Service Manual

74CD11/00G/01G

Compact disc player

CONTENTS

marantz®

model CD11

First issue : 1990

4822 725 50915

MZ 2512

MARANTZ DESIGN AND SERVICE

Using superior design and selected high grade components, MARANTZ company has created the ultimate in stereo sound.
Only **original MARANTZ parts** can insure that your MARANTZ product will continue to perform to the specifications for which it is famous.

Parts for your MARANTZ equipment are generally available to our National Marantz Subsidiary or Agent.

ORDERING PARTS:

Parts can be ordered either by mail or by telex. In both cases, correct part number has to be specified.
The following information must be supplied to eliminate delays in processing your order:

1. Complete address
2. Complete part numbers and quantities required
3. Description of parts
4. Model number for which part is required
5. Way of shipment
6. Signature: any order form or telex must be signed otherwise such part order will be considered as null and void.

MARANTZ INTERNATIONAL
Vestdijk 9
5600 MD Eindhoven
The Netherlands
Phone: +31/40.758290
Telefax: +31/40.75.82.99
Telex: 35000 PHTC NL routing IND NLMTFAT

PARTS ORDERING

Parts may be ordered at the following addresses:

AUSTRIA
HORNYPHON
Vertriebsgesellschaft GmbH
Wienerbergstrasse 1
A 1101 Wien
Austria
Telex: 132.332

BELGIUM
SVD DIVISION MARANTZ
Industrialaan 1
1720 Groot-Bijgaarden
Belgium
Telex: 24466

CHILE
MARANTZ
DIVISION OF PHILIPS S.A.
AV. Santa Maria, 0760
Casilla 2687
Santiago
Telex: 240.239

DENMARK
MARANTZ
DIVISION OF PHILIPS
SERVICE A/S
Prags Boulevard 80
Postbox 1919
DK-2300 København S
Denmark
Telex: 31201

FINLAND
MARANTZ
DIVISION OF OY PHILIPS Ab
Kaivokatu 8
00100 Helsinki
Finland
Telex: 124811

FRANCE
MARANTZ FRANCE
4 Rue Bernard Palissy
92600 Asnières
France
Telex: 611651

GERMANY
MARANTZ GERMANY GmbH
Alexanderstrasse 1
2000 Hamburg
Germany

THE NETHERLANDS
Elpro Marantz
Wint Hontlaan 28
3526 KV Utrecht
The Netherlands
Telex: 4748

NORWAY
MARANTZ
DIVISION OF PHILIPS A/S
Sandstuveien 40
0680 Oslo 6
Norway
Telex: 72640

GREAT BRITAIN
MARANTZ AUDIO U.K. Ltd
Unit 15/16
Saxon Way Industrial Estate
Moor Lane
Harmondsworth UB7 OLW
Great Britain
Telex: 935196

GREECE
SHERTON ELECTRONICS S.A.
P.O.Box 21025
Hippocratus Street 188
Athens 11471
Greece
Telex: 216.795

JAPAN
MARANTZ JAPAN, Inc.
35-1, 7-chome, Sagamiono
Sagamihara-shi, Kanagawa
Japan

KUWAIT
AL ALAMIAH ELECTRONICS
Ussama Building
Fahd al Saleem Street
P.O.Box 23781
Safat-Kuwait
Telex: 22694

ITALY
MARANTZ ITALIANA S.P.A.
Via Chiese, 74
20126 Milano
Italy

SAUDI ARABIA
AL ALAMIAH ELECTRONICS
P.O.Box 5954
University Street
Riyadh 11432
Saudi Arabia
Telex: 401530

SOUTH AFRICA
MARANTZ
DIVISION OF PHILIPS S.A.
Main Road Martindale
P.O. Box. 58088
Newville 21114
South Africa

SPAIN
PHONO S.A.
Ignacio Iglesias 10
Badalona (Barcelona)
Spain
Telex: 59355

SWEDEN
MARANTZ
DIVISION OF PHILIPS
Försäljning AB
Tegeluddsvägen 1
S-115 84 Stockholm
Sweden
Telex: 14060

SWITZERLAND
MARANTZ
Technischer Service
Duenstrasse 3
3186 Düdingen
Switzerland

TURKEY
DOGRUOL Ltd.
I.M.C.
6 Blok N°6310
Unkapani
Istanbul
Turkey
Telex: 22085

MALTA
CACHIA & GALEA
Republic Street, 68D
Valetta
Telex: 1682

PORTUGAL
MARANTZ
Divisao philips S.A. service
Outurela-carnaxide
2795 LinDA-A-VELHA
Telex: 43906

All of the above locations are fully equipped to take care of your total service needs. Because various countries have differing configuration requirements, it is necessary that you contact the service facility in your particular country. In the event that there is no service location listed for your country, please, contact the nearest facility for the necessary assistance.

In case of difficulties, do not hesitate to contact the Technical Department at abovementioned address.

1. TECHNICAL SPECIFICATIONS (DIN)

Audio Characteristics

Channels ..... 2 channels
D/A conversion ..... 1-bit linear/channel

Frequency Characteristics

Line output jack ..... 20 to 20,000 Hz, ± 0.2 dB
BALANCED output jack ..... 20 to 20,000 Hz, ± 0.2 dB
Dynamic range ..... 96 dB
S/N ratio ..... 96 dB
Channel separation ..... 96 dB or more (1 kHz)
THD ..... 0.0025% (1 kHz)
Wow & flutter ..... Precision of quartz
Analog output jacks
Line output jacks ..... Output level 2V RMS
Output impedance 100 ohms
Matching load impedance ..... 10 kilohms or more
BALANCED output jack ..... Output level 3V RMS
Output impedance 100 ohms
Matching load impedance ..... Balanced 600 ohms
Unbalanced 600 ohms to 50 kilohms
Digital output ..... Pin jack, 0.5 Vp-p/75 ohms
(Rectangular optical connector)
optical output — 19 dBm

Optical Readout System

Laser ..... AlGaAs semiconductor
Wavelength ..... 780 nm

Signal System

Sampling frequency ..... 44.1 kHz
Quantization ..... 16-bit linear/channel
Error correction ..... Cross-interleave read solomon code (CIRC), Class A D/A conversion

Power Supply

Power Requirements
E version ..... 110V/120V/220V/24V AC, 50Hz/60Hz
W version ..... 220 V/240V AC, 50Hz/60Hz
U version ..... 120V AC, 50 Hz/60 Hz
Power Consumption ..... 17 W

Cabinet, etc.

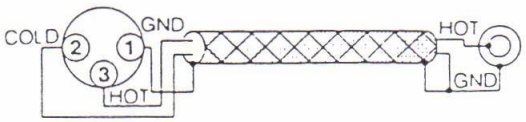
Max. dimensions
Width ..... 457 mm
Height ..... 140 mm
Depth ..... 359 mm
Dimensions
Width ..... 454 mm
Height ..... 122 mm
Depth ..... 342 mm
Weight ..... Approx. 16.7 kg
Operating temperatures ..... + 5 to + 35 °C
Operating humidity ..... 5% to 65% (without condensation)

2. NOTES ON BALANCED OUTPUTS CONNECTORS

The BALANCED output connectors uses XLR connectors.

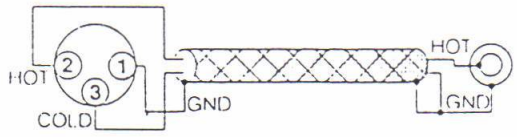
There are two types of professional-type internal wiring methods for XLR connectors.

1. USA method (Pin 2 = COLD, Pin 3 = HOT)



(XLR)

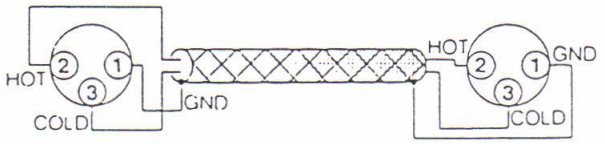
2. Europe method (Pin 2 = HOT, Pin 3 = COLD)



(XLR)

The models use the USA method described in 1 above.

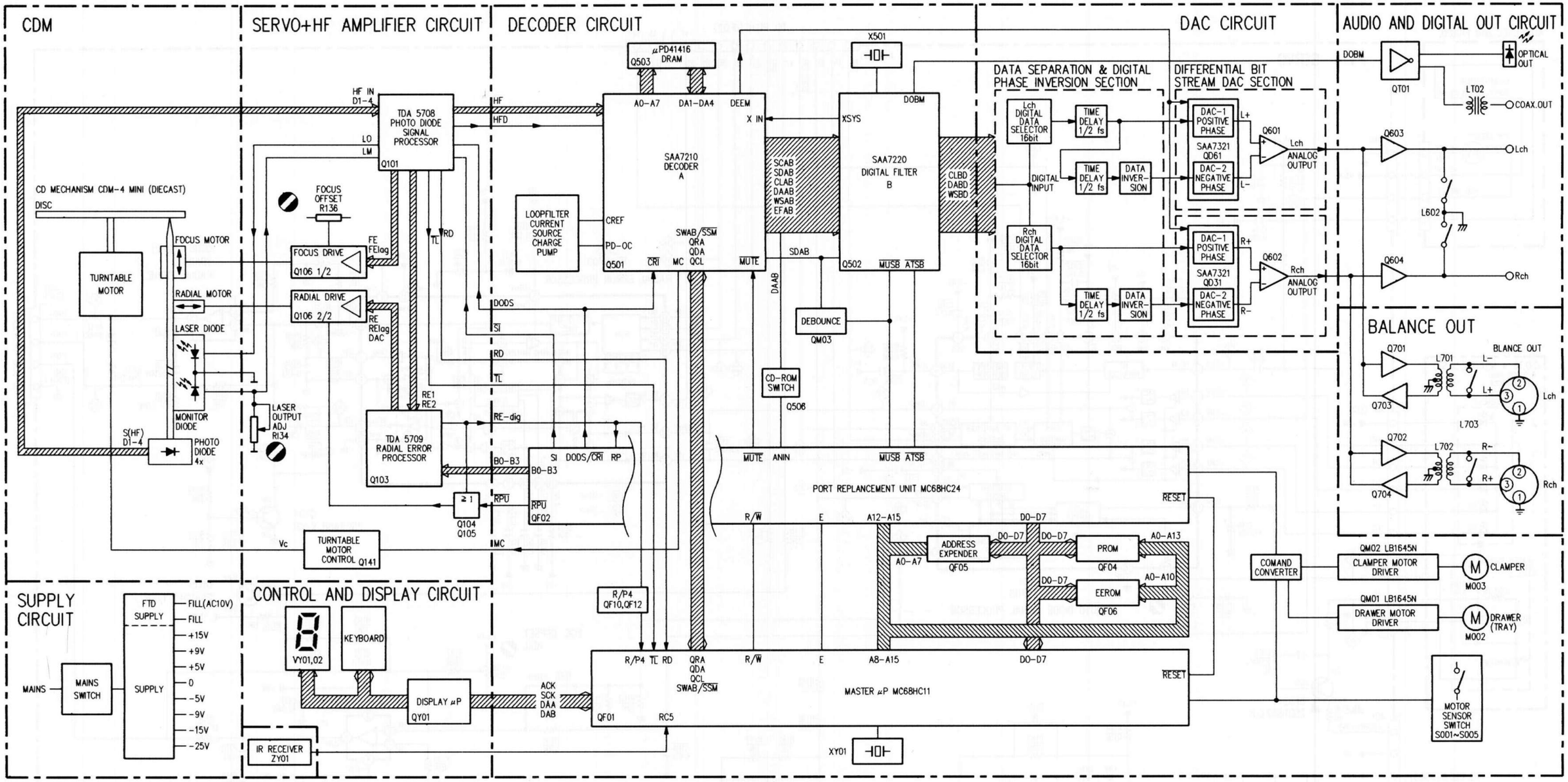
When XLR connector cables are used and if your preamplifier or main amplifier uses the Europe method, the reproduced signal may be out of phase.
In this case, change the connections of pin 2 and pin 3 of one of the XLR connectors of the cable to the USA method.
Also when you use an XLR balanced cable (see illustration below) and if the preamplifier or main amplifier uses the Europe method, change the connections of pin 2 and pin 3 of one of the XLR connectors of the cable to the USA method.



(XLR) (XLR)

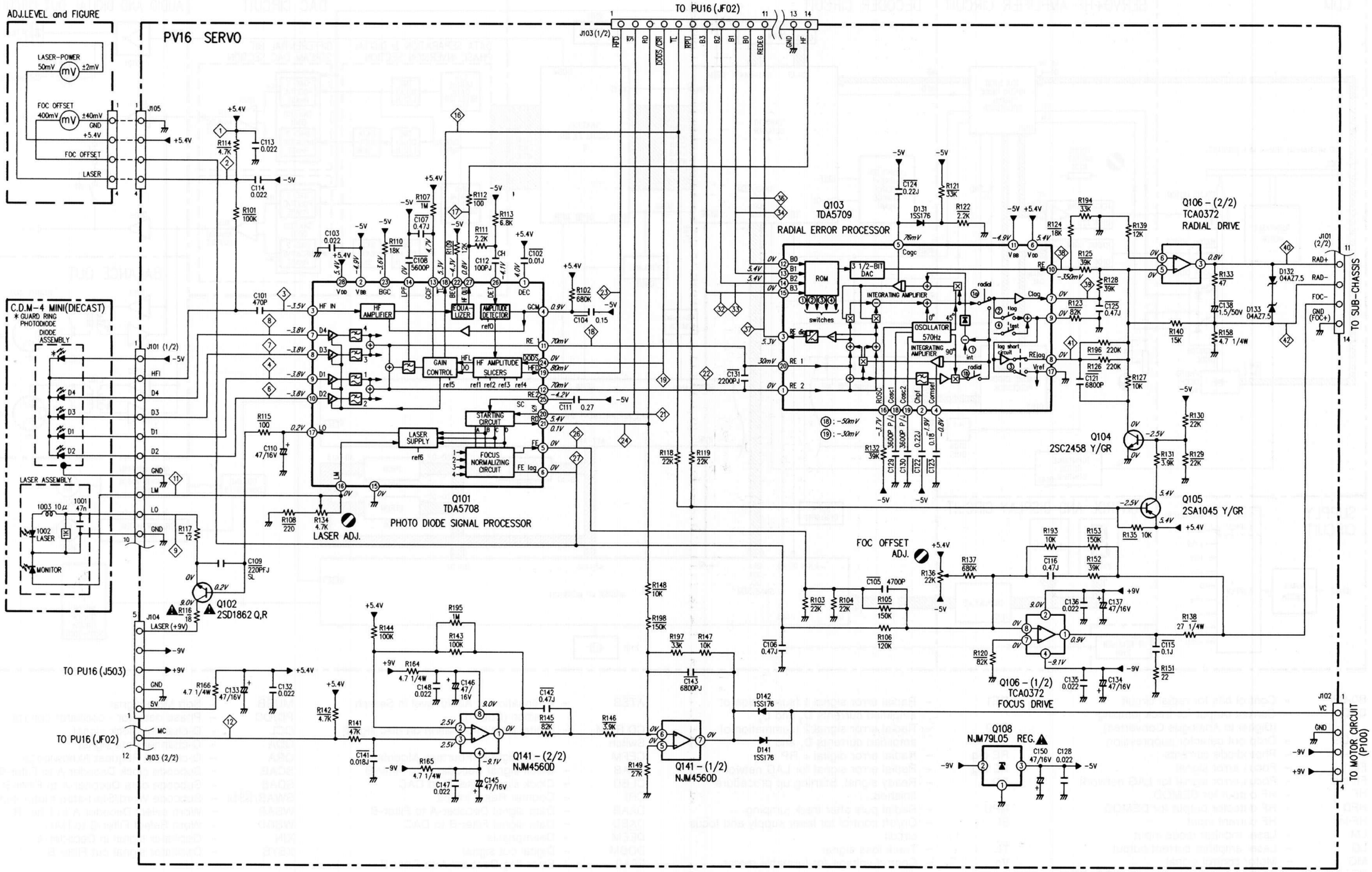
Now the signal can be reproduced in proper phase.

3. BLOCK DIAGRAM

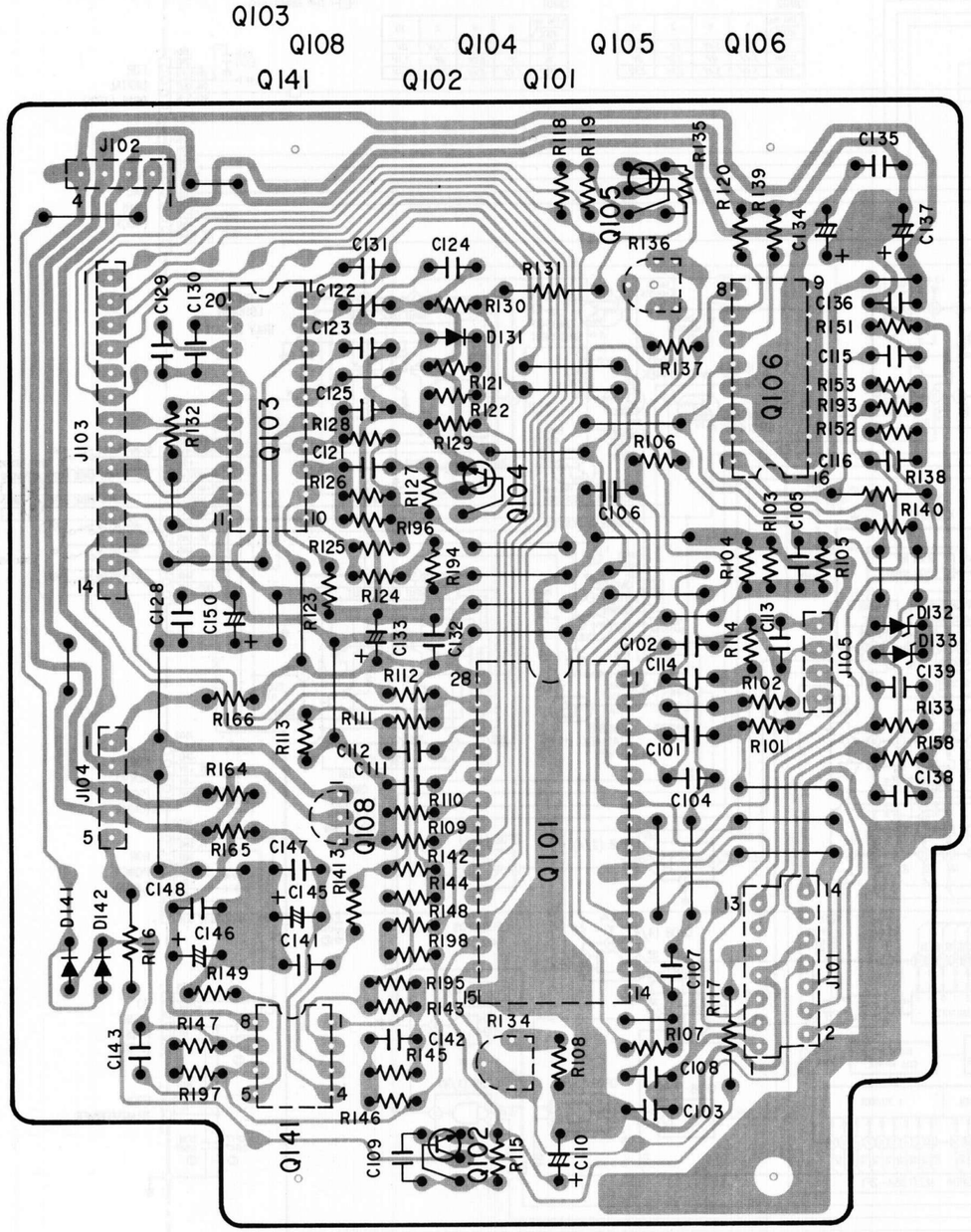


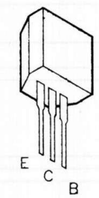
B0-B3 – Control bits for radial circuit
DAC – Current output for track jumping (Digital to Analogue Converted)
$\overline{DODS}$ – Drop out detector suppression
D1÷4 – Photodiode currents
FE – Focus error signal
FE lag – Focus error signal for LAG network
HF – HF output for DEMOD
HFD – HF detector output for DEMOD
HF-in – HF current input
LM – Laser monitor diode input
LO – Laser amplifier current output
MC – Motor control signal
RE – Radial error signal (Amplified RE_2-RE_1 currents)
RE1 – Radial error signal 1 (summation of amplified currents D_3 and D_4
RE2 – Radial error signal 2 (summation of amplified currents D_1 and D_2
RE dig – Radial error digital = RP
RE lag – Radial error signal for LAG network
RD – Ready signal, Starting up procedure finished.
$\overline{RPU}$ – Radial puls after track jumping
$\overline{Si}$ – On/off control for laser supply and focus circuit
$\overline{TL}$ – Track loss signal
Vc – Control voltage for turntable motor
$\overline{ATSB}$ – Attenuation of Audio level in Search position (Cueing)
CD ROM Switch – Digital Data information on disc signal
CEFM – Clock Eight-to-Fourteen Modulator
CLAB – Clock signal Decoder-A to Filter-B
$\overline{CLBD}$ – Clock signal Filter-B to DAC
$\overline{CRI}$ – Counter Reset Inhibit
DAAB – Data signal Decoder-A to Filter-B
$\overline{DABD}$ – Data signal Filter-B to DAC
$\overline{DEEM}$ – Deemphasis
DOBM – Digital out signal
EFAB – Error flag Decoder-A to Filter-B
$\overline{CREF}$ – Reference Current
$\overline{MUTE}$ – Mute signal
$\overline{MUSB}$ – Soft Mute signal
PD/OC – Phase detector - oscillator control
QCL – Q-channel Clock signal
QDA – Q-channel Data signal
QRA – Q-channel Request Aknowledge
SCAB – Subcode clock Decoder-A to Filter-B
SDAB – Subcode data Decoder-A to Filter-B
SWAB/$\overline{SSM}$ – Subcode Word/Start-stop motor signal
WSAB – Word select Decoder-A to Filter-B
WSBD – Word Select Filter-B to DAC
XIN – Oscillator signal in Decoder-A
XSYS – Oscillator signal out Filter-B

4. SCHEMATIC DIAGRAM AND PARTS LOCATION (PATTERN SIDE)

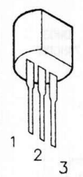


PV16 SERVO

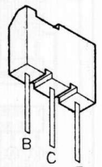




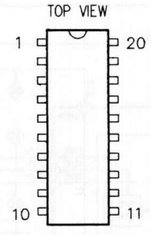
2SA1045 Y/GR
2SC2458 Y/GR



MC79L05



2SD1862Q,R



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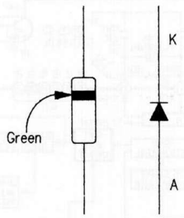
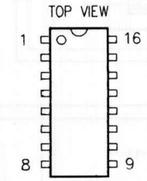
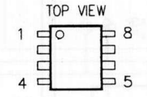


1SS176



TCA0372



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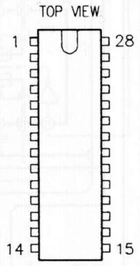
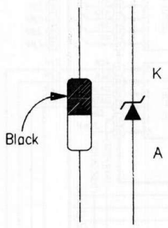
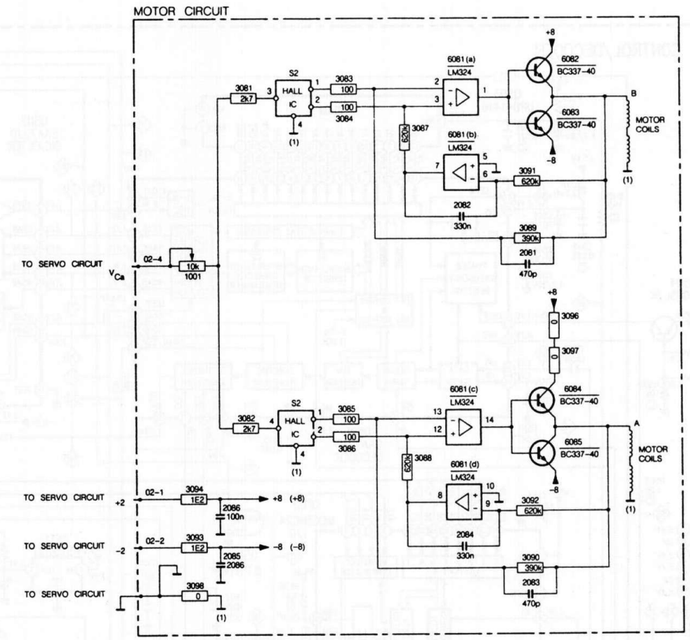
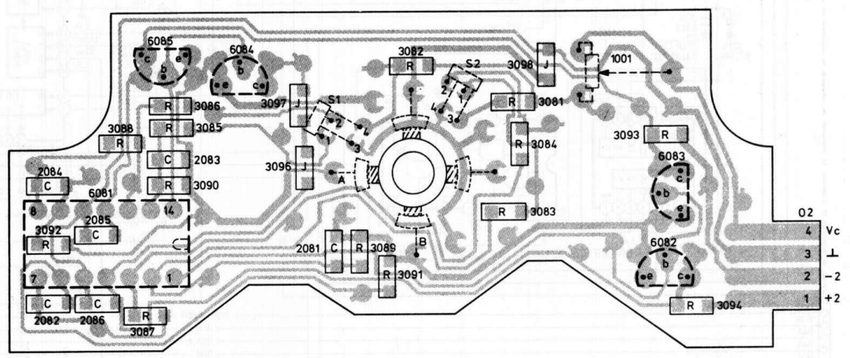


TDA5708



04AZ7.5





PU16 CONTROL/DECODER

Q503 UPD41416 RAM

Q502 SAA7220 DIG.FILTER

Q505 © DTC114TK

Q504 2SA1005L/K

Q501 SAA7210 DECODER

QF02 MC68HC24 I/O

Q506 DTC114TK

QF11 PST5200

QF01 MC68HC11A0P MASTER μP

QF10 74HC00P

QF12 74HC74F

QF03 74HC00F

QF06 X2816BP

QF05 74HC373

QF16© DTA114YK

QF14© DTC144EK

QF13© DTA114YK

QF04 M27128A-2F1

QM02 QM08© QM09© DTC144EK

QM03 QM04© DTC144EK

QM05© DTC114EK

QM06© DTA114EK UP

QM07© DTA114EK DOWN

QF08 (1/4) QF08 (2/4) QF08 (3/4) QF08 (4/4) QF08,QF09 74HC00P

QF09 (1/4) QF09 (2/4) QF09 (3/4)

QM01 LB1645N TRAY IN/OUT

QM02 LB1645N CLAMPER UP/DOWN

QM02 PIN No. / MODE	5	6	2	10
UP	0V	5.4V	0V	7.3V
DOWN	5.4V	0V	7.3V	0V
STOP	5.4V	5.4V	0.5V	0.5V

QM01 PIN No. / MODE	5	6	2	10
OUT	5.4V	0V	7.3V	0V
IN	0V	5.4V	0V	7.3V
STOP	5.4V	5.4V	0.5V	0.5V

© : CHIP COMPONENT
□ : CHIP JUMPER (0Ω)

FOR SERVO PV16 (J103)

TO FRONT PY16 (JY01)

FOR DIGITAL PB16 (JT01)

FOR DAC PD16 (WD01)

FOR SERVO PV16 (J014)

FOR POWER (J803)

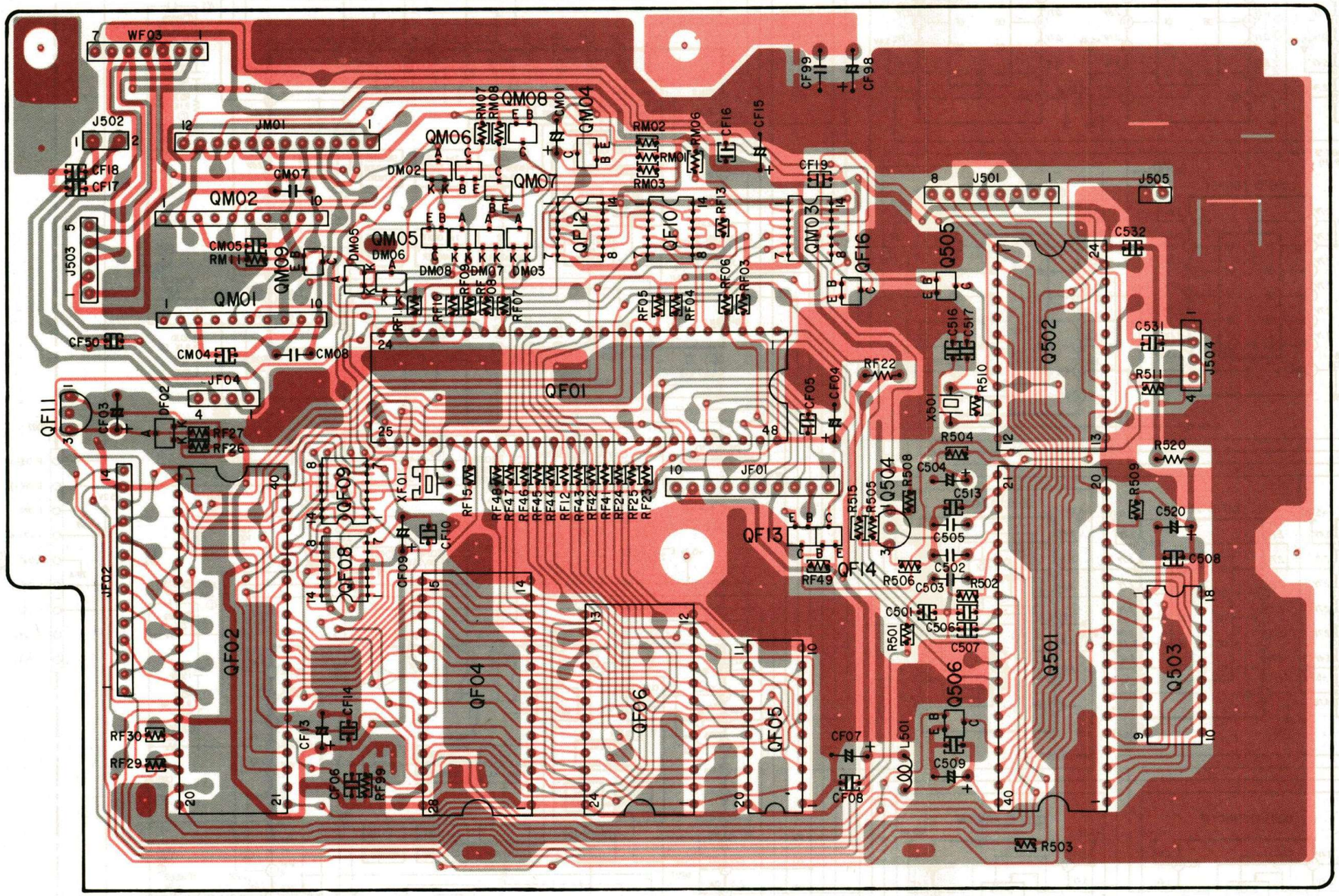
TO FRONT PY16 (JY02)

FROM TRANSFORMER

TRAY-SENSOR.SW

PU16 CONTROL/DECODER COMPONENT SIDE

QF11 QM02 QM01 QF02 QM09 QF09 QF08 QM08 QM06 QM05 QF04 QM07 QM04 QF12 QF01 QF10 QF06 QM03 QF05 QF16 QF13 QF14 Q505 Q504 Q506 Q502 Q501 Q503

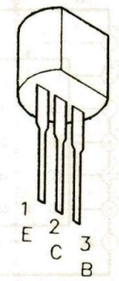


QM09, QM04, QM08
QF14, Q505, Q506

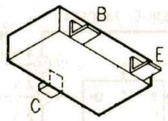
QM05, QM06, QM07
QF13

QF16

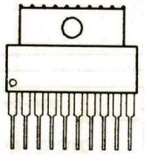
DM06, DM03
DM07, DM08
DF02



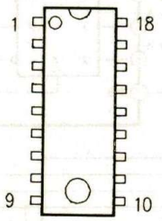
PST523D
2SA1005L/K



DTA114YK, DTA114EK
DTC144EK, DTC114EK



LB1645N



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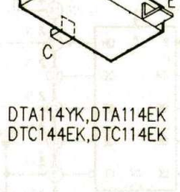
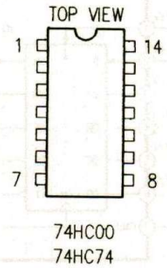
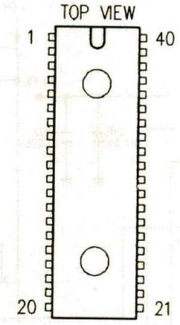
MN4264P-15



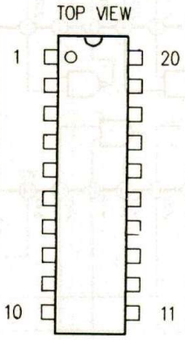
SAA7220P/B



74HC00
74HC74

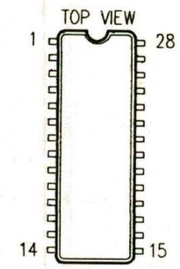


SAA7210

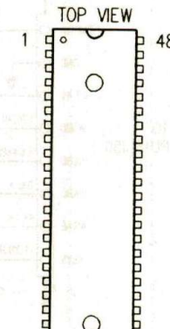


74HC373

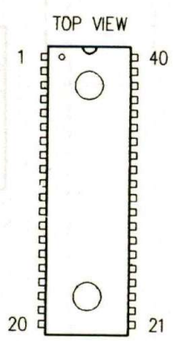
MSM2816A



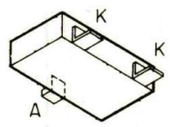
M27128A-2F1



MC68HC11A0P



MC68HC24



MA153
MA151WA
MA-151K

PD16 DAC

© : CHIP COMPONENT

QD04 © 74HC164 · QD05 © 74HC164 · QD06 © 74HC164 · QD07 © 74HC164 · QD08 © 74HC164 · QD09 © 74HC164 · QD13 © 74HC258F · QD01© 74HC00F · QD10 © 74HC164 · QD11 © 74HC164 · QD15 © 74HC74F · QD02 © 74HC74F · QD03 © 74HC74F · QD12 © 74HC74F

QD31 © SAA7321 · QD61 © SAA7321 · QD63 PST523D

WD01: EMPHA · GND · +5.4V · WSBD 176.4K · CLBD 5.6448M · DABD DATA · WSAB 44.1K · XSYS 11.2896M

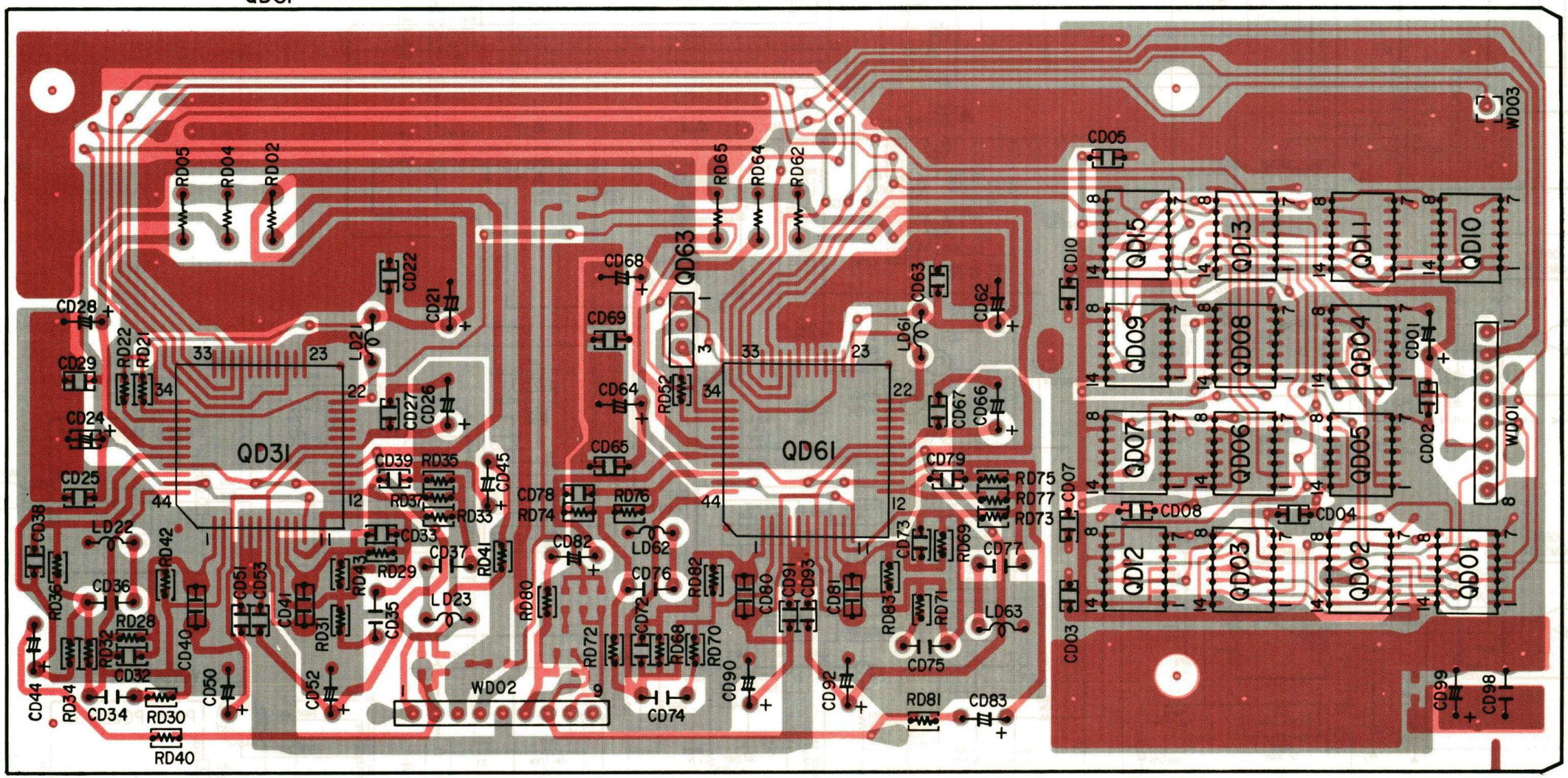
TO PU16(J501)

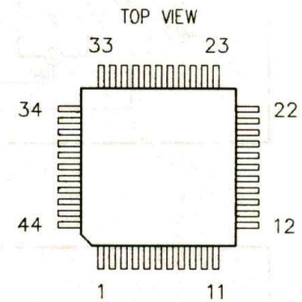
WD02: R CH(−) · R CH(+) · D.GND · +5.2V A · A.GND · L CH(−) · L CH(+) · −15.4V · +15.4V

TO PP16(J601)

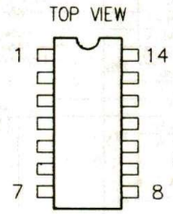
PD16 DAC COMPONENT SIDE

QD15 QD13 QD11 QD10
QD09 QD08 QD04
QD07 QD06 QD05
QD12 QD03 QD02 QD01

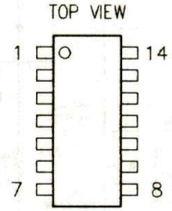




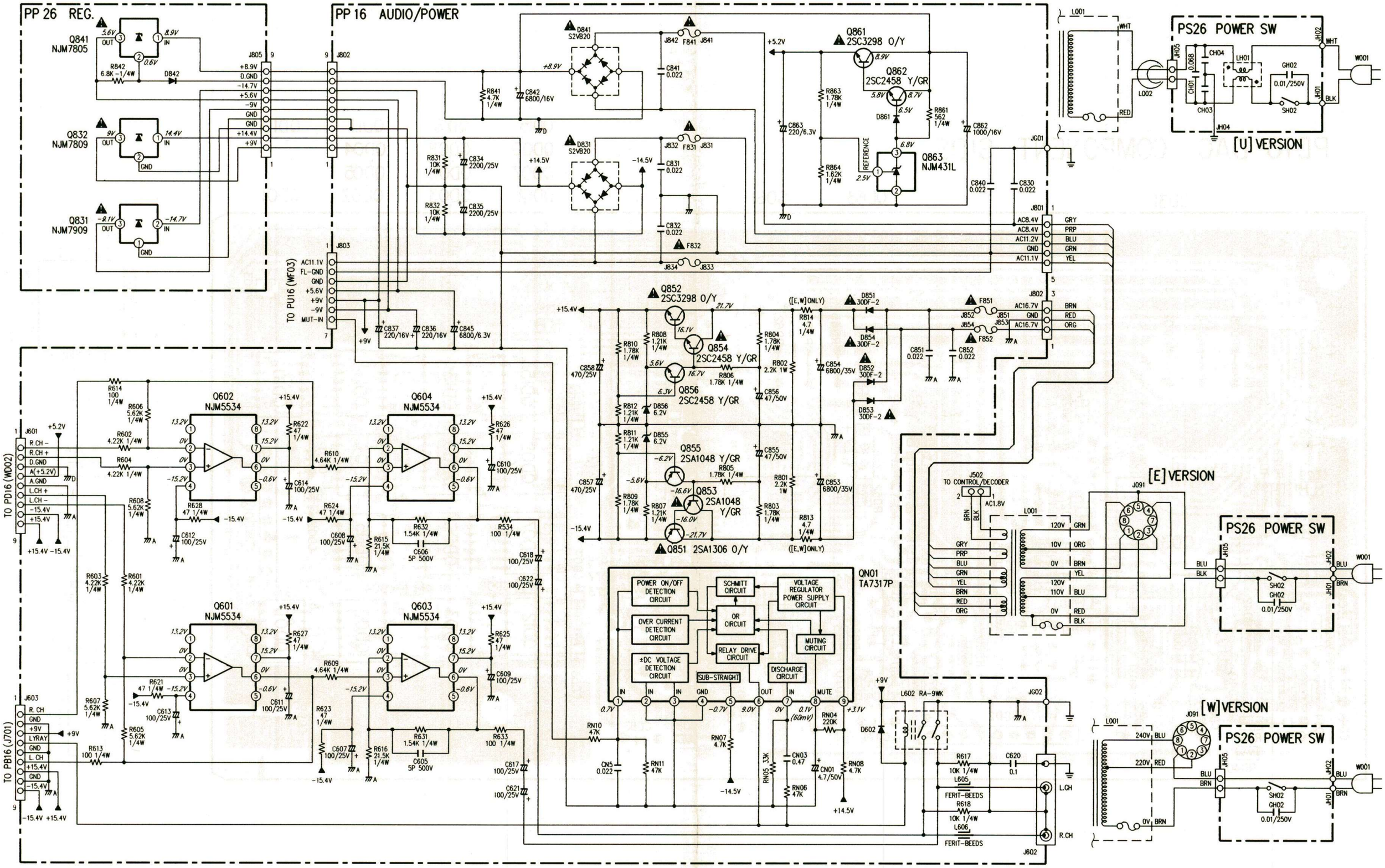
SAA7321



74HC74F
74HC00F
74HC258F

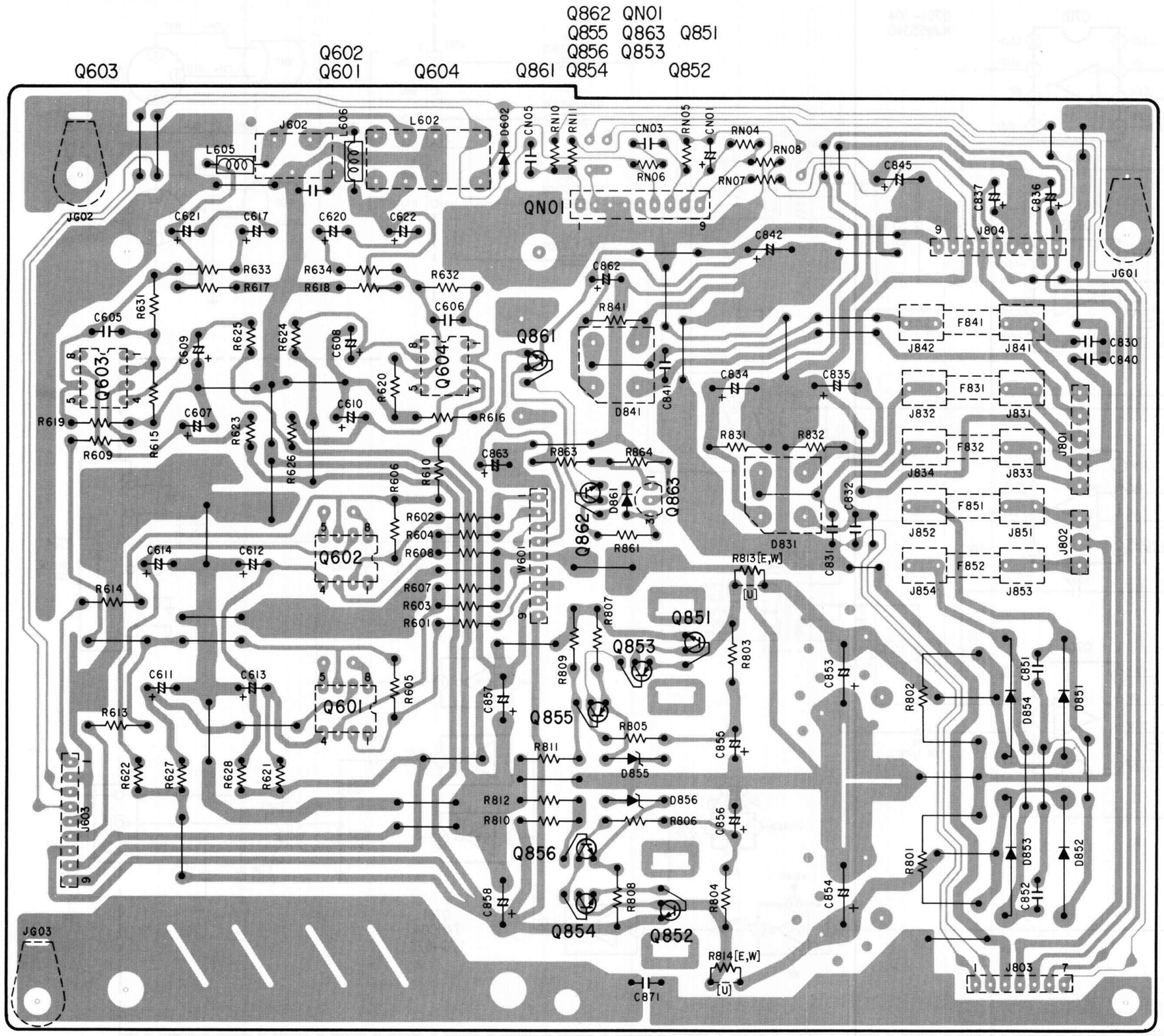


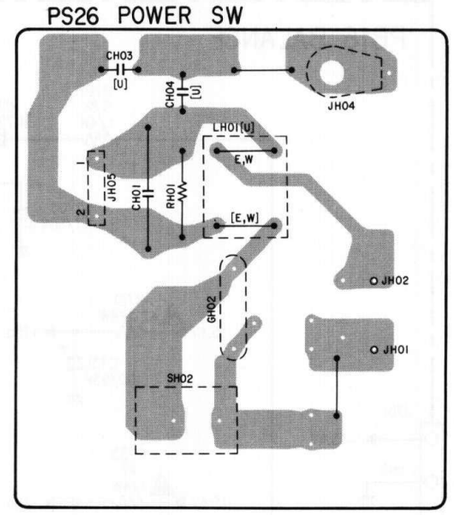
74HC164

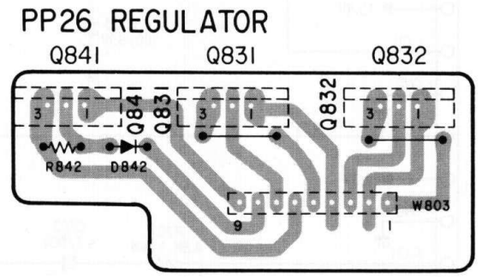


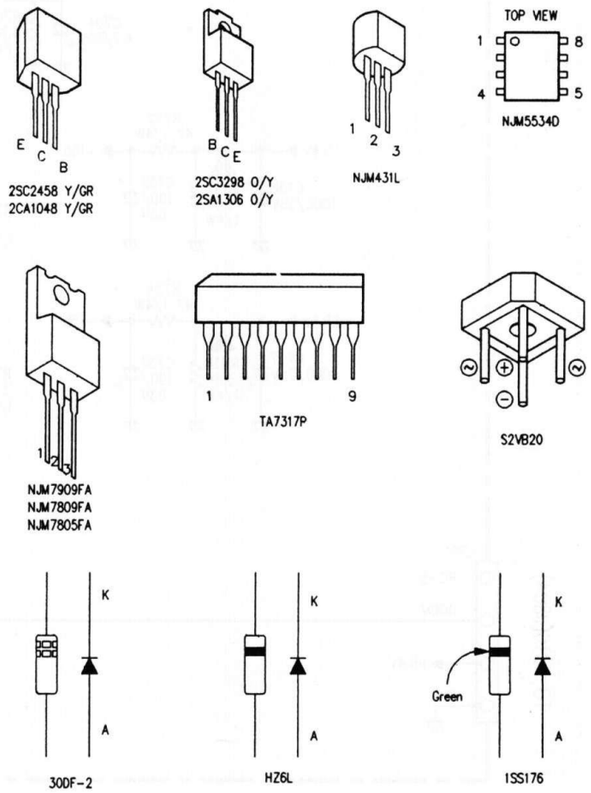
NOTE ON SAFETY:
Symbol ⚠ Fire or electrical shock hazard. Only original parts should be used to replace any part marked with symbol ⚠. Any other component substitution (other than original type), may increase risk of fire or electrical shock hazard.

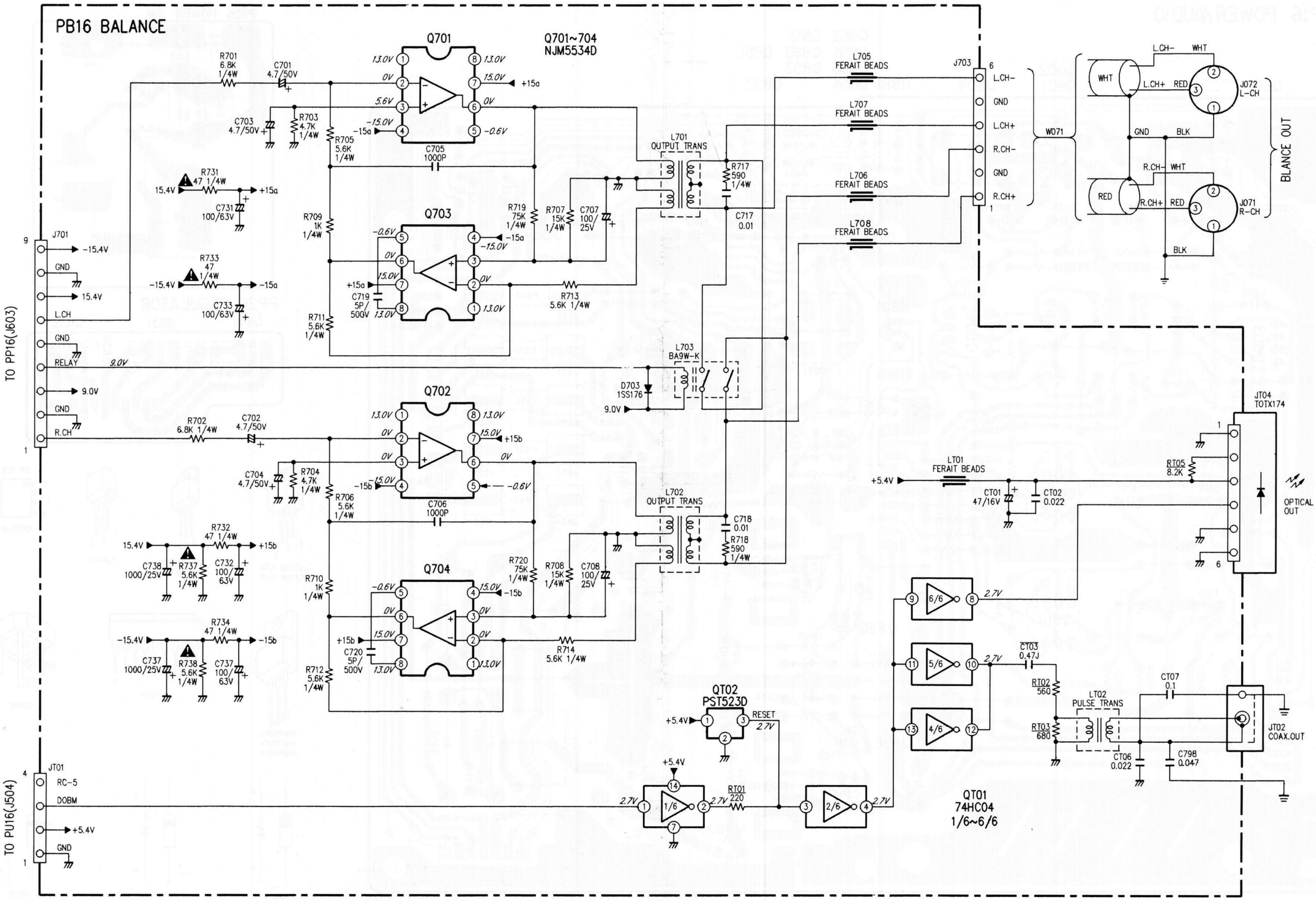
PP16 POWER/AUDIO



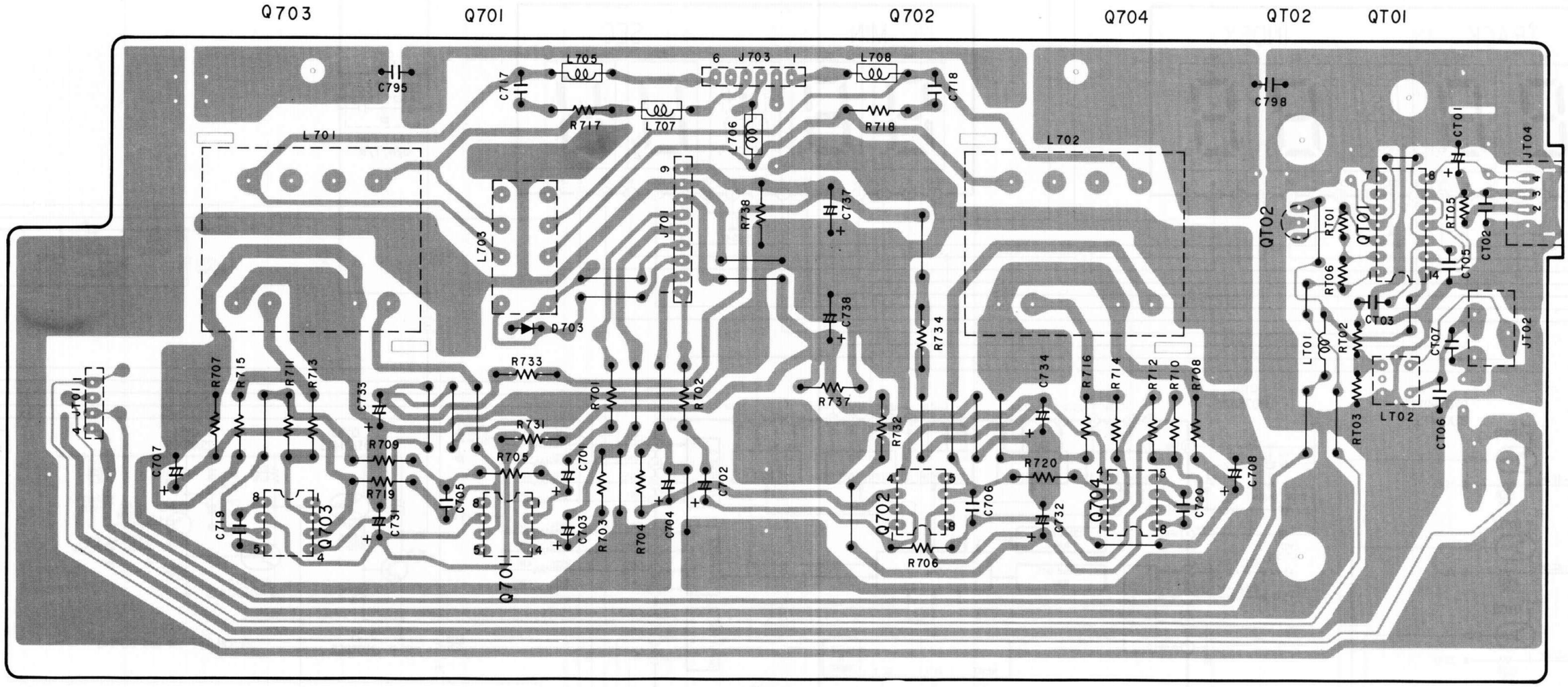


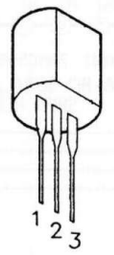




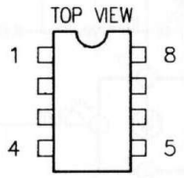

PB16 BALANCE
Q701
Q701~704
NJM5534D
R701 6.8K 1/4W
C701 4.7/50V
C703 4.7/50V
R703 4.7K 1/4W
R705 5.6K 1/4W
C705 1000P
R731 47 1/4W
C731 100/63V
R733 47 1/4W
C733 100/63V
Q703
R709 1K 1/4W
R711 5.6K 1/4W
C719 5P/ 500V
R719 75K 1/4W
R707 15K 1/4W
C707 100/ 25V
R713 5.6K 1/4W
L701 OUTPUT TRANS
R717 590 1/4W
C717 0.01
L705 FERAIT BEADS
L707 FERAIT BEADS
L706 FERAIT BEADS
L708 FERAIT BEADS
J703
L.CH-
GND
L.CH+
R.CH-
GND
R.CH+
W071
L.CH- WHT
WHT
L.CH+ RED
J072 L-CH
GND BLK
R.CH- WHT
RED
R.CH+ RED
J071 R-CH
BLK
BLANCE OUT
J701
-15.4V
GND
15.4V
L.CH
GND
RELAY 9.0V
9.0V
GND
R.CH
TO PP16(J603)
L703 BA9W-K
D703 1SS176
Q702
R702 6.8K 1/4W
C702 4.7/50V
C704 4.7/50V
R704 4.7K 1/4W
R706 5.6K 1/4W
C706 1000P
R732 47 1/4W
C738 1000/25V
R737 5.6K 1/4W
C732 100/ 63V
R734 47 1/4W
C737 1000/25V
R738 5.6K 1/4W
C737 100/ 63V
Q704
R710 1K 1/4W
R712 5.6K 1/4W
C720 5P/ 500V
R720 75K 1/4W
R708 15K 1/4W
C708 100/ 25V
R714 5.6K 1/4W
L702 OUTPUT TRANS
C718 0.01
R718 590 1/4W
JT01
RC-5
DOBM
+5.4V
GND
TO PU16(J504)
QT02 PST523D
RESET
JT04 TOTX174
LT01 FERAIT BEADS
CT01 47/16V
CT02 0.022
RT05 8.2K
OPTICAL OUT
6/6
5/6
4/6
CT03 0.47J
RT02 560
RT03 680
LT02 PULSE TRANS
CT07 0.1
CT06 0.022
C798 0.047
JT02 COAX.OUT
QT01 74HC04 1/6~6/6
RT01 220
1/6
2/6

PBI6 BALANCE

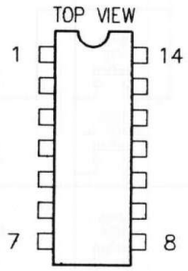




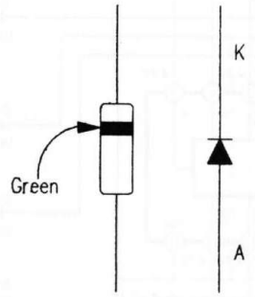
PST523D



NJM5534D



74HCU04



1SS176

PY16 KEY-SENS/DISPLAY

VY02 FL

TRACK INDEX

VY01 FL

MIN SEC

ONLY FOR U/N/T/W

JY02 AC(1.7V) AC(1.7V) AC(10V) GND

JY01 +5.4V GND LACH ACK SDIS SCK DAB DAA RC-5 NC

JF04 JF01 TO CONTROL/DECODER (PU16)

QY01 UPD7537Y

128x4 BITS RAM

2048x8 BITS ROM

CPU

CLOCK & TIMING

OUTPUT PORT 3 I/O PORT 10 OUTPUT PORT 8 OUTPUT PORT 9 I/O PORT 11

I/O PORT 0 I/O PORT 4 OUTPUT PORT 3 I/O PORT 5

QY06~QY13 DTA114TS

QY05 74HC164 8-BIT SERIAL/PARALLEL SHIFT REGISTER

QY53 DTA114TS

QY51 2SA605SP

QY52 DTC114TS

QY54 2SD1862

FL ON/OFF SW and MUTING

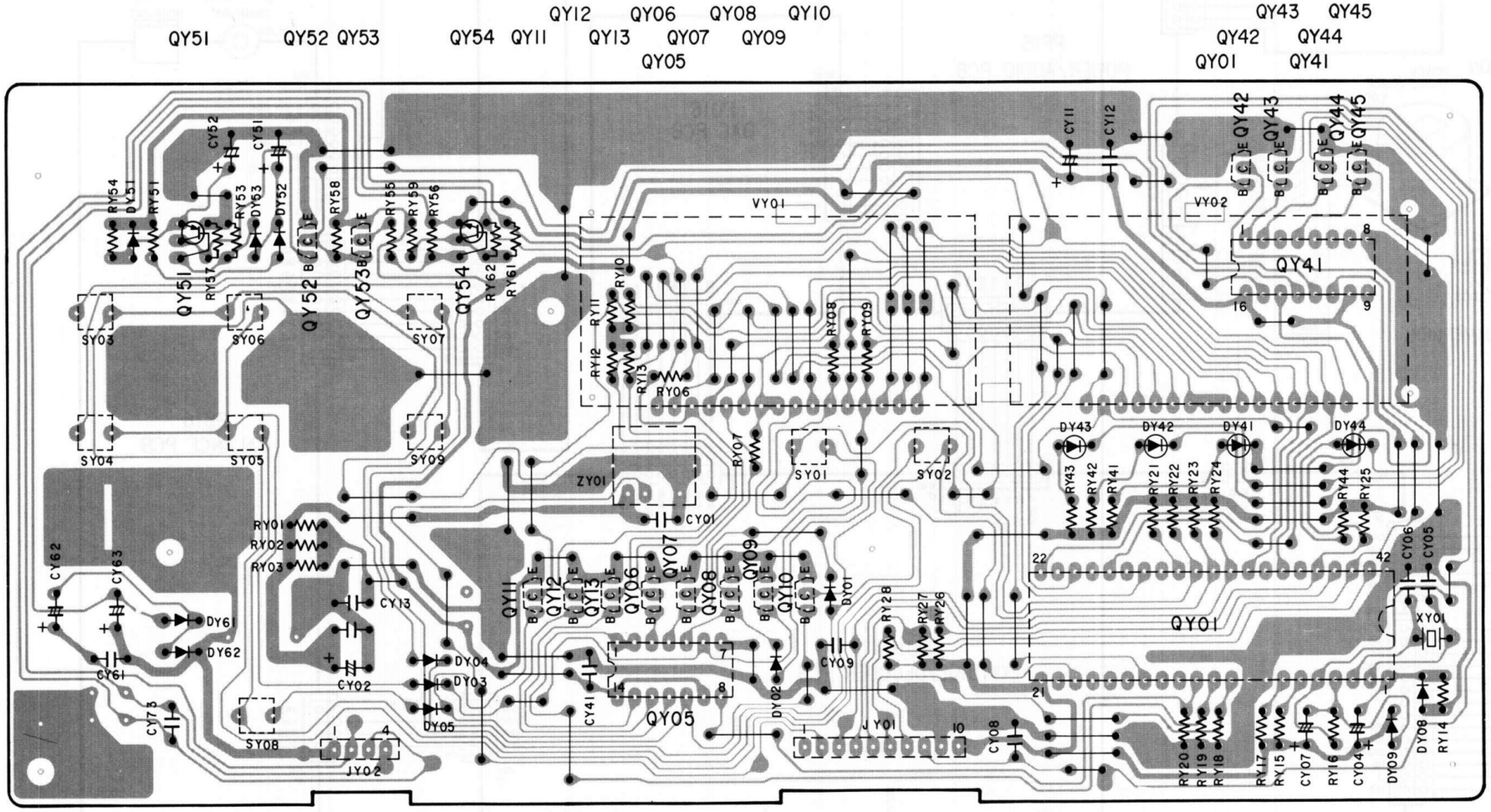
QY41 74HC595 8-BIT SERIAL/PARALLEL SHIFT REGISTER

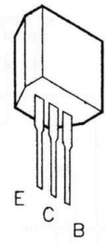
QY42~QY45 DTC114TS

ZY01 PAS-C0615

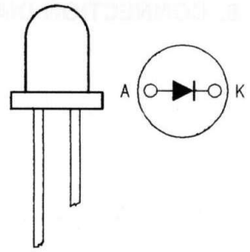
SY01 REPEAT SY02 FTS SY03 OPEN SY04 TRACK >> SY05 TRACK << SY06 PAUSE SY07 PLAY/REPLAY SY08 DISP SY09 STOP/CM

PY16 KEY-SENS/DISPLAY

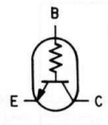




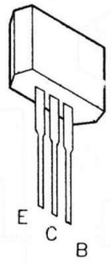
2SD536SD
2SA608SP



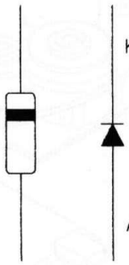
LT308B



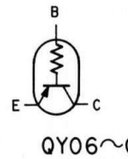
QY42~QY45
QY52



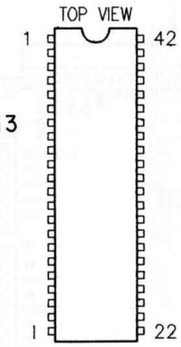
DTA114ES
DTA114TS



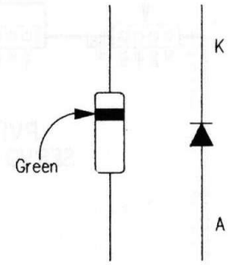
S5688G



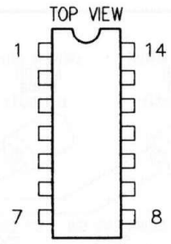
QY06~QY13
QY53



UPD7537A

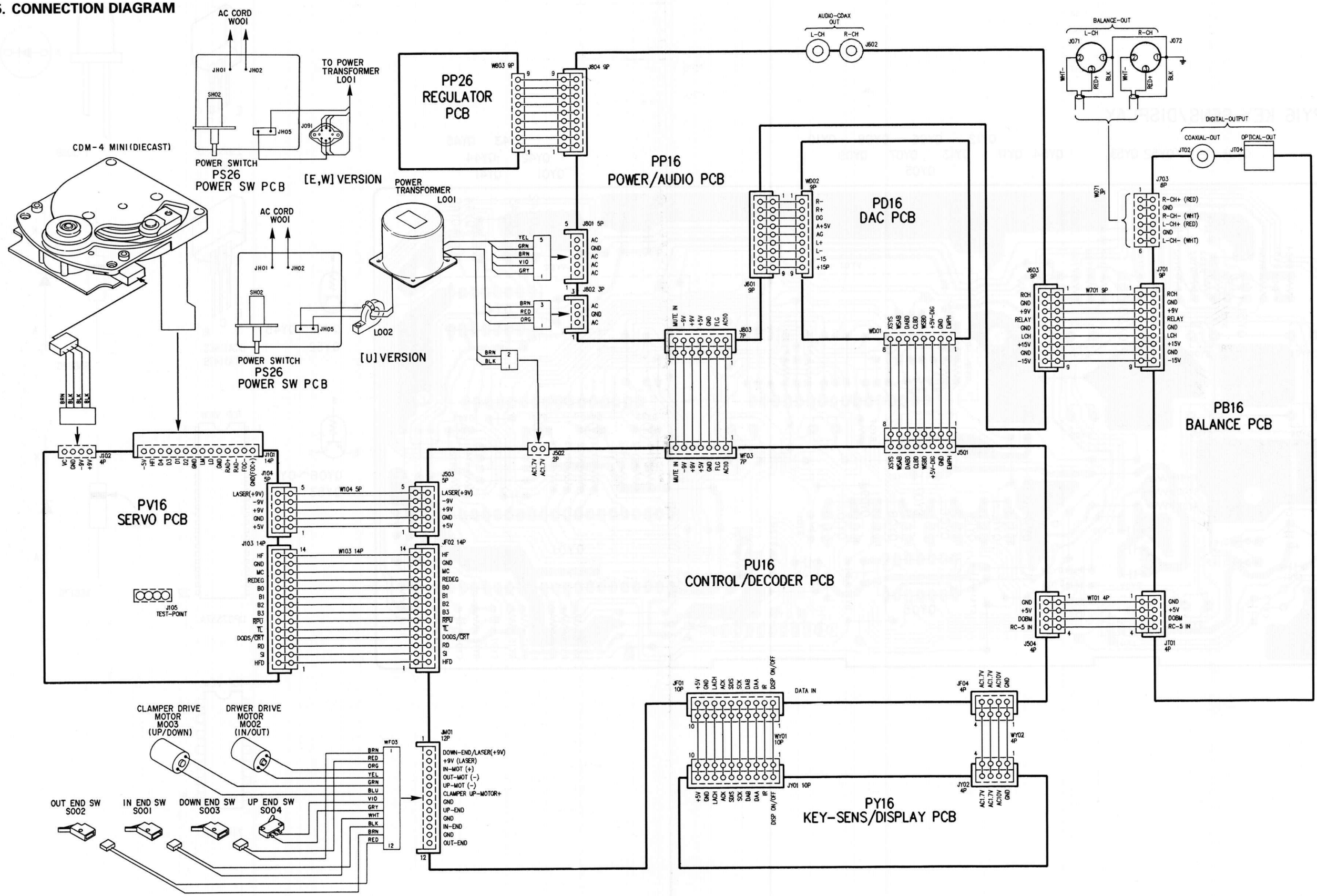


1SS176

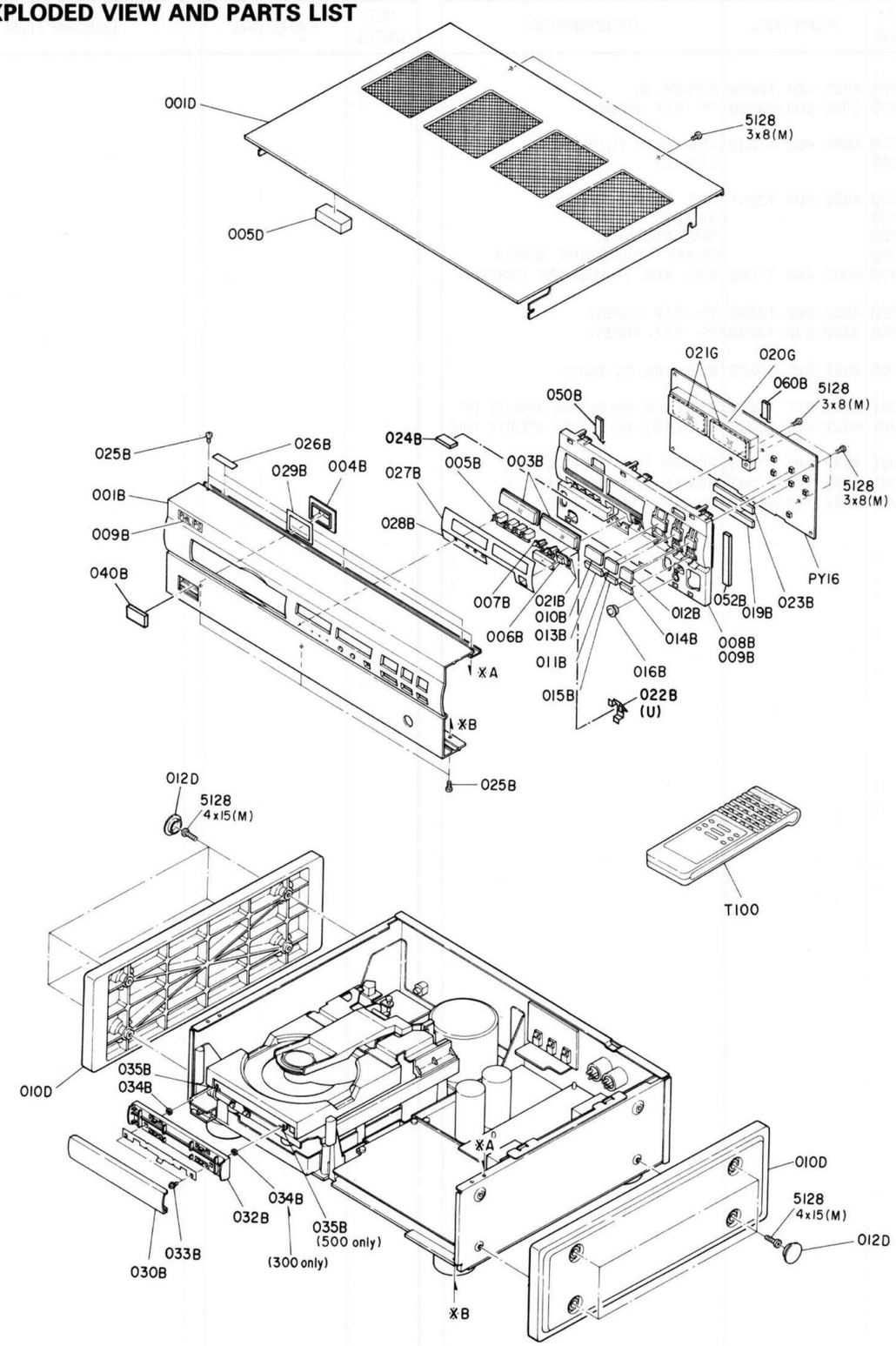


74HC164

5. CONNECTION DIAGRAM

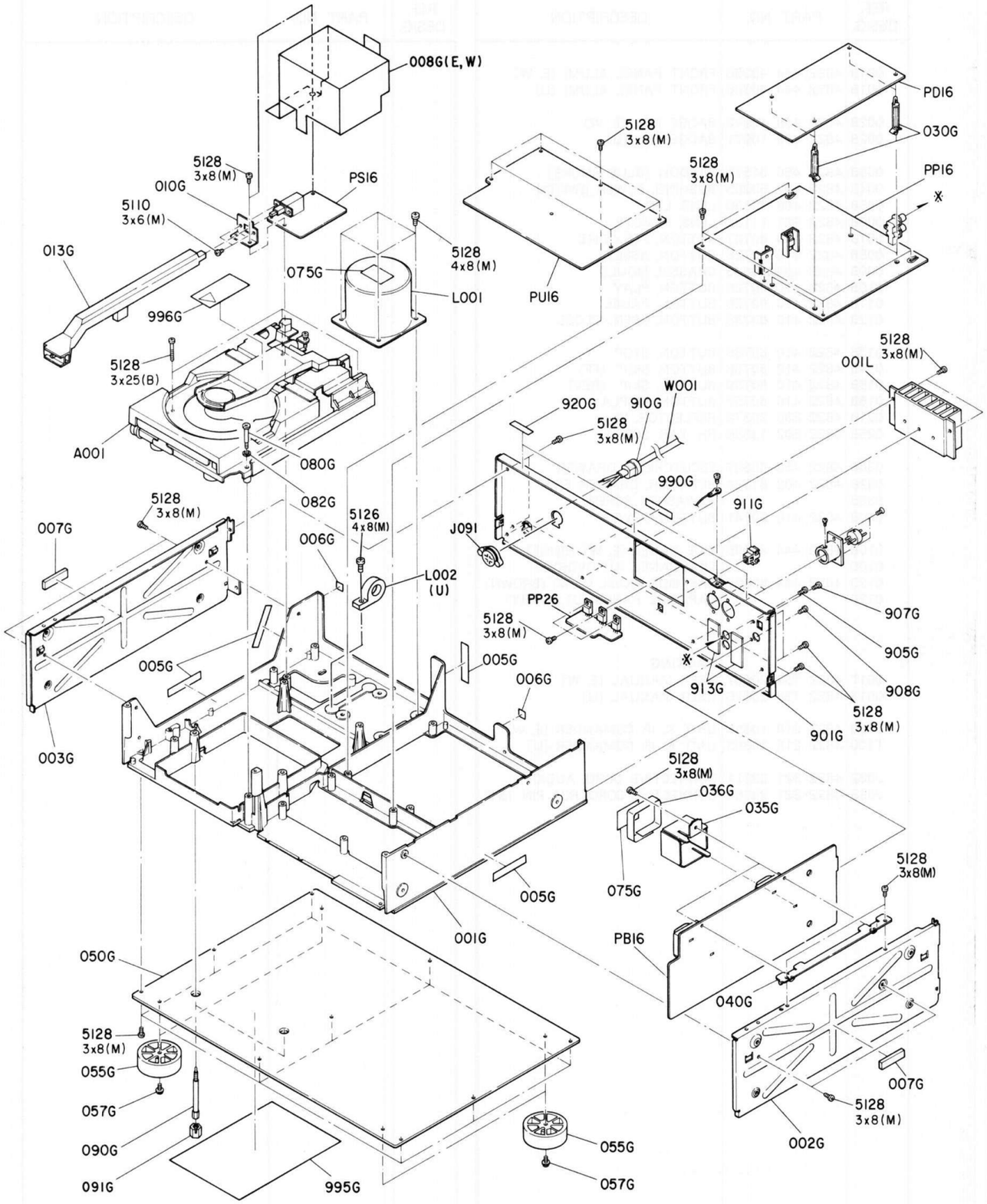


6. EXPLODED VIEW AND PARTS LIST



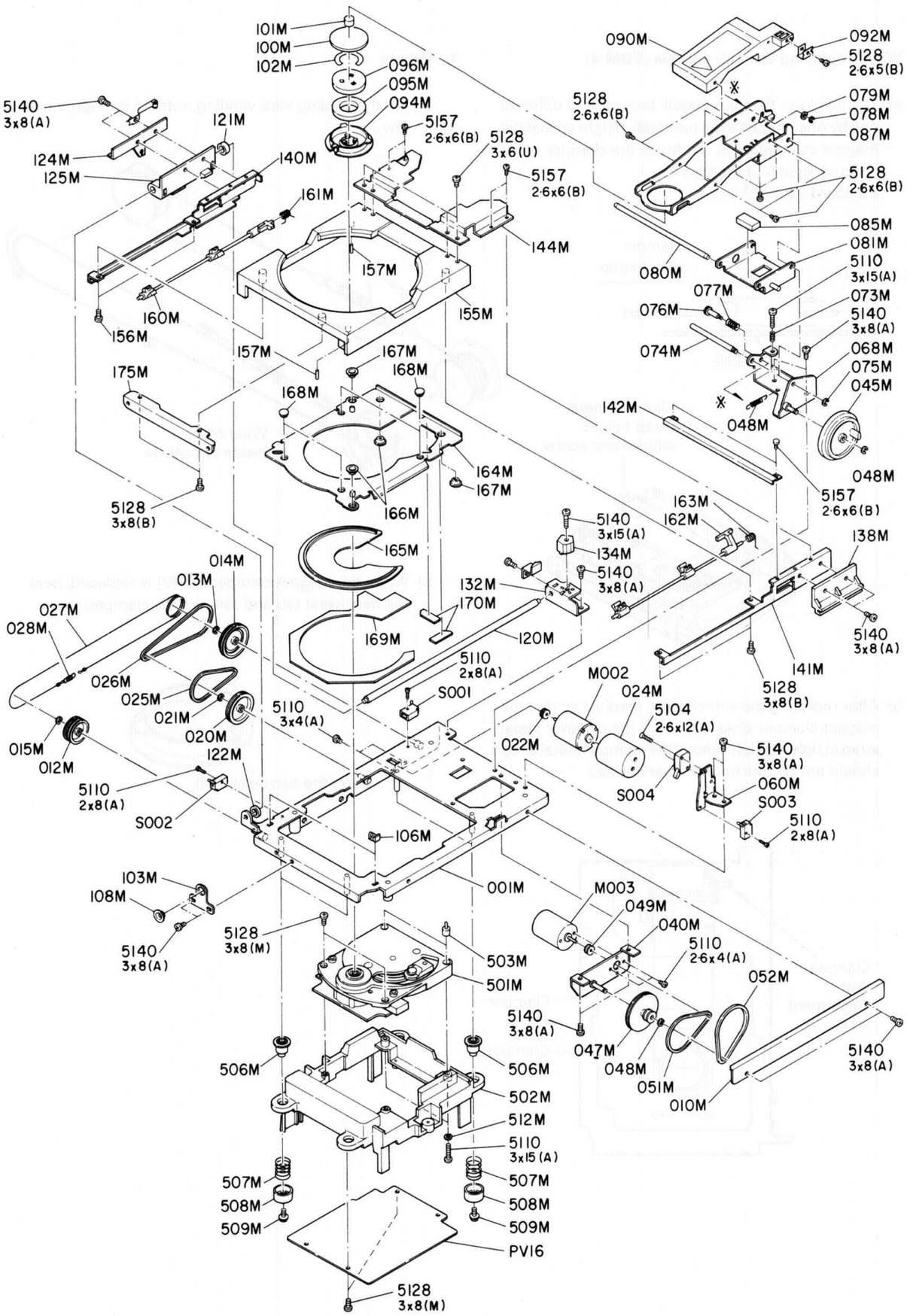
REF. DESIG.	PART NO.	DESCRIPTION
001B	4822 444 40396	FRONT PANEL ALUMI [E, W]
001B	4822 444 40386	FRONT PANEL ALUMI [U]
002B	4822 459 10972	BADGE MZ. [E, W]
002B	4822 459 10971	BADGE PH. [U]
003B	4822 450 61571	WINDOW (BLUE SMOKE)
004B	4822 402 50283	BUSHING, POWER SWITCH
005B	4822 466 70689	LENS, LED
006B	4822 381 11132	LENS, REMOTE
007B	4822 410 60727	BUTTON, FTS/TIME
008B	4822 410 60728	BUTTON, ASSEY
009B	4822 464 50806	CHASSIS, MOULD
010B	4822 410 60725	BUTTON, PLAY
011B	4822 410 60726	BUTTON, PAUSE
012B	4822 410 60738	BUTTON, OPEN/CLOSE
013B	4822 410 60735	BUTTON, STOP
014B	4822 410 60736	BUTTON, SKIP (FF)
015B	4822 410 60739	BUTTON, SKIP (REV)
016B	4822 410 60737	BUTTON, DISPLAY OFF
021B	4822 380 20372	REFLECTOR, IR
025B	4822 502 13636	PH. TAP. SCREW
030B	4822 459 80697	ESCUTCHEON, DRAWER
032B	4822 402 61334	RETAINER, DRAWER ESC.
033B		F. WASHER SCREW
040B	4822 410 60741	BUTTON, POWER
010D	4822 444 40395	SIDE PANEL [E, W] (BEIGE)
010D		SIDE PANEL [U] (IVORY)
012D	4822 444 60607	CAP, SIDE PANEL [E, W] (BROWN)
012D		CAP, SIDE PANEL [U] (IVORY)
		PACKING
001T	4822 736 20687	USER MANUAL [E, W]
001T	4822 736 20676	USER MANUAL [U]
T100	4822 218 10358	UNIT K, IR COMANDER [E, W]
T100	4822 218 10355	UNIT K, IR COMANDER [U]
J082	4822 321 22611	CONNECTIVE CORD, AUDIO
J083	4822 321 22862	CONNECTIVE CORD, RCA PIN 75 Ω

REF. DESIG.	PART NO.	DESCRIPTION



REF. DESIG.	PART NO.	DESCRIPTION
021G	4822 454 12429	STIKER, FL
041G	4822 502 13636	PH. TAP. SCREW
055G	4822 462 41336	LEG (GLD) [E, W]
055G		LEG [U]
057G	4822 502 12511	B. T. SCREW (W/W)
080G		SCREW
082G		WASHER, WAVE
090G		SHAFT, TRANSPORT SCREW
091G	4822 462 71495	CAP, RED, TRANSPORT SCREW
905G	4822 502 13636	PH. TAP. SCREW
908G	4822 502 13636	PH. TAP. SCREW
910G	4822 325 50202	BUSHING, AC CORD
J091	4822 272 10227	VOLTAGE SELECTOR 4POINT [E]
J091	4822 272 10236	VOLTAGE SELECTOR 2POINT [W]
L001	4822 146 21548	POWER TRANSFORMER [E]
L001	4822 146 21547	POWER TRANSFORMER [U]
L001	4822 146 21549	POWER TRANSFORMER [W]

REF. DESIG.	PART NO.	DESCRIPTION



REF. DESIG.	PART NO.	DESCRIPTION
012M	4822 528 81163	PULLEY, WIRE WHEEL (F)
013M	4822 532 11301	RG RING, E
014M	4822 528 81387	PULLEY, WIRE WHEEL (R)
015M	4822 532 11301	RG RING, E
020M	4822 528 81238	PULLEY, TRAY DRIVE
021M	4822 532 11301	RG RING, E
022M	4822 528 81166	PULLEY, MOTOR
025M	4822 358 30762	BELT, MOTOR
026M	4822 358 31065	BELT, TRAY DRIVE
027M	4822 321 30374	JOINT, WIRE ROPE
028M	4822 492 33161	SPRING, WIRE TENSION
045M	4822 528 30392	CAM, CLAMPER DRIVE
046M	4822 532 11301	RG RING, E
047M	4822 528 81164	PULLEY, CLAMPER MIDDLE
048M	4822 532 11301	RG RING, E TYPE
049M	4822 528 81166	PULLEY, MOTOR
051M	4822 358 30762	BELT, MOTOR
052M	4822 358 30763	BELT, CAM DRIVE
060M		BRACKET, SWITCH
073M	4822 492 70628	SPRING, DOWN ADJUSTER
075M	4822 532 11301	RG RING, E
076M	4822 535 93105	SHAFT L/R ADJUSTER
077M	4822 492 70631	SPRING L/R ADJUSTER
078M	4822 530 70122	RG RING, E
079M	4822 532 52236	WASHER
080M	4822 535 92575	SHAFT
081M	4822 402 61335	LEVER, CLAMPER DRIVE
084M	4822 492 70629	SPRING, CLAMPER
094M	4822 526 20174	CLAMPER, MAGNET CASE
095M	4822 526 20175	MAGNET
096M	4822 528 90783	COVER, MAGNET
100M	4822 402 61333	BUFFER, CLAMPER
101M	4822 466 61926	BUFFER, ON 100M
102M	4822 466 61927	BUFFER, ON 096M
106M		HOLDER, TRAY FRONT
108M		BUSHING, FRONT GUIDE
125M	4822 256 91196	HOLDER, SLIDE BEARING
155M	4822 444 50637	CASE, TRAY
161M	4822 492 70633	SPRING, TRAY LIFT, LEFT
163M	4822 492 70632	SPRING, TRAY LIFT, RIGHT
164M	4822 444 50635	TRAY, U/D DISC
501M	4822 691 30233	MECHANISM, CDM-4 MINI (DIECAST)
507M	4822 492 70625	SPRING, SUSPENSION
508M	4822 530 70561	RETAINER, SUSPENTION
M002	4822 361 60467	D. C. MOTOR, TRAY DRIVE
M003	4822 361 60447	D. C. MOTOR, CLAMPER DRIVE
S001	4822 277 21132	SLIDE SWITCH, TRAY IN END
S002	4822 277 21132	SLIDE SWITCH, TRAY OUT END
S003	4822 277 21132	SLIDE SWITCH, CLAMPER DOWN END SENSOR
S004	4822 271 30712	MINI SWITCH, CLAMPER UP END SENSOR

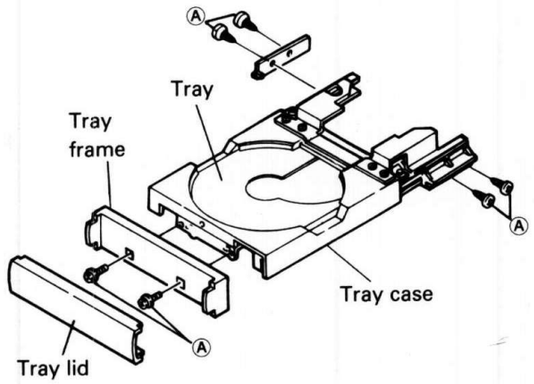
REF. DESIG.	PART NO.	DESCRIPTION

7. TRAY MECHANISM LOADING PROCEDURES

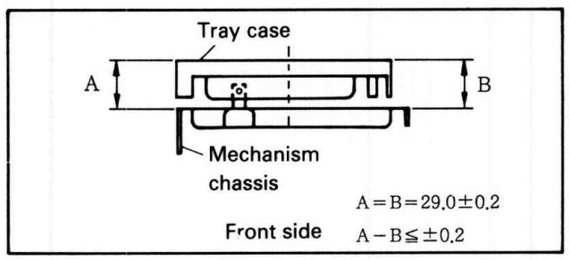
Cautions when servicing

1. When mounting tray and tray case
(when replacing tray case because of damage etc.)

a) When the tray has been positioned improperly with a deviated clearance to the front panel window, remove the tray lid, loosen screws Ⓐ and adjust by moving the tray frame within the range of the holes play.

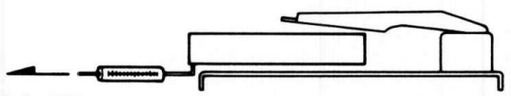


For the tray tilt adjustment, refer to the figure below.

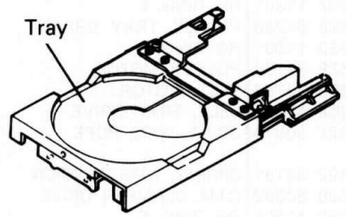


Adjust the tilt with screws Ⓐ.

b) The operating power of the tray is set to 250 - 350gr (Power OFF).



2. When the tray is disengaged to the lower side

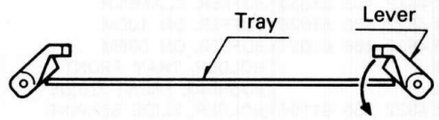


When the tray is pushed downward without the sub-chassis (CDM-4), it will be disengaged. So care will be necessary.

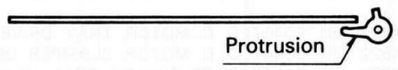
(Closing the tray without the sub-chassis also disengages the tray.)

Mount the tray referring to the figures below.

a) Bring down the lever and put the tray on the protrusion of lever.



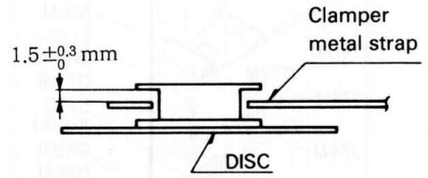
b) While holding the tray, bring down the opposite lever and put the tray on the protrusion of the lever.

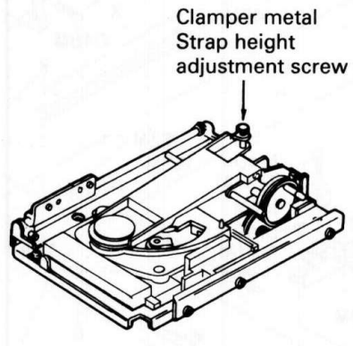


Note:
If both the levers are brought down at the same time, the tray cannot be raised. The levers should be brought down one by one.
If the tray is forced to move to the original position, the two pins injected into the tray case may be bent.

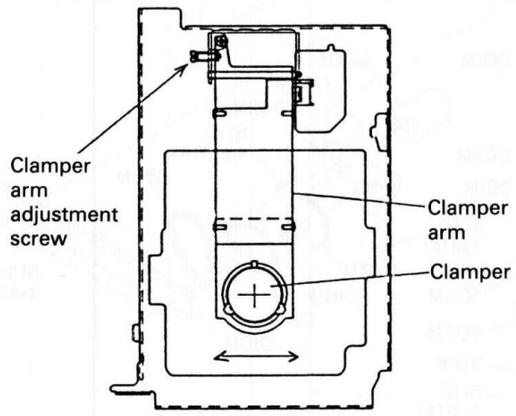
3. When replacing the sub-chassis (CDM-4)

a) The height of the sub-chassis turn table is different one by one. Adjust each turn table height so that the magnet clamper does not touch the clamper metal strap as shown in the figure.
Standard ($1.5 \pm {}^{0.3}_{0}$ mm)



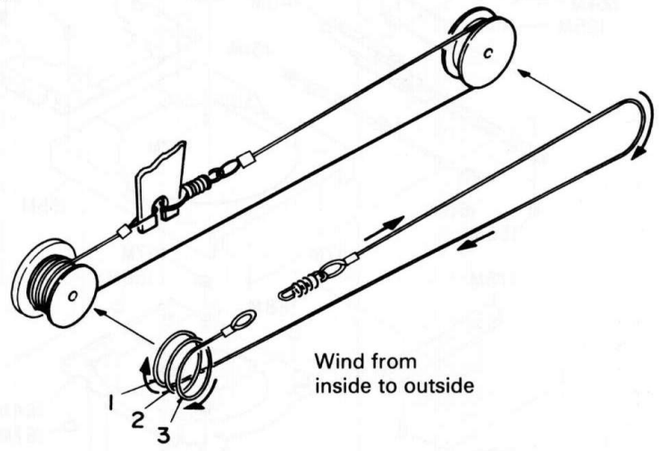


b) After replacing the sub-chassis, readjust so that the magnet clamper does not touch the clamper metal strap at right and left sides. (The clamper metal strap should not be touched to other straps.)



4. Others

a) For the loading wire winding, refer to the figure below.



b) When the magnet clamper (094M) is replaced, bent the narrowest tab and remove the clamper.

8. PRACTICAL HINTS

Test discs

It is important that the test discs be treated with great care.
The disturbances on the discs (black spots, finger-prints, etc.) are exclusive and are unamibiguously positioned. Damages may cause extra drop-outs etc., thus putting an end to the exclusivity of the intentional error on the disc.
In that case it is not possible anymore to check for example the good functioning of the track detector.

Measurements on op-amps

In the electronic circuits, op-amps have frequently been used.
The applications include amplifiers, filters, invertors and buffers.

In those cases where in one way or the other feedback has been applied, the voltage difference at the differential inputs converges to zero.
This applies to both DC and AC signals.
The cause can be traced to the properties of an ideal op-amp ($Z_i = \infty$, $G = \infty$, $Z_o = 0$).
If one input of an op-amp is directly connected to ground, it will be virtually impossible to measure at the inverting and non-inverting inputs.
In such cases only the output signal will be measurable.

That is why in most cases the AC voltage at the inputs will not be given.
The DC voltages at the inputs are equal.

Stimulating with "0" and "1"

During faultfinding it is sometimes necessary to connect certain points to ground or to supply voltage.
As a result certain circuits can be brought in a desired state, thus shortening the diagnosis time.
In a number of cases the relevant points are outputs of op-amps.
These outputs are short-circuit-resistant, that is, they can be brought to "0" or ground without problems.
The output of an op-amp, however, should never be connected directly to the supply voltage.

Measurements on microprocessors

Inputs and outputs of microprocessors should **never** be connected directly to the supply voltage.
The inputs and outputs should only be brought to "0" or ground if this is stated explicitly.

Measurements with an oscilloscope

During measurements with an oscilloscope it is recommended to use a 1:10 test probe, since a 1:10 probe has a considerably smaller input capacitance than a 1:1 probe.

Selection of the ground potential

It is very important to select a ground point that is as close as possible to the test point.

Conditions for injection

- Injection of levels or signals from an **external** source should **never** take place if the relevant circuit has no supply voltage.
- The injected levels or signals should **never** be greater than the supply voltage of the relevant circuit.

Indication of the test points

In the drawing of the diagrams and PCBs the test points are indicated by a number (e.g. ◇12◇) to which the measuring method refers.
In the following measuring method the symbol ◇ has been omitted for the test points indicated.

GENERAL CHECK POINTS

In the detailed measuring method below, a number of general conditions, required for a properly functioning set, will not be mentioned.
Before the detailed measuring method is started, these general points should be checked:

a. Ensure that the disc and objective are clean (remove dust, fingerprints, etc.) and use undamaged discs.

b. Check that all supply voltages are present and that they have the correct values.

Initiation of the service programme of the µP

For the initiation of the service programme of the µP, see detailed measuring method for the decoder circuit: Initiating the service programme.

SERVICING THE CDM UNIT

If the CDM is malfunction, replace whole, CDM unit.

9. MEASUREMENTS AND ADJUSTMENT

Check of the laser supply

The laser and the laser supply in Q101 plus the monitor diode form a feedback system. A defect in the laser supply may result in the destruction of the laser. If, in that case, the laser (= complete CDM unit) is replaced, the new laser will also become defective. However, it is impossible to check and repair a feedback system if a link is missing. For this reason the laser supply can be checked with the circuit below. The green LED replaces the laser, the voltage across the 18-Ohm resistor is fed back as monitor voltage, the 33-Ohm resistor and the switch serve to draw more current from the laser supply.

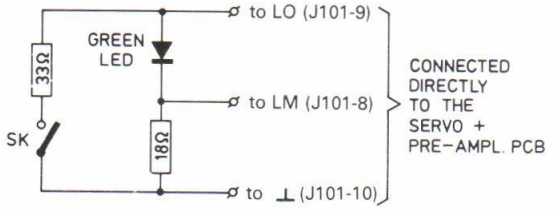


Fig. 4

LED GREEN e.g. CQY 94 IV **5322 130 32182**

The above circuit is connected to connector J101 via an extension cable instead of a flex print. The normal flex print is not suited for this purpose because of its high internal resistance.

Code no. extension cable 4822 322 40066

- The above flex print out of connector J101 on the servo + pre- amplifier PCB.
- Connect the circuit via the extension cable to connector J101.
- Select the play mode by grounding Si (pin 20 of Q101).
  Note: Si = 0, start initialization low, is the play mode.
- Measure the voltage LO (Laser Out) at test point 9.

  SK open: 1,8 V LO 2,3V
  170 mV LM 220 mV
  The green LED emits little light.

  SK closed: 1,8 V LO 2,3 V
  170 mV LM 220 mV
  The green LED emits little light.
- During the change- over from SK closed to SK open, the LED will emit more light for a short moment.
- The control sees to it that the same amount of current flows through the LED when SK is open and when SK is closed.

At $\overline{Si}$ = 1, in the STANDBY state, LO = 0V ± 0,2 V.

Repair procedure

Since laser, monitor diode and photodiodes are very sensitive to static charges, care should be taken that during measurements and adjustments the aids and yourself have a potential that is equal to that of the CD mechanism.

Laser adjustment for CDM4

- Measure the resistance of R108 + R134 with an ohmmeter and adjust potentiometer R134 so that R134 + R108 have a combined value of 1 kΩ.
- Check the monitor diode connections. Measure at test point 11 and ground (⊥).
- Put test disc 5 on the turntable.
- Switch on the set and select the PLAY mode or a similar service position.
- Take a DC voltmeter and measure across R116. The voltage across this resistor should **stay smaller than 1260 mV.**
- Check if HF is present. IF not, stop the measurement immediately and analyse the fault.
- If HF is present, play track 1 of test disc 5 and adjust the sum HF across R114 (test points 1 and 2) to 50 mV with a DC voltmeter.
  Check, during the adjustment, that the voltage across R116 does not exceed 1260 mV.
- If the adjustment is not successful within the 1260 mV margin across R116, check the angle setting.

Adjustment of the focus off-set (FE lag) R136

Coarse adjustment

A – Place potentiometer R136 approximately in mid-position.
- Put test disc 5 on the turntable.
- Brig the player in **service position 1.**
- The focussing motor can now start focussing and when it has found the focal point a "1" will appear on the display.

B – Place with potentiometer R136 the focussing motor in optical horizontal position.
- Hereafter the fine adjustment of the focus offset has to be carried out.

Fine adjustment

- Bring the player in **service position 2.**
- Adjust potentiometer R136 for a voltage across C106 (testpoint 27) of 400 mV ± 40 mV.

Note:
Notice that the CDM is in a horizontal position.

DETAILED MEASURING METHOD FOR THE SERVO + PRE-AMPLIFIER CIRCUIT

PHOTODIODE SIGNAL PROCESSOR IC (Q101)

•$\overline{Si}$ (pin 20; test point 21)
LO (pin 17; test point 9)
LM (pin 16; test point 11)

– With the $\overline{Si}$ signal (=Start Initialization) the laser supply, among other things, is switched on.
When the $\overline{Si}$ signal is "low", the LO signal (=Laser Out) should be "high".
Via the LM signal (=Laser Monitor) the power supply for the laser diode is controlled.

Position of player	POWER ON	Servicing pos. 1*)	PLAY
$\overline{Si}$ signal	"high"	"low"	"low"
LO signal	"low"	"high"	"high"

*) To ensure that the player stays in **servicing position 1,** there should be a disc on the turntable.

To check the laser supply, see "CHECK OF THE LASER SUPPLY"

•FE (pin 5; test point 26)

– The FE signal (=Focus Error) is used to drive the focusing unit.
When the $\overline{Si}$ signal goes "high", the focal point will be searched for.

– When the player is brought into **servicing position 1** without disc, the objective will search for the focal point.
At test point 26 the FE signal varies between +3 V and -3 V.

– The FE signal ensures that the spot stays in focus.
When an error signal is injected, the FE signal will correct.
Bring the player in **servicing position 2** (with disc on turntable).

Inject successively a voltage of +5 V and -5 V (=+1B and -1B) via a 200 kΩ resistance to testpoint 25 and check the FE signal.

Signal injected testpoint 25	+5 V	-5 V
FE signal : test point 26	negative	positive

•FE lag (pin 6; test point 27)

– See adjustment of the focus off-set.

• RD signal (pin 21; test point 24)
HIGH-OHMIC MEASUREMENT

The RD signal (= READY) goes "high" when the starting procedure of Q101 has been completed.

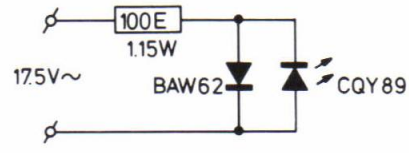
Position of player	POWER ON	**Servicing position 1**	PLAY
RD signal	"low"	"high"	"high"

•D1 (pin 9; test point 4)
D2 (pin 10; test point 6)
D3 (pin 8; test point 7)
D4 (pin 7; test point 8)

– The signals D1÷D4 are the error signals from the photodetector circuits.
– When in servicing position 1 the disc is moved, the focusing unit should keep in track.
When the disc is moving, there should be a changing signal on test points 4, 6, 7 and 8.

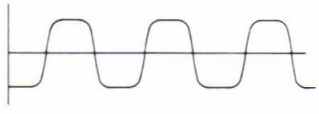
– Check of the photodiodes

Connected the circuit below to an alternating voltage of 17,5 V.



100 E-1.15 W	-	4822 116 51098
BAW 62	-	4822 130 30613
CQY 89	-	4822 130 31332

Switch on the supply voltage and bring the player in the stand-by mode or in **servicing position 0.**
In this measurement, infrared diode CQY89 replaces the function of the laser diode.
When this diode is held above the objective unit, the infrared light falls on the 4 photodiodes.
When the 4 photodiodes are functioning, the following voltage form will be visible on test point 4, 6, 7 and 8 on the servo + pre-amplifier PCB.
(the amplitude depends on the distance between the IR diode and the objective).



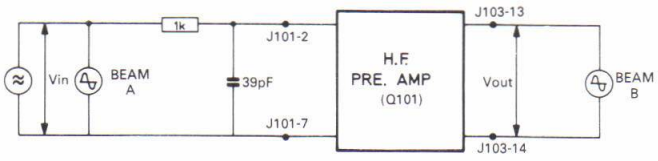
Position of the oscilloscope: 100 ms/div.

•HF-in (pin 3, test point 3)

- The HF-in signal (=High Frequency in) is the information signal from the 4 photodiodes.

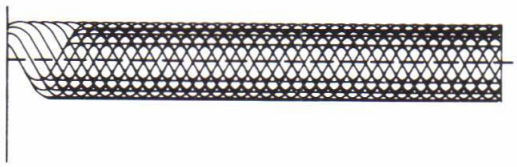
Check of the HF amplifier in Q101

- Take the flexible PCB out of connector J101.
- Switch on the supply voltage.
- Inject a signal V-in of about 10 mVpp, 50 kHz, via the RC network, between connector pin J101-2 and connector pin J101-7 according to the diagram below.
- The output voltage between connector pins J103-13 and J103-14 should be about 1 Vpp.



•HF-out (pin 27; measure at connector pin J103-14)

- The HF-out signal (=High-Frequency) is the amplified information signal for the decoder circuit.
  During playback of test disc no. 5 (4822 897 30096), a so-called "eye pattern" should be present on test point 17 (see figure below).
- The HF signal should be present and stable in:
  the PLAY mode and in
  servicing position 3 after the lead-in track has been read.
  In **servicing position 2** and during the reading of the lead-in track, the HF signal is present, but is not stable.



Position of the oscilloscope: 0,5 µs/div.
Amplitude about 1,5 Vpp.

•DET (pin 26)
HFD (pin 19; test point 23)
$\overline{\text{TL}}$ (pin 18; test point 16)

- The DET signal (=Detector) gives information on the level of the HF signal to the high-frequency Level/Drop-out detector of Q101.
- When the level of the HF signal is too low, the HFD signal (=High-Frequency Detector) will go "low".
- The $\overline{\text{TL}}$ signal (=Track Lost) will then go "low" in order to tell the servo µP that the tracking signals are unreliable.

Method:
(Can only be used in a playing set).

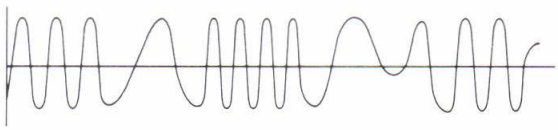
- Put test disc 5A (4822 397 30096) on the turntable.
- Switch on the power-supply switch and press the PLAY key.
- Play track number 10 or 15 and check the HFD signal at test point 23.
  When drop-out pulses are present on the DET signal (pin 26), the HFD pulses should also be present at test point 23.
  (Position of oscilloscope: 2 ms/div).

When the disc is slowly braked by hand, $\overline{\text{TL}}$ pulses will be visible at test point 16.

•RE 1 (pin 11; test point 18)
RE 2 (pin 12; test point 22)

- Signals RE1 and RE2 (Radial Error) are the control signals for the arm during tracking.

- In **servicing position 2**, the following signals should be visible at test point 18 and 22:



Position of the oscilloscope: 2ms/Div.
The frequency strongly depends on the eccentricity of the disc.

•$\overline{\text{DODS}}$ (pin 24: test point 19)

The $\overline{\text{DODS}}$ signal (= Drop Out Detector Suppression) avoids that Drop-Out signals influence the arm control during track jumping.

•SC (pin 25)
SC (=Start Capacitor)
HIGH-OHMIC MEASUREMENT

Position of player	SC (pin 25)
POWER ON	-4 V
PLAY	+5 V
Servicing pos. 1	+5 V

•FE lag (pin 6, test point 27)

- In **service position 2, 3** and in the PLAY mode, a voltage of about 400 mV is present at this point.
  When the disc is moved by hand in service position 1, the FE lag will vary.

RADIAL ERROR PROCESSOR Q103

•Check the signals coming from the servo μP and from photodiode signal processor Q103.

•RE-dig (pin 3; test point 37)

- With the RE dig signal (=Radial Error digital=Radial Polarity), the movement of the arm is controlled/corrected in case of track jumping and bumping against the player).

- In **servicing position 3** or in the PLAY mode a square wave should be present at test point 37.
  Because of frequency variations this square wave is hard to trigger.

- In the positions "SKIP ⏮ " and "SKIP ⏭ " the frequency of the square wave decreases.

•DAC (pin 10; test point 38).
With the DAC signal (=Digital to Analogue Converter) the track jumping speed is controlled.
This signal is derived from the signals B0 ÷ B3 coming from the decoder μP.

•RE (pin 7; test point 39)

- With the RE signal (=Radial Error) the light spot is kept on the track.
  When an error signal is injected, the RE signal will correct.
- Bring the player in **servicing position 3.**
- Inject successively a voltage of +5 V and -5 V (=+1B and −1B), via a 120 k Ω resistance, to pin 5 of Q106 and check the RE signal.

Signal injected test point 38	+5 V	-5 V
RE signal	Negative	Positive

•RE lag (pin 8; test point 41)

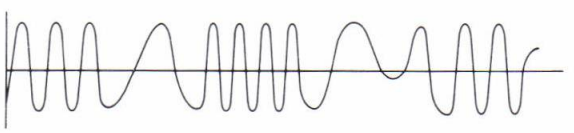
Capacitor C121 in the RE-lag circuit has a memory function.
It memorizes the degree of inclination of the disc.
When a jump is made to a certain track on the disc, the memory should be cleared.
This takes place by the decoder μP ($\overline{RPU}$ signal) via transistor Q104.

During track jumping (SEARCH), slow pulses should be visible at test point 43 (position of the oscilloscope 0,1 ms/Div).
In that case pulses should also be visible on the collector of transistor Q104.

•RE 1 (pin 20; test point 18)
•RE 2 (pin 1; test point 22)

- Signals RE1 and RE2 (Radial Error) are the control signals for the arm during tracking.

- In servicing position 2, the following signals should be visible at test point 18 and 22.



Position of the oscilloscope: 2 ms/Div.-Ac.
The frequency strongly depends on the eccentricity of the disc.

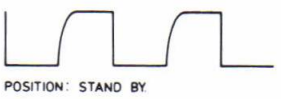
•B0 (pin 12; test point 36)
B1 (pin 13; test point 34)
B2 (pin 14; test point 33)
B3 (pin 15; test point 32)

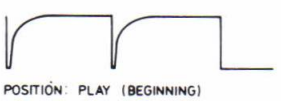
With the B0 ÷ B3 signals
•The radial control is switched on and
•The level on the DAC output is controlled.
- In the SEARCH mode, there should be activity on all 4 test points.

	STOP	PLAY	SERVICING POSISTION 0,1,2 SEARCH ◀◀	SERVICING POSITION 0,1,2 SEARCH ▶▶
B0	"low"	"high"	"low"	"high"
B1	"high"	"high"	"high"	"low"
B2	"high"	"high"	"high"	"high"
B3	"low"	"low"	"low"	"low"

•MCES (test point 12)

The MC signal (= Motor Control) is used to control the speed of the turntable.
- In the standby position (= power on), a signal as shown in the figure below is present at test point 12. The frequency is 88,2 kHz.
- With a disc on the turntable and with the player in service position 3 or in the PLAY mode, a signal as shown in the figure below should be present at test point 12. The frequency is 44,1 kHz.





When the MCES signal is correct the turntable motor must be rotating.

• VC (connector point J102-1)

Fast check.
- Place a disc on the turntable. The voltage at connector point J102-1 will be about Vc = 0 > Vc > −1.7 V during playback.

DETAILED MEASURING METHOD FOR THE DECODER CIRCUIT

Initiating the service programme

Service position "0"

- Press "STOP", "PLAY" and "FTS" while switching on the mains voltage.
- The display shows:
  - The TRACK and INDEX field: LH 1
  - The minutes and seconds field: 00 00.
- Fast CDM check:
  - With "SEARCH ▶▶ " and "SEARCH ◀◀ " : arm outward and inward. (Remote Control only)
  - Laser control and focus control in.
  - Check that the focus unit jumps over the tracks.

ATTENTION: AFTER ONE OF THESE KEYS (SEARCH) IS PRESSED, THE LASER REMAINS DRIVEN UNTIL SERVICE POSITION 3. THEREFORE, AVOID DIRECT EXPOSURE TO THE BEAM IN SERVICE POSITIONS 0, 1 AND 2.

Service position "1"

- Press "SKIP ▶▶| "
- The display shows:
  - The minutes and seconds field: 00 01;
- Functions:
  - Laser control in;
  - Focus start procedure is repeated unlimitedly;
- With "SEARCH ▶▶ " and "SEARCH ◀◀ " : arm outward and inward.
- With "SKIP |◀◀ " one can go back to service position "0".

Service position "2"

- Move arm inward with "SEARCH ◀◀ ".
- Put a disc on the turntable.
- Bring player in service position "1"
- Press "SKIP ▶▶| ".
- The display shows:
  - The minutes and seconds field: 00 02;
- Functions:
  - Laser control in;
  - Focus control in;
  - Turntable motor control in;
  - Decoder generates MC signal;
- With "SEARCH ▶▶ " and "SEARCH ◀◀ " : arm outward and inward.
- With "SKIP |◀◀ " one can go back to service position "1".

Service position "3"

- Bring the player in service position "2" Press "SKIP ▶▶| "
- Put a disc on the turntable.
- Press the "PLAY" key.
- Functions: all keys have their original functions.
- If an error is detected, the player will stop and give an error message on the display. For a description of the error message: See Error table.
- If the µP observes a system error, a system error indication will appear on the display: Er 01 through Er 12.
- If the µP observes an operating error, an operating error indication will be displayed for 1.5 seconds: Er 30 through Er 57 and Er 60.

The service programme can be abandoned again by turning the mains switch (POWER ON/OFF) off and on again (Hardware reset).

The error message number will be displayed only in service programme. (In normal mode, "ERROR" indication will just appear.)

"SEARCH ▶▶ " = Forward search key

"SEARCH ◀◀ " = Reverse search key

"SKIP ▶▶| " = TRACK NEXT key

"SKIP |◀◀ " = TRACK PREV key

ERROR TABLE

System errors

Indication	Cause	Check
Er 01	No RD	$\overline{Si}$, Sc, RD, Photodiode signal processor
Er 02	No $\overline{TL}$ pulse at start-up	$\overline{TL}$, HF, Photodiode signal processor, CD disc present
Er 03	No lead-in track found	CD disc, radial arm position, REdig, Radial error processor
Er 04	Too many $\overline{TL}$ pulses in PLAY	CD disc, $\overline{HFD}$
Er 05	$\overline{TL}$ pulse > 50 msec. in PLAY	CD disc, HF in, photodiodes
Er 06	No $\overline{TL}$ pulse within 0.5 sec. during track jumping	RE-lag circuit
Er 07	Subcoding error during PLAY	HF
Er 08	TOC error	CD disc, turntable motor control, radial arm position
Er 10	Search error: selected point on disc cannot be reached	CD disc
Er 11	EEPROM error: programme deviation	Replace EEPROM
Er 12	RAM in µP MC68HC11 defective	Replace µP MC68HC11

Operating errors

Er 30 "SKIP ⏭ " key operated during the last track, with "REPEAT" turned off.
Er 31 "SKIP ⏮ " key operated during the first track, with "REPEAT" turned off.
Er 32 Index selected before a track has been selected.
Er 33 The selected index number does not exist on this disc.
Er 34 Programme survey requested; no programme present.
Er 35 The programme memory is full.
Er 36 The progammed track is not present on this CD disc.
Er 37 The selected track is not present on this CD disc.
Er 38 Selected time in seconds greater than 59.
Er 39 Error in the selection procedure.
Er 40 Wrong time programmed.
Er 41 The selected time does not exist.
Er 42 The selected track does not exist.
Er 43 FTS data storage error: memory full.
Er 44 FTS data storage error: no programme presented.
Er 45 FTS data storage error: no more free disc number.
Er 46 FTS playback error: no FTS programme in the memory.
Er 47 FTS selection error: "SKIP ⏭ " key actuated while FTS points towards end of the number of tracks.
Er 48 FTS selection error: "SKIP ⏮ " key actuated while the FTS points to the beginning of the number of tracks.
Er 49 FTS selection error: "SKIP ⏭ " or PREVIOUS key actuated at the moment the µP is storing data.
Er 50 FTS selection error: "SEARCH ◀◀ " key actuated while the CD disc has not yet been stored in the FTS memory; or TOC of the disc has not yet been read in.
Er 51 FTS selection error: "SEARCH ◀◀ " key actuated.
Er 52 FTS selection "CANCEL": "CANCEL" key actuated while data are being stored in the memory.
Er 53 "CANCEL" key actuated, but clear function has not been carried out.
Er 54 FTS data storage error: TOC of the CD disc, of which data should be saved, has not yet been read in.
Er 55 FTS playback error: Insufficient data of the TOC of the CD disc read in for processing in the FTS memory. Check the lead-in track.
Er 56 "A→B" key actuated while the player was not in PLAY mode.
Er 57 "SEARCH" key actuated during "SKIP" mode.
Er 60 End of the "FAST FORWARD/FAST REVERSE" search motion.

I MICRO PROCESSOR MC68HC11 (QF01)

- **$\overline{\text{Reset}}$ (pin 39; test point 103)**

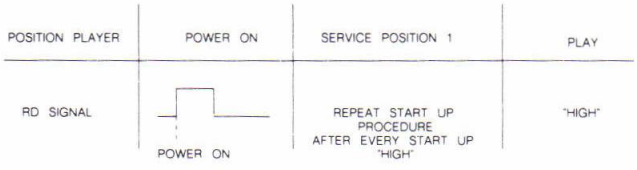
After switching on the supply voltage, a positive voltage should be present.

- **X-TAL out (pen 30; test point 31)**

The frequency of this signal should be 8 MHz.

- **RD (pin 18; test point 24)**

The RD signal (= Ready) goes "high" when the focal point has been found.
So there should be a disc on the turntable.



- **SWAB/$\overline{\text{SSM}}$ (pin 43; test point 78)**

When, after RD "high", the SWAB/$\overline{\text{SSM}}$ is "high" for a short moment (> 0.2 sec), the turntable motor control will be switched on.
The turntable motor is controlled by the MC-signal (test point 81).
To check MC, see: "Decoder A IC". To check the turntable motor control, see Servicing the CDM unit: "Checking of the motor control".

- **$\overline{\text{TL}}$ (pin 18; test point 16)**

- The $\overline{\text{TL}}$ signal (Track Loss) is used to tell the µP that track loss threatens. The µP then can give correction signals with B0 ÷ B3.
- In the "SEARCH" mode, or when the player is bumped against, there are pulses on test point 16.

- **REdig (test point 37)**

The REdig signal (= Radial Error Digital = radial deviation) is used to determine the place of the arm relative to the track and to check/correct in case of track jumping or bumping against the player.

In position PLAY or PAUSE mode, a square wave should be present on test point 37.
Because of frequency variations, this square wave is hard to trigger.

- **$\overline{\text{DODS}}$ (pin 13; test point 19)**

The $\overline{\text{DODS}}$ signal (= Drop Out Detector Suppression) avoids that Drop-Out signals influence the arm control during track jumping.

- **RP/4 (pin 6; test point 94)**

RP/4 enables very fast searching in position SEARCH. In that position, there should be activity at test point 94.

- **E (pin 27; test point 96)**

E is the internal microprocessor block signal of 2 MHz.

- **AS (pin 26; test point 97)**

AS is the Address Select strobe signal working with a 2 MHz clock frequency.

- **Data I (pin 44; test point 98)**
- **Data O (pin 45; test point 99)**
- **SCK (pin 46; test point 100)**
- **ACK (pin 47; test point 100)**

After the player is switched on, there should be activity at test points 98 through 101.

II MICROPROCESSOR SLAVE MC68HC24 (QF02)

- **$\overline{\text{Reset}}$ (pin 39; test point 103)**

When the supply voltage is switched on, a positive voltage should be present.

- **$\overline{\text{Si}}$ (pin 21; test point 21)**

When the $\overline{\text{Si}}$ signal (= Start Initialization) is "low", the laser supply and the focusing control are switched on.

Position of player	POWER ON	Servicing pos. 1	PLAY
$\overline{\text{Si}}$ signal	"high"	When repeating the start procedure "low"	"low"

- **B0 (pin 7 ; test point 36)**
  B1 (pin 8 ; test point 34)
  B2 (pin 9 ; test point 33)
  B3 (pin 10; test point 32)

With the B0 ÷ B3 signals
- The radial control is switched on.
- The level on the DAC output is controlled.
- In the SEARCH mode, there should be activity on all 4 test points.

- In the following positions the signals B0 ÷ B3 are stable:

signal	STOP	PLAY	Service pos. 0,1,2 SEARCH ≪	Service pos. 3 SEARCH ≫
B0	"low"	"high"	"low"	"high"
B1	"high"	"high"	"high"	"low"
B2	"high"	"high"	"high"	"high"
B3	"low"	"low"	"low"	"low"

- **$\overline{\text{DODS}}$ (pin 13; test point 19)**

The $\overline{\text{DODS}}$ signal (= Drop Out Detector Suppression) avoids that Drop-Out signals influence the arm control during track jumping.

III DECODER-A (Q501)

- **Check the MC signal (pin 17; test point 81)**

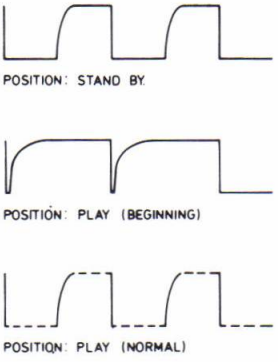
- In stand-by mode, the MC signal (Motor Control) corresponds to the figure below.

  Note:
  The repetition time of the MC signal is 11.3 µsec.

- Place a disc on the turntable.
- In position PLAY or SERVICE POSITION 2, the MC signal corresponds to the figure below.

  Note:
  During start-up the duty cycle is 98%, then the duty cycle of the signal becomes about 50%.

See also servicing the CDM unit: "Check of the motor control".



- **Check the HF signal on test point 65 (eye pattern)**

- Insert a disc.
- The HF signal should be present and be stable in the PLAY mode.
- In SERVICING POSITION 2 and during reading of the lead-in track the HF signal is not stable.

Position of oscilloscope 0.5 µs/DIV.

Amplitude ≈ 1.5 V_{pp}

- **Check the HFD signal on test point 66**

- Insert a disc.
- In the PLAY mode the HFD signal is "high"; however, minor pulses may be present and in cause of disorders on the disc.
- In SERVICING POSITION 2 and during playback of track no. 15 of test disc 5A HFD pulses are visible.
- When the disc is braked a little, HFD pulses are visible.

Position of the oscilloscope 5 ms/DIV

- **Check if the $\overline{\text{MUTE}}$ signal (pin 11; test point 67) is "high"**

  When Filter-B IC is applied, the $\overline{\text{MUTE}}$ input will not be used.

- **Check the CEFM signal (pin 27; test point 68)**

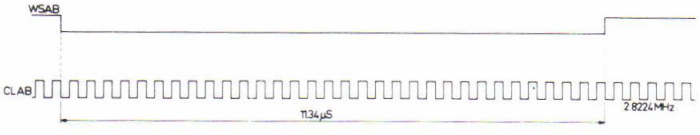
- Place a disc on the turntable.
- In stand-by mode (only the mains switch is depressed), the frequency lies between 2.82 MHz and 5.64 MHz.
- In the position PLAY and SERVICE POSITION 2, the frequency is 4.32 MHz.

- **Check the Xin signal (pin 19; test point 69)**

- The Xin frequency is 11.2896 MHz.
- If this frequency deviates, check test point 70; Xout signal, on Filter-B IC.
  This frequency should also be 11.2896 MHz.

- **Check the timing signals meant for Filter-B IC**

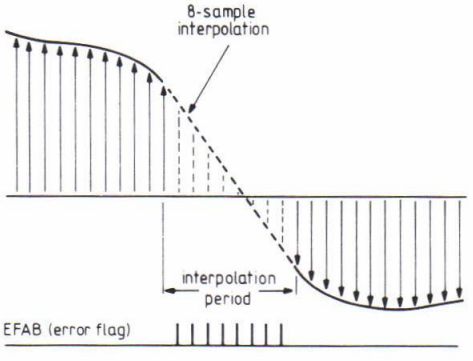
- Place a disc on the turntable.
- Select one of the following positions:
  SERVICE POSITION 2, or position PLAY.
- Trigger the oscilloscope with the WSAB signal (test point 71; pin 39).
- Check signals:
  WSAB at test point 71 (pin 39)
  (Word Select from Decoder-A to Filter-B)
  CLAB at test point 72 (pin 38)
  (Clock from Decoder-A to Filter-B)
  and their interrelation.
- There must be activity at test point 73 (pin 37), DAAB signal (DATA from Decoder-A to Filter-B).



- **Check the EFAB signal (Error Flag from Decoder-A to Filter-B) at test point 74 (pin 36)**

- Place test disc 5A on the turntable.
- During playback, EFAB pulses should be present at test point 74 for soft braking of the disc and during fast search (F.Forward, F.Reverse).

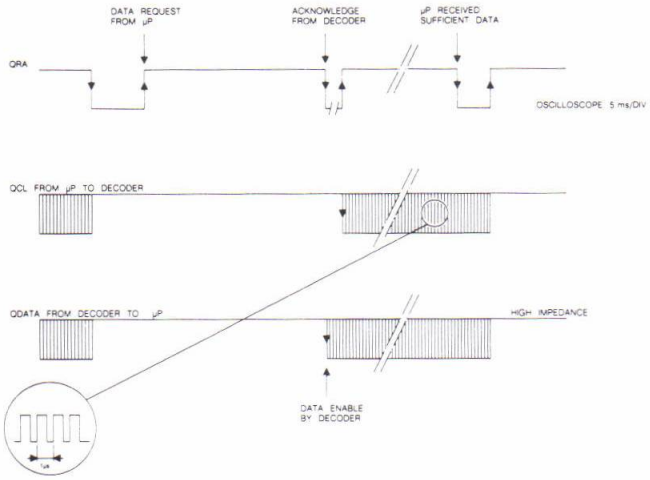
  Note:
  Filter-B IC is capable of interpolating linearly 8 successive EFAB pulses.



- **Check the Q-channel signals**

- Place a disc on the turntable.
- Select one of the following positions:
  SERVICE POSITION 3 or position PLAY.
- Trigger on the QRA signal (Q-channel Request Acknowledge) test point 75; pin 30.
- Check signals QRA at test point 75 (pin 30)
  QCL at test point 76 (pin 31)
  (Q-channel-clock)
  and their interrelation.
- There should then be activity at test point 77 (pin 29) QDA (Q-channel Data).

Note:
The QRA request is initiated by decoder µP (QRA "high"). Then Decoder-A answers this request (QRA goes "low"). With the next leading clock pulse (QCL) the QRA signal is rendered "high" again by the decoder µP.



As soon as the Decoder-A has taken in enough information via QDA, QRA will go low again. That is why the QRA times vary each time.

- **Check the $\overline{\text{SSM}}$ signal (test point 78; pin 33) = Start-Stop turntable motor**

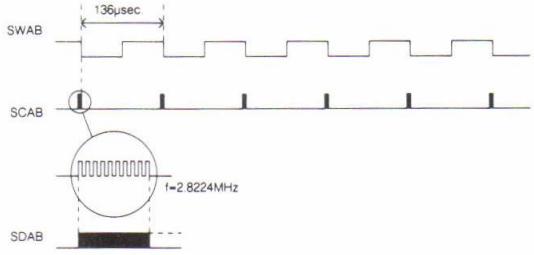
- Motor start pulse when test point 78 is "high" for ⩾ 0.2 sec.
- Motor stop pulse when test point 78 is "low" for ⩾ 0.2 sec.

Note:
After the motor start pulse, SWAB information (Subcoding Word clock) will become visible at this point. The period time of that signal is 136 µsec.

- **Check the subcode clock signals**

- Place a disc on the turntable.
- Select position PLAY.
- Trigger the oscilloscope with the SWAB signal at test point 78.
- Check the following signals:
  SWAB at test point 78; pin 33
  SCAB at test point 79; pin 35 (Subcode Clock from Decoder-A to Filter B)
  SDAB at test point 80; pin 34 (Subcode Data from Decoder-A to Filter B)
  and their interrelations.

Note:
While the burst of 10 clock pulses, appear on SCAB the Q-channel information is transferred on SDAB. Hereafter the P-bit indication follows.
The P-bit is "high" between two bursts of 10 clock pulses in case of pause indication and "low" in case of music indication.



- **Check the $\overline{\text{CRI}}$ signal (pin 28; test point 19)**

The CRI signal is "low" in case of track jumping. Player in position SEARCH.

- **Check the DEEM signal (test point 84; pin 32) .**

- Place test disc 5 on the turntable.
- During playback of track no. 14 (recorded without PRE-EMPHASIS), the DEEM signal should be "low".
- During playback of track no. 15 (recorded with PRE-EMPHASIS), the DEEM signal should be "high".

IV FILTER-B (Q502)

- **Check the signals between Decoder-A IC and Filter-B IC**

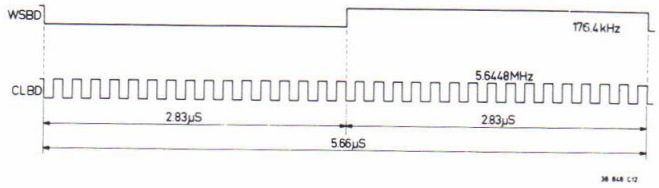
- See sub. "III Decoder-A":
  * Check the X IN signal (test points 69 and 70)
  * Check the timing signals meant for Filter B (WSAB, CLAB, DAAB signals; test points 71, 72 and 73).
  * Check the EFAB signal (test point 74)
  * Check the subcode clock signals (SWAB, SCAB, SDAB signals; test points 78, 79 and 80).

- **Check the timing signals between Filter-B and DAC IC**

- Place a disc on the turntable.
- Select the position PLAY.
- Trigger the oscilloscope with the WSBD signal (Word Select from Filter B to DAC) test point 85 (pin 18).

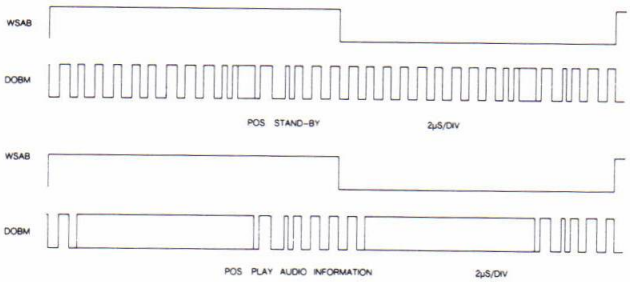
- **Check the following signals:**
  WSBD at test point 85; pin 18
  CLBD at test point 87; pin 16 (Clock signal from Filter-B to DAC) and their interrelation.

If an Audio disc is used, there should be activity at test point 73 (pin 3) DAAB signal (DATA from Decoder - A to Filter-B).
If a disc with Digital Data (CD-ROM) is used, this point is continuously switched "low" by transistor (Q506). Then the ANI signal test point 95 is "HIGH".
In that case the word "data" appears on the display.



- **Check the DOBM signal (Digital Output)**

- Place a disc on the turntable.
- Select the stand-by mode (only mains switch depressed).
- Trigger the oscilloscope with the WSAB signal (test point 71).
- Check the DOBM signal (test point 88; pin 14). An empty audio signal has a fixed pattern. See drawing, "Stand-by".
- Select the PLAY mode. Check the DOBM signal. See drawing "PLAY".



- **In position SEARCH the $\overline{\text{ATSB}}$ signal is "low" test point 89; pin 22 (Attenuation Audio Signal)**

- **Check the $\overline{\text{MUSB}}$ signal test point 90; pin 23 (Soft Mute)**

This signal is "low" in positions:
PAUSE
"SKIP ⏮ " or "SKIP ⏭ " when jumping from one track to another.
During fast SEARCH, when the "FAST" and "SEARCH ◀◀" or "SEARCH ▶▶ " keys have been actuated.

V DATA SEPARATION AND DIGITAL PHASE INVERSION SECTION (QD01—QD15)

For the data to DAC, change the DABD (WD01-6) data array and use separated data of L and R.

- **L/R data selection**

L channel data comes first, so it must be delayed by fs x 1/2 in time to align both channel data. This is the reason why a time delay circuit is added in the L channel data path.

- **Creation of inverted and non-inverted data**

Timings for both the channels are aligned because of only the L channel data delayed. Next, two kinds of data will be prepared. One is a non-inverted data -- original data. The other is an inverted data. To create the inverted data, the data is further delayed by fs x 1/2 and then inverted.

- **DA conversion and output synthesis**

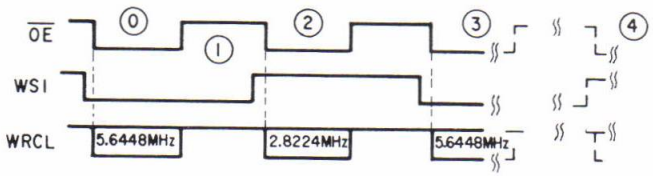
Each L channel inverted/non-inverted data and R channel inverted/non-inverted data is fed to Dual DAC respectively.

- **$\overline{\text{OE}}$ signal**

The $\overline{\text{OE}}$ signal is a signal created by counting down WSBD (WD01-4) signal into 1/2 and delaying it by one clock with CLBD (QD01-pin 6) signal. The time is equivalent to the time for one DABD (WD01-6) signal (a pair of L, R 1).

- **WRCL signal (shift clock of QD04 - QD07)**

The clock is generated when the $\overline{\text{OE}}$ signal is "L". Its frequency is 5.6448 MHz when the WSI (QD03-pin 5) signal is "L" and 2.8224 MHz when the WSI signal is "H".



- The Rch data is stored in QD04 and QD05 and Lch data is stored in QD06 and QD07 under the condition ①. (No data transmission)

- The data is output to QD13 at the rate of 2.8224 MHz BCK; Bit clock (QD02-pin 6) under the condition ②. The QD13 Lch & Rch data outputs are transferred to QD08 and QD09 and to QD10 and QD11, respectively.

- The data of QD08 & QD09 (Lch) and QD10 & QD11 (Rch) are output to the DAC through QD15 (output timing matching) at the timing ③. Simultaneously, the same data but inverted are transferred to QD08 & QD09 (Lch), and QD10 & QD11 (Rch).

- The inverted data entered at the timing 3 is output to DAC at the timing ④.

VI DAC IC (QD31, QD61)

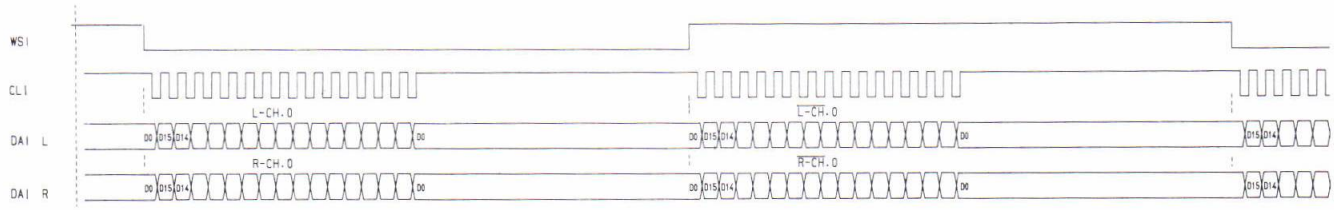
Bit Stream Dual Digital Analog Converter

- **Features**

- I^2S data input
- 3-stage digital filter incorporating F.I.R. filter, linear interpolator and sample and hold
- 2nd order noise shaper to provide a signal-to-noise ratio of > 90 dB
- 16-bit resolution from a 1-bit converter, using switched capacitor integrator
- 3rd order low-pass filter to reduce out-of-band noise
- —12 dB attenuation, de-emphasis and mute control
- Low power consumption (typ. 300 mW)
- Single supply operation (+ 5V)
- —40 to + 85°C operating temperature range

- **WSI (pin 30) Word Select Input; 44.1 kHz**
- **CLI (pin 31) Serial bit Clock; 2.8224MHz**
- **DAI (pin 32) Serial Data Input**

The relations are shown in illustration.

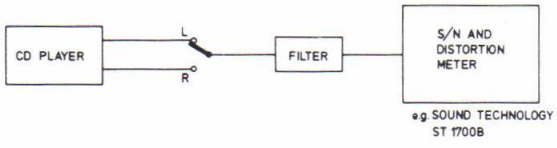


VII DEEM CIRCUIT

- **Check DEEM circuit**

- Place test disc 5 on the turntable.
- During playback of track no. 14 (recorded without PRE-EMPHASIS) the DEEM signal at test point 84 should be "low".
- During playback of track no. 15 (recorded with PRE-EMPHASIS), the DEEM signal at test point 84 should be "high".

VIII SPECIFICATIONS MEASUREMENT



To measure the specification use can be made of audio test disc 4822 397 30085 use 13th order filter 4822 395 30204 to measure:

- Total harmonic distorsion
- Intermodulation distorsion
- Signal–to–noise ratio (s/n)

10. ELECTRICAL PARTS LIST

ASSIGNMENT OF COMMON PARTS CODES.

RESISTOR

R***: (1) GD05---140, Carbon film fixed resistor, ±5%, 1/4W
R***: (2) GD05---160, Carbon film fixed resistor, ±5%, 1/6W

① — Resistance value

Examples

① Resistance value

0.1Ω ... 001	10Ω ... 100	1kΩ ... 102	100kΩ ... 104
0.5Ω ... 005	18Ω ... 180	2.7kΩ ... 272	680kΩ ... 684
1Ω ... 010	100Ω ... 101	10kΩ ... 103	1MΩ ... 105
6.8Ω ... 068	390Ω ... 391	22kΩ ... 223	4.7MΩ ... 475

(Note) Please distinguish 1/4W from 1/6W by the shape of parts used actually.

C***: CERAMIC CAP.

(1) DD1 ----370, Ceramic condenser
Disc type
①② Temp. coeff. P350 — N1000, 50V
Capacity value
Tolerance

Examples

① Tolerance (Capacity deviation)
±0.25pF ... 0
±0.5pF ... 1
±5% ... 5

* Tolerance of COMMON PARTS handled here are as follows.
0.5pF ~ 5pF ... ±0.25pF
6pF ~ 10pF ... ±0.5pF
12pF ~ 560pF ... ±5pF

② Capacity value

0.5pF ... 005	3pF ... 030	100pF ... 101
1pF ... 010	10pF ... 100	220pF ... 221
1.5pF ... 015	47pF ... 470	560pF ... 561

C***: CERAMIC CAP.

(1) DK16---300, High dielectric constant ceramic condenser
Disc type
① Temp. chara. 2B4, 50V
Capacity value

Examples

② Capacity value

100pF ... 101	1000pF ... 102	10000pF ... 103
470pF ... 471	2200pF ... 222	

C***: ELECTROLY CAP. (⫢), FILM CAP. (⫫)

(1) EA---10, Electrolytic condenser
One-way lead type, Tolerance ±20%
①② Dielectric strength
Capacity value

Examples

① Capacity value

0.1μF ... 104	4.7μF ... 475	100μF ... 107
0.33μF ... 334	10μF ... 106	330μF ... 337
1μF ... 105	22μF ... 226	1100μF ... 108
		2200μF ... 228

② Working voltage

6.3V ... 006	25V ... 025
10V ... 010	35V ... 035
16V ... 016	50V ... 050

(2) DF15--- 350, Plastic film condenser
One-way type, Mylar ±5% 50V
① Capacity value

Examples

① Capacity value

0.001μF (1000pF) .. 102	0.1μF ... 104
0.0018μF 182	0.56μF ... 564
0.01μF 103	1μF ... 105
0.015μF 153	

REF. DESIG.	PART NO.	DESCRIPTION
		PB16-BALANCE OUT CIRCUIT BOARD
		PB16-CAPACITORS
C701 ~ C704	4822 124 90386	ELECT 10 μ F 25V
C705	4822 121 51144	FILM 1000PF ±2%
C706	4822 121 51144	FILM 1000PF ±2%
C707	4822 124 22238	ELECT 100 μ F 25V
C708	4822 124 22238	ELECT 100 μ F 25V
C717	4822 121 51209	FILM 0.015 μ F ±2%
C718	4822 121 51209	FILM 0.015 μ F ±2%
C719	4822 123 30093	MICA 5PF ±0.5PF
C720	4822 123 30093	MICA 5PF ±0.5PF
C731 ~ C734	4822 124 22572	ELECT 100 μ F 63V
C737	4822 124 22736	ELECT 1000 μ F 25V
C738	4822 124 22736	ELECT 1000 μ F 25V
C798	4822 122 40491	CERAMIC 0.022 μ F +80%−20%
CT01	4822 124 41539	ELECT 47 μ F 16V
CT02	4822 122 40491	CERAMIC 0.022 μ F +80%−20%
CT06	4822 122 40491	CERAMIC 0.022 μ F +80%−20%
CT07	4822 122 40617	CERAMIC 0.1 μ F +80%−20%
		PB16-RESISTORS
R701	4822 116 53387	5.62K Ω ±2% 1/4W
R702	4822 116 53387	5.62K Ω ±2% 1/4W
R703	4822 050 24642	4.64K Ω ±2% 1/4W
R704	4822 050 24642	4.64K Ω ±2% 1/4W
R705	4822 116 53387	5.62K Ω ±2% 1/4W
R706	4822 116 53387	5.62K Ω ±2% 1/4W
R707	4822 116 82588	15.4K Ω ±2% 1/4W
R708	4822 116 82588	15.4K Ω ±2% 1/4W
R709	4822 050 21002	1K Ω ±2% 1/4W
R710	4822 050 21002	1K Ω ±2% 1/4W
R711 ~ R714	4822 116 53387	5.62K Ω ±2% 1/4W
R715 ~ R718	4822 050 25621	562 Ω ±2% 1/4W
R719	4822 116 53784	68.1K Ω ±2% 1/4W
R720	4822 116 53784	68.1K Ω ±2% 1/4W
⚠ R731 ~ ⚠ R734	4822 111 90731	47 Ω ±2% 1/4W
⚠ R737	4822 116 53387	5.62K Ω ±2% 1/4W
⚠ R738	4822 116 53387	5.62K Ω ±2% 1/4W
		PB16-SEMICONDUCTORS
D703	4822 130 33305	DIODE 1SS176, ETC.
Q701 ~ Q704	4822 209 70226	I C NJM5534D
QT01	4822 209 72503	I C 74HC04
QT02	4822 209 73951	I C PST523D

REF. DESIG.	PART NO.	DESCRIPTION
		PB16-MISCELLANEOUS
J071	4822 264 10226	PLUG (CANON 3P XLR)
J072	4822 264 10226	PLUG (CANON 3P XLR)
J701	4822 265 10079	PLUG, 9P
J703	4822 265 30473	PLUG, 6P
JT01	4822 265 30482	PLUG, 4P
JT02	4822 265 20354	TERMINAL, 1P RCA
JT04	4822 267 31219	JACK, OPT CONNECTOR TOTX174
L701	4822 148 80787	OUTPUT TRANSFORMER
L702	4822 148 80787	OUTPUT TRANSFORMER
L703	4822 280 20448	RELAY, DC9V
L705 ~ L708	4822 158 60605	FERRITE CORE
LT01	4822 158 60605	FERRITE CORE
LT02	4822 142 60388	PULSE TRANSFORMER
W071	4822 321 60772	CONNECTIVE CORD, 3P
		PD16-DAC CIRCUIT BOARD
		PD16-CAPACITORS
CD01	4822 124 41539	ELECT 47 μF 16V
CD02 ~ CD05	4822 122 33136	CERAMIC 0.022 μF ±10%
CD07	4822 122 33136	CERAMIC 0.022 μF ±10%
CD08	4822 122 33136	CERAMIC 0.022 μF ±10%
CD10	4822 122 33136	CERAMIC 0.022 μF ±10%
CD21	4822 124 22238	ELECT 220 μF 10V
CD22	4822 122 32669	CERAMIC 47000PF +80%−20%
CD24	4822 124 22238	ELECT 220 μF 10V
CD25	4822 122 32669	CERAMIC 47000PF +80%−20%
CD26	4822 124 22238	ELECT 220 μF 10V
CD27	4822 122 32669	CERAMIC 47000PF +80%−20%
CD28	4822 124 22238	ELECT 220 μF 10V
CD29	4822 122 32669	CERAMIC 47000PF +80%−20%
CD32	4822 122 32686	CERAMIC 100PF ±5%
CD33	4822 122 32686	CERAMIC 100PF ±5%
CD36	4822 121 51144	FILM 1000PF ±2%
CD37	4822 121 51144	FILM 1000PF ±2%
CD38	4822 122 32921	CERAMIC 150PF ±5%
CD39	4822 122 32921	CERAMIC 150PF ±5%
CD40	4822 121 43734	MICA 330PF ±5%, CHIP
CD41	4822 121 43734	MICA 330PF ±5%, CHIP
CD44	4822 124 90386	ELECT 10 μF 25V
CD45	4822 124 90386	ELECT 10 μF 25V
CD50	4822 124 22238	ELECT 100 μF 25V
CD51	4822 122 32669	CERAMIC 47000PF +80%−20%
CD52	4822 124 22238	ELECT 100 μF 25V
CD53	4822 122 32669	CERAMIC 47000PF +80%−20%
CD62	4822 124 22238	ELECT 220 μF 10V
CD63	4822 122 32669	CERAMIC 0.047 μF +80%−20%
CD64	4822 124 22238	ELECT 220 μF 10V
CD65	4822 122 32669	CERAMIC 0.047 μF +80%−20%
CD66	4822 124 22238	ELECT 220 μF 10V
CD67	4822 122 32669	CERAMIC 0.047 μF +80%−20%
CD68	4822 124 22238	ELECT 220 μF 10V
CD69	4822 122 32669	CERAMIC 0.047 μF +80%−20%
CD72	4822 122 32686	CERAMIC 100PF ±5%
CD73	4822 122 32686	CERAMIC 100PF ±5%
CD76	4822 121 51144	FILM 1000PF ±2%
CD77	4822 121 51144	FILM 1000PF ±2%
CD78	4822 122 32921	CERAMIC 150PF ±5%

REF. DESIG.	PART NO.	DESCRIPTION
CD79	4822 122 32921	CERAMIC 150PF ±5%
CD80	4822 121 43734	MICA 330PF ±5%, CHIP
CD81	4822 121 43734	MICA 330PF ±5%, CHIP
CD82	4822 124 90386	ELECT 10 μF 25V
CD83	4822 124 90386	ELECT 10 μF 25V
CD90	4822 124 22238	ELECT 100 μF 25V
CD91	4822 122 32669	CERAMIC 0.047 μF +80%−20%
CD92	4822 124 22238	ELECT 100 μF 25V
CD93	4822 122 32669	CERAMIC 0.047 μF +80%−20%
		PD16-RESISTORS
RD02	4822 116 60446	3.3Ω ±5% 1/4W FUSE [E, W]
RD02		1.5Ω ±5% 1/4W [U]
RD04	4822 116 60446	3.3Ω ±5% 1/4W FUSE [E, W]
RD04		1.5Ω ±5% 1/4W [U]
RD05	4822 116 60446	3.3Ω ±5% 1/4W FUSE [E, W]
RD05		1.5Ω ±5% 1/4W [U]
RD21	4822 111 90895	10KΩ ±5% 1/10W, CHIP
RD22	4822 111 90895	10KΩ ±5% 1/10W, CHIP
RD28	4822 116 82573	22KΩ ±5% 1/10W, CHIP
RD29	4822 116 82573	22KΩ ±5% 1/10W, CHIP
RD30	4822 111 90891	9.1KΩ ±1% 1/10W, CHIP
RD31	4822 111 90891	9.1KΩ ±1% 1/10W, CHIP
RD32 ~ RD35	4822 111 91364	3.9KΩ ±1% 1/10W, CHIP
RD36	4822 111 91139	6.8KΩ ±5% 1/10W, CHIP
RD37	4822 111 91139	6.8KΩ ±5% 1/10W, CHIP
RD40	4822 111 90893	100Ω ±5% 1/10W, CHIP
RD41	4822 111 90893	100Ω ±5% 1/10W, CHIP
RD42	4822 116 82589	3.3MΩ ±5% 1/10W, CHIP
RD43	4822 116 82589	3.3MΩ ±5% 1/10W, CHIP
RD52	4822 111 90895	10KΩ ±5% 1/10W, CHIP
RD62	4822 116 60446	3.3Ω ±5% 1/4W FUSE [E, W]
RD62		1.5Ω ±5% 1/4W [U]
RD64	4822 116 60446	3.3Ω ±5% 1/4W FUSE [E, W]
RD64		1.5Ω ±5% 1/4W [U]
RD65	4822 116 60446	3.3Ω ±5% 1/4W FUSE [E, W]
RD65		1.5Ω ±5% 1/4W [U]
RD68	4822 116 82573	22KΩ ±5% 1/10W, CHIP
RD69	4822 116 82573	22KΩ ±5% 1/10W, CHIP
RD70	4822 111 90891	9.1KΩ ±1% 1/10W, CHIP
RD71	4822 111 90891	9.1KΩ ±1% 1/10W, CHIP
RD72 ~ RD75	4822 111 91364	3.9KΩ ±1% 1/10W, CHIP
RD76	4822 111 91139	6.8KΩ ±5% 1/10W, CHIP
RD77	4822 111 91139	6.8KΩ ±5% 1/10W, CHIP
RD80	4822 111 90893	100Ω ±5% 1/10W, CHIP
RD81	4822 111 90893	100Ω ±5% 1/10W, CHIP
RD82	4822 116 82589	3.3MΩ ±5% 1/10W, CHIP
RD83	4822 116 82589	3.3MΩ ±5% 1/10W, CHIP
		PD16-SEMICONDUCTORS
QD01	4822 209 82377	I C 74HC00
QD02	4822 209 61494	I C 74HC74
QD03	4822 209 61494	I C 74HC74
QD04 ~ QD11	4822 209 62764	I C 74HC164
QD12	4822 209 61494	I C 74HC74
QD13	4822 209 62765	I C 74HC258
QD15	4822 209 61494	I C 74HC74
QD31	4822 209 62758	I C SAA7321
QD61	4822 209 62758	I C SAA7321
QD63	4822 209 73951	I C PST523D

REF. DESIG.	PART NO.	DESCRIPTION
		PD16-MISCELLANEOUS
LD21	4822 157 62546	CHOKE COIL, 4.7 μH
LD22	4822 157 62547	CHOKE COIL, 820 μH
LD23	4822 157 62547	CHOKE COIL, 820 μH
LD61	4822 157 62546	CHOLE COIL, 4.7 μH
LD62	4822 157 62547	CHOKE COIL, 820 μH
LD63	4822 157 62547	CHOKE COIL, 820 μH
JD02	4822 265 10079	PLUG, 9P
		PP16-POWER/MIXAMP CIRCUIT BOARD
		PP16-CAPACITORS
C605	4822 123 30093	MICA 5PF ±0.5PF
C606	4822 123 30093	MICA 5PF ±0.5PF
C607 ~	4822 124 22572	ELECT 100 μF 63V
C610		
C611 ~	4822 124 22238	ELECT 100 μF 25V
C614		
C617	4822 124 23398	ELECT 220 μF 10V
C618	4822 124 23398	ELECT 220 μF 10V
C621	4822 124 23398	ELECT 220 μF 10V
C622	4822 124 23398	ELECT 220 μF 10V
C830	4822 122 40491	CERAMIC 0.022 μF +80%−20%
C834	4822 124 90367	ELECT 2200 μF 25V
C835	4822 124 90367	ELECT 2200 μF 25V
C836	4822 124 90364	ELECT 220 μF 16V
C837	4822 124 90364	ELECT 220 μF 16V
C840	4822 122 40491	CERAMIC 0.022 μF +80%−20%
C842	4822 124 22243	ELECT 6800 μF 16V
C845	4822 124 23403	ELECT 6800 μF 6.3V
C853	4822 124 42037	ELECT 6800 μF 35V
C854	4822 124 42037	ELECT 6800 μF 35V
C855	4822 124 23364	ELECT 47 μF 50V
C856	4822 124 23364	ELECT 47 μF 50V
C857	4822 124 22734	ELECT 470 μF 25V
C858	4822 124 22734	ELECT 470 μF 25V
C862	4822 124 22722	ELECT 1000 μF 16V
C863	4822 124 23363	ELECT 220 μF 6.3V
CN01	4822 124 22274	ELECT 4.7 μF 50V
		PP16-RESISTORS
R601 ~	4822 050 24642	4.64K Ω ±2% 1/4W
R604		
R605 ~	4822 116 53387	5.62K Ω ±2% 1/4W
R608		
R609	4822 050 24642	4.64K Ω ±2% 1/4W
R610	4822 050 24642	4.64K Ω ±2% 1/4W
R613	4822 050 21001	100 Ω ±2% 1/4W
R614	4822 050 21001	100 Ω ±2% 1/4W
R615	4822 050 22153	21.5K Ω ±2% 1/4W
R616	4822 050 22153	21.5K Ω ±2% 1/4W
R617	4822 050 21003	10K Ω ±2% 1/4W
R618	4822 050 21003	10K Ω ±2% 1/4W
R621 ~	4822 111 90731	47 Ω ±2% 1/4W, FUSE
R628		
R631	4822 116 53791	1.54K Ω ±2% 1/4W
R632	4822 116 53791	1.54K Ω ±2% 1/4W
R633	4822 050 21001	100 Ω ±2% 1/4W
R634	4822 050 21001	100 Ω ±2% 1/4W
R801	4822 116 60346	2.2K Ω ±5% 1W
R802	4822 116 60346	2.2K Ω ±5% 1W

REF. DESIG.	PART NO.	DESCRIPTION
R803 ~	4822 116 53297	1.78K Ω ±2% 1/4W
R806		
R807	4822 050 21212	1.21K Ω ±2% 1/4W
R808	4822 050 21212	1.21K Ω ±2% 1/4W
R809	4822 116 53297	1.78K Ω ±2% 1/4W
R810	4822 116 53297	1.78K Ω ±2% 1/4W
R811	4822 050 21212	1.21K Ω ±2% 1/4W
R812	4822 050 21212	1.21K Ω ±2% 1/4W
R813	4822 111 90967	4.7 Ω ±5% 1/4W [E, W]
R814	4822 111 90967	4.7 Ω ±5% 1/4W [E, W]
R861	4822 050 25621	562 Ω ±2% 1/4W
R863	4822 116 53297	1.78K Ω ±2% 1/4W
R864	4822 116 53758	1.62K Ω ±2% 1/4W
		PP16-SEMICONDUCTORS
Q601 ~	4822 209 70226	I C NJM5534D
Q604		
QN01	4822 209 83312	I C TA7317P
D602	4822 130 33305	DIODE 1SS176, ETC.
▲ D831	4822 130 80907	DIODE S2VB20
▲ D841	4822 130 80907	DIODE S2VB20
▲ D851 ~	4822 130 33074	DIODE 30DF−2
▲ D854		
D855	4822 130 33664	ZENER DIODE HZ6L (3) 6.2V
D856	4822 130 33664	ZENER DIODE HZ6L (3) 6.2V
D861	4822 130 33305	DIODE 1SS176, ETC.
▲ Q851	4822 130 43023	TRANSISTOR 2SA1306 (O, Y)
▲ Q852	4822 130 43311	TRANSISTOR 2SC3298 (O, Y)
▲ Q853	4822 130 60107	TRANSISTOR 2SA1048 (Y, GR)
▲ Q854	4822 130 60839	TRANSISTOR 2SC2458 (Y, GR)
Q855	4822 130 60107	TRANSISTOR 2SC1048 (Y, GR)
Q856	4822 130 60839	TRANSISTOR 2SC2458 (Y, GR)
Q861	4822 130 43311	TRANSISTOR 2C3298 (O, Y)
Q862	4822 130 60839	TRANSISTOR 2SC2458 (Y, GR)
Q863	4822 209 62759	I C NJM431
		PP16-MISCELLANEOUS
▲ F831	4822 253 20168	FUSE, T800MA [E, W]
▲ F831		FUSE, 1A [U]
▲ F832	4822 253 30201	FUSE, T800MA [E, W]
▲ F832		FUSE, 1A [U]
▲ F841	4822 253 20145	FUSE, T1.25A [E, W]
▲ F841	4822 253 40196	FUSE, 1.6A [U]
▲ F851	4822 253 20168	FUSE, T800MA [E, W]
▲ F851		FUSE, 1A [U]
▲ F852	4822 253 20168	FUSE, T800MA [E, W]
▲ F852		FUSE, 1A [U]
J602	4822 267 30955	TERMINAL, 2P RCA
L602	4822 280 20448	RELAY, DC9V
L605	4822 158 60605	FERRITE CORE
L606	4822 158 60605	FERRITE CORE
		PP26-REG. CIRCUIT BOARD
		PP26-SEMI CONDUCTORS
D842	4822 130 33305	DIODE 1SS176, ETC.
▲ Q831	4822 209 62762	I C NJM7909FA
▲ Q832	4822 209 62761	I C NJM7809FA
▲ Q841	4822 209 71903	I C NJM7805FA

REF. DESIG.	PART NO.	DESCRIPTION
		PS26-POWER SWITCH CIRCUIT BOARD
		PS26-CAPACITOR
CH01	4822 121 43733	FILM 0.068 μF ±20%
GH02	4822 121 43732	FILM 0.01 μF ±20%
		PS26-MISCELLANEOUS
LH01	4822 152 20637	NOISE FILTER, CHOKE
SH02	4822 276 11141	PUSH SWITCH, POWER
		PU16-CONTROL/DECODER CIRCUIT BOARD
		PU16-CAPACITORS
C501	4822 122 32686	CERAMIC 100PF ±5%
C504	4822 124 22274	ELECT 4.7 μF 50V
C506	4822 122 33132	CERAMIC 22PF ±5%
C507	4822 126 11058	CERAMIC 82PF ±5%
C508	4822 122 33136	CERAMIC 0.022 μF ±10%
C509	4822 124 90352	ELECT 10 μF 16V
C510	4822 122 33136	CERAMIC 0.022 μF ±10%
C513	4822 122 32669	CERAMIC 0.047 μF +80%−20%
C516	4822 122 33677	CERAMIC 27PF ±5%
C517	4822 122 33677	CERAMIC 27PF ±5%
C520	4822 124 90371	ELECT 470 μF 10V
C531	4822 122 32669	CERAMIC 0.047 μF +80%−20%
C532	4822 122 32669	CERAMIC 0.047 μF +80%−20%
CF03	4822 124 22274	ELECT 4.7 μF 50V
CF04	4822 124 41539	ELECT 47 μF 16V
CF05	4822 122 33136	CERAMIC 0.022 μF ±10%
CF06	4822 122 33136	CERAMIC 0.022 μF ±10%
CF07	4822 124 41539	ELECT 47 μF 16V
CF08	4822 122 33136	CERAMIC 0.022 μF ±10%
CF09	4822 124 41539	ELECT 47 μF 16V
CF10	4822 122 33136	CERAMIC 0.022 μF ±10%
CF13	4822 124 41539	ELECT 47 μF 16V
CF14	4822 122 33136	CERAMIC 0.022 μF ±10%
CF15	4822 124 90371	ELECT 470 μF 10V
CF16	4822 122 33136	CERAMIC 0.022 μF ±10%
CF17	4822 122 33689	CERAMIC 0.01 μF ±10%
CF18	4822 122 33689	CERAMIC 0.01 μF ±10%
CF19	4822 122 32669	CERAMIC 0.047 μF +80%−20%
CF50	4822 122 32669	CERAMIC 0.047 μF +80%−20%
CM01	4822 124 22274	ELECT 4.7 μF 50V
CM04	4822 122 33689	CERAMIC 0.01 μF ±10%
CM05	4822 122 33689	CERAMIC 0.01 μF ±10%
		PU16-RESISTORS
R501	4822 111 90906	2.2K Ω ±5% 1/10W, CHIP
R502	4822 116 82573	22K Ω ±1% 1/10W, CHIP
R503	4822 111 91075	1.2K Ω ±5% 1/10W, CHIP
R504	4822 116 82591	39 Ω ±5% 1/10W, CHIP
R505	4822 111 90918	4.7K Ω ±5% 1/10W, CHIP
R506	4822 111 90895	10K Ω ±5% 1/10W, CHIP
R508	4822 111 91372	820 Ω ±5% 1/10W, CHIP
R509	4822 111 90901	150K Ω ±5% 1/10W, CHIP
R510	4822 111 90901	150K Ω ±5% 1/10W, CHIP
R511	4822 111 90892	0 Ω ±5% 1/10W, CHIP
R515	4822 111 90918	4.7K Ω ±5% 1/10W, CHIP
R520	4822 111 90967	4.7 Ω ±5% 1/4W, FUSE
RF03	4822 111 90895	10K Ω ±5% 1/10W, CHIP
RF04	4822 116 82573	22K Ω ±1% 1/10W, CHIP
RF05	4822 111 90903	18K Ω ±5% 1/10W, CHIP

REF. DESIG.	PART NO.	DESCRIPTION
RF06 ~ RF12	4822 111 90895	10K Ω ±5% 1/10W, CHIP
RF13	4822 111 90918	4.7K Ω ±5% 1/10W, CHIP
RF15	4822 111 90897	1M Ω ±5% 1/10W, CHIP
RF22	4822 111 90967	4.7 Ω ±5% 1/4W, FUSE
RF23 ~ RF25	4822 111 90895	10K Ω ±5% 1/10W, CHIP
RF26	4822 111 90896	100K Ω ±5% 1/10W, CHIP
RF27	4822 116 82573	22K Ω ±1% 1/10W, CHIP
RF29	4822 111 90895	10K Ω ±5% 1/10W, CHIP
RF30	4822 111 90895	10K Ω ±5% 1/10W, CHIP
RF41 ~ RF48	4822 111 90895	10K Ω ±5% 1/10W, CHIP
RF49	4822 111 90906	2.2K Ω ±5% 1/10W, CHIP
RF99	4822 111 90895	10K Ω ±5% 1/10W, CHIP
RM01	4822 111 90919	47K Ω ±5% 1/10W, CHIP
RM02	4822 111 90918	4.7K Ω ±5% 1/10W, CHIP
RM03	4822 111 90918	4.7K Ω ±5% 1/10W, CHIP
RM06 ~ RM08	4822 111 90918	4.7K Ω ±5% 1/10W, CHIP
RM11	4822 111 90918	4.7K Ω ±5% 1/10W, CHIP
		PU16-SEMICONDUCTORS
DF02	4822 130 32868	DIODE MA153, CHIP
DM02	4822 130 32635	DIODE MA-151K, CHIP
DM03	4822 130 32866	DIODE MA151WA, CHIP
DM05	4822 130 32635	DIODE MA-151K, CHIP
DM06 ~ DM08	4822 130 32866	DIODE MA151WA, CHIP
Q501	4822 209 71001	I C SAA7210P
Q502	4822 209 72545	I C SAA7220P/B
Q503	4822 209 73952	I C MB81416C-15/MN4264P-15
Q504	4822 130 61438	TRANSISTOR 2SA1005 (L, K)
Q505	4822 130 90323	TRANSISTOR, DIGITAL DTC114TK
Q506	4822 130 90323	TRANSISTOR, DIGITAL DTC114TK
QF01	4822 209 62768	MICROPROCESSOR MC68HC11A0P
QF02	4822 209 62756	I C MC68HC24
QF04	4822 209 62757	I C M27128A-2F1
QF05	4822 209 62766	I C 74HC373
QF06	4822 209 51273	I C MSM2816A
QF08 ~ QF10	4822 209 82377	I C 74HC00
QF11	4822 209 73951	I C PST523D
QF12	4822 209 61494	I C 74HC74
QF13	4822 130 61436	TRANSISTOR, DIGITAL DTA114YK
QF14	4822 130 90449	TRANSISTOR, DIGITAL DTC144EK
QF16	4822 130 61436	TRANSISTOR, DIGITAL DTA114YK
QM01	4822 209 83803	I C LB1645N
QM02	4822 209 83803	I C LB1645N
QM03	4822 209 82377	I C 74HC00
QM04	4822 130 90449	TRANSISTOR, DIGITAL DTC-144
QM05 ~ QM07	4822 130 60941	TRANSISTOR, DIGITAL DTA114EK
QM08	4822 130 90449	TRANSISTOR, DIGITAL DTC-144
QM09	4822 130 90449	TRANSISTOR, DIGITAL DTC-144

REF. DESIG.	PART NO.	DESCRIPTION
		PU16-MISCELLANEOUS
J501	4822 265 40564	PLUG, 8P
J502		PLUG, 2P
J503	4822 267 40793	PLUG, 5P
J504	4822 265 30482	PLUG, 4P
JF01	4822 265 10216	PLUG, 10P
JF02	4822 265 40772	PLUG, 14P
JF04	4822 265 30482	PLUG, 4P
JM01		PLUG, 12P
L501	4822 152 20647	CHOKE COIL 2.2 μH
X501	4822 242 72395	CRYSTAL 11.2896MHZ
XF01	4822 242 73696	SERARIC VIBRATOR, 3P, 8.0MHZ
		PV16-SERVO CIRCUIT BOARD
		PV16-CAPACITORS
C101	4822 121 42327	FILM 470PF ±5%
C103	4822 122 40491	CERAMIC 0.022 μF +80%−20%
C110	4822 124 41539	ELECT 47 μF 16V
C112	5322 122 31626	CERAMIC 100PF ±5%
C113	4822 122 40491	CERAMIC 0.022 μF +80%−20%
C114	4822 122 40491	CERAMIC 0.022 μF +80%−20%
C128	4822 122 40491	CERAMIC 0.022 μF +80%−20%
C129	4822 121 43744	FILM 3600PF ±5%
C130	4822 121 43744	FILM 3600PF ±5%
C132	4822 122 40491	CERAMIC 0.022 μF +80%−20%
C133	4822 124 41539	ELECT 47 μF 16V
C134	4822 124 41539	ELECT 47 μF 16V
C135	4822 122 40491	CERAMIC 0.022 μF +80%−20%
C136	4822 122 40491	CERAMIC 0.022 μF +80%−20%
C137	4822 124 41539	ELECT 47 μF 16V
C138	4822 124 42033	ELECT 1.5 μF 50V BI-POLA
C145	4822 124 41539	ELECT 47 μF 16V
C146	4822 124 41539	ELECT 47 μF 16V
C147	4822 122 40491	CERAMIC 0.022 μF +80%−20%
C148	4822 122 40491	CERAMIC 0.022 μF +80%−20%
C150	4822 124 41539	ELECT 47 μF 16V
		PV16-RESISTORS
R134	4822 100 11373	4.7K Ω, TRIMMING
R136	4822 100 11352	22K Ω, TRIMMING
R164 ~ R166	4822 111 90967	4.7 Ω ±5% 1/4W, FUSE
		PV16-SEMICONDUCTORS
D131	4822 130 33305	DIODE 1SS176, ETC.
D132	4822 130 80272	ZENER DIODE 7.5V 04AZ7.5, ETC.
D133	4822 130 80272	ZENER DIODE 7.5V 04AZ7.5, ETC.
D141	4822 130 33305	DIODE 1SS176, ETC.
D142	4822 130 33305	DIODE 1SS176, ETC.
Q101	4822 209 62754	I C TDA5708
Q102	4822 130 61441	TRANSISTOR 2SD1862 (Q, R)
Q103	4822 209 83203	I C TDA5709
Q104	4822 130 60839	TRANSISTOR 2SC2458 (Y, GR)
Q105	4822 130 60107	TRANSISTOR 2SA1048 (Y, GR)
Q106	4822 209 62755	I C TCA0372
Q108	4822 209 83825	I C NJM39L05
Q141	4822 209 83627	I C NJM4560D

REF. DESIG.	PART NO.	DESCRIPTION
		PY16-DISPLAY CIRCUIT BOARD
		PY16-CAPACITORS
CY01	4822 122 40617	CERAMIC 0.1 μF +80%−20%
CY02	4822 124 90354	ELECT 100 μF 16V
CY04	4822 124 22571	ELECT 10 μF 50V
CY05	5322 122 31626	CERAMIC 100PF ±5%
CY06	5322 122 31626	CERAMIC 100PF ±5%
CY07	4822 124 22274	ELECT 4.7 μF 50V
CY11	4822 124 90354	ELECT 100 μF 16V
CY12	4822 122 40491	CERAMIC 0.022 μF +80%−20%
CY13	4822 122 40491	CERAMI 0.022 μF +80%−20%
CY41	4822 122 40491	CERAMIC 0.022 μF +80%−20%
CY51	4822 124 41539	ELECT 47 μF 16V
CY52	4822 124 41539	ELECT 47 μF 16V
CY61	4822 122 40491	CERAMIC 0.022 μF +80%−20%
CY62	4822 124 41536	ELECT 100 μF 35V
CY63	4822 124 41536	ELECT 100 μF 35V
CY73	4822 122 40491	CERAMIC 0.022 μF +80%−20%
		PY16-SEMICONDUCTORS
DY01 ~ DY05	4822 130 33305	DIODE 1SS176, ETC.
DY08	4822 130 33305	DIODE 1SS176, ETC.
DY09	4822 130 80319	ZENER DIODE 9.1V 04AZ9.1, ETC.
DY41 ~ DY44	4822 130 80326	L. E. D. LT3D8B
DY51 ~ DY53	4822 130 33305	DIODE 1SS176, ETC.
DY61	4822 130 80839	DIODE S5688G
DY62	4822 130 80839	DIODE S5688G
QY01	4822 209 62769	MICROPROCESSOR UPD7537A
QY05	4822 209 62763	I C TC74HC164BP
QY06 ~ QY13	4822 130 61186	TRANSISTOR, DIGITAL DTA114TS
QY41	4822 209 62767	I C 74HC595
QY42 ~ QY45	4822 130 61189	TRANSISTOR, DIGITAL DTC114TS
QY51	4822 130 42715	TRANSISTOR 2SA608SP, ETC.
QY52	4822 130 61189	TRANSISTOR, DIGITAL DTC114TS
QY53	4822 130 61186	TRANSISTOR, DIGITAL DTA114TS
QY54	4822 130 61441	TRANSISTOR 2SD1862 (Q, R)
		PY16-MISCELLANEOUS
JY01	4822 265 10216	PLUG, 10P
JY02	4822 265 30482	PLUG, 4P
SY01 ~ SY09	4822 276 12455	PUSH SWITCH
VY01	4822 130 90884	DISPLAY UNIT, 5-BT-83GK
VY02	4822 130 90884	DISPLAY UNIT, 5-BT-83GK
XY01	4822 242 73695	SERAMIC VIBRATOR, 590kHz
ZY01	4822 130 82197	PHOTO UNIT, IR RECEIVER

NOTE ON SAFETY:
Symbol ⚠ Fire or electrical shock hazard. Only original parts should be used to replace any part marked with symbol ⚠ . Any other component substitution (other than original type), may increase risk of fire or electrical shock hazard.