

Model 7928A Miniaturized 8 Bit 360° Phase Shifter/Frequency Translator

The Model 7928A is a miniaturized, hermetically sealed PIN diode phase shifter covering the frequency range from 6 to 18 GHz providing a full 360° range of variable phase shift. It can also be used to perform frequency translation.

The unit is an integrated assembly of an RF vector modulator and a driver circuit consisting of an 8-bit D/A converter and a voltage buffer. See Figure 1.

PHASE SHIFT

Phase shifting is achieved utilizing the RF vector modulator approach shown in Figure 2. The 3-dB hybrid coupler divides the RF signal into two quadrature components which are then biased in proportion to the sine and cosine of the desired phase shift. The signals are then combined in-phase to yield desired output.

ACCURACY

Improved phase accuracy and PM/AM performance are achieved by using double-balanced bi-phase linear amplitude modulators. In the main operating band, overall phase accuracy is better than 12°. The same phase accuracy can be achieved at the band edges by using a built-in frequency correction circuit.

Switching speed is better than 500 nsec.

FREQUENCY TRANSLATION (SERrodyNING)

In the design of the Model 7928A special attention has been paid to those characteristics which affect its performance as a frequency translator. These include minimizing PM-to-AM conversion, use of high slew rate drivers, and optimizing phase shift linearity with applied signal. As a result, carrier and sideband suppression levels of over 25 and 20 dB, respectively, are obtained in the main band. The same carrier and sideband performance can be realized over the full stretch band when the internal frequency correction circuit is employed. See Fig. 3 for input control requirements.

On special order, frequency translators can be provided for operation over reduced bandwidths with suppression levels of up to 40 dB. Consult the factory for such requirements.

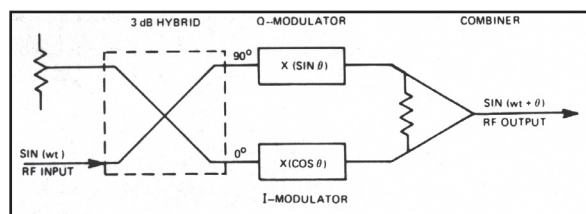


Fig. 2—RF Vector Modulator

- 6 to 18 GHz
- 360° range
- High speed
- Digitally programmable (8 Bits)
- Guaranteed monotonicity
- Hermetically Sealed
- Miniaturized: less than 1.5 in³



Phase Shifter Model 7928A

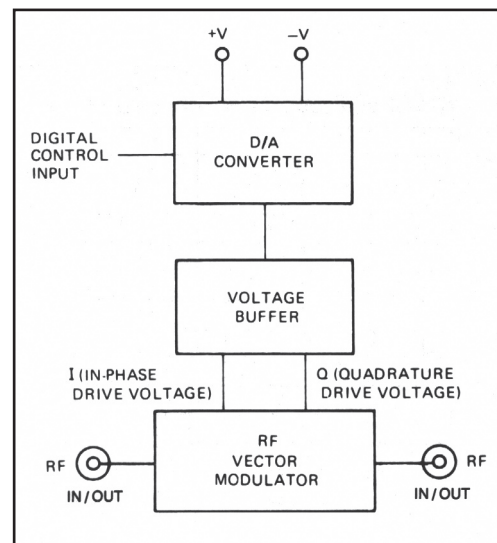


Fig. 1—Model 7928A, block diagram



Model 7928A Specifications

PHASE SHIFTER SPECIFICATIONS

FREQUENCY RANGE (GHz)	INSERTION LOSS (Max.)	VSWR (Max.)	ACCURACY ⁽¹⁾ (Max.)	PM/AM ⁽¹⁾ (Max.)
Main Band 8.0-18.0 Stretch Band 6.0-18.0	12.0 dB	2.0:1	±12° ±15°	±1.1 dB ±2.0 dB

FREQUENCY TRANSLATOR SPECIFICATIONS

TRANSLATION RATE (Min.)	CARRIER ⁽¹⁾ SUPPRESSION (Min.)	SIDE BAND ⁽¹⁾ SUPPRESSION (Min.)	INSERTION LOSS VARIATION (Max.) with translation rate of:
0 to 500 kHz ⁽²⁾	Main Band: 25 dB Stretch Band: 18 dB	Main Band: 20 dB Stretch Band: 15 dB	200 kHz: 1 dB 500 kHz: 3 dB

(1) When operating as a Phase Shifter outside the Main Band Frequency Range, a TTL Low (0) applied to the J3 Power/Control Connector Freq. Correction Pin (pin R) will result in Stretch Band Frequencies exhibiting enhanced performance characteristics. The resultant Accuracy and PM/AM specifications will be the same as those shown for the Main Band Frequency Range. When using the unit as a Frequency Translator, similar enhanced performance can be achieved for Carrier & Sideband Suppression.

(2) All specifications are met using only the five most significant bits for translation rates of 0 to 200 kHz. For translation rates of 201 to 500 kHz, only 4 most significant bits are used.

PERFORMANCE CHARACTERISTICS

Phase Shift

Range 360° in 256 steps
Variation 0.1°/°C

Control Input 8 Bit TTL

Switching Speed

(50% TTL to within 10° of Final Phase Value)..... 500 nsec max

Harmonics -30 dBc

Power Handling Capability Without Performance Degradation

+10 dBm
(typically +13 dBm)
+30 dBm

Survival power

Power Supply Requirements

+5V ±5%, 80 mA max
+12 to +15V, 10 mA max
-12 to -15V, 95 mA max

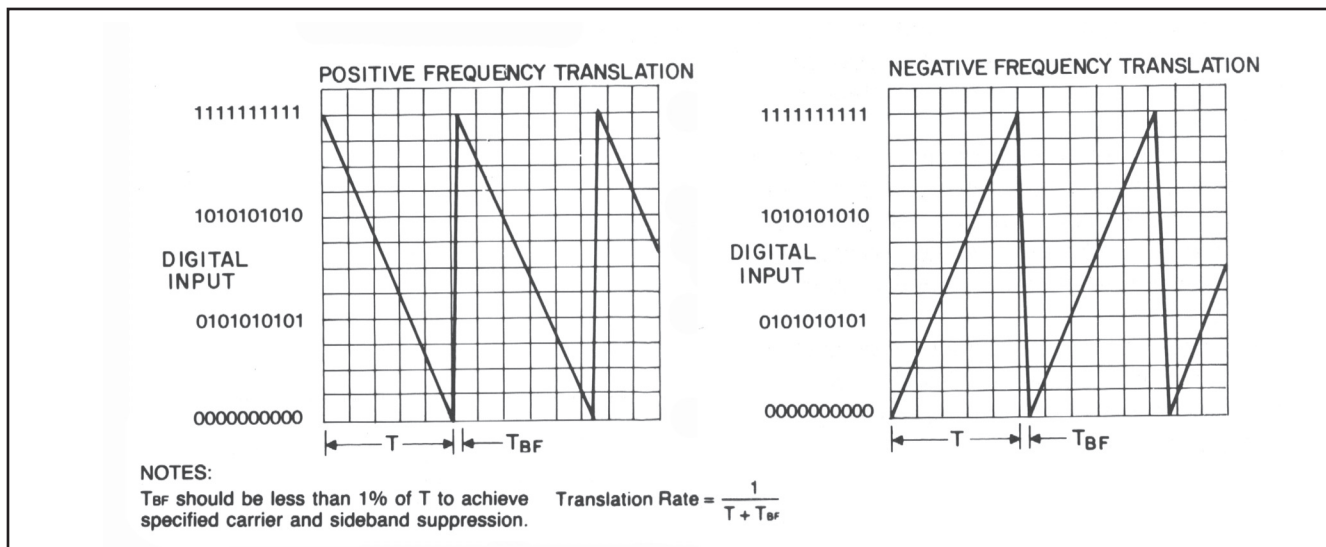


Fig. 3—Model 7928A Control input requirements.



Model 7928A Specifications

ACCESSORY FURNISHED

Mating power/control connector

ENVIRONMENTAL RATINGS

Operating Temperature

Range.....-54°C to +95°C

Non-Operating

Temperature Range.....-65°C to +125°C

AVAILABLE OPTIONS

Option No.	Description
7	Two SMA male RF connectors
10	One SMA male (J1), and one SMA female (J2) RF connector
49	High Rel screening (see table 1, below)

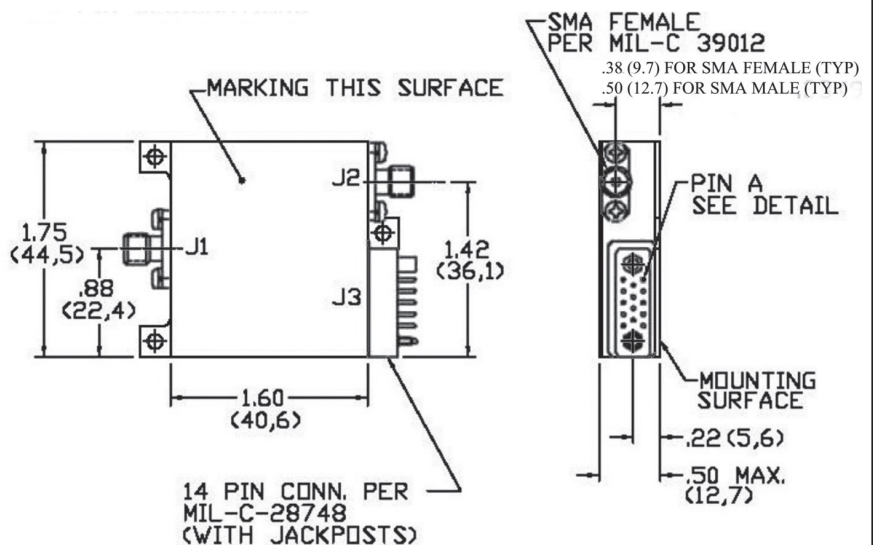
Table 1. Option 49 High Rel Screening

General Microwave's hermetically-sealed products utilize rugged construction techniques and hermetic sealing to meet stringent military requirements for shock, vibration, temperature, altitude, humidity, and salt atmosphere. All hermetically-sealed parts may be ordered, if desired, with 100% screening in accord with the following MIL-STD 883:

TEST	METHOD	CONDITION
Internal Visual	2017	-
Temperature Cycle	1010	B
Mechanical Shock	2002	B
(Burn-In (at +110oC	1015	-
Leak	1014	A1 & A2

DIMENSIONS AND WEIGHT

MODEL 7928A	PIN FUNCTIONS
PIN	FUNCTIONS
A	Ground
B	+5V
C	-12 to -15V
D	1.4° (LSB)
E	2.8°
F	5.6°
H	22.5°
J	11.3°
K	90°
L	180° (MSB)
M	+12 to +15V
N	45°
P	GND
R	Freq. Correction Circuit Select "0" = Band Edge



Model 7928A Wt. 4.0 oz (113gr.) approx.

Dimensional Tolerances: unless otherwise indicated: .XX ±.02; .XXX ±.005

