

SUMMARY

TEST DATA

ON

3.5 TO 6.5 GHz

(OTHER FREQUENCY RANGES ALSO AVAILABLE)

20dB ATTENUATION

±15° PHASE ACCURACY

PHASE SHIFTER / I & Q MODULATOR

PMI MODEL No:

PS-360-AC

WITH OPTIONS: 37, 7224, IQ & RH

SERIAL NUMBER: PM008409

DESIGNED

BY

DANIEL J. VESCUSO

TESTED

BY

DANIEL J. VESCUSO & FRANK REITHMEIER

REPORT

BY

PETER WOOD

OCTOBER 20th, 2000

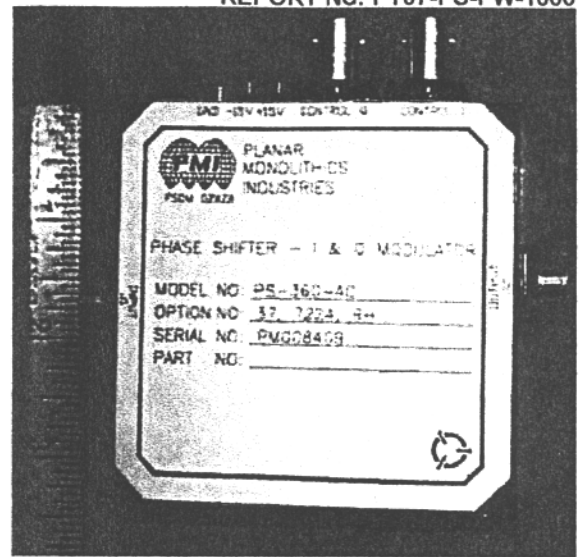


PLANAR MONOLITHICS INDUSTRIES

REPORT No: PT07-PS-PW-1000

FEATURES:

- $\pm 15^\circ$ INSERTION PHASE ACCURACY
- 3.5 TO 6.5GHz FREQUENCY RANGE
- 20dB ATTENUATION RANGE



PHASE SHIFTER / I & Q MODULATOR PMI MODEL NO: PS-360-AC

WITH OPTIONS: 37, 7224, IQ & RH

SPECIFICATIONS

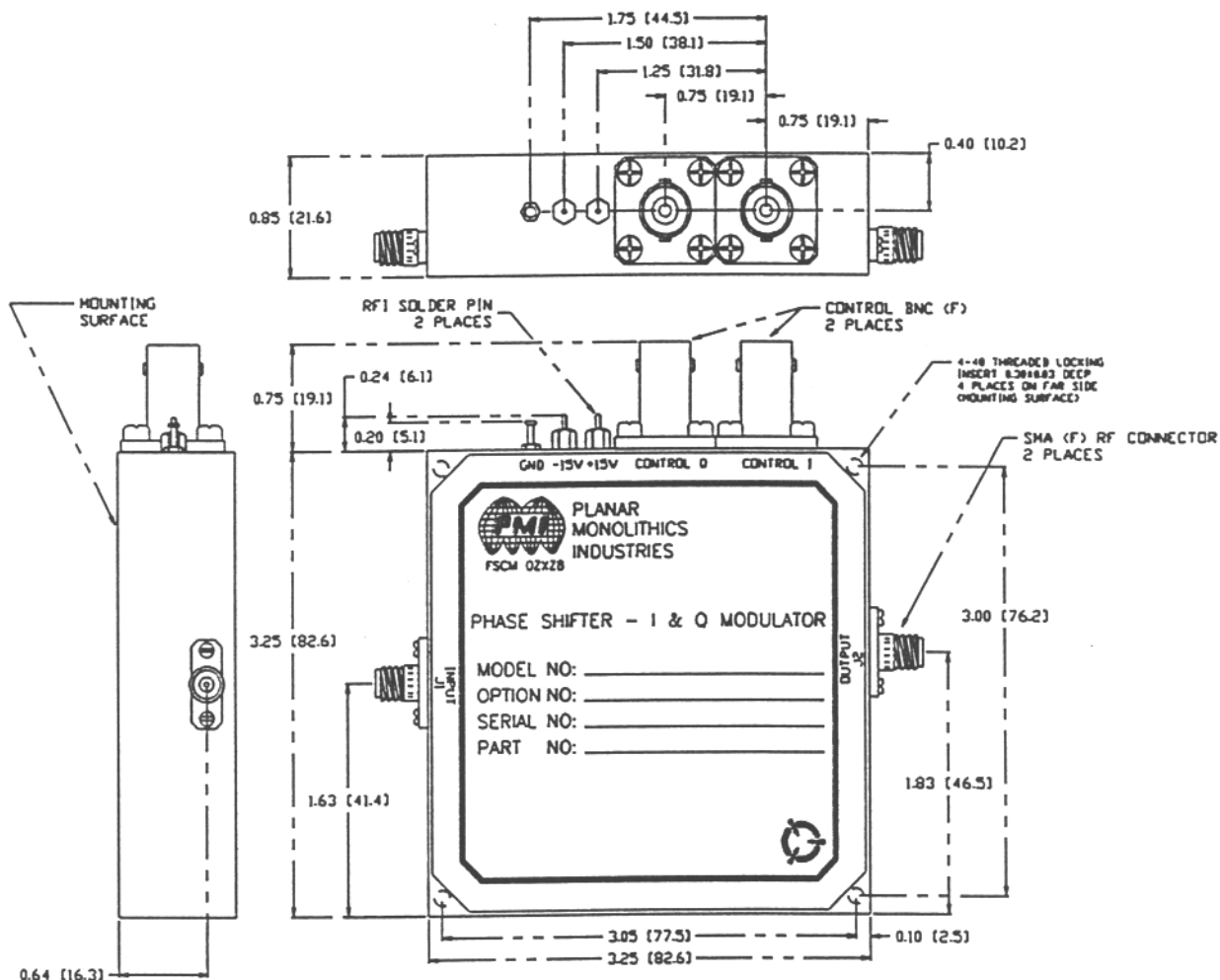
- | | | |
|--|---|---|
| • FREQUENCY RANGE | : | 3.5 TO 6.5GHz (OTHER FREQUENCIES AVAILABLE) |
| • INSERTION LOSS | : | 12dB MAX. |
| • VSWR | : | 2.0:1 MAX. |
| • ATTENUATION RANGE | : | 20dB |
| • ABSOLUTE INSERTION PHASE ACCURACY vs. FREQUENCY (MAX.) | : | $\pm 15^\circ$ MAX. |
| • VARIATION OF PHASE vs. TEMPERATURE (MAX.) | : | $\pm 0.1\text{dB}/^\circ\text{C}$ |
| • VARIATION OF AMPLITUDE vs. TEMPERATURE (MAX.) | : | $0.02\text{dB}/^\circ\text{C}$ |
| • RF POWER HANDLING | : | WITHOUT DEGRADATION SURVIVAL(-65 $^\circ$ TO +25 $^\circ$ C) |
| | : | 100mW CW OR PEAK |
| | : | 1W AVERAGE, 25W PEAK, 1 μ S PULSE WIDTH |
| • FINE GRAIN PHASE RIPPLE (50MHz) (MAX.) | : | 2 $^\circ$ PEAK TO PEAK |
| • CONTROL INPUT | : | 0 TO +10vdc DC FOR BOTH I & Q INPUTS |
| • CONTROL VOLTAGE | : | 0 TO +10vdc (10dB/VOLT TRANSFER FUNCTION) |
| • RESPONSE TIME (MAX.) | : | 0.5 μ S |
| • CONTROL INPUT IMPEDENCE | : | 10K * |
| • CONNECTORS | : | RF INPUT/OUTPUT : SMA FEMALE |
| | : | DC POWER : SOLDER PIN |
| | : | I & Q CONTROL : BNC (SMA, SOLDER PIN AND MULTIPIN AVAILABLE) |
| • DC POWER SUPPLY | : | ± 15 vdc @ $\leq 120\text{mA}$ ($\leq 70\text{mA}$ GOAL) |
| • SIZE | : | 3.25" X 3.25" X 0.85" |
| • WEIGHT | : | 10 OUNCES |

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PLANAR MONOLITHICS INDUSTRIES, INC., 7311-G Grove Road, Frederick, MD 21704
Tel: 301-662-4700 Fax: 301-662-4938 Website: www.AMWAVE.com E-mail: amcpmi@aol.com



MECHANICAL OUTLINE



ENVIRONMENTAL SPECIFICATIONS

TEMPERATURE	:	-55°C to +85°C Operating -65°C to +125°C Non-Operating
HUMIDITY	:	MIL-STD-202F, Method 103B Cond. B
SHOCK	:	MIL-STD-202F, Method 213B Cond. B
VIBRATION	:	MIL-STD-202F, Method 204D Cond. B
ALTITUDE	:	MIL-STD-202F, Method 105C Cond. B
TEMPERATURE CYCLE	:	MIL-STD-202F, Method 107D Cond. A

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ZONE	REV	DESCRIPTION	DATE	APPROVED
		ORIGINAL RELEASE	04/28/00	

DESCRIPTION:
 PMI MODEL PS-360-AC IS A 3.5-6.5 GHz ANALOG CONTROLLED PHASE SHIFTER/I & Q HIGH SPEED MODULATOR. THE PS-360-AC HAS LOW SPURIOUS HARMONICS. IT IS DESIGNED FOR +15/-15 SUPPLY VOLTAGE WITH LOW INSERTION LOSS, VSWR:2:1, SMA FEMALE RF CONNECTORS AND BNC CONTROL CONNECTORS FOR THE I & Q.

SPECIFICATIONS:

- FREQUENCY RANGE: 3.5 GHz TO 6.5 GHz
- INSERTION LOSS: 12 dB MAXIMUM
- VSWR: 2:1
- ATTENUATION RANGE: 20 dB MINIMUM
- ABSOLUTE INSERTION PHASE ACCURACY VS. FREQUENCY (MAX): ±15°
- VARIATION OF PHASE VS. TEMP. (MAX): ±0.1 DEG./°C
- VARIATION OF AMPLITUDE VS. TEMPERATURE (MAX): 0.02 dB/°C
- POWER HANDLING: 100 mW CW OR PEAK (WITHOUT DEGRADATION). 1W AVERAGE, 25W PEAK, 1µsec PULSE WIDTH (SURVIVAL -65°C TO +25°C)
- FINE GRAIN PHASE RIPPLE (50MHz) (MAX): 2° PK-PK
- CONTROL VOLTAGE: 0 TO +10V
- CONTROL INPUT: 0 TO +10V DC FOR BOTH I AND Q INPUTS
- RESPONSE TIME (MAX): 0.5 µsec
- POWER SUPPLY: ±15 VOLTS @ 70 mA
- CONNECTORS: SMA FEMALE RF INPUT/OUTPUT; SOLDER PIN CONTROL;
- CONTROL INPUT IMPEDANCE: 10 K OHMS
- SIZE: 3.25" x 3.25" x 0.85"
- WEIGHT: 10 OUNCE

ENVIRONMENTAL RATINGS:

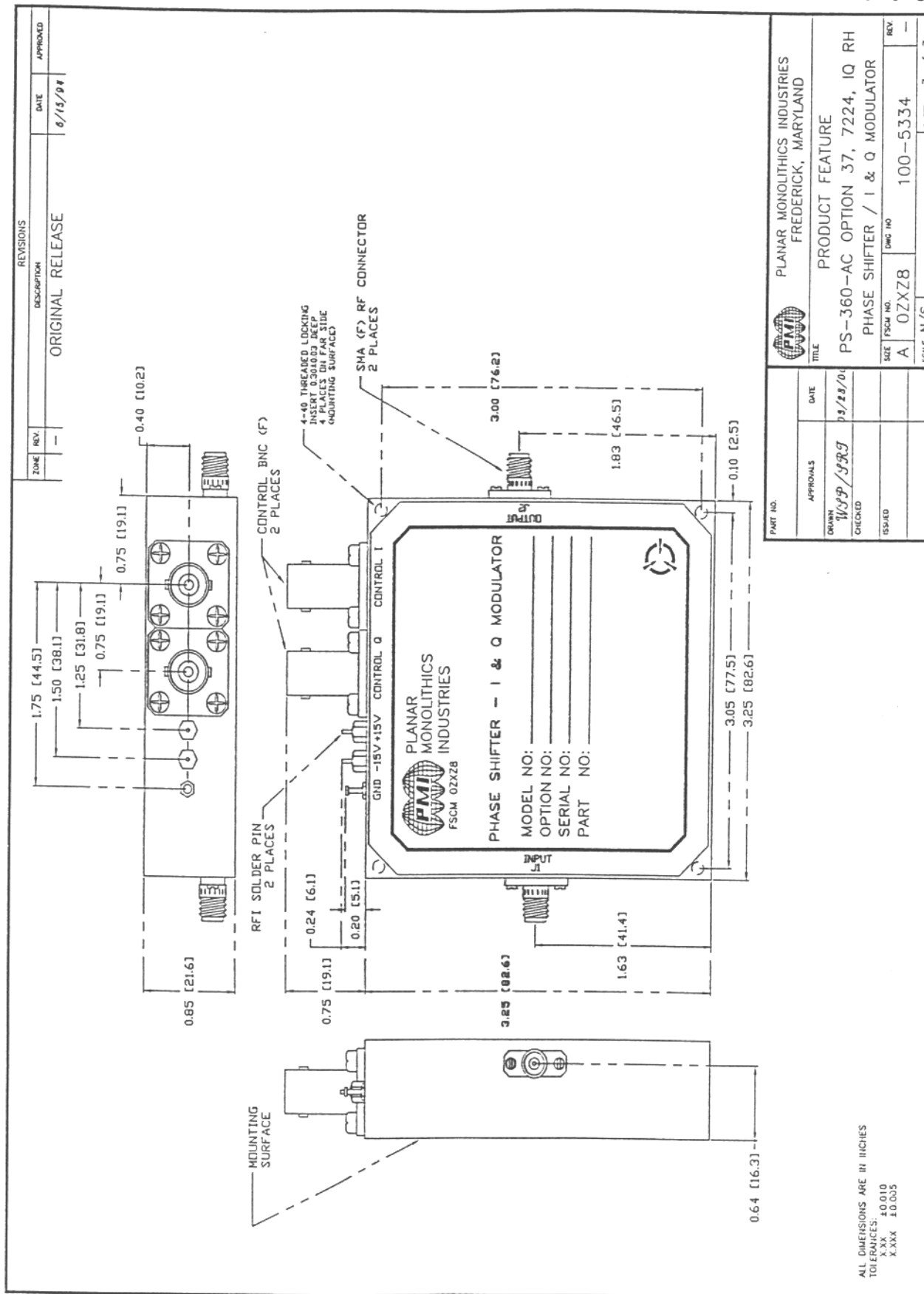
- TEMPERATURE: -54°C TO +100°C (OPERATING) -65°C TO +125°C (STORAGE)
- HUMIDITY: MIL-STD-202F, METHOD 103B COND. B (96 HRS AT 95%)
- SHOCK: MIL-STD-202F, METHOD 213B COND. B (75G 6 msec)
- VIBRATION: MIL-STD-202F, METHOD 204D COND. B (0.06" DOUBLE AMPLITUDE OR 15 G WHICH EVER IS LESS)
- ALTITUDE: MIL-STD-202F,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

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

PART NO.	PLANAR MONOLITHICS INDUSTRIES FREDERICK, MARYLAND		
APPROVALS	DATE	TITLE	SCALE
DESIGNED: WJP/399	05/28/00	PRODUCT FEATURE PS-360-AC OPTION 37, 7224, IQ RH PHASE SHIFTER / I & Q MODULATOR	N/S
CHECKED:		SIZE / FCN NO. / DWG NO.	REV
ISSUED:		A / 0ZXZ8 / 100-5334	1 of 3

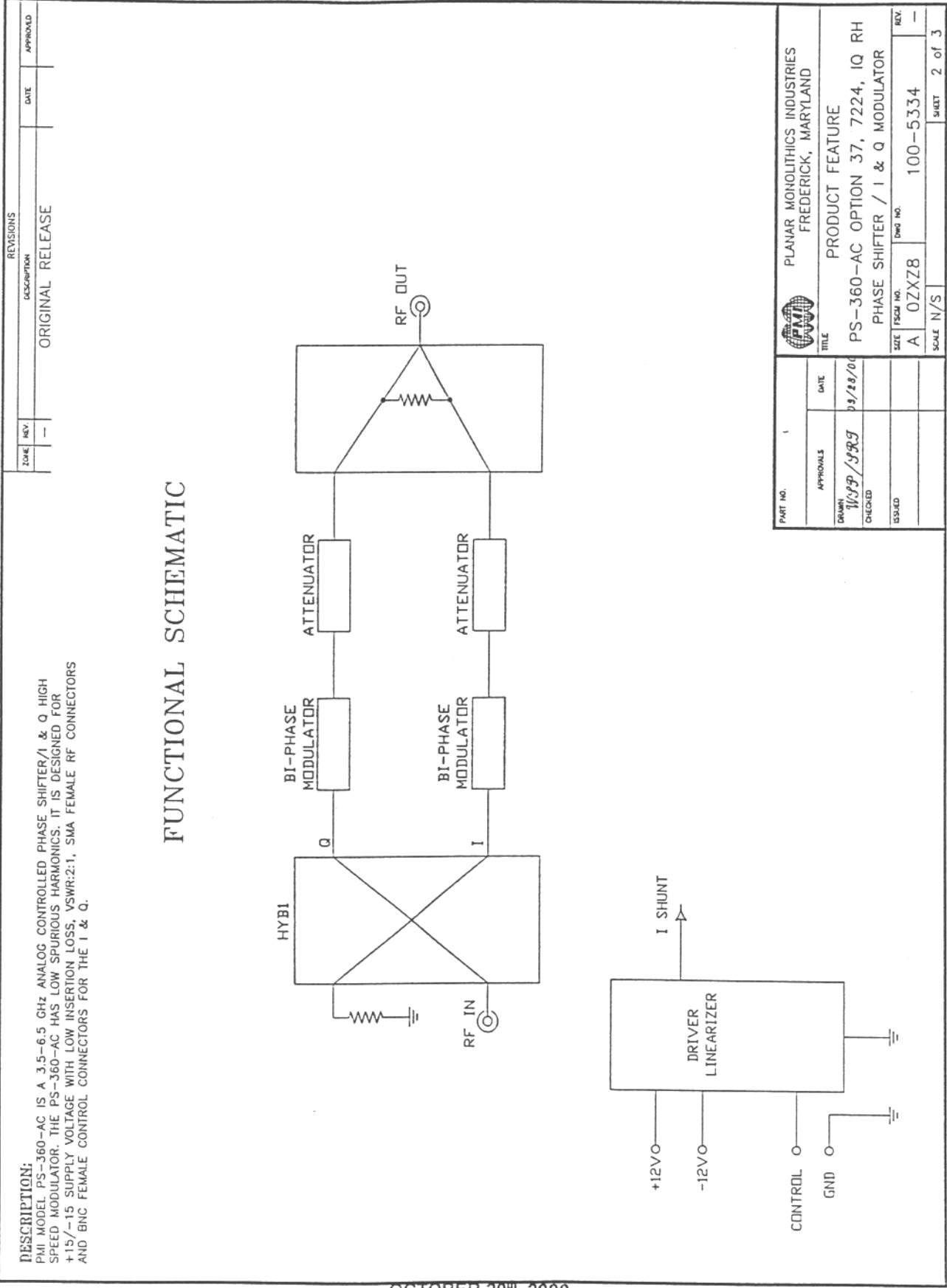
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PART NO. 1		DATE	
APPROVALS		DATE	
DRAWN	WSP/SPG	03/28/00	
CHECKED			
ISSUED			
TITLE		PLANAR MONOLITHICS INDUSTRIES FREDERICK, MARYLAND	
PRODUCT FEATURE		PS-360-AC OPTION 37, 7224, IQ RH	
PHASE SHIFTER / I & Q MODULATOR			
SIZE	FSCM NO.	DWG NO.	REV.
A	0ZXZ8	100-5334	-
SCALE		N/S	SHEET 2 of 3

OCTOBER 20th, 2000



FORM: 324-PS



PLANAR MONOLITHICS INDUSTRIES
 7311 G GROVE ROAD, FREDERICK, MD, 21704
 TEL: (301)831-4257 FAX: (301)662-4938

JOB NO: 00206PE

SUMMARY TEST DATA
 ON
 I & Q MODULATOR/PHASE SHIFTER

CUSTOMER: HE MICROWAVE
 JOB NO: 00206PE
 MODEL NO: PS-360-AC OPT. 37, 7224, RH
 SERIAL NO: PM008409

TESTED BY: J.R.
 DATE: 8/28/00

TEST ITEM NO.	PARAMETERS	SPECIFIED VALUE	MEASURED VALUE	REMARKS QA/QC
1	FREQUENCY RANGE	3.5 TO 6.5 GHz (min)	O.K.	✓
2	VSWR	2 : 1 (max)	1.2 : 1	✓
3	INSERTION LOSS	12 dB (max) 10 dB (goal)	10 dB	✓
4	PHASE ACCURACY	±15°	±15°	✓
5	DELAY ON	100 ns (max)	40 ns	✓
6	DELAY OFF	100 ns (max)	50 ns	✓
7	CONTROL VOLTAGE	0 TO 10 V	-0.2 .. 9.9V	✓
8	CURRENT DRAW + 15 V	70 mA (max)	117 mA	✓
9	CURRENT DRAW - 15 V	70 mA (max)	55 mA	✓

PRODUCTION MANAGER APPROVAL: [Signature] DATED: 8/28/00

QA/QC APPROVAL: [Signature] DATED: 8/28/00

OCTOBER 20th, 2000



PHASE SHIFT VS. CONTROL VOLTAGES VI, VQ

ANGLE IN DEGREES	VI/V	VQ/V
0	-0.12	4.48
45	0.46	0.73
90	4.69	-0.10
135	8.83	0.58
180	9.93	4.61
225	8.86	8.48
270	4.51	9.06
315	0.48	8.45
360	-0.12	4.48

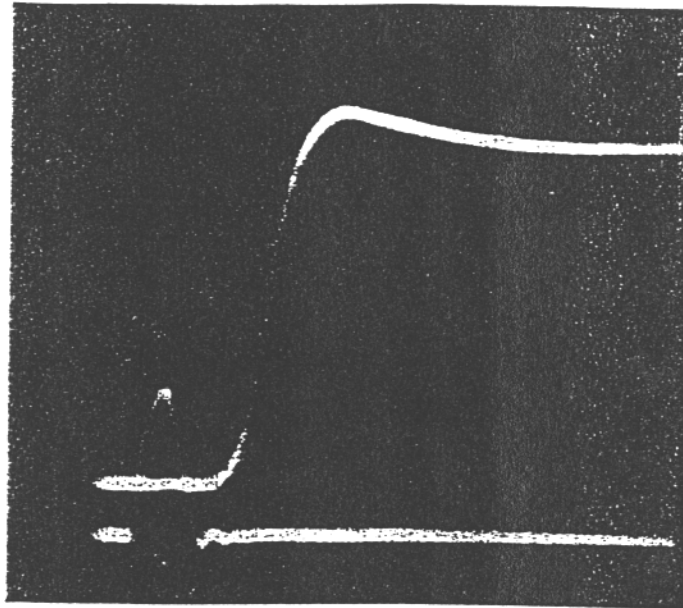
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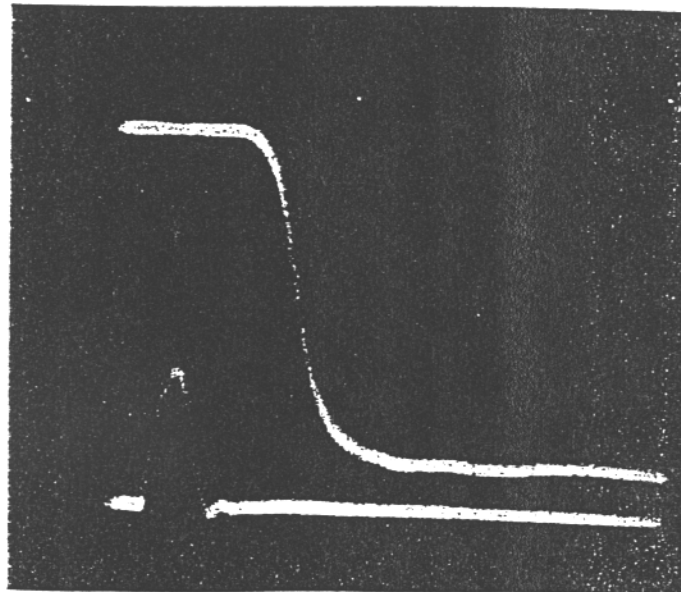


SWITCHING SPEED

HORIZONTAL SCALE: 20 ns / DIVISION



DELAY ON: 40 ns



DELAY OFF: 50 ns

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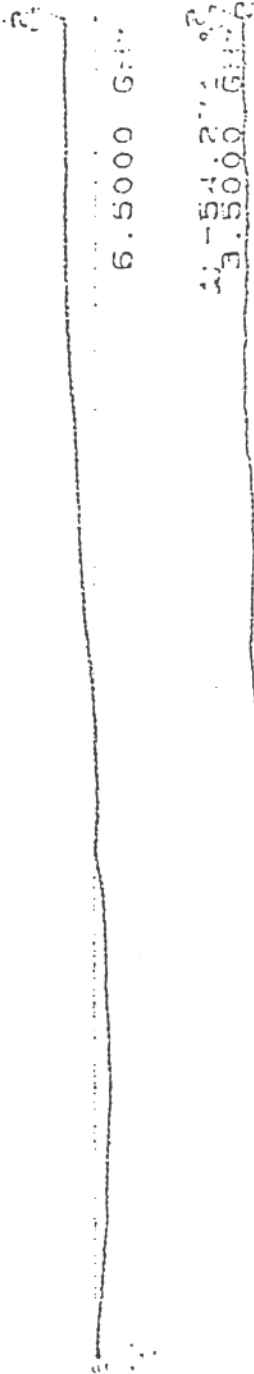


3/5°
 Reference: 0 Phase shift

CH1 S21/M 109 MAG 5 dB/ REF 0 dB
 CH2 S21/M phase 22.5 °/ REF 0 °
 (dB)

1. 3.5000 GHz

Smo



Smo

STOP 6.5000 GHz

START 3.5000 GHz

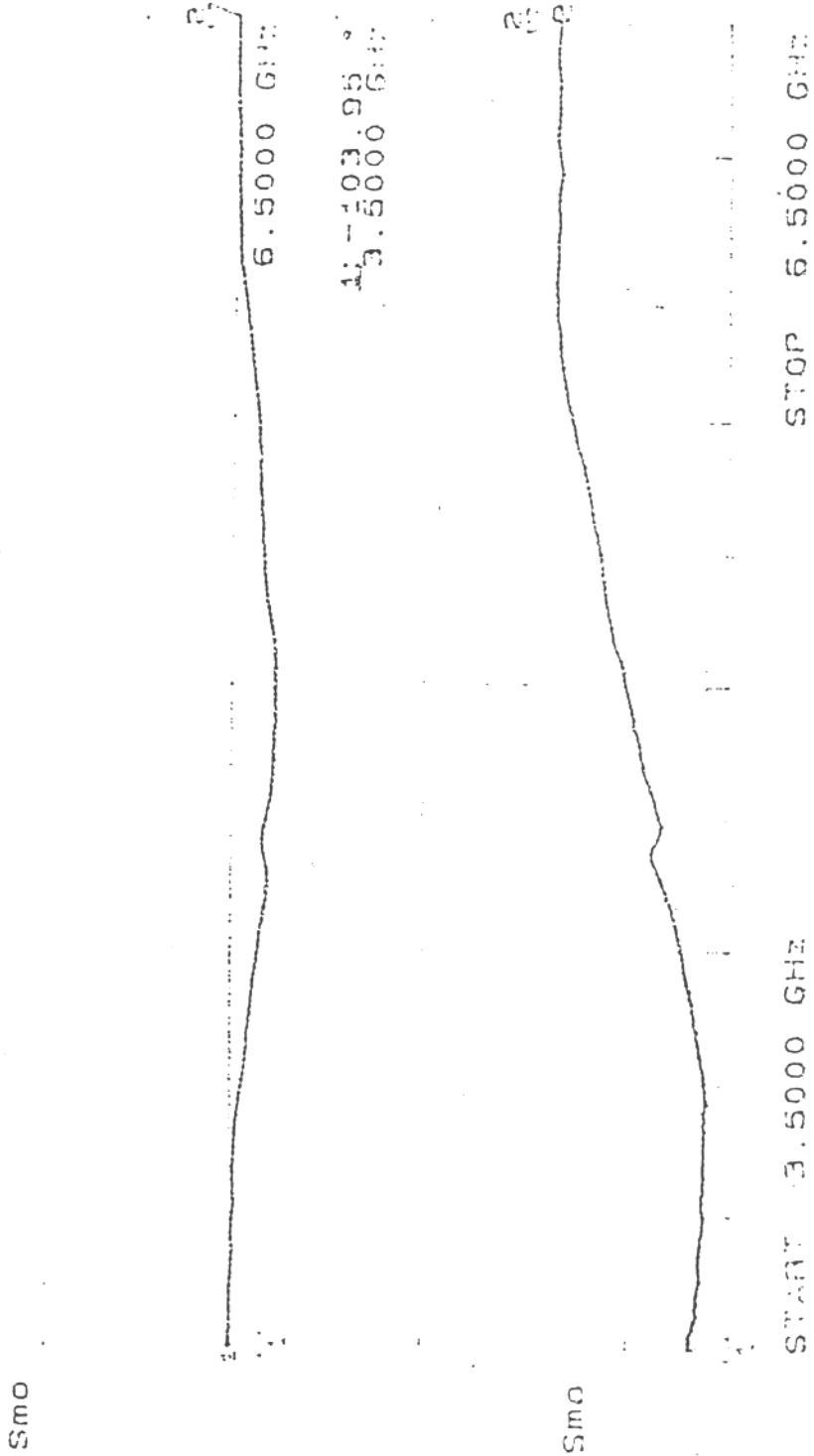
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270° Reference: c Phase Shift

CH1 S21/M I09 MAG 5 dB/ REF 0 dB
 CH2 S21/M phase 22.5 °/ REF 0 °
 (dB) 5.5000 GHz
 1. 3.5000 GHz
 2. 6.5000 GHz



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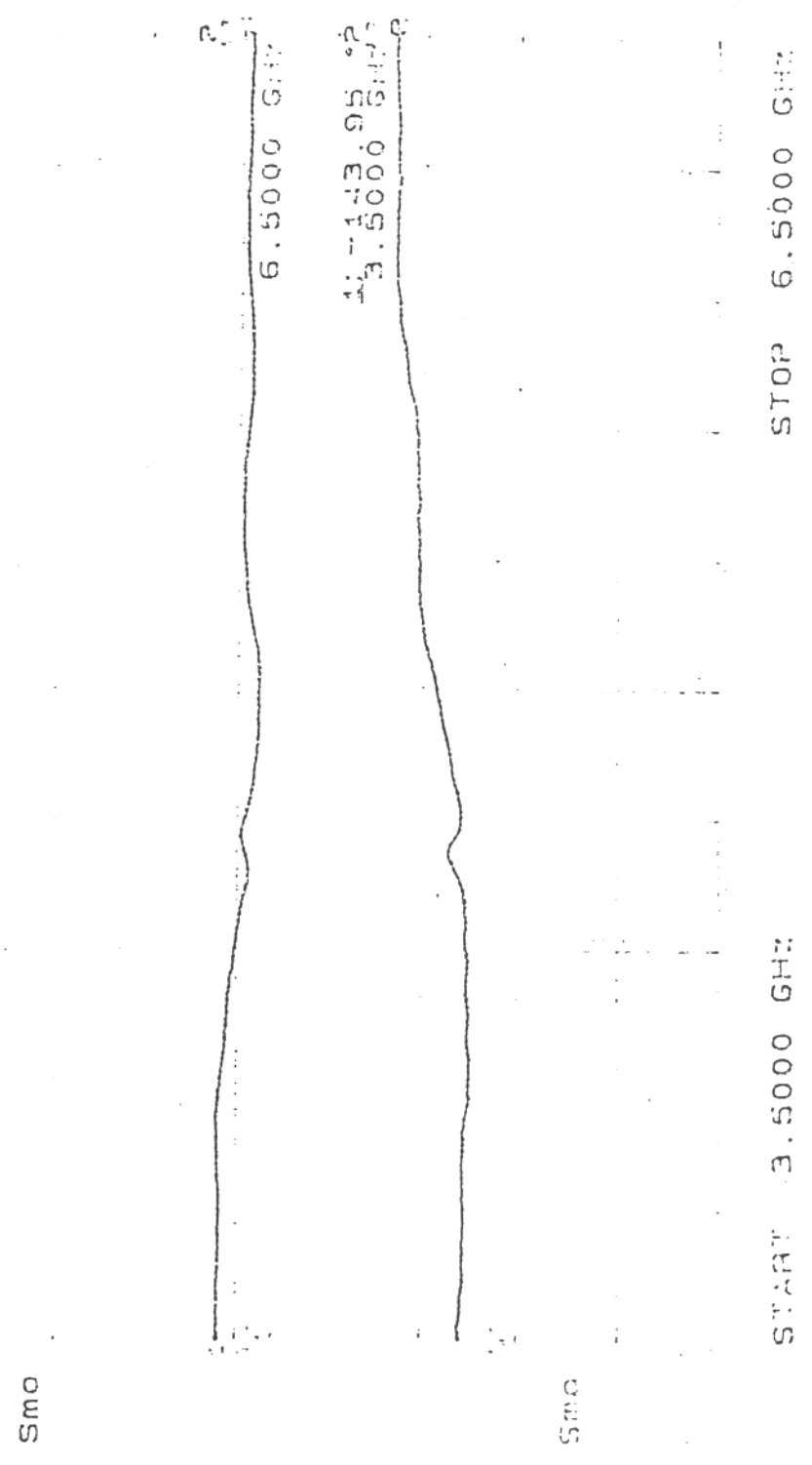
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2250 Reference: 0° phase shift

CH1 S21/M 109 MAG 5 dB/ REF 0 dB
 CH2 S21/M phase 22.5 °/ REF -90 °
 (b2) 6.5000 GHz

1 3.5000 GHz
 2 6.5000 GHz

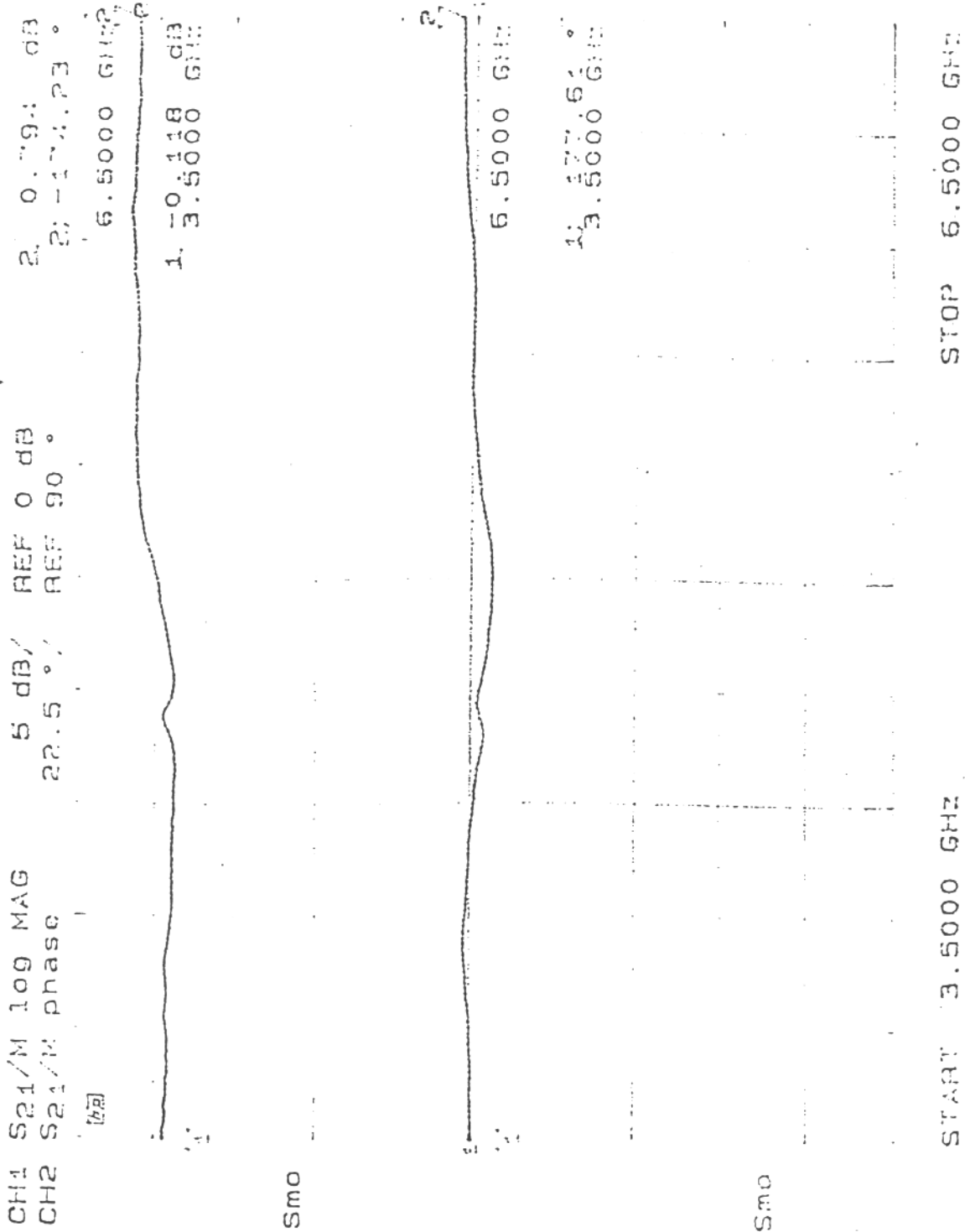


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1800 Reference: \pm Phase Shift

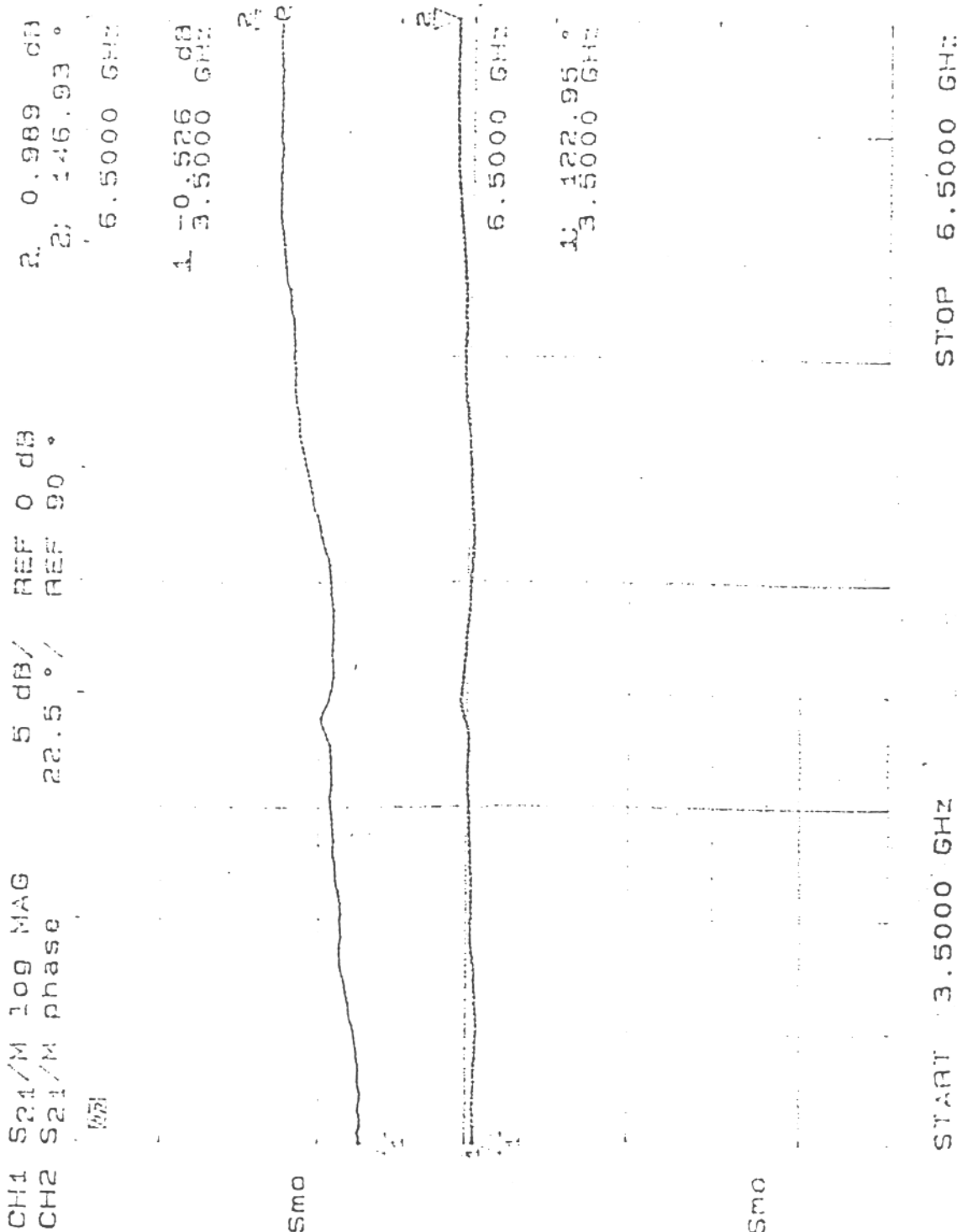


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135° Reference: 0° / 90° shift

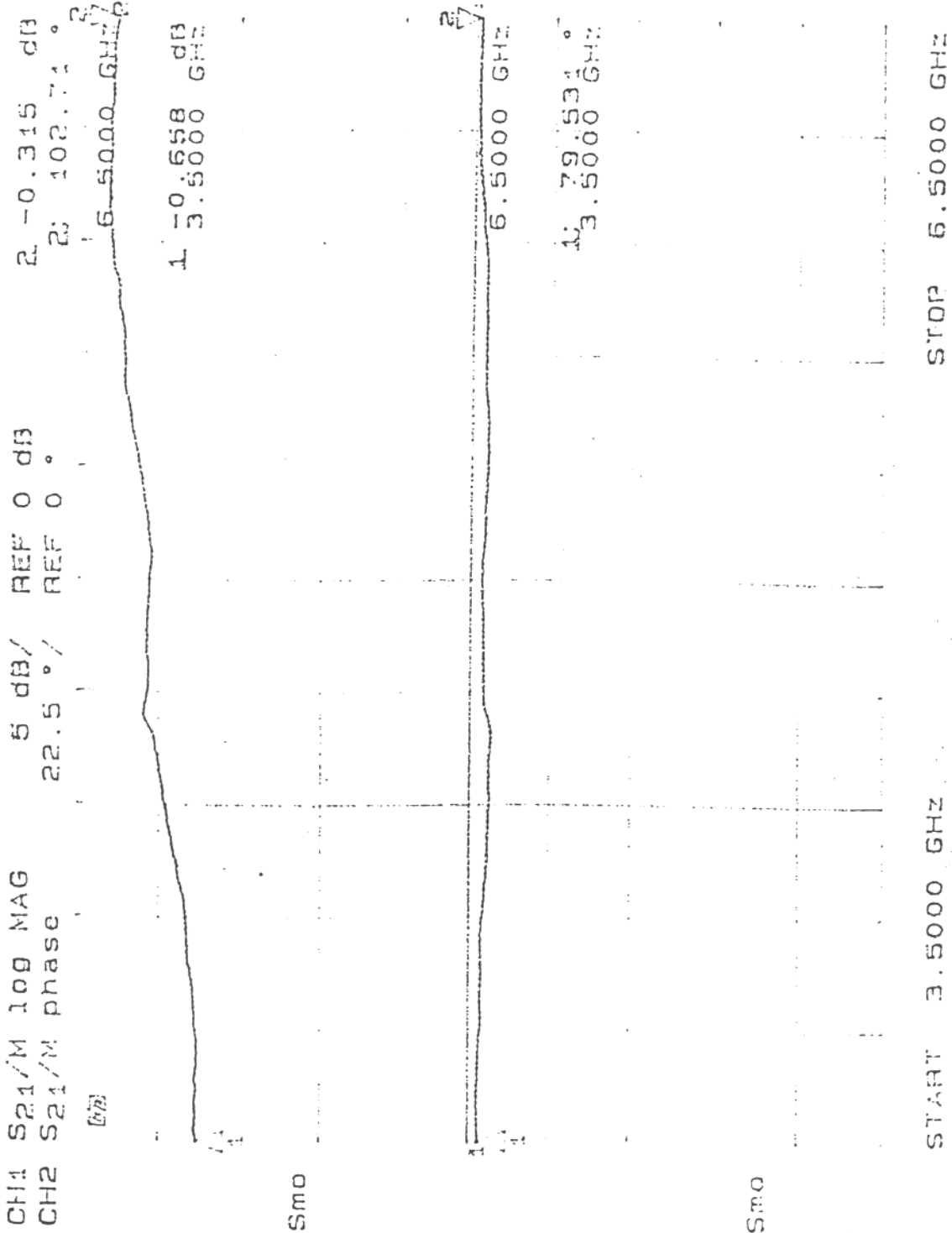


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Reference: 0° Phase Shift

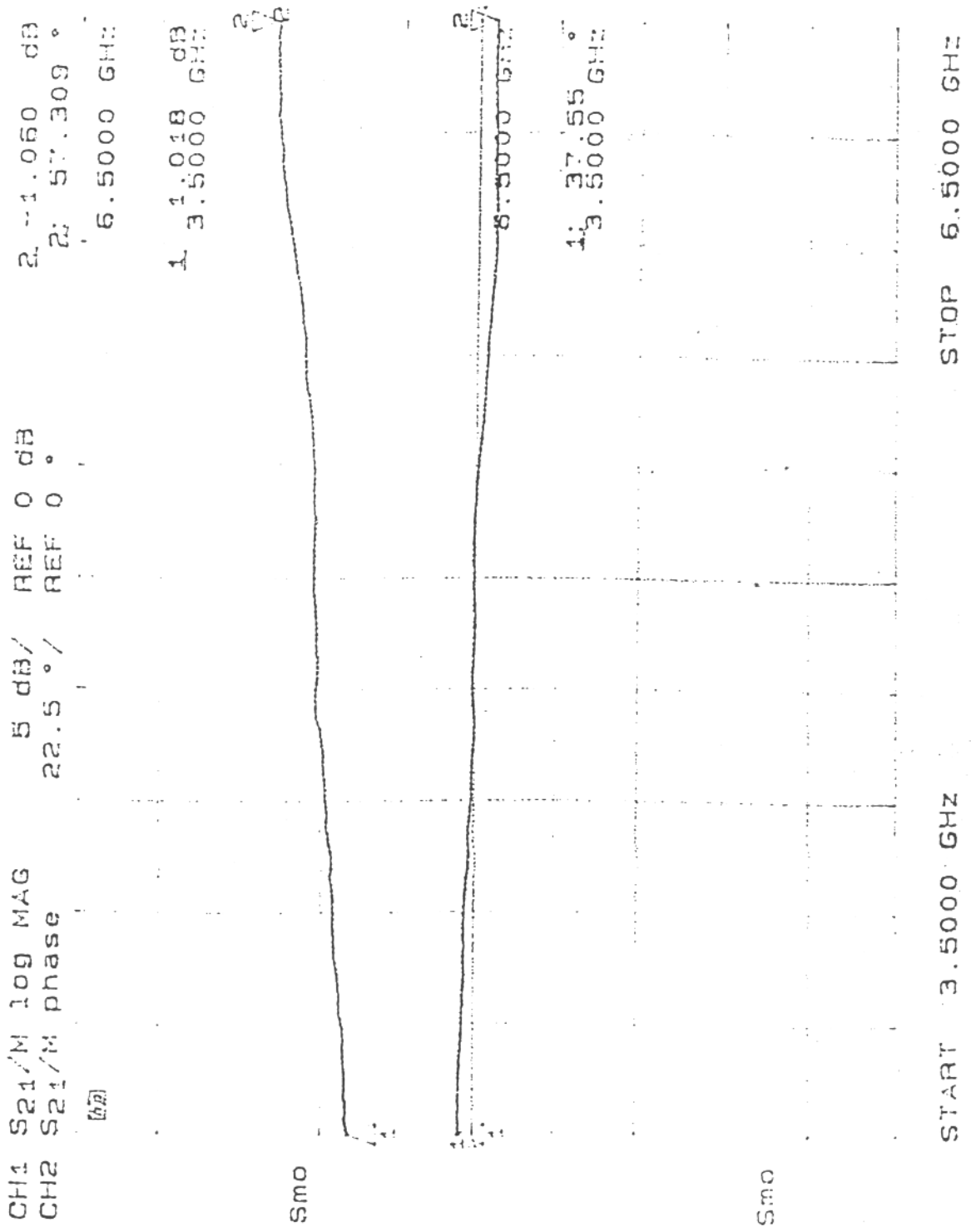


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450 Reference: 0° Phase sh



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