

Model 2553A Precision DC Calibrator Simple Adjustment Procedure

Have a qualified engineer perform simple adjustment of the 2553A at a specialized facility with sufficient precision. The simple adjustment values are retained even when the settings are initialized. If you need to adjust the 2553A more accurately than that is possible with the simple adjustment feature or if you want calibration and adjustment to be performed at a YOKOGAWA factory, contact your nearest YOKOGAWA dealer. If calibration and adjustment are performed at a YOKOGAWA factory, all settings including the simple adjustment values will be initialized to their factory default values.



WARNING

- Ground the instrument before connecting the instrument to the target device. The power cord that comes with the instrument is a three-prong type power cord. Insert the power cord into a grounded three-prong outlet.
- Be sure to turn off the output before connecting or disconnecting the target device.

French



AVERTISSEMENT

- Relier l'instrument à la terre avant de le brancher sur l'appareil cible. Le cordon d'alimentation livré avec l'instrument est doté de trois broches. Brancher le cordon d'alimentation sur une prise de courant à trois plots mise à la terre.
- Toujours mettre hors tension avant de brancher ou de débrancher l'appareil cible.

In addition to the above items, be sure to observe the warnings and precautions provided in the "Wiring Precautions" and "Connecting Wires" sections in the 2553A User's Manual, IM 2553A-01EN.

Required Equipment and Components

- Digital multimeter (DMM) Keysight Technologies 3458A or equivalent
- Standard 10 Ω resistor Yokogawa Test & Measurement Corporation 2792A05 or equivalent
- Standard temperature device Coper Electronics ZC-114A or equivalent
- Thermocouple type K IEC 60584-1 Ed 3.0 or JIS C1602: 1995 compliant

Each piece of equipment and component must be calibrated and with sufficient precision.

Adjustment Conditions

- Ambient temperature: $23^{\circ}\text{C} \pm 2^{\circ}\text{C}$, humidity: 20%RH to 60%RH (no condensation), warm-up time: at least 60 minutes
- Permitted supply voltage range: 90 VAC to 132 VAC and 180 VAC to 264 VAC, permitted supply frequency range: 48 Hz to 63 Hz
- For 10 mV, 100 mV, and thermocouple adjustment ranges of the 2553A, perform adjustment with the 2553A output terminal temperature balanced and stable. During adjustment, be careful in keeping the output terminal temperature from changing.
- Set the DMM's integration time (NPLC) so that sufficiently stable measurements can be obtained (e.g., 20PLC or longer).
 - * NPLC: An acronym for Number of Power Line Cycles. It is a way of expressing the integration time.

Wiring

The 2553A and equipment are wired according to each function, namely voltage, current, thermocouple, resistance, and internal RJC.

For the wiring diagrams, see the wiring examples in the later "Explanation" section.

After wiring, operate the 2553A according to the procedure on the next page.

Procedure

Initializing the 2553A

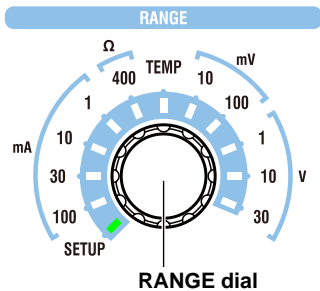
Initialize the 2553A settings.

Initialize the 2553A according to the procedure in "Initializing the Settings" in the 2553A User's Manual, IM 2553A-01EN.

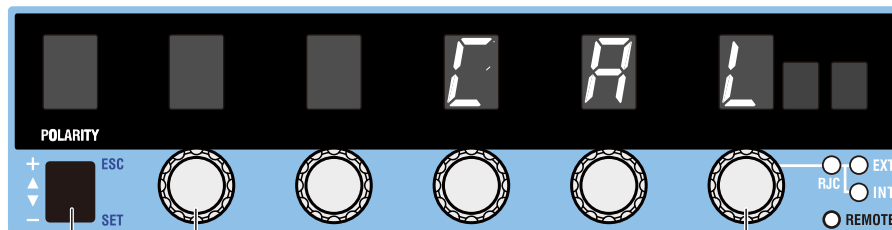
Switching to Simple Adjustment Mode

1. Turn the **RANGE** dial to select SETUP.
The SETUP menu appears.

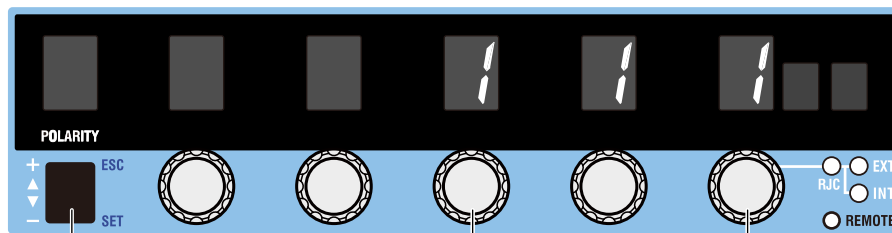
1. **Select SETUP.**
The SETUP indicator turns on.



2. Turn an **output setting** dial to select CAL.
3. Flip the **POLARITY** switch down.
"0" appears.

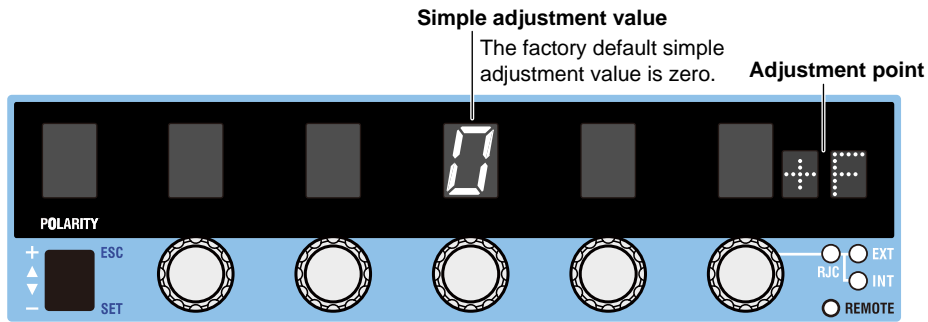


3. Display "0."
2. Select CAL.
4. Turn the three **output setting** dials on the right to set the password "111".
5. Flip the **POLARITY** switch down.



5. When authentication is successful, the 2553A switches to simple adjustment mode.
4. Set the password "111".

When authentication is successful, the 2553A switches to simple adjustment mode. The 30 V indicator of the RANGE dial illuminates, and the simple adjustment value for adjustment point +F appears.



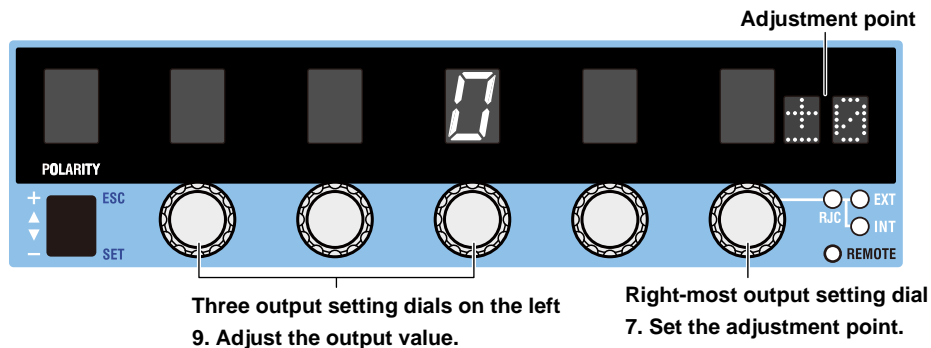
Selecting the Adjustment Range and Adjustment Point and Setting the Simple Adjustment Value

6. Turn the **RANGE** dial to select the adjustment range.
7. Turn the right-most **output setting** dial to select an adjustment point.

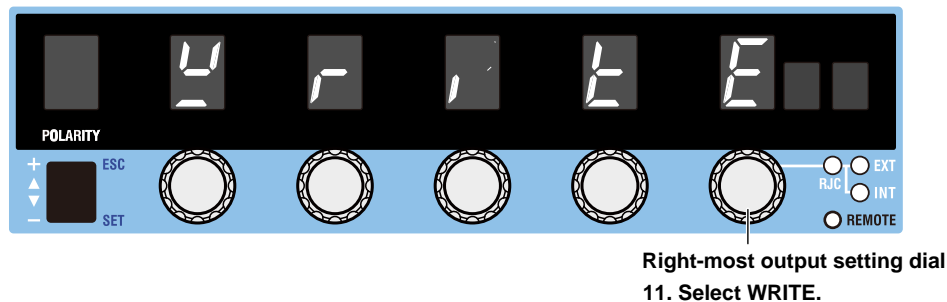
Adjustment points for the adjustment range are displayed. Select from these.

Adjustment Range	RANGE Dial Position	Adjustment Points
10 mV, 100 mV, 1 V, 10 V, 30 V	Voltage ranges	+F, -F, ± 0
1 mA, 10 mA, 30 mA, 100 mA	Current ranges	+F, -F, ± 0
Thermocouple	TEMP	+F, ± 0
Resistance	400 Ω	+F
Internal RJC	SETUP	± 0

8. Flip the **OUTPUT** switch up. The 2553A output turns on. The output value that corresponds to the adjustment range and adjustment point is transmitted from the 2553A output terminals to the measuring instrument (DMM).
9. While viewing the measured value, turn the three **output setting** dials on the left to adjust the 2553A output value.
For details on the adjustable range of each adjustment range, see the later explanation.



10. To set the simple adjustment values of other adjustment points in the same adjustment range, repeat steps 8 and 9.
11. Turn the right-most **output setting** dial to select WRITE. The 2553A output turns off.



12. Flip the **POLARITY** switch down. The simple adjustment values that you have set are written to the 2553A internal memory.
If you change the adjustment range or flip the POLARITY switch up before writing the values to the internal memory, the values are discarded, and the contents in the internal memory are not updated.
13. To set simple adjustment values of other adjustment ranges, repeat steps 6 to 12.

Exiting Simple Adjustment Mode

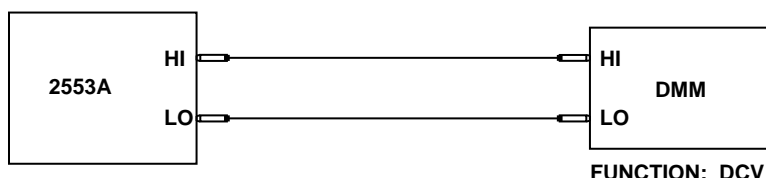
14. Flip the **POLARITY** switch up twice to exit simple adjustment mode and return to the SETUP menu display.

You can also exit simple adjustment mode by flipping the POLARITY switch up once to transition to the state in step 4, set "0," and then flip the POLARITY switch down.

Explanation

Voltage

Wiring Example



Adjustment

2553A Adjustment Range	Output at Each Adjustment Point			Adjustable Range	DMM Range
	+F	-F	±0		
10 mV	+10 mV	-10 mV	0 mV	±1000 ppm of the adjustment range (equivalent to ±0.01 mV)	100 mV
100 mV	+100 mV	-100 mV	0 mV	±1000 ppm of the adjustment range (equivalent to ±0.1 mV)	100 mV
1 V	+1 V	-1 V	0 V	±1000 ppm of the adjustment range (equivalent to ±0.001 V)	1 V
10 V	+10 V	-10 V	0 V	±1000 ppm of the adjustment range (equivalent to ±0.01 V)	10 V
30 V	+30 V	-30 V	0 V	±1000 ppm of the adjustment range (equivalent to ±0.03 V)	100 V

Current (1 mA range, 10 mA range)

Wiring Example



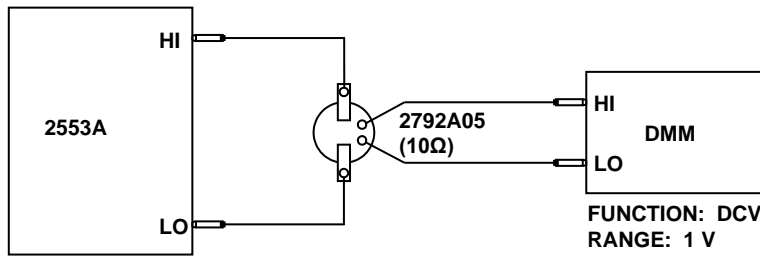
Adjustment

2553A Adjustment Range	Output at Each Adjustment Point			Adjustable Range	DMM Range
	+F	-F	±0		
1 mA	+1 mA	-1 mA	0 mA	±1000 ppm of the adjustment range (equivalent to ±0.001 mA)	1 mA
10 mA	+10 mA	-10 mA	0 mA	±1000 ppm of the adjustment range (equivalent to ±0.01 mA)	10 mA

Depending on the DMM current range, you may not be able to attain sufficient accuracy. If necessary, use a standard resistor and adjust by using a DMM voltage range, as shown in the next section. Use either method depending on the accuracies of the available ranges on the DMM.

Current (30 mA range, 100 mA range)

Wiring Example



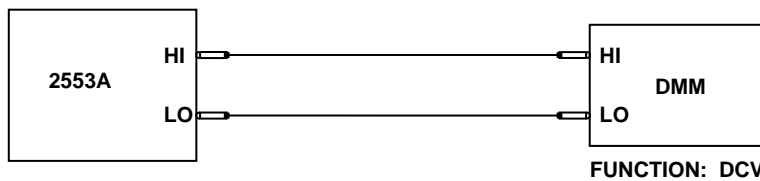
Adjustment

2553A Adjustment Range	Output at Each Adjustment Point			Adjustable Range	DMM Range
	+F	-F	±0		
30 mA	+30 mA	-30 mA	0 mA	±1000 ppm of the adjustment range (equivalent to ±0.03 mA: (DMM measurement/R ₀))	1 V
100 mA	+100 mA	-100 mA	0 mA	±1000 ppm of the adjustment range (equivalent to ±0.1 mA: (DMM measurement/R ₀))	1 V

R₀: 2792A05 resistance (calibration value)

Thermocouple

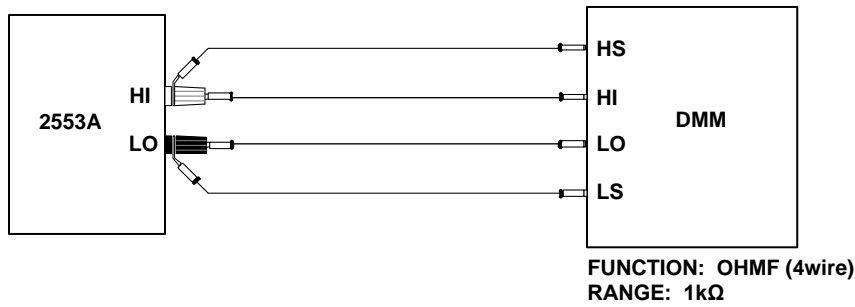
Wiring Example



Adjustment

2553A Adjustment Range	Thermoelectromotive Force at Each Adjustment Point		Adjustable Range	DMM Range
	+F	±0		
Thermocouple (TEMP)	50 mV	0 mV	±99.9 (equivalent to ±99.9 μV)	100 mV

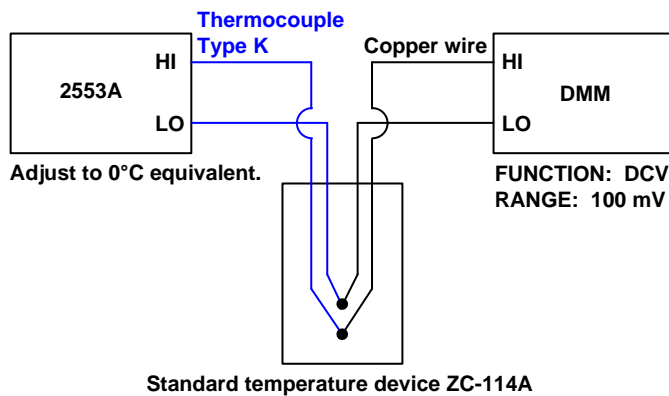
Resistance
Wiring Example



Adjustment

2553A Adjustment Range	Output at Each Adjustment Point +F	Adjustable Range	DMM Range
Resistance (400 Ω)	100 Ω	±1000 (equivalent to ±0.34 Ω)	1 kΩ, 1 mA excitation current

Internal RJC
Wiring Example



Adjustment

- The internal RJC is affected by the adjustment results of the thermocouple adjustment range, mentioned earlier. Adjust the internal RJC after you have adjusted the thermocouple adjustment range.
- Adjust to a value equivalent to 0°C by taking into account the error in the thermocouple that you will be using.
- The 2553A output display is in unit of °C, but the output terminals produce the thermoelectromotive force corresponding to the specified temperature.
- For details on handling the standard temperature device, follow the instruction manual of the device.

2553A Adjustment Range	Output at Each Adjustment Point	Adjustable Range	DMM Range
Internal RJC (SETUP)	0°C	±2.00°C	100 mV

Communication Commands

CALibrate Group

:CALibrate:ADJust:POINt

Function Sets or queries the adjustment point.

Syntax :CALibrate:ADJust:POINt {PFULL|MFULL|ZERO|OFF}

:CALibrate:ADJust:POINt?

PFULL: Positive adjustment point

MFULL: Negative adjustment point

ZERO: Zero

OFF :OFF

Example :CALIBRATE:ADJUST:POINT PFULL

:CALIBRATE:ADJUST:POINT? -> PFULL

Description The selectable parameters vary depending on the function set with the :CALibrate:FUNCTION command as follows.

VOLTage: {PFULL|MFULL|ZERO|OFF}

CURRent: {PFULL|MFULL|ZERO|OFF}

TCouple: {PFULL|ZERO|OFF}

RESistance: {PFULL|OFF}

RJC: {ZERO|OFF}

If set to OFF, the output setting display shows WRITE, and the output is turned off. If a query is made when the output setting display is showing WRITE, OFF is returned.

:CALibrate:ADJust:VALue

Function Sets or queries the simple adjustment value for the selected adjustment point.

Syntax :CALibrate:ADJust:VALue <NRf>

:CALibrate:ADJust:VALue?

- When the :CALibrate:FUNCTION command is set to <Voltage> or <Current>

<NRf> = -1000ppm to 1000ppm
(resolution: 1 ppm)

- When the :CALibrate:FUNCTION command is set to <Resistance>

<NRf> = -1000 to 1000
(resolution: 1)

- When the :CALibrate:FUNCTION command is set to <Thermocouple>

<NRf> = -99.9µV to 99.9µV
(resolution: 0.1µV)

- When the :CALibrate:FUNCTION command is set to <Internal RJC>

<NRf> = -2.00°C to 2.00°C
(resolution: 0.01°C)

Example :CALIBRATE:ADJUST:VALUE 1000

:CALIBRATE:ADJUST:VALUE? -> 1000

Explanation The adjustable range and resolution vary depending on the :CALibrate:FUNCTION command setting. If a value outside the adjustable range is specified, a "222:Dataout of range" error will occur.

:CALibrate:FUNCTION

Function Sets or queries the function (voltage, current, resistance, thermocouple, internal RJC) to perform simple adjustment on.

Syntax :CALibrate:FUNCTION {VOLTage|CURRENT|TCouple|RESistance|RJC}

:CALibrate:FUNCTION?

VOLTage: Voltage

CURRent: Current

TCouple: Thermocouple

RESistance: Resistance

RJC: Internal RJC

Example :CALIBRATE:FUNCTION VOLTAGE

:CALIBRATE:FUNCTION? -> VOLTAGE

Explanation If you change the function before executing the :CALibrate:WRITE command, the simple adjustment values that you have set will return to their original values. Be sure to write the simple adjustment values using the :CALibrate:WRITE command before changing the function.

:CALibrate:INITialize

Function Initializes the 2553A simple adjustment values.

Syntax :CALibrate:INITialize

Example :CALIBRATE:INITIALIZE

Explanation Executing this command will reset all simple adjustment values to zero.

:CALibrate:PASSword

Function Enters the password for switching to simple adjustment mode.

Syntax :CALibrate:PASSword <String>

<String>: Password

Example :CALIBRATE:PASSWORD "111"

Explanation You must enter a password to use the commands in the CALibrate group. Use a character string to set the password. To exit simple adjustment mode, enter an empty string (two consecutive double quotation marks).

:CALibrate:RANGE

Function Sets or queries the adjustment range.

Syntax :CALibrate:RANGE {<Voltage>|<Current>|<Resistance>}

:CALibrate:RANGE?

<Voltage> = 10mV, 100mV, 1V, 10V, 30V

<Current> = 1mA, 10mA, 30mA, 100mA

<Resistance> = 400OHM

Example :CALIBRATE:RANGE 1V

:CALIBRATE:RANGE?

-> :CALIBRATE:RANGE 1.0E+00

Explanation

- Before setting <Voltage>, use the :CALibrate:FUNCTION command to set the function to VOLTage.
- Before setting <Current>, use the :CALibrate:FUNCTION command to set the function to CURRent.
- Before setting <Resistance>, use the :CALibrate:FUNCTION command to set the function to RESistance.

If you set range of a different function, a "131: Invalid suffix" error will occur.

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- If the function is TCouple or RJC and you set the range, a "221: Setting conflict" error will occur. 9.91E+37 is returned as a response to a query.
 - If you change the adjustment range before executing the :CALibrate:WRITe command, the simple adjustment values that you have set will return to their original values. Be sure to write the simple adjustment values using the :CALibrate:WRITe command before changing the adjustment range.

:CALibrate:STATE

Function Sets or queries the output on/off state for simple adjustment.

Syntax :CALibrate:STATE <Boolean>
:CALibrate:STATE?
ON|1: Enabled
OFF|0: Disabled

Example :CALIBRATE:STATE ON
:CALIBRATE:STATE?
-> :CALIBRATE:STATE 1

Explanation If the :CALibrate:ADJust:POINT command is set to OFF, this command (:CALibrate:STATE) cannot be set to ON.

:CALibrate:WRITE

Function Writes the simple adjustment values to the 2553A internal memory.

Syntax :CALibrate:WRITE
Example :CALIBRATE:WRITE