



**TECHNICAL REPORT**

**ON**

**8.5 TO 10 GHz**  
**(OTHER FREQUENCIES AVAILABLE)**

**IQ VECTOR MODULATOR**

**PMI MODEL NO:**

**◆ PS-360-AC OPTION: 810, 7224, IQ, RH ◆**

**SERIAL NUMBERS: PM107352, PM107353, PM108388**

**DESIGNED**

**BY**

**DANIEL J. VESCUSO**

**AND**

**FRANK RETHMEIER**

**REPORTED AND PREPARED**

**BY**

**STEVEN R. TURNER**

**DECEMBER 13, 2001**

***PLANAR MONOLITHICS INDUSTRIES, INC.***

***7311-G GROVE ROAD, FREDERICK, MD 21704***

***WEBSITE: WWW.PLANARMONOLITHICSINDUSTRIES.COM, E-MAIL: PLANARSALES@AOL.COM***

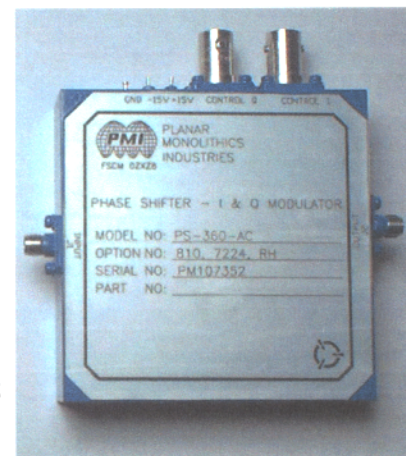
***TELEPHONE: 301-631-1579, FAX: 301-662-2029***

**PAGE 1**

# MODEL NO: PS-360-AC, OPTION: 810, 7224, IQ, RH IQ VECTOR MODULATOR



- ◆ ANALOG CONTROLLED
- ◆ HIGH SPEED MODULATOR
- ◆  $\pm 15^\circ$  ABSOLUTE PHASE ACCURACY
- ◆ LOW INSERTION LOSS



## ● SPECIFICATIONS:

- ◆ **FREQUENCY RANGE** : 8.5 GHz TO 10 GHz  
(OTHER FREQUENCIES AVAILABLE)
- ◆ **VSWR** : 2:1 MAXIMUM
- ◆ **INSERTION LOSS** : 12 dB MAXIMUM
- ◆ **ATTENUATION RANGE** : 20 dB MINIMUM
- ◆ **ABSOLUTE PHASE ACCURACY** :  $\pm 15^\circ$  MAXIMUM
- ◆ **POWER HANDLING**  
(WITHOUT DEGRADATION) : 100 mW CW OR PEAK
- ◆ **RESPONSE TIME** : 0.5  $\mu$ SEC MAXIMUM, 50 nSEC TYPICAL
- ◆ **CONTROL INPUT** : 0 TO +10V DC FOR BOTH "I" AND "Q" INPUTS
- ◆ **POWER SUPPLY** :  $\pm 12$  TO 15 VOLTS @  $\pm 150$  mA MAX,  $\pm 120$  mA TYP.
- ◆ **CONTROL INPUT IMPEDANCE** : 10K OHMS
- ◆ **SIZE** : 3.25" x 3.25" x 0.85"
- ◆ **WEIGHT** : 1 OUNCE MAXIMUM

## ● ENVIRONMENTAL RATINGS:

- ◆ **TEMPERATURE** : -54°C TO +85°C (OPERATING)  
: -65°C TO +100°C (STORAGE)
- ◆ **HUMIDITY** : MIL-STD-202F, METHOD 103B, CONDITION B.
- ◆ **SHOCK** : MIL-STD-202F, METHOD 213B, CONDITION B.
- ◆ **VIBRATION** : MIL-STD-202F, METHOD 204D, CONDITION B.
- ◆ **ALTITUDE** : MIL-STD-202F, METHOD 105C, CONDITION B.
- ◆ **TEMPERATURE CYCLE** : MIL-STD-202F, METHOD 107D, CONDITION A.

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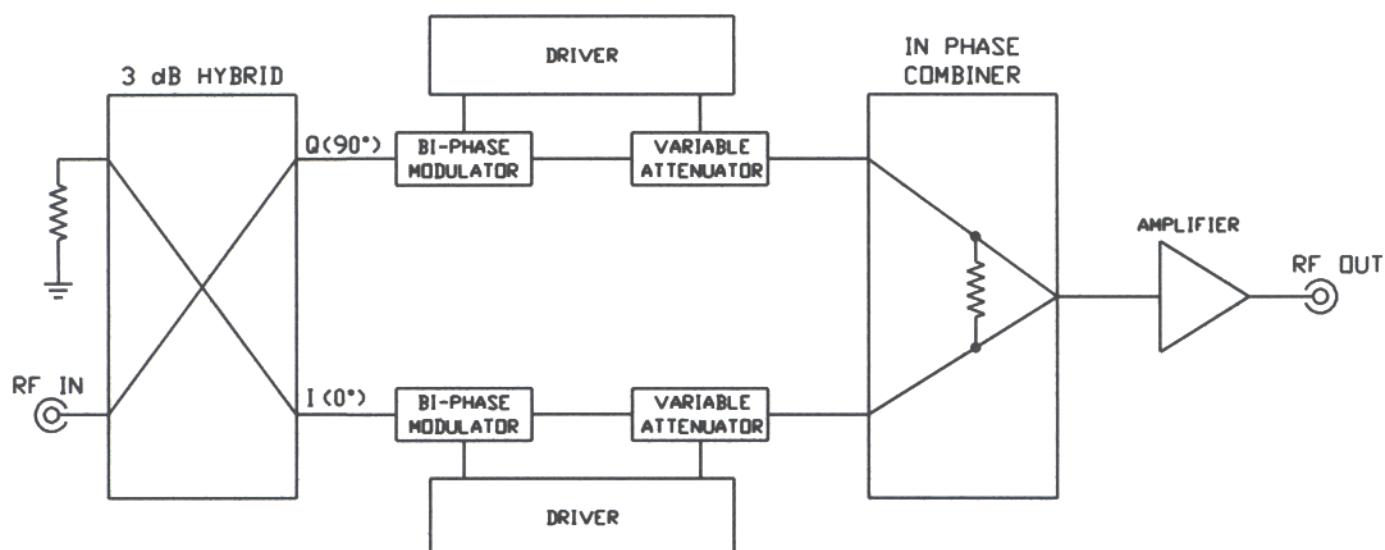
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## ● FUNCTIONAL BLOCK DIAGRAM:



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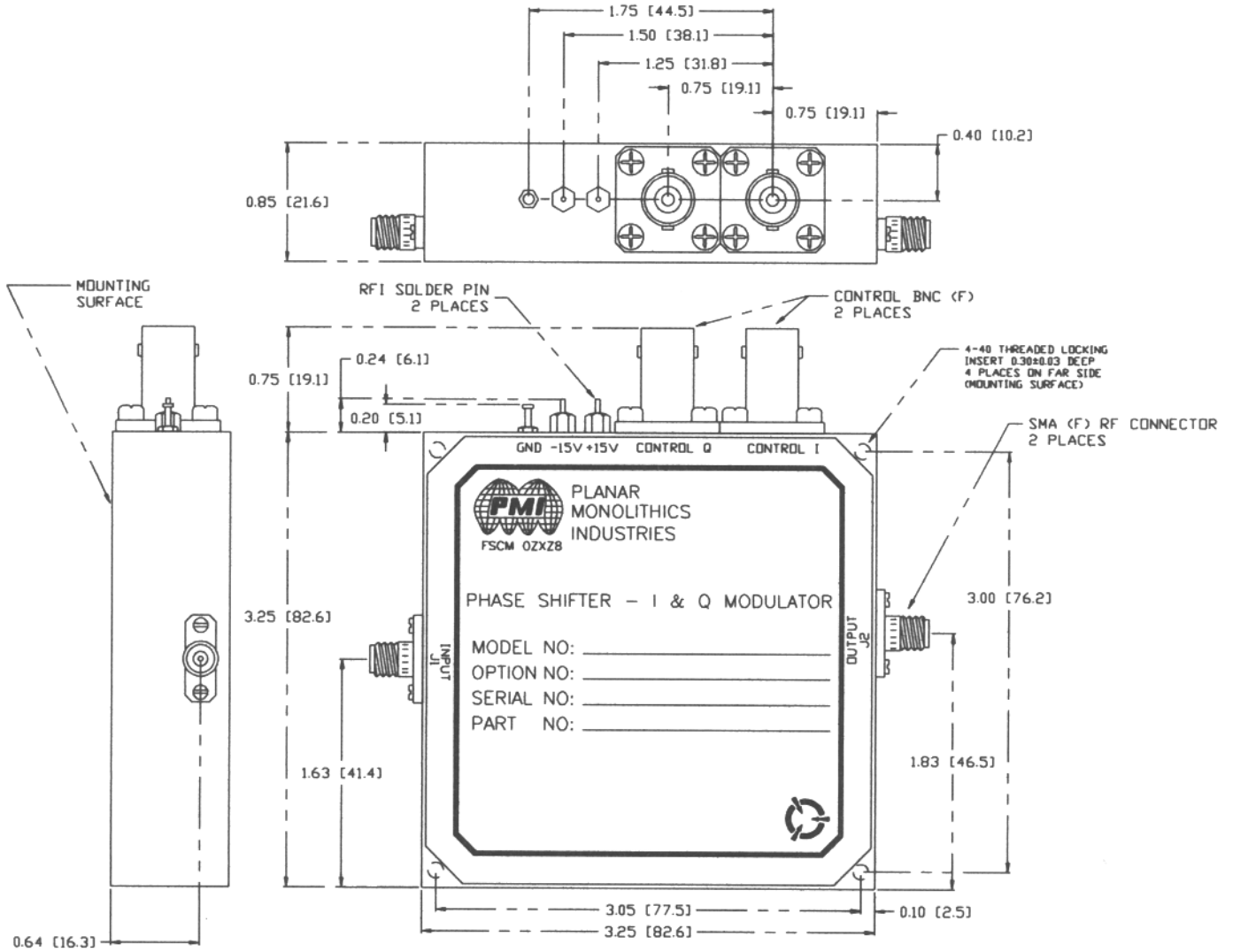
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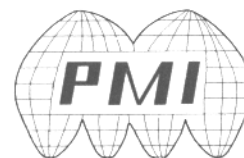
● MECHANICAL OUTLINE:



DIMENSIONS ARE IN INCHES. TOLERANCES: X.XX, ±0.020 & X.XXX, ±0.010

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ZONE	REV	DESCRIPTION	DATE	APPROVAL
A		ORIGINAL RELEASE	02/06/02	

**DESCRIPTION:**  
PMI MODEL PS-360-AC IS A 8-10 GHz ANALOG CONTROLLED PHASE SHIFTER/I & Q HIGH SPEED MODULATOR. THE PS-360-AC HAS LOW SPURIOUS HARMONICS. IT IS DESIGNED FOR +15V/15 SUPPLY VOLTAGE WITH LOW INSERTION LOSS. VSWR:2:1. SMA FEMALE RF CONNECTORS AND BNC FEMALE CONTROL CONNECTORS FOR THE I & Q.

ALL DIMENSIONS ARE IN INCHES  
TOLERANCES:  
X.XX ±0.020  
X.XXX ±0.010

**SPECIFICATIONS**

- FREQUENCY RANGE: 8.5 GHz TO 10 GHz
- INSERTION LOSS: 12 dB MAXIMUM
- VSWR: 2:1
- ATTENUATION RANGE: 20 dB MINIMUM
- ABSOLUTE PHASE ACCURACY: ±1.5° MAXIMUM
- POWER HANDLING: 100 mW CW OR PEAK (WITHOUT DEGRADATION)
- CONTROL INPUT: 0 TO +10V DC FOR BOTH I AND Q INPUTS
- RESPONSE TIME (MAX): 0.5 μsec MAXIMUM, 50 nsec TYPICAL
- POWER SUPPLY: 4.12...15 VOLTS @ 120 mA TYP, 150 mA MAX
- CONNECTORS:  
RF INPUT/OUTPUT: SMA FEMALE  
POWER: SOLDER PIN  
CONTROL: SOLDER PIN
- CONTROL INPUT IMPEDANCE: 10 K OHMS
- SIZE: 3.25" x 3.25" x 0.85"
- WEIGHT: 1 OUNCES MAXIMUM

PHASE SHIFTER - I & Q MODULATOR

MODEL NO:  
OPTION NO:  
SERIAL NO:  
PART NO:

**ENVIRONMENTAL RATINGS:**

- TEMPERATURE: -54°C TO +100°C (OPERATING); -65°C TO +125°C (STORAGE)
- HUMIDITY: MIL-STD-202F, METHOD 103B COND. B (96 HRS AT 95%)
- SHOCK: MIL-STD-202F, METHOD 213B COND. B (75G 6 msec)
- VIBRATION: MIL-STD-202F, METHOD 204D COND. B (0.06" DOUBLE AMPITUDE OR 15 G WHICHEVER IS LESS)
- ALTITUDE: MIL-STD-202F, METHOD 105C COND. B (50,000 FEET)
- TEMPERATURE CYCLE: MIL-STD-202F, METHOD 107D COND. A (5 CYCLES)

NOTE THE ABOVE SPECIFICATIONS ARE SUBJECT TO CHANGE DP REVISION

DATE	APPROVALS	DATE	APPROVALS	DATE	APPROVALS	DATE	APPROVALS
8/06/02	J. TURLEY						

PLANAR MONOLITHICS INDUSTRIES FREDERICK, MARYLAND	PRODUCT FEATURE PS-360-AC OPTION 810, 7224, IQ RH PHASE SHIFTER / I & Q MODULATOR	SIZE FROM NO. (DIM NO.) A QZXZB 100-6191	DATE N/S SHEET 1 of 3
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# MODEL NO: PS-360-AC, OPTION: 810, 7224, IQ, RH IQ VECTOR MODULATOR



CUSTOMER: HE MICROWAVE  
JOB NO: 00527PE  
MODEL NO: PS-360-AC OPT:810, 7224, IQ, RH

TESTED BY: STEVEN TURNER  
SERIAL NO: PM108388  
DATE: 8/30/01

## SUMMARY TEST DATA ON I & Q MODULATOR/PHASE SHIFTER

TEST ITEM NO.	PARAMETERS	SPECIFIED VALUE	MEASURED VALUE	REMARKS QA/QC
1	FREQUENCY RANGE	8.5 TO 10 GHz (min)	OK	✓
2	VSWR	2 : 1 (max)	1.37:1	✓
3	INSERTION LOSS	13 dB (max)	5.59	✓
4	PHASE ACCURACY	±15°	±15°	✓
5	DELAY ON	100 ns (max)	< 100ns	✓
6	DELAY OFF	100 ns (max)	< 100ns	✓
7	CONTROL VOLTAGE	0 TO 10 V	0...9.93	✓
8	CURRENT DRAW + 15 V	150 mA (MAX) 120 mA (TYP)	100 mA	✓
9	CURRENT DRAW - 15 V	150 mA (MAX) 120 mA (TYP)	120 mA	✓

PHASE SHIFT	CONTROL "I" VOLTAGE	CONTROL "Q" VOLTAGE	MEASURED VALUE	REMARKS QA/QC
0°	0	5.1	0°	✓
45°	0.5	0.5	41°	✓
90°	4.91	0	84°	✓
135°	9.11	0.66	125°	✓
180°	9.93	4.5	173°	✓
225°	8.5	8.45	213°	✓
270°	4.5	9.0	261°	✓
315°	0.78	8.97	321°	✓
360°	0	5.1	0°	✓

PRODUCTION MANAGER APPROVAL: [Signature] DATED: 8/31/01  
QA/QC APPROVAL: 02 [Signature] DATED: 9/01/01

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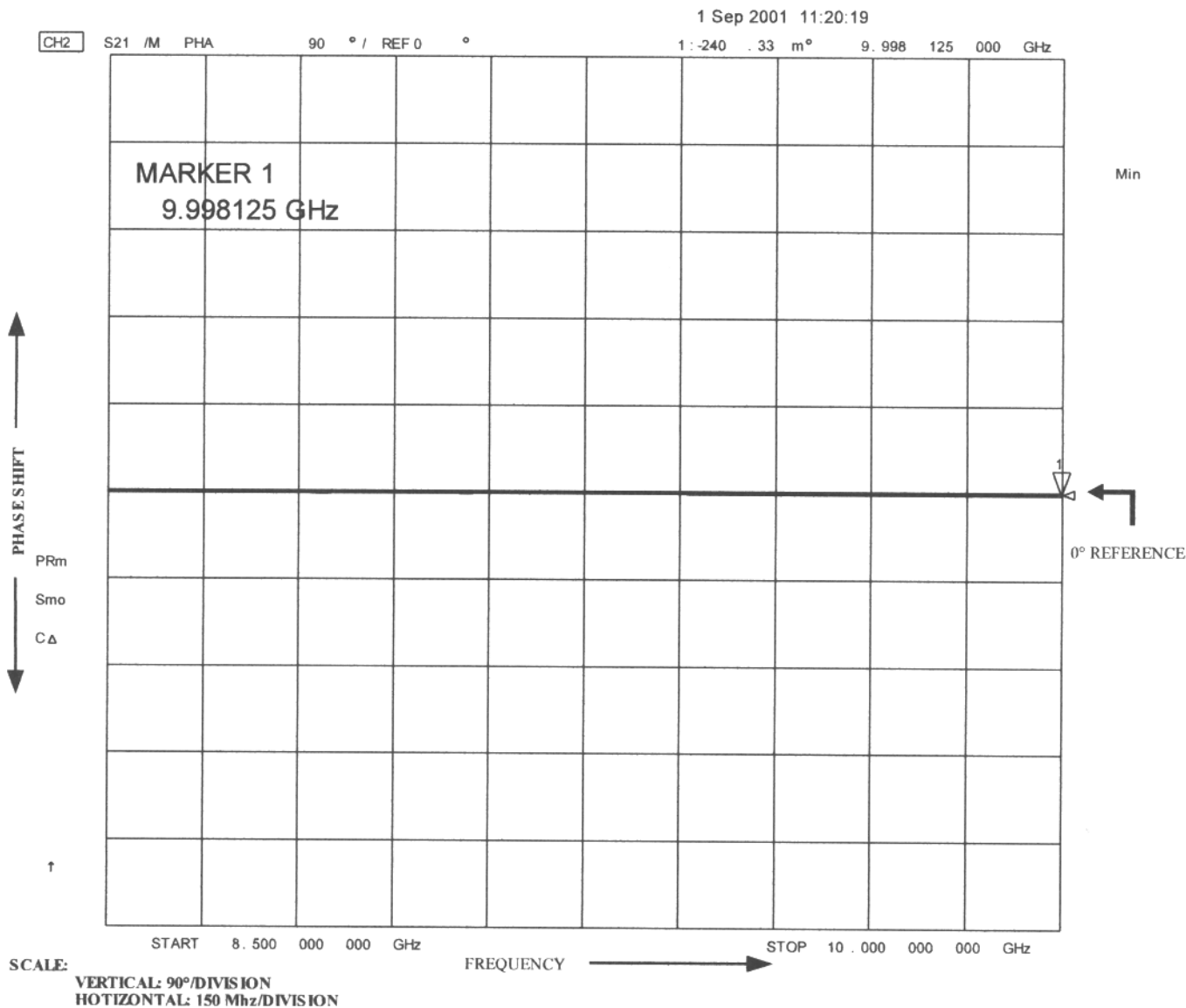
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## 0° PHASE SHIFT



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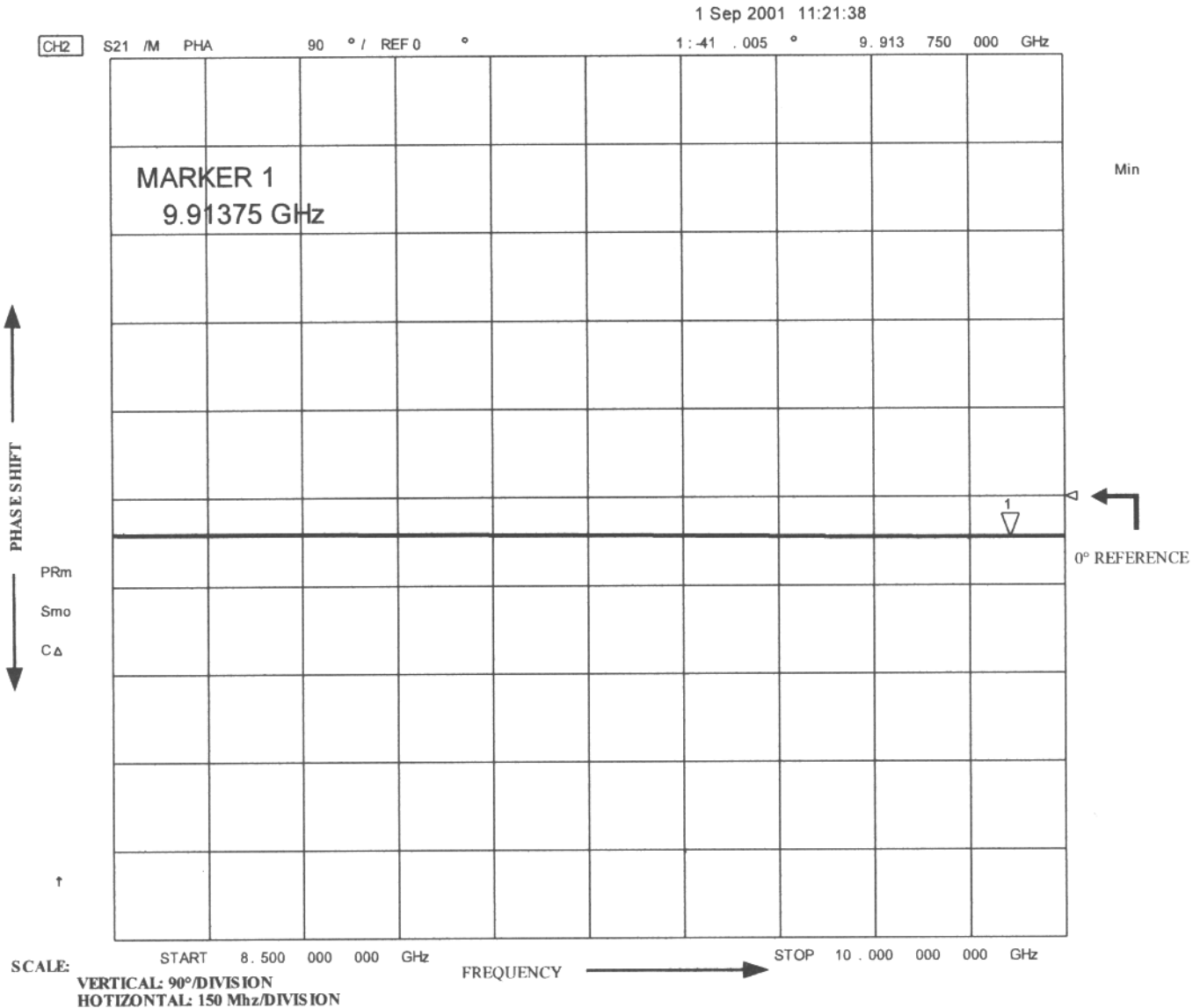
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## 45° PHASE SHIFT



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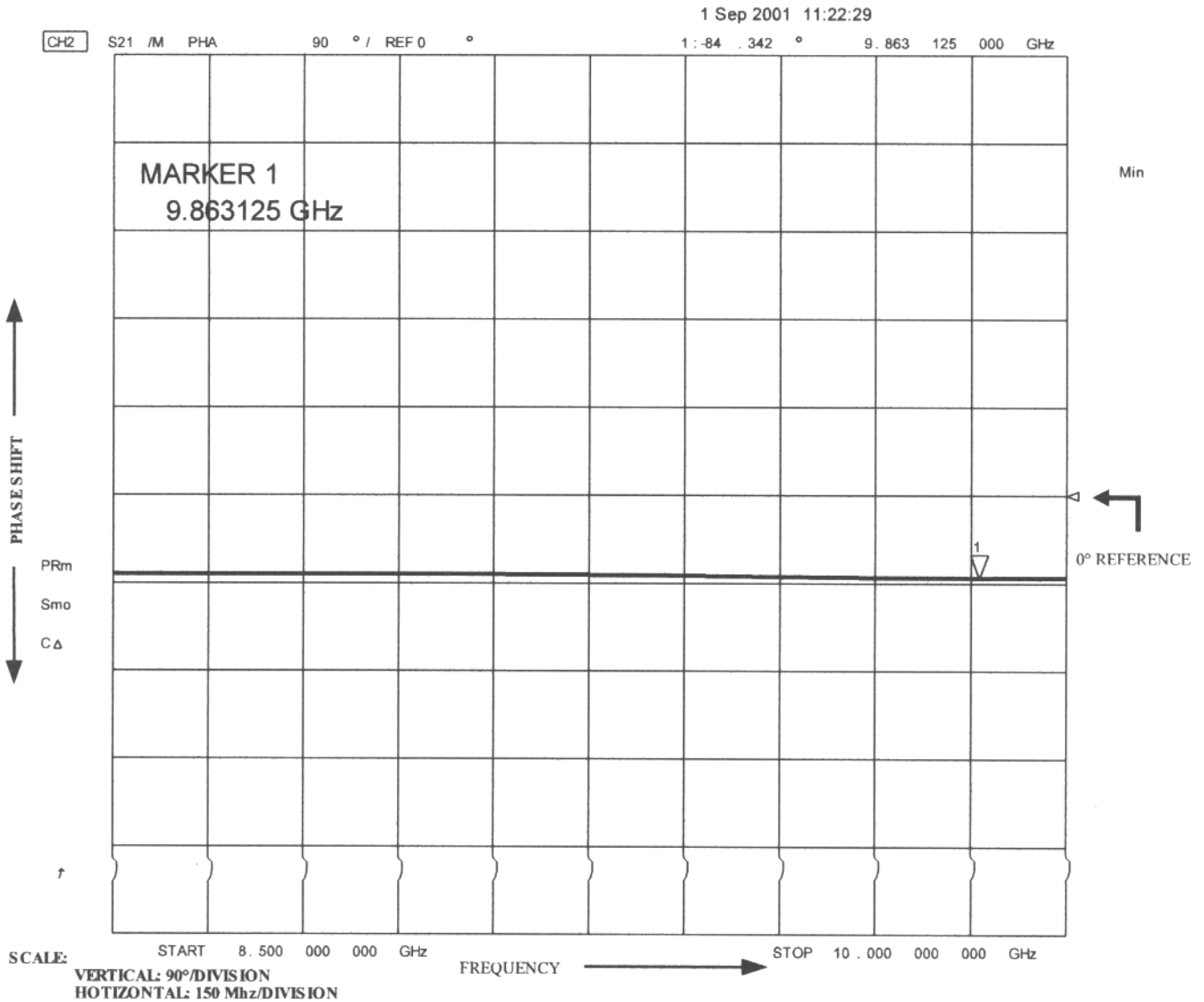
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## 90° PHASE SHIFT



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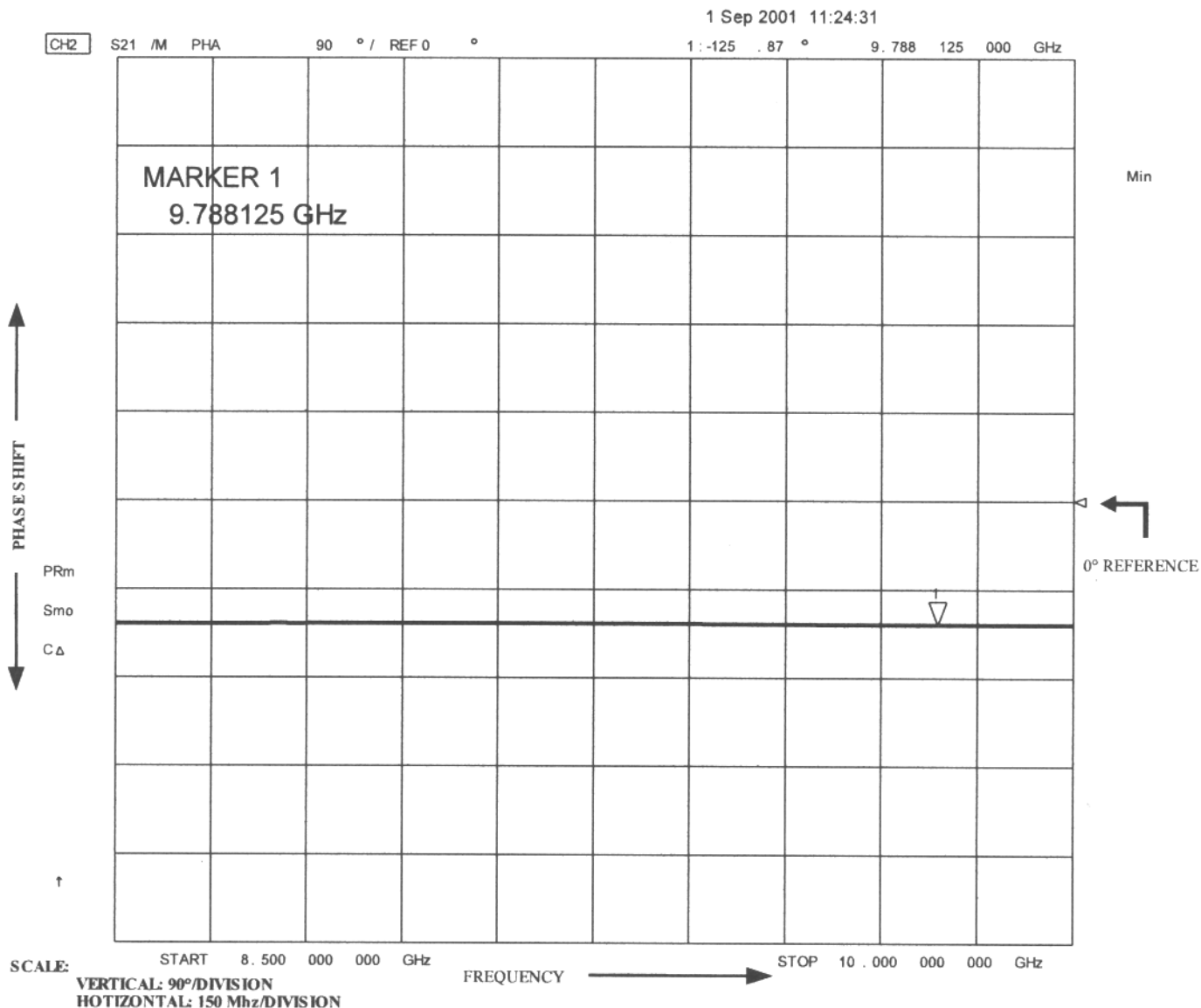
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## 135° PHASE SHIFT



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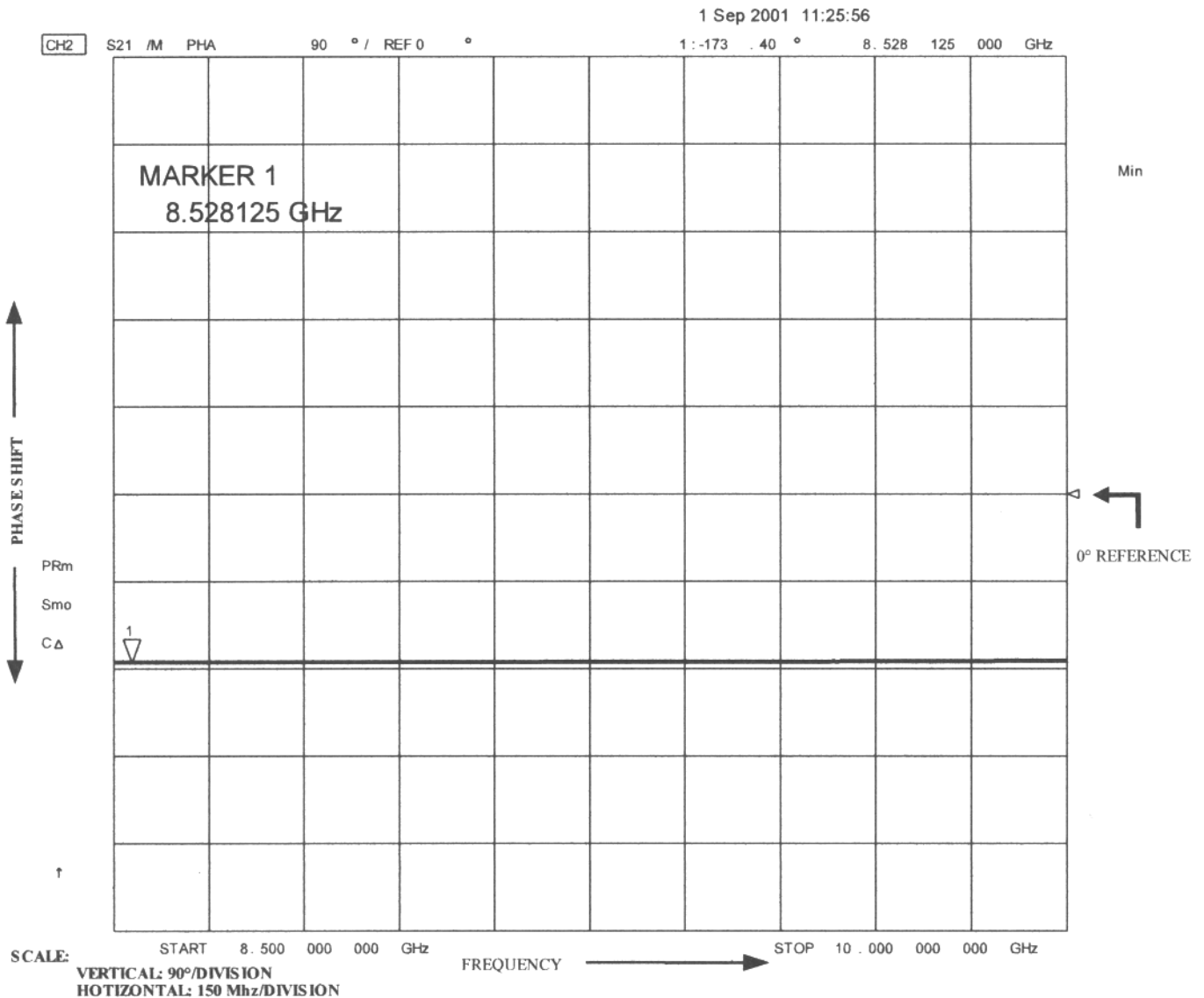
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## 180° PHASE SHIFT



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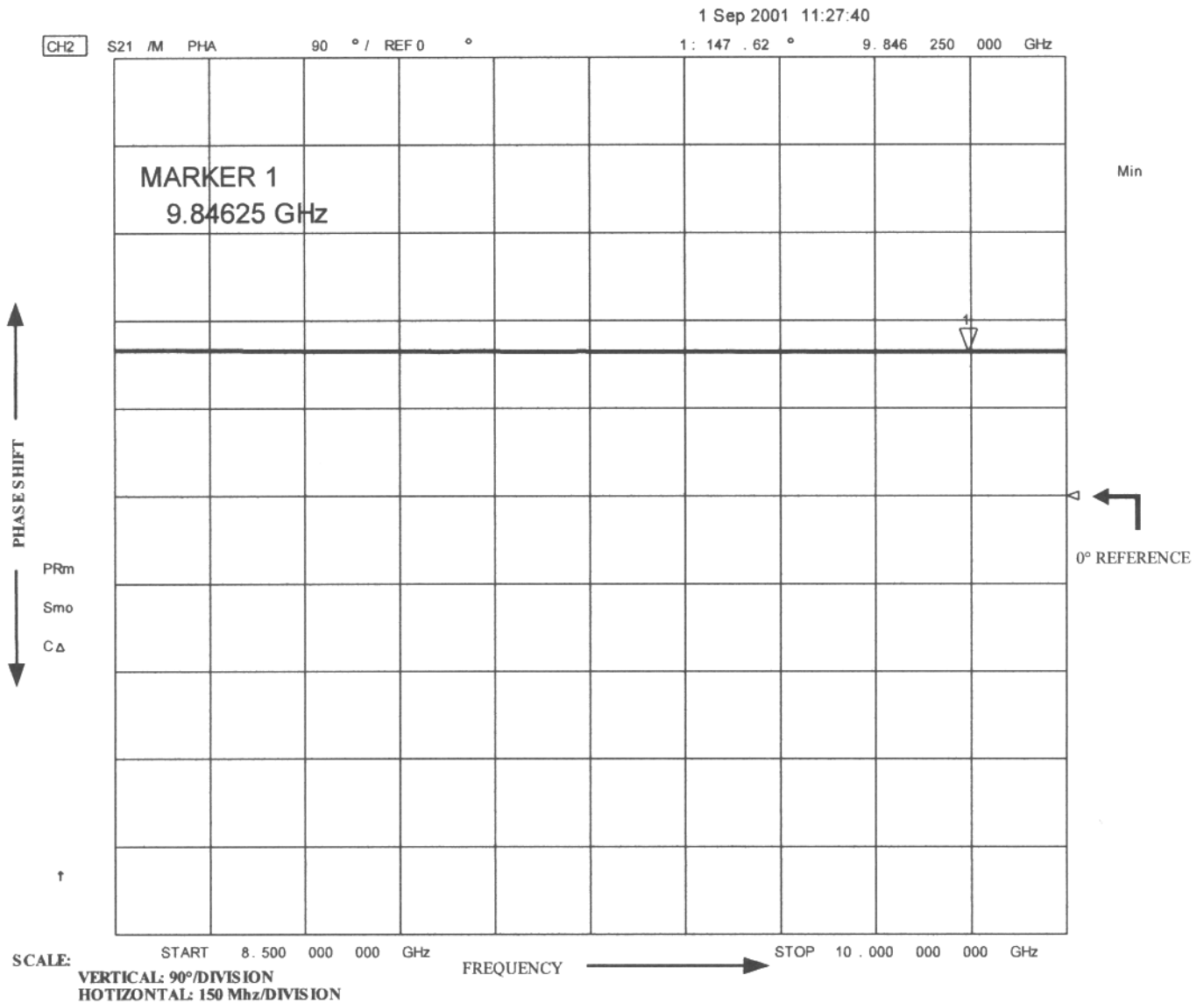
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## 225° PHASE SHIFT



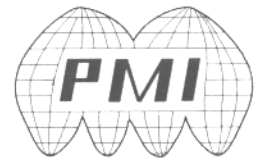
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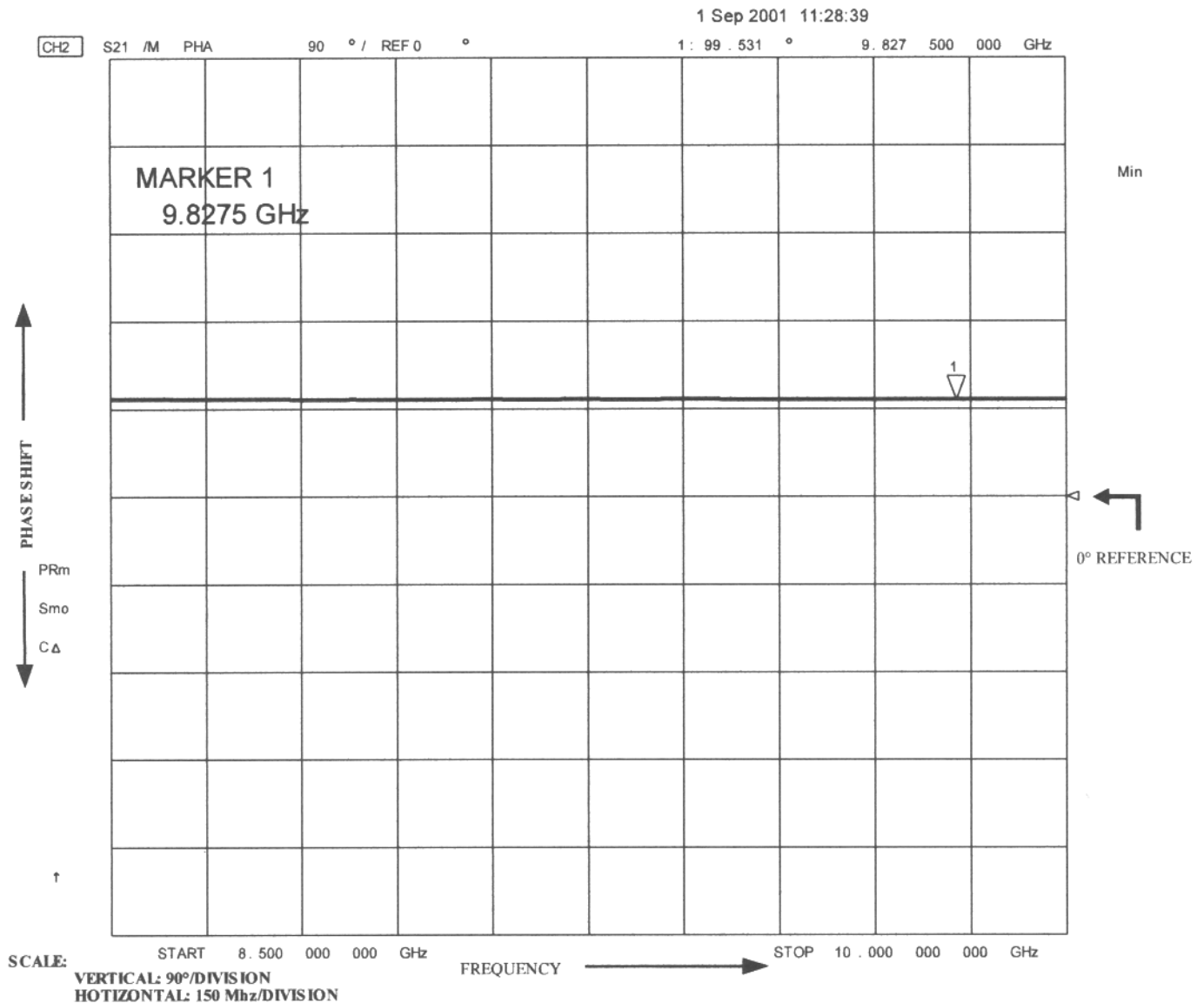
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## 270° PHASE SHIFT



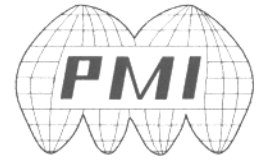
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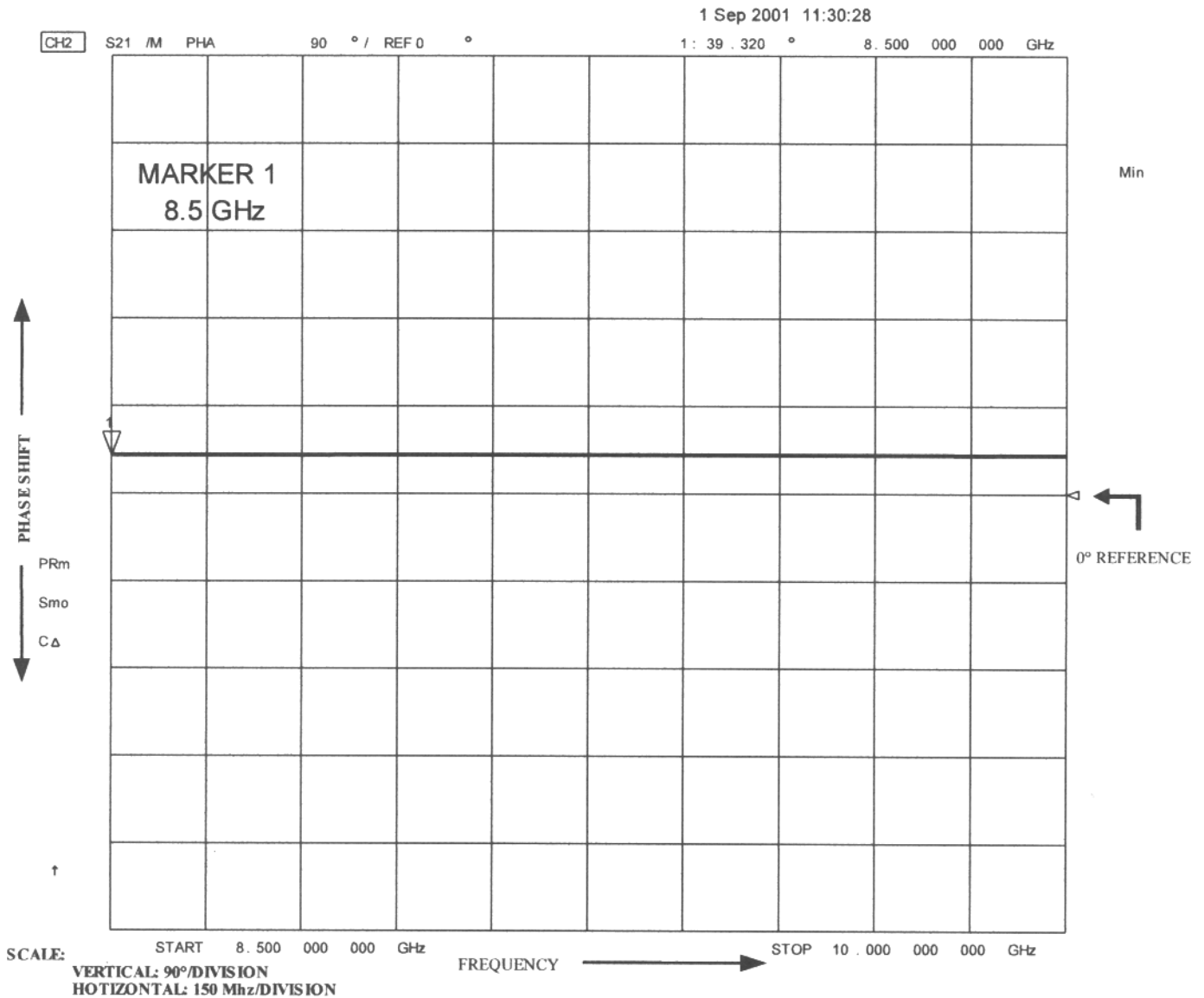
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## 315° PHASE SHIFT



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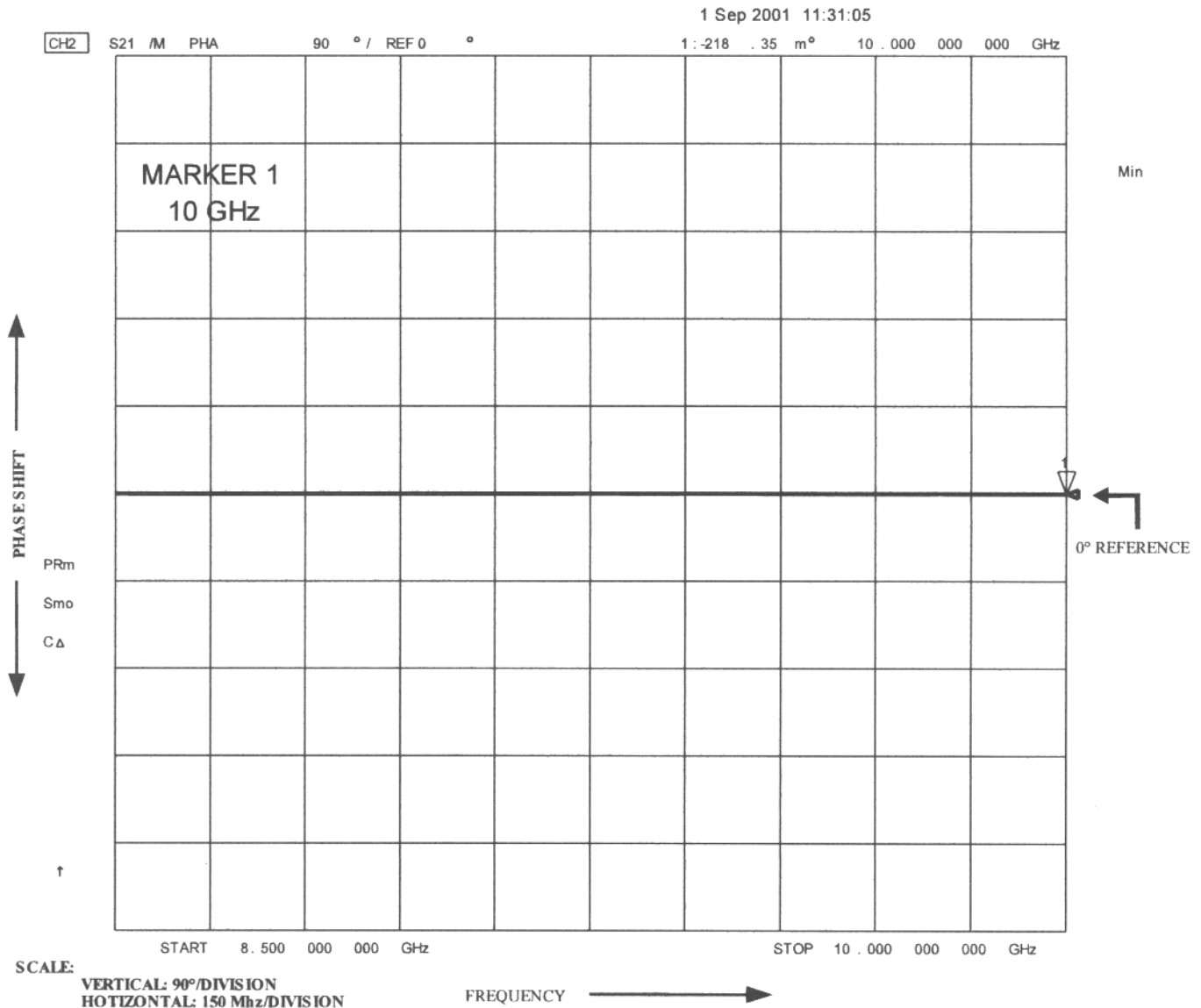
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## 360° PHASE SHIFT



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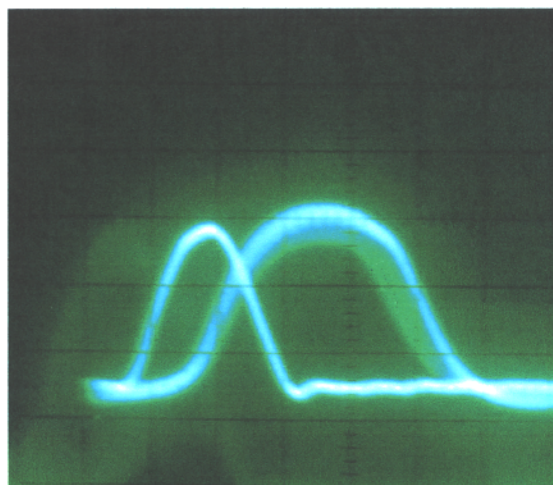
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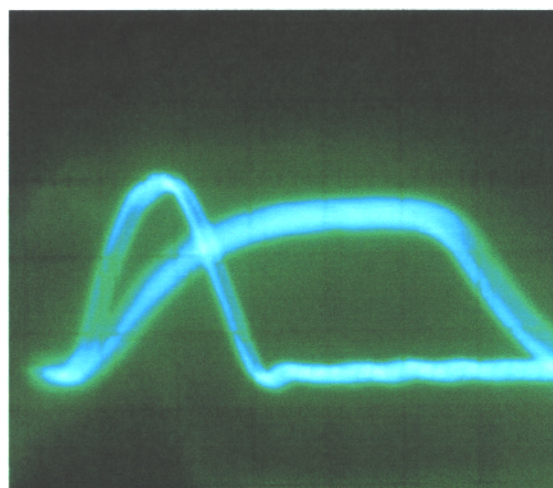


## SWITCHING SPEED (HORIZONTAL SCALE: 10nS/DIVISION)

◆ DELAY ON: 30nS :



◆ DELAY OFF: 50nS :



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