

# ACCURATE SOUND CORPORATION

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MANUFACTURING  
PROFESSIONAL  
EQUIPMENT  
SALES AND SERVICE  
STUDIO DESIGN  
CONSULTING

October 4, 1989

## OPERATION AND SERVICE MANUAL - AS200-TE TAPE EVALUATOR

## COMPUTER INTERFACE CIRCUIT

The computer interface circuit provides 3 functions:

1. A control button interface
2. A capstan tach. interface
3. A computer controlled capstan clock

The following text will provide a basic description of each function along with electrical interface specifications and programming considerations.

### 1. THE CONTROL BUTTON INTERFACE

This circuit provides the remote control of the following:

Ready Button - Tensions tape. If pressed simultaneously with STOP tension is disabled.

Stop - Stops tape motion

Forward - Starts forward motion. The speed is defined by the capstan clock.

Rewind - Starts reverse motion. The speed is defined by the capstan clock.

Tension - This switch is not on the deck. It is only accessible thru the computer interface. The function is to reduce the reel servo gain by 30%. Reducing the servo gain may be necessary in some cases such as:

slow speed  
small or plastic reels  
very thin tape

Remote Enable- This is only accessible thru the computer interface. It does two things:

Disables all the deck buttons except STOP. (Unless JMP-1 is installed, in which case STOP is also disabled.)

Switches the clock from the manual preset speed to the computer control.

The control button interface also provides sense outputs to the computer so that it can monitor deck status. The button light signals for READY, STOP, FORWARD and REVERSE are all sent to the computer. Additionally, the Sync light and End of Tape sense are sent to the computer. The SYNC light turns on if the capstan phase lock loop is locked on the clock.

(control button interface, cont.)

ELECTRICAL:

All interconnects are opto isolated.

Inputs will require a ground completion of 10-15 ma.  
(active low)

Outputs will provide a ground completion thru an open collector drive. 5ma. max.

The 20 Pin Ribbon connector has the following connections:

+5	2	1	Reverse Sw.
+5	4	3	Stop Sw.
+5	6	5	Forward Sw.
+5	8	7	Ready Sw.
Low Torque Comd.	10	9	Enable
E.O.T. Sense	12	11	Ready Sense
Gnd.	14	13	Reverse Sense
Gnd.	16	15	Forward Sense
Gnd.	18	17	Sync Sense
Gnd.	20	19	Stop Sense

2. THE CAPSTAN TACH INTERFACE

The capstan tach interface provides buffering and direction sensing logic for the capstan tach.

The capstan puck (rubber roller) is ground to have a circumference of 8 inches. The Capstan tachometer generates 1000 pulses per revolution. Some useful values are:

30,000 pulses for 240 inches of tape. (20 feet)  
0.24 inches of tape per pulse.

ELECTRICAL

The tach outputs to the computer are thru high speed opto couplers. They will require 50 ma. of current at 5v.d.c. for power. The outputs are T.T.L. compatible.

The connector is a 10 pin ribbon.

Gnd.	2	1	Direction Out - Low on forward
Gnd.	4	3	+5
Gnd.	6	5	Direction Out - Low on reverse
Gnd.	8	7	+5
Gnd.	10	9	Tape Tach. Pulse

### 3. CAPSTAN CLOCK CIRCUIT

The capstan clock circuit consists of three functions:

A data selector circuit that selects between a 7 bit computer input or a 7 bit programming switch. The programming switch permits a preset speed when the computer is not in control.

A crystal controlled clock and divider chain controlled by 7 bit data word.

A Ramp-up circuit that automatically ramps up the clock output to the selected value when starting in either direction. This circuit will also engage if an abrupt increase in clock frequency occurs. It will not engage if a Decrease in frequency occurs. (The user is cautioned that they must take care to not decrease speed too abruptly.) The Capstan circuit only drives the motor it does not hold back, thus 25% to 50% steps down in speed are usually acceptable as the system momentum will cause a ramping effect.

#### PROGRAMMING:

The following chart will help in setting RP2, the fixed speed selector.

IPS	CLK FREQ. KHz	s1 (p 5)	s2 (p 6)	s3 (p 1)	s4 (p 2)	s5 (p 3)	s6 RST	s7 DIV	JMP3 2-3	JMP3 1-2
960	60	on	on	on	on	off	off	off	x	x
800	50	on	on	off	off	off	off	off	x	x
640	37.5	on	on	off	on	on	off	on	on	off
480	30	on	off	on	off	on	off	off	x	x
320	20	on	off	on	off	off	off	off	x	x
240	15	on	off	off	on	on	off	off	x	x
192	12	on	off	off	on	off	off	off	x	x
160	10	on	off	off	off	on	off	off	x	x
120	7.5	on	off	on	off	on	off	on	on	off
96	6	off	on	on	on	on	off	off	x	x
80	5	on	off	on	off	off	off	on	on	off
60	3.75	on	off	off	on	on	off	on	on	off
48	3	off	on	on	off	on	off	off	x	x
32	2	off	on	on	off	off	off	off	x	x
24	1.5	off	on	off	on	on	off	off	x	x
16	1	off	on	off	off	on	off	off	x	x
12	0.75	off	on	on	off	on	off	on	on	off
8	0.5	off	on	off	off	off	off	off	x	x
4	0.25	off	on	off	off	on	off	on	on	off

X - Means Don't Care

(capstan clock cont.)

S1 thru S5 (p5, p6, p1, p2, p3) control the dividers of the crystal oscillator.

S6 initiates a reset which stops the clock - no tape motion.

S7 enables a second divider that is selectable for div. 2 or 4. JMP3 (1-2) sets Div. by 2 while JMP3 (2-3) sets Div. by 4.

The following chart will help program the computer port:

IPS	CONNECTOR PIN NUMBERS								HEX
	15	13	11	9	7	5	3	1	
960	0	0	0	0	1	1	1		0F
800	0	0	1	1	1	1	1		3F
640	0	0	1	0	0	1	0	D	25
480	0	1	0	1	0	1	1	A	57
320	0	1	0	1	1	1	1	T	5F
240	0	1	1	0	0	1	1	A	67
192	0	1	1	0	1	1	1		6F
160	0	1	1	1	0	1	1	C	77
120	0	1	0	1	0	1	0	L	55
96	1	0	0	0	0	1	1	O	87
80	0	1	0	1	1	1	0	C	5D
60	0	1	1	0	0	1	0	K	65
48	1	0	0	1	0	1	1		97
32	1	0	0	1	1	1	1	L	9F
24	1	0	1	0	0	1	1	I	A7
16	1	0	1	1	0	1	1	N	B7
12	1	0	0	1	0	1	0	E	95
8	1	0	1	1	1	1	1		BF
4	1	0	1	1	0	1	0		B5

The HEX value assumes that pin 1 = D0 thru Pin 15 = D7  
Pin 1 is the data strobe line. Data is latched on a high to low transition of D0. Load the Hex value then load the value minus 1.

#### JUMPERS:

There are several jumpers in the clock circuit.

JMP2 - Shifts clock to lo frequency. Do not use.

JMP3 - A 3 pin, 2 position jumper. Center to one side sets added divider for div. by 2. Center to the other side sets for div. by 4. (1-2 div. by 2, 2-3 div. by 4)

JMP4 - Connects clock to output. This should always be used.

## 4. ADJUSTMENT AND ALIGNMENT

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### 4.1 General

The AS200-A system has been conscientiously engineered for long-term stability and reliability. Both mechanical and electrical adjustments have been factory aligned and adjusted for optimum performance and tape handling. The procedures described in this section should, therefore, be necessary only when component replacement occurs as a result of normal system wear due to useage.

When adjustment and alignment becomes necessary, the following equipment is recommended:

- Tentelometer and/or spring type tension gauge (0 - 12 ounces)
- Calibration tapes appropriate to system head format, speed and EQ
- Dual-channel oscilloscope with a bandwidth of DC to at least 25 MHz
- AC Voltmeter (HP 400 F or equivalent)
- Audio Oscillator (HP 204D or equivalent): minimum, sweep generator; recommended
- Test Cables (2 each)
- Head de-gausser

Expendable materials you will need include:

- Cotton head cleaning swabs
- Head and tape guide cleaning solvent

As a general rule, the gain, frequency response, and head condition should be checked every 100 to 150 hours of operation, depending on useage.

### 4.2 Transport Setup and Adjustment

#### 4.2.1 General

Precise control of the tape tension over the heads is maintained by the supply and takeup reel servo systems. Freedom of movement of mechanical guides, arms and rollers is essential to proper operation of the servo system. Regular cleaning and inspection of these components for mechanical freedom should therefore, be considered as part of a routine maintenance procedure. Should a problem with tape handling occur, perform these inspections first.

Generally, tape tension is an accurate indicator of the relative condition of the transport tape handling system. During normal operation, tape tension should be in the range of 4 to 6 ounces. Refer to Figure 4-3A for specific tension measurement points.

#### 4.2.2 Tension Sensor Alignment

The following steps are performed with the power removed from the slave or master machine on which the adjustment is performed. Offered as a recommended procedure, these steps may be tailored to your specific practices.

1. Using a tape "noose" on the supply tension sensor arm, measure the force necessary to maintain the sensor arm at its center position. Approximately 6 to 6.5 ounces yields a 4 ounce running tension measured at the head (see Figure 4-2), and a 5 ounce packing tension at the takeup reel.
2. If adjustment is required, unplug the head connector on the record bay (below the transport—slaves only). The transport must then be tilted out of the cabinet as illustrated in figure 4-1. Use a wooden or metal rod about 12 to 14 inches in length to prop the deck open.

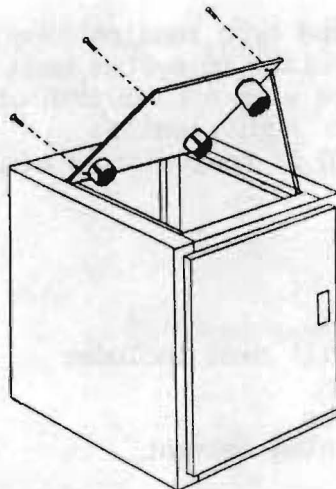


Figure 4-1, Transport Position for Tension Adjustment

3. Disable dashpot by unscrewing the valve screw out (counterclockwise) about 1 and 1/4 turns.
4. Locate the knurled tension spring adjustment knob under the supply sensor arm (Figure 4-3). Determine the direction of the required adjustment: clockwise = less; counterclockwise = more. Loosen the setscrew and move the knob slightly in the required direction. Tighten the setscrew and remeasure tension per step 1.

Repeat this procedure as necessary to obtain the desired tension.

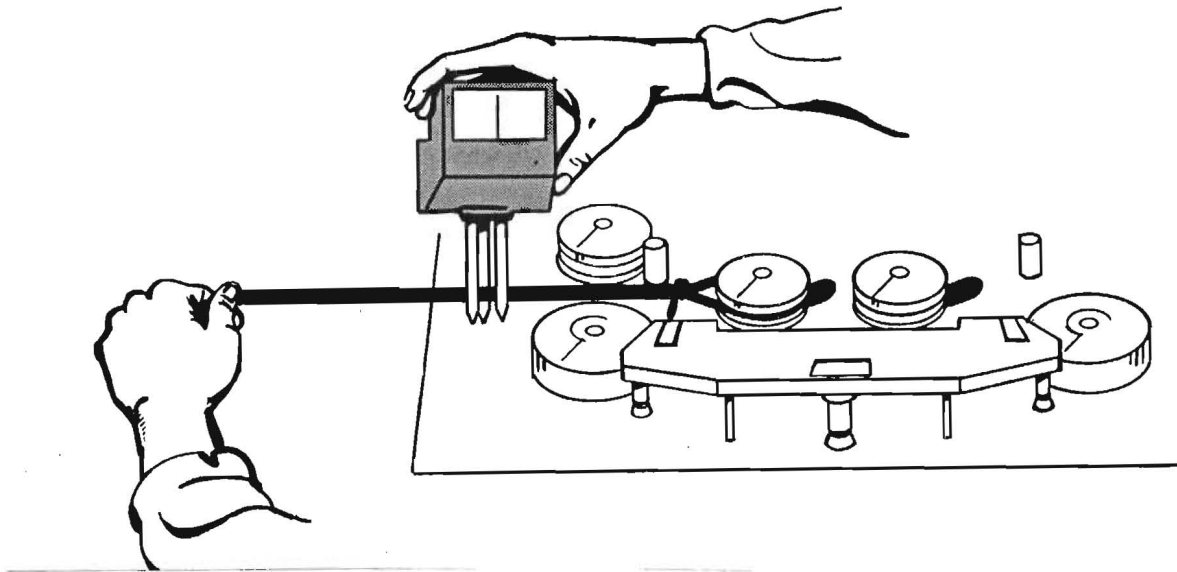


Figure 4-2, Supply and Takeup Tension Measurement

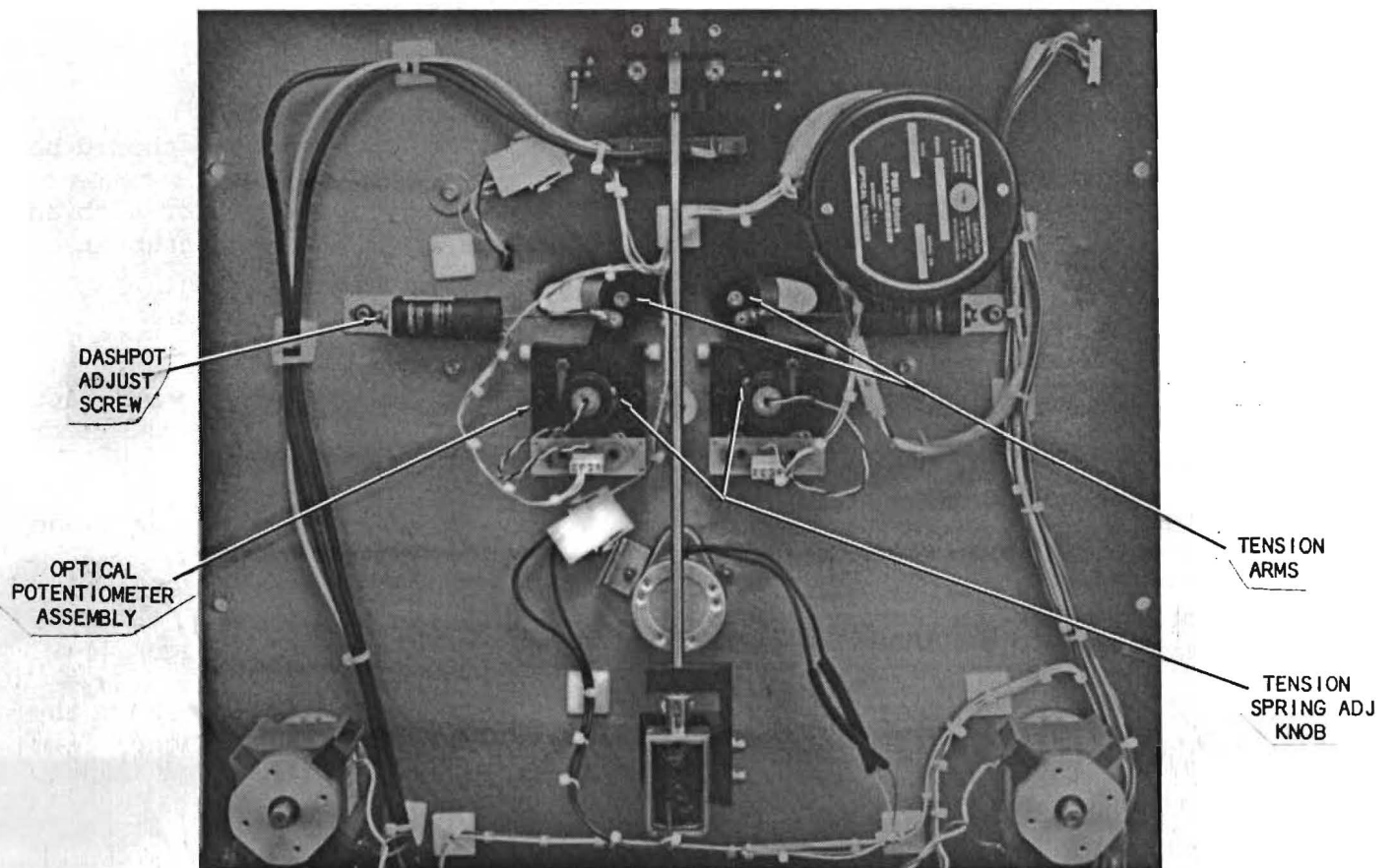


Figure 4-3, Tension Arm Spring and Dashpot Adjustment



5. Adjust the dashpot for proper dampening. Using the tape noose, slowly pull the sensor arm from its inner position toward the outer position while observing the force required to move it from the resting position. Adjust the dashpot valve for approximately 8 to 9 ounces of force.
6. Repeat steps 1 - 3 for the takeup tension arm, except that the desired tension force should be 7 to 7.5 ounces in order to maintain a 5 ounce tension on the takeup reel (see Figure 4-3A).
7. Remove the prop, re-install the head connector, lower the transport into its normal position, and install the four securing screws (Figure 4-1).

#### 4.2.3 Reel Motor Direction Rotation

Insure that the direction of motor rotation and tension arm control operation is correct before proceeding with the tension adjustments.

##### 4.2.3.1 Supply Motor

When the supply tension arm is in the rest position, the motor should be driven clockwise. Moving the arm to the opposite extreme should reverse motor direction. Perform this test by blocking the EOT sensor with an opaque material, pressing READY and observing the direction of supply motor rotation.

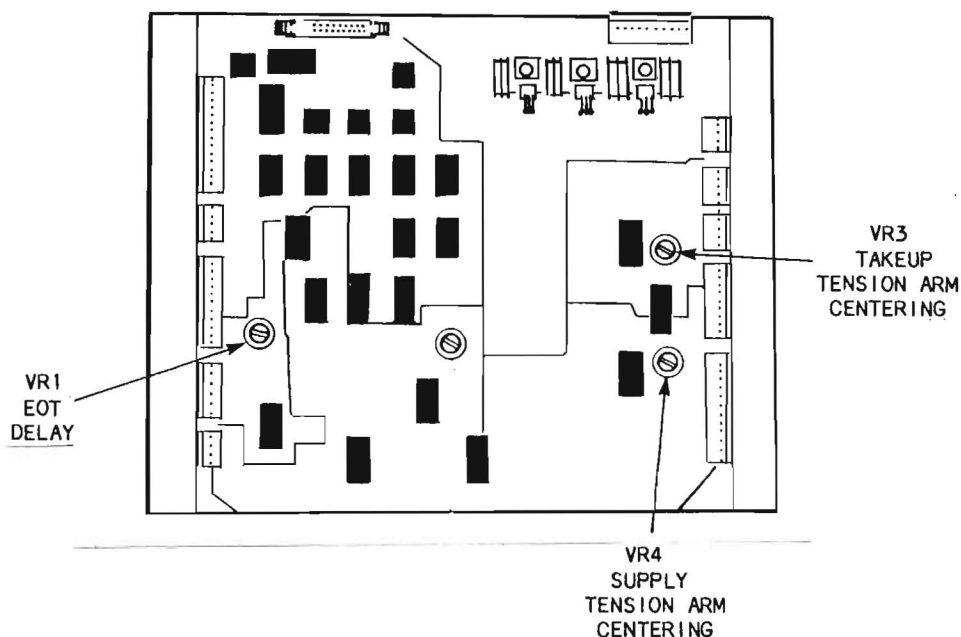
##### 4.2.3.2 Takeup Motor

When the take-up tension arm is in the rest position, the motor should be driven counter-clockwise. When the arm is moved outward to the other extreme, the motor should stop. Perform this test by blocking the EOT sensor with an opaque material, pressing READY and observing the supply motor operation.

#### 4.2.4 Tension Arm Range Centering

The tension arm range centering adjustment must be performed with tape threaded on the deck, AC power applied, and the deck "tensioned" (in the ready state).

1. Open the rear door to expose the Servo board. Use a small flat-blade screwdriver to make any adjustments.
2. For Takeup tension arm centering, adjust potentiometer VR3 so that the takeup sensor arm rests in the center of its travel range (see Figure 4-4).
3. For Supply tension arm centering adjust potentiometer VR4 so that the supply sensor arm rests in the center of its travel range (see Figure 4-4).



**Figure 4-4, Servo Board Adjustments**

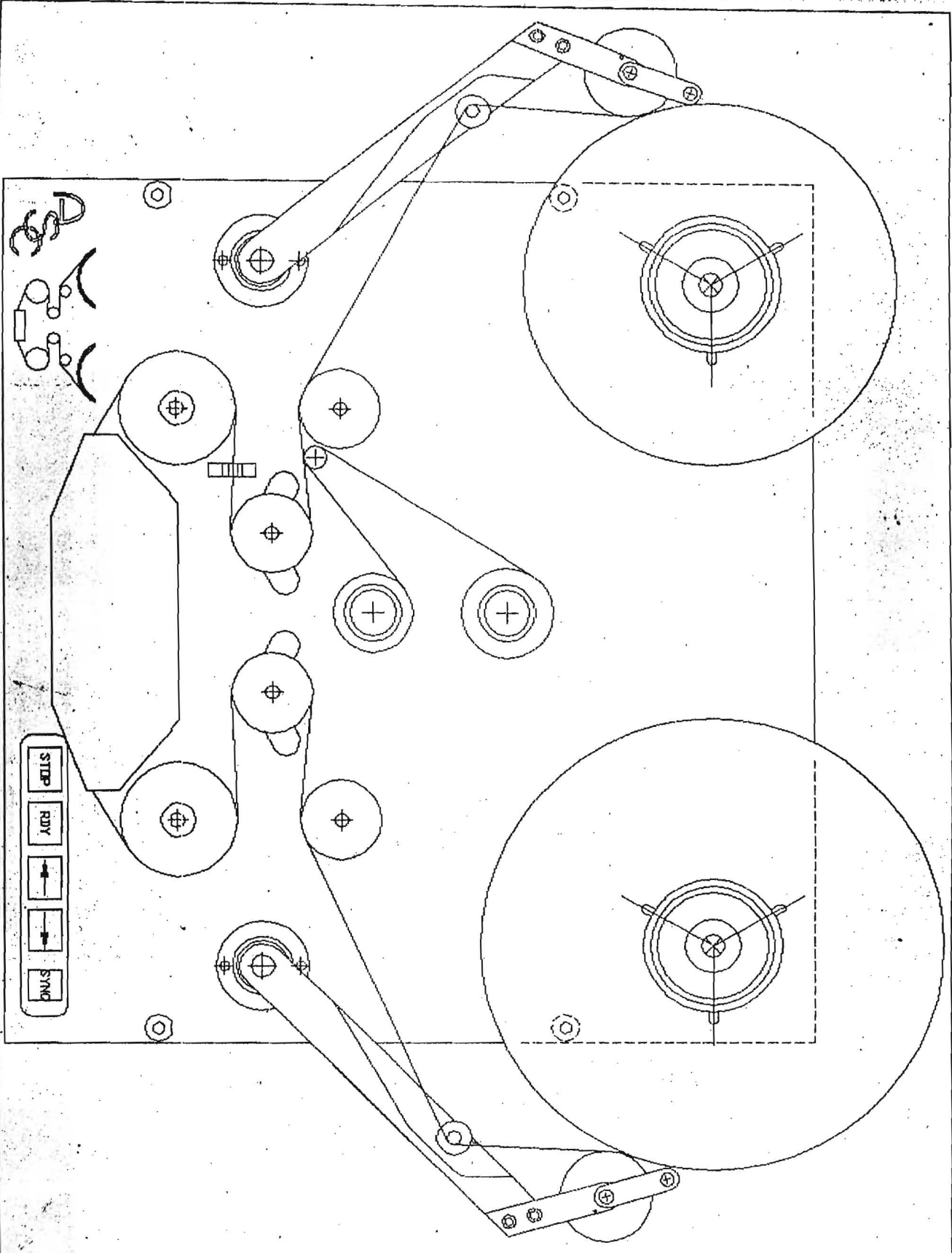
**4.2.5 End-of-tape (EOT) Sensor Adjustment**

The AS200 transports are equipped with a no-tape sense circuit that shuts off all servo systems if tape is either not threaded properly, or runs out during normal operation. The EOT sense circuit consists of a optoelectrical sensor on the top plate through which the tape passes.

The EOT adjustment (VR1 on the Servo board) establishes the voltage threshold at which all servos are shut off. VR1 also adjusts the time-delay after which a no-tape condition is sensed and the servos are shut off. The delay can vary from zero (servos cannot be activated by READY) to infinite (servos continue running when a no-tape condition is sensed). The optimum setting is made so that when READY is pressed (without tape threaded), reel servos are turned on for approximately one-half second, then turn off. When adjusted in this manner and tape is threaded, the reel motors are driven for a sufficient time period to "tension-up" the tape and maintain the servo-ready condition. Zero time delay (READY does not activate the servos) is set by adjusting VR1 fully clockwise. Infinite time delay (a no-tape condition does not shut off the servos) is set by adjusting VR1 fully counter-clockwise.

VR1 setting is typically between 9-11 o'clock (1/3 to 1/2 of the resistance) for correct operation.

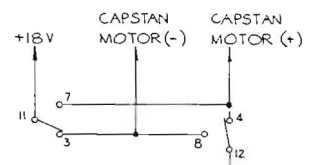
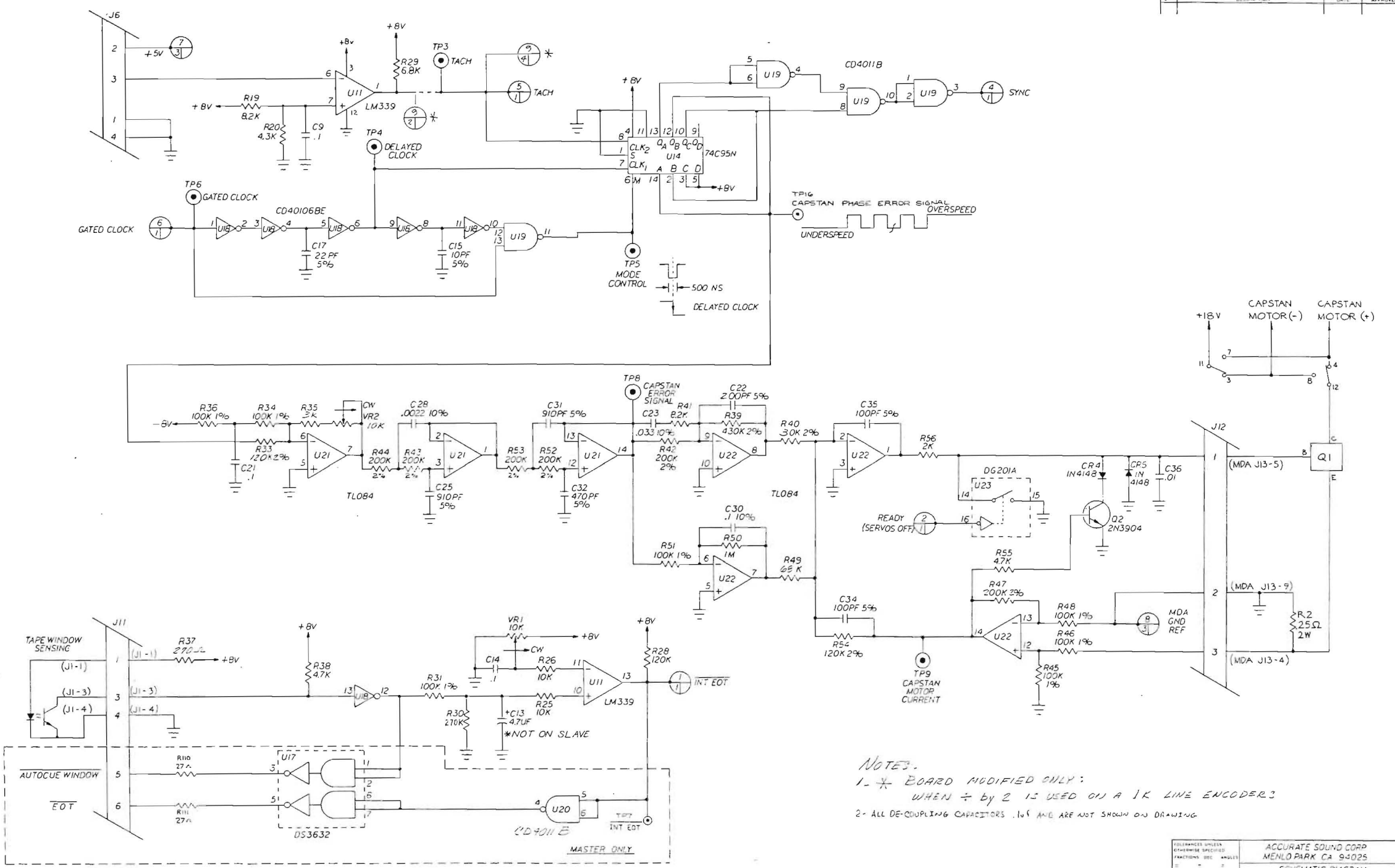
On the master, end-of-tape sense is normally delayed about 2 seconds to permit the use of transparent windows in the tape (used for the Auto-Cue function).



Accurate Sound Corp.		TITLE: TAPE PATH FOR TYPE C DECK, AS-200	
A. DODMAN LVM		REV 01/18/89 701-D-1210 B	
DNE Eng B 8811005A		SHT. 1 OF 1	



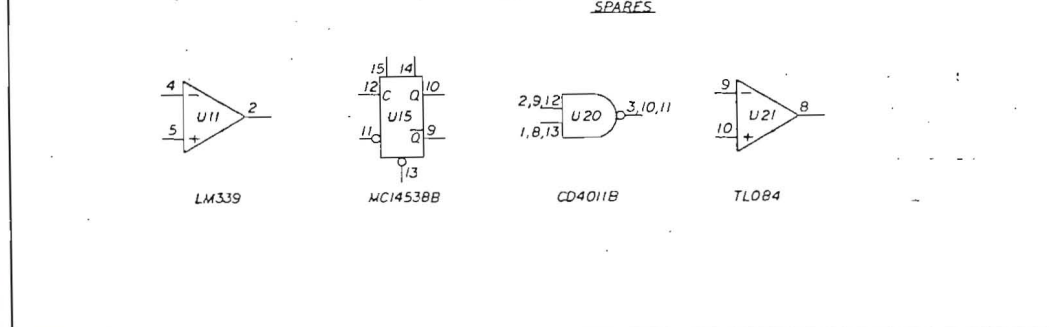
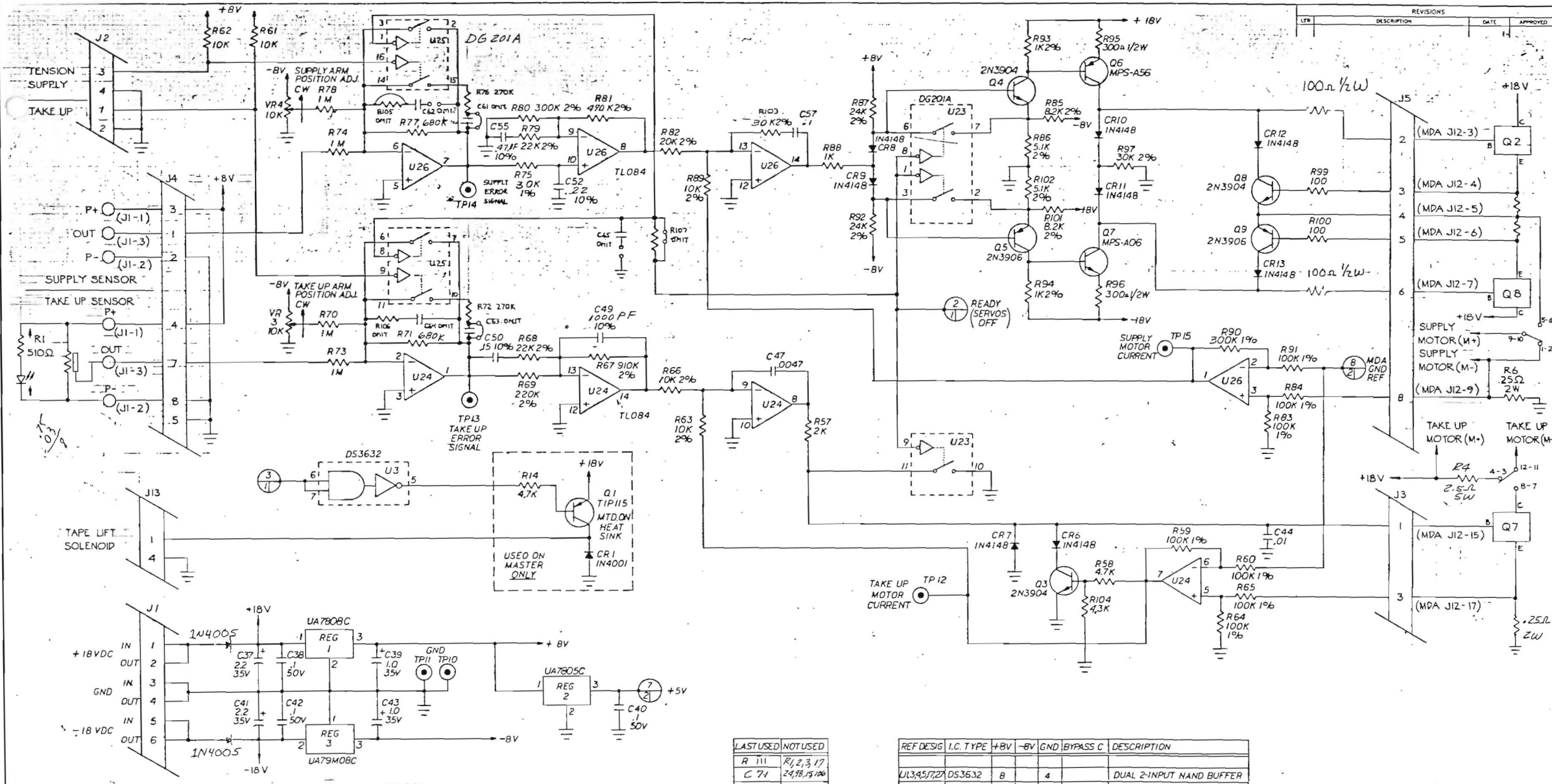
REVISIONS			
NO.	DESCRIPTION	DATE	APPROVED
178			



NOTES:  
 1- \* BOARD MODIFIED ONLY:  
 WHEN ÷ BY 2 IS USED ON A 1K LINE ENCODER  
 2- ALL DE-COUPLING CAPACITORS .1uF AND ARE NOT SHOWN ON DRAWING

APPROVALS	DATE	SCALE	SIZE	DRAWING NO.
NIC	6-5-84		D	2135001-013 04
DO NOT SCALE DRAWING SHEET 2 OF 3				

ACCURATE SOUND CORP  
 MENLO PARK, CA 94025  
 SCHEMATIC DIAGRAM  
 SERVO PCB ASSY 2001390-01  
 CAPSTAN SERVO AND TAPE SENSE



LAST USED	NOT USED
R 111	R <sub>1,2,3,17</sub>
C 71	C <sub>4,7,8,15,106</sub>
U 28	C <sub>45,58</sub>
CR 17	C <sub>6,69-71</sub>
J 13	
VR 4	
REG 3	
Q 9	
JMP 2	JMP1
TP17	

REF DESIG	I.C. TYPE	+BV	-BV	GND	BYPASS	C	DESCRIPTION
U1,3,5,17,21	DS3632	8		4			DUAL 2-INPUT NAND BUFFER
U2	CD4049UB	1	8	.01			HEX INVERTING BUFFER
U6	CD4023B	14	7				TRIPLE 3 INPUT NAND
U7,12	CD4001B	14	7				QUAD 2 INPUT NOR
U8,19,20	CD4011B	14	7				QUAD 2 INPUT NAND
U9,10,16	CD4013B	14	7	.01			DUAL D-TYPE FLIP-FLOP
U11	LM339	3	12	.1			QUAD COMPARATOR
U13	CD4070B	14	7				QUAD EXCLUSIVE OR
U14	74C95N	4	11	.01			4 BIT L/R SHIFT REGISTER
U15	MC14538B	16	8	.01			DUAL MONO.MLTIPLIER
U18	CD40106B	14	7				HEX SCHMITT TRIGGER
U2,22,24,25	TL084CN	4	11		VEA RAIL		QUAD OP-AMP
U23,25	DG201A	13	4	5	VEA RAIL		QUAD ANALOG SWITCH

NOTE: All DE-COUPLING CAPACITORS .10F and ARE NOT SHOWN ON DRAWING.

MODIFIED: 10-9-89 PS

ACCURATE SOUND CORP.  
MENLO PARK, CA 94025

SCHEMATIC DIAGRAM  
SERVO PCB ASSY 2001390-01  
TAKE UP AND SUPPLY REEL

APPROVALS: DATE: 6-5-89

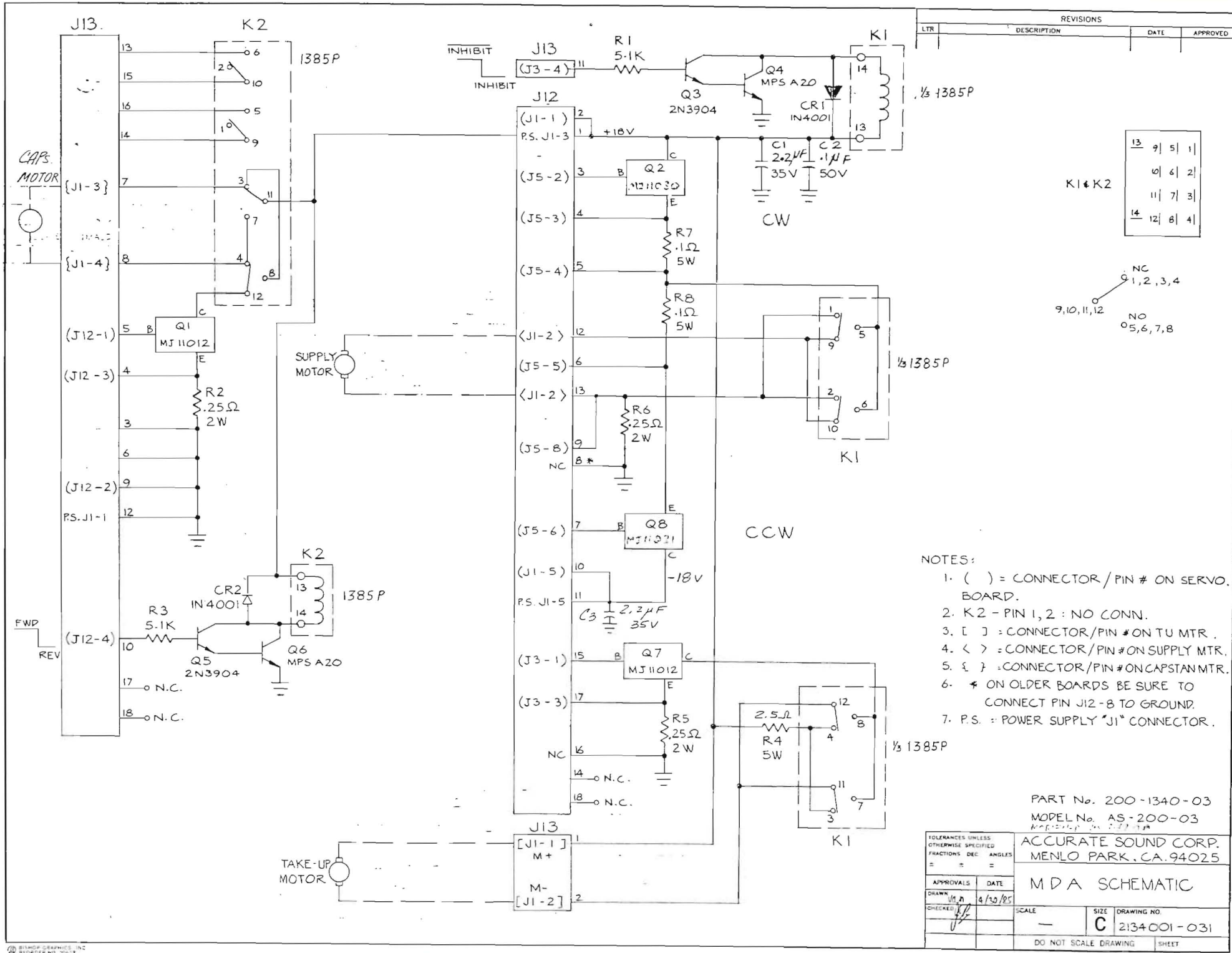
DESIGNED BY: JIC

SIZE: D

DRAWING NO: 2139001-013-04

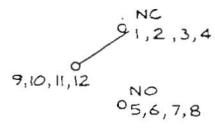
DO NOT SCALE DRAWING

SHEET 3 OF 3



REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED

13	9	5	1
	6	6	2
	11	7	3
14	12	8	4

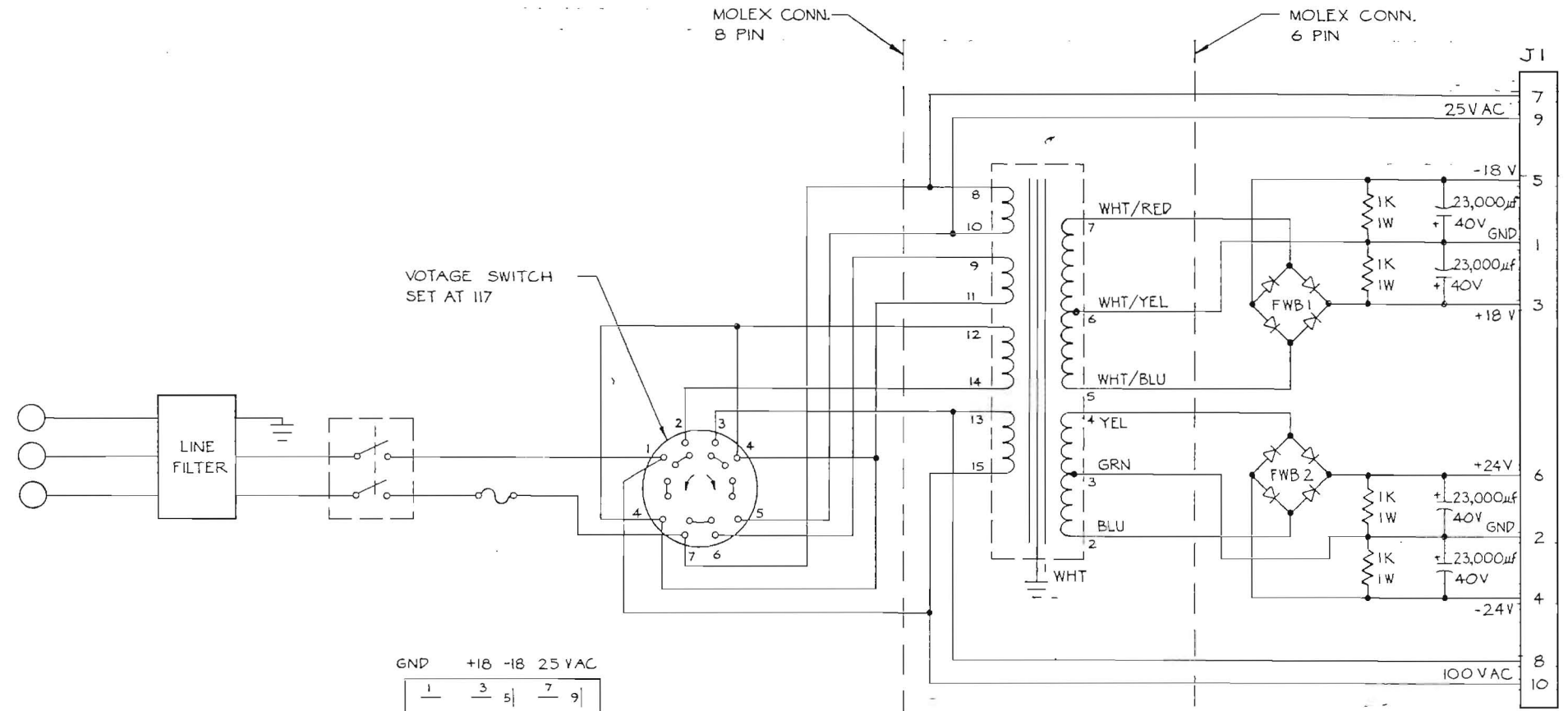


- NOTES:
- ( ) = CONNECTOR / PIN # ON SERVO BOARD.
  - K2 - PIN 1, 2 : NO CONN.
  - [ ] = CONNECTOR / PIN # ON TU MTR.
  - < > = CONNECTOR / PIN # ON SUPPLY MTR.
  - { } = CONNECTOR / PIN # ON CAPSTAN MTR.
  - \* ON OLDER BOARDS BE SURE TO CONNECT PIN J12-8 TO GROUND.
  - P.S. = POWER SUPPLY "J1" CONNECTOR.

PART No. 200-1340-03  
 MODEL No. AS-200-03

TOLERANCES UNLESS OTHERWISE SPECIFIED		FRACTIONS DEC ANGLES	
APPROVALS	DATE		
DRAWN			
CHECKED		SCALE	
		SIZE	DRAWING NO.
		C	2134001-031
DO NOT SCALE DRAWING SHEET			

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED



GND	+18	-18	25 VAC
1	3	5	7 9
2	4	6	8 10

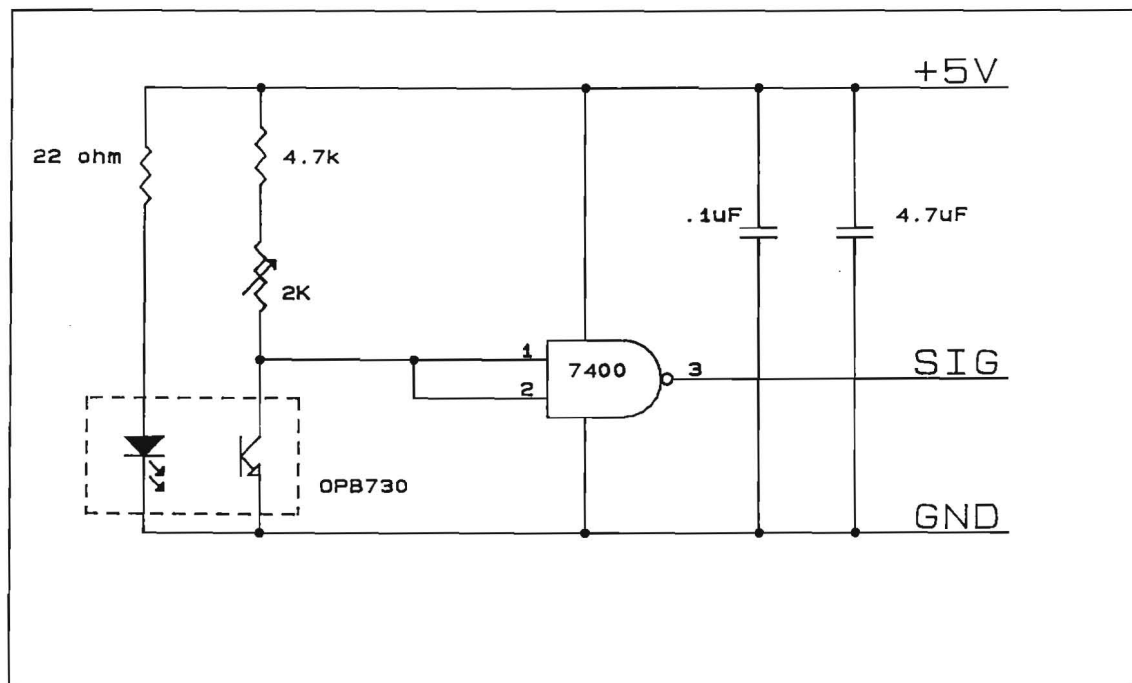
GND -24 +24 100 VAC

VIEW FROM OUTSIDE (FEMALE)  
 10PIN PSU PLUG  
 SCALE : NONE

TOLERANCES UNLESS OTHERWISE SPECIFIED		ACCURATE SOUND CORP.	
FRACTIONS DEC ANGLES		MENLO PARK, CA. 94025	
APPROVALS	DATE	POWER SUPPLY SCHEM.	
DRAWN V.T.M.	10/17/85	SCALE	SIZE C
CHECKED P.S.		DRAWING NO.	
DO NOT SCALE DRAWING		SHEET	



# TAPE TACH SENSOR



ACCURATE SOUND CORPORATION  
AS-200 TE System Wiring 9/22/89  
Tape Tach Sensor

ENTRY



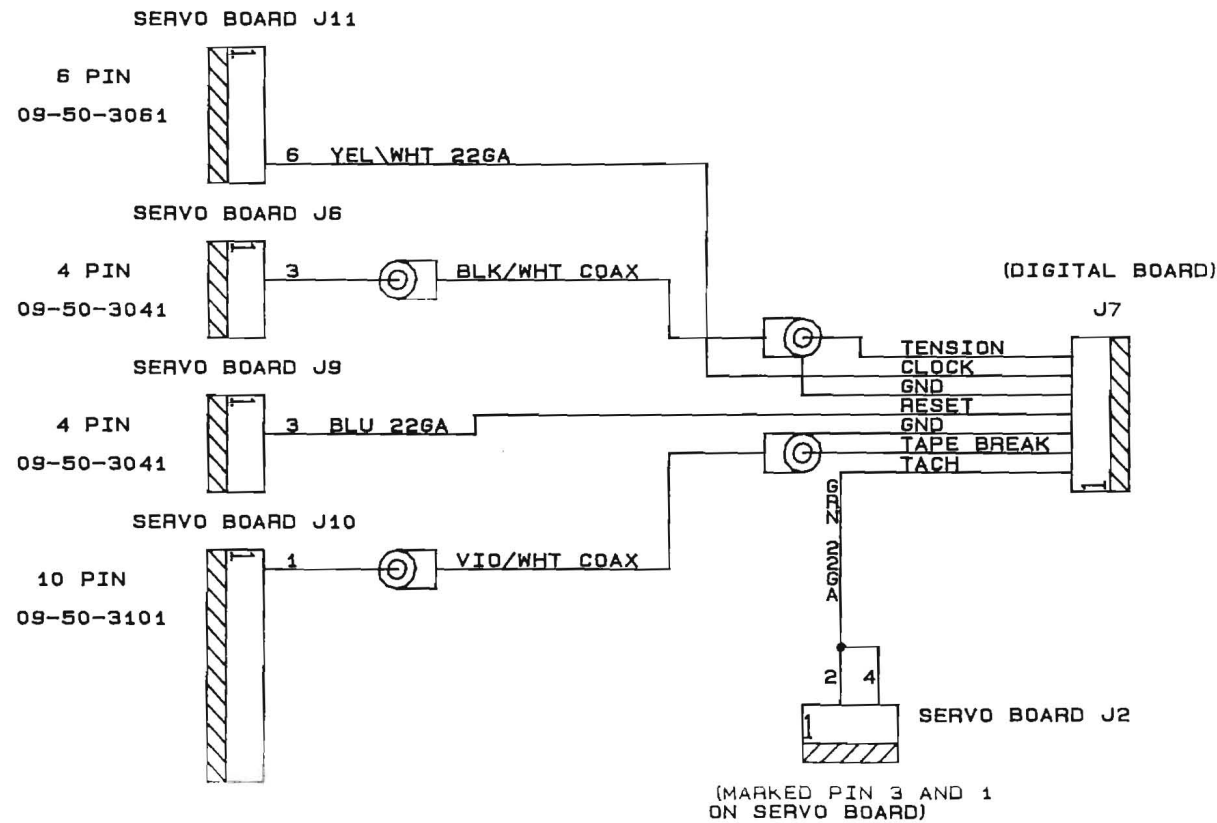
- 20 PIN RIBBON CONNECTOR -

INTERFACE BOARD J1

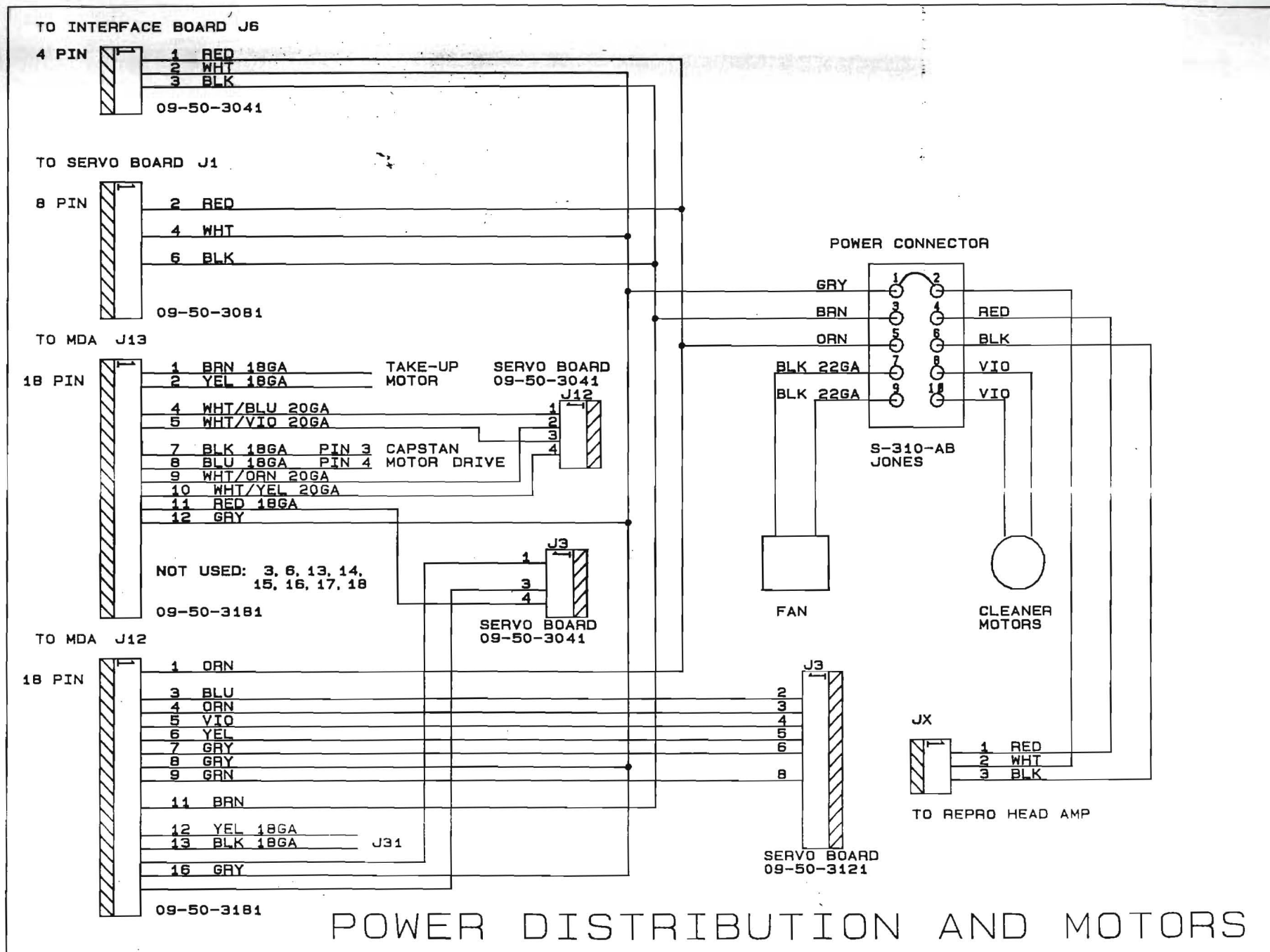


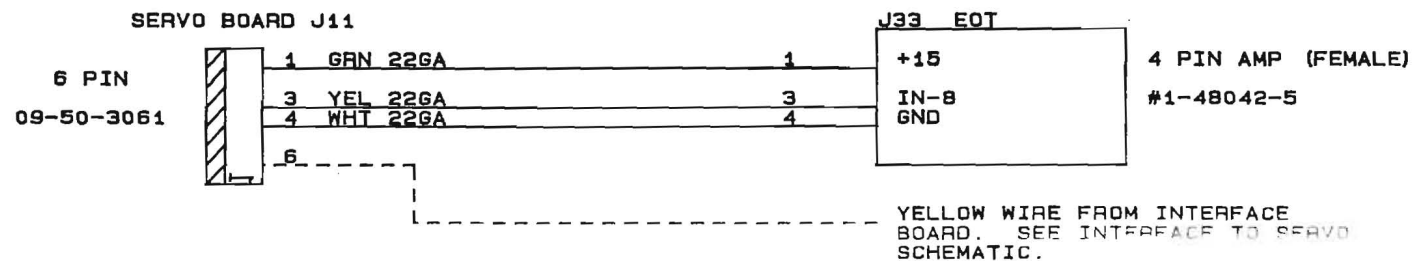
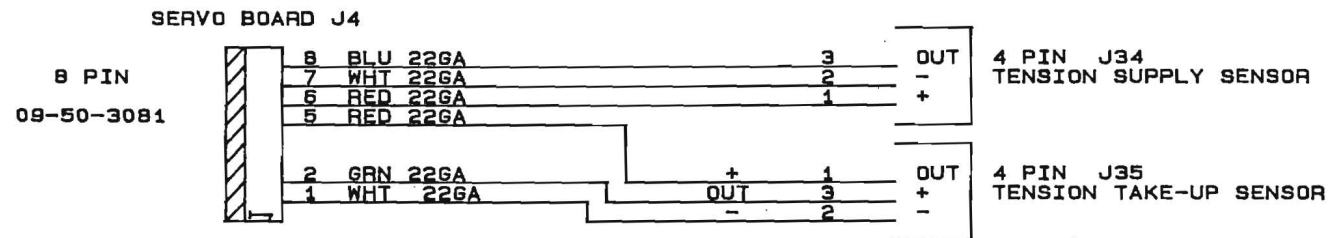
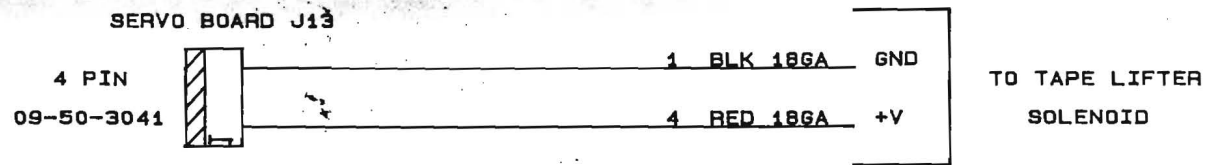
ENTRY

DO NOT PUT IN CONNECTION.  
(NOTE: CONNECTOR IS ON ANOTHER DRAWING)

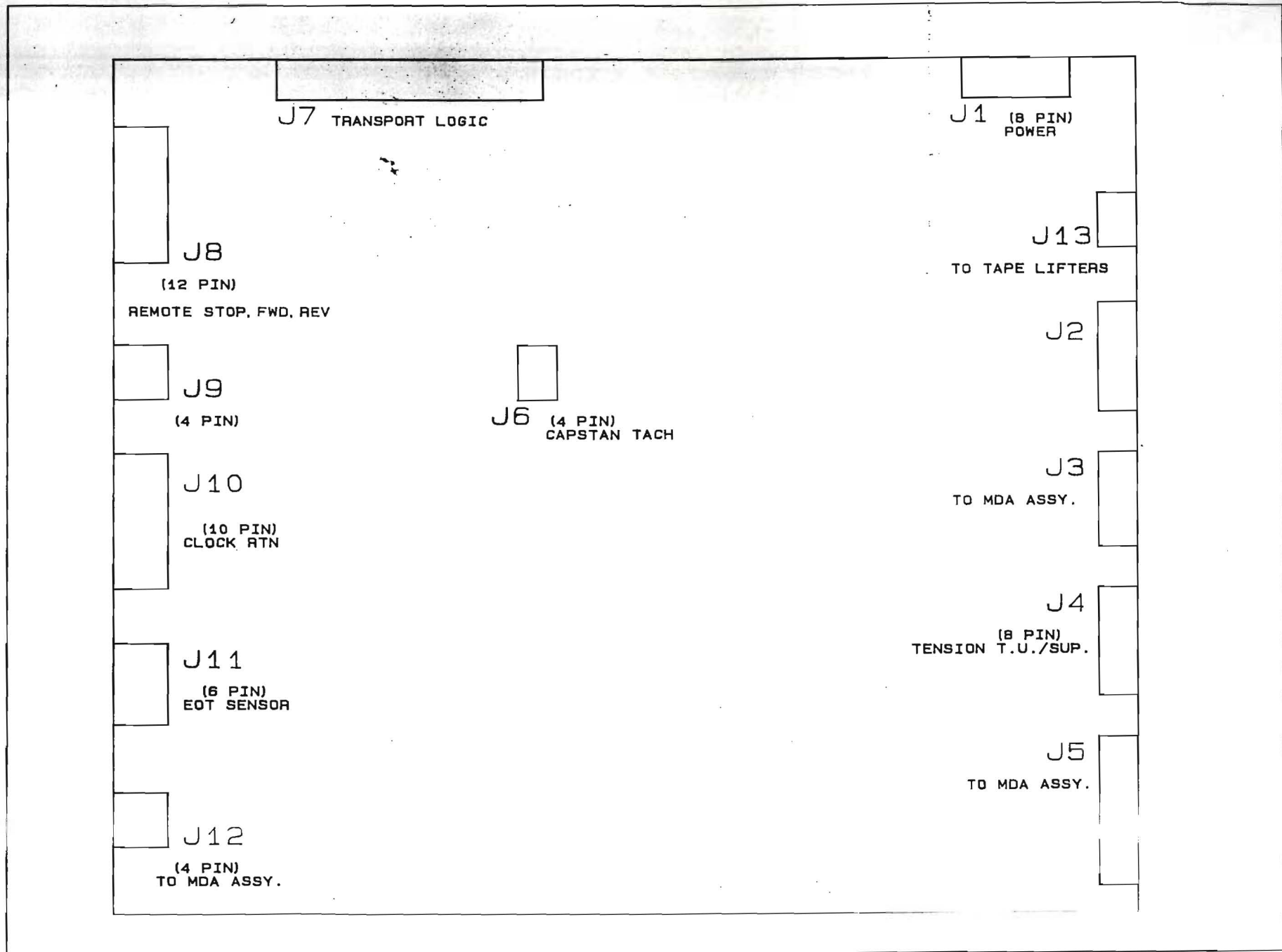


# INTERFACE BOARD TO SERVO BOARD






## MISCELLANEOUS CONNECTIONS



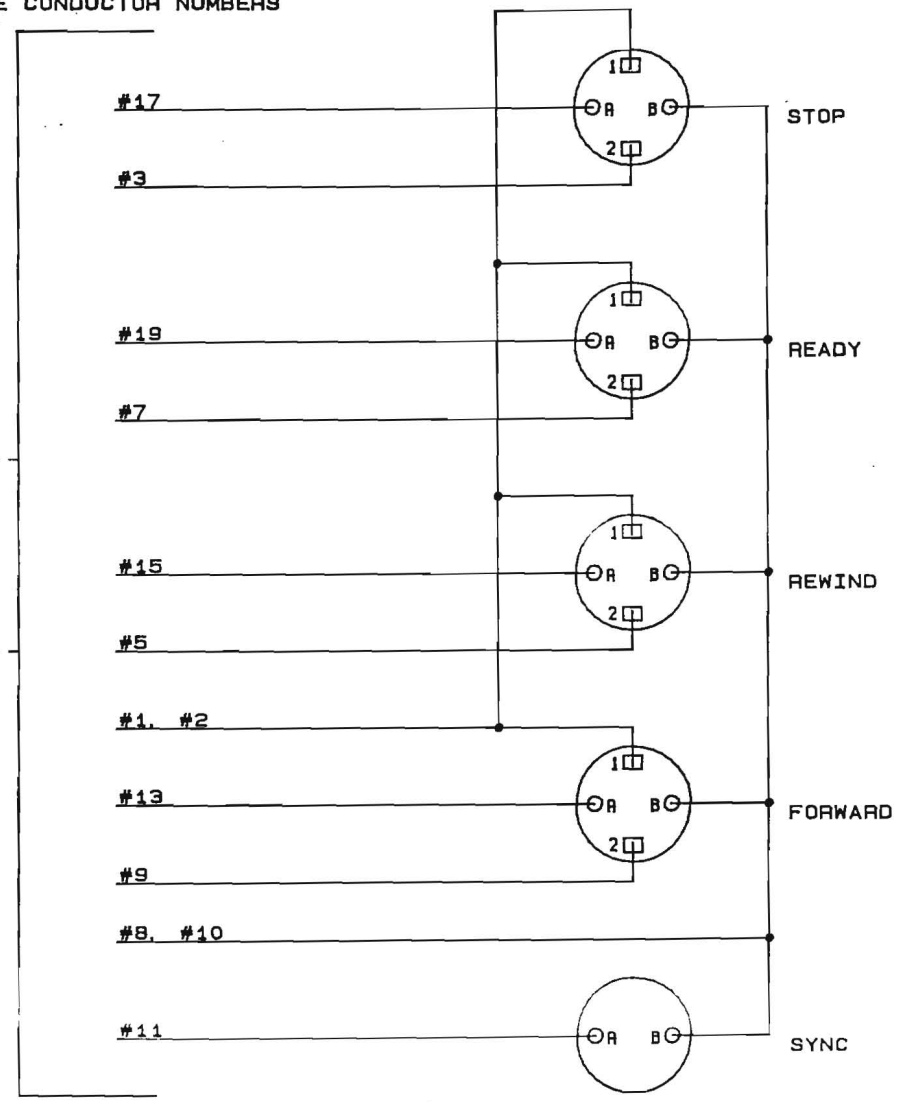
Accurate Sound Corporation  
 AS-200 TE System Wiring 9/22/89  
 PC Board Connector Layout

CLOSE TO HEAD BRIDGE 

RIBBON CABLE CONDUCTOR NUMBERS

20 PIN RIBBON HEADER

J2 ON INTERFACE BOARD



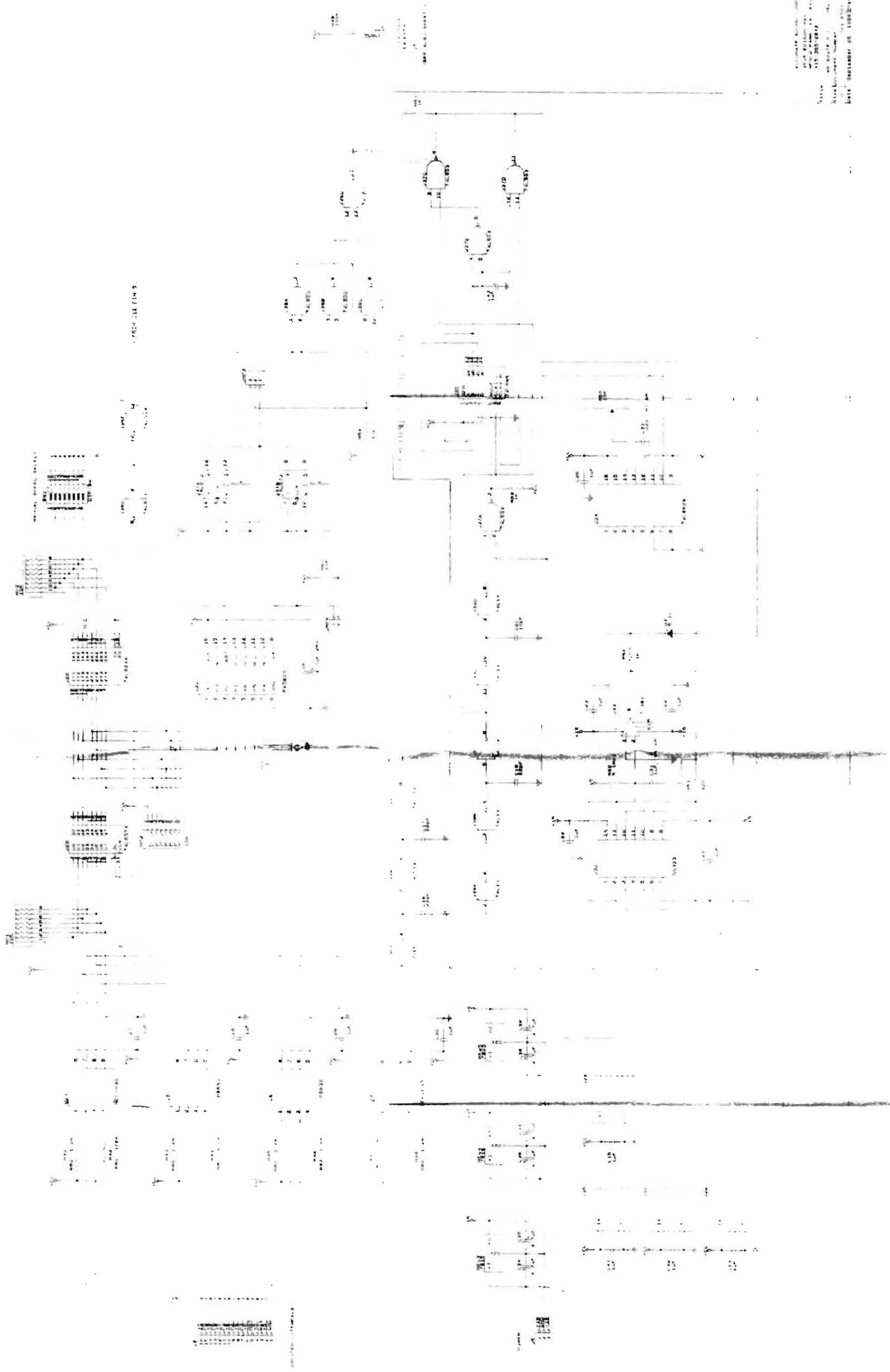
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BY J. H. [unclear]  
CHECKED BY [unclear]  
APPROVED BY [unclear]

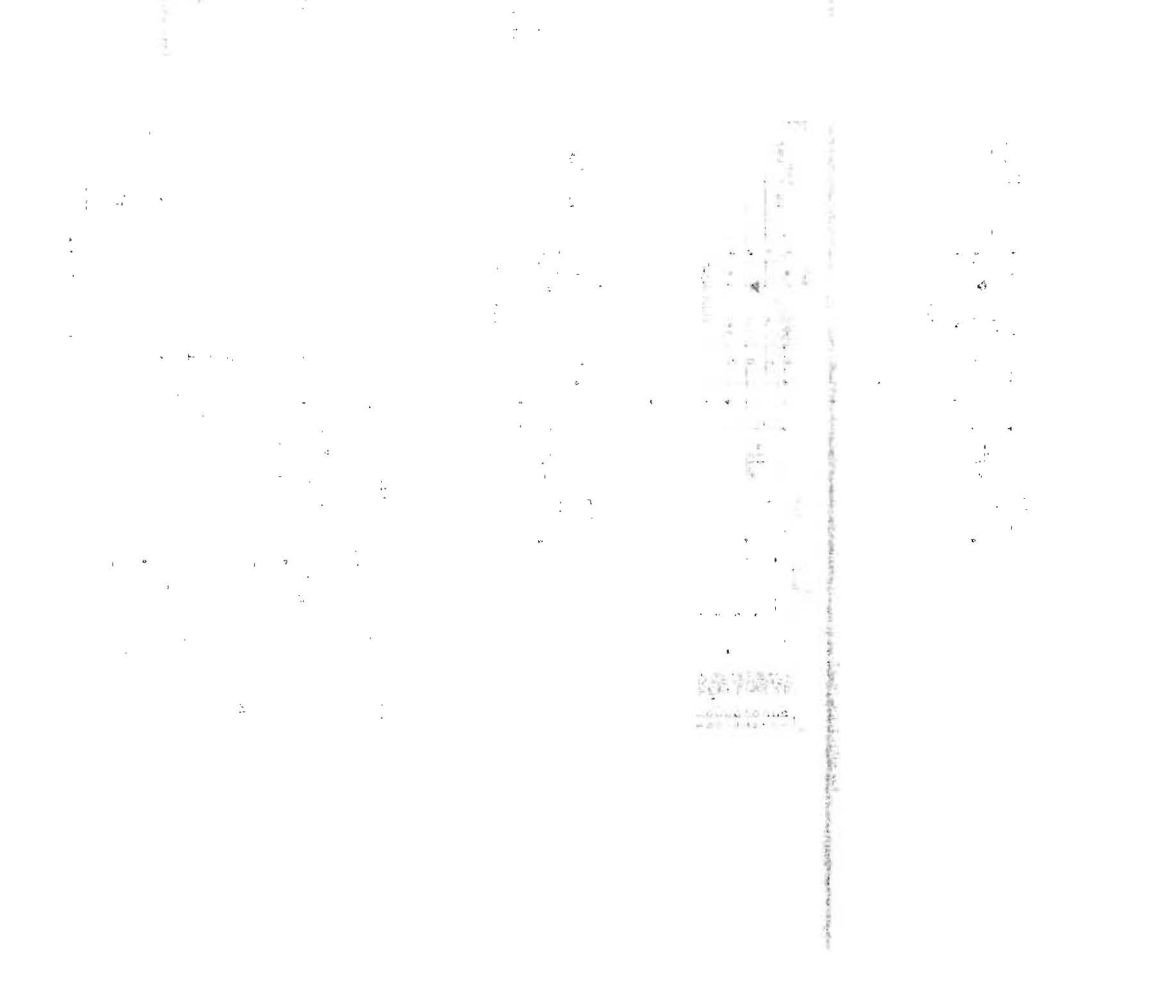






100  
100  
100  
100  
100





1000  
 500  
 0  
 -500  
 -1000