

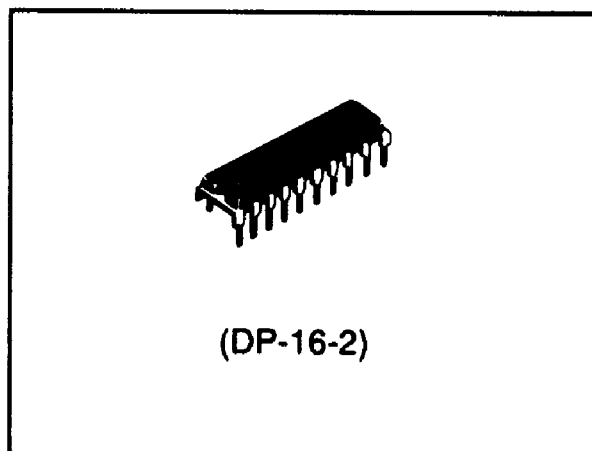
## Synchronous Signal Processing System

### Functions

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

### Features

- Fewer external components
- 10 V<sub>p-p</sub> 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

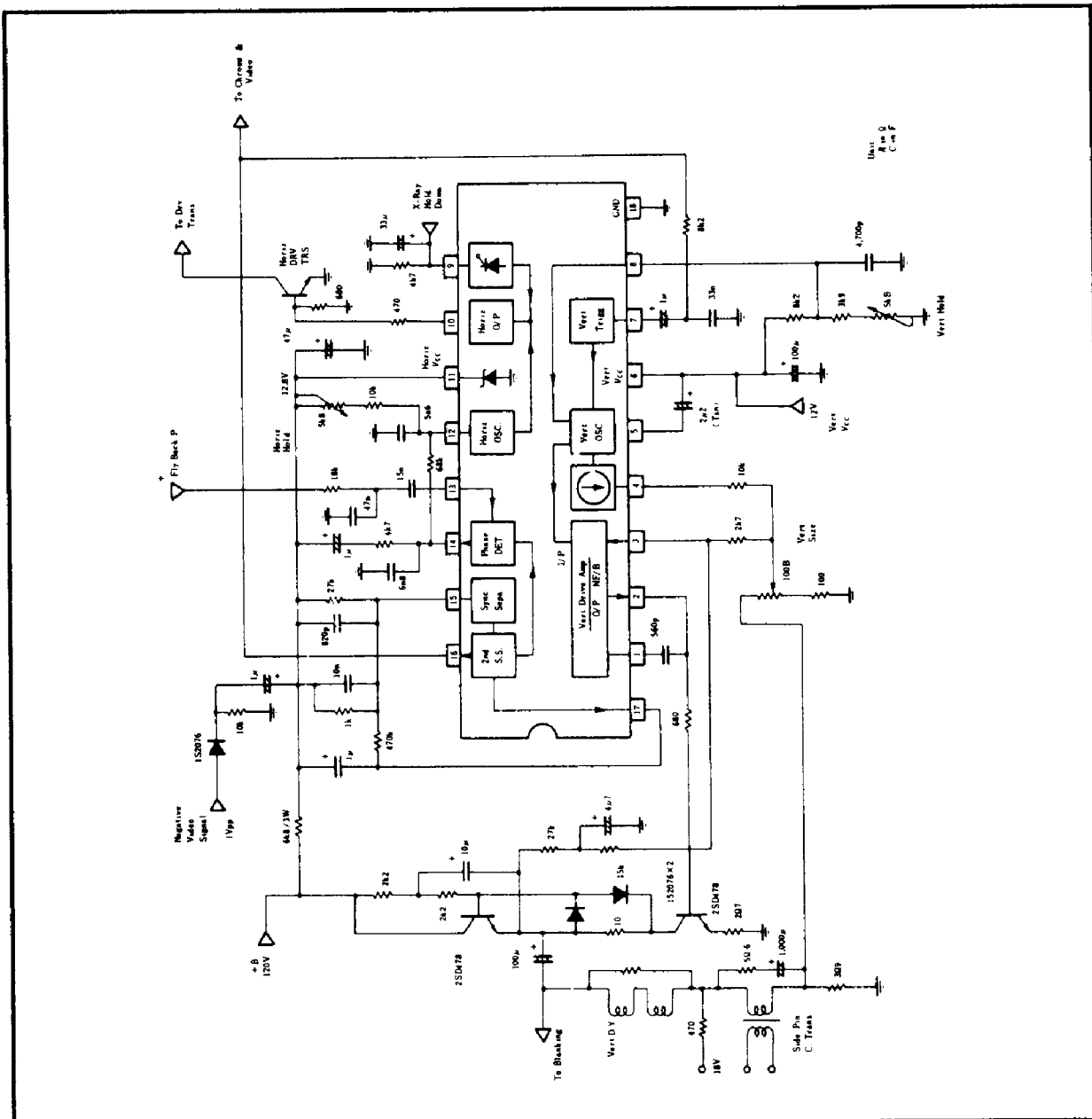
Pin No.	Function	Max. Input/Output Voltage/Current
1	Connected to capacitor to prevent parasitic oscillation	Less than V <sub>CC</sub>
2	Vertical output pin	15 mA
3	Feedback input pin for vertical DC/AC output voltage	Less than V <sub>CC</sub>
4	Connected to resistor to determine vertical oscillation discharge time constant	5 mA
5	Connected to capacitor for vertical oscillation frequency	Less than V <sub>CC</sub>
6	Vertical oscillator power supply pin	16 V
7	Vertical sync input pin	Less than V <sub>CC</sub>
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



## Pin Description (cont)

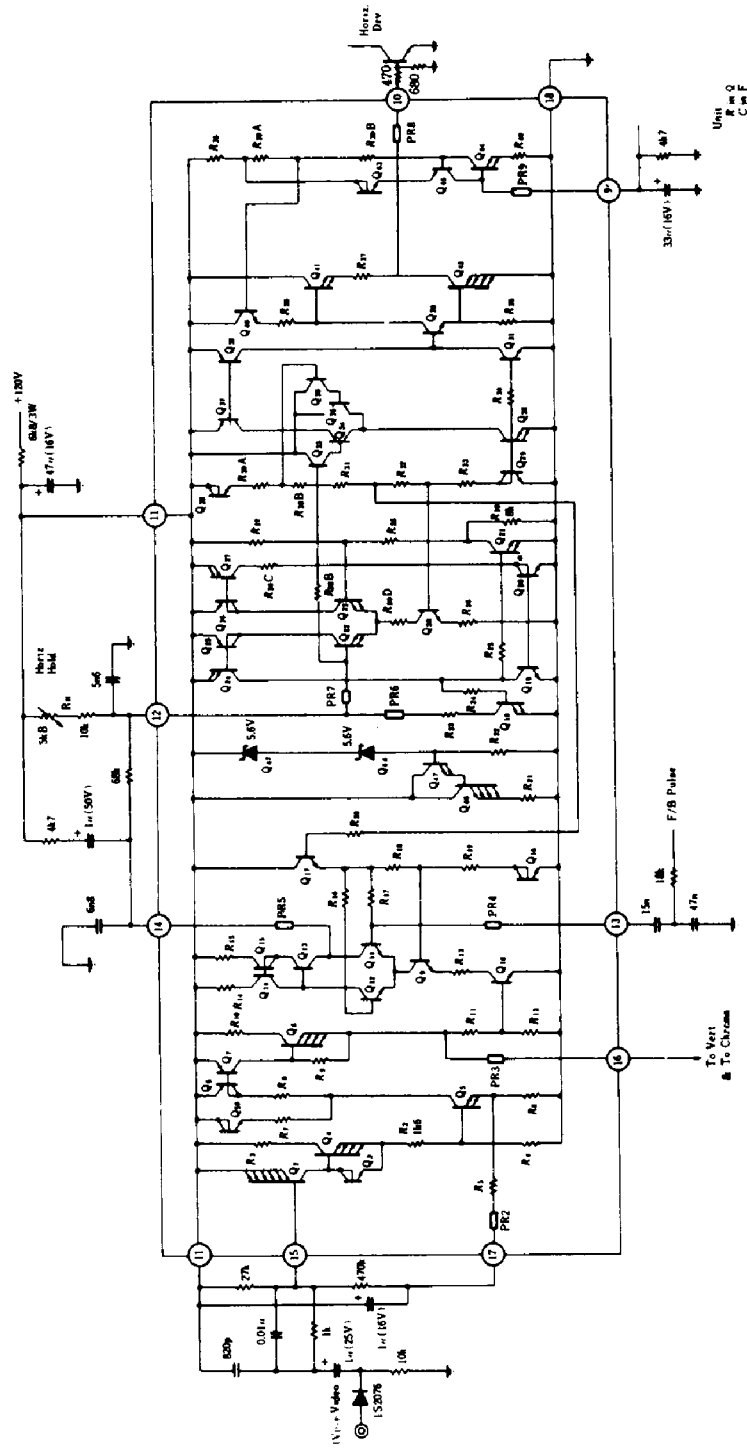
Pin No.	Function	Max. Input/Output Voltage/Current
13	Phase detector FBP (flyback pulse) input pin	5 V <sub>p-p</sub>
14	Phase detector output pin	2 mA
15	Sync separator video signal input pin	3 mA
16	Sync separator output pin	15 mA
17	Sync separator feedback pin	12 V
18	GND pin	—

## Block Diagram



Hitachi America, Ltd. • Hitachi Plaza • 2000 Sierra Point Pkwy. • Brisbane, CA 94005-1819 • (415) 589-8300





**Figure 2 Circuit Schematic (Sync Separator and Horizontal APC)**



Hitachi America, Ltd. • Hitachi Plaza • 2000 Sierra Point Pkwy. • Brisbane, CA 94005-1819 • (415) 589-8300

19

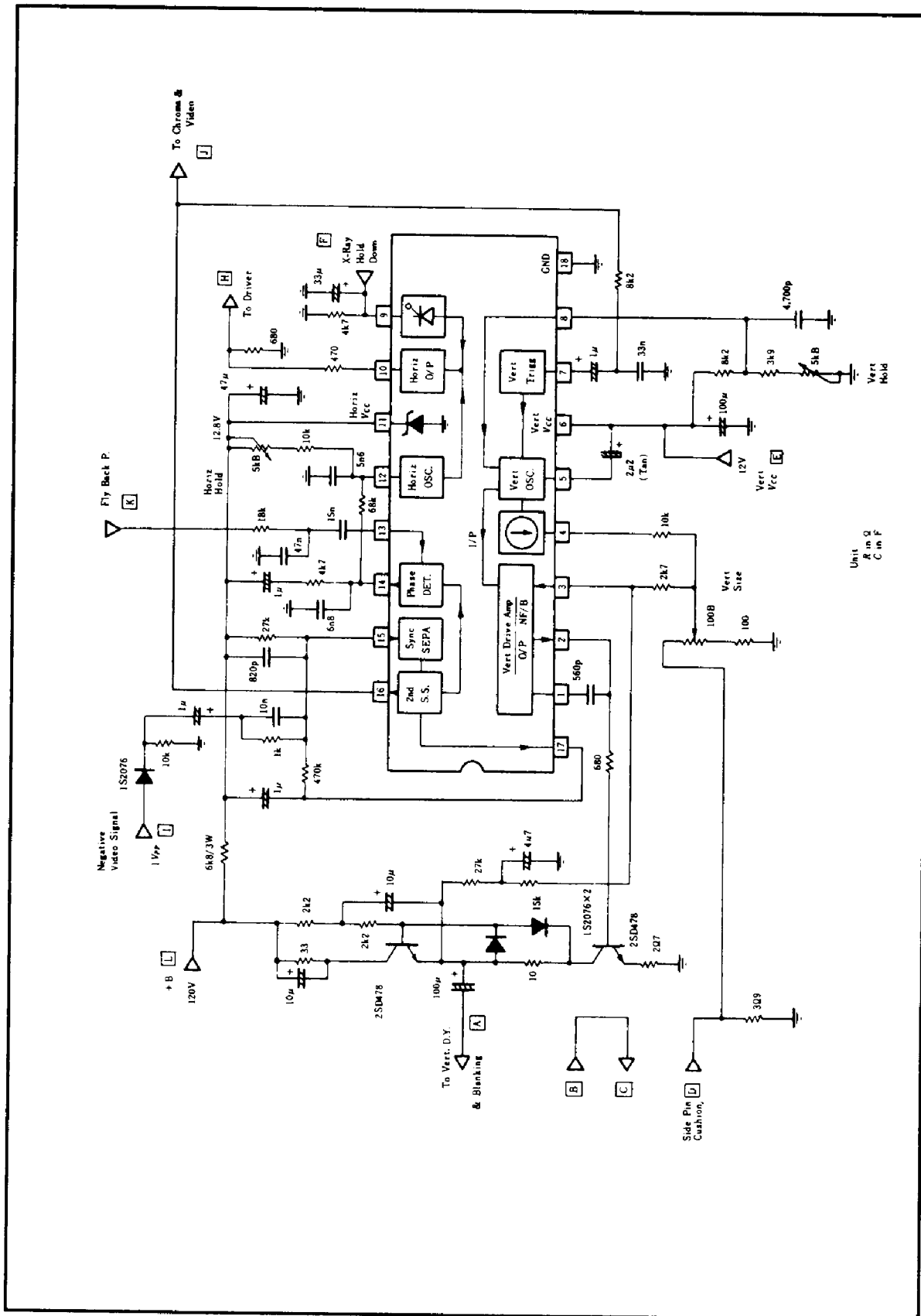


Figure 3 Application Information



## External Parts Functions

PIn No.	Part No.	Functions
1, 2, 3	C <sub>109</sub>	<ul style="list-style-type: none"> <li>• Feedback capacitor preventing parasitic oscillation</li> <li>• Determines closed loop gain (560 pF recommended to prevent abnormal oscillation and crossover distortion)</li> </ul>
	R <sub>111</sub>	<ul style="list-style-type: none"> <li>• Current limiter</li> <li>• Prevents excessive current and surge breakdown</li> <li>• Determines Q<sub>202</sub> base current value</li> </ul>
	R <sub>110</sub>	<ul style="list-style-type: none"> <li>• Determines vertical oscillation section's idling current</li> </ul>
	R <sub>106</sub>	<ul style="list-style-type: none"> <li>• Determines DC feedback to pin 3</li> </ul> <p>where <math>V_{1\text{ DC}}</math> = DC voltage at pin 1 (3.3 V type)  <math>V_{+B}</math> = +B 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 <math>I_{dy}</math> = current into the deflection yoke  <math>V_{p-p}</math> = peak-to-peak voltage at pin 1 (1.5 V<sub>p-p</sub>)</p>
	R <sub>117</sub>	<ul style="list-style-type: none"> <li>• Determines deflection current</li> </ul>
	C <sub>106</sub>	<ul style="list-style-type: none"> <li>• Decoupling capacitor</li> </ul>
	C <sub>105</sub>	<ul style="list-style-type: none"> <li>• Bootstrap capacitor</li> </ul>
	R <sub>115</sub>	<ul style="list-style-type: none"> <li>• Determines vertical size</li> </ul>
	R <sub>105</sub>	<ul style="list-style-type: none"> <li>• Determines vertical oscillator's discharging time</li> <li>• Vertical deflection yoke current linearity adjustment (Large R<sub>105</sub> value lengthens discharging time and reduces oscillation frequency)</li> </ul>
	C <sub>104</sub>	<ul style="list-style-type: none"> <li>• Determines vertical oscillation discharging time constant (Tantalum capacitor recommended)</li> </ul>
7	R <sub>101</sub> , C <sub>101</sub>	<ul style="list-style-type: none"> <li>• Integrates composite vertical sync pulse</li> <li>• Determines vertical pull-in range</li> </ul>
	C <sub>102</sub>	<ul style="list-style-type: none"> <li>• AC coupling capacitor</li> </ul>
8	R <sub>102</sub> , R <sub>103</sub> , R <sub>104</sub>	<ul style="list-style-type: none"> <li>• Determines vertical oscillation bottom voltage (Lower bias voltage at pin 8 increases peak-to-peak oscillation level and reduces oscillation frequency)</li> </ul>
	C <sub>103</sub>	<ul style="list-style-type: none"> <li>• Integrates composite vertical sync pulse</li> <li>• Eliminates horizontal sync component</li> </ul>
9	R <sub>132</sub> , C <sub>130</sub>	<ul style="list-style-type: none"> <li>• Highpass filter in X-ray protection circuit</li> </ul>
10	R <sub>130</sub>	<ul style="list-style-type: none"> <li>• Protects against surge breakdown</li> </ul>
	R <sub>131</sub>	<ul style="list-style-type: none"> <li>• Determines horizontal drive transistor on/off level</li> </ul>



**External Parts Functions (cont)**

Pin No.	Part No.	Functions
11	R <sub>129</sub>	• Determines +B supply current into horizontal drive transistor (Supply 15 mA current. Approximately 9 mA consumed internally and 6 mA used to keep V <sub>CC</sub> level constant.)
	C <sub>129</sub>	• Decoupling capacitor for constant V <sub>CC</sub>
12	C <sub>128</sub> , R <sub>126</sub> , R <sub>127</sub>	• Horizontal oscillation (Larger time constant reduces oscillation frequency)
14	R <sub>125</sub> , R <sub>128</sub> , C <sub>127</sub>	• Determine AFC circuit AC loop gain
	C <sub>126</sub>	• Bypass capacitor
15, 17	C <sub>120</sub>	• Eliminates high frequency noise
	C <sub>121</sub> , R <sub>120</sub> , R <sub>121</sub> , R <sub>122</sub> , C <sub>122</sub> , C <sub>123</sub>	• Determines sync separator base time constant R <sub>120</sub> : Discharging R <sub>122</sub> : Negative feedback C <sub>122</sub> : Pin 17 time constant credit C <sub>123</sub> : Separates stable sync
	D <sub>103</sub>	• 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<sub>CC</sub> lines.
4. 470  $\Omega$  and 680  $\Omega$  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	$\Delta f_{ph}$	$\pm 450$	$\pm 650$	—	Hz	
APC Loop Gain	$f_c$	577.5	750	1070	Hz/ $\mu\text{s}$	
Temperature Coefficient	$\Delta f_{oh}$	-6.0	-3.0	0	Hz/ $^\circ\text{C}$	
Output Pulse Width	$t_{hw}$	22.5	25.0	27.5	$\mu\text{s}$	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	$\Delta f_{pv}$	—	-10	-7.5	Hz	
Temperature Coefficient	$\Delta f_{ov}$	-0.03	0	+0.03	Hz/ $^\circ\text{C}$	

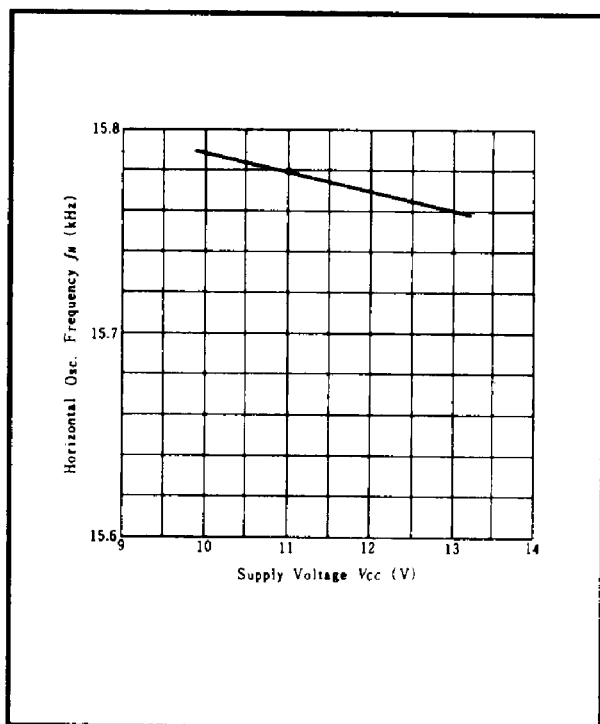
**Table 3 Sync Separator**

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	$\mu\text{s}$	Pin 16

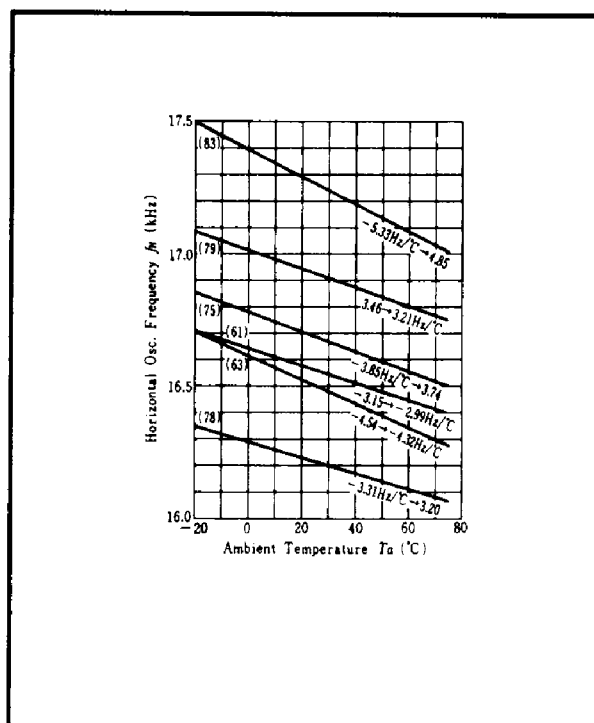




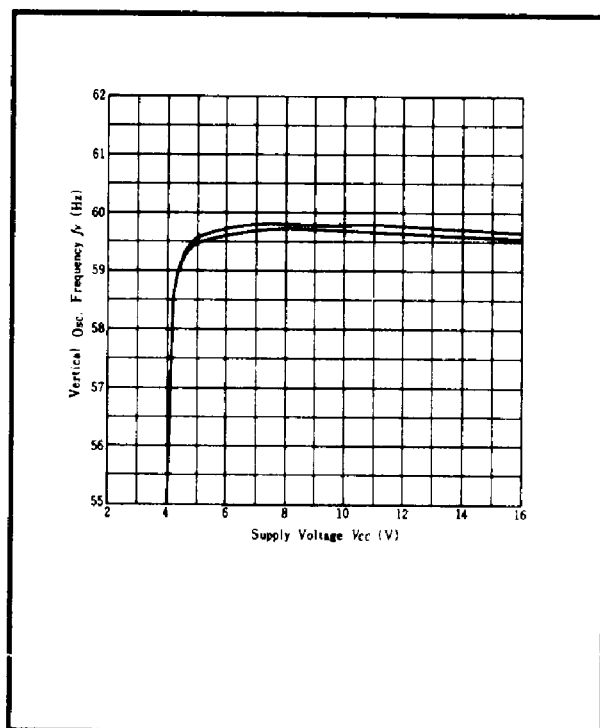
## Typical Performance Curves



**Figure 4 Horizontal Oscillation Frequency vs. Supply Voltage**



**Figure 5 Horizontal Frequency vs. Ambient Temperature**



**Figure 6 Vertical Oscillation Frequency vs. Supply Voltage**

