

AUDIO SYSTEMS

CD 60

Service Manual

CD60 SERVICE MANUAL ADDENDUM

The following service information has been identified since the issue of the CD60 service manual.

1) Transformer (On CD60 Ser. No. 1-420)

A transformer problem has been identified, which results in the unit blowing fuses within the first few days of use. This fault may be confirmed by measuring the resistance of the primary windings. With the **power off and the mains lead disconnected** and a working fuse fitted, the resistance measured across the Live and Neutral pins on the IEC Mains Inlet should be:

110-120V 17 Ohms +15% -8%

220-240V 68 Ohms +15% -8%

The value will, of course, vary slightly during measurement: due to the reactive nature of the component under test. Any significant variation from the above values will indicate a transformer fault. Please note that the fault is fail safe if the correct value of fuse is fitted. The transformer will not exceed its safe working temperature and mains voltages remain isolated from the secondaries.

If further investigation is required, the resistance of winding Yellow - White or Grey - Pink should read 34 Ohms +15% -8%. There should be an open circuit between the two primary windings. Contact Creek Service for a replacement transformer.

2) Secondary Voltages

This information was omitted from the Service Manual. RMS voltages are shown for the different nominal mains supplies supported by this equipment.

<u>Referenced to TP1 (0V):</u>		<u>(240/120V/100V)</u>	<u>(220/110V)</u>
Blue	B-E	13 Vrms	12 Vrms
Green	G-N	13 Vrms	12 Vrms
Red	R-D	22.5 Vrms	20.5 Vrms
Violet	V-T	22.5 Vrms	20.5 Vrms
Orange	O-E	2.1 Vrms	1.95 Vrms

3) MICROMEGA DACs (CD60 Ser No to 499)

Since the design of the CD60 it has been found that the Range of MicroMega D to A converters do not operate correctly when driven by the CD60. The CD60 has a high current capability driver which is designed to give high speed transitions on both leading and trailing edges. The output level is about 1.6Vp-p (unterminated) and 0.8Vp-p into a 75 ohm load. This level can be reduced, at the cost of some additional ringing on the waveform, to a level suitable for the MicroMega by changing R22 from 330R to 1K2. In addition it may be necessary to adjust the core in L1 for optimum results.

4) FUSE RATINGS

The fuse ratings defined from the CD60 are based on the IEC 127 standard. If replacing with UL198 or CSA C22.2 standard fuses (USA and Canada respectively), the equivalent fuse ratings are:

<u>IEC</u>	<u>UL/CSA</u>	
T500mA	T630mA "Slo-Blo"	(for 100/110/120Vac)
T250mA	T315mA "Slo-Blo"	(for 220/240Vac)

CD60

Service Manual

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- 2 Assembly and Faultfinding
- 3 Parts list
- 4 Circuit Diagrams and PCB layouts



**CLASS 1
LASER PRODUCT**

WARNING

Compliance with Safety Regulations require that this unit is restored to its original condition and that parts are used as specified in this document.

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<u>TECHNICAL SPECIFICATION</u>				
Frequency Response	20Hz-20kHz +/-0.1dB at -10dB			
	<u>16Hz</u>	<u>1kHz</u>	<u>16kHz</u>	<u>20kHz</u>
Channel Balance	0.1 dB	0.1 dB	0.1 dB	
Channel Separation	-111 dB	-101 dB	-76 dB	-74dB
THD vs level	0 dB	-78 dB	-80 dB	-79 dB
	-24 dB	-75 dB	-72 dB	-64 dB
	-60 dB	-41 dB	-46 dB	-32 dB
	-80 dB	-22 dB	-46 dB	
dithered	-90 dB	-12 dB		
Resolution	-60 dB	0.03 dB		
	-70 dB	-0.19 dB		
	-80 dB	-0.78 dB		
Deemphasis accuracy	-0.02 dB	+0.06 dB	-0.1 dB	
SNR (A-wtd) without emphasis		-112 dB		
with emphasis		-114 dB		
Output Impedance	180 Ohms			
Peak Output level	2.24Vrms			
H x W x D (max ext dimensions)	90 x 422 x 290 mm			
Weight	5.8 kg			
Laser Diode	wavelength	780nm +/-0.7 %		
	power out at diode	3mW (typ)		
	Output Power after objective lens	100uW		
Mains Voltage	220-240V setting	208 to 265V	at 50 to 60 Hz	Fuse T250mA
	110-120V setting	103 to 140V	at 50 to 60 Hz	Fuse T500mA
	100V (special transformer)	90 to 118V	at 50 to 60 Hz	Fuse T500mA

When the case of this unit is opened a mains voltage hazard exists. Appropriate precautions must be taken. Mains voltages ARE present on the PCB.



This unit contains Static Sensitive Devices. During handling of dissassembled parts ensure an anti static environment with a high resistance (safety) link to the bulk of the unit, or ground.



Compliance with Safety Regulations require that this unit is restored to its original condition and that parts used are as specified in this document.



WARNING:
DISCONNECT FROM MAINS
SUPPLY BEFORE ATTEMPT-
ING THIS CHANGE.

This is achieved by selecting the correct setting on SW2, located near to the power switch. The appropriate Fuse should then be fitted in order to ensure the safe operation of this unit

GUIDE TO UNIT DISASSEMBLY

Mechanism:-

Remove the lid (7 screws).

Remove the lead to the tray motor (on the side of the mechanism) at CN7 and push the drawer out by approximately 3cm. NOTE: The drawer should NOT be manually operated unless CN7 is disconnected as damage can be caused to the servo electronics.

Remove the front panel (3 screws on unit base).

Remove the drawer assembly completely from the mechanism. Remove the three screws now showing. Lift the assembly slightly and disconnect the ribbon cable (CN5) and the disc motor lead (CN6). The ribbon cable is removed by sliding the connector body upwards.

PCB:-

Remove the laser mechanism as above.

Remove the display PCB by removing 2 screws connecting the display to the main PCB. Disconnect the 2 ten way connectors.

Remove the 5 hex spacers (5mm nut driver).

Remove 2 screws from the main PCB plus 2 screws from the rear panel (digital and analog out).

Remove 2 screws from the mains inlet and the screw holding the transformer down. Remove the screw holding the earth tag on the rear panel.

The PCB will now lift from the base.

Note: The PCBs used in the CD60 have plated through holes. Damage must be avoided. For component removal ensure the component lead solder is properly re-flowed or removed before attempting to remove the component.

Note: Anti Static precautions must be observed when handling the PCBs or Laser assembly.

Assembly is the reverse of removal.

Ensure that the earth strap is correctly re-seated, with a shake proof washer between the chassis and the crimp terminal. Ensure the 2 mains inlet screws are refitted, as these provide an additional safety earth to the chassis. Ensure that the front panel is re-seated correctly, so that it does not foul the tray or switch assemblies.

General

Deemphasis: The Deemphasis relay, which selects the additional filter function, is operated every time the drawer opens or closes, in order to maintain the reliability of the contacts. Thus, with the case top removed, a distinct click should be heard during drawer operations (at the point at which the Tray Switch operates).

Reset: A power on reset is applied to the system. This lasts a minimum of 0.5s, after which time the mute relay will open and the display light. Note that the display LED will operate at all times provided the +5V supply is present: giving a visible indication of the Power-On state, even if the display is muted.

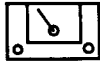
Digital Output: As a service operation, the output waveform can be 'fine tuned' to modify the rise/fall times of the waveform by tuning the core of L1. The level can be adjusted by modifying R22, although this changes the waveform shape. For instance, R22=1K2 will give an underdamped 0.5Vp-p signal into 75 Ohms while R22=330R gives a critically damped 0.8Vp-p signal which most, but not all, outboard DACs can cope with.

TEST GUIDE				Guide	?	Check	At
POWER ON LASER	?	Check	At	Deemphasis OK	NO:	DEEM	tp35 tp45
		Sc					
		Si/RD	tp19				
		LO	TP10				
		LM	TP9				
FOCUSSING							
RD present	NO:	D1	TP6			DAI	tp40
		D2	TP8			DAI	tp42
		D3	TP5			WSI	tp38
		D4	TP4			CLI	tp39
						EFAB	tp41
						MUTE	CN4-9
						ATSB	CN4-10
						XSYS	CN4-1
						SDAB	tp36
						SCAB	tp37
	YES:	FE	tp16				
		FElag	tp17				
DISC ROTATION STOPPED	NO:	MC	tp15 tp29			WSBD	IC12
						CLBD	IC12
						DABD	IC12
						IVleft	IC8-7
						IVrght	IC8-1
						AoutL	IC2-6
						AoutR	IC14-6
						Supplies to IC9	
	YES:	TL	tp13				
		REdig	tp20				
TRACKING OK	NO:	B0	tp24	REGULATED VOLTAGES		Decoupling Caps	
		B1	tp25			Regulators	
		B2	tp26				
		B3	tp27				
		REdig	tp20				
		Cosc 1	tp21				
		Cosc 2	tp22				
		RElag	R129				
		RAD +	ZD2				
		RAD -	ZD3				
JUMP TO TRACK	NO:	DODS	tp14	DISPLAY DIM		ZD4 or IC36	
		HFD	IC26	POWER OK but no Display and no normal Operation		RESET	IC7
SHOCK SENSITIVE		LENS	*				
		DISK					
		TL	tp13				
		HFin	IC26				
		IC30					
		IC32					
* LENS: Great care must be taken in cleaning the lens. Do not apply any force to the assembly. Do not use a spray as this can force dirt particles into the focus motor assembly.				IC7 pin2 must be above threshold voltage 2.5V. Note that serious mains spikes may result in a CD unit RESET. Pin2 provides for rapid turn off of the output mute relay, before loss of the power supplies becomes noticeable. Delay is typically < 50ms from interruption of mains supply.			
				In the case where a defect in the laser supply causes the destruction of the laser: requiring the replacement of the CDM4 unit, then a test circuit should be used in place of the laser assembly. Please contact Creek Audio Systems direct for information.			

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Test Information

<u>Laser Current Adjust</u>			(Meter Connection)
This procedure is required after any change to components in the laser assembly or circuit. Be aware that the pots are very sensitive			
power off	Adjust PR2 to read 1K Ohm +10% -0%	Ohms	TP1 (-) to TP9 (+)
power off	Adjust PR1 to mid position		
power on	Play disc. Adjust PR2 to read 50mV +/-4mV	Volts	TP3 (-) to TP2 (+)
power on	Play disc. Adjust PR1 to read +400mV +/-40mV	Volts	TP1 (-) to TP7 (+)

Test Point	Name	Test Description	Test at:															
13	TL	Intermittant groups of low pulses during search Square wave, T =200us during track change	IC27 pin37															
14	DODS	Low pulses during Track change	IC27 pin4															
15	MC	Disc not running: 50% duty T = 11us square wave During Play : 60% high T = 11us square wave	IC27 pin31															
16	FE	50mV 9Hz sine wave plus broadband noise	R102-R105															
17	FElag	200mV 9Hz sine wave with +250mV offset (offset derived from PR1)	R107															
18	FOC-	During Play : -400mV offset plus dither from [17] Going from stop to play gives a complex burst waveform	R110-R111															
19	Si/RD	During Play : High During Stop : Low	IC27 PIN5															
20	Redig	Stop : High Play : Square wave train, average T = 1.7ms	IC27 PIN34															
21/ 22	Cosc	Sine Wave 1.2Vp-p T = 1.7ms	C134 C155															
23		Stop or Play :2V When CD is nudged: Error voltage, returning to 2V	IC27 PIN11															
24/ 25/ 26/ 27	B0 B1 B2 B3	<table><tr><td><u>stop</u></td><td><u>play</u></td><td><u>track change</u></td></tr><tr><td>low</td><td>high</td><td>activity</td></tr><tr><td>high</td><td>high</td><td>activity</td></tr><tr><td>high</td><td>high</td><td>activity</td></tr><tr><td>high</td><td>low</td><td>activity</td></tr></table>	<u>stop</u>	<u>play</u>	<u>track change</u>	low	high	activity	high	high	activity	high	high	activity	high	low	activity	IC27 PIN10 IC27 PIN9 IC27 PIN8 IC27 PIN7
<u>stop</u>	<u>play</u>	<u>track change</u>																
low	high	activity																
high	high	activity																
high	high	activity																
high	low	activity																
28	XTAL	Approx. sine wave, centred at +2.5V T = 250ns	IC27 PIN38															
29	DISC	12cm disc: low 8cm disc: high	IC27 PIN35															
30	SPIN	low frequency (< 10Hz), 400mVp-p with DC offset Offset= -1V at disc start. =-0.6V at disc end	D16-D17															
31		Eye Pattern biased around +2V (overlapping 'sine' waves of different amplitudes forming a hatched pattern)	R69															

32		Stop: High Play: Low going data in bursts burst is < 10ms long every 27ms	IC27 PIN14
33		Stop: High Play: low going data in bursts (as [32])	IC27 PIN13
34		Stop: High Play: low going data in bursts (as [32])	IC27 PIN12
35	DEEM	High when recording uses De-emphasis	CN4 PIN2
36	SDAB	Low with high going data bursts	CN4 PIN3
37	SCAB	Stop: Low with high going data bursts (repeat time = 60us) Play: Low with high going data bursts (repeat time = 136us)	CN4 PIN4
38	WSI	44.1kHz square wave	CN4 PIN8
39	CLI	(44.1 x 64) kHz square wave	CN4 PIN7
40	DAI	Data stream. Activity during play	CN4 PIN6
41	EFAB	Stop: High Play: Low unless error is detected in data	CN4 PIN5
42		Data Stream after inversion. May be observable on an oscilloscope when Phase is switched.	IC19 PIN6
43		Active only when Dig Out is enabled, otherwise nothing	IC6 PIN9
44		Digital output Approx. 1.6Vp-p unterminated signal 0.6Vp-p terminated into 75 ohm load	DIG OUT
45		Deemphasis relay drive signal. Logic High when DEEM is high. Will change state momentarily when the drawer is opened, at the start and end of the drawer travel.	IC19 PIN3

Test Voltages

With Negative probe to TP1, Test the following points (as marked on the PCB:- grid locations can be found in the parts list) with a high input impedance voltmeter:

Name	Nominal	Range
+24V	24	23 > 25
-24V	24	23 > 25
+12V	12	11.5 > 12.5
+12v	12	11.5 > 12.5
-12V	-12	-11.5 > 12.5
+5V	5.2	5.0 > 5.2
+5A	5.2	5.0 > 5.25
+5B	5.2	5.0 > 5.25
+10V	10.5	10 > 11
-10V	-10.5	-10 > -11
-6V	6	5.8 > 6.2
-5V	-5.2	-5.05 > -5.25
-15V	-14.1	-14 > -15.2
+15A	14	13 > 15
-15A	-14	-13 > -15
+21V	18.7	18.2 > 19.2

(from IC28)

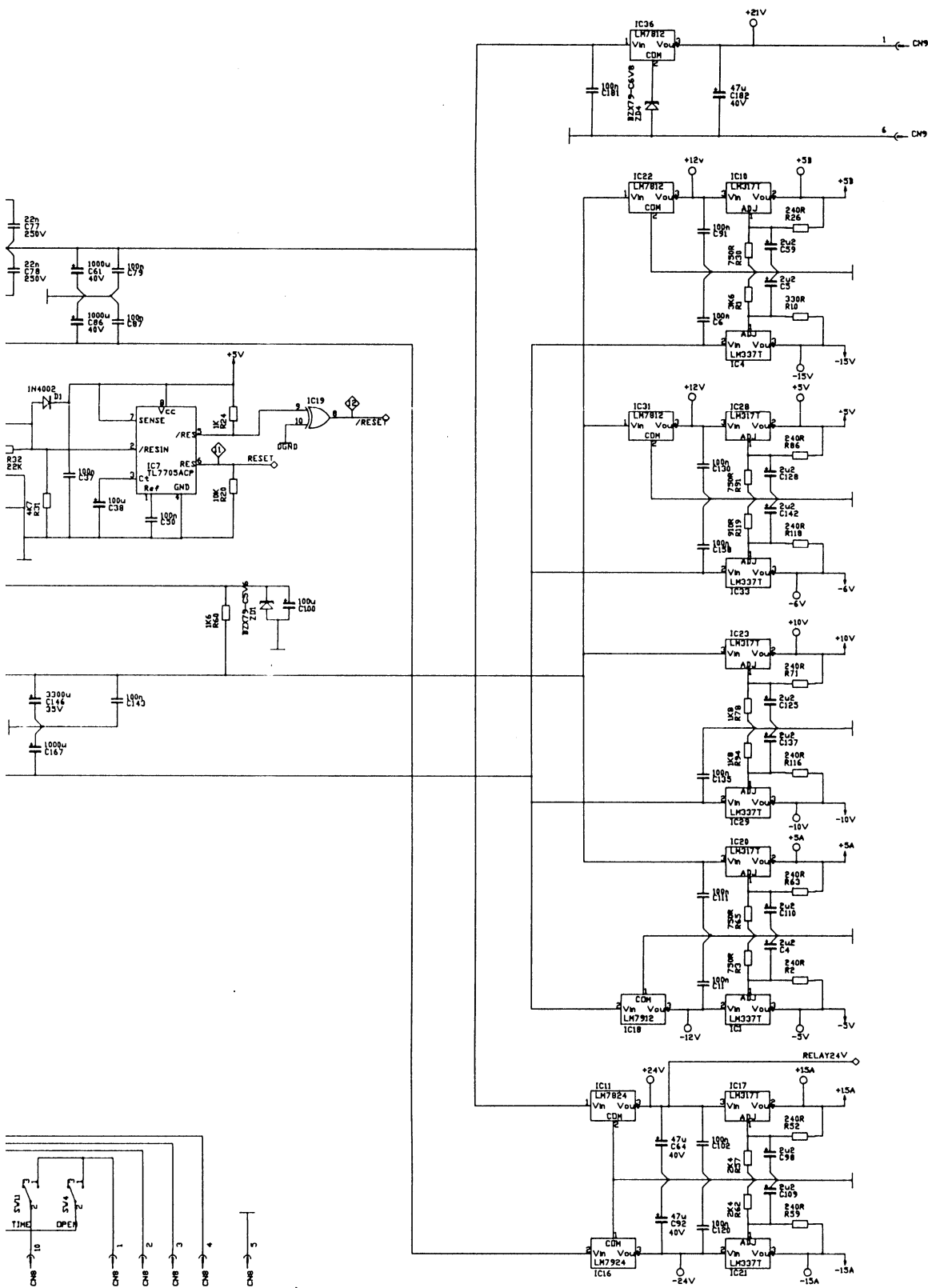
(from IC10)

Ref	Creek code	Desc	@PCB	@CCT	Ref	Creek code	Desc	@PCB	@CCT
C1	2767 6044	150u,40V	2,12	3 - 8B	C76	2767 6011	100u,25V	2,9	3 - 7D
C2	2601 0051	100n	3,12	3 - 8B	C77	2601 0084	22n,250V	16,9	1 - 4B
C3	2767 6011	100u,25V	3,12	3 - 7B	C78	2601 0084	22n,250V	17,9	1 - 4B
C4	2759 0380	2u2,25V	9,12	1 - 7E	C79	2601 0051	100n	15,9	1 - 4B
C5	2759 0380	2u2,25V	11,12	1 - 7B	C80	2601 0051	100n	0,9	3 - 8D
C6	2601 0051	100n	11,12	1 - 6B	C81	2601 0064	22n,100V	2,9	3 - 7D
C7	2606 0776	1n,1%	5,12	2 - 6C	C82	2606 0776	1n,1%	4,8	3 - 7C
C8	2767 6011	100u,25V	5,12	3 - 6B	C83	2606 0777	1500p,1%	4,8	3 - 7D
C9	2767 6011	100u,25V	14,12	3 - 1E	C84	2601 0084	22n,250V	16,8	1 - 4B
C10	2601 0064	22n,100V	3,12	3 - 7B	C85	2601 0084	22n,250V	17,8	1 - 4B
C11	2601 0051	100n	9,12	1 - 6E	C86	2767 6003	1000u,35V	17,8	1 - 4B
C12	2601 0064	22n,100V	5,11	3 - 6C	C87	2601 0051	100n	15,8	1 - 4B
C13	2759 6004	47p	15,11	1 - 3E	C88	2606 0776	1n,1%	5,8	3 - 7D
C14	2767 6044	150u,40V	0,9	3 - 8D	C89	2606 0776	1n,1%	5,8	3 - 6E
C15	2601 0070	1n,10%	1,11	3 - 8B	C90	2601 0064	22n,100V	6,8	3 - 6E
C16	2601 0070	1n,10%	1,11	3 - 8D	C91	2601 0051	100n	12,8	1 - 6B
C17	2767 6011	100u,25V	7,11	3 - 5D	C92	2767 6026	47u,50V	15,8	1 - 6E
C18	2601 0051	100n	14,11	3 - 1E	C93	2601 0064	22n,100V	3,8	3 - 7D
C19	2601 0064	22n,100V	15,11	3 - 4F	C94	2767 6011	100u,25V	6,8	3 - 6E
C20	2601 0064	22n,100V	4,11	3 - 7B	C95	2759 6004	47p	14,8	3 - 3D
C21	2606 0804	220n	9,11	3 - 4C	C96	2759 6004	47p	14,8	3 - 3D
C22	2606 0804	220n	9,11	3 - 4C	C97	2767 6011	100u,25V	3,8	3 - 7D
C23	2606 0804	220n	10,11	3 - 4C	C98	2759 0380	2u2,25V	8,8	1 - 7E
C24	2606 0804	220n	10,11	3 - 4C	C99	2601 0051	100n	10,8	3 - 1E
C25	2606 0804	220n	10,11	3 - 4C	C100	2767 6011	100u,25V	13,8	1 - 5C
C26	2606 0804	220n	10,11	3 - 4C	C101	2606 0804	220n	11,7	3 - 1C
C27	2606 0804	220n	11,11	3 - 3C	C102	2601 0051	100n	8,7	1 - 6E
C28	2767 6011	100u,25V	4,11	3 - 7B	C103	2601 0055	470n	9,7	2 - 6E
C29	2606 0776	1n,1%	7,11	3 - 5B	C104	2767 6011	100u,25V	9,7	2 - 6C
C30	2606 0776	1n,1%	4,11	3 - 7A	C105	2759 0380	2u2,25V	8,7	2 - 5D
C31	2606 0777	1500p,1%	4,11	3 - 7A	C106	2601 0064	22n,100V	9,7	2 - 5D
C32	2606 0776	1n,1%	4,11	3 - 7B	C107	2601 0064	22n,100V	9,7	2 - 6C
C33	2601 0064	22n,100V	11,10	3 - 3D	C108	2759 6004	47p	10,6	2 - 5E
C34	2767 6011	100u,25V	11,10	3 - 3D	C109	2759 0380	2u2,25V	8,6	1 - 7E
C35	0000 0000	not fitted	8,10	3 - 5C	C110	2759 0380	2u2,25V	13,7	1 - 7E
C36	2767 6011	100u,25V	8,10	3 - 3D	C111	2606 0804	220n	13,7	1 - 6D
C37	2601 0051	100n	15,10	1 - 4C	C112	2601 0072	2n2	10,6	2 - 6D
C38	2767 6011	100u,25V	17,10	1 - 4C	C113	2601 0062	10n	2,6	2 - 2C
C39	2767 6024	10u,50V	17,10	1 - 4C	C114	2601 0055	470n	3,6	2 - 2E
C40	2606 0776	1n,1%	5,10	3 - 6C	C115	2601 0066	47n	4,6	2 - 2E
C41	2601 0064	22n,100V	5,10	3 - 6C	C116	2601 0070	1n,10%	4,6	2 - 3D
C42	2767 6035	22u,63V	6,10	3 - 5B	C117	2759 6008	100p	5,6	2 - 3E
C43	2601 0064	22n,100V	6,10	3 - 5B	C118	2601 0064	22n,100V	1,6	2 - 1C
C44	2601 0064	22n,100V	7,10	3 - 5D	C119	2601 0064	22n,100V	3,6	2 - 2C
C45	2601 0064	22n,100V	9,10	3 - 3D	C120	2601 0051	100n	7,6	1 - 6E
C46	2601 0064	22n,100V	14,10	3 - 4E	C121	2759 6002	33p	9,6	2 - 7E
C47	2601 0066	47n	15,10	3 - 4E	C122	2606 0804	220n	5,6	2 - 2E
C48	2767 6011	100u,25V	6,10	3 - 6C	C123	2767 6035	22u,63V	2,6	2 - 2D
C49	2601 0064	22n,100V	8,10	3 - 5E	C124	2759 6023	470p	1,6	2 - 2C
C50	2601 0051	100n	16,10	1 - 5C	C125	2759 0380	2u2,25V	13,6	1 - 7C
C51	0000 0000	not fitted	8,10	3 - 5E	C126	2767 6011	100u,25V	12,5	2 - 5B
C52	2759 6023	470p	11,10	3 - 4D	C127	2601 0064	22n,100V	11,5	2 - 5B
C53	2601 0066	47n	14,10	3 - 4F	C128	2759 0380	2u2,25V	13,5	1 - 7C
C54	2601 0071	1.5n,10%	17,10	1 - 4B	C129	2759 6012	220p	1,5	2 - 1D
C55	2767 6011	100u,25V	8,10	3 - 3D	C130	2601 0051	100n	15,5	1 - 6C
C56	2601 0064	22n,100V	9,10	3 - 3D	C131	2601 0064	22n,100V	4,4	2 - 3E
C57	2767 6011	100u,25V	5,9	3 - 6D	C132	2601 0056	680n	1,4	2 - 5C
C58	2606 0776	1n,1%	6,10	3 - 6E	C133	2601 0051	100n	2,4	2 - 5C
C59	2759 0380	2u2,25V	11,10	1 - 7B	C134	2606 0750	8n2	7,3	2 - 4D
C60	2606 0776	1n,1%	7,10	3 - 5D	C135	2601 0051	100n	13,4	1 - 6D
C61	2767 6003	1000u,35V	16,9	1 - 4B	C136	2601 0064	22n,100V	8,4	2 - 6E
C62	2601 0064	22n,100V	12,9	3 - 1D	C137	2759 0380	2u2,25V	14,4	1 - 7D
C63	2759 6004	47p	13,9	3 - 2D	C138	2767 6011	100u,25V	8,4	2 - 6E
C64	2767 6026	47u,50V	15,9	1 - 6E	C139	2767 6011	100u,25V	1,4	2 - 4E
C65	2601 0064	22n,100V	5,9	3 - 6E	C140	2601 0064	22n,100V	1,4	2 - 4E
C66	2601 0064	22n,100V	8,9	3 - 5D	C141	2767 6011	100u,25V	6,3	2 - 3C
C67	2767 6011	100u,25V	8,9	3 - 5E	C142	2759 0380	2u2,25V	14,4	1 - 7C
C68	2606 0804	220n	9,9	3 - 3D	C143	2601 0051	100n	15,3	1 - 4C
C69	2606 0804	220n	10,9	3 - 4D	C144	2601 0060	4n7	1,3	2 - 3E
C70	2606 0804	220n	10,9	3 - 4D	C145	2601 0065	33n	5,3	2 - 3C
C71	2606 0804	220n	10,9	3 - 4D	C146	2753 0200	3300u,35V	16,3	1 - 4C
C72	2606 0804	220n	10,9	3 - 4D	C147	2601 0072	2n2	4,3	2 - 2C
C73	2606 0804	220n	11,9	3 - 4D	C148	2601 0065	33n	5,3	2 - 3C
C74	2606 0804	220n	11,9	3 - 4D	C149	2767 6011	100u,25V	1,3	2 - 4E
C75	2767 6035	22u,63V	7,9	3 - 5D	C150	2601 0064	22n,100V	1,3	2 - 4E

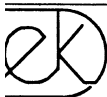
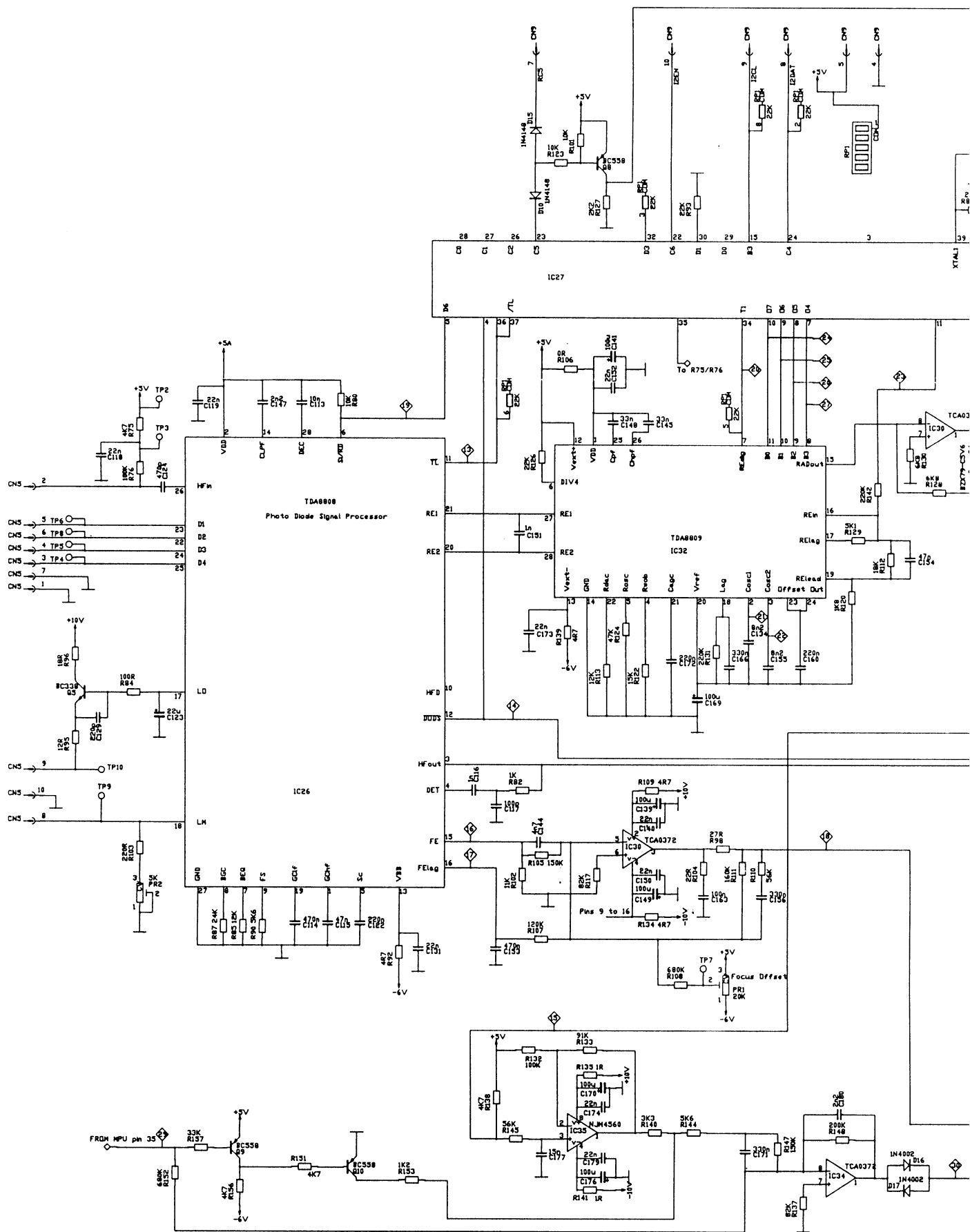
Ref	Creek code	Desc	@PCB	@CCT	Ref	Creek code	Desc	@PCB	@CCT
C151	2601 0070	1n,10%	5,3	2 - 3C	IC11	3723 0035	LM7824	15,9	1 - 6E
C152	2601 0064	22n,100V	6,3	2 - 3C	IC12	6561 0031p	SAA7220	13,9	3 - 2C
C153	2601 0055	470n	3,3	2 - 3E	IC13	3723 6001	OPA2604	5,9	3 - 6E
C154	2601 0066	47n	4,3	2 - 5C					3 - 7D
C155	2606 0750	8n2	7,3	2 - 4D	IC14	3723 0033	NE5534AN	2,8	3 - 7D
C156	2601 0054	330n	1,3	2 - 4E	IC15	3723 0040	LM78L05	7,8	3 - 5D
C157	2601 0084	22n,250V	15,3	1 - 4C	IC16	3723 0037	LM7924	15,8	1 - 6F
C158	2601 0051	100n	14,3	1 - 6C	IC17	3723 0038	LM317T	8,8	1 - 7E
C159	2601 0084	22n,250V	14,3	1 - 4C	IC18	3723 0036	LM7912	15,8	1 - 6E
C160	2606 0804	220n	4,2	2 - 4D	IC19	3723 0031	74HCT86	10,7	3 - 1C
C161	2601 0084	22n,250V	15,2	1 - 3C					3 - 3F
C162	2601 0084	22n,250V	15,2	1 - 3C					3 - 6D
C163	2601 0051	100n	0,2	2 - 4E					1 - 5B
C164	2601 0064	22n,100V	2,2	2 - 6B	IC20	3723 0038	LM317T	13,7	1 - 7D
C165	2767 6011	100u,25V	3,2	2 - 6B	IC21	3723 0039	LM337T	8,7	1 - 7F
C166	2601 0054	330n	5,2	2 - 4D	IC22	3723 0041	LM340T-12	14,7	1 - 6B
C167	2767 6003	1000u,35V	16,2	1 - 4D	IC23	3723 0038	LM317T	13,6	1 - 7C
C168	2767 6011	100u,25V	1,2	2 - 6A	IC24	6561 0021pk	SAA7310	10,5	2 - 6D
C169	2767 6011	100u,25V	5,2	2 - 4D	IC25	6561 0032pk	MN4264	8,5	2 - 6E
C170	2767 6011	100u,25V	10,2	2 - 3F	IC26	6561 0018pk	TDA8808	4,5	2 - 2C
C171	2601 0054	330n	3,2	2 - 4F	IC27	6561 0020pk	XC409032P	10,5	2 - 3B
C172	2606 0804	220n	4,2	2 - 4D	IC28	3723 0038	LM317T	14,5	1 - 7B
C173	2601 0064	22n,100V	6,2	2 - 3D	IC29	3723 0039	LM337T	13,4	1 - 7B
C174	2601 0064	22n,100V	10,2	2 - 3F	IC30	6561 0022pk	TCA0372	2,4	2 - 3E
C175	2601 0064	22n,100V	1,2	2 - 6B	IC31	3723 0041	LM340T-12	15,3	1 - 6B
C176	2767 6011	100u,25V	8,1	2 - 3F	IC32	6561 0019pk	TDA8809	6,3	2 - 4C
C177	2601 0063	15n	9,2	2 - 3F	IC33	3723 0039	LM337T	13,3	1 - 7C
C178	2606 0760	3n3,2000V	19,1	1 - 1B	IC34	6561 0022pk	TCA0372	2,1	2 - 4F
C179	2601 0064	22n,100V	8,1	2 - 3F	IC35	6561 0023pk	NJM4560	9,2	2 - 3F
C180	2601 0072	2n2	2,1	2 - 4F	IC36	3723 0041	LM340T-12	14,1	1 - 6A
C181	2601 0051	100n	14,1	1 - 6A	L1	6561 0029pk	Dig_Trans	14,11	3 - 4E
C182	2767 6026	47u,50V	14,1	1 - 6A	PR1	2362 0008	20K pot	0,5	2 - 4E
C183	2601 0051	100n	2,0	2 - 7B	PR2	2362 0006	5K pot	0,3	2 - 1E
CN1	3422 0004	Audio Out	1,12	3 - 8B	Q1	3630 0045	ZTX453	1,11	3 - 8C
CN2	3422 0003	Digital Out	14,12	3 - 4E	Q2	3630 0045	ZTX453	3,9	3 - 6D
CN3	3432 0020	Mains In	16,12	1 - 1B	Q3	3630 0046	BF550	10,7	2 - 6D
CN4	0000 0000	not fitted	11,7	2 - 7D	Q4	3630 2042	BC548	10,5	2 - 5B
CN5	6561 0028pk	Zif 14w	1,5	2 - 1C	Q5	3630 2043	BC338	1,5	2 - 1D
CN6	6561 0003pk	Stocko-3W black	6,2	2 - 5F	Q6	3630 2042	BC548	10,4	2 - 6C
CN7	6561 0004pk	Stocko-3W grey	8,2	2 - 7B	Q7	3630 2042	BC548	10,3	2 - 7B
CN8	3443 0016	10w PCB Header	13,1	1 - 3F	Q8	3630 2044	BC558	12,3	2 - 3B
CN9	3443 0016	10w PCB Header	15,1	1 - 3A	Q9	3630 2044	BC558	5,0	2 - 2F
D1	3643 0701	1N4002	15,10	1 - 4B	Q10	3630 2044	BC558	6,0	2 - 2F
D2	3643 0702	1N4003	1,10	3 - 8C	R1	2069 6076	3K6,1%	11,11	1 - 7B
D3	3643 0701	1N4002	17,9	1 - 3C	R2	2069 6047	240R,1%	8,12	1 - 7E
D4	3643 0702	1N4003	3,9	3 - 6D	R3	2069 6060	750R,1%	9,12	1 - 7D
D5	3643 0701	1N4002	16,9	1 - 3C	R4	2069 6094	20K,1%	3,11	3 - 7B
D6	3643 0701	1N4002	16,9	1 - 4B	R5	2069 6077	3K9,1%	5,12	3 - 6B
D7	3643 0701	1N4002	17,9	1 - 4B	R6	2069 6076	3K6,1%	6,11	3 - 6C
D8	3643 0701	1N4002	16,9	1 - 4B	R7	2069 6076	3K6,1%	4,11	3 - 7A
D9	3643 0701	1N4002	16,9	1 - 4B	R8	2069 6016	12R,1%	4,11	3 - 7A
D10	3643 0340	1N4148	12,2	2 - 3B	R9	2069 6077	3K9,1%	6,11	3 - 5B
D11	3643 0701	1N4002	14,3	1 - 4C	R10	2069 6050	330R,1%	11,11	1 - 7B
D12	3643 0701	1N4002	16,3	1 - 4C	R11	2069 6038	100R,1%	15,11	1 - 3E
D13	3643 0701	1N4002	15,3	1 - 4C	R12	2069 6050	330R,1%	8,11	3 - 5C
D14	3643 0701	1N4002	15,2	1 - 4C	R13	2069 6045	200R,1%	1,11	3 - 8B
D15	3643 0340	1N4148	12,2	2 - 3B	R14	2069 6045	200R,1%	1,11	3 - 8D
D16	3643 0701	1N4002	3,2	2 - 5F	R15	2069 6084	7K5,1%	3,11	3 - 7B
D17	3643 0701	1N4002	4,1	2 - 5F	R16	2069 6077	3K9,1%	5,11	3 - 6B
F1	3461 0719	T250mA (220V)	18,11	1 - 1B	R17	2069 6065	1K2,1%	7,11	3 - 5C
F1	3461 0722	T500mA (110V)	18,11	1 - 1B	R18	2069 6077	3K9,1%	7,11	3 - 6B
F1	3469 0022	Fuse Holder	18,11	1 - 1B	R19	2069 6063	1K,1%	8,11	3 - 3D
F1	3469 0023	Fuse Cover	18,11	1 - 1B	R20	2069 6087	10K,1%	15,11	1 - 5C
IC1	3723 0039	LM337T	9,12	1 - 7E	R21	2069 6072	2K4,1%	5,11	3 - 7B
IC2	3723 0033	NE5534AN	3,11	3 - 7B	R22	2069 6065	1K2,1%	14,10	3 - 3E
IC3	3723 0040	LM78L05	6,11	3 - 5B	R23	2069 6059	680R,1%	14,11	3 - 4E
IC4	3723 0039	LM337T	11,11	1 - 7B	R24	2069 6063	1K,1%	16,11	1 - 5B
IC5	3723 6001	OPA2604	5,11	3 - 6C	R25	2069 6054	470R,1%	7,10	3 - 5B
				3 - 7B	R26	2069 6047	240R,1%	12,10	1 - 7B
IC6	3723 0032	74HCT365	13,11	3 - 3E	R27	0000 0000	not fitted	3,10	3 - 7B
IC7	3723 0034	TL7705ACP	16,10	1 - 5C	R28	2069 6054	470R,1%	7,10	3 - 5D
IC8	3723 6001	OPA2604	7,10	3 - 5E	R29	2069 6079	4K7,1%	16,10	1 - 4C
				3 - 5C	R30	2069 6060	750R,1%	11,9	1 - 7B
IC9	6561 0030pk	TDA1541 S1	9,10	3 - 4C	R31	2069 6079	4K7,1%	15,10	1 - 4C
IC10	3723 0038	LM317T	12,9	1 - 7B	R32	2069 6095	22K,1%	16,10	1 - 4C

Ref	Creek code	Desc	@PCB	@CCT	Ref	Creek code	Desc	@PCB	@CCT
R33	2069 6050	330R,1%	8,10	3 - 5E	R108	2069 6131	680K,1%	0,3	2 - 4E
R34	2069 6087	10K,1%	2,9	3 - 8B	R109	2069 6007	4R7,1%	0,4	2 - 4D
R35	2069 6076	3K6,1%	6,9	3 - 6E	R110	2069 6105	56K,1%	2,3	2 - 4E
R36	2069 6077	3K9,1%	7,9	3 - 6D	R111	2069 6116	160K,1%	2,3	2 - 4E
R37	2069 6077	3K9,1%	5,9	3 - 6D	R112	2069 6093	18K,1%	4,3	2 - 4C
R38	2069 6065	1K2,1%	7,9	3 - 5E	R113	2069 6089	12K,1%	5,3	2 - 3D
R39	2069 6077	3K9,1%	6,8	3 - 5D	R114	2069 6140	ZEROHM	8,3	2 - 6E
R40	0000 0000	not fitted	3,9	3 - 7D	R115	2069 6079	4K7,1%	10,3	2 - 6B
R41	2069 6063	1K,1%	1,9	3 - 7C	R116	2069 6047	240R,1%	13,3	1 - 7D
R42	2069 6079	4K7,1%	1,9	3 - 8C	R117	2069 6109	82K,1%	1,3	2 - 3E
R43	2069 6094	20K,1%	2,8	3 - 7D	R118	2069 6047	240R,1%	14,3	1 - 7C
R44	2069 6077	3K9,1%	5,9	3 - 6D	R119	2069 6062	910R,1%	14,3	1 - 7C
R45	2069 6076	3K6,1%	3,8	3 - 7C	R120	2069 6069	1K8,1%	4,2	2 - 4D
R46	2069 6072	2K4,1%	6,8	3 - 7D	R121	2069 6084	7K5,1%	10,2	2 - 6C
R47	2069 6063	1K,1%	9,8	3 - 6D	R122	2069 6091	15K,1%	6,2	2 - 3D
R48	2069 6016	12R,1%	3,8	3 - 7D	R123	2069 6087	10K,1%	12,2	2 - 3B
R49	2069 6063	1K,1%	14,8	3 - 2D	R124	2069 6103	47K,1%	6,2	2 - 3D
R50	2069 6119	220K,1%	14,8	3 - 2D	R125	2069 6081	5K6,1%	12,3	2 - 6B
R51	2069 6087	10K,1%	1,8	3 - 8D	R126	2069 6095	22K,1%	6,3	2 - 3C
R52	2069 6047	240R,1%	8,8	1 - 7E	R127	2069 6071	2K2,1%	13,2	2 - 3B
R53	2069 6063	1K,1%	10,8	3 - 3F	R128	2069 6083	6K8,1%	2,2	2 - 5C
R54	2069 6084	7K5,1%	3,8	3 - 7D	R129	2069 6080	5K1,1%	5,2	2 - 4C
R55	2069 6087	10K,1%	11,7	3 - 1C	R130	2069 6083	6K8,1%	1,2	2 - 5C
R56	2069 6140	ZEROHM	9,8	2 - 6E	R131	2069 6119	220K,1%	5,2	2 - 4D
R57	2069 6072	2K4,1%	7,7	1 - 7E	R132	2069 6111	100K,1%	9,2	2 - 3F
R58	2069 6063	1K,1%	13,7	3 - 1C	R133	2069 6110	91K,1%	9,2	2 - 3F
R59	2069 6047	240R,1%	7,7	1 - 7E	R134	2069 6007	4R7,1%	1,2	2 - 4E
R60	2069 6068	1K6,1%	14,7	1 - 5C	R135	2069 6000	1R,1%	10,2	2 - 3F
R61	2069 6040	120R,1%	12,7	3 - 1C	R136	2069 6007	4R7,1%	1,2	2 - 6A
R62	2069 6072	2K4,1%	7,7	1 - 7E	R137	2069 6109	82K,1%	3,2	2 - 4F
R63	2069 6047	240R,1%	13,7	1 - 7D	R138	2069 6079	4K7,1%	10,1	2 - 3F
R64	2069 6068	1K6,1%	10,7	2 - 6D	R139	2069 6007	4R7,1%	6,1	2 - 3D
R65	2069 6060	750R,1%	13,7	1 - 7D	R140	2069 6075	3K3,1%	8,2	2 - 4F
R66	2069 6077	3K9,1%	10,7	2 - 5D	R141	2069 6000	1R,1%	8,2	2 - 3F
R67	2069 6095	22K,1%	8,7	2 - 7D	R142	2069 6119	220K,1%	6,2	2 - 4C
R68	2069 6035	75R,1%	9,7	2 - 6D	R143	2069 6007	4R7,1%	6,1	2 - 6B
R69	2069 6095	22K,1%	9,7	2 - 6E	R144	2069 6081	5K6,1%	6,1	2 - 4F
R70	2069 6086	9K1,1%	9,6	2 - 5D	R145	2069 6105	56K,1%	10,1	2 - 3F
R71	2069 6047	240R,1%	13,6	1 - 7C	R146	2069 6079	4K7,1%	16,1	1 - 3B
R72	2069 6095	22K,1%	9,6	2 - 7E	R147	2069 6042	150K,1%	4,1	2 - 4F
R73	2069 6040	120R,1%	11,6	3 - 1C	R148	2069 6118	200K,1%	2,1	2 - 4F
R74	2069 6140	ZEROHM	12,5	2 - 5B	R149	2069 6089	12K,1%	2,0	2 - 6A
R75	2069 6079	4K7,1%	2,6	2 - 1C	R150	2069 6022	22R,1%	2,0	2 - 7B
R76	2069 6111	100K,1%	1,6	2 - 1C	R151	2069 6079	4K7,1%	5,0	2 - 2F
R77	2069 6071	2K2,1%	7,5	2 - 5D	R152	2069 6131	680K,1%	3,0	2 - 2F
R78	2069 6069	1K8,1%	13,5	1 - 7C	R153	2069 6065	1K2,1%	6,0	2 - 3F
R79	0000 0000	not used	3,6	2 - 2C	R154	2069 6089	12K,1%	3,0	2 - 6B
R80	2069 6087	10K,1%	4,5	2 - 2C	R155	2069 6089	12K,1%	3,0	2 - 6A
R81	2069 6093	18K,1%	11,6	2 - 5B	R156	2069 6079	4K7,1%	4,0	2 - 2F
R82	2069 6063	1K,1%	5,5	2 - 3D	R157	2069 6099	33K,1%	6,0	2 - 2F
R83	2069 6119	220K,1%	12,5	2 - 5B	R158	2069 6089	12K,1%	3,0	2 - 6B
R84	2069 6038	100R,1%	2,5	2 - 1D	RL1	3415 0001	RELAY (Mute)	1,10	3 - 8B
R85	2069 6089	12K,1%	5,5	2 - 2E					3 - 8C
R86	2069 6047	240R,1%	14,5	1 - 7C					3 - 8D
R87	2069 6096	24K,1%	5,5	2 - 2E	RL2	3415 0001	RELAY (Deem)	3,9	3 - 6C
R88	2069 6103	47K,1%	9,5	2 - 6B					3 - 7B
R89	2069 6093	18K,1%	9,4	2 - 6B					3 - 7D
R90	2069 6081	5K6,1%	5,5	2 - 2E	RP1	2250 0015	22K res pack	11,2	2 - 3B
R91	2069 6060	750R,1%	14,4	1 - 7C					2 - 3C
R92	2069 6007	4R7,1%	5,4	2 - 2E					2 - 4A
R93	2069 6095	22K,1%	12,4	2 - 4B					2 - 4B
R94	2069 6069	1K8,1%	13,4	1 - 7D					2 - 4C
R95	2069 6016	12R,1%	0,4	2 - 1D					2 - 6B
R96	2069 6020	18R,1%	2,4	2 - 1D					2 - 5C
R97	2069 6007	4R7,1%	0,4	2 - 5C	SW1	3412 0020	Tray Switch	7,8	2 - 6B
R98	2069 6025	27R,1%	1,3	2 - 4E	SW2	3413 0048	120/240	18,3	1 - 2B
R99	2069 6026	33R,1%	2,4	2 - 5C					1 - 2C
R100	2069 6079	4K7,1%	8,4	2 - 6C	SW3	3414 0079	NE18 (Mains)	18,0	1 - 1B
R101	2069 6087	10K,1%	12,3	2 - 3B					1 - 1C
R102	2069 6088	11K,1%	1,3	2 - 3E	SW4	3412 0019	CL2P (Open)	9,0	1 - 4E
R103	2069 6046	220R,1%	0,3	2 - 1E	SW5	3412 0019	CL2P (Play)	10,0	1 - 3E
R104	2069 6022	22R,1%	0,4	2 - 4E	SW6	3412 0019	CL2P (Pause)	11,0	1 - 3E
R105	2069 6042	150K,1%	1,4	2 - 3E	SW7	3412 0019	CL2P (Stop)	11,0	1 - 3E
R106	2069 6140	ZEROHM	5,4	2 - 3C	SW8	3412 0021	Swmod (Prev)	12,0	1 - 4E
R107	2069 6113	120K,1%	3,3	2 - 3E	SW9	3412 0021	Swmod (Prog)	13,0	1 - 3E

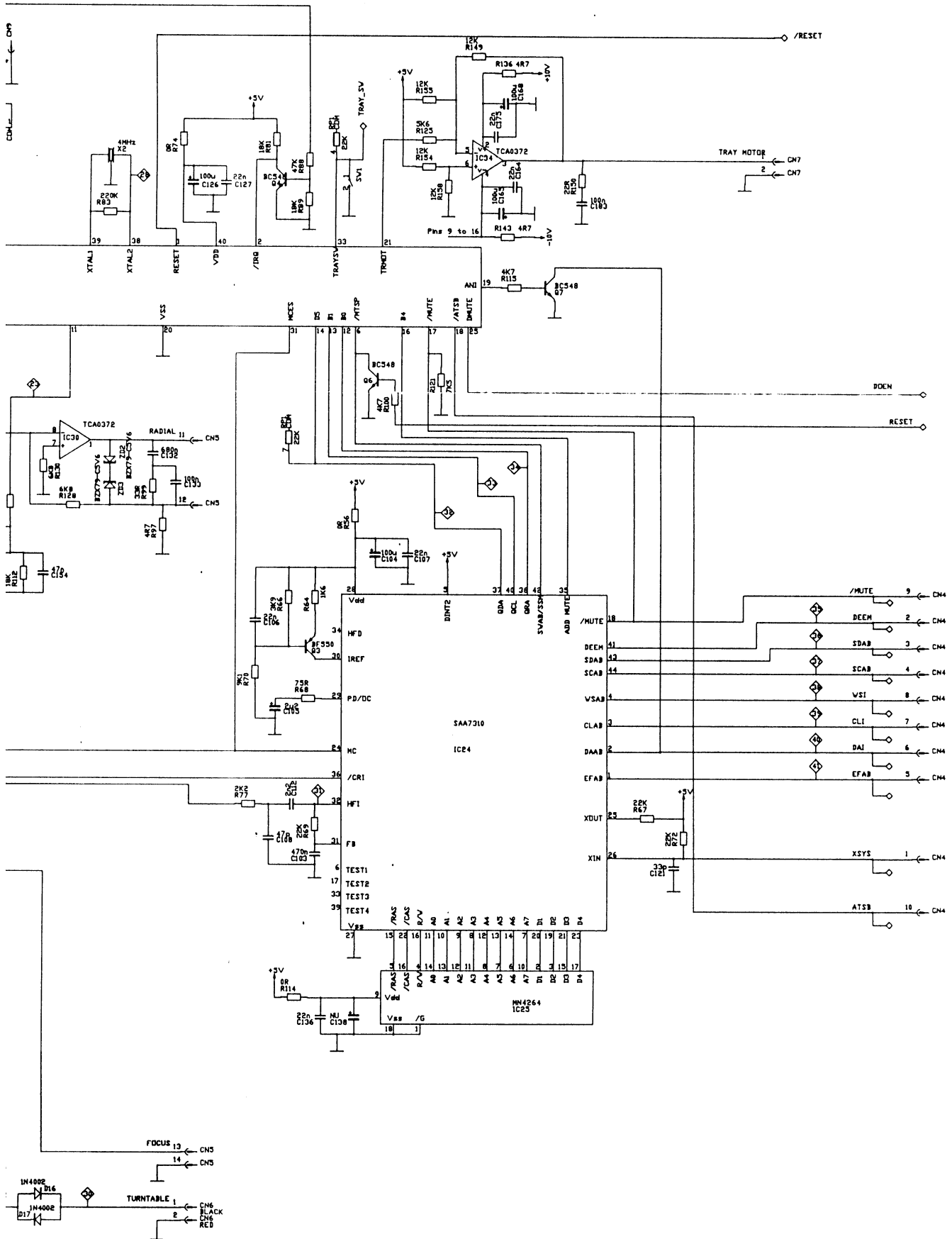
Ref	Creek code	Desc	@PCB	@CCT	Ref	Creek code	Desc	@PCB	@CCT
SW10	3412 0021	Swmod (Next)	14,0	1 - 4E	R-D			16,8	
SW11	0000 0000	not used	14,0	1 - 4E	V-T			17,8	
SW12	3412 0021	Swmod (Phase)	15,0	3 - 1C	W-E			17,3	
SW13	3412 0021	Swmod (Display)	16,0	1 - 3B	Y-W			18,2	
SW14	3412 0021	Swmod (Digital)	16,0	1 - 4E	+10V			12,4	
TR1	3211 9006	TOROID	17,6	1 - 2B	+12V			15,4	
X1	6561 0002pk	11.2896MHz	14,8	3 - 3D	+12v			11,9	
X2	6561 0034pk	4MHz	12,5	2 - 5B	+15A			8,8	
Z1	2069 6140	ZEROHM	14,11		+24V			10,8	
Z2	2069 6140	ZEROHM	8,11	3 - 2E	+5A			12,8	
Z3	2069 6140	ZEROHM	13,9		+5B			13,10	
Z4	2069 6140	ZEROHM	13,8		+5V			12,4	
Z5	2069 6140	ZEROHM	9,8		-10V			12,3	
Z6	2069 6140	ZEROHM	12,8		-12V			15,8	
Z7	2069 6140	ZEROHM	12,8		-15A			8,8	
Z8	2069 6140	ZEROHM	12,8		-15V			11,11	
Z9	2069 6140	ZEROHM	11,6		-24V			15,9	
Z10	2069 6140	ZEROHM	11,6		-5V			9,11	
Z11	2069 6140	ZEROHM	8,5		-6V			13,3	
Z12	2069 6140	ZEROHM	10,5						
Z13	2069 6140	ZEROHM	3,5						
Z14	2069 6140	ZEROHM	4,5						
Z15	2069 6140	ZEROHM	2,5						
Z16	2069 6140	ZEROHM	8,3						
Z17	2069 6140	ZEROHM	8,2						
Z18	2069 6140	ZEROHM	8,3						
Z19	2069 6140	ZEROHM	4,2						
Z20	2069 6140	ZEROHM	14,1						
ZD1	3646 0359	BZX79-C5V6	13,7						
ZD2	3646 0359	BZX79-C5V6	2,4						
ZD3	3646 0359	BZX79-C5V6	3,3						
ZD4	3646 0361	BZX79-C6V8	13,1						
	6561 0005pk	2 pin lead							
	6561 0007pk	Chassis							
	6561 0008pk	Pressure Plate							
	6561 0009pk	Lift Plate							
	6561 0010pk	Tray							
	6561 0011pk	Tension Spring							
	6561 0012pk	CDM4 support							
	6561 0013pk	Tray washer							
	6561 0014pk	Torx T10 screw							
	6561 0015pk	Suspn. Spring							
	6561 0016pk	Suspn. Grommet							
	6561 0026pk	CDM4 assy.							
	7300 0378	Loader Assy							
	7500 0192	10way Interconn							
	7500 0191	Ground Strap							
	7200 0098	Main PCB complete							
	7200 0099	Disp PCB complete							
	7300 0379	Remote Control							
	4825 0008	Rubber Feet							
	5237 0001	Drawer Front							
	6185 0003	Green Lens							
	4537 0001	Transit screw							
	1532 0007	Heatsink(IC31)							
	1532 0008	Heatsink(IC10,22,28)							
	3639 0002	Clip(IC10,22,28)							
TP1			15,12	1 - 3E					
TP2			0,7	2 - 2C					
TP3			0,7	2 - 2C					
TP4			0,6	2 - 1C					
TP5			0,6	2 - 1C					
TP6			0,6	2 - 1C					
TP7			0,5	2 - 4E					
TP8			0,4	2 - 1C					
TP9			0,4	2 - 1D					
TP10			0,4	2 - 1D					
B-E			14,2						
B-K			13,7						
B-N			16,4						
G-N			16,4						
G-Y			18,3						
O-E			16,1						
O_E			16,1						
P-K			17,2						
					<u>Display PCB</u>				
					C1	2759 6012	220p	0,1	
					C2	2601 0064	22n	0,1	
					C3	2767 6035	22u	0,1	
					C4	2767 6035	22u	7,1	
					CN2	3443 0016	STOCKO-10w	6,0	
					CN3	3443 0016	STOCKO-10w	5,0	
					D1	3646 0340	1N4148	3,0	
					D2	3646 0340	1N4148	5,1	
					D3	3646 0340	1N4148	4,1	
					D4	3646 0340	1N4148	4,1	
					D5	3646 0340	1N4148	4,1	
					D6	0000 0000	not used	5,1	
					D7	0000 0000	not used	4,1	
					IC1	6561 0024pk	U3090	4,1	
					LED1	3554 1008	GREEN	6,1	
					OPIC1	6186 0001	IS1U60L	6,0	
					Q1	3630 2042	BC548	7,1	
					R1	2069 6140	ZEROHM	7,2	
					R2	2069 6007	4R7, 1%	0,0	
					R3	2069 6095	22K, 1%	3,0	
					R4	2069 6095	22K, 1%	3,0	
					R5	2069 6095	22K, 1%	5,0	
					R6	2069 6007	4R7, 1%	1,0	
					R7	2069 6103	47K, 1%	2,0	
					R8	2069 6115	150K, 1%	2,0	
					R9	2069 6079	4K7, 1%	3,0	
					R10	2069 6054	470R, 1%	2,0	
					R12	2069 6079	4K7, 1%	6,2	
					R13	2069 6079	4K7, 1%	6,1	
					R14	2069 6007	4R7, 1%	7,1	
					R15	2069 6103	47K, 1%	7,1	
					R16	2069 6050	330R, 1%	7,1	
					V1	6561 0025pk	VF_DISPLAY	5,2	
					...	6561 0006pk	Support	5,2	
					ZD1	3646 0369	BZX79-C15V	2,0	



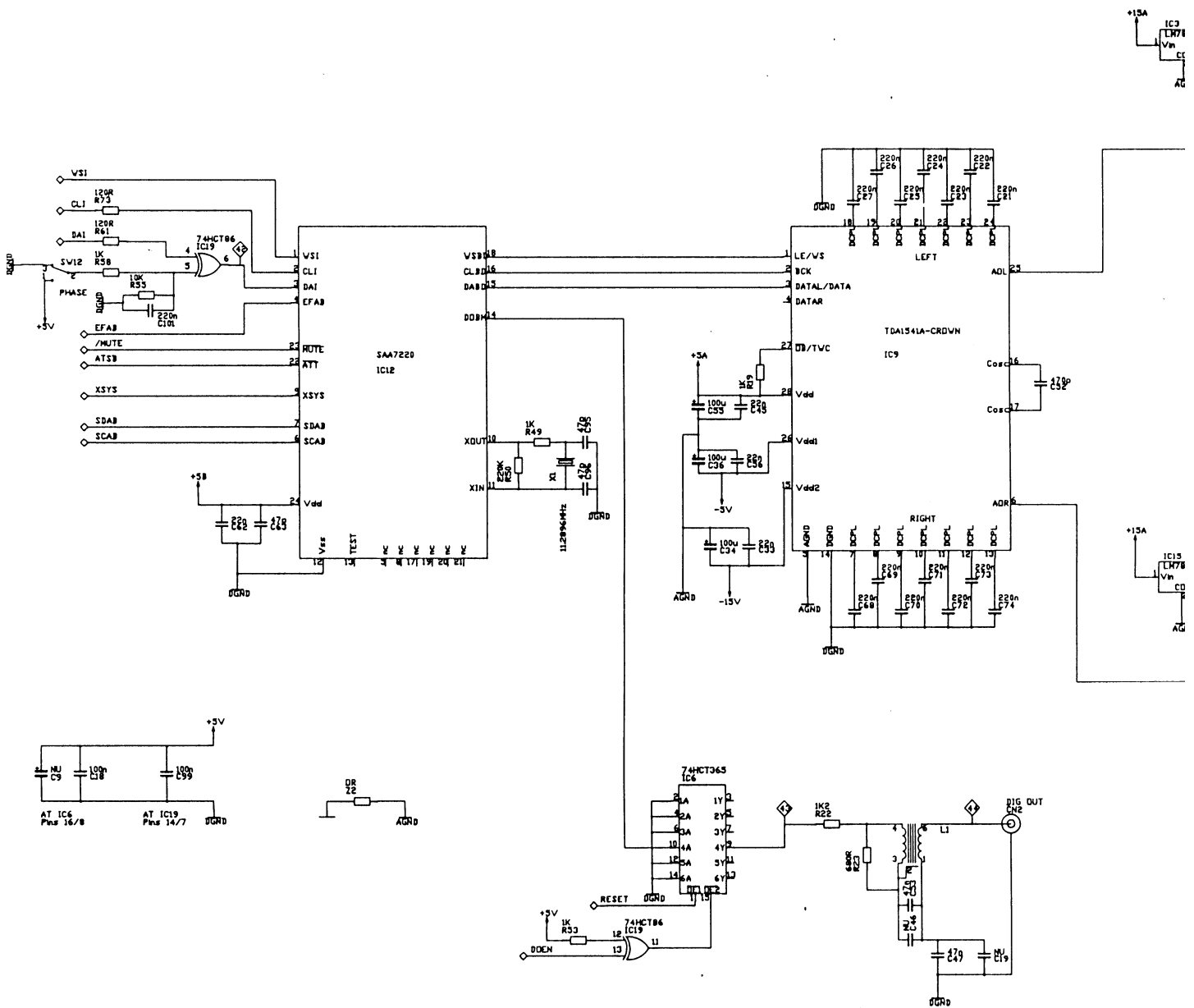
ISSUE 1 01/12/91	ISSUE 4	ISSUE 7	DrawnK Rodgerston
2 01/03/92	5	8	Checked
3	6	9	Approved
TITLE CD60 POWER SUPPLY			1 of 3 A1



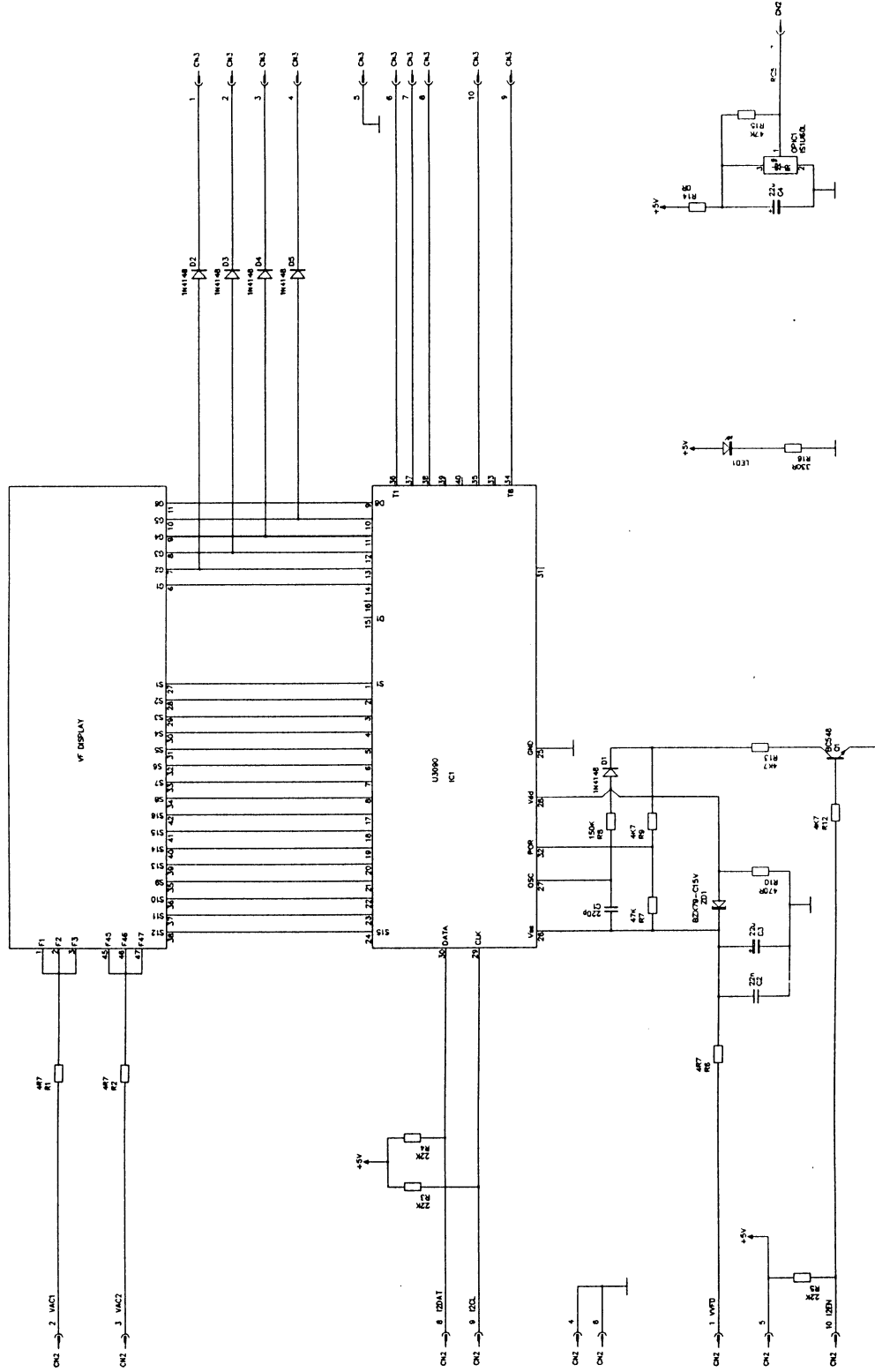
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ISSUE 1 01/12/91	ISSUE 4	ISSUE 7	Drawn K Rodgerso
2 01/03/92	5	8	Checked
3	6	9	Approved
TITLE CD60 SERVO/DECODE CCT			2 OF 3 A1

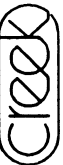


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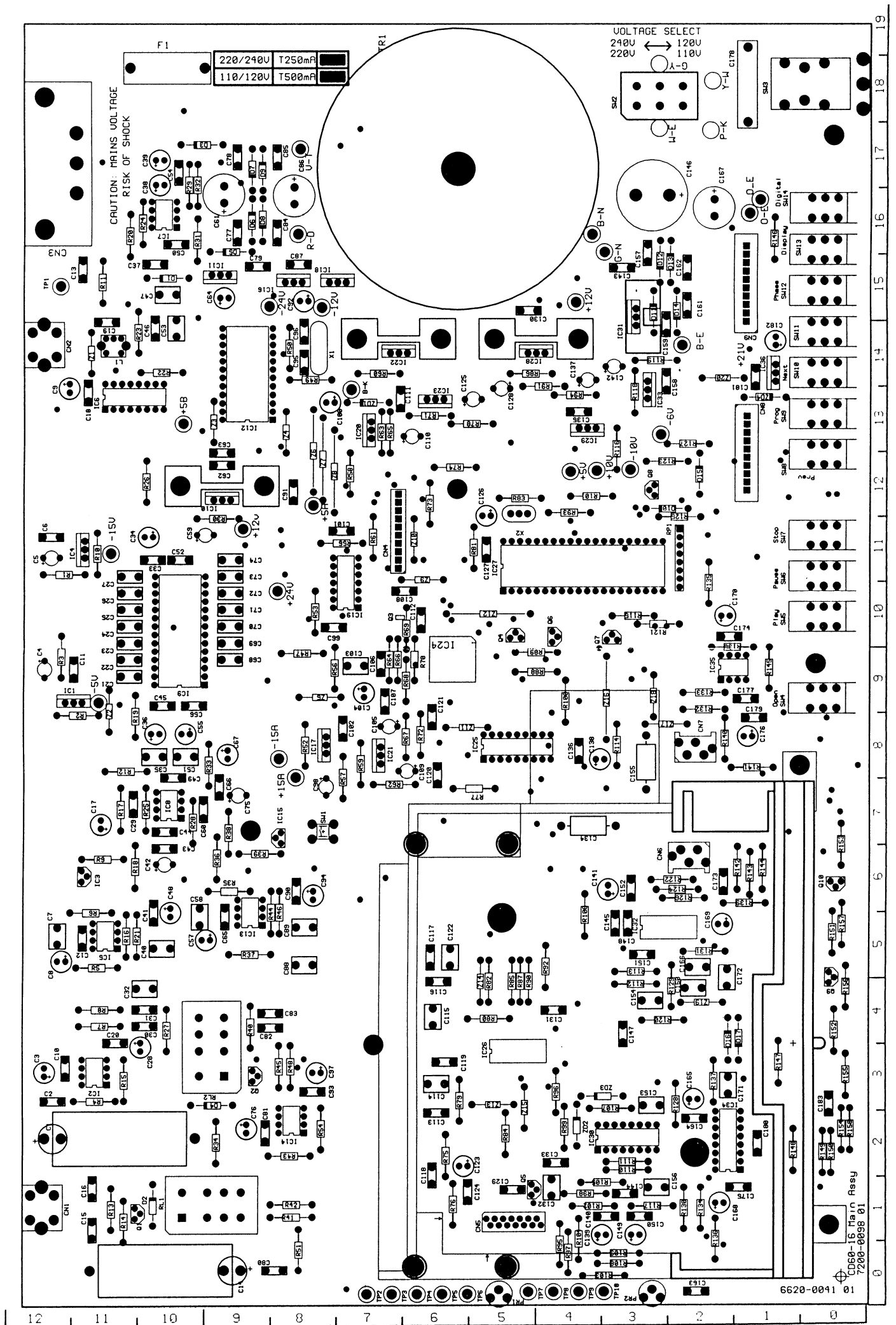


* NOTE: CH1, R11 NOT USED

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ISSUE 1	01/12/91	ISSUE 4	ISSUE 7	Drasn K Rodgerson
3	01/03/92	5	6	Checked
2		6	9	Approved
TITLE C660 DISPLAY				1 1 1 A2



DATE	1-12-91	ISSUE	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450	451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500	501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522	523	524	525	526	527	528	529	530	531	532	533	534	535	536	537	538	539	540	541	542	543	544	545	546	547	548	549	550	551	552	553	554	555	556	557	558	559	560	561	562	563	564	565	566	567	568	569	570	571	572	573	574	575	576	577	578	579	580	581	582	583	584	585	586	587	588	589	590	591	592	593	594	595	596	597	598	599	600	601	602	603	604	605	606	607	608	609	610	611	612	613	614	615	616	617	618	619	620	621	622	623	624	625	626	627	628	629	630	631	632	633	634	635	636	637	638	639	640	641	642	643	644	645	646	647	648	649	650	651	652	653	654	655	656	657	658	659	660	661	662	663	664	665	666	667	668	669	670	671	672	673	674	675	676	677	678	679	680	681	682	683	684	685	686	687	688	689	690	691	692	693	694	695	696	697	698	699	700	701	702	703	704	705	706	707	708	709	710	711	712	713	714	715	716	717	718	719	720	721	722	723	724	725	726	727	728	729	730	731	732	733	734	735	736	737	738	739	740	741	742	743	744	745	746	747	748	749	750	751	752	753	754	755	756	757	758	759	760	761	762	763	764	765	766	767	768	769	770	771	772	773	774	775	776	777	778	779	780	781	782	783	784	785	786	787	788	789	790	791	792	793	794	795	796	797	798	799	800	801	802	803	804	805	806	807	808	809	810	811	812	813	814	815	816	817	818	819	820	821	822	823	824	825	826	827	828	829	830	831	832	833	834	835	836	837	838	839	840	841	842	843	844	845	846	847	848	849	850	851	852	853	854	855	856	857	858	859	860	861	862	863	864	865	866	867	868	869	870	871	872	873	874	875	876	877	878	879	880	881	882	883	884	885	886	887	888	889	890	891	892	893	894	895	896	897	898	899	900	901	902	903	904	905	906	907	908	909	910	911	912	913	914	915	916	917	918	919	920	921	922	923	924	925	926	927	928	929	930	931	932	933	934	935	936	937	938	939	940	941	942	943	944	945	946	947	948	949	950	951	952	953	954	955	956	957	958	959	960	961	962	963	964	965	966	967	968	969	970	971	972	973	974	975	976	977	978	979	980	981	982	983	984	985	986	987	988	989	990	991	992	993	994	995	996	997	998	999	1000	1001	1002	1003	1004	1005	1006	1007	1008	1009	1010	1011	1012	1013	1014	1015	1016	1017	1018	1019	1020	1021	1022	1023	1024	1025	1026	1027	1028	1029	1030	1031	1032	1033	1034	1035	1036	1037	1038	1039	1040	1041	1042	1043	1044	1045	1046	1047	1048	1049	1050	1051	1052	1053	1054	1055	1056	1057	1058	1059	1060	1061	1062	1063	1064	1065	1066	1067	1068	1069	1070	1071	1072	1073	1074	1075	1076	1077	1078	1079	1080	1081	1082	1083	1084	1085	1086	1087	1088	1089	1090	1091	1092	1093	1094	1095	1096	1097	1098	1099	1100	1101	1102	1103	1104	1105	1106	1107	1108	1109	1110	1111	1112	1113	1114	1115	1116	1117	1118	1119	1120	1121	1122	1123	1124	1125	1126	1127	1128	1129	1130	1131	1132	1133	1134	1135	1136	1137	1138	1139	1140	1141	1142	1143	1144	1145	1146	1147	1148	1149	1150	1151	1152	1153	1154	1155	1156	1157	1158	1159	1160	1161	1162	1163	1164	1165	1166	1167	1168	1169	1170	1171	1172	1173	1174	1175	1176	1177	1178	1179	1180	1181	1182	1183	1184	1185	1186	1187	1188	1189	1190	1191	1192	1193	1194	1195	1196	1197	1198	1199	1200	1201	1202	1203	1204	1205	1206	1207	1208	1209	1210	1211	1212	1213	1214	1215	1216	1217	1218	1219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