Instruction Manual and Experiment Guide for the PASCO scientific Model SF-9211

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5/94

STROBOSCOPE

$5.00

PASCO® scientific

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The lightning flash with arrowhead, within an equilateral triangle, is intended to alert the user of the presence of uninsulated "dangerous voltage" within the product's enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.

CAUTION

RISK OF ELECTRIC SHOCK DO NOT OPEN

CAUTION:
TO PREVENT THE RISK OF ELECTRIC SHOCK, DO NOT REMOVE BACK COVER. NO USER SERVICEABLE PARTS INSIDE. REFER SERVICING TO QUALIFIED SERVICE PERSONNEL.

The exclamation point within an equilateral triangle is intended to alert the user of the presence of important operating and maintenance (servicing) instructions in the literature accompanying the appliance.

Table of Contents

Copyright, Warranty and Equipment Return

Please—Feel free to duplicate this manual subject to the copyright restrictions below.

Copyright Notice

Limited Warranty

PASCO scientific warrants this product to be free from defects in materials and workmanship for a period of one year from the date of shipment to the customer. PASCO will repair or replace, at its option, any part of the product which is deemed to be defective in material or workmanship. This warranty does not cover damage to the product caused by abuse or improper use. Determination of whether a product failure is the result of a manufacturing defect or improper use by the customer shall be made solely by PASCO scientific. Responsibility for the return of equipment for warranty repair belongs to the customer. Equipment must be properly packed to prevent damage and shipped postage or freight prepaid. (Damage caused by improper packing of the equipment for return shipment will not be covered by the warranty.) Shipping costs for returning the equipment, after repair, will be paid by PASCO scientific.

Credits

This manual edited by: Dave Griffith

Equipment Return

Should the product have to be returned to PASCO scientific for any reason, notify PASCO scientific by letter, phone, or fax BEFORE returning the product. Upon notification, the return authorization and shipping instructions will be promptly issued.

➤ **NOTE:** NO EQUIPMENT WILL BE ACCEPTED FOR RETURN WITHOUT AN AUTHORIZATION FROM PASCO.

When returning equipment for repair, the units must be packed properly. Carriers will not accept responsibility for damage caused by improper packing. To be certain the unit will not be damaged in shipment, observe the following rules:

① The packing carton must be strong enough for the item shipped.

② Make certain there are at least two inches of packing material between any point on the apparatus and the inside walls of the carton.

③ Make certain that the packing material cannot shift in the box or become compressed, allowing the instrument come in contact with the packing carton.

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Introduction

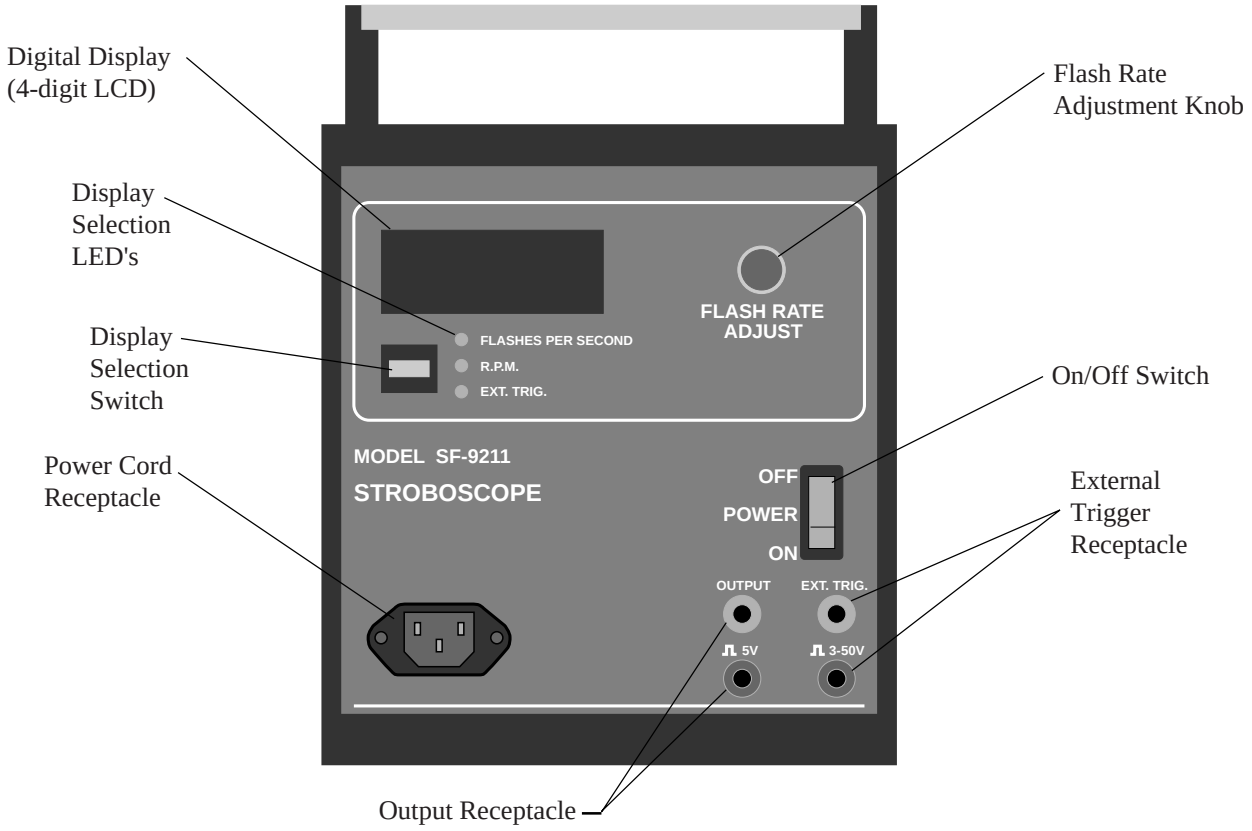
The PASCO Model SF-9211 Stroboscope provides sufficient white light for strobe photography and for "stopping the motion" during laboratory experiments. The light is produced with a Xenon flash tube in a 14cm diameter polished reflector. Flash rate is adjustable from 1-300 flashes per second and a digital display reads the flash rate in either flashes per second or in RPM. For added convenience, a threaded hole (1/4-20 UNC-2B) is provided in the bottom of the unit for mounting the stroboscope onto a tripod.

A variety of special features enhance the utility of this stroboscope. For situations requiring synchronized flashes to large or isolated areas (e.g. separate rooms), it is possible to synchronize the strobe flashes of a number of Model SF-9211 Stroboscopes. Each stroboscope produces a 5 volt output pulse with every flash. This output may be used as an external trigger that will cause a simultaneous flash in a second stroboscope. By using the output signal from each stroboscope to trigger the strobe flashes of another unit, any number of stroboscopes may be synchronized.

The ability of the stroboscope to respond to an external trigger also allows strobe flashes to be synchronized with some external event. This feature can be used to provide automatic adjustment of the flash rate in response to rate changes in the event being observed. It can also insure a photograph is taken at a critical instant when performing strobe photography.

To trigger the stroboscope from an external event, a 3-50 volt pulsed signal will trigger the stroboscope.

Features



Operation

General Operations

Plug in the stroboscope to a standard 117 volt outlet using the supplied power cord. Flip the power switch to ON. The power switch will light, the stroboscope will begin flashing, and the display will read the flash rate in flashes per second. To vary the flash rate, turn the FLASH RATE ADJUST knob located to the right of the display (clockwise increases the rate; counterclockwise decreases the rate).

The LEDs below the display indicate the mode of operation. When the unit is turned on, the top LED will always light, indicating the display is reading in flashes per second. Pressing the switch located to the left of the LEDs changes the display units to RPM. Pressing the switch again will change the mode to External Trigger. In this mode the stroboscope will only flash if an appropriate external trigger is provided. Pressing the switch a third time will return the stroboscope to automatic flash with the display reading in flashes per second.

Using The External Trigger

As already mentioned, the external trigger can be used to synchronize the strobe flashes with another stroboscope or with some external event. Banana plug connectors are provided for hookups operating in this mode. As labeled on the control panel of the stroboscope, the output signal is a 5 volt pulse and the external trigger requires a pulse from 3-50 volts. (As is standard, the black connectors are a common ground.)

To trigger the stroboscope from an external event it is necessary to provide a 3-50 volt pulse that is coupled with the event. Connect this input to the EXT. TRIG. connectors on the control panel of the stroboscope. (Connect the signal to the red connector, the signal ground to the black.) Turn on the stroboscope and switch it to the External Trigger mode. The stroboscope will now flash on the descending edge of every trigger pulse.

When operating in external trigger mode, the display shows the flash rate in flashes per second. Since the unit must count the flashes over each one second period, the flash rate is given only to the nearest integer. (The flash rate reading in this mode is only accurate for flash rates of at least 10 flashes per second.)

To synchronize the flashes of two stroboscopes, simply use the OUTPUT signal from one stroboscope to supply the external trigger for the second. If more than two synchronized stroboscopes are needed, the output from the second may be used to trigger a third, and so on. A daisy-chain of stroboscopes hooked up in this manner will all flash simultaneously in sync with a flash from the first. The flash rate of the first stroboscope may be adjusted manually , or it may be coupled to some other external trigger.

Using The Stroboscope as a Tachometer

The stroboscope offers an easy method for accurately measuring the frequency of rotation of a mechanical system. To do this, mark a convenient point on the rotating device. Beginning with a flash rate that is clearly higher than the frequency of the rotating device, adjust the flash rate until the mark on the device appears stationary. The stroboscope display will then show the frequency of rotation. (If the initial flash rate is not clearly higher than the frequency of rotation, care must be taken, as the mark will appear stationary whenever the frequency of rotation is a higher harmonic of the flash rate.)

Maintenance

➤**WARNING:** High voltages are involved in the normal functioning of this unit. Troubleshooting should be performed only by trained personnel. Please contact PASCO scientific if service is required.

This stroboscope should provide long and trouble free service. It should be cleaned periodically, using a non-abrasive cleaner to avoid scratching the plastic window. Beyond this, no regular maintenance is required.

Should the power switch fail to light when the stroboscope is turned on , there may be a blown fuse (Over time, the power switch may begin to flicker when it is turned on. This does not affect the function of the stroboscope). To replace the fuse, turn off and unplug the stroboscope. Remove the four screws that attach the left side panel of the unit (facing the control panel). Remove the side panel. The fuse is located near the bottom left corner of the printed circuit board, facing the display side of the unit. If the fuse is blown, replace it with a similar 250 mA fuse.

Specifications

Size: 24x18x12 cm.

Power Requirements: 117 VAC, 60HZ

Flash Rate: 1-300 flashes per second: 60-18,000 RPM

Flash Energy (Joules): 1-16 Hz = 1.47
16-64 Hz = 0.18
64-300 Hz = 0.033

Current Pulse Width: 5µs

Arc Length (electrode spacing): = 80mm

Bore Diameter (I.D. of flash tube): = 6.0mm

Tube Life: 250 hours/270 million flashes

Sync Signals:

Output Signal: 5-7 Volt pulse

External Trigger Requirements: 3-50 Volt; Triggers on falling edge of pulse

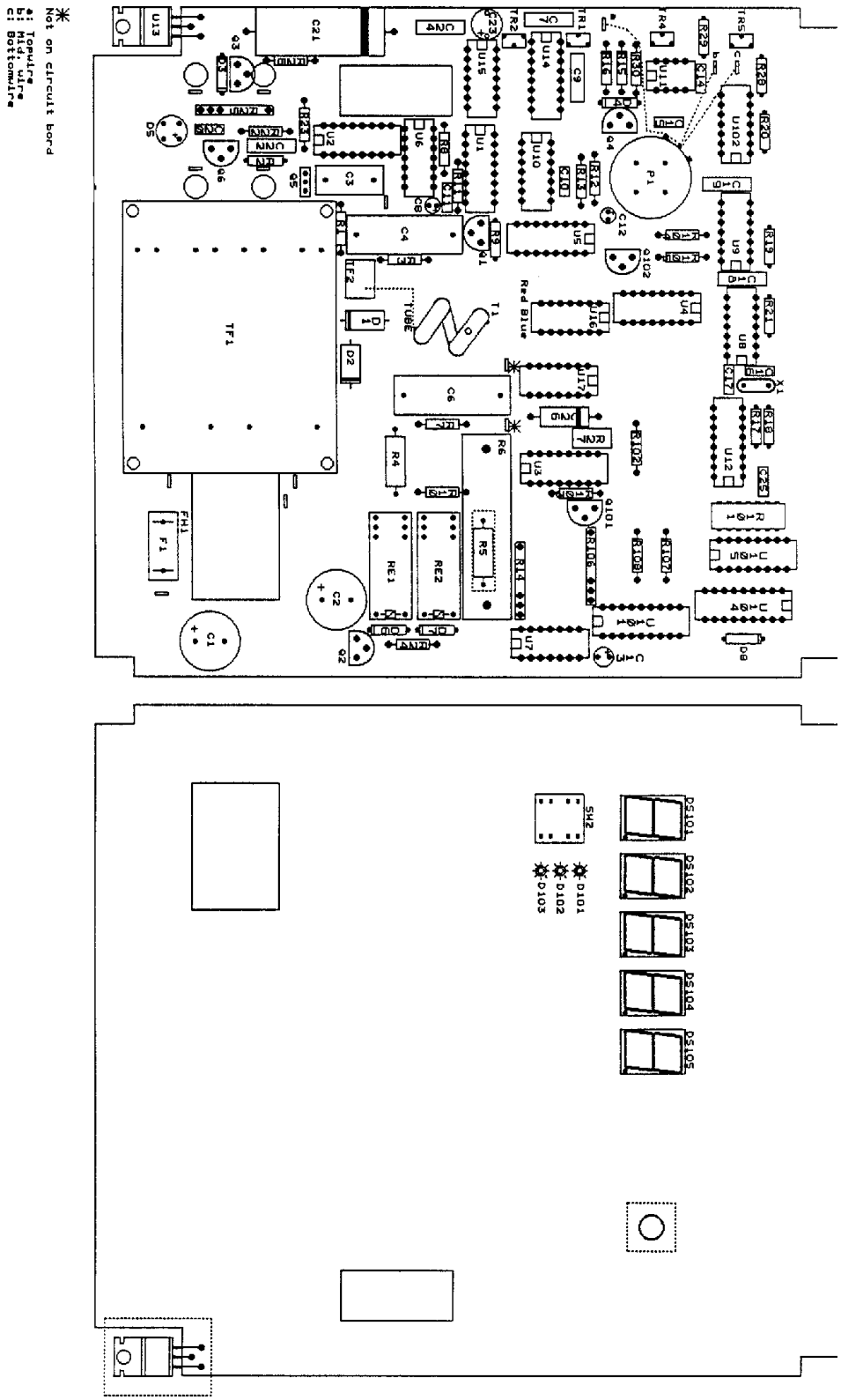
Equipment Included: Power cord, Instruction manual

➤**NOTE:** The stroboscope undergoes two changes in flash intensity: one at approximately 16 Hz and the second at approximately 64 Hz. The overall light output, however, will remain constant.

Parts List

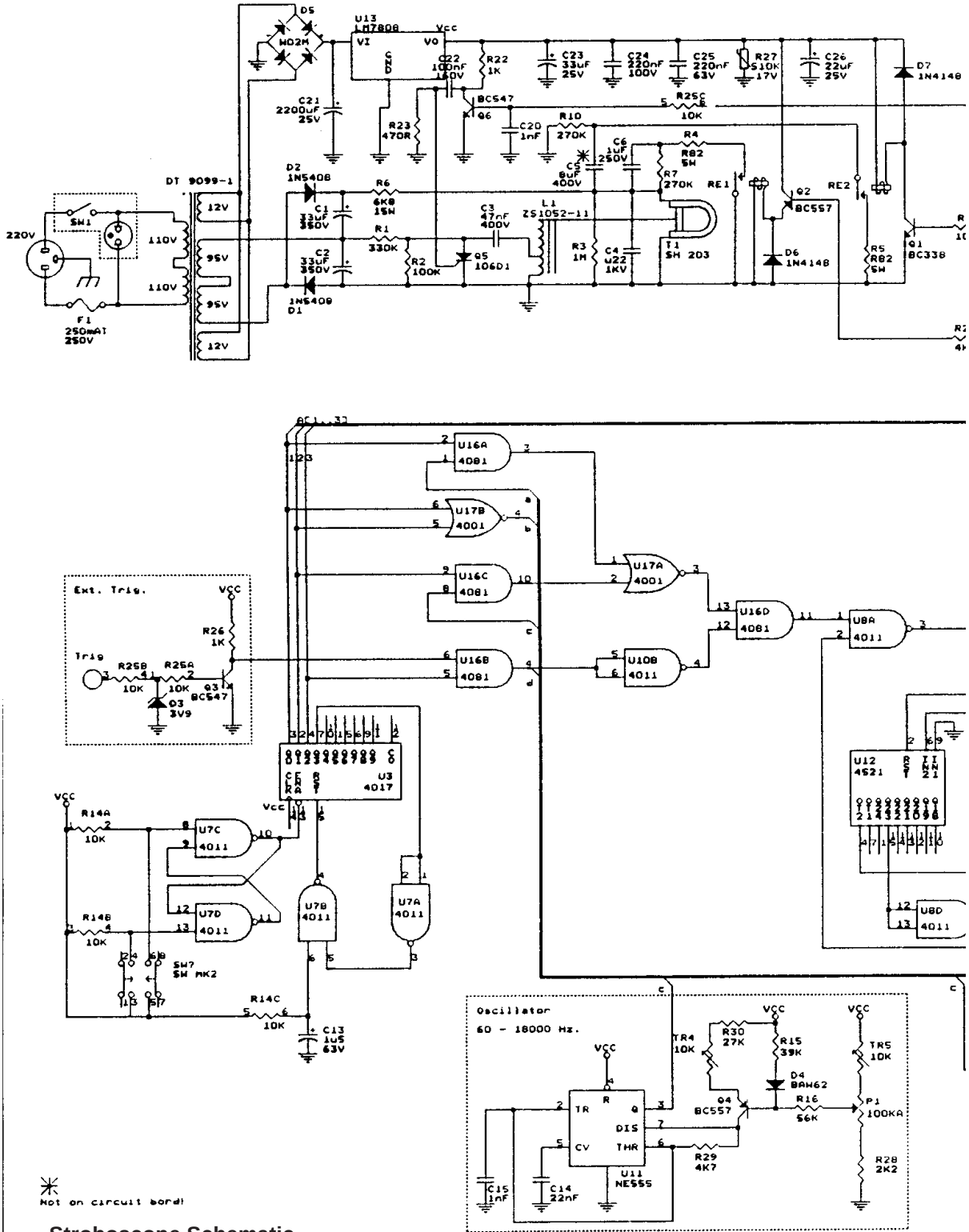
Item No.	Quantity	Reference	Part
1	2	C1,C2	33µF 350V
2	1	C3	47nF 400V
3	1	C4	µ22 1KV
4	1	C5	8µF 400V
5	1	C6	1µF 250V
6	3	C7, C19, C22	100nF 160V
7	3	C8, C12, C13	1µ5 63V
8	2	C9, C24	220nF 100V
9	4	C10, C11, C15, C20	1nF
10	1	C14	22nF
11	2	C16, C17	27pF
12	1	C18	100nF 100V
13	1	C21	2200µF 25V
14	1	C23	33µF 25V
15	1	C25	220nF 63V
16	1	C26	22µF 25V
17	2	D1, D2	1N5408
18	1	D3	3V9
19	1	D4	BAW62
20	1	D5	W02M
21	2	D6, D7	1N4148
22	1	F1	250mAT 250V
23	1	J1	777
24	1	LAMP A	LAMP
25	1	L1	ZS1052-11
26	1	P1	100KA POT
27	1	Q1	BC338
28	2	Q2, Q4	BC557
29	2	Q3, Q6	BC547
30	1	Q5	106D1
31	2	RE1, RE2	A 002 43 05
32	1	R1	330K
33	1	R2	100K
34	1	R3	1M
35	2	R4, R5	R82 5W
36	1	R6	6K8 15W
37	2	R7, R10	270K
38	9	TR4, R8, R9, R11, R12, R13, R19, R20, R21	10K
39	2	R14, R25	10K SIL
40	1	R15	39K
41	1	R16	56K
42	1	R17	18M
43	1	R18	6K8
44	2	R22, R26	1K
45	1	R23	470Ω
46	2	R24, R29	4K7
47	1	R27	S10K 17V
48	1	R28	2K2
49	1	R30	27K
50	1	SW?	SW MK2
51	1	SW1	c5403f
52	2	TERMINAL B, TERMINAL A	TERMINAL
53	1	TF1	DT 9099-1 (220V)
	1	TF1	NT 15293 (117V)
54	1	TR1	4M7 TRIM
55	1	TR2	1M TRIM
56	1	TR5	10K TRIM
57	1	T1	SH 203
58	2	U1, U2	4040
59	3	U3, U4, U5	4017
60	5	U6, U7, U8, U9, U10	4011
61	1	U11	NE555
62	1	U12	4521
63	1	U13	LM7808
64	1	U14	4528
65	1	U15	4071
66	1	U16	4081
67	1	U17	4001
68	1	X1	4194.304
69	5	DS101, DS102, DS103 DS104, DS105	HDSP 5301
70	1	D8	3V3
71	3	D101, D102, D103	LED
72	2	Q101, Q102	BC547
73	1	R101	150Ω
74	1	R102	120Ω
75	2	R103, R104	10K
76	1	R105	1K
77	3	R106, R107, R108	470Ω
78	1	U101	2981A
79	1	U102	4013
80	1	U103	74C926
81	1	U105	2003

Component Layout



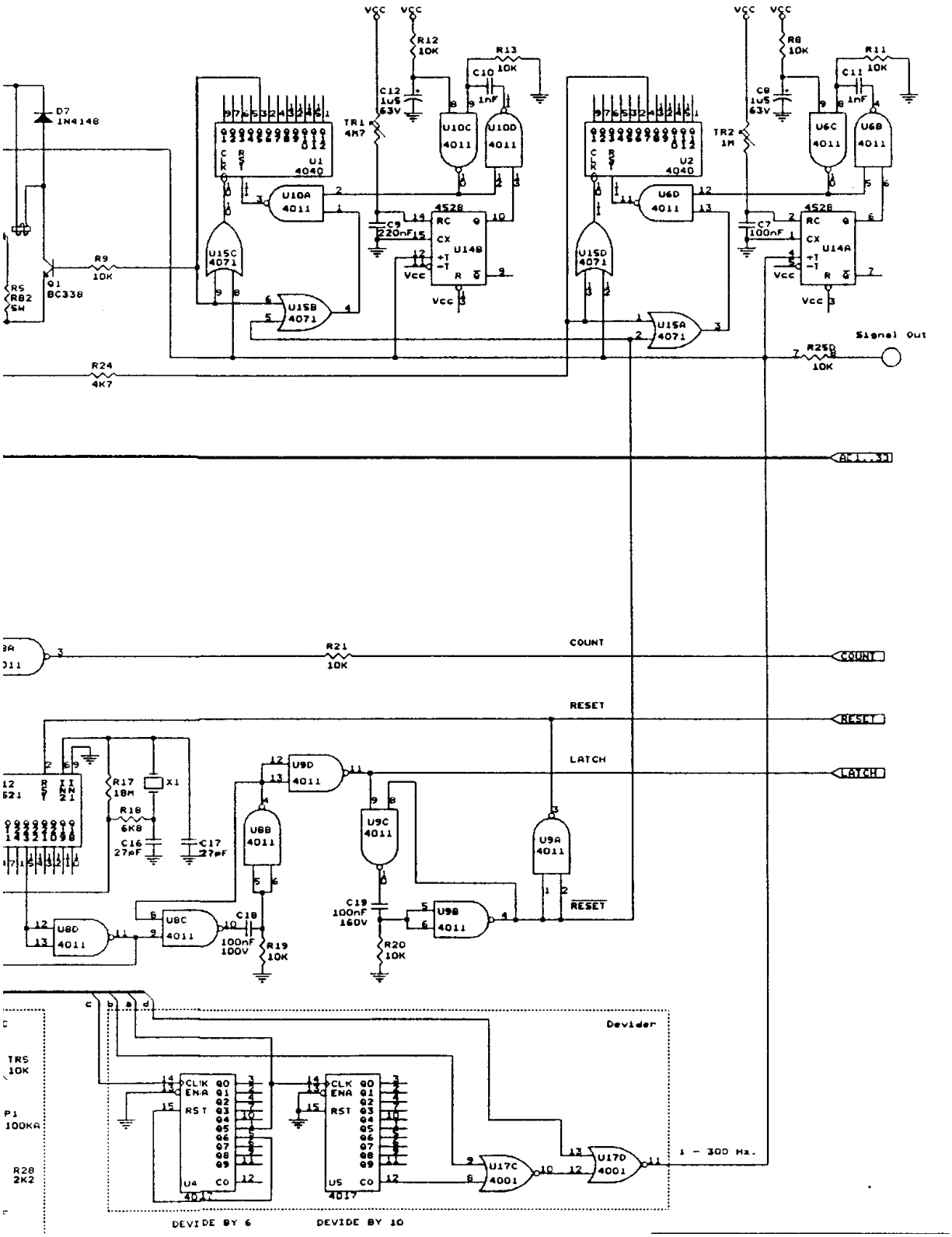
Position of Components
(Dwg. #952-02110)

Schematic



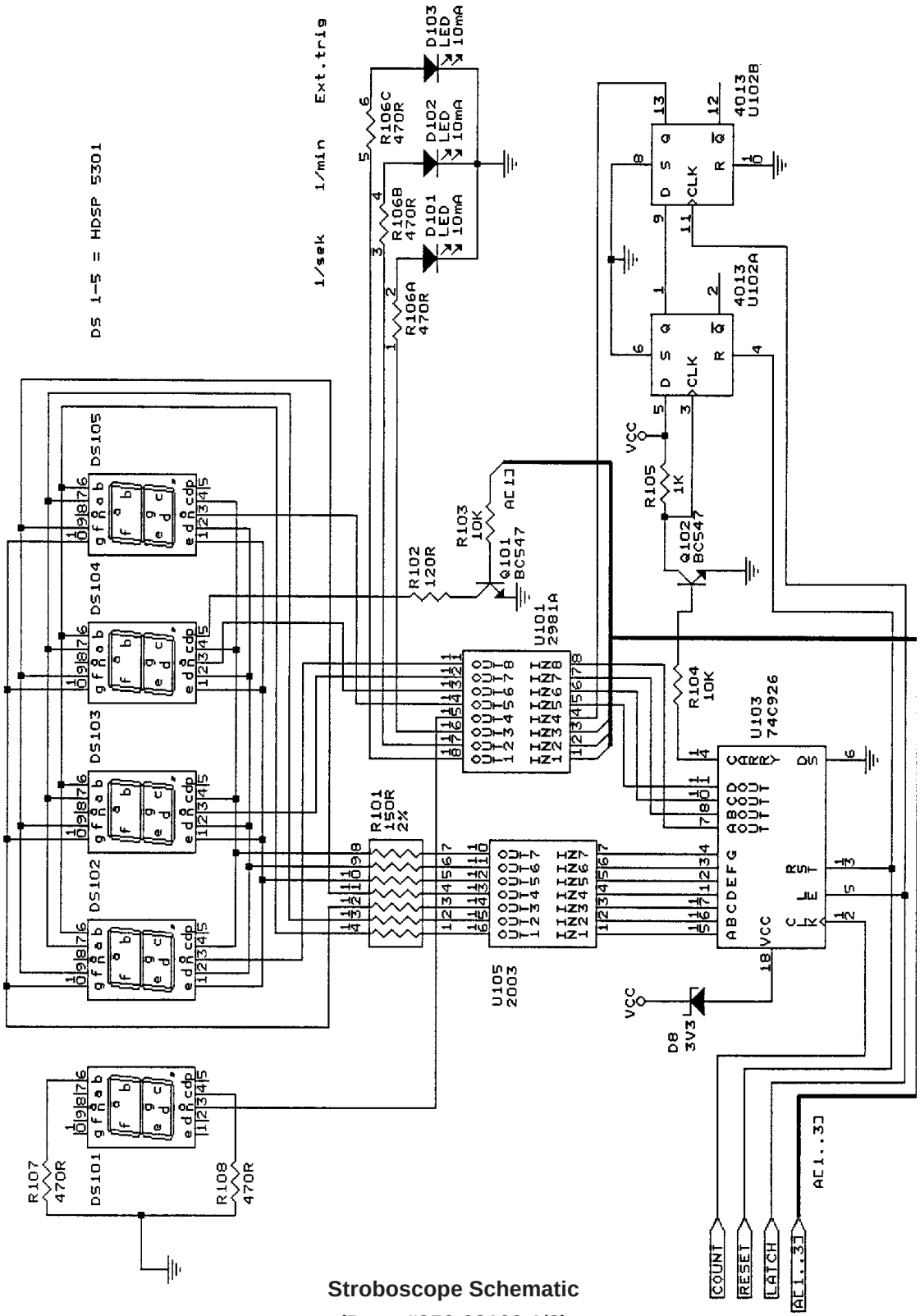
Stroboscope Schematic
(Dwg. #956-02109 1/2)

PASCO scientific



Stroboscope Schematic
(Dwg. #956-02109 2/2)

Schematic LED



Stroboscope Schematic
(Dwg. #956-02109 1/2)

Technical Support

Feed-Back

If you have any comments about this product or this manual please let us know. If you have any suggestions on alternate experiments or find a problem in the manual please tell us. PASCO appreciates any customer feed-back. Your input helps us evaluate and improve our product.

To Reach PASCO

For Technical Support call us at 1-800-772-8700 (toll-free within the U.S.) or (916) 786-3800.

Contacting Technical Support

Before you call the PASCO Technical Support staff it would be helpful to prepare the following information:

- If your problem is with the PASCO apparatus, note:

  Title and Model number (usually listed on the label).

  Approximate age of apparatus.

  A detailed description of the problem/sequence of events. (In case you can't call PASCO right away, you won't lose valuable data.)

  If possible, have the apparatus within reach when calling. This makes descriptions of individual parts much easier.

- If your problem relates to the instruction manual, note:

  Part number and Revision (listed by month and year on the front cover).

  Have the manual at hand to discuss your questions.