



# 6756 Direct/Residual Shear Data Acquisition Software

**NOTE:** Please read the equipment requirements, installation, and operation instructions prior to testing. Reliable test results are dependent on the operator's knowledge of both the software and applicable test methods.

#### **INTRODUCTION**

Karol-Warner Direct/Residual Shear Data Acquisition Software automatically records and graphs data during direct/ residual shear testing of soils. Data points and calculations are determined in accordance with ASTM D3080 and AASHTO T 236 specifications. The data is displayed in real time in a tabular and graphical format. At the conclusion of a test this data can be used to generate a PDF report or imported into spreadsheet applications such as Excel for further processing.

The Direct/Residual Shear Data Acquisition Software offers a variety of benefits for completing direct and residual shear testing.

- · User friendly interface
- · Quick and easy installation and updates
- · Generates professional testing reports
- Capable of exporting data into spreadsheet applications such as Excel
- Optimized for both touch-screen and mouse/keyboard operation
- Compatible with Windows 10, 8, 7, Vista, and XP

#### EQUIPMENT COMPATIBILITY AND TEST SETUP

The following is required to use the Direct/Residual Shear Data Acquisition Software.

Data Readout Box	6574
Windows Operating System	Windows 10, 8, 7, Vista, or XP
Computer	Any tablet, PC, or laptop using Windows XP or newer.

Below is a list of compatible equipment with the Direct/Residual Shear Software. Please contact Karol-Warner Technical Support to inquire about compatibility of transducers and load cells not listed below.

Direct Shear Unit	2001-D, 2050-D
Displacement Transducer	6152 (Qty. 2)
Load Cell	6142
Shear box	Any Karol-Warner or Gilson manufactured shear box



Figure 1: Example test setup using the 2001D Pneumatic Digital Direct Residual Shear Machine and a laptop computer.

Figure 1 shows the 2001D Pneumatic Direct/Residual Shear Machine setup using a laptop. A touchscreen operated tablet or desktop PC can also be used. Two displacement transducers, a load cell and pressure transducer are connected to the data readout box which is then connected to a tablet or PC via a mini-USB to USB cable. These components are included with the 2001D. The 2050-D can also be used but requires vertical load values to be entered manually by the user.

#### INSTALLATION

- 1. Two USB devices are included with the software: A Karol-Warner flash drive containing the installation files and a small, black USB security key. Insert the Karol-Warner flash drive into the tablet or PC to be used during testing. Navigate to the USB Drive in File Explorer then double click on the USB Drive to open the installation files. Save or copy these files locally. The software can be downloaded onto other devices to open and edit test data, but data collection is only enabled when the USB security key is attached.
- **NOTE:** If running Windows 7 or below, right click on the application titled **dotNetFx40\_Full\_x86\_x64** and select **Run as administrator**. Doing so will check the current version of the Microsoft .NET framework. If the .NET Framework is not installed or up to date, the most current version will be installed. If the most current version is already installed, the installer will complete with no further action.

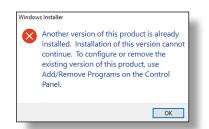


Figure 2: Installation error message

- 2. Run the **DirectShearSetup** file and follow the prompts on the screen. The software should detect any previous versions and uninstall them automatically. If a Windows Installer message appears (Figure 2), follow the prompts and uninstall the previous version of the software. Once installation is complete, close the installer.
- 3. Eject the USB containing installation files and insert the USB security key. Open the Direct/Residual Shear Data Acquisition Software. Click **Help** along the toolbar (Figure 3) then select **Activation** from the drop-down menu. Enter the provided license number, USB ID, and activation code. The software will run normally for 30 days before this information is required to continue use. Activation information can be entered at any point within the first 30 days after installation.
- **4.** Establish the connection between the data readout box and the software:
  - **a.** Make sure all connections to the computer and data readout box are secure.
  - b. Navigate to the Connections tab in the software. Select the COM port for the data readout box from the Serial Port drop down menu. To determine the correct COM port, navigate to Control Panel > Device Manager and view the devices listed under Ports (COM & LPT). The data readout box will appear as a USB serial port. If multiple devices are listed as a USB serial port, the correct serial port can be identified by unplugging the device from the tablet or PC then identifying which serial port disappeared from the listed devices. Once identified, plug the data readout box back into the tablet or PC and click connect.
  - c. Once connected, the travel values will be displayed to the right of the serial port dropdown menu. Gently move one of the LVDTs on the direct shear unit up and down to confirm the connection. The travel value should change.
- **NOTE:** All software installation files and updates are also available for download on <u>www.karolwarner.com</u>. Log into your "My Karol-Warner Account" to access the "Software Downloads" page.

#### SETTINGS AND CONTROLS

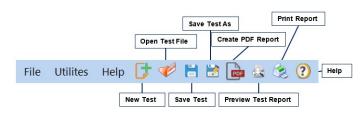


Figure 3: Toolbar

The top toolbar (Figure 3) consists of icons used to start, open, save and create test reports. These commands are also listed under the **File** dropdown menu.

The application settings (Figure 4) can be found under the **Utilities** dropdown menu on the top toolbar. Testing agency and equipment information can be entered here, in addition to selecting testing units and enabling/disabling popup keyboards. Popup keyboards are helpful when using a touch screen operated device. This information will be displayed on the report generated at the completion of a test. These settings remain saved for future testing. There is no need to reenter these settings when opening the program or starting a new test.

Enable F	Popup Keyb	oards/Key	pads s	HEAR RATE DETERMIN	NE METHOD:	Assumed	
SHEAR BOX	TYPE: Squar	e ~	Indicates r	equired entries.			
SHEAR BOX	Win.: 2.6			(	GRID PLATE	0.25	
SHEAR BOX H					POR STONE		
DI	EVICE: 2001E	)		E	BASE PLATE	0.24	
Equipment NORMAL	LOAD:  Pne	umatic C	Dead-	Weight		THICKNESSES:	
English		~					
Jnits of Measure					1	Select Company Logo	Karol•Warne
(Pres default)	Channel 4:	Pres	~				KW
HDsp default)	Channel 3:	HDsp	~	CITY, STATE ZIP:	Millers	ville, MD 21	108
(VDsp default)	Channel 2:	VDsp	~	ADDRESS:	415 He	adquarters	Dr.
(Load default)	Channel 1:	Load	~	COMPANY NAME:	Karol-V	Varner	
	nnel Assignment			Testing Agency Infor		onto	

Figure 4: Application settings

In addition to the application settings, calibration information for pneumatic units (2001 and 2001-D) can also be entered. Select **Calibration** from the **Utilities** dropdown menu. In the calibration menu (Figure 5) the date of calibration, serial number of the direct shear unit, and calibration data can be entered. Initial calibration values are provided with new units. Enter values for both high and low load. These values should be updated each time the unit is calibrated. It is recommended to use the actual load values and their corresponding low or high pressure values that equate to **1/8tsf** (8.52lbs), **1/4tsf** (17.04lbs), **1/2tsf** (34.09lbs), **1tsf** (68.18lbs), **2tsf** (136.4lbs), **4tsf** (272.7lbs), **8tsf** (545.4lbs), **12tsf** (818.0lbs), **16tsf** (1091.0lbs), and **22tsf** (1500.0lbs) when using a 2.5in diameter sample.

	AIR P	RESSURE SETTI	VGS
	Date:		
	Serial Number:		
	ACTUAL LOAD	Low Load Pressure, PSI	High Load Pressure, PSI
			]
			]
)			
		e and Clo	

Figure 5: Calibration menu

#### **RUNNING A TEST**

- 1. Prepare a sample in accordance with the selected test method then seat the shear box with sample in the direct shear unit. Make sure the alignment screws are in place.
- **2.** In the **Setup** tab (Figure 6) enter project and sample information. Yellow boxes indicate required entries to complete testing.

		INF	TIAL CONDITION	OF SPECIMEN		
CLIENT:			SAMPLE DESC:		TEST DATE:	9/21/2018 🖉 -
PROJECT:			USCS CLASS:		SPECIMEN TYPE:	Undisturbed ~
PROJECT ID:			AASHTO CLASS:		SAMPLE PREP:	
SAMPLE ID:			SP.GR. SOLIDS:		LIQUID LIMIT:	
SAMPLE LOC .:			INITIAL HEIGHT, in.:	1.5	PLASTIC LIMIT:	
BORING NO:			WET WEIGHT, g:		PLASTICITY INDEX:	
AMPLE DEPTH:			MOISTURE, %:		VOLUME	in3:
TEST TYPE:	Direct Shear	~	Indica	tes required entries.	AREA	
TESTED BY:					WET DENSITY,	pcf:
					DRY DENSITY.	
K					VOLUME OF SOLIDS	
	Warner			Calculate	INITIAL VOID RA	
Karol	warner		-		INITIAL SATURATION	4, %:

Figure 6: Setup Tab

3. The values in the bottom righthand corner of the Setup tab are calculated using the required entries. Select the Calculate button to perform these calculations before selecting Next in the bottom left hand corner. A dialogue box (Figure 7) will appear. It is recommended that the unit be disconnected from the internet to avoid test interruptions from automatic Windows updates.

Inline Status	
	ne internet. It is recommended to ong/overnight tests, avoiding automatic ceed?
	Yes No

Figure 7: Internet Connection Warning

4. In the Connections tab (Figure 8), make sure the correct serial port is connected using the serial port dropdown menu. Click Set File in the Connections tab. Navigate to the desired file location, name the file, then click Save. Click the Next button to continue to the next tab.

etup Connections	ties Help Consolidation Shee READOUT bravel conne	r Test Finish Test	2 💼 🤹 🌫	. ?		
Senal Port:		- Closed	Shear Dipi Value : Shear Load Value : Normal Dipi Value : val Load (converted) Value :	Nom Signe	al Air I pai :	
4	🕻 Con	nect		[Practice Test]		4
- SET FILE LO	CATION	File				
Ne	ext					

Figure 8: Connection tab

**5.** In the **Consolidation** tab (Figure 9), select the graphing format from the dropdown menu. The graph can be displayed in linear time, log time, or the square root of time. The recording frequency defaults to 0.01 minutes for the first 3 minutes of testing but can be adjusted by entering a different value in the recording frequency field.

a opining	ormat:	<ul> <li>Record every: 0.01 Minutes</li> </ul>	Current Applied Vertical Force, Ib:
		(for 1st 3 min) (defaults to 3 sec. @ 1 min, 10	min @ 20 min)
		SPECIMEN AFTER CONSOLIDATION	CONSOLIDATION
D :	START CONSOL.	SPECIMEN AFTER CONSOLIDATION	CONSOLIDATION TOTALE T., min:
: 🜑	START CONSOL.		
<i>c</i>		NO. STAGES:	TOTAL E.T., min:
D :	START CONSOL. NEW STAGE	NO. STAGES:	TOTAL E.T., min:
<i>c</i>		NO. STAGES: END DIAL READING: END LOAD READING:	TOTAL E.T., min:

Figure 9: Consolidation tab

6. Click Start Consolidation. If using a pneumatic unit apply the load using the pressure regulator then click OK, Begin Consolidation to continue onto the consolidation phase of the test. The software will automatically detect the applied load. For dead-weight units, when prompted, enter the normal load value in pounds (Figure 10). Once the appropriate weights are loaded, click OK, Begin Consolidation then release the load arm. The data is displayed in a tabular format and a graphical format. To view the graph, select the Consolidation Graph tab. A graph of the current stage will be displayed in real-time.



Figure 10: Start Consolidation Dialogue Box

**7.** To start a new consolidation stage, click **New Stage**, apply the appropriate load then click **OK**, **New Stage** (Figure 11).

CONFIRM NE	W STA	GE	
OK, Nev	v Staç	je	

Figure 11: New Consolidation Stage Dialogue Box

8. For dead-weight units, enter the applied load in pounds before continuing. Repeat this step until all stages have been completed. Once completed, click Stop Consol and the software will stop collecting consolidation data. When asked "Do you want to stop consolidation?" (Figure 12) click OK. Calculations are then performed and will appear in the bottom half of the Consolidation tab. Click Next to continue to the shear phase.

in	_		×
ou want stop conso	olidation	?	
OK			
Cancel			
	OK	u want stop consolidation OK	u want stop consolidation? OK

Figure 12: Stop Consolidation Dialogue Box

 Remove the alignment screws from the shear box and click Start Shear in the Shear Test Tab (Figure 13). A dialogue box (Figure 14) will appear with a "Pre-Shear Checklist." Ensure all items on the checklist have been completed, select OK and begin the shear phase.

		aph			
				Copy List D	Data
			START SHEAR DIAL:	MAX. SHEAR STRESS, ker:	
🕑 STA	RT SHEAR	Record every: 0.1	START SHEAR DIAL:	MAX, SHEAR STRESS, kif.	
		Record every: 0.1			
	RT SHEAR	Record every: 0.1	min START SHEAR LOAD:	MAX. SHEAR LOAD, Ibs:	
NE	EW STAGE		min START SHEAR LOAD:	MAX. SHEAR LOAD, bs:	
NE		Record every: 0.1	min START SHEAR LOAD: START NORMAL DIAL START NORMAL LOAD:	MAX. SHEAR LOAD, Ibs:	
	EW STAGE	Clear Data	min START SHEAR LOAD: START NORMAL DIAL START NORMAL LOAD: END SHEAR DIAL:	MAX. SHEAR LOAD. Ibs: MAX. SHEAR DISPLACEMENT, IN. CUMULATIVE TRAVEL, IN.: TOTAL E.T., min.	
Actual Current Shee	EW STAGE OP SHEAR	Clear Data	MIN START SHEAR LOAD: START NORMAL DIAL START NORMAL LOAD: END SHEAR DIAL: END SHEAR LOAD:	MAX. SHEAR LOAD. bs: MAX. SHEAR DISPLACEMENT, n.: CUMULATIVE TRAVEL, n.: TOTAL E.Tmin: AVG. RATE, in./mn:	

Figure 13: Shear Test Tab

🚽 Start Shear Test		-		×
Pre-Shear Checklist				
Has a shear "Seating Load" been applied,	and the 2 knurled nuts at the sh	ear supporting cast	ing been tig	htened?
Have the 2 thumb screws holding shear rin	gs together been removed?			
Has an appropriate "Gap" between shear r	ings been set using the 4 adjust	ing screws?		
Do γοι	u want to begin shea	r?		
	Cancel			

Figure 14: Pre-Shear Checklist

- 10. To start a new shear stage, click New Stage, When the dialogue box (Figure 15) appears, click OK and begin the next stage. Repeat this step until all stages have been completed. Once completed, click Stop Shear to cease collecting test data. When asked "Do you want to stop shear?" (Figure 16) click OK and stop the shear test. Calculations are then performed and will appear in the bottom half of the "Shear Test" tab. Click Next to continue to the Final Test tab.
- **NOTE:** When running a residual shear test, begin a new stage as stated in Step 9. The software will automatically detect the directional change and identify that stage as a residual.

🖳 New Shear St	age	-	L	Ŷ
Do you want	to begin a n	ew sh	ear sta	age?
	OK		]	

Figure 15: New Shear Stage Dialogue Box

🖷 End Shear		-		×
Do you	u want to sto	op she	ar?	
	OK		]	

Figure 16: Stop Shear Dialogue Box

**11.** Enter the final percent moisture in the **Finish Test** tab (Figure 17) then click **Calculate Final Results** to generate the final test calculations. The test data will be saved, and the final values will be displayed in this tab.

Setup C	Connections C	onsolidation	Shear Test Finish	Test					
				Enter: I	FINAL % MOIS	FURE:	ry.		
			1	Calc	ulate Fi	nal Results	5		
				FINA	L DRY DENSI' L WET DENSI' VOID IAL SATURAT	FY, pcf:			

Figure 17: Finish Test Tab

**12.** The saved file can be reopened, edited and saved using the icons on the top toolbar. The test data is saved in ASCII Comma Delimited format which can be opened for further analysis and processing using spreadsheet applications such as Excel.

#### **FRICTION ANGLE TOOL**

To determine the friction angle ( $\Phi$ ) and cohesion intercept (c), navigate to the **Friction Angle** Tab in the software. Select two points from the test data to create a best fit line. Click **Calculate** and the software will calculate  $\Phi$  and c.

Best Fit Line, Select Point	and Cohesic			
-		^		
0.05	0			
0.05	0			
0.05	0			
0.05	0.01			
0.05	0.03			
0.05	0.05			
0.05	0.06			
0.05	0.06			
0.05	0.06			
0.05	0.06			
0.05	0.00	~		
Best Fit Line Coordinal Point 1 (X1, Y1):	tes:	×		
Point 2 (X2, Y2):				
Max. Shear Stress: Normal Stress @ Max. She	2.14 ear: 0.05			
Friction Angle (deg).			0.1.1.	
Cohesion Intercept, c			Calculate	📙 Save

Figure 18: Friction Angle Tool

# EXPORTING DATA TO SPREADSHEET APPLICATION TROUBLESHOOTING

To export spreadsheet compatible test data:

 Open spreadsheet application. Select File > Open > Browse to locate the test file(s). In the bottom right corner of the file explorer(Figure 18)selectAllFiles from the drop-down menu.

← → × ↑ 📙 « Documents	> Test Data	✓ Ö Search T	est Data 🔎
Organize 🔻 New folder			💷 👻 🛄 🤇
🝊 OneDrive	^ Name	^	Date modifie
💻 This PC		No items match yo	our search.
3D Objects			
E Desktop			
Documents	~ <		
	v <	~ All Files	· · · · · · · · · · · · · · · · · · ·

Figure 19: Excel File Explorer

- 2. Navigate to the test file you are trying to export.
- 3. Select the file then select Open.
- **4.** The **Text Import Wizard** dialog box (Figure 19) will appear. Select **Delimited** then click next.

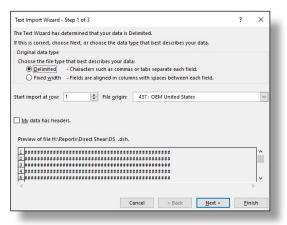


Figure 20: Text Import Wizard Step 1

5. Uncheck the box labeled **Tab** (Figure 20) and select the box labeled **Comma**. Select **Next** then **Finish**.

Text Import Wizard	d - Step 2 of 3				?	×
his screen lets you review below. Delimiters Iab Semicolon <u>Comma</u> Space Qther:		ur data contains. You tive delimiters as one	r can see how y	our text is affected	l in the	
Data <u>p</u> review	*****	****	**			^
· · · · · · · · · · · · · · · · · · ·	************	*****	##			~

Figure 21: Text Import Wizard Step 2-3

**6.** The company information, sample information, and test data will be displayed on the spreadsheet.

## Software is not identifying serial port connections

Confirm there is power going to the data readout box and that all connections to the box and computer are secure. Make sure all ports and connections are free of dust or debris. Open Windows Device Manager to see if the readout box is listed as a device under **Ports (COM & LPT)**. Instructions for determining the correct serial port can be found in the Installation instructions. Once the readout box appears under **Ports (COM & LPT)**, close then reopen the Software and try reconnecting.

### Application License Error Message Appears

This message (Figure 21) will appear when more than the allowed number of test windows is opened. If you would like more than the currently allowed test windows to be opened simultaneously, additional licenses can be purchased. Please contact Please contact Karol-Warner at **1.800.999.7645** or **customerservice@karolwarner.com** to purchase additional licenses.

Application License allows [1] open instances at a ti will close.	X me. This instance
	ОК

Figure 22: Application License Error Message

If you are not attempting to open more than the allowable windows open Task Manager. If you see **Direct-Residual Shear**, select it from the list then select **End Task**. Try reopening the Software.

# **EXAMPLE TEST REPORT**

	Direct She	ear T	69	t Re	nor			3080				
	Direct On		00		pon			0000				
Sample ID:	1508	-0	).1									
Location:	Anytown											
Boring No.:	6B		L									
Depth:	12											
Description:	SLC											
Type of Test:	Direct Shear		0									
Tested By:	LM		- 1									
Date of Test:	10/19/2018			+++	+							
Specimen Type:	Compacted											
Prep:			0.1									
Specific Gravity:	2.65	STRAIN, (%)	5.1									
Plastic Limit:	15	RAIN										
Liquid Limit:	35	STI										
Plasticity Index:	20											
USCS Class:		0	0.2		++							
AASHTO Class:	SLC											
	2.6											
Width of Device, in.:				NI								
Type of Device:	Square											
		0	0.3		┝┿							
Pofora Tast												
Before Test			ŀ	+++	++	_						
Height, in.	1.48											
Water Content, %	15	0	0.4 L									
Area, in2	6.76		0	48 3	2 64 128	256	576	1024		2304		4096
Wet Density, pcf	43.666						F	lapsed SqRt	Time min			
Dry Density, pcf	33.1							iapoed oqra				
Void Ratio	3.98											
Saturation, %	2.62	2	.5000									
Consolidation												
No. Stages	1	2	.2500									
Settlement, in.	0.0045											
		2	.0000		/							
Shear				1								
No. Stages	1	1	.7500	-t						-		
Avg Normal Stress, ksf	0.050	ksf		1								
Max Shear Stress, ksf	1.68	SS	5000									
Max Shear Force, Ibs	78.8	TRE	.5000	1								
Max Displacement, in.	0.067	AR S		1								
Travel, in.	1.697	1 1 1 1 1 1	.2500	1								
Avg. Rate, in./min	3.393	, °		1								
Height Change, in.	0.1450	1	.0000	-	-	-	$\vdash$			-		
Final Height, in.	1.3350			1								
Final Volume, in3	9.025		.7500		-	-	$ \square$			_		
			.1500									
After Test												
Water Content, %	19	0	.5000		1							
Dry Density, pcf	36.694				1							
Wet Density, pcf	43.666	0	.2500		-	-	$\vdash$			-		
Void Ratio	3.66											
Saturation, %	1.23		0									
Equipment: 2001-D, 6574			C	1	0.	050	0.10 SHEA	)0 .R DISPLACI	0.150 EMENT, in.	0.2	200	0.250
415 Head	-Warner Iquarters Dr., Suite 6 Ie, MD 21108				Projec Projec Client	ct No:	729		ar esting L	ab		