Errata

Title & Document Type: **8083A 300 MHz Output Amplifier Module Operating and Service Manual**

Manual Part Number: **08083-90001**

Revision Date: **January 1985**

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OPERATING AND SERVICE MANUAL
300MHz OUTPUT AMPLIFIER
MODULE 8083A

PART OF THE 8080A HIGH FREQUENCY
PULSE GENERATOR SYSTEM

SERIAL NUMBERS

This manual applies directly to instrument serial number

1604G 00101

For instruments with lower serial numbers, refer to the backdating information in Section 8 of this module manual.

For instruments with higher serial numbers, refer to the Manual Change sheets at the end of this module manual.

703 BÖBLINGEN, HERRENBERGER STR. 110, WEST GERMANY.

MANUAL PART NO. 08083-90001
MICROFICHE PART NO. 08083-90501

Printed in West Germany

CERTIFICATION

The Hewlett-Packard Company certifies that this instrument was thoroughly tested and inspected and found to meet its published specifications when it was shipped from the factory. The Hewlett-Packard Company further certifies that its calibration measurements are traceable to the U.S. National Bureau of Standards to the extent allowed by the Bureau's calibration facilities, or to the calibration facilities of other International Standards Organization members.

WARRANTY AND ASSISTANCE

This Hewlett-Packard product is warranted against defects in materials and workmanship. This warranty applies for one year from the date of delivery. Hewlett-Packard will repair or replace products which prove to be defective during the warranty period provided they are returned to Hewlett-Packard. No other warranty is expressed or implied. We are not liable for consequential damages.

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For any assistance, contact your nearest Hewlett-Packard Sales and Service Office. Addresses are provided at the back of this manual.

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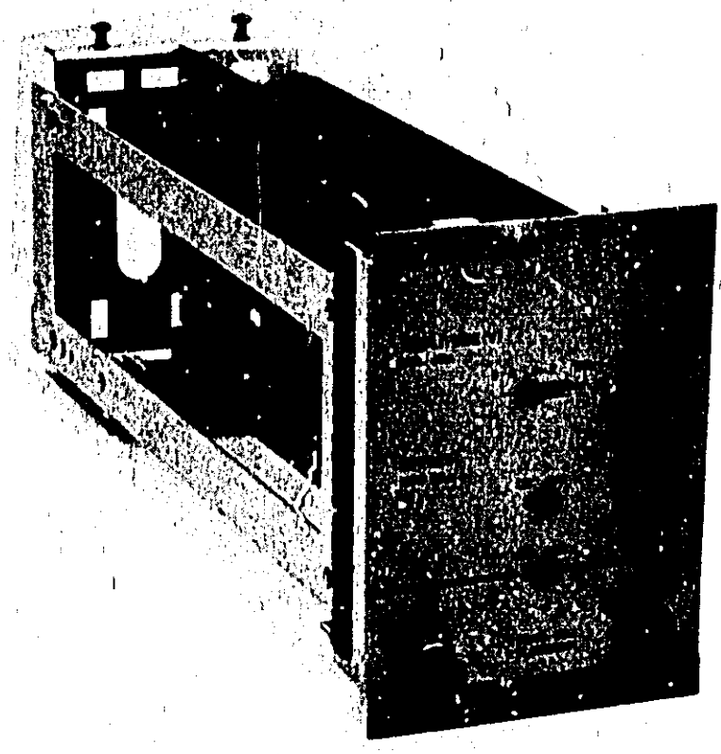


8083A

Figure 1–1. 8083A 300 MHz Output Amplifier Module and Supplied Accessories

1–1 INTRODUCTION

1–2 This Operating and Service manual contains information required to install, operate, test, adjust and service the Hewlett-Packard Model 8083A 300 MHz Output Amplifier module. Figure 1–1 shows the module and accessories supplied. This section covers instrument identification, description, accessories, specifications, and other basic information.

1–3 A microfiche version of this manual is available on 4 x 6 inch microfilm transparencies (order number on title page). Each microfiche package also includes the latest Manual Changes supplement as well as all pertinent Service Notes.

1–4 SPECIFICATIONS

1–5 Instrument specifications are listed in table 1–2. These specifications are the performance standards or limits against which the instrument is tested.

1–6 SAFETY CONSIDERATIONS

1–7 The Model 8083A is a Safety Class 1 instrument (it has an exposed metal chassis that is connected to earth via the 8080 system mainframe). This instrument has been designed according to international safety standards and has been supplied in a safe condition.

1–8 This operating and service manual contains information, cautions and warnings which must be followed by the user to ensure safe operation and to maintain the instrument in a safe condition.

1–9 INSTRUMENTS COVERED BY MANUAL

1–10 Attached to the inside of the instrument side frame is a serial number plate (figure 1–1). The first four digits of the serial number only change when there is a significant change to the instrument. The last five digits are assigned to instruments sequentially. The contents of this manual apply directly to the instrument serial number quoted on the title page. For instruments with lower serial numbers, refer to the backdating information in Section 8 of this module manual. For instruments with higher serial numbers, refer to the Manual Change sheets at the end of this manual. In addition to change information, the Manual Change sheets may contain information for correcting errors in the manual. To keep this manual as up-to-date and accurate as possible, Hewlett-Packard recommends that you periodically request the latest Manual Change development. The supplement for this manual is identified with this manual's print date and part number, both of which appear on this module manual's title page. Complimentary copies of the supplement are available from Hewlett-Packard.

Figure 1–1. Serial Number Plate

1–11 DESCRIPTION

1–12 The Model 8083A is an Output Amplifier module for amplifying signals with repetition rates up to 300 MHz. Pulse amplitude from the complementary outputs is variable from 0.2V to 2V plus a fixed ECL position (–0.8V high, –1.6V low). Pulse baseline can be offset within the range –1V to +1V and output polarity can be switched.

1–13 The power supplies for the 8081A are provided by the 8082A Mainframe.

1–14 OPTIONS

1–15 The only option for the 8083A is a second copy of the operating and service manual which can be obtained by ordering option 910.

1–16 EQUIPMENT REQUIRED BUT NOT SUPPLIED

1–17 To operate the 8083A module, an 8080A Mainframe is required. The 8080A mainframe provides housing and power supplies for the 8083A.

1–18 EQUIPMENT AVAILABLE

1–19 The 8083A is one of a complete range of rep. rate, timing and output modules that form the 8080A high frequency pulse generator system. Repetition rates range from 0–1 GHz and the modules are interchangeable to enable you to purchase a system exactly tailored to your requirements.

1–20 RECOMMENDED TEST EQUIPMENT

1–21 Equipment required to maintain the 8083A is listed in Table 1–1. Other equipment can be substituted if it meets or exceeds the critical specifications listed in the table.

Table 1–1. Recommended Test Equipment

Instrument	Critical Specification	Recommended Model	Used in
Mainframe		HP 8080A	Performance Tests, Adjustments
Sampling Oscilloscope	Dual channel; > 300 MHz bandwidth; up to 200 mV/div. sensitivity; up to 0.5 ns/div sweep speed; 50 ohm input impedance	HP 182C with HP 1810A plug-in	Performance Tests, Adjustments
20 dB Attenuators (2 required)		HP 8491A with 1250–0077 and 1250–0780 adaptors	Performance Tests, Adjustments

Table 1–2. Specifications

DRIVE INPUT	
Input frequency:	300 MHz
Transition time (10 % to 90 %):	≤ 3 ns
Input impedance:	50 Ω typical
Signal levels:	high: 0 V ± 50 mV low: –.6 V ± 50 mV
OUTPUT CHANNELS	NORMAL and COMPLEMENT outputs provided simultaneously
Source impedance:	50 Ω ± 5 %
Polarity:	neg/pos selectable
OUTPUT PULSE	
Amplitude (into 50 Ω load):	3 ranges: 2 V to .6 V (by Vernier) .6 V to .2 V (by Vernier) ECL (–.8 V to –1.6 V typ)
Maximum pulse amplitude:	4 V (into open circuit)
Maximum levels:	± 4 V
Offset (into 50 Ω load):	± 1 V (common to both channels)
Transition time (10 % to 90 %):	≤ 800 ps
Duty cycle:	Determined by duty cycle of driving clock pulse 50 % ± 10 % (with 50 % duty cycle input)
Overshoot & Ringing:	≤ 10 %
Preshoot:	≤ 10 %
Output protection:	max. applied ext. voltage: ± 2 V in POS mode 0 to –4 V in NEG mode or max. ext. current: ± 40 mA
OPTION 910	Additional instrument operating and service manual
SIZE	Quarter mainframe width.

SECTION 2

INSTALLATION

2–1 INTRODUCTION

2–2 This section provides installation instructions for the Model 8083A 300 MHz Output Amplifier module. It also includes information about initial inspection and damage claims, preparation for use, and packaging, storage and shipment.

2–3 INITIAL INSPECTION

2–4 Inspect the shipping container for damage. If the container or cushioning material is damaged, it should be kept until the contents of the shipment have been checked for completeness and the instrument has been checked mechanically and electrically. The contents of the shipment should be as shown in Figure 1–1. Procedures for checking the electrical operation are given in Section 3. If the contents are incomplete, if there is mechanical damage or defect, or if the 8083A does not pass the operator's checks, notify the nearest Hewlett-Packard Sales/Service office. If the shipping container is damaged, or the cushioning material shows signs of stress, notify the carrier as well as the Hewlett-Packard office. Keep the shipping materials for carrier's inspection. The HP office will arrange for repair or replacement without waiting for claim settlement.

2–5 PREPARATION FOR USE

2–6 Installation in 8080A Mainframe

CAUTION

The following installation procedure must only be carried out by qualified service personnel.

2–7 To operate the 8083A it must first be installed in an 8080A Mainframe as follows:

1. Switch the mainframe LINE OFF/ON switch to OFF. Disconnect the power supply cable from the rear of the 8080A mainframe.

2. Remove the upper two feet from the rear of the 8080A mainframe.

3. Remove the 8080A mainframe top cover.

4. Insert the 8083A in the required position in the 8080A mainframe (there are no electrical limitations on the position).

5. Secure the 8083A to the 8080A mainframe using the two screws provided.

6. Connect the signal input to the 8083A input connector (on pc board).

7. Replace the 8080A mainframe top cover.

8. Replace the two feet on the rear of the 8080A mainframe.

2–8 Operating Environment

2–9 The 8083A will operate within specifications when the ambient temperature is between 0°C and 55°C.

2–10 Storage and Shipment

2–11 The 8083A can be stored or shipped at temperatures between −40°C and 75°C. The instrument should be protected from temperature extremes which cause condensation within the instrument.

2–12 If the instrument is to be shipped to a Hewlett-Packard Sales/Service office, attach a tag showing owner, return address, model number and full serial number and the type of service required. The original shipping carton and packaging meterial may be re-usable but the Hewlett-Packard Sales/Service office will also provide information and recommendations on materials to be used if the original packing is not available or re-usable. General instructions for re-packing are as follows:

1. Wrap instrument in heavy paper or plastic.

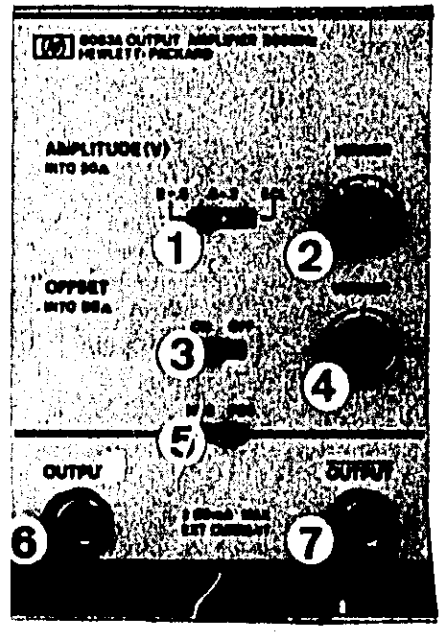
2. Use strong shipping container. A double-wall carton made of 350-pound test material is adequate.

3. Use enough shock-absorbing material (3 to 4 inch layer) around all sides of instrument to provide firm cushion and prevent movement inside container. Protect control panel with cardboard.

4. Seal shipping container securely.

5. Mark shipping container FRAGILE to encourage careful handling.

6. In any correspondence, refer to instrument by model number and full serial number.



(1) AMPLITUDE switch: for selecting the output amplitude range. An ECL position provides fixed ECL-compatible output levels (−0.8V, −1.6V typical).

(2) AMPLITUDE VERNIER: for continuous adjustment of the amplitude within the range selected on the AMPLITUDE switch. This control has no effect when the AMPLITUDE switch is set to ECL.

(3) OFFSET ON/OFF switch: enables/disables the OFFSET VERNIER. In the OFF position, the pulse baseline is at 0V. This switch has no effect when the amplitude is set to ECL.

(4) OFFSET VERNIER: for adjustment of the output pulse baseline over the range −1V to +1V. This control has no effect when the amplitude is set to ECL.

(5) NEG-POS switch: for selecting output pulses of either positive or negative polarity with respect to the pulse baseline. This switch has no effect when the amplitude is set to ECL.

(6) OUTPUT connector: BNC connector provides pulse output.

(7) $\overline{\text{OUTPUT}}$ connector: BNC connector provides complementary pulse output.

Figure 3−1. 8083A Controls and Connectors

OPERATION

PERFORMANCE

CHECK

SECTION 3

OPERATION

3–1 INTRODUCTION

3–2 This operating section explains the function of the controls and connectors and gives the operator's checks and operating instructions for the 8083A 300 MHz Output Amplifier module.

3–3 Panel Features

3–4 Front panel controls and connectors are shown in figure 3–1. Description numbers match the numbers on the illustration.

3–5 Operator's Checks

3–6 Use the Operator's Checks (paragraph 3–9) to verify that the 8083A is functioning correctly. The 8083A must be installed in an 8080A Mainframe for these checks and must also have a rate source. Thus it is important to remember that any fault that is found may be in the 8080A Mainframe, rate source or the 8083A Output Amplifier. If the 8080A Mainframe or rate source are suspected, carry out the performance checks on these modules first.

3–7 Operating Instructions

3–8 Because the 8083A is comparatively simple to operate, the Operator's Checks also serve as the Operating Instructions (see paragraph 3–21).

3–9 OPERATOR'S CHECKS

3–10 The test set for the Operator's Checks is shown in figure 3–2. The 8083A Output Amplifier must be installed in an 8080A Mainframe and must have a rate source.

3–11 Initial Control Settings

Rate Source:

Repetition rate ..... 1MHz square wave
Output impedance ..... 50 Ohms dc coupled

Signal levels –
high ..... 0V ± 50mV
low ..... –0.6V ± 60mV

Max. rep. rate 300MHz
Absolute signal levels
high ..... +50mV
low ..... –3V

8083A:

1 AMPLITUDE range switch 0.6–2
2 AMPLITUDE VERNIER ..... CW
3 OFFSET ON/OFF switch ..... OFF
4 OFFSET VERNIER ..... Center
5 NEG-POS switch ..... NEG

Oscilloscope:

Sensitivity 1V/div
Timebase ..... 0.5 µsec/div
Trigger ..... External, positive slope

3–12 Switch the LINE OFF/ON switch on the 8080A Mainframe to ON. The oscilloscope display should be as shown in figure 3–3 with no noticeable pulse distortion.

3–1 Turn the AMPLITUDE VERNIER 2 fully CCW. Switch the oscilloscope sensitivity to 0.2V/div. The pulse amplitude of both outputs should be $\leq$ 0.6V.

3–14 Switch the AMPLITUDE range switch 1 to .2–.6V. The pulse amplitude of both output should be $\leq$ 0.2V.

3–15 Turn the AMPLITUDE VERNIER 2 fully CW. The pulse amplitude of both outputs should be $\geq$ 0.6V.

3–16 Switch the oscilloscope sensitivity to 0.5V/div. Note the baseline position of each pulse output. Switch the OFFSET switch 3 to ON. Check that the pulse baselines do not move.

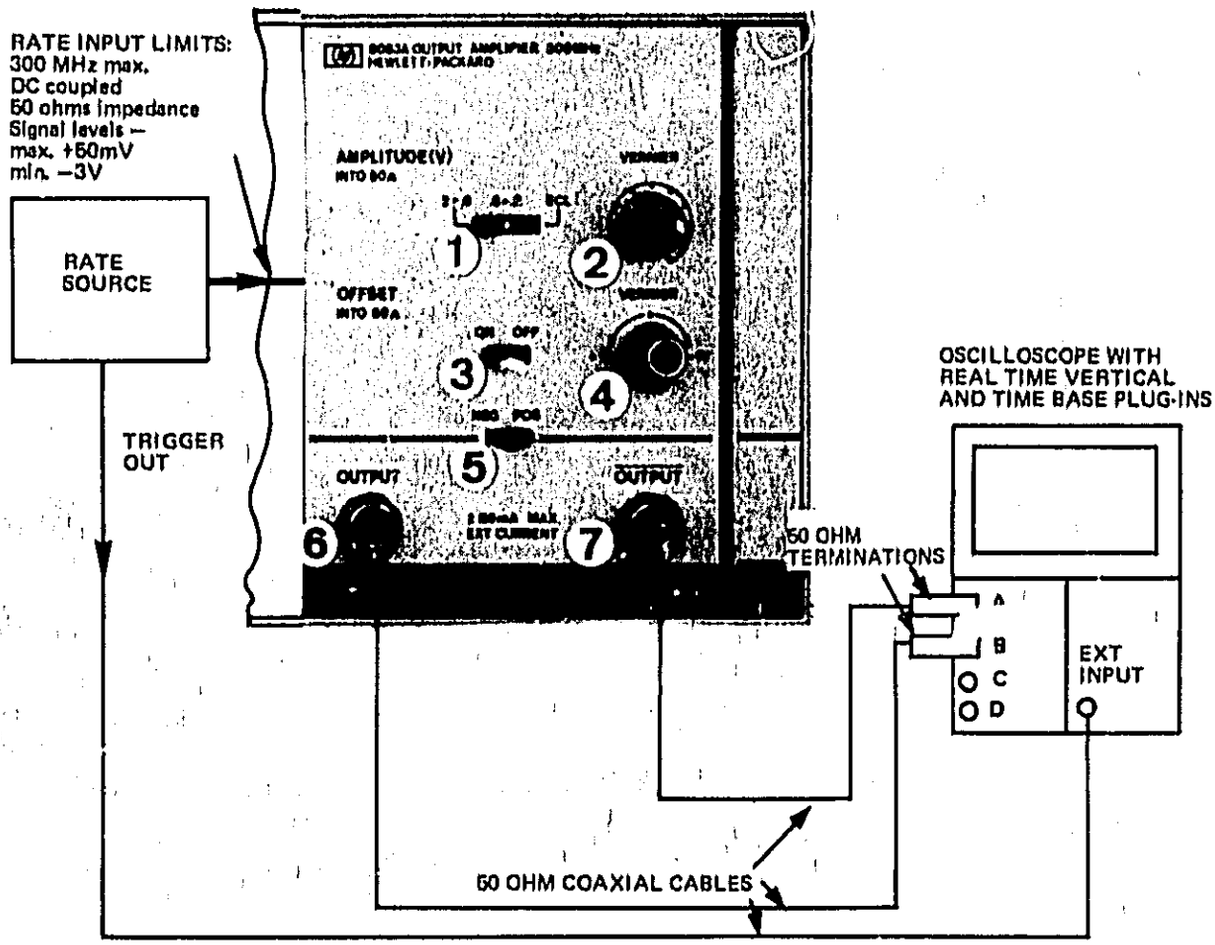


Figure 3–2. Test Set for Operator's Checks

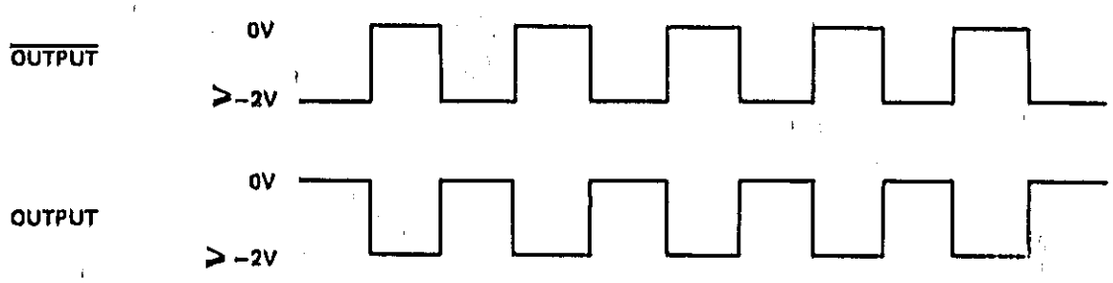


Figure 3–3. 8083A Complementary Outputs

3–17 Vary the OFFSET VERNIER 4 fully CCW and then fully CW and check that the pulse baselines move from –1V at CCW to +1V at CW. There should be a 'dead' area around the center of vernier travel with zero offset.

3–18 Switch the NEG-POS switch 5 to POS and check that the pulse polarities change but the pulse baselines stay at 0V.

3–19 Switch the AMPLITUDE range switch 1 to ECL. The pulse output should be as shown in figure 3–4.

3–20 Vary the AMPLITUDE VERNIER 2 and the OFFSET VERNIER 4 (with OFFSET switch 3 set to ON) and check that they have no effect on the pulse outputs. Switch the NEG-POS switch 5 from POS to NEG and back several times and check that it has no effect on the pulse outputs.

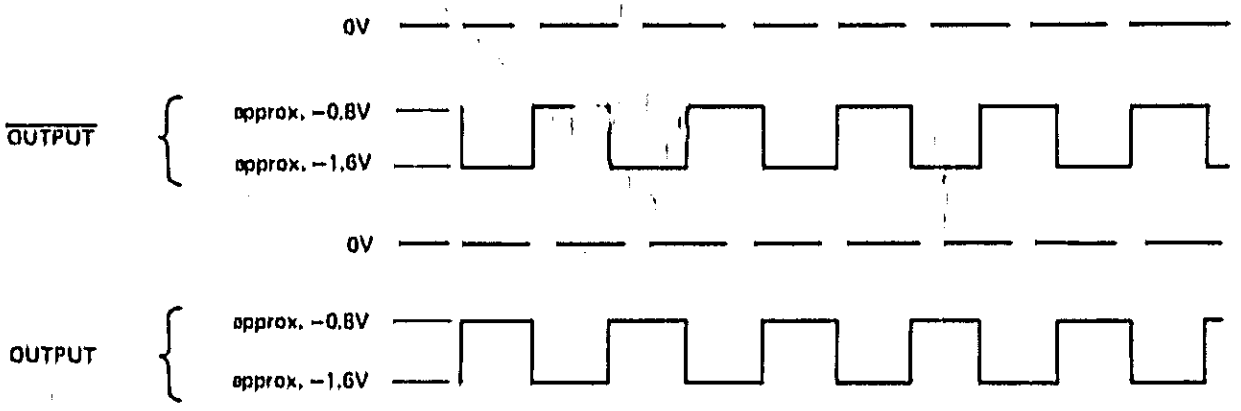


Figure 3–4. 8083A Fixed ECL Outputs

3–21 OPERATING INSTRUCTIONS

3–22 The 8083A 300 MHz Output Amplifier features two complementary outputs with amplitude ranges of .2V –.6V and .6V–2V, continuously adjustable within ranges, plus an ECL position. The ECL position produces fixed, complementary outputs with levels of −0.8V (high) and −1.6V (low). Pulse baseline is variable from −1V to +1V and pulse polarity can be set to either negative or positive.

3–23 A full understanding of the function of each of the controls can be gained by performing the Operator's Checks (para. 3–9).

4–1 INTRODUCTION

4–2 The procedures in this section test the Model 8083A's electrical performance using the specifications of Table 1–2 as the performance standards. All tests can be performed without access to the interior of the instrument. A simple operational test is included in section 3 und Operator's Checks.

4–3 EQUIPMENT REQUIRED

4–4 Equipment required for the performance tests is listed in the Recommended Test Equipment table in section 1. Any equipment that satisfies the critical specifications given in the table can be substituted for the recommended model.

4–5 TEST RECORD

4–6 The results of the performance tests can be tabulated on the Test Record at the end of the procedures. The Test Record lists all of the tested specifications and their acceptable limits. Test results recorded at incoming inspection can be used for comparison in troubleshooting and after repairs or adjustments.

4–7 AMPLITUDE, OFFSET, ECL, DUTY CYCLE, TRANSITION TIMES AND DISTORTION TESTS

SPECIFICATIONS

Amplitude (into 50 ohm load)
. . . . . 2V to 0.6V, 0.6V to 0.2V continuously variable within ranges, plus an ECL output (−0.8V to −1.6V typical)
Offset (into 50 ohm load) . . . . . ± 1V
Duty Cycle . . . . . 50 % ± 10 %

Transition Times (10% to 90%) . . . . . ≤ 800ps
Preshoot, Overshoot & Ringing . . . . . ≤ 10%

DESCRIPTION

The amplitude, offset, ECL capability, duty cycle, transition times and distortion (preshoot, overshoot and ringing of the output pulse are tested using an oscilloscope.

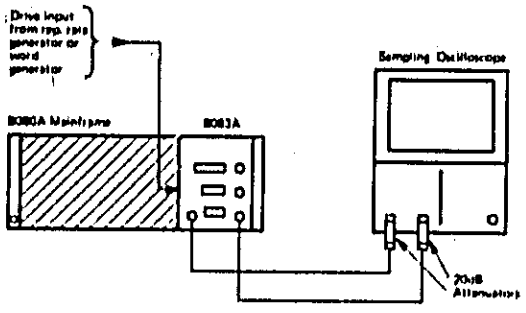


Figure 4–1. Amplitude, Offset, ECL, Duty Cycle, Transition Times and Distortion Test Setup.

EQUIPMENT

Sampling Oscilloscope . . . . . HP 182C Mainframe with 1810A plug-in
20dB Attenuators . . . . . HP 8491A with 1250–0077 and 1250–0780 adapters

PROCEDURE

1. Set up the equipment as shown in figure 4–1 and set the controls as follows:

   Drive Input Signal:

   Repetition rate 100MHz
   Amplitude . . . . . −0.6V ± 50mV to 0V ± 50mV
   Max. input levels . . . . . ± 3V
   Impedance . . . . . 50 ohms
   Duty cycle 50%

8083A:

AMPLITUDE range 0.6–2V
AMPLITUDE VERNIER ..... CW
OFFSET switch ..... OFF
Polarity ..... POS

Oscilloscope:

Sensitivity (both channels) 50mV/div
Trigger ..... external
Timebase mode ..... direct
Timebase – direct 0.2μs/div

2. Note the position of the traces on the display with no signal applied.

3. Measure the output amplitude and baseline position for the following settings:

AMPLITUDE range	AMPLITUDE VERNIER	RESULT
0.6–2V	CW	≥ 2V
0.6–2V	CCW	≤ 0.6V
0.2–0.6V	CW	≥ 0.6V
0.2–0.6V	CCW	≤ 0.2V

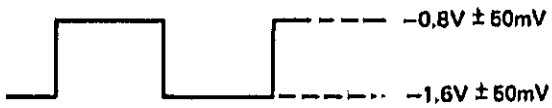
In all cases the baseline shift should be ..... ≤ 50mV

4. Set polarity to NEG and repeat steps 2 and 3.

5. Set the OFFSET switch to ON. Turn the OFFSET VERNIER fully CW.
The offset should be ..... ≤ –1V

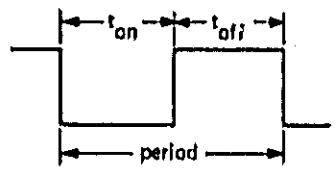
6. Turn the OFFSET VERNIER fully CCW.
The offset should be ..... ≥ +1V

7. Set the OFFSET switch to OFF and the AMPLITUDE range switch to ECL. Measure the ECL levels.



8. Set the Drive Input repetition rate to 300MHz. Set the Model 8083A AMPLITUDE range to 2 – 0.6V and the AMPLITUDE VERNIER to CW. Set the oscilloscope to expanded mode with timebase speeds of 20ns/div. direct and 0.5ns/div. expanded.

9. The output pulse duty cycle should be ... 50 % ± 10 %



$$\text{Duty cycle} = \frac{t_{on}}{\text{period}} \times 100\%$$

10. Set the Drive Input repetition rate to 100MHz. Set the oscilloscope expanded timebase to 1ns/div.

11. The output pulse duty cycle should be ... 50 % ± 10 %

12. Set the Drive Input repetition rate to 10MHz. Adjust the oscilloscope mV/div. control for a full screen trace for both channels.

13. The leading and trailing edge transition times for both channels should be ..... ≤ 800ps

14. The preshoot, overshoot and ringing for both channels should be ..... ≤ 10% of pulse amplitude.

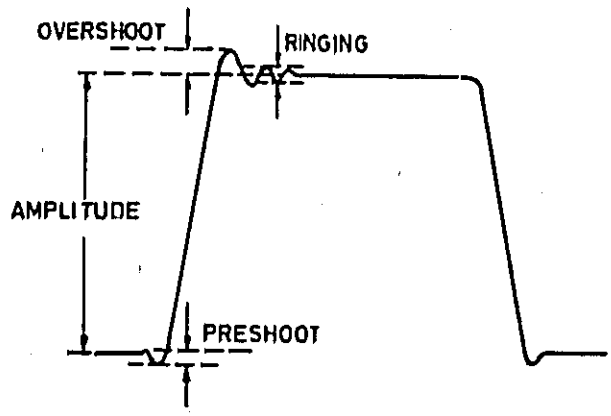


Table 4–1 Performance Test Record

Hewlett-Packard Model 8083A 300MHz Output Amplifier Serial No.	Tested by Date

Paragraph Number	Test	Results		
		Min	Actual	Max
4–7	Amplitude, Offset, ECL, Duty Cycle, Transition Times and Distortion Tests			
	Amplitude (into 50 ohm load)	≤0.2V		–
		–		≥2V
	ECL position: –0.8V to –1.6V typical	–1.6V		–
		–		–0.8V
	Offset (into 50 ohm load): ± 1V	–1V		–
		–		+1V
	Duty Cycle	40 %		60 %
	Transition Times (10% to 90%)	≤800ps		–
	Preshoot, Overshoot, Ringing	≤10%		–

ADJUSTMENTS

SECTION 5

ADJUSTMENTS

5–1 INTRODUCTION

5–2 This section desc. ibes adjustments required to return the Model 8083A 300MHz Output Amplifier to peak operating condition. Included in this section are test setups, and checks and adjustments. Removal and replacement procedures are given in the Disassembly/ Assembly procedure in section 7. An adjustment locator diagram is included in this section.

5–3 SAFETY CONSIDERATIONS

5–4 Although this instrument has been designed in accordance with international safety standards, this manual contains information and warnings which must be followed to ensure safe operation and to retain the instrument in a safe condition (see Sections II and III). Service and adjustments should be performed only by qualified service personnel.

WARNING

Any interruption of the protective (grounding) conductor inside or outside the instrument or disconnection of the protective earth terminal is likely to make the apparatus dangerous. Intentional interruption is prohibited.

5–5 Any adjustment, maintenance, and repair of the opened instrument under voltage should be avoided as much as possible and, when inevitable, should be carried out only by a skilled person who is aware of the hazard involved. The opening of covers or removal of parts, except those to which access can be gained by hand, may expose live parts, and also accessible terminals may be live.

5–6 Capacitors inside the instrument may still be charged even if the instrument has been disconnected from its source of supply.

5–7 Make sure that only fuses with the required rated current and of the specified type (normal blow, time delay, etc.) are used for replacement. The use of repaired fuses and short-circuiting of fuseholders must be avoided.

5–8 Whenever it is likely that the protection has been impaired, the instrument must be made inoperative and be secured against any unintended operation.

5–9 TEST EQUIPMENT REQUIRED

5–10 Table 1–1 contains a list of test equipment and test accessories required in the adjustment procedures. In addition, the tables contain the required minimum specifications and a suggested manufacturer's model number.

5–11 ALIGNMENT TOOL

5–12 A non-metallic alignment tool must be used when making any adjustments to the Model 8083A.

5–13 PERFORMANCE CHECKS

5–14 After making the adjustments, carry out the Performance Checks in Section 4.

5–15 RELATED ADJUSTMENTS

5–16 The following adjustments must be performed in the order indicated in the procedures. The adjustments can not be performed individually because of interaction.

5–17 When setting up the Model 8083A duty cycle, it is important that the duty cycle of the drive input signal is 50%. If in doubt, check this specification first.

5–18 DUTY CYCLE, TRANSITION TIME, DISTORTION AND BASELINE ADJUSTMENTS

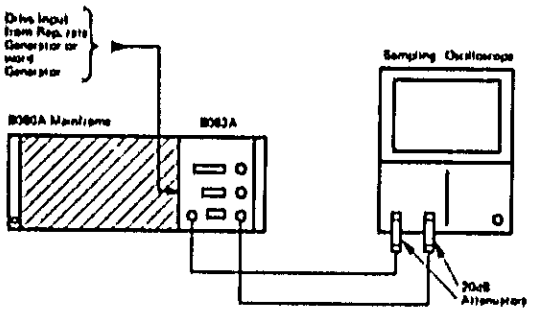


Figure 5–1. Duty Cycle, Transition Time, Distortion and Baseline Adjustments Test Setup.

DESCRIPTION

The purpose of these adjustments is to set up the duty cycle and baseline and adjust for minimum transition times with minimum distortion.

EQUIPMENT

Sampling Oscilloscope ..... HP 182C Mainframe with 1810A plug-in
20dB Attenuators ..... HP 8491A with adaptors 1250–0077 and 1250–0780

PROCEDURE

1. Set up the equipment as shown in figure 5–1 and set the controls as follows:

   Drive Input

   Signal:

   Rep. rate 100MHz
   Amplitude ..... –0.6V ± 50mV
   ..... to 0V ± 50mV
   Max. input levels ..... ± 3V
   Impedance ..... 50 ohms
   Duty cycle 50%

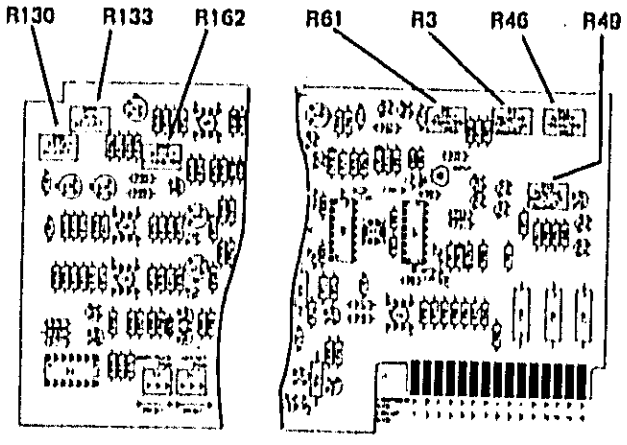
   8083A:

   AMPLITUDE 0.6–2
   VERNIER ..... CW
   OFFSET ..... off
   Polarity ..... NEG

   Oscilloscope:

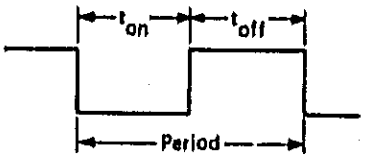
   Sensitivity 200mV/div
   Trigger ..... internal

   Timebase mode ..... expanded
   Timebase – direct 20ns/div
   Timebase – expanded ..... 1ns/div.



BOARD A2

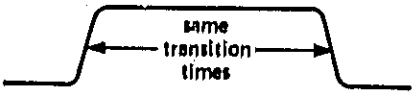
2. Observe both outputs on the display. Adjust A2 R3 for a duty cycle of ..... 50 % ± 10 %



$$\text{Duty Cycle} = \frac{t_{on}}{\text{period}} \times 100\%$$

3. Set scope to 0.5ns/div. Observe OUTPUT on display Adjust A2 R61 for equal transition times.

4. Observe $\overline{\text{OUTPUT}}$ on display Adjust A2 R46 for equal transition times.



5. Set repetition rate to 300MHz. Observe both outputs on the display and readjust duty cycle to above limits (step 2) if necessary using A2 R3.

6. Set repetition rate to 100MHz. Set Model 8083A amplitude VERNIER to CCW. Observe OUTPUT on the display. Adjust A2R61 for leading and trailing edge transition times.

   of ..... ⩽ 650ns

   Preshoot, overshoot and ringing must be ..... ⩽ 10%

7. Observe $\overline{\text{OUTPUT}}$ on the display. Adjust A2R46 for leading and trailing edge transition times of ..... ⩽ 650ns

   Preshoot, overshoot and ringing must be ..... ⩽ 10%

8. Set repetition rate to 300MHz. Set Model 8083A amplitude VERNIER to CW. Readjust duty cycle using A2 R3 to limits in step 2 for both outputs.

   Check that the leading and trailing edge transition times for both outputs are ..... ⩽ 700ps

9. Set the Model 8083A polarity to POS. Adjust duty cycle using A2 R49 to the limits in step 2 for both outputs.

   Check that the leading and trailing edge transition times for both outputs are ..... ⩽ 700ps

5–19 BASELINE ADJUSTMENTS

1. Set the repetition rate to 1MHz. Set the oscilloscope sensitivity to 100mV/div and the timebase to 1μs/div.

2. Disconnect the oscilloscope inputs and center both traces on the graticule. Reconnect both inputs.

3. Turn the OFFSET VERNIER from CCW to CW and back and observe both output traces on the display. Adjust A2R133 for a minimum baseline shift on the display.
   The shift must be ..... ⩽ 20mV

4. Turn the OFFSET VERNIER to CW and observe the $\overline{\text{OUTPUT}}$ trace on the display.
   Adjust A2R130 for a baseline of .... 0V ± 20mV

5. Observe the OUTPUT trace on the display and adjust A2R162 for a baseline of ..... 0V ± 20mV

PARTS LIST

6–1 INTRODUCTION

6–2 This section contains information for ordering parts. Table 6–1 lists abbreviations used in the parts lists and elsewhere in the manual. Table 6–2 lists all replaceable parts in reference designator order. Table 6–3 contains the names and addresses that correspond to the manufacturer code numbers.

6–3 ABBREVIATIONS

6–4 Table 6–1 lists abbreviations used in the parts lists, schematics and elsewhere in the manual. In some cases two forms of the abbreviation are used, one all in capital letters, and one partial or no capitals. This occurs because the abbreviations in the parts lists are always all capitals. However, in the schematics and other parts of the manual, the same abbreviations may have upper and lower case letters.

6–5 REPLACEABLE PARTS

6–6 Table 6–2 is the list of replaceable parts and is organised as follows:

a. Illustrated parts breakdowns for chassis mounted parts.
b. Chassis mounted parts in alphanumerical order by reference designator.
c. Electrical assemblies and their components in alphanumerical order by reference designator.

6–7 The information given for each part consists of the following:

a. The Hewlett-Packard part number.
b. The total quantity (Qty) in the instrument. This is given only once for each part — at the first appearance of the part in the list.
c. The description of the part.
d. A typical manufacturer of the part in a five-digit code.
e. The manufacturers' code number for the part.

6–8 ORDERING INFORMATION

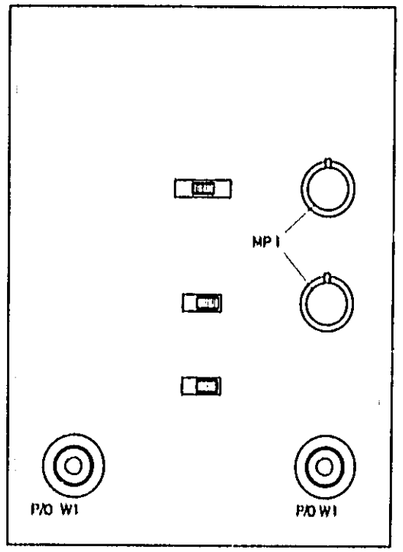
6–9 To order a part listed in the replaceable parts table, quote the Hewlett-Packard part number, indicate the quantity required, and address the order to the nearest Hewlett-Packard office (list of Sales/Service offices at the rear of the 8080A Mainframe manual).

6–10 To order a part that is not listed in the replaceable parts table, include the instrument model number, instrument serial number, the description and function of the part, and the number of parts required. Address the order to the nearest Hewlett-Packard office.

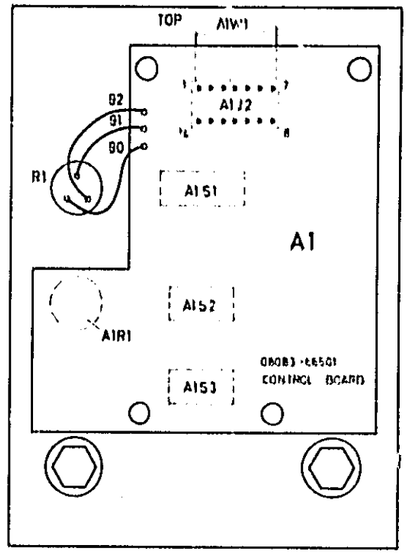
Table 6–1. Abbreviations for Replaceable Parts List

A	AMPERE(S)
ASSY	ASSEMBLY
BD	BOARD(S)
BH	BINDER HEAD
BP	BANDPASS
C	CENTI (10^{-2})
	CERMET
CAR	CARBON
CC	CARBON COMPOSITION
CCW	COUNTERCLOCKWISE
CER	CERAMIC
CMO	CABINET MOUNT ONLY
COAX	COAXIAL
COEF	COEFFICIENT
COMP	COMPOSITION
CONN	CONNECTOR(S)
CRT	CATHODE-RAY TUBE
CW	CLOCKWISE
D	DECI (10^{-1})
DEPC	DEPOSITED CARBON
DP	DOUBLE POLE
DT	DOUBLE THROW
ELECT	ELECTROLYTIC
ENCAP	ENCAPSULATED
EXT	EXTERNAL
F	FARAD'S),
	METAL FILM (FOR RESISTORS)
FC	CARBON FILM/COMPOSITION
FET	FIELD-EFFECT
	TRANSISTOR(S)
FT	TRANSIT FREQUENCY
FH	FLAT HEAD
FIL H	FILLISTER HEAD
FXD	FIXED
G	GIGA (10^{9})
GE	GERMANIUM
GL	GLASS
GRD	GROUNDED
H	HENRY(IES)
HG	MERCURY
HP	HEWLETT-PACKARD
HZ	HERTZ
IF	INTERMEDIATE FREQ.
IMPG	IMPREGNATED
INCD	INCANDESCENT
INCL	INCLUDE(S)
INS	INSULATION(ED)
INT	INTERNAL
K	KILO (10^{3})
KG	KILOGRAM
LB	POUND(S)
LH	LEFT HAND
LIN	LINEAR TAPER
LOG	LOGARITHMIC TAPER
LPF	LOW-PASS FILTER(S)
LVR	LEVER
M	MILLI (10^{-3})
MEG	MEGA (10^{6})
MET FILM	METAL FILM
MET OX	METAL OXIDE
MFR	MANUFACTURER
MINAT	MINIATURE
MOM	MOMENTARY
MTG	MOUNTING
MY	MYLAR
N	NANO (10^{-9})
N/C	NORMALLY CLOSED
NE	NEON
N/O	NORMALLY OPEN
NOP	NEGATIVE POSITIVE ZERO (ZERO TEMPERATURE COEFFICIENT)
NPN	NEGATIVE-POSITIVE-NEGATIVE
NSR	NOT SEPARATELY REPLACEABLE
OBD	ORDER BY DESCRIPTION
OH	OVAL HEAD
OX	OXIDE
P	PEAK
PC	PRINTED (ETCHED) CIRCUIT(S)
PD	POWER DISSIPATION
PF	PICOFARADS
PHL	PHILLIPS
PIV	PEAK INVERSE VOLTAGE(S)
PNP	POSITIVE-NEGATIVE-POSITIVE
P/O	PART OF
PORC	PORCELAIN
POS	POSITION(S)
POT	POTENTIOMETER(S)
P-P	PEAK-TO-PEAK
PRGM	PROGRAM
PS	POLYSTYRENE
PWV	PEAK WORKING VOLTAGE
RECT	RECTIFIER(S)
RF	RADIO FREQUENCY
RFI	RADIO FREQUENCY INTERFERENCE
RH	ROUND HEAD
	OR
	RIGHT HAND
RMO	RACK MOUNT ONLY
RMS	ROOT MEAN SQUARE
RWV	REVERSE WORKING VOLTAGE
S-B	SLOW-BLOW
SCR	SILICON CONTROLLED RECTIFIER
SE	SELENIUM
SEC	SECOND(S)
SECT	SECTION(S)
SI	SILICON
SIL	SILVER
SL	SLIDE
SP	SINGLE POLE
SPL	SPECIAL
ST	SINGLE THROW
STD	STANDARD
TA	TANTALUM
TC	TEMPERATURE COEFFICIENT
TD	TIME DELAY
TFL	TEFLON
TGL	TOGGLE
THYR	THYRISTOR
TI	TITANIUM
TNLDIO	TUNNEL DIODE(S)
TOL	TOLERANCE
TRIM	TRIMMER
U	MICRO (10^{-6})
V	VOLTS
VAR	VARIABLE
VDCW	DC WORKING VOLT(S)
W	WATT(S)
W/	WITH
WIV	WORKING INVERSE VOLTAGE
W/O	WITHOUT
WVDC	WORKING VOLTAGE DIRECT CURRENT
WW	WIREWOUND

FRONT PANEL (MP3)



FRONT PANEL (INSIDE)



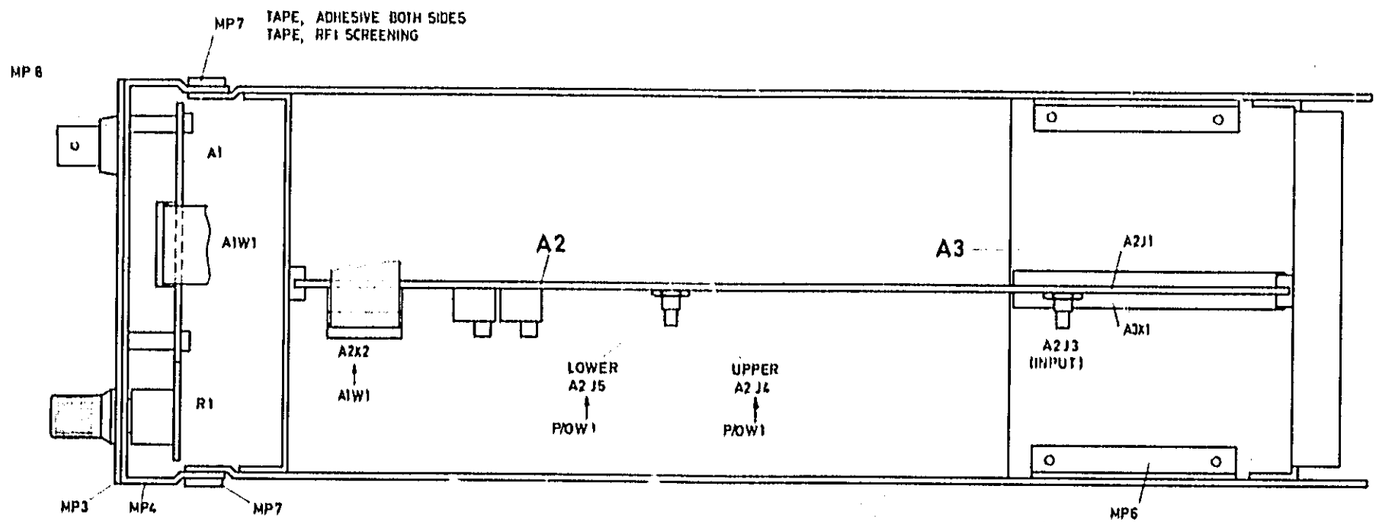


Figure 6-1. 8083A Replaceable Parts

Table 6–2, Replaceable Parts

MODEL 8GE1A

INSTRUMENT SERIAL PREFIX

FRAME

REFERENCE DESIGNATOR	H-P PART NUMBER	DESCRIPTION
A1	08611-61601	HD AY-CLOCKED
A2	08611-61602	HD AY-GENERATOR
A3	08611-66511	HD AY-METHER
MP1	0380-1666	KNOB
MP2	08611-3104	GUIDE PC
MP3	08611-66601	PANEL-FRONT
MP4	5180-8523	PANEL-SUB
MP5	5180-8523	PLATE-SIDE
MP6	8060-8324	ANGLE
MP7	8500-1026	TAPE-INSUL .75W
MP8	8500-8761	TAPE-COND .125 W
MP9	2950-0145	NUT HEX
W1	8120-1618	P-VAR LOW
W2	08611-61603	CBL AY-SHLD

Table 6-2. Replaceable Parts (cont'd)

MODEL [illegible]

INSTRUMENT SERIAL PREFIX

A 1 08383-66501 BOARD-CONTROL

REFERENCE DESIGNATOR		H-P PART NUMBER	DESCRIPTION
A1	R1	2100-2492	R-VAR 5K 20% .5W
A1	S1	3101-[illegible]	SW SLIDE DPDT
A1	S2	3101-[illegible]	SW SLIDE DPDT
A1	S3	3101-[illegible]	SW SLIDE DPDT

MODEL [illegible]

INSTRUMENT SERIAL PREFIX

A 2 08383-66502 BOARD-GENERATOR

REFERENCE DESIGNATOR		H-P PART NUMBER	DESCRIPTION
A2	C1	0160-3456	C-F .01UF 50V
A2	C2	0160-3456	C-F .01UF 50V
A2	C3	0160-3456	C-F .01UF 50V
A2	C4	0160-3456	C-F .01UF 50V
A2	C5	0160-2055	C-F .01UF 100V
A2	C6	0160-2055	C-F .01UF 100V
A2	C7	0160-2055	C-F .01UF 100V
A2	C8	0160-3456	C-F .01UF 50V
A2	C9	0160-2055	C-F .01UF 100V
A2	C10	0160-2055	C-F .01UF 100V
A2	C11	0160-3456	C-F .01UF 50V
A2	C12	0160-3456	C-F .01UF 50V
A2	C13	[illegible]	C-F 1UF 35V
A2	C14	0160-3456	C-F .01UF 50V
A2	C15	0160-3456	C-F .01UF 50V
A2	C16	0160-3456	C-F .01UF 50V
A2	C17	[illegible]	C-F 1UF 35V
A2	C18	[illegible]	C-F .01UF 100V
A2	C19	[illegible]	C-F .01UF 50V
A2	C22	[illegible]	C-F .01UF 100V
A2	C23	0160-3456	C-F .01UF 50V
A2	C24	0160-3456	C-F .01UF 50V
A2	C25	0160-3456	C-F .01UF 50V
A2	C26	0160-3456	C-F .01UF 50V
A2	C27	0160-3456	C-F .01UF 50V
A2	C28	0160-3456	C-F .01UF 50V
A2	C29	0160-3456	C-F .01UF 50V
A2	C30	[illegible]	C-F 20UF 25V
A2	C31	[illegible]	C-F .01UF 100V
A2	C32	[illegible]	C-F 20UF 25V
A2	C33	[illegible]	C-F 20UF 25V
A2	C34	[illegible]	C-F .01UF 50V
A2	C35	[illegible]	C-F 2UF 20V
A2	C36	[illegible]	C-F .01UF 100V
A2	C39	0160-2055	C-F .01UF 100V
A2	C40	0160-3456	C-F .01UF 50V
A2	C41	0160-3456	C-F .01UF 50V
A2	C42	0160-3456	C-F .01UF 50V
A2	CR9	1901-0760	DIO HOT CARRIER
A2	CR10	[illegible]	DIO HOT CARRIER
A2	CR11	[illegible]	DIO HOT CARRIER
A2	CR12	1901-0050	DIO HOT CARRIER
A2	CR13	1901-0050	DIO SI 80V .2A
A2	CR14	1901-0050	DIO SI 80V .2A
A2	CR15	1901-0050	DIO SI 80V .2A
A2	CR16	1901-0050	DIO SI 80V .2A
A2	CR21	[illegible]	DIODE-SCHOTTKY
A2	J1	1820-[illegible]	IC AMPL LIMITER
A2	J3	1250-[illegible]	JACK RECEP STRAI
A2	J4	1250-[illegible]	JACK RECEP STRAI
A2	J5	1250-[illegible]	JACK RECEP STRAI
A2	K1	0490-1034	RELAY 12V .5A
A2	K2	0490-1034	RELAY 12V .5A
A2	K3	0490-1034	RELAY 12V .5A
A2	L5	9100-1642	COIL-CHOKE 270UH
A2	L6	9100-1642	COIL-CHOKE 270UH
A2	L7	9170-0029	FERRITE BEAD
A2	L8	9170-0029	FERRITE BEAD
A2	L9	9100-1642	COIL-CHOKE 270UH
A2	L10	9100-1642	COIL-CHOKE 270UH
A2	L11	9170-0029	FERRITE BEAD
A2	L12	9170-0029	FERRITE BEAD
A2	Q1	1853-0036	XSTR-PNP SI CHIP
A2	Q2	1853-0036	XSTR-PNP SI CHIP
A2	Q3	1854-[illegible]	XSTR NPN 2N2222A
A2	Q4	1854-0725	XSTR NPN-SI
A2	Q5	1854-0725	XSTR NPN-SI
A2	Q6	1853-0281	XSTR PNP
A2	Q7	1853-0036	XSTR-PNP SI CHIP
A2	Q8	1854-0215	XSTR SI NPN
A2	Q9	1854-0215	XSTR SI NPN
A2	Q10	1853-0036	XSTR-PNP SI CHIP
A2	Q11	1853-0036	XSTR-PNP SI CHIP
A2	Q12	1854-0215	XSTR SI NPN
A2	Q13	1854-0215	XSTR SI NPN
A2	Q14	1854-0725	XSTR NPN-SI
A2	Q15	1854-0725	XSTR NPN-SI
A2	Q16	1853-0036	XSTR-PNP SI CHIP
A2	Q17	1853-0314	XSTR 2N2905A PNP
A2	Q18	1853-0314	XSTR 2N2905A PNP
A2	Q19	1854-0215	XSTR SI NPN
A2	Q20	1853-0036	XSTR-PNP SI CHIP
A2	Q21	1853-[illegible]	XSTR PNP
A2	Q22	1853-0036	XSTR-PNP SI CHIP
A2	Q23	1853-0036	XSTR-PNP SI CHIP
A2	Q24	1854-0215	XSTR SI NPN
A2	Q25	1854-0215	XSTR SI NPN
A2	Q26	1854-0215	XSTR SI NPN
A2	Q27	1853-0314	XSTR 2N2905A PNP
A2	Q28	1853-0314	XSTR 2N2905A PNP
A2	Q30	1853-0314	XSTR 2N2905A PNP
A2	Q31	1854-0637	XSTR 2N2219
A2	Q32	1853-0314	XSTR 2N2905A PNP
A2	Q33	1854-0637	XSTR 2N2219
A2	Q34	1853-0036	XSTR-PNP SI CHIP
A2	Q35	1853-0036	XSTR-PNP SI CHIP
A2	Q36	1854-0215	XSTR SI NPN
A2	Q37	1205-0011	HT-SINK TO-5
A2	Q37	1853-0314	XSTR 2N2905A PNP
A2	Q38	1205-0011	HT-SINK TO-5
A2	Q38	1853-0314	XSTR 2N2905A PNP
A2	Q40	1853-0036	XSTR-PNP SI CHIP
A2	Q41	1853-0036	XSTR-PNP SI CHIP
A2	Q42	1854-0215	XSTR SI NPN
A2	Q43	1853-0036	XSTR-PNP SI CHIP
A2	Q44	1854-0215	XSTR SI NPN
A2	R1	0757-0283	R-F 2K 1% .125W F
A2	R2	0757-0283	R-F 2K 1% .125W F
A2	R3	2100-[illegible]	R-VAR 5K 10%
A2	R4	0698-[illegible]	R-F [illegible] 1% .125W
A2	R5	0698-[illegible]	R-F [illegible] .125W
A2	R6	0698-[illegible]	R-F 51.1 1% .125W
A2	R7	[illegible]	R-F 51.1 1% .125W
A2	R8	0698-[illegible]	R-F 51.1 1% .125W
A2	R9	0698-4615	R-F 154 1% .125W
A2	R10	[illegible]	R-F 620 1% .125W
A2	R11	0757-0278	R-F 1.78K 1%
A2	R12	0757-[illegible]	R-F 20K 1% .125W
A2	R13	0698-[illegible]	R-F [illegible] 1% .125W
A2	R14	0757-0442	R-F 10K 1% .125W
A2	R15	0757-[illegible]	R-F 211 1% .125W
A2	R16	0757-0199	R-F 21.5K 1%
A2	R17	0757-[illegible]	R-F 11.2K 1%
A2	R18	0757-[illegible]	R-F 12.6K 1%
A2	R19	0757-[illegible]	R-F 7.5K 1% .125W
A2	R20	0757-0442	R-F 10K 1% .125W
A2	R21	0757-0442	R-F 10K 1% .125W
A2	R22	0698-[illegible]	R-F 4.81K 1%
A2	R23	0757-[illegible]	R-F 24.9 1%
A2	R24	0698-[illegible]	R-F 2.49K 1%
A2	R25	0757-[illegible]	R-F 1.21K 1%
A2	R26	0757-0403	R-F 121 1% .125W
A2	R27	0757-0280	R-F 1K 1% .125W F
A2	R28	0698-[illegible]	R-F 15 5% .125W
A2	R29	0698-[illegible]	R-F 15 5% .125W
A2	R30	0698-[illegible]	R-F 30.1 1%
A2	R31	0698-[illegible]	R-F 27.5 1%
A2	R32	0757-[illegible]	R-F 24.9 1%
A2	R33	0757-[illegible]	R-F 82.5 1% .5W
A2	R34	0757-[illegible]	R-F 75 1% .5W HF
A2	R35	0757-0416	R-F 511 1% .125W
A2	R36	0698-3440	R-F 15.4K 1%
A2	R37	0698-[illegible]	R-F 14K 1% .125W
A2	R38	0698-[illegible]	R-F 330 1% .125W
A2	R39	0698-[illegible]	R-F 225 1% .125W
A2	R40	0698-[illegible]	R-F 1.5K 1% .125W
A2	R41	0757-0317	R-F 1.33K 1%
A2	R42	0757-[illegible]	R-F 250 1% .125W
A2	R43	0757-[illegible]	R-F 30 1% .125W
A2	R44	[illegible]	R-F 39 5% .125W
A2	R45	0757-[illegible]	R-F 332 1% .125W
A2	R46	2100-3351	R-VAR 1K .5W
A2	R47	0757-0401	R-F 100 1% .125W
A2	R48	0757-[illegible]	R-F 105 1% .125W
A2	R49	0698-[illegible]	R-F 430 5% .125W
A2	R49	2101-3274	R-VAR 10K 10%
A2	R50	0698-4413	R-F 402 1% .125W
A2	R51	0757-1251	R-F 24.9 1%
A2	R52	0698-[illegible]	R-F 30 5% .125W
A2	R53	0757-1251	R-F 24.9 1%
A2	R54	0698-[illegible]	R-F 30 5% .125W
A2	R55	0757-[illegible]	R-F 100 1% .125W

REFERENCE DESIGNATOR		H-P PART NUMBER	DESCRIPTION
A2	R39	0757-[illegible]	R-F 130 1% .125W
A2	R57	0698-[illegible]	R-F [illegible] 1% .125W
A2	R59	0757-[illegible]	R-F 20 1% .125W
A2	R60	0757-[illegible]	R-F 200 1% .125W
A2	R61	2100-[illegible]	R-VAR 1K .5W
A2	R62	0757-[illegible]	R-F 332 1% .125W
A2	R63	0698-[illegible]	R-F 1.54K 1% .125W
A2	R66	0757-[illegible]	R-F 82.5 1% .5W
A2	R67	0757-[illegible]	R-F 82.5 1% .5W
A2	R68	0757-[illegible]	R-F 3.32K 1%
A2	R69	0757-[illegible]	R-F 101 1% .125W
A2	R70	0757-[illegible]	R-F 75 1% .5W HF
A2	R71	0757-[illegible]	R-F 75 1% .5W HF
A2	R72	0757-[illegible]	R-F 233 1% .125W
A2	R73	0757-[illegible]	R-F 233 1% .125W
A2	R74	0757-[illegible]	R-F 10K 1% .125W
A2	R75	0698-[illegible]	R-F 7.4K 1%
A2	R76	0757-[illegible]	R-F 6.1K 1%
A2	R77	0757-[illegible]	R-F 511 1% .125W
A2	R78	0698-[illegible]	R-F 7.5K 1%
A2	R79	0757-[illegible]	R-F 20K 1% .125W
A2	R82	0757-[illegible]	R-F 1.1K 1%
A2	R81	0698-[illegible]	R-F 3.1K 1% .125W
A2	R82	0757-[illegible]	R-F 7.5K 1% .125W
A2	R83	0757-[illegible]	R-F 2K 1% .125W
A2	R84	0757-[illegible]	R-F 27K 1% .125W
A2	R85	0757-[illegible]	R-F 12.1K 1%
A2	R86	0698-[illegible]	R-F 4.87K 1%
A2	R87	0698-[illegible]	R-F 8.06K 1%
A2	R88	0757-[illegible]	R-F 10.2K 1%
A2	R89	0698-[illegible]	R-F 2.15K 1%
A2	R90	0757-[illegible]	R-F 562 1% .125W
A2	R91	0698-[illegible]	R-F 2.15K 1%
A2	R92	0698-[illegible]	R-F 2.15K 1%
A2	R93	0757-[illegible]	R-F 4.75K 1%
A2	R94	0698-[illegible]	R-F 196 1% .125W
A2	R95	0698-[illegible]	R-F 4.53K 1%
A2	R96	0757-[illegible]	R-F 1.1K 1% .125W
A2	R97	0757-[illegible]	R-F 1.5K 1% .125W
A2	R98	0757-[illegible]	R-F 1.47K 1%
A2	R99	0757-[illegible]	R-F 392 1% .125W
A2	R100	0757-[illegible]	R-F 13K 1% .125W
A2	R101	0698-[illegible]	R-F 1.0K 1%
A2	R102	0757-[illegible]	R-F 3.2K 1%
A2	R104	0757-[illegible]	R-F 7.5K 1% .125W
A2	R105	0757-[illegible]	R-F 1.5K 1% .125W
A2	R106	0757-[illegible]	R-F 1.5K 1% .125W
A2	R107	0757-[illegible]	R-F 1.5K 1% .125W
A2	R108	0757-[illegible]	R-F 10K 1% .125W
A2	R110	0757-[illegible]	R-F 10K 1% .125W
A2	R111	0698-[illegible]	R-F 13.2K 1%
A2	R112	0698-[illegible]	R-F 10.2K 1%
A2	R113	0698-0385	R-F 2.6K 1%
A2	R114	0698-0385	R-F 2.6K 1%
A2	R115	0698-[illegible]	R-F 866 1% .125W
A2	R116	0698-[illegible]	R-F 866 1% .125W
A2	R117	0757-[illegible]	R-F 30 1% .125W
A2	R118	0757-[illegible]	R-F 30 1% .125W
A2	R119	0757-[illegible]	R-F 10K 1% .125W
A2	R120	0757-[illegible]	R-F 10K 1% .125W
A2	R121	0698-[illegible]	R-F 10.5K 1%
A2	R123	0698-[illegible]	R-F 10.5K 1%
A2	R123	0698-3085	R-F 2.6K 1%
A2	R124	[illegible]	R-F 2.6K 1%
A2	R125	0698-[illegible]	R-F 866 1% .125W
A2	R126	0698-[illegible]	R-F 866 1% .125W
A2	R127	0757-[illegible]	R-F 30 1% .125W
A2	R128	0757-[illegible]	R-F 30 1% .125W
A2	R129	0757-[illegible]	R-F 5.11K 1%
A2	R130	2100-[illegible]	R-VAR 200 10%
A2	R131	0757-[illegible]	R-F 511 1% .125W
A2	R132	0757-[illegible]	R-F 562 1% .125W
A2	R133	2100-[illegible]	R-VAR 2K 10%
A2	R134	0698-[illegible]	R-F 4.42K 1%
A2	R135	0757-[illegible]	R-F 4.75K 1%
A2	R136	0757-[illegible]	R-F 20K 1% .125W
A2	R137	0757-[illegible]	R-F 20K 1% .125W
A2	R138	0757-[illegible]	R-F 20K 1% .125W
A2	R139	0757-[illegible]	R-F 20K 1% .125W
A2	R140	0757-[illegible]	R-F 511 1% .125W
A2	R141	0757-[illegible]	R-F 511 1% .125W
A2	R142	0757-[illegible]	R-F 825 1% .125W
A2	R143	0757-[illegible]	R-F 825 1% .125W
A2	R144	0698-4390	R-F 86.6 1% .125
A2	R145	0757-[illegible]	R-F 75 1% .125W
A2	R146	0757-[illegible]	R-F 1.2K 1%
A2	R147	0757-[illegible]	R-F 1.2K 1%
A2	R148	0698-[illegible]	R-F 453 1% .125W
A2	R149	0698-[illegible]	R-F 453 1% .125W
A2	R150	0757-[illegible]	R-F [illegible] .125W F
A2	R151	0757-0283	R-F 2K 1% .125W F
A2	R152	0698-[illegible]	R-F 1.78K 1%
A2	R153	0698-[illegible]	R-F 1.0K 1%
A2	R154	0757-0250	R-F 6.19K 1%
A2	R155	0757-[illegible]	R-F 6.19K 1%
A2	R156	0757-[illegible]	R-F 90.9 1%
A2	R157	0757-[illegible]	R-F 56.2 1%
A2	R158	0757-[illegible]	R-F 56.2 1%
A2	R159	0757-0400	R-F 90.9 1%
A2	R160	0757-[illegible]	R-F 75 1% .125W
A2	R161	0757-[illegible]	R-F 75 1% .125W
A2	R162	2100-[illegible]	R-VAR 20% 10%
A2	R163	0698-[illegible]	R-F 154 1% .125W
A2	R164	0757-0400	R-F 90.9 1%

REFERENCE DESIGNATOR		H-P PART NUMBER	DESCRIPTION
A2	R165	0698-[illegible]	R-F [illegible] 1%
A2	R171	0698-[illegible]	R-F 2.1K 1%
A2	R173	0698-[illegible]	R-F 562K 1%
A2	R174	0757-0449	R-F 20K 1% .125W
A2	S1	3101-[illegible]	SW SLIDE SPDT
A2	S2	3101-[illegible]	SW SLIDE SPDT
A2	U2	1858-[illegible]	XSTR ARRAY [illegible]
A2	U3	1826-0111	IC-DUAL OP AMPL
A2	U4	1826-0111	IC-DUAL OP AMPL
A2	U5	1826-0111	IC-DUAL OP AMPL
A2	U6	1826-0111	IC-DUAL OP AMPL
A2	U7	1826-0111	IC-DUAL OP AMPL
A2	VR1	1902-3105	DIO BRDN 5.62 V
A2	VR2	1902-3105	DIO BRDN 5.62 V
A2	VR3	[illegible]	DIO BRDN 5.23 V
A2	VR5	1902-3105	DIO BRDN 5.62 V
A2	VR6	1902-3105	DIO BRDN 5.62 V
A2	VR17	1902-[illegible]	DIO BRDN 4.22 V
A2	VR18	1902-[illegible]	DIO BRDN 4.22 V
A2	VR23	1902-[illegible]	DIO BRDN 6.81 V
A2	W1	8159-0005	WIRE 22GA W PVC
A2	X2	1200-[illegible]	LOCK DIP-IC
A2	X2	1200-0544	SOCKET-IC

SERVICE INFORMATION

7–1 INTRODUCTION

7–2 This section contains the component layouts and schematic diagrams for the Model 8083A Output Amplifier. Tables listing the reference designators and schematic symbols used are also given. Refer to section 6 for the replaceable parts information.

7–3 RECOMMENDED TEST EQUIPMENT

7–4 Test equipment and test equipment accessories required to maintain the Model 8083A are listed in table 1–1. Equipment other than that listed can be used if it meets the listed critical specifications.

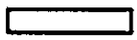
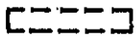
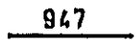
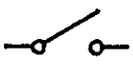
Table 7–1. Reference Designators

A	=	assembly	U	=	micro-circuit
B	=	motor	P	=	plug
BT	=	battery	Q	=	transistor
C	=	capacitor	R	=	resistor
CP	=	coupler	RT	=	thermistor
CR	=	diode	S	=	switch
DL	=	delay line	T	=	transformer
DS	=	lamp	TB	=	terminal board
F	=	fuse	V	=	vacuum, tube, neon bulb, photocell, etc.
FL	=	filter			
HR	=	heater	VR	=	voltage regulator
J	=	jack	W	=	cable
K	=	relay	X	=	socket
L	=	inductor	Y	=	crystal
M	=	meter	TP	=	test point

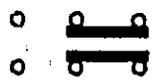
Table 7–2 Schematic Diagram Symbols

The following symbols conform, as far as possible, with ANSI Y32.2, IEEE No. 315 and ANSI Y32.14 (for the logic symbols). These standards should be consulted when further information is required.

Resistance values are in ohms, capacitance values in microfarads and inductance values in microhenries unless otherwise noted!

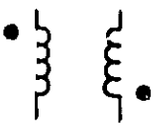
P/O	Part of
	Asterisk denotes a factory selected value. The value shown is the nominal value.
	Encloses front panel nomenclature
	Encloses rear panel nomenclature
	Heavy line indicates signal path
	Heavy dashed line indicates primary feedback path
	Wire colour code. Same as resistor colour code. First number is wire body colour.
	Wire our plug used as link.
	Test point in a circuit. Point may/may not be identified on P. C. board.
	Used with trimmer potentiometers or capacitors to indicate screwdriver adjustment.
	Direct connection to earth.
	Ground connection to instrument chassis or frame.
	Used when a number of common-return connections are at the same potential. If there is more than one such system in the same circuit, numbers are written in the triangles so that all connections with the same potential have the same number.
	Specific potential difference with respect to a potential reference level, eg. 
	Normally open toggle switch. Circles (O) are used for the contacts to indicate a locking type switch.

Spring return, 2-position transfer switch. Triangles (▲) are used for the contacts to indicate a non-locking type switch.



2-position, 2-pole slide switch.

Air cored inductor.



Air cored transformer. The dot (●) is used, when necessary, to indicate instantaneous polarity.

Iron core

Ferrite core

Ferrite bead

Varactor diode

Multi-junction diode

Diode

Zener diode

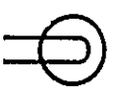
Schottky diode

Light Emitting Diode (LED)

Photodiode

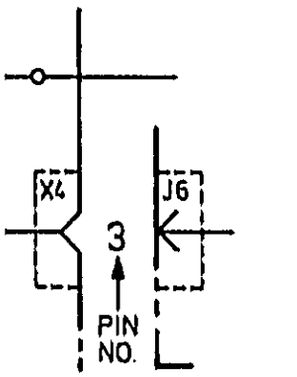
Fuse

Neon



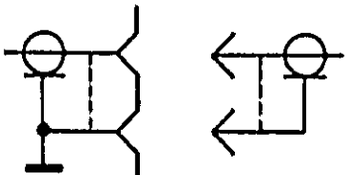
Filament lamp

Terminals and Connectors

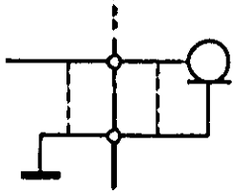


Soldered connection.

Example of fixed male and female connectors with plug and socket and contact designators, eg. P. C. board edge connector and socket.

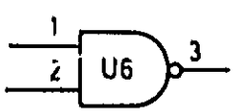


example of bulkhead mounted coaxial socket with free coaxial plug and cable.

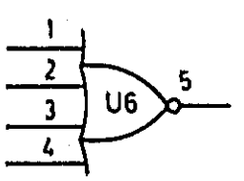


example of coaxial cable with termination soldered to P. C. board.

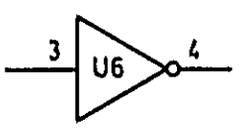
Analog/Digital logic symbols



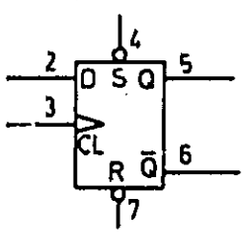
2-input NAND gate



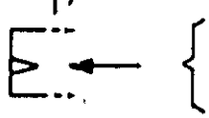
4-input NOR gate



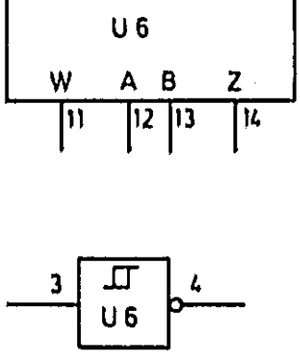
Inverter



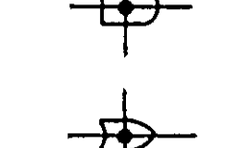
Flip-flop.



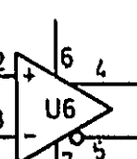
The dynamic indicator denotes that this is a dynamic input and operates on a transition, not a level.



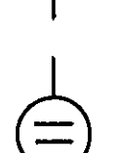
Complex functions represented by rectangular box. Letters can be used inside the rectangle to clarify the function. A truth table should be included, as close as possible to the circuit.



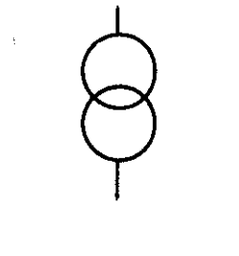
Schmitt trigger



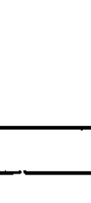
Wired AND connection



Wired OR connection

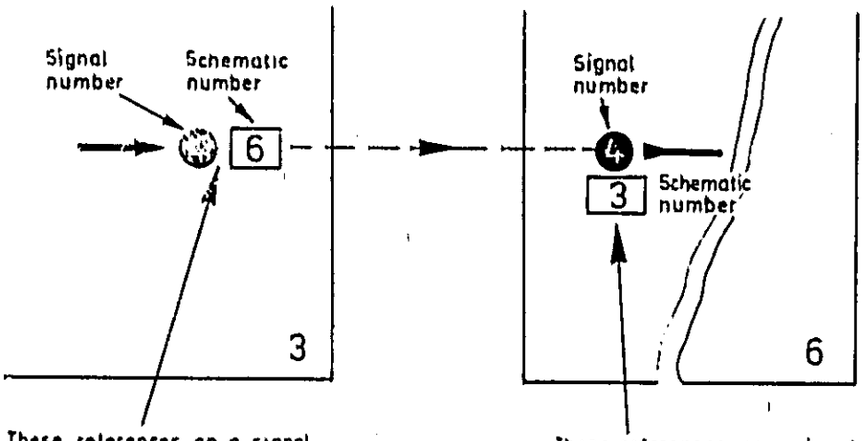


Operational amplifier



Voltage source

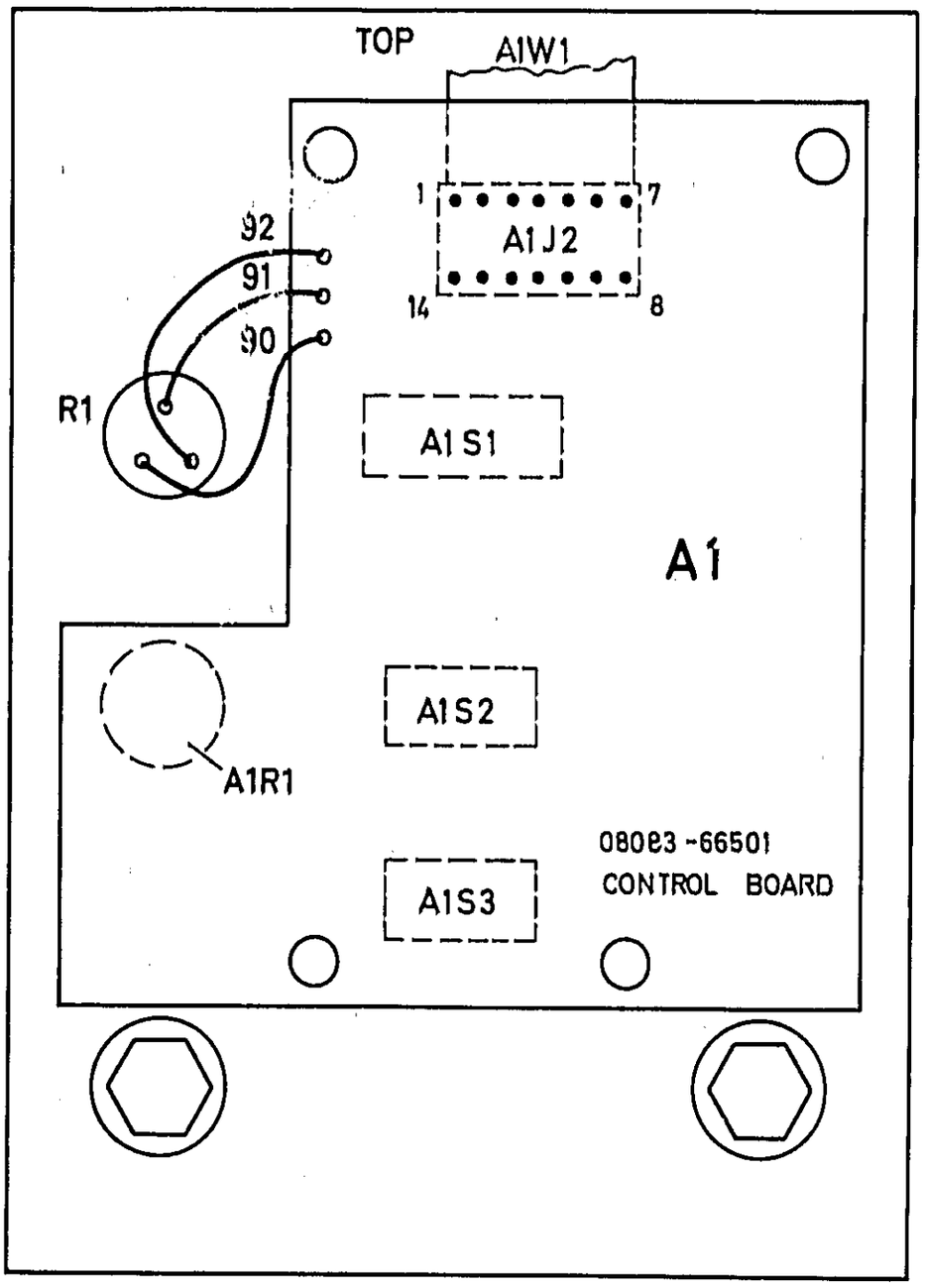
Current source

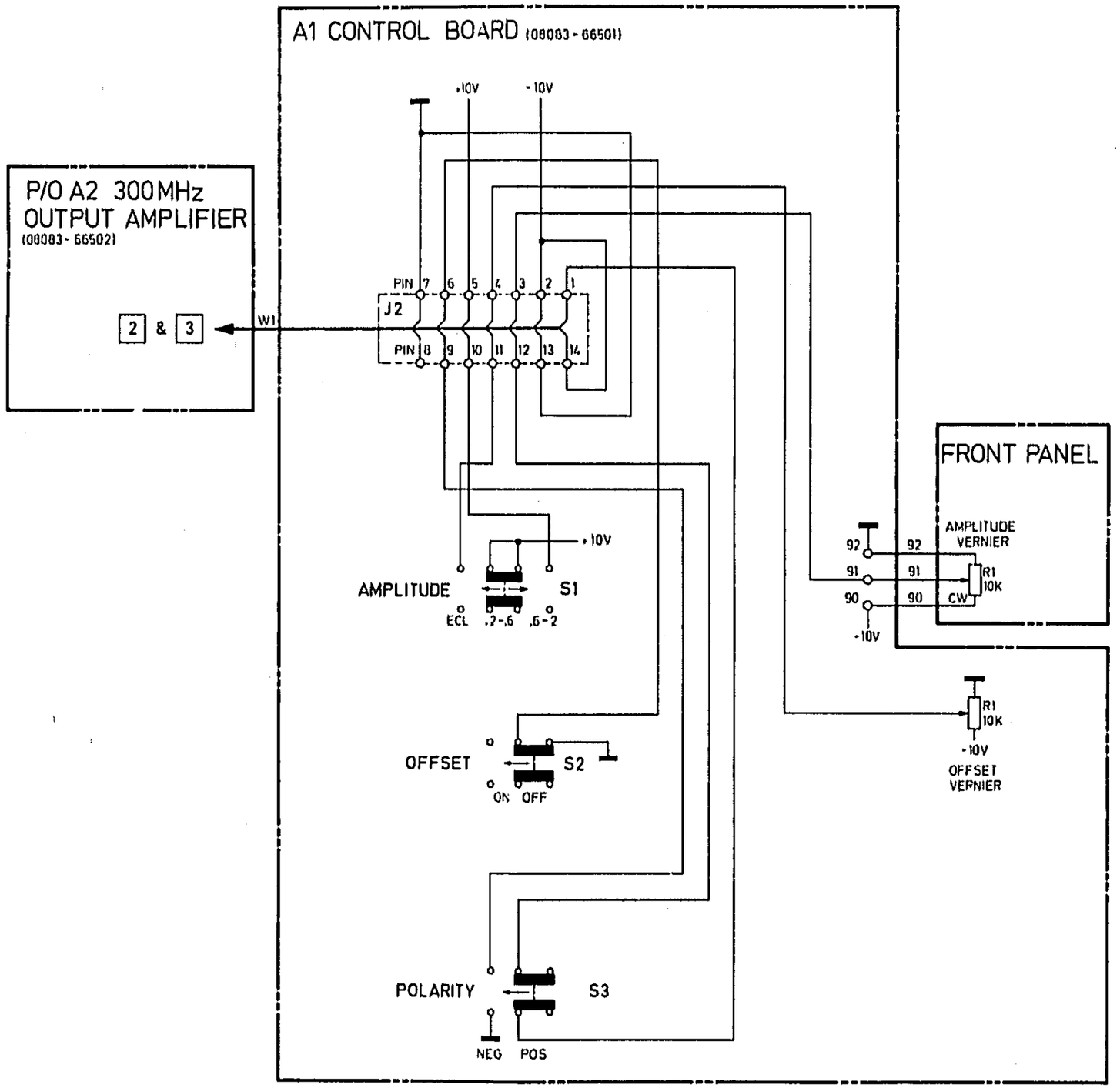


These references on a signal leaving a schematic diagram indicate the signal destination. The circle contains the signal number and the square contains the number of the schematic to which that signal goes.

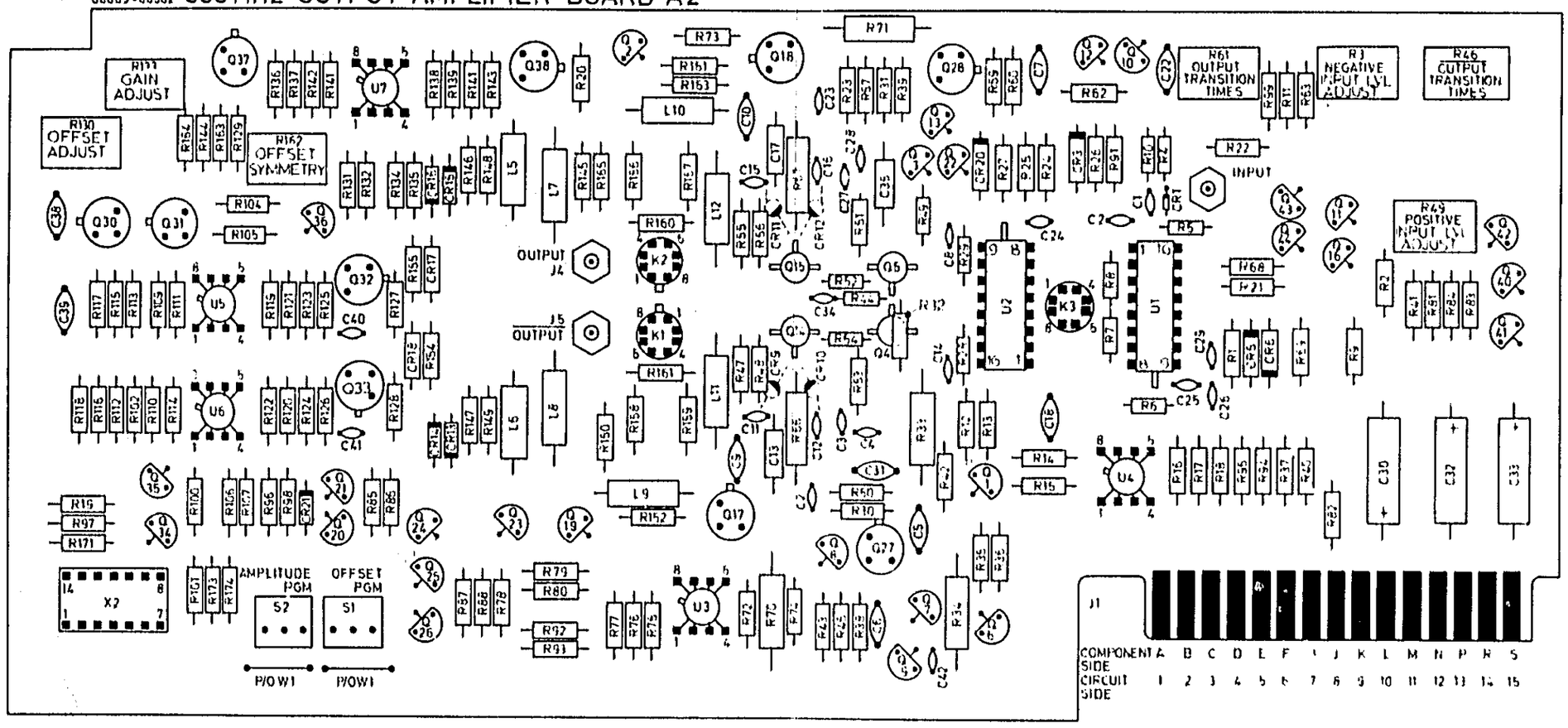
These references on a signal entering a schematic diagram indicate the signal origin. The circle contains the signal number and the square contains the number of the schematic on which that signal originates.

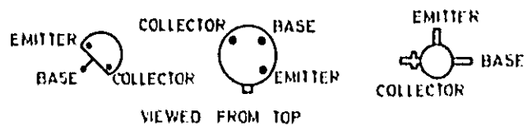
FRONT PANEL (INSIDE)



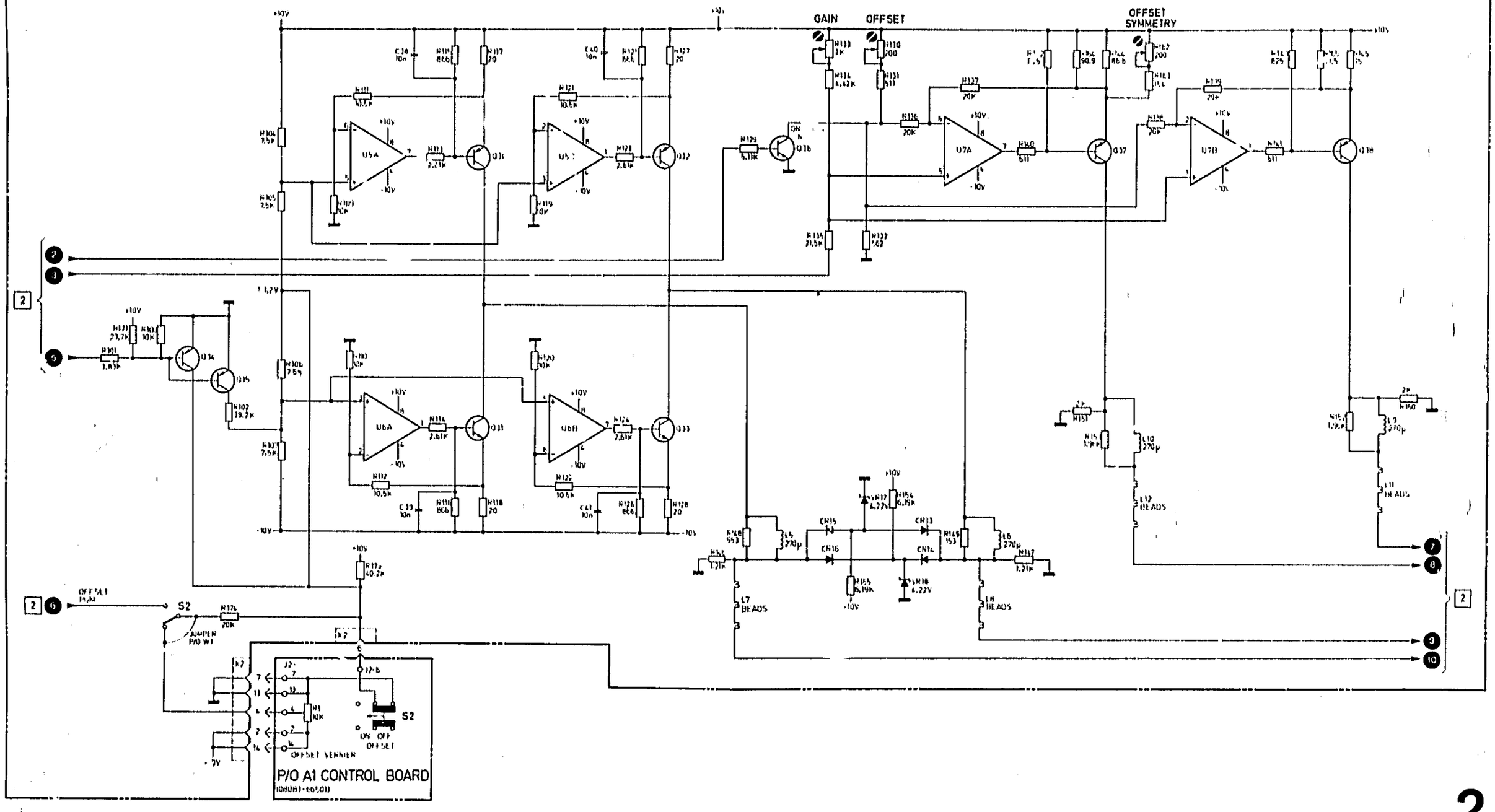

A1 CONTROL BOARD (08083-66501)
P/O A2 300MHz
OUTPUT AMPLIFIER
(08083-66502)
2 & 3
W1
PIN 7 6 5 4 3 2 1
J2
PIN 8 9 10 11 12 13 14
+10V
-10V
AMPLITUDE
S1
ECL .2-.6 .6-2
OFFSET
S2
ON OFF
POLARITY
S3
NEG POS
FRONT PANEL
AMPLITUDE
VERNIER
92
91
90
R1
10K
CW
-10V
OFFSET
VERNIER

08083-66502 300 MHz OUTPUT AMPLIFIER BOARD A2





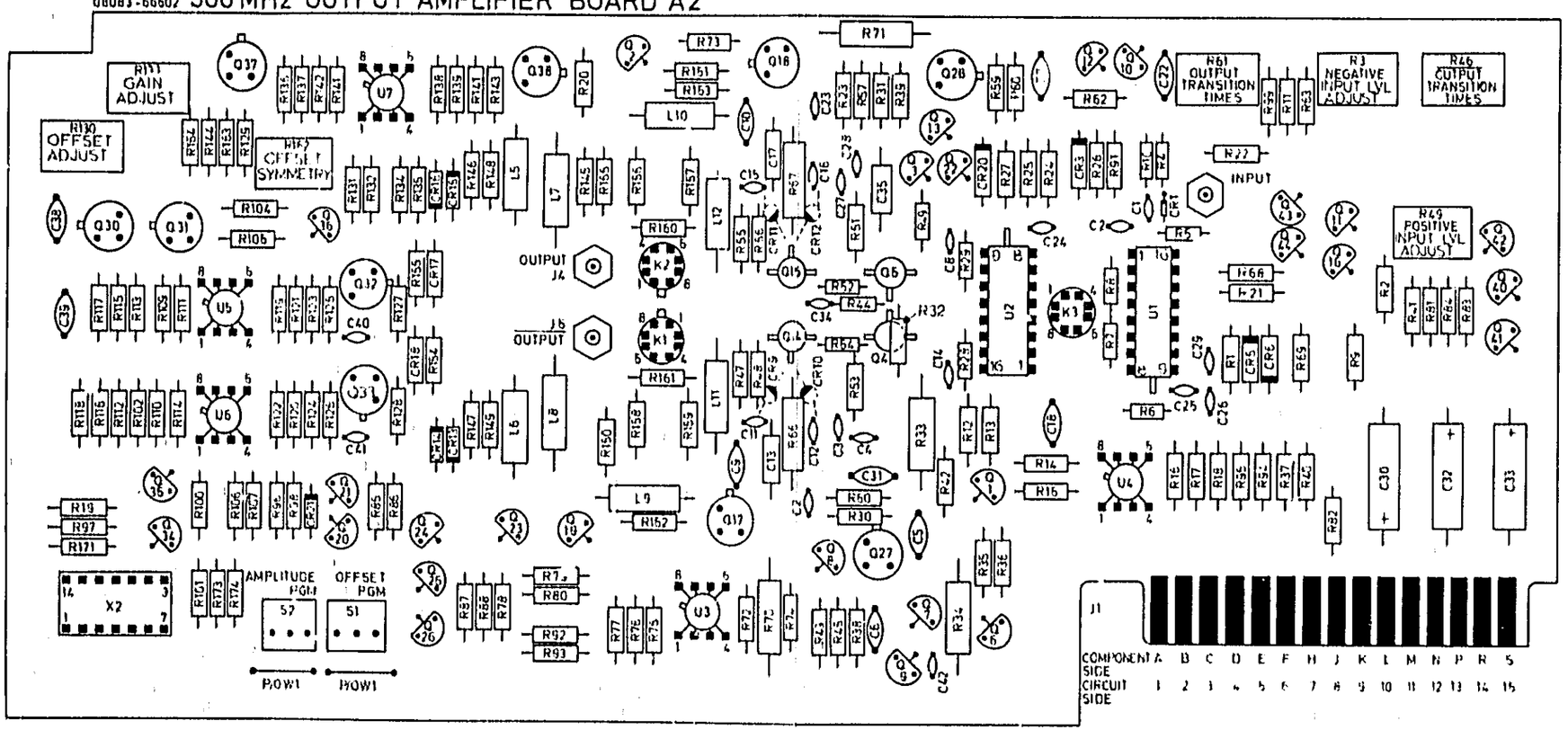
P/O A2 300MHz OUTPUT AMPLIFIER (OFFSET CIRCUITS) 09083-66507

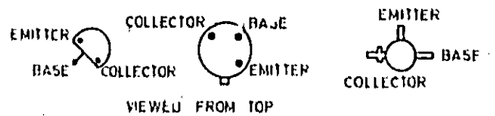


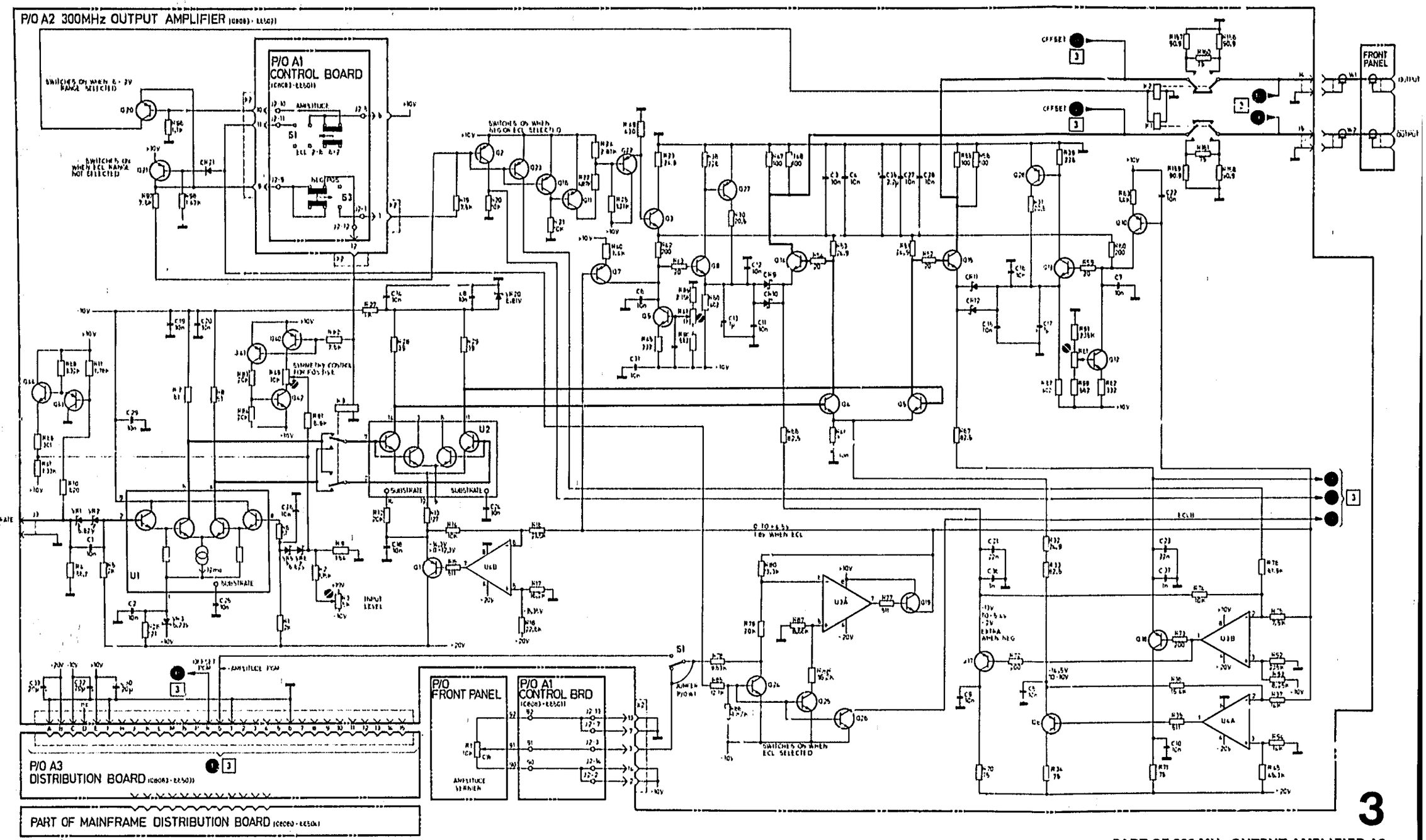
2

PART OF 300 MHz OUTPUT AMPLIFIER A2 (OFFSET CIRCUITS)

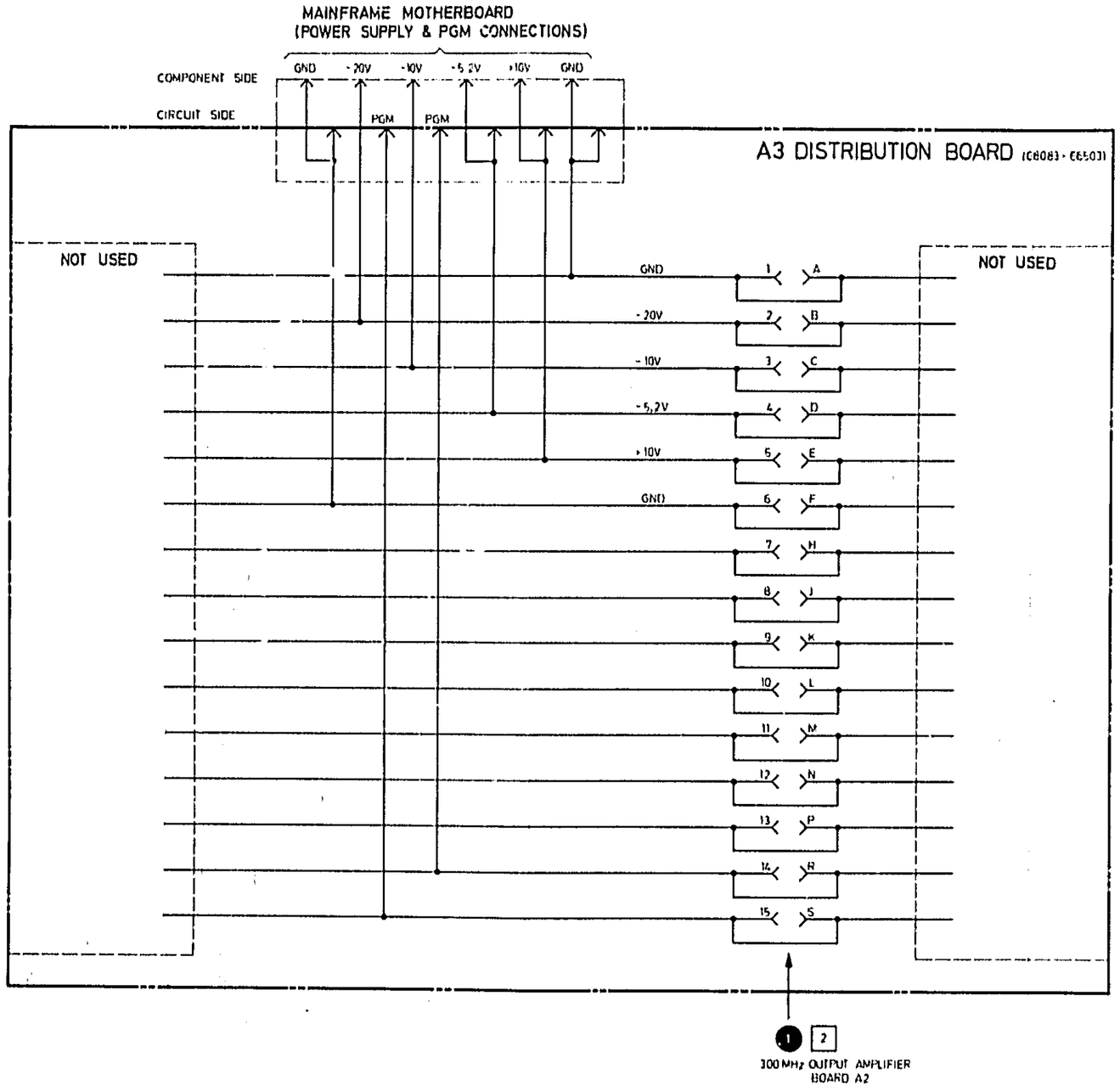
08083-66502 300 MHz OUTPUT AMPLIFIER BOARD A2







PART OF 300 MHz OUTPUT AMPLIFIER A2


MAINFRAME MOTHERBOARD
(POWER SUPPLY & PGM CONNECTIONS)
COMPONENT SIDE
CIRCUIT SIDE
GND
- 20V
- 10V
- 5,2V
+ 10V
GND
PGM
PGM
A3 DISTRIBUTION BOARD (C6083 - C6503)
NOT USED
NOT USED
GND
- 20V
- 10V
- 5,2V
+ 10V
GND
1 A
2 B
3 C
4 D
5 E
6 F
7 H
8 J
9 K
10 L
11 M
12 N
13 P
14 R
15 S
1
2
300 MHz OUTPUT AMPLIFIER
BOARD A2

MANUAL CHANGES

HEWLETT hp PACKARD GmbH

MANUAL CHANGES

Manual for Model Number	8083A Output A
Manual printed on	March 1976
Manual Part Number	08083-90001

Make all ERRATA corrections.

Check the following table for your instrument serial prefix/serial number and make the listed changes to your manual.

▶ New Item

Serial Prefix or Serial Number	Manual Changes	Serial Prefix or Serial Number	Manual Changes
1604G 00116 onwards	1		
1604G 00161 onwards*	1,2		
1604G 00166 onwards	1-3		
1604G 00186 onwards	1-4		
1604G 00251 onwards	1-5		
1604G 00271 onwards	1-6		
1604G 00331 onwards	1-7		

* With the exception of serial numbers -166, -167, -170, -172, -173, -174 and -175.

ERRATA

Replace the specifications in section 1 (table 1-2) with the spec update A attached.

Page 6-4 Change the mechanical drawing as per the attached page 4.

Page 6-5 Change the Replaceable Parts list as follows.

Delete	MP7	(both items)	
Add	MP9	5000-8926	BRACKET 1/4 MOD
	MP13	2200-0141	SCR MCH 4-40 X.31
	MP14	2200-0770	SCR MCH 4-40
	MP15	2360-0332	SCR 6-32 X.312
	MP16	2950-0072	NUT HEX .25-32
	MP19	2190-0067	WASH-LOCK .408ID
	MP20	2190-0068	WASH-LOCK INT 1/2
	MP21	2190-0108	WASH-LOCK .115ID

Page 6-6: Table 6-2. Change or add the following components.

A2 C19	0180-0376	C-F 0.47UF 35V TA
A2 C20	0180-0376	C-F 0.47UF 35V TA
A2CR4	1901-0040	DIO SWITCHING
A2CR7	1901-0040	DIO SWITCHING
A2 L13	9140-0096	COIL 1UH 10%
A2 Q4	1854-0720	XSTR SI NPN HF
A2 Q5	1854-0720	XSTR SI NPN HF
A2 Q14	1854-0720	XSTR SI NPN HF
A2 Q15	1854-0720	XSTR SI NPN HF
A2 R34	0757-1001	R-F 56.2 1% .5W
A2 R36	0698-4480	R-F 15.9K 1% .125W
A2 R37	0757-0289	R-F 13.3K 1% .125W
A2 R48	0698-4406	R-F 115 1% .125W
A2 R56	0698-4406	R-F 115 1% .125W
A2 R74	0698-4475	R-F 9.76K 1% .125W
A2 R95	0757-0475	R-F 274K 1% .125W
A2 R97	0757-0434	R-F 3.65K 1% .125W
A2 R102	0698-4475	R-F 38.3K 1% .125W
A2 R130	2100-3351	R-VAR 500 10%
A2 R166	0698-3378	R-F 51 5% .125W
A2 R167	0698-3378	R-F 51 5% .125W
A2 R175	0757-0434	R-F 3.65K 1% .125W
A2 S1	Delete	
A2 S2	Delete	

ERRATA (cont'd)

Page 7-10: Change the component layout for board A2 as per the attached page 5.

Page 7-11: Schematic 2. Delete the "OFFSET PGM" input and delete switch S2. The jumper wire remains. Change the value of R102 to 38.8K and the value of R130 to 500. Change the Schematic number to 3.

Page 7-12: Make the same changes as for page 7-10.

Page 7-13: Change schematic 3 as per the attached page 6. Change the schematic number to 2.

Page 6-6: Change part number of A2L7, 8, 11, 12 to 5081-1973

CHANGE 1

Page 6-6: Change the following components

A2R72	0698-4453	R-F 402	1%	.125W
A2R73	0698-4453	R-F 402	1%	.125W

Page 7-13: Change the value of R72 & R73 to 402.

CHANGE 2

On Table 6-2, Assembly A2 Parts List:
add C36, C37, C43, C44 10 nF 0160-3879

On Schematic 2:
connect C36 between U5 pin 1 and U5 pin 2
connect C37 between U5 pin 6 and U5 pin 7
connect C43 between U6 pin 1 and U6 pin 2
connect C44 between U6 pin 6 and U6 pin 7

CHANGE 3

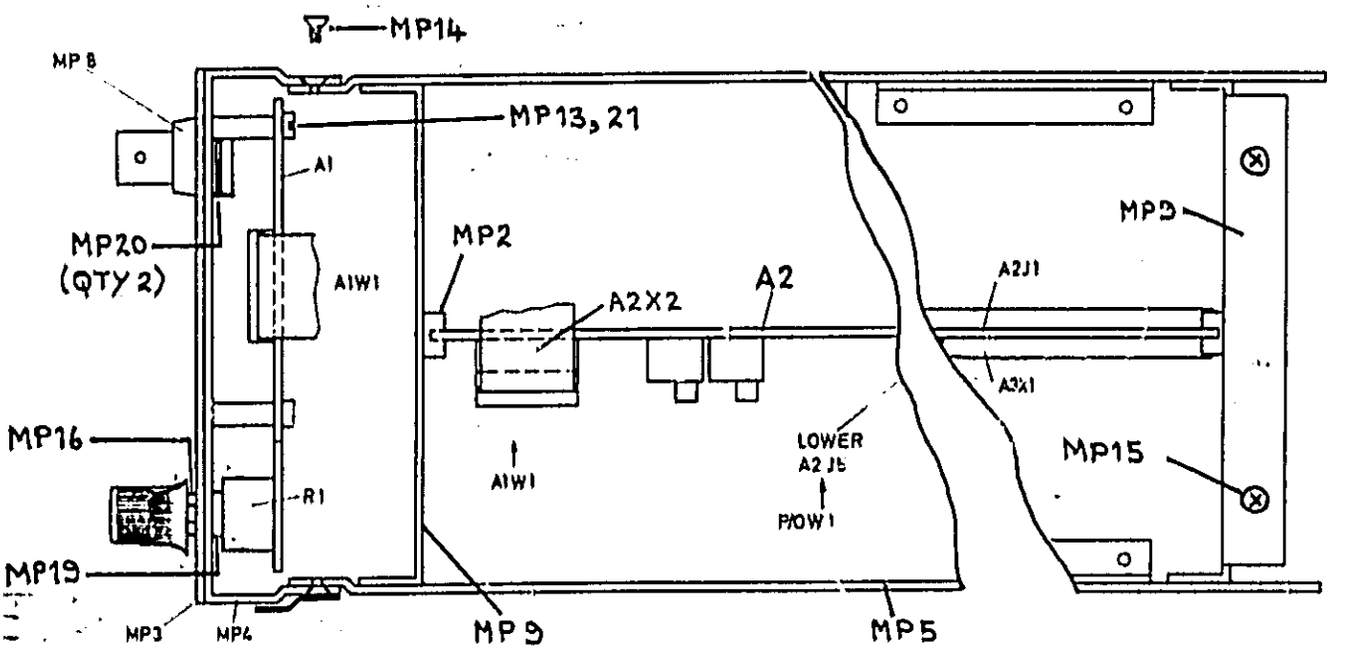
Page 6-5: Delete A3 08093-66503 BD AY MOTHER

Insert J1 1251-2036 CONN PC 30 CONTR
MP22 5020-9021 BD PC

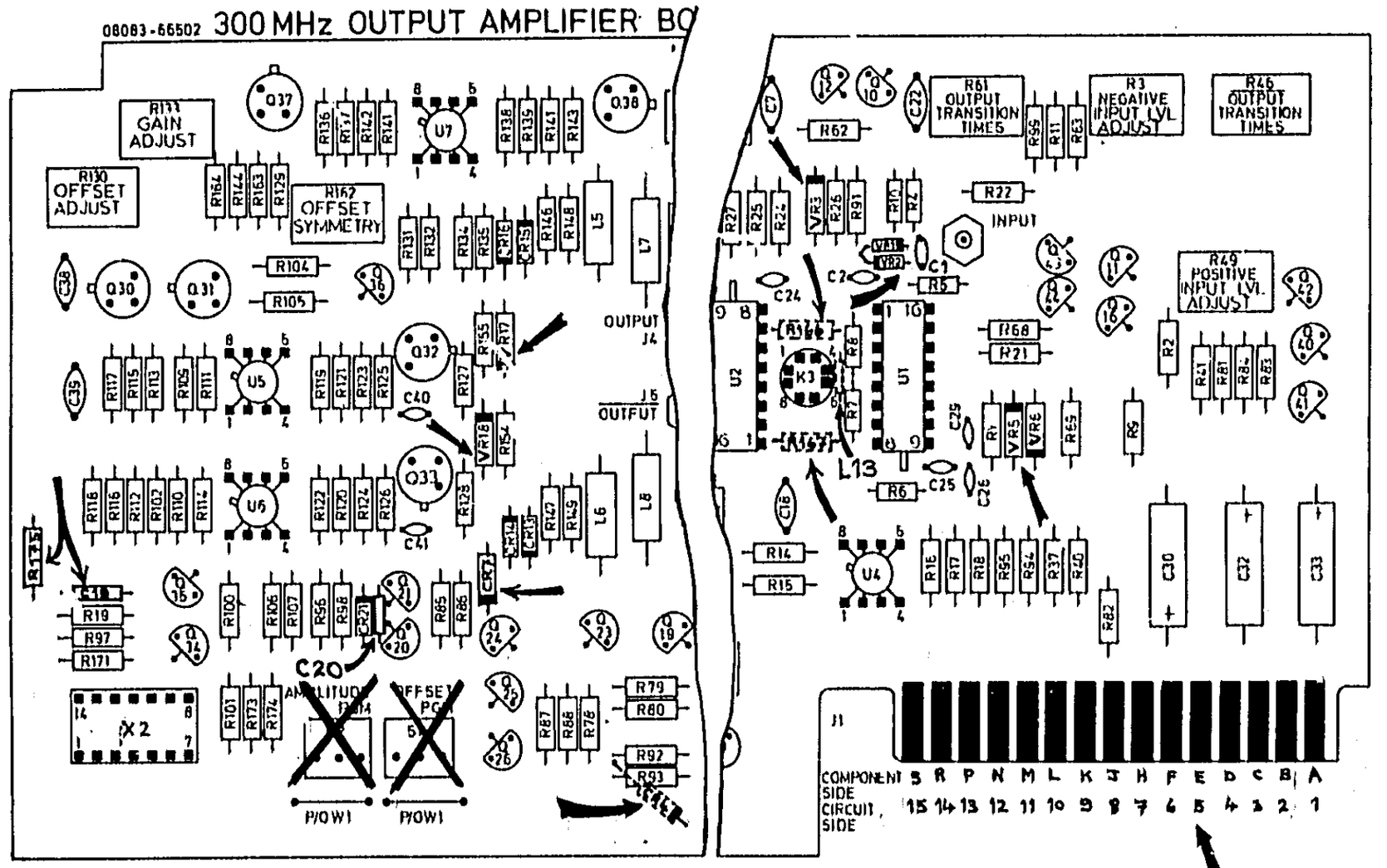
CHANGE 4

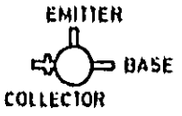
On Table 6-2, Frame parts list, change to read:

MP2 0403-0132 GUIDE PC

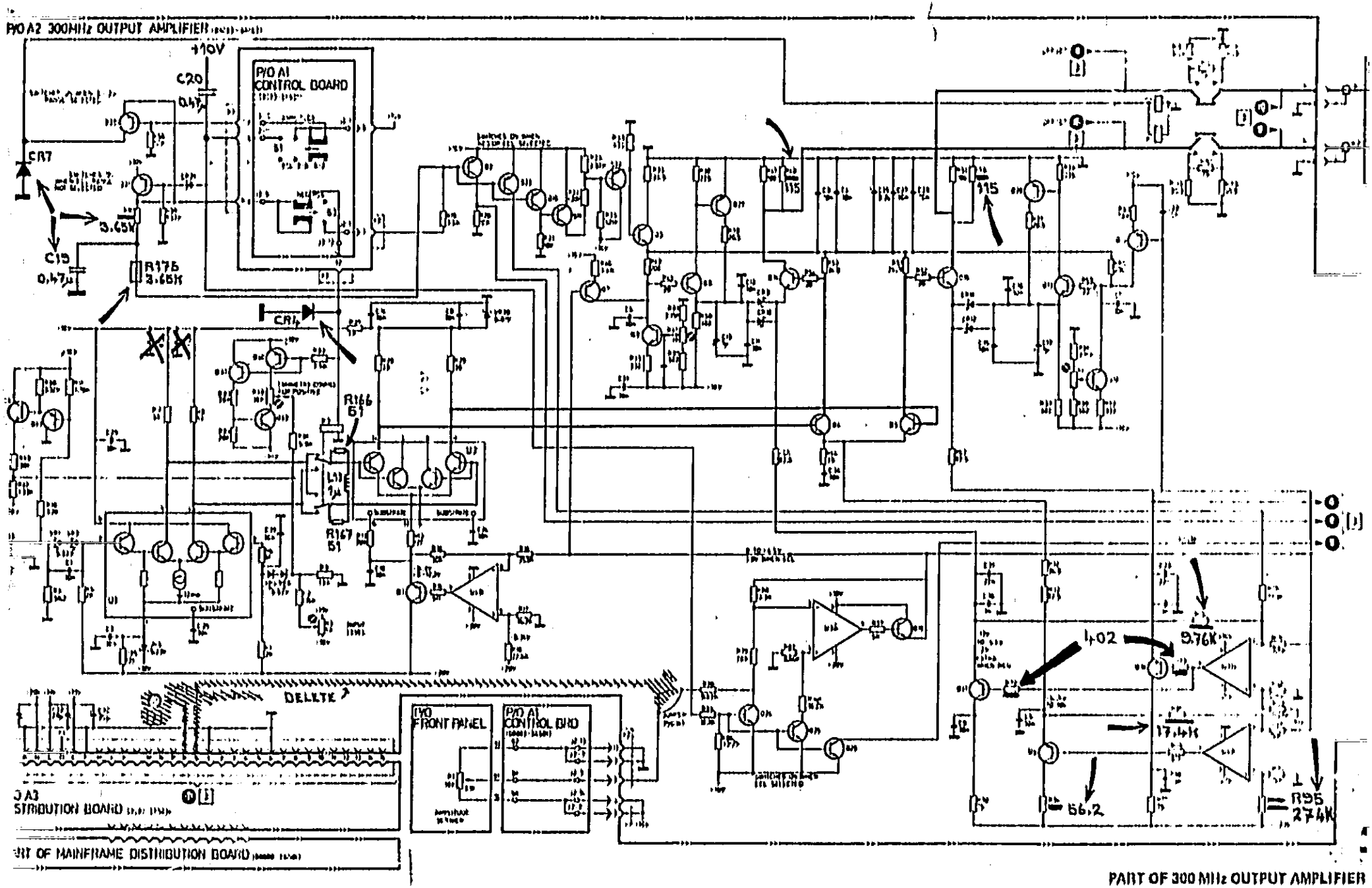


NOTE: ITEMS MP5, MP6, MP9 AND BOARD A3 ARE RIVETED TOGETHER.





NOTE: COMPONENTS WITH DOTTED LINES ARE MOUNTED ON THE SOLDER SIDE OF THE BOARD.


P/O A2 300MHz OUTPUT AMPLIFIER
+10V
C20
0.47µ
P/O A1
CONTROL BOARD
CR7
3.65K
C19
0.47µ
R175
3.65K
CR4
R166
51
R167
51
L11
1µ
115
115
1402
9.76K
17.4K
56.2
R95
274K
DELETE
P/O
FRONT PANEL
P/O A1
CONTROL BRD
O A3
STRIBUTION BOARD
RT OF MAINFRAME DISTRIBUTION BOARD
PART OF 300 MHz OUTPUT AMPLIFIER

CHANGE 5

On Table 6-2, Replaceable Parts List
add: MP23 Chassis Assembly 5061-2113
add the following note to MP2, 6, 5, 9, 22:
"SINGLE PARTS OF RIVET ASSEMBLY MP 23"

CHANGE 6

On Table 6-2, change the Replaceable Parts List to read :

	MP8, MP16	5020-8779	NUT HEX
Add :	A2C45	0160-3878	C-F 1000PF 100V ± 20%

C45 is connected between U4 Pin 1 and Pin 2.

CHANGE 7

On Table 6-2, change the Table of Replaceable Parts to read :

A2R26	0757-0069	R-FXD 121 1% .25W

Table 1–2. Specifications

OUTPUT PULSE

Amplitude (into 50Ω):	3 ranges: 2 V to 0.6 V (by Vernier), 0.6 V to 0.2 V (by Vernier), ECL (–0.8 V to –1.6 V typ)
Maximum levels:	± 4 V
Offset (into 50Ω load):	± 1 V (common to both channels)
Transition time (10% to 90%):	≤ 800 ps
Duty cycle:	Determined by duty cycle of driving (clock) pulse. Can be adjusted ± 10% using trigger level control (inside), e.g. with 50% duty cycle input, output can be from 40%–60% duty cycle.
Preshoot, Overshoot, Ringing:	≤ 10%
Output protection:	max. applied ext. voltage, ± 2 V in POS mode 0 to –4 V in NEG mode or max. ext. current: ± 40 mA

OUTPUT CHANNELS

NORMAL and COMPLEMENT outputs provided simultaneously

Source impedance:	50Ω ± 5%
Reflection coefficient:	< 15%
Polarity:	neg/pos selectable

DRIVE INPUT A

Input frequency:	0 to 300 MHz
Input impedance:	50Ω typical
High signal level:	more pos. than –100 mV
Low signal level:	more neg. than –500 mV
Min. amplitude:	> 500 mVpp
Transition times (10%–90%):	≤ 3 ns
Max. external voltage:	± 1 V
Propagation delay times:	4.8 ns ± 500 ps

OPTION 910	Additional instrument operating and service manual
SIZE	Quarter mainframe width