Starrett®

Model 717
Electronic Gage Amplifier

Operator's Manual

Contents

Section 1

1.1 Checking Contents

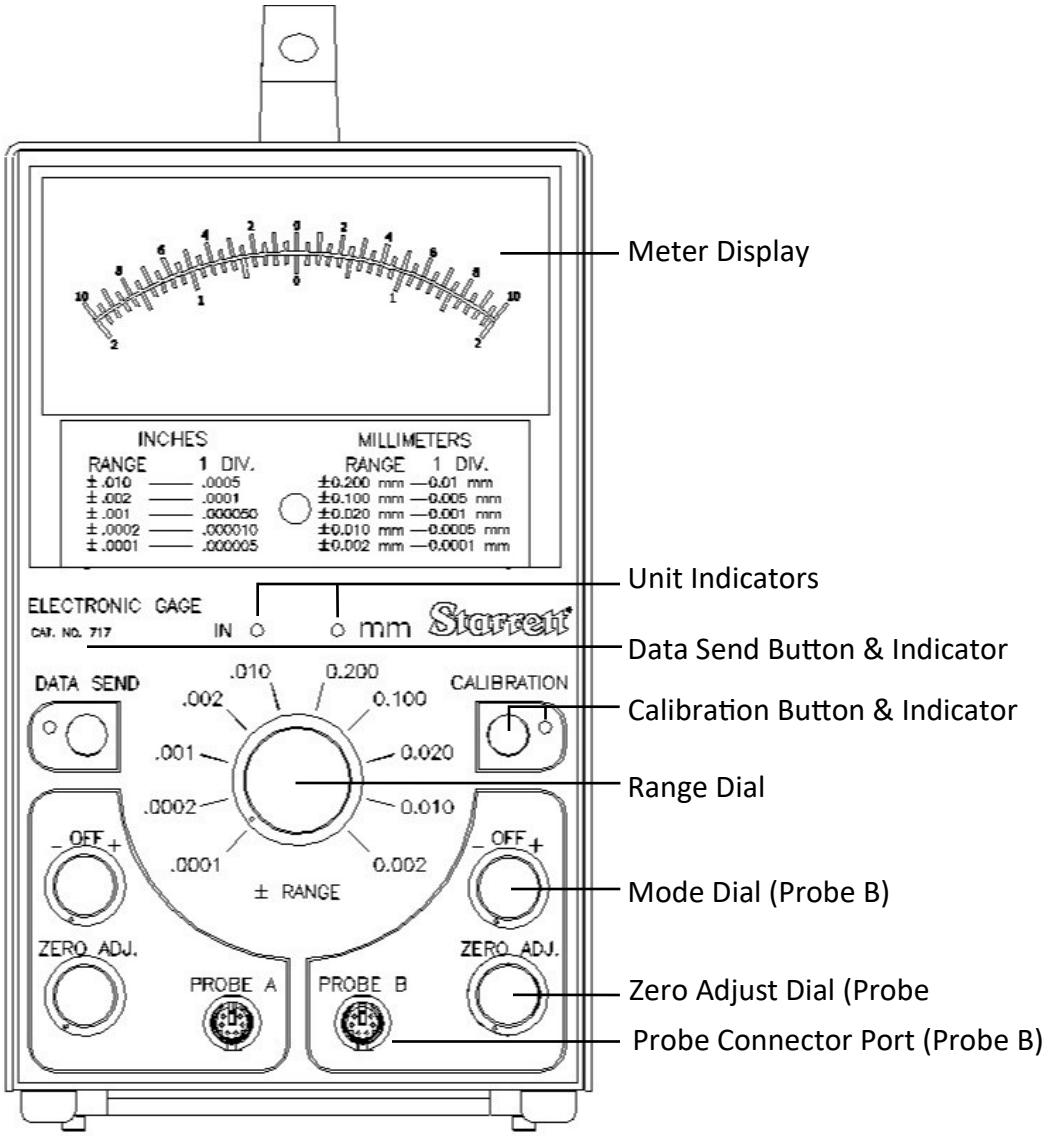
The contents of the package will consist of:

The Model 717 Electronic Gage Amplifier
A 7.5VDC, 500mA power adapter. Starrett Part No. 60636
An Operator's Manual. Starrett Part No. 61970

1.2 Getting Acquainted

Take a moment to become familiar with the locations and names of the Gage Amplifier controls and connections.

The Meter Display is in the upper portion of the front face of the gage amplifier. Below the Meter Display are the two Unit Indicators, English units on the left and metric on the right. These are selected with the Range Dial in the center of the lower portion of the front panel.

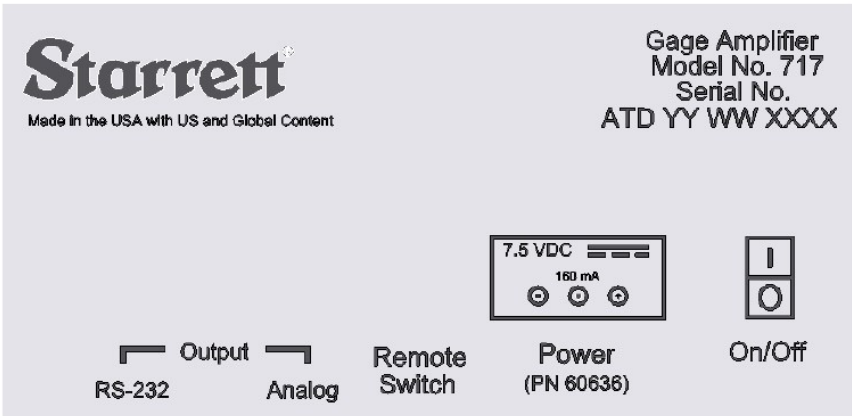


Section 1 (Continued)

On the left side of the front panel is the Data Send push button and indicator. The Calibration push button and indicator are found on the right side. Below these are the probe A and B controls. For each probe there is a data polarity Mode Dial, a Zero Adjust Dial, and a probe connector port.

On the rear panel of the 717 are the power switch and connector as well as the I/O interfaces. From right to left, the power switch is followed by the power adapter jack. Next is the connector for the remote foot switch, the analog BNC port, and the RS232 serial data port.

Rear Panel



1.3 Setting Up

Power

Plug in the transformer end of the AC adapter (use only Starrett Part No. 60636) into a 115V outlet, and the small connector at the other end of the adapter cable into the power jack on the back of the 717.

Probes

Connect the gage probes to the Gage Amplifier by plugging them into the connectors on the front of the unit. Do not force the connectors; they are keyed by two small indentions on the upper edge of the connector shell, and can only be inserted when correctly aligned.

One or two gage probes can be connected to the Gage Amplifier at one time. Use only 715-1Z and 715-2Z gage probes supplied by the L.S. Starrett Company. The instrument is exactly matched to the electrical and mechanical characteristics of the Starrett probes; the use of probes from other sources can result in damage and/or inaccurate readings.

Warning: Never disconnect a probe without first setting the Mode Button (OFF) to OFF. Failure to do this will result in loss of probe calibration settings.

Printer

The 717 can be connected to a printer to record results as testing is performed. A serial printer can be connected directly by means of a serial interface cable (Starrett Part No. 60643), plugged into the RS232 data port on the back of the 717. A parallel printer can also be connected to this port, via a serial-to-parallel interface converter (commercially available) and a second parallel cable. Consult Appendix A for a detailed description of the interface and its functionality.

Computer

Optionally, the 717 can be connected to a computer for remote control or display, or for data recording and analysis. The interface cable (Starrett Part No. 60642), plugged into the RS232 data port on the back of the 717. Consult Appendix A for a detailed description of this interface.

Some computers which use a 25 pin serial communications connector will require a special adapter to connect to this interface cable. Consult the hardware and software manuals for the device in question to determine the precise requirements for such a connection.

Remote Foot Switch

For hands-free printing or collecting of data, a foot switch (Starrett Part No. PT99468) may be plugged into the back of the 717. When this switch is pressed, a data reading is sent to the RS232 digital interface, allowing the operator to have both hands free.

Section 2

2.1 Meter Display Positioning

The viewing angle of the Display Meter may be altered with the use of a pivoting wire bail on the bottom of the unit. To insure parallax-free readings from the meter, it should always be viewed such that the needle stands in front of its own reflection.

2.2 Applying Power

Turn the unit on by toggling up the power switch on the back of the unit. The 717 will first run a startup sequence displaying readings of -10, +10, and 0 while also alternating the Unit Indicators IN, mm, IN.
The Gage Amplifier memory will begin operation according to the most recent calibration settings and the last saved zero positions.

2.3 Control Selections

Range and Units

The Range switch provides a choice of five degrees of sensitivity (or magnification) for either English or Metric measurement. Whenever this switch is on an English position, the 'IN' Unit Indicator is lit. Similarly, turning the switch to any Metric position turns on the 'mm' Unit Indicator.

The figures shown around the Range Dial represent the end scale reading for that range, while the figures given on the Meter Display housing give the value of one scale division for each range.

The upper Meter Display scale (black graduations) is used for any range setting which contains a '1'. The lower scale (red graduations) is used for any range setting containing a '2'. Thus, if the Range Dial were set at .002 on the 'IN' side, you would read the red scale on the Meter Display face, and each scale division would represent one ten thousandth of an inch. If the Range Dial were set at .100 on the Millimeters side, you would use the black scale on the Meter Display and each scale division would represent 5 micrometers.

Probe Controls

The probe connectors and controls are located on the lower part of the front panel. These are arranged in two groups, one for each probe. Each group is comprised of a connector which accepts the probe plug, a mode switch, and a 'ZERO ADJ.' dial.

The mode switch allows the probe to be disconnected from the amplifier input when that switch is in its "OFF" position. The probe's contribution to the final reading can be made in either an up-scale or down-scale direction depending on whether that switch is turned to the plus or the minus position. In this way, the Meter Display can be used for adding or subtracting measurement readings.

The Zero Adjustment dial changes the position of probe's reference point. Turning the dial clockwise or counter-clockwise will result in a Meter Display correction in the same direction. The size of the increments or decrements taken is dependent on the current Range Dial setting. Precise adjustments must be made in the more sensitive ranges.

Relative zero positions may be saved to memory by turning that probe's mode switch to the 'OFF' position.

Section 3

3.1 Reset zero procedure

1) With the unit powered down, disconnect all probes (if any are attached) from the instrument.
2) Set both mode dials to the **OFF** position.
3) Set the range dial to the .**010”** position.
4) Mechanically adjust the needle to read zero by turning the screw located directly below the meter needle.
5) Power-up the instrument and set the probe A mode dial to the **+** position.
6) Do not attach any probes to instrument and adjust the probe A zero adjust dial to achieve a zero reading and turn the probe A mode dial to the **OFF** position.
7) Set the probe B mode dial to the **+** position.
8) Repeat step #6 using the probe B zero adjust dial.
9) Turn probe B mode dial to the **OFF** position.
10) Power-down the instrument.
11) Attach the probe to connector port A and power up the instrument.
12) Turn the probe A mode dial to the **+** position.
13) Physically move the probe until the needle reaches the zero position on the meter.
14) Set the probe A mode dial to the **OFF** position.
15) Power-down the instrument.

3.2 Calibration Procedure

(SECTION 3.1 SHOULD BE PERFORMED BEFORE CALIBRATING)

Before initiating the calibration sequence, the Mode Dial of the Port to be calibrated must be set to the ‘+’ position. The Mode Dial of the other Port must be set to the ‘OFF’ position.

To begin calibration mechanically adjust the probe to a desired zero position. Press and release the Calibration Button once. Note that the Calibration Indicator blinks once and stays lit. Observe the Meter Display needle come to rest at 0.

Next, displace the probe by 0.010" and press and release the Calibration Button once more. Observe the Meter Display now reads 0.010" and the Calibration Indicator has gone dark. Both the calibration constant and zero position at the time of calibration are automatically saved to memory and the calibration sequence is ended.

3.3 Taking Data (IMPORTANT)

Measurements should only be taken using probes that have been calibrated since the last time they were plugged into the unit. *Make sure to re-calibrate a probe each time it is plugged in.*

Warning: If the higher resolution ranges like the .0001” or 0.002mm, are to be use or checked, it is imperative the unit be zeroed at the range to be used. Adjusting the zero at the low resolution, .010” does not guarantee the accuracy of the higher resolution ranges.

Turn the Range button to the high resolution. Adjust the zero so that the meter dial is set to the zero position. Turn the Range button to the desired range then measure.

Section 3.3 Continued

Single Gage Head Measurements

When a single gage head is required, turn the Mode Dial of the unused Port to the 'OFF' position. Then turn the Range Dial to the desired range on either the Inches or Millimeters side of the control.

Position the probe on a 'master' work-piece or some other reference standard. Adjust the probe mechanically to produce a reading near zero. Using the Zero Adjust Dial for the active Port, bring the reading exactly to zero.

Replace the reference standard with the part to be measured. The display will show the differences between that part and the reference standard directly in Inches or Millimeters.

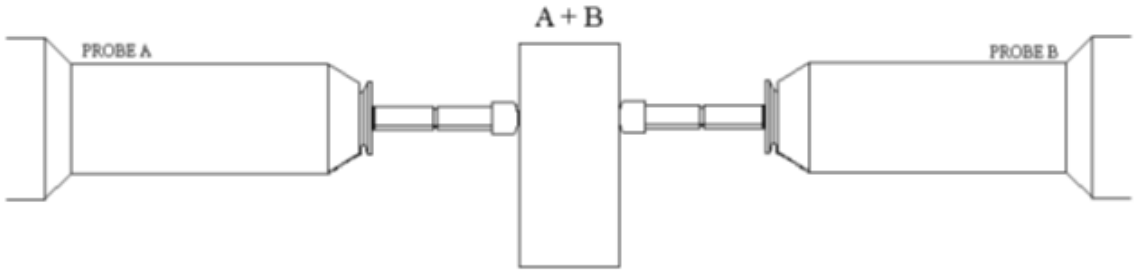
The operator of the instrument is free to choose either the '+' position or the '-' position of the Mode Dial to produce readings in the direction required by the particular measurement setup.

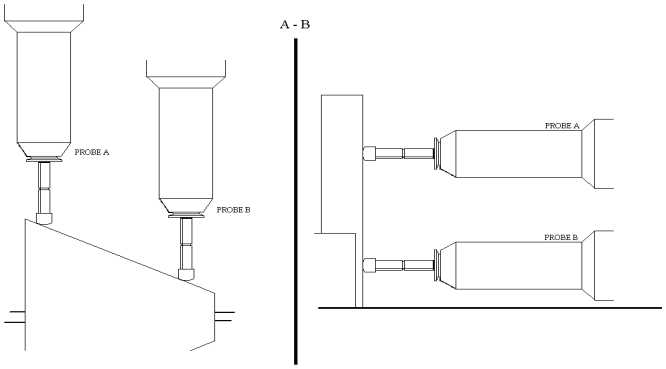
Two Gage Head Measurements

For some gauging problems it is necessary to measure the differences between, or the sum of, the displacements of two separate probes whose sensing tips are resting on two different points of a work-piece.

In all such measurement setups, the general rules to follow are:

1. Make sure each Port has been properly calibrated so that a given displacement at either gage head produces equal readings.
2. Provide a reference standard or 'master' part for the initial positioning of each gage head. Turn the Probe B Mode Dial to 'OFF', and the Probe A Mode Dial to either '+' or '-'. Adjust gage head A mechanically to produce a reading near zero. Then, turn the Probe A Mode Dial 'OFF' and the Probe B Mode Dial to either '+' or '-'. Adjust gage head B mechanically to produce a reading near zero. Finally, turn each Mode Dial to its '+' or '-' position, as required for the particular measurement and, using either of the Zero Adjust Dials, bring the reading exactly to zero. The mechanical zeroing of each gage head is required in order that each gage head have the maximum useful range of motion available to it.
3. Replace the 'master' with an actual work-piece to read the discrepancy between the work-piece and the 'master'.





Digital Measurements

Once a computer has been interfaced to the 717 (see Appendix A for details), readings may be taken and stored digitally. Digital readings are always taken at the most sensitive range. The highest possible measurement resolution is delivered through the RS232 output. Digital readings always reflect the current status of the Ports. A prefix on the reading identifies which Ports are in use. This allows programs, such as WinWedge software to identify the source of the incoming data.

Prefix	Probe (s)
#01	Probe A
#02	Probe B
#03	Probes A and B

The 717 may send out measurements either on singular requests or in a continuous stream. Both methods of data collection can be initiated on the Gage Amplifier itself or remotely via the computer terminal. A momentary push on the Data Send button delivers a single digital reading. A prolonged push on the Data Send button will put the unit in continuous send mode. A subsequent push on Data Send will exit the continuous send mode.

The optional remote foot switch can be used to send single digital readings or to exit from continuous send mode. The foot switch may not be used to initiate the continuous send mode.

To make remote requests for data or to zero the Meter Display via the terminal use the 717 command set. The commands are not case sensitive.

- ? Single data request or exit continuous send mode.
- C Toggle continuous send mode on/off.
- Z Zero the Meter Display.

Output Data Structure

15 Character Data Output
3 Digit Probe Prefix, Space, Space, Decimal Point, 6 Digit Numeric Value, 2 Digit units, Enter

#01{ }{ }.005190in{ENTER}

3.4 Analog Out

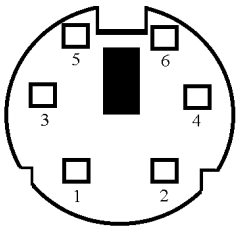
The Analog Output delivers a DC voltage that represents the current gage measurement. The voltage will change 0.1V per division on the meter. For each range setting, valid readings will be within ±2V. Over readings may somewhat exceed ±2V before clipping to the out of bounds signal of ±2.5V.

Appendix A - Interfaces

Probe Interfaces

The 717 is equipped to allow the connection of up to two gage probes to the unit. These interfaces consist of 6-position Micro-DIN shielded receptacles that will accept a Micro-DIN shielded plug. The pin assignments on these receptacles are as follows:

Pin	Signal
1	- Signal
2	(nc)
3	+ Signal
4	(nc)
5	AC Drive
6	Ground



The following Starrett gage probes are suitable for use with this interface:

Model 715-2Z ± 0.020" Cartridge Probe

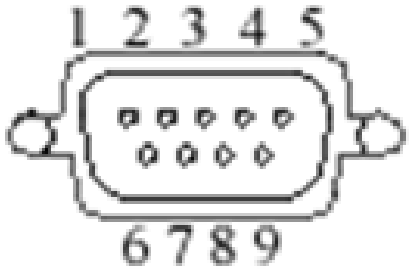
Model 715-1Z ± 0.010" Lever Probe

For other probe types and ranges, contact your L.S. Starrett representative.

Serial Interface

The 717 is equipped with a serial I/O interface, to allow it to communicate with printers, CRT terminals, and computers. This interface consists of an RS232 serial port equipped with a DB-9 male connector. The pin assignments on this connector are as follows:

Pin	Signal
1	(nc)
2	TX
3	RX
4	DTR
5	Ground
6	(nc)
7	RTS
8	(nc)
9	(nc)



Appendix A – Interfaces (Continued)

Printers

The 717 can interface directly with a serial printer, sending it character strings representing data readings. A unidirectional serial data cable (Starrett Part #: 60643) is required. Any ASCII serial printer that conforms to the interface criteria listed below should be fully compatible with the gage amplifier in this configuration:

Input Connector:	DB-9 male connector
Data Rate:	9600 Baud
Parity:	None
Data Bits:	8
Stop Bits:	1
Character Set:	IBM Proprinterâ Compatible

For parallel printers, a commercially available serial-to-parallel converter, and a second cable to connect the converter to the printer, is also required. Any ASCII parallel printer that conforms to the interface criteria listed below should be fully compatible with the gage amplifier in this configuration:

Input Connector:	DB-9 male connector
Data Rate:	9600 Baud

Appendix A – Interfaces (Continued)

Computers

The 717 can interface directly with a computer, treating it both as an input and as an output device. Any computer capable of sending and receiving the ASCII character set in serial form should be fully compatible with the gage amplifier. If an RS232 DB9 connector is not available on the computer connect an RS232 to USB Converter. Identify the USB Port from the Computers Device Manager Port Settings Menu.

To make remote requests for data or to zero the meter via the computer use the 717 command set. The commands are not case sensitive, so upper and lower case letters trigger the same effect.

- ? Single data request or exit continuous send mode.
- C Toggle continuous send mode on/off.
- Z Zero the meter.

ASCII Command Table

Char	Dec	Hex
?	63	3F
c	99	63
C	67	43
z	122	7A
Z	90	5A

RS232 Terminal Program Interface:

A prefix on the data character string identifies which probe (s) are in use. This allows terminal programs, such as Win Wedge software to interpret the incoming data.

Prefix	Probe (s)
#01	Probe A
#02	Probe B
#03	Probes A and B

From Windows desktop: Click on the WinWedge icon. Refer to the WinWedge Instruction Appendix C. If another Terminal program is used set the Port Settings to:

Port: 1 or other USB ports (comm. port currently attached to the unit)
Data Rate: 9600
Parity: None
Data Bits: 8
Stop Bits: 1

Appendix B: Error Indications & Getting Additional Help

Error Indications

The following events are indications that a system or usage fault has occurred, and that remedial action is required:

Event: The needle on the meter stays at one extreme end of the dial or the other, even when the probe is moved through its entire travel, and recalibration does not correct it.

Cause: The connection between the probe and the Gage Amplifier may be defective.

Action: Check to see if the probe has not become unplugged from the front of the amplifier. Reset all connectors and see if that corrects the problem.

Error Messages

Some error conditions are detected by the system and reported to the user. The following messages are of this type, and indicate that corrective action by the operator is required:

Message: A message reading "**error**" is displayed on the computer screen when data readings are requested.

Cause: The range of measurable travel has been exceeded, or both probes are selected 'OFF'.

Action: Verify that at least one probe currently in use is selected and calibrated. Move the relative zero point closer to the position under measurement until valid data readings are again attainable.

Message: The Calibration Mode indicator flashes three times and the amplifier does not enter the Calibration routine.

Cause: The unit is set to a state incompatible with calibration.

Action: Verify that the probe ready for calibration is selected at '+', or positive, and that the other probe is selected 'OFF'.

Message: The Calibration Mode indicator flashes three times after the final step in the calibration routine.

Cause: This warning message suggests there may be a problem reading the probe. Or it might indicate that a non-standard probe is in use.

Action: Verify the probe under calibration is firmly inserted and selected on the correct port. Repeat calibration taking care to begin on the mechanical zero of the probe.

Getting Additional Help

In the event that you need assistance in setting up or operating your Model 717 Gage Amplifier, or in applying it to a particular measurement application, contact your Starrett distributor.

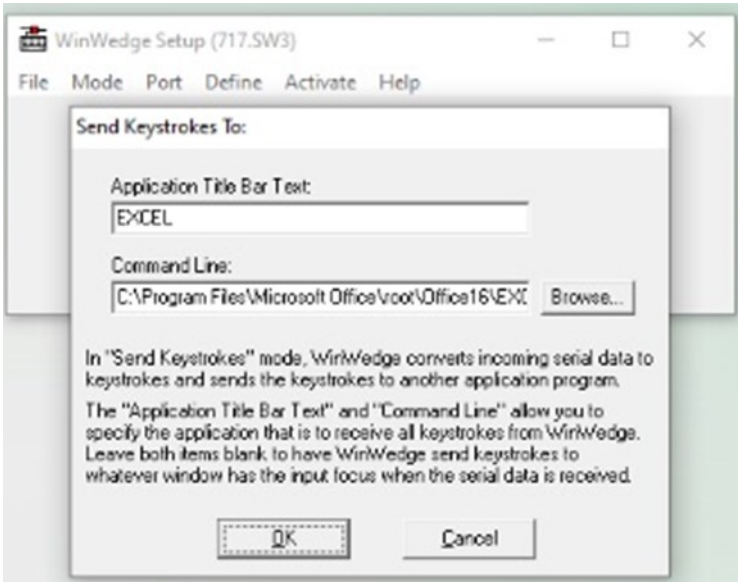
Distributors have a wide knowledge of the Starrett line and are familiar with your business and your particular measurement requirements. In most cases they will be able to resolve your difficulties immediately. In the event that your inquiry or problem is beyond their resources, they can call on factory assistance as required.

Appendix C - WinWedge Instruction

The 719 Software Wedge may be purchased from Starrett Part Number 719

Plug in the model cable in to the “Output – RS232” connector in the rear of the unit. Attach the other end of the cable to the PC RS232 DB9 Connector or to a USB port via an RS232 to USB Cable.

Start the Win Wedge program 717 from the Desktop.



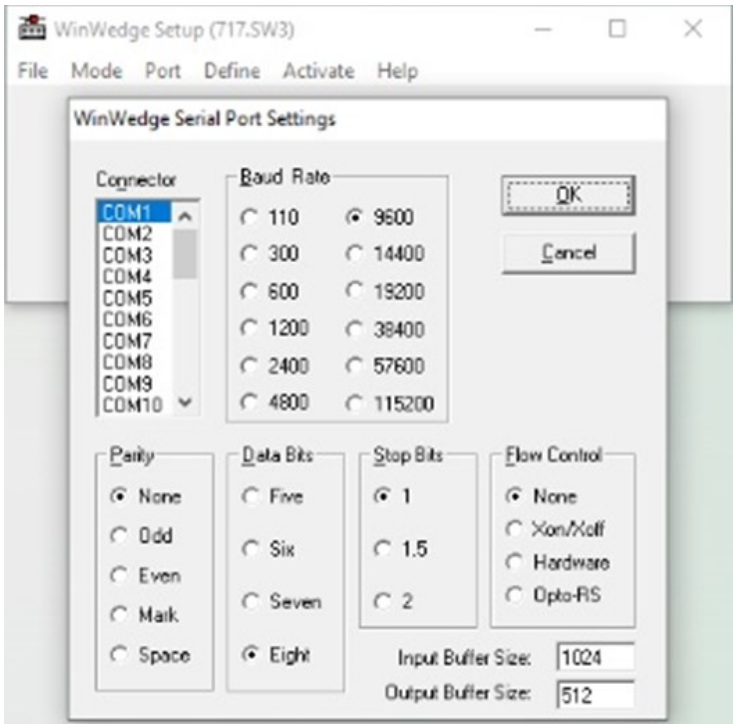
Win Wedge Settings:

Mode – Select External Program to send data
Send Keystroke To:

Application Title Bar Text:
EXCEL
Command Line: (Enter path to EXCEL)

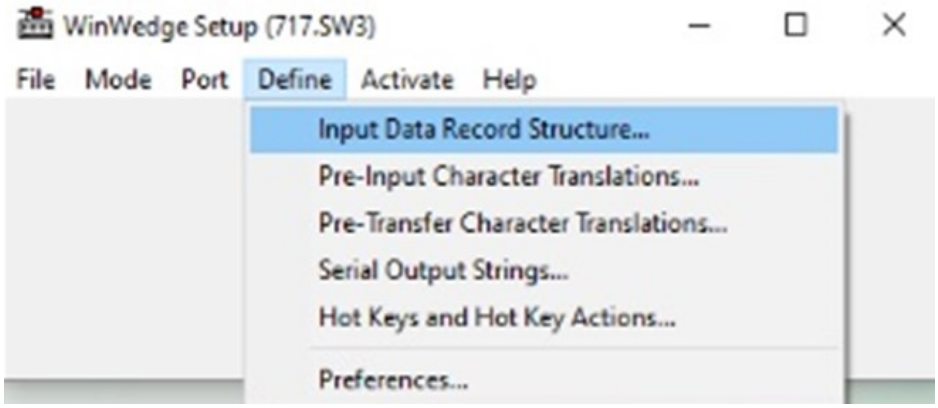
Example of path—C:\Program Files\Microsoft Office\root\Office16 \EXCEL

Press OK

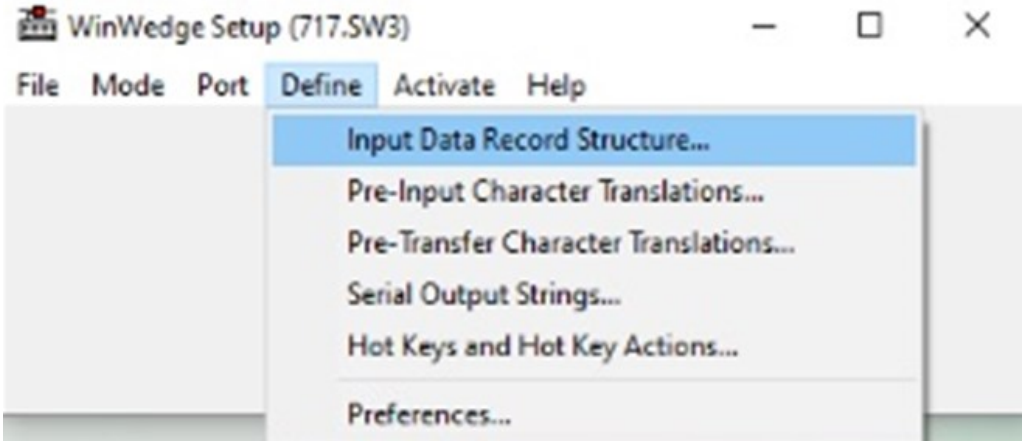


Port – Set Port Settings

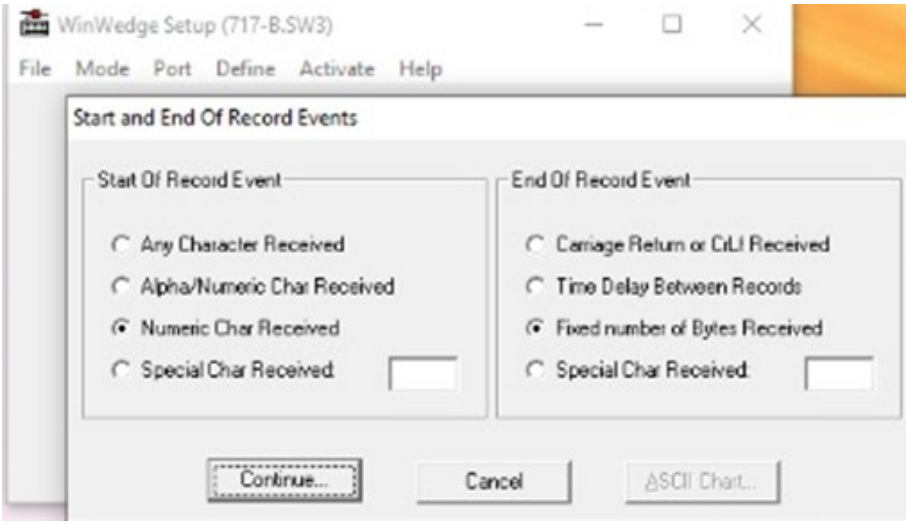
Connector	Select the COM port
Baud Rate	9600
Parity	None
Data Bits	8
Stop Bits	1



Define – Set data structure



Select **Input Data Record Structure**



Start and End of Record Events –

The data out of the 717 Gage includes #01 0.000100in.

It is necessary to truncate the reading to send only the numerical measurement to EXCEL.

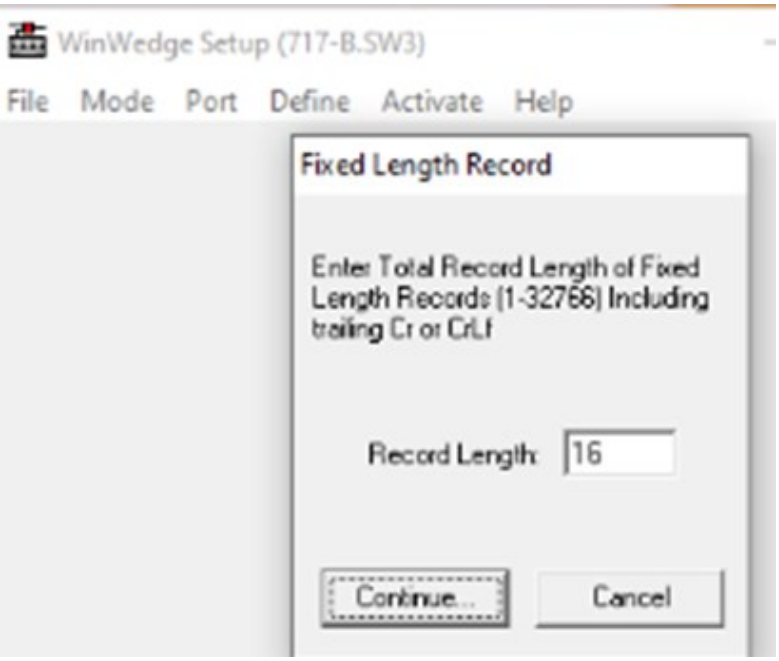
Set the **Start of Record Event**

Select the Numeric Char Received

Set the **End of Record Event**

Select the Fixed number of Bytes Received

Press Continue to open the **Fixed Length Record** menu.

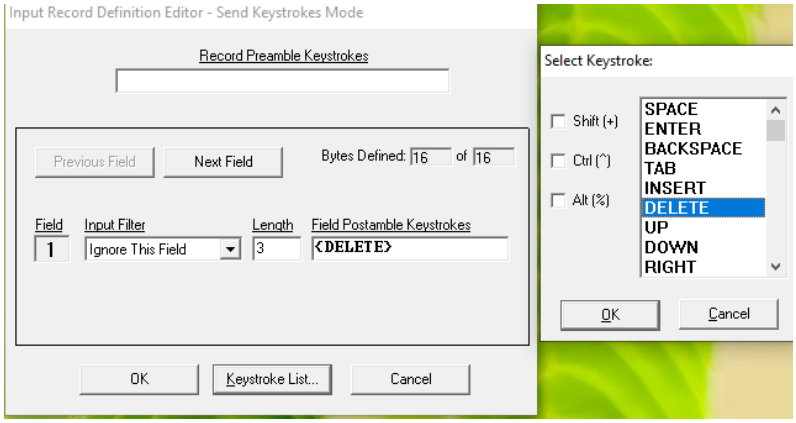


The number of characters transmitted by the 717 Gage is 15 plus the CrLf sent by Win-Wedge for a total of 16.

Enter 16 in the Record Length field

Press Continue

The following screens will define the character transfer actions. The first 3 characters will be deleted. Only numeric data will be extracted from the last 13 characters. The units will not be displayed.



Set the Input Record Definition Editor – Send Keystrokes Mode.

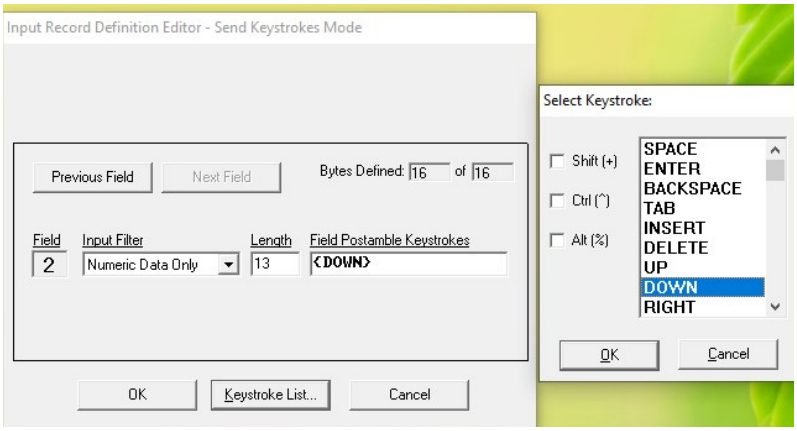
Fill in the field as follows

Field - 1

Input Filter - Ignore This Field

Length - 3

Field Postamble Keystrokes – {DELETE}



Press the **Next Field** Button

Setting the Second Field

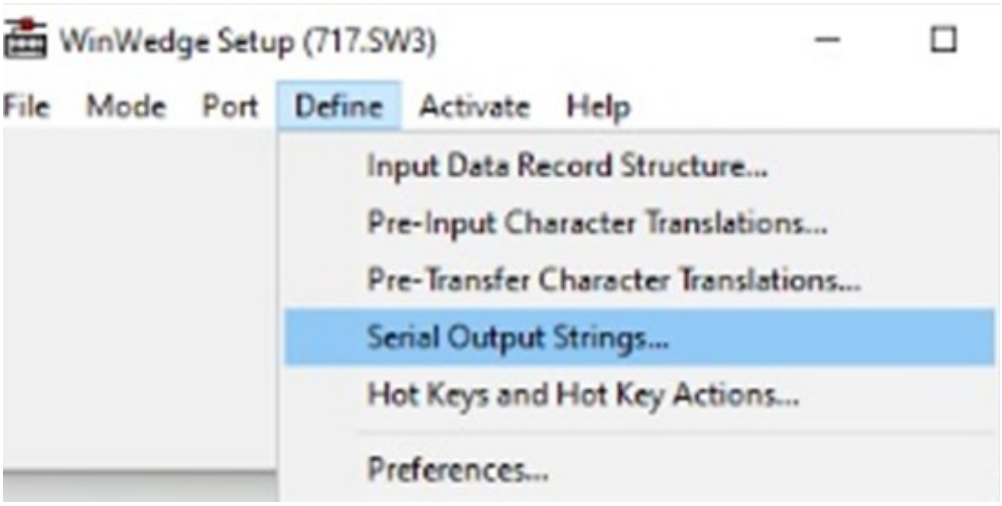
Field - 2

Input Filter - Numeric Data Only,

Length - 13

Field Postamble Keystrokes – {DOWN}

Press OK to complete

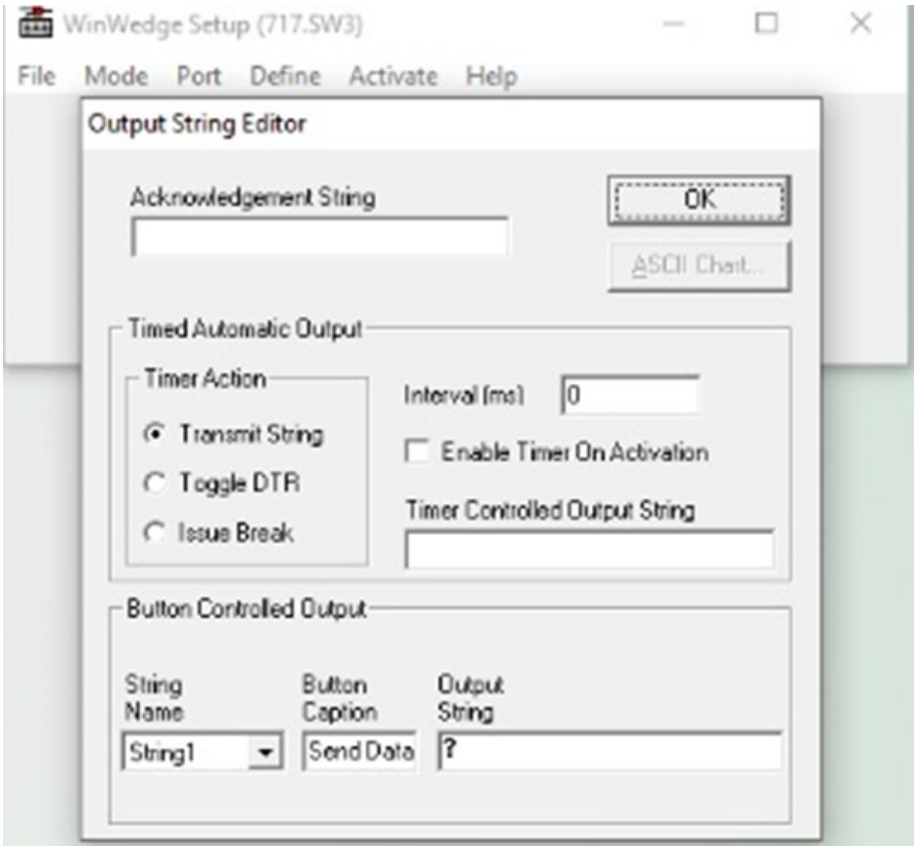


If it is necessary to view the units, select None (No Filter) in the 2nd Input filter.

{DELETE} and {DOWN} ASCII characters selected from the Keystroke List button.

To format the measurement window, select the

Serial Output Strings… option within the Define tab.



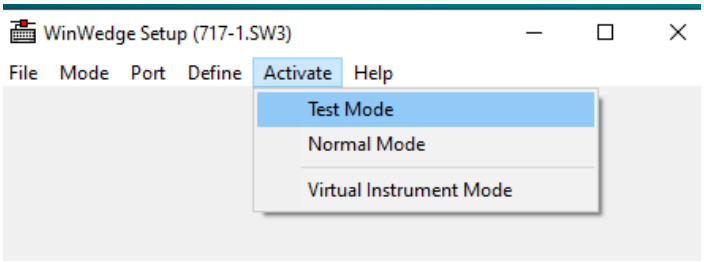
String Name	Button Caption	Output String
String 1	Send Data	?

Set the **Button Controlled Output** fields at the bottom of the screen.

Enter the following within the fields

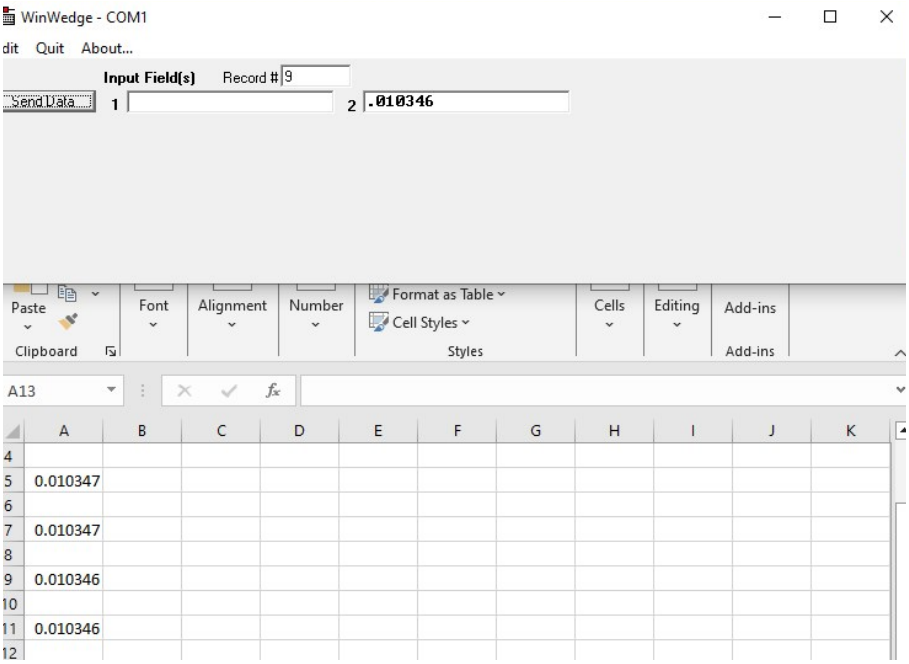
Press OK

Select **File** tab to **SAVE** the application.



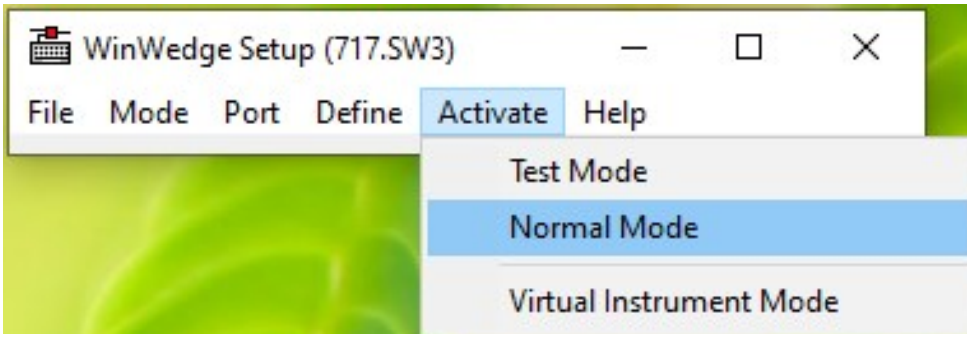
Once it is saved the configuration can be reused by clicking the WinWedge icon within the subdirectory stored. Moving the icon to the desktop will allow the user to access the application without having to make all the adjustments described above.

To start the application, select the **Activate** tab, select **Test Mode**.



Using the Test Mode allows for returning to the settings to make changes if necessary.

Pressing the Send Data button will trigger a request for a measurement and open an EXCEL spreadsheet.



To capture the data into the EXCEL spreadsheet the cursor must be located within a cell in the spreadsheet. Data must be requested by pressing the DATA SEND button on the 717 Gage Amplifier or by pressing a footswitch attached to the Remote Footswitch connector at the back of the gage.

Alternatively it is possible to request data from an assigned hot key on the computer keypad. Refer to instruction on page 18.

Saving in the Normal Mode will create a WinWedge application whose icon may be placed on the computer desktop.

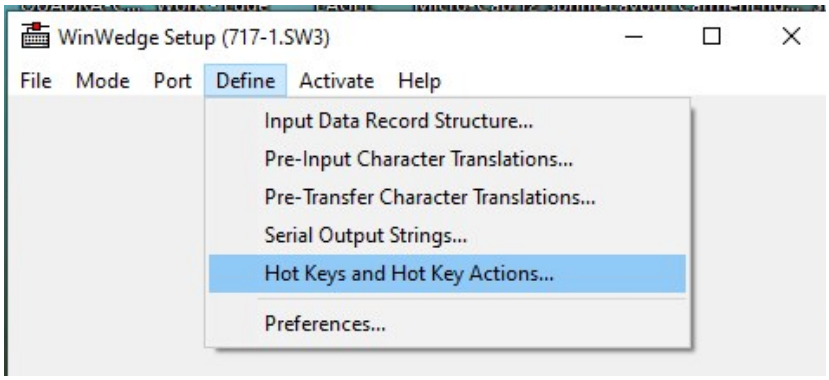
Name and Save the file.

Pressing the WinWedge icon will result in the opening of the application without having to adjust the settings as described in Appendix C.

Assigning a Hot Key to the computer keypad.

Select the Define Tab.

Select the **Hot Keys and Hot Key Actions…**

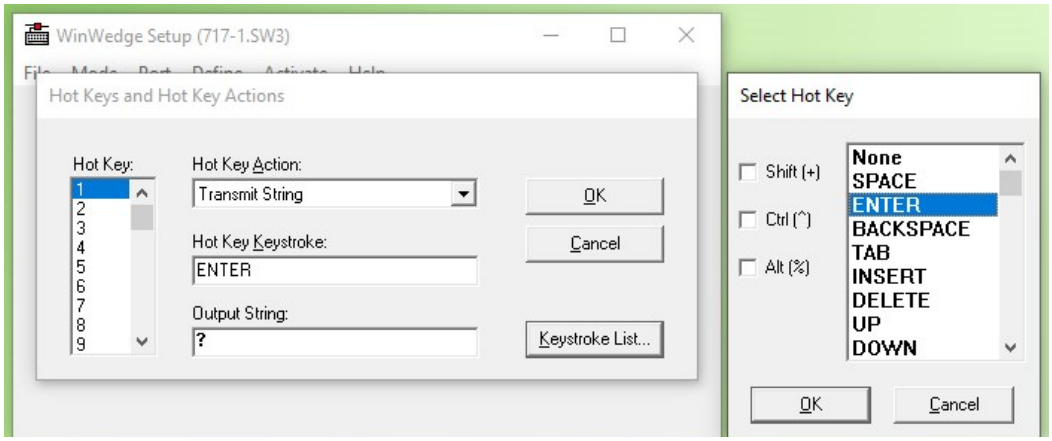


Place the cursor inside the open fields: Hot Key Action, Hot Key Keystroke and Output String to active the options from the drop down menus or the Keystroke List…

Hot Key Actions presents a list of options that may be assigned to the Key. Select Transmit String

Hot Key Keystroke enables the Keystroke List… button. The Keystroke List presents a list of keypad buttons that may be assigned to send a request when pressed. Example the ENTER key if selected will send the Output String to the 717 Gage.

Output String enables the Keystroke List… button. The Keystroke List displays ASCII characters that may be selected to request data from the tool. Example: the 717 transmits data when a ?, is received.



Note: While the WinWedge is active the selected key will not be available for any other function. For instance if the ENTER key is enable to request data it can not be used in other applications. It is suggested the F1 key or other non critical keys be used.