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COMMITTED TO EXCELLENCE

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PLEASE CHECK FOR CHANGE INFORMATION AT THE REAR OF THIS MANUAL.

A6902 ISOLATOR

SERVICE

INSTRUCTION MANUAL

Tektronix, Inc.
P.O. Box 500
Beaverton, Oregon 97077

Product Group 60
070-2905-02

Serial Number _____

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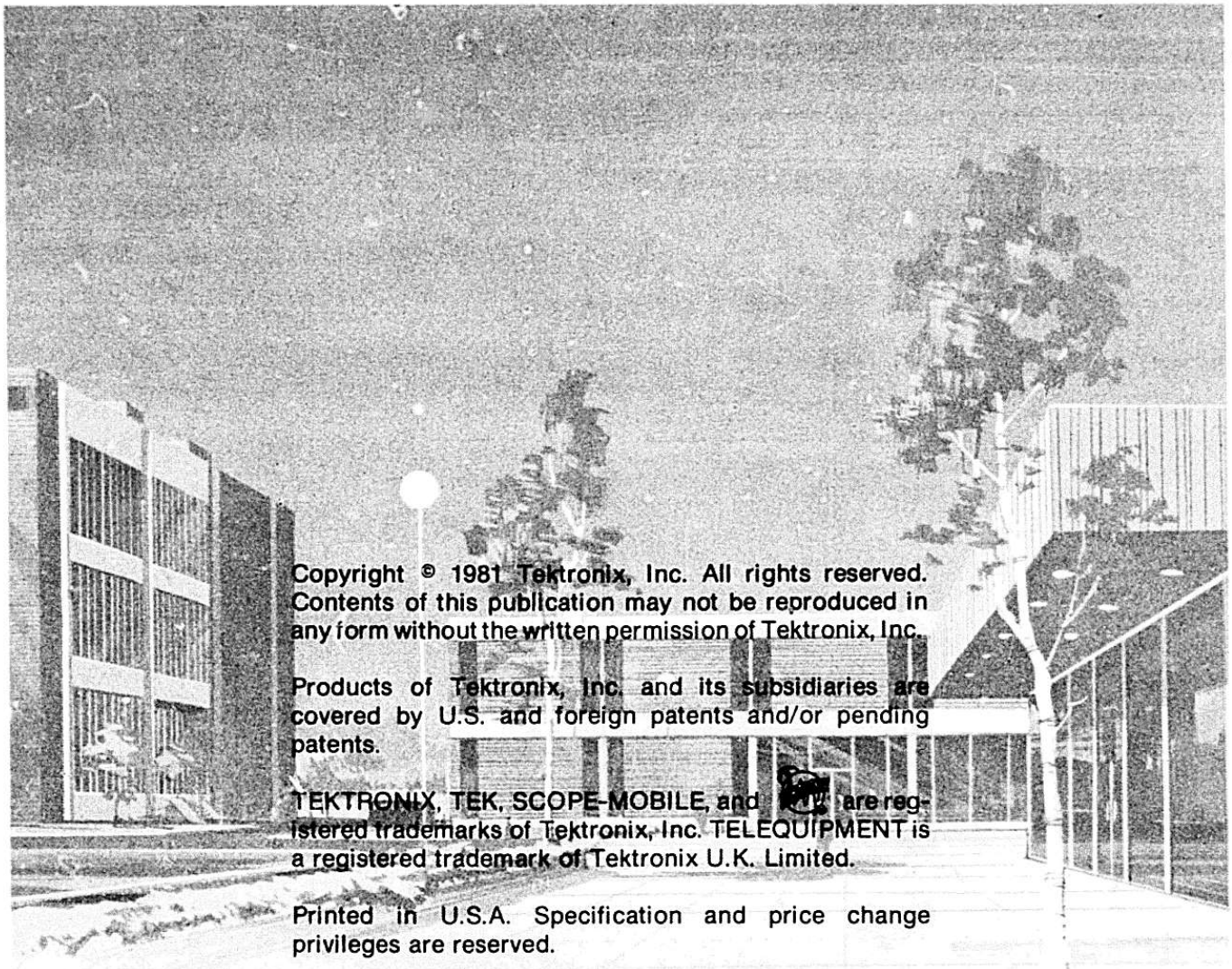

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TABLE OF CONTENTS

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TABLE OF CONTENTS (cont)

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INPUT PROBES

SETTING PROBE-TIP ANGLES

The angle of the 500-V probe tip is continuously variable and may be rotated to any desired position.

The angle of the 1500-V probe tip may be rotated in 90° increments, if necessary, to make it easier to attach the probe to the circuit under test. To change the probe tip angle, refer to Figure 2-7 and perform the following steps:

1. Hold the probe with one hand, placing your forefinger and thumb behind the slide to maintain the slide in the forward position.

2. Loosen the collar by rotating it in the direction shown until it disengages from the probe body.

3. Pull the probe tip away from the probe body until the indexing guides on the shaft of the probe tip disengage from the guide slots in the probe body (approximately one-fourth inch).

4. Rotate the probe tip to the desired position (0°, 90°, 180°, or 270°).

5. Match the indexing guides with the corresponding guide slots for the position chosen and press the probe tip into the probe body until the indexing guides completely engage the guide slots.

6. Thread the collar onto the probe body until the collar is snugly seated.

7. The probe is now ready to be used.

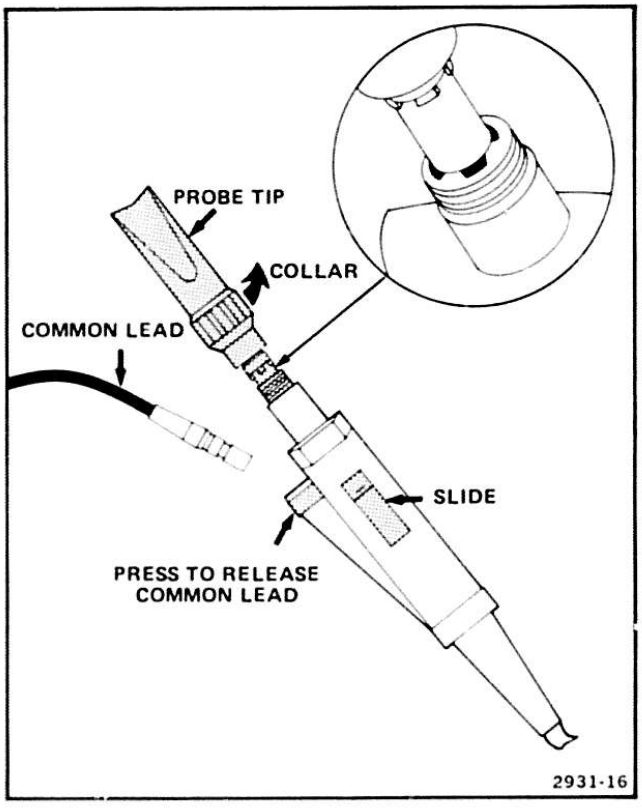

Figure 2-7. Setting the 1500-V probe tip angle and replacing the common lead.

CHANGING INPUT PROBES

The input probes are attached to the instrument via coaxial connectors located inside the zippered pouch. To remove an input probe, grasp each connector (one attached to the probe cable and one attached to the instrument cable) and carefully disconnect them by pulling apart. To install another input probe (either 500-V or 1500-V as required), align the two connectors and press them together until they snap into place and are firmly seated.

Whenever an input probe is changed, the PROBE COMP control must be adjusted. For these instructions, refer to the "Gain Check and Probe Compensation" procedure in the "Operator's Checks and Adjustments" part of this section.

REPLACING COMMON LEADS

To replace the common lead on the 500-V Probe, grasp the end closest to the probe and pull straight away from the probe body. Install the new common lead by inserting the round end into the connector on the probe body.

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PERFORMANCE CHECK PROCEDURE

The "Performance Check Procedure" is used to verify the instrument's Performance Requirements as listed in the "Specification" (Section 1) and to determine the need for readjustment. These checks may also be used as an acceptance test and as a preliminary troubleshooting aid.

INTRODUCTION

This procedure does not check every facet of the instrument; rather it is concerned with those portions of the A6902 that are essential to measurement accuracy and correct operation. Removing the instrument's cover is not necessary to perform this procedure. All checks are made using the operator-accessible front- and rear-panel controls and connectors.

TEST EQUIPMENT REQUIRED

The test equipment given in Table 4-1 is a complete list of equipment required to accomplish both the "Performance Check Procedure" in this section and the "Adjustment Procedure" in Section 5 of this manual. Specific equipment required to perform each individual step in this procedure is listed at the beginning of each step. The item number shown in parenthesis with each piece of equipment refers to the equipment item number presented in Table 4-1.

Test equipment specifications described in Table 4-1 are the minimum necessary to provide accurate results. Therefore, equipment used must meet or exceed the listed specifications. Detailed operating instructions for test equipment are not given in this procedure. If more operating information is required, refer to the appropriate test equipment instruction manual.

When equipment other than that recommended is used, control settings or test setups may need to be altered. If the exact item of equipment given as an example in Table 4-1 is not available, first check the "Minimum Specification" column carefully to determine whether any other equipment might suffice. Then check the "Use" column for the purpose of the item. If a particular check is of little or no importance to your measurement requirement(s), the test equipment item and corresponding step(s) may be omitted.

PERFORMANCE-CHECK INTERVAL

To ensure instrument accuracy, check its performance every 1000 hours of operation or every six months, if used infrequently.

LIMITS AND TOLERANCES

The limits and tolerances given in this procedure are valid only if the instrument has been adjusted at an ambient temperature between +20°C and +30°C, it is operating at an ambient temperature between 0°C and +50°C (unless otherwise noted), and it has had a warmup period of 30 minutes.

Limits and tolerances stated in this procedure are instrument specifications only if they are listed in the "Performance Requirements" column of the "Specification" (Section 1). Tolerances given are applicable only to the A6902 and do not include test-equipment error.

INPUT PROBES

All checks in this procedure are described and illustrated using the 1500-V Input Probe. The 500-V Probe may also be used in any of the check steps, provided that voltages in the "Specification" (Section 1) are not exceeded.

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PREPARATION

Before performing this procedure, ensure that the Line Voltage Selector card, located on the rear of the A6902, is set to the proper range for the voltage source being used and that the correct fuse in installed (see "Preparation for Use" in the "Operating Instructions" section of this manual). Connect the test equipment and instrument to be checked to an appropriate ac-power-input source.

INDEX OF PERFORMANCE-CHECK STEPS

Table 4-1

Test Equipment Required

Item and Description	Minimum Specification	Use	Example of Applicable Equipment
1. Variable Autotransformer	Capable of supplying at least 3 A over a range of 90 V to 132 V.	Check line voltage range.	General Radio W8MT3VM.
2. Digital Multimeter (DMM)	Dc volts range to ±20 V. Accuracy: ±1%.	Check power supplies.	TEKTRONIX DM 501.[a]
3. Oscilloscope	150 MHz bandwidth.	Check bandpass and transient response.	TEKTRONIX 475A.
4. Calibration Generator	0.5 ns rise time. Repetition rate: 1 kHz to 100 kHz. Output: 0.1 V to 100 V ±0.25%.	Signal source for gain and transient response.	TEKTRONIX PG 506.[a]
5. Leveled Sine-Wave Generator	Repetition rate: to 25 MHz. Output: 0 to 5 V.	Check bandpass.	TEKTRONIX SG 503.[a]
6. Power Module		Provide operating voltages for TEKTRONIX TM 500-series test equipment.	TEKTRONIX TM 503 or or TM 506.
7. Adapter	Probe-tip-to-bnc male for 1500-V input probes. Voltage rating: 1500 V (dc + peak ac).	Signal interconnection.	Tektronix Part Number 015-0405-00.[b]
8. Termination	Impedance: 50 Ω. Connectors: bnc.	Signal interconnection.	Tektronix Part Number 011-0049-01.
9. Attenuator	10X attenuation factor. Impedance: 50 Ω. Connectors: bnc.	Signal attenuation.	Tektronix Part Number 011-0059-02.
10. Precision Cable	Impedance: 50 Ω. Connectors: bnc.	Signal interconnection.	Tektronix Part Number 012-0482-00.
11. Cable	Impedance: 50 Ω. Connectors: bnc.	Signal interconnection.	Tektronix Part Number 012-0117-00.

[a]Requires a TM 500-series power module (item 6).

[b]Fits only the 1500-V input probes.

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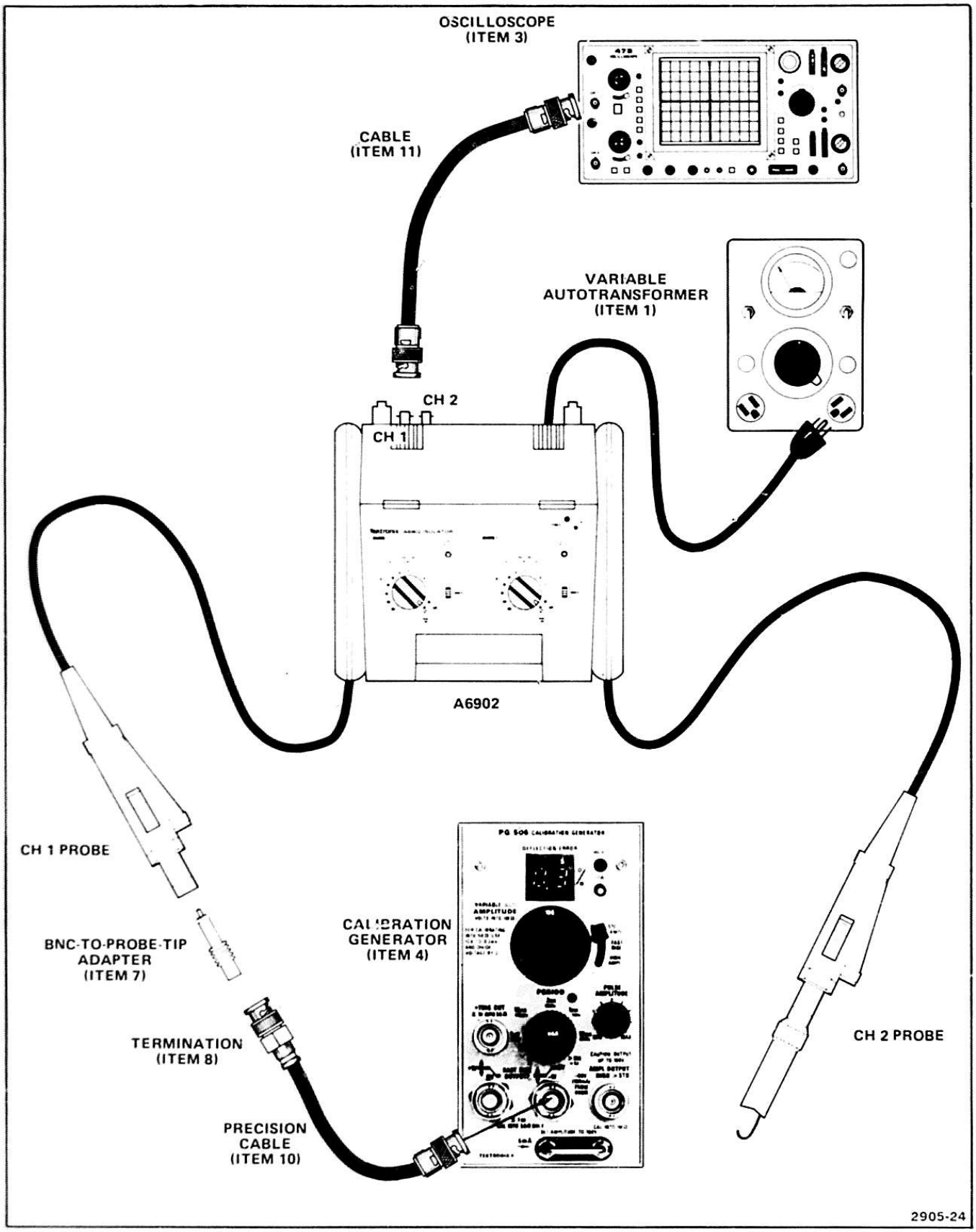

Figure 4-1. Test setup for line voltage range check.

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ADJUSTMENT PROCEDURE

The "Adjustment Procedure" is used to return the instrument to conformation with its "Performance Requirements" as listed in the "Specification" (Section 1). These adjustments should be performed only after the checks in the "Performance Check Procedure" (Section 4) have indicated a need for adjustment of the instrument.

INTRODUCTION

IMPORTANT—PLEASE READ BEFORE USING THIS PROCEDURE

TEST EQUIPMENT REQUIRED

Table 4-1 at the beginning of Section 4 describes all the test equipment required to accomplish both the "Adjustment Procedure" in this section and the "Performance Check Procedure" in Section 4. Specific equipment required to perform each individual step in this procedure is listed at the beginning of each step. The item number shown in parenthesis with each piece of equipment refers to the equipment item number presented in Table 4-1.

Test equipment specifications described in Table 4-1 are the minimum necessary to provide accurate results. Therefore, equipment used must meet or exceed the listed specifications. Detailed operating instructions for test equipment are not given in this procedure. If more operating information is required, refer to the appropriate test equipment instruction manual.

This procedure is based on using the first item of equipment listed in the "Examples of Applicable Equipment" column of Table 4-1. When other equipment is substituted, the control settings or the calibration setups may need to be altered. If the exact equipment listed is not available, carefully check the "Minimum Specification" column to see if any other equipment might suffice. Then check the "Use" column for the purpose of the item. If a particular adjustment is of little or no importance to your requirement(s), the test equipment item and corresponding step(s) may be omitted.

LIMITS AND TOLERANCES

The limits and tolerances stated in this procedure are instrument specifications only if they are listed in the "Performance Requirements" column of the "Specification" (Section 1). Tolerances given are applicable only to the instrument undergoing adjustment and do not include test-equipment error. Adjustment of the instrument must be accomplished at an ambient temperature between +20°C and +30°C, and the instrument must have had a warmup period of at least 30 minutes.

INPUT PROBES

All steps in this procedure are described and illustrated using the 1500-V input probe. The 500-V probe may also be used in any of the steps, provided that voltages in the "Specification" (Section 1) are not exceeded.

ADJUSTMENT SEQUENCE

Because of adjustment interaction, the adjustment steps in this procedure must all be performed and must be accomplished in the exact sequence illustrated in Figures 5-1 and 5-2.

At the beginning of each adjustment step is a list of all the front-panel control settings required to prepare the instrument and the test equipment for performing part a in that step. Each succeeding part within a step should then be performed both in sequence and in its entirety to ensure that control-setting changes will be correct for ensuing parts.

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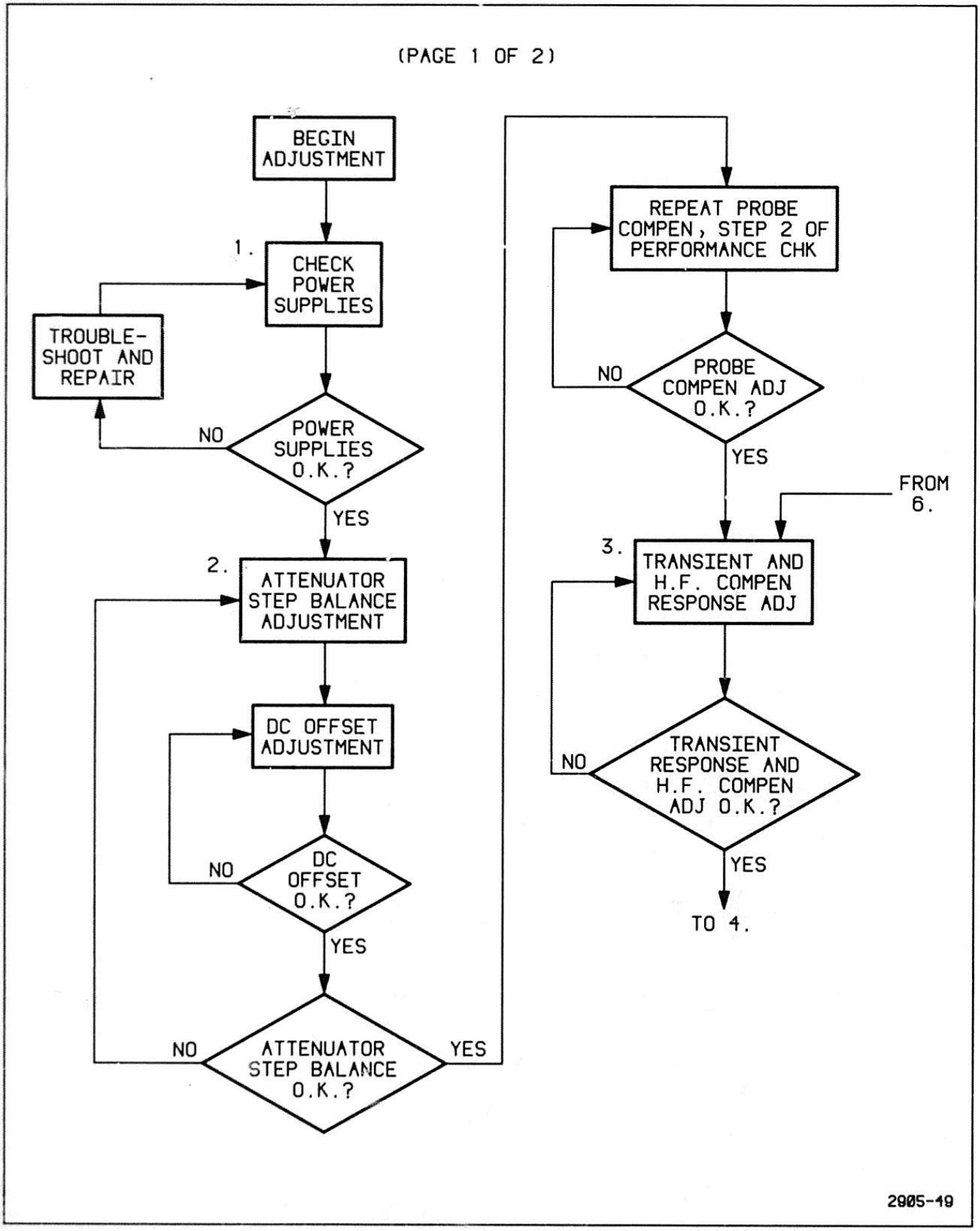

Figure 5-1. Adjustment sequence flow chart, part 1 of 2.

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DIAGRAMS AND CIRCUIT BOARD ILLUSTRATIONS

Symbols

Graphic symbols and class designation letters are based on ANSI Standard Y32.2-1975.

Logic symbology is based on ANSI Y32.14-1973 in terms of positive logic. Logic symbols depict the logic function performed and may differ from the manufacturer's data

The overline on a signal name indicates that the signal performs its intended function when it is in the low state.

Abbreviations are based on ANSI Y1.1-1972.

Other ANSI standards that are used in the preparation of diagrams by Tektronix, Inc. are:

Y14.15, 1966	Drafting Practices.
Y14.2, 1973	Line Conventions and Lettering.
Y10.5, 1968	Letter Symbols for Quantities Used in Electrical Science and Electrical Engineering.

American National Standard Institute
1430 Broadway
New York, New York 10018

Component Values

Electrical components shown on the diagrams are in the following units unless noted otherwise:

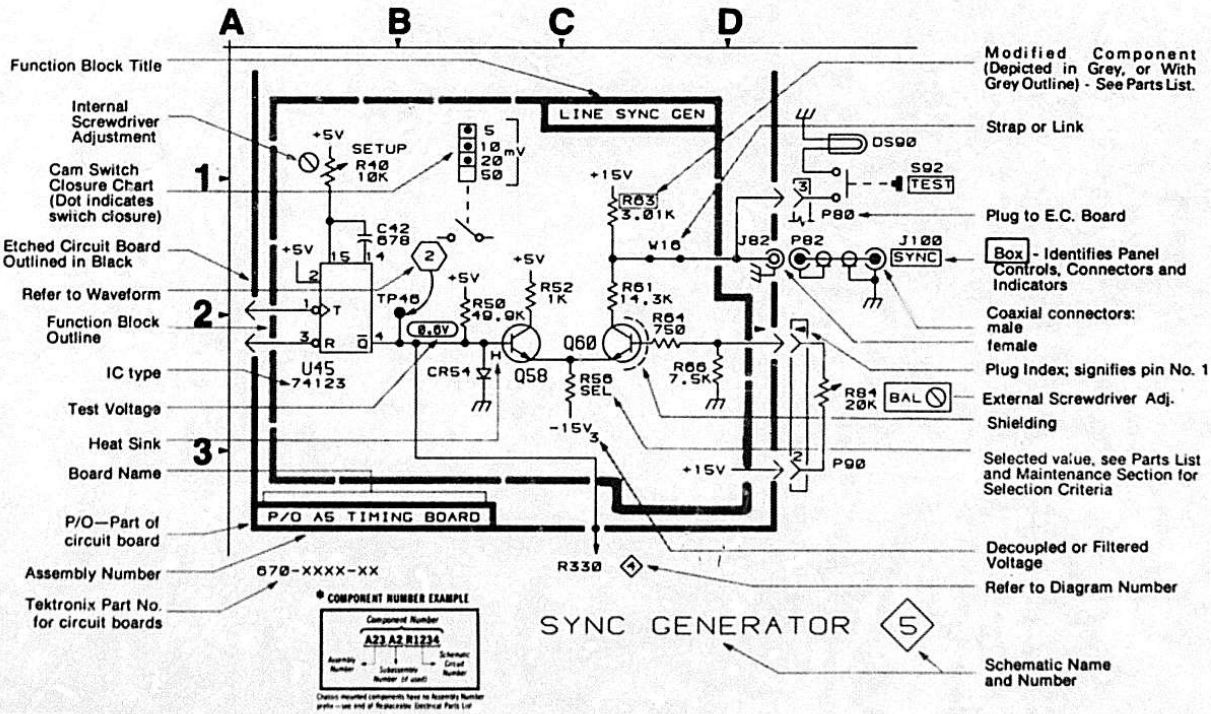
Capacitors = Values one or greater are in picofarads (pF). Values less than one are in microfarads (μF).
Resistors = Ohms (Ω).

The information and special symbols below may appear in this manual.

Assembly Numbers and Grid Coordinates

Each assembly in the instrument is assigned an assembly number (e.g., A20). The assembly number appears on the circuit board outline on the diagram, in the title for the circuit board component location illustration, and in the lookup table for the schematic diagram and corresponding component locator illustration. The Replaceable Electrical Parts list is arranged by assemblies in numerical sequence; the components are listed by component number *(see following illustration for constructing a component number).

The schematic diagram and circuit board component location illustration have grids. A lookup table with the grid coordinates is provided for ease of locating the component. Only the components illustrated on the facing diagram are listed in the lookup table. When more than one schematic diagram is used to illustrate the circuitry on a circuit board, the circuit board illustration may only appear opposite the first diagram on which it was illustrated; the lookup table will list the diagram number of other diagrams that the circuitry of the circuit board appears on.



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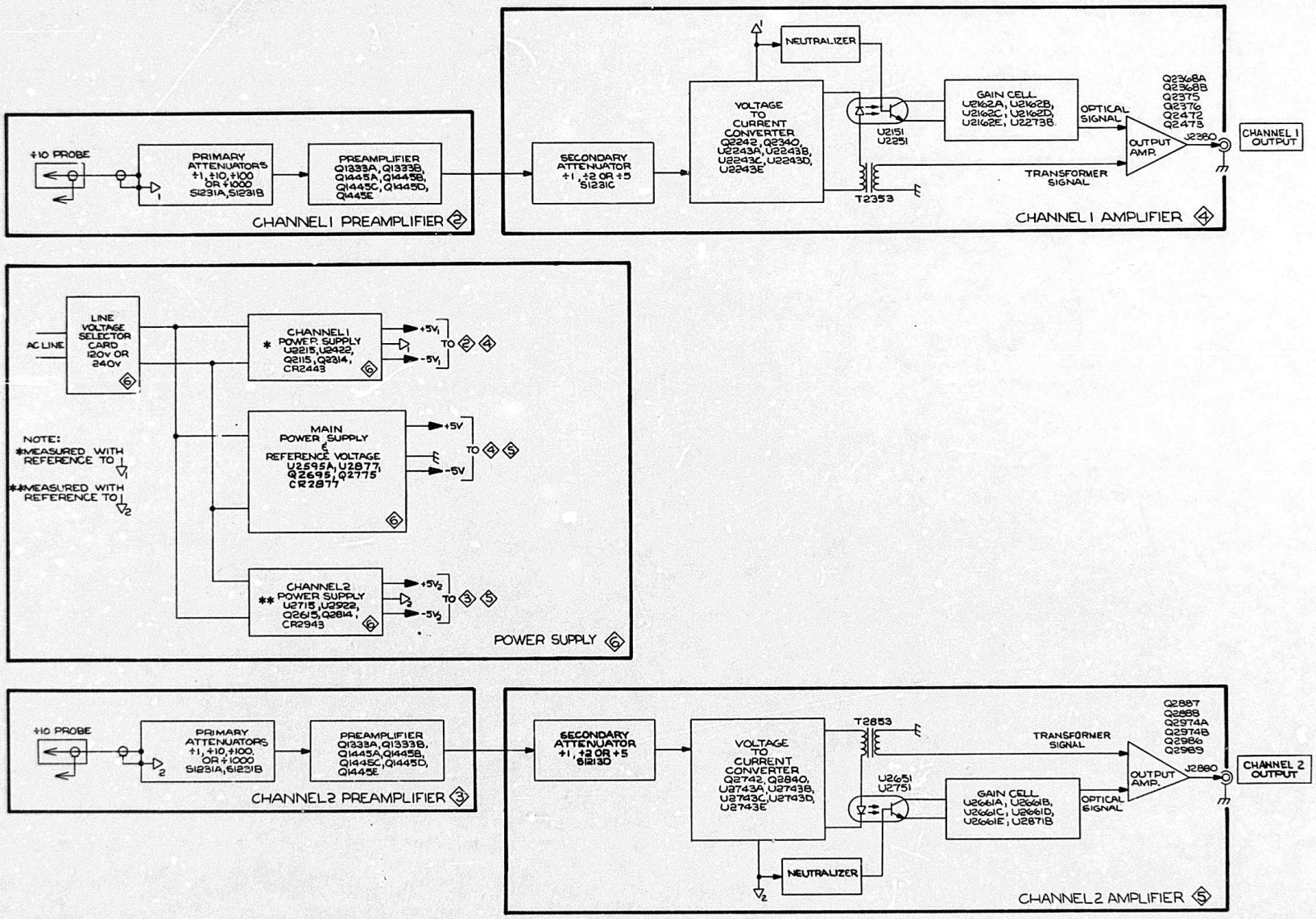

A6902

BLOCK DIAGRAM 1

2905-01
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AC WAVEFORMS

The waveforms adjacent to the schematic diagrams were obtained using the recommended test equipment and setup given below, unless otherwise noted.

Changes to test setups for waveforms are noted where applicable.

RECOMMENDED TEST EQUIPMENT

Item	Specification	Example
Test Oscilloscope	Frequency response: Dc to 150 MHz. Deflection factor: 5 mV to 5 V (to 50 V/div with 10X probe). Input impedance: 1 MΩ, 20 pF. Sweep speed: 5 ms to 0.5 μs/div.	TEKTRONIX 475A, or equivalent.
Probe	Fast-rise 10X probe compatible with the vertical amplifier of the test oscilloscope.	TEKTRONIX P6075A, or equivalent.
Calibration Generator	Standard-amplitude accuracy: ±0.25%. Signal amplitude: 2 mV to 50 V. Output signal: Fast-rise square wave. Repetition rate: 1 to 100 kHz. Rise time: 1 ns or less. Signal amplitude: 10 mV to 1 V. Aberrations: ±2%.	TEKTRONIX PG 506, or equivalent.
T-Connector	Connectors: Bnc.	Tektronix part number 103-0030-00.

CONTROL SETTINGS

A6902 Isolator

VOLTS/DIV (both channels)	20 mV
AC-COMMON-DC (both channels)	COMMON
OUTPUT DC LEVEL (both channels)	Midrange

Test Oscilloscope

All controls as needed for best display, except as follows:

Volts/Division (both channels)	10 mV
AC-GND-DC (both channels)	GND
Position (both channels)	Midrange
Vertical Mode	Channel 1
Time/Division	50 μs
Trigger Mode	Normal
Source	External
Coupling	DC
Slope	+ (plus)
Level	Midrange

Calibration Generator

Std Ampl-Fast Rise-High Ampl	Fast Rise
Period	0.1 ms
Pulse Amplitude	Midrange
Var	Midrange

TEST SETUP

Connect a positive-going, fast-rise signal of approximately 100 mV at 2.5 to 3 kHz to the input probe of the A6902 channel to be tested and to the External Trigger input connector of the test oscilloscope via a bnc T-connector and two 50-Ω bnc cables.

Connect a 10X probe to the Channel 1 input connector of the test oscilloscope. Apply the probe tip to the test point or component lead as indicated on the schematic and on the circuit board illustration associated with that schematic.

Align the trace on the center horizontal graticule line using the test oscilloscope Channel 1 Position control. Change the test oscilloscope Channel 1 AC-GND-DC switch to DC and use the A6902 OUTPUT DC LEVEL control to realign the trace on the center horizontal line. Then set the A6902 AC-COMMON-DC switch to DC. The waveforms shown are typical for troubleshooting purposes only.

The test setup conditions vary with each waveform. The dc voltage level at the waveform location may be obtained, with the A6902 AC-COMMON-DC switch set to COMMON, by using a meter of the type listed under DC VOLTAGES. These voltages are rounded to ±10% due to power-supply tolerances.

DC VOLTAGES

Typical voltages were obtained with the A6902 operating under the conditions noted in the TEST SETUP with no signal applied to the inputs. Measurements were made with respect to the floating ground for the respective channel, for the Preamplifier circuits and their power supplies, or with respect to chassis earth ground for other circuits. All voltages are rounded to ±10%.

RECOMMENDED TEST EQUIPMENT

Item	Specification	Example
Digital Multimeter (for voltages up to 1 kV)	Range: 0 to 1 kV. Input Impedance: 10 MΩ.	TEKTRONIX DM 501 Digital Multimeter. TEKTRONIX Oscilloscope with DM 44 Option.
DC Voltmeter (for voltages above 1 kV)	Range: 0 to 1500 V. Input Impedance: 20 kΩ/V.	Triplett Model 630NA.

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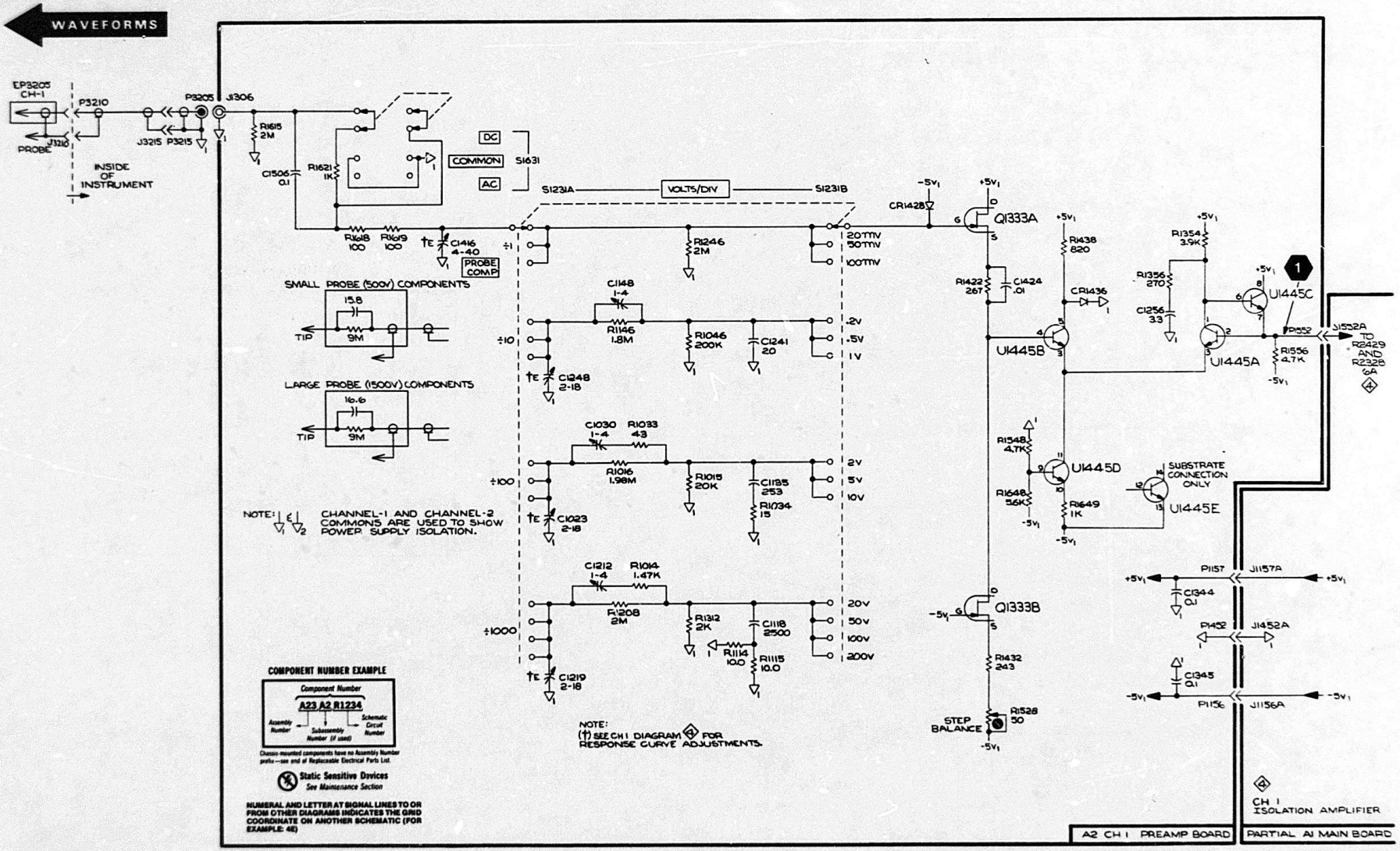

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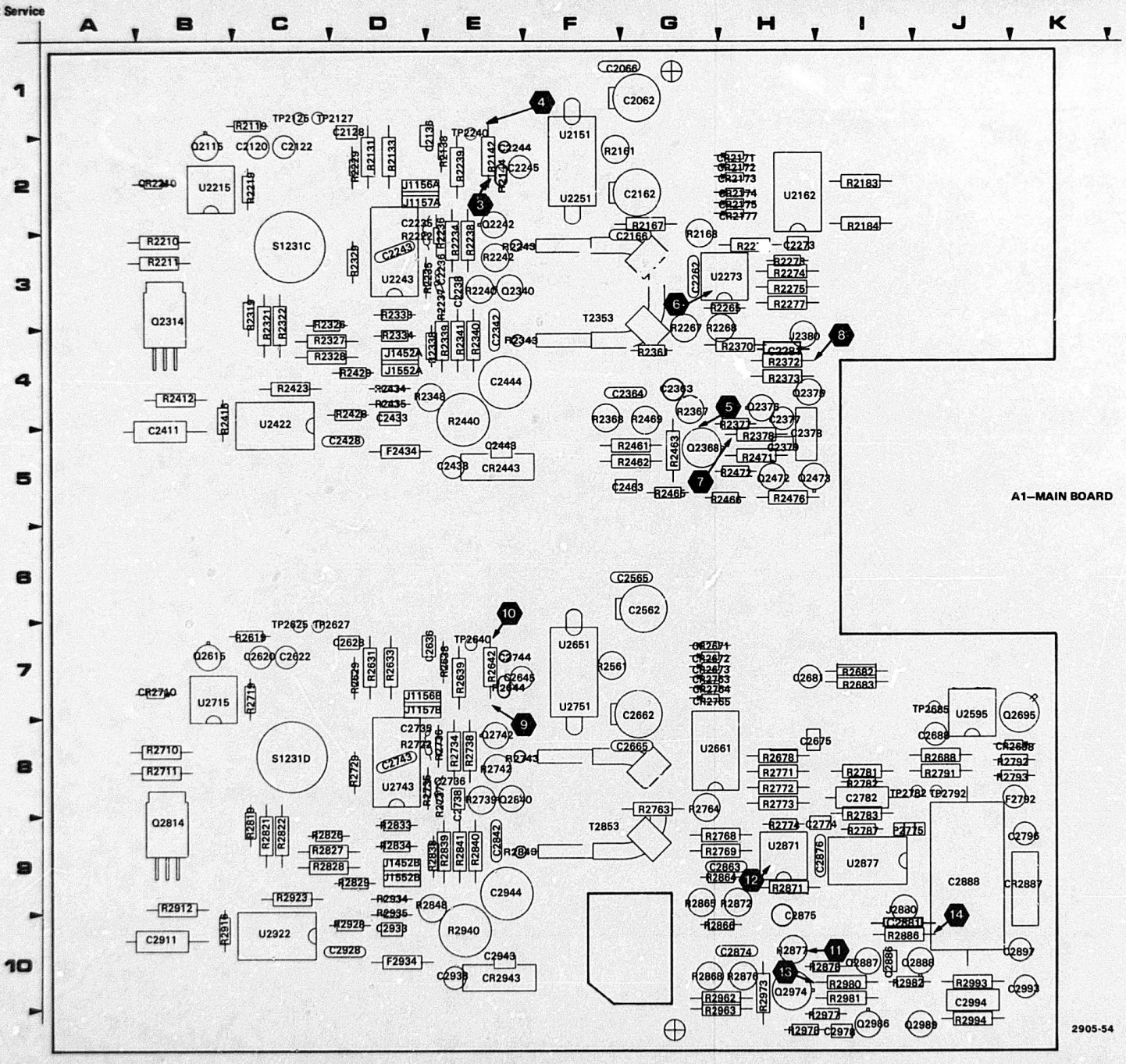

COMPONENT NUMBER EXAMPLE

Component Number: A23 A2 R1234
Assembly Number
Subassembly Number (if used)
Schematic Circuit Number

Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List.

Static Sensitive Devices
See Maintenance Section

Figure 9-5. A1–Main board (Channels 1 and 2 amplifiers).

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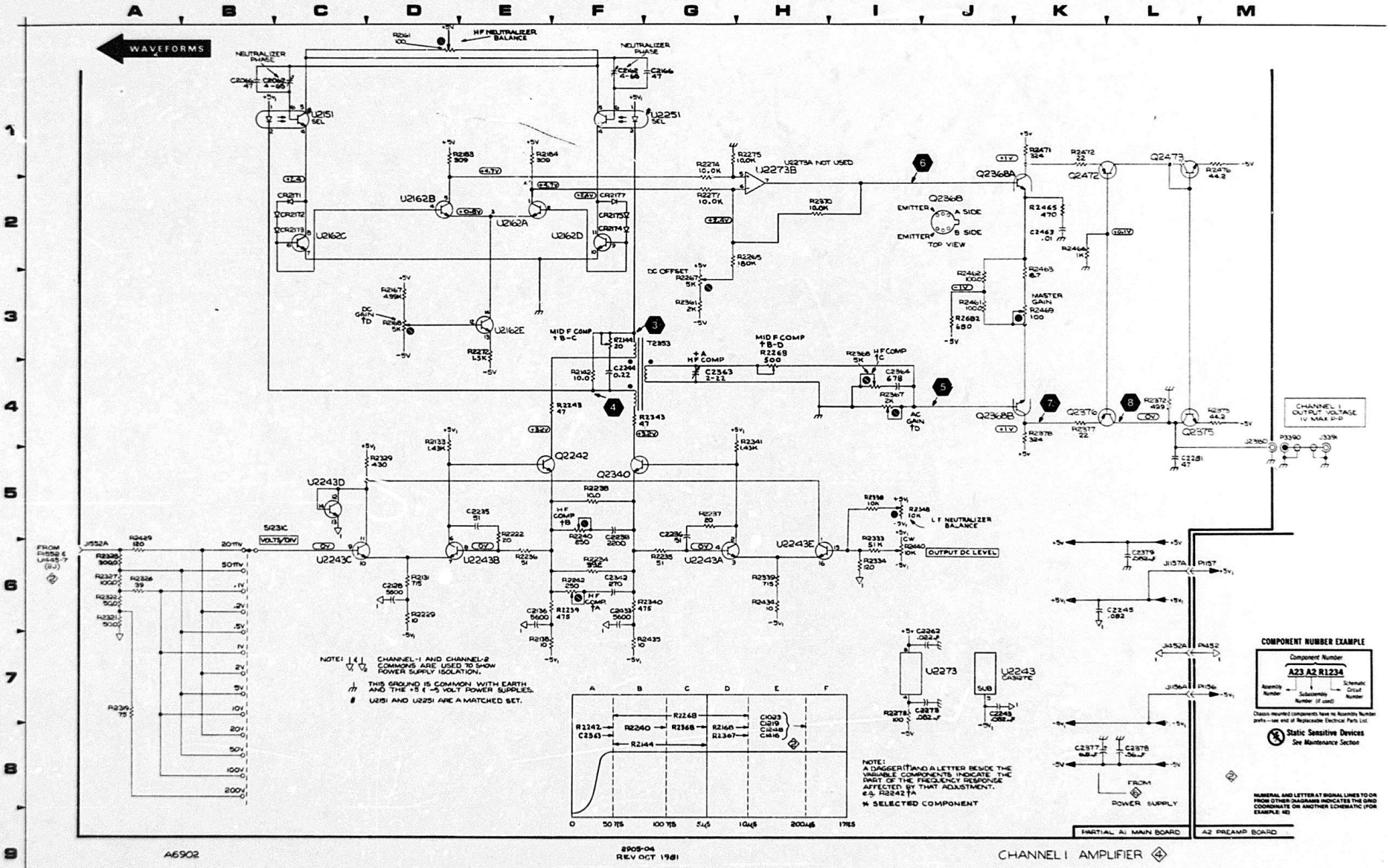

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Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A1C2842	283-0047-00			CAP.,FXD,CER DI:270PF,5%,500V	72982	0831522Z5D00271J
A1C2863	283-0080-00			CAP.,FXD,CER DI:0.022UF,+80-20%,25V	56289	19C611
A1C2874	283-0605-00			CAP.,FXD,MICA D:678PF,1%,300V	00853	D153F6780F0
A1C2875	281-0204-00			CAP.,VAR,PLSTC:2-22PF,100V	80031	287C00222MJ02
A1C2876	283-0110-00			CAP.,FXD,CER DI:0.005UF,+80-20%,150V	56289	19C242B
A1C2881	283-0115-00			CAP.,FXD,CER DI:47PF,5%,200V	59660	805-519-C0F0470J
A1C2886	283-0326-00			CAP.,FXD,CER DI:0.082UF,10%,50V	16546	CW20C823K
A1C2888	290-0797-00			CAP.,FXD,ELCTLT:470UF,+50%-10%,50V	56289	D73403
A1C2897	283-0326-00			CAP.,FXD,CER DI:0.082UF,10%,50V	16546	CW20C823K
A1C2911	290-0187-00			CAP.,FXD,ELCTLT:4.7UF,20%,35V	56289	150D475X0035B2
A1C2928	283-0032-00			CAP.,FXD,CER DI:470PF,5%,500V	72982	0831085Z5E00471J
A1C2933	283-0180-00			CAP.,FXD,CER DI:5600PF,20%,200V	72982	8121N204 E 562M
A1C2938	283-0326-00			CAP.,FXD,CER DI:0.082UF,10%,50V	16546	CW20C823K
A1C2943	283-0326-00			CAP.,FXD,CER DI:0.082UF,10%,50V	16546	CW20C823K
A1C2944	290-0798-00			CAP.,FXD,ELCTLT:180UF,+100-10%,40V	56289	672D187H040DM5C
A1C2978	283-0238-00			CAP.,FXD,CER DI:0.01UF,10%,50V	72982	8121N075X7R0103K
A1C2993	290-0261-00			CAP.,FXD,ELCTLT:6.8UF,10%,35V	12954	D6R8B35K1
A1C2994	283-0129-00			CAP.,FXD,CER DI:0.56UF,20%,100V	56289	725C7
A1CR2171	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A1CR2172	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A1CR2173	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A1CR2174	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A1CR2175	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A1CR2177	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A1CR2210	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A1CR2443	152-0488-00			SEMICOND DEVICE:SILICON,200V,1500MA	04713	3N55 FAMILY
A1CR2671	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A1CR2672	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A1CR2673	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A1CR2698	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A1CR2710	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A1CR2763	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A1CR2764	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A1CR2765	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A1CR2887	152-0488-00			SEMICOND DEVICE:SILICON,200V,1500MA	04713	3N55 FAMILY
A1CR2943	152-0488-00			SEMICOND DEVICE:SILICON,200V,1500MA	04713	3N55 FAMILY
A1F2434	159-0090-00			FUSE,CARTRIDGE:0.25A,125V,FAST-BLOW	71400	GAF 1/4
A1F2792	159-0140-00			FUSE,WIRE LEAD:0.3A,125V,5 SEC	71400	MTH-5
A1F2934	159-0090-00			FUSE,CARTRIDGE:0.25A,125V,FAST-BLOW	71400	GAF 1/4
A1Q2115	151-0220-04			TRANSISTOR:2N3906,CHECKED	80009	151-0220-04
A1Q2242	151-0192-00			TRANSISTOR:SILICON,NPN,SEL FROM MPS6521	04713	SPS8801
A1Q2314	151-0497-00			TRANSISTOR:SILICON,NPN	01295	TIP47
A1Q2340	151-0192-00			TRANSISTOR:SILICON,NPN,SEL FROM MPS6521	04713	SPS8801
A1Q2368	151-0461-01			TRANSISTOR:2N3959,CHECKED	80009	151-0461-01
A1Q2375	151-0198-00			TRANSISTOR:SILICON,NPN,SEL FROM MPS918	04713	SPS8802-1
A1Q2376	151-0220-04			TRANSISTOR:2N3906,CHECKED	80009	151-0220-04
A1Q2472	151-0220-04			TRANSISTOR:2N3906,CHECKED	80009	151-0220-04
A1Q2473	151-0198-00			TRANSISTOR:SILICON,NPN,SEL FROM MPS918	04713	SPS8802-1
A1Q2615	151-0220-04			TRANSISTOR:2N3906,CHECKED	80009	151-0220-04
A1Q2695	151-0208-04			TRANSISTOR:2N4036,CHECKED	80009	151-0208-04
A1Q2742	151-0192-00			TRANSISTOR:SILICON,NPN,SEL FROM MPS6521	04713	SPS8801
A1Q2814	151-0497-00			TRANSISTOR:SILICON,NPN	01295	TIP47
A1Q2840	151-0192-00			TRANSISTOR:SILICON,NPN,SEL FROM MPS6521	04713	SPS8801
A1Q2887	151-0220-04			TRANSISTOR:2N3906,CHECKED	80009	151-0220-04
A1Q2888	151-0198-00			TRANSISTOR:SILICON,NPN,SEL FROM MPS918	04713	SPS8802-1
A1Q2974	151-0461-01			TRANSISTOR:NPN,SI,2N3959	80009	151-0461-01
A1Q2986	151-0220-04			TRANSISTOR:2N3906,CHECKED	80009	151-0220-04

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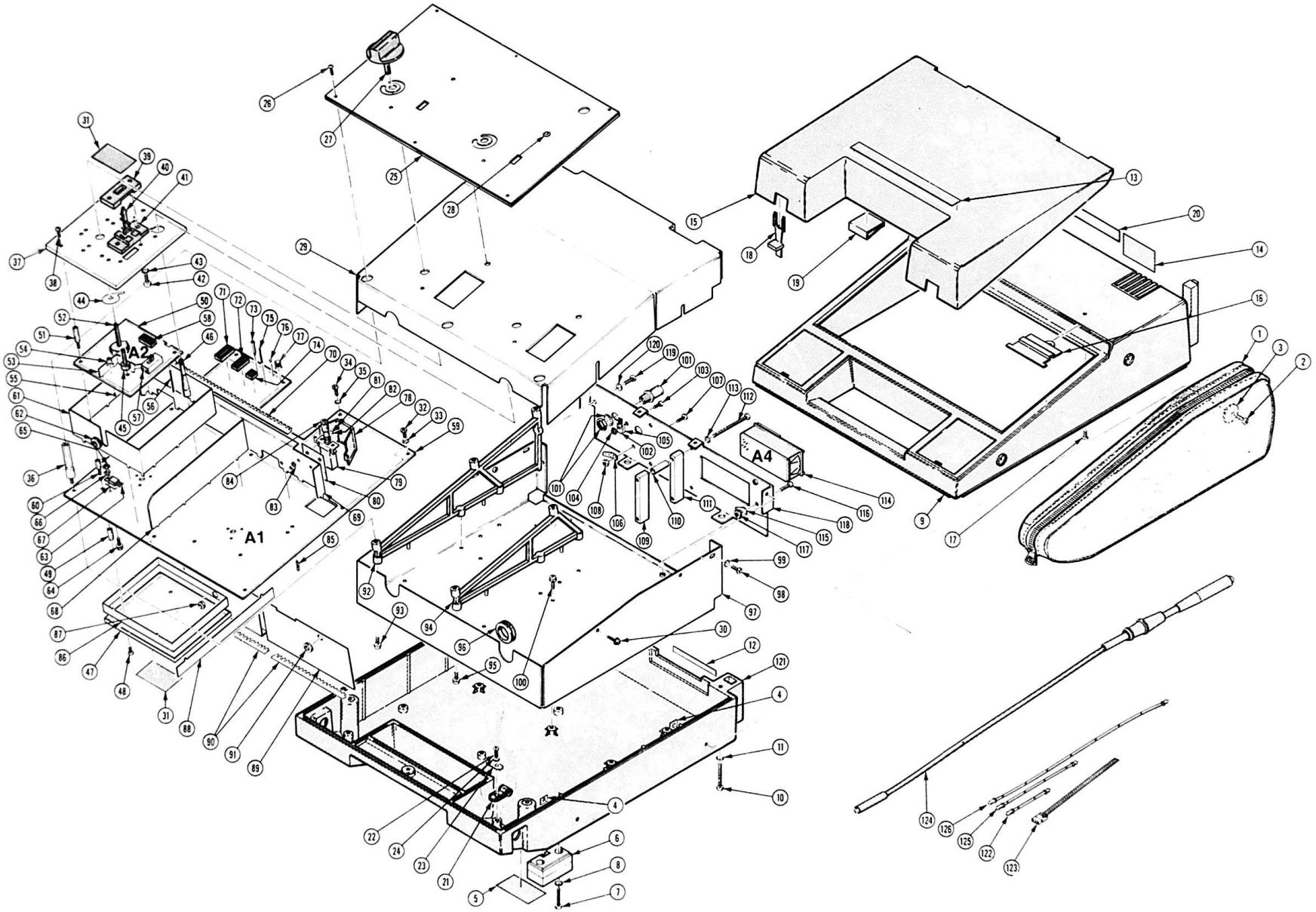

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