

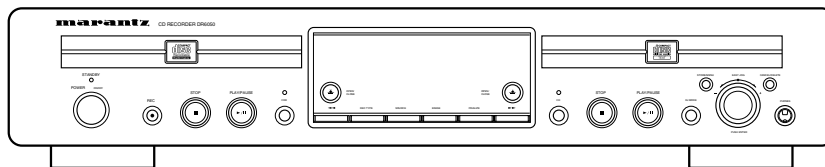
Service Manual

DR6050 /F1N, /K1G, /N1G

/F1B, /K1B, /N1B, /U1B

Compact Disc Recorder

DR6050



REMARK : This service manual explains them by extracting specifications designed for the model DR6050 only. The explanation for CD-R module "MAR775" (Loader : CDL4009' + CD-R Main board) is not mentioned on this service manual.

The CD-R module information is described in the service manual of CD-R modules <MAR770/MAR775>.

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Please use this service manual with referring to the user guide (D.F.U.) without fail.

修理の際は、必ず取扱説明書を準備し操作方法を確認の上作業を行ってください。

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DR6050

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5. Way of shipment
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SHOCK, FIRE HAZARD SERVICE TEST :

CAUTION : After servicing this appliance and prior to returning to customer, measure the resistance between either primary AC cord connector pins (with unit NOT connected to AC mains and its Power switch ON), and the face or Front Panel of product and controls and chassis bottom.

Any resistance measurement less than 1 Megohms should cause unit to be repaired or corrected before AC power is applied, and verified before it is return to the user/customer.

Ref. UL Standard No. 1492.

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

1. Servicing the DR6050

1.1 INTRODUCTION:

The DR6050 is the consumer version of a CD recorder, this means that the SCMS (Serial Copy Management System) is included. The DR6050 can only record on the Audio CDRs (Consumer Use).

The DR6050 is suitable for recording and playback of CD-RW discs (CD-Re Writable disc).

Playback & Recording and Disc

Disc Player/Recorder	CD	CDR				CD-RW				SCMS
		Consumer Disc		Professional Disc		Consumer Disc		Professional Disc		
		Finalized	non Finalized	Finalized	non Finalized	Finalized	non Finalized	Finalized	non Finalized	
Audio CD Player Current products Ex:CD-17	P	P	no	P	no	no	no	no	no	-
Audio CD Player CD-RW playback Ex:CD-17MK II	P	P	no	P	no	P	no	P	no	-
CD-RW Recorder For Professional Ex:CDR630/640	P	P	P/R	P	P/R	P/R	P/R	P/R	P/R	no
CD-RW Recorder For Consumer Ex:DR6050	P	P	P/R	P	P	P/R	P/R	P	P	YES

Consumer : For Digital Audio

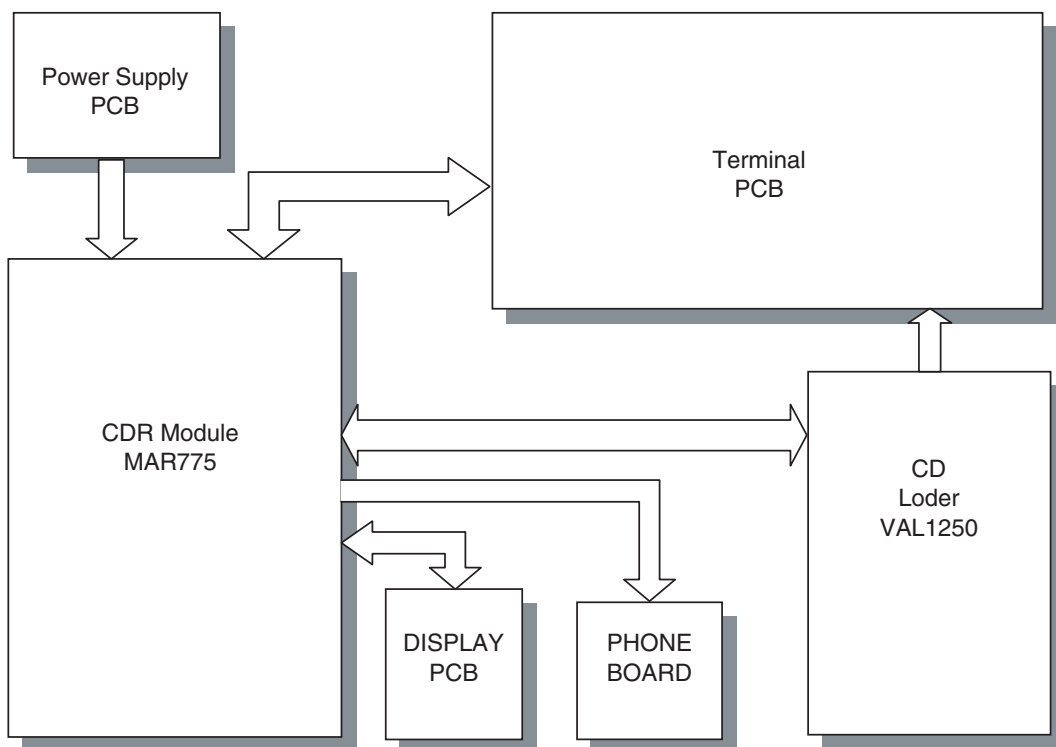
Professional : For General use (Including PC)

P : Playback

R : Recording

1.2 OPENING THE PRODUCT :

The product can be opened by removing the top cover (6 screws). Once the product is opened one can have access to the several PCB's and the main module.



Below the several PCB's and it function and service policy will be discussed:

1.2.1 CDR loader (CDR main module CDL4009 or MAR770):

This complete CDR loader is considered as not repairable in the field. therefore this module will be repaired centrally. A module exchange procedure will be set up for this purpose. The module can be removed from the product by removing 4 screws and the transformer (see demounting the CDR module on page 1-7), and losing the connectors.

This module is the complete CD recorder, it contains the following parts:

CD Mechanism (CDM4009'). Underneath this mechanism a PCB is mounted which is adjusted to the mechanism (laser current settings are stored in EEPROM).

Loader Assy. This mechanical assy takes care for the tray control.

Main PCB. This PCB takes care that the (analog or digital) signal to be recorded is converted into a suitable signal which can be recorded on the disc.

Digital signals with an other sampling frequency then 44.1kHz will be converted in the sample rate converter (DASP) to 44.1kHz.

Analog signals will be first converted into a digital converter by the AD converter.

This PCB also takes care that the signal from the CD (playback) is converted into a suitable digital signal (or analog via the DA converter).

The main microprocessor controls the several functions of this PCB.

1.2.2 Power Supply PCB.

This PCB contains the Power SW, which is jointed the Power bottom on the front panel. This PCB consists of power supply part. The power supply part delivers the several voltages for the different PCB in the DR6050. On this power supply one fuse (primary side) is mounted on this PCB. All parts are available as spare parts.

1.2.3 Terminal PCB.

This PCB contains input and output terminals. All parts are available as spare parts.

1.2.4 Display Board.

This PCB contains the Display, which informs the user about the status of the recording/playback process and it also takes care for scanning the keys on the front panel. The information from the keys is fed via a I²C connection to the main microprocessor on the CDR loader module. Information which needs to be displayed is also fed via this I²C line from the main microprocessor on the CDR loader module to the display controller.

The parts for this PCB are available as service parts so this PCB can be repairable up to component level.

1.2.5 Headphone PCB.

This PCB contains the headphone socket.

IMPORTANT

In case of replace the CD-R module "MAR775", the initialization is necessary. Please initialize the CD-R module with following orders.

1. Press the POWER button (POWER ON) while depressing FINALIZE button and REC TYPE button together.
2. FL Display shows;
WAIT → PGM PROTOCOL → PGM PORT END
3. Press the POWER button (POWER OFF).

Then the CD-R module set up to DR6050 own status.

2 TECHNICAL SPECIFICATIONS

GENERAL

System	Compact disc digital audio
Number of channels	2 (stereo)
Applicable discs	CD, CD-R (digital audio), CD-RW (digital audio)
Power Requirement	
F version	AC 100 V 50 / 60 Hz
K version	AC 110 V / 220 V 50 /60 Hz
N version	AC 230 V 50 Hz
U version.	AC 120 V 60 Hz
Power Consumption	20 W
Operating Temperature	5 °C - 35 °C
Dimension (MAX)	
Width	440 mm
Height	87 mm
Depth	317 mm
Weight	4.4 kg

AUDIO

Frequency Response	20 Hz - 20 kHz
Playback S/N	100 dB
Playback Dynamic Range	96 dB
Playback Total Harmonic Distortion	0.003 %
Recording S/N	90 dB
Recording Dynamic Range	92 dB
Recording Total Harmonic Distortion	0.006 %
Analog Output Voltage	2 V RMS
Digital Coaxial Output	0.5 V (p-p) / 75 ohms
Digital Optical Output	- 20 dB
Headphones	0 - 5 Vrms / 8 - 2000 ohms

Recording values for line input

Digital Coaxial Input (automatic sample rate conversion)	32 - 48 kHz
Digital Optical Input (automatic sample rate conversion)	32 - 48 kHz
Analog Input	600 mVrms / 50 kohms

Specifications subject to change without prior notice.

3. WARNINGS

(GB) WARNING

All ICs and many other semiconductors are susceptible to electrostatic discharges (ESD). Careless handling during repair can reduce life drastically. When repairing, make sure that you are connected with the same potential as the mass of the set via a wristband with resistance. Keep components and tools at this potential.

(F) ATTENTION

Tous les IC et beaucoup d'autres semi-conducteurs sont sensibles aux décharges statiques (ESD). Leur longévité pourrait être considérablement écourtée par le fait qu'aucune précaution n'est prise à leur manipulation. Lors de réparations, s'assurer de bien être relié au même potentiel que la masse de l'appareil et enfiler le bracelet sert d'une résistance de sécurité. Veiller à ce que les composants ainsi que les outils que l'on utilise soient également à ce potentiel.



(D) WARNUNG

Alle ICs und viele andere Halbleiter sind empfindlich gegenüber elektrostatischen Entladungen (ESD). Unsorgfältige Behandlung im Reparaturfall kann die Lebensdauer drastisch reduzieren. Sorgen Sie dafür, daß sie im Reparaturfall über ein Pulsarmband mit Widerstand mit dem Massepotential des Gerätes verbunden sind. Halten Sie Bauteile und Hilfsmittel ebenfalls auf diesem Potential.

(NL) WAARSCHUWING

Alle IC's en vele andere halfgeleiders zijn gevoelig voor electrostatische ontladingen (ESD). Onzorgvuldig behandelen tijdens reparatie kan de levensduur drastisch doen verminderen. Zorg ervoor dat u tijdens reparatie via een polsband met weerstand verbonden bent met hetzelfde potentiaal als de massa van het apparaat. Houd componenten en hulpmiddelen ook op ditzelfde potentiaal.

(I) AVVERTIMENTO

Tutti IC e parecchi semi-conduttori sono sensibili alle scariche statiche (ESD). La loro longevità potrebbe essere fortemente ridotta in caso di non osservazione della più grande cauzione alla loro manipolazione. Durante le riparazioni occorre quindi essere collegato allo stesso potenziale che quello della massa dell'apparecchio tramite un braccialetto a resistenza. Assicurarsi che i componenti e anche gli utensili con quali si lavora siano anche a questo potenziale.

(GB)

AVAILABLE ESD PROTECTION EQUIPMENT :

anti-static table mat	large	1200x650x1.25mm	4822 466 10953
	small	600x650x1.25mm	4822 466 10958
anti-static wristband			4822 395 10223
connection box (3 press stud connections, 1M)			4822 320 11307
extendible cable (2m, 2M, to connect wristband to connection box)			4822 320 11305
connecting cable (3m, 2M, to connect table mat to connection box)			4822 320 11306
earth cable (1M, to connect any product to mat or to connection box)			4822 320 11308
KIT ESD3 (combining all 6 prior products - small table mat)			4822 310 10671
wristband tester			4822 344 13999

(GB)

Safety regulations require that the set be restored to its original condition and that parts which are identical with those specified be used. Safety components are marked by the symbol

(F)

Les normes de sécurité exigent que l'appareil soit remis à l'état d'origine et que soient utilisées les pièces de rechange identiques à celles spécifiées. Les composants de sécurité sont marqués

SAFETY



(D)

Bei jeder Reparatur sind die geltenden Sicherheitsvorschriften zu beachten. Der Originalzustand des Gerätes darf nicht verändert werden. Für Reparaturen sind Originalersatzteile zu verwenden. Sicherheitsbauteile sind durch das Symbol markiert.

(NL)

Veiligheidsbepalingen vereisen, dat het apparaat in zijn oorspronkelijke toestand wordt teruggebracht en dat onderdelen, identiek aan de gespecificeerde, worden toegepast. De Veiligheidsonderdelen zijn aangeduid met het symbool

(I)

Le norme di sicurezza estigono che l'apparecchio venga rimesso nelle condizioni originali e che siano utilizzati i pezzi di ricambio identici a quelli specificati. Componenti di sicurezza sono marcati con

U : VERSION



N : VERSION



(GB) DANGER: Invisible laser radiation when open. AVOID DIRECT EXPOSURE TO BEAM.

(S) Varning !

Osynlig laserstrålning när apparaten är öppnad och spårren är urkopplad. Betrakta ej strålen.

(DK) Advarsel !

Usynlig laserstrålning ved åbning når sikkerhedsafbrydere er ude af funktion. Undgå udsættelse for stråling.

(SF) Varoitus !

Avatussa laitteessa ja suojalukituksen ohitettaessa olet alttiina näkymättömälle laserisäteilylle. Älä katso säteeseen !

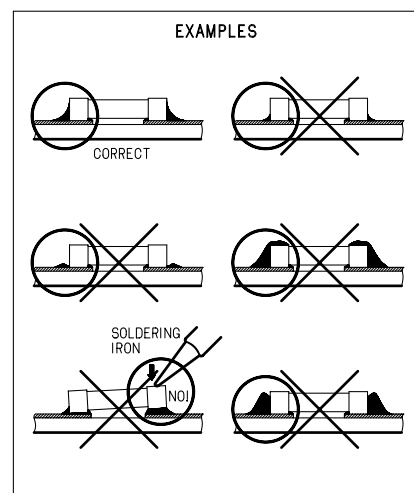
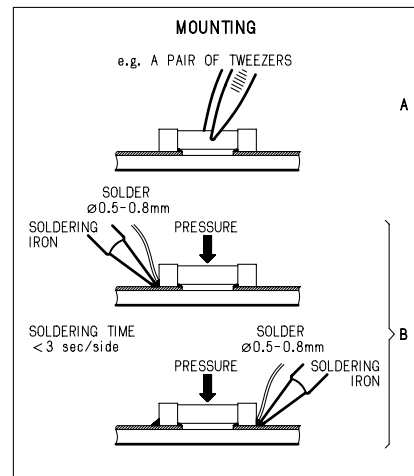
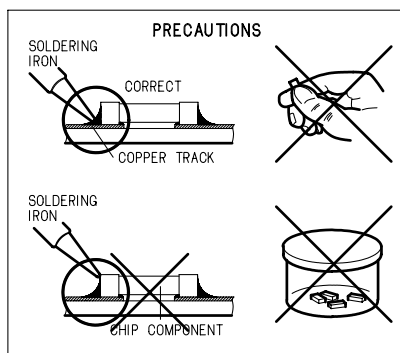
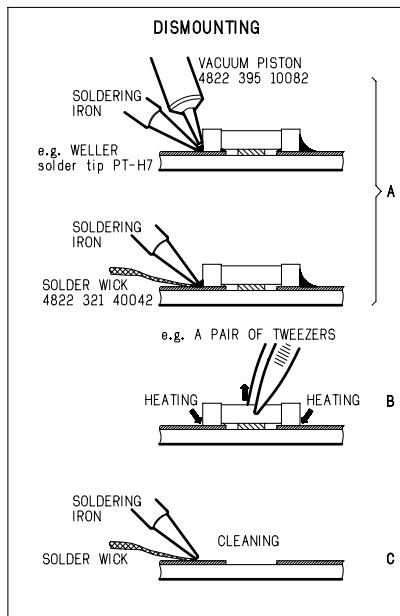
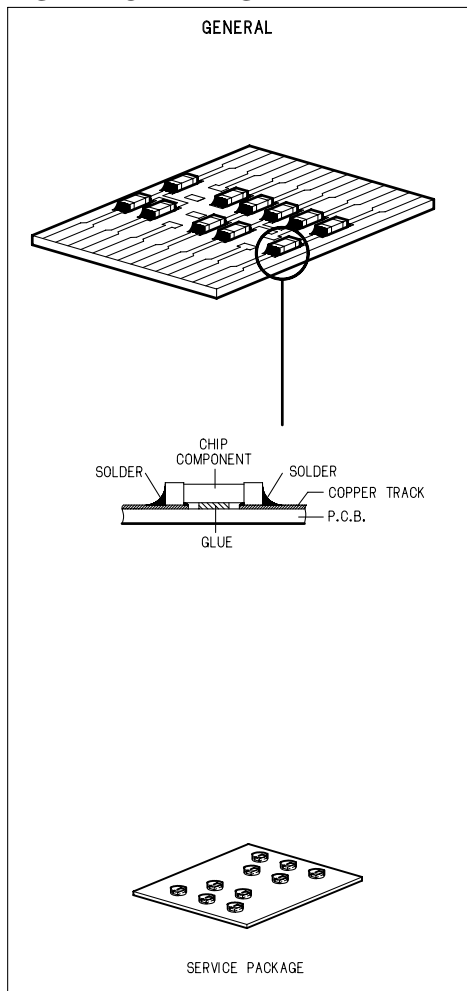
(GB)

After servicing and before returning the set to customer perform a leakage current measurement test from all exposed metal parts to earth ground, to assure no shock hazard exists. The leakage current must not exceed 0.5mA.

(F)

"Pour votre sécurité, ces documents doivent être utilisés par des spécialistes agréés, seuls habilités à réparer votre appareil en panne".

4. SERVICE HINTS



5. SERVICE TOOLS

Audio signals disc	4822 397 30184
Disc without errors (SBC444)+	
Disc with DO errors, black spots and fingerprints (SBC444A)	4822 397 30245
Disc (65 min 1kHz) without no pause	4822 397 30155
Max. diameter disc (58.0 mm)	4822 397 60141
Torx screwdrivers	
Set (straight)	4822 395 50145
Set (square)	4822 395 50132
13th order filter	4822 395 30204
Hexagon socket screw button (No. 1.5)	

6. Diangostic Software

6.1 Dealer mode

The purpose of the dealer mode is to prevent people taking out the CD inside the player at exhibitions, showrooms etc.. This mode disables the open/close function of the player. The dealer mode can be switched on and off pressing keys [OPEN/CLOSE] and [STOP] of the CDR player simultaneously while switching on the unit. The dealer mode is stored in the flash memory and can only be changed by executing the above actions.

6.2 Dealer diagnostics

6.2.2 Requirements to perform the test

- Working keyboard to start up the test.
- Working local display to check the output messages.

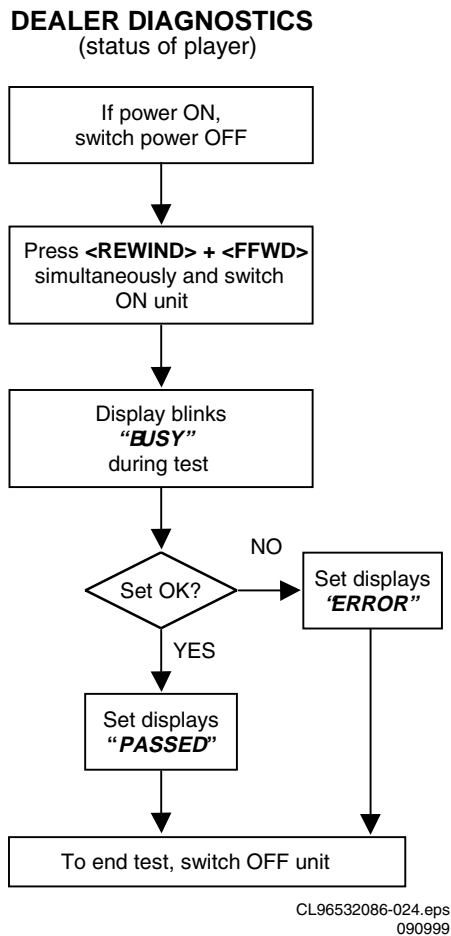


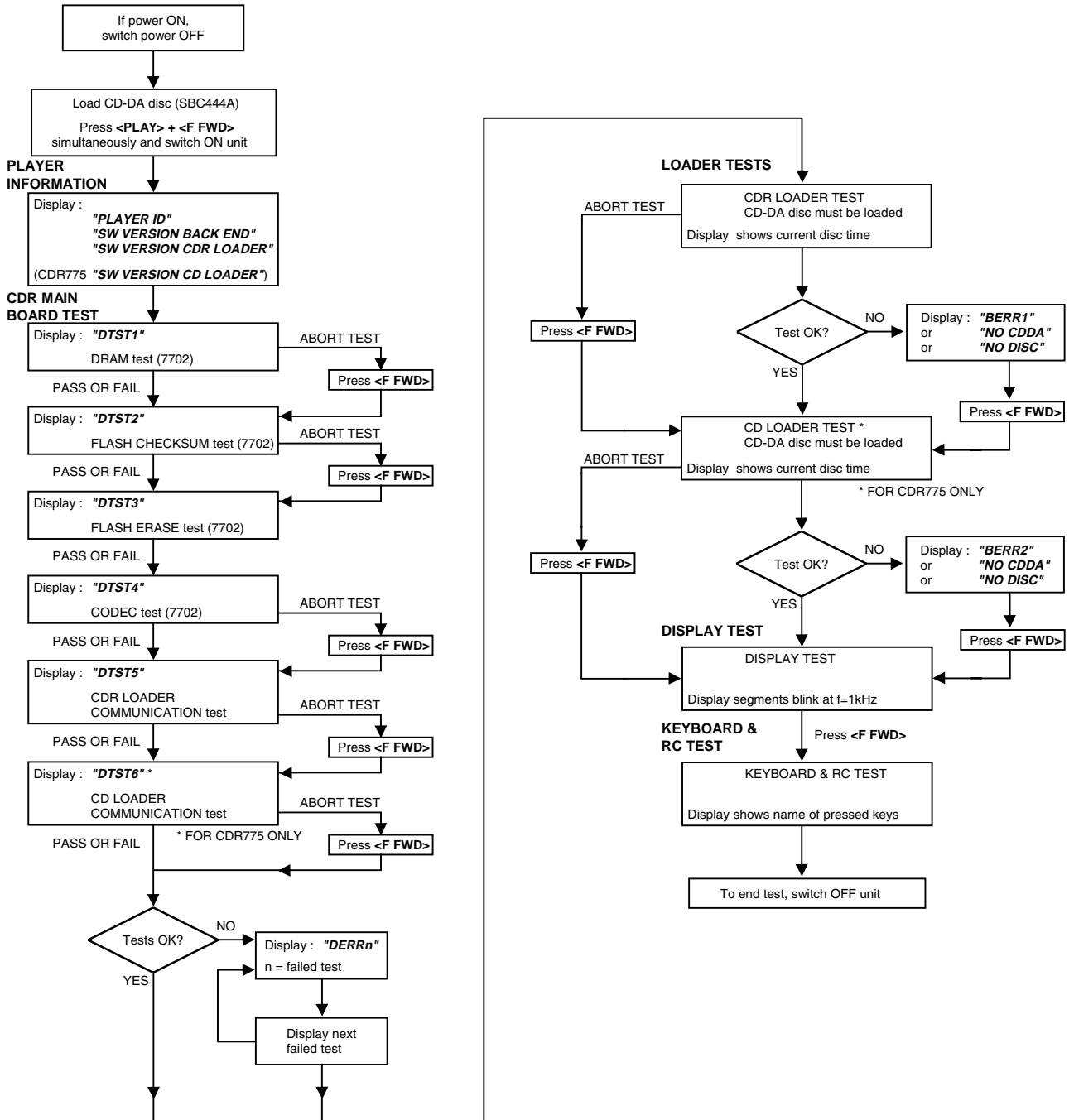
Figure 6-1

6.2.1 Description

The intention of the dealer diagnostics is to give an indication of the CDR player status. An inexperienced, even non-technical dealer will/can perform the test. Tests are executed automatically without need for external tools or disassembly of the unit. This test checks the CDR main board using the same tests as the electrical service diagnostics program. Only the result of the test, "PASSED" or "ERROR", will be shown on the display. Pressing keys [F FWD] and [REWIND] simultaneously while switching on the unit, starts the test. Switching off the unit ends the test.

6.3 Electrical service diagnostics

ELECTRICAL SERVICE DIAGNOSTICS (software versions, test for defective components)



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Figure 6-2

6.3.1 Description

The intention of the electrical service diagnostics is to show the software versions present in the player and to direct the dealer towards defective internal units. The units are : the CDR main board, the CDR loader, the CD loader in case of a DR6050 and the keyboard/display board. A sequence of tests is executed automatically. Some of the tests can be aborted or skipped without the result being taken into account. External tools or disassembly of the unit is not necessary to get the diagnostic information. Pressing keys [PLAY/PAUSE] and [F FWD] simultaneously while switching on the unit, starts the test. Switching off the unit ends the test.

6.3.2 Requirements to perform the test

- Working keyboard to start up the test.
- Working local display to check the output messages.
- A CD-DA disc with a minimum of 3 tracks in all trays to perform the disc test.

6.3.3 Description of the tests

Player information

In this part of the test the following important information can be checked without removing the cover :

- Recorder ID.
- SW-version back end of player.
- SW-version CDR loader.
- SW-version CD loader (only for DR6050).

CDR main board test

[F FWD] key. The message "DERRn" will be displayed with n indicating the faulty test number.

If one of the tests is aborted with the [F FWD] key, no error message will be displayed for this test. The flash data erase test ("DTST3") can not be aborted !

The CDR main board test consists out of :

DRAM test

Display : "DTST1". The DRAM used for buffer management is tested by writing, reading and verifying test patterns.

Flash checksum test

Display : "DTST2". This test checks the checksum of the player's SW stored in the flash.

Flash data erase

Display : "DTST3". During this test, all temporary information (CDtxt) in the flash is erased.

CODEC (ADC/DAC) test

Display : "DTST4". This test checks the CODEC IC by writing, reading and verifying test patterns. The test is not applicable for CDR950.

CDR communication test

Display : "DTST5". The communication between the host processor (DASP) and the CDR loader via the DSA-R-bus is tested.

CD communication test

Display : "DTST6"). The communication between the host processor (DASP) and the CD loader is tested. The test is only applicable for DR6050.

Loader tests

These tests determine if the CDR loader and the CD loader in case of a DR6050 work correctly. A CD-DA disc with a minimum of 3 tracks needs to be inserted in both loaders. A

disc test is executed to check focus control, disc motor control, radial control and jump grooves control. The disc test is performed by audio play-back of 5 seconds at the beginning, middle and end of the disc.

CDR loader test

During the test, the current disc time is shown. In case of an error the message "BERR1" will be displayed and the [F FWD] key must be pressed to continue with the following test. Pressing the [F FWD] key also aborts this test.

CD loader test

For DR6050 only. During the test, the current disc time is shown. In case of an error the message "BERR2" will be displayed and the [F FWD] key must be pressed to continue with the following test. Pressing the [F FWD] key also aborts this test.

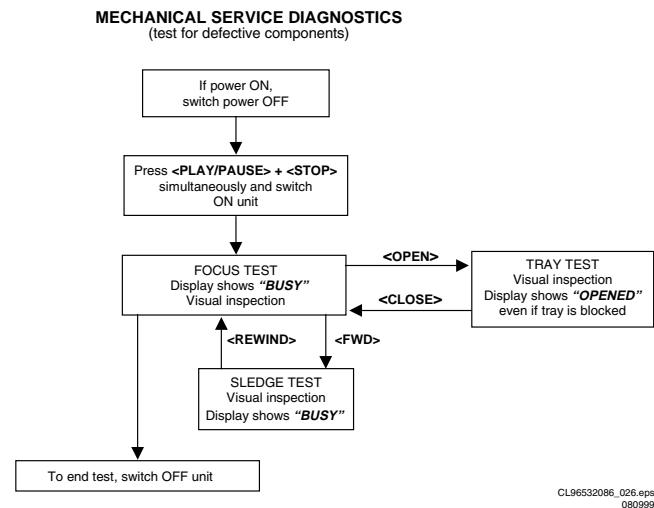
Display test

All segments will blink at a frequency of 1 Hz. Pressing the [F FWD] key will start the next test because the user has to check for himself if all segments work properly.

Keyboard and remote control tests

The test will give the user the ability to test every key without executing the function assigned to it. Therefore, the user needs to press every key on the keyboard and the remote control. The display will show the name of the key being pressed. Pressing more than one key at once will give an unpredictable result except for the service combinations : [PLAY/PAUSE] + [STOP], [PLAY/PAUSE] + [F FWD], [F FWD] + [REWIND], [ERASE] + [RECORD], [PLAY/PAUSE] + [RECORD].

6.4 Mechanical service diagnostics



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Figure 6-3

6.4.1 Description

No external tools are required to perform this test. The cover needs to be removed because the user has to check the movements of the tray, focus and sledge visually. Pressing keys [PLAY/PAUSE] and [STOP] simultaneously while switching on the unit, starts the test. Switching off the unit ends the test. In case of a DR6050, one can check the CD loader mechanics in the same way by pressing the above key combination on the CD player keys.

6.4.2 Requirements to perform the test

Working keyboard to cycle through the tests and to start up the test.
Working local display to check the output messages.

6.4.3 Description of the tests

Focus control test

The focussing lens is continuously moving up and down. The display reads "BUSY".

Sledge control test

After pressing [F FWD] the sledge continuously moves up and down. Pressing [REWIND] stops the sledge at the position it is in and the focus control test resumes. The display reads "BUSY".

Tray control test

This test starts from within the focus control test routine. Pressing [OPEN/CLOSE] moves the tray in or out. In the tray open position one can initiate focus and sledge tests by pressing [F FWD]. One has to stop these tests pressing [REWIND] before it is possible to close the tray again. Depending on the action the display reads "OPEN", "OPENED", "CLOSE" or "BUSY".

6.5.1 Description

This test is initiated by pressing [ERASE] and [RECORD] simultaneously while switching on the unit. The player will erase a complete CD-RW disc (including PMA and ATIP lead out area) at speed N=2. The display shows the countdown of the remaining time required for the operation to complete. The format is "ER mm:ss", where "mm" are the remaining minutes and "ss" the remaining seconds. After completion the message "PASSED" is shown, and the player has to be switched off and on again to start up in normal operating mode. Switching off the unit before completion of the test, leaves the disc in an unpredictable state. In such case only a complete DC-erase procedure can recover the CD-RW disc.

6.5.2 Requirements to perform the test

Functional CDR player.

A CD-RW audio disc must be present in the tray.

6.5 DC-erase service mode

DC ERASE SERVICE MODE (erasure of complete CD-RW)

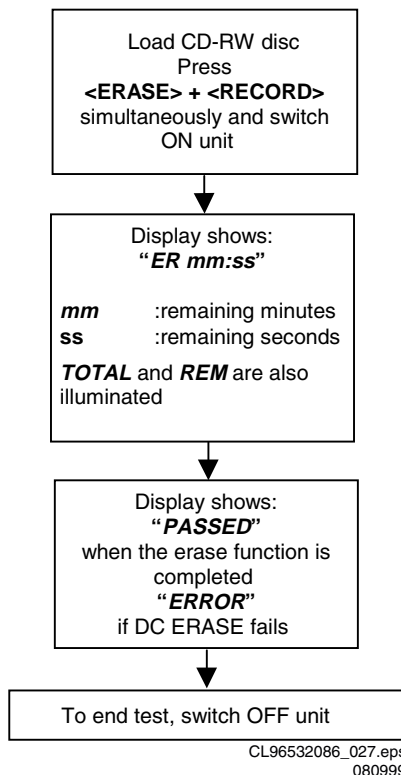


Figure 6-4

7. Faultfinding trees

7.1 CDR-Module

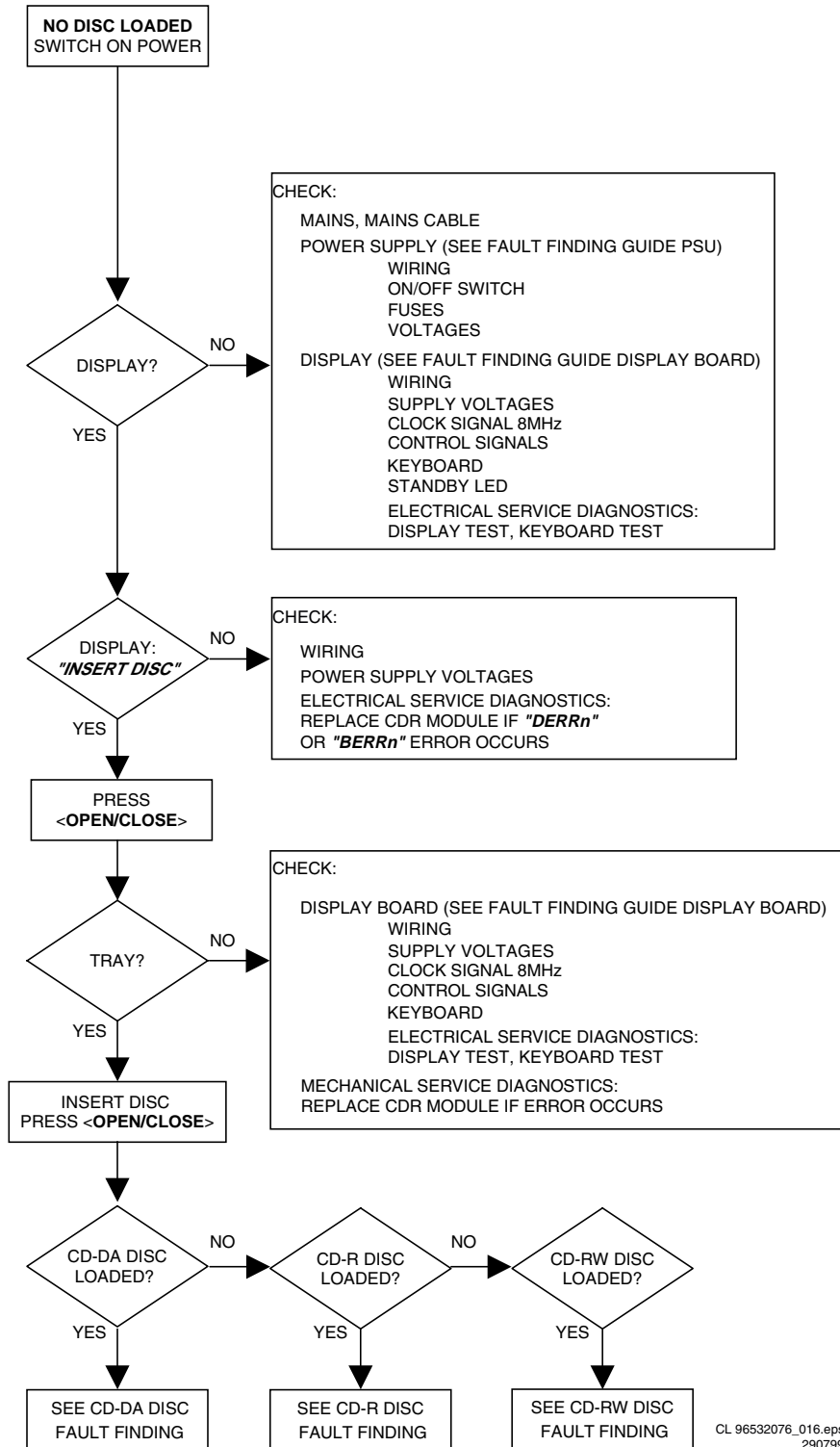
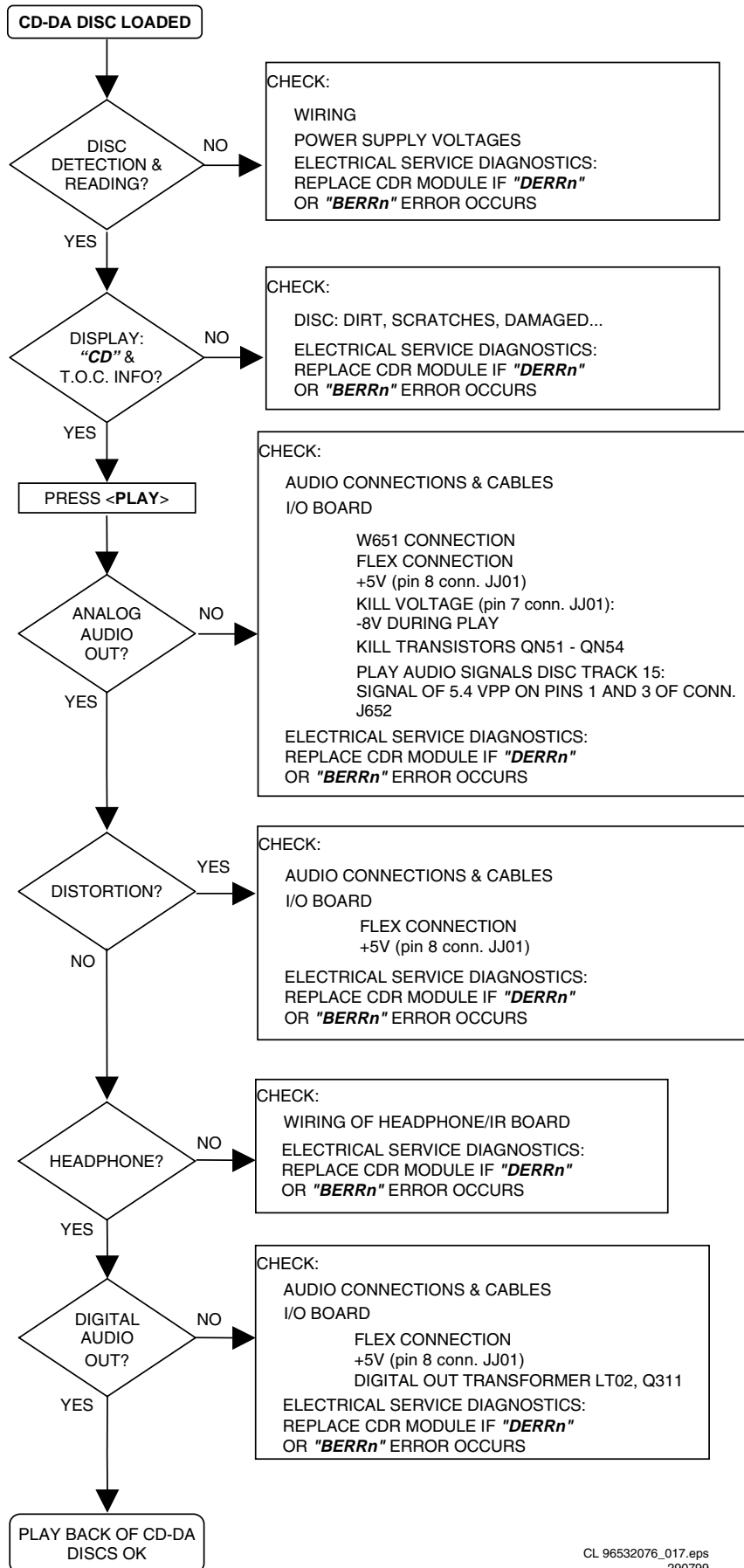
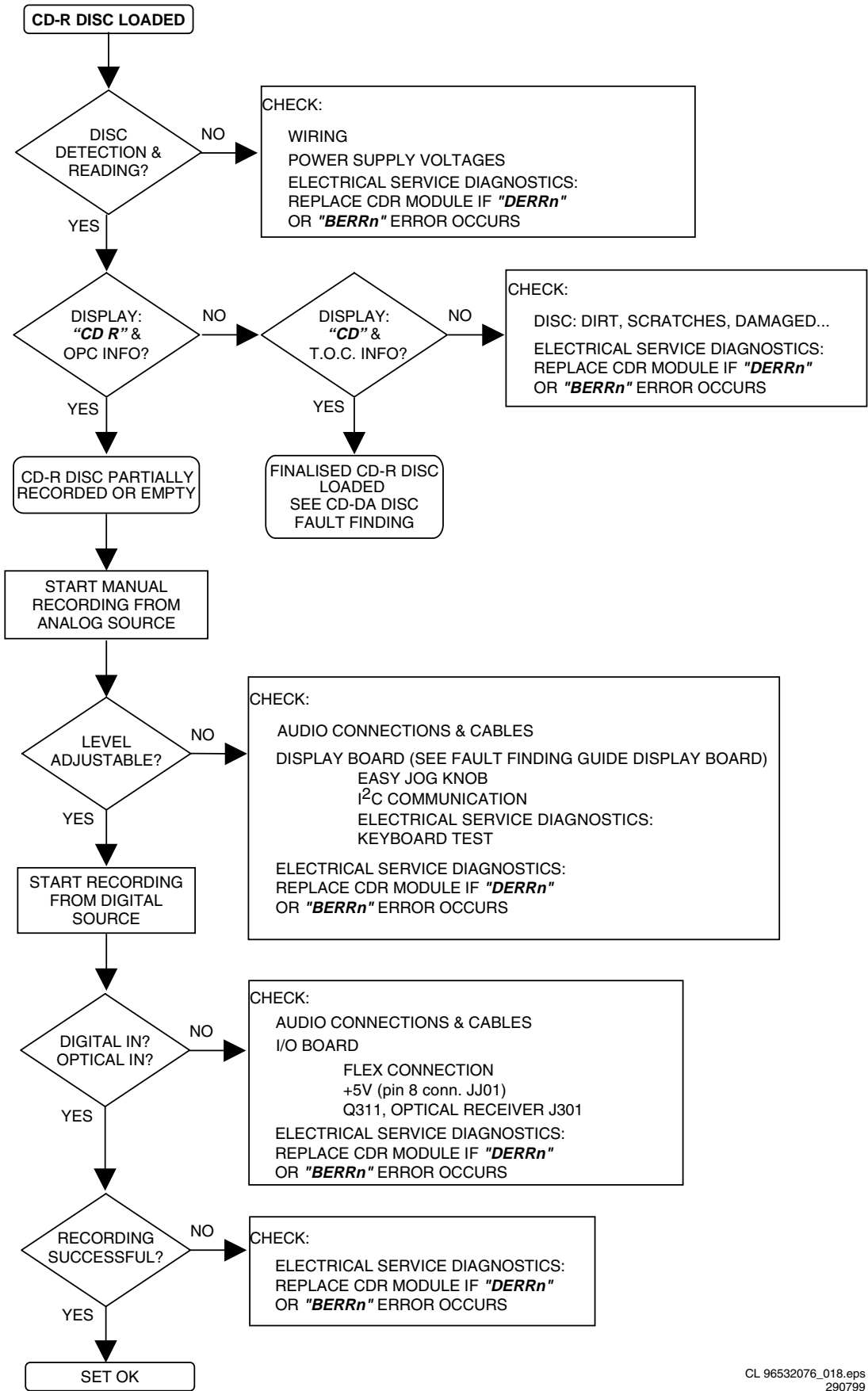


Figure 7-1



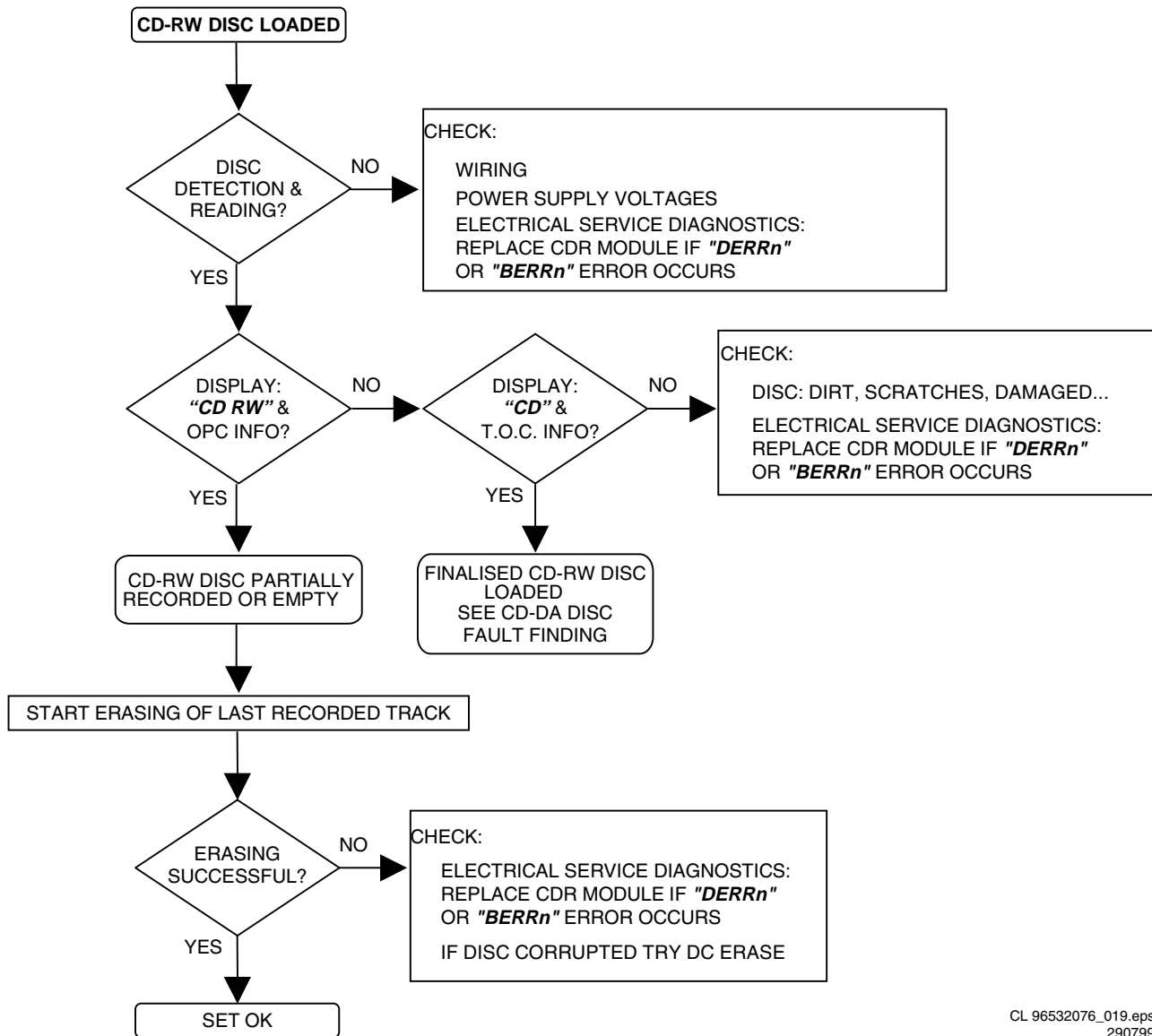
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Figure 7-2



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Figure 7-3

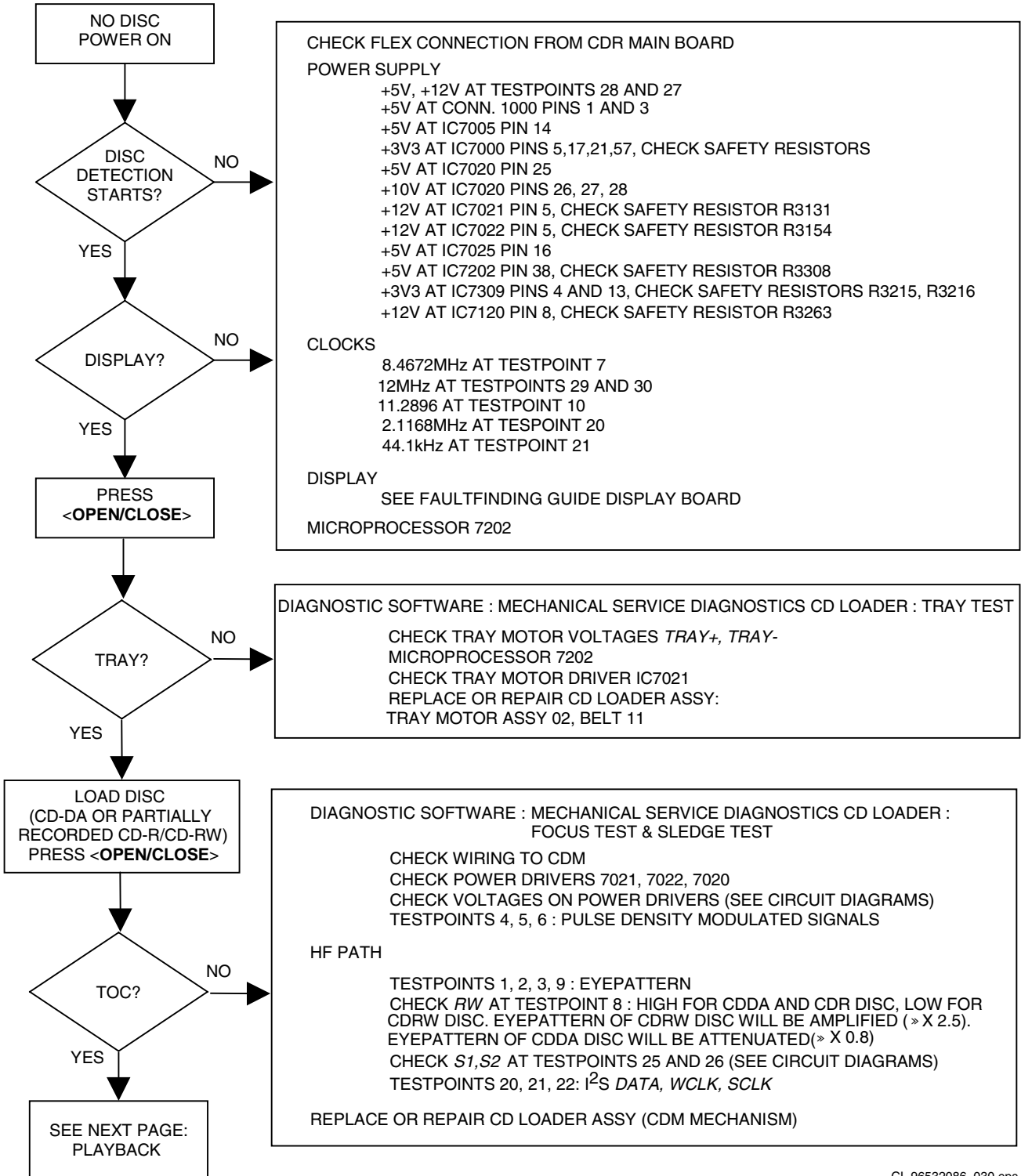


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Figure 7-4

7.2 CD Module

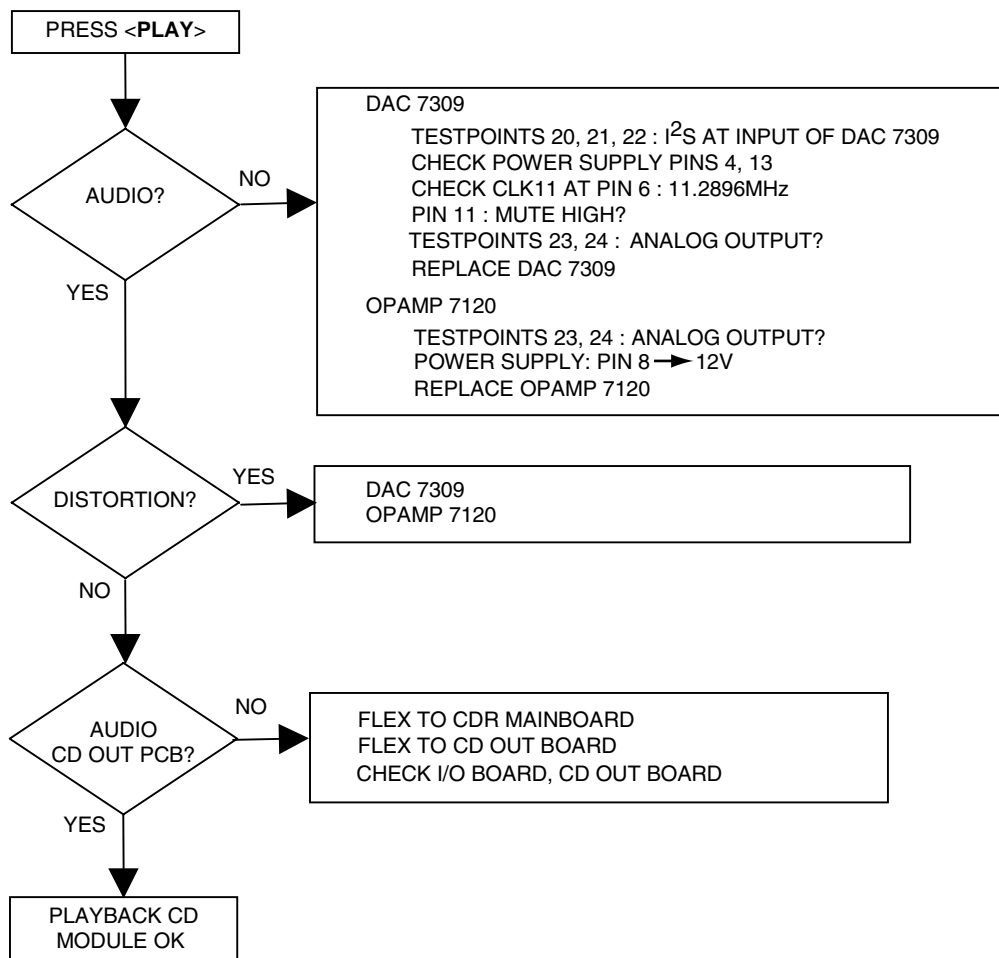
CD MODULE



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Figure 7-5

CD MODULE PLAYBACK



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Figure 7-6

8. Faultfinding Guide

8.1 Display Board

8.1.1 Description of display board

General description

The display board has three major parts : the FTD (Fluorescent Tube Display), the display controller TMP87CH74F and the keyboard. The display controller is controlled by the DASP master processor on the CDR main board. The communication protocol used is I2C. So all the information between DASP and display controller goes via the SDA or I2C DATA and SCL or I2C CLK lines. Communication is always initiated by the DASP on the CDR main board. Unlike the previous generations of CDR players, the interrupt generated by the display controller at key-press or reception of remote control is not used. Instead, the DASP polls the display controller for these events.

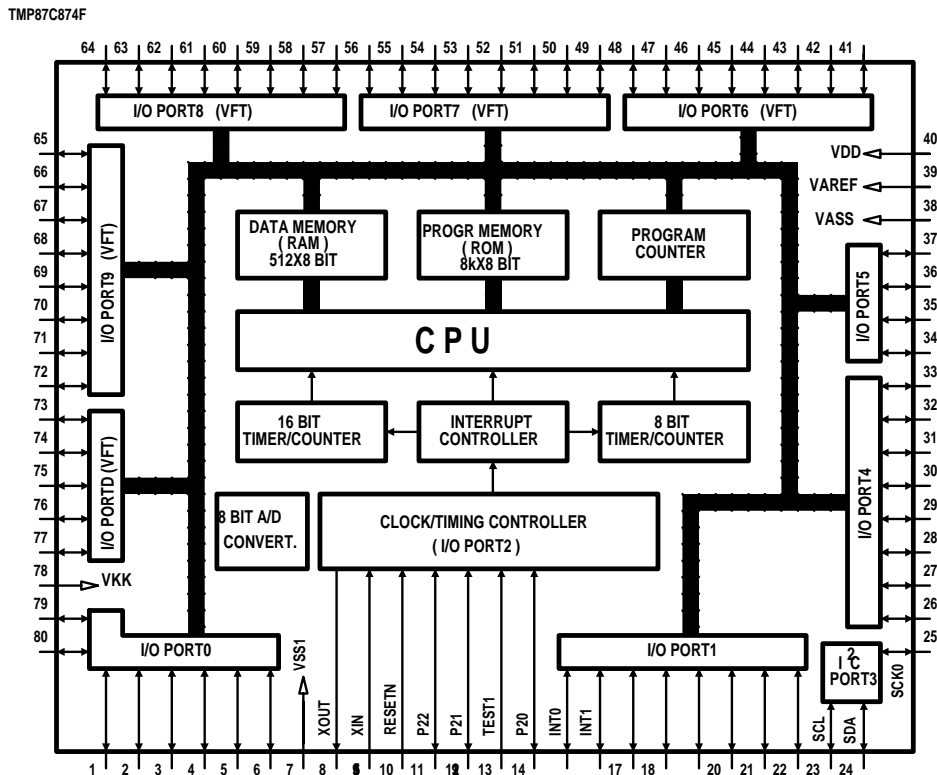
Display controller TMP87C874F

TMP87CH74F (QY01) is a high speed and high performance 8-bit single chip microprocessor, containing 8-bit A/D conversion inputs and a VFT (Vacuum Fluorescent Tube) driver. In this application, its functions are :

- slave microprocessor.
- FTD driver.
- generates the square wave for the filament voltage required for an AC FTD.
- generates the grid and segment scanning for the FTD.
- generates the scanning grid for the key matrix.
- input for remote control.

All the communication runs via the serial bus interface I2C. The display controller uses an 8MHz resonator as clock driver.

BLOCK DIAGRAM



PIN DESCRIPTIONS

INT0	external interrupt input 0
INT1	external interrupt input 1
RESETN	reset signal input, active low
SCL	I2C-bus serial clock input/output
SDA	I2C-bus serial data input/output
TEST	test pin, tied to low
VAREF	analog reference voltage input
VASS	analog reference ground
VDD	+5V
VKK	VFT driver power supply
VSS	ground
XIN, XOUT	resonator connecting pins for high-frequency clock

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Figure 8-1

8.1.2 Test instructions

Supply voltages

The display board receives several voltages via connector JY01.

- VFTD : -35V $\pm 5\%$ measured at pin 2 of conn. JY01.
- VDC1-VDC2 : 3V8 $\pm 10\%$ measured between pin 1 and 3 of conn. 1119.
- +5V +5V $\pm 5\%$ measured at pin 10 of conn. JY01

Voltages VFTD, VDC1 and VDC2 are produced in the power supply unit and sent to the display board via the CDR main board. The +5V voltage is produced on the CDR main board as D5V.

Clock signal

As clock driver for the display controller, a resonator of 8 MHz (XY01) is used. The signal can be measured at pins 8 and 9 of the display controller : 8 MHz $\pm 5\%$.

Control signals

RESET

The reset signal comes via pin 4 of conn. JY01 from the DASP master processor on the CDR main board (SYS_RESET). The reset is low active. It should be kept low during power up for at least 3 machine cycles with supply voltage in operating range and a stable clock signal (1 machine cycle = $12 \times 1/F_c$ (8 MHz sec.)). During normal operation, the reset should be high (3V3). The high signal is 3V3 because the DASP operates on 3V3.

I2C DATA/I2C CLK

These lines connect to the DASP master processor via respectively pin 5 and pin 7 of conn. JY01. When there is no communication, they should have the high level (+5V). The oscillogram below gives an indication of how these signals should look like.

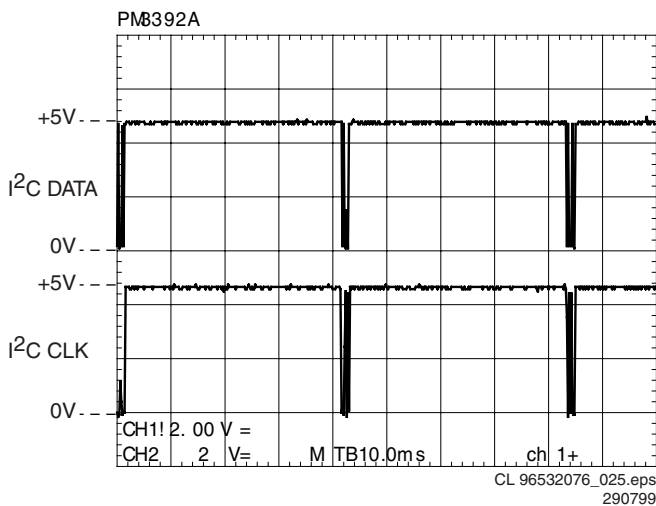


Figure 8-2 'I2C signals'

FTD drive lines

Filament voltage

Should measure 3.8V $\pm 10\%$ (=VDC1-VDC2) between pins 1-3 and pins 1-52 of the FTD(VX01).

Grid lines

Level and timing of all grid lines, G1-->G15, can be checked either at the FTD itself or at the display controller. Grid lines G13, G14 and G15 each have an extra current amplifier in line : QY02 for G13, QY03 for G14 and QY04 for G15. A typical grid line signal shows in the oscillogram below.

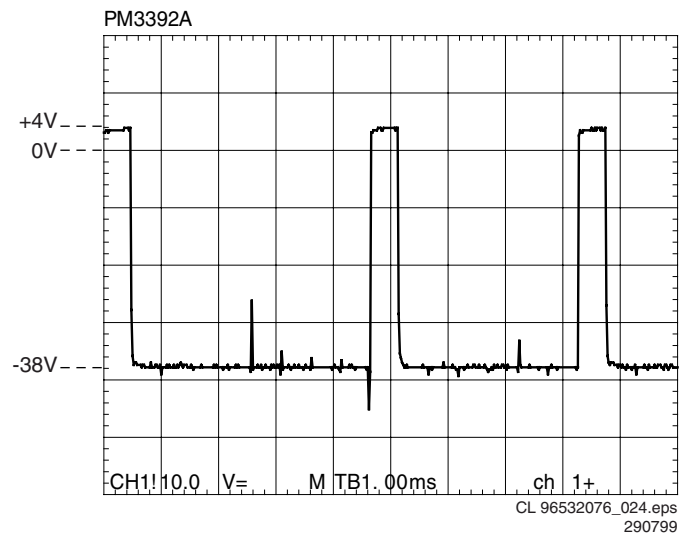


Figure 8-3 'Gridline'

Segment lines

Level and timing of all segment lines, P1-->P21, can be checked either at the FTD itself or at the display controller. The data on these segment lines however, depends on the characters displayed. The oscillogram below shows a segment line with data. A segment line without data maintains a -38V level.

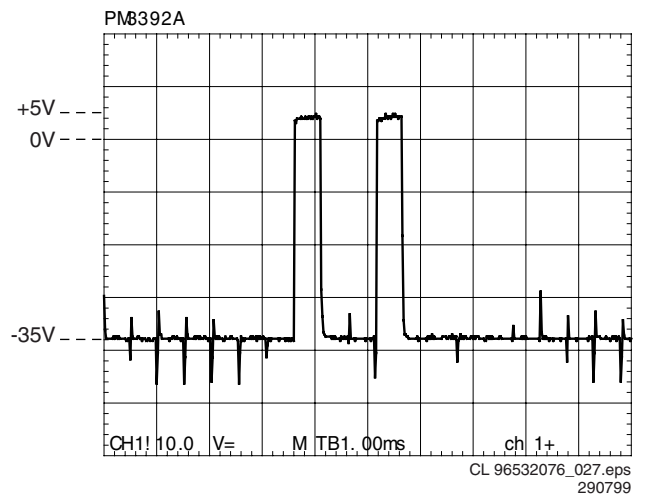


Figure 8-4 'Segment line'

Key matrix lines

The lines connected to pins 34, 35, 36 and 37 of the display controller act as matrix scanners. Without a key pressed, they maintain a low level. As soon as a key is pressed, the scanning line connected to that key puts out a scanning signal, which should look like the oscillogram below. This scanning signal goes via the pressed key to I/O port 4 of the display controller (pins 28 to 33). The display controller can now determine which key has been pressed. Without a key pressed, pins 28 to 33 of the display controller maintain a high level (+5V).

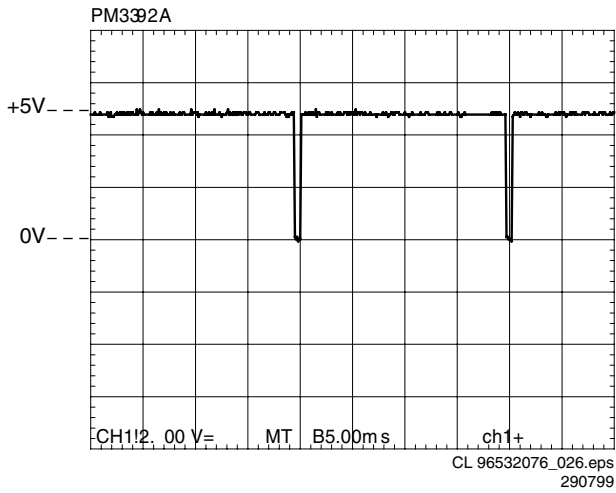


Figure 8-5 'Key matrix scan line'

Easy jog knob

Rotary operation

The easy jog knob (SY26) incorporates a whole heap of user control possibilities in just one knob. Without the knob being operated, pin 1 and 3 of the knob (and thus pin 16 and 17 of the display controller), maintain the +5V level. Turning the knob clockwise briefly connects pin 1 to GND followed by pin 3.

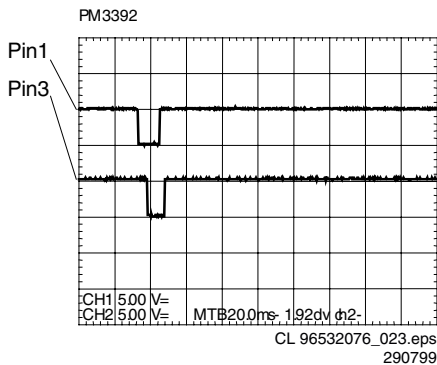


Figure 8-6 'Turn clockwise'

Turning the knob anti-clockwise briefly connects pin 3 to GND followed by pin 1.

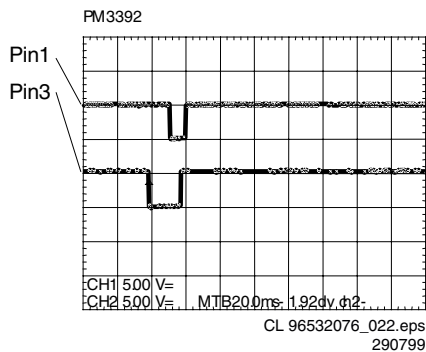


Figure 8-7 'Turn anti-clockwise'

The pulses created this way arrive at pin 16 and 17 of the display controller. The first pulse to arrive tells the controller the direction of the rotation. Counting the pulses reveals the amount of rotation. Combining and decoding this information, the display controller will execute the appropriate task.

Push button operation

This button connects to the key matrix lines and thus the operation is identical to the ordinary keys. Without being pressed, pin 4 of the easy jog maintains the low level, pin 5 the high level. When pressed the scanning signal goes through the closed contact of pins 4 and 5, and can be checked at both pins.

IR receiver - remote control

In the CDR570/930 the IR receiver RPM6934-V4 (ZY01) is mounted on the display board. In all versions the IR receiver connects to the display controller. The signal coming from the receiver can be checked at pin 22 of the display controller. This signal is normally high (+5V). When the remote control is being operated, pulses mixed in with the +5V can be measured. The oscillogram gives an indication of how the signal looks like with the RC being operated.

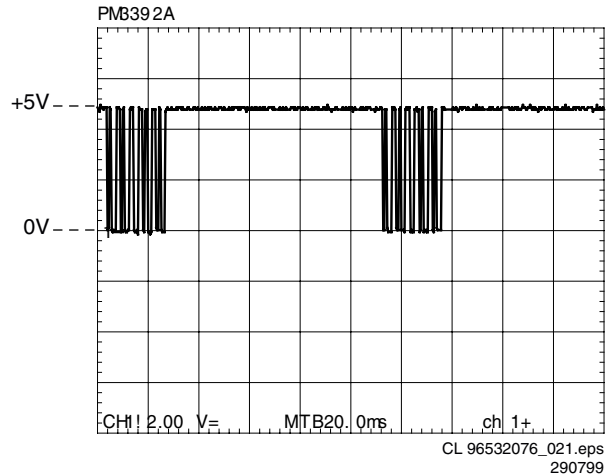
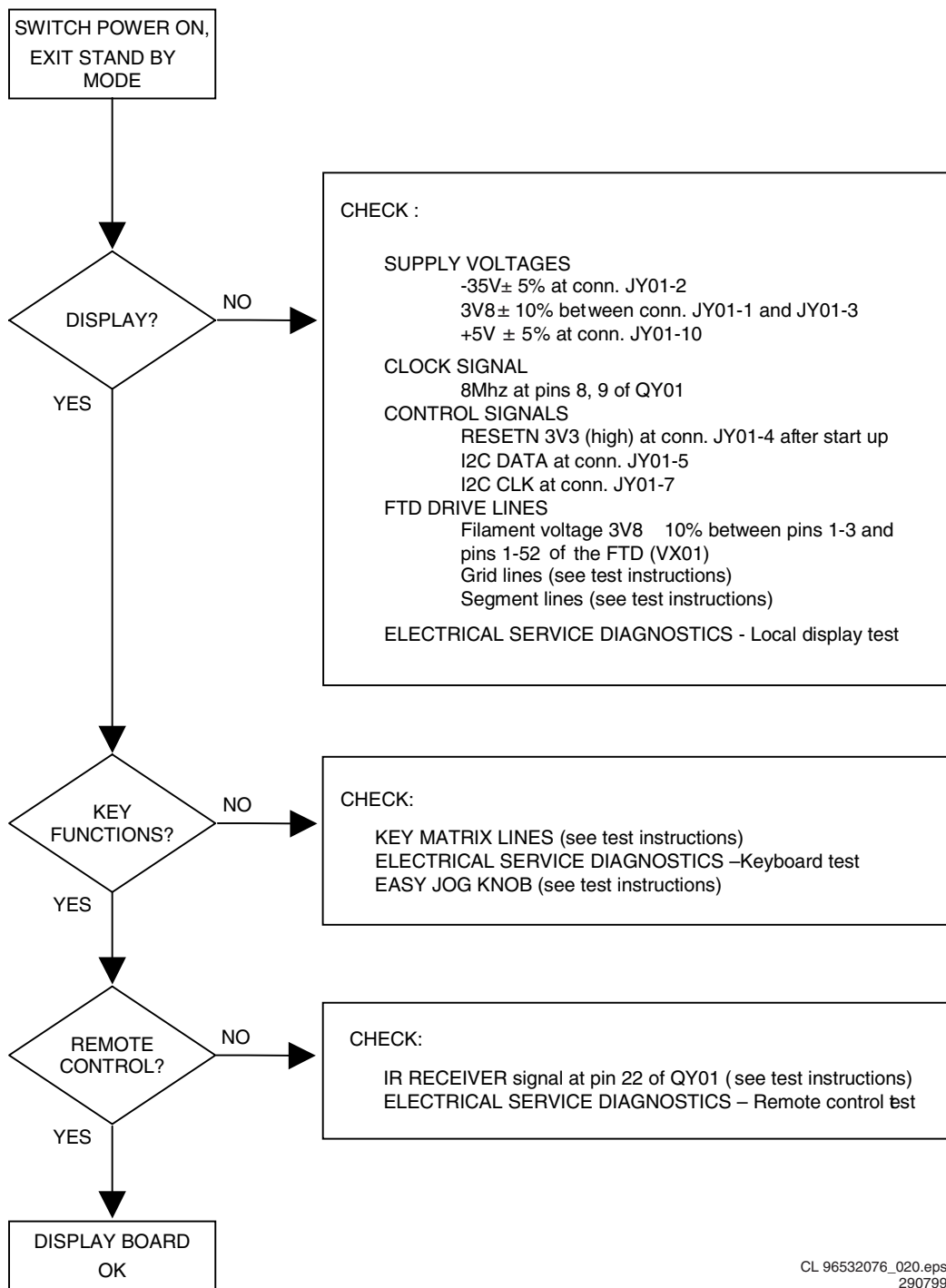


Figure 8-8 'IR receiver signal'

8.1.3 Display board troubleshooting guide



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Figure 8-9 Display board troubleshooting'

8.2 Power Supply Unit P816

8.2.1 Description of P816

MOSFET Q825 is used as a power switch controlled by the controller Q810. When the switch is closed, energy is transferred from mains to the transformer. This energy is supplied to the load when the switch is opened. Through control of the switch-on time, the energy transferred in each

cycle is regulated so that the output voltages are independent of load or input voltage variations. The controlling device MC44603 is an integrated pulse width modulator. A clock signal initiates power pulses at a fixed frequency. The termination of each output pulse occurs when a feedback signal of the inductor current reaches a threshold set by the error signal. In this way the error signal actually controls the peak inductor current on cycle-by-cycle basis.

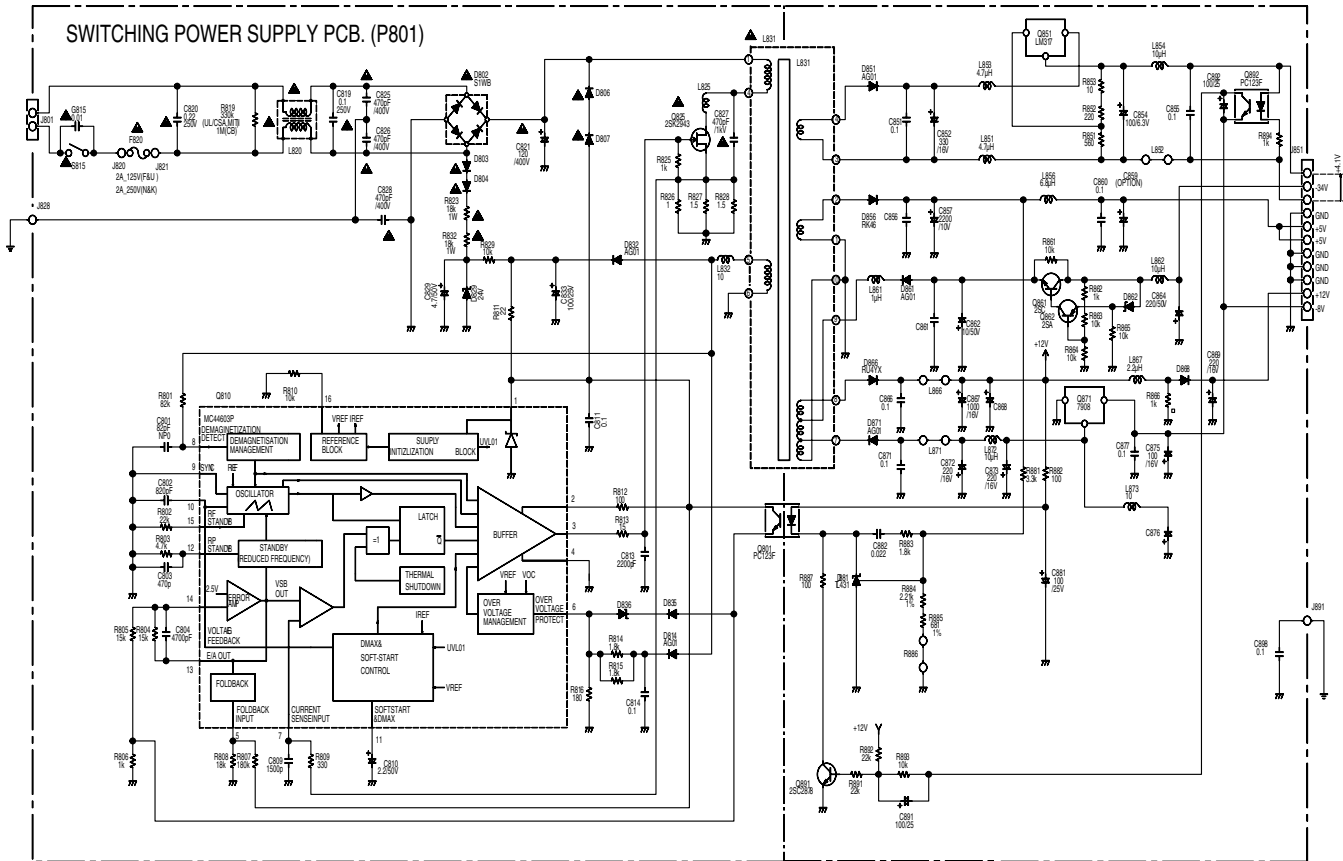
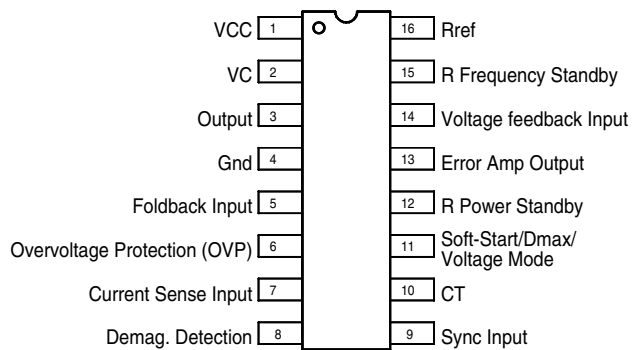


Figure 8-10 'Blockdiagram P816'

Description of controller MC44603

The MC44603 is an enhanced high performance controller that is specifically designed for off-line and DC-to-DC converter applications. This device has the unique ability of automatically changing operating modes if the converter output is overloaded, unloaded or shorted. The MC44603 has several distinguishing features when compared to conventional SMPS controllers. These features consist of a foldback facility for overload protection, a standby mode when the converter output is slightly loaded, a demagnetization detection for reduced switching stresses on transistor and diodes, and a high current totem pole output ideally suited for driving a power MOSFET. It can also be used for driving a bipolar transistor in low power converters. It is optimised to operate in discontinuous mode but can also operate in continuous mode. Its advanced design allows use in current mode or voltage mode control applications.

Pin connections



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Figure 8-11

Pin	Name	Description
1	VCC	This pin is the positive supply of the IC. The operating voltage range after start-up is 9.0 to 14.5 V.
2	VC	The output high state (VOH) is set by the voltage applied to this pin.
3	Output	Peak currents up to 750 mA can be sourced or sunk, suitable for driving either MOSFET or bipolar transistors.
4	Gnd	The groundpin is a single return, typically connected back to the power source.
5	Foldback Input	The foldback function provides overload protection.
6	Oversvoltage Protection	When the oversvoltage protection pin receives a voltage greater than 2.5V, the device is disabled and requires a complete restart sequence.
7	Current Sense Input	A voltage proportional to the current flowing into the power switch is connected to this input.
8	Demagnetisation Detection	A voltage delivered by an auxiliary transformer winding provides to the demagnetisation pin an indication of the magnetisation state of the flyback transformer. A zero voltage detection corresponds to complete core saturation.
9	Synchronisation Input	The synchronisation input pin can be activated with either a negative pulse going from a level between 0.7V and 3.7V to Gnd or a positive pulse going from a level between 0.7V and 3.7V up to a level higher than 3.7V. The oscillator runs free when Pin 9 is connected to Gnd.
10	C _T	The normal mode oscillator frequency is programmed by the capacitor C _T choice together with the Rref resistance value. C _T , connected between Pin 10 and Gnd, generates the oscillator sawtooth.
11	Soft-Start/Dmax/Voltage-Mode	A capacitor, resistor or a voltage source connected to this pin limits the switching duty-cycle. This pin can be used as a voltage mode control input. By connecting Pin 11 to Ground, the MC44603 can be shut down.
12	RP Standby	A voltage level applied to the RP Standby pin determines the output power level at which the oscillator will turn into the reduced frequency mode of operation (i.e. standby mode). An internal hysteresis comparator allows to return in the normal mode at a higher output power level.
13	E/A Out	The error amplifier output is made available for loop compensation.
14	Voltage Feedback	This is the inverting input of the Error Amplifier. It can be connected to the switching power supply output through an optical (or other) feedback loop.
15	RF Standby	The reduced frequency or standby frequency programming is made by the RF Standby resistance choice.
16	Rref	Rref sets the internal reference current. The internal reference current ranges from 100 A to 500 A. This requires that $5.0k\Omega \leq Rref \leq 25k\Omega$.

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Figure 8-12

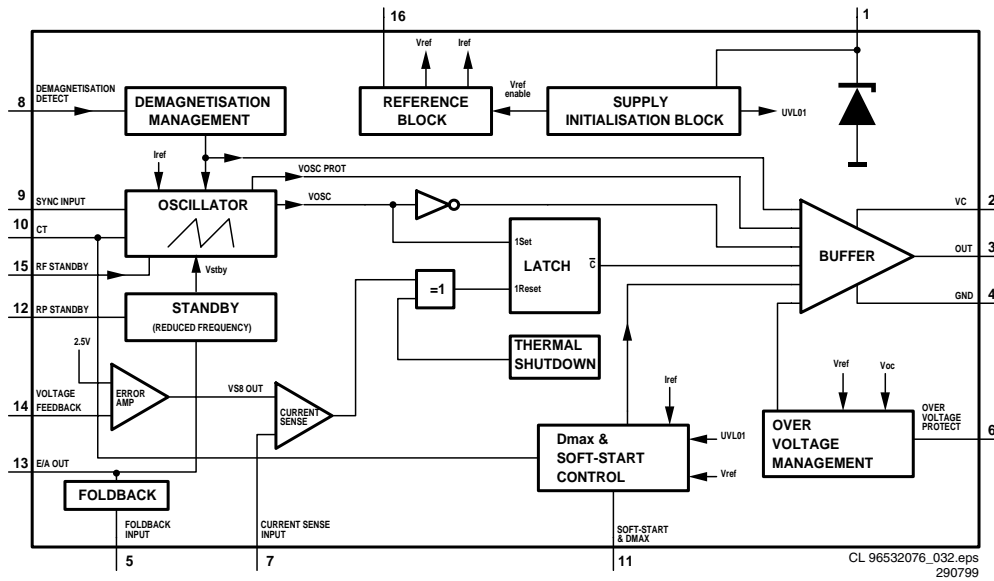


Figure 8-13

Operating description of MC44603

The input voltage V_{cc} (pin 1) is monitored by a comparator with hysteresis, enabling the circuit at 14.5V and disabling the circuit below 7.5V. The error amplifier compares a voltage V_{fb} (pin 14) related to the output voltage of the power supply, with an internal 2.5V reference. The current sense comparator compares the output of the error amplifier with the switch current I_{sense} (pin 7) of the power supply. The output of the current sense comparator resets a latch, which is set every cycle by the oscillator. The output stage is a totem pole, capable of driving a MOSFET directly.

Start up sequence of P816

t1: Charging the capacitors at V_{cc}

C829 will be charged via R823 and R832, C833 and C811 v i a R829. The output is switched off during t1.

t2: Charging of output capacitors

When the input voltage of the IC exceeds 14.5V, the circuit is enabled and starts to produce output pulses. The current consumption of the circuit increases to about 17mA, depending on the external loads of the IC. At first, the capacitors at the V_{cc} pin will discharge because the primary auxiliary voltage, coming from winding 7-9 is below the V_{cc} voltage. At some moment during t2, the primary auxiliary voltage reaches the same level as V_{cc} . This primary auxiliary voltage now determines the V_{cc} voltage.

t3: Regulation

The output voltage of the power supply is in regulation.

t4: Overload

When the output is shorted, the supply voltage of the circuit will decrease and after some time drop below the lower threshold voltage. At that moment, the output will be disabled and the process of charging the V_{cc} capacitors starts again. If the output is still shorted at the next t2 phase, the complete start-and stop sequence will repeat. The power supply goes in a hiccup mode.

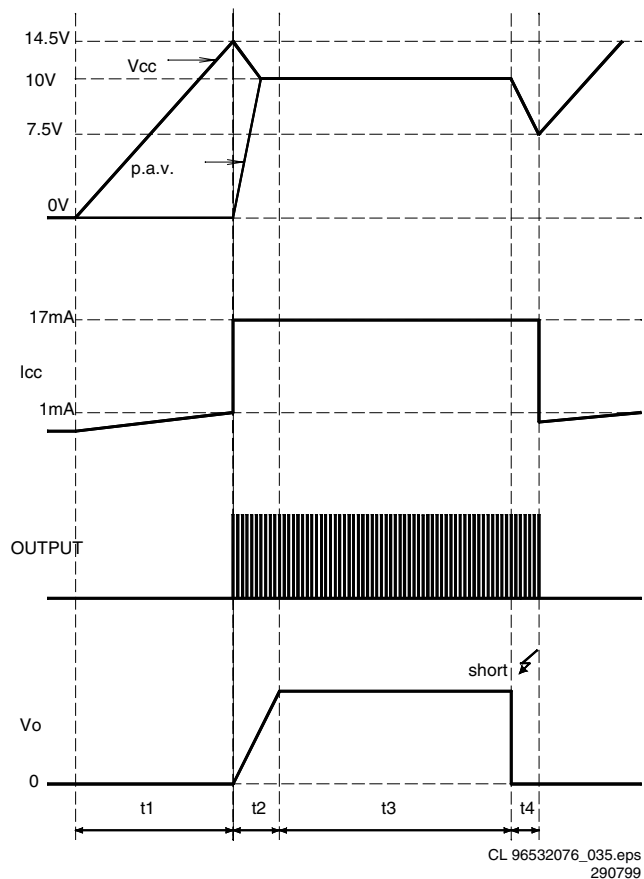


Figure 8-14 'Start-up sequence'

Regulation of P816

Figure 8-14 shows the most relevant signals during the regulation phase of the power supply. The oscillator voltage ramps up and down between V_1 and V_2 . The voltage at the current sense terminal is compared every cycle with the output of the error amplifier V_{comp} . The output

is switched off when the current sense level exceeds the level at the output of the error amplifier.

TimeON phase : A drain current will flow from the positive supply at pin 2 of the transformer through the transformer's primary winding, the MOSFET and Rsense to ground. As the positive voltage at pin 2 of the transformer is constant, the current will increase linearly and create a ramp dependent on the mains voltage and the inductance of the primary winding. A certain amount of energy is stored in the transformer in the form of a magnetic field. The polarity of the voltages at the secondary windings is opposite to the primary winding so that the diodes are non-conducting in this phase.

TimeDIODE phase : When the MOSFET is switched off, energy is no longer supplied to the transformer. The inductance of the transformer now tries to maintain the current which has been flowing through it at a constant level. The polarity of the voltage from the transformer therefore reverses. This results in a current flow through the transformer's secondary winding via the now conducting diodes, electrolytic capacitors and the load. This current is also ramp shaped but decreasing.

TimeDEAD phase : when the stored energy has been supplied to the load, the current in the secondary windings stops flowing. At this point, the drain voltage of the MOSFET will drop to the voltage of C821 with a ringing caused by the drain-source capacitance with the primary inductance.

The oscillator will start a next cycle which consists of the above described three phases. The time of the different phases depends on the mains voltage and the load.

TimeDEAD is maximum with an input of 400VDC and a minimum load. It will be zero with an input of 100VDC and an overload.

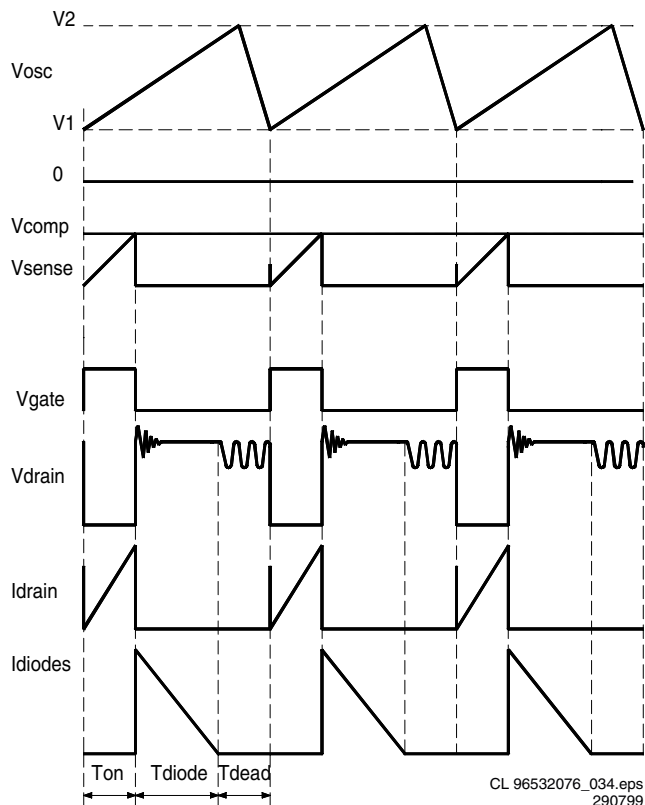
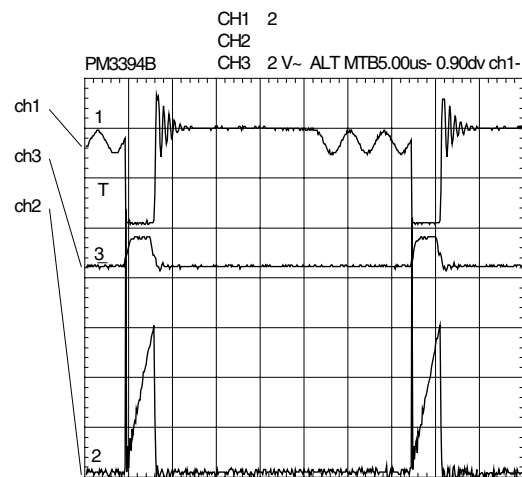
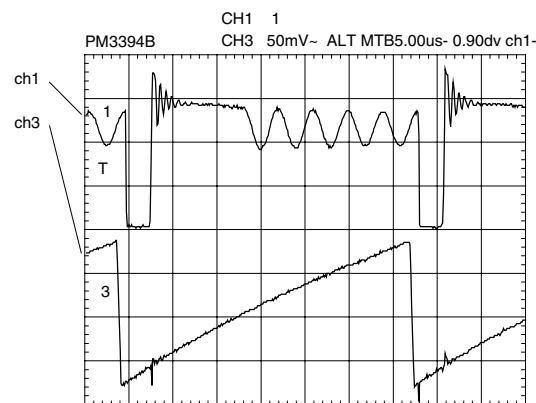


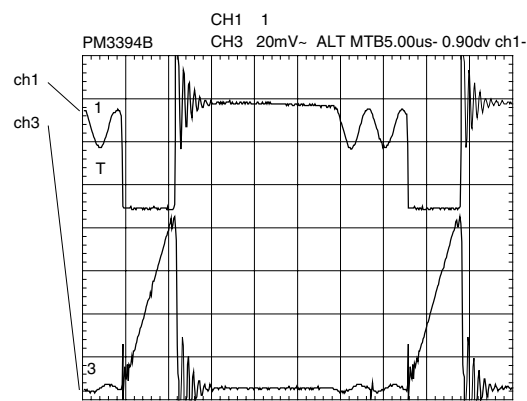
Figure 8-15 'Regulation'



ch1 : Drain voltage
ch2 : Drain current
ch3 : Gate voltage



ch1 : Drain voltage
ch2 : Oscillator voltage



ch1 : Drain voltage
ch3 : Sense voltage

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Figure 8-16 'Oscillograms'

Circuit description of P816

Input circuit

The input circuit consists of a lightning protection circuit and an EMI filter.

The lightning protection comprises R819.

The EMI filter is formed by C820, L820, C825 and C826.

It prevents inflow of noise into the mains.

Primary rectifier/smoothing

The AC input is rectified by rectifier bridge D802 and smoothed into C821. The voltage over C821 is approximately 300V.

It can vary from 100V to 390V.

Start up circuit and Vcc supply

This circuit is formed by R823, R834, C829, D828, R829, R811, C833 and C811.

When the power plug is connected to the mains voltage, the stabilised voltage over D829 (24V) will charge C833 via R829. When the voltage reaches 14.5V across C811, the control circuit of Q810 is turned on and the regulation starts. During regulation, Vcc of IC7110 will be supplied by the rectified voltage from winding 7-9 via L832, D832 and C833.

Control circuit

The control circuit exists of Q810, C802, C804, C807, C809, C810, R802, R803, R804, R807, R808, R809 and R810.

C802 and R810 define the frequency of the oscillator.

Power switch circuit

This circuit comprises MOSFET Q825, Rsense R826, R827 and R828, R825, C827, L825, R812 and R813. R825 is a pull-down resistor to remove static charges from the gate of the MOSFET.

Regulation circuit

The regulation circuit comprises opto-coupler Q801 which isolates the error signal from the control IC on the primary side and a reference component D881. The TL431(D881) can be represented by two components:

a very stable and accurate reference diode

a high gain amplifier

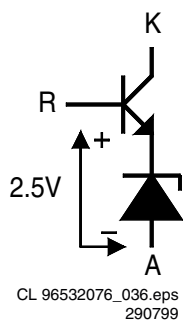


Figure 8-17 'TL 431'

TL431 will conduct from cathode to anode when the reference is higher than the internal reference voltage of about 2.5V. If the reference voltage is lower, the cathode current is almost zero. The cathode current flows through the LED of the opto-coupler. The collector current of the opto-coupler flows through R806, producing an error voltage, connected to voltage feedback pin 14 of Q810.

Demagnetisation

The auxiliary winding (7-9) voltage is used to detect magnetic saturation of the transformer core and connected via R801 to pin 8 of Q810. During the demagnetisation phase, the output will be disabled.

Overvoltage protection circuit

This circuit consist of D814, C814, R814, R815 and R816.

When the regulation circuit is interrupted due to an error in the control loop, the regulated output voltage will increase (overvoltage). This overvoltage is sensed at the auxiliary winding 7-9.

When an overvoltage longer than 2.0 (s) is detected, the output is disabled until VCC is removed and then re-applied. The power supply will come in a hiccup mode as long as the error in the control loop is present.

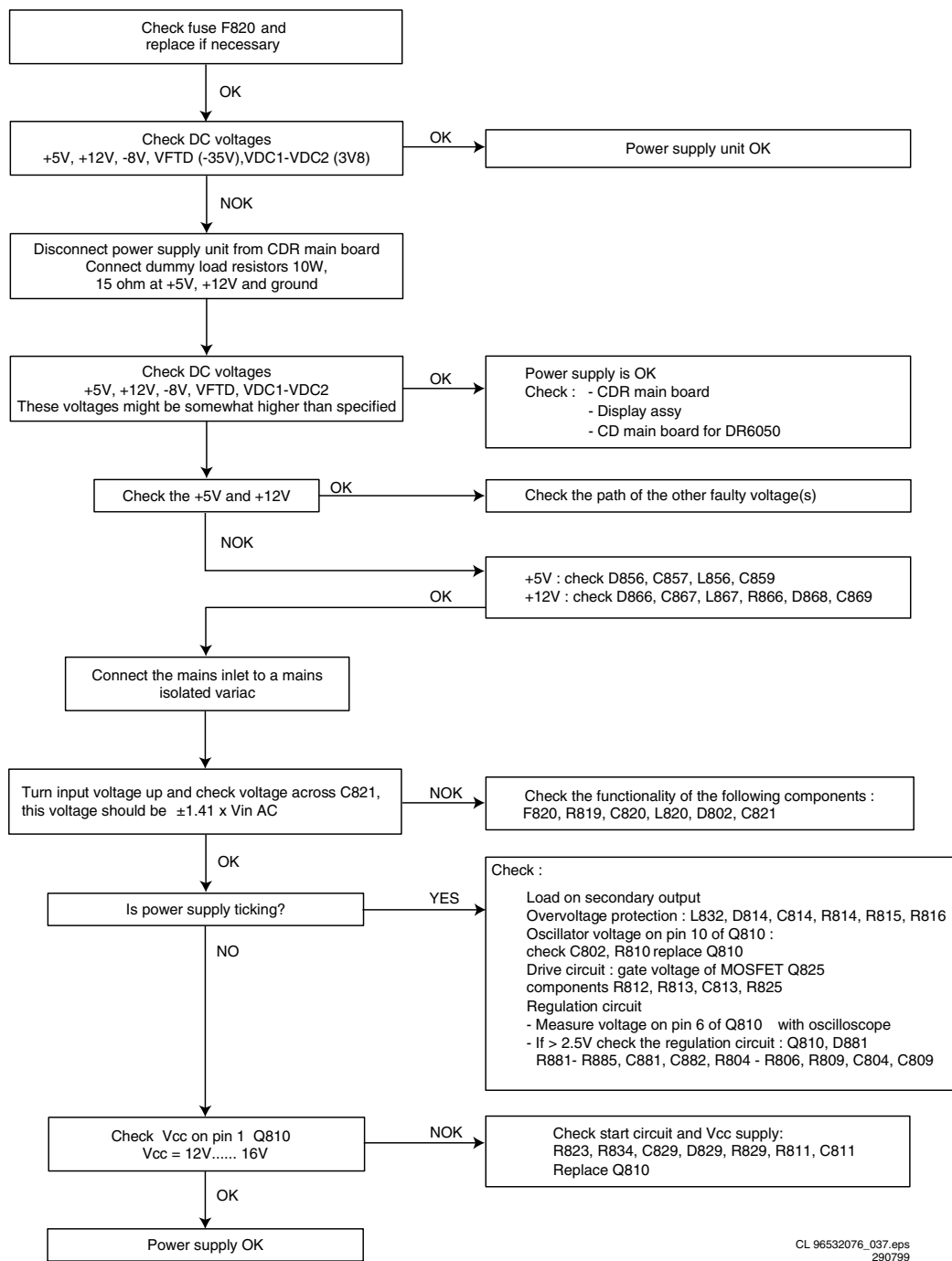
Secondary rectifier/smoothing circuit

There are 5 rectifier/smoothing circuits on the secondary side. Each voltage depends on the number of windings of the transformer.

The -8V supply is regulated by voltage regulator Q871.

On/off circuit

8.2.2 Troubleshooting P816



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Figure 8-18

8.3 CD Main Board

The CD main board is built around the compact disc mechanism VAM1250 and a loader 1250. The CDM delivers diode signals and an unequalised high frequency signal. These signals are necessary inputs for the decoder CD10. Based on these signals the decoder will control the disc. The decoder is able to control the sledge, focus motor, radial motor and turn table. When everything is "locked", the decoder delivers a digital output according to IEC958 standard, subcode to the microprocessor and I2S for reproducing analog audio signals by means of a D/A converter.

The microprocessor controls the CD10 and is slave of the master processor on the CDR main board in the DR6050. Both processors communicate via a DSA connection (data, strobe and acknowledge).

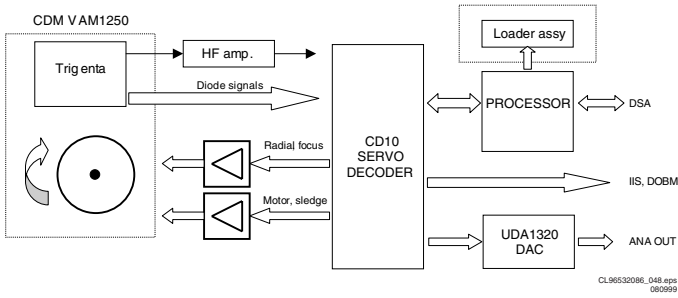


Figure 8-19

8.3.1 Supply Voltages

Description

The CD main board receives +5V and +12V from the CDR main board via respectively pin 16 and pin 15 of connector 1208. The +5V is split up into +5VHF and +5V. The +5VHF is used mainly for the diode currents and the HF-amplifier. The +5V is used for the digital part of the board. On the board a +3V3 is made from the +5V for the decoder CD10 and an A3V3 for the DAC UDA1320. The +12V is split up into A12V for the audio output stage and +12V for the power drivers of the CDM.

Measurements

Connect following supplies to next pins :

- +5V + 5% to pin 16 of connector 1208.
- +12V + 5% to pin 15 of connector 1208.

Ground reference to pin 17 of connector 1208.

Keep microprocessor 7202 in reset by forcing pin 7 of connector 1208 to +5V. Check the following voltages :

Point	Voltage
Position 1000 pins 1,3	+5V ± 5%
Position 7000 pins 5,17,21,57	+3.3V ± 5%
Position 7005 pin 14	+5V ± 5%
Position 7020 pins 25	+5V ± 5%
Position 7020 pins 26,27,28	+10 ±10%
Position 7021 pin 5	+12V ±10
Position 7022 pin 5	+12V ±10
Position 7025 pin 16	+5V ± 5%
Position 7202 pin 38	+5V ± 5% (other appl. 3V3 possible)
Position 7309 pins 4,13	+3V3 ± 5%
Position 7120 pin 8	+12V ± 10

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Figure 8-20

8.3.2 Clock Signals

Description

The microprocessor has its own Xtal or resonator of 12MHz. The CD10 needs a clock of 8.4672MHz + 100ppm. This speed also relates to the disc speed. To avoid locking problems between the two drives in the CDR775, both drives run on the same clock. Therefore the CD main board gets the clock for the decoder from the CDR main board via pin 2 of connector 1208. The DAC needs a system clock to drive its internal digital filters and to clock the I2S signals from the decoder. In our case this is 11.2896MHz (CL11) generated by the CD10.

Measurements

Connect the power supply as described above in "1.1.1. Supply Voltages".

Connect on pin 2 of position 1208 a clock signal of 8.4672 MHz (100ppm minimum rise time of 50ns and at TTL level (0V and +5V). Keep microprocessor 7202 in reset by forcing pin 7 at position 1208 to +5V. Release the reset. Now, the processor will reset the CD10 for at least 75µs. The output clock CL11 should be available now at pin 42 of the CD10.

Check the following frequencies :

Point	Frequency
Position 7000 pin 16	8.4672 MHz ±100ppm
Position 7202 pins 14,15	12MHz ±5%
Position 7309 pin 6	11.2896 MHz ±100ppm
Position 7309 pin 1	2.1168 MHz ±100ppm
Position 7309 pin2	44.1kHz ±100ppm

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Figure 8-21

8.3.3 CD10 Decoder/Servo SAA7324 (7000)

Description

The CD10 is a single chip combining the functions of a CD decoder, digital servo and bitstream DAC. The decoder/servo part is based on the CD7. The decoding part supports a full audio specification and can operate at single speed (n=1) and double speed (n=2).

Block Diagram

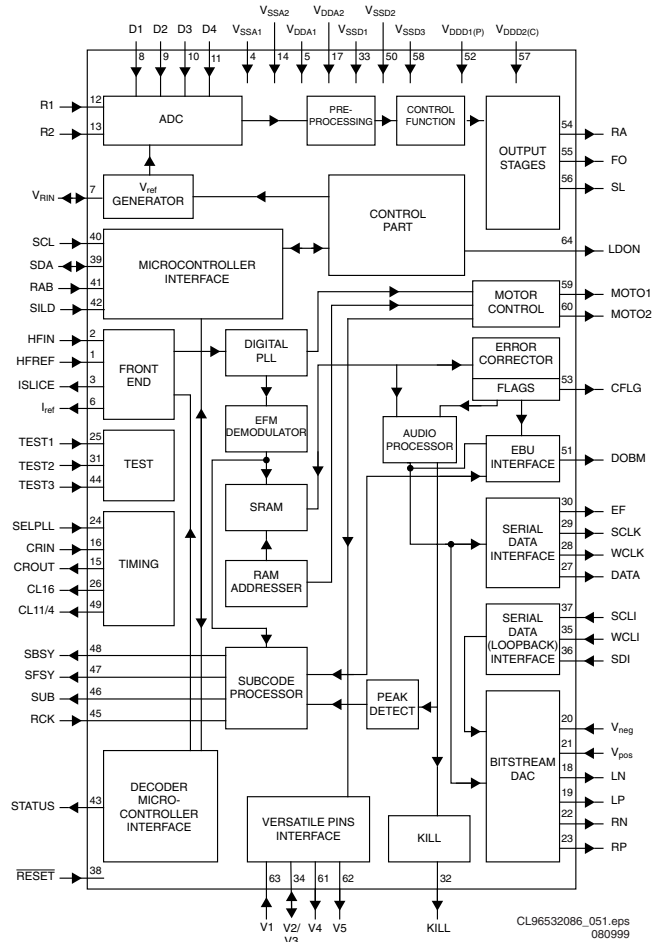


Figure 8-22

Pin Configuration

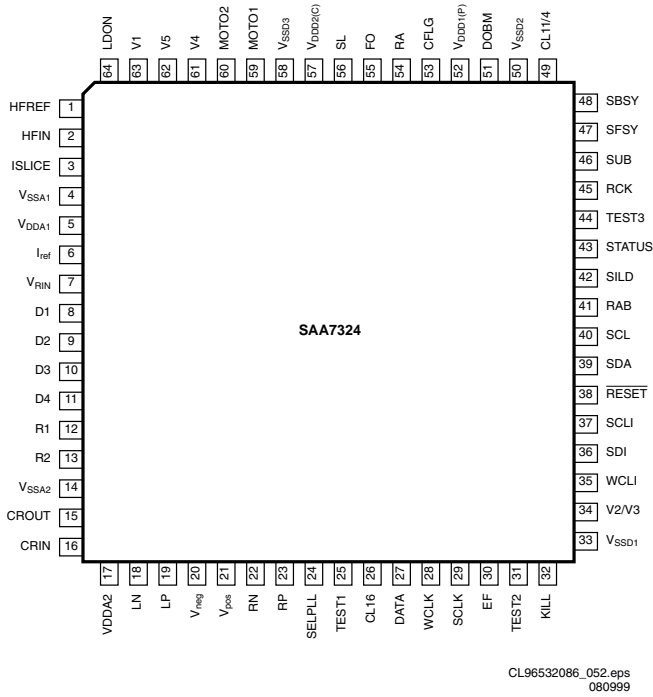


Figure 8-23

8.3.4 TDA7073A Power Drivers (7021, 7022)

Description

The TDA7073A is a dual power driver circuit for servo systems with a single supply. In this configuration it is used to drive the sledge, tray, focus and radial.

Measurements

Keep microprocessor 7202 in reset by forcing pin 7 of connector 1208 to +5V. Connect the power supply as described above in "1.1.1. Supply Voltages". Check the following voltages :

Pin	Location	Value
5	7021	12V ± 10%
5	7022	12V ± 10%
1	7022	1.65V ± 10%
2	7022	1.65V ± 10%
6	7022	1.65V ± 10%
7	7022	1.65V ± 10%
1	7021	5.0 ± 10%
2	7021	5.0 ± 10%
6	7021	1.65V ± 10%
7	7021	1.65V ± 10%

CL96532086_053.eps
080999

Figure 8-24

Pin	Location		Value DC
9	7022	FOC	5.8V ± 10%
12	7022	FOC	5.8V
13	7022	RAD	5.8V
16	7022	RAD	5.8V
9	7021	SLE	5.8V
12	7021	SLE	5.8V
13	7021	TRAY-	5.8V
16	7021	TRAY+	5.8V

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Figure 8-25

8.3.5 BA6856FP Turn Table Motor Driver (7020)

Description

This component is a 3 phase, full wave pseudo linear driving system with inbuilt Hall Bias circuit and 3 phase parallel output.

Measurements

Keep processor 7202 in reset by forcing pin 7 of connector 1208 to +5V. The outputs 9, 10, 11 of connector 1006 are 0V. Pin 21 of the motor driver 7020 is 2.5V ± 10%. Pin 22 of the motor driver 7020 is 2.5V ± 10%. Pin 23 of the motor driver 7020 is 0V.

Pin 19 of the motor driver 7020 is 5V ± 10%.

Put the processor out of reset to continue the measurement. Check MOT1 at pin 59 of CD10. The duty cycle of the output should be 50%. Check wave form at pin 11 of 7005-D : amplitude 5V + 5% duty cycle 50%.

The motor driver 7020 can be measured dynamically by connecting a hall motor to the application panel. Apply a pulse of 1V 10Hz and 15% duty cycle to pin 22 (Ec) as input value with reference to pin 21 (Ecr=2.5V). Measure the output signals on the driver. This will give as response a square wave on pin 17 and pin 18. When a positive voltage is applied, the square wave on pin 17 will go ahead of the square wave on pin 18. All signals will have a value as shown in the truth table. Check the following output signals :

Motor controller truth table

Input conditions conn 1006 pin						Outputs conn 1006			Test points on driver		
6	8	4	7	3	2	9	10	11	18	17	16
U+	U-	V+	V-	W+	W-	UCOIL	VCOIL	WCOIL	HALL_U	HALL_V	HALL_W
L	M	H	M	M	M	6V	0V	0V	0V	5V	
H	M	L	M	M	M	0V	6V	6V	5V	0V	
M	M	L	M	H	M	0V	6V	0V		0V	5V
M	M	H	M	L	M	6V	0V	6V		5V	0V
H	M	M	M	L	M	0V	0V	6V	5V		0V
L	M	M	M	H	M	6V	6V	0V	0V		5V

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Figure 8-26

Hall-elements input signal voltage levels

Input voltage	Level	Tolerance	Unit
H	2.8	0.1	V
M	2.5	0.1	V
L	2.2	0.1	V

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Figure 8-27

8.3.6 Tray Control

Description

The tray control consists of a TDA7073A power driver (7021) controlled by the processor 7202 via pin 19 TRAYIN and pin 20 TRAYOUT. If pin 20 is low and pin 19 high, the TRAY+ signal at pin 16 of 7021 is forced to +8V and the TRAY- signal at pin 13 of 7021 to GND : the tray will open. If pin 20 is high and pin 19 low, TRAY+ becomes GND and TRAY- becomes +8V : the tray will close. If pin 19 and 20 of the processor have the same value, TRAY+ and TRAY- will have the same value as well : the tray stops moving.

Measurements

Keep procesor 7202 in reset by forcing pin 7 of connector 1208 to +5V. Connect a load of 15 Ω , 7W between pin 3 and 4 of connector 1002. Check the voltage over the load with TRAY+ (pin 3) as positive reference. Check also the levels of pins 19 and 20 of the processor.

U TRAY+,TRAY- = <100mV

Pin 20 = +5V

Pin 19 = +5V

Force pin 20 of the processor to ground, and check the voltages.

U TRAY+,TRAY- = -6.5V(10%

Pin 20 = +0V

Pin 19 = +5V

Force pin 19 of the processor to ground as well and check the levels again.

U TRAY+,TRAY- = <100mV

Pin 20 = +0V

Pin 19 = +0V

Release pin 20 of the processor and check the levels.

U TRAY+,TRAY- = 6.5V(10%

Pin 20 = +5V

Pin 19 = +0V

Release pin 19 of the processor and check the levels again:

U TRAY+,TRAY- = <100mV

Pin 20 = +5V

Pin 19 = +5V

8.3.7 HF Path

Description

The pre-amplified HF-signal is presented to both n=1 and n=2 amplifier circuits. The mux/demux switches via software and micro processor controlled S1 and S2 lines between either one of the amplified n=1 or n=2 signals. The signal will then follow

another amplification and filtering circuit. The filtering again is controlled by the S1 and S2 lines, dependant on whether the disc starts up (speed n=1, S1 and S2 Low), disc plays at speed n=1 (S1 Low, S2 High) or disc plays at speed n=2 (S1 and S2 High).

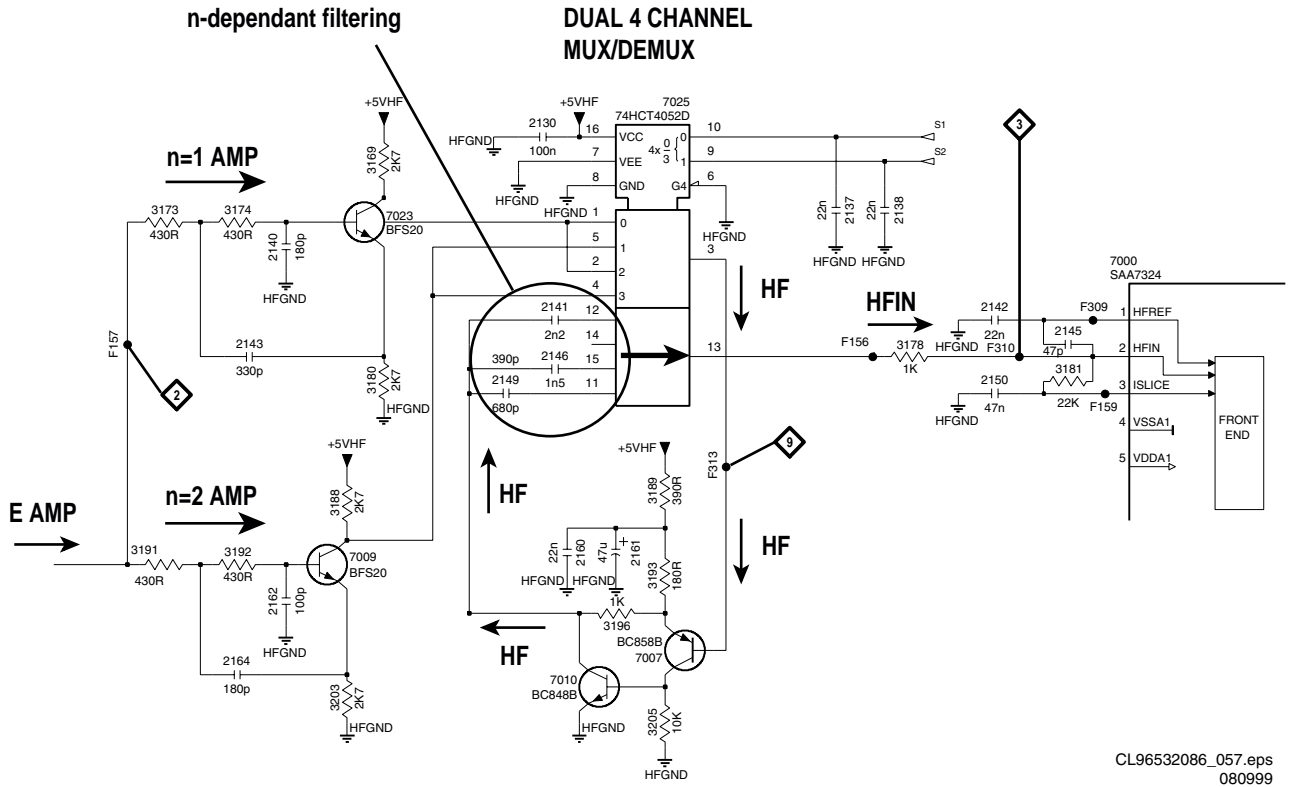


Figure 8-28

DC Settings

Set the power and reset connections as described above in "1.1.1. Supply Voltages". Check the following voltages :

Force	Pin	Location	Measure
	Emitter	7006	2.4 ± 10%
S1 and S2 "HIGH"	Collector	7010	1.9 ± 10%
S1 and S2 "LOW"	Collector	7010	1.9 ± 10%
S1 and S2 "HIGH"	13	7025	1.6 ± 10%
S1 and S2 "LOW"	13	7025	1.6 ± 10%
S1 and S2 "HIGH"	3	7025	3.2 ± 10%
S1 and S2 "LOW"	3	7025	3.2 ± 10%

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Figure 8-29

Transfer Characteristics

Set the power and reset connections as described above in "1.1.1. Supply Voltages". Connect a function generator via a serial resistor of 1k5 to pin 4 of connector 1000. Use the

function generator as a sine wave generator with output level of 1Vt. Check this AC value with an AC mV-meter connected to the input (pin 2) of the CD10 (7000) :

Frequencies	S1 and S2 "low"		S1 and S2 "high"	
	Input V _{AC}	Pin 2 at 7000	Input V _{AC}	Pin 2 at 7000
300 Hz	200mV	< 100mV ± 20%	200mV	< 100mV ± 20%
10 kHz	200mV	295mV ± 20%	200mV	330mV ± 20%
100 kHz	200mV	310 mV ± 20%	200mV	330 mV ± 20%
300 kHz	200mV	385 mV ± 20%	200mV	335 mV ± 20%
800 kHz	200mV	655 mV ± 20%	200mV	485 mV ± 20%
1.5 MHz	200mV	1.1V ± 20%	200mV	760 mV ± 20%
3MHz	200mV	1.1V ± 20%	200mV	1.1V ± 20%

CL96532086_059.eps
080999

Figure 8-30

HFDET Setting

Set the power and reset connections as described above in "1.1.1. Supply Voltages". Connect a function generator via a serial resistor of 1k5 to pin 4 of connector 1000. Use the

function generator as a sine wave generator with output level of 500 kHz, 1Vt. Check this AC value with an AC mV-meter :

Location	Voltage DC		Voltage AC
	No HF	HF	
F190	4.8V± 20%	4.8V± 20%	175mV± 20%
F192	< 100mV	1.1V± 20%	-
F206	4.9V± 20%	150mV± 20%	-

CL96532086_060.eps
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Figure 8-31

8.3.8 Audio Part - DAC

Description

The DAC used, is the UDA1320 bit stream, continuous calibration. I2S signals from various formats can be entered at pins 1,2 and 3. If these signals are in phase with the delivered system clock at pin 6, the DAC will reproduce analog output signals at pins 14 and 16. 0dB level is 0.85Vrms. These analog signals are at 1.65Vdc level.

The DAC has features which can be checked on the input pins. Mute will switch off the analog signals. De-emphasis is not used, since this is done in the decoder. Attenuation of -12dB is not used because this is also done in the decoder.

I2S

I2S is a kind of digital audio format, consisting out of 3 lines : CLOCK, WORDSELECT and DATA.

WORD-SELECT

Word select (WS) indicates whether the data-sample is from the left or the right audio-channel. It has the same frequency as the sample rate of the digital audio signal. This can be 32, 44.1 or 48kHz. Normal polarity is low for a left sample and high for a right sample. So within the low state of the WS-line the data bits for the left channel are transferred, and within the high state the data bits of the right channel are transferred.

CLOCK

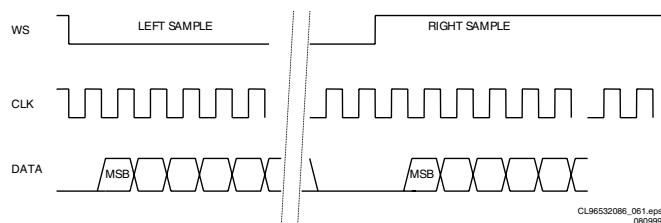
The CLOCK signal (CLK) indicates when DataTips must be set, and when DataTips must be read. The frequency depends on the speed of the I2S-bus, but is always a factor of the frequency of the WS-signal. It can be 48x, 64x, 96, 128x... .In our case it is 48x the sample rate frequency = 2.1168MHz. The

signal is in phase with the WS-signal. Transition of the WS always happens on a falling edge of the CLK.

DATA

DATA contains all data-bits. Data bits are set by the transmitting device, and read by the receiving device. The position of the DATA-bits within the WS-signal is very important. There are several formats for this. In our case we always use Philips I2S format, no Japanese or Sony format. The number of data-bits per channel depends on the used devices.

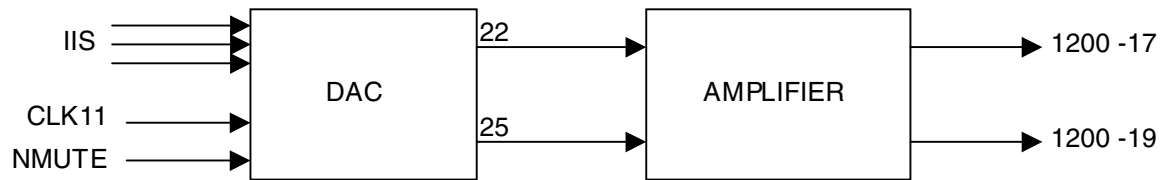
Timing of the I2S-bus, in case of Philips I2S is shown in the next figure :



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Figure 8-32

Measurements



CL96532086_062.eps
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Figure 8-33

Keep processor 7202 in reset by forcing pin 7 of connector 1208 to +5V. This puts the processor outputs in tristate. Check the reset at pin 4 of processor 7202 to make sure that the processor is in reset.

Now, force port 0-4 pin 33 at 7202 to 0V to set the decoder outputs (SCLK, WCLK, DATA, and CLK11).

Check the MUTE pin 11 at 7309 : this pin should be low.

Connect via an I2S generator I2S-signals to the DAC :

Pin 1 at 7309: SLCK.

Pin 2 at 7309: WCLK.

Pin 3 at 7309: DATA.

Connect also the SYSCLK pin 6 at position 7309 to a clock signal of 11.2896 MHz \pm 100ppm.

Generate an I2S signal equivalent with a sine wave of 1kHz at 0dB for both left and right channels.

Check if 0.8 VRMS at pins 14 and 16 at location 7209 with a DC of 1.65VDC.

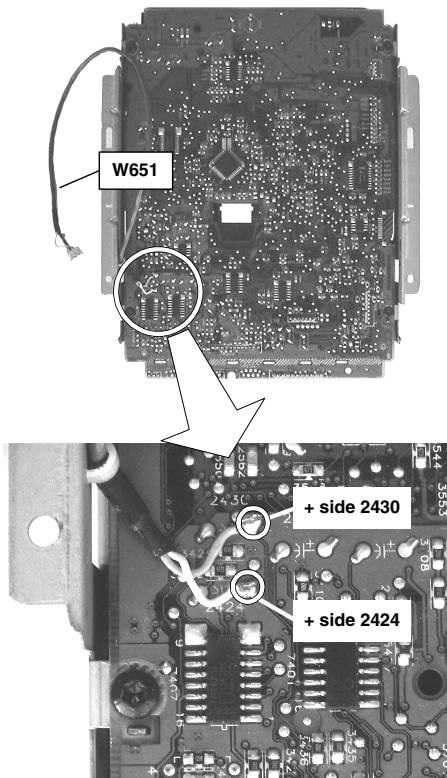
Check if 1.7 VRMS \pm 2 dB at connector pins 1 and 3 at location 1209.

Force MUTE Pin 11 at 7309 high.

Measure again at pins 1 and 3 at location 1209 : both signals should be at -90 dB.

9. WIRING DIAGRAM

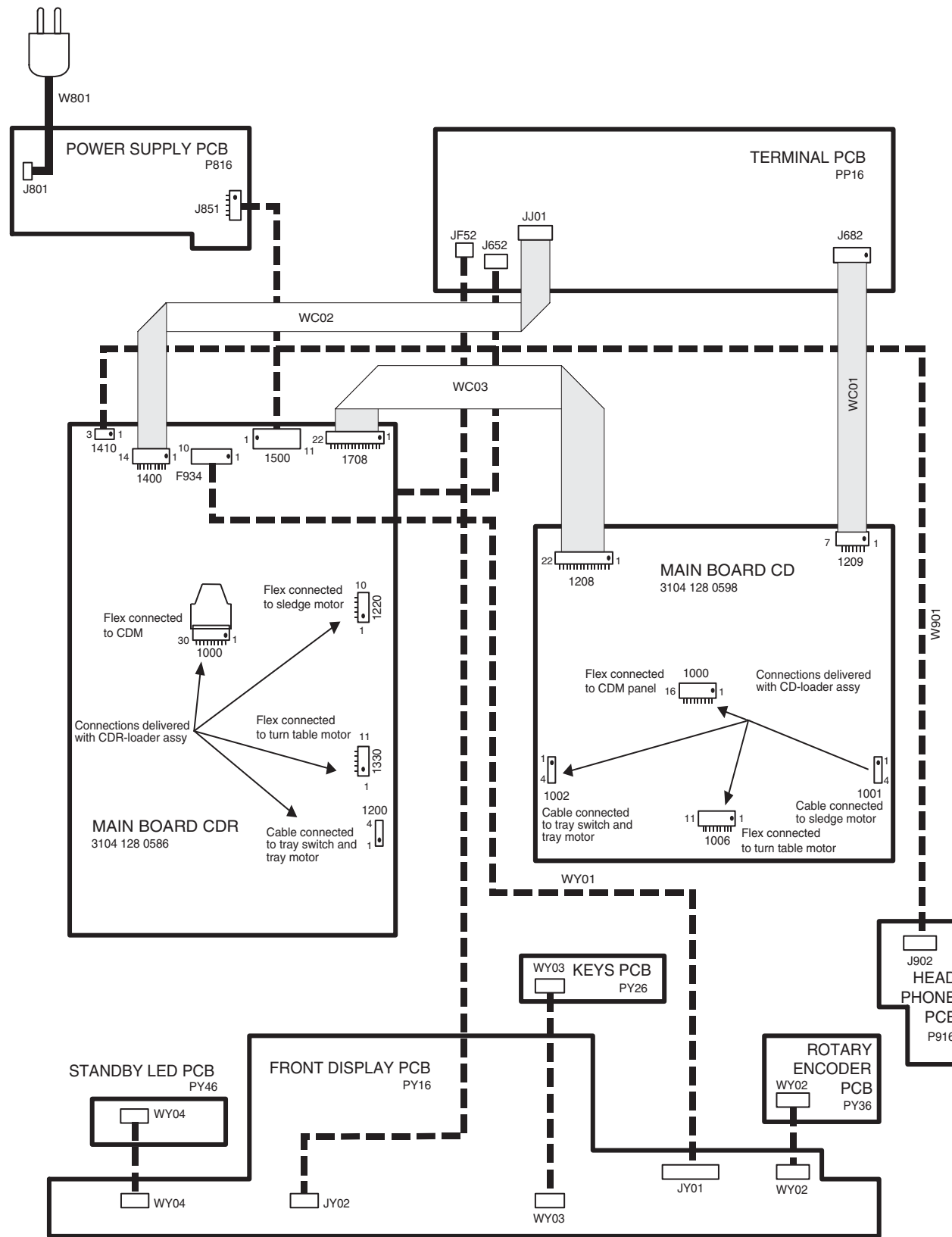
DISMOUNTING ADDITIONAL CABLES



De-soldering and remove cables **W651** from the loader PCB.

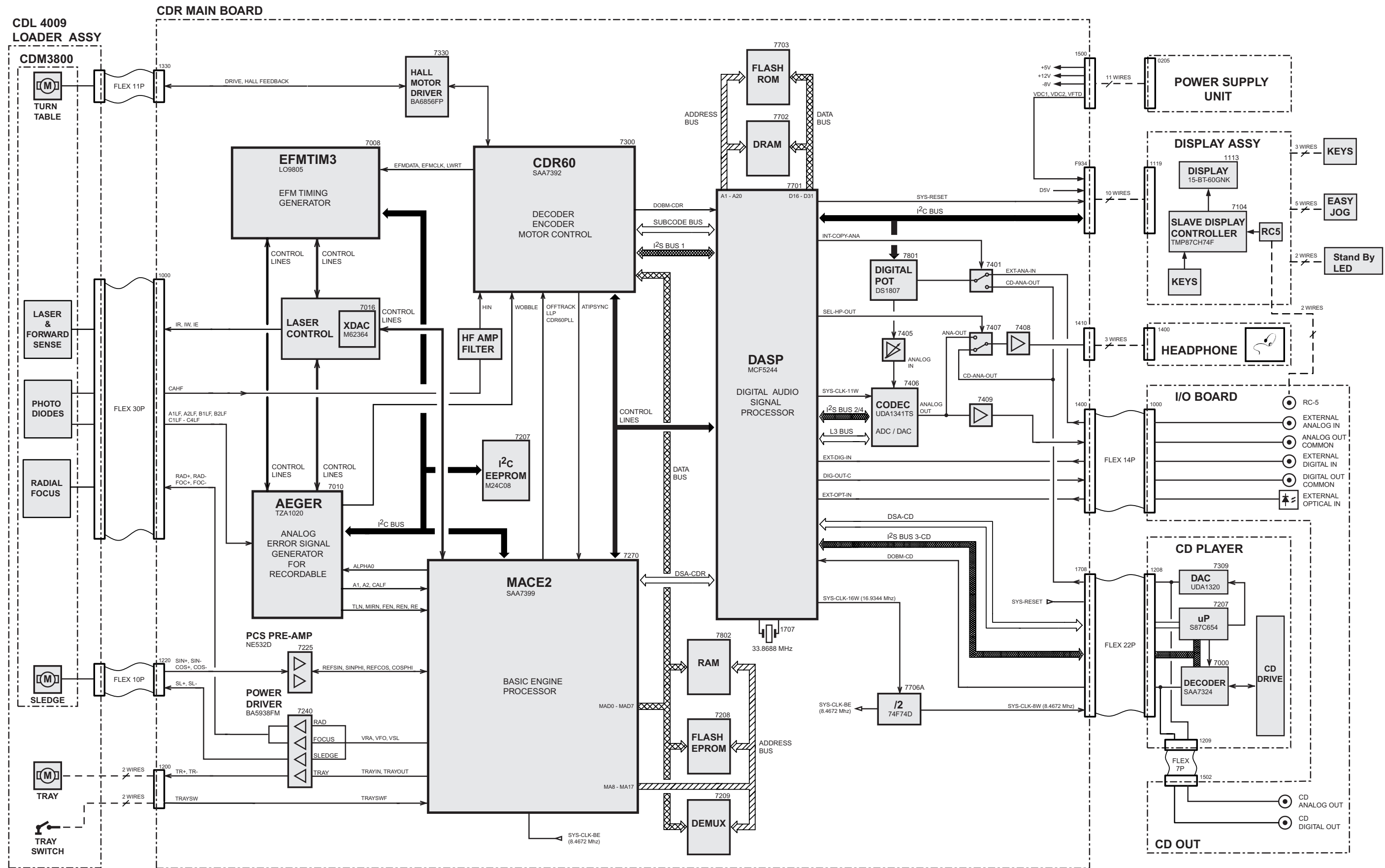
REMARK When replace the CDR module MAR775 to the new one. It is necessary to add removed cables at same positions as follows;

- ◆ WHITE + side lead of capacitor 2424
- ◆ PINK + side lead of capacitor 2430

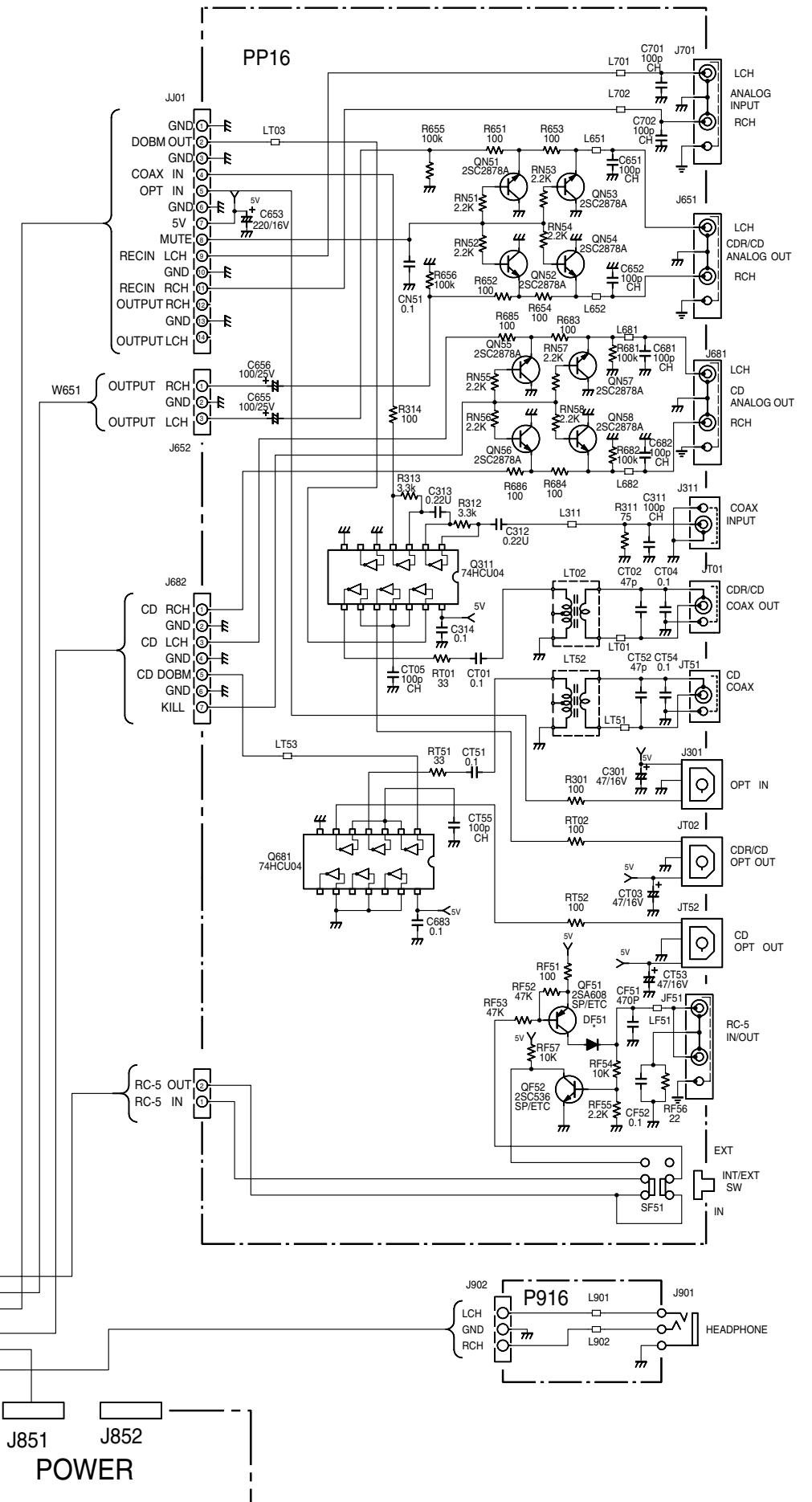
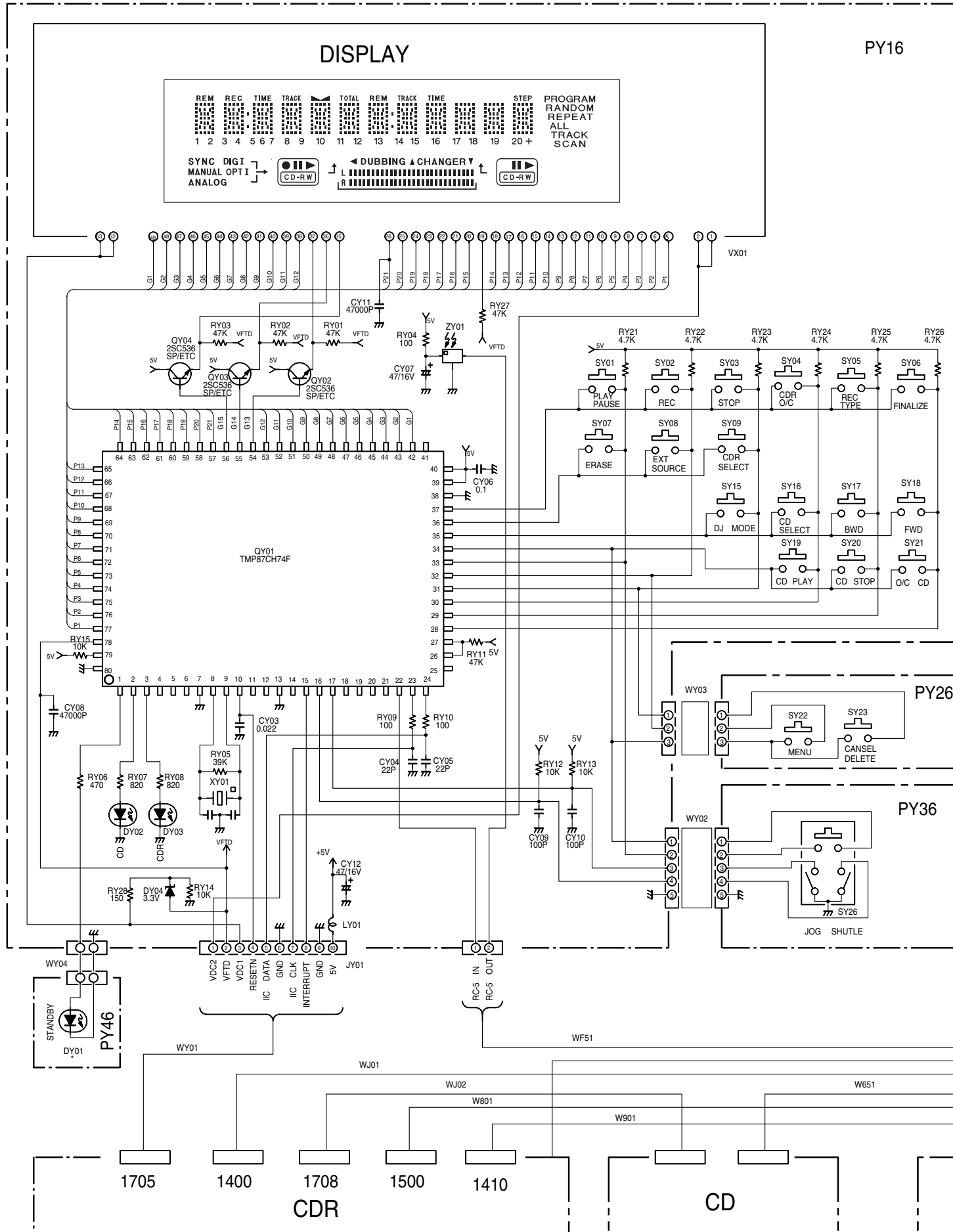


WY01(at conn.F934of CDR main board)	WY02	WY03	WY04
1 VDC2	1 KEY	1 KEY	1 STAND BY
2 VFTD	2 KEY	2 KEY	2 GND
3 VDC1	3 PULS	3 KEY	
4 SYS RESET	4 PULS		
5 IIC DATA	5 GND		
6 GND			
7 IIC CLOCK			
8 DISPL INT			
9 GND			
10 D5V			
WC01(at conn.1209 of CDR main board)	WC02(at conn.1400 of CDR main board)	WC03(at conn.1708 of CDR main board)	
1 RIGHT CD	1 GND	1 GND	
2 GND	2 DOBM CDR	2 DSA DATA CD	
3 LEFT CD	3 GND	3 GND	
4 GND	4 EXT DIG IN	4 DSA STR CD	
5 DOBM CD	5 EXT OPT IN	5 DSA ACK CD	
6 GND	6 GND	6 GND	
7 KILL	7 D5V	7 D5V	
W801(at conn.1500 of CDR main board)	8 KILL	8 12V CD	
1 VDC2	9 LEFT IN	9 GND	
2 VFT	10 GND	10 IIS DATA CD	
3 VDC1	11 RIGHT IN	11 IIS WS CD	
4 GND	12 RIGHT OUT	12 GND	
5 5V	13 GND	13 IIS BCK CD	
6 5V	14 LEFT OUT	14 GND	
7 GND		15 DOBM CD	
8 GND	W801	16 SYS RESET	
9 GND	1 COLD	17 LEFT IN CD	
10 12V	2 HOT	18 GND	
11 ⌚,W,-		19 RIGHT IN CD	
WF51		20 KILL	
1 RC-5 OUT	W901	21 SYS CLOCK 8W	
2 RC-5 IN	1 LEFT HP OUT	22 GND	
	2 GND		
	3 RIGHT HP OUT	W651	
		1 RIGHT CDR OUT	
		2 GND	
		3 LEFT CDR OUT	

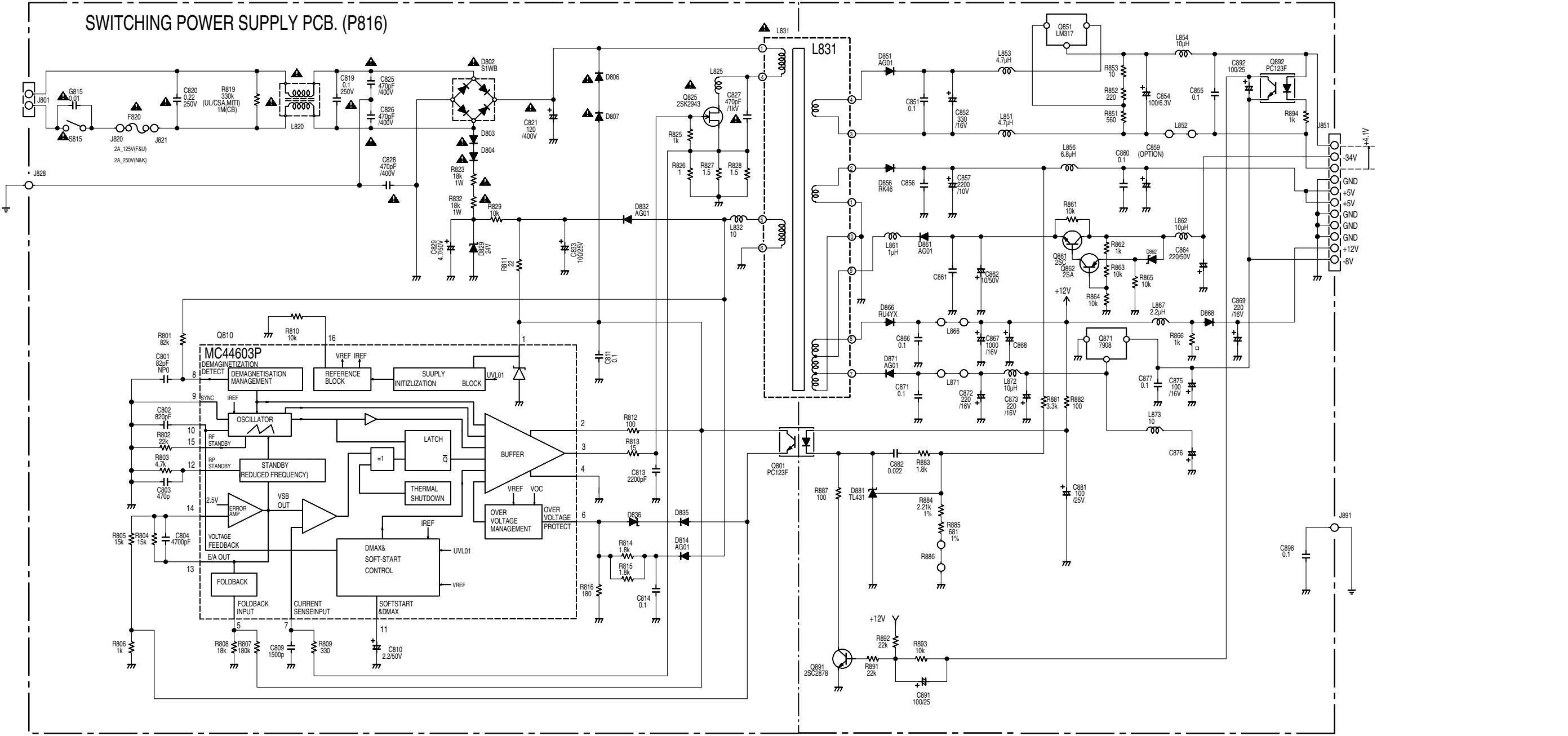
10. BLOCK DIAGRAM



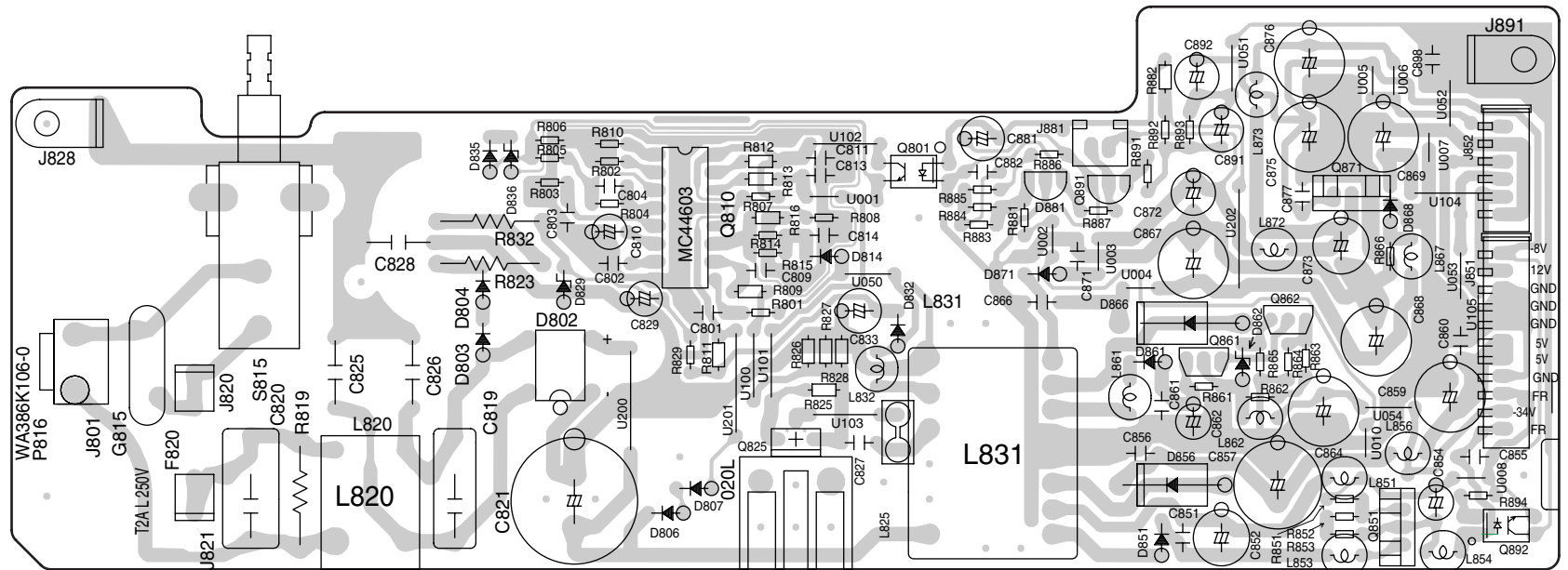
11. SCHEMATIC DIAGRAM AND PARTS LOCATION

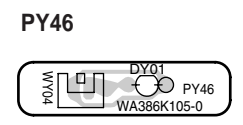
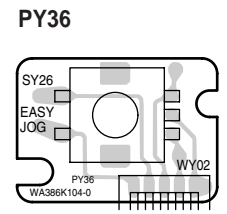
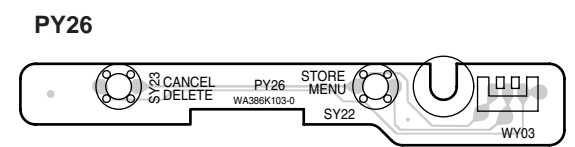
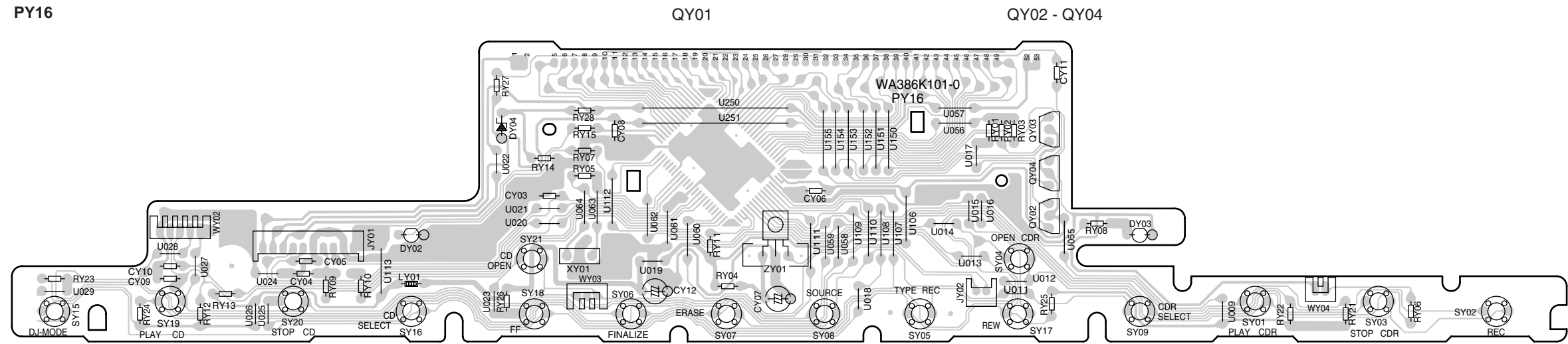
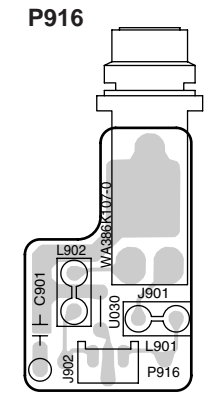
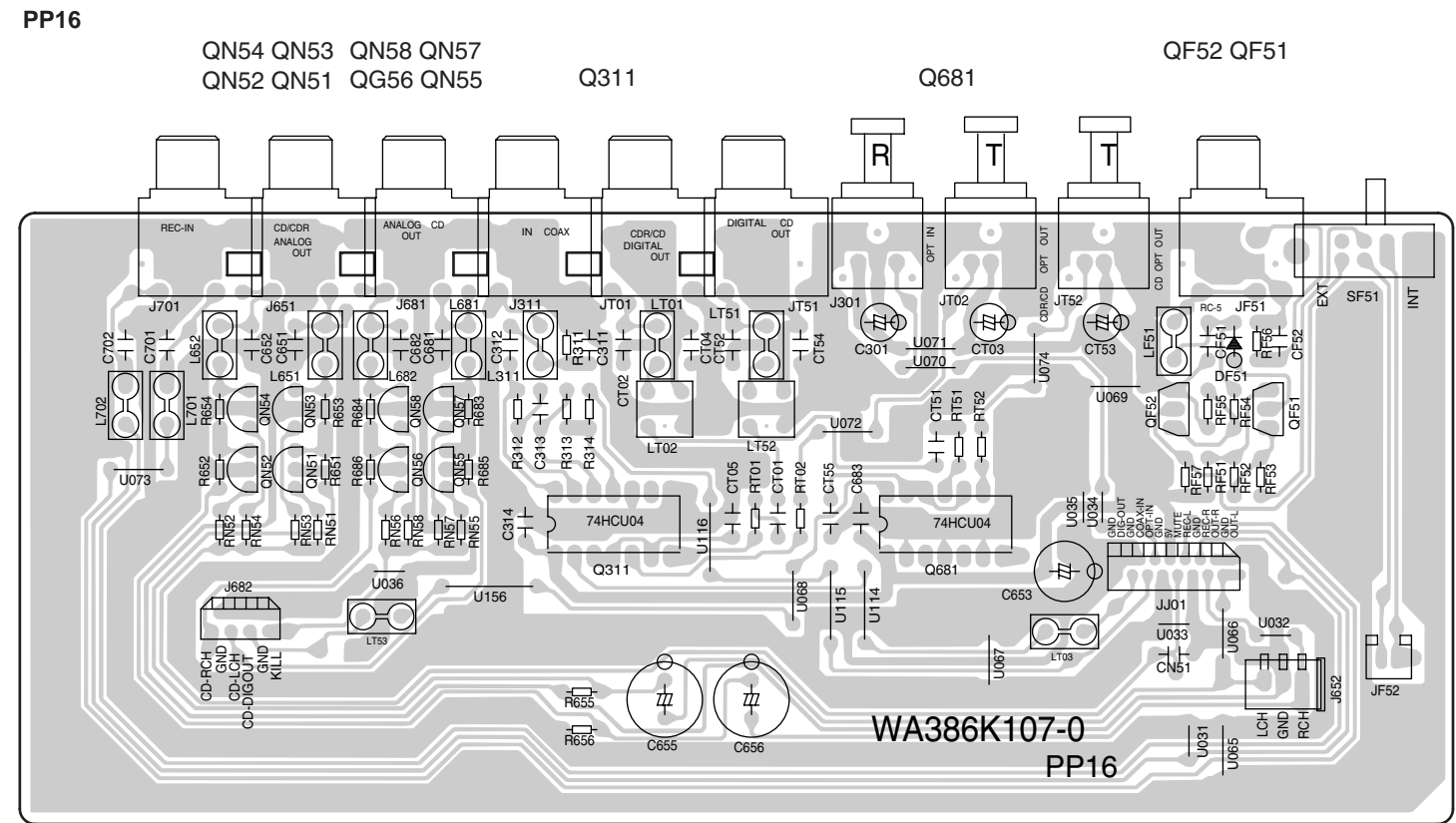


SWITCHING POWER SUPPLY PCB. (P816)



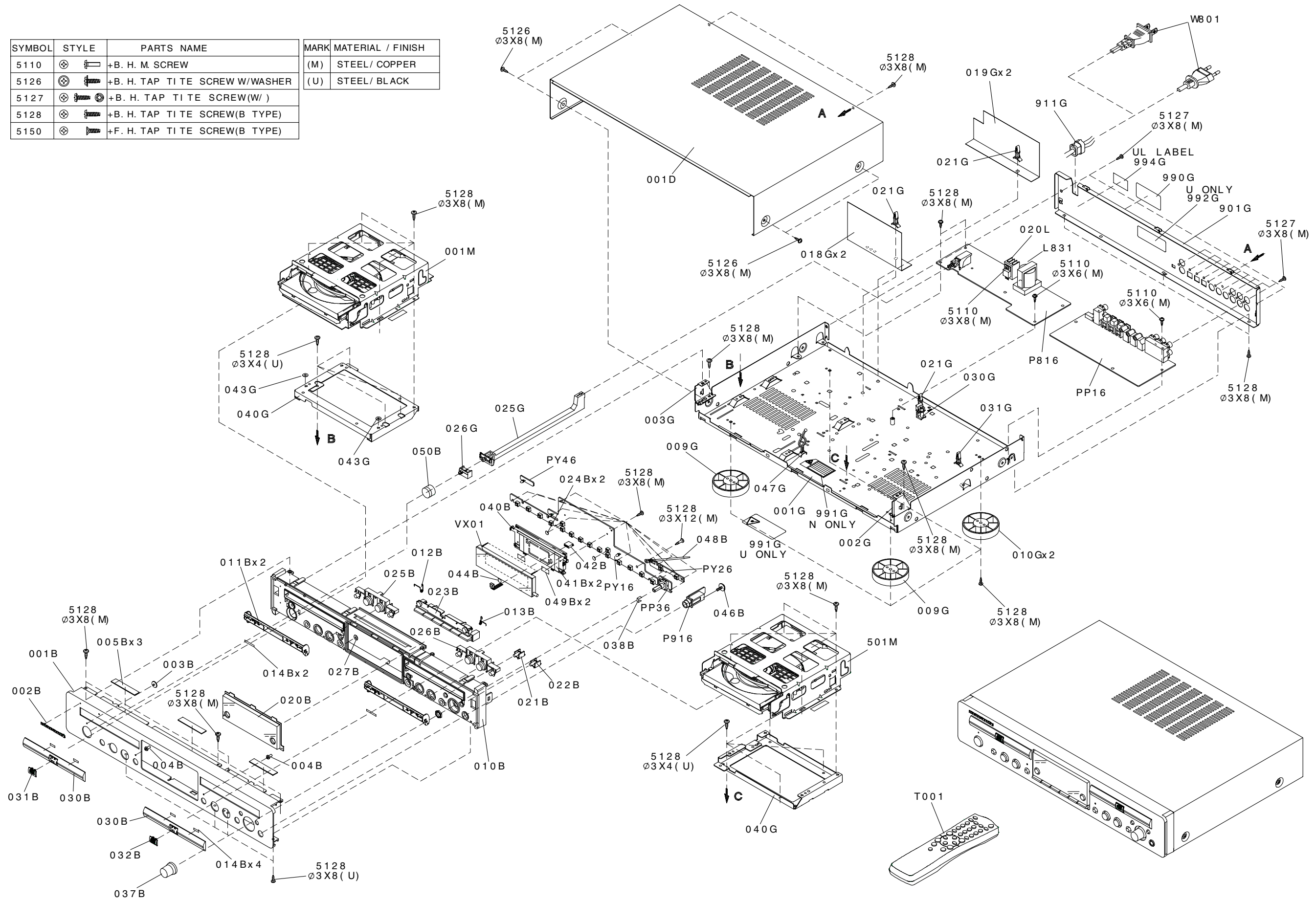
P816 Q810 Q825 Q801 Q891 Q861 Q862 Q851 Q892





12. EXPLODED VIEW AND PARTS LIST

SYMBOL	STYLE	PARTS NAME	MARK	MATERIAL / FINISH
5110		+B. H. M. SCREW	(M)	STEEL/ COPPER
5126		+B. H. TAP TITE SCREW W/WASHER	(U)	STEEL/ BLACK
5127		+B. H. TAP TITE SCREW(W/)		
5128		+B. H. TAP TITE SCREW(B TYPE)		
5150		+F. H. TAP TITE SCREW(B TYPE)		



POS. NO	VERS. COLOR	PART NO. (FOR PCS)	DESCRIPTION	PART NO. (MJI)	POS. NO	VERS. COLOR	PART NO. (FOR PCS)	DESCRIPTION	PART NO. (MJI)	
001B	BLACK	9965 000 06363	FRONT PANEL AL BLK	386K248010				PACKING		
001B	GOLD	9964 000 06396	FRONT PANEL AL GLD	386K248110	001T	/F			USER MANUAL F	386K851110
002B		4822 454 11825	BADGE MARANTZ BL PAINT	185J251010	001T	/K			USER MANUAL ENG/CHI	386K851350
003B		9965 000 01393	LENS STANDBY LED	312J355010	001T	/N	9965 000 06373		USER MANUAL 9 LANG.	386K851310
004B		9965 000 06364	LENS	225K355020	001T	/U			USER MANUAL U	386K851250
010B	BLACK	9965 000 06365	CHASSIS	386K105010	010T				USER MANUAL FLY SHEET	386K851070
010B	GOLD	9964 000 06397	FRONT CHASSIS PL GLD	386K105110						
011B		9965 000 05925	TRAY LID ARM	386K257020	J081	/K	4822 265 10092		JACK AC ADAPTER	YJ04001240
012B		9965 000 06366	SPRING TRAY LID RIGHT	386K115010	T001		9965 000 05922		REMOTE COMMANDER RC6050DR	ZK386K0010
013B		9965 000 05926	SPRING TRAY LID LEFT	386K115020						
020B		9965 000 06367	WINDOW PINK SMOKE	386K158010	W001		4822 321 62205		RCA ST.CORD 1M GOLD	ZD01000550
021B	BLACK	9965 000 06368	BUTTON STORE/MENU BL	386K270010	W002		4822 321 62205		RCA ST.CORD 1M GOLD	ZD01000550
021B	GOLD	9964 000 06398	BUTTON STORE/MENU GL	386K270110	W003		4822 321 62012		RCA RC-5 CORD 0.8M	ZD00900100
022B	BLACK	9965 000 06368	BUTTON CANCEL/DELETE BL	386K270010						
022B	GOLD	9964 000 06398	BUTTON CANCEL/DELETE GL	386K270110						
023B		9965 000 06369	BUTTON SEARCH ETC.BLK	386K270030						
025B	BLACK	9965 000 06370	BUTTON REC STOP PLAY BL	386K270050						
025B	GOLD	9964 000 06399	BUTTON REC STOP PLAY GL	386K270150						
026B	BLACK	9965 000 06371	BUTTON STOP PLAY L	386K270060						
026B	GOLD	9964 000 06400	BUTTON STOP PLAY L	386K270160						
030B	BLACK	9965 000 05930	ESCUTCHEON TRAY LID OUTER BL	386K063010						
030B	GOLD	9964 000 05940	ESCUTCHEON TRay lid OUTER GL	386K063110						
031B	BLACK	9965 000 05931	BADGE CD-RW BL	386K251010						
031B	GOLD	9964 000 05941	BADGE CD-RW GL	386K251110						
032B	BLACK	9965 000 06372	BADGE CD TEXT BL	386K251020						
032B	GOLD	9964 000 06401	BADGE CD TEXT GL	386K251120						
037B	BLACK	9965 000 05932	JOG KNOB BLK JOG KNOB BL	386K154010						
037B	GOLD	9964 000 05942	JOG KNOB GLD JOG KNOB GL	386K154110						
040B			FTD HOLDER FTD HOLDER	370K271110						
041B			STICKER ADHESIVE,FTD	056J122050						
046B			SCREW SCR. 010B + H.P.JACK	183J010010						
050B	BLACK	9965 000 01975	BUTTON POWER BL	255W270010						
050B	GOLD	9964 000 01395	BUTTON POWER GL	255W270110						
009G		4822 462 42129	LEG GOLD HOT STAMP FRONT	183J057010						
010G		4822 462 42048	LEG GOLD HOT STAMP REAR	183J057110						
025G		9965 000 00362	LINK,POWER SW.	349K121010						
026G		9965 000 05933	LINK EXTENSION	386K121010						
911G	/F		BUSHING NIFCO 4516	085J259010						
911G	/K,/N,/U	4822 459 80744	BUSHING NIFCO 2271	450H259010						
001M			MECHANISM CD-R MODULE MAR775	388K304500						
501M			MECHANISM CD MODULE VAL1250	386K304600						
WC01		9965 000 06393	FFC CABLE P=1.25 7PIN	YU07100530						
WC02		9965 000 06394	FFC CABLE P=1.0 14PIN	YU14300520						
WC03		9965 000 06395	FFC CABLE P=1.0 14PIN	YU22220520						
▲ W801	/F,/K		MAINS CORD E MAYOR	YC01800800						
▲ W801	/N	4822 321 11343	MAINS CORD N MAYOR	YC01800790						
▲ W801	/U		MAINS CORD NON-INTEGRAL	YC02000880						
					001S			NOT STANDARD SPEAR PARTS		
					002S				PACKING CASE CUSHION	386K801010 386K809010

13. ELECTRICAL PARTS LIST

ASSIGNMENT OF COMMON PARTS CODES.

RESISTORS

- R***: 1) GD05xxx140, Carbon film fixed resistor, ±5% 1/4W
 R***: 2) GD05xxx160, Carbon film fixed resistor, ±5% 1/6W

① — Resistance value

Examples ;

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

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

CAPACITORS

C***: CERAMIC CAP.

- 3) DD1xxx370, Ceramic capacitor
 Disc type
 Temp.coeff.P350 ~ N1000, 50V
 ② — Capacity value
 ③ — Tolerance

Examples ;

- ② Tolerance (Capacity deviation)
 ±0.25 pF 0
 ±0.5 pF 1
 ±5% 5

* Tolerance of COMMON PARTS handled here are as follows :

- 0.5 pF ~ 5 pF ±0.25 pF
 6 pF ~ 10 pF ±0.5 pF
 12 pF ~ 560 pF ±5%

③ Capacity value

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

C***: CERAMIC CAP.

- 4) DK16xxx300, High dielectric constant ceramic capacitor
 Disc type
 Temp.chara. 2B4, 50V
 ④ — Capacity value

Examples ;

- ④ Capacity value
 100 pF 101 1000 pF 102 10000 pF 103
 470 pF 471 2200 pF 222

C***: 5) ELECTROLY CAP. (⏏), 6) FILM CAP. (⏏)

- 5) EAxxx10, Electrolytic capacitor
 One-way lead type, Tolerance ±20%
 ⑤ — Working voltage
 ⑥ — Capacity value

Examples ;

- ⑤ Capacity value
 0.1 μF 104 4.7 μF 475 100 μF 107
 0.33 μF 334 10 μF 106 330 μF 337
 1 μF 105 22 μF 226 1100 μF 118
 2200 μF 228
- ⑥ Working voltage
 6.3V 006 25V 025
 10V 010 35V 035
 16V 016 50V 050

- 6) DF15xxx350 — Plastic film capacitor
 DF15xxx310 — One-way type, Mylar ±5% 50V
 DF16xxx310 — Plastic film capacitor
 One-way type, Mylar ±10% 50V
 ⑦ — Capacity value

Examples ;

- ⑦ Capacity value
 0.001 μF (1000 pF) 102 0.1 μF 104
 0.0018 μF 182 0.56 μF 564
 0.01 μF 103 1 μF 105
 0.015 μF 153

- NOTE** : 1) The above CODES (R***, R***, C***, C*** and C***) are omitted on the schematic diagram in some case.
 2) On the occasion, be confirmed the common parts on the parts list.
 3) Refer to "Common Parts List" for the other common parts (RI05, DD4, DK4).

NOTE ON SAFETY FOR FUSIBLE RESISTOR :

The suppliers and their type numbers of fusible resistors are as follows;

1. KOA Corporation

- | | | |
|----------------|----------------|-------------|
| Part No. (MJI) | Type No. (KOA) | Description |
| NH05xxx140 | RF25SxxxxΩJ | (±5% 1/4W) |
| NH05xxx120 | RF50SxxxxΩJ | (±5% 1/2W) |
| NH85xxx110 | RF73B2AxxxxΩJ | (±5% 1/10W) |
| NH95xxx140 | RF73B2ExxxxΩJ | (±5% 1/4W) |

* Resistance value * Resistance value
 (0.1 Ω - 10 kΩ)

2. Matsushita Electronic Components Co., Ltd

- | | | |
|----------------|----------------|-------------|
| Part No. (MJI) | Type No. (MEC) | Description |
| NF05xxx140 | ERD-2FCJxxx | (±5% 1/4W) |
| RF05xxx140 | | |
| NF02xxx140 | ERD-2FCGxxx | (±2% 1/4W) |
| RF02xxx140 | | |

* Resistance value * Resistance value

Examples ;

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

ABBREVIATION AND MARKS

ANT. : ANTENNA	BATT. : BATTERY
CAP. : CAPACITOR	CER. : CERAMIC
CONN. : CONNECTING	DIG. : DIGITAL
HP : HEADPHONE	MIC. : MICROPHONE
μ-PRO : MICROPROCESSOR	REC. : RECORDING
RES. : RESISTOR	SPK : SPEAKER
SW : SWITCH	TRANSF. : TRANSFORMER
TRIM. : TRIMMING	TRS. : TRANSISTOR
VAR. : VARIABLE	X'TAL : CRYSTAL

NOTE ON SAFETY :

Symbol \blacktriangle Fire or electrical shock hazard. Only original parts should be used to replaced any part marked with symbol \blacktriangle . Any other component substitution (other than original type), may increase risk of fire or electrical shock hazard.

安全上の注意 :

\blacktriangle がついている部品は、安全上重要な部品です。必ず指定されている部品番号の部品を使用して下さい。

POS. NO	VERS. COLOR	PART NO. (FOR PCS)	DESCRIPTION	PART NO. (MJI)	POS. NO	VERS. COLOR	PART NO. (FOR PCS)	DESCRIPTION	PART NO. (MJI)
			P816-POWER CIRCUIT BOARD					P816-RESISTORS (COMMON)	
			P816-CAPACITORS					CARBON FILM FIXED RES.	
C801		9965 000 06375	CER. 82 pF J 500V CH	DD15820550				±5% 1/6W : R801-R808 R810	
C810		4822 124 40763	ELECT. 2.2µF M 50V RA-2	OA22505020				R814 R815 R829 R851-R853	
C811		4822 122 40617	CER. 0.1µF +80%-20% 50V DC	DD38104010				R861-R866 R881 R883 R887	
C814		4822 122 40617	CER. 0.1µF +80%-20% 50V DC	DD38104010				R891-R894	
▲ C819		9965 000 04979	FILM ECQUL 0.1µF 250V AC	DF17104630				P816-SEMICONDUCTORS	
▲ C820		9965 000 06376	FILM ECQUL 0.22µF 250V AC	DF17224570	▲ D802		4822 130 81248	DIODE S1WB(A)60 30A 600V	HD20031290
▲ C821		9965 000 04981	ELECT. 120µF 400V	EA12740070	▲ D803		9965 000 00388	DIODE AG01 400V 0.7A	HD20049080
▲ C825		9965 000 04980	CER. 470P AC400V	DK17471520	▲ D804		9965 000 00388	DIODE AG01 400V 0.7A	HD20049080
▲ C826		9965 000 04980	CER. 470P AC400V	DK17471520	▲ D806		9965 000 00388	DIODE AG01 400V 0.7A	HD20049080
▲ C827		9965 000 06377	CER. 470P 1KV	DK16471560	▲ D807		9965 000 00388	DIODE AG01 400V 0.7A	HD20049080
▲ C828		9965 000 04980	CER. 470P AC400V	DK17471520	▲ D814		9965 000 00388	DIODE AG01 400V 0.7A	HD20049080
C829		4822 124 80067	ELECT. 4.7µF M 50V RA-2	OA47505020	D829		4822 130 80116	ZENER DIODE 24V	HD32401000
C833		4822 124 41535	ELECT. 100µF M 25V RA-2	OA10702520	▲ D832		9965 000 00388	DIODE AG01	HD20049080
					▲ D851		9965 000 00388	DIODE AG01	HD20049080
C851		4822 122 40617	CER. 0.1µF +80%-20% 50V DC	DD38104010	▲ D856		4822 130 11074	DIODE RK46	HD20050080
C852		9965 000 06378	ELECT. 330µF 16V RJB	EF337016P0	▲ D861		9965 000 00388	DIODE AG01	HD20049080
C854		4822 124 90353	ELECT. 100µF M 10V RA-2	OA10701020	D862		4822 130 34499	ZENER DIODE 20V	HD32001000
C855		4822 122 40617	CER. 0.1µF +80%-20% 50V DC	DD38104010	▲ D866		9965 000 06383	DIODE RU4AM 600V 2.0A	HD20051080
C856		4822 122 40617	CER. 0.1µF +80%-20% 50V DC	DD38104010	D868		9965 000 00388	DIODE AG01 400V 0.7A	HD20049080
C857		9965 000 06379	ELECT. 2200µF 10V RJB	EF228010P0	▲ D871		9965 000 00388	DIODE AG01	HD20049080
C860		4822 122 40617	CER. 0.1µF +80%-20% 50V DC	DD38104010	D881		9965 000 06384	IC TL431 SHUNT REGULATOR	HC33036590
C861		4822 122 40617	CER. 0.1µF +80%-20% 50V DC	DD38104010					
C862		9965 000 06380	ELECT. 10µF 50V RJB	EF106050P0	▲ Q801		4822 130 10431	PHOTO UNIT PC-123F2	HW10032320
C864		4822 124 90366	ELECT. 220µF M 50V RA-2	OA22705020	▲ Q810		4822 209 90025	IC MC44603P	HC10111170
C866		4822 122 40617	CER. 0.1µF +80%-20% 50V DC	DD38104010	▲ Q825		9965 000 00395	F.E.T. 2SK2943 900V 3A	HF22943000
C867		9965 000 06381	ELECT. 1000µF 16V RJB	EF108016P0	▲ Q851		9965 000 06390	IC LM317 ADJ. REG.	HC31937590
C868		4822 124 80123	ELECT. 220µF 16V ARS	OA22701640	Q861		4822 130 41947	TRS. 2SC2458 2SC1740S	HT30001000
C869		4822 124 80123	ELECT. 220µF 16V ARS	OA22701640				2SC3199 ETC.	
C871		4822 122 40617	CER. 0.1µF +80%-20% 50V DC	DD38104010	Q862		4822 130 42715	TRS. 2SA1048 2SA933S	HT10001000
C872		9965 000 06382	ELECT. 220µF 16V RJB	EF227016P0				2SA1267 ETC.	
C873		4822 124 80123	ELECT. 220µF 16V ARS	OA22701640	▲ Q871		9965 000 01744	IC NJM7908FA	HC39908090
C875		4822 124 80123	ELECT. 220µF 16V ARS	OA22701640	Q891		4822 130 43818	TRS. 2SC2878	HT328782A0
C877		4822 122 40617	CER. 0.1µF +80%-20% 50V DC	DD38104010	Q892		4822 130 10431	PHOTO UNIT PC-123F2	HW10032320
C881		4822 124 41535	ELECT. 100µF / 25V	OA10702520					
C882		4822 122 30103	CER. 0.022µF 50V	DK18223310					
C891		4822 124 41535	ELECT. 100µF 25V	OA10702520	▲ F820	/F		P816-MISCELLANEOUS	
C892		4822 124 41535	ELECT. 100µF 25V	OA10702520	▲ F820	/K /N	4822 070 32001	FUSE 2A 250V UL CSA MITI	FS10200350
C898		4822 122 40617	CER. 0.1µF 50V	DD38104010	▲ F820	/U		FUSE 2A 125V	FS10200850
G815		4822 122 33276	CER. DE7150 F 103M	DK17103840				UL CSA MITI FBT	FS10200350
			P816-CAPACITORS (COMMON)		▲ L820		4822 157 70398	LINE FILTER LF-4D-223 22MH	LC22260130
			HIGH DIELECTRIC CONSTANT		L825			FERRITE CORE	FC90050130
			CER. CAPACITOR ±10% 50V :		▲ L831		9965 000 06385	BL02RN2-R62T2	TS12900010
			C802-C804 C809 C813					SWITCHING TRANSF.	
			P816-RESISTORS		L832		9965 000 06386	ER2810SG	
R809		4822 111 31001	RES. 330Ω ±5% 1/6W	GG05331160	L851		9965 000 06387	CHOKO COIL 10µH J%	LC11033900
R811		4822 052 10229	RES. 22Ω ±5% 1/6W	GG05220160	L853		9965 000 06387	CHOKO COIL 4.7µH J%	LC14723900
R812		4822 052 10101	RES. 100Ω ±5% 1/6W	GG05101160	L854		9965 000 06387	CHOKO COIL 4.7µH J%	LC14723900
R813		9965 000 06391	RES. 15Ω ±5% 1/6W	GG05150160	L856		9965 000 06386	CHOKO COIL 10µH J%	LC11033900
R816		9965 000 05893	RES. 180Ω ±5% 1/6W	GG05181160			9965 000 06388	CHOKO COIL 6.8µH	LC16820110
▲ R819	/F	482211682449	RES. 330kΩ K 1/2W ERC12GK	RC10334120	L861		4822 157 62681	PJ8R-6R8M	LC11023900
▲ R819	/K /N	9965 000 00502	RES. 1MΩ ±5% 1W RCR60 L15	RC05105010	L862		9965 000 06386	CHOKO COIL 1µH EL0405	LC11023900
▲ R819	/U		RES. 2.2MΩ 1/2W ERC12UG	RC10225820	L867		9965 000 06389	CHOKO COIL 10µH J%	LC11033900
R823		4822 053 10183	RES. 18kΩ ±5% 1W	GA05183010	L872		9965 000 06386	CHOKO COIL 2.2µH	LC12220190
R825		4822 052 10102	RES. 1kΩ ±5% 1/6W	GG05102160	L873		9965 000 06386	LHLC06TB2R2M	
R826		4822 116 82805	RES. 1Ω ±5% 1/6W	GG05010160	▲ S815		9965 000 05921	CHOKO COIL 10µH J%	LC11033900
R827		9965 000 06392	RES. 1.5Ω ±5% 1/6W	GG05015160				CHOKO COIL 10µH J%	LC11033900
R828		9965 000 06392	RES. 1.5Ω ±5% 1/6W	GG05015160				CHOKO COIL 10µH J%	LC11033900
R832		4822 053 10183	RES. 18kΩ ±5% 1W	GA05183010				PUSH SWITCH	SP01012480
R882		4822 052 10101	RES. 100Ω ±5% 1/6W	GG05101160				ESB92S94B TV-5 1.5MM	
R884		4822 050 22212	RES. 2.21kΩ ±1% 1/6W	GM11622110	J901		9965 000 01662	P916-HEAD PHONE CIRCUIT BOARD	
R885		4822 050 26811	RES. 681Ω ±1% 1/6W	GM11668100	L901			JACK H.P JACK	YJ01003870
R886			JUMPER	75060501P0	L902			HLJ0540-01-410 BLK	
								FERRITE BEAD	FC90050130
								BL02RN2-R62T2	
								FERRITE BEAD	FC90050130
								BL02RN2-R62T2	

POS. NO	VERS. COLOR	PART NO. (FOR PCS)	DESCRIPTION	PART NO. (MJI)
			PP16-REAR PANEL CIRCUIT BOARD	
			PP16-CAPACITORS	
C301		4822 124 41539	ELECT. 47µF M 16V RA-2	OA47601620
C311		5322 122 32265	CER. 100pF J CH 50V BLK	DD15101300
C312		4822 122 40617	CER. 0.1µF +80%-20% 50V DC	DD38104010
C313		4822 122 40617	CER. 0.1µF +80%-20% 50V DC	DD38104010
C314		4822 122 40617	CER. 0.1µF +80%-20% 50V DC	DD38104010
C651		5322 122 32265	CER. 100pF J SL 50V GRN	DD15101300
C652		5322 122 32265	CER. 100pF J CH 50V BLK	DD15101300
C653		4822 124 12404	ELECT. 220µF 16V RA-2	OA22701620
C655		4822 124 80119	ELECT. 1000µF 25V ARS	OA10702540
C656		4822 124 80119	ELECT. 100µF 25V ARS	OA10702540
C681		5322 122 32265	CER. 100pF J CH 50V BLK	DD15101300
C682		5322 122 32265	CER. 100pF J CH 50V BLK	DD15101300
C683		4822 122 40617	CER. 0.1µF +80%-20% 50V DC	DD38104010
C701		5322 122 32265	CER. 100pF J CH 50V BLK	DD15101300
C702		5322 122 32265	CER. 100pF J SL 50V GRN	DD15101300
CF51			CER. 470pF ±10%	DK16471300
CF52		4822 122 40617	CER. 0.1µF +80%-20% 50V DC	DD38104010
CN51		4822 122 40617	CER. 50V DC 0.1µF +80-20%	DD38104010
CT01		4822 122 40617	CER. 0.1µF +80%-20% 50V DC	DD38104010
CT02		4822 126 10513	CER. 47pF	DA15470110
CT03		4822 124 41539	ELECT. 47µF M 16V RA-2	OA47601620
CT04		4822 122 40617	CER. 0.1µF +80%-20% 50V DC	DD38104010
CT05		4822 126 10364	CER. 100pF UP050B101K-A	DA16101110
CT51		4822 122 40617	CER. 0.1µF +80%-20% 50V DC	DD38104010
CT52		482212610513	CER. 47pF	DA15470110
CT53		4822 124 41539	ELECT. 47µF M 16V RA-2	OA47601620
CT54		4822 122 40617	CER. 0.1µF +80%-20% 50V DC	DD38104010
CT55		4822 126 10364	CER. 100pF UP050B101K-A	DA16101110
CY11		9965 000 00368	CER. 0.047µF Z 50V	DA17473110
R311		4822 111 41355	PP16-RESISTOR RES. 75Ω ±5% 1/6W	GD05750160
R***			PP16-RESISTORS (COMMON) CARBON FILM FIXED RES. ±5% 1/6W : R312-R314 R651-R656 R683-R686 RF51-RF57 RN51-RN58 RT01 RT02 RT51 RT52	
DF51		4822 130 32362	PP16-SEMICONDUCTORS DIODE 1SS176 MA165 1SS254 30V 0.1A	HD20002000
Q311		4822 209 63182	IC LC74HCU04	HC700400U0
Q681		4822 209 63182	IC LC74HCU04	HC700400U0
QF51		4822 130 42715	TRS. 2SA1048 2SA933S 2SA1267 ETC.	HT10001000
QF52		4822 130 41947	TRS. 2SC2458 2SC1740S 2SC3199 ETC.	HT30001000
QN51 }		4822 130 43818	TRS. 2SC2878 A	HT328781A0
QN58				
J301		4822 218 11487	PP16-MISCELLANEOUS OPT. CONNECTOR GP1F32R OPTICAL RECIVER	YJ15000150
J311		4822 290 81638	TERMINAL 14X14 RCA 1L1P	YT02010790
J651		4822 265 31045	TERMINAL YKC21-3337 RCA	YT02021080
J681		4822 265 31045	TERMINAL YKC21-3337 RCA	YT02021080
J682			JACK FFC CONNECTOR 07P 9604S-07C	YJ07011370
J701		4822 265 31045	TERMINAL YKC21-3337 RCA	YT02021080
JF51		4822 267 41009	TERMINAL 2P RCA RC-5	YT02020890
JJ01			JACK 14FMN-BTRK	YJ07019380
JT01		4822 290 81638	TERMINAL 14X14 RA 1L1P BLK	YT02010790

POS. NO	VERS. COLOR	PART NO. (FOR PCS)	DESCRIPTION	PART NO. (MJI)
JT02		4822 267 31369	OPT. CONNECTOR GP1F32T OPTICAL OUTPUT	YJ15000090
JT51		4822 290 81638	TERMINAL 14X14 RA 1L1P BLK	YT02010790
JT52		4822 267 31369	OPT. CONNECTOR GP1F32T OPTICAL OUTPUT	YJ15000090
L311			FERRITE BEAD BL02RN2-R62T2	FC90050130
L651			FERRITE BEAD BL02RN2-R62T2	FC90050130
L652			FERRITE BEAD BL02RN2-R62T2	FC90050130
L681			FERRITE BEAD BL02RN2-R62T2	FC90050130
L682			FERRITE BEAD BL02RN2-R62T2	FC90050130
L701			FERRITE BEAD BL02RN2-R62T2	FC90050130
L702			FERRITE BEAD BL02RN2-R62T2	FC90050130
LF51			FERRITE BEAD BL02RN2-R62T2	FC90050130
LT01			FERRITE BEAD BL02RN2-R62T2	FC90050130
LT02		4822 142 60422	PULSE TRANSF. TPS247MN-0386AN	TP41042030
LT03			FERRITE BEAD BL02RN2-R62T2	FC90050130
LT51			FERRITE BEAD BL02RN2-R62T2	FC90050130
LT52		4822 142 60422	PULSE TRANSF. TPS247MN-0386AN	TP41042030
LT53			FERRITE BEAD BL02RN2-R62T2	FC90050130
SF51		4822 277 21559	SLIDE SWITCH INT/EXT	SS02021150
CY03		4822 1224 0588	PY16-FRONT CIRCUIT BOARD PY16-CAPACITORS CER. 0.022µF TP050F223Z	DA17223110
CY04		4822 1261 0362	CER. 22pF	DA15220110
CY05		48221 261 0362	CER. 22pF	DA15220110
CY06		9965 00000368	CER. 0.047µF Z 50V	DA17473110
CY07		4822 124 21901	ELECT. 47µF 6.3V	EJ47600610
CY08		9965 000 00368	CER. 0.047µF Z 50V	DA17473110
CY09		4822 126 10364	CER. 100pF UP050B101K-A	DA16101110
CY10		4822 126 10364	CER. 100pF UP050B101K-A	DA16101110
CY12		4822 124 21901	ELECT. 47µF 6.3V	EJ47600610
R***			PY16-RESISTORS (COMMON) CARBON FILM FIXED RES. ±5% 1/6W : RY01-RY15 RY21-RY28	
DY02		4822 130 11569	L.E.D. HLMF-K200 #2UL RED	HI10005340
DY03		4822 130 11569	L.E.D. HLMF-K200 #2UL RED	HI10005340
DY04		5322 130 31504	ZENER DIODE MTZ J 3.3A	HD30331000
QY01		9965 000 06374	PY16-SEMICONDUCTORS MICROPROCESSOR TMP87CH74F	HU385KT000
QY02 }		4822 130 41947	TRS. 2SC2458 2SC1740S 2SC3199 ETC.	HT30001000
QY04				
LY01		4822 157 62919	CHOKER COIL 100µH J%	LC11043800
SY01 }		4822 276 13732	PUSH SWITCH SKQNAE H/5MM 160GF	SP01013310
SY09				

POS. NO	VERS. COLOR	PART NO. (FOR PCS)	DESCRIPTION	PART NO. (MJI)
SY15 { SY21 VX01		4822 276 13732	PUSH SWITCH SKQNAE H/5MM 160GF	SP01013310
		9965 000 05916	DISPLAY UNIT FTD BJ727GNK 15GRID X 22ANODE	HQ31208410
XY01 ZY01		4822 242 72066	SERAMIC VIB. CST8.0MHZ MT	FQ08004010
		4822 130 11494	IR SENSOR RPM6936-V4	HW10004210
			PY26-KEY CIRCUIT BOARD	
SY22		4822 276 13732	PUSH SWITCH SKQNAE H/5MM 160GF	SP01013310
SY23		4822 276 13732	PUSH SWITCH SKQNAE H/5MM 160GF	SP01013310
			PY36-ROTARY ENCODER CIRCUIT BOARD	
SY26		9965 000 05915	ROTARY SWITCH EC11B WITH PUSH SW	SR03030030
			PY46-LED CIRCUIT BOARD	
DY01		4822 130 11569	L.E.D. HLMF-K200 #2UL RED	HI10005340