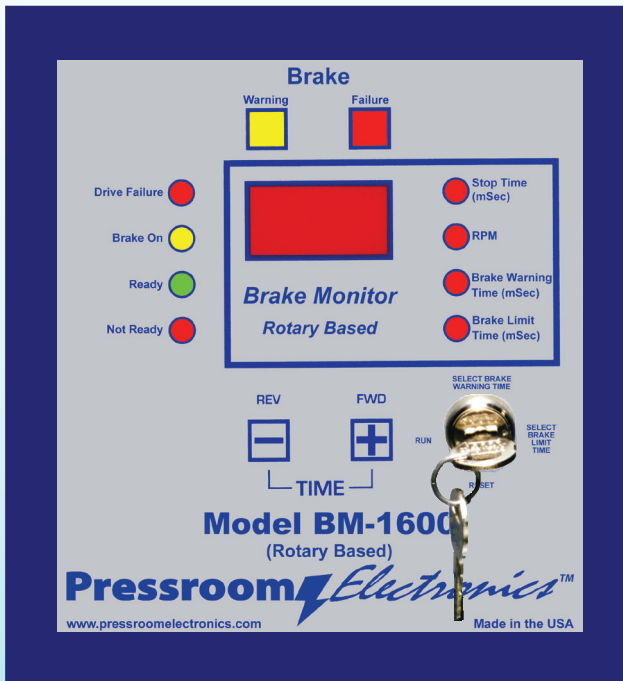


Time Based Brake Monitoring and Time Based Linear Stopping Performance Monitors

For Rotary Applications

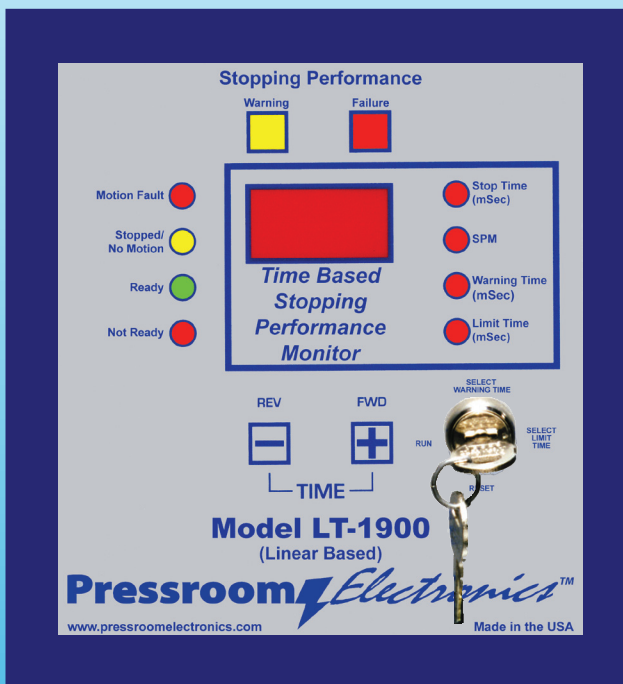
Model BM-1600 incorporates a rotary encoder for rotating shaft based machinery such as air clutch/brake power presses. Complies with OSHA 29 CFR 1910.217 and ANSI B11.1-2009 safety requirements for brake monitoring of mechanical power presses.



Front Panel Mounting Shown

For Linear Applications

Model LT-1900 incorporates a linear transducer for measuring the stopping time of pneumatic and hydraulic presses and machinery. Complies with ANSI B11.2-2013 requirements for hydraulic and pneumatic power presses and complies with ANSI B11.3-2012 stopping performance monitoring requirements for power press brakes.

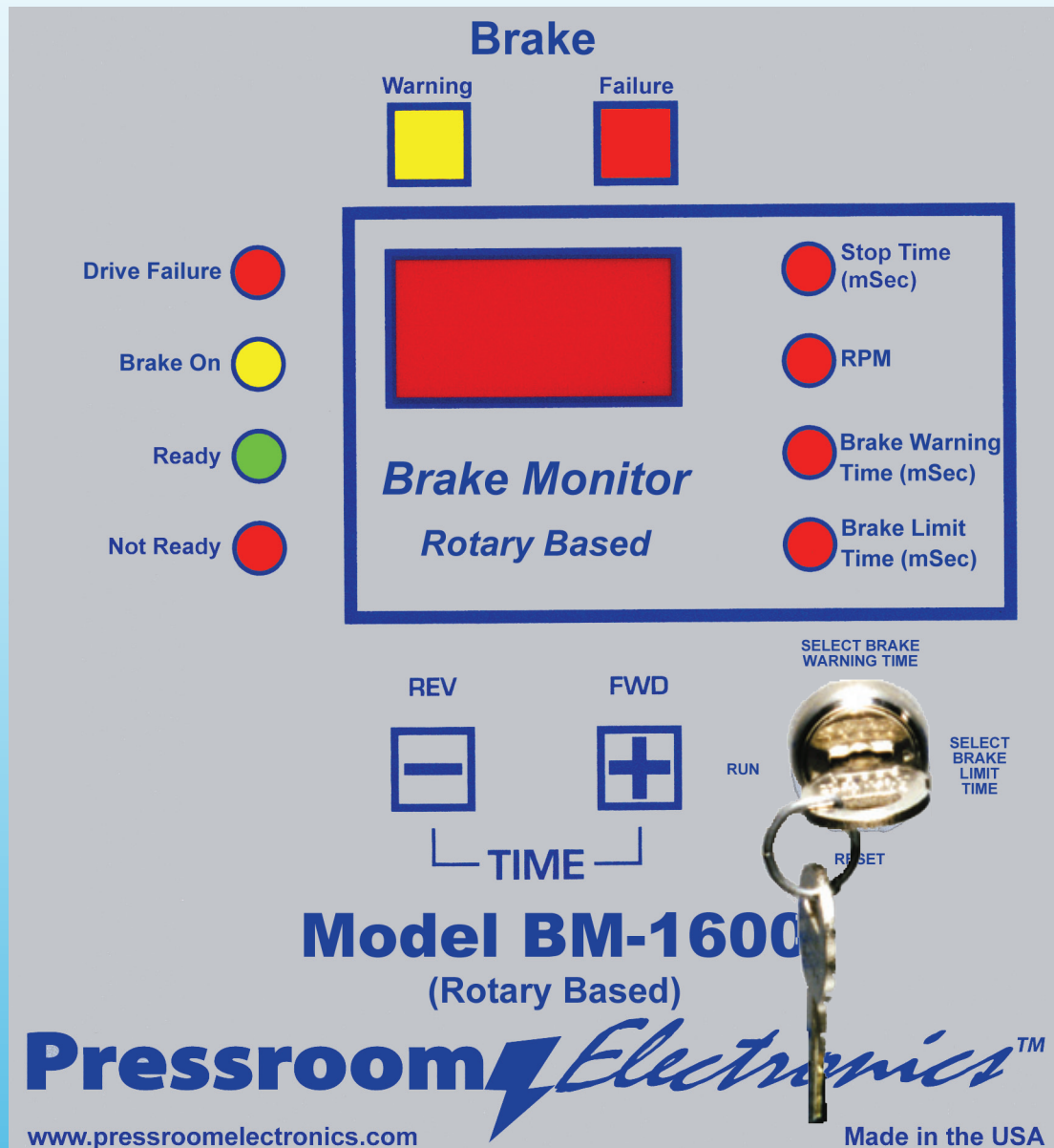


Front Panel Mounting Shown

NOTES

Time Based Brake Monitor

Model BM-1600 with Rotary Encoder for Air Clutch/Brake Power Presses



Pressroom *Electronics*TM

Time Based Brake Monitor/Stopping Performance Monitor

Model BM-1600 (Rotary Encoder Based)

Brake Warning Indicator

Yellow light illuminates when the setpoint is exceeded. Excellent input for the press operator and for maintenance.

Drive Failure

Red LED illuminates when the pulses from the encoder disappear while the brake remains released.

Brake On

Yellow LED illuminates when power to the dual solenoid valve drops out.

Ready

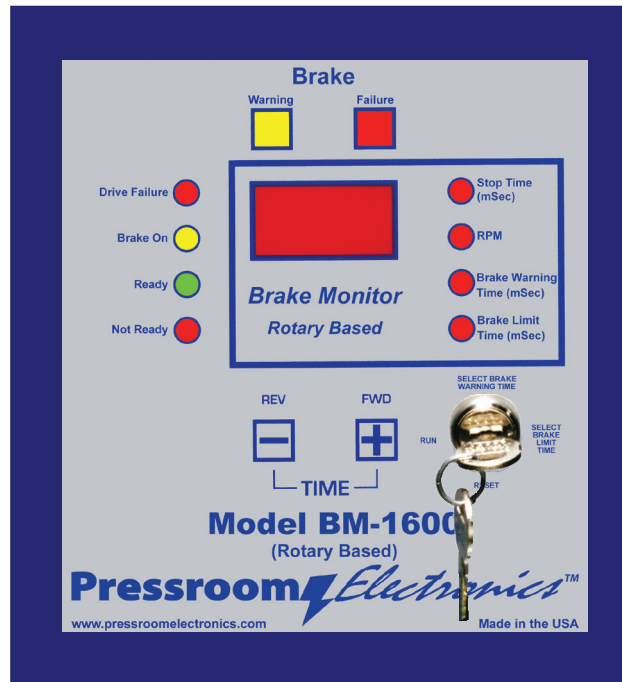
Green LED illuminates when all systems are go.

Not Ready

Red LED illuminates when the brake monitor safety relays have dropped out (i.e., drive failure, internal failure, etc.)

+/- Pushbuttons

The +/- pushbuttons are used to set the time values in milliseconds for the brake warning and the brake limit setpoints.



Brake Failure Indicator

Red LED illuminates when the actual brake stopping time exceeds the programmed brake limit setpoint.

Stop Time

Displayed in milliseconds after every stop in machine cycle and the red LED is illuminated.

RPM/SPM

Displayed during each press cycle when the red LED is illuminated.

Brake Warning Time

Displayed in milliseconds when the red LED is illuminated.

Brake Limit Time

Setpoint is displayed in milliseconds when the red LED is illuminated.

System Programming Security and Safety

Keyed selector switch controls:

- Brake Warning Time Setpoint
- Brake Limit Time Setpoint
- System Reset
- System Run

How the BM-1600 Brake Monitor Works

The BM-1600 is a time based brake monitor that utilizes a high resolution rotary encoder and controller to measure the brake stopping time in milliseconds and also the RPM/SPM of the press. The rotary encoder is attached to the subject machine and is driven on a 1:1 ratio by the power press crankshaft. The brake stopping time of the machine will be displayed on every stop and can be easily read on the bright red light emitting diode (LED) display on the front panel of the unit. The RPM/SPM of the machine will be displayed during the machine cycle. Individual LED indicators are visible and easily define the existing status of the unit during the press cycle (shown above). All system programming and diagnostics are front panel mounted and controlled which will minimize downtime while enhancing operator safety and press maintenance. All operating mode selections are supervisory controlled by a keyed

selector switch which meets all OSHA and ANSI standards for mode selection supervisory control. To program the Brake Warning Time and the Brake Limit Time setpoints, the user inserts the programming key into the lock and turns to the desired position (status LED illuminates). By depressing the +/- buttons to the desired time setting and turning the key back to the Run position, the new warning/failure time setpoints are saved. All errors and time value setpoints are permanently stored in the EEPROM memory which does not require a battery backup. The user cannot change or reprogram the Brake Warning or Brake Limit setpoints while the encoder is in motion, which is an additional safety feature.

The dual force-guided captive contact safety output relays of the BM-1600 are always de-energized when the

programming key is not in the Run position. When the key is in the Run position, the safety output relays are always energized as long as there are no internal or external faults detected. When a fault is detected, it is recorded within the system in non-volatile memory along with the last stopping time. If the power to the Brake Monitor System is removed and reapplied, the last error to occur will come back up and prevent any further use until the programming key is used. Only the key turned to the reset position can clear a fault. If no fault occurred but the programming key is moved into the reset position, the output relays will de-energize as a safety feature. Motion detection will still be monitored while in the Reset position even if the encoder is turning.

Time Based Brake Monitor/Stopping Performance Monitor

Model BM-1600 (Rotary Encoder Based)

OSHA/ANSI Compliance

The BM-1600 system complies with OSHA code 29 CFR 1910.217 and ANSI Code B11.1-2009 for brake monitoring and control reliability standards. The unit will automatically prevent the activation of a successive stroke if the stopping time deteriorates beyond the brake limit setpoint. Required on any press that has a single stroke mode and uses either a two-hand control, light curtain or type B gate system.

Non-volatile EEPROM Memory

All diagnostic faults and brake setpoints are permanently saved in non-volatile memory which does not require battery backup. Information is retained indefinitely after a power loss or machine shutdown.

Advanced Design

The advanced circuitry and user

friendly design on the BM-1600 allows both programming and status monitoring to be performed from the front of the compact panel. There is no need to enter the control panel to adjust switches or thumbwheels which will enhance both safety and productivity.

System Self Diagnostics

Control displays status and system fault codes are on the LED display. A detailed definition, cause, and cure listing is supplied within each installation and operation manual.

Predictive Maintenance Diagnostic Tool

The unique "brake warning" feature on the BM-1600 allows for predictive maintenance to be scheduled on the machine, which will minimize downtime. Factors which will be monitored and affect stopping time:

machine cycle speed, counter-balance air supply, tooling weight, clutch air supply, exhaust restrictions, brake wear adjustment, and clutch wear adjustment.

90° and 270° Stop Time Measurement Built-In

The built-in 90° press stop feature initiates a stop signal at the 90° and the 270° position in the downstroke. This is required information when calculating the location of point of operation guarding systems or palm button assemblies.

Complete Package Supplied

Everything you need to install and operate the BM-1600 is supplied.

- BM-1600 Brake Monitor Controller
- Model E-160 Encoder
- 20' (6m) of encoder cable
- Dimensional and technical data
- Installation and operation manual

Standard Features

- Control reliable design
- Dual captive contact safety relays
- Bright red LED display
- Non-volatile EEPROM memory
- Flat unobtrusive design
- Drive failure detection
- Motion detector
- Automatic 90° and 270° press stop
- Programming security with keyed selector switch
- Very easy to program and to adjust limits
- System self-diagnostics with display codes
- External diagnostic display
- System status indicators (LED's)
- Solid state indicators - No incandescent bulbs to burn out
- Designed specifically for the rigorous metal stamping/metal forming industry
- Interfaces easily with all types of press controls; solid state or relay logic
- Installs with ease on OEM, retrofit, or rebuild projects
- Front panel mount for installation into an existing control panel
- Made in USA

Specifications

Controller

Power Requirements - 120 +/- 10% VAC, 50-60 Hz
24 VDC +/- 10% (optional)

Power Consumption - 8 watts (Relays on)

Temperature Range - 0° to 50° Celsius

Relay Configuration - Dual self-checking force-guided captive contact safety relays

Relay Contact Rating

8 amps @ 250VAC resistive for safety relays

4 amps @ 250VAC resistive for alarm relay

System Accuracy - +/- 1 millisecond

Setpoints - Drive Failure (1 to 25 tenths of a second)

Brake Warning (1 to 999 milliseconds)

Brake Failure (1 to 999 milliseconds)

Enclosure - NEMA 12 (IP 64) Steel

Indicators:

Brake Fault - Red LED

Drive Failure - Red LED

Ready - Green LED

Stop Time Display - Red LED

Brake Warning Setpoint - Red LED

Brake Warning - Yellow LED

Brake ON - Yellow LED

Not Ready - Red LED

RPM - Red LED

Brake Limit Setpoint - Red LED

NEMA 12 Enclosure Dimensions -

8" (203mm) Height x 7" (178mm) Width x 4" (102mm) Depth

Front Panel Mount - 8" (203mm) Height x 7" (178mm) Width x 4" (102mm) Depth

Encoder (Part # E-160 — CW or CCW Rotation Capable)

Cable - 20' (6m) supplied standard; 100' (30m) max.

Gauge: 20 AWG - 3 connectors plus drain

Rating: 300 VAC @ 60 C

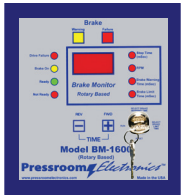
Shaft Loading - Radial: 35 lbs; Axial: 40 lbs.

Temperature Range - 0° to 50° Celsius

Dimensions - 5.5" (140mm) Height x 3.75" (95mm) Width x 3-9/16 (90mm)

Time Based Brake Monitor/Stopping Performance Monitor

Model BM-1600 (Rotary Encoder Based)



The BM-1600 is a time-based brake monitor that utilizes a high resolution rotary encoder and controller to measure the brake stopping time in milliseconds and also the RPM of the press. The rotary encoder is attached to the subject machine and is driven on a 1:1 ratio by the power press crankshaft. The brake stopping time of the machine will be displayed on every stop and can be easily read on the bright red light emitting diode (LED) display on the front panel of the unit. The RPM of the machine will be displayed during the machine cycle.

BM-1600 Brake Monitor System includes:

- BM-1600 controller (BM)
- E-1600 Encoder (supplied standard)
- 20' (6m) encoder cable
- Dimensions and technical data
- Installation and operation manual

BM-1600D Brake Monitor System and Dual-Shaft Encoder System includes:

- BM-1600D controller (BMD)
- EN-1600D Dual-Shaft Encoder
- 20' (6m) encoder cable
- Dimensions and technical data
- Installation and operation manual

ORDERING PROCEDURE FOR BM-1600



BM-1600 in NEMA 12 (IP 64) steel enclosure.

1. Select **BM** or **BDM** for encoder style
2. Specify Mounting Style
 - E** Front Panel Mounting to be installed in an existing control panel.
 - C** Stand alone NEMA12 (IP 64) steel enclosure.
3. Specify Controller input power
 - 1** 24VDC
 - 2** 120VAC 50-60Hz
 - 3** 240VAC 50-60Hz
4. Specify Clutch/Brake Valve Coil Voltage
 - 1** 24VDC
 - 2** 120VAC 50-60Hz
5. Encoder Connector Cable
 - 20' (6m) is supplied standard. If additional length is needed, specify in feet. 100' (30m) max.

EXAMPLE PART NUMBER

BM	-	C	-	2	-	2	-	20
<u>BM</u> -1600 or <u>BMD</u> for dual shaft encoder.		Mounting Style		Input Power		Clutch/Brake Valve Voltage		Encoder Cable (in feet)

Time Based Brake Monitor/Stopping Performance Monitor

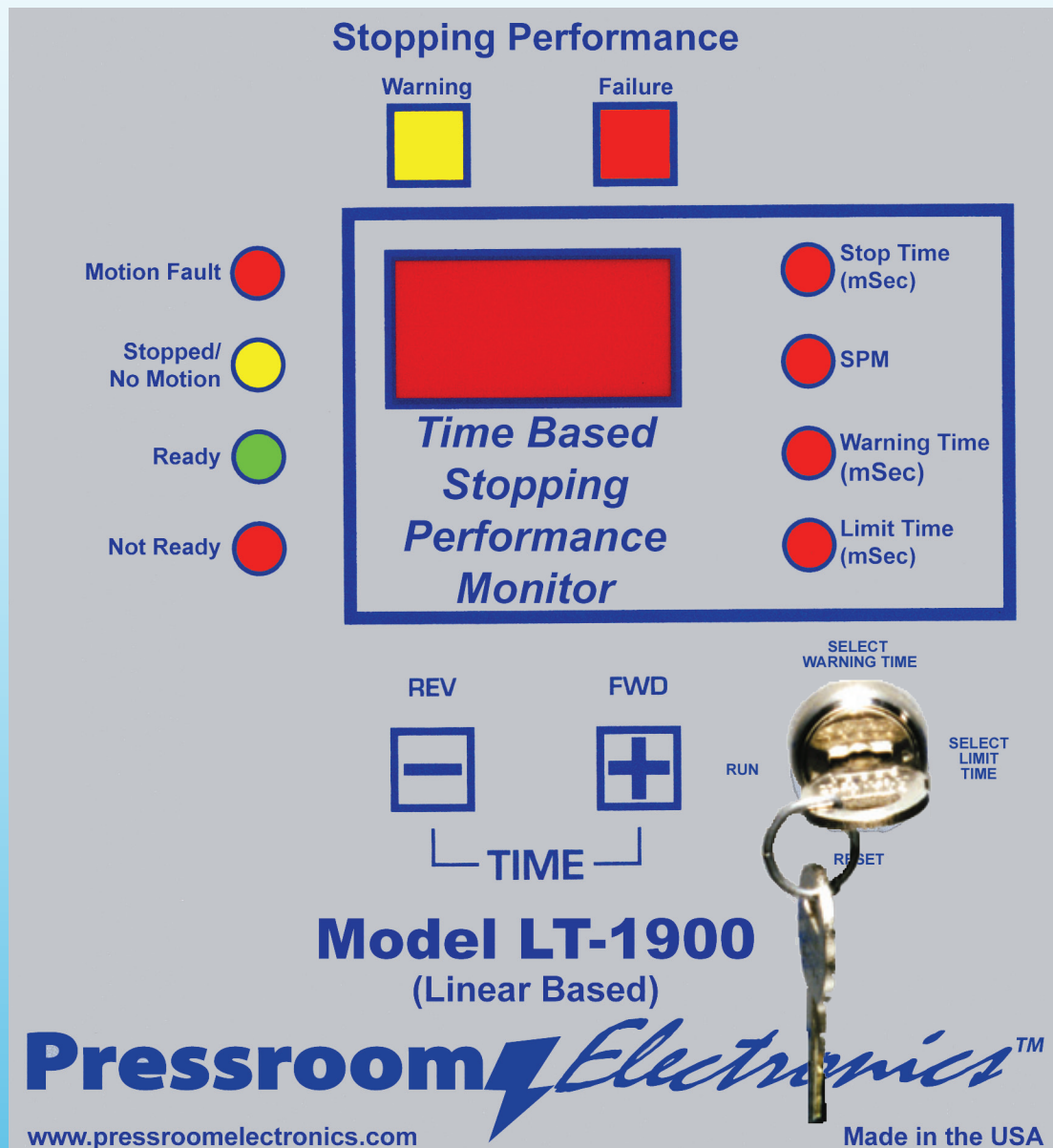
Model BM-1600 (Rotary Encoder Based) Replacement Parts

REPLACEMENT PARTS LISTING OF MODEL BM-1600

Part Number	Description
11-001	Metal box enclosure (with gasket)
11-073	Metal panel mount (with gasket) open frame for brake monitor
20-001	1A Slo-Blo glass 3AG fuse
20-022	1A Slo-Blo nano SMF fuse
21-053	Encoder Wheel (brass)
26-020	Front panel overlay (BM-1600)
42-001	Software microprocessor chip (specify square or rectangular)
43-004	Encoder cable (20')
52-002	Display board
52-003	Computer / Power supply / Relay board (with CPU)
52-084	Ribbon Cable
52-202	Encoder board
53-004	E-1600 Encoder with single-ended shaft (supplied standard)
53-451	EN-1600D Encoder with double-ended shaft

NOTES

Time Based Linear Stopping Performance Monitor Model LT-1900



Time Based Stopping Performance Monitor

Model LT-1900 (Linear Based)

Warning Indicator

Yellow light illuminates when the setpoint is exceeded. Excellent input for the machine operator and for maintenance.

Motion Failure

Red LED illuminates when the pulses from the failure disappear.

Stopped/No Motion

Yellow LED illuminates when power to the valve drops out.

Ready

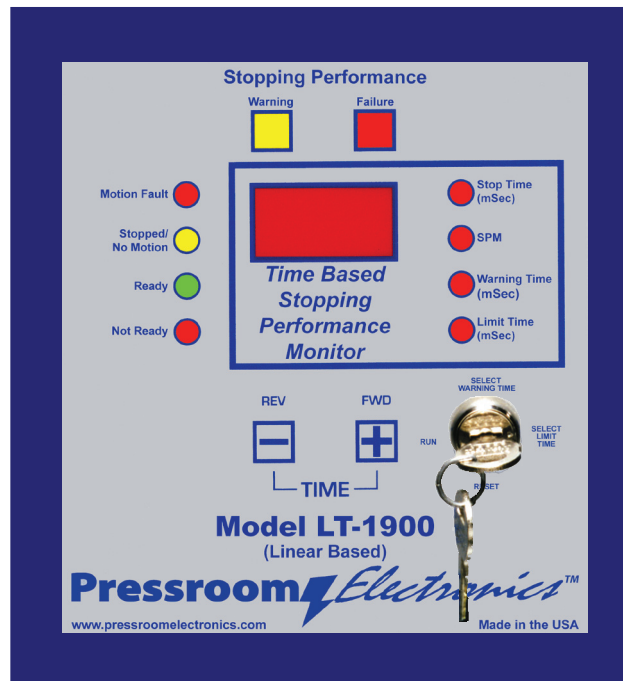
Green LED illuminates when all systems are go.

Not Ready

Red LED illuminates when the monitor safety relays have dropped out (i.e., drive failure, internal failure, etc.)

+/- Pushbuttons

The +/- pushbuttons are used to set the time values in milliseconds for the stopping performance warning and the limit setpoints.



Failure Indicator

Red LED illuminates when the actual stopping time exceeds the programmed stop limit setpoint.

Stop Time

Displayed in milliseconds after every stop in machine cycle and the red LED is illuminated.

SPM

Displayed during each machine cycle when the red LED is illuminated.

Stopping Performance

Warning Time

Displayed in milliseconds when the red LED is illuminated.

Stopping Performance Limit

Time

Setpoint is displayed in milliseconds when the red LED is illuminated.

System Programming Security and Safety

Keyed selector switch controls:

- Warning Time Setpoint
- Limit Time Setpoint
- System Reset
- System Run

How the LT-1900 Stopping Performance Monitor Works

The LT-1900 is a time based stopping performance monitor that utilizes a high resolution linear transducer and controller to measure the machine stopping time in milliseconds and also the SPM of the machine. The linear transducer is attached to the subject machine and is driven on a 1:1 linear ratio by the machine. The stopping time of the machine will be displayed on every stop and can be easily read on the bright red light emitting diode (LED) display on the front panel of the unit. The SPM of the machine will be displayed during the machine cycle. Individual LED indicators are visible and easily define the existing status of the unit during the machine cycle (shown above). All system programming and diagnostics are front panel mounted and controlled which will minimize downtime while enhancing operator safety and machine maintenance. All operating mode selections are supervisory controlled by a keyed

selector switch which meets all OSHA and ANSI standards for mode selection supervisory control. To program the Warning Time and the Limit Time setpoints, the user inserts the programming key into the lock and turns to the desired position (status LED illuminates). By depressing the +/- buttons to the desired time setting and turning the key back to the Run position, the new warning/failure time setpoints are saved. All errors and time value setpoints are permanently stored in the EEPROM memory which does not require a battery backup. The user cannot change or reprogram the Warning or Limit setpoints while the machine is in motion, which is an additional safety feature.

The dual force-guided captive contact safety output relays of the LT-1900 are always de-energized when the

programming key is not in the Run position. When the key is in the Run position, the safety output relays are always energized as long as there are no internal or external faults detected. When a fault is detected, it is recorded within the system in non-volatile memory along with the last stopping time. If the power to the LT-1900 Monitor System is removed and reapplied, the last error to occur will come back up and prevent any further use until the programming key is used. Only the key turned to the reset position can clear a fault. If no fault occurred but the programming key is moved into the reset position, the output relays will de-energize as a safety feature. Motion detection will still be monitored while in the Reset position even if the linear transducer has motion.

Time Based Stopping Performance Monitor

Model LT-1900 (Linear Based)

OSHA/ANSI Compliance

The LT-1900 system complies with OSHA code 29 CFR 1910.217 and ANSI Codes B11.3-2012 and B11.2-2013 for monitoring and control reliability standards. The unit will automatically prevent the activation of a successive stroke if the stopping time deteriorates beyond the brake limit setpoint.

Non-volatile EEPROM Memory

All diagnostic faults and setpoints are permanently saved in non-volatile memory which does not require battery backup. Information is retained indefinitely after a power loss or machine shutdown.

Advanced Design

The advanced circuitry and user friendly design on the LT-1900 allows both programming and status monitoring to be performed from the

front of the compact panel. There is no need to enter the control panel to adjust switches or thumbwheels which will enhance both safety and productivity.

System Self Diagnostics

Control displays status and system fault codes are on the LED display. A detailed definition, cause, and cure listing is supplied within each installation and operation manual.

Predictive Maintenance Diagnostic Tool

The unique "warning" feature on the LT-1900 allows for predictive maintenance to be scheduled on the machine, which will minimize downtime. Factors which will be monitored and affect stopping time: machine cycle speed, air supply, tooling weight, exhaust restrictions, wear adjustment and pressure.

Stop Time Measurement Built-In

The built-in stop feature initiates a stop signal in the downstroke. This is required information when calculating the location of point of operation guarding systems or operator palm button assemblies.

Complete Package Supplied

Everything you need to install and operate the LT-1900 is supplied.

- LT-1900 Controller
- Linear Transducer and Brackets
- Magnet
- 40' (12m) of transducer cable
- Dimensional and technical data
- Installation and operation manual

Standard Features

- Control reliable design
- Dual captive contact safety relays
- Bright red LED display
- Non-volatile EEPROM memory
- Flat unobtrusive design
- Drive failure detection
- Motion detector
- Automatic 90° and stop time tester press stop
- Programming security with keyed selector switch
- Very easy to program and to adjust limits
- System self-diagnostics with display codes
- External diagnostic display
- System status indicators (LED's)
- Solid state indicators - No incandescent bulbs to burn out
- Designed specifically for the rigorous metal stamping/metal forming industry
- Interfaces easily with all types of machine controls; solid state or relay logic
- Installs with ease on OEM, retrofit, or rebuild projects
- Front panel mount for installation into an existing control panel
- Made in USA

Specifications

Controller

Power Requirements - 120 +/- 10% VAC, 50-60 Hz
24 VDC +/- 10% (optional)

Power Consumption - 8 watts (Relays on)

Temperature Range - 0° to 50° Celsius

Relay Configuration - Dual self-checking force-guided captive contact safety relays

Relay Contact Rating

8 amps @ 250VAC resistive for safety relays

4 amps @ 250VAC resistive for alarm relay

System Accuracy - +/- 1 millisecond

Setpoints - Drive Failure (1 to 25 tenths of a second)

Warning (1 to 999 milliseconds)

Failure (1 to 999 milliseconds)

Enclosure - NEMA 12 (IP 64) Steel

Front Panel Mount - 8" (203mm) Height x 7" (178mm)

Width x 4" (102mm) Depth

Indicators:

Fault - Red LED

Motion Fault - Red LED

Ready - Green LED

Stop Time Display - Red LED

Warning Setpoint - Red LED

Warning - Yellow LED

Stopped/No Motion - Yellow LED

Not Ready - Red LED

SPM - Red LED

Limit Setpoint - Red LED

Enclosure rating: NEMA 12, IP 64

Dimensions - .34" (8mm) high, 1.1" (28mm) wide (all lengths)

Active Length - 4" (101mm) active zone - 10.3" (263mm) total length

Active Length - 8" (203mm) active zone - 14.7" (365mm) total length

Active Length - 12" (305mm) active zone - 18.4" (467mm) total length

Active Length - 16" (406mm) active zone - 22.3" (568mm) total length

Active Length - 24" (609mm) active zone - 30.4" (771mm) total length

Mounting Brackets - Supplied standard with each linear transducer

Cable Length - 40' (12m) supplied standard with each linear transducer

Time Based Stopping Performance Monitor

Model LT-1900 (Linear Based)



The LT-1900 is a time-based stopping performance monitor that utilizes a high resolution linear transducer and controller to measure the machine stopping time in milliseconds and also the SPM of the press. The linear transducer is attached to the subject machine and is driven on a 1:1 linear ratio by the machine. The machine stopping time of the machine will be displayed on every stop and can be easily read on the bright red light emitting diode (LED) display on the front panel of the unit. The SPM of the machine will be displayed during the machine cycle.

LT-1900 Stopping Performance Monitor System includes:

- LT-1900 controller (LT)
- Linear transducer with mounting brackets and magnet
- 40' (12m) linear transducer cable
- Dimensions and technical data
- Installation and operation manual



LT-1900 in NEMA 12
(IP 64) steel enclosure.

ORDERING PROCEDURE FOR LT-1900

1. Specify Mounting Style
 - E** Front Panel Mounting to be installed in an existing control panel.
 - C** Stand alone NEMA12 (IP 64) steel enclosure.
2. Specify Controller input power
 - 1** 24VDC
 - 2** 120VAC 50-60Hz
3. Specify Hydraulic Valve Coil Voltage
 - 1** 24VDC
 - 2** 120VAC 50-60Hz
4. Specify linear transducer length (must equal or exceed maximum machine stroke length)
 - 04** 4" (101mm) active length
 - 08** 8" (203mm) active length
 - 12** 12" (305mm) active length
 - 16** 16" (406mm) active length
 - 24** 24" (609mm) active length

*Over 24" (609mm) stroke required. Consult factory.

EXAMPLE PART NUMBER

LT	-	C	-	1	-	1	-	1	-	08
LT -1900		Mounting Style		Input Power		Signal Voltage		Hydraulic Valve Voltage		Transducer Length (in inches)

Time Based Stopping Performance Monitor

Model LT-1900 (Linear Based) Replacement Parts

Part Number	Description
11-001	Metal box enclosure (with gasket) (NEMA 12, IP 64)
11-073	Metal panel mount (with gasket) open frame for LT-1900
15-079	8 position mini-Euro plug connector (Linear Sensor)
20-001	1A Slo-Blo glass 3AG fuse
20-022	1A Slo-Blo nano SMF fuse
26-101	Front panel overlay (LT-1900)
32-101	Safety relay (4 pole, 12 VDC, clear)
42-001	Software microprocessor chip (specify square or rectangular)
52-002	Display board
52-084	Ribbon Cable
52-202	Transducer board
52-319	Computer / Power supply / Relay board (with CPU)
40-009	4" (10.7" - 272mm total length, 4.3" - 110mm sensor area) linear transducer with 40' (12m) cable
40-010	8" (14.7" - 372mm total length, 8.3" - 210mm sensor area) linear transducer with 40' (12m) cable
40-011	12" (18.4" - 467mm total length, 12" - 305mm sensor area) linear transducer with 40' (12m) cable
40-012	16" (22.5" - 572mm total length, 16.1" - 410mm sensor area) linear transducer with 40' (12m) cable
40-013	24" (30.4" - 772mm total length, 24.0" - 610mm sensor area) linear transducer with 40' (12m) cable
40-014	LT-1900 sensor Magnet (requires 1)
40-015	LT-1900 Sensor Mounting Bracket (requires 2)

NOTES

Machine Safeguarding Products



- Safety Light Curtains (all types and styles)
- Safety Mat Systems (all types and styles)
- Universal Safety Controller HUB / Safety PLC
- Ergonomic Palm Buttons *UltraTouch*®
- Safety Interlock Switches (explosion proof)
- Fencing with Interlocks
- Stack Lights and E-Stops
- OSHA and ANSI Compliant Controls
- Customized “control reliable” controls for dual solenoid activated pneumatic & hydraulic safety valve applications
- Energy Isolation and Single Point Lockout Systems
- Plant Surveys and Risk Assessment
- Stainless Steel Enclosures Available
- Customized Control Panels

Additional products to achieve your **Total Safety Solution!!!**

- Safety Light Curtains (All Types and Styles)
- Universal Safety Controller HUB / Safety PLC
- Safety Mat Systems and Controls
 - Area Guarding Systems
 - NSD Safety Mat Systems
 - STTS Safety Mat Systems
 - Direction of Travel Mats
 - High-Temp Welding Mats
- Ergonomic Palm Buttons
 - UltraTouch Palm Buttons
- Safety Interlock Switches (including explosion proof)
- Customized "control reliable" controls for dual solenoid activated pneumatic and hydraulic valve applications
- Fencing with Interlocks
- E-Stop Buttons
- Stack Lights

- Energy Isolation and Single Point Lockout Systems
- Plant Surveys, Risk Assessment & Installation Services
- Customized Control Panels; Stainless Steel enclosures available for all products

Punch Press / Metal Stamping Industry

- Resolver or Rotary Cam Based Clutch / Brake Controls - OSHA/ANSI Compliant
- Punch Press Automation Controllers
- Time-Based Brake Monitors
- Programmable Limit Switches
- Die Protection & Tonnage Monitoring Systems
- Servo Feed Interfaces

Press Brake Guarding and Controls

- Press Brake Guarding for Mechanical, Air Clutch and Hydraulic Press Brakes
- Press Brake Control Systems



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