



Publication Year	2006
Acceptance in OA @INAF	2023-02-08T10:50:17Z
Title	Planck/ LFI: Setup of FM End-To-End test
Authors	MARIS, Michele; FRAILIS, Marco
Handle	http://hdl.handle.net/20.500.12386/33269
Number	PL-LFI-OAT-ME-019

PL- LFI- OAT- ME- 019

Planck/ LFI: Setup of FM End- To- End
test

21 June 2006

Michele Maris,
Marco Frailis

Index

1. Presentation
2. HW setup
3. Tests

1. Presentation

- This memo is the photographic documentation of the setup for the End-To-End tests performed at Alcatel/ Alenia – Milano from 13 June 2006 to 15 June 2006.
- See PL- LFI- ME- 018 for a quick account.

The FM/AVM REBA

CRISA H - P SPU/REBA

SPU

J14

SPU

J34

THIS BOARD MUST BE
SERVICED BY AN
AUTHORIZED PERSON
WHILE THE SYSTEM

IS POWERED ON THE
BOARD MUST BE
REMOVED FROM THE
SYSTEM IN THE PRESENCE

J11
J12
J13
J15
J16

SPU-1
SPU-2
SPU-3
SPU-4
SPU-5
SPU-6
SPU-7
SPU-8
SPU-9
SPU-10
SPU-11
SPU-12
SPU-13
SPU-14
SPU-15
SPU-16
SPU-17
SPU-18
SPU-19
SPU-20
SPU-21
SPU-22
SPU-23
SPU-24
SPU-25
SPU-26
SPU-27
SPU-28
SPU-29
SPU-30
SPU-31
SPU-32
SPU-33
SPU-34
SPU-35
SPU-36
SPU-37
SPU-38
SPU-39
SPU-40
SPU-41
SPU-42
SPU-43
SPU-44
SPU-45
SPU-46
SPU-47
SPU-48
SPU-49
SPU-50
SPU-51
SPU-52
SPU-53
SPU-54
SPU-55
SPU-56
SPU-57
SPU-58
SPU-59
SPU-60
SPU-61
SPU-62
SPU-63
SPU-64
SPU-65
SPU-66
SPU-67
SPU-68
SPU-69
SPU-70
SPU-71
SPU-72
SPU-73
SPU-74
SPU-75
SPU-76
SPU-77
SPU-78
SPU-79
SPU-80
SPU-81
SPU-82
SPU-83
SPU-84
SPU-85
SPU-86
SPU-87
SPU-88
SPU-89
SPU-90
SPU-91
SPU-92
SPU-93
SPU-94
SPU-95
SPU-96
SPU-97
SPU-98
SPU-99
SPU-100

The FM/ AVM REBA

CRISA

H-P SPU/REBA

AvM - SPU

C.I. No : N / 16 / 01

ABCL :

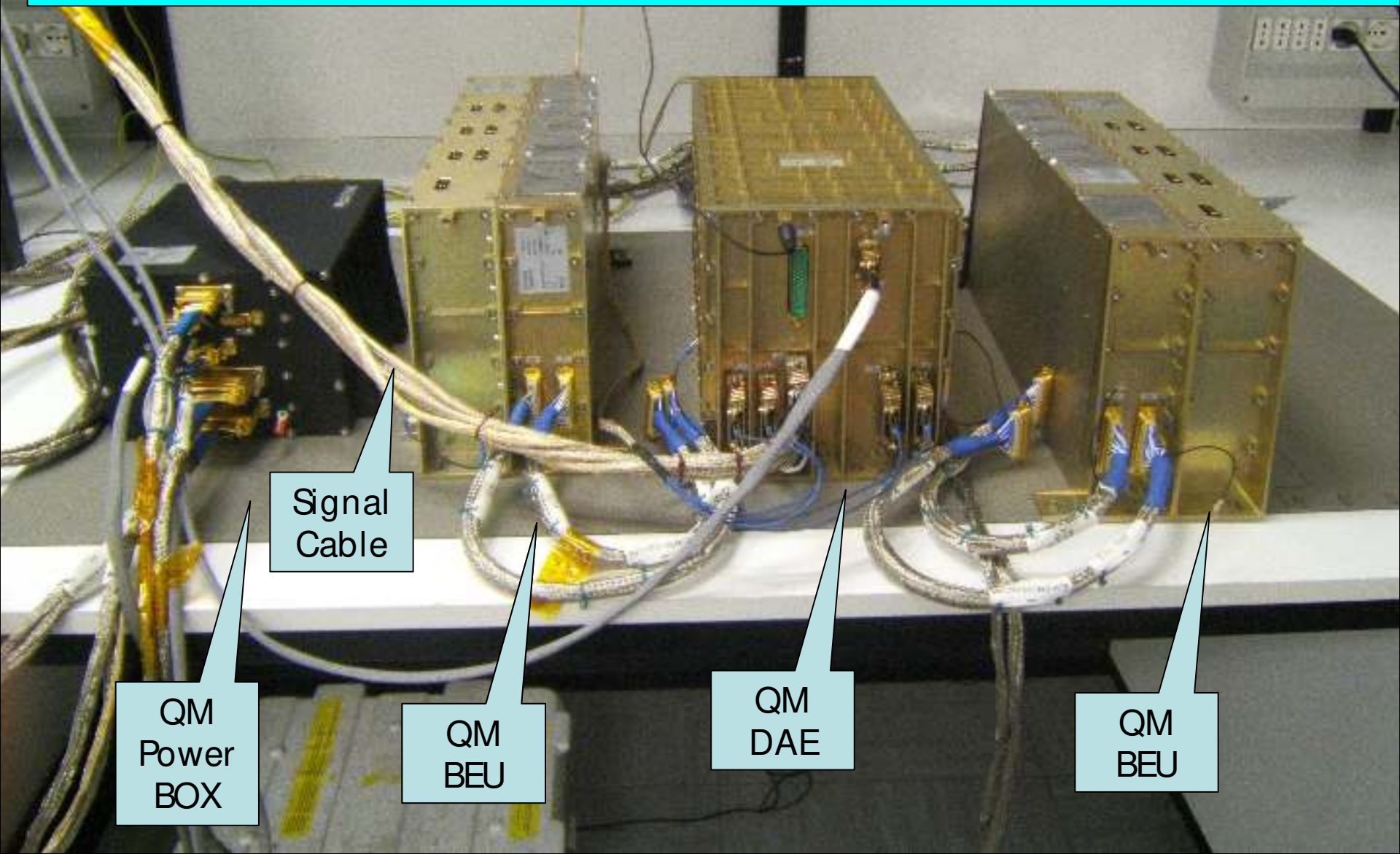
P/N :

S/N :

02

The QM HW With cabling

Note that cables carries to all the inputs of DAE the same signal, also the DAE module only is connected in.



Signal
Cable

QM
Power
BOX

QM
BEU

QM
DAE

QM
BEU

The QM Power Box

LABEN

PROGRAM:	PLANCK LFI
EQUIPMENT	DAE POWER BOX
P. N.	740800115-01B
S.N.	001
MODEL	QM

The QM DAE

PROGRAM:	PLANCK LFI
EQUIPMENT	DAE LEFT BEM BOX
MANUFACTURER	LABEN
P. N.	740800118-01B
S.N.	001
MODEL	QM

The QM HW With cabling

PROGRAM:	PLANCK LFI
EQUIPMENT	DAE DAE BEU BOX
MANUFACTURER	LABEN
P. N.	740800117-01B
S.N.	001
MODEL	QM

The QM DAE BEM box

PROGRAM:	PLANCK LFI
EQUIPMENT	DAE RIGHT BEM BOX
MANUFACTURER	LABEN
P. N.	740800119-01B
S.N.	001
MODEL	QM

The QM DAE FEM box

PROGRAM:	PLANCK LFI
EQUIPMENT	DAE RIGHT FEM BOX
MANUFACTURER	LABEN
P. N.	740800171-01B
S.N.	001
MODEL	QM

The 2020 signal generator with signal splitting plug



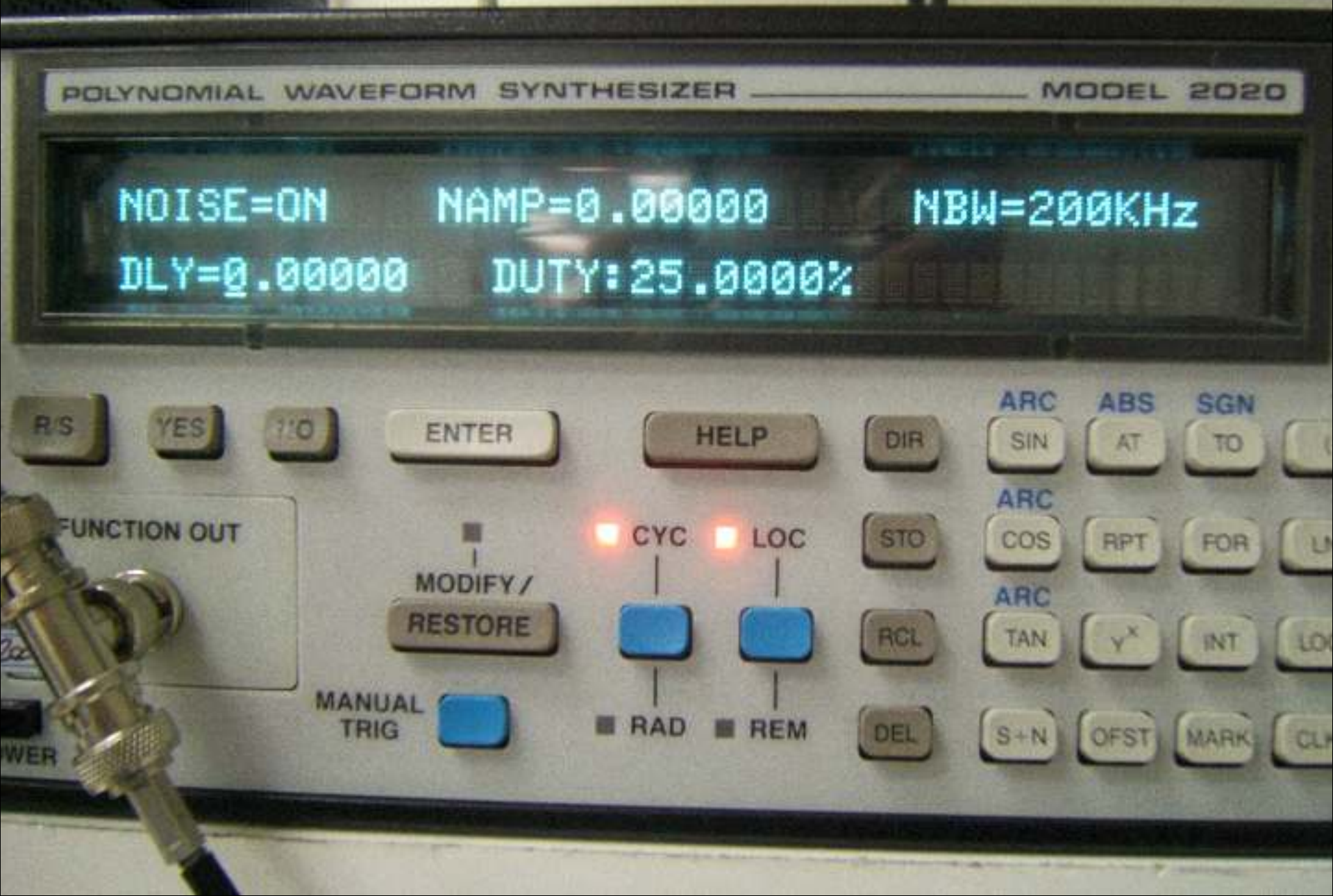
The 2020 signal generator 1ST menu



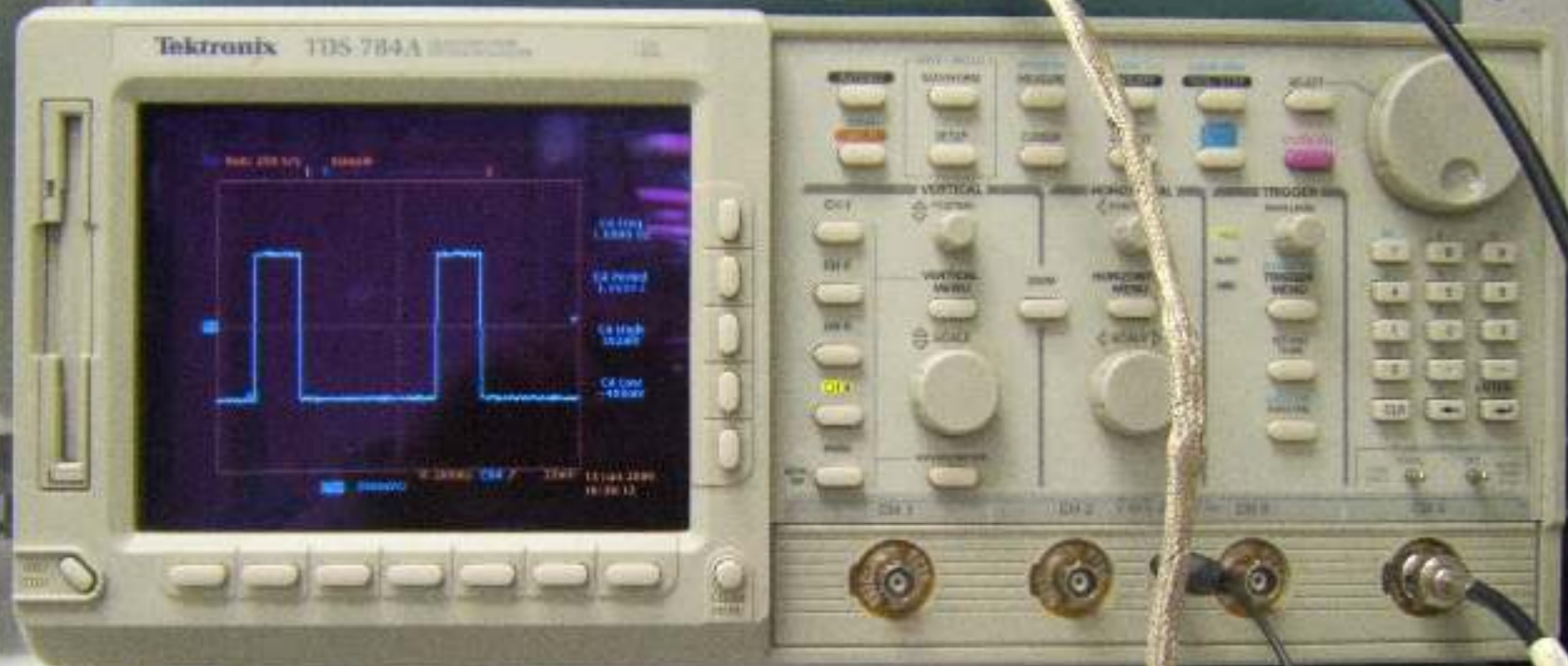
The 2020 signal generator 2nd menu



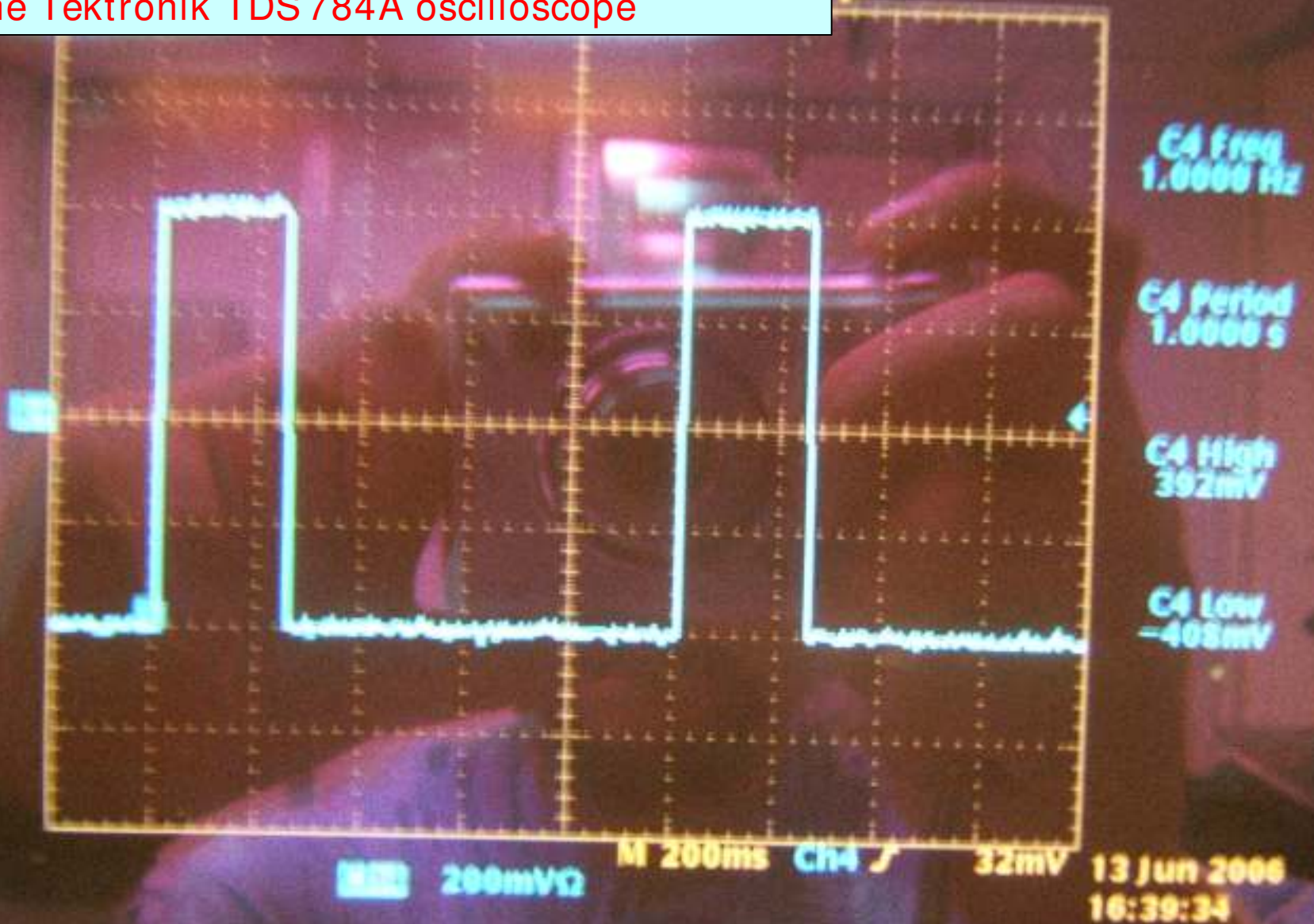
The 2020 signal generator 3rd menu



The Tektronik TDS 784A oscilloscope



The Tektronik TDS 784A oscilloscope



The Tektronik TDS 784A oscilloscope Setup

Signal splitter

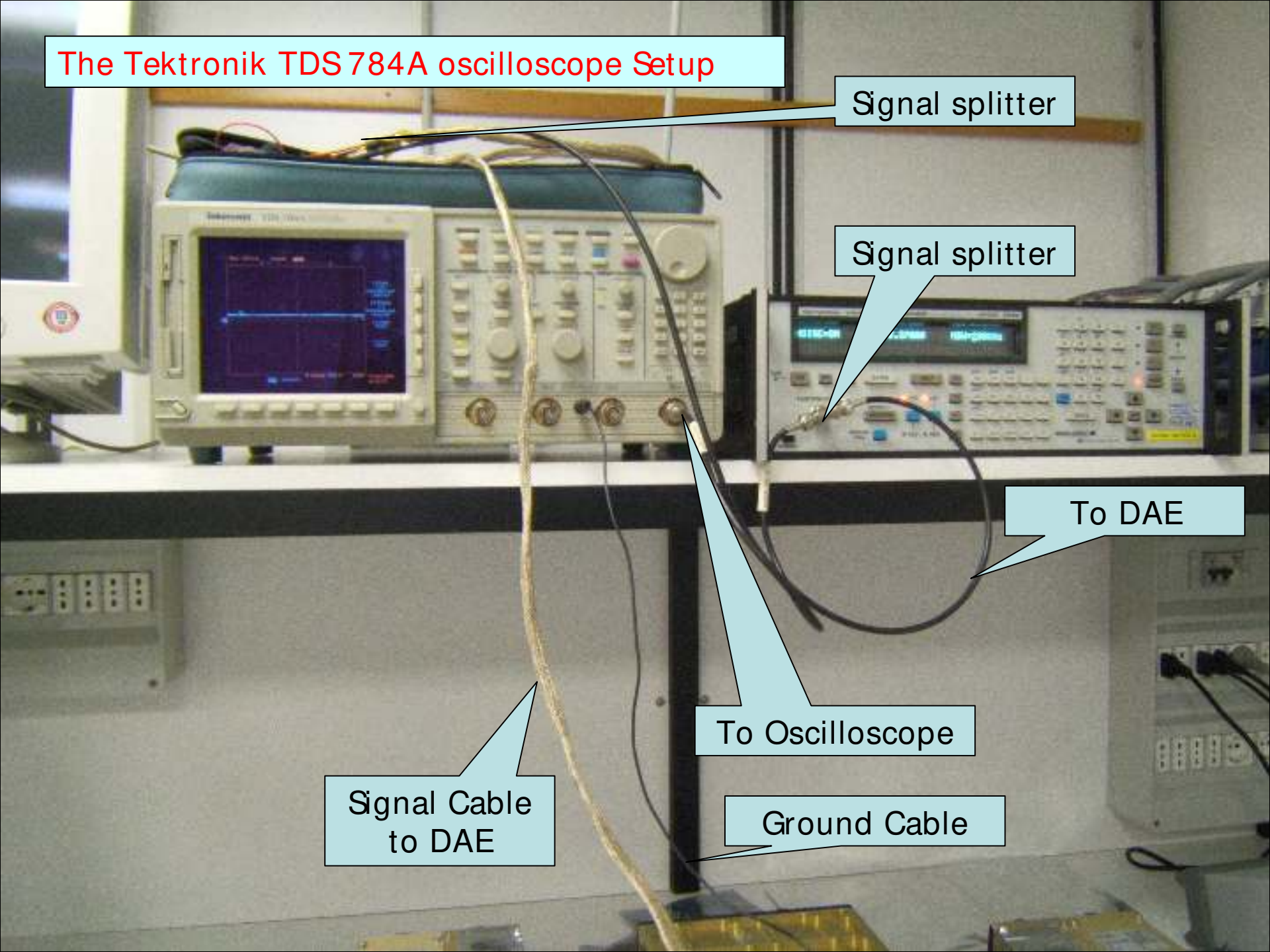
Signal splitter

To DAE

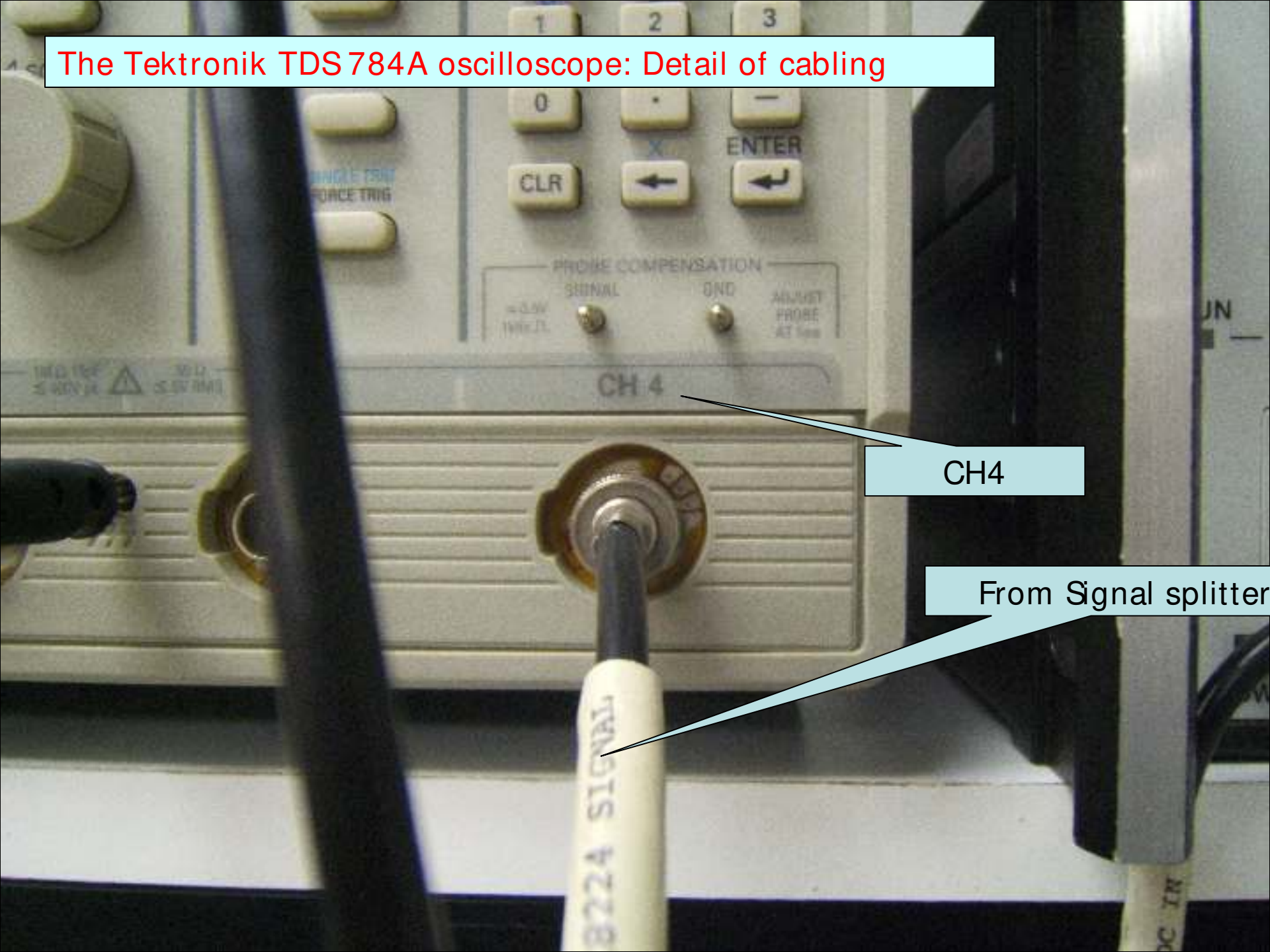
To Oscilloscope

Ground Cable

Signal Cable
to DAE



The Tektronik TDS 784A oscilloscope: Detail of cabling



CH 4

CH4

From Signal splitter

8224 SIGNAL

3 Tests

- XXX_9103
- XXX_9105
- XXX_9106
- XXX_9108
- XXX_9111
- XXX_9113
- XXX_9114
- XXX_9115

XXX_9103

- Square Wave

POLYNOMIAL WAVEFORM SYNTHESIZER

MODEL 2020

FREQ: 299.954m AMP: 0.40000 OFST: 0.00000
FILT=NONE MARK: 0.00000 TRIG=FREE RUN

RUN

RT

YES

NO

ENTER

HELP

ON

ARC

SIN

ABS

AT

SGN

TO

1

2

SRL

COS

RPT

TCR

3

4

ARC

TAN

γ^*

INT

5

6

DE

S-Y

OFST

MARH

7

8

OFF

GLK

FIL

9

0

K

1

M

2

N

3

+

+

□

FORMAT

n

4

U

5

OH

6

x

■

~

SELECT

OF

7

8

9

-

■

~

FIELD

TRIG

-

0

EE

+

■

NOISE

FIELD

STO

COI

RPT

TCR

1

2

RC

TA

γ^*

INT

3

4

DE

S-Y

OFST

MARH

5

6

OFF

GLK

FIL

7

8

TRIG

-

0

EE

+

▲

NOISE

FIELD

TRIG

0

EE

+

▲

NOISE

FIELD

TRIG

0

EE

+

▲

NOISE

FIELD

TRIG

0

EE

+

▲

NOISE

FIELD

TRIG

0

EE

+

▲

NOISE

FIELD

TRIG

0

EE

+

▲

NOISE

FIELD

TRIG

0

EE

+

▲

NOISE

FIELD

TRIG

0

EE

+

▲

NOISE

FIELD

TRIG

0

EE

+

▲

NOISE

FIELD

TRIG

0

EE

+

▲

NOISE

FIELD

TRIG

0

EE

+

▲

NOISE

FIELD

TRIG

0

EE

+

▲

NOISE

FIELD

LIBERTY
ANALOGIC
INTEGRAL IRIG VETO 1B

INTEGRAL IRIG VETO 1B

ANALOGIC

INTEGRAL IRIG VETO 1B

POLYNOMIAL WAVEFORM SYNTHESIZER

MODEL 2020

FREQ: 999.954m AMP: 0.40000 OFST: 0.00000
FILT=NONE MARK: 0.00000 TRIG=FREE RUN

RS

YES

NO

ENTER

HELP

DIR

ARC

SIN

ABS

AT

SGN

TO

FUNCTION OUT

■

REFY /

RESTO

■

CYC

■

LOC

STO

ARC

COS

RPT

FOR

LN

ARC

TAN

Y^x

INT

LOG

MANUAL TRIG



■

0

■

REM

DEL

S+N

OFST

MARK

CLK

POWER

POLYNOMIAL WAVEFORM SYNTHESIZER

MODEL 2020

FILT=NONE

MARK:0.00000

TRIG=FREE RUN

NOISE=ON

NAMP=0.00000

NBW=200KHz

R/S

YES

NO

ENTER

HELP

DIR

ARC

ABS

SGN

SIN

AT

TO

FUNCTION OUT

KEY /

CYC

LOC

STO

ARC

COS

RPT

FOR

LN

T

RESTORE

RCL

ARC

TAN

y^x

INT

LOG

T

MANUAL TRIG

REM

DEL

S+N

OFST

MARK

CLK

FILT

POWER

POLYNOMIAL WAVEFORM SYNTHESIZER

MODEL 2020

NOISE=ON

NAMP=0.00000

NBW=200KHz

DLY=0.00000

DUTY: 25.0000%

RS

YES

NO

ENTER

HELP

DIR

ARC

SIN

ABS

AT

SGN

TO

FUNCTION OUT

CYC

LOC

STO

ARC

COS

RPT

FOR

LN

RESTORE



RCL

ARC

TAN

Y^x

INT

LOG

MANUAL TRIG



REM

DEL

S+N

OFST

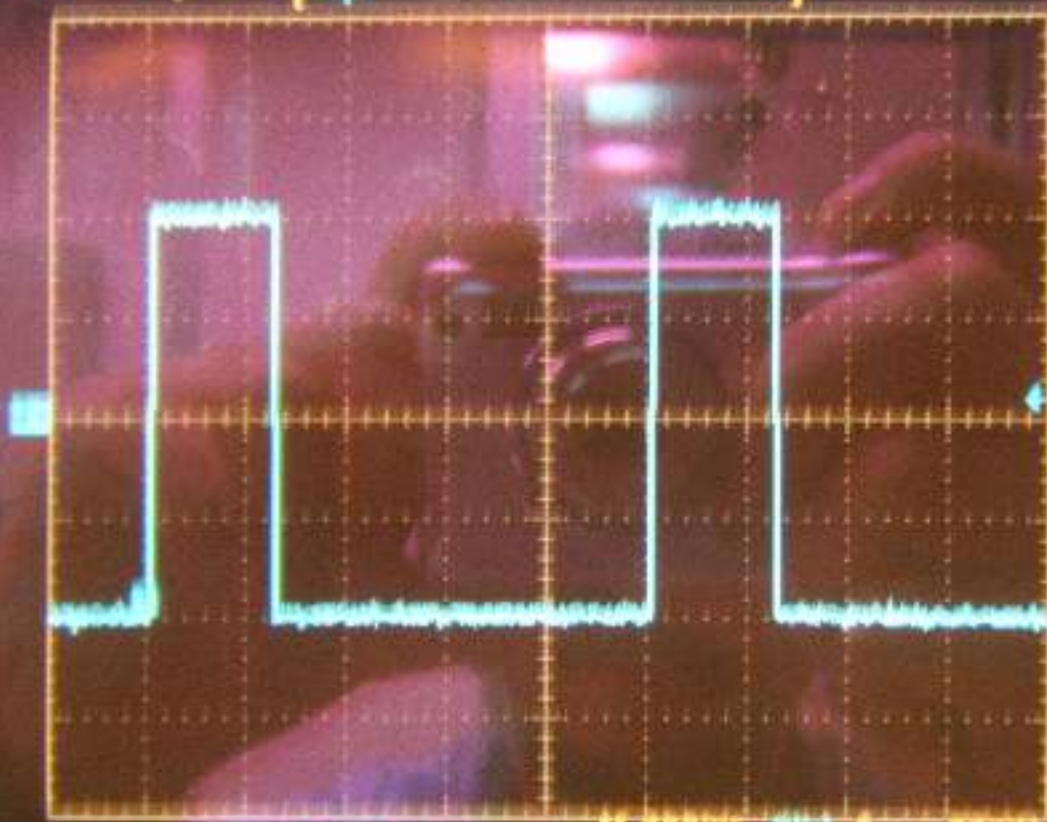
MARK

CLK

POWER

Tek Run: 250 S/s

Sample



C4 freq
1.0000 Hz

C4 Period
1.0000 s

C4 High
392mV

C4 Low
-408mV

200mV

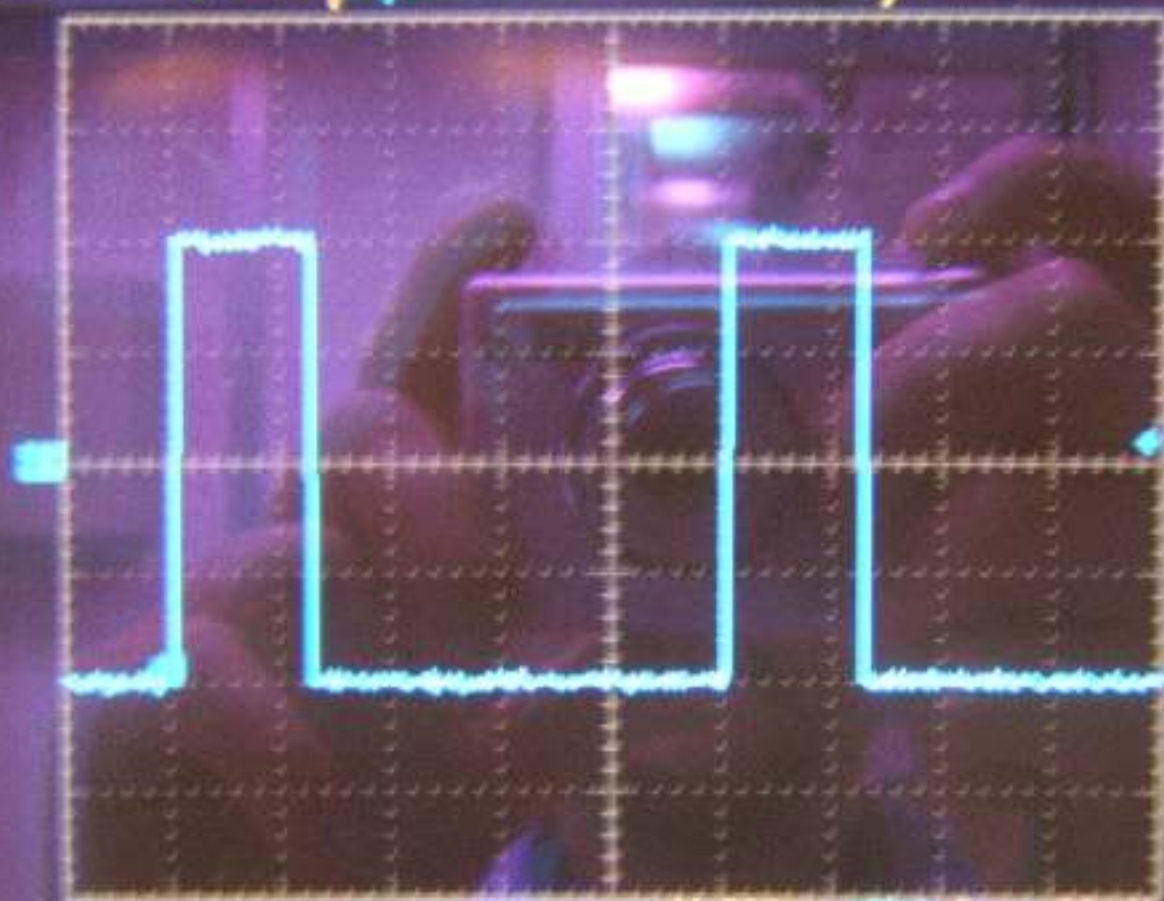
M 200ms CH4

32mV

14 Jun 2006
00:58:11

Run: 250 S/s

Sample (200ns)



C4 Freq
1.000 Hz

C4 Period
1.000 s

C4 High
32mV

C4 Low
-32mV

200mV

M 200ms CH4 J

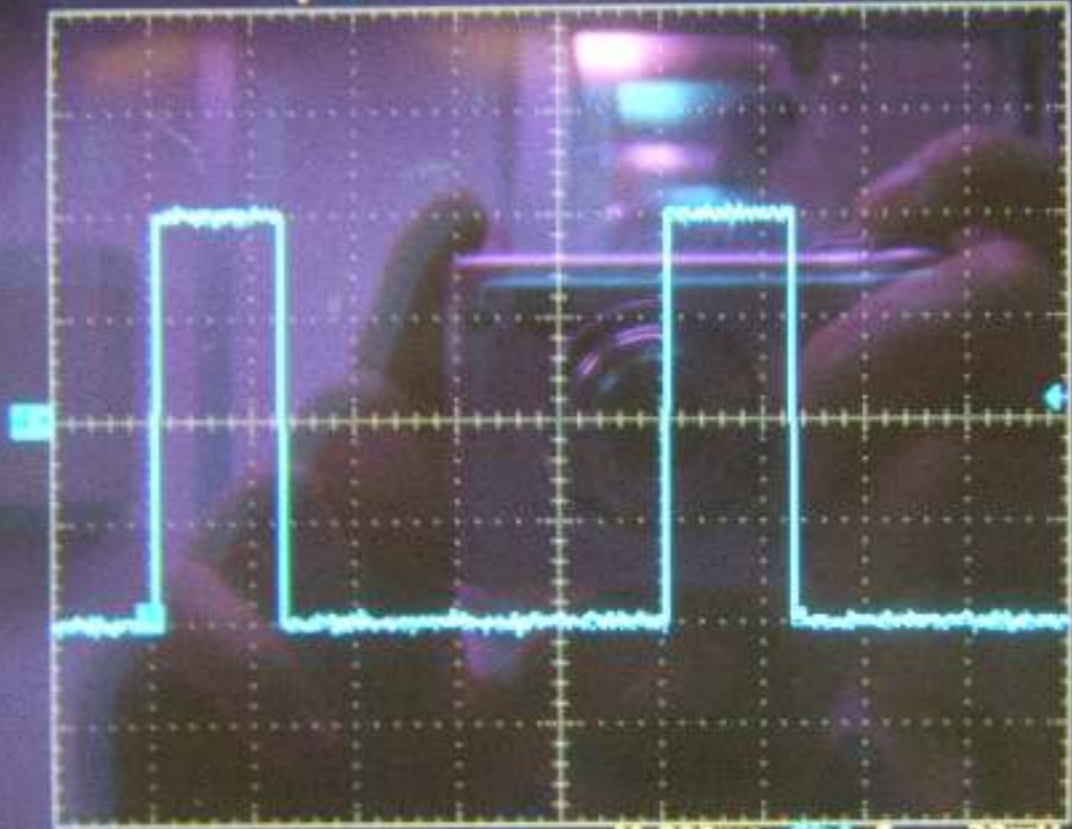
32mV

14 Jun 2006

09:58:17

Tek Run: 250 S/s

Sample



C4 Freq
1.0000 Hz

C4 Period
1.0000 s

C4 High
392mV

C4 Low
-408mV

200mVQ

M 200ms

CH4

32mV

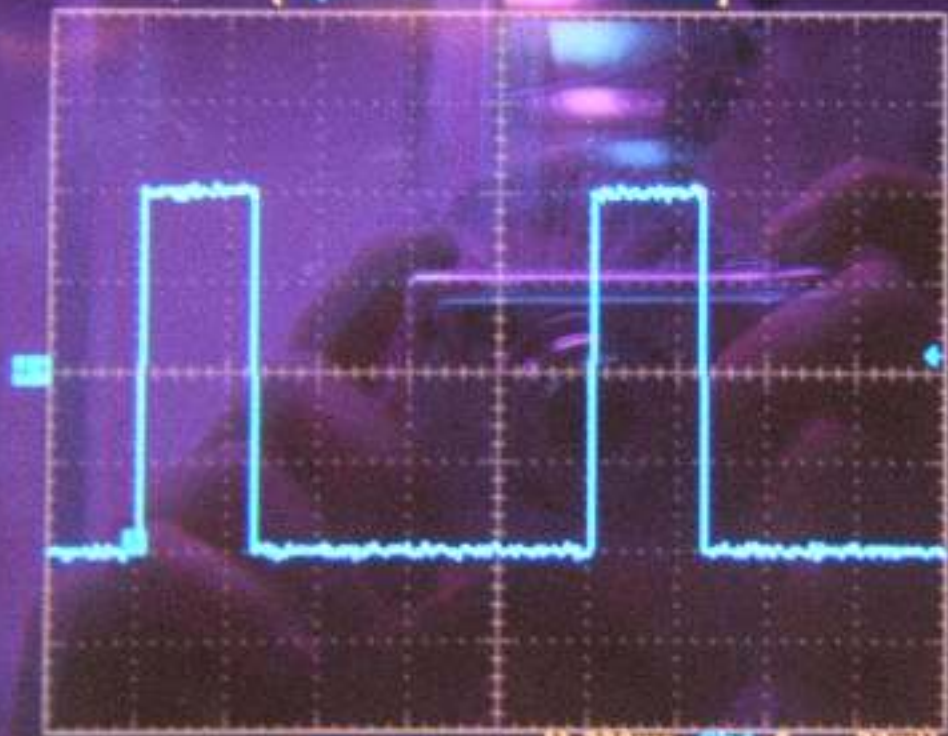
14 Jun 2006

09:58:23

Task Run: 250 S/s

Sample

100ns



C4 Freq
1.0000 Hz

C4 Period
1.0000 s

C4 High
392mV

C4 Low
-405mV



200mV

M 200ms

Ch4

32mV

14 Jun 2006

09:59:12

XXX_9105

- Constant signal
- Square wave
- Triangular Wave
- Sinusoidal wave

XXX_9105

- Constant Signal
- Square wave 1Hz $A=0.4V$, duty = 25%
- Triangular wave 1Hz $A=0.4V$ duty = 25%

POLYNOMIAL WAVEFORM SYNTHESIZER

MODEL 2020

FREQ: 999.954m AMP: 0.40000 DFST: 0.00000
FILT=NONE MARK: 0.00000 TRIG=FREE RUN

RUN

YES

NO

ENTER

HELP

STOP

ARC ABS SGN

SIN COS TAN

ASIN ACOS ATAN

ARCSIN ARCCOS ARCTAN

EXP LN LOG

EXP2 LN2 LOG2

EXP10 LN10 LOG10

EXP-1 LN-1 LOG-1

EXP-2 LN-2 LOG-2

EXP-10 LN-10 LOG-10

EXP-10 LN-10 LOG-10

EXP-10 LN-10 LOG-10

EXP-10 LN-10 LOG-10

EXP-10 LN-10 LOG-10

EXP-10 LN-10 LOG-10

EXP-10 LN-10 LOG-10

EXP-10 LN-10 LOG-10

EXP-10 LN-10 LOG-10

EXP-10 LN-10 LOG-10

EXP-10 LN-10 LOG-10

EXP-10 LN-10 LOG-10

EXP-10 LN-10 LOG-10

EXP-10 LN-10 LOG-10

EXP-10 LN-10 LOG-10

EXP-10 LN-10 LOG-10

EXP-10 LN-10 LOG-10

EXP-10 LN-10 LOG-10

EXP-10 LN-10 LOG-10

1 2 3
4 5 6
7 8 9
0

TRIG CLR
F CE

SPACE

FORMAT
SELECT
FIELD

LANEY
ANALOGIC
INTEGRAL

INTEGRAL 100 VOLT 10

FUNCTION OUT

CYC LOC

MANUAL TRIG

ANALOGIC

LANEY

POLYNOMIAL WAVEFORM SYNTHESIZER

MODEL 2020

FREQ: 999.954m AMP: 0.40000 OFST: 0.00000
FILT=NONE MARK: 0.00000 TRIG=FREE RUN

R/S

YES

NO

ENTER

HELP

DIR

ARC

SIN

ABS

AT

SGN

TO

1

FUNCTION OUT

■

KEY/

■

CYC

■

LOC

STD

ARC

COS

RPT

FOR

LN

RESTORE



RCL

ARC

TAN

Y^x

INT

LOG

MANUAL TRIG



■

■

REM

DEL

S-N

OFST

MARK

CLK

POWER

POLYNOMIAL WAVEFORM SYNTHESIZER

MODEL 2020

FILT=NONE

MARK:0.00000

TRIG=FREE RUN

NOISE=ON

NAMP=0.00000

NBW=200KHz

UN

R/S

YES

NO

ENTER

HELP

DIR

ARC

SIN

ABS

AT

SGN

TO

FUNCTION OUT

CYC

LOC

STO

ARC

COS

RPT

FOR

LN

RESTORE

ARC

TAN

\sqrt{x}

INT

LOG

MANUAL TRIG

RAD

REM

RCL

ARC

S+N

OFST

MARK

CLK

DEL

POWER

POLYNOMIAL WAVEFORM SYNTHESIZER

MODEL 2020

NOISE=ON

NAMP=0.00000

NBW=200KHz

DLY=0.00000

SYM=25.0000%

R/S

YES

NO

ENTER

HELP

DIR

ARC

ABS

SGN

SIN

AT

TO

(

FUNCTION OUT

CYC

LOC

STO

ARC

COS

RPT

FOR

LN

RESTORE

RCL

ARC

TAN

γ^x

INT

LOG

MANUAL TRIG

RA

REM

DEL

S+N

OFST

MARK

CLK

F

POWER

Run: 250 S/s Sample



C4 Freq
998.7mHz
Low signal
amplitude

C4 Period
1.0012 s
Low signal
amplitude

C4 High
112mV
Unstable
histogram

C4 Low
-176mV
Unstable
histogram

200mV M 200ms Ch4 J 32mV 14 Jun 2006 10:34:19

POLYNOMIAL WAVEFORM SYNTHESIZER MODEL 2020

FREQ: 999.954m AMP: 0.40000 OFST: 0.00000
FILT=NONE MARK: 0.00000 TRIG=FREE RUN

K	M	=			
1	2	3	+		
π	μ	∞	X		
4	5	6			
DP	7	8	9	-	
TRIG	0	EE	+		

FUNCTION OUT

ENTER HELP

CYC LDC

MANUAL TRIG

REM

ARC SIN ABS AC SQN TO

ARC COS IBT FOR LN

ARC TAN √ RT LDU T

EE E-11 OFST MARK CLK FLT

2nd F CE

SPACE

FAST

ANALOGIC

DATA PRECISION

FORMAT

SELECT

FIELD

NOISE

↑

↓

LPDEM 100
Precision Digital
0.1% Accuracy
SIGNAL SOURCE
APRIL 2007

INTEGRAL IBIS VETO TR

POLYNOMIAL WAVEFORM SYNTHESIZER

MODEL 2020

FREQ: 999.954m AMP: 0.40000

OFST: 0.00000

FILT=NONE

MARK: 0.00000

TRIG=FREE RUN

RS

YES

NO

ENTER

HELP

DIR

ARC

SIN

ABS

AT

SGN

TO

FUNCTION OUT

CYC

LOC

STO

ARC

COS

RPT

FOR

LN

RESTORE



RCL

ARC

TAN

Y^x

INT

LOG

MANUAL TRIG



REM

DEL

S+N

OFST

MARK

CLK

POLYNOMIAL WAVEFORM SYNTHESIZER

MODEL 2020

FILT=NONE

MARK:0.00000

TRIG=FREE RUN

NOISE=ON

NAMP=0.00000

NBW=200KHz

R/S

YES

NO

ENTER

HELP

DIR

ARC

SIN

ABS

AT

SGN

TO

FUNCTION OUT



KEY /



CYC



LOC

RESTO



STO

ARC

COS

RPT

FOR

LN

ARC

TAN

Y^x

INT

LOG

MANUAL TRIG



REM

RCL

RCL

DEL

S+N

OFST

MARK

CLK

POLYNOMIAL WAVEFORM SYNTHESIZER

MODEL 2020

NOISE=ON

NAMP=0.00000

NBW=200KHz

PHS=0.00000

SYM=50.0000%

RS

YES

NO

ENTER

HELP

DIR

ARC

SIN

ABS

AT

SGN

TO

FUNCTION OUT

CYC

LOC

STO

ARC

COS

RPT

FOR

RESTORE



RCL

ARC

TAN

Y^x

INT

MANUAL TRIG



REM

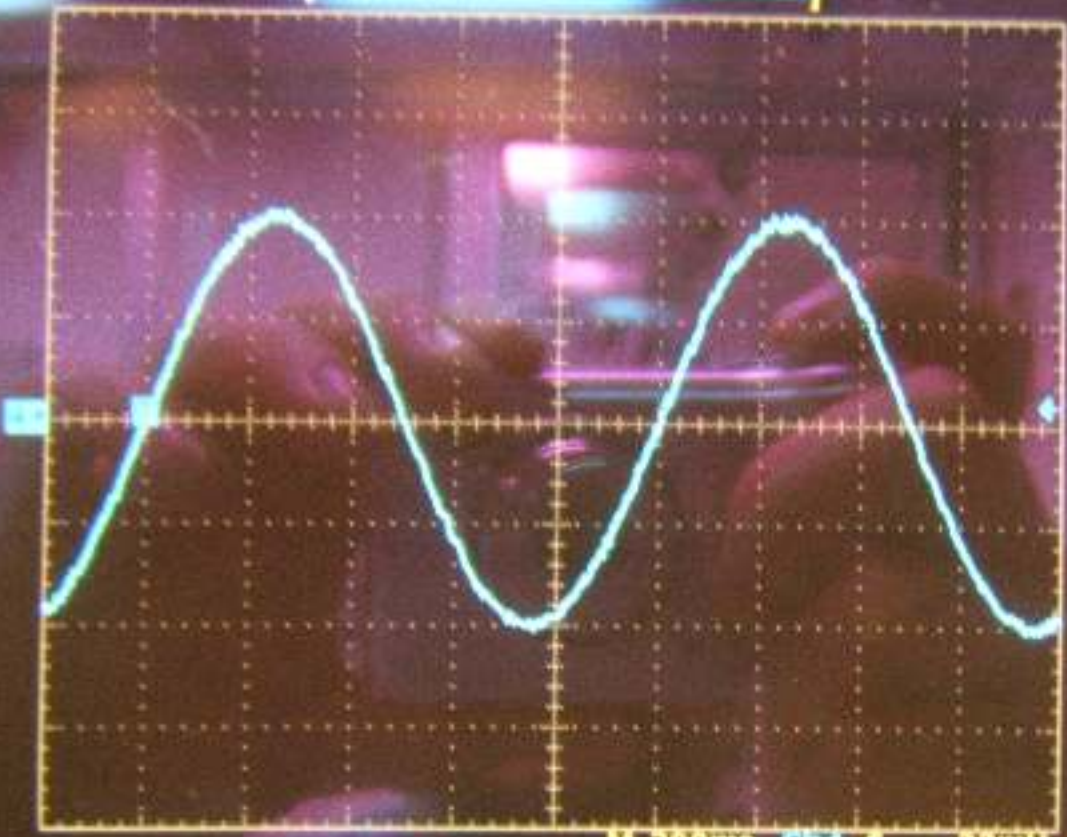
DEL

S+N

OFST

MARK

Tek Run: 250 S/s



C4 Freq
1.0005 Hz

C4 Period
999.6ms

C4 High
384mV

C4 Low
-408mV

200mV

M 200ms Ch4 J

32mV

14 Jun 2006
10:57:47

XXX_9106

- Constant Signal
- Square wave

XXX_9106

- Constant Signal
- Square wave 1Hz $A=0.4V$, duty = 25%

I

POLYNOMIAL WAVEFORM SYNTHESIZER

MODEL 2020

FREQ: 999.954m AMP: 0.40000 OFST: 0.00000
FILT=NONE MARK: 0.00000 TRIG=FREE RUN

Calculator keypad with function keys: K, M, =, -, 1, 2, 3, 4, 5, 6, 7, 8, 9, 0, EE, +, TRIG, IT, F, CE, 2nd, F, CE, SPACE, FAST, INTEGRAL IRIS

Control panel with buttons: RUN, YES, NO, ENTER, HELP, DIR, ARC, ABS, SGN, SIN, AT, TO, COS, RPT, FOR, IN, I, TAN, y^x, INT, LOG, T, 2nd, F, CE, SPACE, FAST, MANUAL TRIG, RESTORE, CYC, LOC, REM, POWER, FUNCTION OUT

POLYNOMIAL WAVEFORM SYNTHESIZER

MODEL 2020

FREQ: 999.954m AMP: 0.40000

OFST: 0.00000

FILT=NONE

MARK: 0.00000

TRIG=FREE RUN

RS

YES

NO

ENTER

HELP

DIR

ARC

SIN

ABS

AT

SGN

TO

FUNCTION OUT

MODIFY /
RESTORE



CYC



LOC

STO

ARC

COS

RPT

FOR

ARC

TAN

Y^x

INT

MANUAL
TRIG



0

REM

RCL

DEL

S-N

OFST

MARK

POLYNOMIAL WAVEFORM SYNTHESIZER

MODEL 2020

FILT=NONE

MARK:0.00000

TRIG=FREE RUN

NOISE=ON

NAMP=0.00000

NBW=200KHz

Control panel with various buttons and indicators:

- Buttons: R/S, YES, NO, ENTER, HELP, DIR, ARC SIN, ABS AT, SGN TO, STO, RCL, DEL, ARC COS, RPT, FOR, ARC TAN, Y^x, INT, S+N, OFST, MARK.
- Indicators: CYC (lit), LOC (lit), REM (checkbox).
- Switches: MANUAL TRIG (blue), RESTORE (grey).
- Labels: FUNCTION OUT, VERIFY/.

POLYNOMIAL WAVEFORM SYNTHESIZER MODEL 202

NOISE=ON NAMP=0.00000 NBW=200KHz
DLY=0.00000 DUTY:25.0000%

FUNCTION OUT

YES NO ENTER HELP DIR ARC SIN ABS SGN
SIN AT TO

MODIFY /

REST

MANUAL TRIG

STO ARC COS RPT FOR
RCL ARC TAN Y^x INT
DEL S+N OFST MARK

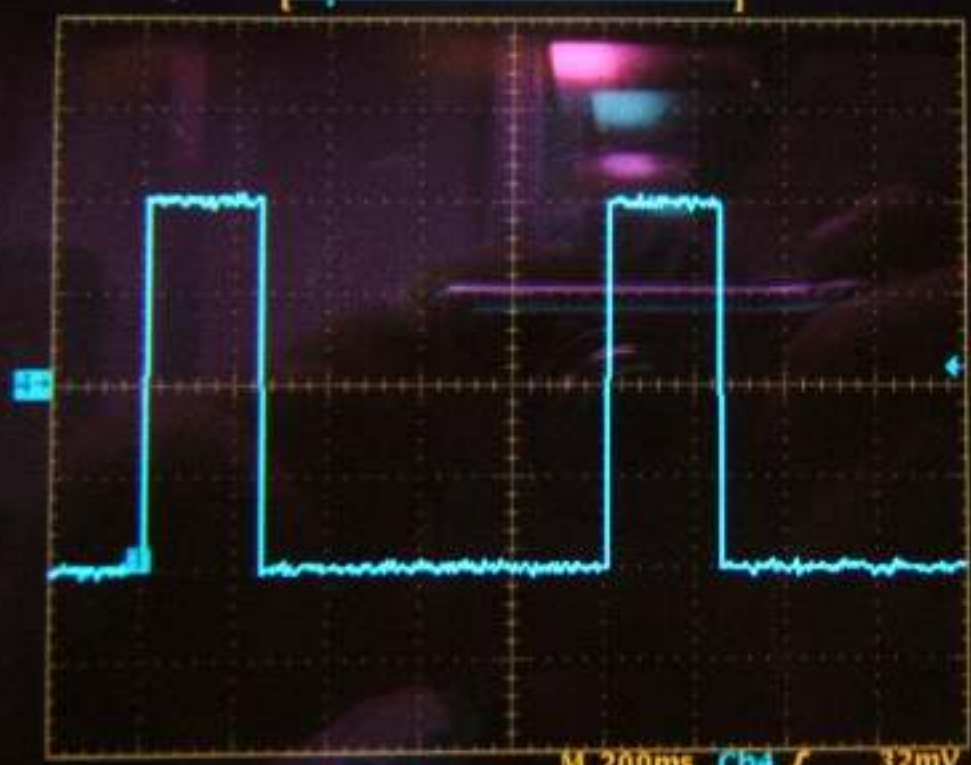
CYC LOC

RE

REM

Tek Run: 250 S/s

Sample [1000000]



C4 Freq
1.0000 Hz

C4 Period
1.0000 s

C4 High
392mV

C4 Low
-40mV

200mV

M 200ms

Ch4

32mV

14 Jun 2006

11:31:19

XXX_9106

- Triangular wave

XXX_9106

- Constant Signal
- Square wave 1Hz $A=0.4V$, duty = 25%
- Triangular wave 1Hz $A=0.4V$ duty = 25%

POLYNOMIAL WAVEFORM SYNTHESIZER

MODEL 2020

FREQ: 999.954m AMP: 0.40000 OFST: 0.00000
FILT=NONE MARK: 0.00000 TRIG=FREE RUN

RT YES NO ENTER HELP DIP ARC ABS SGN SIN AT TO I I TRIG TT EE + NOISE

FUNCTION OUT CYC LOC STO ARC COS RPT FOR LN 1 3rd F CLR CE

RESTORE RC TAN y* INT LOG T SPACE

MANUAL TRIG REM DEL SIN CFST MARK CLK FILT ANALOGIC

POWER



POLYNOMIAL WAVEFORM SYNTHESIZER

MODEL 2020

FREQ: 999.954m AMP: 0.40000

OFST: 0.00000

FILT=NONE

MARK: 0.00000

TRIG=FREE RUN

R/S

YES

NO

ENTER

HELP

DIR

ARC

SIN

ABS

AT

SGN

TO

FUNCTION OUT

■

■

CYC

■

LOC

RESTORE



STO

ARC

COS

RPT

FOR

LN

ARC

TAN

y^x

INT

LOG

MANUAL TRIG



■

■

REM

RCL

DEL

S+N

OFST

MARK

CLK

POLYNOMIAL WAVEFORM SYNTHESIZER

MODEL 2020

FILT=NONE

MARK=0.00000

TRIG=FREE RUN

NOISE=ON

NAMP=0.00000

NBW=200KHz

RS

YES

NO

ENTER

HELP

DIR

ARC

SIN

ABS

AT

SGN

TO

FUNCTION OUT



KEY /

RESTORE



CYC



LOC

STO

ARC

COS

RPT

FOR

ARC

TAN

Y^x

INT

MANUAL TRIG



REM

RCL

DEL

S+N

OFST

MARK

POLYNOMIAL WAVEFORM SYNTHESIZER

MODEL 2020

NOISE=ON

NAMP=0.00000

NBW=200KHz

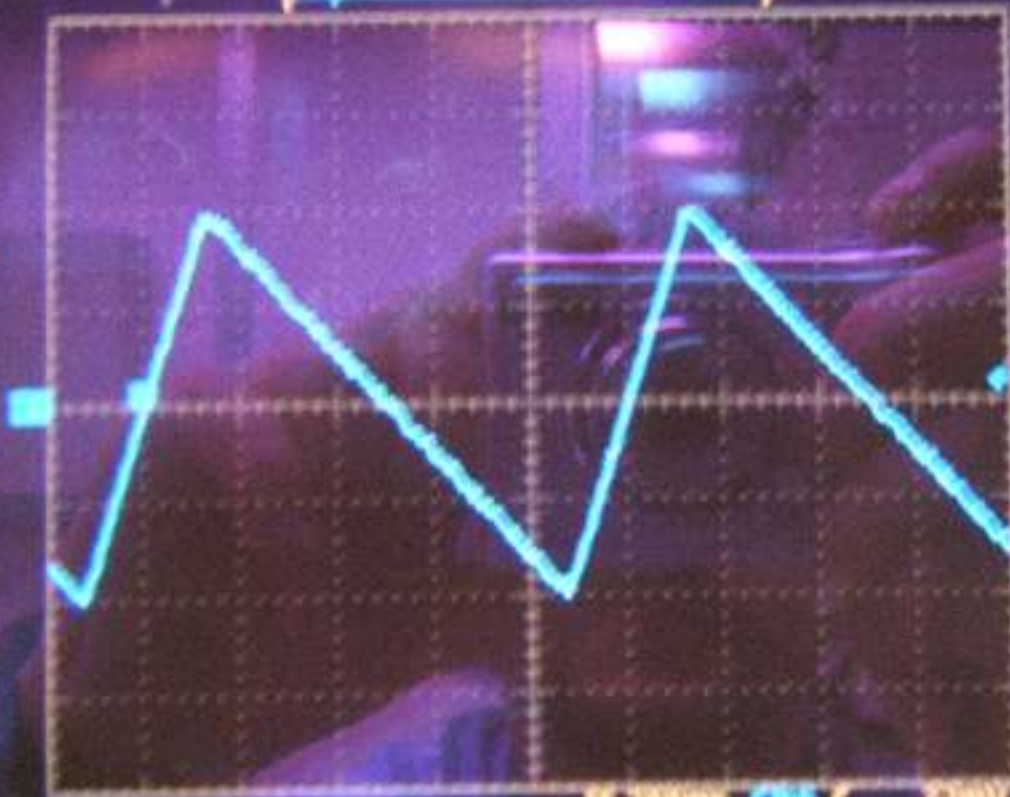
DLY=0.00000

SYM=25.0000%



Test Run: 250 S/s

Sample 



C4 Freq
99.7mhz
Unstable
Histogram

C4 Period
1.0004 s
Unstable
Histogram

C4 High
112mV
Unstable
Histogram

C4 Low
-200mV
Unstable
Histogram

 200mV

200ms CN4

32mV

14 Jun 2008

12:05:27

XXX_9108

- Square wave

XXX_9108

- Constant Signal
- Square wave 1Hz $A=0.4V$, duty = 25%

I



POLYNOMIAL WAVEFORM SYNTHESIZER

MODEL 2020

FREQ: 999.954m AMP: 0.40000 OFST: 0.00000
FILT=NONE MARK: 0.00000 TRIG=FREE RUN

K	M	μ	÷	[Square Wave]	
1	2	3	×		[Sine Wave]
n	U	m	+		
4	5	6	+		[Noise]
OP	B	9	-		
7	8	9	-		
TRIG	0	EE	+		
ARC	TT	F	+	[Up Arrow]	
ARC	TT	CE	+		
ETD	CDG	RPT	+	[Left Arrow]	
ARC	TAN	√	+		
HCL	TAN	√	+	[FAST]	
DEL	3+N	OPS*	+	[Down Arrow]	
DEL	3+N	OPS*	+		

ANALOGIC

Digital PRECISION

INTEGRAL

RUN [Red LED]

FEED [Red LED]

NO [Red LED]

ENTER

HELP

FUNCTION OUT

RESTORE

MANUAL TRIG [Blue LED]

POWER [Black LED]

CYC [Red LED]

LOC [Red LED]

REMAP [Blue LED]

REM [Red LED]

DR [Red LED]

ARC SIN

ABS AC

SGN TO

1

1

ETD

CDG

RPT

FCR

LN

1

HCL

TAN

√

INT

LOG

T

DEL

3+N

OPS*

MARK

CLK

FIL

POLYNOMIAL WAVEFORM SYNTHESIZER

MODEL 2020

FREQ: 999.954m AMP: 0.40000 OFST: 0.00000
FILT=NONE MARK: 0.00000 TRIG=FREE RUN

RUN

Control panel with buttons: R/S, YES, NO, ENTER, HELP, DIR, ARC SIN, ABS AT, SGN TO, STO, RPT, FOR, RCL, TAN, Y^x, INT, LO, DEL, S+N, OFST, MARK, CL.

Function Out section: FUNCTION OUT, RESTORE, MANUAL TRIG, CYC, LOC, REM.

Other labels: POWER, R/S, YES, NO, ENTER, HELP, DIR, STO, RCL, DEL, S+N, OFST, MARK, CL.



POLYNOMIAL WAVEFORM SYNTHESIZER

MODEL 2020

FILT=NONE

MARK:0.00000

TRIG=FREE RUN

NOISE=ON

NAMP=0.00000

NBW=200KHz

R-S

YES

NO

ENTER

HELP

DIR

ARC

ABS

SGN

SIN

AT

TO

FUNCTION OUT

CYC

LOC

STO

ARC

RPT

FOR

LN

COS

FOR

INT

LOG

RESTORE



RCL

ARC

Y^x

INT

LOG

TAN

Y^x

INT

LOG

MANUAL TRIG



D

REM

DEL

S-N

OFST

MARK

CLK

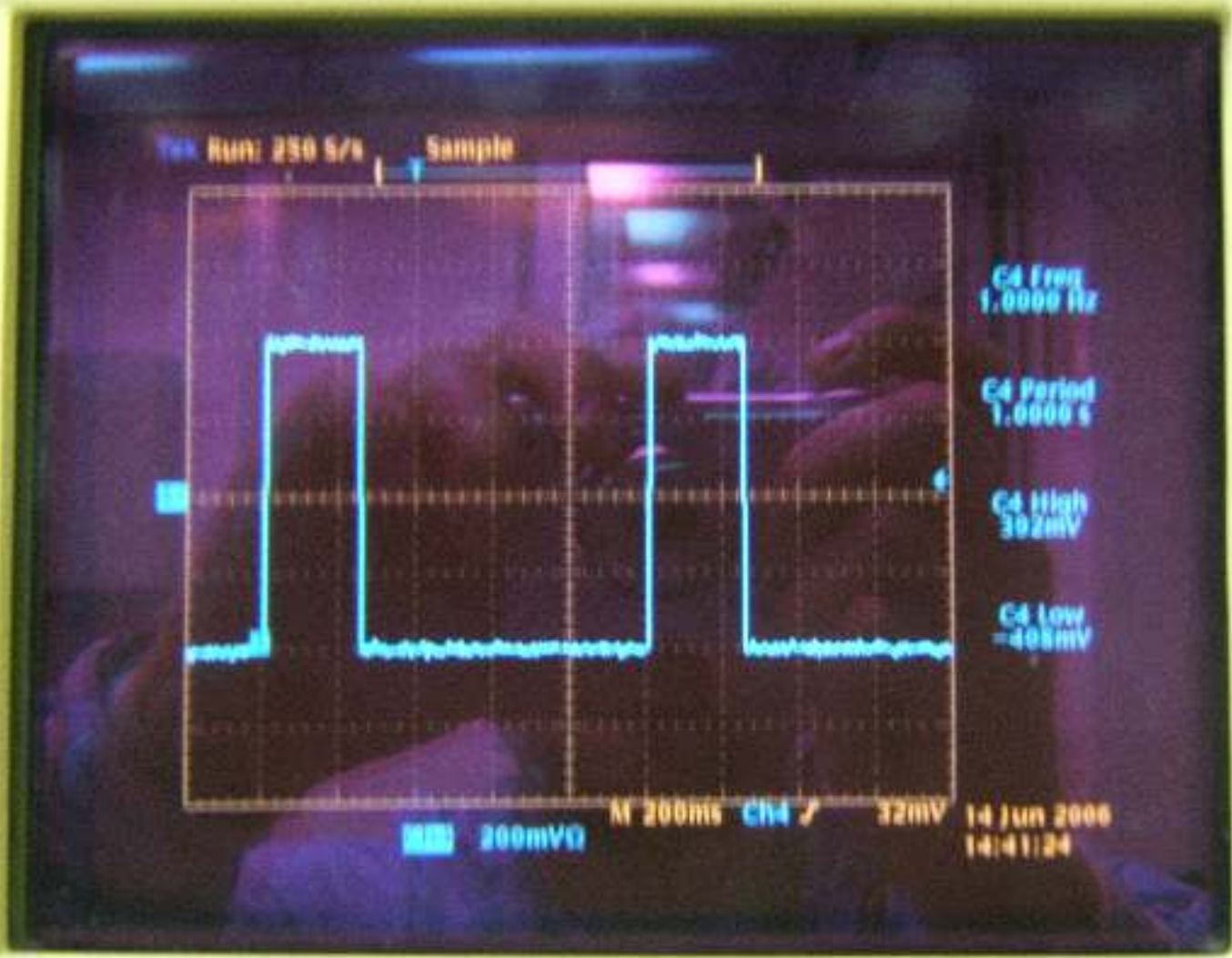
POWER

POLYNOMIAL WAVEFORM SYNTHESIZER

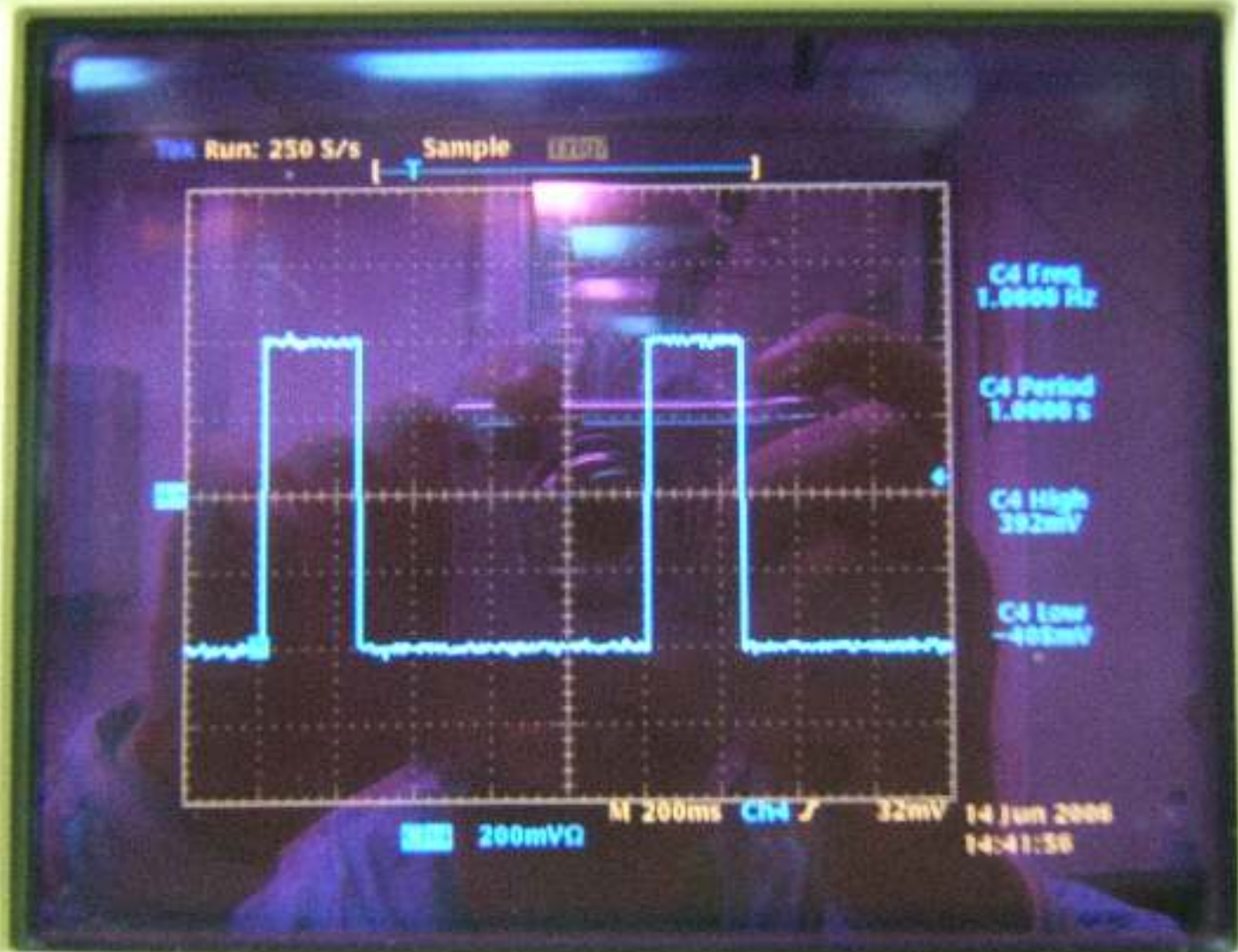
MODEL 2020

NOISE=ON NAMP=0.00000 NBW=200KHz
DLY=0.00000 DUTY:25.0000%





tektronix



XXX_9108

- Constant Signal
- Square wave 1Hz $A=0.4V$, duty = 25%
- Amp = 0.1 0.05 0.01|

POLYNOMIAL WAVEFORM SYNTHESIZER

MODEL 2020

FREQ:999.954m AMP:0.10000 OFST:0.00000
FILT=NONE MARK:0.00000 TRIG=FREE RUN

RUN

STOP

YES

NO

ENTER

HELP

OFF

ARC
SW

ABS
RT

SGN
TO

I

I

TRIG

IT

EE

+

▲

NOISE

FORMAT

SELECT

FIELD

FUNCTION OUT

CYC

LOC

TRIG

ARC
COS

HP1

HP2

LN

I

and

F

CLR
CE

SPACE

◀

FAST

▶

LABEN 111
Circuit Design & Test
4-10000-0000
4-10000-0000
4-10000-0000

MANUAL TRIG

STOP

REM

OFF

ENT

OFST

MARK

CLK

FLT

ANALOGIC

INTEGRATED ELECTRONICS

INTEGRAL IBIS VETO TEST



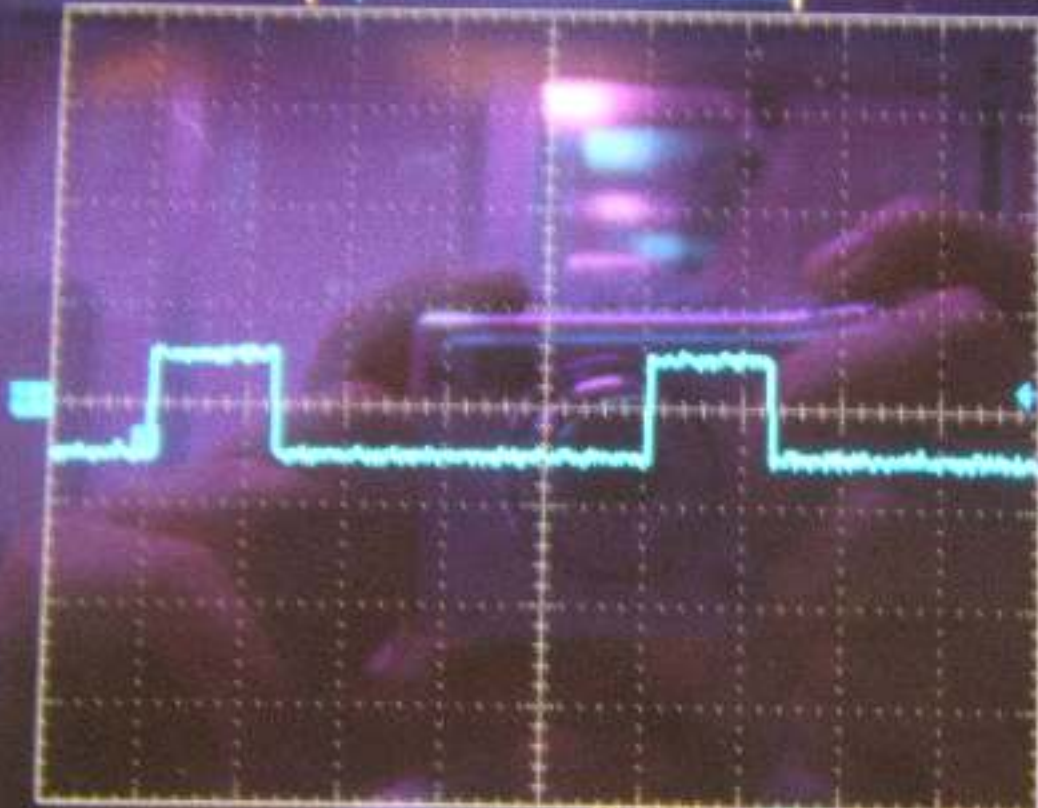
POLYNOMIAL WAVEFORM SYNTHESIZER

MODEL 2020

FREQ: 999.954m AMP: 0.10000 OFST: 0.00000
FILT=NONE MARK: 0.00000 TRIG=FREE RUN



Run: 250 S/s Sample



C4 Freq
1.0001 Hz
Low signal
amplitude

C4 Period
1.0000 s
Low signal
amplitude

C4 High
88mV

C4 Low
-112mV

200mV M 200ms CH4 J 32mV 14 Jun 2006 15:53:12

XXX_9109

- Constant Signal
- Square wave

XXX_9109

- Constant Signal
- Square wave 1Hz $A=0.1$ V, duty = 25%
- Triangular 1Hz $A=0.1$ V duty=25%
- |

POLYNOMIAL WAVEFORM SYNTHESIZER

MODEL 2020

FREQ:999.954m AMP:0.10000 OFST:0.00000
FILT=NONE MARK:0.00000 TRIG=FREE RUN

K	M	=	
1	2	3	+
n	U	m	X
4	5	6	
OP			
7	8	9	-
TRIG.	0	EE	+
		CLR	
		CE	

POWER ON

YES NO ENTER HELP DIR

ARC	ABS	SGN			
SIN	AT	TC			
ARC					
COS	RPT	FOR	LN	I	
ARC					
TAN	Y ^x	INT	LOG	T	
DEL	S+R	OFST	MARK	CLK	FILT

ANALOGIC DATA PRECISION

FUNCTION OUT



CYC LOC

RESTORE

MANUAL TRIG

POWER

POLYNOMIAL WAVEFORM SYNTHESIZER

MODEL 2020

FREQ: 999.954m AMP: 0.10000

OFST: 0.00000

FILT=NONE

MARK: 0.00000

TRIG=FREE RUN

RS

YES

NO

ENTER

HELP

DIR

ARC

ABS

SGN

SIN

AT

TO

FUNCTION OUT



VERIFY /



CYC



LOC

STO

ARC

COS

RPT

FOR

REST



RCL

ARC

TAN

Y^x

INT

MANUAL TRIG



AD



REM

DEL

S+N

OFST

MARK

POWER

POLYNOMIAL WAVEFORM SYNTHESIZER

MODEL 2020

FILT=NONE

MARK:0.00000

TRIG=FREE RUN

NOISE=ON

NAMP=0.00000

NBW=200KHz

R/S

YES

NO

ENTER

HELP

DIR

ARC
SIN

ABS
AT

SGN
TO

FUNCTION OUT



DEFY/

REST



CYC



LOC



STO

ARC
COS

RPT

FOR

MANUAL
TRIG



ND



REM

RCL

ARC
TAN

Y^X

INT

DEL

S+N

OFST

MARK

POWER

POLYNOMIAL WAVEFORM SYNTHESIZER

MODEL 2020

NOISE=ON

NAMP=0.00000

NBW=200KHz

DLY=0.00000

DUTY:25.0000%

R/S

YES

NO

ENTER

HELP

DIR

ARC

SIN

ABS

AT

SGN

TO

FUNCTION OUT

MODIFY /

RES



CYC



LOC

STO

ARC

COS

RPT

FOR

ARC

TAN

Y^x

INT

MANUAL TRIG



AD



REM

RCL

DEL

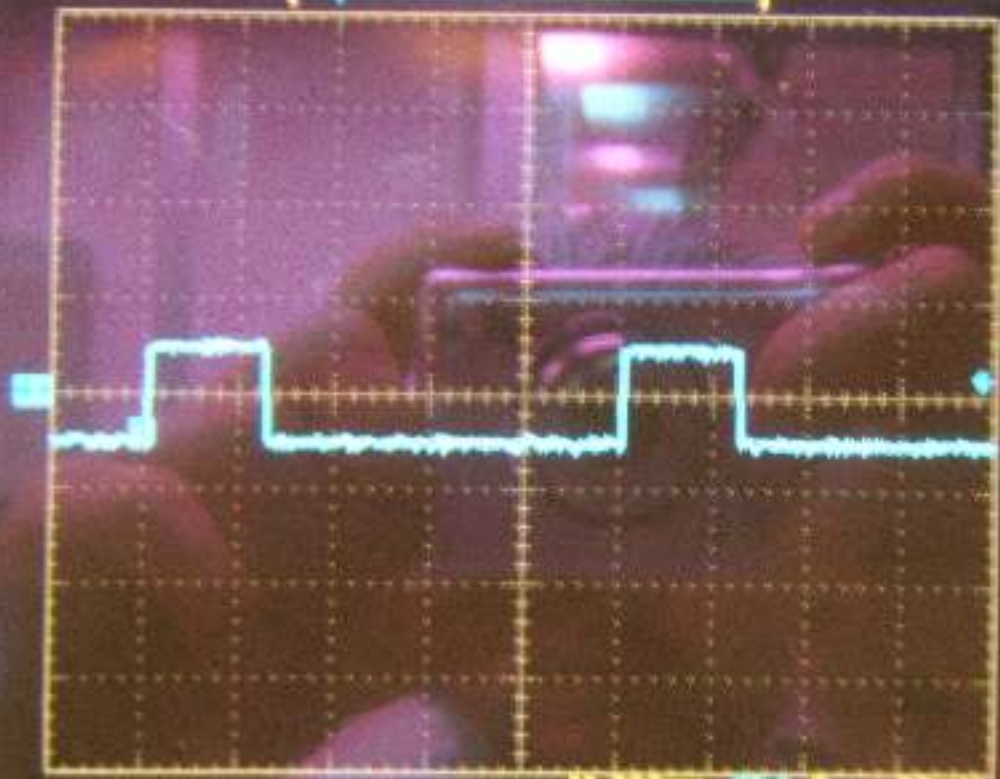
S+N

OFST

MARK

Tex Run: 250 S/s

Sample []



C4 Freq
1.0002 Hz
Low signal
amplitude

C4 Period
1.0000 s
Low signal
amplitude

C4 High
20mV

C4 Low
-11.2mV

200mV

M 200ms CH1

32mV

14 Jun 2006

16:00:52

XXX_9109

- Triangular Wave

POLYNOMIAL WAVEFORM SYNTHESIZER MODEL 2000

FREQ: 999.954m AMP: 0.10000 OFST: 0.00000
FILT=NONE MARK: 0.00000 TRIG=FREE RUN

MIN

YES

NO

ENTER

HELP

ON

ARC

ABS

SGN

SIN

AC

PI

ARC

ODD

PM

FOR

LN

1

ARC

TAN

VP

INT

CO

TRIG

0

TE

+

OP

7

8

9

-

1

2

3

-

=

□

□

□

□

FORMAT

SELECT

NOISE

FIELD

FUNCTION OUT

CYC

DOC

RESTORE

MANUAL TRIG

MEM

OFF

ON

OFF

MAP

CLK

FLY

ANALOGIC

ANALOGIC

INTEGRAL ISIG VETO TE

L.P. 1971
© 1971 Analogic Corporation
MADE IN U.S.A.
TYPE 2000



POLYNOMIAL WAVEFORM SYNTHESIZER

MODEL 2020

FREQ: 999.954m AMP: 0.10000 OFST: 0.00000
FILT=NONE MARK: 0.00000 TRIG=FREE RUN

RUN

R/S

YES

NO

ENTER

HELP

DIR

ARC

SIN

ABS

AT

SGN

TO

FUNCTION OUT

CYC

LOC

STO

ARC

COS

RPT

FOR

LN

RESTORE

RCL

ARC

TAN

Y^x

INT

LOG

MANUAL TRIG

REM

DEL

S-N

OFST

MARK

CLK

POWER

POLYNOMIAL WAVEFORM SYNTHESIZER

MODEL 2020

FILT=NONE

MARK=0.00000

TRIG=FREE RUN

NOISE=ON

NAMP=0.00000

NBW=200KHz

RS

YES

NO

ENTER

HELP

DIR

ARC

SIN

ABS

AT

SGN

TO

FUNCTION OUT



CYC



LOC

STO

ARC

COS

RPT

FOR

LN

RESTORE



RCL

ARC

TAN

Y^x

INT

LOG

MANUAL TRIG



REM

DEL

S+N

OFST

MARK

CLR

POWER

POLYNOMIAL WAVEFORM SYNTHESIZER

MODEL 2020

NOISE=ON

NAMP=0.00000

NBW=200KHz

DLY=0.00000

SYM=25.0000%

RS

YES

NO

ENTER

HELP

DIR

ARC

SIN

ABS

AT

SGN

TO

FUNCTION OUT

CYC

LOC

STO

ARC

COS

RPT

FOR

RESTORE



RCL

ARC

TAN

Y^x

INT

MANUAL TRIG



REM

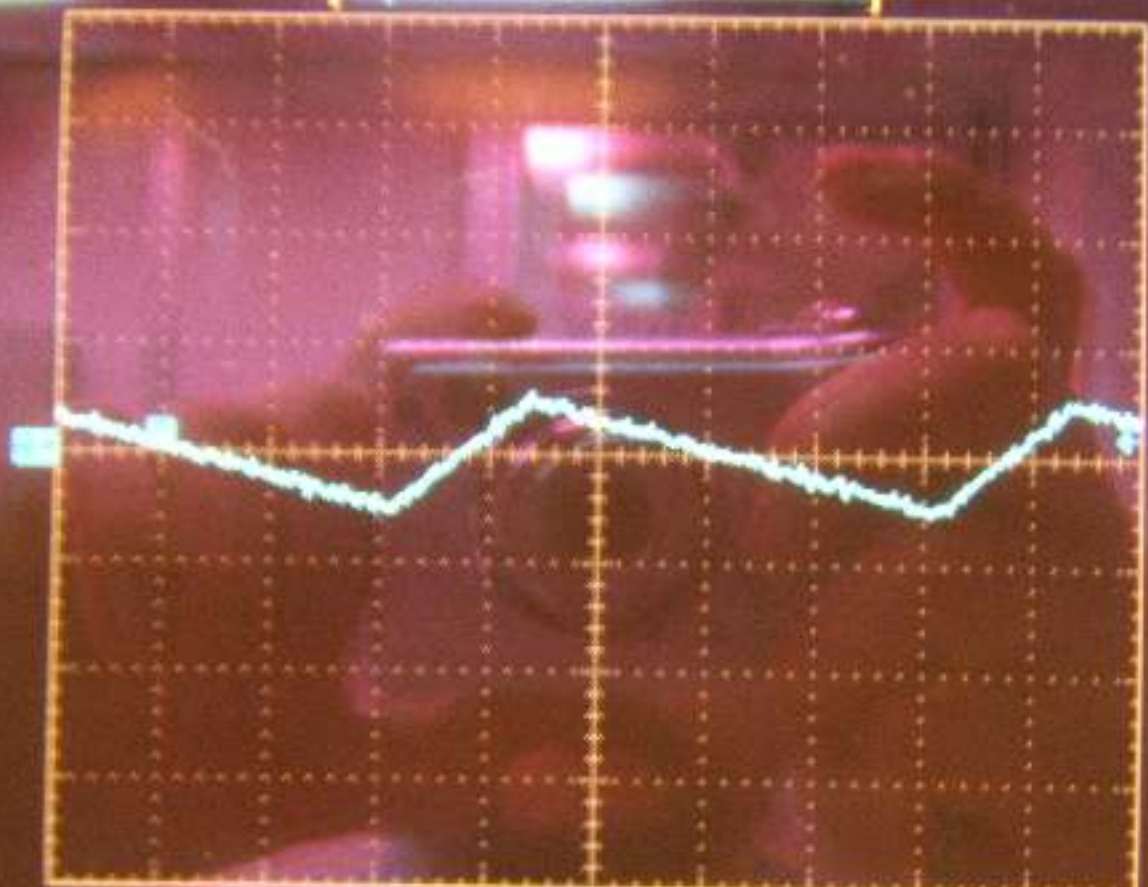
DEL

S+N

OFST

MARK

Run: 250 S/1



C4 Freq
1.0121 Hz
Low signal
amplitude

C4 Period
988.0ms
Low signal
amplitude

C4 High
16mV
Unstable
histogram

C4 Low
-32mV
Unstable
histogram

200mV

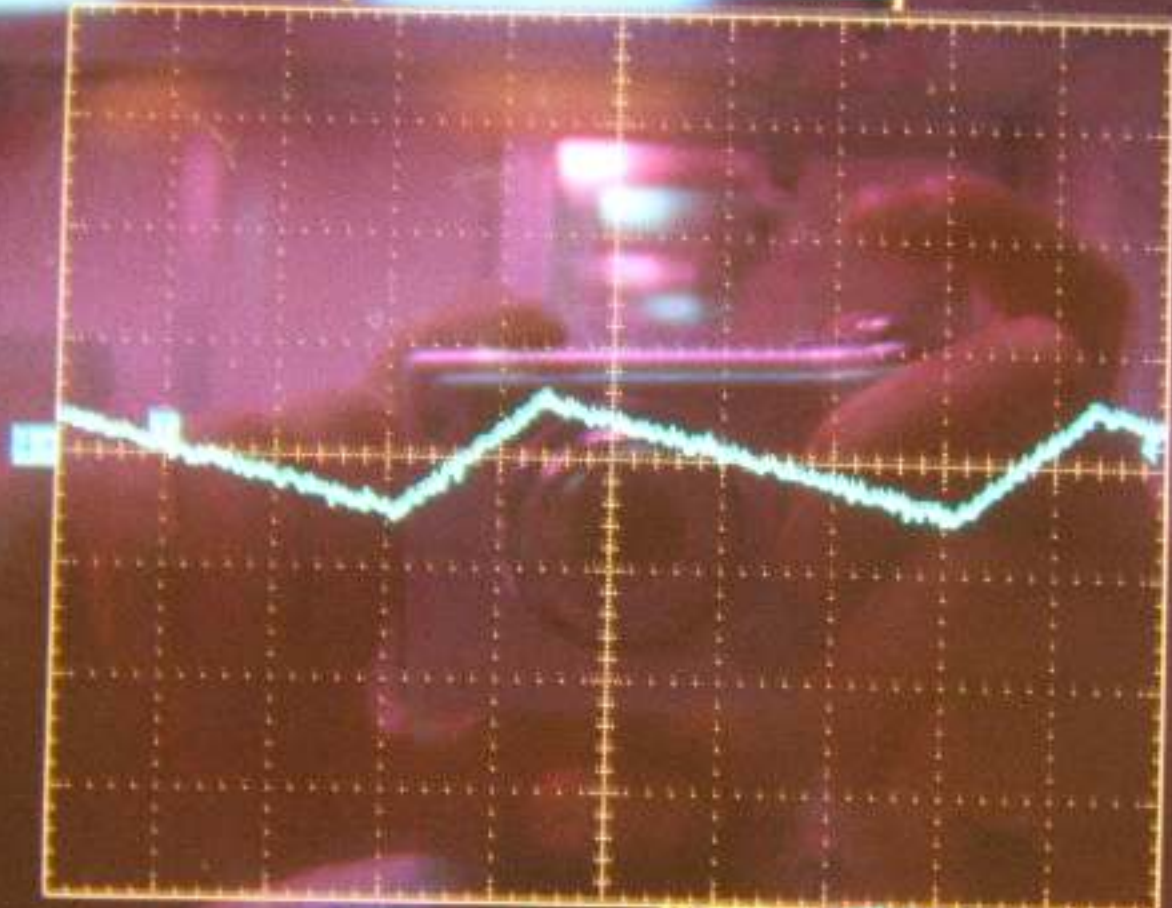
M 200ms

Ch4

32mV

14 Jun 2006
16:08:45

Run: 250 S/s



C4 Freq
961.5 MHz
Low signal
amplitude

C4 Period
1.0400 s
Low signal
amplitude

C4 High
48 mV
Unstable
histogram

C4 Low
-72 mV
Unstable
histogram

200mV

M 200ms CH4 J

32mV

14 Jun 2006
16:08:49

XXX_9111

- Square Wave

XXX_9111

- Square wave Freq=1Hz Amp=0.4V 25% Duty
- Triangular wave Freq=1Hz Amp=0.4V 25% Duty
-

POLYNOMIAL WAVEFORM SYNTHESIZER

MODEL 2020

FREQ: 999.954m AMP: 0.40000 OFST: 0.00000
FILT=NONE MARK: 0.00000 TRIG=FREE RUN

K 1	M 2	= 3	-	■	2	FORMAT
n 4	U 5	m 6	X	■	2	↑ SELECT
OP 7	8	9	-	■	2	↓ FIELD
TRIG -	π 0	i EE	+	■	NOISE	

RUN ■

YES NO ENTER HELP DIS

FUNCTION OUT

POWER

MANUAL TRIG

AD REM

CYC LOC

ARC SH	ABS AT	SIN SO	1	2	
ARC COS	PR	PCR	UN	1	
ARC TAN	y ²	INT	LOG	1	
DE	0-1	OFST	WAPP	CLK	FILT

2nd F CLR CE

SPACE

FAST

ANALOGIC

INTEGRAL 1815 VETO TE

LABETM 3000

POLYNOMIAL WAVEFORM SYNTHESIZER

MODEL 2020

FREQ: 999.954m AMP: 0.40000 OFST: 0.00000
FILT=NONE MARK: 0.00000 TRIG=FREE RUN

RS

YES

NO

ENTER

HELP

DIR

ARC

SIN

ABS

AT

SGN

TO

FUNCTION OUT



KEY/

RESTORE



CYC



LOC

STO

ARC

COS

RPT

FOR

ARC

TAN

Y^x

INT

LOG

MANUAL TRIG



D



REM

RCL

TAN

Y^x

INT

LOG

DEL

S+N

OFST

MARK

CL

POWER

POLYNOMIAL WAVEFORM SYNTHESIZER MODEL 2020

FILT=NONE MARK: 0.00000 TRIG=FREE RUN
NOISE=ON NAMP=0.00000 NBW=200KHz

R/S

YES

NO

ENTER

HELP

DIR

ARC

SIN

ABS

AT

SGN

TO

FUNCTION OUT

REFY/

REST

CYC

LOC

STO

ARC

COS

RPT

FOR

ARC

TAN

Y^x

INT

MANUAL TRIG



D

REM

RCL

DEL

S+N

OFST

MARK

POWER

POLYNOMIAL WAVEFORM SYNTHESIZER

MODEL 202

NOISE=ON

NAMP=0.00000

NBW=200KHz

DLY=0.00000

DUTY:25.0000%

FUNCTION OUT

YES NO ENTER HELP DIR

ARC ABS SGN
SIN AT TO

ARC
COS RPT FOR

ARC
TAN Y³ RT

STO

RCL

DEL

S=N OFST MATH

MODIFY /

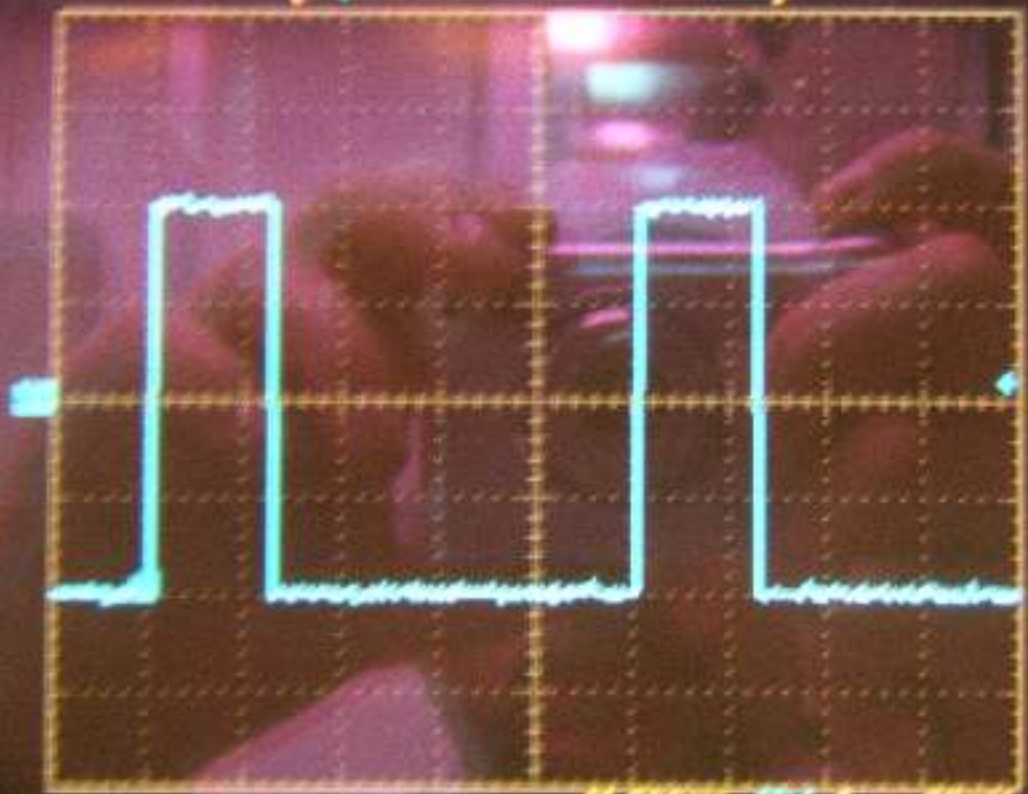
REST

MANUAL TRIG

CYC LOC

AD REM

Run: 250 S/s Sample



C4 Freq
1.000 Hz

C4 Period
1.000 s

C4 High
392mV

C4 Low
-402mV

200mV

M 200ms CH4 J 32mV

15 Jun 2006
10:30:55

XXX_9111

- Triangular Wave

POLYNOMIAL WAVEFORM SYNTHESIZER

MODEL 2020

FREQ: 999.954m AMP: 0.40000 OFST: 0.00000
FILT=NONE MARK: 0.00000 TRIG=FREE RUN

RD

YES

NO

ENTER

HELP

DEF

ARC

ABS

SGN

K

M

=

1

2

3

+

n

U

m

4

5

6

x

OP

7

8

9

-

■

TRIG

0

EE

+

■

NOISE

FUNCTION OUT

■

CYC

■

LOC

■

W/O

ARC

SIN

AT

IO

I

I

TRIG

0

EE

+

■

NOISE

ARC

COS

RPT

FOR

LN

I

2nd

F

CLR

CE

▲

FUNCTION OUT

MANUAL TRIG

■

AD

■

REM

BEL

S-H

OFST

MARK

CLK

FILT

ANALOGIC

DATA PRECISION

▲

◀

▶

▼

FAST

▶

▶

▼

INTEGR

POLYNOMIAL WAVEFORM SYNTHESIZER

MODEL 2020

FREQ: 999.954m AMP: 0.40000 OFST: 0.00000
FILT=NONE MARK: 0.00000 TRIG=FREE RUN

RS

YES

NO

ENTER

HELP

DIR

ARC

SIN

ABS

AT

SGN

TO

FUNCTION OUT

RESTORE

CYC

LOC

STO

ARC

COS

RPT

FOR

ARC

TAN

Y^x

INT

MANUAL TRIG

REM

DEL

S+N

OFST

MARK

POWER

POLYNOMIAL WAVEFORM SYNTHESIZER

MODEL 2020

FILT=NONE

MARK: 0.00000

TRIG=FREE RUN

NOISE=ON

NAMP=0.00000

NBW=200KHz

R/S

YES

NO

ENTER

HELP

DIR

ARC

SIN

ABS

AT

SGN

TO

FUNCTION OUT

MODIFY /

REST

CYC

LOC

STO

ARC

COS

RPT

FOR

ARC

TAN

Y^x

INT

MANUAL
TRIG



AD

REM

RCL

ARC

S+N

OFST

MARK

DEL

CL

POLYNOMIAL WAVEFORM SYNTHESIZER

MODEL 2020

NOISE=ON

NAMP=0.00000

NBW=200KHz

DLY=0.00000

SYM=25.0000%

R/S

YES

NO

ENTER

HELP

DIR

ARC

SIN

ABS

AT

SGN

TO

FUNCTION OUT

MODIFY /

REST



CYC



LOC

STO

ARC

COS

RPT

FOR

MANUAL TRIG



AD

REM

RCL

ARC

TAN

Y^x

INT

DEL

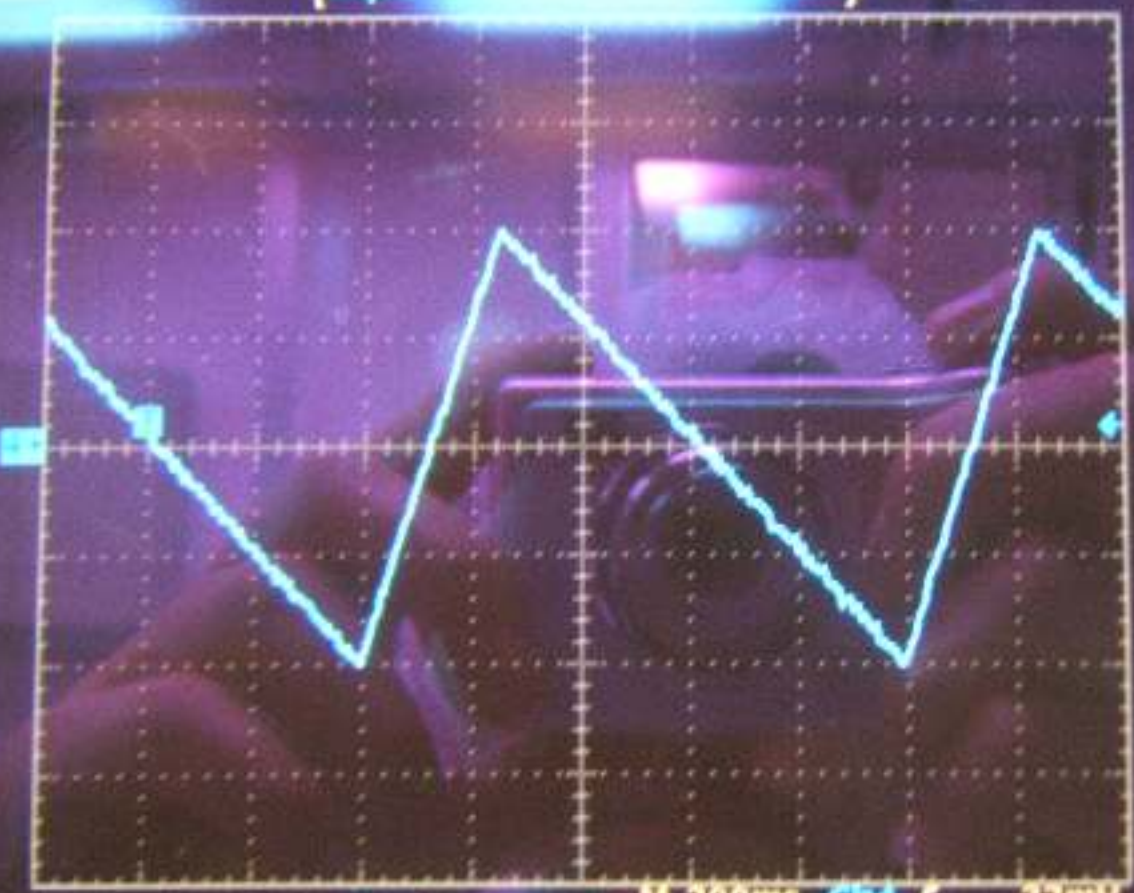
S+N

OFST

MARK

POWER

250 S/s



C4 Freq
1.0000 Hz
Unstable
histogram

C4 Period
1.0000 s
Unstable
histogram

C4 High
200mV
Unstable
histogram

C4 Low
-232mV
Unstable
histogram

200mV

M 200ms Ch4 J 32mV

15 Jun 2006
11:14:10

XXX_9113

- Triangular Waves of different frequencies

XXX_9113

- Triangular wave Freq=1Hz Amp=0.4V 25% Duty

I

Title 1

Paragraph 1, Row 1, Column 2:06 / 5:84

23.91 x 13.23

55%

Side 1 / 1

Default

Document | file home | file home | X CCC wrap

Word | Kwite [12] | OpenOffice

12:29

POLYNOMIAL WAVEFORM SYNTHESIZER

MODEL 2020

FREQ: 999.954m AMP: 0.40000 OFST: 0.00000
FILT=NONE MARK: 0.00000 TRIG=FREE RUN

RUN

RT

YES

NO

ENTER

HELP

DIR

ARC

SIN

ABS

SGN

TO

TRIG

PI

P

EE

+

NOISE

FUNCTION OUT

CYC

LOC

STO

ARC

COS

RPT

FOR

LN

3rd

F

CLR

CE

▲

RESTORE

MANUAL TRIG

REM

RCL

ARC

TAN

Y²

INT

LOG

1

SPACE

◀

FAST

▶

POWER

DEL

B+N

OFST

MARK

CLK

PKT

ANALOGIC

DATA PRECISION

▼

INTS

POLYNOMIAL WAVEFORM SYNTHESIZER

MODEL 2020

FREQ: 999.954m AMP: 0.40000 OFST: 0.00000
FILT=NONE MARK: 0.00000 TRIG=FREE RUN

RS

YES

NO

ENTER

HELP

DIR

ARC
SIN

ABS
AT

SGN
TO

FUNCTION OUT

CYC

LOC

STO

ARC
COS

RPT

FOR

LN

RESTORE

RCL

ARC
TAN

Y^x

INT

LOG

MANUAL
TRIG

REM

DEL

S+N

OFST

MARK

CLK

POWER

POLYNOMIAL WAVEFORM SYNTHESIZER

MODEL 2020

FILT=NONE

MARK:0.00000

TRIG=FREE RUN

NOISE=ON

NAMP=0.00000

NBW=200KHz

UN

R/S

YES

NO

ENTER

HELP

DIR

ARC

SIN

ABS

AT

SGN

TO

FUNCTION OUT

CYC

LOC

STO

ARC

COS

RPT

FOR

LN

RESTORE

ARC

TAN

Y^x

INT

LOG

MANUAL TRIG

R

REM

RCL

S+N

OFST

MARK

CLK

DEL

POWER

POLYNOMIAL WAVEFORM SYNTHESIZER

MODEL 2020

NOISE=ON

NAMP=0.00000

NBW=200KHz

DLY=0.00000

SYM=25.0000%

R/S

YES

NO

ENTER

HELP

DIR

ARC

SIN

ABS

AT

SGN

TO

FUNCTION OUT



KEY /

RESTORE



CYC



LOC

STO

ARC

COS

RPT

FOR

LN

ARC

TAN

Y^x

INT

LOG

MANUAL TRIG



0



REM

DEL

S+N

OFST

MARK

CLK



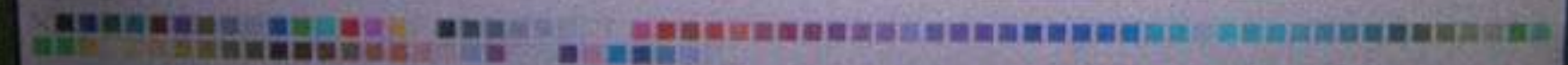
XXX_9113

- Triangular wave Freq = 0.1 Hz



XXX_9113

- Triangular wave Freq=1Hz Amp=0.4V 25% Duty
- Triangular wave Freq=0.1Hz Amp=0.4V 25% Duty
- |



XXX_9113

- Triangular wave Freq=1Hz Amp=0.4V 25% Duty
- Triangular wave Freq=0.1Hz Amp=0.4V 25% Duty
-

POLYNOMIAL WAVEFORM SYNTHESIZER

MODEL 2020

FREQ: 99.9835m AMP: 0.40000 OFST: 0.00000
FILT=NONE MARK: 0.00000 TRIG=FREE RUN

RUN



YES

NO

ENTER

HELP

DIR

ARC

ABS

SIGN

K

M

=

1

2

3

-

n

u

m

4

5

6

x

OP

7

8

9

-

TRIG

0

EE

+

FUNCTION OUT

CYC

LOC

BTD

ARC

COG

RPT

EDR

LN

TRIG

0

EE

+

2nd

F

CLR

CE

SPACE

FAST

MANUAL TRIG



REM

REM

DEL

S+N

OFST

MARK

CLK

FILT

ANALOGIC

DATA PROCESS

POWER



POLYNOMIAL WAVEFORM SYNTHESIZER

MODEL 2020

FREQ: 99.9835m AMP: 0.40000 OFST: 0.00000
FILT=NONE MARK: 0.00000 TRIG=FREE RUN

R/S

YES

NO

ENTER

HELP

DIR

ARC

ABS

SGN

SIN

AT

TO

FUNCTION OUT

CYC

LOC

STO

ARC

RPT

FOR

LN

RESTORE

RCL

ARC

COS

RPT

FOR

LN

TAN

γ^x

INT

LOG

MANUAL TRIG

REM

DEL

S+N

OFST

MARK

CLK

POWER

POLYNOMIAL WAVEFORM SYNTHESIZER

MODEL 2020

FILT=NONE

MARK=0.00000

TRIG=FREE RUN

NOISE=ON

NAMP=0.00000

NBW=200KHz

RS

YES

NO

ENTER

HELP

DIR

ARC

SIN

ABS

AT

SGN

TO

FUNCTION OUT



CYC



LOC

RESTORE



STO

ARC

COS

RPT

FOR

ARC

TAN

y^x

INT

MANUAL TRIG



REM

RCL

DEL

S+N

OFST

MARK

ER

POLYNOMIAL WAVEFORM SYNTHESIZER

MODEL 2020

NOISE=ON

NAMP=0.00000

NBW=200KHz

DLY=0.00000

SYM=25.0000%

FUNCTION OUT

YES NO ENTER HELP DIR ARC SIN ABS SGN TO

STO ARC COS RPT FOR

RCL ARC TAN Y^x INT

DEL S+N OFST MARK

MANUAL TRIG

AD REM

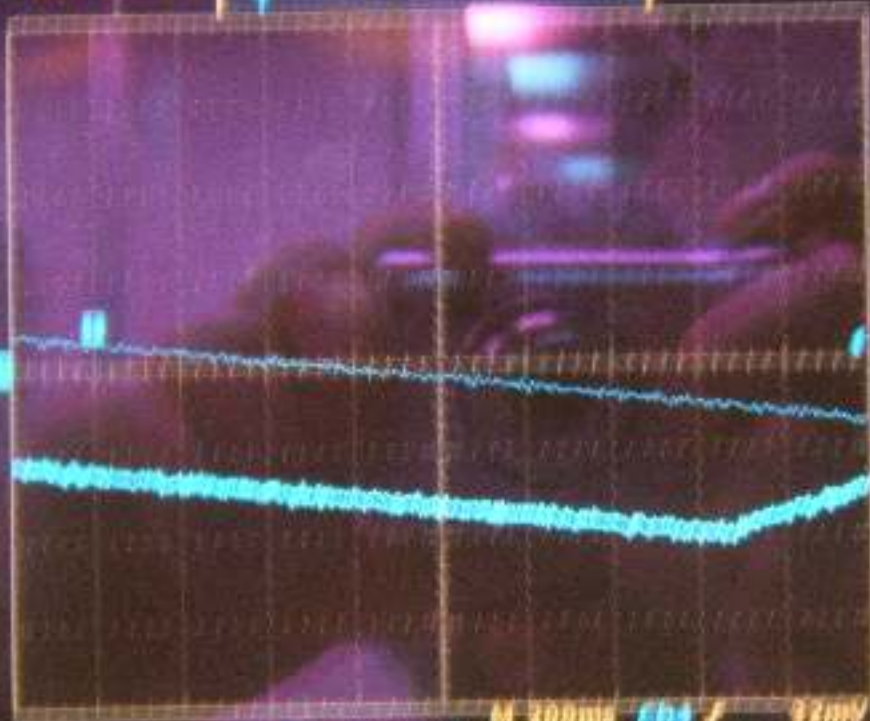
CYC LOC

REST



THE RUN: 250 9/8

Sample



CH1 Freq
76.225112
No. of Cycles
No. of Samples
CH1 Period
1.500000
No. of Cycles
No. of Samples
CH1 High
1.000000
Histogram
CH1 Low
0.500000
Histogram

200mV

M 200ms CH1 / 32mV

15 Jun 2006
12:59:22

XXX_9114

- Triangular Wave

XXX_9114

- Triangular wave Freq=0.1Hz Amp=0.4V 25%
Duty
- Triangular wave Freq=0.05Hz Amp=0.4V 25%
Duty after OBT=7800
- |

POLYNOMIAL WAVEFORM SYNTHESIZER

MODEL 2020

NOISE=ON NAMP=0.00000 NBW=200KHz
DLY=0.00000 SYM=25.0000%

PS

YES

NO

ENTER

HELP

DRY

ARC

ABS

SGN

SIN

AT

TD

I

I

K

M

=

1

2

3

+

n

u

m

4

5

6

x

OP

8

9

7

0

EE

+

TRIG

TT

f

-

0

EE

+

NOISE

FUNCTION OUT

CYC

LOC

RESTORE

MANUAL TRIG

RESTORE

CYC

LOC

MANUAL TRIG

AD

REM

STD

ARC

COS

RPT

FOR

LN

I

RCL

ARC

TAN

y^x

NT

LOG

T

DEL

SIN

DFST

MARK

CLK

FILT

2nd

F

CLR

CE

SPACE

ANALOGIC

ANALOGIC PRECISION

INTEG



POLYNOMIAL WAVEFORM SYNTHESIZER

MODEL 2020

NOISE=ON NAMP=0.00000 NBW=200KHz
DLY=0.00000 SYM=25.0000%

Calculator keypad with scientific function keys:

- Row 1: K (1), M (2), μ (3), +, $\frac{1}{x}$
- Row 2: π (4), U (5), m (6), \times , $\frac{1}{x^2}$
- Row 3: OP (7), 8, 9, -, $\frac{1}{x^3}$
- Row 4: TRIG (.), 0, EE, +, NOISE
- Row 5: 2nd, F, CLR
- Row 6: SPACE, \uparrow , FAST, \rightarrow
- Row 7: \downarrow , INTEGRATE

Control buttons and indicators:

- Buttons: P, FES, NO, ENTER, HELP, DIR, RESTORE, MANUAL TRIG
- Indicators: CYC (lit), LOC (lit)
- Buttons: STO, RCL, DEL, S-N, OFST, MARK, CLK, FILT
- Buttons: ARC SIN, ABS AT, SGN TO, I, I, TRIG, IT, EE, +, NOISE
- Buttons: ARC COS, RPT, FOR, LN, I, 2nd, F, CLR
- Buttons: ARC TAN, y^x , INT, LOG, T, SPACE, \uparrow , FAST, \rightarrow
- Buttons: \downarrow , INTEGRATE



ANALOGIC

DATA PRECISION

INTEGRATE

POLYNOMIAL WAVEFORM SYNTHESIZER

MODEL 2020

FREQ: 99.9835m AMP: 0.40000 OFST: 0.00000
FILT=NONE MARK: 0.00000 TRIG=FREE RUN

RS

YES

NO

ENTER

HELP

DIR

ARC

SIN

ABS

AT

SGN

TO

FUNCTION OUT

KEY /

RESTORE



CYC



LOC

STD

ARC

COS

RPT

FOR

LN

ARC

TAN

y^x

INT

LOG

MANUAL TRIG



D

REM

RCL

S+N

OFST

MARK

CLK

DEL

POLYNOMIAL WAVEFORM SYNTHESIZER

MODEL 2020

FILT=NONE

MARK:0.00000

TRIG=FREE RUN

NOISE=ON

NAMP=0.00000

NBW=200KHz

R/S

YES

NO

ENTER

HELP

DIR

ARC

SIN

ABS

AT

SGN

TO

FUNCTION OUT



CYC



LOC

STO

ARC

COS

RPT

FOR

LN

RESTORE



RCL

ARC

TAN

y^x

INT

LOG

MANUAL TRIG



REM

DEL

S+N

OFST

MARK

CLK

POWER

POLYNOMIAL WAVEFORM SYNTHESIZER

MODEL 2020

NOISE=ON

NAMP=0.00000

NBW=200KHz

DLY=0.00000

SYM=25.0000%

R/S

YES

NO

ENTER

HELP

DIR

ARC

SIN

ABS

AT

SGN

TO

FUNCTION OUT



KEY /



CYC



LOC

STO

ARC

COS

RPT

FOR

LN

RESTO



RCL

ARC

TAN

Y^x

INT

LOG

MANUAL TRIG



D



REM

DEL

S+N

OFST

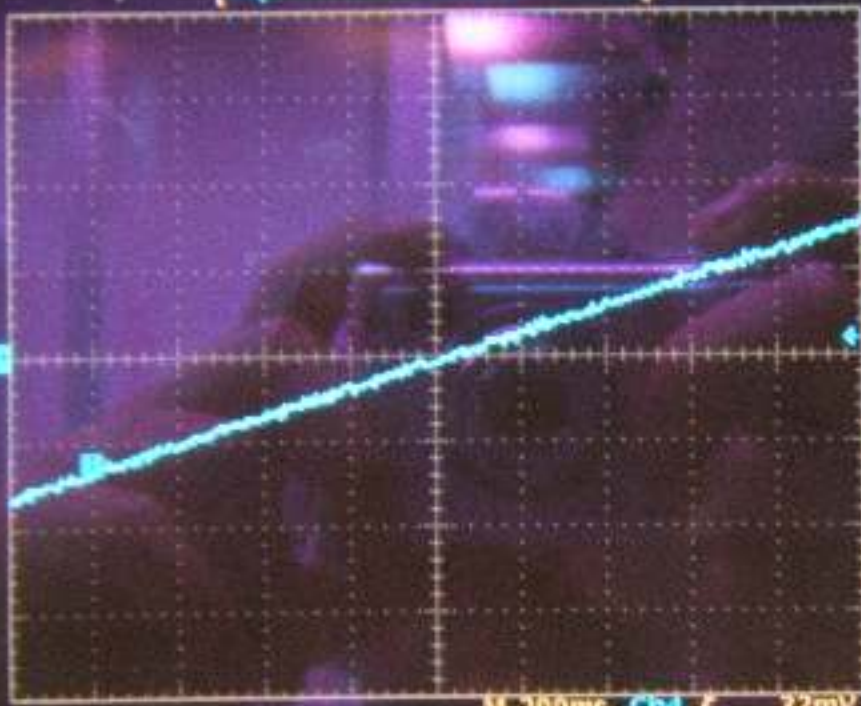
MARK

CLK

POWER

Tab Run: 250 S/s

Sample



C4 Freq
= Hz
No period
found

C4 Period
= s
No period
found

C4 High
88mV
Unstable
histogram

C4 Low
-80mV
Unstable
histogram

200mV

M 200ms Ch4

32mV

15 Jun 2006

13:04:06

CLEAR
MENU

XXX_9115

- Square Waves and Triangular Waves

XXX_9115

- Square wave Freq=1Hz Amp=0.4V 25% Duty
- Triangular wave Freq=0,05Hz Amp=0.4V 25% Duty
-

POLYNOMIAL WAVEFORM SYNTHESIZER

MODEL 2020

FREQ: 999.954m AMP: 0.40000 OFST: 0.00000
FILT=NONE MARK: 0.00000 TRIG=FREE RUN

RUN

FUNCTION OUT

CYC

LOC

MANUAL TRIG

POWER

ARC SIN AT TO I I
ARC COS RPT FOR UN I
ARC TAN y^x RT LOG T
SIN OFST MARK CLK FILT

K M =
1 2 3
4 5 6 X
OP 7 8 9 -
TRIG 0 EE +
2nd F CLR CE
SPACE
ANALOGIC
INTEGRAL TRIG VE

FORMA

SELECT

FIELD

LRDEF
INTEGRAL TRIG VE

POLYNOMIAL WAVEFORM SYNTHESIZER

MODEL 2020

FREQ: 999.954m AMP: 0.40000 OFST: 0.00000

FILT=NONE MARK: 0.00000 TRIG=FREE RUN

R/S

YES

NO

ENTER

HELP

DIR

ARC

SIN

ABS

AT

SGN

TO

FUNCTION OUT

RESTORE

CYC

LOC

STO

ARC

COS

RPT

FOR

LN

ARC

TAN

Y^x

INT

LOG

MANUAL TRIG

REM

RCL

S+N

OFST

MARK

CLK

DEL

POWER

POLYNOMIAL WAVEFORM SYNTHESIZER

MODEL 2020

FILT=NONE

MARK:0.00000

TRIG=FREE RUN

NOISE=ON

NAMP=0.00000

NBW=200KHz

R/S

YES

NO

ENTER

HELP

DIR

ARC

SIN

ABS

AT

SGN

TO

FUNCTION OUT

DEFY /

REST

CYC

LOC

STO

ARC

COS

RPT

FOR

ARC

TAN

Y^X

INT

MANUAL
TRIG

D

REM

DEL

S+N

OFST

MARK

POWER

POLYNOMIAL WAVEFORM SYNTHESIZER

MODEL 2020

NOISE=ON

NAMP=0.00000

NBW=200KHz

DLY=0.00000

DUTY: 25.0000%

RS

YES

NO

ENTER

HELP

DIR

ARC

ABS

SGN

SIN

AT

TD

FUNCTION OUT

MODIFY /

REST

CYC

LOC

STD

ARC

COS

RPT

ROM

ARC

TAN

y^x

INT

MANUAL TRIG

MANUAL TRIG

LD

REM

RCL

DEL

S+N

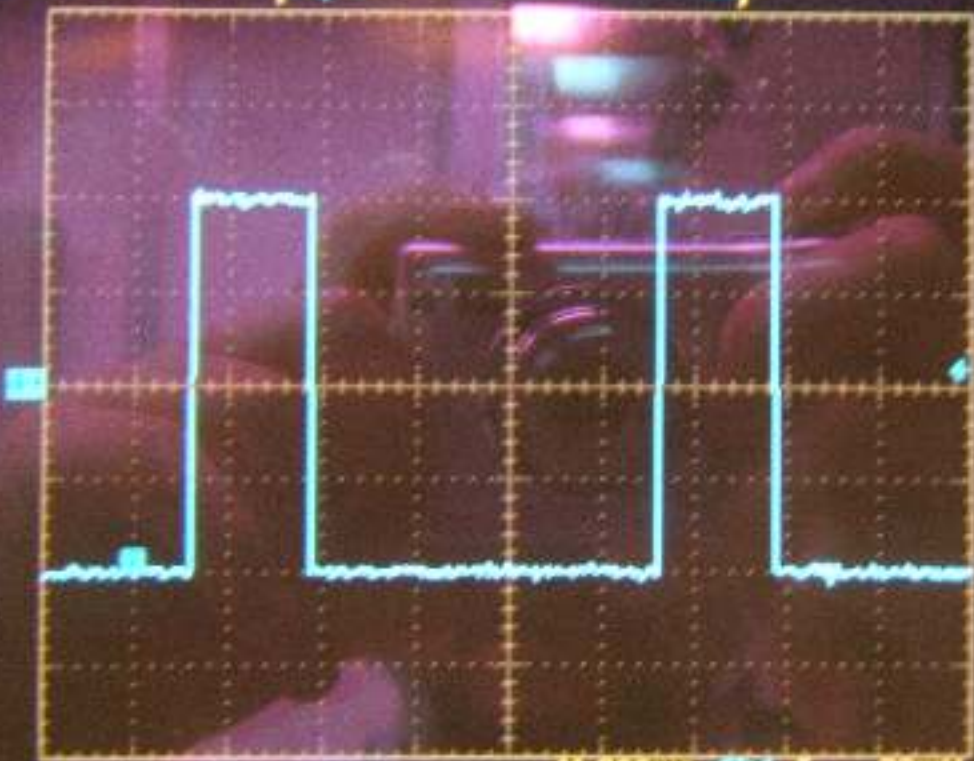
CPST

WASH

POWER

Tek Run: 250 S/s

Sample



C4 Freq
1.0000 Hz

C4 Period
1.0000 s

C4 High
392mV

C4 Low
-405mV

200mV

M 200ms CH4 / 32mV

15 Jun 2006

14:43:00