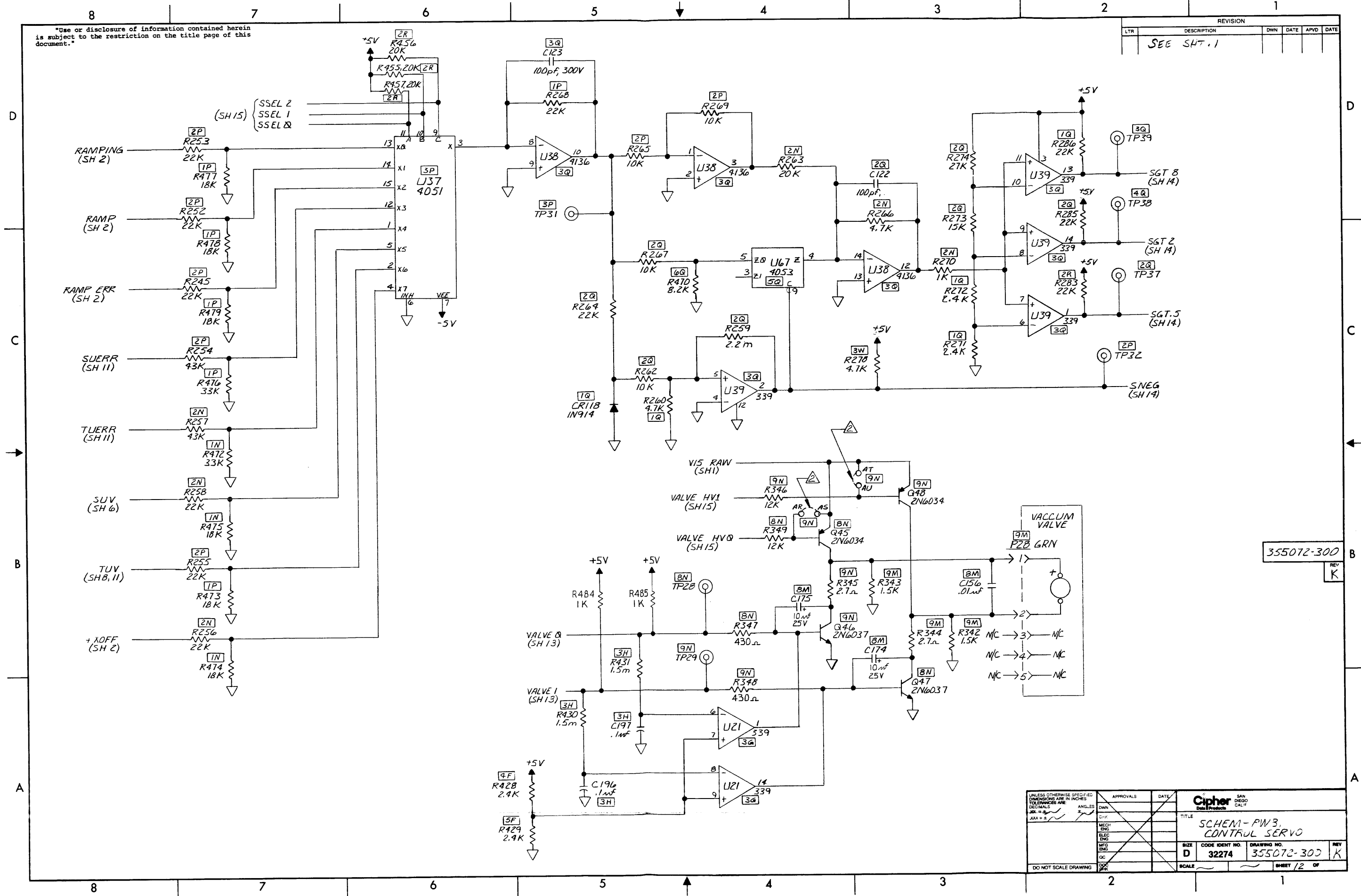
355072-300
REV G

"Use or disclosure of information contained herein is subject to the restriction on the title page of this document."

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE DECIMALS XX = 1 XXX = 2	APPROVALS	DATE		SAN DIEGO CALIFORNIA	
	CHK				TITLE
	MECH				SCHEM - PW3,
	ELEC				CONTROL SERVO
DO NOT SCALE DRAWING	SIZE	CODE IDENT NO.	DRAWING NO.	REV	
	D	32274	355072-300	G	
	SCALE		SHEET	11 OF	

Use or disclosure of information contained herein is subject to the restriction on the title page of this document.

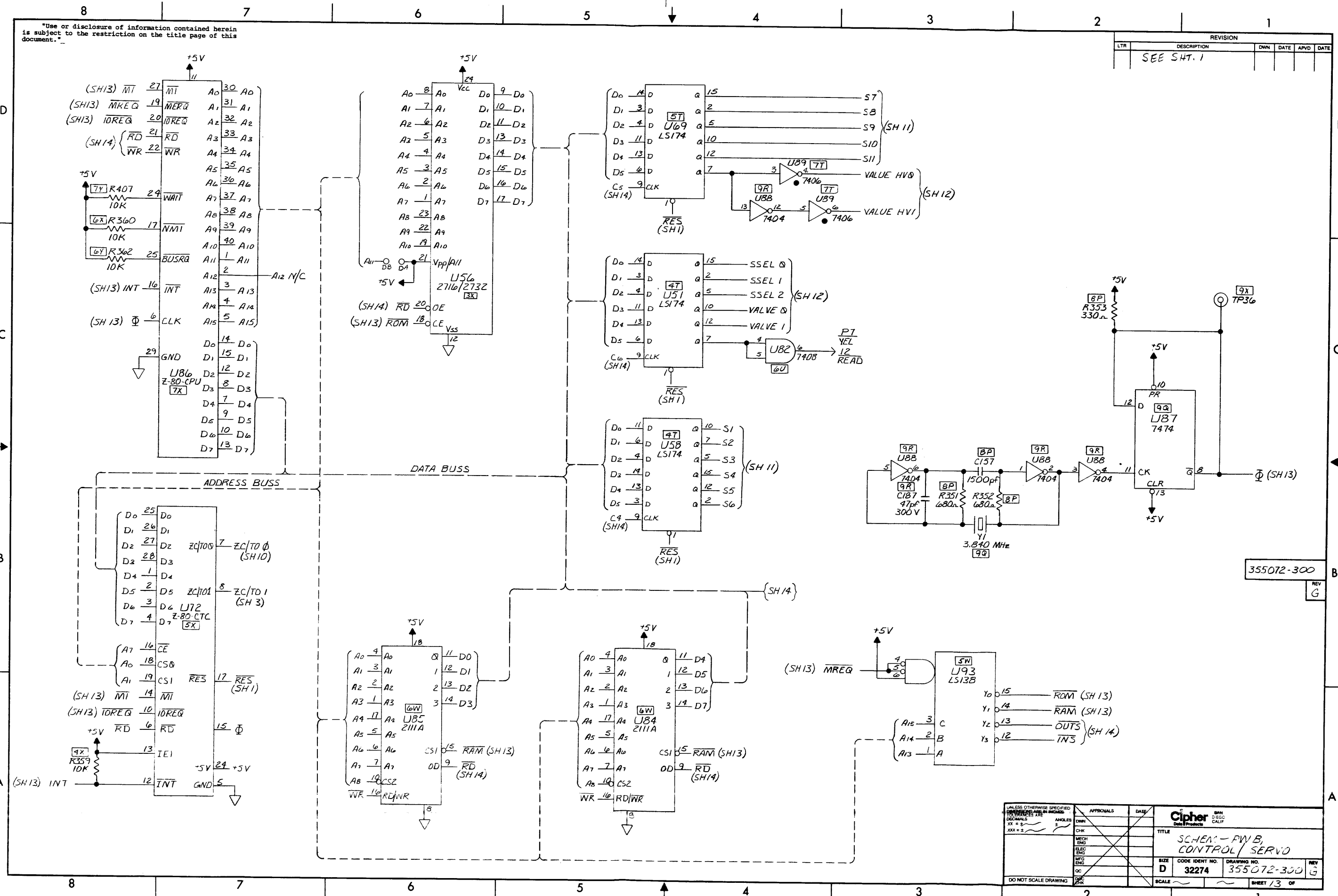
REVISION				
LTR	DESCRIPTION	DWN	DATE	APVD
	SEE SH. 1			



355072-300

REV K

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE DECIMALS		APPROVALS		DATE
SALES	CHK	DWN	CHK	
MED. ENG.				
ELEC. ENG.				
MFG. ENG.				
OC				
DO NOT SCALE DRAWING				
CIPHER DATA PRODUCTS		SAN DIEGO CALIF.		
TITLE: SCHEM-PW3, CONTROL SERVO				
SIZE: D	CODE IDENT NO: 32274	DRAWING NO: 355072-300	REV: K	
SCALE: ~	SHEET 12 OF			



Use or disclosure of information contained herein is subject to the restriction on the title page of this document.

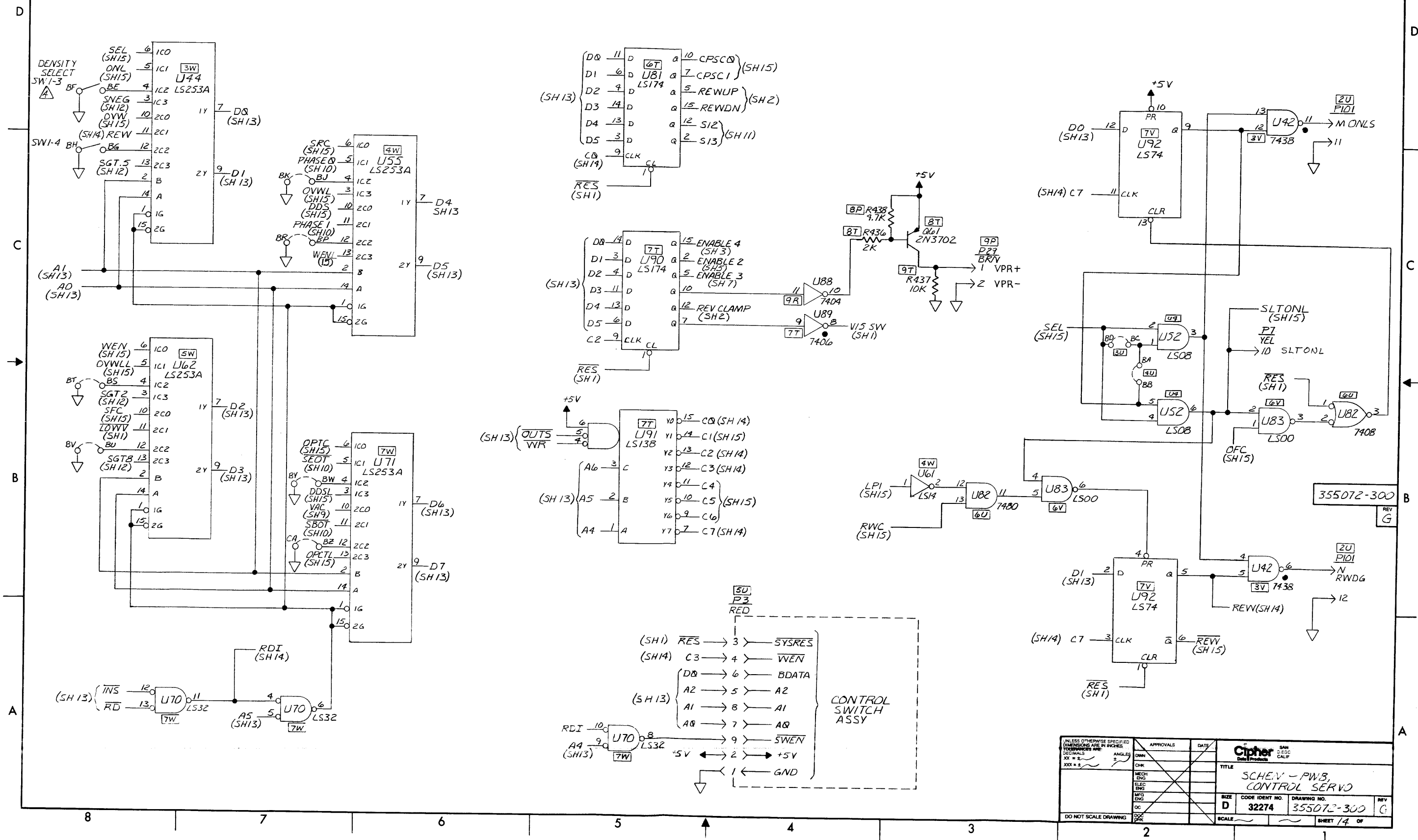
REVISION				
LTR	DESCRIPTION	DWN	DATE	APVD
	SEE SHT. 1			

355072-300
REV G

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES DECIMALS ARE ANGLES		APPROVALS		DATE	CIPHER Data Products SUN D EGG CALIF
XXX = ±	XXX = ±	CHK	DWN		
					TITLE
					SCHEM - PWB CONTROL SERVO
DO NOT SCALE DRAWING		SIZE	CODE IDENT NO.	DRAWING NO.	REV
		D	32274	355072-300	G
					SHEET 13 OF

Use or disclosure of information contained herein is subject to the restriction on the title page of this document.

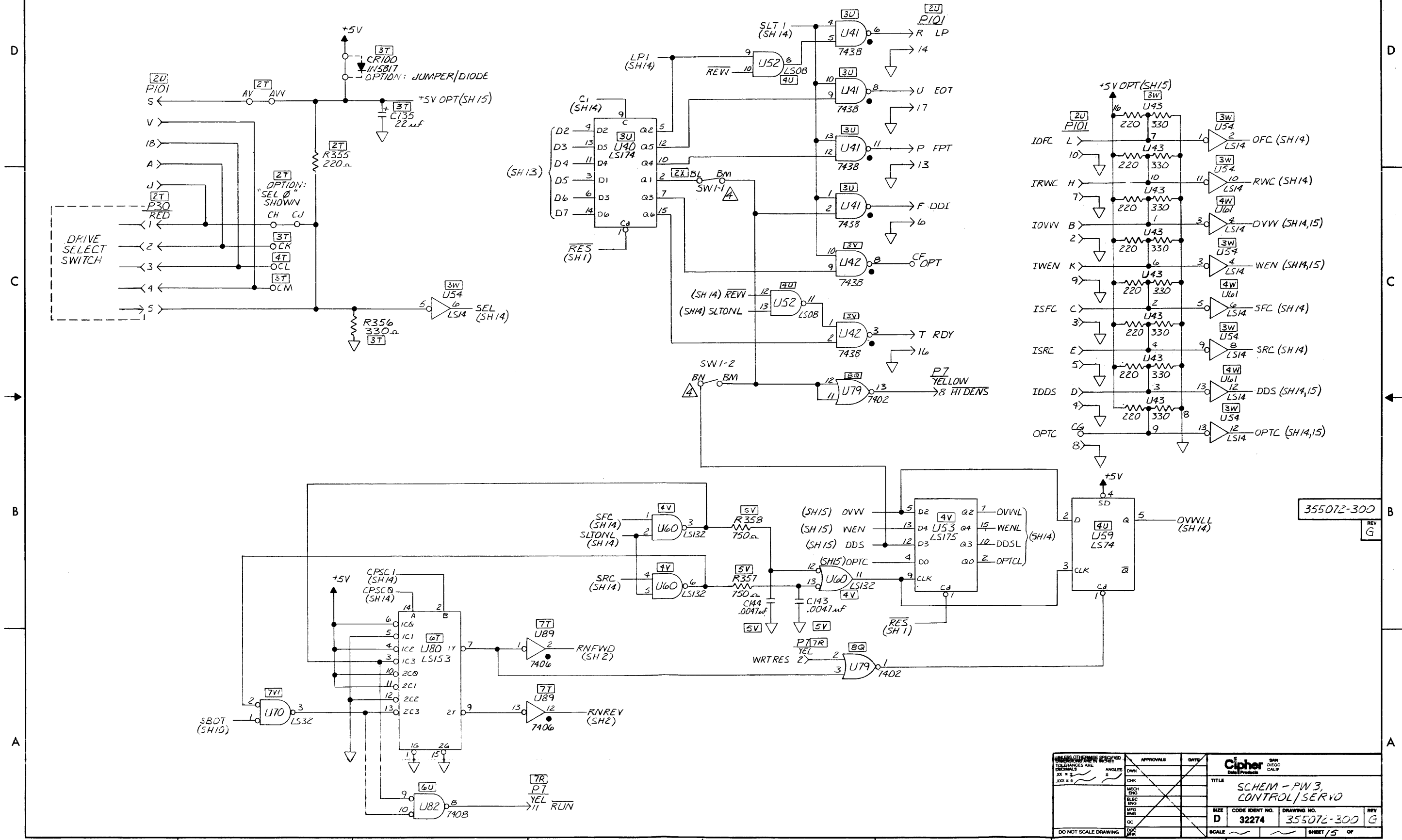
REVISION				
LTR	DESCRIPTION	DWN	DATE	APVD
SEE SH. 1				



UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES		APPROVALS		DATE
XX = ±	XXX = ±	CHK		
		MECH ENG		
		ELEC ENG		
		MFG ENG		
		QC		
		DOC		
DO NOT SCALE DRAWING		CIPHER		DATE
		TITLE		REV
		SCHEM - PW3, CONTROL SERVO		
SIZE	CODE IDENT NO.	DRAWING NO.	REV	
D	32274	355072-300	C	
SCALE		SHEET 14 OF		

"Use or disclosure of information contained herein is subject to the restriction on the title page of this document."

REVISION					
LTR	DESCRIPTION	DWN	DATE	APVD	DATE
	SEE SMT. 1				

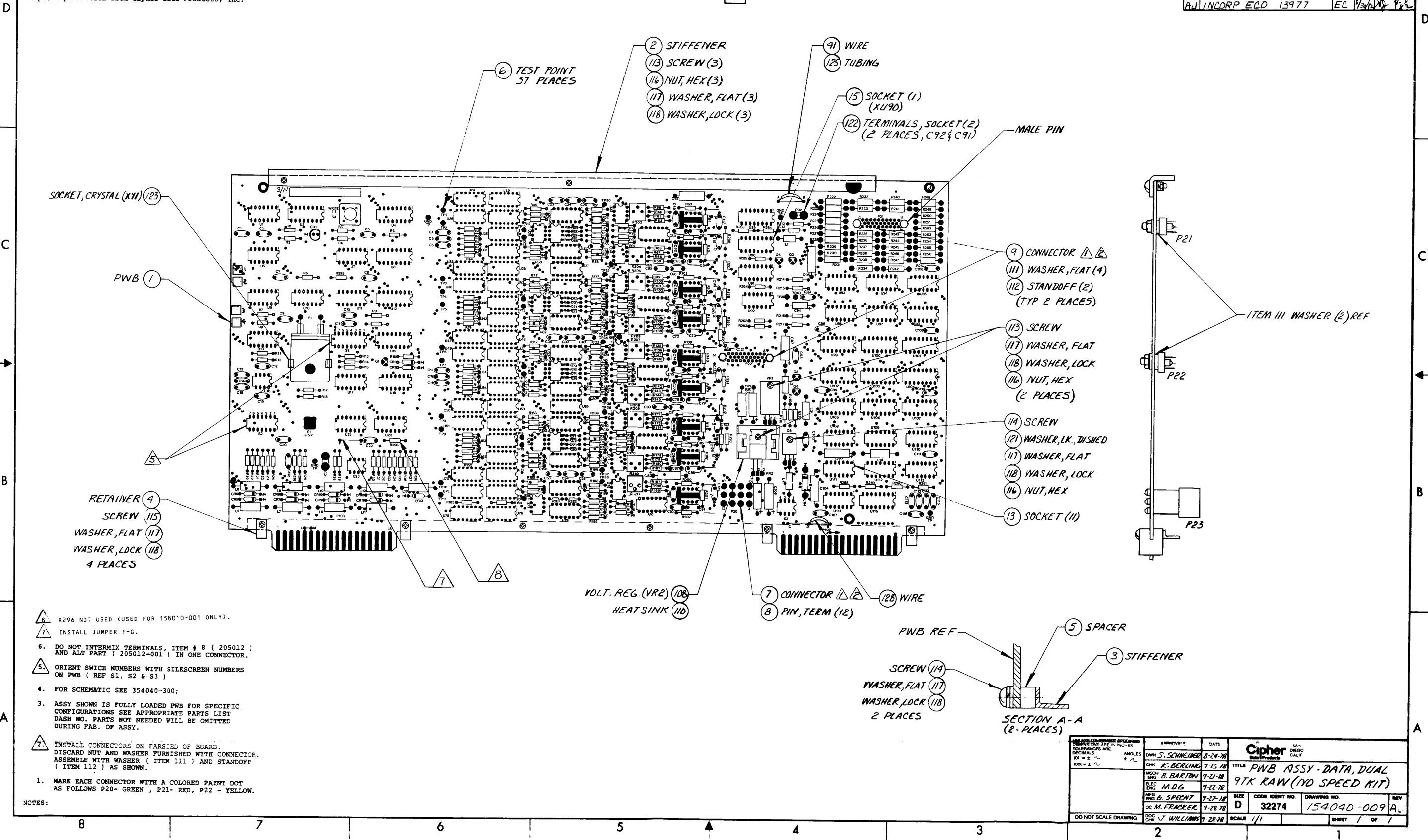


APPROVALS	DATE	CIPHER SAN DIEGO CALIF.
CHK		
MECH ENG		SCHEM - PIN 3, CONTROL/SERVO
ELEC ENG		SIZE
MFG ENG		D
QC		CODE IDENT NO.
DO NOT SCALE DRAWING		32274
		DRAWING NO.
		355072-300
		REV
		G
		SCALE
		SHEET 15 OF

"All information contained in or disclosed by this document is considered CONFIDENTIAL and PROPRIETARY by Cipher Data Products, Inc. By accepting this material the recipient agrees that this material and the information contained therein is held in confidence and in trust and will not be used, reproduced in whole or in part, nor its contents revealed to others, except to meet the purpose for which it was delivered. It is understood that no right is conveyed to reproduce or have reproduced any item herein disclosed without express permission from Cipher Data Products, Inc."

154040-009
REV A

REVISION					
LTR	DESCRIPTION	DWN	DATE	APVD	DATE
AE	REDRAW & INCORP ECO 9731	LS	4-7 81	SD	4-10 81
AF	INCORP ECO 10543	EC	7/24/81	XX	8/2/81
AG	INCORP ECO 11525	FS	11/6/81	XX	1/2/82
AH	INCORP ECO 11901	FS	11/2/81	XX	1/2/82
AJ	INCORP ECO 13977	EC	1/3/82	XX	1/2/82

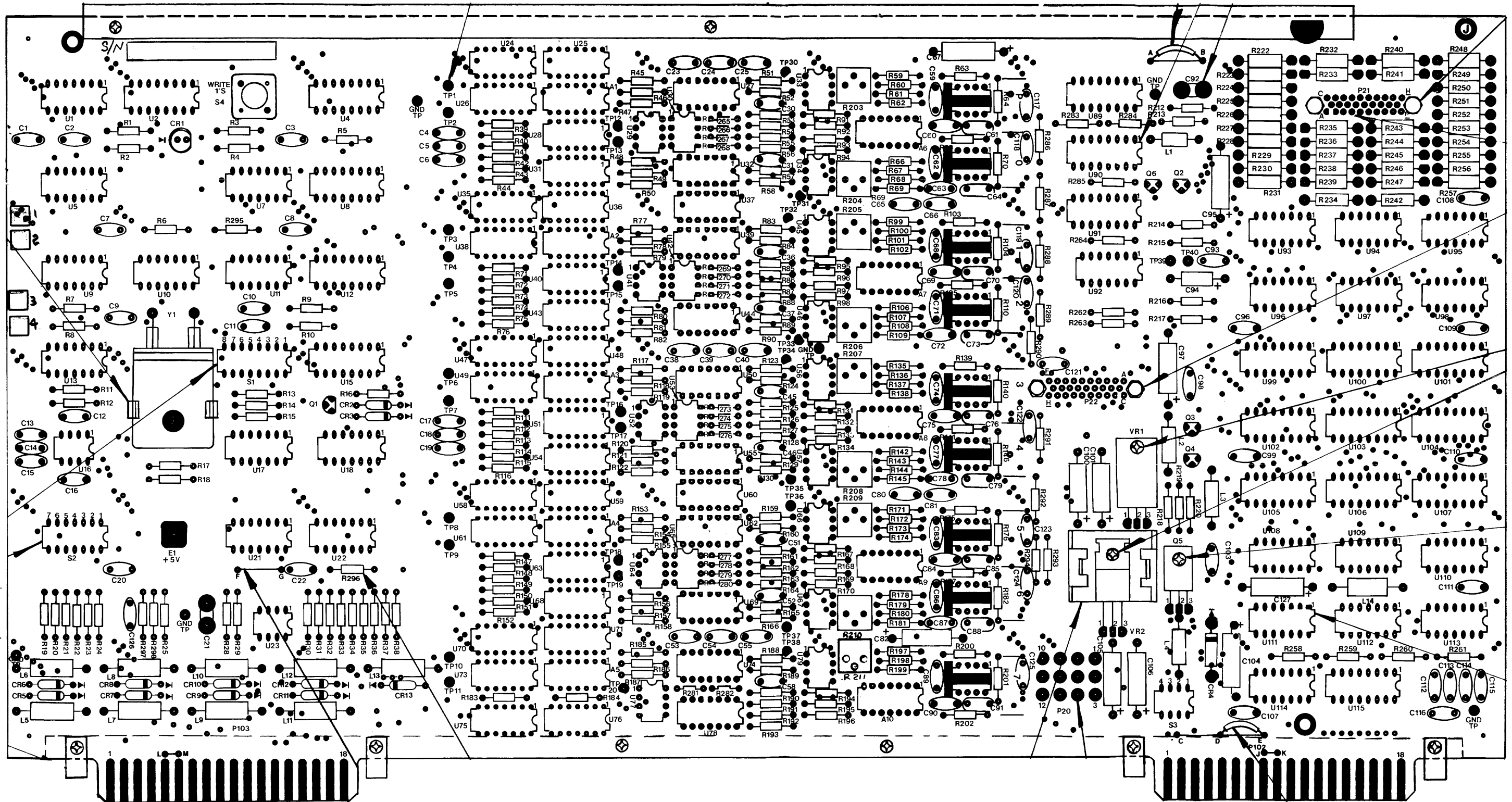


- NOTES:
1. MARK EACH CONNECTOR WITH A COLORED PAINT DOT AS FOLLOWS P20- GREEN, P21- RED, P22 - YELLOW.
 2. INSTALL CONNECTORS ON FARSIDE OF BOARD. DISCARD NUT AND WASHER FURNISHED WITH CONNECTOR. ASSEMBLE WITH WASHER (ITEM 111) AND STANDOFF (ITEM 112) AS SHOWN.
 3. ASSY SHOWN IS FULLY LOADED PWB FOR SPECIFIC CONFIGURATIONS SEE APPROPRIATE PARTS LIST DASH NO. PARTS NOT NEEDED WILL BE OMITTED DURING FAB. OF ASSY.
 4. FOR SCHEMATIC SEE 354040-300;
 5. ORIENT SWITCH NUMBERS WITH SILKSCREEN NUMBERS ON PWB (REF S1, S2 & S3)
 6. DO NOT INTERMIX TERMINALS, ITEM # 8 (205012) AND ALT PART ('205012-001') IN ONE CONNECTOR.
 7. INSTALL JUMPER F-G.
 8. R296 NOT USED (USED FOR 158010-001 ONLY).

APPROVALS		DATE	CIPHER DATA PRODUCTS	TITLE PWB ASSY - DATA, DUAL 97K RAW (170 SPEED KIT)
OWN	S. SCHNEIDER	8-28-78		
CHK	K. BERLING	7-15-78		
MECH ENG	B. BARTON	7-21-78		
ELEC ENG	M.D.G.	7-22-78		
MFG ENG	G. SPECKT	7-27-78		
DC	M. FRACKER	7-28-78		
DR	J. WILLIAMS	7-28-78		

SIZE CODE IDENT NO. DRAWING NO. REV
D 32274 154040-009 A

DO NOT SCALE DRAWING SCALE 1/1 SHEET 1 OF 1



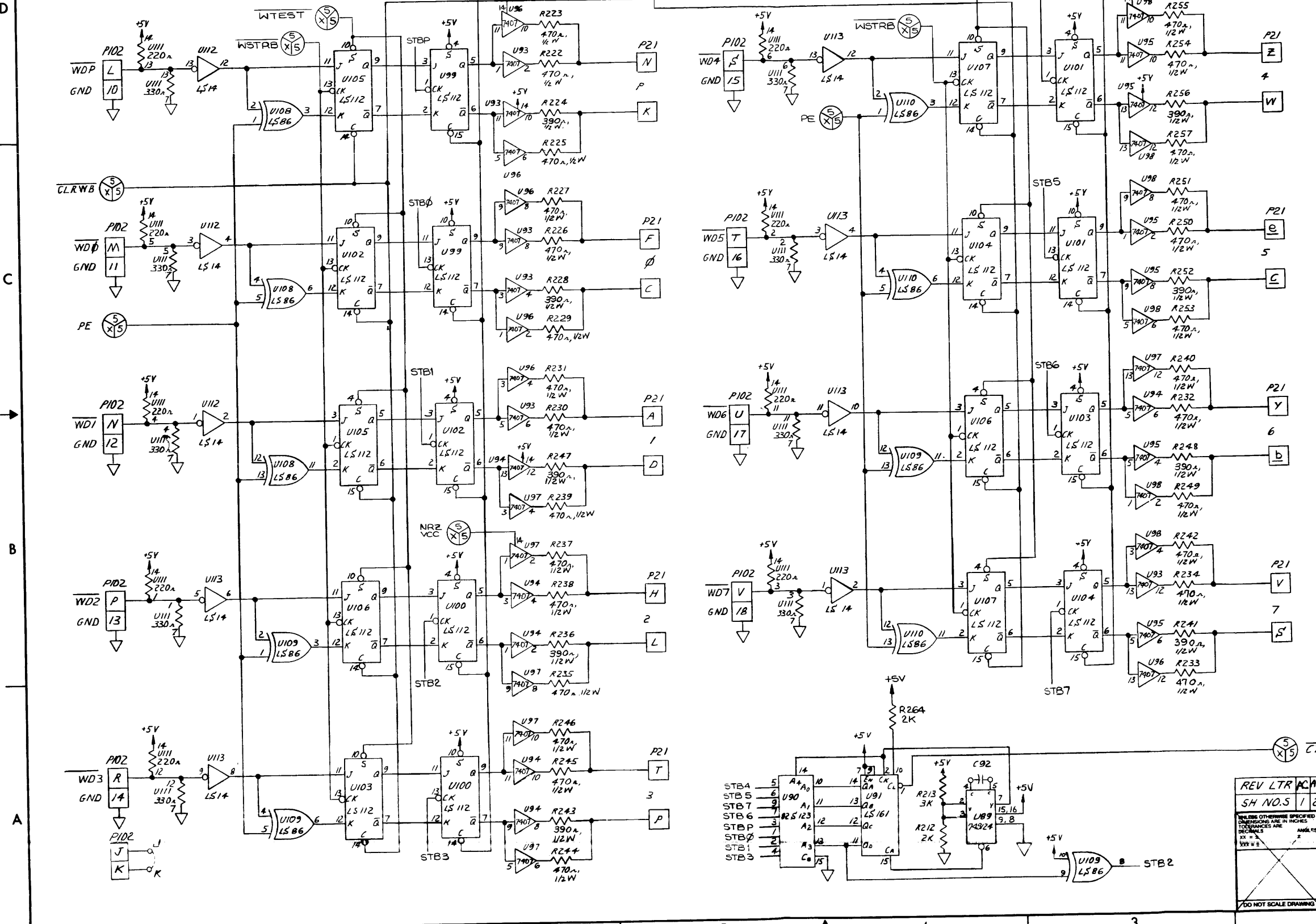
"All information contained in or disclosed by this document is considered CONFIDENTIAL and PROPRIETARY by Cipher Data Products, Inc. By accepting this material the recipient agrees that this material and the information contained therein is held in confidence and in trust and will not be used, reproduced in whole or in part, nor its contents revealed to others, except to meet the purpose for which it was delivered. It is understood that no right is conveyed to reproduce or have reproduced any item herein disclosed without express permission from Cipher Data Products, Inc."

REVISION					
LTR	DESCRIPTION	OWN	DATE	APVD	DATE
A	ENB. REL	ZVS	8/17/78	WJG	10/1/78
B	ECO 4206	ZVS	10/2/78	ZF	10/1/78
C	ECO 4301	ZVS	10/2/78	ZF	10/1/78
D	ECO 4385	ZF	11/2/78	ZF	11/7/78
E	ECO 4496	ZF	11/2/78	ZF	11/7/78
F	ECO 4499	ZF	11/2/78	ZF	11/7/78
G	ECO 4622	ZF	11/2/78	ZF	11/7/78
H	ECO 5192	SGS	3/16/79	ZF	3/16/79
J	ECO 5252	VN	3/17/79	ZF	3/17/79
K	ECO 5371	VN	4/8/79	ZF	4/8/79
L	ECO 5415	VN	4/13/79	ZF	4/13/79
M	INCORP ECO 6725	VN	11/1/79	ZF	11/1/79
N	INCORP ECO 6806	RL	12/4/79	ZF	12/4/79
P	INCORP ECO 6938	SGS	5/22/80	ZF	5/22/80
R	INCORP ECO 7492	KMW	5/21/80	ZF	5/21/80
S	INCORP ECO 7634	CLJ	6/29/80	ZF	6/29/80
T	INCORP ECO 8511	LJ	11/7/80	ZF	11/7/80
U	INCORP ECO 8872	EA	3/2/81	ZF	3/2/81
V	INCORP ECO 9738	LJ	3/2/81	ZF	3/2/81
W	INCORP ECO 11526	EC	1/2/81	ZF	1/2/81
Y	INCORP ECO 11903	EC	1/2/81	ZF	1/2/81
Z	INCORP ECO 11940	EC	1/1/81	ZF	1/1/81
AA	INCORP ECO 11964	UA	1/29/81	ZF	1/29/81
AB	INCORP ECO 13031	ECW	7/20/81	ZF	7/20/81
AC	INCORP ECO 14260	EC	7/25/81	ZF	7/25/81

COMPONENT VALUE TABLE

PWB ASSY	R14	R15
154040-XX	150K	430K
158010-001	330K	150K

- 1. INSTALL JUMPER FOR 154040-001 ONLY.
 - 2. R296 IS USED ON 158010-001 ONLY.
 - 3. FOR COMPONENT VALUE SEE TABLE.
 - 4. SHEET AND SIGNAL REFERENCE CODE.
 - INDICATES SIGNAL SOURCE SHEET CO.
 - INDICATES SHEET NO. SIGNAL IS GOING TO.
 - *M* TO LEFT OF BUBBLE INDICATES FIRST SHT. THAT SIGNAL APPEARS ON.
 - *M* TO RIGHT OF BUBBLE INDICATES LAST SHT. THAT SIGNAL APPEARS ON.
 - COMPONENTS WITH REF. DES. STARTING WITH "A" ARE MOUNTED ON HEADERS.
 - ALL RESISTORS ARE 1/4W, 5%.
 - ALL 3pF CAPS ARE INTRINSIC TO PWB.
- NOTES: UNLESS OTHERWISE SPECIFIED

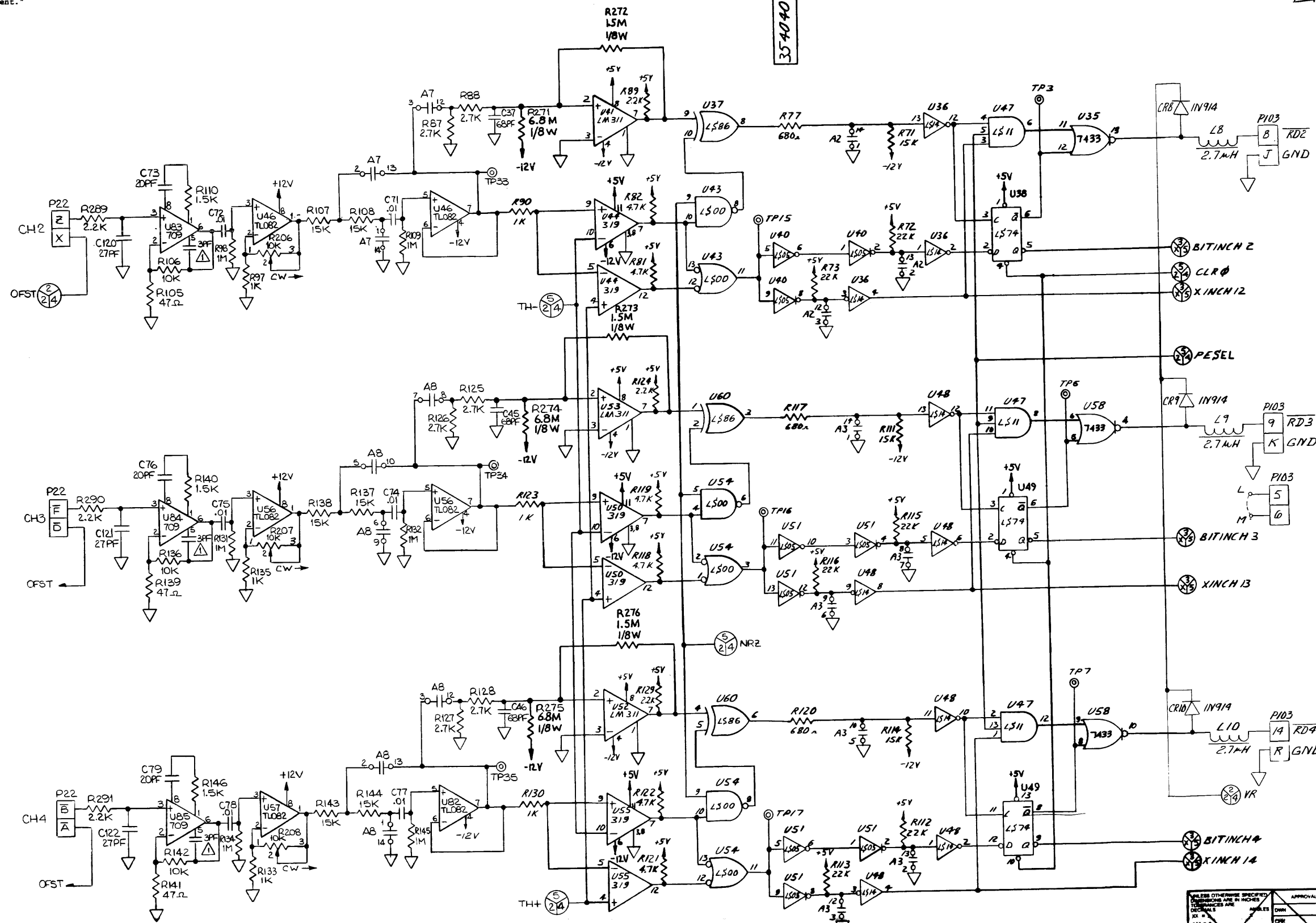


REV	LTR	ACACACAC	AB
SH NO.5	1	2	3
APPROVALS DATE AUTH. L.V. SILVERMAN DATE 8-3-78 DESIGNED BY DATE 8-1-78 CHECKED BY DATE 8-22-78 DRAWN BY DATE 8-22-78 TITLE SCHEMATIC-DATA, DUAL MODE SIZE CODE IDENT NO. 32274 DRAWING NO. 354040-300 SHEET 1 OF 5			



"Use or disclosure of information contained herein is subject to the restriction on the title page of this document."

REVISION			
LTR	DESCRIPTION	DWN	DATE

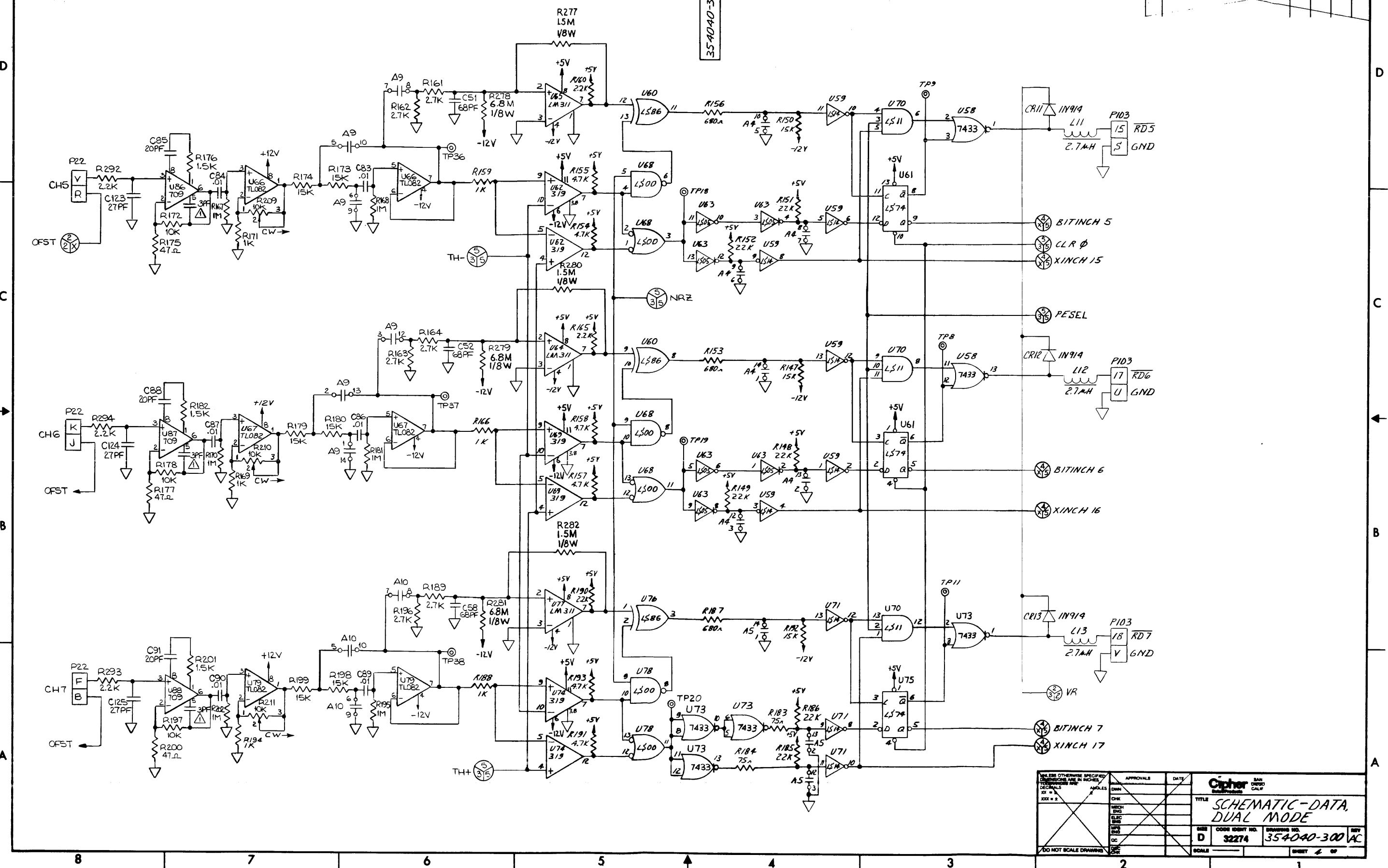


UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES DECIMALS ARE XX XXX = 2	APPROVALS	DATE	Cipher SCHEMATIC-DATA, DUAL MODE
	DWN MECH ELEC QC	DATE DATE DATE	
DO NOT SCALE DRAWING	SCALE	SCALE	SHEET 3 OF 3 32274 354040-300 AC

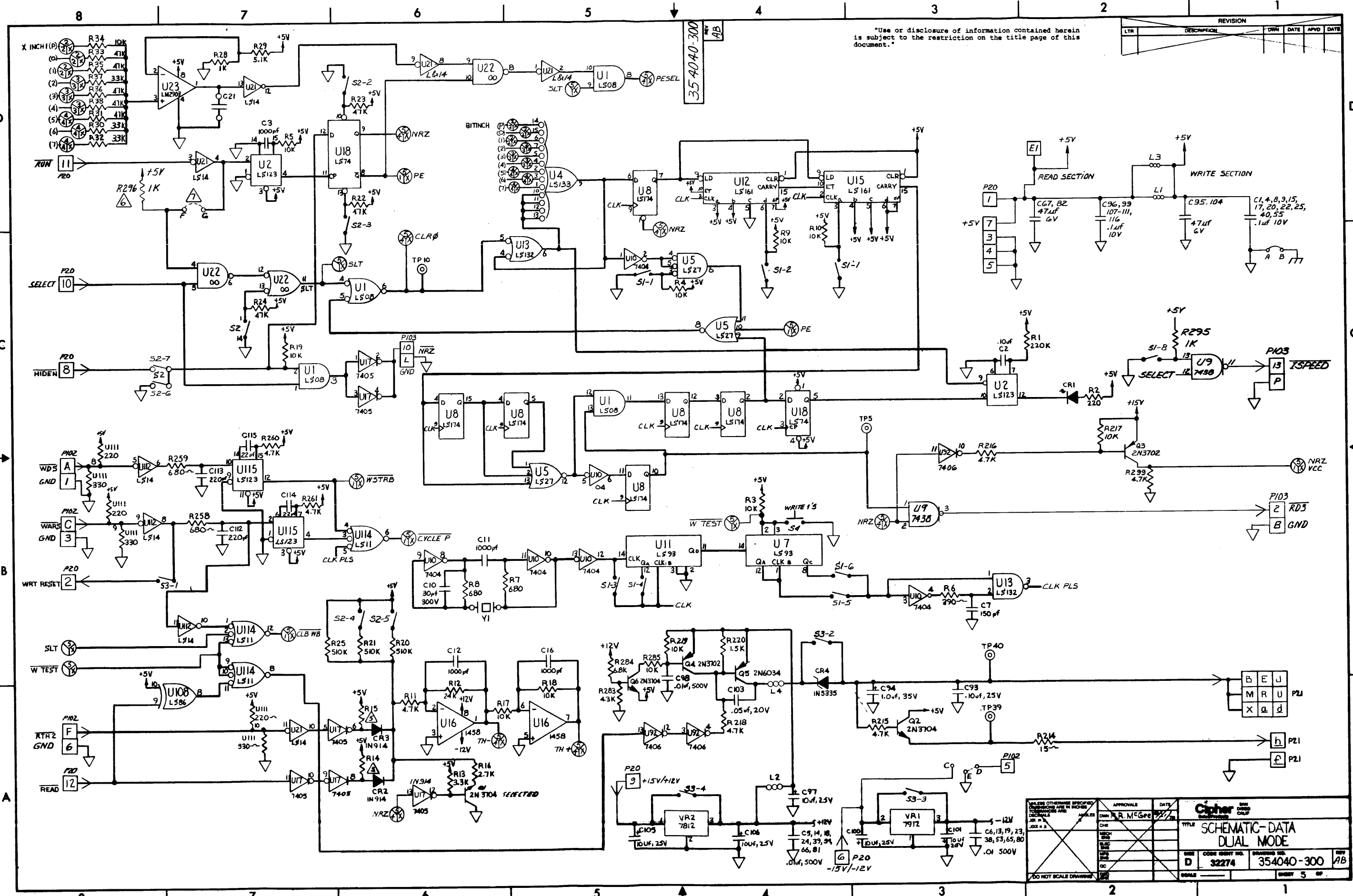
"Use or disclosure of information contained herein is subject to the restriction on the title page of this document."

REVISION				
LTR	DESCRIPTION	OWN	DATE	APVD

35-4040-300
REV AC



UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES DECIMALS ARE ANGLES		APPROVALS		DATE
DESIGNED BY	CHECKED BY	DATE	DATE	DATE
<p>Cipher SAN DIEGO CALIF</p> <p>TITLE: SCHEMATIC-DATA, DUAL MODE</p> <p>SEE CODE SHEET NO. 32274 DRAWING NO. 354040-300 AC</p>				
DO NOT SCALE DRAWING		SCALE	SHEET 4 OF 4	



"Use or disclosure of information contained herein is subject to the restriction on the title page of this document."

REVISION				
LTR	DESCRIPTION	DRW	DATE	APVD

APPROVALS		DATE	
DRW	R. M. Gee	7/77	
TITLE			SCHEMATIC-DATA DUAL MODE
DRW	D	32274	
PARTS LIST		REV	354040-300 AB
QTY			
SCALE			