SETUP AND USE OF A 20J3 STAGE

What's included

- 20J3 stage
- Four legs
- Sensor booster plate
- Four screws for attaching the legs
- Two screws for attaching the sensor
- Hex key wrench

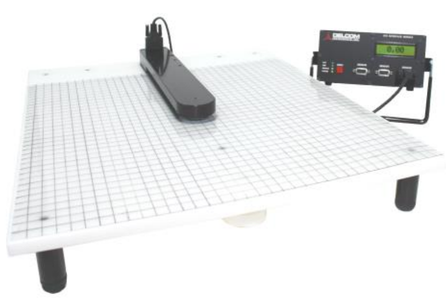
Stage components

The stage is composed of:

- A large stage surface with a cutout to accommodate the sensor
- A triangular platform, which raises and lowers the sensor relative to the stage surface
- A sensor booster plate, which boosts the sensor from the triangular platform to the stage surface
- A series of three pulleys, a belt, and a thumbwheel, which is used to raise and lower the triangular platform
- Four legs that provide clearance for the mechanisms located underneath the stage surface

Assembly instructions

1. Attach the four legs using the four included screws and hex key.
2. Place the sensor booster plate on the movable triangular platform.
3. Place the sensor on top of the sensor booster plate.
4. Reach underneath the stage and insert the two screws for attaching the sensor through the triangular platform and sensor booster plate and into the sensor.
5. Tighten the assembly snugly. There is no need to crank down on the screws.



Preparation of entire instrument for use

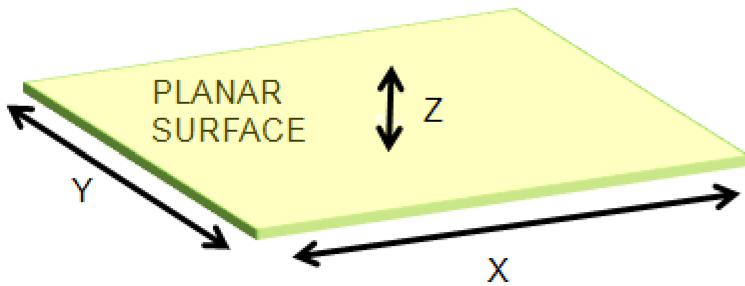
1. Mount the sensor in the stage
2. Connect sensor, module, and PC

3. Turn on the meter
4. If using Delcom software, open Delcom software application

Purposes of the stage

The stage serves three purposes:

1. To assist the user in controlling the elevation (*z* direction) of the material in the sensor gap
2. To assist the user in keeping track of the *xy* (planar) placement of the material in the sensor
3. To assist the user in mapping the material in the *xy* plane



How the stage works

The stage consists of a stage surface that holds the material at a fixed elevation. The triangular platform under the stage is suspended by screws that can be turned by the thumbwheel located in the front, underneath the stage surface. When this thumbwheel is moved left or right, the triangular platform moves up or down. The sensor is placed on top of the platform and therefore moves up and down when the thumbscrew is turned.

Note that material in the sensor gap can be damaged if the thumbscrew lowers the sensor such that the top half of the sensor presses on the material and crushes it.

The stage surface is optimized to receive an overlay designed for specific applications by the user.

For further specifications on the stage, see Delcom_DS2_20J3 Stage.

The effects of elevation on readings

The elevation of the conductive layer in the sensor gap affects the meter's readings. Material placed in close proximity to either half of the sensor will read as less resistive than when placed in the middle of the sensor gap. For best results, the user should place material into the sensor at the same elevation each time. A stage is the most convenient way to achieve this. (See Delcom_KC7_Effects of Elevation in Gap.)

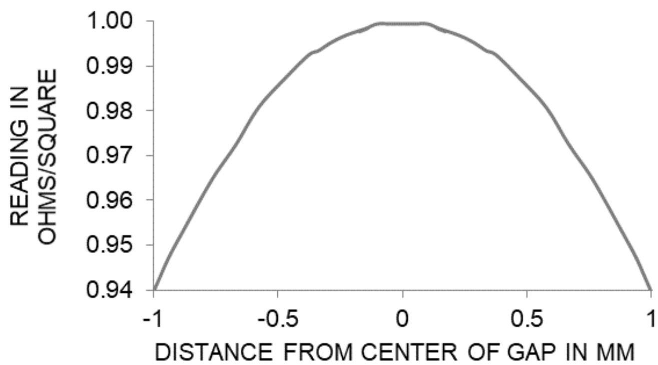


Chart 1. Effects of elevation in gap

The magnetic center

The user can choose any elevation at which to present material to the sensor—however, Delcom recommends that the user attempt to present the center of the conductive layer into the magnetic center of the sensor gap. There are two reasons for this:

1. Delcom calibrates meters to expect the conductive layer in the magnetic center of the sensor. Without any further calibration by the customer, the materials will read a lower sheet resistance if introduced to the sensor higher or lower than the magnetic center.
2. At the magnetic center, the curve (presented in Chart 1) representing the effects of elevation on reading is most forgiving of slight errors in the control of the elevation. In other words, when material is near the magnetic center, the meter will read the same even if the material misses the magnetic center by a few microns. But, if the user has calibrated the meter to expect the conductive layer near one of the faces of the sensor, the curve representing the effects of elevation is much steeper. At such an elevation, a few microns of elevation inaccuracy could result in significantly different readings.

Finding the magnetic center

The magnetic center can easily be found by following a simple process:

1. Zero the meter.
2. Turn the thumbwheel (located in the front and underneath the stage) until the lower half of the sensor is roughly flush with the sensor stage platform.
3. Take any conductive material and place it in the sensor head.

4. Turn the thumbwheel to the right (as seen from the front of the stage). The sensor's readings will become gradually less conductive, then hit an inflection point and start to become more conductive. In ohms/square, the readings will become higher, hit an inflection point, and then decrease again.
5. Whether the meter is set in sheet resistance or sheet conductance, the inflection point is the magnetic center of the instrument. The user can adjust the elevation thumbwheel back and forth until the elevation of the magnetic center is found.
6. Then place every subsequent material being measured into the same elevation to get repeatable readings.

Calibration to an elevation other than the magnetic center

Some users need much of the sensor gap to accommodate a thick nonconductive substrate. For this reason, the conductive layer cannot be presented into the sensor at the magnetic center.

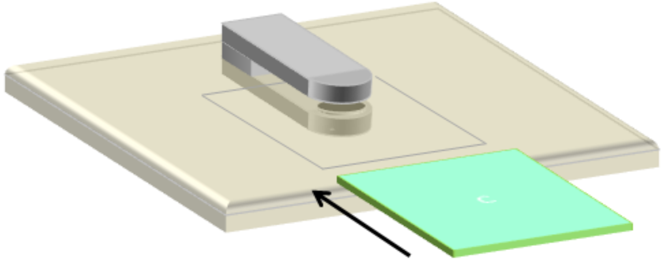
In such a situation, the user should:

1. Choose the height at which all of the conductive layers will be presented into the sensor
2. In the Delcom software, go to Calibration, Digital Slope Fit window
3. Zero the meter
4. Insert a standard of known value into the sensor at the new calibrated height
5. Enter the value of the standard, press Set, and check the radio button next to this box to indicate that you want to use this calibration

Now the meter is calibrated to this elevation. All subsequent readings will expect conductive layers to be presented at this elevation. To revert to the factory settings, merely uncheck the box in the Digital Slope Fit window.

Control of *XY* placement of the material

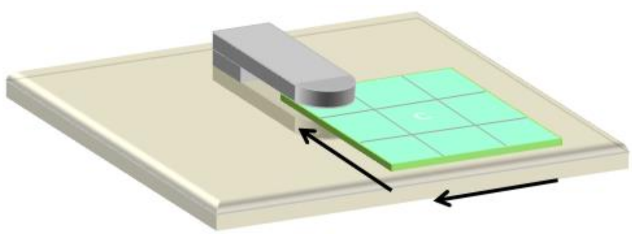
For many applications, users may wish to present material into the sensor at the same position in the *xy* plane. Users can mark the surface of the stage in any way they wish to ensure consistent placement of material.



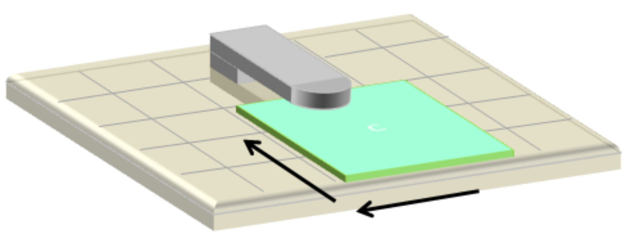
Manual mapping

Mapping of a sheet, panel, or wafer can be easily accomplished using a 20J3 Sensor, 20J3 Stage, and Delcom Software. For conception background on mapping sheet resistance of material, see Delcom_KC15_Manual Mapping.

1. Track material location
    a. Method 1: Mark the material
        i. Use a clear plastic sheet protector of the appropriate size
        ii. Mark a grid on the sheet. The dimensions of grid increments are at the user's discretion.
        iii. Place material to be mapped in the sheet protector

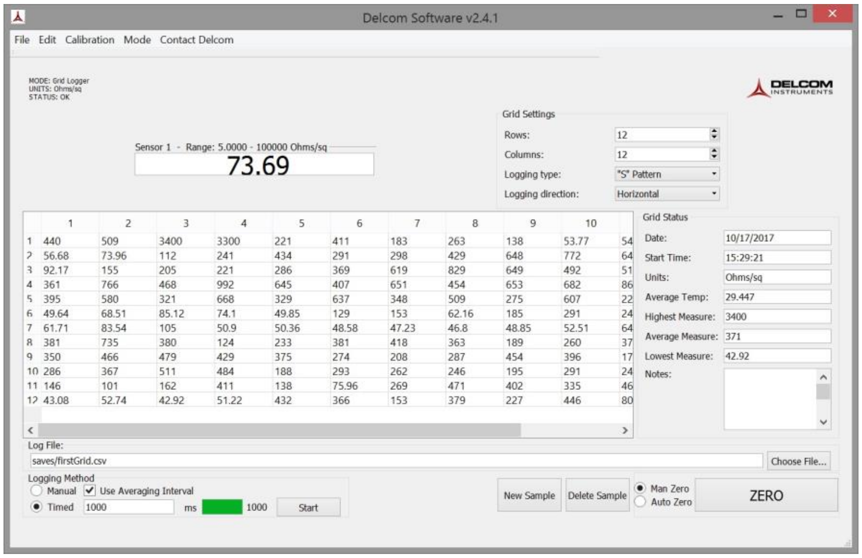


    b. Method 2: Mark the stage
        i. Mark a grid onto the stage surface
        ii. Track increments by moving the edge of the material from one grid line to the next.



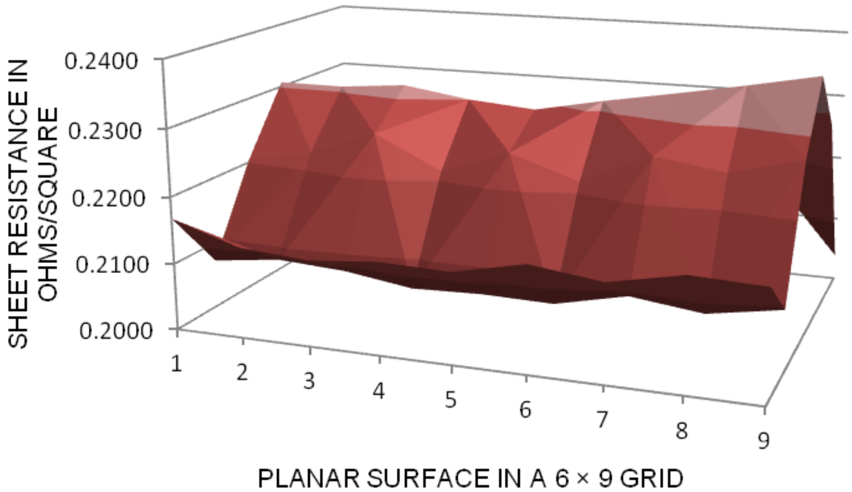
2. Set stage elevation (See Delcom_KC7_Effects of Elevation in Gap)
    a. Place the material (enclosed in the sheet protector) on the stage
    b. Move the material until the center of the sheet is in the sensor spot
    c. Ensure the material is in the center of the sensor gap by moving the stage elevation up and down until the meter displays the lowest value in mhos/square (or the highest value in ohms/square).

3. Set up the software
    a. Open the Delcom software, click Mode, and select Grid Logging.
    b. Choose the number of rows and columns to match those on the sheet protector or stage surface, and choose logging pattern and direction.
    c. Under Logging Method, choose Manual or Timed.
    d. Select the file path for the document save.



Screenshot 1. Delcom software in grid logging mode

4. Manually map the material
    a. Zero the meter.
    b. Place the first grid increment to be mapped in the sensor spot.
    c. Log the data.
        i. If using the timed logging method, set the timer to the desired number of milliseconds, and then press Start. Increment the material one square over (or half an increment) at the completion of the countdown timer.
        ii. If using the manual logging method, press New Sample. Increment the material one square over (or half an increment) and press New Sample again.
    d. Upon completion, the data will already be in the destination you chose before beginning the mapping. There is no need to save when the mapping is finished—the data has been saving in real time.
5. Perform post-process analysis and display
    a. Open in the file (ending in .csv) in Microsoft Excel.
    b. It is simple to create a chart to display data graphically. Select the data, then click Insert, Chart, and Surface.



SHEET RESISTANCE IN OHMS/SQUARE
0.2400
0.2300
0.2200
0.2100
0.2000
1
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PLANAR SURFACE IN A 6 × 9 GRID

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