AUTOMATION OF RESISTANCE MEASUREMENT

DESIGN ARTEFACTS

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GROUP C

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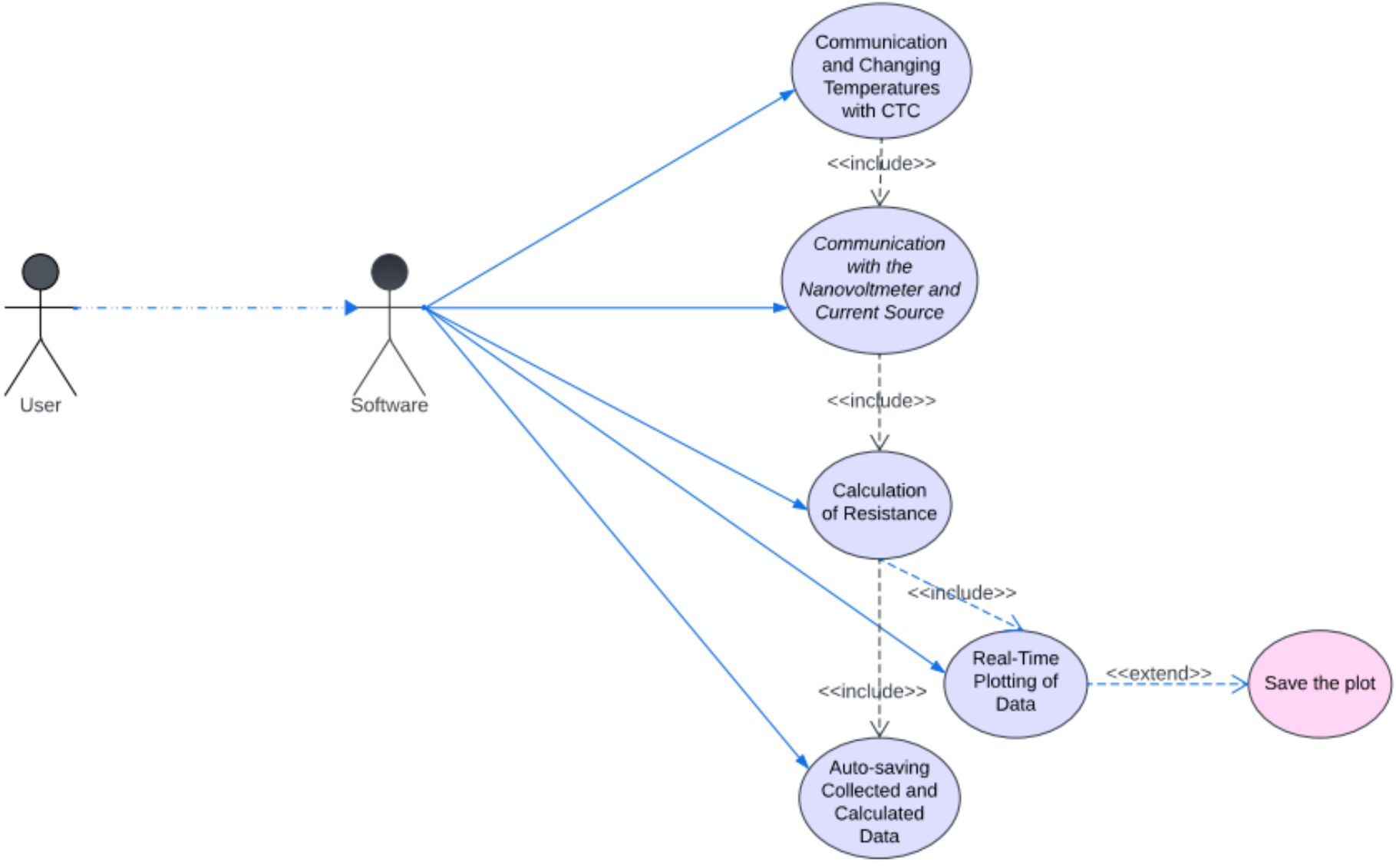
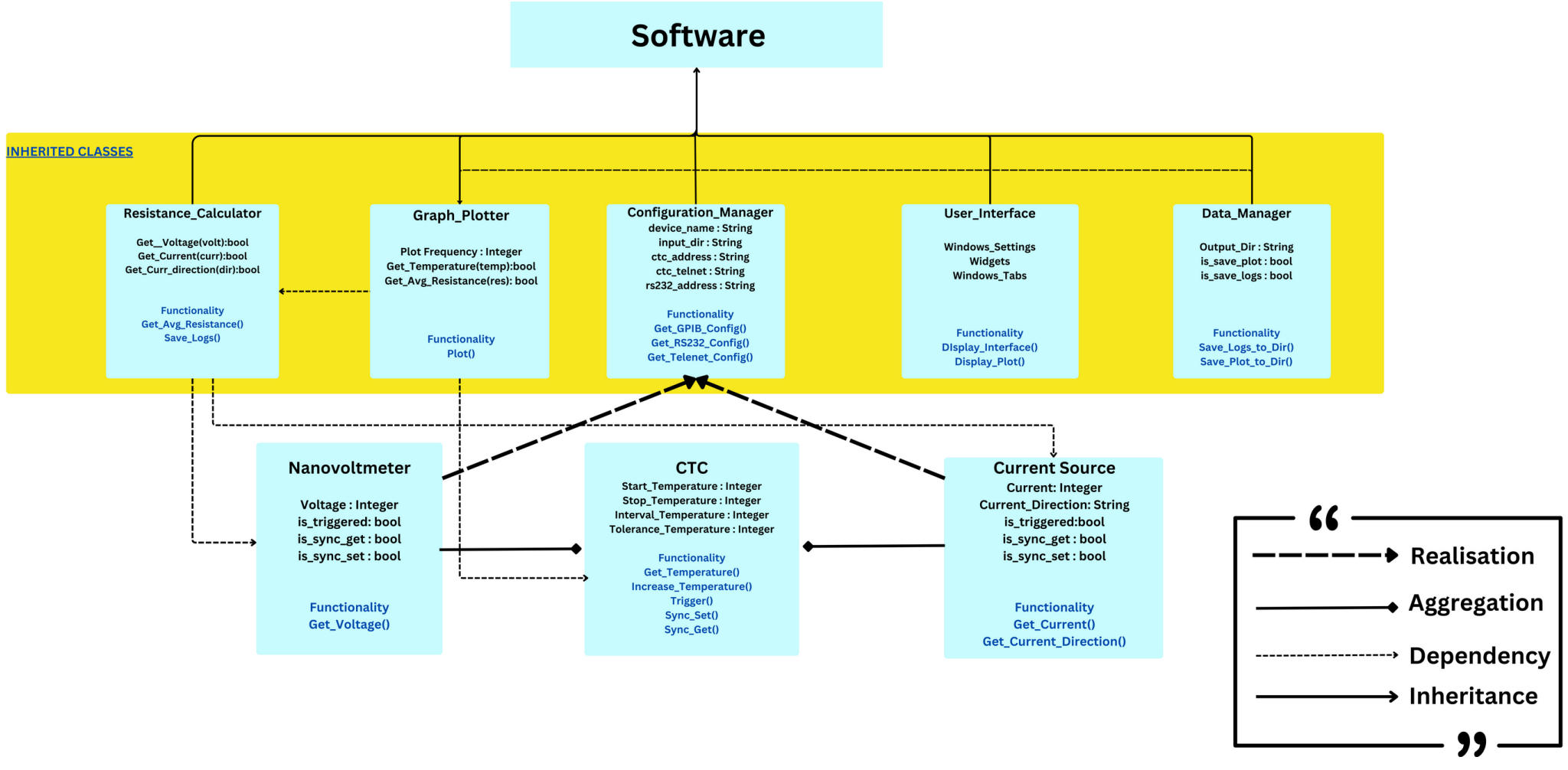
USE-CASE DIAGRAM

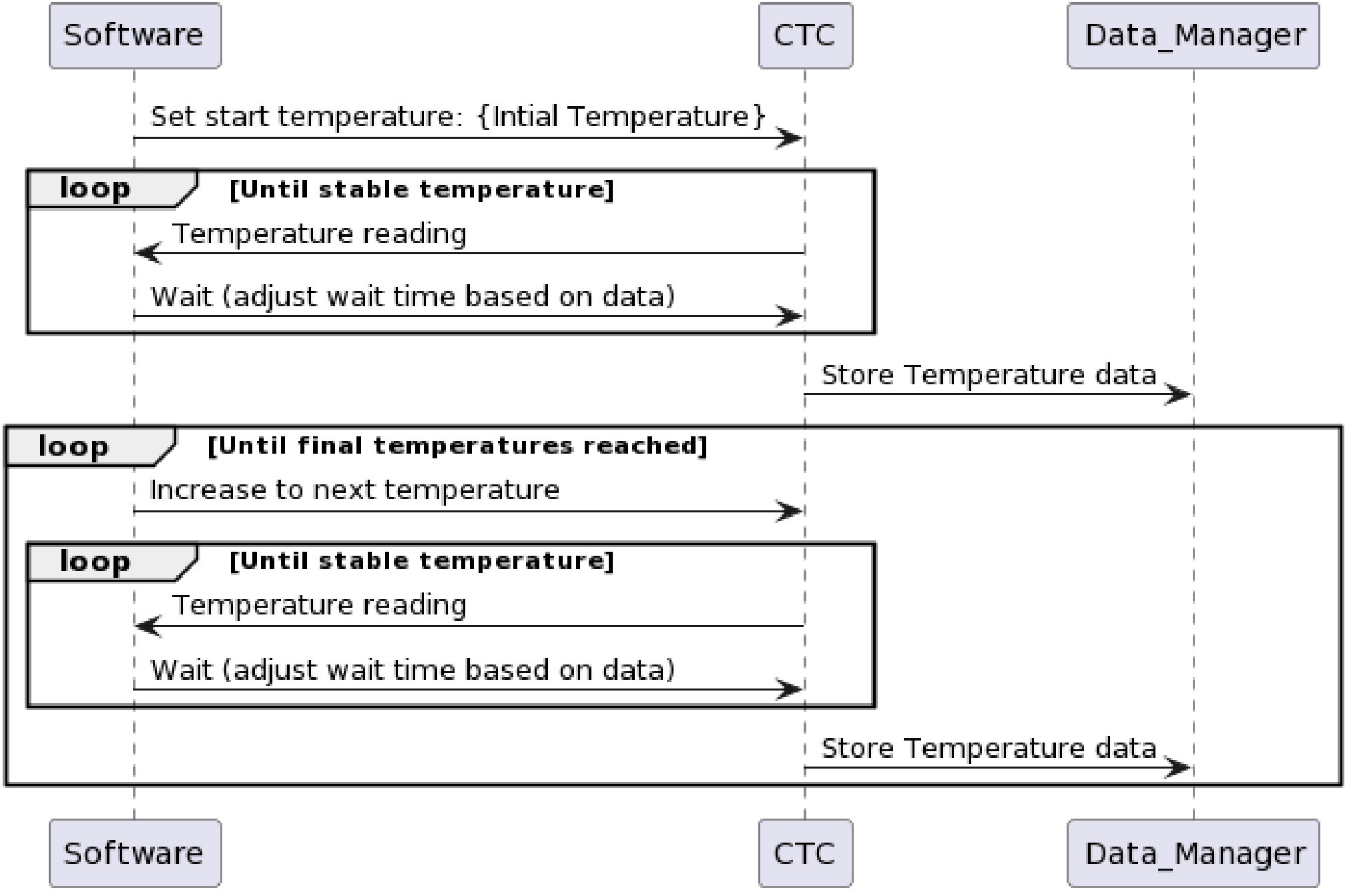

User
Software
Communication and Changing Temperatures with CTC
<<include>>
Communication with the Nanovoltmeter and Current Source
<<include>>
Calculation of Resistance
<<include>>
<<include>>
Real-Time Plotting of Data
<<extend>>
Save the plot
Auto-saving Collected and Calculated Data

CLASS DIAGRAM

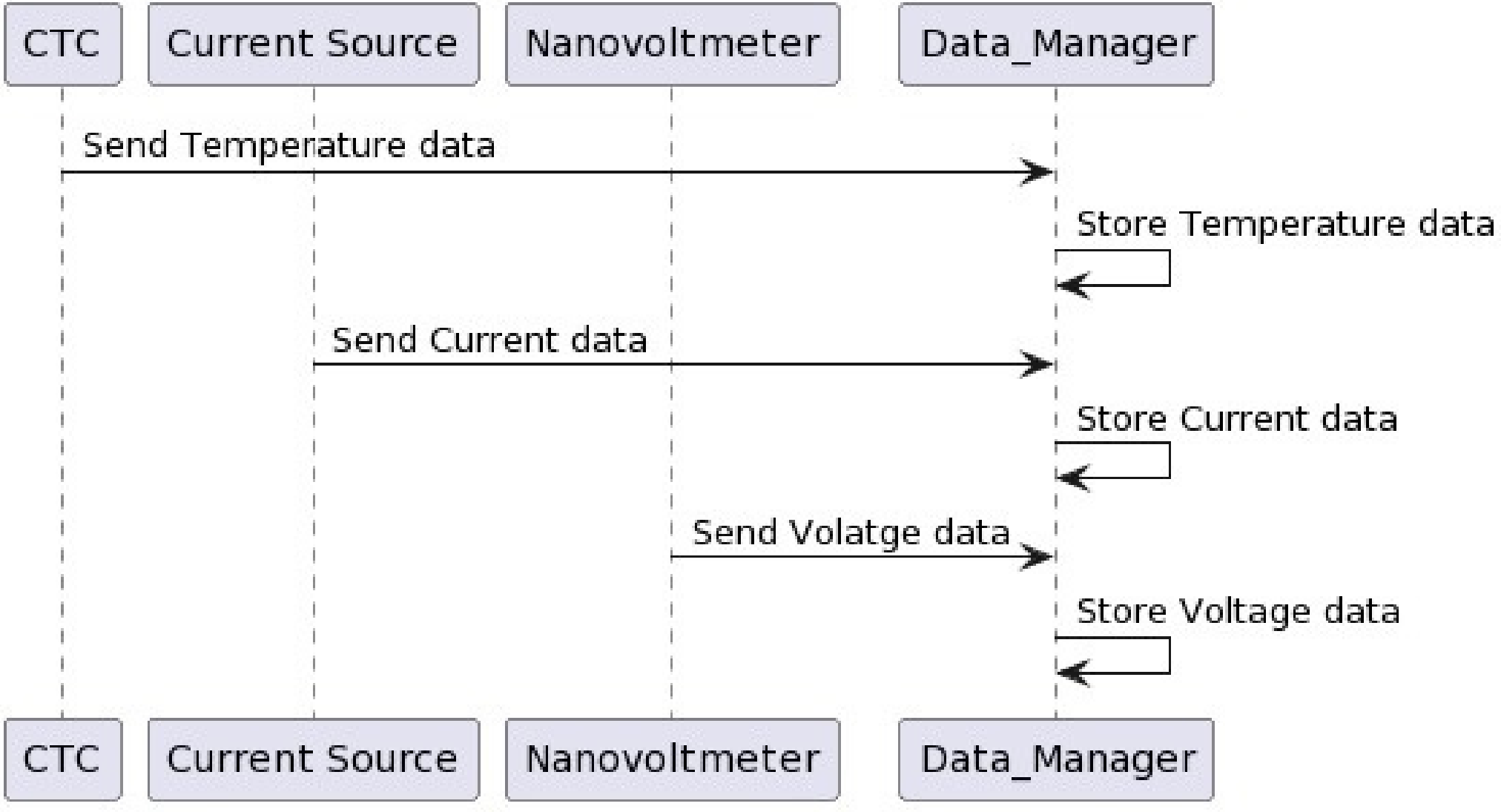

Software
INHERITED CLASSES
Resistance_Calculator
Get__Voltage(volt):bool
Get_Current(curr):bool
Get_Curr_direction(dir):bool
Functionality
Get_Avg_Resistance()
Save_Logs()
Graph_Plotter
Plot Frequency : Integer
Get_Temperature(temp):bool
Get_Avg_Resistance(res): bool
Functionality
Plot()
Configuration_Manager
device_name : String
input_dir : String
ctc_address : String
ctc_telnet : String
rs232_address : String
Functionality
Get_GPIB_Config()
Get_RS232_Config()
Get_Telenet_Config()
User_Interface
Windows_Settings
Widgets
Windows_Tabs
Functionality
DIsplay_Interface()
Display_Plot()
Data_Manager
Output_Dir : String
is_save_plot : bool
is_save_logs : bool
Functionality
Save_Logs_to_Dir()
Save_Plot_to_Dir()
Nanovoltmeter
Voltage : Integer
is_triggered: bool
is_sync_get : bool
is_sync_set : bool
Functionality
Get_Voltage()
CTC
Start_Temperature : Integer
Stop_Temperature : Integer
Interval_Temperature : Integer
Tolerance_Temperature : Integer
Functionality
Get_Temperature()
Increase_Temperature()
Trigger()
Sync_Set()
Sync_Get()
Current Source
Current: Integer
Current_Direction: String
is_triggered:bool
is_sync_get : bool
is_sync_set : bool
Functionality
Get_Current()
Get_Current_Direction()
Realisation
Aggregation
Dependency
Inheritance

SEQUENCE DIAGRAMS

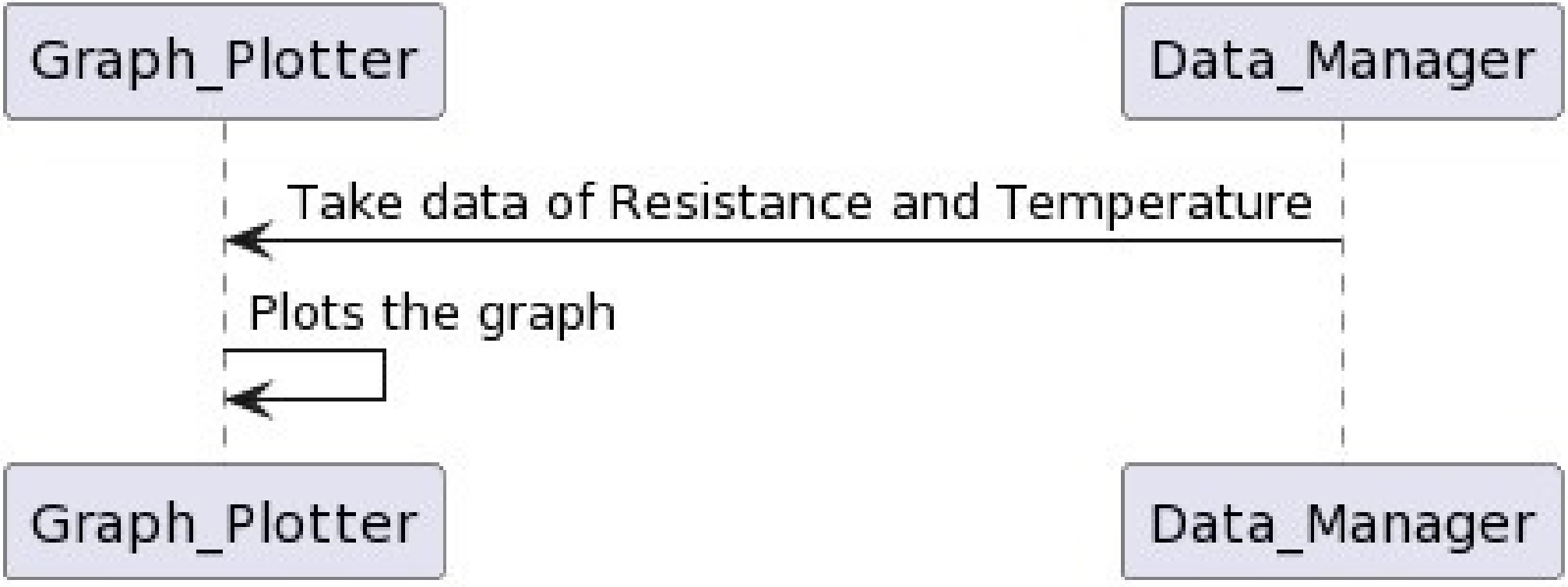
Communication with CTC



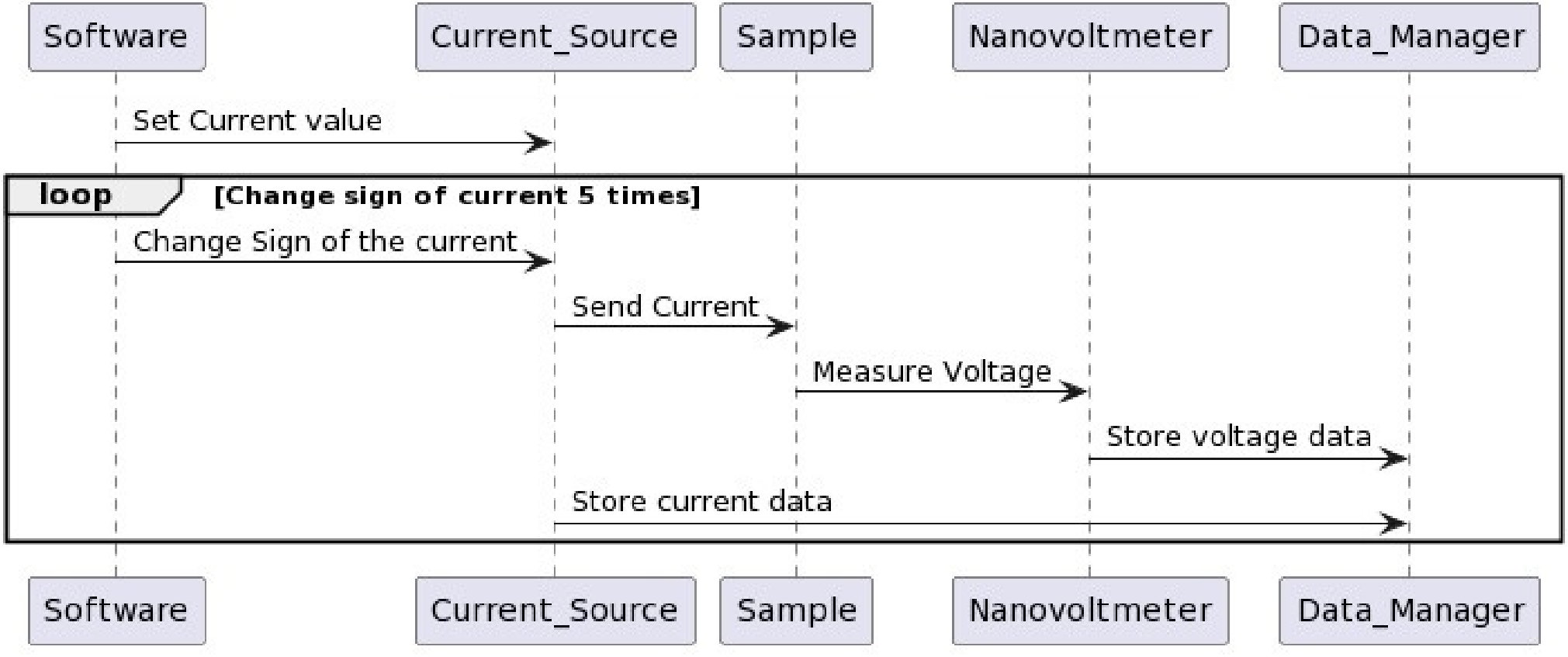
Auto Saving Data



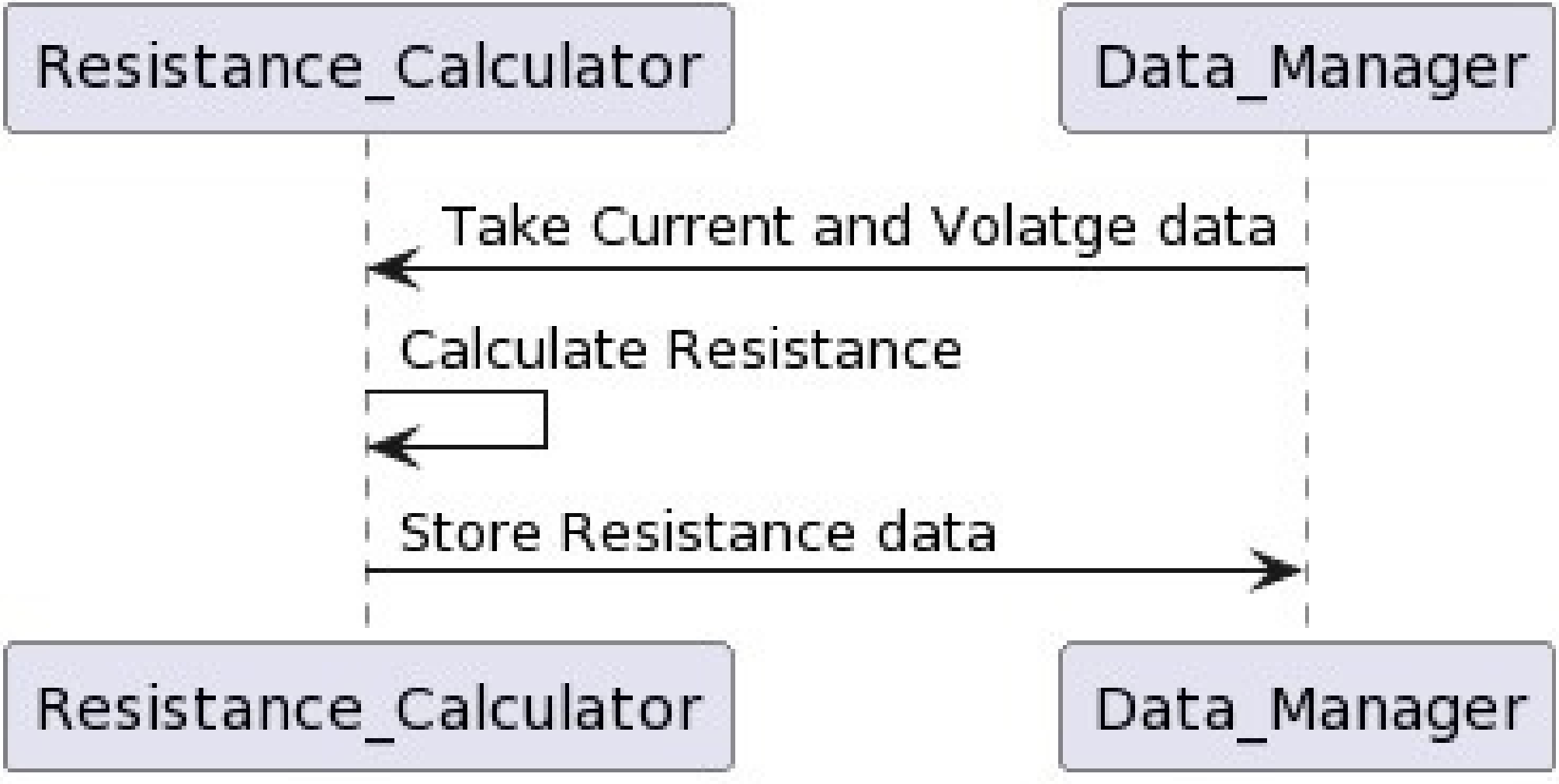
Real time plotting of Data



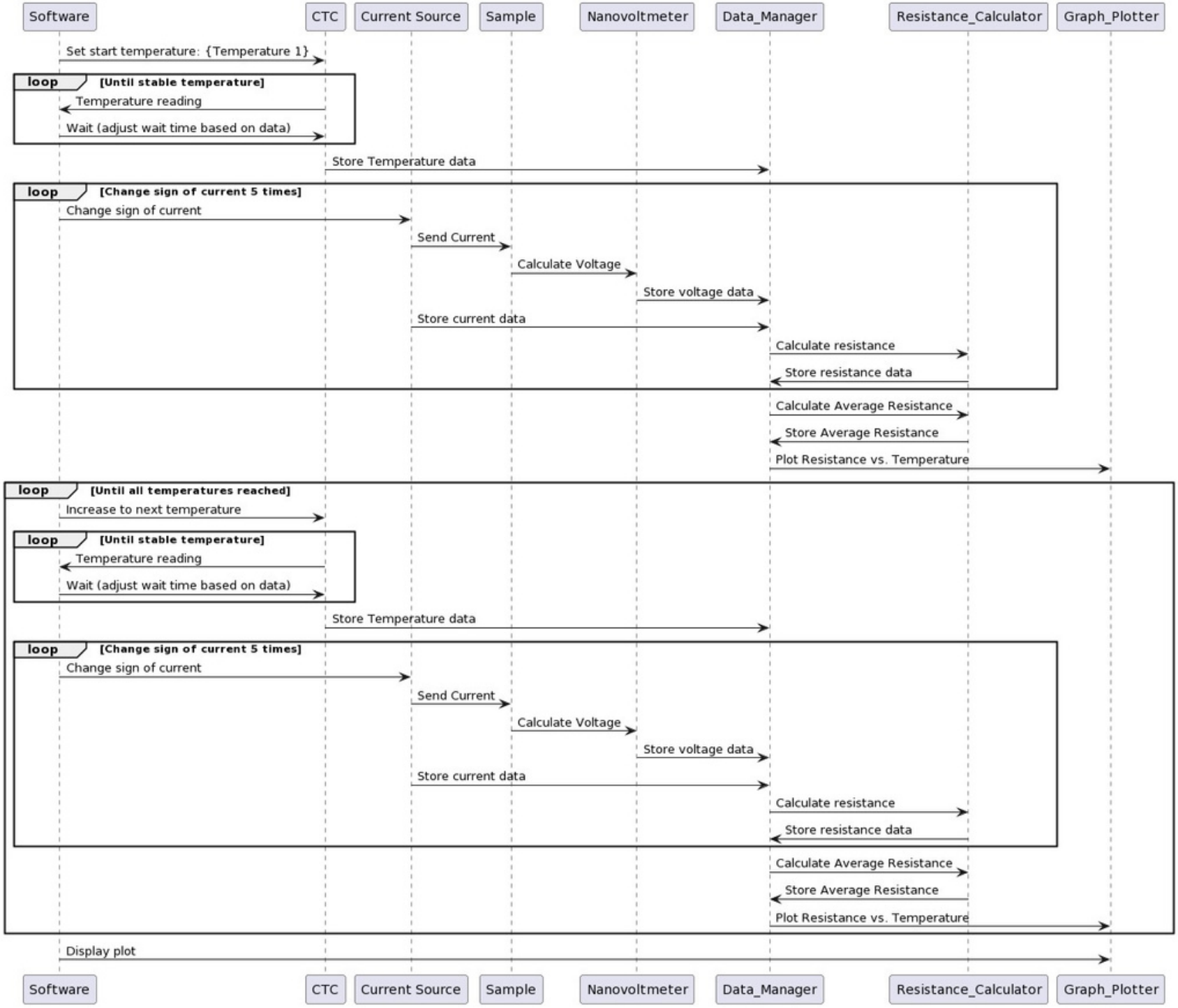
Communication with NanoVoltmeter and Current Source



Calculation of Resistance

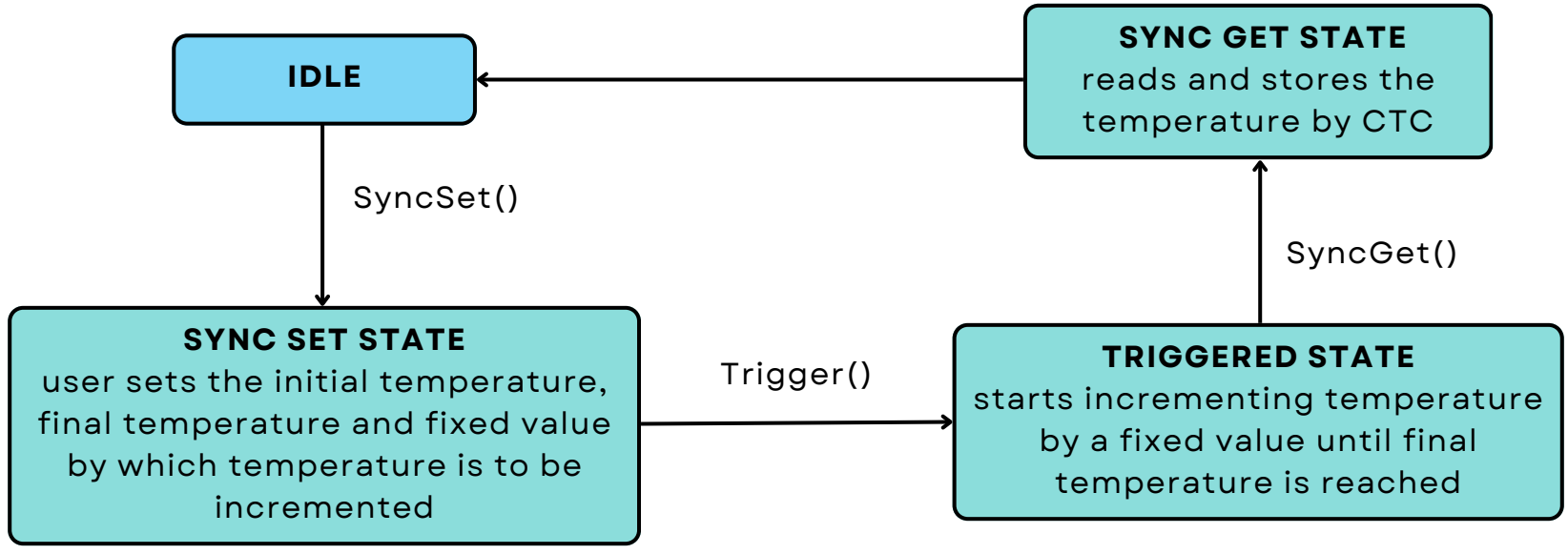


WorkFlow

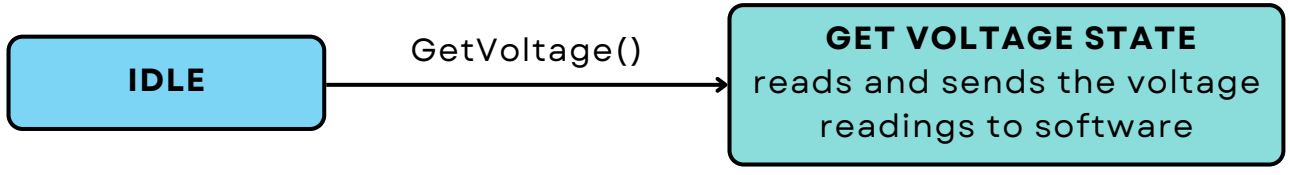

Software
CTC
Current Source
Sample
Nanovoltmeter
Data_Manager
Resistance_Calculator
Graph_Plotter
Set start temperature: {Temperature 1}
loop [Until stable temperature]
Temperature reading
Wait (adjust wait time based on data)
Store Temperature data
loop [Change sign of current 5 times]
Change sign of current
Send Current
Calculate Voltage
Store voltage data
Store current data
Calculate resistance
Store resistance data
Calculate Average Resistance
Store Average Resistance
Plot Resistance vs. Temperature
loop [Until all temperatures reached]
Increase to next temperature
loop [Until stable temperature]
Temperature reading
Wait (adjust wait time based on data)
Store Temperature data
loop [Change sign of current 5 times]
Change sign of current
Send Current
Calculate Voltage
Store voltage data
Store current data
Calculate resistance
Store resistance data
Calculate Average Resistance
Store Average Resistance
Plot Resistance vs. Temperature
Display plot
Software
CTC
Current Source
Sample
Nanovoltmeter
Data_Manager
Resistance_Calculator
Graph_Plotter

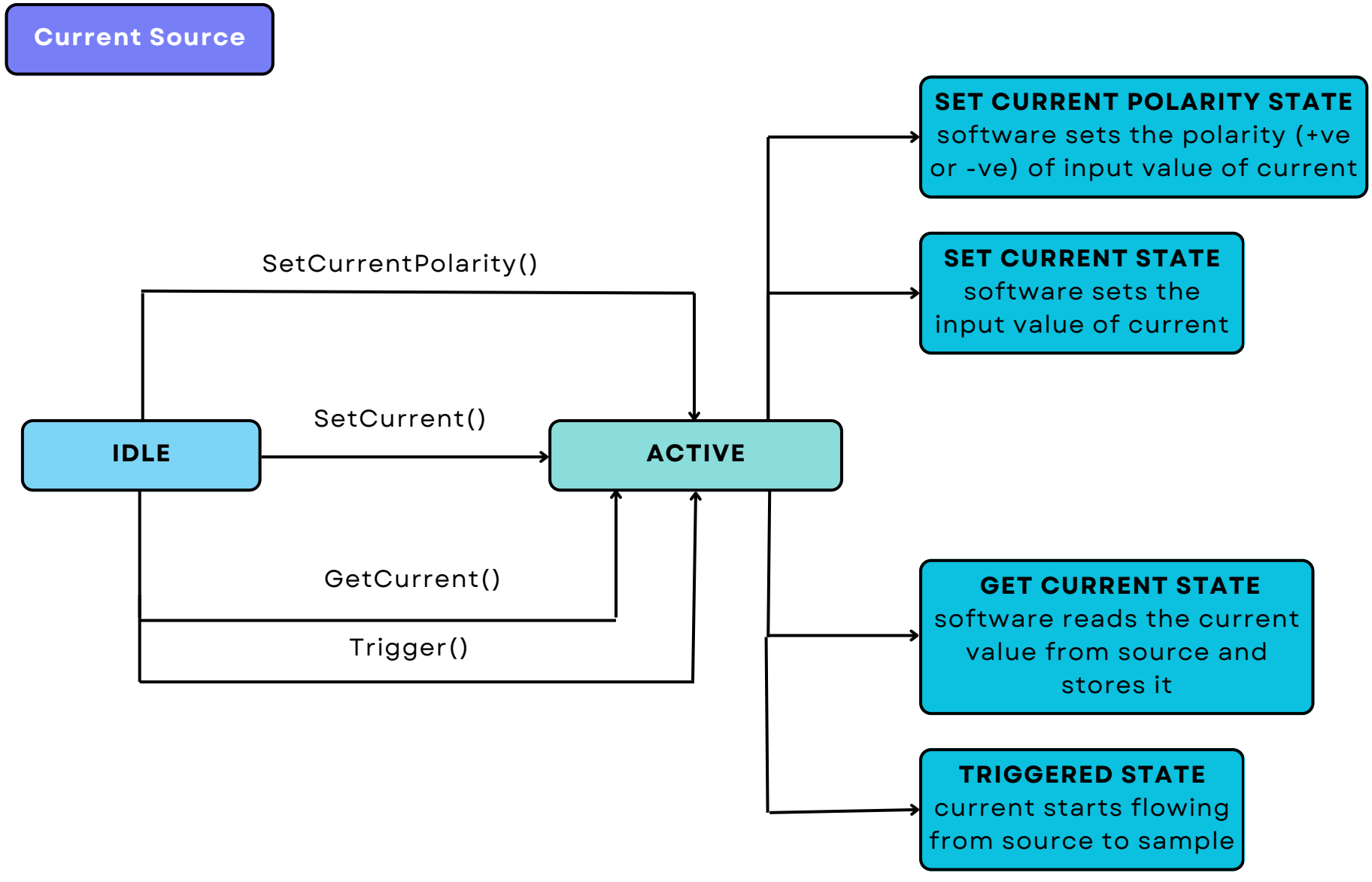
STATE CHART DIAGRAMS

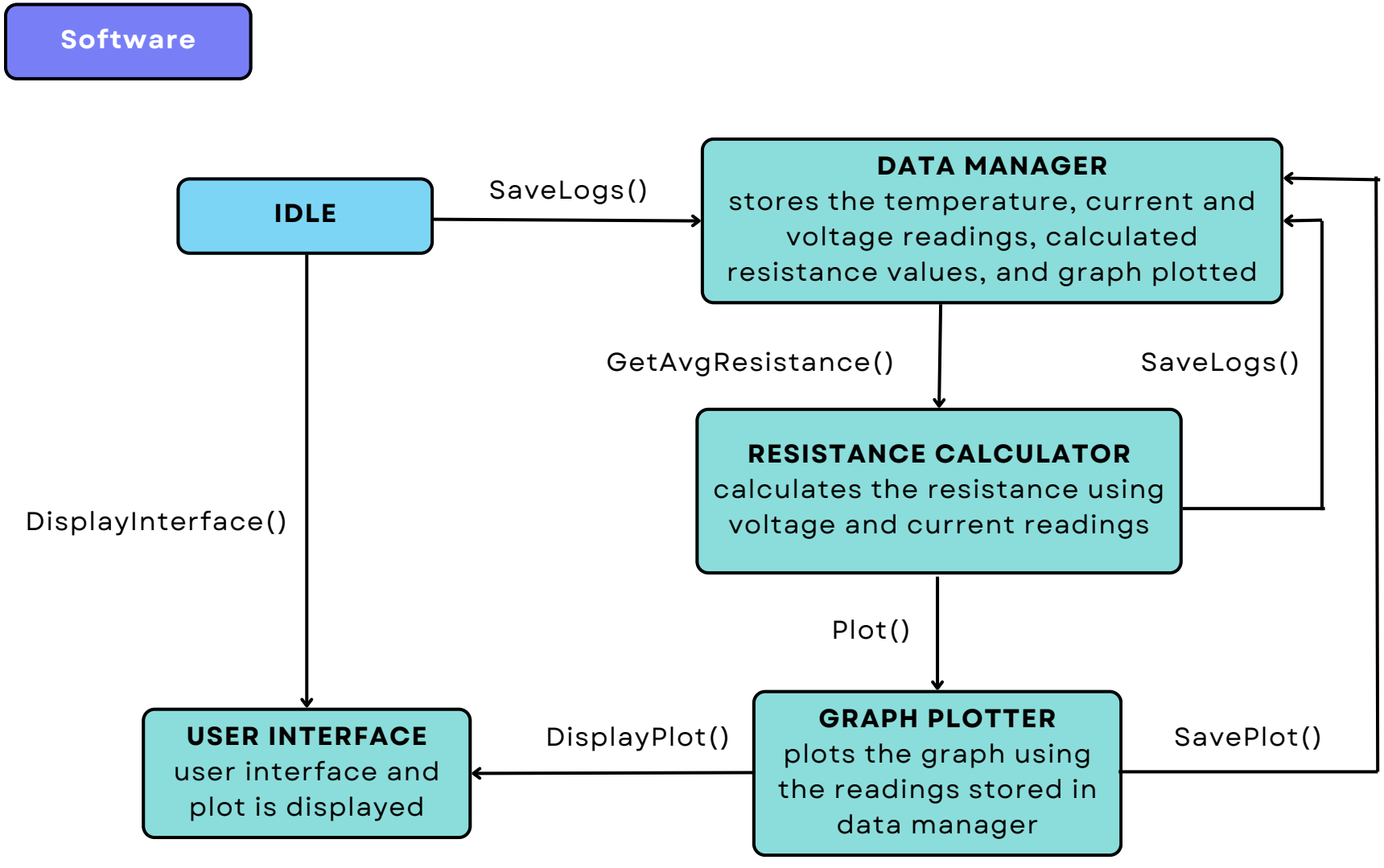
Cryogenic Temperature Controller (CTC-100)



Nano-voltmeter




Current Source
SetCurrentPolarity()
SetCurrent()
IDLE
ACTIVE
GetCurrent()
Trigger()
SET CURRENT POLARITY STATE
software sets the polarity (+ve or -ve) of input value of current
SET CURRENT STATE
software sets the input value of current
GET CURRENT STATE
software reads the current value from source and stores it
TRIGGERED STATE
current starts flowing from source to sample


Software
IDLE
SaveLogs()
DATA MANAGER
stores the temperature, current and voltage readings, calculated resistance values, and graph plotted
GetAvgResistance()
SaveLogs()
RESISTANCE CALCULATOR
calculates the resistance using voltage and current readings
DisplayInterface()
Plot()
USER INTERFACE
user interface and plot is displayed
DisplayPlot()
GRAPH PLOTTER
plots the graph using the readings stored in data manager
SavePlot()