# OSCILLATORS
# STANDARD SPECIFICATIONS

Valpey-Fisher oscillator products include hybrid and discrete oscillators to provide a full range of performance options.

Valpey-Fisher Hybrid Clock Oscillators combine state of the art, thick film hybrid technology with precision quartz crystal resonators to achieve small size, low cost, high reliability and frequency stability in a variety of output waveforms. Package options include leaded through hole and several surface mount designs as well as molded plastic.

| Valpey-Fisher Series | Output |
|---|---|
| VF150 | TTL |
| VF160 | ECL |
| VF170 | CMOS |
| VFHS170 | HCMOS |

Valpey-Fisher Precision Oscillators provide an even more stable frequency reference. They combine high reliability quartz crystals, hermetically sealed in their own enclosures, with individual components specifically selected to optimize that specific circuit design. The following types of oscillators are offered in small, PC board mountable packages with a wide variety of outputs to your exact specifications.

| Valpey-Fisher Series | Type |
|---|---|
| VF500 | Temperature Compensated Crystal Oscillator (TCXO) |
| VF600 | Voltage Controlled Crystal Oscillator (VCXO) |
| VF800 | Oven Controlled Crystal Oscillator (OCXO) |

Valpey-Fisher's more than 50 years of experience with piezoelectric technology makes it a front-runner in the development, design and manufacture of oscillators for both standard and custom applications. Listed here are typical specifications for Standard Valpey-Fisher Oscillators. Complete specifications for each type of oscillator are listed in the following pages. Fully customized oscillators meeting critical frequency requirements in a wide range of demanding applications are also a specialty of Valpey-Fisher. Contact our factory with your special frequency control needs.

## Standard Specifications for Valpey-Fisher VF500, VF600 and VF800 Oscillators

**Frequency range:** Varies by circuit technology and oscillator type. See each oscillator series specifications.

**Frequency adjust range:** ±5.0 PPM min.

**Output:** See Standard Output Tables.

**Input:** Tolerance on input supply voltage is 2%. RF and DC returns are connected to the case.

**VF500 (TCXO):** Frequency set temperature is +25°C, ±2°C.

**VF600 (VCXO):**
Control voltage: ±5.0 VDC, 0 VDC ref.
Control voltage slope: Negative
Linearity: ± 20%
Input impedance: 10 kilohms min.
Input modulation frequency: DC to 10KHz min.

**Stability**
**vs. Supply Voltage:**
VF500 (TCXO): $\pm 1 \times 10^{-7}$/2%
VF800 (OCXO: $\pm 1 \times 10^{-8}$/2%
**vs. Load:** VF500 (TCXO)/
VF600 (VCXO): $\pm 2 \times 10^{-7}$/10%
VF800 (OCXO): $\pm 1 \times 10^{-8}$/10%
**vs. Temperature:** As specified
**vs. Time (Aging—after 30 days power on condition):**
VF500 (TCXO): $-1 \times 10^{-6}$/yr typ
VF800 (OCXO): As specified, from $5 \times 10^{-10}$/day to $1 \times 10^{-9}$/day

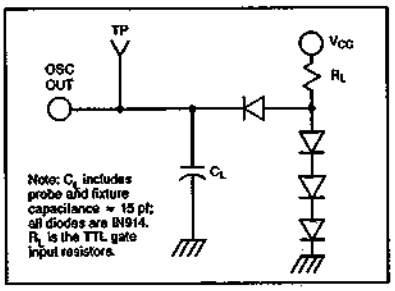
All Valpey-Fisher Oscillator test references are calibrated to the National Bureau of Standards. Product meeting all environmental, mechanical, and electrical requirements of MIL-0-55310, MIL-STD-883, and MIL-STD-202 can be provided.

## Standard Output Tables

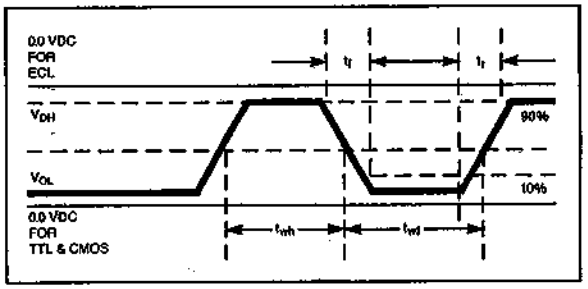
| Sine wave Output | | |
|---|---|---|
| **Frequency** | 500 kHz to 4 MHz | 4 MHz to 1,000 MHz |
| **Output level** | 1V rms min | 0 dBm min |
| **Output load** | 1 kilohm | 50 ohms |
| **Load VSWR** | 1.2:1 max | 1.2:1 max |
| **Harmonics/subharmonics** | −20 dBc | −20 dBc |
| **Spurious** | −60 dBc | −60 dBc |

| Square wave Output | | | |
|---|---|---|---|
| | **TTL** | **ECL** | **HCMOS** |
| **Frequency Range ($f_o$)** | 10 kHz–70 MHz | 50 MHz–200 MHz | 10 kHz–30 MHz |
| **Logic "1"** | +2.4 Vdc min | −0.96 Vdc min | +3.7 Vdc min |
| **Logic "0"** | +0.4 Vdc max | −1.65 Vdc max | +0.2 Vdc max |
| **Symmetry (%)** | 60/40 | 60/40 | 60/40 |
| **Rise/Fall Times ($T_r$/$T_f$)** | 15ns | 2ns | 15ns |
| **Load** | 10 TTL gates | 50 ohms to −2 Vdc | 6 LS TTL |

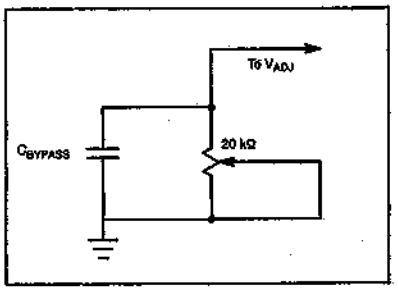
## TTL Test Circuit



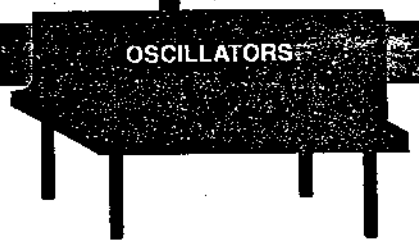

## Standard Wave Form




## Electrical Frequency Adjustment



# VF 150 Series TTL HYBRID CRYSTAL CLOCK OSCILLATORS



Valpey-Fisher VF150 hybrid oscillators are compatible with TTL circuitry and offer a dependable, proven design, hermetic seal, and state of the art thick film technology. The widely used VF150 series is also available with dual and triple outputs, enable/disable and tri-state functions. The tri-state option ensures compatibility of the VF150 series with Automatic Test Equipment (ATE).

Package choices include traditional full size or new half size plated-through-hole metal DIP designs, as well as surface mount, both full and half size, with either leads or pads for soldering.

## VF150 Series TTL Hybrid Crystal Clock Oscillators

| Specifications | |
|---|---|
| FREQUENCY RANGE: | 0.25 MHz to 70.0 MHz |
| OUTPUT: | TTL |
| Symmetry: | 60/40 to 40/60% @ 1.4 VDC level* |
| Rise & Fall Times: | 15 ns max. between 0.4 VDC and 2.4 VDC levels (0.25 MHz to 4 MHz)<br>10 ns max. between 0.4 VDC and 2.4 VDC (4.01 MHz to 20 MHz)<br>6 ns max. between 0.5 VDC and 2.7 VDC levels (20.01 to MHz to 70 MHz) |
| "0" Level: | +0.4V max., sinking 16 mA min. (0.25 MHz to 20 MHz)<br>+0.5V max., sinking 20 mA min. (20.01 MHz to 70 MHz) |
| "1" Level: | +2.4V min., sourcing −0.4 mA min. (0.25 MHz to 20 MHz)<br>+2.7V min., sourcing −0.5 mA min. (20.01 MHz to 70 MHz) |
| Fanout: | 10 TTL gates |
| Short Circuit Output Current: | 18 mA min. |
| INPUT VOLTAGE: | +5 VDC, ±10% |
| INPUT CURRENT (max., unloaded) | 70 mA 0.25 MHz to 3.999 MHz<br>30 mA 4.00 MHz to 20.00 MHz<br>50 mA 20.01 MHz to 70.00 MHz |
| STORAGE TEMPERATURE: | −55°C to +125°C |
| PACKAGE: | See Oscillator Package Chart, pages 16, 17 and 18. |
| ELECTRICAL CONNECTIONS: | PIN #1 N.C.** PIN #7 Case GND<br>PIN #14 +5 VDC PIN #8 Output*** |

Valpey-Fisher welcomes inquiries for stability tolerances and temperature ranges that may be specific to your needs.
*The symmetry shown is standard. Tighter symmetries, such as 45/55, are available upon special request and are indicated by the letter "H" between the code for stability and the code for operating temperature. For example, an 8.0 MHz oscillator with 0.005% stability, an operating temperature range of −40°C to 85°C, and a 45/55 stability would be designated VF150BH1.
**Additional outputs with various phase and frequency relationships are available.
***Enable/disable feature available.

In addition to specifying the *frequency*, use the Valpey-Fisher part number in the chart below to designate the exact *frequency range*, *stability*, and *operating temperature* you require:

| Frequency Range (MHz) | Stability (%) | Operating Temperature Range (°C) | | |
|---|---|---|---|---|
| | | 0 to +70 | −40 to +85 | −55 to +125 |
| 0.25 to 1.124 | 0.0025 | VF154A | VF154A-1 | VF154A-2* |
| | 0.005 | VF154B | VF154B-1 | VF154B-2 |
| | 0.01 | VF154 | VF154-1 | VF154-2 |
| | 0.05 | VF154C | VF154C-1 | VF154C-2 |
| | 0.25 | VF154D | VF154D-1 | VF154D-2 |
| 1.125 to 2.249 | 0.0025 | VF153A | VF153A-1 | VF153A-2* |
| | 0.005 | VF153B | VF153B-1 | VF153B-2 |
| | 0.01 | VF153 | VF153-1 | VF153-2 |
| | 0.05 | VF153C | VF153C-1 | VF153C-2 |
| | 0.25 | VF153D | VF153D-1 | VF153D-2 |
| 2.250 to 3.999 | 0.0025 | VF152A | VF152A-1 | VF152A-2* |
| | 0.005 | VF152B | VF152B-1 | VF152B-2 |
| | 0.01 | VF152 | VF152-1 | VF152-2 |
| | 0.05 | VF152C | VF152C-1 | VF152C-2 |
| | 0.25 | VF152D | VF152D-1 | VF152D-2 |
| 4.00 to 25.00 | 0.0025 | VF150A | VF150A-1 | VF150A-2* |
| | 0.005 | VF150B | VF150B-1 | VF150B-2 |
| | 0.01 | VF150 | VF150-1 | VF150-2 |
| | 0.05 | VF150C | VF150C-1 | VF150C-2 |
| | 0.25 | VF150D | VF150D-1 | VF150D-2 |
| 25.01 to 70.00 | 0.0025 | VF155A | VF155A-1 | VF155A-2* |
| | 0.005 | VF155B | VF155B-1 | VF155B-2 |
| | 0.01 | VF155 | VF155-1 | VF155-2 |
| | 0.05 | VF155C | VF155C-1 | VF155C-2 |
| | 0.25 | VF155D | VF155D-1 | VF155D-2 |

* −55°C to +105°C