TRIGGER PULSE GENERATORS GE2/535 SERIES

Introduction

The GE2/535 series of generators accept either a mixed-sync or a video 1-volt p-p input: they produce trigger pulses at the start of selected lines on both odd and even fields together with a separate output of mixed-sync pulses. The GE2/535 and the GE2/535A are switchable 625-line and 405-line versions respectively. The GE2/535B is a non-switchable version which is suitable for use on either line-standard by selection of certain component values.

These generators have an input impedance greater than 10 kilohms and they require an input signal which has at least 0·2 volts p-p of sync pulses. The amplitude of the negative-going output trigger pulses is approximately 2 volts. The generator loads should be not less than 1 kilohm each.

The GE2/535 and the GE2/535A are constructed on a CH1/26B chassis and the GE2/535B is constructed on a CH1/26A chassis. All three versions use index-peg positions 19 and 23.

Operation

Front and rear panel controls of the GE2/535 and the GE2/535A are shown in Fig. 1. Note that the *Odd Fields* and the *Even Fields* switches are interchanged because of the way in which these fields are defined. With reference to Fig. 1.1 in Instruction V.1, *Field A* on the front panel refers to the fields with the lower line numbers and *Field B* refers to the fields with the higher line numbers.

A two-way soldered connection towards the front of the hinged panel controls the timing of the trigger pulses. With the link in position *Y—Z* the pulses occur at the start of line-sync pulses and with the link in position *X—Z* the pulses occur later (10·5 μs after the start of line-sync pulses in the 625-line versions and 15·7 μs after in the 405-line versions).

There are four trigger pulse outputs, the first of which is switchable to give either one, two or four pulses per picture period as shown in Table 1. The remaining outputs each give one pulse per picture period.

If the line selection switches are set to line A (*Field A*) and to line B (*Field B*) the outputs occur on the following lines:

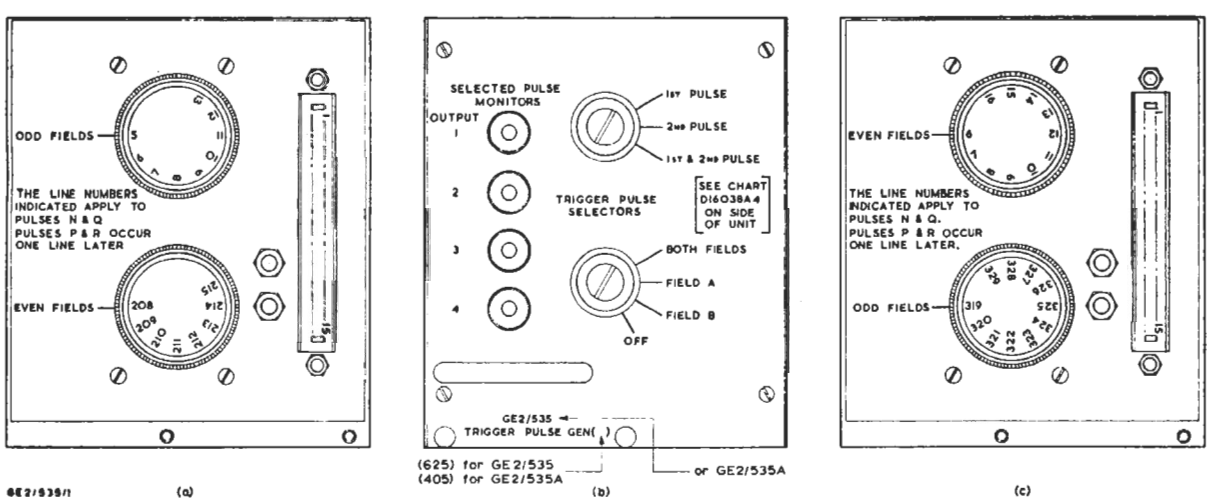


Fig. 1 Layout of Controls on the Trigger Pulse Generator GE2/535

(a) rear panel GE2/535A
(b) front panel
(c) rear panel GE2/535

Output 1

TABLE 1

Switch Settings	*1st pulse*	*2nd pulse*	*1st & 2nd pulses*
Both fields	A, B	A + 1, B + 1	A, A + 1, B, B + 1
Field A	A	A + 1	A, A + 1
Field B	B	B + 1	B, B + 1
Off	—	—	—

Output 2

On line B + 1

Output 3

On line A + 1

Output 4

On line A

The GE2/535B has four similar outputs except that output 1 is unswitchable and occurs on line B. A label is provided on the front panel of the GE2/535B upon which the line-standard and the line numbers of the trigger pulses can be written.

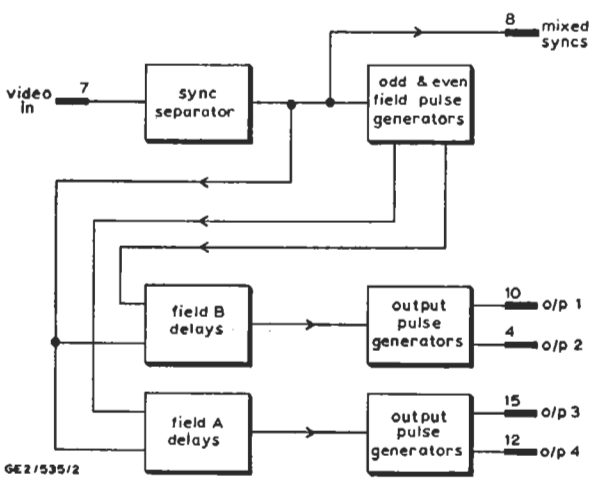


Fig. 2 Simplified Block Diagram of Trigger Pulse Generator GE2/535

General Description

A simplified block diagram, given in Fig. 2, shows the general arrangement of the GE2/535 series of generators. Mixed sync pulses and either odd-field or even-field picture-frequency pulses are fed to each of two delay chains.

The delay chain for each field comprises two identical delay circuits as shown in Fig. 3. A picture-frequency pulse triggers a monostable multivibrator into its unstable state. The output of this multivibrator when it reverts to its stable state changes the following bistable multivibrator into the set state. This is timed to occur approximately in the middle of a given line period. The next line sync pulse changes the bistable multivibrator into its reset state producing a delayed version of the picture-frequency input pulse which is fed to the second delay circuit. Provision is made for by-passing portions of both these circuits to leave one effective delay circuit.

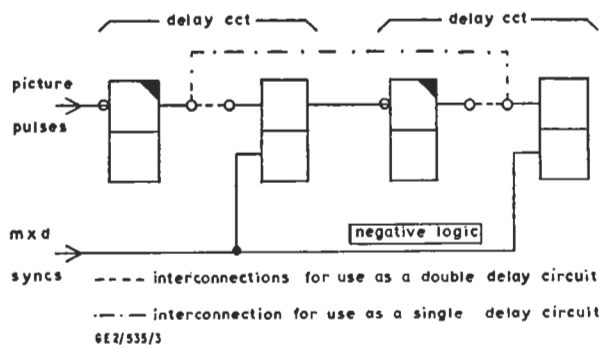


Fig. 3 Delay Circuits in GE2/535

Sync pulses are fed to a 10-μs monostable multivibrator and to a 40-μs monostable multivibrator. The outputs of the 10-μs multivibrator are connected via a switch link to give a negative-going transition either at the start of line syncs (*Y*—*Z*) or a little after the end of line syncs (*X*—*Z*).

The output of the 40-μs multivibrator is a line-frequency rectangular waveform which is used in its normal and inverted forms to gate the odd and even field-frequency pulses to the two delay chains.

Circuit Description

Most of the circuits used in the GE2/535, and shown in Fig. 4, are conventional but the following should be noted.

Input Amplifier

The input amplifier has a tuned circuit in the emitter feed of transistor TR2 which increases the negative feedback at colour subcarrier frequency to reduce the level of subcarrier.

from D16008 A1 iss 3
parts list D16010 A4

INPUT AMPLIFIER & SUBCARRIER
SYNC SEPARATOR
SYNC AMPLIFIER
FIELD PULSE FORMER
R.H. PRINTED BOARD
TRIGGER PULSE SELECTORS

TRANSISTOR TERMINATIONS (VIEW ON LEADS)

GE2/535/5T

GE2/535 SWITCHING (625 LINES SYSTEM) (SEE NOTE 2)

GE2/535A SWITCHING (405 LINES SYSTEM) (SEE NOTE 2)

UNIT	± COMPONENT		
	R24	R33	C16
GE2/535 (625)	4·5k	36k	220p
GE2/535 A (405)	6·2k	62 k	360p

NOTES :
1 STRAP Y TO Z WHEN OUTPUT TRIGGER PULSE IS TIMED TO FRONT EDGE OF SYNC. PULSE. STRAP X TO Z WHEN OUTPUT TRIGGER PULSE IS TIMED TO END OF BACK PORCH.
2 THE LINE NUMBERS INDICATED ON SWITCHES SA & SB APPLY TO PULSES H & G. PULSES P & R OCCUR ONE LINE LATER.
3 POSITIONS R101–R104 ON PRINTED BOARDS ARE NOT USED.
4 LOCATION OF R165, CONNECTS TO TR41(e)
LOCATION OF R166, CONNECTS TO TR39(e)
5 FITTED WHEN REQUIRED

Fig. 4 Circuit of the Trigger Pulse Generators GE2/535 and GE2/535A

Sync Separator and Amplifier

The amplified and inverted video signal from the emitter of transistor TR3 cuts off transistor TR4 during the active line and porch periods to produce a mixed sync waveform at the collector of this transistor. The switching level is set by d.c. restoration via diode D1 and by diode D2 which improves the immunity of the circuit to noise during the sync pulses. The change in the d.c. content of the video waveform for the period of the broad pulses causes the d.c. restoration to fail. Transistor TR48 provides a clamping action to overcome this failure.

Two long-tail pairs in the sync-pulse amplifier further clip the mixed sync pulses and set their output levels.

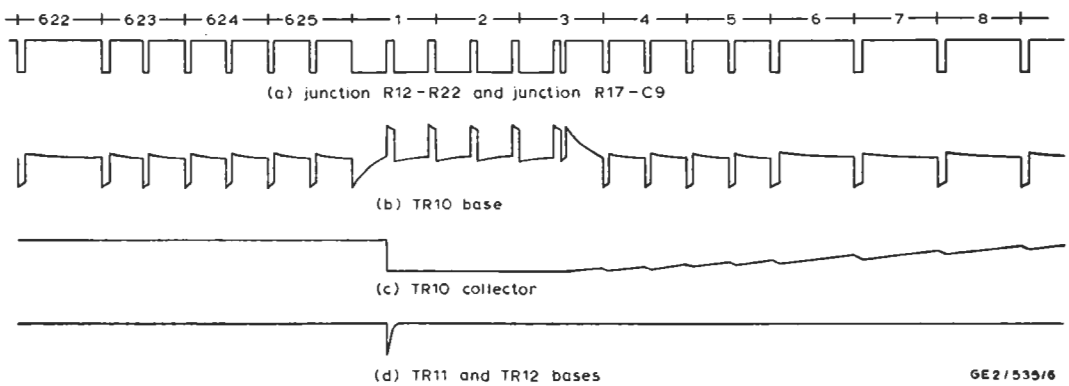


Fig. 5 Waveforms in the Field-pulse Former Circuit

Field Pulse Former

Mixed sync pulses fed to the collector load resistor of transistor TR10 charge capacitor C10. Sync pulses, differentiated via a time constant which is approximately equal to half the broad-pulse period, are applied to the base of this transistor. Thus the transistor can conduct only during the intervals between successive broad pulses. During the first such interval capacitor C10 is discharged via the transistor and is not recharged until the end of the broad pulses. Typical waveforms found in this circuit are shown in Fig. 5.

Output Pulse Generators

These transistors are biased so that only the negative-going differentiated edges of their input waveforms produce pulses about 1 μs in duration.

Fig. 6 shows typical waveforms for trigger pulses on lines 12 and 13.

GE2/535B

The circuit of the GE2/535B is given in Fig. 7 on page 7. The values of the delay resistors given in the two tables on the circuit diagram are for lines in the region of those used for the test-line signal. For typical values for lines lying outside this region see Designs Department Specification No. 9.56(66).

Test Procedure

The test procedure for the GE2/535 depends upon the particular application. A production test schedule is given in Designs Department Specification No. 9.56(66).

See overleaf for Fig. 6

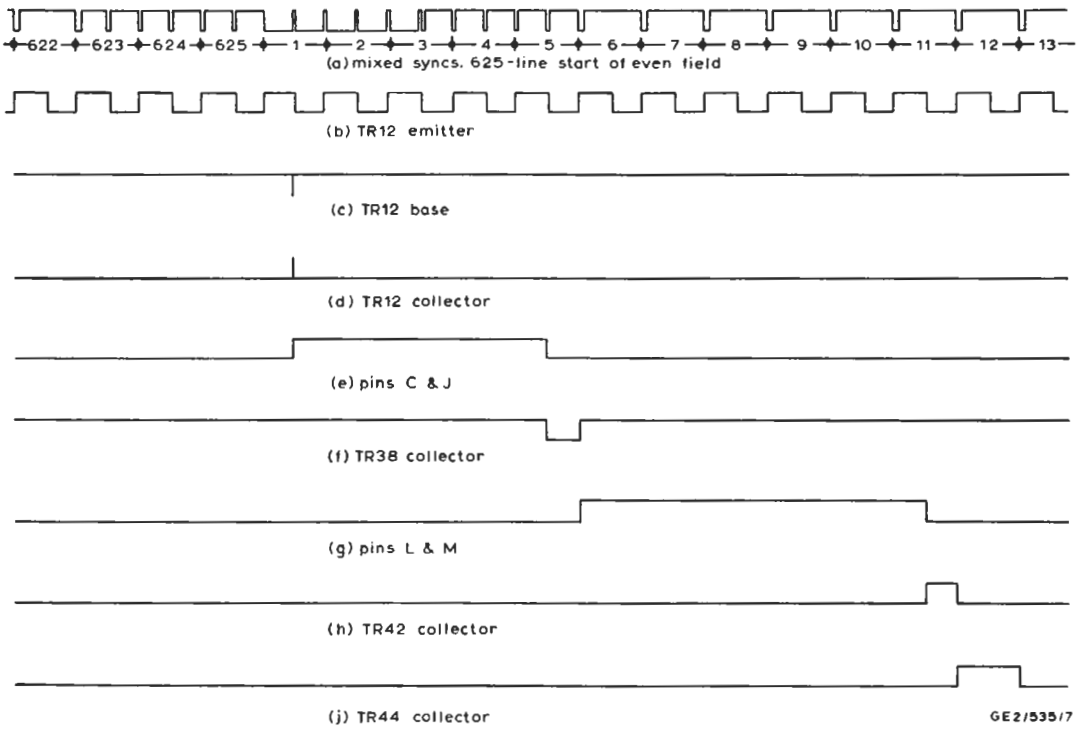
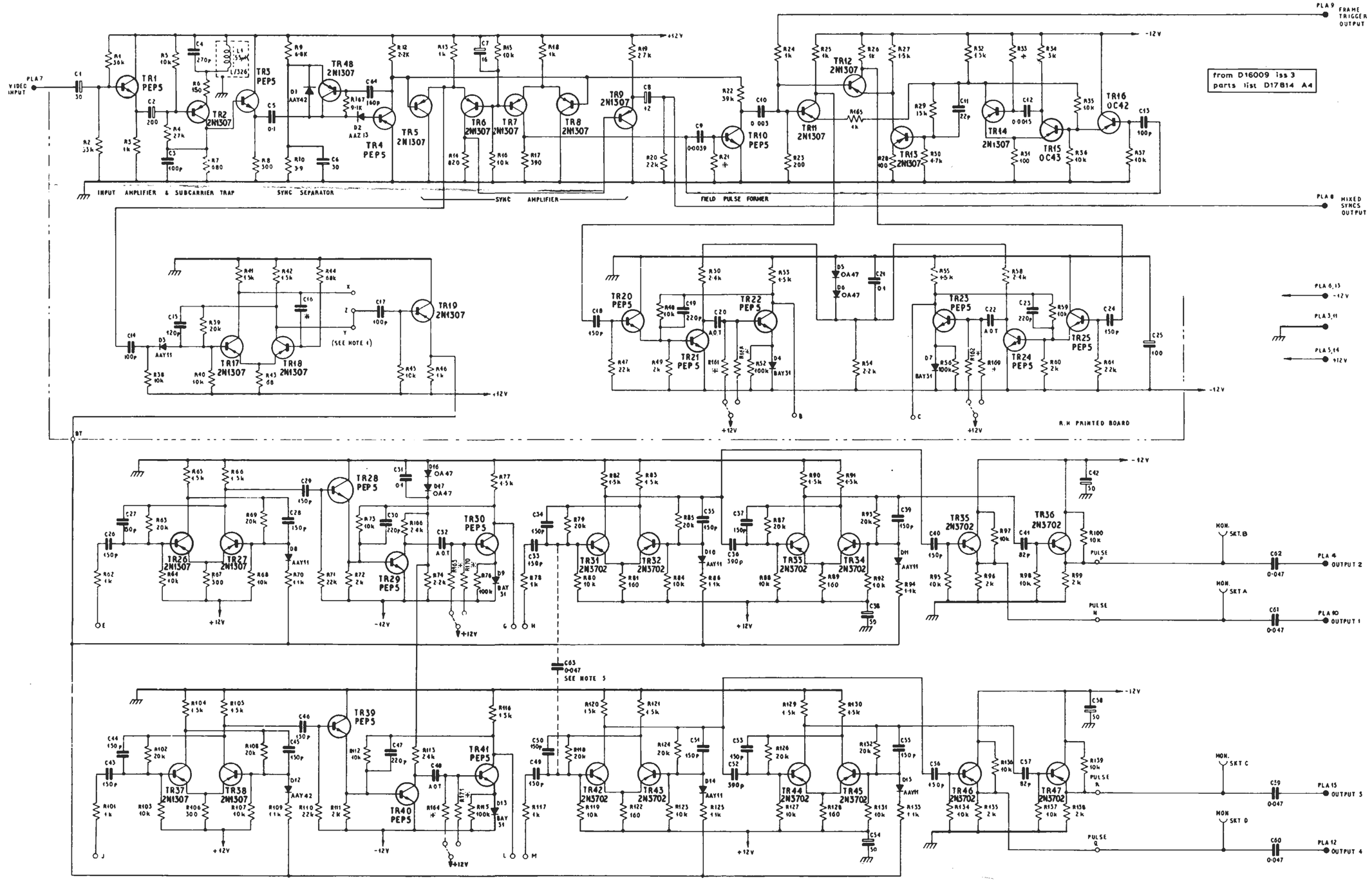


Fig. 6 Typical Waveforms for Trigger Pulses on Lines 12 and 13

MJR 2/68



GE2/535/8T

405 LINE SYSTEM					
LINE No EVEN FIELD	R162 KΩ	R169 KΩ	R164 KΩ	R171 KΩ	CONNECTIONS
11	76			52·3	C. TO J., L. TO M. LINK APPROPRIATE RESISTOR IN CIRCUIT
12		91		52·3	
13	76		82·2		
14		91	82·2		
LINE No ODD FIELD	R161 KΩ	R168 KΩ	R163 KΩ	R170 KΩ	CONNECTIONS
213	68·6			52·3	B. TO E., G. TO H. LINK APPROPRIATE RESISTOR IN CIRCUIT
214		83·4		52·3	
215	68·6		82·2		
216		83·4	82·2		

625 LINE SYSTEM					
LINE No EVEN FIELD	R162 KΩ	R169 KΩ	R164 KΩ	R171 KΩ	CONNECTIONS
16		78·1	53·2		C. TO J., L. TO M. LINK APPROPRIATE RESISTOR IN CIRCUIT.
17	87·7		53·2		
18		78·1		72·5	
19	87·7			72·5	
LINE No ODD FIELD	R161 KΩ	R168 KΩ	R163 KΩ	R170 KΩ	CONNECTIONS
329		73·2	62·8		B. TO E., G. TO H. LINK APPROPRIATE RESISTOR IN CIRCUIT
330	P.F.		62·8		
331		73·2		82·2	
332	83			82·2	

THE RESISTORS FITTED AS STANDARD ARE THOSE USED FOR TEST LINE SIGNAL PURPOSES. LINES 17 & 330 FOR 625 LINES & LINES 13 & 215 FOR 405 LINES. ANY OTHER LINE POSITION IN THE FIELD BLANKING PERIOD MAY BE OBTAINED BY FITTING THE APPROPRIATE RESISTORS IN POSITIONS R161–R164 OR R168–R171. A TABLE OF RESISTOR VALUES TO ENABLE GIVEN LINES TO BE SELECTED IS GIVEN IN THE SPECIFICATION.

* COMPONENT	SYSTEM	
	625 LINES	405 LINES
R29	4·3k	6·2k
R33	36k	62k
C46	220p	360p

NOTES :-
1. STRAP. Y TO Z WHEN OUTPUT TRIGGER PULSE IS TIMED TO FRONT EDGE OF SYNC. PULSE STRAP. X TO Z WHEN OUTPUT TRIGGER PULSE IS TIMED TO END OF BACK PORCH.
2. THE UNIT LINE NUMBERS SHOWN IN THE TABLES APPLY TO PULSES N & Q. PULSES P & R OCCUR ONE LINE LATER.
3. POSITIONS R51, R57, R75 & R144 ON PRINTED BOARDS ARE NOT USED
4. LOCATION OF COMPONENTS
   - R161 CONNECTS TO TR22 (b)
   - R162 " " TR23 (b)
   - R163 " " TR30 (b)
   - R164 " " TR41 (b)
   - R165 " " TR11 (e)
   - R166 " " TR20 (c)
5. FITTED WHEN REQUIRED

TRANSISTOR TERMINATIONS (VIEW ON LEADS)

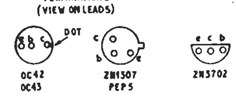


Fig. 7 Circuit of the Trigger Pulse Generator GE2/535B