TANDBERG

SERVICE MANUAL
AND LOGIC CIRCUITS DESCRIPTION

9100X/9200XD

Tandberg
RADIO

LOGIC CIRCUITS DESCRIPTION

All paragraphs in the first half of the book are valid for the 9000 series.

CONTENTS

MECHANICAL AND ELECTRICAL ADJUSTMENTS

All paragraphs in the other half are valid for models 9100X and 9200XD.

CONTENTS

1.0 LOGIC CIRCUIT TYPES AND TRIGGERING METHODS

The circuits on the logic board are built up of and-gates (and-ports), nand-gates (not-and ports), monostable and bistable circuits.

The transistors in a logic circuit work either in saturation (conduct as a closed switch) or in cut-off (blocking as an open switch). The input of the circuit is connected to the base of a transistor via a diode, transistor or resistor, while the output is connected to the collector of the output transistor.

Voltage levels for the 9000X logic circuits are defines as:

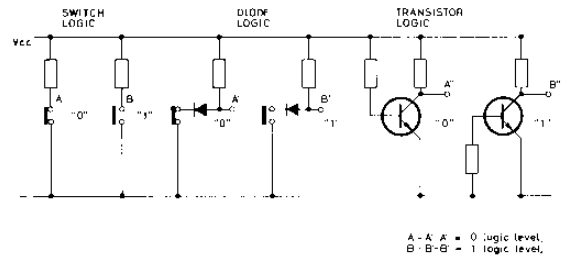|		
High level	(logic 1)	8 to 18.0 V
Low level	(logic 0)	0 to 6.0 V
Threshold level		7.0 V

Fig. 1.1   Examples of elementary logic circuits showing the meaning of logic levels high "1" and low "0",

1.1 AND-GATE

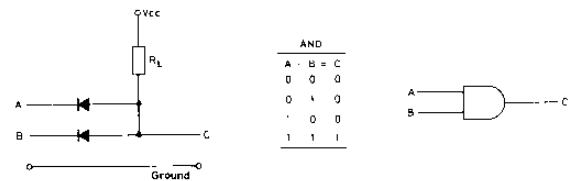Only when all the inputs are high (logic 1) can the output be high.

Fig. 1.2   AND-circuit, truth table and symbol

1.2 INVERTER, NOT-FUNCTION

The output signals are always the inverse (have the opposite logic level) of the input signal (0 is the inverse of 1 and vice versa). If all the inputs on a nand-gate are connected together an inverter is obtained. In general an inverter is combined with a logic function when the inverter is drawn with a small circle following the symbol for the function
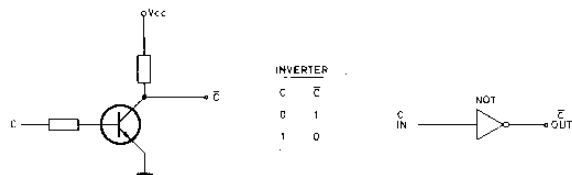

Fig. 1.3   INVERTER-circuit, truth table and symbol

1.3 NAND-GATE

A combination of an and-gate and an inverter forms a nand-gate. The output is low (0) only when all the inputs are high (1). It is enough that one of the inputs is low (0) for the output to be high (1).
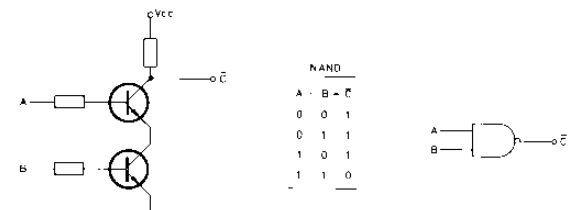

Fig. 1.4   NAND-circuit, truth table and symbol

1.4 FLIP-FLOP, BISTABLE MULTIVIBRATOR

A bistable circuit switches between two stable states dependent on the levels of the trigger pulse at the input.

When the input S (Set) goes low, the output Q goes high and remains in that state.

When the input R (Reset) goes low the output Q goes low and remains in that state.

* Note for truth table:
The two inputs should preferably not be grounded (have logic 0) at the same time, but if it does happen the input which remains low longest will take over control.

The two outputs always have opposite levels.

1.5 MONOSTABLE MULTIVIBRATOR

A monostable circuit has one stable condition and every trigger pulse at the input therefore forces the circuit out of this stable condition for a time which depends on the time constant of the circuit.

The time-constant T, and also the duration of the output pulse, are dependent on the component values in the R-C stage and can be calculated from the formula T = 0.69 x r x c. A typical example is shown in Figure 1.6.

Monostable circuits are used to determine the duration of a function, as for example the pull-in phase for the braking solenoid.

The monostable circuit in 9000X

The two monostable circuits that are used in the 9000X have a different configuration from the one shown in Figure 1.6. The difference lies in the R-C stage itself which in the 9000X consists of a capacitor (C) and a nand-circuit (R) where the capacitor is discharged by a leakage current through through the nand-circuit.

The time constant (T) can be calculated by means of the special formula for this circuit; T in seconds and C in microfarads (uF), T = 0.5 x C.
This is an approximate formula. The spread with IC's is very large, and often the formula T = I x C or even T = 2 x C can be more applicable.
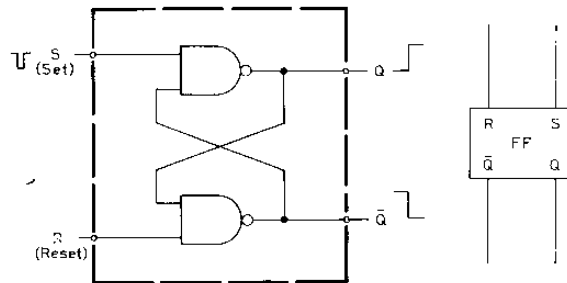
PREVIOUS STATE		INPUT CONDITION		RESULT	
Q	Q	S	R	Q	Q
0	1	0	1	1	0
		0	0	1*	1*
		1	0	no change	
		1	1	no change	
1	0	1	0	0	1
		0	0	1*	1*
		0	1	no change	
		1	1	no change	

Fig. 1.5 FLIP-FLOP circuit, truth table and symbol
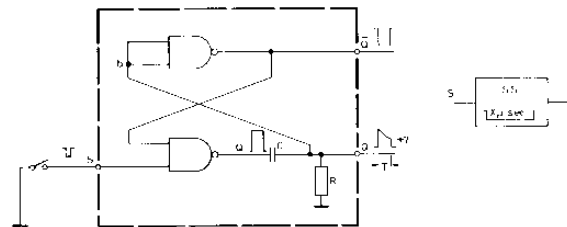
Fig. 1.6 Monostable circuit and symbol

4

A6 OSCILLATOR (NOTES 1-2)

A6 OSCILLATOR BOARD
MODEL 9100X AND 9200XD
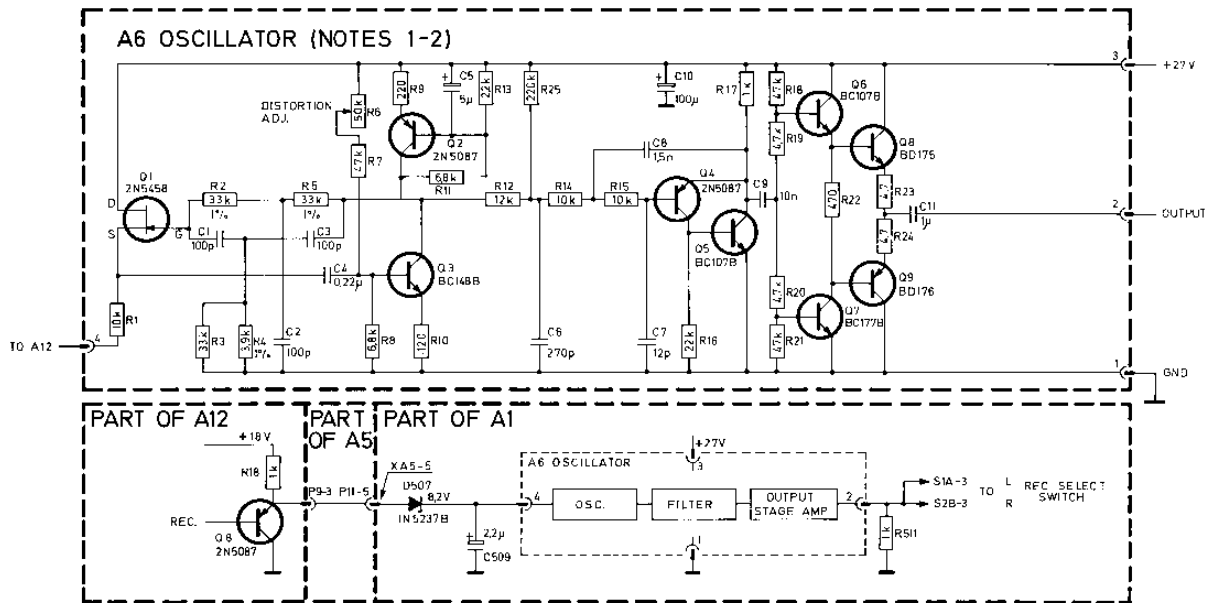
REFERENCE DESIGNATIONS

PREFIX WITH A6	NOT USED
C 1 - 11	
Q 1 - 9	
R 1 - 25	

NOTES:

1. UNLESS OTHERWISE SPECIFIED RESISTANCE IN OHMS.

2. WHEN REFERING TO A COMPONENT ON A PRINTED BOARD ASSEMBLY PUT THE ASSY DESIGNATION IN FRONT OF THE COMPONENT REFERENCE DESIGNATION (E. G. SPECIFY A6R1 AND NOT ONLY R1).

45

A7 EQUAL. REC. AMP. (NOTES 1-5)

REFERENCE DESIGNATIONS

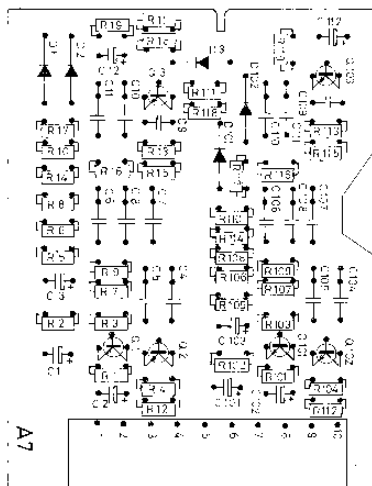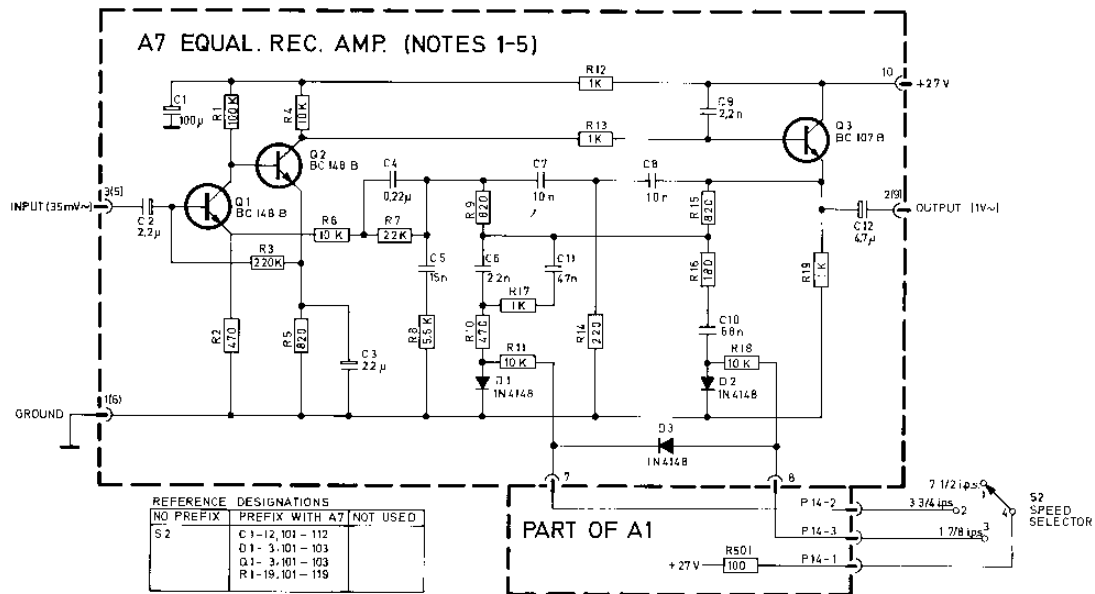| NO PREFIX	PREFIX WITH A7	NOT USED
S 2	C 1 - 12, 101 - 112	
	D 1 - 3, 101 - 103	
	Q 1 - 3, 101 - 103	
	R 1 - 19, 101 - 119	

PART OF A1
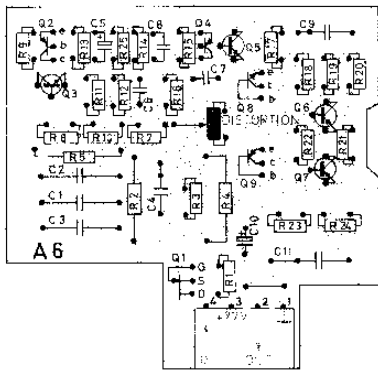
NOTES

1. UNLESS OTHERWISE SPECIFIED RESISTANCE IN OHMS.

2. WHEN REFERRING TO A COMPONENT ON A PRINTED BOARD ASSEMBLY PUT THE ASSY DESIGNATION IN FRONT OF THE COMPONENT REFERENCE DESIGNATION (E.G. SPECIFY A7R1 AND NOT ONLY R1).
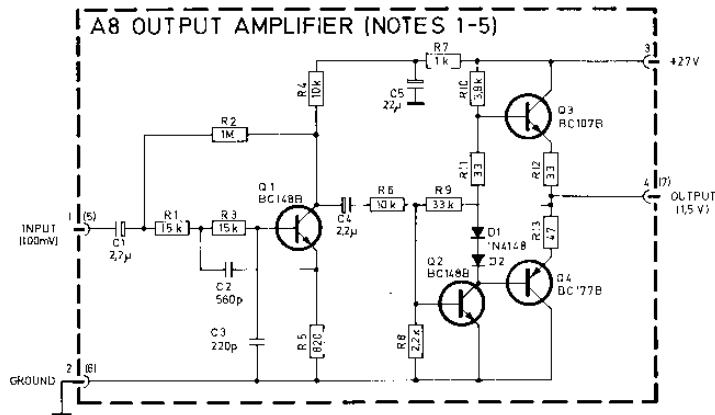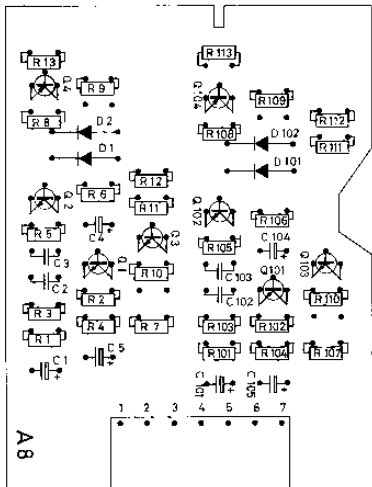
3. ONLY THE L-CHANNEL OF THE ASSEMBLY DESIGNATED A7 IS SHOWN.

4. PLUG TERMINAL NO'S FOR THE R-CHANNEL ARE GIVEN IN BRACKETS BESIDE THE L-CHANNEL PLUG TERMINAL NO'S.

5. L-CHANNEL HAS 1-99 AND R-CHANNEL HAS 100-199 AS COMPONENT NO'S, WHEN REFERRING TO R-CHANNEL COMPONENTS ADD 100 TO THE L-CHANNEL NO'S (E.G. R17 OF THE L-CHANNEL HAS THE SAME VALUE AS R117 OF THE R-CHANNEL).

A7   EQUAL. RECORD AMP.
MODEL 9100X AND 9200XD

A8 OUTPUT AMPLIFIER (NOTES 1-5)

A1 MAIN BOARD (NOTES 1,2 AND 5)

NOTES:

1. UNLESS OTHERWISE SPECIFIED RESISTANCE IN OHMS.

2. WHEN REFERING TO A COMPONENT ON A PRINTED BOARD ASSEMBLY PUT THE ASSY DESIGNATION (E.G. SPECIFY A8R1 AND NOT ONLY R1)

3. ONLY THE L-CHANNEL OF THE ASSEMBLY DESIGNATED A8 IS SHOWN.

4. PLUG TERMINAL NO.'S FOR THE R-CHANNEL ARE GIVEN IN BRACKETS BESIDE THE L-CHANNEL PLUG TERMINAL NO.'S

5. L-CHANNEL HAS 1-99 AND R-CHANNEL HAS 100-199 AS COMPONENT NO.'S WHEN REFERING TO R-CHANNEL COMPONENTS, ADD 100 TO THE L-CHANNEL NO.'S (E.G. R117 OF THE L-CHANNEL HAS THE SAME VALUE AS R117 OF THE R-CHANNEL)

REFERENCE DESIGNATIONS (NOTES 2 AND 5)

NO PREFIX	PREFIX WITH A8	PREFIX WITH A1	NOT USED
R4 ,104	C1-5 , 101-105	C6,7, 106, 107	
	D1-2 , 101-102	D3 ,103	
	Q1-4 , 101-104	P12,15,17	
	R1-15 , 101-113	R22, 28-30, 34-36 43,127,128-130 134-136 ,143	

A8   OUTPUT AMP. BOARD.
MODEL 9100X AND 9200XD

47

A 11 EQUAL. PLAYB. AMP. (NOTES 1-5)

REFERENCE DESIGNATIONS (NOTES 2 AND 5)

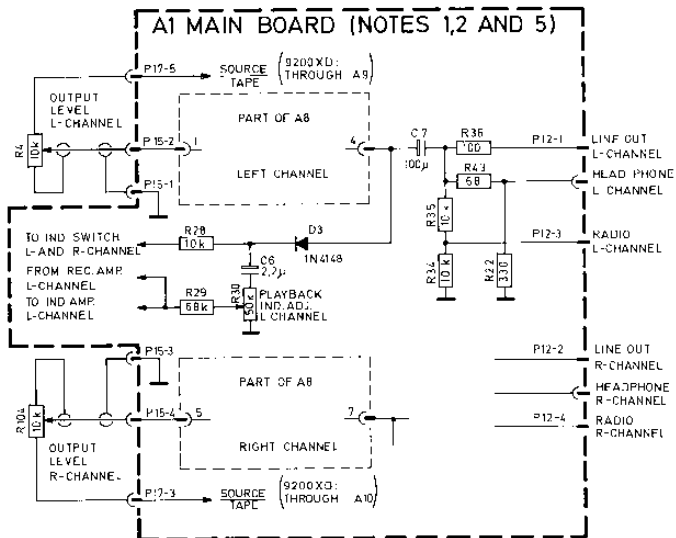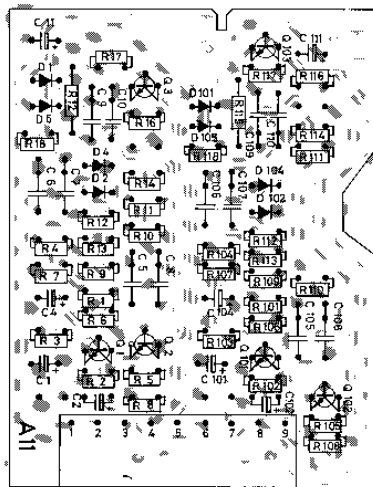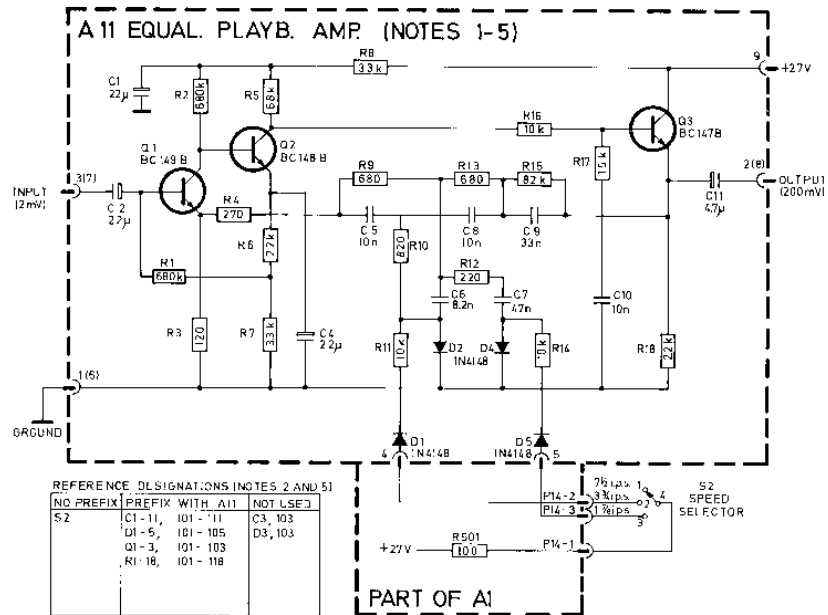| NO PREFIX	PREFIX WITH A11	NOT USED
S2	C1 - 11, 101 - 111	C3, 103
	D1 - 5, 101 - 105	D3, 103
	Q1 - 3, 101 - 103	
	R1 - 18, 101 - 118	

PART OF A1

NOTES:

1. UNLESS OTHERWISE SPECIFIED RESISTANCE IN OHMS.

2. WHEN REFERING TO A COMPONENT ON A PRINTED BOARD ASSEMBLY PUT THE ASSY DESIGNATION IN FRONT OF THE COMPONENT REFERENCE DESIGNATION (E. G. SPECIFY A11R1 AND NOT ONLY R1)

3. ONLY THE L-CHANNEL OF THE ASSEMBLY DESIGNATED A11 IS SHOWN.

4. PLUG TERMINAL NO.'S FOR THE R-CHANNEL ARE GIVEN IN BRACKETS BESIDE THE L-CHANNEL PLUG TERMINAL NO.'S.

5. L-CHANNEL HAS 1-99 AND R-CHANNEL HAS 100-199 AS COMPONENT NO.'S. WHEN REFERING TO R-CHANNEL COMPONENTS, ADD 100 TO THE L-CHANNEL NO.'S (E. G. R17 OF THE L-CHANNEL HAS THE SAME VALUE AS R117 OF THE R-CHANNEL).

**A11 EQUAL. PLAYBACK AMP.
MODEL 9100X AND 9200XD**

48

TANDBERGS RADIOFABRIKK A/S
Postboks 9, Korsvoll, Oslo 8
Norway