SARGON INDUSTRIES, INC.

PRELIMINARY OPERATIONAL INSTRUCTIONS

FOR

650 SERIES D.R.O. DISPLAYS

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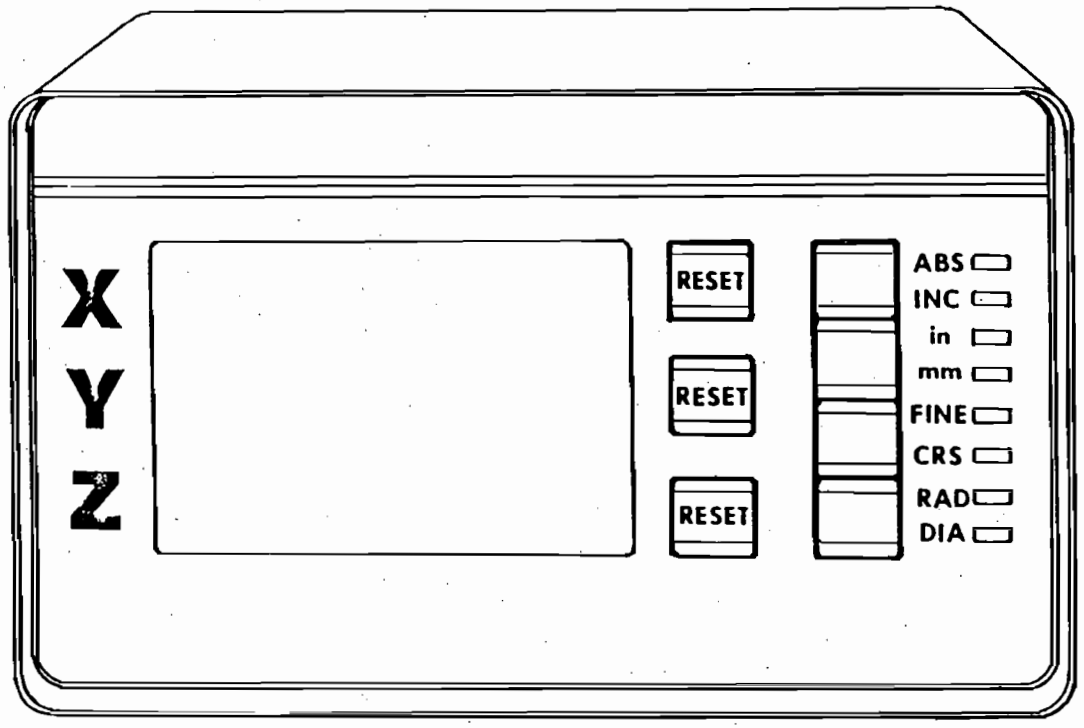

Sargon Industries, Inc.
650 Display
112587-LD
Ludwig Dooman

650 SERIES GENERAL OPERATING INSTRUCTIONS:

A. GENERAL:

The following general operational instructions are common to models 651a, 652A and 653A Digital Readout Displays.

All 650 displays incorporate a unique "non-volatile" memory feature that replaces the old "battery back-up" technology still used by other D.R.O. manufacturers. This feature represents the latest in solid-state and integrated circuit technology. The power supply has a special AC power monitoring detector. This detector commands the microcomputer to store its data in a special memory integrated cicuit upon a power loss condition.

The non-volatile memory is featured when the operator initially turns the display's AC power switch to "ON". The displays digits will flash a series of eights informing the operator that the AC power is on, the computer related electronics is operational, and the last numbers before power went off are now displayed.

WARNING: WHEN AC LINE VOLTAGE DROPS BELOW THE MACHINE-TOOL POWER TOLERANCES THE MEASUREMENT SYSTEM ACCURACY MAY HAVE BEEN JEOPARDIZED.

B. PANEL CONTROLS:

The description of the 650 Series counter display common controls are as follows:

1. AXIS RESET KEY PAD SWITCH: The RESET switch zeros the counter's relevant axis display to an incremental "floating zero".

2. INCH/MM KEY PAD SWITCH: The display's microcomputer converts inch to millimeter dimensions or millimeter to inch dimensions by activating the inch/mm key pad switch to mm or inch.

3. RADIUS/DIAMETER KEY PAD SWITCH: This switch programs the display's "Y" axis microcomputerto convert radius diameter measurements to diameter/radius dimensions. When the switch is activated from radius to diameter, the display reading will double the measured value. Example: If there is a 2 micron scale mounted on a lathe cross slide and it is reading a radius

dimensional value of 0.111 mm, when the operator switches the radius/diameter switch to diameter, the displayed value will immediately change from 0.111 mm to 0.222 mm.

4. ABSOLUTE/INCREMENTAL: ABS/INC mode key pad switch. This switch selects an updated count of either the Absolute, or the Incremental position.

5. FINE/COARSE KEY PAD SWITCH: The Fine/Coarse switch is an exclusive feature that enhances production, reduces scrap, and operator fatique. With this control the operator selects the optimal scale resolution for the job. EXAMPLE: The example machine tool has a 0.0005" (0.01 mm) resolution scale, therefore the display's "FINE" mode will resolve measurements in 0.0005" (0.01 mm) incremental steps, and its COARSE mode will resolve 0.001" (0.02 mm) incremental steps.

6. MACHINE ERROR COMPENSATION (M.E.C.). The M.E.C. keylock switch located on the rear panel with non-volatile memory is an **EXCLUSIVE** feature that facilitates secured machine error compensation in a matter of seconds, and cannot be lost during a power failure.

   Examples of linear machine errors that can be compensated for, are errors realized by geometric distortion such as ways, gibs, and table distortions. These errors can be automatically compensated for by measuring the error of a dimension and programming the compensation factor into the relevant axis microcomputer program.

7. ON/OFF SWITCH: The ON/OFF switch is located on the display's rear panel. AC power is activated to the display's electronics when the switch is in the "ON"(-) position. AC power is removed from the display's electronics when the power switch is in the "OFF" (0) position.

NOTE: All dimensional information is saved during a power failure status.

C. OPERATIONAL PROCEDURES:

1. ON/OFF : To activate unit depress the ON/OFF switch to position marked (-). When you first turn unit on segments will flash. Depress any key on keypad and unit is now ready to operate.To turn unit off, depress the ON/OFF switch to the position marked (0).

2. INCH/mm CONVERSION:

(A) INCH MODE:

Toggle key pad switch, located to the left of the inch/mm L.E.D. red lights so the inch L.E.D. light is illuminated.

ACTION: The system is now ready to operate in the inch mode.

(B) mm MODE:

Toggle key pad switch located to the left of the inch/mm L.E.D. red lights, so the mm L.E.D.light is illuminated.

ACTION: The system is now ready to operate in the metric mode.

3. ABSOLUTE/INCREMENTAL (ABS/INC)

(A) (ABS) ABSOLUTE MODE:

Toggle key pad switch located to the left of the ABS/INC L.E.D. red lights, so the ABS L.E.D.light is illuminated.

ACTION: The system is now ready to operate in the (ABS) Absolute mode.

(B) (INC) INCREMENTAL MODE:

Toggle key pad switch located to the left of the ABS/INC L.E.D. red lights, so the INC L.E.D. light is illuminated.

ACTION : The system is now ready to operate in the (INC) Incremental mode.

(C) INCREMENTAL RESET:

To clear the display's incremental dimension, select and toggle the relevant axis RESET key pad switch.

ACTION: The relevant axis display will depict zero.

(D) ABSOLUTE RESET:

To clear the display's absolute data, select and toggle the relevant axis RESET key pad switch while simultaneously depressing the ABS/INC key pad switch.

ACTION: The relevant axis display will depict zero.

4. FINE/COARSE:

(A) FINE MODE:

Toggle key pad switch located to the left of the FINE/COARSE L.E.D. red lights, so the FINE L.E.D. light is illuminated.

ACTION : The system is now ready to operate in the FINE mode.

(B) COARSE MODE:

Toggle key pad switch located to the left of the FINE/COARSE L.E.D. red lights, so the COARSE L.E.D. light is illuminated.

ACTION: The system is now ready to operate in the COARSE mode.

5. RADIUS/DIAMETER: (RAD/DIA)

(A) RADIUS MODE:

Toggle key pad switch located to the left of the RAD/DIA L.E.D. red lights, so the RADIUS L.E.D. red light is illuminated.

ACTION: The "Y" axis is now ready to operate in the RADIUS mode.

(B) DIAMETER MODE:

Toggle key pad switch located to the left of the RAD/DIA L.E.D. red lights, so the DIAMETER L.E.D.red light is illuminated.

ACTION: The "Y" axis is now ready to operate in the DIAMETER mode.

THE LAST DIMENSION BEFORE POWER OFF IS NOW DISPLAYED.

(6) MACHINE ERROR COMPENSATION:

For the best accuracy, machine error compensation should be done in the unit of measurement that is going to be predominantly used for a particular job. If the the job is in metric then calibrate the system in metric. If the job is in Imperial measurement then calibrate the system in inch.

STEP 1. Select the table area to be calibrated. Example: If the table working area has six inches of displacement then select a 6" 152.4 mm standard gage block.

STEP 2. Reset the incremental and absolute counters to zero.

ACTION: Both incremental and absolute display should depict zeros.

STEP 3. Traverse the table until the display reads the correct calibrated number. Reference to the above 6" (152.4 mm) example, the display would depict 6" (152.4 mm).

STEP 4. Turn the M.E.C. key lock switch located on the rear panel, clockwise to the "CAL" position.

STEP 5. Reset the selected axis to read ZERO on the display.

STEP 6. Measure the machine tool displacement error in the classical manner, using the DRO standard unit of length such as a certified gage block and a dial indicator. It is recommended to compensate for the error at the machine tool table working area such as the vice or job location.

WARNING: THE ABOVE STANDARD MEASURING PROCEDURE MUST BE COMPLETED IN ONE DIRECTION. DO NOT REVERSE THE TABLE DIRECTION DURING THE CALIBRATION PROCEDURE. IF THE TABLE CHANGES DIRECTION THE DISPLAY'S MICRO COMPUTER WILL MEMORIZE THE WRONG MACHINE ERROR CALIBRATION FACTOR.

ACTION: The display will now depict the unit length of the gage block, plus the system error.

STEP 7. Turn the M.E.C. keylock switch to the "OFF" position.

ACTION: The Display should now depict the corrected dimension as set up in para 5. step 3.

NOTE: If the MEC operational procedure has NOT BEEN PROPERLY performed follow the steps below.

STEP 1. Turn the MEC switch from the "CAL" position to the "OFF" position.

STEP 2. Repeat Para. 6 (Machine Error Compensation)

SECTION 2. THE DISPLAY UNITS.

2.1 650 SERIES DISPLAYS.

The following general operating instructions apply to all 650 series displays (models 651, 652 and 653).

Note that the third digit in the part number signifies the number of axes; thus

651 is a single axis unit.
652 is a two-axis unit.
653 is a three-axis unit.

A. GENERAL

(1) **NON-VOLATILE MEMORY** . All 650 Series displays incorporate a **non-volatile memory** feature that protects and stores the data in the event of a **power failure.**
This feature comes into play when the display's AC power is turned on. The display digits will flash a series of eights, informing the operator that the AC power is on and that the unit is working. To remove the flashing eights the operator must press any push-button, whereupon the numbers which were stored when the power went off will be displayed. It follows that, if the scale setting has been changed during power failure, the display will no longer be indicating the current position.

(2) **DIP SWITCHES.** The printed circuit board containing the display cicuitry also includes a number of **DIP** switches which are set in the factory to select certain options. Although these are not intended for use as operational controls, it is possible for them to be changed in the field if necessary. A table to show the effect of the settings of these switches is included as **Appendix A.**

B. FRONT PANEL CONTROLS.

The 650 Series display controls are as follows:

1.RESET: There is one **RESET** push-button for each axis. Each is used to reset the relevant axis display to zero.

2.INCH/MM PUSH-BUTTON: This acts as a toggle switch to change the display reading from inches to millimeters or from millimeters to inches, as required. A small red light (LED) indicates the current mode.

3.RADIUS/DIAMETER PUSH-BUTTON: This is intended for lathe applications and normally applies to the **Y-axis only;** however, it can also be used on the other axes by setting the DIP switches in the appropriate positions (see Appendix A). It

gives the operator a choice of displaying **RADIUS** or **DIAMETER** (which is,of course,equal to twice the radius).Thus, changing from **RADIUS** to **DIAMETER** will result in the displayed value being doubled and changing from **DIAMETER** to **RADIUS** will result in it being halved. The push-button acts as a toggle switch and a small red light (LED) indicates the current mode.

4. **ABSOLUTE/INCREMENTAL PUSH-BUTTON.** The 650 series display units have two seperate counters for each axis. The first counter continuously measures the distance from the starting point of the job and this is called the **ABSOLUTE** dimension.The second counter is used to measure the distance from any other reference point selected by the operator and this is called the **INCREMENTAL** dimension.
The axis display can be used to show either the **ABSOLUTE** or the **INCREMENTAL** dimension, the choice being made by the operator by use of the **ABS/INC** push-button. There are two small red lights (LEDs) adjacent to this push-button, one marked **ABS** and the other marked **INC**, to show which mode the display is in; each push of the **ABS/INC** button will change the mode.

5.**FINE/COARSE** PUSH-BUTTON: This gives the operator a choice between two levels of resolution,differing by a factor of two, according to the requirements of the job. The current mode is indicated by a small red light (LED).

C. **REAR-PANEL SWITCHES.**

1.**MACHINE ERROR COMPENSATION** (M.E.C.) SWITCH: This switch is located on the rear panel and enables data to be stored in the memory of the unit (and to be retained in the event of a power failure) to compensate for certain types of linear machine error. This type of error includes those due to geometric distortion of ways,gibs and tables and machine wear. The normal position for this switch is the **OFF** position.

2.ON/OFF SWITCH: This is located on the rear panel. A.C. power is supplied when the switch is in the **ON(1)** position and removed when it is in the **OFF(0)** position.

D. OPERATIONAL PROCEDURES:

1.DIAGNOSTIC. The 650 Series display units have a built-in diagnostic **SELF-TEST** that tests the operation and tells the operator if everything is functional or if there are faults. The operational procedure is as follows:

STEP 1. Turn on the power. The 7 digit L.E.D.'s will momentarily show the numbers stored when the power was switched off and will then change to "-8.8.8.8.8.8.8" and begin flashing . This indicates that the diagnostic tests are com-

plete and, provided that all LED segments are illuminated, that the display unit is ready for operation.

NOTE. When the display shows random numbers and/or the digit bars do not "flash" the display unit has a fault. If this happens,turn the display off and then back on and try again. If the display still shows a fault ,contact the appropriate **Sargon** Service department.

STEP 2. Press any push-button to stop the flashing and activate the display.

The display is now ready for operation.

2.RESETTING (CLEARING) THE ABSOLUTE COUNTER. Push the **ABS/INC** button so that **ABS** is indicated and **hold it in the depressed position** whilst simultaneously pressing the **RESET** button.

3.RESETTING (CLEARING) THE INCREMENTAL COUNTER. Select the **INCREMENTAL** mode and press the **RESET** button.

4.ONE-TO-ONE MACHINE ERROR COMPENSATION. (M.E.C.):The 650 Series displays are programmed for a one-to- one error compensation factor (zero error) at the factory. To enter a one-to-one compensation factor (that is to erase any error compensation figure in the memory) in the field, switch the **INCH/MM** switch to the **MM** position, the **DIAMETER/RADIUS** switch to **RADIUS**, the **FINE/COARSE** switch to **FINE** and complete the following steps:

STEP 1. Reset both the absolute and incremental counters to zero.

STEP 2. Turn the **M.E.C.** switch to the **CAL** position.

STEP 3. Press the **RESET** push-button for one axis only.

STEP 4. Move the **MEC** switch to **OFF**.

Repeat the procedure for the other axes.

5.MACHINE ERROR COMPENSATION: This procedure needs to be carried out for each axis,one axis at a time.

For enhanced accuracy, machine error compensation should be done in the unit of measurement that is going to be used for a particular job. If the job is in metric then calibrate the system in metric; if it is in inches then calibrate it in inches.

Unless you are using the full travel, greater accuracy will be obtained if you compensate only for movements within the actual working area of the table.

STEP 1.Reset both the incremental and absolute counters to zero.

STEP 2.Select the table area to be calibrated and an appropriate sized standard gage block.

STEP 3. Traverse the table until the display shows the exact measure of the standard gage block; for example,if you are using a six-inch standard gage block, make sure the display reads 6.0000 .

STEP 4. Move the **MEC** switch (located on back panel) to the **CAL** position and leave it in this position.

STEP 5. Reset the selected axis to read **ZERO** on the display.Traverse the table back to the beginning of the standard gage block and reset to **ZERO** again.
Note that the standard measuring procedure must be completed in one direction only; do not reverse the table during the calibration procedure. For example, if a "+" 6.0000 was traversed as in STEP 3, then a "+" reading must be used while indicating the error as in STEP 6.

STEP 6. Measure the machine tool error in the usual way,using the standard gage block,a dial indicator and the Digital Readout Display. Start with the dial indicator and the DRO display on zero at one end of the standard. Move to the other end of the standard, when the dial indicator will again read zero, and observe the reading on the DRO display.
The display will, of course, indicate the measured travel,inclusive of any machine error; for example, for a gage block measuring 6.0000 inches the display reading might be 5.9900.

The error (+ or -) will be the difference between the display reading and the known standard length.

STEP 7. Move the **MEC** switch to the **OFF** position. The display will now show the true value as previously entered (STEP 3 above) and the machine error compensation process for this axis is complete. Repeat the above procedure for the other axes.