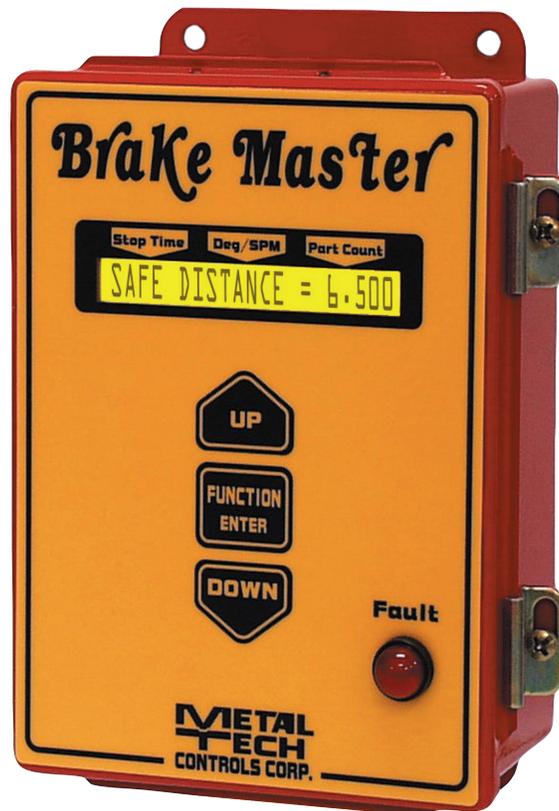


# Brake Master

**Time Based Machine Brake Monitoring**



**2 YEAR WARRANTY PARTS & LABOR  
10 YEAR CONTROLLER BOARD EXCHANGE**

**METAL  
TECH  
CONTROLS CORP.**

800-516-5516

7355 Utilities Rd.  
Punta Gorda, FL 33982

[metaltechcontrols.com](http://metaltechcontrols.com)

# Warranty

**Metal-Tech Controls Corp.** - herein after referred to as **MTCC** warrants its products to be free from defects of material and workmanship and will, without charge, replace or repair any equipment found defective upon inspection at its factory, provided the equipment has been returned, transportation prepaid, within TWO years from date of shipment. At MTCC's option: Upon receipt of a purchase order from the owner for the price of the part needing replacement or repair MTCC may opt to send a replacement part. Upon receipt of the defective part from the owner and inspection by MTCC and where the part is found to be defective by no cause of the owner a credit will be issued.

**Ten Year Controller Board exchange warranty and policy:** After the initial 2 year warranty period MTCC will replace the defective controller board for the exchange fee of \$200.00 provided the defective board is repairable. A purchase order for the full price of an exchange board must be provided to MTCC. Upon receipt of the defective board from the owner and inspection by MTCC and where the part is found to be defective by no cause of the owner a credit will be issued less the \$200.00 exchange fee.

Warranty is specifically at the MTCC's factory. Any on site service will be provided at the sole expense of the purchaser at MTCC's standard field service rates.

**THE FOREGOING WARRANTY IS IN LIEU OF AND EXCLUDES ALL OTHER WARRANTIES NOT EXPRESSLY SET FORTH HEREIN, WHETHER EXPRESSED OR IMPLIED BY OPERATION OF LAW OR OTHERWISE INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.**

No representation or warranty, express or implied, made by any sales representative, distributor, or other agent or representative of MTCC which is not specifically set forth herein shall be binding upon MTCC. MTCC shall not be liable for any incidental or consequential damages or loss arising from reduced or lost production, or expenses directly or indirect arising from the sale, handling, improper application or use of goods or from any other cause relating thereto and MTCC's liability thereunder, in any case is expressly limited to the repair or replacement (at MTCC's option) of goods supplied by MTCC.

All associated equipment must be protected by properly rated electronic/electrical protection devices. MTCC shall not be liable for any damage due to improper engineering or installation by the purchaser or third parties. Proper installation, operation and maintenance of the product becomes the responsibility of the user upon receipt of the product.

Returns and allowances must be authorized by MTCC in advance. There will be a 30 percent restocking charge on all returns. MTCC will assign a RETURNED GOODS AUTHORIZATION (RGA) number which must appear on all related papers and outside of the shipping carton.

**WARNING!** Any attempt to repair or troubleshoot MTCC's products except as limited to the user replaceable components will void the warranty and may render the product unsafe for use. MTCC's products contain complex electronics which may only be tested and repaired by an authorized MTCC trained technician.

# Brake Monitoring & OSHA Regulations

The Brake Master is designed to provide stop time monitoring for part revolution punch presses. It is designed to meet the safety regulations requirements of **OSHA 1910.211(d) and 217**.

**(b)(14):**

Brake system monitoring. When required by paragraph (c)(5) of this section, the brake monitor shall meet the following requirements.

**(b)(14)(i):**

Be so constructed as to automatically prevent the activation of a successive stroke if the stopping time or the braking distance deteriorates to a point where the safety distance being utilized does not meet the requirements set forth in paragraph (c)(3)(iii)(e) or (c)(3)(vii)(c)\* of this section. The brake monitor used with the Type B gate or movable barrier device shall be installed in a manner to detect slide top-stop overrun beyond the normal limit reasonably established by the employer.

**(b)(14)(ii):**

Be installed on a press such that it indicates when the performance of the braking system has deteriorated to the extent described in paragraph (b)(14)(i) of this section; and

**(b)(14)(iii):**

Be constructed and installed in a manner to monitor brake system performance on each stroke.

**\*(c)(3)(viii)(c):**

The safety distance (D(m)) between the two hand trip and the point of operation shall be greater than the distance determined by the following formula:

$$D(m) = 63 \text{ inches/second} \times T(m);$$

where:

D(m) = minimum safety distance (inches); 63 inches/second-hand speed constant and T(M) = the maximum time the press takes for the die closure after it has been tripped (seconds).

**OSHA 1910.217(e) Inspection and Maintenance:**

(1) inspection and maintenance records.

(i) It shall be the responsibility of the employer to establish and follow a program of periodic and regular inspections of his power presses to insure that all their parts, auxiliary equipment, and safeguarding are in a safe operating condition and adjustment. The employer shall maintain records of these inspections which includes the date of the inspection, the signature of the person who performed the inspection, and the serial number or other identifier of the power press that was inspected.

(ii) Each press shall be inspected and tested no less than weekly to determine the condition of the clutch/brake mechanism, anti-repeat feature and single stroke mechanism. Necessary maintenance or repair or both shall be performed and completed before the press is operated. The employer shall maintain records of these inspections and maintenance work performed. The requirements do not apply to those presses which comply with paragraphs (b)(13) and (14) of this section. (see b(14) previous column).

**PMA** (Precision Metalforming Association)

**Interpretation:** If a brake monitoring system is installed, weekly inspections and records are **not** required for the clutch/break mechanism.

## Brake Master Overview

The **BM 1000 Brake Master** meets all published USA OSHA, ANSI and CSA requirements.

**Brake Failure:** Each time the machine comes to a stop anywhere in the cycle a stop time test is performed. The calculated stop time is compared to a failure parameter and in the event the calculation exceeds the parameter the machine is prevented from making a successive stroke until the **Brake Master** is reset.

**Brake Warning:** To help in the proper maintenance of the machine the **Brake Master** provides a brake warning in the event the stopping time of the machine begins to deteriorate but does not exceed the failure parameter, allowing ample warning time to adjust or repair the clutch/brake mechanisms.

**Brake Time Test :** Upon installation it is necessary to perform a

stop time test of the machine to determine the brake failure parameter. This test is designed to determine the worst case machine stop performance scenario by forcing the machine to stop at ninety degrees with the heaviest upper die installed. A sequence of ten stop times are made, then the highest stop time is multiplied by 1.25 percent to determine the failure parameter and 1.10 percent to determine the warning parameter. This test can be performed at any time and as often as desired.

**Display:** The Brake Master displays the stop time in milliseconds, stop time in degrees, strokes per minute and a safe distance calculation for determining safe distance of operator controls and presence sensing safety devices

**Batch Counter:** Program batch counts and if desired perform a press top stop upon completion of the batch.

# Programming The Brake Master

Using the Brake Master Keypad: The BM1000 keypad has three keys, Up, Function/Enter, Down. The Function/Enter key has two functions. To reach the FUNCTION MENU when the machine is not running and to save a function after editing. The UP & Down keys scrolls through the menus and are used to toggle function choices. I.E. Batch Stop, selecting between 'ON or OFF'. Either of the Up or Down keys can be used to make a choice. When entering numbers a flashing cursor will appear, the UP key increments the digit where the cursor is placed, 0 through 9. Press the DOWN key to move the cursor to the next digit ( from right to left). After the last digit, (left most) the cursor will return to the first position.

**PASSWORDS:** Some functions require passwords to edit. 1234 is the temporary password. Change it to your own secret password immediately. If you leave the FUNCTION menu you will have to re-enter your password.

**Password:** Scroll to CHANGE PASSWORD enter 1234, press ENTER, enter your new password, press ENTER

**Automatic Stop Time Test:** Install your heaviest upper die in the machine. Place the ram at top dead center (TDC). Set the machine to INCH. Press the FUNCTION key. Scroll to 'STOP TIME TEST' press ENTER, the message 'MUST BE @ TDC' will appear. Make certain the ram is at top dead center then press ENTER. 'TEST IS READY' will appear briefly and then TEST CYCLE - 1' will be displayed. Holding the palm buttons in, cycle the machine. It will stop automatically at 90 degrees and briefly display the stopping time in milliseconds. Release the palm buttons and then press them again, the machine will cycle completely around until it stops at the 90-degree position. The display will print the second stop time in milliseconds. Do this for ten cycles. After the 10th cycle the control will display the highest stopping time. Press ENTER to accept. The control will display the 'STOP MAX = xxx'. Press ENTER, the control will display the 'BRAKE WARN=xxx', press ENTER. Press ENTER again and the display will return to the 'RUN' mode.

**Safe Distance:** To display the minimum safe distance where the light curtains or the operator station should be placed from the nearest pinch point. Scroll down until the 'SAFE DIS = xx.xx in' screen is displayed. The distance shown is the OSHA formula, 63 inches per second times the stopping time in milliseconds, plus the processing time of the Brake Master. You must add any penetration factor and the reaction time of the light curtain control. (Penetration is the depth in inches to which a body part could be inserted into the light curtain beams without causing a fault).

**Lost Motion:** The BM 1000 monitors the motion of the machine. If the machine is initiated to run and the controller

does not receive signals from the sensor, a LOST MOTION fault will occur. The machine will be disabled until the BM 1000 is powered down. A setting must be programmed for a reference time. Scroll to 'MOTION Stg.=xxx', press ENTER and enter the new setting. The setting is in milliseconds, 1000 represents one second. Set it as low as possible without causing nuisance faults. Press ENTER to save it. Setting the Lost Motion to high could result in serious injury to personnel. SET IT WITH CAUTION!

**SPM or DEGREES:** To select whether the screen displays stopping time in degrees or strokes per minute, scroll to 'DEGREE/SPM=DEG' to change it press ENTER. 'CHG DEG/SPM DEG'. Press ENTER. Press UP or DOWN to change the setting. Press ENTER to save it.

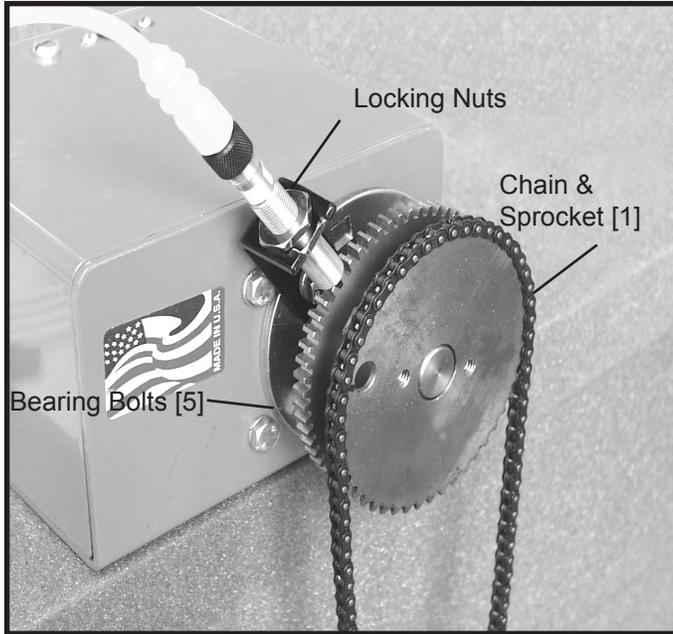
**Stop Max:** The 'Stop Max' setting is the stop time parameter that was saved when you did the stop time test. If you find that the stop time is too high or low, you may adjust it. To change the STOP MAX setting scroll to 'STOP MAX=xxx' press ENTER change the setting. Press ENTER to save. WARNING! Setting the Stop Max to high could result in serious injury to personnel. SET IT WITH CAUTION!

**Batch Count Setting:** Scroll to 'SET BATCH COUNT'. Press ENTER. 'UP=SET/DOWN=HOLD' appears. To change the setting press UP. Enter the batch count desired and press ENTER. If you don't want the counter to function, set it to zero.

**BATCH COUNT HOLD:** To suspend counting temporarily, press DOWN, Press UP or DOWN to toggle between Counting and not counting.

**Batch Stop:** When the batch count is reached the display will show 'BATCH DONE' and flash the red indicator lamp. You can also TOP STOP the machine when the batch is complete. Scroll to 'BATCH STOP = NO', press ENTER. A new screen will display - 'CHANGE STOP = NO'. Press UP or DOWN to change the setting.

# Installation Instructions



The timing gear [2] has two 1/4" holes for attaching it to the hub of the chain sprocket and a keyway for aligning the sprocket and the sensor gear.

## Installing the timing gear.

The machine must be at top dead center (TDC). If it isn't, move it to TDC before proceeding.

Remove the chain and sprocket [1].

Reverse the sprocket and slide it back on to the shaft with the hub facing out. Slide it back on the shaft enough so that 1/4" of the key is exposed.

Put the sensor gear [2] on the shaft and up against the hub of the sprocket [1].

Clamp the two together with a 'C' clamp or other suitable device.

Using a 1/4" transfer punch or a hand drill with a 1/4" bit, mark the center locations of the mounting holes in the sensor gear [2] on the sprocket.

Remove the clamp and sensor gear and drill the two holes using a #7 bit, drill through the sprocket hub. Tap the holes using a 1/4-20 tap.

**NOTE:** It is recommended that the sprocket be removed from the shaft and drilled on a drill press rather than by

hand to make sure the holes are drilled straight.

Using the two 1/4-20 x 3/4" SHCS that are supplied with the sensor gear, bolt the sensor gear to the face of the hub. **NOTE:** Do not use substitute bolts - the ones supplied have a thread lock for preventing them from coming loose and backing out.

Decide where it would be best to locate the sensor 'L' bracket [3]. Keep in mind, routing of the wire and any possible physical obstructions.

Remove one of the bearing retaining flange bolts [5] from the cam box and bolt the sensor bracket on using the supplied 5/16 x 3/4" bolt and lock washer.

Slide the assembly back onto the cam shaft with the sensor gear [2] facing in as shown and secure it in place.

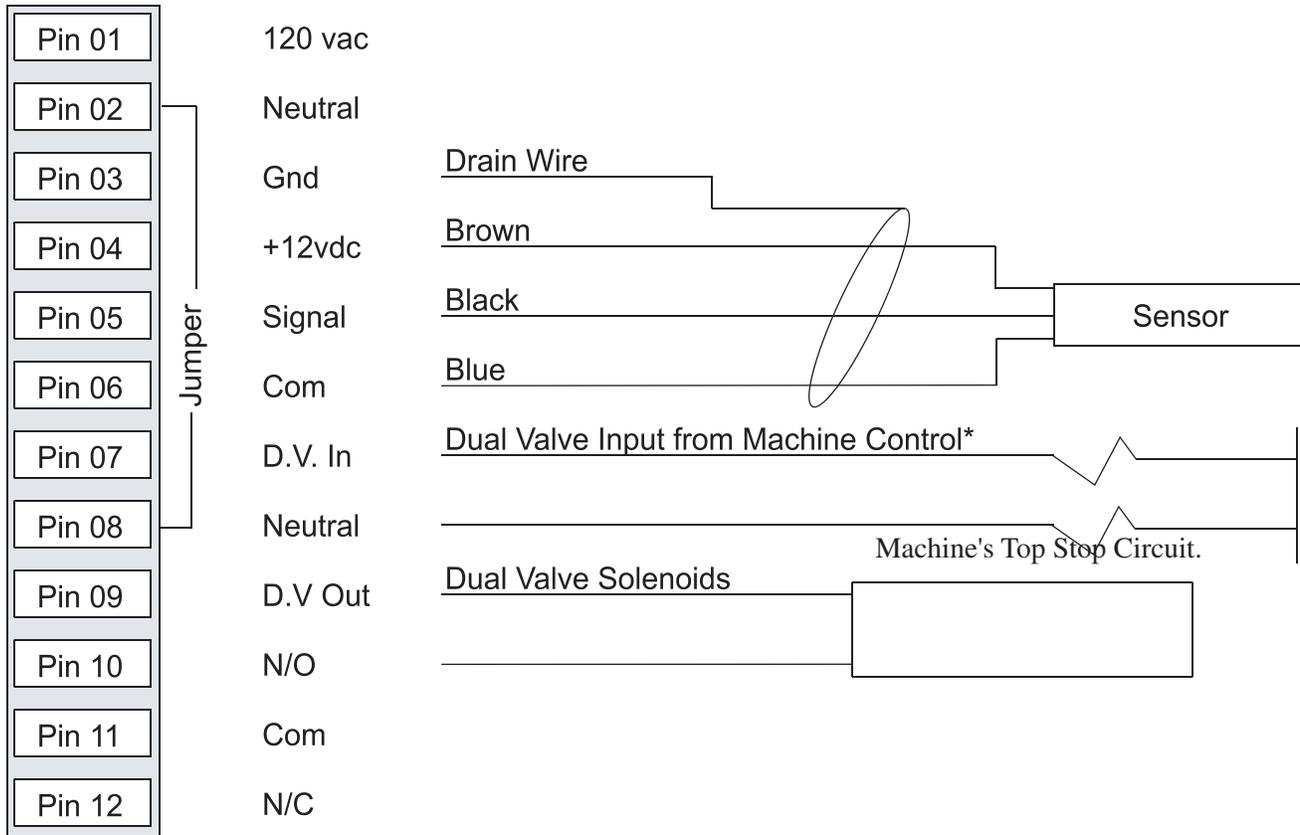
Install the sensor [4] in the slot of the sensor 'L' bracket with



one locking nut on each side as shown. Using a gap gauge adjust the gap between the sensor face and the sensor gear to about 0.30. (thickness of a match book cover) Secure the locking nuts. Attach the sensor cable and route the cable to the Brake Master.

**Caution!** Route the cable away from any AC wires. Use the supplied cable clamps to secure the cable to the machine.

# Wiring Diagram

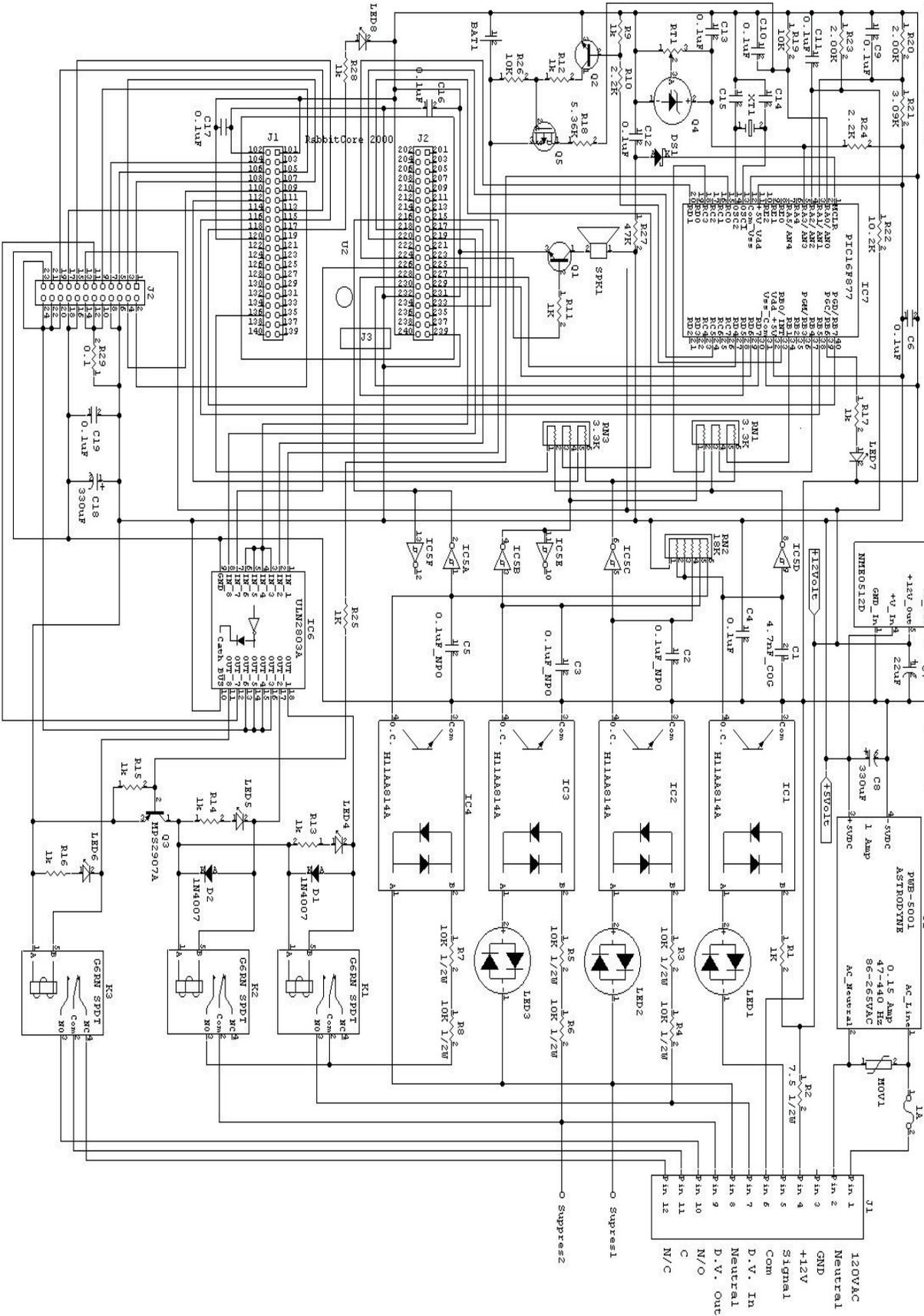


\* This input has to be the last circuit before the Dual Valve Coils. There should be **no other relays, switches or contacts between this circuit and the Dual Valve Coils!**

\*\* Typically, top stop circuits are N/C. Pressing the top stop push button, opens a circuit and the machine stops at the top of stroke. If this is true with this machine, wire the circuit through the N/O contacts. The BM 1000 holds this relay closed during normal operation. Otherwise wire the circuit through the N/C contacts.

# Controller Board Schematic

PCB 10X



# Error Messages

# Trouble Shooting

The Brake Master displays most error messages on the display. Some errors may be detected by the secondary processor. The secondary processor is a backup providing the necessary redundancy for fail safe operation.

<b>Stop Time Exceeded:</b> When the machine came to a stop the stopping time exceeded the preset stop fault parameter.	The machine's brake is wearing and needs adjustment of repair.
<b>Stop Time Warning:</b> same	The clutch is dragging ( not releasing quick enough)
	The counterbalance is not properly adjusted.
	The upper die is heavier than the one used for the initial stop time test.

<b>Lost Motion:</b> The machine was initiated to run or the machine was running and the Brake Master did NOT detect rotational movement from the sensor.	The cam switch chain broke or slipped off the sprocket or the sprocket is slipping on the shaft..
	The sensor/sensor gear gap is set too wide.
	The sensor cable is disconnected or broken.
	The sensor is defective. Call Factory

<b>Power Failure:</b> Momentarily POWER FAILURE is displayed, then the control tries to reset.	Power to the controller is below 4 volts DC. Check the 110 VAC supply power to determine if it is above 80 VAC.
	Power supply is defective. Call Factory

<b>Sensor Power Fail:</b> Power to the sensor is below 12 VDC.	Defective sensor.
	Shorted cable.
	Defective DC/DC converter. Call Factory

<b>PIC FAILURE - 'x':</b> X will equal 1,2,3 or 4	Powering 'OFF' and back 'ON' very quickly can cause the two processors to fail the start up cross-check.
	If it persists. Call Factory

# Notes