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FURNITURE FLAMMABILITY FIXTURE

OPERATION MANUAL

Version 1.1

Table of Contents

1.	Introduction	1
2.	Organization of This Manual	2
3.	Description of the Furniture Flammability Fixture	2
4.	Setup for Tests	3
4.1	Main Assemblies Setup	3
4.2	Checking Operations	3
4.3	Overview of Test Procedures	3
5.	Equipment Setup	4
6.	Test Procedures	5
6.1	Operations Check	6
6.2	Dust Cover Test Procedure	8
6.3	Seating Area Test Procedure	10
7.	Burner Position Adjustments	12
7.1	Adjusting the Approach (x)	12
7.2	Adjusting the Lateral Position (y)	14
7.3	Adjusting the Elevation (z)	15
8.	Specific Equipment Instructions	17
8.1	Mounting Burner Tubes	17
8.2	Mounting Mockups	18
8.3	Burner Offset Gauge	19
8.4	Burner Flame Gauge	19
8.5	Shield Device	20
9.	Definitions and Descriptions	21
10.	Tools and Equipment Required	26
Table 1:	Control Box Settings	27
Table 2:	Burner Position Adjustment Methods	28

Images 1 through 9

1. Introduction

This manual describes the operation of the Furniture Flammability Test Fixture (FFF). The FFF was developed at the Engineering Laboratory of U.S. Consumer Product Safety Commission (CPSC) to support the Upholstered Furniture Flammability project. This test fixture was designed to deliver a test flame to selected mockups in an automated and repeatable manner. The mockups are representations of elements in upholstered furniture: (1) the seating area and (2) the dust cover location.

The design of the FFF accommodates the various flame movements and orientations required for tests on mockups of dust cover, and seating area materials. The modular design of the FFF allows flexibility in test setups and equipment configurations. For example, the seating area mockup test can be performed without any of the required hardware for the dust cover test. With the exception of the seating area mockup frame, the FFF was designed and constructed at the Engineering Laboratory. The seating area mockup frame is similar to that described in British standard BS 5852¹ and is described in the CPSC staff's draft standard (draft standard).²

This manual describes procedures for the three bench-scale mockup tests along with general information and important safety notices. Read through the entire description of each test, especially the safety and equipment requirements, prior to testing. For a description of the complete test procedure, including conditioning and preparation of samples, refer to the Test Plan.

¹BS 5852, Fire Tests for Furniture, Part 1: Methods of Test for the Ignitability by Smokers' Materials of Upholstered Composites for Seating, 1979.

²Draft Standard for Small Open Flame Ignition Resistance of Upholstered Furniture, Consumer Product Safety Commission.

2. Organization of This Manual

This manual is divided into sections containing general and specific information. The paragraphs below are intended to give an overview of the equipment and operation of the FFF. These paragraphs are supplemented by expanded detail and term definitions in separate sections of this manual. References to other sections are by name, in *italics*. Important components are capitalized and are defined or described in *Definitions and Descriptions*. Specifics on performing tests are in *Test Procedures*.

3. Description of the Furniture Flammability Fixture

The FFF consists of three main assemblies. These are the Control Box, the Actuator Assembly, and the Mockup Assembly. [The assemblies control and direct a Burner Tube and support mockups to which the burner is directed.] Frames to hold the mockups, Burner Tubes, and accessories are included with the FFF.

Figure 1 shows overall configurations for large and small hoods. Images 1 through 4 show the two test configurations. The two tests cover the mockups described in the CPSC staff's draft standard: the Dust Cover Mockup and the Seating Area Mockup.

Images 1 and 2 show the FFF setup for dust cover tests. In Image 1, the Burner Tube is beneath the mockup. Fine adjustments to burner position can be made. The Actuator assembly is controlled by an automatically timed sequence from the Control Box. The timing is adjustable and allows the flame application time to be varied for each test, if required. Lastly, a shield is incorporated into the Mockup Assembly to prevent exposure to the burner flame prior to the start of tests.

Image 3 shows the FFF setup for the Seating Area test. The Seating Area Mockup is a bench-scale representation of the seat and back (or side) of a chair. In the image, the Burner Tube is aligned along the Crevice formed between the seat and back of the mockup. There are position and time adjustments available. No shielding is used for the seating area test since mockup pre-heating is minimal in this orientation.

10. Tools and Equipment Required.

Each test laboratory will need the following tools and equipment to prepare for testing with the FFF:

Setup/operation:

- ❑ 120 V AC power.
- ❑ A table or other flat surface near suitable exhaust (defined in draft standard)

Testing:

- ❑ Refer to the CPSC staff's draft standard for additional equipment that is necessary to perform the tests but is not included with the FFF.



5. Equipment Setup

1. Prepare a work area to support the Actuator Assembly, the Mockup Assembly, and the Control Box.
2. Place the Mockup Assembly under a fume hood or within an area with suitable exhaust, as described in the draft standard.
3. Arrange the Actuator Assembly, the Mockup Assembly, and the Control Box as depicted in Image 1 (Dust Cover Test) or Image 3 (Seating Area Test).
4. Set the Control Box settings to those in Table 1 for equipment setup. *Ensure that the Control Box power switch is in the "Off" position prior to connection to a 120 V AC source or to the control cables.*
5. Connect the Control Box, the Actuator Assembly, and the Mockup Assembly using the power and control cords provided.
6. Slide the Boom into the Boom Holder and attach the Burner Holder and Burner Tube in the dust cover or seating area orientation (*Mounting Burner Tubes*) and as shown in Images 4 and 5.

6. Test Procedures

Tests generally require specific conditions to maintain certain properties of the material under study. For example, the ignitability of test materials may be sensitive to environmental conditions. All test materials are therefore conditioned to standard temperature and humidity. Mockups must be tested promptly because the test and conditioning environments normally differ (see draft standard). As a result, preparation procedures for the mockups and for the FFF should be coordinated and practiced by test personnel.

A general summary of procedures follows. The automatic test sequences are set by the front panel controls on the Control Box. Refer to Table 1 for the Control Box Settings for each test.

- Condition the specimens and prepare the mockups. Setup the gas supply and establish a steady flow and flame (draft standard).
- Setup the FFF for either the seating area or the dust cover configuration and select a test sequence (draft standard).
- Place the conditioned mockup on the FFF and adjust the burner position to the relevant area of the mockup. (draft standard).
- Run the test.
- Extinguish the mockup and record observations and measurements (draft standard).



6.1 Operations Check

The following procedure will test the FFF for proper operation. This procedure will also familiarize test personnel with operations and terminology.

Important: *Ensure that the Control Box power switch is in the "Off" position prior to connection to a 120 V AC source.*

1. Test the Actuator Assembly in manual mode: Set the Control Box settings to those in Table 1 for manual setup. *Ensure that nothing obstructs the Boom* and keep hands clear of the Actuator Assembly. Rock the Manual Control Switch to "Flame Out" and hold.

Important: *Release the Manual Control Switch immediately if the Boom contacts anything.*

The Actuator drive will advance to an extreme outward position and stop. Rock the Manual Control Switch to "Flame In" and hold. The Actuator will advance back to the inward position.

2. Test the Actuator Assembly in automatic mode: Set the Control Box settings to those in Table 1 for the seating area test except set the timer to "A020S" (20 s). *Ensure that nothing obstructs the Boom* and keep hands clear of the Actuator Assembly. Press the Start button. The Actuator will advance, stop, pause 20 seconds, and then retract to the initial position. Time the pause period with a stop watch. If the time measured is in the range 19.5 to 20.5 seconds, proceed to the next step.

3. Test the Mockup Assembly in automatic mode: Set the Control Box setting to "A020S" (Table 1) for the dust cover test. Ensure that nothing obstructs the Boom or the Shield Device.

Safety - Keep hands clear of the Mockup Assembly. This assembly has exposed moving parts that respond to timed control sequences.

Press the Start button. The following sequence will develop:

1. The Actuator will advance and stop.
2. After a 3-second delay, the Shield Device on the Mockup Assembly will retract.
3. Following a 20-second delay, the Actuator will retract and the Shield Device will extend to their initial positions.

Time this sequence with the stopwatch and confirm the approximate timing of events. Each event should be timed to ± 0.5 s.

6.2 Dust Cover Test Procedure

Equipment: 6-in (254 mm) tube.
Dust Cover Mockup (draft standard).
Burner Offset Gauge
Dust Cover Configuration (Images 1 and 2)

1. With the Actuator body in the horizontal position, set up the assemblies as shown in Images 1 and 2.
2. Connect a gas supply hose to the 6-in (152 mm) Burner Tube. Adjust the gas flow. Light the flame and allow it to stabilize. Observe the flame height and adjust the gas flow (draft standard).
3. Mount the tube perpendicular to the Boom (Image 4 and *Mounting Burner Tubes*). Slide the Boom through the Boom Holder to the maximum extension (*Burner Position Adjustments*).
4. Set the Control Box settings to those in Table 1 for manual setup. Apply the Shield Lock (*Shield Device*).
5. Place the Dust Cover Mockup on the Dust Cover Mockup Support (*Mounting Mockups*).

Important: The Burner Offset Gauge must not be attached while the tube is in motion.

Caution: The Burner Tube will be hot.

6. Extinguish the flame but maintain gas flow. Push the manual toggle to "Flame Out" until the Burner Tube is fully extended.

7. Attach the *Burner Offset Gauge* to the tube end. Make adjustments to the Burner Tube (*Burner Position Adjustments* and Table 2) to align the Burner Offset Gauge with the position specified in the draft standard.
8. Remove the Burner Offset Gauge. Push the manual toggle to "Flame In" until the Burner Tube is fully retracted.
9. Set the Control Box settings to those in Table 1 for the dust cover test. Disengage the Shield Lock.
10. Relight the flame and allow it to stabilize. Check that the flame is the correct height. (draft standard).
11. Push the "Reset" button.
12. To start the test, push the "Start" button.
13. Record observations and extinguish mockup (draft standard).
14. For a continued sequence of tests, a gas flame may be maintained at the Burner Tube. Check that the flame is the correct height before each test (draft standard). When testing is complete or prior to a break in testing, shut off the gas supply. Reestablish the gas supply as described in the draft standard.
15. Post test: Inspect the length of the Burner Tube and remove adhering debris from the slots and, especially, the inside surfaces near the end. Use a brass rod to clean the inside surface. Also remove any accumulations of waste on the Shield Device and on the Drip Pan.



6.3 Seating Area Test Procedure

Equipment: (1) 10 in (254 mm) tube.
Seating Area Mockup (draft standard).
Seating Area Configuration (Image 3)

1. Raise the Actuator body and slide the Kickstand underneath to support the Actuator at the set angle (approximately 45 degrees). Set up the assemblies as shown in Image 3.
2. Connect a gas supply hose to the 10-in (152 mm) Burner Tube. Adjust the gas flow to the burner.
3. Mount the tube parallel to the Boom (Image 5 and *Mounting Burner Tubes*). Slide the Boom through the Boom Holder to the minimum extension (*Burner Position Adjustments*). Light the flame and allow it to stabilize in this horizontal position. Observe the flame height and adjust the gas flow to the burner (draft standard).
4. Set the Control Box settings for flame application time to those in Table 1 for manual setup.
5. Place the Seating Area Mockup on the Mockup Base (*Mounting Mockups*).
6. Extinguish the flame. Push the manual toggle to "Flame Out". Avoid hitting the Seating Area Mockup by sliding it until the Burner Tube is fully extended.
7. Make adjustments to the tube (*Burner Position Adjustments* and Table 2) to comply with the position specified in the draft standard.
8. Push the manual toggle to "Flame In" until the Burner Tube is fully retracted.
9. Set the Control Box settings to those in Table 1 for seating area test.
10. Relight the flame and allow it to stabilize in the horizontal position. Check that the flame is the correct height. (draft standard).
11. Push the "Reset" button.
12. To start the test, push the "Start" button.

13. Record observations and extinguish mockup (draft standard).
14. For a continued sequence of tests, a gas flame may be maintained at the Burner Tube. Check that the flame is the correct height before each test (draft standard). When testing is complete or prior to a break in testing, shut off the gas supply. Reestablish the gas supply as described in the draft standard.
15. Post test: Inspect the length of the burner tube and remove adhering debris from the slots and, especially, the inside surfaces near the end. Use a brass rod to clean the inside surface. Also remove any accumulations of waste on the Drip Pan.

7. Burner Position Adjustments

With the FFF, the relative position of the Burner Tube can be adjusted to align the tube to the mockups for testing. For certain positioning, Burner Tube orientation can be established by alternate methods. A description of methods is given in Table 2. Note that the initial setup of the main assemblies will affect the ranges of x,y, and z adjustments. Refer to the section *Equipment Setup* for a description of adjustment methods.

The Burner Tube can be moved along the x, y or z reference frame of the Boom Platform. In addition, this reference frame rotates about the Actuator pivot for the purpose of establishing the two distinct "glide paths" of the Burner Tube to the mockups: a horizontal path for the Dust Cover Mockup; a 45 degree elevated path for the downward path to the Crevice area of the Seating Area Mockup (Images 1 and 3, respectively). These adjustments to position are described in more detail below as x,y, z coordinates and the angle,r, of the boom platform to the horizontal.

7.1 Adjusting the Approach (x).

The Approach is the path along which the Actuator moves the Burner Tube and is the method utilized to bring the flame from a remote location into contact with the mockups. There are three methods to adjust the Approach (x): rolling the Mockup Base, sliding the Dust Cover Mockup Support, and using the Approach Positioner. The last is recommended for fine adjustments.

Mockup Base Rollers and Brake.

Loosen the Brake by turning the shaft. Roll the Mockup Base into position and tighten the brake.

Dust Cover Mockup Support

Slide the support into position, keeping it perpendicular to the Dust Cover Base. This method is used for initial setup.

Approach Positioner.

The Approach Positioner (Px) adjusts the position of the Actuator drive along its shafts for the purpose of establishing burner position. Refer to Image 6. This adjuster is located between the Handle and the Actuator drive. In the dust cover mockup test, the approach adjustment will move horizontally. For the seating area mockup test, the Approach Positioner will move at a 45 degree angle into the seat/back crevice of the Seating Area Mockup. Both gross and fine adjustments are possible.

To use:

1. Loosen the Approach Lockdowns completely.

For gross adjustment:

2. Loosen the top screw on the Handle until the thumb screw of the Px can be raised out of the retaining ring.
3. Pull (or push) the Actuator drive into gross position.
4. Set the thumb screw onto the retaining ring, nesting the ring into the nearest desired thumb screw slot.
5. *Lightly* tighten the top screw - the thumb screw must still turn for fine adjustments.

For fine adjustment:

6. After adjusting the top screw until lightly tightened, turn the thumb screw to draw the Actuator drive into final position.
7. Retighten the Approach Lockdowns to secure the position.
Precaution: After adjustment, ensure that the Burner Tube is shielded by the Shield Device by at least 0.5 in (12 mm) when in the maximum Approach position.



7.2 Adjusting the Lateral Position (y).

"Lateral" corresponds to adjustments perpendicular to the Approach; for example: along the Crevice of the seating area. The Actuator angle (r) does not change the lateral position, although changing between the two setup angles ($r = 0$ and 45 degrees) will alter the position of the Burner Tube. There are three methods to adjust the lateral (y) position: sliding the Dust Cover Mockup Support, setting the Burner Tube slots, and using the Lateral Positioner. Any combination of methods can be used for positioning, although *fine* positioning is not normally required in the lateral direction.

Lateral Positioner

The Lateral Positioner (Py) adjusts the position of the Burner Tube through extension of the Boom . The Py adjusts horizontally for the mockup tests. Gross movements between the seating area and dust cover setups as well as finer setup adjustments are possible .

To adjust:

1. Loosen the thumb screw of the Boom Holder to the degree that the Boom can be slid to the desired test position. This corresponds to either maximum boom extension (dust cover test) or minimum (seating area test).
2. *Lightly* tighten, ensuring that the thumb screw is approximately centered over the flat on the boom.
3. Slide the Boom into final position.
4. Tighten the thumb screw. Precaution: After adjustment, ensure that the Burner Tube is shielded by the Shield Device by at least 0.5 in (12 mm) when in the maximum Approach position.

Dust Cover Mockup Support

Slide the support into position, keeping it perpendicular to the Dust Cover Base. This is a rough adjustment only.



7.3 Adjusting the Elevation (z).

The Elevation adjustment sets the gap between the top of the vertical Burner Tube and the materials of the Dust Cover Mockup. Elevation adjusts the horizontal Burner Tube into the seating area Crevice. There are three methods to adjust the elevation (z): adjusting the height of the Adjustment Legs, setting the Burner Tube slots, and using the Elevation Positioner. Leg adjustments are only recommended for initial setup.

Adjustment Legs.

Adjust the four legs to the desired height and level the Actuator Assembly. Generally, the legs should be set at the lowest standing height practical to ensure that the Burner Tube can be lowered into the seating area Crevice. Other means to set this height, such as blocking, can be used. Once the height is set, level the Actuator Assembly.

Burner Tube Slots.

Seat the slots of the Burner Tube into the "V" saddles of the Burner Holder. The slots allow 1 in (25 mm) incremental movements of the tube.

Elevation Positioner.

The Elevation Positioner (Pz) is located on the Boom Platform and adjusts the position of the Burner Tube. For the dust cover test, the elevation positioner will move vertically (Actuator is horizontal, $r=0$ deg). For the seating area test, the elevation positioner will move at 45 degrees to vertical, in a direction perpendicular to the Approach adjustment (Actuator is raised, $r=45$ deg). Both gross and fine adjustments are possible.

To use:

For gross adjustment:

1. Loosen the knurled thumb *nut* (as distinct from knurled thumb *screw*) two turns.
2. To gross adjust upwards - rest thumbs on the tops of the shafts and pull the Boom Holder with fingertips.
3. To adjust downwards - rest thumbs on the top of the Boom Holder and push.
4. Tighten the knurled thumb nut.

For fine adjustment:

5. Ensure that the knurled thumb *nut* is tight.
6. Turn the knurled thumb *screw* to move the Boom Holder - clockwise to lower; counter-clockwise to raise.



8. Specific Equipment Instructions

8.1 Mounting Burner Tubes

The two Burner Tubes mount on the Burner Holder. The 6-inch tube is used for the Dust Cover test; the 10-inch tube for the Seating area test. A gas supply hose, without fittings, slips over the end of the 5/16 in (8 mm) outside diameter tubes. Burner Tubes can be removed and installed while lit.

To mount a tube (Images 5 and 6):

1. Insert a gas hose about 1/2 in (12 mm) over the tube. Mount the hose on the tube end *with the slots ending closest to the hose end*.
2. Loosen the thumb nut of the Burner Holder. Slide the Burner Tube into the open side of the "hook". Align a pair of slots in the tube with the "V" saddles in the Burner Holder and release the nut. (A spring will hold the tube in place).
3. Select an orientation: horizontal for seating area tests; vertical for dust cover tests. Loosen the thumb nut of the Burner Holder about 2-1/2 turns. While holding the Boom, push in the nut and rotate the holder body to the desire position. Note: this must be done with a tube in place. Release and tighten the thumb nut .
4. To remove while lit: Loosen the thumb nut until the Burner Tube can be slid out from the side of the "hook". Installation is the reverse procedure.

8.2 Mounting Mockups

Once the mockups are prepared and assembled (see draft standard), mount the mockups onto the FFF following one of the procedures below.

1. Dust Cover Mockup (Images 2 and 9)

Mount the mockup onto the Dust Cover Mockup Support by placing it between the four thumb nuts. If the clips of the assembled mockup interfere with the thumb nuts, slide the clips just enough to clear. Using the slotted ends of the Holddowns to bear on the mockup, tighten the thumb screws.

2. Seating Area Mockup (Image 3)

Place the mockup onto the rails of the Mockup Base unit by guiding the rails into slotways and onto the tabs of the undercarriage of the mockup. The Seating Area Mockup can be slid along the rails and rest in any position.



8.3 Burner Offset Gauge

This device rests on top of the Burner Tube and is used to gage the vertical offset of the tube from the material of the Dust Cover Mockup (Image 8). The height of the gauge matches the height of the flame. To use, slip the gauge body onto the "hot" end of the tube and rotate the locking pin over the side of the tube. The gauge is then used by bringing the gauge tip into contact with the material of the mockup. Important: to remove, *carefully* unlock the gage and slide it off the tube. This must be done without forcing so that the tube position is not disturbed during setup for tests.

8.4 Burner Flame Gauge

This gauge is used as a distance reference when setting the height of the burner flame with the Burner Tube in either the vertical (dust cover test) or the horizontal (seating area test) orientation (Image 8).

To use the gauge for the dust cover test:

1. Hold the gauge horizontally.
2. Rest the tip of the lower edge of the "bird's mouth" cutout onto the rim of the vertical Burner Tube. This tip is marked "V". Do not allow any portion of the gauge to project into the flame.
3. Hold the gauge in this position briefly as the flame height is compared to the reference mark "X" (top of gauge).
4. Observe the flame height and adjust the gas flow (draft standard).

To use the gauge for the seating area test:

1. Hold the gauge horizontally and perpendicular to the Burner Tube.
2. Rest the U-notch of the lower edge of the gauge onto the horizontal Burner Tube. This notch is marked "H".
3. Rest the gauge approximately 12 mm (0.5 in) from the end of the tube.
4. Hold the gauge in this position briefly as the flame height is compared to the reference mark "X" (top of gauge).
5. Observe the flame height and adjust the gas flow (draft standard).

8.5 Shield Device

This mechanized device (Image 2) is a subassembly of the Dust Cover Base and is controlled through the Control Box. The Shield Device operates automatically during the dust cover test - test personnel should be careful to avoid contact with the shield during operation. A manual lock on the shield is included to make setups more convenient. This lock also electrically isolates the shield to prevent operation while locked. To use the lock:

1. Push and hold the mechanism to the extreme retracted position.
2. Depress and hold the Shield Lock.
3. Release the Shield Lock and then the mechanism, in that order. The mechanism will catch on the Shield Lock.
4. To free the Shield Device, momentarily push the mechanism - this releases the Lock and allows the mechanism to resume the normal position.



9. Definitions and Descriptions

The following is a list of components and their functions. The image in which the component appears and the main assembly to which it belongs are in parentheses. Items in capitals are described in this section.

Actuator Assembly (Image 1). This main assembly uses an electric linear drive to move a burner tube into position. The Actuator Assembly comprises: a base, an actuator mounting, and a burner tube support. The main subcomponents of the base are the: base frame, Adjustment Legs, and Control Connection Box. The main subcomponents of the actuator mounting are the: electric linear drive, guide shafts, pivot (angle r), Kickstand, Handle, Approach Positioner, and actuator position switch. The main subcomponents of the burner tube support are the: Boom Platform, Boom Holder, Boom, Burner Holder, Burner Tubes, and Elevation and Lateral Positioners. The Actuator Assembly is activated by the Control Box (Images 1 and 7).

Adjustment Legs (Actuator). Four threaded, rubber-based supports. Used to establish level and gross setup elevation.

Approach (x-position). The Approach is the path along which the Actuator moves the Burner Tube and is the method utilized to bring the flame from a remote location into contact with the mockups. Its adjustment is parallel to the longitudinal axis of the Actuator Assembly, parallel to the Boom Platform. For the Dust Cover Mockup, the approach is horizontal, below, and parallel to the plane of the dust cover material. For the Seating Area Mockup, the approach is at an angle ($r=45$ degrees) and terminates at the crevice formed between the seat and back of the mockup material. For instructions on making approach adjustments, refer to *Adjusting the Approach (x)*.

Approach Lockdowns (Actuator) (Image 6). The two lever-handled screws that secure the actuator drive to the parallel shafts. When the lockdowns are loosened, Approach Position Adjustments can be made.

Automatic Selector Switch (Control Box) (Image 7). The toggle switch located on the front panel that selects the automatic test mode. The switch can be set for either dust cover or seating area tests.

Boom (Actuator) (Images 4 and 5). The horizontally-mounted rod extending from the Boom Holder and supporting the Burner Holder. The Boom serves as the Lateral Positioner and can be slid into positions for the seating area and dust cover tests.

Boom Holder (Actuator) (Image 4). A support for the Boom that allows lateral position adjustments as well as gross elevation adjustments. See *Burner Position Adjustments* for a description of use.

Boom Platform (Actuator). A sliding table mounted on the shafts of the Actuator Assembly that supports the Boom, positioners, and the Burner Holder and Tubes.

Brake (Mockup Assembly) (Image 2). The wheel locking device for the Mockup Base. To use, turn the knurled rod until loose; roll the Mockup Base and tighten the rod.

Burner Flame Gage (Accessory) (Image 8). A visual gauge that aids in establishing the height of a burner flame. Flame height is specified in the draft standard.

Burner Holder (Actuator) (Images 4 and 5). The device mounted on the Boom that allows attachment of the Burner Tubes. Burner Tubes can be mounted horizontally or vertically and while lit, allowing flame ignition and warmup to be done remotely from test setups. See *Mounting Burner Tubes* for a description of use.

Burner Offset Gauge (Accessory) (Image 8). A visual gauge that aids in establishing the vertical offset of the Burner Tube to the mockup material for the dust cover test. Burner offset is specified in the draft standard.

Burner Tubes (Actuator) (Images 4 and 5). The stainless steel tubes, 0.242 in inside diameter (6.15 mm), that carry the test gas and provide the flame for the mockup tests. A six-inch (102 mm) tube is used for the dust cover test; a ten-inch (254 mm) tube for the seating area test. Tubes have externally grooved rings to seat into the "V" saddles of the Burner Holder.

Control Box (Images 1 and 7). The electronic assembly that controls the mockup tests. The functions and controls are: Power Switch, power indicator light, manual/automatic selector switch (Mode Switch), Test selector switch (Automatic Switch), Manual Control Switch, Start Test button, Reset Test button, Adjustable timing relay (Timer Selector), Main Control Cable, and the Power Cable.

Control Connection Box (Actuator). The cable junction box for the Shield Device and main control cables.

Crevice (Seating Area Mockup). The generally linear and horizontal gap formed between the seat and back portion of the assembled Seating Area Mockup. For seating area tests, the Burner Tube is positioned horizontally into this crevice such that it abuts the material on both horizontal and vertical surfaces of the Seating Area Mockup.

Drip Pan (Mockup Assembly). A standard baking pan used to collect falling debris from the mockup tests. The pan is placed on the Mockup Base and is normally covered with aluminum foil during tests.

Dust Cover Frame, Mockup (Mockup Assembly) (Image 9). A rectangular frame to which the dust cover material is attached with clips (mockup). The frame is positioned horizontally for tests.

Dust Cover Base (Mockup Assembly) (Images 2 and 9). A frame that supports the dust cover mockup. Holddowns secure the mockups.

Dust Cover Mockup Support (Mockup Assembly). The upper portion of the Mockup Assembly that contains the Burner Shield Device and supports the Dust Cover **Base**.

Elevation (z-position). Elevation adjustment ($r=0$) sets the gap between the Burner Tube and the material of the Dust Cover Mockup. For the Seating Area Mockup, elevation adjusts the burner in a direction perpendicular to the Approach ($r=45$ degrees) into the seat crevice. Elevation for seating area mockups is defined as perpendicular to both the longitudinal axis of the Actuator Assembly and to the plane of the Boom Platform. For instructions on making elevation adjustments, refer to *Adjusting the Elevation (z)*.

Handle (Actuator) (Image 6). The hand-hold and terminus for the Approach Position Adjuster and for the kickstand.

Holddowns (Mockup Assembly) (Image 9). Clamps consisting of gripping bars and thumb nuts that secure the dust cover frame.

Kickstand (Actuator) (Image 3). The U-shaped rod that supports the actuator mounting in a tilted orientation for the seating area test. The kickstand is deployed by first raising the Handle and then sliding the Kickstand beneath to the stop.

Lateral (y-position). The lateral position corresponds to adjustments along the Crevice of the seating area mockup. For the dust cover, the Approach and Lateral adjustments make different areas beneath the material accessible for tests. Lateral is defined as perpendicular to the longitudinal axis of the Actuator Assembly, parallel to the Boom Platform. For instructions on making lateral adjustments, refer to *Adjusting the Lateral Position (y)*.

Main Control Cable, C1 (Control Box). The 19-pin circular connector located on the back panel that connects the Control Box to the Actuator Assembly.

Manual Control Switch (Control Box) (Image 7). The toggle switch that controls the flame through manual control of the actuator drive. Pressing the switch up ("Flame Out") moves the burner towards the test sample; switch down ("Flame In") moves the burner back to its starting point.

Mockup Assembly. (Image 1) This main assembly comprises the frameworks that hold the two mockups in position and the mechanized Shield Device, which is controlled by the Control Box. The Mockup Assembly (Images 2 and 3) comprises the Mockup Base, the Dust Cover Base, and the mockup frames

Mockup Base (Mockup Assembly) (Image 1). The lower portion of the Mockup Assembly that supports, on rails, either the Seating Area Mockup or the Dust Cover Base.

Mode Switch (Control Box) (Image 7). The toggle switch that selects the mode of operation. The switch can be set either down ("Automatic") or up ("Manual").

Power Plug (Control Box). The three-prong plug located on the back that provides electrical power to the Control Box, Actuator, and Burner Shield Device.

Power Switch (Control Box) (Image 7). The toggle switch located on the front panel that provides power to the Control Box. A lamp located next to the switch indicates when the Control Box is on.

Reset Test (Control Box) (Image 7). The pushbutton switch that terminates the automatic test sequence. The reset will return the actuator to the home position and initialize test sequences. Use reset to recall the burner only to void a test.

Seating Area Frame, Mockup (Mockup Assembly) (Image 3). A metal framework resembling a scaled seating area that is covered in upholstery materials for testing (mockup). Construction is based on that specified in BS 5852.

Shield Device (Mockup Assembly) (Image 2)
See *Shield Device* for a description.

Shield Lock (Mockup Assembly) (Image 2)
See *Shield Device* for a description.

Start Test (Control Box) (Image 7). The pushbutton switch that initiates the automatic test sequence selected through the Automatic Selector Switch.

Timer Selector (Control Box) (Image 7). The adjustable timing relay that sets the flame application time for the mockup tests.

10. Tools and Equipment Required.

Each test laboratory will need the following tools and equipment to prepare for testing with the FFF:

Setup/operation:

- 120 V AC power.
- A table or other flat surface near suitable exhaust (defined in draft standard)

Testing:

- Refer to the draft standard for additional equipment that is necessary to perform the tests but is not included with the FFF.

Table 1

Control Box Settings

	Equipment Setup	Manual Setup	Seating Area Test	Dust Cover Test
Power Switch	Off	On	On	On
Mode Switch	Manual	Manual	Automatic	Automatic
Manual Control Switch	-----	Flame Out Flame In	-----	-----
Automatic Switch	Seating Area	Seating Area or Dust Cover	Seating Area	Dust Cover
Timer* Selector	A020S	A020S	A020S	A020S

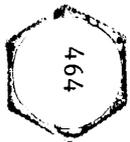


Table 2

Burner Position Adjustment Methods

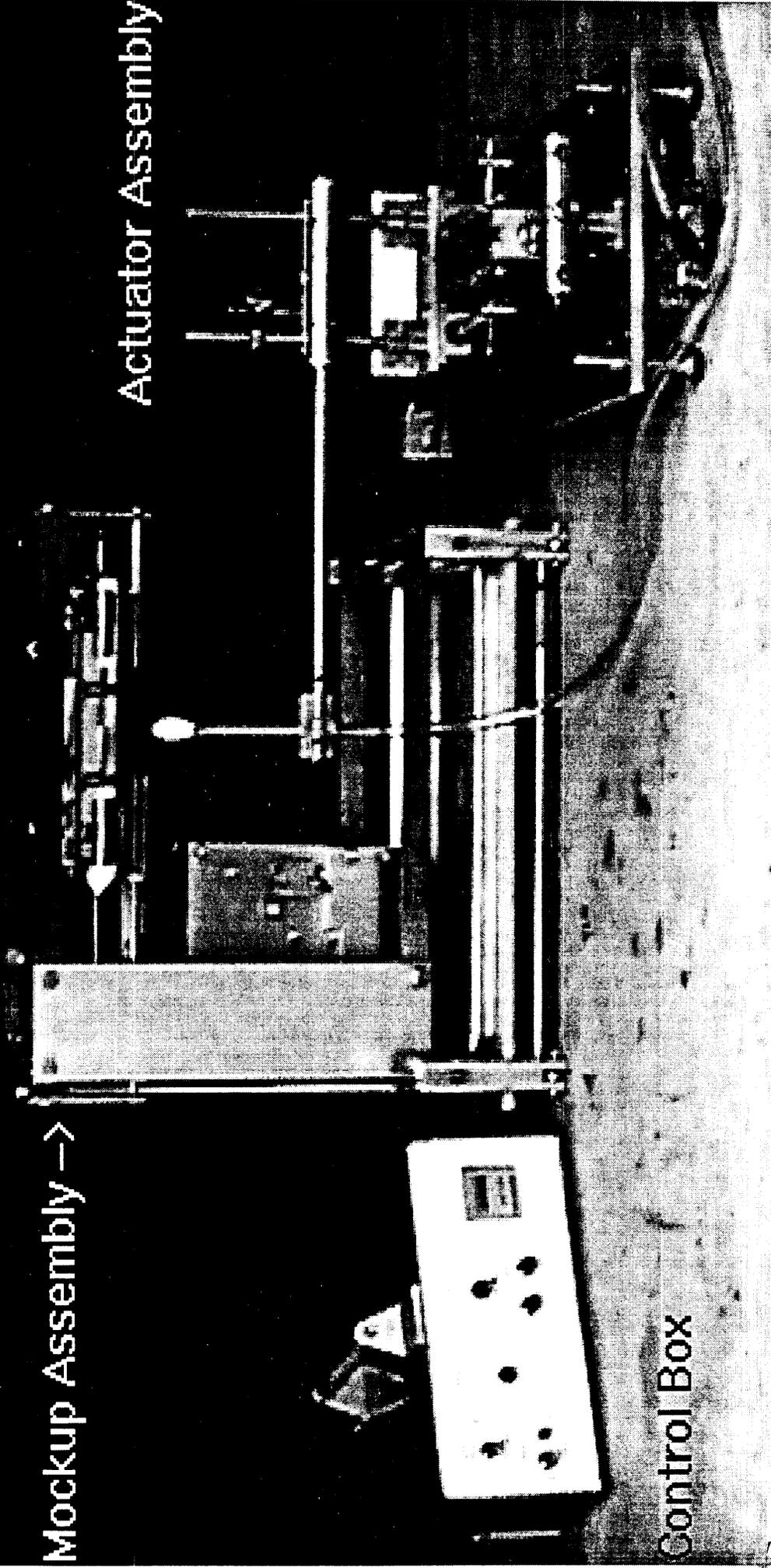
Adjustment Means	Direction*			Initial Setup	Seating Area Test	Dust Cover Test
	X	Y	Z			
Approach Positioner (Px)	■				■	■
Mockup Base rollers/brake	■			■	■	■
Dust/Skirt Mockup Support	■	■				■
Lateral Positioner (Py)		■			■	■
Burner Tube Slots		■	■		Y	Z
Adjustment Legs			■	■		
Elevation Positioner (Pz)			■		■	■

* Frame of reference is the Burner Platform.



FFF Operation Manual
IMAGE 1

Test Configuration for Dust Cover Test



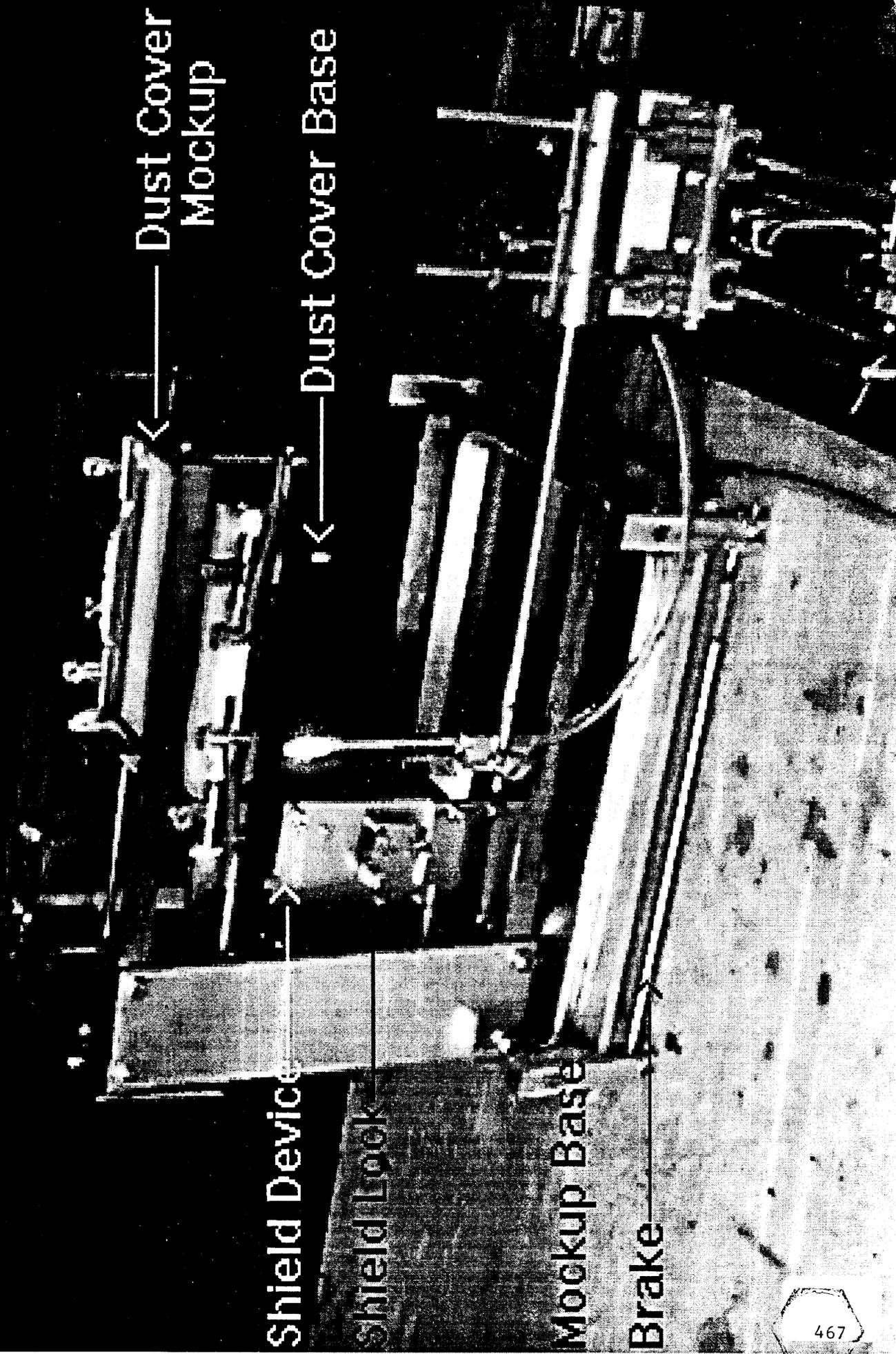
Mockup Assembly →

Actuator Assembly

Control Box

FFF Operation Manual
IMAGE 2

Mockup Assembly with Dust Cover Mockup



Shield Device

Shield Lock

Mockup Base

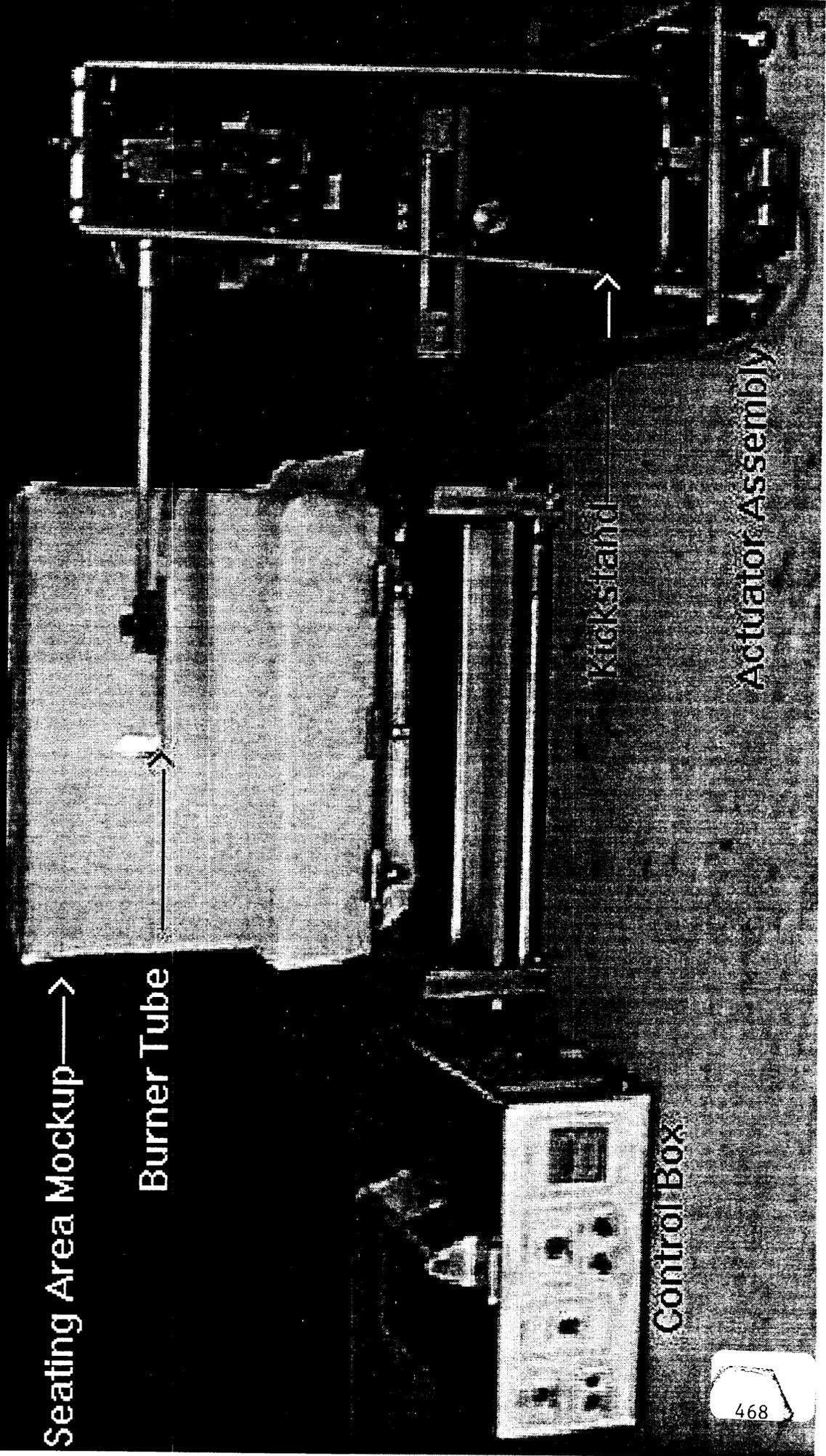
Brake

Dust Cover
Mockup

Dust Cover Base

IMAGE 3

Test Configuration for Seating Area Test



Seating Area Mockup →

Burner Tube

Kickstand

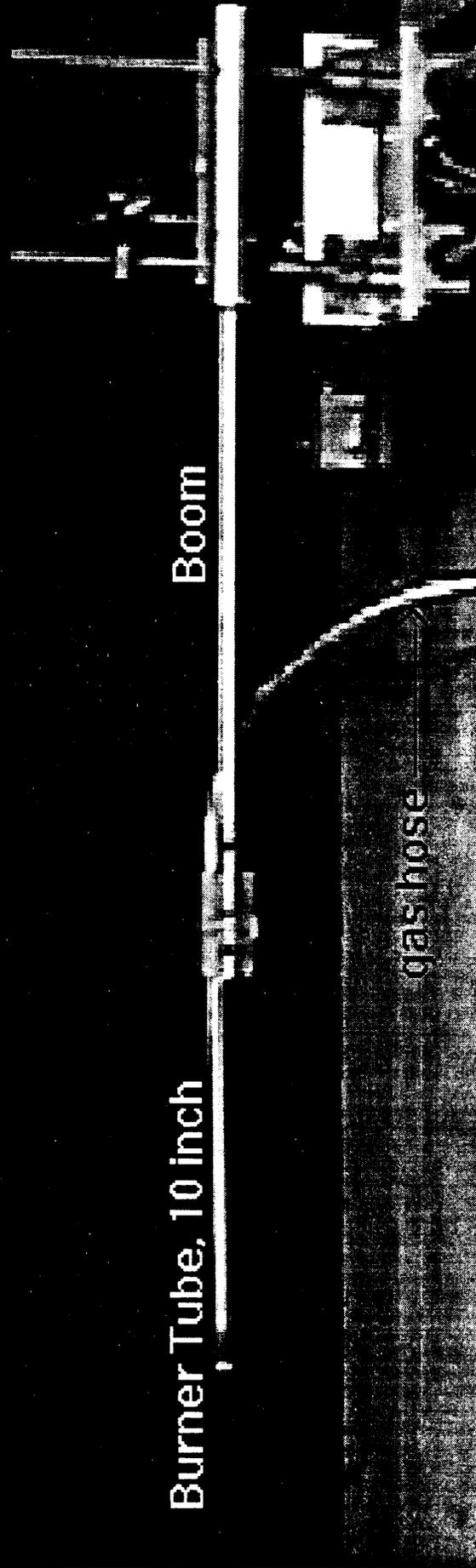
Control Box

Actuator Assembly

FFF Operation Manual

IMAGE 5

Burner Tube Configuration for Seating Area Test



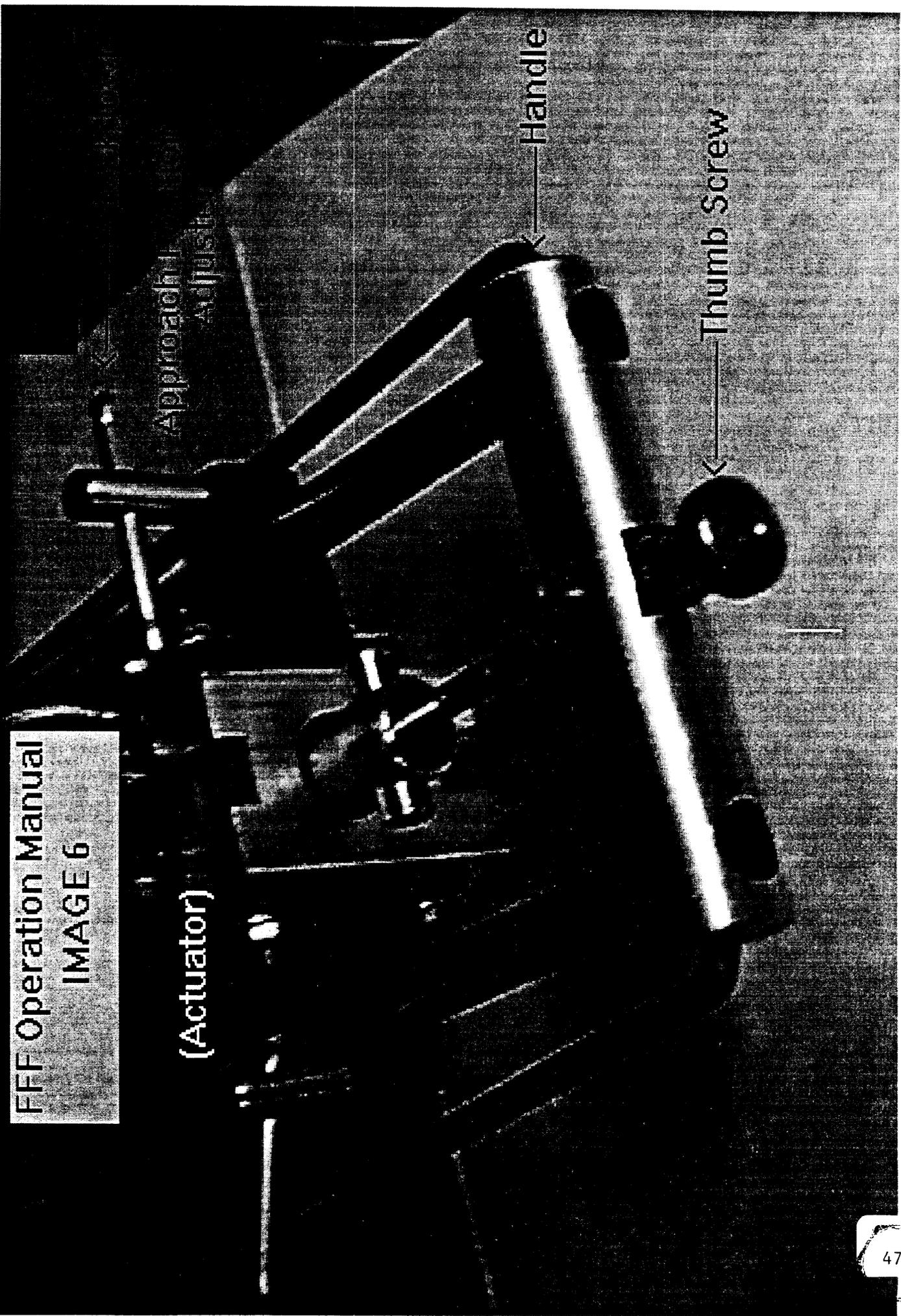
FFF Operation Manual
IMAGE 6

(Actuator)

Approach
Adjuster

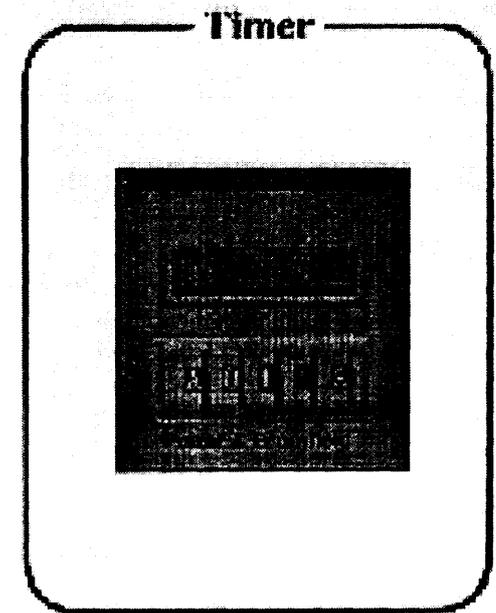
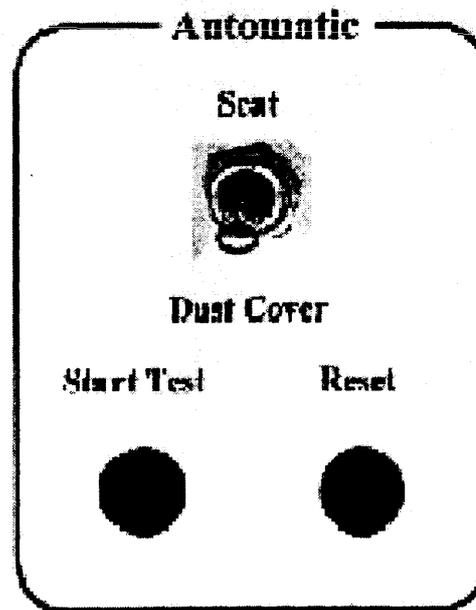
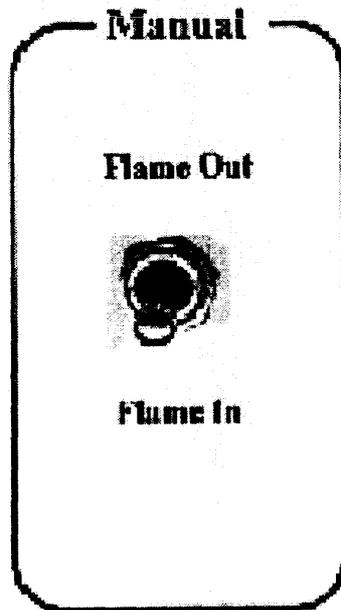
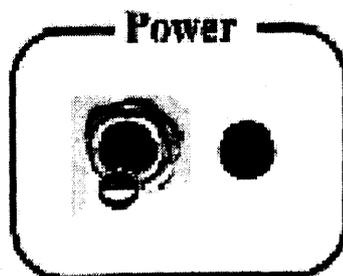
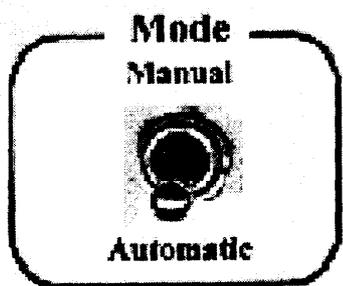
Handle

Thumb Screw



FFF Operation Manual
IMAGE 7
Control Box Front Panel

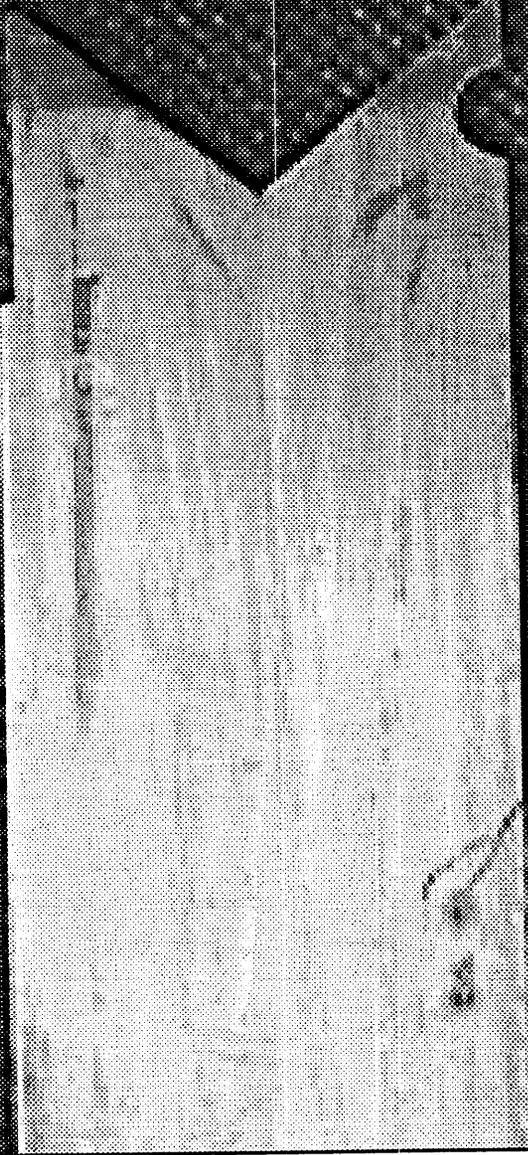
Flame Position Control



United States Consumer Product Safety Commission
Division of Laboratory Sciences
Gaithersburg Maryland

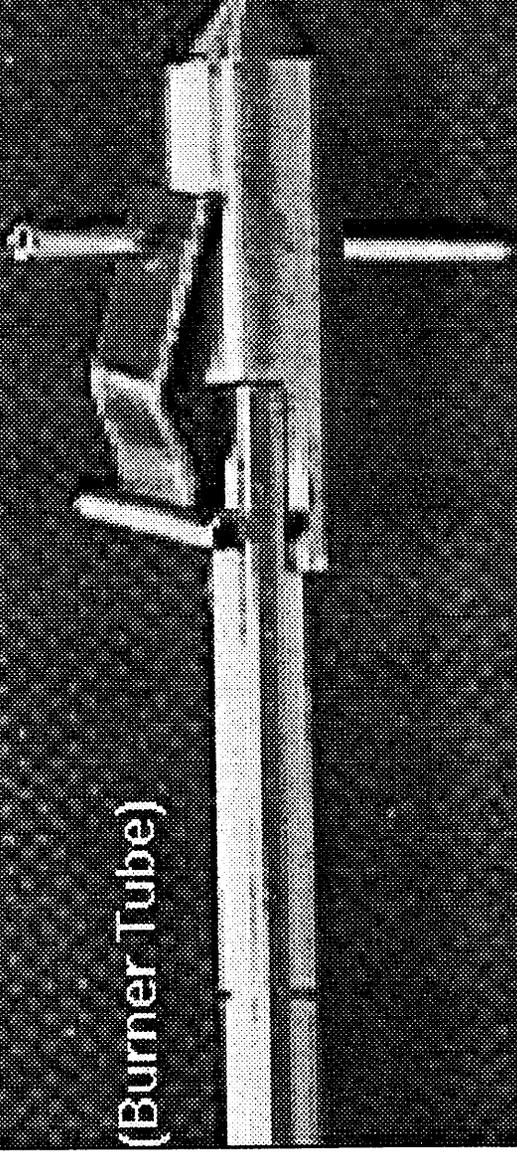
FFF Operation Manual
IMAGE B
View of Gages

← Flame Gage



(Burner Tube)

← Offset Gage



Dust Cover Mockup

Dust Cover Frame

clip

Holddown

Dust Cover Base

Dust Cover Material

