BARCO

BARCO Projection Systems

SECTION L

service sheet

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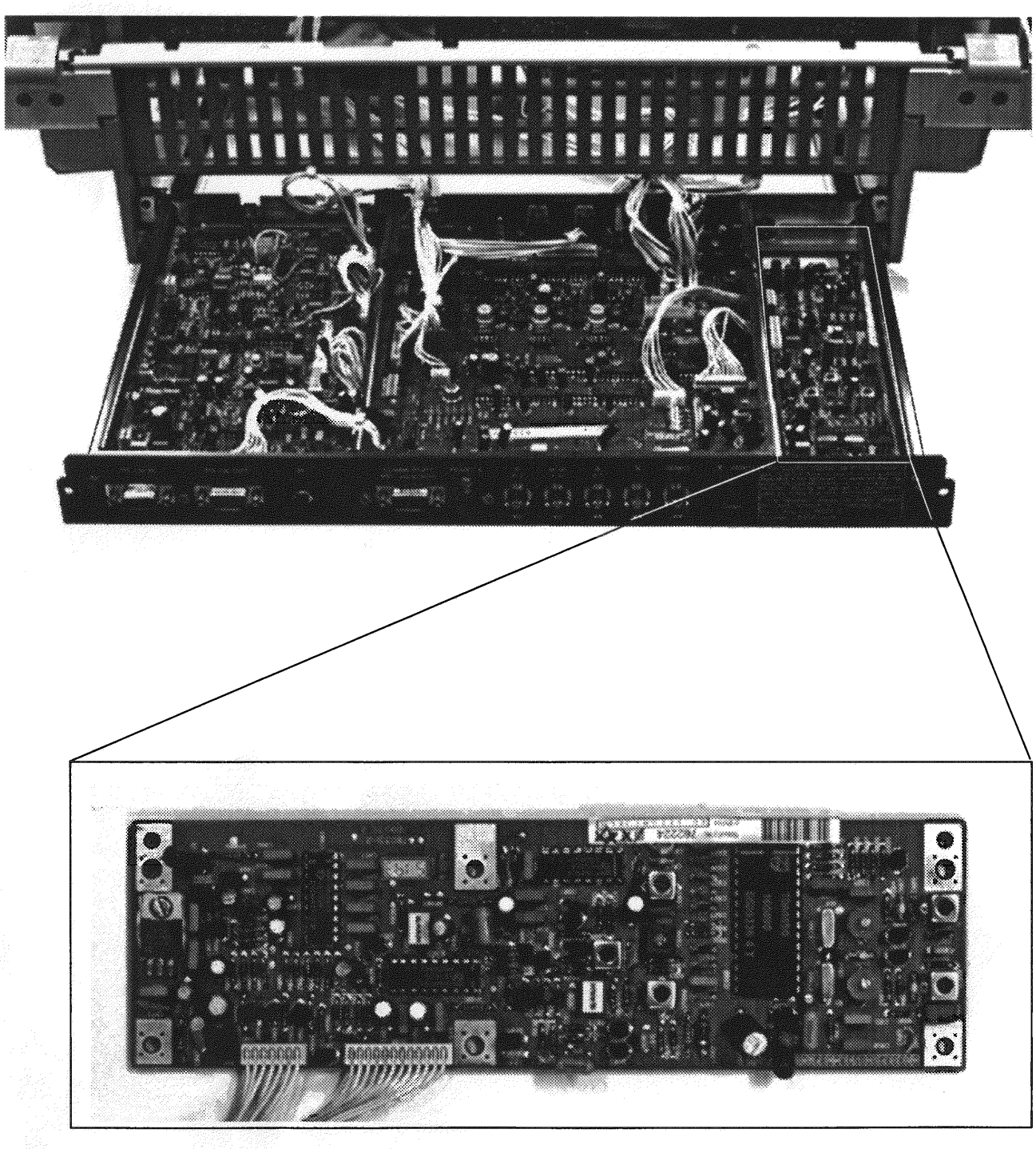
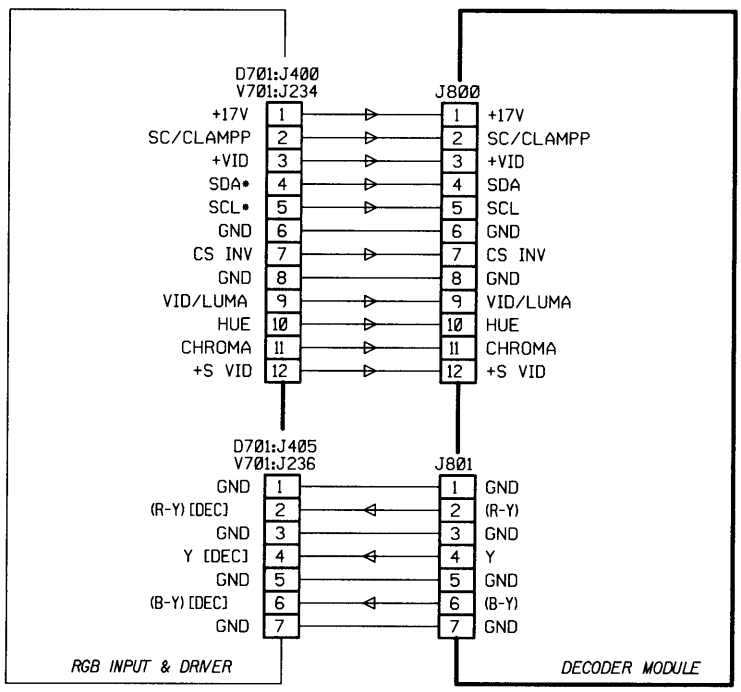
QUAD Decoder

76 2224

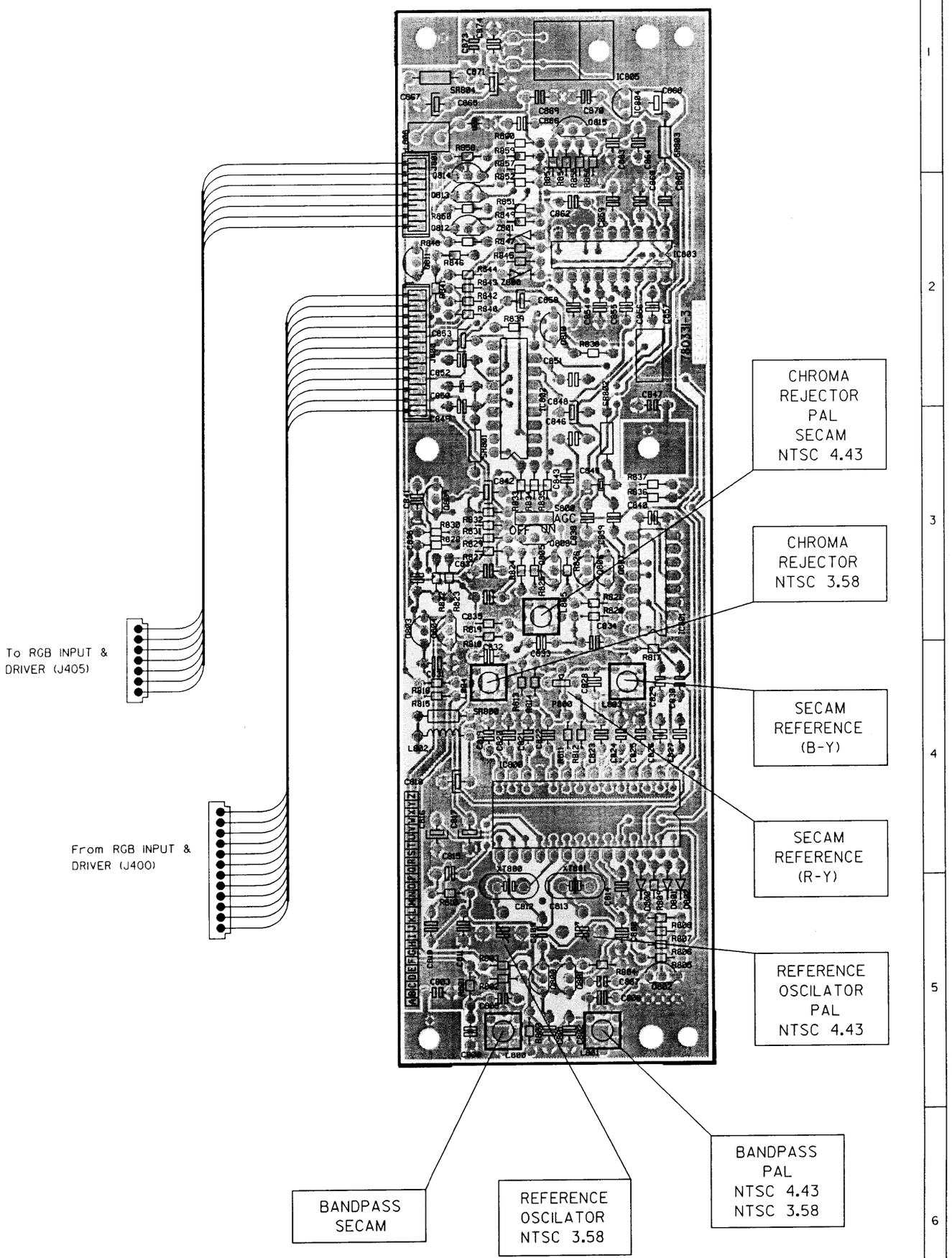




Name Interconnection		Article nr.
DECODER MODULE		76 2224
Date 28-04-1995	Drawn JVDY	Checked JVST

BARCO PROJECTION SYSTEMS

Modification reserved



COMP.	LOC.	COMP.	LOC.
C800	C 5	R818	C 4
C801	C 5	R819	C 3
C802	C 5	R820	C 3
C803	C 5	R821	C 3
C805	C 5	R822	C 3
C806	C 5	R823	C 3
C807	C 5	R824	C 3
C808	C 5	R825	C 3
C809	C 5	R826	C 3
C810	C 5	R827	C 3
C811	C 5	R828	C 3
C812	C 5	R829	C 3
C813	C 5	R830	C 3
C814	C 5	R831	C 3
C815	C 4	R832	C 3
C816	B 4	R833	C 3
C817	C 4	R834	C 3
C818	B 4	R835	C 3
C819	C 4	R836	C 3
C820	C 4	R837	C 3
C821	C 4	R838	C 2
C822	C 4	R839	C 2
C823	C 4	R840	C 2
C824	C 4	R841	C 2
C825	C 4	R842	C 2
C826	C 4	R843	C 2
C827	D 4	R844	C 2
C828	C 4	R845	C 2
C829	D 4	R846	C 2
C830	D 4	R847	C 2
C831	B 4	R848	B 2
C832	C 4	R849	C 2
C833	C 4	R850	C 2
C834	C 3	R851	C 2
C835	C 3	R852	C 2
C836	B 3	R853	C 2
C837	C 3	R854	C 2
C838	C 3	R855	C 2
C839	C 3	R856	C 2
C840	C 3	R857	C 1
C841	B 3	R858	C 1
C842	C 3	R859	C 1
C843	C 3	R860	C 1
C845	C 3		
C846	C 3	S800	C 3
C847	C 2		
C848	C 3	SR800	C 4
C849	C 3	SR801	C 3
C850	C 2	SR802	C 3
C851	C 2	SR803	D 1
C852	C 2	SR804	C 1
C853	C 2		
C854	C 2	XT800	C 5
C855	C 2	XT801	C 5
C856	C 2		
C857	D 2	Z800	C 2
C858	C 2	Z801	C 2
C859	C 2		
C860	D 2		
C861	D 2		
C862	C 2		
C863	C 1		
C864	C 1		
C865	C 1		
C866	C 1		
C867	B 1		
C868	D 1		
C869	C 1		
C870	C 1		
C871	C 1		
C873	C 1		
C874	C 1		
D800	C 5		
D801	D 5		
D802	D 5		
IC800	C 4		
IC801	D 4		
IC802	C 3		
IC803	D 2		
IC804	C 1		
IC805	C 1		
J800	C 2		
J801	C 1		
L800	C 5		
L801	C 5		
L802	B 4		
L803	C 4		
L804	C 4		
L805	C 3		
L806	B 1		
P800	C 4		
Q800	C 5		
Q801	C 5		
Q802	C 5		
Q803	B 4		
Q804	C 4		
Q805	C 3		
Q806	C 3		
Q807	C 3		
Q808	C 3		
Q809	C 3		
Q810	C 2		
Q811	C 2		
Q812	C 2		
Q813	C 2		
Q814	C 2		
Q815	C 1		
R800	C 5		
R801	C 5		
R802	C 5		
R803	C 5		
R804	C 5		
R805	D 5		
R806	D 5		
R807	D 5		
R808	D 5		
R809	D 5		
R810	C 5		
R811	C 4		
R812	C 4		
R813	C 4		
R814	C 4		
R815	B 4		
R816	B 4		
R817	C 4		

Name	Article nr.
DECODER	76 2224-3
Date: 25-04-1995 / Drawn: JVDY / Checked: JVST	

BARCO PROJECTION SYSTEMS

Modifications reserved

780331-3

To INPUT MODULE (JXX)

J801
1 2 3 4 5 6 7 — (R-Y), Y, (B-Y)

To INPUT MODULE (JX)

J800
1 +17V
2 SANDCASTLE
3 +VID
4 SDA
5 SCL
6
7 CS_INV
8
9 VID/LUMA
10 HUE
11 CHROMA
12 +S VID

	V701	D701	INTERFACE RCVDS05
JX	J234	J400	J700
JXX	J236	J405	J701

L801 L800 L804 L805 L803

PRODUCT SAFETY NOTICE

COMPONENTS MARKED WITH * OR ⚠ HAVE SPECIAL CHARACTERISTICS IMPORTANT TO SAFETY. BEFORE REPLACING ANY OF THESE COMPONENTS, READ CAREFULLY THE SERVICE SAFETY PRECAUTIONS. DO NOT DEGRADE THE SAFETY OF THIS SET THROUGH IMPROPER SERVICING.

All values given for standard 75% colour bar with 100% reference white.

AUTOMATIC GAIN CONTROL

IC802 TDA9045
i.c. i.c. 16 17 7 8 14 Vp
PEAK WHITE DETECTOR
SYNC LEVEL DETECTOR
INPUT SELECTION +4 dB
ADDER STAGE
CLAMPING CONTROL
1 15 18 12 13 10 9 5 11
J800 VID/LUMA (9) C858 10M 1Vpp
C853 10M
R840 82E
R843 68E
1.58Vpp R833 560E
3V9pp R835 2K7 C843 10P
S800
J800 SANDCASTLE (2) R842 3K9 Q810 BC559C
+5V
R838 3K9
J800 CS_INV (7) R839 100E

+12V SR801 2E2
C848 1M C851 470K C850 47M C849 100K

J800 CHROMA (11) C836 330K R828 150E R822 15K R823 10K
J800 +S VID (12)
S VIDEO Q803 BC549C
+12V R815 10E C831 100K
R801 2K2
SECAM BANDPASS L800 3u3 C800 390P C805 1K R806 15K Q800 BC549C
+12V R803 10E C801 100K
C809 1K 200mVpp R804 2K2
VIDEO Q804 BC549C
R802 1K5
PAL/NTSC4,43 BANDPASS R800 820E L801 10u C802 120P C806 82P C807 1K R805 15K Q801 BC549C
BANDPASS NTSC3,58 Q802 BC549C R809 10K R808 15K

+12V R832 4.7K R830 10E
1Vpp C842 10M Q809 BC549C C841 100K
R834 1K R831 4.7K

0.25W 0.40W 0.50W 1W 1.5W

+17V SR804 2E2 C871 2M2 IC805 1 IN OUT 2 GND 3 7812 C874 100K +12V

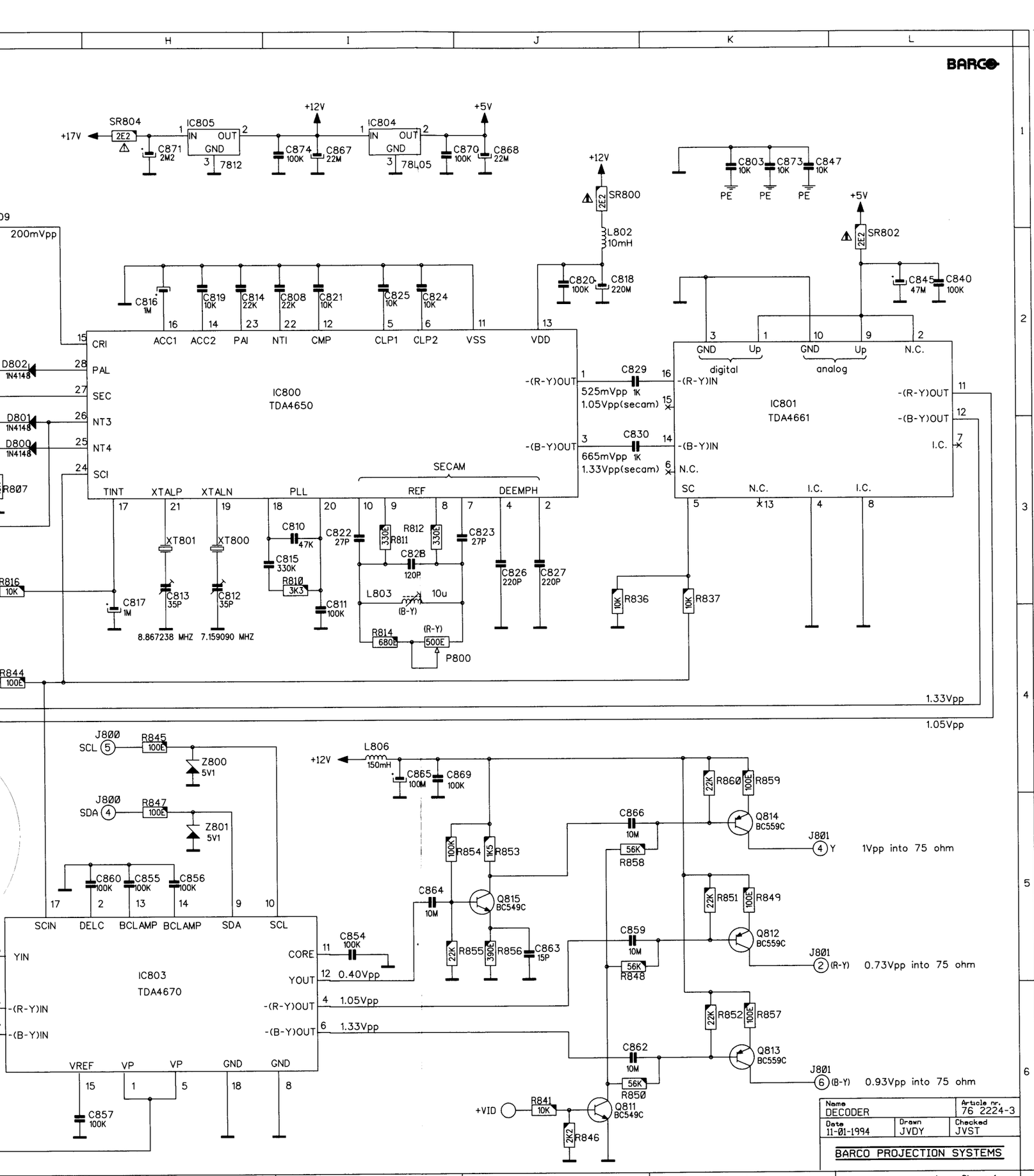
C816 1M C819 10K C814 22K C808 22K C82 10K
16 ACC1 14 ACC2 23 PAI 22 NTI 12 CMP
15 CRI
28 PAL
27 SEC
26 NT3
25 NT4
24 SCI
IC800 TDA4650
D802 1N4148 D801 1N4148 D800 1N4148
TINT 17 XTALP 21 XTALN 19 PLL 18 20
XT801 XT800
C813 35P C812 35P
8.867238 MHZ 7.159090 MHZ
C817 1M
J800 HUE (10) R816 10K
C810 47K C815 330K R810 3K3

J800 SANDCASTLE (2) R844 100E

CHROMA REJECTION NTSC3,58
L805 15u C833 120P R819 68E C834 10M R820 680E R817 15K
+12V R829 10E C837 100K
Q807 BC549C
CHROMA REJECTION PAL/SECAM/NTSC4.43
L804 15u C832 82P R818 68E R813 680E
Q806 BC549C
Q808 BC549C
J800 +S VID (12) R827 100K C835 470K R824 100K
R826 1K Q805 BC549C R821 1K R825 560E
+5V SR803 2F2 C861 100K

J800 SCL (5) R845 100E Z800 5V1
J800 SDA (4) R847 100E Z801 5V1
C860 100K C855 100K C856 100K
17 SCIN 2 DELC 13 BCLAMP 14 BCLAMP 9 SDA 10 SCL
IC803 TDA4670
0.45Vpp C846 330K 16 YIN
1.05Vpp C839 10K 3 -(R-Y)IN
1.33Vpp C838 10K 7 -(B-Y)IN
11 CORE 12 YOUT 4 -(R-Y)OUT 6 -(B-Y)OUT
VREF 15 C857 100K VP 1 VP 5 GND 18 GND 8

Modifications reserved



COMP.	LOC.
C800	E 1
C801	G 1
C802	E 2
C803	K 1
C805	F 1
C806	F 2
C807	F 2
C808	I 2
C809	G 1
C810	I 3
C811	I 3
C812	H 3
C813	H 3
C814	H 2
C815	I 3
C816	H 2
C817	H 3
C818	J 2
C819	H 2
C820	J 2
C821	I 2
C822	I 3
C823	J 3
C824	I 2
C825	I 2
C826	J 3
C827	J 3
C828	I 3
C829	J 2
C830	J 3
C831	E 1
C832	E 5
C833	E 4
C834	E 4
C835	D 6
C836	D 1
C837	F 4
C838	G 6
C839	G 5
C840	L 2
C841	D 3
C842	C 3
C843	D 5
C845	L 2
C846	G 5
C847	K 1
C848	B 4
C849	C 4
C850	C 4
C851	B 4
C852	C 5
C853	B 5
C854	I 5
C855	H 5
C856	H 5
C857	H 6
C858	A 5
C859	J 5
C860	H 5
C861	F 6
C862	J 6
C863	J 5
C864	I 5
C865	I 4
C866	J 5
C867	I 1
C868	J 1
C869	I 4
C870	J 1
C871	H 1
C873	K 1
C874	I 1
D800	G 3
D801	G 2
D802	G 2
IC800	I 2
IC801	K 2
IC802	A 5
IC803	H 5
IC804	I 1
IC805	H 1
J800	A 2
J801	A 1
L800	C 2
L800	E 1
L800	B 2
L800	B 2
L800	C 2
L801	E 2
L801	B 1
L801	C 1
L801	C 1
L801	B 1
L802	J 1
L803	I 3
L803	C 2
L803	C 2
L803	B 2
L803	B 2
L804	E 5
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L804	C 2
L804	C 2
L804	B 2
L805	E 4
L805	C 2
L805	B 2
L805	C 2
L805	B 2
L806	I 4
P800	I 4
Q800	F 1
Q801	F 2
Q802	E 3
Q803	D 1
Q804	D 2
Q805	F 5
Q806	E 5
Q807	E 4
Q808	E 6
Q809	D 3
Q810	B 6
Q811	J 6
Q812	K 5
Q813	K 6
Q814	K 5
Q815	J 5
R800	E 2
R801	E 1
R802	E 2
R803	F 1
R804	G 2
R805	F 2
R806	F 1
R807	G 3
R808	F 3
R809	F 3
R810	I 3
R811	I 3
R812	I 3
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R818	D 5
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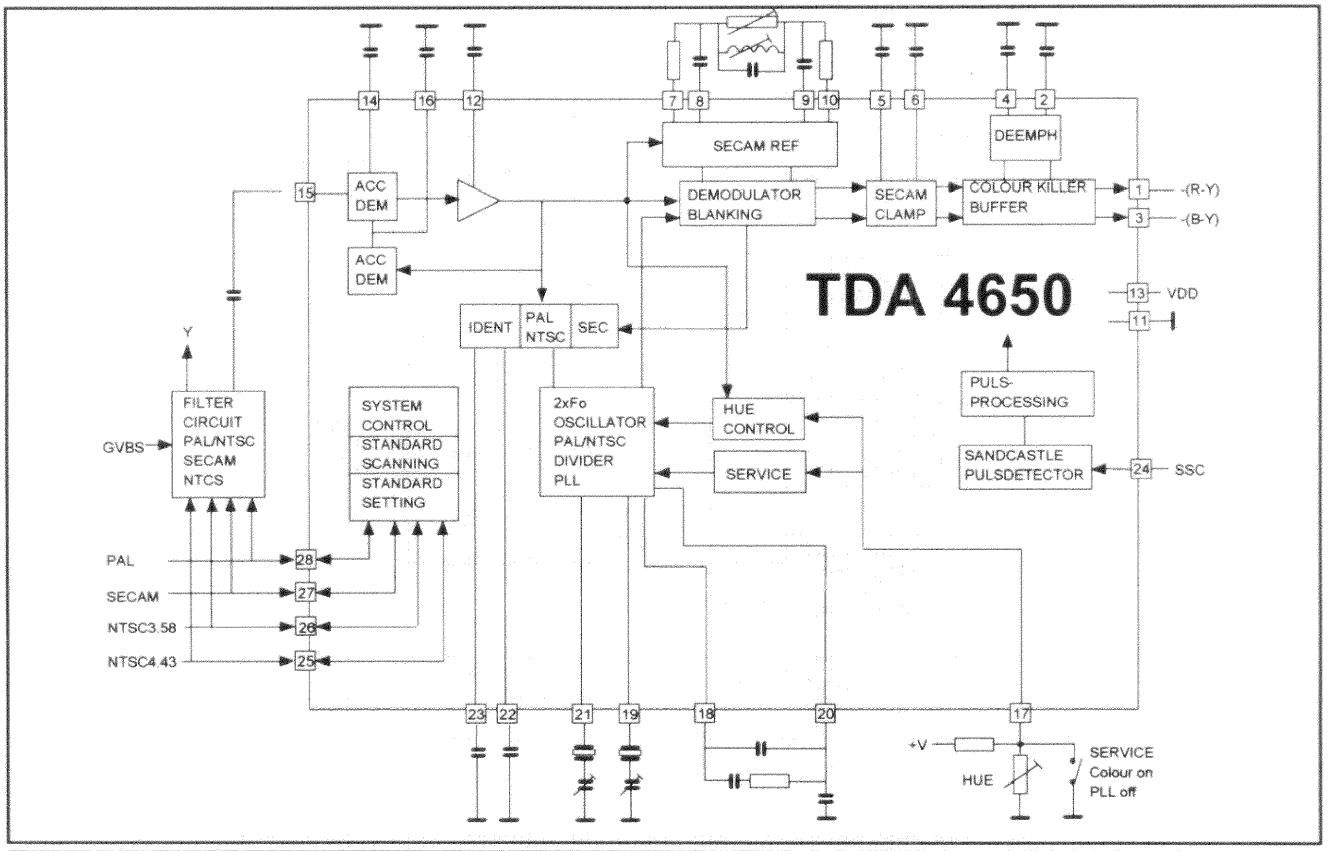
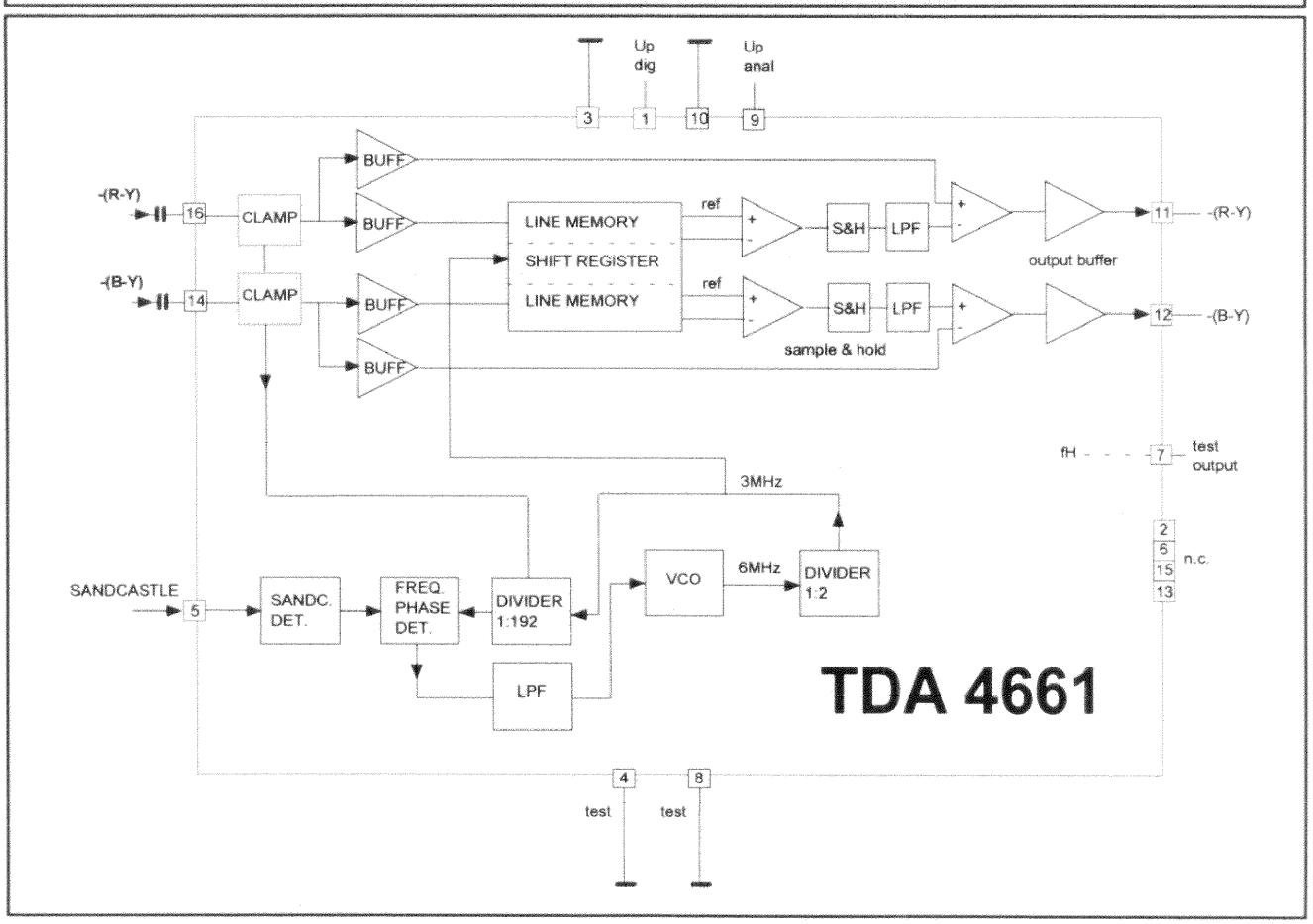
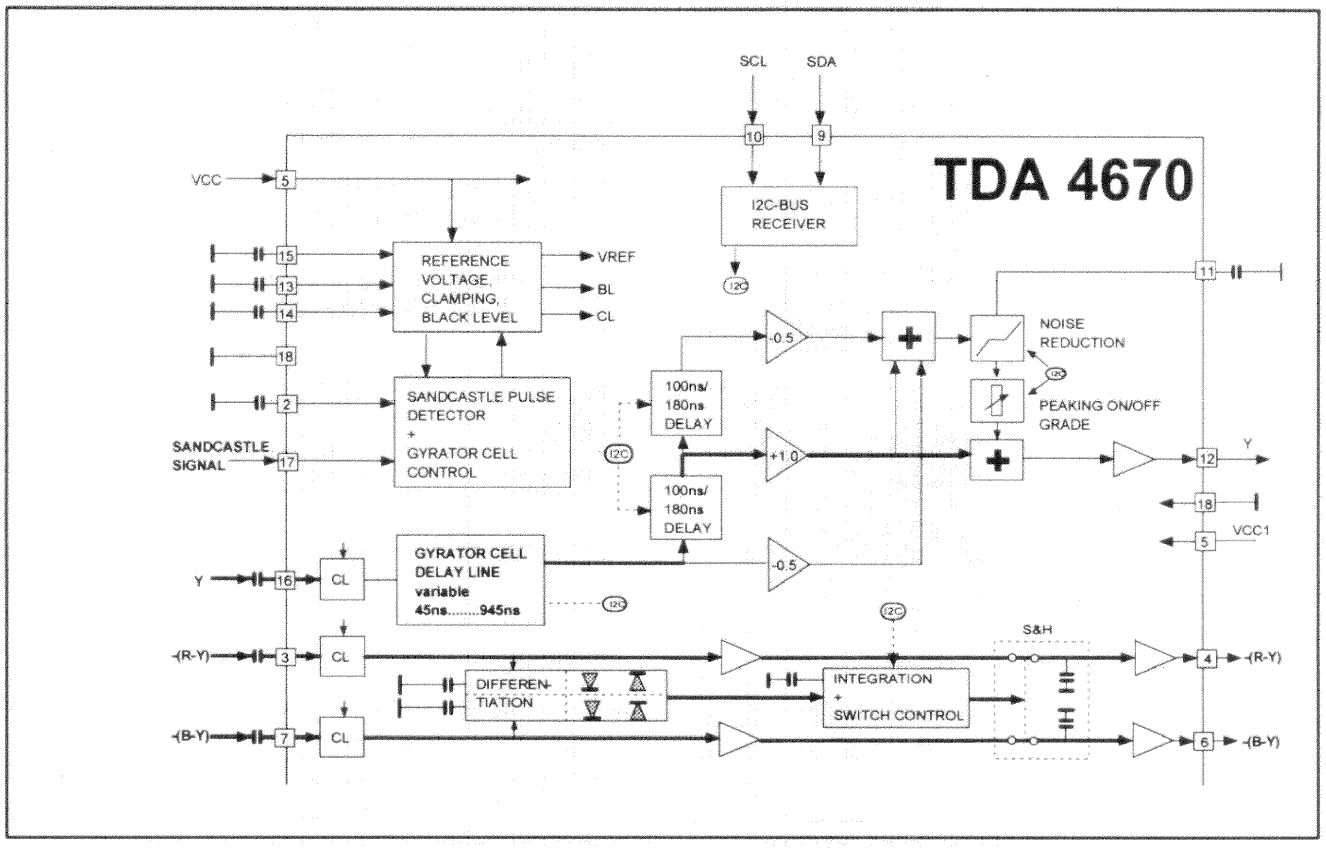
R845	H 4
R846	J 6
R847	H 5
R848	J 5
R849	K 5
R850	J 6
R851	K 5
R852	K 6
R853	J 5
R854	J 5
R855	J 5
R856	J 5
R857	K 6
R858	J 5
R859	K 4
R860	K 4
S800	D 6
SR800	J 1
SR801	C 4
SR802	L 1
SR803	F 6
SR804	H 1
XT800	H 3
XT801	H 3
Z800	H 4
Z801	H 5


TDA 4650
SECAM REF
DEEMPH
ACC DEM
DEMODULATOR BLANKING
SECAM CLAMP
COLOUR KILLER BUFFER
-(R-Y)
-(B-Y)
VDD
IDENT
PAL NTSC
SEC
Y
GVBS
FILTER CIRCUIT PAL/NTSC SECAM NTCS
SYSTEM CONTROL
STANDARD SCANNING
STANDARD SETTING
2xFo OSCILLATOR PAL/NTSC DIVIDER PLL
HUE CONTROL
SERVICE
PULS-PROCESSING
SANDCASTLE PULSDETECTOR
SSC
PAL
SECAM
NTSC3.58
NTSC4.43
+V
HUE
SERVICE
Colour on
PLL off


TDA 4661
Up dig
Up anal
-(R-Y)
-(B-Y)
CLAMP
BUFF
LINE MEMORY
SHIFT REGISTER
ref
S&H
LPF
output buffer
sample & hold
fH
test output
3MHz
SANDCASTLE
SANDC. DET.
FREQ. PHASE DET.
DIVIDER 1:192
VCO
6MHz
DIVIDER 1:2
n.c.
test
test


TDA 4670
SCL
SDA
10
9
I2C-BUS RECEIVER
VCC
5
REFERENCE VOLTAGE, CLAMPING, BLACK LEVEL
VREF
BL
CL
15
13
14
18
2
SANDCASTLE PULSE DETECTOR + GYRATOR CELL CONTROL
SANDCASTLE SIGNAL
17
100ns/ 180ns DELAY
100ns/ 180ns DELAY
-0.5
+1.0
-0.5
NOISE REDUCTION
PEAKING ON/OFF GRADE
11
12
Y
18
VCC1
5
Y
16
CL
GYRATOR CELL DELAY LINE variable 45ns.....945ns
-(R-Y)
3
CL
-(B-Y)
7
CL
DIFFEREN-TIATION
INTEGRATION + SWITCH CONTROL
S&H
4
-(R-Y)
6
-(B-Y)

TECHNICAL DESCRIPTION OF THE "QUAD DECODER"

Introduction.

The Quad decoder section uses the combined set TDA4650 / TDA4661 / TDA4670 for luminance and chrominance handling and the TDA9045 for automatic gain control.

The TDA4661 comprises two horizontal sync locked CCD (Charged Coupled Devices) delay lines (64 µS) working in NTSC as a 'comb filter', as propagation delay line in PAL and as simple delay lines in SECAM.
Cross colour is minimised in SECAM as at the outputs of the colour chip TDA4650 only one colour difference signal is available at one time.

The TDA4670 comprises the luminanace delay line, the enhancing or sharpness control and improves the transient of the colour signals. This chip is I2C-bus controlled.

A. Video composite.

The video composite is AC coupled at pin 2 and pin 12 of the automatic gain control IC TDA9045. Depending on the position of the switch S800 (to bypass the AGC circuit), the output video signal at pin 18 or the video signal at pin 6, arrives at the buffer Q809 where it is AC coupled and available at the emitter on a correct DC level.

For the operation of the AGC circuit, delivering a constant output signal at pin 6 on a constant black level, two pulses are needed:
- the SC/Clamping pulse (to be applied to pin 10). This pulse is generated on the Sync module 76 2226 (see description mentionned module).
- the composite Sync signals 'CS_INV'. These pulses are generated by the IC LM1881 'Sync Separator', output pin 1, which is buffered-inverted by IC18, output 2, and thereafter via emitter follower Q19, called 'CS_INV'.

This buffer, transistor Q809, feeds the emitter followers Q804 and Q8067 - Q807 respectively for the chrominance and luminance filters.

Luminance :

The colour subcarrier is rejected with L804 / C832 for Pal / SECAM and N4 or with L805 / C833, tuned at 3.58 Mhz for NTSC 3.58.
Note that both transistors Q806 and Q807 are blocked in SVideo (Transistor Q808 is conducting in the SVideo mode whereas its emitter voltage blocks the mentioned transistors).

A next buffer Q805 supplies the Yin input of the TDA4670 through the capacitor C846.

In the first stage of this chip the signal is clamped to the black level and then reduced to a suitable level for the following delay line. This delay line consists of 13 all-pass cells (cell = 90 nS) which are built with gyrators.

This delay time is switchable via the I^2C bus. A peaking (sharpness control) is incorporated with two selectable centre frequencies (2.6 and 5 Mhz). This circuit consists of two additional delay cells, two 0.5 gain inverting amplifiers and a summation stage.
For better noise reduction the peaking signal is applied via a coring stage and a switchable amplifier before being added to the main signal. The grade of peaking can be controlled by means of the I^2C bus commands.

Chrominance :

The chrominance is filtered by one of the chrominance filters Pal / N4 (L801/C802) or Secam (L800/C800) and via the respective emitter followers Q801 or Q800 applied via C809 to pin 15 of the colour chip TDA4650. In case of N3 the filter L801/ C802 is tuned to 3.58 Mhz with C806, switched with Q802.

The chip identifies and demodulates PAL, SECAM, NTSC 3.58 and NTSC 4.43 chrominance signals. The automatic standard recognition by sequential inquiry secures SECAM identification at 50 Hz only, with PAL priority.
The system identification part scans during 4 vertical periods the colour in the sequence Pal / Secam / N3 / N4. Four switched outputs for chrominance filter selection are available at the pins 28 - 25. Note that, by applying an external +9 volts to the appropriated pin the chip can be forced into one colour.

a) The delay line chip TDA4661 :

The delay line chip consists of :

a) two delay lines of 64 µS based upon a switched capacitor technique (CCD). These have normal delay function for PAL and SECAM, and a comb filter function for NTSC to avoid chrominance cross colour.

b) An internal clock of 3 Mhz for the shift register delay lines, derived from a 6 Mhz VCO, which is locked to the line frequency with a sandcastle pulse at pin 5. This means absolutely alignment free.
A divider by 192 provides a clamp pulse for the input circuits.
Sample and hold low-pass filters behind the delay lines suppress the clock signal.
The delayed and undelayed signals are added and fed to the output pins 11, 12 via a buffer stage.

By adding two subsequent lines in SECAM, and as one of these lines is blanked (line sequential blanking), we get at any time the two color difference signals at the respective outputs.

b) SECAM .

For SECAM an amplitude limiting circuit is active before quadratic modulation.
The signal amplitude and H/2 content of the colour difference signals (R-Y) and (B-Y) is dependent on the characteristics of the external tuned circuit at pins 7, 8, 9 and 10.
The resonance frequency of this external circuit is adjusted in that way that the demodulated **Fo** - carrier is zero for the (B-Y), with L803.
Now, by adjusting the quality factor of the circuit with P800, it is possible to get zero output for the (R-Y) Fo carrier (un-modulated carrier).
De-emphasis is applied with internal resistors and tuned to the correct value with the capacitors at pins 4 and 2.

The colour difference signals are line sequentially (each two lines) blanked to a level equal to the black signal (black) level.

By this measure only one colour signal is available at any time at the output of the colour chip in order to reduce colour crosstalk.

c) PAL / NTSC .

The 8 Mhz X-tal is connected at pin 21 and tuned with C813, the 7.2 Mhz X-tal for NTSC 3.58 Mhz is connected at pin 19 and tuned with C812. They can be adjusted to the centre frequency "fo" when the service pin 17 is below the 0.5 volts level (burst off).
The PAL switching stage (correction of the [R-Y] polarity) is disabled in NTSC and on the other hand the phase shifting or Hue is disabled for PAL.

With the delay lines the delayed and undelayed signals are added to compensate propagation shifts, or to obtain the correct colours.

In NTSC, adding delayed and undelayed signals means that the luminance is suppressed on condition the chrominance is same for two subsequent lines.

The delay lines here behave as a **'comb' filter.**

d)Transient improvement

The regulated (R-Y) and (B-Y) signals from IC801 TDA4661 are now sent to the CTI chip TDA4670 for improving the transient time of these chroma signals. This is performed as follows :

Both colour difference channels consist of a clamping stage at the input, a buffer amplifier, a storage stage and an output amplifier. The storage, which is operated by a differential amplifier, stores the colour difference signal during the transient time of the input signal and then switches rapidly to accept the new signal.

A signal formed by differentiating, full wave rectifying and summing the two colour difference signals is compared with a reference signal. The resultant signal is used to switch the sample-and-hold circuits.

Note that the colour transient improvement function can be switched off or on by means of the I^2C-bus commands (not implemented here).

The outputs Yout, -(B-Y) and -(R-Y) are now AC coupled respectively at pin 8 (Y), pin 7 (R-Y) and pin 6 (B-Y) of the IC500 TDA4686 via the wire interconnection J800/J400 for further video processing.
The Yout, amplified by Q815, is now AC coupled at pin 8 of the TDA4686 (on RGB in+Driver module) via the current driver Q814 and via the wire interconnection J801/J236 for further video processing..
The outputs -(B-Y) and -(R-Y) are AC coupled respectively at pin 6 and pin 7 of the TDA4686 (on RGB in+Driver module) via the current drivers Q813 and Q812, the wire interconnection J801/J236, the inverting transistors Q245 and Q261 for further video processing.

B. SVideo .

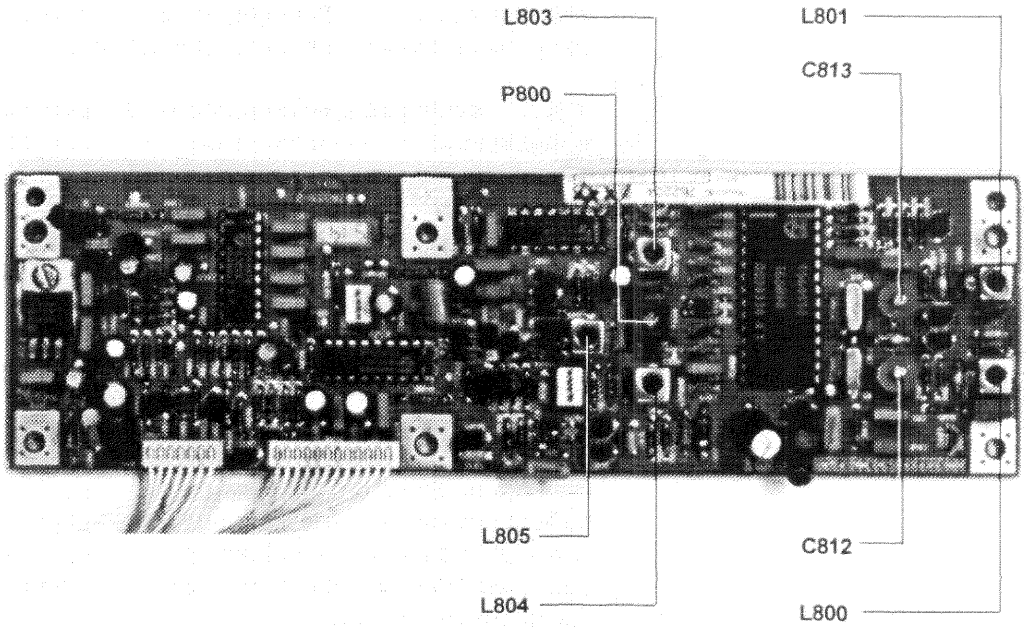
The +SVideo Voltage forward biases Q803 and Q808 to respectively "accept" the chrominance and luminance signals. This voltage automatically blocks Q807 and Q806 / Q804.
The flow is now the same as described before.

ADJUSTMENT PROCEDURE QUAD DECODER 76 2224

Preparation

- Switch the projector in the VIDEO MODE. Select source 1.
- Connect to the VIDEO input e.g. an electronic colour test video signal (see photo)

Location of controls



A. VIDEO INPUT SIGNAL :
Pal Colour test image

1. Reference Oscillator C813

- if there is no colour, adjust trimming capacitor C813 until colour is being received.
- short-circuit pin 17 of IC800 to earth.
- adjust the trimming capacitor C813 for colour zero beat.
- remove the short-circuit.

2. Chroma Rejector (L804) *(photo 1)*

- connect an oscilloscope to the emitter of transistor Q805 (Y signal).
- adjust the core of coil L804 for a minimum of chroma in the video signal.

3. Chroma filter L801 *(photo 2)*

- connect the oscilloscope to the emitter of the transistor Q801 (R804).
- adjust the core of coil L801 for maximum chroma signal.

B. VIDEO INPUT SIGNAL:
Secam Colour test image

4. Secam Reference circuit (L803 - P800) *(photo 3 & 4)*

- connect the oscilloscope to the capacitor C838 (B-Y) (pin 12 IC801).
- adjust L803 so that the level of the (B-Y) signal without colour information is the same as the level during blanking.
- connect the oscilloscope to the capacitor C839 (R-Y) (pin 11 IC801).
- adjust P800 so that the level of the (R-Y) signal without colour information is the same as the level during blanking.
- If necessary the level in (B-Y) channel has to readjust to zero with the coil.

5. BELL Filter L800 *(photo 5)*

- connect an oscilloscope to the emitter of Q800 (R804).
- adjust L800 for a flat amplitude of the signal during two successive lines.

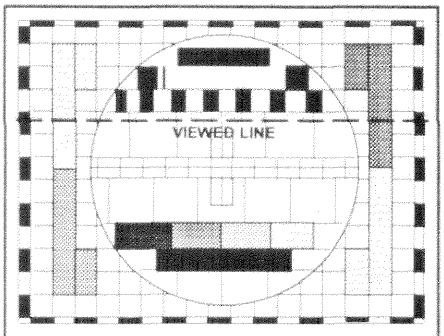
C. VIDEO INPUT SIGNAL :
NTSC 3.58 TEST IMAGE

6. Reference Oscillator C812

- If there is no colour, adjust trimming capacitor C812 until colour is being received.
- short circuit pin 17 of IC800 to earth.
- adjust trimming capacitor C812 for a colour zero beat.
- remove the short-circuit.

17. Chroma rejector L805 *(refer to photo 1)*

- connect the oscilloscope to the emitter of Q805 (R825).
- adjust the core of coil L805 for a minimum of chroma in the video signal.



TEST PICTURE
Viewed line: contrast color bar

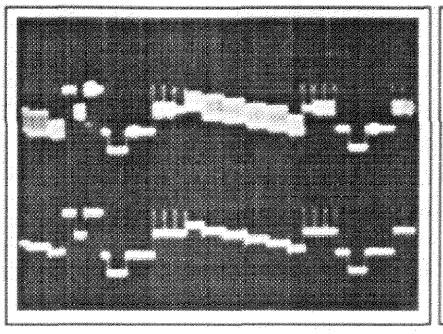


Foto 1
Alignment chroma rejector L802
Upper track: viewed video line
Lower track: Y signal

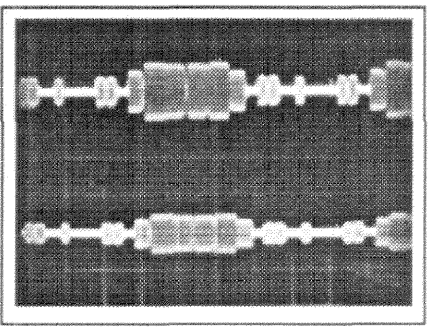


Foto 2
Alignment maximum Chroma L800
Upper track: viewed video line
Lower track: max Chroma signal

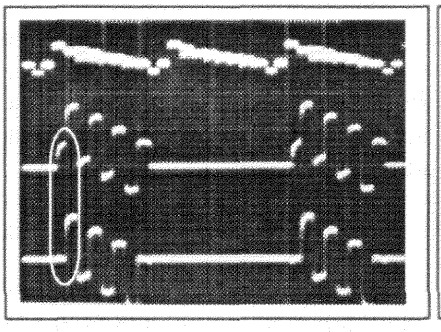


Foto 3
Alignment SECAM Ref circuit L805 (B-Y)
Upper track: viewed video line
Lower track:
1: incorrect setting
2: correct setting

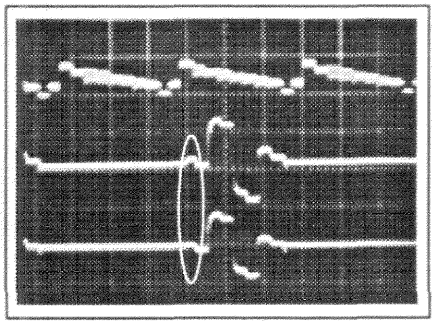


Foto 4
Alignment SECAM Ref circuit P800 (R-Y)
Upper track: viewed video line
Lower track:
1: incorrect setting
2: correct setting

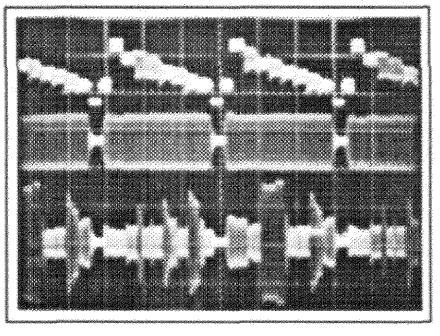


Foto 5
BELL FILTER L801
Upper track: viewed video line
Lower track:
1: correct setting
2: incorrect setting

Parts listing 76 2224

ITEM NO.	SIT.	DESCRIPTION
34 84073		CD CT FTMS P 7 135
34 8512		CD CT FTMS P12 80
11 59061	C800	C PP RA 390P J100E2 1830
11 2774	C801	C CE MI 100N S 63E2
11 2243	C802	C NPO MI 120P J 63E2
11 2763	C803	C CE MI 10N U 63E2
11 2739	C805	C CE MI 1N K100E2
11 22415	C806	C NPO MI 82P J 63E2
11 2739	C807	C CE MI 1N K100E2
11 37161	C808	C POMERA 22N K100E2
11 2739	C809	C CE MI 1N K100E2
11 3720	C810	C POMERA 47N K 63E2
11 3724	C811	C POMERA 100N K 63E2
11 7001	C812	C T 7 -35P 160
11 7001	C813	C T 7 -35P 160
11 37161	C814	C POMERA 22N K100E2
11 3730	C815	C POMERA 330N K 63E2
11 1546	C816	C EL RA 1M M 50E2 85
11 1546	C817	C EL RA 1M M 50E2 85
11 1478	C818	C EL RA 220M Z 25E2 85
11 2763	C819	C CE MI 10N U 63E2
11 3724	C820	C POMERA 100N K 63E2
11 2763	C821	C CE MI 10N U 63E2
11 2235	C822	C NPO MI 27P G 63E2
11 2235	C823	C NPO MI 27P G 63E2
11 2763	C824	C CE MI 10N U 63E2
11 2763	C825	C CE MI 10N U 63E2
11 2366	C826	C N750MI 220P J 63E2
11 2366	C827	C N750MI 220P J 63E2
11 2692	C828	C N750MI 120P J500E2
11 2739	C829	C CE MI 1N K100E2
11 2739	C830	C CE MI 1N K100E2
11 2774	C831	C CE MI 100N S 63E2
11 22415	C832	C NPO MI 82P J 63E2
11 2243	C833	C NPO MI 120P J 63E2
11 1678	C834	C EL BRA 10M M 25E2 85
11 3732	C835	C POMERA 470N K 63E2
11 3730	C836	C POMERA 330N K 63E2
11 2774	C837	C CE MI 100N S 63E2
11 37121	C838	C POMERA 10N K100E2 365
11 37121	C839	C POMERA 10N K100E2 365
11 3724	C840	C POMERA 100N K 63E2
11 2774	C841	C CE MI 100N S 63E2
11 1531	C842	C EL RA 10M M 35E2 85
11 2230	C843	C NPO MI 10P G 63E2
11 1476	C845	C EL RA 47M M 25E2 85
11 3730	C846	C POMERA 330N K 63E2
11 2763	C847	C CE MI 10N U 63E2
11 1546	C848	C EL RA 1M M 50E2 85
11 3724	C849	C POMERA 100N K 63E2
11 1476	C850	C EL RA 47M M 25E2 85
11 3732	C851	C POMERA 470N K 63E2
11 3724	C852	C POMERA 100N K 63E2
11 1531	C853	C EL RA 10M M 35E2 85
11 3724	C854	C POMERA 100N K 63E2
11 3724	C855	C POMERA 100N K 63E2
11 3724	C856	C POMERA 100N K 63E2
11 3724	C857	C POMERA 100N K 63E2
11 1531	C858	C EL RA 10M M 35E2 85
11 1678	C859	C EL BRA 10M M 25E2 85
11 3724	C860	C POMERA 100N K 63E2
11 3724	C861	C POMERA 100N K 63E2
11 1678	C862	C EL BRA 10M M 25E2 85
11 2232	C863	C NPO MI 15P G 63E2
11 1678	C864	C EL BRA 10M M 25E2 85
11 1477	C865	C EL RA 100M Z 25E2 85
11 1678	C866	C EL BRA 10M M 25E2 85
11 1532	C867	C EL RA 22M M 35E2 85
11 1532	C868	C EL RA 22M M 35E2 85
11 3724	C869	C POMERA 100N K 63E2
11 3724	C870	C POMERA 100N K 63E2
11 1548	C871	C EL RA 2M2M 50E2 85
11 2763	C873	C CE MI 10N U 63E2
11 3724	C874	C POMERA 100N K 63E2
13 1621	D800	D S 1N4148 075150 DO35
13 1621	D801	D S 1N4148 075150 DO35
13 1621	D802	D S 1N4148 075150 DO35
13 2828	I800	U 4650 TDA DIP28 PDECOD
13 28291	I801	U 4661 TDA DIP16 PDELAY
13 2818	I802	U 9045 TDA DIP18 PVID_P
13 2830	I803	U 4670 TDA DIP18 PVID
13 4032	I804	U 78L05 TO92 PSTAB
13 4002	I805	U 7812 TO220 PSTAB
30 60121	L800	CH RA ES 3.3 UH S7 T
30 60241	L801	CH RA ES 10 UH S7 T
30 61322	L802	CH AX NS 10 UH
30 60241	L803	CH RA ES 10 UH S7 T
30 60281	L804	CH RA ES 15 UH S7 T
30 60281	L805	CH RA ES 15 UH S7 T
30 6052	L806	CH RA NS 150 UH
10 7005	P800	R TCE H500E M 0W5 S7 TS3362P
78 0331	PC..	PCD PJ53 700 DEC 03
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13 1411	Q801	Q BC549C N SS TO92 030A1
13 1411	Q802	Q BC549C N SS TO92 030A1
13 1411	Q803	Q BC549C N SS TO92 030A1
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13 1411	Q811	Q BC549C N SS TO92 030A1
13 14182	Q812	Q BC559C P SS TO92 030A1
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13 1411	Q815	Q BC549C N SS TO92 030A1
10 1535	R800	R MF H820E F 0W4 E2
10 1540	R801	R MF H 2K2 F 0W4 E2
10 1538	R802	R MF H 1K5 F 0W4 E2
10 1512	R803	R MF H 10E F 0W4 E2
10 1540	R804	R MF H 2K2 F 0W4 E2
10 1550	R805	R MF H 15K F 0W4 E2
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10 1550	R808	R MF H 15K F 0W4 E2
10 1548	R809	R MF H 10K F 0W4 E2
10 1542	R810	R MF H 3K3 F 0W4 E2
10 1530	R811	R MF H330E F 0W4 E2
10 1530	R812	R MF H330E F 0W4 E2
10 1534	R813	R MF H680E F 0W4 E2

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10 1548	R816	R MF H 10K F 0W4 E2
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10 1522	R819	R MF H 68E F 0W4 E2
10 1534	R820	R MF H680E F 0W4 E2
10 1536	R821	R MF H 1K F 0W4 E2
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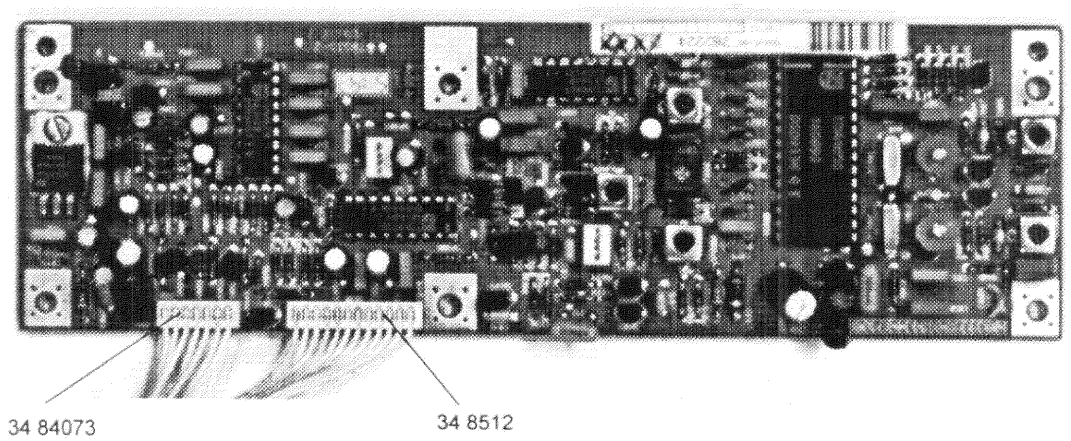
10 1552	R860	R MF H 22K F 0W4 E2
31 3286	S800	J MD1 MBT P 3 R1SN
10 11049	SR80	R CFFH 2E2 J 0W25 SKS2
10 11049	SR81	R CFFH 2E2 J 0W25 SKS2
10 11049	SR82	R CFFH 2E2 J 0W25 SKS2
10 11049	SR83	R CFFH 2E2 J 0W25 SKS2
10 11049	SR84	R CFFH 2E2 J 0W25 SKS2
30 6849	X800	X 7.159090 MHZ HC49 S20
30 6816	X801	X 8.867238 MHZ HC49 S20
13 1716	Z800	D ZEN 5V1 0W5 C DO35
13 1716	Z801	D ZEN 5V1 0W5 C DO35

Spare parts 76 2224

ART NO.	DESCRIPTION	QUANTITY
10 11049	R CFFH 2E2 J 0W25 SKS2	5
10 7005	R TCE H500E M 0W5 S7 TS3362P	1
11 2692	C N750MI 120P J500E2	1
11 7001	C T 7 -35P 160	2
13 1411	Q BC549C N SS TO92 030A1	12
13 14182	Q BC559C P SS TO92 030A1	4
13 1621	D S 1N4148 075150 DO35	3
13 1716	D ZEN 5V1 0W5 C DO35	2
13 2818	U 9045 TDA DIP18 PVID_P	1
13 2828	U 4650 TDA DIP28 PDECOD	1
13 28291	U 4661 TDA DIP16 PDELAY	1
13 2830	U 4670 TDA DIP18 PVID	1
13 4002	U 7812 TO220 PSTAB	1
13 4032	U 78L05 TO92 PSTAB	1
30 60121	CH RA ES 3.3 UH S7 T	1
30 60241	CH RA ES 10 UH S7 T	2
30 60281	CH RA ES 15 UH S7 T	2
30 6052	CH RA NS 150 UH	1
30 61322	CH AX NS 10 UH	1
30 6816	X 8.867238 MHZ HC49 S20	1
30 6849	X 7.159090 MHZ HC49 S20	1
31 3286	J MD1 MBT P 3 R1SN	1
31 33921	J MD JMP P 1 E1SN	1
34 84073	CD CT FTMS P 7 135	1
34 8512	CD CT FTMS P12 80	1
36 20216	SCR D84 M 3 X 6 SI	1
36 6102	NUT D934 M 3 S Z	1
36 7502	WSHR D6798 A 3.2 S Z	1
78 0331	PCD PJ53 700 DEC 03	1

PRODUCT SAFETY NOTICE

Components identified by ⚠ have SPECIAL CHARACTERISTICS IMPORTANT TO SAFETY. Before replacing any of these components, read carefully the service safety precautions.