Colour television

FL1.0

Service
Service
Service

AD 92.05

Service Information

In numerous sets with production code AG21 and higher a COMB-module has been used. In this service information you will find all the necessary information concerning this module, including a brief circuit description.

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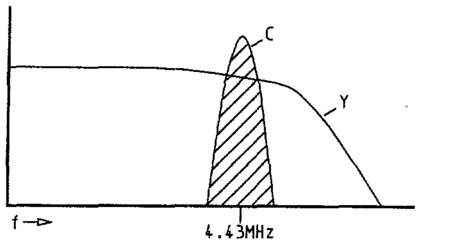
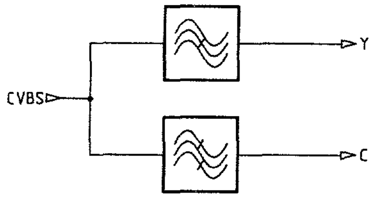
Comb filter

Introduction



CL26532079/013,F1-1

Fig. 1



CL26532079/013,F1-2

Fig. 2

In recent years the picture quality of current TV sets has steadily increased. One of the phenomenon always open to improvement was the crosstalk between colour and luminance (also known as cross colour and cross luminance). With the introduction of COMB filtering this phenomenon has become a thing of the past.

The cause of cross colour and cross luminance is the fact that the chrominance signal is modulated on a carrier wave that lies within the luminance spectrum. (fig.1). These signals must be separated for a display. In normal TV sets this is achieved by blocking the chrominance signal before the luminance channel using a band stop filter (fig 2.) and for the chrominance channel by filtering out the chrominance signal with a band-pass filter.

This filtering can not be performed accurately for any length of time as harmonics (interference) from the chrominance signal are present in the luminance channel and vice versa. In practise separation appears to be incomplete, which results in interference (e.g. colour patterns in black and white striped blocks). By employing a COMB filter this phenomenon has forever become a thing of the past.

The classic COMB filter

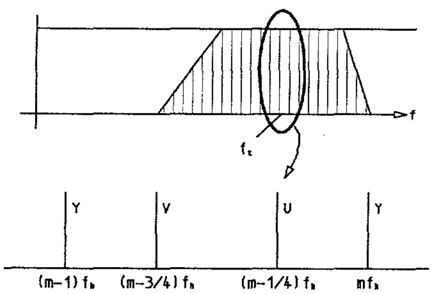


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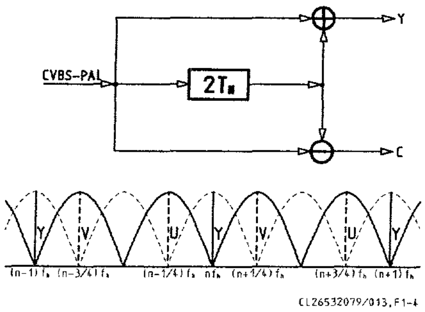
Fig. 3



CL26532079/013,F1-4

Fig. 4

This explanation of the principle of the COMB filter is based on the PAL system. A video which does not change vertically (every line is equal) the components of the luminance signal are a multiple of the line frequency (15625 Hz). The chrominance components are a multiple of the half-line frequency with a shift of a quarter line frequency (fig. 3).
By employing a filter with a periodic response and maximum-minimum distance of a quarter line frequency it is possible to separate luminance and chrominance. This COMB-shaped characteristic provides this filter with the name COMB filter.

An example of a COMB filter is given in fig.4. In order to understand COMB circuits it is better to examine the signals in the time-domain. Because the chrominance signal is modulated on a carrier frequency of 283.75 * the line frequency (with a 25 Hz offset), after two lines the chrominance signal will be in opposing phase. The luminance signal is then still in phase. By counting up or deducting the signals results in separate chrominance and luminance signals. In fig. 4 the signal delayed by a delay line is added to then deducted from the direct signal.

The disadvantage of this method of filtering is that it only operates correctly if the picture does not change vertically. In a vertically moving picture the transition is affected.
To improve the vertical filter characteristics the FL1 has been equipped with two COMB filter circuits in series. One of the two filters can then always provide the correct signal during vertical transition. A medium detector is used to continually determine which of the two signals is correct and then select it.
At the same time only the chrominance signal is filtered out. By subtracting this signal from the CVBS subsequently results in the luminance signal.

The practical realisation

In this description the following abbreviations will be used for the various signals:

C_n = The current chrominance signal. This signal has a 2 line delay in comparison to the incoming signal.
C_n+2 = The future chrominance signal. This signal is undelayed.
C_n-2 = The initial chrominance signal. This signal has a 4 line delay.
Y_n = The current chrominance signal.

Block diagram

In Figure 5 a block diagram of the COMB filter is given, the complete circuit appears further in this publication.

The COMB filter is built up around 2 delay lines (IC7602 & IC7628), the actual filter and a selection switch (IC7690).

The incoming CVBS signal is sent via low-pass filter 5600 to IC7602 and via band-pass filter 5802 to the comparator in IC7675 (C_n+2). IC7602 is an analogue delay line with a delay of 128µS (2 line periods). The output signal of IC7602 goes to a second delay line in IC7628, via the band-pass filter 5827 to the comparator in IC7675 (C_n), and via the low-pass filter 5615 to the luminance input of IC7675 (Y_n).
The output signal of the second delay line in IC7628 (therefore with a total delay of 4 lines) is available on pin 6 of and goes via the band-pass filter 5628 to the comparator in IC7675 (C_n-2).

Delay lines

The two delay lines are both identical. These are analogue delay lines where the input signal (pin 1) automatically appears at the output (pin 6) following the delay time (FIFO = first in first out). The delay time is determined by the clock frequency on pin 10. For a delay of 128µS this frequency must be 4.43 MHz.

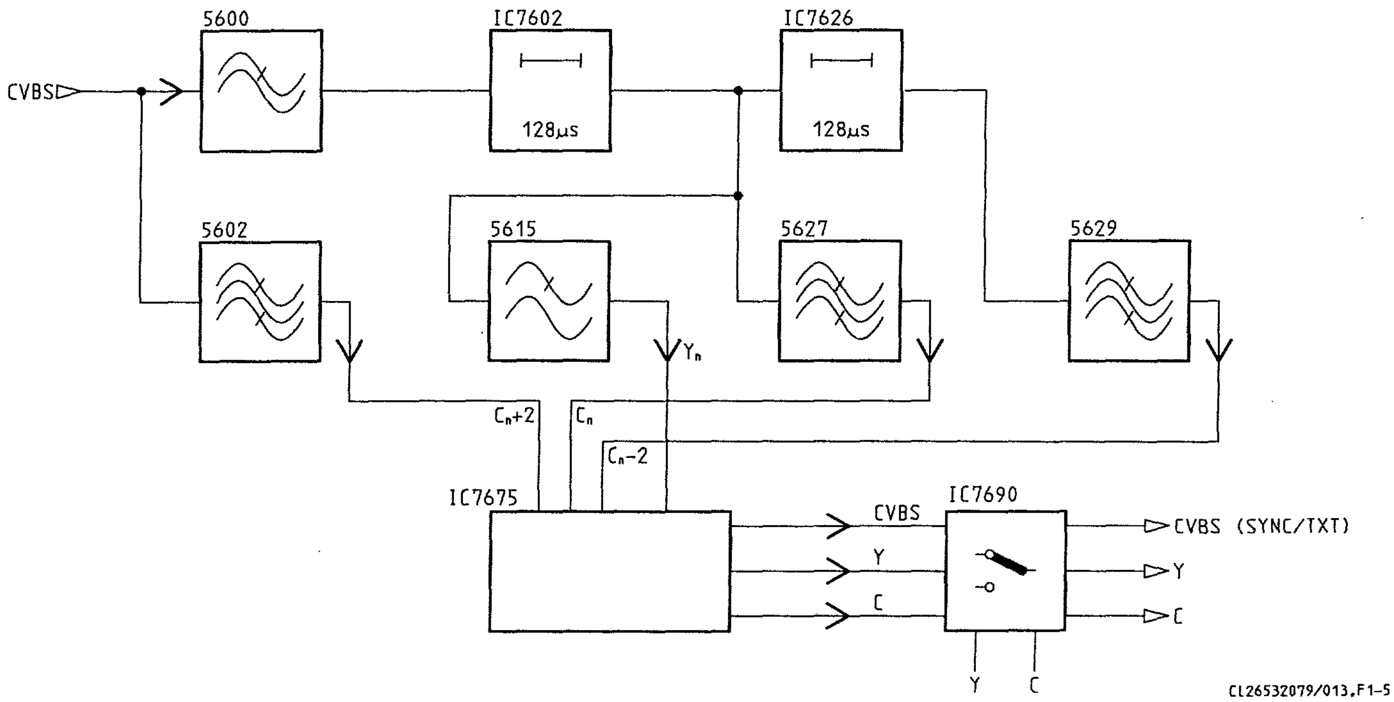


Fig. 5

The clock frequency is taken from the crystal frequency of chrominance decoder. This frequency is 8.86 MHz and is carried via TS7850 to pin 3 of IC7851. This flip-flop is switched as a double distributor. The required frequency of 4.43 MHz is available on pin6.

Because the signals C_n+2, Cn and C_n-2 have to be compared with one another they have to be of equal phase and amplitude. The phase can be adjusted with R3618 (Y_n), R3844 (C_n) and R3637 (C_n-2). Amplitude with R3647 (C_n) and R3653 (C_n-2).

COMB filter

The filter (IC7675) consists of two parts: the chrominance COMB filter and the luminance filter.

In filtering it is assumed that the signal delayed with 2 lines is the current signal ($_n$). The signal is available on pin 18 (Chrominance) and pin 27 (Luminance). On pin 19 the undelayed chrominance signal (C_n+2) is available and the 4 line delayed chrominance signal (C_n-2) on pin 17.The chrominance signals are first buffered and subsequently sent to the comparator circuit via C2671 (C_n-2), C2672 (C_n) and C2673 (C_n+2).
The signal selected by this comparator form the comb filtered chrominance signal that is available on pin 7.

Subtracting this signal from the luminance signal Y_n results in the formation of the filtered Y signal.
The voltage on pin 4 determines the amplification of the chrominance signal in the subtraction circuit, thereby enabling the correct filter action to be adjusted.

Selection switch

The chrominance signal travels via TS7682 and TS7680 to switch A (pin 13) in IC7690. The unfiltered luminance/sync signal travel to switch B (pin 1) via TS7684, TS7686 and TS7688 in IC7690. The filtered luminance signal travels to switch C (pin 3) in IC7690.
The other switch inputs of IC7690 are fed with the unfiltered luminance (pins 2 and 5) and chrominance (pin 12) signals.

With the filter-on signal a choice can subsequently be made from amongst the filtered and unfiltered signals. This signal is made low by the controls (=filter off) if the customer switches out the filter, and on the presence of SVHS signals (which have their chrominance and luminance signals already separated). Due to the fact that this COMB filter is only suitable for PAL signals, the filter-on signal is suppressed on the presence of any other signals. For this purpose the PAL recognition on the chrominance decoder (IC7365) on the small signal panel is supplied by the base of TS7652.

If the system recieved is not PAL this signal will remain low, causing TS7652 to conduct, through which TS7653 conducts, causing the filter-on signal to be made low.

Switch A now supplies the chrominance signal (pin 14), switch B the luminance/sync signal for the synchronisation and for teletext (pin 15), and switch C the luminance signal (pin 4).

Power supply voltages

Power supply voltages are drawn from the +13V. Two voltages are drawn for this purpose; The +8V is produced by the voltage stabiliser IC7878 and the +5V by the serial-stabiliser around TS7623. In this manner a stable voltage is formed over zener diode D6600, which travels to the base of TS7623 via TS7624 and TS7622. Transistors TS7624 and TS7625 form a differential amplifier which adjust the output voltage equal to the zener diode voltage.

Adjustments

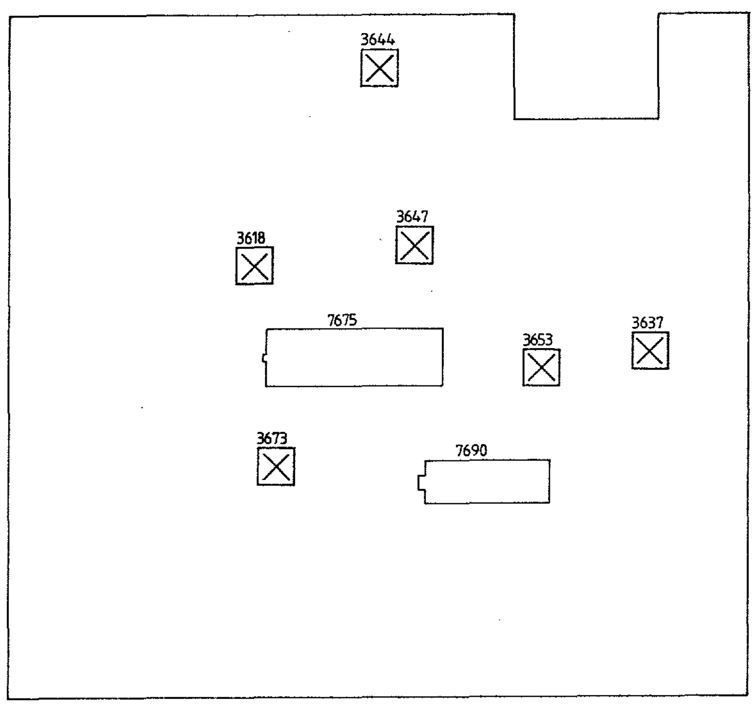
To perform these adjustments use a pattern generator with a separate subcarrier output (e.g. PM5518) and a two channel oscilloscope with an inverter and an A+B mode.

1. Set the generator in PAL mode. Connect the colour carrier wave signal to pin 20 of EXT1 (AUX) and select extern 1.
Connect the channel A probe to pin 12 of IC7675.
Connect the channel B probe to pin 11 of IC7675.
Invert the signal on channel B.
Place the oscilloscope in A+B mode.
Adjust 3647 to minimum signal.
Adjust 3644 to minimum signal.
Adjust 3647 to minimum signal.

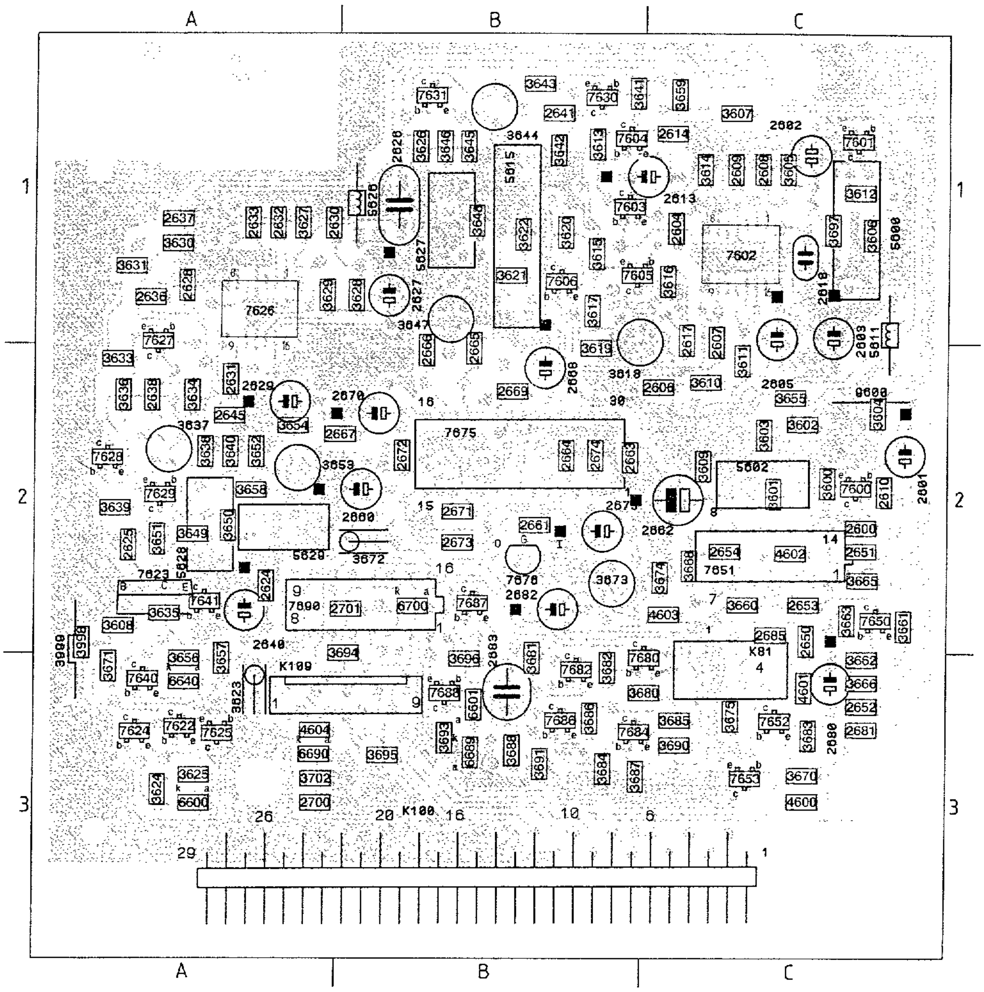
2. Set the generator in PAL mode. Connect the colour carrier wave signal to pin 20 of EXT1 (AUX) and select extern 1.
Connect the channel A probe to pin 12 of IC7675.
Connect the channel B probe to pin 10 of IC7675.
Invert the signal on channel B.
Place the oscilloscope in A+B mode.
Adjust 3653 to minimum signal.
Adjust 3637 to minimum signal.
Adjust 3653 to minimum signal.

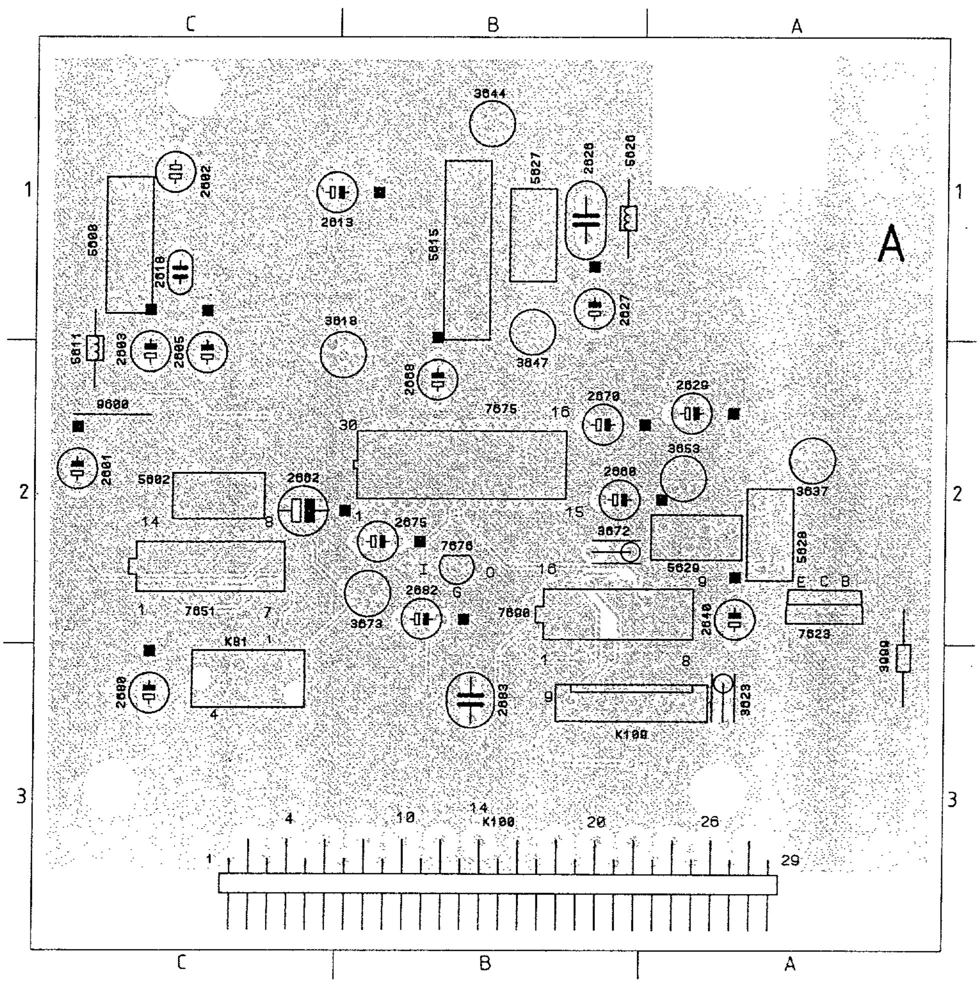
3. Set the generator in PAL mode. Connect the colour carrier wave signal to pin 20 of EXT1 (AUX) and select extern 1.
Connect the channel A probe to pin 7 of IC7675.
Connect the channel B probe to pin 1 of IC7675.
Observe both signals simultaneously on the oscilloscope and adjust 3618 in such a manner that both signals are in phase.

Set the generator in PAL mode. Connect the subcarrier signal to pin 20 of EXT1 (AUX) and select extern 1.
Connect the channel A probe to pin 8 of IC7675.
Adjust 3673 to minimum signal.



3.1 CHASSIS FL1.0 Comb filter/Kamm-Filter/Filtre en peigne





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2601	C2	3628	B1
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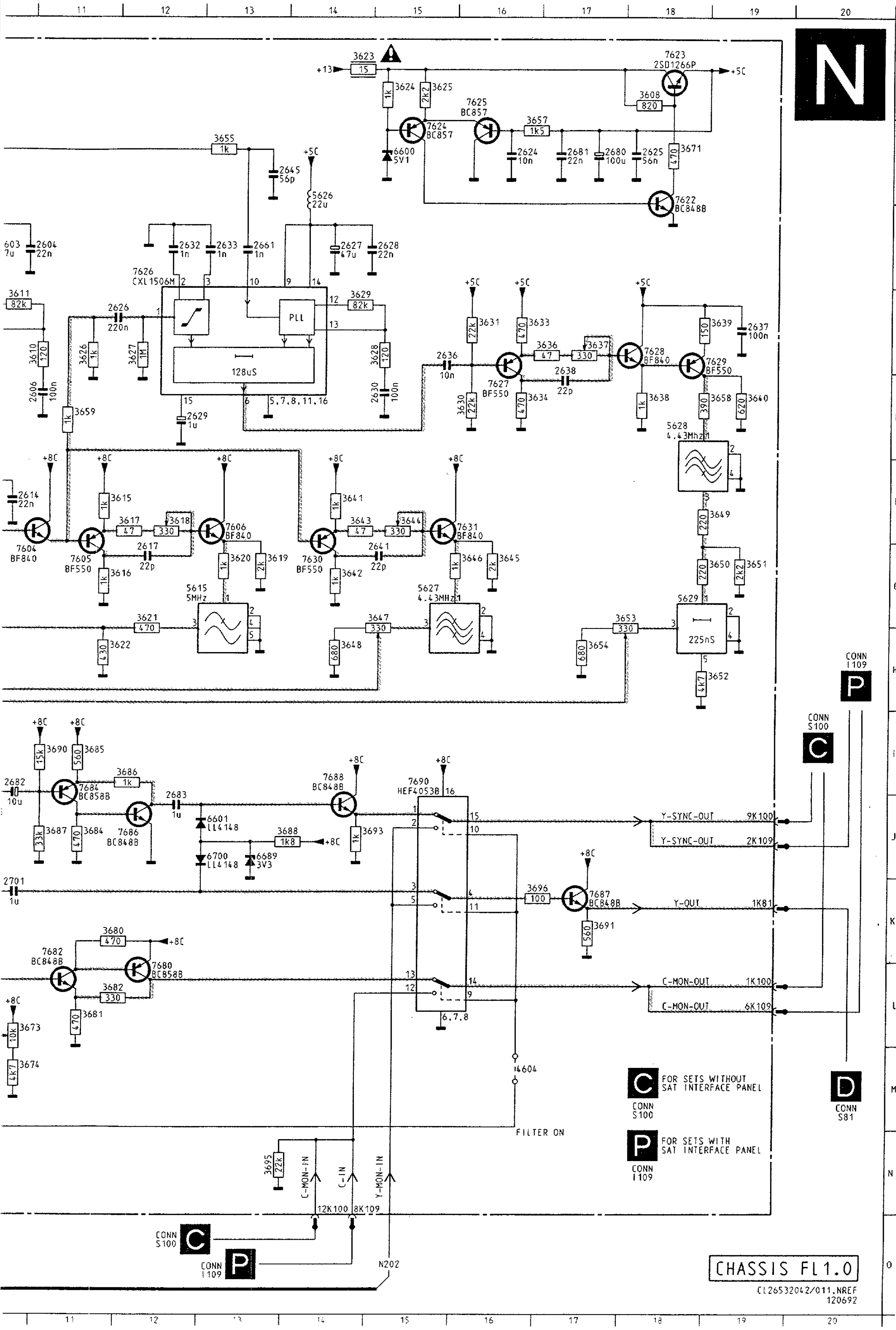
2603	C2	3630	A1
2604	C1	3631	A1
2605	C2	3633	A2
2606	C2	3634	A2
2607	C2	3635	A3
2608	C1	3636	A2
2609	C1	3637	A2
2610	C2	3638	A2
2613	B1	3639	A2
2614	C1	3640	A2
2617	C2	3641	B1
2618	C1	3642	B1
2624	A2	3643	B1
2625	A2	3644	B1
2626	B1	3645	B1
2627	B1	3646	B1
2628	A1	3647	B2
2629	A2	3648	B1
2630	A1	3649	A2
2631	A2	3650	A2
2632	A1	3651	A2
2633	A1	3652	A2
2636	A1	3653	A2
2637	A1	3672	B2
2638	A2	3673	B2
2640	A3	3999	A3
2641	B1	5600	C1
2645	A2	5602	C2
2650	C3	5611	C2
2651	C2	5615	B1
2652	C3	5626	B1
2653	C2	5627	B1
2654	C2	5628	A2
2660	B2	5629	A2
2661	B2	7600	C2
2662	C2	7601	C1
2663	B2	7603	B1
2664	B2	7604	B1
2665	B2	7605	B1
2666	B2	7606	B1
2667	A2	7622	A3
2668	B2	7623	A2
2669	B2	7624	A3
2670	B2	7625	A3
2671	B2	7627	A2
2672	B2	7628	A2
2673	B2	7629	A2
2674	B2	7630	B1
2675	B2	7631	B1
2680	C3	7640	A3
2681	C3	7641	A2
2682	B3	7650	C3
2683	B3	7651	C2
2685	C3	7652	C3
2700	A3	7653	C3
2701	B3	7675	B2
3600	C2	7676	B2
3601	C2	7680	B3
3602	C2	7682	B3
3603	C2	7684	B3
3604	C2	7686	B3
3605	C1	7687	B2
3606	C1	7688	B3
3607	C1	7690	B2
3608	A3	9600	C2
3609	C2	K109	B3
3610	C2	K81	C3
3611	C2		
3612	C1		
3613	B1		
3614	C1		
3615	B1		
3616	C1		
3617	B2		
3618	B2		
3619	B2		
3620	B1		
3621	B1		
3622	B1		
3623	A3		
3624	A3		
3625	A3		
3626	B1		



2600	C 4	3662	B
2601	C 6	3663	B
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2603	C10	3666	B
2604	C11	3668	B
2605	E 8	3670	M
2606	E11	3671	B1
2607	C 9	3672	I
2608	C 8	3673	L1
2609	C 9	3674	M1
2610	D 3	3675	M
2613	F10	3680	K1
2614	F10	3681	L1
2617	G12	3682	L1
2618	D 8	3683	M
2624	B16	3684	J1
2625	B18	3685	I1
2626	D11	3686	I1
2627	C14	3687	J1
2628	C15	3688	J1
2629	E12	3690	I1
2630	E15	3691	K1
2632	C12	3693	J1
2633	C13	3694	D
2636	D15	3695	N1
2637	D19	3696	K1
2638	E17	3697	D
2641	G15	4601	N
2645	B13	4602	B
2650	B 3	4604	M1
2651	A 3	5600	D
2652	B 4	5602	E
2653	B 4	5611	B1
2654	B 8	5615	G1
2660	J 2	5626	B1
2661	C13	5627	G1
2661	J 2	5628	E1
2662	M 4	5629	G1
2663	M 5	6600	B1
2664	M10	6601	J1
2665	I 6	6689	J1
2666	I 7	6700	J1
2667	I 7	7600	D 4
2668	I 9	7601	D 6
2669	M 7	7602	C 8
2670	M 6	7603	F 9
2671	K 4	7604	G1
2672	K 4	7605	G1
2673	K 5	7606	F1
2674	M 6	7622	B18
2675	J10	7623	A18
2680	B17	7624	B15
2681	B17	7625	A16
2682	I10	7626	C12
2683	J12	7627	E16
2685	N 2	7628	D18
2701	K10	7629	D18
3600	D 4	7630	G14
3601	F 4	7631	F16
3602	D 4	7650	B 4
3603	D 5	7651	A 6
3604	D 3	7652	M 3
3605	D 7	7653	N 4
3606	D 6	7675	I 5
3607	C 7	7676	I 3
3608	A18	7680	L12
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3610	D11	7684	I11
3611	D10	7686	J12
3612	D 6	7687	K17
3613	F 9	7688	I14
3614	G 9	7690	I15
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3618	F12		
3619	G13		
3620	G13		
3621	G12		
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3644	F15		
3645	G16		
3646	G16		
3647	G15		
3648	H14		
3649	F19		
3650	G19		
3651	G19		
3652	H19		
3653	G18		
3654	H17		
3655	B13		
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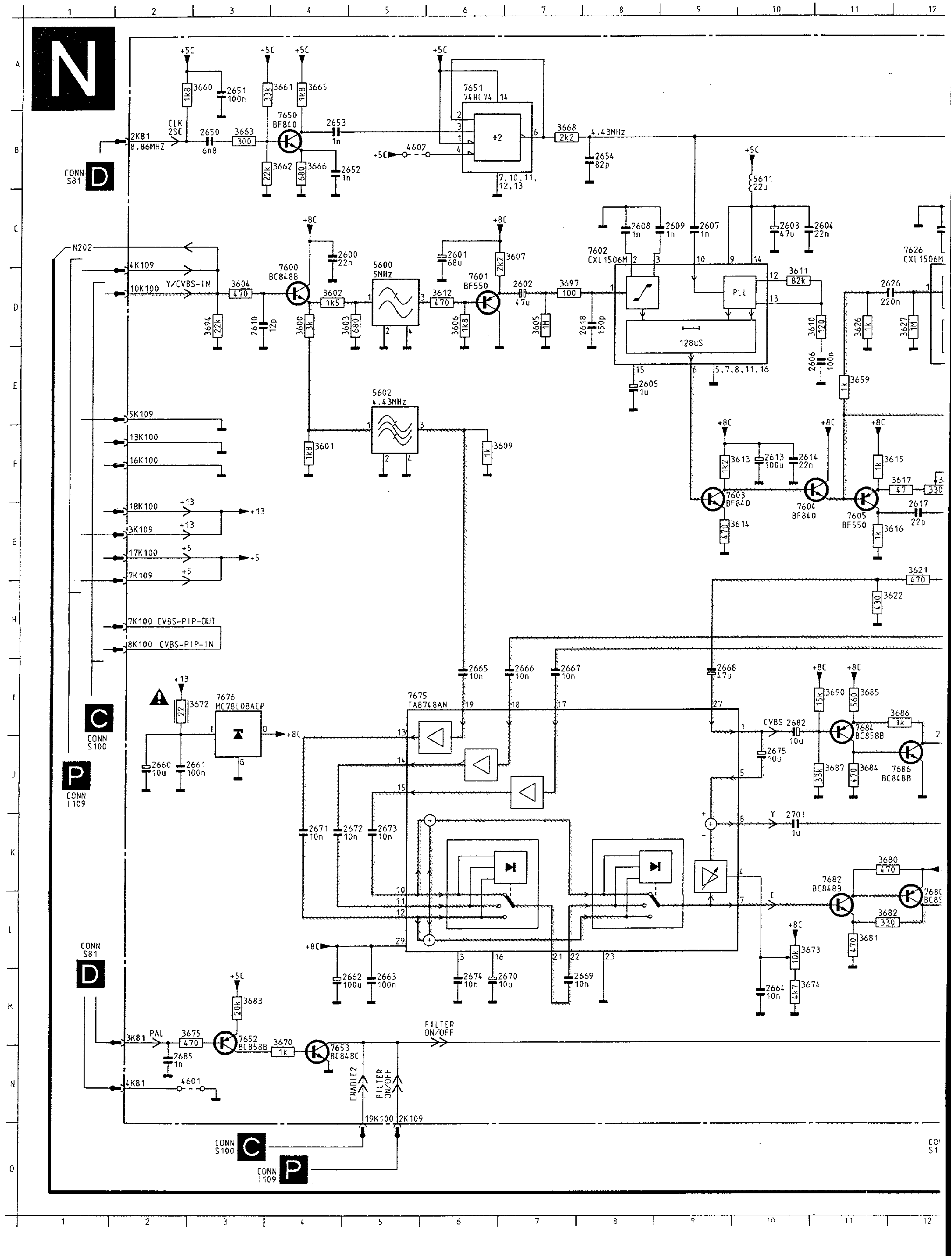
3658	E19		
3659	E11		
3660	A 3		
3661	A 4		

Comb filter/Kamm-Filter/Filtre en peigne



Spare parts list/Stückliste/Liste

Comb-filter

Various

1255	4822 212 30275	COMB FILTER TERREST.
	4822 265 51323	28P
	4822 265 30378	4P MALE FOR BTB-WTB

2600	4822 122 31797	22nF 10% 63V
2601	4822 124 22606	68µF 20% 16V
2602	5322 124 41939	100MU 6V3
2603	4822 124 40177	47µF 20% 10V
2604	4822 122 31797	22nF 10% 63V
2605	4822 124 40242	1µF 20% 63V
2606	4822 122 31947	100nF 20% 63V
2607	5322 122 31647	1nF 10% 63V
2608	5322 122 31647	1nF 10% 63V
2609	5322 122 31647	1nF 10% 63V
2610	4822 122 32139	12pF 5% 63V
2613	4822 124 41584	100µF 20% 10V
2614	4822 122 31797	22nF 10% 63V
2617	4822 122 31772	47pF 5% 50V
2618	4822 122 31349	68pF 2% 100V
2624	4822 122 32862	10nF 80% 50V
2625	4822 122 33105	56nF 10% 63V
2626	4822 121 42408	220nF 5% 63V
2627	4822 124 40177	47µF 20% 10V
2628	4822 122 31797	22nF 10% 63V
2629	4822 124 40242	1µF 20% 63V
2630	4822 122 31947	100nF 20% 63V
2631	5322 122 31647	1nF 10% 63V
2632	5322 122 31647	1nF 10% 63V
2633	5322 122 31647	1nF 10% 63V
2636	4822 122 32442	10nF 50V
2637	4822 122 31947	100nF 20% 63V
2638	4822 122 31772	47pF 5% 50V
2641	4822 122 31772	47pF 5% 50V
2645	4822 122 31774	56pF 5% 50V
2650	4822 122 32597	6,8nF 10% 63V
2651	4822 122 31947	100nF 20% 63V
2652	5322 122 31647	1nF 10% 63V
2653	5322 122 31647	1nF 10% 63V
2654	4822 122 31839	82pF 10% 50V
2660	4822 124 40435	10µF 20% 50V
2661	4822 122 33496	100nF 10% 63V
2662	4822 124 41643	100µF 20% 16V
2663	4822 122 33496	100nF 10% 63V
2664	4822 122 32442	10nF 50V
2665	4822 122 32442	10nF 50V
2666	4822 122 32442	10nF 50V
2667	4822 122 32442	10nF 50V
2669	4822 122 32442	10nF 50V
2670	4822 124 40435	10µF 20% 50V
2671	4822 122 32442	10nF 50V
2672	4822 122 32442	10nF 50V
2673	4822 122 32442	10nF 50V
2674	4822 122 32442	10nF 50V
2675	4822 124 40435	10µF 20% 50V
2680	4822 124 41584	100µF 20% 10V
2681	4822 122 31797	22nF 10% 63V
2682	4822 124 40435	10µF 20% 50V
2683	4822 121 51319	1µF 10% 63V
2685	5322 122 31647	1nF 10% 63V
2701	4822 126 11725	1µF 205 5V

3600	4822 051 10302	3k 2% 0,25W
3601	4822 051 10182	1k8 2% 0,25W
3602	4822 051 10152	1k5 2% 0,25W
3603	4822 051 10681	680Ω 2% 0,25W
3604	4822 051 10471	470Ω 2% 0,25W
3605	4822 051 10105	1M 5% 0,25W
3606	4822 051 10182	1k8 2% 0,25W
3607	4822 051 20222	2k2 5% 0,1W
3608	4822 051 10821	820Ω 2% 0,25W
3609	4822 051 10102	1k 2% 0,25W
3610	4822 051 51201	120Ω 1% 0,125W
3611	4822 051 10823	82k 2% 0,25W
3612	4822 051 10471	470Ω 2% 0,25W
3613	4822 051 10112	1k1 2% 0,25W
3614	4822 051 10471	470Ω 2% 0,25W
3615	4822 051 10102	1k 2% 0,25W
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3617	4822 051 10479	47Ω 2% 0,25W
3618	4822 101 21203	330Ω
3619	4822 051 10202	2k 2% 0,25W
3620	4822 051 10102	1k 2% 0,25W
3621	4822 051 10471	470Ω 2% 0,25W
3622	4822 051 10511	510Ω 2% 0,25W
3623	4822 052 10159	15Ω 5% 0,33W
3624	4822 051 10102	1k 2% 0,25W
3625	4822 051 20222	2k2 5% 0,1W
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3647	4822 101 21203	330Ω
3648	4822 051 10681	680Ω 2% 0,25W
3649	4822 051 10221	220Ω 2% 0,25W
3650	4822 051 10221	220Ω 2% 0,25W
3651	4822 051 10222	2k2 2% 0,25W
3652	4822 051 10472	4k7 2% 0,25W
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3654	4822 051 10681	680Ω 2% 0,25W
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3657	4822 051 10152	1k5 2% 0,25W
3658	4822 051 10391	390Ω 2% 0,25W
3659	4822 051 10102	1k 2% 0,25W
3660	4822 051 10182	1k8 2% 0,25W
3661	4822 051 10333	33k 2% 0,25W
3662	4822 051 10223	22k 2% 0,25W
3663	4822 051 10301	300Ω 2% 0,25W
3665	4822 051 10182	1k8 2% 0,25W
3666	4822 051 10681	680Ω 2% 0,25W
3668	4822 051 20222	2k2 5% 0,1W
3670	4822 051 10102	1k 2% 0,25W
3671	4822 051 10471	470Ω 2% 0,25W
3672	4822 052 10229	22Ω 5% 0,33W
3673	4822 105 10455	
3674	4822 051 10472	4k7 2% 0,25W
3675	4822 051 10471	470Ω 2% 0,25W
3680	4822 051 10471	470Ω 2% 0,25W
3681	4822 051 10471	470Ω 2% 0,25W
3682	4822 051 10331	330Ω 2% 0,25W
3683	4822 051 10203	20k 2% 0,25W
3684	4822 051 10471	470Ω 2% 0,25W
3685	4822 051 10561	560Ω 2% 0,25W
3686	4822 051 10102	1k 2% 0,25W
3687	4822 051 10333	33k 2% 0,25W
3688	4822 051 10182	1k8 2% 0,25W
3690	4822 051 10153	15k 2% 0,25W
3691	4822 051 10561	560Ω 2% 0,25W
3693	4822 051 10102	1k 2% 0,25W
3694	4822 051 10223	22k 2% 0,25W
3695	4822 051 10223	22k 2% 0,25W
3696	4822 051 10101	100Ω 2% 0,25W
3697	4822 051 10101	100Ω 2% 0,25W

Jumper

4601	4822 051 10008	0Ω 5% 0,25W
4602	4822 051 10008	0Ω 5% 0,25W
4604	4822 051 10008	0Ω 5% 0,25W

5600	4822 242 81243	TH315LSMS-3258TADV
5602	4822 242 81244	H314BDIS-2454WAD
5611	4822 157 52983	2N2
5615	4822 242 81242	H316LSN-2009QCD
5626	4822 157 52983	2N2
5627	4822 242 81244	H314BDIS-2454WAD
5628	4822 242 81244	H314BDIS-2454WAD
5629	4822 320 40285	25NS 4,43mHz

6440	4822 130 80446	LL4148
6600	4822 130 80905	LLZ-F5V1
6601	4822 130 80446	LL4148
6689	4822 130 81139	LLZ-C3V3
6700	4822 130 80446	LL4148

7600	5322 130 41982	BC848B
7601	4822 130 42131	BF550
7602	4822 209 31492	CXL1506M
7603	4822 130 60887	BF840
7604	4822 130 60887	BF840
7605	4822 130 42131	BF550
7606	4822 130 60887	BF840
7622	5322 130 41982	BC848B
7623	4822 130 60775	2SD1266P
7624	4822 130 61233	BC857
7625	4822 130 61233	BC857
7626	4822 209 31492	CXL1506M
7627	4822 130 42131	BF550
7628	4822 130 60887	BF840
7629	4822 130 42131	BF550
7630	4822 130 42131	BF550
7631	4822 130 60887	BF840
7650	4822 130 60887	BF840
7651	5322 209 82575	PC74HC74P
7652	5322 130 41983	BC858B
7653	5322 130 41982	BC848B
7675	4822 209 31491	TA8748AN
7676	4822 209 11345	MC78L08ACP
7680	5322 130 41983	BC858B
7682	5322 130 41982	BC848B
7684	5322 130 41983	BC858B
7686	5322 130 41982	BC848B
7687	5322 130 41982	BC848B
7688	5322 130 41982	BC848B
7690	5322 209 10576	HEF4053BP