



## INSTRUCTIONAL MANUAL

**3 / 4 / 8 CH. BRAKE PEDAL  
TRAVEL TESTER (METRIC)  
MODEL KEI-095A**

**KEMKRAFT** ENGINEERING, INC.  
MODEL KEI-095A BRAKE PEDAL TESTER (METRIC)

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# **KEMKRAFT** ENGINEERING, INC.

## MODEL KEI-095A BRAKE PEDAL TESTER (METRIC)

### GENERAL DESCRIPTION

The KEMKRAFT Model KEI-095 Brake tester is a precision test instrument which will display and record brake pedal travel, brake pedal effort, brake line pressure, and car deceleration during vehicle drive testing. Setup is accomplished in a few minutes with four transducers and a cigarette lighter plug. Data is stored in the Brake Tester for approximately 4.5 minutes of test time at the rate of 10 data readings per second. Multiple tests can be run and each test is identified by its start and stop time/date.

### INSTALLATION

1. Open the KEI-095 Brake tester box and remove the two pedal transducers and power cable.
2. Place the Floor transducer on a stable area of the car with the front line marking facing toward the front of the car. Align the transducer so that the axis of the transducer is exactly parallel to the centerline of the car. See figure 1. Rotate the transducer so that the number label faces up.
3. Place the Pedal transducer on the pedal arm. Lock the fixture securely in place. Adjust the multi-axis fixture so that the transducer is level and parallel to the centerline of the car. Rotate the transducer so that the number label faces up, with the wires toward the front of the car.

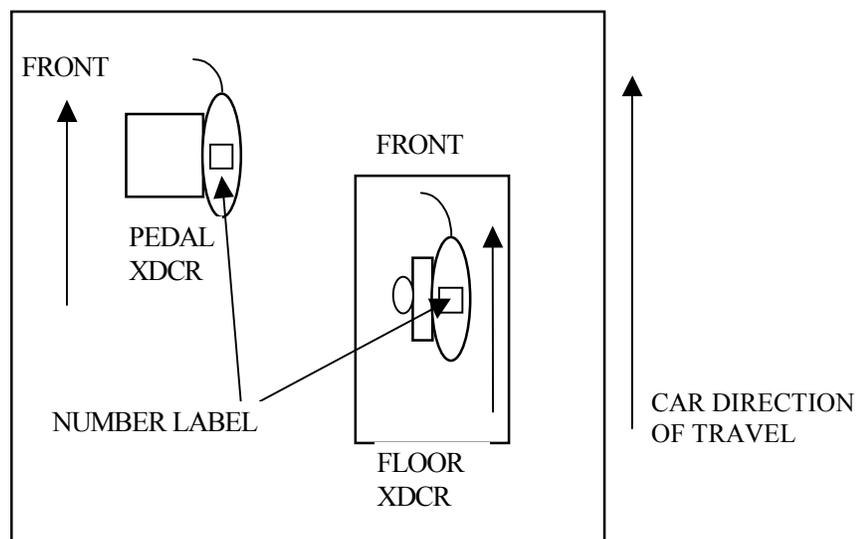


Figure 1

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4. If the Pedal force transducer is used, place it on the brake pedal and secure it firmly in place.
5. If the Brake Pressure transducer is used, install it on the master cylinder using an adapter (user supplied). The threads are 1/4-18 NPT Male. If the Brake Pressure Transducer is not being used, a terminating plug (KE095P1) for the Pressure connector is supplied.
6. Route all transducer cables so that they do not interfere with pedal operation. The cables must have enough slack to move freely without binding.
7. Plug the transducer cables and the power cable into the Brake tester. The brake tester connectors are marked and keyed so no damage can occur from incorrect cable connection.
8. **Start the car** and plug the power cable into the car cigarette lighter.
9. Turn the Brake Tester on. The start-up screen will be displayed. Press any key to enter the Main menu.

### MAIN MENU

0 = Start Test
1 = Calibrate
2 = System Setup
3 = Download Data

10. Press the 2 key to enter the system setup menu and press the 4 key again to display the pedal angles.
11. Adjust the pedal and floor transducers so that their angles read less than +/- 2 degrees. Adjust the transducer angles by loosening the center thumbscrew slightly, adjusting the transducer, and *carefully* re-tightening the screw.

The installation is now complete. Press the \* key twice to return to the main menu and the tester is ready to be used.

## OPERATION

The operation of the KEI-095 Brake Tester is controlled by various menus. Select the required operation from the menu using numbers on the keypad. Any entered data is entered on the keypad. Decimal points are added automatically.

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### To run a test:

1. Be sure all setup is complete as detailed in the Installation section. Be sure the car is running. Turn on the Brake Tester power switch. Always start and stop the engine with Brake Tester power off.
2. Press the 0 key to select START TEST. The Test menu will be displayed. Press the 0 key again to start the test.
3. A menu screen will display that shows the functions of each key during testing. Press any key to start the test.

0 = Zero All XDCRs
1 = Data Col STR/STP
3 = Reset Peak
Press (*) to Abort

4. The test screen will now be displayed.

TRAV:	0.0	0.0
FRCE:	0.0	0.0
DCEL:	0.0	0.0
PRES:	0.0	0.0

The current value is displayed in the first data column and the greatest positive or negative peak value is displayed in the second data column.

The Units are:

Travel = Centimeters

Force = Newtons

Decel = 100%= 1g

Pressure = Bars

5. With the engine on, the shifter in park, and your foot off the brake pedal, press the **0** key to **Zero** all values. The Brake tester will store the zero values until the unit is switched off.
6. While testing, the **Peak** value can be reset by pressing the **3** key at any time. **This has no effect on data storage or any other reading, it resets the displayed peak only.**

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7. To begin **data storage** at any time press the **1** key.

This data storage screen will now be displayed.

R:000	0.0	0.0
T:000	0.0	0.0
S:.10	0.0	0.0
RUN:	0.0	0.0

The first line of the test screen R:000, indicates that the brake tester is now collecting data. The number will begin counting upward to indicate how much memory has been used.

The second line of the test screen T:000, tells you the total memory that has been used. The memory is full when the display reaches T:285.

The third line of the test screen S:00, indicates the number of samples per second.

The fourth line of the test screen will change to RUN, indicating that the Brake Pedal tester is in data acquisition mode.

To stop data collection at any time, press the 1 key again.

The start and stop time of each test (pressing the 1 key) is recorded and stored in memory to identify tests.

8. Press the \* key at any time to abort the data collection and return to the test menu. If data collection is in progress, when the \* key is pressed, the data collection will be stopped and the data end time stamped with the current time.

### SYSTEM SETUP

Certain system parameters must be modified when changing to a new vehicle or adjustment is required. The pedal length from pivot point to the middle of the brake pedal must be changed when switching to a new vehicle.

The clock should be checked for accuracy and reset for daylight savings time.

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### **Enter a new Pedal Length (cm):**

1. Turn on the brake tester. Press any key to display the main menu.
2. Press the 2 key to enter the System Setup Menu.
3. Press the 1 key to enter the Test Parameters Menu.

The Test Parameters Menu will be displayed.

Test Parameters Menu 1 = Set Pedal Length 2 = Vary Sample Rate * = ABORT
---

4. Press the 1 key to change the pedal length.
5. The display will show the current pedal length. Enter the Four numbers of the new pedal length on the keyboard. Be sure to enter any leading zeros and the hundreds place decimal point will be entered automatically.

When the fourth number is entered, the display will go back to the Test Menu. The new pedal length is stored in memory and will remain until it is changed again.

### **Change Data Sample Rate**

1. Press the 2 key to enter the System Setup Menu.
2. Press the 1 key to enter the Test Parameters Menu.
3. Press the 2 key to change the sample rate. The standard default rate is 10 samples per second with a maximum rate of 50. **If the sample rate of 10 is changed to 50 the data storage time is decreased.**

### **Enter Data Trigger Parameter:**

1. Press the 2 key to enter the System Setup Menu. Press the 2 key to enter the Test Options Menu.

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2. Press the 1 key to enter the Triggering Settings Menu.
3. Enter a 0 to disable the triggering or 1 to enable the triggering.
4. Enabling the triggering allows you to select which transducer and value will trigger the data recording during a test.

### **Enter RUN Display Options:**

1. Press the 2 key to enter the System Setup Menu. Press the 2 key to enter the Test Options Menu.
2. Press the 2 key to enter the Display Options Menu.

This menu allows the user decide how many channels are displayed in the RUN menu. On a 4 channel KEI-095 3 or 4 channels are selectable. An 8 channel allows the user to select 3,4 or 8 channels.

This menu also allows the user to decide if the first channel displays angle or travel. Default is set for travel.

### **Enter HUD (Heads up Display) Setup:**

1. Turn on the brake tester. Press any key to display the main menu.
2. Press the 2 key to enter the System Setup menu. Press the 2 key to enter Test Options Menu.
3. Press the 4 key in the setup menu to set HUD (Factory)Default bargraph values for Upper Limit, Target, Lower Limit.
4. Press the 3 key to enter the HUD Option menu.

The display will show the following.

```
*** HUD OPTIONS ***
Head Up Disp. = OFF
 0 = OFF   1 = ON
Press * to Abort
```

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5. Press the 0 key to Disable the HUD data communications.
6. Press the 1 key to Enable the HUD data communications.
7. Press the \* key to abort or continue through the menus.

\*\*\* HUD OPTIONS \*\*\*  
Numeric Disp. = OFF  
0 = OFF 1 = ON  
Press \* to Abort

8. Press the 0 key to Disable the LCD display.
9. Press the 1 key to Enable the HUD display.

The following display is a 4 Channel unit.

0 = Pedal Travel  
1 = Deceleration  
2 = Force  
3 = Pressure

The following display is an 8 Channel unit.

1,2,3,4 = Aux. Channel  
5 = Pedal Travel  
6 = Deceleration  
7 = Force 8 = Pressure

10. Press the 0 – 8 key to select the channel that will be displayed on the HUD.

Pedal Travel Setup  
UPPER    xxxx.x  
TARGET  xxxx.x  
LOWER    xxxx.x

11. Enter the Upper, target and lower values to be displayed on the bargraph.

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12. Press the 3 key to turn off the LCD display update, Press the 4 key to turn on the LCD display update. (The Bargraph will continue to operate until disabled.)
13. Press the \* key to return to the System Setup and main menus.

### **Enter a new time and date:**

1. Turn on the brake tester. Press any key to display the main menu.
2. Press the 2 key to enter the System Setup menu. Press the 3 key to set the time and date.
3. The display will show the current time and date.
4. Press the 1 key to change the time if required.
5. Enter the new time, in 24 hr format (1:00 pm = 13:00:00), on the keypad. Enter a 2 number hours, 2 number minutes, and 2 number seconds. The display will return to display the new time.
6. Press the 0 key to change the date if required.
7. Enter the new date on the keypad. Enter a 2 number months, 2 number days, and the last 2 digits of the year. The display will return to display the new date.
8. Press the \* key to return to the System Setup and main menus.

### **Display Pedal and Floor transducer angles:**

1. Press the 2 key to enter the System Setup Menu.
2. Press the 4 key to display the transducer angles.
3. Press \* to Exit.

## **TRANSDUCER CALIBRATION**

The KEI-095 brake tester works by comparing the angle on the brake pedal level transducer to the angle of the floor transducer. The angles must be the same from each transducer. Because the pedal travel and deceleration values are derived from these angles, the angles must be accurate for the system to be accurate. **Periodic re-calibration of the system is necessary.**

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Calibration requires a Calibration Stand Model KE095CS that has four precision +/- angles, and zero, to set the pedal and floor transducers to, a precision known weight for the force transducer, and a Pressure Calibration box Model KE095CB that has a precision known value for the pressure transducer.

### **To calibrate the Angle Transducers:**

1. Connect the KEI-095 brake tester to a 12.6 to 15 volt, 500 ma power supply. Connect all transducers to their brake tester ports.
2. Turn on the brake tester. Press any key to display the main menu.
3. Mount pedal angle transducer and floor angle transducer to the calibration stand. **Make sure the number labels on both transducers are facing up.**
4. Press the 2 key to enter the System setup mode. Press the 2 key to set the pedal length. **Enter 17.78 cm** as the pedal length. This is required to calibrate the transducers using Calibration stand KE095CS. Press \* to return to the Main menu.
5. Press the 1 key to enter the Calibration mode.
6. To prevent unwanted access to the calibration modes a numeric code must be entered. Enter "1", "2", "3", "4" on the keypad.

The calibration menu will be displayed.

1 = Cal Angle XDCRs
2 = Cal Force XDCR
3 = Cal Press XDCR
4 = Cal Aux. XDCRS

7. Press the 1 key to calibrate both transducers at the same time.
8. The display will show the current raw transducer output. For the angle transducers, place the calibration stand on a level surface and adjust the transducer so that the reading is as close to zero as possible. Press the 1 key when close to 0.00 degrees.
9. The display will instruct the operator to set the angle transducers to a known negative angle. The recommended first angle is -60 degrees, however any angle 0 to -99.999 degrees can be used. Set the transducers to the angle and enter the 5 digits of the angle (60.000) on the keyboard or select \* if the displayed angle is correct to continue.

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10. When the fifth number is entered, the display will show the next recommended angle to be entered.
11. The display will instruct the operator to set the angle transducers to the next negative angle. The recommended angle is -45 degrees, however any angle from 0 to the previous angle can be used. Set the transducers to the angle and enter the 5 digits of the angle (45.000) on the keyboard or select \* if the displayed angle is correct to continue.
12. When the fifth number is entered, the display will go show the next recommended angle to be entered.
13. The display will instruct the operator to set the angle transducers to the next negative angle. The next recommended angle is -30 degrees, however any angle from 0 to the previous angle can be used. Set the transducers to the angle and enter the 5 digits of the angle (30.000) on the keyboard or select \* if the displayed angle is correct to continue.
14. The display will instruct the operator to set the angle transducers to the next negative angle. The next recommended angle is -15 degrees, however any angle from 0 to the previous angle can be used. Set the transducers to the angle and enter the 5 digits of the angle (15.000) on the keyboard or select \* if the displayed angle is correct to continue.
15. The display will instruct the operator to set the angle transducers to zero angle. The recommended angle is 0 degrees, however any angle from the previous angle to the next angle can be used. Set the transducers to the zero angle and enter the 5 digits of the angle (00.000) on the keyboard or select \* if the displayed angle is correct to continue.
16. The display will instruct the operator to set the angle transducers to the first positive angle. The recommended angle is 15 degrees, however any angle from 0 to 99.999 can be used. Set the transducers to the angle and enter the 5 digits of the angle (15.000) on the keyboard or select \* if the displayed angle is correct to continue.
17. The display will instruct the operator to set the angle transducers to the next positive angle. The recommended angle is 30 degrees, however any angle greater than the previous angle can be used. Set the transducers to the angle and enter the 5 digits of the angle (30.000) on the keyboard or select \* if the displayed angle is correct to continue.
18. The display will instruct the operator to set the angle transducers to the next positive angle. The recommended angle is 45 degrees, however any angle greater than the previous angle can be used. Set the transducers to the angle and enter the 5 digits of the angle (45.000) on the keyboard or select \* if the displayed angle is correct to continue.
19. The display will instruct the operator to set the angle transducers to the last positive angle. The recommended angle is 60 degrees, however any angle greater than the previous angle

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can be used. Set the transducers to the angle and enter the 5 digits of the angle (60.000) on the keyboard or select \* if the displayed angle is correct to continue.

20. When the last angle is entered, the display will read "Calibration Complete".
21. Calibrate all transducers and check the angle values using the System Setup menu XDCR Angles display.

### **To calibrate the Pedal Force Transducer:**

1. Connect the KEI-095 brake tester to a 12.6 to 15 volt, 500 ma power supply. Connect all transducers to their brake tester ports.
2. Turn on the brake tester. Press any key to display the main menu.
3. Press the 1 key to enter the Calibration mode.
4. To prevent unwanted access to the calibration modes a numeric code must be entered. Enter "1", "2", "3", "4" on the keypad. The calibration menu will be displayed.
5. Press the 2 key to calibrate the pedal force transducer.
6. The display will show the current raw transducer output. For the pedal force transducer, just place on a level surface. Press the 0 key.
7. Place a known weight from 22.2 to 440.4 N on the transducer and enter the five numbers of the weight on the keypad. Be sure to enter any leading zeros and the decimal point will be entered automatically.
8. When the fourth number is entered, the calibration is complete. Press the \* key to exit the calibration mode.

### **To calibrate the Brake Pressure Transducer:**

1. Connect the KEI-095 brake tester to a 12.6 to 15 volt, 500 ma power supply. Connect all transducers to their brake tester ports.
2. Connect the pressure transducer through the KE095CB with the cable and transducer.
3. Turn on the brake tester. Press any key to display the main menu.
4. Press the 1 key to enter the Calibration mode.

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5. To prevent unwanted access to the calibration modes a numeric code must be entered. Enter "1", "2", "3", "4" on the keypad. The calibration menu will be displayed.
6. Press the 3 key to calibrate the brake pressure transducer.
7. The display will show the current raw transducer output. For the brake pressure transducer set the calibration box switch to ZERO. Press the 0 key.
8. Set calibration box switch to CAL. Enter the 5-digit calibration number that is on the label on the front panel. Each pressure XDCR has it's own CAL# depending on the serial number of the transducer.
9. When the fifth number is entered, the calibration is complete. Press the \* key to exit the calibration mode.

**To calibrate the AUX. Pressure Transducers:**

1. Connect the KEI-095 brake tester to a 12.6 to 15 volt, 500 ma power supply. Connect all transducers to their brake tester ports.
2. Connect the pressure transducer to AUX. CH1-4.
3. Turn on the brake tester. Press any key to display the main menu.
4. Press the 1 key to enter the Calibration mode.
5. To prevent unwanted access to the calibration modes a numeric code must be entered. Enter "1", "2", "3", "4" on the keypad. The calibration menu will be displayed.
6. Press the 4 key to calibrate the AUX. pressure transducers.
7. Press 1 to select the channel 1 to calibrate.
8. The display will show the current raw transducer output. With the Aux. pressure transducer set to ZERO. Press the 0 key.
9. Apply calibrated pressure to the Aux. transducer under test. Enter the calibrated pressure value in Bars.
10. When the fifth number is entered, the calibration is complete. Press the \* key to exit the calibration mode.

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11. Repeat steps 7 through 10 for channels 2-4.

### DOWNLOADING DATA

The KEI-095 Brake Tester can store data for download to a computer and further analysis. The Kemload32 program and the Download menu are used for this purpose. After downloading the data, the memory can be reset using the same menu.

#### To download data:

1. Connect the KEI-095 Brake Tester RS-232 port to the computer COM1 port. The connections are detailed in the following menu. Turn on the Brake tester.

CABLE CONNECTIONS ARE:	
KEI-095 RS-232 (9 Pin) D-Type	COMPUTER COM1 (9 Pin) D-Type
Pin 2 (RxD)	Pin 2 (TxD)
Pin 3 (TxD)	Pin 3 (RxD)
Pin 5 (GND)	Pin 5 (GND)

2. From Windows 95/98 start the KEMLOAD32 program. Verify COM baud rate is set for 19200,n,8,1 and program is set for ASCII text mode.
3. From the KEI-095 main menu press the 3 key. The Download Data Menu will be displayed.

----- Download ----- 5 = Download Data 9 = Reset Memory Press * to Abort
---

4. Press the 5 key to begin the data download. If the Download Error message is displayed, check the cable.
5. The data will display on the computer screen as it is being received by the computer. When the download is complete, both the computer and Brake tester will indicate this.
6. If the data is to be saved on disk, select file then, Save...or Save as... The data will be automatically saved to a file upon successful download. This auto save feature can be disabled in the properties menu.

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7. The data remains in the KEI-095 Brake tester memory and can be download as many times as desired. To clear the memory and reset the pointer to T:000, select the Download menu and press the 9 key to reset memory. **\*\* NOTE:\*\*** Be sure no important data remains in the Brake Tester memory before clearing or resetting it as all data is irretrievably lost.

### **REAL TIME DATA DOWNLOAD TO PC**

The KEMKRAFT Model KEI-095 has Real Time download capabilities. This feature is desirable when you are doing multiple test runs and need to display and store the information while conducting the test. The software allows you to capture large amounts of information without the worry of using up the memory in the KEI-095 before the testing is complete.

### **SETUP**

1. Install KEMLOAD32 download software.
2. **Disable the HUD display on the KEI-095.**
3. To download the data collected in memory from the KEI-095 follow the procedure outlined in the DOWNLOAD section of this manual.
4. The Real Time Download (RTDL) does not effect collection of data in the memory of the KEI-095 Brake pedal tester.

Data to be collected in memory can be started and stopped while the data is also being dumped to the PC.

### **OPERATION**

1. With the KEI-095 all setup and in the Start Test Menu , **Select Options Menu** on the PC and enable the RTDL option then press F6 to start the real time download. (Maximum data collection in KEMLOAD32 is around 14,000 lines or about 20 - 25 min. of continuous data dump depending on available base memory of the P.C.)
2. To stop real time download to the PC press the KEI-095 \* **Key to Abort**. This will stop the data dump to the PC and data collection in memory on the KEI-095, if the internal memory storage is running.
3. To Save the data the procedure is the same as is outlined in the Download section of this manual.