FIG. 1

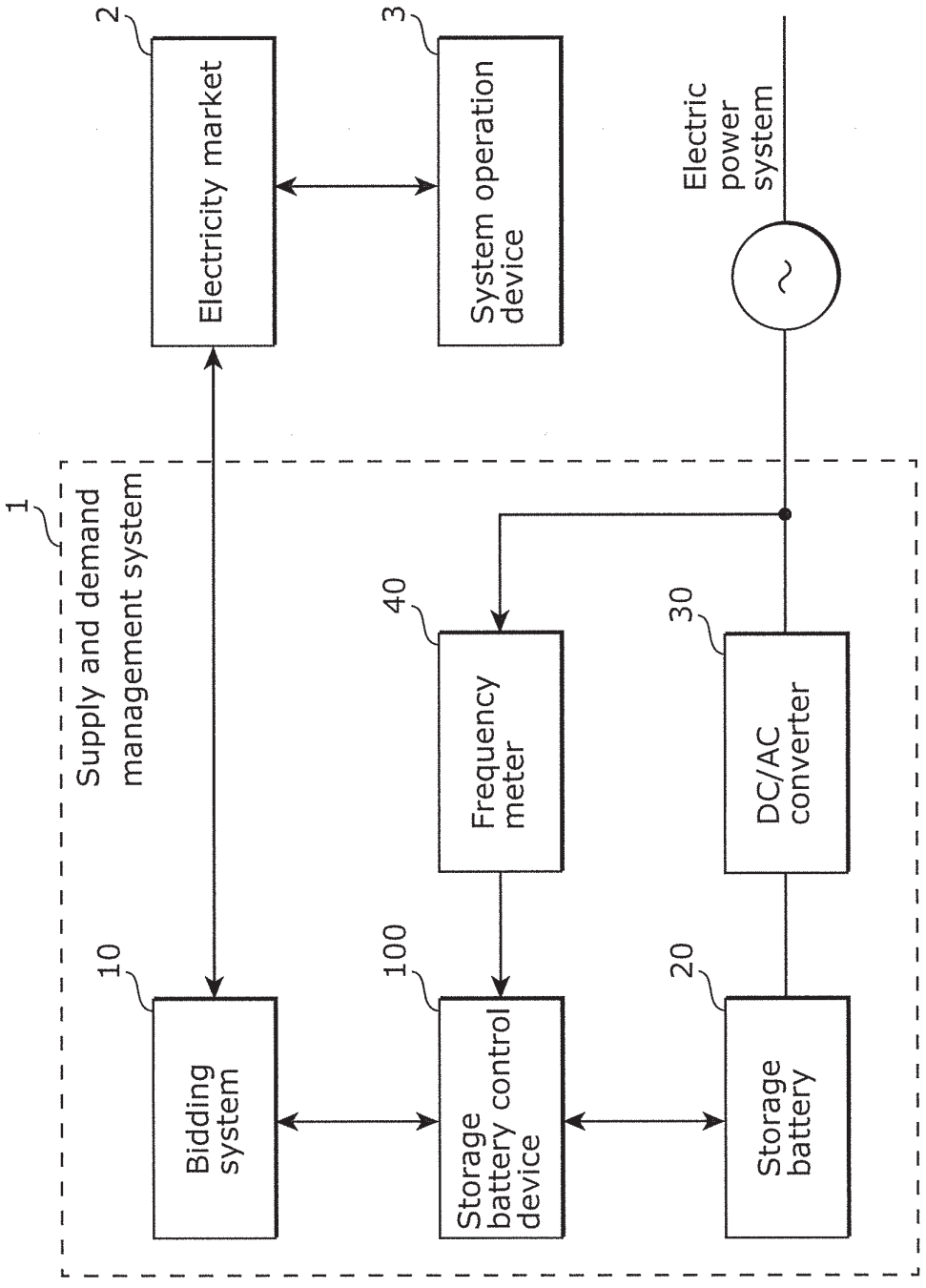

1
Supply and demand management system
2
Electricity market
3
System operation device
Electric power system
10
Bidding system
100
Storage battery control device
20
Storage battery
40
Frequency meter
30
DC/AC converter

FIG. 2

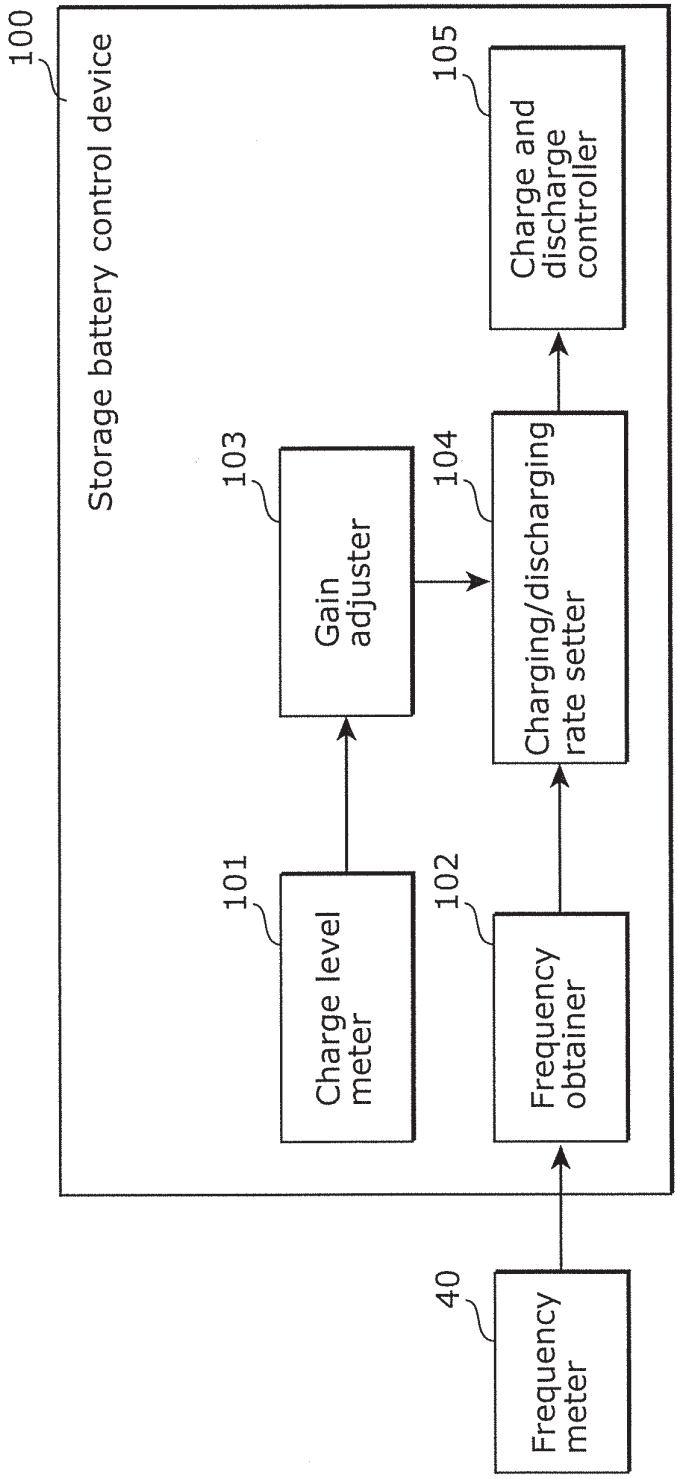

100
Storage battery control device
105
Charge and discharge controller
103
Gain adjuster
104
Charging/discharging rate setter
101
Charge level meter
102
Frequency obtainer
40
Frequency meter

FIG. 3

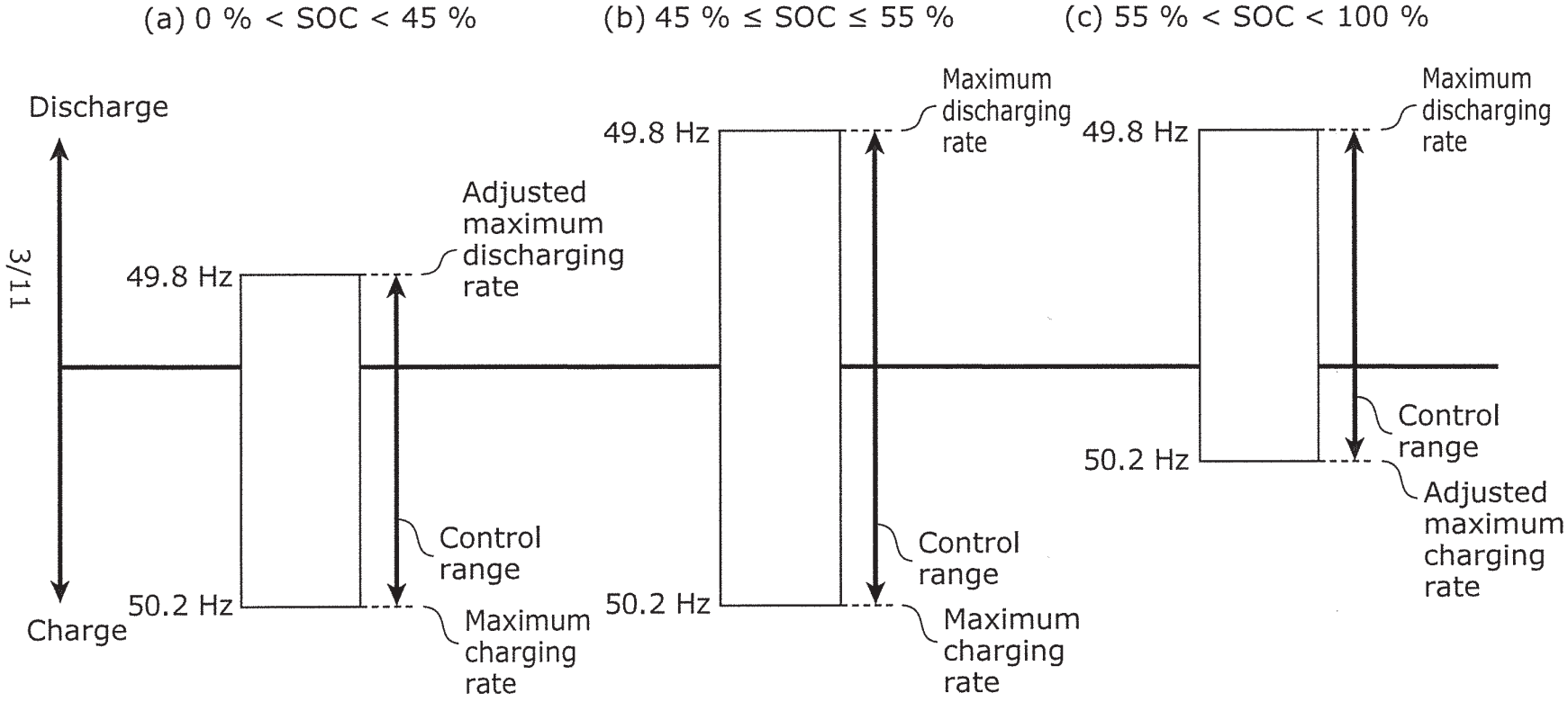

(a) 0 % < SOC < 45 %
(b) 45 % ≤ SOC ≤ 55 %
(c) 55 % < SOC < 100 %
Discharge
Charge
49.8 Hz
50.2 Hz
Adjusted maximum discharging rate
Control range
Maximum charging rate
Maximum discharging rate
Adjusted maximum charging rate
3/11

FIG. 4A

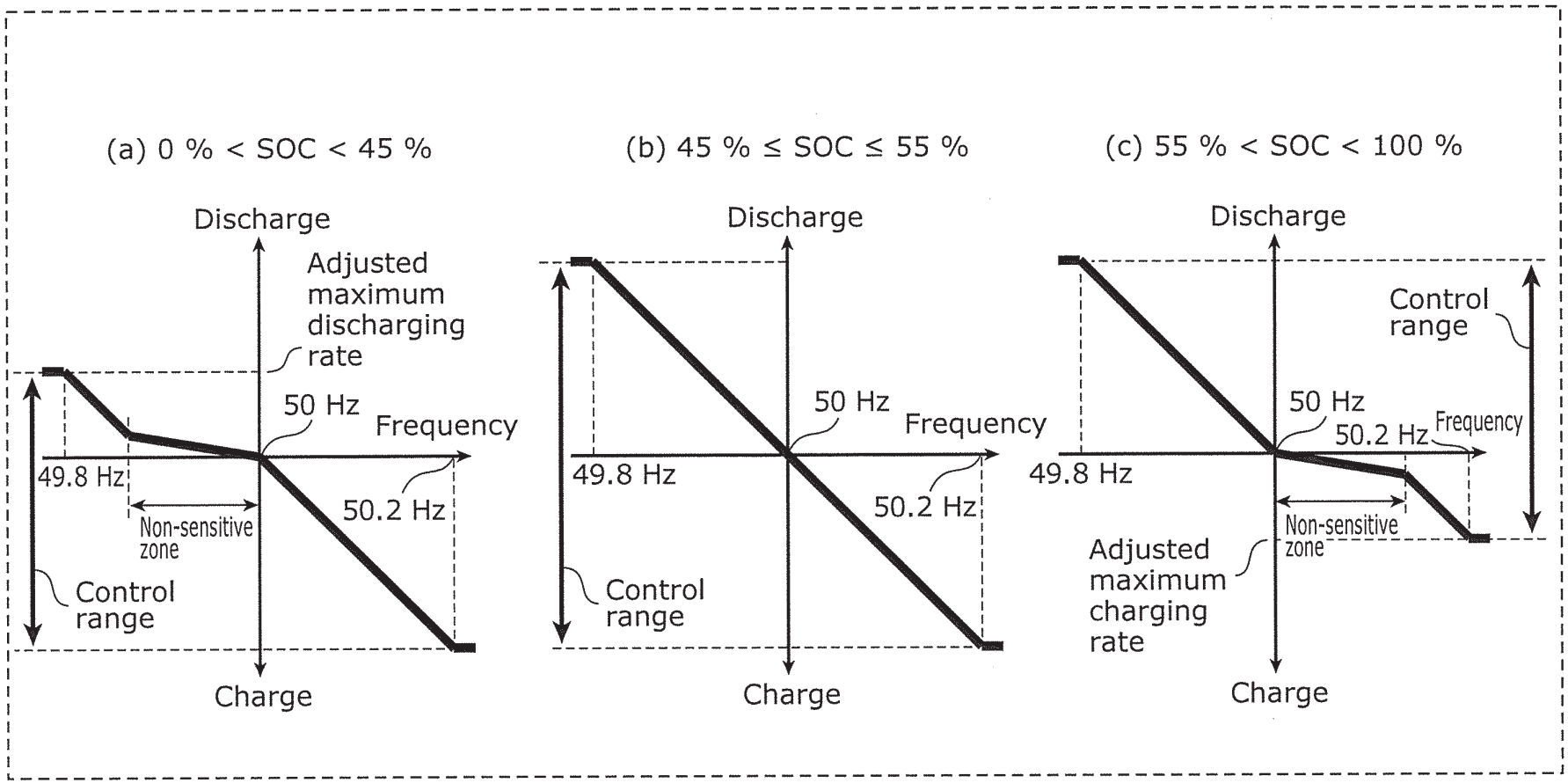

(a) 0 % < SOC < 45 %
Discharge
Adjusted maximum discharging rate
50 Hz
Frequency
49.8 Hz
50.2 Hz
Non-sensitive zone
Control range
Charge
(b) 45 % ≤ SOC ≤ 55 %
Discharge
50 Hz
Frequency
49.8 Hz
50.2 Hz
Control range
Charge
(c) 55 % < SOC < 100 %
Discharge
Control range
50 Hz
50.2 Hz
Frequency
49.8 Hz
Non-sensitive zone
Adjusted maximum charging rate
Charge

FIG. 4B

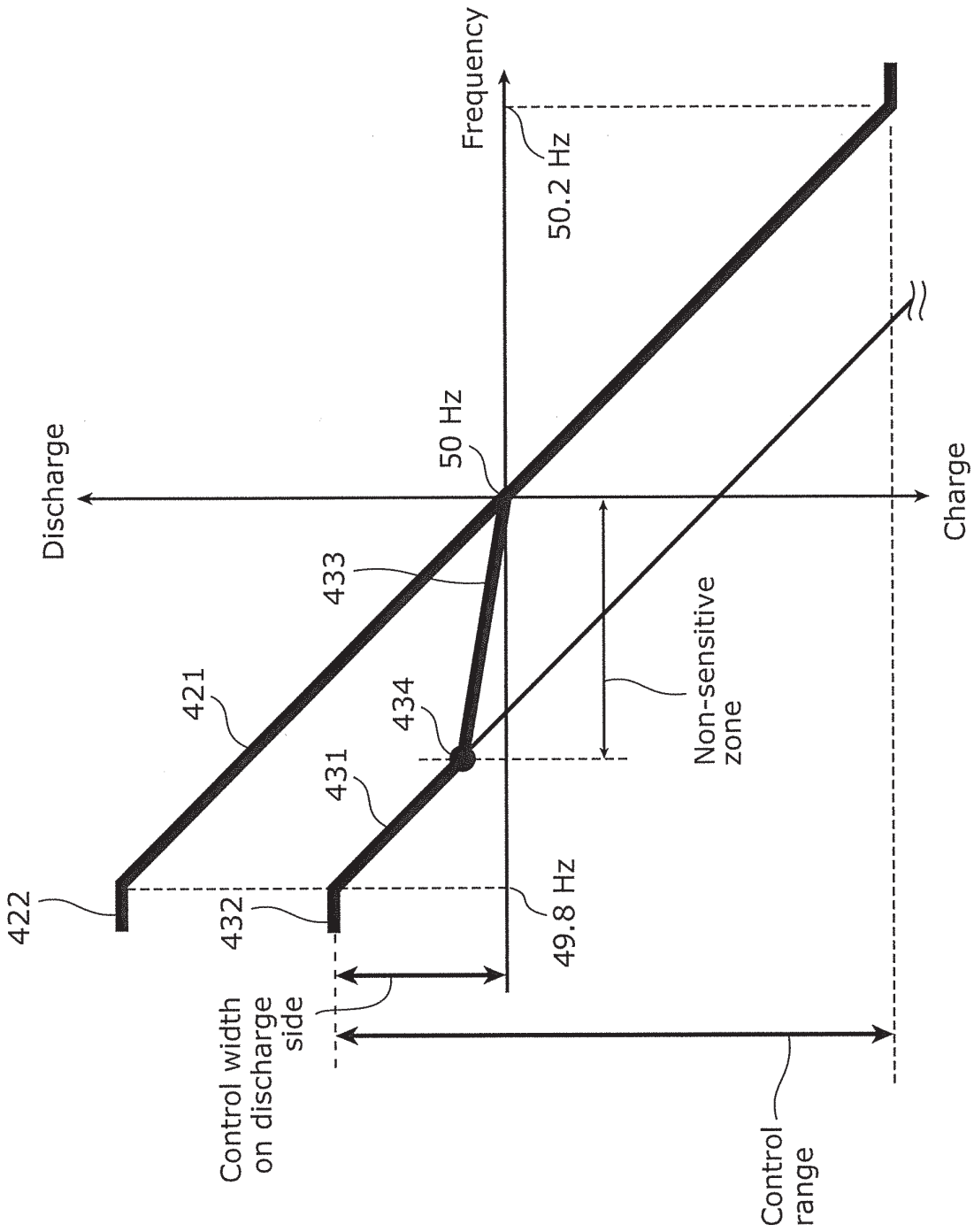

Frequency
50.2 Hz
50 Hz
Discharge
Charge
433
421
434
431
422
432
49.8 Hz
Non-sensitive zone
Control width on discharge side
Control range

FIG. 5

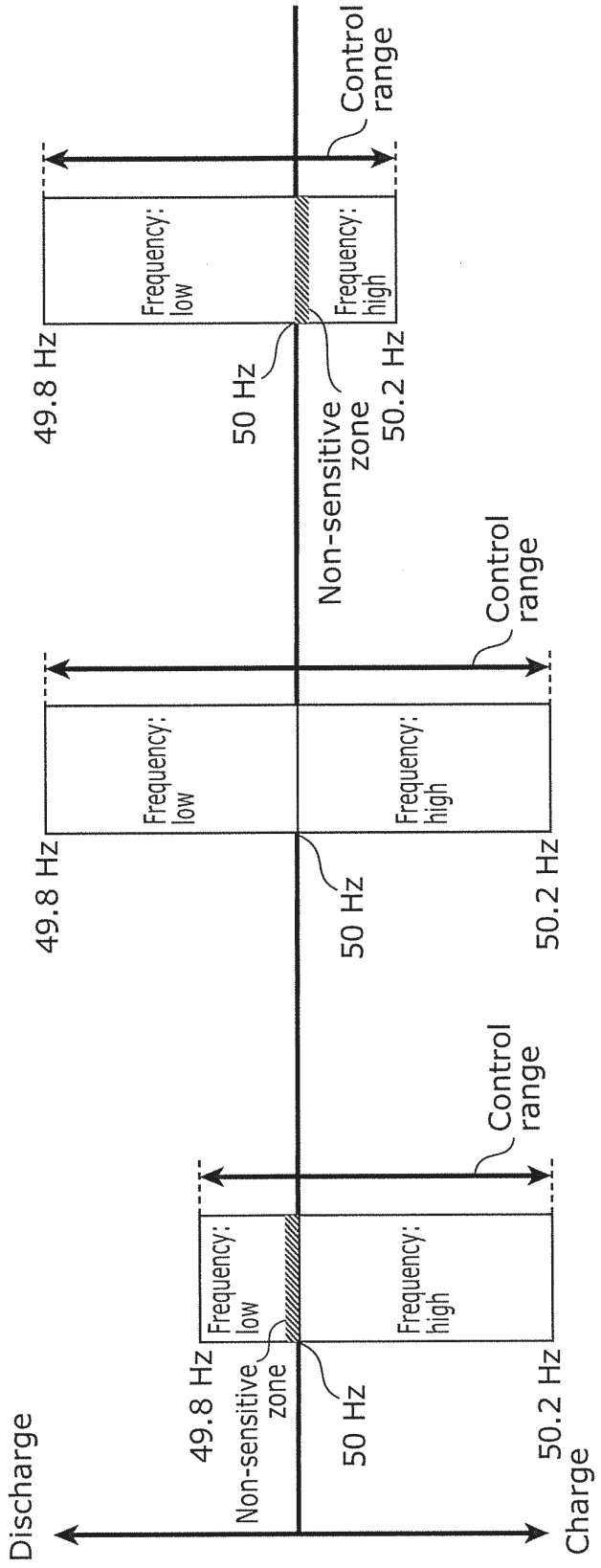

(a) 0 % < SOC < 45 %
(b) 45 % ≤ SOC ≤ 55 %
(c) 55 % < SOC < 100 %
Discharge
Charge
Control range
Frequency: low
Frequency: high
49.8 Hz
50 Hz
50.2 Hz
Non-sensitive zone

FIG. 6

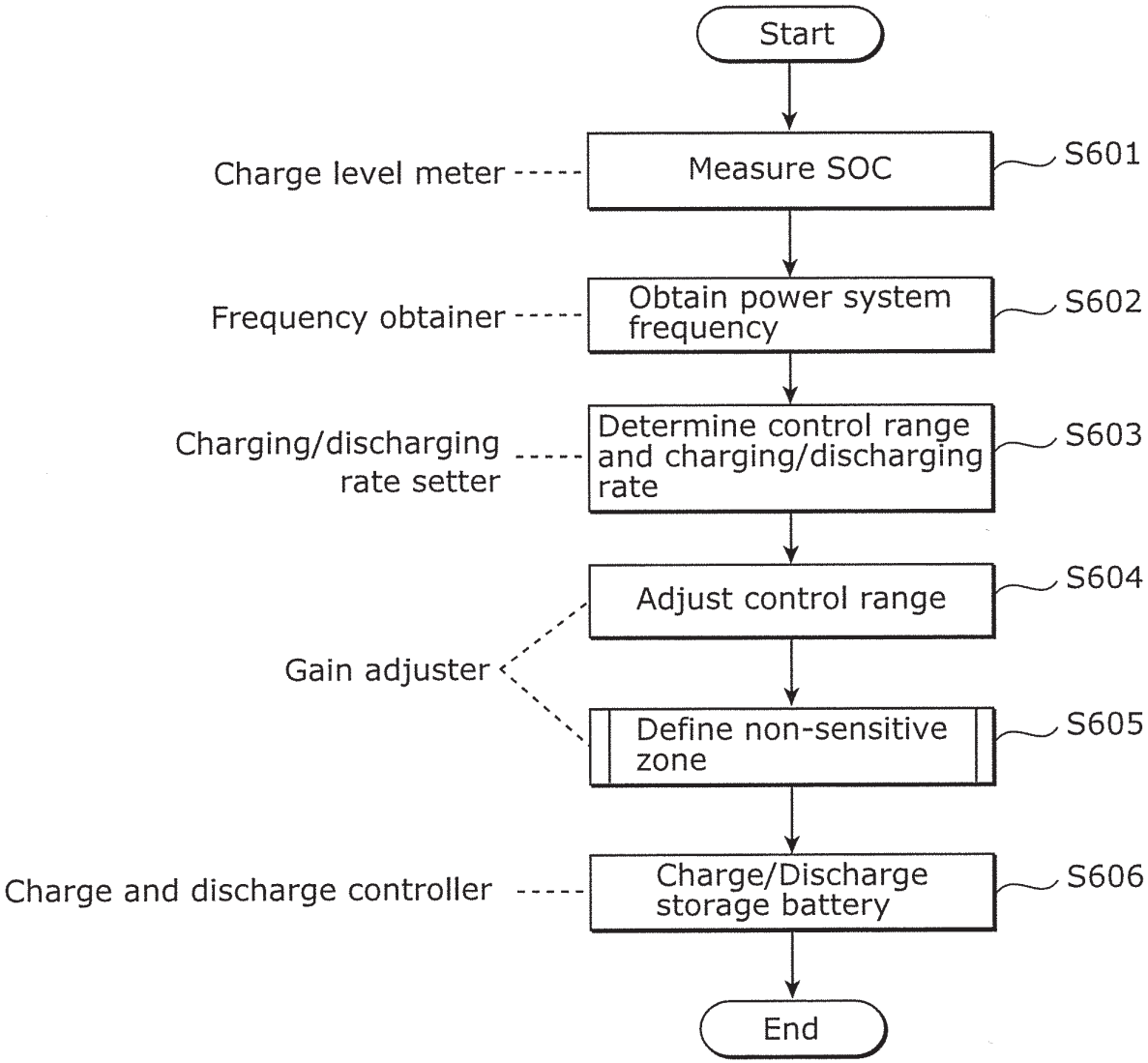

Start
Charge level meter
Measure SOC
S601
Frequency obtainer
Obtain power system frequency
S602
Charging/discharging rate setter
Determine control range and charging/discharging rate
S603
Adjust control range
S604
Gain adjuster
Define non-sensitive zone
S605
Charge and discharge controller
Charge/Discharge storage battery
S606
End

FIG. 7

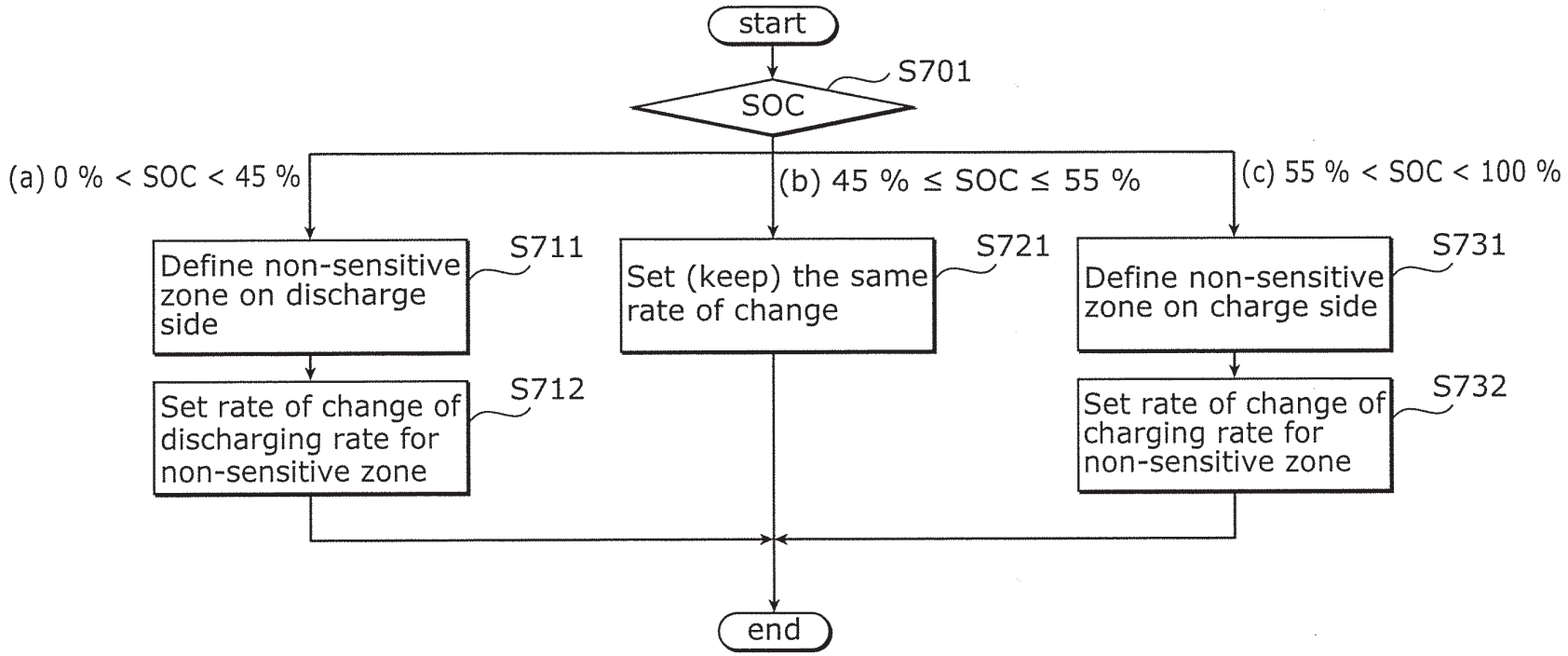

start
S701
SOC
(a) 0 % < SOC < 45 %
(b) 45 % ≤ SOC ≤ 55 %
(c) 55 % < SOC < 100 %
Define non-sensitive zone on discharge side
S711
Set rate of change of discharging rate for non-sensitive zone
S712
Set (keep) the same rate of change
S721
Define non-sensitive zone on charge side
S731
Set rate of change of charging rate for non-sensitive zone
S732
end

FIG. 8

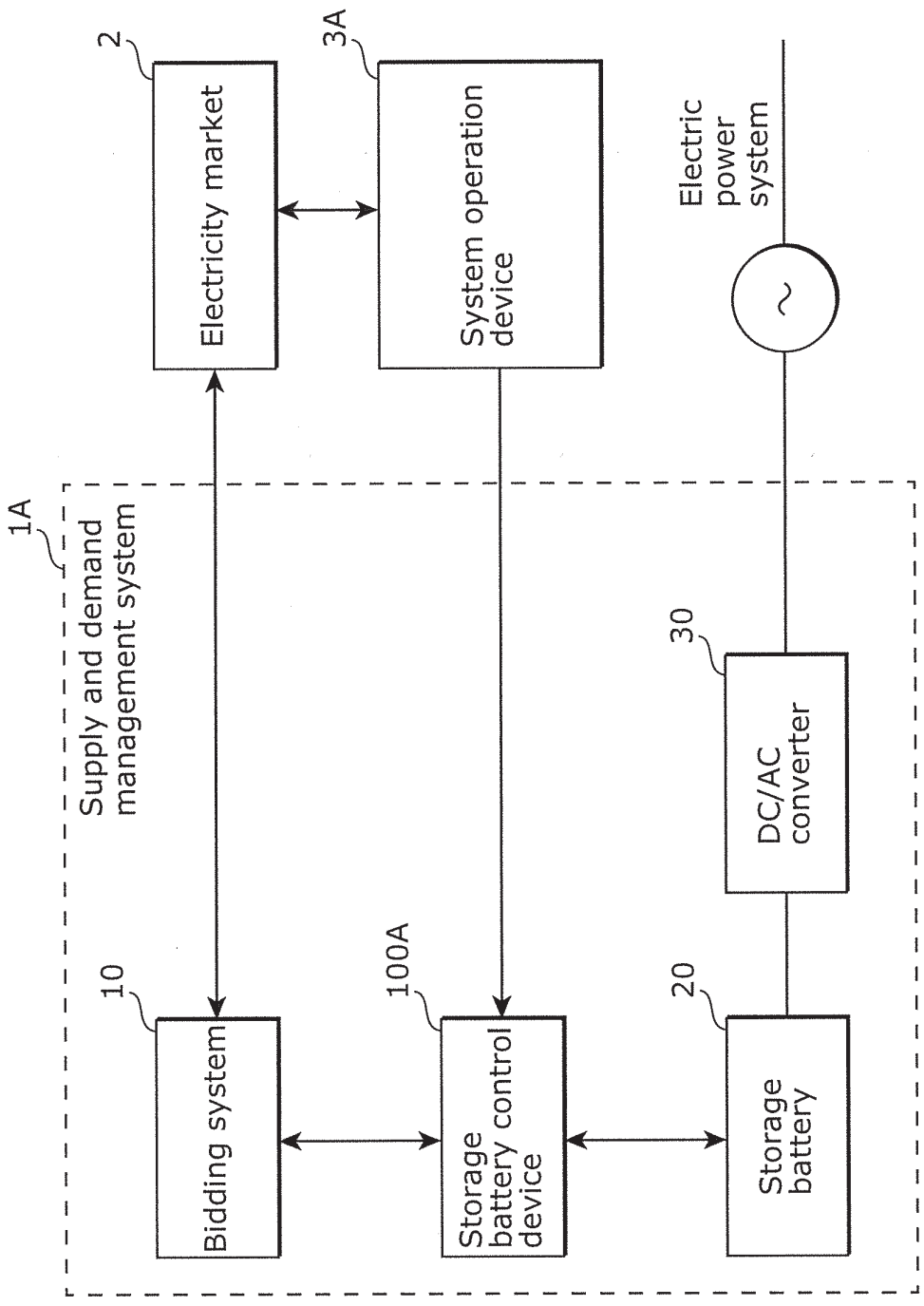

2
Electricity market
3A
System operation device
Electric power system
1A
Supply and demand management system
10
Bidding system
100A
Storage battery control device
30
DC/AC converter
20
Storage battery

FIG. 9

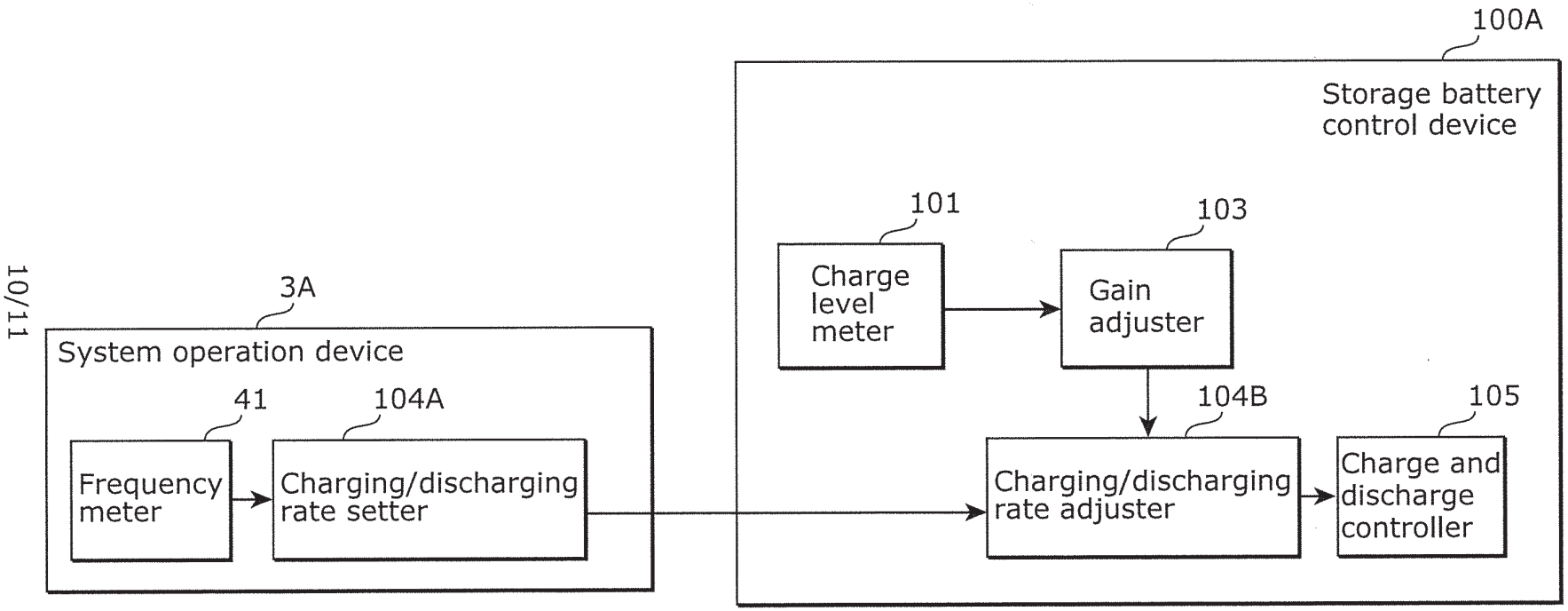
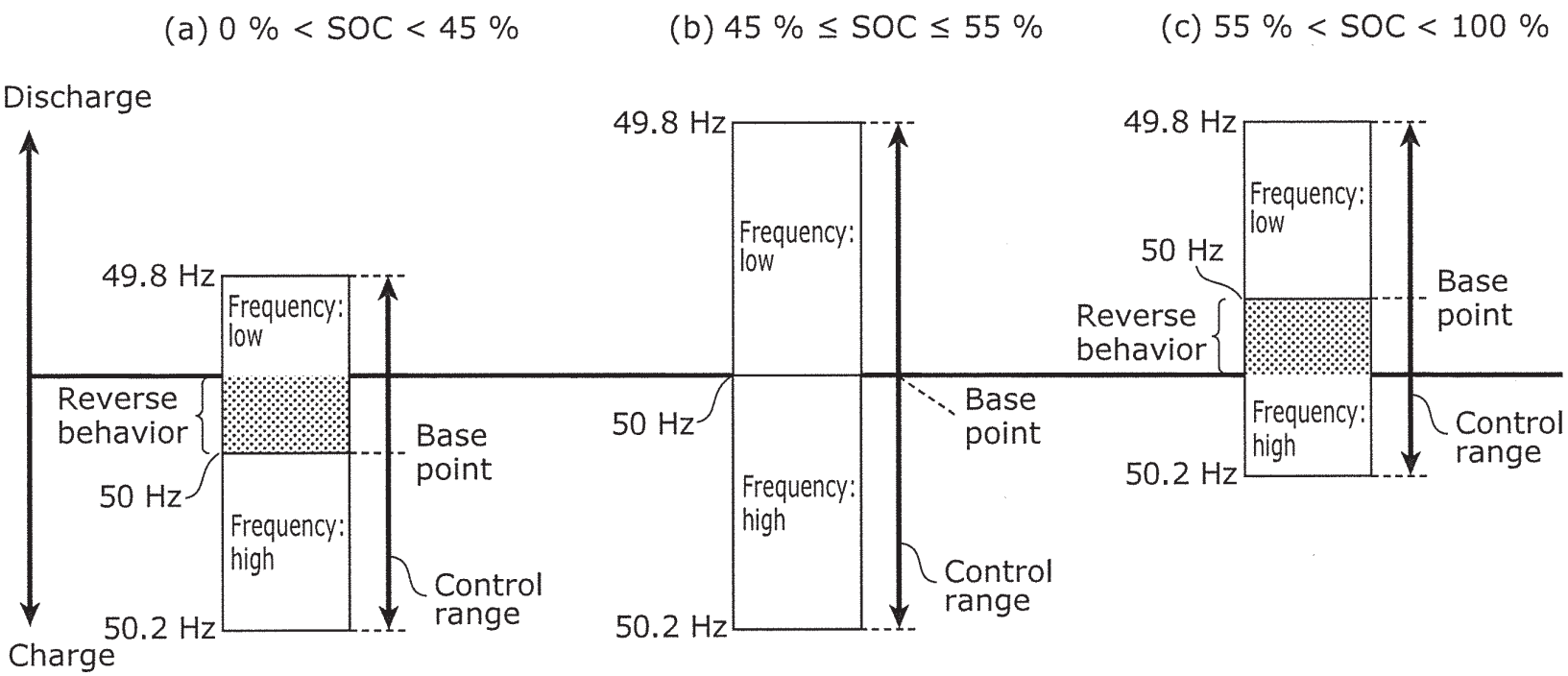

10/11
3A
System operation device
41
Frequency meter
104A
Charging/discharging rate setter
100A
Storage battery control device
101
Charge level meter
103
Gain adjuster
104B
Charging/discharging rate adjuster
105
Charge and discharge controller

FIG. 10


(a) 0 % < SOC < 45 %
(b) 45 % ≤ SOC ≤ 55 %
(c) 55 % < SOC < 100 %
Discharge
Charge
49.8 Hz
Frequency: low
Reverse behavior
50 Hz
Frequency: high
50.2 Hz
Base point
Control range