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Instron
Model 5583
Load Frame

Operator's Manual

INSTRON

Amendment Incorporation Record		
Amendment Number	Brief Description Of Content	Name Of Person Incorporating Amendment
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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 which are potentially hazardous, particularly the actuator in a servohydraulic testing system or the moving crosshead in an electromechanical testing system.

Always be aware of the possible hazards when you operate and maintain these systems. You must not operate any materials testing equipment unless you are thoroughly familiar with its function and operation. Unfamiliarity with a materials testing system can lead to unexpected actuator or crosshead motion with the consequent risk of injury and damage.

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

Ensure that the test set-up and the test you will be using on materials, assemblies or structures constitutes no hazard to the operator. Use all mechanical and electronic limits features. These are supplied for your safety to enable you to prevent movement of the actuator piston beyond desired regions of operation.

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 judgment.

Warning

Disconnect the electrical power supply before removing the covers to electrical equipment.

You must disconnect the equipment from the electrical power supply before removing any electrical safety covers or replacing fuses. Do not reconnect the main power source while the covers are off unless the manual specifically instructs you to do so. Refit covers as soon as possible.

Disconnect power supplies before removing the covers to rotating machinery.

You must disconnect the equipment from all power supplies before removing any cover which gives access to rotating machinery, e.g. belts, screws or shafts.

Do not reconnect any power supply while the covers are off unless the manual specifically instructs you to do so. If you have to operate the equipment to perform maintenance tasks with the covers off, ensure that all loose clothing, long hair, etc. is tied back. Refit covers as soon as possible.

Shut down the hydraulic power supply and discharge hydraulic pressure before you disconnect 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 them from moving while the system is operating and to prevent a hose from whipping about in the event of a rupture.

Warning

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.

Use protective shields or screens if any possibility exists of a hazard from the failure of a specimen, assembly or structure under test.

Use protective shields 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 using materials testing equipment, 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.

Protect electrical cables from damage and inadvertent disconnection.

A disconnected or damaged cable can cause the sudden loss of controlling and feedback signals which results in an open loop condition which 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.

Warning

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. A warning notice concerning low or high temperature operation must be displayed 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.

Take care when installing or removing a specimen, assembly or structure.

Installation or removal of a specimen, assembly or structure involves working inside the hazard area between the grips or fixtures. 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

Do not place a test system off-line from computer control without first ensuring that the actuator or crosshead will not move when you 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.

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.

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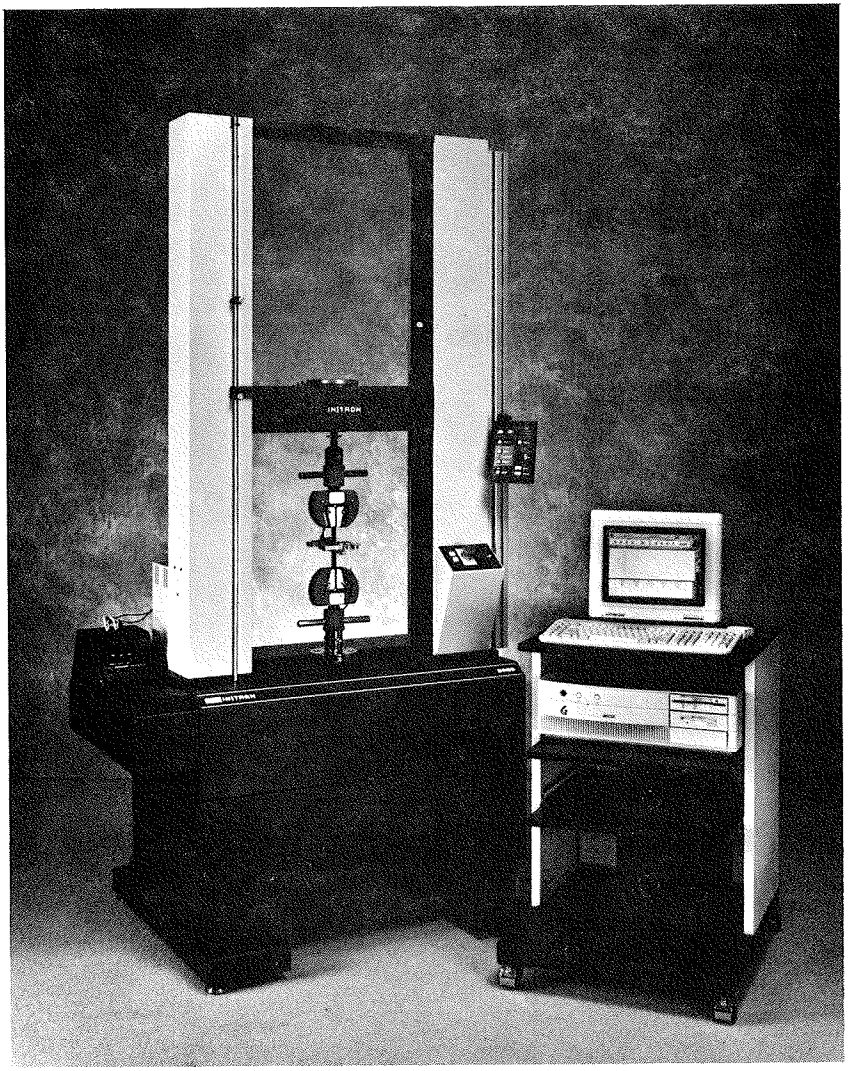

Frontispiece-Series 5500 Test System

Chapter 1
Introduction

Outline

This chapter introduces you to the load frame and describes the load frame components and their function.

After you read this chapter, you will:

- know the purpose of the load frame
- be able to identify the load frame components
- understand the function of each component.

Purpose

Load Frame

The load frame is an electromechanical materials testing instrument which applies tensile or compressive test forces to specimens from a wide range of materials. The load frame is a rigid, stable structure with a high stiffness value into which a load cell mounts between a force producing crosshead and stationary member. The high stiffness values ensure that the test forces generated by the moving crosshead are transmitted to the specimen. The load cell converts these forces into an electrical signal for measurement and and purposes.

Control System

Control of the load frame comes from a personal computer running a special materials testing software program. You set up the software to instruct the load frame how to do a test, then the software controls the movement of the crosshead during a test. The software also calculates and stores results from the test, displays graphs of the test, and lets you format and print reports comprising various results and graphics.

About this Manual

This manual provides you with a basic understanding of the Series 5500 load frame and its principles of operation. It contains components descriptions, specifications, installation procedures, function and operational details, maintenance procedures and replaceable parts information.

In addition to this manual, there is is also a software manual which describes the system software and how to use it. You can get interactive help and tutorial information while you run the system from the software on-line documentation on the system computer. Accessories, such as the strip chart and X-Y recorders, printer and most grips and extensometers, come with their own separate instruction manual.

Product Support

If you encounter a problem with your test system, or if you want to order accessories or parts, call Instron Service from the following list:

In the United States:	1-800-473-7838
In Canada:	1-800-461-9123
In all other regions of the world:	Nearest Instron Service Office

A listing of international Instron Sales and Service offices, including addresses and telephone numbers is on the back of this manual.

Description

The load frame comprises a base structure, crosshead, two columns and a frame control unit. Figures 1-1 and 1-2 illustrate the load frame components.

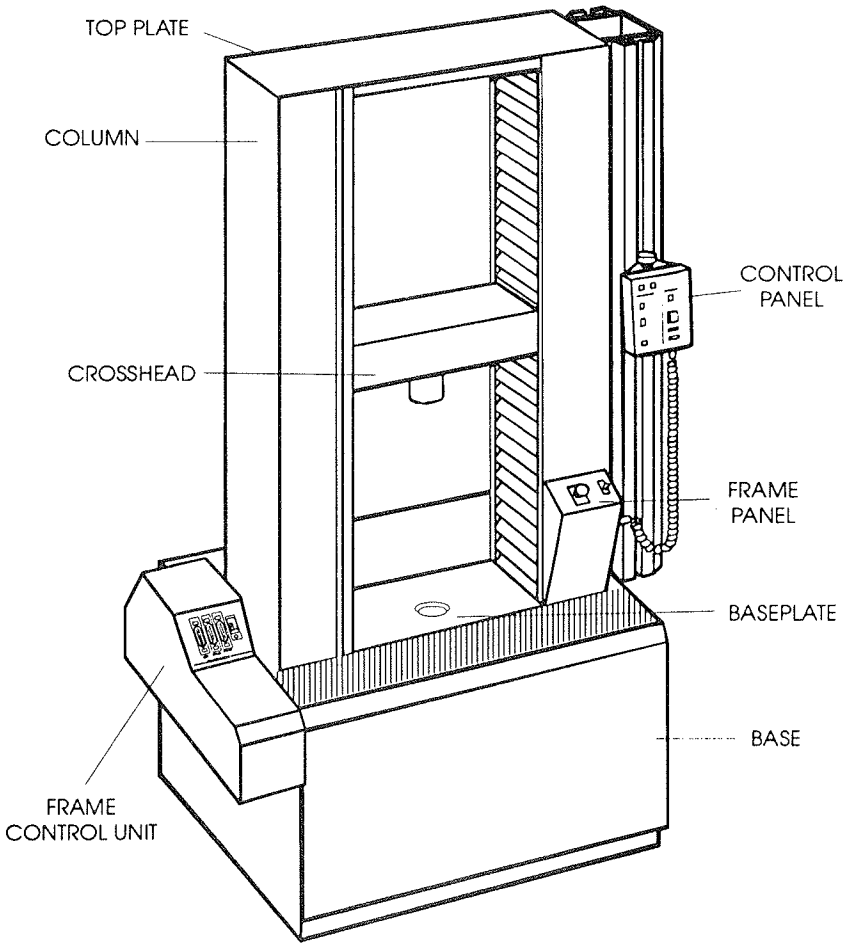

Figure 1-1. Load Frame Components

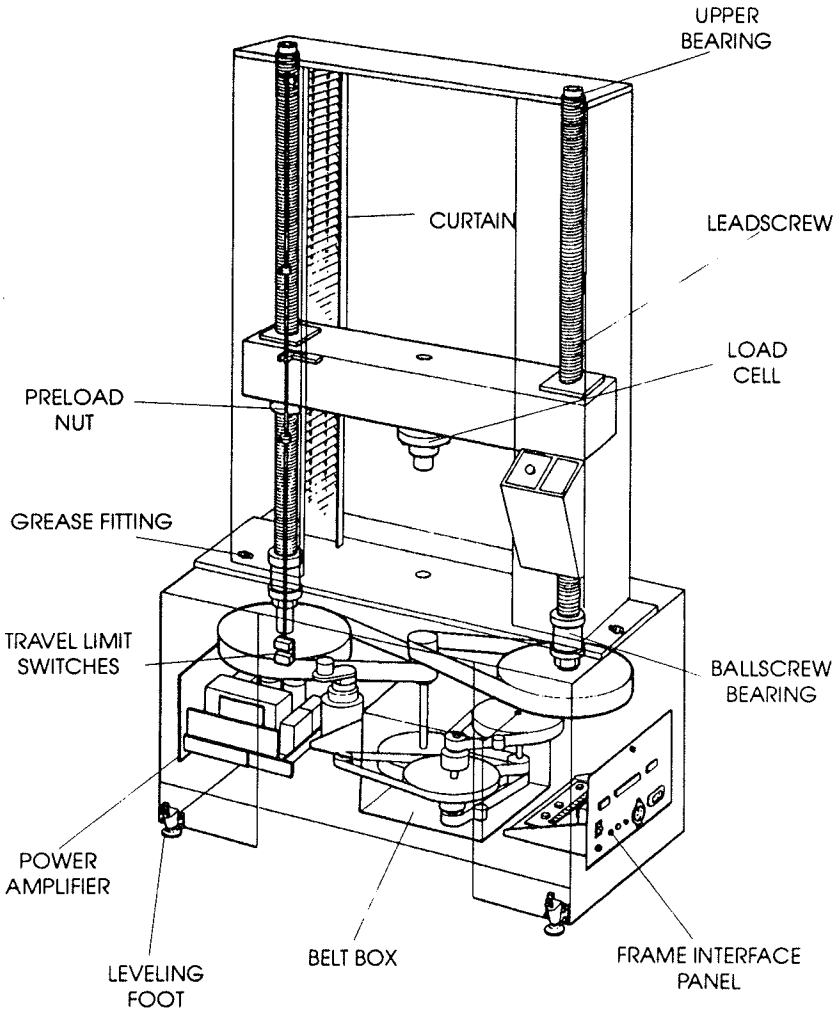

Figure 1-2. Internal Components

Base

The base structure is a rectangular sheet metal box with a rigid steel table on its top. In the center of the table are tapped holes. A leadscrew assembly and grease fitting pass through each end of the plate. An overtravel limit rod passes through the plate in front of the left leadscrew assembly. There are four leveling feet on each corner of the base bottom. Internally, the base houses an electromechanical drive system and a frame interface panel.

On the right side of the base is a frame interface panel. Externally, the panel contains connectors for the frame control unit, PIP accessories, pneumatic grip control, load frame power and electrical fuses. Internally, the panel circuit board contains a d.c. power supply, a drive relay, encoder phase circuits, and frame ID circuit. A frame control unit attaches to the left side of the base.

The power amplifier is an electronic circuit which connects between the computer and the drive motor. A drawer in the base contains the circuit, a motor relay and a motor circuit breaker.

The belt box assembly contains a high and low speed clutch, interconnecting pulleys and belts and an output shaft which extends out from the top of the housing. A crosshead drive motor assembly mounts on the left side of the box.

The crosshead drive motor is a d.c. electrical motor which belts couple to the belt box. An encoder assembly attaches to the top of motor housing.

Crosshead

The crosshead is a steel rectangular block with a vertical center bore. A bolt pattern of tapped holes surrounds the bore. A ballscrew nut attaches to each end of the crosshead where the leadscrew passes through a vertical bore. Two screws attach a limit switch actuator to the top of the crosshead.

Columns

Each column contains a threaded leadscrew with a sheet metal housing and a protective curtain. A preload nut threads on the leadscrew under the bottom of the crosshead. The screw passes through the crosshead bore and ballscrew nut. A bearing attaches to the top of the leadscrew and a steel plate houses the bearing and extends over to the other leadscrew bearing. The right-hand column has a slotted extrusion which supports the electronic control panel.

A travel limit rod passes through the base plate and extends along the length of the left leadscrew housing. The rod passes through a limit actuator which is fixed to the crosshead. Two limit stops with knurled thumbs screws are fixed to the limit rod.

Inside the base, the bottom of each screw connects to a leadscrew drive pulley. The screw passes through a ballscrew bearing which is fixed to the base table. The screw extends upward. A control panel attaches to the right leadscrew housing. The control panel contains power and emergency stop controls.

Frame Control Unit

The frame control unit is an enclosure on the left side of the load frame. Internally, the unit has a power supply and a card cage with a digital signal processor card, optional transducer signal conditioning cards, an optional analog output card.

Depending on which options you select, there is a **LOAD** and two **STRAIN** channel connectors and a seven segment LED display on the front of the unit. On the read of the unit are four analog BNC output jacks are on the rear of the unit.

Function

Electrical Control System

The system operates on a closed loop servo control circuit. This circuit constantly compares the command signal with pulse signals from an incremental optical encoder within the drive train. The encoder signals reflect the crosshead position. A cable carries the signal to the computer. The system identifies this returning signal as **EXTENSION**. The computer subtracts the encoder signal from the command signal and expresses the difference as an error signal. The error signal is the power amplifier input signal. A cable carries the error signal through the frame interface board in the base to the power amplifier.

Power Amplifier

The pulse-width modulated servo amplifier controls the d.c. power to the crosshead drive motor. Electrical connections from the frame interface board carry the error signal to the power amplifier input. The amplifier controls the amplitude and polarity of the d.c. current to the drive motor. The amplitude of the signal determines the acceleration of the crosshead while the polarity determines the direction.

Frame Control Unit

The frame control unit preamplifies and digitally processes transducer and control signals. A d.c. power supply within the unit supplies the digital signal process card, transducer conditioner card, and analog output card with power.

The **LOAD** conditioner card preamplifies and conditions the load cell signal. The **STRAIN 1** and **STRAIN 2** conditioner cards preamplify and condition extensometers and displacement gauges signals. The cards are optional, and are identical to the load conditioner card.

The analog output card provides outputs of the analog signals from the load cell and extensometers to a recorder or other measuring device. The signals are available on either BNC connectors or on a 15-pin subminiature D-connector.

Frame Interface Panel

The frame interface panel is a junction for power and control connections. The main power connector determines the input voltage and the power output connector supplies the frame control unit with power. The fuses protect system components from excessive current conditions. The panel connections carry signals between the load frame and the frame control unit, pneumatic grips and pipping devices.

Internal to the frame interface panel, the frame interface board contains circuits and connections which identify the load frame, indicate frame operational status and system interlocks. The load frame handset connects to a connector on the board. The board contains a drive relay. When you energize the drive relay coil, the contacts carry electrical power to the crosshead drive motor.

Load Cell

The load cell measures the tensile or compressive force the crosshead exerts on a test specimen. The control electronics provide a reference signal to the load cell via a transducer cable. When the crosshead exerts force on a specimen, the force is transmitted to the load cell. The force causes a mechanical displacement within the cell. Strain gauges within the cell change the reference signal in proportion to the amount of force. The load cell cable carries the signal to the frame control unit where the circuits amplify, and digitally process the signal. A cable carries the output to the computer. The system identifies this signal as **LOAD**.

Each load cell contains self-identifying resistors which allow the test system to recognize the cell type and capacity, and to perform automatic calibration. Load cell identification provides automatic electronic overload protection at 102% of the cell's maximum capacity.

Mechanical System

The crosshead motor, belt box, leadscrews and crosshead comprise the mechanical drive system. Figure 1-3 illustrates the drive system within the load frame.

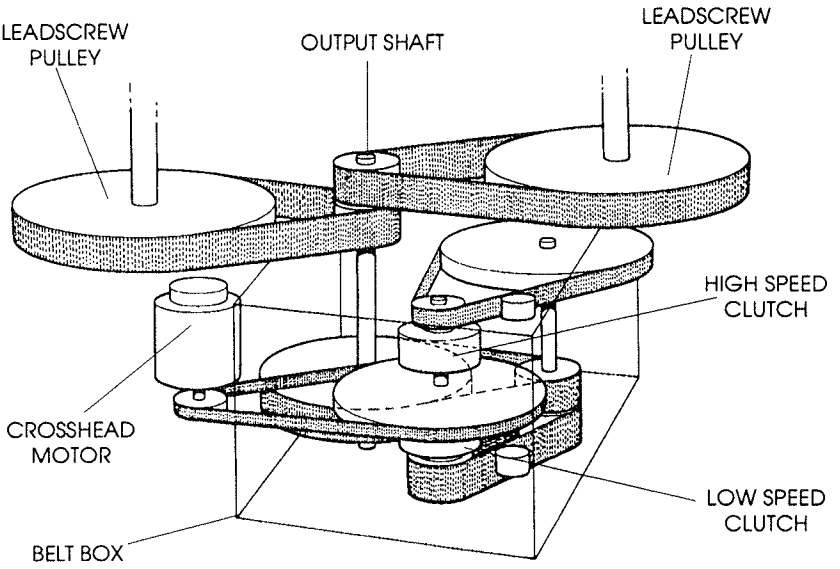

Figure 1-3. Mechanical Drive Components

Crosshead Motor

The amplifier circuit output drives the crosshead motor in the direction and speed of the command signal. The motor shaft pulley turns the motor belt which transfers the rotary motion of the crosshead drive motor to the belt box assembly.

Belt Box

The motor belt transfers the rotary motion of the crosshead drive motor to the clutch shaft. Depending on the command signal speed, the system will use either a high or low speed clutch. The low or high speed belt turns the intermediate belt which transfers the clutch shaft motion to the belt box output shaft. The belt box output shaft turns the main drive belts which turn each of the leadscrew pulleys.

Leadscrews

The main drive belts turn the leadscrews pulleys which rotate the leadscrews. The upper and lower leadscrew bearings allow the screw to rotate while restricting any lateral motion. The screw action of the leadscrews and the ballscrew nuts provide the vertical motion which moves the crosshead. The non-load bearing top plate supports the leadscrews and increases the frame stiffness.

A preload nut on each leadscrew positions a drive nut. You loosen or tighten the preload nuts, depending on the test direction, to ensure that the load frame transfers test forces between the leadscrew and the crosshead evenly.

Crosshead and Baseplate

The movement of the extremely stiff crosshead generates a force which is transmitted to a specimen which a pair of grips are holding between the baseplate and the crosshead. Threaded bores in the crosshead and baseplate provide you with a means to install a variety of load cell, grips and other accessories.

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Chapter 2
Specifications

Outline

This chapter details the load frame performance, dimensional, power, and environmental specifications.

Performance

Parameter	Specification
Load Capacity	150 kN (37,500 lb.)
Force Rating	25 kN up to 500 mm/min. (5625 lb. up to 20 in./mm.) 150 kN up to 50 mm/min. (33750 lb. up to 2 in. /min.)
Crosshead Speed	0.05 to 500 mm/min. (0.002 to 20 in./min.)
Speed Accuracy (No Load)	+/- 0.2% over 100 mm (4 in.)
Return and Jog Speed	500 mm/ min. (20 in./min.)
Load Accuracy	+/-0.5% of reading to 1/10 of load cell capacity. +/- 1% of reading to 1/50 of load cell capacity +/- 1 display count.
Strain Accuracy	+/-0.6% of reading +/-1 display count.
Position Accuracy (no load)	+/-0.1 mm (0.004 in.) or +/-0.15% of displacement.
Position Repeatability (no load)	+/- 0.05 mm (+/-0.002 in.)

Parameter	Specification
Crosshead Alignment	Total indicated reading relative to vertical axis: +/- 0.2 mm over 100 mm (+/- 0.008 in.) over 4 in. of travel. 0.4 mm (+/-0.015 in.) over full travel.
Crosshead Travel	1220 mm (48 in.) excluding grips and fixtures.
Testing Space	Lateral: 560 mm (22 in.) Front to back: unlimited.
Encoder Feedback Resolution	High clutch: 0.1 mm (4×10^{-6} in.) at crosshead. Low clutch: 0.025 µm (4×10^{-6} in.) at crosshead.

Dimensions and Weight

Load Frame

Figure 2-1 illustrates the load frame dimensions.

Dimension	mm (in.)
A. Overall Height	2260 (89)
B. Overall Width	1300 (53)
C. Crosshead Travel	1221.8 (48.1)
D. Base Width	1115 (43.8)
E. Base Depth	580 (22.8)
F. Column Width	390 (15.35)
G. Column Depth	200 (7.9)
H. Crosshead Height	152 (6)
I. Crosshead Width	560 (22)

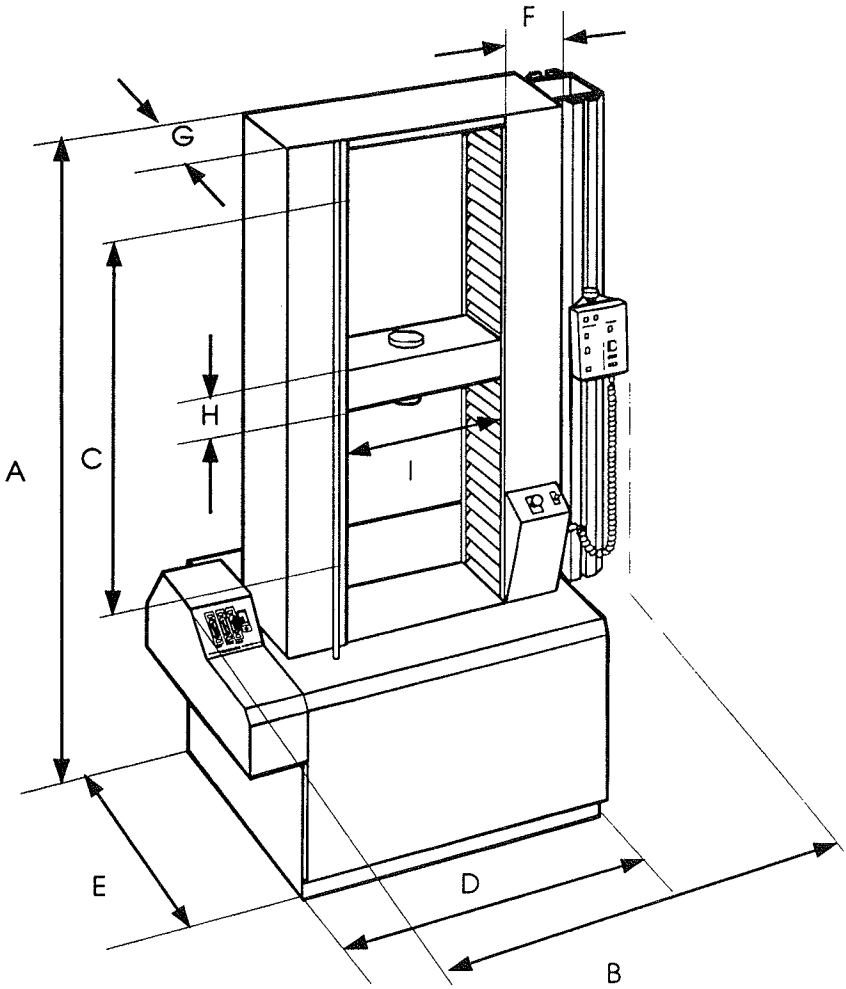

Figure 2-1. Load Frame

Baseplate

Figure 2-2 illustrates the baseplate dimensions.

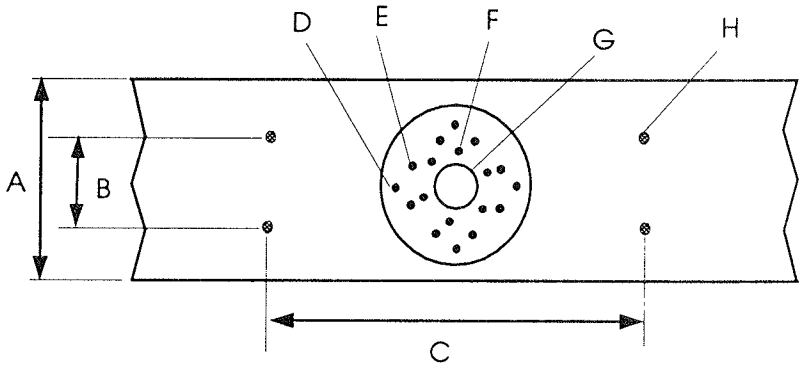

Figure 2-2. Baseplate

Dimension	mm (in.)
A	255 (10.04)
B	90 (3.543)
C	280 (11.024)

Bore	Thread
D	8 x 3/8 -24 in. 5.062 in. diameter circle
E	4 x 1/4 -20 in. 5 in. diameter circle
F	6 x M10 100 mm diameter circle
G	40 x 3 mm recess no threads
H	4 x M10 accessory threads

Crosshead

Figure 2-3 illustrates the crosshead dimensions.

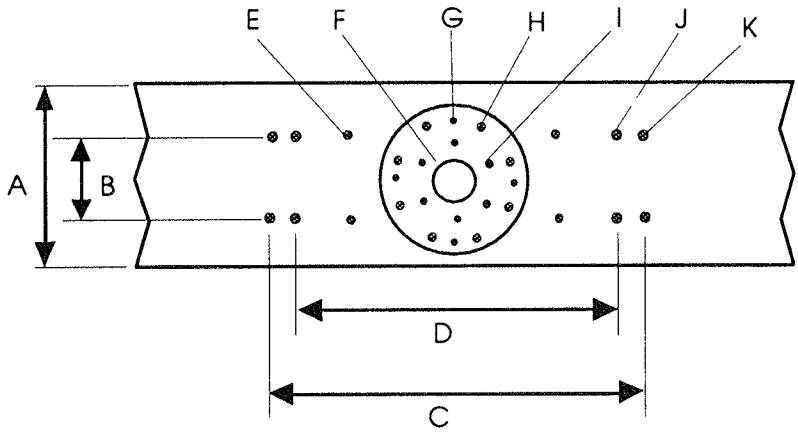

Figure 2-3. Crosshead

Dimension	mm (in.)
A	255 (10.04)
B	90 (3.543)
C	280 (11.024)
D	254 (10.0)

Bore	Thread
E	4 x 1/4 -20 in. accessory threads
F	M48 left-hand
G	4 x 1/4 -20 in. 5 in. diameter circle
H	8 x 3/8 -24 in. 5.062 in. diameter circle
I	6 x M10 100 diameter circle
J	4 x 3/8 -16 in. accessory threads
K	4 x M10 accessory threads

Weight

Item	Weight kg. (lb.)
Load Frame	500 (1100)

Electrical

Parameter	Specification
Main Power Input	100/120/ 220/ 240/ V a.c. single phase.
Frequency	47 to 63 Hz.
Voltage Variation	+/- 10% of main power input.
Maximum Power	2000 VA

Environmental

Parameter	Specification
Operating Temperature	10 to 30° C (50 to 86° F)
Storage Temperature	-40 to 66° C (-40 to 151° F)
Rate of Temperature Change	2° C (3.6° F) per hour. Changes above this may affect system performance.
Relative Humidity	10 to 90% (non-condensing).

Load Cells

General

Parameter	Specification
Sensitivity	2 mv/v
Non-linearity	+/-0.05% of indicated load to 1/10 of capacity.
Hysteresis	less than 0.05% of full rated output
Creep	less than 0.05% of full rated output
Temperature Effect on Zero	0.002% of full rated output per $^{\circ}$ F
Temperature Effect on Span	0.002% of full rated output per $^{\circ}$ F
Temperature Compensation Range	-7 to 49° C (20 to 120° F)

2525-800 Series

Figure 2-4 and Table 2-1 detail the 2525-800 Series load cell dimensions.

Table 2-1. Series 2525-800

Catalog Number	Maximum Capacity kN (lb.)	Instron Interface Type	Dimension mm (in.) A	B	C	D
2525-801	100 (20000)	1	72 (2.8)	34 (1.34)	16 (0.63)	142 (5.6)
2525-802	50 (1000)	1	72 (2.8)	34 (1.34)	16 (0.63)	142 (5.6)
2525-804	10 (2000)	0	20 (0.79)	12 (0.47)	6 (0.24)	133 (5.23)
2525-805	5 (1000)	0	20 (0.79)	12 (0.47)	6 (0.24)	133 (5.23)
2525-806	1 (200)	0	20 (0.79)	12 (0.47)	6 (0.24)	133 (5.23)
2525-807	0.1 (20)	00	12 (0.47)	6 (0.24)	2.5 (0.1)	135 (5.32)
2525-808	0.01 (2)	00	12 (0.47)	6 (0.24)	2.5 (0.1)	135 (5.32)

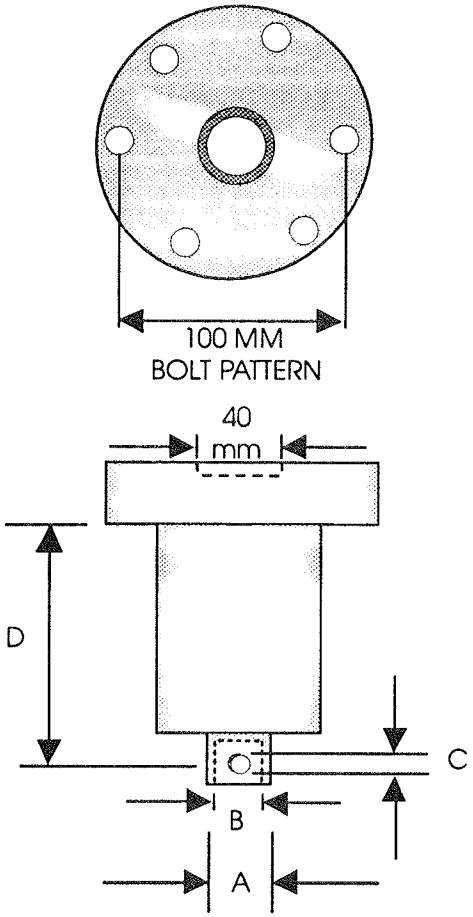

Figure 2-4. Series 2525-800.

2518-100 Series

Figure 2-5 and Table 2-2 detail the Series 2518-100 load cell dimensions,

Table 2-2. Series 2518-100

Instron Catalog Number	Maximum Capacity kN (lb.)	Adapter Type	Dimensions mm (in.)			Threads metric left-hand	
			A	B	C	D	E
2518-122	600 (134880)	IIA	210 (8.27)	150 (5.91)	222 (8.74)	72	20
2518-111	200 (44000)	II	210 (8.27)	150 (5.91)	170 (6.7)	48	20
2518-100	100 (22000)	I	140 (5.51)	100 (3.94)	96 (3.8)	30	10
2518-101	50 (1100)	I	140 (5.51)	100 (3.94)	96 (3.8)	30	10
2518-102	20 (4400)	I	140 (5.51)	100 (3.94)	96 (3.8)	30	10
2518-103	10 (2200)	I	140 (5.51)	100 (3.94)	96 (3.8)	30	10

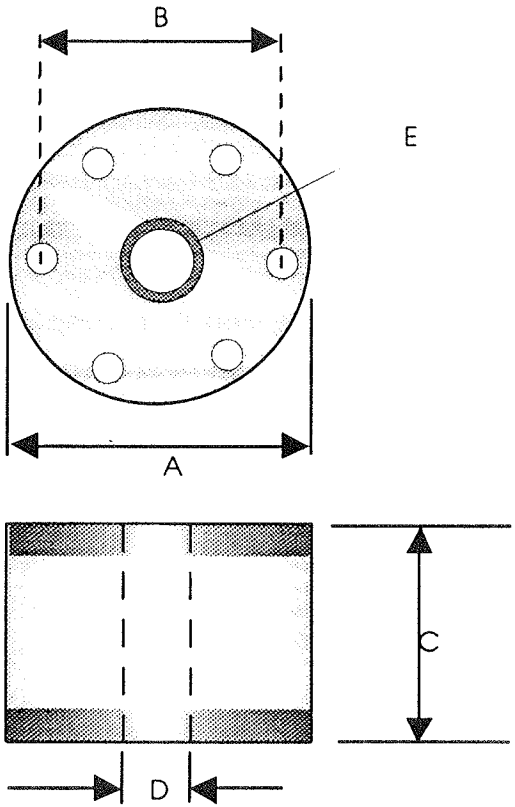

Figure 2-5. Series 2518-100

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Chapter 3
Installation

Outline

This chapter contains installation procedures to guide you through the installation process. Each procedure contains an equipment list, a checklist and a set of instructions.

Unpacking

It is the customer's responsibility to arrange for the off-loading, unpacking and transportation of the equipment to the test site. This includes all insurance and safety responsibilities.

Instron ships the load frame on either a wooden skid in an upright position, or in a crate in a prone position.

Note *Do not remove the wooden skid until you decide what method you will use to transport the test system to its test site. Leaving the load frame on the skid makes it easier to move.*

Unpack the load frame in following sequence:

(a) Remove the shipping crate, but leave the load frame fastened to the skid.

(b) Remove the shrink wrap vapor barrier encasing the load frame.

(c) Use the packing list to inventory all the items. Some accessories may be in the container with the load frame or in separate packages.

(d) Keep all packing material until the system is installed and you account for all parts, assemblies and accessories.

Lifting Frames with a Crane

Equipment

You need the following items:

- a crane with a load rating of 1.5 x the load frame gross weight.
- two lifting slings.
- protective padding.

Checklist

Check for the following conditions before you lift the load frame:

- ❑ There are no bolts or straps holding the load frame to the skid.
- ❑ All personnel are clear of the area around the load frame.

Procedure

(a) Wrap protective material around the crosshead.

(b) Attach the two lifting slings to the crosshead and secure them to the crane hook as Figure 3-1 illustrates.

(c) Slowly lift the frame and pivot it about its base until it is clear of the skid.

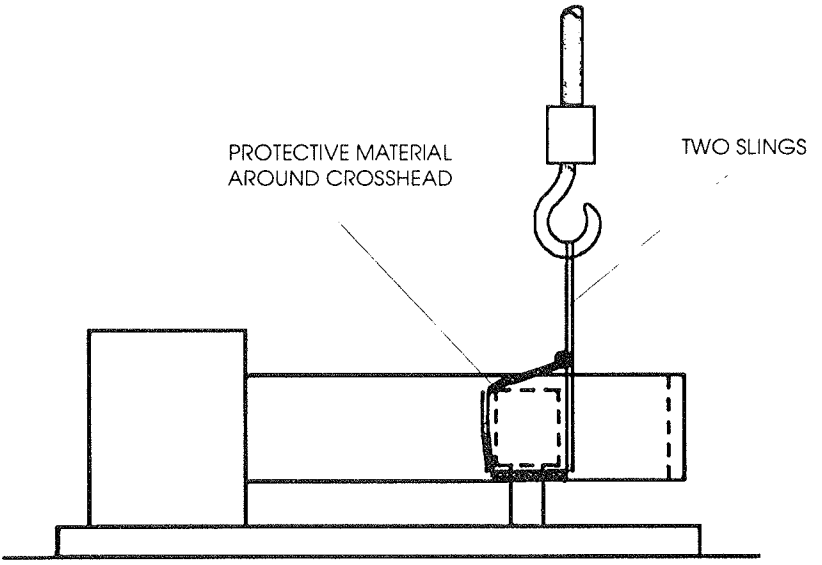

Figure 3-1. Initial Position

(d) Remove the skid and slowly lower the frame until the front corner is on the floor. Continue lowering the frame until all four base corners are resting on the floor as Figure 3-2 illustrates.

(e) Remove the lifting straps and protective padding.

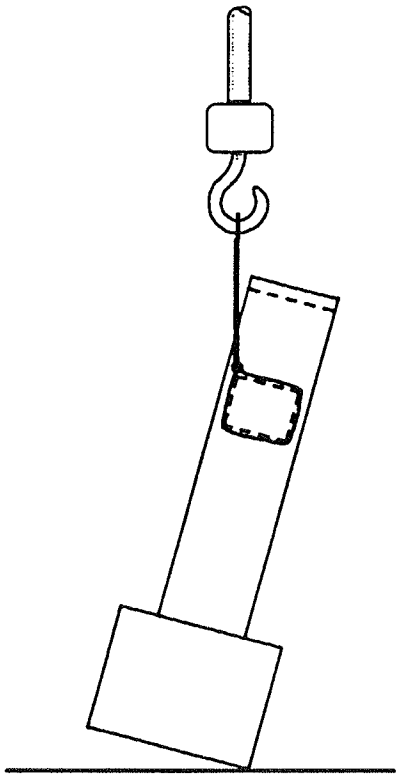

Figure 3-2. Final Positioning

Lifting Frames with a Forklift

Equipment

You need the following items:

- a forklift with a load rating of 1.5 x the load frame gross weight.
- a skid slightly larger area than the load frame base and about 25 mm (1/2 in.) higher than the forklift blades.
- block and tackle.

Checklist

Check for the following conditions before you lift the load frame:

- ❑ There are no loose accessories on the shipping skid.
- ❑ The load frame is bolted to the shipping skid.

Procedure

(a) Place a skid in front of the frame base as Figure 3-3 illustrates.

Warning

Do not remove any bolts or straps that secure the frame to the shipping skid.

(b) Remove one board from the shipping skid just beyond the crosshead towards the top tie plate as Figure 3-3 illustrates.

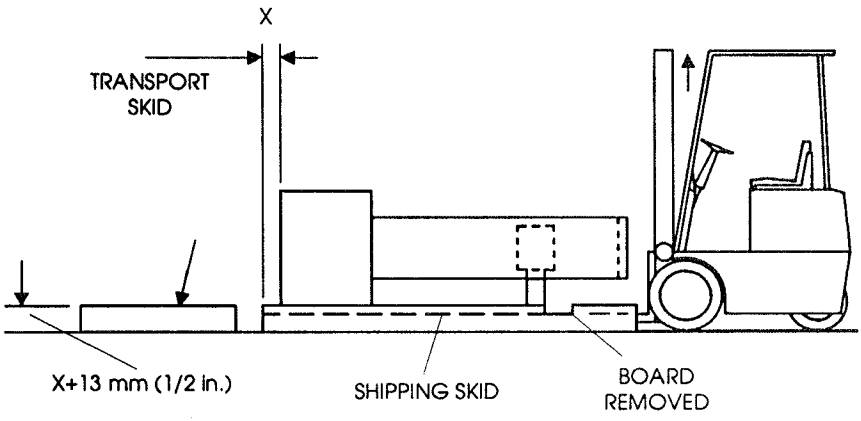

Figure 3-3. Forklift Starting Position

(c) Using a forklift, approach the frame from the top end of the load frame.

(d) Insert the forks under the shipping skid.

(e) Lift the whole assembly to about a 35^{o} angle relative to the floor.

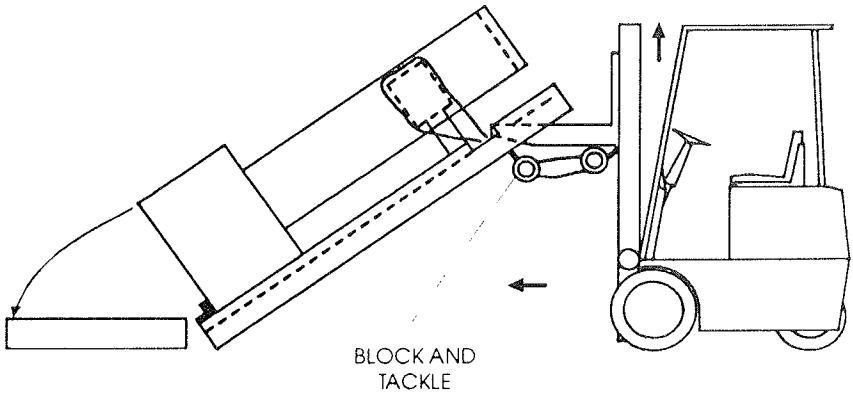

Figure 3-4. Lifting the Load Frame

(f) Attach a small block and tackle to the crosshead. Pass the line from the block through the opening in the shipping skid and around a crossbar on the forklift to a point where the operator can control the line. Refer to Figure 3-4.

(g) Move the forklift carriage up and forward while taking up the slack in the block and tackle line.

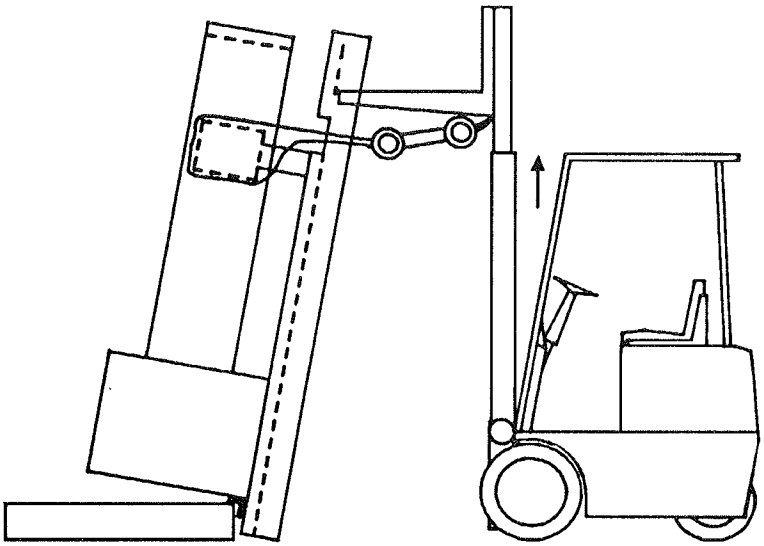

Figure 3-5. Final Positioning

(h) When the load frame reaches a balance point, use the block and tackle to hold it against the forklift as Figure 3-5 illustrates.

(i) Move the forklift forward until the frame base rests upright on the transporting skid.

(j) Remove the shipping skid from the frame.

Transporting to the Test Site

Warning

Do not lift the frame by the top plate. This plate will not support the weight of the frame and could break causing personal injury and equipment damage.

Caution

Do not lift the frame by inserting forklift blades under the base if you have removed the shipping skid. Lifting the frame in this manner will damage the frame base.

There are two methods of transporting the load frame to the test site.

- Use a forklift to lift the upright load frame while a shipping skid is supporting the frame base as Figure 3-6 illustrates.
- Use a forklift with padded forks to lift the load frame from under the crosshead as Figure 3-7 illustrates.

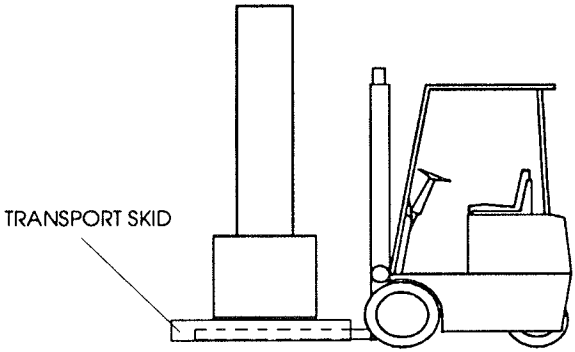

Figure 3-6. Lifting Under the Base

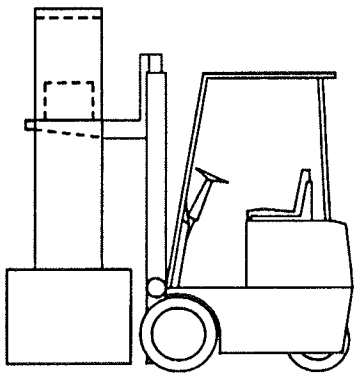

Figure 3-7. Lifting Under the Crosshead

Siting

Site Requirements

Check for the following site requirements before you install the system:

- ❑ The site floor is capable of withstanding the weight of the load frame.
- ❑ There is adequate clearance between the load frame and the site ceiling.
- ❑ Electrical power is within 4.8 m (16 ft.) of the system.
- ❑ The site environment meets the system environmental specifications. Refer to page 2-10
- ❑ There is adequate air flow to the frame control unit.
- ❑ The system is accessible for routine service.

Note *Series 5500 test systems in the United States and Canada have a communications modem for remote diagnostics which requires at least one telephone line. Ideally, the test site should have two phone lines, one for voice and the other for data communications. Refer to page 7-3 for more details.*

Leveling

By leveling the four feet on each corner of the base, you prevent the base from rocking and provide a level test surface.

Equipment

You need the following items:

- spirit level.
- open-end wrenches, 5/8 in. and 15/16 in.

Procedure

(a) Place a spirit level on the frame baseplate.

(b) Using the open-end wrenches, alternately adjust the height of each foot while you monitor the spirit level reading.

(c) Rotate the spirit level 90^{o} to verify that the load frame is level from side-to-side and front-to-back.

Setting the Main Power

You can alter the frame interface power input connector to accept line voltages from 90 to 250 V a.c., 47 to 63 Hz.

Note *The load frame is factory set to the voltage you specified on the purchase order. Use the following procedure if the facility power source does not match the frame setting.*

Equipment

You need the following items:

- pointed probe.
- 3 AB type fuses.

Checklist

Check for the following conditions before you set the main power:

- ❑ There is no cable connecting the load frame to a line voltage source.
- ❑ All power source cables match the following CEE wire color code:

  Brown-high (live)

  Light blue-low (neutral)

  Green and yellow- earth ground

- ❑ If you are changing the voltage to 200 - 250 V a.c., add a male plug to the power cable that matches the facility power source.

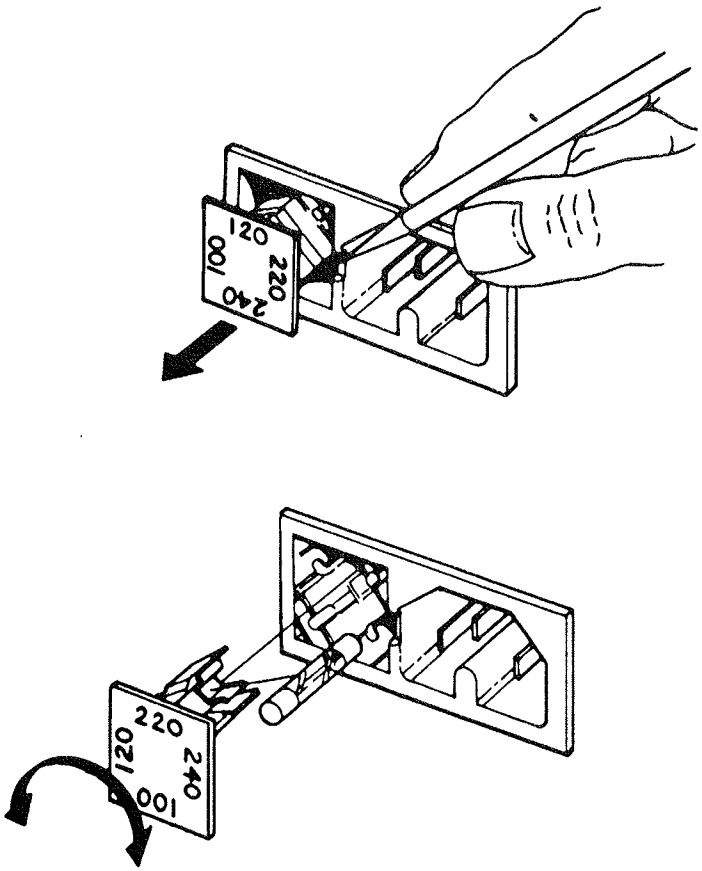

Figure 3-8. Input Line Voltage Adapter

Warning

Shut off the main power switch and disconnect the power cable to the load frame before you change the power setting. Dangerous voltage levels are present within the fuse holder.

Procedure

(a) Insert a sharp probe into the middle of the connector and pry out the fuse holder as Figure 3-8 illustrates. The number at the top of the holder is the voltage

(b) Change the fuse in the holder according to the voltage and fuse rating in Table 7-1 on page 7-10.

(c) Rotate the fuse holder until the voltage you desire is at the top.

(d) Firmly press the holder back into the connector.

Connecting Cables

Warning

Do not connect power cables with the power on. Connect the cables with the power off to avoid hazardous voltages and component damage.

Requirements

To establish communications between the computer and load frame, connect the following cables:

- A504-89 from the facility power source to the frame interface board **LINE-IN** input.
- A504-88 from the frame interface panel **CONTROLLER POWER** output to the frame control panel **POWER IN** input.
- A570-5 from the frame interface panel **CONTROLLER** port to the frame control unit **FRAME** port.
- 82-10-63 from the computer communications port to the frame control unit **COMPUTER** port.

Note *The system requires a load cell to measure test forces on a specimen, but not for control of the moving crosshead. You install the appropriate transducers according to your test requirements. Refer to page 5-4 for details on selecting load cells.*

Power

Caution

Use a three wire, grounded main power cable. The load frame operates from a single phase two wire grounded power source that does not apply more than 250 volts rms between the supply conductors or between the ungrounded supply conductor and earth ground.

Checklist

Check for the following conditions before you connect the load frame to the power source:

- ❑ The load frame **POWER** switch is **OFF**.
- ❑ The input voltage adapter is set to match the source voltage. Refer to page 3-14.

Procedure

(a) Connect the power cable (A504-89) into a voltage power source outlet.

(b) Connect the power cable female connector to the frame interface board **LINE-IN** input.

(c) Check that there is adequate slack in the cable so as not to put excessive strain on the connector.

Frame Interface Panel

Figure 3-9 illustrates the frame interface panel connections.

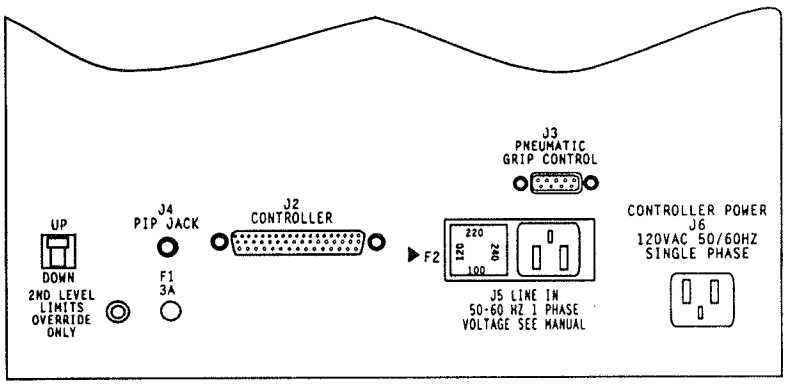

Figure 3-9. Load Frame Signal Cables

Connection	Description
J2 CONTROLLER	A 50 pin female port that carries control and status signals to the frame control unit.
J3 PNEUMATIC GRIP CONTROL	A female 9 pin input that connects an optional pneumatic grip control.

Connection	Description
J4 **CONTROLLER** **POWER**	A female three prong output that connects a 120 V a.c. single phase power source to the frame control unit.
J6 **PIP**	A female jack that connects an optional remote recorder pen pipping device such as an event marker or an incremental extensometer.
J5 **LINE IN**	A male three prong input connector with an integral fuse holder assembly. You can remove the fuse holder and reposition it to select the proper taps of the input power transformer to match the main powers source. Refer to page 3-14.

Frame Control Unit

Front Connections

The transducer connections are on the front of the frame control unit. Each transducer connection is integral to a specific conditioning card within the frame control unit. Figure 3-10 illustrates the frame control unit transducer connections.

Note *Load cells other than the Series 2525 require an adapter cable which connects between the load cell connector and the frame control unit* ***LOAD CELL*** *connection.*

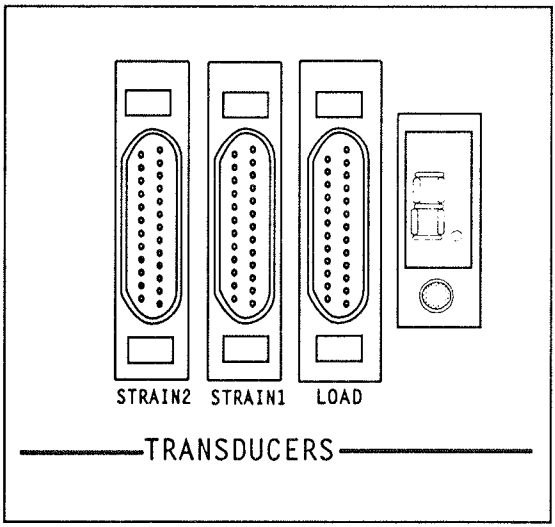

Figure 3-10. Frame Control Unit Connections (Front)

Connection	Description
LOAD	A female 25 pin interface that connects a load cell to the transducer conditioning circuit in the frame control unit.
STRAIN 1	A female 25 pin interface that connects an extensometer to an optional transducer conditioning card in the frame control unit.
STRAIN 2	A female 25 pin interface that connects an extensometer to an optional transducer conditioning card in the frame control unit.

Rear Connections

The **SERVICE, PIP** and **COMPUTER** connections are integral to the digital signal processing card. All analog outputs are integral to the optional analog outputs card. Figure 3-11 illustrates the rear connections.

Connection	Description
SERVICE	A male 25 pin serial digital port that connects an optional communications modem for remote diagnostics.
PIP	A female jack that connects an optional remote recorder pen pipping device such as an event marker or an incremental extensometer.

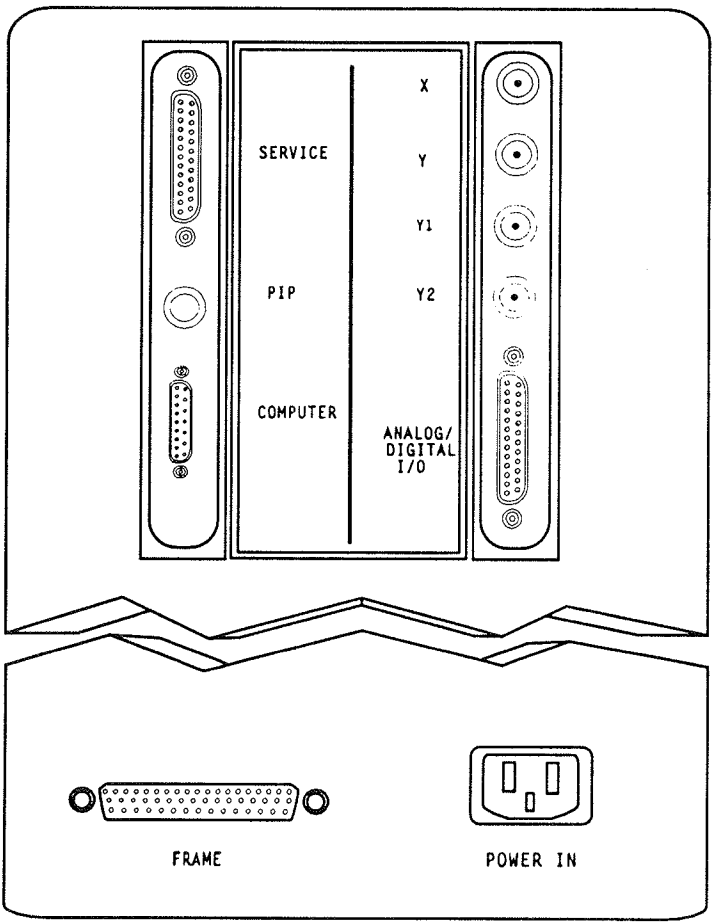

Figure 3-11. Frame Control Unit Connections (Rear)

Connection	Description
COMPUTER	A female 15 pin digital communications port that connects to the computer's male 15 pin digital communications connector.
X	A female analog BNC output terminal that connects to a recorder or other analog input device.
Y	A female analog BNC output terminal that connects to a recorder or other analog input device.
Y_1	A female analog BNC output terminal that connects to a recorder or other analog input device.
Y_2	A female analog BNC output terminal that connects to a recorder or other analog input device.
ANALOG/ DIGITAL I/O	A female 25 pin port that connects to an analog/ digital input/ output device.
FRAME	A 50 pin female interface that connects a cable to the frame control unit.
POWER IN	A three prong male input that connects a 120 V a.c. power cable to the frame interface panel.

Chapter 4
Function of Controls

Outline

This chapter details the function of the frame controls. Each section contains a panel illustration and an explanation of the panel controls.

Frame Interface Panel

Figure 4-1 illustrates the frame interface panel controls.

Control	Function
LIMITS OVERRIDE	Press the **LIMITS OVERRIDE** button switch to move the crosshead away from the second level travel limit switch.
UP/ DOWN	Turn the **UP/ DOWN** two position switch to select the crosshead direction when you are overriding a second limit switch. You must remove the switch guard to operate the switch.

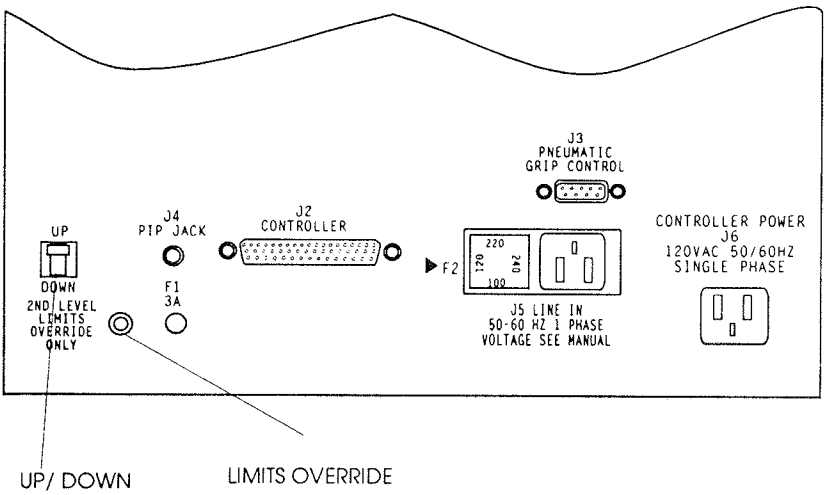

Figure 4-1. Frame Interface Panel

Frame Panel

The frame panel mounts on the front of the right column cover. Figure 4-2 illustrates the panel.

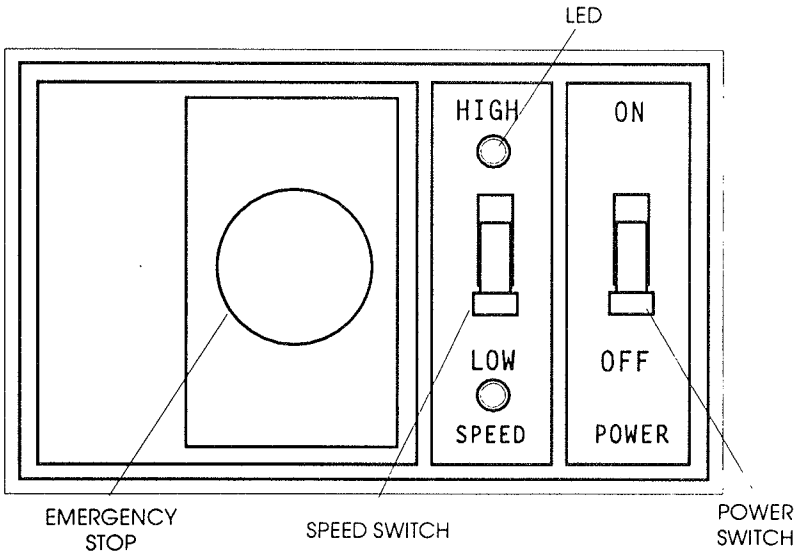

Figure 4-2. Frame Panel

Control	Function
EMERGENCY STOP	Press the red **EMERGENCY STOP** switch to stop the crosshead from moving. Once you press the switch, it de-energizes the drive motor relay and locks in the off position. To restore operation, set the main power switch to off, turn the switch clockwise until it releases, then switch the main power switch to on.

Control	Function
POWER	Switch the two position **POWER** circuit breaker to control the a.c. power to the load frame. An indicator light next to the switch illuminates when power is on.
SPEED	Select the two position switch to change the crosshead speed and load range. The switch circuit energizes clutches which engage belts and pulleys in the belt box. LED indicators illuminate the crosshead speed range. Select **HIGH** when your test requires crosshead speeds up to 500 mm/min. (20 in./min.) at load ranges to 25 kN (5600 lb.) Select **LOW** when your test requires crosshead speeds up to 50 mm/min. (2 in./min.) at load ranges to 150 kN (33,750 lb.).

Control Panel

Figure 4-3 illustrates the control panel which is on the right-hand column.

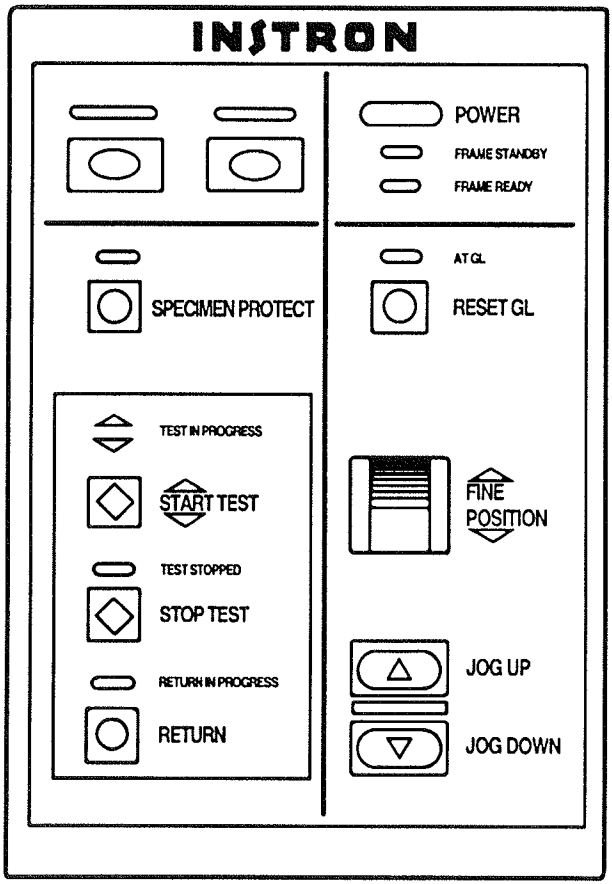

Figure 4-3. Control Panel

Control	Function
JOG UP	Press the **JOG UP** arrow button to move the crosshead up (⇑). If you hold the button in, the crosshead speed increases linearly until you release the button.
JOG DOWN	Press the **JOG DOWN** arrow button to move the crosshead down (⇓). If you hold the button in, the crosshead speed increases linearly until you release the button.
FINE POSITION	Turn the **FINE POSITION** thumbwheel control to slowly position the crosshead. **FINE POSITION** allows you to set an accurate gauge length, or to set a precise grip position for loading specimens.
RESET GL	Press the **RESET GL** button to set the gauge length after you move the crosshead to the location you desire.
AT GL	The **AT GL** indicator illuminates when the crosshead is at the preset gauge length. It also illuminate when you press the **RESET GL** button, which indicates that the current crosshead position is now the new gauge length.

Control	Function
POWER	The **POWER** indicator illuminates when system power is on. In **STANDBY**, the system supplies power to the load cell and its conditioner board but not to the frame. In **FRAME READY**, the system supplies power to all subsystems, and is ready for operation.
SPECIMEN PROTECT	Press the **SPECIMEN PROTECT** button to protect the test specimen or other load string components from overloads. The **SPECIMEN PROTECT** button toggles this function on and off. The **ACTIVE** and **INHIBITED** indicators show when **SPECIMEN PROTECT** is functioning or not.
START TEST	Press the **START TEST** button to begin the test after you set all test parameters. While the test is running, the **TEST IN PROGRESS** indicators show the crosshead direction. These indicators are especially useful when the crosshead speed is very slow.
STOP TEST	Press the **STOP TEST** button at the end of the test to stop the crosshead, if you have not already been programmed it at the computer. This button can also stop crosshead motion during a test in order, for example, to inspect a specimen or to change ranges on a recorder. Press **START TEST** to resume the test from the present position.

Control	Function
RETURN TO GL	Press the **RETURN TO GL** button to return the crosshead to the Gauge Length position, set previously with the **RESET GL** button, at the end of the test. While the crosshead is moving toward the gauge length position, the **RETURN IN PROGRESS** indicator illuminates.

Frame Control Unit

The self-test indicators for the load frame are next to the transducer connectors on the frame control unit. Figure 4-4 illustrates the indicators.

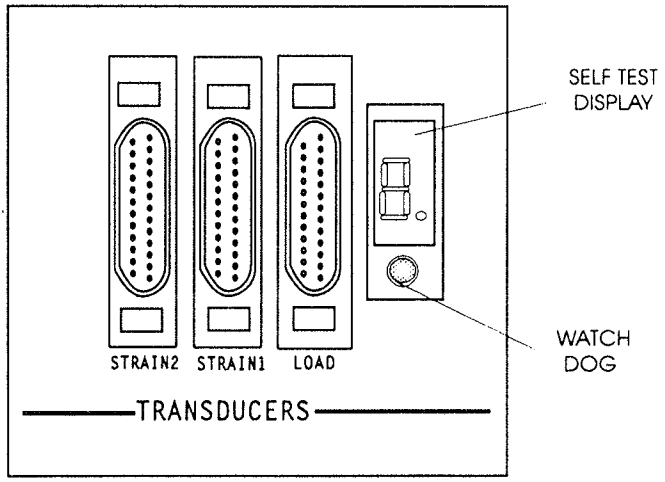

Figure 4-4. Frame Control Unit Indicators

Indicator	Function
Self Test Display	This seven segment LED displays a character sequence during the self test procedure when you turn the power **ON**.
Watch Dog Status LED	During normal system operation, this single red LED is not lit. It illuminates if communication between the computer and controller is lost due to an open circuit, component failure or a power interruption.

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Chapter 5
Preparation for Use

Outline

This chapter contains information for preparing the load frame for use. A checklist details the load frame conditions prior to operation. There are specific procedures for installing and aligning a load cell, setting travel limits and adjusting the preload nuts.

Checklist

Check for the following conditions before you operate the load frame:

- ❑ All cable connections are secure.
- ❑ The load frame **POWER** switch is **ON**.
- ❑ The load frame is **ON** or in the **STAND-BY** mode for at least 15 minutes, prior to testing, to assure that the load weighing components stabilize. This warm-up period is necessary whenever you change a load cell or install a strain gauge extensometer.
- ❑ The circuit breaker on the power amplifier panel is on; otherwise the crosshead drive motor will not function.
- ❑ The crosshead travel limits are set to prevent the crosshead from traveling too far and causing damage to the grips and fixtures. Refer to page 5-15 .
- ❑ The computer test parameters are set in accordance with your test program requirements. Refer to the on-line test information on the computer screen for details about the system and running a test.

Turning Power On

The load frame electrical power is independent of the computer and other external peripherals and accessories. You must turn on each component's power switch individually.

Checklist

Check for the following conditions before you turn the load frame power on.

- ❑ The system computer and its peripherals are connected to a power source and their power switches are on.
- ❑ All relevant load frame cables are connected. Refer to page 3-17 .

Procedure

(a) Switch the frame panel **POWER** switch **ON.**

(b) Check that the frame panel power indicator illuminates.

(c) Watch the frame control unit display as it counts through a diagnostic sequence. Refer to the Operating Instructions manual for details on the proper sequence.

(d) After the sequence is complete, run the Merlin software.

Selecting a Load Cell

Use the following guide lines when you choose a load cell:

- The load cell capacity should be greater than the maximum test load the system will exert on the specimen during a test.
- The maximum test load the system will exert on the specimen during a test should be greater than 1% of the load cell capacity.

If you have to choose between different load cells because of overlapping ranges:

- Select a higher-capacity load cell if your test requires minimal load cell deflection.
- Select a lower-capacity load cell if your test requires a maximum long term balance or stability.

If you do not know the approximate value of the specimen strength install the highest capacity load cell at first and perform a preliminary test at a slow speed to determine the load range. After you perform the preliminary test you can determine if you can use a lower capacity load cell for better resolution.

Installing a Series 2518-100 Load Cell

The 5568 test system uses a Series 2518-100 load cell for high capacity testing. Initial installation and alignment is done at the factory. Should you need to remove the load cell for servicing, or to accommodate a unique test fixture, you must align the load cell when you install it.

Equipment

You need the following items:

- hex key wrench, 1/4 in.
- torque wrench.
- alignment rod (T464-146).
- locknuts, 2.

Checklist

Check for the following conditions before you install the load cell.

- ❑ All screw threads, bores and mating surfaces are clean and free of damage.
- ❑ There is adequate clearance between the bottom of the crosshead and the baseplate to install the alignment rod and load cell.
- ❑ The load frame **POWER** switch is **ON** and the computer is running the Merlin software program.
- ❑ The crosshead is stationary.

Procedure

(a) Support the load cell from the bottom and lift it into position under the crosshead.

(b) Rotate the cell so the cable is facing towards the rear of the load frame and align the load cell bolt pattern to the crosshead bolt pattern.

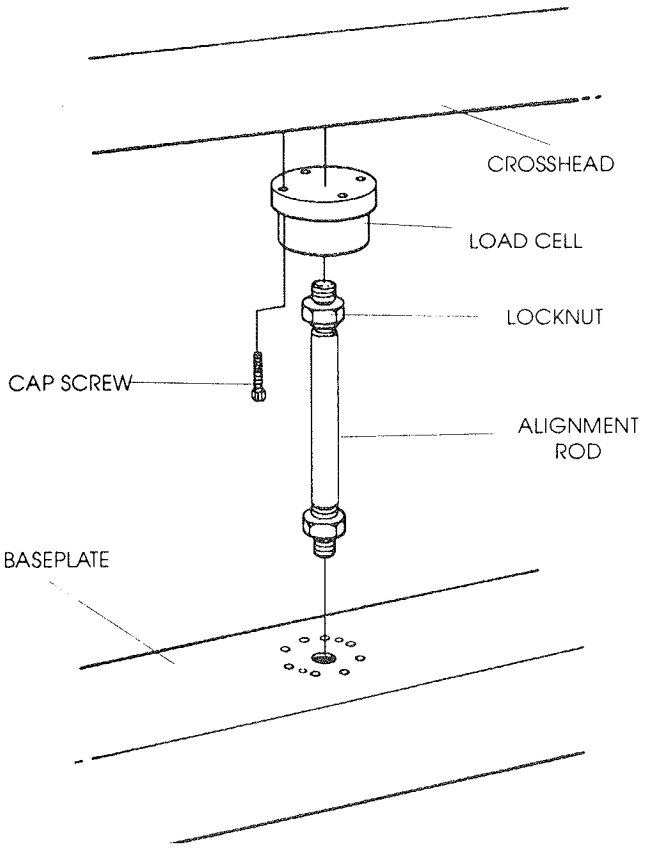

Figure 5-1. Load Cell Installation

Note *Do not completely tighten the screws, you'll need to shift the load cell a small amount when you install the alignment rod.*

(c) Use the 1/4 in. hex key wrench to thread the eight 3/8 -24 by 2 1/4 in. cap screws through the load cell flange and into the crosshead. Refer to Figure 5-1.

(d) Turn a locknut on each end of the alignment rod. Make sure the nut is at the end of the thread.

(e) Thread one end of the rod completely into the load cell.

(f) Carefully move the crosshead down until the alignment rod is just touching the baseplate.

(g) Thread the bottom end of the alignment rod into the baseplate threaded bore until the thread engagement in both ends is about equal. If you are having trouble threading the rod, shift the load cell to align the threads.

(h) Hand-tighten the locknuts against the load cell and baseplate.

(i) Carefully move the crosshead down until the system displays a 10 kN (2000 lb.) compressive load

(j) Use the torque wrench to alternately tighten the screws to 67 N-m (50 ft.-lb.).

(k) Move the crosshead up until the system displays a zero load.

(l) Turn the locknuts back onto the rod.

(m) Turn the alignment rod out of the adapter and into the load cell.

(n) Move the crosshead up enough for you to remove the rod.

(o) Remove the rod.

(p) Hook the load cell cable to the bracket on the back of the crosshead and attach it to the adjustable clip on the rear of the column cover.

(q) Plug the load cell cable into the **LOAD** connector on the front of the frame control unit.

(r) Use the Merlin software program to verify that the system can identify and calibrate the load cell.

(s) Before you run a test, leave the system on for at least 15 minutes to allow the load cell circuitry to stabilize. After this warm-up period calibrate the load cell again.

Installing a 2525-800 Load Cell

If a high capacity load cell is on the crosshead, you can install a smaller capacity 2525-800 Series load cell to it by using an optional adapter assembly.

The following procedure requires you to apply a tension load that slightly exceeds the capacity of the 2525-800 load cell. This action preloads all the threaded connections and eliminates discontinuity in the load curve during a test.

Equipment

You need the following items:

- hex key wrench, 8 mm.
- torque wrench.
- adapter assembly (includes: adapter, locknut, six M10 x50 cap screws and a spanner wrench.).
- specimen capable of withstanding a load 105 % of the load cell capacity.
- grips rated for 105% of the load cell capacity.

Checklist

Check for the following conditions before you install a 2525-800 Series load cell to a high capacity load cell:

- ❑ All bolt land tapped threads are free of dirt and damage.
- ❑ There is enough space between the crosshead and the baseplate to install the load cell.

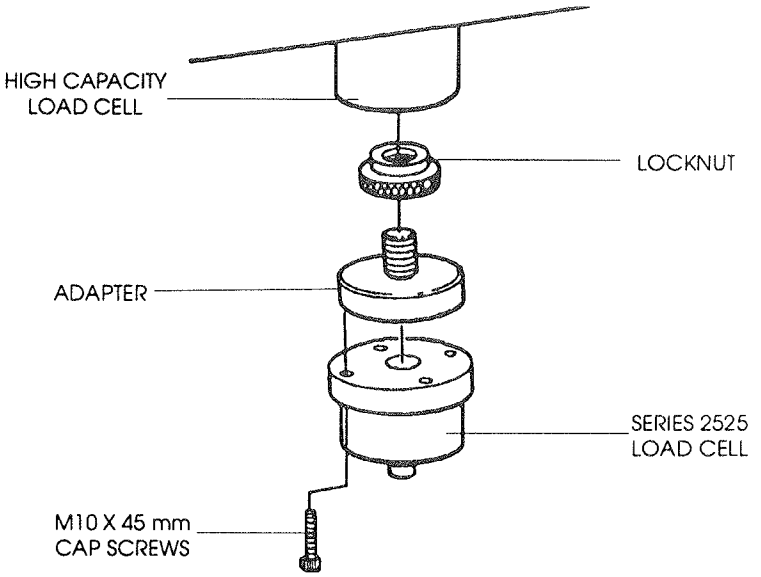

Figure 5-2. Installing a Series 2525-800 Load Cell

Procedure

Figure 5-2 illustrates the load cell installation.

(a) Thread the locknut onto the adapter.

(b) Thread the adapter into the high capacity load cell.

(c) Back off the adapter at least on-half turn to avoid applying internal pressure to the load cell.

(d) Turn the locknut up against the load cell.

(e) Center the 2525-800 load cell on the adapter. Make sure the cable is facing to the rear of the load frame.

(f) Use the hex key wrench to thread the six cap screws through the load cell and into the adapter.

(g) Use the torque wrench to tighten the screws to 50 N-m (37 lb.-ft.).

(h) Assemble the proper grips and a rigid specimen to the load cell and the baseplate.

(i) Carefully apply a tensile load to the specimen equal to 105% of the maximum capacity of the 2525-800 load cell.

(j) Use the spanner wrench to tighten the locknut.

(k) Remove the tensile load.

(l) Hook the load cell cable to the bracket on the back of the crosshead and attach it to the adjustable clip on the rear of the column cover.

(m) Plug the load cell cable into the **LOAD** connector on the front of the frame control unit.

(n) Use the Merlin software program to verify that the system can identify and calibrate the load cell.

(o) Before you run a test, leave the system on for at least 15 minutes to allow the load cell circuitry to stabilize. After this warm-up, calibrate the load cell again.

Grip Adapters

Load cells require coupling adapters to attach grips for tension testing, or anvils and tables for compression testing. A number of types and sizes of these adapters are available for Instron load cells. If you need assistance in determining your grip and adapter requirements, contact your regional Instron Sales and Service Office or the factory.

Load String

The load string is all of the components you install between the moving crosshead and the stationary baseplate. This includes the grips, attachment kits and the specimen. A tight connection between each component is essential for accurate test data. Any backlash in the load string components will degrade the integrity of test results.

Each grip or fixture requires an attachment kit to connect the grip to either the load cell or baseplate. The type of attachment kit will depend on the type of grip and load cell.

Clevis Pin Couplings

A clevis pin coupling is typically used for attaching the grips to an electromechanical test system. Figure 5-3 illustrates the clevis pin coupling. A male shank connects to a female clevis socket, which connects to either the load cell or to the baseplate. A clevis pin couples the shank and socket together. A locknut assures that no end play exists in the grip to load frame connection.

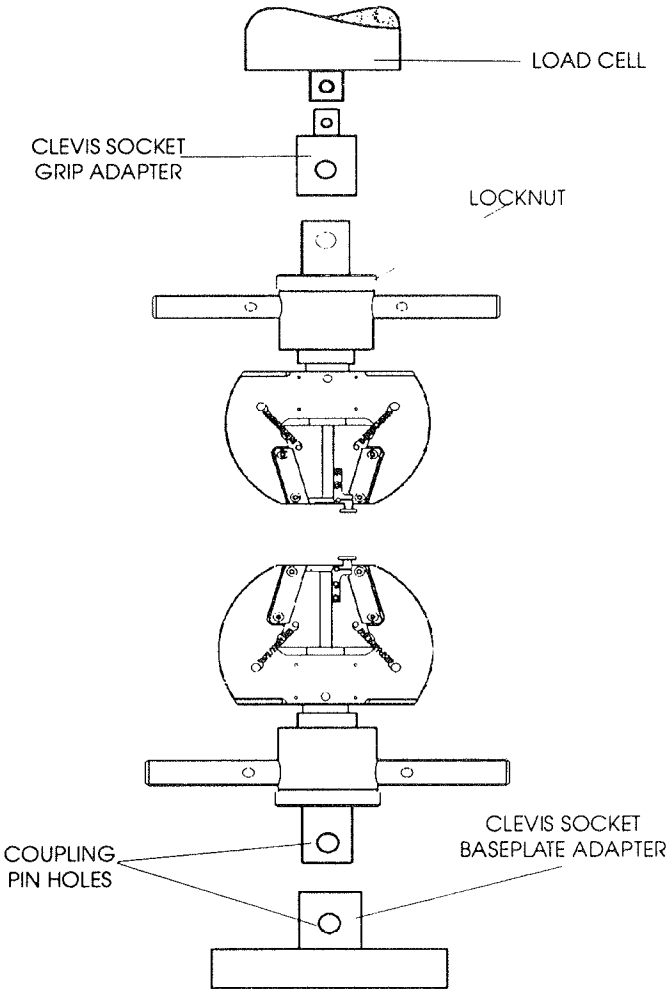

Figure 5-3. Clevis Pin Couplings

Threaded Couplings

Figure 5-4 illustrates a threaded coupling. A threaded attachment kit uses a female clevis socket which threads into the actuator or load cell. You eliminate any end play by tightening a locknut against the baseplate or load cell and the grip locknut against the grip adapter.

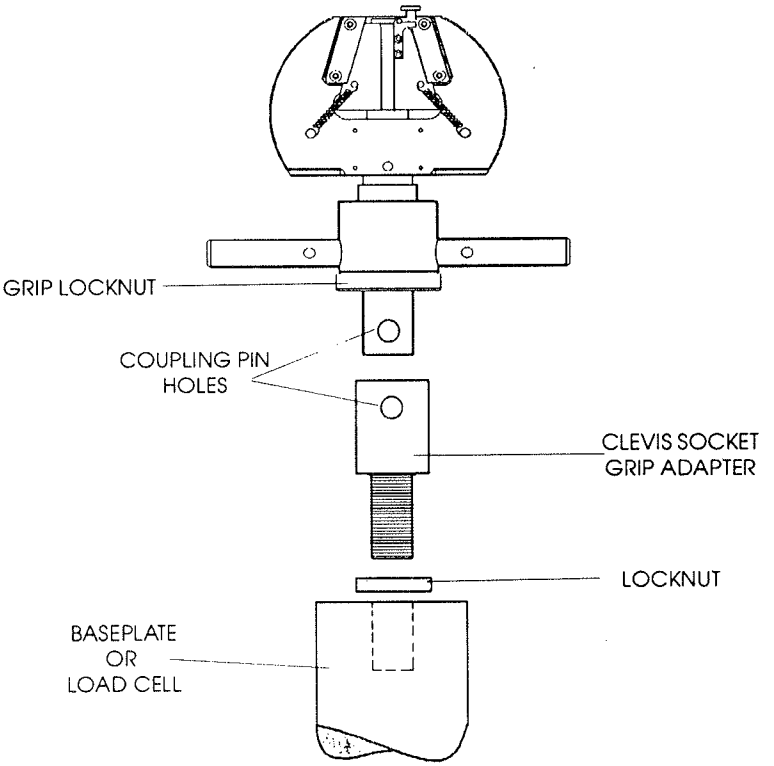

Figure 5-4. Threaded Coupling

Setting Travel Limits

When the moving crosshead trips a first level limit switch, the crosshead stops moving. The second level switch is a fail safe device if a first level switch does not function. When the crosshead trips a second level switch, circuits de-energize the drive motor relay and the crosshead stops. Both switches are inside the base. Figure 5-5 illustrates the travel limits.

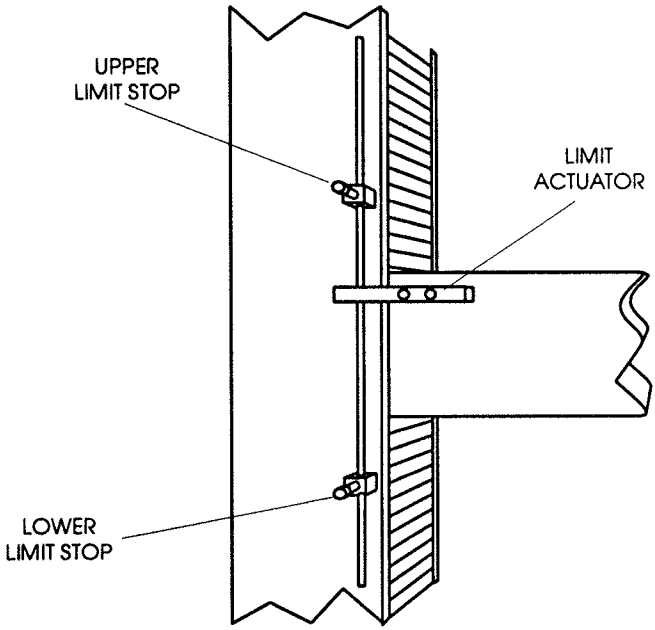

Figure 5-5. Travel Limits

Checklist

Check for the following conditions before setting the travel limits:

- ❑ The crosshead is stationary.
- ❑ The test parameters are set.

Procedures

Use the following set of instructions to set the travel limits for a tensile and compressive tests, respectively:

Tensile Test

(a) Set the upper limit stop to a point just beyond the expected maximum travel (extension) in the tensile direction.

(b) Set the lower limit stop just below the starting position (gauge length).

Compressive Test

(a) Set the upper limit stop to a point just above the starting position (gauge length).

(b) Set the lower limit stop to a point just beyond the expected maximum travel (extension) in the compressive direction.

Resetting Travel Limits

The procedure for resetting the travel limits depend on whether the system trips a first or second level limit. Use the following procedure sub-sections to reset the travel limits:

First Level Limit

Checklist

Check for the following conditions before resetting the travel limits:

- ❑ The load frame **POWER** switch is **ON**.
- ❑ The crosshead is stationary.

Procedure

You can reset the limit by jogging the crosshead away from the stop or by :

(a) Loosening the limit stop on the rod.

(b) Sliding the stop away from the limit actuator.

Second Level Limit

The **LIMITS OVERRIDE** toggle and pushbutton switches are on the frame interface panel. You operate these controls to move the crosshead when the system has exceeded a second level limit.

Equipment

You need a 5/64 in. hex key wrench.

Checklist

Check for the following conditions before you reset a second level travel limit:

- ❑ You have attempted to reset the travel limit by sliding the limit stop away from the limit actuator.
- ❑ The load frame **POWER** switch is **ON**.

Caution

Make sure you select the proper switch setting (UP or Down) to move the crosshead. Moving the crosshead in the wrong direction can damage the load cell and fixtures if a rigid specimen is installed.

Procedure

(a) Use the 5/64 in. hex key wrench to remove the two bracket retaining screws.

(b) Slide the switch bracket to the left.

(c) After you determine which direction it is necessary to move the crosshead, switch the **UP/DOWN** switch in that direction.

Note *When you press the **LIMITS OVERRIDE** button, the crosshead moves at the maximum speed of the low speed clutch. If the frame panel **SPEED** switch is set to **HIGH**, the system automatically engages the low speed clutch.*

(d) Press and hold the **LIMITS OVERRIDE** button until the second level limit resets.

(e) Switch the **UP/DOWN** switch to the center position.

(f) Slide the switch bracket to the right.

(g) Tighten the two bracket retaining screws.

Adjusting Preload Nuts

Preload nuts are below the crosshead on both leadscrews as Figure 5-6 illustrates. You must tighten these nuts prior to compression testing.

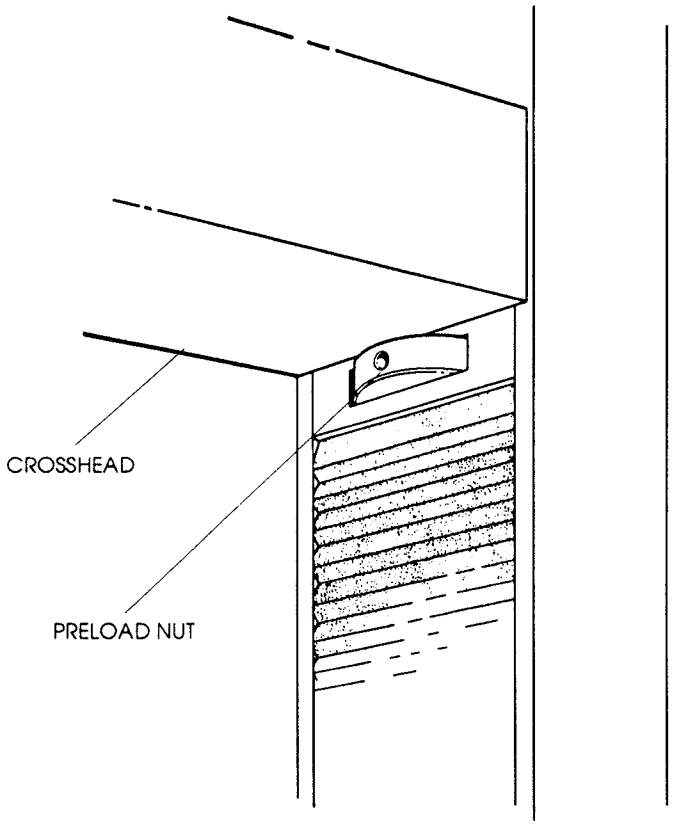

Figure 5-6. Preload Nuts

Caution

Loosen the preload nuts when you run a tension test, this prevents the preload nut from wearing.

Equipment

You need the following items:

- bar wrench.
- rigid specimen capable of withstanding a 5 kN (1000 lb.) compressive load.
- compressive fixtures capable of withstanding a 5 kN (1000 lb.) compressive load.
- load cell rated for 5 kN or greater.

Checklist

Check for the following conditions before you adjust the preload nuts:

- ❑ There is ample room for you to install the fixtures and specimen between the load cell and grip adapter.
- ❑ Travel limits are set to prevent the fixtures from colliding.
- ❑ The load frame **POWER** switch is **ON** and the computer is running the Merlin software program.
- ❑ The system identifies and calibrates the load cell.

Procedure

(a) Install the compressive fixtures to the load cell and grip adapter.

(b) Calibrate the **LOAD** channel.

(c) Install the rigid specimen.

(d) Apply a 5 kN (1000 lb.) compressive force to the specimen.

(e) Hand-tighten the preload nuts against the crosshead.

(f) Using the bar wrench, fully tighten the preload nuts.

(g) Remove the compressive load.

(h) Remove the specimen.

Chapter 6
Operation

Outline

This chapter gives instructions on basic operation of the testing system.

Starting a Test

Checklist

Check for the following conditions before you start a test:

- ❑ All relevant procedures from the Preparation for Use chapter are complete. Refer to page 5-2.
- ❑ The **LOAD** and **STRAIN** channels are calibrated. Refer to the Merlin Reference Document.
- ❑ The crosshead travel limits are set. Refer to page 5-15.
- ❑ The frame panel **SPEED** switch is set for the range your test requires. Refer to page 6-3 .
- ❑ The load cell, grips and fixtures are appropriate for your test.

Procedure

Press the **START TEST** button to begin the test. While the test is running, the **TEST IN PROGRESS** indicators display the crosshead direction.

Changing Speeds

Switching the **SPEED** switch on the frame panel changes the crosshead's speed range. Before starting a test, you should determine what speed range the test requires.

To change the crosshead speed:

(a) Use the Merlin software to disable the load frame.

(b) Switch the frame panel **SPEED** switch to the position your test requires.

Switch Position	Range
LOW	25 kN up to 500 mm/min. (5625 lb. up to 20 in./mm.)
HIGH	150 kN up to 50 mm/min. (33750 lb. up to 2 in. /min.)

(c) Use the Merlin software to enable the load frame.

The crosshead is ready to travel within the speed range you have selected.

Note *If you change the **SPEED** switch position while the system is enabled, there is no effect on the crosshead speed. The crosshead always travels within the speed range that it was in when you enabled the load frame.*

Stopping A Test

Depending on the conditions during a test, you can stop the test by using either load frame controls or software settings.

STOP Button

Pressing the control panel **STOP** button, stops the crosshead at its current position. This is the normal method of stopping a test.

EMERGENCY STOP Button

Pressing the load frame Emergency Stop button stops the crosshead at its current position. Use this control whenever a condition develops during a test that jeopardizes the safety of the operator, or could result in damage to the specimen or test fixtures. You turn the button counter-clockwise to reset the system.

LIMITS

When the crosshead makes contact with either the upper or lower limit stops, the crosshead stops. By setting the limits, you can prevent grips and fixtures from colliding.

Software Controls

The system stops a test when it encounters a limit or event that you set to ***Stop*** action in the software. Similarly, the system returns the crosshead to gauge length when it encounters a limit or event that you set to ***Return*** action in the software. The software ***Stop*** and ***Return*** actions are the same as for the **STOP** and **RETURN** buttons on the control panel.

Shutting Off the System

Power Switch

When you turn the **POWER** switch to **OFF**, all power to the load frame is shut off. Peripherals, such as the computer, recorders, and printers, must be shut off by their power switches.

You can switch the power off anytime, but you should wait until the computer completes all test, data calculation and printing tasks.

Note *Shut the system power off before you:*

- *perform any maintenance procedure on the load frame.*
- *disconnect the main power cable.*
- *move the load frame.*
- *connect or install accessories.*

Stand-by Mode

When the system is in the **STAND-BY** mode, power is shut off to all of the load frame except for the load cell and its conditioner card. By leaving the system in this mode, you eliminate having to wait for the load cell to warm up when you restart the system.

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Chapter 7
Maintenance

Outline

This chapter contains routine maintenance procedures and specific information for component replacement.

Checklist

The following list details routine maintenance checks you should perform at least once a week.

- ❑ Clean the load frame according to the Cleaning procedure on page 7-9.
- ❑ Check all cables for wear and chafing. Replace any damaged cables.
- ❑ Check that all cable connections are tight and secure.
- ❑ Check all grips, fixtures, and accessories for damage or deformation from over loading. Replace any damaged items.
- ❑ Check that the load frame is level. If it is not, level according to the Leveling procedure.
- ❑ Check that signal and power cables have adequate slack so as not to put excessive strain on connectors.
- ❑ Check that the self-test indicators on the frame control unit complete the test sequence each time you turn the system on.

Factory Support and Diagnostics

The test systems which Instron sells in the United States and Canada have a 9600 baud modem and remote control communications software installed. During the system warranty period, Instron Service uses this setup to ensure that your test system is operating properly and should a problem arise, diagnose the cause and provide the a remedy.

After the warranty period expires, you have the option to purchase a service contract which includes the modem and communications software. if you do not purchase the service contract, the modem and software .

Setting Up the Modem

The modem setup uses commercial telephone lines to make remote connections between your testing system and a diagnostic computer system at the Instron Service Center. This allows service center support personnel to see exactly the same screen displays that you see on your system.

Your test site should have two phone lines, one for voice and the other for data. You can use a single phone line to pass simple display messages. There is no interaction required by the test system operator, however, a phone line for the data link is the minimum requirement.

Removing Panels

Certain maintenance procedures require you to remove the load frame sheet metal panels in order to access components and lubrication points.

Warning

Disconnect electrical power to the frame. Dangerous voltages and moving machinery are present.

Equipment

You need the following items:

- slotted screwdriver.
- metric hex key set.

Checklist

Check for the following conditions before you remove the panels:

- ❑ The load frame **POWER** switch is **OFF**.
- ❑ The load frame power cable is disconnected from the main power source.

Procedure

(a) Loosen the two slotted screws under the bottom edge of the base panel.

(b) Remove the hex head screws from the top of the panel.

(c) To remove the panel, lift it straight up.

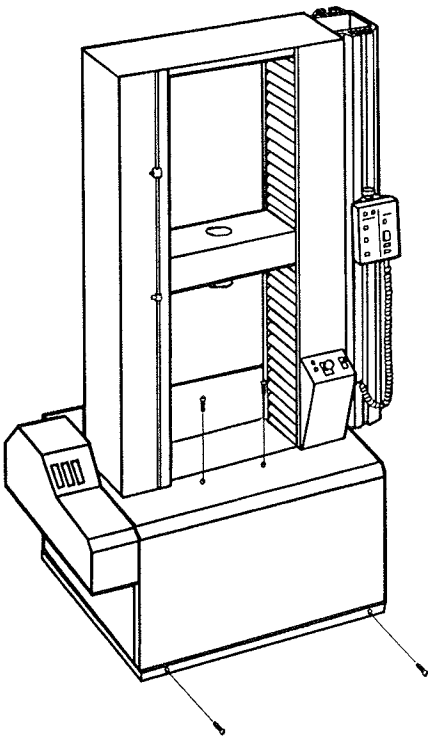

Figure 7-1. Removing The Front Panel

Lubrication

The leadscrews, lower bearing carriers and guidance rods require periodic lubrication. Figure 7-2 illustrates the load frame lubrication points.

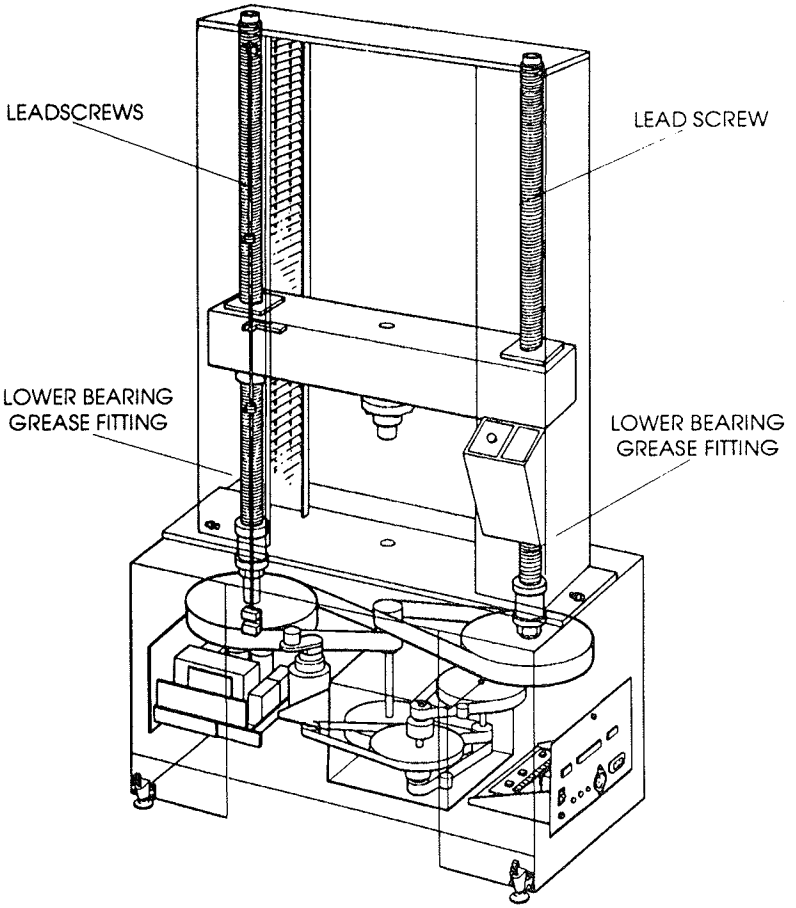

Figure 7-2. Lubrication Points

Equipment

You need the following items:

- SAE 30 Non-detergent oil (leadscrews).
- Lubriko M-6 (bearing carriers).
- Lubriplate 630A (guidance rods).
- grease dispenser.
- hex key.
- brush.

Checklist

Check for the following conditions before you lubricate the load frame:

- ❑ The load frame **POWER** switch is **OFF.**
- ❑ The load frame power cable is disconnected from the main power source.
- ❑ The front base panel is off.

Procedures

The following procedure subsections detail the steps for lubricating the leadscrews and lower bearing carriers:

Leadscrews

Under normal test conditions, you should lubricate the leadscrews semi-annually. When you regularly use the system for high-load cycle testing, inspect the leadscrews and lubricate them more often.

(a) Using the hex key, remove the screws from the top of the retaining plate of each cover.

(b) Lower the leadscrew covers.

(c) Brush SAE 30 oil over the entire length of each leadscrew.

(d) Replace the leadscrew covers.

Lower Bearing Carriers

You should lubricate the lower bearing carriers at least four times per year.

(a) Using a grease dispenser of Lubriko 6, connect the dispenser nozzle to the lower bearing carrier fitting.

(b) Apply two pumps to each fitting.

(c) Wipe off any excess grease.

Cleaning

You should clean the load frame weekly, or more often if the machine is operating in a dusty or dirty environment.

Painted Surfaces

Use a soft cloth dampened with a mild detergent to wipe all painted surfaces.

Caution

Do not use solvents on painted areas or the leadscrew covers. Solvents damage the finish.

Metallic Surfaces

To prevent corrosion from developing on metallic surfaces, wipe them with a soft cloth dampened with a light oil.

Caution

Do not use too much oil, it attracts abrasive particles which could accelerate wear.

Replacing Fuses

Warning

Shut off the main power and remove the power cable before you replace a fuse.

Caution

Replace a fuse with the same type and size as the original. Installing the wrong fuse could damage the load frame electrical circuits.

Table 7-1. Fuses

Fuse	Purpose	Ampere Rating
F1	Power line to frame control unit.	3
F2	Main power fuse.	12 @100/120V 6 @ 220/240V

Replacing the Frame Interface Board

Note *Contact Instron Customer Service before you replace the frame interface board.*

Equipment

You need the following items:

- hex key, 6 mm.
- small flathead screwdriver.
- replacement frame interface circuit board.

Checklist

Check for the following conditions before you replace the frame interface board:

- ❑ The load frame **POWER** switch is **OFF.**
- ❑ The load frame power cable is disconnected from the power source.
- ❑ There are no external cables connecting to the frame interface panel.

Warning

Switch the POWER switch OFF and disconnect the main power cable before you open the frame interface panel. Dangerous voltages are present behind the frame interface panel.

Procedure

(a) Use a hex key to loosen the four cap screws on the frame interface panel.

(b) Tilt the panel down.

(c) Remove all internal cables connecting to the frame interface circuit board.

(d) Use a hex key to remove the four cap screws holding the board to the panel.

(e) Align the screw holes of the replacement circuit board to the panel standoffs.

(f) Fasten the board to the panel by using the hex key to install the four cap screws.

(g) Install the internal cables to the circuit board.

(h) Tilt the panel up.

(i) Use the hex key to tighten the four cap screws on the frame interface panel.

(j) Reconnect all the cables to the frame interface panel before you start the system.

Replacing the Crosshead Motor

Note *Contact Instron Customer Service before you replace the crosshead motor.*

Warning

Shut off the main power and remove the power cable before you remove any load frame panels.

Equipment

You need the following items:

- tags (for marking cables).
- 1/4 in. open end wrench.
- Loctite No. 242.

Checklist

Check for the following conditions before you replace the crosshead motor:

- ❑ The load frame **POWER** switch is **OFF**.
- ❑ The main power cable is disconnected from the power source.
- ❑ The rear base panel is off.

Procedure

To replace the crosshead motor, refer to Figure 7-3 and the following set of instructions.

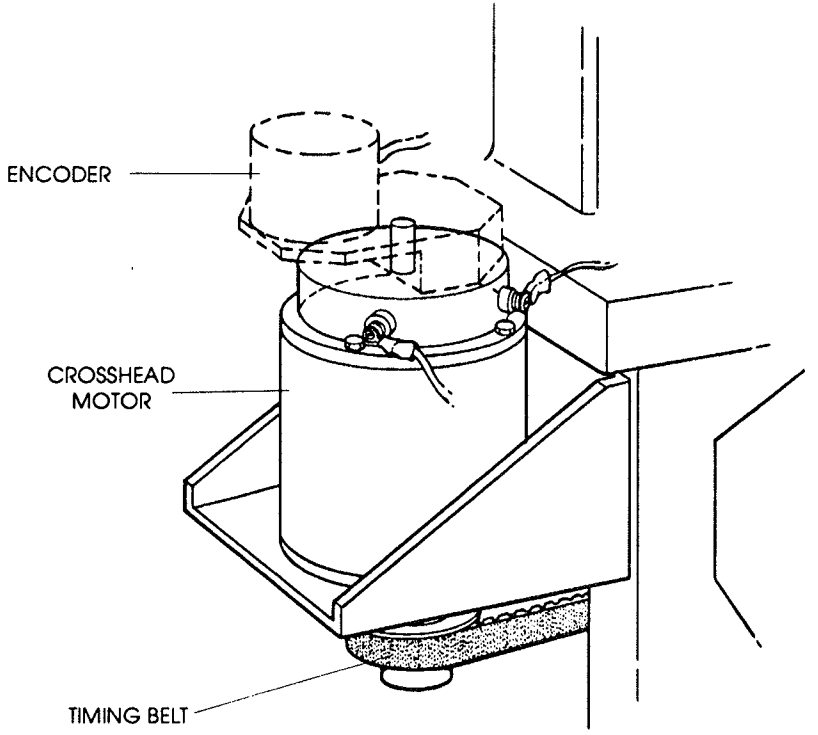

Figure 7-3. Crosshead Motor

(a) Remove the two screws securing the encoder mounting plate to the top of the motor housing and remove the encoder.

(b) Tag and disconnect the two wires from the motor.

(c) Note the position of the timing belt pulley on the motor shaft for reassembly. Loosen the motor shaft set screw or hub clamp. and remove the pulley from the motor shaft.

(d) Use the 1/4 in. open end wrench to loosen the four hex head screws securing the motor to the bracket and slide the motor towards the belt box to provide slack in the belt.

(e) Slide the belt off the sprocket on the motor shaft. Loosen the set screws on the sprocket and slide the sprocket off the shaft. Note that the shaft key was used.

(f) Remove the four screws holding the motor to the bracket and remove the motor.

(g) Install a new motor using the four screws in step (d). Do not tighten the screws.

(h) Slide the sprocket onto the motor shaft with the key in place.

(i) Before you tighten the sprocket screws, align the bottom surface of the sprocket with the bottom surface of the drive sprocket on the clutch shaft in the belt box. You can check the alignment by placing a straight edge across the two surfaces.

(j) Tighten the set screw on the motor sprocket and apply Loctite No. 242 to the screws.

(k) Install the timing belt onto the motor sprocket. Adjust the belt tension by sliding the motor back until the belt just flexes at its mid point.

(l) Tighten the motor mounting screws.

(m) Connect the two wires to the proper terminal on the motor.

(n) Install the two motor cover screws.

Replacing the Power Amplifier

Note *Contact Instron Customer Service before you replace the power amplifier.*

Equipment

You need the following items:

- metric hex key set.
- marking tags.

Checklist

Check for the following conditions before you replace the power amplifier:

- ❑ The load frame **POWER** switch is **OFF**.
- ❑ The power cable is disconnected from the power source.

Procedure

(a) Loosen the hex head screw at the top of the power amplifier drawer panel.

(b) Pull the unit forward on the slides.

(c) Tag the wire on the left side of Terminal Block TB2 with its corresponding connection marking.

(d) Disconnect the wire.

(e) Tag and the disconnect the wires to relay K1 and earth ground wire to the chassis below K1.

(f) Tag and disconnect the earth ground wire to the mounting screw on the left end of the Terminal Block TB1.

(g) Remove the four screws and nuts securing the power amplifier mounting plate to the drawer chassis and lift the assembly out of the drawer.

(h) Install a new amplifier assembly by reversing the above procedure.

(i) Close and secure the power amplifier drawer before turning on the system.

Replacing the Encoder

Note *Contact Instron Customer Service before you replace the encoder.*

Equipment

You need the following items:

- diagonal cutting shears.
- replacement encoder.
- nylon ties.
- U.S. customary hex key kit.

Checklist

Check for the following conditions before you replace the encoder:

- ❑ The load frame **POWER** switch is **OFF**.
- ❑ The power cable is disconnected.
- ❑ The rear base panel is off.
- ❑ The frame interface panel is open.

Procedure

(a) Disconnect the encoder cable from connector x103 on the frame interface board.

(b) Using the diagonal cutting shears, cut the nylon ties securing the cable to the wiring harness.

(c) Loosen the three panhead screws on the encoder.

(d) Slide the encoder to slacken the drive belt tension.

(e) Remove the two screws holding the mounting plate to the top of the motor housing.

(f) Mark the position of the pulley on the encoder shaft, then remove the pulley from the shaft.

(g) Remove the encoder assembly from the mounting plate.

(h) Install the replacement encoder on the mounting plate and install the pulley onto its shaft in the same position as the old encoder shaft.

(i) Use the two panhead screws to mount the assembly on the motor shaft.

(j) Install the timing belt on the two pulleys.

(k) Pull the mounting plate to tension the belt until it flexes about 3 mm (1/8 in.) at the center point.

(l) Tighten the two screws.

(m) Using nylon ties, secure the encoder cable to the wiring harness as the old cable.

(n) Connect the encoder cable to the circuit board.

(o) Install the front panel and close the frame interface panel.

Replacing the Drive Relay

Note *Contact Instron Customer Service before you replace the drive relay.*

Warning

Switch the load frame power off and disconnect the power cable before you open the power amplifier drawer. Dangerous voltages are present within the drawer.

Equipment

You need the following items:

- hex key, 3/16 in.
- tags (for marking cables).

Checklist

Check for the following conditions before you replace the drive relay:

- ❑ The load frame **POWER** switch is **OFF.**
- ❑ The load frame power cable is disconnected.

Procedure

(a) Using a 3/16 in. hex key, loosen the panhead screw at the top of the power amplifier drawer.

(b) Open the power amplifier drawer.

(c) Tag each wire

(d) Using a screwdriver, remove the two screws securing the relay to the drawer.

(e) Remove the relay.

(f) Install a new relay.

(g) Using a screwdriver, install the two screws to secure the relay to the drawer.

(h) Reconnect the wires according to the tag markings.

(i) Close the drawer.

(j) Using a 3/16 in. hex key, tighten the panhead screw at the top of the power amplifier drawer.

Replacing Frame Control Cards

Note *Contact Instron Customer Service before you replace a frame control card.*

Use the following procedure if a frame control unit card fails or to add an optional **STRAIN** or analog output card to the system.

Equipment

You need the following items:

- hex key wrench, 4 mm.
- electro-static discharge wrist strap and grounding cable.

Checklist

Check for the following conditions before you replace or add a conditioning card:

- ❑ The load frame **POWER** switch is **OFF.**
- ❑ The load frame main power cable is disconnected from the power source.

Procedure

(a) Disconnect the all external cables to the frame control unit.

(b) Use the 4 mm hex key to remove the four screws at the front and rear edge of the frame control unit cover. Refer to Figure 7-4.

(c) Tilt the frame control unit cover toward the front of the load frame. Disengage the front lip on the frame control unit cover, and lift off the cover.

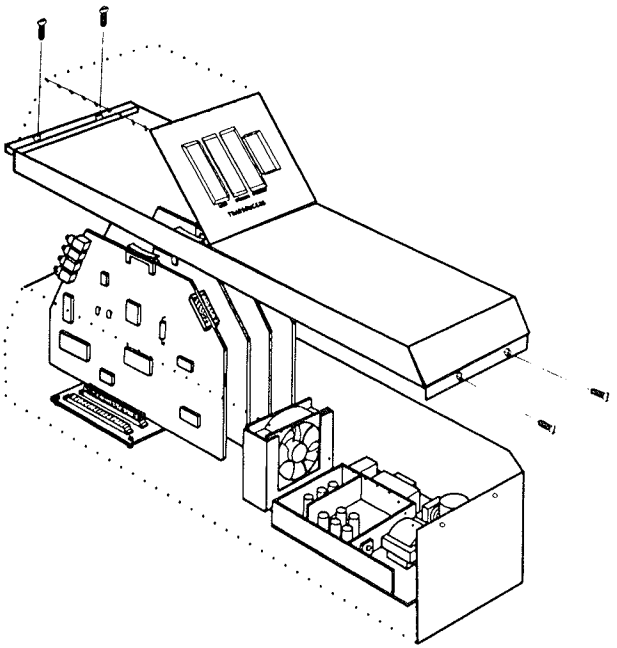

Figure 7-4. Removing the Frame Control Unit Cover

CAUTION

Always wear a grounded wrist strap when you handle a card. You must take this precaution to prevent electro-static discharges from damaging a card component.

(d) To remove a card, loosen the two screws securing the shield to the card cage. Grasp the plastic handle on the top of the card and pull straight upward. It may be necessary to rock the card back and forth slightly to release the card from its edge connector.

(e) To insert a card, align the card in the cage so that the card edges align with the edge guides in the frame control unit. Push the card down into place, making sure the card edge connector engages the cage connector. Tighten the two shield screws.

Note *If you are replacing the Digital Signal Processing board, make sure that you connect the 50 pin ribbon cable to the connector on the top of the replacement card.*

(f) Replace the frame control unit cover. Secure the cover with the four screws in step (b).

(g) Replace all cables in their original connectors.

Load Cells

Stability

The two primary factors controlling the load cell signal stability are temperature and creep. Either factor will cause a shift in the zero balance point.

Temperature

Changes in the temperature of the load cell mechanical strain gauge elements and the bridge circuit resistors will cause a zero point balance shift. If you test requires maximum zero balance point stability for a long period, select a cell with a capacity rating as close to the maximum test loads as possible. The temperature balance shift becomes proportionately less as the test loads approach the full capacity of the cell.

Creep

Cell creep occurs as a gradual and small shift in the zero balance point after you quickly apply or remove a high load. For most cells the creep coefficient is less than 0.05% of full rated output, although for a 500 gram load cell this may be as high as 0.5% because of its more sensitive design.

Electrical Calibration

Calibrating a load cell electrically eliminates handling and applying precision dead weights to the cell for calibration purposes. This method is as accurate and stable as the dead weight method, but does not check the cell mechanics. Two other factors influence the operation of these cells, modulus compensating resistors and electrical calibration resistors. Modulus compensation prevents temperature induced modulus changes from affecting the calibration or sensitivity of the cell. While the effect is small, the sensitivity of an electrically calibrated load cell must be the same as the calibration signal; this agreement must exist under environmental conditions which may be different from those which existed in the laboratory at the time of calibration.

Troubleshooting Load Cells

A quick way to determine if you damaged a load cell during a test is to measure the resistance of the strain gauge circuits within the cell.

Equipment

You need an ohm meter to check the load cell circuits.

Checklist

Make sure the load frame **POWER** switch is **OFF** before you troubleshoot a load cell.

Procedure

(a) Disconnect the load cell cable from the frame control unit **LOAD** connector

(b) Measure the load cell connector pins according to Table 7-2.

Table 7-2. Load Cell Resistance Values

LOAD CELL	CONNECTOR PINS	RESISTANCE OHMS
2518 Series	3 to 9	350
2512 Series	1 to 5	140
	3 to 9	0

(c) If the resistance does not match the values in table remove the load cell and contact your regional Instron Sales and Service representative to make arrangements to repair or replace the cell.

Troubleshooting

Improper adjustments or the lack of maintenance is the cause of most load frame operating problems. To help you when a problem develops, Table 7-3 suggest a probable cause and recommends a solution.

Note *If you are unable to solve a problem, write down the load frame model and serial number and have a telephone at the test site before you contact Instron Service.*

Table 7-3. Troubleshooting

Problem	Cause	Remedy
Load frame power indicator does not illuminate when POWER switch is ON.	Open electrical circuit between load frame and power source.	Check power source circuit breakers and power cable connections.
	Fuse F2 is open.	Replace F2. Refer to page 7-10.
		Check that J5 voltage setting matches facility source voltage. Refer to page 3-14 .

Table 7-3. Troubleshooting

Problem	Cause	Remedy
Frame control unit display does not illuminate.	Open circuit between frame control unit and load frame.	Check cable connections between frame interface board and frame control unit.
	Fuse F3 is open.	Replace F3. Refer to page 7-10.
	Faulty frame control unit component.	Contact Instron Service.
Compression load curve is non-linear near zero load	Preload nuts are not tight.	Refer to page 5-20.
Load frame vibrates or fails to produce maximum rated force.	Main drive belt or motor pulley belts are loose.	Contact Instron Service.
Crosshead moves erratically.	Faulty encoder.	Refer to page 7-19.
	Loose belt or gear.	Contact Instron Service.
Crosshead will not move.	Faulty power amplifier.	Refer to page 7-17.
	Faulty drive relay.	Refer to page 7-21.
	Faulty crosshead motor.	Refer to page 7-13.
Load cell will not balance or calibrate.	Open circuit between load cell and frame control unit.	Check LOAD connection on frame control unit.
	Large offset due to creep or temperature.	Refer to page 7-26

Chapter 8
Replacement Parts

Outline

This chapter contains load frame and sub assembly illustrations and parts listings. You can use this information to order replacement parts and for general reference.

Finding a Part

To identify a part from an illustration:

(a) Locate the part on the illustration and follow the callout line from the part to the item number.

(b) Refer to the Item No. column in the appropriate parts list.

(c) Refer to the description heading for a brief description of the item. If two or more parts comprise the item, parts listing will follow.

The description column includes the common name of an item. The description may also list the manufacturer's part number when appropriate.

(d) Refer to Part No. column for the Instron part number.

(e) Refer to the Qty. column for the number of parts required per frame.

Quantities for similar parts on the system are in separate listings.

Note *When you order parts from Instron, specify the part number the description and quantity for each item. Also, note the frame model and serial number.*

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External Components

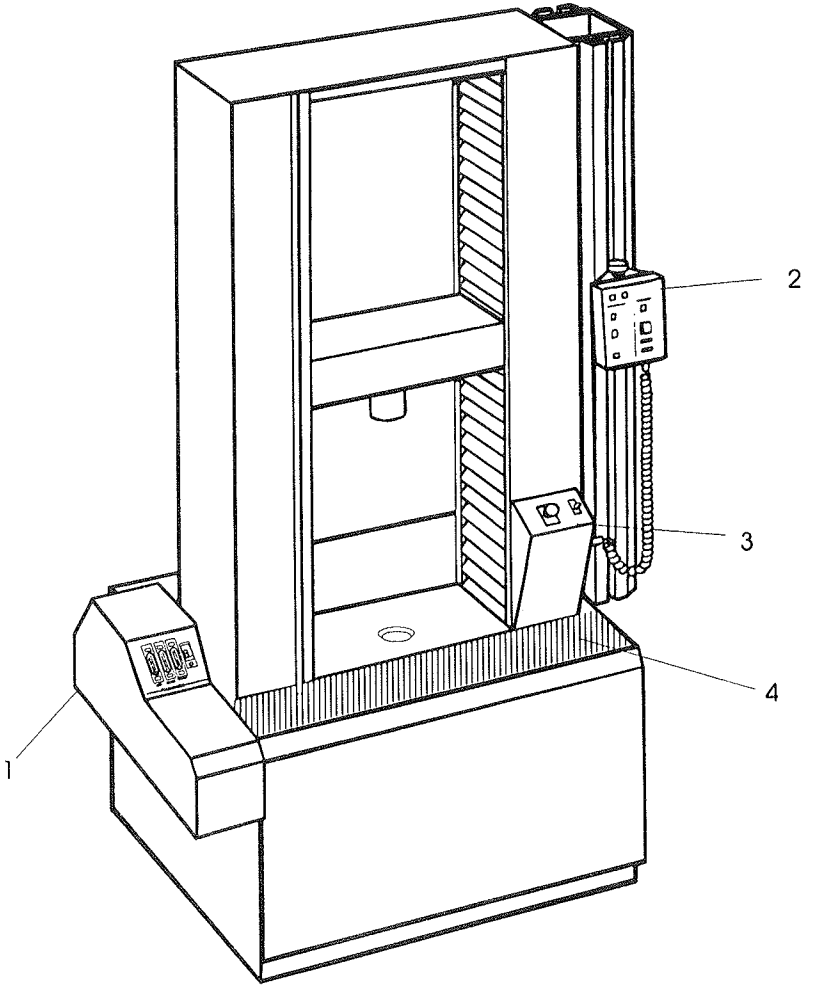

Figure 8-1. Load Frame

Item	Description	Part No.	Qty.
1	Frame Control Unit	A563-127	1
	Transducer Conditioner	A565-1	1
	Analog/Digital I/O	A565-9	1
	Digital I/O	A565-11	1
2	Frame Panel	A563-75	1
3	Control Panel	A563-16	1
4	Protective Mat	T464-128	1

Internal Components

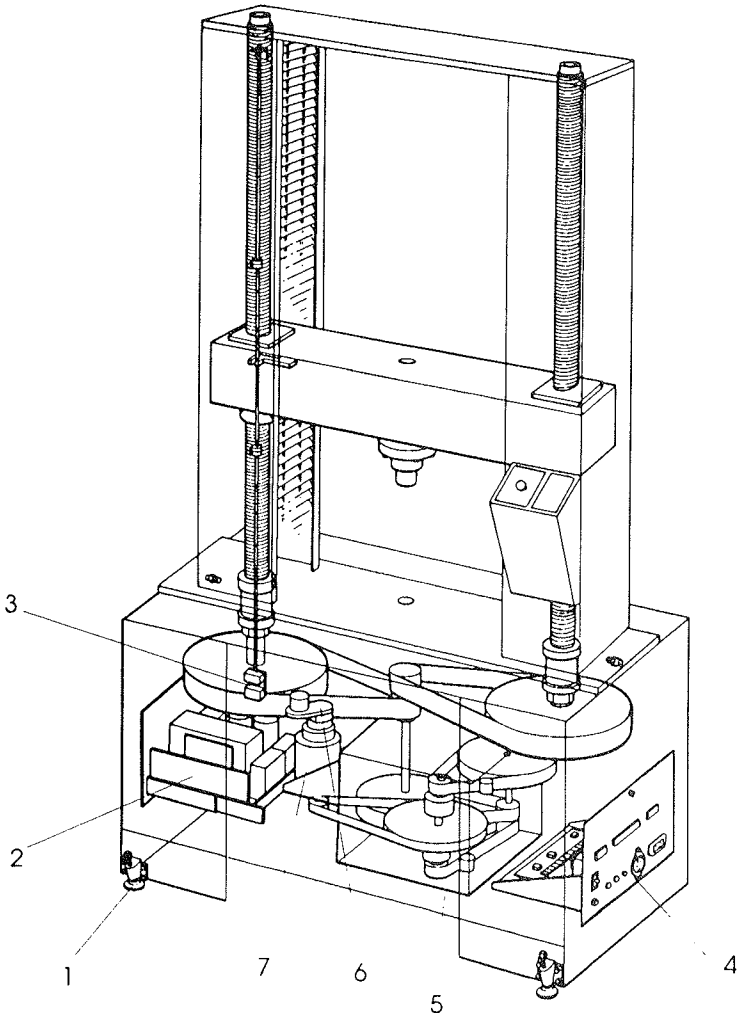

Figure 8-2 Internal Components

Item	Description	Part No.	Qty.
1	Leveling Foot	A464-29	4
2	Power Amplifier Drawer	A460-53	1
	Power Amplifier	A460-79	1
	Drive Relay	61-3-9	1
3	Limit Switch Assembly	A29-76	1
4	Frame Interface Panel	A563-72	1
	Circuit Board	A563-65	1
5	Belt Box	A464-5	1
6	Encoder Assembly	A530-29	1
7	Drive Motor	SC48-1-17	1

Ancillary Components

Description	Part No.	Qty.
Interface Cable	A570-5	1
Main Power Cable	A504-89	1
Controller Power Cable	A504-88	1
Computer Interface Cable	82-10-63	1
Load Cell Adapter Cables		
Male 25 to 15 female	A565-5	1
Female 25 to 15 male	A565-6	1
Hex Key Set (metric)	80-1-215	1
Hex Keys (US Customary)		
5/16	206A14	1
3/16	80-1-15	1
Steel Rod	T530-32	1
Alignment Rod	T464-146	1
Locknut M48 x 2 LH	T489-8	2
Fuses		
6 Ampere	27-2-52	1
8 Ampere	27-2-53	1
12 Ampere	27-2-50	2
15 Ampere Slow-blow	27-2-101	1

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