

INSTRUCTION MANUAL

INFORMATION ON THE FOLLOWING CONTAINED HEREIN				
Tektronix Camera Type	Complete Assembly Number	Subassembly Part Number		
		Control Box	Diffuser Assembly	Mounting Bracket
C-12	016-0280-00	016-0289-00	337-1606-00	407-1030-00
C-27	016-0280-00	016-0289-00	337-1606-00	407-1030-00
C-30A	016-0284-00	016-0289-00	337-1603-00	407-1018-00
C-31	016-0284-00	016-0289-00	337-1603-00	407-1018-00
C-50	016-0278-00	016-0289-00	337-1604-00	386-2046-00
C-51	016-0279-00	016-0289-00	337-1605-00	386-2046-00
C-59	016-0290-00	016-0289-00	337-1603-00	386-2046-00

**WRITING SPEED
ENHANCER
(WSEN)**



WARRANTY

All TEKTRONIX instruments are warranted against defective materials and workmanship for one year. Any questions with respect to the warranty should be taken up with your TEKTRONIX Field Engineer or representative.

All requests for repairs and replacement parts should be directed to the TEKTRONIX Field Office or representative in your area. This will assure you the fastest possible service. Please include the instrument Type Number or Part Number and Serial Number with all requests for parts or service.

Specifications and price change privileges reserved.

Copyright © 1971, new material copyright 1972 by Tektronix, Inc., Beaverton, 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.

U.S.A. and foreign TEKTRONIX products covered by U.S. and foreign patents and/or patents pending.

TEKTRONIX is a registered trademark of Tektronix, Inc.

TABLE OF CONTENTS

SECTION 1	SPECIFICATION	Page
	Introduction	1-1
	Optical Characteristics	1-1
	Electrical Triggering Characteristics	1-1
	Battery Electrical Characteristics	1-1
	Environmental Characteristics	1-1
	Accessories	1-1
SECTION 2	INSTALLATION INSTRUCTIONS	
	General	2-1
	C-50 And C-51 Cameras (Without Battery Pack)	2-1
	C-50 And C-51 Cameras (With Battery Pack)	2-3
	C-59 Cameras	2-4
	C-12 And C-27 Cameras	2-6
	C-30A And C-31 Cameras	2-7
SECTION 3	OPERATING INSTRUCTIONS	
	General	3-1
	Controls And Connectors	3-1
	General Operation	
	Introduction	3-1
	Triggering	3-1
	Operation	3-2
SECTION 4	ELECTRICAL	
	Introduction	4-1
	Circuit Description	
	Triggering Methods	4-1
	Manual And X-Sync Triggering	4-1
	+ Gate Triggering	4-1
	Calibration	
	Introduction	4-1
	Tektronix Field Service	4-1
	Test Equipment Required	4-1
	Calibration	4-2
	CIRCUIT BOARD PHOTO & DIAGRAM	
	ELECTRICAL PARTS LIST	
	MECHANICAL PARTS LIST & ILLUSTRATION	

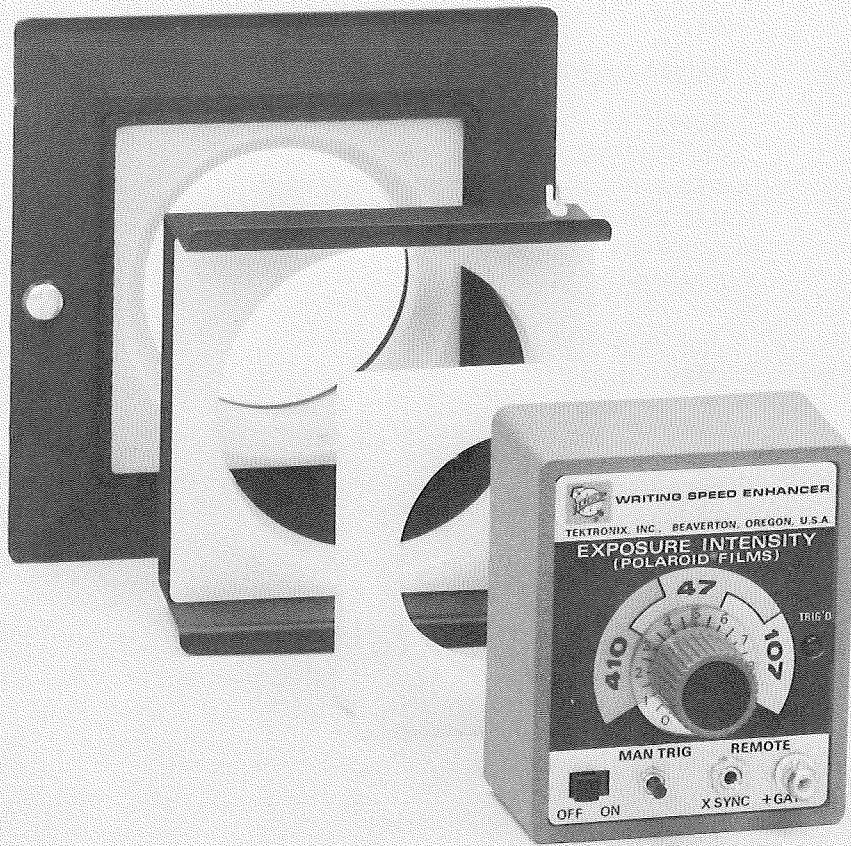


Fig. 1-1. Writing Speed Enhancer.

SECTION 1

SPECIFICATION

Introduction

The Tektronix Writing Speed Enhancer is a device used to increase the photographic writing speed of oscillography recording films. A light diffuser mounted behind the lens in the camera provides accurately controlled "film-fogging" illumination levels. The Writing Speed Enhancer allows variations of these fogging illumination levels for use with films with various ASA ratings.

This Instruction Manual covers the installation of the Writing Speed Enhancer on Tektronix C-12, C-27, C-30A, C-31, C-50, C-51, and C-59 cameras.

The following electrical characteristics apply over the stated environmental range for instruments that have been calibrated at an ambient temperature of $+25^{\circ}\text{C}$, $\pm 5^{\circ}\text{C}$ unless otherwise stated.

OPTICAL CHARACTERISTICS

Writing Speed Gain: Approximately 3 to 5 times.

Fogging Illumination: Provided by four light-emitting (6,500 Å) diodes in a specially designed diffuser.

ELECTRICAL TRIGGERING CHARACTERISTICS

Triggering Method: Manual or automatic. Automatic triggering provided by the appropriate external signals connected to the enhancer + GATE or X-SYNC input connectors.

Exposure Time: 0.5 second, $\pm 10\%$.

Exposure Repeatability: Within $\pm 5\%$.

Trigger Indicator: A light-emitting diode (LED) mounted on the Writing Speed Enhancer front panel. LED will not light if battery charge level is below 13 volts.

Minimum Trigger Requirements: 2 volts with a duration of 50 ns.

Maximum Input Voltage: +15 volts.

BATTERY ELECTRICAL CHARACTERISTICS

Number of Cells: Two.

Type: NEDA No. 1604 carbon-zinc or NEDA No. 1604M mercury cells.

Nominal Voltage Per Cell: Nine volts.

Typical Battery Life Expectancy to Cutoff (6.5 volts per cell): Approximately one year or 10,000 flashes.

ENVIRONMENTAL CHARACTERISTICS

NOTE

The following environmental limits apply when tested in accordance with the recommended procedures. Complete details on environmental test procedures, including failure criteria, etc., may be obtained from your local Tektronix, Inc., representative or field office.

Temperature: Operating, 0°C to $+50^{\circ}\text{C}$; storage (without batteries), -40°C to $+55^{\circ}\text{C}$.

Altitude: Operating, sea level to 15,000; storage (without batteries), sea level to 50,000 feet.

Vibration (Operating With Camera Mounted on Oscilloscope): Fifteen minutes along each axis at a displacement amplitude of 0.010 inch within 0.002 inch. 10 to 55 to 10 hertz in one-minute sweeps. Three minutes at any resonant point, or if none, at 55 hertz.

Shock (Operating With Camera Mounted on Oscilloscope): 15 g's, $\frac{1}{2}$ sine, 11 ms duration, one shock in each direction along three major axes, total of six shocks.

ACCESSORIES

Standard accessories supplied with this instrument will be found in the Mechanical Parts List section. For optional accessories, see the current Tektronix, Inc. catalog.



SECTION 2

INSTALLATION INSTRUCTIONS

General

This section provides the necessary instructions to facilitate installation of the Writing Speed Enhancer on a variety of Tektronix camera types. There are five basic procedures provided; one for C-12 and C-27 cameras, one for C-30A and C-31 cameras, two for C-50 and C-51 cameras, and one for the C-59 camera.

NOTE

If the Writing Speed Enhancer control box and diffuser to be used were not ordered from Tektronix, Inc. as a calibrated pair, or if either unit has been repaired or replaced, the calibration procedure in Section 4 should be performed before installing the Writing Speed Enhancer on the camera.

C-50 And C-51 Cameras (Without Battery Pack)

1. Install the dark slide in the film back of the camera. Remove the film back from the camera.

2. Remove the light shield (item number 1-59 in the Mechanical Parts List Illustrations in the appropriate camera manual) from the rear of the lens. This light shield will be re-used only in the event the Writing Speed Enhancer is removed from the camera.

3. Remove the left side cover from the camera. The four screws may be discarded.

NOTE

On the C-51 camera, install the provided O-ring on the rear lens element in the manner shown in Fig. 2-1. The O-ring serves as a light seal for the diffuser assembly and must be positioned just past the groove in the lens element toward the shutter.

4. Route the diffuser assembly power cable through the camera in the manner shown in Fig. 2-2.

5. Install the diffuser assembly (with the arrow out and pointed up) in place of the removed light shield. It will be necessary to adjust component and wire dress to allow the diffuser assembly to be seated fully into the camera

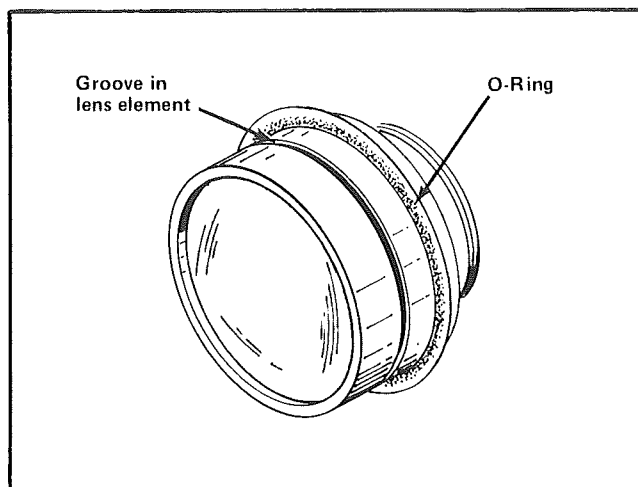


Fig. 2-1. Correct placement of the light sealing O-ring on the rear lens element of a C-51 camera.

housing. After the diffuser is properly seated, tighten the fasteners on each side of the diffuser.

CAUTION

Do not scratch the paint on the diffuser during installation.

6. Remove the mounting plate from the back of the Writing Speed Enhancer. Save the four screws for later use.

7. Place the Writing Speed Enhancer mounting plate on the camera side panel in the manner shown in Fig. 2-3.

8. Mark the center of the mounting plate's large hole on the camera side panel. Remove the panel and drill the marked hole with a 9/32-inch diameter drill. The finished hole in the side panel should have a diameter of 0.281 inch, ± 0.015 inch.

9. Install the two nine-volt batteries into the Writing Speed Enhancer control box.

10. Re-install the mounting plate on the back of the control box. Use the four flat-head screws removed in step 6. See Fig. 2-4.

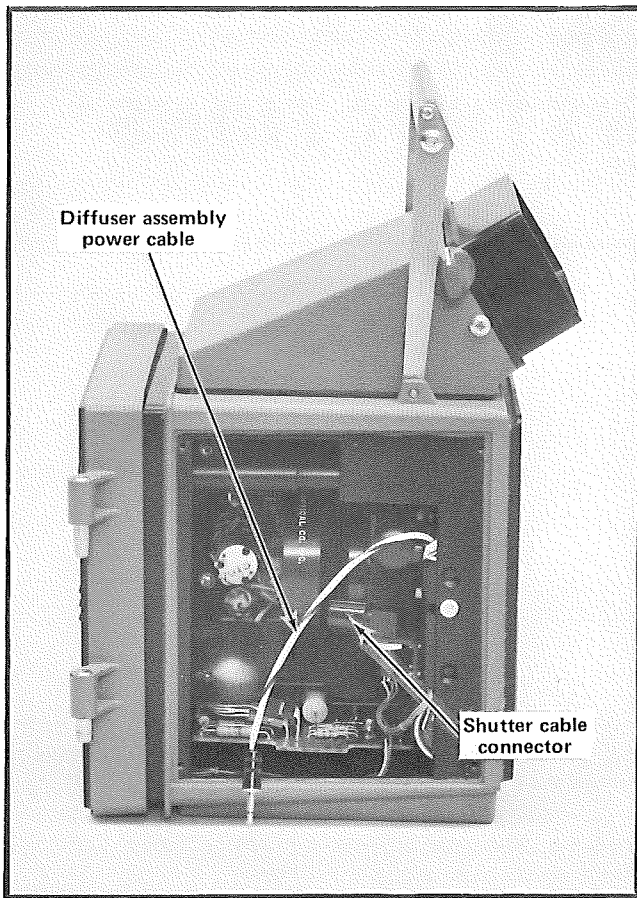


Fig. 2-2. Correct routing for the diffuser assembly power cable when the Writing Speed Enhancer is installed on a camera not having a battery pack.

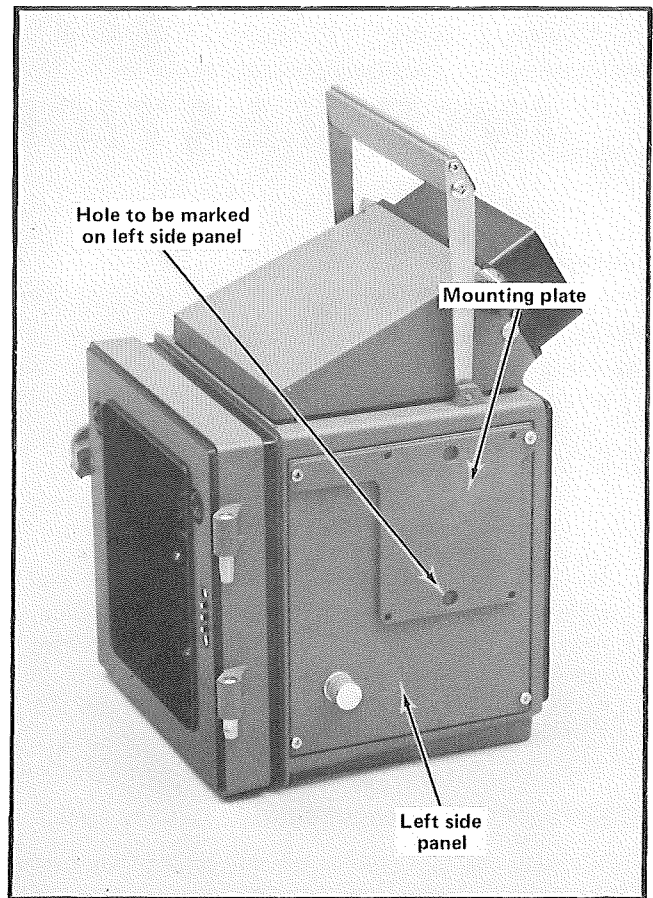


Fig. 2-3. Correct placement of Writing Speed Enhancer control box mounting plate on the left side panel of the camera.

11. Pass the diffuser assembly power cable plug through the hole drilled in the camera side panel.

12. Plug the diffuser assembly power cable into the back of the Writing Speed Enhancer control box.

13. Hold the camera side panel in place on the camera with the circuit board connector on the side panel mated with the camera circuit board. Also hold the Writing Speed Enhancer control box against the camera side panel with the control box mounting plate correctly positioned. Then, insert and tighten four 4-40 round head screws (provided with the Enhancer) to secure both the side panel and the control box mounting plate to the camera.

This completes the installation of the Writing Speed Enhancer onto the camera. Re-install the camera film back and test the assembly for correct operation.

NOTE

Visible light from the diffuser assembly can best be seen under low ambient light conditions.

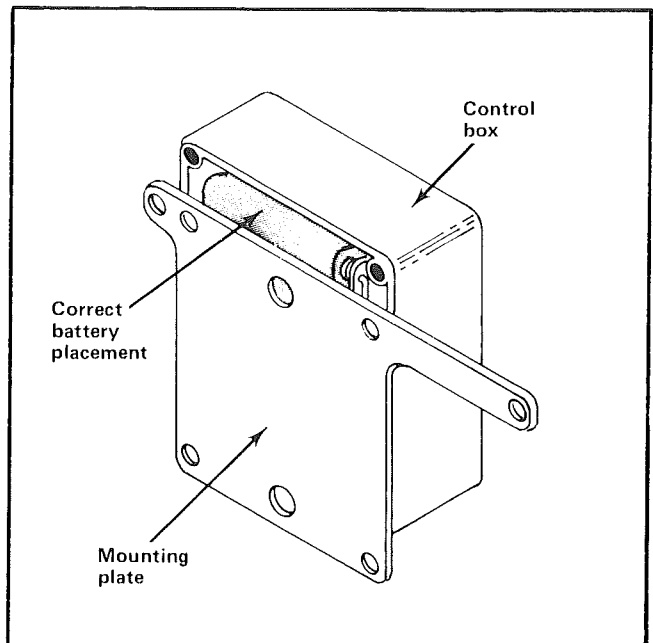


Fig. 2-4. Correct placement of the Writing Speed Enhancer mounting plate on the control box when used on a camera not having a battery pack.

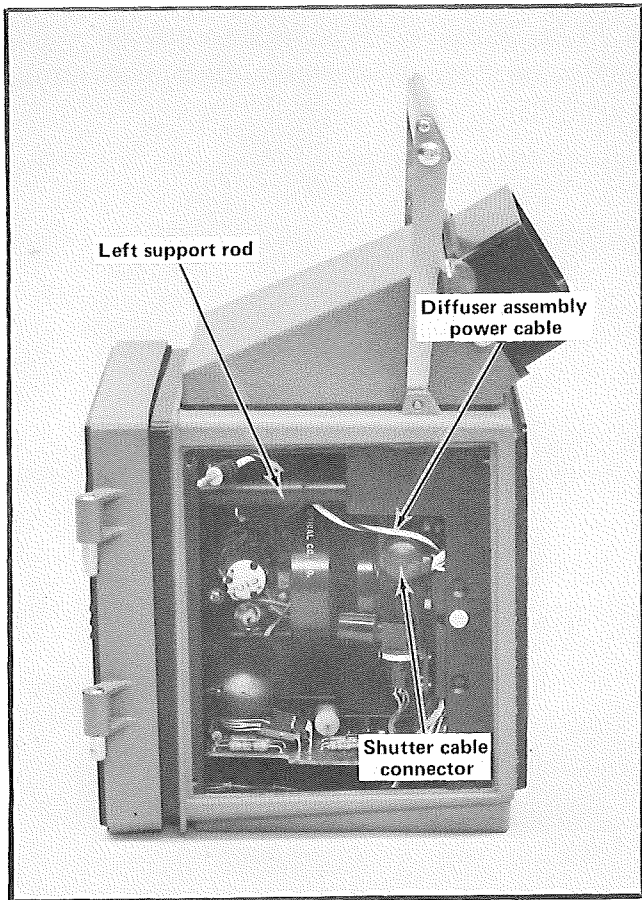


Fig. 2-5. Correct routing for the diffuser assembly power cable when the Writing Speed Enhancer is installed on a camera having a battery pack.

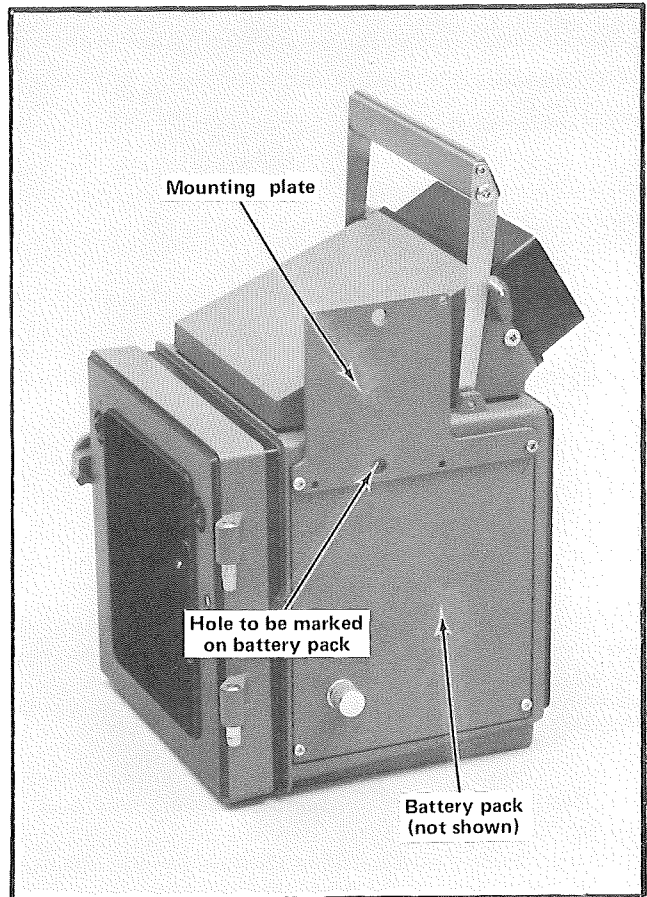


Fig. 2-6. Correct placement of the Writing Speed Enhancer control box mounting plate on the battery pack.

C-50 And C-51 Cameras (With Battery Pack)

1. Install the dark slide in the film back of the camera. Remove the film back from the camera.

2. Remove the light shield (item number 1-59 in the Mechanical Parts List Illustrations in the appropriate camera manual) from the rear of the lens. This light shield will be re-used only in the event the Writing Speed Enhancer is removed from the camera.

3. Remove the battery pack from the left side of the camera. The four screws may be discarded.

NOTE

On the C-51 camera, install the provided O-ring on the rear lens element in the manner shown in Fig. 2-1. The O-ring serves as a light seal for the diffuser assembly and must be positioned just past the groove in the lens element toward the shutter.

4. Route the diffuser assembly power cable through the camera in the manner shown in Fig. 2-5.

5. Install the diffuser assembly (with the arrow out and pointing up) in place of the removed light shield. It will be necessary to adjust component and wire dress to allow the diffuser assembly to be seated fully into the camera housing. After the diffuser is properly seated, tighten the fasteners on each side of the diffuser.

CAUTION

Do not scratch the paint on the diffuser during installation.

6. Remove the mounting plate from the back of the Writing Speed Enhancer control box. Save the four screws for later use.

7. Place the Writing Speed Enhancer mounting plate on the battery pack in the manner shown in Fig. 2-6.

Installation Instructions—WSEN

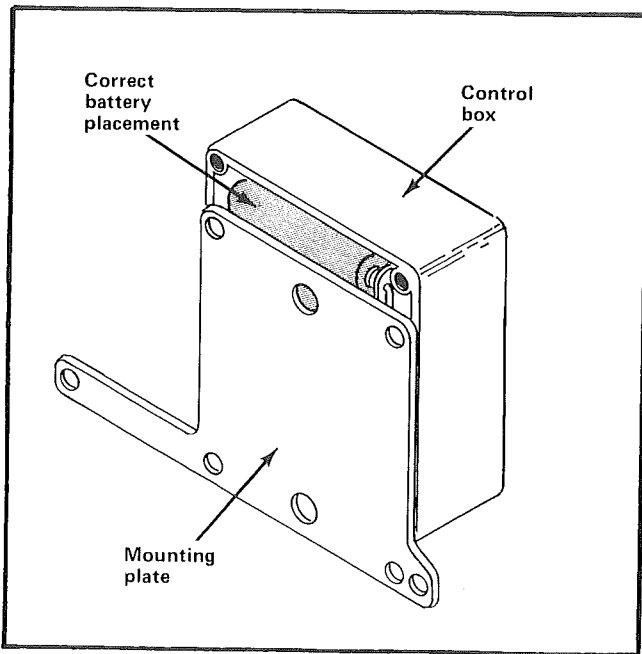


Fig. 2-7. Correct placement of the Writing Speed Enhancer mounting plate on the control box when used on a camera having a battery pack.

8. Mark the center of the mounting plate's large hole on the battery pack side panel. Drill the marked hole with a 9/32-inch diameter drill. The finished hole in the side panel should have a diameter of 0.281 inch, ± 0.015 inch.

9. Install the two nine-volt batteries into the Writing Speed Enhancer control box.

10. Re-install the mounting plate on the back of the control box. Use the four flat-head screws removed in step 6. See Fig. 2-7.

11. Pass the diffuser assembly power cable plug through the hole drilled in the battery pack side panel.

12. Plug the diffuser assembly power cable plug into the back of the Writing Speed Enhancer control box.

13. Hold the battery pack in place on the camera with the circuit board connector on the battery pack mated with the camera circuit board. Also hold the Writing Speed Enhancer control box against the camera battery pack with the control box mounting plate correctly positioned. Then, insert and tighten four 4-40 round head screws (provided with the Enhancer) to secure both the battery pack and Writing Speed Enhancer control box mounting plate to the camera.

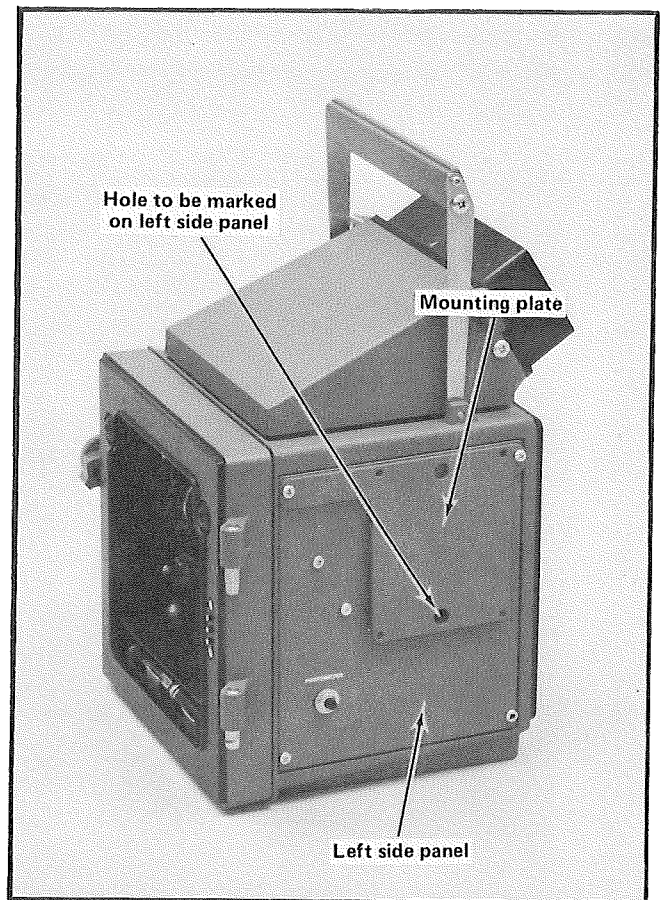


Fig. 2-8. Correct placement of Writing Speed Enhancer control box mounting plate on the left side panel of the C-59 camera.

This completes the installation of the Writing Speed Enhancer onto the camera. Re-install the camera film back and test the assembly for correct operation.

NOTE

Visible light from the diffuser assembly can best be seen under low ambient light conditions.

C-59 Cameras

1. Install the dark slide in the film back of the camera. Remove the film back from the camera.

2. Remove the left side cover from the camera. The four screws may be discarded.

3. Remove the mounting plate from the back of the Writing Speed Enhancer control box. Save the four screws for later use.

4. Place the Writing Speed Enhancer mounting plate on the camera side panel in the manner shown in Fig. 2-8.

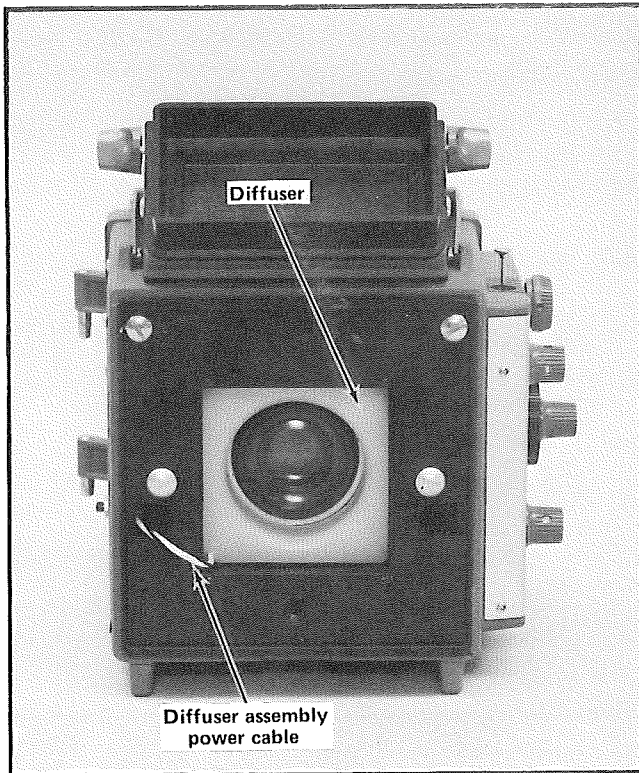


Fig. 2-9. Installing the diffuser assembly into the C-59 camera.

5. Mark the center of the mounting plate's large hole (see Fig. 2-8) on the camera side panel. Drill the marked hole with a 9/32-inch diameter drill. The finished hole in the side panel should have a diameter of 0.281 inch, ± 0.015 inch.

6. Install the two nine-volt batteries into the Writing Speed Enhancer control box.

7. Re-install the mounting plate on the back of the control box. Use the four flat-head screws removed in step 5. See Fig. 2-3.

8. Remove the protective covering from the tape on the back side of the diffuser assembly. Press the diffuser assembly into the rear of the camera in the manner shown in Fig. 2-9.

9. Route the power cable for the diffuser assembly in the manner shown in Figs. 2-9 and 2-10.

10. Pass the diffuser assembly power cable plug through the hole drilled in the camera side panel.

11. Plug the diffuser assembly power cable into the back of the Writing Speed Enhancer control box.

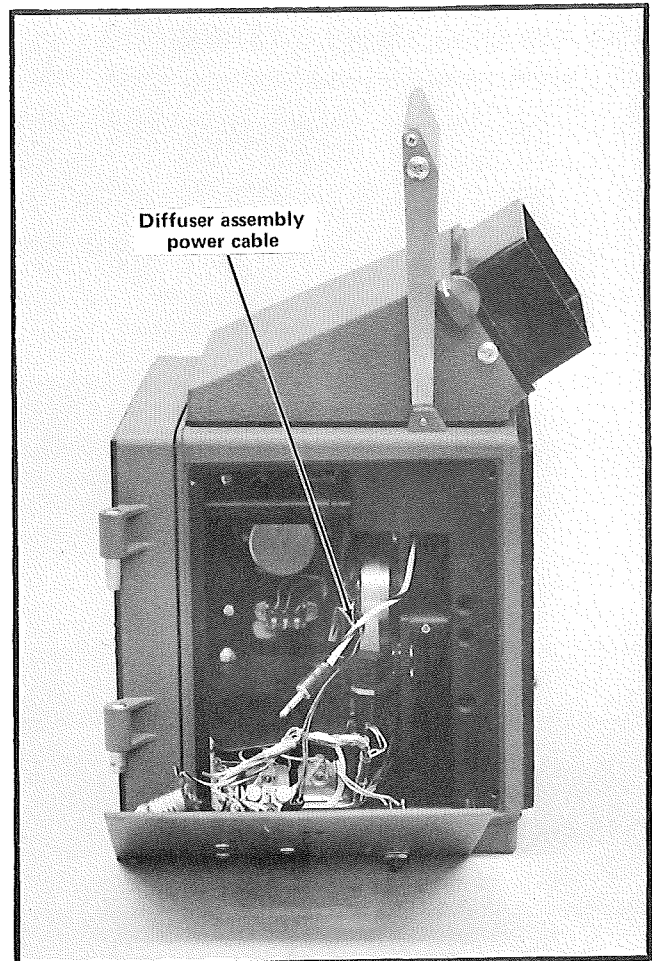


Fig. 2-10. Routing the power cable for the diffuser assembly.

12. Hold the camera side panel in place on the camera. Also hold the Writing Speed Enhancer control box against the camera side panel with the control box mounting plate correctly positioned. Then, insert and tighten four 4-40 round head screws (provided with the Enhancer) to secure both the side panel and Writing Speed Enhancer control box mounting plate to the camera.

13. Check the diffuser assembly power cable routing to insure it does not interfere with any of the internal optical devices.

This completes the installation of the Writing Speed Enhancer onto the camera. Re-install the camera film back and test the assembly for correct operation.

NOTE

Visible light from the diffuser assembly can best be seen under low ambient light conditions.

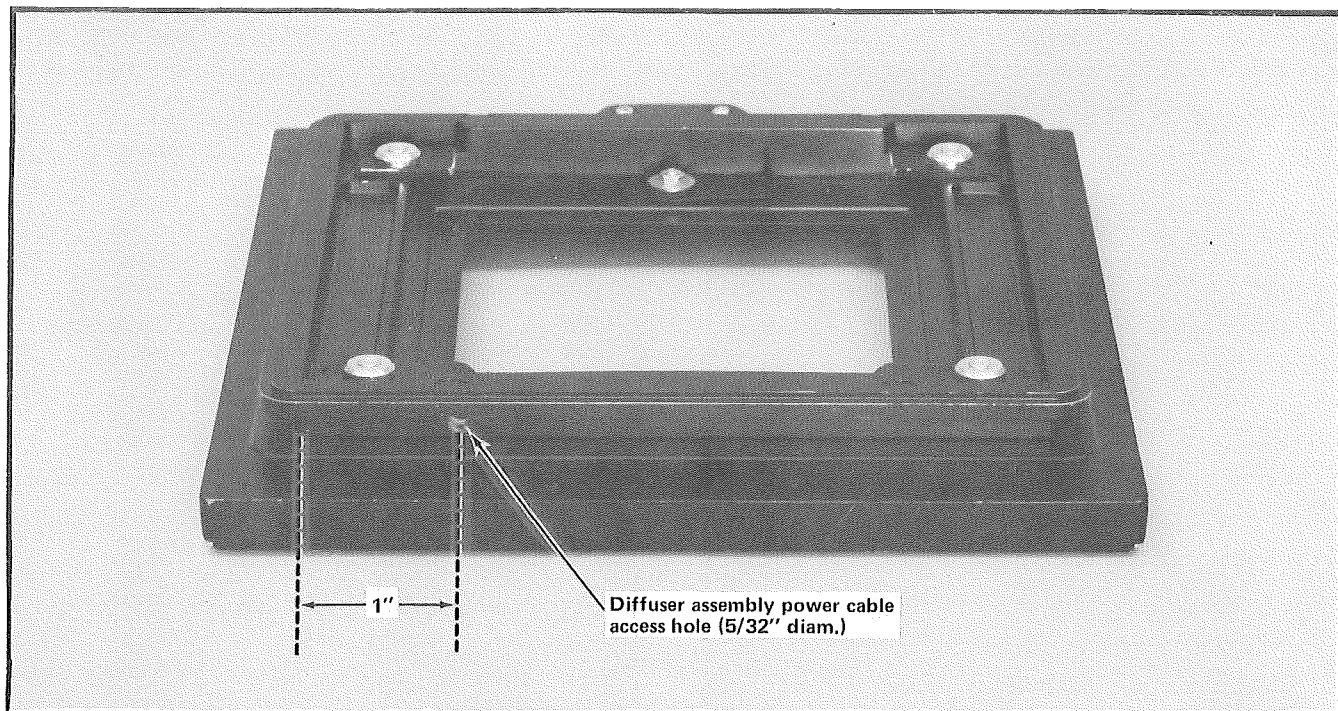


Fig. 2-11. Correct location of access hole for diffuser assembly power cable.

C-12 And C-27 Cameras

1. Install the dark slide in the film back of the camera. Remove the film back from the camera.

2. Remove the Adjustable Rotating Slide Adapter from the back of the camera (see camera manual for correct parts identification).

3. Drill a 5/32-inch diameter hole in the slide adapter in the location shown in Fig. 2-11. Finished hole diameter should be 0.156 inch, ± 0.010 inch and it should be centered in the trough.

4. Remove the power cable from the diffuser assembly. Note how the wires are connected to the terminals on the diffuser.

5. Route the diffuser assembly power cable through the hole drilled in step 3.

6. Install the diffuser into the slide adapter with the electrical terminals adjacent to the hole drilled in step 3. Lock the diffuser in place. See Fig. 2-12.

7. Reconnect the diffuser assembly power cable to the diffuser. See Fig. 2-12.

8. Plug the diffuser assembly power cable into the back of the Writing Speed Enhancer control box.

9. Install the Writing Speed Enhancer control box onto the Adjustable Rotating Slide Adapter in the location

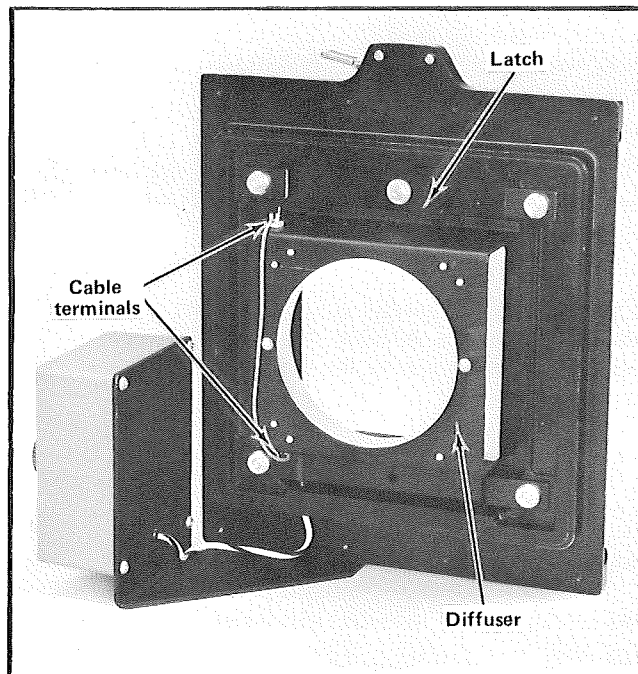


Fig. 2-12. Correctly installing the diffuser assembly on the Rotating Slide Adapter.

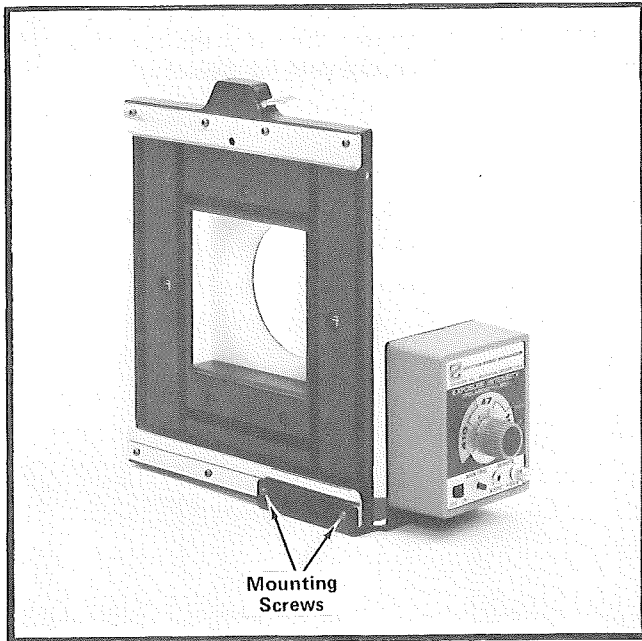


Fig. 2-13. Mounting the Writing Speed Enhancer control box on the Adjustable Rotating Slide Adapter.

shown in Fig. 2-13. Use the two screws shown in Fig. 2-13 to secure the control box to the adapter.

This completes the installation of the Writing Speed Enhancer onto the camera. Re-install the Adjustable Rotating Slide Adapter and the film back onto the camera and test the assembly for correct operation.

NOTE

Visible light from the diffuser assembly can best be seen under low ambient light conditions.

C-30A And C-31 Cameras

1. Install the dark slide in the film back of the camera. Remove the film back from the camera.

2. On Type C-30A cameras, set the object to image ratio at 1.5:1.

3. Use a small round or half-round file to file a small round groove in the rear casting of the camera in the location shown in Fig. 2-14. The depth of the small groove should be approximately one-half the thickness of the diffuser assembly power cable.

4. Remove the metal filings as thoroughly as possible from inside the camera.

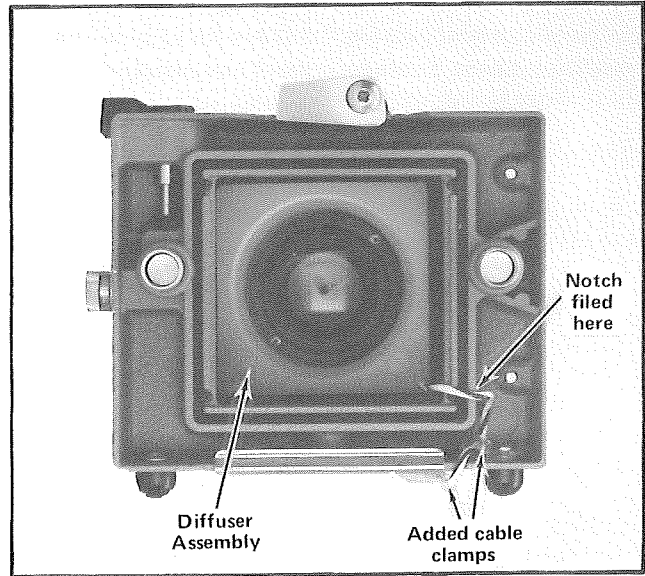


Fig. 2-14. Correct installation of the diffuser assembly in C-30A and C-31 type cameras.

5. Remove the protective covering from the tape on the back of the diffuser assembly. Press the diffuser assembly into the rear of the camera in the manner shown in Fig. 2-14.

6. Route the diffuser assembly power cable through the notch provided in step 3. Secure the cable with the cable clamps provided in the manner shown in Fig. 2-14. There should be sufficient cable length to allow the camera to be set to an object-to-image ratio of 1.5:1 and the cable should not interfere with the image area when the image-to-object ratio is changed.

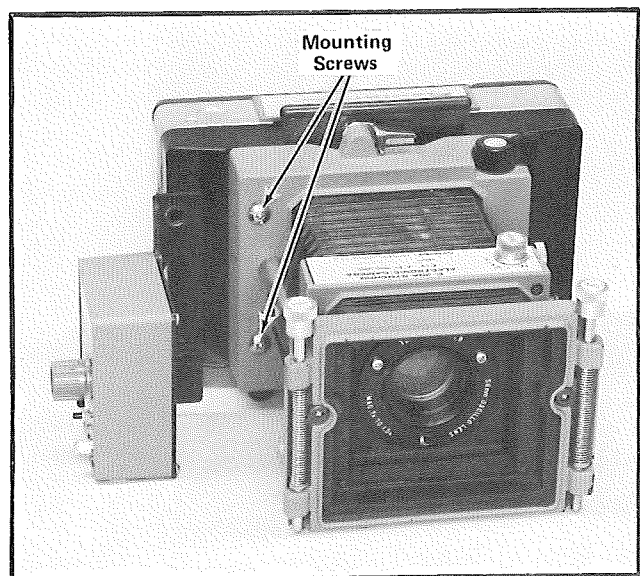


Fig. 2-15. Mounting the Writing Speed Enhancer control box on the C-30A/C-31 cameras.

Installation Instructions—WSEN

7. Loosen the two screws on the right-front side of the rear camera casting (see Fig. 2-15) enough to allow slipping the Writing Speed Enhancer control box mounting bracket under them. Retighten the two screws.

8. Plug the diffuser assembly power cable into the back of the Writing Speed Enhancer control box.

This completes the installation of the Writing Speed Enhancer onto the camera. Re-install the film back onto the camera and test the assembly for correct operation.

NOTE

Visible light from the diffuser assembly can best be seen under low ambient light conditions.

SECTION 3

OPERATING INSTRUCTIONS

General

To effectively use the Writing Speed Enhancer, the operation and capabilities of the device must be known. This section describes the operation of the front-panel controls and connectors and gives some general operating information.

Controls And Connectors

EXPOSURE INTENSITY	A calibrated control to permit varying the light output of the diffuser assembly.
TRIG'D	Indicates when the light source in the diffuser assembly is on. The TRIG'D indicator will not illuminate if the battery voltage is too low; however, the diffuser light emitting diodes may still flash.
OFF-ON	Disables the light source in the diffuser and the front-panel TRIG'D indicator.
X SYNC	Miniature phone jack to provide external triggering capabilities synchronous with the camera shutter opening. Ground closure triggers the unit.
+ GATE	BSM input connector for trigger signals from gate outputs of oscilloscopes. Triggering occurs at the beginning of the sweep when the gate input signal is positive-going.
MAN TRIG	Pushbutton switch to provide manual triggering capabilities.

GENERAL OPERATION

Introduction

The Writing Speed Enhancer improves the ability of films to photographically record fast-occurring oscilloscope displays by using a technique called "film-fogging". Film-fogging is achieved by uniformly exposing the film in the

camera to accurately controlled low levels of light (generated by the diffuser assembly) that are supplementary to the light of the display being photographed. This supplementary light compensates for some of the deficiencies of the rapid oscilloscope exposure and minimizes film reciprocity failure.

Film-fogging can be used prior to, during, or after the taking of the picture. The greatest writing speed gain will be realized by using film-fogging coincident with the taking of an oscilloscope picture. There are three basic methods of triggering the Writing Speed Enhancer. How the Enhancer is triggered will determine whether pre-, post-, or simultaneous-fogging is being used. Simultaneous fogging is recommended for maximum writing speed gain. Simultaneous fogging means simultaneous to the majority of the light exposure the film receives, which is coincident with the CRT phosphor decay.

Triggering

Camera Triggered (Recommended Method). The simplest method of obtaining simultaneous triggering is to trigger the Writing Speed Enhancer directly from the camera. To do this, connect the special cable provided as a standard accessory to the Writing Speed Enhancer (Tektronix part number 012-0339-00 for C-50, C-51, C-59 cameras or 012-0364-00 for C-12, C-27, C-30A, C-31 cameras) between the X Sync connector of the camera and the X SYNC input connector of the Enhancer. This allows the camera to trigger the Writing Speed Enhancer as the camera shutter opens. For a single-shot event, this method can only be used where the camera triggers the event.

NOTE

Set the Writing Speed Enhancer ON-OFF switch to the OFF position when making connections to the Enhancer to prevent accidental triggering.

The source of triggering signal applied to the X SYNC input connector is not, however, restricted to a camera. Any closure to ground at the X SYNC input for approximately one microsecond duration is sufficient to cause triggering.

Operating Instructions—WSEN

+ Gate Triggered. The + GATE input connector uses the + Gate output signal of an oscilloscope as a trigger source; however, any positive-going signal with at least a 50 nanosecond duration at an amplitude level of at least +2 volts will trigger the Writing Speed Enhancer. Use the special cable provided as a standard accessory (Tektronix part number 012-0340-00) to connect the + Gate output of the oscilloscope to the + GATE input of the WSEN. This method of triggering must be used for a single-shot event if the time at which the event will occur is unknown.

NOTE

Because of signal deterioration due to cable capacitance, the maximum length of cable used to connect a + Gate signal to the WSEN should be limited to 20 inches of 50-ohm RG-58/U coaxial cable.

The oscilloscope will now trigger the Writing Speed Enhancer at the start of the sweep. Operating the camera and the oscilloscope in the single-sweep mode with + Gate triggering for the WSEN again results in simultaneous fogging (the recommended method).

Manually Triggered. The MAN TRIG pushbutton provides the ability to obtain all three methods of fogging. Pre-fogging is obtained by pushing the MAN TRIG pushbutton before taking the picture, while post-fogging is pushing the button after taking the picture. Simultaneous fogging, the recommended method, is accomplished by pushing the button as the picture is being taken.

Operation

When determining the initial setting of the Writing Speed Enhancer EXPOSURE INTENSITY control, two considerations arise; what type of camera and what type of film is

being used. Table 3-1 offers some suggested initial settings for some of the more common camera type/Polaroid¹ film combinations. Since these are only suggested starting points, optimizing writing speed enhancement will involve taking several sample photos and varying the ENHANCEMENT INTENSITY control setting between photos until best performance is obtained.

For example, assume a C-30A camera is being used with the object-to-image ratio set to 1:0.7 and the film being used is Polaroid[®] Type 410 roll film with an ASA rating of 10,000. Table 3-1 then suggests starting with an ENHANCEMENT INTENSITY setting of 2.5. Take a picture at this setting, and then take pictures with the ENHANCEMENT INTENSITY control set first to 2.0, and then 3.0. Judge from these which direction to go with the Enhancer control, and make changes in half-number steps. If the film being used were Type 107 or Type 47, control settings could be varied in whole-number steps.

TABLE 3-1

Recommended Initial
WSEN Control Settings

Camera Type	Type 107 Film	Type 47 Film	Type 410 Film
C-12 C-27	7.0	5.5	2.5
C-30A (1:0.7 Mag)	7.5	5.5	2.5
C-30A (1:1 Mag)	9.0	7.0	3.0
C-31	7.0	5.0	2.0
C-59	7.5	5.5	2.5
C-50 C-51	7.0	5.0	2.0

¹ Registered trade mark of Polaroid Corp.

SECTION 4

ELECTRICAL

Introduction

This section of the manual contains a description of the electrical circuitry used in the Writing Speed Enhancer. Also provided in this section are procedures and information to facilitate calibrating and performance checking the WSEN to ensure correct operation. Refer to the circuit diagram (shown at the rear of the manual) for electrical values and relationships.

CIRCUIT DESCRIPTION

Triggering Methods

There are three basic methods of triggering the Writing Speed Enhancer; (a) manually by pushing the MAN TRIG pushbutton, (b) automatically by connecting the X Sync contacts of a camera shutter to the X SYNC input connector of the WSEN, and (c) automatically by connecting the positive-going + Gate output signal from an oscilloscope to the + GATE input connector of the WSEN.

Manual And X Sync Triggering

Pushing the MAN TRIG pushbutton or the closing of the X Sync contacts in a camera shutter grounds one end of R206. This causes the base of Q208 to go negative, which turns on Q208. When Q208 is turned on, it conducts current through R208, resulting in a positive movement at the collector of Q208. This positive movement is coupled through C209 to the gate of silicon controlled rectifier Q212, causing Q212 to turn on, which in turn causes Q220 to conduct. Q220 conducts very heavily (into saturation) which results in its collector voltage being at very nearly the same level as its emitter (approximately +18 volts).

When Q220 conducts, Q237 is biased on, and conducts current through the light-emitting diodes in the diffuser assembly. The amount of current flowing through the diodes in the diffuser assembly is determined by the setting of the EXPOSURE INTENSITY control, R237. At the same time that Q237 is biased on, silicon controlled rectifier Q225 is turned on, and conducts current through the TRIG'D indicator light-emitting diode CR225.

The length of time current is conducted through the light-emitting diodes in the diffuser assembly is determined

by the RC time-constant of R218-C218. When C220 turns on, C218 starts to charge positive toward the collector level of Q220 through R218. Q218 is a programmable unijunction transistor. When the voltage on the anode of Q218 reaches the predetermined level set by divider R215-R216 in the gate circuit, Q218 turns on. This discharges C218 and, at the same time, causes a positive excursion to occur at the cathode of Q212. Q212 turns off, turning off Q220, and the circuit returns to its initial quiescent state.

+ Gate Triggering

The positive-going signal applied to the + GATE input connector, J201, is differentiated by C201 and R201 and applied to the base of Q202. Q202, quiescently biased off, is pulsed on briefly and conducts current through R202. This results in a positive pulse at the gate of silicon controlled rectifier Q212, which causes Q212 to turn on. The remainder of the circuitry now performs as described for Manual And X Sync Triggering.

CALIBRATION

Introduction

The Writing Speed Enhancer control box and diffuser assemblies are shipped from the factory as a calibrated pair. If either unit is repaired or replaced, or two units are to be used together that were not ordered from the factory as a calibrated pair, it will be necessary to perform recalibration.

Tektronix Field Service

Tektronix, Inc. provides complete instrument repair and recalibration at local Field Service Centers and the Factory Service Center. Contact your local Tektronix Field Office or representative for further information.

Test Equipment Required

The following test equipment or equivalent is required for complete calibration of the Writing Speed Enhancer. Specifications given for the test equipment are the minimum necessary for accurate calibration. All test equipment is assumed to be correctly calibrated and operating within the listed specifications.

Test Equipment

Description	Minimum Specifications	Usage	Example
1. DC Milliammeter	Range, 0-25 milliamperes; Accuracy, within 2%.	Adjusting output current of control box.	a. Triplet Model 630-NA Multimeter. b. Simpson Model 262. Multimeter.
2. Test Oscilloscope	Bandwidth, DC to one megahertz; deflection factor, five volts/division.	Check duration of enhancing pulse.	a. Tektronix 422 Oscilloscope.

Calibration

Calibration of the Writing Speed Enhancer consists of matching the current output capability of the control box to the current requirement of the diffuser assembly. A tag on the diffuser assembly states the current requirement for that particular diffuser. To match the control box to the required current, proceed as follows:

1. Disconnect the diffuser assembly from the control box.

2. Remove the WSEN control box from the camera and remove the mounting plate or bracket from the control box.

3. Connect the DC Milliammeter between the collector of Q237 and circuit common. The plus meter lead should be connected to the collector of Q237, and the minus lead to circuit common. See Fig. 4-1.

4. Set the DC Milliammeter to a scale that will most conveniently measure the current value indicated on the tag on the diffuser assembly.

5. Remove Q218 from its socket.

6. Press the MAN TRIG pushbutton.

7. Set the EXPOSURE INTENSITY control fully clockwise.

8. CHECK—The DC Milliammeter current reading should be within 0.5 milliampere of the value indicated on the tag on the diffuser assembly.

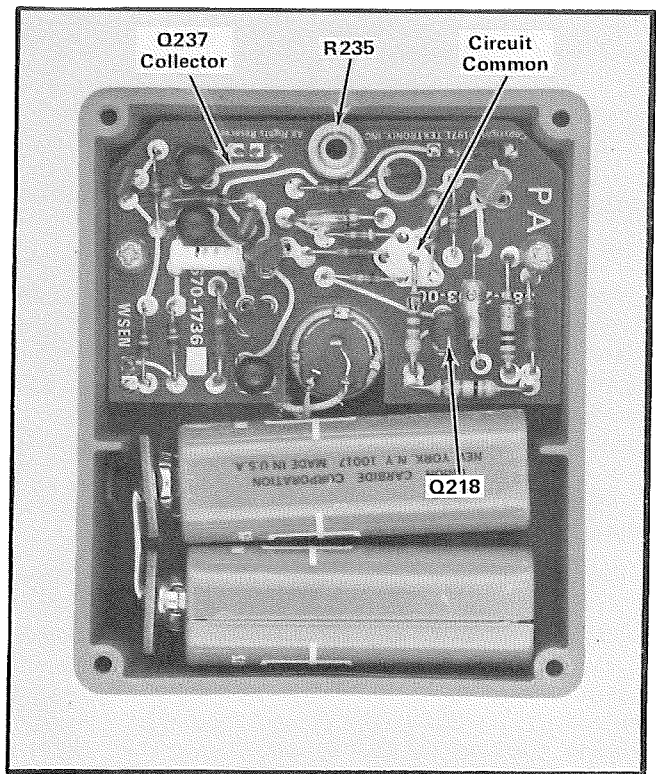


Fig. 4-1. Location of Q218 and circuit calibration test points and adjustments.

9. ADJUST—Intensity Cal adjustment R235 (see Fig. 4-1) for the exact current reading indicated on the tag on the diffuser.

10. Disconnect the DC Milliammeter from the control box and replace Q218 in its socket.

NOTE

Calibration steps 11 through 17 are only check steps to insure correct instrument operation, and may be omitted if so desired.

11. Connect the tip of the probe from the test oscilloscope to the collector of Q237. Connect the probe ground lead to circuit common in the control box. See Fig. 4-1.

12. Set the test oscilloscope for an overall vertical sensitivity (including probe attenuation) of 5 volts/division DC coupled.

13. Set the test oscilloscope for Normal (non-automatic) triggering from an internal source with AC trigger coupling.

14. Set the Trigger Level control to mid-range, the Time/Div to 1 second/division, and the Horizontal Position control so the display will start at the left edge of the CRT graticule.

15. Re-connect the diffuser assembly to the control box.

16. Push the MAN TRIG pushbutton.

17. CHECK—CRT display for a positive-going rectangular pulse with a time duration of 5 seconds, $\pm 10\%$ (5 divisions, ± 0.5 division).

This completes the calibration procedure for the Writing Speed Enhancer. Re-install the mounting plate or bracket onto the control box and re-install the control box onto the camera. The instrument should now meet or exceed the specifications given in Section 1.

SECTION 5 DIAGRAM & PARTS LIST

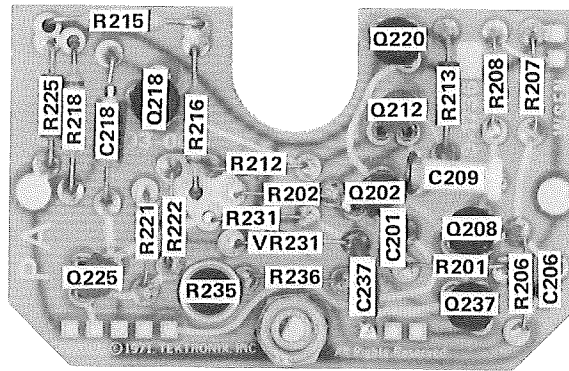
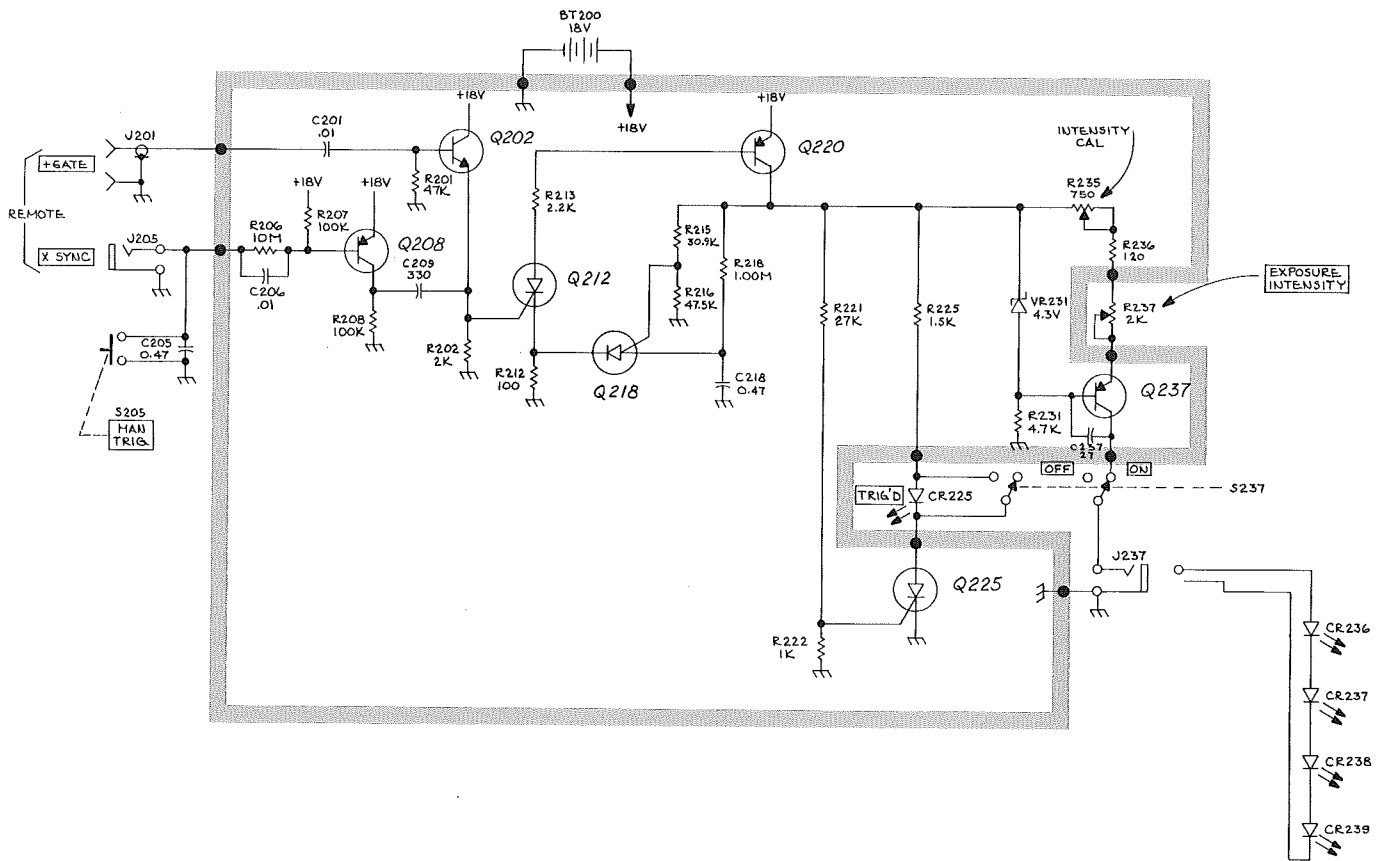


Fig. 5-1. Circuit board component locations.



WRITING SPEED ENHANCER

Ⓐ

0671
R/L

ELECTRICAL PARTS LIST

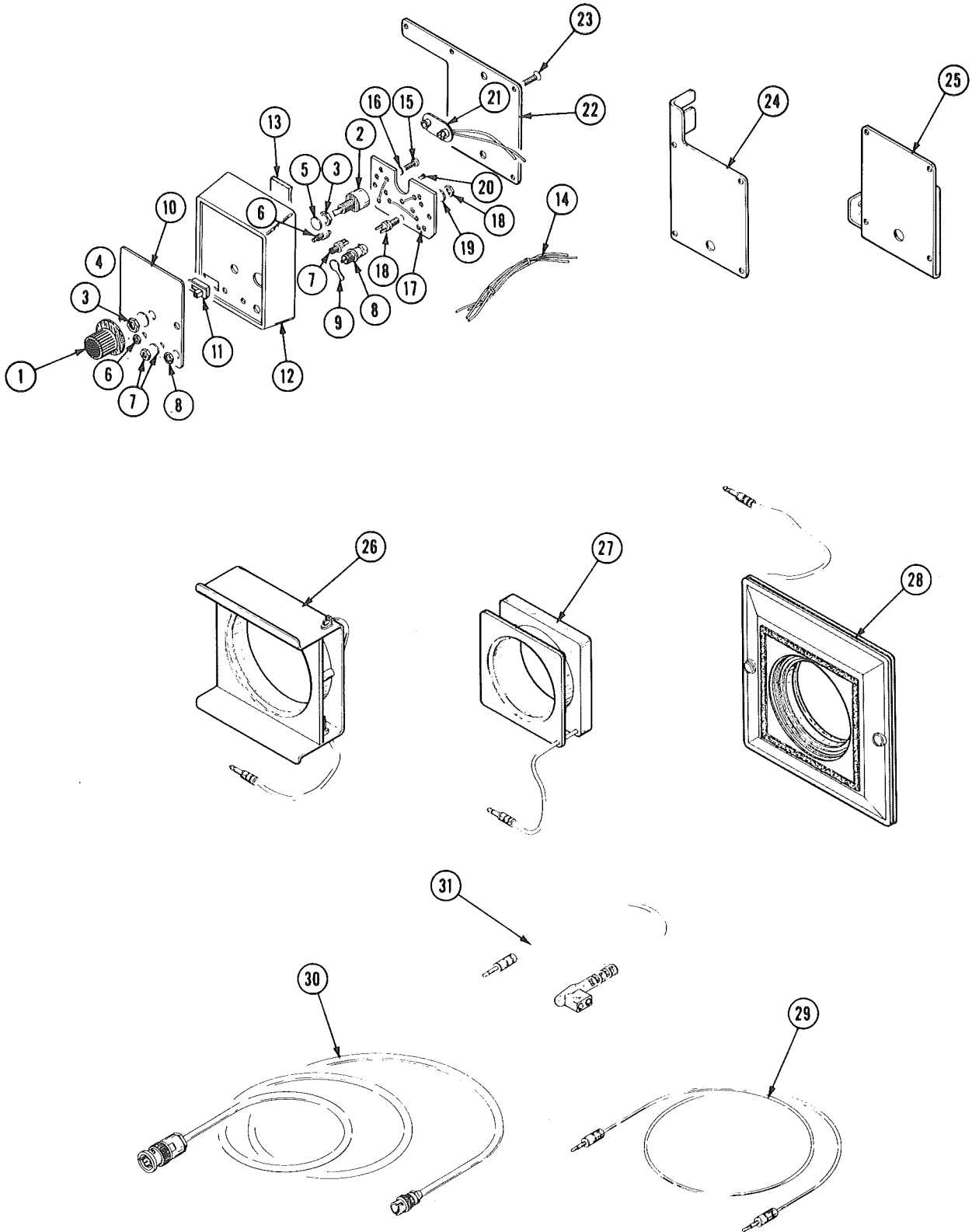
Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
ASSEMBLY	670-1736-00			MAIN Circuit Board Assembly
BATTERY				
BT200 (2)	146-0017-00			Battery, dry, 18 V
CAPACITORS				
C201	283-0238-00			0.01 μ F, Cer, 50 V, 10%
C205	283-0203-00			0.47 μ F, Cer, 50 V
C206	283-0238-00			0.01 μ F, Cer, 50 V, 10%
C209	281-0546-00			330 pF, Cer, 500 V, 10%
C218	290-0244-00			0.47 μ F, Elect., 35 V, 5%
C237	283-0076-01			27 pF, Cer, 500 V, 10%
SEMICONDUCTOR DEVICE, DIODES				
CR225 ¹	150-1001-00			Light emitting, 2 V, 70 mA
CR236 ¹				Light emitting
CR237 ¹				Light emitting
CR238 ¹				Light emitting
CR239 ¹				Light emitting
VR231	152-0395-00			Zener, replaceable by 1N749A, 400 mW, 4.3 V, 5%
CONNECTORS				
J201	131-0282-00			Bulkhead, receptacle
J205	131-0407-00			Jack, telephone
J237	131-0407-00			Jack, telephone
P237	134-0079-00			Plug
TRANSISTORS				
Q202	151-0192-00			Silicon, NPN, selected from MPS6521
Q208	151-0220-00			Silicon, PNP, replaceable by 2N4122
Q212	151-0503-00			Silicon, SCR, replaceable by 2N5060
Q218	151-0508-00			Silicon, unijunction, replaceable by X13T520 or selected from D13T1
Q220	151-0220-00			Silicon, PNP, replaceable by 2N4122
Q225	151-0503-00			Silicon, SCR, replaceable by 2N5060
Q237	151-0220-00			Silicon, PNP, replaceable by 2N4122
RESISTORS				
R201	317-0473-00			47 k Ω , 1/8 W, 5%
R202	317-0202-00			2 k Ω , 1/8 W, 5%
R206	317-0106-00			10 M Ω , 1/8 W, 5%
R207	317-0104-00			100 k Ω , 1/8 W, 5%
R208	317-0104-00			100 k Ω , 1/8 W, 5%
R212	317-0101-00			100 Ω , 1/8 W, 5%
R213	315-0222-00			2.2 k Ω , 1/4 W, 5%
R215	321-0336-00			30.9 k Ω , 1/8 W, 1%
R216	321-0354-00			47.5 k Ω , 1/8 W, 1%

¹Furnished as a unit with DIFFUSER ASSEMBLY (See Mechanical Parts List).

Electrical Parts List—WSEN

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	No. Disc	Description
RESISTORS (cont)				
R218	321-0481-00			1 M Ω , 1/8 W, 1%
R221	317-0273-00			27 k Ω , 1/8 W, 5%
R222	317-0102-00			1 k Ω , 1/8 W, 5%
R225	315-0152-00			1.5 k Ω , 1/4 W, 5%
R231	317-0472-00			4.7 k Ω , 1/8 W, 5%
R235	311-1262-00			750 Ω , Var
R236	317-0121-00			120 Ω , 1/8 W, 5%
R237	311-1032-00			2 k Ω , Var
SWITCHES				
S205	260-0735-00			Push, SPST, MAN. TRIG.
S237	260-0960-00			Slide, miniature, ON/OFF

FIGURE 1 EXPLODED





MECHANICAL PARTS LIST

Replacement parts should be ordered from the Tektronix Field Office or Representative in your area. Changes to Tektronix products give you the benefit of improved circuits and components. Please include the instrument type number and serial number with each order for parts or service.

ABBREVIATIONS

BHB	binding head brass	h	height or high	OHB	oval head brass
BHS	binding head steel	hex.	hexagonal	OHS	oval head steel
CRT	cathode-ray tube	HHB	hex head brass	PHB	pan head brass
csk	countersunk	HHS	hex head steel	PHS	pan head steel
DE	double end	HSB	hex socket brass	RHS	round head steel
FHB	flat head brass	HSS	hex socket steel	SE	single end
FHS	flat head steel	ID	inside diameter	THB	truss head brass
Fil HB	fillister head brass	lg	length or long	THS	truss head steel
Fil HS	fillister head steel	OD	outside diameter	w	wide or width

FIGURE 1 EXPLODED

Fig. & Index No.	Tektronix Part No.	Serial/Model No.		Q f y	Description
		Eff	Disc		
1-	016-0280-00			1	WRITING RATE ENHANCER (C-12/27)
	016-0284-00			1	WRITING RATE ENHANCER (C-30A/31)
	016-0278-00			1	WRITING RATE ENHANCER (C-50)
	016-0279-00			1	WRITING RATE ENHANCER (C-51)
	016-0298-00			1	WRITING RATE ENHANCER (C-59)
	- - - - -			-	each assembly includes:
	016-0289-00			1	POWER SUPPLY
	- - - - -			-	power supply includes:
-1	366-1362-00			1	KNOB, charcoal
	- - - - -			-	knob includes:
	213-0153-00			1	SETSCREW, 5-40 x 0.125 inch, HSS (not shown)
-2	- - - - -			1	RESISTOR, variable
	- - - - -			-	mounting hardware: (not included w/resistor)
-3	210-0583-00			2	NUT, hex., 0.25-32 x 0.312 inch
-4	210-0940-00			1	WASHER, flat, 0.25 ID x 0.375 inch OD
-5	210-0046-00			1	WASHER, lock, internal, 0.261 ID x 0.40 inch OD
-6	260-0735-00			1	SWITCH, push, w/hardware--MAN TRIG
-7	131-0407-00			1	CONNECTOR, telephone jack, w/hardware
-8	131-0282-00			1	CONNECTOR, bulkhead receptacle, w/hardware
	- - - - -			-	mounting hardware: (not included w/connector)
-9	210-0223-00			1	TERMINAL, lug, 0.25 inch diameter, SE
-10	333-1462-00			1	PANEL, front
-11	260-0960-00			1	SWITCH, slide--OFF ON
-12	380-0247-00			1	HOUSING
-13	348-0102-00			ft	PAD, cushioning, 0.125 feet
-14	179-1725-00			1	CABLE HARNESS
-15	213-0034-00			2	SCREW, tap, 4-40 x 0.312 inch, PHS
-16	210-0906-00			2	WASHER, fiber, 0.125 ID x 0.203 inch OD

FIGURE 1 EXPLODED (cont)

Fig. & Index No.	Tektronix Part No.	Serial/Model No.		Q † y	Description
		Eff	Disc		
1-17	- - - - - ¹			1	CIRCUIT BOARD ASSEMBLY--MAIN
	- - - - -			-	circuit board assembly includes:
	388-2303-00			1	CIRCUIT BOARD
-18	131-0407-00			1	CONNECTOR, telephone jack, w/hardware
	- - - - -			-	mounting hardware: (not included w/connector)
-19	210-0910-00			1	WASHER, fiber, 0.313 ID x 0.188 inch OD
-20	136-0252-04			21	SOCKET, pin connector
-21	131-1160-00			2	BATTERY CLIP
-22	386-2046-00 ^{2,3,4}			1	PLATE, mounting
	- - - - -			-	mounting hardware: (not included w/plate)
	211-0007-00			2	SCREW, 4-40 x 0.188 inch, PHS (not shown)
-23	213-0012-00			4	SCREW, 4-40 x 0.375 inch, 100° csk, PHS
-24	407-1018-00 ⁵			1	PLATE, mounting
	- - - - -			-	mounting hardware: (not included w/plate)
	213-0034-00			4	SCREW, thread forming, 4-40 x 0.312 inch, PHS
-25	407-0103-00 ⁶			1	PLATE, mounting
	- - - - -			-	mounting hardware: (not included w/plate)
	213-0034-00			4	SCREW, thread forming, 4-40 x 0.312 inch, PHS
	211-0018-00			2	SCREW, 2-56 x 0.25 inch, PHS
-26	337-1606-00 ⁶			1	DIFFUSER ASSEMBLY
-27	337-1603-00 ^{4,5}			1	DIFFUSER ASSEMBLY
-28	337-1604-00 ²			1	DIFFUSER ASSEMBLY
	337-1605-00 ³			1	DIFFUSER ASSEMBLY
-29	012-0339-00 ^{2,3,4}			1	CABLE, interconnecting, 1.5 feet long
-30	012-0340-00			1	CABLE, interconnecting, 2.5 feet long
-31	012-0364-00 ^{5,6}			1	CABLE, interconnecting, 9.50 inches long

STANDARD ACCESSORIES

070-1196-01 1 MANUAL, instruction (not shown)

¹See Electrical Parts List for part number.
²016-0278-00 only.
³016-0279-00 only
⁴016-0290-00 only
⁵016-0284-00 only
⁶016-0280-00 only