

HA11235

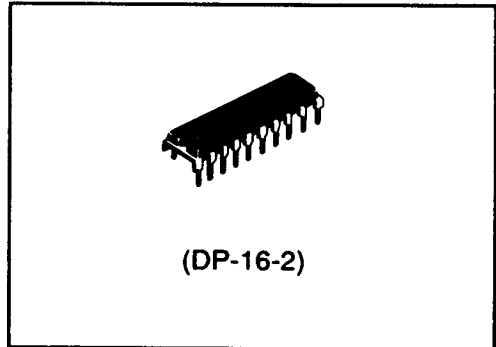
Synchronous Signal Processing System

Functions

- Sync separator
- Horizontal automatic frequency control (AFC)
- Horizontal oscillator
- X-ray protector
- Vertical oscillator
- Vertical driver

Features

- Fewer external components
- 10 V_{p-p} sync separator output
- Voltage regulator for horizontal supply voltage
- 7.5 Hz/rad horizontal AFC DC loop gain
- Output stage positive feedback eliminated by vertical oscillator's astable multivibrator
- Vertical oscillator waveform used for vertical output drive; only one high-stability (tantalum) capacitor required for vertical stage
- Vertical output stage stabilized by DC feedback to pin 3
- Vertical linearity adjustment can be eliminated



Ordering Information

| Type No. | Package |
|----------|---------|
| HA11235 | DP-16-2 |

Pin Description

| Pin No. | Function | Max. Input/Output Voltage/Current |
|---------|---|-----------------------------------|
| 1 | Connected to capacitor to prevent parasitic oscillation | Less than V _{CC} |
| 2 | Vertical output pin | 15 mA |
| 3 | Feedback input pin for vertical DC/AC output voltage | Less than V _{CC} |
| 4 | Connected to resistor to determine vertical oscillation discharge time constant | 5 mA |
| 5 | Connected to capacitor for vertical oscillation frequency | Less than V _{CC} |
| 6 | Vertical oscillator power supply pin | 16 V |
| 7 | Vertical sync input pin | Less than V _{CC} |
| 8 | Determines vertical oscillation frequency | 5 mA |
| 9 | X-ray protector input pin | 5 mA |
| 10 | Horizontal section output pin | 15 mA |
| 11 | Horizontal oscillator power supply pin | 25 mA |
| 12 | Connected to horizontal oscillator CR | 12 V |



Circuit Schematics

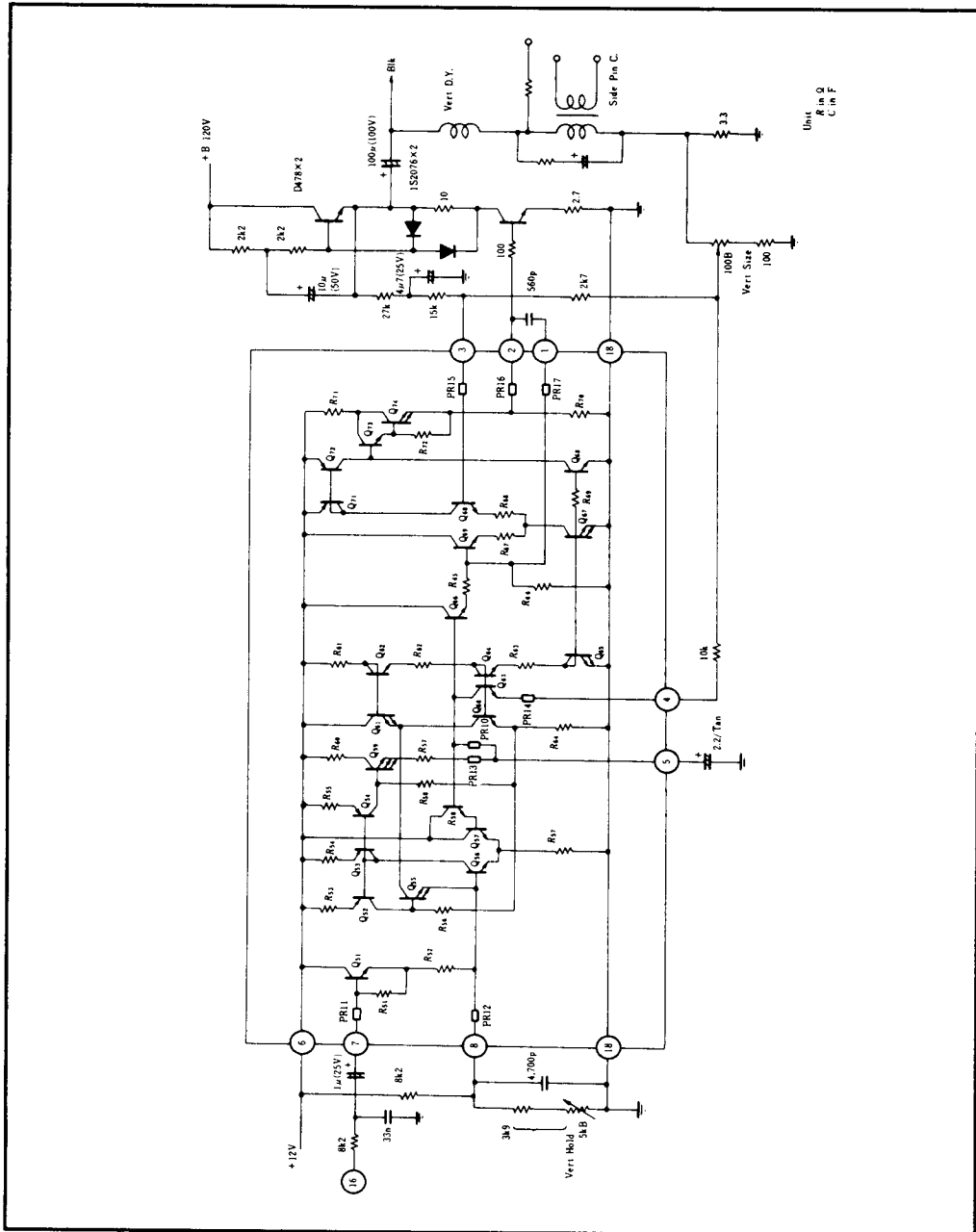


Figure 1 Vertical Oscillator and Driver



External Parts Functions

| Pin No. | Part No. | Functions | |
|---------|--|--|---|
| 1, 2, 3 | C ₁₀₉ | <ul style="list-style-type: none"> Feedback capacitor preventing parasitic oscillation Determines closed loop gain (560 pF recommended to prevent abnormal oscillation and crossover distortion) | |
| | R ₁₁₁ | <ul style="list-style-type: none"> Current limiter Prevents excessive current and surge breakdown Determines Q₂₀₂ base current value | |
| | R ₁₁₀ | <ul style="list-style-type: none"> Determines vertical oscillation section's idling current | |
| | R ₁₀₆ | <ul style="list-style-type: none"> Determines DC feedback to pin 3 <p>where $V_{1\text{ DC}} = \text{DC voltage at pin 1 (3.3 V type)}$ $V_{+B} = +B \text{ supply voltage applied to the vertical}$</p> $\frac{V_{1\text{ DC}}}{R_{112}} \times (R_{112} + R_{109} + R_{108}) = \frac{V_{+B}}{2}$ $I_{dy} = \frac{V_{p-p}(R_{112} + R_{109})}{R_{109} R_{117}}$ <p>output I_{dy} = current into the deflection yoke V_{p-p} = peak-to-peak voltage at pin 1 (1.5 V_{p-p})</p> | |
| | R ₁₁₇ | <ul style="list-style-type: none"> Determines deflection current | |
| | C ₁₀₆ | <ul style="list-style-type: none"> Decoupling capacitor | |
| | C ₁₀₅ | <ul style="list-style-type: none"> Bootstrap capacitor | |
| | R ₁₁₅ | <ul style="list-style-type: none"> Determines vertical size | |
| | 4 | R ₁₀₅ | <ul style="list-style-type: none"> Determines vertical oscillator's discharging time Vertical deflection yoke current linearity adjustment (Large R₁₀₅ value lengthens discharging time and reduces oscillation frequency) |
| | | C ₁₀₄ | <ul style="list-style-type: none"> Determines vertical oscillation discharging time constant (Tantalum capacitor recommended) |
| 7 | R ₁₀₁ , C ₁₀₁ | <ul style="list-style-type: none"> Integrates composite vertical sync pulse Determines vertical pull-in range | |
| | C ₁₀₂ | <ul style="list-style-type: none"> AC coupling capacitor | |
| 8 | R ₁₀₂ , R ₁₀₃ , R ₁₀₄ | <ul style="list-style-type: none"> Determines vertical oscillation bottom voltage (Lower bias voltage at pin 8 increases peak-to-peak oscillation level and reduces oscillation frequency) | |
| | C ₁₀₃ | <ul style="list-style-type: none"> Integrates composite vertical sync pulse Eliminates horizontal sync component | |
| 9 | R ₁₃₂ , C ₁₃₀ | <ul style="list-style-type: none"> Highpass filter in X-ray protection circuit | |
| 10 | R ₁₃₀ | <ul style="list-style-type: none"> Protects against surge breakdown | |
| | R ₁₃₁ | <ul style="list-style-type: none"> Determines horizontal drive transistor on/off level | |



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External Parts Functions (cont)

| Pin No. | Part No. | Functions |
|---------|---|--|
| 11 | R ₁₂₉ | • Determines +B supply current into horizontal drive transistor (Supply 15 mA current. Approximately 9 mA consumed internally and 6 mA used to keep V _{CC} level constant.) |
| | C ₁₂₉ | • Decoupling capacitor for constant V _{CC} |
| 12 | C ₁₂₈ , R ₁₂₆ , R ₁₂₇ | • Horizontal oscillation (Larger time constant reduces oscillation frequency) |
| 14 | R ₁₂₅ , R ₁₂₈ , C ₁₂₇ | • Determine AFC circuit AC loop gain |
| | C ₁₂₆ | • Bypass capacitor |
| | C ₁₂₀ | • Eliminates high frequency noise |
| 15, 17 | C ₁₂₁ , R ₁₂₀ , R ₁₂₁ , R ₁₂₂ , C ₁₂₂ , C ₁₂₃ | • Determines sync separator base time constant R ₁₂₀ : Discharging R ₁₂₂ : Negative feedback C ₁₂₂ : Pin 17 time constant credit C ₁₂₃ : Separates stable sync |
| | D ₁₀₃ | • Noise limiter |

- Notes
1. Use the service switch to turn the vertical output off, with pin 3 grounded.
 2. C₁₂₈ (horizontal oscillator): Use polyester capacitors and polypropylene capacitors in 1:1 ratio for zero of the temperature coefficient of the horizontal oscillation frequency.

Notes for Pattern Wiring

1. To avoid problems like frequency offset, the GND pin should be connected to the GND line in the video detection section.
2. The GND lines in the external application circuit's horizontal and vertical sections should be kept separate until connected at the same point.
3. Problems like offset in the horizontal oscillator section have been caused by separation and long wiring of pin 12 and 14 V_{CC} lines.
4. 470 Ω and 680 Ω resistances at pin 10 should be connected close to the GND.



Absolute Maximum Ratings ($T_a = 25^\circ\text{C}$ unless otherwise specified)

| Item | Symbol | Rating | Unit |
|--|-----------|-------------|------------------|
| Supply Voltage | V_{CC} | 16 | V |
| Operating Temperature Range | T_{opr} | -20 to +75 | $^\circ\text{C}$ |
| Storage Temperature Range | T_{stg} | -55 to +125 | $^\circ\text{C}$ |
| Power Dissipation ($T_a = 75^\circ\text{C}$) | P_T | 500 | mW |
| Output Current (Pin 2, 10, and 16) | I_O | 20 | mA |

Electrical Characteristics**Table 1 Line Circuitry**

| Item | Symbol | Min | Typ | Max | Unit | Test Conditions |
|-------------------------|-----------------|-----------|-----------|--------|----------------------|--|
| Regulated Voltage | V_{11} | — | 12.8 | — | V | $I_{CC} = 15\text{ mA}$ |
| Supply Current | I_{CC} | — | 15 | — | mA | |
| Free-Running Frequency | f_{oh} | 14,734 | 15,734 | 16,734 | Hz | $R_h = 12.6\text{ k}\Omega$, $C_h = 5.6\text{ nF}$ |
| Pull-In Range | Δf_{ph} | ± 450 | ± 650 | — | Hz | |
| APC Loop Gain | f_c | 577.5 | 750 | 1070 | Hz/ μs | |
| Temperature Coefficient | Δf_{oh} | -6.0 | -3.0 | 0 | Hz/ $^\circ\text{C}$ | |
| Output Pulse Width | t_{hw} | 22.5 | 25.0 | 27.5 | μs | Pin 10 |

Table 2 Frame Circuitry

| Item | Symbol | Min | Typ | Max | Unit | Test Conditions |
|-------------------------|-----------------|-------|-----|-------|----------------------|----------------------------|
| Free-Running Frequency | f_{ov} | 55 | 60 | 65 | Hz | $R_v = 5.2\text{ k}\Omega$ |
| Pull-In Range | Δf_{pv} | — | -10 | -7.5 | Hz | |
| Temperature Coefficient | Δf_{ov} | -0.03 | 0 | +0.03 | Hz/ $^\circ\text{C}$ | |

Table 3 Sync Separator

| Item | Symbol | Min | Typ | Max | Unit | Test Conditions |
|----------------------------------|----------|-----|------|-----|---------------|---------------------|
| Input Voltage Peak-to-Peak Value | V_{15} | 0.2 | — | — | V | Negative-going sync |
| Output Voltage | V_{sy} | 8.0 | 10.0 | — | V | Peak-to-peak value |
| Output Pulse Width | t_{sy} | 4.5 | 5.0 | 5.5 | μs | Pin 16 |



Typical Performance Curves

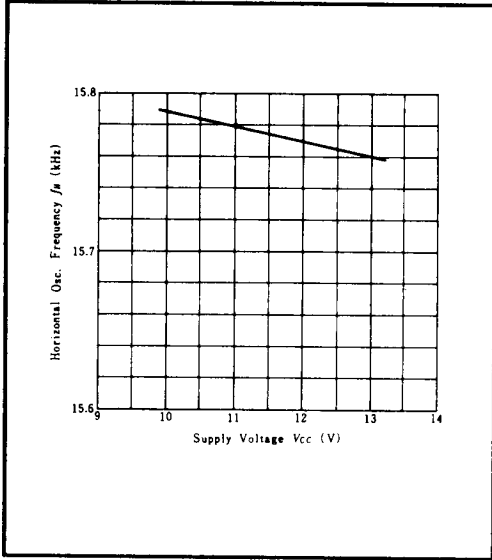


Figure 4 Horizontal Oscillation Frequency vs. Supply Voltage

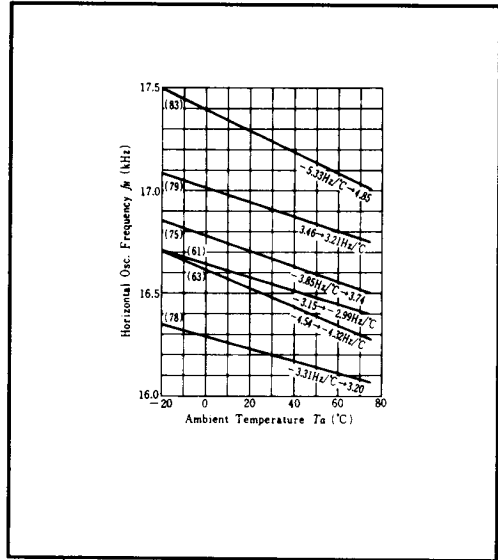


Figure 5 Horizontal Frequency vs. Ambient Temperature

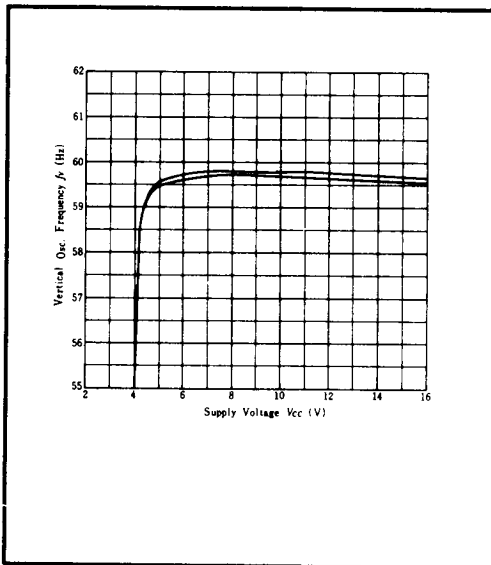


Figure 6 Vertical Oscillation Frequency vs. Supply Voltage

