

TEAC TECHNICAL INFORMATION

9703

TASCAM MMC-38, Change of the Software

5th February 1997

On the MMC-38 with serial number 50001 and higher, ROM, U12 on the MAIN PCB Assy has been changed to **Version 1.03, P/No. S002224-00C**.

Version 1.03 corrects following two problems:

- 1 Recording track select is unable on the 3rd machine in daisy-chained DA-38s or DA-88s.
- 2 When record function of any one track is set to ON, previous setting for all other tracks is cleared falsely. This problem occurs when recording track select is made by [Masked Write] in the MMC command that is available on, for instance, NOTATOR LOGIC made by EMAGIC.

Products with serial number up to 49999 in Tokyo stock have been reworked and have been replaced with Version 1.03 ROM. They can be identified with "●" mark stamped at right side of the serial number.

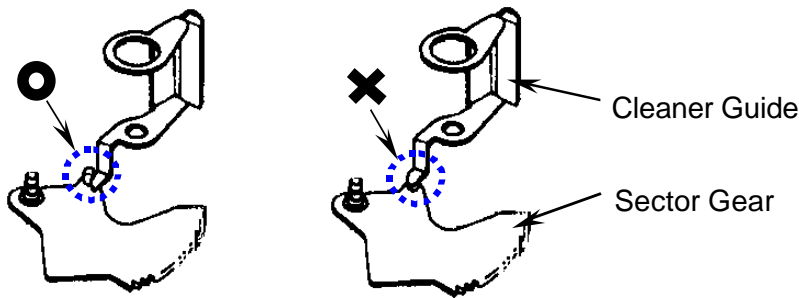
Products with serial number 50001 and higher have no identification mark since Version 1.03 ROM have been mounted at the production line.

TEAC TECHNICAL INFORMATION

TASCAM DA-38/88/98, Impedance Roller Height Adjustment

No. **9918**
 DATE 22nd July 1999

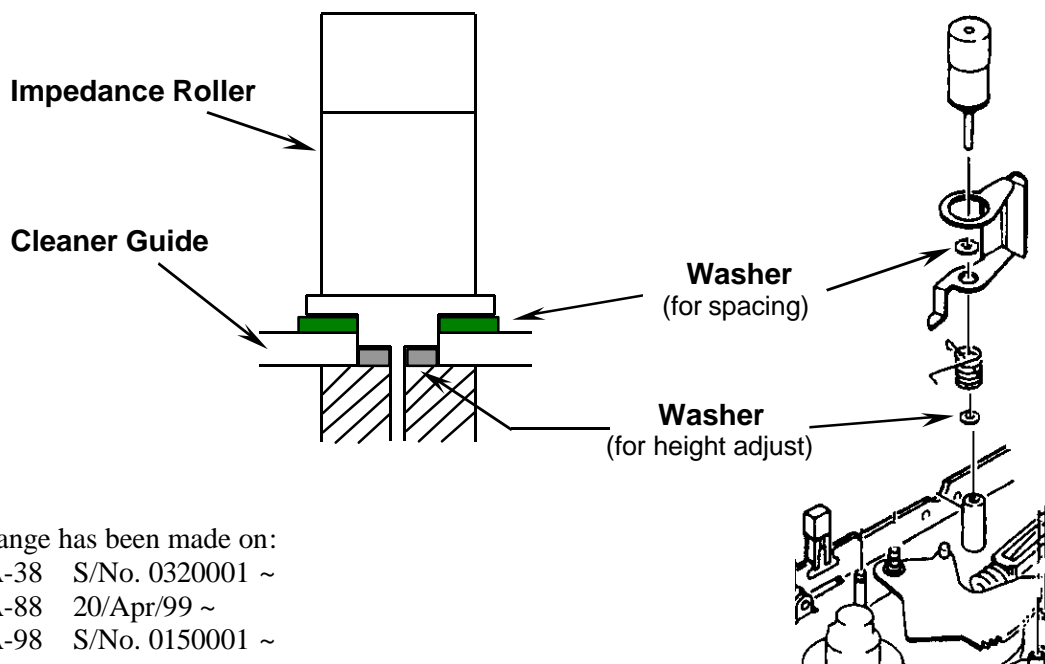
A washer (Procedure 4-6-1, DA-38/98 service manual) has been used to adjust the height of impedance roller. If thicker one is used, there is a possibility that a lever of cleaner guide and a pin of sector gear do not engage causing incomplete tape loading.



To fix the height of cleaner guide uniformly, three pairs of washer have been newly used.

	Pair 1	Pair 2	Pair 3
Washer (for spacing)	M0090660 (3.85×6×t0.2)	M0090670 (3.85×6×t0.25)	M0090680 (3.85×6×t0.3)
Washer (for height adjust)	M0090610 (1.63×3×t0.13)	M0090620 (1.63×3×t0.2)	M0090630 (1.63×3×t0.25)

Notice: Do not mix different pairs.



Change has been made on:
 DA-38 S/No. 0320001 ~
 DA-88 20/Apr/99 ~
 DA-98 S/No. 0150001 ~

TEAC TECHNICAL INFORMATION

TASCAM DA-38/88/98, Changes on Mechanism (S-Err 08/31)

No. **9917R**
DATE 22nd July 1999

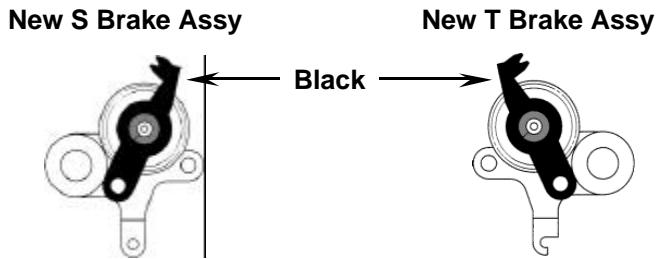
This is an additional information for item 3 of Tech-Info No. 9917.

3. Tape Slack

Clutch torq for S & T Brake Assy has been changed from 45 gf to 20 gf.

Thickness of a magnet mounted on T Reel Base Assy has been changed from 1.39 to 1.45 mm.

~~Note: There is no identification color or mark on them.~~



TEAC TECHNICAL INFORMATION

TASCAM DA-38/88/98, Changes on Mechanism (S-Err 08/31)

No. **9917**
 DATE 2nd July 1999

Various changes on the reel section have been made step by step as follows.
 All changes intend to reduce the possibilities for S-Err 08/31.

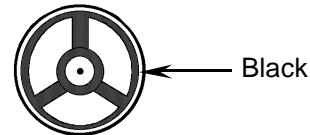
1. Reel Clutch Torq

S & T Reel Base Assy have been changed so that clutch torque becomes more stable.
 Note: Only T Reel Base Assy has been changed once again on the item 3.

	Old	New
S Reel Base Assy	17061086-00	M006071-00A
T Reel Base Assy	17061087-00	M006072-00A

Change has been made on:
 DA-38 S/No. 0150001 and higher
 DA-88 S/No. 0580001 and higher
 DA-98 S/No. 0070001 and higher

New Reel Base Assy



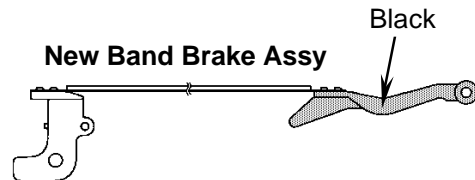
2. Band Brake

Felt pad of some Band Brake Assy's was slightly thick causing that Soft Brake touches the S Reel Base. Thickness of the felt pad has been secured.

	Old	New
Band Brake Assy	17968214-00	M008223-00A

Change has been made on:
 DA-38 S/No. 0250001 and higher
 DA-88 30/Sep/98 and after
 DA-98 S/No. 0110001 and higher

New Band Brake Assy



3. Tape Slack

Tape slack may occur when FF/REW → STOP is operated with following tapes.
 maxell P5-90HMBQ / AMPEX 488H-113 / 3M P5-60HXP

Clutch torq for S & T Brake Assy and T Reel Base Assy have been slightly tuned.
 Note: There is no identification color or mark on them.

	Old	New
T Reel Base Assy	M006072-00A	M006072-00B
S Brake Assy	17698203-00	M008776-00A
T Brake Assy	17968205-00	M008777-00A

Change has been made on:
 DA-38 S/No. 0320001 and higher
 DA-88 20/Apr/99 and after
 DA-98 S/No. 0150001 and higher

TEAC TECHNICAL INFORMATION

TASCAM DA-38, Shield Cover

No. **9912**
 DATE 14th May 1999

In case (-00B) head is mounted on the DA-38 S/No. up to 0139999, error rate may deteriorate as shown below.

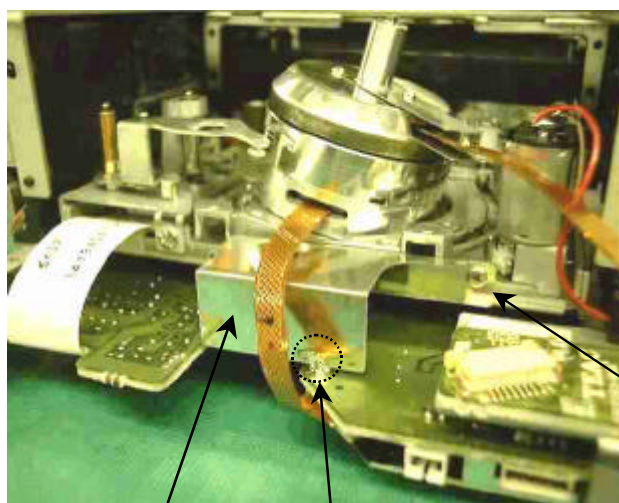
A-HEAD: 0100 or more

B-HEAD: 1000 or more

Solution is fitting a shield cover that has been applied on the products S/No. 0140001 and higher.

Parts Required

Part Number	Description	Qty
M006636-00A	Shield Cover, P	1
57800120-04	Screw, Bind M2 x 4	1



Shield Cover, P

Solder here.

Apply M2x4 screw here.

Note: This information relates to only the DA-38. DA-88 and DA-98 do not need the shield cover since the RF unit is away from the Servo PCB Assy.

TEAC TECHNICAL INFORMATION

TASCAM MMC-38, ROM Upgrade (V1.05)

No. **9903**
DATE 19th February 1999

SYSTEM ROM, U12 on the MAIN PCB Assy has been upgraded from V1.04 to V1.05 on the products with S/No. 0110001 and higher.

	P/No. (PGMed ROM)	P/No. (Blank ROM)
SYS V1.05	S002224-00E	S0018093 (M27C512-12C1)

Problem corrected by SYS V1.05

Response of REC Function LED for CH9 to 16 on the TM-D1000 is too slow.

Note: This phenomenon happens when the MMC-38, multiple DTRS machines and the TM-D1000 are connected by **MMC Closed Loop**.

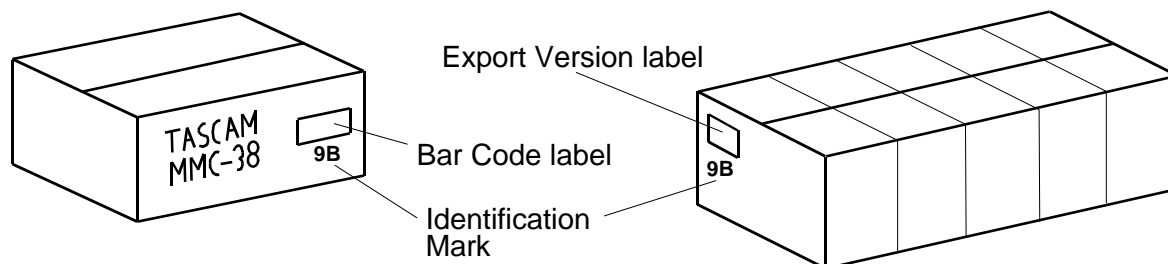
Refer to supplement owner's manual P/No. D004763-00A attached.

Products with S/No. up to 0109999 in Tokyo stock have been reworked and replaced with V1.05. They can be identified with "9B" mark stamped on a carton as shown below.

Products with S/No. 0110001 and higher have been mounted SYS V1.05 with no mark.

One unit carton

Five units carton



Notice: In case the TM-D1000 and the MMC-38 are connected by **MMC Closed Loop**, following Symptoms regarding REC Function will occur with each combination.

TM-D1000	MMC-38	Symptom
V1.20	V1.05	No problem
V1.20	~ V1.04	REC Function LED turns off when entering Rec mode.
~ V1.19	V1.05	REC Function status changes falsely when two or more channels are assigned simultaneously. With Using the MMC-38, when REC Function is assigned by the TM-D1000, REC Function lamp flickers momentarily.
~ V1.19	~ V1.04	Response of REC Function LED for CH9~16 on the TM-D1000 is too slow.

- When controlling a chain of DTRS units (DA-38, etc.) using the MMC-38, it is important that any slave units are powered up before the master DTRS unit (connected directly to the MMC-38) is switched on.
If the master DTRS unit is switched on before the slave units, the master unit's record functions cannot be controlled using the MMC-38.
- When two or more DTRS units are controlled using the MMC-38, the timing of the MMC status data may be erratic.

TEAC TECHNICAL INFORMATION

TASCAM DA-38 / DA-98, S-Error 02

No. **9848**
 DATE 18th December 1998

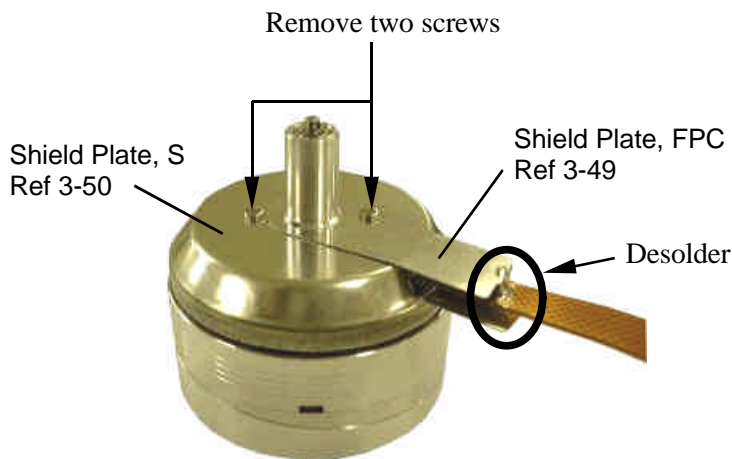
Symptom: Drum hesitates to rotate smoothly. [S-Err 02] is displayed.

Cause: Recording Rotary Transformer gets stuck. Gluing was not proper on some Rec Rotary Trans.

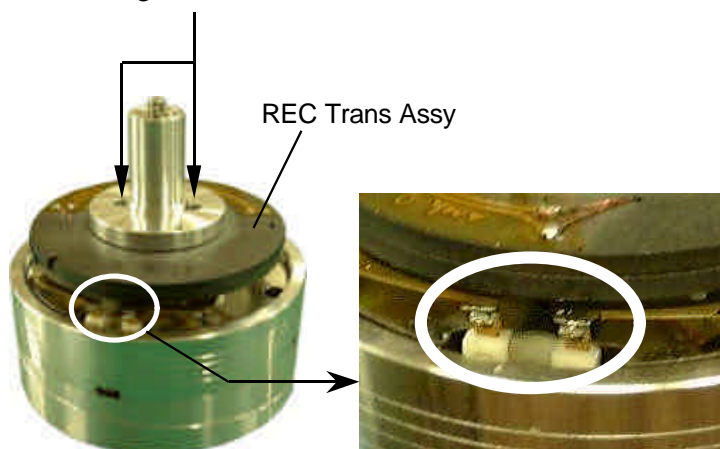
Solution: Replace the rotary transformer with Rec Trans Assy (SV), P/No. V000863-00A.

Procedure

1 Disassembling



Rotate the REC Trans Assy so that two screws can be found through the holes. Remove those two screws.



Desolder the head terminals.
 (There are same terminals at the opposite side.)

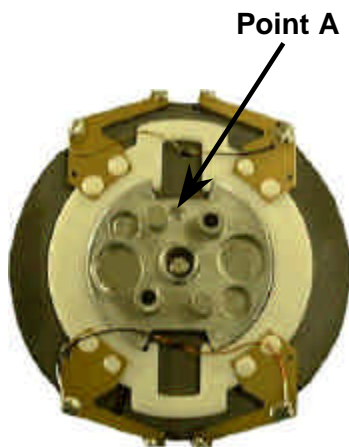
2 Assembling

Mount the new Rec Trans Assy onto the drum assy. After mounting, reinstate the all parts.

- 1) Point A and Point B shown below should meet upon assembling.
- 2) All screws are specified to be tightened by 1.5 kgf.cm.

Use following tools introduced by Tech-Info No. 9516.

P/No. 577282780-00 Torque Screwdriver
P/No. J0025300 Attachment bit (+)



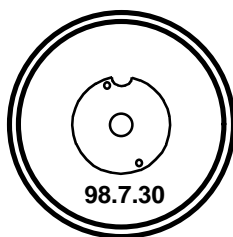
REC Trans Assy
P/No. V000863-00A
(bottom view)



Drum Assy
(top view)

Note:

- 1) Tokyo stock has been reworked and "8H" has been stamped at the carton box.
- 2) Following spares stock have been reworked.
P/No. M004346-00B Drum Assy
P/No. V000548-00B Drum Assy (RLP)
- 3) Gluing on the Drum Assy assembled after 30/July/98 has been secured.
Date of production is indicated on the top of drum assy as shown below.



Drum Assy top view

TEAC TECHNICAL INFORMATION

TASCAM DA-88, Service Hint for No [E. CLOC] Indication

No. **9839**
DATE 25th September 1998

In very rare occasion, [E. CLOC] is **NOT** indicated on the counter display when the word clock is not fed and the clock source is set "WORD".

If this phenomenon is experienced, slight adjustment on the PLL circuit is required.

Follow the flow chart on page 2 of this information and perform WORK 1, 2 and 3 accordingly.

WORK 1

Replace C41 (15 pF) with 12 pF then point ① becomes 4.5 V or less.

Replace C54 (27 pF) with 22 pF then point ② becomes 4.5 V or less.

WORK 2

Replace R162 (180 Ω) with 180 Ω ~ 10 kΩ then point ① becomes 1 V or more.

Replace R163 (180 Ω) with 180 Ω ~ 10 kΩ then point ② becomes 1 V or more.

WORK 3

Replace R162 (180 Ω) with 180 Ω ~ 0 Ω then point ① becomes 1 V or less. If problem still exists, connect resistor 10 kΩ ~ 100 kΩ parallel to R25.

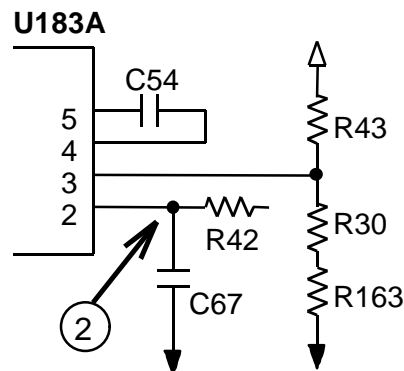
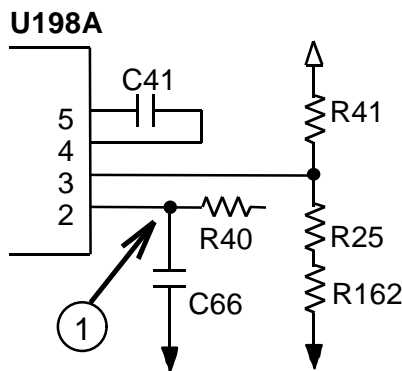
Replace R163 (180 Ω) with 180 Ω ~ 0 Ω then point ② becomes 1 V or less. If problem still exists, connect resistor 10 kΩ ~ 100 kΩ parallel to R30.

After WORK 3 is performed, return to the top of the flow chart and confirm it reaches to "Finish".

SYSTEM CONTROL PCB (1/2)

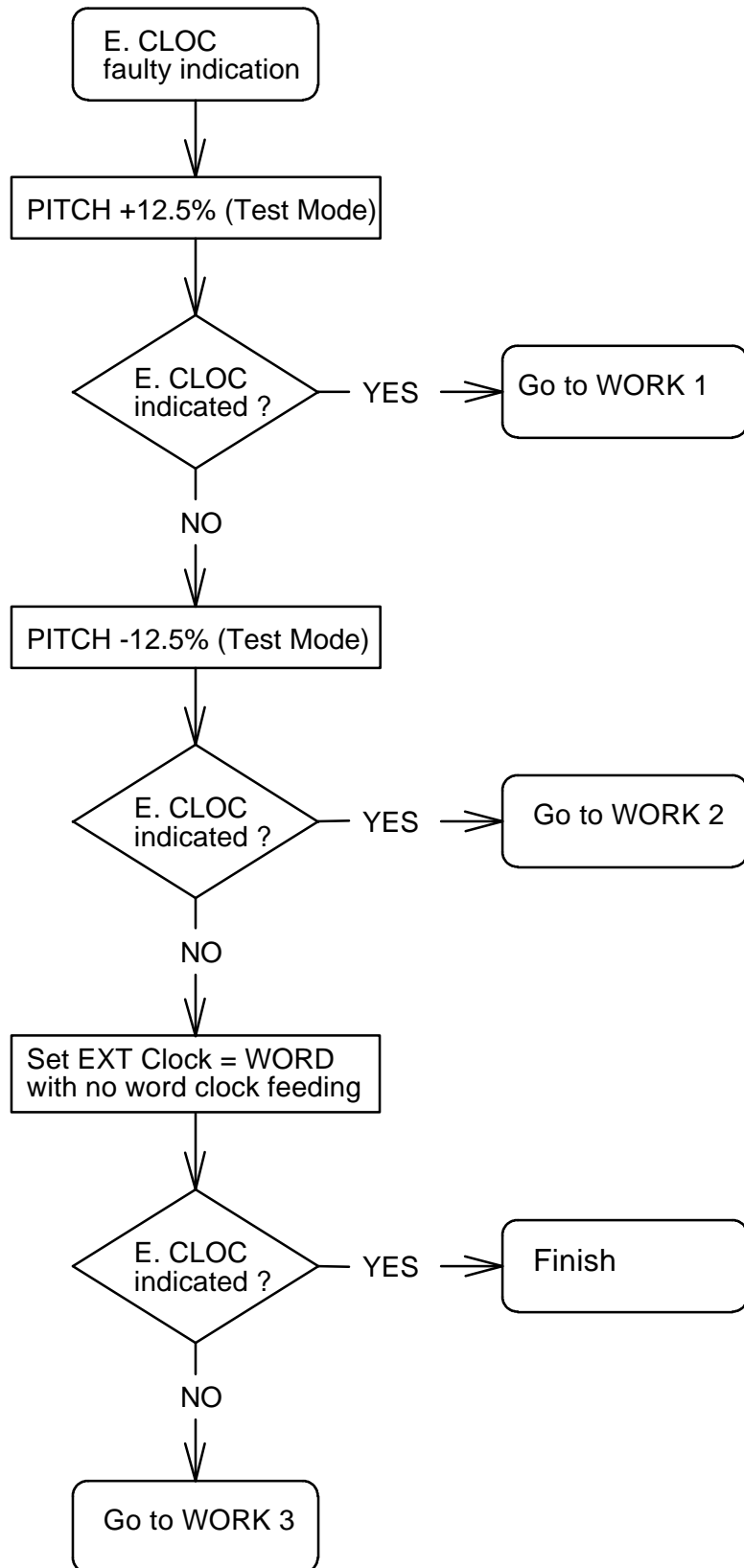
(C, 6)

(D, 6)



Notice: Following changes have been made on the DA-88 S/No. 090001 and higher.

	Old	New
R25/R30	4.3 kΩ	3.9kΩ
R162/R163	jumper wire	180 Ω



TEAC**TECHNICAL INFORMATION****TASCAM DA-88, WORD IN from Emitter Follower Driver**No. **9838**

DATE 25th September 1998

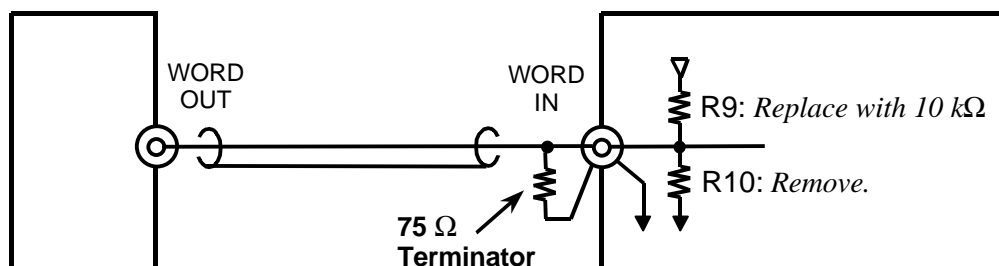
If the word clock is fed to the DA-88 from machines that use emitter follower type drivers at the word output stage, the DA-88 will not synchronize to the word clock.

Notice:

- 1 This phenomenon occurs with DA-88 S/No. 230001 and higher or the SYS PCB Assy that the changes of Tech-Info No. 9836 and 9837 have been incorporated.
- 2 This phenomenon has been confirmed with following machines.
 - SONY PCM-7030/7050, RM-3324/3348(Remot Control Unit for PCM-3324/3348)
 - YAMAHA 02R

When above phenomenon is experienced, perform following procedures.

- 1) Replace R9 on the SYS PCB Assy with 10 k Ω , 1/4 W, **P/No. 52400306-20**
- 2) Remove R10.
- 3) Connect an outside 75 Ω termination via a BNC T-piece.

**Emitter Follower
Output Machine****DA-88 SYS PCB Assy****Notice:**

- 3 If WORD is set for the clock source and 75 Ω terminator is connected, clock master machine should be turned ON. In other cases, remove both the outside terminator and the connection.
- 4 This countermeasure is effective for machines that use Emitter Follower type drivers for the word output. For machines not using Emitter Follower types (such as PCM-3324, PCM-7010), this countermeasure is not applicable.
- 5 If the DA-88(that this countermeasure has already been done on) is connected at the end of the word sync chain, connect a 75 Ω terminator using a BNC T-piece.

TEAC TECHNICAL INFORMATION

TASCAM DA-88, Change of SYS PCB Assy (2)

No. **9837**
 DATE 25th September 1998

If the WORD IN terminal is fixed at low level continuously or no word clock is fed, clock selection becomes impossible/unstable.

When this phenomenon is experienced, perform the procedures below.

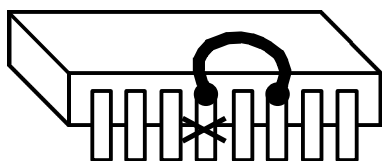
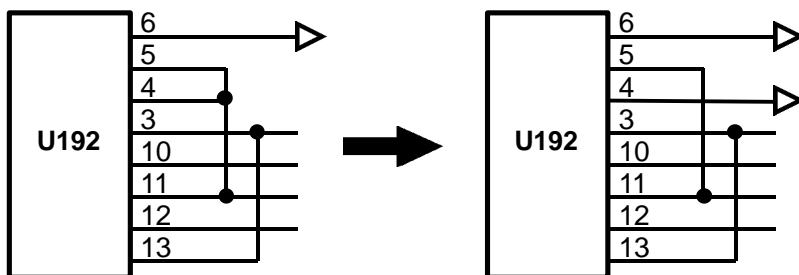
Notice 1): This phenomenon occurs on the following.

1. DA-88 S/No. 230001 to 309999.
2. SYS PCB Assy updated with a procedure of Technical Information No. 9836.

Notice 2): SYSTEM ROM should be replaced with Version 4.00 or higher after this change.

If old ROM is used, all LEDs will light upon powering on.

SYS Version 4.01, P/No. S001610-00D



Cut pin U192 pin 4.
 Add a jumper wire between pin 4 and 6

Above change has been incorporated on the products with S/No. 310001 and higher.

TEAC**TECHNICAL INFORMATION****TASCAM DA-88, Change of SYS PCB Assy (1)**No. **9836R**

DATE 18th October 2000

*This is the revised edition of Tech-Info No. 9836.
One part number was wrongly mentioned.*

X

WORK2	S0015330,	HD74ACT244
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O

WORK2	S0015530,	HD74ACT244
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TEAC

TECHNICAL INFORMATION

TASCAM DA-88, Change of SYS PCB Assy (1)

No. **9836**
 DATE 25th September 1998

Note: "LRCK" stands for Left / Right Clock. It works to separate the digital audio data into odd/even channel. Source of the LRCK is an incoming word clock.

Symptom

- 1) One sample delay. Odd and even channel signal outputs are inverted.
- 2) Digital dubbing from slave to master is impossible or gets noise with using PW-88DL cable.
- 3) Noise on record or play.

Cause (Each paragraphs corresponds to paragraphs listed on **Symptom**.)

1) **Inverted LRCK**

There is a very little possibility that a phase of internal LRCK is inverted against external WORD. This will occur at the probability of 1/100 under each conditions shown below.

- | | |
|--------------|--|
| Master DA-88 | When clock source is changed from INT to WORD.
When [E. CLOC] is restored. |
| Slave DA-88 | At the moment of powering on.
When [E. CLOC] is restored.
At the moment of chase lock. |

2) **Delayed LRCK**

The LRCK generated in the slave DA-88 tends to delay against the master WORD. The delay would be accumulated with speed deviation of logic ICs.

3) **Temperature Drift**

The LRCK becomes inconsistent when environment temperature around U191 reaches 90 to 100 degrees centigrade.

Solution

- Perform WORK 1 for Symptom 1)
- Perform WORK 2 for Symptom 2)
- Perform WORK 3 for Symptom 3)

Parts required

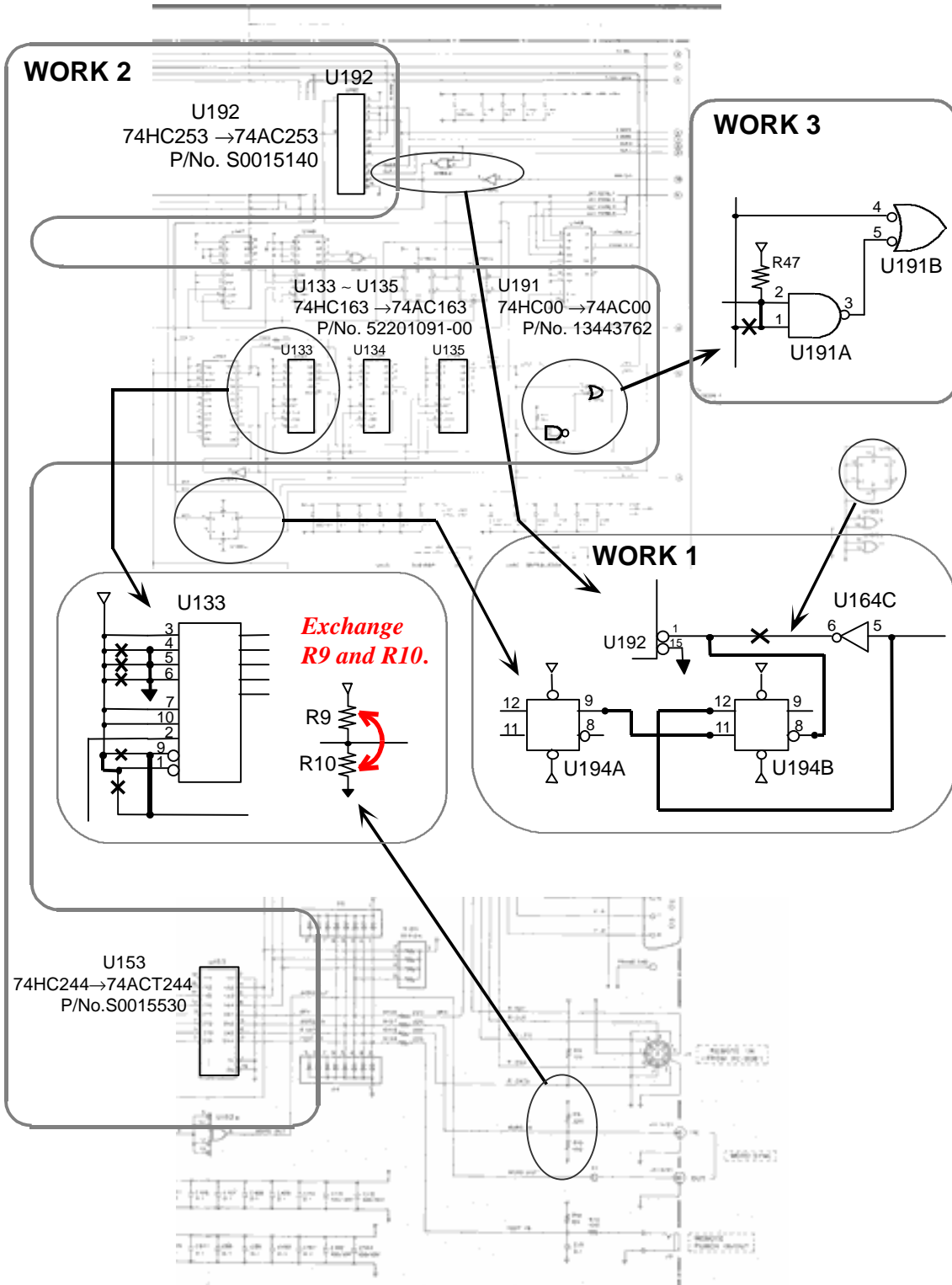
WORK 1	Jumper wires	
WORK2	52201091-00, TC74AC163P	3 pcs
	S0015330, HD74ACT244	1 pce
	S0015140, HD74AC253PC	1 pce
WORK 3	13443762, HD74AC00P	1 pce

Note: All WORK 1, 2 and 3 have been incorporated on:

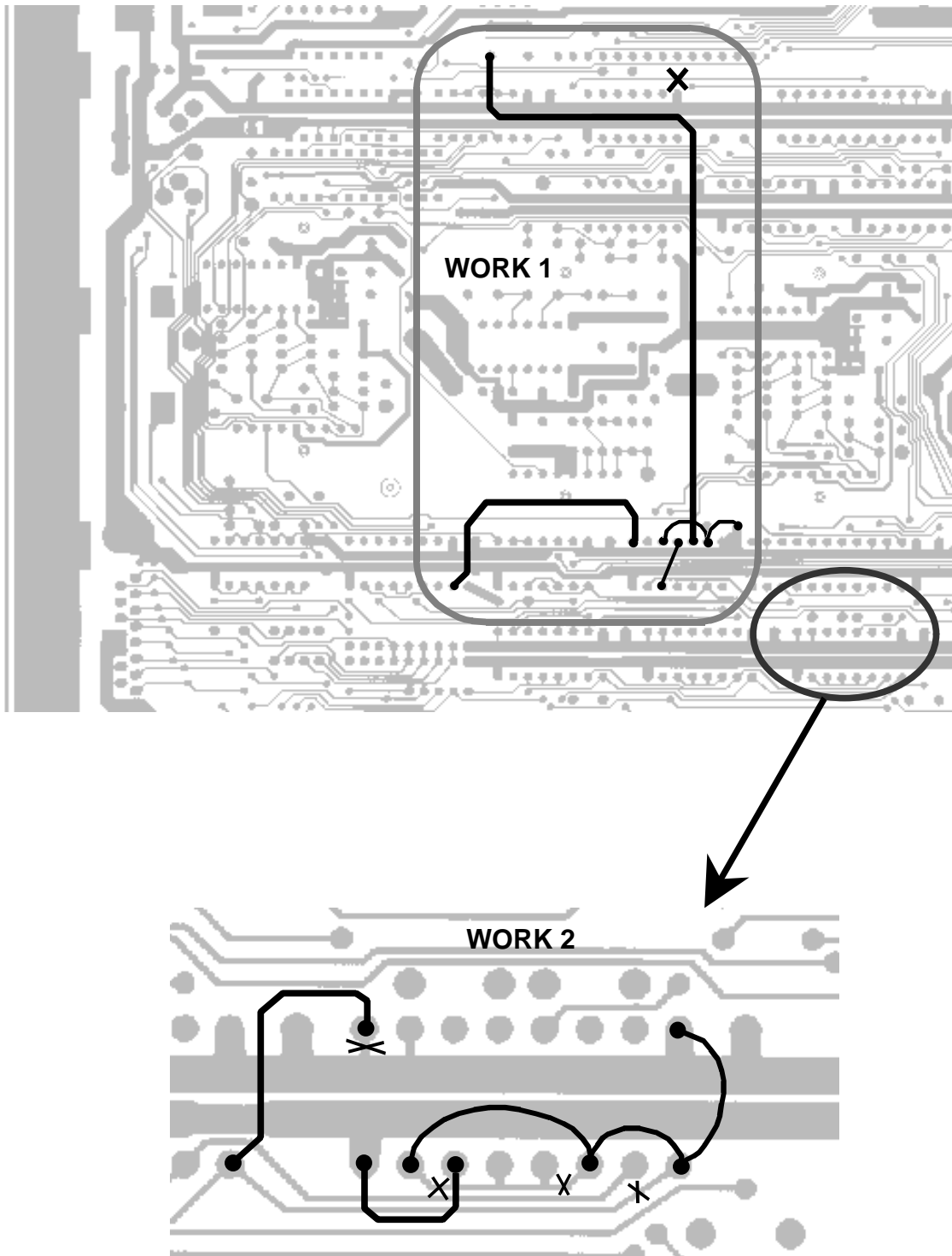
- 1) Products with S/No. 230001 and higher.
- 2) SYS PCB Assy that shows PCB version 52103517-02/-03 .
 * Part number for SYS PCB Assy has not been changed.

Overview of WORK 1, 2 and 3

Refer to page 3 and 4 for more details.

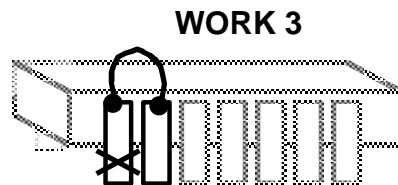
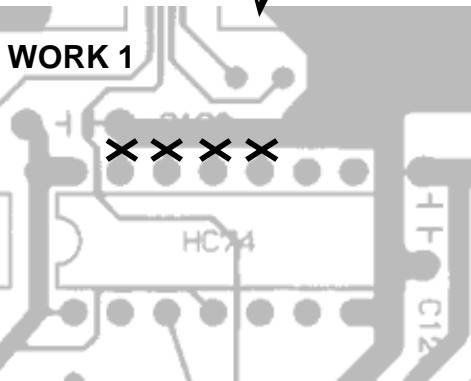
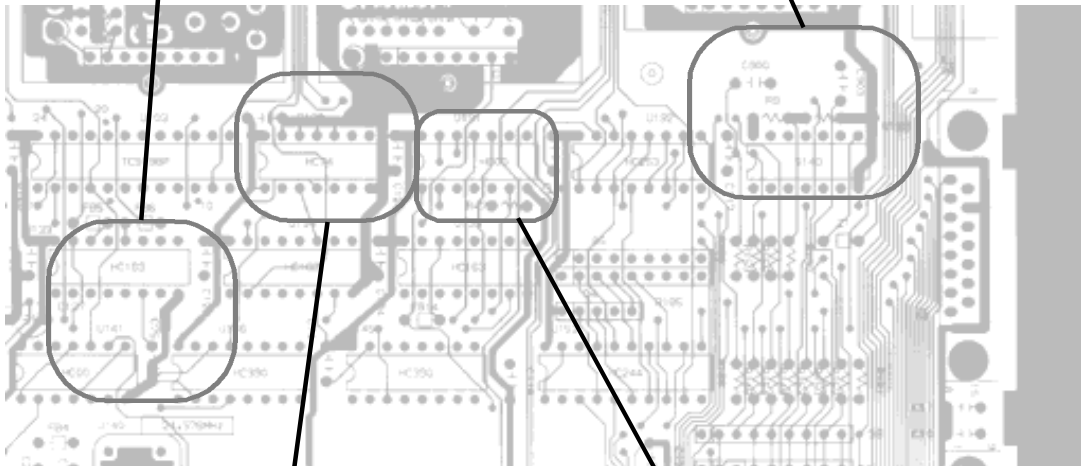
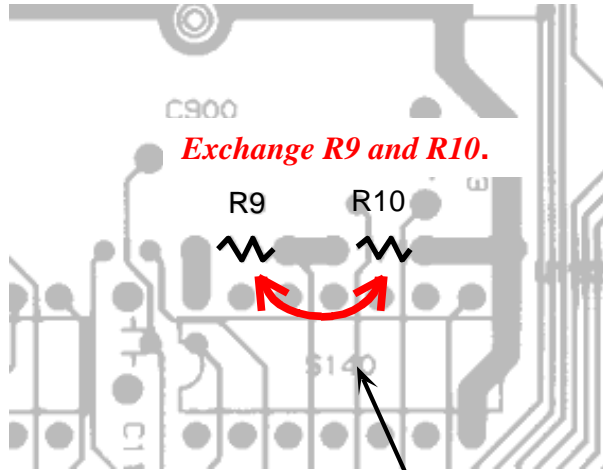
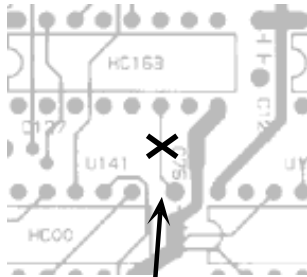


SYS PCB Assy (Soldering Side)



SYS PCB Assy (Component Side)

WORK 2



**TECHNICAL INFORMATION****TASCAM MMC-38, ROM Upgrade (V1.04)**No. **9835**

DATE 7th September 1998

SYSTEM ROM, U12 on the MAIN PCB Assy has been upgraded on the products with S/No. 0100001 and higher.

Old	New	P/No. (PGMed ROM)	P/No. (Blank ROM)
V1.03	V1.04	S002224-00D	S0018093 (M27C512-12C1)

Problem corrected by SYS V1.04

MMC-38's default of MMC command "MMC REC MODE" has been set to "disable". Some of MMC controllers send out MMC REC MODE "enable" command for switch the REC MODE for controlled device, but some of them do not. Therefore DA-38 cannot enter to record mode in case MMC controller that dose not send out MMC REC MODE of "enable" command, tries to record via MMC-38 to DA-38.

Correction of this phenomenon is made by changing default of MMC REC MODE to "enable".

**TECHNICAL INFORMATION****TASCAM DA-38, ROM Upgrade (SYS V1.08)**No. **9832**

DATE 31st July 1998

SYSTEM ROM, U105 on the SYS PCB Assy has been upgraded on the products with S/No. 0100001 and higher.

	Old	New	P/No. (PGMed ROM)	P/No. (Blank ROM)
SYS	V1.03	V1.08	S002036-00E	S0018093 (M27C512-12C1)

Problem corrected by SYS V1.08

When powering on without a cassette, selection of the sampling frequency was inconsistent that some units were initialized at 44.1 kHz and some were initialized at 48 kHz.

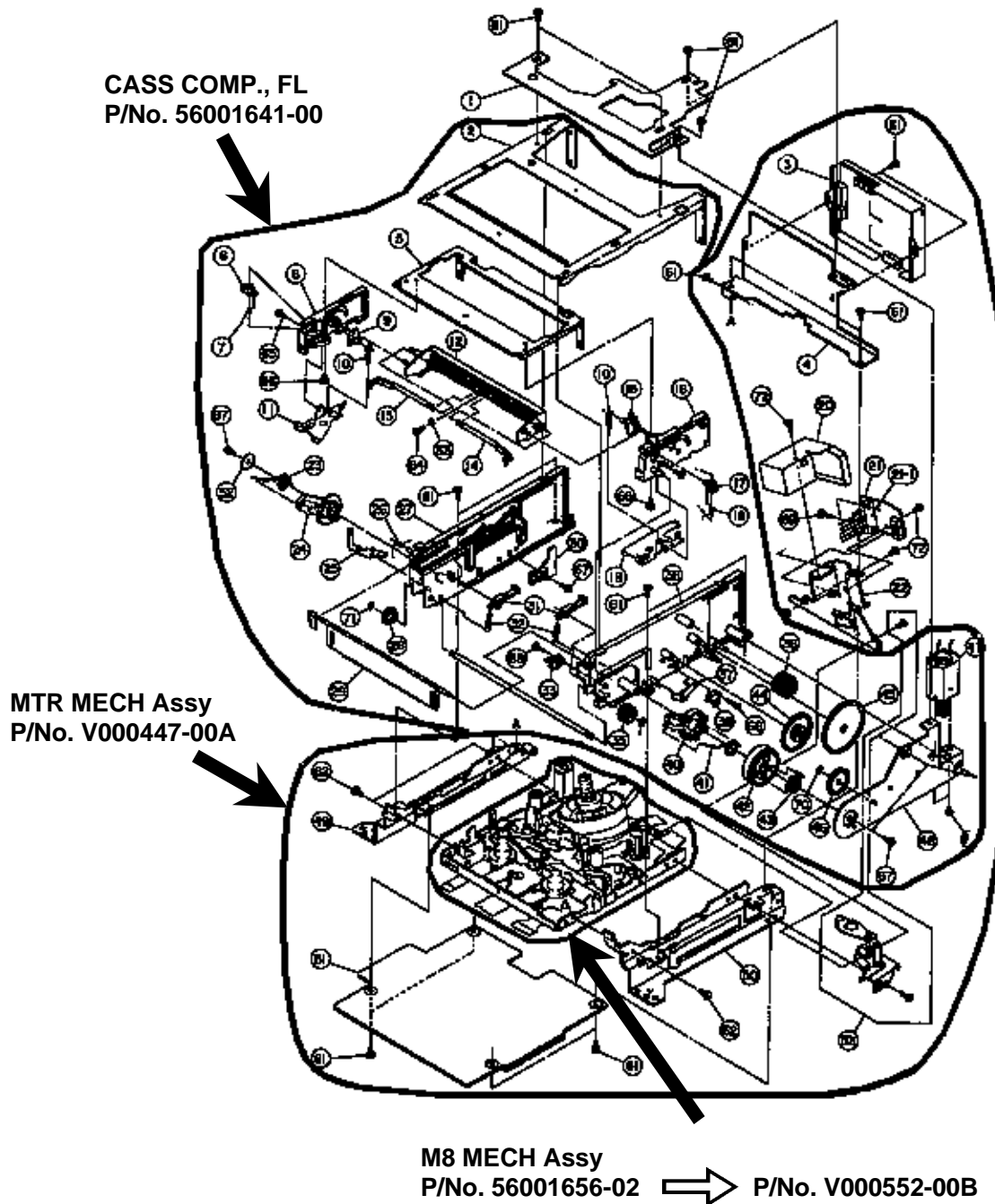
With V1.08, it has been fixed at 48 kHz.

TEAC TECHNICAL INFORMATION

TASCAM DA-88, Mechanism Assy

No. 9823
DATE 5th June 1998

The following are available as spare parts.



TEAC TECHNICAL INFORMATION

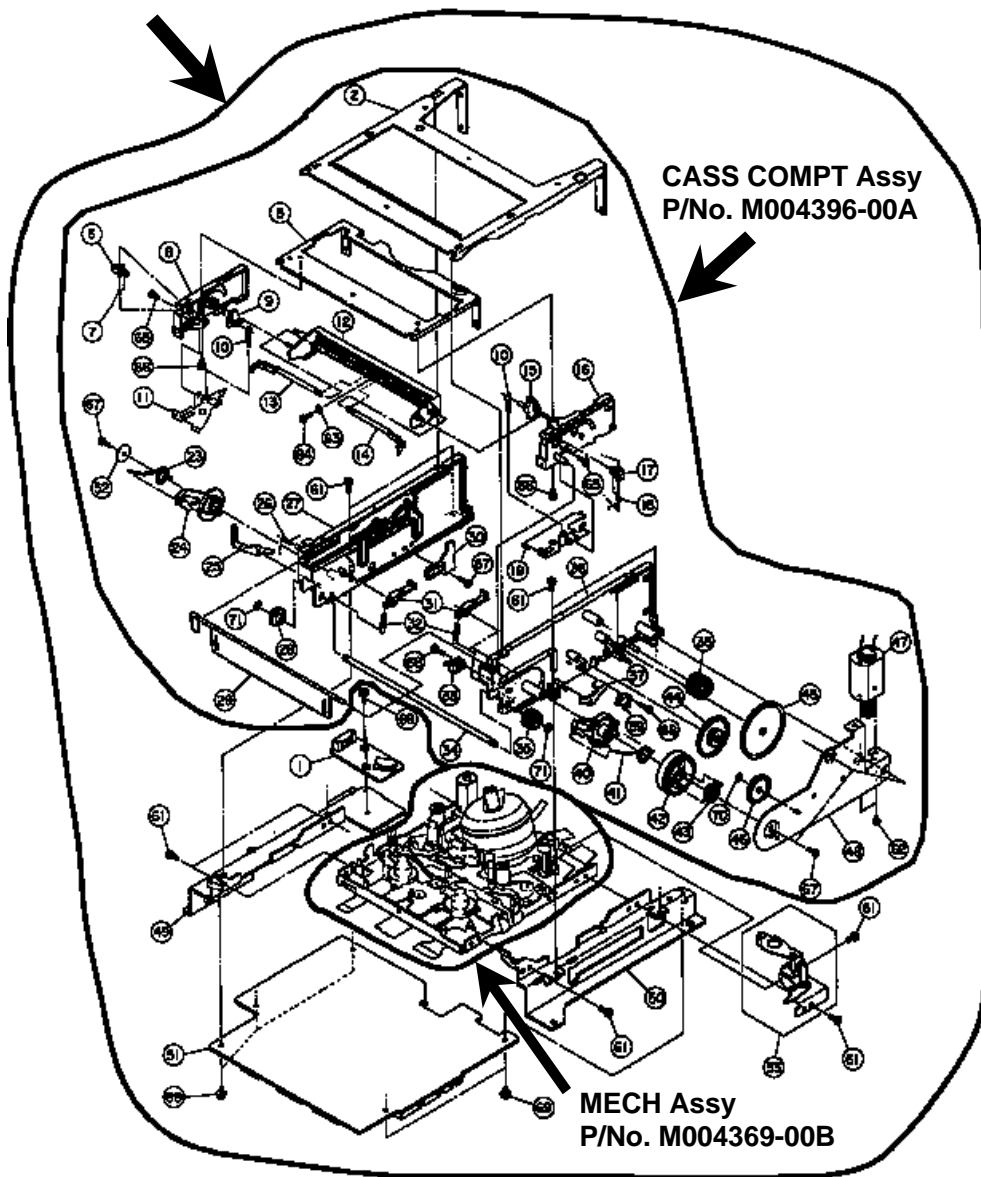
TASCAM DA-38, Mechanism Assy

No. 9822
DATE 5th June 1998

The following are available as spare parts.

TRANSPORT Assy
P/No. M004370-00A

CASS COMPT Assy
P/No. M004396-00A



TEAC TECHNICAL INFORMATION

TASCAM DA-88/38, Change of Drum Head

No. **9814**
 DATE 2nd April 1998

For ease of production, material of head chip has been changed to MIG (metal in gap). Old and new are compatible. Accordingly, part number for Drum Assy and Mechanism Assy have been changed as listed below.

DA-88 (changed on the products S/No. 520142 and higher)

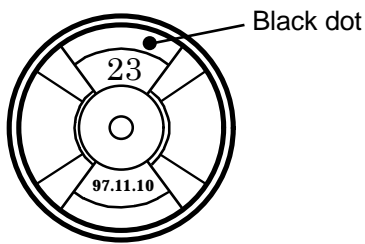
	Old	New
Drum Assy	56001657-22	56001657-23
Drum Assy (RLP)	V000359-00A	V000359-00B
Mechanism Assy	56001656-01	56001656-02

DA-38 (changed on the products S/No. 0140117 and higher)

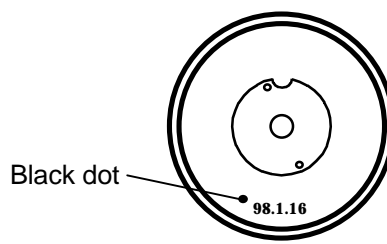
	Old	New
Drum Assy	M004346-00A	M004346-00B
Drum Assy (RLP)	V000548-00A	V000548-00B
Mechanism Assy	M004369-00A	M004369-00B

Note: The new Drum and Mechanism Assy for DA-38 are the original part of the DA-98.

Drum Assy (RLP)
 P/No. V000359-00B



Drum Assy (RLP)
 P/No. V000548-00B



TEAC TECHNICAL INFORMATION

9707

TASCAM DA-38, Clearing the backup RAM

14th March 1997

Strictly confidential

Procedure:

- 1 Set the DA-38 to Test Mode¹.
- 2 Ensure that no tape is loaded and SHIFT LED is turned off.
- 3 Hold SHIFT and press CLEAR.
- 4 Display shows [r E H d 9].
- 5 Press and hold CLEAR two seconds.
- 6 Display shows [CLEAR] and all data in the RAM is cleared.

In case drum time² or times of head cleaning³ are needed to be set, proceed to below.

- 7 Press MENU.
- 8 Display shows [d. □□□□]. Use ▼▲ to set.
- 9 Press MENU.
- 10 Display shows [d.5 □□□□]. Use ▼▲ to set.
- 11 Press MENU.
- 12 Display shows [CLE. □□□□]. Use ▼▲ to set.
- 13 Turn the power off.

References:

- ¹ See 2-3, page 4, service manual.
- ² See 2-2, page 4, service manual.
- ³ See 2-5, page 4, service manual.

TEAC TECHNICAL INFORMATION

9703R

TASCAM MMC-38, Change of the Software

15th February 1997

This is the revised edition of Technical Information No.9703. Difference between 9703 and 9703R is that identification mark and location have been altered.

On the MMC-38 with serial number 50001 and higher, ROM, U12 on the MAIN PCB Assy has been changed to **Version 1.03, P/No. S002224-00C**.

Version 1.03 corrects following two problems:

- 1 Recording track select is unable on the 3rd machine in daisy-chained DA-38s or DA-88s.
- 2 When record function of any one track is set to ON, previous setting for all other tracks is cleared falsely. This problem occurs when recording track select is made by [Masked Write] in the MMC command that is available on, for instance, NOTATOR LOGIC made by EMAGIC.

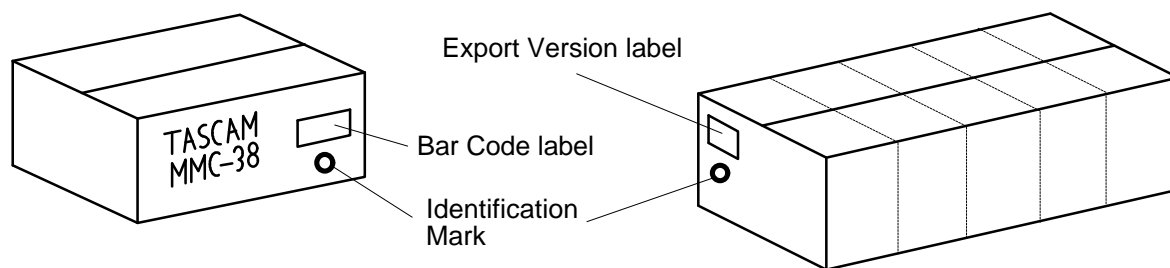
Products with serial number up to 49999 in Tokyo stock have been reworked and have been replaced with Version 1.03 ROM. ~~They can be identified with "●" mark stamped at right side of the serial number.~~



They can be identified with "O" mark stamped on a carton as shown below.

One unit carton

Five units carton



Products with serial number 50001 and higher have no identification mark since Version 1.03 ROM have been mounted at the production line.

TEAC TECHNICAL INFORMATION

9703

TASCAM MMC-38, Change of the Software

5th February 1997

On the MMC-38 with serial number 50001 and higher, ROM, U12 on the MAIN PCB Assy has been changed to **Version 1.03, P/No. S002224-00C**.

Version 1.03 corrects following two problems:

- 1 Recording track select is unable on the 3rd machine in daisy-chained DA-38s or DA-88s.
- 2 When record function of any one track is set to ON, previous setting for all other tracks is cleared falsely. This problem occurs when recording track select is made by [Masked Write] in the MMC command that is available on, for instance, NOTATOR LOGIC made by EMAGIC.

Products with serial number up to 49999 in Tokyo stock have been reworked and have been replaced with Version 1.03 ROM. They can be identified with "●" mark stamped at right side of the serial number.

Products with serial number 50001 and higher have no identification mark since Version 1.03 ROM have been mounted at the production line.

TEAC**TECHNICAL INFORMATION****TASCAM DA-38/78HR/98, No Drum Time Counting**

No.	0001
DATE	28th March 2000

Symptom: There is a possibility that drum time is erratic or not counted.

Cause: EEPROM (U904 on the Servo PCB Assy) that stores drum time has been changed once on the following products.

DA-38:	S/No. 310113 and up (totally 200 units)
DA-78HR:	S/No. 0010001 to 0049999
DA-98:	S/No. 150001 and up

Original is ST93C46 (P/No. S0002483). New one is M93C46-MN6T (P/No. S0033414). However, with new one, there is a possibility for erratic or no drum time counting.

Solution: Replace new one with original one.

DA-78HR S/No. up to 0049999 in Tokyo stock have been reworked and "D" mark have been stamped on the carton.

All products with S/No. 0050001 and higher have ST93C46 (P/No. S0002483) mounted.

TEAC TECHNICAL INFORMATION

9623

TASCAM DA-38, Connection with YAMAHA O2R

30th August 1996

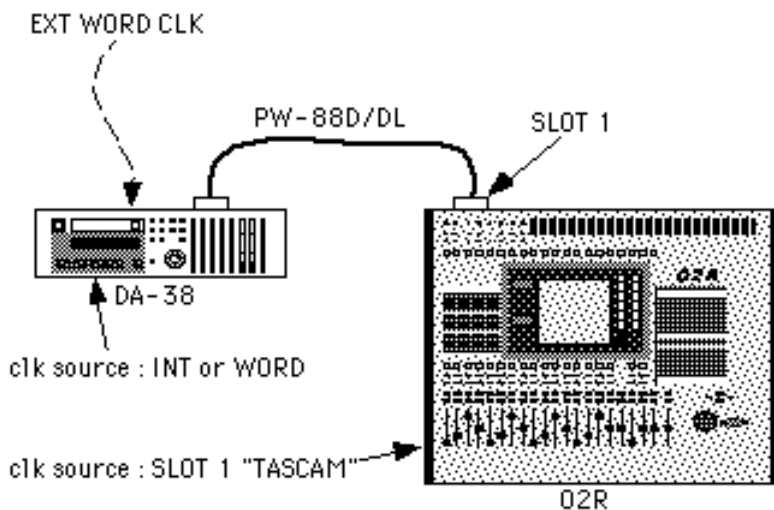
This explains particular of TASCAM DA-38 and YAMAHA O2R connected in various cases.

Notice: In case any other connection methods than this information are required, please ask customers to contact local YAMAHA agent.

1 DA-38 and O2R

DA-38 should be used as a source of master clock. Clock source of O2R is set to a slot where the CD8-TD, an optional YAMAHA I/O card (TASCAM) is inserted.

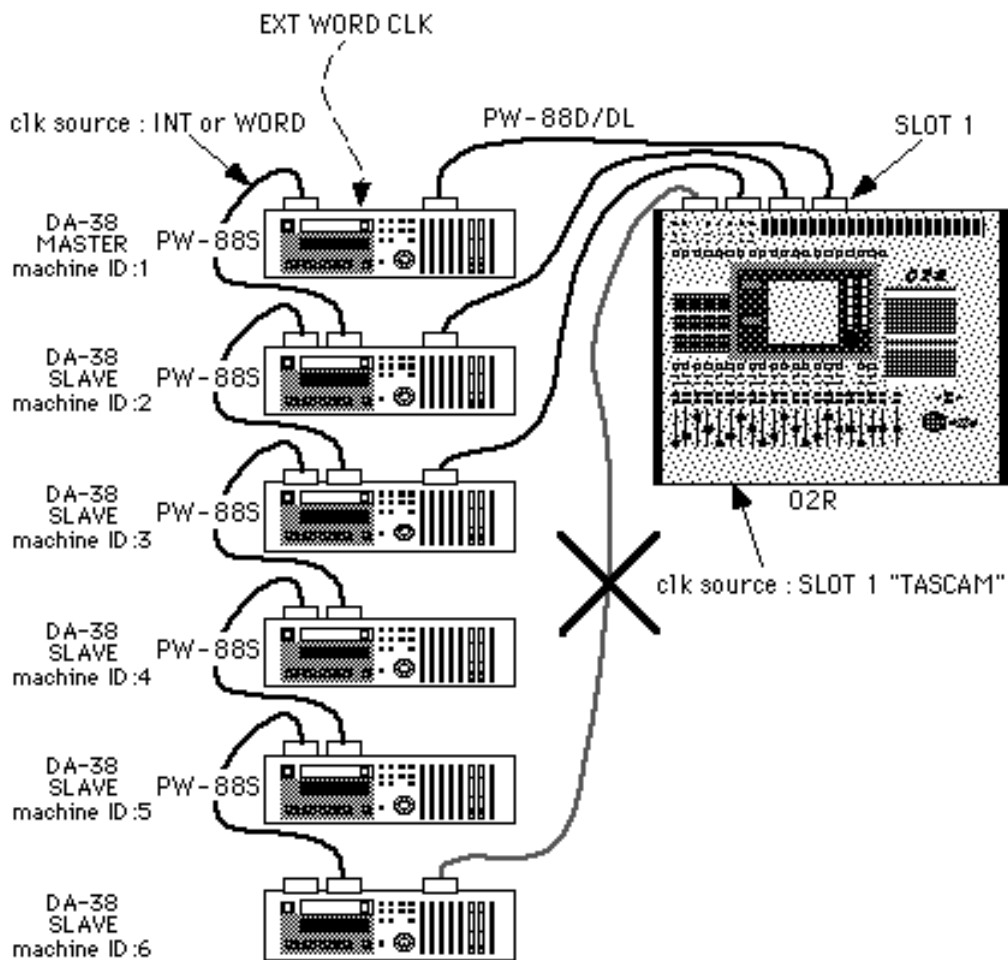
If system set up is made with other methods, data transmission from O2R to DA-38 may not be done properly although DA-38 to O2R is OK.



2 Multiple DA-38s and O2R

O2R accepts upto 4 units of DA-38. Clock source of O2R should be set to a slot where the master machine among multiple DA-38s being connected.

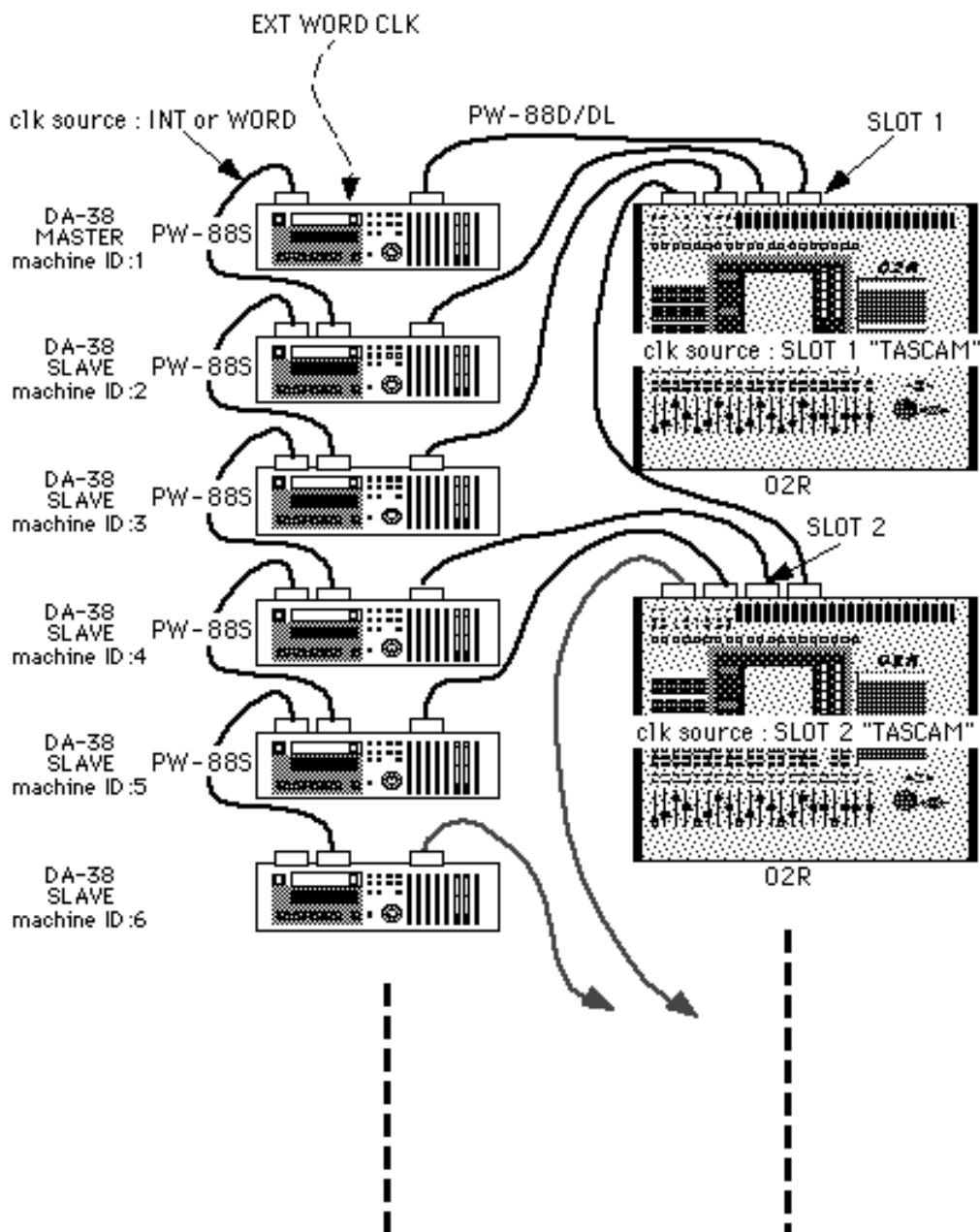
In the case of below, master DA-38 is connected to SLOT 1, then, clock source of O2R should be set to SLOT 1 "TASCAM". In multiple DA-38s connected to O2R, sync cable (PW-88S) should be connected in regular sequence. In case any discontinuity of regular order of sync cable is made, data transmission from O2R to DA-38 may not be done properly although DA-38 to O2R is OK.



3 Multiple DA-38s and multiple O2Rs

O2R can be daisy chained upto 4 units with the Digital Cascade card inserted to a slot. Then totally 10 units of DA-38 (3 units of DA-38 on master O2R, 2 on slave 1 O2R, 2 on slave 2 O2R, 3 on slave 3 O2R) can be connected to multiple O2Rs.

In the case of below, clock source of 1st O2R should be set to SLOT 1 "TASCAM" and clock source of 2nd O2R should be set to SLOT 2 "TASCAM". Sync cable (PW-88S) should be connected in regular sequence. In case any discontinuity of regular order of sync cable is made, data transmission from O2R to DA-38 may not be done properly although DA-38 to O2R is OK.



TEAC TECHNICAL INFORMATION

9621

TASCAM DA-88, Tape Related Lock-up Time Reduction

5th July 1996

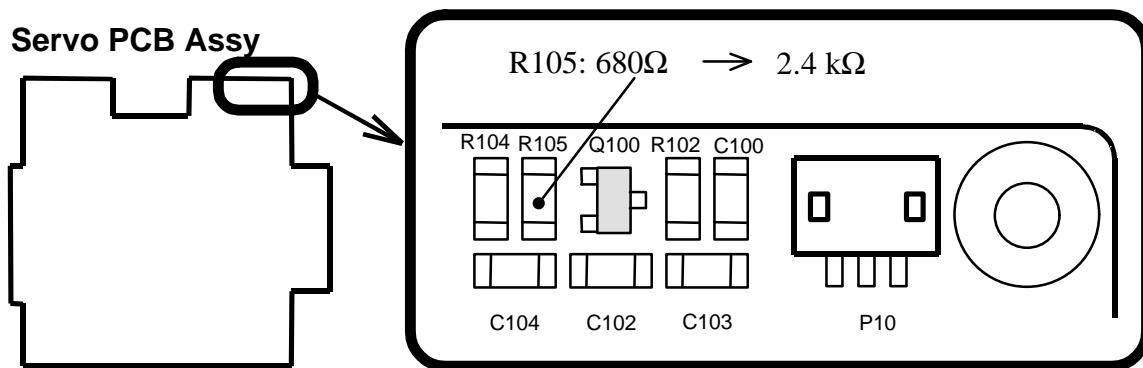
Phenomenon: The slave DA-88's capstan servo does not lock immediately when used as a slave machine chasing a master DA-88 or external timecode. This occurs with some brands of Hi8 cassette tapes, but not all brands.

Cause: The ATF signal is recorded with too much level for certain tape formulations..

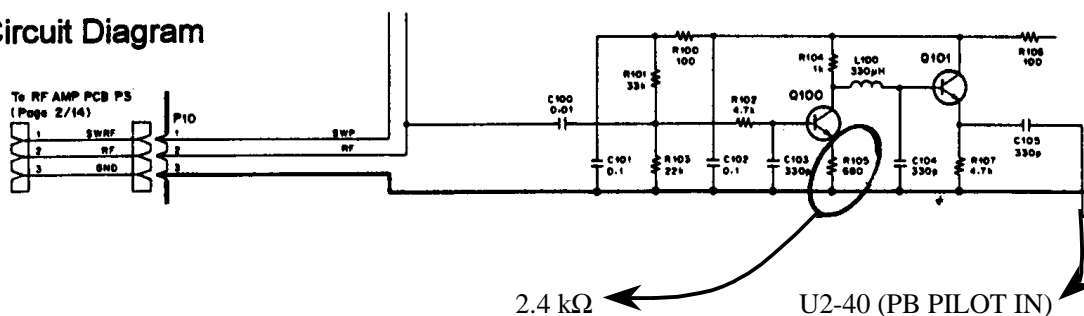
This excessive level can affect the correct operation of the capstan servo system.

Solution: Reduce the ATF signal input stage by replacing R105 (680Ω) on the Servo PCB Assy with 2.4 kΩ, **P/No. 11152242**.

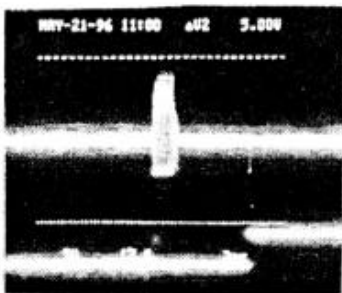
This change has already been made on units with S/No. 450001 and higher.



Circuit Diagram



U2-43 (PRE AMP OUT)
ATF signal too much level



U2-43 (PRE AMP OUT)
ATF signal proper level



TEAC TECHNICAL INFORMATION

9620R

TASCAM DA-88, Change of Mechanical Parts

13th August 1996

Note: This is the revised edition of the Tech-Info No. 9620. Difference between 9620 and 9620R is only the part number for the Slide Moving Guide T that the correct number is 17968228-00.

Slide Moving Guide T

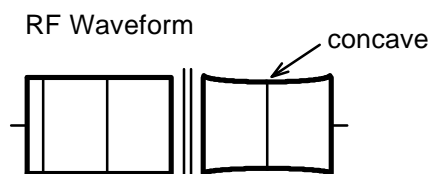
Phenomenon: Right side on the RF waveform is observed concave as shown below.

Adjustment of take-up side guide roller cannot remove the concave portion.

Solution: Replace Slide MGT (Ref 4-29) with new, ~~P/No. 17968227-00~~

P/No. 17968228-00

Note that part number for new guide has not been changed but all stocks in TEAC Parts Center are new.



New Slide MGT has been introduced to:

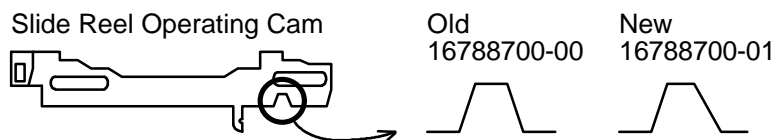
- * DA-88 S/No. 300001 and up or,
- * Mechanism Assy S/No. 142001 and up. Number can be found on the head shield (Ref 3-20).

Slide Reel Operating Cam

Phenomenon: Tape becomes loosened in case F.FWD/REW (×100 speed) → STOP is operated. S-Err 31 is displayed.

Solution: Replace Slide Reel Operating Cam (Ref 5-16) with new, **P/No. 16788700-01**.

Purpose of this change is to reduce a mechanical load on the Slide Reel Operating Cam. However, mostly cause of this phenomenon is a dust accumulated on the chassis.



New Slide Reel Operating Cam has been introduced to:

- * DA-88 S/No. 430001 and up or,
- * Mechanism Assy S/No. 157001 and up

TEAC TECHNICAL INFORMATION

9620

TASCAM DA-88, Change of Mechanical Parts

28th June 1996

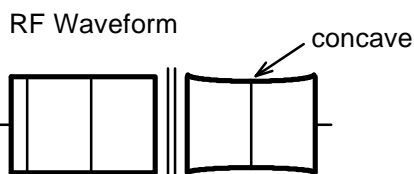
Slide Moving Guide T

Phenomenon: Right side on the RF waveform is observed concave as shown below.

Adjustment of take-up side guide roller cannot remove the concave portion.

Solution: Replace Slide MGT (Ref 4-29) with new, **P/No.17968227-00**.

Note that part number for new guide has not been changed but all stocks in TEAC Parts Center are new.



New Slide MGT has been introduced to:

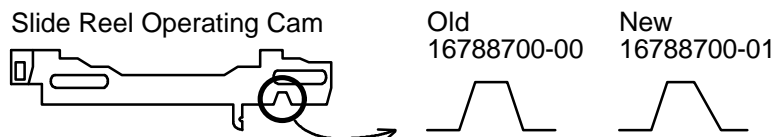
- * DA-88 S/No. 300001 and up or,
- * Mechanism Assy S/No. 142001 and up. Number can be found on the head shield (Ref 3-20).

Slide Reel Operating Cam

Phenomenon: Tape becomes loosened in case F.FWD/REW ($\times 100$ speed) \rightarrow STOP is operated. S-Err 31 is displayed.

Solution: Replace Slide Reel Operating Cam (Ref 5-16) with new, **P/No. 16788700-01**.

Purpose of this change is to reduce a mechanical load on the Slide Reel Operating Cam. However, mostly cause of this phenomenon is a dust accumulated on the chassis.



New Slide Reel Operating Cam has been introduced to:

- * DA-88 S/No. 430001 and up or,
- * Mechanism Assy S/No. 157001 and up

TEAC TECHNICAL INFORMATION

9616

DA-88, Hidden Function of SYS Rom Ver. 3.10

14th June 1996

The following function has been supported in the software of SYS Rom version 3.10 or more.

1. Auto Play - RWD - Play Loop

a. Auto Play upon Powering On

To enter: Power On while holding PLAY/STOP/FF/RWD keys.

[**P. on PLAY**] is briefly displayed.

To release: Power On while holding STOP key.

[**P. on StOP**] is briefly displayed.

b. BOT Play

To enter: Power On while holding PLAY/FF/RWD keys.

[**bot PLAY**] is briefly displayed.

To release: Power On while holding PLAY/FF keys.

[**bot StOP**] is briefly displayed.

c. EOT RWD

To enter: Power On while holding PLAY/STOP/RWD keys.

[**Eot rEW**] is briefly displayed.

To release: Power On while holding STOP/RWD keys.

[**Eot StOP**] is briefly displayed.

This status is kept in RAM data and backed up. There is a chance to enter in this function unintentionally. And it is unable to reboot for normal operation unless above is executed.

2. Peak Hold ON/OFF in the Level Meter

a. Peak Hold On

To enter: Power On while holding RECORD/STOP/RWD keys.

[**P. hold On**] is briefly displayed.

To clear: Press CLEAR key while holding ▲ key.

b. Peak Hold Off

To enter: Power On while holding RECORD/PLAY/RWD keys.

[**no P. hold**] is briefly displayed.

This status is not kept in RAM data thus released by power off and on again.

TEAC TECHNICAL INFORMATION

9612

DA-88, RCA PIN-JACK Contact

7th June 1996

Contact of the mechanical-SW of RCA Pin-Jack on A/D PCB may become opened when insertion of the plug has been made in incorrect direction with excessive force. The balanced input through D-Sub connector becomes impossible consequently.

The problem tends to occur especially with the units used for rental purpose since the units can be handled much roughly. To cope with this problem, resistor-summing of unbalanced and balanced signals becomes available by fitting the Buffer Amp Kit as shown in page 3.

V000 318-00A **Buffer Amp Kit for all 8 channels** consists of:

4 pcs E001 815-00A **Buffer Amp PCB Assy for a pair channel**

Each Buffer Amp PCB Assy comes with:

4 pcs	5241 4588-20	R, Metal Film 1.8k
2 pcs	5241 4598-20	R, Metal Film 4.7k
2 pcs	5240 5501-20	R, Carbon ERD-A3TJ 10k
2 pcs	E001 811-00A	Processed Shield Wire, 55 mm

Each Buffer Amp is supplied with an adhesive tape stuck for mounting it. To harmonize such retrofitting, the PCB Assy should be fabricated by hand made. The price of this kit is high as FOB ¥ 13,000.-/ea therefore. Yet, introducing this Buffer Amp Kit is recommended for the persons who have been suffering with the problem.

- ① Cut wire of CH1A and CH2A connectors and remove and discard it as shown in Fig.1.
- ② Attach the Buffer Amp PCB Assy by the adhesive tape as shown in Fig.2.
- ③ Remove * marked four components per Buffer Amp PCB as shown in Fig.3:

C101, 102 (680 p)
R071, 072 (220)

- ④ Replace * marked eight resistors with the supplied resistors per each Buffer Amp PCB as shown in Fig.3:

R021, 022, 031 and 032 (1.3 k) with 1.8 k
R061 and 062 (220) with 4.7 k
R081 and 082 (56 k) with 10 k

- ⑤ Connect the supplied 55 mm shield wires as shown in Fig.3.
- ⑥ Connect wires of the Buffer Amp PCB Assy to the A/D PCB as shown in Fig.3.

Repeat all steps up to CH 8 so that the following changing is all made.

C103 ~ 108 (680 p)	→	Remove (*)
R073 ~ 078 (220)	→	Remove (*)
R023 ~ 028 (1.3 k)	→	1.8 k (*)
R033 ~ 038(220)	→	1.8 k (*)
R063 ~ 068 (220)	→	4.7 k (*)
R083 ~ 088(56 k)	→	10 k (*)

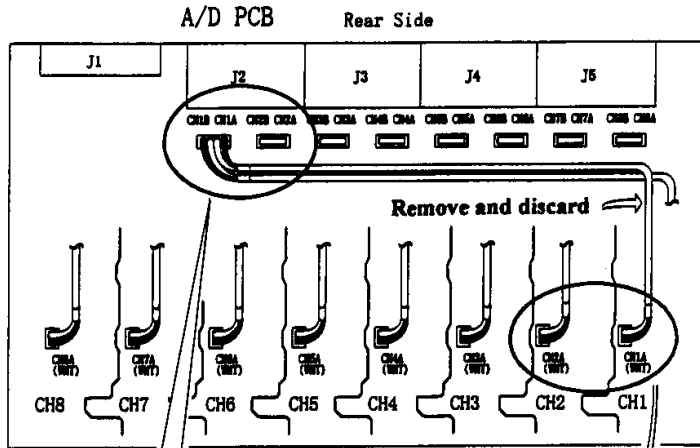


Fig.1

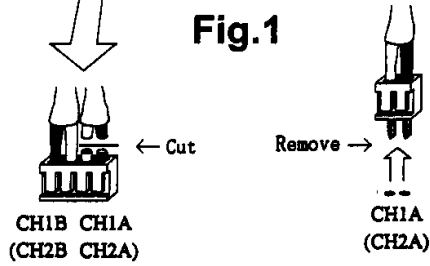


Fig.3

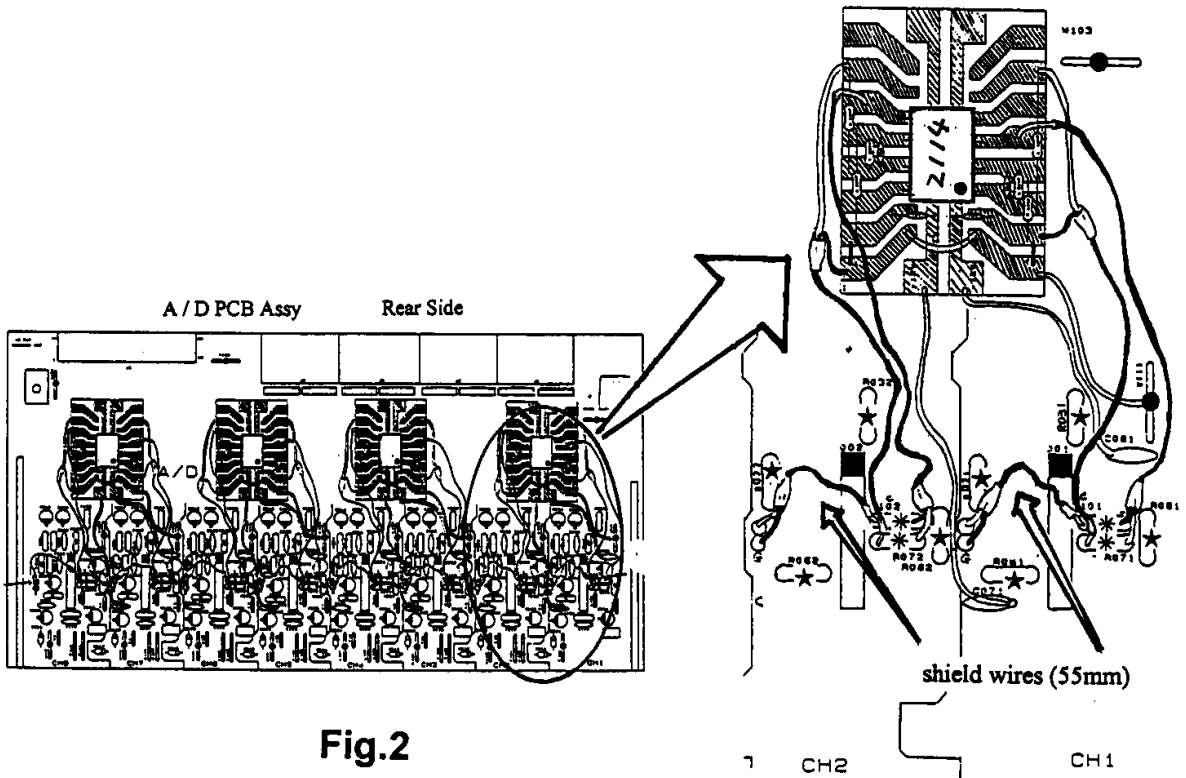
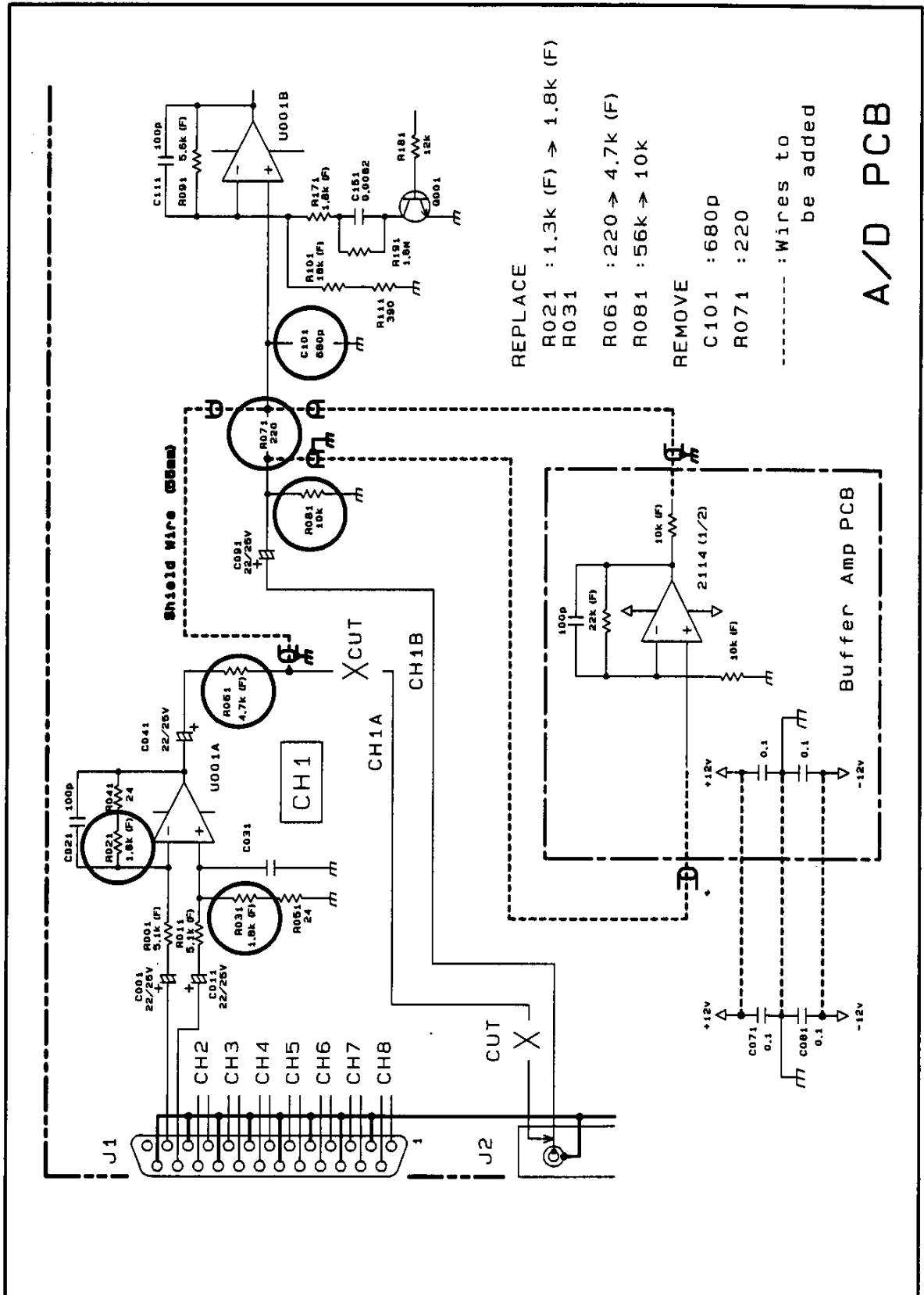


Fig.2



TEAC TECHNICAL INFORMATION

9605

TASCAM DA-88, Fracture of the Logic Cam L

17th May 1996

Phenomenon: S-Error 11 occurs. Mechanism does not work. Unable to load/unload a tape.

Cause: Fracture at inmost groove of the Logic Cam L (Ref 5-25).

Solution: Replace a damaged Logic Cam L. At the same time, replace the Sector Gear Assy (Ref 5-23) with the latest **P/No. 17968210-03**.

When assembling the mechanism, timing of the gears should be adjusted.

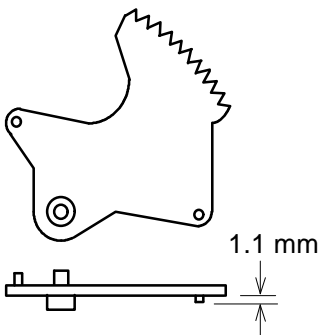
For practical work, refer to next page as well as Supplement Service Manual, P/No. D001414-00A.

Notice: This phenomenon may occur only on the products S/No. 240371 - 380800 on which Sector Gear Assy (-01) has been mounted.

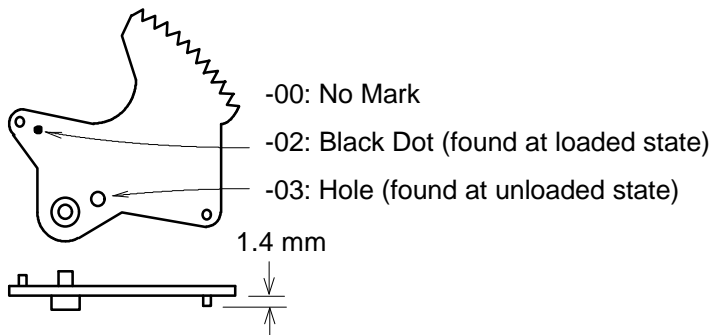
Difference between (-01) and others (-00/02/03) is height of a pin which works with the Logic Cam L. Height of (-01) is 1.1 mm while that of others is 1.4 mm.

Groove of the Logic Cam L is affected by the shorter pin.

Sector Gear Assy
17968210-01



Sector Gear Assy
17968210-00/02/03



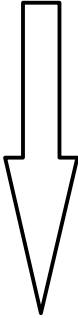
Products S/No. 240371 ~ 380800 in Tokyo stock have been reworked and the Sector Gear Assy have been replaced with the latest 17968210-03.

They can be identified with "6A" stamped at right side of the serial number on the unit/carton.

Products S/No. 390001 and up have no identification mark since the Sector Gear Assy (-02/-03) have been mounted at the production line. See below for details:

DA-88 S/No.	10001 ~ 240370	240371 ~ 380800	390001 ~	430001 ~
Version of Sector Gear Assy	-00	-01 6A stamped on reworked stock	-02	-03

DISASSEMBLING



Ref 4-3 DRUM ASSY

|
4-1 CAM MOTOR

|
Turn the Loading Worm Gear (Ref 5-8) by your finger so that mechanism mode comes to a condition of Fig.10, page 11 of the supplement service manual (P/No. D001414-00A).

|
4-21 SENSOR LED

|
4-23 DEW SENSOR

|
4-10 TENSION REGULATOR BAND (page 10)

|
4-14 TENSION SPRING

|
4-13 TENSION REGULATOR ARM

|
4-15 PROTECTOR

|
4-45 CLEANING GUIDE

|
4-20 GUIDE RAIL

|
4-26, 27, 28, 30 M GUIDE S (page 8)

|
5-23 SECTOR GEAR (page 8)

|
5-25 CAM GEAR L (page 7)



ASSEMBLING

TEAC TECHNICAL INFORMATION

9604

TASCAM DA-88, Service Manual Correction

17th May 1996

Correction is required on the Supplement Service Manual, P/No. D001414-00A.

On page 7

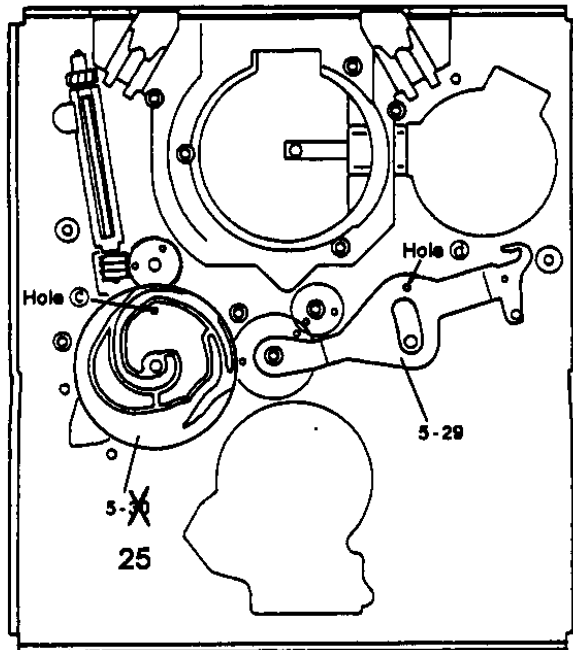


Fig. 3

On page 8

SECTOR GEAR Assy

4. Installing ~~CAMP LOGIC~~ (5-23)

Install 5-23 so that hole ① in 5-23 in Fig. 4 is aligned with the holes (hole ② in 5-25 aligned in 1) of 2 with hole ③ in the mechanism chassis).

TEAC TECHNICAL INFORMATION

9602

TASCAM DA-88, Re-lapped Drum Head

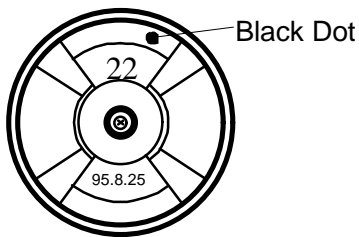
2nd February 1996

This information relates to the previous information No. 9601.

Drum Head, Re-Lapped, P/No. V000359-00A has been newly become available.

This spare part is supplied after lapping work is completed at the factory.

Identification mark of a black dot is applied as shown:



Price of this Drum Head is slightly higher than the original, however, it can skip the lapping work upon servicing. Providing the Re-Lapped Drum Head for out going purpose is recommended.

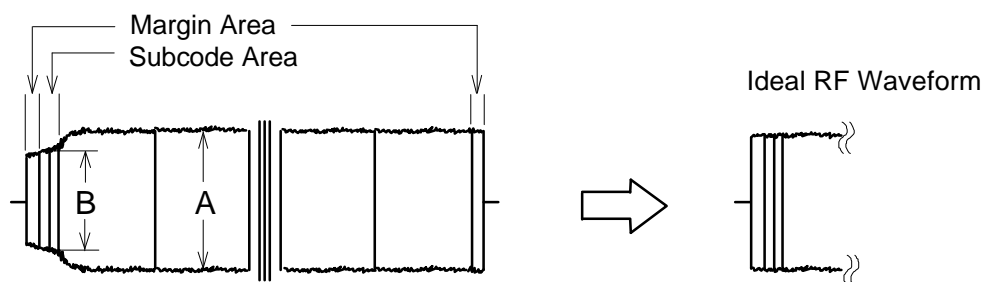
TEAC TECHNICAL INFORMATION

9601

TASCAM DA-88, Lapping Cassette Tape

2nd February 1996

When the Drum Head is replaced with brand-new 56001657-21 or -22, there is a possibility that left side of the RF waveform becomes rounded/dull as shown below. Adjustment of supply guide cannot remove that dullness.



Specification: $B/A \geq 80\%$

Value of B should be measured at Subcode Area, not at Margin Area.

When such is experienced, use of **Lapping Cassette Tape, P/No. 14809662** is suggested.

Preparation

- 1 Load MTT-88101/88102 playback test tape and adjust guide roller to maximize value of B.
- 2 Load a blank (unformatted) tape and do formatting several tens of seconds.
- 3 Rewind and observe the RF waveform of formatted portion.
- 4 In case out of the specification ($B/A \geq 80\%$), proceed to below.

Using the Lapping Cassette Tape

- 5 Enter the deck into Test Mode.
- 6 Insert the lapping cassette tape.
- 7 Play the tape *one second*.
- 8 Eject it.
- 9 Clean drum head and whole tape path with referring to Technical Information No. 9414.
- 10 Confirm whether the waveform is in specification.

Notice on using the lapping cassette tape

- * This tape has a huge abrasivity. 1 μm head wear will be resulted by 3 seconds of PLAY.
- * Do not command SHUTTLE or F.FWD/RWD.
- * Discard the lapping cassette tape when tape comes its end.
- * Providing the lapping cassette tape for in house purpose of drum head replacing is recommended.

TEAC TECHNICAL INFORMATION

9518

TASCAM DA-88, Change of Drum Head

27th October 1995

For ease of production, rotary transformer fitted in lower drum has been changed. Accordingly, part number of drum head has been changed on the products serial numbered 360377 and up.

Old	New
P/No. 56001657-21	P/No. 56001657-22

Old and new are interchangeable, replacement procedure should be referred to Technical Information No. 9503.

New drum head has a print of "22" on its top surface.

TEAC TECHNICAL INFORMATION

9505

12th May 1995

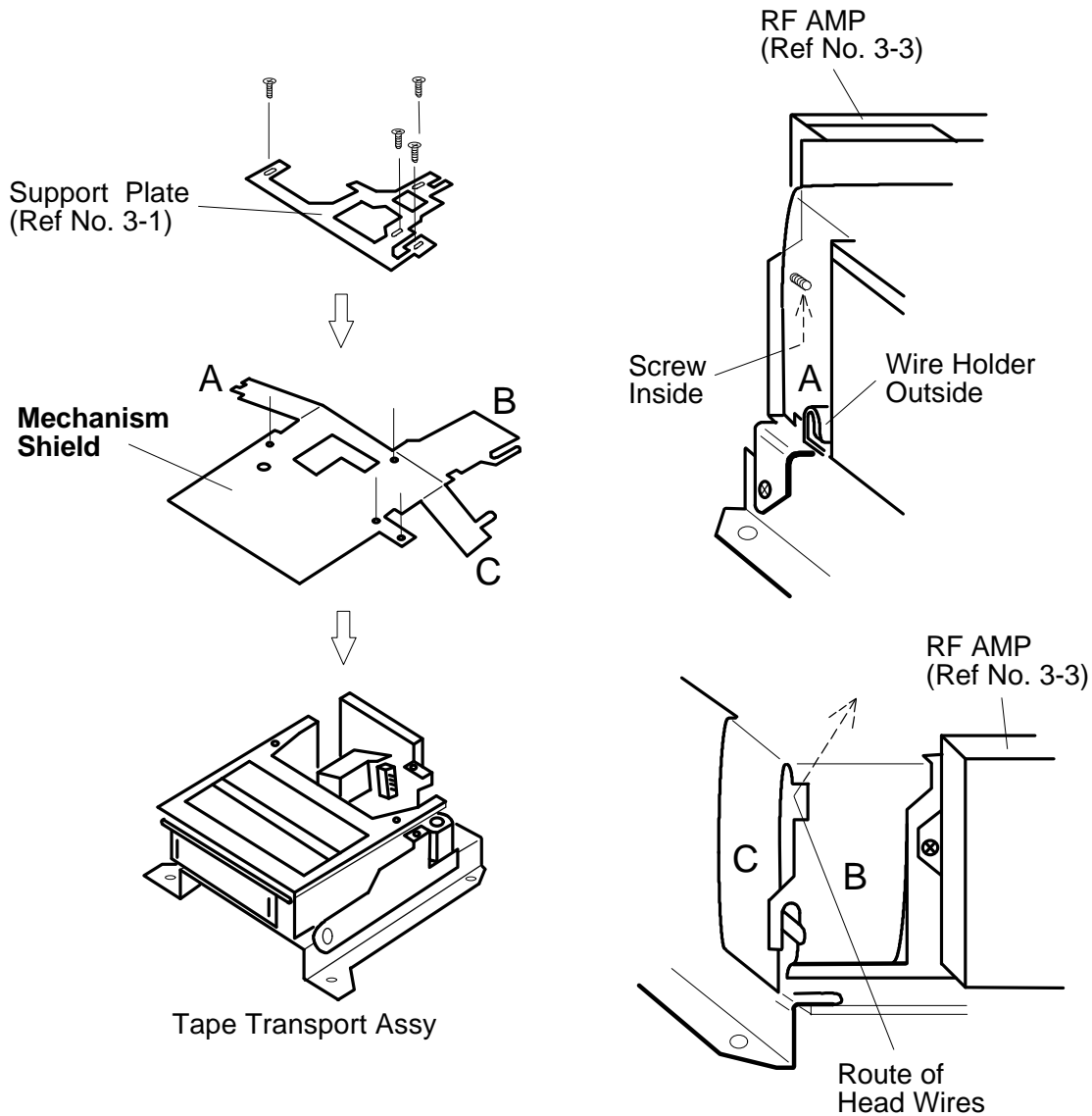
DA-88, Shielding Mechanism

To isolate a Tape Transport Assy from present flow of air, Mechanism Shield, Part Number **M003157-00A** has been designed. The shield is made of semi-transparent plastic sheet.

The Tape Transport Assy becomes free from dirt accumulation of the atmospheres.

Products S/No. 300001 and up have this shield.

No further component to fit is needed. Once remove Support Plate (Ref No. 3-3) and refer to below for assembling.



TEAC TECHNICAL INFORMATION

9503R

27th October 1995

DA-88, Change of Drum Head and RF AMP PCB Assy

This information corrects Technical Information No. 9503.

Applicable Serial Number should read as "290562" like below:

quote

Drum Head is changed to new, P/No. **56001657-21** since original head chip is no longer available and different make head chip becomes available with slight cost reduction. Due to this change, RF AMP PCB Assy is also changed to P/No. **52003534-10** to suit to new Drum Head. Products of Serial Number ~~280001~~ and up have new Drum Head and new RF AMP PCB Assy.

Unquote



290562

TEAC TECHNICAL INFORMATION

9502

27th April 1995

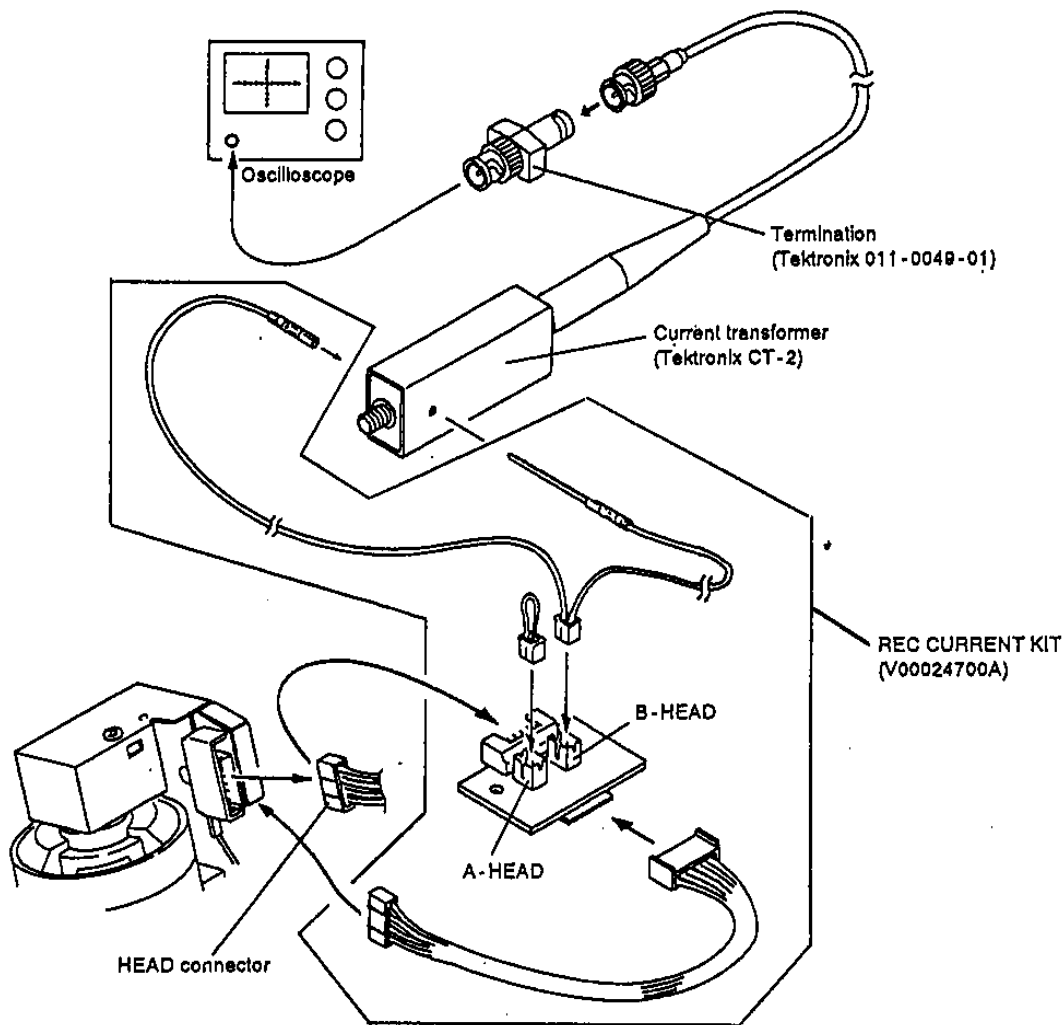
DA-88, Record Current Adjustment

This information introduces a new system of Record Current Adjustment which requires following items :

- 1 REC CURRENT KIT (TEAC Part No. **V000247-00A**)
- 2 CURRENT TRANSFORMER, Tektronix CT-2
- 3 TERMINATION, 50 Ω, BNC (Tektronix Part No. 011-0049-01)

Place order for REC Current Kit with TEAC Parts Supply Center as usual spare part.
Purchase CT-2 and Termination at your local Tektronix distributors.

Connect all items as shown below and refer to 3-7-1 Adjusting Recording Current on the original and supplement service manual.



TEAC TECHNICAL INFORMATION

9420

DA-88, System Control Program Change

8th December 1994

U156 on the SYSTEM PCB Ass'y has been changed to SYS Ver 3.03, P/No. **S001610-00A**.

This new Ver 3.03 corrects following :

- 1 In case tape used on master unit is set to "Rec Inhibit", master unit is unable to command Rehearsal or Auto IN/OUT to slave units.

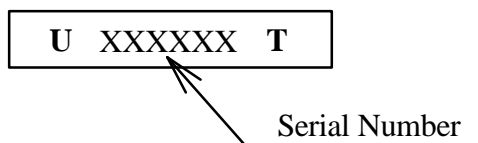
- 2 Even if dip switch S1-7 on the SY-88 rear panel is set to ON, timecode reproduced on the DA-88/SY-88 does not lock to the edge frame of video reference clock while Rehearsal or Auto IN/OUT.

- 3 There is a possibility to damage pre-recorded audio data on track 5 to 8 when following operation is made via 9-pin control.
 - 1) Any tracks from 5 to 8 are being recorded.
 - 2) Rec Function buttons on all tracks being recorded are turned off just before or just after the recording is stopped (by STOP, PLAY, FF/REW, SHUTTLE).

After above operation is once made, record enable command for track 5 to 8 keeps ON even if REC LED's are turned off.

Note : Following products have SYS Ver 3.03 mounted.

- * Products serial number 210001 and up.
- * Products having "U" and "T" marks beside the serial number as shown below.



TEAC TECHNICAL INFORMATION

TASCAM DA-88, Eliminating Noise

9419

8 December 1997

Cleaning Guide Kit is available under part number V000102-00A.

It consists of following parts;

1 pce	cleaning Guide Assy
1 pce	cleaning Roller Assy
1 pce	Torsion spring, Arm T
1 pce	Impedance Roller S
1 pce	Polyester Washer, 1.7 x 5.0 x 0.13t
2 pcs	Screw, M2 x 4
4 pcs	J-shaped Jumper Wire

This kit works to eliminate electrical noise which comes out of audio output terminals. Prior to the modification, ensure that wear of drum head is within the figure explained in the Technical Information No.9413. If not, replace drum head first.

Before performing the modification, check value of present error rate and note it because the value varies slightly depending on each DA-88.

On the Mechanism Assy

- 1.0 Mounting new type Impedance Roller Assy.
- 1.1 Dismount Mechanism Assy from main unit. See Fig 1.
- 1.2 Separate Cassette Compartment from Mechanism Assy. See Fig 1.
Clean drum head and every tape guides. See Technical information No.9414 for cleaning practice.
- 1.3 Remove Screw A. This screw is used again, do not lose it. See Fig 2.
Remove existing Impedance Roller S Assy and polyester Washer A. Abandon them. See Fig 2.
- 1.5 Insert Torsion spring through the cylindrical base. See Fig 3. 1.6 Assemble new Cleaner Guide Assy and new Impedance Roller. Place them together with washer onto the cylindrical base. See Fig 3. 1.7 Ensure that no gap exists,between roller and cylindrical base by pushing down the Impedance Roller Assy. Ensure also that the top of Impedance Roller S protrudes 1.0 +/- 0.3 mm higher than the top surfaces of Cleaner Guide encircled.
Then, fit and tighten the screw A of Para 1.3 as it was.
- 1.8 Hook the Torsion spring as shown Fig 3. Ensure that the Cleaner Guide Assy moves smooth toward the drum head direction.

- 2.0 Mounting new type cleaning Roller Assy.
- 2.1 Remove existing two screws C. See Fig 4.
- 2.2 Place the new cleaning Roller Assy on the chassis temporarily. Fit new screws D loosely, and settle new Roller Assy at exact position. Then, tighten new screws D. See Fig 4.
Note that new screw is longer than the old. On mounting the Roller Assy, do not touch the surface of drum head.
- 2.3 Try pushing the Lever O slowly toward the direction shown on Fig 5. When the Lever is kept pushed, the Roller @ touches surface of drum head first, then retract itself. touch and retracting.

On the REC/PLAY PCB Assy

- 1.0 Modification on Foil Pattern Side.
Dismount REC/PLAY PCB Assy from main unit. See Fig 1.
Assume that the PCB Assy stands upright with its P204 connector atop, foil pattern side facing operator. See Fig 7.
Perform following modifications.
- 1.1 Cut foils which come out of the Pin 3 and Pin 4 of P1 connector. See Fig 7.
- 1.2 There are half moon shaped foils facing symmetric each other at ten spots. Bridge these foils facing direct with solder. See Fig 7.
- 1.3 Connect all four foils 5.0mm, 0.5mm, 2.0mm, 3.0mm wide each run horizontal together direct with peeling off the insulation resist on the spots. See Fig 7.
- 1.4 DC power source comes to the two full moon shaped solder spots made by Para 1.2 located at the right of P1 connector. And harmful electricity remains in the capacitors of this DC power source. Discharge it by shorting these two spots a moment with 100 Ohm approx. resistor.
- 2.0 Remove following component parts on the REC/PLAY PCB Assy.
- 2.1 Five Transformers T1, T2, T3, T4, T5, See Fig 8.
After removing all transformers, the PCB looks like Fig 8-1.
And twenty five through holes appear. Among them, the five through holes shown with " -1 " mark consist circuit of vital signal passing. Ensure that connection of through hole are not melted and cut while removing transformer. If through hole connection is found damaged, mend it by inserting fine wire and soldering it.
- 2.2 U5 IC. Cut all pins short for easy removal in advance. See Fig 8.
- 2.3 Three Photo Couplers U7, u8, U9. See Fig 8.
- 2.4 Four EMI Filters U21, U22, U23, U24. Filters are made of ferrite. Smash ferrite first. See Fig 9. Remove solder and wires then.
- 2.5 Two Resistors R285, R286. Applicable to Sr Nbr up to 130000.

- 3.0 Modification on Component Parts Side.
- 3.1 Make U-shaped Jumper wire by cutting the J-shaped Jumper wire. See Fig 9. After U21 filter removed, three foil spots remain in line. Connect foil spots of both ends with U-shaped Jumper wire. Ensure that the Jumper wire does not touch the center spot. See Fig 9. Do same on the foil spots of U22, U23, U24 ex-filters.
- 3.2 Make direct connection of following four spots with the Para 3.1 remainder Jumper wire. Assume that the PCB Assy stands upright with its P204 connector atop, component parts facing operator.

- | | |
|--|------------|
| * Grounding foil leftmost vertical - TP12 | See Fig 8. |
| * Soldered spot of right side C71 - foil under C71 | See Fig 8. |
| * Soldered spot of left side C72 - foil under C72 | See Fig 8. |
| * Horizontal foil runs above Ci4 - foil under U205 | See Fig 8. |

Of course, the insulation resist over the spots to be connected must be peeled off before soldering.

When all of modifications are completed, ensure the following.

- * While tape runs, no curl of tape occurs on the lower portion of Impedance Roller S. See Fig 6.
- * Tape touches even on the blade of cleaner guide. See Fig 6.
- * Adjust VC0 Offset again. See 3-4 at page 13 S/M.
- * Ensure that the error rate is within specification, and also within the value measured in advance of performing modification. See 3-7-3 at page 17 S/M.
- * Ensure that RF wave form is within the value specified. See 3-5-3 at page 15 S/M.

Note :

1.0

Mechanism Assy and REC/PLAY PCB Assy are adjusted in the factory as one individual combination. When plural sets of DA-88 are modified, keep the combination in order. Do not mix them.

2.0

Rework of all above mentioned modifications were completed with the products stocked in TEAC warehouse. They are identifiable with "T" mark stamped at the right side of serial numbers shown on carton and on label stuck on rear chassis. All products serial numbered 210001 and up have these modifications given in the production line and have no "T" mark.

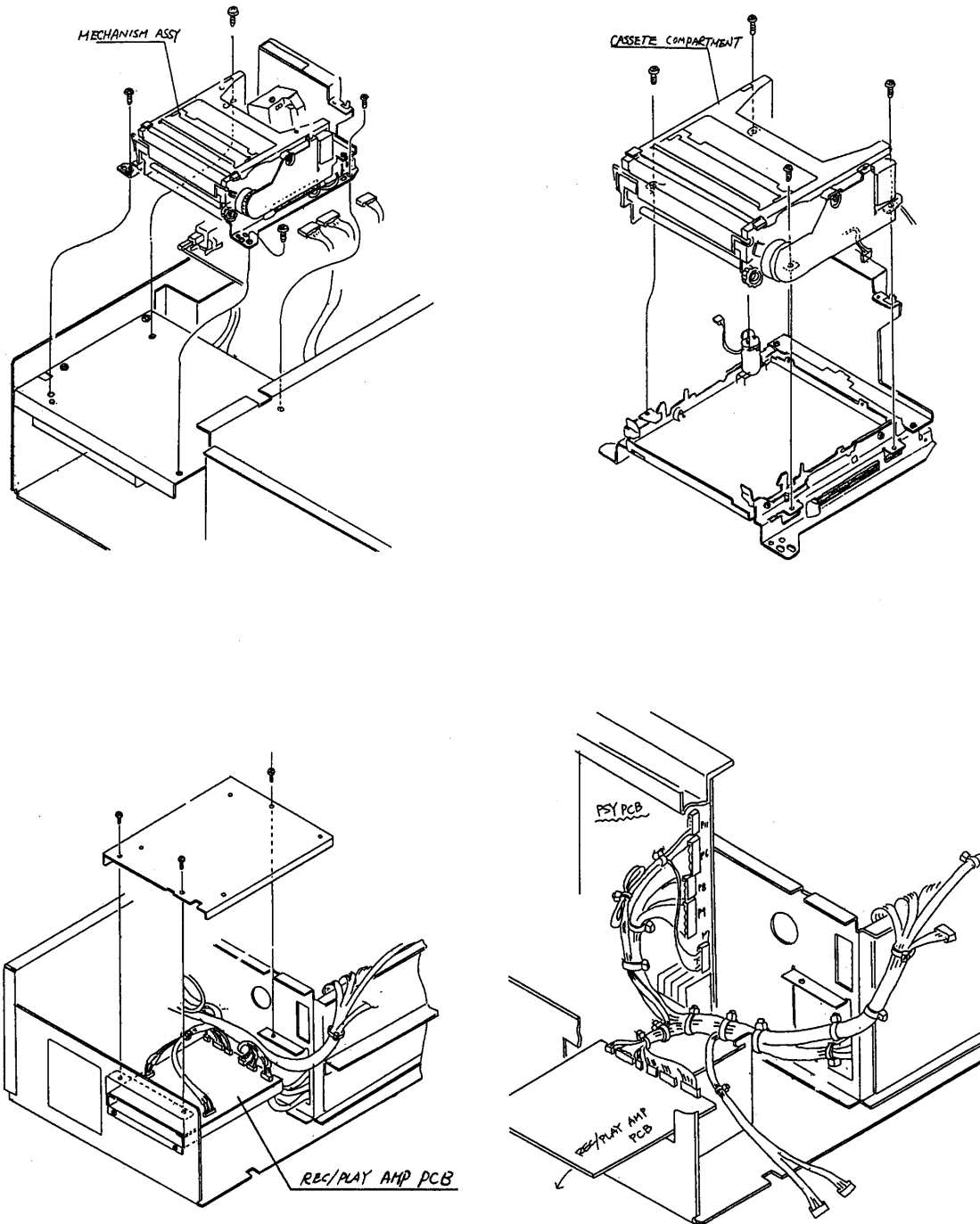


Fig 1

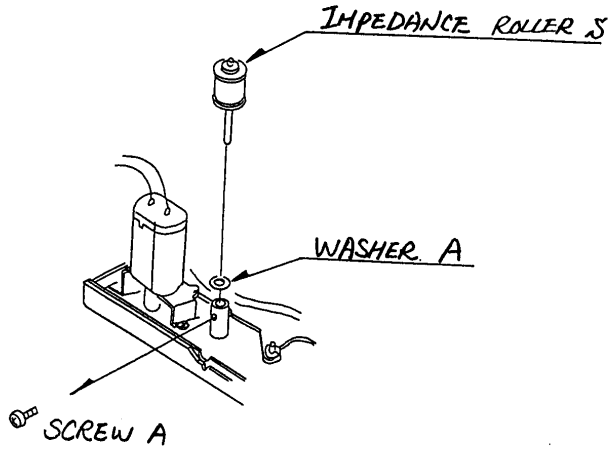


Fig 2

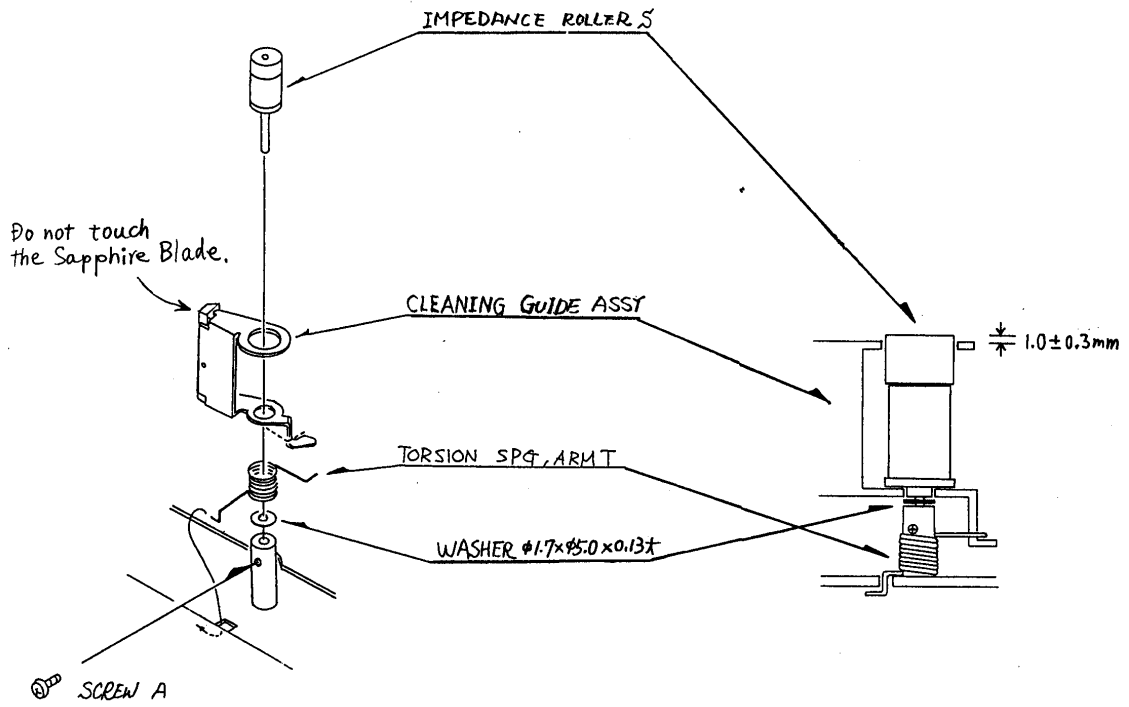


Fig 3

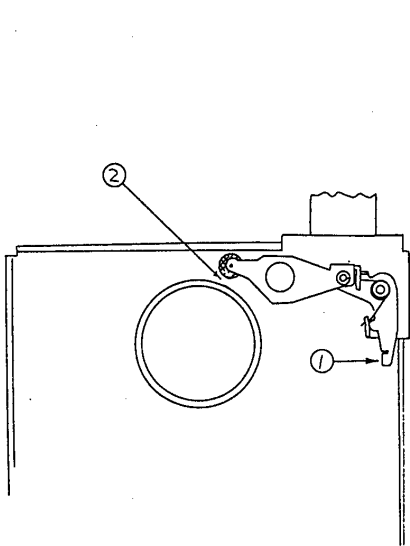
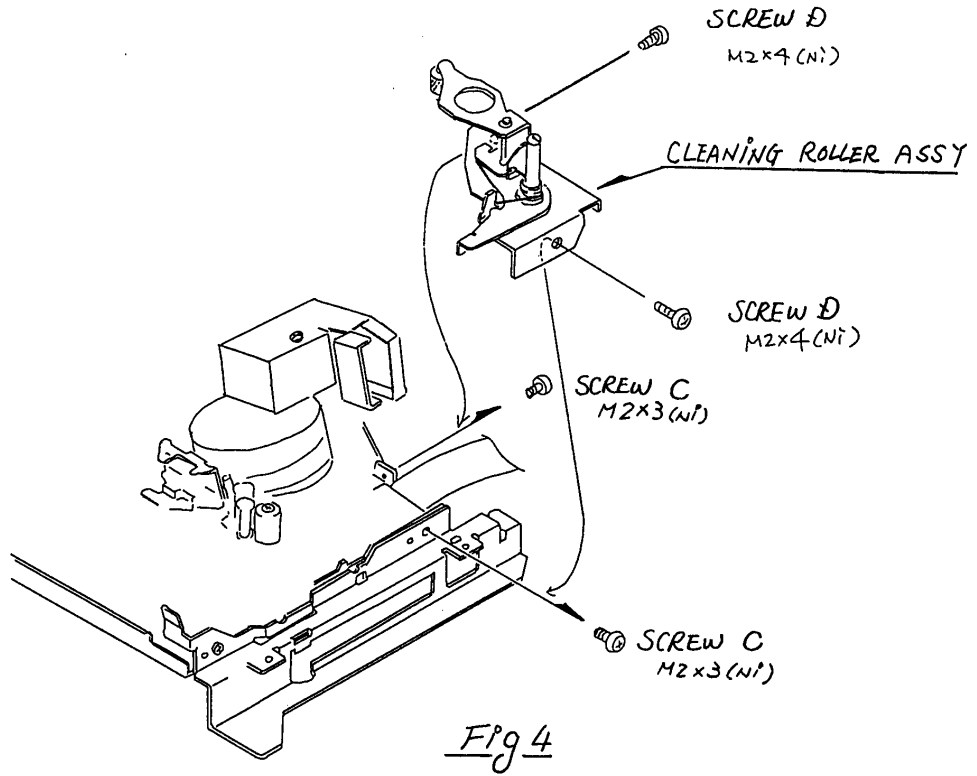


Fig 5

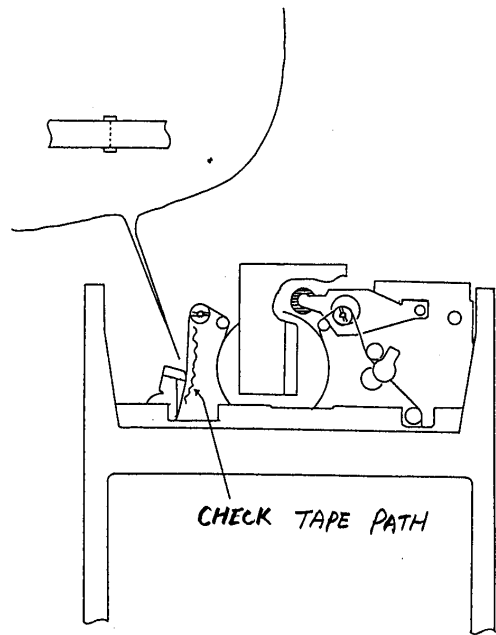


Fig 6

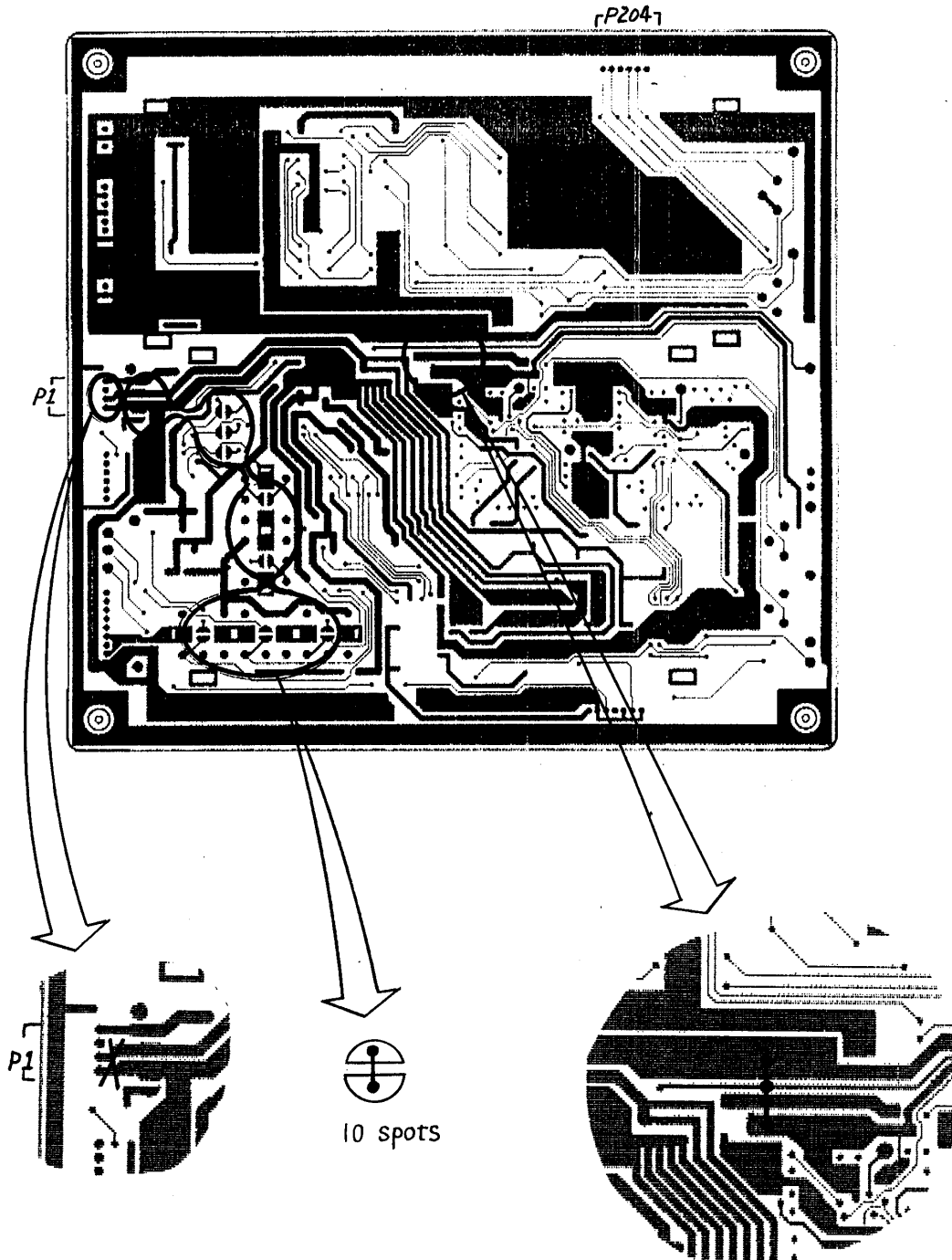


Fig 7

TEAC TECHNICAL INFORMATION

9418

DA-88, IC Change

6th November 1994

Various changes have been made on the U1 IC of Servo PCB Assy.

Details are :

1. On Servo IC Version 2.00 mounted on the products serial numbered 200001 and up.
 - 1) Six kinds error messages are added newly. They tell the following :
 - S Err-11: Unable to shift mechanism mode within the five seconds of command reception.
 - S Err-21: Tape is not wound into cassette half even Eject is commanded.
 - S Err-31: Occurrence of tape slack during tape runs.
 - S Err-41: Unable to latch solenoid on FF/REW winding.
 - S Err-68: Reel motor does not rotate, reel servo is not locked even 1.5 second elapsed after these Play/Shuttle/FF/REW commanded.
 - S Err-59: Reel motor does not rotate, reel servo is not locked even 1.5 second elapsed after Eject command.
 - Note : These S Err-11/21/31/41 are the branches of S Err-01.
 - 2) Improve mechanism functioning for preventing tape damage.

When remainder of tape is detected on Eject, M Loading Guide will not be brought to Stop position and the cassette stays loaded in the deck. S Err-21 is displayed instead.
 - 3) Wow/flutter figures on normal tape run mode, and servo characteristics of starting capstan motor rotation are improved.
 - 4) Voltage for starting drum motor is increased. This will prevent failure of motor start against the increase of load on starting rotation.

2. On Servo IC Version 2.02 mounted on the products serial numbered 210001 and up.

1) To make countermeasure against problems of S Err-01 and S Err-31.

As shown on Tech Info No.9415, value of the R613 was adjusted to avoid the effect of characteristic dispersion of IC U8 mounted on the Servo PCB Assy. However, such adjustment become unnecessary since the characteristics of reel servo is improved on Version 2.02 IC.

Note : The modified R613 should be replaced with the original 18 kohm resistor

(Part Number **11152183**) at the same time of replacing old IC with the Version 2.02 IC.

2) Perform automatic correction against the failure of S Err-31.

Slack of tape was left not corrected on the products using IC Version 2.00, error message was displayed instead. To reduce subsequent effect of tape slack such as the touch of grease to the tape causing tape damage, following countermeasures are introduced on the product using Version 2.02 IC.

* When S Err-31 is displayed on FWD Play, slack of tape is wound back by supply reel automatically

* When S Err-31 is displayed on REV Play, slack of tape is wound forward by take up reel automatically.

3) Perform automatic correction against the failure of S Err-21.

When reminder of tape is detected on Eject, supply reel winds back the reminding tape into cassette half, M Loading Guide returns to Stop position after that. Thus, damage of tape and such risk as the tape comes off of tape guide could be reduced.

Note : When any problem mentioned in Tech Info No.9415 is experienced, replacement of old IC with Servo IC Version 2.02 P/No. **52208346-04** is recommended.

TEAC**TECHNICAL INFORMATION****TASCAM DA-88, Remedy for S-Err 01 caused by slack tape**No. **9415**

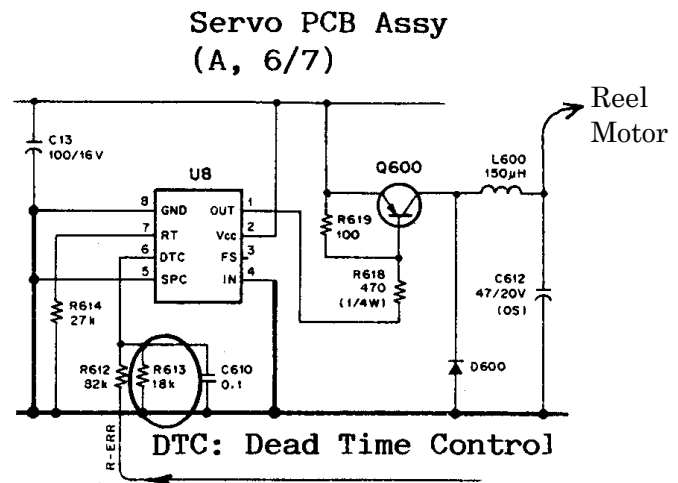
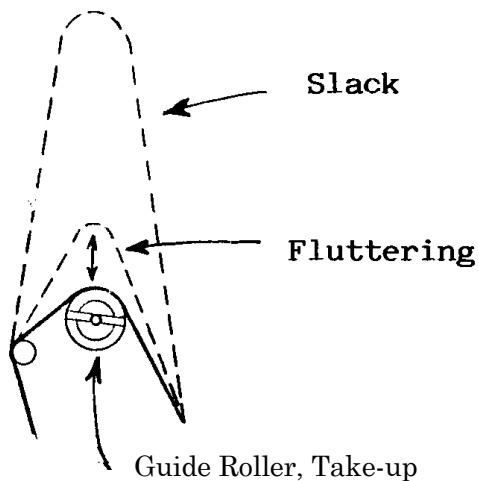
DATE 29th July 1994

Problem

Tape runs fluttering on shuttle reverse mode, and become slacked at the vicinity of Take-up side Guide Roller. This will result occurrence of S-Err 01 occasionally.

Cause

Characteristics of IC U8 mounted on the Servo PCB Assy driving reel motor is not exactly sue one by one. Its difference makes driving of reel motor momentary unstable especially at the starting of shuttle reverse.

**1-0 Countermeasure Work**

1-1 Connect oscilloscope to TP9 of RFG on the Servo PCB.

Set scope at DC 5 v, 0.1 msec/Div range.

1-2 Load 120 minutes g tape, locate it to the vicinity of BOT.

1-3 Shuttle tape on about 1/2 - 1/4 speed FWD for about 2 Sec.

Then turn dial rapidly to REV 1/2 - 1/4 speed.

Repeat this operation several times.

1-4 Watch wave form on the scope at the moment of shifting

FWD to REV. Select value of R6i3 resistor in relation with the length of time until which flipping two lines become stable.

Two lines keep flipping. -

change R6i3 to 22 kohm.

Two lines flipping stop
in several seconds. -

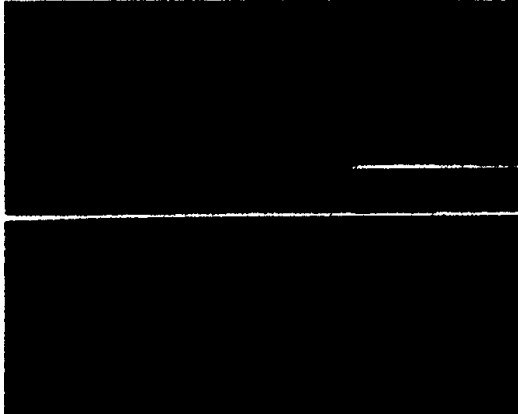
change R6i3 to 20 kohm.

Flipping stops within 1 sec. -

No change of R6i3, no modification
further required, therefore.

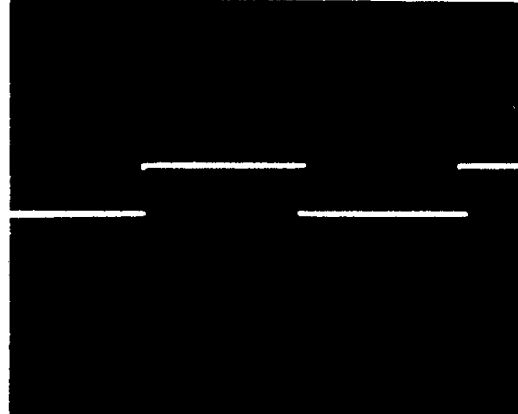
Unstable State:

Two lines flipping
TP9 RFG (SHTL REV)



Stable State:

Square wave sways
slow horizontal (1610Hz approx.)
TP RFG SHTL FWD x 1)



1-5 To replace R613 resistor, remove whole PCB Assy because the resistor is located under metal plate.

1-6 With the resistor replaced, ensure that the wave form on the scope become stable by repeating 1-1 and 1-3 steps. Also, ensure that the fluttering of tape has disappeared. Then, proceed to 2-1 through 2-5 steps. In case it does not disappear, work the following.

In case the R613 is found replaced with 20 kohm already, replace it again with 22 kohm, and proceed to 1-1 through 1-6 steps.

In case the R613 is found replaced with 22 kohm already, replace IC U8, change the 22 kohm to 18 kohm.

Then proceed to 1-1 through 1-6 steps.

2-0 Check if adverse effect occurs

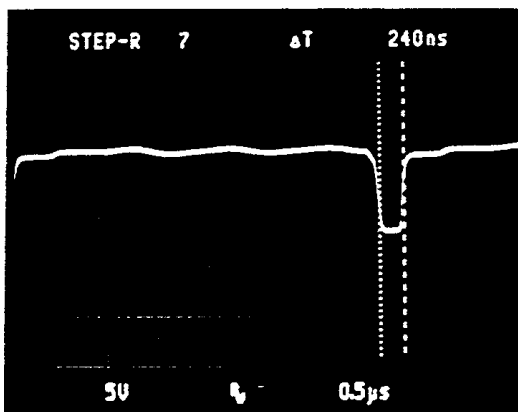
2-1 Take out tape. Set power off, and set it on again.

2-2 Set scope at DC 5 V, 0.5 usec/Div range.

Observe voltage of Pin 1 U8 on the scope. If the voltage stays at 8 volt, it assures that adverse effect of this modification has been avoided. Proceed to 2-5 step.

In case wave form shown is observed, note the time span of low level.

← 270 kHz approx. →



Wave form of Pin 1 U8
R613 replaced with 22 kohm

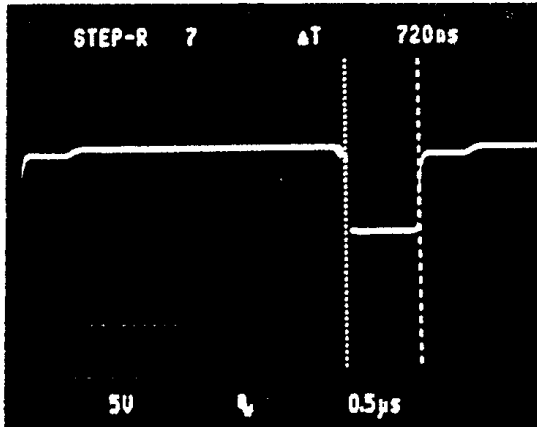
[Powered on with no tape loaded]

→ ← The narrower this spans, the better

2-3 Load 120 minutes tape, locate it to the vicinity of BOT.

2-4 Shuttle tape on FWD x 1 speed and observe the voltage of Pin 1 U8. Then see the time span of low level. If that span is more than two times the span of low level measured on 2-2 step, it assures that adverse effect resulted is within a safe operation. Proceed to 2-5 step.

If not, replace U8, replace existing R613 with 18 kohm resistor and proceed to 1-1 through 1-6 steps.



Wave form of Pin 1 U8
R613 replaced with 22 kohm

[SHTL FWD x 1 seed at Beginning Of Tape]

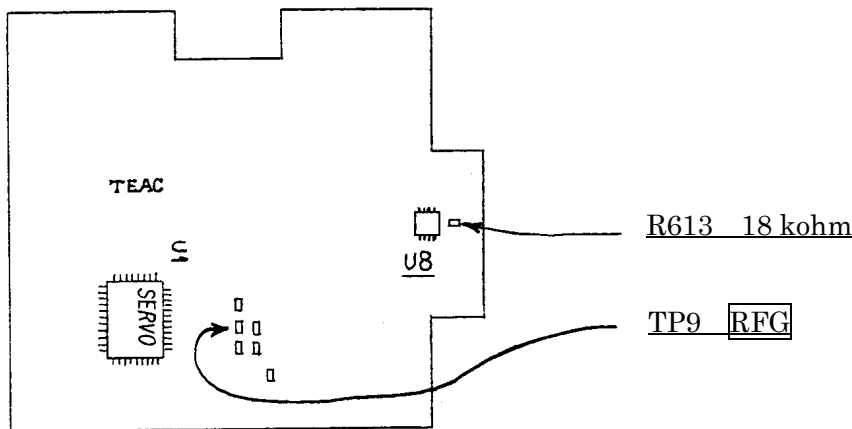
→ | ← Two times or more the span of Step 2-2

2-5 Connect scope TP9 of RFG and set scope at DC 5iV, 0.1 msec/Div range. Shuttle tape on FWD x 1 speed and observe the wave form. Modification ends when the frequency of the square wave sways slow horizontal is about 1610 Hz.

Parts required

- | | |
|-------------|-------------------------|
| 11152203- | Resistor, Chip, 20 kohm |
| 11152223- | Resistor, Chip, 22 kohm |
| 52204508-00 | IC, TL5001CPS : U8 |

Spots on Servo PCB Assy



In addition, the products stocked in TEAC warehouse are performed with this selection. They are identifiable with "T" mark stamped at specified position in previous information No. 9413.

**TECHNICAL INFORMATION****TASCAM DA-88, Life of Drum Head**

No. **9413**
DATE 8th July 1994

The head tip of a rotary drum head protrudes 18-20 microns above the surface of drum. When this protrusion become worn by about 10 microns, total drum head should be replaced. Value of wear is measured microscopically using a particular apparatus which require delicate maintenance. Further, its price is expensive. Such apparatus is not practical for servicing purpose.

However, the value of wear can roughly be calculated with the following formula on the DA-88 of serial number up to 210000.

$$0.1 \times (\text{Times cleaning}) + 0.005 \times (\text{Hours drum rotated})$$

When head has been cleaned 25 times by TEAC cleaning tape during 1000 hours operation, for example, wear of head tip is calculated as 7.5 microns. To display the number of times cleaning, see page 5 owner's manual, and execute "cleaning the heads" mode. While keeping this mode, push ▲ and ▼ buttons same time. Then, the times is displayed. Hours drum rotated can also be observed on the display. See Para 2-1.3 at page 4 service manual for it.

Note :

Cleaning time was settled 15 seconds on the products of serial number up to 210000. However, it has been shortened to 5 seconds on the products of serial number 210001 and up. Therefore, the index should read $0.03 \times (\text{Times cleaning})$ on these later products.

In addition, the products having "T" mark stamped at the right of serial number on the carton and on the model name label stuck on rear chassis as well have been modified to run 5 seconds cleaning.

**TECHNICAL INFORMATION****TASCAM DA-88, System Control Program Change**No. **9412**

DATE 8th July 1994

Various changes have been made on the programming of U156 System Control ROM IC as Ver 3.01. Hereunder are the details :

1. When the set comes to Stop after finishing Locate, E.Hi-8t or E.thin.t is displayed. In other case, FF or REW LED kept lighted. All of LED indications come off sometimes. Those symptoms are corrected on Ver 3.01 by cutting intersection of communication between signal data and servo processing.

2. When plural DA-88 are operated master and slave, phase difference of 1 Fs time span occurs between the outputs of master & slave. On Ver 3.01, this is corrected by resetting A/D converter once after Chase-Lock.

3. When counter acts as bar indicator, set goes to Re-Chase mode and become out of sync. To correct this symptom, following changes are made on the Ver 3.01 program.

* Even when ABS is unreadable, Sync mode is kept continued.

* Set returns to Re-Chase mode when time difference occurs between master and slave sets.

4. Addition of Sync Format

* Load new tape, then wind to BOT point.

* Make the Chase of slave sets On.

* Make the master and slave sets Format state, and selects same Fs.

* Sync format is executed when master set is made Rec state.

5. Adding Park Position Measurement and Installation Modes

(SY-88 Ver 3.00 is required.)

* Park Position Measurement

To open menu, make display DIFF mode, keep ▲ button pressed and push DISPLAY button. ON and OFF can be shifted by pressing ▲ or ▼ button. To close menu, press DISPLAY button.

* Park Position Installation Mode.

To open menu, make display DIFF mode, keep ▼ button pressed and push DISPLAY button. ON and OFF can be shifted by pressing ▲ or ▼ button.

To close menu, press DISPLAY button.

* Auto Park Position Installation Mode.

When Measurement mode is ON and Display is DIFF mode, press both ▲ and ▼ buttons.

6. Improvement of Rehearsal and Auto Punch In/Out Modes

* With former program, Punch In/Out with ON THE FLY state was settled with the condition that Rehearsal and Auto Punch In/Out mode should be entered. With Ver 3.01, Punch In/Out point with ON THE FLY can be settled with out setting Rehearsal and Auto Punch In/Out mode.

* On RHSL and Auto Punch In/Out modes, locate to Pre-Roll In point with LOC1, and to Pre-Roll Out point with LOC2.

7. CH&SE can be released with STOP button on CH&SE ON mode.

8. On this Ver. 3.0i, cleaning time is changed to 5 second.
It was 15 second formerly.

Note :

The products serial numbered up to 210000 stocked in TEAC warehouse have this new Ver 3.0i System Control ROM IC 52208347-09 as U156 mounted. And those products can be identified with the "T" mark stamped at the right of serial number on the carton and on the serial number of real chassis.

All products serial numbered 210001 and up have this new Ver 3.01 System Control ROM IC mounted already.

TEAC TECHNICAL INFORMATION

TASCAM DA-88, DSP PCB Circuit Change

No. **9411**
 DATE 7th July 1994

When AC main is cut momentarily while tape runs, and that AC main revived while the drum head keeps rotating by inertia, data on the tape could be DC erased for about i-2 Fs time span.

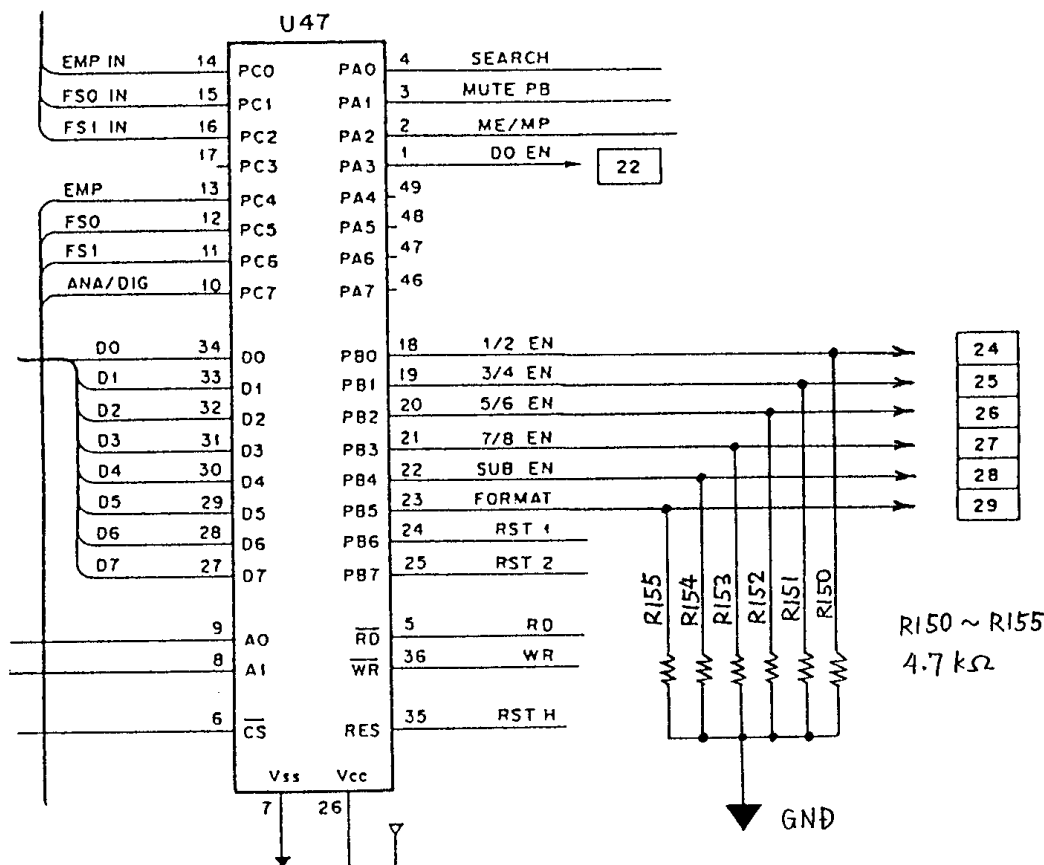
Cause :

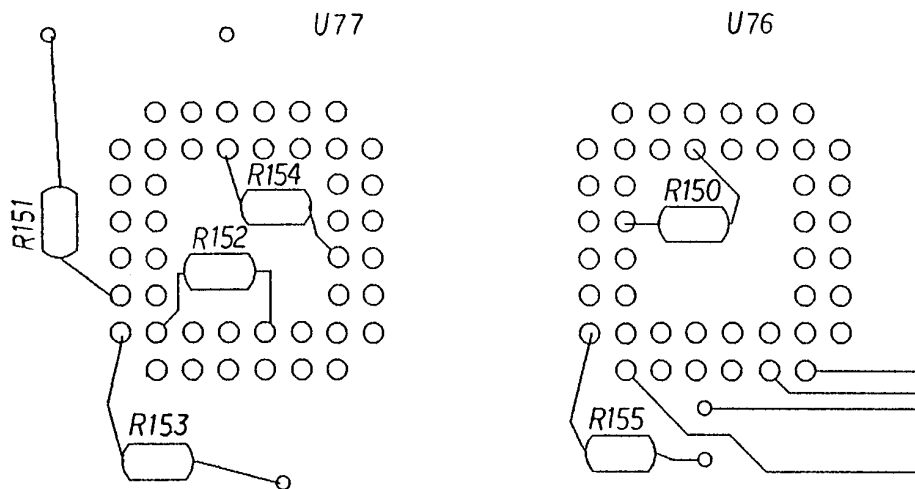
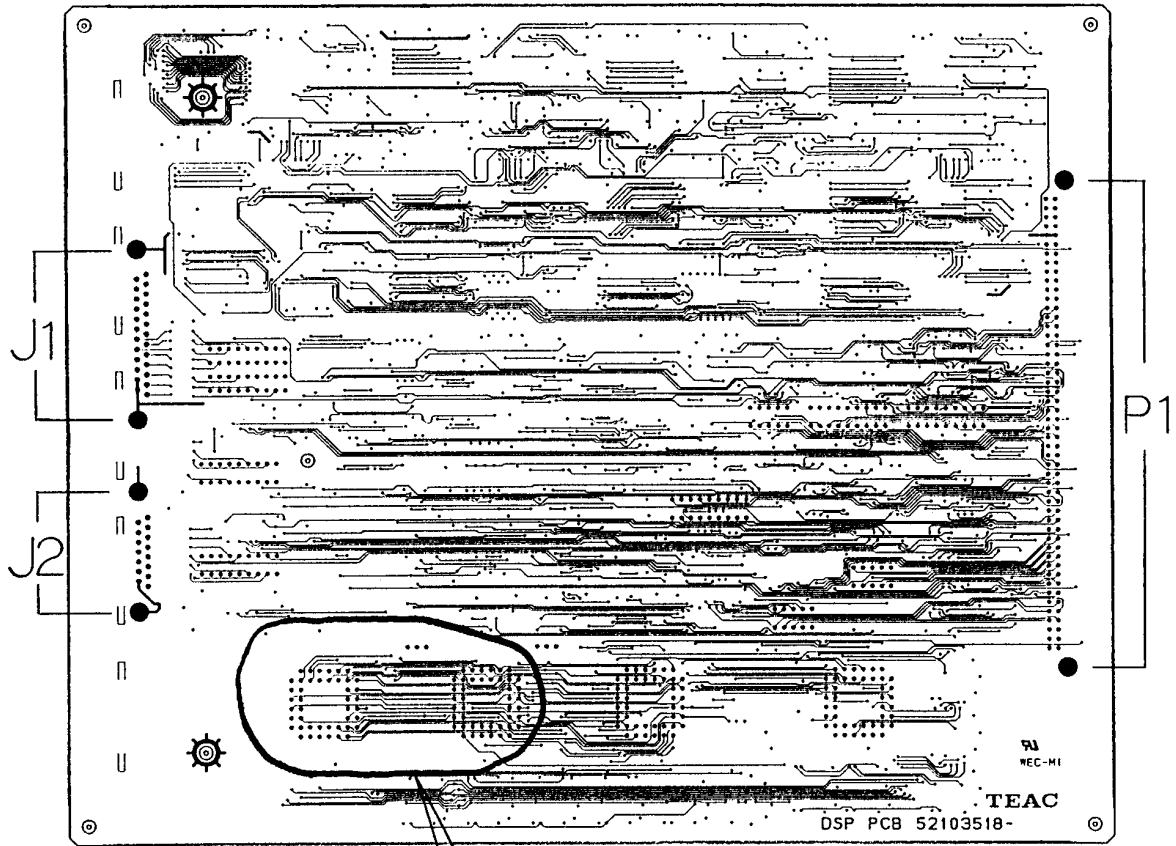
At the moment of power ON, Pins 18 through 23 of U47 IC on the DSP PCB Assy go high state falsely. This will make the system Rec Enable state.

Remedy :

By adding six 4.7 Kohm pull down resistors as R150 through R155 between these six pins each and ground, the problem is suspended. Since the vicinity of U47 IC pins are densely foiled, adding of resistors is performed on the pins of U76 and U77 ICs equivalent. Part number of the 4.7 Kohm resistor is 52400298-20. See drawings on page 2/2 for locating the spots of changes on the DSP PCB Assy.

Note that the products of serial number 180001 and up have this modification completed.





**TECHNICAL INFORMATION****TASCAM RC-848, Modification for Anti-Static**No. **9405**

DATE 10th February 1994

Owing to the effect of static electricity, LEDs of the controller become itself on/off at random momentarily. Following modification is requested to eliminate this problem.

- a. Open carton, take out the set.
- b. Remove six screws on the bottom chassis.
- c. Separate chassis into two segments upper and lower.

On Operation PCB Assy

- d. Prepare 120 mm Jumper wire of which one end terminated with an earth lug. Remove Screw A which fix the PCB Assy. Place an insulation washer on the PCB hole of Screw A. Place the earth lug of Jumper wire on the washer. Tighten earth lug, washer and PCB altogether with Screw A. Then solder another end of Jumper wire to the C104 GND side. See Fig 1 and 2.
- e. Prepare 100 mm Jumper wire of which one end terminated with an earth lug. Remove Screw B which fix the PCB Assy. Place an insulation washer on the PCB hole of Screw B. Place the earth lug of Jumper wire on the washer. Tighten earth lug, washer and PCB altogether with Screw B. Then solder another end of Jumper wire to the C103 GND side. See Fig 1 and 3.

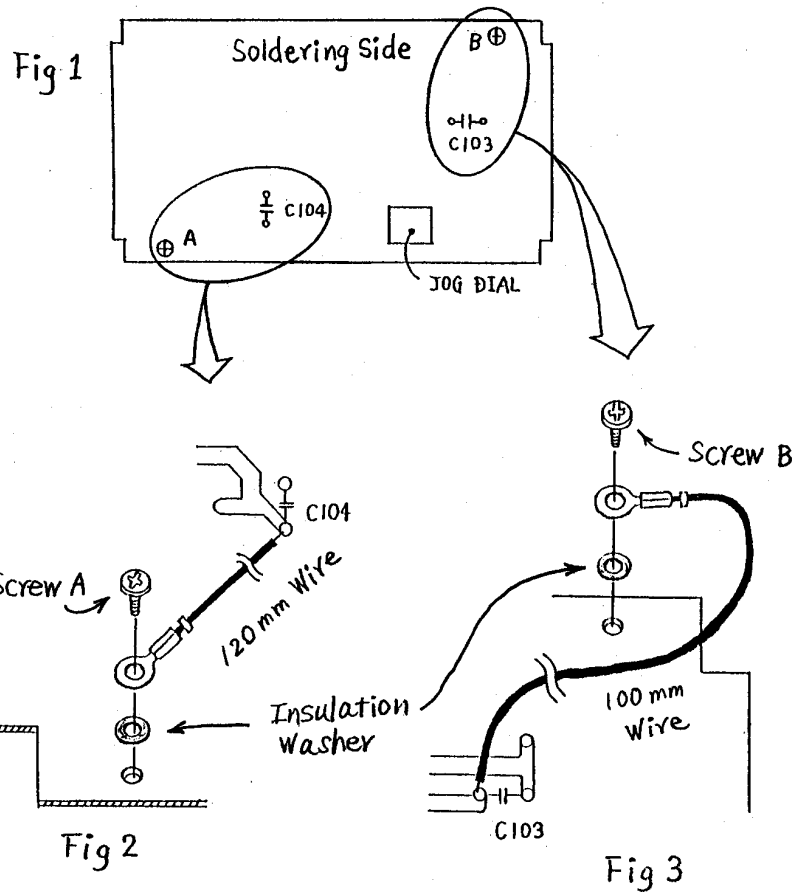
On Control PCB Assy

- f. Remove all eight screws which fix four D-sub connectors on the rear panel of lower chassis. Then, free Control PCB Assy from lower chassis.
- g. Solder Pin 8 of U21 IC and spot C with 40 mm Jumper wire. See Fig 4 and 6.
- h. Cut PCB foil at the spot D. Bridge this cut with 51819620-00 non-flammable resistor 3.3 Ohm. See Fig 4 and 5.
- i. Replace C17 with 52602703-10 capacitor 470 uF/16V. See Fig 4.
- J. Replace C21 with a 5 mm Jumper wire. See Fig 4.
- k. Remove R34 resistor 1 Ohm.
- l. Replace U2 IC with 52208324-04 Ver 2.04 IC.

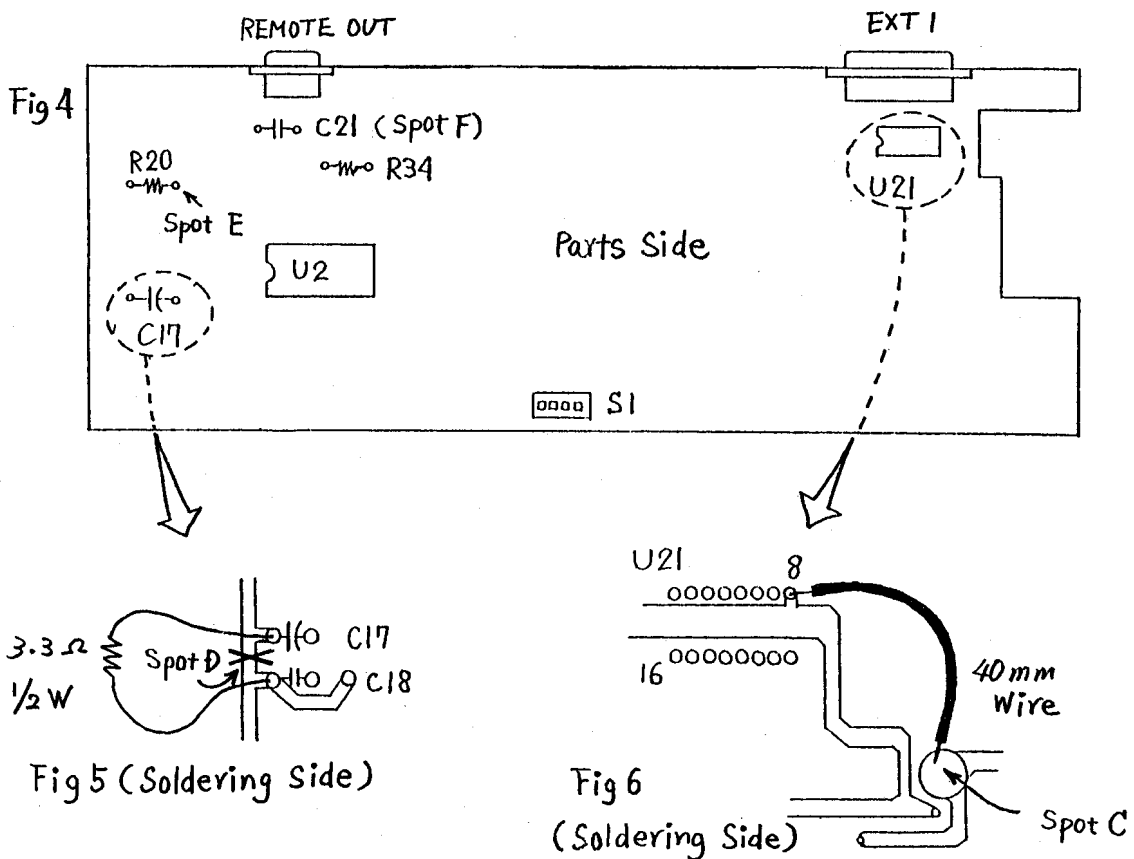
- m. Mount PCB Assy on the chassis.
- n. Set power switch of the DA-88 to be operated with OFF. Connect DA-88 and RC-848, then set power switch ON.
- o. Set 1st toggle ON, 2nd 3rd and 4th OFF on the S1 dipped switch. Then, set power switch of the DA-88 to be operated with ON. Keep the DA-88 powered on for several seconds.
- P. Set power switch of the DA-88 to be operated with OFF.
- q. Set all four toggles on the S1 dipped switch OFF.
- r. Combine separated upper and lower chassis with six 57836130-O6 tapping screws with botches. Do not use original screws of paragraph b at this step.
- S. When DA-88 is not in hand, disregard ON/OFF step of power switch of DA-88. Instead, connect +12 Volt DC of external power supply to spot E and its GND to spot F. See Fig 4. Then simulate setting power switch of the DA-88 OFF/ON/OFF by setting the power switch of external power supply sue.
- t. Insert supplement printings to the owner's manual.
- u. Parts required for this modification are supplied as follow.

52208324-04	IC ROM Ver 2.04
57001425-05	Supplement printing RC-848 English
57001445-04	Supplement printing RC-848 French/German
V0000550-0A	Modification Kit RC-848 to contain following
	Jumper Wire p=5.O
	Non-flammable Resistor 3.3 Ohm
	Capacitor 47OuF/16V
	GND wires with & without Earth Lug
	Tapping Screw with Botches
	Insulation Washer

[OPERATION PCB ASSY]



[CONTROL PCB ASSY]

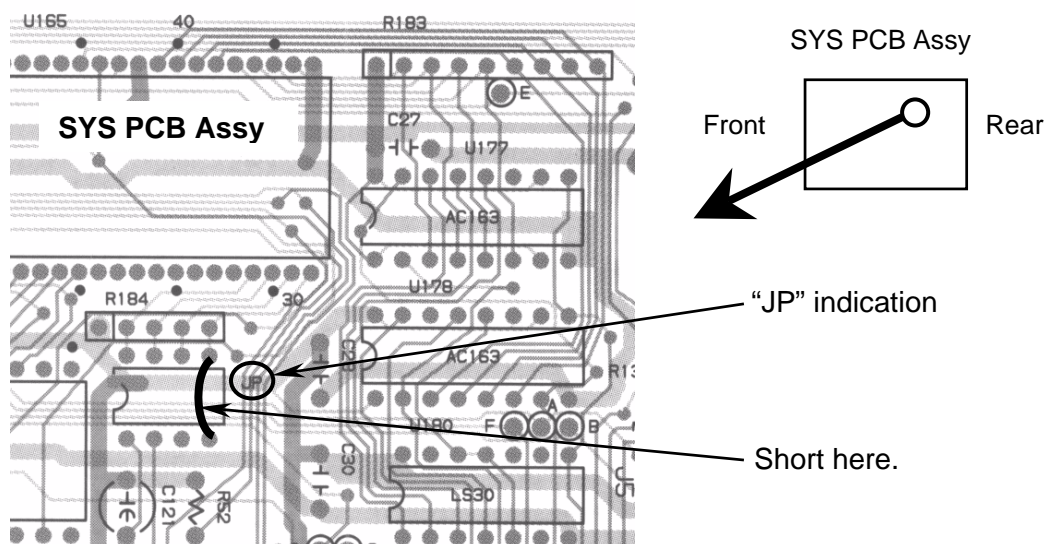


TEAC**TECHNICAL INFORMATION****TASCAM DA-88, Clearing the Drum Time**

No.	0205
DATE	28th May 2002

Strictly Confidential**1. On the early products**

1. Turn the power on with "JP" shorted temporarily.
2. [rEAdy] appears.
3. Press STOP.
4. [CLEAR] appears then all data is cleared.
5. Turn the power off.

**2. On the products that have SYS V3.10 and higher**

Note: Even if the unit has SYS V3.10 and higher, procedure 1 shown above is still available.

1. Set the DA-88 to test mode without cassette inserted.
Procedure for entering test mode is indicated on 2-1-5, page 4, service manual.
2. Confirm if ABS LED in the display window is lighting. If not, press DISPLAY key until ABS LED lights.
3. Hold ▼ and ▲ then press CLEAR.
4. [rEAdy] appears.
5. Press STOP, [CLEAR] appears then all data is cleared.

In case the drum time should be restored, follow the procedure below.

6. Press DISPLAY then [d. 0000] appears. Enter the drum time with using ▼/▲.
7. Press DISPLAY then [d.S 0000] appears. Enter the drum search time with using ▼/▲.
8. Press DISPLAY then [CLE. 0000] appears. Enter the times of cleaning with using ▼/▲.
9. Turn the power off.

TEAC**TECHNICAL INFORMATION****TASCAM DA-78HR/98, Change of Photo Transistor**No. **0007**

DATE 28th March 2000

Production of the phototransistor for BOT/EOT sensor has been discontinued. Substitution is as follows. Bracket for the phototransistor has also been changed as the shape of the new phototransistor does not match the original bracket.

	Original	New
Ref 3-21	P/No. 13419661 PHOTO TR, PLT-462T3	P/No. 13419521 Photo Element, GL450
Ref 3-22	P/No. 16788721-00 Bracket, LED (white)	P/No. 16788721-50 Bracket, LED (black)

Note: Original parts are still available as of 28/Mar/2000.

PHOTO TR, PLT-462T3 656 pcs

Bracket, LED (white) 510 pcs

Change has been made on:

DA-98 S/No. 0170001 and higher

DA-78HR S/No. 0060001 and higher

DA-38/88 No production



PCM1710U

Sound PLUS Stereo Audio DIGITAL-TO-ANALOG CONVERTER

FEATURES

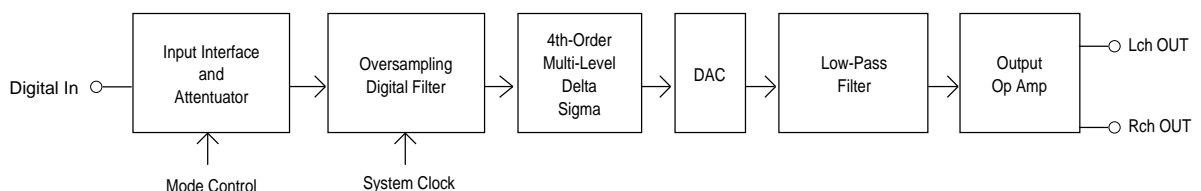
- **COMPLETE STEREO DAC:**
8X Oversampling Digital Filter
Multi-Level Delta-Sigma DAC
Analog Low Pass Filter
Output Amplifier
- **HIGH PERFORMANCE:**
-92dB THD+N
98dB Dynamic Range
110dB SNR
- **ACCEPTS 16 OR 20 BITS INPUT DATA**
- **SYSTEM CLOCK: 256fs or 384fs**
- **SINGLE +5V POWER SUPPLY**
- **ON-CHIP DIGITAL FILTER:**
Soft Mute and Attenuator
Digital De-emphasis
Double-Speed Dubbing Mode
- **SMALL 28-PIN SOIC PACKAGE**

DESCRIPTION

The PCM1710 is a complete stereo audio digital-to-analog converter, including digital interpolation filter, delta-sigma DAC, and analog voltage output. PCM1710 can accept either 16-bit normal or 20-bit normal input data (MSB first, right justified), or 16-bit IIS data (32-bits per word, continuous clock).

The digital filter performs an 8X interpolation function, as well as special functions such as soft mute, digital attenuation, de-emphasis and double-speed dubbing. Performance of the digital feature is excellent, featuring -62dB stop band attenuation and ± 0.008 dB ripple in the pass band.

PCM1710 is suitable for a wide variety of consumer applications where good performance is required. Its low cost, small size and single +5V power supply make it ideal for automotive CD players, bookshelf CD players, BS tuners, keyboards, MPEG audio, MIDI applications, set-top boxes, CD-ROM drives, CD-Interactive and CD-Karaoke systems.



International Airport Industrial Park • Mailing Address: PO Box 11400 • Tucson, AZ 85734 • Street Address: 6730 S. Tucson Blvd. • Tucson, AZ 85706
Tel: (520) 746-1111 • Twx: 910-952-1111 • Cable: BBRCORP • Telex: 066-6491 • FAX: (520) 889-1510 • Immediate Product Info: (800) 548-6132

SPECIFICATIONS

All specifications at +25°C, +V_{CC} = +V_{DD} = +5V, f_S = 44.1kHz, f_{SYS} = 384/256fs, and 16-bit data, unless otherwise noted.

PARAMETER	CONDITIONS	PCM1710U			UNITS
		MIN	TYP	MAX	
RESOLUTION		16		20	Bits
DIGITAL INPUT					
Logic Family					
Input Logic Level (except XTI)					
V _{IH}		2.0			VDC
V _{IL}				0.8	VDC
Input Logic Current (except XTI)				-200	μA
Input Logic Level (XTI)					
V _{IH}		3.2			VDC
V _{IL}				1.4	VDC
Input Logic Current (XTI)				±50	μA
Output Logic Level (CLKO):					
V _{OH}		4.5			VDC
V _{OL}				0.5	VDC
Output Logic Current (CLKO)		±10			mA
Data Format	Normal (16/20-bit)/IIS (16-bit) selectable				
Sampling Frequency		32	44.1	48	kHz
System Clock Frequency	384f _S	12.288	16.934	18.432	MHz
System Clock Frequency	256f _S	8.192	11.2894	12.288	MHz
DC ACCURACY					
Gain Error			±1.0	±5.0	% of FSR
Gain Mis-Match Channel-To-Channel			±1.0	±5.0	% of FSR
Bipolar Zero Error	V _O = 1/2V _{CC} at Bipolar Zero		±20.0		mV
Gain Drift			±50		ppm of FSR/°C
Bipolar Gain Drift			±20		ppm of FSR/°C
DYNAMIC PERFORMANCE⁽¹⁾					
THD+N at F/S (0dB) ⁽²⁾	f _{IN} = 991kHz		-92	-88	dB
THD+N at -60dB ⁽²⁾	f _{IN} = 991kHz		-36	-32	dB
Dynamic Range	EIAJ A-weighted		98		dB
S/N Ratio	EIAJ A-weighted	104	110		dB
Channel Separation		90	94		dB
DIGITAL FILTER PERFORMANCE					
Pass Band Ripple	Normal Mode			±0.008	dB
Pass Band Ripple	Double Speed Mode			±0.018	dB
Stop Band Attenuation	Normal Mode	-62			dB
Stop Band Attenuation	Double Speed Mode	-58			dB
Pass Band	Normal Mode			0.4535	fs
Pass Band	Double Speed Mode			0.4535	fs
Stop Band	Normal Mode			0.5465	fs
Stop Band	Double Speed Mode			0.5465	fs
De-emphasis Error	(f _S 32kHz ~ 48kHz)	-0.05		+0.03	dB
ANALOG OUTPUT					
Voltage Range			3.2		V _{p-p}
Load Impedance		5			kΩ
Center Voltage			+1/2V _{CC}		V
POWER SUPPLY REQUIREMENTS					
Voltage Range: +V _{CC}		+4.5	+5.0	+5.5	VDC
+V _{DD}		+4.5	+5.0	+5.5	VDC
Supply Current (+I _{CC}) + (+I _{DD})			45	70	mA
TEMPERATURE RANGE					
Operation		-25		+85	°C
Storage		-55		+100	°C

NOTE: (1) Dynamic performance specs are tested with external 20kHz low pass filter. (2) 30kHz LPF, 400Hz HPF, Average Mode. Shibusoku #725 THD Meter.

The information provided herein is believed to be reliable; however, BURR-BROWN assumes no responsibility for inaccuracies or omissions. BURR-BROWN assumes no responsibility for the use of this information, and all use of such information shall be entirely at the user's own risk. Prices and specifications are subject to change without notice. No patent rights or licenses to any of the circuits described herein are implied or granted to any third party. BURR-BROWN does not authorize or warrant any BURR-BROWN product for use in life support devices and/or systems.

PIN ASSIGNMENTS

PIN NAME	NUMBER	FUNCTION
Input Interface Pins		
LRCIN	1	Sample Rate Clock Input. Controls the update rate (fs).
DIN	2	Serial Data Input. MSB first, right justified format contains a frame of 16-bit or 20-bit data.
BCKIN	3	Bit Clock Input. Clocks in the data present on DIN input.
Mode Controls and Clock Signals		
CLKO	4	Buffered Output of Oscillator. Equivalent to fs.
XTI	5	Oscillator Input (External Clock Input). For an internal clock, tie XTI to one side of the crystal oscillator. For an external clock, tie XTI to the output of the chosen external clock.
XTO	6	Oscillator Output. When using the internal clock, tie to the opposite side (from pin 5) of the crystal oscillator. When using an external clock, leave XTO open.
CKSL	23	System Clock Select. For 384fs, tie CKSL "High". For 256fs, tie CKSL "Low".
MODE	24	Operation Mode Select. For serial mode, tie MODE "High". For parallel mode, tie MODE "Low".
MUTE	25	Mute Control. To disable soft mute, tie MUTE "High". To enable soft mute, tie MUTE "Low".
MD/DM1	26	Mode Control for Data/De-emphasis. See "Mode Control Functions" on page 11.
MC/DM2	27	Mode Control for BCKIN/De-emphasis. See "Mode Control Functions" on page 11.
ML/DSD	28	Mode Control for WDCK/Double speed dubbing. See "Mode Control Functions" on page 11.
Analog Functions		
V _{OUTR}	13	Right Channel Analog Output.
V _{OUTL}	16	Left Channel Analog Output.
Power Supply Connections		
DGND	7, 22	Digital Ground.
V _{DD}	8, 21	Digital Power Supply (+5V).
V _{CC2R}	9	Analog Power Supply (+5V), Right Channel DAC.
AGND2R	10	Analog Ground (DAC), Right Channel.
EXT1R	11	Output Amplifier Common, Right Channel. Bypass to ground with a 10µF capacitor.
EXT2R	12	Output Amplifier Bias, Right Channel. Connect to EXT1R.
AGND	14	Analog Ground.
V _{CC}	15	Analog Power Supply (+5V).
EXT2L	17	Output Amplifier Bias, Left Channel. Connect to EXT1L.
EXT1L	18	Output Amplifier Common, Left Channel. Bypass to ground with a 10µF capacitor.
AGND2L	19	Analog Ground (DAC), Left Channel.
V _{CC2L}	20	Analog Power Supply (+5V), Left Channel DAC.

ABSOLUTE MAXIMUM RATINGS

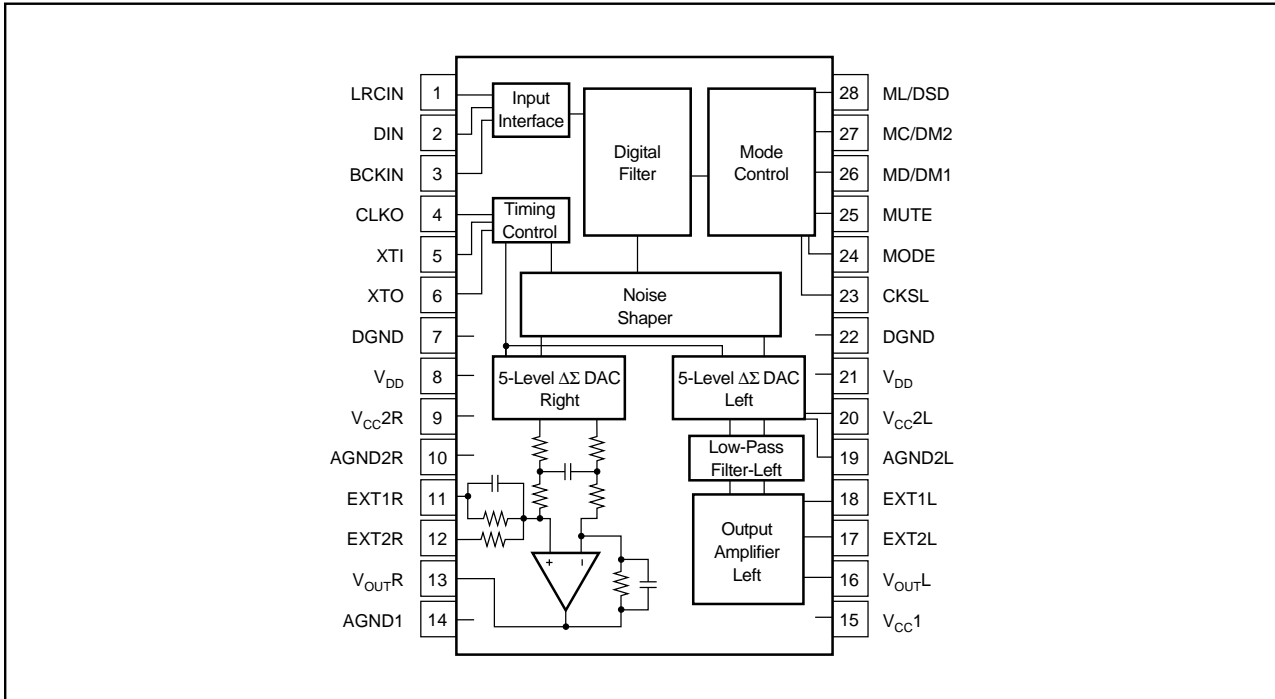
Power Supply Voltages	±6.5VDC
+V _{CC} to V _{DD} Voltage	±0.1V
Input Logic Voltage	-0.3V to V _{DD} +0.3V
Power Dissipation	400mW
Operating Temperature Range	-25°C to +85°C
Storage Temperature Range	-55°C to +125°C
Lead Temperature (soldering, 5s)	+260°C

PACKAGE INFORMATION

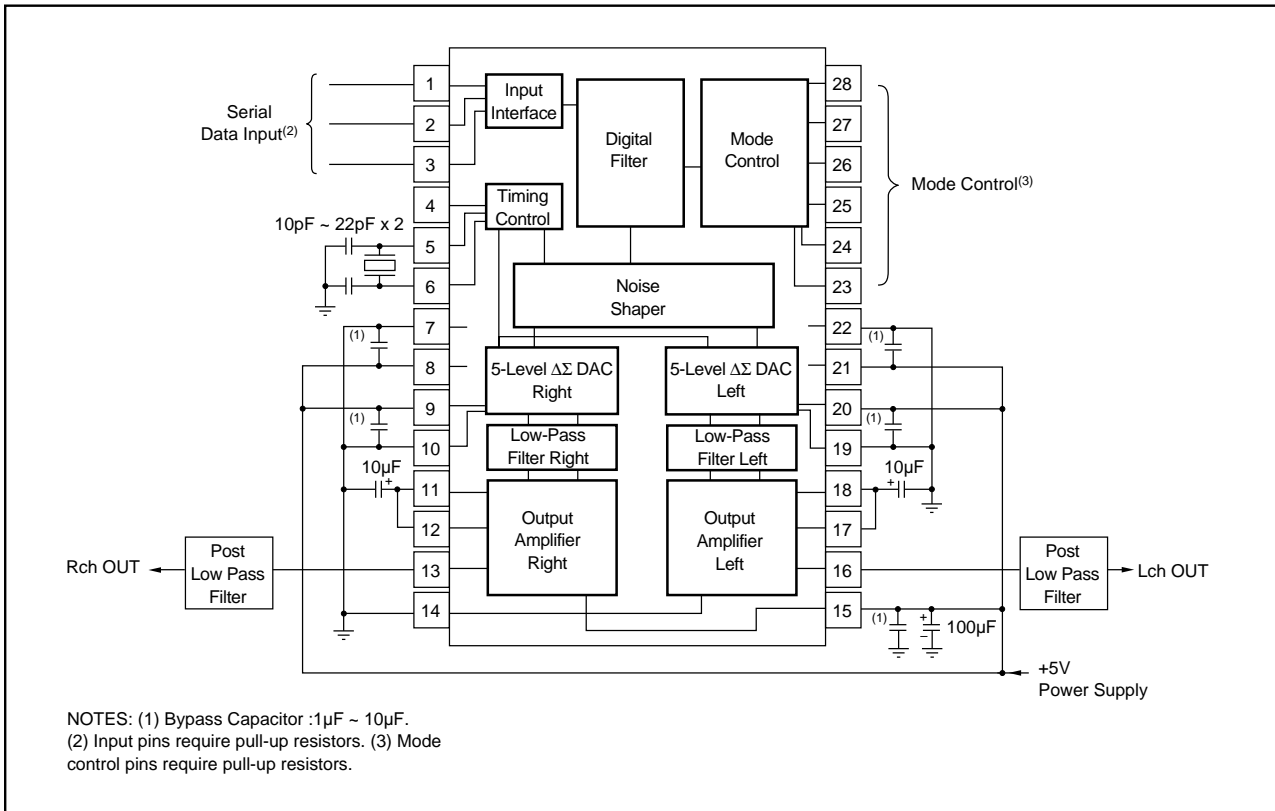
MODEL	PACKAGE	PACKAGE DRAWING NUMBER ⁽¹⁾
PCM1710U	28-Pin SOIC	217

NOTE: (1) For detailed drawing and dimension table, please see end of data sheet, or Appendix D of Burr-Brown IC Data Book.

PIN CONFIGURATION



CONNECTION DIAGRAM



DATA INPUT TIMING

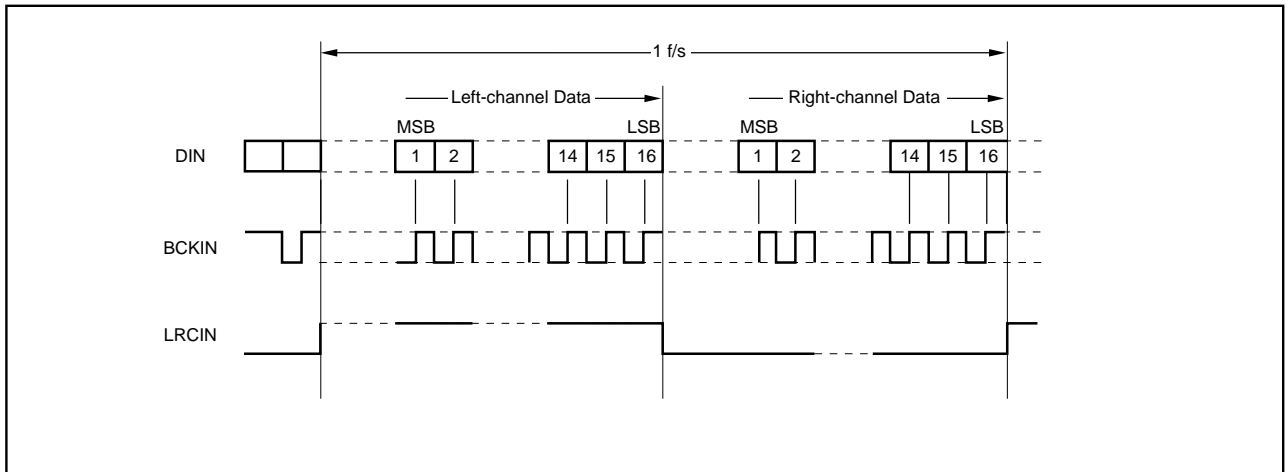


FIGURE 1. Normal Format, 16-Bit (LRCIN H: Lch).

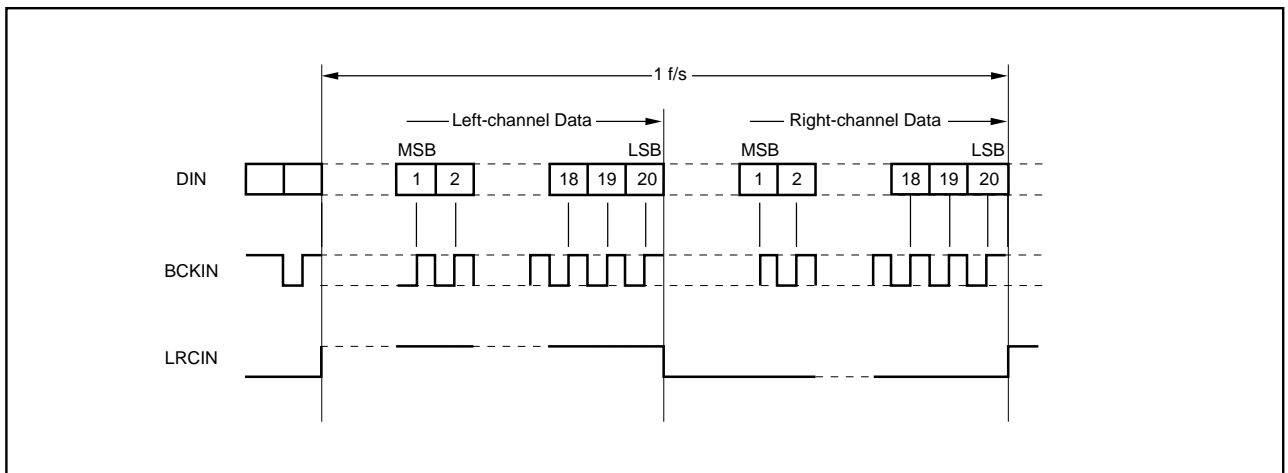


FIGURE 2. Normal Format, 20-Bit (LRCIN H: Lch).

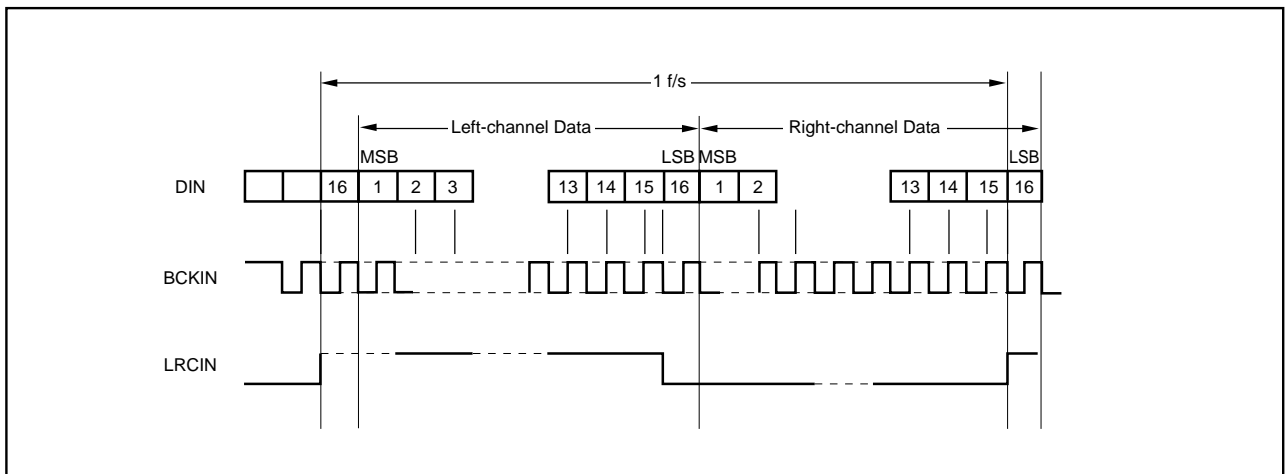


FIGURE 3. IIS Format, (16-Bit, 32 BCKIN Clock Cycles Per f_s Interval).

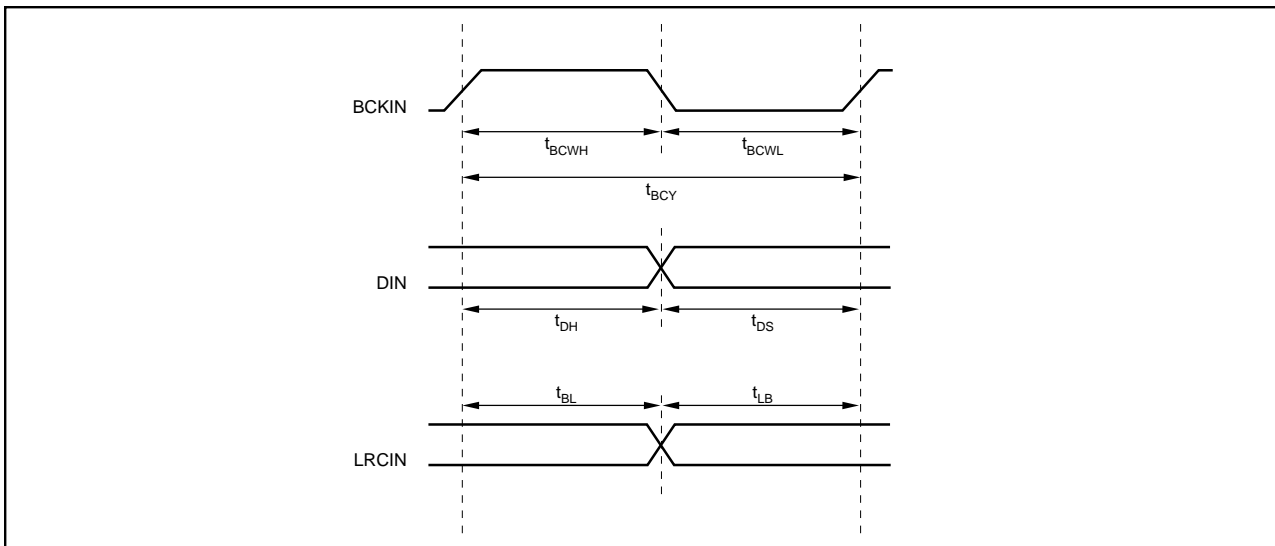


FIGURE 4. Data Input Timing.

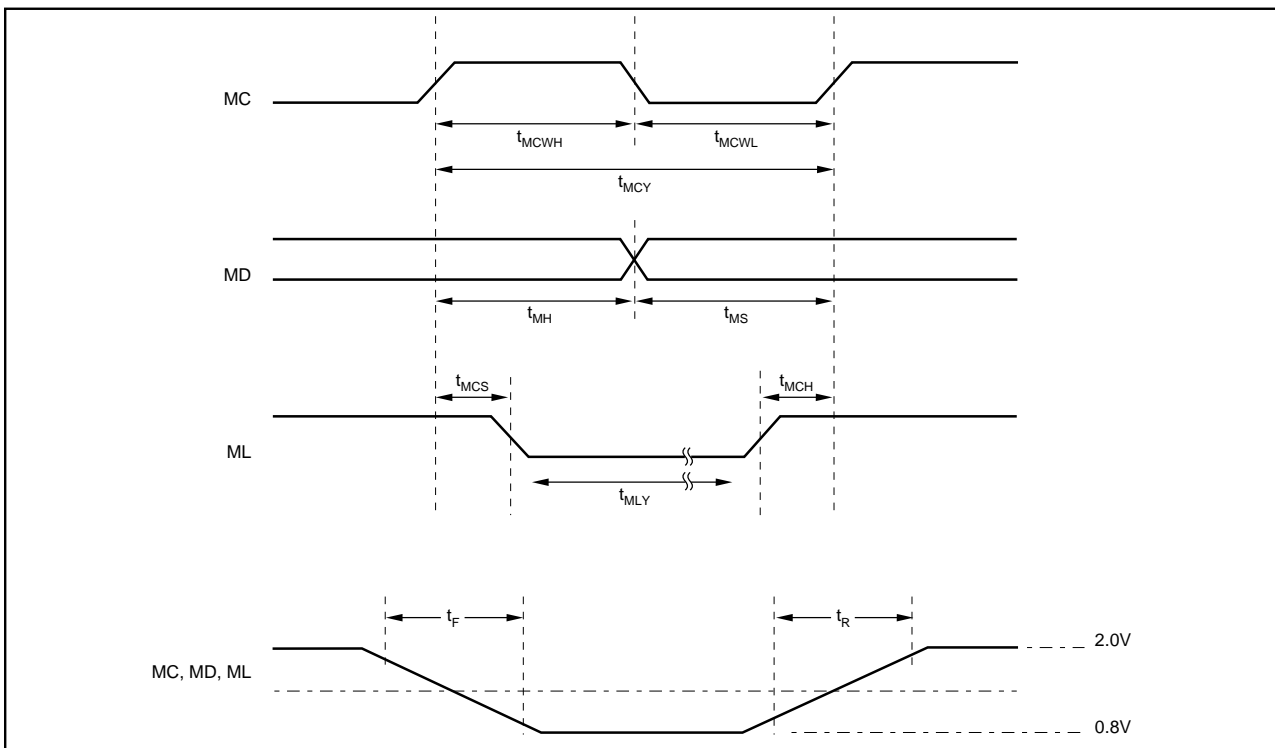


FIGURE 5. Serial Mode Control Timing.

BCK Pulsewidth (H Level)	t_{BCWH}	70ns (min)
BCK Pulsewidth (L Level)	t_{BCWL}	70ns (min)
BCK Pulse Cycle Time	t_{BCY}	140ns (min)
DIN Setup Time	t_{DS}	30ns (min)
DIN Hold Time	t_{DH}	30ns (min)
BCK Rising Edge → LRCI Edge	t_{BL}	30ns (min)
LRC I Edge → BCK Rising Edge	t_{LB}	30ns (min)

TABLE I. Data Input Timing Specifications (Refer to Figure 4).

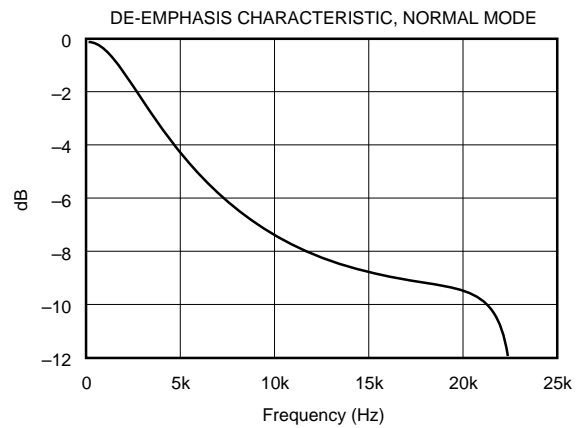
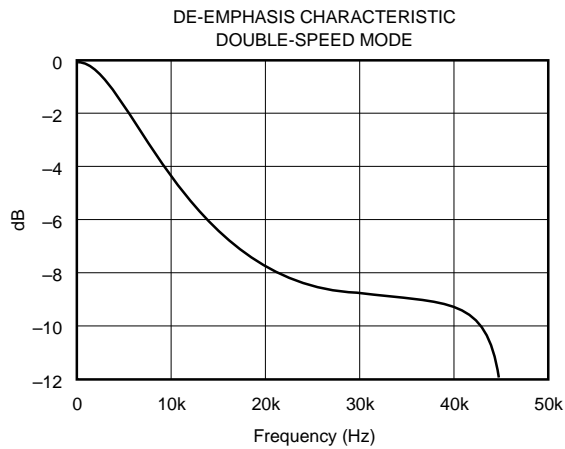
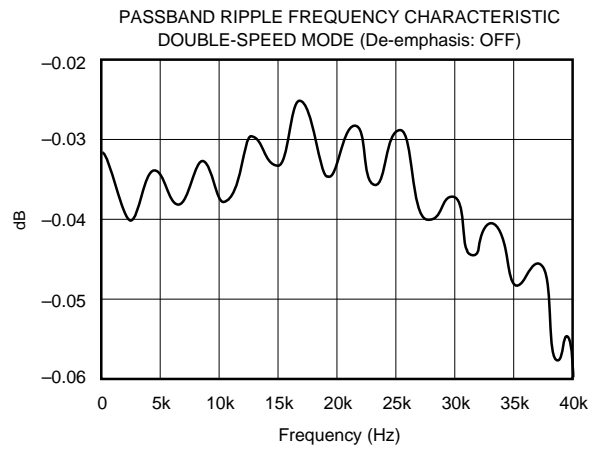
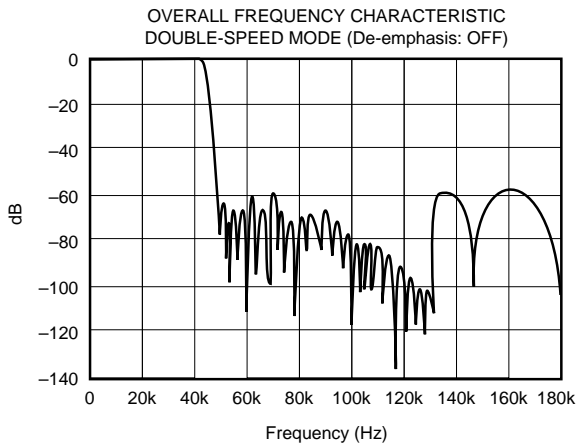
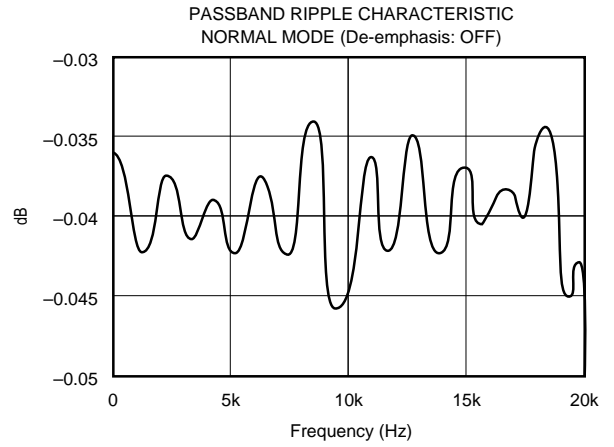
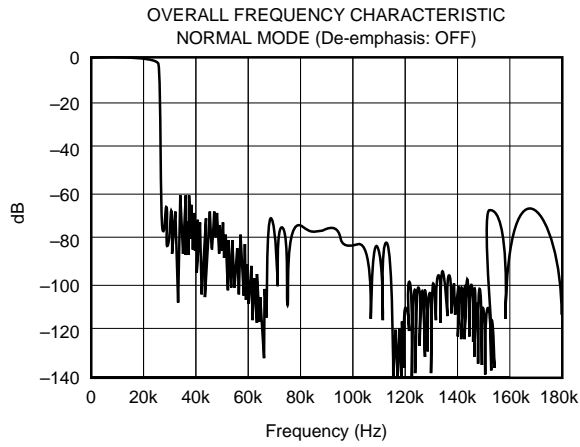
MC Pulsewidth (H Level)	t_{MCWH}	50ns (min)
MC Pulsewidth (L Level)	t_{MCWL}	50ns (min)
MC Pulse Cycle Time	t_{MCY}	100ns (min)
MD Setup Time	t_{MS}	30ns (min)
MD Hold Time	t_{MH}	30ns (min)
ML Setup Time	t_{MCS}	30ns (min)
ML Hold Time	t_{MCH}	30ns (min)
ML Low-Level Time	t_{MLY}	$1/\text{sysclk} + 20\text{ns (min)}$
MC, MD, ML Rise Time	t_R	15ns (max)
MC, MD, ML Fall Time	t_F	15ns (max)

TABLE II. Serial Mode Control Timing Specifications (Refer to Figure 5).

TYPICAL PERFORMANCE CURVES

All specifications at +25°C, +V_{CC} = +V_{DD} + 5V, f_s = 44.1kHz, f_{sys} = 384/256fs, and 16-bit data, unless otherwise noted.

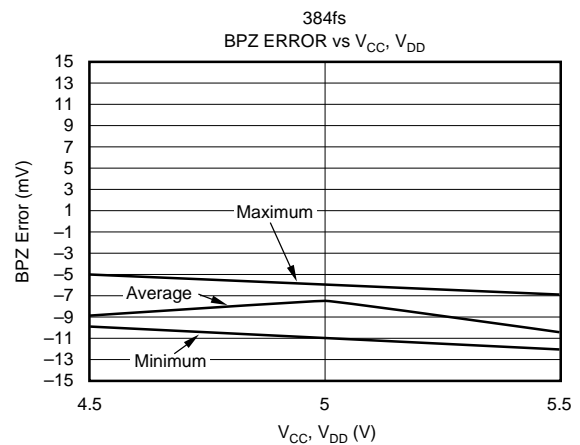
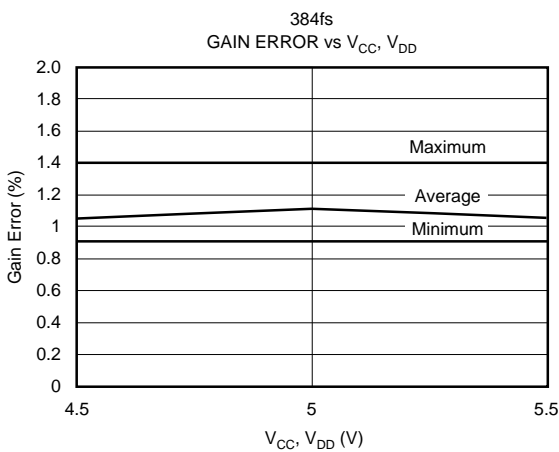
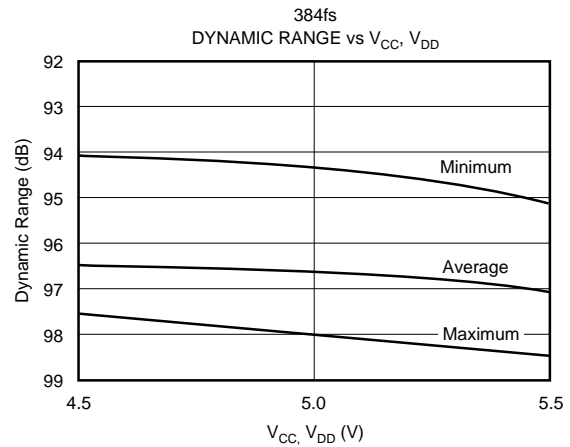
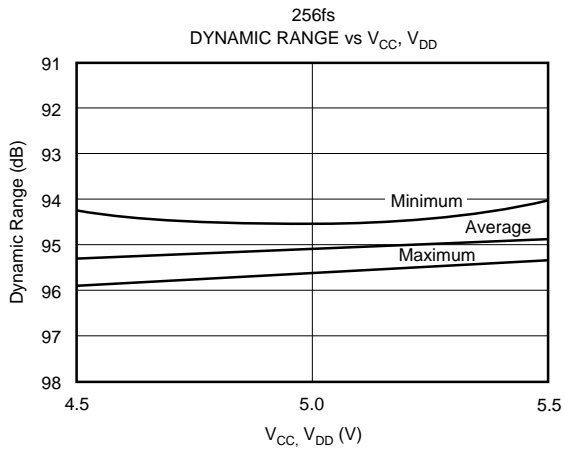
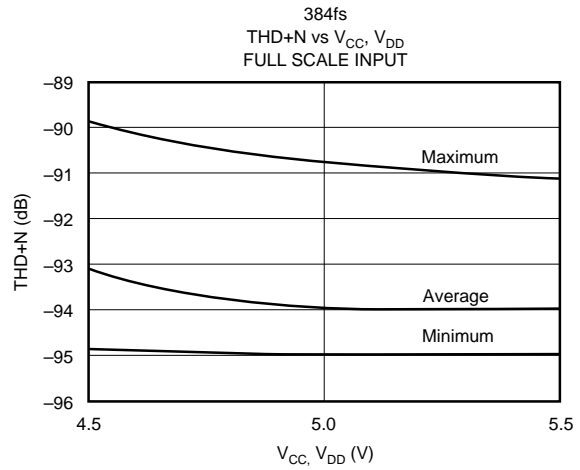
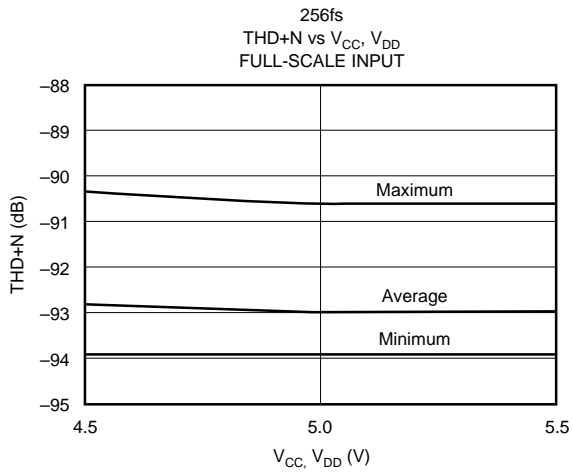
DIGITAL FILTER



TYPICAL PERFORMANCE CURVES (CONT)

At $T_A = +25^\circ\text{C}$, $V_S = \pm 5\text{V}$, $R_L = 100\Omega$, $C_L = 2\text{pF}$, and $R_{FB} = 402\Omega$, unless otherwise noted. Based on 200 piece sample from 3 diffusion runs.

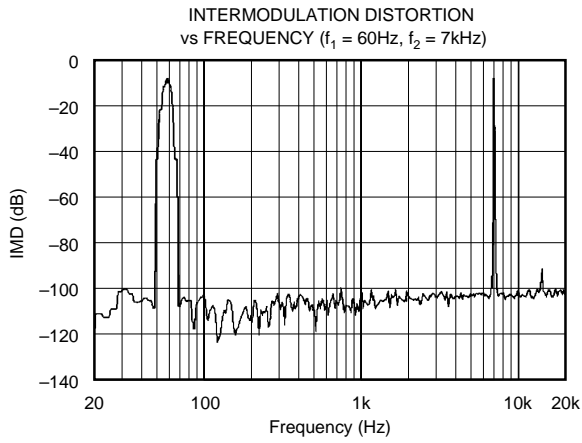
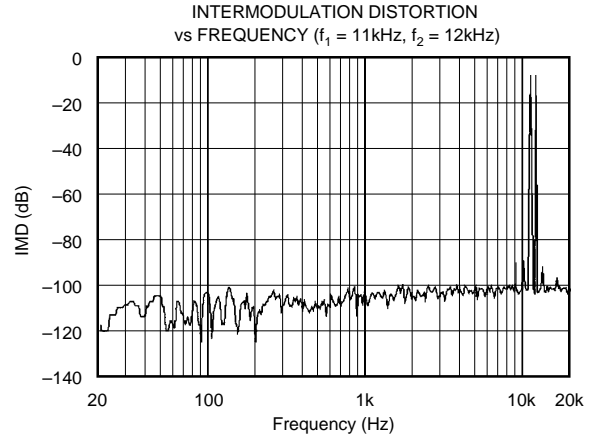
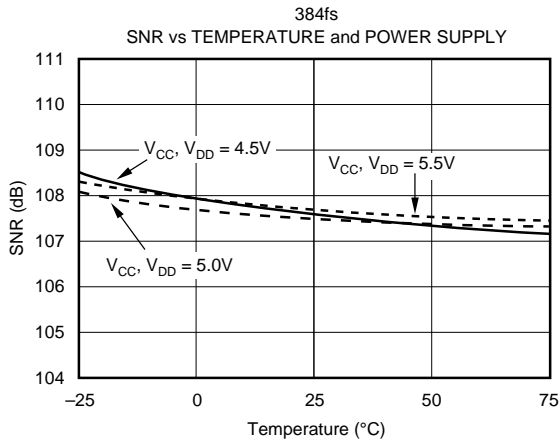
DYNAMIC PERFORMANCE



TYPICAL PERFORMANCE CURVES (CONT)

At $T_A = +25^\circ\text{C}$, $V_S = \pm 5\text{V}$, $R_L = 100\Omega$, $C_L = 2\text{pF}$, and $R_{FB} = 402\Omega$, unless otherwise noted. Based on 200 piece sample from 3 diffusion runs.

DYNAMIC PERFORMANCE



CAUTION: Minimum and maximum values on typical performance curves are not meant to imply a guarantee. Curves should be used for reference only. Refer to specification for guaranteed performances.

FUNCTIONAL DESCRIPTION

PCM1710 has several built-in functions including digital attenuation, digital de-emphasis and soft mute. These functions are software controlled. PCM1710 can be operated in two different modes, **Serial** or **Parallel**. Serial Mode is a three-wire interface using pin 26 (MD), pin 27 (MC), and pin 28 (ML). Data on these pins are used to control de-emphasis mode, mute, double-speed dubbing, input resolution and input format. PCM1710 can also be operated in parallel mode, where static control signals are used on pin 26 (DM1), pin 27 (DM2), and pin 28 (DSD). Operation of both of these modes are covered in detail in the next sections.

CAUTION: Mode control signals operate on level triggered logic. The minimum timing conditions detailed in Figures 5 and 6 MUST be observed.

MODE CONTROL: SERIAL/PARALLEL SELECTION

MODE = H	Serial Mode
MODE = L	Parallel Mode

TABLE III. Serial and Parallel Mode are Selectable by MODE Pin (Pin 24).

MODE CONTROL: SELECTABLE FUNCTIONS

FUNCTION	SERIAL MODE (MODE = H)	PARALLEL MODE (MODE = L)
Input Data Format Selection	0	X(Normal Mode Fixed)
Input Data Bit Selection	0	X(16-bit Fixed)
Input LRCI Polarity Selection	0	X
De-emphasis Control	0	0
Mute	0	0
Attenuation	0	X
Double Speed Dubbing	0	0

NOTE: 0: Selectable, X: Not Selectable.

TABLE IV. Selectable Functions in Serial Mode and Parallel Mode.

Table IV indicates which functions are selectable within the user's chosen mode. All of the functions shown are selectable within the serial mode, but only de-emphasis control, mute and double-speed dubbing may be selected when using PCM1710 in the parallel mode.

PARALLEL-MODE: DE-EMPHASIS CONTROL (PIN 24 [MODE] = L)

DM1 (Pin 26)	DM2 (Pin 27)	De-emphasis
L	L	OFF
H	L	32kHz
L	H	48kHz
H	H	44.1kHz

TABLE V. De-emphasis (Pins 26 and 27).

In the parallel mode, de-emphasis conditions are controlled by the logic levels on pin 26 (DM1) and pin 27 (DM2). For PCM1710, de-emphasis can operate at 32kHz, 44.1kHz, 48kHz, or disabled.

PARALLEL-MODE: DOUBLE-SPEED DUBBING CONTROL (PIN 24 [MODE] = L)

DSD = H	Normal Mode
DSD = L	Double-Speed Dubbing Mode

NOTE: When the Double-Speed Dubbing Mode is selected, the System Clock must be 384fs (CKSL: Pin 23 = H).

TABLE VI. DSD (Pin 28).

In the parallel mode, double-speed dubbing can be enabled by holding pin 28 (DSD) at a logic "low".

CAUTION: Double-speed dubbing cannot operate if the system clock is set at 256fs.

SERIAL MODE CONTROL

In order to use all of PCM1710's functionality, the **serial mode control** should be used. PCM1710 must be addressed three separate times to set all of the various registers and flags that control these functions.

Table VII together with Figure 6 details the control of the PCM1710 in the serial mode. Internal latches are used to hold this serial data until the PCM1710 is enabled to use the data. The serial mode is used by applying clocked data to the following pins:

NAME	PIN	FUNCTION
MC	27	Clock for Strobing in Data
ML	28	Latches Data into the Registers
MD	26	8-bit Data Word Defining Operation

	B0	B1	B2	BIT NO.	MODE FLAG	FUNCTION MODE SELECTION				MODE BY DEFAULT	
						MODE	BIT VALUE	SELECTED FUNCTION			
Mode 1	H	L	L	B3	DEEM2	Sampling Frequency for De-emphasis		DEEM2			
				B4	DEEM1			0	1		
								DEEM1	0		48kHz
								1	32kHz		44.1kHz
				B5	IIR	De-emphasis	0	De-emphasis OFF			OFF
						1	De-emphasis ON				
B6	MUTE	Mute	0	Mute OFF		OFF					
		1	Mute ON								
B7	DSD	Double-Speed	0	Double-speed OFF		OFF					
		1	Double-speed ON								
Mode 2	H	L	H	B3		Not Assigned					
				B4	TST	Test Mode	0	Infinite Zero Detection OFF		ON	
						1	Infinite Zero Detection ON				
				B5	IW	Input Resolution	0	16-Bit		16-Bit	
						1	20-Bit				
				B6	LRPL	Polarity for LRCL	0	Lch:high/Rch:low		Lch:high Rch:low	
		1	Lch:low/Rch:high								
B7	IIS	Input Format	0	Normal		Normal					
		1	IIS								

TABLE VII. Serial-Mode Control Input Format (Pin 24 [MODE] = H)—Refer to Figure 6 for Timing Diagram.

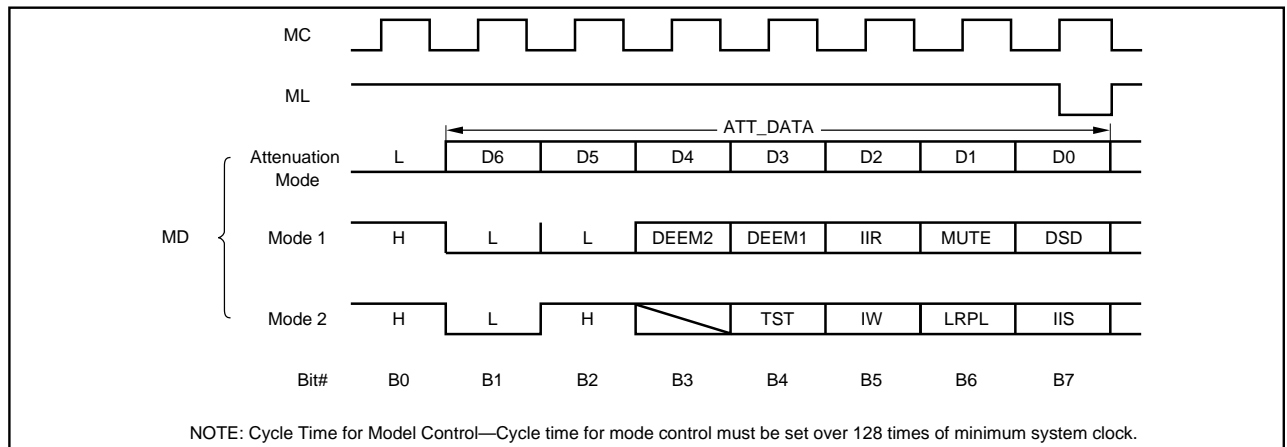


FIGURE 6. Mode Control Input Format, Serial Mode.

DIGITAL ATTENUATION

One of the functions which can be implemented through use of the serial mode control is attenuation. This function allows the user to control the level of the output, independent of the of the input level set by the actual input data supplied to the DAC.

Referring to Figure 6, when the first data bit (B0) on MD (pin 26) is low, the attenuation function is enabled. The next seven bits (B1 - B6) define a binary value, ATT_DATA, that indicates the desired level of attenuation. The attenuation level is given by:

$$\text{Level} = 20\log_{10} (1 - \text{ATT_DATA}/127) \text{ dB}$$

When all 7 bits of the ATT_DATA word are high (ATT_DATA = 127), attenuation is infinite and the output of PCM1710 will be zero.

MODE 1 CONTROLS

This mode can be enabled with the sequence of 1, 0, 0 as the first three bits on MD (pin 26). This mode allows for the following functions:

De-emphasis	On/Off
De-emphasis Frequency	32kHz, 44.1kHz, 48kHz
Soft Mute	On/Off
Double-Speed Dubbing	On/Off

DIGITAL DE-EMPHASIS

PCM1710 allows three different sampling rates for digital de-emphasis. B3 and B4 are used for binary control of the de-emphasis frequency:

B3	B4	Frequency
0	0	OFF
0	1	48kHz
1	0	32kHz
1	1	44.1kHz

Once the reset has been established on pin 27 (MC), the de-emphasis frequency defaults to 44.1kHz. B5 is a master control for de-emphasis. A high level on B5 enables de-emphasis (frequency controlled by B3 and B4), and a low level on B5 disables de-emphasis.

SOFT MUTE

Soft mute is enabled when B6 is high. The soft mute occurs gradually, unlike the forced infinite zero detection. When the mute data bit is high, complete muting will occur in $127/f_s$ seconds. For $f_s = 44.1\text{kHz}$, complete mute will occur in 2.88ms.

DOUBLE-SPEED DUBBING

Double-speed dubbing is used when the application allows for the CD to be copied at twice the normal playback rate. Double-speed dubbing is enabled when B7 is high. This mode can only operate when the system clock is set at 384fs. Double-speed dubbing can only occur when the sample rate is 44.1kHz. Since f_s is set at 44.1kHz, the system clock in double-speed mode is at 192fs.

MODE 2 CONTROLS

Mode 2 is enabled when B0 is high, B1 is low, and B2 is high. This mode controls infinite zero detection, input resolution, LRCI polarity and input format.

INFINITE ZERO DETECTION

B4 is used to enable or disable infinite zero detection. PCM1710 monitors both data input (DIN) and bit clock (BCKIN). When the data input is continuously zero or one for 65,536 cycles of the bit clock, infinite zero detection occurs, which forces the output of the PCM1710 to one-half of V_{CC} (typically 2.5V). Once this happens, only the output amplifier is connected. This is done to avoid having the noise shaped output spectrum of the DAC appear at the output of the PCM1710. This function is especially useful for CD applications when the player is between tracks. An inherent attribute of all delta-sigma architectures is the presence of quantization noise when the input is constant (all 1s or 0s). When the zero detect circuit disconnects the DAC from the output amplifier, a very low level “click” noise may be audible. The click noise occurs at approximately -76dB , and in many cases is inaudible.

INPUT RESOLUTION

PCM1710 is capable of accepting either 16-bit or 20-bit input data. Specifications for PCM1710 are tested and guaranteed using 16-bit data. When 20 bits are used, dynamic performance is improved by approximately 2dB. Refer to “Typical Performance Curves” for a comparison of 16-bit and 20-bit data. A low on B5 places PCM1710 in 16-bit mode, and a high on B5 sets PCM1710 to 20-bit mode.

SAMPLE RATE CLOCK POLARITY

B6 controls the polarity of the sample rate clock (LRCIN) polarity. When B6 is low, data will be accepted on the left channel when LRCIN is high, and on the right channel when LRCIN is low. When B6 is high, data will be accepted on the right channel when LRCIN is high, and on the left channel when LRCIN is low.

INPUT FORMAT

Normal input mode for PCM1710 is MSB first, right justified. PCM1710 may also be operated with IIS (32 continuous clock cycles per word) input format. When B7 is low, the input format is “normal”. When B7 is high, the input format is “IIS”. However, PCM1710 can only accept IIS input format when it is in 16-bit mode. 20-bit data must be entered in normal mode.

DEFAULT MODE

At initial power-on, default settings for PCM1710 are 44.1kHz f_s , de-emphasis off, mute off, double-speed off, infinite zero detect on, 16-bit input LRCIN left channel high, and normal input mode.

SYSTEM CLOCK

SAMPLING FREQUENCY	SYSTEM CLOCK FREQUENCY
32kHz	256fs 8.1920MHz
32kHz	384fs 12.2880MHz
44.1kHz	256fs 11.2896MHz
44.1kHz	384fs 16.9344MHz
48kHz	256fs 12.2880MHz
48kHz	384fs 18.4320MHz

TABLE VIII. Relationship of f_s and System Clock.

NORMAL/DOUBLE-SPEED DUBBING

For most CD playback applications operating at 384fs, the system clock frequency must be 16.9344MHz, in both the normal mode and double-speed dubbing mode. Table VIII illustrates the relationship between f_s and output clock frequency in both modes.

PARAMETER	ML/DSD (PIN 28)	
	H (Normal)	L (Double Speed)
XTI Input Clock Frequency	384fs	192fs
XTI Frequency	16.9344MHz ($f_s = 44.1\text{kHz}$)	16.9344MHz ($f_s = 88.2\text{kHz}$)
CLKO Output Clock Frequency	384fs	192fs

TABLE IX. Relationship Between Normal/Double Speed and f_s .

EXTERNAL SYSTEM CLOCK

Figure 7 is a diagram showing the internal clock in conjunction with an external crystal oscillator.

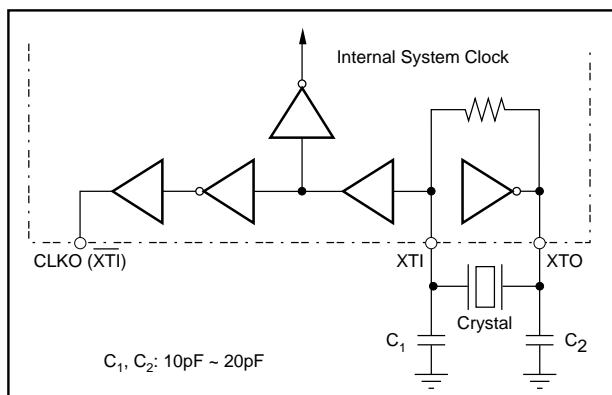


FIGURE 7. External Crystal Oscillator.

Figure 8 is a diagram showing the internal clock with an external clock source, instead of an oscillator. An external system clock (input to XTI) must meet the following conditions:

HIGH LEVEL	$V_{IH} > 0.64V_{DD}$	$T_H > 10ns$
LOW LEVEL	$V_{IL} > 0.28V_{DD}$	$T_L > 10ns$

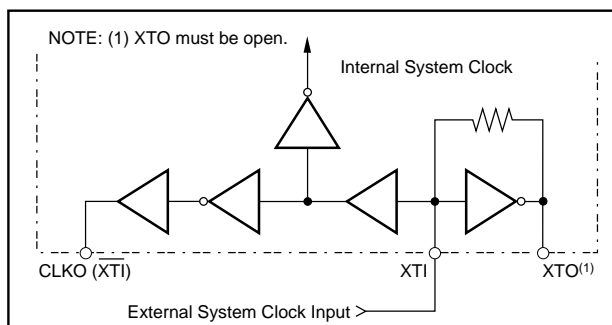


FIGURE 8. External System Clock.

POWER SUPPLY CONNECTIONS

PCM1710 has two power supply connections: digital (V_{DD}) and analog (V_{CC}). Each connection also has a separate ground. If the power supplies turn on at different times, there is a possibility of a latch-up condition. To avoid this condition, it is recommended to have a common connection between the digital and analog power supplies. If separate supplies are used without a common connection, the delta between the two supplies during ramp-up time must be less than 0.6V.

An application circuit to avoid a latch-up condition is shown in Figure 9.

BYPASSING POWER SUPPLIES

The power supplies should be bypassed as close as possible to the unit. Refer to Figure 19 for optimal values of bypass capacitors. For applications which require very high perfor-

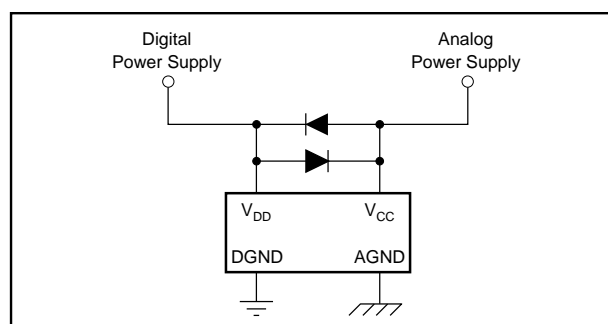


FIGURE 9. Latch-up Prevention Circuit.

mance at low levels (such as keyboards, synthesizers, etc.) it may be beneficial to provide additional bypassing on pin 15 (V_{CC1}) with a low ESR 100 μ F capacitor. This will eliminate stray tones which may be above the noise floor.

THEORY OF OPERATION

PCM1710 is an oversampling delta-sigma D/A converter, consisting of an input interface/attenuator, a 4th-order multi-level delta-sigma modulator, a low pass filter and an output amplifier (see Figure 10).



MODULATOR

The delta-sigma section of the PCM1710 is based on a 5-level amplitude quantizer and a 4th-order filter. This converts oversampled 16- or 20-bit input data to 5-level delta-sigma format. A block diagram of the 5-level modulator is shown in Figure 11.

This 5-level delta-sigma modulator has the advantage of improved stability and jitter sensitivity over the typical one bit (2-level) delta-sigma modulator.

The combined oversampling rate of the delta-sigma modulator and the internal 8X oversampling digital filter is 48fs at a system clock of 384fs and 32fs at a system clock of 256fs.

A block diagram of the 4th-order filter section $H_f(z)$ in the delta-sigma modulator is shown in Figure 12.

In general, high order one-bit delta-sigma modulators have disadvantages due to loop instability (multiple integration stages). The five level delta-sigma modulator of the PCM1710 uses phase compensation techniques to obtain stable operation. In Figure 12, the coefficients B1 to B4 give the basic form of the filter, and A2 to A4 are used for phase compensation of the feedback loop.

The theoretical quantization noise performance of five level delta-sigma modulator is shown in Figure 13 and 14. In the audio band, the quantization noise floor level of the PCM1710 is less than 130dB (at a system clock of 384fs).

APPLICATION CONSIDERATIONS

16-BIT vs 20-BIT OPERATION

In the serial mode, PCM1710 can be configured to accept either 16-bit or 20-bit data. The specifications listed in this data sheet are the 16-bit data. Some improvements in dynamic performance can be realized by using 20-bit data. Internally, the PCM1710's digital filter uses only 20-bit data. If the input data is 16-bit, the filter adds four zeros to complete the 20-bit input word. Typical performance differences between 16-bit and 20-bit data are shown in Tables X and XI.

DATA	256fs	384fs
16-bit	-91dB	-93dB
20-bit	-94dB	-96dB

TABLE X. THD+N Performance at Full Scale.

DATA	256fs	384fs
16-bit	94dB	96dB
20-bit	96dB	98dB

TABLE XI. Dynamic Range.

DELAY TIME

There is a finite delay time in delta-sigma converters. In A/D converters, this is commonly referred to as latency. For a delta-sigma D/A converter, delay time is determined by the order number of the FIR filter stage, and the chosen sampling rate. The following equation expresses the delay time of PCM1710:

$$T_D = 22.625 \times 1/f_s$$

$$\text{For } f_s = 44.1\text{kHz}, T_D = 22.625/44.1\text{kHz} = 513.04\mu\text{s}$$

Applications using data from a disc or tape source, such as CD audio, CD-Interactive, Video CD, DAT, Minidisc, etc., generally are not affected by delay time. For some professional applications such as broadcast audio for studios, it is important for total delay time to be less than 2ms.

INTERNAL RESET

If the sample rate clock (LRCIN) is stopped during operation, the infinite zero detect circuit will cause the output to go to $V_{CC}/2$ after 65,536 cycles of the bit clock (BCKIN). Once a new system clock has been applied, there will be a delay until output data is correlated to the input. This is due to the digital delay of the filter.

When power is first applied to PCM1710, an automatic reset function occurs after 64 cycles of LRCIN.

CHANGING SAMPLING RATE

For normal operation, LRCIN and XTI should be synchronized at either 256fs or 384fs. When the sampling rate is

changed during operation, output data is invalid during the delay period (T_D) and for two subsequent cycles of LRCIN. After two cycles of LRCIN, the output is a valid representation of the input data.

OUTPUT FILTERING

For testing purposes all dynamic tests are done on the PCM1710 using a 20kHz low pass filter. This filter limits the measured bandwidth for THD+N, etc. to 20kHz. Failure to use such a filter will result in higher THD+N and lower SNR and Dynamic Range readings than are found in the specifications. The low pass filter removes out of band noise. Although it is not audible, it may affect dynamic specification numbers.

The performance of the internal low pass filter from DC to 24kHz is shown in Figure 15. The higher frequency rolloff of the filter is shown in Figure 16. If the user's application has the PCM1710 driving a wideband amplifier, it is recommended to use an external low pass filter. A simple 3rd-order filter is shown in Figure 17. For some applications, a passive RC filter or 2nd-order filter may be adequate.

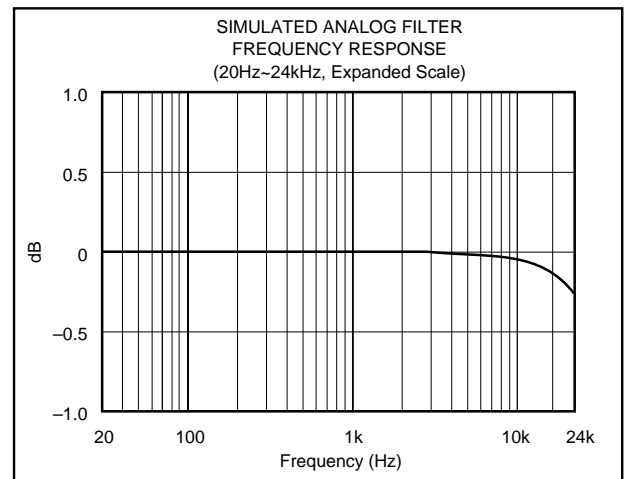


FIGURE 15. Low Pass Filter Frequency Response.

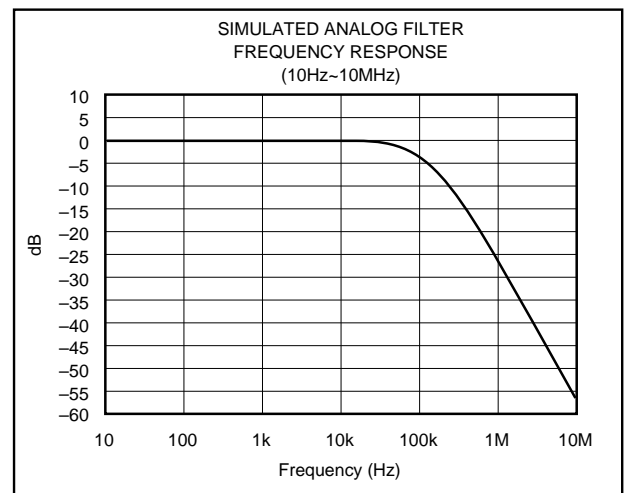


FIGURE 16. Low Pass Filter Frequency Response.

TEST CONDITIONS

Figure 18 illustrates the actual test conditions applied to PCM1710 in production. The 11th-order filter is necessary in the production environment for the removal of noise, resulting from the relatively long physical distance between the unit and the test analyzer. In most actual applications, the third-order filter shown in Figure 17 is adequate. Under normal conditions, THD+N typical performance is -70dB with a 30kHz low pass filter (shown here on the THD meter), improving to -92dB when the external 20kHz second-order filter is used.

EVALUATION FIXTURES

Two different evaluation fixtures are available for PCM1710.

DEM-PCM1710

This evaluation fixture is primarily intended for quick evaluation of the PCM1710's performance. DEM-PCM1710 can accept either an external clock or a user-installed crystal

oscillator. All of the functions can be controlled by on-board switches. DEM-PCM1710 does not contain a receiver chip or an external low pass filter. DEM-PCM1710 requires a single $+5\text{V}$ power supply.

DEM-DAI1710

This fixture is more complete than DEM-PCM1710; it includes a Digital Audio Interface (DAI) receiver chip for easy use and to provide a low-jitter 256fs system clock to the PCM1710. Also included are dual second-order low pass filters using Burr-Brown's OPA2604 dual FET-input op amp. The output of the DEM-DAI1710 is 2V_{rms} , using standard BNC-type connectors.

All of the functions of PCM1710 can be evaluated by using the DEM-DAI1710 jumper selections. DEM-DAI1710 requires $+5\text{V}$ and $\pm 5\text{V}$ to $\pm 15\text{V}$ power supplies. The schematic diagram for DEM-DAI1710 is shown in Figure 19. For more detailed information on the evaluation fixtures, contact your local Burr-Brown representative.

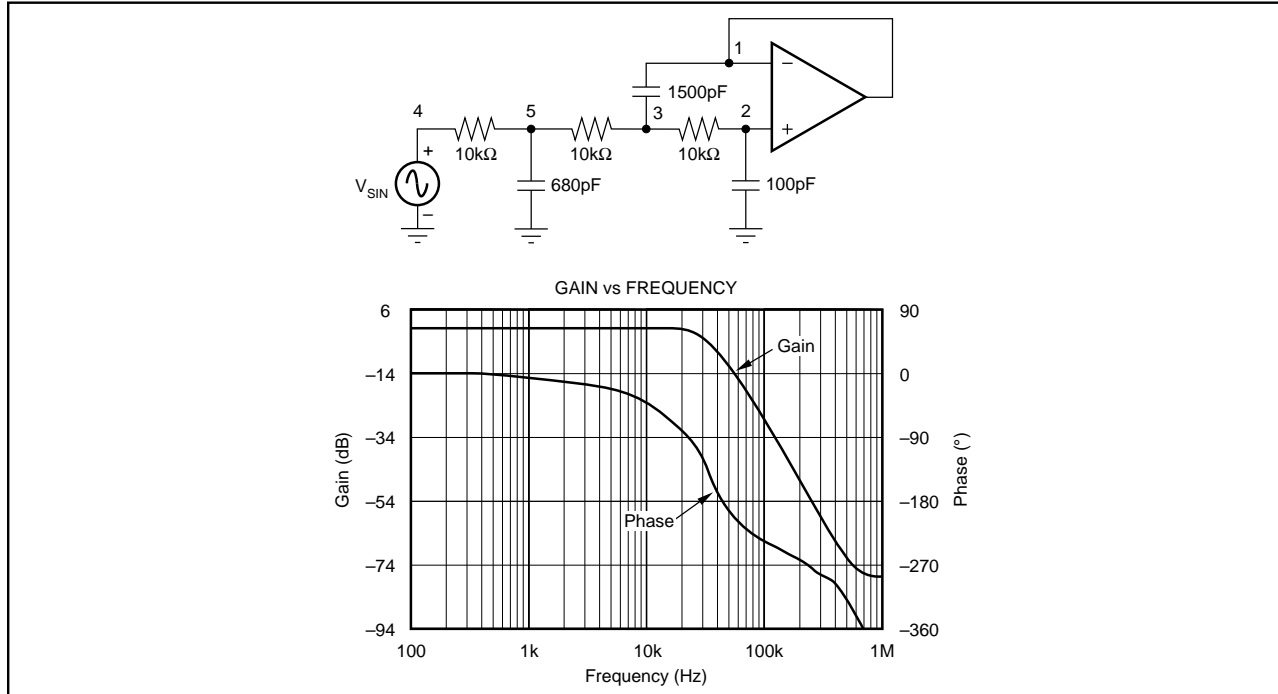


FIGURE 17. 3rd-Order LPF.

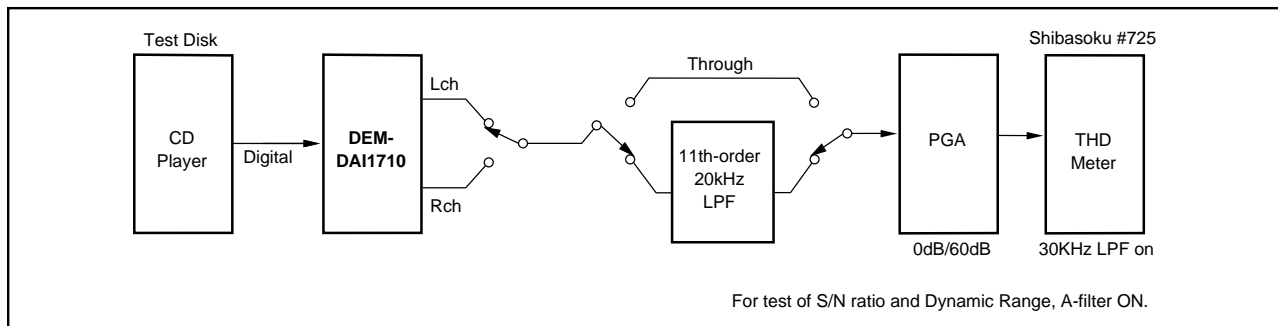


FIGURE 18. Test Block Diagram.

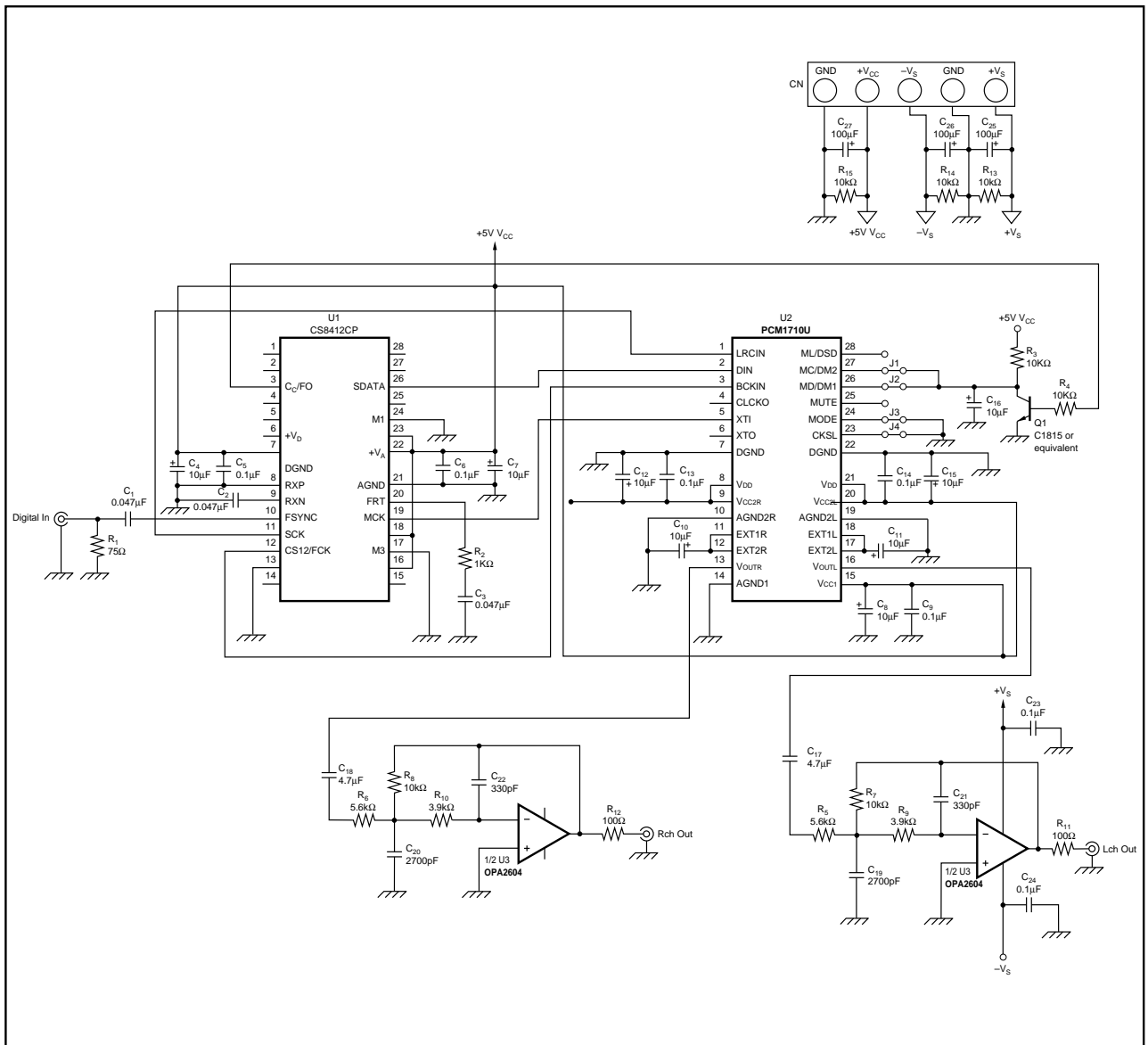


FIGURE 19. DEM-DAI1710 Schematic Circuit Diagram.

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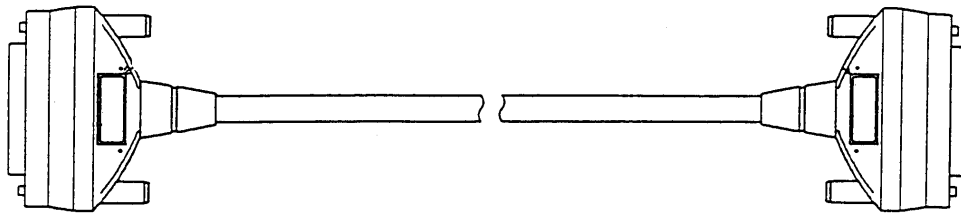
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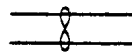
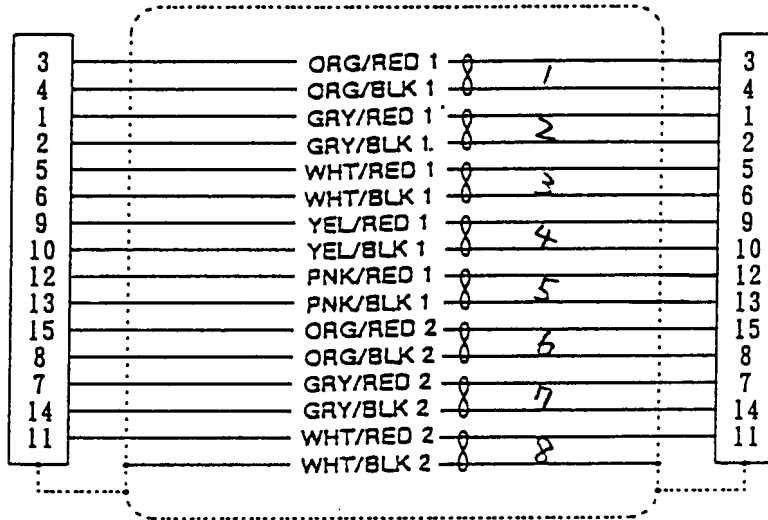
Cable Assy, MMC-38

Male
DA-38 SYNC IN

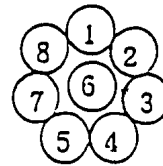
Female
MMC-38 REMOTE OUT



← 1000 ± 30 mm →

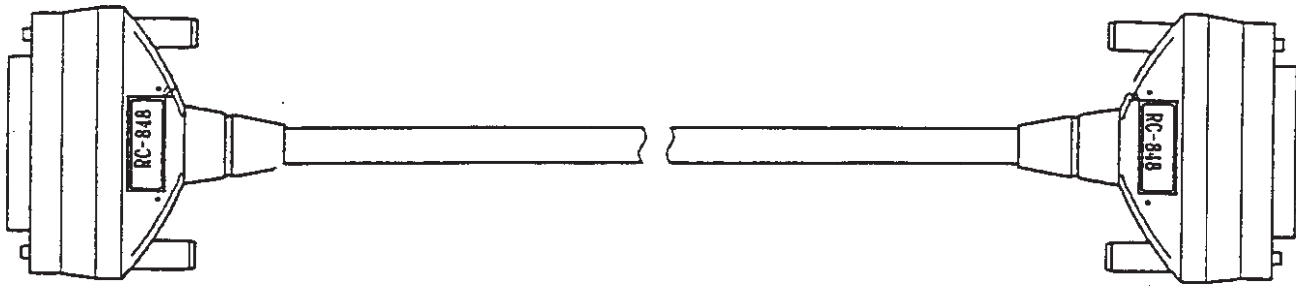


means Twisted wire



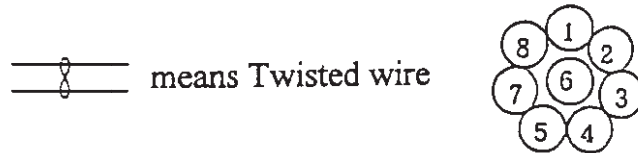
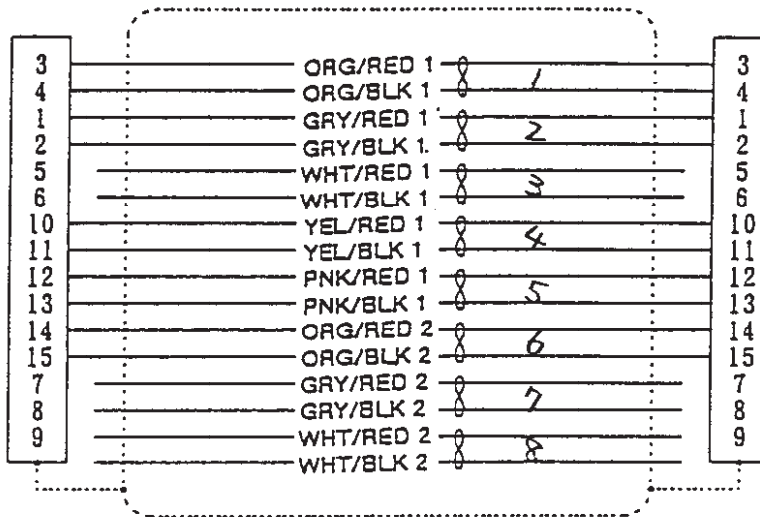
- | | | |
|-------|-------------|--|
| 1 pce | 53363570-00 | Connector Plug, 15 pin D-Sub(Male) |
| 1 pce | 13152907 | Connector Socket, 15 pin D-Sub(Female) |
| 2 pcs | 53363580-00 | Case Assy, 15 pin D-Sub |

THE CABLES FOR REMOTE



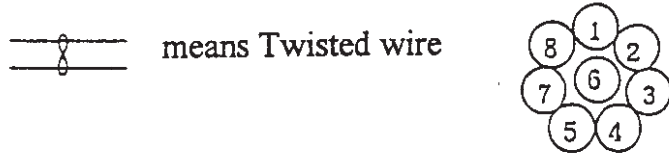
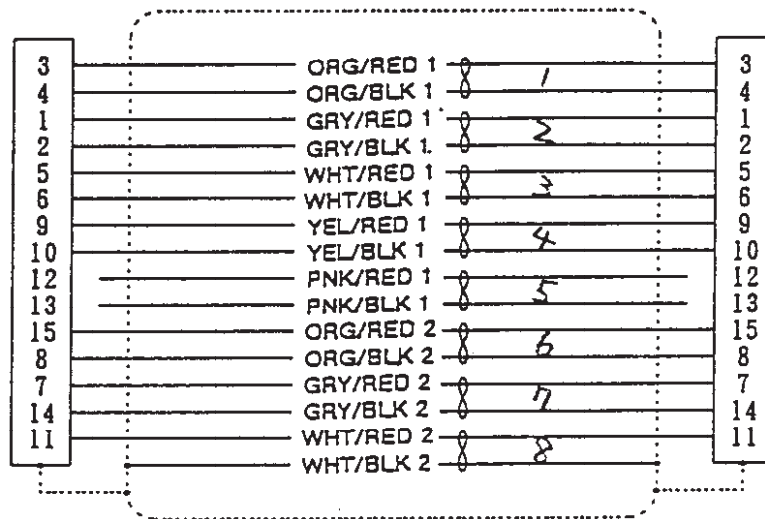
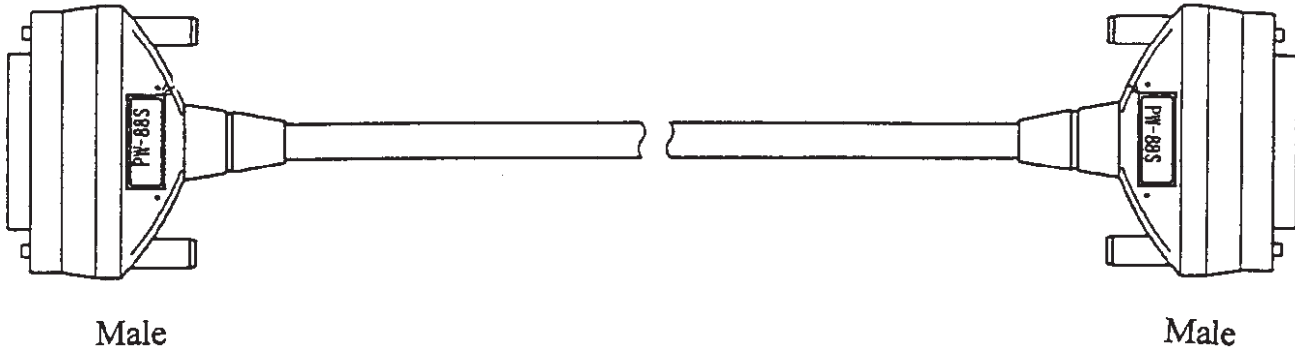
Female

Male



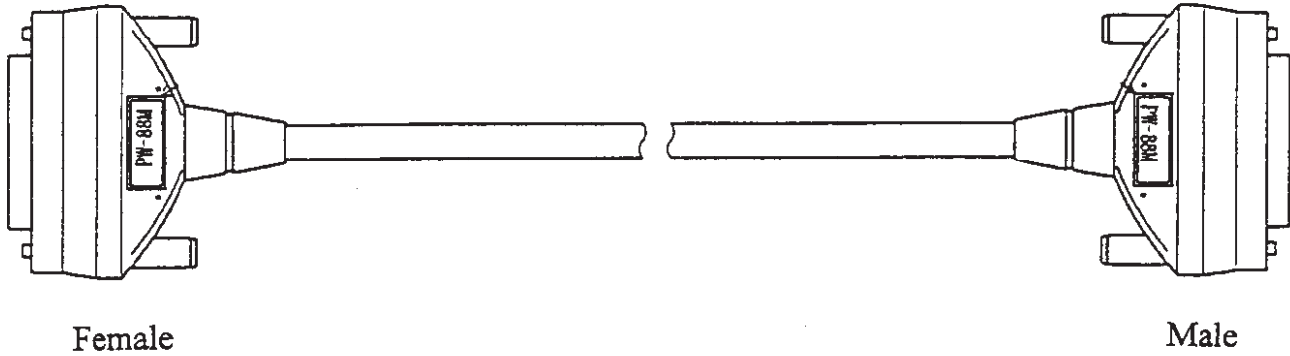
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- 1 pce. 1315 2907- Connector Socket, 15 pin D-Sub (Female)
- 2 pcs. 5336 3580-00 Case Assy, 15 pin D-Sub

THE CABLES FOR SYNC



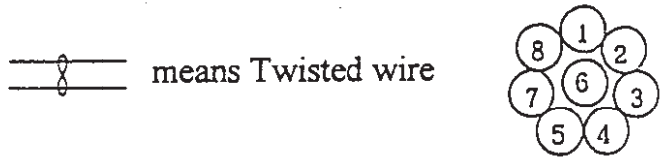
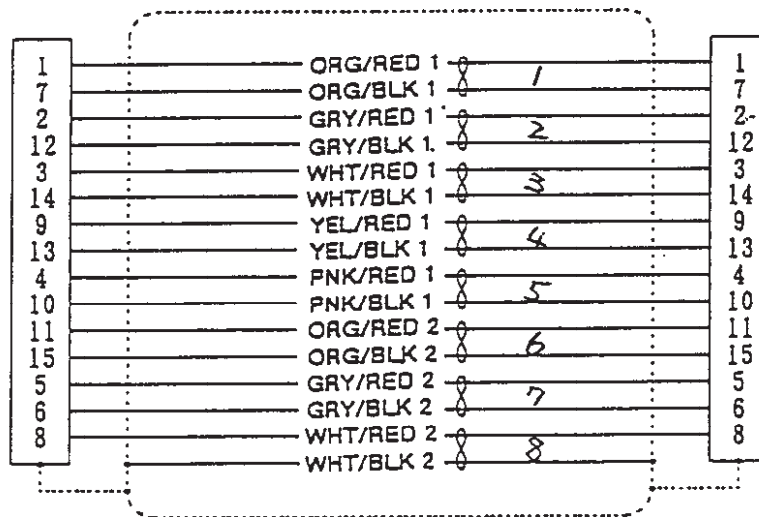
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- 2 pcs. 5336 3580-00 Case Assy, 15 pin D-Sub

THE CABLES FOR METER



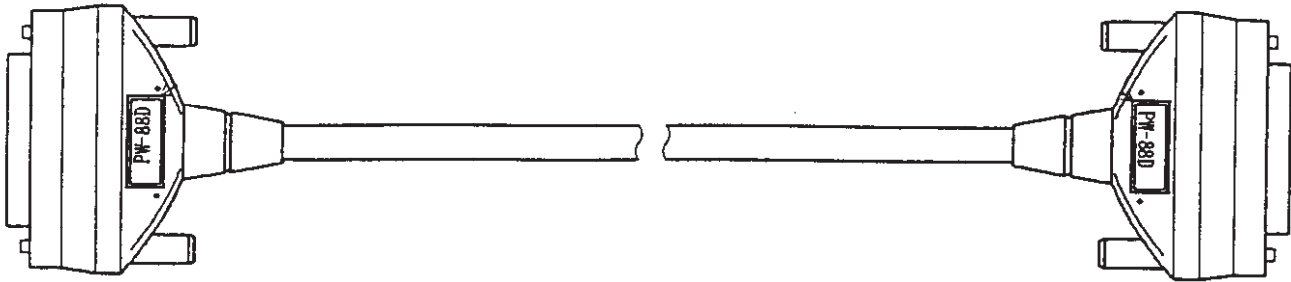
Female

Male



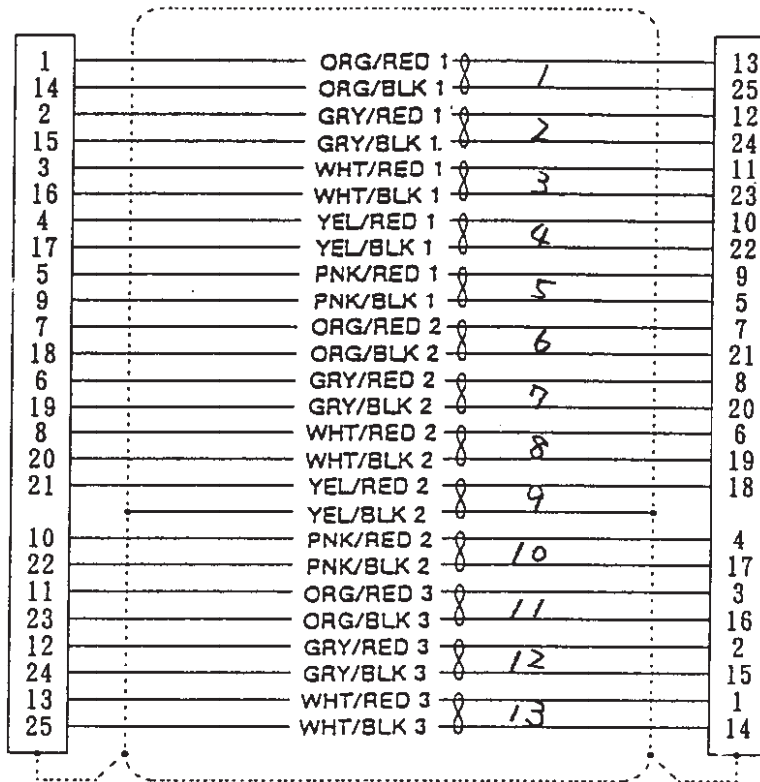
- 1 pce. 5336 3570-00 Connector Plug, 15 pin D-Sub (Male)
- 1 pce. 1315 2907- Connector Socket, 15 pin D-Sub (Female)
- 2 pcs. 5336 3580-00 Case Assy, 15 pin D-Sub

THE CABLES FOR TDIF

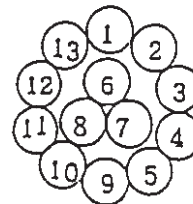


Male

Male



means Twisted wire



- 2 pcs. 1315 2908- Connector Plug, 25 pin D-Sub (Male)
- 2 pcs. 5336 3581-00 Case Assy, 25 pin D-Sub