The PEEK ADR-2000 unit uses inputs from piezoelectric sensors to conduct vehicle, speed, axle weight, classification, length, gross weight counts. The PEEK ADR is fully portable, and require a brief lane closure the installation of the piezoelectric sensor across the lanes. The installation described below included application of the ADR-2000 with a MSI Roadtrax BL sensor deployed on the left lane of a two lane road. BL stands for “brass linguini” which describes the shape of the piezoelectric sensor.

In the picture below, the sensor was inserted into a pocket tape with tar adhesive on its underside. Prior to installation, the pavement was dried with a blow torch. The ADR-2000 was chained to one of the traffic sign poles shown in the picture.

In general, piezoelectric sensors act as transducers that turn force, or mechanical stress into electrical charge, which can then be turned into voltage. The piezoelectric sensors have a polarized crystal sandwiched between two metal plates, thus creating a capacitor. When an external force, such as a vehicle, causes a deformation of the crystal, the result is a charge that is a function of the applied force.
**Detector Package**

This traffic monitoring system consists of the following items:

1) 2 – 12 ft. piezoelectric sensors
2) ADR-2000 unit
3) Interface Box
4) TOPS software
5) Required cables (RS232 Communication Cable, Power Cable to recharge unit)

**Power Requirements**

The PEEK ADR-2000 comes with an internal, rechargeable battery. It can also be equipped with an optional solar panel that extends the duration of field counts. The power cable to recharge the battery plugs into the same port as the RS232 serial cable used for data extraction. The ADR needs to display 6 Volts or more for reliable deployment (the LCD display shows the current voltage).

**Installation**

The piezoelectric sensors need to be installed in an area that is dry and free from moisture, rocks, and oil. The temperature of the road surface should be above 50 °F. The ideal site for installation is a road of level grade and even surface. The following are required for the installation of the PEEK ADR-2000 and the piezoelectric sensors:

1) Utility Knife
2) 25 foot tape measure
3) Piece of chalk
4) #1 Phillips screwdriver
5) Medium flat screwdriver
6) Broom, if the place for the sensors needs to be swept

The following are the steps for installing the PEEK ADR-2000 and the piezoelectric sensors at the chosen site:

1) Measure and cut the pocket tape 12 inches longer than the piezoelectric sensors, 2 pieces of tape are required. Do not remove the backing until the tape is ready for installation onto the road.
2) Measure and mark a 3’ x 4’ x 5’ triangle to ensure that the tape is installed perpendicular to traffic.
3) Measure and mark the dimensions of the sensor spacing on the road surface. The standard spacing for the piezoelectric sensors is 16 feet apart.
4) Slide each piezoelectric sensor into its own piece of pocket tape.
5) Remove the paper backing to expose the adhesive of the pocket tape.
6) Keeping the tape straight and inline with the marks, place the tape on the roadway.
7) Place the splice between the sensor and the “Lead In” at the shoulder line. This is to reduce the amount of traffic that may run over the splice and damage the sensor.
8) Walk the tape down on both sides making sure that the tape is completely in contact with the pavement.
9) Repeat the procedure for the second sensor.
10) Open the Interface Box and slip the “Lead In” cable through the water tight connector into the Interface Box.
11) Connect the sensors to the terminal strip as follows:
   a. Sensor 1 Center Core to the terminal with the Red wire.
   b. Sensor 1 Outer Shield to the terminal with the Black wire.
   c. Sensor 2 Center Core to the terminal with the White wire.
   d. Sensor 2 Outer Shield to the terminal with the Black wire.

12) Close the Interface Box and connect it to the ADR.
    Once the counts are completed, simply remove the piezoelectric sensors from the pocket tape, and haul the system to the office or to another location.

Unit Setup

Setting up the ADR unit configurations can be performed via keypad, laptop computer, or modem connected to the ADR unit.

To set up the PEEK ADR-2000 directly on the unit, these steps can be followed:
1) Go into the Menu screen on the unit. Select “Custom Setup.”
2) On the next screen, enter a Site ID, and a Station number.
3) The following is the basic setup we used to configure the PEEK ADR-2000:
   a. Sensors In Array?: Set to WIM Sensors
   b. Type Of Array?: Press “Enter” to continue (no choice)
   c. Use Onscale?: Set to No.
   d. Number Of Arrays?: Set to 1
   e. Files Required?:
      i. BIN: Set to Yes
      ii. PVR: Set to Yes
   f. Number Of Studies?: Set to 1
   g. Heading 1?: Set to Class
   h. Summate Classes?: Set to No
   i. Heading 2?: Set to Speed
   j. Speed – Number Of Bins?: Set to 7 (A higher number provides a more precise split of speed counts.)
   k. Speed – Bin 1 of 7: Set to Less Than 9 MPH
   l. Speed – Bin 2 of 7: Set to 9 To 19 MPH
   m. Speed – Bin 3 of 7: Set to 19 To 29 MPH
   n. Speed – Bin 4 of 7: Set to 29 To 39 MPH
   o. Speed – Bin 5 of 7: Set to 39 To 49 MPH
   p. Speed – Bin 6 of 7: Set to 49 To 59 MPH
   q. Speed – Bin 7 of 7: Set to Greater Than 59 MPH (Note: the user can set any desired combination of speed Bins. The first speed bin will be from 0 to the amount set, and the last speed bin will be from the greatest amount set to infinity.)
   r. Heading 3?: None (User can change this if another count, such as weight, is needed.)
   s. PVR settings:
      i. What Classes?: Set to All Classes
      ii. Which Arrays? Set to Array 1: Set to Yes
   t. Main Interval: Set to 15 min
   u. When Armed settings:
i. Start Next Interval?: Set to Yes (By selecting No, the user can enter a later time and date for the detector to start collecting.)

ii. Never End?: Set to Yes (By selecting No, the user can enter a later time and date for the detector to stop collecting.)

**Running the Unit**

Once configured, the PEEK ADR-2000 will start collecting at the next interval. For example, if the Main Interval is set equal to 15 minutes (which we did), and if the current time is 11:07, then, the unit will start collecting data at the next interval, which would be 11:15. To stop the collection, one can go into the menu and select “Quit Arm” and “Yes.” If the collection is stopped by quitting (or the collection has reached its end time), data collection can start again without going through the whole setup process again by pressing “F1” on the unit. This arms the detector using the already set configuration.

Once the unit is collecting data, one can monitor the data collection by going into the menu and selecting “Check” and “Count Monitor” to see the current vehicle count over each array. Alternatively, “Vehicle Monitor” may be selected and this will show each per-vehicle detection as it occurs. See page 5-2 of the “PEEK Traffic Automatic Data Recorder Operation and User Guide” for more information on the labels at the top of the LCD display.

**Data Retrieval**

The procedure to retrieve stored data is as follows:

1) First, the connection properties must be set on the ADR-2000 and the computer.
   a) Select “Configure” on the ADR-2000’s main menu, then go to “COMMS.”
   b) The settings should be:
      I. Modem Initialization COM1: Set to “None/PC COM1 Baud Rate: Set to “192000” (or any rate – user take note of setting).
      II. COMMS. ID: Set to “1” (or any number – user take note of setting).
      III. COMMS Operation?: Set to “NORMAL.”
   c) Load the “TOPS” program on the computer.
   d) Go to “Tools,” then “Communications,” then “Properties” and then “Manual Options.” A window like the one below should be showing:

   ![Connection Properties Window]

   e) Set the Connection Properties under “Connection Options” to the following:
I. Type of Connection: Set to “Local.”
II. Type of Protocol: Set to “Peek ADR.” Port: Set to “COM 1.”
    Baud Rate: Set to “192000” (or whatever value it was set to).
III. Then click on “Protocol Options” tab, and set the “Comms ID”
    as shown below

![Connection Properties Window](image)

f) Set the Comms ID to 1 (or whatever value it was set to).

2) Ready to get the data: Go to “Tools,” “Communications,” and then click on “Get All”
   (or you use “Get New”).
3) Once the files have been retrieved, a screen like the one below is displayed. Click on
   the desired file, and it should become highlighted. Click on “Next” in the bottom
   right hand side of your screen.

![Data Retrieval Screen](image)

4) The following screen is shown:
5) Select the data from the desired day. Upon clicking on that day, it becomes highlighted. Then click on “Next.” This opens the “Report Wizard”:

6) Click on “Next”:

7) Decide the format of data display. For example, if “Daily Volume” count in 15 minute intervals is selected the following screen appears:
8) On this screen, one can select your “Report Data Interval,” “Report Interval Heading Format,” “Printing Options,” and “Totals.” Click “Finish” once all selections are made and the “Daily Volume” count in 15 minute intervals is shown.

9) To extract other data, such as Speed Volumes, the procedure is basically the same. The user simply needs to select “Daily Speed” (this is for the Daily Speed Counts), and follow the Report Wizard as shown above.

10) You can also export data into Excel by going to “File,” and then “Export” which prompts to the “Export Wizard” shown below:
11) Click on “Next”:

12) Select the format for the exported data. For Excel, “Comma Delimited” works well.
13) Click on “Finish” to be prompted to choose where to save the file.
14) Open Excel, import the data and proceed with spreadsheet analysis.