SONY PCM-3324
TLS-4000

INTERFACE DOCUMENTATION

Interface number : 1.812.440.20
IF - Doc number : 10.27.1381

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Order No: 10.27.1381 (Ed. 0690)

Summary

1 General

1.1 Modules, part numbers

	Order Number
■ Interface kit, complete (Interface, cable, documentation)	21.812.440.20
■ Interface assembly (HW, SW)	1.812.440.20
IF software set	1.812.979.20
IF cable 5 m	1.023.761.00

1.2 Slave models

- SONY PCM-3324 (Multichannel digital audio recorder)
- Machines with compatible control: -

1.3 Software

■ Initial version index 20	1.812.979.20

2 Start-up procedure

2.1 TLS4000/interface requirements

Order Number

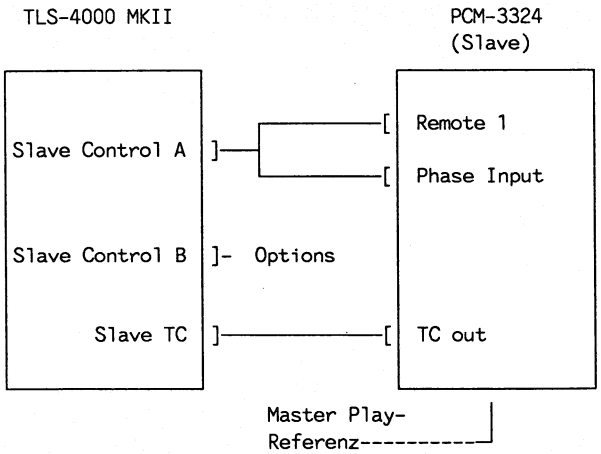
- Synchronizer board later than 1.812.320.23
- Interface: correctly set DIL switches (see Section 3.3)

2.2 Slave machine requirements

- x fade time: Switch in position F
  Test machine: S/N 11207 V4 Nov 87
- Depending on the operating mode (see Section 3.3, switch 3), a vari sync unit (VSU-3310) must be looped into the capstan control signal.

2.3 Cabling TLS 4000 / SONY PCM-3324

- Standard cabling



- Alternative with VSU-3310

2.4 Quick test, alignment

- After power has been switched on, no error should be signalled by the LCDs (flashing, approx. 2 Hz). The left-hand LED (DL1) should be dark. (Also refer to Section 3.5)

- The correct wiring of the move pulses can be checked by displaying the slave time (LCU or controller).

- No alignment is necessary, because the capstan control voltage is aligned automatically by periodically comparing the capstan frequency with the move pulse frequency. The sampling frequency is determined and displayed by measuring the move pulse period during PLAY. Automatic calibrations are signalled with LEDs (DL2, DL4).

3 Operating instructions

3.1 Technical data

- Slave type:
  SMPTE/EBU TC machine with move pulse information without code in spooling mode
  - GOTO function with PLAY-STOP sequence
  - Parking in LOCK mode with edit lead
  - CHASE-PLAY transition with preroll parking

- Tape deck control:
  with parallel remote control (REMOTE 1)

- Capstan servo control:
  with DC voltage, vnom ±12.5%

- Move pulse information:
  biphase signal 250 Hz at 48 kHz sampling frequency (linear to sampling frequency)

- Typical lockup time
  (from CUED condition, master start - SYNC) : < 2 sec
  (from CHASE 10*vnom, master start - SYNC) :

- Drop-in delay: 44 msec
  Drop-out delay: 6 msec

- TC compensation: 0 msec

3.2 List of functions

Tape deck functions:

- STOP
  PLAY, REC Nominal (internal reference PCM-3324) or ext. varispeed (TLS reference, ±12.5%)
  EDIT Identical to STOP
  FORW, REW Variwind speed with directional control signal, 0 ... vmx,
  SHTLF, SHTLR Identical to FORW, REW

- LOC, LOCREL
  Locate implemented in interface

- MUTE and REHEARSE
  These functions are not available on REMOTE 1. For an external user-specific circuit the TLS supplies one parallel control output each on the SLAVE CONTROL B connector (also refer to Section 3.3).

- EVENT RELAY
  Control of this relay is possible (see Section 3.3).

- CONDITIONAL COMMANDS
  Code-controlled initiation is possible for the following functions:
  Tape deck commands STOP .. SHTLR,
  Audio mute commands MUTEON .. RHRSOFF
  Relay control EVON, EVOFF

- STATUS INQUIRY
  The tape deck status of the PCM-3324 is read via the parallel interface. The sampling frequency is determined by measuring the move pulse frequency in PLAY mode.

- AUDIO channel remote control, TRANSPARENT commands, KEYBOARD DISABLE
  Not implemented

3.3 DIL switches

The following functions can be set with the DIL switch SZ81:

- Switch 1: Polarity of the RECEN signal (see Section 3.4)
  Record inhibit is achieved with
  OFF: active signal (LOW)
  ON: inactive signal (HIGH or open)

- Switch 2: Rehearse mode
  When the REHEARSE mode is enabled, the RECORD commands are
  OFF: suppressed
  ON: forwarded to the PCM-3324.

  The switch is set to the OFF position if no external REHEARSE circuit (controlled by the S-REHR signal on the SLAVE CONTROL B connector) is available for correct rehearse simulation. This prevents unintentional recording in PREVIEW edit mode.

- Switch 3: Synchronization mode
  After the differences have been eliminated in LOCK mode, the capstan is
  OFF: controlled by the PCM-3324
  ON: still controlled by the synchronizer.

  In normal PLAY mode (OFF) the PCM-3324 must run with the same reference as the master (e.g. video sync) !

  If the machine should always operate under control of the synchronizer (ON position), a VARYSYNC UNIT (VSU-3310) must be looped into the capstan control line (to the PHASE INPUT). Only in this way will a correct digital audio signal be available.

- All other switches are unused.

3.4 Supplementary functions on the SLAVE CONTROL B

- RECEN (pin 2):
  Record enable for hardware inhibition of the RECORD function. Depending on the setting of DIL switch 1, the inhibition is accomplished either with an active LOW or inactive HIGH signal.

- REL1 (pin 6), REL2 (pin 7):
  The relay contact REL1/REL2 can be used for any purpose. It is controlled with the EVON, EVOFF commands via the serial TLS interface.

- S-REHR (pin 15):
  Output (open collector, active = LOW) for controlling an external REHEARSE circuit. It is enabled when the rehearse function is activated (with RHRSON command).

- S-MUTE (pin 16):
  Output (open collector, active = LOW) for controlling an external MUTE circuit. It is enabled when the mute function is activated (with MUTEON command).

- MVCL (pin 21), MVDR (pin 24):
  The move pulse information (outputs, open collector) derived from the slave signals can be used for controlling the master tallies when the PCM-3324 functions as the master.
  MVDR: LOW = forward
  MVCL: The frequency at nominal play speed is 500 Hz or 459.375 Hz, depending on the scanning frequency (48 kHz or 44.1 kHz).

3.5 Pilot LEDs

Four LEDs are located on the interface front panel for status and error indication:

DL 1 2 3 4 (front view)

- After power on a brief self-test program is started. If a fault is detected the program stops and signals the error with a flashing LED (approx. 2 Hz).

  DL 1 2 3 4 (- LED dark, # LED flashes)

DL1	DL2	DL3	DL4	
-	#	-	-	RAM error detected
-	-	#	-	SSDA error detected (MC68A52)
-	-	-	#	Timer error detected (MC68A40)

- After a successful start the 4 LEDs are used as status indicators. If the first LED (DL1) is light, the synchronizer is not ready for operation. The two adjacent LEDs indicate the cause:

  DL 1 2 3 (- LED dark, * LED lit)

DL1	DL2	DL3	
*	*	*	No connection with synchronizer board
*	*	-	No connection with PCM-3324 (power fail)
*	-	*	Irregular state of the PCM - 3324
*	-	-	PCM-3324 signals TAPE OUT

- If the first LED switches off, the system is ready. The other LEDs indicate various operating states.

DL 1 2 3 4 (- LED dark, * LED lit)

DL1	DL2	DL3	DL4	
-	*			Request for automatic alignment of the capstan control voltage. This occurs during the next synchronizer-controlled PLAY phase by comparing the control reference with the momentary move pulse frequency.
-		*		Capstan control by synchronizer
-		-		PCM-3324
-			*	Measured sampling frequency: 44.1 kHz
-			-	48 kHz

3.6 Test points

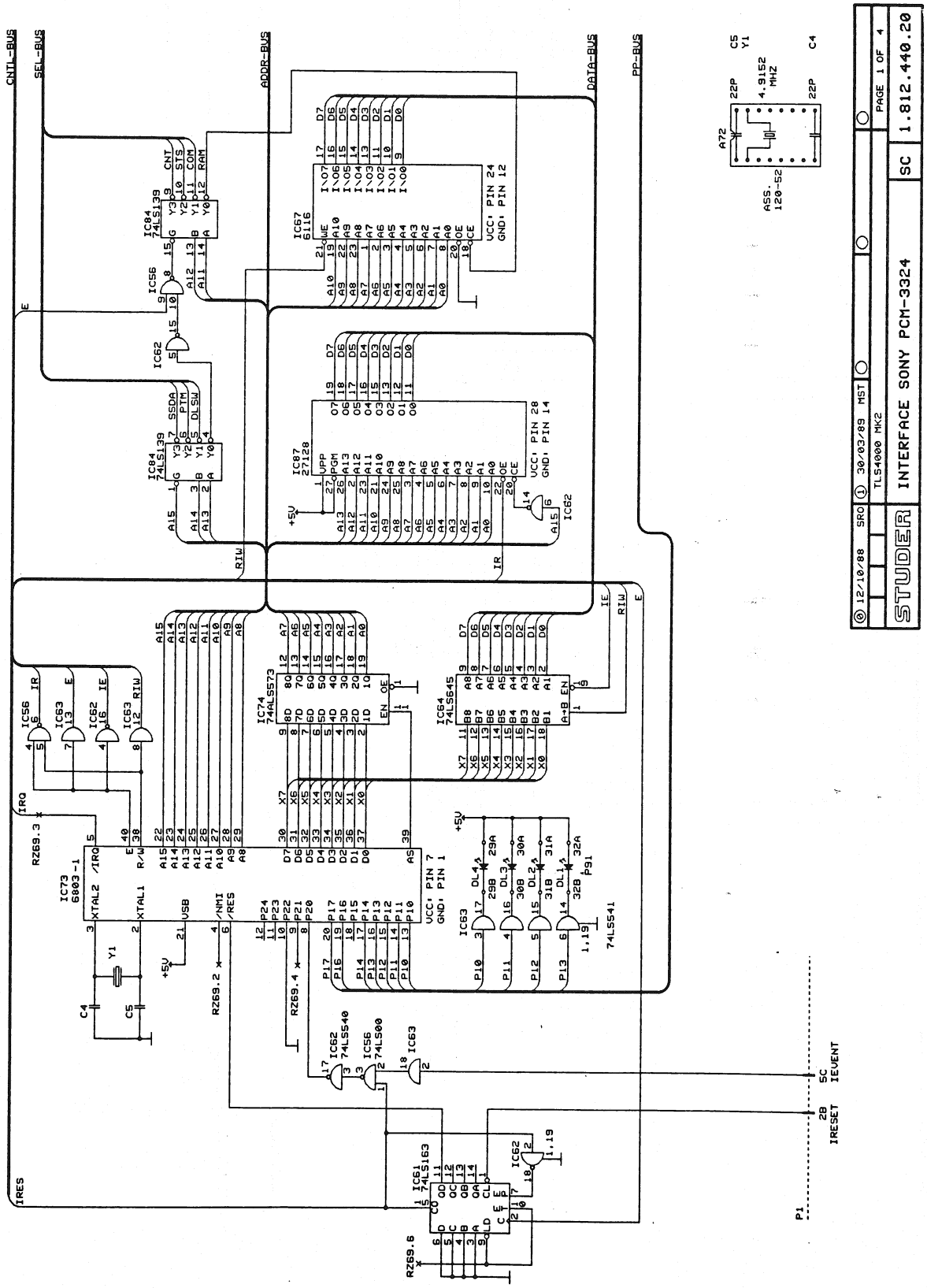
- None

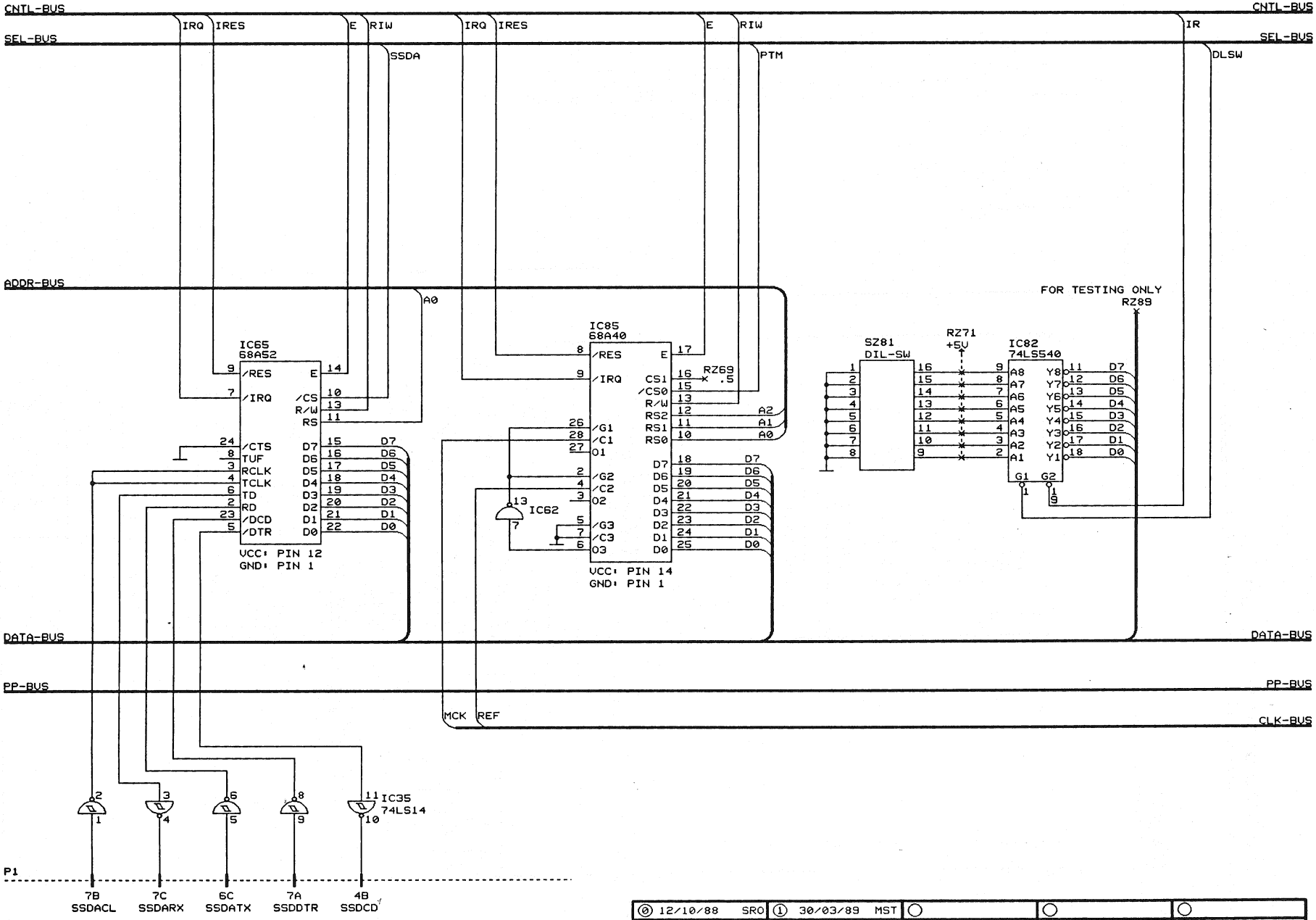
3.7 Application notes

- Move pulse frequency as master tallies (see 3.3)
- An additional remote control IF-3310 can be looped into the connection to the REMOTE 1 connector.

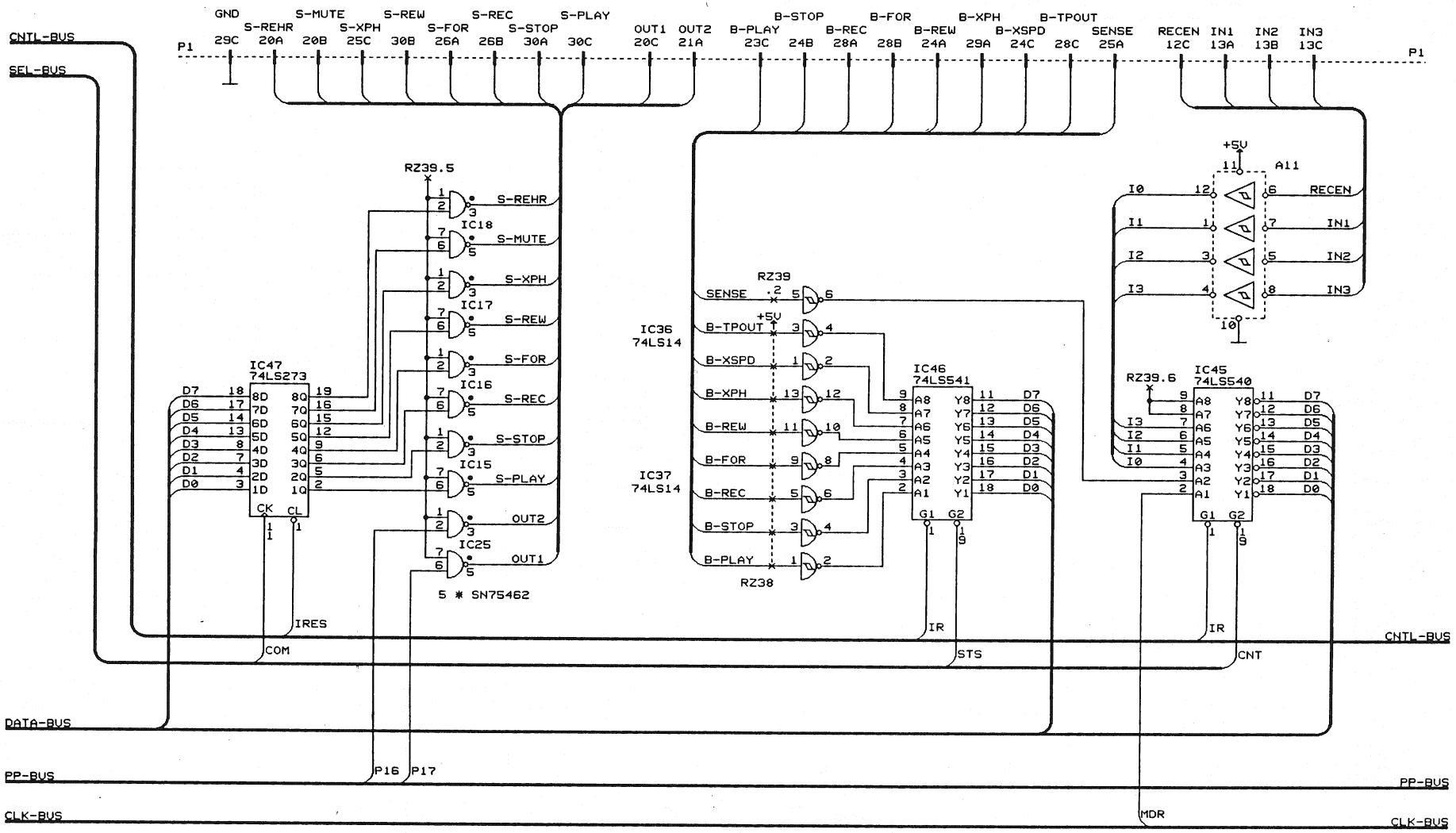
4 Service documentation

4.1 Diagrams





⓪ 12/10/88 SRO	① 30/03/89 MST				
	TLS4000 MK2				PAGE 2 OF 4
STUDER	INTERFACE SONY PCM-3324		SC	1.812.440.20	



⓪ 12/10/88 SRO	① 30/03/89 MST				
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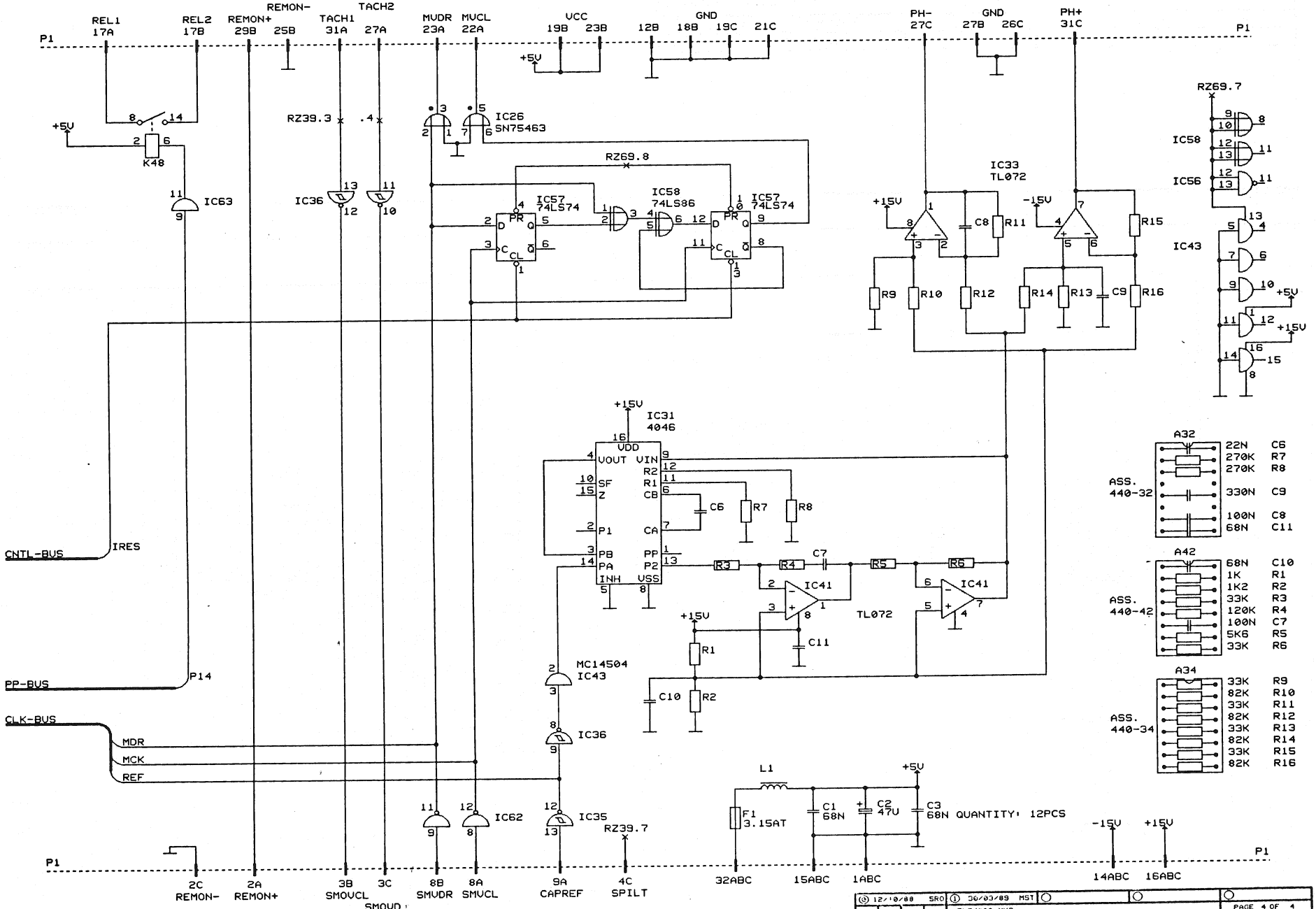
STUDER	INTERFACE SONY PCM-3324		SC	1.812.440.20	


P1
REL1 17A
REL2 17B
REMON+ 29B
REMON- 25B
TACH1 31A
TACH2 27A
MVDR 23A
MVCL 22A
VCC 19B 23B
GND 12B 18B 19C 21C
PH- 27C
GND 27B 26C
PH+ 31C
+5V
K48
IC63
IC36
RZ39.3
RZ39.4
IC26 SN75463
RZ69.8
IC57 74LS74
IC58 74LS86
IC33 TL072
+15V
-15V
R9 R10 R12 R14 R13 C9 R16
C8 R11 R15
RZ69.7
IC58
IC56
IC43
IC31 4046
VDD VOUT VIN SF Z P1 PB PA INH VSS R2 R1 CB CA PP P2
C6 R7 R8
R3 R4 C7 R5 R6
IC41 TL072
C11 R1 C10 R2
MC14504 IC43
IC36
IC62
IC35
RZ39.7
L1 F1 3.15AT C1 68N C2 47U C3 68N QUANTITY: 12PCS
CNTL-BUS IRES
PP-BUS P14
CLK-BUS MDR MCK REF
A32 ASS. 440-32 22N C6 270K R7 270K R8 330N C9 100N C8 68N C11
A42 ASS. 440-42 68N C10 1K R1 1K2 R2 33K R3 120K R4 100N C7 5K6 R5 33K R6
A34 ASS. 440-34 33K R9 82K R10 33K R11 82K R12 33K R13 82K R14 33K R15 82K R16
2C REMON- 2A REMON+ 3B SMOVCL 3C SMOVD 8B SMVDR 8A SMVCL 9A CAPREF 4C SPILT 32ABC 15ABC 1ABC 14ABC 16ABC
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SC
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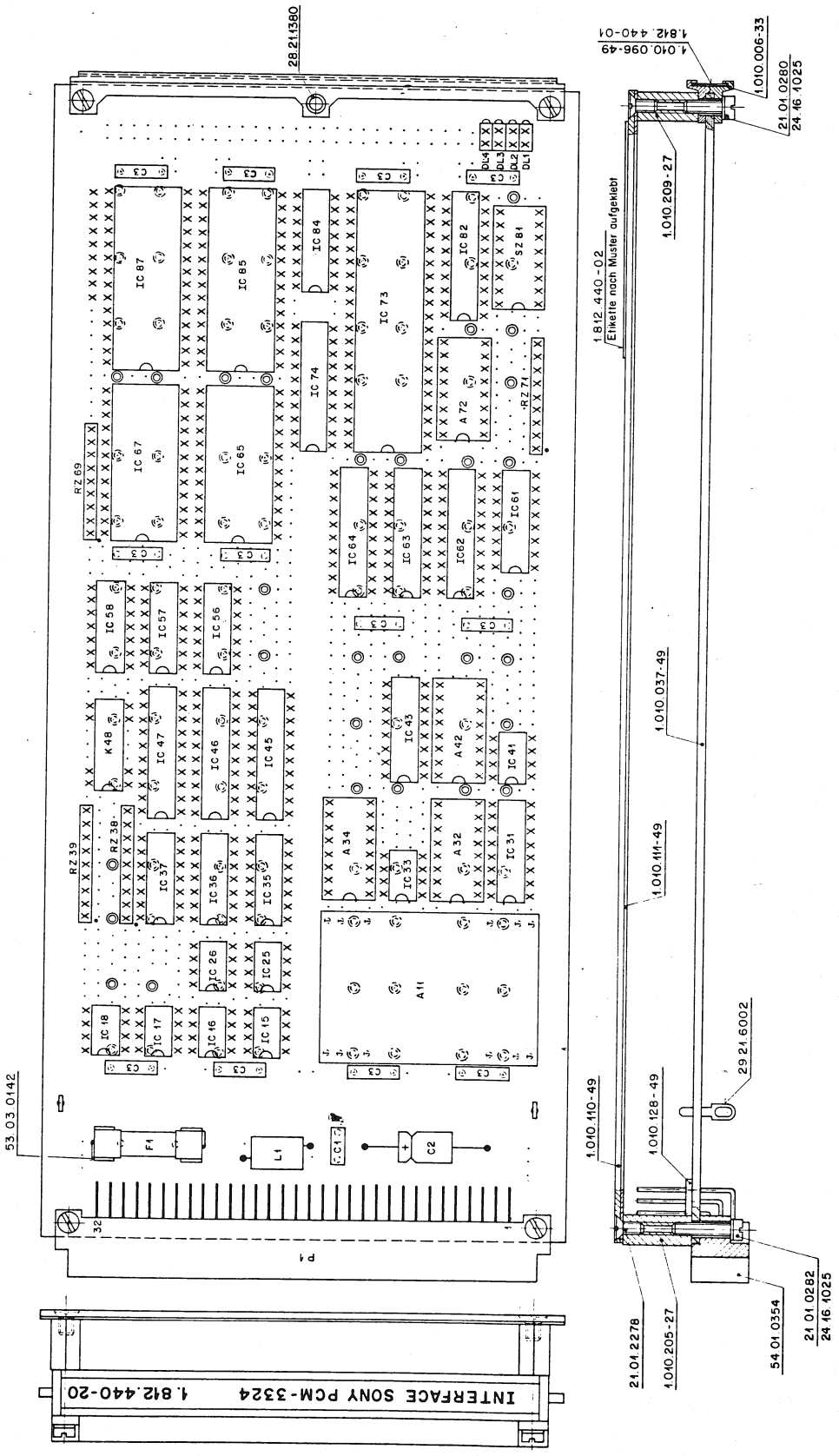
4.2 Component arrangement



4.3 Component position list

IF SONY PCM-3324 1.812.440.20

Ad	..POS..	...REF.No...		DESCRIPTION.....	MANUFACTURER
	A....32	1.812.233.00		Assembly 440-32	St
	A....34	1.812.234.00		Assembly 440-34	St
	A....42	1.812.235.00		Assembly 440-42	St
	A....72	1.812.201.00		Assembly 120-52	St
	A....11	1.812.250.00		Input Network	St
	C.....1	59.99.0205	68 nF	-20%, 63V , CER	
	C.....2	59.25.3470	47 uF	-20%, 16V , EL	
	C.....3	59.99.1200	68 nF	20%, 63V , PET Quantity: 12	
	DL....1	50.04.2107		LED red ,555-2007	Di
	DL....2	50.04.2107		LED red ,555-2007	Di
	DL....3	50.04.2107		LED red ,555-2007	Di
	DL....4	50.04.2107		LED red ,555-2007	Di
	F.....1	51.01.0122	3.15 AT	250V, 5 * 20	
	IC...15	50.05.0227		SN 75 462 JG, SN 75 472 P	
	IC...16	50.05.0227		SN 75 462 JG, SN 75 472 P	
	IC...17	50.05.0227		SN 75 462 JG, SN 75 472 P	
	IC...18	50.05.0227		SN 75 462 JG, SN 75 472 P	
	IC...25	50.05.0227		SN 75 462 JG, SN 75 472 P	
	IC...26	50.05.0203		SN 75 463 JG, DS 75 463	
	IC...31	50.07.0046		CD 4046 BE, MC 14046 BCP ,A	RCA,Mot
	IC...33	50.09.0101		TL 072 CP	TI
	IC...35	50.06.0014		SN 74 LS 14	
	IC...36	50.06.0014		SN 74 LS 14	
	IC...37	50.06.0014		SN 74 LS 14	
	IC...41	50.09.0101		TL 072 CP	TI
	IC...43	50.15.0103		MC 14504	
	IC...45	50.06.0540		SN 74 LS 540	
	IC...46	50.06.0541		SN 74 LS 541	
	IC...47	50.06.0273		SN 74 LS 273	
	IC...56	50.06.0000		SN 74 LS 00	
	IC...57	50.06.0074		SN 74 LS 74	
	IC...58	50.06.0086		SN 74 LS 86	
	IC...61	50.06.0163		SN 74 LS 163	
	IC...62	50.06.0540		SN 74 LS 540	
	IC...63	50.06.0541		SN 74 LS 541	
	IC...64	50.06.0645		SN 74 LS 645	
	IC...65	50.16.0114		MC 68A52 P ,A	
	IC...67	50.14.0107		HM 6116 LP-4,SRAM 2k x 8, 200nsec	
	IC...73	50.16.0107		MC 6803-1, HD 6803P-1 ,A	Mot,Hi
	IC...74	50.06.1573		SN 74 ALS 573	
	IC...82	50.06.0540		SN 74 LS 540	
	IC...84	50.06.0139		SN 74 LS 139	
	IC...85	50.16.0113		MC 68A40 P	
	IC...87	50.14.0125	see note	HM 4827128 G-25, EPROM 16K x 8, 300nsec	
	K....48	56.02.1003	5 V 1*A	100V/0.5A, Print	
	L.....1	62.01.0115		Wide Band HF-Choke	
	P.....1	54.01.0354		Card Connector 3 * 32 Euro Wrap	
	RZ...38	57.88.4332	8 * 3.3K	2%, Single Line	
	RZ...39	57.88.4332	8 * 3.3K	2%, Single Line	
	RZ...69	57.88.4332	8 * 3.3K	2%, Single Line	
	RZ...71	57.88.4332	8 * 3.3K	2%, Single Line	
	SZ...81	55.01.0168		8 * ON, DIL-Switch	

Notes : Software release 1.812.979.20 (IC 87)

The following elements are not inserted :
RZ 89

CER = Ceramic, EL = Electrolytic, PET = Met. Polyester

MANUFACTURERS : Di = Dialco
Hi = Hitachi
Mot = Motorola
RCA = RCA Corporation
St = Studer
TI = Texas Instruments

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4.4 Signal description, slave connector A

SLAVE CONTROL A:

Pin	Signal	Type	Description
1	B-PLAY	ttl in	PLAY status
2	B-REW	ttl in	REWIND status
3	B-STOP	ttl in	STOP status
4	B-XSPD	ttl in	EXT PLAY SPEED status
5	SENSE	ttl in	SLAVE AVAILABLE input (active high)
6	REMON-	dc in	remote power on: slave signal ground
7	S-XPH	oc out	EXT VARIPLAY command
8	S-FOR	oc out	FAST FORWARD command
9	S-REC	oc out	RECORD command
10	GND		signal ground
11	TACH2	log in	move sensor phase 2
12	GND		signal ground
13	PH-	dc out	EXT VARIPLAY control voltage (inverted)
14	B-REC	ttl in	RECORD status
15	B-FOR	ttl in	FAST FORWARD status
16	B-TPOUT	ttl in	TAPE OUT status
17	B-XPH	ttl in	EXT VARIPLAY status
18	REMON+	dc in	remote power on: slave supply voltage
19	GND		signal ground
20	S-STOP	oc out	STOP command
21	S-REW	oc out	REWIND command
22	S-PLAY	oc out	PLAY command
23	TACH1	ttl in	move sensor phase 1
24	-		
25	PH+	dc out	EXT VARIPLAY control voltage (non inverted)

- The capstan is controlled with a balanced DC voltage. The move pulse signal is a 2-phase logic signal (250 Hz)

signal types:	ttl in	LS-TTL input with internal pullup to 5V active low
	oc out	open collector output without internal pullup max 28V/0.3A
	dc in	analog input
	dc out	analog output

4.5 Slave connector B

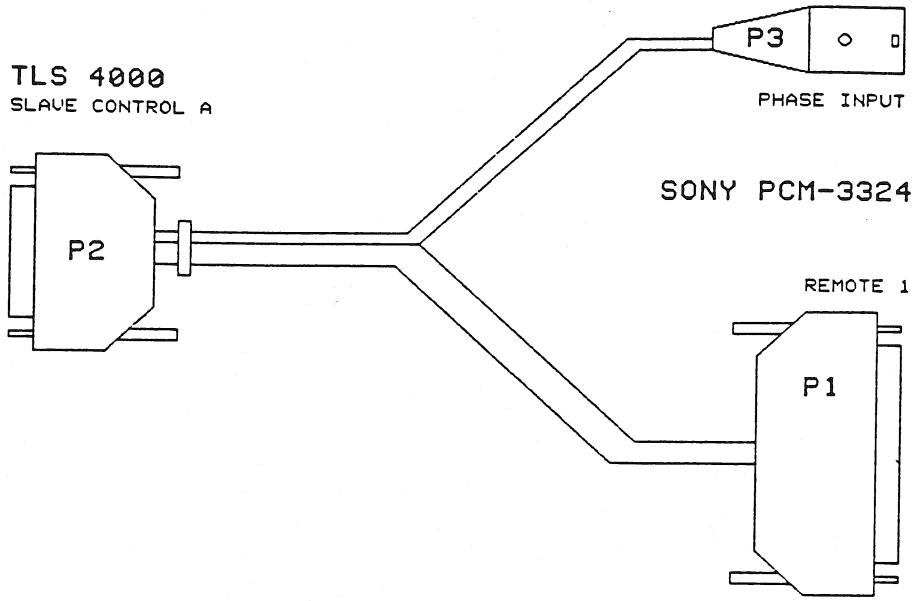
SLAVE CONTROL B:

Pin	Signal	Type	Description
1	GND		signal ground
2	RECEN	I inp	record enable/safe (see DIL switches)
3	IN1	I inp	unused input
4	IN2	I inp	unused input
5	IN3	I inp	unused input
6	REL1		relay contact 1 (100V/0.5A)
7	REL2		relay contact 2 (100V/0.5A)
8	-		
9	-		
10	GND		signal ground
11	-		
12	-		
13	VCC	supply	synchronizer power supply +5V
14	GND		signal ground
15	S-REHR	oc out	REHEARSE command output
16	S-MUTE	oc out	MUTE command output
17	OUT1	oc out	unused output
18	OUT2	oc out	unused output
19	-		
20	GND		signal ground
21	MVCL	oc out	MOVE clock (500Hz at 48kHz sampling rate)
22	-		
23	-		
24	MVDR	oc out	MOVE direction (LOW = forward)
25	VCC	supply	synchronizer power supply +5V

signal types:

I inp	logic input with internal pullup driven by switch, o.c. or active driver activ: < 1V inactive: 2..30V or open
oc out	open collector output without internal pullup max 28V/0.3A
supply	power supply voltage

4.6 IF cable (drawing, wiring list)



P2. 1	B-PLAY	P1. 1
2	B-REW	3
3	B-STOP	5
4	B-XSPD	8
5	SENSE	10
6	REMON-	25
7	S-XPH	30
8	S-FOR	34
9	S-REC	36
10	GND	26
11	TACH2	16
14	B-REC	2
15	B-FOR	4
16	B-TPOUT	7
17	B-XPH	9
18	REMON+	12
19	GND	29
20	S-STOP	33
21	S-REW	35
22	S-PLAY	37
23	TACH1	15

12		P3. 1
13	PH-	2
25	PH+	3
	SHIELD	

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STUDER	IF-KABEL SONY PCM-3324	5M		1.023.761.00