

MODEL: T-73-13-03**5511, 5512**

5510 Series 1MHz Bandwidth Analog Modulator/Demodulator

Description

The Model 5511 and 5512 are precision, wide bandwidth V/F and F/V converters respectively, intended to be used as the modulator and demodulator for an analog fiber optic data link. The 5511 accepts a $\pm 1V$ full scale analog input at a 1MHz bandwidth. An offset adjust pin is provided which can be used to bias the 5511 input to allow bipolar operation. The input voltage is converted into a TTL-compatible frequency output over the 8 to 10MHz range. This TTL output can then be used to modulate the optical transmitter in an existing digital fiber optic data link, or to implement a stand-alone analog data link.

The Model 5512 demodulator performs the reverse process, converting an 8 to 10MHz TTL frequency input into an analog output voltage over the range of $\pm 1V$ full scale. Again, an offset pin is provided to allow the recovery of bipolar voltages. Analog linearity through the modulator/demodulator system is $\pm 0.1\%$ FS for signals up to 1MHz in bandwidth.

The 5511 and 5512 are packaged in 2.0"x2.0"x0.4" plastic shells. Operating temperature range is 0°C to +70°C. Power dissipation is 1.5W for either the 5511 or 5512 on $\pm 15V$ power supplies.

Using the 5510 Series Analog Modulator/Demodulator General Considerations

As with any high precision conversion circuitry, the use of a ground plane is strongly recommended. The layout should be clean, with output pulses routed as far away as possible from the input analog signals. As shown in Figure 1, bypass capacitors should be mounted as close as possible to the power supply pins of the 5511 or 5512.

Offset and Gain Calibration

The V/F OFFSET adjustment potentiometer should be a 20K Ω , 10-turn unit. With this pot in the circuit, initial offsets of up to $\pm 10mV$ may be trimmed to zero.

The V/F GAIN adjustment potentiometer should be a 200 Ω , 10-turn unit with a recommended temperature coefficient of 100ppm/ $^{\circ}C$ or better. With this potentiometer in the circuit, initial gain errors of up to $\pm 2\%$ may be trimmed to zero.

To calibrate the 5511, the offset is adjusted prior to adjusting the gain. With a voltage at the analog input of 0V signal at V_N , adjust the OFFSET pot until an output frequency of 9.000MHz is obtained at the pin. With a full scale voltage alternating between -1.0V and +1.0V at V_N of the V/F, adjust the gain pot for an equal deviation in output frequency between 10.000MHz and 8.000MHz respectively. Calibra-

FEATURES

- ☐ Wide Analog Bandwidth
dc to 1MHz
- ☐ Good Link Linearity
0.1% End-to-End
- ☐ Course and Fine Offset
Inputs
Allows bipolar operation
- ☐ Convenient Interfacing
TTL Compatible
- ☐ PC-Mounted Module
2.0"x2.0"x0.4" Plastic Package

APPLICATIONS

- ☐ Analog Transmission on
Existing Digital Data
Links
- ☐ Wide Bandwidth Analog
Data Links
- ☐ Wide Bandwidth, Low
Speed A/D Converters

Specifications

All Specifications Guaranteed at 25°C Unless Otherwise Noted

T-73-13-03

5511 MODULATOR**ANALOG INPUT**

Input Voltage

±1V

Input Overrange

5% minimum

Maximum Input Voltage

±V_s without damage

Input Impedance

5kΩ nominal

OFFSET VOLTAGE INPUT

Input Voltage

9.0V ±0.25V

Offset Error

±5%, adjustable to zero

TRANSFER CHARACTERISTICSFull Scale Frequency Output (F_{out})

8-10MHz, +5% overrange

Transfer Function

 $F_{out} = [9M - (V_{IN} \cdot 1M)]Hz$

Non-Linearity

±0.05% FS typical,

±0.1% FS maximum

Gain Error

±5%, adjustable to zero

Full Scale Step Response

2 cycles of new frequency plus 2μs

Overload Recovery

12 cycles of new frequency

FREQUENCY OUTPUT

Output Pulse Width

50ns ±5ns

Logic Levels

Logic 1 ("Low")

Logic 0 ("High")

<0.4V @ 16mA sink

>3.5V

Fanout

10 TTL loads

STABILITY

(Exclusive of external components)

Gain - Tempco

±100ppm/°C FS maximum

Gain - Power Supply Sensitivity

100ppm/% change in supply voltage

Offset - Tempco

±50μV/°C maximum

Offset - Power Supply Sensitivity

20μV/% change in supply voltage

POWER REQUIREMENTS

+15V, ±3%

-15V, ±3%

+5V, ±5%

35mA

5mA

60mA

Absolute Power Supply Limits

±15V, ±3%;

+7V

ENVIRONMENTAL AND MECHANICAL

Operating Temperature Range (Rated Performance)

0°C to +70°C

Storage Temperature

-55°C to +125°C

Dimensions

2.0"x2.0"x0.4"

Plastic module

5502 DEMODULATOR**FREQUENCY INPUT**

Input Pulse Width

45ns maximum; negative

Logic Levels

Logic 1 ("Low")

Logic 0 ("High")

<0.4V @ 16mA sink

>3.5V

Input Load

1TTL load

TRANSFER CHARACTERISTICSFull Scale Frequency Input (F_{IN})

8 to 10MHz, +5% overrange

Transfer Function

 $[(9MHz - F_{IN}/1MHz)] \cdot V$

Non-Linearity

±0.05% FS typical;

±0.1% FS maximum

Gain Error

±5%, adjustable to zero

Full Scale Step Response

2 cycles of new frequency plus 2μs

Overload Recovery

12 cycles of new frequency

ANALOG OUTPUT

Output Voltage

±1V

Output Overrange

5% minimum

Ripple Voltage

±500mV typical at carrier frequency;

assumes no low pass filter present on

output

Specifications (continued)

Specifications (continued)
All Specifications Guaranteed at 25°C Unless Otherwise Noted

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OFFSET VOLTAGE INPUT Input Voltage 9.0V ± 0.25 V Offset Error $\pm 5\%$, adjustable to zero	POWER REQUIREMENTS <table><tr><td>+15V, $\pm 3\%$</td><td>-15V, $\pm 3\%$</td><td>+5V, $\pm 5\%$</td></tr><tr><td>35mA</td><td>5mA</td><td>60mA</td></tr></table> Absolute Power Supply Limits ± 15 V, $\pm 3\%$; +7V	+15V, $\pm 3\%$	-15V, $\pm 3\%$	+5V, $\pm 5\%$	35mA	5mA	60mA
+15V, $\pm 3\%$	-15V, $\pm 3\%$	+5V, $\pm 5\%$					
35mA	5mA	60mA					
STABILITY (Exclusive of external components) Gain - Tempco ± 100 ppm/ $^{\circ}$ C FS maximum Gain - Power Supply Sensitivity 100ppm/% change in supply voltage Offset - Tempco ± 50 μ V/ $^{\circ}$ C maximum Offset - Power Supply Sensitivity 20 μ V/% change in supply voltage	ENVIRONMENTAL AND MECHANICAL Operating Temperature Range (Rated Performance) 0 $^{\circ}$ C to +70 $^{\circ}$ C Storage Temperature -55 $^{\circ}$ C to +125 $^{\circ}$ C Dimensions 2.0"x2.0"x0.4" Plastic module						

Using the 5510 Series Analog Modulator/Demodulator

tion is now completed.

To calibrate the 5512, the offset is adjusted prior to adjusting the gain. With a TTL frequency at the input to the 5512 of 9.000MHz, adjust the OFFSET pot until an output voltage of 0.000V is present

on the output pin. With a TTL frequency of 10.000MHz on the input, adjust the GAIN pot until the output voltage equals -1.000V. Please refer to the section entitled **“Low-Pass Filtering Output Ripple”** for additional information.

Grounding

The Analog and Digital grounds are internally connected within the 5511/5512 circuitry. The use of a ground plane is recommended. If a ground plane is not

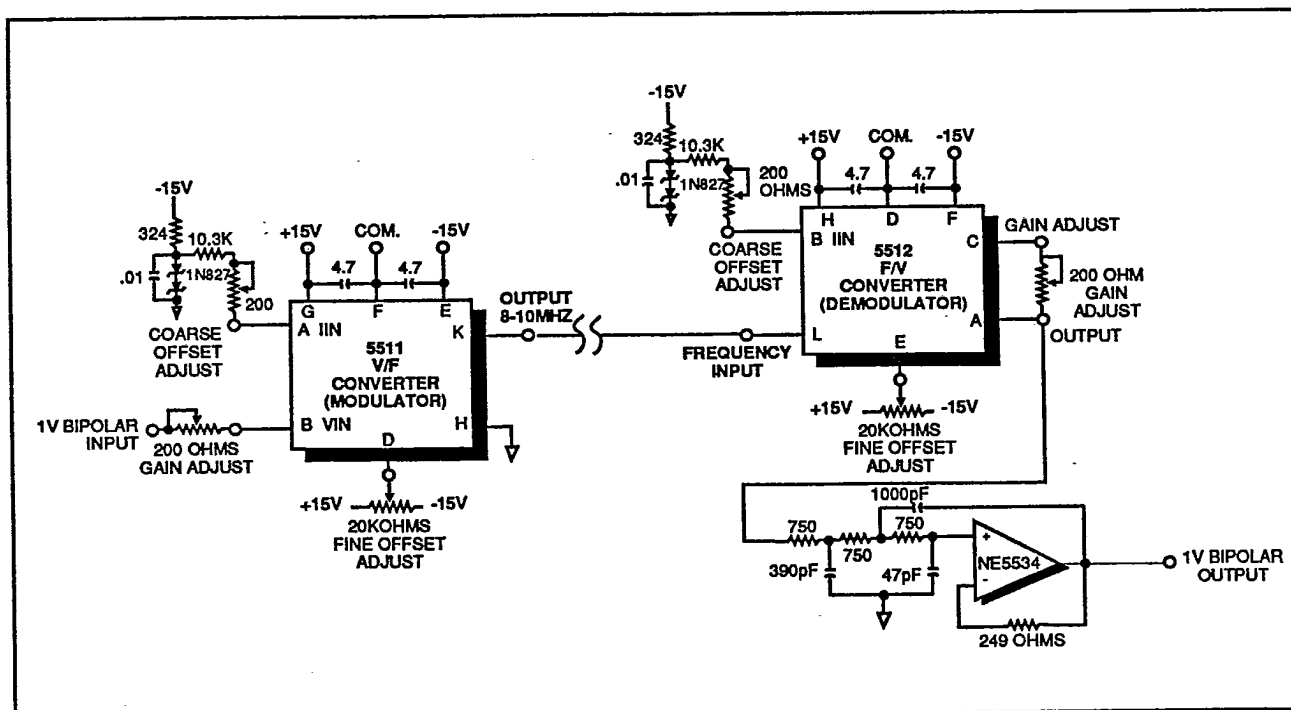


Figure 1. 5511/5512 Interconnection

Using the 5510 Series Analog Modulator/Demodulator

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feasible, then a single-point ground ("star" ground) must be used. Significant performance degradation will result if these grounding schemes are not utilized.

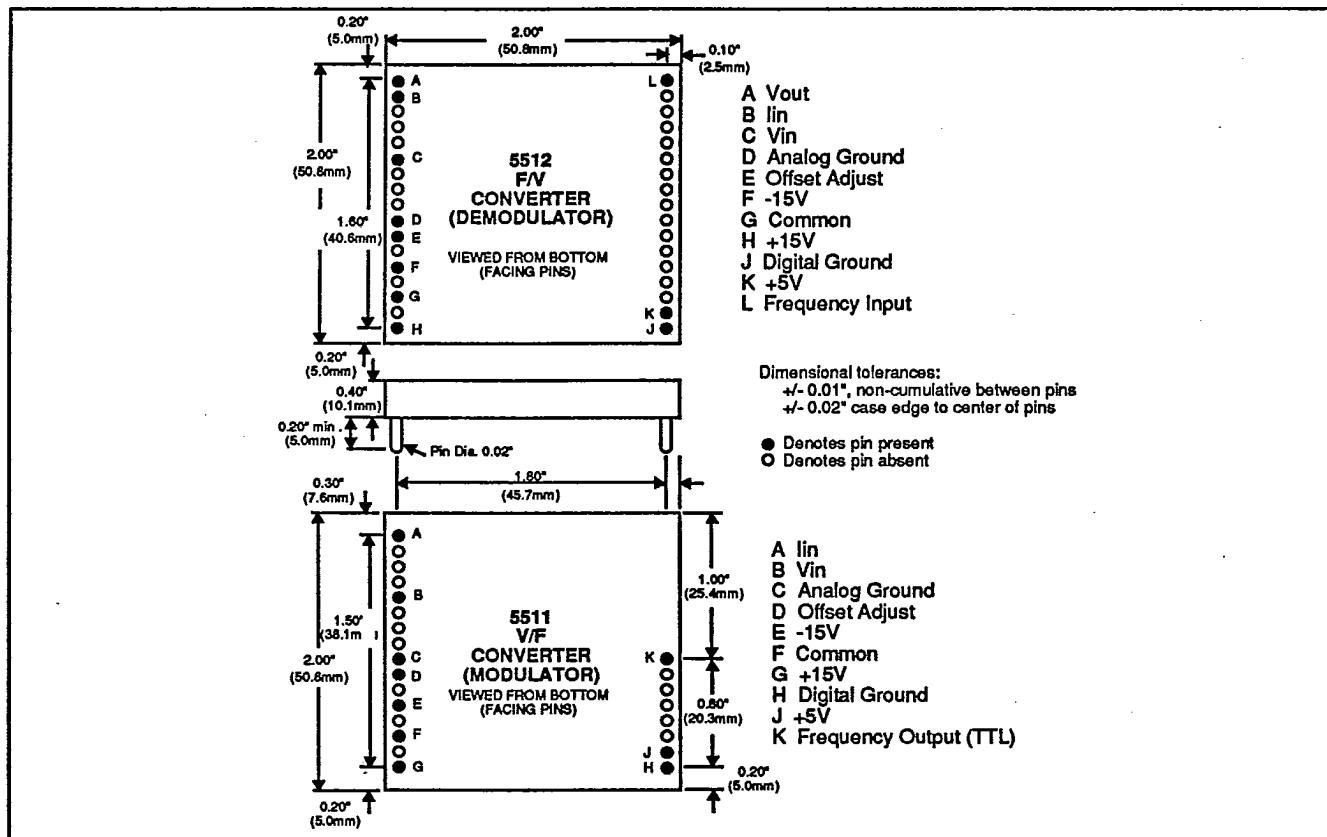
Low-Pass Filtering of 5502 Output Ripple

The 5512 analog output has an

ac component that is composed of the carrier frequency. Unfiltered, this ripple voltage can be as large as 500V. To filter this ripple voltage and maintain the overall link analog bandwidth for the intended application, a capacitor is connected between the OUTPUT and OFFSET ADJUST pins of the F/V converter.

The value of this feedback capacitor is dependent on the bandwidth to be preserved and the required settling time of the receiver circuit. Representative values are given in Figure 1.

Mechanical/Pinout



ORDERING INFORMATION

1MHz Bandwidth, $\pm 0.1\%$ Linearity
 Analog Modulator
 Analog Demodulator

Order Model:
 5511
 5512



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