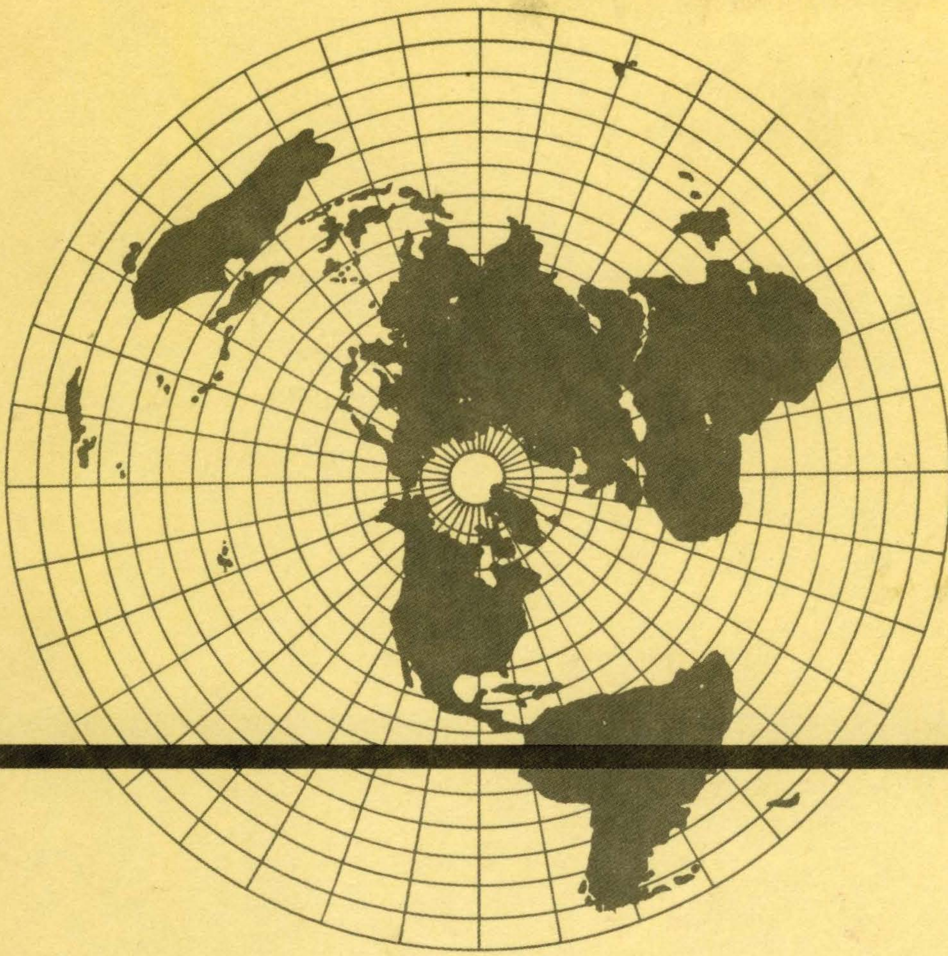
SIGNAL COMPARATOR
MODEL 6.143

Publ. No. 00 800.2023-0



EAI

ELECTRONIC ASSOCIATES INC. ■ LONG BRANCH, NEW JERSEY

EAI® ELECTRONIC ASSOCIATES, INC. *West Long Branch, New Jersey*

SIGNAL COMPARATOR
MODEL 6.143

Publ. No. 00 800.2023-0

November 1966

RELATED PUBLICATIONS

The table below lists other publications which may be of interest to the readers of this manual. Unless otherwise indicated by title or footnote, all are maintenance handbooks. Note that maintenance handbooks directly applicable to a particular system are normally supplied with the system.

Title	Publication Number
Handbook of Analog Computation	00 800.0001-2
TR-20 Computer Operators Reference Handbook	00 800.2003-1
Sine-Cosine Diode Function Generators, Models 16.313 and 16.314	00 800.2005-0
TR-20 Maintenance Manual	00 800.2006-0
Transport Delay Simulator, Type 2.448	00 800.2009-0
Reactor Kinetics Group, Type 2.475	00 800.2010-0
Dual DC Amplifier, Model 6.282	00 800.2011-0
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Repetitive Operation Display Unit 34.034 and 34.035	00 800.2024-1
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Bulletin No. IL-64104-6
June, 1966

CONTENTS

ILLUSTRATIONS

SIGNAL COMPARATOR 6.143

1. GENERAL.

The Signal Comparator consists of a three-stage transistorized amplifier and DPDT relay. This unit is used to automatically perform a switching function according to the magnitude and sign of the signal voltage relative to a bias signal.

The front panel of the comparator forms a portion of the patch panel and provides terminations for the input signal IN_1, and the bias signal IN_2. In addition there is a termination for each of the relay contacts which perform the desired switching functions. (See figure 1.)

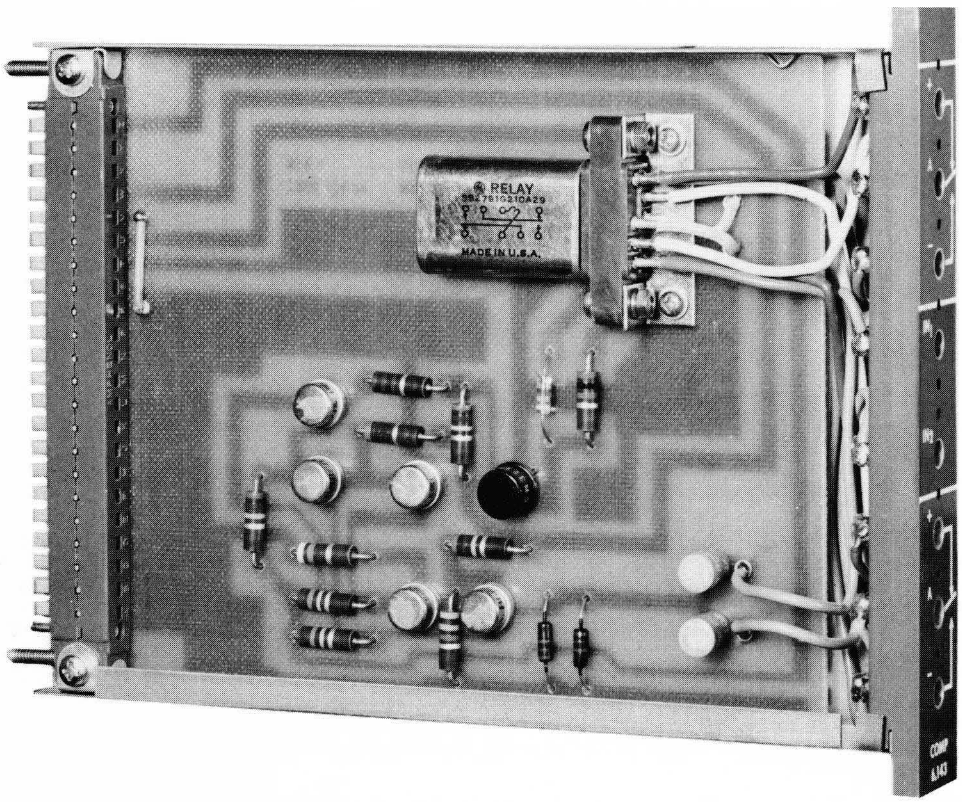

Figure 1. Signal Comparator 6.143

2. PATCHING.

Figure 2 illustrates a typical example of how a comparator may be used. IN_1 is connected to the output terminal of an amplifier whose output voltage is compared to the switching level voltage. The IN_2 termination is connected to the arm of a potentiometer; the potentiometer is then set to the desired switching level voltage. The relay contacts are connected to the circuit that is to be controlled.

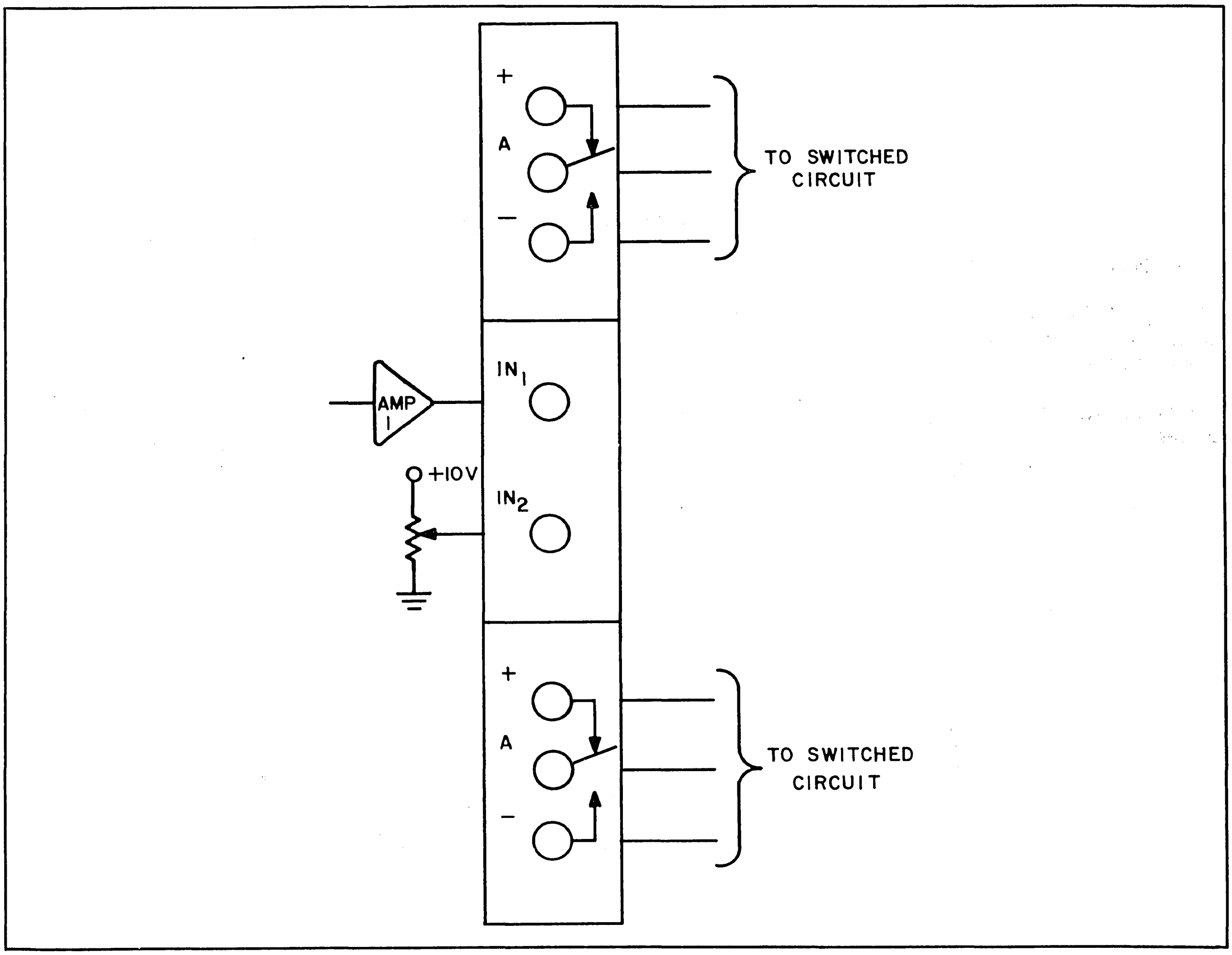

Figure 2. Comparator Patching

3. CIRCUIT DESCRIPTION.

The Comparator circuitry (with patch panel connections) is shown on schematic drawing B006 134 0S, and in the simplified schematic drawing, figure 3. Also shown in figure 3 is the external attenuator patched to input IN_2 to establish the switching level.

In figure 3 the switching level is assumed to be +5 volts and the voltage at the arm of the attenuator patched to input IN_2 is approximately -5 volts. As long as the input to IN_1 remains above +5 volts, the base of Q1 is positive and the transistor is cut off. With this condition, Q6 is also non-conducting and relay K1 is de-energized. The relay contacts remain in the position shown with the arms resting on the plus contacts.

The conditions in the amplifier at this time are as follows: Q1 is cut off, as mentioned above; Q3 is conducting, because the base is returned to the -15 volt supply through R3, and the emitter is connected to the +15 volt supply through R9 (Q4 is not conducting, as explained below); Q5 is cut off by the bias developed across R8. No current flows in the emitter circuit through R10, and Q6 is reverse-biased to cutoff through R11.

The drift caused by increased temperature is reduced through the use of Q2 and Q4. Note that an increase in temperature will increase Ico in the input transistor Q1 and a similar increase will occur in Q2. These changes are applied to the base and emitter of Q3, respectively, causing the two increases to cancel.

When the input at IN_1 drops to +5 volts, the base of Q1 is at zero potential with respect to ground; the transistor conducts because of the slight forward bias applied to the emitter through R5. Collector current in R3 biases Q3 to cutoff and, as a result, Q5 is driven into conduction. Since Q5 is connected as an emitter-follower, Q6 also conducts because of the forward bias developed across R11. Relay K1 in the collector circuit is energized and the relay transfers to the minus contacts.

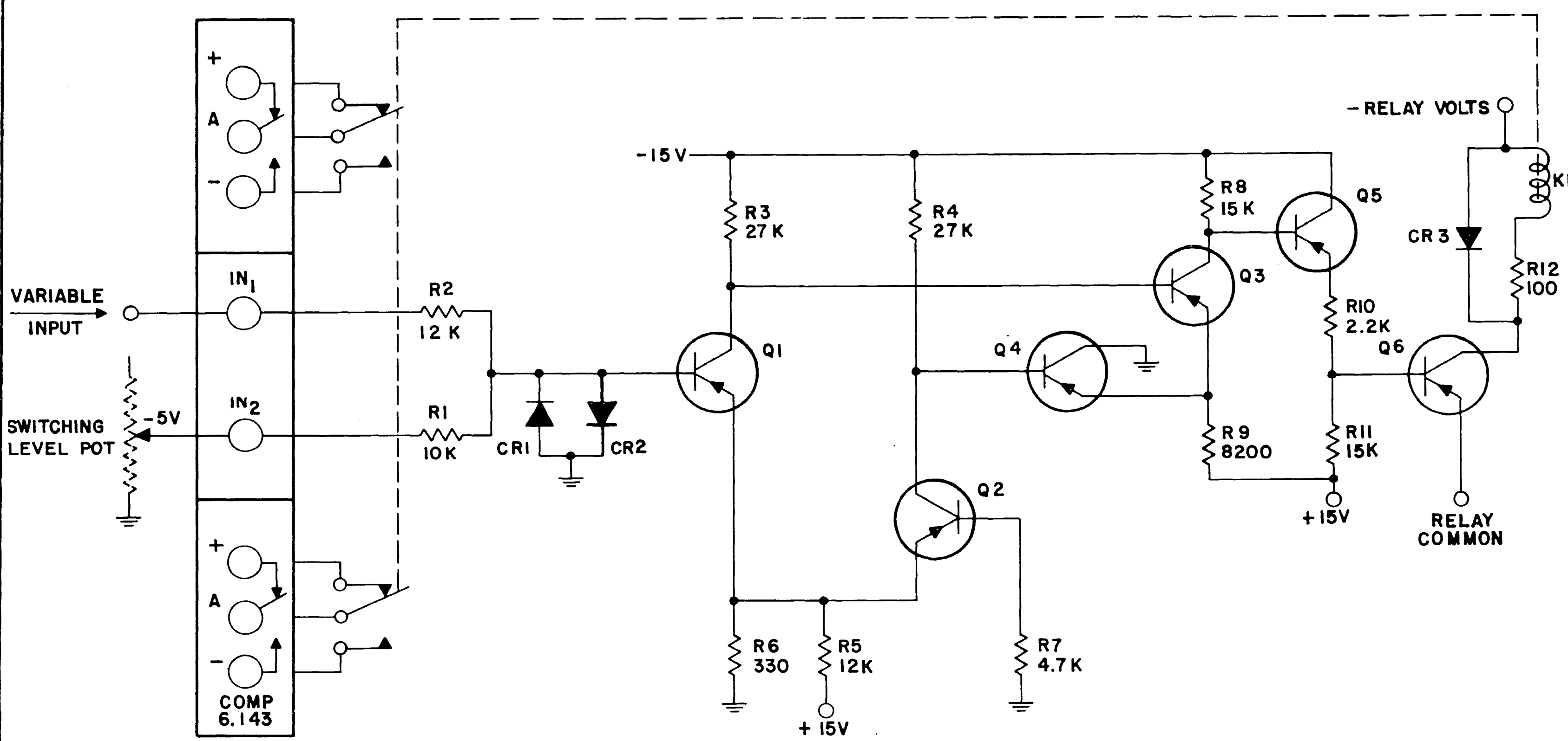

Figure 3. Comparator Amplifier, Simplified Schematic

When Q1 conducts, the emitter current through R6 develops cutoff bias for the emitter of Q2. As Q2 is turned off, Q4 conducts, drawing current through R9 which applies reverse bias to the emitter of Q3. Thus the emitter receives a negative signal at the same time as the positive signal is applied to the base.

Diodes CR1 and CR2 protect the input transistor by limiting the amount of voltage which can be applied across the base-emitter junction. In the output circuit of Q6, the diode CR3 protects the transistor against momentary application of a high forward bias to the collector caused by the collapsing field around the relay coil when the circuit is broken.

4. WIRING.

The following table provides the necessary data for wiring comparator connectors:

PIN	FUNCTION
T	RELAY COMMON
U	-RELAY VOLTAGE
V	±GROUND
W	+15V
Z	-15V

5. ADJUSTMENT AND TEST PROCEDURE.

To check the comparator switch-time and sensitivity, patch in accordance with the circuit shown in figure 4. Set switches S1 and S2 to the positions shown in figure 4, the scope sensitivity to 0.1V/CM dc, the scope sweep to 2 milliseconds/CM and the voltmeter to the 0.1 volt range. Connect -10 volts to R1 and adjust R1 for zero reading on the voltmeter. Measure the distance between the top and bottom of the triangular wave as twice the comparator switch time (1 CM equals 2 milliseconds). Move switch S2 to ground R3. Set the scope sweep to 50 milliseconds/CM and set the sensitivity to 0.5 millivolts/CM. Measure the difference between the peak-to-peak voltage as switching sensitivity. Typically, the switch time is 7 milliseconds; the maximum permissible time is 10 milliseconds. Typically, the maximum sensitivity is .5 millivolts; the minimum permissible is 3 millivolts.

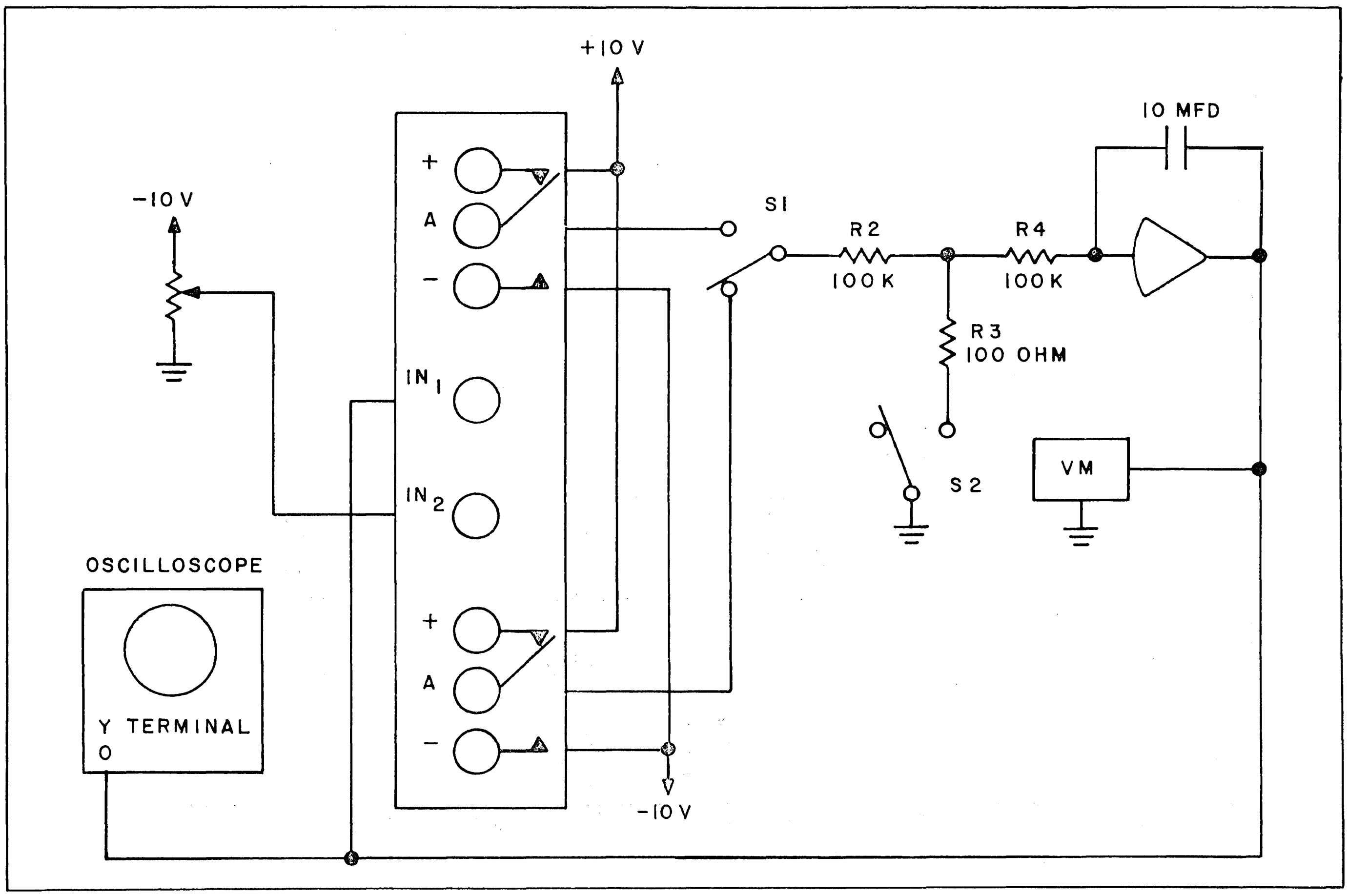

Figure 4. Comparator Test Circuit

APPENDIX 1

REPLACEABLE PARTS LIST

SIGNAL COMPARATOR, MODEL 6.143

This appendix contains a Replaceable Parts List for the equipment described in this manual. In each case, a brief description of the part is listed. Where applicable, a reference symbol (schematic designation) is included. To enable a particular sheet to be readily located, an index precedes the individual replaceable parts lists.

The category column in the parts list indicates the availability of each listed part so that a replacement part can be obtained as quickly as possible.

Category "A" - The parts in category "A" are standard electronic items that are usually available from any commercial electronic supplier. In order to expedite obtaining items of this nature, it is suggested that they be purchased from a local source whenever possible. If necessary these parts may be purchased from EAI by specifying the EAI Part Number.

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CAUTION

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PLEASE NOTE THAT EAI RESERVES THE RIGHT TO MAKE PART SUBSTITUTIONS WHEN REQUIRED. IN ALL CASES EAI GUARANTEES THAT THESE SUBSTITUTIONS ARE ELECTRICALLY AND PHYSICALLY COMPATIBLE WITH THE ORIGINAL COMPONENT.

PARTS LIST INDEX

SIGNAL COMPARATOR, MODEL 6.143

ITEM	REF. DESIG.	DESCRIPTION	EAI NO.	*CAT.
1		Connector Block: Lettered (COMP 6.143)	00 542.0363-5	B
		<u>6.134 RELAY COMPARATOR AMPLIFIER</u>		
1	CR1,2	Diode	00 614.0007-0	B
2	CR3	Diode	00 614.0043-0	B
3	K1	Relay: 430 ohm DC Coil, 2 Form C Contacts	00 618.0126-0	B
4	Q1 thru 5	Transistor	00 686.0032-0	B
5	Q6	Transistor: 2N321	00 686.0004-0	A
6	R1	Resistor, Fixed, Wirewound, Precision: 10K ohms ±1%, 0.2W	00 638.0288-0	B
7	R2	Resistor, Fixed, Wirewound, Precision: 12K ohms ±1%, 0.2W	00 638.0289-0	B
8	R3,4,8	Resistor, Fixed, Composition: 27K ohms ±5%, 1/2W	00 626.0273-0	A
9	R5	Resistor, Fixed, Composition: 15K ohms ±5%, 1/2W	00 626.0153-0	A
10	R6,13	Resistor, Fixed, Composition: 47K ohms ±5%, 1/2W	00 626.0473-0	A
11	R7	Resistor, Fixed, Composition: 4.7K ohms ±5%, 1/2W	00 626.0472-0	A
12	R9	Resistor, Fixed, Composition: 8.2K ohms ±5%, 1/2W	00 626.0822-0	A
13	R10	Resistor, Fixed, Composition: 2.2K ohms ±5%, 1/2W	00 626.0222-0	A
14	R11	Resistor, Fixed, Composition: 12K ohms ±5%, 1/2W	00 626.0123-0	A
15	R12	Resistor, Fixed, Composition: 100 ohms ±5%, 1/2W	00 626.0101-0	A
16	XK1	Socket, Relay: 8 Contacts	00 650.0046-0	A
17		Connector: 22 Contacts; Male	00 542.0488-0	A

*NOTE: THE CATEGORY COLUMN IS DESIGNED TO INDICATE AVAILABILITY OF PARTS.
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B - INDICATES PARTS THAT SHOULD BE PURCHASED FROM EAI.

DATE 11 / 9 / 66

UNIT TITLE

RELAY COMPARATOR AMPLIFIER

MODEL NO.

6.143 Sh. 1 of 1 Sh.

M446

APPENDIX 2

DRAWINGS

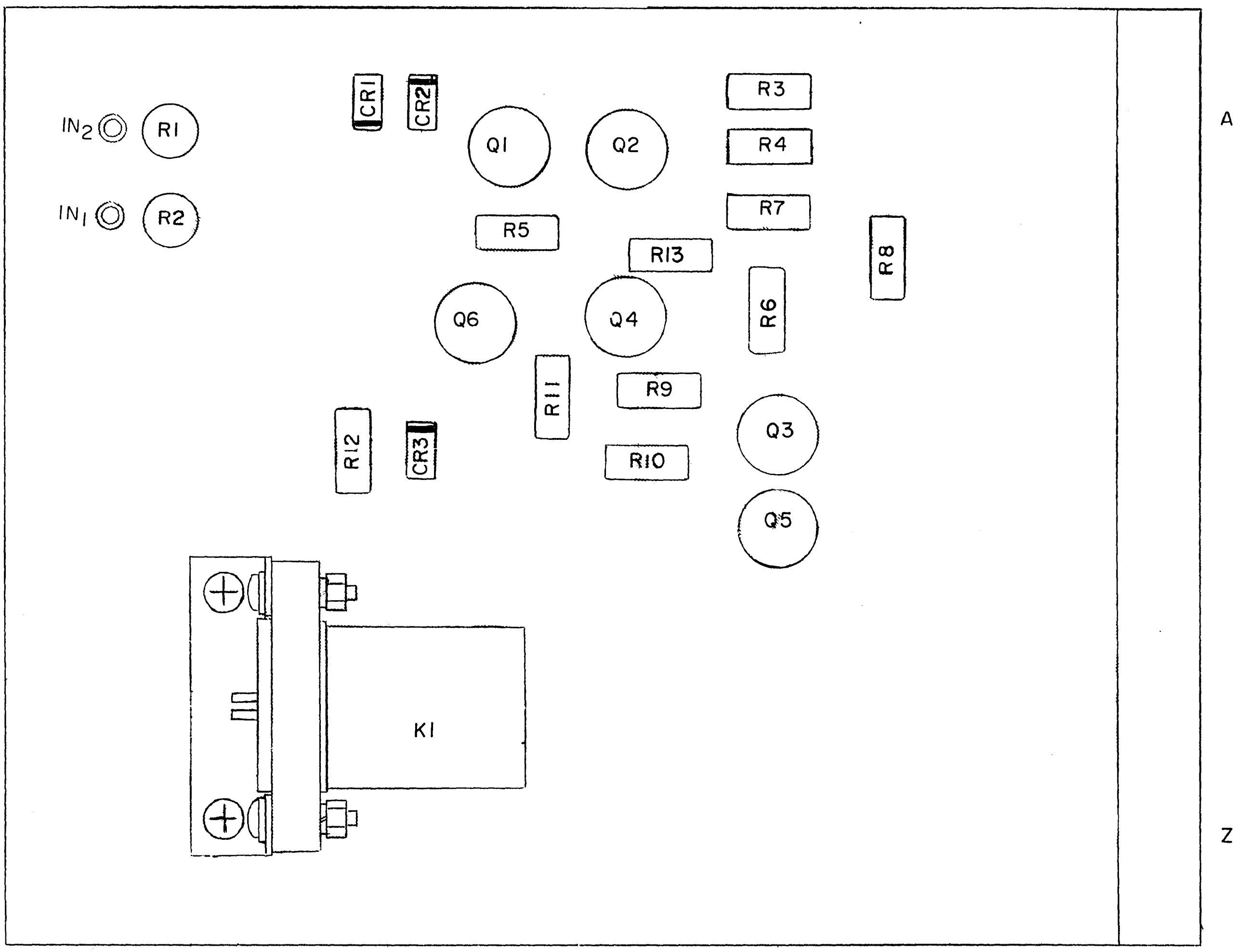
SIGNAL COMPARATOR, MODEL 6.143

This appendix contains necessary schematics and wiring diagrams of equipment described in this manual. To facilitate locating a particular sheet, an index is provided that lists the model number of each unit or component, the type of drawings, and the associated drawing number. The drawings are bound into the manual in the order listed under the index Drawing Number column.

EAI drawings are prepared in accordance with standard drafting practices for electro-mechanical and electronic equipment. All symbols are in accordance with current government standards.

INDEX

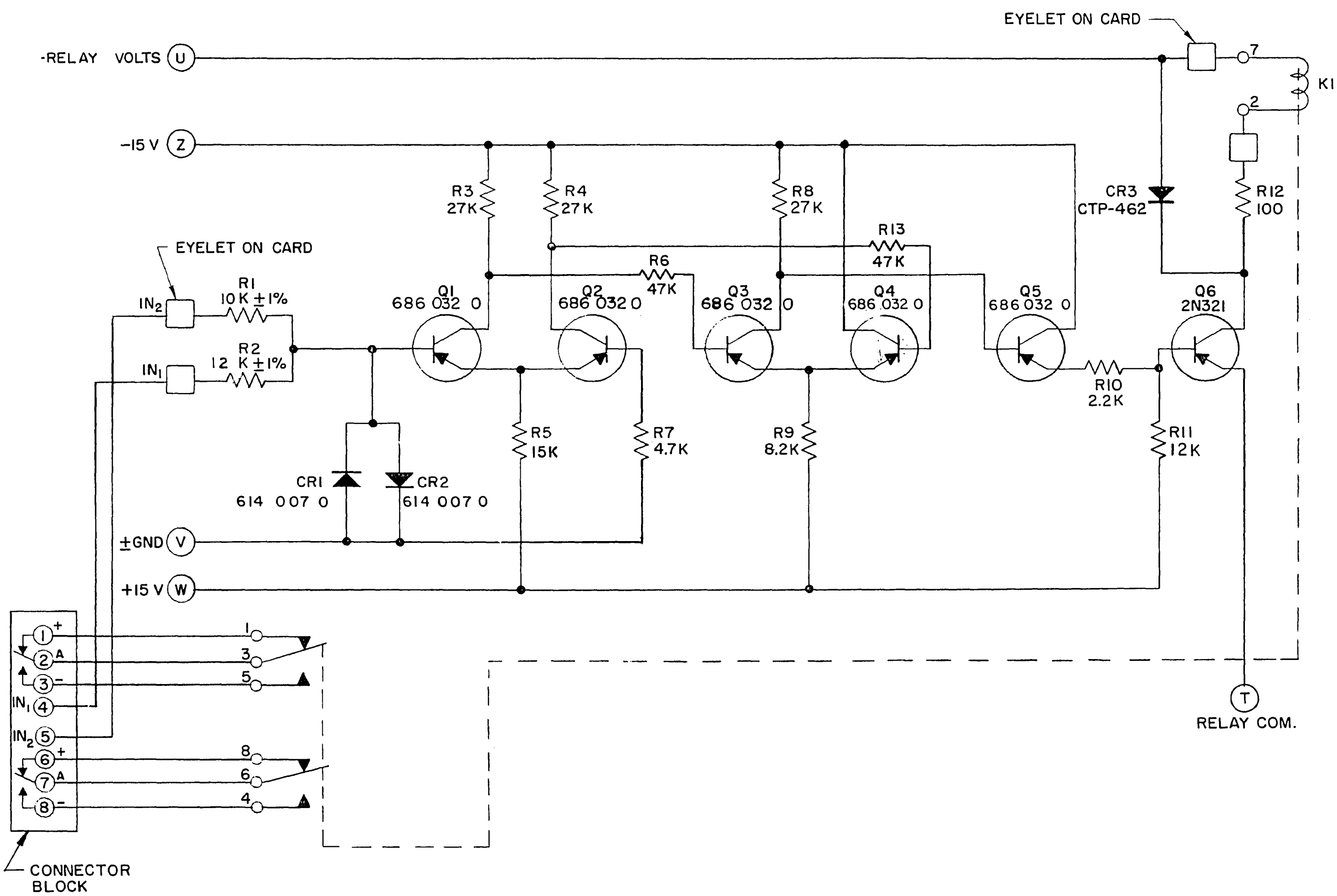
Unit or Component	Type of Drawing	Drawing Number
6.143 Signal Comparator	Schematic	B006 134 0S



6.134 Relay Comparator

NOTE:
1. ALL RESISTORS ARE 10% 1/2 W UNLESS OTHERWISE SPECIFIED.

5



ELECTRONIC ASSOCIATES, INC. LONG BRANCH, NEW JERSEY	
SCHEMATIC RELAY COMPARATOR AMPLIFIER	
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SIZE	
REV. NO.	
PROJECT 1830	B 006 134 0S
SHEET / OF / SHEETS	

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