■ Measurements and Adjustments

Warning: This product uses a laser diode. Refer to caution statements on page 2.

Measuring Instruments and Special Tools

- Test discs
1. Playability test disc (SZZP1054C)
2. Uneven test disc (SZZP1056C)

- Musical program disc (ordinary)
- DC electronic voltmeter (EVM)

PREPARATION

1. Remove the loading unit as shown in Fig. 1.
   (Refer to "Handling of the loading unit" on pages 28, 29.)
2. Set the unit in the test mode as follows: hold the STOP and PLAY keys on and set the POWER switch to ON.
   (Refer to "Test mode setting" on page 21.)
3. Follow the adjustment procedure.

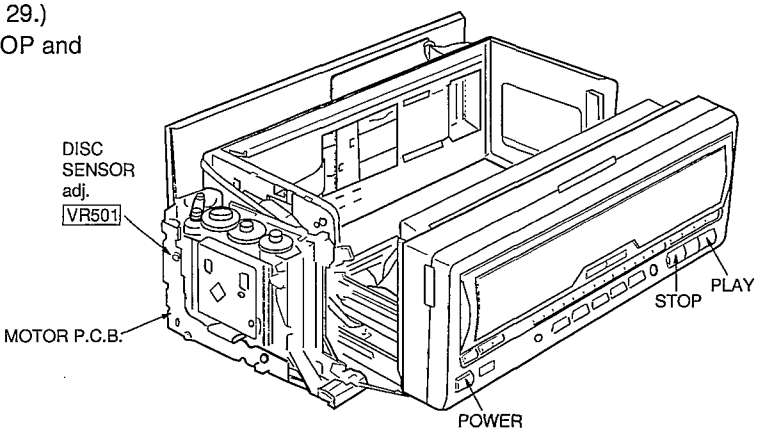

Fig. 1

(1) DISC SENSOR ADJUSTMENT

1. Unsolder the short land to open circuit as shown in Fig. 2.
2. Connect the DC electronic voltmeter across **TP501** (+) and **TP502** (−) on the motor P.C.B. as shown in Fig. 2.
3. Adjust **VR501** so that the DC electronic voltmeter read **2.8± 0.1V.**
4. Short-circuit the land by soldering after adjustment as shown in Fig. 2.

(2) CHECK OF PLAY OPERATION AFTER ADJUSTMENT

*** Checking Skip Search**

1. Play an ordinary musical program disc.
2. Press the skip button to check for normal skip search operation (in both the forward and reverse directions).

*** Checking Manual Search**

1. Play an ordinary musical program disc.
2. Press the manual search button to check for smooth manual search operations at either low or high speed (in both the forward and reverse directions).

*** Checking Playability**

1. Play the 0.7 mm black dot and the 0.7 mm wedge on the playability test disc (SZZP1054C) and verify that no sound skip or noise occurs.
2. Play the middle tracks of the uneven test disc (SZZP1056C) and verify that no sound skip or noise occurs.

• Adjustment points

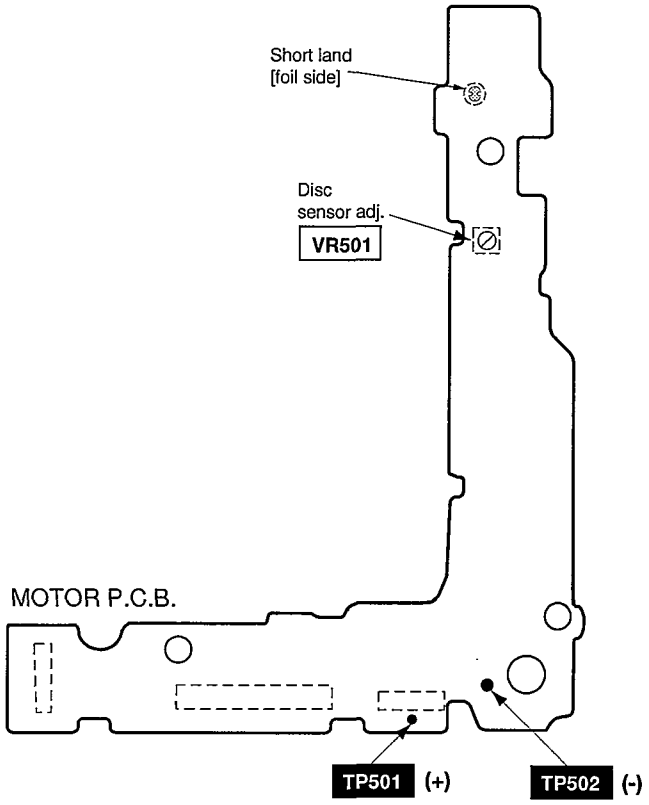

Fig. 2

• Terminal guide of IC's, transistors and diodes.

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 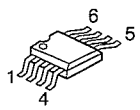 </td>
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 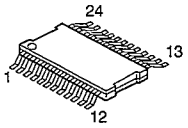 </td>
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 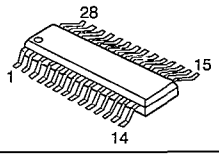 </td>
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 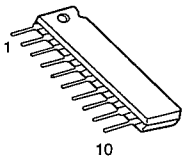 </td>
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 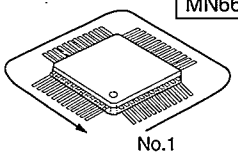 </td>
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 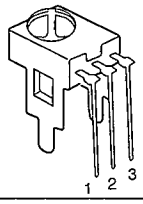 </td>
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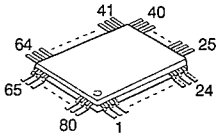
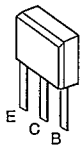
  </td>
<td>  </td>
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 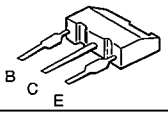 </td>
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 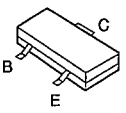 </td>
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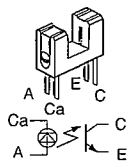
<td>  </td>
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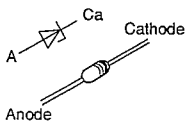
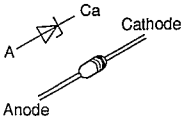
  </td>
<td>  </td>
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 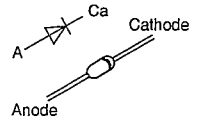 </td>
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 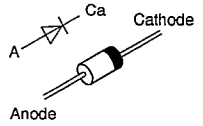 </td>
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 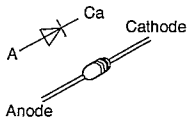 </td>
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 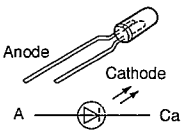 </td>
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 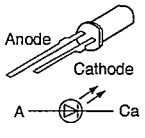 </td>
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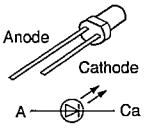
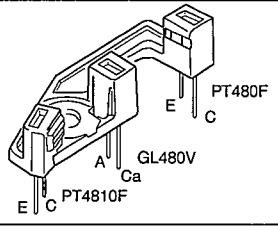
  </td>
<td colspan="2">  </td>
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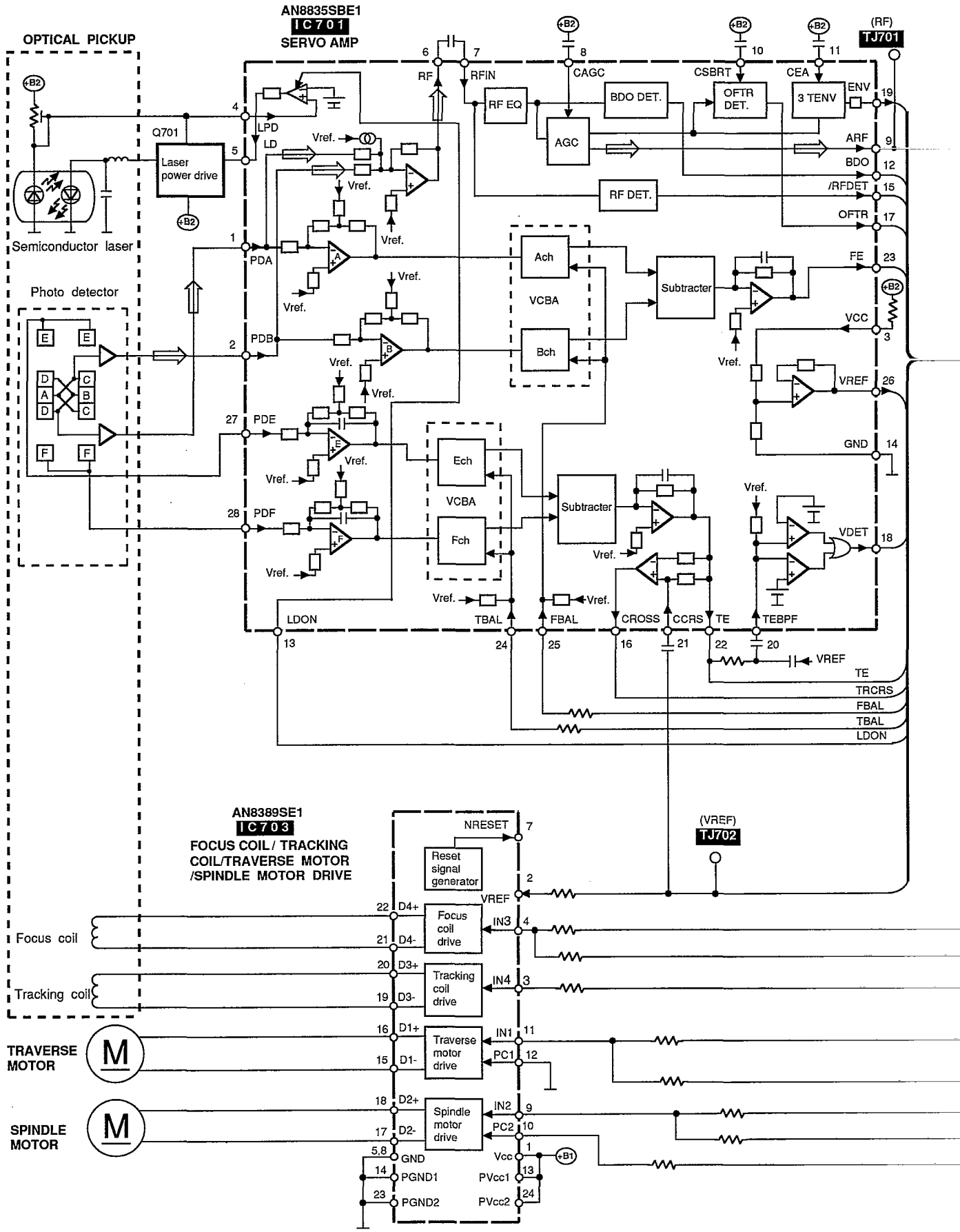
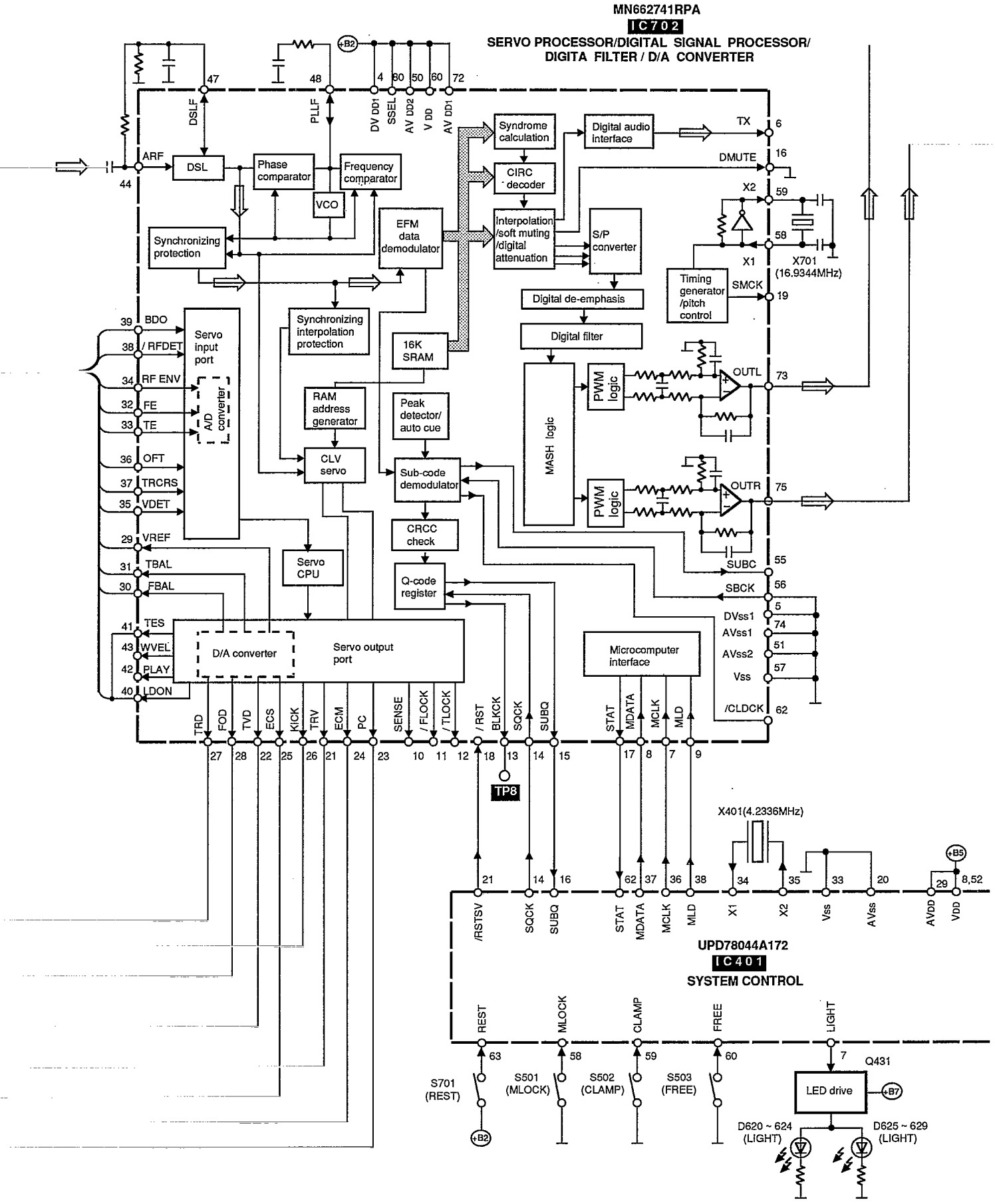
Block Diagram



● Signal line ⇨ : Audio signal



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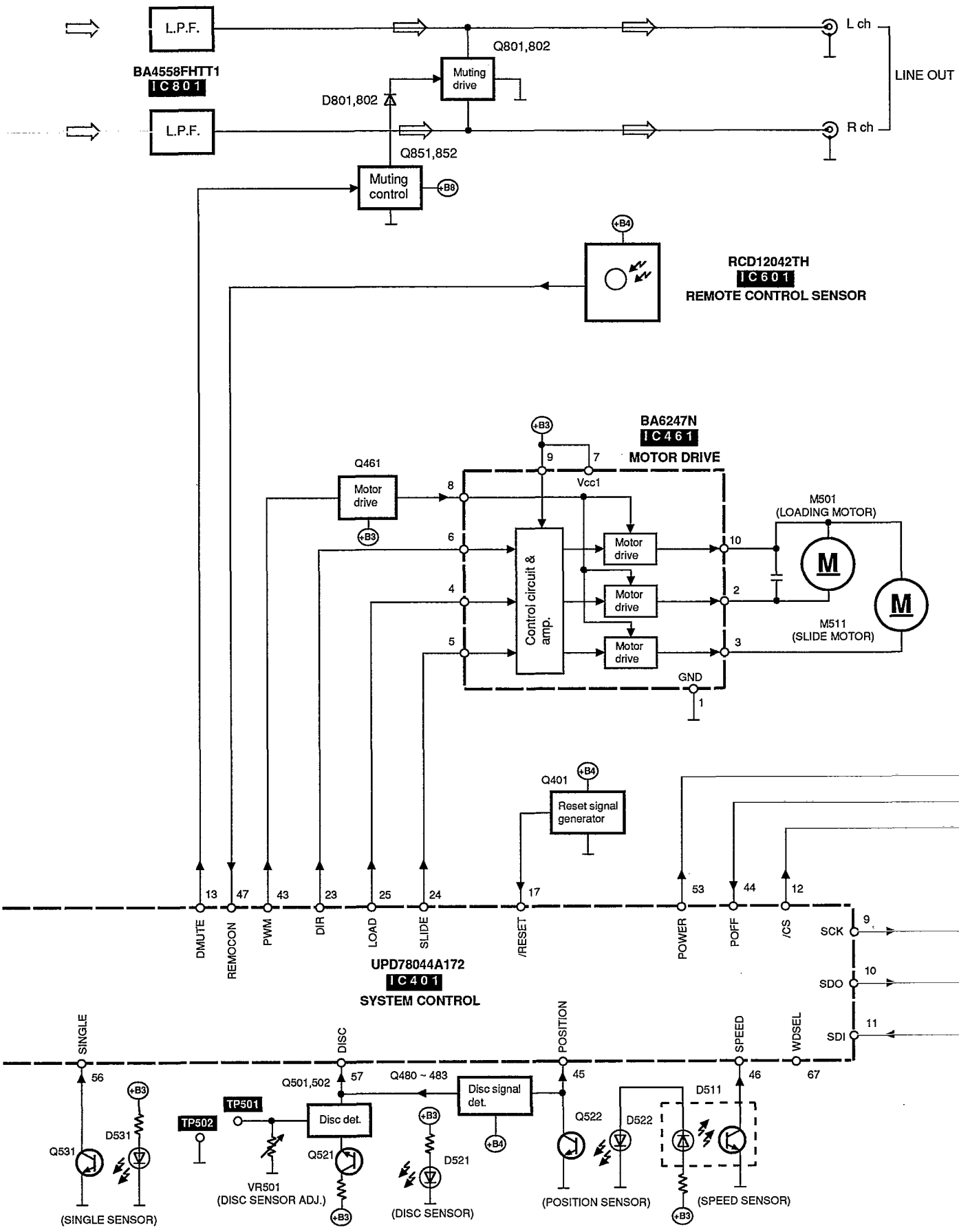

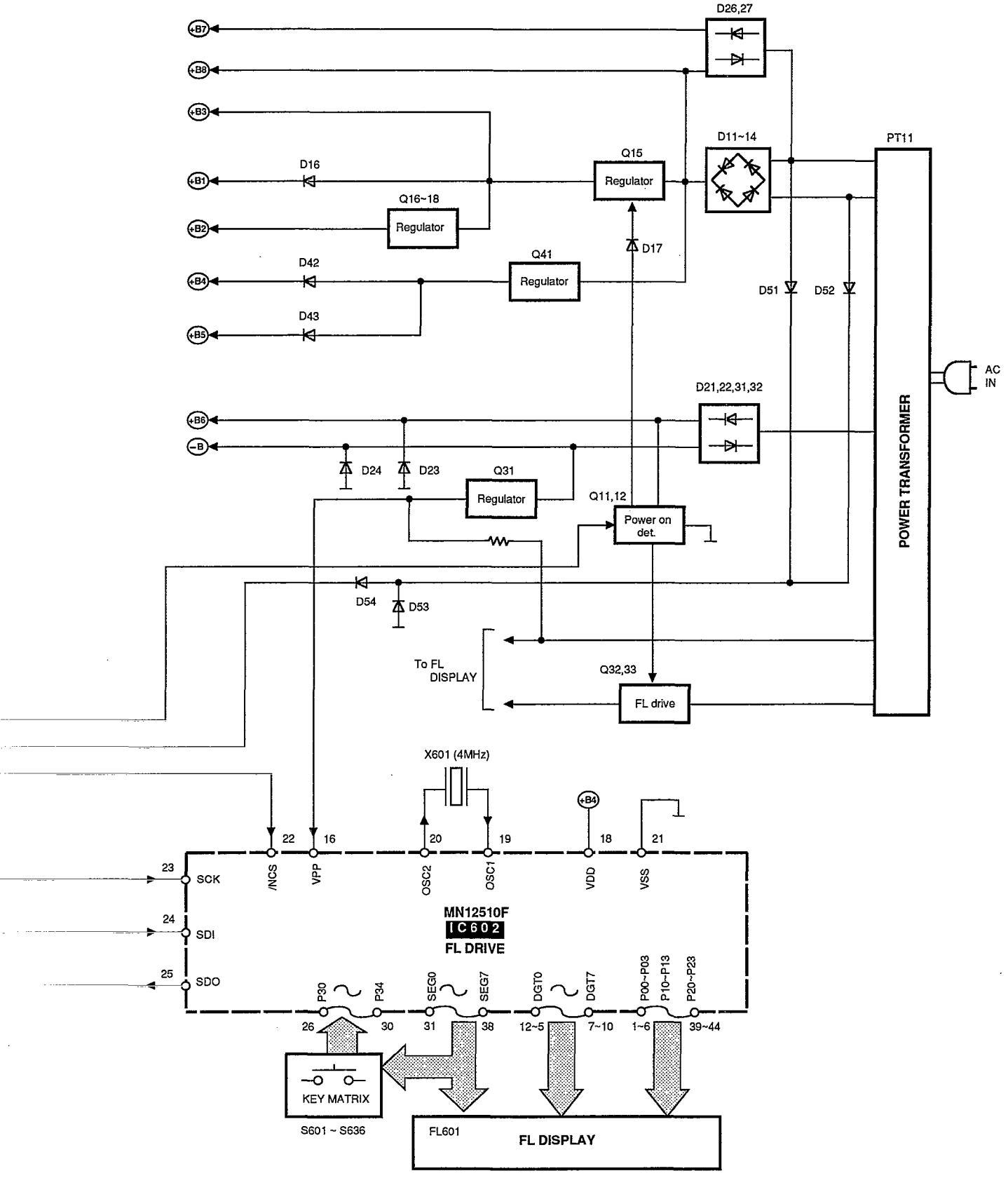
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+B7
+B8
+B3
D11~14
PT11
Q15
D16
Regulator
+B1
Q16~18
Regulator
+B2
D17
Q41
D42
Regulator
+B4
D51
D52
D43
+B5
AC
IN
D21,22,31,32
+B6
-B
POWER TRANSFORMER
D24
D23
Q31
Regulator
Q11,12
Power on
det.
D54
D53
To FL
DISPLAY
Q32,33
FL drive
X601 (4MHz)
+B4
22
16
20
19
18
21
23
SCK
24
SDI
25
SDO
/NCS
VPP
OSC2
OSC1
VDD
VSS
MN12510F
IC602
FL DRIVE
P30
P34
SEG0
SEG7
DGT0
DGT7
P00~P03
P10~P13
P20~P23
26
30
31
38
12~5
7~10
1~6
39~44
KEY MATRIX
S601 ~ S636
FL601
FL DISPLAY

■ Terminal Guide

● IC401 (UPD78044A172): System control

Pin No.	Mark	I/O Division	Function
1 ~ 6	NONE	—	Not connected
7	LIGHT	O	Not used, open
8	VDD	I	Power supply terminal
9	SCK	O	Serial clock output terminal
10	SDO	O	Serial data output terminal
11	SDI	I	Serial data input terminal
12	/CS	O	Chip select terminal
13	DMUTE	O	Muting control signal
14	SQCK	O	sub-code Q register clock
15	NC	—	Not connected
16	SUBQ	I	Sub-code Q data
17	/RESET	I	Reset signal input
18	NONE	—	Not connected
19	KBDATA	O	Keyboard data signal (Not used open)
20	AVSS	—	GND terminal
21	/RSTSV	O	Reset signal output
22	/LCK	O	Not used, open
23	DIR	O	Motor control signal
24	SLIDE	O	Motor control signal
25	LOAD	O	Motor control signal
26	KBCS	O	Chip select terminal (Not used, open)
27	SEL 1	—	Not used, connected to GND
28	KBCLK	O	Serial clock terminal (Not used, open)

Pin No.	Mark	I/O Division	Function
29	AVDD	I	Power supply terminal
30	AVREF	I	Power supply terminal (Not used, connected to GND)
31	XT1	—	Not used, connected to GND
32	XT2	—	Not used, open
33	VSS	—	GND terminal
34	X1	I	Crystal Osc terminal (f=4.2336MHz)
35	X2	O	
36	MCLK	O	Command clock signal
37	MDATA	O	Command data signal
38	MLD	O	Command load signal ("L" LOAD)
39	EPCLK	O	Not used, open
40	EPSO	I	Not used, open
41	/EPCS	O	Not used, open
42	/EPHOLD	O	Not used, open
43	PWM	O	Motor control signal
44	POFF	I	Power det. terminal
45	POSITION	I	Rotary tray position det. terminal
46	SPEED	I	Loading motor speed sensor signal
47	REMOCON	I	Remote control signal input
48	IC	—	Not used, connected to GND
49 ~ 51	NONE	—	Not connected
52	VDD	I	Power supply terminal
53	POWER	O	Power ON/OFF output terminal

Pin No.	Mark	I/O Division	Function
54	EPSI	O	Serial data input terminal (Not used, OPEN)
55	NONE	—	Not connected
56	SINGLE	I	Disc slot det. terminal for single play
57	DISC	I	Disc control signal
58	MLOCK	I	Mechanism det. terminal (S501)
59	CLAMP	I	Mechanism det. terminal (S502)
60	FREE	I	Mechanism det. terminal (S503)
61	PHSEL1	—	Not connected
62	STAT	I	Status signal (CRC, CUE, CLVS, TTSTOP, FCLV, SQCK)
63	REST	I	Rest position det.

Pin No.	Mark	I/O Division	Function
64	PHSEL2	—	Not connected
65	STP 1	—	Not used, connected to GND
66	STP 2	—	Not used, connected to GND
67	WDSEL	—	Not connected
68	LED 3	O	LED drive signal
69 • 70	NONE	—	Not connected
71	VPP	I	Power supply terminal (Not used, connected to GND)
72 ~ 80	NONE	—	Not connected

◐ IC602 (MN12510F): FL drive

Pin No.	Mark	I/O Division	Function
1 • 2	P21 • P20	O	Segment signal of FL display
3 ~ 6	P03 ~ P00	O	Segment signal of FL display
7 ~ 10	DGT7 ~ DGT4	O	Grid signal of FL display
11	NC	—	Not connected
12 ~ 15	DGT3 ~ DGT0	O	Grid signal of FL display
16	VPP	I	Power supply terminal
17	NC	—	Not connected
18	VDD	I	Power supply terminal
19	OSC 1	I	Crystal Osc terminal (f=4.2326MHz)
20	OSC 2	O	

Pin No.	Mark	I/O Division	Function
21	VSS	—	GND terminal
22	/NCS	I	Chip select terminal
23	SCK	I	Serial clock input terminal
24	SDI	I	Serial data input terminal
25	SDO	O	Serial data output terminal
26 ~ 30	P30 ~ P34	I	Key return signal
31 ~ 38	SEG 0 ~ SEG 7	O	Segment signal of FL display and key scan signal
39 ~ 42	P 10 ~ P 13	O	Segment signal of FL display and key scan signal
43 • 44	P 23 • P 22	O	Segment signal of FL display and key scan signal

● IC702 (MN662741RPA): Servo processor/ digital signal processor/ digital filter D/A converter

Pin No.	Mark	I/O Division	Function
1	BCLK	O	Serial bit clock terminal
2	LRCK	O	L/R discriminating signal
3	SRDATA	O	Serial data (Not used, open)
4	DV_{DD1}	I	Power supply (digital circuit) terminal
5	DV_{SS} 1	—	GND (digital circuit) terminal
6	TX	O	Digital audio interface signal
7	MCLK	I	Command clock signal
8	MDATA	I	Command data signal
9	MLD	I	Command load signal ("L":LOAD)
10	SENSE	O	Sense signal (OFT, FESL, NACEND, NAJEND, POSAD, SFG)
11	/FLOCK	O	Optical servo condition (focus) ("L": lead-in)
12	/TLOCK	O	Optical servo condition (tracking) ("L": lead-in)
13	BLKCK	O	Sub-code block clock (f=75Hz) (Not used, open)
14	SQCK	I	Sub-code Q register clock
15	SUBQ	O	Sub-code Q data
16	DMUTE	I	Muting input ("H": MUTE) (Not used, connected to GND)
17	STAT	O	Status signal (CRC, CUE, CLVS, TTSTOP, FCLV, SQCK)
18	/RST	I	Reset signal ("L": reset)
19	SMCK	O	System clock (f=4.2336MHz) (Not used, open)
20	PMCK	O	Frequency division clock signal (No used, open) ($f=\frac{1}{1.92}$ x ck=88.2kHz)
21	TRV	O	Traverse servo control

Pin No.	Mark	I/O Division	Function
22	TVD	O	Traverse drive signal
23	PC	O	Turntable motor drive signal ("L": ON)
24	ECM	O	Turntable motor drive signal (Forced mode)
25	ECS	O	Turntable motor drive signal (Servo error signal)
26	KICK	O	Kick pulse output
27	TRD	O	Tracking drive signal output
28	FOD	O	Focus drive signal output
29	VREF	I	D/A drived output (TVD, ECS, TRD, FOD, FBAL, TBAL) normal voltage input terminal
30	FBAL	O	Focus balance adj. output (Not used, open)
31	TBAL	O	Tracking balancef adj. output
32	FE	I	Focus error signal (analog input)
33	TE	I	Tracking error signal (analog input)
34	RFENV	I	RF envelope signal
35	VDET	I	Oscillation det. signal ("H": det.)
36	OFT	I	Off track signal ("H": Off track)
37	TRCRS	I	Track cross signal input
38	/RFDET	I	RF detection signal ("L": detection)
39	BDO	I	Dropout detection signal ("H": dropout)
40	LDON	O	Laser power control ("H": ON)
41	TES	O	Tracking error shunt output ("H": dropout)
42	PLAY	O	Play signal ("H": play) (Not used, open)

Pin No.	Mark	I/O Division	Function
43	WVEL	O	Double velocity status signal ("H": double) (Not used, open)
44	ARF	I	RF signal input
45	IREF	I	Reference current input
46	DRF	I	DSL bias terminal (Not used, open)
47	DSLF	I/O	DSL loop filter terminal
48	PLLF	I/O	PLL loop filter terminal
49	VCOF	I/O	VCO loop filter terminal
50	AVDD2	I	Power supply (analog circuit) terminal(2)
51	AVss2	—	GND (analog circuit) terminal
52	EFM	O	EFM signal (Not used, open)
53	PCK	O	PLL extract clock (f= 4.3218MHz) (Not used, open)
54	PDO	O	Phase comparated signal of EFM and PCK (Not used, open)
55	SUBC	O	Sub-code serial output clock (Not used, open)
56	SBCK	I	Sub-code serial input data (Not used, connected to GND)
57	V ss	—	GND terminal
58	X1	I	Crystal oscillator terminal (f=16.9344MHz)
59	X2	O	
60	VDD	I	Reset signal ("L": reset)
61	BYTCK	O	Byte clock signal (Not used, open)
62	/CLDCK	O	Sub-code frame clock signal (f CLDCK=7.35KHz: Normal) (Not used, open)
63	FCLK	O	Crystal frame clock (Not used, open)
64	IPFLAG	O	Interpolation flag terminal (Not used, open)

Pin No.	Mark	I/O Division	Function
65	FLAG	O	Flag terminal (Not used, open)
66	CLVS	O	Turntable servo phase synchro signal ("H": CLV, "L": Rough servo) (Not used, open)
67	CRC	O	Sub-code CRC check terminal ("H": ON, "L": NG) (Not used, open)
68	DEMPH	O	De-emphasis ON signal ("H": ON) (Not used, open)
69	RESY	O	Re-synchronizing signal of frame sync. (Not used, open)
70	/RST2	I	Reset terminal after " MASH" circuit (Not used, connected to power supply)
71	/TEST	I	Test terminal (Normal: "H") (Not used, connected to power supply)
72	AVDD1	I	Power supply (analog circuit) terminal (1)
73	OUTL	O	Lch audio signal
74	AV ss1	—	GND (analog circuit) terminal (1)
75	OUTR	O	Rch audio signal
76	RSEL	I	Polarity direction control terminal of RF signal (Not used, connected to power supply
77	CSEL	I	Frequency control terminal of crystal oscillator (Not used, connected to GND)
78	PSEL	I	Test terminal (Normal:"L") (Not used, connected to GND)
79	MSEL	I	"SMCK" terminal frequency select ("L": SMCK=4.2336MHz) (Not used, connected to GND)
80	SSEL	O	"SUBQ" terminal mode select ("H": Q code buffer) (Not used, connected to power supply

● IC701 (AN8835SBE1): Servo amp

Pin No.	Mark	I/O Division	Function
1	PDA	I	Focus signal input terminal 1 (Ach)
2	PDB	I	Focus signal input terminal 2 (Bch)
3	VCC	I	Power supply terminal
4	LPD	I	Laser PD signal
5	LD	O	Laser power auto control output
6	RF	O	RF amp terminal
7	RF IN	I	AGC input terminal
8	CAGC	I	AGC detection capacitor input
9	ARF	O	RF signal
10	CSBRT	I	OFTR capacitor connection terminal
11	CEA	I	HPF-AMP capacitor connection terminal
12	BDO	O	Dropout detection control
13	LDON	I	LD APC ON/OFF ("H": ON, "L": OFF)
14	GND	—	GND terminal

Pin No.	Mark	I/O Division	Function
15	/RFDET	O	RF det. signal ("L": det.)
16	CROSS	O	Tracking error zero cross output
17	OFTR	O	Off track detection ("H": det.)
18	VDET	O	Oscillation det. signal ("H": det.)
19	ENV	O	Envelope output terminal
20	TEBPF	I	Oscillation detect input terminal (Not used, open)
21	CCRS	I	CROSS capacitor connection terminal
22	TE	O	Tracking error signal
23	FE	O	Focusing error signal
24	TBAL	I	Tracking balance adj. input
25	FBAL	I	Focus balance adj. input
26	VREF	O	Reference voltage output
27	PDE	I	Tracking signal input terminal 1 (Ech)
28	PDF	I	Tracking signal input terminal 2 (F ch)

● IC703(AN8389SE1): Focus coil/ tracking coil/ traverse motor/ spindle motor drive

Pin No.	Mark	I/O Division	Function
1	Vcc	I	Power supply terminal
2	VREF	I	Reference voltage input
3	IN4	I	Motor driver (4) input
4	IN3	I	Motor driver (3) input
5	GND	—	GND terminal
6	NC	—	Not used, connected to GND
7	NRESET	O	Reset terminal (Not used, open)
8	GND	—	GND terminal
9	IN2	I	Motor driver (2) input
10	PC2	I	PC2 (power cut)input
11	IN1	I	Motor driver (1) input
12	PC1	I	PC1 (power cut) input (Not used, connected to GND)

Pin No.	Mark	I/O Division	Function
13	PVcc1	I	Driver power supply (1)
14	PGND1	—	Driver GND terminal (1)
15	D1-	O	Motor driver (1) output terminal (-)
16	D1+	O	Motor driver (1) output terminal (+)
17	D2-	O	Motor driver (2) output terminal (-)
18	D2+	O	Motor driver (2) output terminal (+)
19	D3-	O	Motor driver (3) output terminal (-)
20	D3+	O	Motor driver (3) output terminal (+)
21	D4-	O	Motor driver (4) output terminal (-)
22	D4+	O	Motor driver (4) output terminal (+)
23	PGND2	—	Driver GND terminal (2)
24	PVcc2	I	Driver power supply (2)

■ Schematic Diagram (Parts list on pages 70~73.)

(This schematic diagram may be modified at any time with the development of new technology.)

Note:

- **S501**: Lock det. switch. (MLOCK)
- **S502**: Clamp det. switch. (CLAMP)
- **S503**: Clamp det. switch. (FREE)
- **S601**: Stop (■) switch.
- **S602, 603**: Disc skip switches. (S602: +, S603: –)
- **S604**: Programming (PROGRAM) switch.
- **S605**: Single play (SINGLE ▶) switch.
- **S606**: Pause (▮▮) switch.
- **S607, 608**: Track skip switches. (S607: ▶▶| , S608: |◀◀)
- **S609**: Direct programming (DIRECT) switch
- **S610**: Power "STANDBY ⏻ /ON" (POWER, STANDBY ⏻ ON) switch.
- **S611**: Play (▶) switch.
- **S612, 613**: Search (SEARCH) switches. [S612: ▶▶, S613: ◀◀]
- **S614**: Group enter (GROUP ENTER) switch.
- **S615**: OPEN/CLOSE det. switch.
- **S616~620**: Disc group (DISC GROUPING PLAY) switches.
  [S616: A, S617: B, S618: C, S619: D, S620: E]
- **S621~631**:
  Numeric (1~9, 0, ≥ 10) switches.
  (S621: (0), S622: (1), S623 (2), S624: (3), S625: (4), S626: (5), S627: (6), S628: (7), S629: (8), S630: (9), S631: (≥ 10))
- **S633**: Disc selector (DISC) switch .
- **S634**: Disc enter (DISC ENTER) switch.
- **S636**: ID scan (ID SCAN) switch.
- **S701**: Rest detector.
- The voltage value and waveforms are the reference voltage of this unit measured by DC electronic voltmeter (high impedance) and oscilloscope on the basis of chassis.
  Accordingly, there may arise some error in voltage values and waveforms depending upon the internal impedance of the tester or the measuring unit.

* The parenthesized are the values of voltage generated during playing (Test disc 1kHz, L+R, 0dB), others are voltage values in stop mode.

- Important safety notice:
  Components identified by ⚠ mark have special characteristics important for safety. Furthermore, special parts which have purposes of fire-retardant (resistors), high-quality sound (capacitors), low-noise (resistors), etc. are used as occasion calls. When replacing any of components, be sure to use only manufacturer's specified parts shown in the parts list.
- ⎓ / ⎓: Positive voltage lines and negative voltage lines.
- ⟹ : audio signal lines.

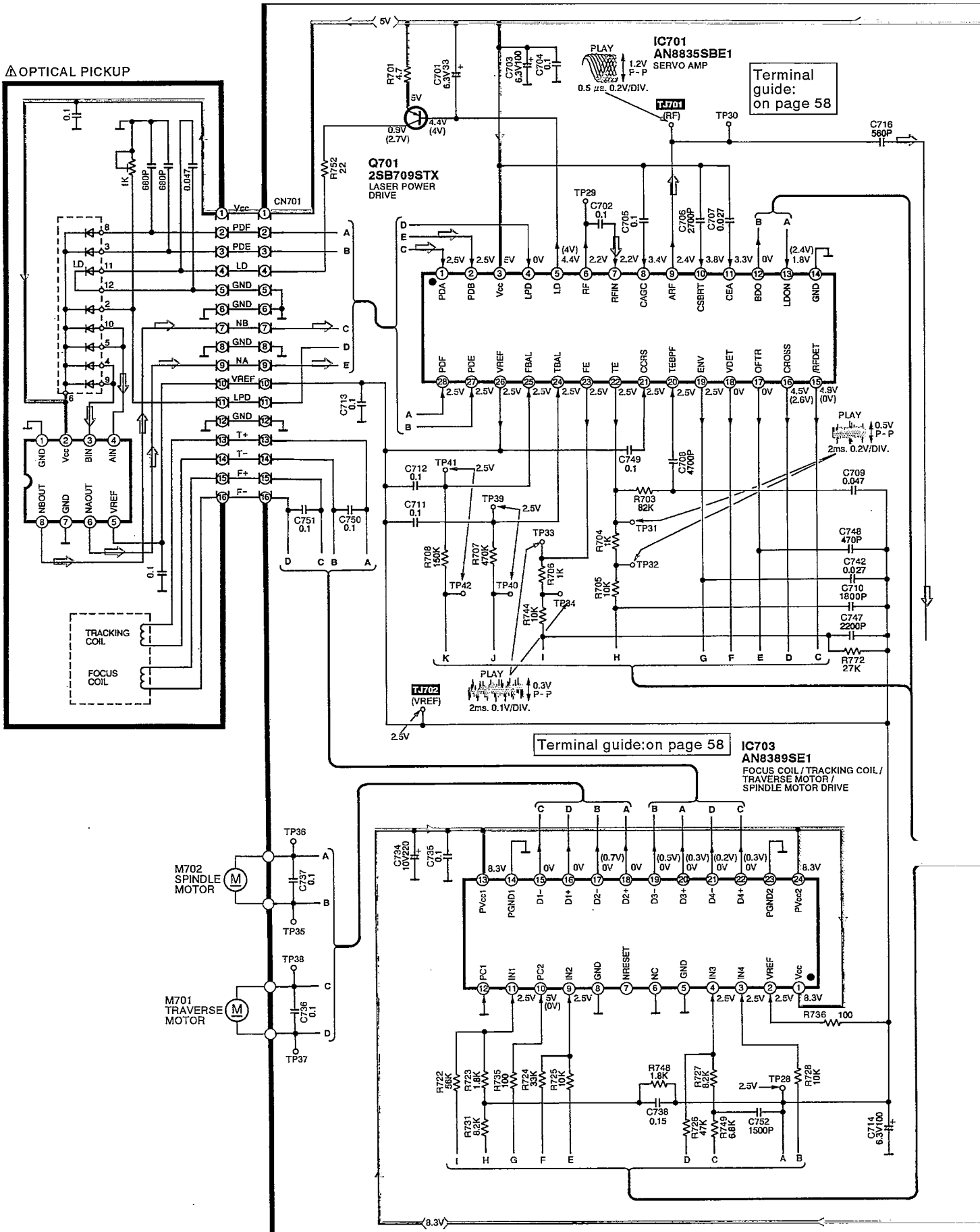
Caution!

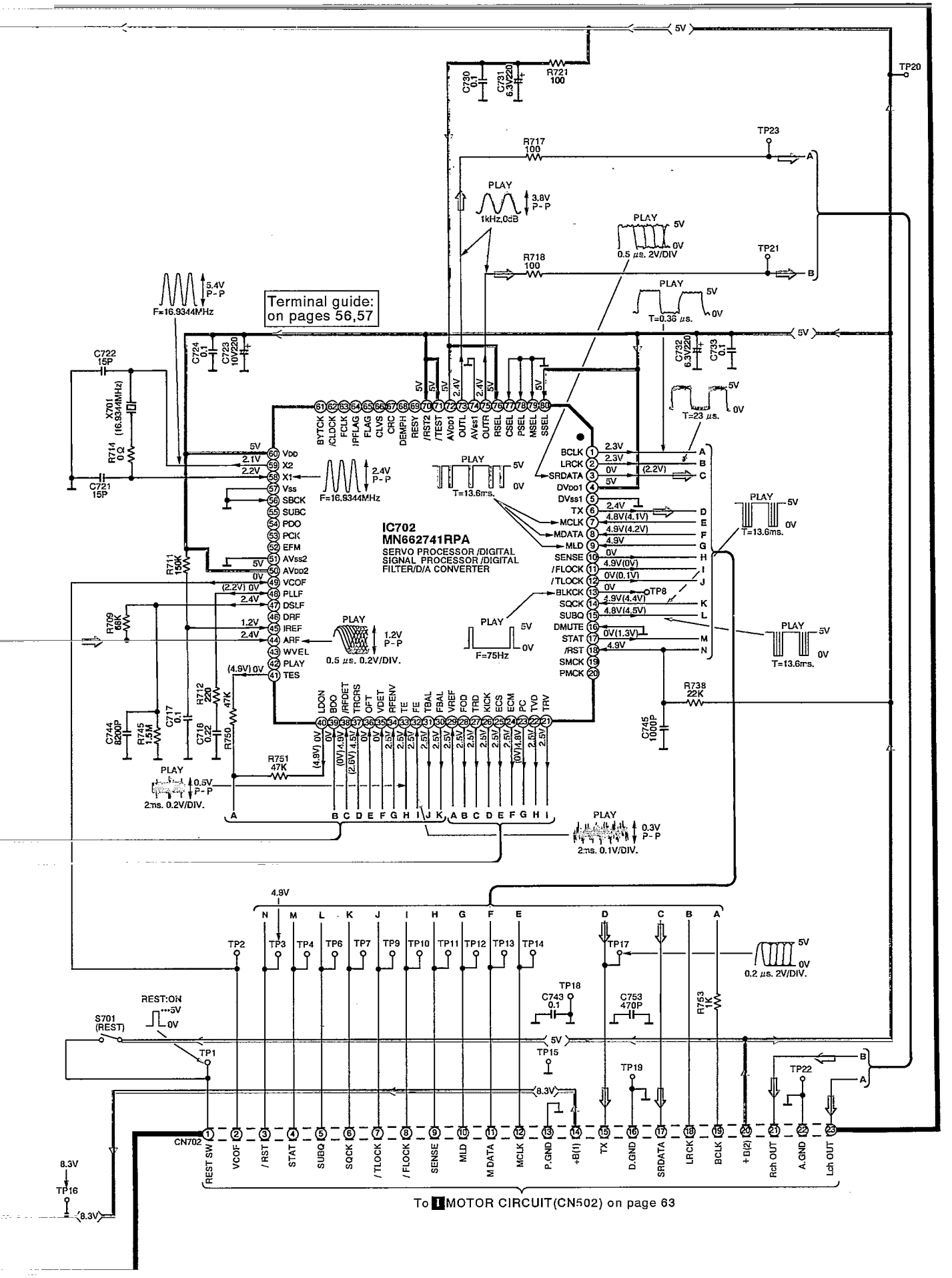
IC and LSI are sensitive to static electricity.
Secondary trouble can be prevented by taking care during repair.

- Cover the parts boxes made of plastics with aluminum foil.
- Ground the soldering iron.
- Put a conductive mat on the work table.
- Do not touch the pins of IC or LSI with fingers directly.

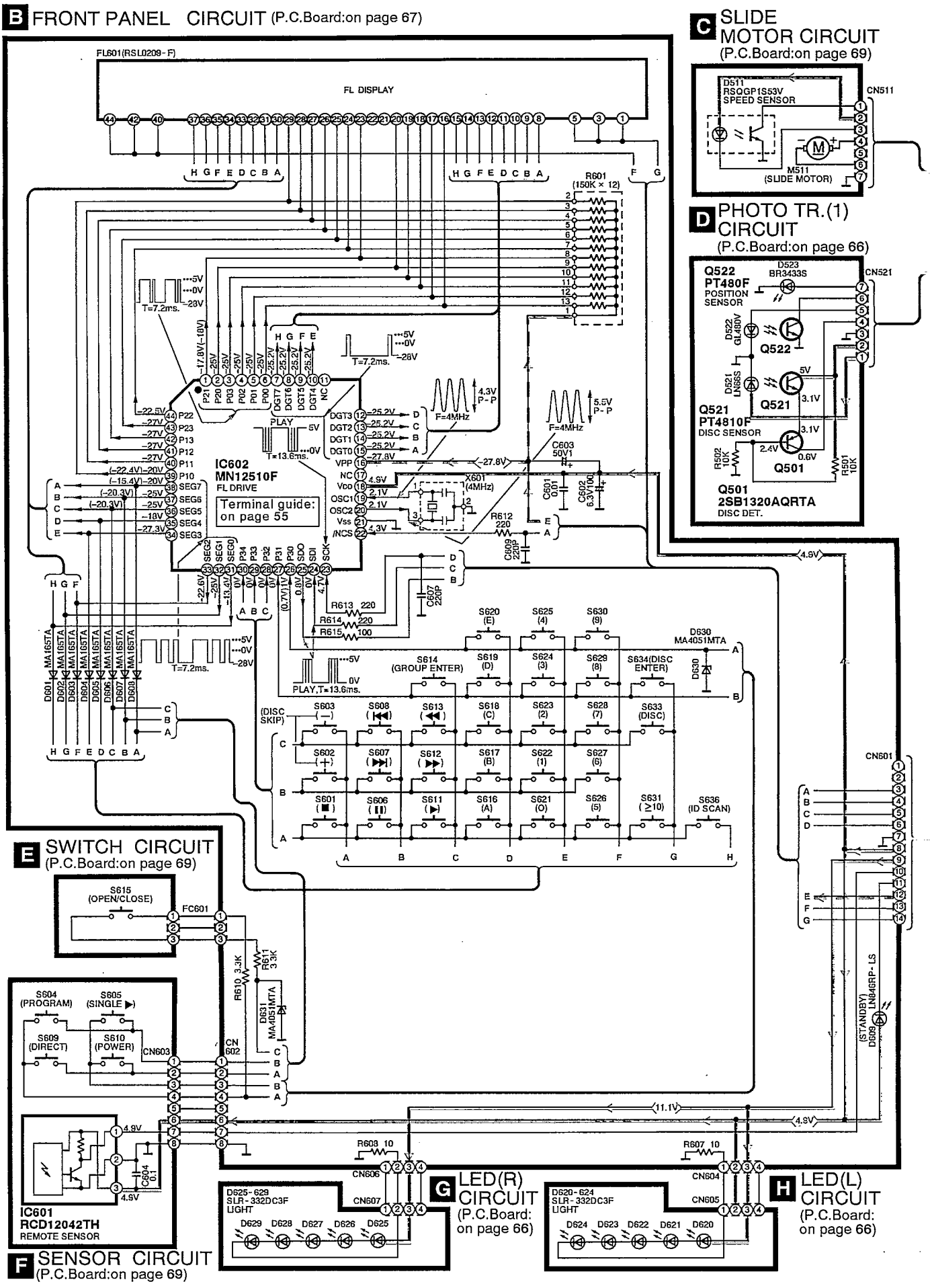
• ⟹ : Audio signal lines.

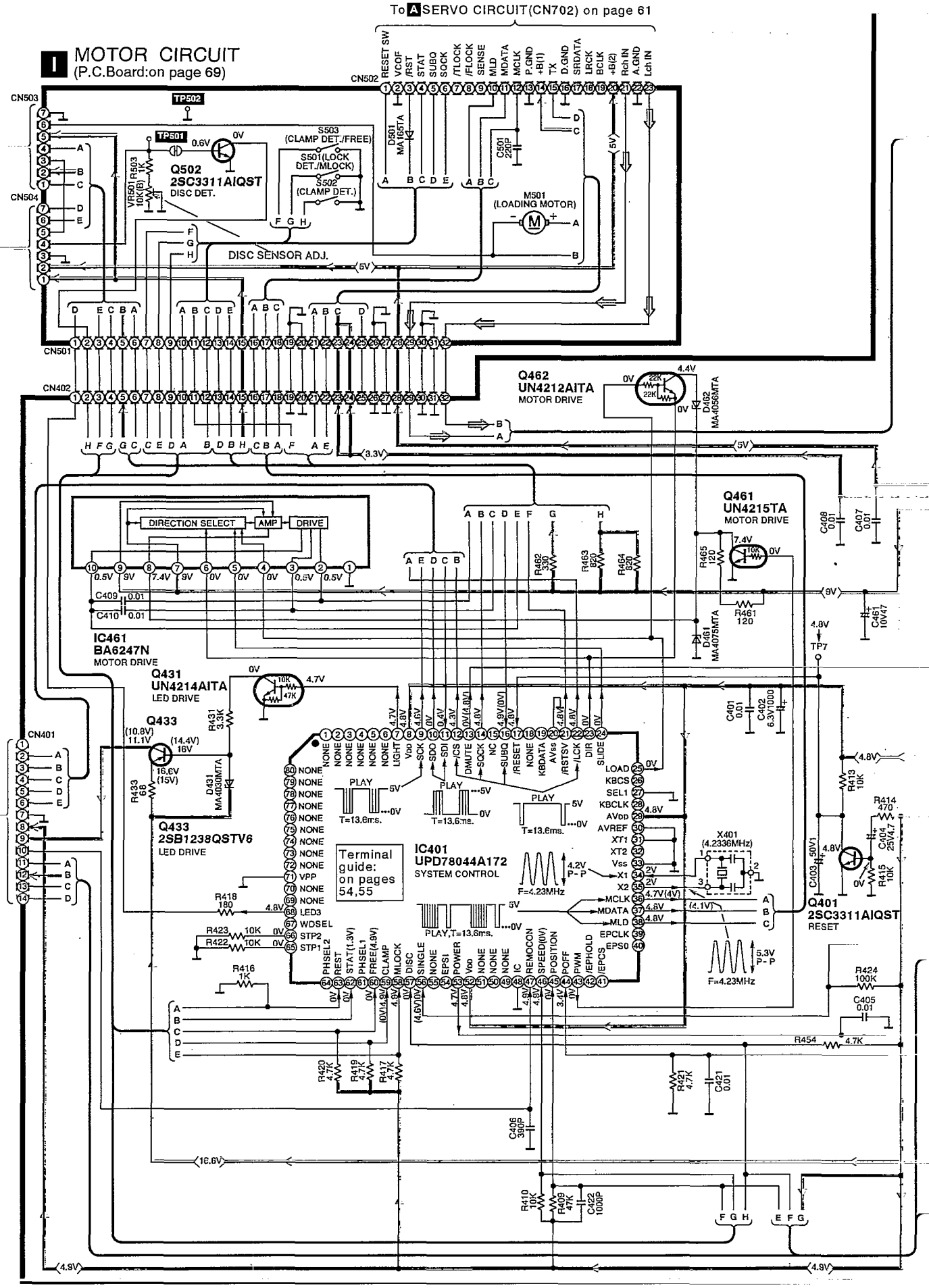
A SERVO CIRCUIT (P.C.Board:on page 66)



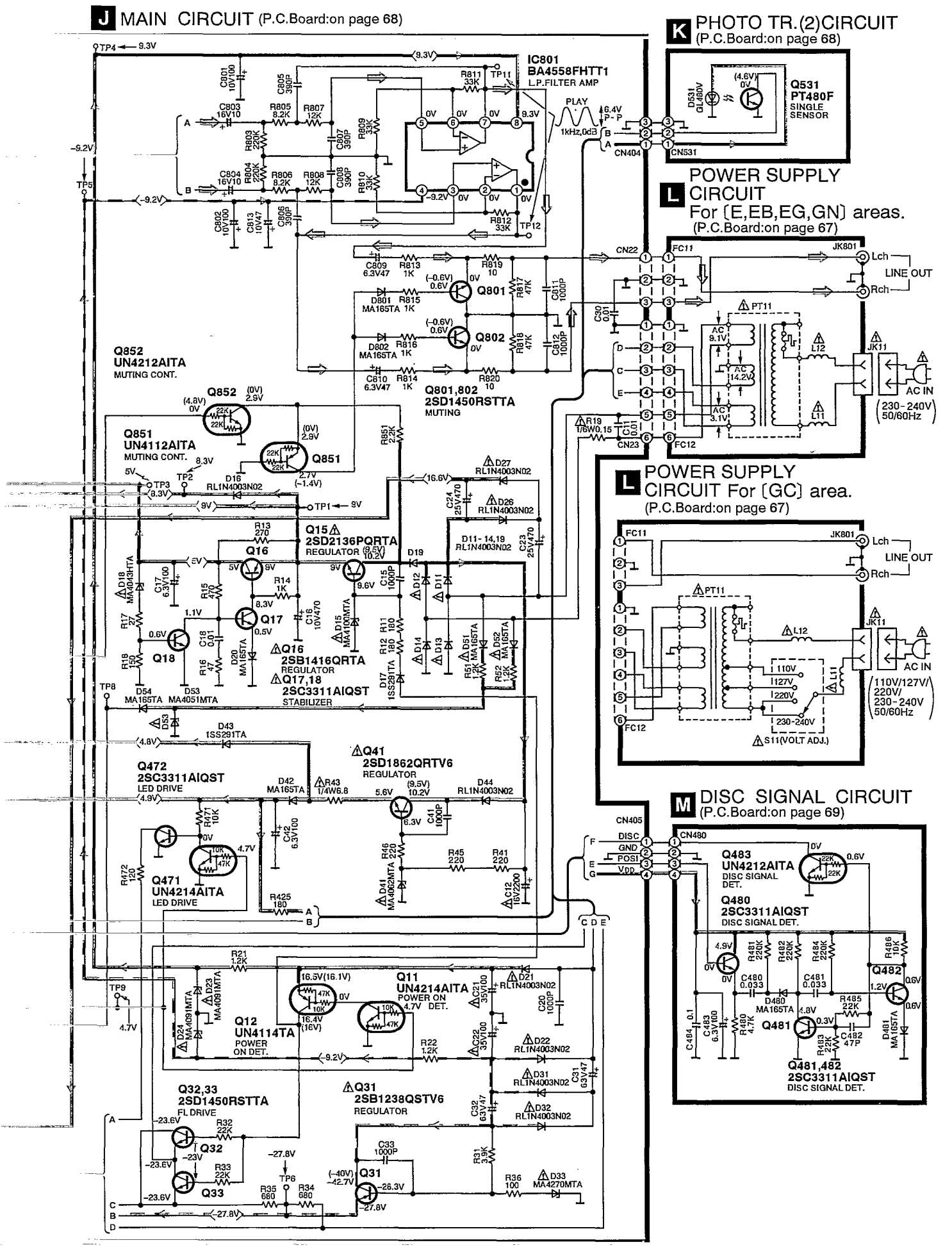

Terminal guide:
on pages 56,57
IC702
MN662741RPA
SERVO PROCESSOR /DIGITAL
SIGNAL PROCESSOR /DIGITAL
FILTER/D/A CONVERTER
F=16.9344MHz
F=75Hz
REST:ON
S701
(REST)
CN702
REST SW
VCOF
/ RST
STAT
SUBQ
SQCK
/ TLOCK
/ FLOCK
SENSE
MLD
M.DATA
MCLK
P.GND
+B(I)
TX
D.GND
SRDATA
LRCK
BCLK
+B(2)
Rch OUT
A.GND
Lch OUT
To MOTOR CIRCUIT(CN502) on page 63

● ⟹ : Audio signal lines.

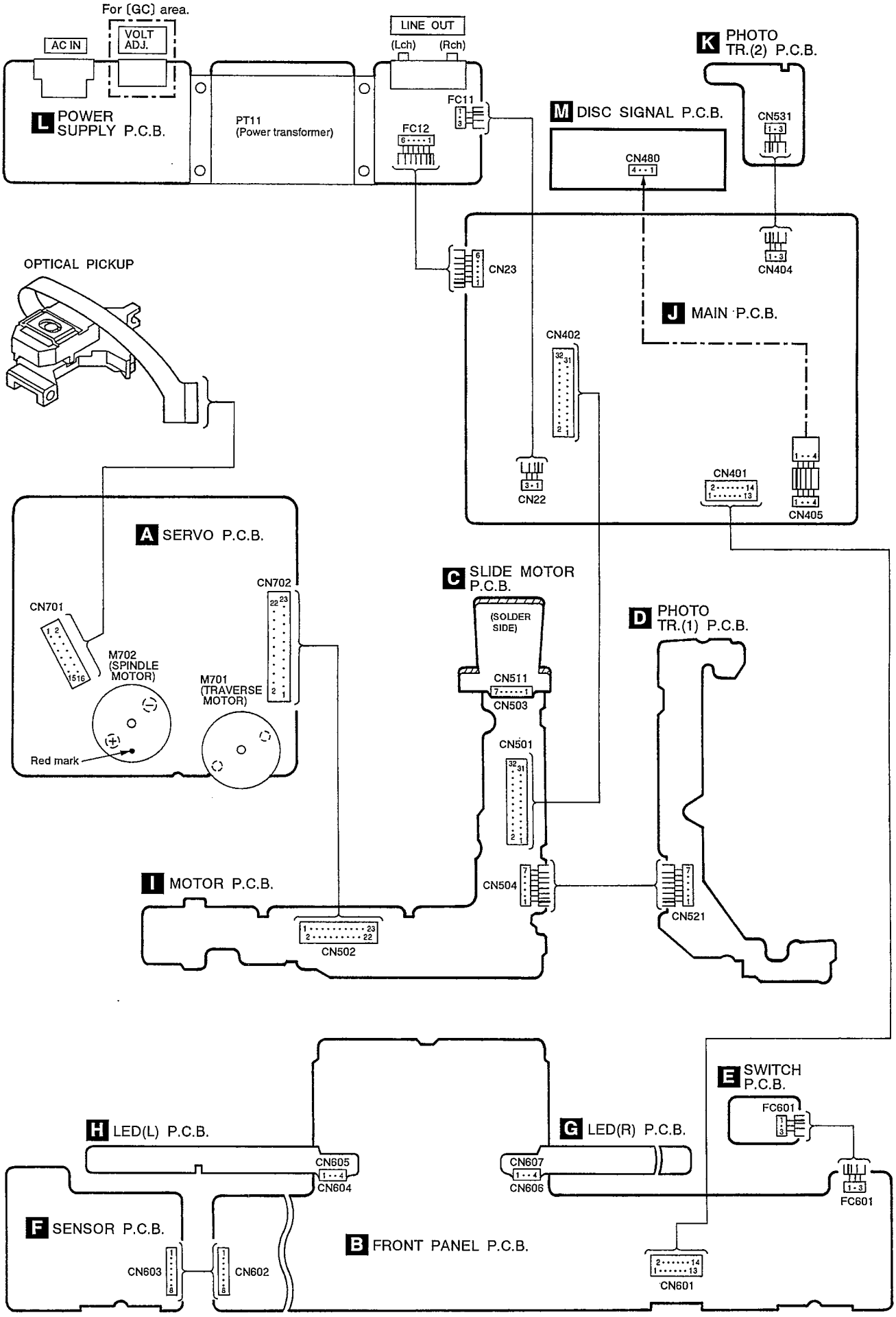



To A SERVO CIRCUIT(CN702) on page 61
I MOTOR CIRCUIT
(P.C.Board:on page 69)
CN502
RESET SW
VCOF
/RST
STAT
SUBQ
SOCK
/TLOCK
/FLOCK
SENSE
MLD
MDATA
MCLK
P.GND
+B(1)
TX
D.GND
SRDATA
LRCK
BCLK
+B(2)
Rch IN
A.GND
Lch IN
CN503
CN504
CN501
CN402
TP502
TP501
0.6V
0V
Q502
2SC3311AIQST
DISC DET.
VR501 R503 10K(B) 1K
S503
(CLAMP DET./FREE)
S501(LOCK DET./MLOCK)
S502
(CLAMP DET.)
M501
(LOADING MOTOR)
DISC SENSOR ADJ.
D501 MA165TA
C501 220P
5V
Q462
UN4212AITA
MOTOR DRIVE
4.4V
22K
D462 MA4056MTA
3.3V
DIRECTION SELECT
AMP
DRIVE
Q461
UN4215TA
MOTOR DRIVE
7.4V
10K
R462 330
R463 820
R464 820
R465 120
R461 120
D461 MA4075MTA
C408 0.01
C407 0.01
C409 0.01
C410 0.01
C461 10V47
9V
IC461
BA6247N
MOTOR DRIVE
Q431
UN4214AITA
LED DRIVE
10K
47K
4.7V
4.8V
TP7
C401 0.01
C402 6.3V1000
Q433
(10.8V)
11.1V
(14.4V)
16V
16.6V
(15V)
R431 3.3K
R433 68
D431 MA4030MTA
Q433
2SB1238QSTV6
LED DRIVE
CN401
Terminal guide: on pages 54,55
IC401
UPD78044A172
SYSTEM CONTROL
PLAY
T=13.6ms.
F=4.23MHz
4.2V P-P
X401
(4.2336MHz)
R418 180
R423 10K
R422 10K
R416 1K
R420 4.7K
R419 4.7K
R417 4.7K
R421 4.7K
C421 0.01
C405 0.01
R424 100K
R454 4.7K
C406 390P
R410 10K
R409 47K
C422 1000P
Q401
2SC3311AIQST
RESET
R413 10K
R414 470
R415 10K
C404 25V4.7
C403 50V1
5.3V P-P
F=4.23MHz
16.6V
4.9V

• ⟹ : Audio signal lines.

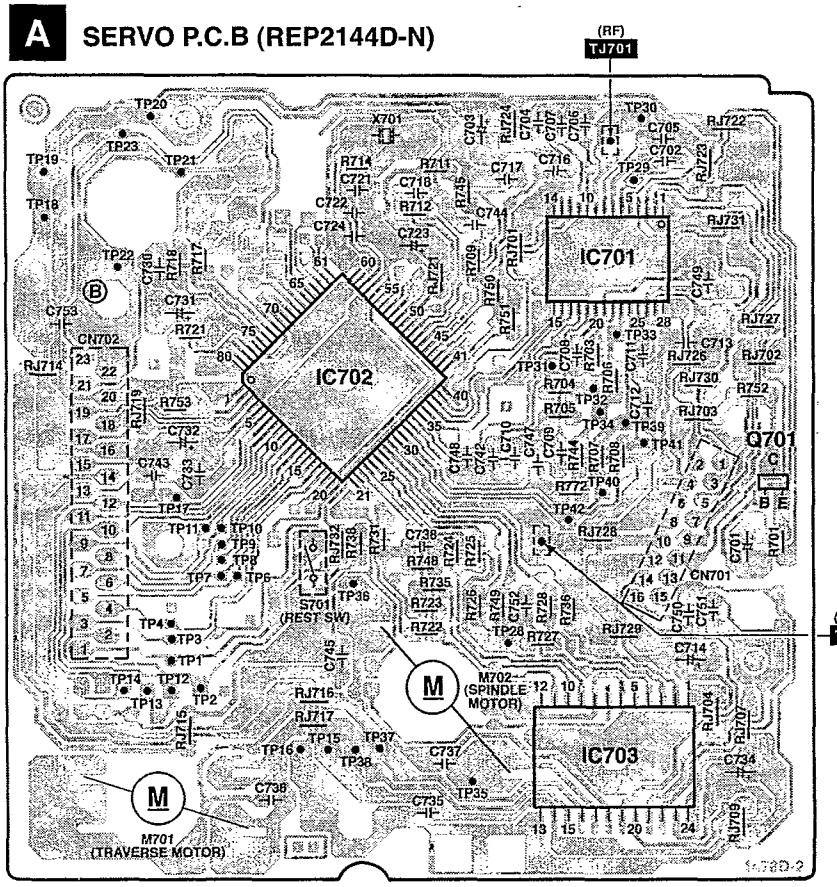


Wiring Connection Diagram

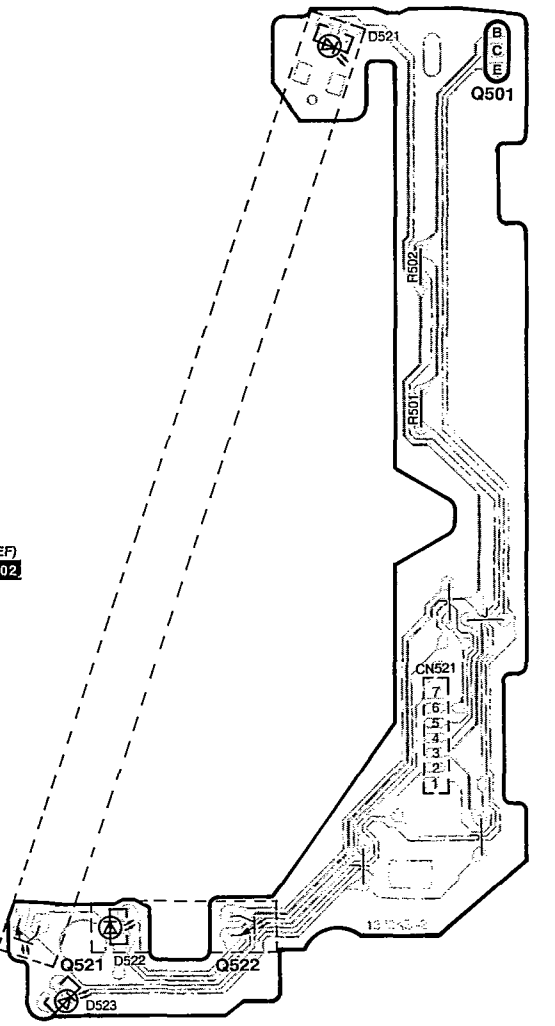


■ Printed Circuit Board Diagram

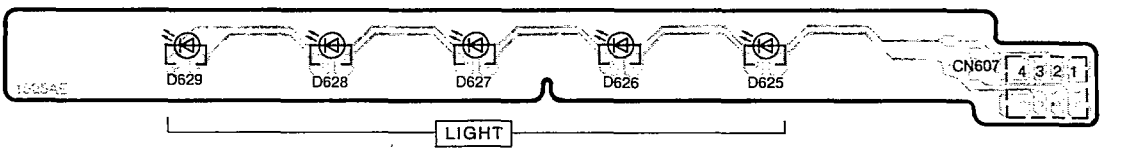
A SERVO P.C.B (REP2144D-N)



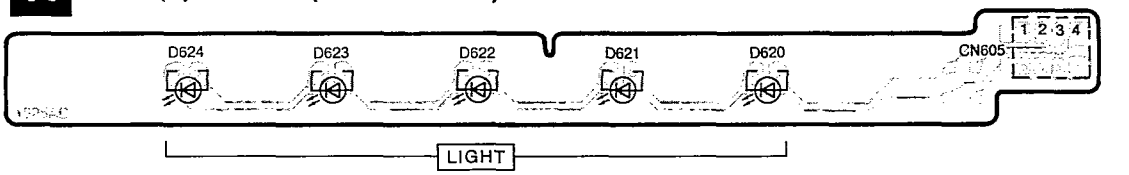
D PHOTO TR.(1) P.C.B. (REP2219A–2N)



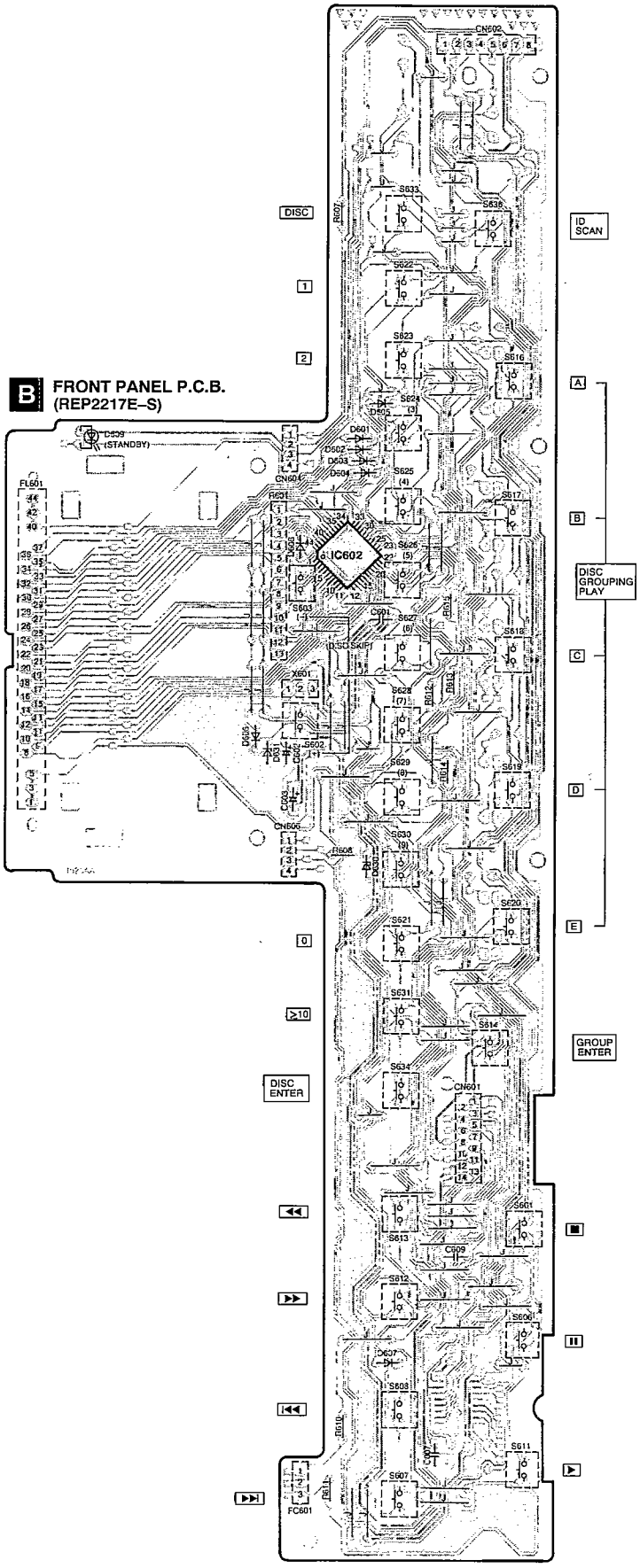
G LED (R) P.C.B. (REP2217E–S)



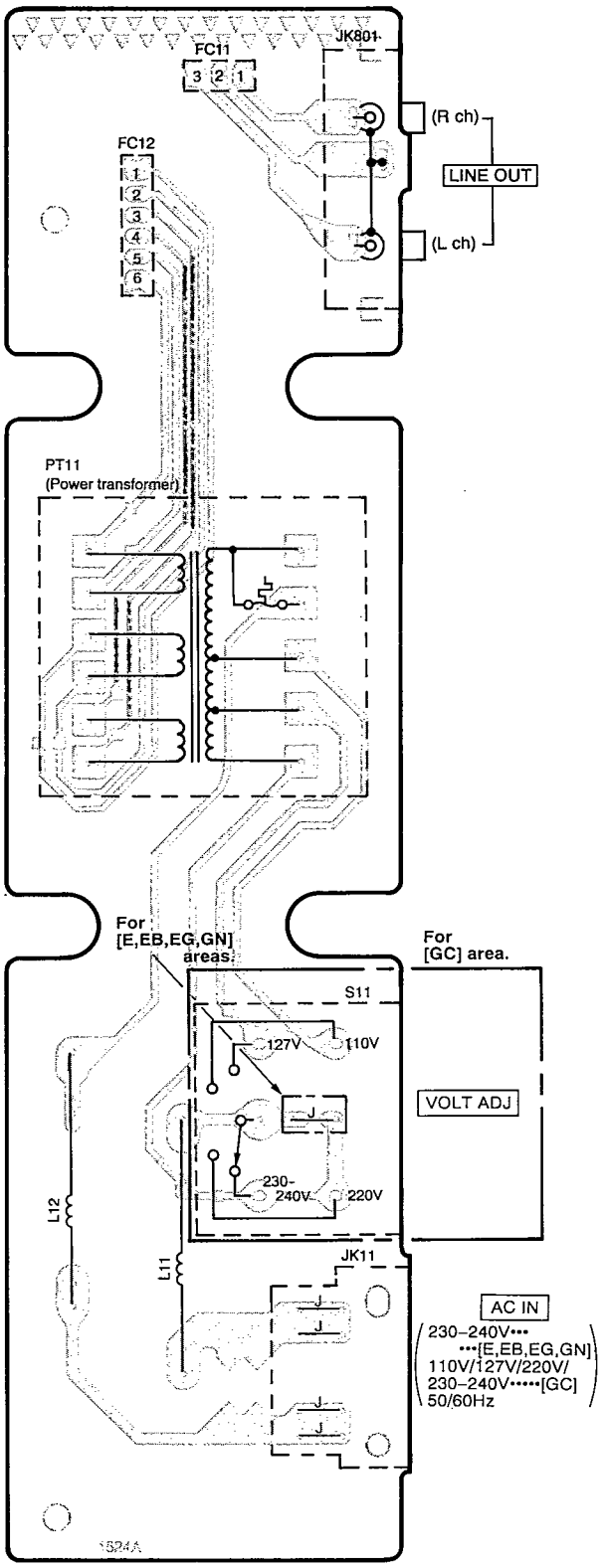
H LED (L) P.C.B. (REP2217E–S)



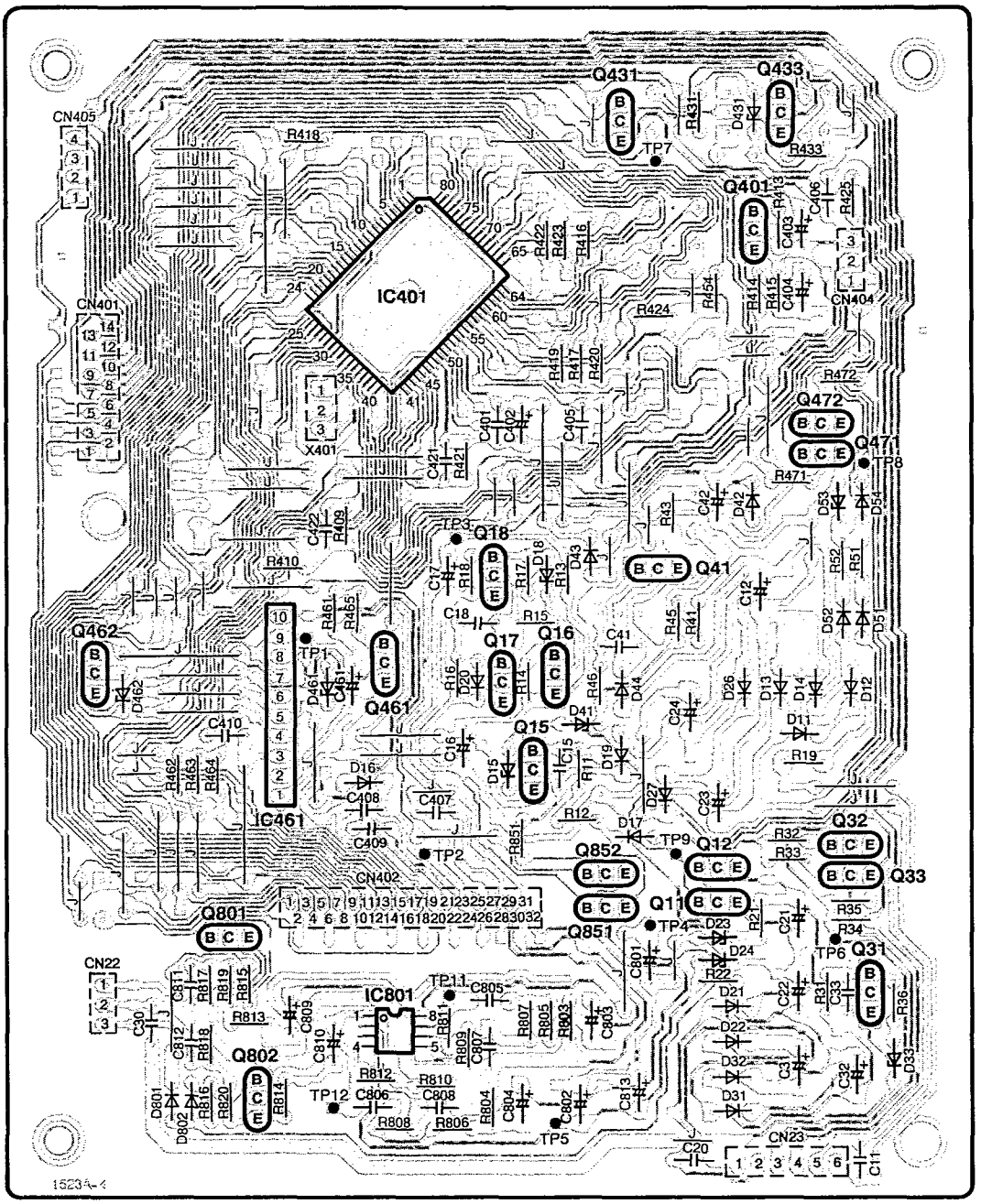
B FRONT PANEL P.C.B. (REP2217E–S)



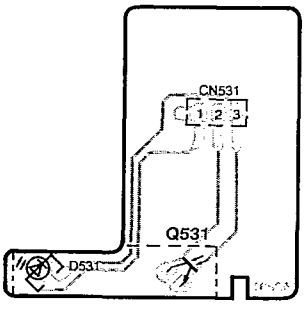
L POWER SUPPLY P.C.B.
(REP2218B–P•••[E,EB,EG] REP2218C–P•••[GN] REP2218D–P•••[GC])



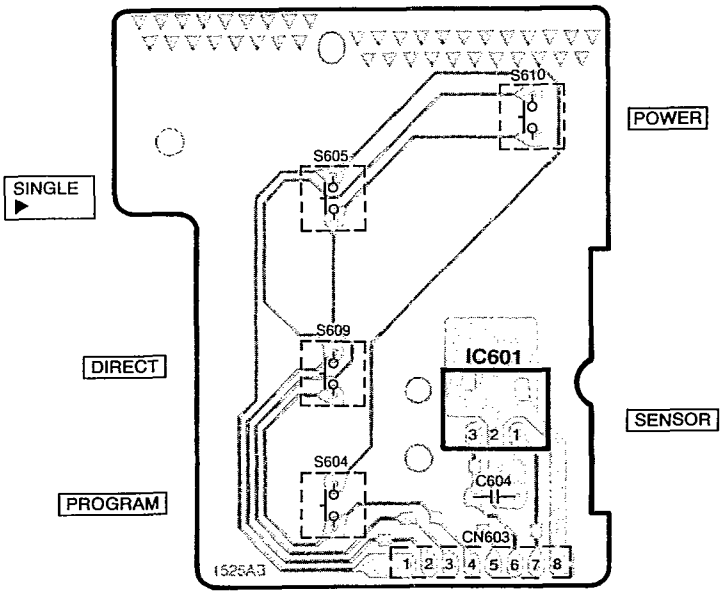
J MAIN P.C.B. (REP2216B–M)



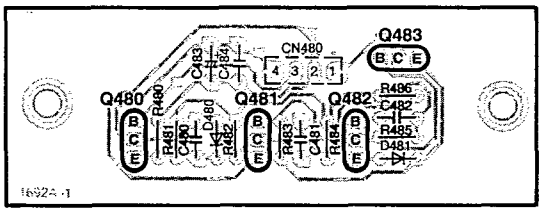
K PHOTO TR.(2) P.C.B. (REP2348A–N)



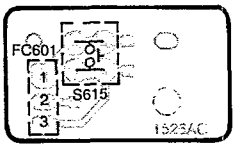
F SENSOR P.C.B. (REP2217E–S)



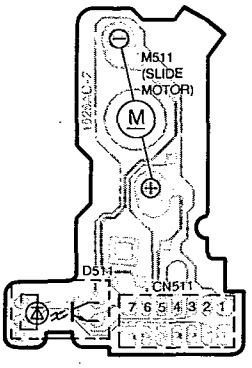
M DISC SIGNAL P.C.B. (REP2385A–N)

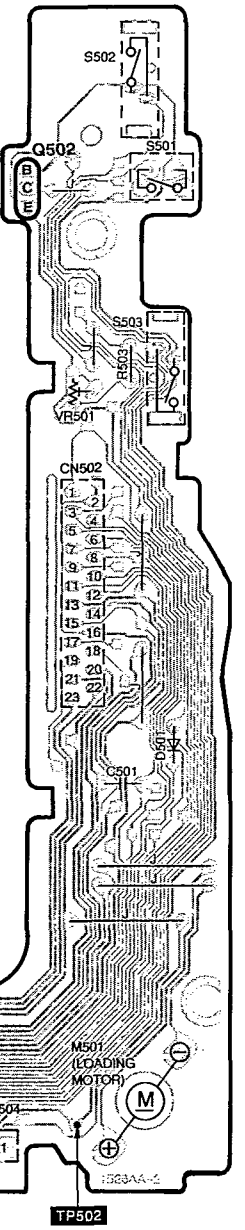


E SWITCH P.C.B. (REP2217E–S)



C SLIDE MOTOR P.C.B. (REP2219A–3N)





I MOTOR P.C.B. (REP2219A–1N)