

TEKTRONIX SHUTTER ACTUATOR

Copyright © 1962 by Tektronix, Inc., Portland, Oregon. Printed in the United States of America. All rights reserved. Contents of this publication may not be reproduced in any form without permission of the copyright owner.

TEKTRONIX SHUTTER ACTUATOR

INTRODUCTION

The Tektronix Shutter Actuator is a solenoid-operated shutter release for use with trace-recording cameras. This instrument permits remote triggering of oscilloscope cameras, or simultaneous triggering of two or more cameras. It may also be used with time-delay or time-lapse equipment for photographing time-related phenomena. A shorting-type trigger switch is utilized, requiring no external voltage trigger.

CIRCUIT DESCRIPTION

The solenoid unit screws directly into the cable-release mount on the shutter*, and the cord from the solenoid plugs into a jack on the panel of the Power Supply unit. A 350-volt pulse from the 100 μ f capacitor, C610, in the Power Supply energizes the solenoid, causing the actuating bayonet to operate the shutter. A spring in the solenoid unit immediately returns the bayonet to its normal position.

The Power Supply unit contains the power transformer and the triggering circuit of the instrument. The transformer primary consists of two windings, permitting operation on either 117 volts (parallel-connected) or 234 volts (series-connected). Normally the transformer is wired for 117-volt use, but it may be easily converted to 234 volts. In either case the input power leads are attached to terminals #1 and #4. For 117-volt operation, terminal #1 is also joined to #2 with a bus wire and terminal #4 is joined to #3 in the same manner. To convert for 234-volt operation, remove these two bus wires and join terminals #2 and #3 with a single bus wire.

One secondary winding of T601 supplies six volts ac for operation of the pilot light and the switching relay. The other secondary winding delivers 250 volts ac which operates through the

*Use only the following shutters:

shutter	aperture	lens	object:image
Alphax #3	f 1.9	Wollensak	1:0.9
Ilex #3X	f 1.9	Elgeet	1:0.9
Alphax #4	f 1.5	Simpson	1:1

diodes to charge capacitor C610 to 350 volts, when the relay is in its normal position. The capacitor is kept at full charge until the trigger switch is operated, closing the discharge circuit. The leak resistor R610 discharges C610 when the instrument is not in use.

Relay K610 is electrically triggered either by depressing the MANUAL TRIGGER switch, SW610, or by closing the Remote circuit connected to the REMOTE TRIGGER terminals. When the relay is triggered, C610 discharges through the output circuit, energizing the solenoid.

OPERATION

General

EQUIPMENT CONNECTIONS. When the oscilloscope and camera are set up for the desired display, prepare the Shutter Actuator for operation as follows:

1. Connect the remote triggering leads as desired.
2. Screw the solenoid into the cable release mount on the shutter.
3. Insert the phone plug from the solenoid into the OUTPUT jack on the panel of the Power Supply.
4. Connect the Power Supply unit to the power line.
5. Turn ON the POWER switch. The instrument is now ready for operation.

REPETITION RATE. The solenoid-energizing capacitor requires approximately three seconds to completely re-charge, but a full charge is not required for operation of the unit. It is recommended that triggering of the Shutter Actuator be spaced at least two seconds apart.

SHUTTER DELAY. The length of time required for the camera shutter to become fully open after the TRIGGER switch has been operated is approximately 15 to 20 milliseconds, depending primarily on the type of shutter used.

Fast Exposure

To operate the camera shutter on a short exposure using the timing mechanism of the shutter:

1. Set the shutter exposure time and the aperture as desired.
2. Position the film for exposure.
3. Press the MANUAL TRIGGER button (or Remote Trigger switch), then release it. The shutter will open when the button is pressed, remain open for the preset exposure time, then close.

Time Exposure

To operate the camera shutter on an exposure of longer duration than provided by the shutter timing mechanism:

1. Set the shutter exposure at "T" and the aperture as desired.
2. Position the film for exposure.
3. Press the MANUAL TRIGGER button (or Remote Trigger switch), then release it. The shutter will open when the Trigger button is pressed and will remain open when the button is released. Leave the shutter open for the desired exposure time.
4. Press the TRIGGER button and release it. The shutter will close when the button is pressed and remain closed when it is released.

Note

"Bulb" setting of the shutter should not be used with this Tektronix Shutter Actuator. The solenoid cannot be kept in an energized state by the Power Supply due to the fact that the actuating signal from the trigger circuit is in the form of a pulse. Therefore when the shutter speed control is set at "Bulb", the Actuator will open the shutter then allow it to close immediately. The shutter open-time will be uncalibrated, with the duration depending on the amount

of charge stored in the actuating capacitor and upon the speed of mechanical action of the solenoid and the shutter. A Special Shutter Actuator is available for applications requiring "Bulb-type" shutter operation. Consult your local Tektronix Field Office.

Multiple Camera Operation

For simultaneous operation of more than one camera shutter, Tektronix Shutter Actuators may be parallel-connected in the following ways:

1. Connect the Remote Trigger terminals of two or more Power Supply units in parallel, operating from a common trigger switch.
2. Connect two or more solenoid units in parallel, operating from a single Power Supply unit. IMPORTANT: The number of solenoids that can be operated from a single Power Supply unit depends on the power-line voltage. See Table 1 below for the number of solenoids which may be operated from one Power Supply.
3. Connect Power Supply units and solenoids in parallel, using both of the two previous methods.

Instructions given above for single Actuator operation also apply for units wired in parallel.

TABLE 1. Maximum Number of Solenoids to be Operated from one Power Supply Unit.

Line Voltage*	Shutter		
	Alphax #3	Ilex #3X	Alphax #4
100 volts	4	2	2
110 volts	5	3	3
120 volts	6	4	4
130 volts	7	5	5

*Multiply line voltage by 2 for 234-volt wiring.

PARTS LIST

BULBS

B601	6.3v	Incand. Mini.	150-018
------	------	---------------	---------

CAPACITORS

C160	2 x 50 μ f	540v	290-163
------	----------------	------	---------

DIODES

D611	1N2862	Silicon	152-047
D612	1N2862	Silicon	152-047

FUSES

F601	.2 Amp., Slo Blow	For 117 volts	159-044
F601	.1 Amp., Slo Blow	For 234 volts	159-048

RELAYS

K601	KRP5AG	Relay Holding	148-018
------	--------	---------------	---------

RESISTORS

R610	100 k	2 w	Comp.	10%	306-104
R611	220 k	1/2 w	Comp.	5%	301-224
R612	220 k	1/2 w	Comp.	5%	301-224

SWITCHES

SW601	POWER ON	Toggle, SPST	260-134
SW610	MANUAL TRIGGER	Push Button, Norm. open	260-247

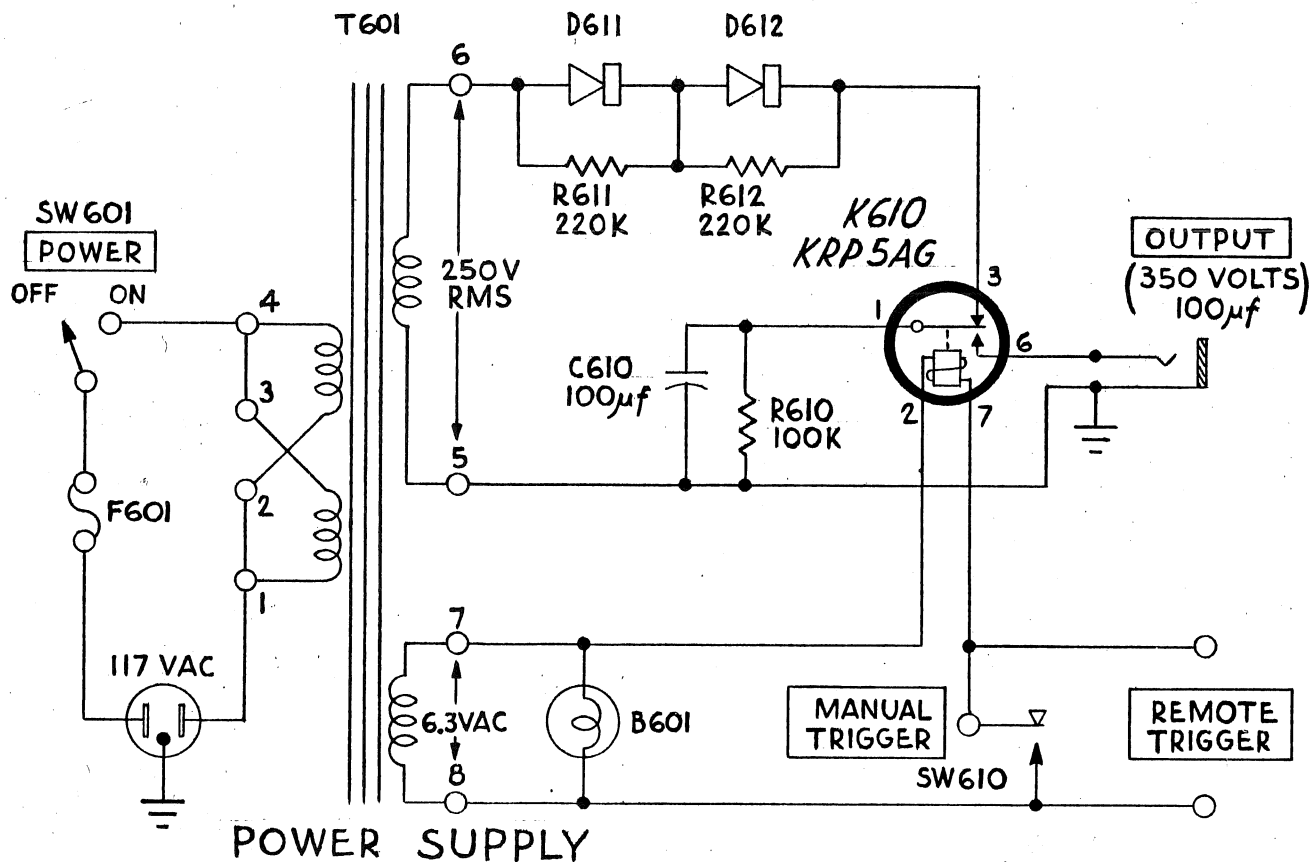
TRANSFORMERS

T601	Power	120-237
------	-------	---------

MECHANICAL PARTS LIST

BRACKET, ALUM., TRANS. MTG., 1-13/16 x 2	406-129
BUSHING, NYLON, BINDING POST	358-036
BUSHING, STRAIN RELIEF	358-161
CABLE, ACTUATOR	179-603
CABLE, COAX, RG174A/U, 48"	175-068
CABLE, HARNESS	179-603
CAP, SOLENOID	200-399
COIL, FIXED, 4500 TURNS	108-239
CORD, POWER, 20GA., 3-WIRE, 8FT.	161-015
CORE, SOLENOID, .437 x 1.187	276-531
COVER, BOX, BOTTOM	200-309
COVER, CABLE, VINYL, 1-9/16 x .270 ID	200-353
COVER, CABLE, VINYL, 3/4 x .312 ID	200-352
COVER, COIL FORM, BLACK	200-351
COVER, TOP, SUB	200-350
FOOT, RUBBER, BLACK	348-037
HOLDER, FUSE	352-014
HOUSING, SOLENOID	380-038
HOUSING, WRAP-AROUND, 5-39/64 x 4-11/16	380-031
LOCKWASHER, STEEL, INT. #4	210-004
LOCKWASHER, STEEL, INT. #6	210-006
LOCKWASHER, STEEL, INT. #10	210-010
LUG, BANANA, PEEWEE	210-215
LUG, SOLDER, SE 6	210-202
LUG, SOLDER, SE10 LONG	210-206
NUT, HEX, BRASS, 4-40 x 3/16	210-406
NUT, HEX, BRASS, 6-32 x 1/4	210-407
NUT, KEPS, STEEL, 6-32 x 5/16	210-457
NUT, HEX, STEEL, 10-32 x 3/8	210-445
NUT, HEX, BRASS, 15/32-32 x 9/16	210-414
NUT, SWITCH, 12-SIDED, 15/32-32 x 5/64	210-473

PANEL, FRONT	333-691
PLATE, METAL, CAP. MTG.	386-255
PLUG, SWITCHRAFT #750	134-051
PLUNGER, SOLENOID, 1/8 x 1.472	214-223
POST, BINDING, 5-WAY	129-036
RING, LOCKING, SWITCH, 15/32 ID	354-055
RING, RETAINING, TRU ARC	354-158
ROD, SPACER, 5/16 x 2-13/16	384-588
SCREW, THREAD CUTTING, 2-56 x 3/16 PHS	213-055
SCREW, PHILLIPS, 4-40 x 5/16 FHS	211-038
SCREW, W/LOCKWASHER, 4-40 x 5/16 PHS	211-033
SCREW, 4-40 x 3/8 BHS	211-012
SCREW, PHILLIPS, 4-40 x 3/8 PHS	211-071
SCREW, 4-40 x 1/2 RHS	211-015
SCREW, PHILLIPS, 6-32 x 5/16 FHS	211-538
SCREW, 6-32 x 1 FHS	211-534
SCREW, SET, 8-32 x 1/2 HSS	213-005
SOCKET, LIGHT, W/LENS	136-047
SOCKET, STM8G, MOLDED	136-013
SOCKET, TINI-JAX #42A	136-094
SPACER, NYLON, CERAMIC STRIP	361-007
SPRING, RETURN, SOLENOID	214-224
SPRING, SHOCK, SOLENOID	214-225
STRIP, CERAMIC, 7 NOTCHES	124-149
TAG, INSERT, S/N	334-679
TAG, SOLENOID	334-805
WASHER, STEEL, .026 x 1/4 ID	210-940
WASHER, STEEL, .030 x .470	210-902
WASHER, SOLENOID, .031 x .600 ID	210-950



2-16-62