CMI 500 SERIES

USERS GUIDE

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Oxford Instruments Contact Measurement
945 Busse Road Elk Grove Village, IL 60007
Tel: (847) 439-4404 Fax: (847) 439-4425
Web Site: http://www.OICM.com/
Customer Support e-mail: support@OICM.com

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1. INTRODUCTION

1.1 PURPOSE OF EQUIPMENT

The CMI 500 series are dedicated non-destructive plating thickness testers.
They are designed to precisely measure the through-hole copper on both
unetched and etched printed circuit boards.

1.2 THEORY OF OPERATION

The CMI 500 series operates on the eddy current principle. Since the
parameters of board thickness, etched or unetched plating, and vendor
copper thickness are necessary to compute the through-hole copper
thickness, these parameters have been preset at the factory. To compensate
for any drift that may occur, only one calibration standard is necessary for
calibration purposes. Every parameter combination may have its own unique
memory location, thus separate statistics can be accumulated. The
portability of the unit allows for direct measurement at the tank. Dependent
on the model, the gage can measure between 0.1 and 3.0 mils of through-
hole copper.

1.3 LOCATION OF INSTRUMENT

The CMI 500 hand held plating thickness tester is designed to be used in a
shop environment. All cable connections are covered to prohibit foreign
matter from getting into the unit. The carrying case provides additional
coverage of any openings on the unit.

1.4 ELECTRICAL CONNECTIONS

Each CMI 500 gage will operate at equal efficiency from either a 9-volt battery or a low voltage power supply connected to a 115-volt or 230-volt, 50/60 Hertz, single-phase alternating current power source.

If a battery is the only source of power to the gage, the battery low indicator in the lower right corner will display BAT when the battery is low. A 9-volt alkaline battery will have approximately one hour of life left at this point. Replace the battery as soon as possible.

1.5 SETUP

1.5.1 Unpacking

Carefully open and inspect the shipping box, and remove all items. Notify Oxford Instruments Measurement Systems and/or the carrier immediately in case of damage to the unit.

1.5.2 Cable Connections

There are three connectors provided at the top on the unit. Each cable connection to the CMI 500 system is unique to prevent incorrect connection. There is a phone type jack for connection of the printing or serial dump cable, a jack for the connection of a low voltage power supply, and a polarized 6 pin threaded connector for the probes. Connection of any other external device may damage the gage.

1.6 POWER ON/OFF

The unit can be turned on or off at any time by pressing the ON/OFF key. The gage will turn off automatically after ten (10) minutes have passed and no entry or measurement has been taken.

When the unit is turned on, the software version number will appear in the upper left hand corner of the display, and the main display will show the model number. This will be shown for one second and then the hole size will be displayed. The display will then scroll through the parameters of the last used memory location, displaying each for about 1 second.

If the ON key remains depressed when turning the unit on, all of the segments of the display are turned on for testing purposes. All alphanumeric characters will be shown as "8"s. All decimal points and all border messages will be on. If any of the segments are missing, **DO NOT** continue using the gage.

1.7 PROBE

The ETP probe consists of the connecting cable, a barrel and a very delicate probe tip. Exercising reasonable care while using the probe will greatly increase its life and serviceability.

GUIDELINES FOR MAXIMIZING ETP PROBE LIFE

❑ **NEVER** lift or hold the CMI 500 gage by the probe or its cable.

❑ When measuring a hole on a board less than 70 mils thick, make certain the opposite side of the board is free from obstruction. You will have to tilt or elevate the board from the work surface.

❑ If the probe does not fit easily into a hole *do not* force it. Forcing the tip into a hole will damage it.

❑ Do not drag the probe tip across the surface of a board to the location where a hole is to be measured.

❑ Always lift the probe above the board surface and move it to the next hole to be measured.

❑ Hold the probe with the notch facing towards you so that the probe tip and the hole are visible.

❑ Carefully insert the probe tip into the hole without scraping the tip against the wall of the hole.

❑ Gently press and hold the probe tip against the wall of the hole opposite from the notch while taking a measurement.

❑ After the measurement has been taken, carefully remove the probe without scraping the probe tip against the wall of the hole.

❑ Always keep the probe tip protected with the red cap when the probe is not in use.

1.8 UNITS

The units can be changed from mils to µm (micrometers) by pressing the ZERO/UNITS key. Both the statistics and readings will be changed according to the units selected.

```
┌─────────────────────────────────────────┐
│                 NOTE:                    │
│                                          │
│      DO NOT CHANGE THE UNITS OF          │
│         MEASUREMENT WHILE                │
│      ACCUMULATING DATA.  THE             │
│    SOFTWARE CANNOT KEEP TRACK            │
│      OF MIXED UNITS AND THE              │
│     HISTOGRAM WILL NOT PRINT.            │
└─────────────────────────────────────────┘
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1.9 MEASUREMENT

Once the gage is calibrated, measurements can be taken. Measurements can be taken in two modes, the continuous mode and the automatic mode. Pressing the C/M key can change the measurement modes.

1.9.1 Continuous Mode

When the gage is in the continuous mode, instantaneous readings are displayed when the probe is placed in the hole. These readings are <u>not</u> saved into the statistics. When the continuous mode is activated, the display will show 0.00 with the probe in air.

1.9.2 Automatic Mode

When the gage is in the automatic mode, any reading taken when the probe is placed in the hole is displayed and the reading is saved into the statistics. When the probe is placed in air, the last reading taken will remain on the display until another reading is taken.

1.9.3 Taking Measurements

To take measurements with the CMI 500 gage, hold the probe with the notch facing you. Carefully place the probe in the hole and gently press and hold the side of the probe opposite the notch against the wall of the hole. **DO NOT** force the probe tip into the hole. **DO NOT** drag the probe tip across the surface of the board. When measuring a board less than 70 mils thick, tilt or elevate the board from the work surface so that the probe tip does not contact the surface. After the measurement has been taken, carefully remove the probe without scraping the probe tip against the wall of the hole.

If the unit is in the automatic mode, it will beep when the measurement is displayed. If the unit is in the continuous mode, the measurement will be displayed until the probe is lifted out of the hole.

2. UNIT OPERATION

The CMI 500 Series of gages is intended for measurement of through hole copper in etched and unetched boards, and the accumulation of statistics from the measurements. There are different models within the CMI 500 Series. Some models are provided with temperature compensation that will maintain the accuracy of the readings when measuring parts that are warm from the plating bath, and when measuring while variations occur in the room ambient. See Appendix A for a description of the features and capabilities of each model.

2.1 MEMORY MANAGEMENT

2.1.1 Memory Structure

The CMI 500 series gages have 99 memory locations. Each location can store a calibration, parameters, measurement readings, and statistical data. When the gage is turned on, it selects the last memory location that was used to take measurements and scrolls through the parameters from that memory location. It displays each of the parameters for approximately one second. Each time the gage is turned on, or when a new memory location is selected, the gage scrolls through the parameters for the current memory location in the following sequence.

1. First the display will show "bd" in the upper left corner, and the board thickness in the main display.
2. The unit will next show "Cu" in the upper left corner, and the main display will show the vendor copper thickness, in ounces.
3. The unit will next show the plating type, either etched (y-EtcH) or unetched (n-EtcH).
4. Finally, the current memory location will show in the upper left corner and the last reading taken will be displayed, if the unit is in the automatic mode. If the unit is in the continuous mode the display will show 0.00. The gage is now ready to take measurements.

2.1.2 How to Select A Memory Location

A memory location must be made active before it can be used to store information. To activate a memory location, select it by using Method 1. To select memory locations that already are active, use either of the following methods.

METHOD 1

1. Press the SEL key. The word "SEL" will appear on the display.

2. Enter the desired memory location (1-99) using the numerical keys. The location number will appear in the upper left corner of the display.

3. Press the ENTER key.

4. The unit will scroll through the parameters in the chosen location.

METHOD 2

1. Press the SEL key. The word "SEL" will appear on the display.

2. Press the SEL key again, causing the display to scroll through the active memory locations. The location number will appear in the upper left corner of the display.

3. When the desired memory location is displayed, press the ENTER key

4. The unit will scroll through the parameters in the chosen location.

2.1.3 How to Change Calibration Parameters

When a memory location is first made active, a default calibration is assigned with the following parameters. The default parameters are: 62 board, 1 oz. copper, unetched. To change the parameters of a calibration use the following procedure.

1. Using either method described in 2.1.2, go to the memory location in which you want to change the calibration parameters.

2. Press the "*" key followed by the SEL key. The current board thickness will be shown on the main display and "bd" will be shown in the upper left corner. The board thickness shown on the display is the pad to pad board thickness, i.e., the thickness of the dielectric material plus all copper and solder. Valid board thicknesses are from 30 to 250 mils. Enter the desired board thickness using the numerical keys. Check the display. If incorrect, press the CLEAR key and re-enter the value. When finished press the ENTER key.

3. Next the current vendor copper thickness in ounces will be shown on the main display, and "Cu" will be shown in the upper left corner. Press the SEL key until the desired vendor copper thickness is displayed. Press the ENTER key.

4. The plating type will then be shown in the main display as "EtcH". An "n" or "y" will be displayed in the upper left corner. A "y" stands for yes, meaning that the type is etched. An "n" stands for no, meaning

that the type is unetched. Pressing the SEL key toggles the choice between "n" and "y". Press the SEL key until the correct choice for etched is displayed, then press the ENTER key.

5. The calibration parameter change is complete. The unit reverts to the measurement mode, and is ready to take measurements.

2.1.4 How to Clear a Memory Location

When a memory location is cleared it is deactivated and all statistics, measurements and calibration information are deleted. A memory location can be cleared by using one of the following methods.

METHOD 1

1. Press the SEL key. The word "SEL" will appear on the display.

2. Enter the desired memory location (1-99) using the numerical keys. The location number will appear in the upper left corner of the display.

3. Press the CLEAR key. This causes the location number to flash, giving the options of continuing or aborting the clearing process.

a. To continue the clearing process, press the CLEAR key again, then press the ENTER key.

b. To abort the clearing process, press the ENTER key.

<div align="center">**OR**</div>

METHOD 2

1. Press the SEL key. The word "SEL" will appear on the display.

2. Press the SEL key again, which causes the display to scroll through the active memory locations. The memory location number is shown in the upper left corner of the display.

3. When the desired memory location is displayed, press the CLEAR key. This causes the location number to flash, giving the options of continuing or aborting the clearing process.

a. To continue the clearing process, press the CLEAR key again, then press the ENTER key.

b. To abort the clearing process, press the ENTER key.

2.2 CALIBRATION

Occasionally the gage may experience a slight drift in readings. To compensate, the CMI 500 gage can be calibrated using the standard supplied

with the unit. This procedure corrects all memory locations. A single adjustment is all that is needed, regardless of parameters or number of active memory locations.

To determine if the unit has drifted, set up a calibration containing the parameters listed on the calibration standard. These parameters are: 62 mil board thickness, 1 oz. vendor copper, unetched. Take a measurement on the calibration standard using the method described in 2.2.2. If the reading is out of tolerance, the gage should be re-calibrated.

2.2.1 Initializing Temperature Compensation

The CMI 500 Series of gauges have a temperature compensation feature which automatically maintains the accuracy of the readings when measuring parts that are still warm from the plating bath or at room temperature. The feature is initialized before shipment, however it is recommended that the feature be re-initialized before using the gauge for the first time. It also must be initialized whenever a new probe is placed on the unit. To initialize the feature press in sequence [* **2 0]** and then the [**ENTER]** key. Once the temperature compensation is turned, on cycle power to the gage by turning it OFF then back ON to activate the temperature compensation.

### 2.2.2 How to Calibrate with ETP Standards

The ETP Standards supplied by Oxford Instruments are labeled with parameters and through-hole copper thickness. Accept the default parameters or change the parameters as described in 2.1.3. The thickness of the standard is certified in one location (top wall of hole). Insert the probe tip in the through-hole of the standard, then move it so that it rests against the top wall of the hole as shown in the figure on the following page. Each calibration and subsequent measurements on the calibration standard are to be made at this location only.

Oxford Instruments

S/N 3-0000
BOARD 62 MIL (1574 UM)
1 OZ UNETCHED

1.00 MIL (25.4 UM)

MEASURE AT TOP

ETP STANDARD

certified location
probe tip
through-hole
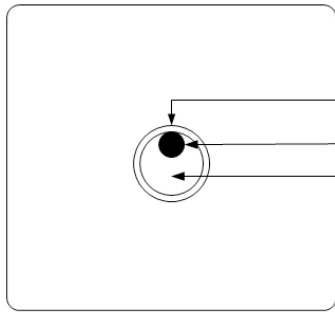
(through-hole enlarged to show position of probe)

2.2.3 How to Make a Single Point Calibration

The calibration process can be aborted by pressing the CAL key before entering the through-hole copper thickness.

> **NOTE:**
>
> AFTER CALIBRATING THE UNIT, THE VALUE ENTERED WILL APPEAR ON THE DISPLAY. THIS READING WILL NOT AFFECT THE STATISTICS.

1. Press the CAL key. A c0 will appear in the upper left corner of the display and the word CAL will appear on the right.

2. Place the probe tip in the hole (as described in 2.2.2). Enter the thickness labeled on the standard using the numeric keys. After the first digit in the thickness has been entered, the probe can be removed from the hole.

3. Check the display. If incorrect, press the CLEAR key and enter the desired value.

4. When finished, press the ENTER key.

2.2.4 How to Make an Average Calibration

The gage can also be calibrated by taking an average of several readings in the hole in the calibration standard. The calibration process can be aborted at any time by pressing the CAL key before entering the through-hole copper thickness.

1. Press the CAL key. A c0 will appear in the upper left corner of the display.

2. Place the probe in the hole and press the ENTER key.

3. Repeat step 2 (up to 9 times). A "cn" will be displayed on the upper left, with n representing the number of readings taken so far in the calibration.

4. After the desired number of readings has been taken, remove the probe from the hole and enter the value labeled on the standard using the numeric keys. Check the display. If incorrect, press the CLEAR key and enter the desired value.

5. When finished, press the ENTER key.

2.3 OFFSET

An offset will add or subtract the entered value from readings taken with the CMI 500 gage. The offset is **global** and will affect **every** reading in **every** memory location until the offset is cleared or re-entered as zero. A maximum offset of $\pm$ **0.5 mils (12.7 m)** can be entered.

When the unit is first turned on or a new memory location is selected, the gage scrolls through the calibration parameters. The last number flashing on the display is the offset and "OF" appears in the upper left corner. The offset can be cleared by pressing the CLEAR key or accepted by pressing the ENTER key.

2.3.1 How to Enter an Offset

1. If the gage is reading too **low**, an offset should be added to the reading. To enter a positive offset:
   a. Press the "*" key. OP will appear in the upper left corner of the display and a "-" will appear on the main display.
   b. Enter "1" and "1" using the numerical keys and press the ENTER key. OF will appear in the upper left corner of the display.
   c. Enter the value to be added using the numerical keys and press the ENTER key.
   d. The unit will revert back to the measurement mode.

2. If the gage is reading too **high**, an offset should be subtracted from the reading. To enter a negative offset:
   a. Press the "*" key. OP will appear in the upper left corner of the display and a "-" will appear on the main display.
   b. Enter "1" and "0" using the numerical keys and press the ENTER key. OF will appear in the upper left corner of the display.
   c. Enter the value to be subtracted using the numerical keys and press the ENTER key.
   d. The unit will revert back to the measurement mode.

2.3.2 How to Clear an Offset

1. To clear an offset without changing memory locations, press the "*" key followed by "1" and "0" or "1" and "1". OP will appear in the upper left corner of the display. Enter a value of 0 and press the ENTER key.

OR

2. Go to the memory location from which you want to remove the offset. When the gage finishes scrolling through the calibration parameters, the last number flashing is the offset and "OF" appears in the upper left corner. Press the CLEAR key to remove the offset.

2.4 LIMITS

Limits can be put into the CMI 500 gage to provide an indication that a reading exceeds a high or low thickness specification. While in the automatic mode if any reading falls outside the limits, there will be a long beep and the letters HI or LO, as appropriate, will appear on the upper left of the display. The limits apply only to the calibration that is in use when the limits are entered. Each memory location can have its own set of limits.

2.4.1 How to Set Limits

1. To enter an upper limit, press the LIMIT key. The gage will show H - L on the display.
   a. Press the HIGH key.
   b. The default thickness of 3.00 mils, or any previously entered upper limit, will be displayed.
   c. Enter the desired upper limit using the numerical keys and press the ENTER key.
2. To enter a lower limit press the LIMIT key. The gage will show H - L on the display.
   a. Press the LO key.
   b. The default thickness of 0.00 mils, or any previously entered lower limit, will be displayed.
   c. Enter the desired lower limit using the numerical keys and press the ENTER key.

2.4.2 How to Remove Limits

1. To remove an upper limit, press the LIMIT key. The gage will show H - L in the display.
   a. Press the HIGH key.
   b. Enter the default thickness of 3.00 mils and press the ENTER key.
2. To remove a lower limit, press the LIMIT key. The gage will show H - L in the display.
   a. Press the LO key.

b.   Enter 0.00 mils and press the Enter key.

2.5 CONDUCTIVITY CORRECTION FACTOR

A correction factor may be required, where the conductivity of the copper on the board being measured is different from that of the boards used to determine the calibration curves, or where other factors cause the CMI 500 to read the copper thickness incorrectly.

The correction factor is a multiplier that is applied to the final thickness calculation. Its range is from 0.5 to 1.5, and each memory location may have its own factor. If the factor is other than the default value of 1.0, it will be displayed at the end of the sequence of parameters that normally appear when a memory location is selected or when the unit is turned on.

2.5.1 How To Add A Correction Factor

1.   Using the procedure in 2.1.2, select the memory location to which you wish to add a correction factor.

2.   Press in sequence the "*", "1", and "2" keys. Press the ENTER key.

3.   The letters "cF" will appear in the upper left of the display and 1.000 in the center.

4.   Enter the value of the correction factor and press the ENTER key. You will not need to press the ENTER key if the factor you enter has three decimal places.

5.   The correction factor will now be applied to all measurements taken at this memory location.

2.5.2 How To Remove A Correction Factor

1.   Using the procedure in 2.1.2, select the memory location from which you wish to remove a correction factor.

2.   Press in sequence the "*", "1", and "2" keys. Press the ENTER key.

3.   The letters "cF" will appear in the upper left of the display and the present correction factor will appear in the center.

4.   To abort the removal of the correction factor press the ENTER key.

5.   To continue the removal process, enter the value 1.000. The unit will revert back to the measurement mode. The display will show the memory location in the upper left and the last reading taken will appear in the center. If the gage is in the continuous mode the display will show 0.00.

6. The default value of 1.000 (no correction factor) will be applied to this memory location.

2.6 HOW TO TAKE MEASUREMENTS

To take measurements with the CMI 500 gage, hold the probe with the notch facing you. Place the probe in the hole and gently press the side of the probe opposite the notch against the wall of the hole. If the unit is in the automatic mode, it will beep, the measurement will be displayed, and the reading will be saved into the statistics. If the unit is in the continuous mode, the measurement will be displayed until the probe is lifted out of the hole, and will not be saved into statistics.

If an unwanted measurement is taken while in the automatic mode, it can be cleared from the statistics by pressing the CLEAR key. After the CLEAR key is pressed, the reading will be cleared and the previous reading will be displayed.

2.7 STATISTICS

After readings have been taken in the automatic mode the statistics saved in each memory location can be displayed. The statistic selected will remain on the display until the C/M key is pressed, or the probe is placed in a hole on another sample.

2.7.1 Viewing The Statistics

Measurements taken in each memory location are stored separately as individual sets of statistics. Select the memory location from which you wish to display the statistics. When a statistics key is pressed a letter, shown in parenthesis in the table below, and the word STAT will appear in the upper left of the display.

N (N)	=	Number of readings
MEAN (M)	=	Mean of readings
S.D. (S)	=	Standard deviation of the readings
HIGH (H)	=	Highest reading
LOW (L)	=	Lowest reading

To leave the statistics mode and continue taking readings:

A. Press the C/M key

OR

B. Place the probe on a part.

Upon leaving the statistics mode, the last reading taken will be displayed. Any subsequent measurements will be added to the statistics in the memory location selected.

2.7.2 Clearing The Statistics

If the word FULL appears on the display and the unit beeps while taking measurements, the statistics' memory is full and should be cleared. Readings can continue to be taken with the unit, however the new readings will not be saved and the statistical information (i.e. standard deviation, mean, etc.) will not be updated. To clear statistics follow the procedure described below.

1. Select the memory location from which you wish to clear statistics.

2. Press any of the statistics keys so that the gage is displaying a statistic.

3. Press the CLEAR key. The word "STAT" will flash in the lower left corner of the display.

4. To abort the clearing of the statistics, press the ENTER key while the unit is flashing "STAT".

5. To continue the clearing process, press the CLEAR key again to confirm that the statistics are to be cleared.

<div style="border:1px solid black; padding:10px; text-align:center;">

Note:

THE READINGS WILL BE SAVED IN THE STATISTICS' MEMORY UNTIL CLEARED, EVEN IF THE GAGE IS TURNED OFF AND THE BATTERY IS REMOVED.

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2.8 OUTPUT OPTIONS

Review the default settings for the output options before printing or performing a serial dump. To change the baud rate and/or formatting enter the appropriate keystrokes described in the following table. Select and make an entry from line 1 or line 2 of the table, line 3 or line 4 of the table, and make one entry from lines 5 through 8 of the table.

The factory default settings in the gage are " " "1" "ENTER"; " " "3" "ENTER"; " " "7" "ENTER". This is a setting of "Carriage return"; "Disregard BUSY line"; and "4800 baud".

1.	" "	"1"	"ENTER"	Terminate each line with a carriage return.
2.	" "	"2"	"ENTER"	Terminate each line with a carriage return and line feed.
3.	" "	"3"	"ENTER"	Disregard the printer BUSY line when outputting data.
4.	" "	"4"	"ENTER"	Output data only when the BUSY line is not active.
5.	" "	"5"	"ENTER"	Set 300 baud.
6.	" "	"6"	"ENTER"	Set 1200 baud.
7.	" "	"7"	"ENTER"	Set 4800 baud.
8.	" "	"8"	"ENTER"	Set 9600 baud.

2.8.1 Printing Output

Only readings taken in the automatic mode can be printed. To print readings and/or statistics, connect the serial printer to the gage with the cable supplied with the printer. Select the memory location and the type of information to be printed as described below.

If the printer is connected to the gage while readings are being taken, the readings will be transferred directly to the printer and printed out. If the printer is not connected to the gage while readings are being taken, the readings are stored in the statistics' memory and can be printed out at a later time. To print the statistics and/or readings perform the following steps.

1. Select the memory location to print from as described in section 2.1.2.

2. Press the PRINT key.

3. The display will show P - A. Repeatedly pressing the PRINT key causes the display to scroll through the available printing options.

P - A	=	Print stats, data and histogram
P - S	=	Print stats only
P - d	=	Print data only
P - H	=	Print histogram only
P -	=	No printing

4. To start the printing:

> a. Press the ENTER key when the required option is displayed

> - OR -

> b. Wait for three (3) seconds when the required option is displayed.

2.8.2 PRINT HEADER

This allows configuration of the optional header printing. The header is simply an outline that can be filled by the user during measurement and can be used for record keeping purposes. To enable the Print Header Function press, * 30 ENTER. To disable the Print Header Function press * 31 ENTER. The print header appears first when printing data.

Sample Print Header with Statistics Information

```
==============================
Channel:  1       5 Readings
Board Thickness: 62 mil
1.0 oz. Copper      No Etch
Job No.: _____
Work Order: _____
Date: _____
Time: _____
Operator Initials: _____
------------------------------
STATS:
              Mean =  1.80 mil
Standard Deviation =  0.01 mil
 Percent Deviation =  0.34%
          Accuracy =  0.01 mil
              High =  1.80 mil
               Low =  1.79 mil
             Range =  0.01 mil
```

2.8.3 Serial Output

Standard Configuration

All CMI 500 series gages have a serial output capability. The stored readings can be uploaded to a host PC with a upload cable P\N 12-0001-00002, or equivalent

1. Connect the cable to the serial output port of the gage and connect the other end of the cable to a host PC that has software suitable for uploading serial data.

2. Select the memory location as described in Sec. 2.2.2.2, from which readings are to be uploaded.

3. Press the DUMP key to begin the data transfer.

Option 200-SRG

Readings from a selected memory location can be uploaded to an IBM or compatible PC where the Statistics and Report Generator program option will collect and store them. The program has a full statistical capability and can view and print X Bar and R charts and histograms of the data. This feature will upload the readings taken in automatic mode, continuous mode when the readings capture feature is activated, and scan mode. The serial output feature requires an IBM or compatible PC, with a Windows 95 or later operating system, and at least 16M bytes of memory. An RS232, 9-pin connector that is configured for a serial port, must also be available.

For installation instructions and operating information, please refer to the Statistics and Report Generator Users Manual.

INSTRUMENT CONNECTION

1. Connect the cable provided with the Statistics and Report Generator package to the instrument at the serial output (RS 232) connector with the 4-pin phone type plug.

2. Connect the other end of the cable with the DB9 connector to an available serial port on the host PC.

3. The port number to which the instrument is connected and the appropriate baud rate for the instrument is selected in the Statistics and Report Generator program.

PROGRAM OPERATION

1. Accumulate statistics with the gage.

2. Select the memory location from which readings are to be uploaded. Refer to section 2.1.2 for a description of how to select a location.

3. Press the DUMP key. The display will show d - - indicating that the data is being transferred to the PC.

4. Refer to the Statistics and Report Generator Users Manual provided with the software for instructions on how to use the program.

> **Note:**
> IF NO DATA HAS BEEN TRANSFERRED WITHIN 20 SECONDS, THE PROCESS ABORTS.

APPENDIX A

CMI 500 SERIES - TROUBLESHOOTING GUIDE

SYMPTOM	CURE

Printer prints out incoherent symbols (usually hearts and question marks) every time a reading is taken	Factory settings in the gage have changed. Press "*" "1" "*" "3" "*" "7"
	 OR
	 Dip switched on Seiko printer have changed. Set the dip switches as follows:
	 DSW1 1 = OFF
	           2-4 = ON
	           5-6 = OFF
	           7-8 = ON
	 DSW2 1-3 = ON
	           4-5 = OFF
	           6 = ON
	 OR
	 Make sure all of the connections to and from the printer are secure.

Unit indicates 'BAT' in the lower right corner of the display, beeps three times and then shuts off.	The battery is low or dead. Replace the battery.
The word FULL is displayed after taking a reading.	The statistics' memory is full. Refer to section 2.7.2 to clear the statistics.
Unit will not calibrate.	Recalibrate the unit following the instructions in section 2.2. OR Make sure the correct units of measurement are being used; do not enter 1.86 m instead of 1.86 mils.
The unit locks up and no other	Clear all of the gage settings by

troubleshooting techniques correct the problem. NOTE: Use this procedure as a last resort. Try all other options first.	pressing in sequence the '*' '9' '1' '9' '1' keys (*9191). The word ZAP will appear on the display and the unit will power off. **WARNING** – This clears all calibrations, statistics and probe tuning information from every memory location. After this procedure is used recalibrate the unit as described in section 2.2.