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Technical Document Distribution

Brand:	**Mu-Tron**	
Model	**Digital Delay**	
Product:	**Effect Unit**	
Description:	**Service Manual**	**Dated: 1979**

Musicparts Document Number: 39794 TechTips: 0 Pages: 18

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MU-TRON DIGITAL DELAY

Service Manual

MU-TRON

SPECIFICATIONS

DELAY RANGE:	.625ms to 160ms
FREQUENCY RESPONSE:	Dry -- 20Hz to 20KHz Delay -- 25Hz to 10KHz
INPUT IMPEDANCE:	100K ohm (Balanced or Single Ended)
C.M.R.R.:	40db (typical)
INPUT LEVEL RANGE:	-15dbm to +15dbm
INPUT CONNECTORS:	XLR-3 and 1/4" phone
OUTPUT IMPEDANCE:	600 ohms
OUTPUT LEVEL:	Adjustable to +20dbm
MEMORY TYPE:	2x16K dynamic RAM
VARIABLE DELAY RANGE:	4 : 1 continuous
MODULATION SPEED:	.1Hz to 20Hz
MODULATION DEPTH:	4 : 1 maximum
FEEDBACK RANGE:	0 to 100%
DYNAMIC RANGE:	85db (typical)
T.H.D.:	0.2% or less (any delay setting)

MU-TRON, Incorporated
45 Hartwell Avenue
Lexington, Massachusetts, 02173
MU-TRON Telephone: 617/861-6000

THE MU-TRON DIGITAL DELAY

REFERENCE	ARP PART NUMBER	ARP/MFG NUMBER	DESCRIPTION
R96	1000910	X201R103B	Pot, Rotary, Trimmer, 10K
R9,26,35	1000916	X201R104B	Pot, Rotary, Trimmer, 100K
R78	1002301	CTSY450SF	Pot, Rotary, Linear, 1K
R4,52,74	1002302	CTSY450SF	Pot, Rotary, Linear, 10K
R10	1002402	CTSY450SF	Pot, Rotary, Linear, 100K
R53	1002403	CTSY450SF	Pot, Rotary, Log, 100K
R83	1002501	CTSY450SF	Pot, Rotary, Rev Log, 1M
CR10,14,15,16,17,18	1200301	1N4148	Diode, Signal
CR7	1200503	1N4733A	Diode, Zener, 5.1V
CR8	1200504	1N5226	Diode, Zener, 3.3V
CR3,4,5,6	1202101	1N4002	Rectifier, 100V
Q2,4	1302901	2N3904	Transistor, NPN
Q3	1303001	2N3906	Transistor, PNP
Q1	1304901	2N5485	Transistor, N Channel, FET
Q5	1305101	2N4125	Transistor, PNP
Z13	1400501	CA3086	Transistor array, NPN
Z10	1400601	4011UBE	IC, NAND GATE, 4 x 21
Z30	1400801	301AN	IC, Op Amp
Z3	1401702	SN74LS00N	IC, NAND GATE, 4 x 21
Z29	1403801	MC7912CT	IC, -12V Regulator
Z12	1404201	4007 UBE	IC, C Mos, Pair plus inverter
Z18, 32	1404402	4013BE	IC, Dual D, Flip-Flop, Set/Reset
Z23,25	1404501	4016BE	IC, Quad Bilateral Switch
Z20, 21	1405201	4520	IC, Dual, Binary, Up-Counter
Z17, 34	1405401	339	IC, Quad Voltage Comparator
Z33	1406601	SN74LS04N	IC, Hex Inverter
Z27	1407401	MC7805CT	IC, +5V Regulator
Z19, 31	1407901	CD4030BE	IC, Gate, Quad, Exclusive -Or
Z1,2	1408901	SN74LS26N	IC, Gate, 4x21, NAND Hi volt
Z4,5	1410501	74LS393	IC, Counter, Dual, 4 Bit
Z6,7	1410601	74LS157	IC, Mux, Quad 2-1
Z8,9	1410701	4116	IC, Ram, 16K, Dynamic, MOS

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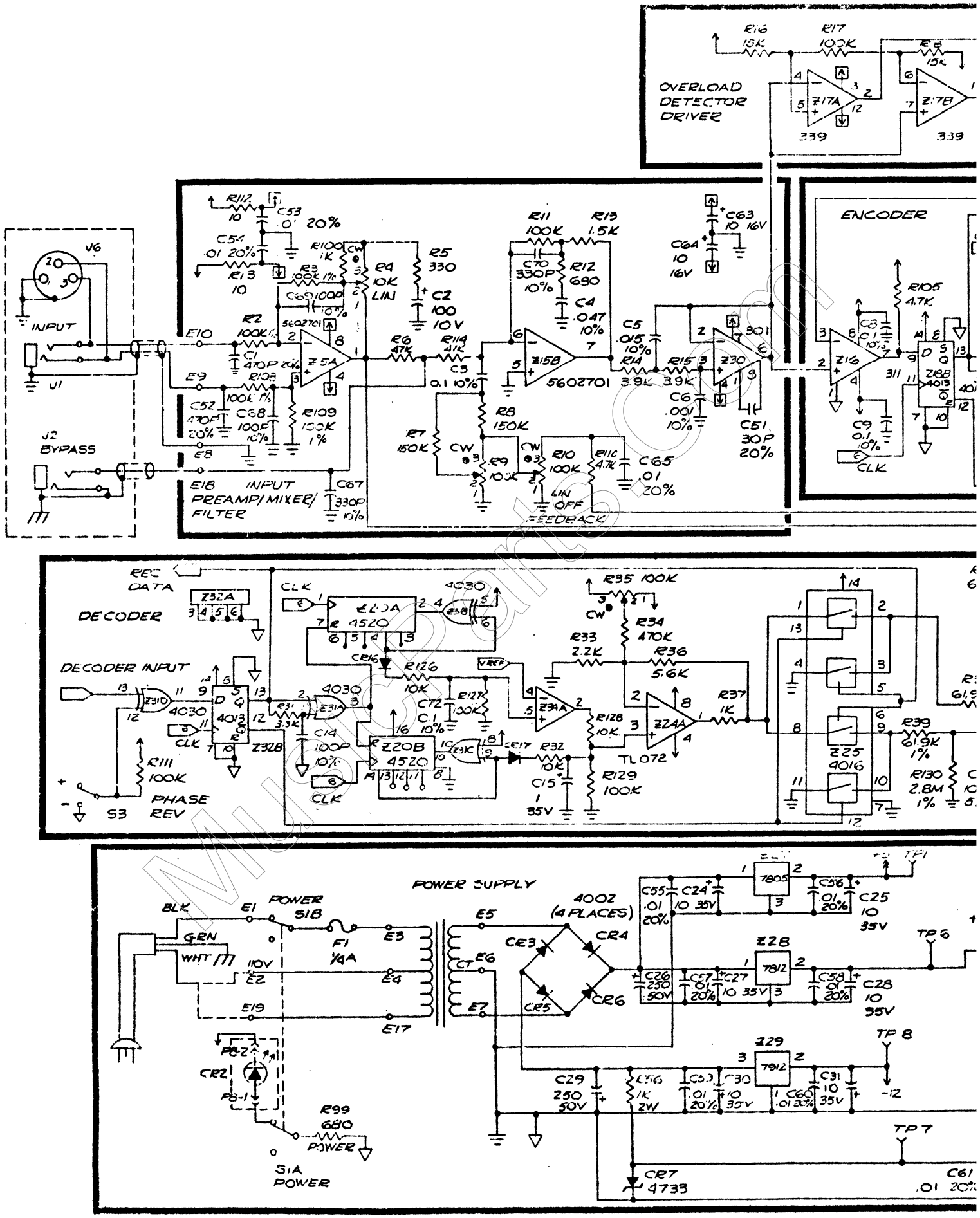
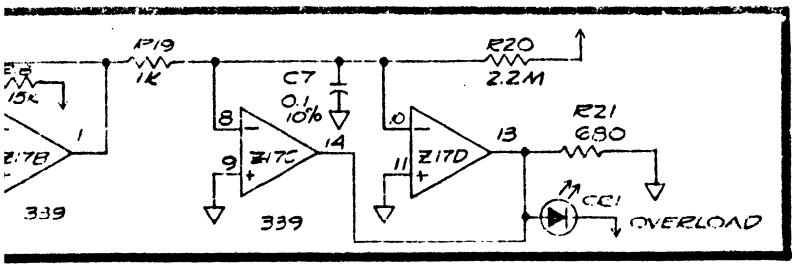
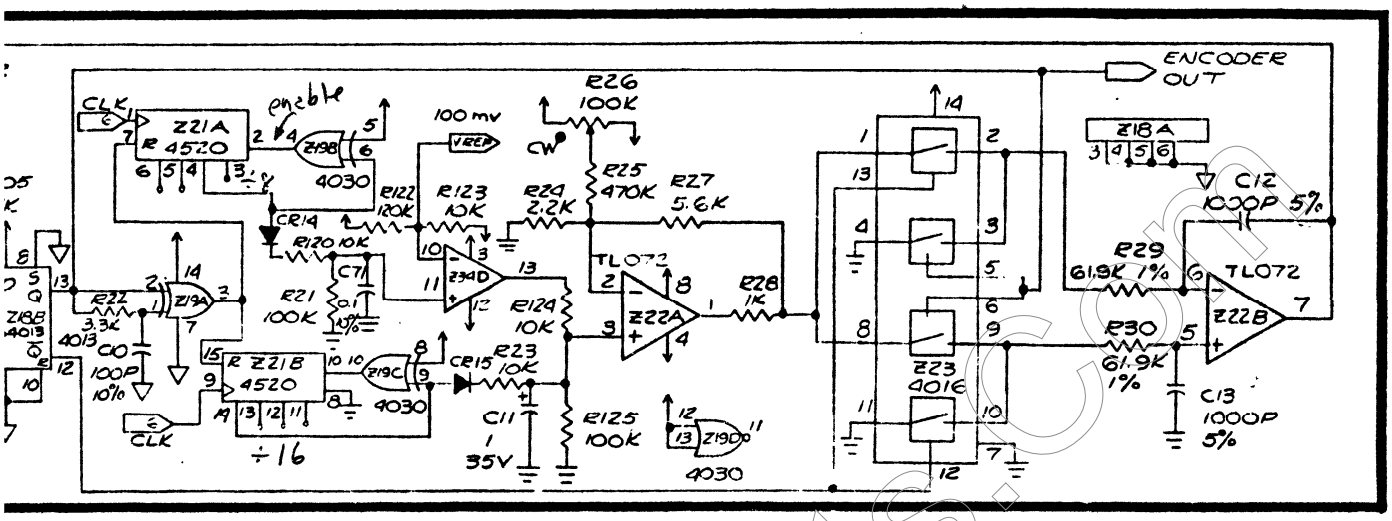
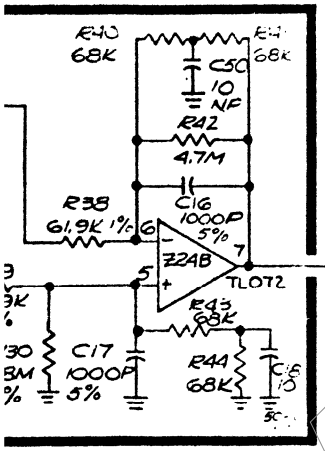
REFERENCE	ARP PART NUMBER	ARP/MFG NUMBER	DESCRIPTION
Z22,24	1410801	TL072CP	IC, Op Amp, Dual, FET, Low Noise
Z28	1410901	MC7812CP	IC, 12 V Regulator
Z16	1411001	311	IC, Voltage Comparator
F1	1700403	MDV1/4	Fuse, Pigtail, Slow Blow 1/4A
S4	1904501	5XFA15FA201	Push Switch Array, 5 module
S2,3,5	1904601	ST2-1S2V-1F1	Toggle Switch DPDT
S1	1904701	NE15/F	Push Switch, DPDT
Z11,14,15,26	5602701	1406401	Dual Op Amp, Sel. (RC4558NB)
T1	5701201		Power Transformer

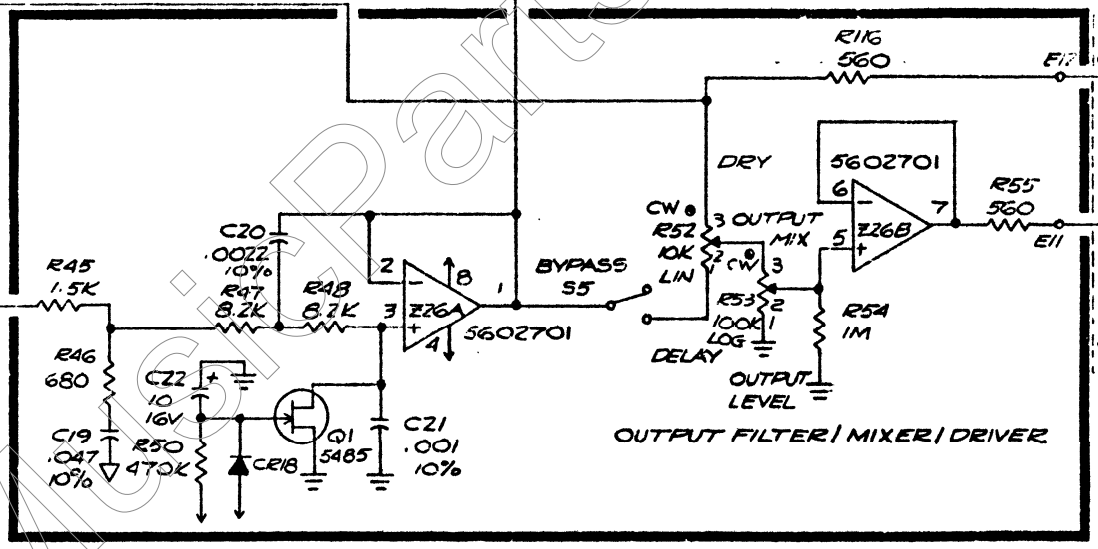

OVERLOAD DETECTOR DRIVER
R16 15K
R17 100K
R18 15K
Z17A
Z17B
339
ENCODER
J6
INPUT
J1
J2 BYPASS
E10
E9
E8
E18 INPUT PREAMP/MIXER/ FILTER
R112 10
C53 .01 20%
C54 .01 20%
R113 10
R100 1K
R3 100K 1%
C69 1000P 10%
R4 10K LIN
R5 330
C2 100 10V
R2 100K 1%
C1 470P 20%
Z5A
R108 100K 1%
C52 470P 20%
C68 100P 10%
R109 100K 1%
R6 47K
R114 47K
C3 .1 10%
R11 100K
R13 1.5K
C70 330P 10%
R12 680
C4 .047 10%
Z15B
5602701
C5 .015 10%
R14 3.9K
R15 3.9K
Z30
C6 .001 10%
C51 30P 20%
C63 10 16V
C64 10 16V
R8 150K
R7 150K
R9 100K
R10 100K
R11C 4.7K
C65 .01 20%
LIN OFF FEEDBACK
C67 330P 10%
R105 4.7K
C8 .1 10%
Z16
Z18B 4013
C9 .1 10%
CLK
DECODER
REC DATA
Z32A
DECODER INPUT
Z31D
4030
Z32B
CLK
R111 100K
PHASE REV
S3
Z20A 4520
R126 10K
R127 100K
C72 .1 10%
C14 1000P 10%
Z20B 4520
Z31A
Z31B
Z31C
R31 3.3K
R32 10K
C15 1 35V
R129 100K
VREF
R35 100K
R34 470K
R33 2.2K
R36 5.6K
R37 1K
R128 10K
Z22A
TL072
Z25 4016
R39 61.9K 1%
R130 2.8M 1%
POWER SUPPLY
BLK
GRN
WHT
E1
POWER S1B
F1 1/4A
110V
E2
E3
E4
E19
E17
E5
E6
CT
E7
4002 (4 PLACES)
CR3
CR4
CR5
CR6
C55 .01 20%
C24 10 35V
Z27 7805
C56 .01 20%
C25 10 35V
TP1
TP6
C26 250 50V
C57 .01 20%
C27 10 35V
Z28 7812
C58 .01 20%
C28 10 35V
TP8
C29 250 50V
R99 680 POWER
S1A POWER
PB-2
PB-1
CR2
Z29 7912
C30 10 35V
C31 10 35V
C60 .01 20%
-12
TP7
CR7 4733
C61 .01 20%

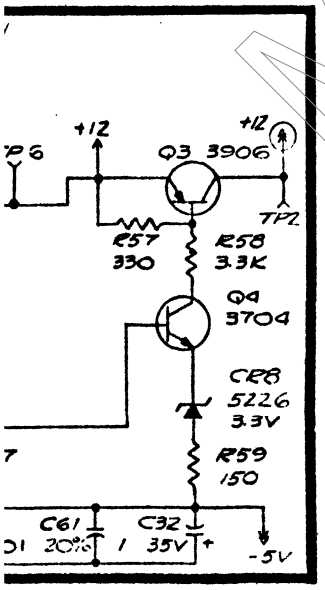


LTR	DESCRIPTION	DATE	APPROVED
A	PILOT REL 103	[illegible]	DRL







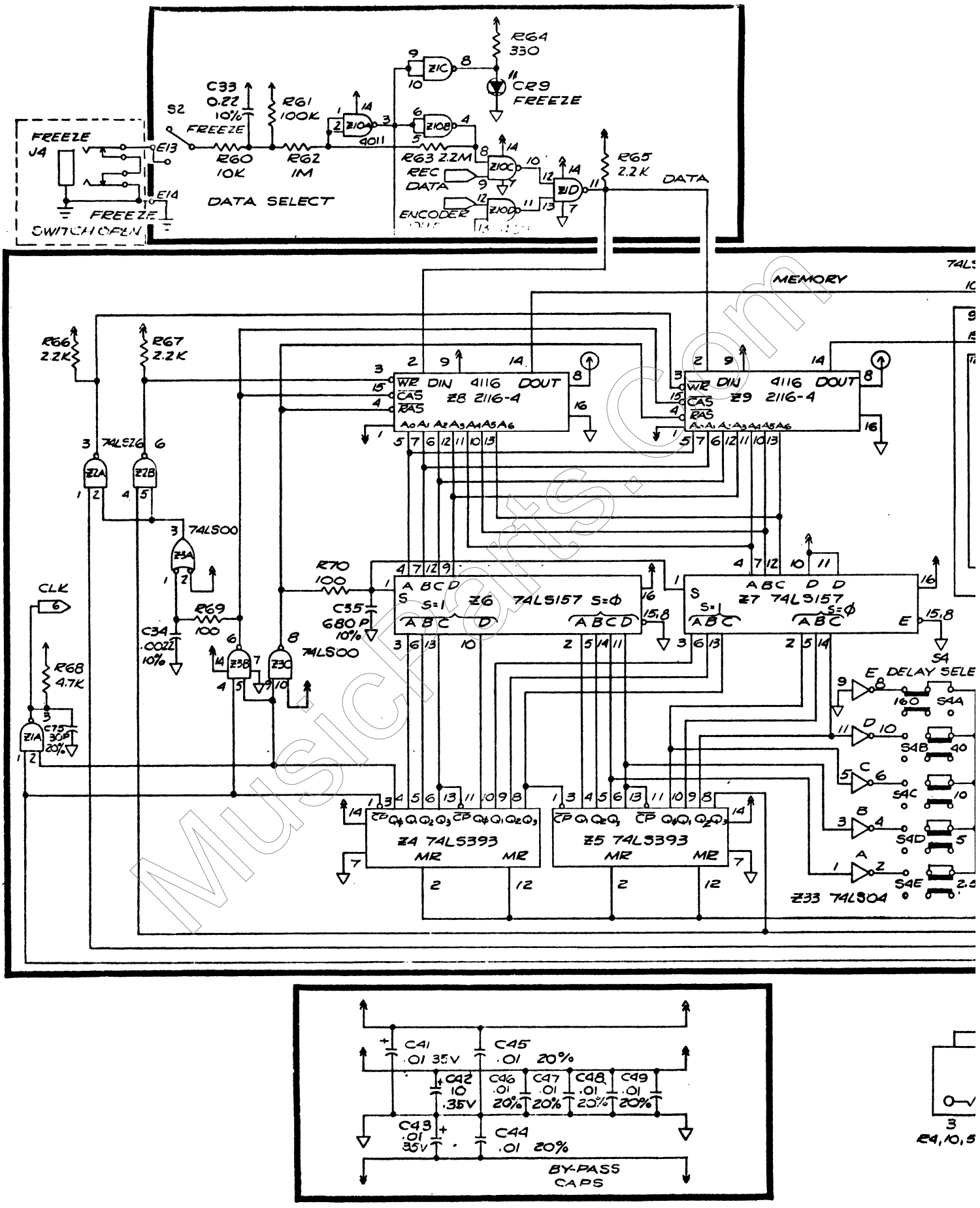


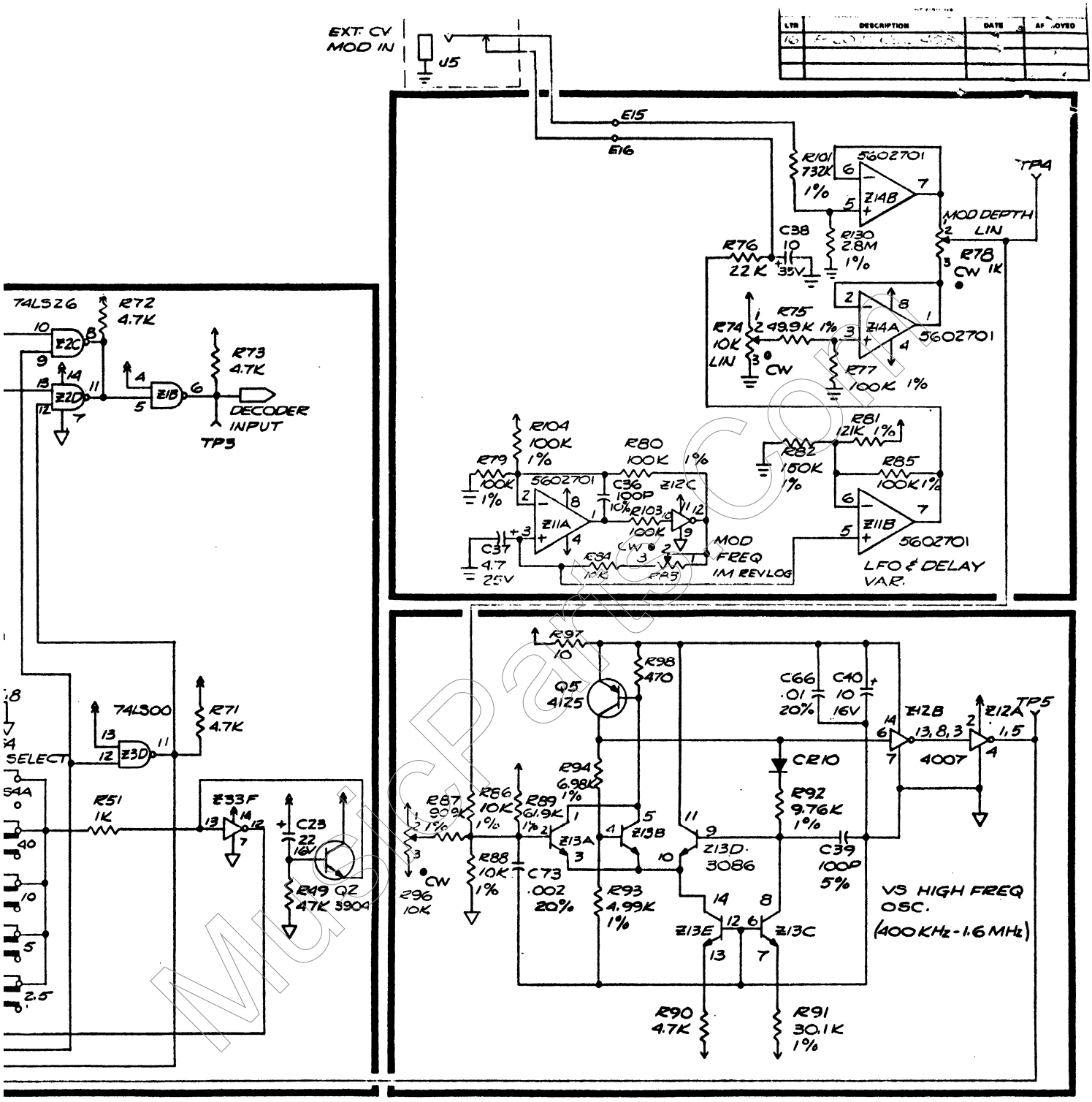
NOTES:

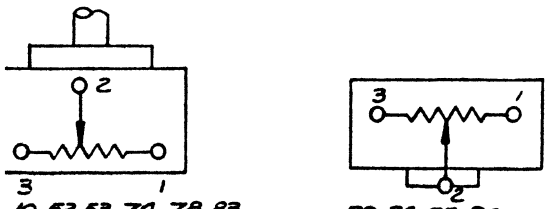
1. UNLESS OTHERWISE SPECIFIED:
   ALL RESISTOR VALUES ARE IN OHMS 1/4W, 5%
   ALL CAPACITOR VALUES ARE IN μF (P: PICOFARADS)
   ALL DIODES ARE 4148.
2. HIGHEST REF. DESIGNATION
   Z34, S5, Q5, R129, C75, CR18
3. CONVENTIONS USED FOR SUPPLY VOLTAGE CONNECTIONS:

↑	IMPLIES +12V
↓	IMPLIES -12V
↑	IMPLIES +5V
↓	IMPUES -5V

ARP PART NO	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES XX ± .02	ARP INSTRUMENTS INC	
USED ON PL722-4001	TOLERANCES XXX ± .010 ANGLES ± 1°	TITLE SCHEMATIC P.C.BD. DIGITAL DELAY	
MATERIAL	REMOVE BURRS & SHARP EDGES DO NOT SCALE DRAWING	DRAWN GD	
FINISH	CHECKED LLZ	SIZE D	DRAWING NO 772,15 REV 16
	APPROVED TPL	SCALE NONE	SHEET 1 OF 2
	APPROVED		


R64 330
CR9 FREEZE
C33 0.22 10%
R61 100K
S2 FREEZE
FREEZE J4
E13
E14
R60 10K
R62 1M
DATA SELECT
FREEZE SWITCH OPEN
Z1C
Z1O 9011
Z1OB
R63 2.2M
REC DATA
ENCODER
Z1OC
Z1D
Z1OD
R65 2.2K
DATA
MEMORY
R66 2.2K
R67 2.2K
WE DIN 4116 DOUT
CAS Z8 2116-4
RAS
A0 A1 A2 A3 A4 A5 A6
CAS Z9 2116-4
74LS26
Z2A
Z2B
74LS00
Z3A
Z3B
Z3C
R70 100
R69 100
C34 .0022 10%
C35 680P 10%
CLK
R68 4.7K
Z1A
C75 30pf 20%
ABCD
S=1 Z6 74LS157 S=Φ
S=Φ Z7 74LS157
Z4 74LS393
Z5 74LS393
MR
CP
S4
E DELAY SELE
S4A 160
S4B 40
S4C 10
S4D 5
S4E 2.5
Z33 74LS04
C41 .01 35V
C45 .01 20%
C42 10 .35V
C46 .01 20%
C47 .01 20%
C48 .01 20%
C49 .01 20%
C43 .01 35V
C44 .01 20%
BY-PASS CAPS





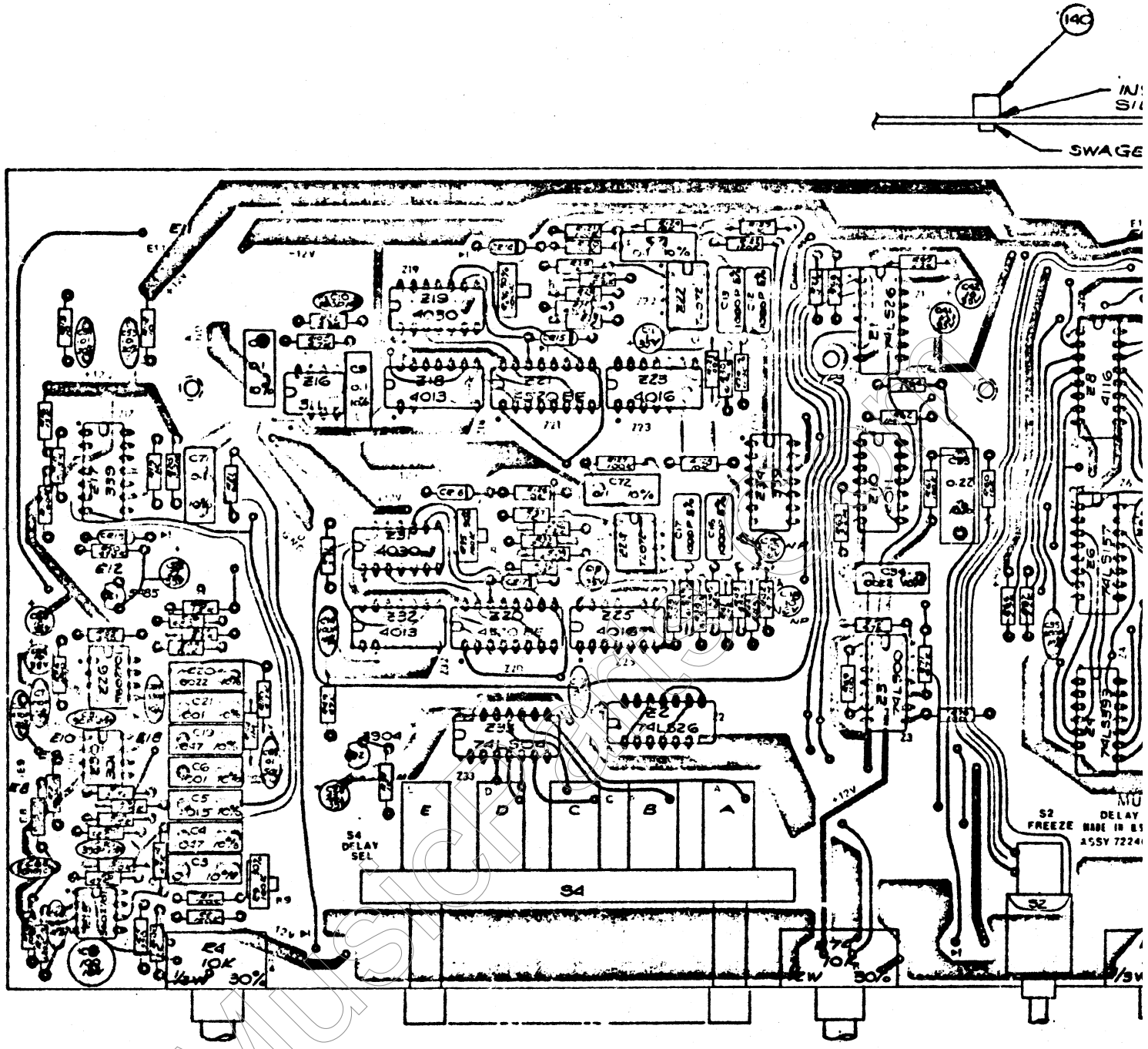
,10, 52, 53, 79, 78, 83

E9, 26, 35, 96

BASE VIEW (LOOKING TOWARD TERMINALS)

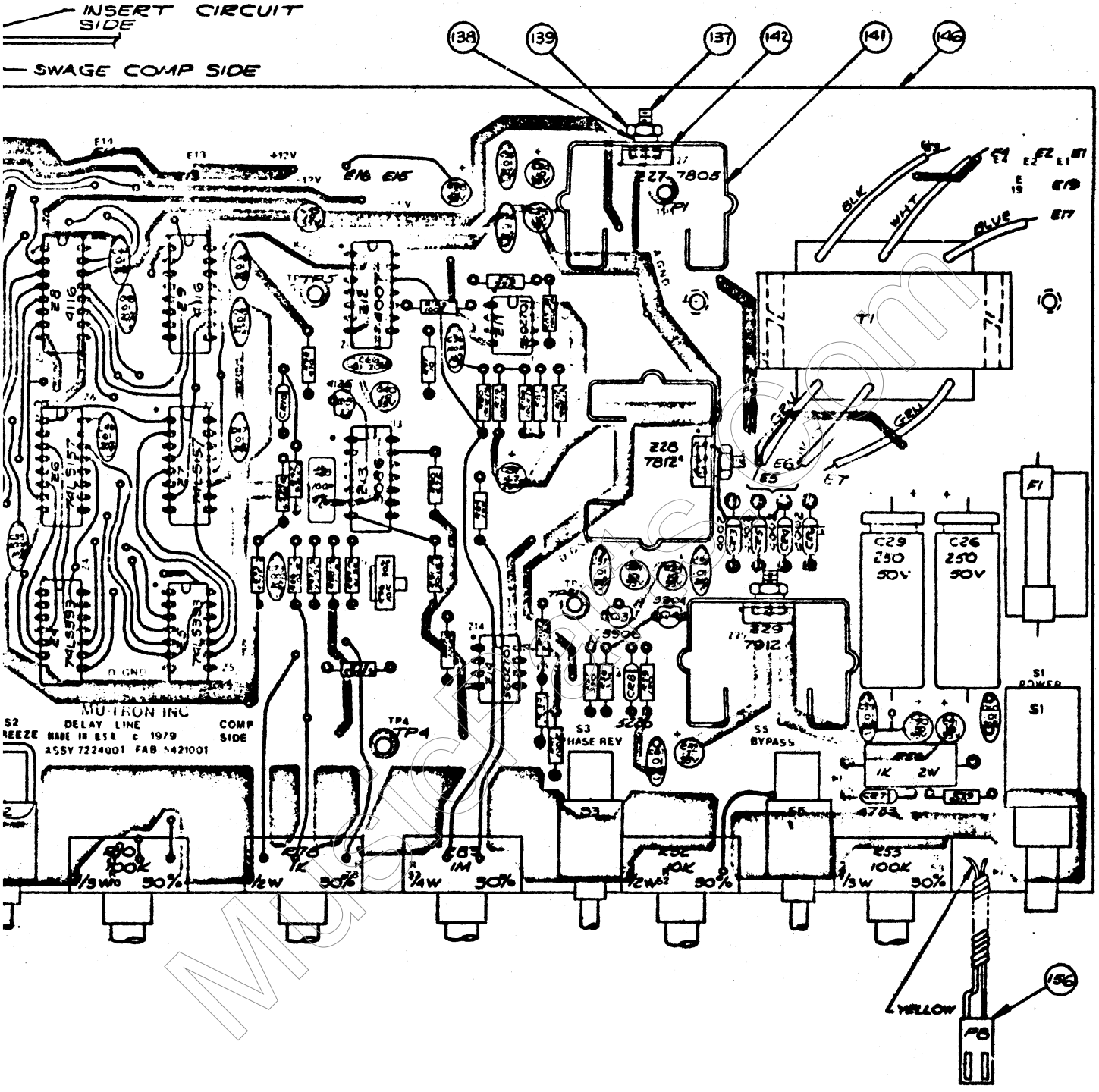
LTR	DESCRIPTION	DATE	APPROVED
B	[illegible]	[illegible]	

ARP PART NO	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES XX ± .02 XXX ± .010 ANGLES ± 1° REMOVE BURRS & SHARP EDGES DO NOT SCALE DRAWING		ARP INSTRUMENTS INC
USED ON 11/29001			
MATERIAL	DRAWN G.D		TITLE SCHEMATIC P.C. BD. DIGITAL DELAY
FINISH	CHECKED		SIZE D DRAWING NO 77215 REV
	APPROVED		SCALE NONE SHEET 2 OF 2
	APPROVED		



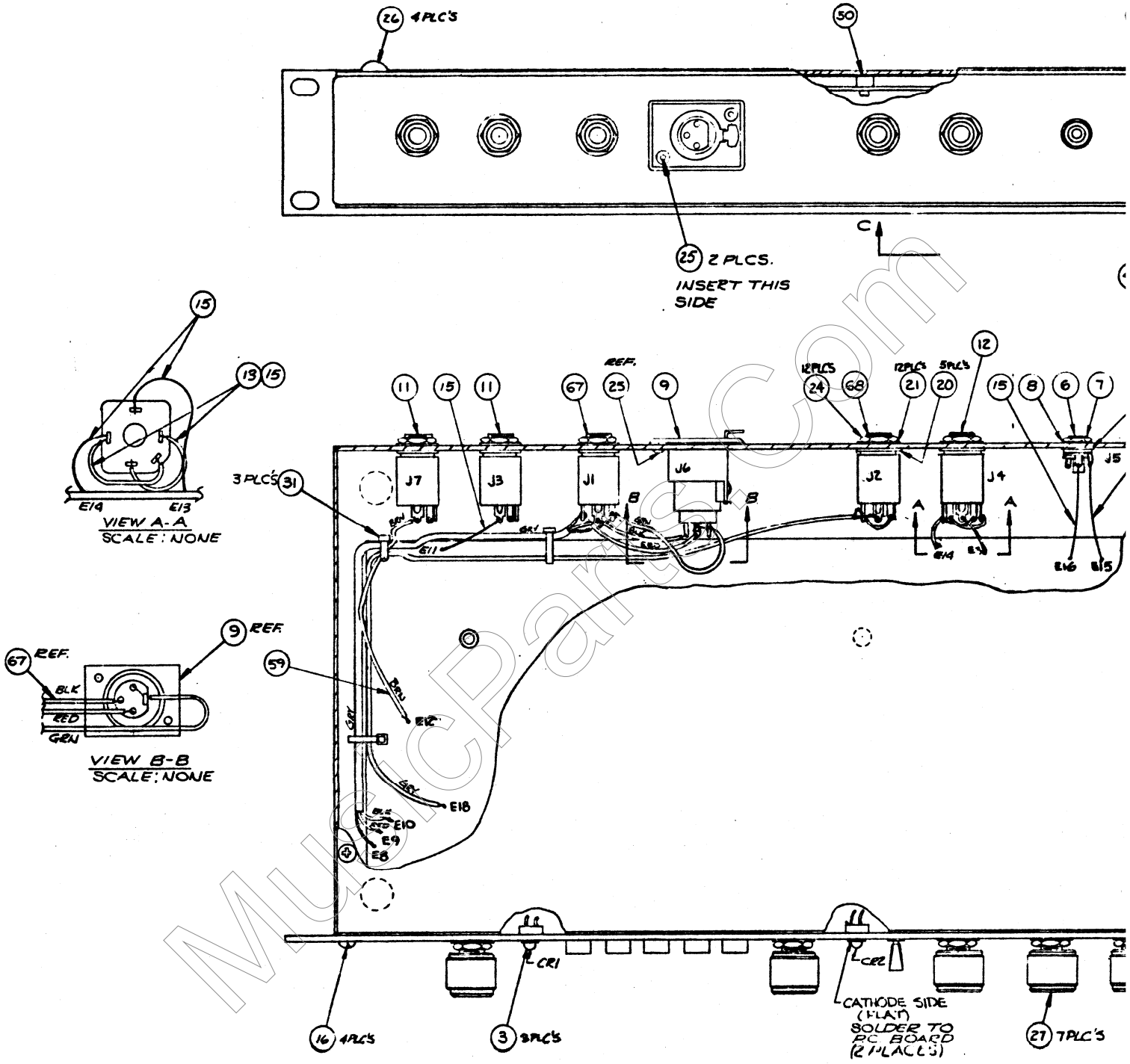
NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   ALL RESISTOR VALUES ARE IN OHMS 1/4W, 5%.
   ALL CAPACITOR VALUES ARE IN MF. (P = PICOFARADS).
   ALL DIODES ARE 4148.
2. BEND DOWN PIN 1 AND ITS DIAGONAL COUNTERPART ON 71 THRU 234.
3. FINISHED ASSY. TO BE FREE OF EXCESS FLUX.
4. FOR PARTS LIST SEE PL7224001



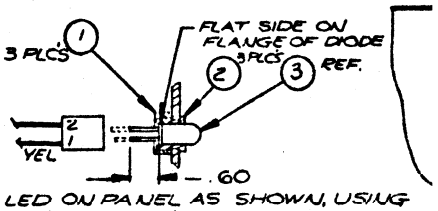
LTR	DESCRIPTION	BY	APPROVED
16	PILOT REL 403		LTL
17	PPC. NO 0098		

ARP PART NO 7224001	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES XX ± .03	ARP INSTRUMENTS INC	
USED ON PL753760/03	TOLERANCES XXX ± .010 ANGLES ± 1° REMOVE BURRS & SHARP EDGES DO NOT SCALE DRAWING	TITLE PC BOARD ASSY. DIGITAL DELAY	
MATERIAL —	DRAWN G.D. 7/10/79	SYM PCA	SIZE D
FINISH —	CHECKED	DRAWING NO 72240	REV 17
	APPROVED	SCALE NONE	SHEET 1 OF 1
	APPROVED		



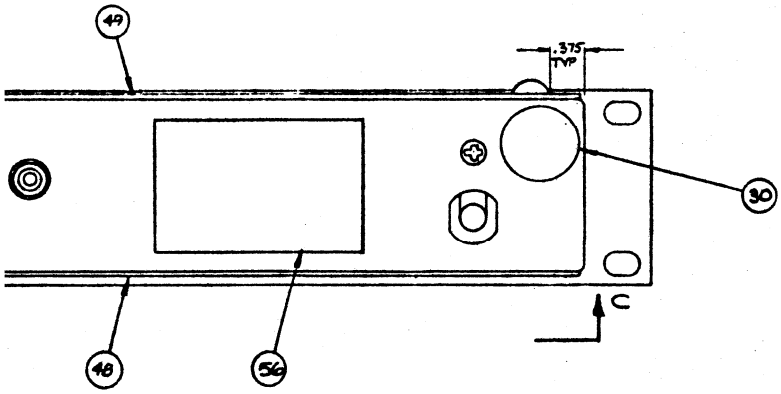
NOTES:

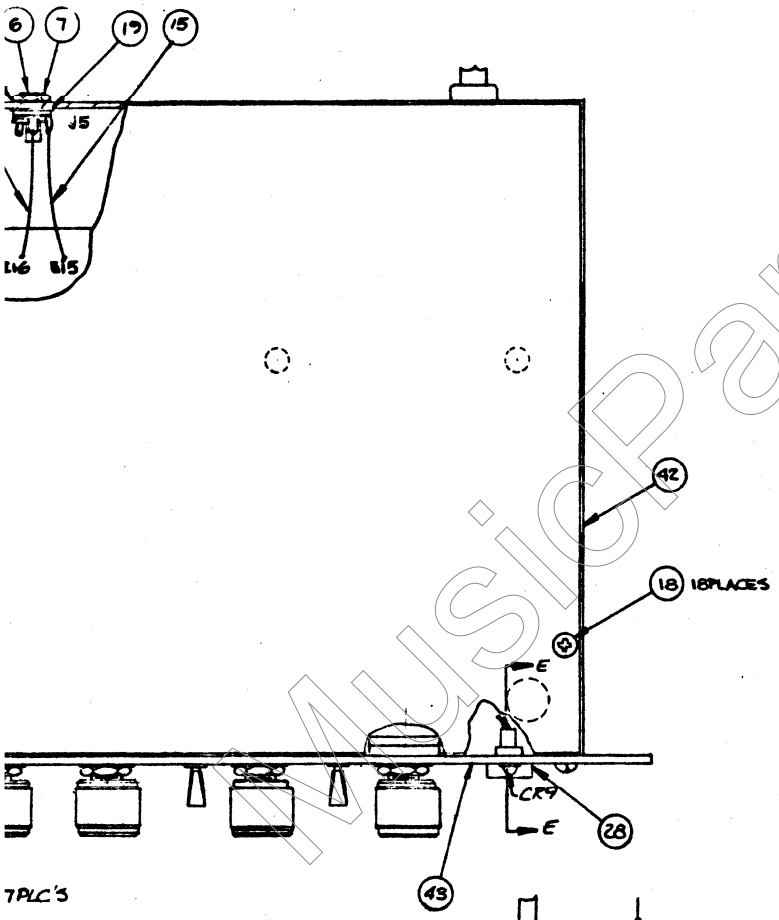
1. FOR PARTS LIST, SEE TABULATION.

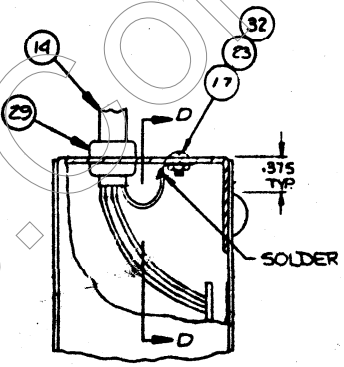


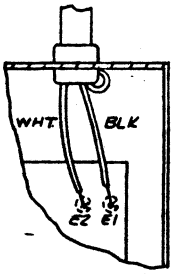
INSTALL LED ON PANEL AS SHOWN, USING LONG LEAD (CATHODE) AS ORIENTATION CUT LEADS TO DIMENSION SHOWN AND INSTALL CONNECTOR.

SECTION E-E SCALE: NONE

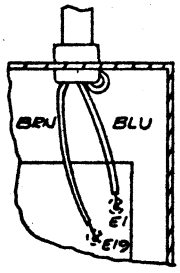






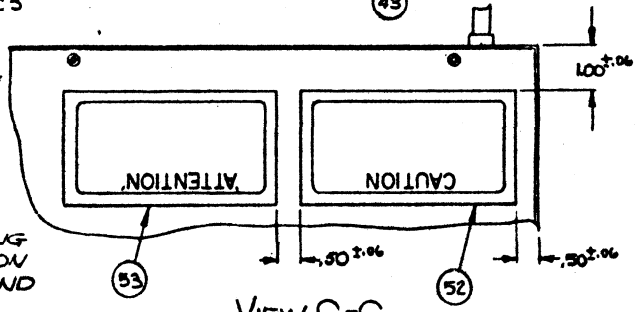


SECTION D-D
120V CSA LA



SECTION D-D
240V STD

7PLC'S



VIEW C-C
SCALE: 1/2

ARP PART NO.	DESCRIPTION	USED ON
7537601	240V STD.	PL8311101
7537603	120V CSA, LA	PL8311001

ARP PART NO SEE TABULATION	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES	ARP INSTRUMENTS INC
USED ON SEE TABULATION	TOLERANCES XX ± .02 XXX ± .010 ANGLES ± 1°	TITLE FINAL ASSY DIGITAL DELAY
MATERIAL —	REMOVE BURRS & SHARP EDGES DO NOT SCALE DRAWING	
FINISH —	DRAWN	SIZE A / SIZE D / DRAWING NO 75376 / REV 2
	CHECKED DGC	SCALE 1/1 / SHEET 1 OF 1
	APPROVED	
	APPROVED	

FCN015

FIELD CHANGE NOTICE

MODEL: MU-TRON DIGITAL DELAY, 1173 DATE: 2/27/80

EFFECTIVITY: Serial Numbers 0001 - 0425

SYMPTOM: Break up or erratic signal at the end of a long decaying note. (Guitar, piano, etc.)

PROBLEM: As the note is allowed to fade down, the signal level approaches the inherent noise level. The voltage on C71 (Z34D) becomes equal to the comparator reference on Pin 10. Z34D begins to rapidly "chatter" on and off. This causes the integration rate to change up and down rapidly, producing an audible alteration of the output.

REPAIR: Using the two unused sections of Z34, build a circuit to detect the voltage at the integrator and when that level is low enough, pull the comparator reference almost to ground. This will force the comparator's open collector output to float, effectively stifling the "break up".

MATERIAL REQUIRED:
- 1 - 2.2K 1/4W 5%
- 1 - 100 ohm 1/4W 5%
- 3 - 10K 1/4W 5%
- 1 - 47 ohm 1/4W 5%
- 1 - CA339 Quad Comparator (In case of breakage)

STEP 1: (Refer to diagram attached)
On Component Side:
1) Change R122 to 2.2K and R123 to 100 ohms.
2) Cut foil and add 10K in series to Pin 10, Z34.
3) Remove Z34 and cut foil at Pin 4 as shown. Reinstall Z34. If damaged, use new CA339.

STEP 2: (Refer to diagram attached)
On Circuit Side:

CAUTION: Very little clearance. Position components as close to board as possible and insulate leads. Be certain insulation will not be pierced when bottom is installed.

1) Add a 10K resistor between Pin 1, Z34 and the junction of R122 and R123.
2) Add a 10K resistor between Pin 3 and Pin 6, Z34.
3) Add a 47 ohm resistor between Pin 8 and Pin 12, Z34.

ARP INSTRUMENTS, INC., 45 HARTWELL AVE., LEXINGTON MA 02173. 617/861-6000

STEP 3: (Refer to diagram attached)
On Circuit Side:

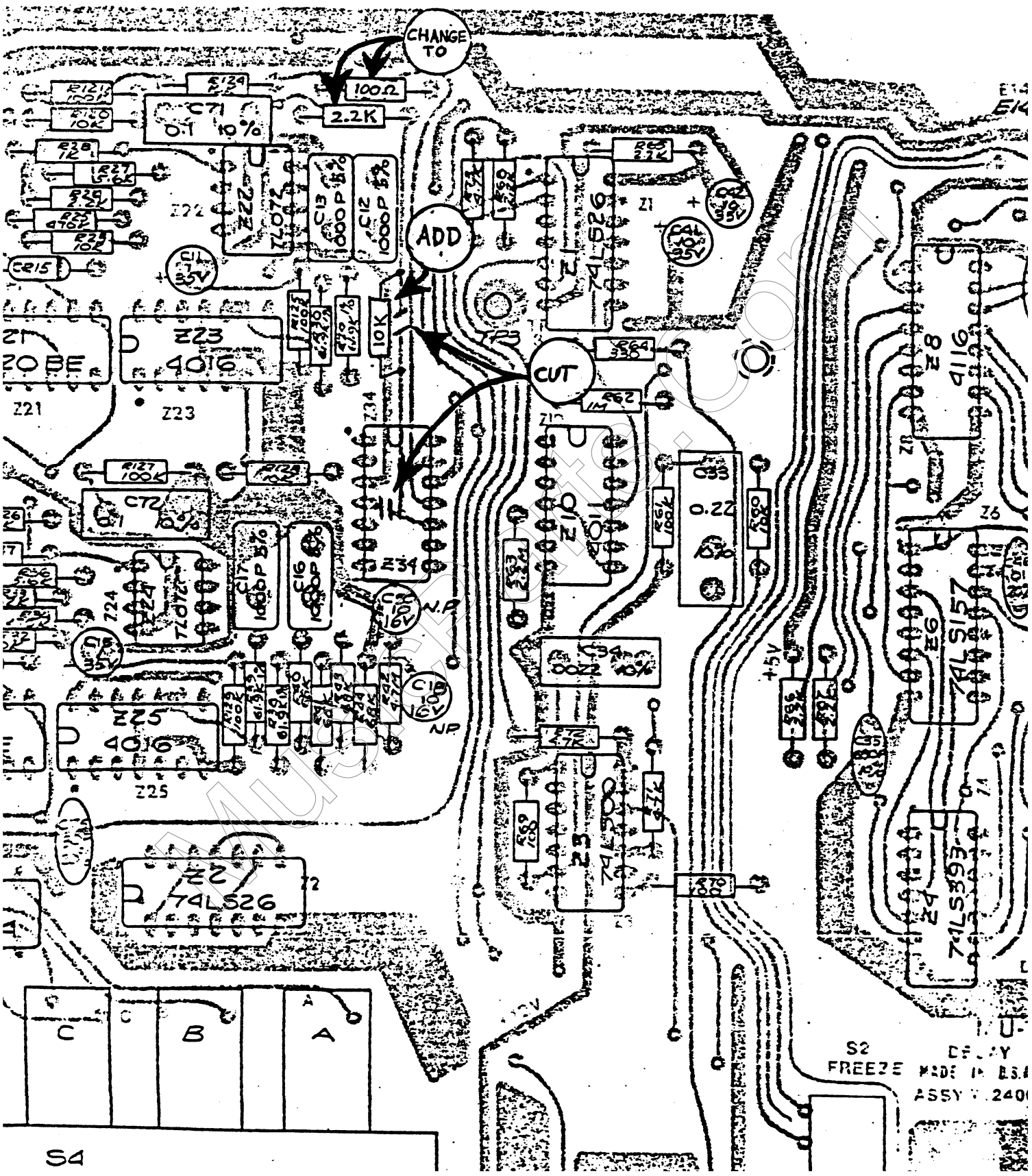
CAUTION: Use insulated wire for all jumpers. Be certain insulation will not be pierced when bottom is installed.

1) Add 5 jumpers as follows:
   a) Pin 8, Z23 to Pin 9, Z34 (note incorrect label on foil side)
   b) Pin 8, Z25 to Pin 7, Z34.
   c) Pin 6, Z34 to Pin 8, Z34.
   d) Pin 1, Z34 to Pin 4, Z34.
   e) Pin 10, Z34 to Pin 14, Z34.

STEP 4: Reassemble Unit and Test.

STEP ONE

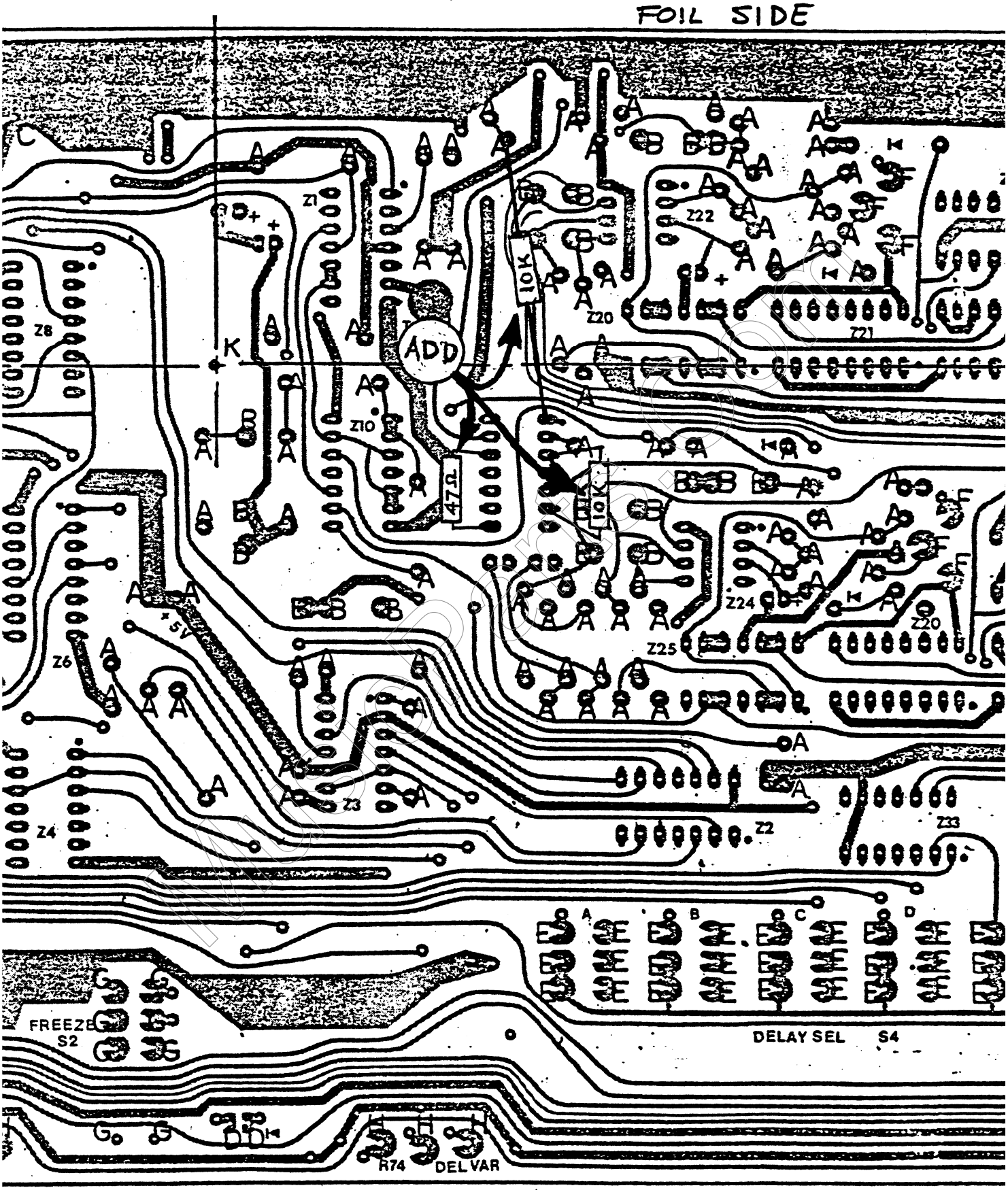
COMPONENT SIDE



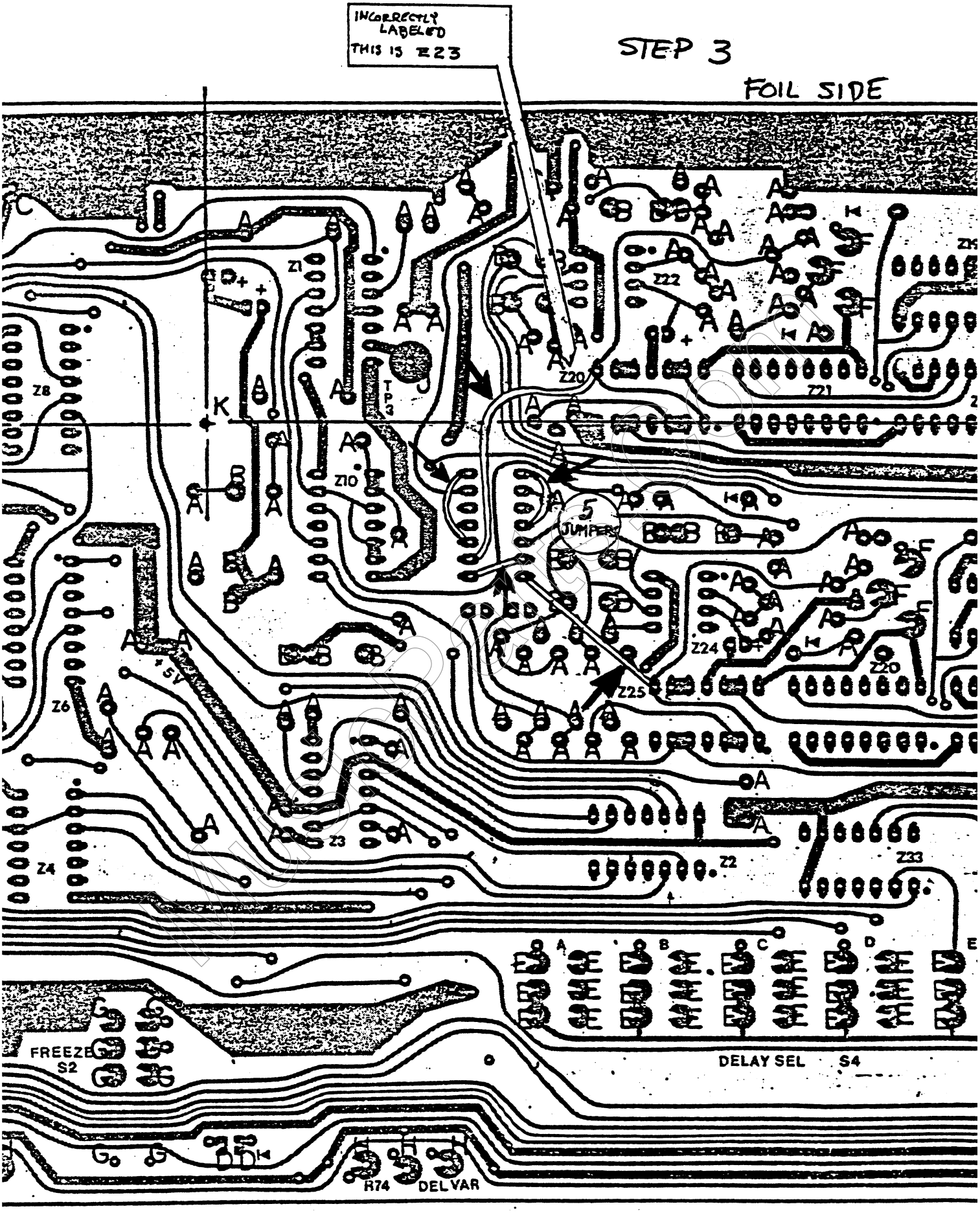
Add resistors, and cut traces

STEP 2

FOIL SIDE



Add 3 resistors



Add 5 jumpers

WARNING

TO PREVENT FIRE OR SHOCK HAZARD,
DO NOT EXPOSE THIS APPLIANCE
TO RAIN OR MOISTURE.

MU-TRON