

# TDA2590

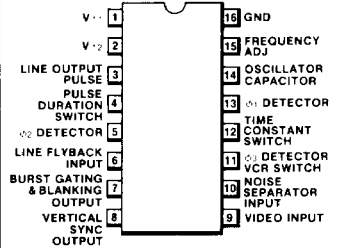
## TV HORIZONTAL OSCILLATOR COMBINATION FAIRCHILD LINEAR INTEGRATED CIRCUITS

**GENERAL DESCRIPTION** — The TDA2590 is a monolithic integrated circuit designed as a horizontal oscillator combination for TV receivers and monitors. It is constructed using the Fairchild Planar\* process.

- LINE OSCILLATOR USING THE THRESHOLD SWITCHING PRINCIPLE
- PHASE COMPARISON BETWEEN SYNC PULSE AND OSCILLATOR VOLTAGE ( $\phi_1$ )
- PHASE COMPARISON BETWEEN LINE FLYBACK PULSE AND OSCILLATOR VOLTAGE ( $\phi_2$ )
- SWITCH FOR CHANGING THE FILTER CHARACTERISTIC AND THE GATE CIRCUIT (WHEN USED FOR VCR)
- COINCIDENCE DETECTOR ( $\phi_3$ )
- SYNC SEPARATOR
- NOISE SEPARATOR
- VERTICAL SYNC SEPARATOR AND OUTPUT STAGE
- COLOR BURST KEYING AND LINE FLYBACK BLANKING PULSE GENERATOR
- PHASE SHIFTER FOR THE OUTPUT PULSE
- OUTPUT PULSE DURATION SWITCHING
- OUTPUT STAGE FOR DIRECT DRIVE OF THYRISTOR DEFLECTION CIRCUITS
- SYNC GATING PULSE GENERATOR
- LOW SUPPLY VOLTAGE PROTECTION

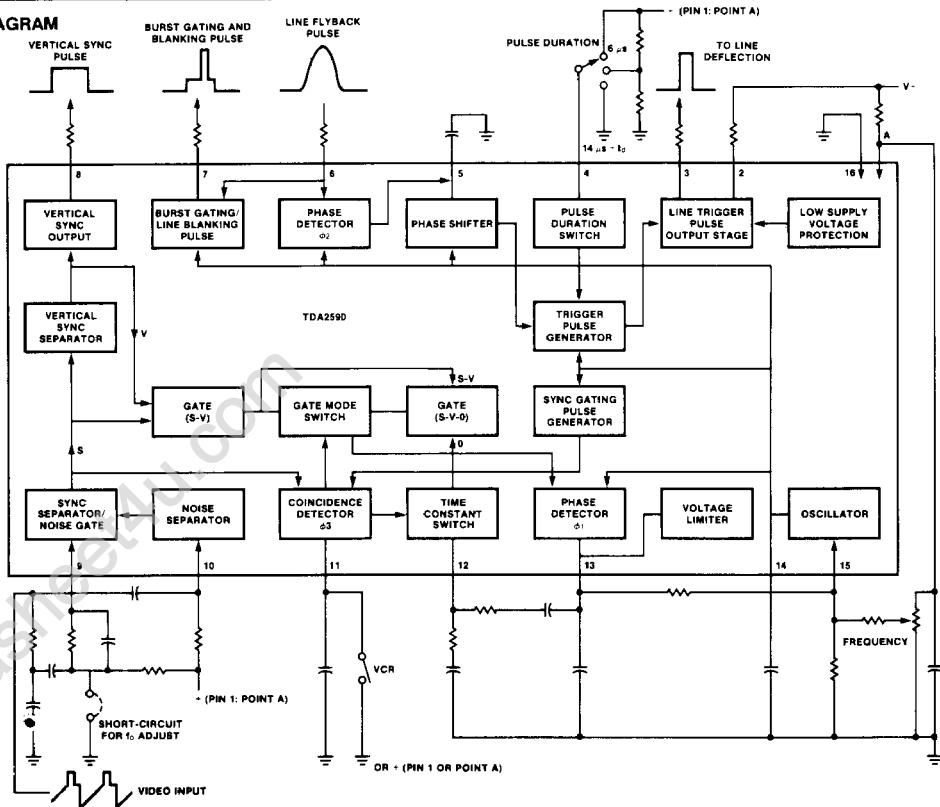
\*Planar is a patented Fairchild process.

### CONNECTION DIAGRAM 16-PIN DIP (TOP VIEW) PACKAGE OUTLINE 9B



ORDER INFORMATION  
TYPE 2590 PART NO. TDA2590

### BLOCK DIAGRAM



**ABSOLUTE MAXIMUM RATINGS**

|   |                 |
|---|-----------------|
| Supply Voltage at Pin 1 (When Supplied by the IC) | 13.2 V          |
| Supply Voltage at Pin 2                           | 18 V            |
| Power Dissipation                                 | 800 mW          |
| Storage Temperature                               | -25°C to +125°C |
| Operating Temperature                             | -20°C to +60°C  |
| Pin Temperature (Soldering, 10 s)                 | 260°C           |

**VOLTAGES**

|                                  |             |
|----------------------------------|-------------|
| V <sub>4</sub> , V <sub>11</sub> | 0 to 13.2 V |
| V <sub>9</sub> , V <sub>10</sub> | -6 to +6 V  |

**CURRENTS**

|                       |         |
|-----------------------|---------|
| I <sub>2</sub> (peak) | 400 mA  |
| I <sub>3</sub> (peak) | -400 mA |
| I <sub>4</sub>        | 1 mA    |
| I <sub>6</sub>        | ±10 mA  |
| I <sub>7</sub>        | -10 mA  |
| I <sub>11</sub>       | 2 mA    |

**ELECTRICAL CHARACTERISTICS:** T<sub>A</sub> = 25°C; V<sub>1</sub> = 12 V. See test circuit unless otherwise noted.

| CHARACTERISTICS                      | CONDITIONS      | MIN                                   | TYP          | MAX                   | UNITS              |                    |
|--------------------------------------|-----------------|---------------------------------------|--------------|-----------------------|--------------------|--------------------|
| Supply Current                       | I <sub>1</sub>  |                                       | 30           |                       | mA                 |                    |
| <b>SYNC SEPARATOR (PIN 9)</b>        |                 |                                       |              |                       |                    |                    |
| Input Switching Voltage              | V <sub>9</sub>  |                                       | 0.8          |                       | V                  |                    |
| Input Keying Current                 | I <sub>9</sub>  |                                       | 5            | 100                   | μA                 |                    |
| Input Blocking Current               | I <sub>9</sub>  | V <sub>9</sub> = -5 V                 |              | 1                     | μA                 |                    |
| Input Switching Current              | I <sub>9</sub>  |                                       |              | 5                     | μA                 |                    |
| Input Voltage (pk-pk)                | V <sub>9</sub>  | Sync Positive Video Signal            | 1            | 3                     | 7                  | V <sub>pk-pk</sub> |
| <b>NOISE SEPARATOR (PIN 10)</b>      |                 |                                       |              |                       |                    |                    |
| Input Switching Voltage              | V <sub>10</sub> |                                       | 1.4          |                       | V                  |                    |
| Input Keying Current                 | I <sub>10</sub> |                                       | 5            | 100                   | μA                 |                    |
| Input Switching Current              | I <sub>10</sub> |                                       | 150          |                       | μA                 |                    |
| Input Blocking Current               | I <sub>10</sub> | V <sub>10</sub> = -5 V                |              | 1                     | μA                 |                    |
| Input Voltage (pk-pk)                | V <sub>10</sub> | Sync Positive Video Signal            | 1            | 3                     | 7                  | V <sub>pk-pk</sub> |
| Superimposed Noise Voltage (pk-pk)   | V <sub>n</sub>  |                                       |              | 7                     | V <sub>pk-pk</sub> |                    |
| <b>LINE FLYBACK PULSE (PIN 6)</b>    |                 |                                       |              |                       |                    |                    |
| Input Current                        | I <sub>6</sub>  |                                       | 10           |                       | μA                 |                    |
| Input Switching Voltage              | V <sub>6</sub>  |                                       | 1.4          |                       | V                  |                    |
| Input Limiting Voltage               | V <sub>6</sub>  |                                       | -0.7 to +1.4 |                       | V                  |                    |
| Input Resistance                     | R <sub>6</sub>  |                                       | 400          |                       | Ω                  |                    |
| <b>PULSE DURATION SWITCH (PIN 4)</b> |                 |                                       |              |                       |                    |                    |
| Input Voltage                        | V <sub>4</sub>  | t = 0 μs, V <sub>3</sub> = 0 (Note 1) |              | 5.4 to 6.5            | V                  |                    |
|                                      |                 | t = 6 μs                              |              | 9.4 to V <sub>1</sub> | V                  |                    |
|                                      |                 | t = 14 μs + t <sub>d</sub> (Note 6)   |              | 0 to 4                | V                  |                    |
| Input Current                        | I <sub>4</sub>  | t = 0 μs, V <sub>3</sub> = 0          |              | 0                     | μA                 |                    |
|                                      |                 | t = 6 μs                              | 200          |                       | μA                 |                    |
|                                      |                 | t = 14 μs + t <sub>d</sub> (Note 6)   |              |                       | -200               | μA                 |

**ELECTRICAL CHARACTERISTICS:**  $T_A = 25^\circ\text{C}$ ;  $V_1 = 12\text{ V}$ , See test circuit unless otherwise noted. (Cont'd)

| CHARACTERISTICS   |  | CONDITIONS  | MIN             | TYP                   | MAX        | UNITS              |
|---|--|---|-----------------|-----------------------|------------|--------------------|
| <b>OSCILLATOR (PIN 14 and PIN 15)</b>   |  |   |                 |                       |            |                    |
| Low Level Threshold Voltage   | $V_{14}$   |   |                 | 4.4                   |            | V                  |
| High Level Threshold Voltage  | $V_{14}$   |   |                 | 7.6                   |            | V                  |
| Discharge Current   | $I_{14}$   |   |                 | $\pm 47$              |            | mA                 |
| Free Running Frequency  | $f_o$  | $C_{14} = 4.7\text{ nF}$ , $R_{15} = 12\text{ k}\Omega$ |                 | 15625                 |            | Hz                 |
| Spread of Frequency   | $\Delta f_o/f_o$                                 | Note 4  | -5              |                       | +5         | %                  |
| Frequency Control Sensitivity   | $\Delta f_o/\Delta I_{15}$                       |   |                 | 31                    |            | Hz/ $\mu\text{A}$  |
| Adjustment Range  | $\Delta f_o/f_o$                                 |   |                 | $\pm 10$              |            | %                  |
| Frequency Change With Supply Voltage  | $\frac{\Delta f_o/f_o}{\Delta V/V_{\text{nom}}}$ | $V_1 = 12\text{ V}$ , Note 4                            | -0.05           |                       | +0.05      |                    |
| Frequency Change With Supply Voltage  | $\Delta f_o$                                     | $V_1 = 12\text{ to }5\text{ V}$ , Note 4                | 10              |                       | +10        | %                  |
| Temperature Coefficient of Oscillator Frequency per $^\circ\text{C}$            |  | Note 4  | $-10^{-4}$      |                       | $+10^{-4}$ |                    |
| <b>COINCIDENCE DETECTOR (<math>\phi_3</math>) and SWITCHING ON VCR (PIN 11)</b> |  |   |                 |                       |            |                    |
| Input Voltage   | $V_{11}$   | Note 2  |                 | 0 to 1.5              |            | V                  |
| Input Current   | $I_{11}$   | Note 2  |                 |                       | -200       | $\mu\text{A}$      |
| Input Voltage   | $V_{11}$   |   |                 | 9 to $V_1$            |            | V                  |
| Input Current   | $I_{11}$   |   |                 | 1 to 2                |            | mA                 |
| Output Voltage  | $V_{11}$   |   |                 | 0.5 to 6              |            | V                  |
| Peak Output Current   | $I_{11}$   | Without Coincidence                                     |                 | 0.1                   |            | mA                 |
| Peak Output Current   | $I_{11}$   | With Coincidence  |                 | -0.5                  |            | mA                 |
| <b>VERTICAL SYNC PULSE (PIN 8)</b>  |  |   |                 |                       |            |                    |
| Output Voltage  | $V_8$  | Positive Going  | 10              | 11                    |            | $V_{\text{pk-pk}}$ |
| Output Resistance   | $R_8$  |   |                 | 2                     |            | $\text{k}\Omega$   |
| Turn-ON Delay   | $t_{\text{on}}$                                  | Delay between leading edge of input & output signal     |                 | 12                    |            | $\mu\text{s}$      |
| Turn-OFF Delay  | $t_{\text{off}}$                                 | Delay between trailing edge of input & output signal    | $t_{\text{on}}$ |                       |            | $\mu\text{s}$      |
| <b>BLANKING AND BURST GATING PULSE (PIN 7)</b>                                  |  |   |                 |                       |            |                    |
| Burst Gating Pulse Output Voltage   | $V_7$  | Positive Going  | 10              | 11                    |            | $V_{\text{pk-pk}}$ |
| Output Resistance   | $R_7$  |   |                 | 400                   |            | $\Omega$           |
| Phase Relationship to Leading Edge  | t  | Note 3 $V_7 = 7\text{ V}$                               |                 | 1.9 typ<br>1.0 to 2.8 |            | $\mu\text{s}$      |
| Phase Relationship to Trailing Edge   | t  | Note 3 $V_7 = 7\text{ V}$                               |                 | 6.6 typ<br>5.8 to 7.4 |            | $\mu\text{s}$      |
| Blanking Pulse Output Voltage   | $V_7$  |   |                 | 2.5 to 3.5            |            | V                  |
| <b>LINE DRIVE PULSE (PIN 3)</b>   |  |   |                 |                       |            |                    |
| Output Voltage  | $V_3$  | Positive Going  |                 | 10.5                  |            | $V_{\text{pk-pk}}$ |
| Output Current (Average Value)  | $I_3$  |   |                 | -100                  |            | mA                 |
| Output Resistance   | $R_3$  | For leading edge of Line Pulse                          |                 | 2.5                   |            | $\Omega$           |
| Output Resistance   | $R_3$  | For trailing edge of Line Pulse                         |                 | 20                    |            | $\Omega$           |
| Output Pulse Duration   | $t_p$  | $V_4 > 9.4\text{ V}$                                    |                 | 6 typ<br>4.5-7.5      |            | $\mu\text{s}$      |
| Output Pulse Duration   | $t_p$  | $V_4 < 4\text{ V}$ , Note 6                             |                 | $14 + t_d$            |            | $\mu\text{s}$      |
| Supply Voltage for Switching off the Output Pulse                               | $V_1$  |   |                 | 4                     |            | V                  |

ELECTRICAL CHARACTERISTICS:  $T_A = 25^\circ\text{C}$ ;  $V_1 = 12\text{ V}$ . See test circuit unless otherwise noted. (Cont'd)

| CHARACTERISTICS   | CONDITIONS            | MIN   | TYP                             | MAX  | UNITS              |
|---|-----------------------|---|---------------------------------|------|--------------------|
| <b>PHASE COMPARISON (<math>\phi_1</math>) (PIN 13)</b>  |                       |   |                                 |      |                    |
| Control Voltage Range   | $V_{13}$              |   | 3.8 to 8.2                      |      | V                  |
| Peak Control Current  | $I_{13}$              |   | $\pm 2.1$ typ<br>$\pm 1.9$ -2.3 |      | mA                 |
| Output Blocking Current   | $I_{13}$              | $V_{13} = 4$ to 8 V                             |                                 | 1    | $\mu\text{A}$      |
| Output Resistance   | $R_{13}$              | Current Source $V_{13} = 4$ to 8 V              | High                            |      | ohmic              |
| Output Resistance   | $R_{13}$              | Emitter Follower $V_{13} < 3.8$<br>or $> 8.2$ V | Low                             |      | ohmic              |
| Control Sensitivity   |                       |   | 2                               |      | kHz/ $\mu\text{s}$ |
| Capture & Holding Range   | $\Delta f$            | 82 k $\Omega$ between Pins 13 & 15              | $\pm 780$                       |      | Hz                 |
| Spread of Capture & Holding Range   | $\Delta(\Delta f)$    | Note 4  | $\pm 10$                        |      | %                  |
| <b>PHASE COMPARISON (<math>\phi_2</math>) (PIN 5)</b>   |                       |   |                                 |      |                    |
| Control Voltage Range   | $V_5$                 |   | 5.4 to 7.6                      |      | V                  |
| Peak Control Current  | $I_5$                 |   | $\pm 1$                         |      | mA                 |
| Input Current at Blocked Phase Detector   | $I_5$                 | $V_5 = 5.4$ to 7.6 V                            |                                 | 5    | $\mu\text{A}$      |
| Output Resistance   | $R_5$                 | Current Source $V_5 = 5.4$ to 7.6 V             | High                            |      | ohmic              |
| Output Resistance   | $R_5$                 | $V_5 = < 5.4$ or $> 7.6$ V                      | 8                               |      | k $\Omega$         |
| Allowable Delay between Leading Edge of Output Pulse and Leading Edge of Flyback Pulse ( $t_{rp} = 12\ \mu\text{s}$ ) | $t_d$                 |   | 0-15                            |      | $\mu\text{s}$      |
| Static Control Error  | $\Delta t/\Delta t_d$ |   |                                 | 0.2  | %                  |
| <b>OVERALL PHASE RELATION</b>   |                       |   |                                 |      |                    |
| Phase Relation Between Middle of Sync Pulse and the Middle of the Flyback Pulse                                       | $t$                   | Note 5  | 2.6                             |      | $\mu\text{s}$      |
| Tolerance of Phase Relationship   | $\Delta t$            |   | -0.7                            | +0.7 | $\mu\text{s}$      |
| <b>TIME CONSTANT SWITCH (PIN 12)</b>  |                       |   |                                 |      |                    |
| Output Voltage  | $V_{12}$              |   | 6                               |      | V                  |
| Output Current  | $I_{12}$              |   | -1                              | +1   | mA                 |
| Output Resistance   | $R_{12}$              | $V_{11} = 2.5$ to 7 V                           | 100                             |      | $\Omega$           |
| Output Resistance   | $R_{12}$              | $V_{11} = < 1.5$ V or $> 9$ V                   | 60                              |      | k $\Omega$         |
| <b>INTERNAL GATING PULSE</b>  |                       |   |                                 |      |                    |
| Pulse Duration  | $t_p$                 |   | 7.5                             |      | $\mu\text{s}$      |

NOTES:

- Can also be left unconnected.
- When supplied by the IC.
- Phase relationship between the middle of the sync pulse at the input and leading or trailing edge of the burst gating pulse.
- Excluding the affect of variations in external components tolerances.
- The adjustment of the overall phase relation and consequently the leading edge of the output pulse occurs automatically by phase control  $\phi_2$ . If additional adjustment is used, the following values apply:

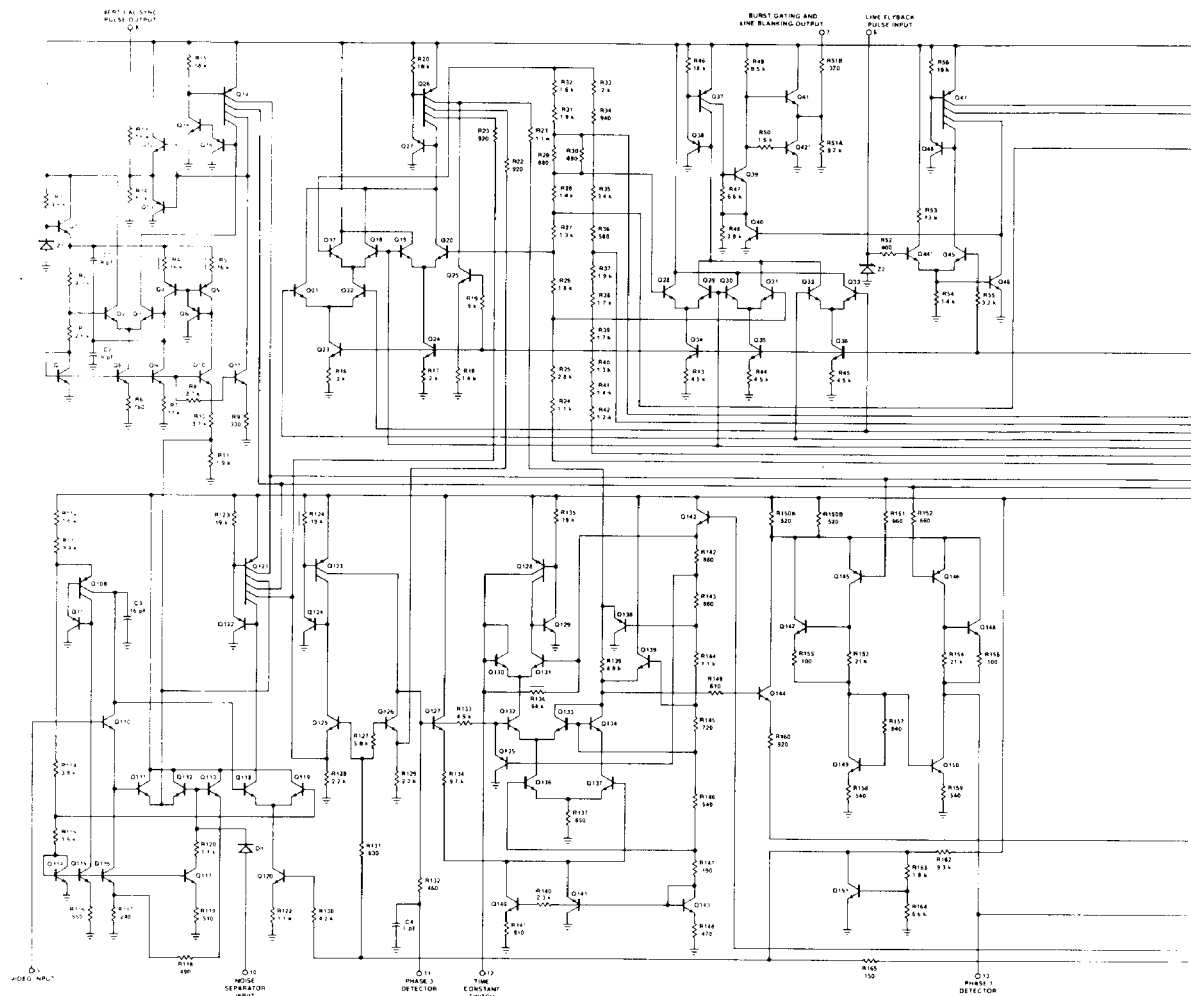
ADJUSTMENT SENSITIVITY

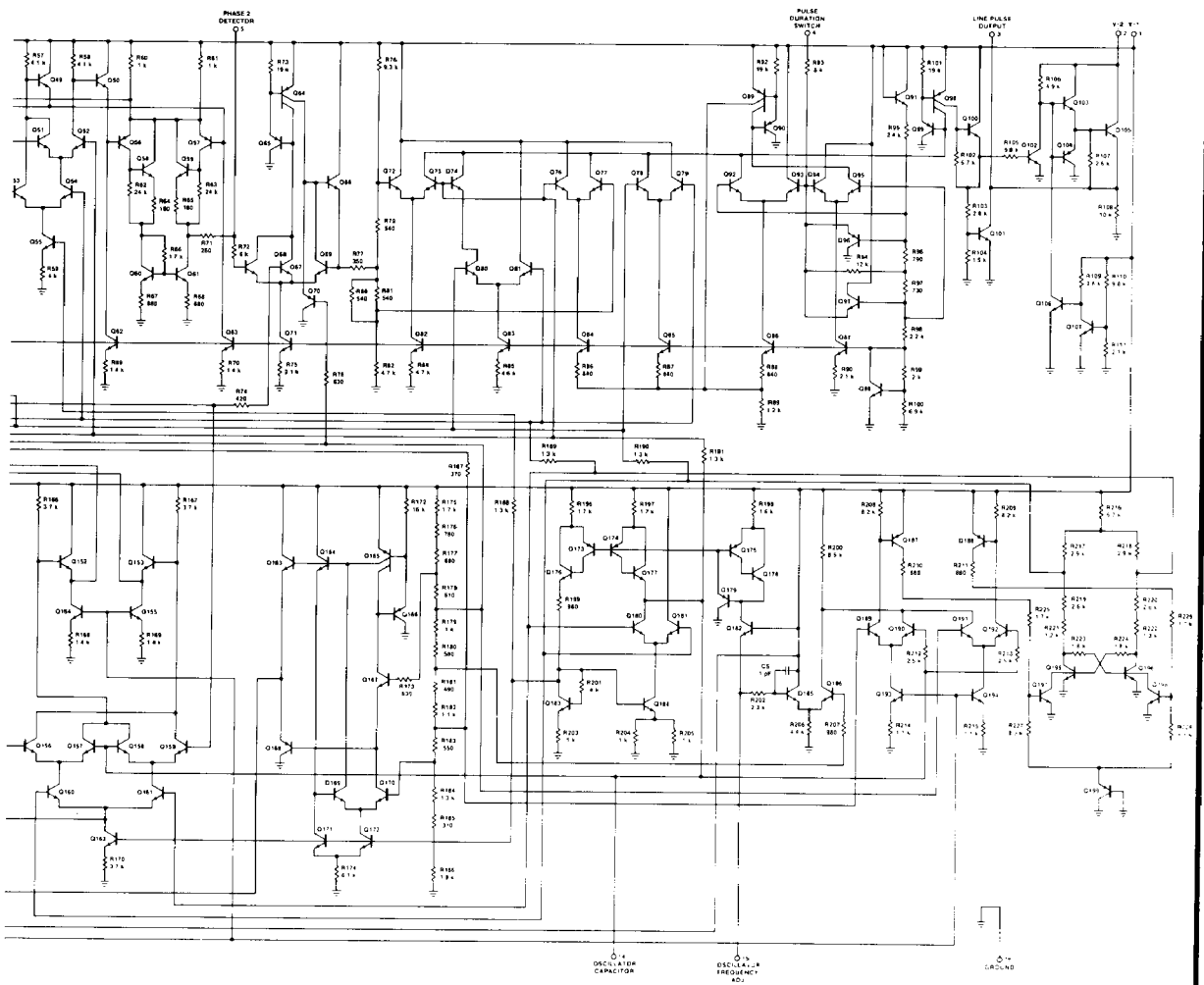
caused by: adjustment voltage  $\Delta V_5/\Delta t$  typ 0.1 V/ $\mu\text{s}$   
 adjustment current  $\Delta I_5/\Delta t$  typ 30  $\mu\text{A}/\mu\text{s}$

- $t_d$  = switch-OFF delay of the line output stage.

4

EQUIVALENT CIRCUIT





TEST AND APPLICATIONS CIRCUIT

