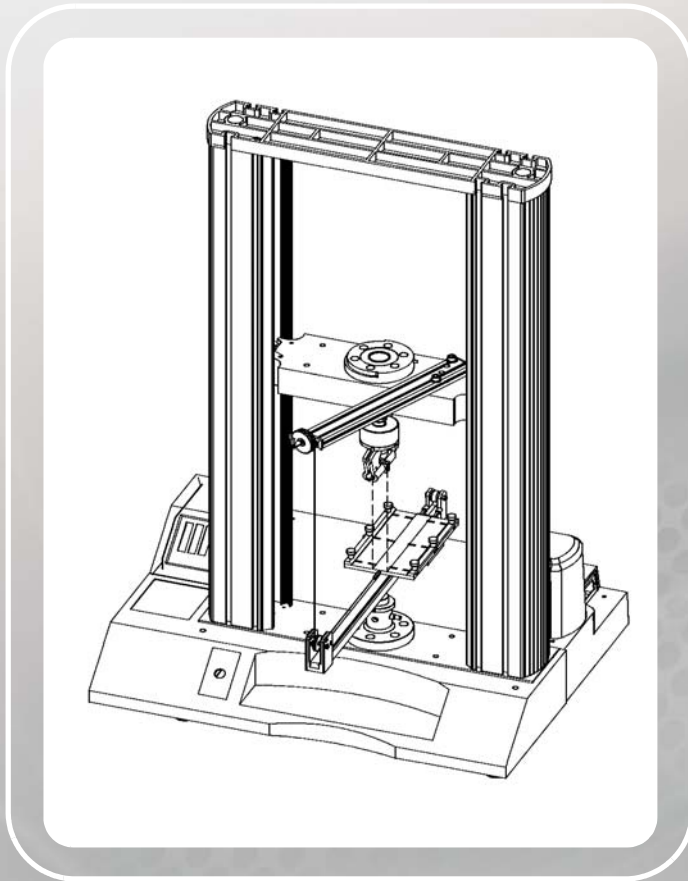


Peel Test Fixtures



Electromagnetic Compatibility

Where applicable, this equipment is designed to comply with International Electromagnetic Compatibility (EMC) standards.

To ensure reproduction of this EMC performance, connect this equipment to a low impedance ground connection. Typical suitable connections are a ground spike or the steel frame of a building.

Proprietary Rights Notice

This document and the information that it contains are the property of Illinois Tool Works Inc. (ITW). Rights to duplicate or otherwise copy this document and rights to disclose the document and the information that it contains to others and the right to use the information contained therein may be acquired only by written permission signed by a duly authorized officer of ITW.

Trademarks

Instron® is a registered trademark of Illinois Tool Works Inc. (ITW). Other names, logos, icons and marks identifying Instron products and services referenced herein are trademarks of ITW and may not be used without the prior written permission of ITW.

Other product and company names listed are trademarks or trade names of their respective companies.

Original Instructions

Copyright © 2017 Illinois Tool Works Inc. All rights reserved. All of the specifications shown in this document are subject to change without notice.

Worldwide Headquarters

Instron
825 University Avenue
Norwood, MA 02062-2643
United States of America

European Headquarters

Instron
Coronation Road
High Wycombe, Bucks HP12 3SY
United Kingdom

Industrial Products Group

Instron
900 Liberty Street
Grove City, PA 16127
United States of America

General Safety Precautions



Materials testing systems are potentially hazardous.

Materials testing involves inherent hazards from high forces, rapid motions, and stored energy. You must be aware of all moving and operating components in the testing system that are potentially hazardous, particularly force actuators or a moving crosshead.

Carefully read all relevant manuals and observe all Warnings and Cautions. The term Warning is used where a hazard may lead to injury or death. The term Caution is used where a hazard may lead to damage to equipment or to loss of data.

Instron products, to the best of its knowledge, comply with various national and international safety standards, in as much as they apply to materials and structural testing. We certify that our products comply with all relevant EU directives (CE mark).

Because of the wide range of applications with which our instruments are used, and over which we have no control, additional protection devices and operating procedures may be necessary due to specific accident prevention regulations, safety regulations, further EEA directives or locally valid regulations. The extent of our delivery regarding protective devices is defined in your initial sales quotation. We are thus free of liability in this respect.

At your request, we will gladly provide advice and quotations for additional safety devices such as protective shielding, warning signs or methods of restricting access to the equipment.

The following pages detail various general warnings that you must heed at all times while using materials testing equipment. You will find more specific Warnings and Cautions in the text whenever a potential hazard exists.

Your best safety precautions are to gain a thorough understanding of the equipment by reading your instruction manuals and to always use good judgement.

It is our strong recommendation that you should carry out your own product safety risk assessment.

Warnings



Hazard - Press the Emergency Stop button whenever you consider that an unsafe condition exists.

The Emergency Stop button removes hydraulic power or electrical drive from the testing system and brings the hazardous elements of the system to a stop as quickly as possible. It does not isolate the system from electrical power, other means are provided to disconnect the electrical supply. Whenever you consider that safety may be compromised, stop the test using the Emergency Stop button. Investigate and resolve the situation that caused the use of the Emergency Stop button before you reset it.



Flying Debris Hazard - Make sure that test specimens are installed correctly in grips or fixtures in order to eliminate stresses that can cause breakage of grip jaws or fixture components.

Incorrect installation of test specimens creates stresses in grip jaws or fixture components that can result in breakage of these components. The high energies involved can cause the broken parts to be projected forcefully some distance from the test area. Install specimens in the center of the grip jaws in line with the load path. Insert specimens into the jaws by at least the amount recommended in your grip documentation. This amount can vary between 66% to 100% insertion depth; refer to supplied instructions for your specific grips. Use any centering and alignment devices provided.



Hazard - Protect electrical cables from damage and inadvertent disconnection.

The loss of controlling and feedback signals that can result from a disconnected or damaged cable causes an open loop condition that may drive the actuator or crosshead rapidly to its extremes of motion. Protect all electrical cables, particularly transducer cables, from damage. Never route cables across the floor without protection, nor suspend cables overhead under excessive strain. Use padding to avoid chafing where cables are routed around corners or through wall openings.

Warnings



High/Low Temperature Hazard - Wear protective clothing when handling equipment at extremes of temperature.

Materials testing is often carried out at non-ambient temperatures using ovens, furnaces or cryogenic chambers. Extreme temperature means an operating temperature exceeding 60 °C (140 °F) or below 0 °C (32 °F). You must use protective clothing, such as gloves, when handling equipment at these temperatures. Display a warning notice concerning low or high temperature operation whenever temperature control equipment is in use. You should note that the hazard from extreme temperature can extend beyond the immediate area of the test.



Crush Hazard - Take care when installing or removing a specimen, assembly, structure, or load string component.

Installation or removal of a specimen, assembly, structure, or load string component involves working inside the hazard area between the grips or fixtures. When working in this area, ensure that other personnel cannot operate any of the system controls. Keep clear of the jaws of a grip or fixture at all times. Keep clear of the hazard area between the grips or fixtures during actuator or crosshead movement. Ensure that all actuator or crosshead movements necessary for installation or removal are slow and, where possible, at a low force setting.



Hazard - Do not place a testing system off-line from computer control without first ensuring that no actuator or crosshead movement will occur upon transfer to manual control.

The actuator or crosshead will immediately respond to manual control settings when the system is placed off-line from computer control. Before transferring to manual control, make sure that the control settings are such that unexpected actuator or crosshead movement cannot occur.



Robotic Motion Hazard - Keep clear of the operating envelope of a robotic device unless the device is de-activated.

The robot in an automated testing system presents a hazard because its movements are hard to predict. The robot can go instantly from a waiting state to high speed operation in several axes of motion. During system operation, keep away from the operating envelope of the robot. De-activate the robot before entering the envelope for any purpose, such as reloading the specimen magazine.

Warnings



Hazard - Set the appropriate limits before performing loop tuning or running waveforms or tests.

Operational limits are included within your testing system to suspend motion or shut off the system when upper and/or lower bounds of actuator or crosshead travel, or force or strain, are reached during testing. Correct setting of operational limits by the operator, prior to testing, will reduce the risk of damage to test article and system and associated hazard to the operator.



Electrical Hazard - Disconnect the electrical power supply before removing the covers to electrical equipment.

Disconnect equipment from the electrical power supply before removing any electrical safety covers or replacing fuses. Do not reconnect the power source while the covers are removed. Refit covers as soon as possible.



Rotating Machinery Hazard - Disconnect power supplies before removing the covers to rotating machinery.

Disconnect equipment from all power supplies before removing any cover which gives access to rotating machinery. Do not reconnect any power supply while the covers are removed unless you are specifically instructed to do so in the manual. If the equipment needs to be operated to perform maintenance tasks with the covers removed, ensure that all loose clothing, long hair, etc. is tied back. Refit covers as soon as possible.



Hazard - Shut down the hydraulic power supply and discharge hydraulic pressure before disconnection of any hydraulic fluid coupling.

Do not disconnect any hydraulic coupling without first shutting down the hydraulic power supply and discharging stored pressure to zero. Tie down or otherwise secure all pressurized hoses to prevent movement during system operation and to prevent the hose from whipping about in the event of a rupture.



Hazard - Shut off the supply of compressed gas and discharge residual gas pressure before you disconnect any compressed gas coupling.

Do not release gas connections without first disconnecting the gas supply and discharging any residual pressure to zero.

Warnings



Explosion Hazard - Wear eye protection and use protective shields or screens whenever any possibility exists of a hazard from the failure of a specimen, assembly or structure under test.



Wear eye protection and use protective shields or screens whenever a risk of injury to operators and observers exists from the failure of a test specimen, assembly or structure, particularly where explosive disintegration may occur. Due to the wide range of specimen materials, assemblies or structures that may be tested, any hazard resulting from the failure of a test specimen, assembly or structure is entirely the responsibility of the owner and the user of the equipment.



Hazard - Ensure components of the load string are correctly pre-loaded to minimize the risk of fatigue failure.

Dynamic systems, especially where load reversals through zero are occurring, are at risk of fatigue cracks developing if components of the load string are not correctly pre-loaded to one another. Apply the specified torque to all load string fasteners and the correct setting to wedge washers or spiral washers. Visually inspect highly stressed components such as grips and threaded adapters prior to every fatigue test for signs of wear or fatigue damage.

Table of Contents

Chapter 1: Introduction	11
Purpose	11
Description of Product	11
System Safety and Information Labeling	12
Product Support	13
About This Manual	13
Technical Support	14
Chapter 2: Specifications	15
90° Peel Test Fixture	15
Specifications	15
Variable Angle Peel Test Fixture	16
Specifications	16
Chapter 3: Installation	17
Overview	17
Load String	18
Installing Onto a Single Column Frame	18
Installation Procedure	19
Installing Onto Dual Column Frames	20
Installation Requirements	21
Installation Procedure	22
Installing Onto 2300/3300 Dual Column Frames	22
Installation Requirements	23
Installation Procedure	24
Installing Onto 4411 Dual Column Frames	24
Installation Requirements	25
Installation Procedure	26
Installing the Cable Assembly	26
90° Peel Test Fixture	27

Variable Angle Peel Test Fixture	28
Setting Up the Variable Angle Fixture Sled	33
Setting the 90°, 120°, 135° and 150° Peel Angle	33
Setting the 30°, 45° and 60° Peel Angle	36
Chapter 4: Operation	39
Setting Up a Specimen	39
Checklist	40
Removing a Specimen	43
Checklist	43
Procedure	43
Chapter 5: Maintenance	45
Maintenance Checklist	45
Maintenance Procedures	45
Maintaining the Guide Rail	45
Lubricating the Bearing Block	45
Chapter 6: Parts	47
General Information	47
Replacement Parts	48
Ancillary Parts	51

Chapter 1

Introduction

• Purpose	11
• Description of Product.....	11
• System Safety and Information Labeling.....	12
• Product Support.....	13

Purpose

Instron's 90° Peel Test Fixture (Model 2820-035) and the Variable Angle Peel Test Fixture (Model 2820-036) are testing devices designed to measure the force required to peel a sample from its backing material or substrate.

The fixture mounts onto Instron's electromechanical testing machines. The fixture sled is designed with crosshead assistance to reduce strain on the specimen and maintain a constant angle of pull.

Description of Product

Both the 90° peel test fixture and the variable angle peel test fixture consist of a bearing-mounted sled that is linked to the testing machine's crosshead by a cable and pulley system. The variable angle peel fixture has a sled with a T-slot sled onto which you secure the substrate material. The 90° peel fixture has only a T-slot sled. The T-slots allow the substrate clamps, which secure the substrate to the sled, to adjust to a variety of substrate widths.

One end of the specimen is secured to a substrate that is, in turn, secured to the T-slot sled, and the other end is inserted into a standard grip (not supplied with the peel test fixture).

As the crosshead moves in the tension direction, the cable pulls the sled laterally along the guide rail to maintain a constant angle for the peel (90° angle or the pre-set angle



on the variable peel fixture). This prevents any exertion of outside forces on the specimen.

The force required to peel the specimen is monitored by the load cell on the crosshead, providing a direct measure of bond strength.

System Safety and Information Labeling

Instron incorporates both the ISO and ANSI safety and information labels. Individual machines have either the ISO or ANSI warnings, not both. ISO labels display pictogram labels with no text, whereas ANSI labels include text and are used primarily in the United States. [Table 1](#) on page 12 explains the meanings of the labels that display on the peel test fixtures.

Table 1. Safety and Information Labeling Descriptions

Label	Meaning	Type	Purpose
	Crush hazard	ISO	Indicates that a crush hazard exists. Keep clear of these areas.
	Low clearance hazard	ISO	Indicates that a low clearance hazard exists. When working with the peel test fixture, keep clear of the crosshead extension to avoid possible head injury.

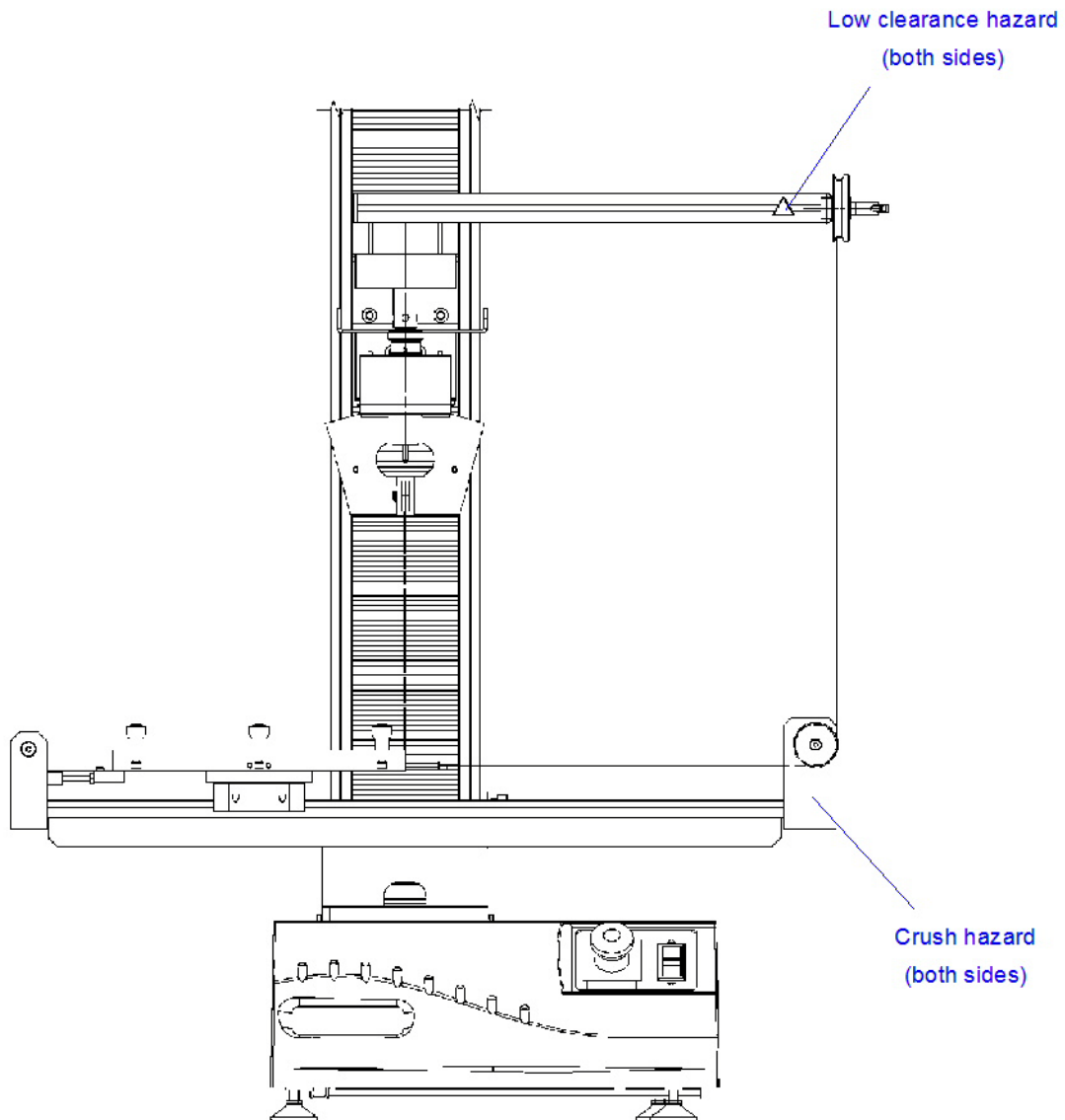


Figure 1. Peel Test Fixture Safety Labeling

Product Support

About This Manual

This manual provides an overview of the two peel test fixtures, including specifications, installation instructions and operating guidelines. The two peel test fixtures are:

- Model 2820-035 - 90° Peel Test Fixture.
- Model 2820-036 - Variable Angle Peel Fixture.

Technical Support

Instron provides documentation, including manuals and online help, that can answer many of the questions you may have. It is recommended that you review the documentation sent with the system you purchased for possible solutions to your questions.

You can also check the Frequently Asked Questions (FAQs) page on Instron's website for additional information. If you need more information, you can submit your question by completing a Service Support form on the website.

If you cannot find answers in these sources, contact Instron's Professional Services department directly:

Worldwide	www.instron.com
In the United States & Canada:	1-800-473-7838
Outside the U.S./Canada:	Contact your local Instron Sales and Service office.

A list of Instron offices is available on our website at www.instron.com.

Chapter 2

Specifications

- 90° Peel Test Fixture 15
- Variable Angle Peel Test Fixture 16

90° Peel Test Fixture

Specifications

Table 2. Specifications for 90° Peel Test Fixture

Parameter	Specification
Associated standards	ASTM B571 and D2861
Machine compatibility	Electromechanical testing machines (Adapters may be required on some older machines - Contact Instron Service for assistance)
Maximum load	1 kN (225 lbf)
Sled width	150 mm (5.9 in)
Sled length or Maximum peel length	250 mm (9.84 in)
Maximum substrate dimensions ¹	Width - 130 mm (5.1 in) Length - 250 mm (9.84 in)
Maximum substrate thickness ²	7 mm (0.27 in)

1. Not supplied by Instron.

2. If your test requires a thicker substrate, contact Instron Sales to discuss your specific needs.

Variable Angle Peel Test Fixture

Specifications

Table 3. Specifications for Variable Angle Peel Test Fixture

Parameter	Specification
Associated standards	ASTM B571 and D2861
Machine compatibility	All machines (Adapters may be required on some older machines - Contact Instron Service for assistance)
Maximum load	1 kN (225 lbf)
Sled width	150 mm (5.9 in)
Sled length or Maximum peel length	250 mm (9.84 in) For 3342/5542/5842 frames, the effective peel length is limited as follows: <ul style="list-style-type: none"> • 30° angle: 150 mm (5.9 in) • 45° angle: 160 mm (6.3 in) • 60° angle: 180 mm (7.1 in)
Maximum substrate dimensions ¹	Width - 130 mm (5.1 in) Length - 250 mm (9.84 in)
Maximum substrate thickness ²	7 mm (0.27 in)
Available angles ³	30°, 45°, 60°, 90°, 120°, 135°, 150° * * 150° is not recommended because the sled may slide unevenly.

1. Not supplied by Instron.

2. If your test requires a thicker substrate, contact Instron Sales to discuss your specific needs.

3. If your test requires a different peel angle, contact Instron Sales to discuss your specific needs.

Chapter 3

Installation

• Overview.....	17
• Installing Onto a Single Column Frame	18
• Installing Onto Dual Column Frames	20
• Installing Onto 2300/3300 Dual Column Frames	22
• Installing Onto 4411 Dual Column Frames	24
• Installing the Cable Assembly.....	26
• Setting Up the Variable Angle Fixture Sled	33

Overview

The basic installation process for both the 90° peel test fixture and the variable angle peel test fixture is the same except for the cable assembly and sled position. However, installation is slightly different depending upon the type of Instron testing machine you are using. This chapter provides installation instructions for the following frame types:

- Single column frames
- Series 5900, 5500, 5800, 4400, 4200, 1122, 1123, and 1125 dual column frames (table and floor models)
- 2300 and 3300 dual column frames (table and floor models)
- 4411 frame

Refer to the appropriate section in this chapter for installation instructions.

Refer to [“Installing the Cable Assembly”](#) on page 26 for cable assembly instructions for both the 90° peel test fixture and the variable angle peel test fixture.

The variable angle peel test fixture also requires specific positioning of the T-slot sled depending upon the angle required for your test. Refer to [“Setting Up the Variable Angle Fixture Sled”](#) on page 33 for instructions.



Refer to “[Parts](#)” on page 47 to identify specific part numbers for any components mentioned in the following sections.

Load String

The load string includes all of the components you install between a force producing load frame component (actuator or moving crosshead) and a stationary rigid member (base plate or fixed crosshead). This includes the load cell, grips, fixtures, attachment adapters and the specimen. A tight connection between each component is essential for accurate test data. Any backlash between the load string components will degrade the integrity of the test results.

Installing Onto a Single Column Frame

The following section describes installing both the 90° peel test fixture and variable angle peel test fixture on Instron’s single column frames.

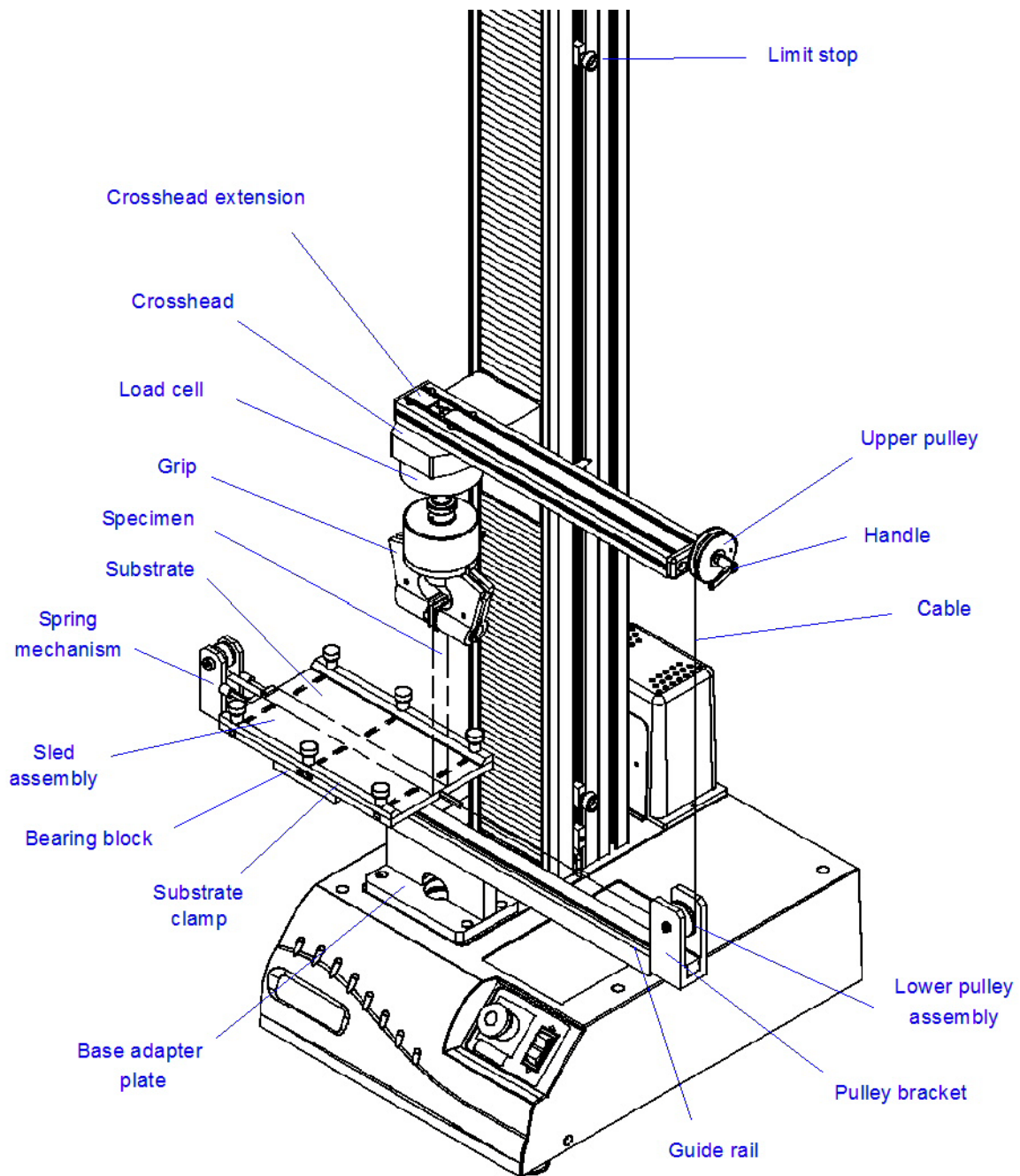


Figure 2. Installation for Single Column Frame

Installation Procedure



See [Figure 2](#) on page [19](#) to identify the components described in this section. Note that sled assembly on the 90° peel fixture includes the bearing block, T-slot sled, and

substrate clamps. On the variable angle peel fixture, the sled assembly includes the bearing block, sled, T-slot sled, protractor, and substrate clamps.

To install the peel test fixture onto a single column frame:

1. Install the crosshead extension to the top of the crosshead using the four M4 washers and four M4 x 25 cap screws.
2. Insert a locating disc (see Note below) into the base of the frame, over the Type O base adapter. You do not need to remove the Type O base adapter, however, the Type D base adapter must be removed.



Locating disc (part #T1335-1048) is included with the ancillary parts for the single column frames.

1. Attach the sled assembly to the frame's base by securing the base adapter plate with four M6 x 20 cap screws. Ensure that the lower pulley aligns under the upper pulley.
2. Install the cable assembly between the upper pulley and the sled assembly. Refer to [“Installing the Cable Assembly”](#) on page 26.

If you are using a variable angle peel test fixture, you also need to set up the T-slot sled to meet your test requirements. Refer to [“Setting Up the Variable Angle Fixture Sled”](#) on page 33.

The peel fixture is now ready for testing.

To position a specimen in the fixture, refer to [“Setting Up a Specimen”](#) on page 39 for instructions.

Installing Onto Dual Column Frames

The following section describes installing both the 90° peel test fixture and variable angle peel test fixture on Instron's dual column table and floor models for the following Instron Series: 5900, 5500, 5800, 4400, 4200, 1122, 1123, and 1125.

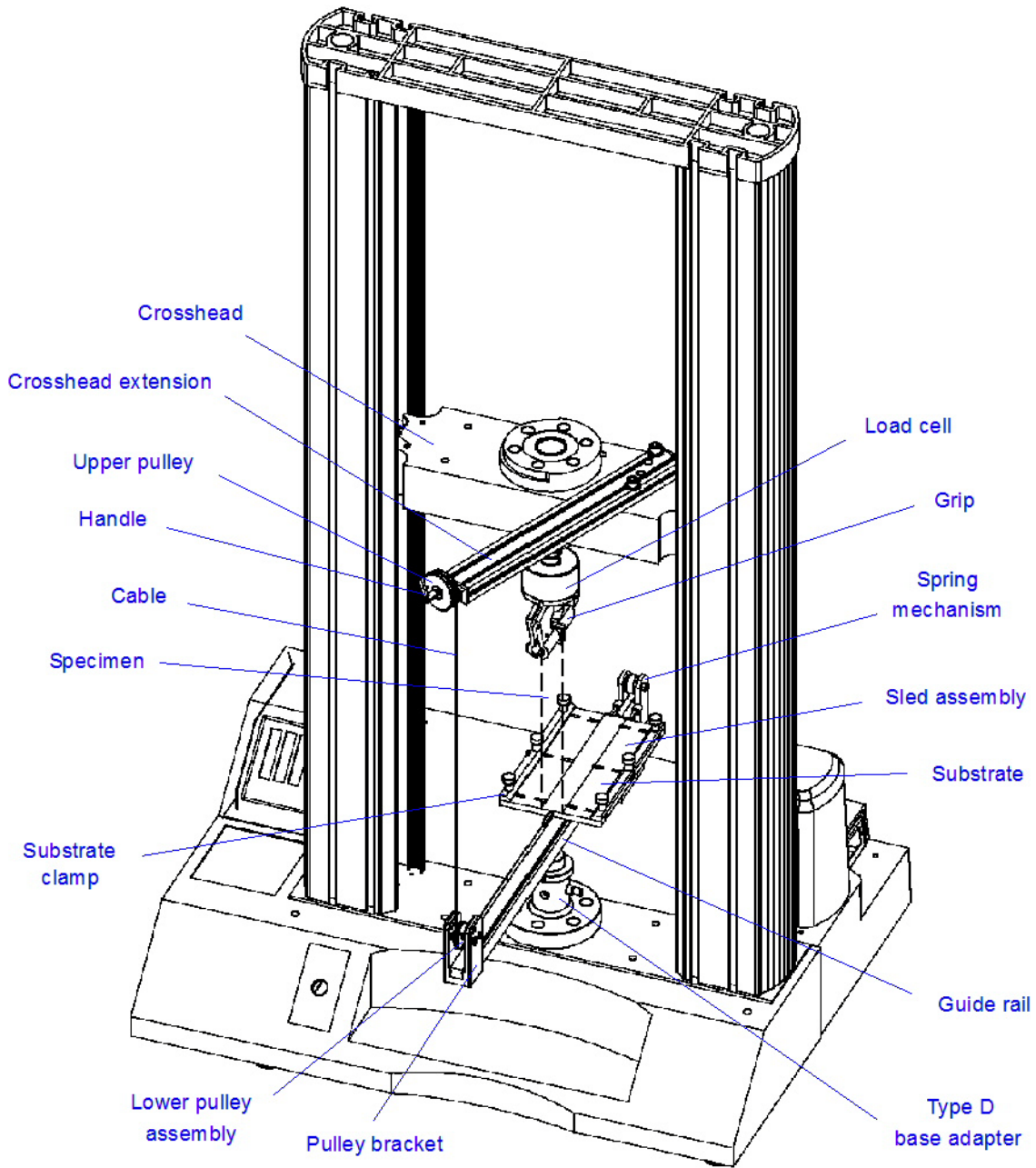


Figure 3. Installation 5900/5500/5800/4400/4200/1122/1123/1125 Dual Column Frames

Installation Requirements

To install the peel test fixture on a dual column frame, you need a Type D base adapter for the frame including coupling pin and locknut.

Installation Procedure



See [Figure 3](#) on page [21](#) to identify the components described in this section. Note that sled assembly on the 90° peel fixture includes the bearing block, T-slot sled, and substrate clamps. On the variable angle peel fixture, the sled assembly includes the bearing block, sled, T-slot sled, protractor, and substrate clamps.

To install the peel fixture onto a dual column frame:

1. Install the crosshead extension to the top of the crosshead using the following ancillary parts:

Load Frame Series	Washer	Cap screws	Quantity
5900, 5500, 5800, 4200, 4400	M10	M10 x 50	2
1122, 1123, 1125	½ inch	½ -13 x 1.75	2

1. Insert the sled assembly into the frame's Type D base adapter. Ensure that the lower pulley aligns under the upper pulley.
2. Secure the sled assembly to the base adapter with a coupling pin and then tighten the lock nut.
3. Install the cable assembly between the upper pulley and the sled assembly. Refer to [“Installing the Cable Assembly”](#) on page [26](#).

If you are using a variable angle peel test fixture, you also need to set up the T-slot sled to meet your test requirements. Refer to [“Setting Up the Variable Angle Fixture Sled”](#) on page [33](#).

The peel fixture is now ready for testing.

To position a specimen in the fixture, refer to [“Setting Up a Specimen”](#) on page [39](#) for instructions.

Installing Onto 2300/3300 Dual Column Frames

The following section describes installing both the 90° peel test fixture and variable angle peel test fixture on Instron's Series 2300 and 3300 dual column table and floor models.

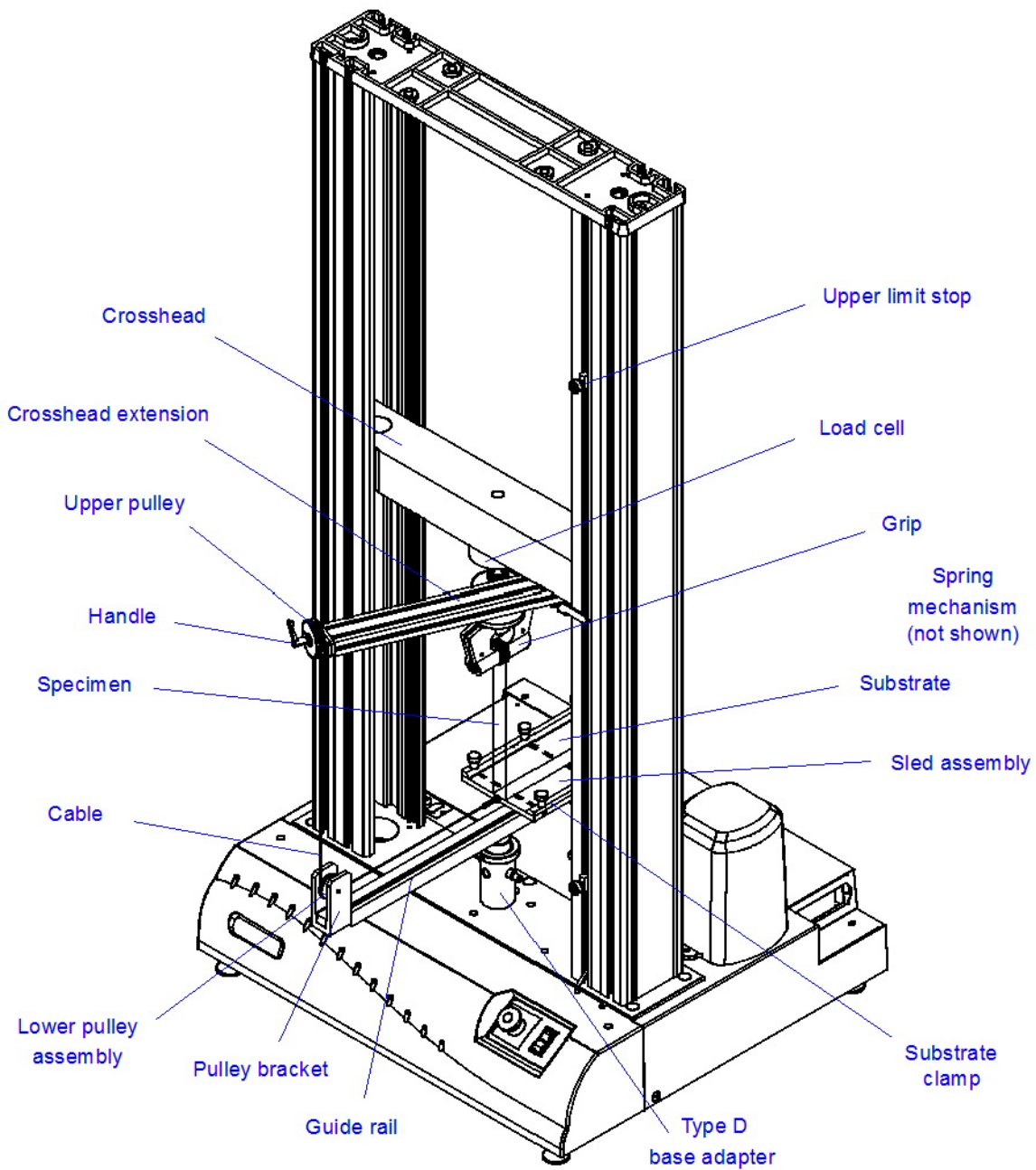


Figure 4. Installation on 2300 and 3300 Dual Column Frames

Installation Requirements

To install the peel test fixture on a dual column frame, you need a Type D base adapter for the frame including coupling pin and locknut.

Installation Procedure



See [Figure 4](#) on [page 23](#) to identify the components described in this section. Note that sled assembly on the 90° peel fixture includes the bearing block, T-slot sled, and substrate clamps. On the variable angle peel fixture, the sled assembly includes the bearing block, sled, T-slot sled, protractor, and substrate clamps.

To install the peel fixture onto a dual column frame:

1. Install the crosshead extension to the bottom of the crosshead using the two M10 washers and two M10 x 50 cap screws that are included with the ancillary parts.
2. Insert the sled assembly into the frame's Type D base adapter. Ensure that the lower pulley aligns under the upper pulley.
3. Secure the sled to the base adapter with a coupling pin and then tighten the lock nut.
4. Install the cable assembly between the upper pulley and the sled assembly. Refer to [“Installing the Cable Assembly”](#) on [page 26](#).

If you are using a variable angle peel test fixture, you also need to set up the T-slot sled to meet your test requirements. Refer to [“Setting Up the Variable Angle Fixture Sled”](#) on [page 33](#).

The peel fixture is now ready for testing.

To position a specimen in the fixture, refer to [“Setting Up a Specimen”](#) on [page 39](#) for instructions.

Installing Onto 4411 Dual Column Frames

The following section describes installing both the 90° peel test fixture and variable angle peel test fixture on Instron's Series 4411 dual column frame.

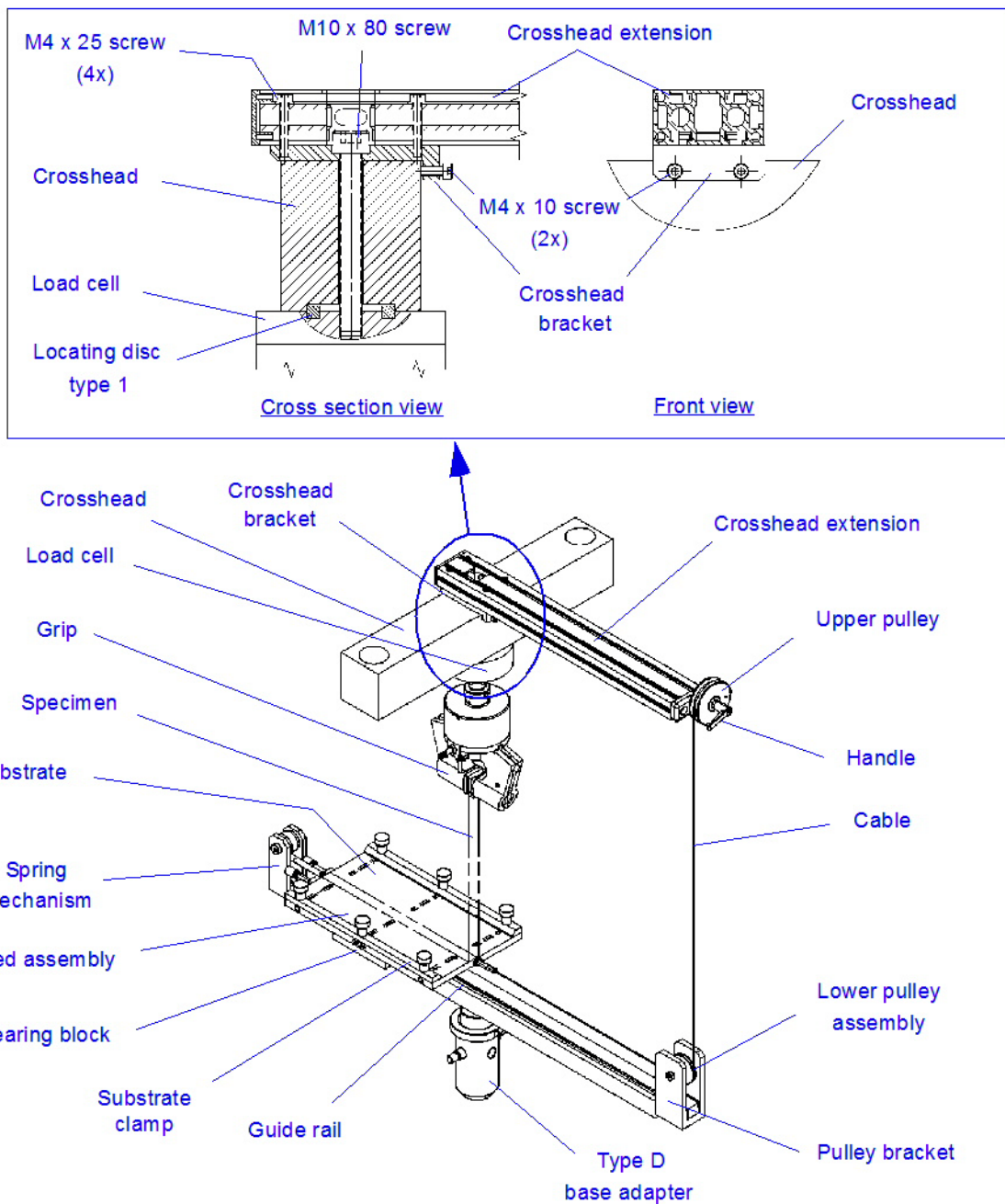


Figure 5. Installation on 4411 Load Frame

Installation Requirements

To install the peel test fixture on a dual column frame, you need a Type D base adapter for the frame including coupling pin and locknut.

Installation Procedure



See [Figure 5](#) on page [25](#) to identify the components described in this section. Note that sled assembly on the 90° peel fixture includes the bearing block, T-slot sled, and substrate clamps. On the variable angle peel fixture, the sled assembly includes the bearing block, sled, T-slot sled, protractor, and substrate clamps.

To install the peel fixture onto a 4411 frame:

1. Attach the crosshead extension to the crosshead bracket using the four M4 x 25 screws and M4 washers.
2. Place the crosshead extension and bracket on top of the crosshead and insert the load cell mounting screw (M10 x 80 cap screw) through the center of the extension, bracket and crosshead, as shown in [Figure 5](#) on page [25](#). Hand tighten the screw into the load cell.
3. Insert the two M4 x 10 cap screws to the front of the bracket and align the crosshead extension so that it is perpendicular to the crosshead.
4. Tighten the load cell mounting screw to 25 Nm (18 ft-lb).
5. Insert the sled assembly into the frame's Type D base adapter. Ensure that the lower pulley aligns under the upper pulley.
6. Secure the sled to the base adapter with a coupling pin and then tighten the lock nut.
7. Install the cable assembly between the upper pulley and the sled assembly. Refer to [“Installing the Cable Assembly”](#) on page [26](#).

If you are using a variable angle peel test fixture, you also need to set up the T-slot sled to meet your test requirements. Refer to [“Setting Up the Variable Angle Fixture Sled”](#) on page [33](#).

The peel fixture is now ready for testing.

To position a specimen in the fixture, refer to [“Setting Up a Specimen”](#) on page [39](#) for instructions.

Installing the Cable Assembly

The cable assembly differs depending upon whether you have the 90° peel fixture or the variable angle fixture. The following sections describe both procedures.

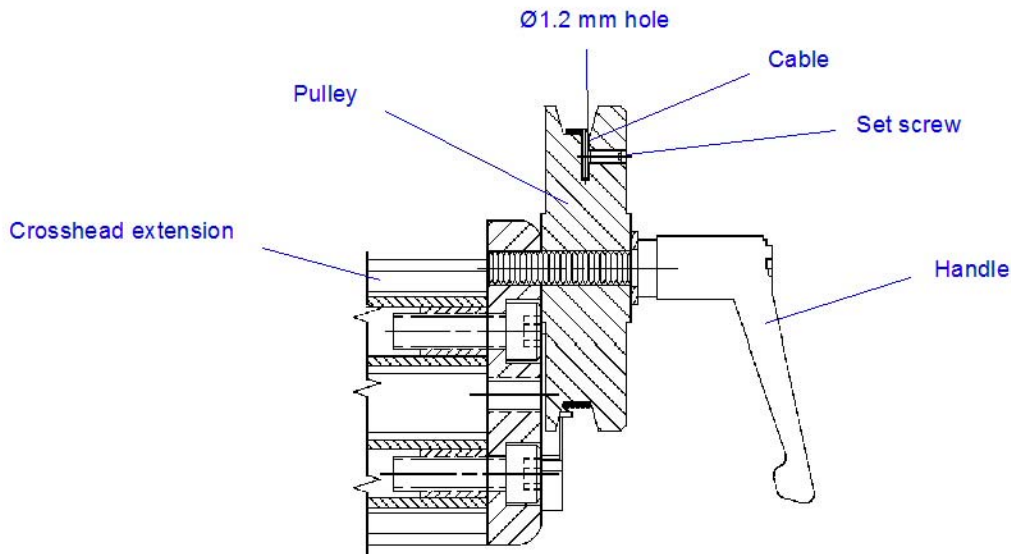


If the cable end is frayed, cut off the end and proceed with installation.

90° Peel Test Fixture

To install the cable assembly on the 90° peel test fixture:

1. Loosen the upper pulley using the handle so that the pulley can rotate.
2. Secure the cable to the upper pulley by inserting the loose end into the hole on the pulley (1.2 mm diameter). Secure the cable with a set screw using the hex key that is provided. See [Figure 6](#) on page 28.
3. Turn the upper pulley to wrap the cable around the pulley several times so that the cable aligns vertically with the lower pulley.
4. Use the handle on the upper pulley to secure the pulley in place.
5. Route the cable under the lower pulley so that the cable end is facing the sled.
6. Connect the turnbuckle on the cable end to the set screw on the sled, as shown in [Figure 7](#) on page 28.
7. Adjust the handle position on the upper pulley to protect the operator from head injury.



All single column frames and 4411 dual column frame

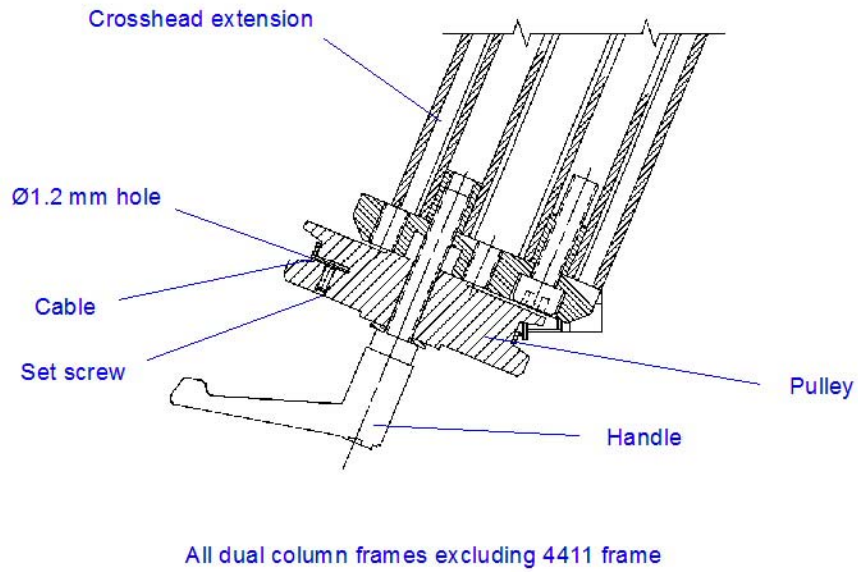


Figure 6. Attaching the Cable to the Upper Pulley

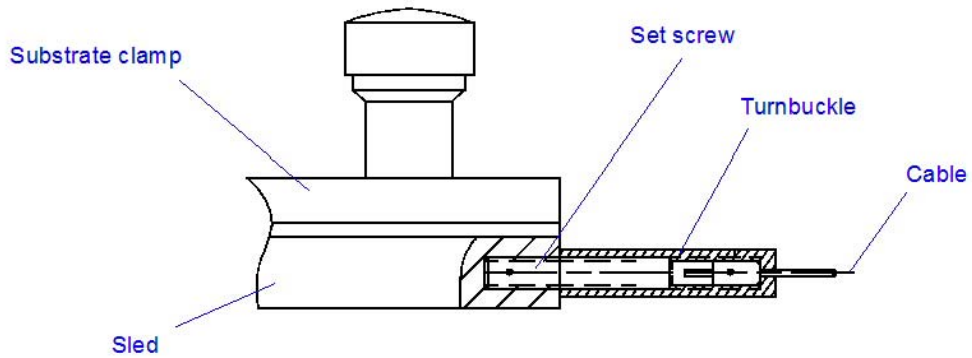


Figure 7. Attaching the Cable to the Fixture Sled

Variable Angle Peel Test Fixture

The variable angle peel test fixture uses two separate cables. Therefore, installing the cable assembly on the variable angle peel test fixture requires assembling both the upper cable assembly and lower cable assembly.

You can use the variable angle peel test fixture for a 90° angle.

Upper Cable Assembly

To install the cable onto the upper pulley:

1. Loosen the upper pulley using the handle so that the pulley can rotate.
2. Secure the cable to the upper pulley by inserting one cable end into the hole on the pulley (1.2 mm diameter). Secure the cable with a set screw using the hex key that is provided. See [Figure 6](#) on page 28.
3. Turn the upper pulley to wrap the cable around the pulley several times so that the cable aligns vertically with the lower pulley assembly.
4. Use the handle on the upper pulley to secure the pulley in place.
5. Proceed to the following section, to complete the cable assembly.

Lower Cable Assembly

To install the cable onto the lower pulley assembly:

1. Determine the angle required for your test and select the appropriate pulley for the required angle. Refer to the [Table 9](#) on page 53 for a list of ancillary parts for the variable angle peel test fixture.

Each pulley has the angle marked on its side. One pulley can be used for two angles: one specified angle and its complement angle. For example, one pulley is used for both the 45° and its complement angle, 135°. Each side of this pulley is marked with either 45° or 135°, which indicates the proper positioning in the pulley bracket. Refer to [Step 3](#) for further guidance.

Each pulley for the variable angle peel fixture has two tracks: one for the cable from the upper pulley, and one for the cable from the fixture sled. See [Figure 8](#) on page 30.

The pulley for the 90° angle has only one track. Position the cable into the lower pulley so that the cable end is facing the sled. Do not wind the cable around the pulley. Proceed to [Step 4](#).

1. Attach the cable from the upper pulley by inserting the cable into the hole on the appropriate track for the upper pulley connection and tighten with a hex key. Turn the pulley clockwise to wind the cable around the pulley several times, ensuring that the cable winds underneath the pulley. Refer to [Table 4](#) on page 31 to determine the appropriate cable setup for your test requirements.

2. Attach the sled cable by inserting the cable into the hole on the remaining track and tighten with a hex key. Wind the cable underneath the pulley, as shown in [Table 4](#).
3. Position the pulley in the pulley bracket so that the required angle marker on the pulley faces the same direction as the angle markers on the pulley bracket.
4. Insert the shoulder screw into the hole on the pulley bracket that corresponds to the angle required for your test. For variable angles, use the 3/16 inch shoulder screw. For the 90° angle, use the 1/4 inch shoulder screw. Position the pulley on the shoulder screw and tighten the shoulder screw with a hex key or screwdriver.
5. Wrap the sled cable once around the pulley so that the cable winds underneath the pulley and aligns horizontally with the sled.
6. Connect the turnbuckle on the cable end to the set screw on the sled, as shown in [Figure 7](#) on page [28](#).

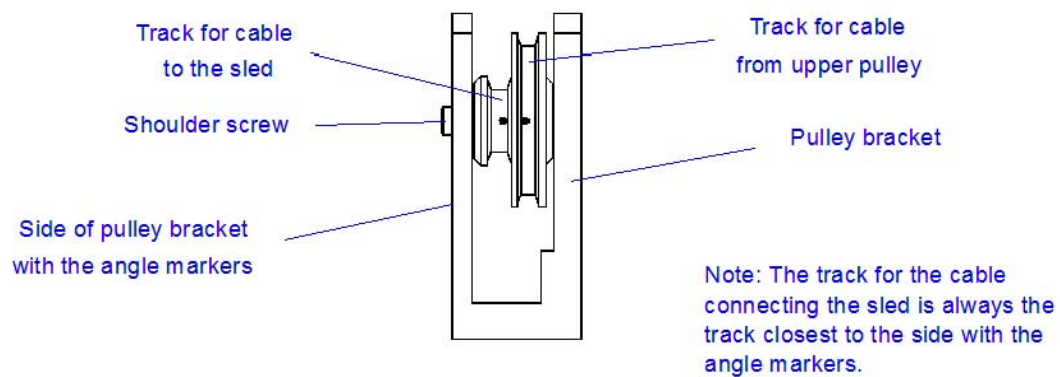


Figure 8. Lower Pulley Assembly

Table 4. Variable Angle Pulley Setup

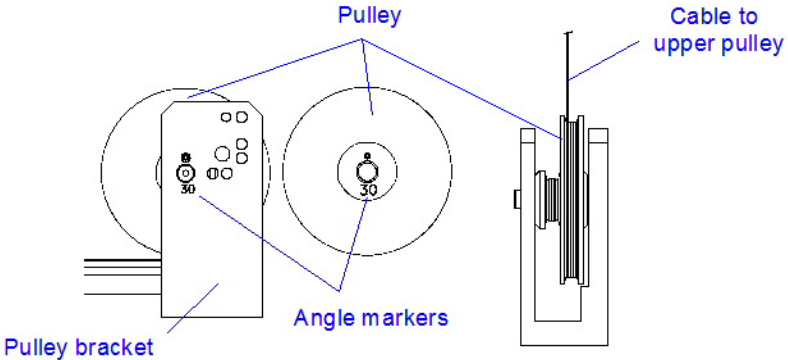
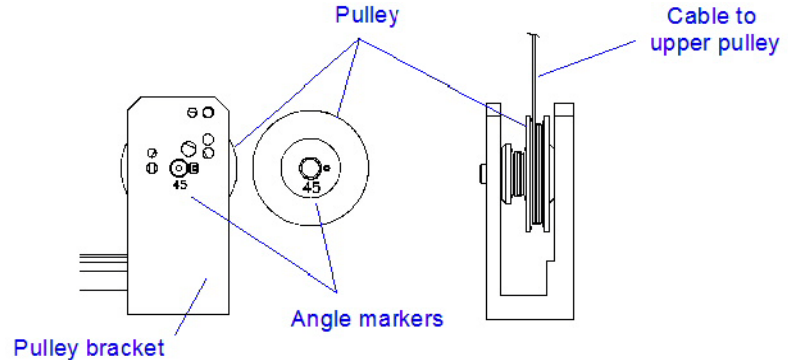
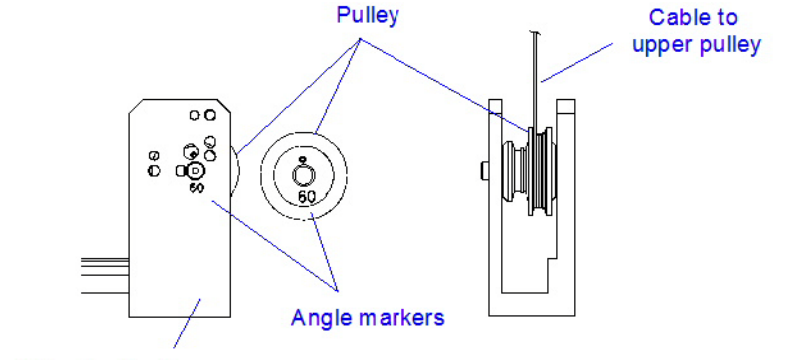
Peel Angle	Pulley Setup	Minimum Number of Coils Around Pulley ¹
30°		3.5
45°		4.0
60°		5.0

Table 4. Variable Angle Pulley Setup (Continued)

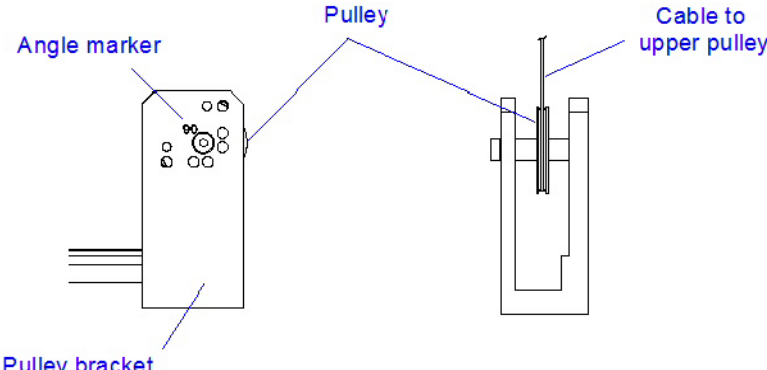
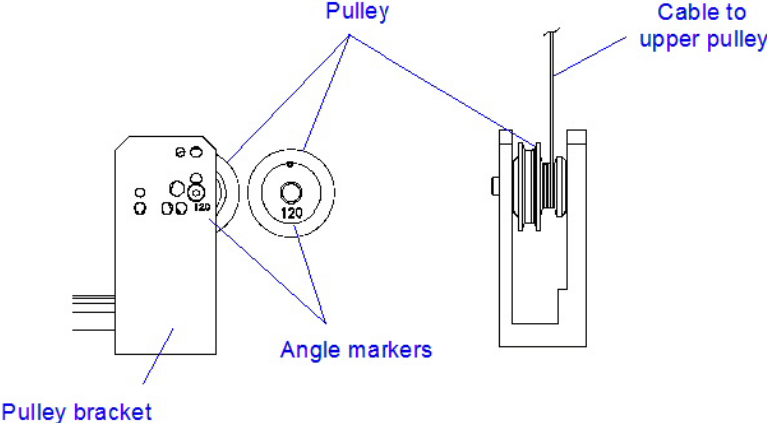
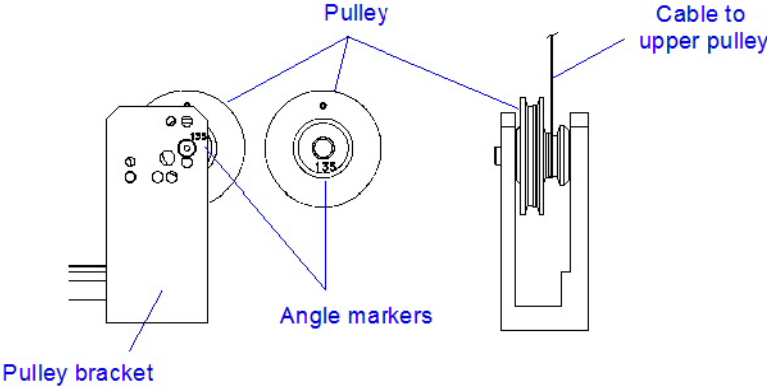
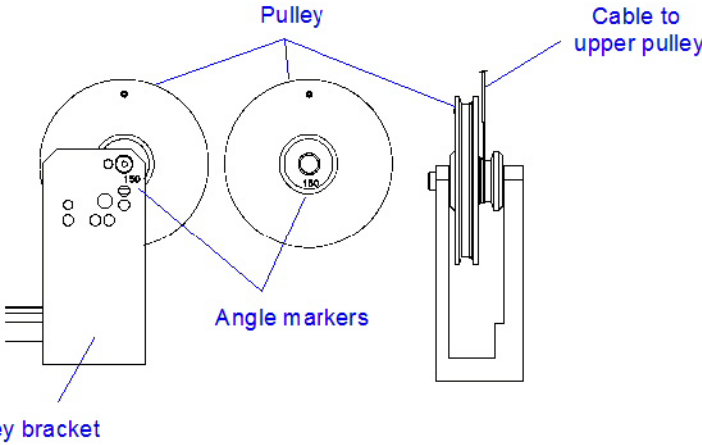
Peel Angle	Pulley Setup	Minimum Number of Coils Around Pulley ¹
90°	 <p>Angle marker</p> <p>Pulley</p> <p>Cable to upper pulley</p> <p>Pulley bracket</p>	Not Applicable
120°	 <p>Pulley</p> <p>Cable to upper pulley</p> <p>Angle markers</p> <p>Pulley bracket</p>	3.5
135°	 <p>Pulley</p> <p>Cable to upper pulley</p> <p>Angle markers</p> <p>Pulley bracket</p>	2.5

Table 4. Variable Angle Pulley Setup (Continued)

Peel Angle	Pulley Setup	Minimum Number of Coils Around Pulley ¹
150°	 <p>Note: 150° is not recommended because the sled may slide unevenly.</p>	1.5

1. The minimum number of times that the cable from the upper pulley must be wrapped around the lower pulley to ensure the cable has sufficient length to complete the test.

Setting Up the Variable Angle Fixture Sled

Setting up the variable angle peel test fixture sled for the different angles requires specific positioning of the fixture sled.

Setting the 90°, 120°, 135° and 150° Peel Angle

To set the 90°, 120°, 135° and 150° angles for the variable peel fixture sled:

1. Determine what angle is required for your test.
2. Loosen the handle and move the T-slot sled to the appropriate angle by aligning the angle marker on the protractor with the top edge of the sled. Refer to [Table 5](#) for graphics showing proper sled setup for each angle.
3. Tighten the handle to secure the T-slot sled at the desired angle.

Table 5. Variable Angle Sled Setup

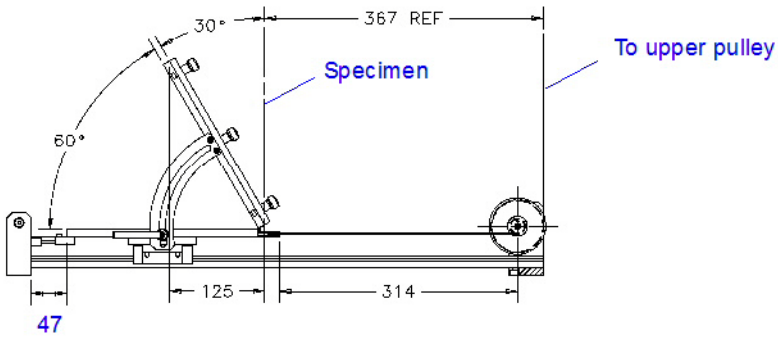
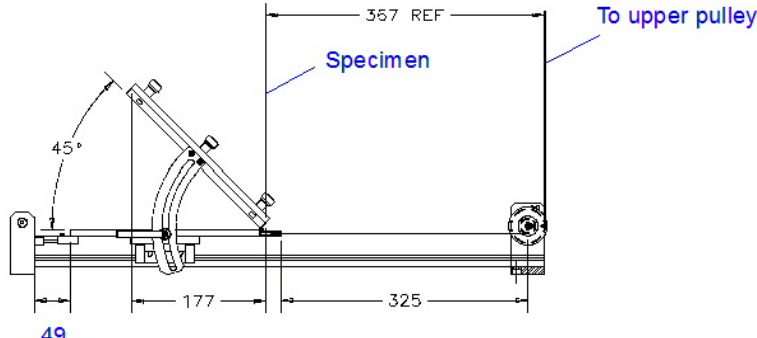
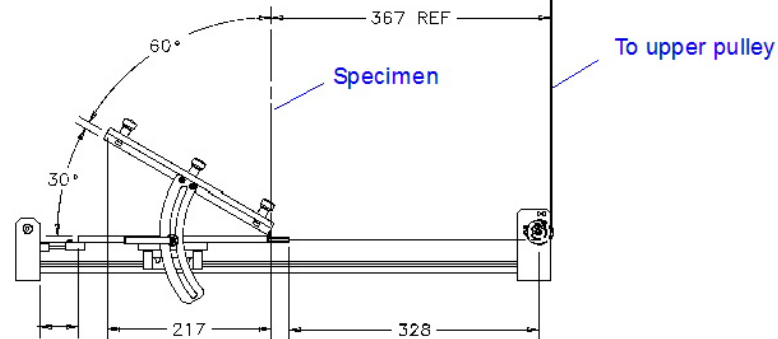
Peel Angle	Sled Setup Note: Distance dimensions are shown in mm.	Maximum Crosshead Travel
30°		485 mm ¹ 19.10 inches For 3342/5542/ 5842: 285 mm 11.22 inches
45°		440 mm ^a 17.32 inches For 3342/5542/ 5842: 285 mm 11.22 inches
60°		385 mm ^a 15.15 inches For 3342/5542/ 5842: 285 mm 11.22 inches

Table 5. Variable Angle Sled Setup (Continued)

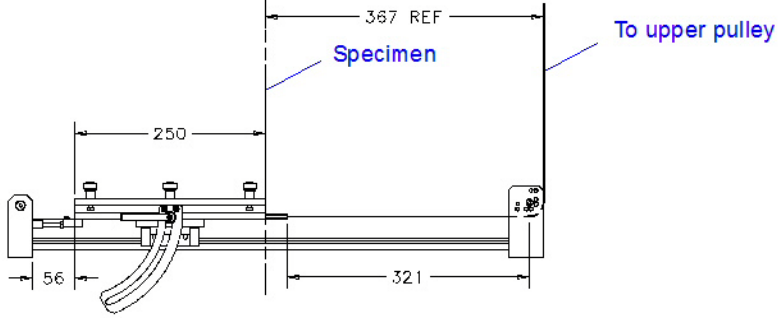
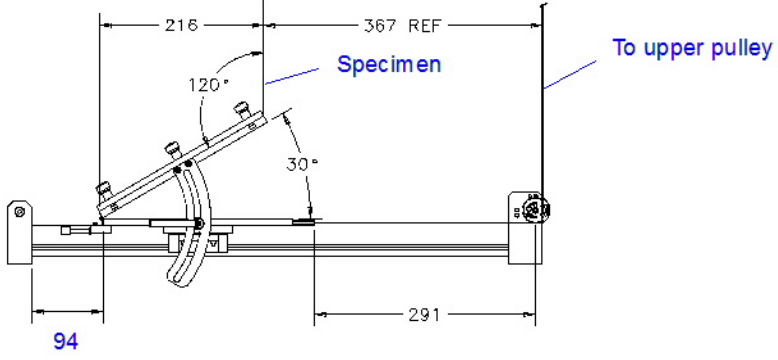
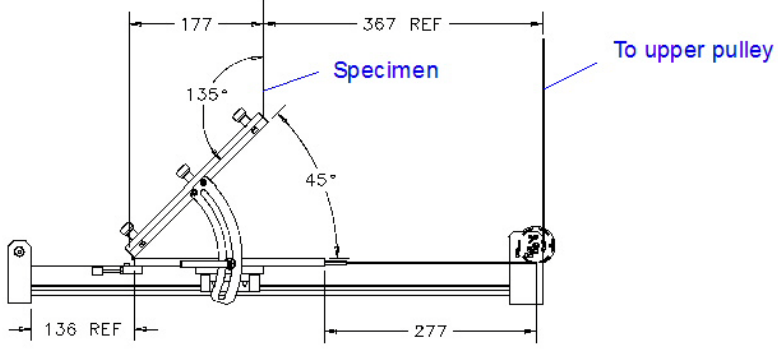
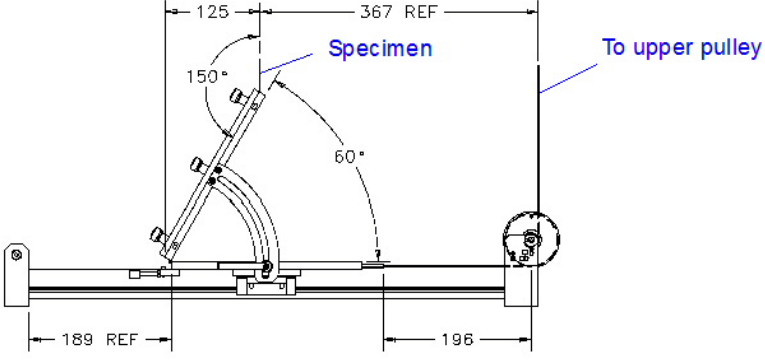
Peel Angle	Sled Setup Note: Distance dimensions are shown in mm.	Maximum Crosshead Travel
90°		285 mm 11.22 inches
120°		150 mm 5.90 inches
135°		105 mm 4.13 inches

Table 5. Variable Angle Sled Setup (Continued)

Peel Angle	Sled Setup Note: Distance dimensions are shown in mm.	Maximum Crosshead Travel
150°	<p>Note: 150° is not recommended because the sled may slide unevenly.</p> 	45 mm 1.77 inches

1. Due to the size of the 3342/5542/5842 frames, the maximum crosshead travel on these frames is limited as described in the table. These figures were determined using Instron's mini grips, catalog #2716-016.

Setting the 30°, 45° and 60° Peel Angle

To set the 30°, 45° and 60° angles, you must reverse the T-slot sled on the sled:

1. Determine what angle you require for your test.
2. Remove the four lower screws on the hinge that connects the T-slot sled to the sled, as shown in [Figure 9](#) on page 37.
3. Unscrew the handle.
4. Remove the hex head bolt with the tab washer and two washers (one washer between each protractor and the side of the sled).
5. Unscrew the cable turnbuckle from the sled.
6. Reattach the hinge to the opposite side of the sled using the four screws from [Step 2](#).
7. Reconnect the cable turnbuckle onto the sled.
8. Reattach the hex head bolt with the tab washer onto the sled, ensuring that you mount the two washers between the sled and the protractor on each side of the sled.
9. Reattach the handle.

10. Move the T-slot sled to the appropriate angle by aligning the angle marker on the protractor with the top edge of the sled. Refer to [Table 5](#) on page 34 for graphics showing proper sled setup for each angle.
11. Tighten the handle to secure the T-slot sled at the desired angle.

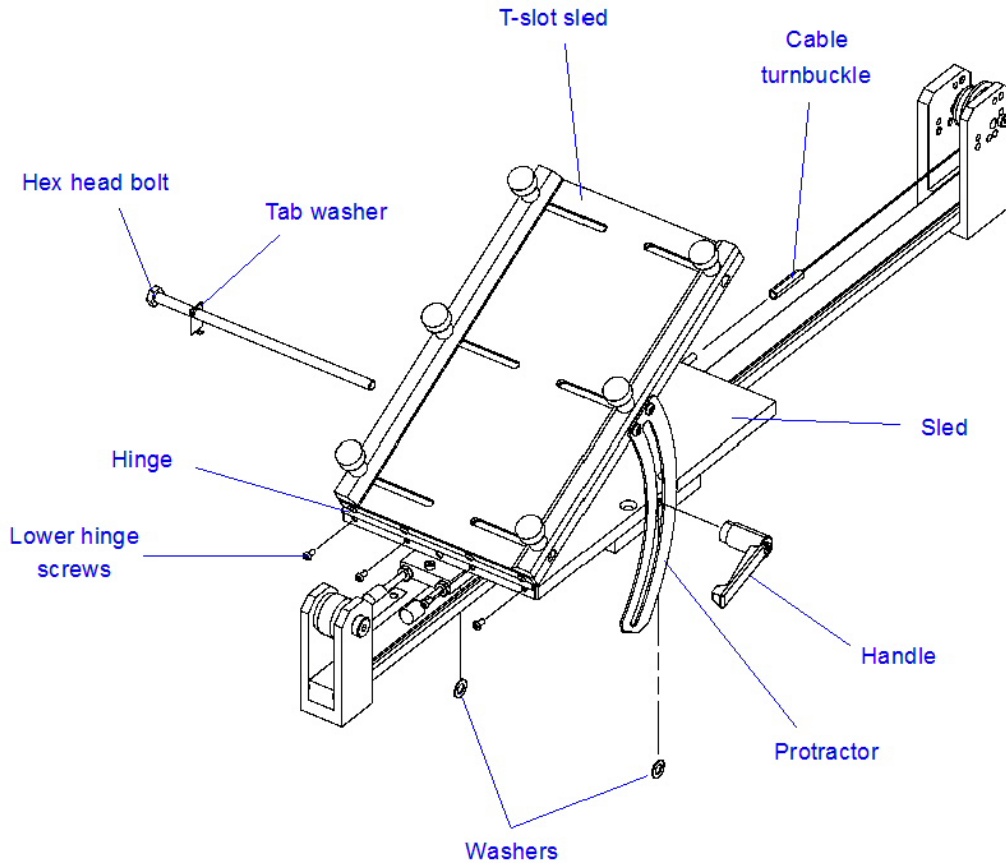


Figure 9. Reversing the T-slot Sled for the Variable Angle Fixture

Chapter 4

Operation

-
- Setting Up a Specimen 39
 - Removing a Specimen..... 43
-

Setting Up a Specimen

Specimens must be prepared in accordance with the ASTM standards B571 or D2861.



Substrates are not provided by Instron. Substrates are usually user-defined plates with a specific surface that meets your specific testing requirements.

If necessary, see [Figure 2](#) on page 19 or [Figure 3](#) on page 21 to identify the parts described in this section.

Warning



Crush hazard - take care when installing or removing a specimen, assembly, structure or load string component.

Installation or removal of a specimen, assembly, structure or load string component involves working inside the hazard area between the grips or fixtures. When working in this area, ensure that other personnel cannot operate any of the system controls. Keep clear of the jaws of a grip or fixture at all times. Keep clear of the hazard area between the grips or fixtures during actuator or crosshead movement. Ensure that all actuator or crosshead movements necessary for installation or removal are slow and, where possible, at a low force setting.

Warning



Flying Debris Hazard - Make sure that test specimens are installed correctly in grips or fixtures in order to eliminate stresses that can cause breakage of grip jaws or fixture components.

Incorrect installation of test specimens creates stresses in grip jaws or fixture components that can result in breakage of these components. The high energies involved can cause the broken parts to be projected forcefully some distance from the

test area. Install specimens in the center of the grip jaws in line with the load path. Insert specimens into the jaws by at least the amount recommended in your grip documentation. This amount can vary between 66% to 100% insertion depth; refer to supplied instructions for your specific grips. Use any centering and alignment devices provided.

Checklist

Before you begin:

- Set up the testing machine for the test, ensuring that the crosshead moves in the tension direction. Set up your test in accordance with ASTM standard B571 or D2861. Refer to [“Understanding Peel Displacement”](#) on page 41 for information about setting up a virtual measurement for peel displacement in Bluehill®.
- Set appropriate travel limits on the testing machine as a safety precaution.
- Install an appropriate load cell on the machine’s crosshead.
- Install an appropriate grip that has suitable load capacity and jaw faces for the material being tested.
- Ensure that the mating surfaces of the grips, load cell and substrate are free of dirt or debris.



Grips and load cells are not supplied with the peel test fixture. For guidance in selecting an appropriate grip or load cell, contact Instron’s Service department for assistance. Refer to [“Product Support”](#) on page 13.

Installing the Substrate



The T-slot sled on the peel test fixture contains markings in both millimeters and inches to ensure consistent placement of the substrate for repeated tests.

To install a substrate:

1. Loosen the 6 black knobs on the edge of the T-slot sled to loosen the substrate clamps.
2. Place the substrate on the T-slot sled, positioning it so that one end of the substrate lies at the edge of the sled and is centered under the grip.
3. Adjust the substrate clamps on the T-slots so they fit over the edge of the substrate.
4. Lift the substrate clamps enough to place them over the substrate.
5. Tighten the black knobs to secure the substrate to the T-slot sled.

Refer to “[Installing a Specimen](#)” on page 41 to complete the installation of the specimen.

Installing a Specimen

Caution

Set the upper limit stop to prevent the crosshead from moving so far that the cable fitting on the fixture sled collides with the lower pulley. Such contact will damage the peel test fixture.

Refer to [Table 5](#) on page 34 to determine the maximum crosshead travel limitations for each angle.

To install a specimen in the peel fixture:

1. Secure the specimen to the substrate, ensuring that one end of the specimen lays flat on the substrate. Attach enough of the specimen to the substrate to meet your test requirements. Leave one end of the specimen loose so you can insert it into the grip.
2. Use the jog buttons on the test machine to move the crosshead into position. Proper position places the grip so that the loose specimen end engages the entire length of the jaw faces (or satisfies the insertion depth recommended for the grip you are using).
3. Place the loose end of the specimen in the grip and secure it in place.
4. Adjust the upper pulley on the peel test fixture to ensure that the specimen aligns vertically between the grip and the sled, and to eliminate any slack in the cable. Slack in the cable line can adversely affect the test results.
5. Set the upper limit stop on the load frame. Refer to the above Caution note.

The specimen is ready for testing.

Understanding Peel Displacement

The variable angle peel fixture lets you calculate the peel force between either an adhesive and the fixture sled, or an adhesive and a known substrate, at discrete angles of inclination. Due to the geometry of the system, depending on the peel angle, the distance moved by the crosshead is not necessarily the same as the distance peeled. Therefore, crosshead displacement should not be used in calculations since it is not truly indicative of the length of material actually peeled.

Peel factor is a value that correlates the distance traveled by the crosshead to peel displacement.

Peel factor = (crosshead displacement \ peel displacement)

which has been determined to be equal to:

$$1 + (1 - \sin (\text{peel angle}))$$

The Bluehill® Peel, Tear and Friction method contains a Peel Displacement virtual measurement for 90° peel and 180° peel specimens. For those specimens, the peel factor is 1.0 and 2.0, respectively.

For other peel angles, you should use a Tension test method and create a virtual measurement that multiplies Tensile Displacement by the appropriate peel factor, derived from the formula above. The following table lists the peel factors for each of the peel angles supported by the variable angle peel fixture:

Peel Angle (degrees)	Peel Factor
30	1.500
45	1.293
60	1.134
90	1.000
120	1.134
135	1.293
150	1.500
180	2.000

Using a peel angle of 120° as an example, the virtual measurement would be:

$$\text{Peel displacement} = \text{Tensile displacement} * 1.134$$

Removing a Specimen

Warning



Hazard - Do not release the specimen from the grip while the specimen is under a load or if the system is in LOAD or STRAIN control.

Checklist

Check for the following conditions before removing a specimen:

- The test system is not exerting a load on the specimen.
- There is no measuring device, such as an extensometer or LVDT, on the specimen.

Procedure

After a test is complete:

1. Press Return to move the crosshead and T-slot sled back to the gauge length position.
2. Loosen the grip to disengage the specimen.
3. Remove the specimen from the grip.
4. Remove the substrate from the T-slot sled.

Chapter 5

Maintenance

• Maintenance Checklist	45
• Maintenance Procedures	45

Maintenance Checklist

Perform the following checklist items after approximately 1000 test runs:

- Ensure that the cable is properly secured to the fixture sled and upper pulley. Check these items either daily or weekly.
- Clean the guide rail of any dust or debris using a soft lint-free cloth. If necessary, reapply a light coating of oil on the guide rail. Refer to [“Maintaining the Guide Rail”](#) on page 45.
- Ensure that the bearing block slides smoothly along the guide rail. If necessary, lubricate the bearing block. Refer to [“Lubricating the Bearing Block”](#) on page 45.

Maintenance Procedures

Performing the following maintenance procedures will ensure that your peel test fixture operates efficiently for many years.

Maintaining the Guide Rail

To properly maintain the guide rail and avoid rust from developing, lightly oil the guide rail using WD40 at least once a year. If the peel test fixture experiences frequent use, then perform this procedure more frequently.

Lubricating the Bearing Block

To lubricate the bearing block:

1. Locate the grease nipple on the bearing block. It is located on the right side of the block under the sled.
2. Fill the nipple with a lithium soap base grease (NLGI Grade Number 2) until it begins overflowing from the nipple.
3. Wipe away any excess grease from the nipple.
4. Slide the sled along the full length of the guide rail to evenly distribute the grease over the guide rail.

It is recommended that this procedure be done annually. If the peel test fixture experiences frequent use, then perform this procedure more frequently.

Chapter 6

Parts

• General Information	47
• Replacement Parts	48
• Ancillary Parts	51

General Information

This section provides illustrations and parts listings of Models 2820-035 and 2820-036 to facilitate ordering replacement parts and for general reference. To identify the various components, first locate the part in [Figure 10](#) or [Figure 11](#) and then refer to its item number in the associated table.

To understand data given in the tables, note the following:

- The Item Number column indicates the callout number from the illustration.
- The Description column includes the common name of an item and other terms relating to its usage. The description may also list the manufacturer's part number when appropriate.
- The Part Number column lists only Instron part numbers.
- The Machine Type column identifies the Instron load frame type for which the part is specifically intended. If there is no entry in this column, the part is used on all three frame types.
- The Quantity column provides how many of that part is required. Quantities for similar parts used elsewhere are in separate listings.



When ordering parts from Instron, specify the part number, description, and the quantity of the parts you need. Also, supply your testing system type and its serial number in order to assist Instron in confirming the configuration of your testing system.

Replacement Parts

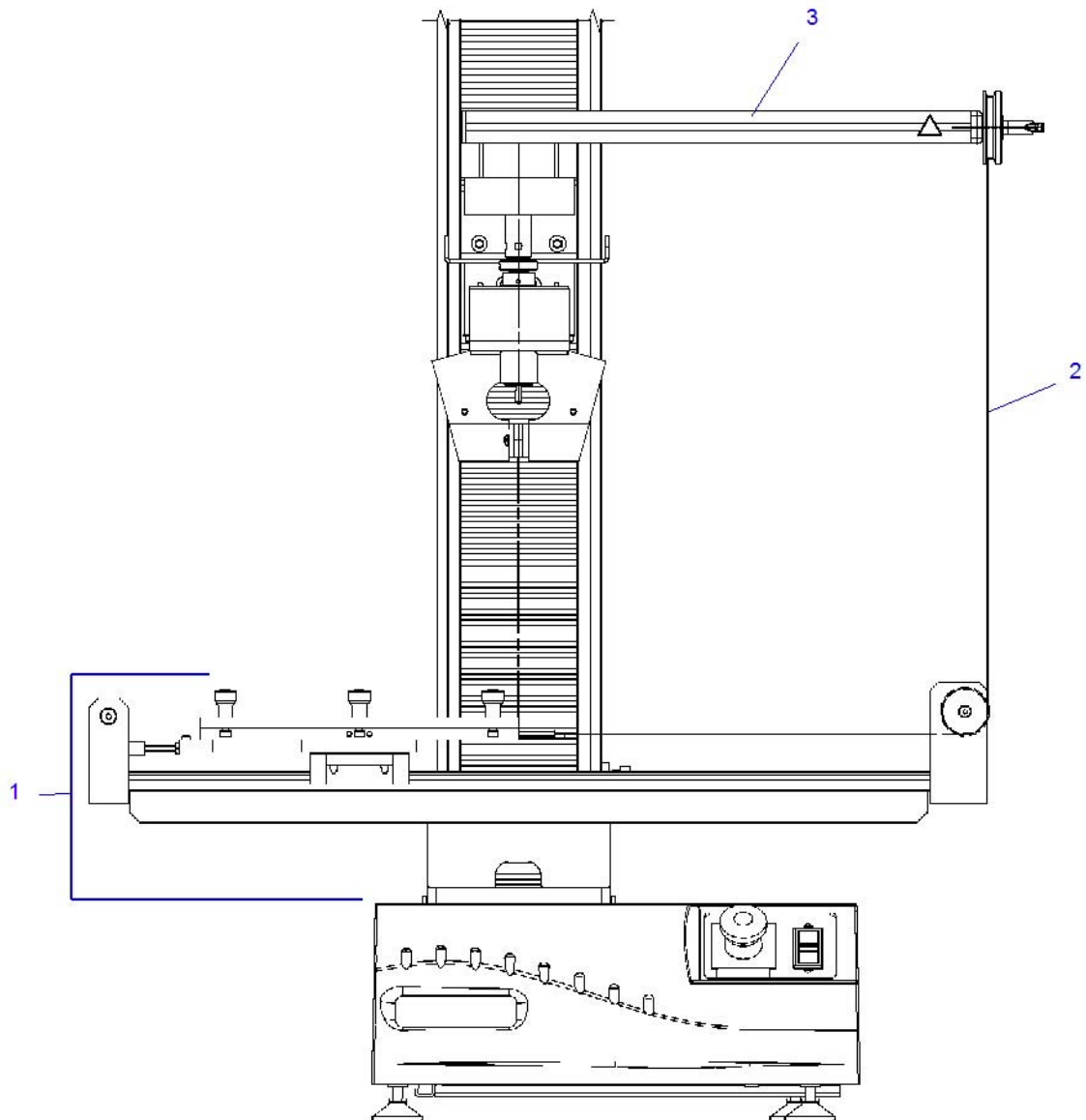


Figure 10. 90° Peel Test Fixture - Component Parts

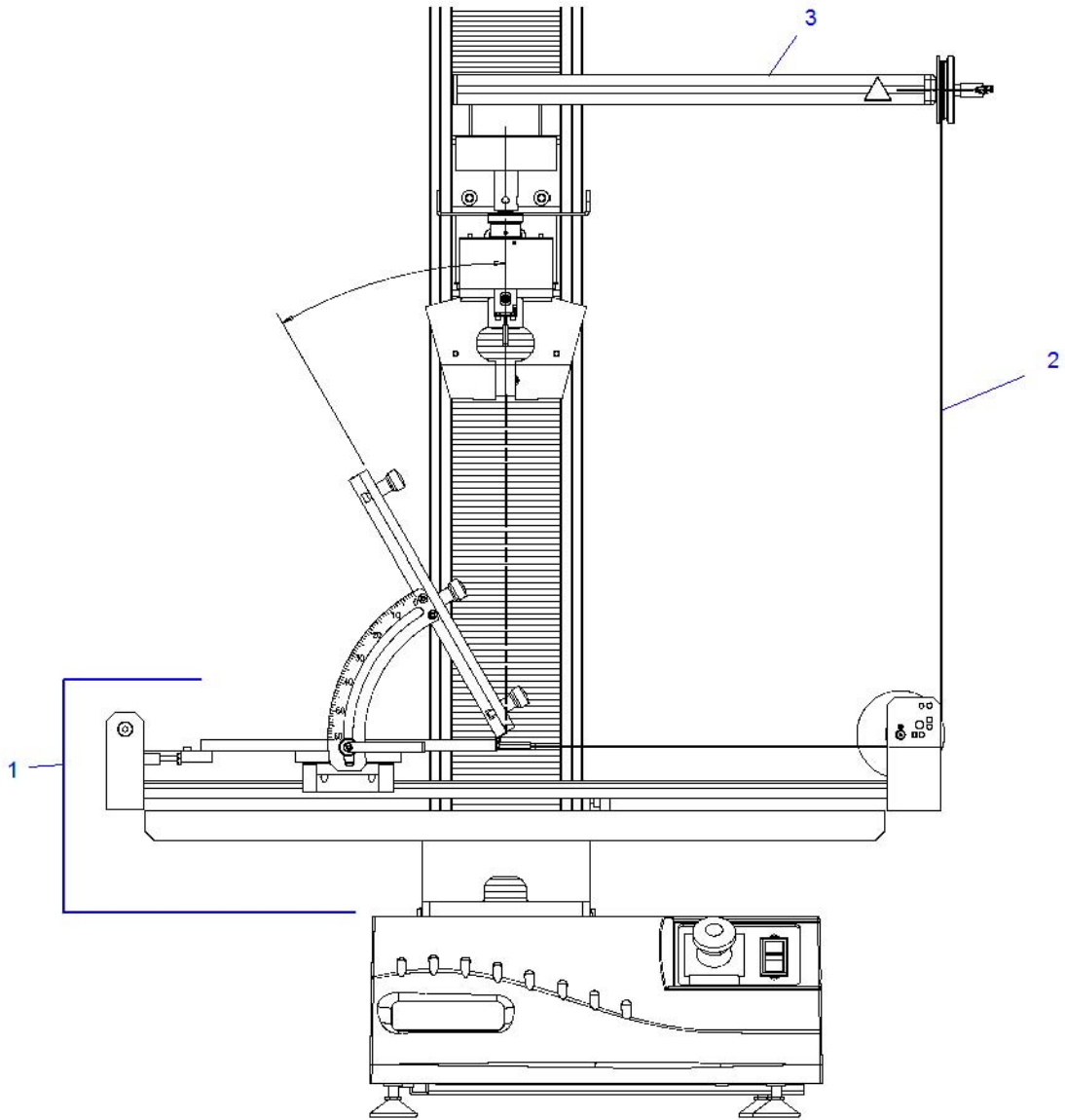


Figure 11. Variable Angle Peel Test Fixture - Component Parts

Table 6. 90° Peel Fixture Component Parts

Item #	Description	Part Number	Frame Type	Quantity
1	90° Peel fixture sled assembly	A581-73	All frames	1

Table 6. 90° Peel Fixture Component Parts (Continued)

Item #	Description	Part Number	Frame Type	Quantity
2	Cable assembly	A581-75	All frames	1
	Cable	113-1-16	All frames	5 ft
3	Crosshead extension	T581-62	Single column frames, 4411 dual column frames	1
	Crosshead extension	T581-69	2300/3300/4400/ 5500/5900 5800/4200 dual column frames	1
	Crosshead extension	T581-85	1122/1123/1125 dual column frames	1

Table 7. Variable Angle Peel Fixture Component Parts

Item #	Description	Part Number	Frame Type	Quantity
1	Variable angle peel fixture sled assembly	A581-74	All frames	1
2	Cable assembly - 90° angle	A581-75	All frames	1
	Cable assembly - Variable angles	A581-76	All frames	1
	Cable	113-1-16	All frames	5 ft
3	Crosshead extension	T581-62	Single column frames, 4411 dual column frames	1
	Crosshead extension	T581-69	2300/3300/4400/ 5500/5900 5800/4200 dual column frames	1
	Crosshead extension	T581-85	1122/1123/1125 dual column frames	1

Ancillary Parts

Ancillary Parts are included with the system upon delivery and are required to complete the installation of the peel test fixture, or are necessary for different configurations. Keep these components in a safe place so they do not get misplaced.

Refer to [Table 8](#) for the 90° peel test fixture list of ancillary parts or [Table 9](#) on page [53](#) for the variable angle peel test fixture list of ancillary parts.

Table 8. 90° Peel Fixture Ancillary Parts

Frame Type	Description	Part Number	Quantity	Purpose
Single column frames	Socket head cap screw, M4 x 25	201S94	4	Installing the crosshead extension onto the crosshead
	Set screw, M2.5 x 6	401H13	1	Securing cable to upper pulley
	Socket head cap screw, M6 x 20	201S146	4	Installing the sled assembly to the base of the frame
	Washer, M4	610L8	4	Installing the crosshead extension onto the crosshead
	Hex key, 1.30 mm A/F	206C3	1	Securing cable to upper pulley
2300/3300/4400/5500/5900/5800/4200 dual column frames	Socket head cap screw, M10 x 50	201S235	2	Installing the crosshead extension onto the crosshead
	Set screw, M2.5 x 6	401H13	1	Securing cable to upper pulley
	Washer, M10	610L9	2	Installing the crosshead extension onto the crosshead
	Hex key, 1.30 mm A/F	206C3	1	Securing cable to upper pulley

Table 8. 90° Peel Fixture Ancillary Parts (Continued)

Frame Type	Description	Part Number	Quantity	Purpose
4411 frames	Socket head cap screw, M4 x 25	201S94	4	Installing the crosshead extension onto the crosshead
	Set screw, M2.5 x 6	401H13	1	Securing cable to upper pulley
	Washer, M4	610L8	4	Installing the crosshead extension onto the crosshead
	Hex key, 1.30 mm A/F	206C3	1	Securing cable to upper pulley
	Crosshead bracket	T581-87	1	Securing the crosshead extension to the frame's crosshead
	Socket head cap screw, M4 x 10	201S88	4	Securing the crosshead bracket to the front of the crosshead
	Load cell mounting screw, M10 x 80	201V61	1	Securing the crosshead extension, bracket and load cell to the crosshead
1122/1123/ 1125 frames	Socket head cap screw, 1/2-13 x 1.75	201E158	2	Installing the crosshead extension onto the crosshead
	Set screw, M2.5 x 6	401H13	1	Securing cable to upper pulley
	Washer, 1/2 inch	610D14	2	Installing the crosshead extension onto the crosshead
	Hex key, 1.30 mm A/F	206C3	1	Securing cable to upper pulley

Table 9. Variable Angle Peel Fixture Ancillary Parts

Frame Type	Description	Part Number	Quantity	Purpose
Common to all frames	Variable angle pulley	T581-81-1	1	Pulley for 30° and 150° angles
	Variable angle pulley	T581-81-2	1	Pulley for 45° and 135° angles
	Variable angle pulley	T581-81-3	1	Pulley for 60° and 120° angles
	90° pulley	32-51-1	1	Pulley for 90° angle
	Shoulder screw, 3/16 inch x 1 1/4 inch	9-6-23	1	Supports the variable angle pulley in the lower pulley bracket
	Shoulder screw, 1/4 inch x 1 1/4 inch	430F6	1	Supports the 90° angle pulley in the lower pulley bracket
	Spacers	122-3-3	2	Centers the 90° angle pulley in the lower pulley bracket
Single column frames	Socket head cap screw, M4 x 25	201S94	4	Installing the crosshead extension onto the crosshead
	Set screw, M2.5 x 6 LG	401H13	1	Securing cable to upper pulley
	Socket head cap screw, M6 x 20	201S146	4	Installing the sled assembly to the base of the frame
	Washer, M4	610L8	4	Installing the crosshead extension onto the crosshead
	Hex key, 1.30 mm A/F	206C3	1	Securing cable to upper pulley
2300/3300/4400/5500/5900/5800/4200 dual column frames	Socket head cap screw, M10 x 50	201S235	2	Installing the crosshead extension onto the crosshead
	Set screw, M2.5 x 6 LG	401H13	1	Securing cable to upper pulley
	Washer, M10	610K9	2	Installing the crosshead extension onto the crosshead
	Hex key, 1.30 mm A/F	206C3	1	Securing cable to upper pulley

Table 9. Variable Angle Peel Fixture Ancillary Parts (Continued)

Frame Type	Description	Part Number	Quantity	Purpose
4411 frames	Socket head cap screw, M4 x 25	201S94	4	Installing the crosshead extension onto the crosshead
	Set screw, M2.5 x 6 LG	401H13	1	Securing cable to upper pulley
	Washer, M4	610L8	4	Installing the crosshead extension onto the crosshead
	Hex key, 1.30 mm A/F	206C3	1	Securing cable to upper pulley
	Crosshead bracket	T581-87	1	Securing the crosshead extension to the frame's crosshead
	Socket head cap screw, M4 x 10	201S88	4	Securing the crosshead bracket to the front of the crosshead
	Load cell mounting screw, M10 x 80	201V61	1	Securing the crosshead extension, bracket and load cell to the crosshead
1122/1123/ 1125 frames	Socket head cap screw, 1/2-13 x 1.75	201E158	2	Installing the crosshead extension onto the crosshead
	Set screw, M2.5 x 6	401H13	1	Securing cable to upper pulley
	Washer, 1/2 inch	610D14	2	Installing the crosshead extension onto the crosshead
	Hex key, 1.30 mm A/F	206C3	1	Securing cable to upper pulley

The background of the page is a light gray color with abstract, flowing, curved lines in a slightly darker shade of gray. There are also sections with a fine, repeating dot pattern, similar to a halftone or perforated metal texture, located on the left and bottom right sides. At the bottom of the page, there is a solid red horizontal bar.

Product Support: www.instron.com