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Brand:	**Ibanez**
Model	**DM2000**
Product:	**Digital Delay**
Description:	**Service Manual**

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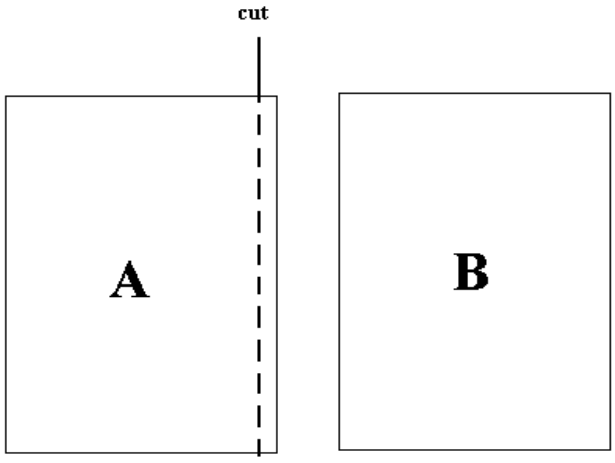
Two Sheet Pasteup Guide

11x17" paper size



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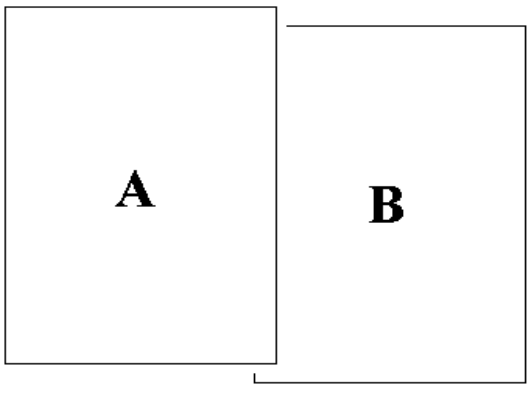

Only one trim cut is needed, then overlay as shown and tape.

Ibanez

SERVICE MANUAL

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DIGITAL DELAY
DM2000

MANUAL No.030

[INDEX] [PAGE]

PUBLICATION 1983

200-11-1983

MYSKHM

PRINTED IN JAPAN

SPECIFICATIONS

1.Controls:	INPUT LEVEL(PULL MIC), mSec(DELAY RANGE), DELAY TIME, WIDTH, SPEED, FEEDBACK(PULL INVERT), DRY LEVEL, DELAY LEVEL, EFFECT/BYPASS SWITCH, POWER SWITCH	
2.Headroom Indicator:	ACTIVE(Green), OVER(Red)	
3.Jacks:	INPUT, MIX OUTPUT, INVERT-MIX OUTPUT BYPASS/EFFECT FOOTSWITCH	
4.Delay Time:	1.0msec to 1023msec (Pitch=1msec)	
5.Frequency Responce:	DELAY:	10Hz to 16KHz (+0.5dB, -3dB)
	DRY :	10Hz to 20KHz (+0.5dB, -3dB)
6.Input Impedance:	INPUT:	100Kohms
	RECEIVE:	100Kohms
7.Input Level:	INPUT:	+4dBm (+20dBm Max.)
	INPUT:	-20dBm (+3dBm Max.)
	RECEIVE:	+4dBm (+16dBm Max.)
8.Output Impedance:	DRY:	1Kohms
	MIX:	1Kohms
	INVERT MIX:	1Kohms
	SEND:	1Kohms
9.Output Level:	DRY:	+4dBm
	MIX:	+4dBm
	INVERT MIX:	+4dBm
	SEND:	+4dBm
9.Equivalent Input Noise:	-95dBm(IHF-A INPUT shorted)	
10.Total Harmonic Distortion:	DELAY:	less than 0.2%
	DRY:	less than 0.1%
11.Weight:	3.5Kg. (7.7lbs)	
12.Dimensions(WxHxD) :	482 x 44 x 233mm (19.0 x 1.8 x 9.2in)	
13.Power Requirement :	120V	60Hz 19W
	220-240V	50Hz 22W

ADJUSTMENTS & CHECK

INFORMATION : 0dBm=775mV

[A] VOLTAGE CHECK
1.GROUND to C23: +15V (Output Current approx. 135mA)
2.GROUND to C21: -15V (Output Current approx. 110mA)
3.GROUND to C17: +5V (Output Current approx. 520mA)

[B] SWITCH CHECK
1.On/Off switches as follows, and check each LED lights normality.
MOD ON/OFF, FEEDBACK INV/NOR, HOLD ON/OFF, BYPASS ON/OFF
2.Up/Down DELAY TIME switch, and check the time turns from 0msec to 1023msec.
Check the up/down switches fulfill its slow/fast double function.

[C] CLOCK FREQUENCY
1.CLOCK
Connect the SYNCHROSCOPE and the FREQUENCY COUNTER to pin12 or pin13 of IC141(MN4016) on DIGITAL P.C.B.
Set knobs as follows. WIDTH='0', SPEED='0', MOD='OFF'
Adjust SR-1 for a frequency of 64KHz.
2.MODULATION
Set knobs as follows. WIDTH='10', SPEED='0', MOD='ON'
Adjust SR-2 for a lowest frequency of 32KHz(0.03125msec).
Check the highest frequency sweeping to 128KHz(0.0078125msec).

[D] A/D CONVERTER BIAS
Set all knobs to '0'.
Connect the SYNCHROSCOPE to cathode of D16 on DIGITAL P.C.B.
Watching the slope-wave like stairs, adjust SR-4 for normal stairs-like wave.

[E] HEADROOM INDICATOR
Set knobs as follows. BYPASS='ON', INPUT='-20dBm'
Put 400Hz -16dBm sinewave into INPUT.
Adjust INPUT LEVEL knob for -16dBm at MIX OUTPUT (by the LEVEL METER).
Adjust SR-3 just to light '0'-indicated LED of HEADROOM INDICATOR.(Also lighting '-10' & '-5' LED.)
Check all of 5 indicator LEDs light when inputting -4dBm sinewave.

[F] BIAS & T.H.D.
1.OFFSET
Set Knobs as follows. All switches set OFF.
INPUT='+4dBm', INPUT LEVEL='10', FEEDBACK='0', DRY='0', DELAY='10'
Connect the SYNCHROSCOPE to E5 of Connector on ANALOG P.C.B.
Set the TONE BURST GENERATOR.
Put 400Hz +8dBm sinewave set SIGNAL:INTERVAL=2:5 to INPUT.
Watching the scope, adjust VR-3 for the wave to be offset symmetrical wave.
Adjust VR-5 by the same procedures at MIX OUTPUT.
If you have not a TONE BURST GENERATOR, adjust VR-3 & VR-5 for minimum distortion at output.
2.T.H.D.
Put 400Hz +13dBm sinewave into input.
Connect the DISTORTION METER to MIX OUT.
Check the distortion less than 0.3%.

[G] LINEARITY
Settings are as same as [F].
Put 400Hz +4dBm sinewave into INPUT.
Adjust INPUT LEVEL knob for +4dBm at OUTPUT.
Attenuate input level to -36dBm, and adjust VR-6 for -36dBm at OUTPUT.

[H] FREQUENCY RESPONSE
1.CUTOFF FREQUENCY
Settings are as same as [F].
Put 16KHz +4dBm sinewave into INPUT.
Adjust VR-2 for +1dBm at MIX OUT.
2.Set DRY knob '10', and increment DELAY TIME 1msec, 2msec, 3msec on and on.
Check comb filter cutoff frequency becomes low at OUTPUT.
3.Rotate FEEDBACK knob to '10', check the feedback effect.
4.Switch FEEDBACK to INV., check the phase to be inverted.
5.Check DRY, MIX, INV.MIX, FEEDBACK-SEND output working well.
6.Check the level difference within +/-3dB at DRY and DELAY OUTPUT.

[I] HEARING TEST
1.FEEDBACK
Settings are as follows. INPUT='-20dBm' INPUT LEVEL: suitably
others='10'
MOD='ON' FEEDBACK='INV' HOLD='OFF',
BYPASS='OFF' DELAY TIME='1msec'
Put the signal suitably.
Hearing the sound, adjust VR-1 for maximum effect also not to oscillate.
Check not to oscillate when SPEED knob set at '5'.
Set DELAY TIME '500msec', MOD 'OFF', and check the sound repeats more than 10sec.
2.STEREO CHORUS
Settings are as follows. WIDTH & SPEED='5' FEEDBACK='0'
DRY & DELAY='10'
MOD='ON' BYPASS='OFF' DELAY TIME='10msec'
Connect one amplifier to MIX OUTPUT, other one to INV.MIX OUTPUT.
Hearing the sound, check the stereo chorus effect.
3.FEEDBACK LOOP
Settings are as follows. WIDTH & SPEED='0'
FEEDBACK, DRY & DELAY='10'
MOD='OFF' FEEDBACK='NOR'
HOLD & BYPASS='OFF' DELAY TIME='500msec'
Hearing the sound, check the delay effect at FEEDBACK SEND.
Short RECEIVE, check no feedback effect.
4.HOLD
Settings are as same as 3. except that FEEDBACK knob is '0'.
Input suitable signal and, then after 1023msec or more, switch HOLD 'ON'.
Check the signal repeats on and on.
The repeating interval (i.e. HOLD TIME) is 1023msec not concerned with DELAY TIME.
5.FOOTSWITCH
Connect REMOTE FOOTSWITCH into MOD,HOLD and BYPASS ON/OFF jacks.
Check the ON/OFF function working well.
6.SWITCH NOISE
Check no shock noise when switching the following switches.
INPUT, MOD ON/OFF, FEEDBACK INV/NOR, HOLD ON/OFF, BYPASS ON/OFF
7.NOISE
Settings are as same as 3., and input suitable signal.
Check no abnormal noise (i.e. A/D converting noise) at INPUT '-20dBm' or '+4dBm'

TROUBLE SHOOTINGS

1.First, check the following voltage and current.
  a) AC line voltage.
  b) DC regulated voltage. (see ADJUSTMENT & CHECK page)
  c) DC output current. (--ditto--)

2.Then, check the switching circuit.
  Turning the level high, the signal through the switching FET.
  Check point

Connector No.		D1		D3		D5	
IC143 pin No.		4	3	2	1	8	9	10	11
MODULATION	LED ON	0V	5V						
	OFF	5V	0V						
FEEDBACK	LED ON			0V	5V				
	OFF			5V	0V				
HOLD	LED ON					0V	5V		
	OFF					5V	0V		
BYPASS	LED ON							0V	5V
	OFF							5V	0V

Initial setting is BYPASS LED 'ON', others 'OFF'.

Check input-output of IC143(SN74LS05N) : input 0V - output 5V
                                         input 5V - output 0V
Check input-output of IC142(TC5020BP) : input 0V - output 15V
                                        input 5V - output 0V

Check switching function of Tr1,Tr2,Tr4 and Tr12 on DIGITAL P.C.B.
When MODULATION FOOTSWITCH turns OFF to ON (or MODULATION LED OFF to ON), IC142 pin15 turns to 15V, Tr1 turns OFF, Tr2 turns ON, then Tr4 turns OFF, Tr12 turns ON.

Check switching function of Q8 and Q5 on ANALOG P.C.B.
When FEEDBACK FOOTSWITCH turns OFF to ON (or FEEDBACK LED OFF to ON), IC142 pin2 turns to 15V, Q8 turns OFF, then Q5 turns OFF.

Check switching function of Q6,Q7,Q3,Q4 and Q9 on ANALOG P.C.B.
When BYPASS/EFFECT FOOTSWITCH turns OFF to ON (or BYPASS LED OFF to ON), IC142 pin12 turns to 15V, Q7 turns OFF, Q6 turns ON, then Q4 and Q9 turns OFF, Q3 turns ON.

3.Next, check the CPU(IC101 uPD8048C) output.

INDICATION of LED	CPU pin No. 22	21	19	18	17	16	15	14	13	12	
ex. 0000msec.	0	0	0	0	0	0	0	0	0	0	
0001msec.	0	0	0	0	0	0	0	0	0	5	
0002msec.	0	0	0	0	0	0	0	0	5	0	
0003msec.	0	0	0	0	0	0	0	0	5	5	
1022msec.	5	5	5	5	5	5	5	5	5	0	
1023msec.	5	5	5	5	5	5	5	5	5	5	(Volts)

ENABLE output (CPU pin No.31,32,33,34)
  Wave Form: Periodic Time 14msec. (High level 3.5msec.)
  Wave Delay: pin32 is 3.5msec delayed against pin31.
              pin33 is --ditto-- pin32.
              pin34 is --ditto-- pin33.

4.Check the followings. (Data is seen in page of ADJUSTMENT & CHECK.)
  a) L.F.O. : IC147 pin7 : Trianglewave : Depends on SPEED VR.
  b) V.C.O. : IC148,Tr11,Switching(Tr1,2,4,12) : Depends on WIDTH VR.
  c) CLOCK : IC114,Tr10 : Squarewave : Depends on CLOCK VR.

5.Check LED Level Meter (IC146). (See ADJUSTMENT & CHECK.)

6.If aboves are all O.K., check the ANALOG PCB.
  Check the following in sequence:
  1.Muting Relay (waiting time is approx 5-10sec)
  2.INPUT JACK. AMP(IC1), INPUT VR.
  3.DRY OUTPUT JACK, AMP(IC2)
  4.PRE EMPHASIS(IC5), L.P.F.(Q12,13,14,IC6)(-48dB/OCT)
  5.COMPRESSOR(IC6,8,9)
  6.EXPANDER(IC7,8,10)
  7.L.P.F.(Q10,11,15)(-36dB/OCT)
  8.DE EMPHASIS(IC7)
  9.DELAY VR.
  10.AMP(IC2), MIX & INV.MIX AMP(IC3), DRY VR., MIX & INV.MIX JACK
  11.FEEDBACK LOOP AMP(IC4), SEND & RECEIVE JACK, FEEDBACK VR.
  12.Electrical contact of connectors and jacks.

PARTS LIST

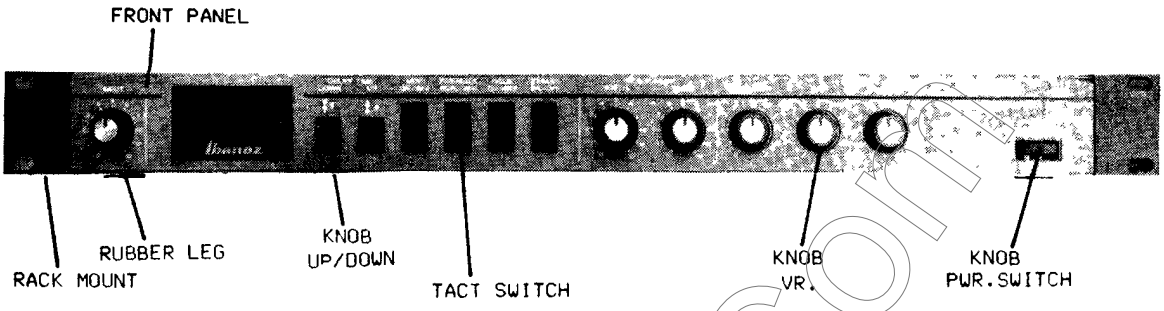
Please check your nation and the line voltage.

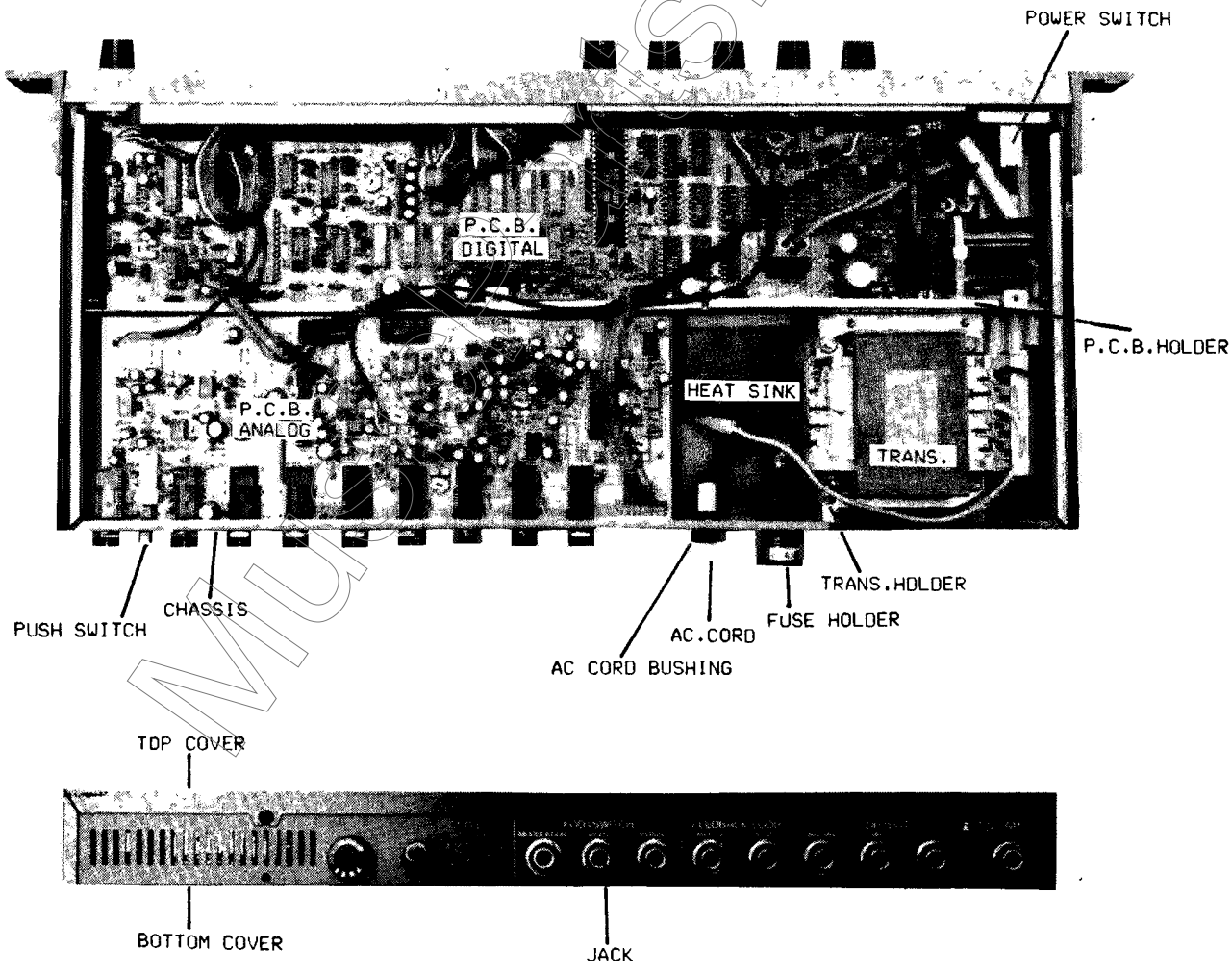
TYPE	ACCVJ	NATION	AC.CORD	TRANS.	FUSE	FUSE HOLDER
M	100	JAPAN	0.75VFF	MT-DM0401A	61ML0.5	SN2059
N	120	U.S.A.	KP11/SVT182C	MT-DM0402A	61ML0.5	SN2059
T	120	CANADA	KP30/SVT183C	MT-DM0402A	61ML0.5	SN2059
Q	220	SWITZERLAND	KP419E/CTCE3	MT-DM0403A	ES20500	SN2250
R	240	U.K.	SP308/BS	MT-DM0403A	ES20500	SN2250
S	240	AUSTRALIA	KP550/LTSA3	MT-DM0403A	ES20500	SN2250
U	220	OTHER EUROPE	BB6721	MT-DM0403A	ES20500	SN2250

PARTS NAME	TYPE	PARTS No.	REF.No.	REMARKS
FRONT PANEL		MS-DM0401		
TOP COVER		MS-DM0102B		
BOTTOM COVER		MS-DM0103B		
CHASSIS		MS-DM0402		
HEAT SINK		MS-DM0406		
P.C.B.HOLDER		MS-DM0403A		
TRANS.HOLDER		MS-DM0106A		
RACK MOUNT	(x2)	MS-DM0107		
POWER SWITCH		ESB8213V		
AC CORD BUSHING		SR-5N-4		
KNOB	(x6)	MK-DM0101A	VR.	
KNOB	(x2)	MK-DM0401	UP/DOWN	
KNOB	(x1)	SMR-1S	PWR.SWITCH	
RUBBER LEG	(x4)	RL-DM0101		
P.C.B.	ANALOG	MP-DM0401B		
JACK	(x9)	HLJ0520-01-110		
PUSH SWITCH		PV00A1-018	LEVEL	
RELAY		DS-2M-DC5V		
SEMI FIXED R.	(x5)	RVF8P103	SR2-6	
SEMI FIXED R.	(x1)	RVF8P203	SR1	
CONNECTOR ASSY.	(x3) 340mm	5264-3-340	(3P)(F)	
CONNECTOR ASSY.	(x1) 250mm	5264-3-250	(3P)(F)	
CONNECTOR ASSY.	(x1) 90mm	5264-6	(6P)(F)	
CONNECTOR ASSY.	(x1) 160mm	5264-8	(8P)(F)	
IC (Compandor,SIG)	(x1)	NE570N	IC8	
IC (Op.Amp,JRC)	(x9)	NJM4558DD	IC1-7,9,10	
TRANSISTOR (TO)	(x7)	2SC1815BL	Q2,10-15	
TRANSISTOR (TO)	(x4)	2SA1015GR	Q1,6-8	
FET (TO)	(x4)	2SK246GR	Q3-5,9	
DIODE (TO)	(x13)	1S1588	D1-3,5-14	
DIODE (HI)	(x1)	W03C	D4	
ZENER DIODE(NEC)	(x1)	RD5.1EB	ZD1	
P.C.B.	LED	MP-DM0402B		
IC (Latch,LED Driver,MA)	(x1)	MN4511B	IC1	
TRANSISTOR (TO)	(x4)	2SC1815BL	Tr1-4	
TRANSISTOR (TO)	(x1)	2SA1015GR	Tr5	
TACT SWITCH	(x4)	KHC11901		
TACT SWITCH	(x2)	KHF10903		
LED	5dot (x1)	LN05G3R2		
LED	4x7seg (x1)	LN543RK		
LED	Red (x4)	LN222RP		
CONNECTOR ASSY.	(x3)	5264-10	(10P)(F)	
P.C.B.	DIGITAL	MP-DM0403A		
VARIABLE R.	(x5) B100K	EWH14AP20B15	WIDTH,IN.,F.,ORY,DELAY	
VARIABLE R.	(x1) C500K	EWH14AP20C55	SPEED	
IC (CPU,NEC)	(x1)	uPD8048C-423	IC101	
IC (64K DRAM,NEC)	(x12)	uPD4164C-3	IC118-129	
IC (12bit SAR,AMD)	(x1)	Am2504PC	IC135	
IC (12bit D/A,AMD)	(x1)	Am6012PC	IC137	
IC (Level Conv.,TO)	(x1)	TC5020BP	IC142	
IC (Analog SW.,TO)	(x1)	TC4016BP or MN4016B	IC141	
IC (ROM,TI)	(x1)	TBP18S030NDM2K	IC115	
IC (Comparator,NS)	(x1)	LM311N	IC136	
IC (JFT Op.Amp,TI)	(x2)	TL082CP	IC140,147	
IC (LED Driver,MA)	(x1)	AN6884	IC146	
IC (Op.Amp,JRC)	(x3)	NJM4558D	IC110,138,148	
IC (NAND Gate,TI)	(x3)	SN74LS00N	IC114,144,145	
IC (Inv.TI)	(x1)	SN74LS05N	IC143	
IC (AND Gate,TI)	(x3)	SN74LS08N	IC102-104	
IC (Data Selector,TI)	(x5)	SN74LS157N	IC108,109,132-134	
IC (Flip Flop,TI)	(x2)	SN74LS174N	IC130,131	
IC (Binary Adder,TI)	(x3)	SN74LS283N	IC105-107	
IC (Latch,TI)	(x2)	SN74LS375N	IC116.117	
IC (Binary Counter,TI)	(x3)	SN74LS393N	IC111-113	
IC (+5V Reg,FC)	(x1)	uA7805UC	IC139	
TRANSISTOR (TO)	(x1)	2SC2824Y	Tr3	
TRANSISTOR (TO)	(x1)	2SA1184Y	Tr7	
TRANSISTOR (TO)	(x8)	2SA1015GR	Tr1,2,8-10,14,16,19	
TRANSISTOR (TO)	(x3)	2SC18158L	Tr5,6,13	
TRANSISTOR (MI)	(x1)	2SC1583F	Tr11	
FET (TO)	(x6)	2SK246GR	Tr4,12,15,17,18,20	
DIODE BRIDGE (SAN)	(x2)	RB-152	DB1,2	
DIODE (HI)	(x2)	W03C	D5,6	
DIODE (TO)	(x24)	1S1588	D1-4,7-26	
ZENER DIODE (NEC)	(x1)	RD4.7EB	ZD1	
CERAMIC RESONATOR	6MHz	FCK6-OM		
SEMI FIXED R.	(x1) 5K	RVF8P502	SR4	
SEMI FIXED R.	(x1) 10K	RVF8P103	SR1	
SEMI FIXED R.	(x2) 100K	RVF8P104	SR2,3	
CONNECTOR	(x4)	5267-3A	(3P)(M)	
CONNECTOR	(x1)	5267-6A	(6P)(M)	
CONNECTOR	(x1)	5267-8A	(8P)(M)	
CONNECTOR	(x3)	5267-10A	(10P)(M)	

If you want these parts, please write clearly like ex. as follow.
ex. : PARTS DM2000 IC AN6884 1pc

DISPOSITION OF PARTS





Parts Nos. are shown in parts list.

****
* DIGITAL P.C.B. DM2000 *
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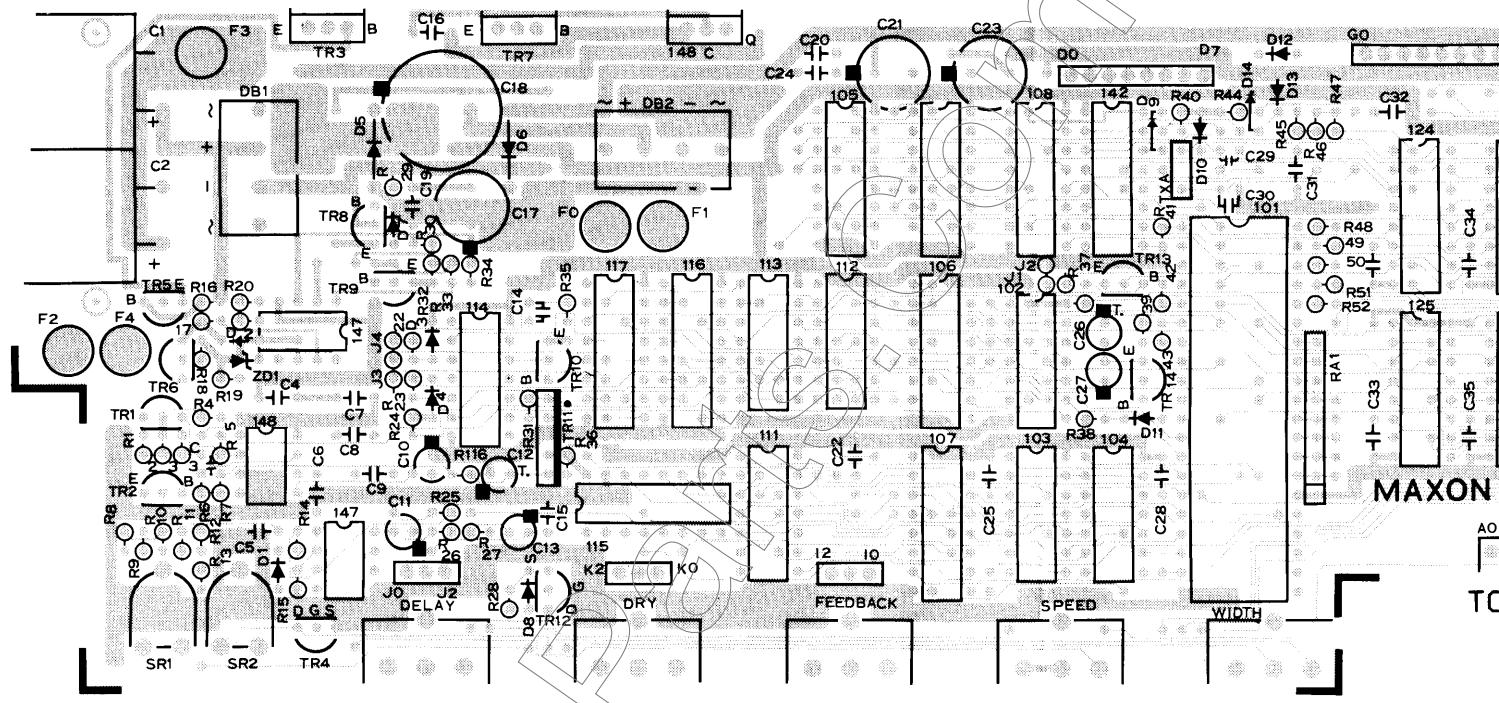
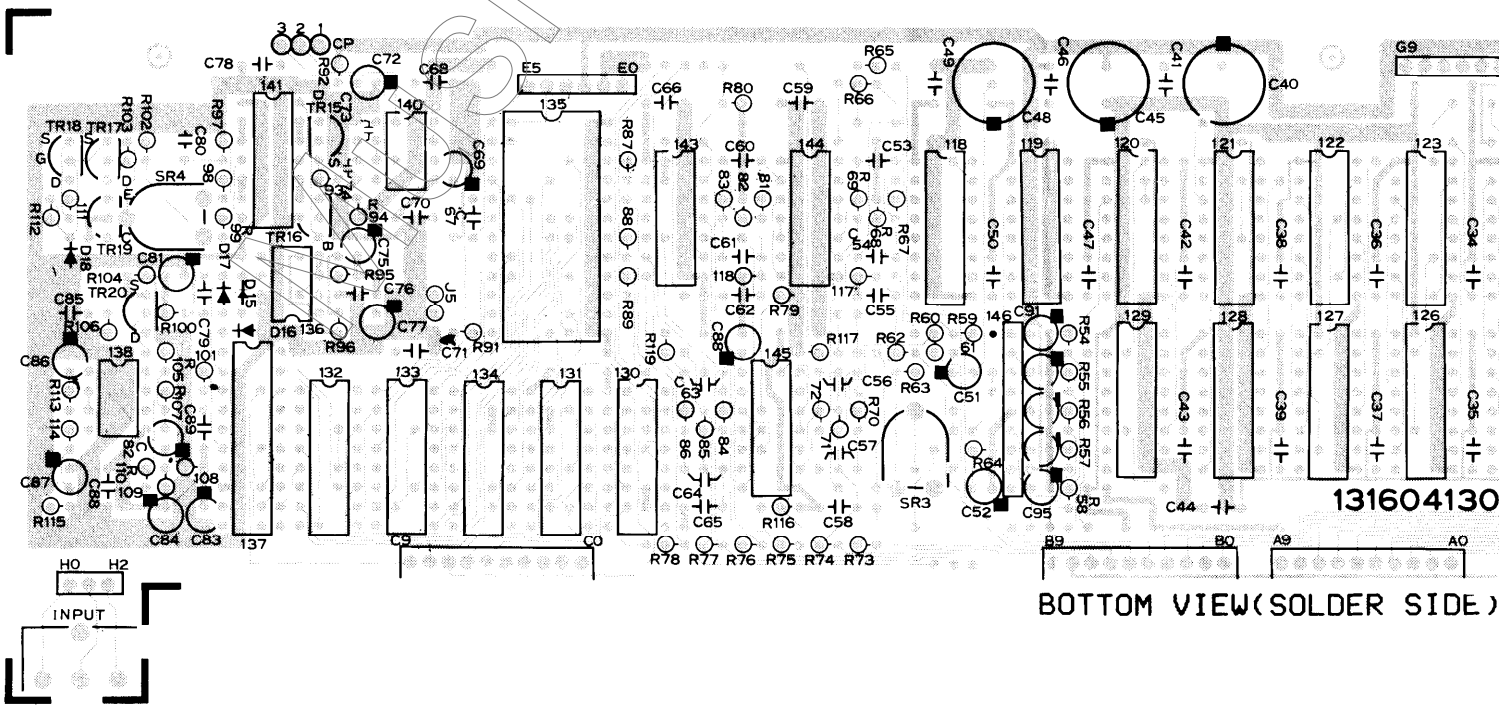
[INFORMATION]

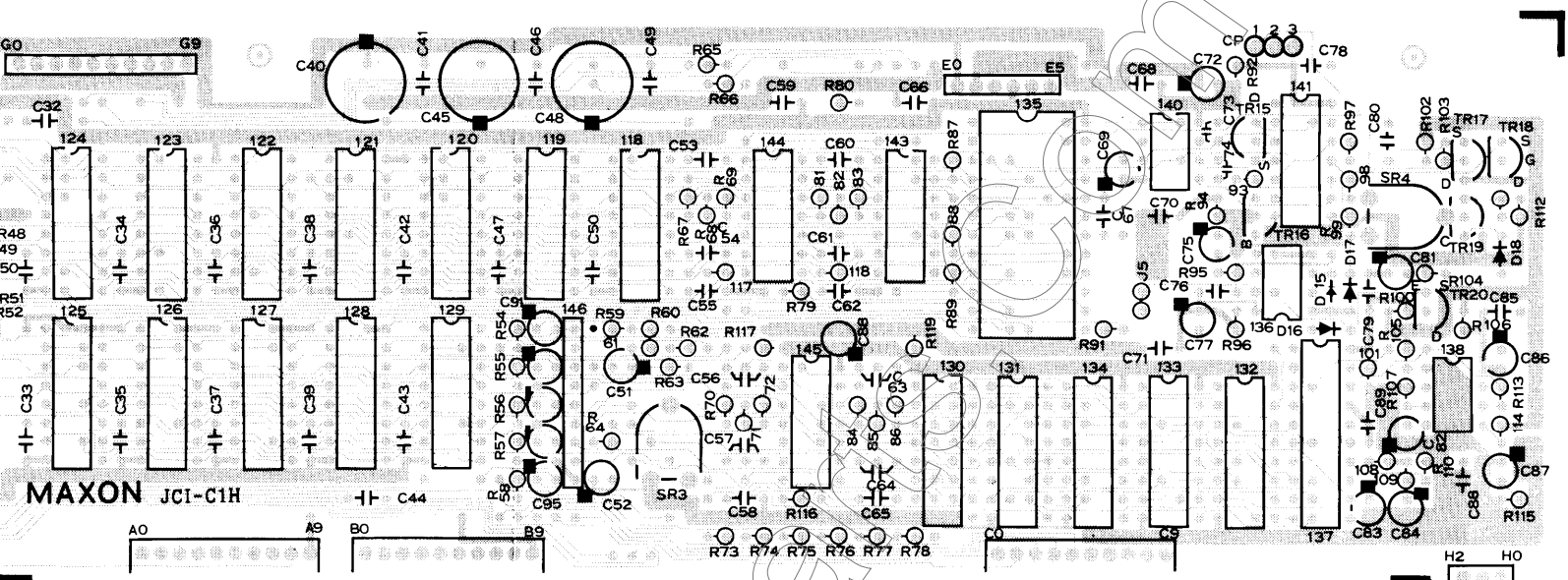
As shown in the following, there are two types in the DIGITAL P.C.B.
The old one is numbered as '131604130403'.
The new one is numbered as '131604130403B'.
But even if the number is '131604130403', please see the BIAS HOLE,
if the hole is painted by resist color, the P.C.B. is new one.
(BIAS HOLE is the through hole which mounted no parts.)

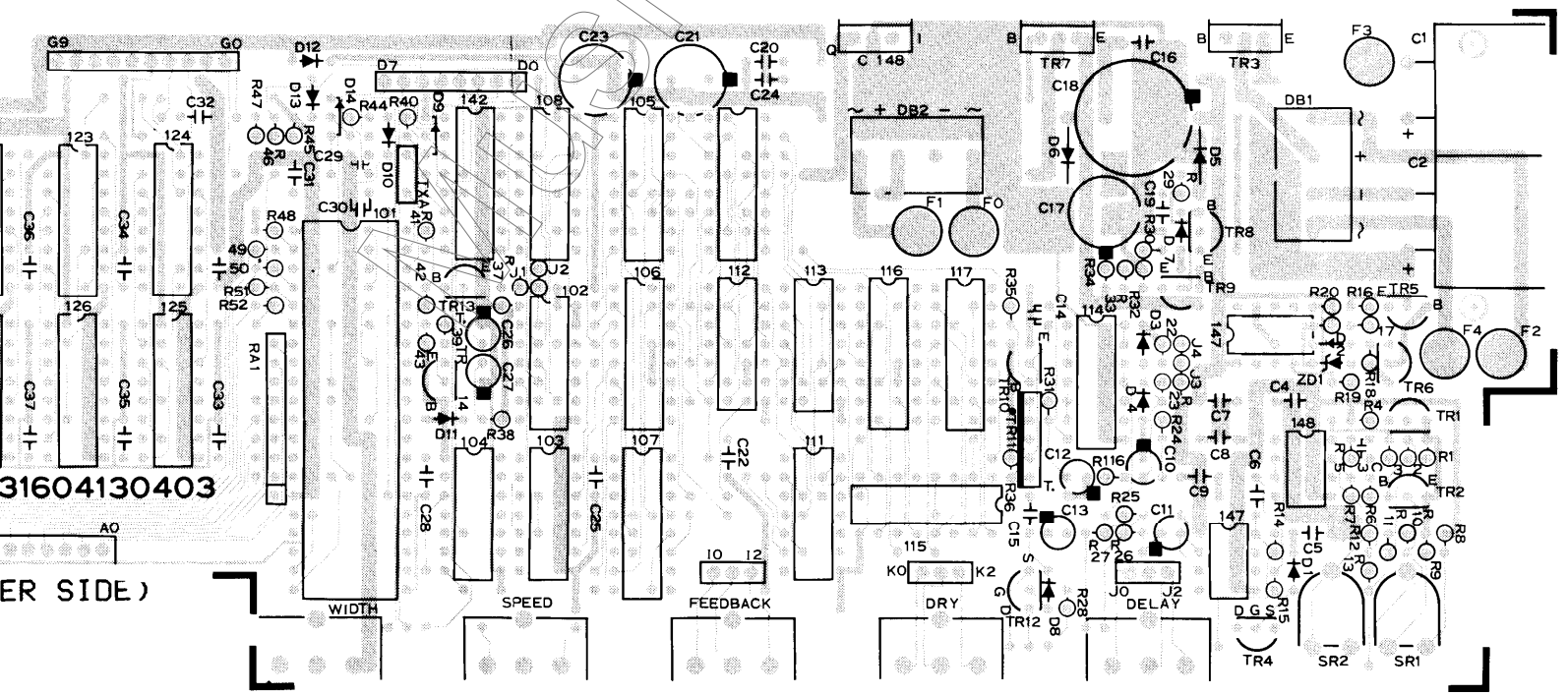
131604130403

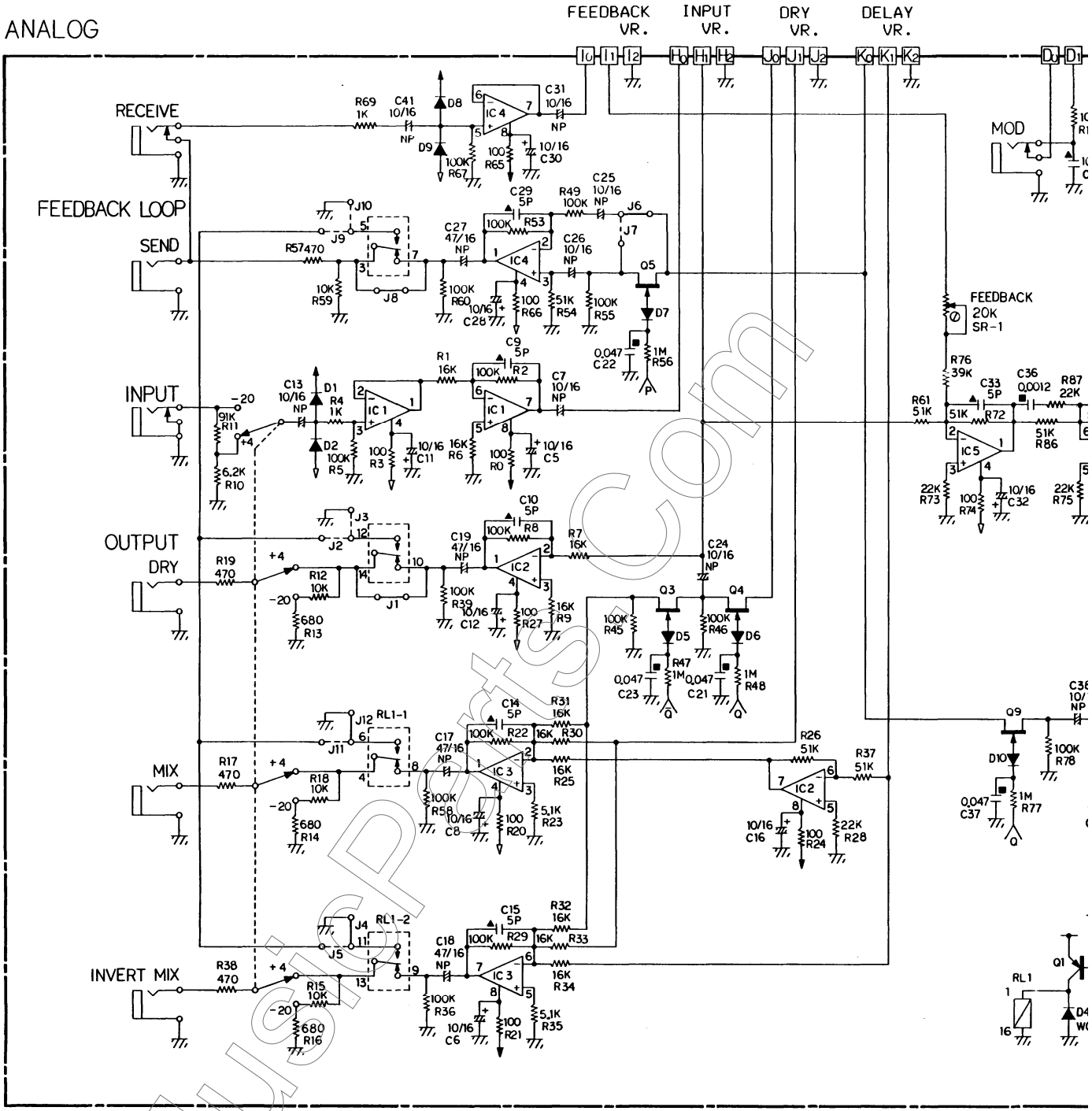


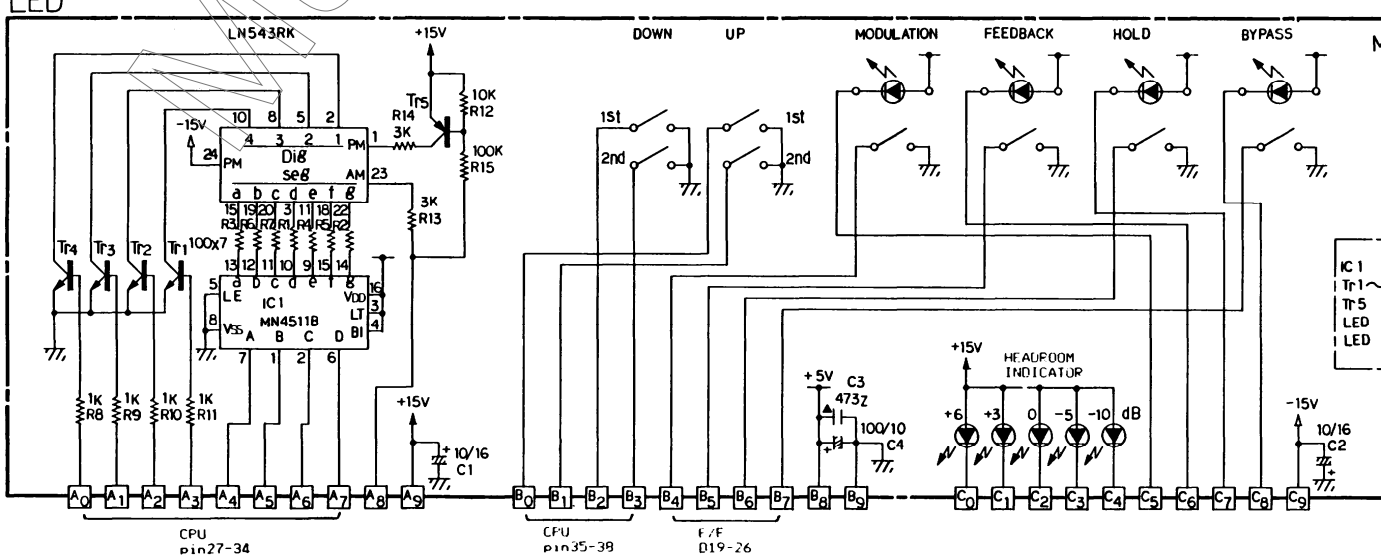


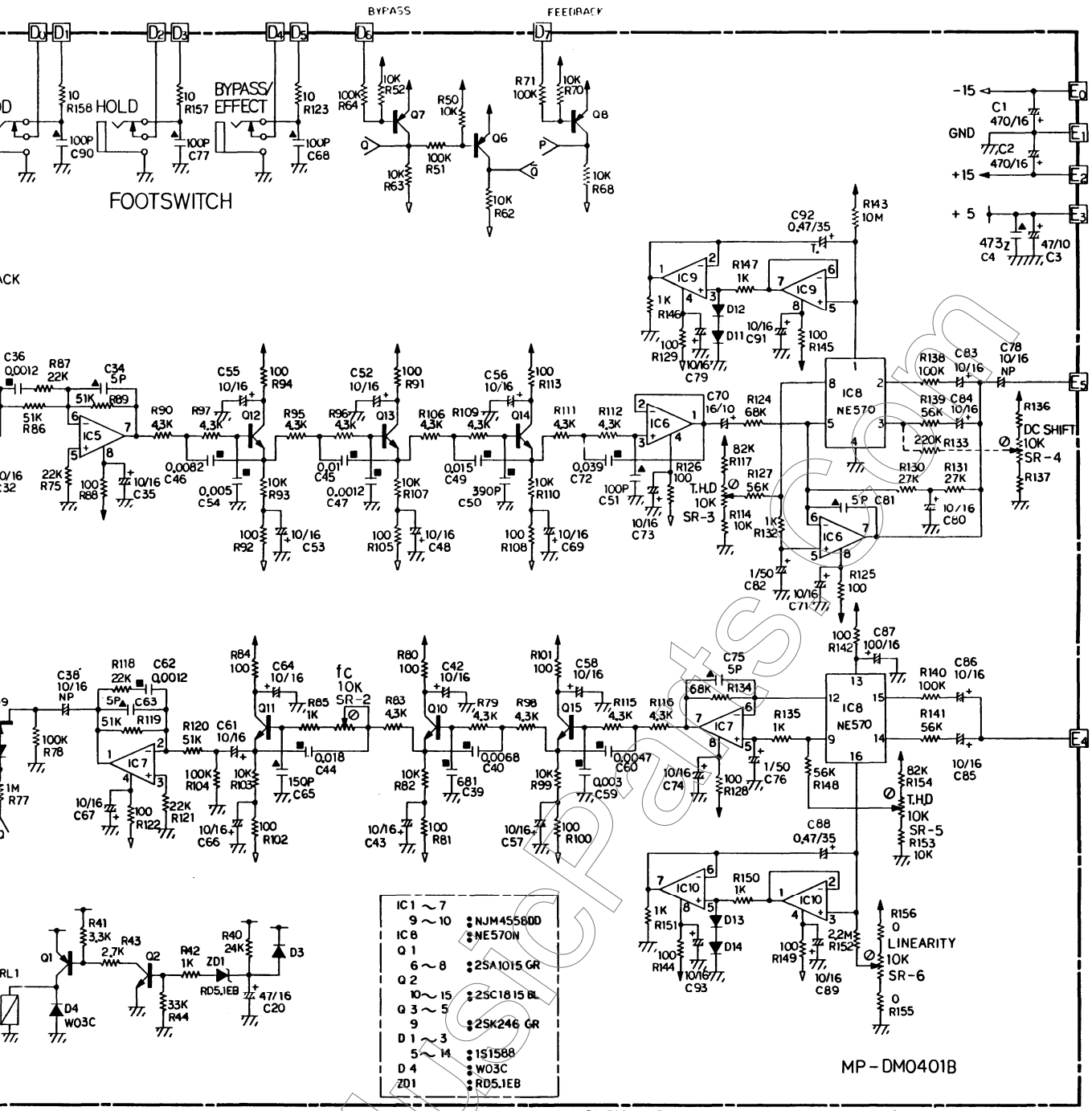
131604130403
131604130403B



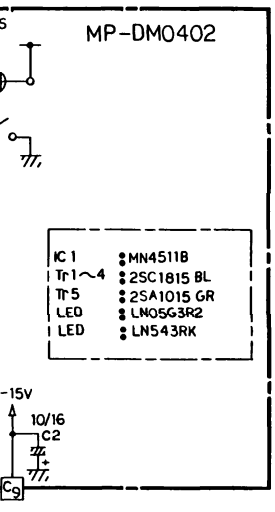




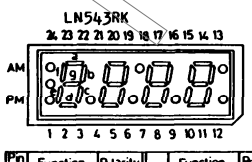




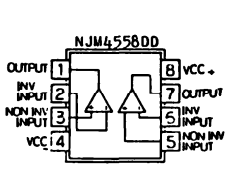
CAUTION : This schematic diagram is a normal standard one.
The parts rating and/or schematic diagram will be changed without notice.

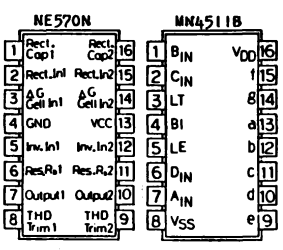


Top View

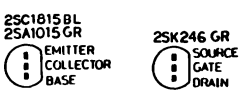


Pin No.	Function	Polarity		Function	Polarity
1	PM	A	13	FM. Alarm	K
2	Dig 1	K	14	FM	A
3	Seg d	A	15	Seg a	A
4	dp 1	A	16	dp 2	K
5	Dig 2	K	17	Upper Colon Lower Colon	K
6	Lower Colon	A	18	Seg f	A
7	Upper Colon	A	19	Seg b	A
8	Dig 3	K	20	Seg c	A
9	dp 2	A	21	dp 1	K
10	Dig 4	K	22	Seg g	A
11	Seg e	A	23	AM	A
12	Alarm	A	24	AM.PM	K





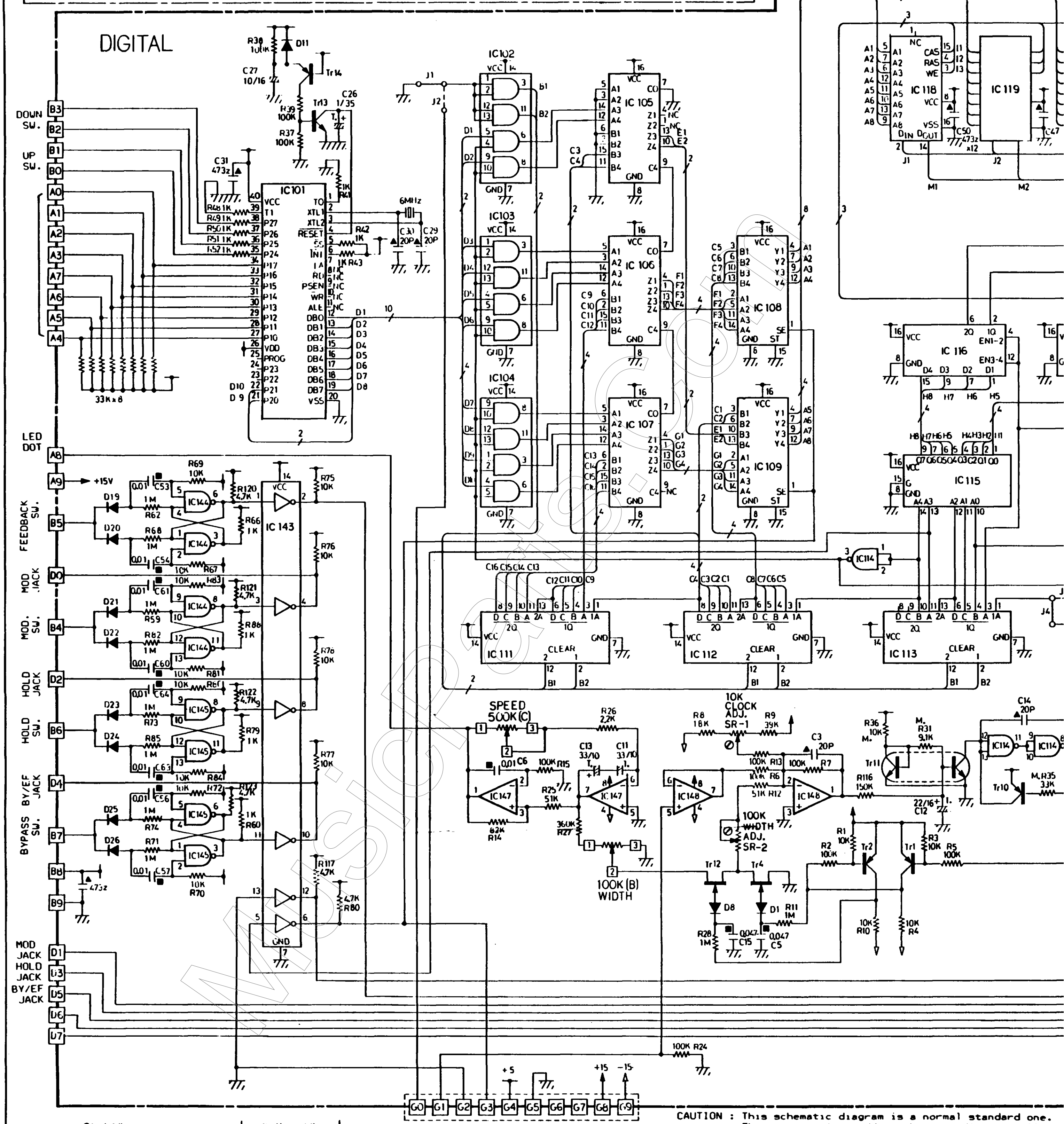
Bottom View



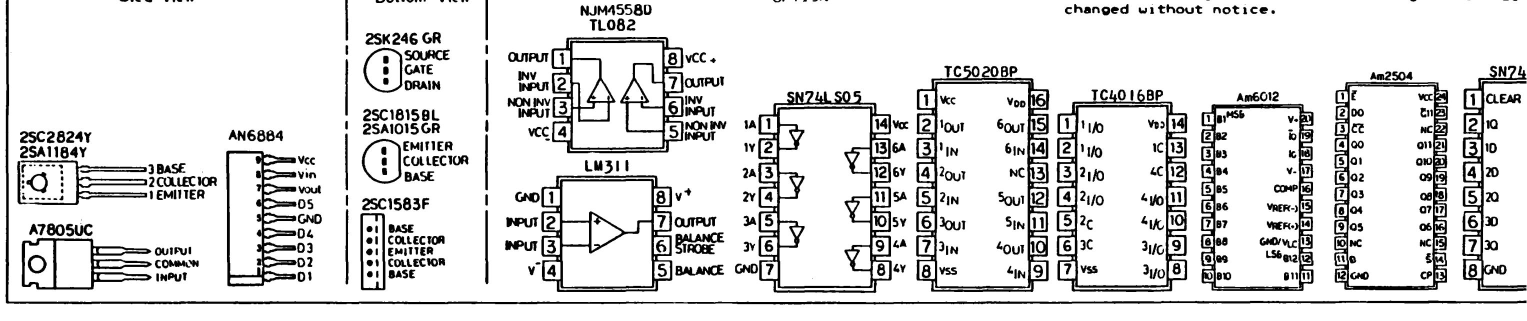
【NOTE】
▲:CERAMIC capacitor. All ceramic capacitors are above 25V rating.
■:FILM capacitor. All film capacitors are above 50V rating.
NP:NON POLAR capacitor.
T:TANTALUM capacitor.

And all capacitors are ELECTOLYTIC capacitors, unless otherwise marked.
Unless otherwise indicated:
Resistance in Ω, K=KΩ, M=MΩ
Resistors, 1/4W or 1/8W, ±5% rating
Capacitance in P=PF, μ=μF

IC101	μPD8048C	IC111～113	SN74LS393N	IC130～131	SN74LS174N	IC141	TC4016BP	Tr7	2SA1184Y
IC102～104	SN74LS08N	IC114		IC135	Am2504PC	IC142	TC5020BP	Tr4,12,15,17,18,20	2SK246GR
IC105～107	SN74LS283N	144～145	SN74LS00N	IC136	LM311N	IC143	SN74LS05N	Tr5,6,13	2SC1815BL
IC108～109		IC115	TBP18S030NDM2K	IC137	Am6012PC	IC146	AN6884	Tr11	2SC1583F
132～134	SN74LS157N	IC116～117	SN74LS375N	IC139	μA7805UC	Tr1,2,8,9,10,14,16,19	2SA1015GR	D1～4,7～26	1S1588
IC110,138,148	NJM4558D	IC118～129	μPD4164C-3	IC140,147	TL082CP	Tr3	2SC2824Y	D5,6	W03C



CAUTION : This schematic diagram is a normal standard one. The parts rating and/or schematic diagram will be changed without notice.



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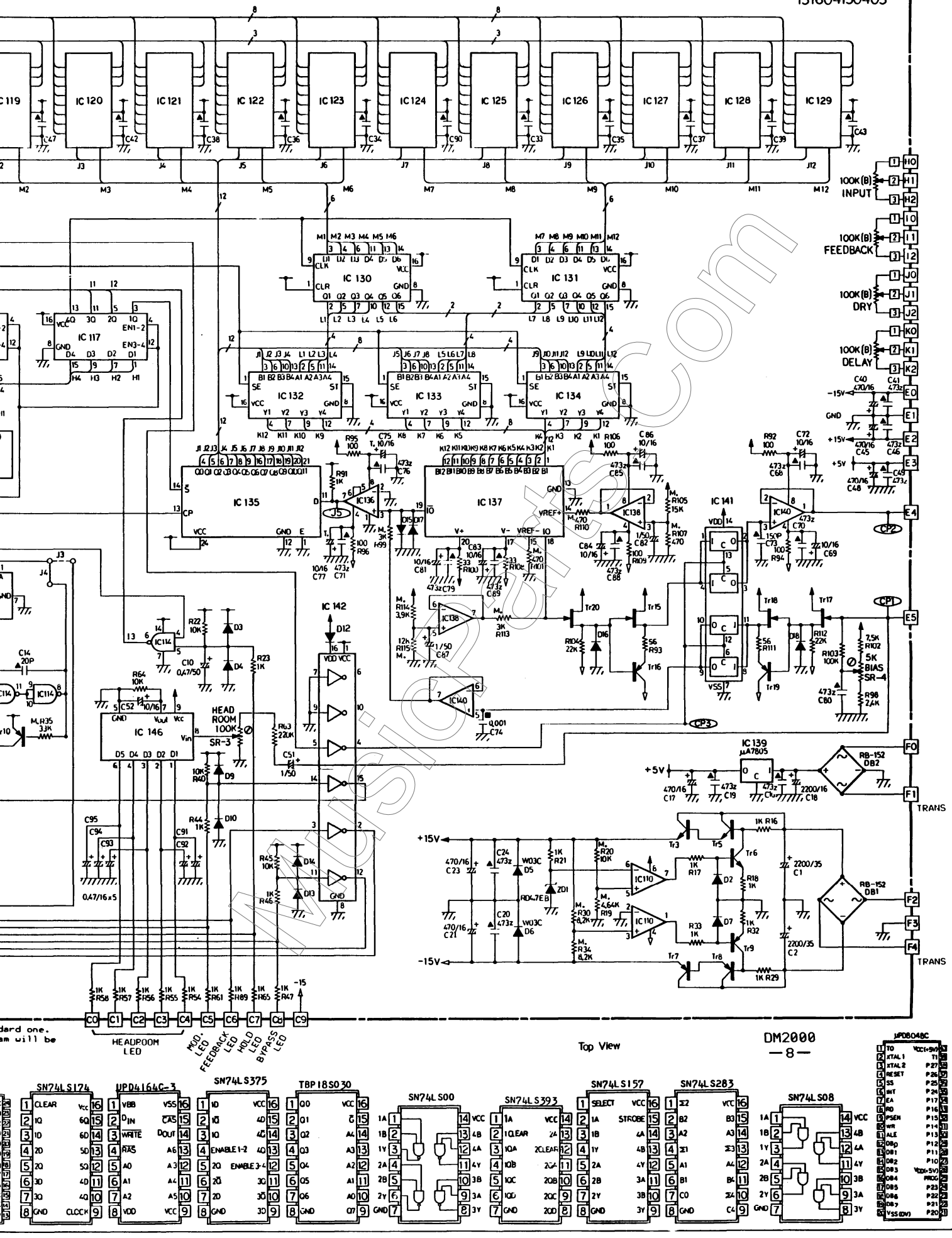

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* A part of SCHEMATIC DIAGRAM of DIGITAL CIRCUIT DM2000 *
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[INFORMATION]

As shown in the following, the first shipping lot of DM2000s have different schematic diagram.
Except this part of one, almost as same as normal schematic diagram.