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

5B40
TIME BASE

INSTRUCTION MANUAL

Tektronix, Inc.
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070-1742-00
Product Group 52

Serial Number _____

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WARNING

THE FOLLOWING SERVICING INSTRUCTIONS ARE FOR USE BY QUALIFIED PERSONNEL ONLY. TO AVOID PERSONAL INJURY, DO NOT PERFORM ANY SERVICING OTHER THAN THAT CONTAINED IN OPERATING INSTRUCTIONS UNLESS YOU ARE QUALIFIED TO DO SO.

OPERATING INSTRUCTIONS

INSTRUMENT DESCRIPTION

The 5B40 Time Base provides a fully triggerable sweep and external horizontal input for the 5400 series oscilloscopes. It features an edge-lighted main SECONDS/DIV selector switch. When used in a mainframe with readout capabilities, the SECONDS/DIV information is displayed on the crt face. All front-panel controls are conveniently grouped and color coded for ease of identification and operation. Pushbuttons select various trigger modes from either vertical plug-in compartment. Although designed for use in the right hand or sweep compartment of the oscilloscope, the 5B40 will operate in the vertical compartments to produce vertical sweeps.

PREPARATION FOR USE

Your 5B40 is calibrated and ready for use when received. Fig. 1-1 shows installation-removal procedure. Refer to the Front Panel Controls illustration in the foldout pages for a complete description of the front panel. Color patterns printed on the front panel help to identify functionally grouped controls. Blue surrounds controls associated with the display mode; green, the triggering functions.

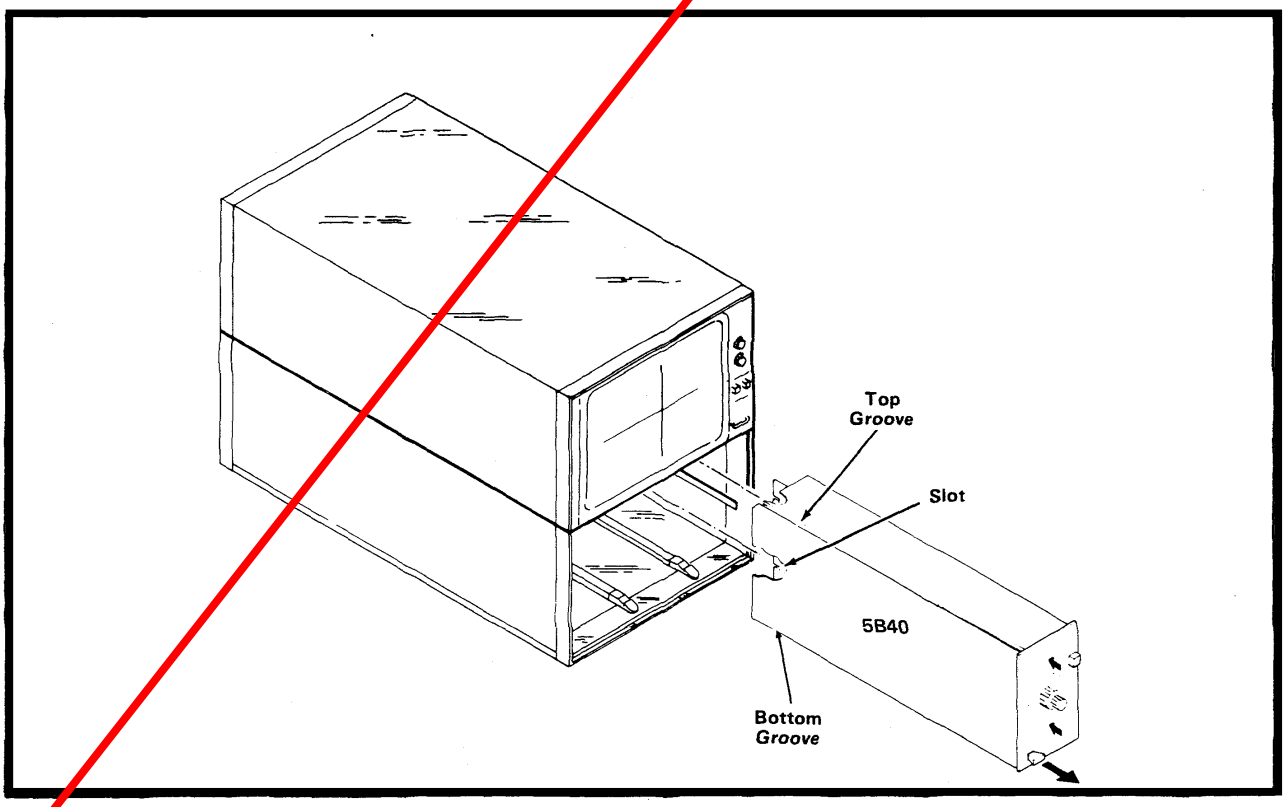


Fig. 1-1. 5B40 Installation-Removal Procedure.

THEORY OF OPERATION

INTRODUCTION

Use the schematic diagrams, block diagram, waveform diagrams, all in the pull-out pages in the rear of this manual, and this discussion to understand the operation of the 5B40.

TRIGGER AND EXTERNAL HORIZONTAL INPUT AMPLIFIER

Trigger signals from the left and right vertical compartments in the main frame pass through their appropriate switches (S100) to the input of fet Q120. R109 and R110 combine with resistors in the mainframe to provide fifty-ohm terminations for the trigger lines. R105 and R107 are dividers for the ac line voltage used in the line trigger mode. C105 acts as a low-pass filter, keeping noise from affecting the triggering. The external horizontal input is applied through a compensated attenuator, (R100, R102, R116, C100, C115 and C116) to the gate of fet Q120 when S100 is in the proper position. All of the inputs are grounded when not in use.

S110A provides ac coupling by placing C112 and C114 in series with the gate of Q120 in the AC COUPL mode. R125 provides dc balance for the amplifier circuit through Q124. VR120, VR122, CR120 and CR122 provide overvoltage protection for this circuitry. CR124 shifts the voltage level at the base of Q130, causing its emitter to rest at approximately zero voltage with no signal. The signal is fed to Q130, an emitter follower. The emitter of Q130 drives the trigger comparator amplifier through S280-1. This switch opens when the external horizontal amplifier is used. Output is then taken from R130 and fed directly to Q310. In the LF REJ position, C130 is placed in series with Q130 and Q135. This capacitor, in conjunction with R132, acts as a high-pass filter above about 7.5 kHz.

TRIGGER COMPARATOR

This circuitry selects the voltage level on the waveform where triggering takes place. Q135 and Q140 serve as a voltage comparator. The triggering signal is applied to the base of Q135. The dc level at the base of Q140 is set by R160, the TRIGGERING LEVEL control. If the voltage at the base of Q135 is higher, current flows through Q135 and the collector of Q140 is high. The opposite is true if the base voltage of Q135 is lower, and the collector of Q140 is low. C133 and C140 are switched in the circuit in the HF REJ position. C133 prevents signals above about 50 kHz from reaching the base of Q135, while C140 attenuates the triggering signal between the collectors of the comparator transistors.

TRIGGER GENERATOR

U165, an integrated circuit, converts the trigger signal from the trigger comparator to a gate waveform used for sweep control. With pin 1 connected to ground (+ SLOPE), a positive going waveform (3 to 4 V) on the input (pin 13) causes pin 3 (output) to rise to about 4.1 V and pin 4 ($\overline{\text{output}}$) to drop to about 3.2 V. Pin 14 is negative going under the above conditions. The output gate occurs when pins 13 and 14 are within about 20 mV of each other. Placing pin 1 at +5 V (− SLOPE) causes a gate output at pins 3 and 4 when pin 13 is negative going and pin 14 positive going. After completion of the sweep, during holdoff time, pins 6 and 10 are high (about +4.2 V). This inhibits the trigger generator until these pins drop to about 3.2 V after holdoff time.

SWEEP CONTROL

U175, with additional external circuitry, controls the sweep generator. In the automatic triggering mode, pin 19 of U175 is grounded. If pins 1 and 2 of U175 receive no trigger gates from the trigger generator for a period of time determined by R214 and C214, circuitry in U175 outputs a negative-going square-wave. This negative-going square-wave from pin 3 drives the base of Q218 negative. The collector goes positive and stays positive for the duration of the sweep.

When the sweep operates in the triggered mode, a negative pulse from the trigger generator to the base of Q218 also causes the collector of Q218 to go positive. This starts the sweep. In the single sweep mode, pin 12 is connected to +5 V and pin 19 is ungrounded. When the sweep is armed, pins 7 and 11 of U175 are low. This causes the collector of Q190 to rest near +5 V, lighting the TRIG'D READY lamp. This action at pins 7 and 11 also occurs when the sweep is in the triggered mode. The current through DS186 and R186 is not sufficient to allow DS186 to emit visible light, but enough to prevent high currents at turn on.

When pin 18 is at +5 V, ±1 V, the sweep is disabled. When the voltage is at 0 V, ±1 V, the sweep is enabled. This occurs through action at the anode of CR182 from the mainframe, through CR184 and the RESET button or in the external horizontal amplifier mode, through S280-9 and CR230. The sweep is disabled when the RESET button is held closed to prevent transients from falsely triggering the sweep in the single sweep mode.

SERVICE INFORMATION

Symbols and Reference Designators

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).

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 goes to the low state.

Abbreviations are based on ANSI Y1.1-1972.

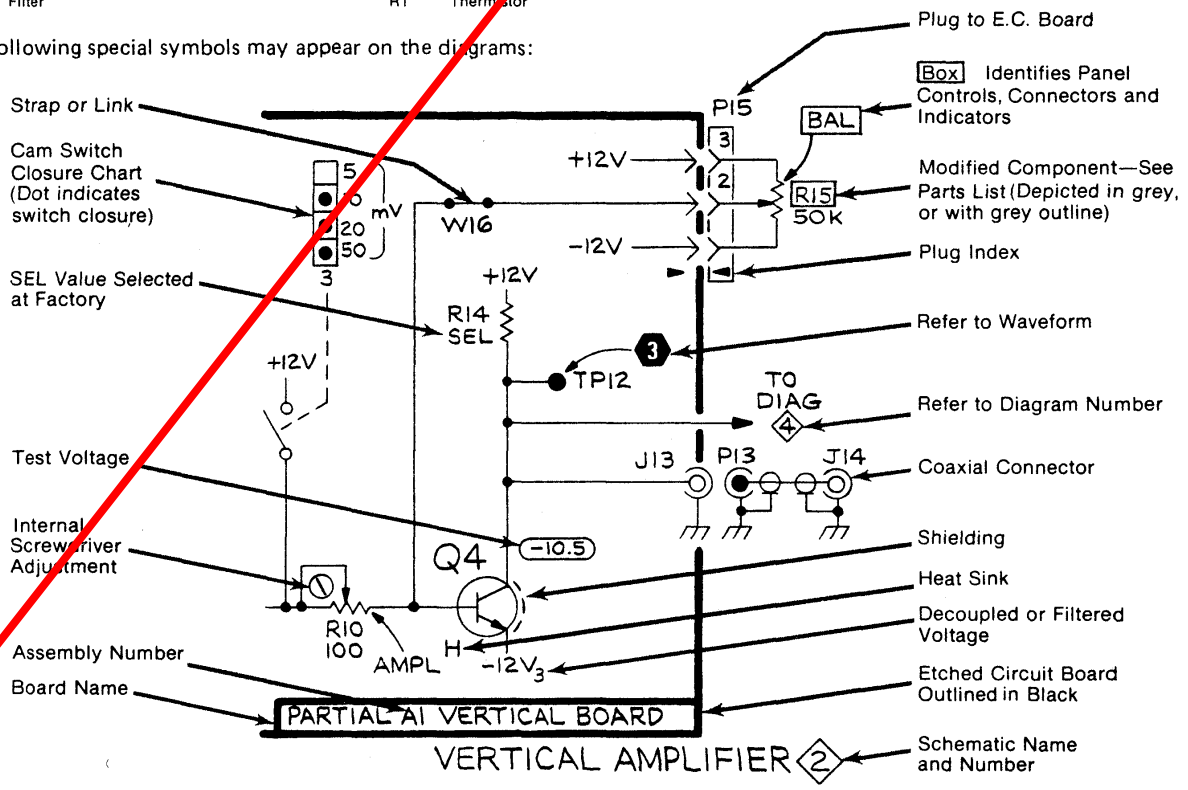
Other ANSI standards that are used in the preparation of diagrams by Tektronix, Inc. are:

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.

The following prefix letters are used as reference designators to identify components or assemblies on the diagrams.

A	Assembly, separable or repairable (circuit board, etc)	H	Heat dissipating device (heat sink, heat radiator, etc)	S	Switch or contactor
AT	Attenuator, fixed or variable	HR	Heater	T	Transformer
B	Motor	HY	Hybrid circuit	TC	Thermocouple
BT	Battery	J	Connector, stationary portion	TP	Test point
C	Capacitor, fixed or variable	K	Relay	U	Assembly, inseparable or non-repairable (integrated circuit, etc.)
CB	Circuit breaker	L	Inductor, fixed or variable	V	Electron tube
CR	Diode, signal or rectifier	M	Meter	VR	Voltage regulator (zener diode, etc.)
DL	Delay line	P	Connector, movable portion	W	Wirestrap or cable
DS	Indicating device (lamp)	Q	Transistor or silicon-controlled rectifier	Y	Crystal
E	Spark Gap, Ferrite bead	R	Resistor, fixed or variable	Z	Phase shifter
F	Fuse	RT	Thermistor		
FL	Filter				

The following special symbols may appear on the diagrams:

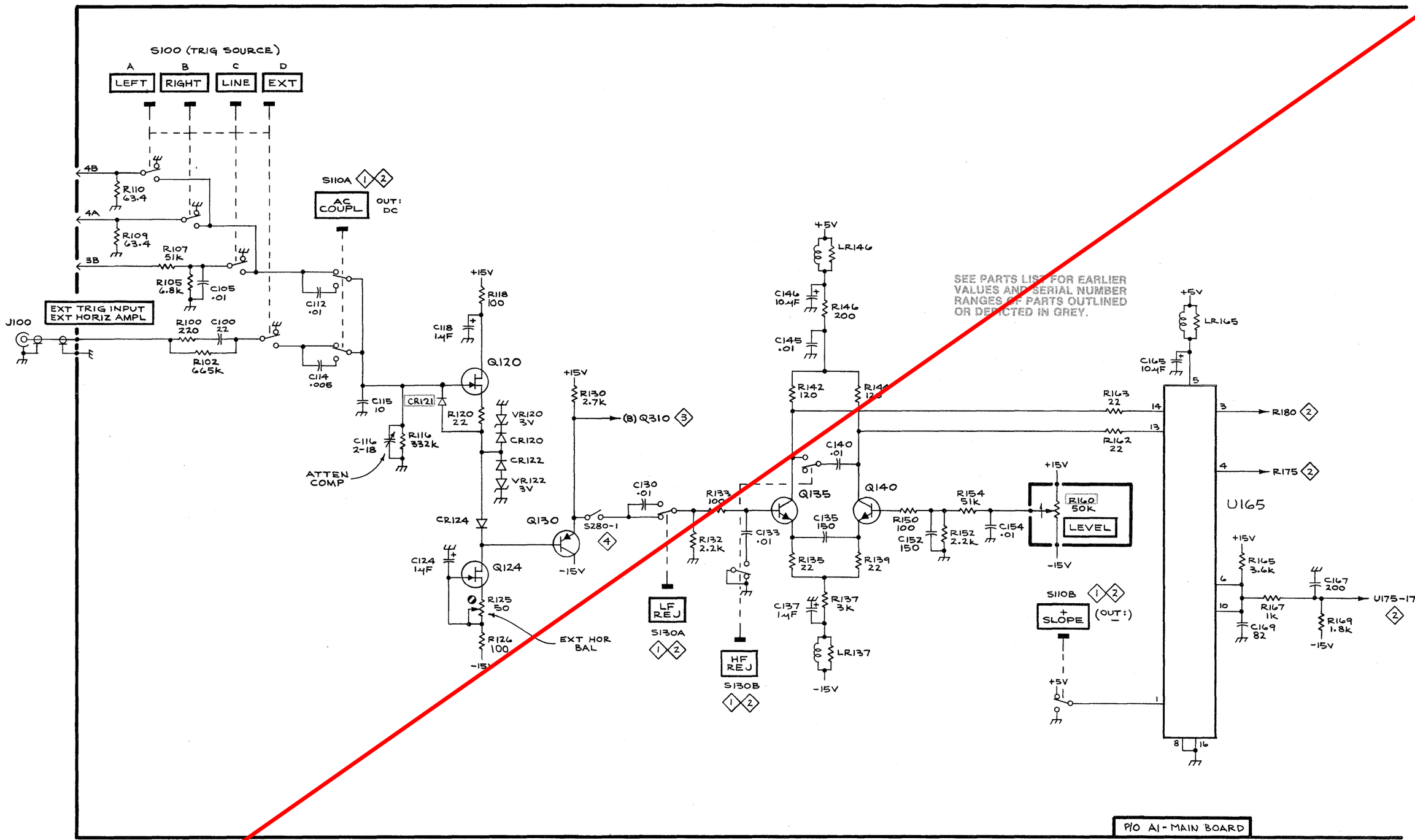


MANUAL CHANGE INFORMATION

At Tektronix, we continually strive to keep up with latest electronic developments by adding circuit and component improvements to our instruments as soon as they are developed and tested.

Sometimes, due to printing and shipping requirements, we can't get these changes immediately into printed manuals. Hence, your manual may contain new change information on following pages.

A single change may affect several sections. Since the change information sheets are carried in the manual until all changes are permanently entered, some duplication may occur. If no such change pages appear following this page, your manual is correct as printed.



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INPUT AND TRIGGER GENERATOR 1

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