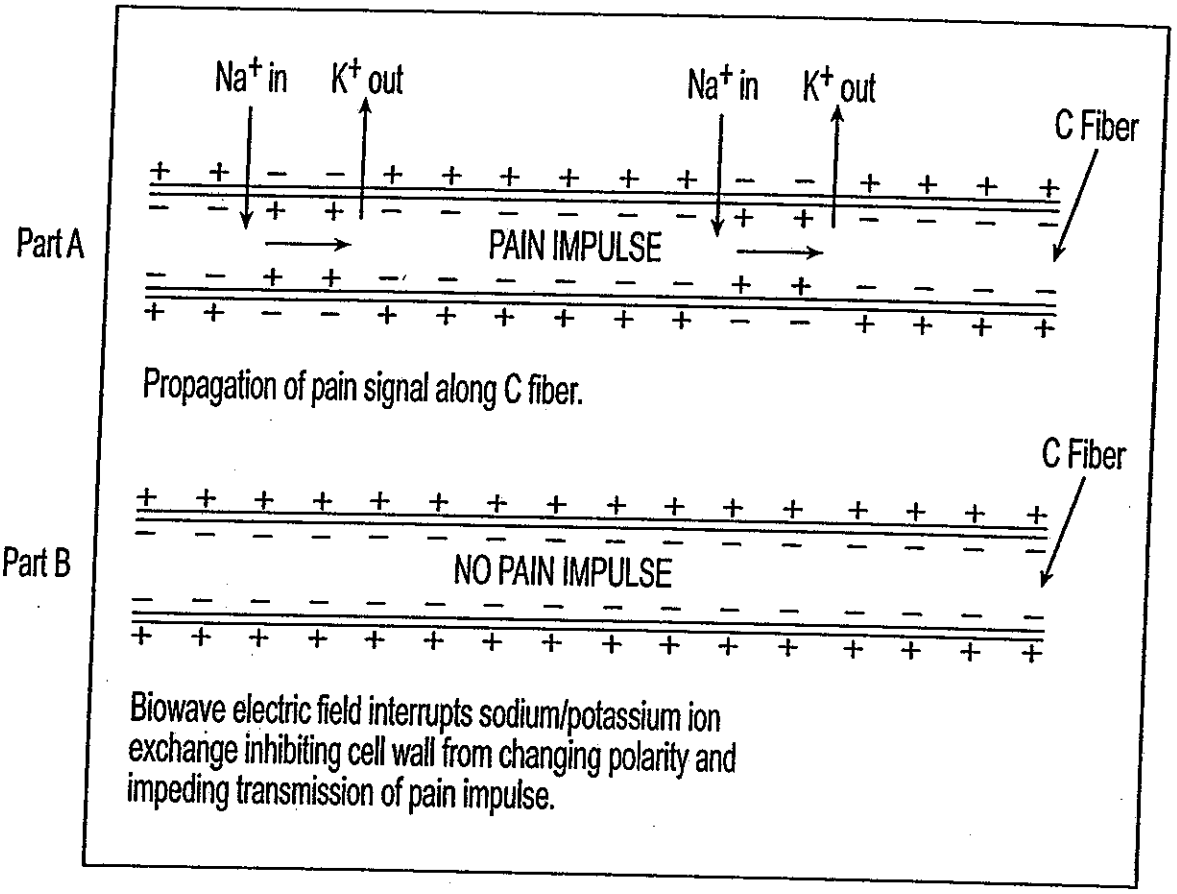

Part A
Na+ in
K+ out
Na+ in
K+ out
C Fiber
PAIN IMPULSE
Propagation of pain signal along C fiber.
Part B
C Fiber
NO PAIN IMPULSE
Biowave electric field interrupts sodium/potassium ion exchange inhibiting cell wall from changing polarity and impeding transmission of pain impulse.

Fig. 1

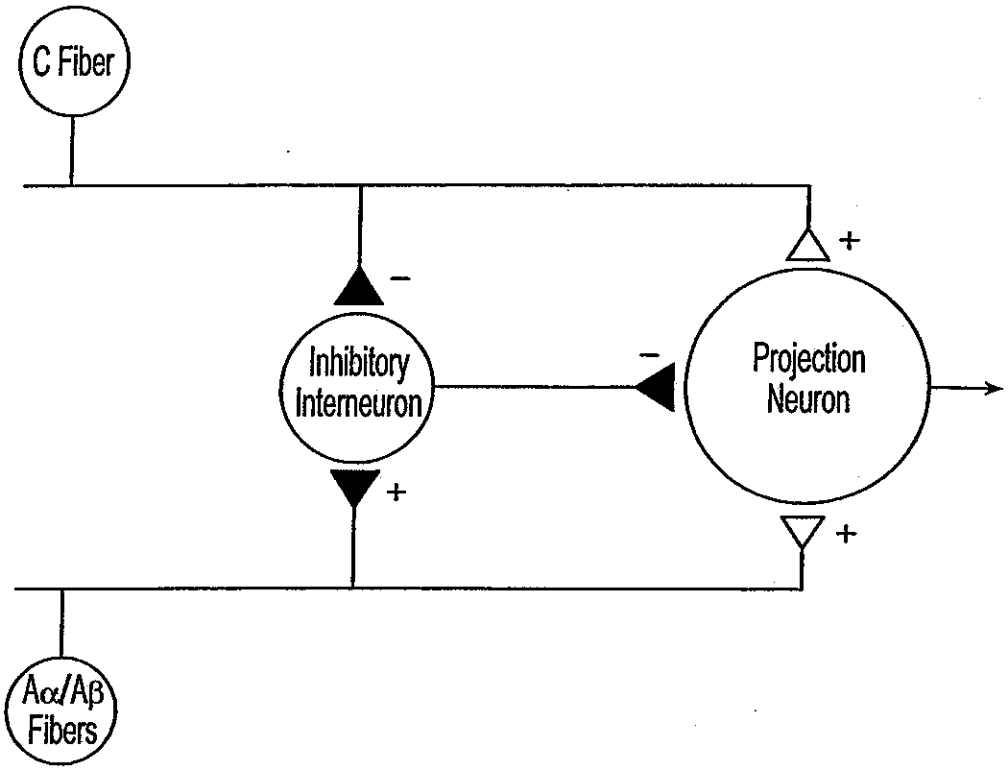

C Fiber
Inhibitory Interneuron
Projection Neuron
Aα/Aβ Fibers
+
−
−
+
+

Fig. 2


OPPOSITE pad placed on front of shoulder directly across from round PAIN Site Pad

Fig. 3

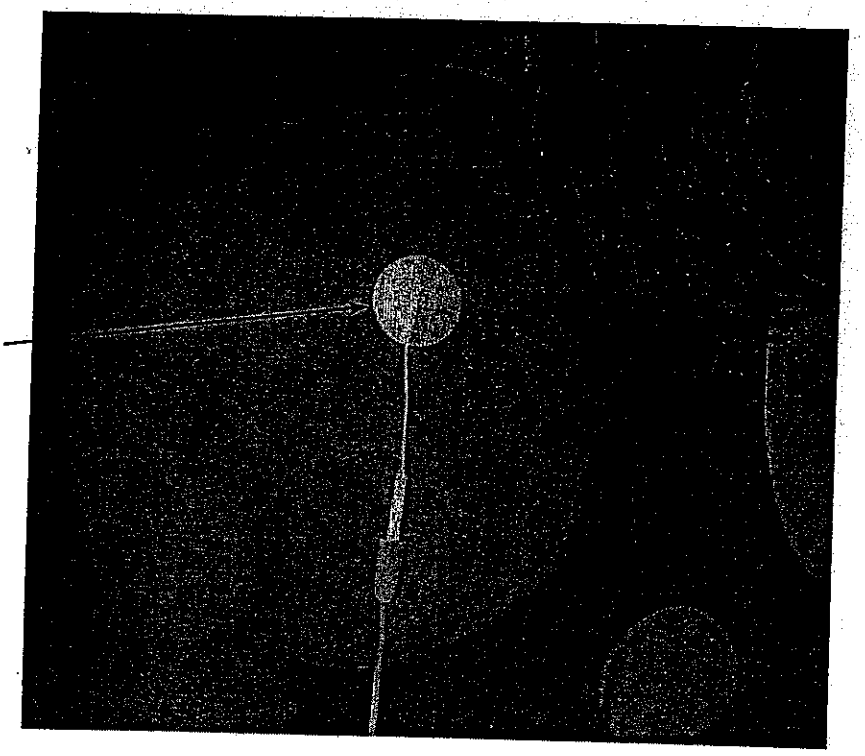

PAIN Site pad placed on back side of shoulder directly over source of pain

Fig. 4

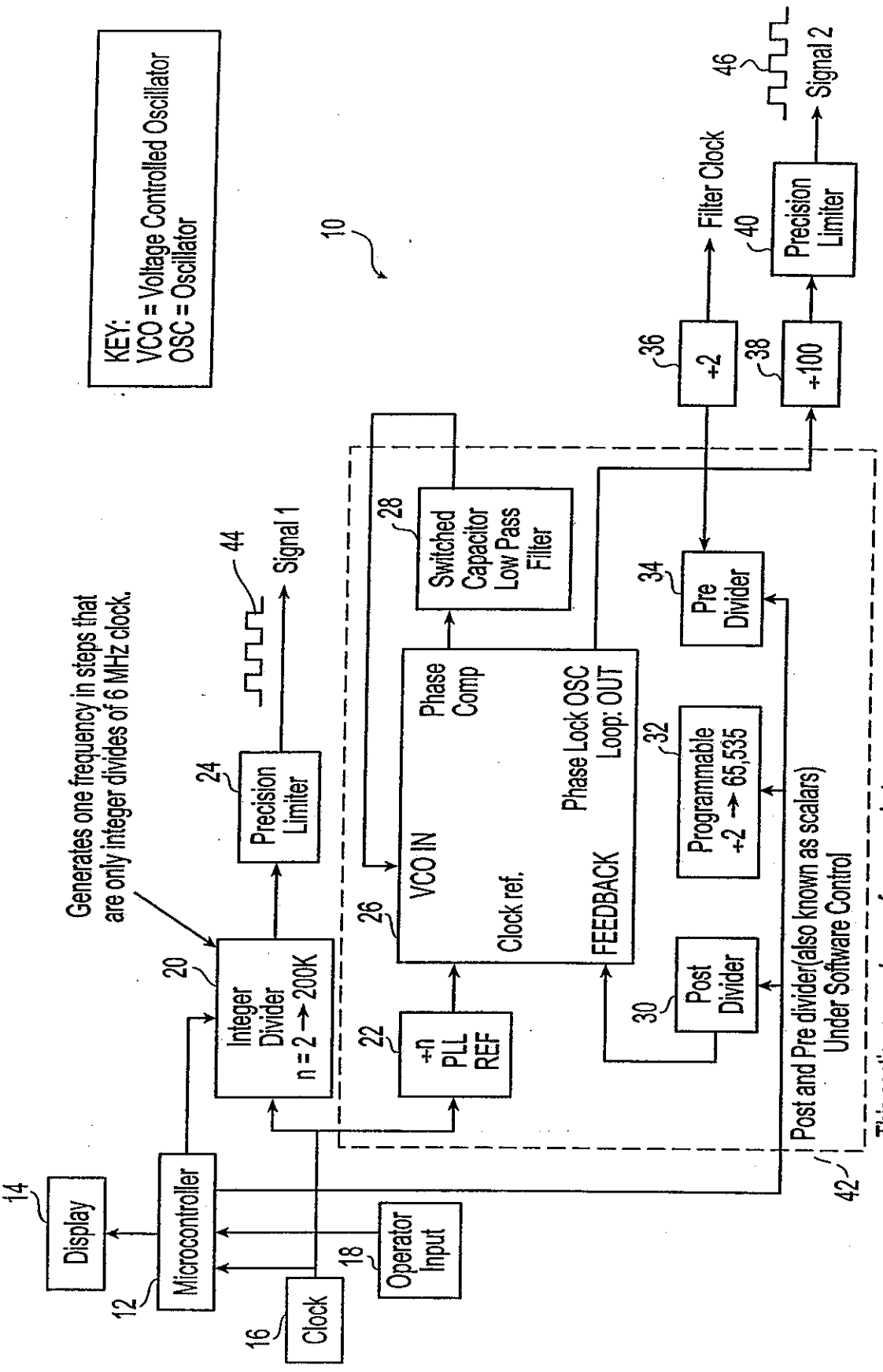

KEY:
VCO = Voltage Controlled Oscillator
OSC = Oscillator
10
Generates one frequency in steps that are only integer divides of 6 MHz clock.
Integer Divider n = 2 → 200K
20
Precision Limiter
24
Signal 1
44
+n PLL REF
22
VCO IN
Clock ref.
26
Phase Comp
Phase Lock OSC Loop: OUT
FEEDBACK
Switched Capacitor Low Pass Filter
28
Post Divider
30
Programmable ÷2 → 65,535
32
Pre Divider
34
÷2
36
÷100
38
Filter Clock
Precision Limiter
40
Signal 2
46
Post and Pre divider(also known as scalars) Under Software Control
This section generates any frequency between 2 and 200 kHz with 1 Hz resolution
42
Display
14
Microcontroller
12
Operator Input
18
Clock
16

Fig. 5

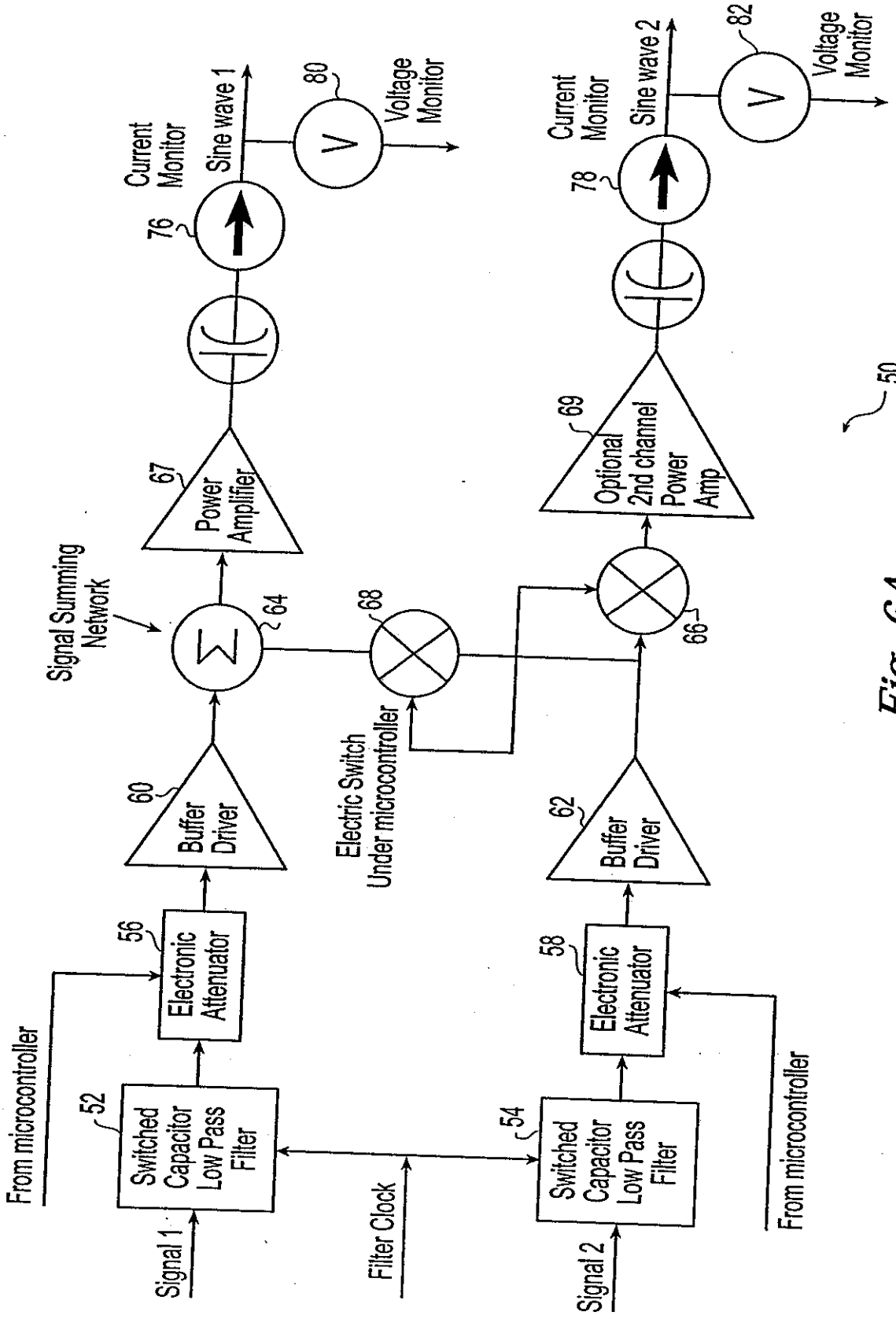

From microcontroller
Signal 1
Switched Capacitor Low Pass Filter
52
Electronic Attenuator
56
Buffer Driver
60
Signal Summing Network
64
Power Amplifier
67
Current Monitor
76
Sine wave 1
80
Voltage Monitor
Filter Clock
Electric Switch Under microcontroller
68
Signal 2
Switched Capacitor Low Pass Filter
54
Electronic Attenuator
58
Buffer Driver
62
66
Optional 2nd channel Power Amp
69
Current Monitor
78
Sine wave 2
82
Voltage Monitor
From microcontroller
50

Fig. 6A

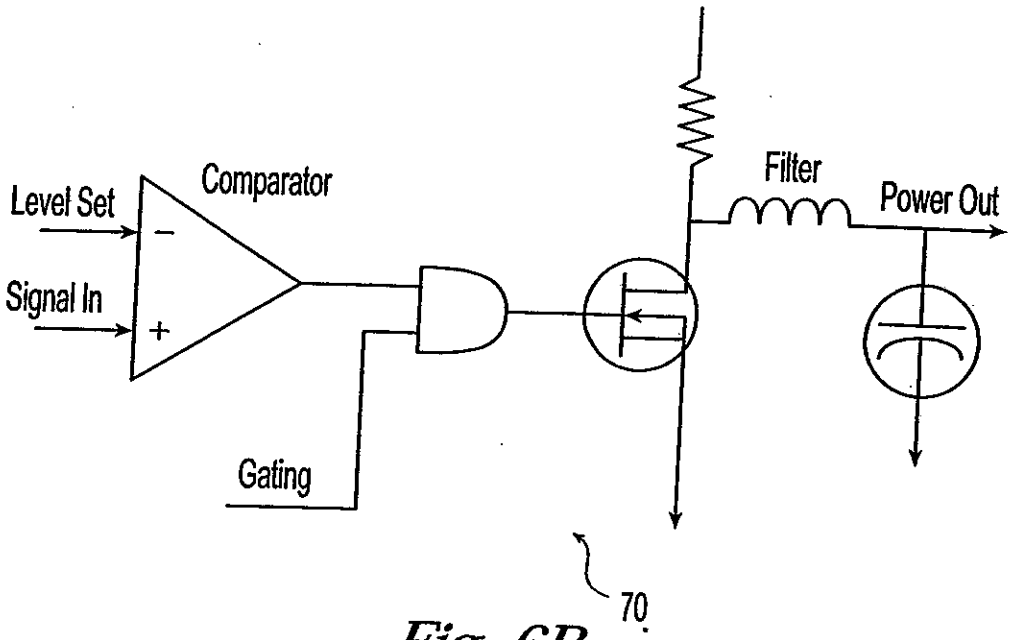

Level Set
Signal In
Comparator
Gating
Filter
Power Out
70

Fig. 6B

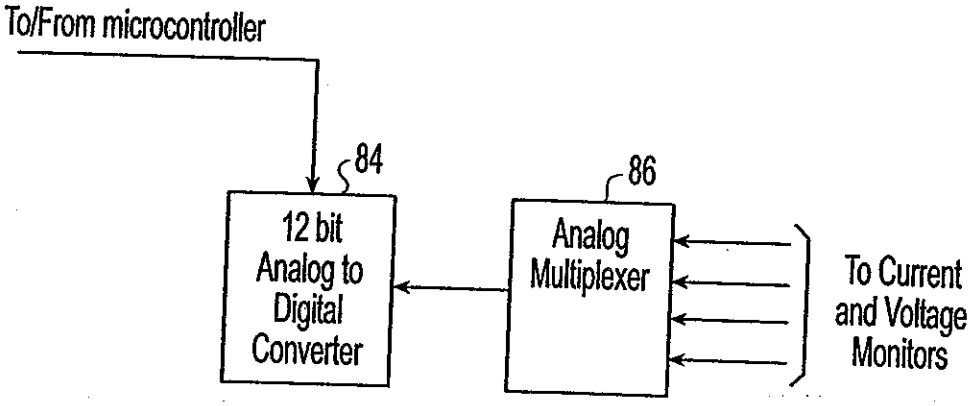

To/From microcontroller
84
12 bit Analog to Digital Converter
86
Analog Multiplexer
To Current and Voltage Monitors

Fig. 7

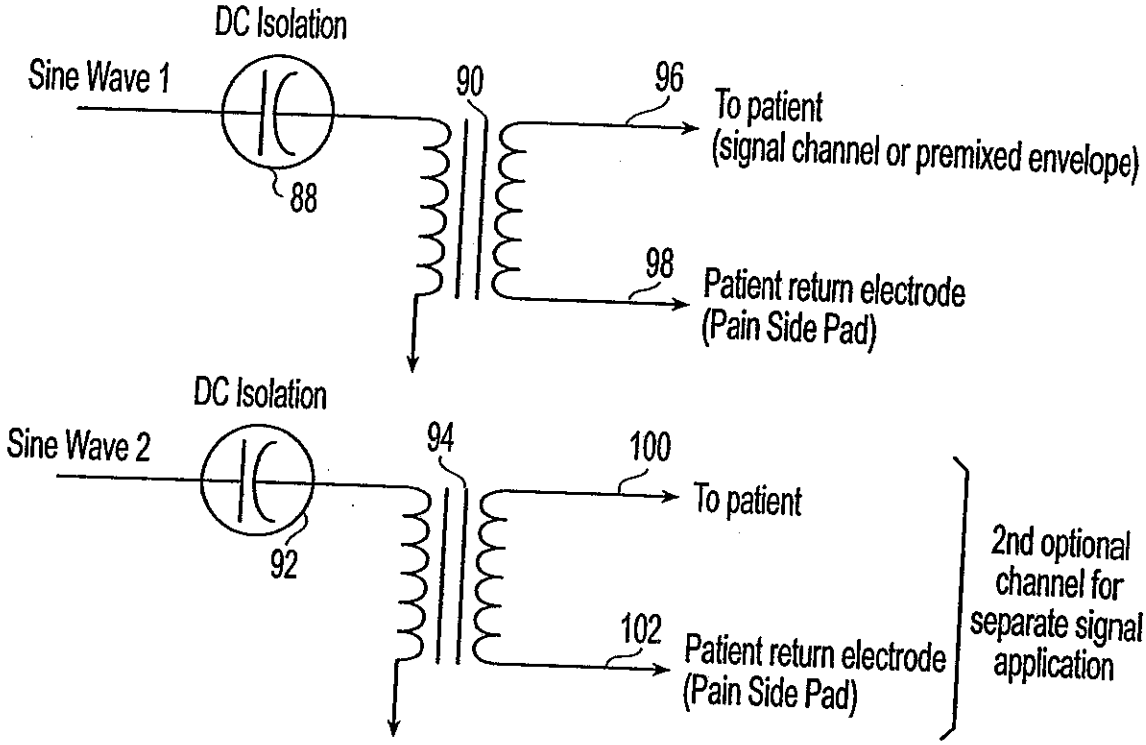

DC Isolation
Sine Wave 1
88
90
96
To patient
(signal channel or premixed envelope)
98
Patient return electrode
(Pain Side Pad)
DC Isolation
Sine Wave 2
92
94
100
To patient
102
Patient return electrode
(Pain Side Pad)
2nd optional
channel for
separate signal
application

Fig. 8

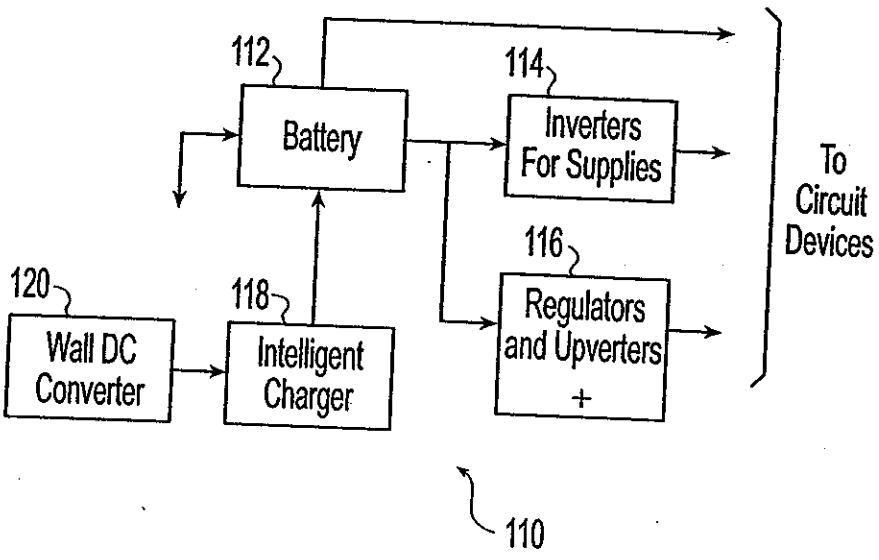

112
Battery
114
Inverters
For Supplies
To
Circuit
Devices
116
Regulators
and Upverters
+
120
Wall DC
Converter
118
Intelligent
Charger
110

Fig. 9

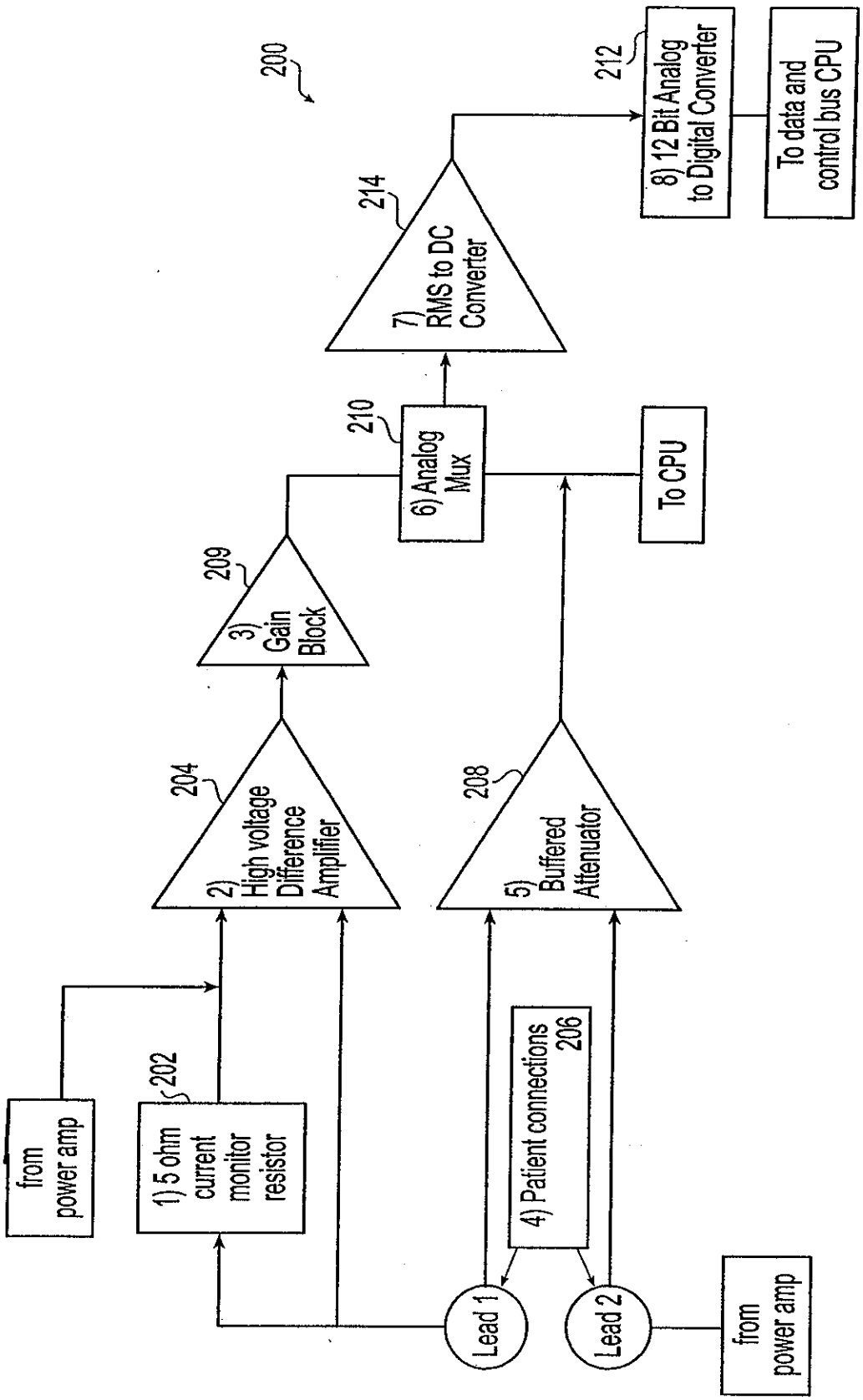

200
212
8) 12 Bit Analog to Digital Converter
To data and control bus CPU
214
7) RMS to DC Converter
210
6) Analog Mux
To CPU
209
3) Gain Block
204
2) High voltage Difference Amplifier
208
5) Buffered Attenuator
from power amp
202
1) 5 ohm current monitor resistor
4) Patient connections 206
Lead 1
Lead 2
from power amp

Fig. 10

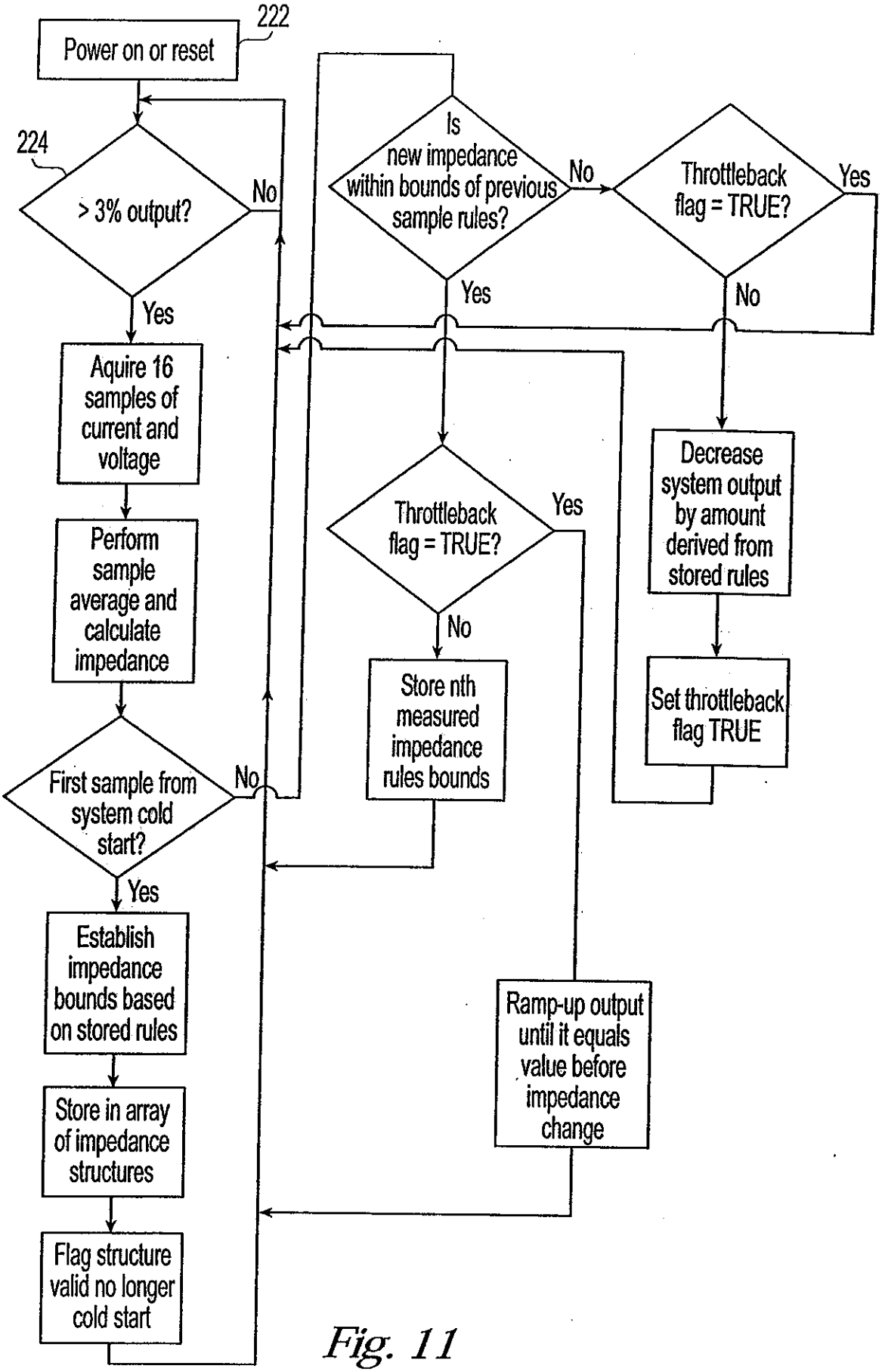

222
Power on or reset
224
> 3% output?
No
Yes
Aquire 16 samples of current and voltage
Perform sample average and calculate impedance
First sample from system cold start?
No
Yes
Establish impedance bounds based on stored rules
Store in array of impedance structures
Flag structure valid no longer cold start
Is new impedance within bounds of previous sample rules?
No
Yes
Throttleback flag = TRUE?
Yes
No
Store nth measured impedance rules bounds
Throttleback flag = TRUE?
Yes
No
Decrease system output by amount derived from stored rules
Set throttleback flag TRUE
Ramp-up output until it equals value before impedance change

Fig. 11

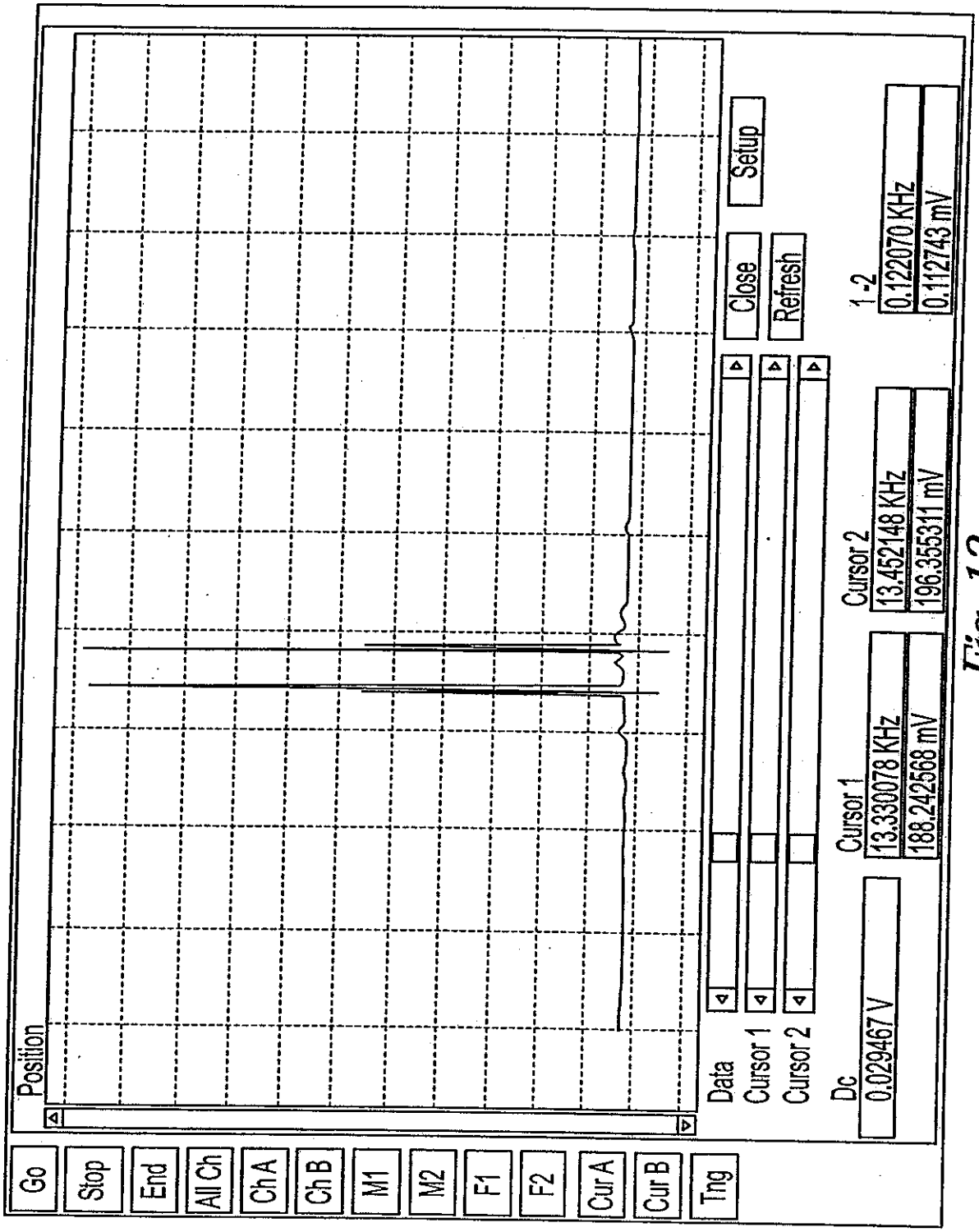

Go
Stop
End
All Ch
Ch A
Ch B
M1
M2
F1
F2
Cur A
Cur B
Trig
Position
Data
Cursor 1
Cursor 2
Dc
0.029467 V
Cursor 1
13.330078 KHz
188.242568 mV
Cursor 2
13.452148 KHz
196.355311 mV
1-2
0.122070 KHz
0.112743 mV
Close
Refresh
Setup

Fig. 12

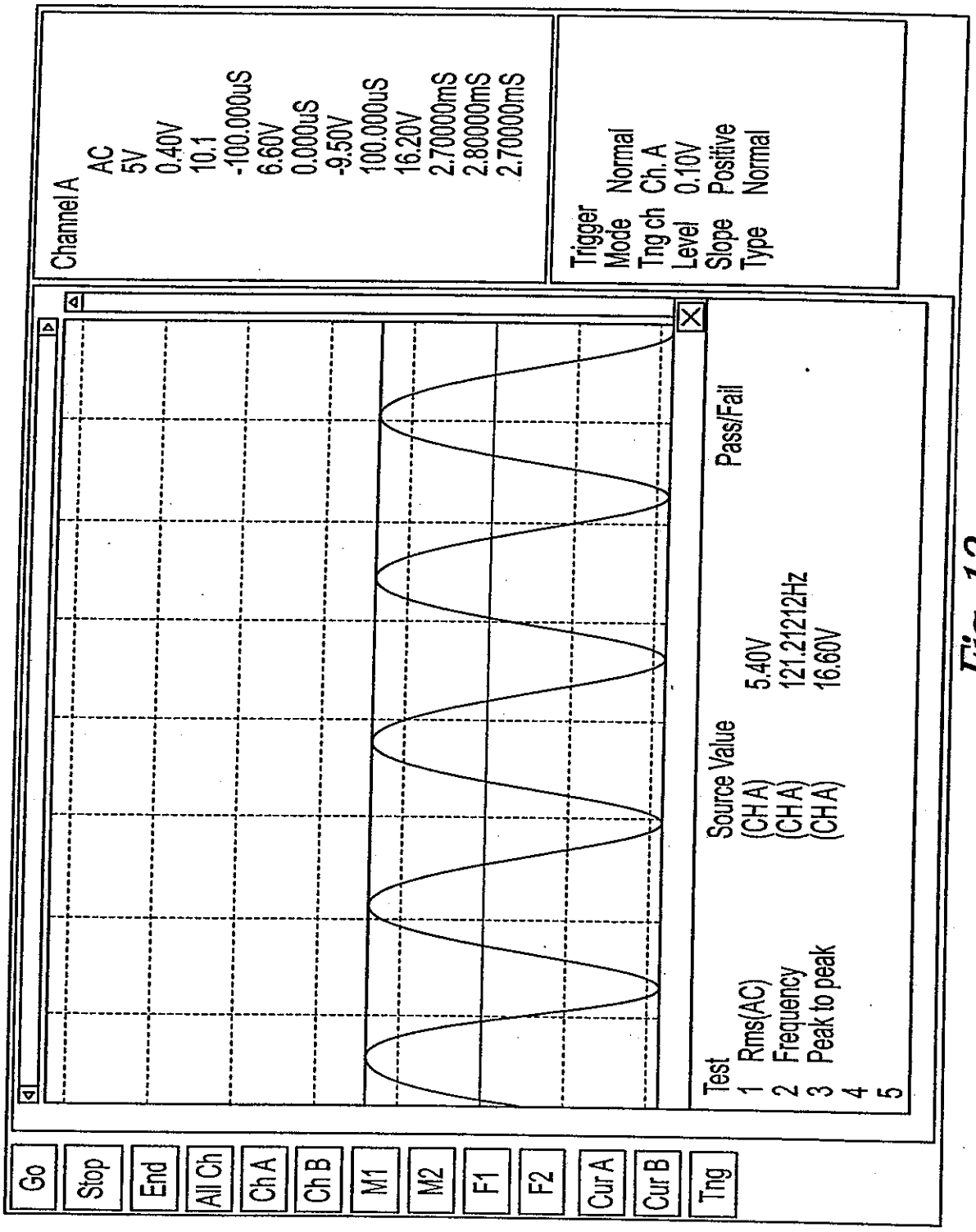

Go
Stop
End
All Ch
Ch A
Ch B
M1
M2
F1
F2
Cur A
Cur B
Tng
Channel A
AC
5V
0.40V
10.1
-100.000uS
6.60V
0.000uS
-9.50V
100.000uS
16.20V
2.70000mS
2.80000mS
2.70000mS
Trigger
Mode Normal
Tng ch Ch. A
Level 0.10V
Slope Positive
Type Normal
Test
Source Value
Pass/Fail
1 Rms(AC) (CH A) 5.40V
2 Frequency (CH A) 121.21212Hz
3 Peak to peak (CH A) 16.60V
4
5

Fig. 13

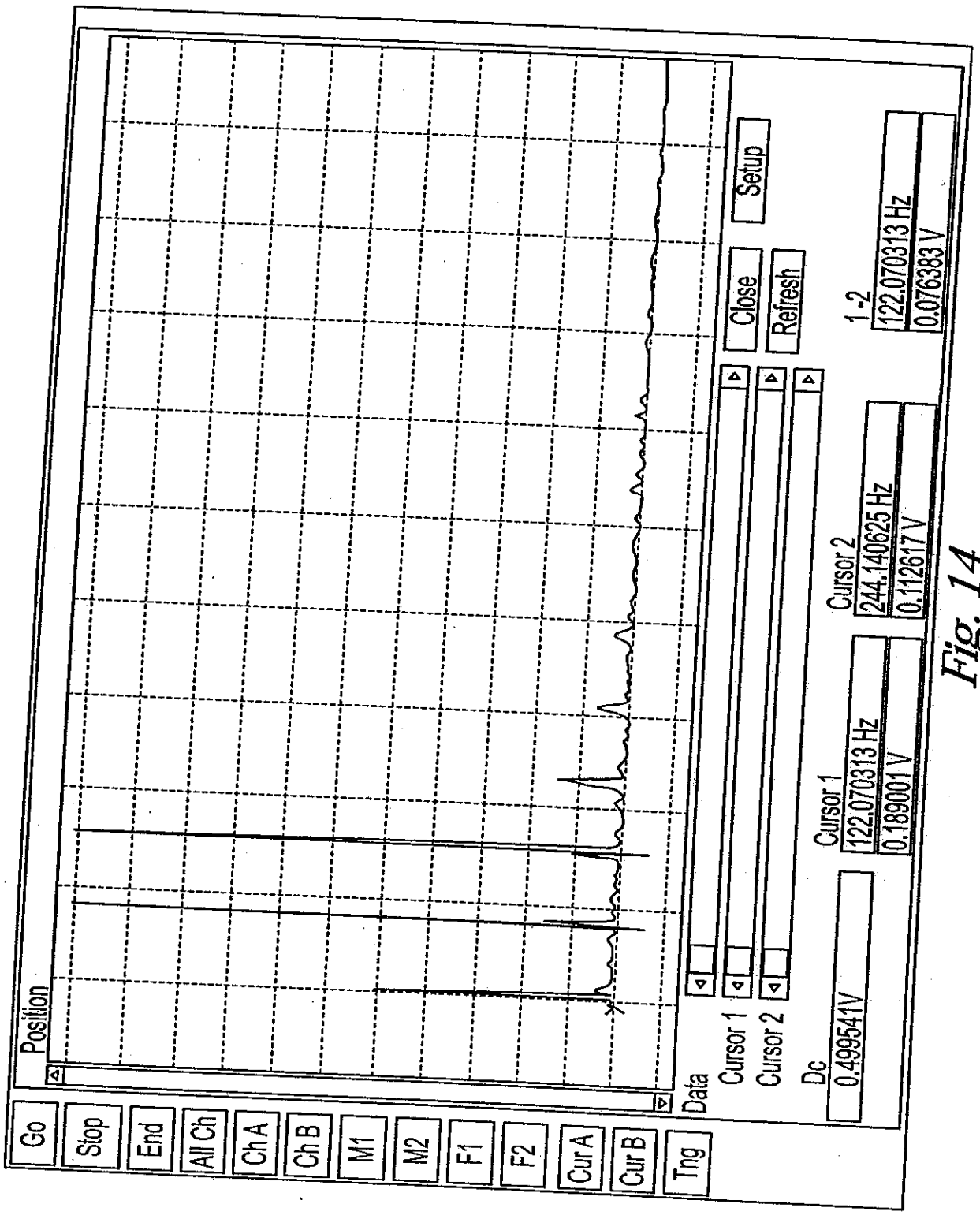

Go
Stop
End
All Ch
Ch A
Ch B
M1
M2
F1
F2
Cur A
Cur B
Tng
Position
Data
Cursor 1
Cursor 2
Dc
0.499541V
Cursor 1
122.070313 Hz
0.189001 V
Cursor 2
244.140625 Hz
0.112617 V
1-2
122.070313 Hz
0.076383 V
Close
Refresh
Setup

Fig. 14

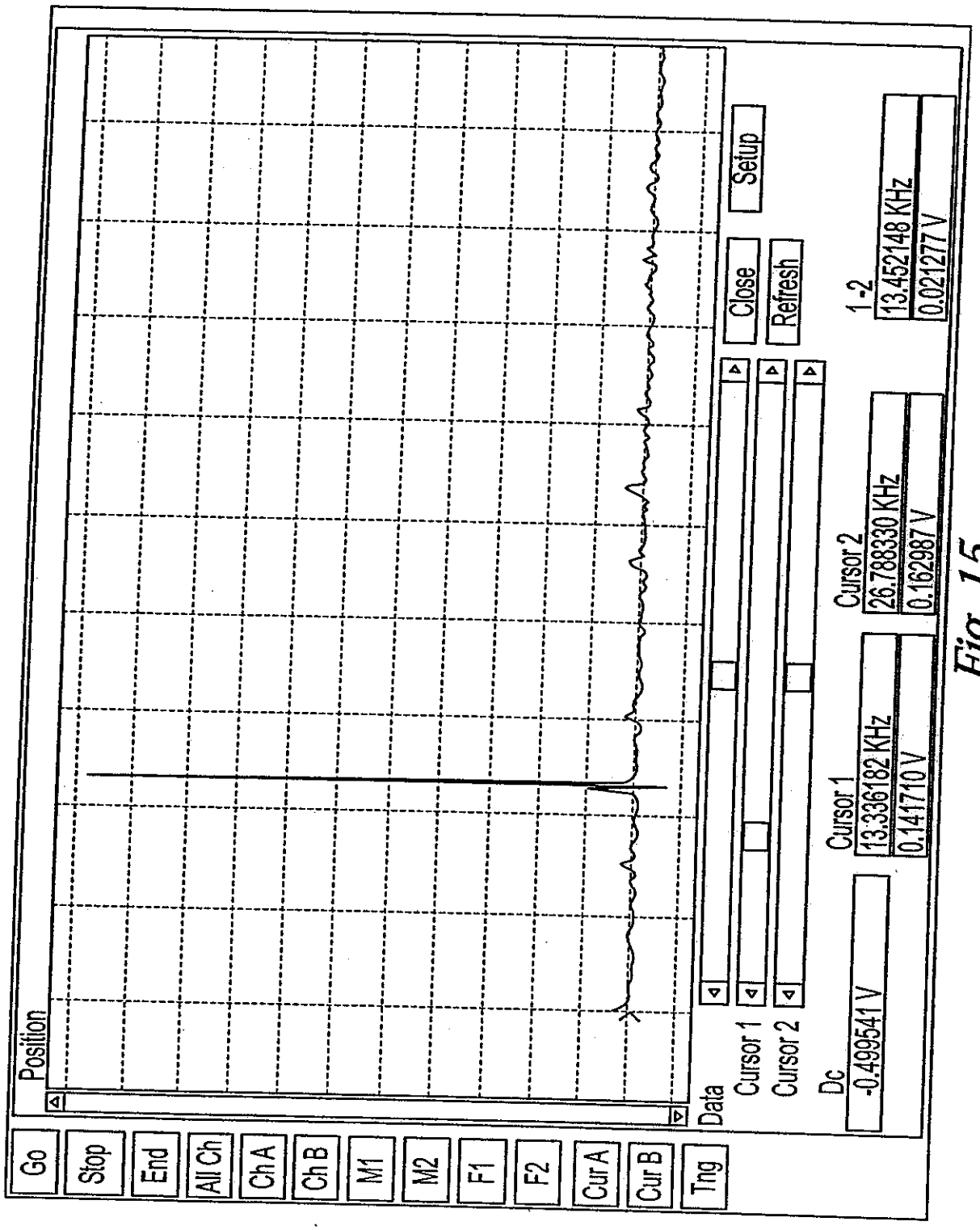

Go
Stop
End
All Ch
Ch A
Ch B
M1
M2
F1
F2
Cur A
Cur B
Tng
Position
Data
Cursor 1
Cursor 2
Dc
-0.499541 V
Cursor 1
13.336182 KHz
0.141710 V
Cursor 2
26.788330 KHz
0.162987 V
1-2
13.452148 KHz
0.021277 V
Close
Refresh
Setup

Fig. 15