MANUAL SUPPLEMENT

TEKTRONIX®

7B53A/7B53AN

DUAL TIME BASE

OPTION 5

INSTRUCTION MANUAL

Tektronix, Inc. P.O. Box 500 Beaverton, Oregon 97005
070-1471-00

WARRANTY

This Tektronix product is warranted against defective materials and workmanship, under normal use, for a period of one year from date of initial shipment. Tektronix will repair or replace, at its option, those products determined to be defective within the warranty period and returned, freight prepaid, to a Tektronix Service Center. There is no implied warranty for fitness of purpose.

Please direct all requests for service or replacement parts to the nearest Tektronix Service Center or Field Office; include the type or part number of the product and its serial number.

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SPECIFICATION

General Information

The TV Sync Separator permits TEKTRONIX real-time oscilloscopes to display composite video signals. The TV Sync Separator clips video information from the incoming video signal; then, it amplifies and separates the field or vertical trigger pulses from the line or horizontal trigger pulses. Line rate or field rate trigger pulses are provided depending on the position of the front panel switch.

This manual insert describes the special features of the 7B53A/7B53AN OPTION 5 plug-in unit which has been modified to enable triggering on composite video signals through the use of a Sync Separator circuit. The EXT ÷ 10 and LINE positions of the Main Triggering Amplifier SOURCE switch have been replaced by the TV FIELD and TV LINE switch positions, allowing the sweeps to be triggered by the output of the Sync Separator circuit at a Field or Line Rate. The delayed sweep circuit has TV LINE/EXT or INT/EXT SOURCE triggering capability, depending on whether the connection is made to P903 or P904.

Compatability

The TV Sync Separator can be used with 7400, 7500, 7600, 7700, and 7900-Series real time TEKTRONIX oscilloscopes.

External Graticules

External graticules for the main frame are available. Use the following information when ordering:

Main Frame	External Graticule
7403N-7603	CCIR Composite, Part No. 378-0684-04
	NTSC Composite, Part No. 378-0684-05
7500, 7700, 7900	CCIR Composite, Part No. 378-0625-05
	NTSC Composite, Part No. 378-0625-06

ELECTRICAL CHARACTERISTICS

Connector	Input or Output Signal
COMPOSITE VIDEO IN (2 Major Divisions)	Needs 2 major divisions peak-to-peak sync negative composite video signal.
FIELD RATE	A group of one to six pulses, whose minimum amplitude is 2 V negative, shall re-occur at a field rate. The width of each individual group of pulses shall not exceed 3H.
LINE RATE	The line trigger pulses available shall have a clean leading edge and a minimum amplitude of 180 mV negative.

SYSTEM CHARACTERISTICS

Compatibility	Compatible with V and H sync signals of standard 405, 625, 819 Line/50 Hz, and 525 Line/60 Hz broadcast systems; 405 to 1201 Line closed circuit systems.
Trigger Sensitivity	2 major divisions or more will provide stable V or H triggering.

OPERATING INSTRUCTIONS

Introduction

This section describes using the TV Sync Separator portion of the time base plug-in unit.

Using the TV Sync Separator Plug-In

a. Connect a coaxial cable from the oscilloscope vertical signal input connector to a composite video signal source of such amplitude as to produce at least 2 major divisions of vertical deflection.

b. Set the oscilloscope Main Triggering Amplifier SOURCE switch to TV FIELD and the SLOPE switch to –.

c. Refer to the information under Obtaining a Display in this section to obtain a display.

Adjusting the CLIPPING LEVEL Control (R914)

NOTE

If the input amplitude of the composite video changes, it may be necessary to readjust the CLIPPING LEVEL control (R914).

a. Connect the composite video as described under the heading Using the TV Sync Separator Plug-In.

b. Turn the CLIPPING LEVEL control (R914) fully clockwise.

c. Set the oscilloscope controls to obtain the desired video display.

d. Slowly rotate the CLIPPING LEVEL control (R914) counterclockwise until a point is found where the most stable video display results.

Obtaining a Display

Install the TV Sync Separator Plug-In in the oscilloscope as described under Using the TV Sync Separator. The following instructions apply for the 7B53A/7B53AN OPTION 5 plug-in unit.

Set the 7B53A/7B53AN OPTION 5 controls as follows:

Main Triggering Amplifier

SLOPE	–
MODE	AUTO
COUPLING	DC
SOURCE	TV FIELD

Main Time Base

TIME/DIV	2 ms
MAG	X1

TWO FIELD DISPLAY

To obtain a two field display, adjust the LEVEL control to obtain a triggered display. The TIME/DIV VARIABLE control may be adjusted to obtain a display of slightly less than two fields.

LINE DISPLAYS

1. Variable Line Selector. To obtain Variable Line Selector capabilities, the DLY'D TRIG control must be set to the RUNS AFTER DLY TIME position. Pull the TIME/DIV knob outward and rotate the knob to the desired time/div position (10 μs). Rotate the DELAY TIME MULT control to the desired portion of the waveform. Push the TIME/DIV knob in and the desired portion of the waveform will be displayed. The delayed sweep is free running in this mode of operation.

2. Discrete Line Selector. For Discrete Line Selector capability, place the Delayed Sweep Triggering SOURCE switch in TV LINE position. Rotate the DLY'D TRIG control out of the RUNS AFTER DLY TIME position and set the control to obtain a triggered sweep. Rotate the DELAY TIME MULT control until the desired line is displayed. When rotating the DELAY TIME MULT control, the display will jump from line to line.

3. Main Triggering Amplifier TV Line. Set the TIME/DIV switch to 10 μs and check that the Main Triggering Amplifier SOURCE switch is set to TV LINE. Adjust the LEVEL control to obtain a stable display at the H rate.

DELAYED INTERNAL TRIGGER OPTION

The Delayed Sweep Triggering SOURCE selection may be changed from TV LINE/EXT to INT/EXT or vice versa. For INT/EXT triggering source capability, move the coaxial connector from P903 to P904 and change the pushbutton to read INT/EXT. The pushbutton is stored on the TV Sync Separator board.

CIRCUIT DESCRIPTION

A composite video signal from 0.1 volt peak to peak to 4 volts peak to peak must be supplied to P900 (COMPOSITE VIDEO IN) connector to obtain the required triggers from the main frame instrument. From TP900 the composite video signal passes through a clipping circuit composed of emitter follower Q904, clipping amplifier Q908 and associated circuitry. The clipping circuit, whose clipping level is set by R914 (CLIPPING LEVEL), clips only the video from the composite video signal.

From the clipping circuit the remaining pulses of the composite video signal are amplified by Q920. The negative (line or horizontal sync) pulses present at the collector of Q920 pass through CR921 and C920 to P902 and P903. When the Main Triggering Amplifier SOURCE switch is set to TV LINE, the negative (line or horizontal sync) pulses are available in main trigger or delayed trigger.

The positive (field or vertical sync) pulses present at the collector of Q920 cannot pass through CR921; however, they and the negative (line or horizontal sync) pulses will pass through CR918 to the base of Q924. The negative pulses will pass through CR918 since, during the greater percentage of their duty cycle, the line or horizontal sync pulses are positive and will appear to CR918 as positive pulses.

The line or horizontal sync pulses are kept from getting through Q924 by the RC network of C926 and R926. During the line or horizontal sync pulse time, Q924 is kept cut off by the bias provided by C926. The charge across C926 is kept high by the high repetition rate of the line or horizontal sync pulses.

During the field or vertical sync pulse interval, C926 biases Q924 to cutoff only part of the time due to the relatively low repetition rate of the field or vertical sync pulses. The time that Q924 is allowed to conduct is such that every other field or vertical sync pulse will be amplified by Q924. The negative field or vertical trigger pulses present at the collector of Q924 are supplied through emitter follower Q932 and C932 to P901 (FIELD RATE) connector and to the TV FIELD pushbutton. The field or vertical trigger pulse group are available constantly at P901 for the Main Triggering Amplifier only.

C924, located in the collector circuit of Q924 and the base circuit of Q932, serves to filter out any line or horizontal sync pulses which may still be present. CR932 sets the bias on Q932.

CALIBRATION PROCEDURE

Optional Test Equipment

067-0601-00 Calibration Fixture (Television Test Signal Generator)

Plug-In Cards for 067-0601-00 Generator

067-5001-00	System A	405/50
067-5002-00	System M	525/60
067-5003-00	System B	625/50
067-5004-00	System E	819/50
067-5005-00	System F	819/50
067-5006-00	EIA Standard	729/60
067-5007-00	EIA Standard	875/60
067-5008-00	EIA Standard	945/60
067-5009-00	EIA Standard	1029/60
067-5010-00	EIA Standard	1201/60

CHECK/ADJUST PROCEDURE

1. Check TP900 Waveform

a. Connect a composite video signal to the vertical plug-in unit.

b. Set the 7B53A/7B53AN OPTION 5 controls as follows:

Main Triggering Amplifier

SLOPE	–
MODE	AUTO
COUPLING	DC
SOURCE	TV FIELD
MAIN TIME BASE	
MAG	X1
TIME/DIV	2 ms

c. Adjust the vertical deflection factor of the oscilloscope to obtain a 2 major division display. Adjust the 7B53A/7B53AN OPTION 5 Main Triggering Amplifier LEVEL control to obtain a triggered display.

d. Connect a 10X probe from the test oscilloscope to TP900 on the TV Sync Separator board. Connect a field drive signal from the signal generator to the test oscilloscope Ext Trig Input connector for use as an external trigger source.

e. Check for a normal video signal display on the test oscilloscope (same as signal from generator). Amplitude of the signal will vary with changes of input signal level.

NOTE

If the trigger pick-off circuit is overdriven or the plug-in Vertical Position control is rotated to its fully clockwise or counterclockwise position, the waveform may become distorted. If so, the sync separator will not function properly unless the display amplitude is 2 major divisions as described in part c of this step and the Vertical Position control is moved away from its extreme position.

2. Check TP926 Waveform and Adjust R914

a. Connect the 10X probe to TP926. Set the test oscilloscope controls to obtain a stable display.

b. Adjust the Clipping Level control R914 by rotating the control fully clockwise. Then, rotate the control counterclockwise until one or more negative-going pulses in a group are displayed on the test oscilloscope during the vertical sync pulse interval. The exact number of pulses is dependent on the television standard of the composite video signal being applied to the vertical plug-in unit. Fig. 1 shows a normal display obtained for the 525/60 television standard. The pulse amplitude is approximately 4 volts negative below the H pulses. If R914 is improperly adjusted, the H rate trigger will not be normal during the vertical sync pulse interval.

3. Check TP932 Waveform

a. Connect the 10X probe to TP932.

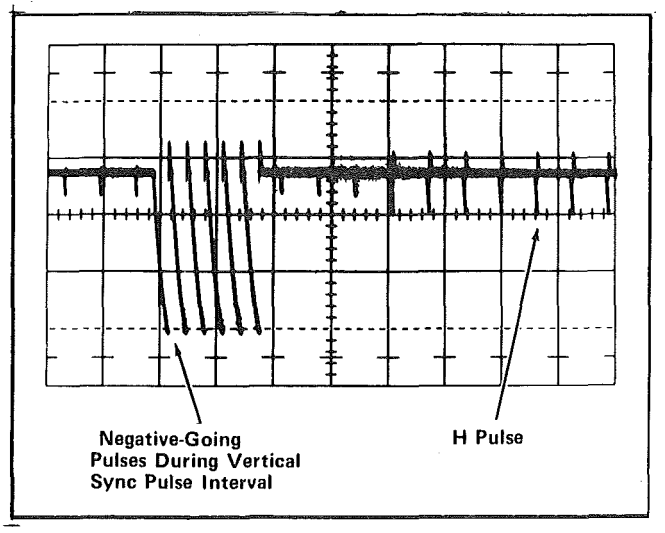


Fig. 1. Normal 525/60 waveform at TP926. Vertical deflection factor is 2 V/div; time/div is 50 μs.

b. Check for a test oscilloscope display of one or more negative-going pulses in a group during the vertical sync pulse interval. The number of pulses is dependent on the television standard composite video signal being applied to the plug-in unit. The pulse is very fast; approximately 0.1 μs in width at the 50% amplitude level. Full pulse amplitude is approximately 2.8 volts.

4. Check TP920 Composite Sync Waveform

a. Connect the 10X probe to TP920.

b. Check test oscilloscope display. The waveform should be negative-going composite sync occurring at the H rate; amplitude should be approximately 180 mV. All video, except burst, should be clipped off.

5. Check Sync Separator Operation

a. Apply various television standard composite video signals (domestic and closed circuit) to the plug-in unit.

NOTE

If desired, apply only those composite video signals that will be used at your facility.

b. With the 10X probe connected to TP920, check the test oscilloscope display for a proper waveform as described in step 4.

c. Disconnect the 10X probe.

6. Check Variable Line Selector Operation

a. Apply the desired composite video signal to the vertical plug-in unit.

b. Check that the 7B53A/7B53AN OPTION 5 Main Triggering Amplifier SOURCE switch is set to TV FIELD and the TIME/DIV switch is set to 2 ms. Set the TIME/DIV VARIABLE control to display slightly less than two fields. Adjust the Main Triggering LEVEL control to obtain a triggered display.

c. Set the 7B53A/7B53AN OPTION 5 DLY'D TRIG control to RUNS AFTER DLY TIME position. Set the Delayed Sweep Triggering controls as follows:

SLOPE	–
COUPLING	DC
SOURCE	TV LINE

d. Pull the DLY TIME knob outward and set the DLY TIME switch to the desired position (10 μs). Rotate the DELAY TIME MULT control to intensify the desired portion of the display. Then, push the DLY TIME knob in to view the intensified portion.

NOTE

In this mode of operation the delayed sweep is free running.

7. Check Discrete Line Selector Operation

a. Set the 7B53A/7B53AN OPTION 5 Main Triggering Amplifier SOURCE switch to TV LINE. Adjust the LEVEL control to obtain a triggered display.

b. Rotate the DLY'D TRIG control out of the RUNS AFTER DLY TIME position and adjust this control to obtain a triggered delayed sweep. Rotate the DELAY TIME MULT control to display the desired portion of the signal.

NOTE

In this mode of operation the displayed portion of the signal will jump from line to line as the DELAY TIME MULT control is slowly rotated.

8. Check Main Triggering Amplifier TV Line Operation

a. Set the TIME/DIV to 10 μs. Check that the Main Triggering Amplifier SOURCE switch is set to TV LINE.

b. Adjust the Main Triggering Amplifier LEVEL control to obtain a stable display at H rate.

9. Check Delayed Internal Trigger Operation

Move the coaxial cable connector from P903 to P904 on the TV sync separator board and change the Delayed Sweep Triggering SOURCE TV LINE pushbutton. The INT/EXT pushbutton is stored inside the 7B53A/7B53AN OPTION 5 plug-in unit on the TV Sync Separator board.

PARTS LIST

The following changes should be made to the appropriate parts list for this modified instrument. When ordering replacement parts specify instrument type, serial number, and mod number. Include the circuit number, part number, and description of the desired item.

*Parts identified by an asterisk are unique to this modified product and are not normally stocked.

Electrical Parts List

Capacitors

C900	Add	283-0092-00	0.03 μf	cer	200 V	+80% −20%
C904	Add	290-0517-00	6.8 μf	emt	35 V	
C908	Add	281-0550-00	120 pf	cer	500 V	10%
C920	Add	283-0092-00	0.03 μf	cer	200 V	+80% −20%
C924	Add	281-0511-00	22 pf	cer	500 V	10%
C926	Add	281-0605-00	200 pf	cer	500 V	
C929	Add	283-0010-00	0.05 μf	cer	50 V	
C932	Add	283-0092-00	0.03 μf	cer	200 V	+80% −20%

Diodes

CR908	Add	152-0075-00	Germanium	Tek Spec	
CR909	Add	152-0141-02	Silicon	1N4152	
CR912	Add	152-0141-02	Silicon	1N4152	
CR913	Add	152-0141-02	Silicon	1N4152	
CR916	Add	152-0195-00	Zener	1N751A	0.4 W, 5.1 V, 5%
CR917	Add	152-0075-00	Germanium	Tek Spec	
CR918	Add	152-0141-02	Silicon	1N4152	
CR920	Add	152-0195-00	Zener	1N751A	0.4 W, 5.1 V, 5%
CR921	Add	152-0075-00	Germanium	Tek Spec	
CR932	Add	152-0075-00	Germanium	Tek Spec	

Transistors

Q904	Add	151-0188-00	Silicon	2N3906
Q908	Add	151-0188-00	Silicon	2N3906
Q920	Add	151-0192-00	Silicon	Replaceable by MPS-6521
Q924	Add	151-0192-00	Silicon	Replaceable by MPS-6521
Q932	Add	151-0188-01	Silicon	Replaceable by 2N3251

Resistors

R900	Add	315-0221-00	220 Ω	1/4 W	5%
R904	Add	315-0563-00	56 k	1/4 W	5%
R905	Add	315-0471-00	470 Ω	1/4 W	5%
R907	Add	315-0681-00	680 Ω	1/4 W	5%
R908	Add	315-0203-00	20 k	1/4 W	5%

Resistors (cont)

R909	Add	315-0334-00	330 k	1/4 W	5%
R910	Add	315-0105-00	1 m	1/4 W	5%
R912	Add	315-0182-00	1.8 k	1/4 W	5%
R913	Add	315-0182-00	1.8 k	1/4 W	5%
R914	Add	311-1226-00	2.5 k	var	
R918	Add	315-0112-00	1.1 k	1/4 W	5%
R920	Add	315-0303-00	30 k	1/4 W	5%
R921	Add	315-0513-00	51 k	1/4 W	5%
R922	Add	315-0274-00	270 k	1/4 W	5%
R923	Add	315-0242-00	2.4 k	1/4 W	5%
R924	Add	315-0103-00	10 k	1/4 W	5%
R926	Add	315-0154-00	150 k	1/4 W	5%
R928	Add	315-0822-00	8.2 k	1/4 W	5%
R929	Add	315-0123-00	12 k	1/4 W	5%
R932	Add	315-0822-00	8.2 k	1/4 W	5%
R940	Add	315-0102-00	1 k	1/4 W	5%
R941	Add	315-0102-00	1 k	1/4 W	5%

Switch

S10	Change	670-1969-00	Main Trigger Source

Test Point

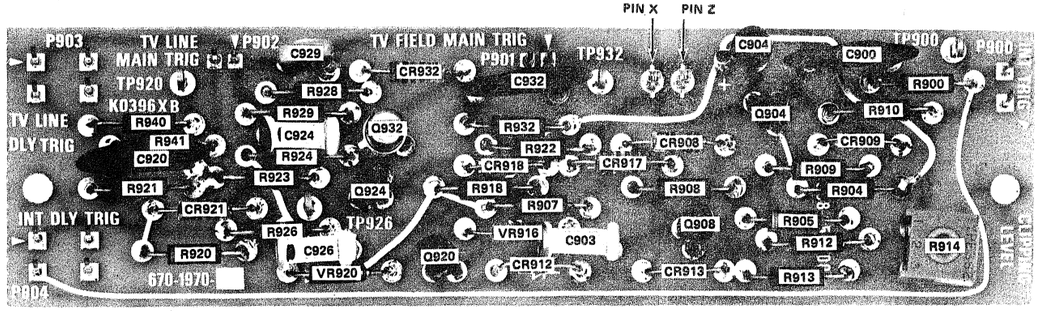
TP900	Add	214-0579-00
TP920	Add	214-0579-00
TP926	Add	214-0579-00
TP932	Add	214-0579-00

Mechanical Parts List

Post, Metallic	Add	5	129-0339-00
Front Panel	Change	1	333-1542-00
Identification Tag	Add	1	334-1377-00
Knob	Add	1	366-1257-00
Switch Trigger Source	Change	1	670-1969-00
E.C. Board, T.V. Sync Separator	Add	1	670-1970-00

Accessories

Manual, Option 5 Supplement	Add	1	070-1471-00



PARTIAL INTERFACE BOARD

P61

R 76

+15V

X

Z

C904 6.8μF

NO CONNECTION TO P83

R82

P70

P900

R67

INT TRIG

TP900

R900 220

C900 .03

Q904

R904 56K

R905 470

R909 330K

CR909

R910 1M

C908 120

R912 1.8K

CR912

CR913

R913 1.8K

R914 2.5K

CLIPPING LEVEL

Q908

R907 680

R908 20K

CR908

CR917

CR916 5.1V

R918 1.1K

CR918

R922 270K

R926 150K

Q924

C924 22

TP926

R924 10K

Q932

C926 200

R928 8.2K

R929 12K

C929 .05

CR932

R932 8.2K

C932 .03

TP932 [TV FIELD]

TV FIELD MAIN TRIG

P901

CR921

R920 30K

R921 51K

R923 2.4K

C920 .03

Q920

CR920 5.1V

TP920 [TV LINE]

R940 1K

R941 1K

TV LINE MAIN TRIG

P902

TV LINE DLY TRIG

P903

INT DLY TRIG

P904

S10 MAIN TRIG SOURCE

EXT

TV LINE

TV FIELD

INT

(RELEASE)

P10

(INT. TRIG. SIGNAL ON INTERFACE BOARD)

P14

P13

P11

FROM ① MAIN TRIG IN VIA R1

R15 47

P12

TO MAIN TRIG COUPLING SW S20 ①

MAIN TRIG SOURCE P.B. BOARD

TO P41 ④ DLY'D TRIG SOURCE SW S42

TV LINE / EXT

CUSTOMER OPTION

TO P41 ④ DLY'D TRIG SOURCE SW S42

INT / EXT

SEE PARTS LIST FOR SEMICONDUCTOR TYPES

TV SYNC SEPARATOR BOARD

7B53A/7B53AN OPTION 5

REV. B, DEC. 1976

WMW 12 71

TV SYNC SEPARATOR (PARTIAL TRIGGER PREAMP ①)

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.

SERVICE NOTE

Because of the universal parts procurement problem, some electrical parts in your instrument may be different from those described in the Replaceable Electrical Parts List. The parts used will in no way alter or compromise the performance or reliability of this instrument. They are installed when necessary to ensure prompt delivery to the customer. Order replacement parts from the Replaceable Electrical Parts List.

CALIBRATION TEST EQUIPMENT REPLACEMENT

Calibration Test Equipment Chart

This chart compares TM 500 product performance to that of older Tektronix equipment. Only those characteristics where significant specification differences occur, are listed. In some cases the new instrument may not be a total functional replacement. Additional support instrumentation may be needed or a change in calibration procedure may be necessary.

Comparison of Main Characteristics

DM 501 replaces 7D13		
PG 501 replaces 107	PG 501 - Risetime less than 3.5 ns into 50 Ω.	107 - Risetime less than 3.0 ns into 50 Ω.
108	PG 501 - 5 V output pulse; 3.5 ns Risetime	108 - 10 V output pulse 1 ns Risetime
PG 502 replaces 107		
108	PG 502 - 5 V output	108 - 10 V output
111	PG 502 - Risetime less than 1 ns; 10 ns Pretrigger pulse delay	111 - Risetime 0.5 ns; 30 to 250 ns Pretrigger pulse delay
PG 508 replaces 114	Performance of replacement equipment is the same or better than equipment being replaced.	
115		
2101		
PG 506 replaces 106	PG 506 - Positive-going trigger output signal at least 1 V; High Amplitude output, 60 V.	106 - Positive and Negative-going trigger output signal, 50 ns and 1 V; High Amplitude output, 100 V.
067-0502-01	PG 506 - Does not have chopped feature.	0502-01 - Comparator output can be alternately chopped to a reference voltage.
SG 503 replaces 190, 190A, 190B	SG 503 - Amplitude range 5 mV to 5.5 V p-p.	190B - Amplitude range 40 mV to 10 V p-p.
191		
067-0532-01	SG 503 - Frequency range 250 kHz to 250 MHz.	0532-01 - Frequency range 65 MHz to 500 MHz.
SG 504 replaces 067-0532-01	SG 504 - Frequency range 245 MHz to 1050 MHz.	0532-01 - Frequency range 65 MHz to 500 MHz.
067-0650-00		
TG 501 replaces 180, 180A	TG 501 - Trigger output-slaved to marker output from 5 sec through 100 ns. One time-mark can be generated at a time.	180A - Trigger pulses 1, 10, 100 Hz; 1, 10, and 100 kHz. Multiple time-marks can be generated simultaneously.
181		181 - Multiple time-marks
184	TG 501 - Trigger output-slaved to market output from 5 sec through 100 ns. One time-mark can be generated at a time.	184 - Separate trigger pulses of 1 and 0.1 sec; 10, 1, and 0.1 ms; 10 and 1 μs.
2901	TG 501 - Trigger output-slaved to marker output from 5 sec through 100 ns. One time-mark can be generated at a time.	2901 - Separate trigger pulses, from 5 sec to 0.1 μs. Multiple time-marks can be generated simultaneously.

NOTE: All TM 500 generator outputs are short-proof. All TM 500 plug-in instruments require TM 500-Series Power Module.