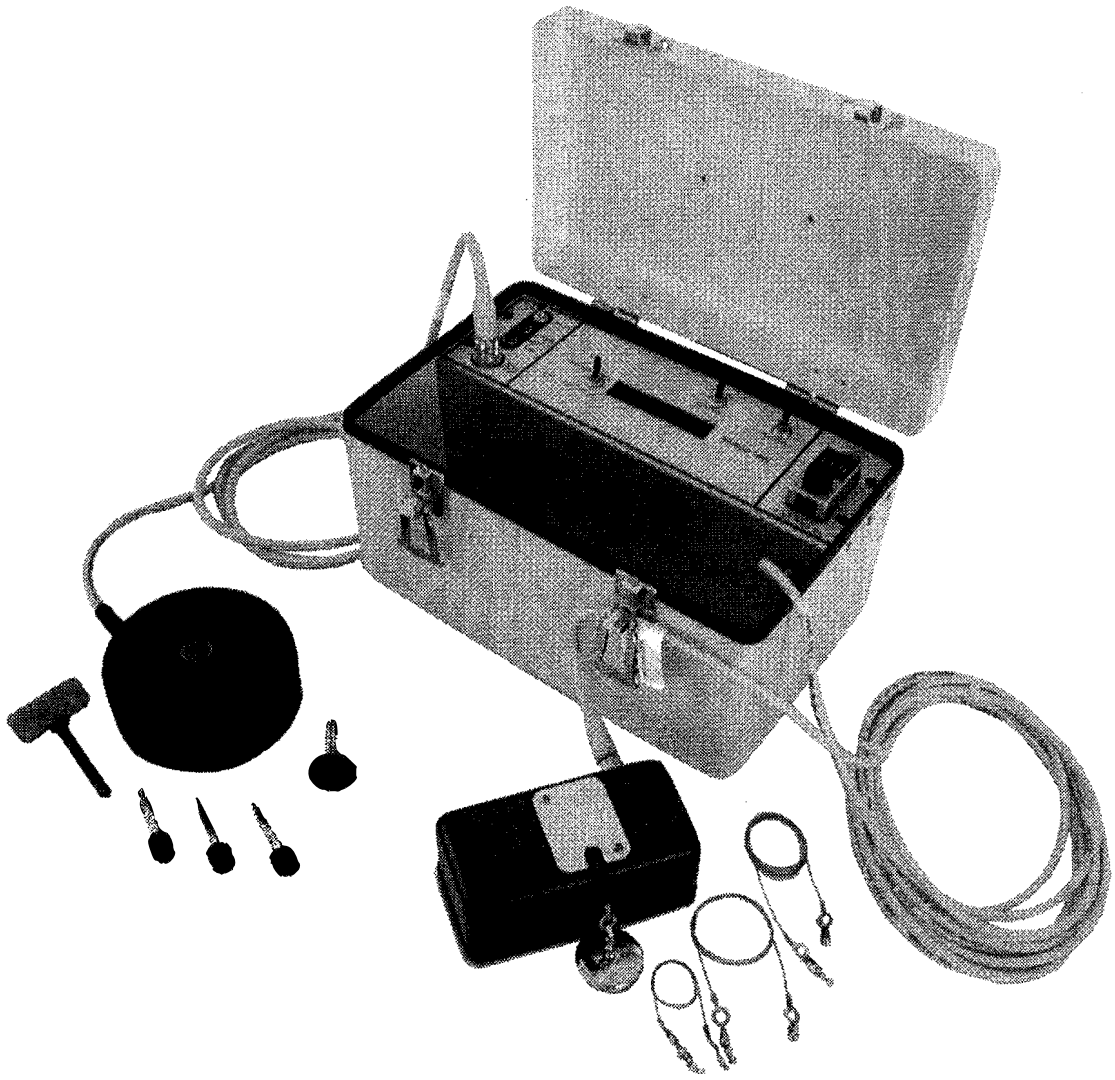
ROCKFORD
SYSTEMS, LLC

INSTRUCTION MANUAL FOR
Stop-Time Measurement Device



IMPORTANT: PLEASE REVIEW THIS ENTIRE PUBLICATION BEFORE OPERATING OR MAINTAINING THE STOP-TIME MEASURING DEVICE.

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Manual No. KSL-267

Contents

Chapter 1: Overview

The stop-time measurement device is a self-contained, portable electronic stop time meter capable of measuring elapsed time, stop time (Ts) from 1-9999 milliseconds. It also calculates the minimum safety distance (Ds) based on the OSHA formula, as understood by the factory, and will display up to 999.9 inches to the nearest 0.1 inches.

The stop-time measurement device consists of four components:

Meter	This is the "brains" of the unit, with processing electronics that display the test results.
Position/Velocity (P/V) Transducer	This motion and position sensor attaches to the press with its base and cable magnets.
Auto-Hand (A/H)	This hand-held device is used to automatically release a run control or press an E-Stop control on the press.
Auto-Flag (A/F)	This assembly is attached to the Auto-Hand to test presses equipped with electronic guards, i.e. photoelectric barrier guards (light curtains) or capacitance type guards (conduit rail sensors).
Option: Manual Start Switches	These two switches plug into the MANUAL START jack on the meter panel and are used to manually start the timing.
Option: Remote Tachometer with Base	The tachometer replaces the P/V Transducer and Auto-Hand when testing high speed or continuous stroke presses that can't stop within one stroke. With the wheel attachment, it can be used to test conveyors or indexing tables.

1.1: Switches and Connectors

ON/OFF	This is the unit's power switch. In the ON or OFF position the power cord may be plugged into 115 VAC outlet for recharging the battery. In the ON position, the unit may be operated from the internal battery or 115 VAC line.

NOTE: With the device ON and plugged in, the battery charges at a lower rate.

TIME UP/TIME DOWN	This switch determines the direction of the test. In the TIME DOWN position you are performing a standard test according to OSHA requirements. The switch should be in the TIME UP position when checking press top stop.
STOP TIME (mSEC)/ SAFETY DISTANCE (IN)	This switch is used to select the display mode, either time or distance. Time is measured in milliseconds and distance is measured in inches.
FULL REV/PART REV	This switch is used to determine the press clutch operation mode, either full or part revolution. The majority of tests are run in the part revolution mode.
CONTROL START POINT (IN)	Known as CSP, this dial is used to set the point in the stroke at which the command to start timing and fires the Auto-Hand is given. When the CSP dial is turned clockwise, the dial will increment and de-increment when turned counterclockwise. The CSP dial reads in tenths of an inch. Example: 123 equals 12.3".
MANUAL START	This jack is used with the optional manual start switches.
AUTO-HAND	This connector is used to connect the Auto-Hand to the meter.

1.2: Theory of Operation

The P/V transducer measures the open height of a press. When this measurement coincides with the preset CSP position, and the ram is traveling in the direction selected on the TIME UP/TIME DOWN switch, the Auto-Hand will release one of the two run controls or press an E-STOP control to initiate the press stop. When the ram stops, the P/V transducer sends a stop signal to the meter and the meter displays either stop time or safety distance, whichever display mode was selected prior to the test.

NOTE: No OSHA standard exists for defining when a press has stopped (at what ram velocity). The device ends its measurement when the ram velocity is approximately .17 inches per second (10 inches per minute). When measuring stop time, you must take into account all elements and devices used to bring the ram to rest. These include the "flight time" of the run and E-STOP buttons (time for switch to activate), control relays, solenoids valves and clutch and brake mechanical elements. Where an electronic guard (light curtain) is used, response time of the device and the depth penetration factor must be added to that measured by the device before calculating safety distance. Response time is generally stated by manufacturers of electronic guards. However, to verify systems, the Auto-Flag can be used.

Chapter 2: Unpack & Set-Up

The stop-time measurement device has been carefully inspected and tested before shipment. Unpack the unit and perform a visual inspection to assure that no damage has occurred during shipping. If damage is found, notify the transportation company immediately. Only the consignee may institute a claim with the carrier for damage during shipment.

2.1: Set-Up and Test

1. The device's battery is shipped with a partial charge. Plug in the unit and charge the battery until the green LED goes off (maximum charge time is eight (8) hours).

2. Connect the P/V transducer with the appropriate connector.

3. Make the following switch settings:

Display	SAFETY DISTANCE (IN)
Revolution	PART REV
Timing Direction	TIME DOWN
Control Start Point (CSP)	200 (20.0 inches)

4. Push the ON/OFF switch ON.

5. Place the P/V transducer on a metal desk or steel plate. The magnetic base will hold the unit in place.

6. Carefully slide the cable magnet from its keeper. Do not let the cable run free, it can be damaged by impact from sudden release. Pull the cable magnet out approximately 24 inches.

7. Bring the magnet back towards the P/V transducer. The P/V transducer will reel in the cable automatically. When the cable magnet is about 20 inches from the base of the P/V transducer, the device will start counting. The unit will continue counting as long as the cable velocity is .17 inch per second (10 inches/minute) or greater.

8. Stop the cable from rewinding or pull the magnet out. The display will stop incrementing and show the results.

9. Again, pull the cable out approximately 24 inches. The display's current value will remain because the device is set in the TIME DOWN direction.

10. Let the cable rewind. The display will reset to "0" and start counting. The zero reset occurs automatically at the beginning of the count and cannot be seen.

NOTE: The device will count when the cable is rewinding and stop when the cable stops or the direction is reversed.

11. Change the TIME UP/TIME DOWN switch to the TIME UP position and start with the cable rewound. The device will begin to count when the 20 inch CSP setting is reached and continue until the cable stops or the direction is reversed.

12. Set the CSP dial to several values and check that the meter begins to count at the preset positions when the cable is moving in the direction selected by the TIME UP/TIME DOWN switch.

13. If the optional Manual Start Switches are available, continue with steps 14-15. If not, move to Chapter 3: Operating Instructions.

14. Plug one of the Manual Start Switches in the MANUAL Start jack. If the meter is ON, the counter will begin to run. Switch the meter OFF and then ON to reset the counter.

15. If the Manual Start Switch is normally closed (red plug), the meter will begin to count when the switch is pushed. If the Manual Start Switch is normally open (black plug), the meter will begin to count when the switch is released.

Chapter 3: Operating Instructions

3.1: Placement of Position/Velocity (P/V) Transducer

1. Position the magnetic base of the P/V transducer on a clean area of the press's bed or bolster plate.

2. Extend the cable magnet to the ram in a straight line, perpendicular to the transducer and attach the magnet to the ram. A test will not start at 90 degrees if the cable is angled.

3. Connect the P/V transducer to the meter using the cable provided.

CAUTION: Never place the transducer where the press or dies can close in on it. Also, be sure when the press closes, the transducer still has some cable extended to keep it from slamming the magnet into the body of the transducer.

3.2: Set the Control Start Point (CSP)

There are three ways to set the CSP depending on the following conditions. Proceed to the section that best fits your condition.

A. Setting the CSP dial when the press stroke is known.

B. Setting the CSP dial when the press stroke is not known.

C. Setting the CSP dial at the 90 degree crankshaft position.

A. Setting the CSP dial when the press stroke is known.

1. Raise the press to the top of its stroke.

2. a. Set the TIME UP/TIME DOWN switch to TIME DOWN position.
   b. Set the FULL REV/PART REV switch to PART REV.
   c. Select either STOP TIME (mSEC) or SAFETY DISTANCE (IN) display.

3. Switch on the meter.

4. Turn the CSP dial clockwise until the meter begins to count.

5. Switch the meter OFF and then ON to stop the counter.

6. Turn the CSP dial counterclockwise somewhere below the reading where the meter began to count.

7. Slowly turn the CSP dial clockwise and stop when the meter begins to count. The number displayed in the CSP dial is the distance between the base of the P/V transducer and the ram.

8. Subtract 1/2 of the press stroke from the number displayed in the CSP dial to calculate the Control Start Point.

Example: If the number displayed in the CSP dial is 240 (24.0") and the press stroke is 6", subtract 3" (1/2 stroke) from 24.0" equals 21.0". This is the mid-stroke position. While it may not represent the exact 90 degree point of the crankshaft, it is close. This electronically measured point in the stroke will start the meter, and fires the Auto-Hand.

9. Set the CSP dial to the result of Step 8. From the example, the CSP dial would be set to 210 (21.0")

B. Setting the CSP dial when the press stroke is not known.

1. Find the open height of the press by performing steps 1-7 in subsection (A). Record the distance determined in step 7.

2. Lower the press ram to the bottom of the stroke. Find the closed height of the press by performing steps 2-7 in subsection (A). Record the distance determined in step 7.

3. Using the two distances determined from steps 1 and 2, calculate the mid-stroke position using the following method: Add the two measurements together and divide by two (2).

Example: Midstroke = (Open Height + Closed Height) ÷ 2

4. Set the CSP dial to the above result.

C. Setting the CSP dial at the 90 degree crankshaft position.

To test at the 90 degree crankshaft position, or when the P/V Transducer cable is angled, the CSP will act as a reference setting.

1. Inch the press to 90 degrees by observing the crankshaft or stroke indicator.

2. Perform steps 2-7 in subsection (A).

3. The distance determined in step 7 (number displayed on the CSP dial) is the 90 degree point of the crankshaft, which includes allowance for the cable angle.

NOTE: When testing the top stop, the distance determined in step 3 will correspond to the 270 degree position of the crankshaft when the TIME UP/TIME DOWN switch is in the TIME UP position.

3.3: Set the TIME UP/TIME DOWN Switch

The TIME UP/TIME DOWN switch is used to select the direction the press (closing or opening) is moving when the automatic stop command is given. This switch must be properly set even when a manual test, with the optional manual start switches, is performed.

NOTE: The stop-time measurement device has the capability to check both down and up stop times to aid in setting the press counterbalance.

For best results, the down stop time test should be initiated at 90 degrees, and the up stop time should be initiated at 270 degrees. During these tests, it is important to stop the ram before the dies engage on the down stoke and before top dead center on the up stroke. On some presses, however, the ram may take more than 90 degrees to come to a complete stop. If so, adjust the CSP as follows:

1. On the down stop time test, increase the Control Stop Point (CSP) setting to initiate a stop between 0 and 90 degrees. Continue increasing the CSP and testing the press until the ram can be stopped before the dies engage.

2. Similarly, on the up stop time test, decrease the CSP setting to initiate a stop between 180 and 270 degrees. Continue decreasing the CSP and testing the press until the ram can be stopped before top dead center.

It is important to test both the down and up stop times using the same press control. Typically, an inch button or two-hand control in the inch mode is used since the up stop time test is not possible in the single-stroke mode with two hand controls.

Adjusting the counterbalance air pressure to obtain near equal down and up stop times will set the counterbalance at is optimum point.

NOTE: Always follow the press manufacturer's recommendations for setting the counterbalance. Several down stroke Safety Distance and/or Stop Time tests must be performed after setting the counterbalance to ensure proper press operation and guarding.

3.4: Using Auto-Hand

The Auto-Hand is designed to release or push press controls. It can release a two-hand control or inch button, or push an E-Stop button. Auto-Hand is not required if you are using one of the optional Manual Start Switches.

Using Auto-Hand with Two Hand or Inch Control (Release to Stop)

The Auto-Hand releases or pushes buttons with a spring-loaded plunger. When the plunger is pushed, it will latch into position. The device provides a voltage pulse to energize a solenoid that releases the spring loaded plunger. If the two-hand control has a ring guard, the Auto-Hand should rest on the guard and the three support legs are not needed.

1. Connect Auto-Hand to the meter. Depress the plunger and place the extended end over one of the two-hand buttons. Rest Auto-Hand on the button's ring guard. If no ring guard exists, screw in the three legs to serve as a rest. Use your other hand to press the other button.

2. Cycle the press. The Auto-Hand will actuate when the desired CSP is reached, releasing the button and initiate a press stop.

NOTE: The Auto-Hand can only release 10 lb of force and may not release if pushed against the button with excessive force. In this case, use one leg as a spacer, to prevent applying excessive force. Place over switch and repeat step 2.

NOTE: Be sure the press has stopped before the bottom of the stroke. Readings are invalid if the press goes through the bottom of the stroke before stopping. If this happens, increase the CSP setting slightly until the press stops before the bottom.

3. Remove Auto-Hand and restart the press to return the ram to top stop.

4. Read the meter display. This value is the Stop Time or Safety Distance, depending on the display mode selected prior to the test.

Using Auto-Hand with and E-STOP Button (Push to Stop)

1. Screw the plunger extension into the plunger end that retracts when the plunger is depressed. This end is used to push an E-STOP button. Attach the three legs to this side, if required.

2. With the Auto-Hand plunger depressed, place the unit over the E-STOP button to be pushed. Check that the plunger extension is adjusted out far enough to push the button when the Auto-Hand releases.

3. Position the Auto-Hand over the E-STOP button. The plunger extension should not touch the E-STOP button.

4. Cycle the press while holding Auto-Hand over the button. Auto-Hand will operate when the desired CSP is reached and push the E-STOP button, stopping the press.

3.5: Using Auto-Flag with Auto-Hand

Auto-Flag is used in conjunction with Auto-Hand to test the entire press control loop which includes electronic guards, i.e. photoelectric barrier guards (light curtains) or capacitance type guards (conduit rail sensor).

This test initiates a press stop by obstructing the sensing area with Auto-Flag, causing the guard to activate a stop signal in the press.

Attaching Auto-Flag to Auto-Hand

1. Screw the Auto-Flag into the retracted end of the plunger when the Auto-Hand plunger is depressed. Adjust the Auto-Flag so that it is just outside of the light curtain.

2. Rest the Auto-Hand with Auto-Flag against the light curtain enclosure just outside the sensing area.

3. Now, set up the meter and the P/V Transducer as described earlier to run a test.

4. Cycle the press. When the ram crosses the 90 degree point (position in the stroke desired to initiate a press stop), the Auto-Hand will release the flag into the sensing area initiating a press stop.

NOTE: During this test, verify that when the press stops, the dies have not fully engaged and the press has not gone through the bottom of its stroke. If either situation occurs, increase the CSP setting slightly and repeat the test. The displayed stop time is the total of the electronic guard delay plus press control and braking effectiveness.

If desired, the OSHA formula for safety distance can be read directly from the display. Set the STOP TIME/SAFETY DISTANCE switch to SAFETY DISTANCE prior to the test. Presses using electronic guards have other mandated control requirements (brake monitors, for example) which should be in place and operating correctly.

When determining SAFETY DISTANCE for light curtains, the depth penetration factor must be added to the meter reading.

3.6: Using Optional Manual Start Switches

The device can be used in a manual mode with one of two optional Manual Start Switches. These switches are plugged into the MANUAL START jack on the meter panel. No wiring to the press control is required.

1. Normally Open Switch (PSD0110400). Designated with a black plug. Used over an inch button or two-hand control, this switch starts the meter when released.

2. Normally Closed Switch (PSD0110309). Designated with a red plug. Used over an E-STOP button, this switch starts the timing when pressed.

Perform the following Steps:

1. Set the TIME UP/TIME DOWN, FULL REV/PART REV, and STOP TIME/SAFETY DISTANCE switches as required.

2. Mark the ram or slide and frame with chalk, paint, etc. at the 90 degree point.

3. When the marks are aligned during the stroke of the press, release or push the Manual Start Switch being used. This takes practice to get into sync with the press. Ten to 20 strokes may be needed. Be sure the readings are fairly repetitive. Using the Manual Start Switches is less accurate than Auto-Hand.

3.7: Using Optional Remote Tachometer

For testing continuous stroke or high speed presses perform the following steps:

1. Connect the Remote Tachometer to the P/V Transducer cable in the case.

2. Position the Remote Tachometer on the press (machine) with the magnetic base. Center the rubber nose cone on the rotating shaft, such as a press's crankshaft or cam switch shaft. Good axial alignment is needed.

NOTE: If the shaft rotation, viewed by the tachometer, is clockwise, toggle the TIME UP/TIME DOWN switch to TIME UP. If the shaft rotation is counterclockwise, toggle the switch to TIME DOWN. Toggle the STOP TIME/SAFETY DISTANCE switch to STOP TIME.

3. If the press is to be tested from the E-STOP button, use the normally closed (red) Manual Start Switch. (See section 3.6: Using Optional Manual Start Switches). When testing the press RUN or INCH button(s), use the normally open (black) Manual Start Switch.

4. Choose the correct switch and plug it into the Manual Start jack on the panel.

5. Tape the switch temporarily over the control button. Cycle the press. When pressing the Manual Start Switch and E-STOP button simultaneously, the press begins to stop and the meter starts counting. After the press stops, the meter displays STOP TIME in milliseconds. Similarly, the Normally Open Manual Start Switch released simultaneously with the RUN or INCH button starts the meter counting upon release.

NOTE: Run several tests, initiate stops at the same position in the stroke. Results should be fairly repetitive. Use only the largest values in determining safety distance to be used. Prudent judgement suggests adding 10% to 20% to the readings being measured.

NOTE: The Auto-Hand and P/V Transducer are not used with the Remote Tachometer.

3.8: Calculate Stop Angle

1. To calculate the Stop Angle requires a press stop started exactly at 90 degrees or 270 degrees, use the Auto-Hand. Set the Control Start Point (CSP) to 90 degree crankshaft position. To set the CSP, see Section 3.2: Set the Control Start Point (CSP).

2. Raise the press to top stop, then cycle the press. The press will begin to stop when the ram reaches 90 degrees. Leave the ram where it stopped.

3. Rotate the CSP dial counterclockwise somewhere below the point where the ram is stopped. This will be approximate, accuracy is not required.

4. Rotate the CSP dial clockwise until the meter starts to count.

5. Switch the meter OFF then ON to reset the counter.

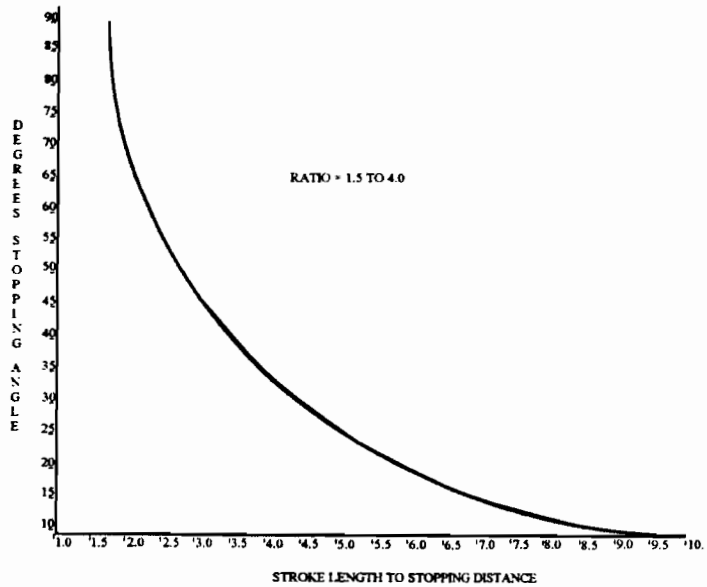
6. Repeat steps 3-5 until the CSP dial displays the new position of the stopped ram.

7. Subtract the stopped ram position in step 6 from the 90 degree position in step 1. The result is the distance the ram moved after a stop occurred. This distance is called, "ram or slide after-travel", "stopping distance" or "over-run".

8. Use the curve in the following figure to determine the stopping angle. This curve is based on a connecting rod to stroke length ratio of two (2).

Example: 16" connection rod, 8" stroke = 2.0. Lower ratios than 2 will have smaller stopping angles. Higher ratios will have greater stopping angles. The curve is useful for ratios of 1.5 to 4.0 and across the 15 degree to 40 degree stopping angle range. Higher ratios and larger than 40 degree stops should not use this curve.

9. Determine the ratio of press stroke to stopping distance (divide stroke by stopping distance). Locate this ratio on the horizontal axis of the graph, move up to the curve and read across to the vertical axis, finding the stopping angle in degrees.



Review Points:

1. Be sure to start at exactly 90 degrees or 270 degrees by observing crankshaft or indicator.

2. Be sure press does not go through bottom or top of stroke.

3. Small differences in stopping distance make for large differences in stopping angle, especially when the stopping angle exceeds 45 degrees. Read the CSP dial carefully.

When determining stop angle be sure of the following:

1. The P/V transducer cable must be parallel to the slide motion. The cable magnet must be directly above the P/V transducer.

2. In down stroke tests, the ram must stop before it reaches the bottom of the stroke.

3. The mid-stroke position can be used as the 90 degree crankshaft position. Since this is one of the reference points used to make linear measurements of the ram travel to determine stop angle, care must be taken to initiate the stop at exactly the 90 degree position.

4. If the press is equipped with a functioning angular position indicator, this can be used to indicate crank or cam angular position. If no indicator is available, the angular position may be deter mined from the crank or camshaft position. Mark the 90 degree position.

5. Using the stop angle from the previous graph, add the desired brake wear allowance, typically 10-15%. This is the included angle setting between the top stop cam limit and the brake monitor cam limit switch. This setting should be locked or adjusted only by authorized person nel.

6. If the brake wear allowance on the brake monitor was 10%, add 20% to the safety distance measurement used to set the two-handed controls, or electronic guards such as optical presence sensors. Increasing the stop time will cause the brake monitor to activate and the operator will have an additional 10% safe distance margin.

3.9: Using the Stop-Time Meter to Aid in Setting Cam Limit Switch Brake Monitors

Cam limit switch brake monitors check the angular travel of a press during a top stop, thus determining the brake efficiency by determining the total included stop angle between the normal top stop cam switch and the brake cam switch. The function of the top stop cam is to bring the press to a stop at, or very near, the top of the press stroke. Very often, the exact parked position of the press is affected by the type of part being made. Most often, users favor a parked position typically 5 degrees after top dead center.

The top stop cam switch is set to disengage the clutch, and apply the brake at some point on the up stroke in order to allow the press to coast to the desired top stop position. As die weight, brake wear and other response factors increase, this setting may have to be adjusted to operate earlier in the stroke to compensate for this additional wear. This adjustment results in parking the press at the desired top stop location but ignores the fact that this setting may also affect an overtravel cam switch used as a brake monitor.

Adjusting the top stop cam, without adjusting the brake monitor cam, causes longer stop times to occur before the brake monitor activates.

If the current safety distance is not increased, a dangerous situation can exist whereby the operator's controls or safeguard devices may be too close to the point of operation. The top stop brake monitor is trying to judge the stop efficiency on the down stroke based on the test made on the upstroke. To do this, stopping time and stop angle on both down and up stroke should be known. Ideally, they should be the same, and in a press where counterbalances are used, they must be the same.

Checking the down and up stroke time should be done prior to making the down stop time test. This is done by using the meter with Auto-Hand. The two-hand control circuit will not generally do this. Typically, the simplest control that can do this is the inch circuit. Auto-Hand can be used over this control for initiating a stop anywhere in the stroke. The timing direction selector switch on the meter is set for either down or up, whichever direction is being tested. Several stops should be made in both directions, and an average in each direction should be made. Readings taken in each direction should be close to the others made in that direction. Erratic readings are reason to suspect a defective brake or control circuit which should be repaired before proceeding.

The stop-time measurement device measures slide position, direction and velocity to determine brake efficiency stop time. The initiation of a stop can be made at almost any reasonable point near mid-stroke (assuming the press is balanced), and will accurately measure the stop time.

3.10: Test Presses Running in a Continuous Mode

Because the meter sends a release command to the Auto-Hand each time the P/V transducer crosses the Control Start Point (CSP), a special method must be used to test a press running in a continuous mode. Typically, this test is performed on the press's Emergency Stop (E-STOP) button or a presence sensor.

1. Position the P/V transducer as described in Section 3.1: Placement of Position/Velocity (P/V) Transducer.

2. Set the CSP to initiate a stop at the 90 degree crankshaft position.

3. Ready Auto-Hand to press the E-STOP button or interrupt the presence sensor with Auto-Flag.

4. Make the following meter switch settings:

Display	(as desired)
Timing Direction	TIME DOWN
Revolution	PART REV

5. Press the meter power switch OFF.

6. Start the press in continuous mode.

7. Observe that the press is up to speed.

8. When the ram is on the up stroke, press the power switch ON. When the ram goes through the top of the stroke and crosses the 90 degree point, Auto-Hand will release and press the E-STOP button or interrupt the presence sensing field with Auto-Flag.

9. After the press stops, verify that the ram has not gone through the bottom of the stroke or that the dies have engaged. If either of these conditions have occurred, the reading is inaccurate. Increase the CSP setting slightly and test until neither of these conditions occur.

NOTE: In some cases, stopping a continuous run press requires more than one stroke of the ram. The standard stop-time device is incapable of testing such an occurrence. To perform this type of test, the optional Remote Tachometer is needed. Contact the factory for details.

3.11: Set Press Counterbalance

The stop-time measurement device has the capability of checking both down and up stop times to aid in setting the press's counterbalance. For best results, the down stop time test should be initiated at 90 degrees and the up stop time test at 270 degrees. It is important to stop the ram before engagement of the dies on the down stroke, and before top dead center on the up stroke. However, on some presses, the ram may take longer than 90 degrees to come to a complete stop. Test this condition as follows:

1. On the downward stop time test, increase the Control Start Point (CSP) setting to initiate a stop between 0 and 90 degrees. Continue increasing the CSP and testing the press until a down stop of the ram can be made before the dies have fully engaged.

2. On the upward stop time test, decrease the CSP setting to initiate a stop between 180 degrees and 270 degrees. Continue decreasing the CSP and testing the press until an upward stop of the ram can be made before the top stop.

NOTE: It is important to test both the down and up stop times using the same press control. Typically, an inch button or two-hand control in the inch mode will be used since an up stop time test is not possible in the single stroke mode using a two-hand control.

Adjust the counterbalance to obtain equal down and up stop times. This sets the counterbalance at the optimum point.

Always follow the press manufacturer's recommendations when setting the counterbalance. Several safety distance and/or stop time tests must be performed after the setting of the counterbalance to ensure safe press operation and guarding.

3.12: Test Full Revolution Clutch Presses

Calculating the safety distance of a full revolution clutch press per OSHA 29 CFR 1910.217(c)(3)(viii)(c) is as follows:

Dm=63 inches/second x Tm; where:
Dm=Minimum safety distance (inches);
63 inches/second = hand speed constant:
and
Tm = the maximum time the press takes for die closure after it has been tripped (seconds). For full revolution clutch presses with only one engaging point, Tm is equal to the time necessary for one and one-half revolutions of the crankshaft. For full revolution clutch presses with more than one engaging point, Tm shall be calculated as follows:
Tm = [1/2 + (1 / Number of engaging points per revolution)] x time necessary to complete one revolution of the crankshaft (seconds).

The device can aid in calculating safety distance of a full revolution clutch press by measuring the time necessary to complete one revolution of the crankshaft. Perform the following steps:

1. Set the FULL REV/PART REV switch to FULL REV.
2. Set the TIME UP/TIME DOWN switch to TIME UP.
3. Set the STOP TIME/SAFETY DISTANCE switch to STOP TIME.
4. Position the P/V transducer as described in Section 3.1: Placement of Position/Velocity (P/V) Transducer.
5. Push the meter power switch to ON.
6. Cycle the press. The meter will begin counting when the ram begins to travel down and will stop counting when the ram stops on the up stroke. The meter will display the time for one stroke of the press.

NOTE: Do not set the STOP TIME/SAFETY DISTANCE switch to SAFETY DISTANCE. The meter can not read safety distance for full revolution clutch presses.

Chapter 4: Certification and Warranty

The factory certifies that the stop-time measurement device has been inspected and tested at the factory prior to shipment and meets requirements defined by the contract under which it is furnished.

Warranty, Disclaimer and Limitation of Liability

WARRANTY

Rockford Systems, LLC warrants that this product will be free from defects in material and workmanship for a period of 12 months from the date of shipment thereof. ROCKFORD SYSTEMS, LLC'S OBLIGATION UNDER THIS WARRANTY IS EXPRESSLY AND EXCLUSIVELY LIMITED to repairing or replacing such products which are returned to it within the warranty period with shipping charges prepaid and which will be disclosed as defective upon examination by Rockford Systems, LLC. This warranty will not apply to any product which will have been subject to misuse, negligence, accident, restriction and use not in accordance with Rockford Systems, LLC's instructions or which will have been altered or repaired by persons other than the authorized agent or employees of Rockford Systems, LLC. Rockford Systems, LLC's warranties as to any component part is expressly limited to that of the manufacturer of the component part.

DISCLAIMER

The foregoing Warranty is made in lieu of all other warranties, expressed or implied, and of all other liabilities and obligations on the part of Rockford Systems, LLC, including any liability for negligence, strict liability, or otherwise, and any implied warranty of merchantability or fitness for a particular purpose is expressly disclaimed.

LIMITATION OF LIABILITY

Under no circumstances, including any claim of negligence, strict liability, or otherwise, shall Rockford Systems, LLC be liable for any incidental or consequential damages, or any loss or damage resulting from a defect in the product of Rockford Systems, LLC.

Chapter 5: Specifications

ELECTRONICS

Display	4 digit, 14 segment, 1/4" red LED Stop Time: 0-9999 milliseconds Safety Distance: 0-999.9 inches
Accuracy	+/-1%
Power Source	Internal Battery or 115 VAC
Battery Type	6 Volt, sealed lead acid
Operating Time	(Full Charge) 10 hours (continuous)
Recharge Time	8 hours

MECHANICAL

Meter	Material: aluminum. Finish: baked enamel Dimensions: 11"L x 7" W x 7"H. Weight: 9.0 lbs.
Auto-Hand	Material: aluminum. Finish: anodized. Dimensions: 4.5" dia. x 2" H. Weight: 3.0 lbs.
P/V Transducer	Material: aluminum. Finish: anodized Dimensions (cable magnet extended): 5.25"L x 2.75"W x 4.75"H. Weight: 1.6lbs. Cable Stroke: 49"